MAXX-2470HD

BROADCAST TIME DELAY

Operations Manual
Model 2470-HD Time Delay

360 Systems® BROADCAST

Operations Manual

Model 2470-HD Time Delay

Version 1.04.526
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100-145-0020 MAXX-2470 HD Time Delay UM

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Safety Notices

Safety Terms and Symbols

The following warning symbols are used in this manual

English	ATTENTION: refer to owner's manual for important information.
Français	ATTENTION: veuillez vous référer au mode d'emploi pour une information importante.
Italiano	ATTENZIONE: fate riferimento al manuale per informazioni importanti.
Español	ATENTCION: favor de referir al manual de operacion por informacion importante.

English	WARNING: electrical shock hazard.
Français	AVERTISSEMENT: danger de choc électrique.
Italiano	AVVERTIMENTO: pericolo di shock elettrico.
Español	ADVERTENSIA: peligro de choque electrico.

General Safety Caution

Heed the following important cautions regarding the 2470 HD-Time Delay in order to avoid personal injury or equipment damage.

Only qualified personnel should perform installation and service. Refer to appropriate sections of this product manual for instruction. Contact 360 Systems Customer Support for further explanation, or to clarify any uncertainty.

Disconnect the power cord before removing the cover.

Personal Injury Precautions

To avoid electric shock, do not operate this product with cover removed.

To avoid risk of fire, replace the power cord only with same type and rating as specified. Replace damaged power cords immediately.

This product is grounded through the grounding conductor of the power cord. To avoid electric shock, do not remove or modify the contacts on the plug.

Prevent the power cord from being walked on, pinched, or abraded.

To reduce the risk of fire or electric shock, do not expose this unit to rain or moisture.

Remove jewelry, such as rings, watches, or necklaces before servicing this equipment.

Product Damage Precautions

The 2470 HD-Time Delay contains hard disk drives and other fragile electronic and mechanical devices. While this product is very reliable, it is still vulnerable to shock. Handle it with care, and exercise caution not to drop or bump the recorder as damage to internal components may result. Turn off power before moving the Time Delay.

Do not obstruct air vents. Maintain an ambient temperature below 30°C (86°F).

Clean only with a soft cloth dampened with water. Do not spray cleaners or solvents directly on the product.

CAUTION:

Replace battery only with the same, or equivalent, battery type. Follow all local laws regarding the disposal of BR and CR Lithium batteries. Batteries should be fully discharged prior to disposal.

CAUTION:

Never use the rear-panel power supply switch to shutdown the Time Delay. Doing so may cause errors in the hard disk array. Should this happen, the array can be reinitialized without any data loss; however, the process may take several hours. Shutdown the system only by momentarily pressing the front panel reset button, or through the On-Screen user interface.

Product Registration

Important: As the owner of new capital equipment, you will want to take advantage of product information, enhancements, upgrades, or notifications issued by 360 Systems. Send in your Warranty Card so 360 Systems can remain in contact with you. Mail or fax it to 360 Systems offices in the USA at the address on page 52.

Product Improvements and Upgrades

360 Systems reserves the right to make changes and/or improvements to its products without incurring any obligation to incorporate such changes or improvements in units previously sold. Certain features mentioned in this document may not be present in all models. Time Delays are not offered for sale in all countries.

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2470-HD Time Delay

Introduction

360 Systems 2470 HD-Time Delay is a high-quality program delay for television broadcast, satellite delivery, and other applications requiring a user-settable delay time for video, audio, and ancillary data. Applications for the delay include:

- Compensation for time zone differences, where a program is received at a different time than when it needs to air.
- Program origination delays, where content is time-shifted prior to transmission or distribution.
- "+1" channels that allow cablecasters to offer multiple feeds of the same program content to maximize channel exposure with limited additional cost. Viewers can choose to see a variety of different shows in their chosen viewing time, or see an immediate repeat of a show that interested them simply by changing the channel.

The can be thought of as a black box that records video, audio, and specific ancillary data information; it then delays the playback of the program by a user-selectable time period. Whatever goes in, comes out later.

The Time Delay will operate as a set-and-forget box with no user intervention. On restarting after a power failure, it will again start delaying the input according to the most recent user settings. The delay time is user-programmable from 6 seconds to greater than 8 hours. The programmed delay interval is frame-accurate over an indefinite time period; if several Time Delays are fed identical input signals, they will remain in sync indefinitely.

The Time Delay employs high quality, visually lossless JPEG2000 video encoding at 100 Mb/s. JPEG2000 is an ideal codec for this application, providing superior final image quality when used in conjunction with other codec processes such as MPEG or H.264 for satellite transmission and cable distribution.

16 embedded audio channels are provided. Alternately, two +4 dBu analog channels are available. Audio I/O is on chassis-mounted gold-plated XLR-3 connectors. Available options allow for 8 channels of AES/EBU.

ATC Time Code is reproduced, as well as up to 12 selectable lines of Vertical Interval Ancillary (VANC) data. (In 1080i 6 lines from field 1 are selected, and the corresponding lines in field 2 are automatically selected.)

Time Delay Features

- Functions in a stand-alone configuration with no external machine controls, and requires no third-party software.
- Operates unattended for long periods of time. No operator intervention or file maintenance required for continuous operation.
- All settings are non-volatile, allowing unattended restart on power-up. The unit automatically reconfigures itself for the last-specified delay time, and re-enters the record/playback cycle.
- System configuration is accomplished through a GUI interface using a local keyboard, mouse and VGA monitor.
- Allows user to specify a frame-accurate delay time, such that multiple units will play back in frame-accurate sync when fed identical input video.
- RAID-5 hardware-based drive array protects stored data against a single drive failure.
- 1 HD-SDI program input.
- 1 E-E monitor output, 1 delayed program output. HD-SDI and HDMI connectors provided. Each output appears on both HD-SDI and HDMI simultaneously.
- Records video in 10-bit JPEG 2000, at 100 Mb/s for visually lossless picture quality.
- Records user-choice of audio sources: 8 stereo pairs SDI embedded, or 1 stereo pair of +4 analog. XLR-3 connectors are provided on the rear panel. In addition, 4 stereo pairs AES/EBU digital are selectable with the addition of the optional DXP-5.
- Compatible with Dolby® surround encoding.
- Captures and plays ATC (Horizontal ancillary time code).
- Synchronizes to video input.
- Upon loss of input video, records black and uses internal reference until input is restored.
- Outputs black and audio silence during the recording interval preceding the desired program output delay.
- Captures and plays 12 selectable lines of VANC data.
- Front panel status LEDs: genlock, power, fan failure, drives(RAID) , system errors.
- System Monitor signals available from GPI Outputs to indicate RAID status, fan failure, system errors, and loss of input.
- 2 rack-unit (3¾″) height. Forced-air cooling.

Installation

Unpacking

Your 2470HD Time Delay has been carefully inspected and calibrated before shipment to allow immediate operation upon installation. Check all items for signs of visible damage which may have occurred during shipment. If any item is damaged, contact the carrier to file a claim.

Keep the packing materials in the event that the unit must be shipped. If the original packaging is not available, make sure that the following criteria are met:

- Packaging must be able to withstand the product weight.
- Product must be held firmly within the package.
- There must be at least two inches (50mm) of space between the product and outer container.
- The corners of the product must be protected.

Package Contents

Confirm that all items on the packing list have been received. Contact 360 Systems if any item is missing.

- ✓ Model 2470HD Time Delay
- ✓ Keyboard
- ✓ 2-Button Wheel Mouse.
- ✓ Software backup on USB memory stick
- ✓ Operations Manual
- ✓ Power cord
- ✓ Warranty Card

The Time Delay is not shipped with a video monitor. Select a VESA-compliant CRT or LCD monitor capable of a refresh rate of at least 75 Hz. **Note that the Time Delay may not start correctly if an unsuitable monitor is connected.**

If you own more than one Time Delay, it may be appropriate to use a single keyboard, monitor, and mouse with a KVM switch to select between units. Not all KVM switching systems are compatible. The KVM switch must supply an active signal to the Time Delay at all times, even when switched away from it. When first powering up the Time Delay, use only the supplied keyboard and mouse directly connected. Then test the KVM switch system that will be used thoroughly before installation is completed. **NOTE: If the mouse and keyboard connections are interchanged, the Time Delay may not boot up properly.** Be especially careful about this when using extender cables.

Rack Mounting

There are four adhesive-backed rubber feet on the Time Delay. These may need to be removed when rack mounting the unit.

Cables attached to the rear of the Time Delay should be supported by the rack mounting rails. Do not support substantial cable weight from the Time Delay.

Remove the front panel to expose the rack screw slots. Fasten the Time Delay into the rack. Replace the front panel. Tighten the front panel access screws.

Important Installation Notes

System Cooling

When many pieces of equipment are mounted in an equipment rack, a considerable amount of heat may be produced, which must be removed efficiently. Further, a lower operating temperature will make equipment operate more reliably, and it will last longer. In the extreme case, excessive temperatures cause rapid equipment failure, and damage which can be difficult to repair.

Heat in an equipment rack should be removed by forced air. This is often accomplished by blowers installed in the top of the rack, venting into the room. An alternative is to draw hot air from the top of the rack into an air-conditioning return duct, and not vent it into the equipment room; cold air should be ducted into the bottom of the rack.

The optimum air temperature for cooling electronic equipment is 25° C (72° F). When many pieces of equipment are contributing to the heat load, a substantial air-flow will be needed, and the inlet temperature may need to be lower.

Check These Points

- Are all ventilation holes in the Time Delay free of obstruction?
- Can blowers or HVAC system adequately remove heat from the equipment rack?
- Have you measured the actual temperature inside the rack? Do this near the top.
- Verify that the HVAC system is not on a timer that can shut off on weekends or holidays.
- What procedures are in place to protect the equipment when the HVAC system fails?

Power Conditioning

It is good practice to operate an on-air video Time Delay from an Uninterruptible Power Source, or UPS. All utility power systems experience occasional transient events, including brownouts and dropouts, which are capable of taking the Time Delay off the air. It is the station operator's job to plan for and overcome such contingencies.

UPS units suitable for smoothing short-term power line problems come in two varieties:

Change-over UPS Design

This design senses drop-outs and low line voltage, and switches its output to an internal inverter operating from a battery. This UPS is low in cost, and is most often used in non-critical applications such as desk-top computers. A disadvantage is that it may create its own power transients when switching between utility power and its inverter supply. For this reason **360 Systems does not recommend this type for use with the Time Delay.**

Continuous Conversion UPS Design

This improved design continuously converts utility power to DC, stores it in a battery, then produces isolated AC power from an inverter. It never switches, and is immune to input transients, brownouts, and blackouts. Models are available with batteries of almost any size, making the continuous-conversion UPS suitable for transient suppression or long-term operating power in the absence of utility power.

Recommended UPS Models

The following makes of continuous conversion UPS systems are suitable for use with 360 Systems' video products:

APC Smart-UPS 2200-XL

Eaton/Powerware Corporation, Model 9125, www.powerware.com

This unit is available in several different configurations to accommodate various current load and power failure support times.

The minimum requirement for maximum current load for a single Time Delay is 2 amps.

Operating Environment

A Time Delay is a critical element in broadcast operations. Its installation should safeguard it from every external event that can interfere with it doing the task expected of it. 360 Systems' engineers have experience with thousands of installations, and have become aware of a number of environmental factors that can adversely affect performance. Two of these have already been discussed: power conditioning and inadequate cooling. Two others, less obvious, should also be considered:

RF Interference by Cell Phones

Many people are not aware that cell phones can attain a very substantial power output, even when no conversation is taking place. You may have experienced the effect of a cell phone interfering with a common desk phone placed nearby. Carrying a cell phone into a machine room where it is in close proximity to broadcast equipment and its associated wiring is unwise. They are able to interfere with serial control commands, video synchronization, and in some cases can crash the CPU in equipment.

Some major broadcasters prohibit the carrying of cell phones into certain machine areas. 360 Systems believes that the risk of undesired equipment behavior from their RF fields is very real.

Static Discharge

Static electricity discharge is accepted by most people as an inevitable consequence of living in a dry area. It is, rather, a result of floor coverings that may enhance appearances, but are inappropriate for use around critical pieces of broadcast equipment. Static discharge can do two adverse things:

- Discharge into a connector can—and will—destroy internal circuitry of equipment. The result will always be difficult to diagnose and repair.
- Discharge to equipment frames or wiring can crash a CPU and take the station off the air. The event may seem random or unrelated to static, but it is clearly a catastrophic event—and one that can repeat indefinitely as humidity varies.

Several steps can be taken to protect equipment from static discharge:

- Do not install critical broadcast equipment in a room with carpeting.
- Connect equipment racks directly to an earth ground with a heavy copper conductor.
- Do not operate equipment with a lifted safety ground (green frame ground).
- Install a humidifier, if necessary, to reduce the likelihood of static discharge.

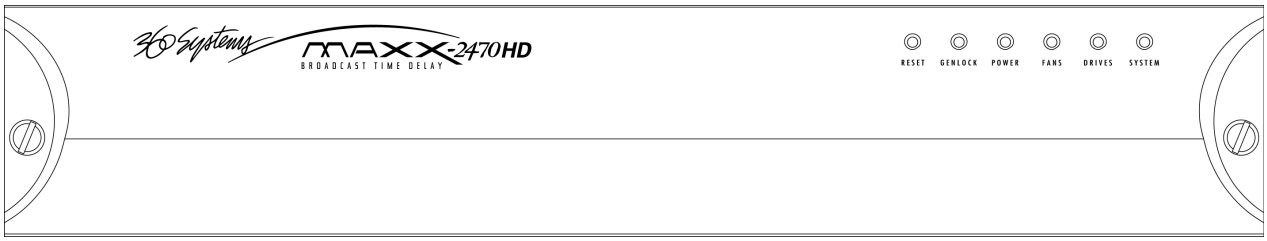
About Time Delay Software

The Time Delay is shipped with its application programs and operating system installed.

The first time that it is started, it must be connected to a keyboard, monitor and mouse. The Time Delay will ask you to accept the Software Licensing Agreement before it will operate. This screen will only appear during the initial startup.

If for any reason it becomes necessary to reinstall any software, refer to the *Software / Firmware updates* chapter on page 374 for instructions.

Front Panel Features



Reset button

The recessed **Reset** button initiates start-up and shut-down of the 2470HD Time Delay. Press it momentarily to start the Time Delay. A sequence of start-up screens will appear, ending with the graphic user interface.

When the Time Delay is running, pressing the **Reset** button momentarily will cause the system to begin an orderly shutdown. This can also be initiated from the GUI by selecting **START > SHUTDOWN > SHUTDOWN**. In most cases the power will shut off automatically, however if the front panel lights begin to blink the file system has been properly closed and it is safe to force the power off by holding the front panel button in for 4 seconds.

In the event that the system has stopped responding to commands and will not shutdown, hold the button in for 4 seconds to force a power down.

Do not use the rear panel switch on the power supply to shut down the Time Delay. Abrupt power loss can cause loss of information stored on the disk array. The rear panel power switch can be used to prevent re-application of power during service procedures once the normal shut down sequence is complete.

CAUTION:

LOSS OF DATA CAN OCCUR IF THE POWER IS TURNED OFF WITHOUT A SHUTDOWN.

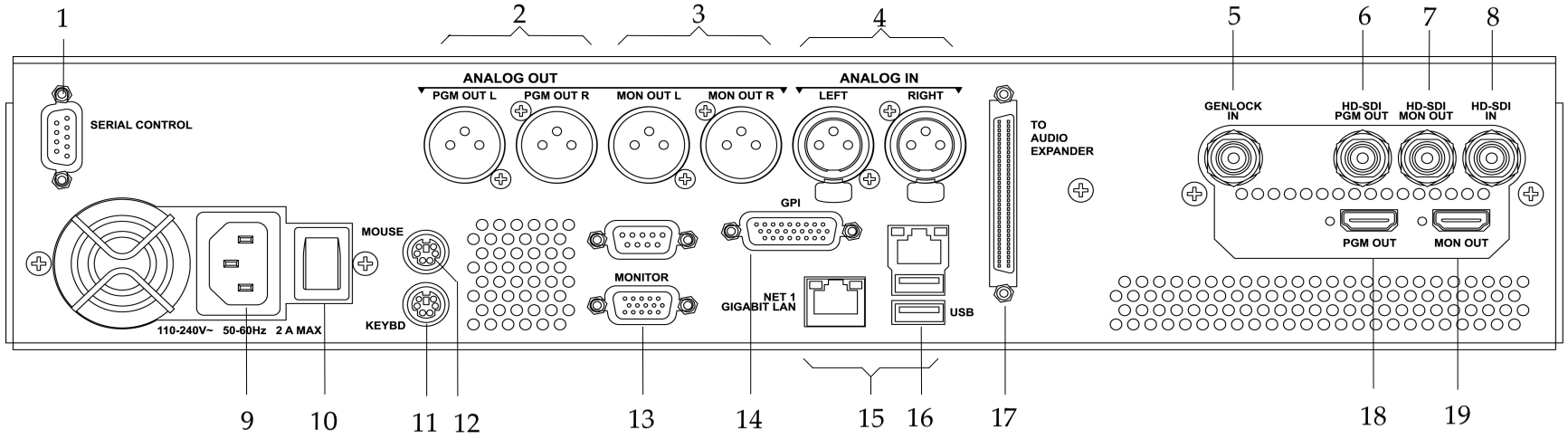
USE THE FOUR SECOND SHUTDOWN ONLY IF THE SYSTEM IS NOT RESPONDING OR THE SHUTDOWN PROCESS DOES NOT TURN THE POWER OFF AUTOMATICALLY.

Indicators

Five blue LED Status Indicators appear on the front panel. These indicators are illuminated continuously or are dark when the system is functioning normally. Error conditions are indicated by flashing. See the table *Front Panel Indicators* on page 37 for diagnostic meanings.

The Status Indicators are also available as GPI outputs, along with an additional output warning for loss of input. See *GPI connector* on page 29 for details.

Rear Panel Drawing



1. Serial control port (EIA-422) (Future use.)
2. (2) XLR-3 audio outputs
3. (2) XLR-3 audio monitors
4. (2) XLR-3 audio inputs
5. Genlock Input (Future Use)
6. HD-SDI main Program output
7. HD-SDI E-E monitor output
8. HD-SDI video input
9. AC Power connector
10. AC Power switch
11. Keyboard port
12. Mouse port
13. SVGA monitor port
14. GPI port, 26-pin female
15. Gigabit Ethernet ports (Use NET1 only.)
16. USB Ports (Use only for program updates)
17. Audio Expander connector
18. HDMI main Program output
19. HDMI E-E monitor output

Rear Panel Connectors

The Time Delay provides one video input with up to 16 Embedded audio channels, one delayed video output with audio, and a second monitoring output which reflects input video and audio (E-E).

Additionally, there are two analog audio inputs that can be used instead of embedded audio. These correspond to audio channels 1 and 2, and appear in the embedded audio on the video outputs and the XLR outputs. The XLR audio outputs will also carry audio channels 1 and 2 when embedded audio is selected as the input source.

The HDMI outputs carry audio channels 1 and 2 when either embedded or analog audio is selected. Audio from other channels cannot be output by either Analog or HDMI audio.

Rear Panel Designation	Connector Type	Function
HD-SDI IN	BNC	HD-SDI Video Program Input
HD-SDI MON OUT	BNC	HD-SDI E-E monitor out
MON OUT	HDMI	Local E-E monitor
HD-SDI PGM OUT	BNC	Main HD-SDI Video Program Out
PGM Out	HDMI	Local Program output
ANALOG IN LEFT	XLR	Audio Channel 1 Input
ANALOG IN RIGHT	XLR	Audio Channel 2 Input
ANALOG PGM OUT L	XLR	Audio Channel 1 Main Program Out
ANALOG PGM OUT R	XLR	Audio Channel 2 Main Program Out
ANALOG MON OUT L	XLR	Audio Channel 1 E-E Out
ANALOG MON OUT R	XLR	Audio Channel 2 E-E Out
GPIO	DB-26	Error Monitor outputs
GENLOCK	BNC	Future use
NET 1	RJ-45	Gigabit Ethernet (for diagnostic use)
Serial In	DB-9	future use
Other Motherboard I/O	various	future use

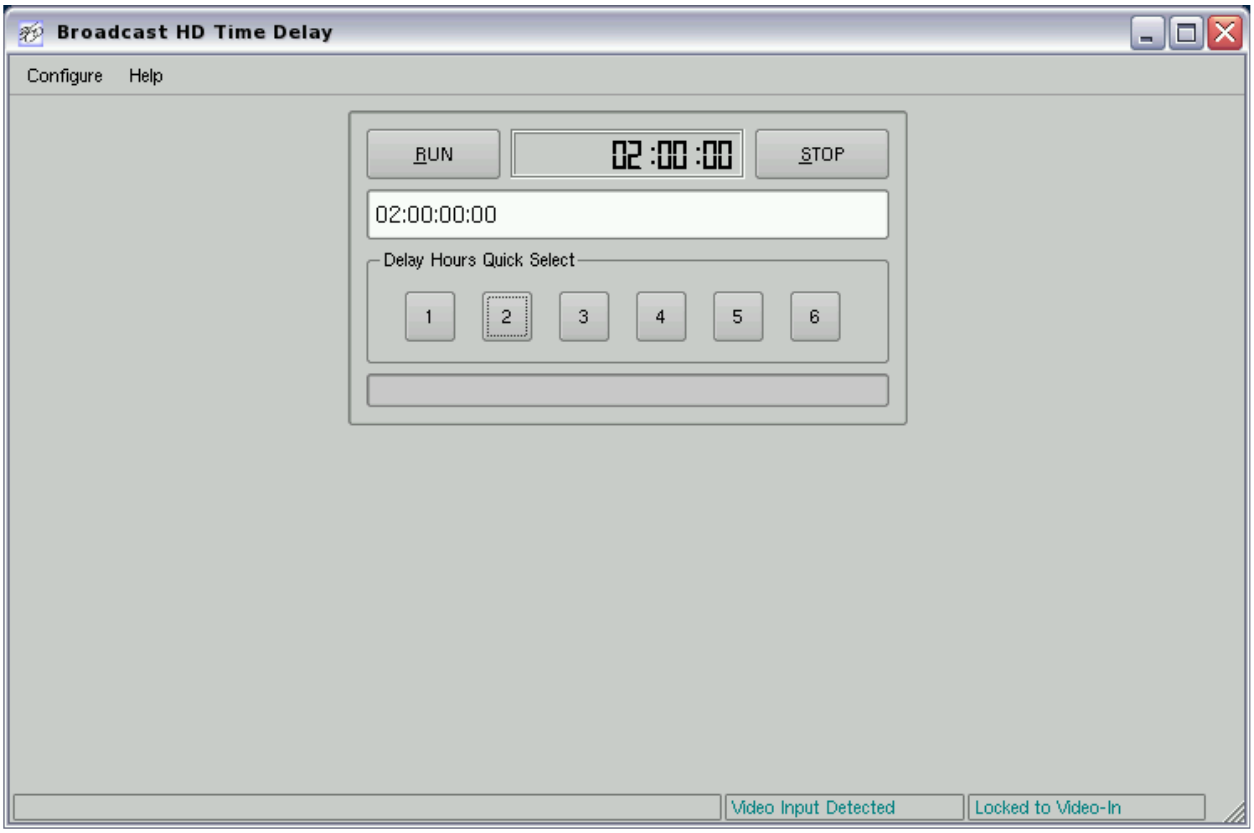
Operations

The Graphical User Interface

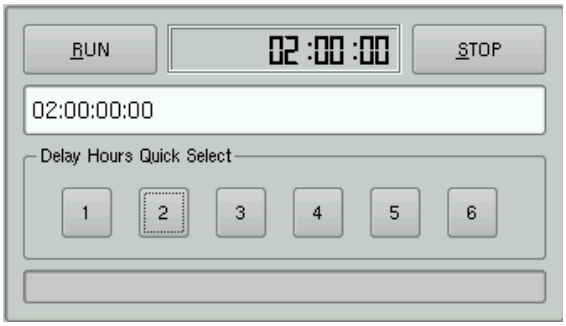
The Time Delay uses a Graphic User Interface (GUI) to control most functions. A keyboard and mouse are included, and the user needs to supply an SVGA monitor—either CRT or flat-panel.

The GUI is divided into two sections: Run/Stop control, and Time Delay Set. Controls and displays for each section are described below.

In addition, the Menu Bar provides two dialogs, accessed through **Configure > Options**, and **Help > About**.



Graphical User Interface



Run, Stop, Time to Air display
Time Delay Setting and Quick Select Presets

Run/Stop Control

Run

The **RUN** button initiates or restarts the time delay process. Press **RUN** to begin a new delay cycle, and restart the Time-to-Air countdown. When the countdown reaches zero, it changes to ON LINE, and the delayed video begins playing from the main Program Output.

Upon power up the Time Delay will automatically enter Run mode and start the delay process.

Stop

The **STOP** button stops playout and clears stored program content from memory. Note that the Time Delay value can only be changed when the machine is in the **STOP** mode.

Time to Air

Initially, the Time to Air display shows the selected Time Delay Setting. Once **RUN** is pressed and the recording process sets up and commences, Time to Air is a countdown value, displaying the time remaining before delayed program material reaches the output. It is an approximate display value; it is not directly locked to the video timing.

Time Delay Setting

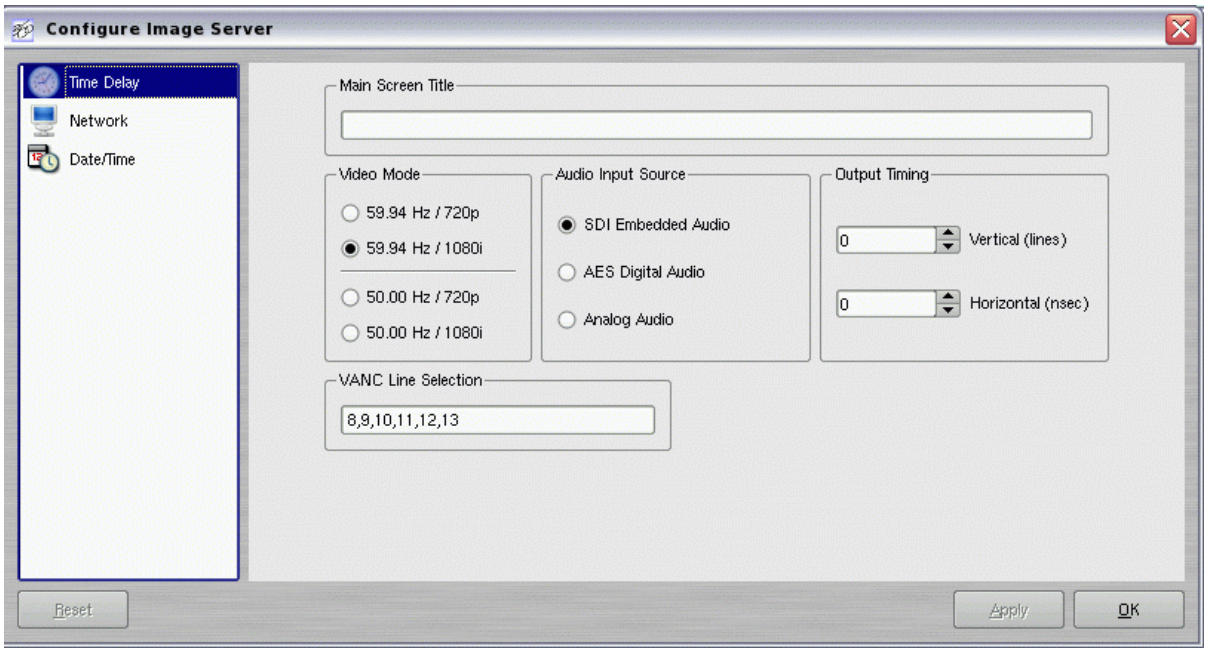
Delay time is entered and displayed in the **DELAY TIME** window in HH:MM:SS:FF format. (Hours:Minutes:Seconds:Frames) The desired time is entered from the keyboard from left-to-right.

Delay times may also be entered as whole units of seconds, minutes, hours, by appending a suffix, (s, m, or h) to the value entered into the text box, such as “120m” or “30s.”

Delay Hours Quick Select

Six preset buttons provide a rapid way to set a delay time to an even number of hours from 1 to 6. With the machine stopped, clicking on one of these buttons will immediately load that time value, expressed in hours. An appropriate number of zeros will also be entered for MM:SS:FF. The presets are not active while the machine is running.

Configure Options Dialog



Configure Options Dialog

Main Screen Title

This allows a user selected title to replace the default "Time Delay" in the title bar of the main GUI window.

Video Mode

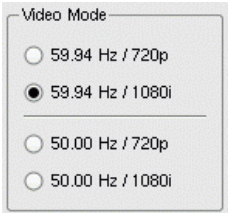
Four radio buttons select the Video Mode, which includes the frame rate and video format. These are:

59.94 Hz / 720p

59.94 Hz / 1080i

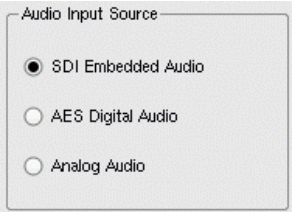
50 Hz / 720p

50 Hz / 1080i



This setting can only be changed when the Time Delay is stopped. When it is changed, the unit will display a warning and then automatically perform a quick restart to initialize in the newly selected mode.

Audio Input Source



Three radio buttons select the input source for audio. These are:

SDI Embedded Audio

AES Digital Audio (when optional DXP-5 interface is connected)

Analog Audio

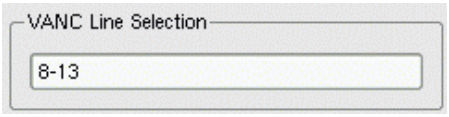
The Analog audio inputs are the pair of +4 dBu analog XLR inputs on the rear panel.

This setting can only be changed when the Time Delay is stopped.

Regardless of the input selected, audio will always appear in parallel, both in the embedded audio HD-SDI stream, the analog XLR outputs and the optional DXP-5 AES/EBU outputs. The input selection affects how many channels are available. With Analog, channels 1 and 2 are active and channels 3-16 will carry silence on embedded audio and AES/EBU outputs. With AES/EBU selected, channels 9-16 of the embedded audio output will carry silence.

The 2470HD Time Delay supports embedded audio in groups 1-4, which includes Audio Channels 1-16, providing 24-bit,
48 KHz, synchronous audio, as per SMPTE 299M.

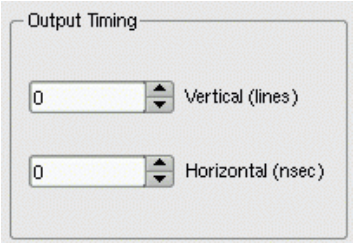
VANC Line Selection



This field accepts either a comma separated list of specific line numbers, or the limits of a range separated by a hyphen as shown here.

- In 720p operation, up to 12 lines can be specified. Valid line numbers are in the range of 1 to 25.
- In 1080i operation, up to 6 lines can be selected from field 1; the corresponding lines in field 2 will automatically be recorded. Valid line numbers in 1080i are in the range of 1 to 20.

Output Timing



This controls the timing relationship of the output to the reference, which is the input video. (The GENLOCK input is not active and is reserved for future use.)

Note that these timing adjustments apply only to the Delay output, not the Monitor output. The monitor outputs are designed for confidence monitoring only, and are not timed.

In most applications these adjustments are not necessary. They are only used in environments where the output must be adjusted to match other timed equipment, for example when using a switcher or video mixer that requires precise timing alignment.

Both adjustments are made by using numeric entry from the keyboard or the Up and Down Arrow buttons next to the parameter's numeric display.

The Output Timing values are the only parameters that are adjustable while the Time Delay is in RUN to allow timing while in operation. Adjustments take effect immediately without using Apply or OK, allowing the effects to be seen easily. The picture will blank while the change takes effect.

Vertical (Lines)

Adjusts the output line timing in relation to the reference, by an amount equal to one complete line. The adjustment range is -4 to +30 lines.

Horizontal (nsec)

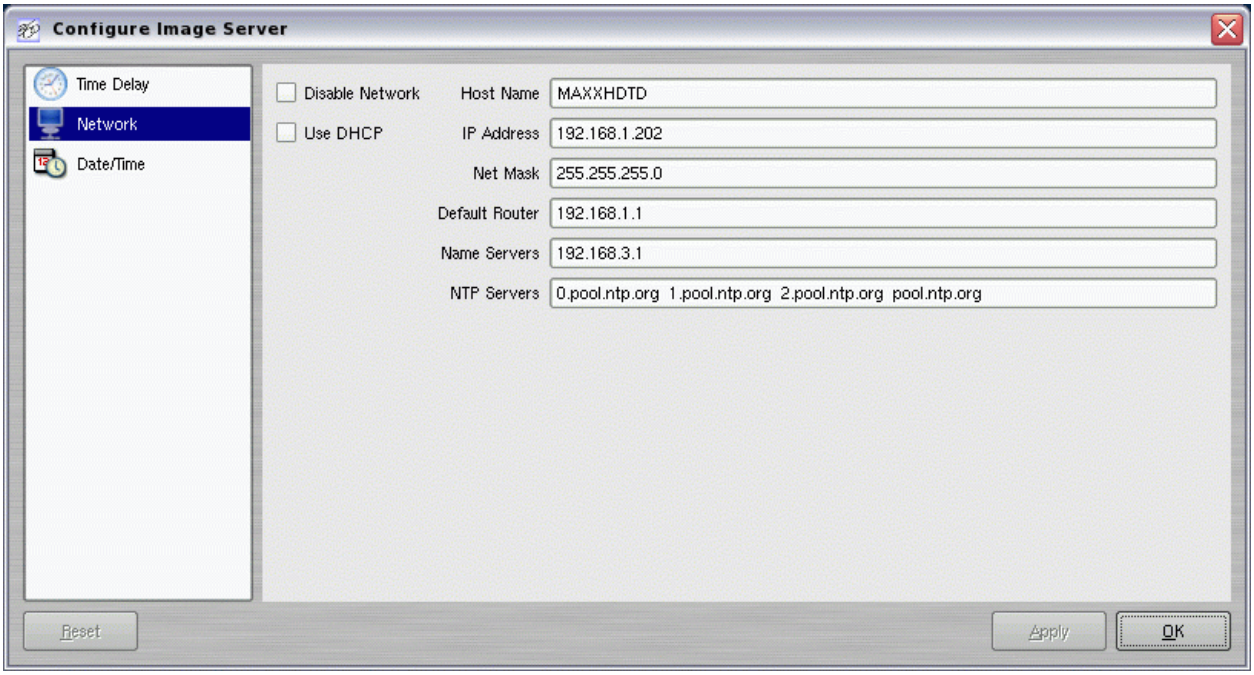
Adjusts the output line timing in relation to the reference, by an amount equal to one half pixel. The adjustment range is ±100,000.

The Up/Down Arrow buttons increment in steps of 10 nsec.

Configure Network

Network parameters are set in the Configure Network dialog. Network communication for the Time Delay is designed primarily to support access to error logs and factory diagnostics. It can also support automatic time updates using the NTP protocol. The system time is used only in the diagnostic system message logs, it does not affect the operation of the Time Delay in any way.

Use only the NET1 connection on the rear panel to connect to the network. Make no connection to NET2.



Configure Network dialog

Use the Configure Network dialog to configure network communication settings.

From the Main Menu selection bar at the top of the screen, select **Setup > Options**, then in the window on the left select Network.

Each Time Delay is shipped with a unique default network Host Name and IP Address. Qualified network engineers may change these configurations to suit your specific network environment. Factory defaults for networking are:

- Disable Network is checked
- Use DHCP is unchecked

Disable Network Checkbox

This selection turns the network off or on. The default is Disable.

Use DHCP Checkbox

Enabling DHCP will configure the network interface automatically.

If the DHCP box is not selected, the user may then manually enter assignments in the following windows:

- Host Name
- IP Address
- Net Mask
- Default Router
- Name Server

Host Name may be a fully qualified domain name, such as edit1.mydomain.com. All other manually configured addresses must be properly formatted IP addresses.

Saving Network Configuration

Click on OK or APPLY to accept new entries. To abandon unsaved changes and return to the current setting, click the red close box at the upper right of the dialog window. Changes will not take full effect until the Time Delay is powered off and back on.

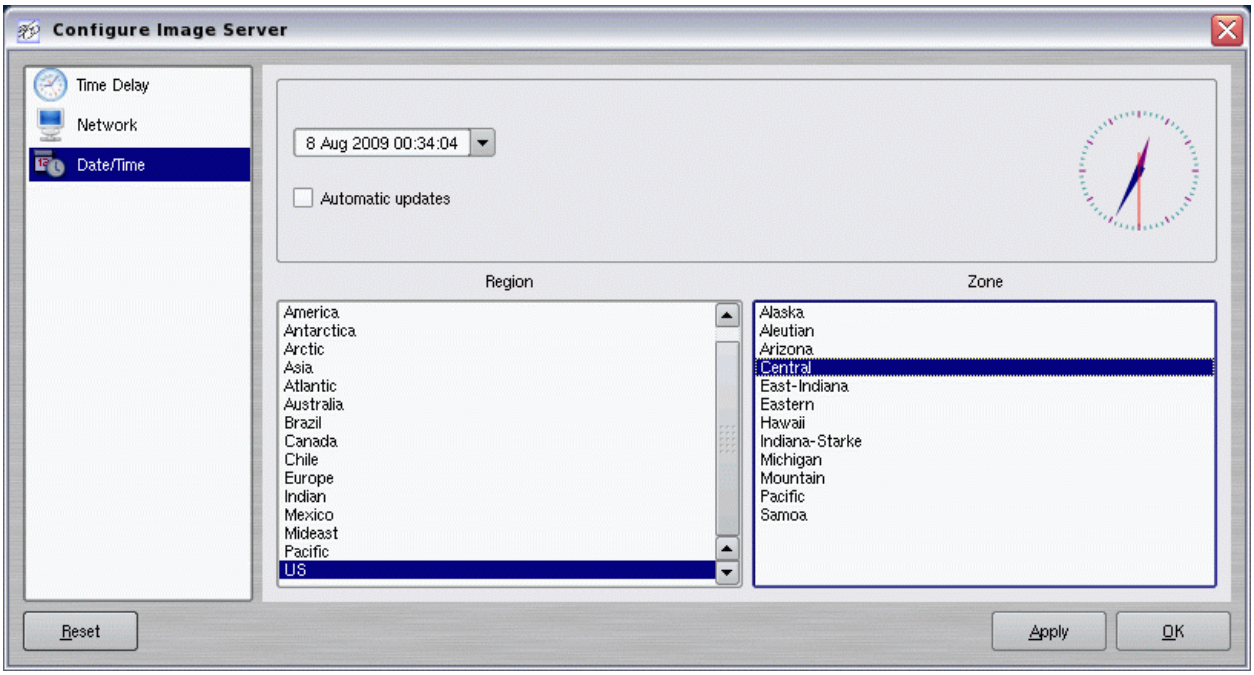
Date and Time

Date and Time are used only for display in the GUI and internal error-logging, the system time has no effect on the operation of the video delay.

From the Main Menu selection bar at the top of the screen, select Configure > Options, then select Date/Time in the window at left.

The date and time in the Time Delay's system clock can be set by entering values in the Time Set window. To enable the NTP service, check the Automatic Updates box. A valid entry for at least one NTP server must be made in the Network setup dialog, and the network must be configured and connected. See the next section for information on NTP.

The date and time should only be set when the Time Delay is in STOP mode.



Date and Time dialog

Network Time Protocol

Automatic Date/Time Updates

The Time Delay's clock can be set automatically from a network time server that is referenced to Coordinated Universal Time (UTC).

This is accomplished using the Network Time Protocol (NTP). A time server could be an in-house computer that is equipped with a GPS receiver, or a radio receiver locked to signals from the NIST radio station WWV. Alternatively, public time servers may be used which are accessible through an Internet connection.

Connecting to the Network

To obtain automatic date/time updates from the public time servers on the Internet, you will need to provide the server with Internet access. Generally, servers would be connected on a secure high-speed local area network, with any Internet connection going through a router with an integrated firewall. The Network Time Protocol uses TCP/IP port number 123, so be sure the firewall is configured to allow access to this port per Figure 1.

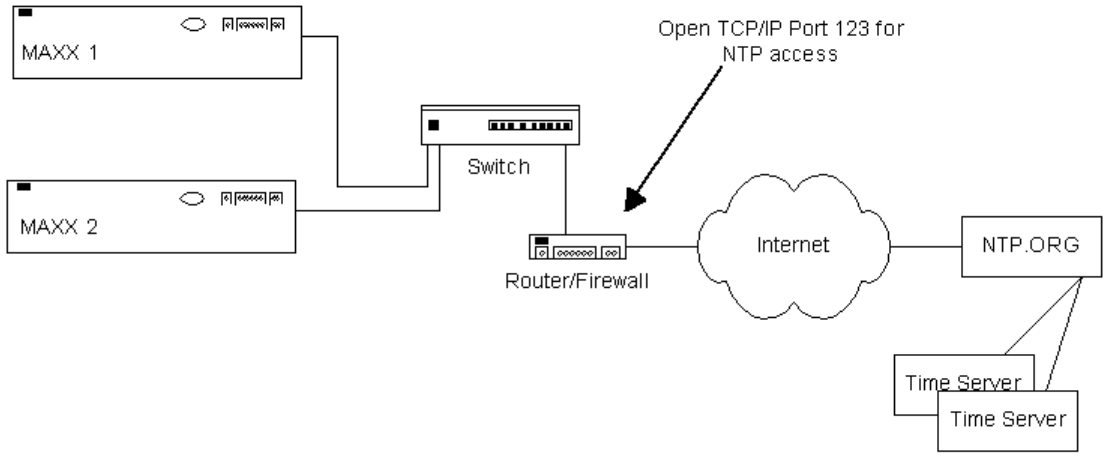


Figure 1 - NTP Network Block Diagram

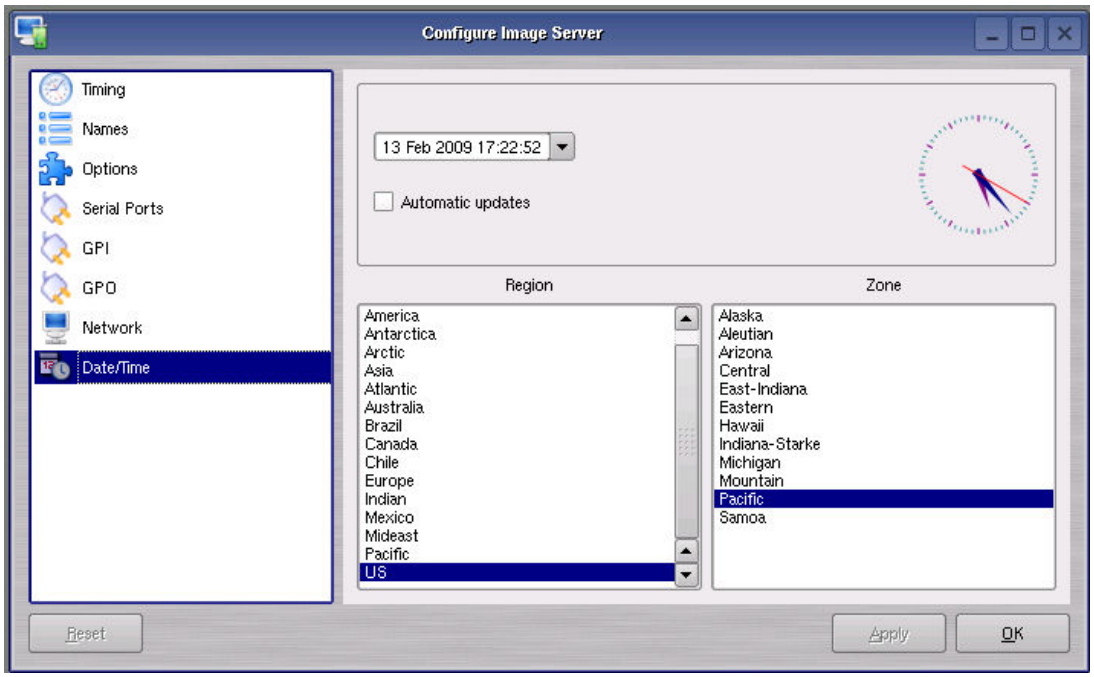
Configuring NTP

The Time Delay GUI is used to set the time zone and to enter the networking parameters.

Selecting the Time Zone

Starting at the main menu bar, Click **Edit->Configure->Date-Time screen**. When "Automatic Updates" is not checked, the Region and Zone lists are enabled. Select your region and then the zone within that region. There may be more than one way to your zone; America/New York, for example, is the same as US/Eastern. Click the **APPLY** button to activate the settings.

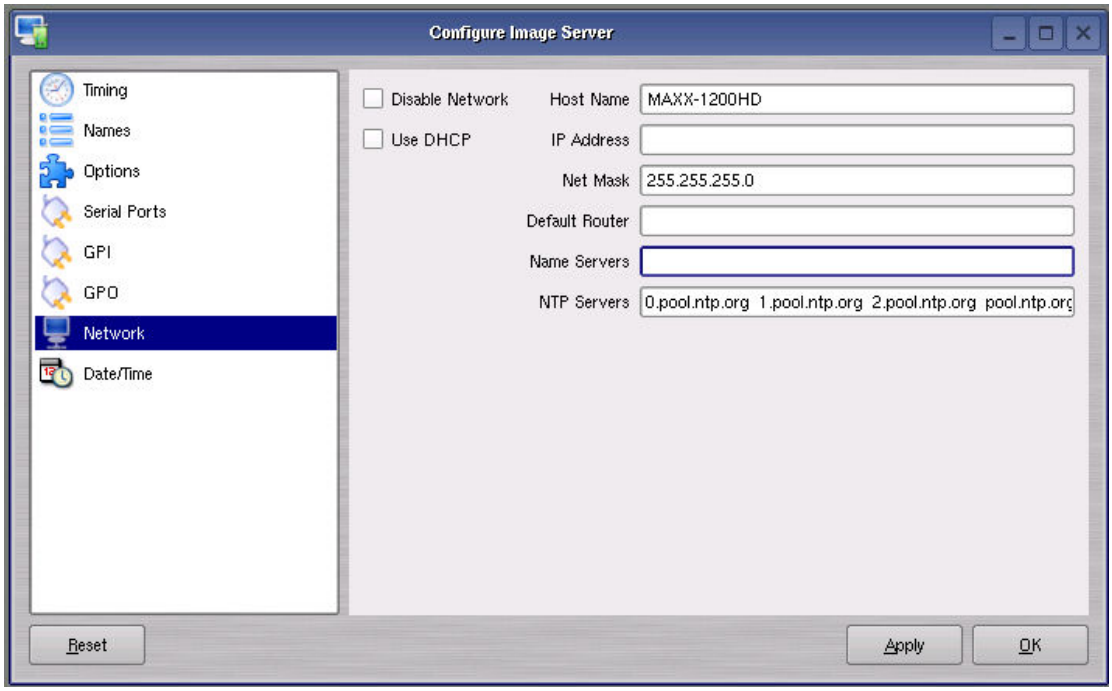
> After changing the time zone a Quick Restart must be performed before changes become effective.



Date/Time Configuration Screen

Entering Network Parameters

From the GUI's main menu bar, Click **EDIT > CONFIGURE > NETWORK**. The screen below appears. Make sure the basic network parameters have been entered.



Network Configuration Screen

Disable Network: uncheck

Host Name: (Any name will suffice, but since this name appears on each line of the Time Delay's diagnostic logs, it is a good idea to keep this short.) The name should also be unique from other devices on the network.

If **"Use DHCP"** if not checked, then enter a fixed IP address compatible with your local subnet. For example,

IP Address: 192.168.1.20
Net Mask: 255.255.255.0
Default Router: 192.168.1.1

The **Name Servers** and **NTP Servers** fields provide the information needed to reach the public time servers.

The **NTP Servers** field contains a list of time servers, either by numeric IP address, or by site name (URL). Entries are separated by spaces.

The nonprofit Internet Systems Consortium, Inc. (ISC) maintains sites that automatically return lists of public time servers to an NTP client such as the server. Hence, the **NTP Servers** field is initially filled in with the URL's for these sites (0.pool.ntp.org, for example). Of course, this list with the addresses of specific time servers you may want to use can be overwritten. However, any attempt to clear the **NTP Servers** field will reset it to the default list.

Note: When URLs (non-numeric site address such as pool.ntp.org) are used in the **NTP Servers** field, the IP address of at least one DNS (Domain Name server) in the **Name Servers** field must be provided. Typically, this address is supplied by the Internet Service Provider.

These name servers translate URL names into numeric IP addresses needed to access the sites in question.

When using a GPS-based time server which is connected directly to a local area network, enter its numeric IP address (such as 192.168.1.60) into the **NTP Servers** field, leaving the **Name Servers** field blank.

Also, if the numeric IP addresses of the public or corporate time servers on the Internet is known, these addresses can be entered, separated by spaces, in the **NTP Servers** field, leaving the **Name Servers** field blank, since there would be no URLs to be resolved.

Note: Not all time servers allow unlimited public access. Refer to www.ntp.org for more information.

Click the **APPLY** button to save your changes.

Technical Specifications

Video

Time delay	Adjustable, 6 sec to 8 hours
Time set format	HH:MM:SS:FF (True number of frames per hour)
Video reference	Synchronizes to video input.
Accuracy	Frame accurate.
Inputs	1 HD-SDI, 75Ω BNC connector
Outputs	1 delayed output, 1 E-E monitor. Each available as both HD-SDI 75Ω BNC and HDMI
Video standards	1080i or 720p selectable
Field rates	50 Hz or 59.94 Hz selectable
Compression format	JPEG2000, 100 Mb/sec

Audio

Embedded Audio	16 channels Groups 1-4 per SMPTE 299M
Analog Inputs/Outputs	2 audio channels per video channel (corresponds to Embedded Audio Group 1 channels 1 & 2)
Analog audio I/O format	Balanced, +4 dBu, XLR-3 connector
Audio coding	48k sample rate, 24-bit word, Linear PCM
Bit-for-Bit® capable	Transparent to Dolby-E, Dolby-AC-3
Optional DXP Digital Audio Interface	
Digital Inputs/Outputs	4 stereo pairs (8 channels) per video channel. (Corresponds to Embedded Audio Groups 1 and 2.)
Digital audio format	AES/EBU, XLR-3 connector (AES-3-2000)

Ancillary Data

Line selection – 720p	Up to 12 lines in the range of 1 to 25.
Line selection – 1080i	Up to 6 Field 1 lines in the range of 1 to 20. Each corresponding Field 2 line is automatically selected for a possible total of 12 lines.
Closed Captions	Records and plays CC data on line 9 per EIA-708B
ATC time code	Reproduced as recorded with delayed video.

Network Communications

Network port	Gigabit Ethernet
Transfer protocol	FTP
Data available	Error log

Disk Storage

Drives	(4) 300 GB 10,000 RPM Serial ATA in RAID-5 array
Drive access	Accessible/replaceable from front panel

Miscellaneous

Operating system	Linux®
Front panel indicators	LED: Power-on, Genlock, Fan alarm, RAID alarm, System alarm
Miscellaneous ports	Keyboard, mouse, SVGA display, Ethernet
GPI control inputs/outputs	26-pin high density D connector
Serial control input	9-pin, EIA-422, future use
Cooling	Forced air
Power	100 to 240 volts universal, 50/60 Hz, 165 watts
Mechanical	3½″ x 19″ x 18″ (89 x 483 x 457 mm) H-W-D
Mounting	Rack mount (2U)
Weight	27 lb. (10.6 Kg) net
Country of origin	U.S.A.
Agency approvals	UL, C-UL, CE, FCC Class A

Connector Pin Designations

Audio XLR-3 Connector Pinout

The Pinout for the XLR connectors is shown below.

Pin	BALANCED ANALOG	AES/EBU DIGITAL
1	SHIELD (frame ground)	SHIELD (frame ground)
2	" + " or HOT	Digital +
3	" – " or COMMON	Digital -
Shell	Frame ground	Frame ground

Serial Control Connector Pinout

Serial Control is currently used for factory testing only.

Pin	EIA-422, DB9-F Connector
1	GND
2	Transmit A (TX–)
3	Receive B (RX+)
4	GND
5	N/C
6	GND
7	Transmit B (TX+)
8	Receive A (RX-)
9	GND
Shell	Frame ground

BNC Connectors

The following note applies to all video and genlock connectors:

A BNC connector used as an output has a 75-ohm source impedance.

A BNC connector used as an input has a fixed 75-ohm termination.

GPI Connector

The GPI connector is a high-density DB-26-F connector. The GPI outputs are used as System Monitor outputs to indicate error conditions and system failures. These open-collector outputs may be used to source current to drive an external LED or control input. They should not be connected to any voltage greater than 12 volts. Care should be taken when interfacing to other equipment that there is not a significant difference in potential between the system grounds or the AC supplies.

GPI CONNECTOR INTERFACING SHOULD ONLY BE UNDERTAKEN BY QUALIFIED ELECTRONICS TECHNICIANS.

GPI Connector Pinout

Pin	Signal	Pin	Signal
7	N/C	20	N/C
8, 9, 10	GND	21, 22	+5V Source (200mA max)
11	GPO 2 - **GENLOCK**	23	GPO 1 - **DRIVES**
12	GPO 4 - **FAN**	24	GPO 3 - **INPUT**
13	GPO 6 - **COMBINED**	25	GPO 5 - **SYSTEM**

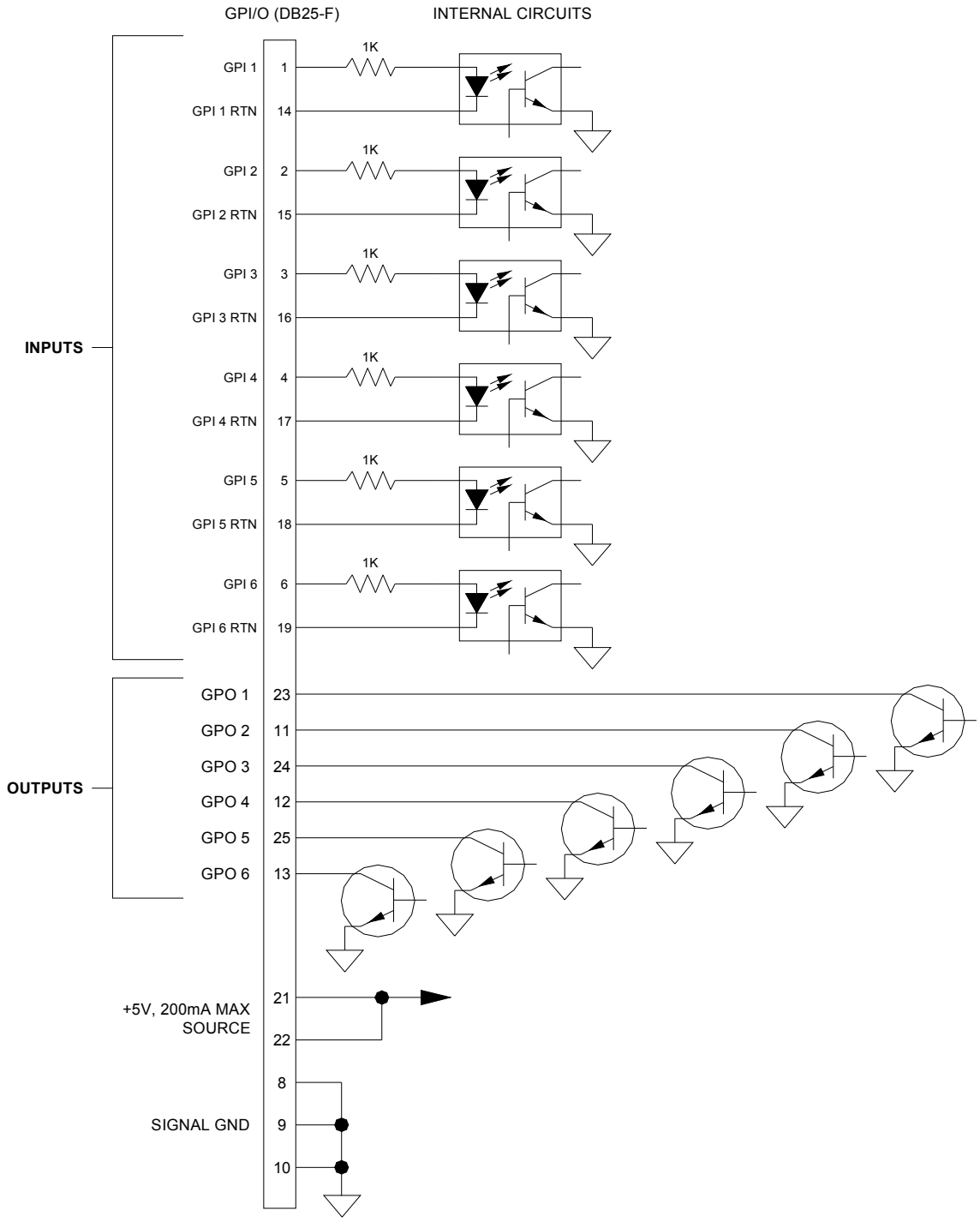
System Monitor Outputs and Error Conditions

The SYSTEM Error is activated whenever there is an over temperature condition of the chassis or CPU, or a power supply voltage is detected to be out of tolerance (the combination of the front panel SYSTEM and POWER indicators). The FAN Error monitors the CPU fan and the internal Drive fan, not the chassis and power supply exhaust fans. The INPUT Error indicates loss of the entire video signal, not a black picture condition. GENLOCK also indicates loss of input signal. The COMBINED Output activates whenever any of the other errors are activated.

Open collector outputs can be wired together to create other combined signals ("wired-or" connection). For example, you can create a combined error indicator that does not include the GENLOCK error by wiring pins 12, 23, 24 and 25 together.

Six **General Purpose Inputs** are present on the DB-26-F connector but are not currently active. Each is optically isolated from system circuitry, and individual floating returns are provided. +5 volts may be sourced from pins 21 or 22, or provided by an external source. Current limiting devices are provided in the unit.

Pin	Signal	Pin	Signal
1	GPI 1	14	GPI 1 RTN
2	GPI 2	15	GPI 2 RTN
3	GPI 3	16	GPI 3 RTN
4	GPI 4	17	GPI 4 RTN
5	GPI 5	18	GPI 5 RTN
6	GPI 6	19	GPI 6 RTN



GPI Input/Output Connector Schematic

Testing the GPI System Monitor Outputs

Using the "alarmtest" Utility.

In order to test the wiring in a new installation, there is a way to exercise the individual outputs without having to create all of the indicated error conditions. The "alarmtest" program allows temporarily reassigning one or all of the various outputs to the Loss of Input condition so that all connected systems can be proven.

The alarmtest program is run from a terminal window in the GUI. To open a terminal window and run the program:

1. Turn off NumLock on the keyboard.
2. Hold the Control and Shift keys, and briefly press the F12 function key.
3. In the resulting window, type
   `alarmtest` Enter
4. Perform a Quick Restart.

The program will run, and instruct you to perform a Quick Restart to activate the new assignments. Now, all of the GPI outputs are assigned to the Loss of Video Input warning. To activate the GPI outputs, simply disconnect the video input. If you wish to see them deactivate, reconnect the video input.

It is also possible to test individual outputs, so that crossed connections can be discovered, or particular alarm conditions can be tested. To do this, perform the same procedure as above, but add either an output number from 1 to 6, or the name of one of the warning signals, for example

`alarmtest 1` Enter

or

`alarmtest drives` Enter

will cause the Output 1 DRIVES failure warning to activate whenever the video input is disconnected. The signal name can be either all uppercase or all lowercase. The signal names are DRIVES, GENLOCK, INPUT, FAN, SYSTEM and COMBINED.

You can change outputs by running the program repeatedly with different output specifications, each time performing a Quick Restart to activate the new assignment. When the terminal window opens, you can press the up arrow key to retrieve the previously typed command, and edit the output number or name.

To restore the default assignments for normal operation, repeat the steps above with no individual output specified:

`alarmtest` Enter

Be sure to perform the final Quick Restart.

System Board Ports

Standard computer I/O ports on the Time Delay include video monitor, keyboard, mouse, and two Gigabit Ethernet ports. Pinouts are provided to assist in wiring or trouble-shooting.

Keyboard and Mouse

Keyboard and mouse ports are provided on the rear panel. Both ports are provided with a resettable fuse protecting the +5V supply to the peripheral. Use only the wheel mouse supplied with the Time delay. Other mice may not work correctly.

SVGA Ports

A VESA-compliant VGA or SVGA computer monitor should be connected to the 15-pin video port. The Time Delay is pre-configured to an SVGA screen resolution of 1024 x 768 and 64,000 colors. The refresh rate will auto-negotiate with the attached monitor to achieve the best appearance. This resolution is best viewed on 17-inch or larger monitors. 360 Systems does not provide monitors for the Time Delay.

Use only VESA compliant monitors with a maximum refresh rate of at least 75 Hz.

SVGA Connector Pinout

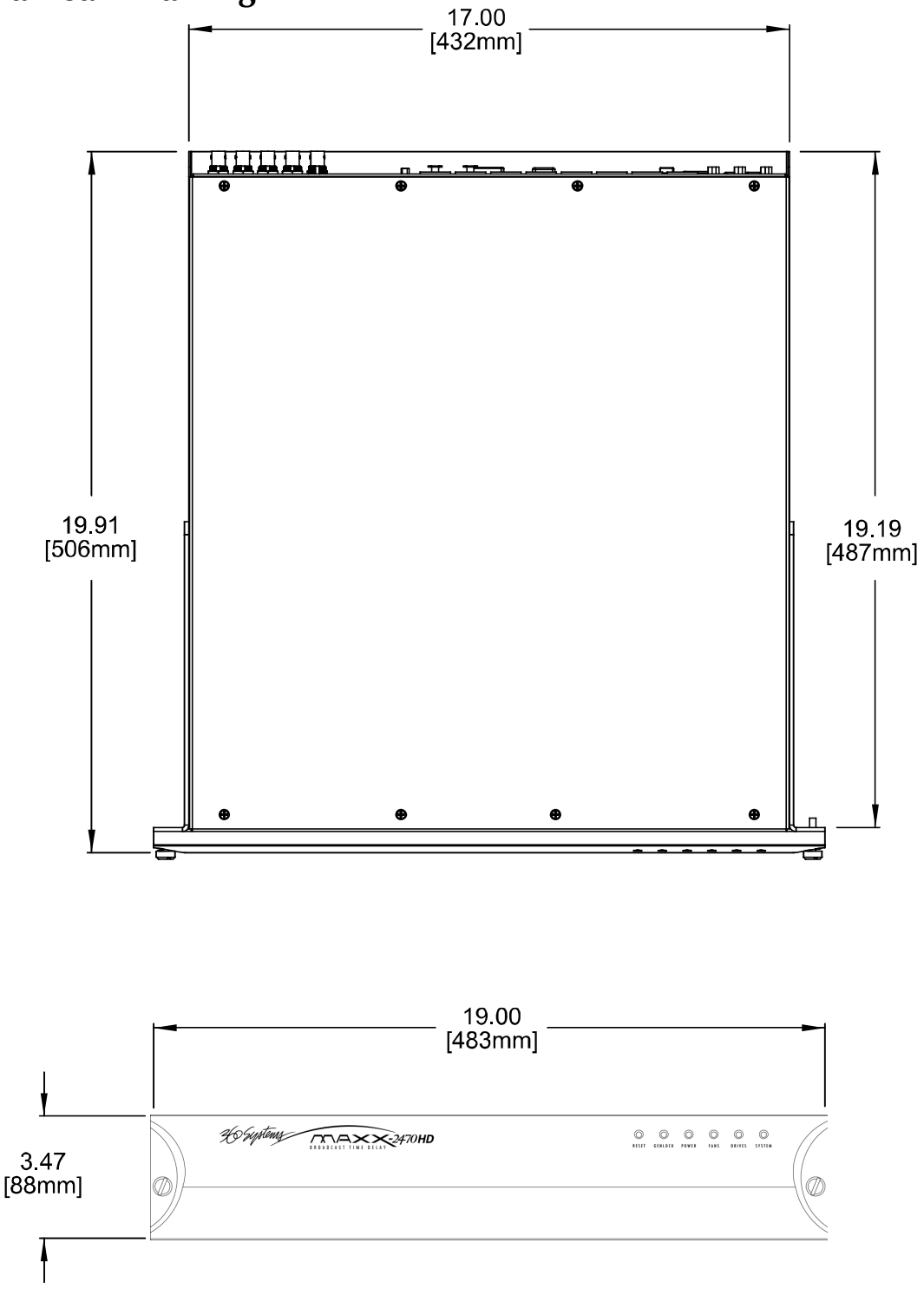
Pin	Signal	Pin	Signal
1	RED	9	+5V
2	GREEN	10	GND
3	BLUE	11	Reserved*
4	Reserved*	12	SDA
5	GND	13	HSYNC
6	RED RTN	14	VSYNC
7	GREEN RTN	15	SCL
8	BLUE RTN	Shell	Frame ground

* Pulled high to +5V.

Unused Ports

An unused RS-232 serial port may be present on the unit. This is not active and no connection should be made to it. Also, the USB ports are for Software / Firmware updates only. **Do not connect** a keyboard or mouse to them.

Mechanical Drawing



Dimensional Drawing

Program Updates from USB Memory

Program updates for the 2470HD Time Delay may be issued from time to time. The operating system and application programs can be updated by the user from a USB Flash Drive distributed by 360 Systems. The current software version may be determined by looking in the GUI **Help > About** dialog.

To install a program update, follow these instructions. Please read them completely before beginning.

1. Discontinue all record, play, network transfer or system-level operations.
2. With power applied, insert a 360 Systems USB Flash Drive into one of the USB sockets.
3. Press the front panel power switch briefly to shutdown the Time Delay.
4. Wait 5 seconds, then press the front panel power switch again to boot from the USB Flash Drive.
5. The Installer menu provides a choice to Update the Time Delay operating system, begin a new complete install, or cancel the install.

   Choose NEW to partition and reformat the drive array, and install the new operating system.

   The message, "Please wait while server is being installed" will appear with an activity indicator. When installation is complete, the server will automatically reboot from its hard disk array, and will display a copyright notice while starting up.
6. **IMPORTANT!** Remove the USB Flash Drive. Never leave it plugged into the server.

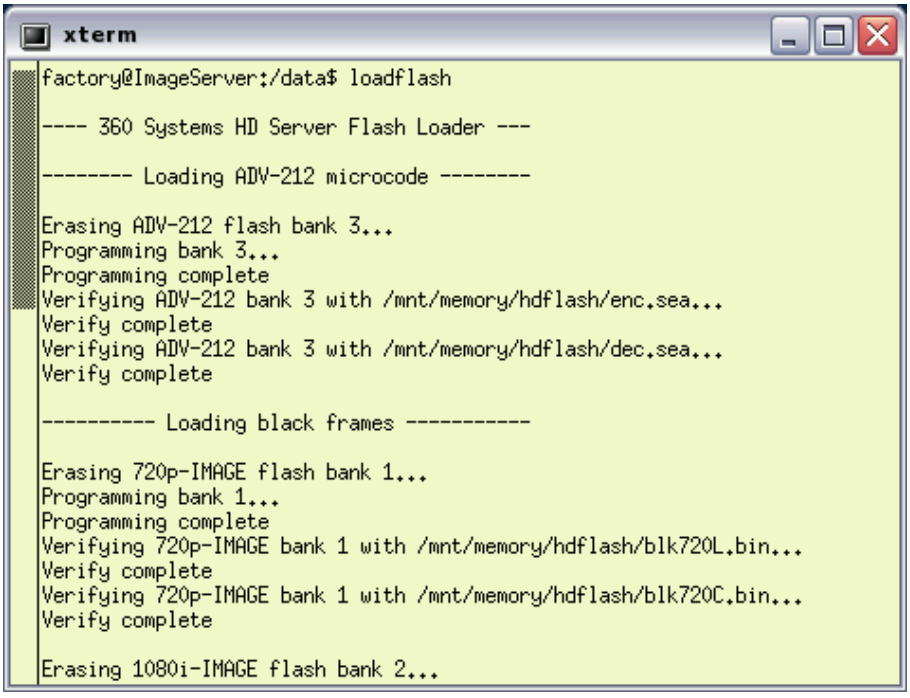
Updating Firmware

Firmware is low-level code used by the video hardware; it is not server operating system software. If a software update is to be performed as well, install it first unless instructions that came with the software update specifically require loading a particular version of firmware. This procedure must be done from the local GUI; it cannot be done at a Remote Workstation. The following operation should only be undertaken by competent computer technician.

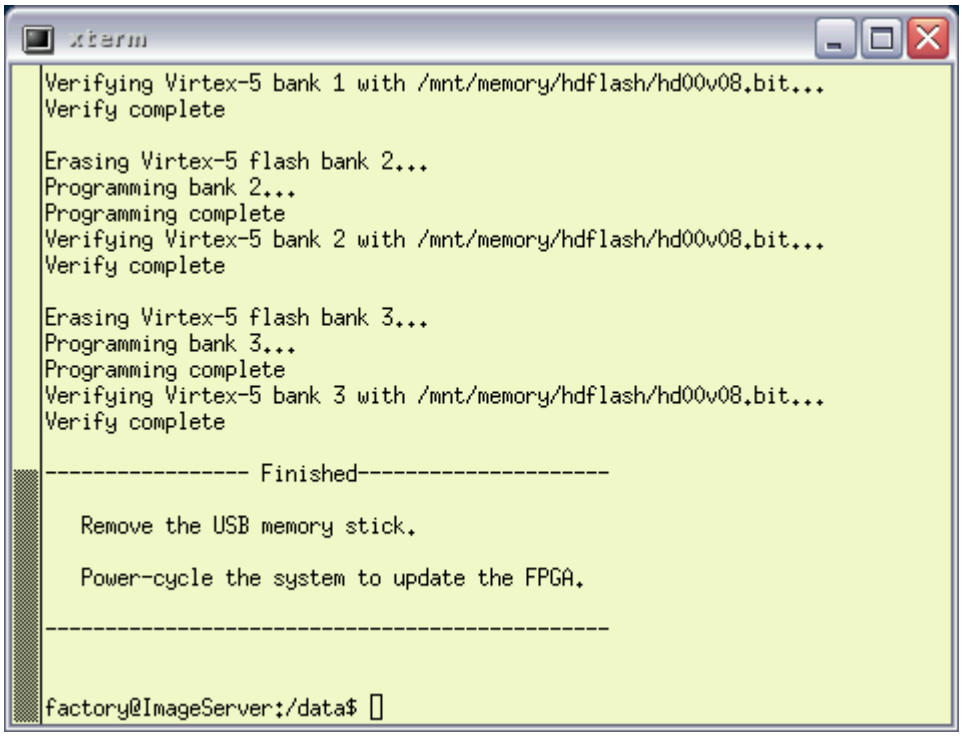
To update the firmware:

1. Power off the 2470HD Time Delay by selecting **Start > Shutdown > Shutdown**. Power on again, using the front panel **RESET** button, accessible through the small hole near the LEDs.
2. Once the server has finished initializing, close the GUI by clicking the 'close' button at the upper right corner of the main window.
3. Open a terminal window by holding the Shift and Control keys and pressing the F12 key on the keyboard. Stop the server application by typing:
   `killall app` **Enter**
4. Insert the flash memory stick that was supplied with the firmware. Wait several seconds for the system to recognize the flash drive.
5. In the terminal window, type: `loadflash` **Enter**

You will see messages like the following:



After each bank is loaded, you should see the message “Verify complete”. The procedure will continue, and finally end with the prompt and cursor:



If any of the banks indicate an error during the erase, verify, or programming phases, IMMEDIATELY repeat the operation “loadflash Enter” without doing any other operation.

If the procedure still fails, perform this entire procedure again. Should you still encounter a problem, please contact 360 Systems technical support.

Maintenance

Fault Diagnostics

Front Panel Indicators

The five LED indicators on the front panel are used to diagnose fault conditions. The meaning of each indicator is noted in the following table. During normal operation all five indicators will be on.

GENLOCK	FLASHING indicates that there is no signal, or an invalid signal, at the **INPUT** connector.	Check the INPUT cable connections or signal. (GENLOCK input is reserved for future use.)
POWER	FLASHING indicates that there is a fault in the system power supply.	Shut down the Time Delay and contact 360 Systems Customer Support for further hardware diagnosis.
FANS	FLASHING indicates that there is a fault of the internal chassis fan.	Check the chassis fan operation. Replace if necessary. Do not run the Time Delay without a working fan.
DRIVES	FLASHING indicates that there is a fault in the system RAID array.	Check the RAID array status using the utility under **START > RAID STATUS.**
SYSTEM	FLASHING indicates that the CPU fan is running slow, or stopped; or that the CPU temperature or voltage is not within manufacturer's specification.	Shut down the Time Delay and contact 360 Systems Customer Support for further hardware diagnosis.

The bottom line of the GUI will announce error conditions, in some cases giving further detail on the nature of a fault. For example, when the System light is flashing, the GUI may indicate a temperature error or a power supply voltage that is out of tolerance.

The GPI Outputs are programmed to indicate errors as well. These can be interfaced to an alarm or warning light in installations where the GUI and the front panel are not visible to control room personnel. See page 29.

Repairs should be performed only by qualified electronics technicians.

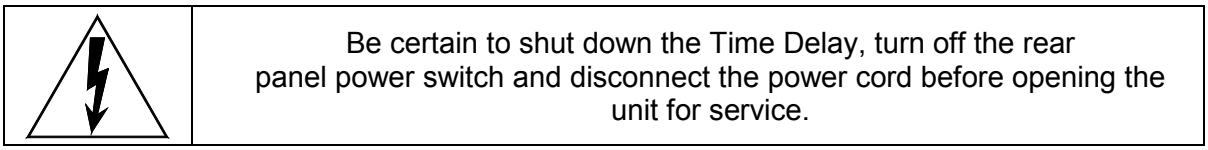
Gigabit Ethernet Indicators

The Gigabit Ethernet port NET1 has the following indicator LEDs:

Label	Indication	Meaning
ACT/LNK (Left)	Green on	The port is connected to a valid link partner
	Green flashing	Data activity
	Off	No link
10=OFF 100=YELLOW 1000=GREEN (Right)	Off	10 Mbps
	Yellow flashing	100 Mbps
	Green	1000 Mbps

NET 2 is not active. Make no connection to this port.

Access to Components



The following sections provide instruction on disassembly and re-assembly for maintenance.

The front panel is removed to allow access to the hard drives.

The top cover is removed to service an I/O card or power supply.

Removing the Front Panel

The front panel is easily removed for access to the four disk drives, or for removing the server from an equipment rack. Using a coin or a flat-blade screwdriver, unscrew the two large panel fasteners on the left and right sides of the face panel. Hold the panel in place while undoing the screws. Since the loosened screws are captive, you may use them to pull the panel away from the chassis.

To re-install the front panel, tuck all wires into the chassis and move the face panel into position. Screw the front panel fasteners back into the chassis. Tighten the front panel access screws with a screwdriver.

NOTE: The Time Delay is vulnerable to accidental system reset while removing or re-installing the front panel. It is recommended that the front panel be removed or attached only while the system is OFF.

Removing the Top Cover

Using a No. 2 Philips head screwdriver, unscrew the fourteen 6-32 Philips head screws attaching the top cover to the rear panel.

General Handling Precautions

ESD Precautions

Observe electrostatic discharge (ESD) precautions to avoid damaging static-sensitive components when handling any PC card or disk drive.

- When the case of your server is open and its internal parts are exposed, do not touch any internal part without first grounding yourself to the chassis.
- Always wear a ground strap or work on an ESD-protective mat.
- DO NOT remove components from protective packaging until you are properly grounded.
- Handle printed circuit boards by their edges or by the metal bracket.
- Don't touch any pin, contact, lead or component on the printed circuit boards.
- Keep disk drives in their anti-static package until installed in the server.

Mechanical Concerns

- Be careful when installing I/O cards into your system. Excessive force can damage the PC boards, cables, hard drives or the motherboard.
- Be sure each board is aligned with its slot in the mating connector before installing. Use care to not flex any PC boards.
- Interface cable connectors must be mated carefully. Use care to not bend any of the pins. The connectors provided are keyed to prevent upside-down insertion.
- Interface cables are fragile and must not be pinched. Ensure that their dress does not restrict airflow from fans or heat sinks within the enclosure.
- Prior to installation, keep disk drives stored in a foam-lined protective carton to protect them from physical damage.

Installing/Removing I/O Cards

Follow the preceding instructions to remove the top cover. The I/O cards are accessible from the top of the chassis. Generally, I/O cards can be extracted or installed with a No. 2 Philips screwdriver. Each I/O card is held in place by several 6-32 X ¼″ pan head or #1 Phillips screws on the rear panel of the chassis.

Video I/O Card

Remove the four 6-32 x ¼″ pan head Phillips screw holding the video card to the rear panel. The video I/O card is also held by a support bracket near the front panel. Remove the 6-32 x ¼″ pan head Phillips screw holding the bracket to the inside wall of the chassis.

While supporting the riser card, gently pull the video card and the riser card until the video connectors are clear of the rear panel. Lift the video card from the chassis. Unplug all interconnect cables from the video card. Immediately place the video card into a conductive storage bag to protect it from electrostatic discharges.

Reverse the procedure to install a card. After all the screws are reinstalled, check that the riser card, RAID card, and video card are all seated properly in their PCI connectors.

RAID Controller Card

Unplug the Serial-ATA cable from the RAID card.

Remove the 6-32 x ¼″ pan head Phillips screw holding the RAID card to the rear panel. Gently pull the card from its slot. Immediately place it in a conductive storage bag for protection from electrostatic discharge that can damage it.

Reverse the procedure to install a card. Be certain to install the Serial ATA cable into the RAID card connector.

Accessing the Main System Board

There are no user-configurable options on the main system board. If you suspect that the system board is not operating properly, consult with 360 Systems before proceeding. DO NOT undertake any repairs on it.

Analog Audio Level Calibration

The input gain and output gain of the analog audio circuits are factory calibrated to a +4 dBu standard. Each circuit includes a trim pot with a range of approximately ±2.5 dB. The following procedure may be used to calibrate these for unity gain. Each trim pot is located above the XLR connector with which it is associated. The procedure below is simplified to reestablish unity gain in cases where only the analog inputs are in use.

Calibration Procedure

This procedure assumes that the technician is fully familiar with audio test procedures employing Audio Precision® test equipment, or its equivalent.

1. Set the delay time to a minimum value, so that an input signal will appear at the **PGM OUT** connections in as short a time as possible.
2. Use the audio generator to apply a 1 kHz sine wave at a level of +4 dBu to **ANALOG IN LEFT**. Initially, do not adjust the input level trim pot.
3. While observing the output level of **MON OUT L**, adjust its trim pot until a level of +4 dBu is obtained. Only in the event that that level cannot be obtained, adjust the **ANALOG IN LEFT** trim pot to obtain +4 dBu.
4. Observe the level of **PGM OUT L** and adjust its output trim pot to obtain +4 dBu.
5. Repeat for **ANALOG IN RIGHT** and **MON OUT R** and **PGM OUT R** outputs.

Managing the RAID Disk Array

The Disk Array Configuration Utility provides tools for monitoring and managing the disk array. Monitoring and troubleshooting programs automatically check the array, report problems and provide access to RAID status information and service options.

A single drive fault should not cause data loss; but remember: the drive array is degraded and no longer has storage redundancy. Hence, another disk failure may cause a complete loss of data and system failure. After a drive failure it is strongly recommended that at the earliest time diagnostics be performed, and the server be taken off line while the RAID array is rebuilt.

Error Notification and Repair

The Time Delay will notify users in the event of a fault by flashing the front panel **DRIVES** light. A flashing **DRIVES** light can be triggered by a variety of conditions. A failure condition will also be indicated in the GUI in the status bar, on the bottom of the screen and highlighted in yellow as shown below. A GPIO Output is available that can activate a warning lamp or alarm upon a RAID or system fault. Refer to page 29 for more information on GPIO interfacing. A drive fault can be trigged by a variety of conditions. The first step in response to an error warning is to open the RAID **CHECK STATUS** window from the On-Screen Start Menu. Click **Start > System > RAID Status** to launch the Array Configuration Utility.

GUI Drive Fault Indication

The **RAID Maintenance** window (Figure 5, page 47) displays the current status of the RAID controller and all disks connected to the RAID system. On inspection, you will find the array in one of the following states:

- **OK**, indicated by "OK" for Array Unit 0 and all Ports (drives);
- **Initializing**, indicated by "Initializing" on the Array Unit 0 status line;
- **Degraded**, indicated by "Degraded" on the Array Unit 0 status line;
- **Verifying**, indicated by "Verifying x%" on the Array Unit 0 status line;
- **Rebuilding**, indicated by "Rebuilding x%" on the Array Unit 0 status line.

"Verifying" is the process by which the array controller corrects data parity errors that may have occurred because of power loss, incorrect shutdown or some other data error.

The term "degraded" refers to the state of the Array data, not necessarily the hardware or disk drives themselves. It indicates that the parity information that protects the data is not up to date.

Parity errors may occur if the Time Delay loses power, or is improperly shut off. No data will be lost, but the parity re-initialization process may take several hours. NEVER use the rear panel power supply switch to shutdown the server. Shut down the system only by momentarily pressing the front panel **Reset** button or selecting **Start > Shutdown > Shutdown** from the graphic user interface.

Note that in some cases the power may not automatically shut off after a Shutdown is executed. When the front panel LED indicators start flashing in response to the Shutdown command, the file system has been successfully closed and it is safe to force the power off by holding the **Reset** switch in for four seconds.

A degraded array with a drive listed as "Not In Service" or "Inaccessible" is usually indicative of a permanent drive error, typically a single disk or cable failure, but redundant data will allow normal operations to continue. You may first try to rebuild the array with the existing drive still installed. If the array continues to indicate a failed drive, replace the drive and then rebuild the array. A hard disk array must be repaired using exactly the same drive model and capacity as other drives in the array. Because specific drive models become unavailable as time goes on, 360 Systems recommends that maintenance spares be purchased at the same time as the server.

Log-In to the RAID Utilities

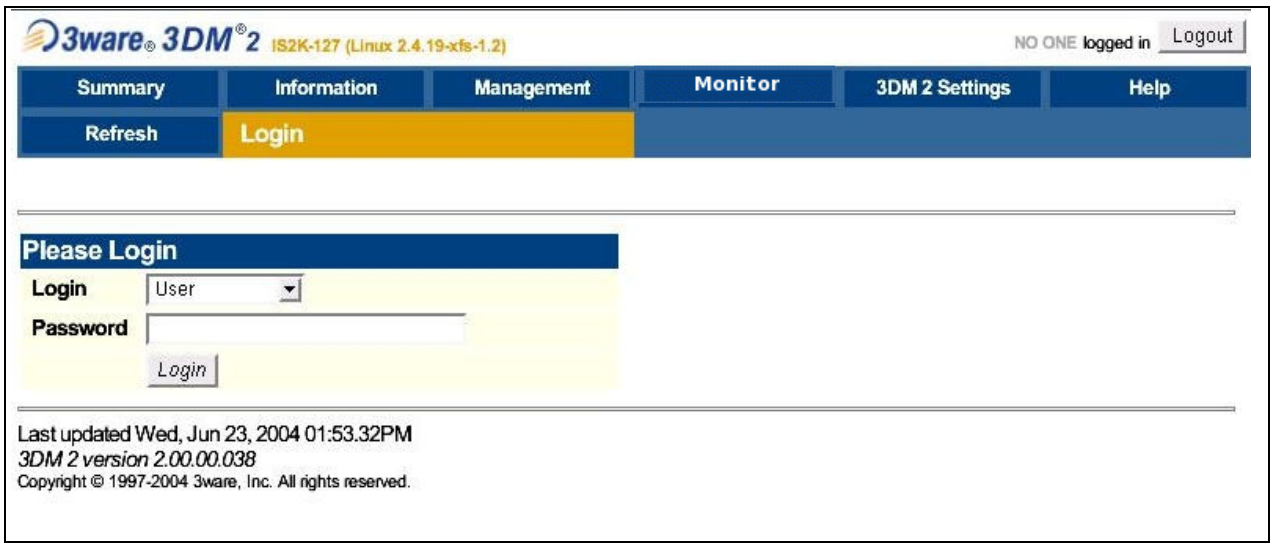


Figure 2: Log In to RAID Utilities

To log in to the RAID utilities, perform the following steps. The above screen will appear.

- Open the RAID utilities by selecting **START>RAID STATUS**
- In the **Login** window, select ADMINISTRATOR from the drop down menu.
- In the **Password** window, make no entry; leave it blank. In the event this does not work, use the password "3ware".
- Click the **Login** button to enter the 3ware Utilities.

Determining the Condition of the RAID Array

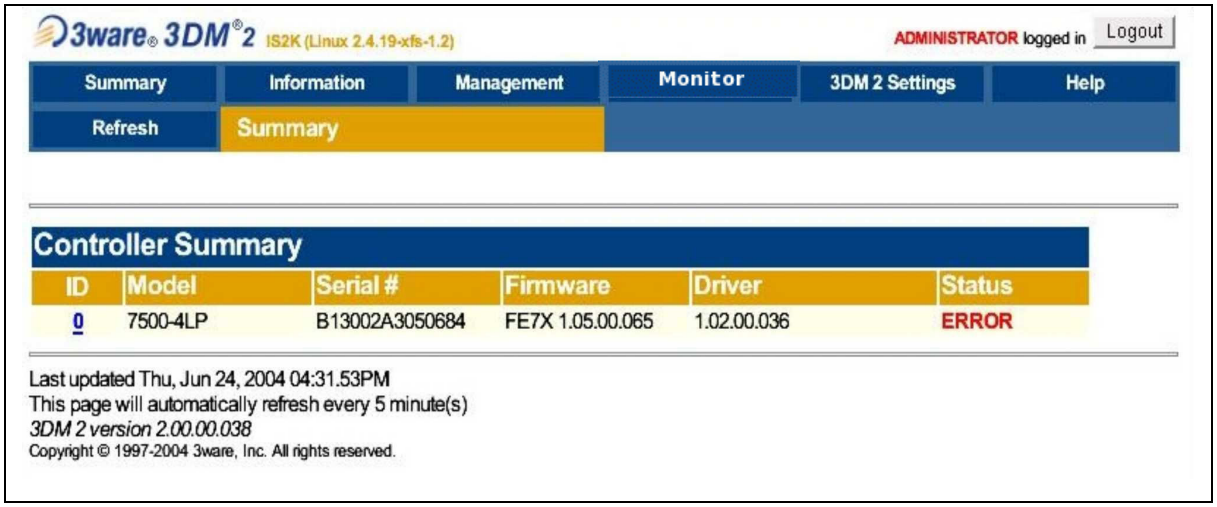


Figure 3: Report of RAID Array Condition in Summary Screen

To replace a failed drive in the RAID control utility, perform the following steps. The above screen should appear.

- Login as ADMINISTRATOR.
- Note the ERROR STATUS on this Summary Screen.
- If an error condition is indicated continue to next page.

Displaying the Alarm Log of the Raid Array

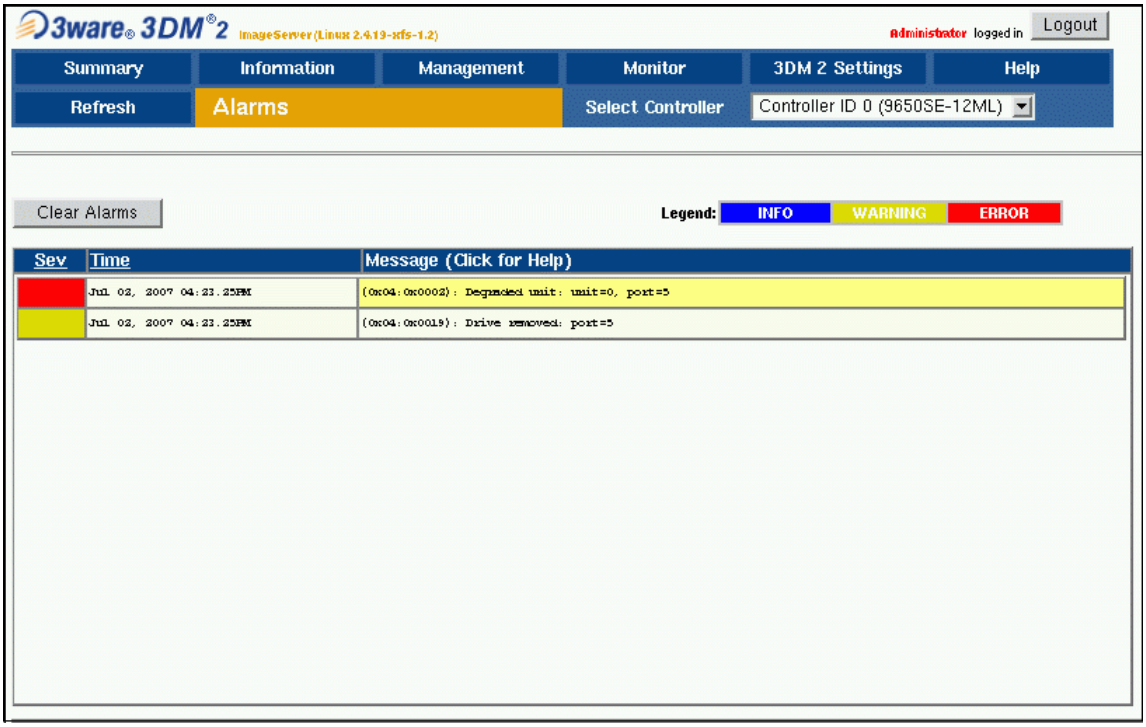


Figure 4: Alarm Log Display

The RAID controller keeps track of any condition that would adversely affect its reliability. In the event that an error should occur, the *alarm log* will be helpful in diagnosing the problem.

The above screen will appear.

- Select **MONITOR>ALARMS** from the screen.
- Make note of any error conditions reported, and what Port numbers they refer to.

Some examples of error messages are:

Drive Timeout Error – The drive failed to respond to a command from the controller within the allotted time. This is sometimes a benign condition, but often indicates a hardware problem with the drive.

Drive Error – The drive reported a data error. A rare isolated occurrence may be acceptable, but probably indicates a drive failure.

Drive SMART Threshold Exceeded – The drive's self diagnostic program is reporting an impending drive failure. The drive should be replaced.

Remapping Bad Sector – This is a normal function of a hard drive's self maintenance. As a drive ages it is normal for sectors to fail, these are reassigned to a different part of the drive. Several may occur within a very short period (seconds to a few minutes.). Multiple such errors within a few days may indicate an impending drive failure.

Unclean Shutdown Detected – Power was lost without an orderly shutdown sequence, and the parity information was not updated.

Checking Status of the Drives

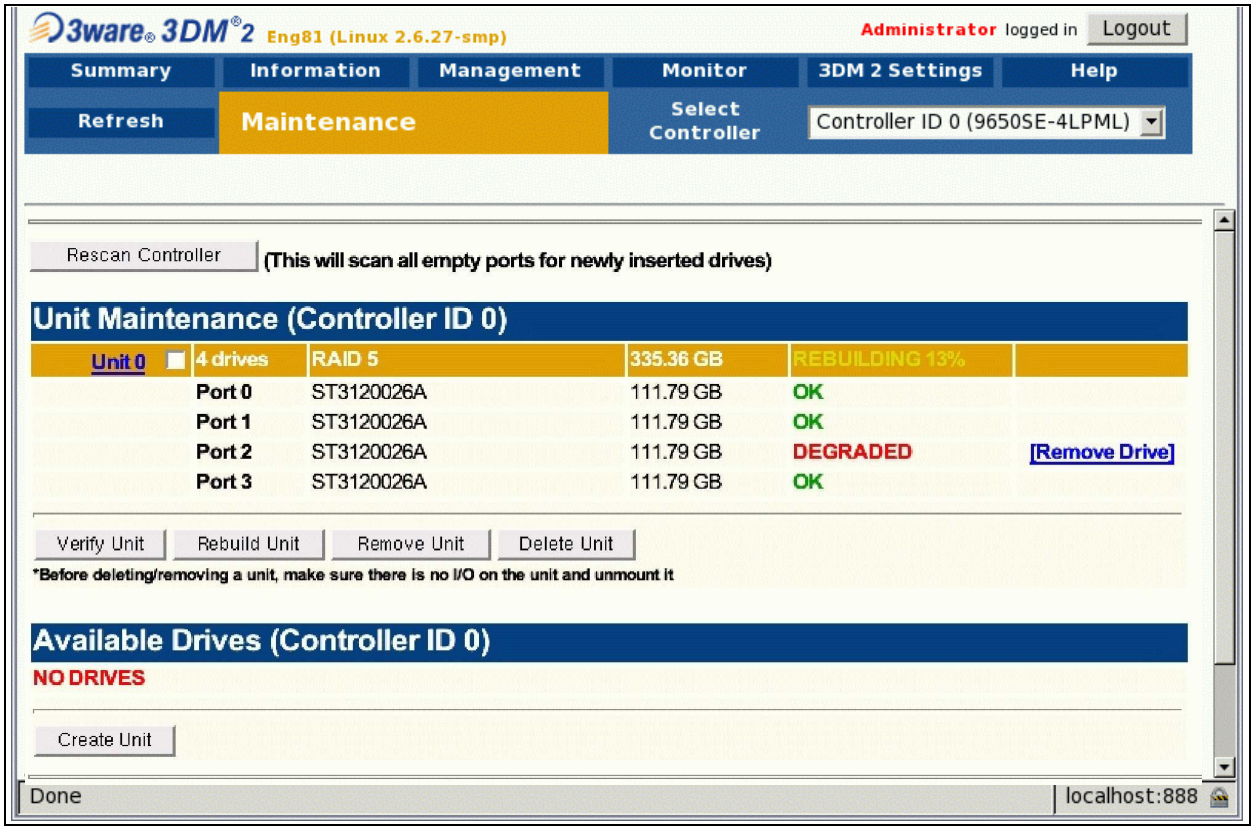


Figure 5: RAID Maintenance Display

To check the status of the RAID drive array, perform the following steps. The above screen should appear.

- Select **MANAGEMENT>MAINTENANCE**.
- Note the status of each drive in the array.

Removing a Degraded Drive from the RAID Unit

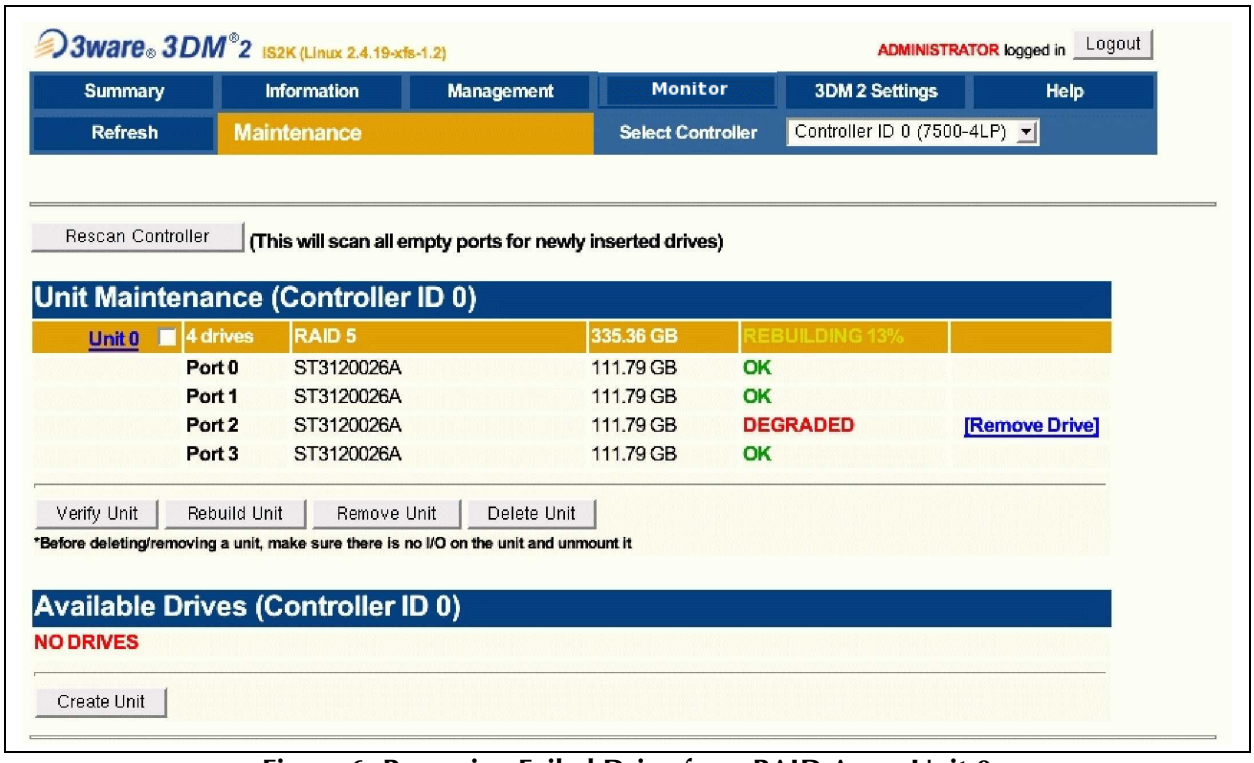


Figure 6: Removing Failed Drive from RAID Array Unit 0

The UNIT MAINTENANCE SCREEN above will appear.

- Remove the degraded drive from the menu by clicking **Remove Drive**.
- Select the **Rescan Controller** option on the above screen to have the system recognize the drive as Available.

Rebuilding the RAID Array

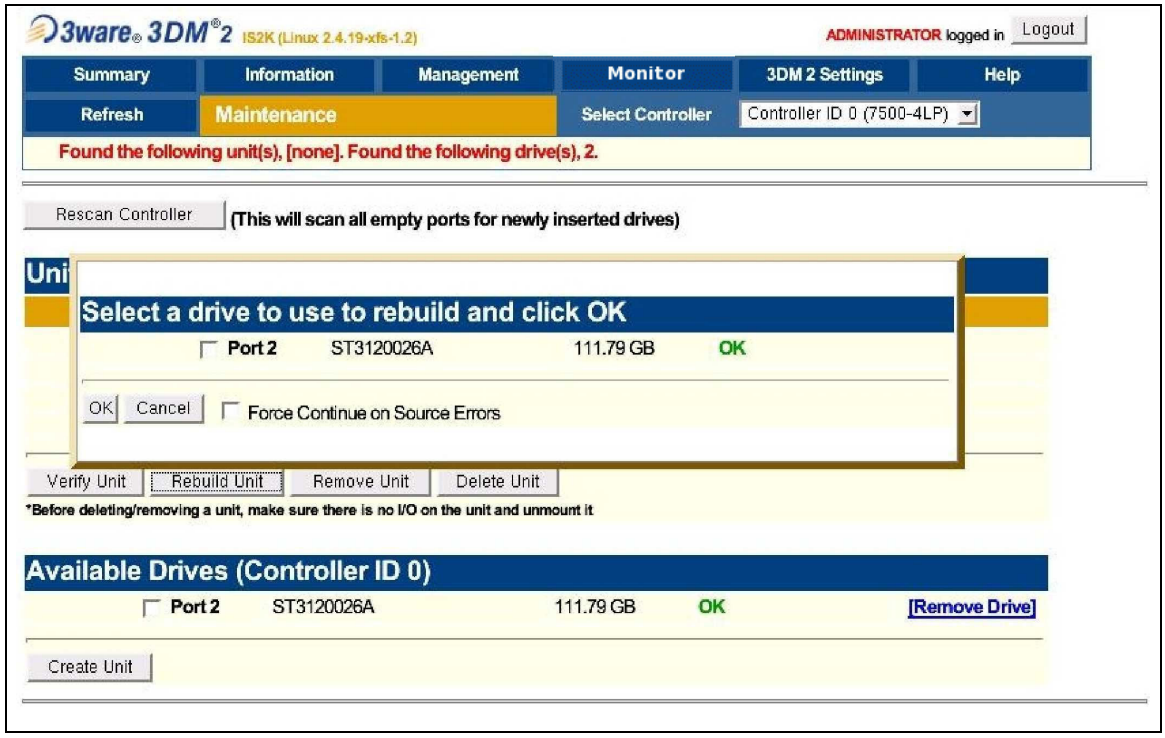


Figure 7: Selecting a Drive to Use in Rebuilding the Array

- Take the Time Delay offline and stop the delay process.
- Select **Rebuild Unit**. The REBUILD SCREEN above will appear.
- Select the available drive by clicking the check box.
- Press **OK**. The RAID array will begin rebuilding with the new drive.
- When complete, OK will be shown in the status for all ports on the MAINTENANCE menu.

Replacing Hard Drives

The server hard disk drives have been factory tested and configured in a RAID 5 array. Each drive is numbered (0-3) and must be attached to the correctly numbered data cable. Drive bays are also numbered.

Please read *Removing the Front Panel* on page 38 for instructions on accessing the hard drive bays. Detailed information about how to replace hard drives is on page 51.

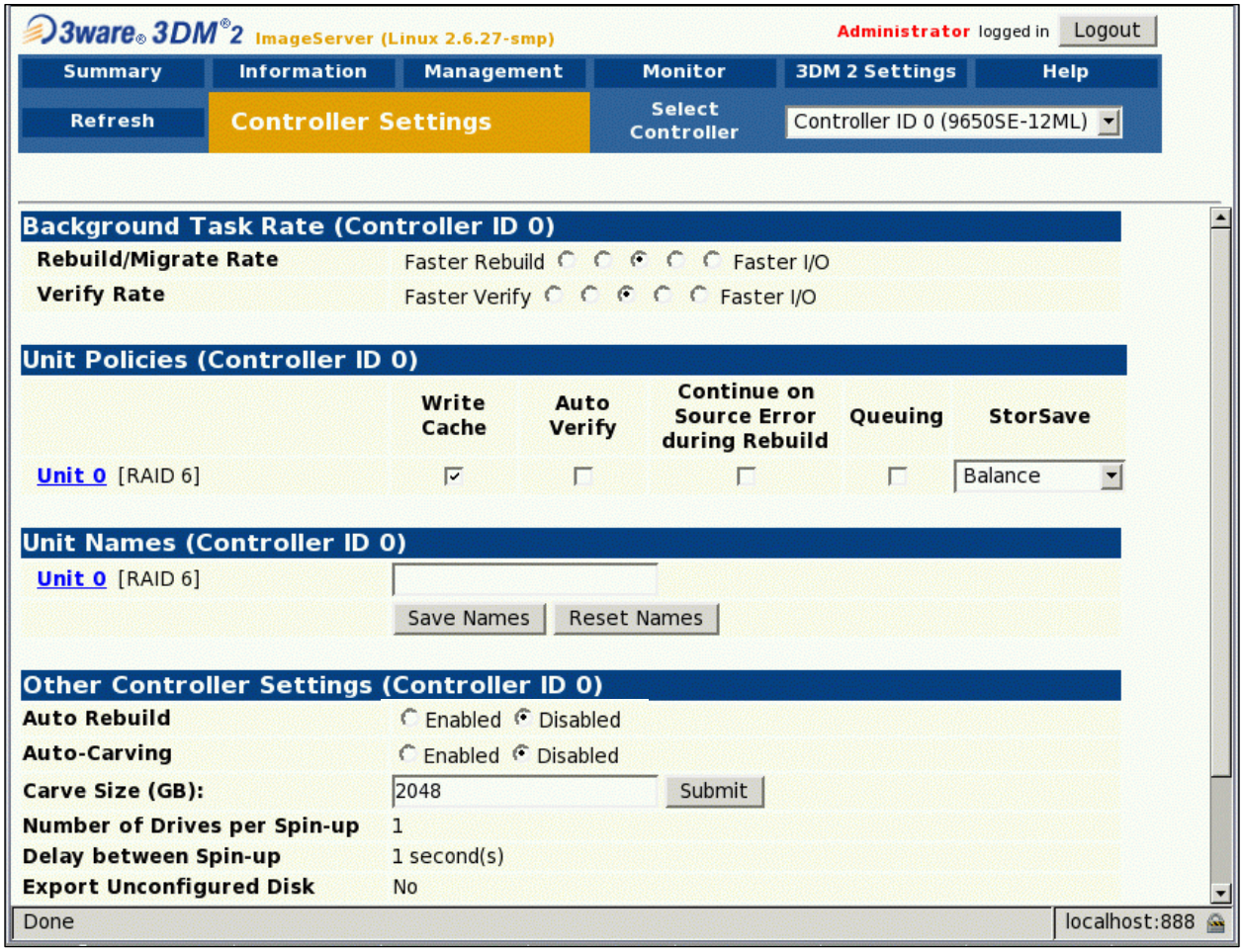
RAID Controller Settings

The RAID controller is configured at the factory. The following is provided only to verify these settings and to recreate them if necessary in the event the system is rebuilt. (The software installation should configure these correctly, but they should be checked to verify accuracy.)

Do not use the Scheduled Events, Email Announcement or Remote Login features.

These settings are critical to proper operation of the system. The only parameter that can be changed is "Continue on Source Error during Rebuild" which when turned on relaxes the condition that any error found in the source material will stop the rebuild process.

It is particularly critical that the Write Cache be checked, and Auto Rebuild be disabled.



Replacing a Hard Drive

Generally, the only time that a hard drive should be removed from the disk array is when the drive array diagnostic software identifies a permanent fault. In this case, the front panel **DRIVES** LED will blink. Use the hard disk management tools to verify that a drive is at fault. The application monitors many things about the array and individual drives, and will clearly indicate whether a drive has failed.

Each hard drive bay is numbered 0 through 3, as are the drives. If for any reason one or more drives have been removed, they must be reinstalled in a bay whose number matches the drive. Installation in the wrong location will damage data stored on all drives.

1. Turn system power OFF with the front panel button. After it has shut down, turn off the AC power switch and unplug the AC power cord.
2. Remove the front panel as described on page 38.
3. Disconnect the power and Serial ATA data cable from the drive, and remove it from the drive bay.
4. Replace the drive, fasten the holding plate in place, and reattach drive cables. Note that the data cables are numbered; re-attach then to the same drive location from which they were removed.
5. Replace the front panel and tighten the two large screws.
6. Replace the AC power cord and turn on the rear panel AC switch.
7. Turn the system ON using the front panel button and check the RAID array status.
8. Check for correct operation of the Time Delay.

NOTE: All drives in the RAID array should be identical. Any replacement must have an actual capacity equal to or larger than the drives that existed when the array was originally created.

Drives that are advertised as being a particular size vary in actual size. Before attempting to rebuild an array, check that the size of the drive reported when it is installed is at least equal to or larger than the existing drives in the array.

Notices

Product Registration

Important — As the owner of new capital equipment, you will want to take advantage of the product information, enhancements, upgrades, or notifications issued by 360 Systems. Send in your Warranty Card so 360 Systems can remain in contact with you. Mail or fax it to 360 Systems offices in the USA at the address given below.

Product Improvements and Upgrades

360 Systems reserves the right to make changes and/or improvements to its products without incurring any obligation to incorporate such changes or improvements in units previously sold. Certain features mentioned in this document may not be present in all models. The 2470HD Time Delay is not offered for sale in all countries.

Repair Policy

A product being returned under warranty shall be sent to 360 Systems, freight prepaid, in the original or equivalent packaging. Call 360 Systems for a return authorization number *before* returning a product.

Use the following address for shipping and correspondence. 360 Systems' offices are open Monday through Friday, from 8:30 AM to 5:00 PM, Pacific Time.

360 Systems	Telephone	(818) 991-0360
Customer Service Dept.	Fax	(818) 991-1360
31355 Agoura Road	E-mail	info@360systems.com
Westlake Village, CA 91361	Website	www.360systems.com

Trademarks

Software

Regulatory Certificates and Compliance

Safety

The Model 2470HD Time Delay was tested by Underwriters Laboratories and found to comply with the following safety standards:

EN 60950, 3rd Edition, dated December 1, 2000, Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment.

Radio Interference Compliance

Radio Interference (USA)

WARNING: This equipment has been tested and found to comply with the limits for Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction's manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at his own expense.

The user is cautioned that changes and modifications made to the equipment without approval of the manufacturer could void the user's authority to operate this equipment. It is suggested that the user use only shielded and grounded cables to ensure compliance with FCC Rules.

FCC Emission Limits

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation.

Radio Interference (Canada)

English: This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations. Français: Cet appariel numérique de la classe A respecte toute les exigences du Reglement sur le matériel brouilleur du Canada.

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For 360 Systems® Time Delay Software

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If part of the product is defective, the entire product must be returned along with the original purchase receipt or other evidence of purchase and a description of the defect to 360 Systems, 31355 Agoura Road, Westlake Village, California 91361. Upon receipt, its condition will be verified, and if the product qualifies for warranty coverage, 360 Systems will, at its option, repair or replace the product without charge. In the case of replacement, if the replacement for a defective product is no longer available, 360 Systems will replace it with a similar product or, if not available, a product of equal value.

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