

Broadcast Multi Channel Video Encoder and Mux

USER'S Guide



MADE IN AMERICA

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Broadcast Multi Channel Video Encoder and Mux

1 **ABOUT THE PRODUCT**

The Multi Channel Video Encoder and Multiplexer (MCVE) provides a cost effective means to enable a TV station to convert multiple analog video and audio feeds into single ASI stream. The encoder can process one high definition (HD) channel or four standard definition channels (NTSC) with a variety of configurations. With a simple connection to a modulator, you are ready to begin broadcasting. In addition, multi channel preview is available via the DVI output connector on the front panel of the unit.

2 **SETUP AND CONFIGURATION**

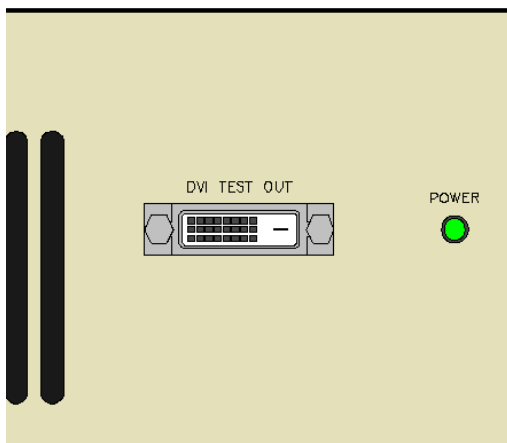
The encoder accepts analog (composite) and digital inputs (HD-SDI and SD-SDI). Analog audio inputs are also available. All inputs can be found on the rear panel of the unit.

The encoder is configured through an integrated Web Interface using any Internet browser. The Ethernet port can also be used to program PSIP data.

3 **PACKAGE CONTENTS**

- Multi Channel Video Encoder
- Power Cable
- Quick Start Guide
- Screw Terminal Audio Connectors (Qty. 4)
-

4 **UNDERSTANDING THE FRONT PANEL**



4.1 **Connectors on the Front Panel**

4.2 **Test DVI Out - Live preview**

This connector allows the user to connect the MCVE to a DVI capable (720p) display device.

The Multi-Channel Video Encoder has a live preview of all channels for the current mode. This feature requires an external monitor/TV with a DVI port. The display must be capable of at least 1280x720 (natively or by scaling) resolution. This feature is always enabled, so additional configuration is not necessary.

The live preview displays post-processed video and channel specific information for quick reference. Video/Audio PIDs, Video Source (Analog/Digital), Audio stream (AC-3/None), Video Format, and current Video Bit rate are available in the display.

The live preview feature is solely intended to be a monitoring tool and should not be used for any other purpose. Also, the live preview feature is a video-only preview, no dedicated audio outputs are provided.

4.2.1 Power The Power LED gives the current status of the unit. The LED will be green if the unit is powered and operational. If the LED is red, the unit has entered a thermal shutdown state. If the LED is not lit, the unit is off or unpowered.

4.2.2 Environmental

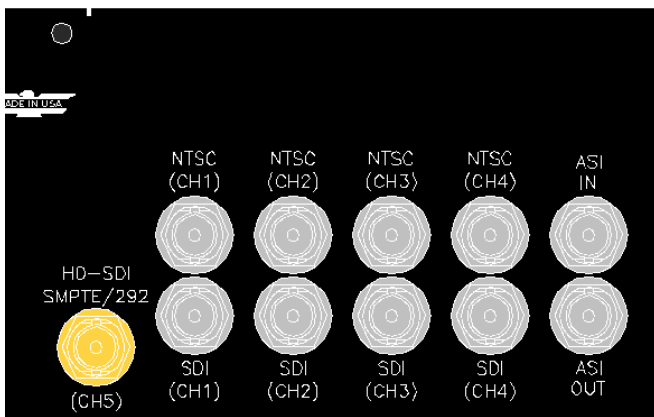
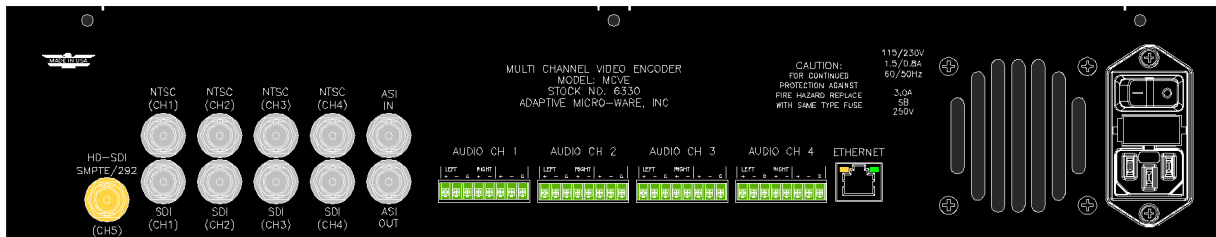
Operating temperature: 0°C (32°F) to 50°C (122°F) ambient

Storage temperature: -30°C (-22°F) to 80°C (176°F)

Powered Unit Thermal Shutdown 65°C (~150°F)

Humidity, operating and storage: 95% non-condensing

5 UNDERSTANDING THE BACK PANEL



5.1 Video Connectors

HD-SDI SMPTE/292

This BNC input is compatible with HD-SDI sources with output resolutions of 720p and 1080i.

5.2 NTSC (CH1, CH2, CH3, CH4)

These BNC inputs are capable of receiving analog (composite) video sources.

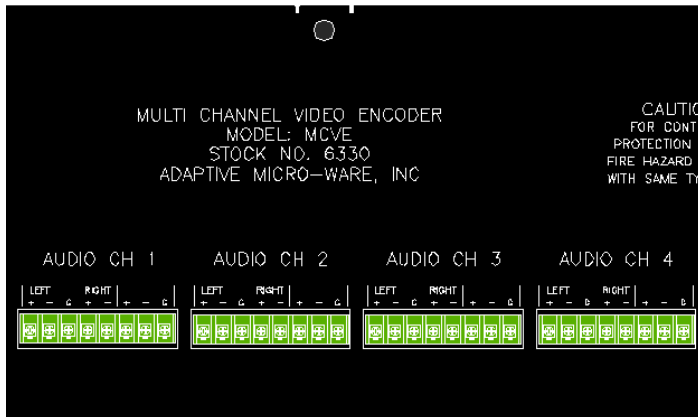
5.3 SDI (CH1, CH2, CH3, CH4)

These BNC inputs are capable of receiving digital video (480i) and digital audio.

5.4 ASI OUT

This BNC output provides the resulting ATSC compliant transport stream.

5.5 Audio Connectors



AUDIO (CH 1, CH 2, CH 3, CH 4)

These analog audio inputs correspond to the NTSC video inputs. For example, AUDIO CH 1 is the analog audio input for the NTSC (CH1) video input. All analog audio sources must provide a balanced, professional line level (+4dBu).

6 ETHERNET CONNECTOR



6.1 ETHERNET

This 10/100 Ethernet port allows the encoder settings to be configured via the integrated web interface.

- Amber/Power: The unit is powered.

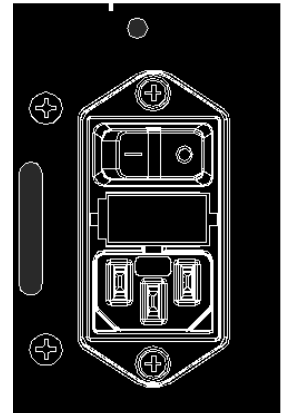
- Green/Link: Link is present.

6.2 Power Connector

The power connector supplies the unit with power from a 115VAC or 230VAC outlet. The unit includes a 3-prong, grounded power cord.

The AC voltage selection switch is located on the side of the unit closest to the power connector. This switch must be in the correct position for the AC supply voltage or the unit may be damaged.

The power switch, located directly above the power cord receptacle, is used to turn the unit on and off.



7 MAKING CONNECTIONS

7.1 Prerequisites

The unit must be located in a dry, temperature controlled location. Airflow to the unit must not be restricted. Covering the cooling vents may cause the unit to overheat.

There are many connections to be made to the unit, so proper placement is key. The unit will need access to the following connections:

- AC Power (115V/230V)
- Up to four analog and/or digital sources
- ASI receiver for ASI OUT
- Ethernet (RJ-45)

Access to the following connection is optional:

- DVI capable display device

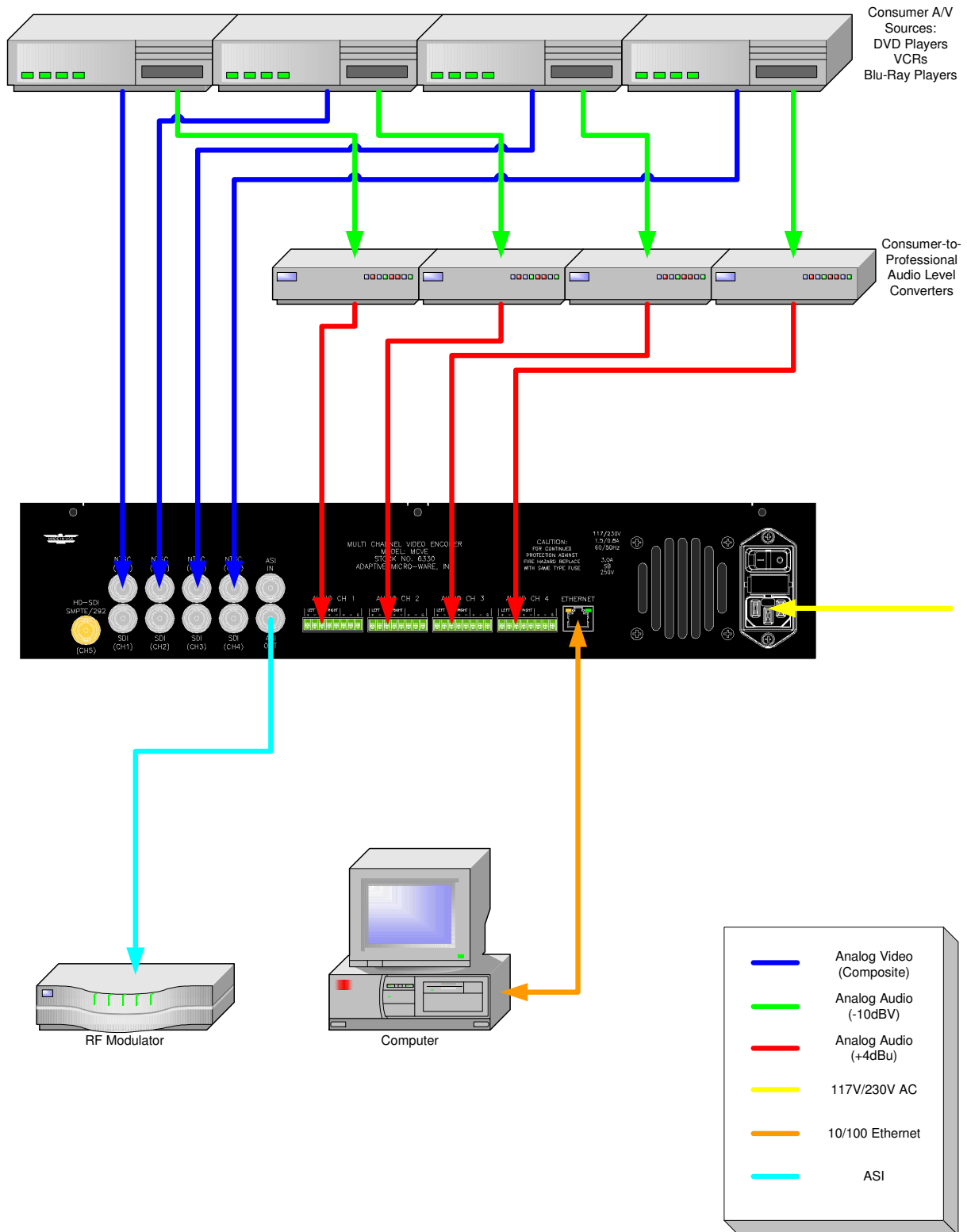
7.2 Connection Steps

1. Mount the unit securely in a standard 19" rack.

Connect the supplied power cord to the power connector on the back of the unit.
(Note: Ensure the unit is turned off before proceeding.)

2. Connect all analog and/or digital video sources to the appropriate video input connectors.
3. Connect analog audio sources (if applicable) to the supplied screw terminal audio connectors. Please be sure to connect with wires as shown on the back of the unit. Pay attention to signal polarities and ground for both Left and Right channels.
4. Connect the ASI OUT to the desired destination using a high-quality 75 Ω BNC cable. A short run (under 7ft) should be used to minimize interference and signal loss.
5. Connect an Ethernet cable (CAT5 or higher) to the Ethernet connector.
6. (Optional) Connect a DVI capable display device to the DVI output on the unit.

7.3 Example Interconnections



8 ACCESSING THE WEB INTERFACE

The integrated web interface allows users to quickly customize video encoder settings. The web interface consists of three main sections: Status, Configuration, and Mode. This section explains how to use each configuration page of the Multi-Channel Video Encoder web interface.

The content of many web interface pages will vary depending upon the encoder mode that is set. For example, when in four-channel mode, the Status page will display four separate panes containing information pertaining to four separate SD video channels. However, when the encoder is configured for three-channel mode, the Status page will only contain three panes of information. Other pages function in a similar manner.

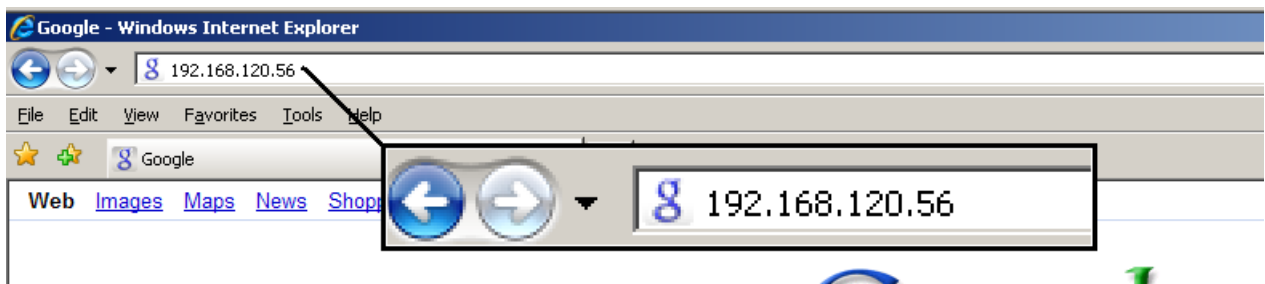
8.1 Connecting to an Encoder

Any standard web browser can be used to connect to the web interface. A unit is reachable by the static IP address to which it has been assigned. Type only the IP address into the address bar of your browser and press the 'Enter' key to initiate the connection process. The unit has a default Ethernet configuration of the following settings:

- IP Address: 192.168.120.56
- Subnet Mask: 255.255.0.0
- Default Gateway: 192.168.120.1

The computer must have an IP address on the same subnet as the encoder in order to connect to the unit's web interface.

Note: It is important that each encoder's network settings be configured properly before connecting it to a network segment that is shared with other Multi-Channel Video Encoders or devices using static IP addresses. Networking conflicts may occur and could cause connection issues.

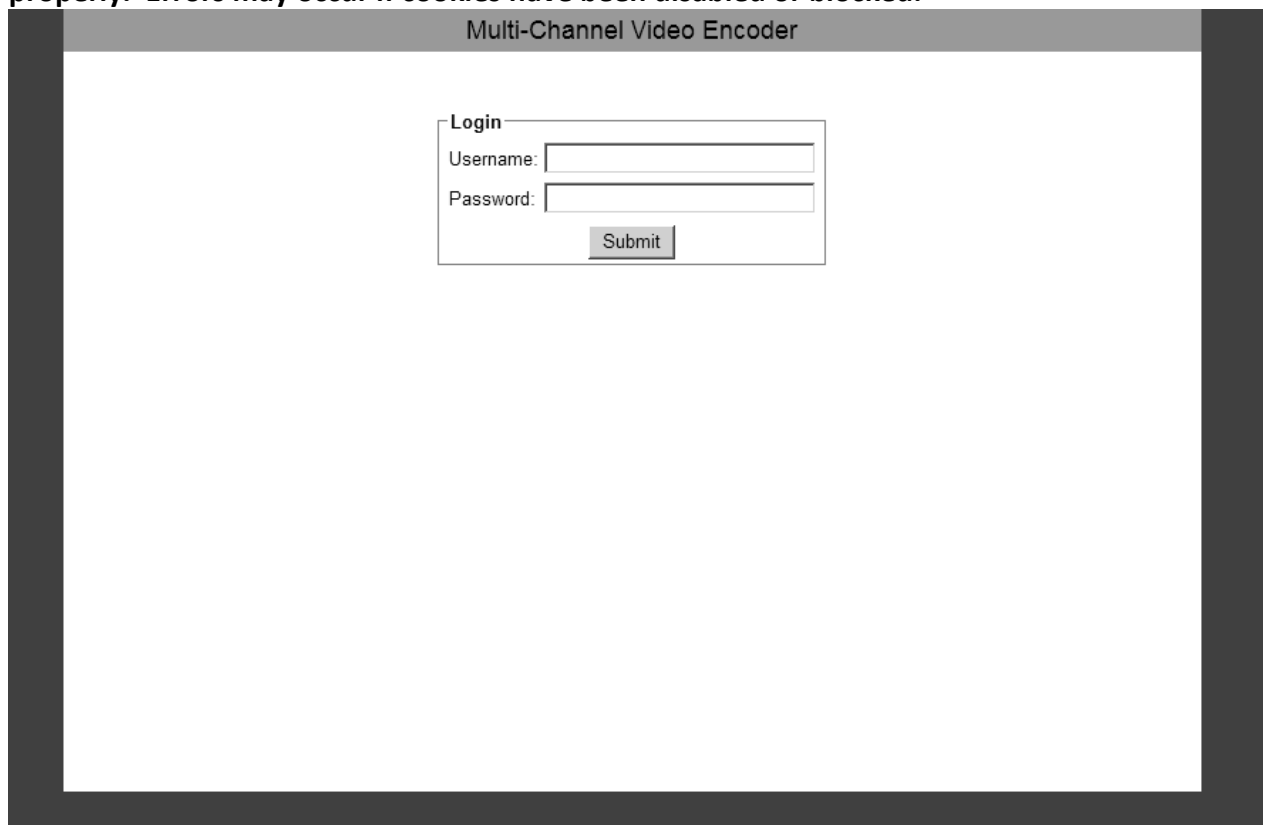


8.2 Login

Once connection to the Multi-Channel Video Encoder has been established, the Login page is displayed. There are two types of users: administrators and guests. Please see the section below labeled 'Network' for a description of users and user rights. The default administrative login is 'admin' and the password is 'pass'. The default guest login is 'guest' and the password is 'pass'.

To log into an encoder, you must type the username and password into the appropriate field. After typing in the required information, press the 'Enter' key or click on the 'Submit' button.

Note: Cookies must be enabled in your browser in order for pages to be displayed properly. Errors may occur if cookies have been disabled or blocked.



Multi-Channel Video Encoder

Login

Username:

Password:

8.3 Status

After a successful login, the Status page is displayed. The status page provides a brief overview of the hardware/firmware version, internal operating temperatures and the status/format of the video sources. The status page information can be updated by clicking the 'Refresh' button.

Multi-Channel Video Encoder

Status Configuration Mode Logout

Hardware Version: 12/08/08 Rev. 1 Internal Temperature 1: 92.9°F (Max: 150°F)
Firmware Version: 12/08/08 Build 1 Internal Temperature 2: 87.5°F (Max: 150°F)

SD 1	
Source Connected	Connected
Source Enabled	Enabled
Video Resolution	720x480
Scan Type	Interlaced
Frame Rate	29.97 fps
Format	480i

SD 2	
Source Connected	Connected
Source Enabled	Enabled
Video Resolution	720x480
Scan Type	Interlaced
Frame Rate	29.97 fps
Format	480i

SD 3	
Source Connected	Connected
Source Enabled	Enabled
Video Resolution	720x480
Scan Type	Interlaced
Frame Rate	29.97 fps
Format	480i

SD 4	
Source Connected	Connected
Source Enabled	Enabled
Video Resolution	720x480
Scan Type	Interlaced
Frame Rate	29.97 fps
Format	480i

Refresh

8.4 Configuration

The configuration menu consists of six tabs: Video, Transport, PSIP, Audio, Network and Date/Time. Each tab allows the user to change related encoder settings.

8.5 Video

The Video Configuration page gives the user the ability to individually configure settings on each of the available video channels. Each channel has a variety of configurable settings.

- Video bit rate can be adjusted on a channel-by-channel basis. However, the total bit rate of all video/audio channels (and transport stream overhead) cannot exceed 19.39Mbps.
- Closed Caption processing may be enabled or disabled.
- The video filter may be disabled, or set to one of three filtering levels.
- GOP (Group of Picture) size is configurable between 1 and 120. This means that the first frame in a GOP will be an I-frame and remaining frames will be P-frames.
- All SD channels may be setup for Analog or Digital inputs. However, in all modes containing an HD channel, the 'Input Type' is digital only. All channels, regardless of mode, can be disabled.
- Please see the section labeled "Video Input Channel" for a detailed explanation of this feature.

Note: Video bit rates are target bit rates. This does not mean the bit rate specified will be met under all conditions. The complexity of the video greatly determines what the minimum video bit rate can be. For example, if a bit rate of 0.0 is entered, the encoder cannot realistically allocate 0 bits for the video stream. In this instance the channel should be disabled if no output is desired. Please take care when selecting video bit rates. Monitoring the video output may be necessary to ensure proper operation.

Multi-Channel Video Encoder					
Status	Configuration	Mode	Logout		
Video	Transport	PSIP	Audio	Network	Date/Time
SD 1					
Bitrate		4.2 Mbps			
Closed Caption		<input type="radio"/> Enabled <input checked="" type="radio"/> Disabled			
Video Filter Level		Disabled ▾			
GOP Size		15			
Input Type		<input checked="" type="radio"/> Analog <input type="radio"/> Digital <input type="radio"/> Disabled			
Video Input Channel		1 ▾			
SD 2					
Bitrate		4.2 Mbps			
Closed Caption		<input type="radio"/> Enabled <input checked="" type="radio"/> Disabled			
Video Filter Level		Disabled ▾			
GOP Size		15			
Input Type		<input checked="" type="radio"/> Analog <input type="radio"/> Digital <input type="radio"/> Disabled			
Video Input Channel		2 ▾			
SD 3					

9 PSIP

The PSIP Configuration page allows users to set information such as the Transport Stream ID, channel names, and major/minor channel numbers.

	Channel Name	Major Ch. #	Minor Ch. #
SD 1	<input type="text"/>	<input type="text" value="3"/>	<input type="text" value="1"/>
SD 2	<input type="text"/>	<input type="text" value="3"/>	<input type="text" value="2"/>
SD 3	<input type="text"/>	<input type="text" value="3"/>	<input type="text" value="3"/>
SD 4	<input type="text"/>	<input type="text" value="3"/>	<input type="text" value="4"/>

10 AUDIO

The Audio Configuration page allows the user to adjust parameters associated with the Dolby® Digital AC-3 encoded stereo audio. All channels configured with digital inputs must have their respective channel streams configured properly in order to process audio correctly. Typical values are 0 and 1, but this may vary by source. These audio stream settings are ignored for channels configured for analog input. An 'Audio Delay' adjustment is also available to allow compensation for audio/video skew.

Dolby® Digital specific settings are configurable on this page as well.

Multi-Channel Video Encoder

Status Configuration Mode Logout

Video Transport PSIP Audio Network Date/Time

Digital Audio Control			
SD 1	Left Channel: 0	Right Channel: 1	Delay: 0 ms
SD 2	Left Channel: 0	Right Channel: 1	Delay: 0 ms
SD 3	Left Channel: 0	Right Channel: 1	Delay: 0 ms
SD 4	Left Channel: 0	Right Channel: 1	Delay: 0 ms

SD 1

Audio Service Configuration	
Data Rate	192 kbps
Sample Rate	48 kHz
Audio Coding Mode	2/0: L,R
Dialog Normalization	-27 dB

Bitstream Information

Dolby Surround Mode	Not Indicated
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Preprocessing

Dynamic Range Control

Line Mode	Film Standard
RF Mode	Film Standard

Audio Service Configuration

Data Rate	192 kbps
Sample Rate	48 kHz

11 NETWORK

The Network Configuration page gives the user the ability to change the network settings associated with an encoder. A static IP address is required. DHCP is not supported on this device. Please see your network administrator to get the appropriate settings for your network. Usernames and passwords may also be set here. There are two levels of access for this device. Administrators have full control over all available settings. Guests can view all current settings, but have limited settings control.

Multi-Channel Video Encoder																			
Status	Configuration	Mode	Logout																
Video	Transport	PSIP	Audio	Network	Date/Time														
<table border="1"><tr><td>Static IP Address</td><td>192.168.120.56</td></tr><tr><td>Subnet Mask</td><td>255.255.0.0</td></tr><tr><td>Gateway IP Address</td><td>192.168.120.1</td></tr><tr><td>Admin User Name</td><td>admin</td></tr><tr><td>Admin Password</td><td>pass</td></tr><tr><td>Guest User Name</td><td>guest</td></tr><tr><td>Guest Password</td><td>pass</td></tr></table>						Static IP Address	192.168.120.56	Subnet Mask	255.255.0.0	Gateway IP Address	192.168.120.1	Admin User Name	admin	Admin Password	pass	Guest User Name	guest	Guest Password	pass
Static IP Address	192.168.120.56																		
Subnet Mask	255.255.0.0																		
Gateway IP Address	192.168.120.1																		
Admin User Name	admin																		
Admin Password	pass																		
Guest User Name	guest																		
Guest Password	pass																		
<input type="button" value="Save"/>																			

12 DATE/TIME

The Data/Time Configuration page allows the user to set the current date and time for the encoder. Having precise settings is critical to remain compliant with ATSC standards. For this reason, automatic time configuration is recommended. However, if an internet connection is not available, the date and time can be set manually. The encoder's current time is displayed for reference. If the encoder is configured to automatically acquire time settings from the Internet, the IP Address of a time server will be required. The time server specified must support the Network Time Protocol (NTP) in order for automatic time acquisition to work properly.


Note: It may take several minutes for the Current System Time to update once the settings have changed from manual to automatic or when the system has been powered down for an extended period of time and is configured for automatic time acquisition. Clicking the 'Refresh' button will update the time displayed on the page. If the time fails to update properly after five minutes, validate that the IP address specified in the "Time Server IP" field is correct. Also, check your connection to the Internet and confirm that the 'Gateway IP Address' (on the Network page) is set correctly.

The screenshot shows the 'Date/Time' configuration page of a 'Multi-Channel Video Encoder'. The page has a navigation bar with 'Status', 'Configuration', 'Mode', and 'Logout'. Below this is a sub-navigation bar with 'Video', 'Transport', 'PSIP', 'Audio', 'Network', and 'Date/Time'. The main content area contains two configuration panels. The first panel includes 'Current System Time' (Sun Jan 6 00:13:46 1980), 'Configuration Method' (Manual selected, Automatic unselected), 'Time Zone' (GMT 0:00), 'Current Date' (1 / 1 / 2009), and 'Current Time (24hr)'. The second panel includes 'GPS Offset' (15 Seconds), 'Automatically Adjust for Daylight Savings Time' (No selected, Yes unselected), 'DST Start Date (mm/dd/yyyy)' (3 / 8 / 2009), 'DST Start Time' (2:00 AM), 'DST End Date (mm/dd/yyyy)' (11 / 1 / 2009), and 'DST End Time' (2:00 AM). At the bottom are 'Refresh' and 'Save' buttons.

Video	Transport	PSIP	Audio	Network	Date/Time
Current System Time: Sun Jan 6 00:13:46 1980					
Configuration Method: <input checked="" type="radio"/> Manual <input type="radio"/> Automatic					
Time Zone: GMT 0:00					
Current Date: 1 / 1 / 2009					
Current Time (24hr):					
GPS Offset: 15 Seconds					
Automatically Adjust for Daylight Savings Time: <input type="radio"/> Yes <input checked="" type="radio"/> No					
DST Start Date (mm/dd/yyyy): 3 / 8 / 2009					
DST Start Time: 2:00 AM					
DST End Date (mm/dd/yyyy): 11 / 1 / 2009					
DST End Time: 2:00 AM					
Refresh Save					

13 MODE

There are three modes in which the encoder can be configured. These consist of Single-Channel mode, Three-Channel mode and Four-Channel mode. When the mode is changed, some settings are set to their defaults. These fields are: Input Type, Video Input Channel, Program Number, Channel Name, and Minor Channel Number. These settings may be reconfigured after a mode change. If the total bit rate of all channels exceeds the transport stream bit rate, video and audio bit rates will be reset to their default values.



The screenshot displays the 'Multi-Channel Video Encoder' web interface. At the top, there is a navigation bar with four tabs: 'Status', 'Configuration', 'Mode', and 'Logout'. The 'Mode' tab is currently selected. Below the navigation bar, the main content area features a form with a label 'Encoder Mode' on the left and a dropdown menu on the right. The dropdown menu is open, showing the selected option 'Four Channel (Up to Four 480i)'. Below the form, there is a 'Save' button.

14 VIDEO INPUT CHANNEL

Any SD input (Analog or Digital) can be routed/duplicated to any other SD output. For example, in 4-channel mode, Channel 1's analog input can be routed to SD 1, SD 2, SD 3, and/or SD 4 (or any other combination). As another example, in 3-channel mode, Channel 4's digital input can be routed to SD 1 and/or SD2. Despite the flexibility of the Multi-Channel Video Encoder's routing capabilities, there are limitations.

An HD source cannot be routed to an SD output.

Only one Input Type can be configured for each channel. For example, if Channel 1's analog input is routed to SD 2, Channel 1's digital input cannot be used as another input.

Text Field Valid Values

Name	Page	Valid Values
Video Bit rate	Video Configuration	Total of all channels < 96% of 19.39Mbps
GOP Size	Video Configuration	0 to 120
Program Number	Transport Configuration	1 to 65535
All PID Values	Transport Configuration	48 to 8176
Transport Stream ID	PSIP Configuration	1 to 65535
Channel Name	PSIP Configuration	All ASCII Printable Characters (0x20 to 0x7F) 7 Characters Maximum
Major Channel Numbers	PSIP Configuration	1 to 99
Minor Channel Numbers	PSIP Configuration	1 to 99
Audio Delay	Audio Configuration	-300 to 300 (ms)
IP Addresses	Network Configuration	All IP Addresses conforming to standard network address spaces.
Username/Passwords	Network Configuration	All ASCII Printable Characters (0x20 to 0x7F) 10 Characters Maximum

Time Server IP Address	Date/Time Configuration	All IP Addresses conforming to standard network address spaces.
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15 MAXIMUM CONNECTIONS AND TIMEOUT

The Multi-Channel Video Encoder integrated web interface will only allow one concurrent user to be logged in at any given time. During the period when someone is logged in, an error message will be displayed to other users informing them of the condition.

Each page is equipped with a 'Logout' link which will, when clicked by the user that is currently logged in, allow other users to log in. An inactivity timeout period of 5 minutes is in place so that users cannot lock themselves out of an encoder. Additionally, this adds security to the device by requiring a user to log in again after a period of inactivity.

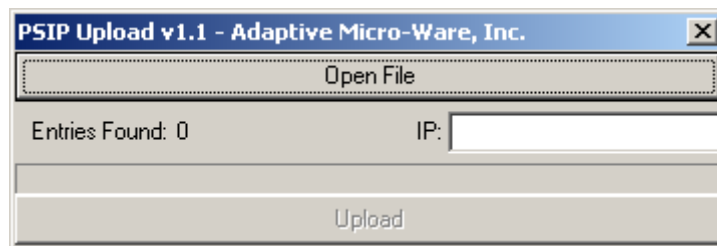
16 LOADING PSIP DATA

The Multi-Channel Video Encoder can be loaded with PSIP data via a Windows-based PC configured with the PSIP Upload application.

An example file is included with the installation program. All formatting must be followed in order to correctly upload the PSIP data to the encoder. Only one file may be uploaded to the encoder for the duration that the PSIP data is valid. The file must contain all PSIP information for all channels. If multiple files are uploaded, only the last will be used.

The application supports uploading a maximum of 2500 program entries. An upload may take several minutes to complete depending upon the number of entries.

Note: Care must be taken when changing the encoder mode after PSIP data has been uploaded to the encoder. PSIP data may need to be corrected and uploaded again to match the new channel configuration. It is the user's responsibility to keep the PSIP data organized to correspond to the actual video. The date and time included in the PSIP data file must be entered using GMT and without adjustment for Daylight-Savings Time.



17 GLOSSARY

- API -** Application Programming Interface, a set of functions or methods used to access some functionality.
- AES -** Audio Engineering Society, Organization responsible for many standards used within the audio, video DVD and broadcast industries. www.aes.org
- ASI -** Asynchronous SCSI Interface.
- BITRATE -** The amount of data being transported, measured relative to quantity over time in bits per second (thousand bits per second or Kb/s, million bits per second or Mb/s, billion bits per second or Gb/s and trillion bits per second or Tb/s).
- DVI -** Digital Visual Interface.
- EIT PID -** Event information table; the EIT is part of the DVB standard and provides schedule information for digital programming.
- GOP SIZE -** The GOP size determines total number of frames in the GOP (Group of Pictures). Current GOP sizes are for example 9 or 12.
- NTSC -** National Television Standards Committee. Video standard established by the United States (RCA/NBC) and adopted by numerous other countries: 525-line video with 3.58-MHz chroma subcarrier and 60 cycles per second.
- PMT ID -** Program Map Tables (PMTs) contain information about programs. For each program, there is one PMT. Each PMT shall be transmitted on a separate PID although technically it is not required. The PMTs describe which PIDs contain data relevant to the programs. PMTs also provide metadata about the streams in their constituent PIDs. For example, if a program contains an MPEG-2 video stream, the PMT will list this PID, describe it as a video stream, and provide the type of video that it contains. The PMT may also contain additional descriptors providing data about its constituent streams.
- PSIP-** Program and System Information Protocol. This is the digital information transmitted by a DTV station that includes the time and date, major and minor channel numbers, and program information.
- SDI -** The professional digital video connection format using a 270 Mbps transfer rate. A 10-bit, scrambled, polarity-independent interface, with common scrambling for both component ITU-R 601 and composite digital video and four groups each of four channels of embedded digital audio. SDI uses standard 75-ohm BNC connectors and coax cable.

SMPTE - The Society of Motion Picture and Television Engineers. An international research and standards organization. The SMPTE time code, used for marking the position of audio or video in time, was developed by this group.