Operations Manual

Version 4.08.378
September 2008

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360 Systems ®

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 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 covers 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 Broadcast 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 server.

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 power 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 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. Time Delays are not offered for sale in all countries.

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Broadcast Time Delay

Introduction

360 Systems' Broadcast 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 vertical interval data. Applications for the delay include:

- Compensation for worldwide time zones 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.

- Time delays of 24 hours. This delay may be used by a broadcaster to provide "evergreen" material in the event of network/satellite transmission problems. In this instance, material received exactly 24 hours earlier could be re-transmitted until problems are resolved.

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

The Broadcast 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 20 seconds to greater than 24 hours. The programmed delay interval is frame-accurate over an indefinite time period; if several Broadcast Time Delays are fed identical input signals they will remain in sync indefinitely.

The video channel accepts both Composite (CVBS) and SDI video signals.

Four audio channels are provided, and may be AES/EBU digital, or embedded in an SDI stream. Alternately, two +4 dBu analog channels are available. Audio I/O is on chassis-mounted gold-plated XLR-3 connectors.

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 time delay, 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 program input, with selectable CVBS or SDI input connection. 1 E-E monitor output, 1 delayed program output. SDI and composite video BNC connectors provided. Each output appears on both SDI and Composite simultaneously.

- Records video in MPEG-2, 4:2:2 profile, 30 Mb I-frame.

- Records user-choice of audio sources: 2 stereo pairs SDI embedded, 2 stereo pairs AES/EBU digital, or 1 stereo pair of +4 analog. XLR-3 connectors are provided on the rear panel.

- Compatible with Dolby®-E and Dolby®-AC-3 audio.

- Captures and plays VITC (Vertical Interval time code).

- Accepts analog video (black burst) reference for genlocked playout.

- Synchronizes to video input upon loss of external reference.

- Upon loss of input video, records black until input is restored.

- Outputs SDI black and audio silence during the recording interval preceding the desired program output delay.

- Captures and plays VBI data. See table.

- Special handling for Video Index data on line 11 in PAL format.

- Front panel status LEDs: power, genlock, RAID status, fan failure, system errors.

- System Monitor signals available from GPI Outputs to indicate RAID status, fan failure, system errors, loss of genlock and loss of input.

- 2 rack-unit (3¾") height. Forced-air cooling. 160 watt power consumption.

Installation

Unpacking

Your 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 a unit must be shipped by you. 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.

- ✓ Broadcast Time Delay
- ✓ Keyboard
- ✓ 2-Button Scroll Mouse.
- ✓ Software CD-ROM backup copy
- ✓ Rack Mount Hardware Kit
- ✓ 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 servers. 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

Note: If you plan to use digital audio, be sure to change the configuration of the Analog/Digital Audio Jumpers inside the unit before mounting the Time Delay in a rack. The jumpers are factory set to the Analog audio position. For more information about changing the jumpers, see Analog/Digital Audio Selection on page 34.

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

In North America, the Time Delay will usually be mounted in a 19″ rack enclosure having 10-24 or 10-32 tapped holes. In countries with metric standards, the user will need to supply appropriate fasteners.

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 using #10 flat-head Phillips screws (provided in North America). 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?

Important Installation Notes

Power Conditioning

It is good practice to operate an on-air video server from an Uninterruptible Power Source, or UPS. All utility power systems experience occasional transient events, including brownouts and dropouts, which are capable of taking a server 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 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' Image Server 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 video server is a most critical element in a broadcast operation. 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:

Important Installation Notes

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 (video servers) 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 to reduce the level 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.

The CD-ROM drive is intended only for installing software. It may not be used to load video or audio program content.

If for any reason it becomes necessary to reinstall any software, refer to the *Maintenance* chapter on page 36 for instructions.

Front Panel Features
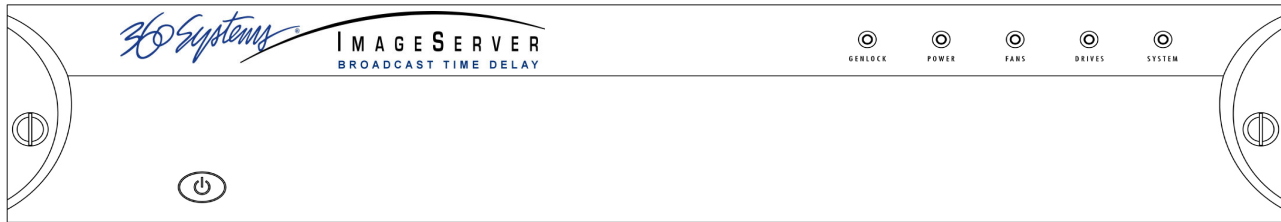
Power ON/OFF button

The blue front panel button initiates start-up and shut-down of the Broadcast Time Delay. Press it momentarily to start the server. A sequence of start-up screens will appear, ending with the 3-channel graphic user interface.

When the Broadcast Time Delay is running, pressing the blue 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 Broadcast 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 when the system is functioning normally. See the table *Front Panel Indicators* on page 30 for diagnostic meanings.

The Status Indicators are also available as GPI outputs, along with additional output warnings for loss of input and loss of genlock. See *GPI Interfacing* for details.

Rear Panel Drawing
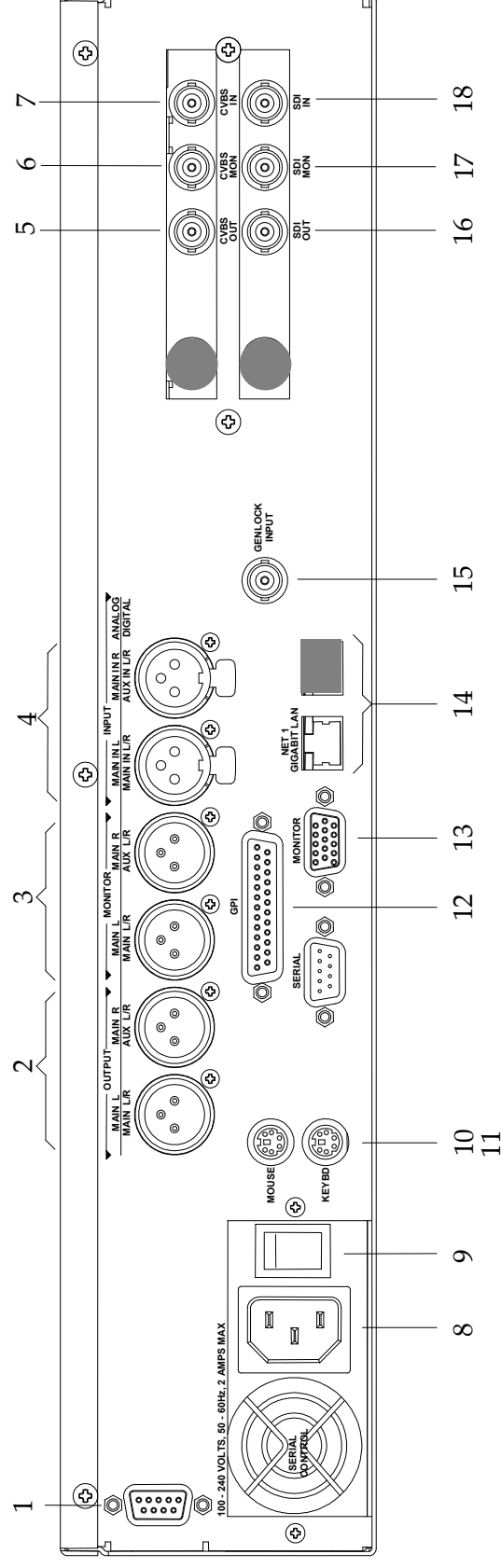
1. Serial control port (EIA-422)
2. (2) XLR-3 audio outputs (AES/EBU digital or +4 balanced analog)
3. (2) XLR-3 audio monitors (AES/EBU digital or +4 balanced analog)
4. (2) XLR-3 audio inputs (AES/EBU digital or +4 balanced analog)
5. Composite video main output
6. Composite video EE monitor output
7. Composite video input
8. AC Power connector
9. AC Power switch
10. Mouse port
11. Keyboard port
12. GPI port, 25-pin female
13. SVGA monitor port
14. Gigabit Ethernet ports (Use NET1 only.)
15. Genlock Input
16. SDI video main output
17. SDI video EE monitor output
18. SDI video input

Rear Panel Connectors

The Broadcast Time Delay provides one video input with up to four audio channels, one delayed video output with audio, and a second monitoring output which reflects input video and audio (E-E), and can be used as a confidence-monitor.

XLR In 1L	(AES/EBU Ch. 1/2)	Main program input 1
XLR In 1R		Main program input 2
XLR In 2L	(AES/EBU Ch. 3/4)	Aux program input 3
XLR In 2R		Aux program input 4
XLR Mon Out 1L	(AES/EBU Ch. 1/2)	Main E-E monitor out 1
XLR Mon Out 1R		Main E-E monitor out 2
XLR Mon Out 2L	(AES/EBU Ch. 3/4)	Aux E-E monitor out 3
XLR Mon Out 2R		Aux E-E monitor out 4
XLR Pgm Out 1L	(AES/EBU Ch. 1/2)	Main program out 1
XLR Pgm Out 1R		Main program out 2
XLR Pgm Out 2L	(AES/EBU Ch. 3/4)	Aux program out 3
XLR Pgm Out 2R		Aux program out 4
BNC SDI 1 In		SDI program Input
BNC SDI Mon Out		SDI E-E monitor out
BNC SDI Out		SDI program out
BNC CVBS 1 In		CVBS program Input
BNC CVBS Mon Out		E-E monitor out
BNC CVBS Out		CVBS program out
BNC Genlock		Genlock input
BNC LTC In		Longitudinal time code in
BNC LTC Out		Longitudinal time code out
DB-25 GPIO		Error Monitor Outputs
DB-9 Serial In		future use
Motherboard I/O		future use

VBI Lines Captured and Played

The Broadcast Time Delay records and passes through all VBI lines between 11 and 22 (inclusive, field 1 and corresponding lines in field 2) in both NTSC and PAL. Following are examples of recorded VBI data, along with their typical[1] line locations:

> Line 11: PAL Video Index (PAL only – special processing enabled by default. See page 23.)
> Line 12-22: Teletext (PAL – also line 11 if Video Index is disabled.)
> Line 14 & 16: VITC
> Line 19: Wink Data (Interactive TV)
> Line 20, 22: AMOL (Nielson data)
> Line 21: Closed captioning
> Line 23 WSS (PAL)

[1] With the exception of Video Index, the Time Delay can reproduce these signals on any VBI line.

Operations

The Graphical User Interface

The Broadcast Time Delay uses a Graphical 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 four sections: Run/Stop control, Time Delay Set, Input Configuration, and System Calibration. Controls and displays for each section are described below.
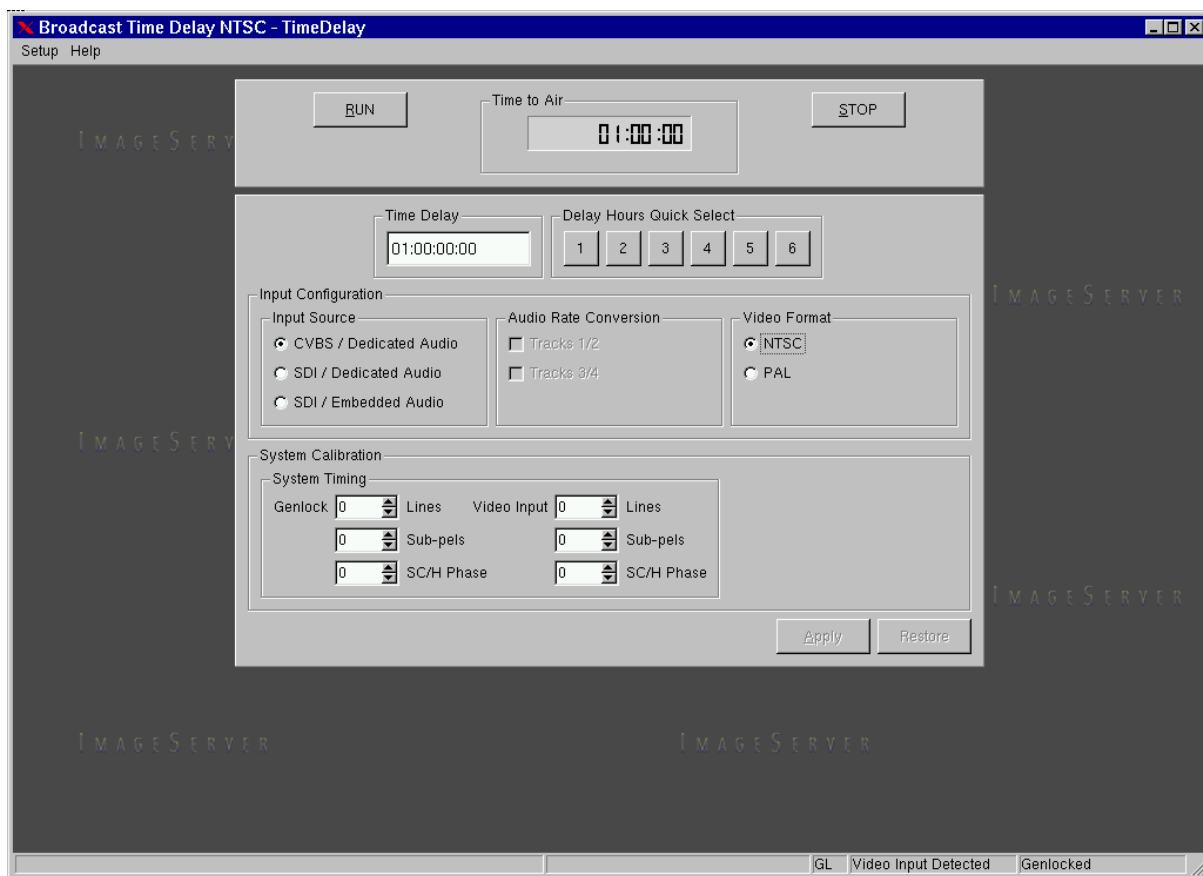
Graphical User Interface
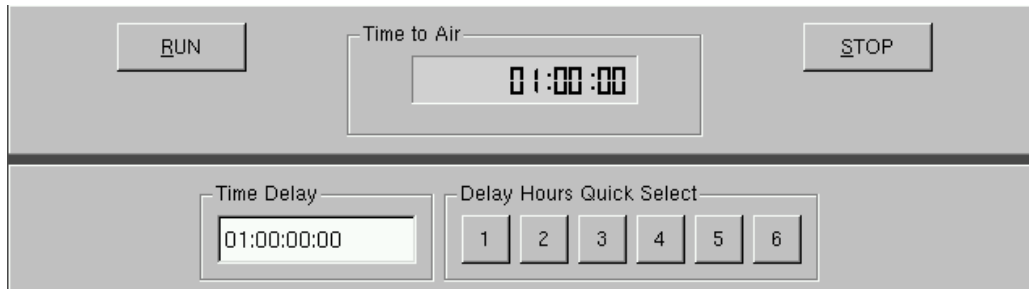
Run, Stop, Time to Air display
Time Delay and Time Delay Presets

Run/Stop Control

Run

The RUN button initiates or restarts the time 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. Press RUN to begin a new delay cycle, and restart the Time-to-Air countdown.

Time to Air

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 D.HH:MM:SS:FF format. (Day.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, or days by appending a suffix, (s, m, d, or h) to the value entered into the text box, such as "120m" or "30s."

Time Delay Presets

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.
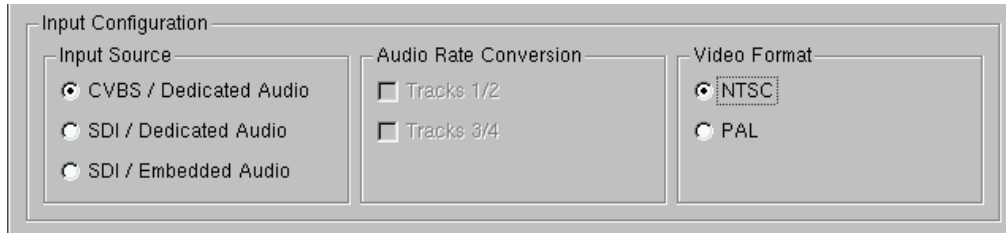
Input Configuration

Input Configuration

Input Source

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

> CVBS (composite video using XLR audio inputs)

> SDI (Serial Digital with using XLR audio inputs)

> SDI (Serial Digital with embedded audio)

The XLR audio inputs can be either two stereo pairs (4 channels) of AES/EBU digital audio or a stereo pair of +4 dBu analog inputs, as determined by jumpers on the audio card.

Regardless of the input selected, audio will always appear in parallel both in the embedded audio SDI stream and at the XLR outputs. Broadcast Time Delay supports Group 1 embedded audio, which includes Audio Channels 1-4, 20-bit, 48 KHz, synchronous audio, as per SMPTE 272A.

> Note that when Embedded Audio is selected as the input, if Genlock is also used **the video input must be synchronous with the genlock signal.** It is recommended that when using Embedded Audio, use the input as the source of system timing by leaving the Genlock input unconnected. Using an uncorrelated SDI signal and Genlock will result in noise in the Embedded Audio output.

Audio Sample Rate Conversion

Two check-boxes are provided to engage built-in sample rate converters for either (or both) of audio channels 1 & 2, and 3 & 4. When checked, the time delay converts incoming AES/EBU audio tracks to a 48 KHz broadcast standard synchronized with video genlock. Audio sample rate conversion boxes will be grayed-out if the SDI/ Embedded audio check-box is selected, or the XLR audio inputs are jumpered for analog audio.

> When using Genlock and an input that is not synchronized to that same Genlock signal, enable the sample rate conversion even if your AES audio source is 48 KHz.

Video Format

This selection is used to select NTSC or PAL operation. When this setting is changed, you will be prompted to restart the system.
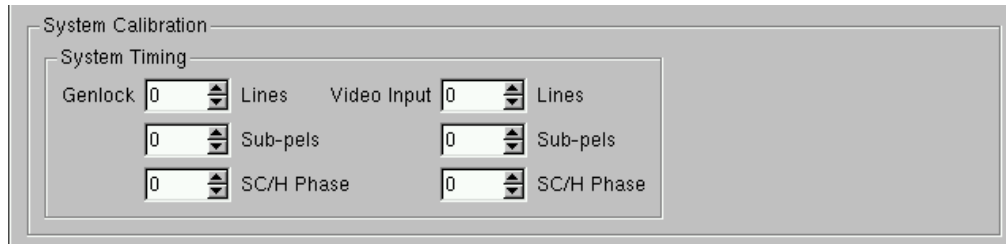
System Timing

System Timing

There are two sections, one applies to operation when synchronizing to the Genlock signal, the other when synchronizing to the input. When the system is in Run mode, only one section will be active depending on the presence or absence of the genlock signal.

Note that these timing adjustments apply only to the Delay outputs, not the Monitor outputs. The monitor outputs are designed for confidence monitoring only, and are not timed. They exhibit a fixed delay relative to the input of approximately 1/3 of a video line.

Note that in many 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 where many different sources must be consistent.

Lines

Adjusts the output line timing in relation to the active reference, by an amount equal to one complete line. The adjustment range is -3 to 12

Sub-pels

Adjusts the output line timing in relation to the active reference, by an amount equal to one half pixel. The adjustment range is -907 to 1139

SC/H Phase

Adjusts the Sub-Carrier/Horizontal phase relationship. Use a vector scope to view the phase relationship between the CVBS output and reference and adjust the setting. Changes to the setting are effective after the APPLY button is pressed. The adjustment range is effectively ±90°; the numeric settings do not correspond to degrees.
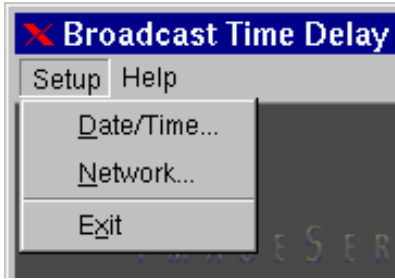
Setup Menu

Configure Network

Network parameters are set in the Configure Network dialog. In the **Setup** menu in the upper left corner of the main window, select **Network.** Network communication for the Broadcast Time Delay is designed primarily to support access to error logs and factory diagnostics.

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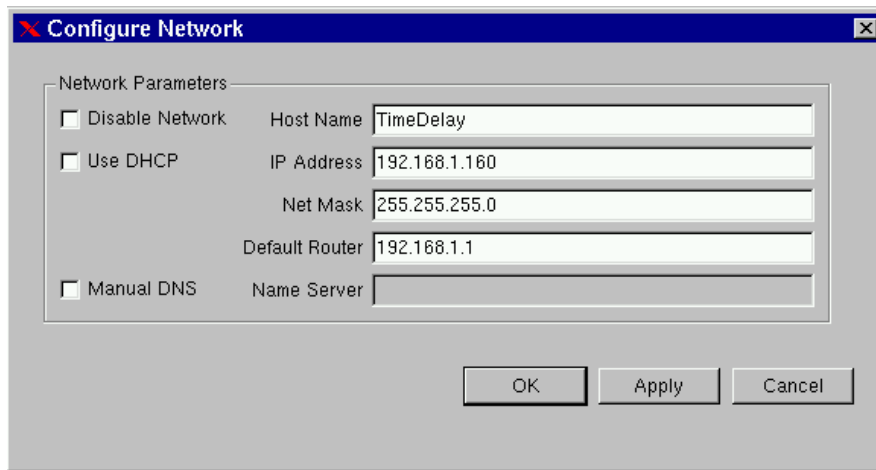
Configure Network dialog

Use the Configure Network dialog to configure network communication settings.

From the Main Menu selection bar at the top of the screen, select **Setup > Network**.

Each Broadcast 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
- Manual DNS 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.

Manual DNS Checkbox

When using DHCP, the DNS name resolution is usually configured automatically. Enabling Manual DNS configuration requires that a DNS server address be supplied for name resolution.

Saving Network Configuration

Click on OK, APPLY, or CANCEL to accept or abandon new entries. Changes will not take full effect until the Broadcast Time Delay is powered off and back on.

Set Date and Time

From the Main Menu selection bar at the top of the screen, select Setup > Date/Time.

The date and time in the Broadcast Time Delay's system clock can be set by entering values in the Time Set window. Time stamps 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.

The date and time should only be set when Broadcast Time Delay is in STOP mode.
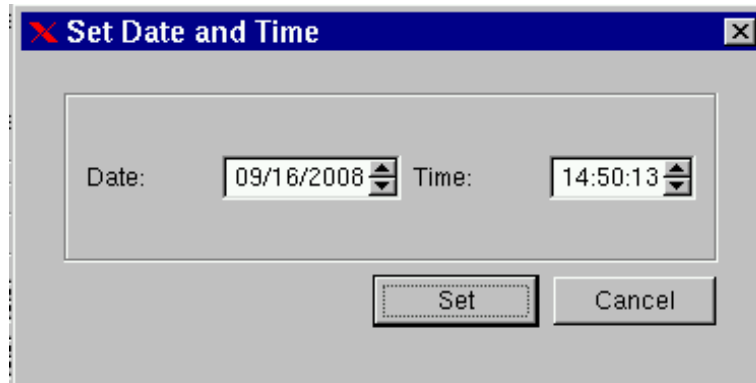
Set Date and Time dialog

Technical Specifications

Video

Time delay	Adjustable, 20 sec to 25 hours
Time set increment	D.HH:MM:SS:FF (True number of frames per hour)
Video reference (genlock)	External black burst (RS-170A) Synchronizes to video input upon loss of external reference
Accuracy	Frame accurate; long term is same as genlock reference
Inputs	1, selectable CVBS or SDI
Outputs	1 delayed output, 1 E-E monitor. Each available as both CVBS and SDI
Analog video I/O	Composite (CVBS), 75Ω BNC connector, RS-170A
Digital video I/O	SDI, SMPTE 259M-C, 75Ω BNC connector
Video standards	NTSC: 525/60, PAL: 625/50
Compression format	MPEG-2, 4:2:2 Profile @ Main Level, I-frame, 30 Mb/sec

Audio

Embedded Audio	Group 1, Audio Channels 1-4, 20-bit, 48 kHz, synchronous audio, as per SMPTE 272A
Digital Inputs/Outputs	2 stereo pairs (4 channels) per video channel
Digital audio format	AES/EBU, XLR-3 connector (AES-3-2000)
Analog Inputs/Outputs	2 mono audio channels per video channel
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

VBI Data[1]

SDI Closed Captions	Records and plays CC data on line 21 per EIA-708B
Composite video Closed Capt.	Records and plays CC data on line 21 per EIA-608B
VITC time code	Can be placed on any lines from 12 to 18; [includes user bits]
AMOL/Nielson data	Records and plays on line 20, 22
Video Index[2]	Line 11&324 (PAL SDI only) Class 1.1 data per SMPTE RP186-2008
WSS	Line 23 & 336 (PAL only.)

Network Communications

Network port	Gigabit Ethernet
Transfer protocol	FTP
Data available	Error log

Disk Storage

Drives	(4) 250 GB Serial ATA in RAID-5 array
Drive access	Accessible/replaceable from front panel
CD-ROM drive	Internal, for loading operating system and software upgrades

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	25-pin D connector, future use
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), optional rear supports
Weight	27 lb. (10.6 Kg) net
Country of origin	U.S.A.
Agency approvals	UL, C-UL, CE, FCC Class A

[1]The Broadcast Time Delay records and passes through all VBI lines between 11 and 22 (inclusive, field 1 and field 2) in NTSC and lines 11 to 23 in PAL.

[2]In PAL mode, special handling of line 11 Video Index data is enabled by default, but can be disabled to allow normal reproduction of line 11. See Video Index below.

Video Index

Video Index is supported in PAL mode SDI input only. The data is used mainly to communicate information about the format and aspect ratio of the video signal to down stream equipment. The Time Delay does not take any action based on the Video Index data, it only passes it to the output.

When no valid Video Index data is present, no data is output.

In the event of total input signal loss (no SDI input carrier), whatever Video Index data was in the last frame (including the case of no data) is held on the output.

The data passed as defined by SMPTE RP-186-2008 Class 1.1, is:
* Octet 1 - Scanning System, Active Format Description,
* Octet 2 - Signal Form Data Field and Reserved Data Field,
* Octet 3 - Sampling Structure Data Field and Reserved Data Field.

Video Index uses a special coding method that not only relies on the digital nature of SDI, but also does not pass unaltered through MPEG encoding. The Time Delay takes the Video Index data from line 11 and reinserts it on the output. This takes the place of normal video recording on line 11 in both CVBS and SDI. To disable this feature for normal line 11 recording in CVBS or SDI:

1. Turn off the NumLock on the keyboard, hold the Shift and Control keys and briefly press the F12 function key.

2. A terminal window will open. Type "`videoindex disable`" and then Enter.

3. **Power down the system** and restart to effect the new configuration.

To restore Video Index operation, repeat the steps above using "`videoindex enable`". The current state of the unit can be determined by using simply "`videoindex`".

Appendix

Audio XLR-3 Connector Pinout

The selection of analog or digital audio signals to appear on the XLR connectors is determined by the setting of the internal audio selection jumpers on the internal audio PC card. 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, LTC, 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 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, and any time a power supply voltage is detected to be out of tolerance. 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 indicates loss of signal, but may not be triggered by a noisy or out of spec 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). 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-25-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/O (DB25-F)   INTERNAL CIRCUITS

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

INPUTS

GPO 1	23
GPO 2	11
GPO 3	24
GPO 4	12
GPO 5	25
GPO 6	13

OUTPUTS

+5V, 200mA MAX SOURCE	21
	22
	8
SIGNAL GND	9
	10
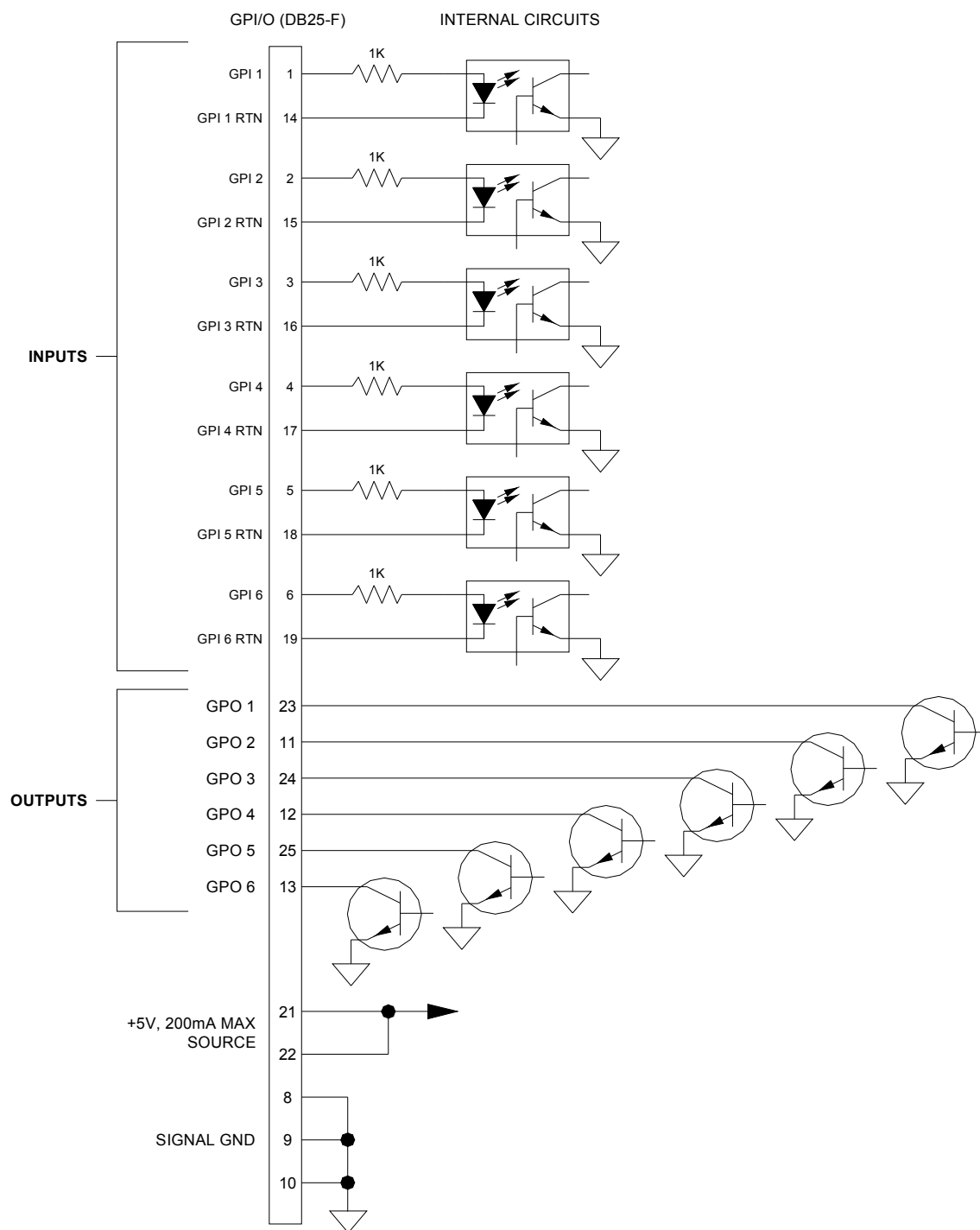
GPI Input/Output Connector Schematic

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 Image Server 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 Broadcast 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 Broadcast 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 Broadcast 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 server.

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

Unused USB ports and an RS-232 serial port may be present on the unit. These are not active and no connection should be made to them.

Mechanical Drawing

17.00
[432 mm]

18.85
[479 mm]

18.12
[460 mm]

19.00
[483 mm]

3.47
[88 mm]
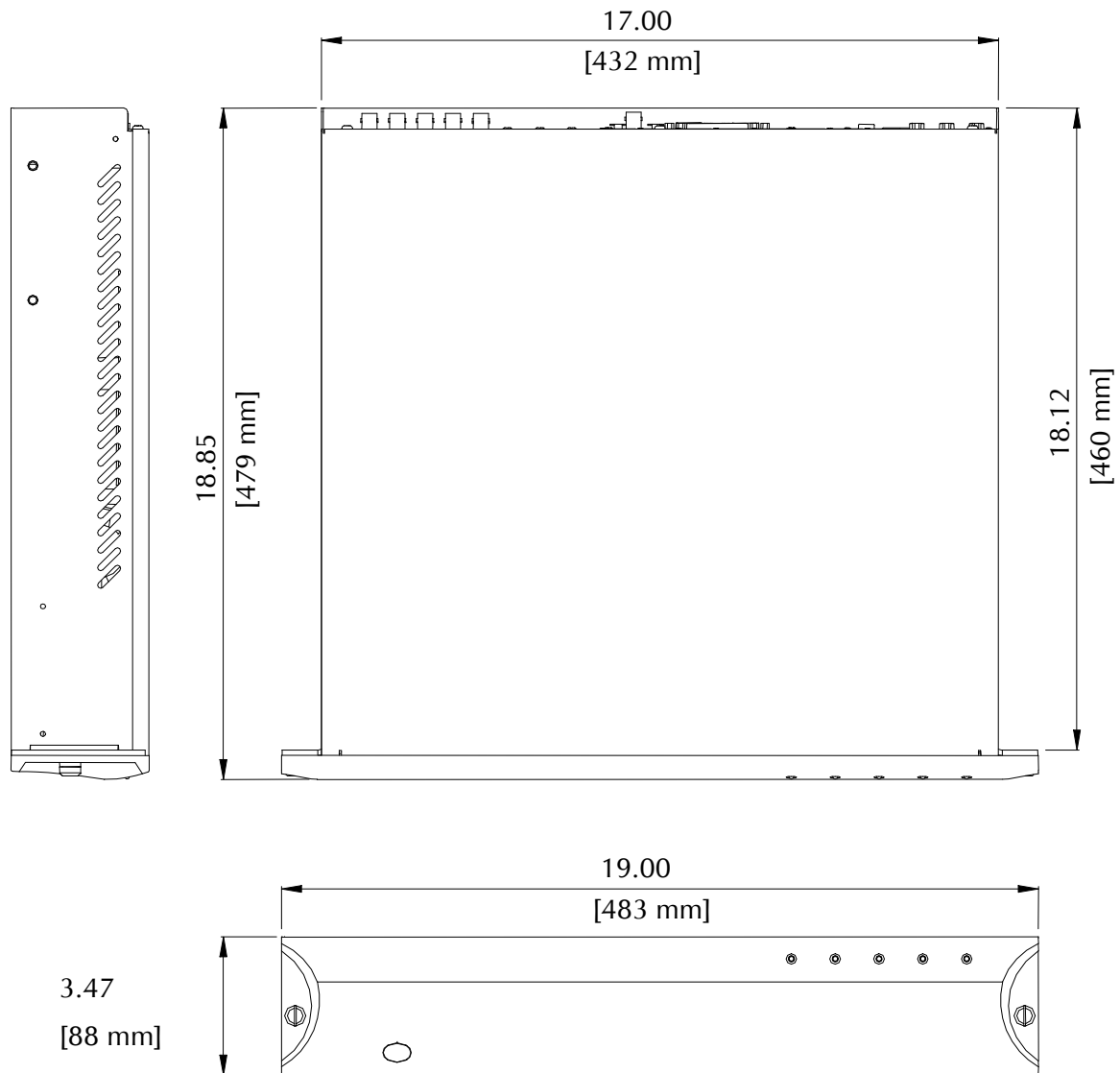
Dimensional Drawing

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 Genlock signal, or an invalid signal, at the **GENLOCK** input connector. **In installations that use the input for synchronization, this does not represent an error condition.**	Check the Genlock setting in the On-Screen System menu. Check the Genlock cable connections or signal.
POWER	FLASHING indicates that there is a fault in the system power supply.	Shut down the Broadcast 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 Broadcast 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 Broadcast 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.

⚠	Repairs should be performed only by qualified electronics technicians.
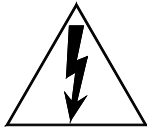
Gigabit Ethernet Indicators

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

	Be certain to shut down the Broadcast Time Delay, turn off the rear panel power switch and disconnect the power cord before opening the unit for service.

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

The front panel is removed to access the internal CD-ROM drive (for system program updates), or to service the hard drives.

The top cover is removed to access the analog/digital audio selection jumpers, or to service an I/O card, the system board, or power supply.

Removing the Front Panel

The front panel is easily removed for access to the CD-ROM drive, 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 Broadcast 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. The system can be powered ON for program updates with the front panel removed.

Removing the Top Cover

Using a No. 2 Philips head screwdriver, unscrew the three 6-32 Philips head screws attaching the top cover to the rear panel. Slide the cover back until it is clear of the front panel, and then lift it off.

To re-install the top cover, set the cover on top of the chassis and slide the cover forward until its front pins engage the front panel. Secure the cover to the rear of the chassis with the three 6-32 screws.

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 one or two 6-32 X ¼″ pan head Phillips screws on the rear panel of the chassis.

Video I/O Card

Remove the 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 from the riser card. When the video card is clear of the PCI riser connector, move the card toward the front of the unit until the video connectors are clear of the rear panel. Lift the video card from the chassis. Unplug the 50-pin ribbon cable 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 three Serial-ATA cables 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 cables into the correct RAID card connectors. The cables are marked with connector numbers to match the numbers appearing next to each RAID card connector. If these cables are not connected correctly, the data in the RAID array will be destroyed.

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/Digital Audio Selection

GAIN ADJUST

JUMPER BLOCK PAIR SHOWN
IN DIGITAL POSITION

JUMPER BLOCK PAIR SHOWN
IN ANALOG POSITION
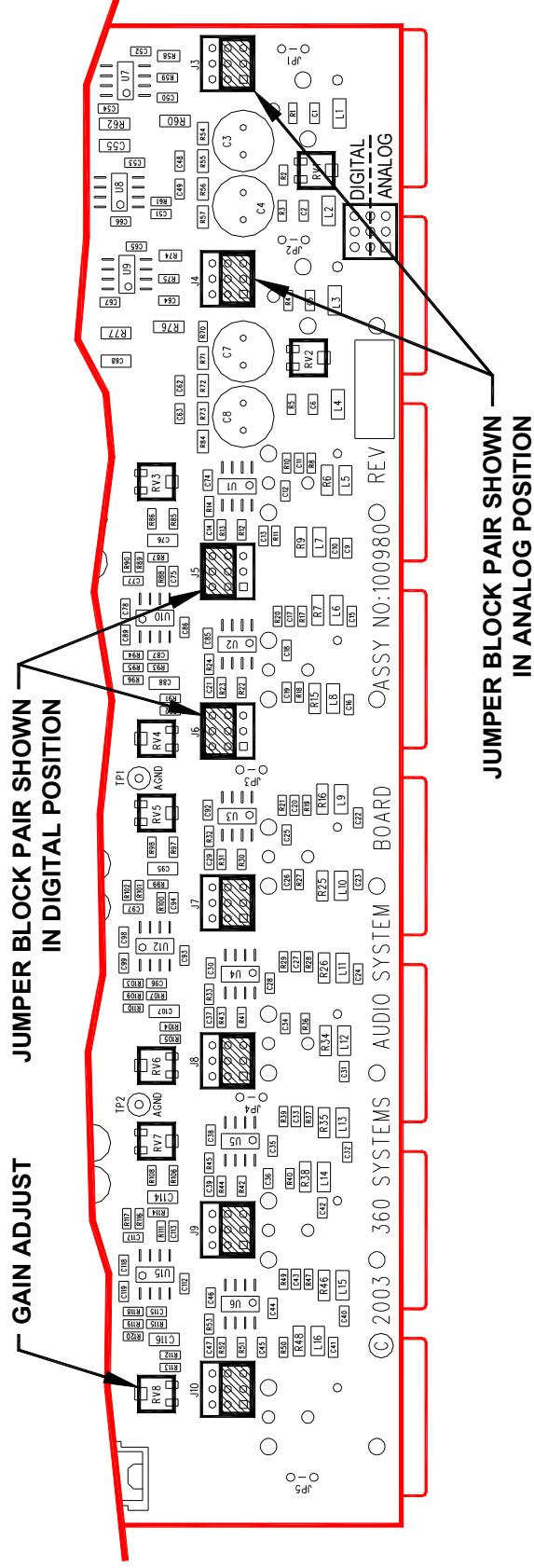
Both jumpers for each channel (Left & Right, or Main & Aux) must be set together, either analog or digital.

SETTING AND CALIBRATION REFERENCE DESIGNATIONS

Connector	Main 2 L Main 2 L/R	Main 2 R Aux 2 L/R	Main 1 L Main 1 L/R	Main 1 R Aux 1 L/R	Main In L Main In L/R	Main In R Aux In L/R
Jumper	J8	J7	J6	J5	J4	J3
Trimmer	RV6	RV5	RV4	RV3	RV2	RV1

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. Refer to the preceding drawing for the location of trim pots and jumper blocks referred to in the calibration procedures.

Calibration Procedure

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

1. Position the jumper block J5 and J6 for Channel 1 output to obtain a digital output.

2. Set the delay time to a minimum value, so that an input signal will appear at the Main Outputs.

3. Use the audio generator to apply a 1 kHz sine wave at a level of +4 dBu to analog audio Input 1-L.

4. While observing the digital output level of audio Channel 1-L, adjust input gain trim pot RV2 until a level of −20 dBFS is obtained. (+4 dBu is 20 dB below full scale, which is +24 dBu; therefore it reads 20 dB below full scale or Fs.)

5. Repeat steps 2 through 4 for analog audio Input 1-R, while adjusting input gain trim pot RV1.

The server's input gain is now calibrated. It remains to calibrate each analog output for unity gain using the following procedure:

6. Position all audio output jumper blocks to obtain analog outputs.

7. Apply a 1 kHz sine wave at a level of +4 dBu to analog audio Input 1-L.

8. While observing the output level of audio Channel 1-L, adjust output gain trim pot RV4 until a level of +4 dBu is obtained.

9. While observing the output level of audio Channel 1-R, adjust output gain trim pot RV3 until a level of +4 dBu is obtained.

10. Repeat steps 9 and 10 to adjust the gain of the left and right outputs.

The server's output gain is now calibrated, and the entire sequence of the preceding steps has established a gain of unity through the server. Another method is to use digital input with a digital sine wave of −20 dBFS to calibrate analog outputs 1 & 2.

Program Updates via CD-ROM

The Broadcast Time Delay operating system and On-Screen User Interface programs can be updated by the user via the internal CD-ROM drive. Program updates may become available by 360 Systems from time to time. The current software version can be determined by looking in the On-Screen program **About** box, or by pressing the F1 key.

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

Remove the Broadcast Time Delay front panel. The internal CD-ROM drive will be seen at the left front of the server.

With the Time Delay powered on, press the CD eject button on the drive. The drawer will open a short distance. Gently pull the drawer open and insert the CD-ROM disk, printed side up. Push the drawer closed until it latches.

Press the front panel power switch briefly to shutdown the Time Delay.

Wait 5 seconds, then press the front panel power switch again to boot from the CD.

An installation option menu will be displayed which includes the choices "Update," "New," and "Cancel." Select "Update."

The message, "Please wait while Software is being installed" will appear with an activity indicator. When installation is complete, the server will automatically reboot from its hard disk array, and display the usual copyright notice while it is starting up. It will also release the CD drawer. Remove the CD. Never leave it in the CD drive.

Replace the front panel. Tighten the two large front panel access screws.

If a disk cannot be ejected because the system is not responding or is powered off, the CD-ROM drawer can be released by inserting a paper clip into the small hole on the front of the drive.

Hard Disk Management

The Time Delay employs an advanced Serial-ATA controller that manages four high-capacity hard disks operating in a RAID-5 configuration. This design increases system performance, and by storing parity data, helps prevent data loss should a drive fail.

This system brings a high level of reliability to Serial-ATA RAID through a new, switched architecture that exceeds the reliability of SCSI shared-bus storage systems. The earlier shared-bus architecture of SCSI has inherent performance limitations due to arbitration latency, since only one drive may use the bus at a time. Further, a single drive failure can bring the entire storage system down.

By contrast, the Time Delay uses a non-blocking switched architecture to isolate the drives from one another. Any drive failure makes that drive unavailable and the rest of the storage system remains undisturbed. In addition, the Time Delay uses Advanced Data Protection features, where all drive commands are checked to ensure that no command corruption has taken place over the entire data path.

Some of the Time Delay RAID implementation features and benefits include:

- Non-blocking switch technology with RAID 5 parity
- On-board processor minimizes host CPU overhead
- Easy-to-configure arrays
- Dynamic sector repair for robust data protection
- Accelerated RAID-5 writes
- Easy drive replacement from front panel

About RAID 5

A RAID 5 configuration features the data striping of RAID 0, combined with the parity benefits of RAID 4. Using a parity (exclusive OR) function, RAID 5 can tolerate the loss of one drive. Parity information is distributed across all drives rather than being concentrated on a single disk. This avoids throughput loss due to contention for the parity drive. Spare drives can be used to rebuild an array after a drive is replaced.

RAID-5 capacity equals the size of drive times (number of drives -1). In addition, the array's storage efficiency increases with the number of disks; from 66.7 % for 3 drives to 75 % for 4 drives: storage efficiency = (number of drives -1) X (number of drives).

RAID Level 5:
"Independent Access Array with Rotating Parity"
High Data Reliability & Transfer Capacity
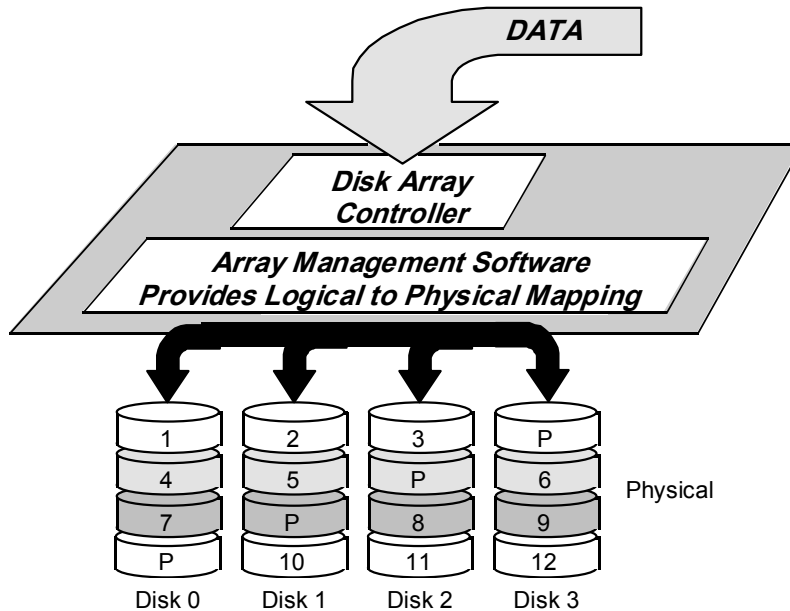
Figure 21: RAID 5 Array Schematic

Improved Write Performance

The Time Delay uses new designs to improve RAID-5 write performance for both large sequential and small random transactions. This advanced block caching firmware delivers extremely high performance for RAID-5 write operations.

Managing Disk Arrays

The Time Delay's 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. The first step in response to a flashing light 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.

The **RAID Status** window (Figure 23) 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;
- **Rebuilding**, indicated by "Rebuilding x%" on the Array Unit 0 status line.

"Rebuilding" 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. Upon detection of a parity error, the controller will automatically start the initialization process as a background task. This task should not interfere with Image Server's ability to record or play clips.

Parity errors may occur if the Image Server loses power, or is improperly shut off. No data will be lost, but the parity reinitialization process may take several hours. NEVER use the rear panel power supply switch to shutdown the Image Server. Shut down the system only by momentarily pressing the front panel power 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 power switch in for 4 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 Image Server.

![360 Systems logo]

Log-In to the RAID Utilities

Figure 22: Log-In to RAID Utilities

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

- Open the RAID utilities by selecting **START>SYSTEM>RAID STATUS**

- In the **Login** window, enter ADMINISTRATOR.

- 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 Login Utilities.

Determining the Condition of the RAID Array
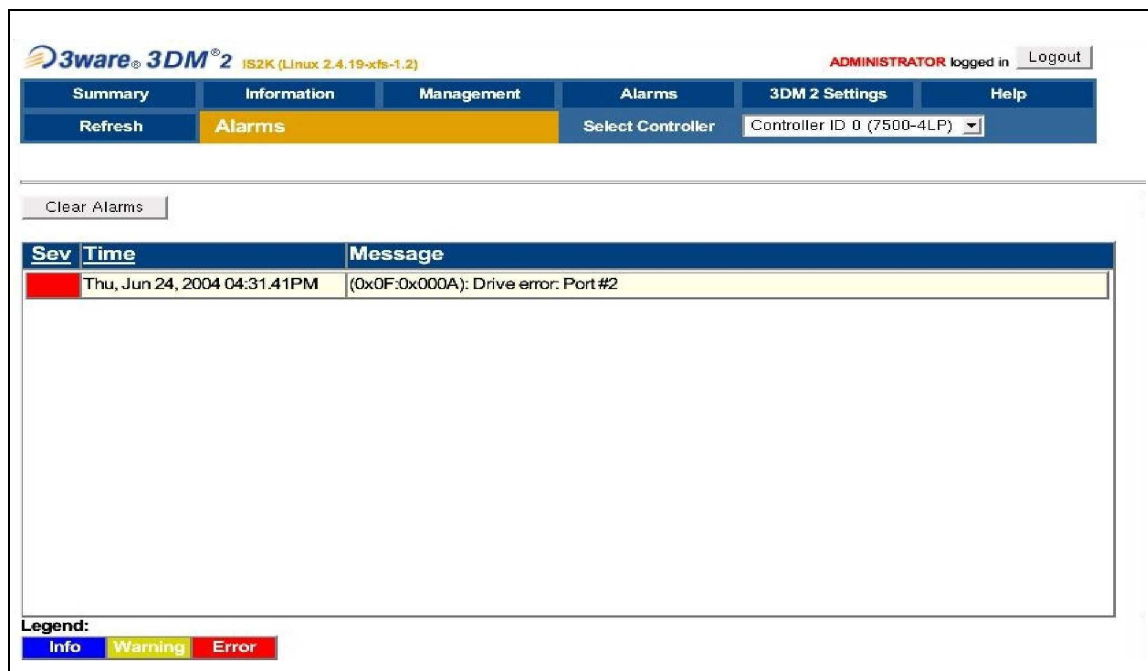
Figure 23: Report of RAID Array Condition

To replace a failed drive in the RAID control utility, perform the following steps. The above drawing 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 24: Checking Status of RAID Array

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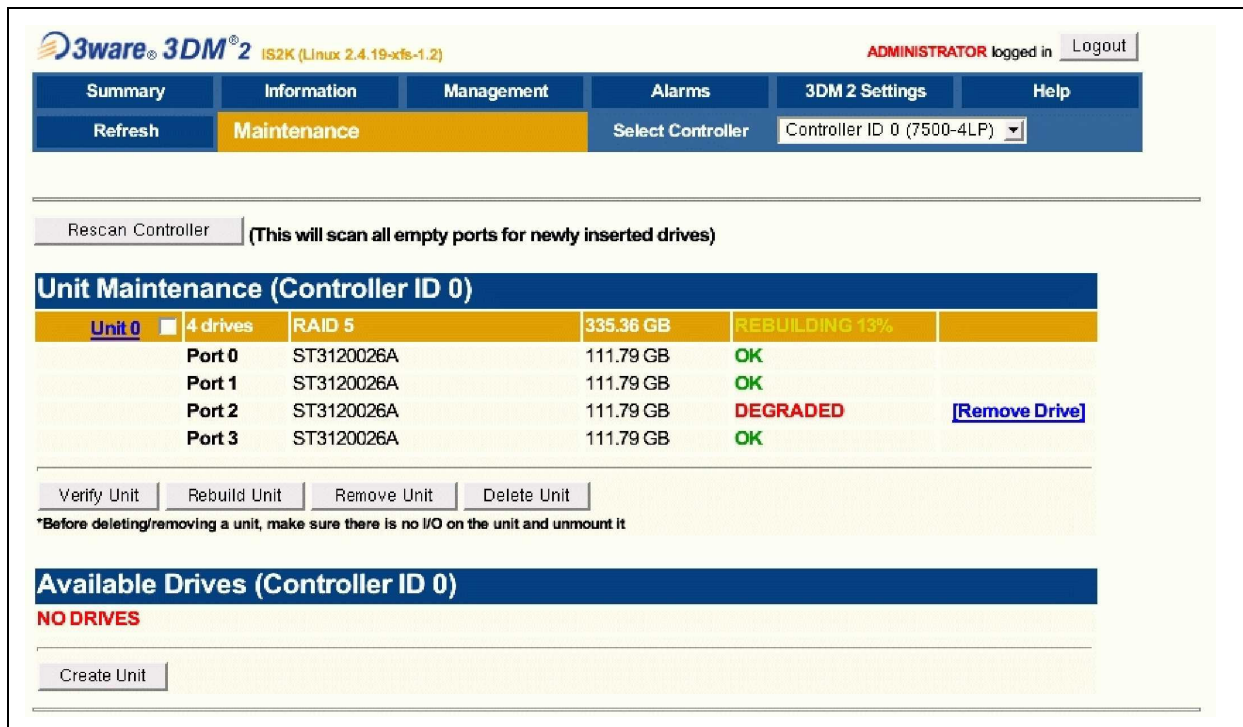
Drive Error – The drive reported a data error. A rare isolated occurrence may be acceptable, but probably indicates a drive failure.

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 25: RAID Maintenance Display

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

- Select **MANAGEMENT>MAINTENANCE**.

- Note the status of each drive in the array.

Removing the Degraded Drive from the RAID Unit

Figure 26: Removing Failed Drive from RAID Controller

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.

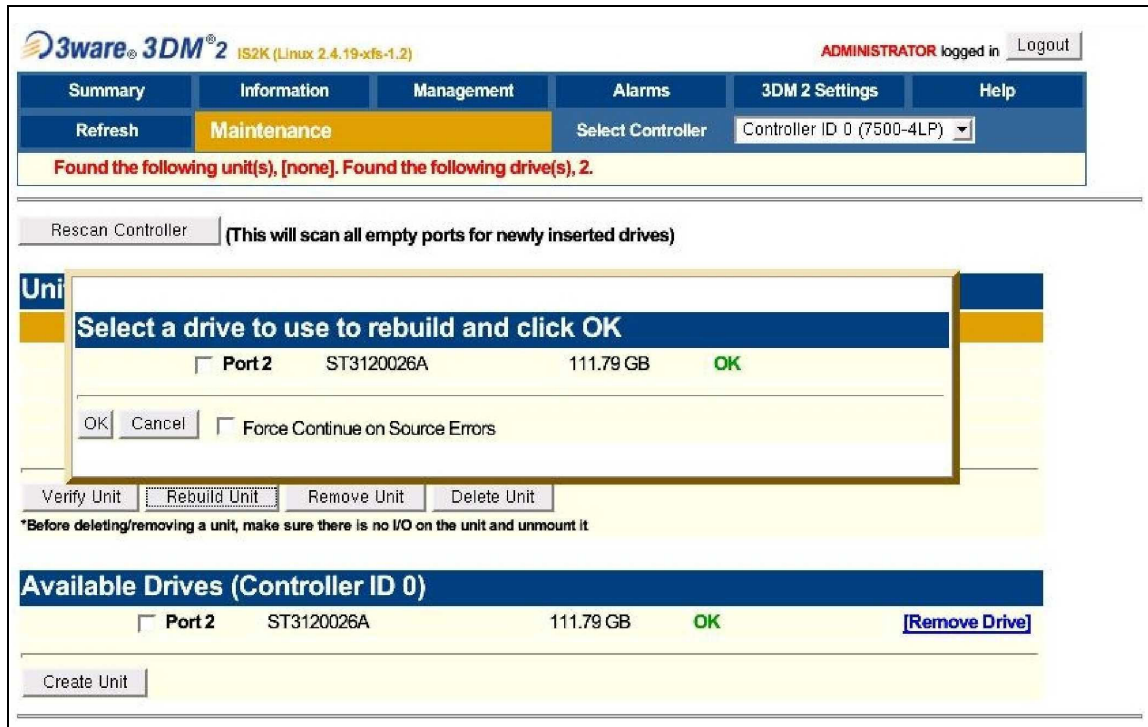## Rebuilding the RAID Array

Figure 27: Selecting a Drive to Use in Rebuilding the Array

- 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. This process may take a long time, but the Image Server can still be used.

- When complete, OK will be shown in the status for all ports on the MAINTENANCE menu.

Replacing Hard Drives

The Image 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 31 for instructions on accessing the hard drive bays. Detailed information about how to replace hard drives is on page 46.

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 above.

3. Unscrew the holding plate from the front of the drive sub-chassis.

4. Disconnect the power and Serial ATA data cable from the drive, and remove it from the drive bay.

5. 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.

6. Replace the front panel and tighten the two large screws.

7. Replace the AC power cord and turn on the rear panel AC switch.

8. Turn the system ON using the front panel button and check the RAID array status.

9. Check for correct operation of the server.

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. See the size columns shown in figure 26 and 27.

Notices

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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

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

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Laser Safety

Laser safety in the United States is regulated by the Center for Devices and Radiological Health (CDRH). The laser safety regulations are published in the "Laser Product Performance Standard," Code of Federal Regulation (CFR), Title 21, Subchapter J.

The International Electrotechnical Commission (IEC) Standard 825, "Radiation of Laser Products, Equipment Classification, Requirements and User's Guide," governs laser products outside the United States. Europe and member nations of the European Free Trade Association fall under the jurisdiction of the Comité Européen de Normalization Electrotechnique (CENELEC).

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)

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