360 Systems IMAGESERVER **MAXX-2400**

OPERATORS MANUAL

For use with Software Version 4.06.375

Image Server *MAXX 2400*

March 2009

900-105-0005-07 2400 UM
Added PAL parameters to Final Cut Pro / IMX Table

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PREFACE

This manual provides installation, setup and operating instructions for 360 Systems MAXX 2400 Image Server™. It is organized to provide quick access to topics of primary interest. An extensive Table of Contents is provided at the beginning and a subject Index at the end, to assist in locating information.

If you have already used hard disk video servers (or VTRs), you may find discussion of the basic server to be covering familiar topics. However, it is strongly recommended that engineering managers and staff members operating the MAXX 2400 read through this manual. Being familiar with its operation can prevent operational mistakes, and will make all users aware of important set-up and maintenance issues.

Software and Operations Manual Revisions

Software revisions are released from time-to-time that introduce new product features, or improve the performance of the product. When such revisions are shipped in the form of a CD-ROM, printed operational notes will be included. When revisions are introduced in the course of product production, an updated Operations Manual will be shipped with new servers.

Your comments are welcome. If anything in this manual seems unclear, please let us know by sending an email to support@360systems.com.

Typographical Conventions

The following typographical conventions are used to clarify meaning:

- Connector or indicator labeling that appears on the unit is shown in **Arial Narrow Bold**.
- GUI menu items are shown in **Arial Bold**.
- Test typed into the GUI and Key Commands are shown in `Courier Bold.`
- GUI sub-menu paths are shown by the **>** symbol.

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 MAXX 2400 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.

- Lifting or moving the unit should be done using appropriate carts and/or dollies. Use two people to lift the unit.

PRODUCT DAMAGE PRECAUTIONS

- MAXX 2400 recorders contain 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 MAXX 2400. 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 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. MAXX 2400s are not offered for sale in all countries.

Trademarks
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OPERATING ENVIRONMENT

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 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 MAXX 2400 free of obstruction?

- Can blowers or HVAC system adequately remove heat from the equipment rack?

- Have you measured the <u>actual temperature</u> inside the rack? Do this near the top.

- Verify that the HVAC system is <u>not</u> 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 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 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 MAXX 2400.**

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'
MAXX 2400 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 a single MAXX 2400 is 500 Watts.

RFI/EMI interference

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 or radio 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. This includes the unconnected ends of cables
  connected to the equipment.

- Discharge to equipment frames or wiring can cause unpredictable behavior including data loss
  and crashes that can take the station off the air. 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.

INTRODUCTION

The Image Server MAXX 2400 is the logical evolution of the successful Image Server line of Broadcast Digital Video Server products. The MAXX 2400 is designed from the ground up to deliver outstanding performance and value in a multi-channel MPEG-2 and DV-format server. MAXX 2400 adds a 6 Terabyte hot-swappable RAID-6 array and a new intuitive hierarchical file system for organizing large amounts of content. Two video inputs and four video outputs with analog, digital, and Gigabit Ethernet interfaces make it an excellent choice for the next-generation plant.

- 6 Terabytes of Double Fault tolerant RAID-6 storage space (4.6 Terabytes useable)

- Hot swappable drives with front access

- Redundant Power Supplies

- Playout for MPEG-2, DV-25, key-and-fill TARGA graphics and IMX (D10)

- 2 video Inputs selectable between SDI or Composite inputs

- Input Frame Synch for capturing content from asynchronous sources such as VTRs.

- 4 simultaneous outputs, selectable between SDI or Composite outputs

- Fast file import via FTP over Gigabit Ethernet

- Content exchange with NLEs

- Optional round-trip support for Final Cut Pro$^{®}$ with the IMX Option.

- MXF Compliant

- Intuitive graphical user interface

- Remote Control from a PC using the Remote Workstation software

- Intuitive hierarchical file system

- Advanced Playlisting capability

- +4dBu balanced analog or AES/EBU digital, with SDI embedded audio, four audio channels per video channel.

360 Systems ®

UNPACKING

CAUTION!!

Image Server MAXX 2400 weighs more than 75 pounds with all disks installed. Please use appropriate carts and lifting techniques when following these instructions.

Package Contents

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

- ✓ Image Server MAXX 2400
- ✓ Keyboard
- ✓ 2-Button Scroll Mouse.
- ✓ Software CD-ROM, backup copy
- ✓ Remote Workstation Software CD
- ✓ AXP1 Module
- ✓ AXP1 Interface Cable
- ✓ CXP Module
- ✓ CXP Interface Cable
- ✓ Twelve 500Gb Hard Drives
- ✓ Rack Mount Hardware Kit
- ✓ Operations Manual
- ✓ Power cords (2)
- ✓ Warranty Card

NOTE

Before unpacking hard drives, refer to the following sections on RACK MOUNTING (Page 15) and INSTALLING THE HARD DRIVES (Page 16) before removing the drives.

RACK MOUNTING

CAUTION!!
It is recommended that you first rack mount the MAXX 2400 before installing the drives. This will reduce the weight significantly and simplify the mounting process.

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 MAXX 2400 in a rack. The jumpers are factory set to the Analog audio position. For more information about changing the jumpers, see APPENDIX A – SETTING THE AUDIO JUMPERS FOR ANALOG/DIGITAL.

In North America, the MAXX 2400 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 MAXX 2400 should be supported by the rack mounting rails. Do not support substantial cable weight from the MAXX 2400.

Install the included rack mount slide rails in the rack. They must be securely mounted at both the front and back of the rack. Extend the slides in the slide rails. Carefully mate them with the rails on the sides of the MAXX 2400 – **this process requires at least two people** unless an adjustable lift is available. Slide the MAXX 2400 into the rack.

Deploy the front panel to expose the rack screw slots. Unscrew the knurled fasteners and pull forward and down to deploy the front panel. Fasten the MAXX 2400 into the rack using appropriate flat-head screws (#10 Phillips screws provided in North America). Retract the front panel. Tighten the front panel access screws.

Mounting the Audio Module (AXP1)
The supplied AXP1 module may also be rack mounted in a Standard 1-RU space above or below the MAXX 2400, on the front or rear of the rack. Four elongated screw holes are provided to facilitate rack mounting of the AXP1 Module. The AXP1 module is connected to the MAXX 2400 using the supplied 68 Pin cable. Connect one end of the cable to the mating connector on the rear of the ACX Module. Connect the other end to the AXP1 connector on the rear panel of the MAXX 2400 . Refer to Figure 4 on page 20 for information about connecting audio signals to the AXP1 Module.

Mounting the Control Module (CXP)
The supplied CXP module may also be rack mounted in a Standard 1-RU space above or below the MAXX 2400, on the front or rear of the rack. Four elongated screw holes are provided to facilitate rack mounting of the CXP Module. The CXP module is connected to the MAXX 2400 using the supplied 68 Pin cable. Connect one end of the cable to the mating connector on the rear of the CXP Module. Connect the other end to the CXP connector on the rear panel of the MAXX 2400. Refer to Figure 6 on page 23 for information about connecting GPI and automation signals to the CXP Module.

Connecting the Monitor, Mouse and Keyboard

The MAXX 2400 is not shipped with a video monitor. Select a VESA-compliant CRT or LCD monitor with a minimum refresh rate of 75Hz. Note that the MAXX 2400 may not start correctly if an unsuitable monitor is connected. Connect the monitor to the VGA port on the rear of the unit. Refer to Figure 2 on Page 17

Connect the keyboard to the PS-2 keyboard port on the rear of the unit; connect the mouse to the mouse port. Refer to Figure 2 on page 17. **NOTE: If the mouse and keyboard connections are interchanged, the MAXX 2400 may not boot up properly.** Be especially careful about this when using extender cables.

If you own more than one MAXX 2400, 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 ImageServer at all times, even when switched away from it. When first powering up the MAXX 2400, use only the supplied keyboard and mouse directly connected. Then test the KVM switch system that will be used thoroughly before installation is completed.

Installing the Hard Drives

MAXX 2400 uses twelve, 500Gb drives in its 6 Terabyte RAID 6 array. These are packaged in a separate carton inside the main carton. The drives are fully configured and ready to run the MAXX 2400 application. **It is important that the drives be installed in the correct positions in the RAID array**. Each drive has a number affixed to it's packaging material. Install each drive in the corresponding numbered bay according to Figure 1.

Deploy the drive bay door by loosening the knurled screws and pulling lightly forward and down.

Install each hard drive in the corresponding numbered slot as follows.

1. Open the blue locking lever by pulling forward slightly
2. Insert the drive in the bay by sliding it in till you feel it "seat"
3. Close the locking lever.

Figure 1 - Drive Bay Organization

REAR PANEL CONNECTIONS

Figure 2 indicates the Rear Panel connections on MAXX 2400. Each connection is described briefly in the following text. Make all connections appropriate to your workflow before applying power to the MAXX 2400.
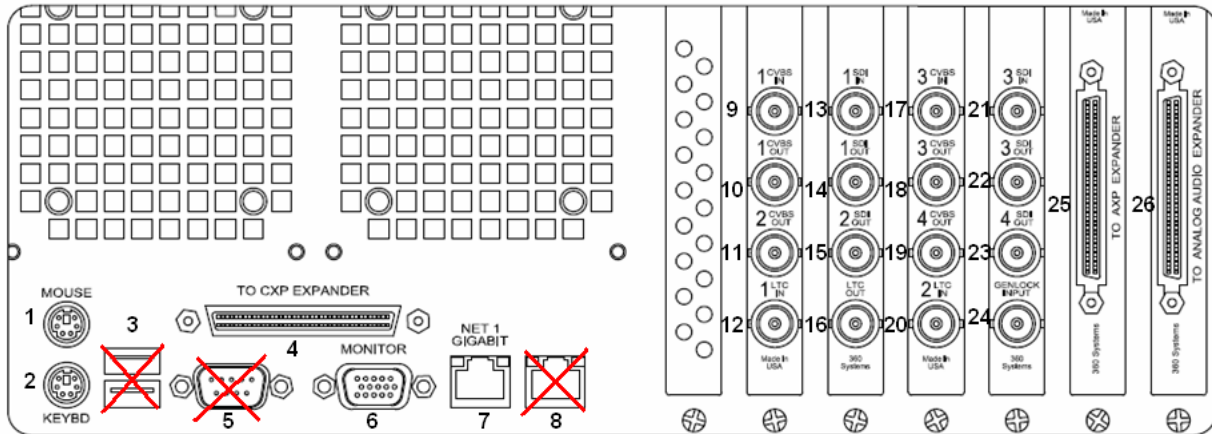
Figure 2 - Rear Panel Detail

1. Mouse
3. USB (UNUSED)
5. Serial Port (UNUSED)
7. Net1 - Gigabit Ethernet
9,17. Channel 1 and 3 CVBS (Analog) Inputs
10,11,18,19. Channel 1,2,3,4 CVBS Outputs
14,15,22,23. Channel 1,2,3,4 SDI (Digital) Outputs
24. Genlock Input
26. AXP2 Interface Connector.

2. Keyboard
4. CXP Interface Connector
6. VGA Monitor
8. Net 2 (UNUSED)
13,21 Channel 1 and 3 SDI (Digital) Inputs
12,20 Channel 1 and 3 LTC Inputs
16. LTC Output
25. AXP1 Interface Connector

SDI (Digital) Video Inputs (13,21)
The MAXX 2400 records Digital video on channels #1 and 3. It has separate BNC inputs for SDI (serial digital per SMPTE 259M) and analog video (CVBS) signals.

CVBS (Analog) Video Inputs (9,17)
The MAXX 2400 records CVBS analog video on channels #1 and 3. It has separate BNC inputs for SDI (serial digital per SMPTE 259M) and analog video (CVBS) signals.

SDI and CVBS inputs have a fixed 75-ohm termination.

SDI (Digital) Video Outputs (14,15,22,23)
Channels 1,2,3 and 4 have video outputs in SDI. Digital video appears in SDI format at 270 Mb/s and conforms to SMPTE 259M.

CVBS (Analog) Video Outputs (10,11,18,19)
Channels 1,2,3 and 4 have video outputs in composite (CVBS) format .

Genlock Sync Reference (24)
The MAXX 2400 can be referenced to an external genlock reference in the form of CVBS black. The **GENLOCK** input provides a fixed 75-ohm termination. An internal crystal reference is also provided so that the server can be used as a stand-alone player.

Gigabit Ethernet Port (7)

A Gigabit Ethernet port is provided on the MAXX 2400. The **NET 1** port is intended for external transfer of program content between video servers. The server supports MXF file transfer, for backup and content interchange between products from different manufacturers, as well as file import in various formats from desktop editors. The **NET 1** port is also used for remote control using the optional Remote Workstation software. The **NET 2** (8) port is reserved for future use and is not active. Use only the **NET 1** port.

LTC Time Code Input (12,20)

An LTC time code input is provided for Channel 1 (**12** in Figure 2) and Channel 3 (**20** in Figure 2) . The LTC input provides a > 10k ohm termination. This input may be selected by means of the On-Screen user interface and recorded as a time code reference. This input may be selected by means of the On-Screen user interface and used as a start time reference. Note that time code is not actually recorded, the time code read at the start of recording is captured. When the clip is played back, the time code (in display, VITC and LTC outputs) starts from the captured time and proceeds continuously.

LTC Time Code Output (16)

An LTC time code output is provided on the **LTC OUT** BNC connector. It may be selected by means of the On-Screen user interface to output time code from any of the four video channels during playback. The LTC output has a source impedance of < 5 ohms.

Keyboard (1)

Attach the alphanumeric keyboard to the purple 5-pin **KEYBD** connector to control the server and manage clips with the On-Screen graphic user interface. **Note that the server will only recognize the keyboard if it is attached before power up.**

Mouse (2)

A two-button scroll mouse is provided with the MAXX 2400. Plug the mouse into the green 5-pin **MOUSE** port. **Do not use the USB ports, even if the supplied mouse is USB capable**. Note that the server will only recognize the mouse if it is attached before power up.

Monitor (6)

A VESA-compliant computer monitor may be connected to the 15-pin VGA video port. The MAXX 2400 resolution is fixed at 1024 x 768 pixels, with a refresh rate of 72 Hz. This is best-viewed on 17-inch or larger monitors. 360 Systems does not provide monitors for the server. **Do not use older monitors that are not VESA compliant. The server may not start properly if an unsuitable monitor is connected.**

Serial Port (5)

The system board serial port is not used. Make no connection.

USB Ports (3)

The system board USB ports are not used. Make no connection.

Power Switch (Not shown in Figure 2)

Shutdown the system only by momentarily pressing the front panel power button, or through the SHUTDOWN command on the On-Screen user interface.

HOLDING DOWN THE POWER BUTTON FOR FOUR SECONDS WILL FORCE A SHUTDOWN. USE THIS METHOD ONLY IF THE UNIT IS NOT RESPONDING

AUDIO MODULE (AXP1) CONNECTIONS

The AXP1 Module is a 1RU Rack-mountable module that provides for connection of the audio equipment. Connect The AXP1 Module to the AXP1 Expansion connector on the rear panel of MAXX 2400 using the supplied 68 Pin SCSI cable. Figure 4 indicates the AXP1 module's connectors and their functions.

CAUTION!!

It is possible to plug the AXP1 Module into the CXP1 or AXP2 Module Connection. Damage to the system may occur if power is applied with the AXP1 plugged into the wrong connector. The AXP1 connector on the MAXX 2400 is clearly marked. Connect the AXP1 per Figure 3. Be certain it is properly connected before applying power to the system.
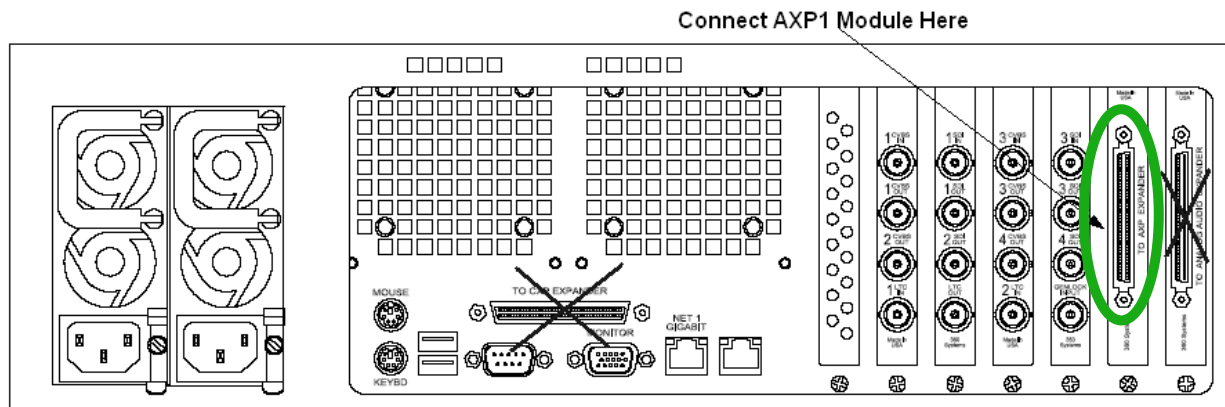
Figure 3 - AXP1 Connection to 2400 Chassis
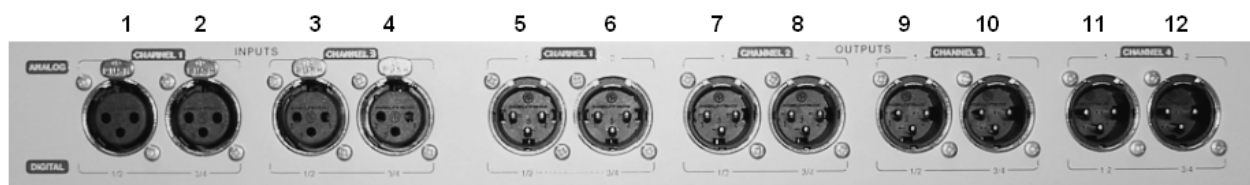
Figure 4 – AXP Expansion Module Connections

Each of the pairs of connectors corresponds to one of the video channels' inputs or outputs. Depending on internal jumper settings, each pair can be either:

- Two channels of balanced analog audio with a reference level of +4 dBu.
  OR
- Four channels of AES/EBU digital audio (two channels per connector).

The table below shows the functions of the connectors for ANALOG and DIGITAL modes.

Connector	ANALOG	DIGITAL
1. Video Channel 1 Audio Input #1	Channel 1 (Left)	Channels 1 & 2 (Main)
2. Video Channel 1 Audio Input #2	Channel 2 (Right)	Channels 3 & 4 (Aux)
3. Video Channel 3 Audio Output #1	Channel 1 (Left)	Channels 1 & 2 (Main)
4. Video Channel 3 Audio Output #2	Channel 2 (Right)	Channels 3 & 4 (Aux)
5. Video Channel 1 Audio Output #1	Channel 1 (Left)	Channels 1 & 2 (Main)
6. Video Channel 1 Audio Output #2	Channel 2 (Right)	Channels 3 & 4 (Aux)
7. Video Channel 2 Audio Output #1	Channel 1 (Left)	Channels 1 & 2 (Main)
8. Video Channel 2 Audio Output #2	Channel 2 (Right)	Channels 3 & 4 (Aux)
9. Video Channel 3 Audio Output #1	Channel 1 (Left)	Channels 1 & 2 (Main)
10. Video Channel 3 Audio Output #2	Channel 2 (Right)	Channels 3 & 4 (Aux)
11. Video Channel 4 Audio Output #1	Channel 1 (Left)	Channels 1 & 2 (Main)
12. Video Channel 4 Audio Output #2	Channel 2 (Right)	Channels 3 & 4 (Aux)

About the Audio I/O

The MAXX 2400 provides audio inputs and outputs in three formats:

- Balanced analog audio at a reference level of +4 dBu, corresponding to a digital level of -20dbFS.

- Digital audio in 24 bit AES/EBU format per AES-3-2000. 48 KHz sample rate.

- SDI embedded audio, 20 bit, 4-channels on SDI audio group 1, channels 1, 2, 3 and 4.

Note:

Internal jumpers select between analog or digital audio. Both *analog and AES/EBU audio signals are not available at the same time* on a given input or output channel. However, each channel's pair of inputs and outputs can be set up differently, if desired. See Appendix A.

A set of XLR-3 connectors allows high-quality connections to be made in either format. Embedded audio appears in the SDI output stream at all times. Refer to Appendix A for instruction on how to set the unit up for analog or digital audio.

Analog Audio Capability

When the analog audio format is selected, each video channel has two audio channels, recorded together as a stereo pair. Internal trimmers allow adjustment to unity gain. Refer to APPENDIX H - AUDIO LEVEL CALIBRATION. The outputs carry channels 1 and 2 when four channel material is played back.

Digital Audio Capability

When AES/EBU digital audio is selected, each video channel has four audio channels, which are recorded as two stereo pairs. Because a single XLR connector carries a *stereo pair* in AES/EBU format, and only one (monaural) channel in analog, the server provides an extra pair of audio channels when used with AES/EBU audio signals.

Embedded Audio Capability

When SDI embedded audio is selected, four audio channels are available for recording. Embedded audio is always inserted in the video outputs. Note that discrete audio (analog or AES/EBU) is also available on XLR connectors, at the same time embedded audio appears in the video stream. Embedded audio has a 20-bit resolution. Refer to *Using Embedded Audio* on Page 69 for details on using embedded audio.

Audio Word Size and Sample Rate

The MAXX 2400 employs 24-bit audio A/D and D/A converters, and records audio into a 24-bit frame, regardless of the word size received. The sample rate is fixed at 48K. When using the AES/EBU digital input, the 48K sample rate of the incoming digital audio must be derived from the video genlock reference. If it is not, or if a different sample rate is used, the MAXX 2400's input sample rate converters must be selected. Refer to Using Audio Sample Rate Conversion on page 71.

Note:
Encoded audio streams , such as Dolby E® ®must be referenced to video genlock, and the input sample rate converters must be disabled when recording such streams.

CONTROL MODULE (CXP) CONNECTIONS

The CXP Module is an external 1RU rack-mountable module that provides for the connection of the serial ports for automation control and the GPIO interface. Use the supplied 68 Pin cable. Connect one end to the connector on the rear of the CXP Module. Connect the other end to the CXP Expander port on the rear of the unit. Note that there are two cables supplied for initial connection. Both are identical and may be used to connect either module.

CAUTION!!

It is possible to plug the CXP1 Module into the AXP1 Module Connection. **Damage to the system may occur if power is applied with the CXP1 plugged into the AXP1 connector**. The CXP1 connector on the MAXX 2400 is clearly marked. Connect the CXP1 module per Figure 5. Be certain it is properly connected before applying power to the system.
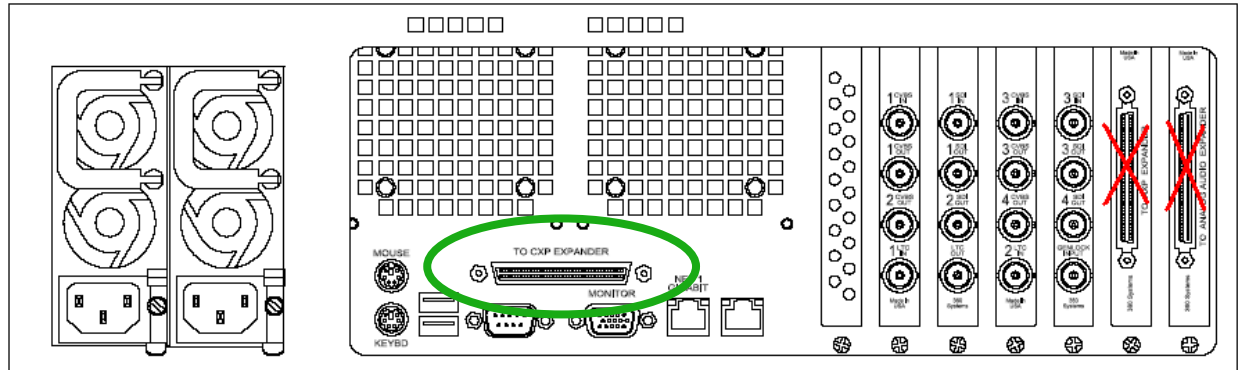
Figure 5 - CXP1 Connection to main chassis
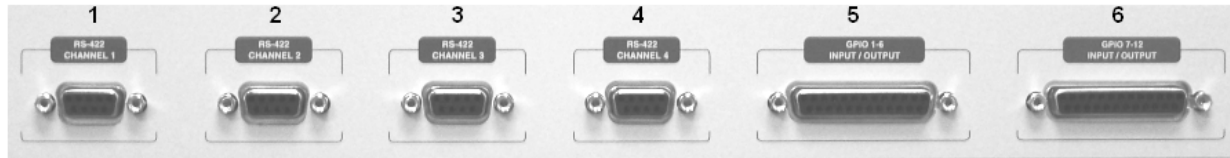
Figure 6 - CXP Module Connections

1,2,3,4 - Serial Control Ports for channels 1,2,3 and 4

Each of the MAXX 2400's four 9-pin "D" connectors permits independent control of any of the four video channels. They can accept serial commands in VDCP, Sony BVW or Odetics protocol. The multiple serial ports allow simultaneous connection of an automation controller and a desktop controller. See the chapter on Automation Control for further details.

Most broadcast automation systems, and some remote control panels, employ the VDCP protocol. A list of supported VDCP commands will be found in APPENDIX K - SERIAL COMMAND PROTOCOLS. Many controllers used for transport, instant replay, and edit control employ Sony BVW or Odetics protocol.

5,6 - GPI Control

The MAXX 2400 provides six GPI inputs for control of machine functions, which appear on the 25-pin **GPI** connector. This "General Purpose Interface" can be connected to switch contacts or an open-collector transistor output. GPI inputs are programmable, and can provide machine control such as PLAY, STOP, or RECORD through simple external switches.

The MAXX 2400 also provides six GPI status outputs which may be used to confirm that a command has been received, or for other purposes. The function of these open-collector outputs are programmable, and may be used to operate an LED, or they can be connected to a suitable logic input. The pin-out for the GPI connector will be found in APPENDIX I on Page130.

BASIC OPERATION

POWER ON/OFF

Connecting the dual power supplies
Maxx 2400 is equipped with fully redundant power supplies. Connect each power supply to a separate source of AC power. Looking at the rear of the unit, the two IEC main power receptacles are located on the left. The unit will operate indefinitely on a single supply. If AC power is lost on one of the two supplies, a high-pitched alarm will sound to indicate the power loss. The MAXX 2400 will accept world-wide power sources in the range of 100-240 volts AC, 50-60 Hz. The server is shipped with a power cord appropriate for the region in which it is sold. Replace the power cord only with one of the same type and rating.

Power On
The blue front panel button initiates start-up and shut-down of the MAXX 2400. Press it momentarily to start the server. A sequence of start-up screens will appear, ending with the display of the 4-channel Graphic User Interface (GUI) (Figure 7 on Page 25).

During the first power on the system must be connected to a keyboard, monitor and mouse. The Image Server will ask you to accept the Software Licensing Agreement before it will operate. This screen will only appear during the initial startup.

Power Off
When the MAXX 2400 is running, pressing the blue front panel button momentarily will cause the system to begin an orderly shutdown. 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.

CAUTION:

**USE THE FOUR SECOND SHUTDOWN ONLY IF THE SYSTEM IS NOT RESPONDING.
LOSS OF DATA CAN OCCUR WHEN THE OVERRIDE SHUTDOWN IS USED.**

CAUTION:
ALWAYS DISCONNECT BOTH POWER CABLES ANY TIME THE TOP PANEL IS TO BE REMOVED.
Serious damage to the server can occur if service is attempted with AC power attached.

The front panel power switch does not disconnect AC power!

GRAPHICAL USER INTERFACE (GUI) OVERVIEW

Once MAXX 2400 has successfully powered up, the VGA monitor will display the GUI of Figure 7. This view provides:

- A main System Menu bar for configuration operations

- A Status Bar that displays various system messages

- Four VTR-like transport controls, one for each of the four video channels.
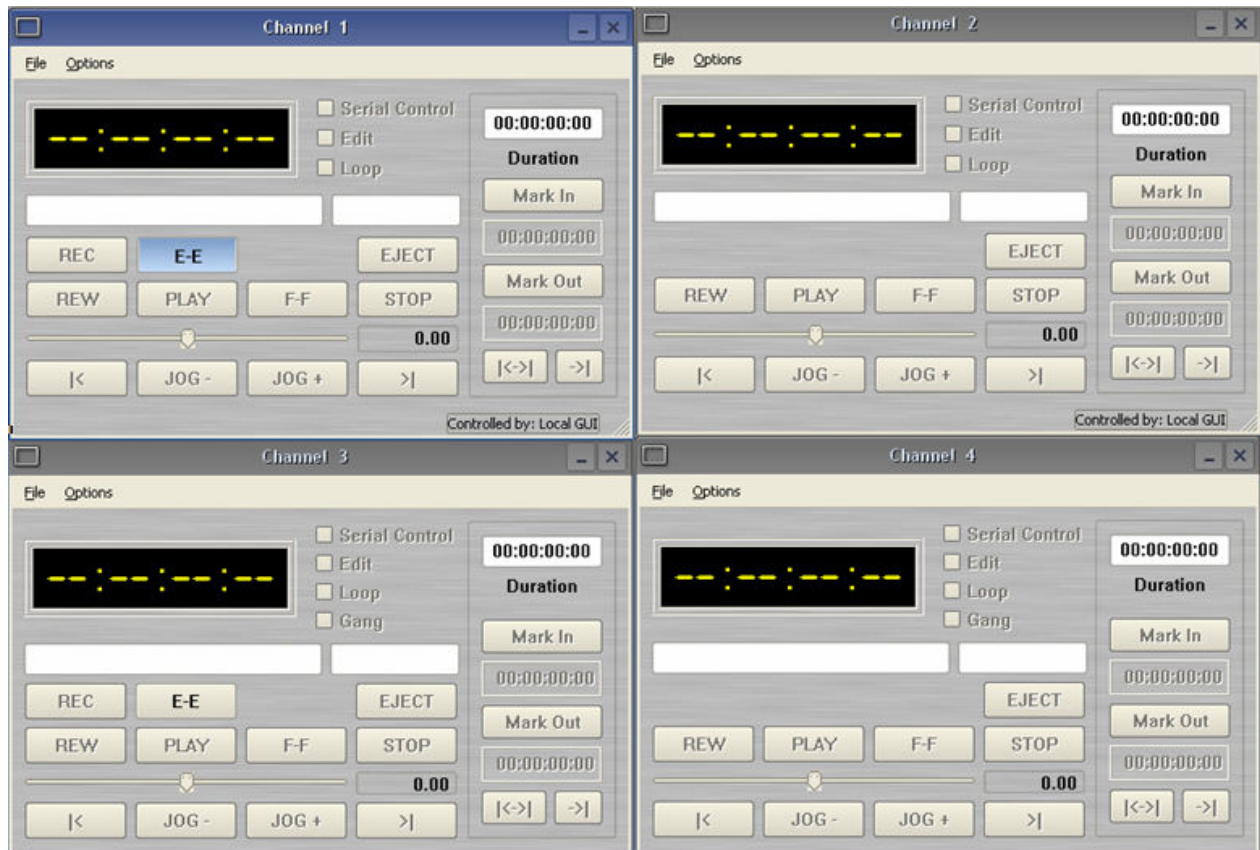
Figure 7 - User Interface

When using the mouse, all buttons of all channels will operate immediately, without first selecting a window to activate it. (Channel 3 is active in the illustration above, indicated by its blue title bar.)

When using key commands, the active window is the only transport that will respond. Use the **CTRL+TAB** key combination to change the active window in rotation, or use the mouse to activate the desired window by clicking anywhere in it.

Windows can be moved, resized and overlapped by dragging the title bar, the edges or the resize tab at the lower right corner of each window. The **CTRL+TAB** key combination will also bring the activated window to the top, in front of all other windows.
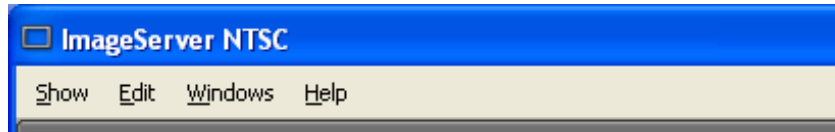
System Menu Bar

The System Menu bar contains four menus: Show, Edit, Windows and Help.

Show Menu
Contains selections for the four Channels and the clip management windows.

Channel 1
Channel 2
Channel 3
Channel 4

> Opens the specified window if it is closed, brings it to the top and activates it.

> Key Commands – **F1, F2, F3**

Clip List

> Opens the Clip Navigator window if it is closed, brings it to the top and activates it. See page 49.

> Key Command – **Ctrl+L**.

Find Clips

> Opens the Clip Locator dialog. See page 26.

> Key Command – **Ctrl+F**.

Edit Menu
Contains a single selection, **Configuration**. This opens the main System Configuration dialog. See page 42.

Windows Menu
Choices in this menu change the way the windows are displayed. Use the **CTRL+TAB** key combination to change the active window in rotation, or use the mouse to activate the desired window.

Cascade

> Arranges all open windows so that they are overlapping, but offset. It is useful as a starting point to rearrange the windows This choice is especially useful with small monitors.

Tile

> Arranges all open windows so that each is fully visible at the same time. This choice is especially useful with larger monitors. In case the Windows don't tile as expected, select Cascade to restore their original size and order, then select Tile.

In addition, there are selections for each open transport window. Selecting one of these brings that transport to the top of the display and makes it the active window.

Help Menu
Contains a single item, **About**, which displays the Image Server software versions, serial number and Unit ID.

The Status Bar
A status bar appears at the bottom of the window that provides system information to the user including GENLOCK, INPUT VIDEO DETECTED, and TIME REMAINING—PERCENT FULL. Messages such as CONNECTED TO HOST or CONNECTION TO HOST REFUSED are also displayed as diagnostics. Error and status messages from the RAID system can also be displayed here.

Channels 1 and 3 can either **Record or Play video content**. Channels 2 and 4 can play back content. All channels may be used at the same time.

Each channel can be controlled in two different views.

1. The Transport View
2. The Playlist View

The Transport Channel View

The Transport Channel View is shown in Figure 8 - Transport Channel View. This is the default view of each channel. Basic transport operations such as **play**, **stop**, **record**, and **head/tail trimming** appear in the Clip Transport window for each channel. These operate in familiar VTR fashion.

Elapsed Time Field
Display Elapsed Time of current clip

Edit - Check to enable editing (such as Mark-In, Mark-Out)

Serial Control - Check to enable external automation control through serial port

Loop - Check to cause a Clip to repeat (loop) indefinitely

Clip Name Field - Displays the Clip Name

Duration - Indicates duration of current Clip

E-E - Press to monitor recording source

Mark In/Out - Set the In and out points. The counters will indicate the selected points.

Record - Press to begin Recording

Eject - Eject a clip

Rewind - Press to rewind Clip

Stop - Stop a Clip

Shuttle - Slider bar controls playback speed

F-F - Fast Forward a Clip

Play/Pause - Play/Pause a Clip

Review Out - Audition the mark-out point

Review Clip - Cue's a Clip to the Mark-in point

Go To |<
Press to move to previous mark of start of Clip

Jog -/+ - Press to move to previous (-) or next frame (+)

Go To |>
Press to move to next mark or end of Clip

Figure 8 - Transport Channel View

Transport Menu Bar

There are two menus, **File** and **Options**.

File Menu

Contains six selections in Channel 1, five in Channels 2 and 3.

New

Channel 1 only. Opens the Clip Navigator to allow naming of a new clip, then prepares the channel for recording. See page 35.

Key Command – `Ctrl+N`.

Open

Opens the Clip Navigator to allow choosing a clip to load into the transport.

Key Command – `Ctrl+D`.

Save

Saves an edited clip using its existing file name.

Key Command – **Ctrl+S**.

Save As

Opens the Clip Navigator to allow saving an edited version of the clip with a new name. This allows making alternate versions of a clip or making multiple segments of a master clip.

Key Command – **Ctrl+A**.

Playlist

Switches from Transport View to Playlist View.

Close

Closes the Transport window. This has the same effect as the Close box in the upper right corner of the window. Note that this will not stop playback or eject a loaded clip.

Options Menu

This menu contains two selections.

Take Control

Takes control of the video channel from another user (the Serial Control, a Remote Workstation, or if you are using a Remote Workstation possibly the local GUI.) This item is grayed out when the window has control.

Key Command – **Ctrl+T**.

Configure

Opens the video channel's Configuration dialog. See pages 34 and 48.

Key Command – **Ctrl+C**.

The Playlist Channel View

The Playlist Channel View is shown in Figure 9 - Playlist Channel View. This view allows multiple clips to be loaded in a "playlist" and played in sequence.
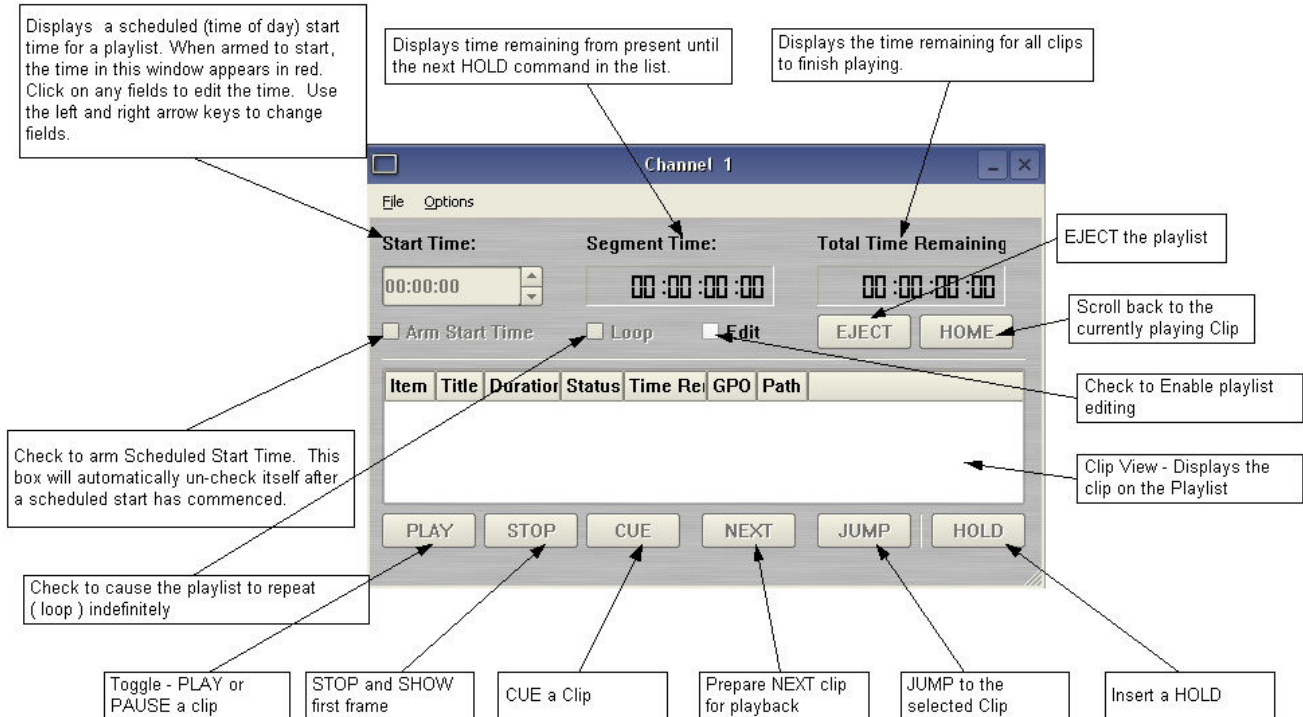
Figure 9 - Playlist Channel View

Playlist Menu Bar

There are two menus, **File** and **Options**.

File Menu

Open

  Opens the Clip Navigator to allow choosing a clip to load into the transport.

  Key Command – **Ctrl+D**.

Append

  Opens the Playlist Selection dialog to allow choosing a Playlist to Append to the currently loaded list. This can be done while playing to allow continuous playback of new Playlists. See page 60.

Save

  Saves an edited Playlist using its existing file name.

  Key Command – **Ctrl+S**.

Save As

Opens the Clip Navigator to allow saving an edited version of the clip with a new name. This allows making alternate versions of a clip or making multiple segments of a master clip.

Key Command – **Ctrl+A**.

Rename

Opens the Playlist Selection dialog to allow renaming the currently loaded Playlist.

Transport

Switches from Playlist View to Transport View.

Eject

Ejects the currently loaded Playlist in preparation for creating a new one. (It is not necessary to Eject a list to load another saved list.)

Key Command – **Ctrl+N**.

Close

Closes the Playlist window. This has the same effect as the Close box in the upper right corner of the window. Note that this will not stop playback or eject a loaded list.

Options Menu
This menu contains two selections.

Take Control

Takes control of the video channel from another user (the Serial Control, a Remote Workstation, or if you are using a Remote Workstation possibly the local GUI.) This item is grayed out when the window has control.

Key Command – **Ctrl+T**.

Configure

Opens the Playlist's Configuration dialog. See page 59. Note that this is different than the dialog for the video channel setup, which must be accessed from the Transport View window.

Key Command – **Ctrl+C**.

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MAKING A RECORDING FROM THE GUI

Video recordings are made using the Transport View of **Channel 1 or Channel 3**. Channels 1 and 3 can record or play back clips but cannot do both at the same time. **Channels 2 and 4 are playback only**. Follow these steps to record a clip on MAXX 2400. Note that most of the configuration setting steps can be skipped once an established workflow is in place. **The example uses Channel 1. The steps work identically on Channel 3, the other record-capable channel.**

Record Configuration Options

Set Channel 1 to the Transport View
If necessary, set channel 1 to the Transport View (Figure 8). Click **FILE->TRANSPORT** in the Channel 1 Playlist View to switch to the Transport View.

Setting the Sync Source
To use a genlocked source, select **External Sync** using the GUI as follows**:**

    A.   From the main menu bar select **EDIT->CONFIGURE**. The screen of Figure 10 appears. Select the **TIMING** option.
    B.   Select **EXTERNAL** as the sync source.
    C.   Check that the front panel **GENLOCK** LED is now illuminated and the word GENLOCKED now appears in the bottom right of the main GUI window.
    D.   If necessary set the **LINES** and **SUB-PELS** settings. See System Timing on page 69.

About Genlock Signal Quality

A genlock signal connected to the MAXX 2400 must conform to the SMPTE 318M standard. An unstable genlock source may result in unwanted artifacts in the video output or recorded data.

To use a non-genlocked CVBS source, follow the instructions above but select either **INTERNAL** or **EXTERNAL** Sync.

NOTE: MAXX 2400 is equipped with **Input Frame Buffers** on the CVBS inputs that allow recording from non-genlocked sources. No configuration is required to use the frame buffer. Refer to Appendix D for more information.
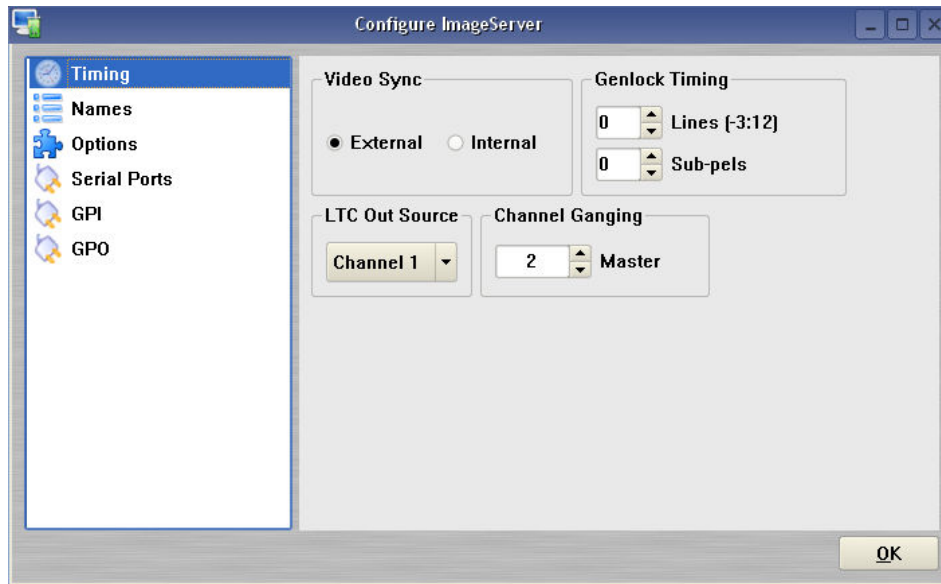
Figure 10 - Timing Configuration Screen

Setting the Video Input Source

The MAXX 2400 can accept a video signal at either its composite video input (CVBS), or its serial digital (SDI) input. Verify that the input to be used is currently active. For a discussion of the SDI – Embedded Audio option, refer to Configuring Embedded Audio on Page 70.

Select **OPTIONS->CONFIGURE** from the Channel 1 Transport Window.

The Dialog of Figure 11 appears. Select the appropriate Video Input source by clicking the related radio button in the **Video Input Source** section of the dialog. Click **APPLY** or **OK**.
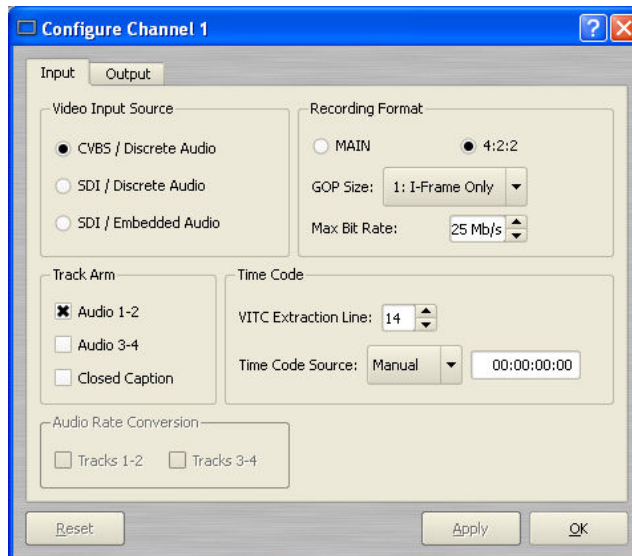
Figure 11 - Channel Configure Dialog

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Arming the Audio tracks
The MAXX 2400 can record either two or four audio tracks according to a selection made in the Channel 1 Configuration window. When a selection is made it will be saved for future recordings.

Select **OPTIONS->CONFIGURE** from the Channel 1 Transport Window. Refer again to Figure 11 for a view of the Channel 1 Configuration Dialog.

- Check **Audio 1-2** if you wish to record on tracks 1 and 2 only

- Check **Audio 3-4** if you wish to record on tracks 3 and 4 (only when using AES-EBU or SDI Embedded audio input.)

- Check BOTH **Audio 1-2 AND Audio 3-4** if you wish to record on tracks 1, 2, 3 and 4

- **Uncheck all boxes** if you don't want to record audio.

- Check **Closed Caption** for all above cases if you want to record closed caption data into a separate, dedicated track (See *Setting the Recording Format* below).

Bit-for-Bit® Recording & Playback
The recording, storage and playback of audio program material such as Dolby®-E, Dolby Digital (AC-3) or DTS® requires that upon playout the data stream be identical to the original. *Do not use the audio sample rate converters when working with these encoded audio formats.*
The Image Server and a Dolby® encoder must be supplied with the same genlock signal.

Audio Sync Reference
The audio sample rate is derived from the selected video sync reference. Audio is recorded at a nominal 48K sample rate, so the 0.1% pull-down for 29.97 NTSC is taken into account when generating the audio sample rate for color NTSC. There is no drop frame in PAL video.

Setting the Recording Format
Refer again to Figure 11.

Select either **Main (**Main Profile @ Main Level (4:2:0), or **4:2:2** (4:2:2 Profile@ Main Level) by selecting the corresponding radio button. Refer to Appendix B for a discussion of Profiles.

Select either **1: I-Frame Only**, **6: IBBPBB** or **15: IBBPBB**…
Refer to Appendix B for a discussion of the GOP structure.

Select the **Bit Rate** to record at. The range is **4 – 50Mb/s** unless **Main** profile is selected. In **Main** profile, **the maximum rate is 15Mb/s**. Generally, very good quality video can be achieved at rates as low as 8Mb/s with IBBPBB settings.

> The MAXX 2400 always records Closed Caption data directly into the video. However, when using bit rates below 10Mb/s it is advisable to enable the dedicated Closed Caption track in the Arm Tracks section described above. This will guarantee that the encoding process will not affect the Closed Caption data.

Setting the Time Code Source
This function selects the time code source for newly recorded clips. A time code value is obtained from the selected input source at the start of a new recording. Refer to Figure 11. Choose **VITC, LTC** or **Manual** input source. For **MANUAL**, enter the desired time value for the first frame of the recording in the **Starting Time Code** entry field.

Beginning Recording

When the steps outlined above in "Setting up for Recording" are done, you are ready to record. Place Channel 1 in the Record Ready mode as follows.

A. From the Channel 1 Transport Window, Select **FILE->NEW**. The dialog of Figure 12 appears.
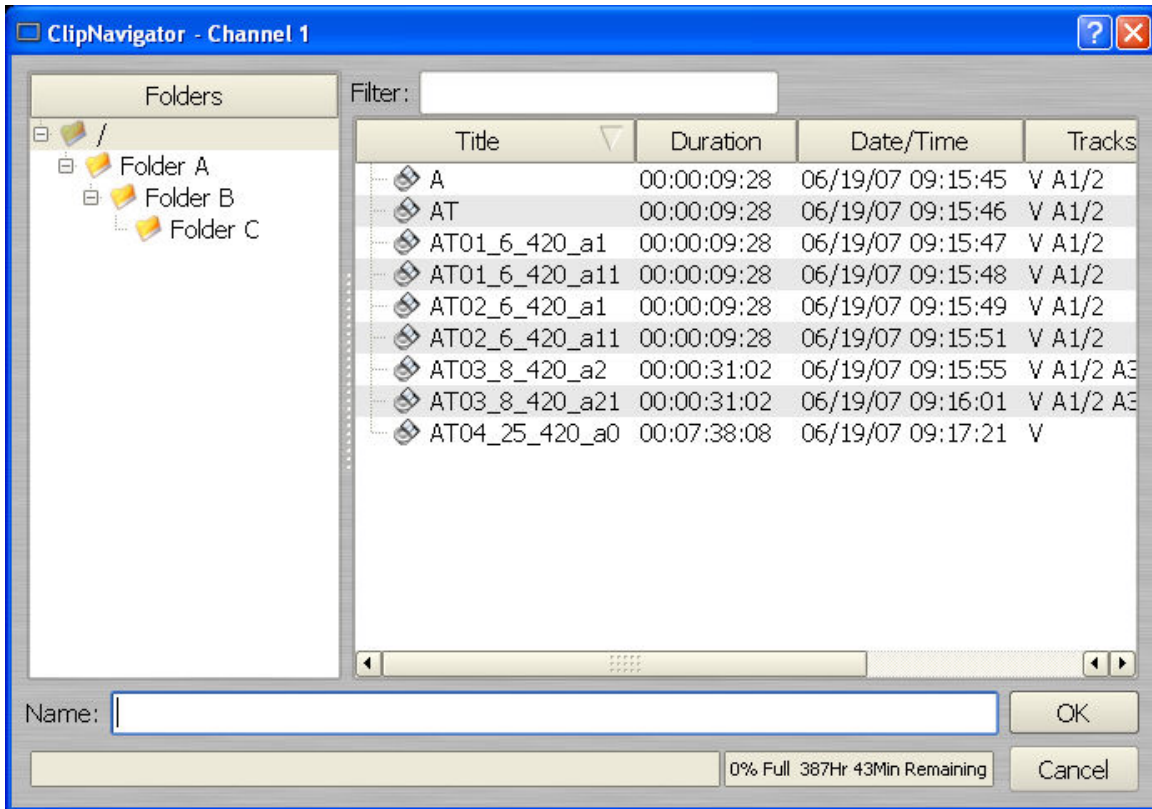
Figure 12 - Channel 1 Clip Navigator "New" mode

B. Note the **Folder Structure** in the **FOLDERS** window to the left. If you have not added any folders (refer to *Organizing Clips* on Page 47) no folders will be shown. If you have already created a folder structure you can select the destination folder for your clip at this time by clicking on the folder you want it to be placed in. You can always move or copy it later as well.

C. Enter a clip name using the keyboard. You may use up to 31 characters. Spaces may be used; however, some characters *other than* upper or lower case letters and numbers may not be used. These characters will not enter into the name field when typed. They include * ( ) + = ; : ' " < > , . / and ? A list of existing clips will appear in the large window, and can be used as a name reference when creating new clip names.

Note: File naming is case sensitive. Upper case letters sort before lower case. The name *FILE* sorts in the order shown, based on differing capitalization: *FILE*, *File*, *fiLe*, and *file*. When using the Image Server with automation systems or other remote controls, it is not a good practice to distinguish files only by differences in case.

D. The Channel 1 transport Window will display the words **IDLE CUEING** for two seconds or less. When ready to record, the Channel 1 Transport Window will display **IDLE READY** per Figure 13.
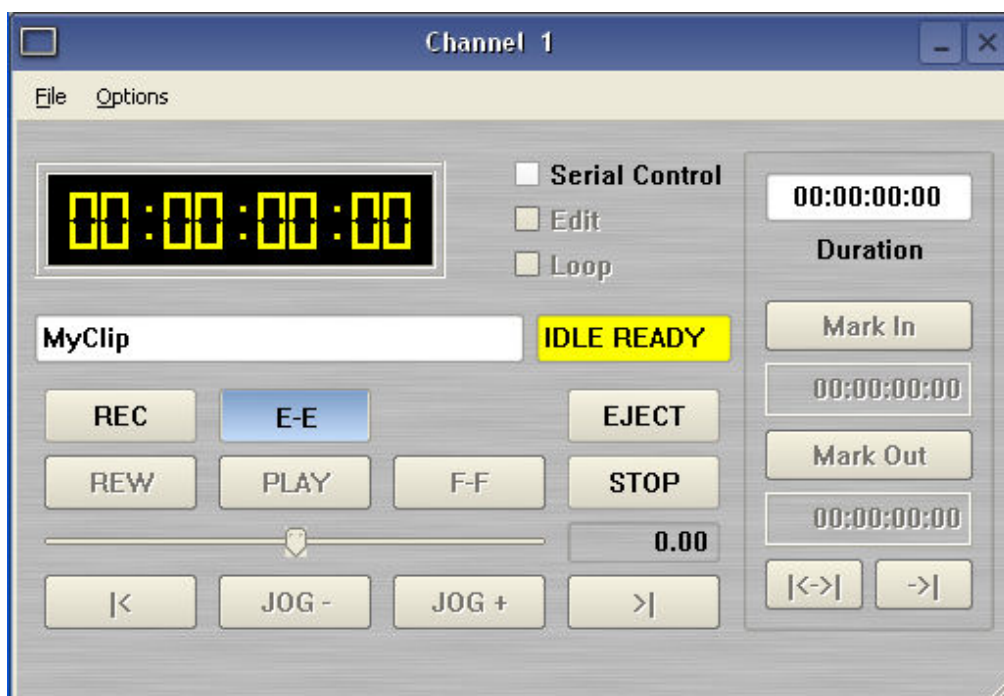
Figure 13 - Channel 1 Ready To Record

E. You may now click the RECORD button at any time to begin recording. The yellow time display counters will update the clip duration continually.

F. To stop recording, click **STOP**.

Note: An in-progress recording must be at least 10 seconds long before it will appear in the clip list. Hitting the **STOP** button to end the recording after less than 10 seconds will also cause the clip to appear in the clip list

Using E-E Mode to Monitor the Recording Source

The **E-E** button appears in the Channel 1 and Channel 3 Record/Play window. It allows the input signal to be monitored from the server output. E-E Mode toggles automatically as described below, but can also be switched manually at any time.

When a new clip is created for recording, the input source is automatically switched ON to the output—an E-E connection. When a clip is opened for play on Channel 1 or 3, E-E monitoring is switched OFF.

When Channel 1 or 3 is switched to playlist mode, the E-E monitor is switched OFF. E-E mode cannot be toggled while the channel is in playlist mode.

When E-E is ON, the input video signal is routed to the outputs. Manually toggle the E-E mode button OFF to switch the output to the servers output, for conventional playback operation.

Under automation control, Auto E-E behavior is slightly different than under GUI control. The server will remain in E-E ON mode until a transport control command (Play, Stop, Jog, etc) is received. After receiving such a command, the server will remain in E-E OFF mode until record mode is entered. In record mode, E-E mode is ON. As with GUI operation, automation controllers may send E-E ON and E-E OFF commands to override the automatic operation.

Note that when in E-E mode the channel 1 or 3 video outputs are not timed to the genlock signal. This will not be noticeable when connected directly to a monitor, however there will be timing offsets when feeding timed routers or switchers. The symptoms of this will vary depending on the particular equipment, including horizontal picture shift or timing error indications. . If the input is not synchronous with genlock, it may roll vertically. E-E mode is not intended to be used on-air, only as a production tool.

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PLAYING A CLIP FROM THE GUI

Video Playback can be done on all four channels, individually or simultaneously. The record-capable channels (1 and 3) can either record or play back, but cannot do both at the same time. Follow these steps to play back a clip.

Beginning Playback

A. Verify your sync source according to the instructions in *Making A Recording From The GUI* on Page 32.
B. Select **FILE->OPEN** from the Transport Window of Channel 1,2 ,3 or 4. The Clip Navigator will appear per Figure 14.
C. Navigate the folder structure if necessary by clicking on the folders.
D. Select the clip you want to play by double-clicking on it.
E. When the Transport Window indicates **Idle Ready**, you can play the clip at any time by clicking **PLAY.**
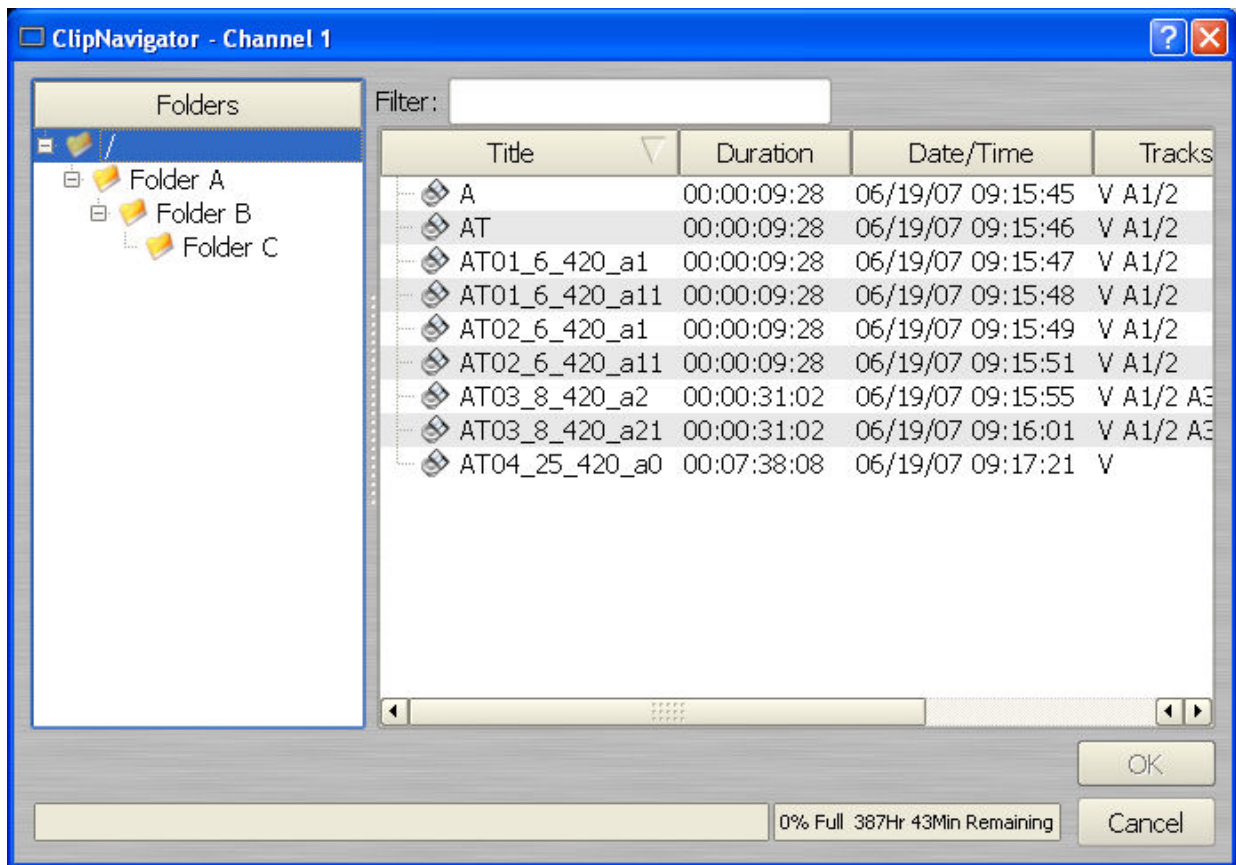
Figure 14 - Channel 1 Clip Navigator in "Open" Mode

Looping a Clip
Clicking on the **LOOP** checkbox in the Transport View will cause a clip to loop until **LOOP** is unchecked or until you click **STOP**. **LOOP** may be checked or unchecked before or during playback, but must be changed at least 2 seconds before the end of clip to take immediate effect.

Pausing a Clip
Click **PAUSE** at any time to pause a clip. Click again to resume. The **PAUSE** button is the same key as the **PLAY** button.

Ejecting a Clip
Ejecting a clip effectively removes it from the transport. The channel will output Black. Press **EJECT** to eject a clip.

Using Jog
The **JOG +** command will move to the next frame and go to Still. The **JOG -** command will move to the previous frame and go to Still.

Using GO-TO
Click the arrows **|<** or **>|** to go to the next trim point (Mark In or Mark Out) in the selected direction. When in Edit mode, an additional click in the selected direction will go to the actual beginning or end of the entire clip.

Using Fast Forward / Rewind
F-F (Fast Forward) and **REW** (Rewind) buttons transport program material at high speed in the chosen direction. Four speed choices are available in each direction. Click the button repeatedly for: 4x, 16x, 64x, and 128x. Audio does not play at these speeds.

Using Shuttle to Control Playback Speed
The **Shuttle Control** is a slider bar that controls playback speed. Playback speed control employs *varispeed* algorithms that may skip frames. It is not a perfect fast motion mechanism.

The **center position** represents zero speed, or Still.

The **right** and **left** extents of the slider represent $\pm$ 2x maximums.

The Shuttle control slider works in three basic ways: Snap-Back to still, Hold Speed, and Mouse Wheel.

- In **Snap-Back** operation, click and drag the slide control to change speed. Releasing the slider bar will let it snap back to zero speed, or still.

- For **Hold Speed** operation, position the cursor over the slider control scale (not the slider arrow) and click the left mouse button to increment the speed control. The transport will run in the selected direction at the selected speed without holding the mouse button down. The cursor may now be moved over the Stop button to wait for the desired point.

- When **using a scroll mouse**, position the cursor over the slider scale and rotate the wheel to increment speed. Rolling the wheel in opposite directions changes the direction the arrow slider moves. To stop video, click the Stop button or the arrow slider.

EDITING A CLIP

Edit controls are activated with the **Edit** check box. Several buttons are available to define the beginning and end of a region within a clip; associated time code displays are also present.

These non-destructive Mark In and Mark Out trim points can be set to define a portion of a clip to be played. These "edit pointers" do not create a new clip from the original material; they act like virtual trims, and material outside of the trim points is excluded, but can be retrieved by resetting the Mark pointers. After setting the Mark In and Mark Out points, clips will play between these points. These edit values are saved with the clip.

Edits may be saved to the current clip by de-selecting the **Edit** check box, or choosing **Save** from the clip window **File** menu. **Save As** works to save the edit points to a new clip name, even if the edits have not been saved in the current clip. This is a great help while conducting an Edit-while-Recording.

Using Edit-while-Recording
Clips are most often edited after recording is complete, but it is sometimes desirable to create sub-clips while the recording is still in progress. This is the preferred way to extract sports highlights, for example.

First, wait at least ten seconds after the recording begins. Open the recording on either Channel 2 or 3 by selecting the clip name from the **FILE > OPEN** menu. (A recording must be 10 seconds long before it will appear in the clip list.)

Use the transport controls to select and mark the In- and Out-Points, as desired.

Without un-checking **Edit**, select **FILE > SAVE AS**, enter a new clip name, and click **Enter**. A new clip is created that will play only between the In-Point and Out-Point. This clip can now be played on the third channel, or assembled into a playlist.

Next, use the transport controls to locate another set of In- and Out-Points for a second segment, and repeat the **Save As** command.

As noted above, it is usually easier to leave the edit channel in Edit mode when you plan to make multiple "Saved As" clips. If you de-select **Edit** with unsaved changes, you will be given a choice to save or discard the edit points. Remember that you will be saving the edits to the file that is currently being recorded. re-editing is required to see parts of it outside the region defined by Mark In and Mark Out, even if the recording continues after the editing session.

Marking the IN point
Sets the current time code value into the Mark In point time display. The Mark In button can capture a time code value from the clip when it is still, or on-the-fly.

Mark In Display
Displays the time code of the Mark In point. When no Mark In point has been set manually, this displays the Start of Message (SOM) time code (usually 00:00:00:00). Trim points will be automatically rounded down to the nearest GOP boundary when edits are saved.

The values in this display window may be set by two methods:

- Enter Mark In point from the keyboard: Use the mouse or Tab key to move between In and Out fields. When a field is highlighted, enter a numeric value from the keyboard.

- Whether a clip is still or playing, press Mark In to capture a time code value from the clip's current position.

Marking the Out Point

Sets the current time code value into the Mark Out point time display. The Mark Out button can capture a time code value from the clip when it is still, or on-the-fly.

Mark Out Display

Displays the Mark Out point time code. When no Mark Out point has been set manually, this displays the EOM time code (originally the end time of the recording).

The values in this display window may be set by two methods:
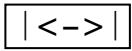
- Enter Mark Out point from the keyboard: Use the mouse or Tab key to move between In and Out fields. When a field is highlighted, enter a numeric value from the keyboard.

- Whether or not a clip is still or playing, press Mark Out to capture a time code value from the clip's current position.

Duration Display

Displays the total running time (TRT) of the current clip. TRT is defined as the difference in the time codes between the first and last frames, plus one. For example, if the first frame of the clip is 00:00:00:00 and last frame displayed at the end is 00:00:01:15, the reported duration will be 00:00:01:16.
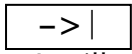
With NTSC drop-frame time code, the true play duration may not be the exact numerical value of ((Mark Out – Mark In) + 1) due to the discontinuities in the drop-frame time line. The true run time is shown in the Clip Navigator.

Auditioning the Mark In Point (Review Clip Button)

The Review Clip button |<->| cues the clip to the Mark In point (or SOM, if no Mark In point exists) and begins playback. Review Clip will stop at the Mark Out point. The Mark Out point will be displayed in Still mode.

The Review Clip button may be used to check the Mark In point without playing all the way through the clip. After Review Clip is pressed and play begins, all of the standard transport buttons are available for use.

Auditioning the Mark Out Point (Review Out Button)

The Review Out button ->| may be used to audition the Mark Out point without playing all the way through the clip. It will cue the clip to three seconds before the Mark Out point (or EOM, if no Mark Out Point exists) and then begin playback. Review Out will stop at the Mark Out Point.

SYSTEM CONFIGURATION

The following configuration options apply to the System as a whole and not to individual channel transports.

Assigning Names to the Server and Transport Channels
The MAXX 2400 can be assigned a name that will be displayed along the top of the Main GUI Window. Each individual channel transport can also be given a name.
To assign a name to the server or the transport channels, click **EDIT->CONFIGURE ->NAMES** from the main menu pulldown.

The screen of Figure 15 is displayed. Use the keyboard to type in a name for any of the selections. Names can be up to 31 characters in length. Spaces, digits and other non-alphanumeric characters may be used. Click **APPLY** to accept the name. The names will appear in their appropriate windows immediately.
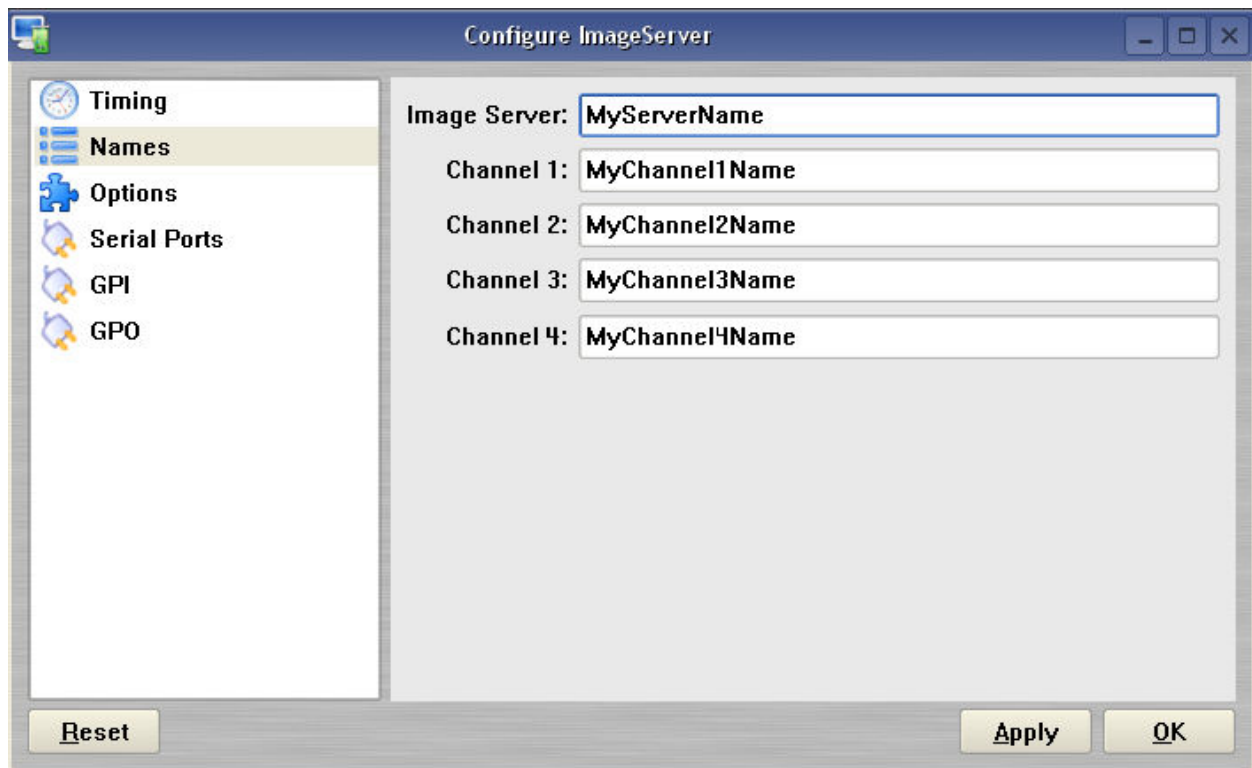
Figure 15 - Configure Names Screen

Programming GPIO Outputs

The MAXX 2400 has six General Purpose Outputs, referred to as GPO 1 through GPO 6. Each GPO can be programmed to go active on the selected channel when one of the following events occurs.

IDLE	- Activate when the transport returns to idle
PAUSED	- Activate when the transport is paused
STOPPED	- Activate when the transport is stopped
PLAYING	- Activate when the transport is playing
RECORDING	- Activate when the transport is recording
RAID System Fault	- Activate when a RAID or System Fault occurs
NO GENLOCK	- Activate when there is no genlock
NO VIDEO INPUT	- Activate when there is no video at the selected input
PLAYLIST	- Control GPO via playlist. (Refer to Page 61)

To program a GPIO output, select **EDIT->CONFIGURE->GPO.** The screen of Figure 16 is displayed. GPO 1 through 6 are the 6 triggerable outputs. The checkboxes to the right of each selection represent channel 1, 2 ,3 and 4. GPO 5 is shown with the trigger option pulldown expanded.

To activate one of the GPO, pulldown the event menu and select which event will activate the GPO. Select an associated channel where applicable by checking the channel checkbox. Click **APPLY** to activate.
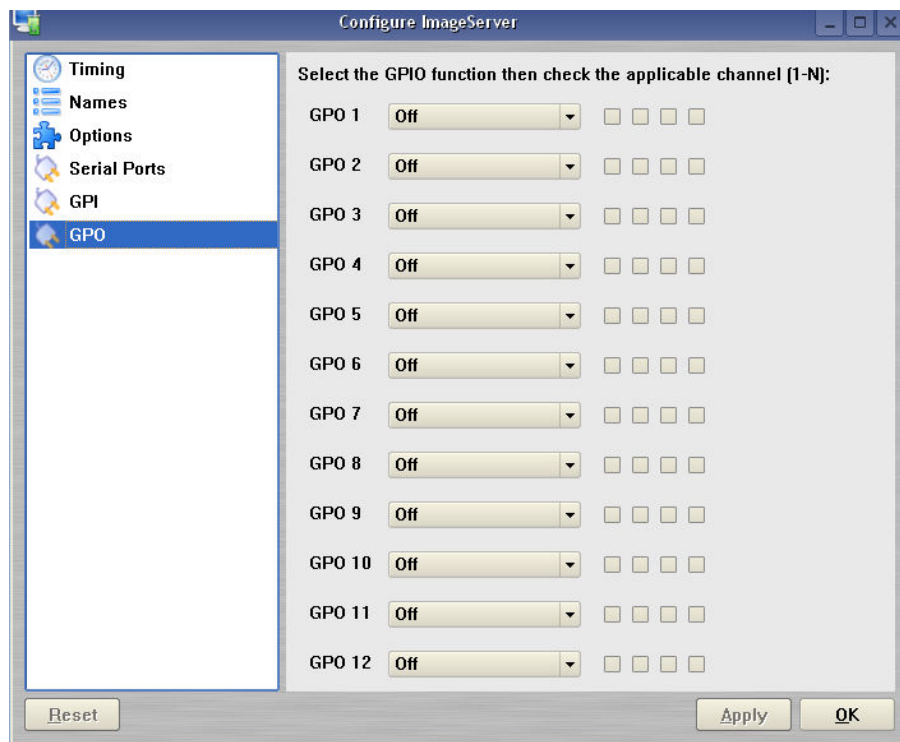
Figure 16 - GPO Configuration Screen

Programming GPIO Inputs

The MAXX 2400 has six General Purpose Inputs, referred to as GPI 1 through GPI 6. Each GPI can be programmed to trigger one of the following events on a channel.

CUE	Cue a clip
JUMP	Cue selected clip for immediate playback (Playlist Mode only)
NEXT	Prepare next clip in a playlist for playback (Playlist Mode only)
PAUSE	Pause a clip
PLAY	Play a clip
RECORD	Start a recording
SELPREV	In Playlist Mode – Navigate to clip above currently selected clip
SELNEXT	In Playlist Mode – Navigate to clip below currently selected clip
STOP	Stop a clip

To program a GPIO Input, select **EDIT->CONFIGURE->GPI.** The screen of Figure 17 is displayed. GPI 1 through 6 are the six programmable inputs. The checkboxes to the right of each selection represent channel 1, 2, 3 and 4. GPI 5 is shown with the trigger option pulldown expanded.

To activate one of the GPI, check the checkbox for the channels of interest, then pulldown the event menu and select which event will be triggered when the GPI goes active. Click **APPLY** to activate.
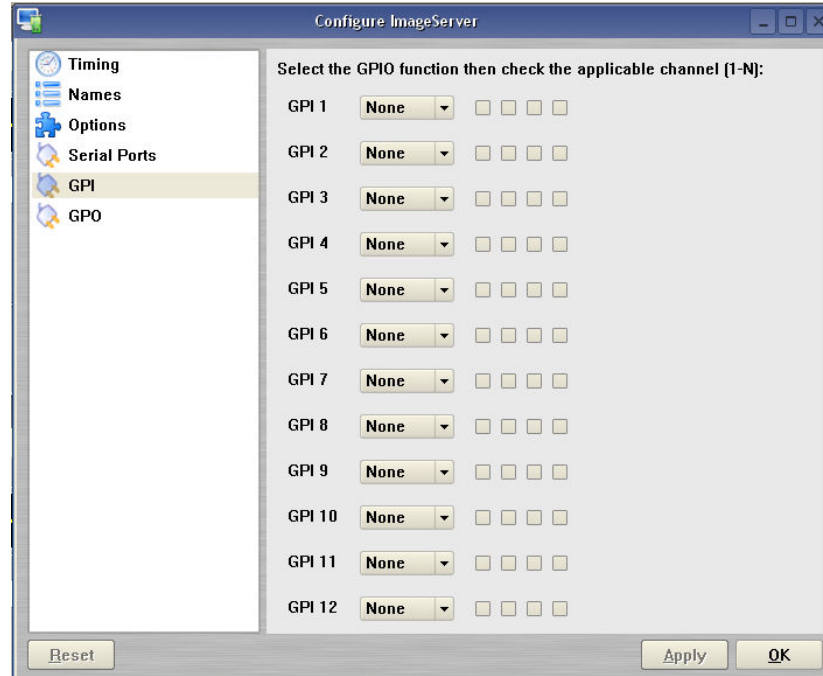
Figure 17 - GPI Configuration Screen

Configuring Linear Time Code (LTC)

The Image Server supports only drop-frame time code for NTSC operations. It may not be used with non-drop-frame time code. **LTC Out Source** chooses which channel will control the LTC Timecode output.

Configuring the Network

The Image Server provides a number of user settings that configure it for use as a practical network. These will be found on the Configure Network tab shown below.

The **NET-1** Ethernet port on the Image Server has a unique IP Address. In this way, each Image Server can be identified on the network.

Network Settings Tab

Use the Image Server graphic user interface to configure network communication settings. From the Main Menu selection bar at the top of the screen:

Click **EDIT->CONFIGURE->NETWORK**

The screen of Figure 18 is displayed.
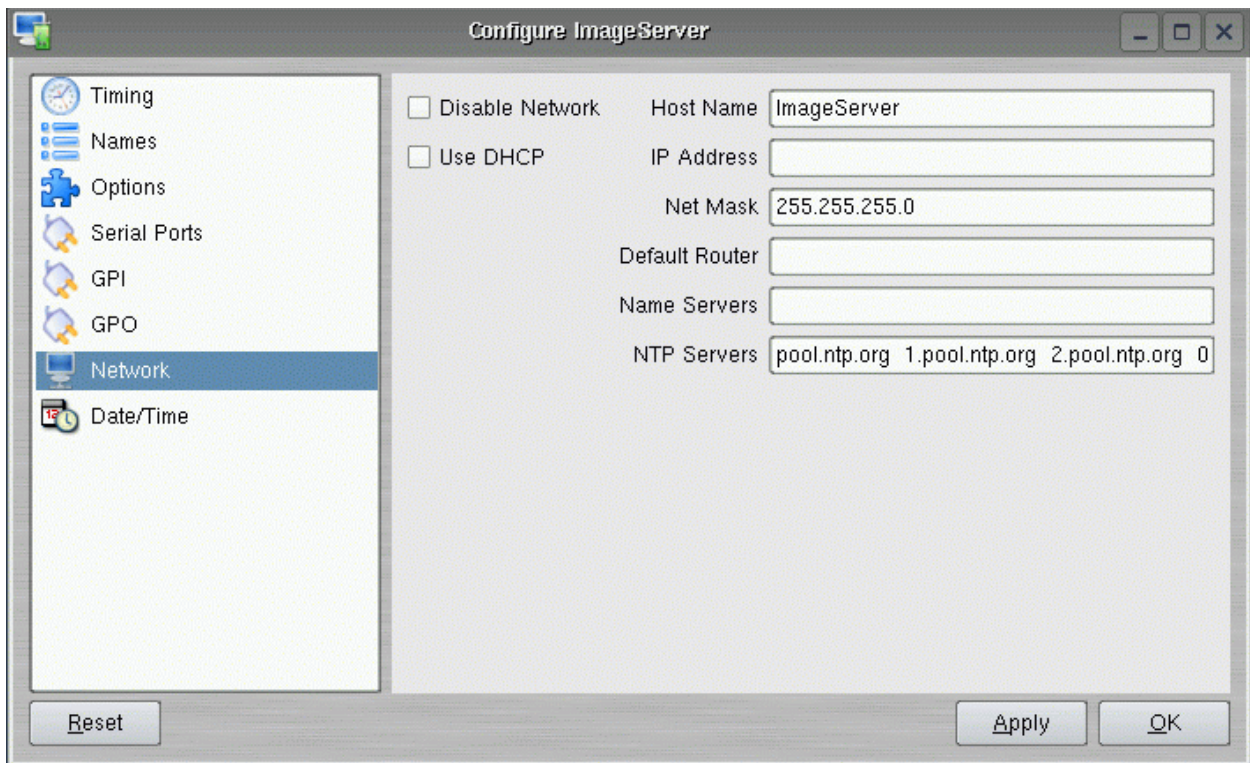
Figure 18 - Network Configuration Screen

Each Image Server is shipped with a 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:

- Network Disabled
- Use DHCP

Disabling the Network [X]

This selection turns the network OFF or ON. The default is ON, but can be turned off to deny access to/from the network for security purposes.

Enabling/Disabling DHCP [X]

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:

- IP Address   (Example: 192.168.1.20)
- Net Mask   (Example: 255.255.255.0)
- Default Router   (Example: 192.168.1.1)

The Host Name and NTP domain 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, APPLY**, or **CANCEL** to accept or abandon new entries.

Setting the Date and Time

Click **EDIT->CONFIGURE->DATE/TIME.** The screen of Figure 19 appears.
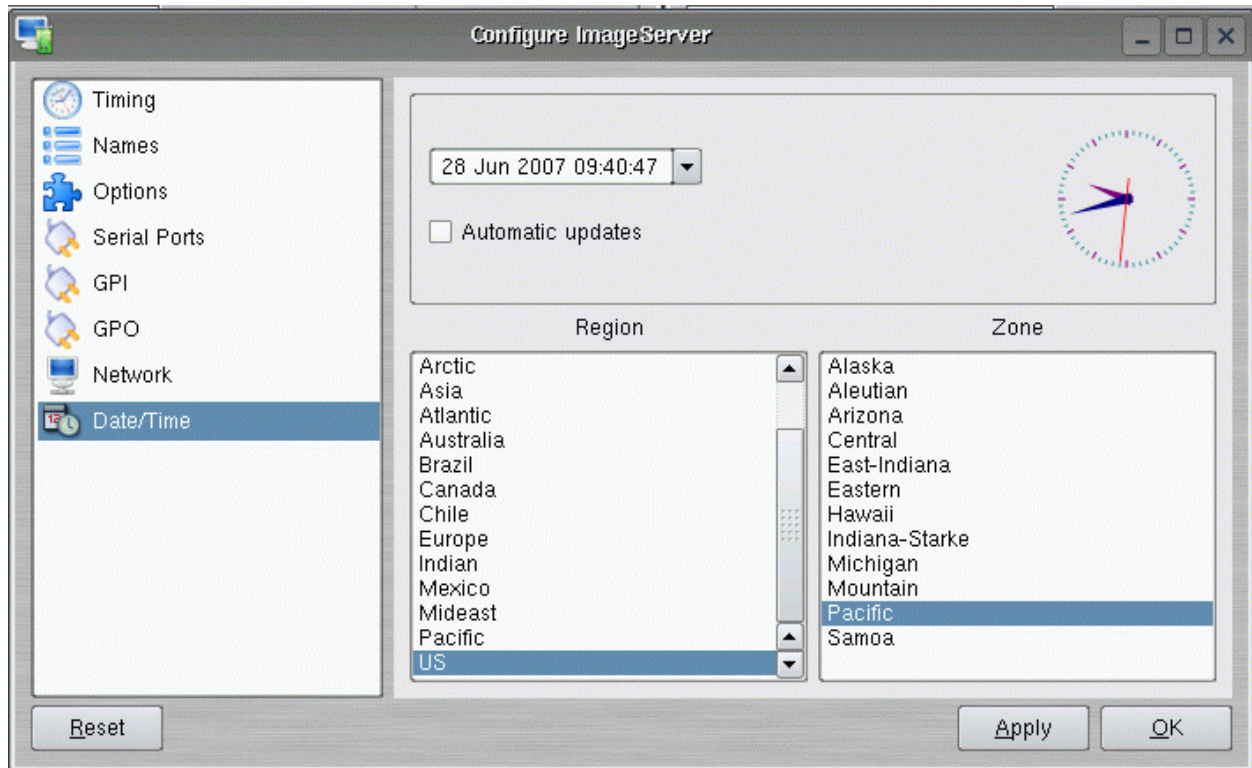
Figure 19 - Time/Date Configuration Screen

Select the **REGION** and **ZONE** according to your geographical location and time zone by scrolling with the scroll-bar as necessary and then clicking on the selected value.

Set the **TIME** and **DATE** by clicking on the Time/Date field and navigating the clock and calendar.

Check **Automatic Updates** to enable automatic updates using the Network Time Protocol (NTP). Refer to Using *The Network Time Protocol* on Page 79.

> **Note:** A System Restart is required for a Time Zone change to take effect

Calibrating Channels

Setting the SC/H Phase

Refer to Figure 20. This parameter adjusts the Sub-Carrier/Horizontal phase relationship. Use a vector scope to view the phase relationship and adjust the setting. **Changes to the setting are effective immediately without clicking Apply or OK.** The adjustment range is ±90°. Refer to System Timing on Page 69.

Setting the Audio Delay

Refer to Figure 20. Audio timing relative to picture output can be configured for audio channels 1-2 and 3-4. The value is set in millisecond increments, plus-or-minus 1,000ms (up to 1 second). The setting is applied to a clip when it is loaded for playback. This can compensate for systems issues downstream from the server that result in leading or lagging audio.
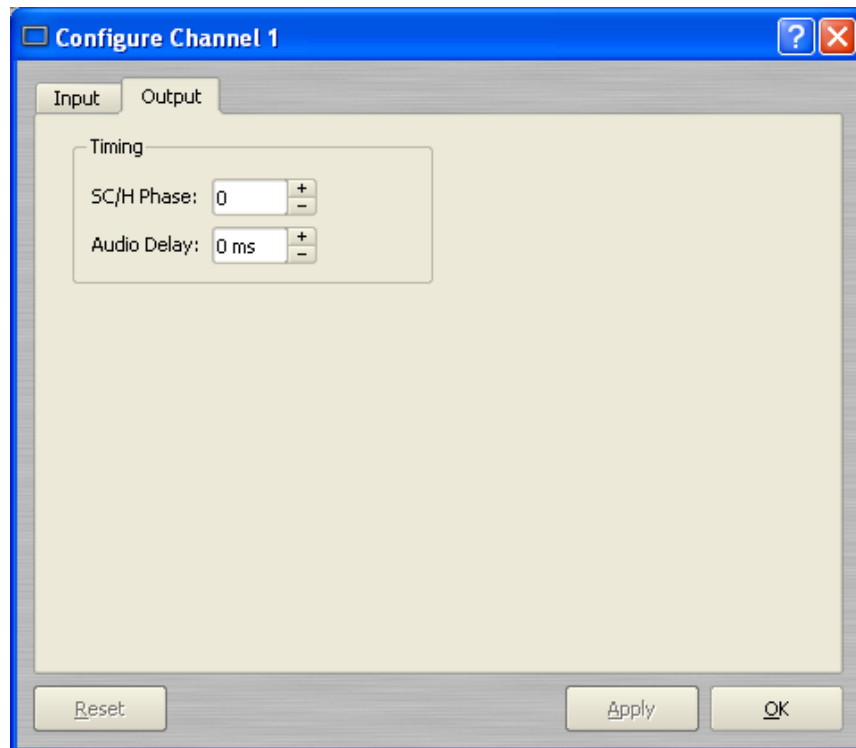
Figure 20 - Playback Channel Configuration

CLIP NAVIGATOR

MAXX 2400 provides a powerful Clip Navigator for use in organizing clips. Clip Navigator allows the user to:

- Rename and Delete Clips
- Create, name and rename "folders".
- "Nest" folders within other folders.
- Freely Move, Copy and Rename clips within the folder structure.
- Find Clips within the folder structure.
- Clips can be dragged and dropped anywhere on a Transport for immediate playback.
- Selected single or multiple clips can be dragged into a Playlist. See page 56.

Creating Folders

To create a folder:
A. Click **SHOW->CLIPLIST** from the main pulldown menu.
B. The Clip Navigator of Figure 21 is displayed**. Right-Click** on the folder icon displayed under the **FOLDERS** window.
C. Select **NEW FOLDER** from the pulldown. Enter the folder name in folder name dialog
D. Click **OK.**
E. A "nested" structure can be created by repeating the procedure with an existing folder selected. The new folder will be created "under" the selected folder.
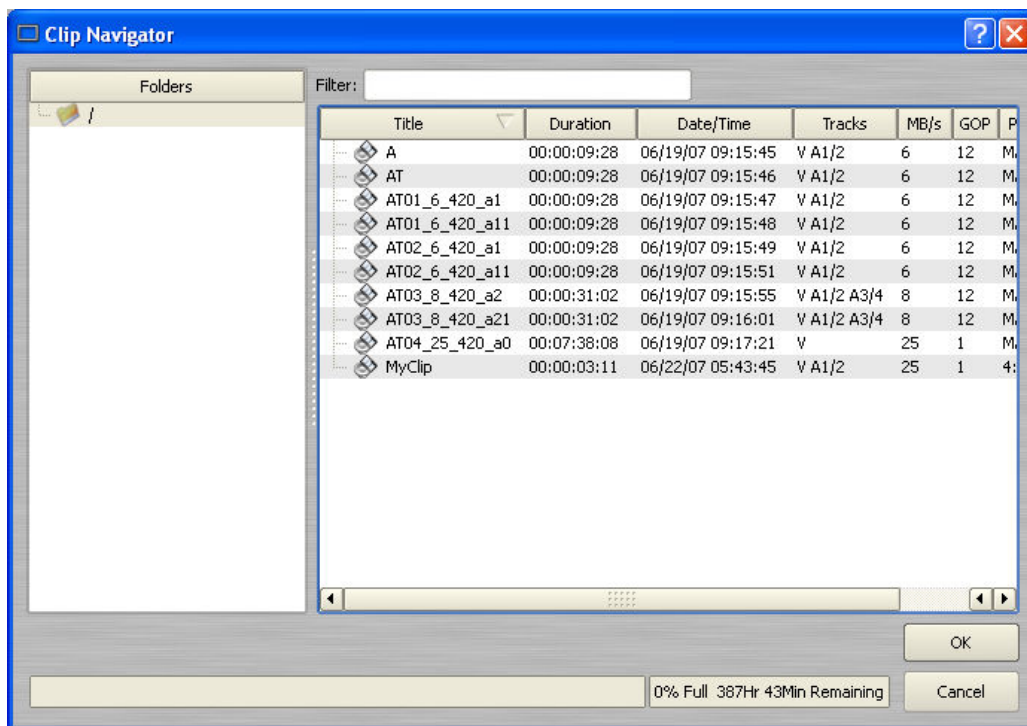
Figure 21 - Clip Navigator

Renaming and Deleting Folders

To Rename a folder, right click on the folder and select Rename Folder from the popup menu. Note that renaming a folder should be avoided when it contains clips included in playlists. The path names in the playlist will not be updated and the clips in the renamed folder will be listed as "MISSING" when the playlist is loaded.

To Delete a folder, first delete or move all of the clips and subfolders it contains. Then, right click on the folder and select Delete Folder from the popup menu.

Navigating Folders

Once a folder structure is created, it can be easily navigated with the Clip Navigator. Move from folder to folder simply by clicking on the folders in the FOLDER window. The view will automatically expand if folders are "nested" within folders. Figure 22 shows a 3 level nested folder structure.
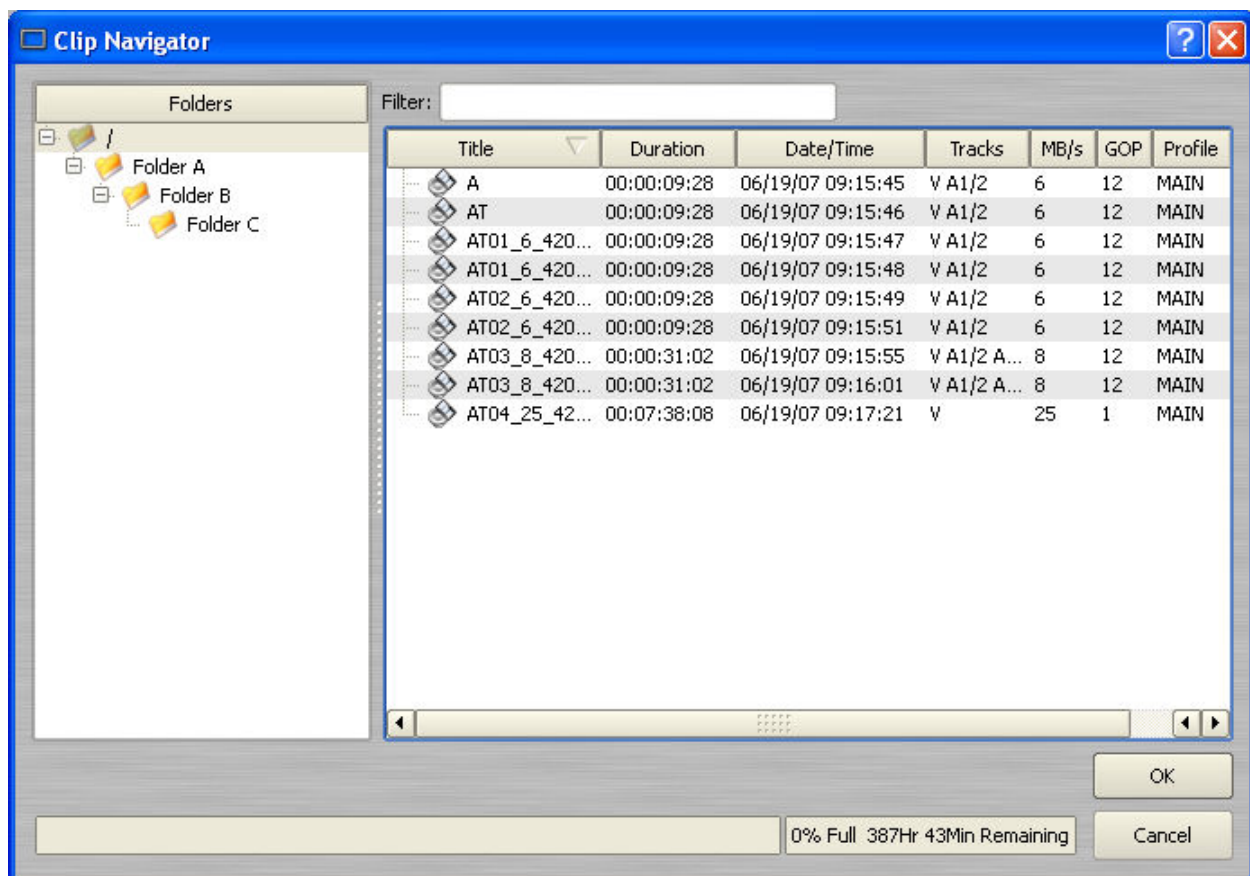
Figure 22 - Clip Navigator with folders

Moving and Copying Clips

Clips can be moved and copied from any folder to any other folder. Note that moving a clip that is included in a playlist will make it unavailable in that playlist. Also, if an automation system is in use, moving a clip out of the folder assigned to the serial port will make it unavailable to the automation system.

To move a clip to another folder:

    A. Expand the folders in the FOLDER window so that the destination folder is visible.

    B. If necessary, you can limit the number of clips displayed by typing a string in the **FILTER** window. For example, typing "AT" in the filter window would limit the display to all clips that contain "AT" somewhere in the clip name. Pressing the **Clear** button restores the complete display.

    C. Navigate to the clip location.

    D. Drag the clip to the destination folder by placing the cursor over the clip, holding down the left mouse button and "dragging" it to the destination folder. Release the left mouse button to "drop" the clip into the destination folder.

    E. MAXX 2400 will list two options. **MOVE HERE** or **COPY HERE**. Select **MOVE HERE** to delete the clip from the original directory. Select **COPY HERE** to leave the original copy intact. . Note that this is a "virtual" copy, both clip names refer to the same data on the disk.

Renaming and Deleting Clips

Clips can be renamed by right clicking on them with the mouse, then selecting Rename from the pop-up menu.

Clips can be deleted by right clicking on them with the mouse, then selecting Delete from the pop-up menu.

Sorting Clips

Clips can be sorted in forward or reverse order by any of the columns by clicking once or twice on the column heading. The previous sort is maintained so for instance if you sort by Name then by Profile, the clips of each Profile will be sorted by Name.

Finding Clips

Clips can be easily located within the folder structure using the MAXX 2400 Clip Locator. To locate a clip:

    A. Click **SHOW->FIND CLIPS .** The Clip Locator screen of Figure 23 appears.

    B. Select a "root" folder to begin a search by selecting the folder from **LOOK IN.**

    C. Check **Search Subfolders** to search in folders "under" the selected folder.

    D. Check **Case Sensitive** to make the search case-sensitive.

    E. Check **Stop After First Match** to find only the first match.

    F. Check **Use Regular Expressions** to search for the string of interest **ANYWHERE** in the clip name. With **Regular Expressions unchecked**, the search will match only clips that **BEGIN** with the string entered at **FIND**.

    G. Optionally, enter a string in the **FILTER** field to limit the number of clip displayed. For example, entering "AT" in the FILTER field will limit the display to only clips containing "AT" in their clip name. Pressing the **Clear** button restores the complete display.

    H. Enter a name or part of name in the **FIND** field. Press **ENTER** to initiate the search. The clip(s) will be displayed according to the rules set by the checkbox settings.
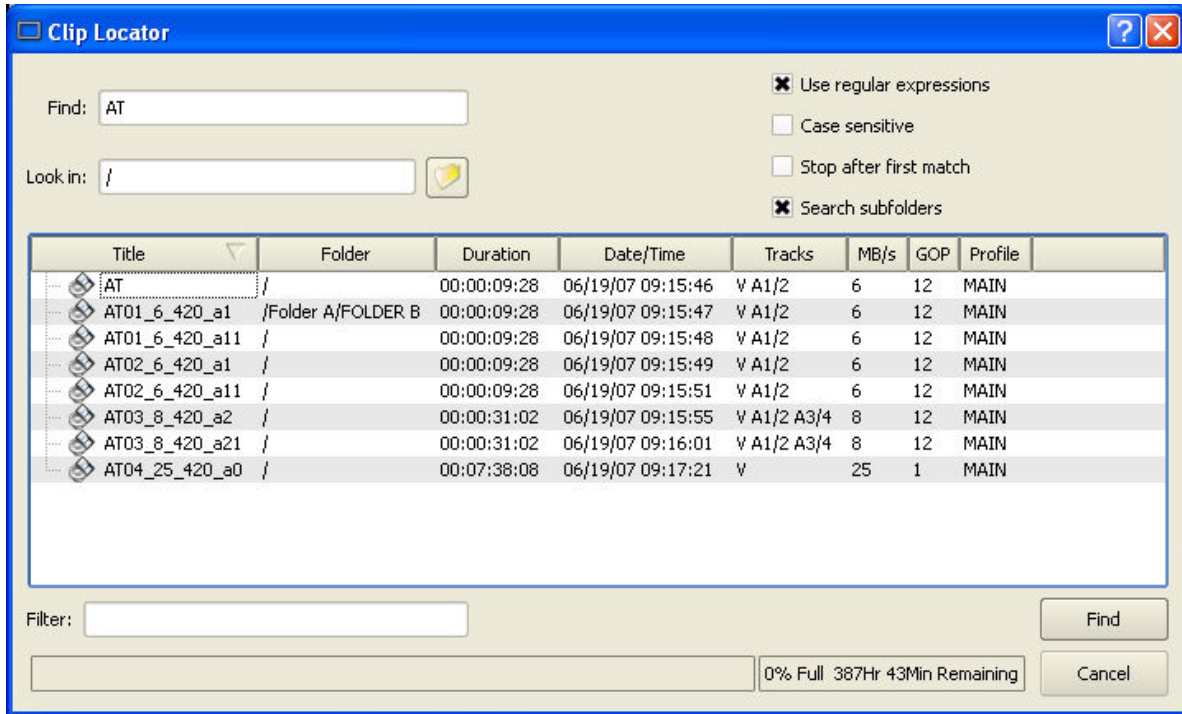
Figure 23 - Clip Locator

Finding Clips Using Wildcards
(Use Regular Expressions is not checked)

The following wildcard conventions may be used in a search.

*   Match anything. For example, to find all clips starting with "xyz", use the pattern "**xyz***".
To find all clips containing "2008" use "***2008***".

?   Match any single character.

Note that with Use Regular Expressions checked, expression for match anything is ".*", and the expression for match any single character is ".". See the next section.

Finding Clips Using Regular Expressions

A regular expression (or RE) specifies a pattern to be matched in a clip name.

Regular expressions can contain both special and ordinary characters. Ordinary characters just match themselves. Thus, the RE "**night**" would match the "night" in the clip name "Tonight Show", so this and any other clip name with "night" in it would be placed in the list of found clips.

The following special characters are supported:

.   (dot) This matches any single character. "a**.**c" matches "abc", "aac", "a2c" and "a c" but not "acd".

^   (caret) This matches the start of a clip name. To find all clips starting with "xyz", for example, use the Regular Expression "^xyz".

$ Match the end of the clip name. To find all clips ending in "xyz" use the RE "xyz$".

<   Match the beginning of a word. For example "<Show" will match all clip names containing a word that starts with "Show", such as "Now Showing", but not "LateShow".

>   Match the end of a word.

*   Match zero or more repetitions of the preceding character. G*N "**.***" will match anything – "G**.***N**.***" will match "Georgia Evening News" or "Good Night"

+   Match 1 or more repetitions of the preceding RE.

?   The preceding Regular Expression term is optional. "ab?c" will match "ac" or "abc" but not "adc".

[ ]   Used to indicate a set of characters. Characters can be listed individually, or a range of characters can be indicated by giving two characters and separating them by a "-". Special characters are not active inside sets. For example, [a+$] will match any of the characters "a", "+", or "$"; [a-z] will match any lowercase letter, and [a-zA-Z0-9] matches any letter or digit. If you want to include a "-" inside a set, precede it with a backslash, or place it as the first character. You can match all characters that are *not* within the set by making "^" as the first character of the set; "^" elsewhere will simply match the "^" character. For example, [^7] will match any character except "7".

SPACE   A space is treated as an ordinary character. " Show " (<space>Show) will match "Tonight Show" but not "Now Showing" or "NewShow". " " will match any clip with a space in the name.

The subject of Regular Expressions is much larger than can be completely covered here. They are used in several different operating systems and programming languages. Further information can be found on the internet and in books on Regular Expressions and Linux.

USING PLAYLISTS

MAXX 2400's Playlisting software provides an extensive set of capabilities for building, editing and playing complex sequences of program content. Advanced Playlisting appears as on-screen windows, with a clean Graphic User Interface that makes it easy to run with no extra equipment. It's invaluable for building commercial breaks, news rundowns, still-store and clip lists. You can create and store as many playlists as needed, each with its own unique name. For many users, Advanced Playlisting may be all that's needed to go to air. The Playlisting software has the following features and benefits.

- Drag-and-drop playlist building and editing on a graphic interface
- Edit lists while they're running
- Start at any point in a list
- Displays run time for clips, plus segment length and total remaining time
- On-the-Fly commands for Pause, Skip, Hold, Next and Jump functions
- Append a playing list with a saved playlist
- Six programmable GPI Output events embedded in playlist clips
- Programmable time-of-day start for a playlist
- Generates an As-Run Log
- Set rules for deleting unneeded material on the playlist
- Simple text format allows playlists to be created, viewed and edited offline
- FTP access allows playlists to be transferred between ImageServers or to/from a PC

The Playlist view

The Playlist View for channel 1 is shown in Figure 24. It's functions are briefly described here. Table 1 provides an overview of Playlist control functions and their associated hot-keys.
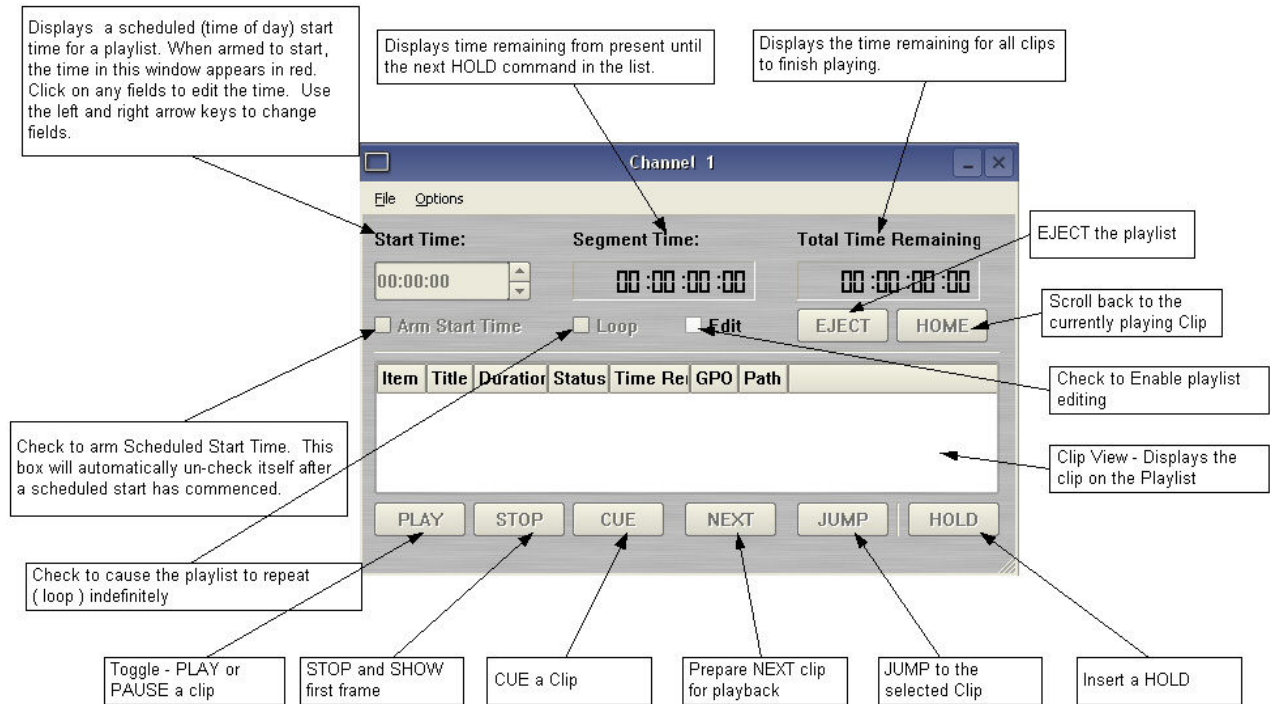
Figure 24 - Channel 1 Playlist View

FUNCTION	DESCRIPTION / REFERENCE	INVOKE	HOT-KEY
PLAY/ PAUSE	Play / Pause a clip (Page 56,58)	PLAY Button	P or SPACE
STOP/ SHOW	Stop / Show First Frame (Page 58)	STOP Button	S
CUE	Cue a clip (Page 58)	CUE Button	C
NEXT	Prepare next clip for playback (Page 58)	NEXT Button	N
JUMP	Jump to the selected clip (Page 59)	JUMP Button	J
LOOP	Check to loop a Playlist (Page 58)	LOOP Checkbox	L
EDIT	Check to enable editing (Page 60)	EDIT Checkbox	E
ARM START TIME	Enable Scheduled Start Time (Page 36)	ARM START TIME Checkbox	T
HOME	Scroll to currently playing Clip (Page 59)	HOME Button	H

Table 1 - Playlist Control Functions

Creating and Running a Playlist

To Create a Playlist (Using channel 1 in the example):

A. Change the transport for Channel 1 to the **Playlist View**. Click **FILE->PLAYLIST** in the Channel 1 transport pulldown menu. The window of Figure 24 appears.

B. Click the **EDIT** check box to put the channel into edit mode.

C. Click **SHOW->CLIP LIST** from the main menu to open the Clip Navigator. Both windows are now visible per Figure 26.

D. Double click on a clip in the Clip Navigator to add it to the Playlist. The clip will appear in the playlist. The first clip will indicate a status of **CUED**.

E. Repeat the procedure to add more clips.

F. Click **PLAY** to run the playlist. The clips will be played in the order they were entered in the playlist. The currently playing clip will indicate a status of **PLAYING**. The next clip on the list will indicate a status of **CUED**
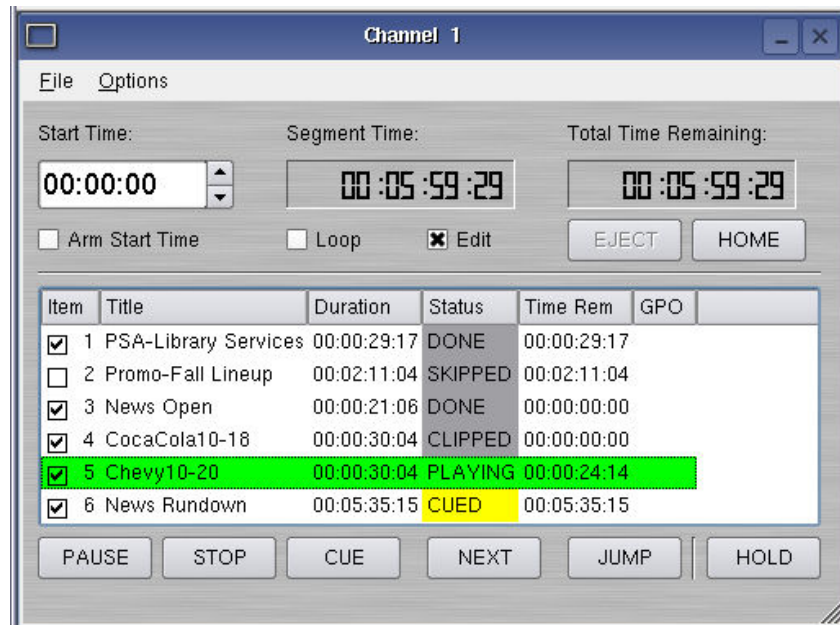
Figure 25 – Active Playlist

G. To SAVE the Playlist Select **FILE->SAVE-AS.** Enter a file name. Click **SAVE.**

H. To SAVE an existing playlist without changing the name, use **FILE->SAVE.**

Status Indications

Status refers to what has taken place, is now taking place, or will take place with regard to each clip.

BLANK	WHITE	CLIP IS AVAILABLE TO PLAY
CUEING	PURPLE	CLIP IS TRANSITIONING TO A CUED STATUS. MAX TRANSITION TIME IS 4 SEC.
CUED	YELLOW	CLIP IS READY TO PLAY ON COMPLETION OF THE PRECEDING CLIP, OR WHEN THE PLAYLIST STARTS, IF NOT PRESENTLY RUNNING.
PLAYING	GREEN	CLIP IS ACTUALLY PLAYING.
DONE	GRAY	CLIP HAS PLAYED COMPLETELY, FROM FIRST FRAME TO LAST FRAME.
MISSING	RED	CLIP WAS NOT FOUND
CLIPPED	GRAY	CLIP BEGAN PLAYING, BUT DID NOT COMPLETE
PAUSED	GREEN	CLIP HAS BEEN PAUSED. FURTHER, WHEN PAUSE IS ASSERTED THE PLAYLIST IS NOT ADVANCING.
SKIPPED	GRAY	CLIP WAS SKIPPED, EITHER BY A NEXT OR CUE OPERATION, OR BECAUSE THE SKIP CHECKBOX WAS SELECTED.
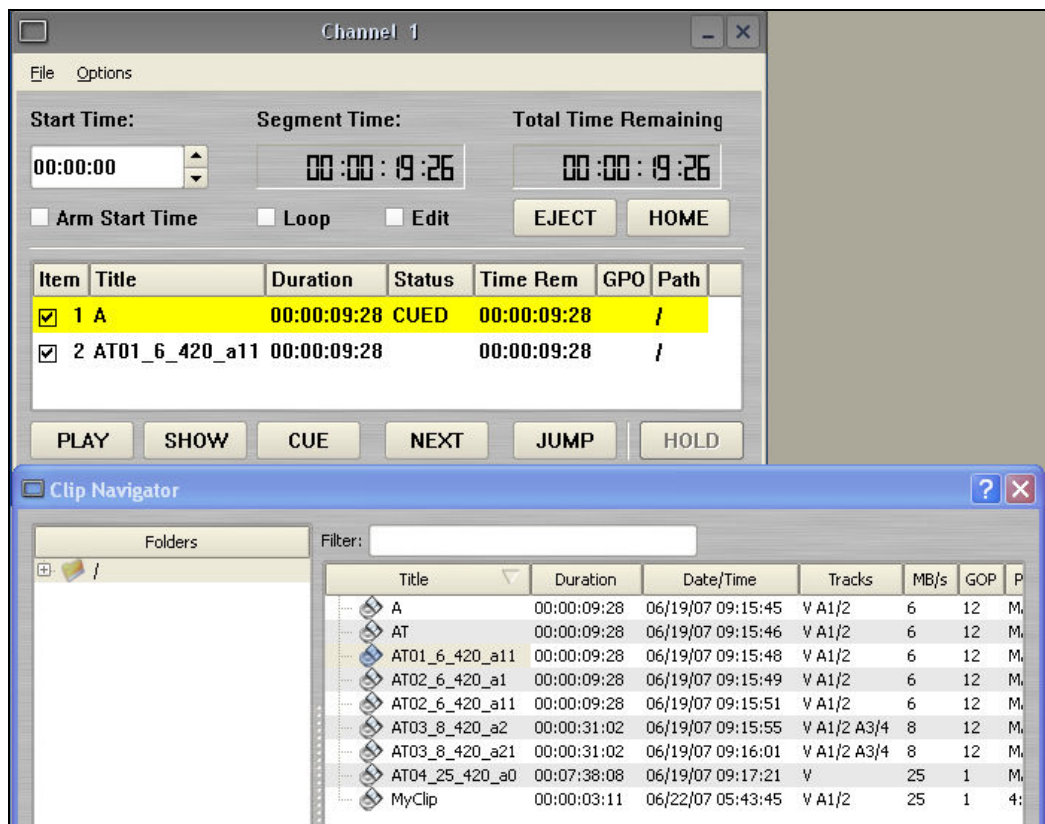
Figure 26 - Channel 1 Playlist with Clip Navigator

Loading a Playlist (FILE->LOAD)

Click **FILE->LOAD** from the Playlist View to bring up the list of available Playlists. Double-click on a playlist to load it.

Saving a new Playlist (FILE->SAVE AS)

Once a Playlist has been created, it can be saved by selecting **FILE->SAVE AS** from the Playlist View pulldown menu. Type in an appropriate name and click **SAVE**.

Saving an existing Playlist (FILE->SAVE)

An existing Playlist can be saved by selecting **FILE->SAVE** from the Playlist View pulldown menu. Type in an appropriate name and click **SAVE**.

Setting a Start Time for a Playlist

Set a start time for a Playlist by entering a twenty four hour time of day in Hours, Minutes And Seconds in the **START TIME** field (see Figure 24). Click on any field to edit the field. Check the **ARM START TIME** checkbox to arm the start time. The **ARM START TIME** checkbox will automatically uncheck itself once the playlist has started.

Stopping a Playlist (STOP)

Click **STOP** to halt a Playlist.

Pausing a Playlist (PLAY/PAUSE)

When a Playlist is running, the **PLAY** key will change to indicate **PAUSE**. Pressing **PAUSE** stops the Playlist immediately, on the current frame of a clip. Pressing it again will resume playback.

Cueing a Clip (CUE)

When the Playlist is running, click **CUE** to immediately prepare a selected clip for playback. When the current clip is finished playing, the Playlist will play the Cued clip, followed by all subsequent clips. This allows the user to skip over clips that appear in the list between the currently playing clip and the selected clip. The user may also re-cue a clip that has already been played. In this case, the Playlist will restart from the selected clip, and all subsequent events will be played (or re-played) in sequence. When the Playlist is stopped, CUE will prepare the selected clip to play when Play is pressed, or the list is started automatically by Arm Start Time.

Looping a Playlist (LOOP [X])

To loop the entire playlist after the last clip completes, check the **LOOP** checkbox at any time. Upon un-checking, the list will play to completion and then stop.

Showing the First Frame of a CUED clip (SHOW)

When a clip is cued, the **STOP** button legend changes to **SHOW**. Pressing it will display the first frame of the cued clip.

Preparing the Next Clip for Playback (NEXT)

When a Playlist is stopped, click **NEXT** to prepare the next clip in the Playlist for playback. While the Playlist is running, **NEXT** will immediately begin playing the next clip in the Playlist. (The next clip may require several seconds to load and cue for a seamless transition.)   If the next event in the Playlist is a HOLD, the **NEXT** command will move to the Hold event, and video will display black.

Jumping to a selected Clip (JUMP)
Click **JUMP** to cue any selected clip for immediate playback; this permits jumping over intervening clips. **JUMP** also allows clips that have already been played to be immediately re-cued and played. In this case, the Playlist will restart from the selected clip, and subsequent events will be re-played in sequence.

Automatically scrolling to the currently playing Clip (HOME)
Click **HOME** to make the currently playing clip visible in the List View window. . If no clip is playing, then the currently-cued clip is displayed. This is helpful if you have manually scrolled elsewhere in large Playlist. Once this is done, the display will also maintain the currently-playing clip within the window, if EDIT is off

Setting the Maximum Number of Played Items to Keep
To set the number of played items to be retained in a playlist
click **OPTIONS->CONFIGURE** from the Playlist View of the channel pulldown. Use the thumbwheel UP and DOWN scroll button to increase or decrease the number of clips to retain. **The default value of zero will retain ALL Clips.**
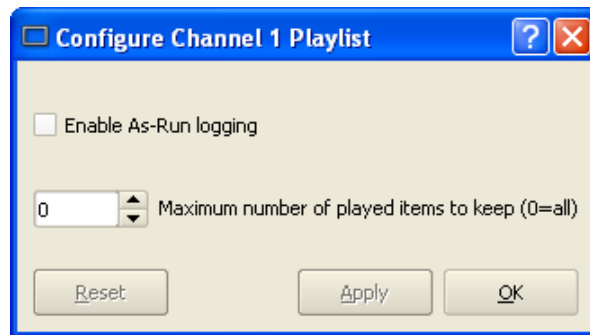
Figure 27 - Channel Playlist Configure Screen

Enabling As-Run Logging
To enable As-Run logs, Click **OPTIONS->CONFIGURE** from the Playlist View of the Channel Transport. Check the Enable As-Run logging to enable As-Run logging. Uncheck the box to disable As-Run logging. When enabled, a check mark will appear next to the As-Run log label, and files played by a playlist will be written to an As-Run log. As-Run logs are available only through FTP downloads; they cannot be viewed or printed from the MAXX 2400. After logging into an Image Server, select the ASRUN folder. All logs are stored in this location, and have the extension ".arl". Refer to **APPENDIX E – AS-RUN LOGGING** for more details about As-Run logging functionality.

Viewing, Editing and Archiving Playlists
Playlists can be accessed via the MAXX 2400's FTP feature, allowing several capabilities:
- Lists can be backed up on a PC, and sent to another ImageServer.
- Lists can be viewed and printed from the PC
- Lists can be edited or created on the PC and uploaded to the MAXX 2400.

Playlists are found on the MAXX 2400 FTP directory in the lists folder. They are simple text files with the extension .lst. Refer to APPENDIX G – PLAYLIST MANAGEMENT DETAIL for more information.

360 Systems ®

EDITING PLAYLISTS

Removing a Clip from a Playlist
To remove a Clip from a Playlist:
    A. Make sure the clip to be removed is not PLAYING or CUED
    B. Position the cursor over the Clip and right-click. Select **REMOVE** from the pulldown menu.

Removing All Clips Above or Below the Selected Clip
All clips above or below the selected clip can be removed unless a CUED or PLAYING clip is affected. Maxx 2400 will "grey out" these options if removal is not allowed for this reason.

To Remove All clips above a selected clip:
    A. Move the cursor over the clip to select it
    B. Right click the mouse and select **Remove All Above** from the pulldown menu.

To Remove All clips below a selected clip:
    A. Move the cursor over the clip to select it
    B. Right click the mouse and select **Remove All Below** from the pulldown menu.

Inserting a HOLD into a Playlist
The HOLD command inserts a hold (wait) event in a Playlist immediately _before_ the selected clip. The PLAY or JUMP command will restart a Playlist after it has stopped on a HOLD line. The HOLD command is also available in the Playlist Item Context Menu, accessed by right-clicking in the Playlist item window. If a Programmed Start Time has been set and is armed, the Playlist will resume when the Programmed Start Time occurs. See Page 58 for instructions on setting a programmed start time.

Appending a Playlist (FILE->APPEND)
Make sure the **EDIT** checkbox is checked in the Playlist View window.
Click **FILE->APPEND** from the Playlist View to bring up the list of available Playlists. Double-click on a playlist to load it. It will appear at the end of the list after a label event that shows the name of the appended list. This operation can be performed during playback, allowing a new playlist to be loaded without interruption of programming.

Changing the duration of Clips in a Playlist
Make sure the **EDIT** checkbox is checked in the Playlist View window. Position the cursor over a clip and right-click. Select **EDIT DURATION** from the pulldown menu**. Enter a duration** in the Duration window. The minimum duration is 4 seconds. The entry may be in one of the following formats.

    1. Hours, Minutes, Seconds and Frames entered as HHMMSSFF
           04300102 = 4 Hours, 30 minutes, 1 second, 2 frames
    2. Hours, Minutes, Seconds and Frames entered as HH:MM:SS:FF
           03:39:41:17 = 3 Hours, 39 minutes, 41 seconds, 17 frames
    3. As a whole number along with the special characters H for hours, S for seconds, M for minutes
           7H would set 7 hour duration. 31m would set 31 minutes.15s would set 15 seconds.

NOTE: The Clip duration is affected only within the Playlist, for this event. The duration of the source clip is not changed. Other events containing the same clip are not changed.

Mapping GPO to Playlist events

The Image Server has six General Purpose Outputs, referred to as GPO 1 through GPO 6. Any of these can be programmed to go active at a pre-determined time, or o*ffset,* after the beginning of a Playlist clip. An active d*uration* can also be set, after which the output again goes inactive. **In all cases, every output will go inactive when a clip ends.** By default, a new clip contains no programmed GPI output commands. Refer to APPENDIX F – GPIO SPECIFICATIONS for details on electrically interfacing to the GPIO connections.

To Map a Playlist event to a GPO Output, Follow these steps.

A. Select **EDIT->CONFIGURE->GPO.** The screen of Figure 28 is displayed. GPO 1 through 6 are the 6 triggerable outputs. The checkboxes to the right of each selection represent channel 1, 2, 3 and 4. GPO 5 is shown with the trigger option pulldown expanded.

   a. Set the GPO of interest to **PLAYLIST** mode from the pulldown

   b. Set the Channel to video 1, 2 and/or 3 by checking the appropriate box to the right. Click **APPLY** to activate the settings.

B. Check the **EDIT** checkbox in the Playlist View of the transport.

C. Place the cursor over a Clip in a Playlist. Right click on the clip. Select **EDIT GPO**. The GPO Editor (Figure 29) appears.

D. Enable the GPO of interest by checking the corresponding **ENABLED** checkbox.

E. Enter an offset into the Clip to activate the GPO line in the Offset Field. The form of the field is Hours, Minutes, Seconds and frames. (HH:MM:SS:FF)

F. Enter the Duration for the GPO to remain active in the Duration Field using the same format. Click **APPLY** to activate the changes.
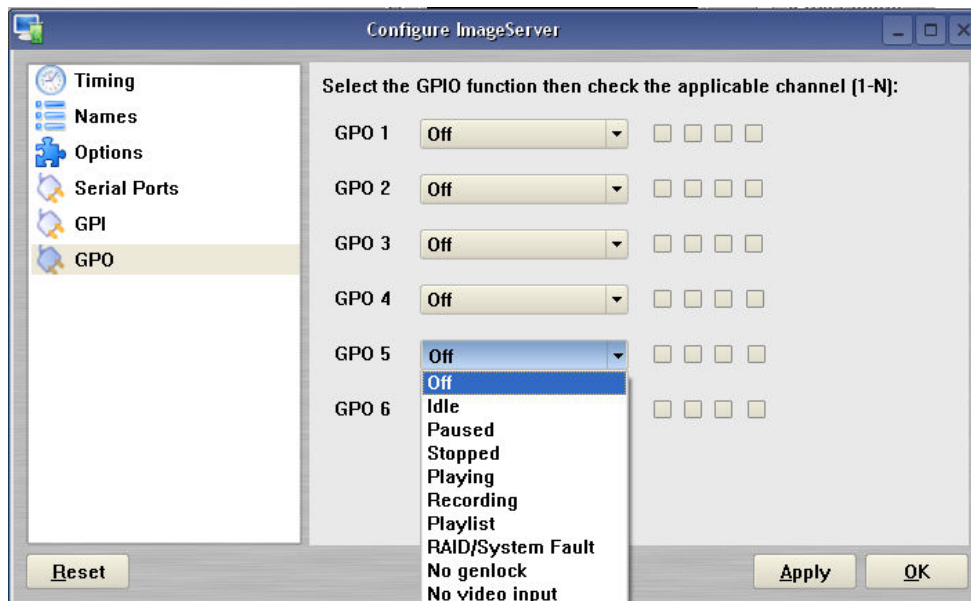
Figure 28 - GPO Configuration Screen
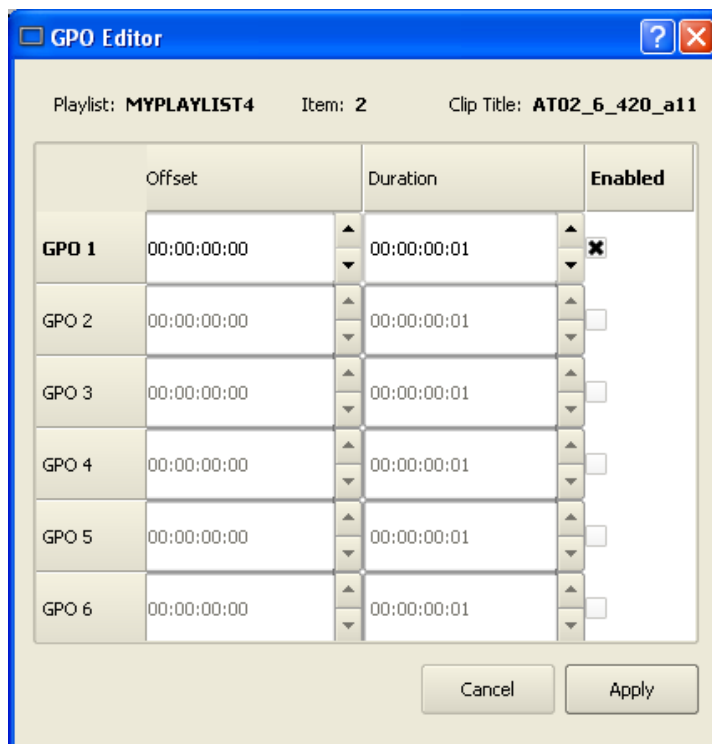
Figure 29 - GPO Editor

Mapping GPI to Control a Playlist

Playlists can be controlled with the Six GPI Inputs as described in Programming GPIO Inputs on Page 44.

USING AUTOMATION CONTROL

MAXX 2400 provides standard RS-422 serial control ports that allow operation with many broadcast automation systems, instant replay panels, video switchers, and remote control devices.

For compatibility with simple controllers and push buttons, the server also provides twelve GPI (contact closure) inputs, and twelve programmable-command outputs (Refer to Page 61).

Remote Serial Control
The Image Server's four 9-pin serial control ports permit independent control of its four video channels. MAXX 2400 supports the following serial protocols.

    1. VDCP
    2. SONY BVW (9-pin)
    3. ODETICS Extension to the SONY BVW (9 pin) protocol

The physical connections for Automation control are made on the supplied CXP Module. Refer to Figure 30.
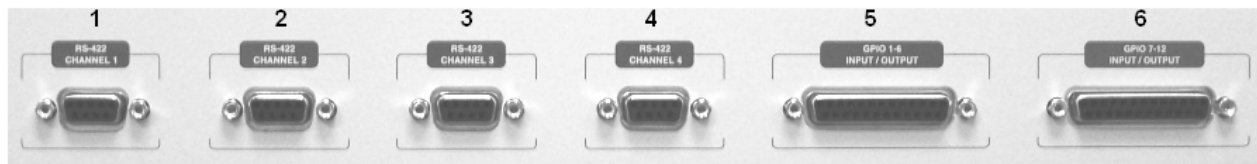
Figure 30 - CXP Module

      1. RS-422 Control Channel 1, also referred to as COM1
      2. RS-422 Control Channel 2, also referred to as COM2
      3. RS-422 Control Channel 3, also referred to as COM3
      4. RS-422 Control Channel 4, also referred to as COM4
      5. GPIO Connector 1 (Inputs 1-6, Outputs 1-6)
      6. GPIO Connector 2 (Inputs 7-12. Outputs 7-12)

When using VDCP, Each port can also respond to channel ID numbers that are equal to, or multiples of, its base number.(The Assigned Serial Ports option must be off – see page 67.) For example, channel 1 will also respond to channel ID numbers 5, 9, 13, etc. This can be helpful when an automation system needs to control a number of Image Servers at once but cannot use duplicate channel ID numbers on any output.

The server's multiple serial ports allow simultaneous connection of an automation controller and a desktop editing controller. This way, one could configure an edit controller on Channel 1 for record, playout, and editing; while an automation controller on Channel 2 manages play-to-air operations.

It is also possible for a single VDCP controller to control multiple Image Server channels.

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Controller Priority
Only one serial controller can control a given video channel at a time. In general, the first controller to gain control of a video channel will have exclusive command. This prevents conflicting instructions that would cause unexpected behavior. The only exception is that the graphic user interface can immediately take control of a channel by selecting Serial Control in that channel's dialog window.

External controllers are prohibited from taking control away from the GUI, the **SERIAL CONTROL** mode must be checked in the channel dialog window before a remote control device can communicate with that channel.

Configuring the automation interface

Setting the automation protocol for a video channel
Each of the three video channels can be configured independently for one of the following protocols.

1. VDCP
2. SONY BVW
3. ODETICS

To map a protocol to a channel, Click **EDIT->CONFIGURE->SERIAL PORTS** from the main pull-down menu. The screen of Figure 31 is displayed. Use the **PORT** pulldown to select COM1,2, 3 or 4. These map to Video channels 1,2, 3 and 4.

- Select VDCP to map the port to VDCP protocol
- Select BVW to map the port to SONY BVW protocol
- Select BVW to map the port to ODETICS protocol

NOTE:
 VDCP operation can allow control of a channel by ID number from a different numbered serial port, while BVW and Odetics protocol control only the channel number corresponding to the number of the serial port in use. Take care if using both protocols not to allow VDCP controllers to address a channel that is controlled by BVW/Odetics on another serial port.
If necessary turn on "Assigned Serial Ports" in VDCP Options – this will force VDCP to control the channel corresponding to the serial port it is connected to regardless of the channel ID in the control messages.
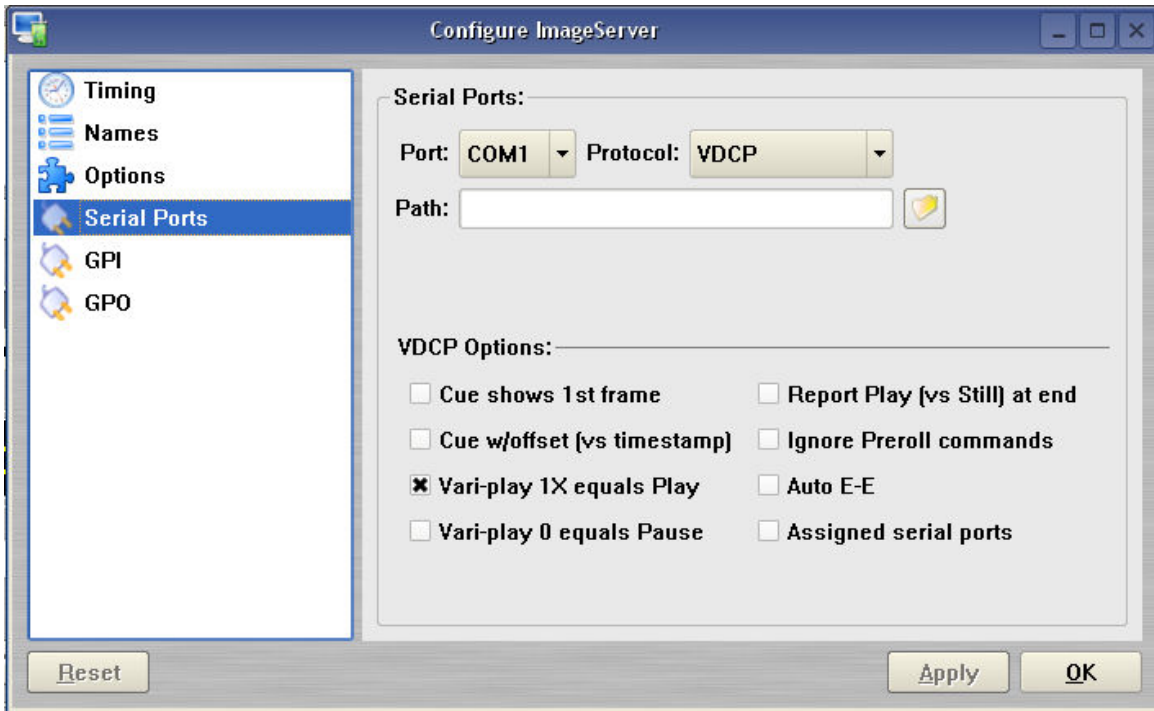
Figure 31 - Serial Port Configuration Screen

Other Automation Options

As illustrated in Figure 31, a number of check boxes are provided that control how the Image Server will respond to certain VDCP commands. Once set, these options remain selected when the server is turned off, and until changed by the user.

Setting the Automation Source Directory

By default, automation equipment will access the Home or Root directory as a source of clips. The directory accessed by automation equipment can be set for each port as follows.

Select the port (COM1, COM2, COM3 or COM4) to be used.

Click on the **FOLDER** icon in the **PATH** field of the Configuration Screen of Figure 31. Navigate to the folder to be accessed by automation equipment.

It is recommended that for most applications only the root directory be used, and the automation system be relied on for file management rather than the server. Automation can only see the clips that are in the assigned Automation Source Directory. There are two classes of applications for folders in conjunction with serial control:

![360 Systems logo]

Limiting the number of clips accessible to automation or remote controllers.
- Some controllers have limited capacity for clip display and selection. Using a folder to present only the currently needed clips can streamline operation.
- Content can be prevented from being aired but still be readily accessible. Content can be ingested at any time and made available to air by moving it into the Automation Source Directory.
- "Archived" material can be held in organized folders, then copied into the Automation Source Directory as needed to air. The copies can then be deleted after airing without affecting the archived copy.
- Content for different purposes can be grouped in folders, and selected by changing the Automation Source Directory.

Segregating material for different broadcast channels
- Content can be placed in a folder for each channel, and played out by separate automation systems or controllers. Each channel can run completely independently – there can be duplicate file names with different content, and the opportunity for airing content on the wrong channel is greatly reduced.
- Content that is common to both channels can be copied into both directories. When this is done in the GUI (as opposed to FTP transfer) the copies reference the same data so they are available immediately and take no additional disk space.

NOTE: The following options will apply to all four video channels. They cannot be individually configured for each video channel.

Cue Shows 1st Frame
Upon receiving a Cue With Data or a Play Cue command, the server will cue the clip then jog to and display the first frame of video. (This also applies to Odetics protocol.)

Cue with Offset (vs. Timestamp)
When checked, the time code for the clip becomes "zero-based" with reference to the head point. To move to the head point of the clip, the automation controller would send a time code value of 00:00:00:00, regardless of the clip's original time stamp. When unchecked, the Image Server will calculate time code position based upon the time stamp from the first frame of the unedited clip. Note that this only affects the operation of the serial port, it does not change the way the ImageServer displays time code in the GUI.

Vari-Play 1X Equals Play
The Image Server will interpret a Vari-play 1x command as a Play command. (This also applies to Odetics protocol.)

Vari-Play 0 Equals Pause
The Image Server will interpret a Vari-play 0x command as a Pause command. (This also applies to Odetics protocol.)

Report Play (vs Still) At End
When the end of a clip is reached, the Image Server will report Play to the automation controller, instead of Still.

Ignore Preroll Commands
A minimum 10-frame pre-roll is required to allow the server time to respond to serial commands. See the documentation for your controller or automation to find out how to set the preroll value. Due to variations in the way preroll commands are implemented in various systems, it may be sufficient to check this box only. The setting of 10 frames in the controller will then work correctly.

This option is very seldom used, it allows preroll commands to be ignored and assumes that the operational preroll is 10 frames. Do not check this unless you experience problems with frame accuracy on recordings and playback transitions. Start with a setting of 10 frames on the automation system and if necessary adjust until you achieve proper timing.

Auto E-E
Toggles Auto E-E mode (input monitor) on/off.

Assigned Serial Ports
VDCP protocol provides for altering the mapping of Serial Port to Video Channel via control commands. Checking this option will **lock** the Serial Port to Video Channel ordering.
- When checked, any command received on a particular serial port will be used to control the like numbered video channel. This means that automation systems that use fixed or limited VDCP ID numbers can use any output to control any channel of the ImageServer.
- With this option checked, there is no requirement for a Port Open command to allow the automation to control the channel. With some systems, this can negate the requirement to restart the automation system when bringing the ImageServer online.
- Do not check this option when using controllers that communicate with all channels over a single serial port.

Communication Port Parameters
The serial data transfer parameters for the Image Server are fixed and cannot be changed. These characteristics are common to all automation controllers:

Baud Rate	38.4 K Baud
Start Bits	1
Data Bits	8
Parity	Odd
Stop Bits	1

Tested Automation Controllers

The Image Server has been tested by 360 Systems and the manufacturers of equipment listed below, and found to operate correctly. This list is not comprehensive, and the inclusion or absence of a product does not indicate a preference for any make or model. Operational variations do exist between makes and models.

Manufacturer	Controller	Protocol	Notes
HARRIS AUTOMATION	ADC-100	VDCP	ALL HARRIS CONTROLLERS SAME
SUNDANCE	FAST BREAK	VDCP	
NVERZION	EMC-NT	VDCP	
CRISPIN CORP.	SYSTEM 2000	VDCP	
FLORICAL	AIR BOSS	VDCP	
VCI SOLUTIONS (DTG)	AIRO	VDCP	
TIGHTROPE MEDIA	CABLECAST	ODETICS	
HARDATA	HDX VIDEO	ODETICS	
IBIS	ITA	VDCP	
PEBBLE BEACH SYSTEMS	ANEMONE	VDCP	
PROBEL	MORPHEUS	VDCP	
PHAROS	PLAYTIME	VDCP	
AVECO	ASTRA	VDCP	
THOMSON-PARKERVISION	PVTV-PLUS NEWS	VDCP	ALL CR SERIES

Tested Remote Control Panels and Switchers

The Image Server has been tested by 360 Systems and manufacturers of the remote control devices and video switchers listed below, and found to operate correctly.

Manufacturer	Controller	Protocol	Notes
ROSS VIDEO	SYNERGY® SWITCHERS	VDCP	
ECHOLAB	OPERA SWITCHERS	VDCP	
DNF CONTROLS	4000-CL	VDCP	ALSO USED WITH DNF SHOT BOX
DNF CONTROLS	300-SSM	P2	BVW-75, ALSO ODETICS PROTOCOL
ASH VALE	SM-2	P2	SLOW MOTION CONTROLLER
BUF	VTC-4000	P2	BVW-75, ALSO ODETICS PROTOCOL
BUF	SPOT	VDCP	ALSO ODETICS PROTOCOL
LANCE DESIGNS	TDC-100	ODETICS	
HI-TECH SYSTEMS	ACTIV CART BOX	VDCP	ALL VDCP PRODUCTS SAME

ADVANCED TOPICS

System Timing
The ImageServer is capable of using an external genlock signal as a timing reference. This allows the outputs to be timed the same as other video signals in a facility. There are three adjustments to fine tune this synchronization to compensate for differences in equipment and wiring. Genlock LINES and SUBPELS set the sync relationship of all of the outputs to the incoming reference. Color timing is adjustable for each channel independently with the SC/H PHASE setting.

These settings should be made in the following order:

1. Genlock Lines: This is a global setting for all of the outputs. *It rarely ever needs to be adjusted.* It allows the output timing to be varied by a line of video. This would be adjusted so that the output of the first line of video happens concurrently with other contributing inputs. The visible effect is that the picture will rise or fall by one line when viewed at the output of a video switcher or on a genlocked monitor. Note that this setting can cause vbi lines such as Closed Captioning and VITC to appear on different (and possibly inappropriate) lines.

2. Genlock Subpels: This is a global setting for all outputs. It allows the output timing to be adjusted by half a pixel. The visible effect is that the picture will move horizontally when viewed at the output of a video switcher or genlocked monitor. The adjustment is made by using a waveform monitor and comparing the falling edge of horizontal sync between the output and another contributing signal (not the genlock signal.) Some video switchers indicate when a signal is timed within spec; this can be used to determine when the setting is correct. If correct system timing is indicated over a range of subpel settings, determine the extreme of the range and set the value in the middle.

3. SC/H Phase: This is a setting per channel, found in the Transport > Options > Configure menu (it does not appear in the Playlist's Options menu.) The adjustment is made by using a vector scope display referenced to the color reference, usually the genlock signal. Play back the zCBARS clip. Adjust the SC/H PHASE to align the color with the vector scope points. Note that it is normal to see some slight periodic variation in the vector display.

Using Embedded Audio
Embedded Audio is standard equipment on MAXX 2400. It is based on SMPTE standard 272M-A. Key features include:

- Synchronous 20-bit audio at a 48 KHz sample rate. Non-synchronous audio and other sampling rates are not supported.

- While up to 16 channels of audio may be present in an SDI stream (arranged in 4 groups of 4 channels), the Image Server records and plays back only Group 1 audio channels (channels 1-4).

- In E-E mode, all embedded audio will pass through the Image Server unaltered.

- The user can select audio to record from either a +4 analog, AES/EBU digital, or embedded audio source. Mix-and-match among inputs is not supported.

- Embedded audio is always included in the SDI stream on playback, and audio will simultaneously appear on the AES/EBU or analog audio outputs, as selected by the audio card option jumpers. When analog audio is selected, only channels 1 & 2 will be available at the analog output. Embedded channels 3 and 4 are not affected.

- User bits in the SDI embedded audio stream are not supported.

- 20 bit Dolby E is supported

Configuring Embedded Audio

From the GUI window, click **OPTIONS->CONFIGURE** from the Transport View of Channel 1 or Channel 3. The Channel Configuration window (Figure 32) will appear. Use this window to configure Embedded Audio.
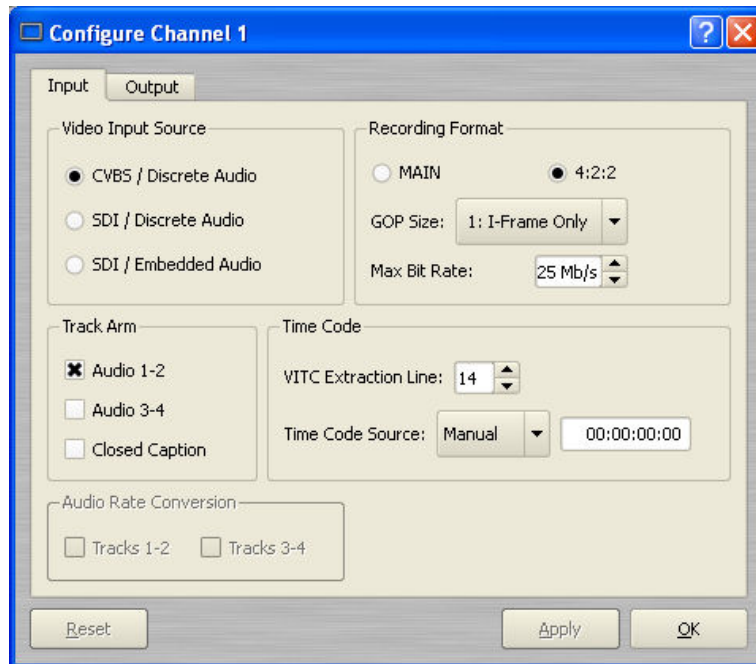
Figure 32 - Channel Configuration Screen

Setting the Input Source

Three buttons select the input source for video and audio. These are:
- CVBS/Discrete Audio (composite video with AES/EBU or analog audio inputs)

- SDI/Discrete Audio (serial digital video with AES/EBU or analog audio inputs)

- SDI/Embedded Audio (serial digital video with embedded audio)

The discrete audio inputs can be either: two stereo pairs (4 channels) of AES/EBU digital audio, or one stereo pair of +4dBu analog inputs, as determined by jumpers on the audio card. Regardless of the input selected, audio will always appear in the SDI output stream as embedded audio, and at the discrete outputs as either AES/EBU (digital) or as +4 dBu balanced analog audio.

The Image Server supports Group 1 embedded audio, which includes audio channels 1-4, 20-bit, 48 kHz, synchronous audio, as per SMPTE 272A.
The analog audio channels always input to and output from channels 1 and 2. Audio channels 1,2,3 & 4 always correspond to their like-numbered Group 1 Embedded Audio channels.

Note: When recording SDI, the SDI signal must be synchronous with genlock.

Using Audio Sample Rate Conversion
Two check-boxes are provided to engage built-in sample rate converters for either (or both) of audio channel pairs 1 & 2, and 3 & 4. When checked, the incoming AES/EBU audio tracks are converted to a 48K broadcast standard synchronized by video genlock.

The sample rate converters should be used in any of these cases:

1. The incoming digital audio and video are not referenced to the genlock.

2. The sync reference is set to INTERNAL.

3. The incoming digital audio is not at 48 KHz sample rate.

Note: Audio sample rate conversion is not applicable for Embedded Audio and Audio Rate Conversion boxes will be grayed-out if the SDI/ Embedded audio check-box is selected, or if the XLR audio inputs are jumpered for analog audio.

Using Channel Ganging

Transport operations on Video Channels can be locked or "ganged" together to allow frame-accurate key and fill material (either stills or clips) to be implemented. (See Using Ganging for Key And Fill Operations on Page 72). Channel Ganging might also be used to create certain types of presentations, such as synchronized matte backdrops on News Broadcasts.

Maxx 2400 can gang channels as follows:

1. Select a Channel Ganging Master channel. This can be channel 1, 2 or 3. To configure the Channel Ganging Master Click **EDIT->CONFIGURE->TIMING** from the Main Menu. The screen of Figure 33 is displayed.

2. Once the Master Channel is selected, any **HIGHER NUMBERED** channel may be ganged to it by clicking the **GANG** checkbox in the Transport View of that channel. For example, if Channel 1 is selected as the Ganging Master, channels 2,3 and 4 can be ganged to it. If Channel 2 is the Ganging Master, channels 3 and 4 may be ganged to it and so on.

It is possible to gang channel 4 to channel 2 and leave channel 3 free for recording.
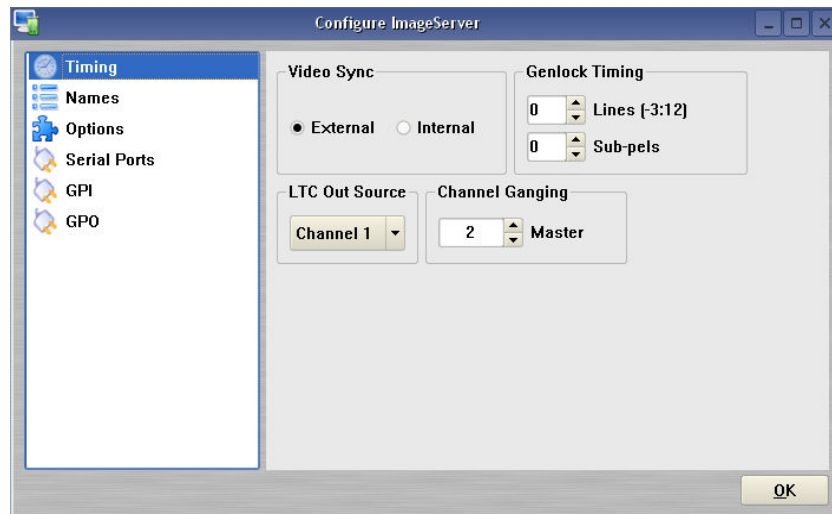
Figure 33 - Timing Configuration Screen

Using Ganging for Key And Fill Operations
Channel Ganging is most commonly used to support and Key and Fill operations. Ganging allows generation of frame-accurate key and fill material (either stills or clips). This in turn is used with a downstream keyer or video effects generator to be externally combined with a third video source. Manual or automation control of the Master channel is all that is needed to play both the key and the fill.

Key and fill clips are associated by their names. The Key Clip must have the same name as the Fill Clip with a trailing underscore. Example:

Fill clip name: myfile

Key clip name: myfile_

There is no provision for automatic loading of similar named clips on more than two channels - the Master channel and the next higher numbered Ganged channel. Additional channels must be loaded manually, after loading the master channel.

Proper key and fill operation requires two clips of identical length. This can be accomplished by editing with head and tail trim. Long GOP mpeg clips should not be used if editing will be required to allow precise head point positioning.

Channel 2 is ganged to Channel 3 in the following example.

When a clip is opened/cued on Channel 2, Image Server automatically looks for another clip with the same name, plus a trailing underscore. If the clip is found, it is loaded on Channel 3. The Channel 2 clip contains the "fill" material, while the Channel 3 clip has the "key" (or alpha) file.

An automation system, could, for example, issue a VDCP Cue command to Channel 2 for a clip called "logo". Channel 3 would automatically be loaded with clip "logo_". A Still or Play command sent to Channel 2 would cause both Channels 2 and 3 to display the fill and key clips, respectively.

Note that the VDCP checkbox option to "show first frame" for a Cue command is ignored for channels in ganged mode. The automation system must issue a Still command to Channel 2 to achieve this effect.

Ingesting a TARGA file via FTP automatically creates a key clip and a fill clip, each a single frame in length. For example, if file "xyz.tga" is transferred to an Image Server via FTP, then a pair of single-frame clips is created: "xyz" and "xyz_" containing the fill and key material.

Using DV Video and Graphics

Playback of DV-format video and TARGA Graphics is included in MAXX 2400.   It plays DV-25 files in native format, and TARGA graphics files including those with key and fill. DV and Graphics enables direct FTP import from Photoshop®, After Effects®, Final Cut Pro®, Xpress DV/Pro™, Liquid Edition and Vegas video.

With DV and Graphics, Image Servers are able to function as both a graphics still-store and an animation playout server.   Its four simultaneous outputs give it the power to combine video, graphics and animation playback. Channels can be ganged in various combinations to provide key-and-fill playout, while Channel 1 plays background video. Refer to *Channel Ganging* on Page 72. The following capabilities are included:

Importing TARGA Graphics Files

The Image Server will recognize and ingest single-frame TARGA files via FTP from most network-attached graphics workstations. TARGA files have a .tga extension, and may contain an alpha (or key) channel. During transfer, the Image Server will split the TARGA file into a Fill frame, and a Key frame if it exists. These will be converted to high-resolution MPEG-2 files, one frame in length.

For example, if an original file is named Logo.tga, the MPEG-2 files created will be named Logo.mxf (the fill file) and Logo_.mxf (the key file). Note the trailing underscore "_" added to the file name of the key. This allows the TARGA file to be used for key and fill applications when channels 2 and 3 are ganged together.

Once a TARGA file is ingested, it exists only as an MXF MPEG-2 file. The processed file may be transferred to-and-from network-attached storage, another Image Server, or a graphics workstation, as two separate MXF MPEG-2 files.

The resolution of a TARGA image should be 720 x 480 for NTSC video or 720 x 576 for PAL. If the original TARGA image is not of this resolution, the Image Server will attempt to re-scale it, possibly introducing some dimensional distortion. The bit depth of the files must be 24 or 32 bit. The Image Server does not support Targa sequences, only single frame graphics.

Animation Import

From the Image Server's standpoint, an "animation" is a clip with a minimum length of two seconds. Clips used in back to back seamless playback must be a minimum of four seconds long. A separate Alpha channel may or may not be present. Any graphics workstation capable of exporting files supported by the Image Server can make transfers to it via FTP. If an alpha channel is present, the naming conventions of the Key/Fill Mode apply: the file name for the key video is the same as the filename for the fill video with the addition of an underscore character (_). Many software programs have the ability to create content compatible with the Image Server , including Final Cut Pro® 4, Avid® DV Xpress, DV/Pro, Liquid Edition, Vegas video, and Adobe® After Effects®, Premiere® and Photoshop®.

Still Frames

A single-frame clip (a "still") may be inserted into a playlist. The length of a still will appear as one frame in the clip list. When a still is encountered, the playlist will pause and hold the still image until a Play command is issued, at which point the playlist will continue to the next clip in the list. When using the GUI, the space bar (a keyboard shortcut) will also advance the playlist. Stills may be placed anywhere in a playlist. In fact, a playlist may be entirely composed of stills.

A still frame clip in a playlist can have a duration assigned to it (See page 60). It will then play for that duration and the list will continue automatically.

Stills are created when TARGA files are ingested. (See page 73 for a description of TARGA file ingest.) It is also possible to create still frames from video clips that use a 1 frame GOP (I-frame only.) When editing the clip, make the In and Out points the same frame. This frame will be displayed when the clip is played in the Playlist.

FTP FILE TRANSFERS

MAXX 2400 features Gigabit Ethernet connectivity using an RFC-1359 compliant FTP server. File transfers to and from the Image Server are managed from an FTP client file transfer program running on a Windows® or Macintosh® computer. This provides a rapid way to execute drag-and-drop file transfers; it can also manage many Image Servers at once and does not tie up the Image Server GUI, which may already be in use. Table 2 indicates the supported FTP client list.

FTP Client	Version	Platform
Flash FXP	3.2.0	WINDOWS XP, WIN2K
DOS FTP	5.1.2600	WINDOWS XP, WIN2K
WS FTP	5.08	WINDOWS XP, WIN2K
Internet Explorer	6.0.2900	WINDOWS XP, WIN2K
Fetch	5.2	MAC OSX
CyberDuck	2.7.3	MAC OSX

Table 2 - Supported FTP Clients

FTP programs may also be used to move recorded or edited material between an Image Server and Network Attached Storage (NAS) or a DVD-ROM library.

From a networking or system-integration viewpoint, the Image Server appears as a normal FTP server in any size network, with the exception that it may only send, receive, or store video files that are compatible with the Image Server.

> **The Image Server is designed to be used in a private dedicated video network. A firewall must be used in systems that require internal security or connection to public networks. Consult with a network security specialist for guidance on the best hardware, programming and practices for your facility's requirements.**

Gigabit Ethernet Cable Quality

The high data rates generated by Gigabit Ethernet require high-quality cable designed for this application. Low-quality network cables can result in high error rates and lower transmission speed. For Gigabit operation, standard CAT-5 cable should be used only for very short cable runs.

New Category 5e (enhanced) cables ensure maximum transfer rates, and should be used as the minimum standard. Category 6 cable is a more recent product designed for applications where longer cable runs are required.

Configuring the FTP interface

Before logging in to the MAXX 2400 FTP server, the network must be configured according to the local network topology. This is primarily a matter of setting a static IP address or configuring MAXX 2400 to use DHCP to obtain an IP address from a DHCP server. Refer to *Configuring the Network* on Page 45 for details on configuring the network for FTP.

If you will be connecting directly to a PC or Laptop, configure the ImageServer as IP address 192.168.1.3, net mask 255.255.255.0 and disable DHCP. In the PC, double click on the Local Area Connection Icon in the system tray or in the Network and Dial-Up Connections in the Control Panel. In the Local Area Connection Status dialog, click on Properties. Click on the item "Internet Protocol (TCP/IP)" and click on Properties again. In Local Area Connection Properties, turn off "Obtain an IP Address Automatically" by selecting "Use the Following IP Address" and set the address to 192.168.1.2, net mask to 255.255.255.0.

No hardware settings are available or needed. The **NET-1** port automatically negotiates port speed and configures transmit and receive connections, and does not need a "crossover" cable when connecting directly to a PC.

The actual transfer rate depends on the format of the files being transferred, the number and bit rate of video streams being played. In practice, broadcast content encoded at 12 Mb/sec should transfer at a rate five times faster than real time, even while the server is playing video.

Logging in to Maxx 2400

Maxx 2400 allows only for anonymous login. Using one of the FTP clients shown in Table 2, enter "anonymous" as the user name or check the "anonymous" checkbox on the login screen.

When the FTP client is connected, it will display the Clips in the main directory and all of the sub-folders. Clips can be uploaded, downloaded, deleted and renamed using standard FTP client commands. Clips in the subfolders can be displayed by entering those folders. Consult the documentation for your FTP client for information on changing folders.

> **The MAXX 2400 will support two simultaneous data transfers** (2 in, 1 in and 1 out or 2 out.) There can be up to two additional FTP sessions active for other purposes such as viewing the directory.

File Sizes Reported in Listing
The size of a clip reported in the file listing is the amount of video and audio data included between the In/Out points.

Overwriting Files
It is the responsibility of the client application (Windows Explorer, FlashFXP, etc) to ask the user if they want to overwrite a file.

Note that some types of files (such as .avi and Targa) change their file extensions when they have been transferred into the ImageServer. In these cases, the FTP client **cannot warn of a file overwrite.** It is important to take extra care when using these types of files not to overwrite necessary files.

Interrupted and Resumed Transfers
If a transfer is interrupted (for example, by a dropped connection) the amount of the file that has been transferred is kept on the target system. Resumption of a partial transfer is possible if the FTP client supports it**.**

Transfer of Edited Segments

The Image Server sets MARK-IN and MARK-OUT points in a clip as "edit pointers." For all edit operations within a given Image Server, these pointers produce "virtual edits" that save disk space, and the time it would take to re-write the marked region as a new file.

It is clearly impractical to transfer a long file to obtain a 30-second virtual clip marked within it. Therefore, the Image Server transfers *only* the region between In/Out points, and not the entire file. If you want to transfer the entire recording, be sure that the In/Out markers are set to the beginning and end of material before the transfer.

To maintain the identity of the transferred clip, the time code references for its Mark-In/Out points are maintained, as shown in Figure 34. (Note that DV files do not contain a start time, so all segments of edited DV format clips will start at 00:00:00 after being transferred.)

When transferring edited material, keep in mind that you are making copies of the data on the target device. While subclips that reference the same video content on the original recordings take up minimal extra disk space, they could take considerably more space on the target storage.
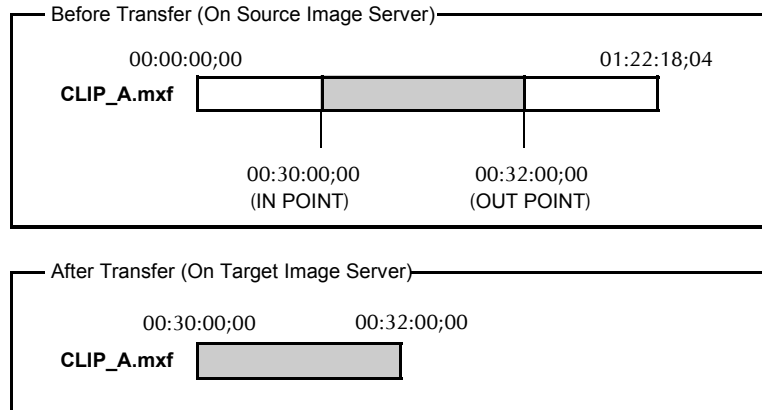

Figure 34 – Result of a network file transfer

Supported file types

MAXX 2400 recognizes media file types by their file extension. It is important that the file extension properly identifies the file content. Attempts to send a file in one format but masquerading as another due to a wrong file extension may result in undefined behavior. The following formats are supported:

MXF - Material Exchange Format (.mxf)

The ImageServer supports FTP import and export of MPEG-2 files in MXF format conforming to operational pattern 1A. The video essence must be a standard-definition (NTSC or PAL) MPEG-2 elementary stream, including D10. The audio essence must contain 16 or 24 bit samples, sampled at 48000Hz, organized as a single track containing 1, 2 or 4 audio channels. Applicable standards are SMPTE 377M, 378M and 381M.

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DV Stream (.dv)

The ImageServer recognizes elementary DV25 (25 Mb/s) streams containing multiplexed video and audio according to SMPTE 314M. The audio must be 48 KHz sample rate locked to video. The .dv file extension is maintained, allowing transfer of .dv files between ImageServers and graphic workstations without modification. DV50 is not supported.

AVI Files in DV format (.avi)

An AVI file is a container that encapsulates a wide range of audio and video formats. The ImageServer can recognize only DV AVI Type 1 and Type 2. Type 1 .avi files contain a single stream of multiplexed audio and DV format video as described above.. Type 2 .avi files contain separate audio and video (even though the video may contain the same or different audio interleaved.) During ingest of .avi files, the server will convert the file into a DV stream (.dv) for storage and future FTP transfer. When the resulting .dv file is exported, if it was originally a type 2 it will contain the .avi audio, not any audio that may have been present in the DV video stream..

MPEG-2 Program Stream (.mpg, .std)

Standard-definition MPEG-2 program streams containing up to 2 stereo pairs of 16-bit, 48 KHz, MPEG2 Layer 1 audio are supported. 16-bit audio files will be written into a 24-bit space.

TARGA (.tga)

24 or 32 bit format (16 bit format is not supported.) During transfer, the TARGA file will be split into a Fill frame and a Key (Alpha) frame. These are saved as two separate MPEG-2 clips, each one frame in length. The clip name for the fill frame is the base name of the .tga file, while the key frame has this name with an appended underscore character. The resulting files will be available as MXF files for subsequent FTP transfer.

PES – Packetized MPEG-2 Elementary Stream (.mp2, .m2v)

The ImageServer will accept MPEG-2 standard-definition elementary stream files. These contain video-only, no audio.

Wave (.wav) or Wave-64 (.w64)

The ImageServer will accept WAVE or WAVE-64 files containing only audio. Audio files should contain 24-bit stereo pairs sampled at 48 KHz. The resulting audio-only clips are available for play out, but do not appear in the FTP directory listing for subsequent transfers.

Playlists (.lst, .txt)

An ImageServer play list is a text-based file residing in the /lists directory. Play lists can be created off-line and transferred to the ImageServer using FTP. See page 122 for further information on Playlist file editing and management.

As-Run Logs (.arl)

As-Run logs are available from FTP to confirm the operation of the ImageServer Advanced Playlist feature. See page 118 for further information on using As-Run logs.

USING NETWORK TIME PROTOCOL

Automatic Date/Time Updates
When using Image Server play-lists in broadcast applications, an accurate record is often needed of what was played and when. The Image Server's As-Run logging feature creates such a record, time stamping each played clip using the machine's internal date/time clock. Very accurate time stamping can be achieved by synchronizing the server's clock to an external time base that is referenced to Coordinated Universal Time (UTC).

This is accomplished using the Network Time Protocol (NTP) to interrogate time servers through a network connection. 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 Image Server with Internet access. Generally, Image 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 35.
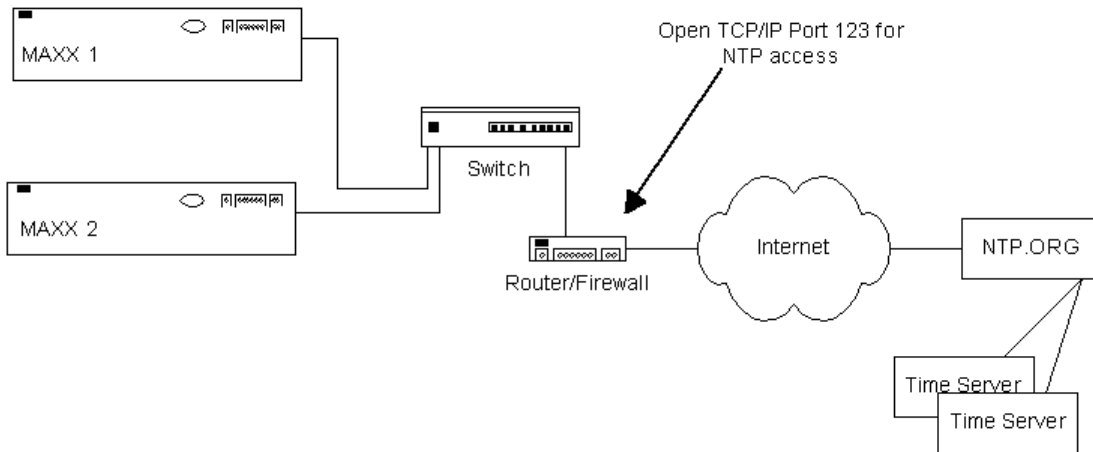

Figure 35 - NTP Network Block Diagram

Configuring NTP

The Image Server GUI is used to set the time zone and to enter the networking parameters. The local GUI must be used, as these configuration screens are not available on the Remote Workstation Interface.

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, you must perform at least a Quick Restart before the changes become fully effective.
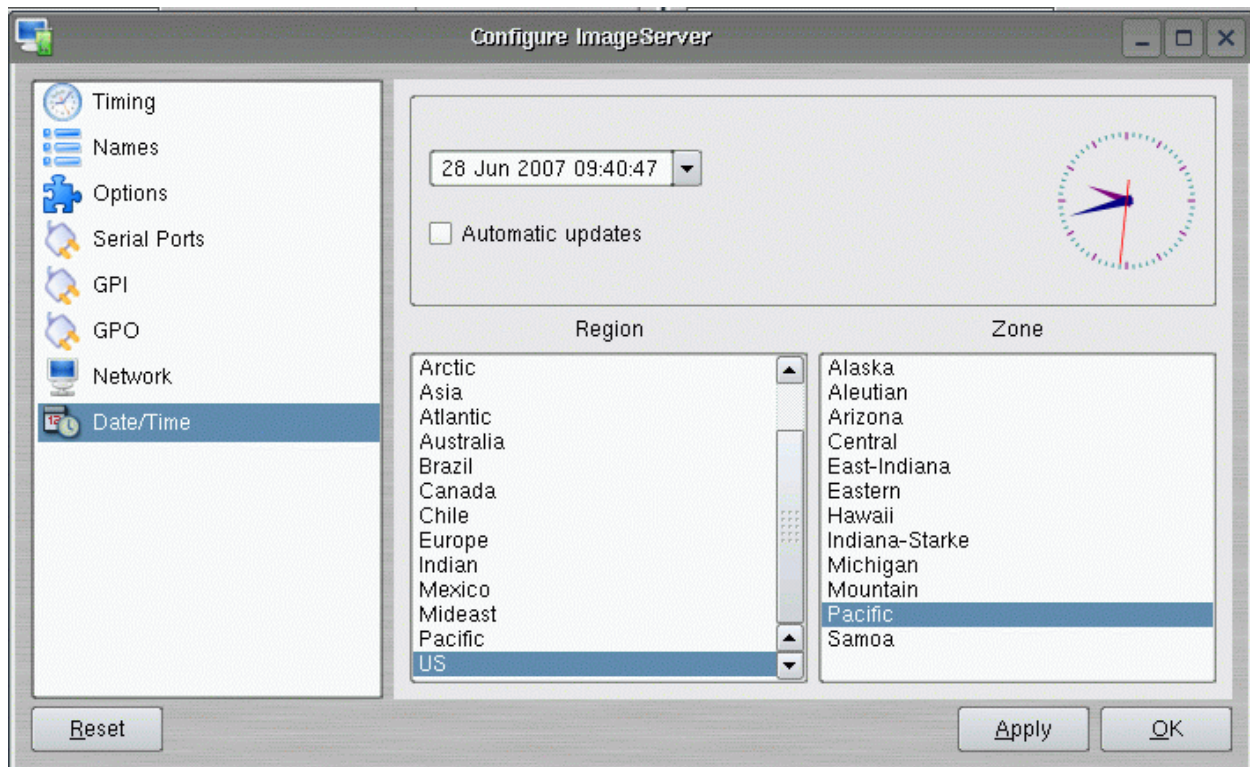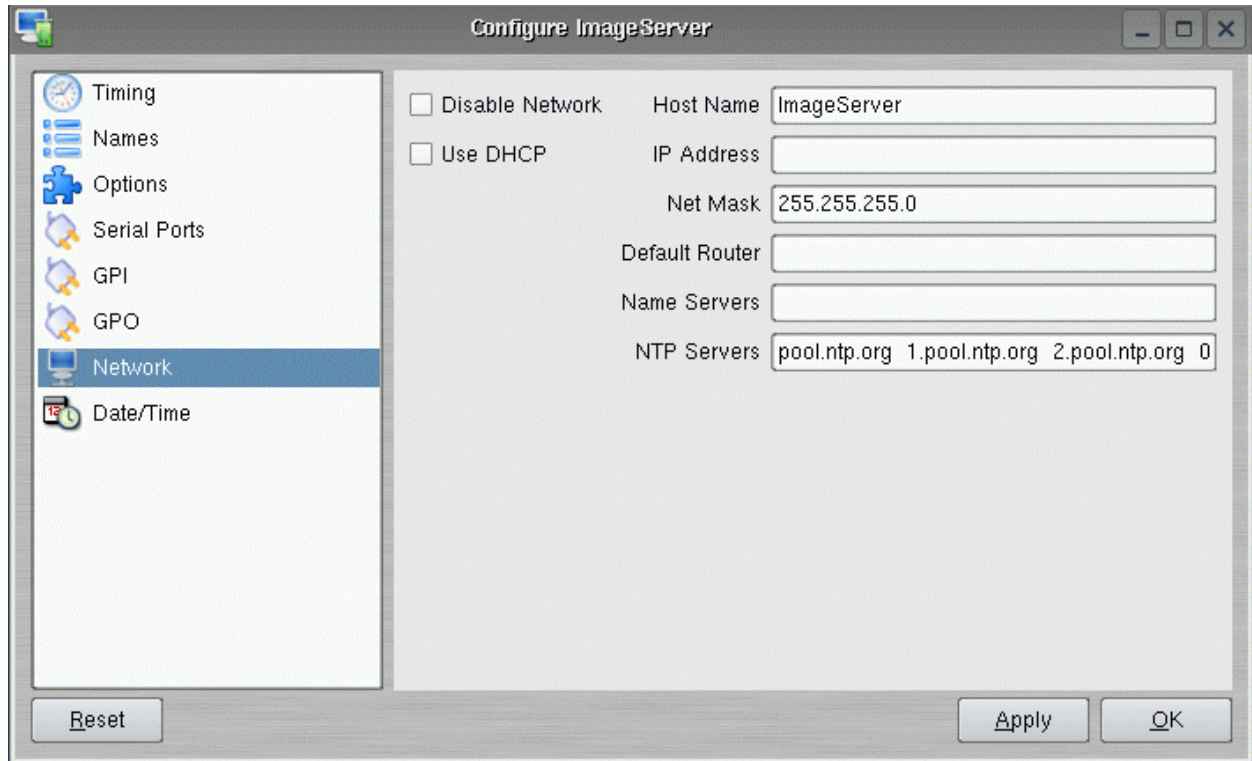

Figure 36 - Date/Time Configuration Screen

Entering Network Parameters

From the GUI's main menu bar, Click **EDIT->CONFIGURE->NETWORK**. The screen of Figure 37 appears. Make sure the basic network parameters have been entered.

Figure 37 - Network Configuration Screen

Disable Network: uncheck

Host Name: (Any name will suffice, but since this name appears on each line of the Image Server'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 Image 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 you can overwrite this list with the addresses of specific time servers you may want to use. However, if you try to clear the *NTP Servers* field it will be reset to the default list.

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

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

If you are using a GPS-based time server for instance, that is connected directly to your 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 you know the numeric IP addresses of the public or corporate time servers on the Internet, you can enter these addresses, 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.

USING THE REMOTE WORKSTATION INTERFACE

MAXX 2400's Remote Workstation Interface is a software application that provides IP control of the server from PC workstations located within a facility.

A remote workstation can access one or more video channels of an Image Server to perform ingest, playback, trimming, playlisting, traffic operations or monitoring of server activities.

Applications include—
- Control of an Image Server located in a machine room

- Ingest station for loading commercials and other content from tape

- Edit station for trimming content

- Building, editing and running playlists

- Remote control of an Image Server located at a transmitter site ("evergreen" backup)

- Access to file content and operations by engineering or management

- Control of more than one Image Server from a single workstation

- On a wireless network, an Image Server can be controlled by a secure Wi-Fi enabled laptop computer

- Remote control in a conference room, or during auditorium presentations

- Image Servers may be securely controlled from a remote location, even across public Internet connections, with inexpensive VPN (Virtual Private Network) technology.

A single Image Server may be controlled from many remote workstations, at different locations on the network. See Figure 38.

Similarly, a single computer can run multiple Remote Workstations to control multiple ImageServers.

Remote Workstation provides the same functionality as the local GUI with the following exceptions.

- Remote Workstation cannot access the servers Network configuration screen
- Remote Workstation cannot shutdown the server.
- Remote Workstation cannot access the RAID status display
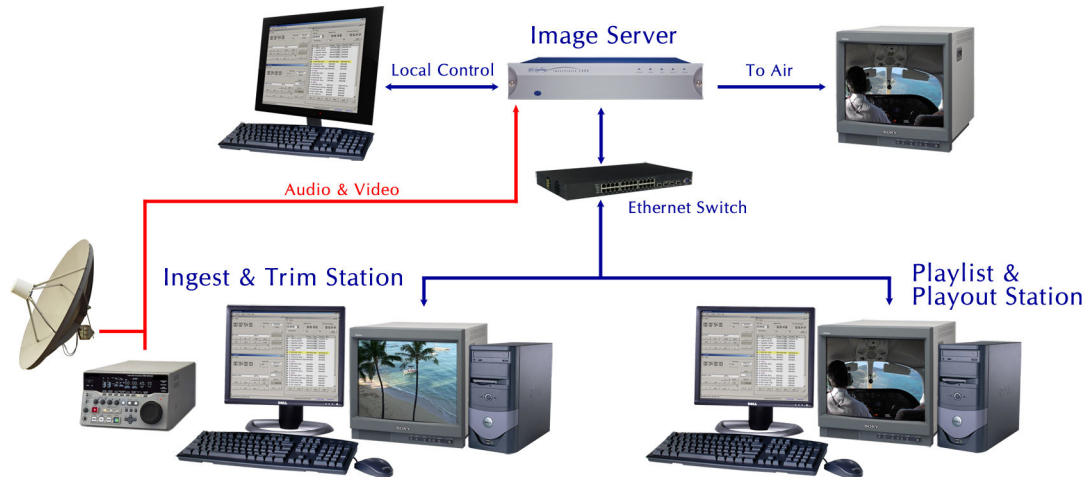- Remote Workstation cannot display MAXX 2400's time-of-day clock.

Figure 38 - Remote Workstation Deployments

System Requirements

- PC with Windows XP or Windows 2000 installed. Other operating systems have not been tested and as of this writing are not supported.

- 6 MB free space on the computer hard disk, plus 64 MB RAM.

- The computer and the Image Server must be connected to the same Ethernet network.

About the Remote Workstation Interface

The Remote Workstation Interface consists of a CD-ROM carrying the Remote Workstation application for Windows 2000 and Windows XP computers. It self-installs using the normal Windows prompts.

It is possible to install the Remote Workstation software on a number of PCs; any of them can then control an Image Server.

Operations

Up to four Remote Workstations can simultaneously view the channel activity of a single Image Server. Only one Remote Workstation, however, can take control of a video channel at any given time. Control of the Image Server video channel is not automatically granted to a Remote Workstation just by attempting to use the GUI; control must be actively taken, using the TAKE CONTROL option described below. This allows remote monitoring of Image Server channel activity while greatly reducing the likelihood that a remote user will interfere with operations initiated by another. All Workstations, including the Image Server's local GUI, have equal priority and any can take control of a video channel at any time. Control is granted for server channels individually, and not automatically for all four; therefore, four Remote Workstations can each control a separate video channel. Each Remote Workstation can display or close transport windows without affecting other Workstations or the Local GUI.

The IP address of a Remote Workstation currently controlling a channel appears in the status bar on the bottom-left of the Playlist or Channel window.

A menu labeled Options appears at the upper-left of each Image Server channel window. Clicking this menu presents a drop-down menu with a TAKE CONTROL option. Select this then click Yes in the confirmation dialog to give control of the video channel to your workstation.

Installation

To install Remote Workstation software from CD-ROM:
- Insert the CD-ROM into the drive on a PC.

- The auto-run capability of Windows will start the Remote Workstation setup program. If it does not, select the Run... option of the taskbar Start Menu and type: D:\setup.exe. If necessary, replace D:\ with the drive letter of your CD-ROM.

- You will be prompted to enter the IP address of the Image Server you wish to control. If you know the address, enter it here. This information can also be entered after installation.

- You will be asked to agree or disagree with the terms under which this software is licensed to you. If you agree, installation will continue. If you do not agree, installation will stop. Follow the prompts to finish installation.

- By default, the Remote Workstation software installs all required files into the C:\Program Files\ImageServer RWI folder. However, during the installation process an alternate directory may be specified. If a previous version of Remote Workstation is already installed on the Host computer, use this feature to install the new version in a uniquely named folder, for example C:\Program Files\ISMAXX2400.

After Installation

A 360 Systems Remote Workstation icon will appear on your desktop. Double click the icon to open a remote session on the Image Server. To change the target Image Server you wish to access, right click on the Remote Workstation icon. Select "Properties" from the drop-down menu. In the "Target" text box, change the IP address listed in the box to the IP address of the Image Server and select "OK" or "Apply." Refer to Figure 39.
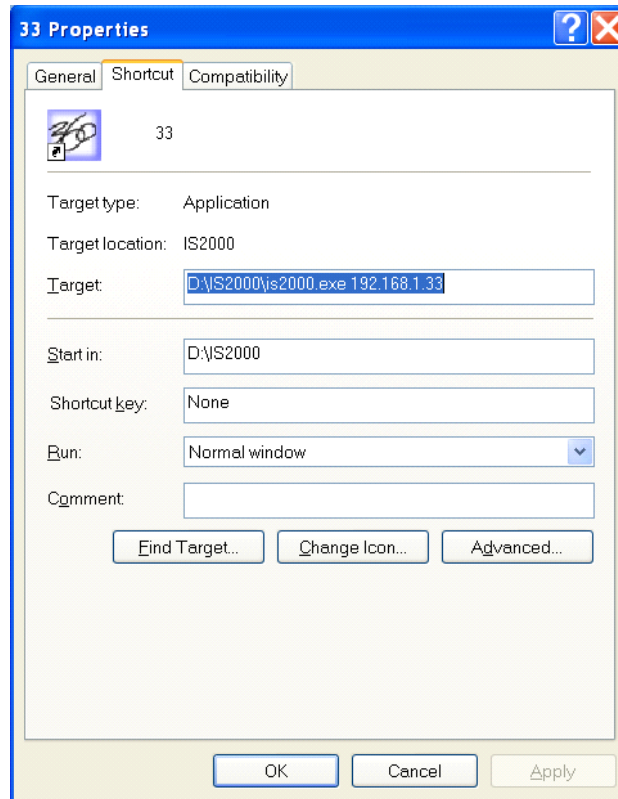
Figure 39 – Remote Workstation Properties Page

Because multiple simultaneous sessions of Remote Workstation may be run on a single PC, it is possible to make copies of the Remote Workstation icon and change the IP address of each to allow one-click access to any number of Image Servers. Simply right click on the Remote Workstation icon and select Copy from the pop-up menu. Next, right click anywhere on the desktop and select Paste. Finally, follow the instructions above to edit the IP address to match the second ImageServer.

USING IMAGE SERVER WITH FINAL CUT PRO

The Image Server IMX option coupled with Telestream's Flip4Mac ImageServer Component provides a "round-trip" compatibility with Apple Final Cut PRO, providing the following capability:

- Record Industry Standard IMX Content.
- Export IMX clips to Final Cut PRO over Gigabit Ethernet using the Flip4Mac ImageServer Component Plug-in developed especially for Image Server.
- Edit IMX clips in Final Cut PRO.
- Export IMX clips back to Image Server for Playback.

Requirements

The following equipment is required to support Final Cut PRO interoperation:

1. Image Server MAXX with IMX Hardware Option 300-102-0024-01
2. Image Server software version 4.05.370 or later
3. Final Cut PRO software version 5.0.4 or later
4. Telestream Image Server Flip4MAC plug-in version 2.1.10.12
5. Apple Macintosh computer "MAC PRO" including:

    a. Dual Core Xeon 2.66Ghz with
    b. 1GB DDR2 RAM minimum.
    c. NVIDIA GeForce 7300 GT graphics with 256MB memory
    d. 250GB Serial ATA 3GB/s 7200-rpm hard drive

Recording IMX Content
Image Server is capable of recording MPEG-2 material in SONY IMX format at 30, 40 or 50 Mb/s. This format must be selected if material is to be edited in Final Cut PRO. Material recorded in Main or 4:2:2 profiles <u>cannot</u> be edited on Final Cut Pro.

From the **Configure** Window **–>** Choose **Channel 1**

- Set the MPEG-2 Format to 4:2:2 IMX
- Set the Max Bit Rate to 30, 40 or 50 Mb/sec.

The use of 30 Mb/s is strongly recommended. The additional quality of 40 and 50 Mb/s in most cases is not worth the extra disk storage space and transfer time required.

ImageServer 2000, MAXX 250 and MAXX 400 units can play 2 channels of 40 or 50 Mb/s IMX.

- Select **File->New** from the channel 1 transport window
- Press RECORD to begin recording.

Transferring IMX Content from Image Server to Final Cut PRO
Start Final Cut PRO. Make sure you have installed the *Telestream* Image Server plug-in.

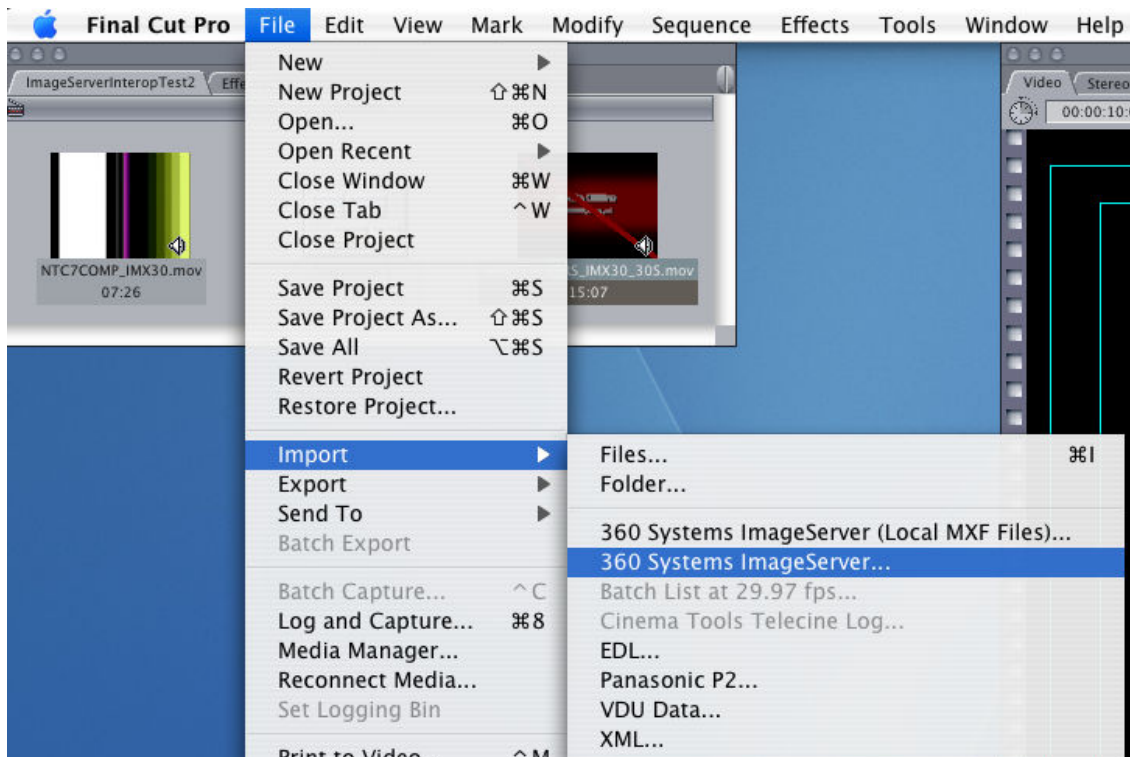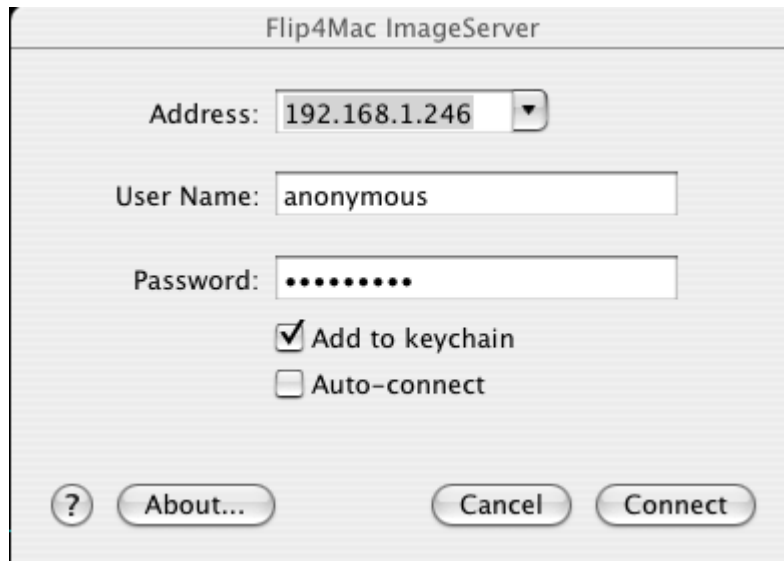- Select File->Import->Image Server per Figure 1


Figure 1 – File Import Menu

- A pop-up (Figure 2) prompts for the IP address, User Name and Password. Enter the IP address in the designated field. Enter **Anonymous** for the User Name. Click on **CONNECT**

Figure 2 – Image Server Connect Screen

A list of files on the target Image Server will be displayed per Figure 3. Click the check box on the file or files you want to import. Click the **IMPORT** button.
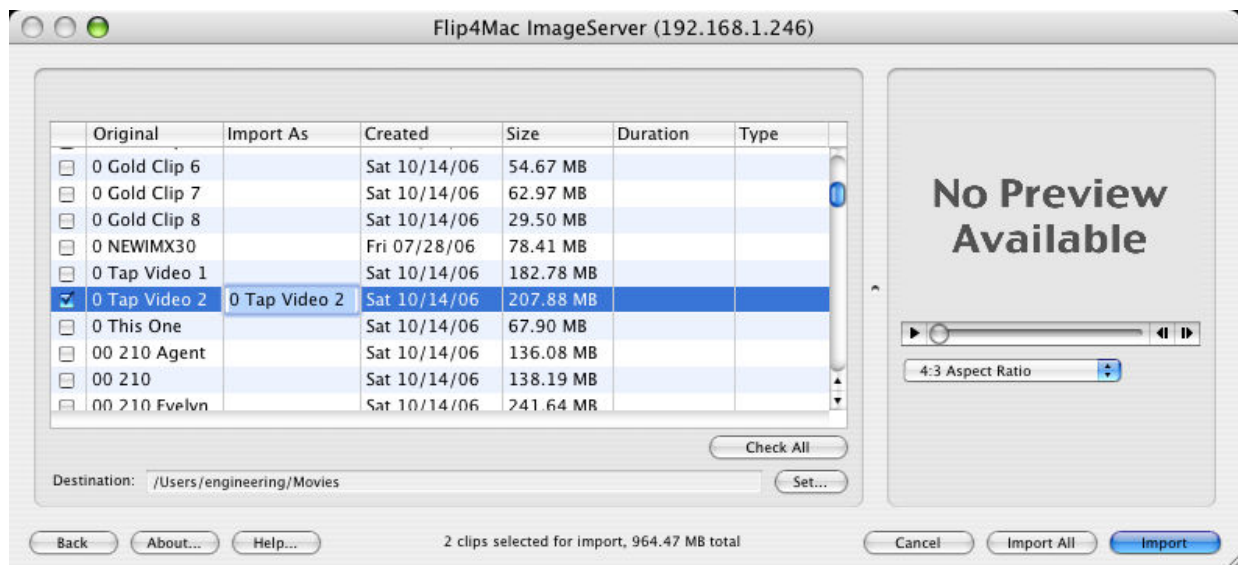
Figure 3 – Image Server File List Screen

The file will upload. Load times will vary depending on data rate of the encoded material, the class of MAC you are using and whether the Image Server is busy playing out to air. Here are some examples of load times. In general, Import and Export times are symmetrical.

Clip Format	Clip Duration	Transfer Time - Idle	Transfer Time - Playing	Clips Playing
30Mb/s IMX	60 seconds	49 Seconds	57 Seconds	3 - 30Mb/s
40Mb/s IMX	60 seconds	61 Seconds	63 Seconds	3 - 40Mb/s
50Mb/s IMX	60 seconds	70 Seconds	73 Seconds	3 - 50Mb/s

Once the file is loaded it will appear as an icon that displays the first frame of the content and the name of the clip. Before material can be edited, the sequence settings in Final Cut Pro must be set to match the characteristics of the clip. This is important because if they do not match, Final Cut PRO will attempt to render the entire cut before it can be edited. This is fairly quick on clips of one or two minutes, but it can be unacceptably slow on longer clips.

Check the Characteristics of the clip
Mouse over the icon of the imported clip. Hold down the CTRL key and click on the icon. Select **Properties** from the pull-down. Make a note of the properties. If you will continually edit the same type of content you will not have to repeat this step.

Set the Sequence Settings to match the clip characteristics
Select **Sequence->Settings.**
Configure the settings to match the properties of the clip. Of particular significance is the Compressor field. Here is an example of sequence settings for a 30 Mb/s IMX clip recorded on the Image Server:

Property	Setting for IMX @ 30Mb encoded on Image Server	
	NTSC	PAL
Frame Size	720 X 486	720 X 576
Aspect Ratio	NTSC – CCIR 601 (40:27)	PAL – CCIR 601 (5:4)
Field Dominance	Lower	Lower
Editing Timebase	29.97	25
Compressor	MPEG IMX 525/60 (30 Mb/s)	MPEG IMX 625/50 (30 Mb/s)
Audio Rate	48 KHz	48 KHz
Depth	16 bit	16 bit

The only difference in the settings for 40Mb/s and 50 Mb/s clips is the compressor used should match the bit rate.

Once the Sequence Settings have been configured, drag the icon of the clip down to the timeline. If the settings are properly configured, a red line *should not* appear above the clip on the Timeline. If a red line *does* appear, recheck the sequence settings and clip properties and repeat the step above.

Editing Content in Final Cut PRO
Entire industries exist to educate and assist Final Cut PRO users. In summary, once the clip is on the Timeline, the first frame will be displayed in one of the television-like sequence windows. If it has been imported properly, you will be able to play it using the intuitive VCR-like controls in the window. It is important to select and work only on a specific region that requires editing. If a specific region is not selected, Final Cut PRO may render the entire clip every time you make a change. The rendering process is quite time-consuming. Refer to relevant Final Cut PRO documentation for tutorials.

Exporting and Playing Content on the Image Server

Once content has been edited in Final Cut PRO, it can be re-exported back to the Image Server for storage and playout as follows:

Select File->Export->Image Server per Figure 4

The same pop-up menu is displayed as for the file Import function. Enter the IP address of the server and check ANONYMOUS login. The edited file will be exported via FTP to the server.
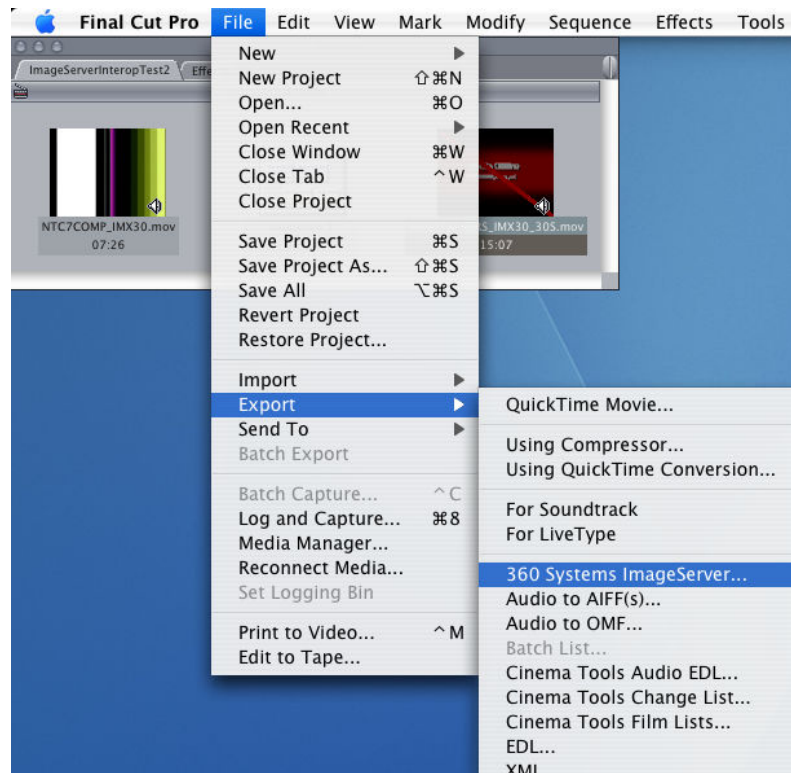

Figure 4 – File Export Screen

360 Systems

MAINTENANCE

FAULT DIAGNOSTICS

Front Panel Indicators

The five LED indicators on the front panel are used to diagnose server fault conditions. The meaning of each indicator is noted in the following table. During normal operation, all indicators will be on, with the possible exception of Genlock (if Internal Sync is selected).

⚠	**Repairs should be performed only by qualified electronics technicians.**

GENLOCK	OFF indicates that the Genlock setting in the System menu is "Internal" FLASHING indicates that Genlock is selected in the System menu, but there is no signal, or an invalid signal, at the **GENLOCK** connector.	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 Image Server 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 and CPU fan operation. Replace if necessary. Do not run the Image Server 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 > System > RAID STATUS.**
SYSTEM	FLASHING indicates that the CPU fan is running slow, or stopped; or that the CPU temperature or voltage is not within specification.	Shut down the Image Server and contact 360 Systems Customer Support for further hardware diagnosis.
ALL LED's FLASHING	Application Halt, Operating System Halt, or Major System Fault	Attempt to perform a system shutdown via GUI or momentary press of front panel Power button. Otherwise, hold the power button down until the system powers off. If flashing continues after restart contact 360 Systems Tech Support. Note: All LED's flashing during system startup is normal.

Troubleshooting Other Conditions

System won't boot	Not using a VESA compliant monitor.
	Mouse and Keyboard connections reversed.
	More than two drives have failed.
Mouse cursor erratic	Mouse driver out of sync. (Sometimes happens with some KVM switches.) Press Control+Alt+F12, then Control+Alt+F7 to restart mouse driver.
	Incompatible mouse – use mouse supplied with ImageServer.
Keyboard not responding.	Connection was interrupted. Restart is required if connection is lost.
Mouse not responding.	Connection was interrupted. Press Control+Alt+F12, then Control+Alt+F7 to restart mouse driver.

360 Systems®

Gigabit Ethernet Indicators

The Gigabit Server Adapter card has the following indicator lights:

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=GREEN 1000=YELLOW (Right)	Off	10 Mbps
	Green	100 Mbps
	Yellow	1000 Mbps

ACCESS TO COMPONENTS
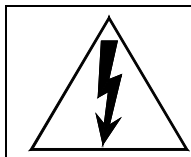
⚡	Be certain to shut down the Image Server, turn off the rear panel power switch and **disconnect both power cords** before opening the unit for service.

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.

Deploying the Front Panel

The front panel is easily deployed for access to the CD-ROM drive, the twelve 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. Pull forward and down to deploy the front panel in the open position

To replace the front panel, push upward and toward the unit. Screw the front panel fasteners back into the chassis. Tighten the front panel access screws with a screwdriver.

Removing the Top Cover

To remove the top cover, Press on the two blue release buttons on the top cover and slide back, then lift up.

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 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

> ⚠ **Be sure both power cords are removed** before performing any servicing of I/O cards. MAXX 2400 may be damaged even with the power switch turned off.

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. 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.

RAID Controller Card

Unplug the Serial-ATA cables from the RAID card, checking the labeling to be sure they can be reinstalled in the same positions.

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.

> **NOTE:** If these cables are connected in the wrong order, the data in the RAID array will be destroyed.

Accessing the Motherboard
There are no user-configurable options to set 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 the motherboard.

HARD DISK MANAGEMENT

MAXX 2400 employs an advanced Serial-ATA controller that manages twelve high-capacity hard disks operating in a RAID-6 configuration. This design increases system performance, and by storing parity data, can survive the loss of up to two drives in the array without data loss.

The Image Server 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 had inherent performance limitations due to arbitration latency, since only one drive may use the bus at a time. Further, a single drive failure could bring the entire storage system down.

By contrast, the Image Server 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 Image Server 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 Image Server RAID implementation features and benefits include:

- Non-blocking switch technology with RAID 6 parity
- On-board processor minimizes host CPU overhead
- Easy-to-configure arrays
- Dynamic sector repair for robust data protection
- Accelerated RAID-6 writes
- Easy, hot-swappable drive replacement from front panel

About RAID 6

A RAID 6 configuration features the data striping of RAID 0, combined with the parity benefits of RAID 4. RAID-6 is similar to RAID-5 in that 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. RAID-6 uses two parity stripes, and RAID-5 uses one. RAID-5 can tolerate the loss of one drive whereas RAID-6 can tolerate the loss of two drives due to the extra parity stripe. Spare drives can be used to rebuild an array after a drive is replaced.

RAID-6 capacity equals the size of drive times (number of drives -2). In addition, the array's storage efficiency increases with the number of disks; from 75 % for 8 drives to 83% for 12 drives: storage efficiency = (number of drives -2) / (number of drives).
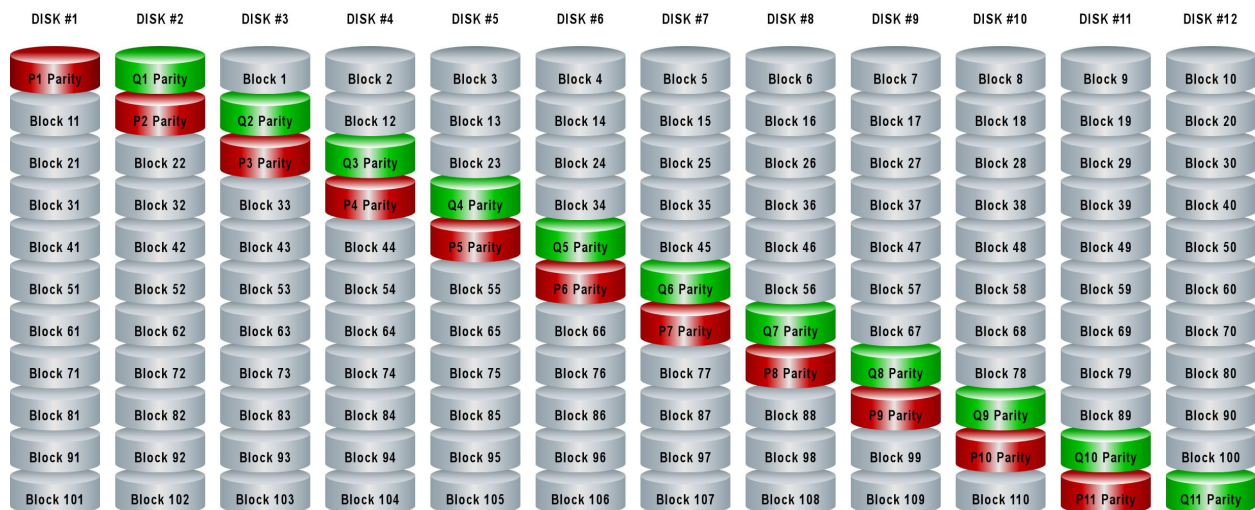
Figure 40 - RAID 6 Array Schematic

Improved Write Performance

The Image Server uses new designs to improve RAID-6 write performance for both large sequential and small random transactions. This advanced block caching firmware delivers extremely high performance for RAID-6 write operations.

MANAGING DISK ARRAYS

The Image Server'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.

If up to two drive faults should occur, it should not cause data loss; but remember that the drive array is degraded and no longer has fault tolerance. Hence, another disk failure will 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.

Error Notification and Repair

The Image Server will notify users in the event of a fault by flashing the front panel **DRIVES** light. A failure condition will also be indicated in the Image Server GUI in the status bar, on the bottom of the screen and highlighted in yellow (Figure 41). A GPIO Output can be programmed to activate upon a RAID or system fault. This can be used to activate a warning lamp or alarm. Refer to Page 43 for more information on Mapping GPIO events. A drive fault can be trigged 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.

Figure 41 - GUI Drive Fault Indication

The **RAID Status** window (Figure 44) 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.
- **Verifying**, indicated by "Verifying 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 rebuilding 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. Shutdown the system only by <u>momentarily</u> pressing the front panel power button or selecting **Start > Shutdown > Shutdown** from the graphic user interface.

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.
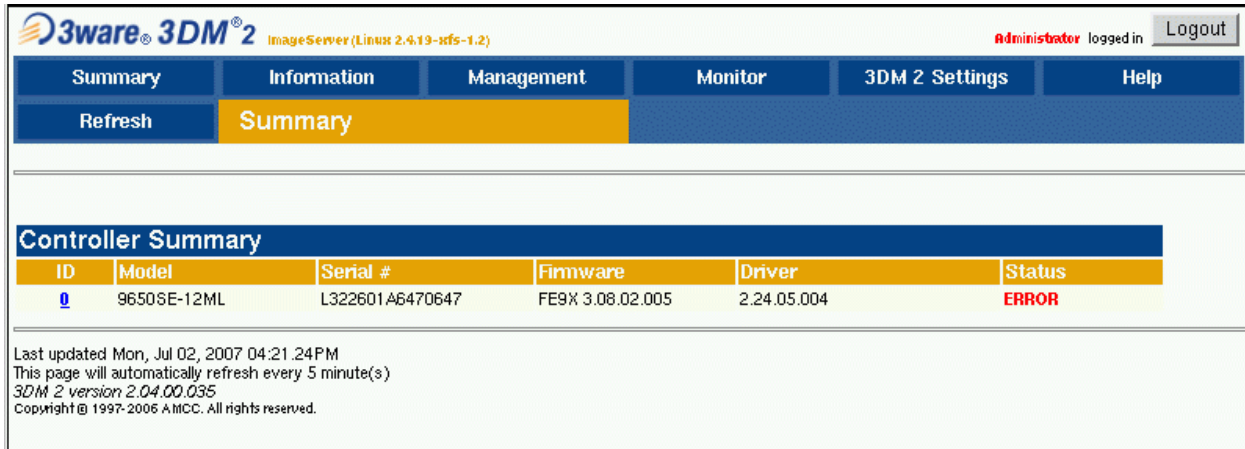
Log-In to the RAID Utilities

Figure 42 - RAID Utilities Login Screen

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
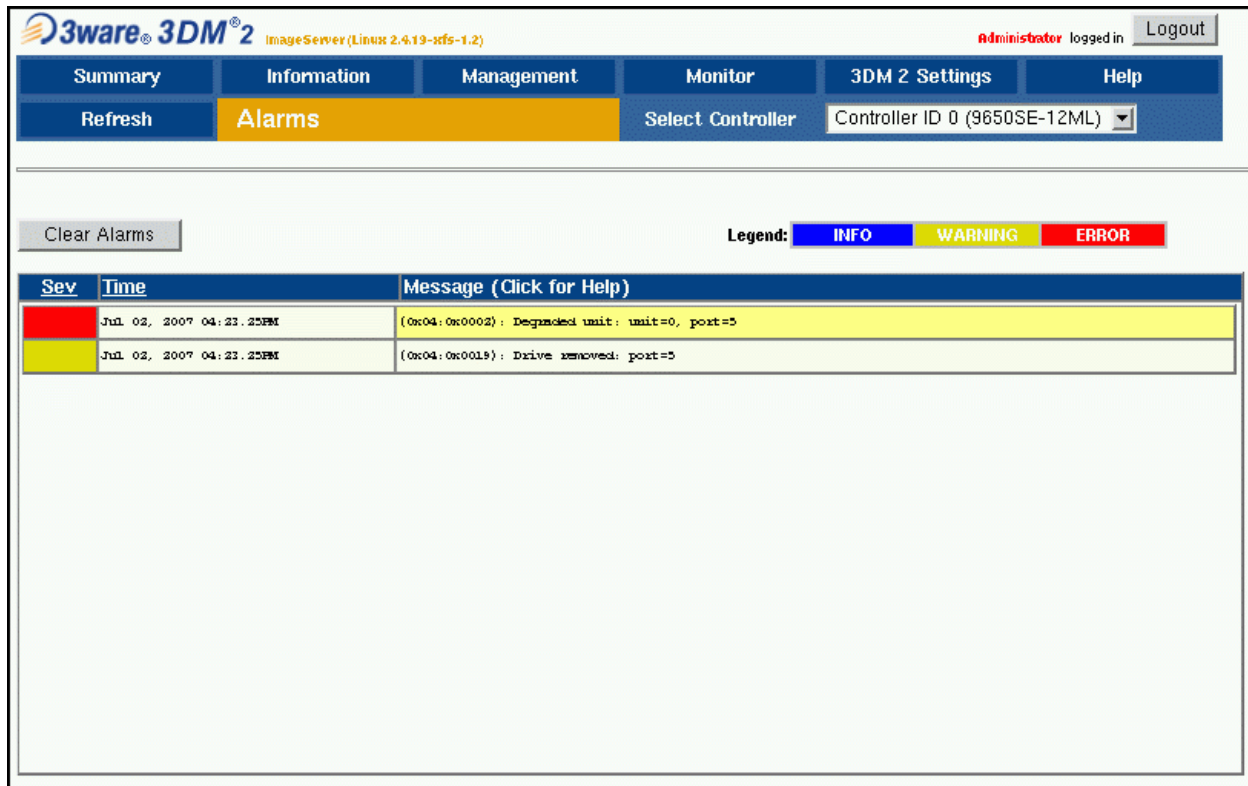
Figure 43 - RAID Array Condition Screen

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 44 - RAID Array Status Screen

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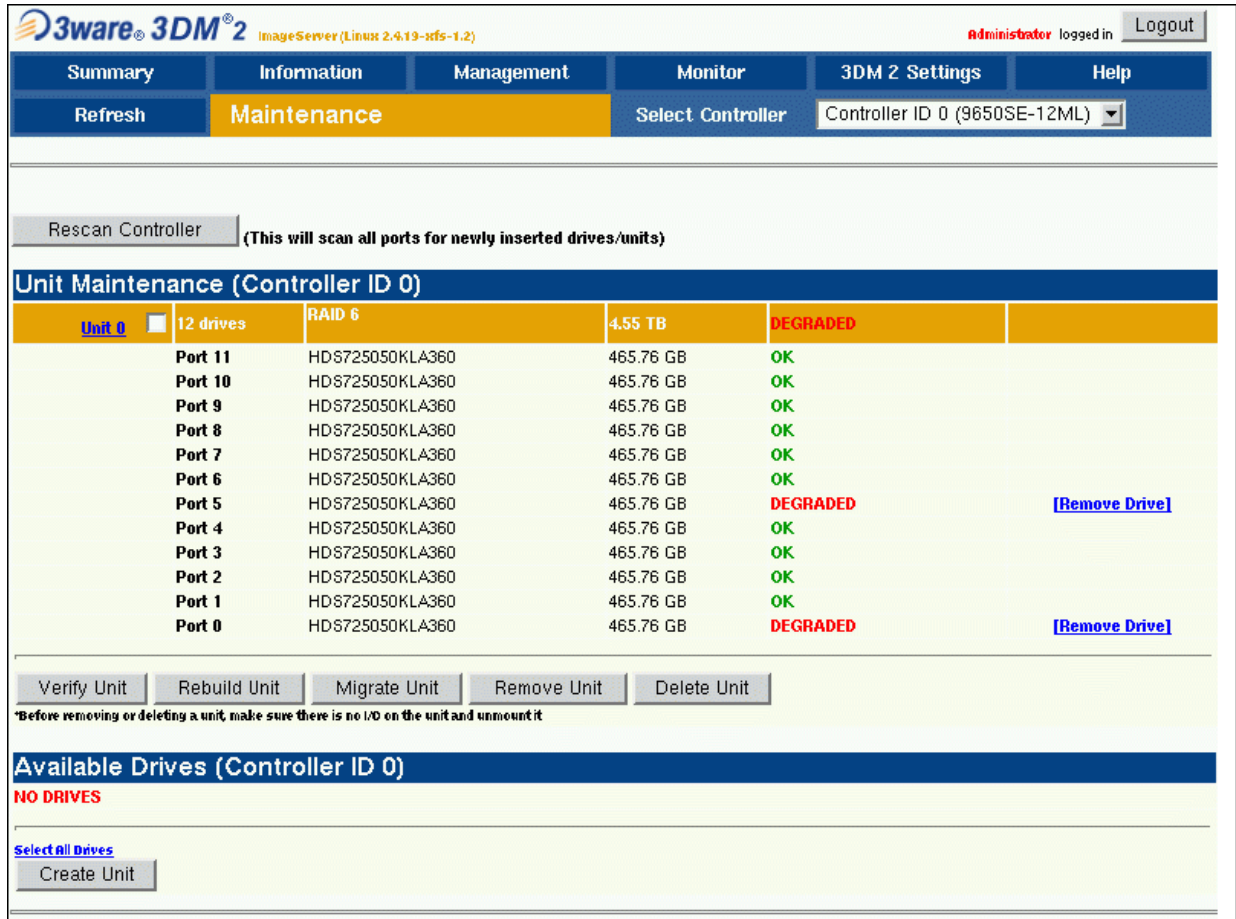
Drive Error – The drive reported a data error. A rare isolated occurrence may be acceptable, but probably indicates a drive failure.

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.
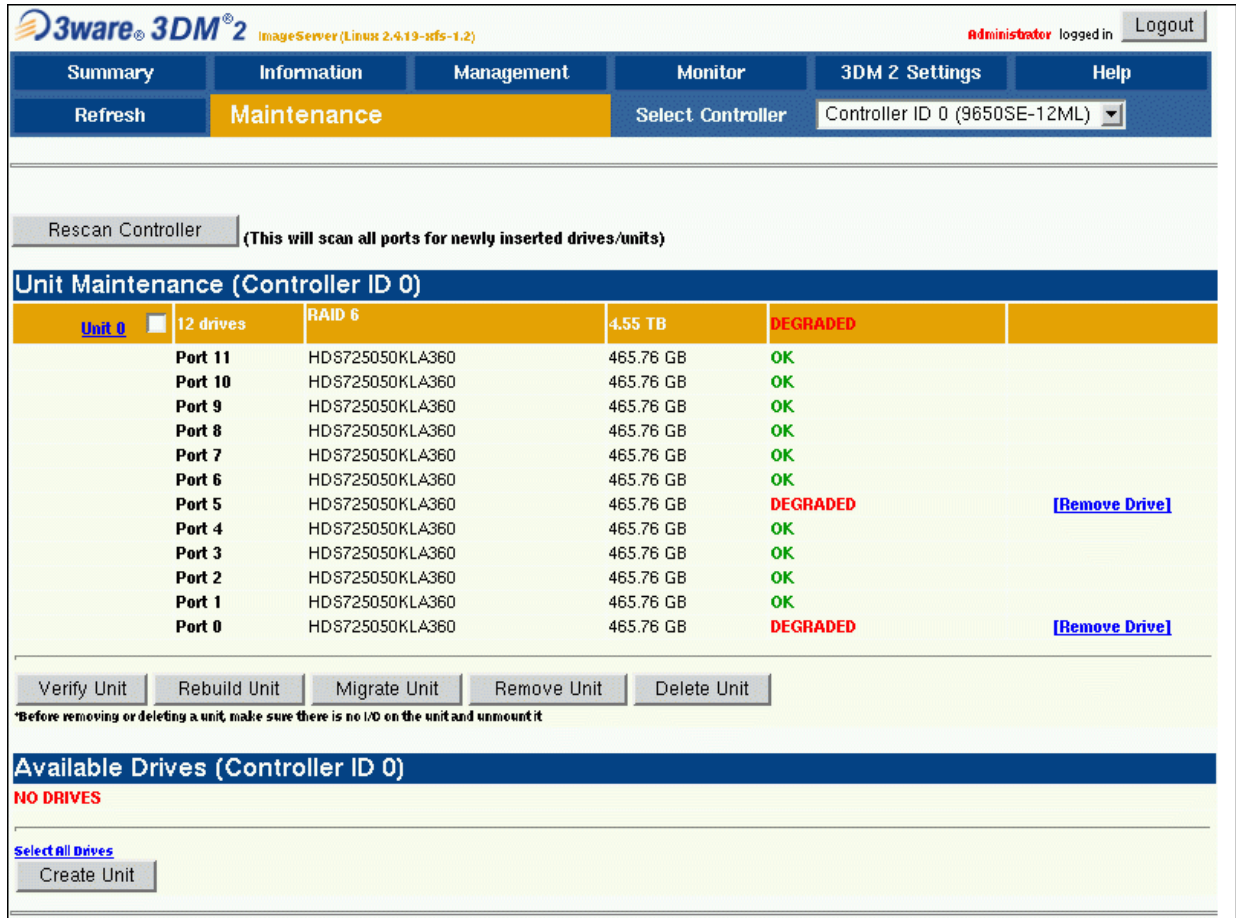
Checking Status of the Drives

Figure 45 - RAID Array Maintenance Screen

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 46 - Removing Failed Drive From Array

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 47 - Selecting A drive to rebuild

- 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.

![360 Systems logo]

Replacing Hard Drives
Maxx 2400 Hard Drives are hot-swappable, meaning they can be replaced "on-the-fly" without loss of data or interruption of server operation.

To replace a drive:
A. Loosen the knurled screws fastening the front panel. Pull forward and down to expose the drive.
B. Remove the drive by pulling on the blue lever to unlatch the drive. Refer to Figure 48. Remove the drive from the tray and replace it with the replacement drive.
C. With the blue latch still extended, gently slide the tray into the bay until you feel it "seat". Press on the latch to lock the drive into place. Return the panel to it's normal position.

Figure 48 - Front Panel Deployed – Disk Unlatched

FACTORY REPAIR POLICY

A video server 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.

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

REGULATORY CERTIFICATIONS

Safety

The Image Server 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.

Laser Compliance

The CD-ROM device used in this product is a Class 1 certified laser product. Operating this product outside specifications or altering its original design may result in hazardous radiation exposure, and may be considered an act of modifying or new manufacturing of a laser product under U.S. regulations contained in 21 CFR Chapter 1, subchapter J or CENELEC regulations in HD 482 S1. People performing such an act are required by law to re-certify and re-identify this product in accordance with provisions of 21 CFR subchapter J or distribution within the USA, and in accordance with CENELEC HD 482 S1 for distribution within countries using the IEC 825 standard.

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)

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

PRODUCT WARRANTY

Limited Warranty
This product is warranted to the original purchaser against defects in material and workmanship for a period of one year from the date of original purchase. This warranty covers parts and labor and is effective when the product is used without alteration for the purpose intended by 360 Systems. This warranty excludes products with modified or unauthorized software, that have been subject to misuse or neglect, that have been modified, repaired improperly or by unauthorized personnel, damaged by rough handling, abuse, improper operation, excessive temperature, lightning strike, static electricity, electrical surges or other electrical system malfunctions, improper or inadequate maintenance or care and that have been subject to use of unauthorized or non-conforming accessories or attachments. This warranty also excludes normal wear and deterioration occasioned by the use of the product.

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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Some states do not allow the exclusion or limitation of incidental or consequential damages under certain circumstances, so the above limitations and exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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For Image Server MAXX 2400 Software

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7. This Agreement shall be governed by and construed in accordance with the laws of the State of California, U.S.A., without reference to conflicts of laws provisions or the 1980 U. N. Convention on Contracts for the International Sale of Goods and, as to matters affecting copyrights, trademarks and patents, by U.S. federal law. Any dispute with respect to this Agreement shall be brought and heard either in the California state courts located in Los Angeles County, California, or the federal district court for the Central District, Western Division, located in Los Angeles, California. In such event, the parties to this Agreement each consent to the *in personam* jurisdiction and venue of such courts. The parties agree that service of process upon them in any such action may be made if delivered in person, by courier service, by telegram, by facsimile or by first class mail, and shall be deemed effectively given upon receipt.

This Agreement sets forth the entire agreement between You and Company pertaining to the licensing of the Software, and supersedes in its entirety any and all written or oral agreements previously existing between the parties with respect to such subject matter. If any provision of this Agreement is held invalid or unenforceable, such provision shall be revised to the extent necessary to cure the invalidity or unenforceability, and the remainder of this Agreement shall continue in full force and effect. In the event of any conflict between any provision of this Agreement and applicable law, the provisions of this Agreement affected shall be modified to remove such conflict and permit compliance with such law, and as so modified this Agreement shall continue in full force and effect. This Agreement may not be assigned without the consent of company

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APPENDIX A – SETTING THE AUDIO JUMPERS FOR ANALOG/DIGITAL

Analog/Digital Audio Selection

Figure 51 indicates jumper positions to select between analog or digital audio. Note that each output may be individually selected. As described earlier, when analog audio is selected, only *two channels* are available, while selection of AES/EBU digital audio provides two *stereo pairs*, one on each XLR connector. Both jumpers for each channel (Left & Right, or Main & Aux) must be set together, either analog or digital. The MAXX 2400 must be power cycled for jumper changes to take effect.

1. **Power off the unit. REMOVE BOTH POWER CORDS**

2. Remove the Chassis top by depressing the two blue release button, then sliding back and up.

3. The Audio board is the left most PCI card viewed from the front of the unit. Remove the PCI hold down screw. Remove Four connectors on one side of PCB per Figure 49

4. Remove the genlock cable (Figure 50) on the opposite side of the PCB by pulling gently away from the PCB.

5. Rock the board up and out of the PCI slot.

6. Configure the jumpers according to Figure 51.

7. Replace the board, connectors and the lid.

2. Remove Two Ribbon Connectors by pulling towards this box

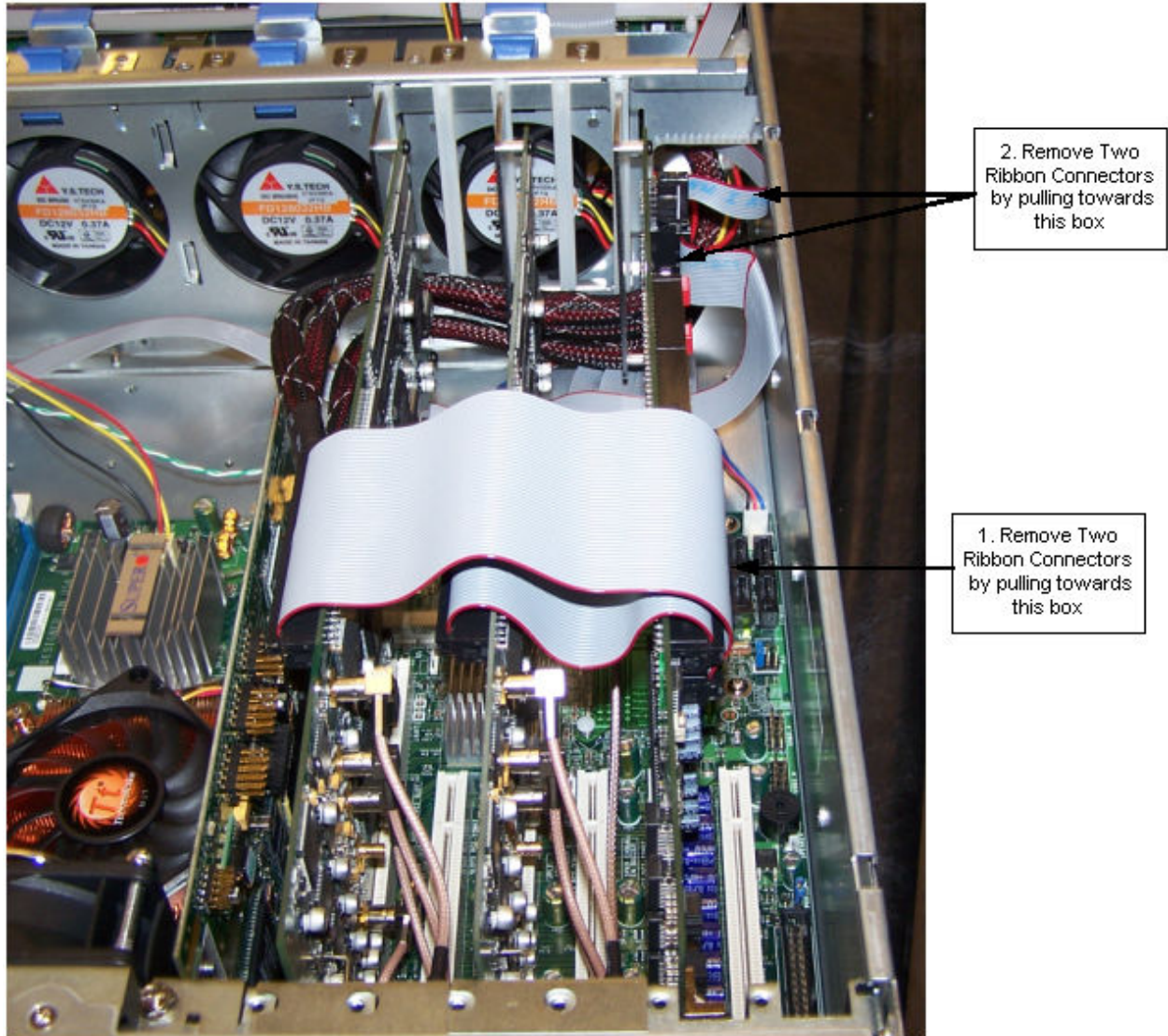1. Remove Two Ribbon Connectors by pulling towards this box

Figure 49 - Audio PCB Detail
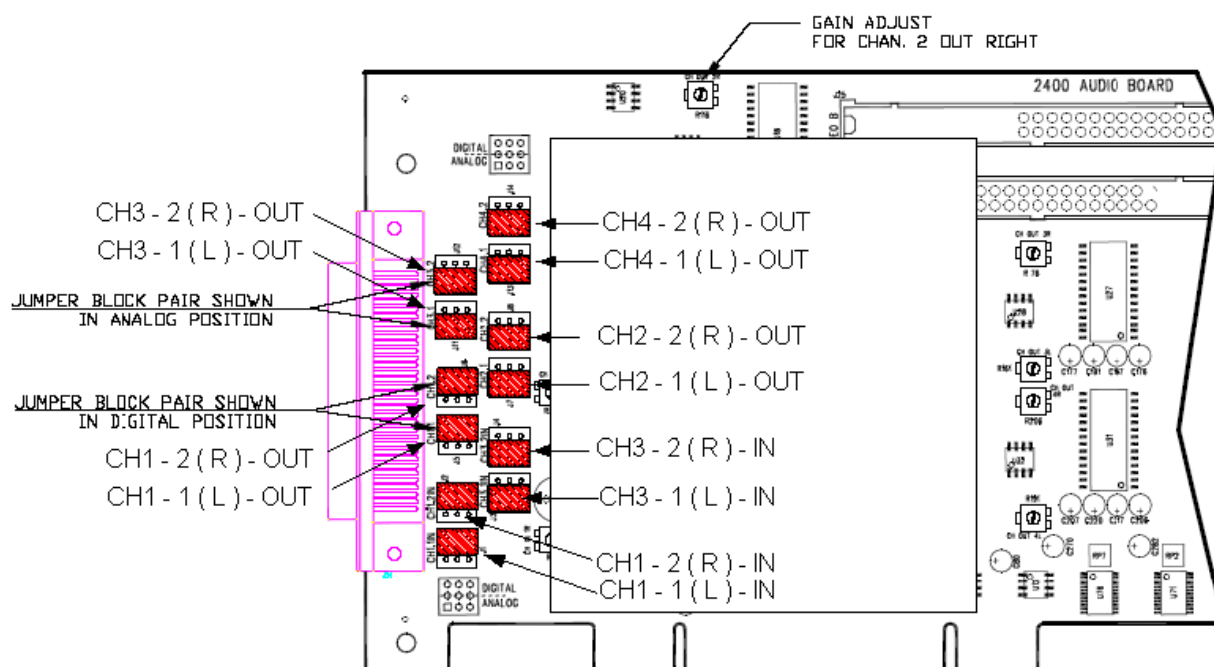

Figure 50 - Audio PCB Genlock Cable Detail

Figure 51: Jumper location on audio card for selection of analog or digital audio.

APPENDIX B – PROFILES AND GOP STRUCTURES

MPEG-2 Profiles

MPEG-2 accommodates certain sub-set functionality by defining a set of profiles and levels. MAXX 2400 supports two of these.

Profile/Level	Width	Height	Color	Max. Bit Rate
Main Profile@Main Level	720	576	4:2:0	15Mbps
4:2:2 Profile@Main Level	720	576	4:2:2	50mbps

Table 3 - Supported MPEG-2 Profiles

GOP Structure

GOP structure defines the MPEG Group of Pictures coding as combinations of I, P, and B frames. The allowable combinations are presented in a drop-down list. I-Frame only encoding will produce the least compressed picture and requires more hard disk space. However, I-frames facilitate frame-accurate editing. For broadcast-quality resolution, I-frame encoding should be considered at 25 Mb/sec and above. Low bit rates should never be used with I-frame encoding.

Long-GOP video recorded with P and B frames produces superior image quality for a given data rate, compared to I-frame. Most broadcasters go to air with 8, 10 or 12 Mb/sec content, having long GOP length.

ImageServers produce and require Closed GOP architecture. Open GOP is not supported.

Encode Mode

MAXX 2400s employ Variable Bit Rate (VBR) MPEG-2 encoding. For almost all broadcast applications, VBR encoding produces superior results than its alternative, Constant Bit Rate.

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APPENDIX C – INPUT CHANNEL FACTORY SETTINGS

The factory default settings for Input Channel Configuration are presented for reference. Most of these video encoding options will be suitable for general broadcast operations, but may not be optimum for contribution content, or use at low bit rates.

Input source	CVBS	MPEG-2 Profile	4:2:2
Track Arm		**GOP Structure**	I-FRAME
Video	ON		
Audio 1-2	ON	**BIT RATE**	12 Mb/s
Audio 3-4	OFF		
CC	OFF		
Audio Sample Rate Conversion			
Tracks 1-2	OFF		
Tracks 3-4	OFF		
Timecode Source	MANUAL		
Start:Time	00:00:00:00		

Figure 18: Input Channel Factory Default Settings

APPENDIX D – USING THE CVBS INPUT FRAME BUFFER

When a genlocked source is not available, as in the case of satellite receivers or consumer tape machines, Image Server MAXX 2400's internal input frame synchronizer will re-synchronize the source. The frame synchronizer works by buffering incoming frames, and re-aligning them with the genlock signal applied to the MAXX 2400. The output frame rate of the server is synchronized to genlock. Note that if the input frame rate is different than genlock, then greater or fewer frames will be present in the recorded file. The difference will not be noticeable in most circumstances, since crystal time references are produced with accuracies in the range of 25 to 100 ppm, resulting in a frame error after some hours of play time.

There are no operating controls for the frame synchronizer. It is disabled when the input is referenced to genlock.

When using AES/EBU audio input from non-genlocked sources, turn on the Audio Rate Conversion. (See Page 71.)

NOTE: The frame buffer does not process SDI inputs. Unreferenced SDI inputs require an external frame synchronizer.

---

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APPENDIX E – AS-RUN LOGGING DETAIL

To enable As-Run logs, open a Playlist window, select Options, then click on As-Run Logs. When enabled, a check mark will appear next to the As-Run log label, and files played by a playlist will be written to an As-Run log. Clips played in a transport window do not get written to an As-Run log.

As-Run logs are available only through FTP downloads; they cannot be viewed or printed from the MAXX 2400. After logging into a MAXX 2400, select the ASRUN folder. All logs are stored in this location, and have the extension ".arl".

As-Run Naming Convention

The Naming convention for as-Run logs is as follows: **mm**dd.**c**_xxxx.**n**.arl

mm	month (01 through 12)
dd	Day (01 through 31)
c	Channel (1 through 3)
xxxx	Name of Playlist
n	Instance Count
arl	file extension

Sample As-Run Log

IS-76152 as-run (Ch2:KQRS) Engr Wed Feb 02, 2005 [Wednesday PM]   Pg 1

```
 1 10:54:40  00:00:05:00  KRBE ID - Legal                PLAYED OK
 2 10:54:45  00:00:30:00  Cellular One – Talk Time        PLAYED OK
 3 10:55:15  00:00:30:00  Burger Stop – 2 for 1           PLAYED OK
 4 10:55:45  00:00:15:00  Promo – Friends - Today         PLAYED OK
 5 10:56:00  00:00:30:00  Bank of America – Gold Years   PLAYED OK
 6 10:56:30  00:07:18:05  RICKI WEDNESDAY – SEG 1        PLAYED OK
```

Periodically, old logs should be deleted using the Delete command on your FTP client software.

As-Run Log Page Header

This section describes the format of the first line (page header):

IS-76152 as-run (Ch2:KQRS) Engr Wed Feb 02, 2005 [Wednesday PM]   Pg 1

IS-76152: IS-XXXXX, where XXXXX is the unique machine ID as shown in Help > About > Unit ID.

as-run (Ch2:KQRS): ChX is the channel number and KQRS is the name of the specific channel, as defined in the Configuration System window.

Engr: The name of the MAXX 2400, as defined in the Configuration System window.

Wed Mar 30, 2005: The base date to which clip times are referenced.

[Wednesday PM]: The name of the playlist

Pg 1: The page number of the printout.

As-Run Log Body

This section describes the format of the body of an As-Run log:

2 10:54:45   00:00:30:00   Cellular One – Talk Time   PLAYED OK

2: The line number (order) of the clip as it appears in the playlist. The same clip could have multiple numbers as files are added or deleted.

10:54:45 The time at which the clip was played in HH:MM:SS, on a 24-hour clock.

00:00:30:00 The length of the clip in HH:MM:SS.FF, on a 24-hour clock.

Cellular One – Talk Time: The name of the clip.

PLAYED OK: The status of the played clip.

Other possible status conditions are:

CLIPPED - Less than the full length played.

SKIPPED – The clip was skipped over because it was deselected (unchecked) or playback was order was modified by CUE or JUMP

STOPPED – The clip was stopped during playout.

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APPENDIX F – GPIO INTERFACING

GPIO Connectors

General purpose control inputs (GPI) may be applied to the GPIO port, which is a DB-25-F connector. These inputs are optically isolated from the MAXX 2400 circuitry; individual floating returns are provided. +5 volts may be sourced from pins 21 or 22, or provided from an external source. Current limiting devices are provided within the MAXX 2400.

General purpose outputs also appear on the GPIO connector. Open-collector outputs are provided as status outputs, and may be used to drive an external LED or control input.

Refer to the connector pin-out table and partial schematic, following.

GPIO Connector Pinout

Numbers in parentheses indicate numbering of signals on GPIO Connector 2

Pin	Signal	Pin	Signal
1	GPI 1 (7)	14	GPI 1 (7) RTN
2	GPI 2 (8)	15	GPI 2 (8) RTN
3	GPI 3 (9)	16	GPI 3 (9) RTN
4	GPI 4 (10)	17	GPI 4 (10) RTN
5	GPI 5 (11)	18	GPI 5 (11) RTN
6	GPI 6 (12)	19	GPI 6 (12) RTN
7	N/C	20	N/C
8, 9, 10	GND	21, 22	+5V SOURCE (200MA MAX)
11	GPO 2 (8)	23	GPO 1 (7)
12	GPO 4 (10)	24	GPO 3 (9)
13	GPO 6 (12)	25	GPO 5 (11)

Warning: Incorrect wiring of GPI connector may damage GPI interface circuitry.
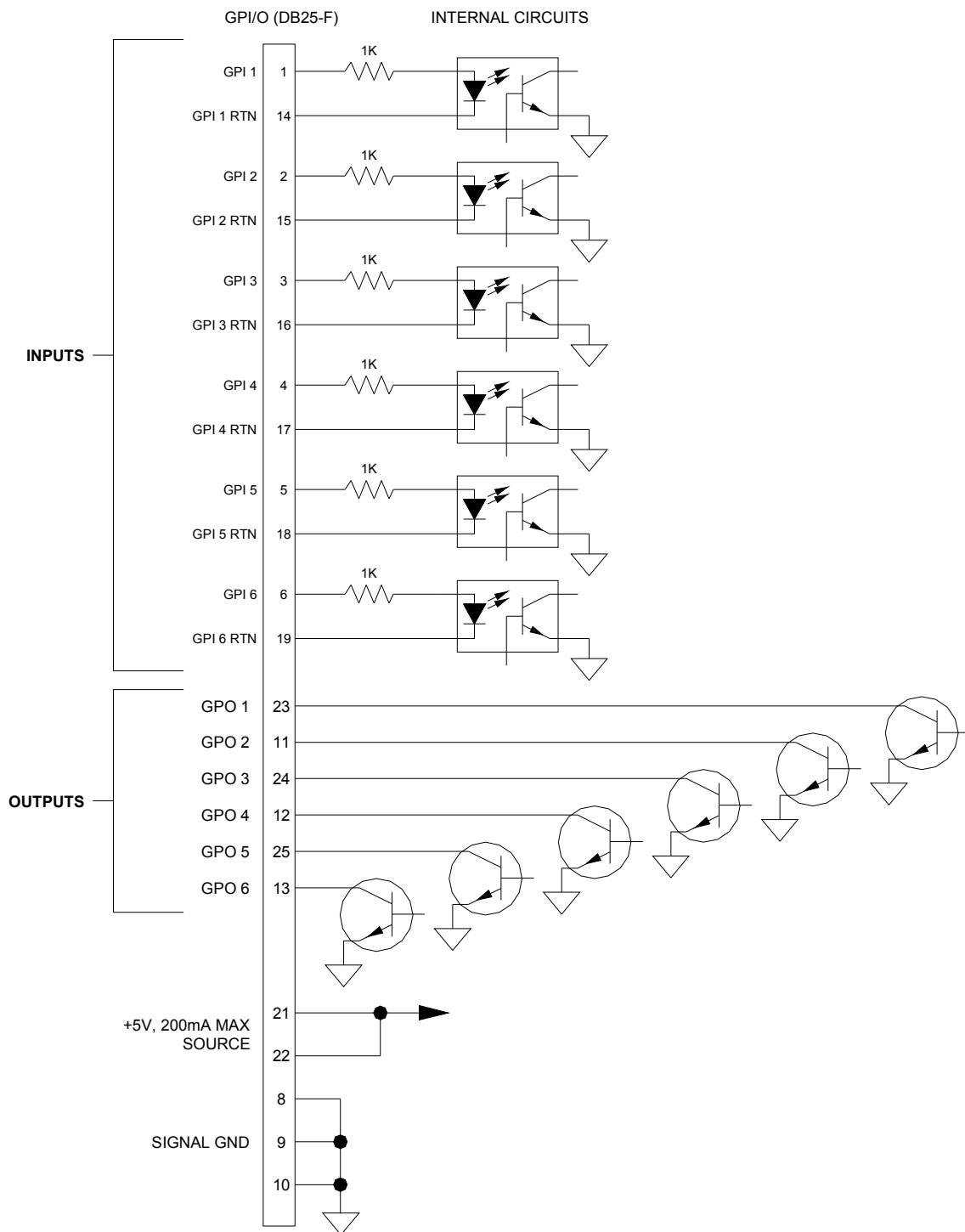
Figure 52 - GPIO Connection Schematic

This applies to connector 1, outputs 1-6. Outputs 7-12 can be wired similarly.

APPENDIX G – PLAYLIST MANAGEMENT DETAIL

Playlists can be accessed via the ImageServer's FTP feature, allowing several capabilities:

- Lists can be backed up on a PC, and sent to another ImageServer.

- Lists can be viewed and printed from the PC

- Lists can be edited or created on the PC and uploaded to the ImageServer.

Playlists are found on the ImageServer FTP directory in the lists folder. They are simple text files with the extension .lst. Below is an example of a playlist as it appears in the GUI and its corresponding .lst file:
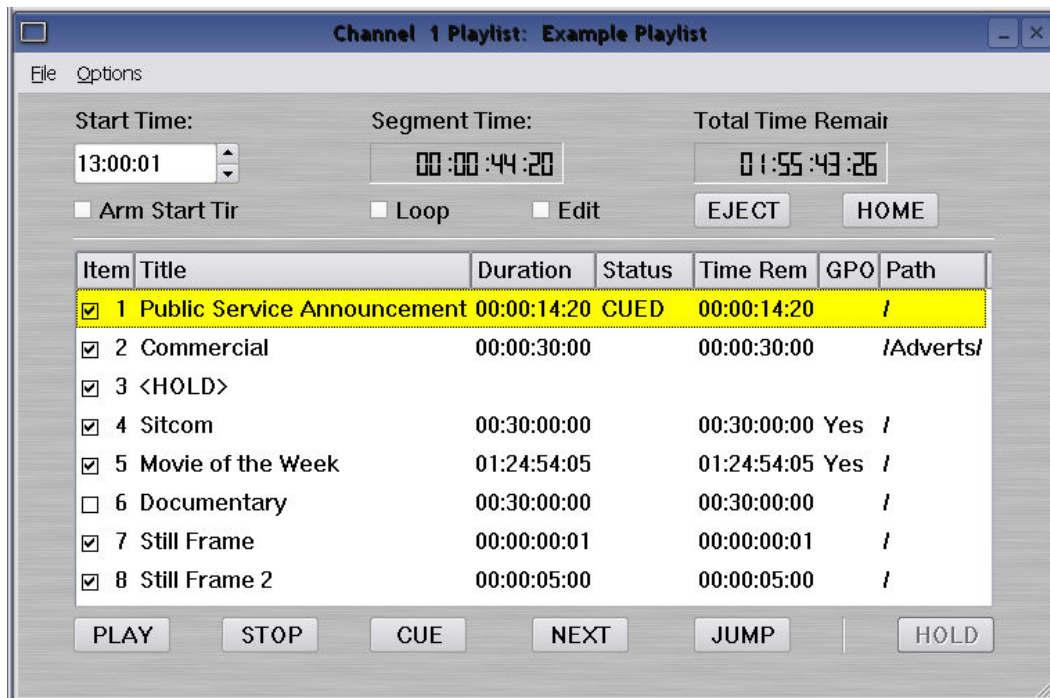

```
#360PLAYLIST 2.0
#StartTime 13000100
#Loop 0

"/Public Service Announcement"
"/Adverts/Commercial"
"<HOLD>", HOLD
"/Sitcom",#1@0;10
"/Movie of the Week",#2@15;1000,#6@1245000;400
"/Documentary", SKIP
"/Still Frame"
"/Still Frame 2", frames=150
```

Each line of the example appears with its explanation below:

```
#360PLAYLIST 2.0
```
Header line, this must always be present exactly as shown.

```
#StartTime 13000100
```
This is the Start Time in military format, hours, minutes, seconds and frames, without leading zeros. This value shows 13:00:01 or 1 minute past 1 pm. The default is 0 which is 12 midnight. While frames are present in this value, the last two digits should always be "00" when entering any value except 0.

```
#Loop 0
```
This is the default, a looping list would show "`#Loop 1`".

```
"/Public Service Announcement"
```

This is the first clip in the list, named Public Service Announcement. It is enclosed in quotes, and preceded by a forward slash (/) which denotes that the clip is found in the root directory (i.e. it is not in a subfolder).

```
"/Adverts/Commercial"
```

This is the second clip, named Commercial. It is in the Adverts subfolder. Further levels of subfolder nesting would be shown as "`/Folder/Subfolder/ClipName`".

```
"<HOLD>", HOLD
```

This is a Hold event. The list will stop until it is restarted by command.

```
"/Sitcom",#1@0;10
```

This clip has a GPI Output event associated with it, in this case Output #1, at an offset of 1 frame, for a duration of 10 frames. Similar to Start Time values, GPI Output Offsets and Durations are represented as hours, minutes, seconds and frames without leading zeros. The format is:

,#GPIOutputNumber@Offset;Duration

```
"/Movie of the Week",#2@15;1000,#6@1245015;400
```

This clip has two GPI Output events, Output #2 @ 15 frames offset ; 10 seconds duration, and #6@1 hour 24 minutes 50 seconds 15 frames offset; 4 seconds duration.

```
"/Documentary", SKIP
```

This clip is skipped, this is programmed in the GUI by unchecking the check box for the event.

```
"/Still Frame"
```

Still frames appear the same as standard motion clips; the name of this clip is Still Frame.

```
"/Still Frame 2", frames=150
```

This still frame has a duration programmed. Unlike other time values, durations are frame counts. In NTSC this is a 5 second duration. While it is possible to add a duration to a motion clip, this is not recommended. It is only allowed to specify fewer frames than the edited length of the clip (Mark In to Mark Out). You cannot make the clip "loop" by specifying a longer duration.

When opening Playlist files in a text editor, you may have to change the file type to "All Files" to be able to see files with the .lst extension.

Some text editors, such as Notepad, do not display each line separately. Word and Wordpad work correctly. This is because the files have only Line Feeds (LF) at the ends of lines. The ImageServer will accept modified or externally created files with only LF or with both LF and Carriage Return (CR) at line endings. You cannot use only CR without LF.

You can edit the list by:

- Changing the names of the clips.

    Clip names are case sensitive. Any clip name that does not match an existing clip will be reported as MISSING when the list is loaded on the ImageServer. This also applies to the names of any subfolders.

- Adding or deleting events manually.

    Any of the available event types can be created.

- Modifying or adding to existing events.

    You can add ", SKIP" ", frames=xx" or GPI Outputs.

- Cut and Paste the contents of one list into another, or duplicate sections of a list.

Save the file as a raw text file, and replace the .txt extension with .lst. File names should be limited to 31 characters.

When transferring .lst files via FTP, always specify Binary mode. Do not use ASCII or Auto.

APPENDIX H - 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 procedures may be used to calibrate these for unity gain. The audio board must be partially removed from the chassis to perform this procedure.

1. **Power off the unit. REMOVE BOTH POWER CORDS**

2. Remove the Chassis top by pressing the two blue release buttons, then sliding back and up.

3. The Audio board is the left most PCI card viewed from the front of the unit. Remove the PCI hold down screw and rock the board up, being careful not to overextend the cables attached to it.

4. Configure the jumpers according to the ANALOG setting. See Figure 53

Refer to Figure 53 for the location of trim pots and jumper blocks referred to in the calibration procedures. Table 4 Indicates mapping to audio channels.
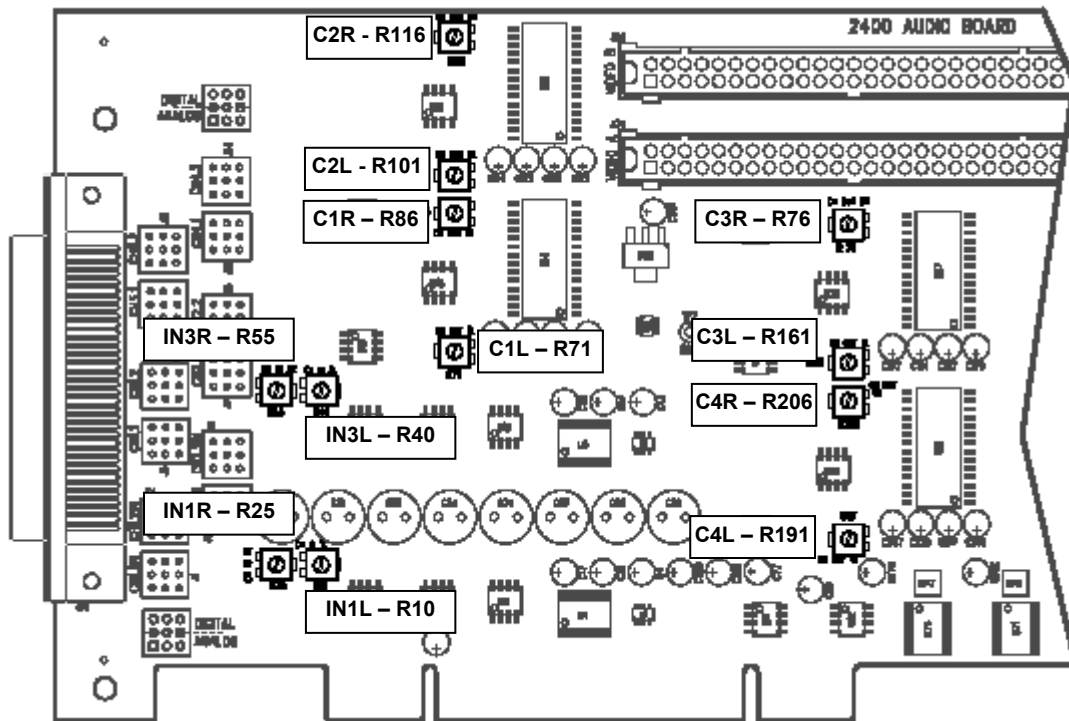
Figure 53 - Audio Board Trimpot Location

Channel	Input Channel 1		Input Channel 3		Output Channel 1		Output Channel 2		Output Channel 3		Output Channel 4	
Connector	L	R	L	R	L	R	L	R	L	R	L	R
Trimmer	R10	R25	R40	R55	R71	R86	R101	R116	R161	R76	R191	R206
Jumpers	J1 and J2		J3 and J4		J5 and J6		J7 and J8		J11 and J12		J13 and J14	

Table 4 - Jumper and Trimpot mapping

Calibration Procedure

1. Position the jumper block J5 and J6 for Channel 1 output to obtain an analog output.

2. Play the test clip titled zTONE present on the Image Server disk. This stereo clip is recorded at a level equivalent to a +4 dBu output level.

3. While observing the output level of audio Channel 1 Left on a calibrated meter, adjust trimmer R71 until a level of exactly +4.00 dBu is obtained.

4. Repeat this procedure for audio Channel 1 Right, while adjusting trimmer R86, and also for each subsequent audio channel using its associated trim pot.

Having established accurate gain settings for all analog audio outputs in steps 1 through 3 above, calibrate the Image Server's input gain as follows:

5. Using the graphic user interface, place server Channel 1 in the E-E mode, so that an input signal will appear at its output.

6. While observing the output level of audio Channel 1-L, apply a 1 kHz sine wave from the audio generator to audio Input 1-L.*

7. Adjust input trimmer R10 until a level of exactly +4.00 dBu is obtained at the output of Channel 1L.

8. Repeat this procedure for audio Input 1-R, making the gain adjustment with input trimmer R25.

The preceding steps establish a gain of unity through the server.

* In the absence of a generator, use the calibrated outputs of Channel 2 playing zTONE to feed the inputs.

Alternate Calibration Procedure

If the calibration test clip titled zTONE is not found on the Image Server's disk, it is still possible to accurately calibrate the audio channels.

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

9. Using the On-Screen graphic user interface, place server Channel 1 in the E-E mode, so that an input signal will appear at its output.

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

11. 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.)

12. 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:

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

14. Using the graphic user interface, verify that server Channel 1 is in E-E mode, so that an input signal will appear at its output.

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

16. While observing the output level of audio Channel 1-L, adjust output gain trim pot R10 until a level of +4 dBu is obtained.

17. While observing the output level of audio Channel 1-R, adjust output gain trim pot RV25 until a level of +4 dBu is obtained.

18. Make a 1-minute clip of the 1 kHz sine wave at a level of +4.00 dBu. Save this clip for future use in calibrating the server.

19. Play this clip from Channel 2 and repeat steps 9 and 10 to adjust the gain of the left and right outputs.

20. Play the clip created in step 11 from Channel 3 and repeat steps 9 and 10 to adjust the gain of the left and right outputs.

The server's output gains are now calibrated, and the entire sequence of the preceding steps have established a gain of unity through the server.

Another method is to use digital input with a digital sine wave of −20dBFS to calibrate analog outputs 1 & 2, then switch the input to analog and calibrate the input through output 1 in E-to-E mode.

APPENDIX I - PROGRAM UPDATES VIA CD-ROM

Program updates are issued by 360 Systems from time to time. The Image Server's operating system and application programs can be updated by the user from new CD-ROMs, using the internal CD-ROM drive. The current software version may be determined by looking in the GUI **About** box, or by pressing the F1 key.

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

1. Deploy the MAXX 2400 front panel (Page 16). The internal CD-ROM drive is located on the left side.

2. With power applied, 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.

3. Press the front panel power switch briefly to shutdown the Image Server.

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

5. The Installer menu provides a choice to Update the Image Server operating system, begin a new complete install, or cancel the install.

   - Choose UPDATE if you want to keep the video and audio clip files that exist on the Image Server. Use this selection for all normal software updates.

   - Choose NEW only if you want to partition and reformat the drive array, and install the new operating system.

IMPORTANT! Using the NEW option will destroy all video and audio files on the Image Server. For normal software upgrades, use the UPDATE option instead of NEW. The use of the NEW option is REQUIRED if the RAID Array is being created for the first time. This would usually occur the first time new disks are installed.

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6. The message, "Please wait while Image 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. It will also release the CD drawer. Remove the CD. Never leave it in the CD drive.

7. 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.

APPENDIX J - CONNECTOR SPECIFICATIONS

Audio XLR-3 Connector Pinout

Signals appearing on the XLR connectors are determined by the setting of the internal Analog/Digital Audio Selection jumpers.

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

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 applies to all video, LTC, and Genlock connectors:
- A BNC connector used as an output will have a 75-ohm source impedance.
- A BNC connector used as an input will have a fixed 75-ohm termination.

GPIO Connectors

General purpose control inputs (GPI) may be applied to the GPI ports, which are DB-25-F connectors. These inputs are optically isolated from the Image Server circuitry; individual floating returns are provided. +5 volts may be sourced from pins 21 or 22, or provided from an external source. Current limiting devices are provided within the ImageServer.

General purpose status outputs also appear on the GPIO connector. Open-collector outputs are provided as status outputs, and may be used to drive an external LED or control input.

See page 120 for more information on GPIO interfacing.

GPIO Connector Pinout

Numbers in parentheses indicate numbering of signals on GPIO Connector 2

Pin	Signal	Pin	Signal
1	GPI 1 (7)	14	GPI 1 (7) RTN
2	GPI 2 (8)	15	GPI 2 (8) RTN
3	GPI 3 (9)	16	GPI 3 (9) RTN
4	GPI 4 (10)	17	GPI 4 (10) RTN
5	GPI 5 (11)	18	GPI 5 (11) RTN
6	GPI 6 (12)	19	GPI 6 (12) RTN
7	N/C	20	N/C
8, 9, 10	GND	21, 22	+5V SOURCE (200MA MAX)
11	GPO 2 (8)	23	GPO 1 (7)
12	GPO 4 (10)	24	GPO 3 (9)
13	GPO 6 (12)	25	GPO 5 (11)

APPENDIX K - SERIAL COMMAND PROTOCOLS

VDCP Command Table

The Image Server responds to the following VDCP commands. Shaded areas indicate commands slated for future implementation.

	COMMAND FROM CONTROLLER				RETURN FROM CONTROLLED DISK

CMD-1	CMD-2	NAME	CMD-1	CMD-2	NAME
0X / 8X	15	Delete Protect ID		04	ACK
0X / 8X	16	Undelete Protect ID		04	ACK

CMD-1	CMD-2	NAME	CMD-1	CMD-2	NAME
1X	00	Stop		04	ACK
1X	01	Play		04	ACK
1X	02	Record		04	ACK
1X	04	Still		04	ACK
1X	05	Step		04	ACK
1X	06	Continue		04	ACK
1X	07	Jog		04	ACK
1X	08	Varispeed Play		04	ACK
1X	0A	EE Mode		04	ACK

CMD-1	CMD-2	NAME	CMD-1	CMD-2	NAME
2X / AX	1D	Rename ID		04	ACK
2X	1E	Preset Std. Time		04	ACK
2X / AX	1F	New Copy		04	ACK
2X	20	Sort Mode		04	ACK
2X	21	Close Port		04	ACK
2X	22	Select Port		04	ACK
2X / AX	23	Record Initialize		04	ACK
2X / AX	24	Play Cue		04	ACK
2X / AX	25	Cue with Data		04	ACK
2X / AX	26	Delete ID		04	ACK
2X / AX	2C	Record Init with Data		04	ACK
2X	30	Preset		04	ACK

CMD-1	CMD-2	NAME	CMD-1	CMD-2	NAME
3X	01	Open Port	3X	81	Grant/Denied
3X / BX	02	Next	3X	82	List of ID's
3X	05	Port Status Request	3X	85	State Status
3X	06	Position Request	3X	86	Position
3X / BX	07	Active ID Request	3X	87	Active ID
3X	08	Device Type Req.	3X	88	Device Type
3X	10	Syst. Status Request	3X	90	System Status
3X / BX	11	ID List	3X	91	List of ID's
3X / BX	14	ID Size Request	3X	94	ID Size
3X / BX	16	ID Request	3X	96	ID Presence
3X	17	Compression Settings Request	3X	97	Compression Settings
3X / BX	18	ID's Added List	3X	98	List ID's Added
3X / BX	19	ID's Deleted List	3X	99	List ID's Deleted

AX and BX versions are long-filename variants.

Macro commands (5X/DX in CMD-1) are not implemented.

P2 Serial Command Table

The Image Server command set includes most commands used in BVW tape machines. Commands not implemented include those for DMC operations, audio split and in/out points, and those specifically related to tape as a medium.

The server will return Device Type response 20.25 for BVW-75 (NTSC); 21.25 for BVW-75 (PAL).

COMMAND	DESCRIPTION	RETURN	COMMENT
00.11	DEVICE TYPE REQUEST	ACK	
00.1D	LOCAL ENABLE	ACK	
00.0C	LOCAL DISABLE	ACK	
20.00	STOP	ACK	
20.01	PLAY	ACK	
20.02	RECORD	ACK	
20.10	FAST FORWARD	ACK	
2X.11	JOG FORWARD	ACK	
2X.12	VAR FORWARD	ACK	
2X.13	SHUTTLE FORWARD	ACK	
20.20	REWIND	ACK	
2X.21	JOG REVERSE	ACK	
2X.22	VAR REVERSE	ACK	
2X.23	SHUTTLE REVERSE	ACK	
20.30	PRE-ROLL	ACK	
20.0F	EJECT	ACK	
20.05	STANDBY ON	ACK	
20.60	FULL E-E OFF	ACK	
20.61	FULL E-E ON	ACK	
24.31	CUE UP WITH DATA	ACK	
40.08	TIMER 1 RESET	ACK	
40.10	IN ENTRY	ACK	
40.11	OUT ENTRY	ACK	
40.18	IN SHIFT +	ACK	
40.19	IN SHIFT -	ACK	
40.1A	OUT SHIFT +	ACK	
40.1B	OUT SHIFT -	ACK	
40.2D	LOST LOCK RESET	ACK	
41.36	TIMER MODE SELECT	ACK	
41.37	INPUT CHECK	ACK	
44.00	TIMER 1 PRESET	ACK	
44.04	TIME CODE PRESET	ACK	
44.31	PRE-ROLL TIME PRESET	ACK	
41.33	SERVO REFERENCE SELECT	ACK	
N/A	TIMER MODE STATUS	ACK	
7X.20	STATUS DATA	7X.20	
N/A	COMMAND SPEED SENSE	71.2E	
40.48	REF VIDEO SELECT ON	ACK	
40.49	REF VIDEO SELECT OFF	ACK	
6X.0E	CURRENT TIME SENSE	ACK	

ACK = 10.01   NAK = 11.12.xx

Odetics® Protocol

Odetics serial protocol is an extension of Sony P2 tape machine control protocol. Among its most significant features is the selection of a file by name rather than by time-code location, as with P2. Odetics protocol is used by many table-top controllers, and some automation systems. Its implementation in the Image Server appears in the following table.

Note that the Odetics protocol only supports clips names up to 8 characters. Longer clip names are automatically filered out from responses by the server.

ACK = 0X1001

COMMAND	DESCRIPTION	RETURN	COMMENT
0X1001			
0x000C	LOCAL DISABLE	ACK	
0x0011	DEVICE TYPE	0X1211	BVW-75
0x001D	LOCAL ENABLE	ACK	
0x2000	STOP	ACK	
0x2001	PLAY	ACK	
0x2002	RECORD	ACK	
0x2004	STAND BY OFF	ACK	
0x2005	STAND BY ON	ACK	
0x200D	DMC START	ACK	COMMAND HAS NO EFFECT
0x200F	EJECT	ACK	
0x2010	FAST FORWARD	ACK	
0x2X11	JOG FORWARD	ACK	
0x2X12	VAR FORWARD	ACK	
0x2X13	SHUTTLE FORWARD	ACK	
0x2020	REWIND	ACK	
0x2X21	JOG REVERSE	ACK	
0x2X22	VAR REVERSE	ACK	
0x2X23	SHUTTLE REVERSE	ACK	
0x2030	PREROLL	ACK	
0x2X31	CUE UP	ACK	
0x2X38	PROG SPEED PLAY PLUS	ACK	
0x2X39	PROG SPEED PLAY MINUS	ACK	
0x2052	TENSION RELEASE	ACK	COMMAND HAS NO EFFECT
0x2054	ANTI CLOG TIMER DISABLE	ACK	COMMAND HAS NO EFFECT
0x2055	ANTI CLOG TIMER ENABLE	ACK	COMMAND HAS NO EFFECT
0x2X5C	DMC SET FORWARD	ACK	COMMAND HAS NO EFFECT
0x2X5D	DMC SET REVERSE	ACK	COMMAND HAS NO EFFECT
0x2060	FULL EE OFF	ACK	
0x2061	FULL EE ON	ACK	
0x4X00	TIMER1 PRESET	ACK	
0x4X04	TIME CODE PRESET	ACK	
0x4008	TIMER1 RESET	ACK	
0x4010	IN ENTRY	ACK	
0x4011	OUT ENTRY	ACK	
0x4X14	IN PRESET	ACK	

COMMAND	DESCRIPTION	RETURN	COMMENT
0x4X15	OUT PRESET	ACK	
0x4018	IN SHIFT PLUS	ACK	
0x4019	IN SHIFT MINUS	ACK	
0x401A	OUT SHIFT PLUS	ACK	
0x401B	OUT SHIFT MINUS	ACK	
0x4020	IN RESET	ACK	
0x4021	OUT RESET	ACK	
0x402D	LOST LOCK RESET	ACK	
0x4X30	EDIT PRESET	ACK	COMMAND HAS NO EFFECT
0x4X31	PRE-ROLL TIME PRESET	ACK	
0x4X32	TAPE AUTO SELECT	ACK	
0x4X33	SERVO REFERENCE SELECT	ACK	
0x4X34	HEAD SELECT	ACK	COMMAND HAS NO EFFECT
0x4X35	COLOR FRAME SELECT	ACK	COMMAND HAS NO EFFECT
0x4X36	TIMER MODE SELECT	ACK	
0x4X37	INPUT CHECK	ACK	
0x4040	AUTO MODE OFF	ACK	
0x4041	AUTO MODE ON	ACK	
0x4046	VARIABLE MEMORY OFF	ACK	
0x4047	VARIABLE MEMORY ON	ACK	
0x4048	VIDEO REFERENCE DISABLE OFF	ACK	COMMAND HAS NO EFFECT
0x4049	VIDEO REFERENCE DISABLE ON	ACK	COMMAND HAS NO EFFECT
0x4X70	VIDEO INPUT SELECT	ACK	
0x4X91	OUTPUT VIDEO LEVEL	ACK	COMMAND HAS NO EFFECT
0x4X92	OUTPUT SETUP BLACK LEVEL	ACK	COMMAND HAS NO EFFECT
0x4X93	OUTPUT CHROMA LEVEL	ACK	COMMAND HAS NO EFFECT
0x4X98	OUTPUT H PHASE	ACK	COMMAND HAS NO EFFECT
0x4X99	OUTPUT SC PHASE	ACK	COMMAND HAS NO EFFECT
0x4X9A	OUTPUT VIDEO HUE	ACK	COMMAND HAS NO EFFECT
0x6X0A	TC GEN DATA SENSE		
	GEN TIME DATA	0X7408	
	GEN UB DATA	0X7409	
	GEN U BAND TC DATA	0X7809	
0x600C	CURRENT TIME SENSE		
	CORRECTED LTC TIME DATA	0X7414	
	VITC TIME DATA	0X7406	
	TIMER1 DATA	0X7400	
	HOLD USER BITS LTC DATA	0X7415	
	HOLD USER BITS VITC DATA	0X7416	
0x6010	IN DATA	0X7410	
0x6011	OUT DATA	0X7411	
0x6012	A IN DATA	NAK	
0x6013	A OUT DATA	NAK	
0x6020	STATUS DATA	0X7420	
0x6X23	SIGNAL CONTROL DATA	0X7423	

COMMAND	DESCRIPTION	RETURN	COMMENT
0x602E	COMMAND SPEED DATA	0X712E	
0x602F	VAR MEM SPEED DATA	0X712F	
0x6X30	EDIT PRESET DATA	NAK	
0x6031	PREROLL TIME DATA	0X7431	
0x6036	Timer Mode Status	0X7136	
0xA001	AUTO SKIP	ACK	ODETICS COMMAND
0xAX02	CUE UP TO RECORD	ACK	ODETICS COMMAND
0xAX04	PREVIEW IN PRESET	ACK	ODETICS COMMAND
0xAX05	PREVIEW OUT PRESET	ACK	ODETICS COMMAND
0xA006	PREVIEW IN RESET	ACK	ODETICS COMMAND
0xA007	PREVIEW OUT RESET	ACK	ODETICS COMMAND
0xAX10	ERASE ID	ACK	ODETICS COMMAND
0xA014	LIST FIRST ID	0X8814	ODETICS COMMAND
0xA015	LIST NEXT ID	0X8814	ODETICS COMMAND
0xAX18	ID STATUS REQUEST	0X8818	ODETICS COMMAND
0xA01C	MAXIMUM STORAGE LENGTH	0X891C	ODETICS COMMAND
0xAX20	SET DEVICE ID	ACK	ODETICS COMMAND
0xA021	DEVICE ID REQUEST	0X8821	ODETICS COMMAND
0xCX01	JUMP FORWARD X FRAMES	ACK	ODETICS COMMAND
0xCX02	JUMP BACK X FRAMES	ACK	ODETICS COMMAND
0xCX03	GET LOADED ID	ACK	ODETICS COMMAND

APPENDIX L - TECHNICAL SPECIFICATIONS

Video	
Input/Output Channels (baseband)	Two – each independent Record or Play
	Input Composite or SDI selectable, Output Composite and SDI
Output Channels	Two – Composite and SDI
Analog video I/O	Composite, 75Ω, BNC
Digital video I/O	SDI, SMPTE 259M, 75Ω BNC
Video standards	525/60 NTSC; 625/50 PAL (Model dependent)
MPEG recording formats	MPEG-2: 4:2:2 Profile @ Main Level to 50 Mb/s
	MPEG-2: Main Profile @ Main Level to 15 Mb/s (4:2:0 or 4:1:1)
DV playback format	Playback of 25 Mb/sec DV files imported via Ethernet.
Graphics playback format	Playback of TARGA files with key & fill imported via Gigabit Ethernet.
Word Size	10 bits dithered to 8
Frame format	I-frame, 6-GOP, 14 GOP
Minimum pre-roll	10 frames
Video sync reference (Genlock)	External black burst or internal crystal
Audio	
Digital Inputs/Outputs	2 stereo pairs (4 channels) per video input or output
Digital audio format	AES/EBU, 110-ohm, XLR-3 connector (AES-3-2000)
Dynamic range (digital)	144 dB (24-bit word size)
Audio format	48k sample rate, 24-bit word size, Linear PCM
Embedded audio	20-bit, 4-channel.
Bit-for-Bit® data handling	Transparent to Dolby®-E, Dolby AC-3
Analog Inputs/Outputs	2 mono channels per video input or output
Analog audio format	Balanced, +4 dBu, XLR-3 connector
Frequency response	10 Hz – 20 kHz ±0.1 dB
Harmonic distortion	<0.002% THD+N at full scale –1 dB
Dynamic range	112 dB (24-bit word size)
Headroom	20 dB above nominal +4 dBu operating level
Audio sync reference	Derived from video reference
Time Code	
LTC In	External time code, > 10k Ω BNC connector
LTC Out	External time code, Z = 750Ω, BNC connector
VITC line number, NTSC	Field 1: Lines 14, 16; Field 2: Lines 277, 279
VITC line number, PAL	Field 1: Lines 19, 21; Field 2: Lines 332, 334

Closed Captions

Closed Captions	Records and plays CC data per EIA-608B

Control Inputs

Automation control, RS-422	VDCP; 4 ports, 9-pin female "D" connector
Other serial control, RS-422	P2, Odetics
GPI control inputs/outputs	6 optically isolated inputs, 6 open-collector outputs, 25-pin female "D" connector

Video Networking

File interchange formats	MXF (SMPTE 377M, 378M, 381M); OP-1a, OP-1b; MPEG-2 program streams & elementary streams; DV stream (.dv or .avi); TARGA graphics import.
Network port	Gigabit Ethernet
File transfer protocol	FTP

Disk Storage

Storage time (max)	Over 700 hours max at 12 Mb/s
Capacity	2400B, 4.7TB available for storage
Data redundancy	Hardware-generated RAID-6 utilizing 12 drives
Drive arrangement	Located within enclosure, accessible behind front panel
CD-ROM drive	Internal, replaceable from front panel. (For loading operating system and feature upgrades.)

Miscellaneous

Front panel indicators	5 LEDs indicate Power-on, Genlock, Fan alarm, Drive alarm, System alarm
Miscellaneous ports	Keyboard, mouse, SVGA display
Cooling/Operating Temperature	Forced air; Ambient operating temperature 10º to 35º C
Power	100 – 240 VAC, 50/60 Hz, 2.0 amp max. Shut down switch on front panel; hard AC mains switch on rear panel

Physical

Mechanical	5½" x 19" x 29.5" (139 x 483 x 749 mm) H-W-D
Mounting	Rack mount (3U)
Weight	73 lb. (12.7 Kg)
Agency approvals	FCC Class A, CE
Country of origin	U.S.A.

APPENDIX M – IMPORTING MPEG PROGRAM STREAM FILES

Encoding MPEG-2 Files Compatible with ImageServer

360 Systems recommends the use of the Main Concept MPEG Encoder. It is available as a stand alone product as well as integrated into codecs bundled with various video editing programs.

MPEG video encoding is a highly complex and variable system, designed to accommodate many different applications. **It is very important to note that not all MPEG program stream files are compatible with the decoder in the ImageServer.** Before deploying a system that depends on material from external encoders, it is critical to observe the following:

- Decide on a bit rate and GOP structure that will suit your needs. If necessary, perform tests with various types of program material that will be presented. Be sure to include graphics and scenes with representative detail, motion characteristics and audio.

- Once you have a standard format selected, perform tests with the material on the ImageServer running a representative broadcast day, with a wider selection of different clips. Use the same workflow to create and transfer the content as will be used in actual operation.

- In the event that you must accept material from different sources (especially if that means different editing platforms or video formats) be sure to run tests that demonstrate compatibility between them. Inspect the quality of transitions carefully.

Once you have determined your processes and workflow, it is important ensure that they remain unchanged. Seemingly minor changes can have serious negative effects on playback quality, or even **interrupt a broadcast**.

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360 Systems does not guarantee the performance of the ImageServer with all possible forms of externally encoded material. It is the responsibility of the user to qualify this material and actually test it to ensure that it is compatible.

General Requirements

FILE NAMES	31 characters or less followed by a ".mpg" extension. Upper/Lower case alpha, 0-9, #%&()-_
STREAM TYPE:	PROGRAM (VIDEO + AUDIO)
VIDEO RESOLUTION:	720x480 (NTSC) or 720x576 (PAL) 4:3 DISPLAY
FRAME RATE:	29.97 (NTSC) or 25 (PAL) (Pulldown is not supported.)
FIELD ORDER:	INTERLACED, TOP FIELD FIRST (See note below.)
BITRATE TYPE:	VARIABLE
BITRATE RANGE:	Recommended range 5 to 30 Mb/s. Minimum 2 Mb/s, maximum 50 Mb/s
GOP STRUCTURE:	Closed GOP (Open GOP architecture is not supported) Recommended values 1 (I frame) 6 (IBPBPB) or 15
PROFILE:	MAIN or 4:2:2
LEVEL:	MAIN
CHROMINANCE FORMAT:	4:2:2 or 4:2:0
SEQUENCE HEADERS:	REQUIRED – 1 per GOP
Recommended combinations of Bit Rate, GOP size and Profile (Chrominance format):	
	25 Mb/s, I frame only, 4:2:2 – high quality, for contribution content
	15 Mb/s, I frame only, Main (4:2:0) – good quality, frame accurate editing
	12 Mb/s, 6 frame GOP, Main (4:2:0) – good quality, efficient storage.
	8 Mb/s, 15 frame GOP, Main (4:2:0)– highest storage efficiency.
AUDIO MODE:	MPEG LAYER 2
AUDIO SAMPLE RATE:	48000 HZ STEREO NO DE-EMPHASIS
AUDIO BITRATE:	384 KBPS VARIABLE BITRATE or highest available value. Note that using lower bit rates will not save storage space as audio is uncompressed before storage. Low rates adversely affect audio quality.
MULTIPLEXING TYPE:	MPEG-2
	ALIGNED SEQUENCE HEADERS
	TIMESTAMPS IN ALL FRAMES
	SEQUENCE END CODES required.
	PROGRAM END CODE required.
PACK SIZE:	2048 BYTES
STARTUP DELAYS:	PACK=0, AUDIO=180, VIDEO=180. A/V offsets using these parameters are not supported.

ImageServer 2000 and 6T models do not support intermixing (playing back-to-back) material encoded bottom field first with that encoded top field first. Top field is the method used by the ImageServer, therefore if both imported and recorded material are to be used together, imported material must be encoded top field first. Bottom field first can *only* be used when all the material to be played on a particular channel is encoded that way, or in applications where clips are played one at a time.

APPENDIX N - KEYBOARD SHORTCUTS

Transport Control

L	Forward at 4x, 16x, 64x, 128x
K	Pause (Stop)
J	Reverse at 4x, 16x, 64x, 128x
Space Bar	Play/Pause (toggle)
R	Record
Home	Go To Head point
End	Go To Tail point
Shift + E	E/E Toggle
Shift + L	Loop Toggle
Shift + C	Local Toggle
Shift + J	Eject Clip
Right Arrow	Jog forward 1 frame
Left Arrow	Jog reverse 1 frame

File Operations

Ctrl + N	New
Ctrl + O	Open
Ctrl + S	Save
Ctrl + A	Save As
Ctrl + D	Delete
Ctrl + R	Rename

Menu Operations

Alt + F	Expands File Menu
Alt + T	Expands Transport Menu
Alt + C	Expands Configure Menu
Alt + P	Expands Playlist Menu
Alt + W	Expands Window Menu
Alt + H	Expands Help menu

Edit Operations

E	Enter/Exit Edit Mode
I	Capture Mark In
O	Capture Mark Out
Shift + R	Review Edit
Shift + T	Review Tail

Playlist

Home	Recue
Space	Play/Pause
K	Stop

Playlist Edit

Shift + C	Clear
Left Arrow	<< (Remove clip)
Right Arrow	>> (Add clip)

Navigating Between Channels

Ctrl + < number >	Switches to Transport Channel <number>
Alt + < number >	Switches to Playlist Channel <number>

Mark In/Mark Out Times (Edit Mode)

< number >	Inserts right justified number
DEL	Removes last digit
ESC	Aborts time code entry
. ; : (any)	Shifts time code left
TAB	Toggles between Mark In and Mark Out times

APPENDIX O - MECHANICAL DIMENSIONS
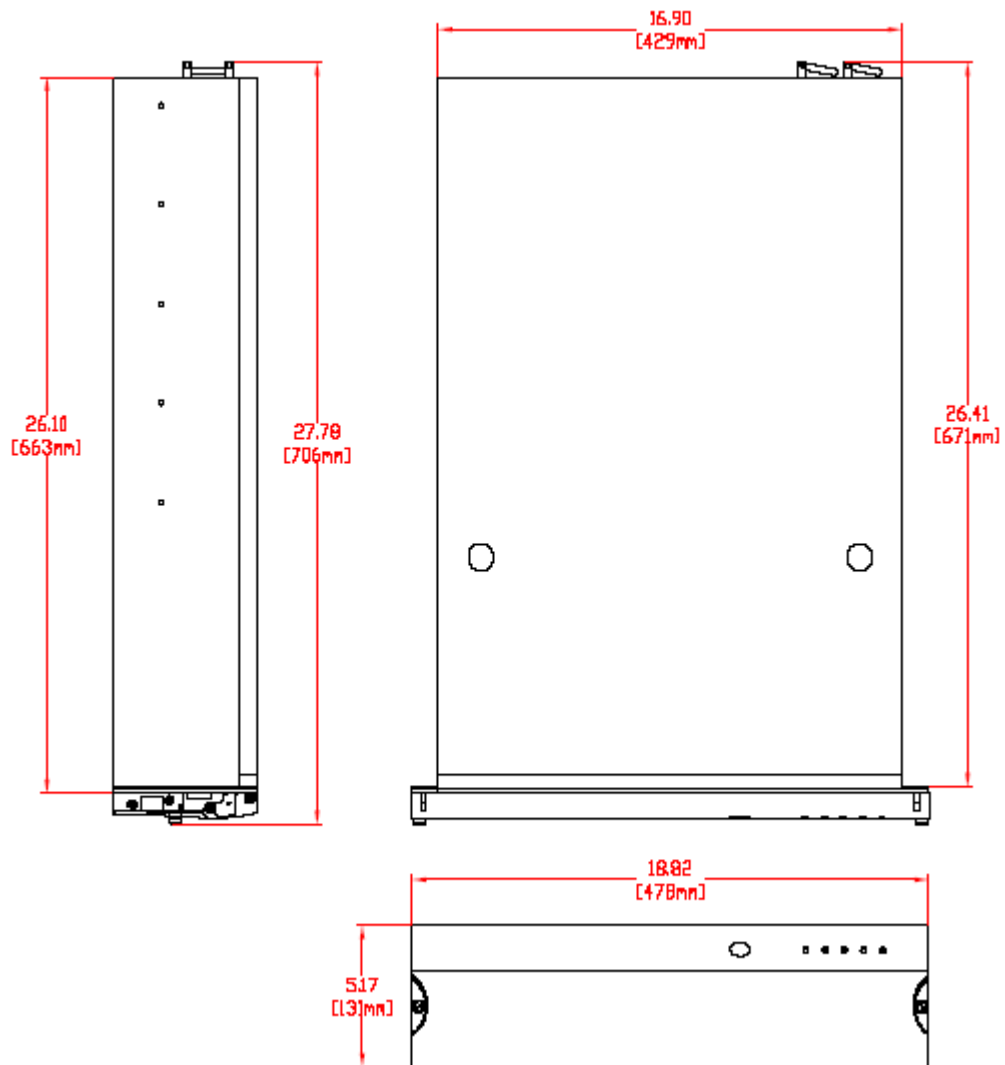
Figure 54 - Mechanical Dimensions

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