CMS-2200
Cinema Media Server

Installation and User Manual

USL Inc.

1.0 USL Cinema Media Server Manual

Introduction – CMS-2200

The USL Cinema Media Server (CMS-2200) represents the latest technology in cinema systems. The powerful CMS-2200 hardware combined with the screen management system software (SMS) and the theater management software (mini-TMS) are designed to provide a complete digital cinema solution. The CMS-2200's rich feature set includes JPEG and MPEG DCP decoding in addition to full HDMI 1.4 support including HDMI 3D.

Key Features:

- **Solid State Storage:** 3 x 1TB
- **Decoders:** JPEG (2K, 4K, HFR) and MPEG
- **Alternate Content:** HDMI 1.4b with 3D and HD-SDI
- **Ingest ports:** eSATA and USB 3.0
- **Automation:** Ethernet and CMSA-100
- **Multi-Projector:** LTC sync and 3DLS built in
- **Object Based Sound:** OBS capable with software updates

Note: This CMS-2200 installation and user manual is a work in progress and changing on a daily basis. USL is committed to continuous improvement on this document as the CMS-2200 software and features are solidified and introduced to the field. Early releases of this manual are being provided as guidance while the documentation work continues. Please check with USL for the formally released Installation and User manual that will be provided as soon as it's available.

Introduction - SMS software

The USL screen management system software provides a concise, intuitive software solution to managing multiple CMS-2200 systems from a single, highly integrated platform. In addition to the core tools required to manage content, build playlists and schedule shows, the SMS provides information rich overview screens to allow instant access to the overall cinema status.

Key Features:

- **Multi-Screen Management:** Mini-TMS functionality built-in
- **Media Transfer:** FTP support built-in
- **Mobile Enabled**: Windows/Android/Apple OS
- **User Interface:** Clear, concise, intuitive
- **Automaton:** Built-in support for projectors and USL products
- **Support Tools:** Web interface included

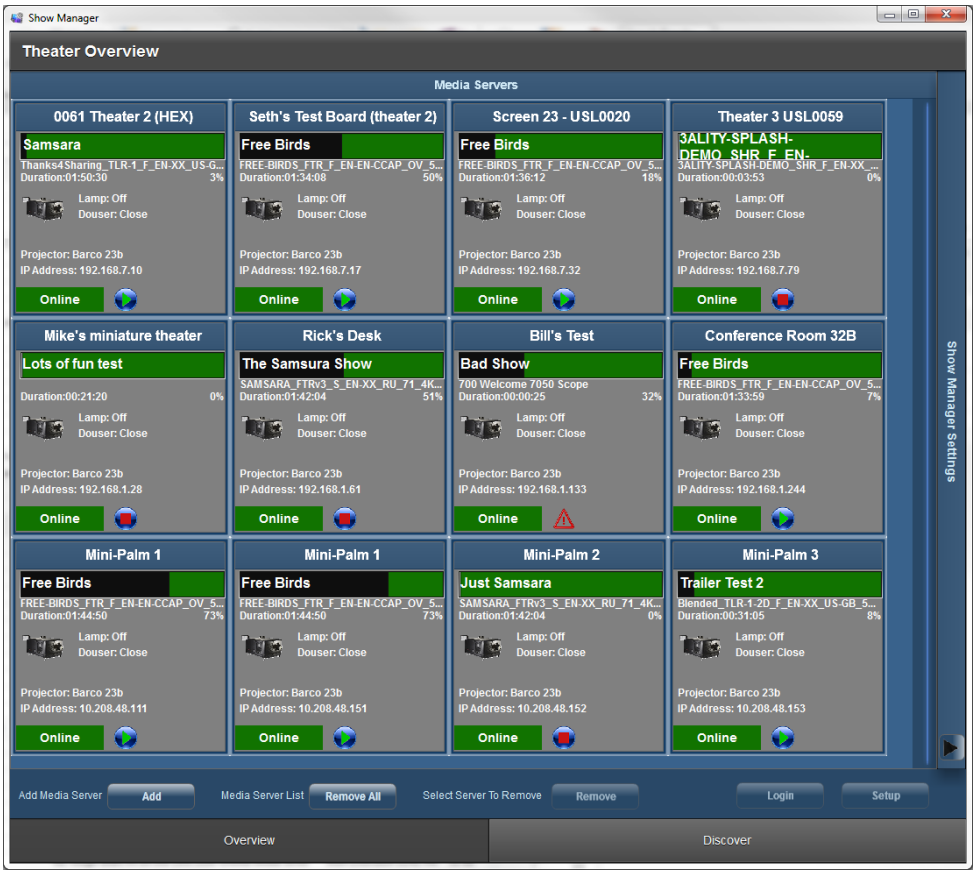

Table of Contents

Table of Figures

Table of Tables

CMS-2200 Conformance Declarations

Europe Union (CISPR 22)

The USL CMS-2200 complies with the EMC requirement of EN55022 and EN55024 when operated in accordance with this manual.

Warning:	This is a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

FCC

This equipment has been tested and found to comply with the limits for a 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 this instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Canada

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil de la classe A est conforme à la norme NMB-003 de Canada.

Video Training

USL has produced training videos for the CMS-2200 to cover installation, use and troubleshooting.

Video training titles include:

- **Parts and Installation**
- **SMS Install**
- **Ingesting Content**
- **Playing Content**
- **Troubleshooting**
- **SSD Replacement**
- **CGI Interface**
- **System Settings**
- **Building a playlist**
- **The Scheduler**
- **Battery Replacement**

The training videos are available at:

http://www.uslinc.com/index.php?option=com_content&view=article&id=98:product-videos&Itemid=131

Important Safety Instructions

1. Read these instructions.
2. Keep these instructions.
3. Follow all instructions.
4. Do not use this apparatus near water.
5. WARNING: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
6. Clean only with dry cloth.
7. Only use attachments/accessories specified by the manufacturer.
8. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way.
9. This equipment is intended for installation in a restricted access location.

Caution: Troubleshooting must be performed by a trained technician. To reduce the risk of electric shock, do not attempt to service this equipment unless you are qualified

---

Battery Caution:

There is a **Risk of Explosion** if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions and local law. Replace only with the same or equivalent type.

Product End of Life Information

This product was designed and built by USL to provide many years of service, and is backed by our commitment to provide high-quality support. When it eventually reaches the end of its serviceable life, it should be disposed of in accordance with local or national legislation.

Product Contents

☐ CMS-2200 Cinema Media Server

☐ Front panel security label (for Barco projectors)

☐ Quick Start Guide (printed)

☐ Documentation (DVD)

- CMS-2200 Installation and User Manual
- CMS-2200 product registration form
- Conformance document
- CMSA-100 Manual

CMS-2200 Registration Form

To meet forensic marking requirements USL must track the CMS-2200 systems and the installed location. USL is committed to making this process as quick and easy as possible. This form can be sent electronically to USL via email, or it can be printed and faxed to **(805) 549-0163**.

By email: Please use support@uslinc.com Insert **CMS-2200 Registration** in the subject line.

Cinema Information:

Cinema Circuit _____

Cinema Name _____

Address 1 _____

Address 2 _____

City _____

County/Province/State _____

Postal Code/Zip _____

Number of Screens _____

Contact Information:

First Name _____

Last Name _____

Email Address _____

Telephone _____

CMS-2200 Information:

CMS-2200 Serial Number _____ Screen Name or Number _____

CMS-2200 Serial Number _____ Screen Name or Number _____

CMS-2200 Serial Number _____ Screen Name or Number _____

CMS-2200 Serial Number _____ Screen Name or Number _____

CMS-2200 Serial Number _____ Screen Name or Number _____

CMS-2200 Serial Number _____ Screen Name or Number _____

CMS-2200 Serial Number _____ Screen Name or Number _____

CMS-2200 Serial Number _____ Screen Name or Number _____

CMS-2200 Serial Number _____ Screen Name or Number _____

CMS-2200 Serial Number _____ Screen Name or Number _____

Optional Information

☐ No 3D	☐ Dolby 3D	☐ Real D	☐ Other 3D
	☐ Using HD-SDI	☐ Using HDMI	☐ Using HDMI-3D
☐ Using CMSA-100	☐ Barco Projector	☐ NEC Projector	☐ Christie Projector

Supported JPEG rates

Resolution	Aspect Ratio	Frame Rates
4K Rates		
4096 x 1716	2.39:1 Scope	24, 25, 30
3996 × 2160	1.85:1 Flat	24, 25, 30
4096 x 2160	Full 4K	24,25, 30
2K / 2D Rates		
2048 x 858	2.39:1 Scope	24, 25, 30, 48, 50, 60
1998 × 1080	1.85:1 Flat	24, 25, 30, 48, 50, 60
2048 x 1080	Full 2K	24, 25, 30, 48, 50, 60
2K / 3D Rates		
2048 x 858	2.39:1 Scope	24, 25, 30, 48, 50, 60
1998 × 1080	1.85:1 Flat	24, 25, 30, 48, 50, 60
2048 x 1080	Full 2K	24, 25, 30, 48, 50, 60

Table 1-1. Supported JPEG Rates

Supported HDMI rates

2D Formats

Video Code	Format Definition	Aspect Ratio
1	640x480p@59.98/60Hz	4:3
2	720x480p@59.98/60Hz	4:3
3	720x480p@59.98/60Hz	16:9
4	1280x720p@59.98/60Hz	16:9
16	1920x1080p@59.98/60Hz	16:9
17	720x576p@50Hz	4:3
18	720x576p@50Hz	16:9
19	1280x720p@50Hz	16:9
31	1920x1080p@50Hz	16:9
32	1920x1080p@23.98/24Hz	16:9
33	1920x1080p@25Hz	16:9
34	1920x1080p@29.97/30Hz	16:9

Table 1-2. Supported 2D HDMI formats

Video Code	Format Definition	3D Format
32	1920x1080p@23.98/24Hz	Frame Packing
4	1280x720p@59.98/60Hz	Frame Packing
19	1280x720p@50Hz	Frame Packing
5	1920x1080i@59.98/60Hz	Side-by-Side (Half)
20	1920x1080i@50Hz	Side-by-Side (Half)
32	1920x1080p@23.98/24Hz	Top-and-Bottom
4	1280x720p@59.98/60Hz	Top-and-Bottom
19	1280x720p@50Hz	Top-and-Bottom

Table 1-3. Supported 3D HDMI rates

Supported HD-SDI rates

Color	Mode	Resolution	Rate	SDI Mode	Width	Height
YCbCr	4:2:2	10-b	24-30 + psf	1x 1.5G	1920	1080
YCbCr	4:2:2	10-b	48-60	2x 1.5G	1920	1080
RGB	4:4:4	10-b	24-30 + psf	2x 1.5G	1920	1080
YCbCr	4:4:4	10-b	24-30 + psf	2x 1.5G		
RGB	4:4:4	12-b	24-30 + psf	2x 1.5G	1920	1080
YCbCr	4:4:4	12-b	24-30 + psf	2x 1.5G		
YCbCr	4:2:2	12-b	24-30 + psf	2x 1.5G		
YCbCr	4:2:2	10-b	48-60	1x 3G	1920	1080
RGB	4:4:4	10-b	24-30 + psf	1x 3G	1920	1080
YCbCr	4:4:4	10-b	24-30 + psf	1x 3G		
YCbCr	4:4:4	12-b	24-30 + psf	1x 3G	1920	1080
RGB	4:4:4	12-b	24-30 + psf	1x 3G		
YCbCr	4:2:2	12-b	24-30 + psf	1x 3G	1920	1080

Table 1-4. Supported HD-SDI Rates

Supported MPEG rates

Resolution	Aspect Ratio	Frame Rates
1920 x 1080	2.39:1 Scope	23.98, 24, 25, 29.98, 30, 48, 50, 60
1920 x 1080	1.85:1 Flat	23.98, 24, 25, 29.98, 30, 48, 50, 60

Table 1-5. Supported MPEG rates

2.0 CMS-2200 Configurations

The CMS-2200 is a flexible design that can be easily applied to any size cinema application. This section describes three possible configurations: a small single screen; a medium triplex with manager's station; and a large multiplex with storage server.

Single Screen

The single screen configuration illustrated in Figure 2-1 is an example of a simple installation with a SMS station and projector located on a management network. For content ingest, the media can be connected directly to the CMS-2200 via eSATA or USB 3.0.

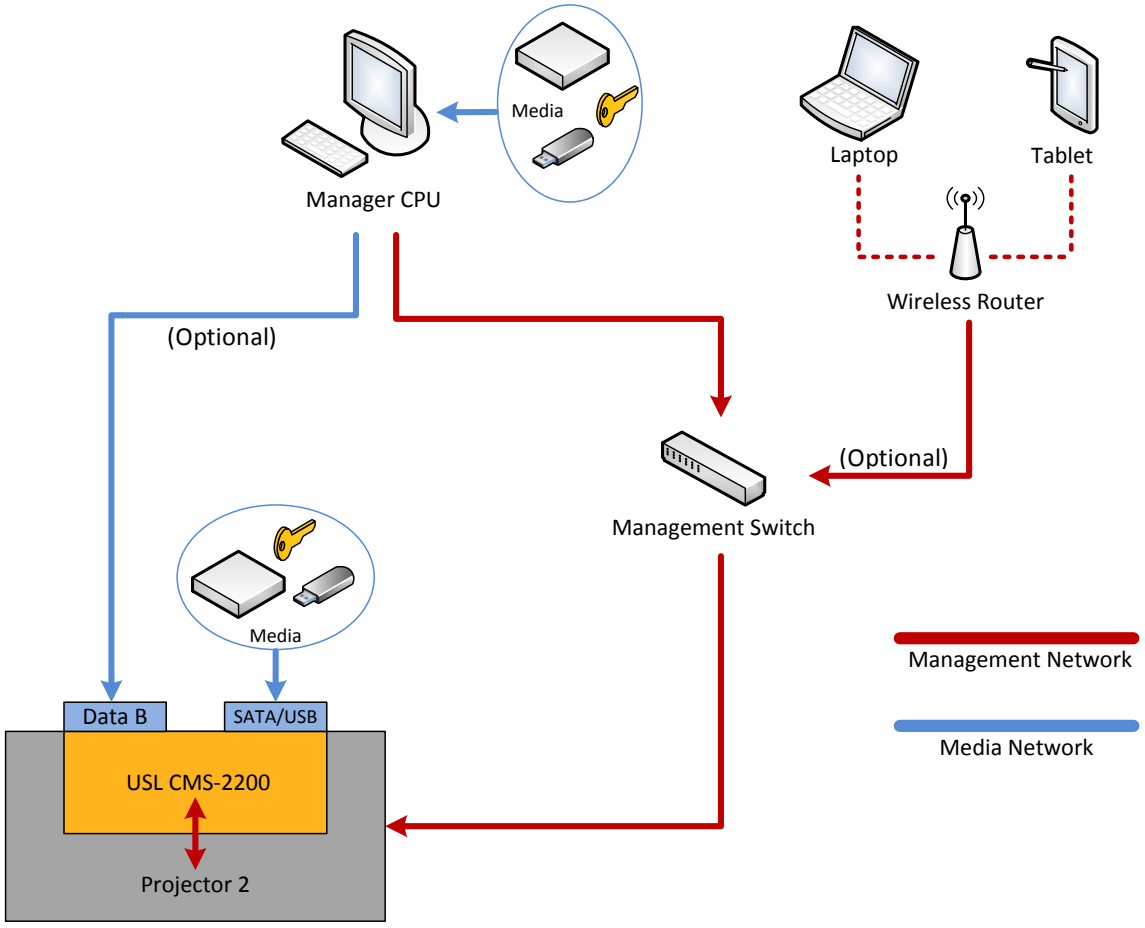

Figure 2-1. Single Screen Configuration

Options: If an installer chooses to setup a Media Network, content can be connected to the SMS control station and sent to the CMS-2200 using the Data B port.

The SMS software can be installed on mobile devices, allowing wireless control of the CMS-2200 with the setup of a wireless router and a network switch.

Multiplex Configuration

Figure 2-2 illustrates a multiscreen configuration that includes a manager station and/or NAS server for content ingest and storage. Content ingests can be accomplished at the managers station or the NAS server. Once ingested, content can be quickly distributed to the multiple CMS-2200 systems. The **Media** network is used to distribute content to the CMS-2200 units, while the **Management** network carries the control functions between the SMS software and the projectors.

Note that the manager's station has network connections to both the Media and the Management networks. For automation, the ETH ports on the CMS-2200 may be used to communicate with external equipment over Ethernet, or the CMSA-100 may be used to provide automation functionality. The **Automation** and **Management** networks can be merged to handle both functions on the same network and simplify the configuration.

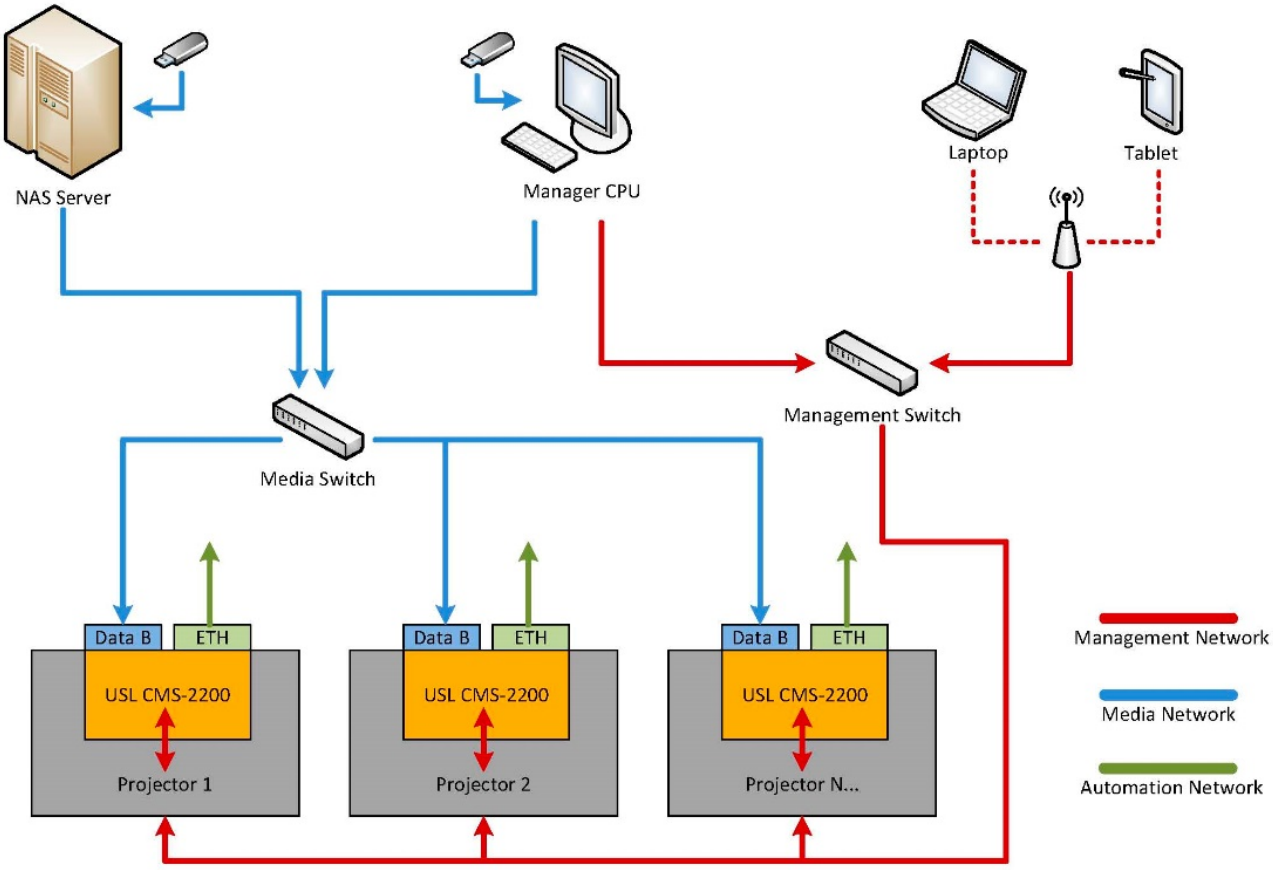

Figure 2-2. Triplex Configuration

Note: Only three projectors are shown above, but the configuration can scaled out to a larger number of screens to support any complex network topology. Refer to Section 3.0 for more information on the Management and Media networks as well as suggested IP address schemes.

3.0 CMS-2200 Cinema Media Server

CMS-2200 Hardware

The USL CMS-2200 hardware is USL's state of the art cinema media server. This section will describe the CMS-2200 hardware connections and physical installation.

Ethernet Connections

The Ethernet Data Connections are identified in Figure 2-1. There are three Ethernet ports, Data A, Data B and AUX Ethernet. The typical network configuration for the CMS-2200 is to have a **Management** network and a **Media** network. USL recommends this network configuration for proper operation of the CMS-2200.

Management Network

The **AUX** Ethernet connection is for the **Management** network. This network is used for SMS connections, along with Ethernet automation and auditorium control. Single screen configurations can operate with only the management network.

Media Network

For multi-screen configurations the **Data B** port is used for the **Media** network connection. The media network is used for content transfer. This connection is used to support ftp file transfer of content from a manager's station or TMS system.

Data A is an additional port that is intended for future expansion. It is currently disabled, but it could be used as an independent Ethernet port or bound to Data B for higher bandwidth in the future. The two **Fiber Data** ports are fiber SPF cages that will accept fiber optic interfaces. The fiber optic ports are matched to the data A and data B ports. If a fiber optic module is installed, the CMS-2200 will automatically use the fiber optic port and not the Ethernet data inputs for the media network.

4

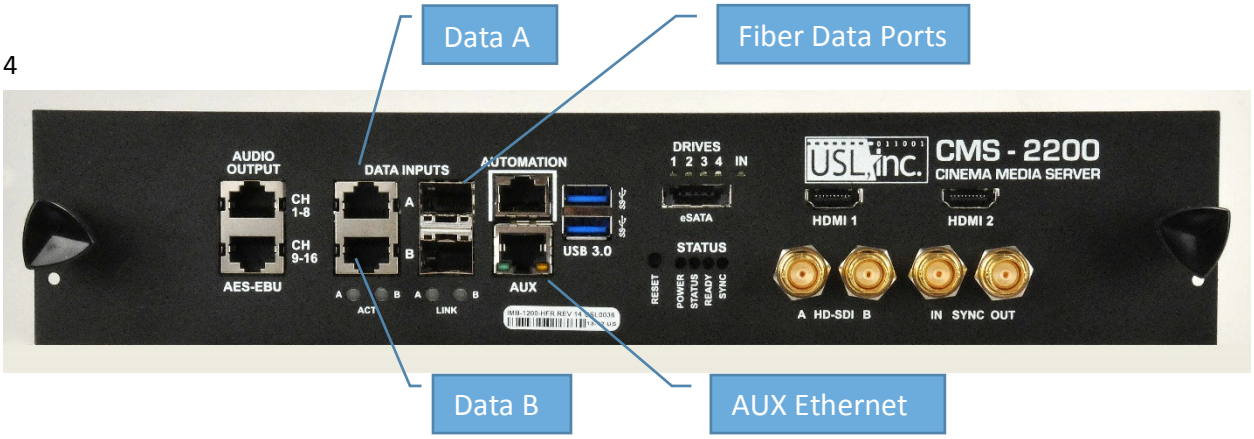

Figure 3-1. Ethernet and fiber data ports

Audio Outputs

There are two **Audio Output** ports that provide 16 channels of AES/EBU audio. The connections for each port are listed in the table. Standard CAT-5 cables may be used to directly connect these ports to the cinema audio processor.

Audio channels one through eight are available on the top port, so a single connection can be used to cover 5.1 and 7.1 audio configurations.

RJ-45 Pin	Signal	RJ-45 Pin	Signal
1	AES 1-2 +	1	AES 9-10 +
2	AES 1-2 -	2	AES 9-10 -
3	AES 3-4 +	3	AES 11-12 +
4	AES 5-6 +	4	AES 13-14 +
5	AES 5-6 -	5	AES 13-14 -
6	AES 3-4 -	6	AES 11-12 -
7	AES 7-8 +	7	AES 15-16 +
8	AES 7-8 -	8	AES 15-16 -

Table 3-1. Audio connections

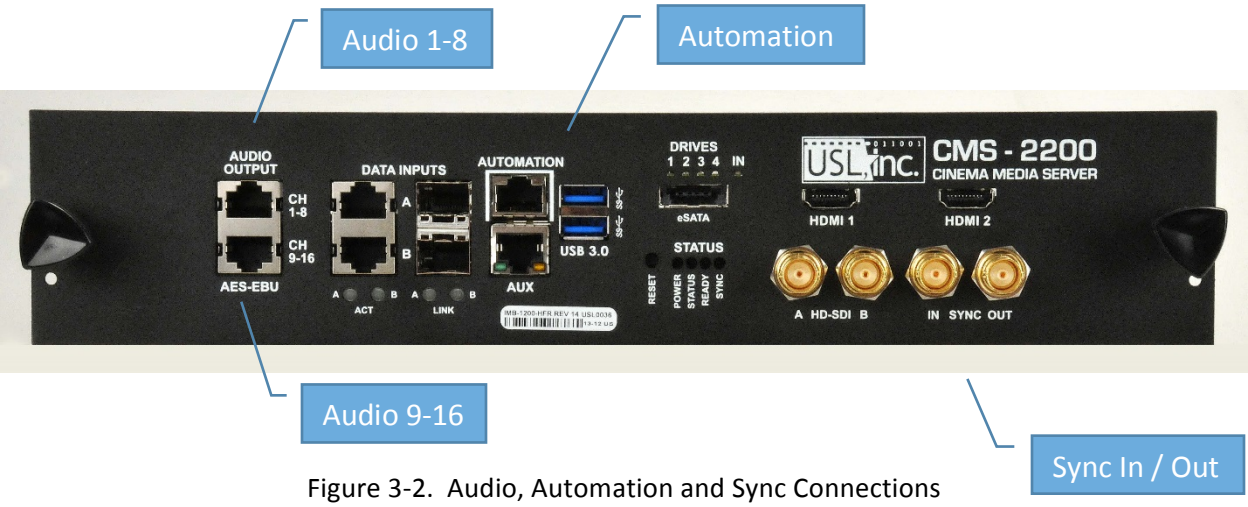

Figure 3-2. Audio, Automation and Sync Connections

Automation

The **Automation** port is designed specifically for the CMSA-100 automation controller. This port can be used in two ways. The first option is to connect this port via a standard Ethernet cable (CAT-5) to the CMSA-100 automation controller. A second option is to use the automation port directly as a four output, two input automation connection.

The connections for the automation port are listed in the table below. Note that this port is NOT an Ethernet port. It will not function properly should it be connected to a network switch or hub. The port is specifically designed as a point-to-point connection.

RJ-45 Pin	Signal	RJ-45 Pin	Signal
1	Out 1	5	+12V DC
2	Out 2	6	In 1
3	Out 3	7	In 2
4	Out 4	8	GND

Table 3-2. Automation connections

Sync In, Sync Out

The **Sync In** and **Sync Out** connections are designed for large screen and multi-projector applications (3DLS). The Sync Out connection provides standard (SMPTE 12M) LTC output for synchronizing external equipment. Section 12 describes multi-projector 3DLS application configurations.

Alternate Content Inputs

The CMS-2200 provides both HDMI and HD-SDI alternate content inputs. **HDMI-A** and **HDMI-B** are independent HDMI 1.4 compliant ports that support HDMI 3D. The **HD-SDI** input supports single and dual-link HD-SDI. The supported video rates for the HDMI and HD-SDI ports are listed in Section 1 under product specifications.

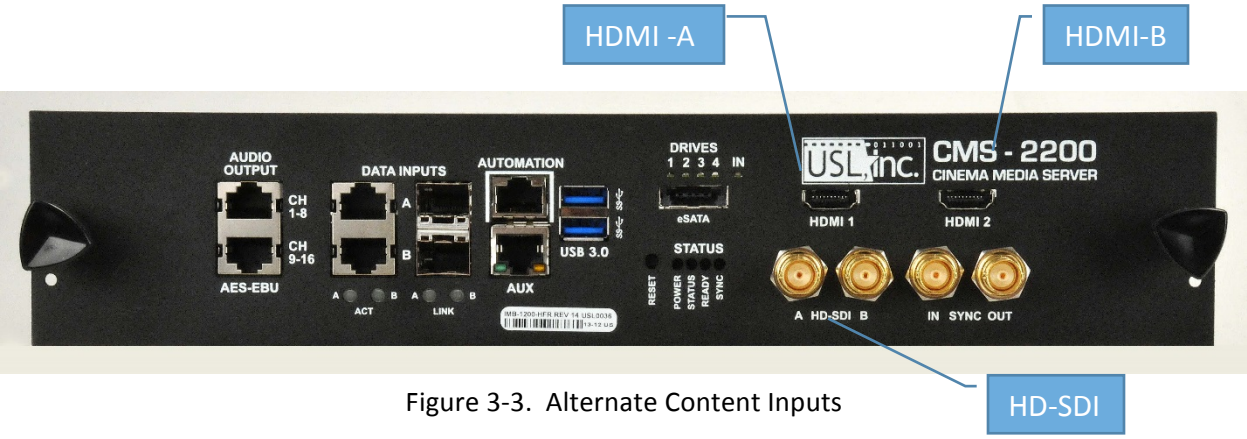

Figure 3-3. Alternate Content Inputs

Ingest Ports

For content and KDM ingests the CMS-2200 provides both an eSATA port and two USB 3.0 input ports. The eSATA port can supply power to support certain drives with combo power/data cables.

Serial Number

The CMS-2200 serial number label is located in the center of the front panel and is used to uniquely identify the CMS-2200 for KDMs. The serial number is in the format of **USL1234** and is also encoded in the barcode on the label. Please refer to this serial number when communicating with USL service and support as USL keeps a complete product history for each CMS-2200 serial number.

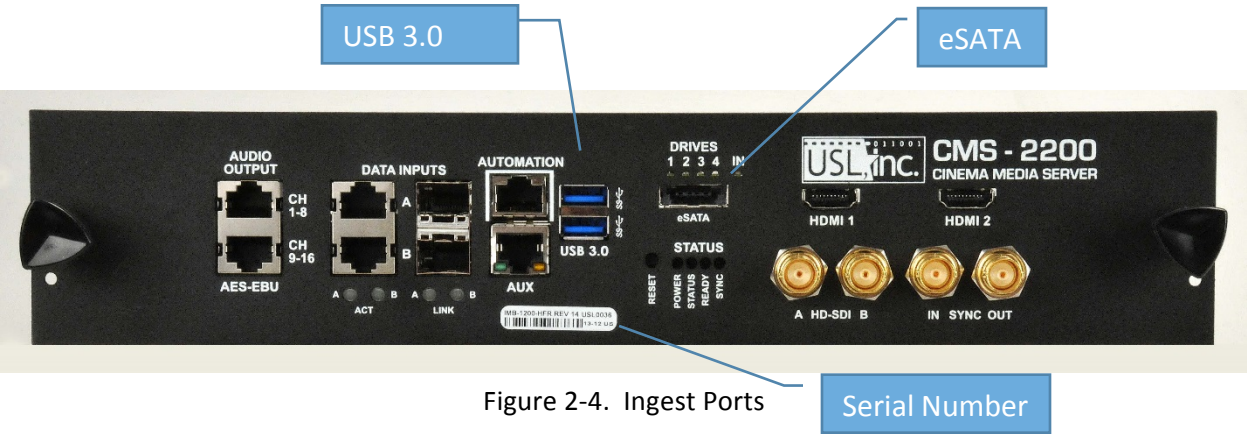

Figure 2-4. Ingest Ports

Status and Reset.

There are a number of LED indicators on the CMS-2200 for status and activity. Below the data inputs are the Ethernet Link and Activity LEDs. Above the eSATA port are the SSD drive status indicators. They will flash green for activity on each of the four SSD drives.

The CMS Status LED functions are listed in the table below.

LED Name	Function	Notes
Power	Power is at the CMS-2200	
Status		
Ready	The CMS is ready and functional	
Sync		
Drives 1-4	SSD Drive Activity	Green when in use.
IN		
ACT A – B	Data Input Activity LEDs	Ethernet port activity
Link A - B	Data Input Link LEDs	Ethernet port link

Table 3-3. LED functions

The reset button is be used to reset the CMS-2200. In normal operation reset should not be used and is not required. Reset will force a hard reset of the IMB, the ISS, and all processors in the hardware.

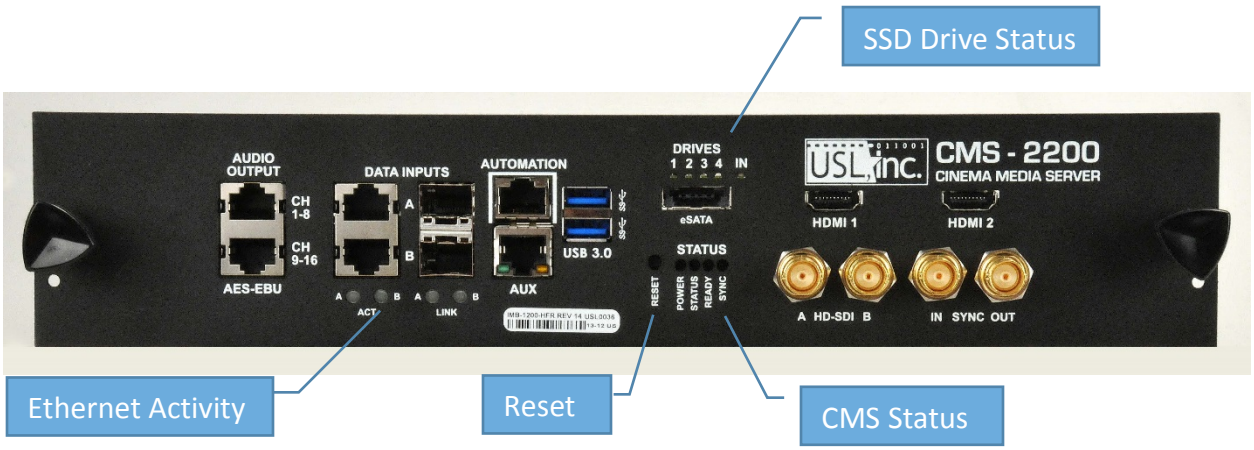

Figure 2-5. Status LEDs and Reset

CMS-2200 Installation

For experienced users the CMS-2200 Quick Start Guide can be used to quickly and efficiently install and configure the CMS-2200 system. The installation steps are outlined below and then described in detail in the following pages.

Installing the hardware

- ☐ Be sure to have tools and ESD strap to be prepared.
  The tools required will include a screwdriver, a #1 Phillips screwdriver and an ESD grounding strap.

- ☐ Check the front panel.
  USL recommends that you check the front panel on the CMS-2200 to be sure it matches the type of projector that it will be installed in. There are unique front panels for the Barco, NEC, and Christie projectors.

- ☐ Be familiar with projector marriage.
  USL recommends that you are familiar with the projector marriage process before starting the installation of the CMS-2200. Once installation is started, the CMS-2200 must be married to the projector per the manufacture's procedure before the CMS-2200 will be functional.

- ☐ Remove the projector covers
  Follow the manufacturer's instructions for removing the covers to allow access to the IMB slot. Be sure the power is turned off before removing the access panels.

- ☐ Remove Enigma card if necessary
  If an enigma cared is installed, disconnect the HD-SDI cables and remove the enigma card from the projector.

Note: Use an EP-100 to keep enigma card alive. The enigma card has a battery that will only last approximately six months without power. USL recommends the USL EP-100 to keep Enigma card alive.

- ☐ Install CMS-2200
  Remove the CMS-2200 from is anti-static bag and slide it into the IMB slot on the projector. Be sure the CMS-2200 is fully seated in its slot.
  The CMS-2200 is not "hot pluggable" so be certain the power is turned off on the projector.

- ☐ Install front panel mounting screws.
  For Barco projectors, install the two 6mm mounting screws on each side of the front panel to secure the CMS-2200 in its slot. Failure to install the mounting screws may allow the CMS-2200 to slip out of its slot and fail.

  For NEC projectors, the CMS-2200 is equipped with two captive screws in the front panel. Use these screws to secure the CMS-2200. Failure to install the mounting screws may allow the CMS-2200 to slip out of its slot and fail.

  For Christie projectors, no mounting screws are required.

☐ Install the panel tamper label (Barco projectors only)
Barco projectors require that a tamper label, which is included with the CMS-2200 is attached across the edge of the CMS-2200 and the side panel of the projector. The label will provide security detection if the CMS-2200 is removed.

☐ Replace cover
Follow the manufactures instructions for reinstalling the projector panels.

☐ Install the projector Ethernet cable.
Reinstall the projector's Ethernet cable.

☐ Install AES audio cable
Install the AES/EBU audio cables to the audio ports. Refer to Table 2-1 and Figure 2-2 for connection information. Standard Ethernet (Cat 5 or Cat 6) cables can be used to provide the connection to USL audio processors like the JSD-100 and JSD-60.

☐ Install Automation Network cable (optional)
If a CMSA-100 will be used in the system, connect the automation cable. For the CMSA-100 a standard Ethernet (Cat 5 or Cat 6) cable may be used for the connection. The CMS-2200 comes with built in automation cues to support the CMSA-100.

For GPIO interfaces refer to Table 2-2 and Figure 2-2 for wiring details. The CMS-2200 comes with built in automation cues to support the GPIO interface.

☐ Install Management (Ethernet automation) Network cable (optional)
If the system requires a control network or Ethernet automation devices, install the Control network cable into the AUX port on the front of the CMS-2200. Refer to Figure 2-1 for the location of the AUX port.

☐ Install Media Network Ethernet cable (optional)
For systems that have a **Data** network, typically used for transferring content between systems, install the data network Ethernet cable into data port B on the CMS-2200. Refer to Figure 2-1 for the location of the data B port.

☐ Perform Marriage procedure
Follow the manufacturer's marriage procedure to marry the CMS-2200 to the projector.

Install SMS Software.

- ☐ Install Adobe Air on your computer or laptop
  The SMS software requires Adobe Air to be installed on the host computer or laptop. Adobe Air is free package that can be downloaded from Adobe.com.(https://get.adobe.com/air/)Once Adobe Air is properly installed on the computer the SMS software can be installed.

- ☐ Use CGI interface to download latest SMS software from CMS-2200.
  USL recommends using the USL CMS-2200 CGI interface for downloading the SMS software directly from the CMS-2200. The reason is that this will guarantee the SMS software will match the CMS-2200. Refer to Section 12 for complete details on the USL CMS-2200 CGI interface.

  An alternative method is to install the SMS software from the DVD included with the CMS-2200. The DVD contains a CMS-2200 code package and a matching SMS software package that can be installed directly on a computer or laptop.

- ☐ Run Installation file to install the SMS software.
  Once the SMS software package has been downloaded to the computer or laptop, run the install package to install the software.

  For the SMS software to communicate with CMS-2200s, the computer must be on the same network as the projector, or have access to that network.

Configure CMS-2200 system settings.

- ☐ Open the SMS software
  Once installed, the SMS software can be opened by double clicking the SMS application icon. Refer to section 3 for complete details on using the SMS software.

- ☐ Log into the desired CMS-2200.
  Use the **Discover** tab used to discover the available CMS-2200 media servers as described in Section 3 on page 13.

  Log onto the desired CMS-2200 using one of the default user accounts described in Table 4-1. The log in process is described in Section 4 under **Login**.

  For many of the settings below an installer level account or higher will be required. User = **installer**, Password = **installer** is recommended.

NOTE: As settings are changed in the SMS, be sure to save the settings using the **save button**. The save button will display the disk icon and will be located on various SMS pages near where the setting is made.

☐ Add Users as necessary
Users can be added by selecting **Users** in the **System Tab.** The process is described in section 10 on page 52.

Users can only add other users of the same access level or a lower.

☐ Set Projector Type
In the **System Tab** under **Settings** and **Projector, set the Projector type**. (Barco, NEC, or Christie) This step will configure proper Ethernet routing, given the projector the CMSS-2200 is installed in.

☐ Select 4K downsample (if 2K projector)
For 2K projectors, set the 4K downsample to **ON**. This will automatically decode all 4K content to 2K, so it will stream on 2k projectors. For 4K projectors set this to **OFF**, allowing for a full 4k resolution on playback.

☐ Set 3D system type, if system is 3D.
For 3D systems, select the 3D type in use. The choices are; **None**, **RealD**, **Dolby**, and **Other**.
Be sure to save the settings by using the **save** button.

☐ Turn on CineCanvas and Auxiliary Content Server as required.
In the **System Tab**, under **Settings** and **Server**, turn on **CineCanvas** to enable subtitles and turn on **Auxiliary Content Server** to enable closed captions.
Be sure to save the settings by using the **save** button.

☐ Set the proper time zone
In the **System Tab**, under **Settings** and **Server**, set the appropriate local time zone by selecting the continent and the major city for that time zone.
Be sure to save the settings by using the **save** button.

☐ Set the Screen Name
In the **System Tab**, under **Settings** and **Auditorium Settings**, set the auditorium screen name.
Be sure to save the setting by using the **save** button.

☐ Adjust the secure time offset if required (+ / - 360 seconds)
In the **System Tab**, under **Settings** and **Media Block**, adjust the secure media block time if required. The time may be adjusted +/- 360 seconds each year.
Be sure to save the setting by using the **save** button.

☐ Define additional automation cues if necessary.
Refer to section 7.2 for information on adding additional automation cues. Automation cues are added in the **System Tab**, under **Settings** and **Automation**.

☐ Set the audio system type and IP address.
In the **System Tab**, under **Settings** and **Audio**, Set the Audio System Type to match the cinema audio processor that will be used.

☐ Set the Audio System IP address to allow Ethernet commands to locate the cinema audio processor.
Be sure to save the settings by using the **save** button.

☐ Set the audio delay (+/- 200ms).
Set the audio delay value (in milliseconds) to synchronize the audio and video. A sync-pop test clip is provided on the CMS-2200 DVD.

☐ Select the audio sampling rate.
Select the Audio Sampling Mode. In 96K mode, both 48 KHz and 96 KHz audio will be played. In 48 KHz mode, 96 KHz audio will be down-sampled to 48 KHz, so all content will be played at 48 KHz.
Be sure to save the settings by using the **save** button.

☐ Re-configure the audio channel routing as desired.
In the **System Tab**, under **Settings** and **Audio**, the default audio channel routing is one-to-one and matches the standard DCI definitions. If changes are desired to the audio channel routing, refer to Section 11 - Audio Settings for a description of changing the default channel routing.

If changes are made to the audio channel routing, be sure to save the settings by using the **save** button.

Single and Multi Auditorium Configurations

Below is a **suggested** IP address configuration that can be used to manage a single or multi-auditorium system. This configuration is designed to support from one to fourteen screens.

Calculated Addresses	
Management Network IP Address	10.208.48.0
Management Network Subnet Mask	255.255.254.0
Media Network IP Address	10.209.48.0
Media Network Subnet Mask	255.255.254.0
Management Network - Rack	
Gateway / Router	10.208.48.1
Secondary Gateway / Router	10.208.48.2
Antenna Controller (DigiOne)	10.208.48.4
Primary Satellite IRD - eth1	10.208.48.5
Secondary Satellite IRD - eth1	10.208.48.6
VSAT Satellite Router (iDirect)	10.208.48.7
Streamer - eth1	10.208.48.8
Management Switch 1	10.208.48.10
Management Switch 2 (unused)	10.208.48.11
Media Switch 1 Management	10.208.48.12
Media Switch 2 Management (unused)	10.208.48.13
Service Laptop Address (when on site)	10.208.48.16
Reserved	10.208.48.17
Reserved	10.208.48.18
Reserved	10.208.48.19
Reserved	10.208.48.20
UPS 1	10.208.48.21
UPS 2	10.208.48.22
Satellite Server - eth0	10.208.48.23
Satellite Server - BMC	10.208.48.24
Management Interface	10.208.48.25
Reserved	10.208.48.26
Reserved	10.208.48.28
Reserved	10.208.48.29
Reserved	10.208.49.191
Reserved	10.208.49.192

Management Network - Screen Equipment	**Screen**	**Screen**	**Screen**
	1	**2**	**14**
Automation Controller	10.208.48.31	10.208.48.32	10.208.48.44
Video Scaler	10.208.48.71	10.208.48.72	10.208.48.84
Media Player	10.208.48.111	10.208.48.112	10.208.48.124
Projector Head	10.208.48.151	10.208.48.152	10.208.48.164
Projector TPC	10.208.48.191	10.208.48.192	10.208.48.204
Cinema Audio Processor	10.208.49.31	10.208.49.32	10.208.49.44
DMA 8	10.208.49.71	10.208.49.72	10.208.49.84
LSS-100 Light and Sound Sensor			
Cinema Audio Monitor			
Auditorium Management Switch	10.208.49.151	10.208.49.152	10.208.49.164

Media Network - Rack	
Media Switch 1 Media interface	10.209.48.1
Streamer - eth0	10.209.48.8
Satellite Receiver - eth1	10.209.48.23
Media Interface	10.209.48.30
Reserved	10.209.48.31 - 50
Reserved	10.209.48.60 - 80
Reserved	10.209.48.135 - 165

Media Network - Screen Equipment	**Screen**	**Screen**	**Screen**
	1	**2**	**14**
Media Player - media interface	10.209.48.101	10.209.48.102	10.209.48.114

Satellite Network	
Network IP Address (same for all sites)	10.50.2.0
Subnet Mask	255.255.255.224
Primary Satellite IRD - eth0	10.50.2.5
Secondary Satellite IRD - eth0	10.50.2.6
Streamer - eth0.4	10.50.2.8
Satellite Server - eth0.4	10.50.2.23
Satellite Interface (unused)	10.50.2.25

4.0 Screen Management System (SMS)

Opening the SMS

The USL screen management application is opened via the SMS application icon, which may be placed on the desktop or toolbar. The SMS application will open to the **Overview** screen shown in Figure 3-1. For the application to discover and connect to CMS-2200 systems it must be on the management network with the CMS-2200 units.

The **Discover** tab allows the SMS application to discover all CMS-2200 units currently located on a network. To start the discovery process, enter a starting and ending IP address into the address boxes. In Figure 3-1 the starting IP is shown as 10.204.48.0 and the ending IP is 10.204.48.255. Four CMS-2200 units have been discovered and are shown with their IP addresses.

Clicking the **Start** button will initiate a scan of all of the IP addresses in the range. Any CMS-2200 units located in this IP address range will be identified. The **Stop** button may be used to terminate the scan early if desired. Below the Discover box, are two buttons used to complete the process. The **Add Selected** button will add a specific CMS-2200 and the **Add All** button will automatically add all of the discovered media servers.

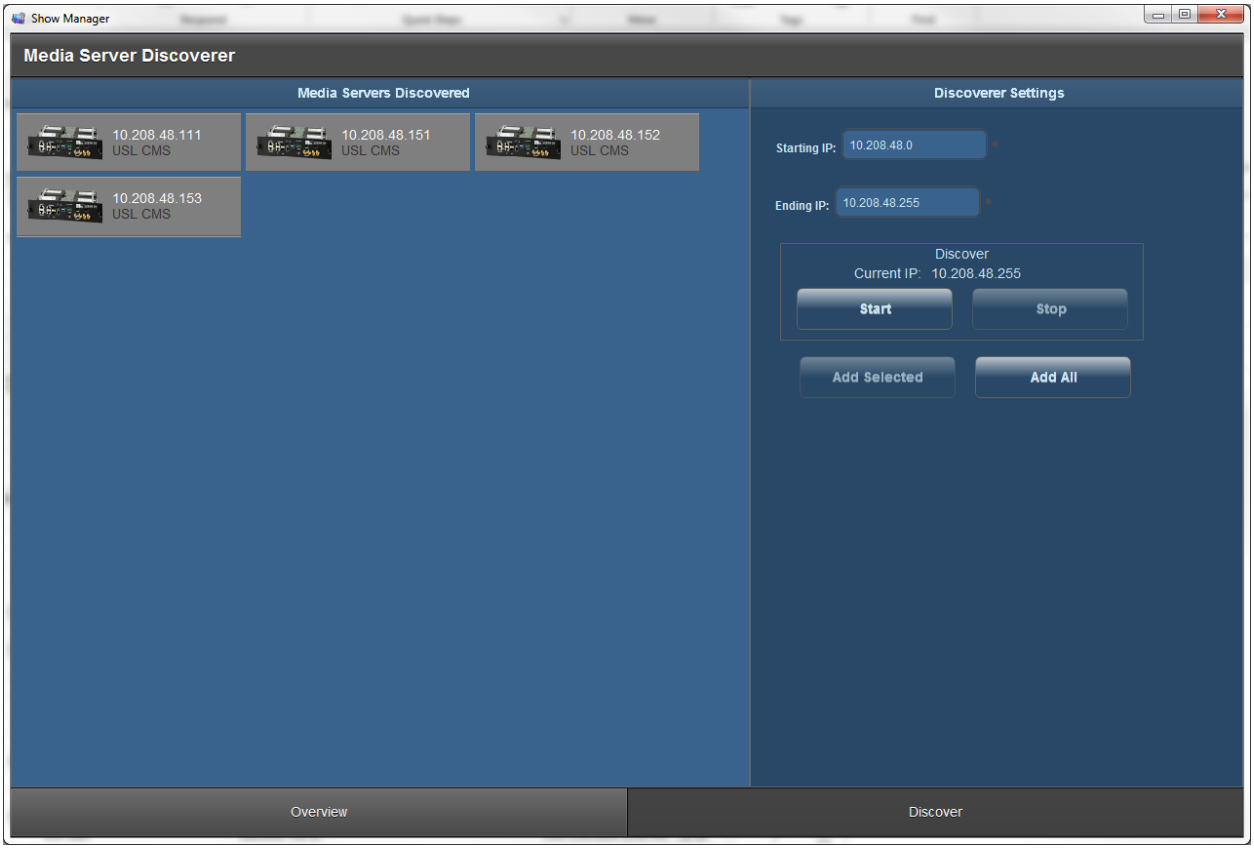

Figure 4-1. SMS Discovered Servers

5.0 Theater Overview

Once the CMS media servers have been added to the SMS, the discovered media servers will be displayed in the overview section as shown in Figure 4-1 and Figure 4-2. The list view is displayed in Figure 4-1 with the show manager settings displayed. The **Hide Settings** button may be used to hide the show manager settings as shown in Figure 4-2. In these examples, twelve CMS-2200 units have been discovered with all twelve being displayed in Figure 4-2. Any discovered media server may be selected for log in by clicking on the server and using the login button, or by double clicking on the server tile.

The state of each media server can be quickly identified by the following icons:

Playing **Paused** **Stopped** **Error**

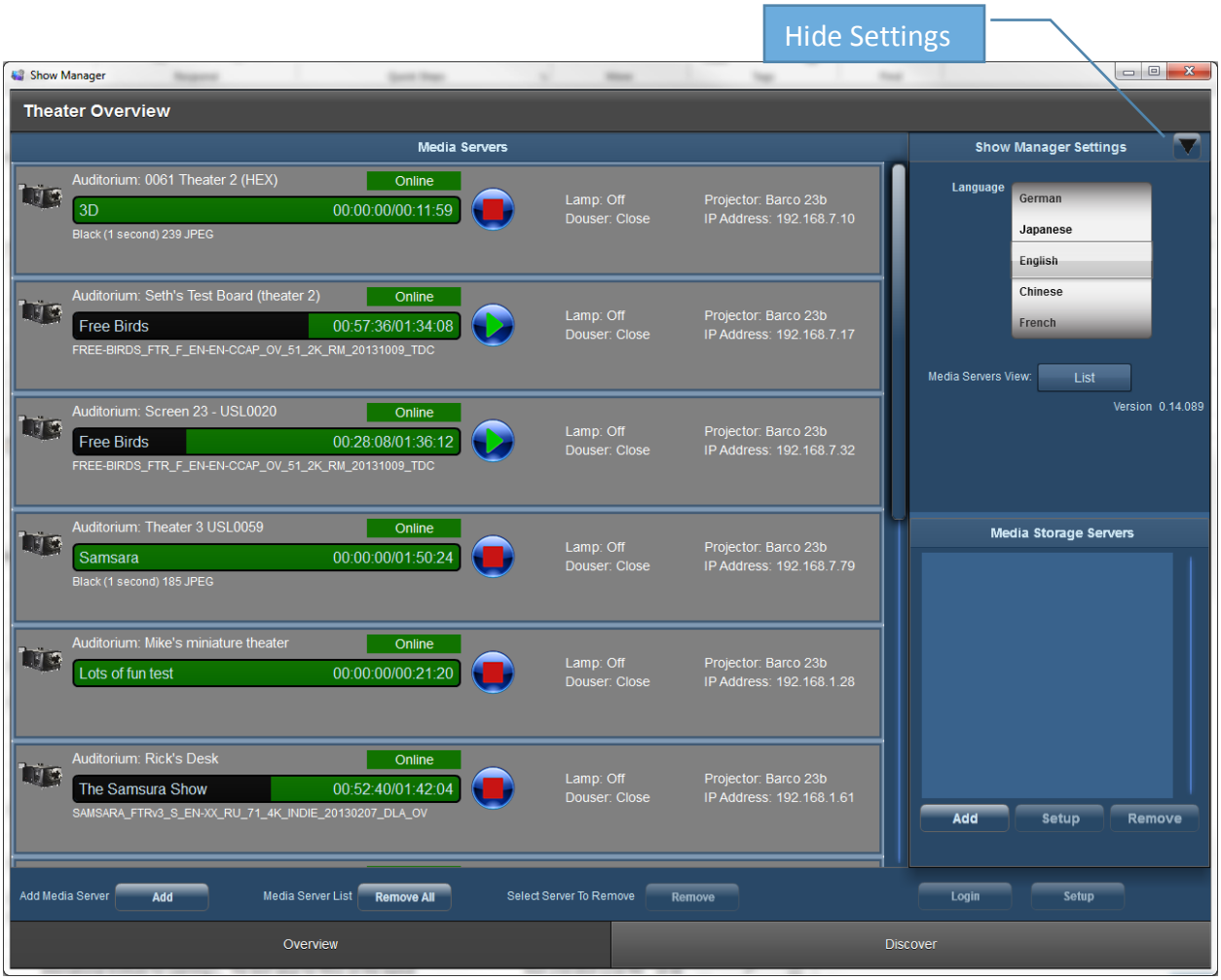

Figure 5-1. Overview Screen - List view

Show Manager Settings

There are a number of show manager settings provided at the theater overview for easy access. This includes the language setting, the SMS software version, and external storage server details.

Language

In the Show Manager Setting pane, the **Language** spinner is used to select the correct language. In this example English is selected.

SMS Software Version

Below the **Media Server View** button in Figure 5-1, the **Version** of the SMS software can be found. Version 0.14.089 is shown in the example.

Media Storage Servers

This data field is for adding and configuring external storage servers that the CMS-2200 can pull content from.

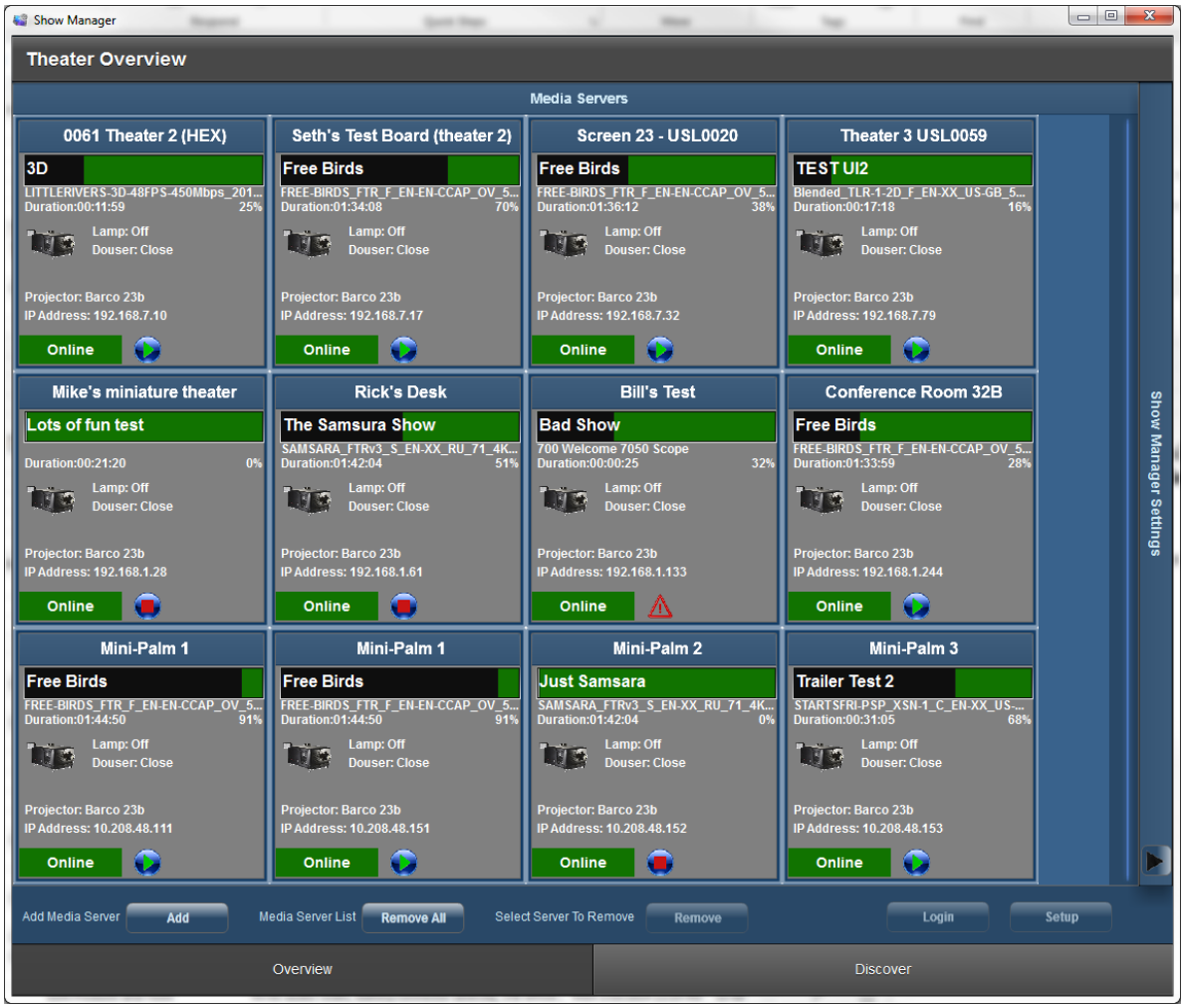

Figure 5-2 Overview – Tile View

Server Summary Tiles

In each server tile overview information is shown including the **Auditorium**, **Projector Type** and **IP address**. An **Online** state indicates that the SMS has a communications channel with the CMS-2200. The **Offline** indicates there is no communications, i.e. the projector is turned off or disconnected. For online media servers the current transport state is indicated, such as **Playing**, **Stopped**, and **Paused.**

The progress bar at the top of each summary tile will indicate the approximate position for an active show. In Figure 5-3, auditorium **Conference Room 32B** is configured with a Barco 23b projector at IP address 192.168.1.244. The CMS is **Online** and currently playing **Free Birds**. The show has a duration of 1:33:59 is 49% complete with playback.

Note that the black portion of the current show progress bar indicates the portion that has played. The green portion remains to be played.

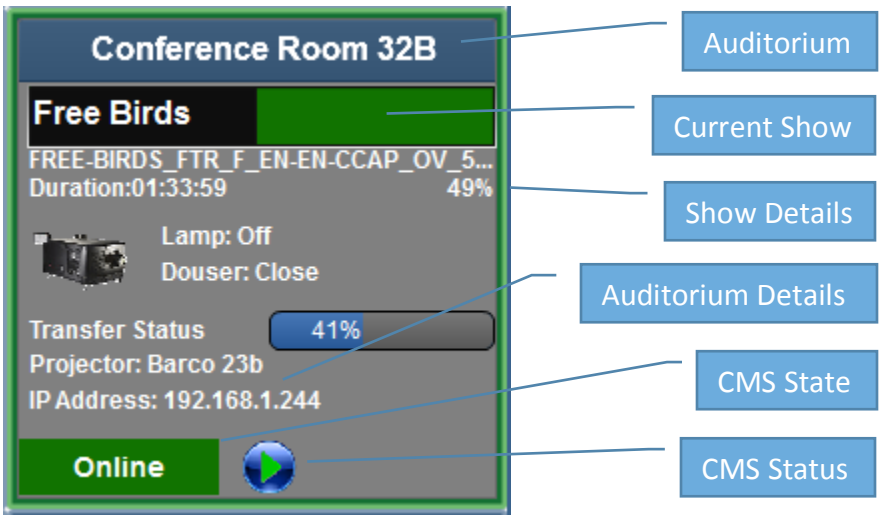

Figure 5-3. SMS Overview Detail

Along the bottom of the overview screen are buttons to add and remove CMS servers and to login to a specific server. Figure 4-3 illustrates the buttons and each will be described below.

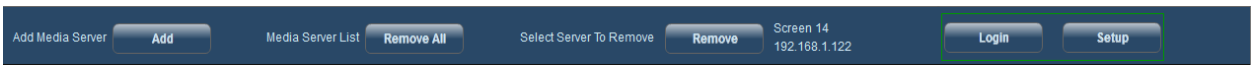

Figure 5-4. SMS Overview Buttons

Add Media Server

The **Add** Button will open the Server Setting and Information dialog box. Providing an **IP address** and clicking the **Save** button will create a placeholder for a media server. When the SMS is able to communicate with that server it will automatically update the **Screen Name** and **Projector type** from the CMS-2200 system. The add media server feature is convenient for pre-configuring media servers that are not yet online.

Figure 5-5. Server Settings and Information

Media Server List

The **Remove All** button will remove all of the media servers from the overview. It is typically used to quickly clear the overview to start a new discovery. Clearing the overview is not required, but it can eliminate clutter or unused servers from the overview pane.

Remove

The **Remove** button will remove the selected media server. A pop-up warning will give you a **Yes** - **No** selection before removing the media server.

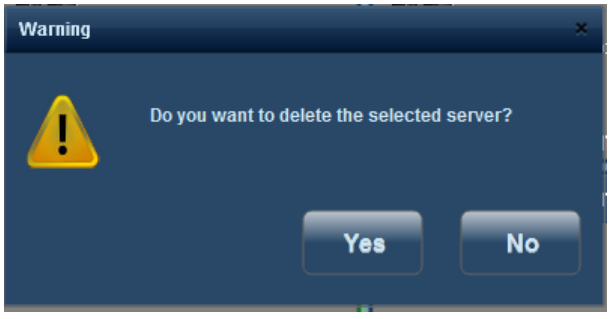

Figure 5-6. Warning for Remove

Login

The **Login** button will bring up the login screen dialog with the IP address displayed in the title bar. A user name and password are required for access to a CMS-2200. Each user account as its own set of permissions and access privileges. The default user accounts are shown in the table below.

Username	Password	Notes	User Level
projection	(empty password)	No password required	Projectionist
manager	**manager**		Manager
installer	**installer**		Installer
admin		Contact USL for password	Administrator

Table 5-1. Default accounts

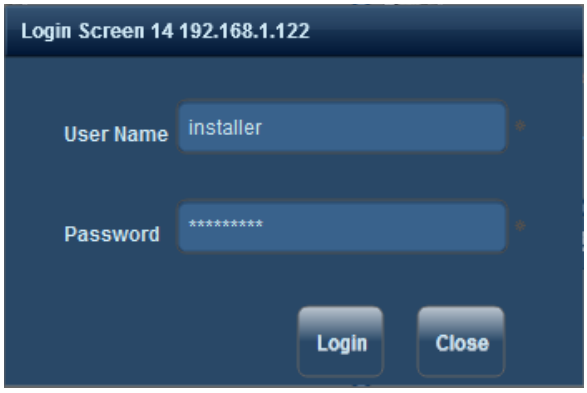

Figure 5-7. Login Pop-Up

Setup

The **Setup** button allows for quick edits of existing screens on the overview page. For example, if a user added a device with an incorrect IP address they could use the **Setup** button to make the fix -- instead of removing and adding again.

Figure 5-8. Server Settings and Information

Show Manager Home

The show manager player screen is designed to provide all of the critical information for given media server in a single view. The **Status Bar** at the top and the **Screen Tabs** located at the bottom remain for all of the SMS views. The status bar and screen tabs will be covered first, followed by a detailed description of the player screen.

Figure 5-9. Show manager player screen

Status Bar

The **Status Bar** at the top provides a concise view of status, alert messages, connected drives, the selected server, along with the current time and date. Below is a description of each of the status bar element.

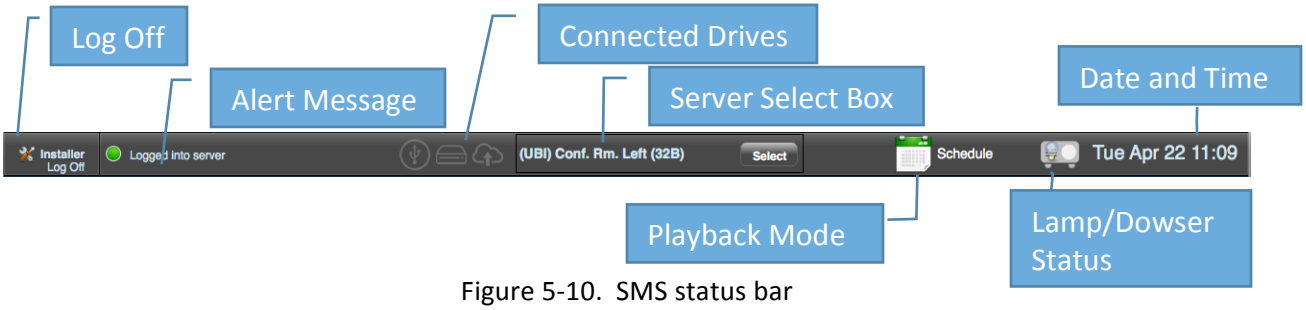

Figure 5-10. SMS status bar

Log Off

The **Log Off** button will log the SMS out of this CMS media server and return to the overview page.

Alert Messages

Clicking on the green icon or the message will bring up the **Alert Message box**, which provides a list of the recent alert messages, the message type icon, and the time and date the message was logged. Clicking the **Trash** button will clear the alerts. A **Yes – No** warning is provided before the messages are deleted. Clicking the **OK** button will confirm deletion and close the Alert Message box.

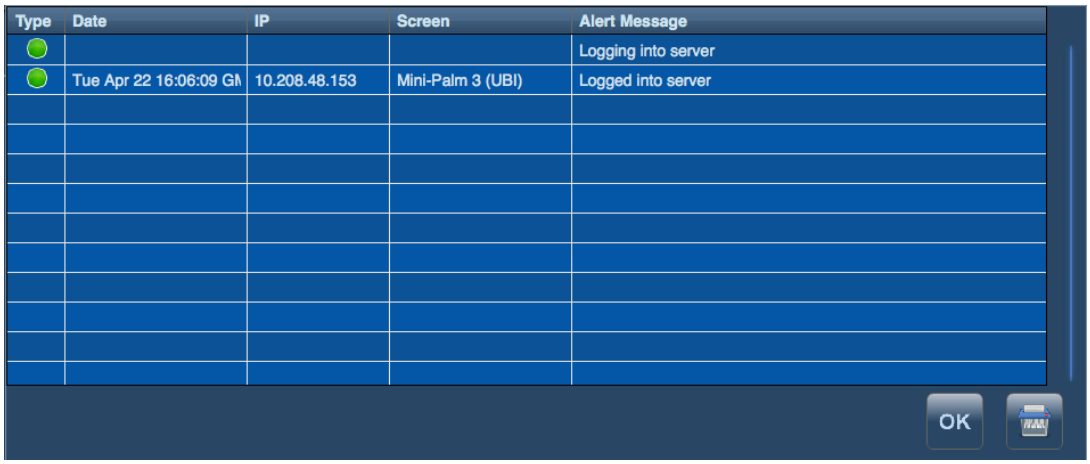

Figure 5-11. Alert message box

Connected Drives

The **Connected Drives** icons indicate the presence of any connected storage. These icons will flash green when a new device is detected. They will remain solid green when the device is ready to be used. The icons are as follows:

USB drive **eSATA port** **Network Storage**

Playback Mode

The mode status icon is a fast way to observe the play state that the current CMS device is in.

Lamp and Dowser Status

This icon retrieves the current Lamp and Dowser status of the project the CMS-2200 is connected to.

Lamp Off, Dowser Off

Lamp Off, Dowser Open

Lamp On, Dowser Closed

Lamp On, Dowser Open

Date and Time

The current date and time is indicated on the far right side of the SMS status bar. When no CMS systems are selected the time becomes the local computer time. When the SMS is logged on to a CMS system the SMS time is synchronized to the CMS-2200 secure clock time.

Screen Select Box

The **Screen Select Box** serves two functions. Upon login to a particular CMS, the box will show **Loading Assets** while all of the specific media server details are loaded and the SMS is updated.

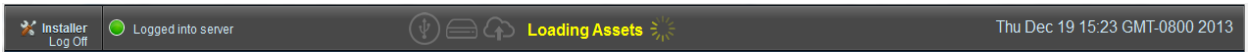

Figure 5-12. Screen Select Box

After the SMS is synchronized with the CMS the screen select box will change to a dropdown indicating the name of the CMS that it is logged into. Clicking this box will expose a dropdown list of the discovered protectors. Any of the available systems may be selected without needing to log out of the SMS. This is a quick way to log into other CMS systems.

Figure 5-13. Screen Select Dropdown

Screen Tabs

Figure 5-14 SMS Screen Tabs

At the bottom of the SMS overview is the **Screen Tabs** bar. There is a tab for each of the screen views available on the SMS. The tabs are **Player**, **Automation**, **Builder**, **Content**, **Scheduler**, and **System**. The current tab being displayed is shown in a darker gray. Each of these tab views is described in subsequent sections.

6.0 Player

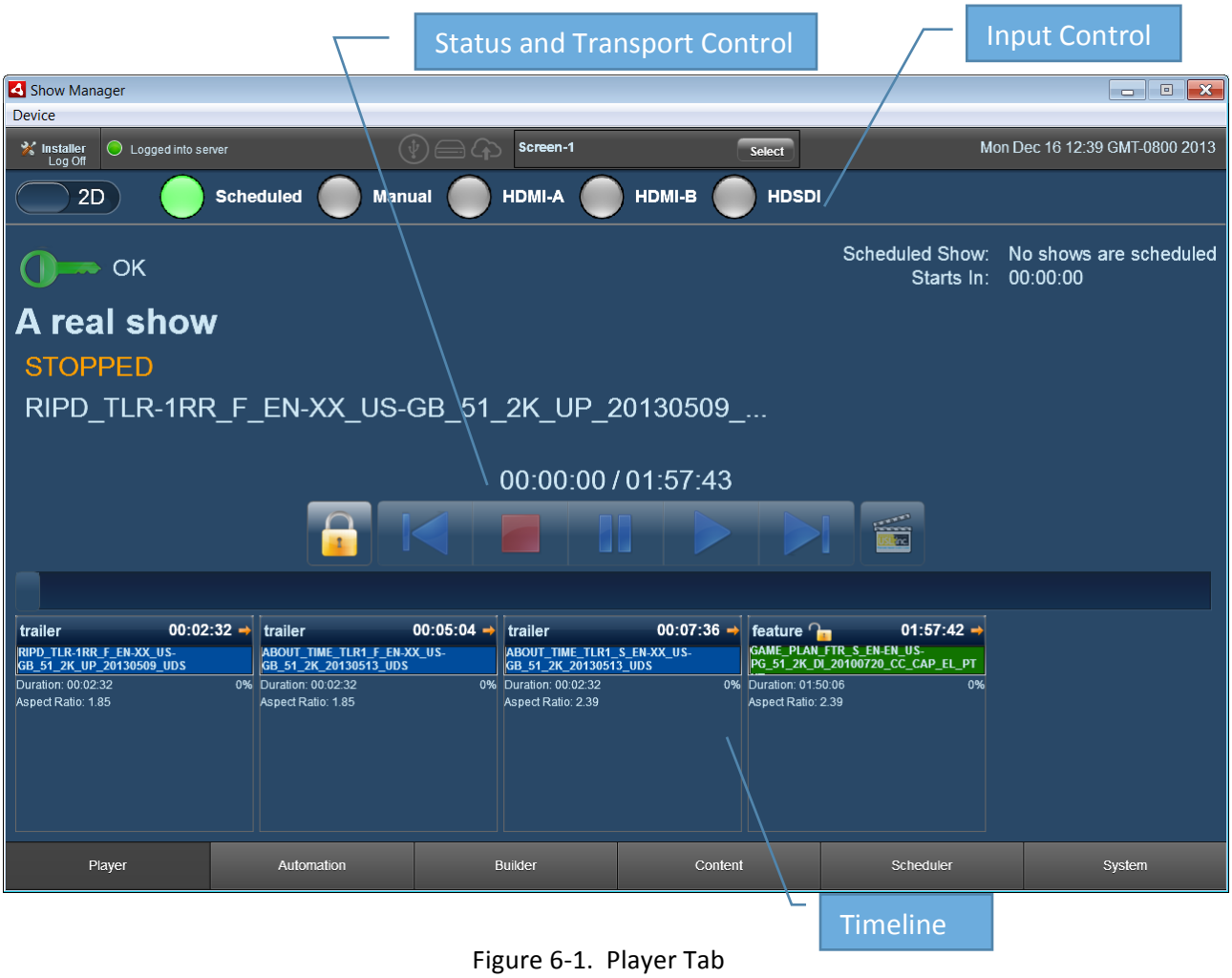

Figure 6-1. Player Tab

The player view is composed of three main sections. The **Input Select**, the **Status and Transport Controls** and the **Timeline**.

Input Control

The input control bar provides three distinct, but related functions. The 2D/3D selector, Scheduled & Manual mode select, and Alternate input select.

Figure 6-2. Input Control Bar

2D/3D Selector

The 2D / 3D selector 

is set to the projector's configuration, not the content type. If the projector is configured for 3D operation, then **3D** should be selected. In this mode 2D content will automatically be '**cloned'** to play on the 3D system. When **2D** is selected and 3D content is played, the CMS-2200 system will automatically provide left eye only (2D) to the projector.

Scheduled and Manual Mode

When **Manual** mode is selected, only the transport controls are used to determine activity. The content must be manually started, paused, or stopped. No scheduled or automatic transport control occurs. This mode is convenient for selecting a particular clip, trailer, show or playlist and manually playing it.

In **Scheduled** mode the scheduler system is enabled and the scheduling system will automatically load, validate and stream playlists according to the schedule. In this mode the transport controls are still available and will override any scheduled operation.

In the case of manual intervention when in scheduled mode, the scheduling system will wait for any manually selected clip or playlist to complete, the SMS will then return to a **stopped** state and wait for the beginning of the next scheduled show to begin again.

The SMS scheduler will not join a show in mid-stream. Similarly manually selected content will not be preempted by a scheduled show, even when in scheduled mode. The scheduled show will simply be skipped and the schedule will wait for the player to return to the **Stopped** state and then load the playlist with the next available start time.

HDMI-A, HDMI-B, HD-SDI

The Selector buttons for the **HDMI-A**, **HDMI-B** and **HD-SDI** inputs on the CMS-2200 will select these alternate inputs. When these inputs are in use the transport controls and scheduler are no longer in effect. The HDMI and HDMI-B inputs are fully HDMI-1.4B and HDMI-3D compliant.

Status and Transport Control

The status and transport control portion provides all of the essential status information in a single view.

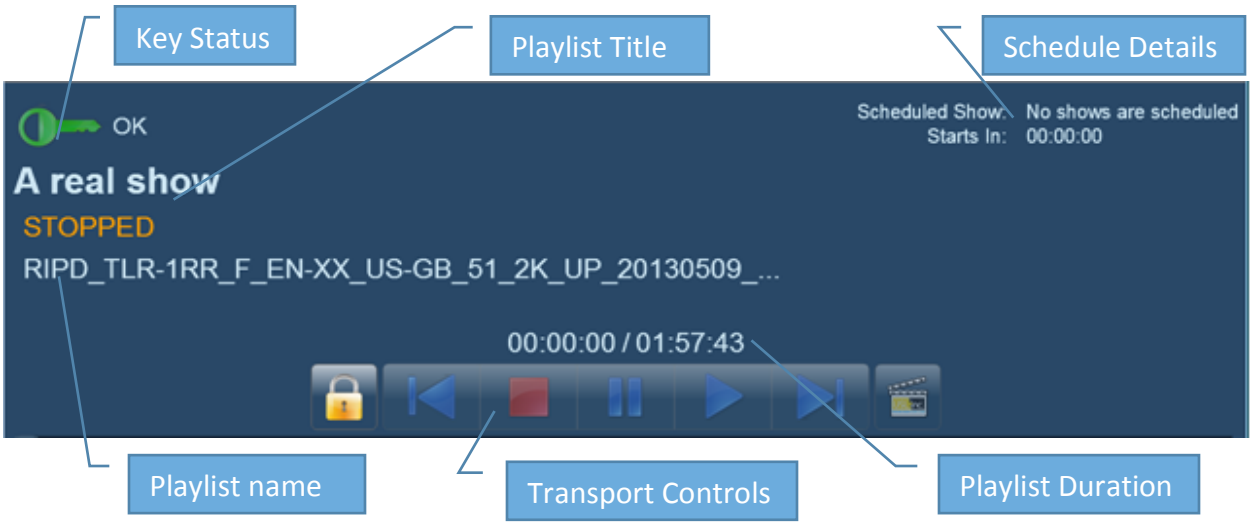

Figure 6-3. Status and Transport Control

In the upper right of the transport control pane time information is shown. The top line is the scheduled show start and duration. Before the show, the **Starts in** timer indicated will count down until the show begins. Once started, it will change to an **Ends In** timer that counts down until the show completes.

Key Status		
	**Green Key**	Good to go
	**Amber Key**	Warning: Keys to expire soon, or within 24 hours.
	**Red Key**	Error: The content will not play

Table 6-1. Key status

Above the transport controls are two timers in HH:MM:SS format. The timers indicate play time from the beginning of the playlist and the total play time for the playlist.

The transport controls from left to right are: **Lock, Skip Back, Stop, Pause, Play, Skip Forward and Content Select**. The table below describes the function of each of the transport controls.

Icon	Function	Notes
	**Lock/Unlock**	When locked, click and hold (**Long Press**) until unlocked to enable transport controls. The transport controls will auto lock after 20 seconds.
	**Skip Back**	Skips back in the playlist by one reel.
	**Stop**	Stops streaming with a black screen. The stop icon will be red to indicate the stopped state.
	**Pause**	Pauses the show, with the last image on screen. The pause control will be green to indicate paused.
	**Play**	Plays the playlist. Play will be green when in play mode.
	**Skip Forward**	Skips forward one reel.
	**Content Select**	Content Select is used to select content to play. This control is enabled when the current show is stopped, or no show is selected. Either playlists or individual clips may be selected.

Table 6-2. Transport control buttons

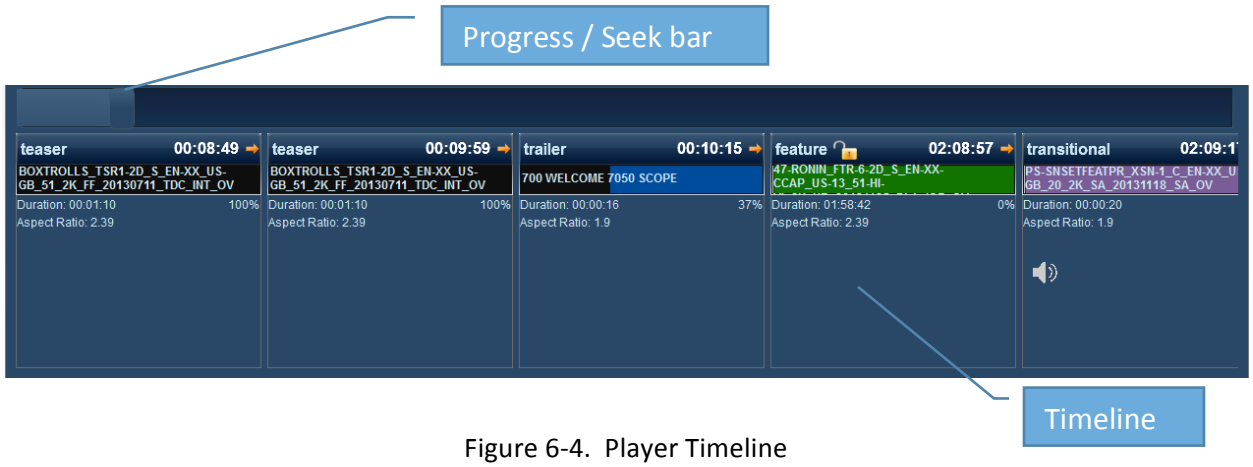

Figure 6-4. Player Timeline

At the top of the player timeline is the **progress / seek bar**. This bar will slide from left to right to indicate the **progress** as the playlist is streamed. When the transport controls are unlocked, this bar can be dragged to any position along the timeline to **seek** to that position.

The player timeline graphically illustrates the current show information in timeline form. Each of the clips in the playlist is show from left to right order. Each content box contains a number of details about that specific clip.

Figure 6-5 below shows the variety of information that can be found within the content boxes.

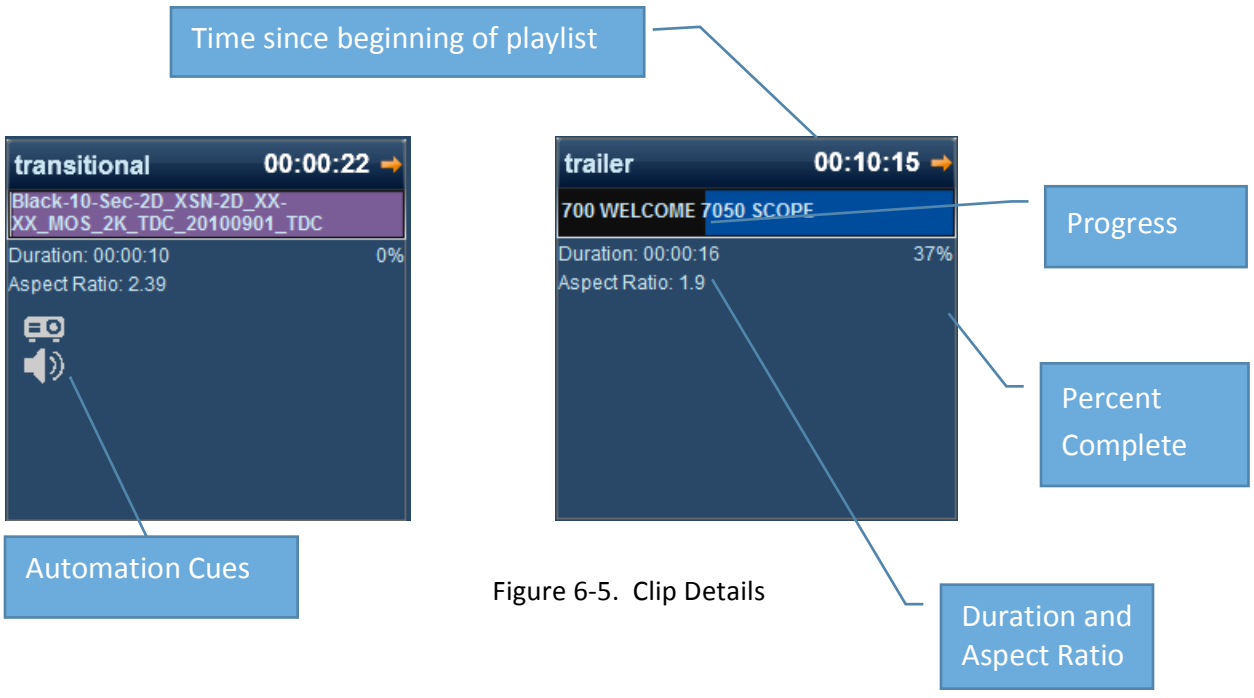

Figure 6-5. Clip Details

7.0 Content Tab

The Content tab is where all content is managed. The right side of the page displays the internal content, which resides in the CMS-2200 solid state drives. Along of top of the content tab are data filter tabs, to allow filtering of the content. The filters include; **All Clips**, **Features**, **Trailers**, **Ads**, **Test Clips**, and **Licenses**. The data list may be further sorted by clicking on the individual headings. Sorting may be done for the **Title**, **Type**, **Duration**, **Size**, **2-3D** and **Aspect Ratio**.

The left side panel shows the external content, which could be on a USB, eSATA, or Network location. There is also a transfer status tab which will display the status of content that is currently being transferred to the CMS-2200.

Along the bottom are the standard tool buttons, which are listed here.

 **Refresh**  **Delete**  **Properties**

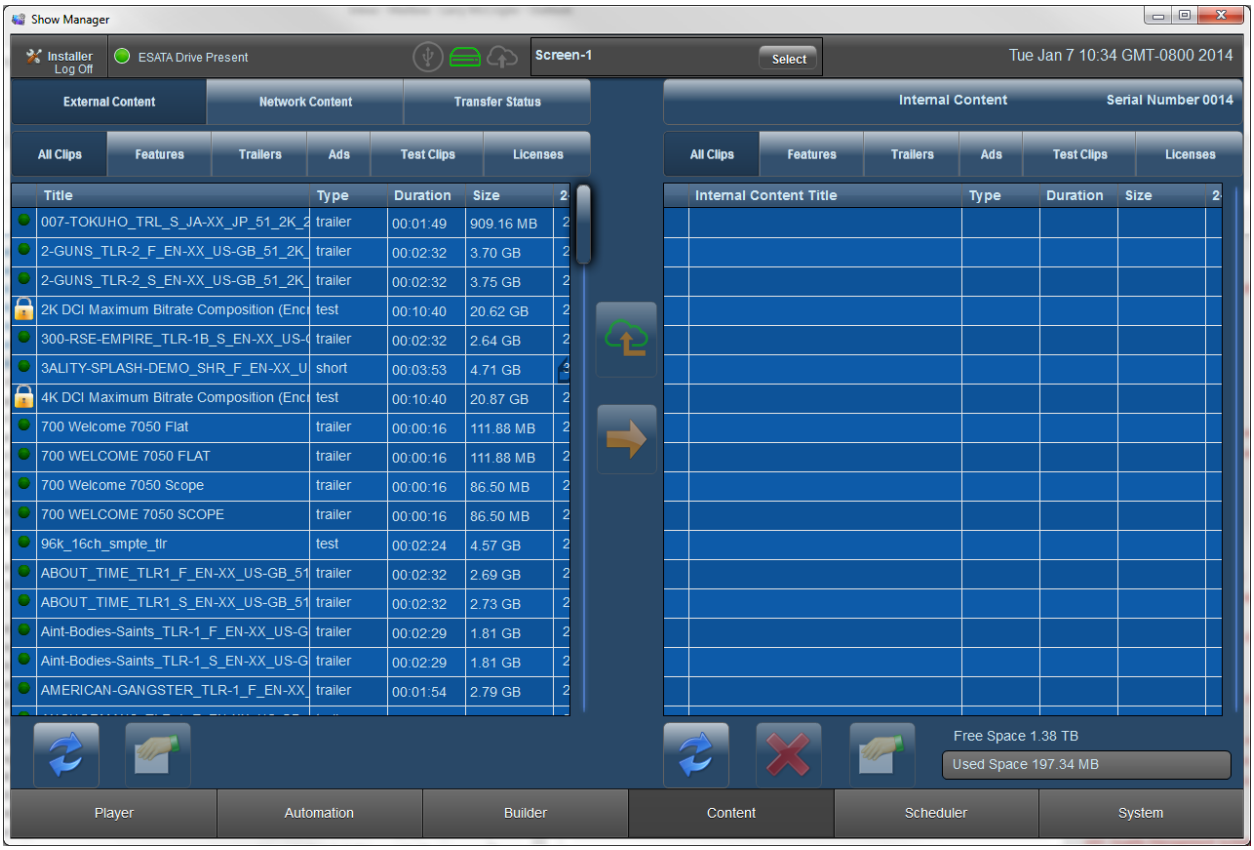

Figure 7-1. Content Screen

External Content

In Figure 7-1 an eSATA drive is plugged into the CMS-2200 as indicated by the green drive icon . The content on the eSATA drive is listed on the left side panel. The CMS does not yet have any content on its internal SSD storage, as the right side panel is empty.

The lower right hand corner storage bar lists both the used space and the free space available on the solid state drives. In the example above 1.38 TB is available for content storage.

The first column in the external content grid contains icons to indicate the status of that content. Each of the status icons are described in the following table.

	Green Light	Good to Go
	Encrypted content – Locked	Needs Current license before it can be streamed
	Encrypted Content - Unlocked	The content is encrypted, but current licenses are available. This content can be streamed
	Glasses – 3D	3D content
	Valid License	Valid license
	Expired License	The license has expired and is no longer valid.
	Corrupt or Missing Data	Playback will cause error

Table 7-1. Content status icons

Warning pop up for copying selected content

Figure 7-2. Warning Pop-Up for Copy

Figure 7-3. Content Selected for Copy

Figure 7-3 is an example of a block of content that is selected to be copied to the internal drives.

The transfer icon ⚡ indicates the content is currently being transferred. The **Transfer Status Tab** shown in Figure 7-4 is useful for monitoring the progress of content transfers.

Figure 7-4. Transfer Status View

Content Properties

The properties button  can be used with either external or internal content to see the details for any piece of content. The **OK** button will close the content details window. The **<Previous** button and the **Next>** button can be used to quickly scroll up and down the content list to view the properties for each. Figure 7-5 illustrates the properties box with the information available for each clip.

Figure 7-5. Content Properties

In the example in Figure 7-6, a USB drive with KDMs is plugged into the CMS-2200 as indicated by the icon. The KDMs are scanned and only valid keys for this particular CMS-2200 show up in the left data grid. Keys not specifically target for this CMS-2200 will not show up on the list, even if they exist on the drive. In the **Licenses** view the date issued, **Valid From** and **Valid To** fields are shown. The **green check** icons indicate the keys are currently valid. Note there is one key with the **lock** icon, indicating this is a valid key for this particular CMS-2200, but the key has expired. There is a second key above with a **green check** that is currently valid for that content. The CMS-2200 will automatically match valid keys with content when multiple keys are transferred.

In Figure 7-6, the **Licenses** filter is selected on the internal content for the CMS-2200 with no keys installed on the device. Transferring a license is the same process as all other content. The **right arrow** will copy all selected items.

Content is good

Key is valid

Key will expire within 48 hours

Key has expired

Delete Content

Copy Items

Invalid Content

Refresh List

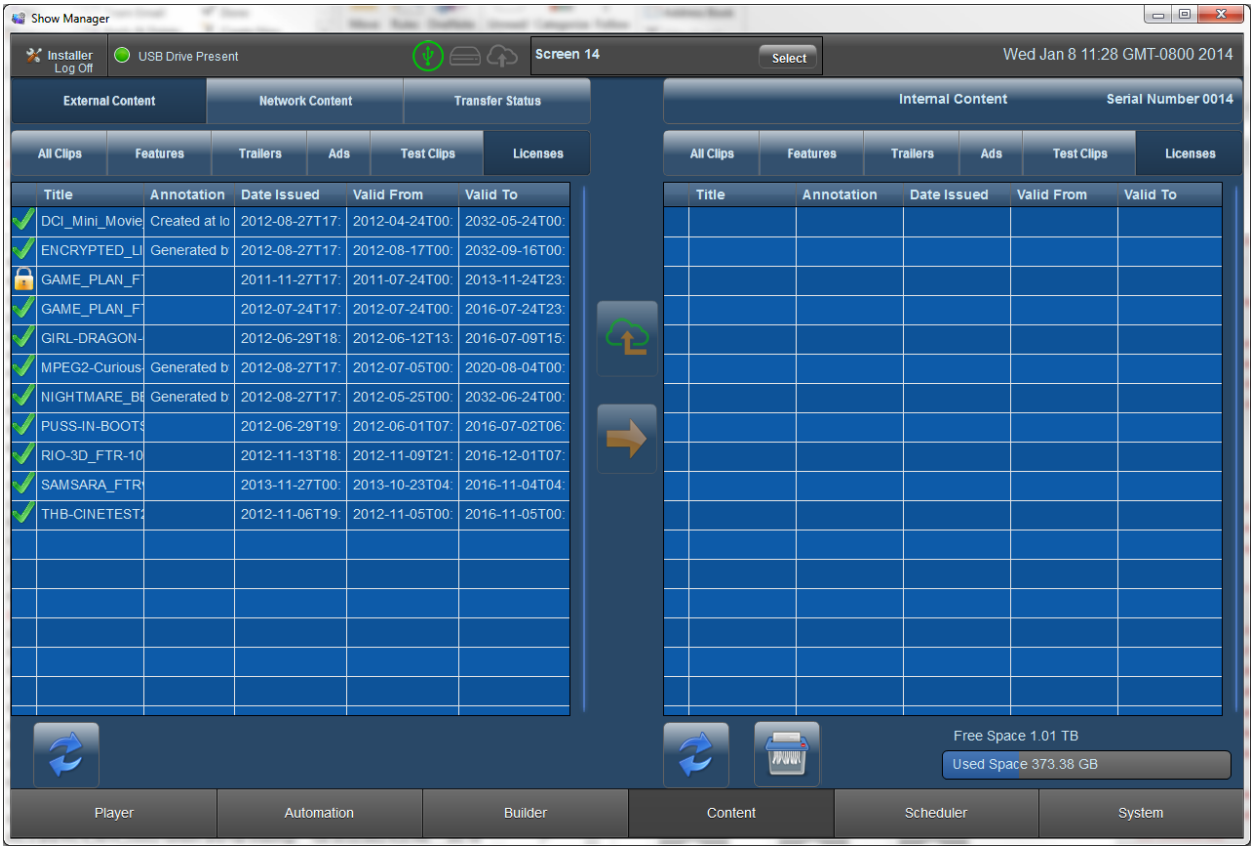

Figure 7-6. Ingesting Licenses

It is worth noting in Figure 7-7 that one key "**THB CINETEST 2**" has a **green check** when it is displayed as external content on the USB drive, but it changes to a **red X** when it is transferred to the CMS-2200. This is because when on an external drive, only the key is checked to confirm it is targeted for this CMS-2200 and that the date range is valid. Once the license is moved to the CMS-2200 it is revalidated in detail. In this case there is a problem with the signing information of the key and therefore it is invalid.

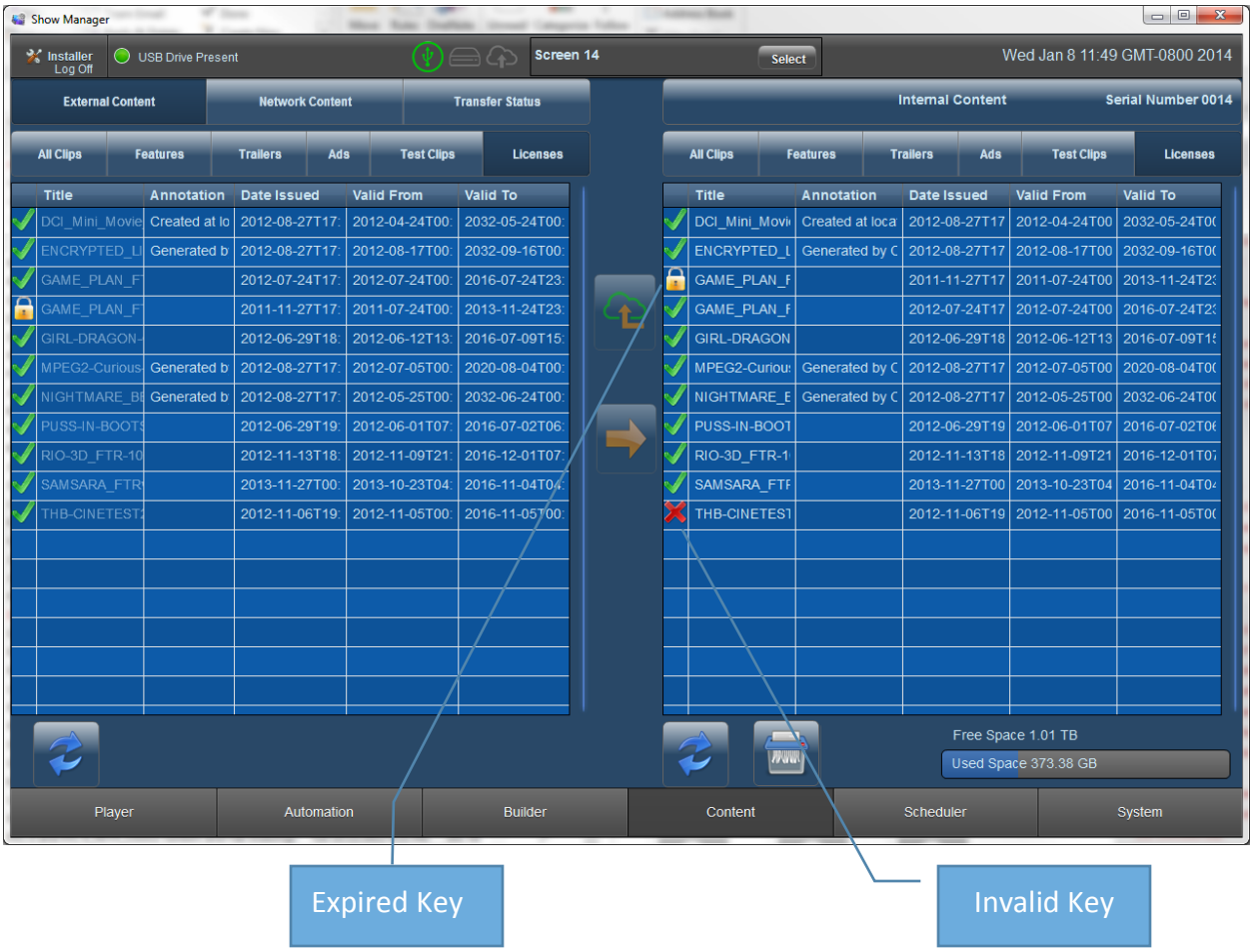

Figure 7-7. Key Validity Check

FTP Transfers

To transfer Internal Content to other CMS devices first select the clip from the right side list and press the  icon. A menu will pop-up allowing you to select the intended destination and input the login credentials for that server. Transfer speeds may vary network to network.

Figure 7-7. FTP Export Pop-Up

NOTE: Read & Write options for internal server must be enabled for both the sending and receiving device. These settings can be configured in System -> Settings -> Server tab.

8.0 Builder Tab

With content ingested onto the CMS-2200, the **Builder Tab** is used to build playlists. This tab is used to create the playlists, with transitions, trailers, ads, automation cues, and other content. Once shows are built they can be scheduled for playback on the CMS-2200.

In Figure 8-1 the available content is shown on the right hand side of the show builder pane. Along the top are the content filter tabs to aid in selecting the desired content. A **Cues** tab is also available for selecting the various automation cues for the playlist.

Once created, playlists will be listed on the left side of the builder tab. Along the bottom is the timeline where shows are constructed. In this figure there are no existing playlists, so the Show Builder graphic is displayed.

Figure 8-1. Builder Tab View

Each of the required steps for building shows will be detailed in this section. Below the content grids are the tool buttons listed here.


Refresh


New Playlist


Copy Show


Add Clip / Show / Cue


Delete


Properties

Building a Playlist

Selecting the **New Playlist** button  will bring up the new show dialog window and add a title block to the start of the timeline as shown in Figure 8-2. In this example the title is left as **New Show** and **Ok** is selected to start the build process.

Figure 8-2. Playlist Details

Next clips can be selected from the content data list and the **Add Clip** button  is used to drop selected clips into the timeline. At the top of each clip the time from the beginning of the playlist is displayed. Figure 8-3 illustrates the beginning of the **New Show** with three black clips added. A quick alternative way to add clips to a playlist is to double click on the content.

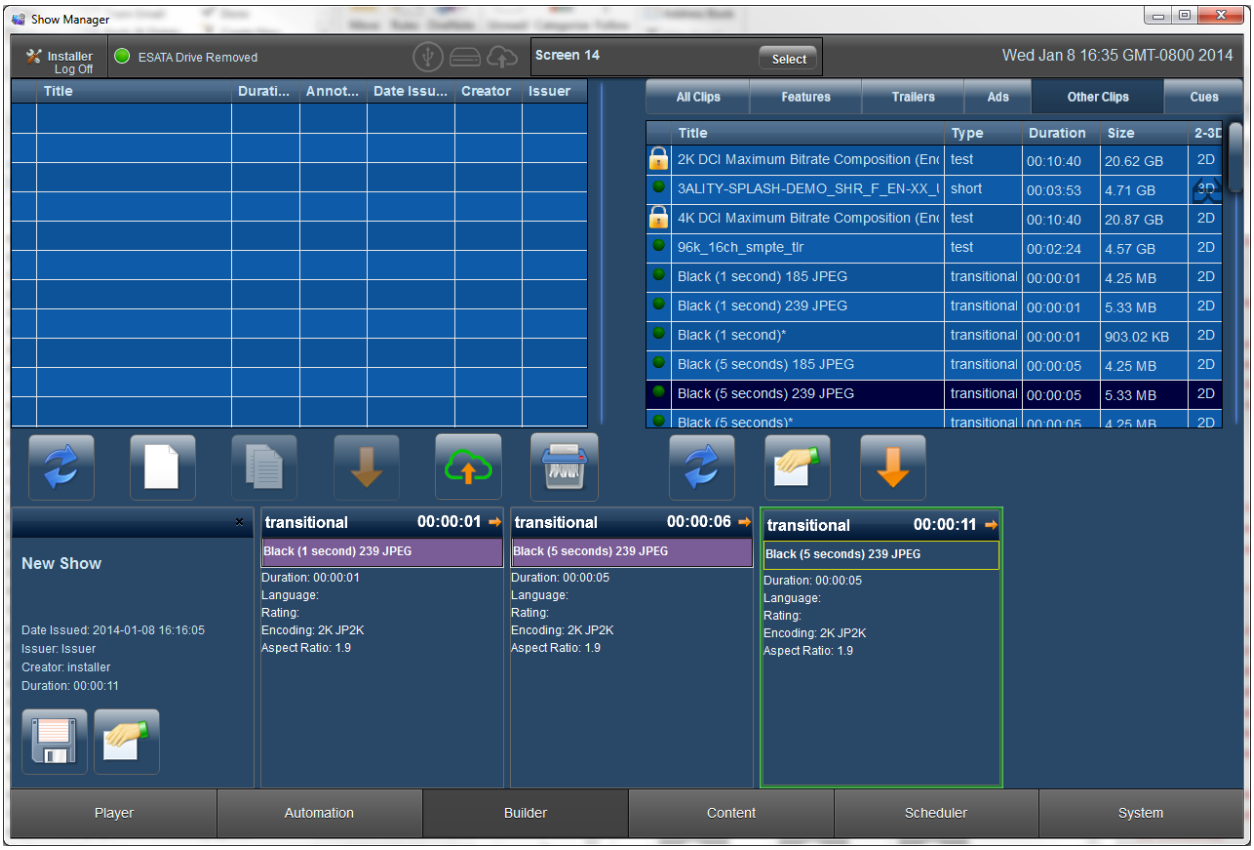

Figure 8-3. Adding Content to Playlist

Adding Trailers to the Playlist

Trailers are added in the same way, by selecting the content and adding them to the timeline. The timeline will automatically slide to the left as additional content is added to the playlist. A double click on the desired trailer will quickly add it to the timeline. Figure 8-4 includes trailers that have been added to the playlist.

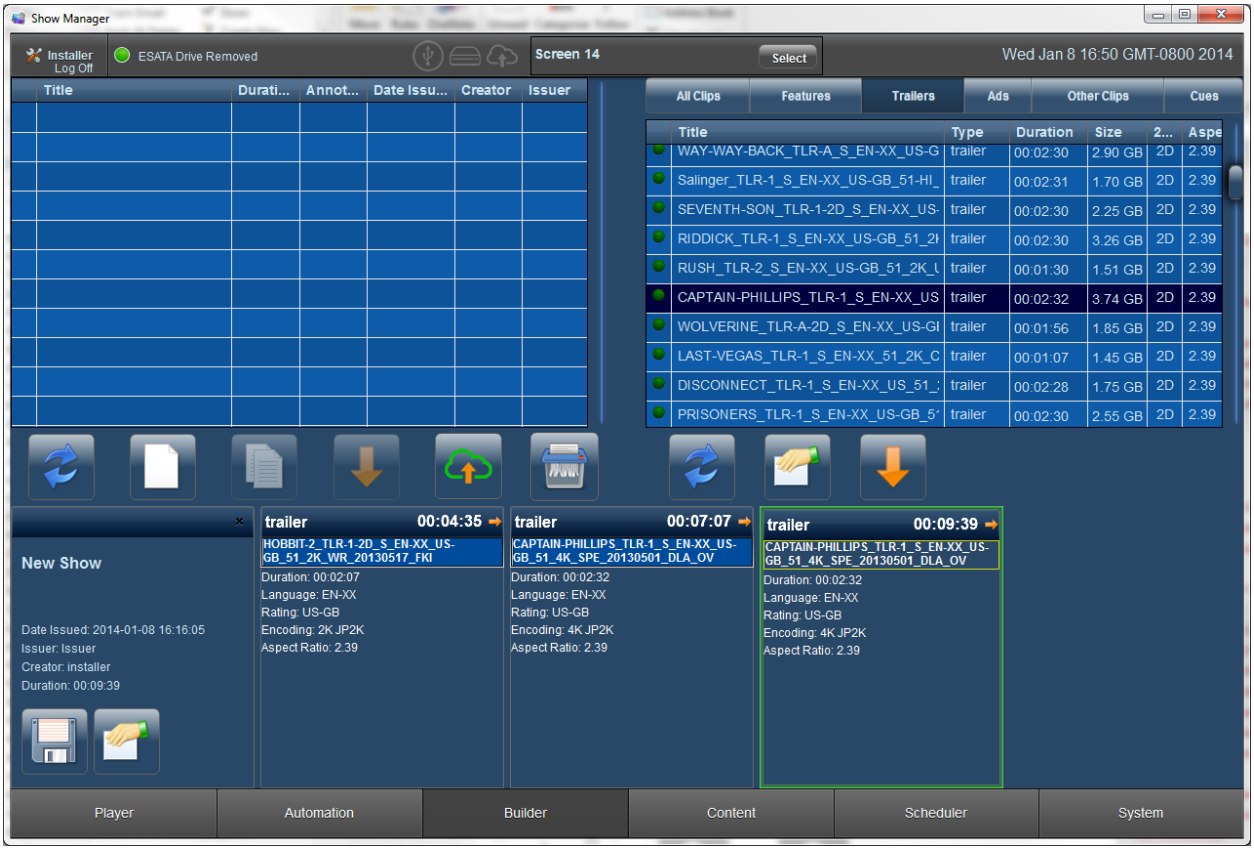

Figure 8-4. Adding Trailers to Playlist

If a mistake is made and the wrong content is added or the clip needs to be repositioned in the timeline, a **long press** (clicking and holding) on the content that needs to be altered will bring up the edit buttons. In Figure 8-5 the **Captain Phillips** trailer was added twice. A long press was done to the second instance and the edit icons have appeared.

The back arrow is used to move the clip to an earlier position in the playlist. The **Delete** icon will remove the selected clip.

Mover earlier **Delete** **Move later**

Figure 8-5. Making changes to a Clip

Saving the Playlist

When the desired content is added to the playlist, selecting the **Save** button in the playlist title block will save the show. The playlist will appear in the left data grid, with the **Title**, **Duration**, **Annotation**, **Creator**, and **Issuer** information as shown in 8-6. The unlock icon is displayed with the playlist as the encrypted feature contained in the show has a valid license. The unlock icon is also displayed in the timeline for the feature clip to make it clear that content has a valid key.

The timeline may be slid to the left or right to view other portions of the playlist when it extends past the view pane.

To help easily distinguish various types of content, differing colors are assigned to each content type as illustrated in Figure 8-6.

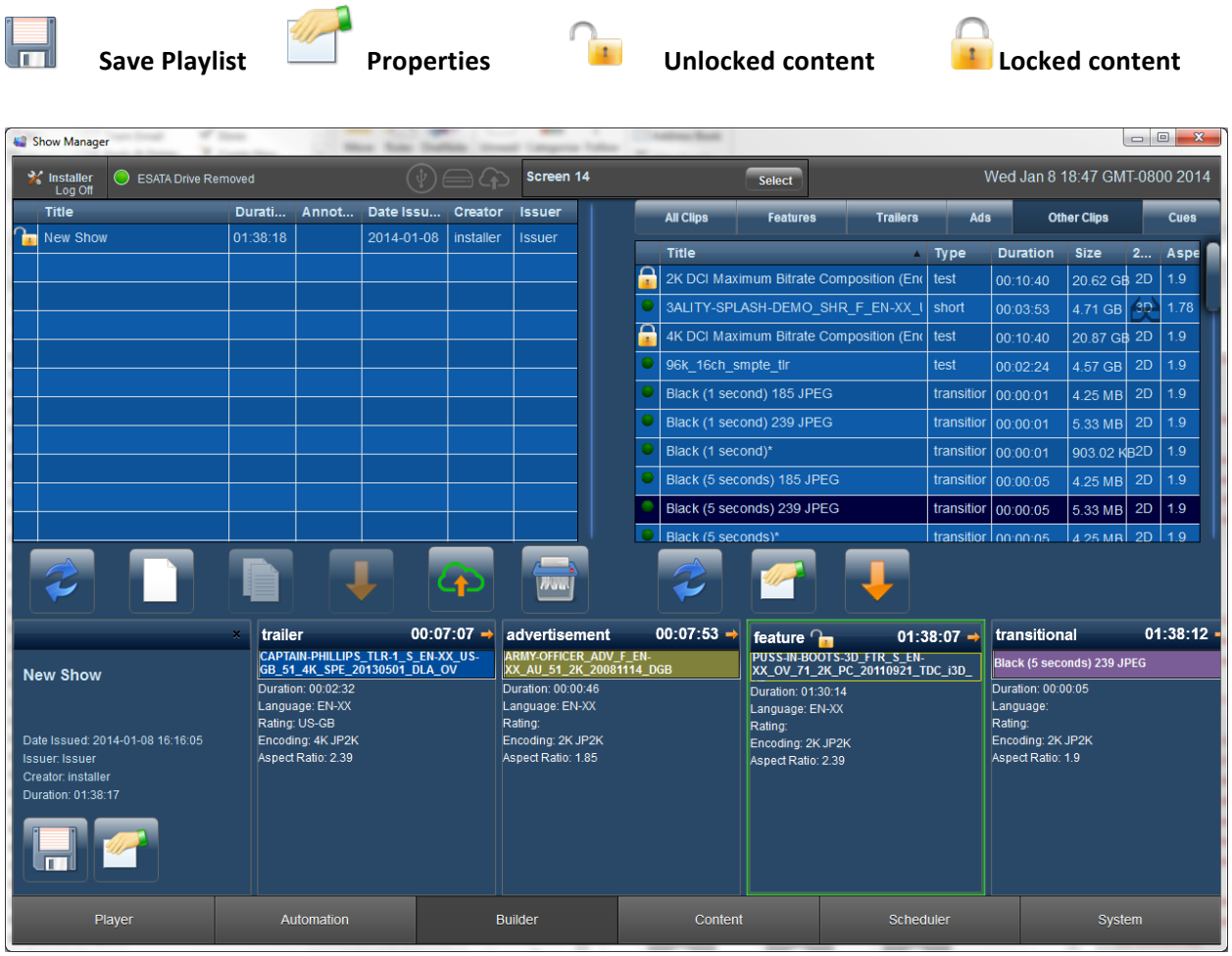

Figure 8-6. Saving Playlist

Automation Cues

With all of the content added, the next step is to add the automation cues required for this playlist. The CMS-2200 comes with many built-in cues to support the projectors, CMSA-100 and USL cinema processors. Figure 8-7, 8-8, and 8-9 show examples of the CMSA, projector, and audio cues that come built into the CMS-2200. Additional custom cues may be defined and added to the list as necessary

Figure 8-7. CMSA Automation Cues

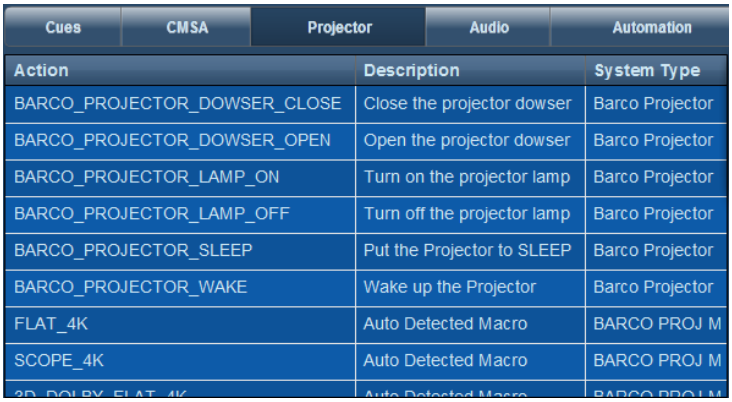

Figure 8-8. Projector Automation Cues

Figure 8-9. Audio Automation Cues

Adding Automation Cues

To add automation cues to the playlist, the first step is to select the clip to receive the cue. Double clicking on any of the predefined cues will quickly attach it to the selected clip in the timeline. A cue can also be attached to a clip by using the **Add** button.

In automation view there are buttons along the bottom of each clip to add automation cues. The **Add Cue** button is used to add an automation cue to the selected clip. The **Edit Cue** button is used to make changes to an existing automation cue and the **Delete Cue** button can remove a selected cue.

Clicking on the **Add Cue** button will bring up the cues dialog window (Figure 8-10), which will allow the selection of the appropriate cue and setting of the offset. The offset may be either from the **start** or the **end** of the clip.

Figure 8-10. Cues Dialog

Figure 8-11 illustrates the **Dowser Close** and **Audio Mute** cues that were added to the first clip of the playlist. Each as the default offset (00:00:00) from the start of the cue. Note that the timeline has changed to the automation view, so that each automation cue can be easily seen with its offset.

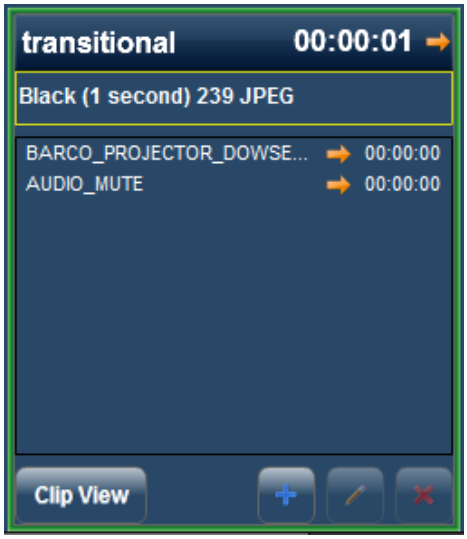

Figure 8-11. Cue Detail

Clip View

The **clip view** button will return the timeline to its normal view as shown if Figure 8-12. The automation cues are now identified as icons in the clip. The location of the graphics will be positioned relative to their offset within the clip. The timeline view makes it easy to quickly identify both where automation cues are, and what type of cue is located in each clip. The icons below categorize the cues.

Projector Cues **Ethernet Automation Cues** **Audio Cues**

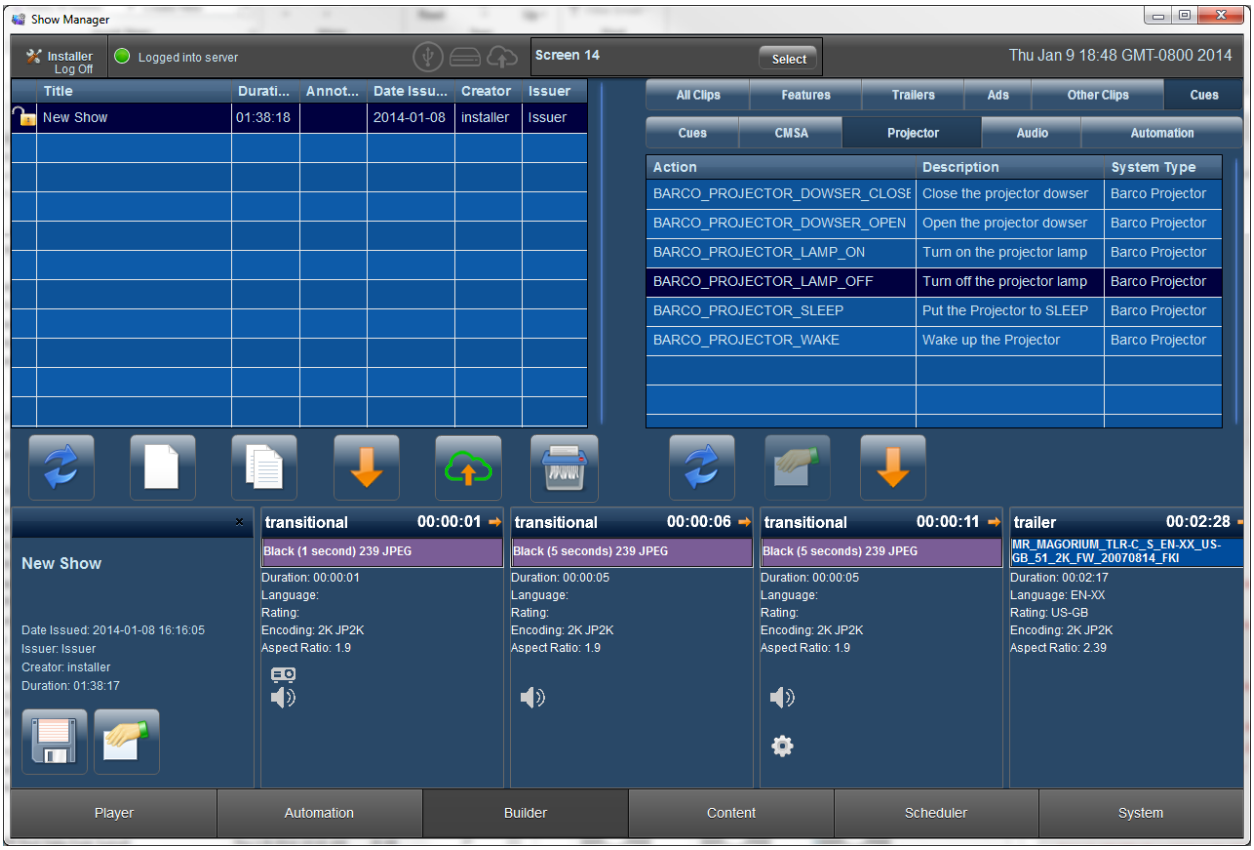

Figure 8-12. Clip View of Timeline with Automation Cues

Copy Playlist

Using the **Copy Playlist** button will duplicate the playlist in the grid that is currently selected. A dialog window will ask to confirm copying the playlist.

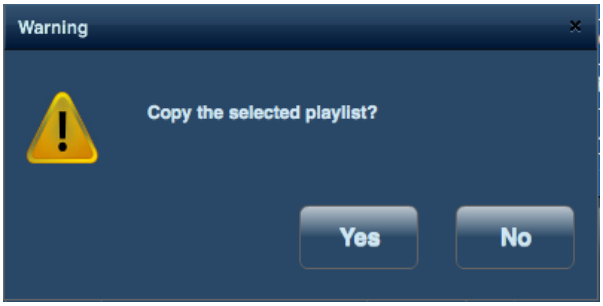

Figure 8-13. Copy Playlist

In the Figure 8-14 the **New Show** was copied to a second show and a third show. The title and main feature of each copied show was then edited. All three shows are now visible in the playlist pane on the left side of the builder display.

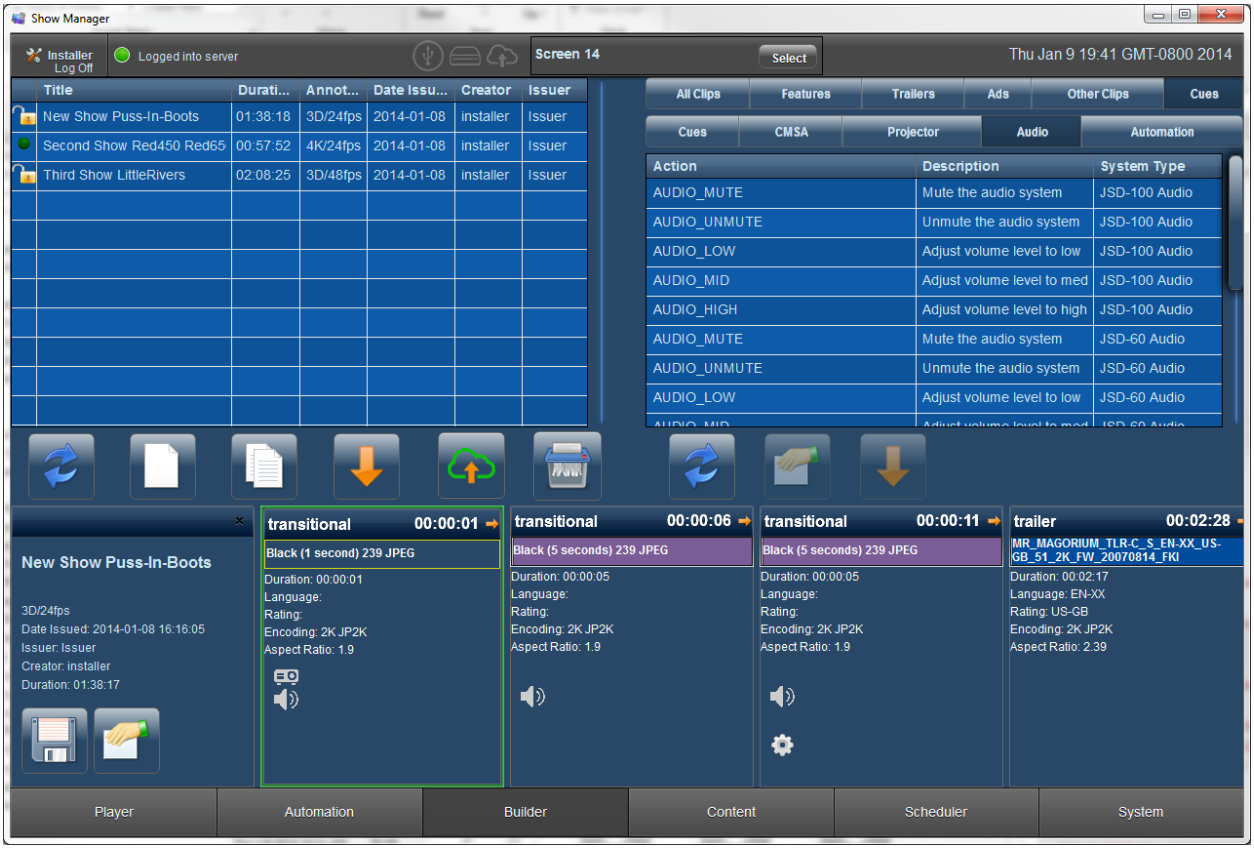

Figure 8-14. Several Copied Shows

Show Playlist Transfer

Users can transfer show playlists to other CMS devices using the upload button  . This feature will copy the order of clips and their attached cues to another CMS system. The content associated with those clips will need to be ingested on the receiving CMS for valid playback to occur.

Intermissions

Intermission support has been added. On the CMS Builder tab, you can add a secondary playlist as a cue to a playlist. When playback reaches this cue, the main playlist will stop, the secondary playlist will load and play to completion, then the main playlist will load and resume.

1. Build a playlist as desired that will be the intermission.
2. Click the middle of a clip pane to bring up “cue” view.
3. Click the reel icon to select a playlist to add as intermission.
4. A cue with the name of the playlist will be added. Select the cue and click the “edit” pencil button to change the timing.
5. Save the playlist.

9.0 Scheduler Tab

With show playlists created, the **scheduler tab** is used to schedule the shows. The scheduler tab is organized with the available shows listed in the upper left data grid. On the right side of the Schedule tab is the schedule calendar. The schedule calendar can be filtered by **All Days** or a **Single Day** along the top tabs. The **left arrow** and **right arrow** buttons can be used to move ahead or back in time.

To schedule a show, one of the available shows is selected by clicking on the show name and using the spinner control to select the start date and time. The **right arrow** button will place the show into the calendar. The calendar will display the **start time**, the **end time** and the **duration** of the show.

Schedule Show

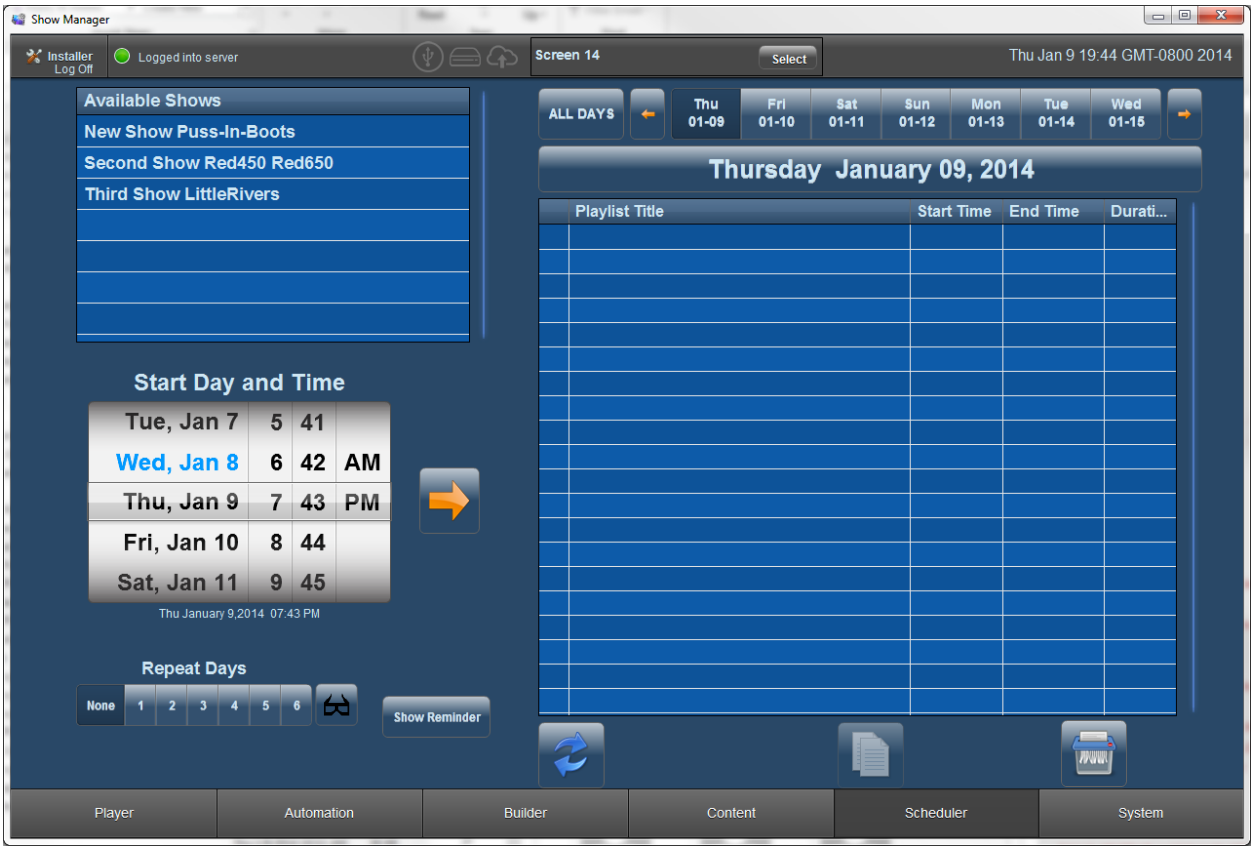

Figure 9-1. Scheduler Tab

In Figure 9-2, **New Show Puss-In-Boots** was added at 3:00 pm, 5:00 pm, 7:00 pm, and 9:00 pm.

The **Repeat Days** buttons are used to automatically add additional shows for the selected number of subsequent days. In the case of the 3:00 PM show the **Repeat Days** was selected for **5**, which also added the show for the next five days. Thus in Figure 8-3 the calendar shows the 3:00 show is also scheduled on the subsequent five days Friday, Saturday, Sunday and Monday and Tuesday.

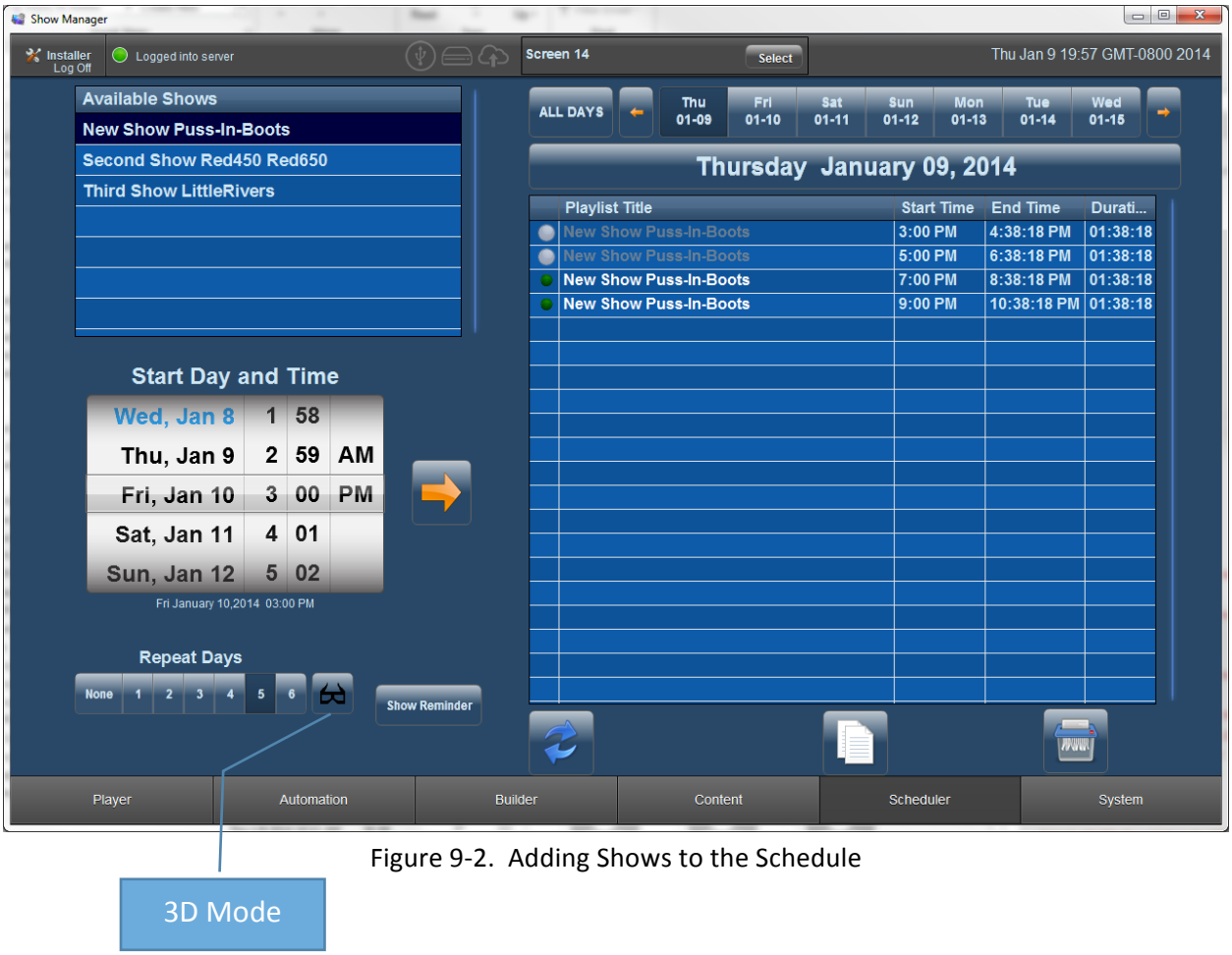

Figure 9-2. Adding Shows to the Schedule

3D Mode

If a playlist contains a 3D content select the icon before adding the show to the schedule. This will switch the CMS to 3D mode automatically when the schedule show is loaded. All 2D content in the playlist will be played in clone mode and display properly. For example a playlist containing a 3D feature with 2D trailers will be played seamlessly with the 3D icon applied to the scheduled playlist

Figure 9-3. Show Schedule Across Several Days

All Scheduled Shows displays shows scheduled over all days

Figure 9-4. All Scheduled Shows

In the case where adding a show will overlap in the schedule the following pop-up will warn of the overlap and the show will not be added to the schedule.

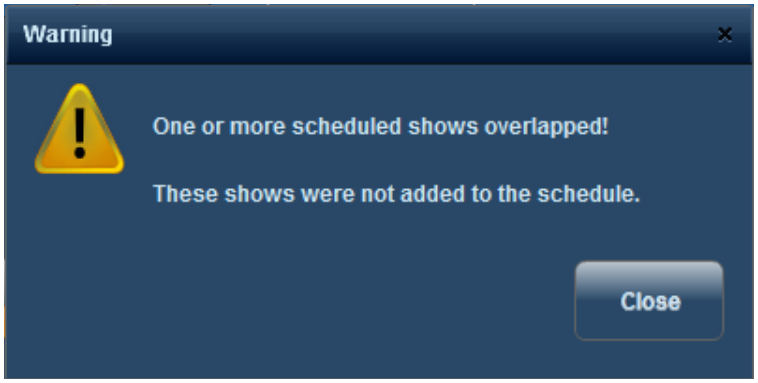

Figure 9-5. Warning Overlapping Schedules

In the case where a scheduled show needs to be moved, double clicking on the already scheduled show will bring up a change box as shown in Figure 8-6. This dialog box will allow the start time to be changed.

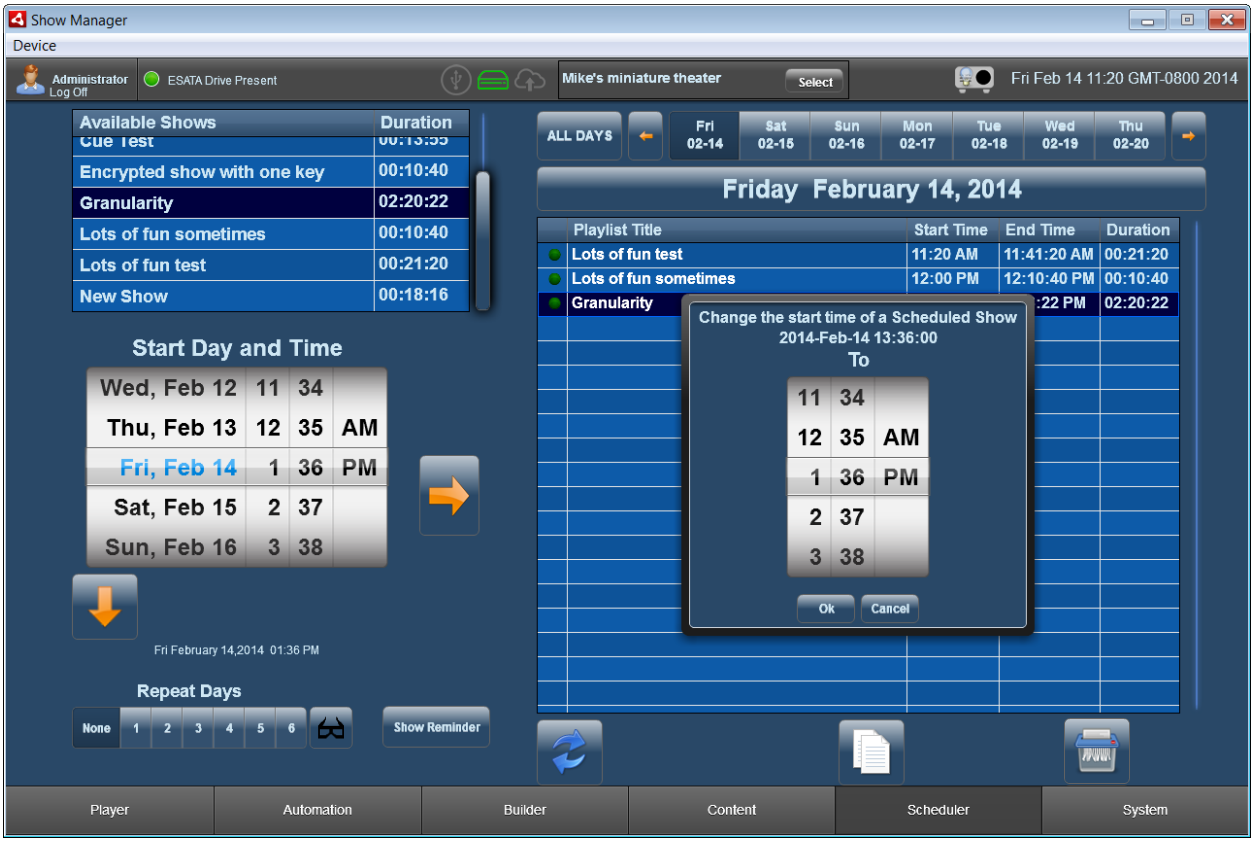

Figure 9-6. Change Start Time of Scheduled Show

Show Start Reminder

A show reminder can be set, which will create a pop-up alert before each scheduled show. The available alerts are 1 minutes, 5 minutes, 15 minutes, 30 minutes and 1 hour. The reminder will automatically close in 10 seconds, or can be closed immediately with the close button.

Figure 9-7. Show Start Reminder

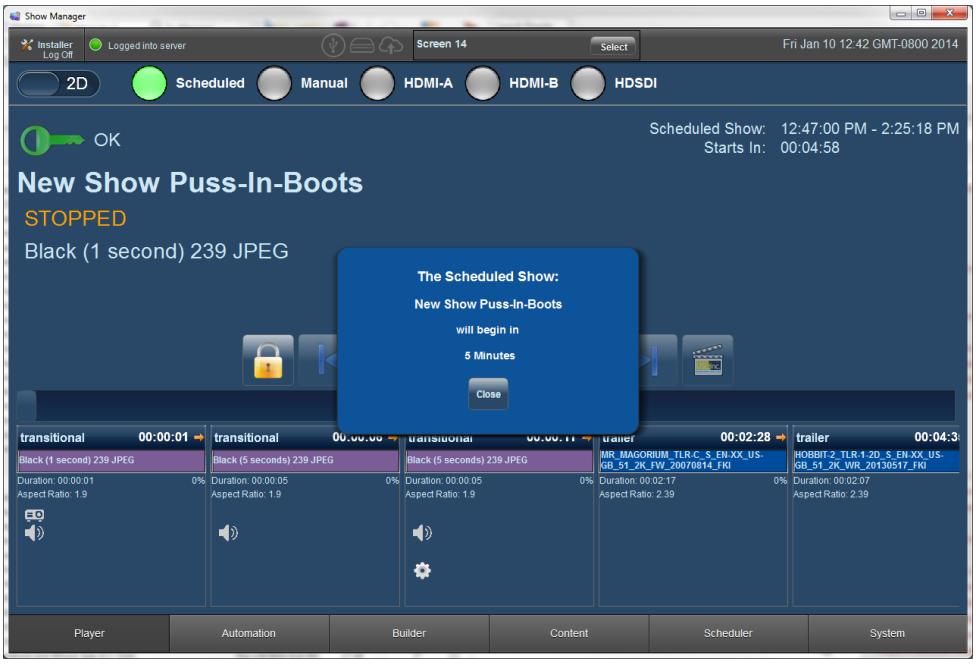

Figure 9-8. Reminder Pop-Up on Player Screen

Schedules are active as soon as they are created and the **Player** is set in **Scheduled** mode. When in scheduled mode, the player will automatically load the next available scheduled show and place it in the stopped mode. The scheduled **start** and **end** time will be available on the player in the upper right and the **Starts In** timer will countdown until the scheduled start time arrives and the show begins. When a scheduled show time arrives, the player will automatically start the show.

Even when in scheduled mode, the transport controls can be unlocked and used to manually override the schedule. The scheduler will not preempt a manual override or playing feature. The scheduler will wait until the player is in a **Stopped** state and then wait for the next available start time in a scheduled show. If the player is in a **Stopped** state when a scheduled start time arrives the player will play that show.

Copy Schedule

The **Copy Schedule** button will bring up a copy dialog box that allows a show to be copied forward up to seven days. Figure 8-8 illustrates the **Copy Schedule** feature. The **Second Show Red450 Red 650** show is selected (dark blue) so it will be the show that is copied forward. One or more shows can be selected for copying. If no shows are selected, then ALL shows will be copied forward the specified number of days.

 **Copy Schedule**  **Delete Schedule**  **Refresh Schedule List**

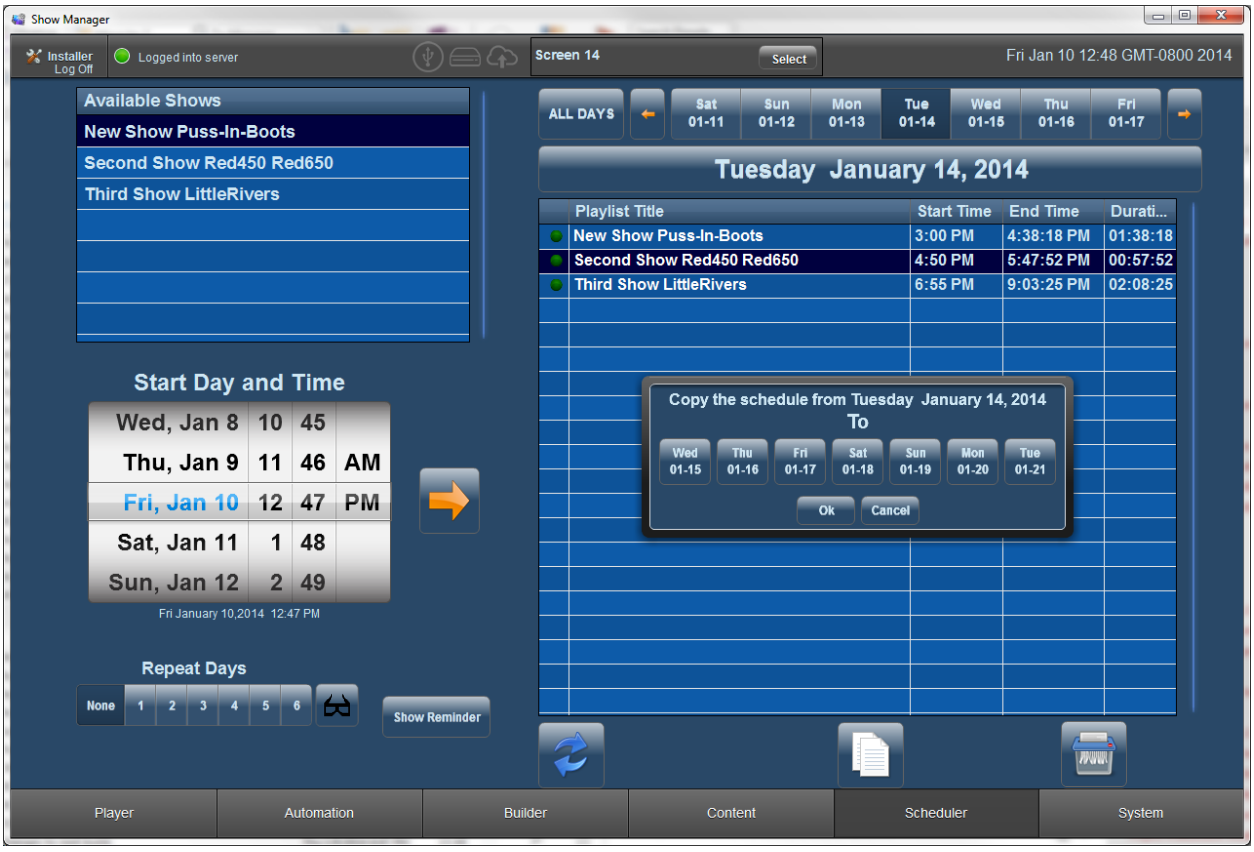

Figure 9-9. Copy Schedule

10.0 Automation Tab

CMSA-100

The **Automation** tab provides a direct visual representation of the USL CMSA-100 automation system. When a CMSA automation system is connected, pressing any of the automation buttons will flash that automation cue on the CMAS-100 unit. The LED on automation view will flash to indicate the cue was activated and the LED on the automation unit will also flash. The indicators above each function will flash when CMSA automation cues are triggered during a show that is playing.

The labels that below each button on the virtual CMSA-100 may be customized to display any alternative text

Browsing Automation Commands

On the bottom half of the **Automation** tab is a list of all the available automation commands. The **All**, **CMSA**, **Projector** and **Audio** buttons on the left can filter commands. To execute an automation command, first select it, and then press the **Fire Cue** button .

Figure 10-1. Automation Tab

11.0 System Tab

The System tab page is divided into System Status, Users, Security Reports and Settings subsections.

System Status

The System Status page provides detailed information on the CMS-2200 that is useful for diagnostic purposes. System statistics are displayed here, along with disk space usage, and the current RAID status. Additionally, the system log messages are displayed in the bottom part of the screen with the log message and the associated timestamp.

In the event the RAID needs to be resynchronized, clicking the button will begin this process. The CMS-2200 can run RAID resynchronization while playing content without any interruption or interference from this process.

Figure 11-1. System Status

Users Details

On the user details page, users may be added and assigned a user level. Users may be enabled or disabled. The user accounts reside on the CMS-2200. The standard tool buttons are available and listed below.

Refresh user list **Add new user** **Edit existing user** **Delete user**

Figure 11-2. User Details

The Add User pop up provides space for the user name, the user level, **Projectionist**, **Manager**, **Installer**, or **Administrator**; and a user password. User accounts can be enabled or disabled with the **User Enable** check box. It is important to note that users cannot create user accounts above their own level, thus only an administrator can create other administrator accounts.

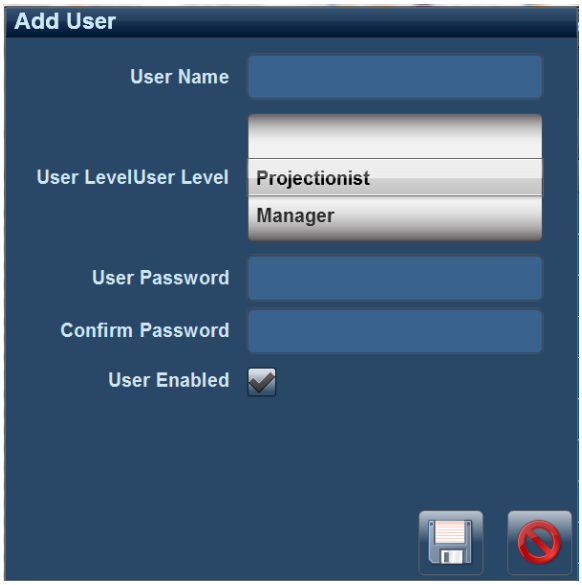

Figure 11-3. Add User Pop-Up

The Edit User tool will bring up the User details, however the passwords will not be displayed. In order to change the password the **Change Password** box must be checked. This will add a field for the old password to be entered, which will enable the new user password and confirm password values to be stored using the **Save Settings** button

Figure 11-4. Edit User

Security Reports

The **Security Report Manager** enables the user to generate Digital Rights Management logs for reporting to content distributors. Once a date range is chosen using the two spinners a XML Security Report can be generated and saved locally by using the **Save Security Report** button. The saved Security Report will only contain logged data that occurred in the chosen date range.

Figure 11-5. Security Reports

System Settings

Projector Settings

Projector Type

Projector Type should be selected with **Barco**, **NEC** and **Christie** are the available choices. The predefined Projector automation commands depend on having the correct Projector Type set.

2K/4K Setup

The **Downsample 4K** switch should be set **ON** for 2K projectors, so that 4K content will be automatically down sampled to 2K for projection. It should be set to **OFF**, for 4K projectors.

3D System Setup

The **3D System Type** should be set to the appropriate 3D configuration. Choices include None, Real-D, Dolby 3D and Other for different 3D systems.

Figure 11-6. Projector Settings

Note: Once the desired settings are configured use the **Save** button to apply them.

Server Settings

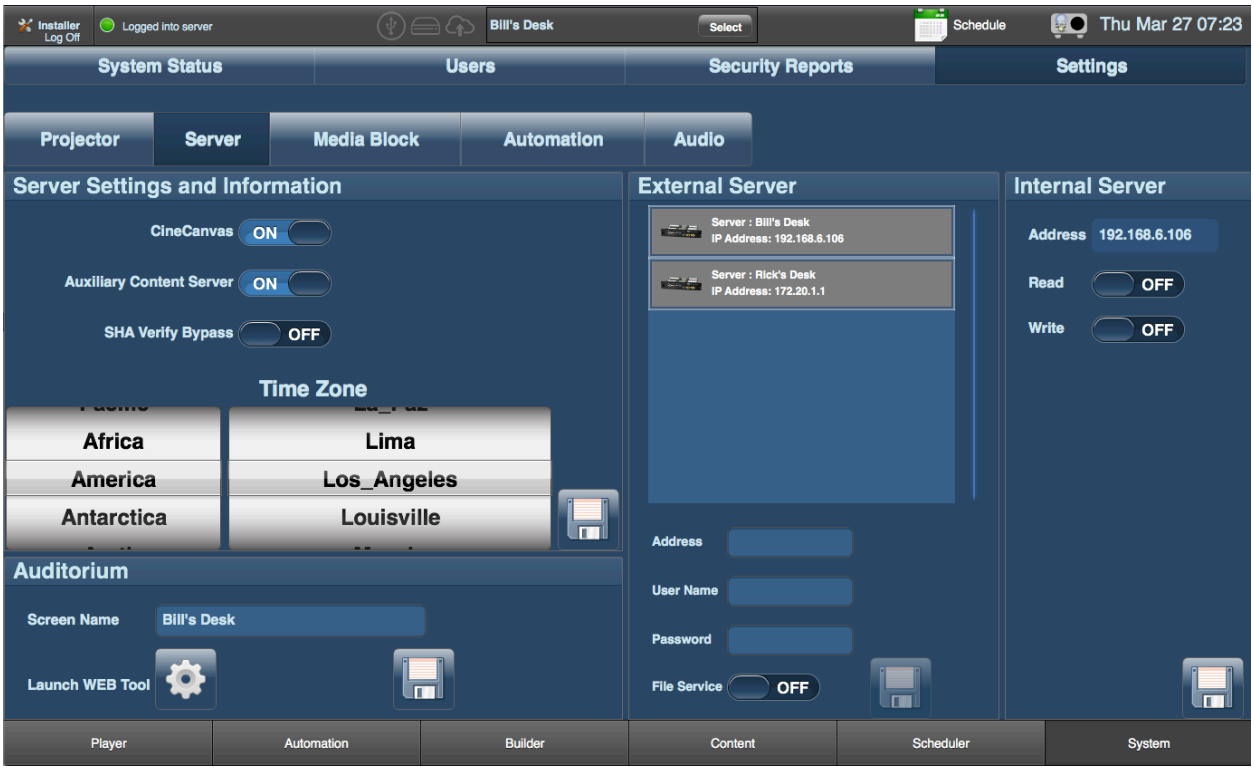

Figure 11-7. Server Settings

CineCanvas

Controls subtitles via the projector. It should be set to **ON** to support CineCanvas subtitles.

Auxiliary Content Server

If captioning support is desired the Auxiliary Content Server switch should be set to **ON**.

SHA Verify Bypass

This switch provides a way to bypass the verification of the SHA hash. It is recommended to be set to **OFF** so that the validity of content assets can be verified during the ingest process. Having the bypass set to **OFF** will increase the time of the ingest process.

Time Zone

The device time zone should be set for the local time zone that the CMS-2200 is in. To avoid confusion, verify that the system running the SMS software is also in the same time zone.

Screen Name

This field changes how the CMS-2200 appears in the Overview Screen and to other clients.

Launch Web Tool

Brings up the USL CMS-2200 Web interface. This interface is used to update the software, retrieve logs, and configure settings described in Section 12.

External File Service

Each CMS-2200 has the ability to connect to Manger stations, Network Attached Storage (NAS) servers and other CMS-2200's located on the Media Network. A properly configured Media Network allows

content to be transferred seamlessly between separate networked devices, simplifying the ingest process for multiplex theaters. To enable these features make sure the **File Service** switch is set to **ON**. To add an external server either choose it from the list of discovered devices or manually add it using address field.

If you are mounting another CMS-2200 as an external server the default login credentials are below.

Username: **ftp**

Password: ftp

A green cloud icon will activate in the Status Bar once a successful connection has been established. Content from other devices will now populate in the External Content pane of the **Content** tab and can be transferred like any other physically attached storage device. For more information on Media Network setup see the Media Network portion of Section 3.

Note:	After establishing a connection, allow a few minutes for a full initial scan of the networked storage device.

Internal File Service

To share a CMS-2200 on the Media Network – allowing internal content to be accessed on other devices – turn the **Read** switch to **ON**. Ensure that the address field is consistent with the IP address schema outlined in Section 3 – Media Network. If you wish to allow **Write** capabilities on other devices set the corresponding switch to **ON**. When the desired settings are made save them with the icon in the lower right.

Note:	Both **Read** and **Write** functions must be enabled for transferring content between CMS devices and for most Theatre Management (TMS) actions.

To check if the Internal Server has been configured correctly, fall back to the Overview screen. Any CMS-2200's with enabled Internal File Service will appear with the green cloud icon in its status with the corresponding IP address.

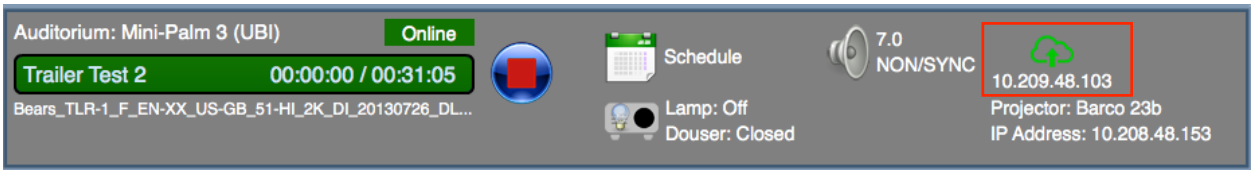

Figure 11-8. Overview of Internal Server

Media Block Details

Figure 11-9. Media Block Settings

Internal Information

The **Internal Media Block Information** pane has specific model and version details for the media block.

Security Status and Marriage

Marriage – Will be Active if both Physical and Logical Marriages are OK

Physical Marriage – Monitors the tamper state of the ICP

Logical Marriage – Monitors the secure communication between the CMS and projector

Enclosure – Indicates the state of the IMB security heatsink

Service Door – Monitors the current state of the service door tamper switches.

Battery – Indicates the current status of the security battery. When the battery indicates low, it should be replaced according to the procedure in Section 14.

Warning: It is important that this procedure be completed carefully and according to the procedure, as the battery is responsible for maintaining the secure keys for the CMS-2200. If the procedure is not followed correctly, the keys will be lost and the CMS-2200 will be unusable.

Adjust Media Block Time

This section indicates the current media block time, which is used for all logs and secure time. The media block time is allowed to be adjusted +/- 360 seconds within 365 days. The current offset is shown and the slider may be adjusted to provide a new offset setting. The **Save button** must be used to store the new offset.

Adjust HD-SDI Settings

This pane allows you to match the input mode of a variety of HD-SDI sources.

Automation System

The Automation subsection of System Settings is where automation commands can be viewed, added, edited, or removed. The left most button toggles between predefined and user defined commands. The remaining buttons filter automations by category. Predefined automation commands cannot be edited or removed in the SMS software.

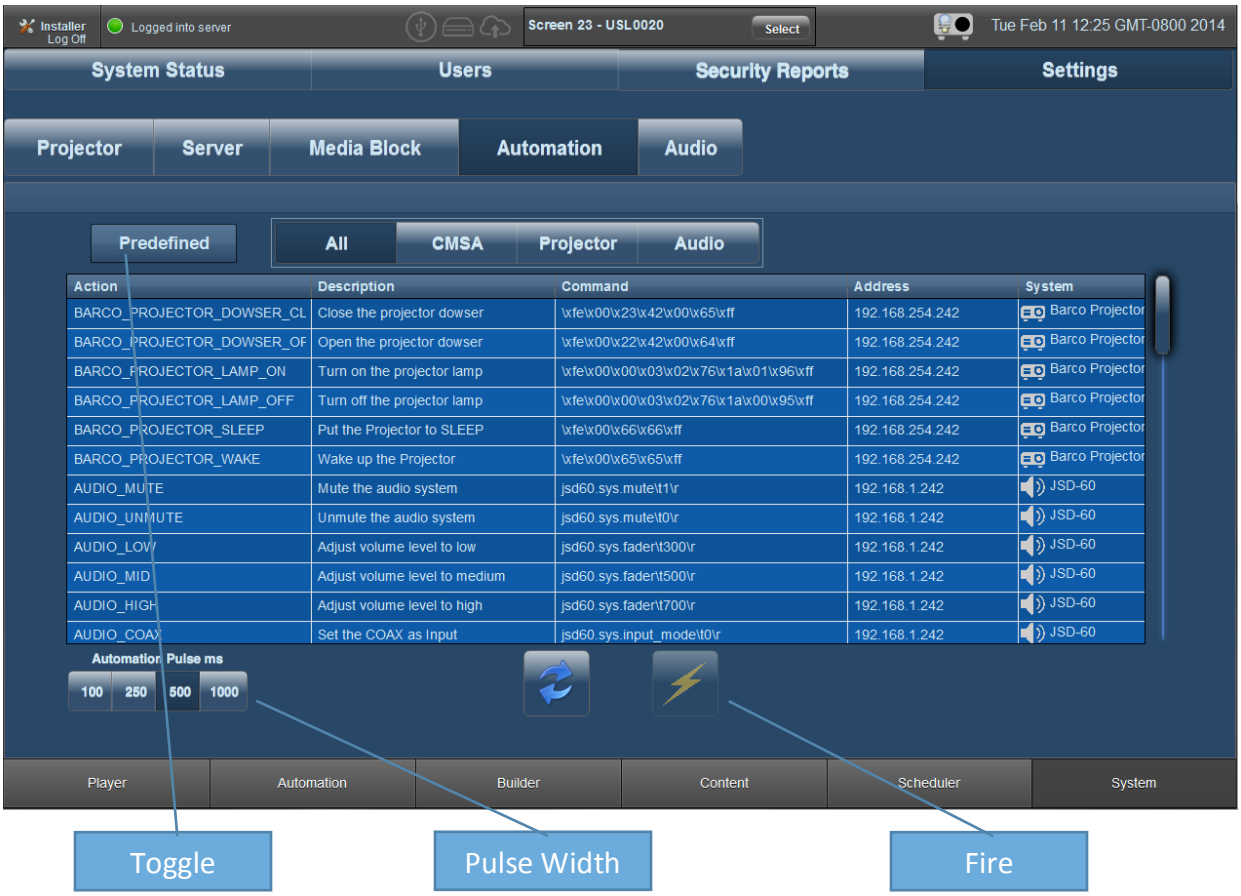

Figure 11-10. Automation System Settings

To add a command to the automation library, set the toggle button to **User Defined** and use the **Add icon**. Fill in the required red fields and choose a relevant category for the command before saving. You may test that command sends properly by using the **Fire** button.

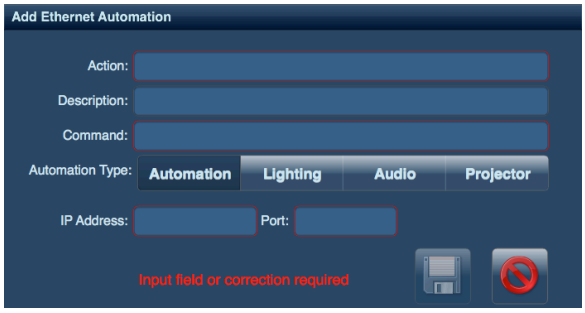

Figure 11-11. Custom Automations

Audio Settings

Audio System Type

The spinner should be set to the cinema audio processor being used. When the audio system type is changed, the Predefined audio automation commands in the system will change to match the new device.

Audio System IP Address

Enter the IP address for the cinema audio processor, which will be used to send Ethernet automation commands to the cinema audio processor. The **save button** must be used to store the new setting.

Audio Delay

The audio delay is used to synchronize the audio and video from the CMS-2200. The slider may be used to set a +/- 200 ms offset in the audio. The **save button** must be used to store the new setting.

Audio Sampling Mode

The sampling mode can be set to 96 KHz or 48 KHz sampling. When set to 48K, the CMS-2200 will down sample all audio to 48 KHz sampling. When set to 96 KHz, the CMS-2200 will play audio in either 48 KHz, or 96 KHz sampling as provided by the DCP.

Channel Routing

The CMS-2200 can be configured to support custom audio routing of DCP's with SMPTE audio formatting. If the DCP is not packaged as SMPTE audio, interop channel assignments will be the default output.

MDA Audio Rendering

A DCP containing the MDA immersive audio format can be pre-rendered for specific auditoriums during the ingest process. To enable ensure the **Render MDA Audio** switch is set to **ON**. Next, use the **Browse** button to load the VBAP theater configuration file that specifies your auditoriums dimensions. If you are unsure if content has MDA audio formatting check its properties in the Content tab.

Note: To apply any setting change, press the Save icon at the lower right of the window.

12.0 Web Interface

The USL Web interface is a browser-based tool that utilizes Python scripts to automate numerous tasks for the CMS-2200. To use the USL CMS-2200 Web interface open a web browser to the following address.

http://ip_address_of_the_projector:43758

For example:

http://192.168.254.246:43758

or

http://192.168.254.246:43758/cgi-bin/pycgi.py

Here is a list of actions that can be accomplished via the CGI interface.

- Configure CMS
- Export automation database
- Export configuration files
- Get playback status
- Import configuration files
- Import settings package
- Revert automation to factory settings
- Set IMB projector IP and type
- Start playback
- Download SMS software update
- Export playlist
- Generate log package
- Import automation database
- Import playlist
- Reboot CMS-2200
- Revert configuration to factory settings
- Show last update log
- Stop playback

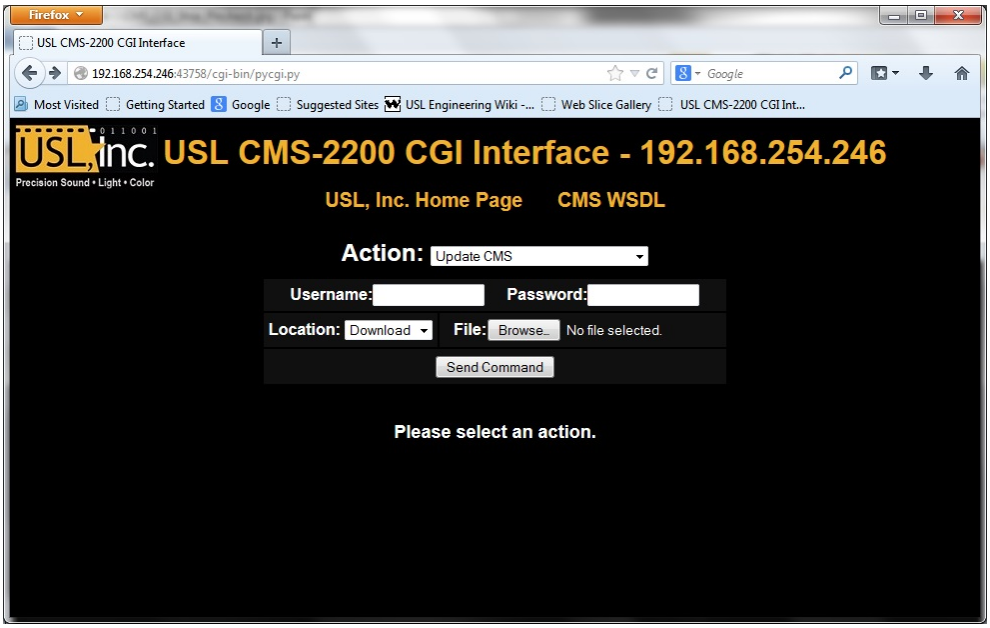

Figure 12-1. Web Interface

Update CMS

Update CMS, shown in Figure 11-2 is used to load a software update to the device. The **Username** and **Password** fields verify user access level credentials. The update location may be the USB port on the front of the CMS-2200 or a local file (**Download**). The **Browse** button is be used to navigate to the code package file. The **Send Command** button will send the command to the CMS-2200 and initiate the update process. Figure 12-3 shows the results of an update CMS command, which provides details as each process completes.

The CMS-2200 update will include updates to the Web interface and updates to the SMS software stored on the CMS-2200. After any CMS-2200 update, the **Download SMS** command should be used at all SMS locations to download the matching SMS client.

Figure 12-2. Update CMS

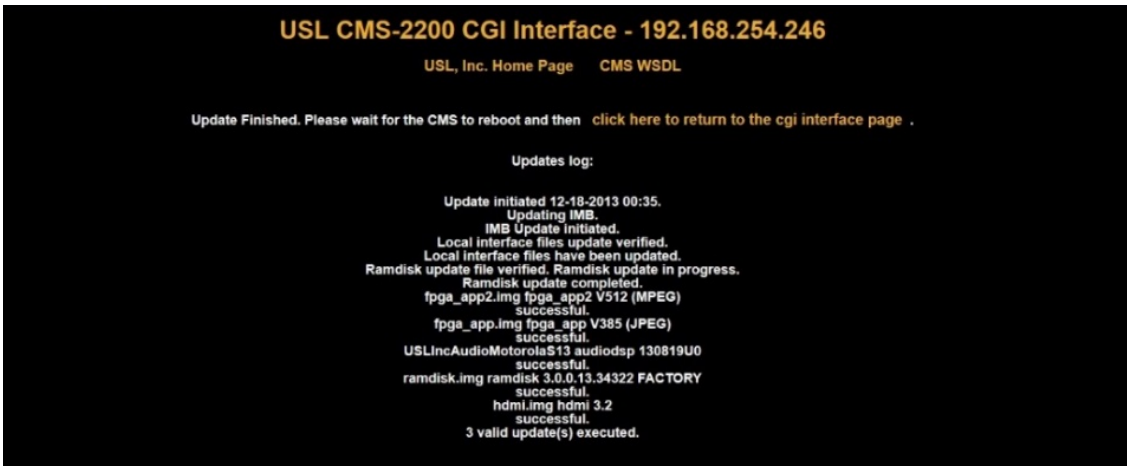

Figure 12-3. Update CMS Results

Figure 12-4 illustrates the **Set IMB Projector IP and Type** function. This sets the **Projector Type** (Barco, NEC, or Christie) and **IP address** on the CMS-2200. This function is important in configuring the CMS-2200 to communicate with the projector and the auditorium networks.

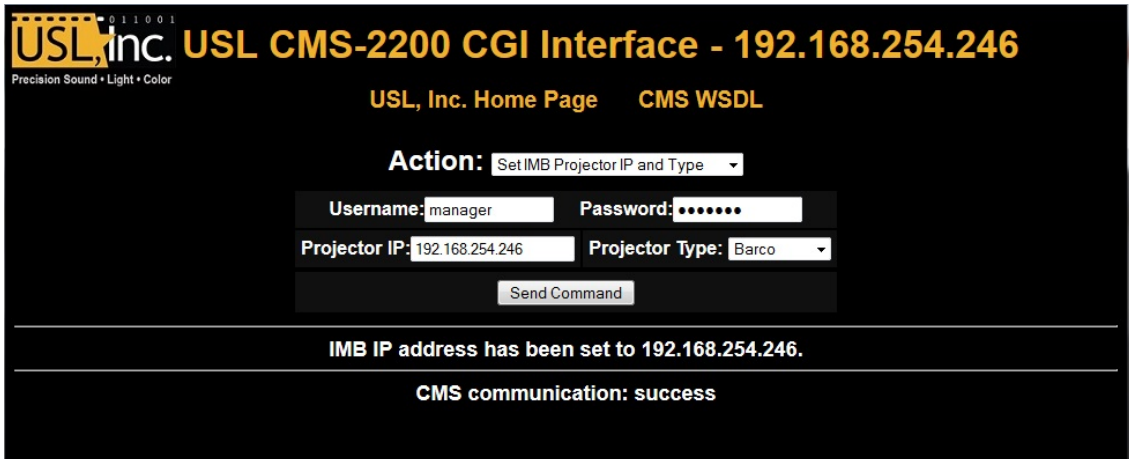

Figure 12-4. Set Projector IP Address and Type

Generate Log Package

The **Generate Log Package** function is used to extract the logs from the CMS-2200. This process can take several minutes to complete.

Caution: Do NOT generate log packages while playing content. The process could interfere with the playback and possibly interrupt the show.

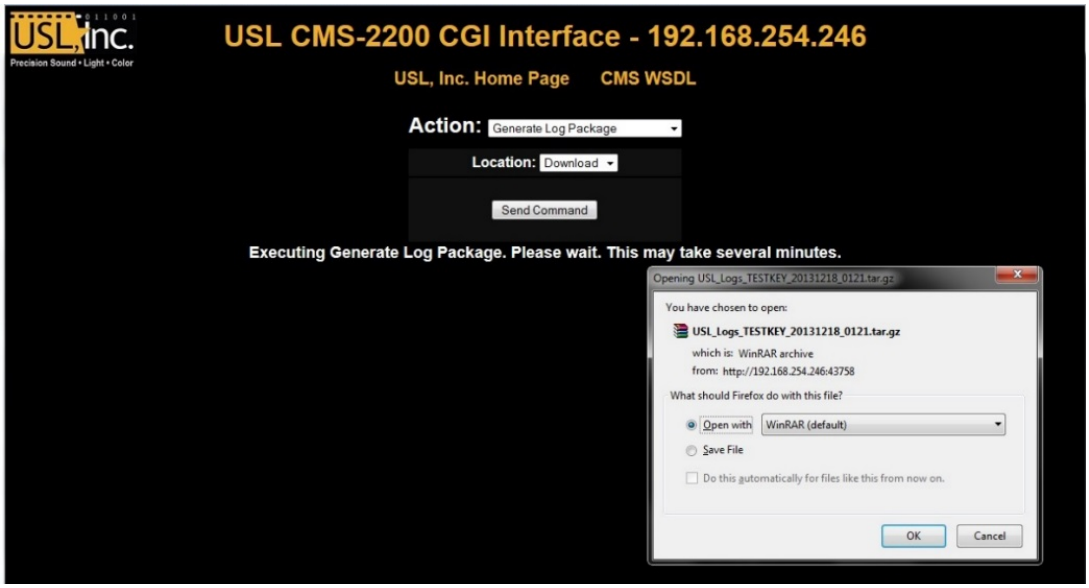

Figure 12-5. Generate Log Package

Edit System Configuration

An important use of Web Interface is to easily edit some of the CMS-2200's backend settings. To make changes to these settings, choose Edit System Configuration from the dropdown menu and enter valid login credentials. Many of these settings are also accessible from SMS software.

Network Configuration

This menu allows edits to be made to the IP address assignments for the Projector, Aux Port (Automation Network), and Data B Port (Media Network).

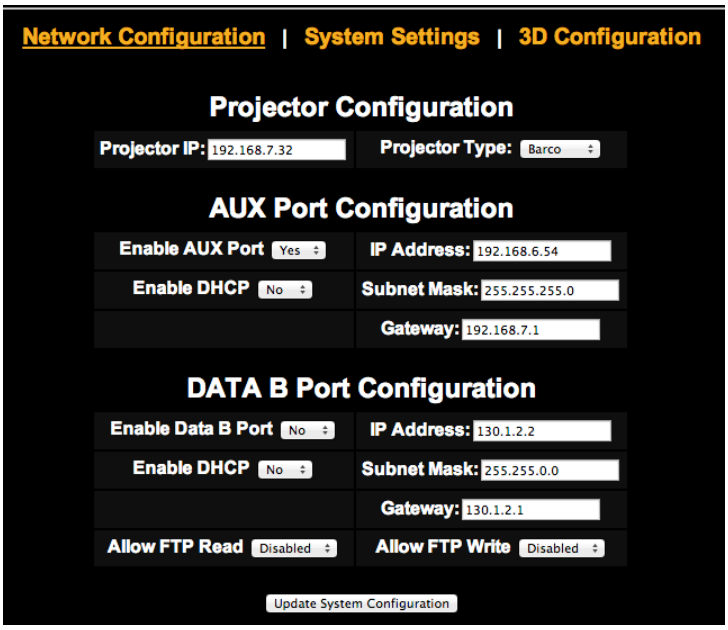

Figure 12-6. Network Configuration

Projector Configuration

The Projector IP should match the location of the projector on the network.

AUX Port Configuration

The AUX port allows an alternate route for automation commands to reach the projector. The IP assignments can be manually set in this menu.

Data B Port Configuration

The Data B Port is used for many of the content transfer features of the Media Network described in Section 11 – Server Settings. To enable content transfers between CMS-2200s, manager computers, and NAS servers **Enable** the Data B Port and FTP Read/Write. The recommended IP schemes are located on the Tables in Section 3.

Note: Any setting updates in the Web interface will require a reboot of CMS-2200 to be applied.

System Settings

This menu contains many of the settings described in the System Settings tab of the SMS software. For more information on a specific setting see the matching category of Section 11.

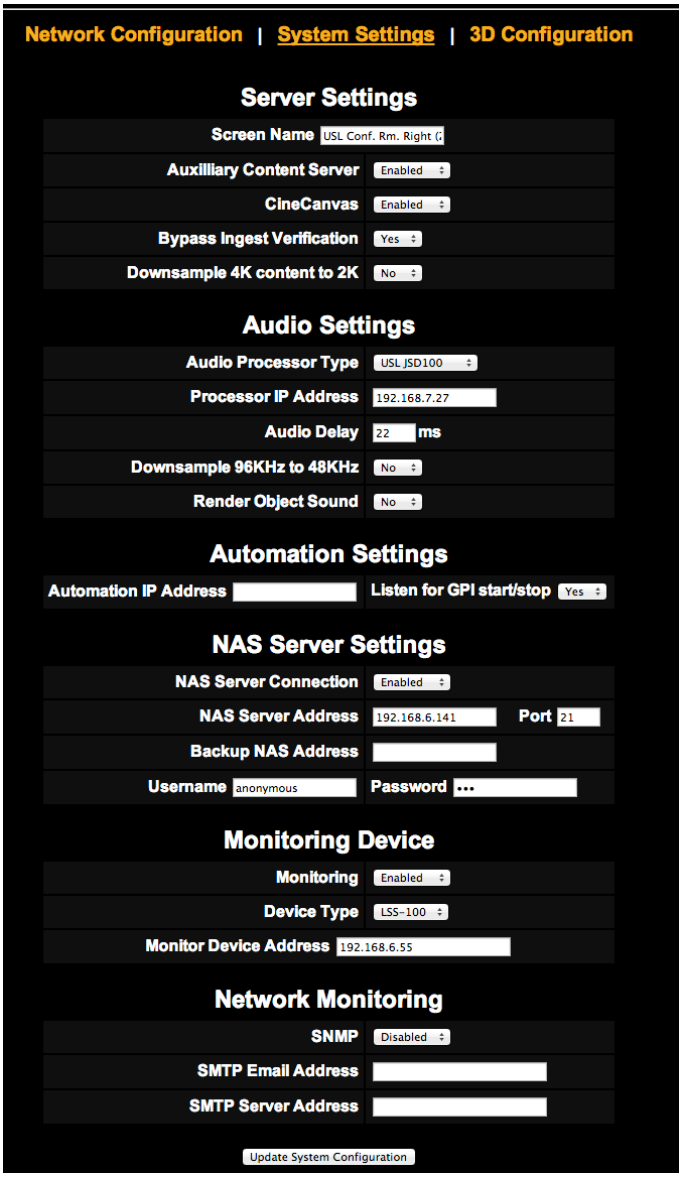

Figure 12-7. System Settings

Note: Any setting updates in the Web interface will require a reboot of CMS-2200 to be applied.

Note: Some options in this menu may still be in development

3D Configuration

It is recommended to use the default 3D settings for your 3D system, but if changes are needed visit the 3D Configuration Menu of the Web Interface. Default settings may be restored at any time by using the **Restore Defaults** button.

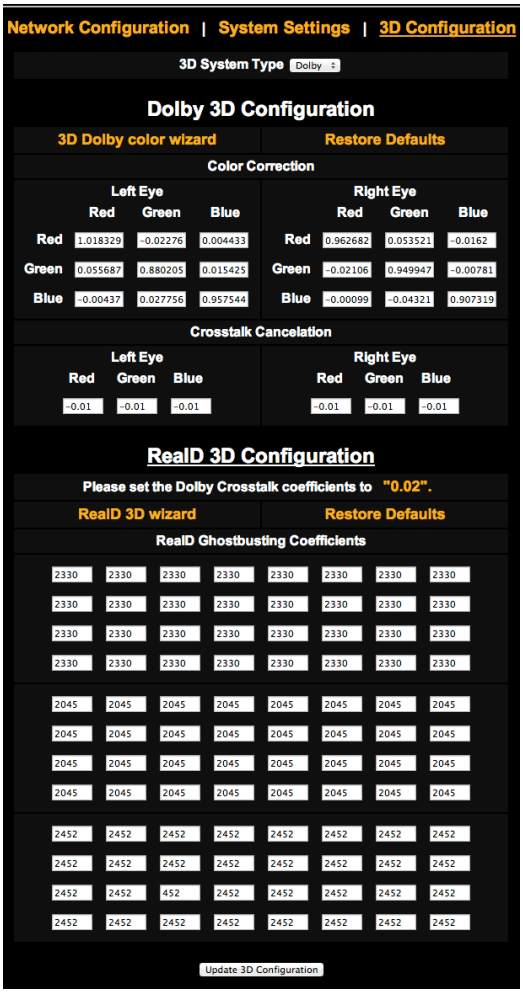

Figure 12-8. 3D Configuration

Dolby 3D Configuration

If Color Correction or Crosstalk Cancelation tweaks need to be made manually enter desired values or follow the 3D Dolby Color Wizard.

RealD 3D Configuration

Enter RGB Ghostbusting Coefficients manually or follow the RealD 3D Wizard.

Note: Any setting updates in the Web interface will require a reboot of CMS-2200 to be applied.

13.0 Long Term Maintenance

Care and Maintenance

To meet DCI and FIPS requirements, the CMS-2200 is manufactured with a 3.0V Lithium Ion battery. The battery is designed to have a full 10 years of life from the date of manufacturer. When unused, the battery is designed to have a one year shelf life from the date of manufacture.

USL recommends the EP-100 supply be used to keep CMS-2200 units powered if they are kept unused for long periods of time. The EP-100 supply will keep the CMS-2200 powered and in reset mode, to provide maximum battery life to the product. When the CMS-2200 is powered it will have a 10 year battery shelf life.

Note: The highest battery drain occurs when a CMS-2200 is first powered and then subsequently removed and stored for a long period of time. In this state the battery is holding up the marriage tamper alarm, which is the maximum battery drain on the battery. The EP-100 supply eliminates this battery drain by powering the CMS-2200.

Replacing the Battery

The battery status can be checked in the security status section of the **Media Block** tab in **System Settings**. The SMS software will issue an alert when the battery needs to be replaced. The battery is designed for a full 10 year life of the product, but it is field swappable if necessary.

Warning: It is important that this procedure be completed carefully and according to the procedure, as the battery is responsible for maintaining the secure keys for the CMS-2200. If the procedure is not followed correctly, the keys will be lost and the CMS-2200 will be unusable and must be returned to USL.

Caution: Risk of Explosion if the battery is replaced by an incorrect type. Dispose of used batteries according to the instructions and local law. Replace only with the same or equivalent type.

There is an online video demonstration for replacing the battery on a CMS-2200. USL recommends watching this video to become familiar with the process before attempting a battery replacement.

- ☐ Parts and Tools required for the procedure include:
  The replacement battery (CR2477)
  An interim battery (CR2032)
  Loctite
  Phillips screw driver

- ☐ Remove six screws holding the top board in place
  Do not lose the lock washers that go with the screws.

- ☐ Remove ISS upper board by lifting gently near the PCI interface connector at the rear of the unit.
  Note that the keyed card between the cards must be inserted correctly, or it will damage the boards.

- ☐ Locate the battery and remove rubber retaining lid from existing battery.
  Do not remove the battery yet

- ☐ Install the interim battery (CR2032) into the interim slot on the board.
  Allow approximately 30 seconds for the voltages to equalize before proceeding.

- ☐ Remove the old CR2477 battery by lifting it up.

- ☐ Replace with the new CR247 battery ensuring that it is fully seated in the holder
  Again allow approximately 30 seconds for the voltages to equalize before proceeding

- ☐ Remove the interim battery by gently pulling the retaining clip out of the way and lifting the battery out.

- ☐ Replace the rubber retaining lid on the new battery

- ☐ Re-install the upper ISS-1200 board; ensure the keyed riser is properly installed.
  Note the front of the card is mated with the front panel first and then the rear of the card is pressed down into place.

- ☐ Replace the six screws holding the two boards together, paying attention to use the lock washers for each screw.

- ☐ The CMS-2200 is ready for replacement into the projector.

Check the **Media Block** settings, under **Settings** in the **System Tab** to check the battery status. If the procedure was completed properly the battery will report **OK**.

Replacing a Solid State Drive

Solid state drives were chosen for the CMS-2200 specifically because of their long term reliability. It is expected that over a 10 year product life that no solid state drives will fail, however the drives are field swappable in the unlikely event that a drive needs to be replaced. An online video demonstrating drive replacement can be found on the CMS-2200 product page on the company web site.

The SMS software will indicate a failed drive for a CMS-2200 on the system screen. It is important to replace the correct failed drive to maintain the integrity of the raid storage. It is also critical that the replacement drive from USL matches the firmware and specifications of the existing solid state drives. USL maintains a record of all drives shipped with its CMS-2200 products.

- ☐ The parts and tools required for this procedure.
  A replacement solid state drive from USL.
  A tamper seal (included with the replacement drive)
  Anti-static protection.

- ☐ Remove the two retaining screws on each side of the solid state drive.

- ☐ Break the tamper seal holding the drive in place.

- ☐ Gently remove the hard drive by sliding it out to the side of the CMS-2200.

- ☐ Slide in the new hard drive and press if firmly into the connector.

- ☐ Replace the two retaining screws.

- ☐ Install the tamper seal provided with the replacement hard drive.

The CMS-2200 can now be reinstalled in the projector. The new drive will automatically be integrated into the raid array. This process can take several hours to complete. USL recommends leaving the system turned on for two hours to ensure the process is complete and the drive is fully integrated into the raid system. The system may be turned off at any time before completion, it will simply take longer for the raid integration process to complete. The CMS-2200 is fully functional and ready to ingest content and stream movies while the raid integration is proceeding. The process will run entirely and transparently in the background.

Diagnostics

There are a wide variety of things that can go wrong when installing and using the CMS-2200 system. USL has provided a number of built in diagnostic tools that can be used to help identify the issue and determine what the required actions are.

In general problems fall into two categories, those related to install and configuration, and those that occur during normal operations. In both cases USL's customer service is available to assist with whatever problems occur. It is important to always have the serial number of the CMS-2200 unit when contacting USL so the product history can be looked up to help resolve the problem.

First Steps

The first step for many problems are to make sure all the cables are properly connected and that all the equipment, projector, CMS-2200, cinema audio processor, automation equipment, amplifiers, network routers, etc. are powered on.

Next, be sure there are no network issues and that the SMS software can communicate correctly with the processor. It is also valuable to check the GUI interfaces for the projector and audio processors to be sure that equipment is configured correctly and operating as expected.

Front Panel LEDs

Status Light on the CMS-2200. Normally the **Power LED** will be **ON** indicating power is available and the **Ready LED** will be **ON** indicating the processor is up and functioning properly. It is normal to have **Status** and **Sync LEDs OFF**.

The internal solid state drive LEDs (**Drives 1-4**) should **flash** when in playback or content ingest. It is normal for these LEDs to be **off** during other times.

SMS Software Tools

The SMS software has a number of diagnostic displays that should be checked. Simply connecting from the SMS to a CMS-2200 is an indication that the CMS-2200 is on the network and communicating properly with the SMS software.

Be sure to check the SMS software version located in the show manager settings on the **Theater Overview** page. If necessary the Web interface can be used to download current SMS software from the CMS-2200. It is important that the software on the CMS-2200 match each other.

Alert Messages.

The SMS Player screen will display the current player state, which is usually stopped or playing. It will show **Error** when there are problems with the keys, or content or playlists. Check the **alert messages**, located in the **status bar** for a list of current warning or errors along with the **time, IP address**, and **screen name** associated with the event. **Green dots** indicate information, **yellow dots** indicate warnings and **red dots** indicate errors.

System Status

The system status can be checked in the **system tab**. There are a number of statistics listed on this display. Normally the statics should be zero, except the top two items. The first **(del)** is the number of frames delivered and the second **(req)** is the number of frames requested. These two numbers should match and will reflect the current number of frames that have been streamed for the current playback.

System Logs

Along the bottom of the system status page is a scrolling list of system logs. The list is a 255 entry buffer from the CMS-2200. This display provides a convenient window into the CMS-2200 system logs to see what is happening at any given time.

Disk Space and Current Raid Status

For drive space and storage issues, the RAID status will list the status for the drives and provide the tools to resynchronize the RAID as necessary.

The Web interface

The primary diagnostic tool in the Web interface is the log package generator. The Generate Log package command is used to download the log file to the browser for storage, or to a USB drive attached to the CMS-2200. This command can take 5 minutes or more to complete, so patience is required. The log file can be saved and sent to USL. The logs are the most detailed source of diagnostic information that can be used to resolve almost any difficulty.

Another Web interface command commonly used is Reboot CMS-2200. This command will reboot the CMS-2200. This command has the advantage of resetting the CMS-2200 without needing to power-cycle the projector. Thus it avoids the lamp cool-down time associated with projector power cycles.

The USL website

The USL website can be very helpful in resolving issues. Check the website for CMS-2200 and SMS FAQs, to see if the problem has been reported and a solution is available.

Installation and configuration issues can often be resolved by watching the training videos that USL provides on various CMS-2200 subjects.

A trouble ticket may be completed online, which USL's customer service team will investigate and provide a response to.

If the problem is still not resolved, call USL customer support directly at +1 (805) 549-0161.

14.0 Product Support

USL proudly stands behind its products. We are ready to answer questions about the installation or operation of the CMS-2200. The manual, application notes and other documents are available on our website. You may contact USL by:

Phone: +1 (805) 549-0161
Email: support@uslinc.com
File a support ticket electronically at: www.uslinc.com/support

Please check the USL website for the latest software packages and updates for the CMS-2200 product.
www.uslinc.com

USL is interested in your comments. Please feel free to contact us with any comments or suggestions.

Support for tampered boards

Caution: Per DCI and FIPS specifications this product contains integrated tamer security features. In the event that it is tampered with, the product will render itself inoperable. Tamper events are not recoverable in the field and the product must be returned to the factory to be repaired.

Tampering includes, but is not limited to, removing screws, tampering with the heat sink, removing the battery, or modifying the electronics in any way.

A good indication that a board has been tampered with includes a tamper alarm in the **Systems Settings** tab, or a board that will not marry to a projector.

Should a tamper event occur, notify USL customer service.

Support for advanced replacements

Warning: Each CMS-2200 unit is uniquely keyed per DCI and FIPS specifications to provide the required security features. Should hardware be changed in the field, the replacement will by necessity have a new and unique serial number. It is not possible to obtain a replacement CMS-2200 with the same serial number as a unit already in the field.

15.0 USL One Year Limited Warranty

USL, INC. warrants that each product manufactured by it will be free from defects in material and workmanship under normal usage over a period of one (1) year after its purchase new from and authorized dealer. Our obligation under this warranty is limited to repairing or replacing any product or component which we are satisfied does not conform with the foregoing warrantee and which is returned to our factory freight paid, or serviced by one of our authorized contractors. The forgoing warranty is exclusive and in lieu of all other warranties, whether expressed or implied. Such warranty shall not apply to any product or component (A) repaired or altered by anyone other than USL, Inc. or an authorized service contractor; (B) tampered with or altered in any way or subjected to misuse, negligence or accident or (C) which has been improperly connected, installed or adjusted other than in accordance with USL, Inc.'s instruction.