GRASS VALLEY GROUP

Instruction Manual

software release **1.0**

8990ARC
SD ASPECT RATIO CONVERTER

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Preface

About This Manual

This manual describes the features of a specific module of the 8900 Series Modular Products family. As part of this module family, it is subject to Safety and Regulatory Compliance described in the 8900 Series frame and power supply documentation (see the *8900TX/8900TF/8900TFN Frames Instruction Manual*).

8990ARC SD Aspect Ratio Converter

Introduction

The 8990ARC converts between standard (4:3) and widescreen (16:9) SD video formats. Flexible aspect ratio control is provided on the module's front panel and through remote control using the 8900 web browser graphical user interface (GUI).

The 8990ARC is compact and fits in the 8900 frame which holds up to 10 modules in 2 RU. It supports 270 Mb serial digital video with outputs referenced from the input signal.

Key features include:

■ 270 Mb component serial digital input and output,

■ Module is hot-swappable,

■ Module settings are stored in non-volatile memory,

■ Automatic 525/625 line selection based on video input,

■ Passes horizontal ancillary data (HANC),

■ Passes or blanks vertical interval ancillary data (VANC),

■ GPI (general purpose interface) input can recall one of four user-defined preset settings,

■ Optional blanking of top and bottom one, two, or three active lines, and

■ Remote control and monitoring through the 8900 frame ethernet I/F.

Installation

Installation of the 8990ARC module is a process of:

■ Placing the module in the selected frame slot, and

■ Cabling and terminating signal ports.

The 8990ARC module can be plugged in and removed from an 8900 Series frame with power on. When power is applied to the module, LED indicators reflect the initialization process (see *Power Up on page 5*).

Frame Capacity

The maximum number of 8900 modules allowed in a frame is determined by frame cooling capacity. Table 1 provides the power capacity, cooling capacity, and maximum module count for the 8990ARC in each frame type.

Table 1. Power, Cooling, and Module Capacity of 8900 Frames

Capacity Calculated	8900T2 Frame	8900T2-F Frame	8900TX Frame	8900TF Frame	8900TFN Frame
Power (W)	60	60	100	100	100
Recommended Module Cooling (W)	30	60	30	90	90
8990ARC Modules	6	10	6	10	10

Note Module capacity figures assume no other modules are in the frame. If the maximum number of modules a frame can handle is less than ten, provide as much space between the modules as possible.

Module Placement in the 8900 Frame

There are ten cell locations in the frame to accommodate either analog or digital modules. These are the left ten locations. Refer to Figure 1.

The two cells on the right are allocated for the power supplies. For additional information concerning the Power Supply module, refer to the 8900 Power Supply manual.

The third cell from the right is allocated for the Frame Monitor or Network Interface module. These modules provide health bus monitoring and control options.

Figure 1. 8900 Series Frame

Any 8900 Module

Power
Supplies
(only)

Frame Monitor or
Network Interace Module
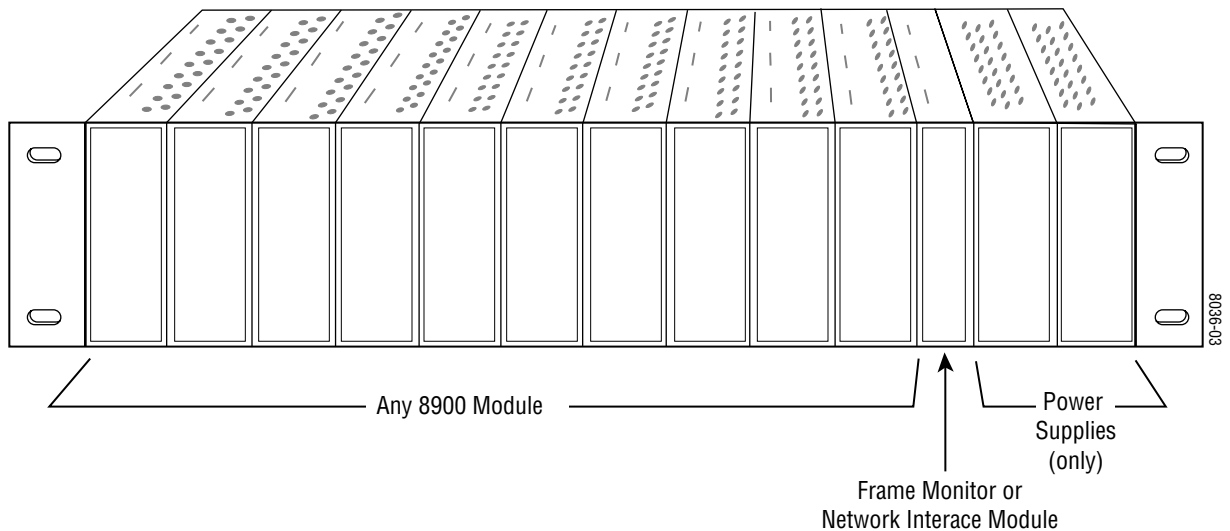
8900 modules are interchangeable within the module cells. There are 10 BNC connectors in each cell's I/O group. The functional assignment of each connector in a group is determined by the module that is placed in that cell. The maximum number of modules an 8900 frame can accept is ten. Figure 2 illustrates the rear connector plate for an 8900 Series frame.

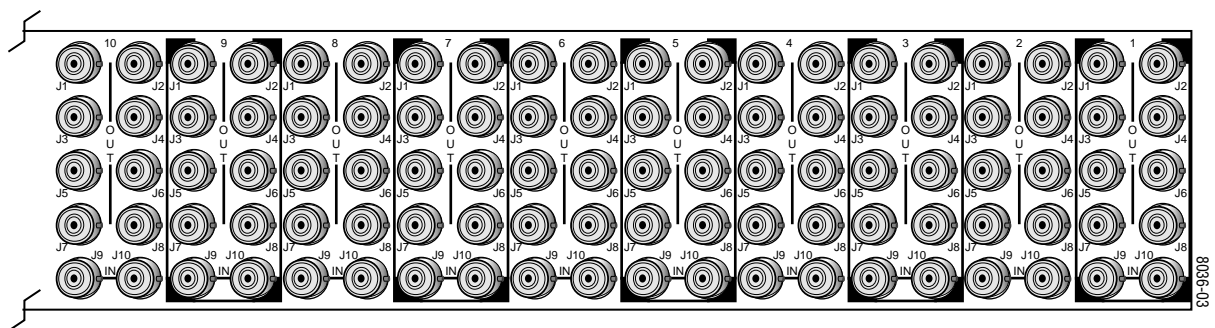*Figure 2. 8900 Series Frame Rear Connectors*

Note   At the back of this manual (hard-copy only) are die-cut overlay cards that can be placed over the rear connector BNCs to identify the specific 8990ARC connector functions.

To install a module in the frame:

1. Insert the module, connector end first, with the component side of the module facing to the right and the ejector tab to the top.

2. Verify that the module connector seats properly against the backplane.

3. Press the ejector tab in to seat the module in place.

Cabling

Loop-through Input

Connect an input source to one of the loop-through input connectors, J9 or J10 (see Figure 3). The 8990ARC input accepts SMPTE 259M 8 or 10-bit component serial digital video. Terminate the unused connector into 75Ω if the signal is not looped to other equipment.

Figure 3. 8990ARC Input, Output and GPI Connectors
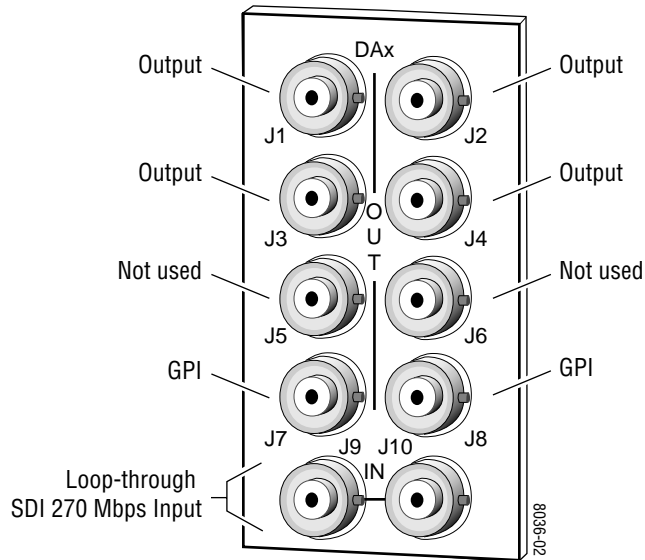
Outputs

The 8990ARC provides four 75 Ω component video output BNCs (J1 through J4).

The destination equipment should have a 75 Ω input impedance or loop through inputs that are terminated into 75 Ω.

General Purpose Interface (GPI) Connections

BNCs J7 and J8 accept GPI control signals that select one of four user-defined preset settings that are stored using the onboard configuration controls or the remote GUI controls. The GPI can be used with a user-provided panel with four latching momentary switches and appropriate resistors. No tally is provided from the module (see *GPI Control on page 12*).

Power Up

The various front LED indicators and configuration switches are illustrated in Figure 4. Upon power-up, the green PWR LED should light and the yellow CONF LED should illuminate for the duration of module initialization.

Operation Indicator LEDs

With factory default configuration and a valid input signal connected, the green PWR LED, and one of the green signal standard LEDs (525 or 625) should illuminate (refer to Table 2 on page 6 to see the possible operating indicator combinations).

Video input presence is indicated by the appropriate 525 or 625 LED (indicating a 525-line or 625-line input signal has been detected). The appropriate Mode LED is on.

Figure 4. LEDs and Configuration Switches
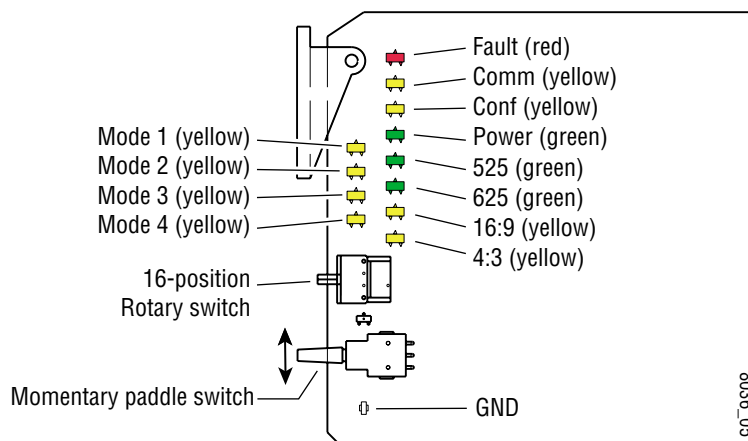
A red FAULT LED indicates an error situation and, with the previously described LEDs, can indicate the operational conditions presented in Table 2 on page 6.

Table 2. Indicator LEDs and Conditions Indicated

LED	Indication	Condition
Fault (red)	Off	Normal operation
	On continuously	Module has detected internal fault
	Short flash	EDH errors will cause short flashes. In most applications a few, infrequent EDH errors will not be of consequence. Continuous EDH errors result in obvious output signal degradation.
COMM (yellow)	Off	No activity on frame communication bus
	Long flash	Location Command received by the module from a remote control system
	Short flash	Activity present on the frame communication bus
CONF (yellow)	Off	Module is in normal operating mode
	On continuously	Module is initializing, changing operating modes or updating firmware
	Flashing	Indicates rate of change of paddle switch controlled analog setting. The longer the switch is held, the more the flashing rate and the change-of-setting rate increases
PWR (green)	Off	No power to module or module's DC/DC converter failed
	On continuously	Normal operation, module is powered
525 (green)	Off	Input signal is 625 standard or no signal is present
	On continuously	Input signal is 525 standard and present
625 (green)	Off	Input signal is 525 standard or no signal is present
	On continuously	Input signal is 625 standard and present
16:9 (yellow)	Off	4:3 mode is selected
	On	16:9 mode is selected
4:3 (yellow)	Off	16:9 mode is selected
	On	4:3 mode is selected
Mode 1 (yellow)	Off	Another mode is selected
	On	Mode 1 is selected
Mode 2 (yellow)	Off	Another mode is selected
	On	Mode 2 is selected
Mode 3 (yellow)	On	Another mode is selected
	Off	Mode 3 is selected
Mode 4 (yellow)	On	Another mode is selected
	Off	Mode 4 is selected

Table 3 on page 7 shows the output formating control options and the resultant output processing for various input signals and controls enabled.

Table 3. Input Combinations and Resulting Outputs

WSS Input & Enable	Video Index Input & Enable	GPI Input & Enable	User Selected Control	Resulting Output Signal Processing Control
Valid and enabled	Any condition	Any condition	Mode, format	WSS control
None or disabled	Valid and enabled	Any condition	Mode, format	Video Index control
None or disabled	None or disabled	Valid and enabled	Mode, format	GPI control
None or disabled	None or disabled	None or disabled	Mode, format	User selected processing

Configuration

The 8990ARC can be configured locally using onboard switches or remotely using the 8900NET network interface. The configuration of the 8990ARC determines:

■ Output aspect ratio (16:9/4:3),

■ Display conversion mode see (*Ouput Conversion Modes on page 9*),

   ■ Bypass (no conversion),

   ■ Letterbox for 16:9 output or Pillarbox for 4:3 output,

   ■ Full-height for 16:9 output or Full-width for 4:3 output,

   ■ 14:9 output,

■ Position of converted ouputs on the monitor (Tilt for vertical and Pan for horizontal positioning),

■ Enable/disable of Wide Screen Signaling (WSS) allowing control from video source data,

■ Number of active lines blanked (None, 1, 2, or 3),

■ High or Low vertical resizing filtering – for vertical black/white or severe chroma transitions,

■ Blanking or passing of vertical ancillary data (VANC),

■ Enable/disable of video index mode allowing control from data within the video input signal,

■ Enable/disable of GPI control,

■ Save/Recall of user-defined configurations for each of four GPI and one non-GPI controlled memory register, and

■ Recall of factory default settings.

Onboard Configuration Switches and LEDs

The 8990ARC module can be configured using the rotary and paddle switches shown in Figure 5. The CONF LED is a configuration status indicator. These three components perform the following:

■   Function (rotary) switch — Addresses one of 16 possible positions (0 through 9 and A through F) to access a desired function for configuration. Not all positions are used (see Table 4).

Note   The Function switch should be kept in position 0 when not in use to avoid any inadvertent change in configuration. 0 is an inactive position.

■   SW1 (paddle) switch — Actuates or selects the desired setting for the selected function when the switch is held momentarily in either the Up or Down position.

■   CONF (configuring) LED — When on, indicates the module is initializing or processing configuration information.

Figure 5. Module Configuration Switches and LEDs
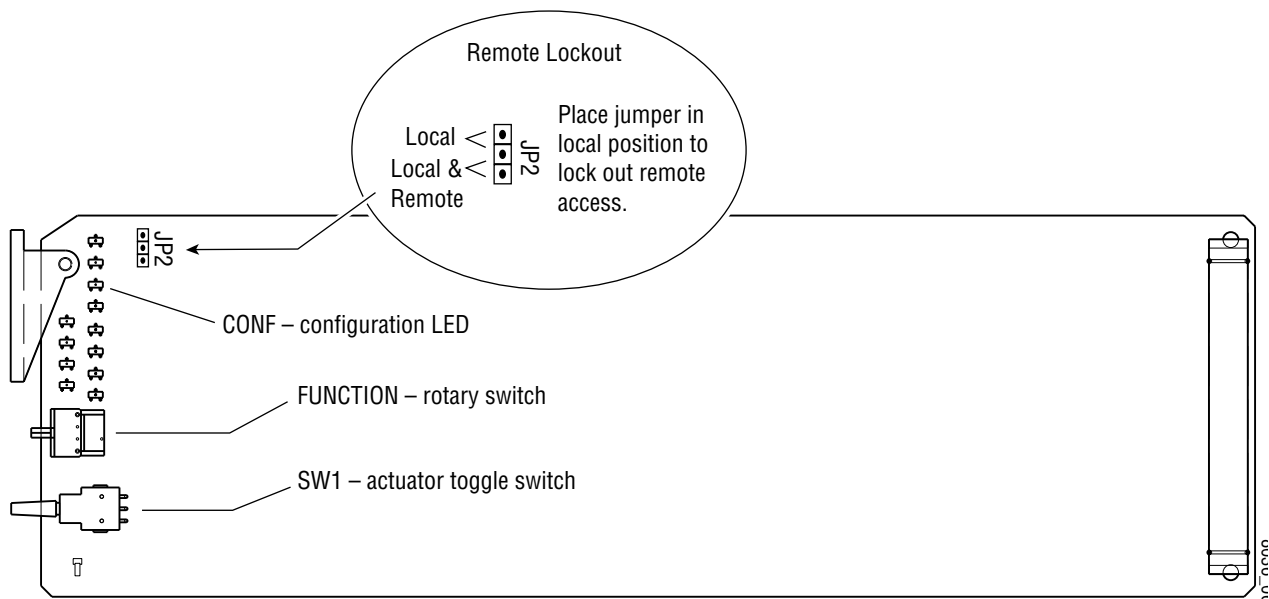
Local On-board Module Configuration

The 8990ARC offers a choice between 4:3 and 16:9 video signal output formats and one of four picture conversion modes for each format, see Table 4). The various signal processing and content options are listed in the table and can also be addressed using the Remote Configuration and Monitoring GUI (see *Remote Configuration and Monitoring on page 13*).

Note   When module power recycles the last setup state is restored. The module does not revert to a factory or the user default.

To make a configuration setting:

1. Rotate the Function Switch to the desired function switch position.

2. Move the paddle switch to the up or down position and hold momentarily to set the desired function.

Table 4. 8990ARC Configuration Functions

Function Switch	Paddle Switch Up	Paddle Switch Down	Function Description
0	--	--	Inactive position
1	16:9 output [†]	4:3 output	Selects output aspect ratio
2	Decrease (4, 3 ,2 [†], 1)	Increase (1, 2 [†], 3, 4)	Steps through four output conversion modes (see below)
3	Position left or up Center is default	Position right or down Center is default	Move picture position on the monitor to one of three positions depending on applicable mode—Tilt (top, center, bottom) or Pan (left, center, right). Positioning mode is determined by the picture conversion mode selected.
4	Disable [†]	Enable	Enable/disable Wide Screen Signaling Control
5	Decrease (3, 2, 1, 0 [†])	Increase (0 [†], 1, 2, 3)	Steps through choices for active line blanking—none, one, two, or three lines
6	High [†]	Low	Select High or Low vertical resizing filtering – switch to low to remove ringing in lines with vertical black/white or severe chroma transitions
7	Blank [†]	Pass	Blank or pass Vertical Ancillary Data (VANC)
8	Disable [†]	Enable	Video index mode control (see *Video Index Coding*)
9	Disable [†]	Enable	General Purpose Interface (GPI) enable/disable
A	Recall	Save	Save/recall GPI 1 mode and current option settings
B	Recall	Save	Save/recall GPI 2 mode and current option settings
C	Recall	Save	Save/recall GPI 3 mode and current option settings
D	Recall	Save	Save/recall GPI 4 mode and current option settings
E	Recall	Save	Save current or recall last saved user settings
F	Recall	--	Default settings recall

[†] Factory Default

Ouput Conversion Modes

Function switch position 2 selects one of four output conversion modes for either 4:3 or 16:9 format:

■ For 4:3 format, 1 = Bypass, 2 = letterbox, 3 = full height, 4 = 14:9, or

■ For 16:9 format, 1 = Bypass, 2 = pillarbox, 3 = full width, 4 = 14:9.

Figure 6 on page 10 and Figure 7 on page 11 illustrate the ouput conversions for both 4:3 and 16:9 formats.

Figure 6. 4:3 Picture Input to 16:9 Display

INPUT - 4:3

CONVERSION

Mode 1, Bypass
Complete picture with horizontal
stretch

Shift horizontally

Mode 2, Pillarbox
Complete picture with no distortion;
Position left, center, or right (Pan)

Mode 3, Full Width
Top and bottom cropping;
Position top, center, or bottom (Tilt)

= lost picture

Shift
vertically

Shift horizontally

Mode 4, 14:9
Top and bottom cropping;
Position left, center, or right (Pan)

= lost picture

Figure 7. 16:9 Picture Input to 4:3 Display

INPUT - 16:9

CONVERSION

Mode 1, Bypass

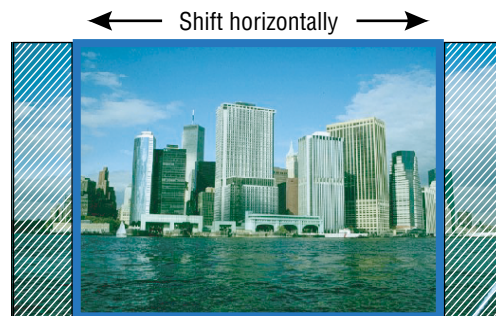Complete picture with vertical
distortion (objects appear taller)

Mode 2, Letterbox

Complete picture in Letterbox
format with blanking at top and bottom
Position top, center, or bottom (Tilt)

Shift
vertically

Shift horizontally

Mode 3, Full Height

Horizontal cropping
Position left, center, or right (Pan)

= lost picture

Mode 4, 14:9

Vertical blanking
Horizontal cropping
Position top, center, or bottom (Tilt)

= lost picture

Shift
vertically

Video Index Coding

In the video input signal, video source data can be inserted (on lines 11 or 324 for 625, on 14 or 277 for 525) to identify the signal line standard and aspect ratio (per SMPTE RP-186 specification). If this information is present and the 8990ARC Video Index function is enabled and the module output mode matches the input, the module will pass the signal as is. If the output mode does not match, the module will use the selected conversion mode (2, 3, or 4). The Video Index coding is passed through to the 8990ARC output unaltered.

Wide Screen Signaling (WSS)

In 625-line systems the video input signal can contain video source data on line 23 (per specification EN 300 294 v1.3.2). If WSS is enabled, the 8990ARC output conversion mode will be controlled according to this input data. If Video Index Control is also enabled, the WSS control, when present, will take precedence. WSS coding is passed through to the 8990ARC output unaltered.

GPI Control

A GPI control input can be connected to either J7 or J8 (not both) on the rear panel. This is a loop-through input to an A/D converter and a 1.21 KΩ resistor to +5 V. When the module's GPI function is enabled, the 8990ARC software will recognize a GPI input voltage level to select one of four stored user-defined modes. Looping the input to additional modules allows a single GPI signal to set them all (up to 10 modules).

The GPI input is created by the application of a parallel resistor between the coax center and common ground that results in a voltage lower than +5 V to the A/D converter.

The following voltages (all ±0.4 V) will select the GPI register indicated:

■ 1.25 V = GPI 1

■ 2.08 V = GPI 2

■ 2.92 V = GPI 3

■ 3.75 V = GPI 4

The resistors required for these voltages are shown in Figure 8.

Figure 8. Typical GPI Input Circuit Diagram
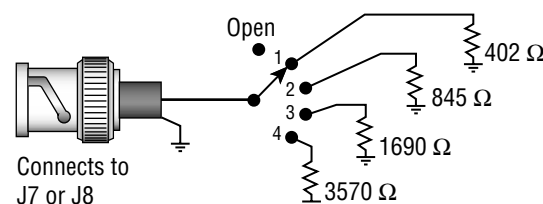
Remote Configuration and Monitoring

8990ARC configuration and monitoring can be performed using the 8900NET interface in 8900TF or TFN frames (see Figure 9). This section describes the GUI access to the module configuration functions. Refer to the 8900NET Network Interface Module Instruction Manual for information on setting up and operating the 8900 frame network.

For remote access, make sure the jumper block on the module is set for both Local and Remote access (Figure 5 on page 8).

Note   The physical appearance of the menu displays shown in this manual represent the use of a particular platform, browser and version of 8900NET module software. They are provided for reference only. Displays will differ depending on the type of platform and browser you are using and the version of the 8900NET software installed in your system.

The 8900 modules can be addressed by clicking on a specific module icon in the frame status display or on a module name or slot number in the link list on the left.

Figure 9. 8900NET GUI

The Links section lists the frame and its current modules. The selected link's Status page is first displayed and the sub-list of links for the selection is opened. The sub-list allows you to select a particular information page for the selected device.

Content display section displays the information page for the selected frame or module (frame slot icons are also active links).

The 8990ARC will indicate a SMPTE Alarm fault on the Frame Status display for the following alarms:

■ Lack of valid video input

■ Internal Fault

■ Board Failure

Module Configuration Displays

The 8900 GUI provides the following links and displays for the 8990ARC module (Figure 10):

■ Status and Slot Configuration displays showing status and slot configuration information (location and user assigned names),

■ Module Configuration displays, and

■ Software Update display.

The Status and Slot Configuration displays operate in the same manner for all remote controllable 8900 modules. Refer to the 8900NET manual for more information on these displays. Some functions listed may not be supported by a particular module. These will be indicated as not supported.

Figure 10. 8990ARC Display Links
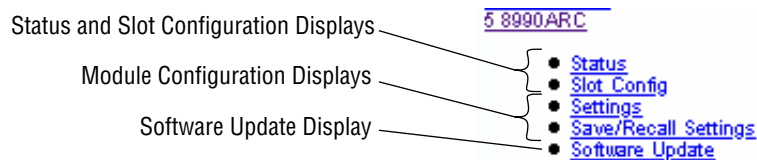
Software Update Display

The Software Update display allows you to download new software versions for the module. Refer to the 8900NET manual and the Grass Valley Group web site at http://www.grassvalleygroup.com for complete details and new software versions.

Module Configuration Displays

This section discusses the Module Configuration Displays used to set parameters required for 8990ARC module operation. You may select output format, control options, and signal *options*. Press the **APPLY** button to activate the selections.

Settings

The Settings display (Figure 11) allows you to:

■ Select Output Format – 4:3 or 16:9,

■ Select Conversion Mode – output picture ratio options,

■ Select Tilt or Pan – Tilt appears in modes that allow vertical position adjustment, Pan appears in modes that allow horizontal position adjustment,

■ Enable/disable Video Index control (see *Video Index Coding on page 12*),

■ Enable/disable Wide Screen Signaling (see *Wide Screen Signaling (WSS) on page 12*),

■ Enable GPI control (see *GPI Control on page 12*),

■ Pass/blank vertical ancillary data (VANC),

■ Select active line blanking option, and

■ Select high or low V Process BW (vertical resizing) filter – switch to low to remove ringing in lines with vertical black/white or severe chroma transitions (see *Vertical Resize Filtering on page 21*).

Figure 11. Settings Display

8990ARC SD Aspect Ratio Converter

Use
This
Link
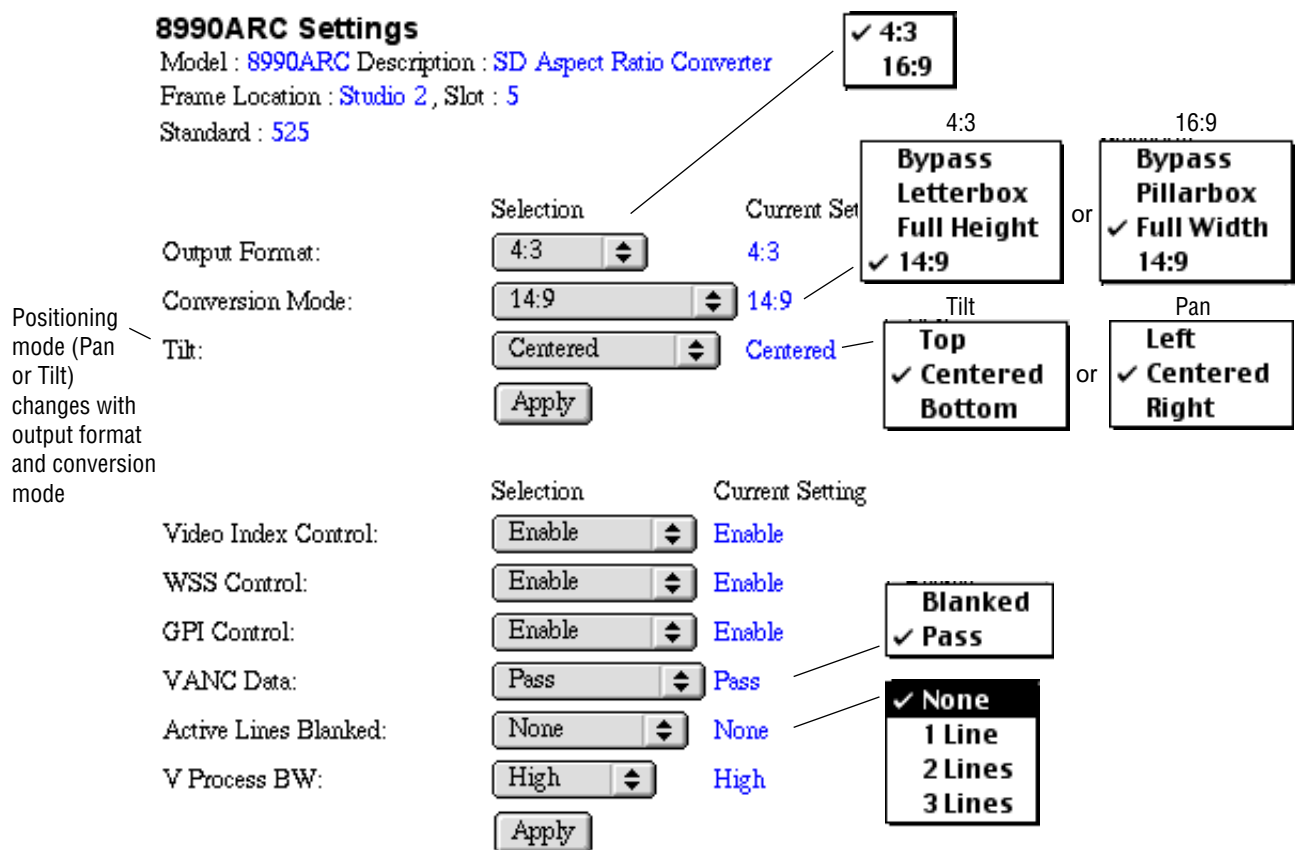
Save/Recall Settings Display

The 8990ARC provides five storage registers to save module configuration settings for access through standard local and remote control or through the GPI interface (see Figure 12). Current module configuration settings are displayed above the recall/save buttons. Factory default settings can be recalled using the **Recall Defaults** button.

Figure 12. Save/Recall Display

Specifications

Table 5. 8990ARC Specifications

Parameter	Value
SDI Input	
Signal type	SMPTE 259M-C or EBU tech 3267, 8 or 10-bit serial digital component video
Number of inputs	1 loop-through
Connector type	75 Ω BNC
Return loss	> 15 dB, 5 to 270 MHz
Max input cable lengthl	225 m (984 ft) of Belden 8281 or equivalent
SDI Outputs	
Number of outputs	4
Connector type	75 Ω BNC
Signal type	SMPTE 259M-C or EBU tech 3267
Output impedance	75 Ω
Return loss	> 15 dB, 5 to 270 MHz
Signal Processing	
Signal path	12-bit processing internally then rounded and truncated to 10 bits
525/625 selection	Automatic
Aspect ratio selection	16:9 to 4:3, 4:3 to 16:9, manual or automatic if video index or WSS input is enabled
Modes 16:9 to 4:3 conversion	• No processing • Letter-box (no loss) • Full height (h-crop) • 14:9 sub-image (some h-crop, less than full height)
Modes 4:3 to 16:9 conversion	• No processing • Side panels (no loss) • Full width (v-crop) • 14:9 sub-image (some v-crop, less than full width)
Horizontal position	Left/center/right justified output (shrink) or input (magnify)
Vertical position	Top/center/bottom justified output (shrink) or input (magnify)
Horizontal ancillary data	All horizontal embedded ancillary data (HANC) passed to output
Hot switch handling	Module will handle input signal hot switched between synchronous signals that are timed within the same line without causing glitches in the output stream
Switching line processing	None
Vertical interval blanking	Vertical interval active line time data optionally replaced by black or blanking – 20 or 21 lines blanked for 525; 25 lines blanked for 625 signals
Active line blanking	Top and bottom 0, 1, 2, or 3 lines In 525: Field 1 – 21 to 23 and 263 to 261; Field 2 – 20 to 22 and 262 to 260 In 625: Field 1 – 23 to 25 and 310 to 308; Field 2 – 336 to 338 and 623 to 621
Output signal EDH	Error Detection Handling (EDH) check-words per SMPTE RP 165 inserted in output signal
Performance	
Electrical length	75.25 lines all modes
Response to input signal loss	Output signal is invalid

Table 5. 8990ARC Specifications - (continued)

Parameter	Value
Environmental	
Frame temperature range	0 to 45 degrees C
Operating humidity range	0 to 90% non-condensing
Non-operating temperature	- 10 to 70 degrees C
Mechanical	
Frame type	8900 Series
Power Requirements	
Supply voltage	+ 12 V
Power consumption	4.75 Watts

Service

The 8990ARC Digital to Analog Converter modules make extensive use of surface-mount technology and programmed parts to achieve compact size and adherence to demanding technical specifications. Circuit modules should not be serviced in the field unless otherwise directed by Customer Service.

If your module is not operating correctly, proceed as follows:

■ Check frame and module power and signal present LEDs.

■ Verify power at the voltage tespoints (see Figure 14) and check Fuse F1 if no voltage is detected.

■ Check for presence and quality of input signals.

■ Verify that source equipment is operating correctly.

■ Check cable connections.

■ Check output connections for correct I/O mapping (correct input connector is used for the corresponding channel output).

Refer to Figure 4 for the location of PWR LED and Table 2 on page 6 for proper LED indications.

If the module is still not operating correctly, replace it with a known good spare and return the faulty module to a designated Grass Valley repair depot. Call your Grass Valley representative for depot location.

Figure 13. Refer to *Contacting Grass Valley Group* at the front of this document for the Grass Valley Customer Service Information number.

Figure 14. Fuse and Voltage Testpoint Locations
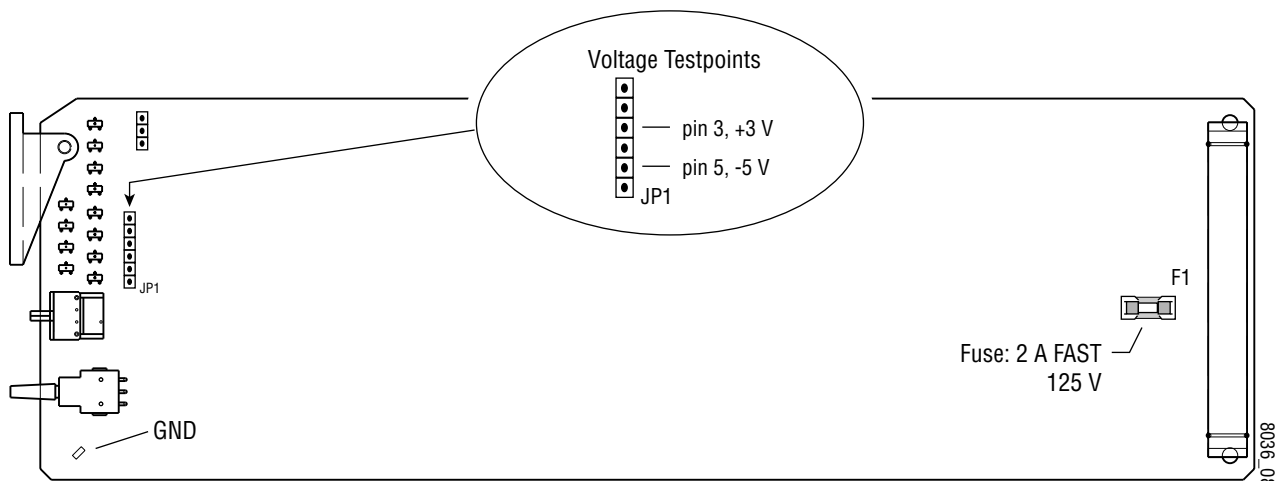
Functional Description

Refer to the block diagram in Figure 15 while reading the following functional description.

Figure 15. 8990ARC Block Diagram
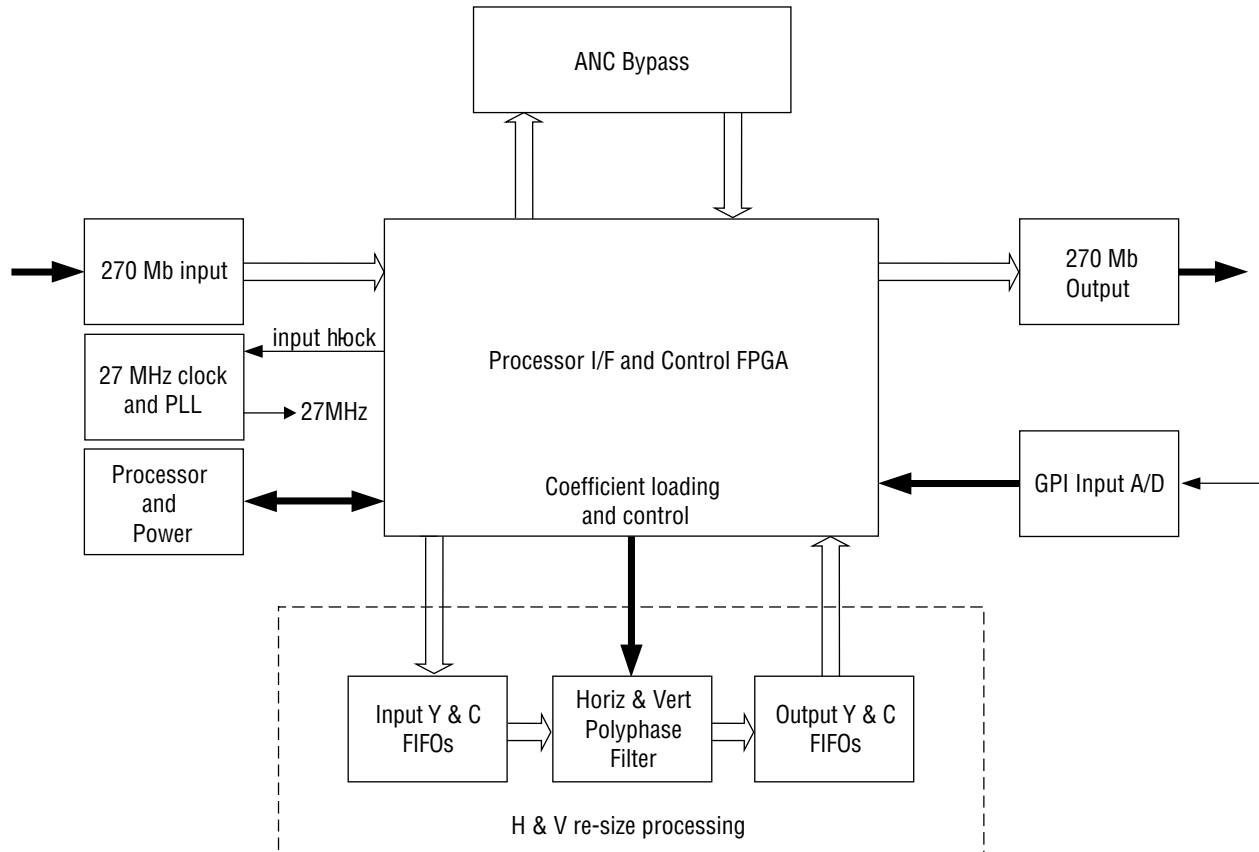
Input and Ancillary Data Processing

The input signal is deserialized and enters the control Field Programmable Gate Array (FPGA). Sync is detected and is used to H-lock the system 27 MHz clock. All horizontal and vertical interval data is routed through the ancillary date (ANC) bypass FIFO to delay match the re-sized active picture data and is multiplexed back, with the re-sized data, to the parallel data output. This output is serialized and output through 4 buffers and connectors.

Active Picture Processing

The active picture portion is routed through the H & V re-sizing portion shown. Depending on the mode and input format selected, H and V will be scaled up or down. The maximum delay for this processing is required for vertical magnification, where the starting position of the output will be at last position in the input picture. The worst case is 4:3 input and mode 3 (full-width) with the vertical position set at the bottom of the field. In all modes, the overall delay will be fixed at this worst case for each line rate.

H & V Re-sizing Algorithm

Scaling up (magnify) creates more pixels or lines in a selected region than is available in the input and therefore requires a horizontal or vertical position adjustment. It is accomplished by periodically holding off the reading of data from the input FIFO, while re-computing a new pixel/line in its corresponding poly-phase filter.

Scaling down (shrink) decimates pixels or lines from the entire source image and results in a blanked region in the output, which is adjusted using the horizontal or vertical position adjustment. It is accomplished by periodically holding off the writing of data to the output FIFO, while re-computing a new pixel/line in its corresponding poly-phase filter.

In modes 2 and 3 only one operation is performed, H or V scale up or down. In mode 4, the 14:9 sub-image both scaling up and scaling down are done independently and simultaneously.

Vertical Resize Filtering

All the poly-phase filters used for vertical magnification or shrink have maximum bandwidth. Video sources with high contrast or chroma saturated horizontal edges will produce some filter ringing within a few lines above and below the edge. One example of such an edge is contained in the SMPTE color bar test pattern. If this effect needs to be eliminated, then linear-interpolators can be used in these vertical processing modes in the V Process BW configuration selection. The consequence of this selection is having a reduced vertical bandwidth.

Video Index Information Coding Support

Video source data can be inserted on lines 11 or 324 in 625 line or 14 and 277 in 525 line systems per SMPTE RP-186 specification. The very first section of this coding region, Class 1.1, data octet 1, encodes options on the source of being 525/625 line and 4x3 or 16x9 format. If the input to the 8990ARC

contains this section of coding and the Video Index Control function is enabled, the mode will automatically change to 1 (no processing) if the input format and selected output format are the same. It will revert to the previous, 2 through 4 selection when either the input format changes or the user changes the desired output format.

Index

Numerics

P

R

S

T

V

8990ARC SD Aspect Ratio Converter
Rear Connector Overlay

Fold along vertical lines to break perforations, then tear to separate vertical pairs.

| ← Fold | Fold → | ← Fold | Fold → | ← Fold | Fold → |

8990ARC   8990ARC   8990ARC

J1   OUT   OUT   J2   J1   OUT   OUT   J2   J1   OUT   OUT   J2

J3   OUT   OUT   J4   J3   OUT   OUT   J4   J3   OUT   OUT   J4

NOT
J5   USED   J6   J5   NOT USED   J6   J5   NOT USED   J6

GPI
INPUT
J7   J8   J7   GPI INPUT   J8   J7   GPI INPUT   J8

IN

J9   J10   J9   IN   J10   J9   IN   J10

8990ARC   8990ARC   8990ARC

J1   OUT   OUT   J2   J1   OUT   OUT   J2   J1   OUT   OUT   J2

J3   OUT   OUT   J4   J3   OUT   OUT   J4   J3   OUT   OUT   J4

NOT
J5   USED   J6   J5   NOT USED   J6   J5   NOT USED   J6

GPI
INPUT
J7   J8   J7   GPI INPUT   J8   J7   GPI INPUT   J8

IN
J9   J10   J9   IN   J10   J9   IN   J10

| ← Fold | Fold → | ← Fold | Fold → | ← Fold | Fold → |

8990ARC SD Aspect Ratio Converter
Rear Connector Overlay

Fold along vertical lines to break perforations, then tear to separate vertical pairs.

| ← Fold | Fold → | | ← Fold | Fold → | | ← Fold | Fold → |

8990ARC　　　　　　　　**8990ARC**　　　　　　　　**8990ARC**

| J1 | OUT | OUT | J2 | | J1 | OUT | OUT | J2 | | J1 | OUT | OUT | J2 |

| J3 | OUT | OUT | J4 | | J3 | OUT | OUT | J4 | | J3 | OUT | OUT | J4 |

NOT USED　　　　　　　NOT USED　　　　　　　NOT USED

J5　　　　J6　　　　　J5　　　　J6　　　　　J5　　　　J6

GPI INPUT　　　　　　GPI INPUT　　　　　　GPI INPUT

| J7 | | | J8 | | J7 | | | J8 | | J7 | | | J8 |

IN　　　　　　　　　IN　　　　　　　　　IN

J9　　　　J10　　　　J9　　　　J10　　　　J9　　　　J10

8990ARC　　　　　　　　**8990ARC**　　　　　　　　**8990ARC**

| J1 | OUT | OUT | J2 | | J1 | OUT | OUT | J2 | | J1 | OUT | OUT | J2 |

| J3 | OUT | OUT | J4 | | J3 | OUT | OUT | J4 | | J3 | OUT | OUT | J4 |

NOT USED　　　　　　　NOT USED　　　　　　　NOT USED

J5　　　　J6　　　　　J5　　　　J6　　　　　J5　　　　J6

GPI INPUT　　　　　　GPI INPUT　　　　　　GPI INPUT

| J7 | | | J8 | | J7 | | | J8 | | J7 | | | J8 |

IN　　　　　　　　　IN　　　　　　　　　IN

J9　　　　J10　　　　J9　　　　J10　　　　J9　　　　J10

| ← Fold | Fold → | | ← Fold | Fold → | | ← Fold | Fold → |