

Acappella

SMALL ROUTERS

Instruction Manual

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the most watched worldwide

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Grass Valley Web Site

The www.thomsongrassvalley.com web site offers the following:

Online User Documentation — Current versions of product catalogs, brochures, data sheets, ordering guides, planning guides, manuals, and release notes in .pdf format can be downloaded.

FAQ Database — Solutions to problems and troubleshooting efforts can be found by searching our Frequently Asked Questions (FAQ) database.

Software Downloads — Software updates, drivers, and patches can be downloaded.

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Preface

About This Manual

This manual provides installation, configuration, operation, safety, and regulatory information for the Acappella small router products.

Safety Summary

Read and follow the important safety information below, noting especially those instructions related to risk of fire, electric shock or injury to persons. Additional specific warnings not listed here may be found throughout the manual.

WARNING Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

Safety Terms and Symbols

Terms in This Manual

Safety-related statements may appear in this manual in the following form:

WARNING Warning statements identify conditions or practices that may result in personal injury or loss of life.

CAUTION Caution statements identify conditions or practices that may result in damage to equipment or other property, or which may cause equipment crucial to your business environment to become temporarily non-operational.

Terms on the Product

The following terms may appear on the product:

DANGER — A personal injury hazard is immediately accessible as you read the marking.

WARNING — A personal injury hazard exists but is not immediately accessible as you read the marking.

CAUTION — A hazard to property, product, and other equipment is present.

Symbols on the Product

The following symbols may appear on the product:



Indicates that dangerous high voltage is present within the equipment enclosure that may be of sufficient magnitude to constitute a risk of electric shock.



Indicates that user, operator or service technician should refer to product manual(s) for important operating, maintenance, or service instructions.



This is a prompt to note fuse rating when replacing fuse(s). The fuse referenced in the text must be replaced with one having the ratings indicated.



Identifies a protective grounding terminal which must be connected to earth ground prior to making any other equipment connections.



Identifies an external protective grounding terminal which may be connected to earth ground as a supplement to an internal grounding terminal.



Indicates that static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

Warnings

The following warning statements identify conditions or practices that can result in personal injury or loss of life.

Dangerous voltage or current may be present — Disconnect power and remove battery (if applicable) before removing protective panels, soldering, or replacing components.

Do not service alone — Do not internally service this product unless another person capable of rendering first aid and resuscitation is present.

Remove jewelry — Prior to servicing, remove jewelry such as rings, watches, and other metallic objects.

Avoid exposed circuitry — Do not touch exposed connections, components or circuitry when power is present.

Use proper power cord — Use only the power cord supplied or specified for this product.

Ground product — Connect the grounding conductor of the power cord to earth ground.

Operate only with covers and enclosure panels in place — Do not operate this product when covers or enclosure panels are removed.

Use correct fuse — Use only the fuse type and rating specified for this product.

Use only in dry environment — Do not operate in wet or damp conditions.

Use only in non-explosive environment — Do not operate this product in an explosive atmosphere.

High leakage current may be present — Earth connection of product is essential before connecting power.

Dual power supplies may be present — Be certain to plug each power supply cord into a separate branch circuit employing a separate service ground. Disconnect both power supply cords prior to servicing.

Double pole neutral fusing — Disconnect mains power prior to servicing.

Use proper lift points — Do not use door latches to lift or move equipment.

Avoid mechanical hazards — Allow all rotating devices to come to a stop before servicing.

Cautions

The following caution statements identify conditions or practices that can result in damage to equipment or other property

Use correct power source — Do not operate this product from a power source that applies more than the voltage specified for the product.

Use correct voltage setting — If this product lacks auto-ranging power supplies, before applying power ensure that the each power supply is set to match the power source.

Provide proper ventilation — To prevent product overheating, provide equipment ventilation in accordance with installation instructions.

Use anti-static procedures — Static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

Do not operate with suspected equipment failure — If you suspect product damage or equipment failure, have the equipment inspected by qualified service personnel.

Ensure mains disconnect — If mains switch is not provided, the power cord(s) of this equipment provide the means of disconnection. The socket outlet must be installed near the equipment and must be easily accessible. Verify that all mains power is disconnected before installing or removing power supplies and/or options.

Route cable properly — Route power cords and other cables so that they are not likely to be damaged. Properly support heavy cable bundles to avoid connector damage.

Use correct power supply cords — Power cords for this equipment, if provided, meet all North American electrical codes. Operation of this equipment at voltages exceeding 130 VAC requires power supply cords which comply with NEMA configurations. International power cords, if provided, have the approval of the country of use.

Use correct replacement battery — This product may contain batteries. To reduce the risk of explosion, check polarity and replace only with the same or equivalent type recommended by manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Troubleshoot only to board level — Circuit boards in this product are densely populated with surface mount technology (SMT) components and application specific integrated circuits (ASICs). As a result, circuit board repair at the component level is very difficult in the field, if not impossible. For warranty compliance, do not troubleshoot systems beyond the board level.

Regulatory Notices

Certifications and Compliances

FCC Emission Control

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 the 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 his own expense. Changes or modifications not expressly approved by Grass Valley can affect emission compliance and could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules (E4 environment). Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation.

Canadian EMC Notice of Compliance

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

EN55103-1/2 Class A Warning

For products that comply with Class A. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

This product has been evaluated for Electromagnetic Compatibility under the EN 55103-1/2 standards for Emissions and Immunity and meets the requirements for E4 environment.

Safety Certification

This product's components have been evaluated and meet the Safety Certification Standards listed in [Table 1](#).

Table 1. Safety Certification Standards

Component	Standard	Designed/Tested for compliance with:
Acappella router Acappella Remote panel	ANSI/UL 60950-1-2002	Safety of Information Technology Equipment, including Electrical Business Equipment (First edition)
	IEC 60950	Safety of Information Technology Equipment, including Electrical Business Equipment (First edition, 2001).
	CAN/CSA C22.2 NO. 60950-1-03 First edition	Safety of Information Technology Equipment, including Electrical Business Equipment.
	BS EN60950-2000	

Physical Configuration

The Acappella routers are designed for a variety of broadcast and professional applications. The Acappella frame is 1 rack unit in height.

Dual-format routers:

- Wideband (HD and SD) digital video with AES digital audio.

Single-format routers:

- Wideband (HD and SD) digital video, or
- AES digital audio,

Features:

- Plug and play operation using default configuration,
- Available with integrated Local Panel,
- Remote Panels,
- Available with internal redundant Power Supplies.
- Serial port for automation, and
- Ethernet interface for User defined configuration.

Front Covers

The front of the Acappella frame and the related remote panels will vary with the configuration of the system. All Acappella frames can be ordered with a local panel installed in the frame. When a local panel is ordered, the front will appear with the button configuration that matches the Acappella frame's configuration. Remote panels can be ordered in several configurations and do not have to match the Acappella frame's configuration. For example, using an Acappella system with 8 inputs, 4 outputs, a local panel, and a Remote Panel. The local panel would have the appearance of an 8x4 ([Figure 8 on page 18](#)), however, the Remote Panel could have one of several possible appearances.

Any Acappella frame ordered without a Local Panel will appear as shown in [Figure 1](#).

Figure 1. Acappella Front with no Local Panel

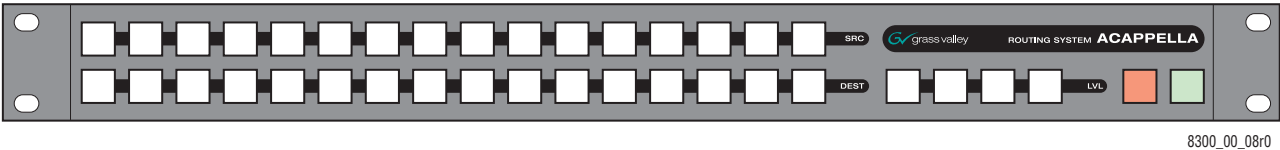


All Local Panel fronts will have four Level buttons, a green Enable button, a red Protect button. The number of Source and Destination buttons will change depending on the frame’s configuration for local panels and the desired configuration for remote panels.

The panel’s appearance is related to how many Sources and Destinations are available, not how many Levels are used. That is why systems with 8x4 Wideband only, 8x4 Wideband and 8x4 AES, or 8x4 Wideband and 8x4 Dual Stream AES would all use the same panel.

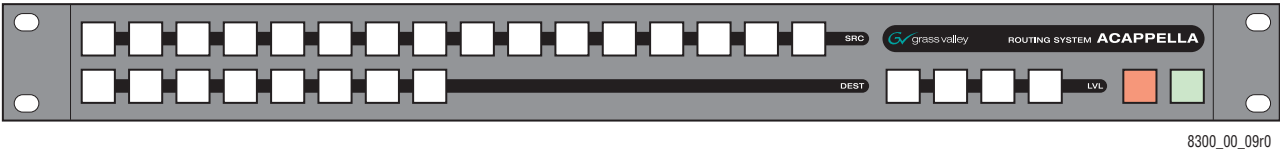
The Local Panel on any system with 16 Sources and 16 Destinations appears as shown in [Figure 2](#). This configuration is also available as a Remote Panel.

Figure 2. 16x16 Front



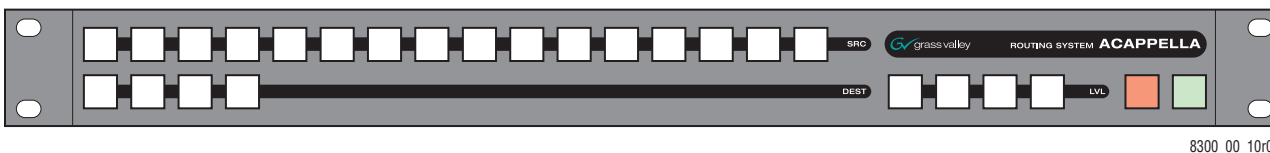
The Local Panel on any system with 16 Sources and 8 Destinations appears as shown in [Figure 3](#). This configuration is also available as a Remote Panel with either the same number of Sources and Destinations as the Acappella frame or as a subset of the system’s total Destinations.

Figure 3. 16x8 Front



The Local Panel on any system with 16 Sources and 4 Destinations appears as shown in [Figure 4](#). This configuration is also available as a Remote Panel with either the same number of Sources and Destinations as the Acappella frame or as a subset of the system's total Destinations.

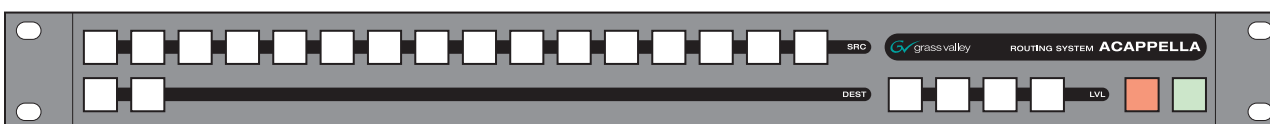
Figure 4. 16x4 Front



8300_00_10r0

The Local Panel on any system with 16 Sources and 2 Destinations appears as shown in [Figure 5](#). This configuration is also available as a Remote Panel with either the same number of Sources and Destinations as the Acappella frame or as a subset of the system's total Destinations.

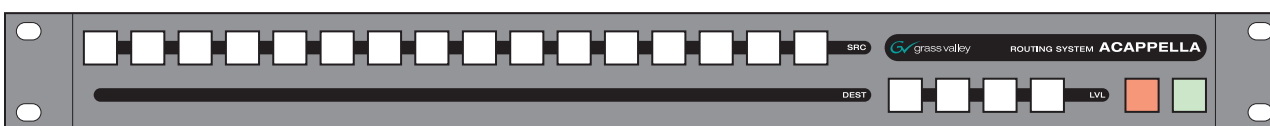
Figure 5. 16x2 Front



8300_00_11r0

The configuration shown in [Figure 6](#) is available as a Remote Panel to limit the available 16 Destinations to a single user defined Destination.

Figure 6. 16x1 Single Destination Front



8300_00_12r0

The Local Panel on any system with 8 Sources and 8 Destinations appears as shown in [Figure 7](#). This configuration is also available as a Remote Panel with either the same number of Sources and Destinations as the Acappella frame or as a subset of the system's total Sources and/or Destinations.

Figure 7. 8x8 Front



8300_00_13r0

The Local Panel on any system with 8 Sources and 4 Destinations appears as shown in [Figure 8](#). This configuration is also available as a Remote Panel with either the same number of Sources and Destinations as the Acappella frame or as a subset of the system’s total Sources and /or Destinations.

Figure 8. 8x4 Front



The configuration shown in [Figure 9](#) is available as a Remote Panel to limit the available Sources to eight and the available Destinations to two.

Figure 9. 8x2 Front



The configuration shown in [Figure 10](#) is available as a Remote Panel to limit the available Sources to eight and the available Destinations to a single user defined Destination.

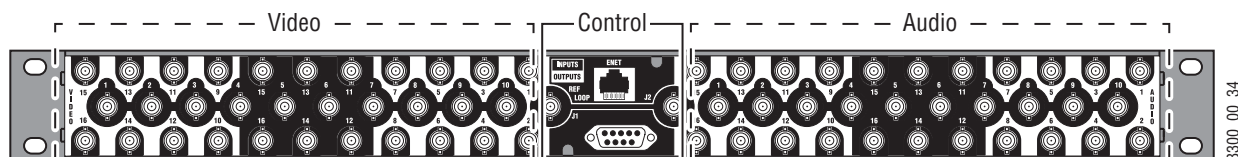
Figure 10. 8x1 Single Destination Front



Backplanes

When viewed from the rear, the Acappella backplane is divided as shown in Figure 11. The control area in the center will appear on all frames. The Audio section on the right and the Video section on the left will change depending upon the configuration of the frame. Inputs are indicated by white numbers in the black area, are located in the top and bottom row of the black area, and the entire middle row. Outputs are indicated by black numbers in the white areas and are located in the top and bottom rows of the white areas.

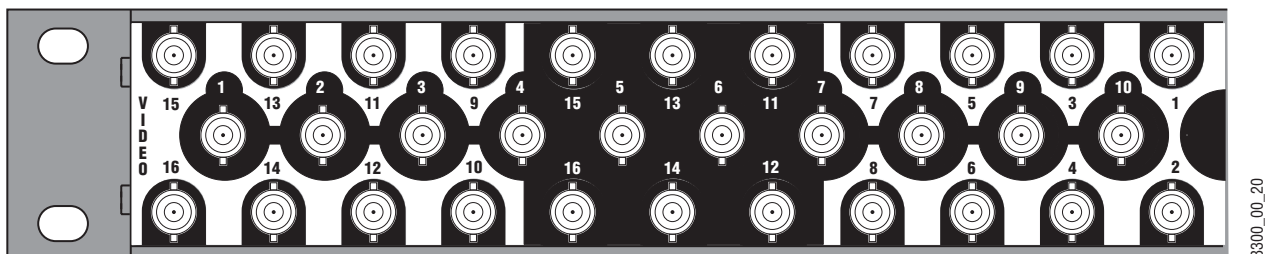
Figure 11. Acappella Backplane



Video Configuration

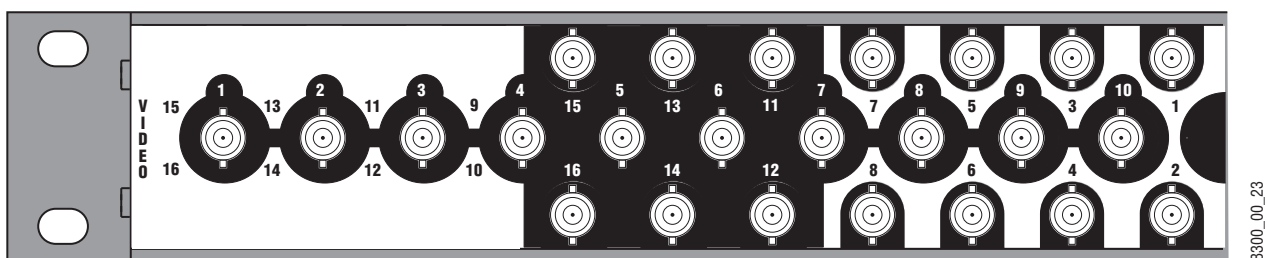
The configuration shown in Figure 12 is 16 Inputs by 16 Outputs. This configuration can be used by digital wideband (HD and SD) video.

Figure 12. 16x16 Video BNC Backplane



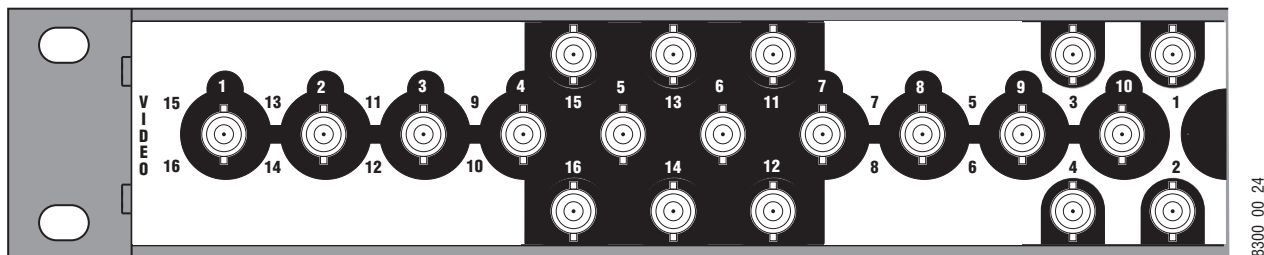
The configuration shown in Figure 13 is 16 Inputs by 8 Outputs. This configuration can be used by digital wideband (HD and SD) video.

Figure 13. 16x8 Video BNC Backplane



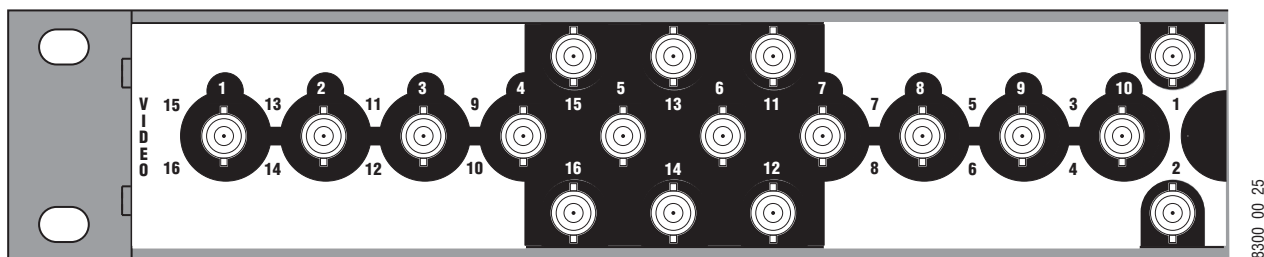
The configuration shown in [Figure 14](#) is 16 Inputs by 4 Outputs. This configuration can be used by digital wideband (HD and SD) video.

Figure 14. 16x4 Video BNC Backplane



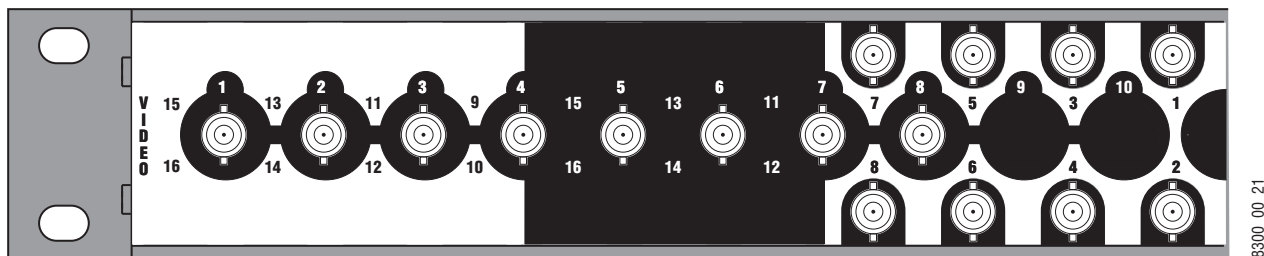
The configuration shown in [Figure 15](#) is 16 Inputs by 2 Outputs. This configuration can be used by digital wideband (HD and SD) video.

Figure 15. 16x2 Video BNC Backplane



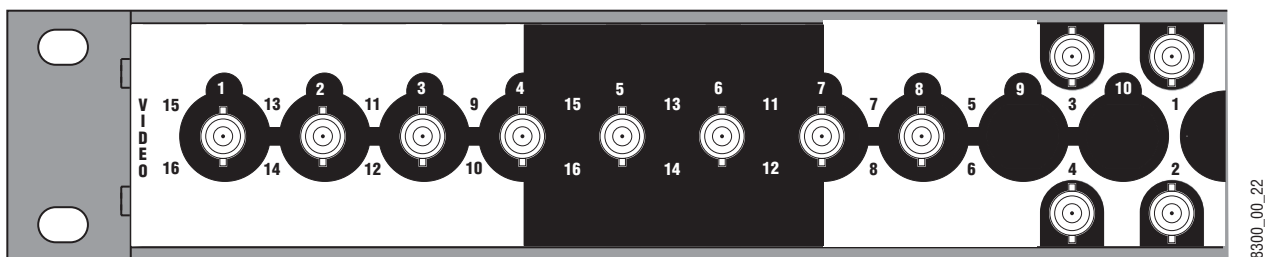
The configuration shown in [Figure 16](#) is 8 Inputs by 8 Outputs. This configuration can be used by digital wideband (HD and SD) video.

Figure 16. 8x8 Video BNC Backplane



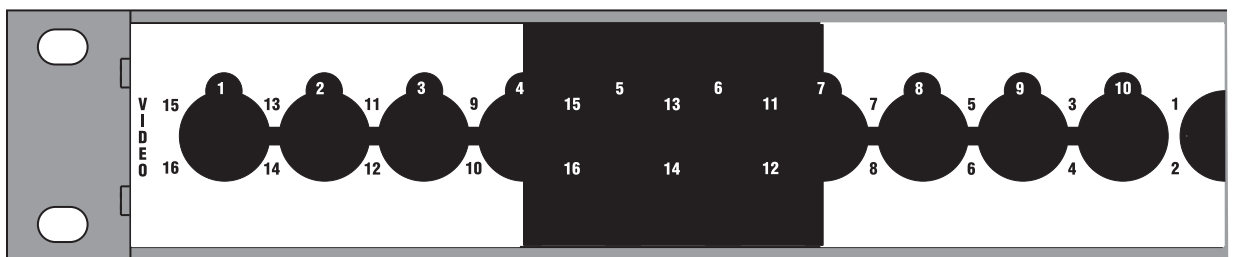
The configuration shown in [Figure 17](#) is 8 Inputs by 4 Outputs. This configuration can be used by digital wideband (HD and SD) video.

Figure 17. 8x4 Video BNC Backplane



The blank configuration shown in [Figure 18](#) is used on systems that have audio with no video.

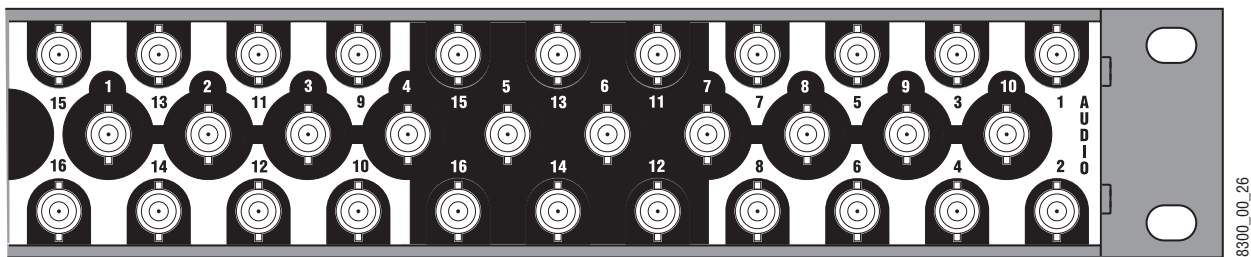
Figure 18. Blank Video Backplane



Audio Configuration

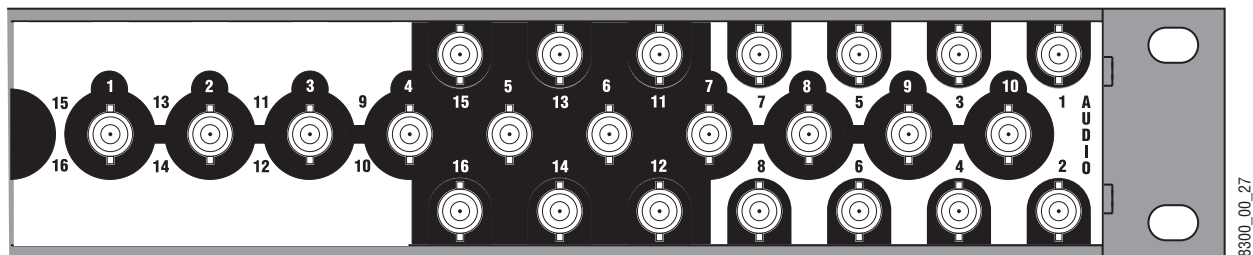
The configuration shown in [Figure 19](#) is 16 Inputs by 16 Outputs in a Single Stream of digital (AES) audio.

Figure 19. 16x16 Audio Single Stream BNC Backplane



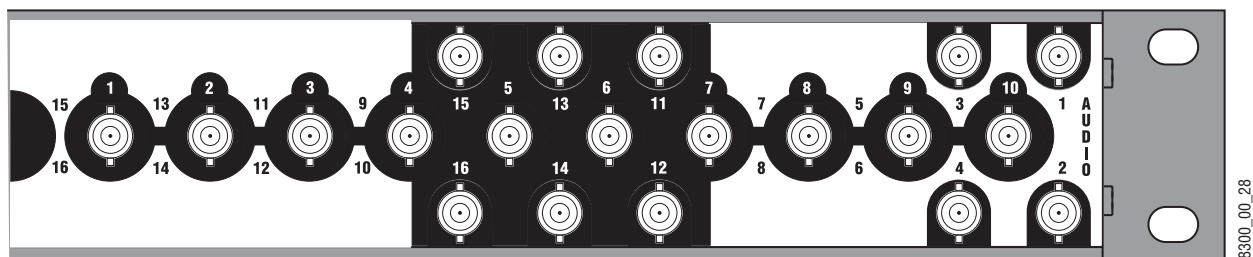
The configuration shown in [Figure 20](#) is 16 Inputs by 8 Outputs in a single stream of digital (AES) audio.

Figure 20. 16x8 Audio Single Stream BNC Backplane



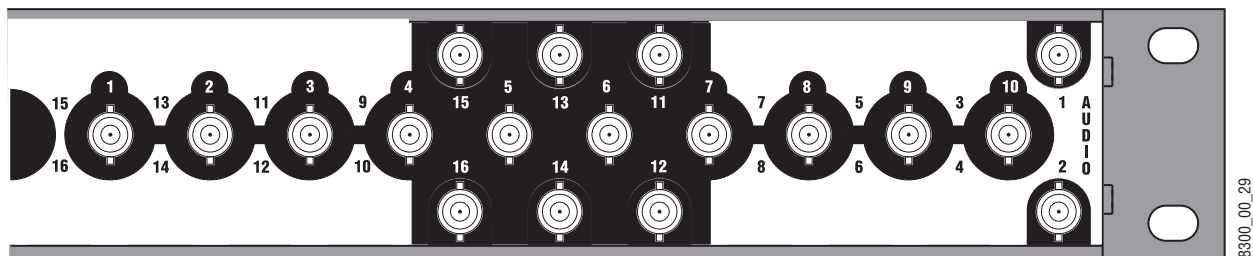
The configuration shown in [Figure 21](#) is 16 Inputs by 4 Outputs in a single stream of digital (AES) audio.

Figure 21. 16x4 Audio Single Stream BNC Backplane



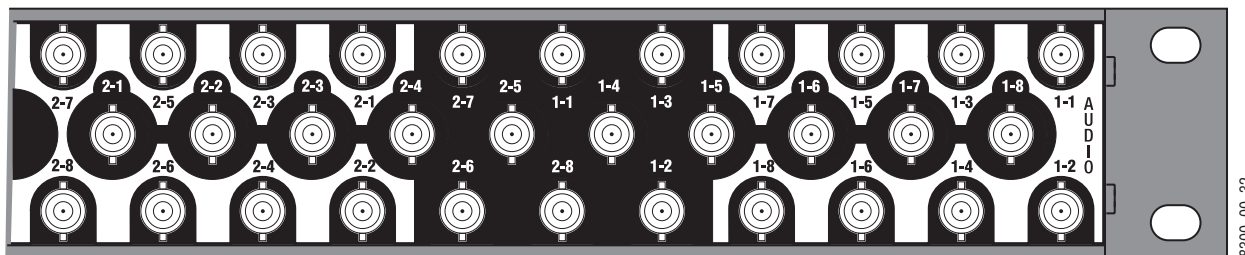
The configuration shown in [Figure 22](#) is 16 Inputs by 2 Outputs in a single stream of digital (AES) audio.

Figure 22. 16x2 Audio Single Stream BNC Backplane



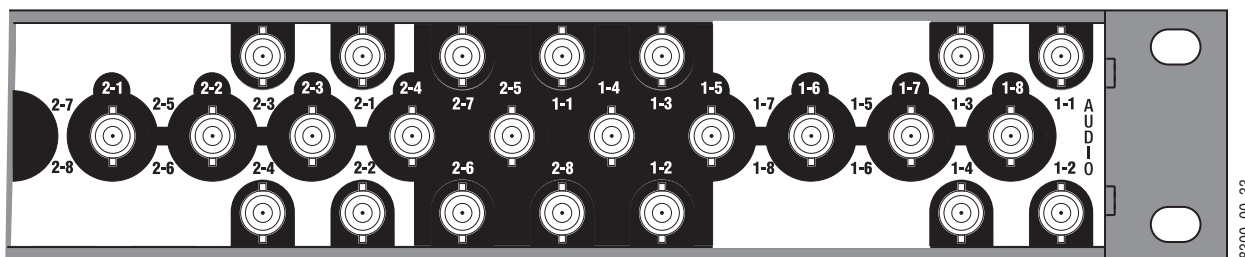
The configuration shown in [Figure 23](#) is 8 Inputs by 8 Outputs in dual streams of digital (AES) audio.

Figure 23. 8x8 Audio Dual Stream BNC Backplane



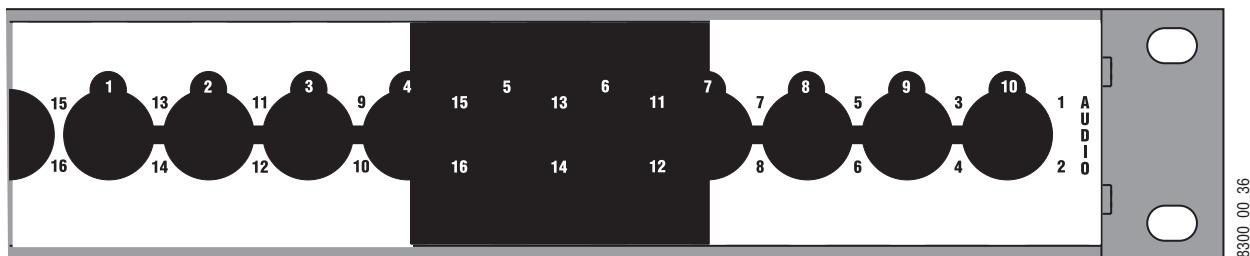
The configuration shown in [Figure 24](#) is 8 Inputs by 4 Outputs in dual streams of digital (AES) audio.

Figure 24. 8x4 Audio Dual Stream BNC Backplane



The blank configuration shown in [Figure 25](#) is used on systems that have video with no audio.

Figure 25. Blank Audio Backplane



Backplane Combinations

Current combinations of Video and Audio backplanes are shown in [Table 2](#).

Table 2. *Acappella Frame Backplane Combinations*

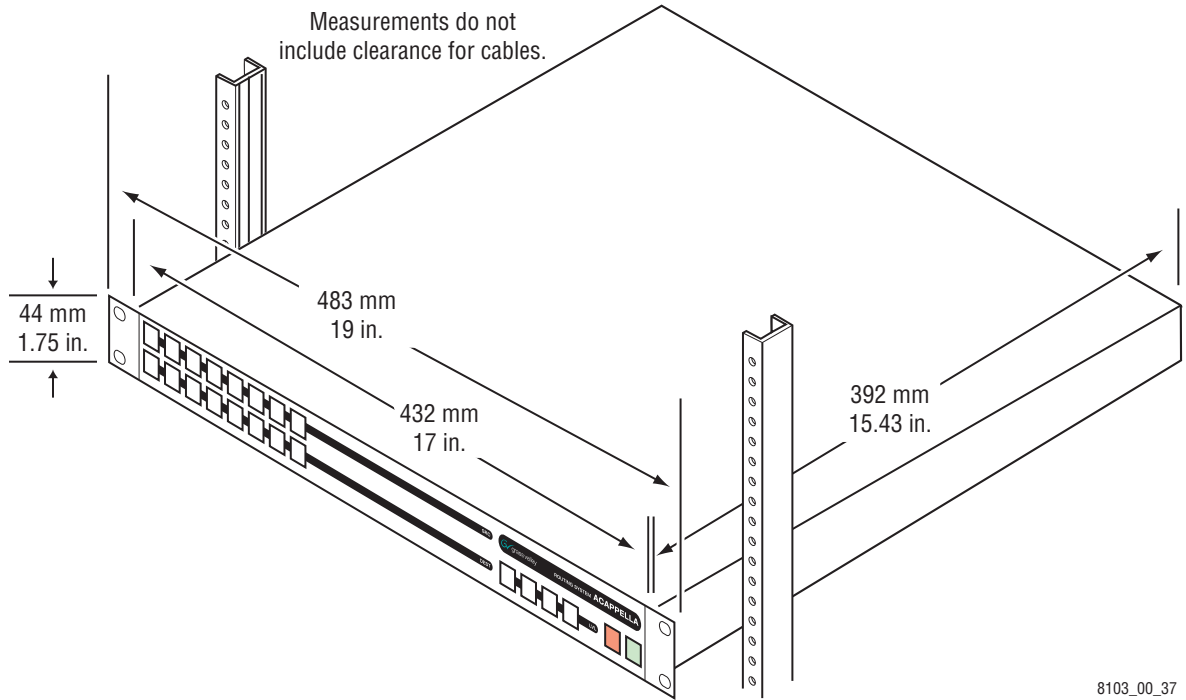
Model	Inputs	Outputs	Backplane		Description
			Video	Audio	
A84HR	8	4	8x4 Video BNC Backplane (page 21)	Blank Audio Backplane (page 23)	Wide-band reclocking digital video
A84DU	8	4	Blank Video Backplane (page 21)	8x4 Audio Dual Stream BNC Backplane (page 23)	Dual stream digital AES audio
A84HR-DU	8	4	8x4 Video BNC Backplane (page 21)	8x4 Audio Dual Stream BNC Backplane (page 23)	Wide-band reclocking digital video with dual stream digital AES audio
A88HR	8	8	8x8 Video BNC Backplane (page 20)	Blank Audio Backplane (page 23)	Wide-band reclocking digital video
A88DU	8	8	Blank Video Backplane (page 21)	8x8 Audio Dual Stream BNC Backplane (page 23)	Dual stream digital AES audio
A88HR-DU	8	8	8x8 Video BNC Backplane (page 20)	8x8 Audio Dual Stream BNC Backplane (page 23)	Wide-band reclocking digital video with dual stream digital AES audio
A162HR	16	2	16x2 Video BNC Backplane (page 20)	Blank Audio Backplane (page 23)	Wide-band reclocking digital video
A162AU	16	2	Blank Video Backplane (page 21)	16x2 Audio Single Stream BNC Backplane (page 22)	Single stream digital AES audio
A162HR-AU	16	2	16x2 Video BNC Backplane (page 20)	16x2 Audio Single Stream BNC Backplane (page 22)	Wide-band reclocking digital video with single stream digital AES audio
A164HR	16	4	16x4 Video BNC Backplane (page 20)	Blank Audio Backplane (page 23)	Wide-band reclocking digital video
A164AU	16	4	Blank Video Backplane (page 21)	16x4 Audio Single Stream BNC Backplane (page 22)	Single stream digital AES audio
A164HR-AU	16	4	16x4 Video BNC Backplane (page 20)	16x4 Audio Single Stream BNC Backplane (page 22)	Wide-band reclocking digital video with single stream digital AES audio
A168HR	16	8	16x8 Video BNC Backplane (page 19)	Blank Audio Backplane (page 23)	Wide-band reclocking digital video
A168AU	16	8	Blank Video Backplane (page 21)	16x8 Audio Single Stream BNC Backplane (page 22)	Single stream digital AES audio
A168HR-AU	16	8	16x8 Video BNC Backplane (page 19)	16x8 Audio Single Stream BNC Backplane (page 22)	Wide-band reclocking digital video with single stream digital AES audio
A1616HR	16	16	16x16 Video BNC Backplane (page 19)	Blank Audio Backplane (page 23)	Wide-band reclocking digital video
A1616AU	16	16	Blank Video Backplane (page 21)	16x16 Audio Single Stream BNC Backplane (page 21)	Single stream digital AES audio
A1616HR-AU	16	16	16x16 Video BNC Backplane (page 19)	16x16 Audio Single Stream BNC Backplane (page 21)	Wide-band reclocking digital video with single stream digital AES audio

Installation

Acappella Frame Rack Installation

The Acappella frame is installed in a standard 483 mm (19 inch) rack. Rear frame support is supplied as an option. The frame occupies 1 rack unit. Cooling is by horizontal front-to-back airflow using internal fans. See [Figure 26](#).

Figure 26. Acappella Installation Front View

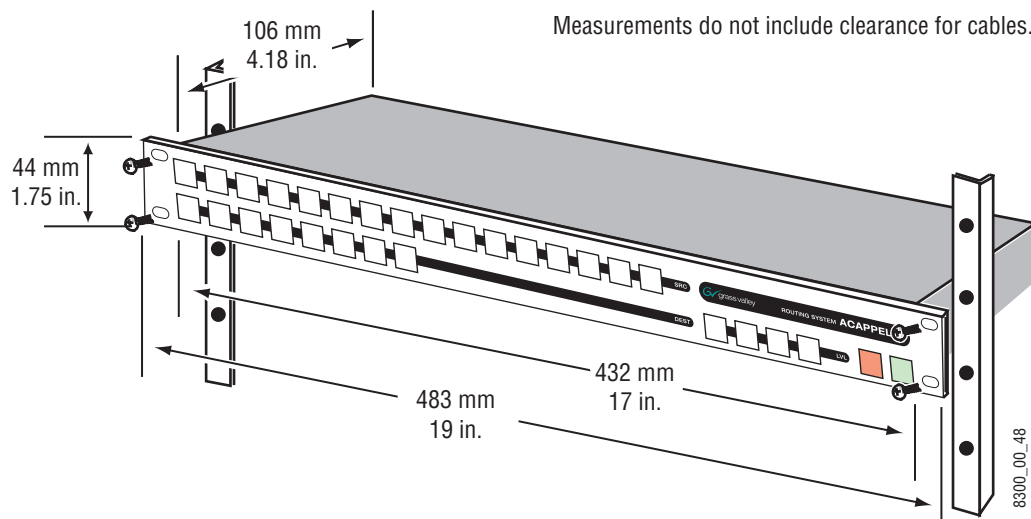


Note The depth shown is for the frame. Additional space is needed for cable clearances.

Remote Panel Rack Installation

Remote panel rack mounting is straightforward and requires no special tools or adaptors. Simply position the Remote Panel in the rack and secure the panel in place. Refer to [Figure 27](#).

Figure 27. Rack Mount Remote Panel Installation



Acappella Cabling

Figure 28 shows all possible cabling for a 16x16 Acappella frame with 16 Video Inputs and Outputs and 16 single stream Audio Inputs and Outputs. The second Power Supply and the Serial RS-422 are optional.

Figure 28. 16x16 Cabling

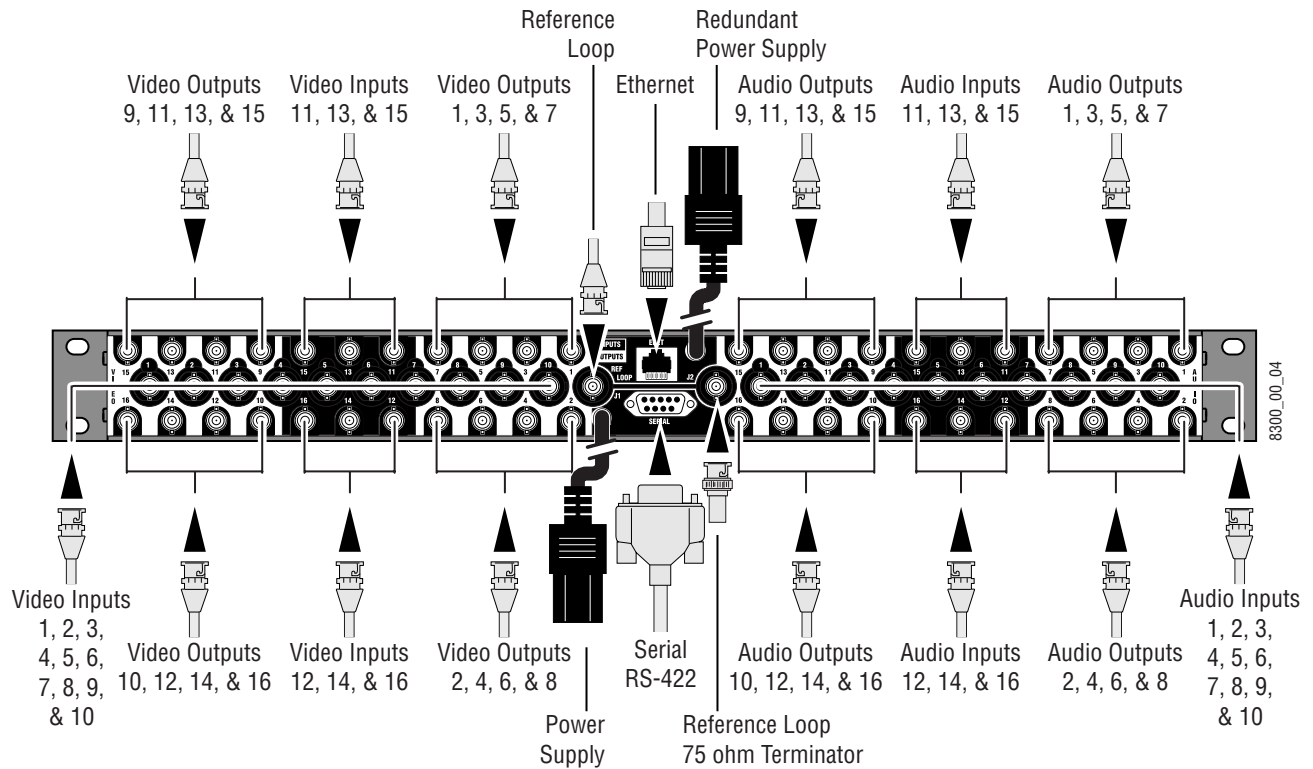
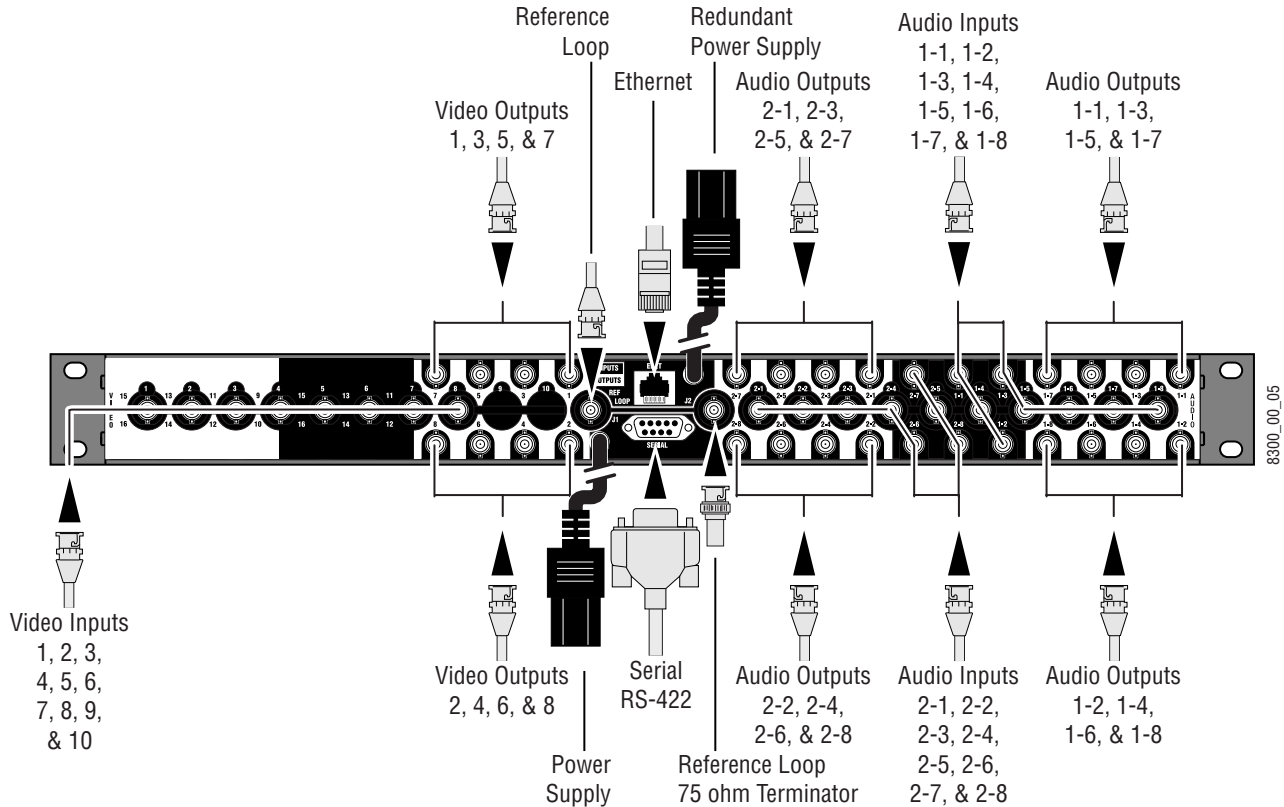


Figure 29 shows all possible cabling for an 8x8 Acappella frame with 8 Video Inputs and Outputs and 8 dual stream Audio Inputs and Outputs. The second Power Supply and the Serial RS-422 are optional.

Figure 29. 8x8 Cabling



Control Cabling

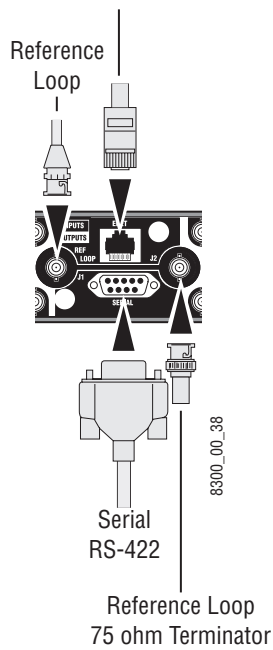


Table 3 shows the connectors in the Control area of the Acappella frame.

Table 3. Control Cabling

Label	Connector		Details
	Type	Gender	
ENET	RJ-45	Female	Ethernet network communication interface is 100Base-T compatible, use Category 5e cable, 8 conductor twisted pair.
SERIAL	9 pin D	Female	RS-422 interface, use serial cable.
REF LOOP	BNC	Female	Video reference supports Color Black or Tri-Level-Sync, use unbalanced 75 ohm connector, Loop-thru cabling supported.

Serial 9 Pin D Connector Pinout

Table 4 contains pinout information for the Serial RS-422/485 9 Pin D connector.

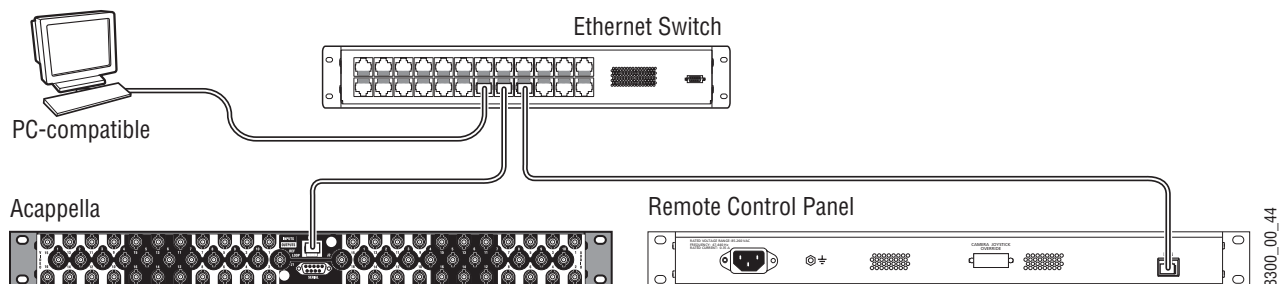
Table 4. Serial D Connector Pinouts

Controlled	Pin	Function	Pin	Function
9 Pin D Female 	1	GND	6	TX Com
	2	TX-	7	TX+
	3	RX+	8	RX-
	4	RX Com	9	GND
	5	NC	-	-

Ethernet Cabling

The Acappella frame and optional components use Ethernet to communicate. Use standard pin-to-pin (patch) Category 5e cables to connect to a switch. Use a peer-to-peer (crossover) cable when connecting directly to a PC-compatible or laptop. For normal operation an Ethernet network is recommended using patch cables and switches. Figure 30 shows a Closed Network system with an Acappella router, a Remote Panel, and a PC-compatible connected to a switch.

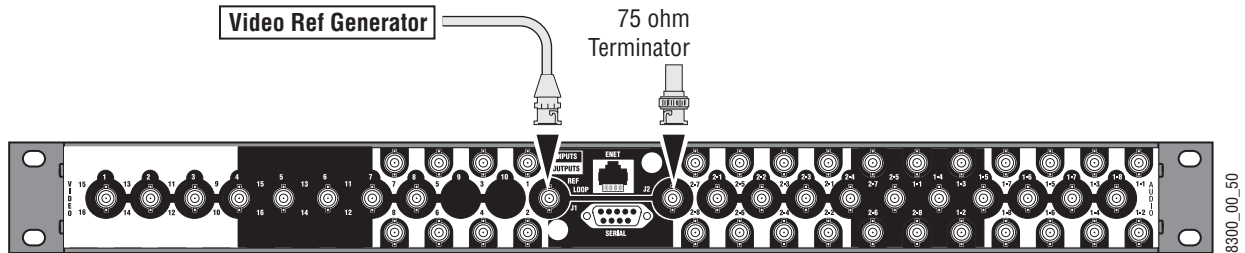
Figure 30. Ethernet Cabling



Reference Cabling

Video reference signals can be routed via loop-thru daisy-chains with the end of the chain terminated. Color Black or Tri-Level Sync signals is used. Audio timing also uses the Video reference. The Video Reference as shown in [Figure 31](#) is the default cabling for plug and play.

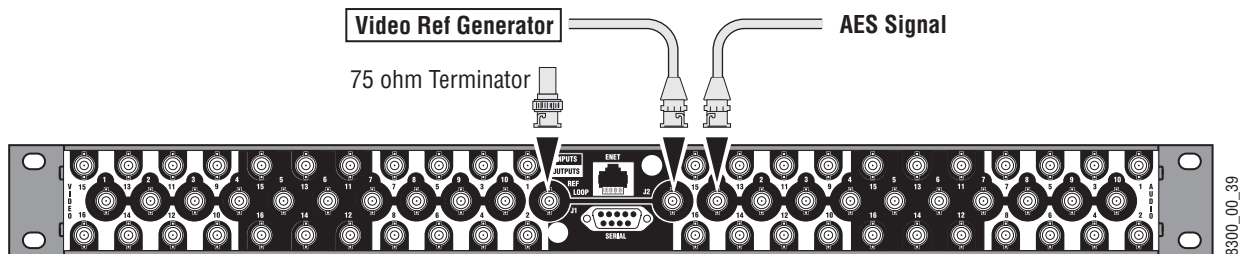
Figure 31. Video Reference Connections



To use an AES signal for Audio timing see [Router Reference Configuration on page 60](#) to select AES Src 1 instead of the default Video Reference.

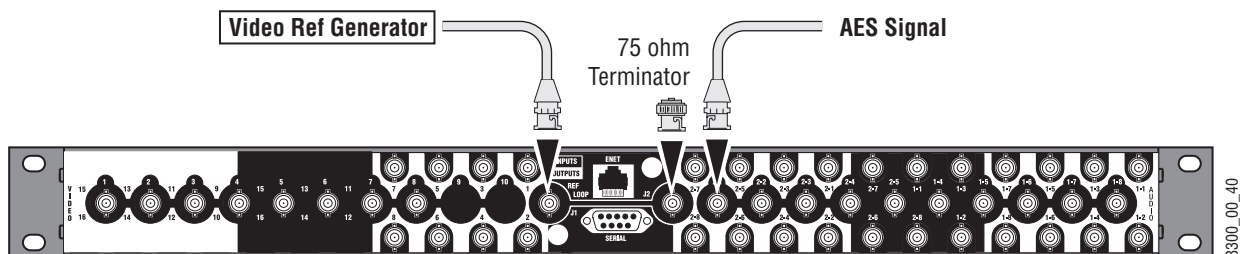
In [Figure 32](#) a Continuous Feed Aes Signal is connected to Audio Input 1, the Video reference is connected to J2, and the Video reference is terminated at J1. The Video reference can be connected to either J1 or J2, there is no preferred order.

Figure 32. Reference Signal Cabling Option for Single Stream Audio



In [Figure 33](#) a continuous feed AES signal is connected to Audio Input 2-1, the Video reference is connected to J1, and the Video reference is terminated at J2.

Figure 33. Reference Signal Cabling Option for Dual Stream Audio



Input and Output Cabling

The backplane of the Acappella router is marked with numbers identifying the Input and Output connectors. White numbers on a black background identify Inputs, while black numbers on a white background identify Outputs. To see the different Input and Output configurations see [Backplanes on page 19](#).

Figure 34 shows the Input and Output cabling for a 16x16 configuration with 16 Video Inputs and Outputs and 16 single stream Audio Inputs and Outputs.

Figure 34. Input and Output Cabling for a 16x16HR-AU

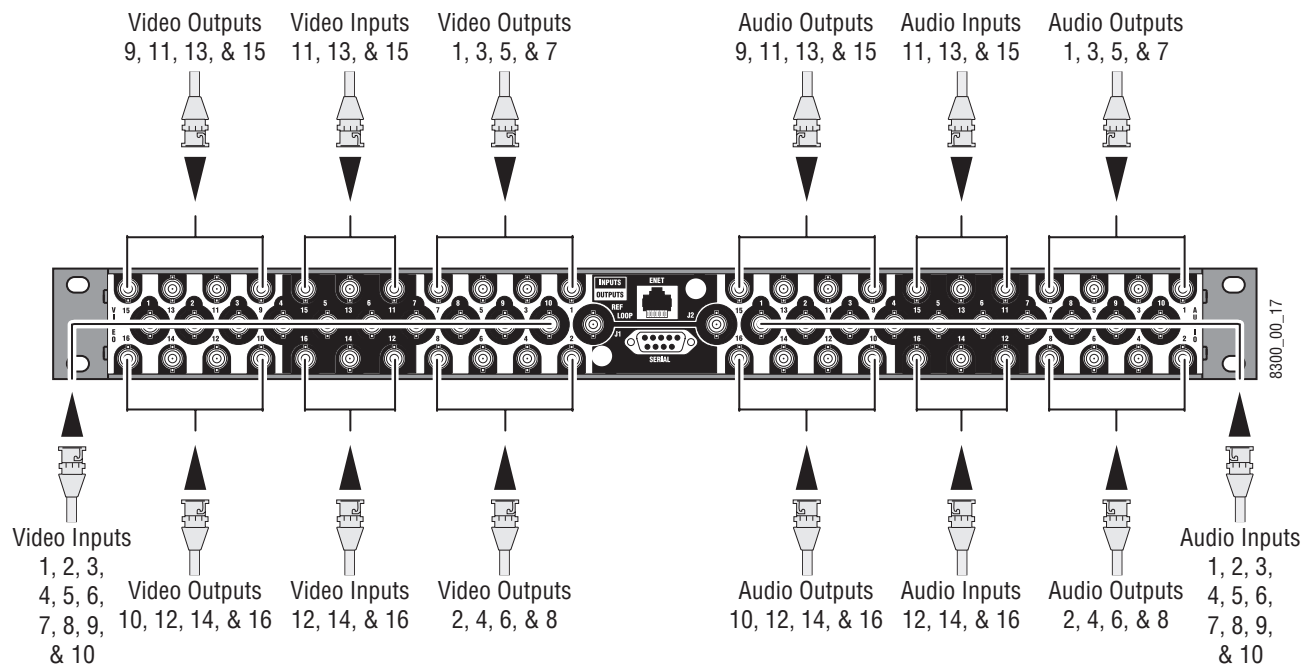
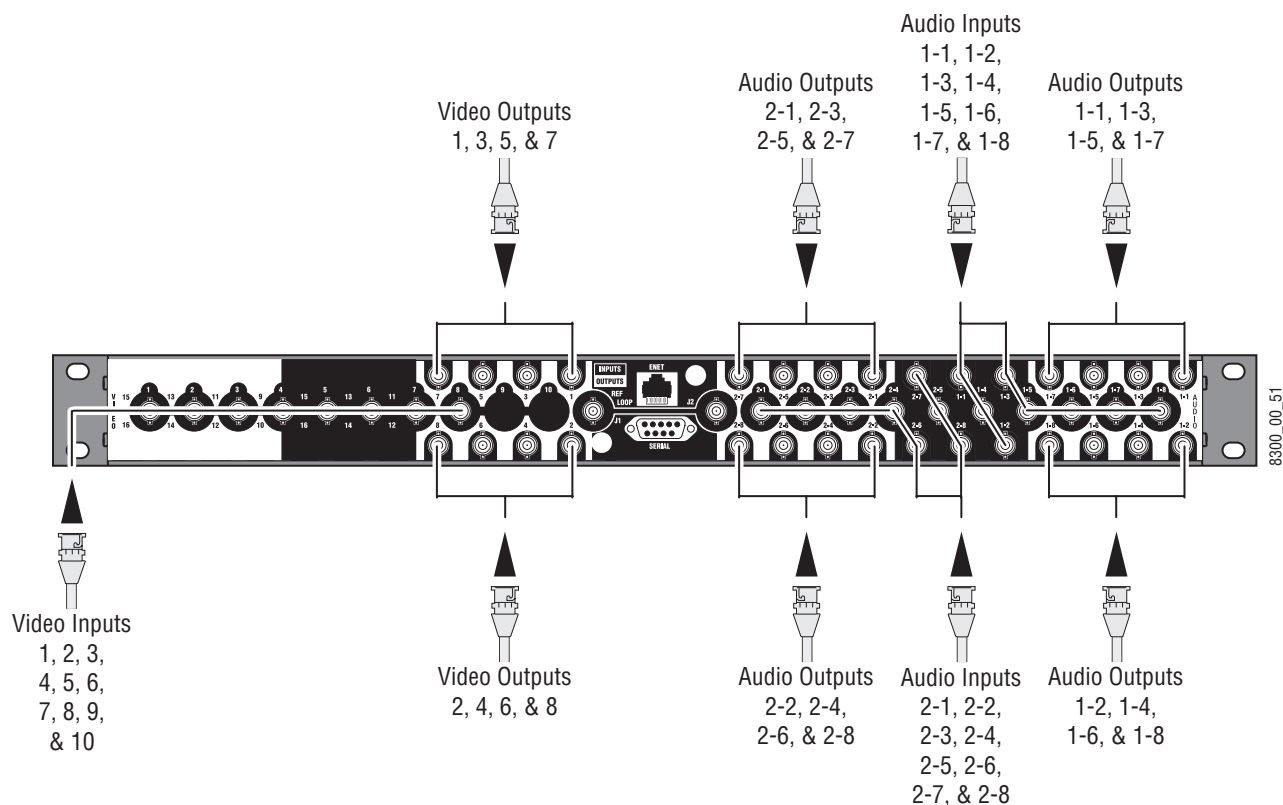


Figure 35 shows the Input and Output cabling for an 8x8 configuration with 8 Video Inputs and Outputs and 8 dual stream Audio Inputs and Outputs.

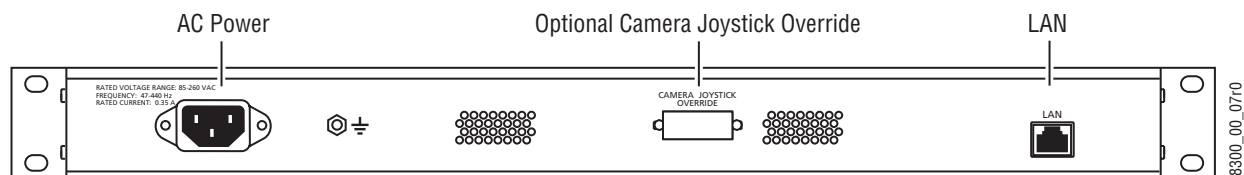
Figure 35. Input and Output Cabling for a 8x8HR-DU



Remote Panel Cabling

The Remote Panel has connectors for RJ-45 Ethernet and AC Power. The Camera Joystick Override is optional. See Figure 36.

Figure 36. Remote Panel Cabling

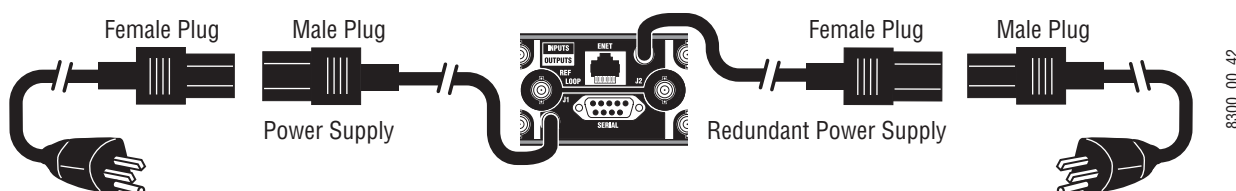


Power

The Acappella frame uses internal auto-ranging AC power supplies. One Power Supply is standard, the optional second Power Supply is fully redundant.

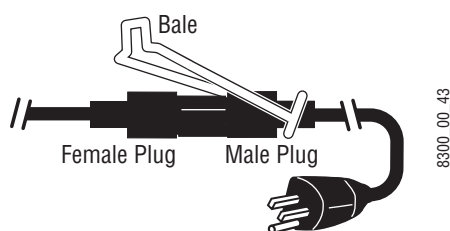
The frame ships with one or two captive power cords. A separate power cord (shipped with the frame) needs to be attached to each of the captive power cords as shown in [Figure 37](#)

Figure 37. AC Power Supplies



A bale clamp is provided to secure the power cords.

Figure 38. Power Cord Bale Clamp



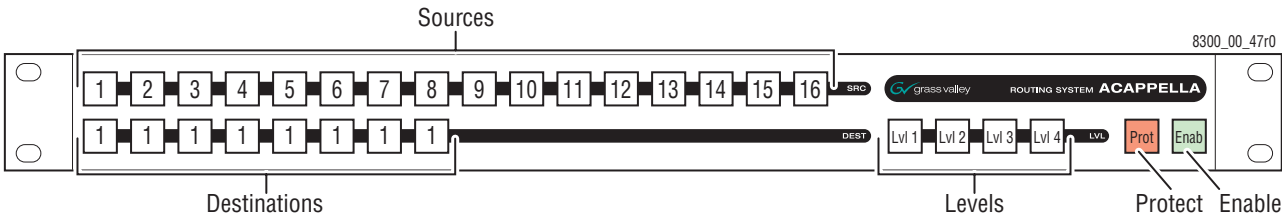
Defaults for Plug and Play

Default Levels are determined by the router's physical configuration. A router with a physical configuration of 8x8HR-DU would have 3 default Levels; Level 1 is digital Video, Level 2 is AES digital Audio dual stream 1, Level 3 is AES digital Audio dual stream 2. A 16x16HR-AU router would have 2 default Levels; Level 1 is digital Video and Level 2 is AES digital Audio single stream.

The default signal type is Auto reclocking for digital Video. The active AES digital Audio attributes are; Audio mode: Normal, Resolution: 20 bit, Select: Individual, and Block Align: On. All other AES digital Audio attributes are inactive so Bypass, Invert, Sum, Mute, and Swap attributes are all in an Off status.

The default signal path is for Source signal number 1 connected to Input number 1 to be sent to all Destinations. This default condition will only appear the first time the Acappella is powered up. Once the panel has been changed by selecting a Source other than number 1 and taking that source to a Destination, the panel will remember the new state.

Figure 39. Default Configuration 16x8 panel



Panel Operation

Acappella matrices will always have the same quantity of Sources and the same quantity of Destinations in every Level.

Therefore, a frame that has 8 Inputs, 4 Outputs, digital wideband (HD and SD) video and Dual Stream digital AES audio, would have three Levels as follows:

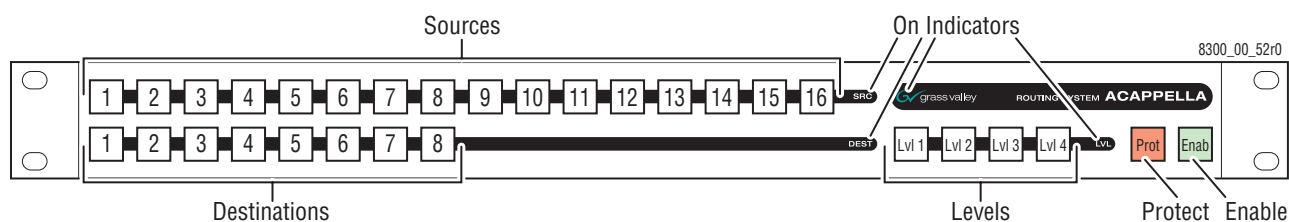
- Eight inputs and four outputs of video,
- Eight inputs and four outputs of audio, and
- A second set of eight inputs and four outputs of audio.

A frame that has 16 Inputs, 16 Outputs, digital wideband (HD and SD) video and Single Stream digital AES audio, would have two Levels:

- Sixteen inputs and sixteen outputs of video, and
- Sixteen inputs and sixteen outputs of audio.

The On Indicators will be lit when there is power to the panel. See [Figure 43](#). Buttons will be either Off, Backlit, Low Tally, or High Tally depending on the button's status.

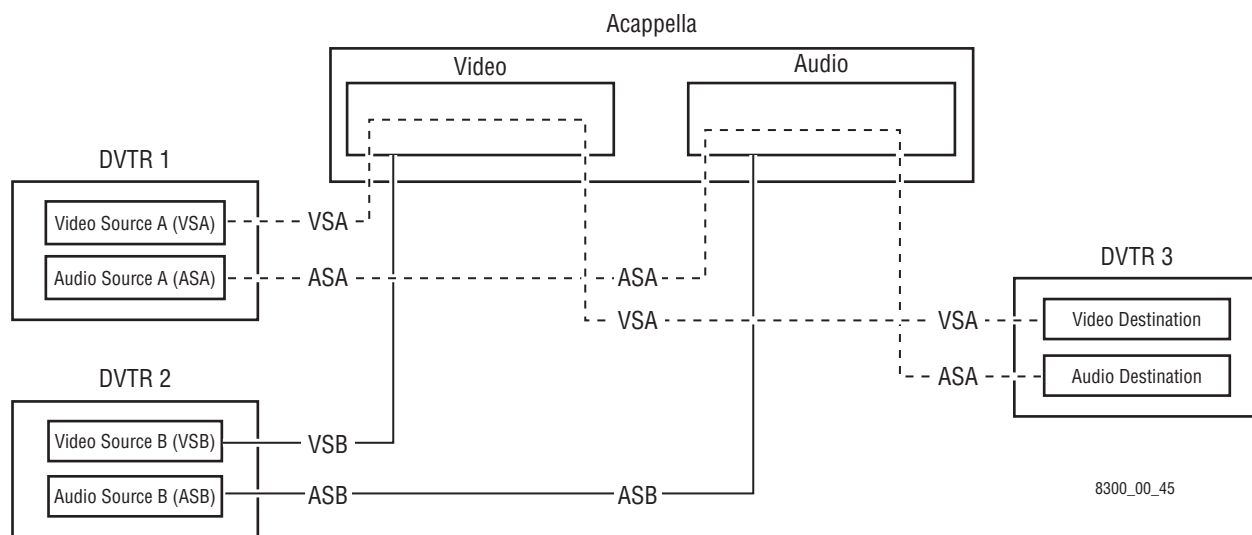
Figure 40. 16x8 Local Panel Layout



Multi-Level Switching

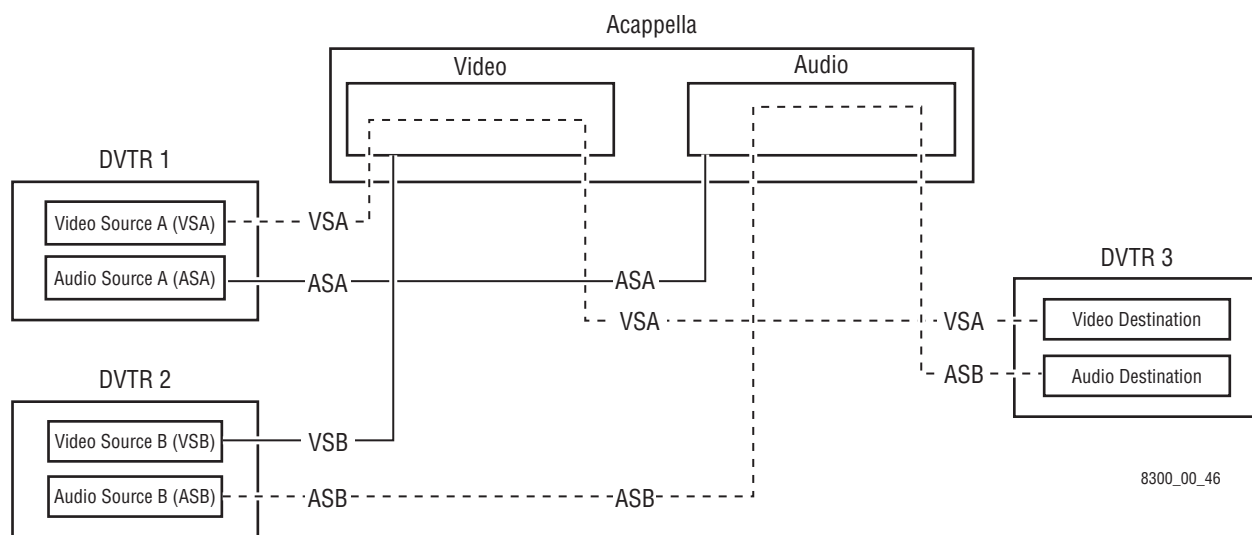
There are two modes of multi-Level switching: All-Level Takes and Break-away Takes. All-Level Takes switch the same input number on all Levels, to the controlled Destination, as shown in [Figure 41](#).

Figure 41. Traditional All-Level Take



A Breakaway Take is performed by accessing the control Levels of a Destination individually and selecting a different Source on at least one Level other than that selected on the others. Breakaways allow a Destination to selectively utilize video and audio from different Sources.

Figure 42. Breakaway Take

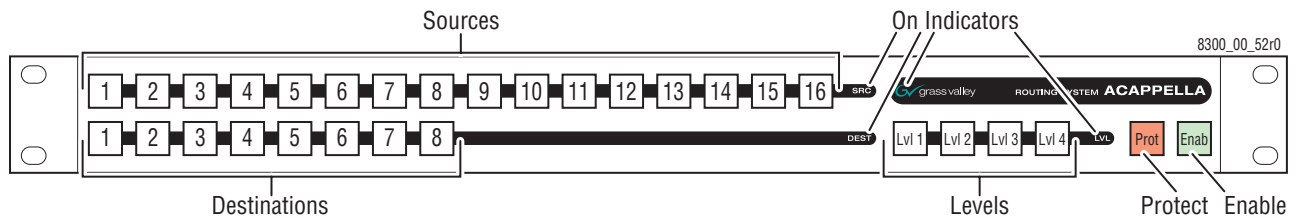


Local Panel Operation

The Local Panel must be enabled by pressing the **Enable** button. When the panel is not enabled it is possible to view status but crosspoints can not be changed.

The Local Panel is shown in Figure 43. Depending on the configuration of the Acappella router the panel will have a maximum of 16 **Source** buttons and a maximum of 16 **Destination** buttons. All panels will have 4 **Level** buttons, a **Protect** button, and an **Enable** button.

Figure 43. 16x8 Local Panel Layout



Local Panel Enable Button

The **Enable** button is green and is found on the lower right of the panel. See Figure 43.

Local Panel Enable Button Action

Press and release of an active **Enable** button causes the following actions:

- Deactivates the panel,
- Inactive **Enable** button is illuminated at Backlight Tally, and
- The **Protect** and **Source** buttons do not operate.

Press and release of an inactive **Enable** button causes the following actions:

- Activates the panel, and
- Active **Enable** button is illuminated at High Tally.

Other button activity on an inactive panel (not enabled):

- Source Tally (on active Destinations) is displayed normally,
- Active Destination can be changed (by press and release of another Destination button) to view Source status on the new Destination,
- A Destination Gang preset can be created, but not Taken, and
- Levels can be changed to view Source status on any Level.

Local Panel Protect Button

The **Protect** button is red and is found on the lower right of the panel. See [Figure 43](#).

Local Panel Protect Button Action

Press and release of the inactive **Protect** button to activate a Protect causes the following actions:

- Active **Protect** button is illuminated at High Tally,
- Activates Protect status on the active Destinations, and

No change is allowed to the current Source on a protected Destination, either by action on this panel, or by any remote device (via ethernet) action.

- All Destinations in a Destination Gang are protected.

Press and release of the active **Protect** button causes the following actions:

- Inactive **Protect** button is illuminated at Off Tally,
- Deactivates Protect on the active Destinations, and
- All Destinations in a Destination Gang are removed from the Protected state.

Local Panel Source Button

Local Panel Single Source Button Action

Press and release of a single **Source** button causes the following actions:

- Connects a Source to the active Destination on all active Levels,
- Tallies only the active Source at High Tally illumination intensity,
- All other Sources become inactive at Backlight Tally illumination intensity,
- If a Breakaway,
 - The single Source button is High Tally,
 - The left most active Level button is High Tally, and
 - Inactive Level Tally remains at Backlight Level,
- If Chop function is active,
 - Press and release of a **Source** button inactivates the Chop, and
 - Connects the Source to the active Destination,

Note Chop is a toggle between two Sources to a single Destination.

- If Destination Gang and All Levels are active,
 - Press and release of a **Source** button connects that Source to all Destinations in the Gang,
 - All **Destination** buttons (in the Gang) are High Tally, and
 - Active **All Level** button Tally is updated to High Tally,
- If Destination Gang is active, but not All Levels active,
 - Press and release of a **Source** button connects that Source to all Destinations in the Gang for only the active Levels,
 - The individual **Destination** buttons (in the Gang) are either Low Tally to indicate Breakaway, or High Tally to indicate no Breakaway, and
 - Active **All Level** button Tally is updated to indicate either Breakaway as Low Tally, or no Breakaway as High Tally.

Local Panel Multiple Source Button Action

Press and release of a **Source** button while press and hold of the current **Source** button causes the following actions:

- Initiates the Chop function between two Sources on a single Destination,
- If Destination Gang is currently active, Chop will not invoke, and
- Both **Source** buttons are High Tally during active Chop function.

After Chop function is activated, press of any button will inactivate the Chop.

Local Panel Destination Button

Local Panel Single Destination Button Action

Single **Destination** button press and release causes the following actions:

- Activates that Destination,
- Inactivates all other Destinations,
- Active **Destination** button is High Tally,
- Inactive **Destination** buttons are Backlight Tally,
- Updates the Source Tally and active Level Tally to reflect the active Destination status,
- Inactive Level Tally remains at Backlight Level, and
- Destination Gang is cancelled.

Local Panel Multiple Destination Button Action

Press and release of a **Destination** button while press and hold of active **Destination** button will create a Destination Gang condition with the following actions:

- A second press and release of a secondary **Destination** button (while the primary **Destination** button is still depressed) will drop or add (toggle) that Destination from the Destination Gang,
- If any Destination is currently Protected, that Destination will not be added to the Gang,
- When a secondary Destination is added to the Destination Gang,
 - High Tally if it is connected to the same Source (on all active Levels) as the primary Destination,
 - Low Tally if it is connected to a different Source (on any active Level) as the primary Destination, and
 - All active **Level** button Tally is updated to indicate either Breakaway as Low Tally, or no Breakaway as High Tally,

Local Panel Level Button

The left most enabled **Level** button is the Tally Level, it is High Tally and the Source Tally is updated to be the Source on this Level.

Local Panel Single Level Button Action

Press and release of disabled **Level** button causes the following actions:

- Activates the Level,
- High Tally if the Source connected on that Level is the same Source as the left most Tally Level button,
- Low Tally if the Source connected on that Level is not the same Source as the left most Tally Level button

Press and release of enabled **Level** button causes the following actions:

- Inactivates that Level, and
- Backlight Tally.

Remote Panel Operation

Remote panels expand the functionality of the Acappella router and allow Source, Destination, and Level changes. Destination Gang and Chop require a Local Panel.

Note The Enable and Protect buttons are not active on a Remote Panel.

Remote Panel Single Source Button Action

Press and release of a single **Source** button causes the following actions:

- Connects a Source to the active Destination on all active Levels,
- Tallies only the active Source at High Tally illumination intensity,
- All other Sources become inactive at Backlight Tally illumination intensity,
- If a Breakaway,
 - The single Source button is High Tally,
 - The left most active Level button is High Tally, and
 - Inactive Level Tally remains at Backlight Level,

Remote Panel Single Destination Button Action

Single **Destination** button press and release causes the following actions:

- Activates that Destination,
- Inactivates all other Destinations,
- Active **Destination** button is High Tally,
- Inactive **Destination** buttons are Backlight Tally,
- Updates the Source Tally and active Level Tally to reflect the active Destination status, and
- Inactive Level Tally remains at Backlight Level.

Remote Panel Single Level Button Action

Press and release of disabled **Level** button causes the following actions:

- Activates the Level,
- High Tally if the Source connected on that Level is the same Source as the left most Tally Level button,
- Low Tally if the Source connected on that Level is not the same Source as the left most Tally Level button

Press and release of enabled **Level** button causes the following actions:

- Inactivates that Level, and
- Backlight Tally.

Maintenance and Troubleshooting

Field Replaceable Units

Acappella frames are not serviced in the field. Return faulty units to a designated repair depot. Contact Customer Service. (See [Contacting Grass Valley on page 2.](#))

Troubleshooting

Check Connections

- Connections should be tight and electrically sound
- Cables should be checked for damage

Check Inputs

- AC power connections,
- Signal input (video, audio) must be present and within specifications,
- Cable length should be within recommended limits,
- Reference Signal must be present, within specifications, and must not be electrically noisy, and
- Input Signals are required to be zero timed.

Problems and Solutions

Switching Problems

Switching Latency

All crosspoints involved in a Take do not switch in the same vertical interval. This can be caused by noisy or missing VI Reference Signal and/or incorrect timing on the Input Signals. All Input Signals are required to be zero timed.

Options

Software

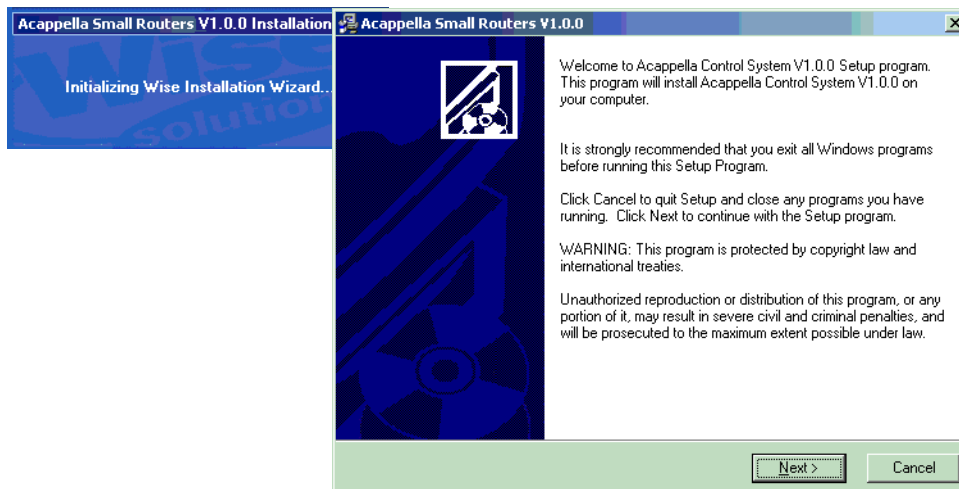
Acappella ships with a software CD. On the CD are several applications that will enable you to make adjustments to the Acappella configuration. After you have added a PC-compatible to the closed Acappella network, you need to install the Acappella software on the PC-compatible.

Software Installation

The Acappella Software CD will install the Acappella Matrix software, Acappella Remote Panel software, NetConfig application (a Network Configuration Tool), NetConfig Instruction Manual, and the Acappella Instruction Manual on a PC-compatible.

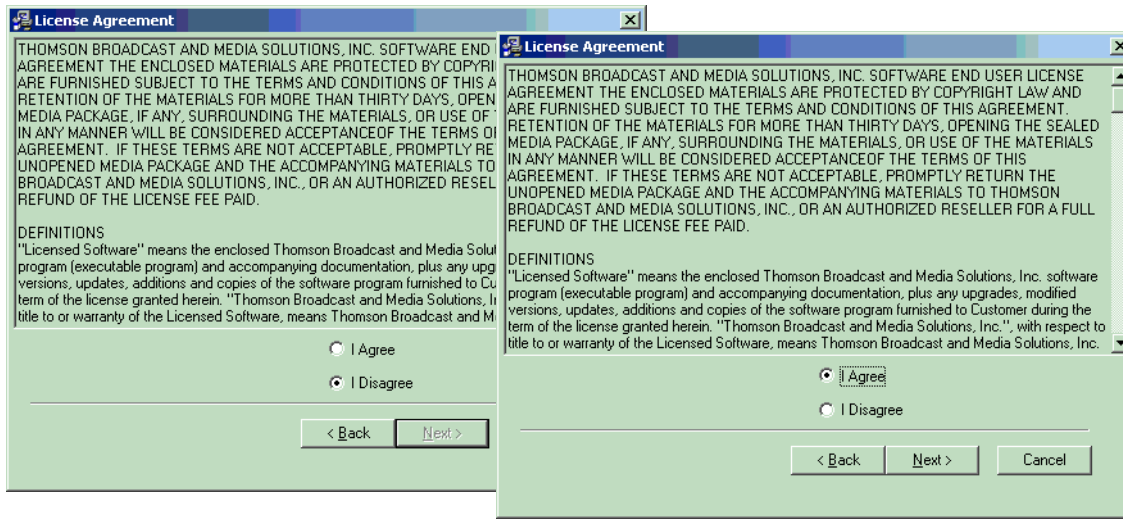
1. Insert Acappella Software CD, it will autostart. If the CD does not start look for the Setup.exe file.
2. Click **Next** when the Welcome screen appears.

Figure 44. Welcome Window



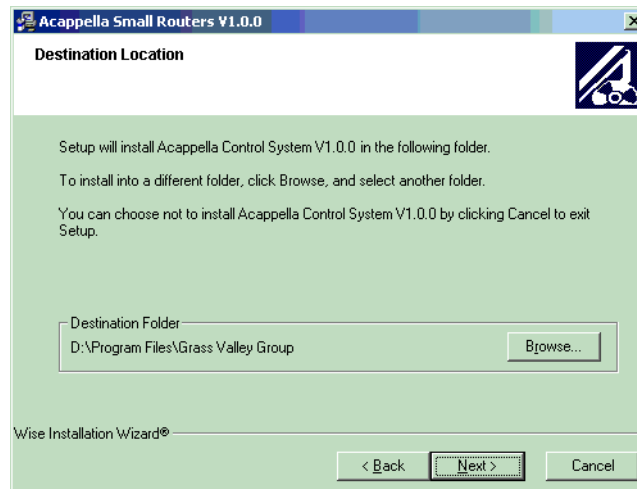
3. Select **I Agree**, then click **Next**.

Figure 45. License Windows



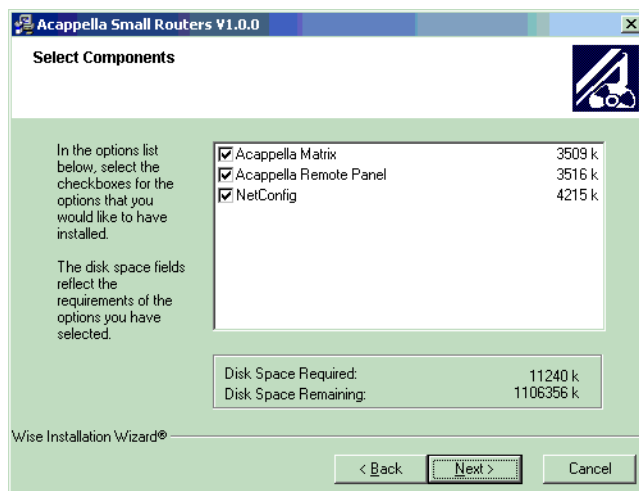
4. Click **Next** to accept the default directory or **Browse** to select a different location for the directory.

Figure 46. Directory Window



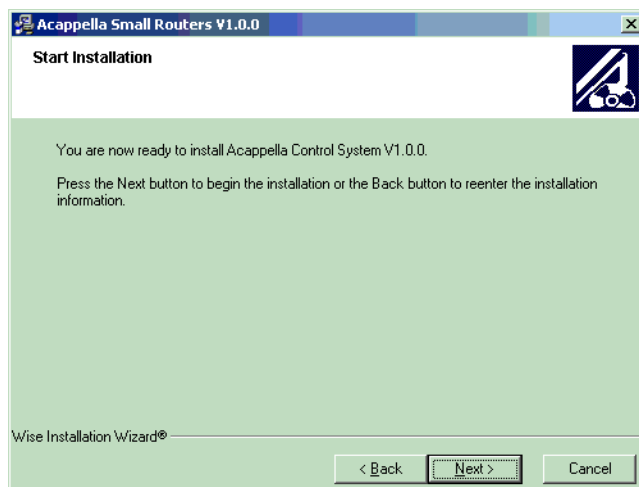
5. Click **Next** to accept all the applications or deselect any applications you don't want and then click **Next**.

Figure 47. Applications Window



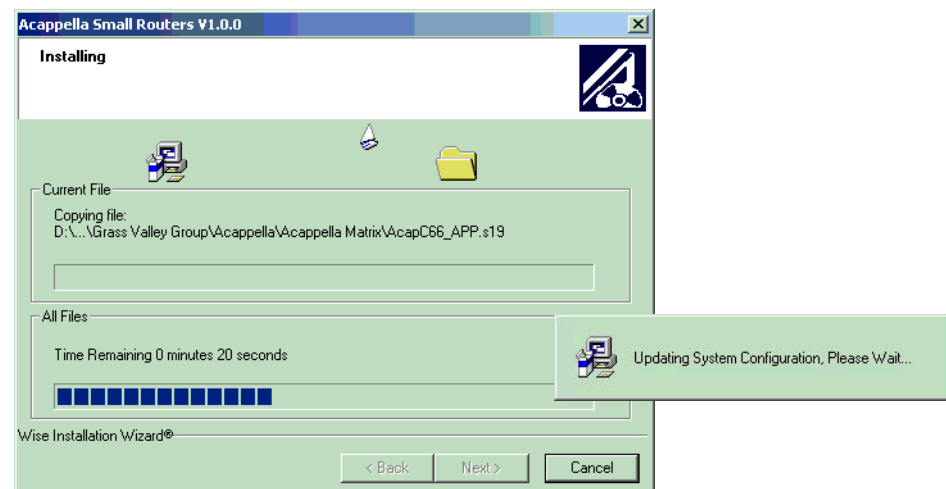
6. Click **Next** to begin the Installation.

Figure 48. Start Installation Window



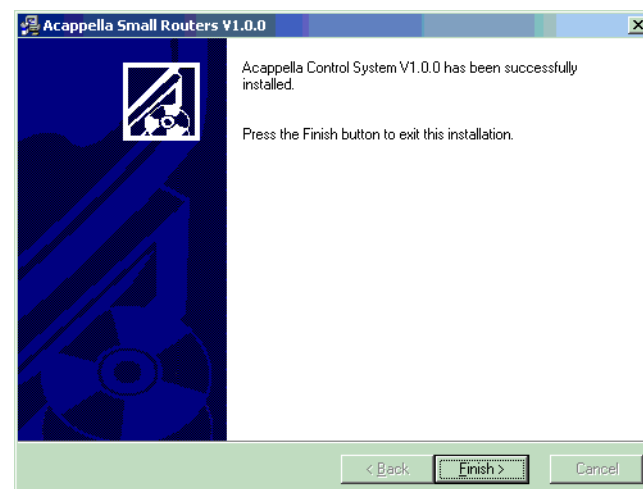
Status windows will appear while the software is loading.

Figure 49. Status Windows



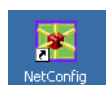
7. Click Finish to complete the Installation.

Figure 50. Finish Window



NetConfig

NetConfig is a Network Configuration Tool used to view information about devices on a network, load software to devices, and to accept user configuration changes. Acappella routers are shipped with the NetConfig client installed as are many of the Thomson Grass Valley products. Once the NetConfig software is installed on a PC-compatible, you will be able to view and interact with all the NetConfig client devices on the same network.

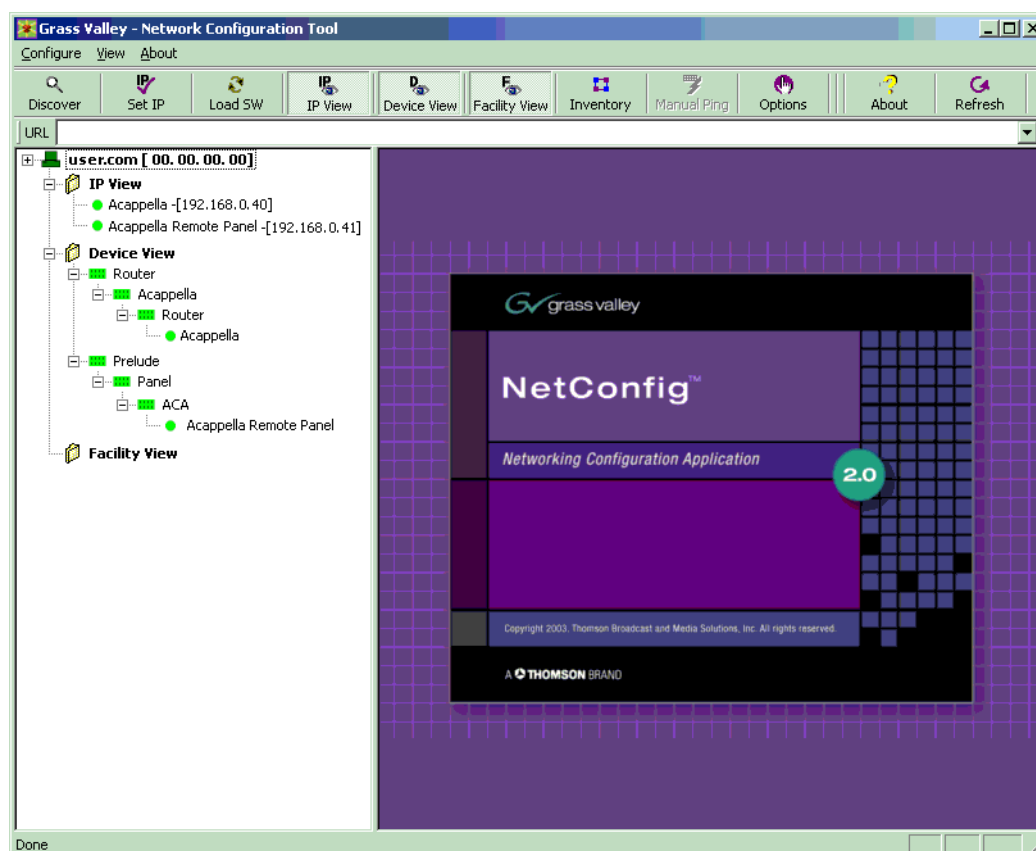


To open NetConfig find the shortcut on the PC-compatible's desktop.

The NetConfig window has two frames, one frame is for finding the device you want to interact with and the other frame displays the device's configuration windows.

In a closed network, Acappella and an Acappella Remote panel would appear as shown in [Figure 51](#). The **user.com -[00.00.00.00]** would be replaced with the name and IP address of the PC-compatible running NetConfig.

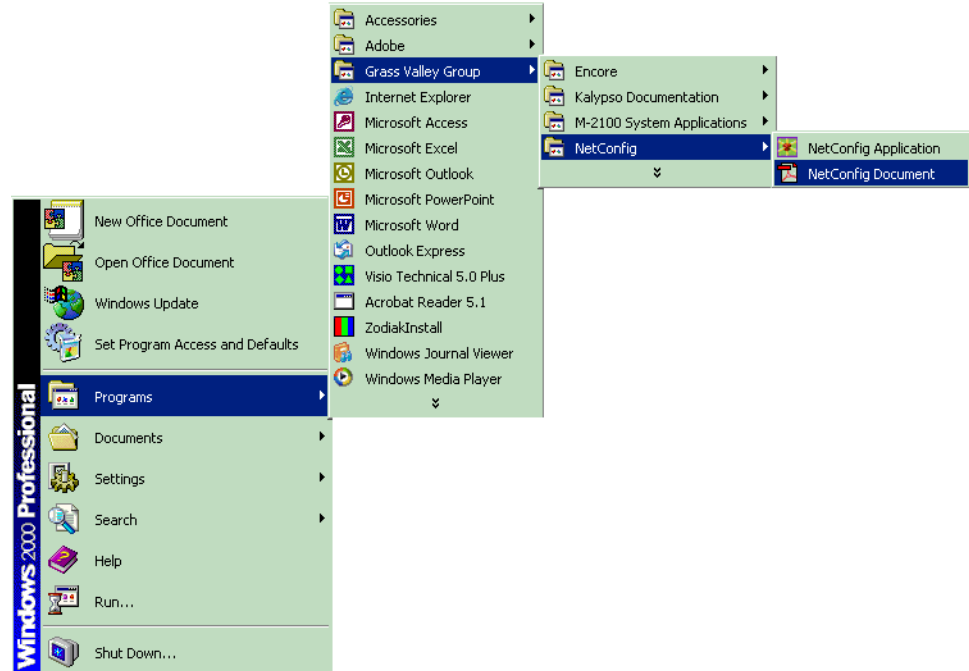
Figure 51. NetConfig Window



Select the device that you want to view from either the IP View or the Device View. See [Acappella Pages](#) on page 53 for details.

When NetConfig was installed the netconfig manual pdf file was also installed. The manual is available using the menu shortcuts as shown in Figure 52.

Figure 52. Desktop Menu Shortcuts for NetConfig

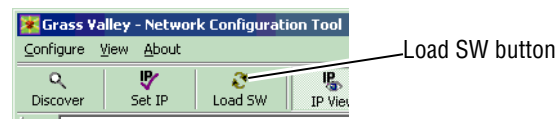


Load Software

Use NetConfig to load software to Acappella routers and Acappella Remote Panels.

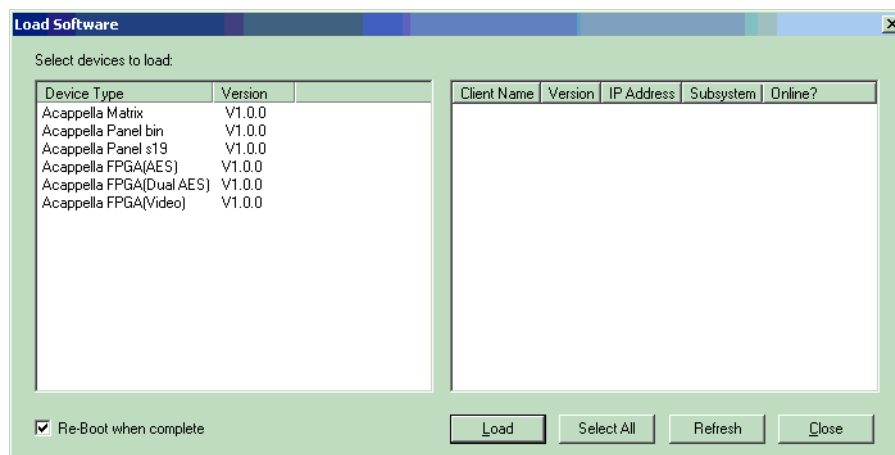
1. Open NetConfig and select the Load SW button in the toolbar.

Figure 53. Load SW



- The Update Devices window will come up as shown in [Figure 54](#). The latest versions of Acappella software will appear in the Device Type list.

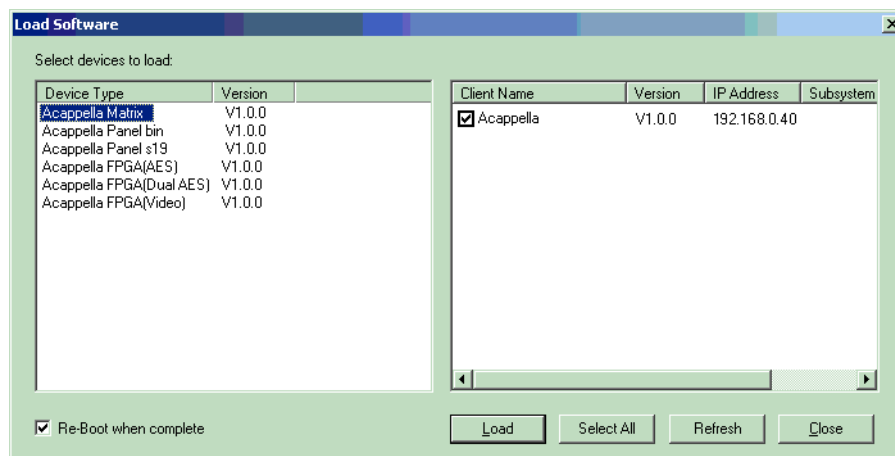
Figure 54. Update Devices Window



- Highlight the Device Type name of the software version you wish to update. Devices will appear in the window.

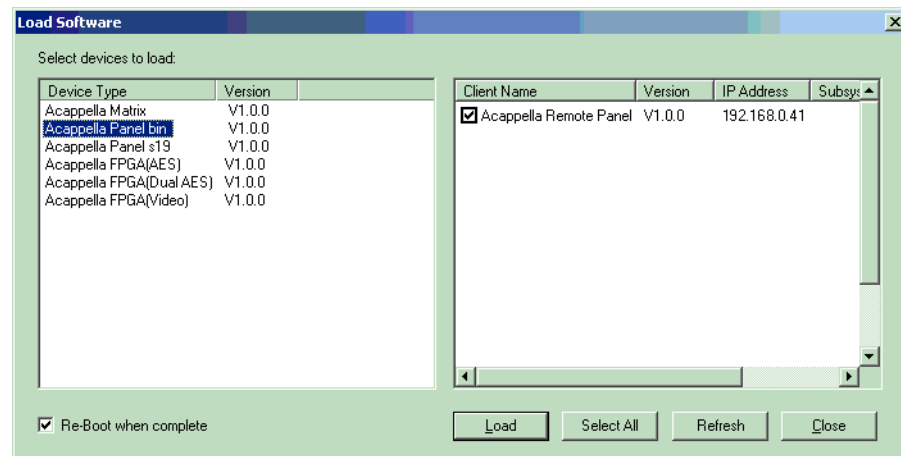
Highlight Acappella Matrix for Acappella matrices, see [Figure 56](#).

Figure 55. Acappella Matrix



Highlight Acappella Panel bin for Remote Panels, see [Figure 56](#).

Figure 56. Remote Panels



4. Check the box for the Acappella to update in the Client Name list.
5. Check the **Re-Boot when complete** checkbox in the lower lefthand corner to have the matrix re-boot when the software update is complete.
6. Click the **Load** button to begin the update.
7. Once all downloads are complete, use the **Refresh** button to update the window and check that the version of software has been downloaded to each selected device successfully.
8. When finished, select the **Close** button.

Web Browser Interface

Enter the IP address of the Acappella router (default 192.168.0.40) or Remote panel (default 192.168.0.41) into a web browser to access the Acappella web pages. If the IP addresses have changed and you don't know what they are, you can use NetConfig to view the new IP Addresses.

Acappella Pages

Router Configuration

Acappella routers use a set of seven pages to provide information and to allow user defined configuration changes. The pages are accessed by either NetConfig or a web browser.

Router Description

The Router Description page is a read only page. Some of the information displayed here is entered automatically such as Product Part Number, Serial Number, etc. The Location and Asset Tag can be changed on a different page. The Level, Source (SRC), and Destination (DST), Tally status will reflect the current state of the router when the page was accessed. To update the Tally information click on the **Refresh** button.

Figure 57. Router Description Page

Acappella Router Refresh Button

Model: [A1616HR-AU-L](#)
 Description: [16x16x2 Vid-AES w/Local Panel](#)
 Location: [Studio One](#)

Router Matrix

Level	Type	DST 1	DST 2	DST 3	DST 4	DST 5	DST 6	DST 7	DST 8	DST 9	DST 10	DST 11	DST 12	DST 13	DST 14	DST 15	DST 16
1	SD/HD Video	SRC 3	SRC 2	SRC 2	SRC 3	SRC 4	SRC 5	SRC 6	SRC 7	SRC 8	SRC 9	SRC 10	SRC 11	SRC 12	SRC 13	SRC 14	SRC 15
2	AES Stereo	SRC 3	SRC 2	SRC 2	SRC 3	SRC 4	SRC 5	SRC 6	SRC 7	SRC 8	SRC 9	SRC 10	SRC 11	SRC 12	SRC 13	SRC 14	SRC 15

Product Part Number: [610-1051-00](#)
 Serial Number: [VR12345](#)
 Matrix PCB Number: [671-6560-00c](#)
 Firmware Versions: [001, 004, 002, 003](#)
 Software Version: [V1.0.0 - Aug 03 11:47:00 2004](#)
 Boot Version: [1.0.0 - 5272 acap](#)
 Asset Tag:

Router System Configuration

The Router System Configuration page is used to make adjustments to the router.

The first three user configuration items are optional and they can be left blank:

Router Name:

This field is used to give the router a unique name. The name entered here will appear at the top of each of the router web pages. The name will also appear in the NetConfig logical tree list under **IP View** and **Device View**. The field will accept up to 60 characters. However, it is recommended that entries be kept short to keep the name from wrapping.

Location:

This field is used to give the router a physical location name. The location entered here will appear in the header for each of the router web pages. The field will accept up to 60 characters. However, it is recommended that entries be kept short to keep the name from wrapping.

asset tag:

This field is used to track internal capital asset numbers that a user might assign to a router. The field will accept up to 20 characters.

The following settings come from the factory with default settings. User adjustments can be made to these settings. The default settings can be restored on the [Router Factory Defaults](#) page.

Local Panel Button Blink Rate:

This setting is used to modify the blink rate of the buttons on the Local Panel. Default is 5 which is equal to 0.5 seconds or 120 blinks per minute. The higher the Blink Rate the slower the button will blink, as 50 equals 5 seconds or 12 blinks per minute.

Local Panel Dim Button Intensity:

This setting is used to adjust the button brightness at Low Tally.

Serial Control Port Baud Rate:, Parity:, Data Bits:, and Stop Bits:

These settings are used for serial interface settings for the 9 pin D connector on the router. The settings are determined by the requirements of the controlling serial device.

Do reset

This setting is only required if changes are made to the Serial Control Port settings.

Save New Settings

This button saves changes to the **Router Name**, **Location**, **Asset Tag**, **Local Panel Button Blink Rate**, and **Local Panel Dim Button Intensity** fields. To view changes after clicking the **Save New Settings** button, click on the **Refresh** button.

Figure 58. Router System Configuration Page

Acappella Router System Configuration  Refresh Button

[Description](#)
[System Config](#)
[Network Config](#)
[Video Config](#)
[AES Config](#)
[Reference Config](#)
[Factory Default](#)

Model: [A1616HR-AU-L](#)
 Description: [16x16x2 Vid-AES w/Local Panel](#)
 Location: [Studio One](#)

System Parameters

Router Name:
 Location :
 Asset Tag:
 Local Panel Button Blink Rate: Range 1 to 50 (0.1 sec per count)
 Local Panel Dim Button Intensity: Range 1 to 4 (1=low, 4=bright)
 Serial Control Port Baud Rate: Range 300 to 115200
 Serial Control Port Parity: None=0, Odd=1, Even=2
 Serial Control Port Data Bits: Range 7 to 8
 Serial Control Port Stop Bits: Range 1 to 2

Post Save Selection - Force router reset if box checked

☐ Do reset

Changes to above Serial Control Port parameters will take effect only after router reset.

Router Network Configuration

Router Network Configuration page is used to change the IP Address, SubNet Mask, and Gateway IP Address, of the router.

Figure 59 shows the default settings that are used in a closed network. There is no reason to change these settings.

Figure 59. Router Network Configuration Page

Acappella Router Network Configuration  Refresh Button

[Description](#)
[System Config](#)
[Network Config](#)
[Video Config](#)
[AES Config](#)
[Reference Config](#)
[Factory Default](#)

Model: A1616HR-AU-L
 Description: 16x16x2 Vid-AES w/Local Panel
 Location: Studio One

Network Parameters

MAC Address: 00:b0:09:00:87:f0
 IP Address: 192.168.0.40
 SubNet Mask: 255.255.255.0
 Gateway IP Address: 0.0.0.0

Post Save Selection - Force router reset if box checked

☐ Do reset

[Save New Settings](#)

Router Video Configuration

Router Video Configuration Page is used to adjust the reclocking rate on a Destination by Destination basis. The default setting is **Auto**.

CAUTION This is a live page, any changes made to the settings will be implemented immediately.

Auto reclocking will lock to a signal rate of either 143 Mb/s, 270 Mb/s, 360 Mb/s, 540 Mb/s, or 1.485 Gb/s.

Bypass will pass the signal without reclocking.

Selecting a signal rate such as 270 Mb/s will cause the Output to lock to the selected signal rate. If the incoming signal is not the selected rate the Output will be put into Bypass mode. For example, if the incoming signal is 1.485 Gb/s and the reclocking rate selected is 540 Mb/s which is incorrect, then the signal would be in Bypass with no reclocking and the Output would say Not Locked.

After selecting a new reclocking rate, the router will try to lock the Output to that rate. It may take several seconds and clicking the **Refresh** button to see the change. Figure 60 shows Bypass and Auto settings. If a signal rate such as 270 Mb/s is selected as the Reclocking Rate then the Output would show **Locked** or **Unlocked**.

Figure 60. Router Video Configuration Page

Acappella Router Video Configuration  Refresh Button

Model: A1616HR-AU-L
Description: 16x16x2 Vid-AES w/Local Panel
Location: Studio One

Level 1 Video Outputs

Destination	Reclocking Rate	Output
DST 1	Bypass	Bypass
DST 2	143 Mb/s 270 Mb/s 360 Mb/s 540 Mb/s 1.485 Gb/s Bypass Auto	Bypass
DST 3		Bypass
DST 4		Bypass
DST 5		Bypass
DST 6	Bypass	Bypass
DST 7	Auto	270 Mb/s
DST 8	Auto	270 Mb/s
DST 9	Auto	270 Mb/s
DST 10	Auto	270 Mb/s
DST 11	Auto	270 Mb/s
DST 12	Auto	270 Mb/s
DST 13	Auto	270 Mb/s
DST 14	Auto	270 Mb/s
DST 15	Auto	270 Mb/s
DST 16	Auto	270 Mb/s

Router AES Configuration

There are several AES Attributes that may be assigned. The default is Resolution **20 bit**, Audio Mode **Normal** (Stereo) and Block Align **On**.

Note For information on what AES Attributes are and how they can be used see [Appendix B-AES Attributes](#) on page 73.

CAUTION This is a live page, any changes made to the settings will be implemented immediately.

The AES Attribute settings are:

Resolution:

This attribute determines how the signal bits are processed. A signal has 24 bits with the last four bits designated as auxiliary (AUX) bits.

In **20 bit** mode the four AUX bits pass through the router unaffected by any processing. If channels A and B are swapped, the four AUX bits stay in the same place. If the signal is muted, the four AUX bits are not muted.

In **24 bit** mode the router will treat the four AUX bits as though they are part of the audio data. If Channels A and B are swapped, the four AUX bits will swap locations. If the audio is muted, the four AUX bits will be muted.

Bypass

This setting is used to pass an asynchronous signal. Placing a Destination signal into **Bypass** mode will cause the other settings in the table to disappear.

Figure 61. Bypass Mode

Destination Signals	Bypass	Audio Mode	Invert	Sum	Muting	Output Signals	Block
DST 1 Chan A Chan B	☒ Bypass					A B	

Audio Mode	Invert	Output Signals
☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Mute	A B
☐ Normal ☒ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Mute	B A
☐ Normal ☐ Swap ☒ A Only ☐ B Only	☐ Invert ☐ Mute	A A
☐ Normal ☐ Swap ☐ A Only ☒ B Only	☐ Invert ☐ Mute	B B

Audio Mode

There are four variations in this mode:

- **Normal** Channel A to Channel A and Channel B to Channel B,
- **Swap** Channel A to Channel B and Channel B to Channel A,
- **A Only** Channel A to Channel A and to Channel B, and
- **B Only** Channel B to Channel A and to Channel B.

Only one of the four variations can be active.

Invert	Sum	Muting	Output Signals
☒ Invert	☐ Sum	☐ Mute	-A
☒ Invert	☐ Sum	☐ Mute	-B
☐ Invert	☒ Sum	☐ Mute	A+B
☐ Invert	☒ Sum	☐ Mute	A+B
☒ Invert	☒ Sum	☐ Mute	-A-B
☒ Invert	☒ Sum	☐ Mute	-A-B

Invert

When a channel is inverted a - (minus sign) will appear in front of the A or B in the Output column.

Sum

When the channels are summed both an A and a B will appear in the Output column. A + (plus sign) will appear between the two letters unless the channels are inverted.

Muting	Output Signals
☒ Mute	Muted
☒ Mute	Muted

Mute

This attribute creates a silence or absence of sound. **Mute** will override all other settings. When you remove a **Mute** the other attributes will apply to the signal. If you select a Source for a Destination that does not have a signal both Channel A and Channel B will be in **Mute**.

Block Align

This attribute is an alignment of one signal's amplitude to another signal's amplitude at switching. This alignment prevents a crack or pop at switching.

Figure 62. Router AES Output Configuration Page

[Description](#)

[System Config](#)

[Network Config](#)

[Video Config](#)

[AES Config](#)

[Reference Config](#)

[Factory Default](#)

Acappella Router AES Output Configuration

Model: [A1616HR-AU-L](#)

Description: [16x16x2 Vid-AES w/Local Panel](#)

Location: [Studio One](#)

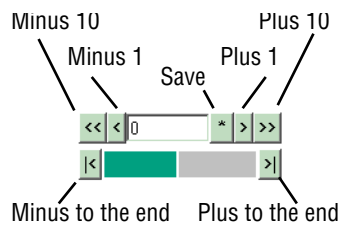
Resolution: ☒ 20 bit ☐ 24 bit

Level 2 AES Outputs

Destination Signals	Bypass	Audio Mode	Invert	Sum	Muting	Output Signals	Block
DST 1 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 2 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 3 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 4 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 5 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 6 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 7 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 8 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 9 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 10 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 11 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 12 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 13 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 14 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 15 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align
DST 16 Chan A Chan B	☐ Bypass	☒ Normal ☐ Swap ☐ A Only ☐ B Only	☐ Invert ☐ Invert	☐ Sum ☐ Sum	☐ Mute ☐ Mute	A B	☒ Align

Router Reference Configuration

Router Reference Configuration Page is used to make adjusts to the reference signal.



The video reference adjustments are set using the indicators as shown. The bar on the bottom of the indicator will move to the left and right to show how the current adjustment relates to the total range. There are two indicators, one for Vertical Offset and one for Horizontal Offset.

The default setting depends on your reference signal; NTSC is middle of line 10, PAL is middle of line 6, and Tri-Level is middle of line 7.

The Audio Reference default is to use the Video Reference. To use an AES signal as the Audio Reference select **AES Src1**. See [Reference Cabling on page 30](#) for signal cabling requirements. If AES Src 1 is selected and the signal connected to Source 1 is either not a continuous feed or is missing then **Invalid** will appear. If the signal is connected correctly and is the right type then **AES Present** will appear.

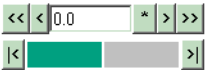
Figure 63. Router Reference Configuration Page

Acappella Router Reference Configuration  Refresh Button

Model: [A1616HR-AU-L](#)
Description: [16x16x2 Vid-AES w/Local Panel](#)
Location: [Studio One](#)

Video Reference

Reference Input: [525](#)
Standard: [NTSC](#) [Locked](#)

	Minimum	Maximum
Vertical Offset:		
	Reference Lines	-15 16
Horizontal Offset:		
	microseconds	-32.0 32.0

Note: With offsets set to 0, switch occurs with respect to reference input as follows
NTSC Middle of line 10
PAL Middle of line 6
Tri-Level Middle of line 7

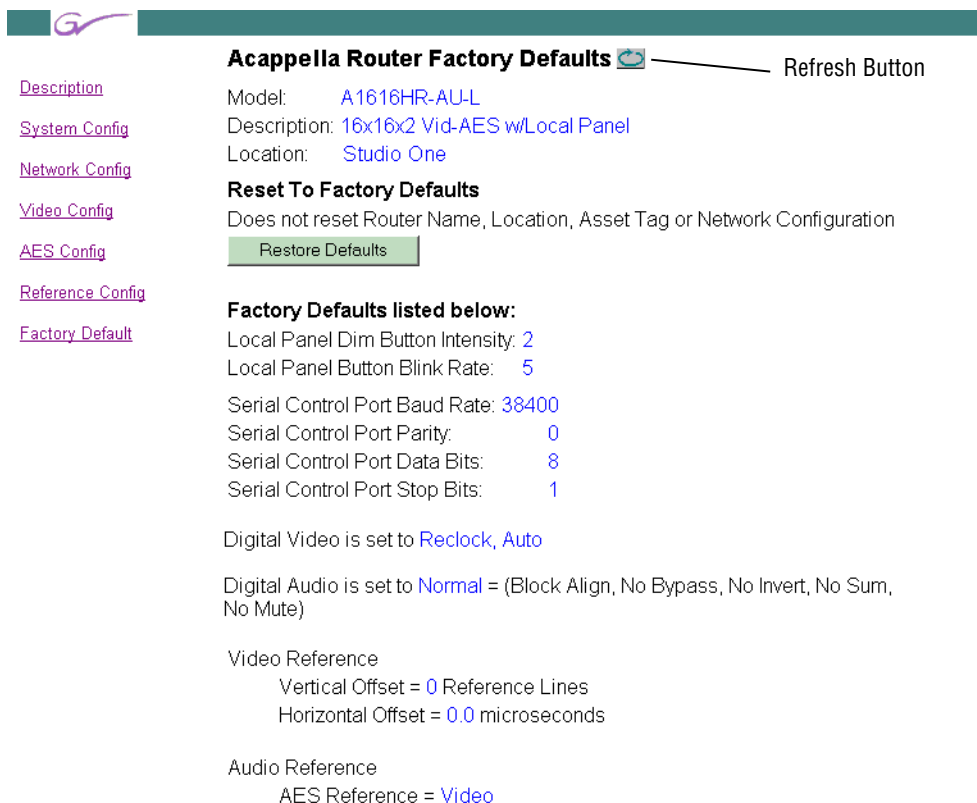
Audio Reference

AES Reference: ☒ Video ☐ AES Src1

Router Factory Defaults

Router Factory Defaults page shows what the settings are for the items that have factory defaults. To restore the listed settings to the factory defaults click on the **restore defaults** button.

Figure 64. Router Factory Defaults



Acappella Router Factory Defaults  Refresh Button

[Description](#)
[System Config](#)
[Network Config](#)
[Video Config](#)
[AES Config](#)
[Reference Config](#)
[Factory Default](#)

Model: [A1616HR-AU-L](#)
 Description: [16x16x2 Vid-AES w/Local Panel](#)
 Location: [Studio One](#)

Reset To Factory Defaults
 Does not reset Router Name, Location, Asset Tag or Network Configuration
[Restore Defaults](#)

Factory Defaults listed below:
 Local Panel Dim Button Intensity: [2](#)
 Local Panel Button Blink Rate: [5](#)
 Serial Control Port Baud Rate: [38400](#)
 Serial Control Port Parity: [0](#)
 Serial Control Port Data Bits: [8](#)
 Serial Control Port Stop Bits: [1](#)

Digital Video is set to [Reclock, Auto](#)

Digital Audio is set to [Normal](#) = (Block Align, No Bypass, No Invert, No Sum, No Mute)

Video Reference
 Vertical Offset = [0](#) Reference Lines
 Horizontal Offset = [0.0](#) microseconds

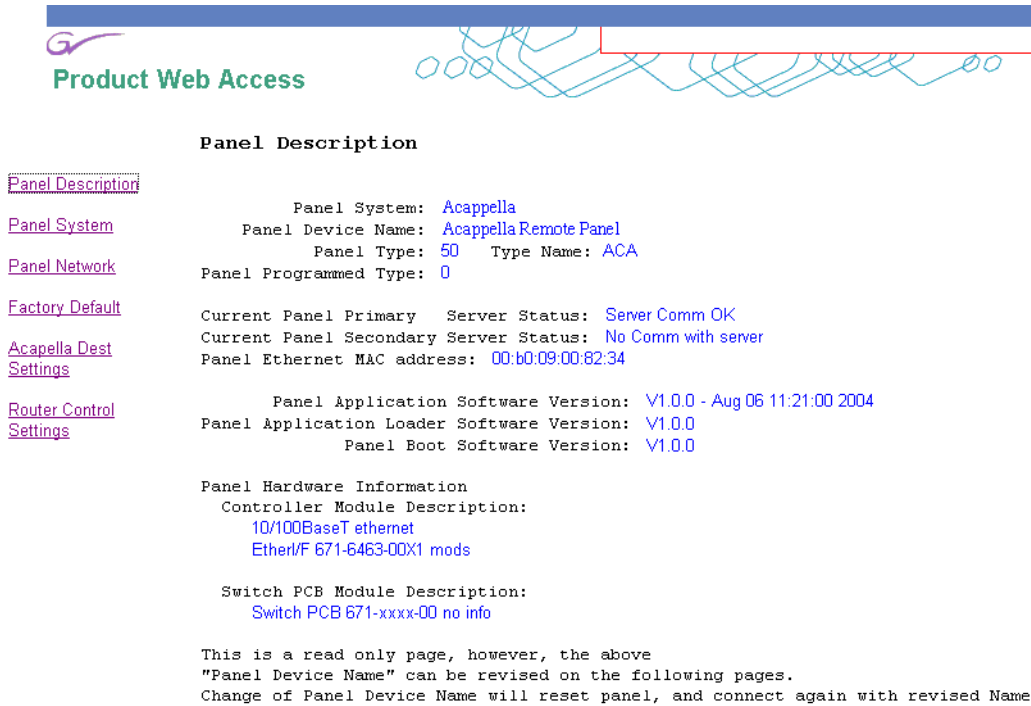
Audio Reference
 AES Reference = [Video](#)

Remote Panel Configuration

Panel Description

Panel Description page is a read only page. All of the information displayed here is entered automatically except the Panel Device Name which is entered on a different page.

Figure 65. Remote Panel Description Page



Remote Panel System Configuration

Panel System Configuration page is used to make adjustments to the Remote Panel.

The panel device name field is optional. This field is used to give the remote Panel a unique name. The name entered here will appear at the top of each of the Remote Panel pages. The name will also appear in the NetConfig logical tree list under **IP View**. The field will accept up to 60 characters. However, it is recommended that entries be kept short to keep the name from wrapping.

The following settings come from the factory with default settings. User adjustments can be made to these settings. The default settings can be restored on the [Remote Panel Factory Defaults](#) page and the [Remote Panel Network Configuration](#) page.

Panel Button Blink Rate:

This setting is used to modify the blink rate of the buttons on the Remote Panel. Default is 5 which is equal to 0.5 seconds or 120 blinks per minute. The higher the Blink Rate the slower the button will blink, as 50 equals 5 seconds or 12 blinks per minute.

Panel Background Button Intensity:

This setting is used to adjust the button background brightness. This is primarily used to illuminate the panel so the buttons can be seen in a dark environment.

Panel Dim Button Intensity:

This setting is used to adjust the button brightness at Low Tally.

Save New Settings

This button saves changes to the **Router Name**, **Location**, **Asset Tag**, **Local Panel Button Blink Rate**, and **Local Panel Dim Button Intensity** fields. To view changes after clicking the **Save New Settings** button, click on the **Refresh** button.

Figure 66. Remote Panel System Configuration Page

Panel System Configuration

Panel Device Name:

Panel Blink Button Lamp Rate: Range 1 to 50 (0.1 sec per count)

Panel Background Button Intensity: Range 0 to 9 (0=off, 1=low, 9=bright)

Panel Dim Button Intensity: Range 1 to 9 (1=low, 9=bright)

Panel Display Intensity: Range 1 to 7 (1=low, 7=bright)

Panel Potentiometer Range: Range 1 to 1023

Panel Rotary Shaft Range: Range 1 to 1023

Panel Console Baud Rate: Range 9600 to 115200 (parity=none,databits=8,stopbits=1)

Serial Port2 Baud Rate: Range 9600 to 115200

Serial Port2 Parity: 0=None, 1=Odd, 2=Even

Note The **Panel Display Intensity**:, **Panel Potentiometer Range**:, **Panel Rotary Shaft Range**:, **Serial Control Port Baud Rate**:, **Serial Port2 Baud Rate**:, and **Serial Port2 Parity**:, settings do not apply to Remote Panels and are not used.

Remote Panel Network Configuration

Network Configuration page is used to change the IP Address, SubNet Mask, and Gateway IP Address, of the panel.

Figure 67 shows the default settings that are used in a closed network. There is no reason to change these settings.

The default Ethernet IP for a Remote Panel is 192.168.0.41. This IP Address is entered in the **Ethernet IP:** and the **Primary Server Ethernet IP:** fields. The default Ethernet IP for an Acappella router is 192.168.0.40, this is entered in the **Matrix Control Ethernet IP:** field.

Figure 67. Remote Panel Network Configuration Page

Product Web Access

Panel Network Configuration

Panel Device Name:

Current Settings

Ethernet IP:

Subnet Mask:

Gateway IP:

Primary Server Ethernet IP:

Secondary Server Ethernet IP:

Server Port Number:

Server Port Type:

Max Router Hops (Multicast):

Online Poll Time out seconds:

Matrix Control Ethernet IP:

Network Mode Selection - Enable DHCP if box checked

Caution: Panel will expect to find a DHCP server to resolve above Ethernet IP

☐ Set DHCP Mode (get IP from host)

Post Save Selection - Force panel reset if box checked

Caution: Will force panel to reset, and then resume using new network settings.

☐ Do reset

Remote Panel Factory Defaults

Panel Factory Defaults page displays the factory default settings. This is a read only page.

Figure 68. Remote Panel Factory Defaults Page



Remote Panel Acappella Destination Configuration

Destination Configuration page is used to assign Sources to the Remote Panel buttons.

CAUTION This is a live page, any changes made to the settings will be implemented immediately.

Figure 69. Remote Panel Destination Configuration Page

Product Web Access

Panel Description

Panel System

Panel Network

Factory Default

Acappella Dest Settings

Router Control Settings

Acappella Destination Configuration

Panel Device Name:

Remote Panel Dest Map: Range 0 to 16 (0 indicates a disabled button)

Dest Button 1:	1
Dest Button 2:	2
Dest Button 3:	3
Dest Button 4:	4
Dest Button 5:	5
Dest Button 6:	6
Dest Button 7:	7
Dest Button 8:	8
Dest Button 9:	9
Dest Button 10:	10
Dest Button 11:	11
Dest Button 12:	12
Dest Button 13:	13
Dest Button 14:	14
Dest Button 15:	15
Dest Button 16:	16

Remote Panel Router Configuration

Router Configuration page is used to select the physical router configuration of the Acappella Router for this Remote Panel interface. Select the Acappella Router type from the dropdown menu. See [Figure 70](#).

Figure 70. Router Configuration Type

Product Web Access

Router Configuration

[Panel Description](#)
[Panel System](#)
[Panel Network](#)
[Factory Default](#)
[Acappella Dest Settings](#)
[Router Control Settings](#)

Router Config

Aca16x16x2

Aca16x16x2
Aca8x8x1
Aca8x8x3
Aca16x16x1
Aca16x16x2
Encore32x32x3

Post Save Selection - Force panel reset if box checked

☒ Do reset

Caution: Will force panel to reset, and then resume using new router controller settings.

Check **Do reset** and click **Save New Settings** to apply selection.

Figure 71. Router Configuration Type

Product Web Access

Router Configuration

[Panel Description](#)
[Panel System](#)
[Panel Network](#)
[Factory Default](#)
[Acappella Dest Settings](#)
[Router Control Settings](#)

Router Config

Aca16x16x2

Post Save Selection - Force panel reset if box checked

☒ Do reset

Caution: Will force panel to reset, and then resume using new router controller settings.

Specifications

Mechanical and Power Specifications

Table 5 contains the specifications for the physical frame.

Table 5. Mechanical and Power Specifications Maximum Configuration

Component	Depth ^a	Width	Height	Weight	Rack Units	Voltage Input	Power Consumption (Maximum)
Router	392 mm 15.43 in.	483 mm 19 in.	44 mm 1.75 in.	4.89 kg. 10.78 lbs.	1	100-240 V AC 550-400 Hz	≤ 40 W
Remote Panel	106 mm 4.18 in.	483 mm 19 in.	44 mm 1.75 in.	1.04 kg. 2.3 lbs.	1	100-240 VAC 50-60 Hz	≤ 25 W

^a Allow room behind the frame for cabling

Acappella Router

Table 6 contains the specifications for the routing matrix.

Table 6. Acappella Router

Environmental		
Temperature		0 - 40 degrees Celsius
Humidity		10-90%, non-condensing
Video Reference		
Type	NTSC 525	Line Standard Field switching middle of line 10
	PAL 625	Line Standard Field switching middle of line 6
	Tri-Level	Line Stand Field switching middle of line 7
Vertical Offset (0 midpoint)		Adjustable from -15 lines up to +16 lines
Horizontal Offset (0 midpoint)	NSC 525 &	Adjustable up to ± 30.5 µs
	PAL 625	Adjustable up to ± 31.1
	Tri-Level	720p/59.94 & 720p/60 adjustable up to ± 10.3 µs 720p/50 adjustable up to ± 12.7 µs 1080i/59.94 & 1080i/60 adjustable up to ± 14.2 µs 1080i/50 adjustable up to ± 17.1 µs 1080p/24 & 1080fs/48 adjustable up to ± 18.0 µs
Impedance/Connector		High, Looping – BNC
Return Loss		> 40 5dB (0.1 MHz-5 MHz) 75 ohm Termination

SD and HD Digital Video

Table 7 contains the specifications for SD and HD Digital Video.

Table 7. SD and HD Digital Video

Inputs		
Type		Serial digital video conforming to SMPTE 259M or SMPTE 292M
Connector		BNC 75 ohm
Return loss		> 15dB (10 MHz-1.5GHz)
DC offset		0 V (AC coupled) ± 0.5 V
Impedance		75 ohms
Cable equalization	SD	Automatic ≤ 300 meters of Belden 1694A or equivalent for data rate ≤ 270 Mbps
	HD	Automatic ≤ 100 meters of Belden 1694A or equivalent for data rate ≤ 1.485 Gbps
Outputs		
Type		Serial digital video conforming to SMPTE 259M or SMPTE 292M
Connector		BNC 75 ohm
Return loss		> 15dB (10 MHz-1.5GHz)
Signal amplitude		800 mV ±10% when terminated into 75 ohm
Impedance		75 ohms
DC offset		0 V (AC coupled) ± 0.5 V
Operational Modes		
Reclocking		Automatic or manual selection of 143 Mbps, 270 Mbps, 360 Mbps, 540 Mbps, & 1.485 Gbps
Non-standard bit rates		Non-reclocked operation or bypass switched from 10 Mbps to 540 Mbps with signals that have a maximum ones/zeros ratio of 20:1

AES Digital Audio

Table 8 contains the specifications for AES Digital Audio.

Table 8. AES Digital Audio

General	
Connectors	BNC75 ohm unbalanced
Switch Point	Next audio sample after video switches
Switching Transients	No discontinuity, switching is frame synchronous
Signal Format	Unbalanced AES-3id-1995, SMPTE-276-M (AES/EBU)
Inputs	
Format	SMPTE-276M (specifies AES3)
Cable Length	350M of RG59/U (9259) for 75 ohm systems 450M of 8281 for 75 ohm systems
Impedance / Connector	75 ohm BNC
Return loss	$\geq$ 25dB 0.1-6mhz 75 ohms unbalanced
Sample rate	48KHz
Cable EQ	none

Table 8. AES Digital Audio

Outputs	
Format	SMPTE276-M (AES3)
Voltage	1 Vpp into 75 ohms single ended
Rise-time	Approximately 19nS
Return loss	$\geq 25\text{dB}$ 0.1-6mhz 75 ohms unbalanced
Input to output delay	≤ 4.2 audio samples
Synchronizing	Yes
Reclocking	Yes
Output Jitter	$\leq 1\text{nS}$
Sample rate	48KHz

Reference Materials

AES Attributes

The AES Attributes are illustrated here for general reference. Acappella uses Channel A for Channel 1 or Left, and Channel B for Channel 2 or Right.

Figure 72. AES Attributes

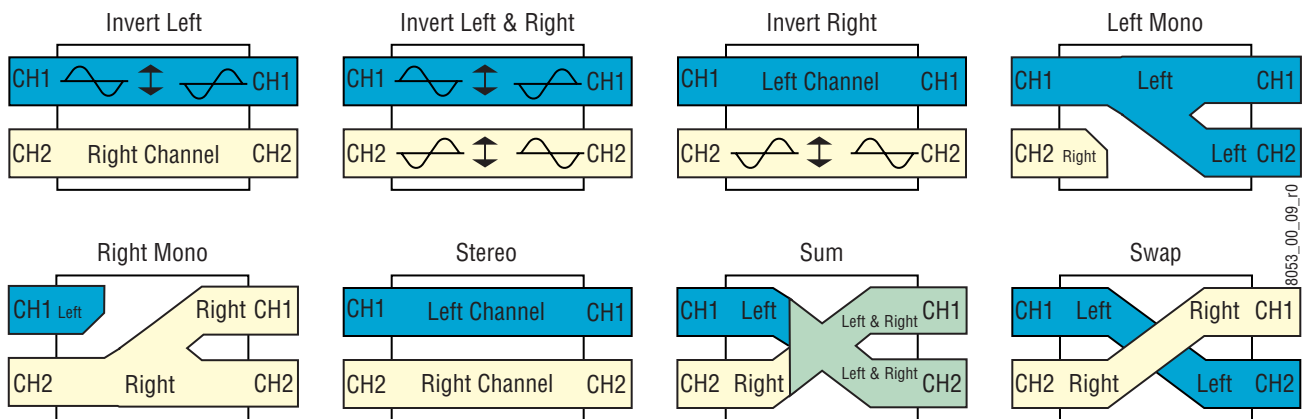
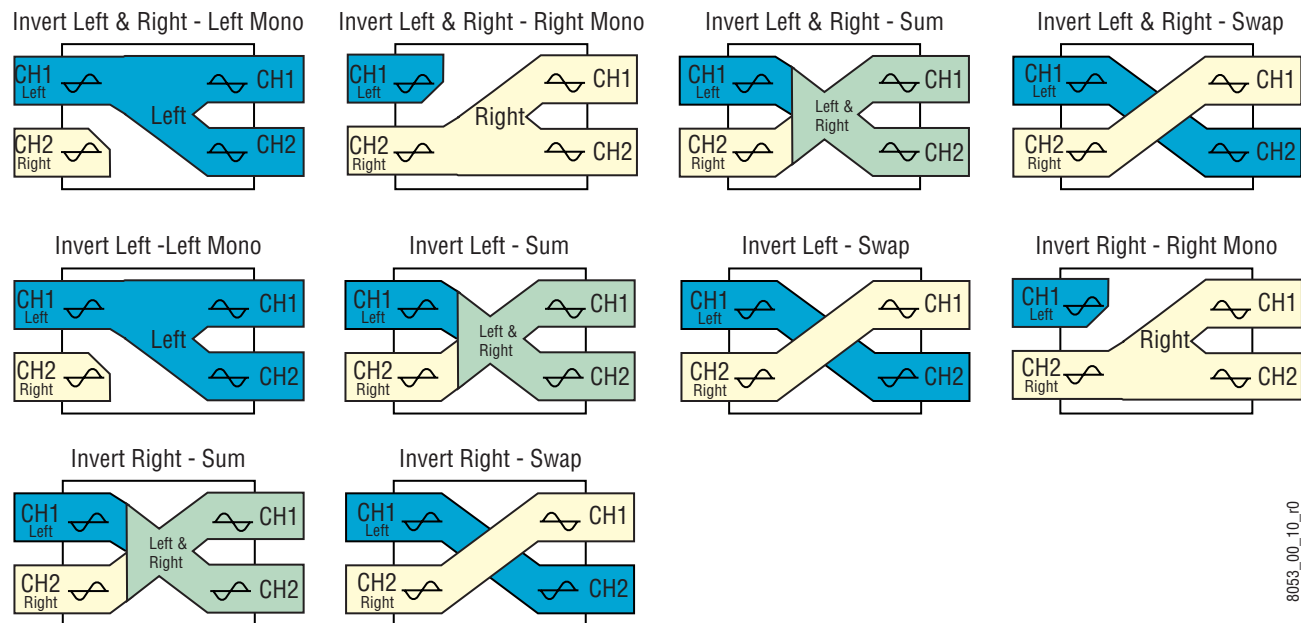


Table 9. AES Attributes

AES Attribute	Description
Invert Left	Inverts Left (Channel 1) only. Right (Channel 2) is not affected.
Invert Right	Inverts Right (Channel 2) only. Left (Channel 1) is not affected.
Right Mono	Right (Channel 2) is sent to both Channel 1 and Channel 2.
Sum	Left (Channel 1) and Right (Channel 2) are combined.

AES Attribute	Description
Invert Left & Right	Inverts Left (Channel 1) and Right (Channel 2).
Left Mono	Left (Channel 1) is sent to both Channel 1 and Channel 2.
Stereo	Neither Left (Channel 1) nor Right (Channel 2) is affected.
Swap	Left (Channel 1) and Right (Channel 2) are swapped.

Figure 73. AES Attribute Combinations



8053_00_10_r0

Table 10. AES Attribute Combinations

AES Attribute Combination	Description
Invert Left & Right - Left Mono	Inverts Left (Channel 1) and Right (Channel 2) then Left (Channel 1) is sent to both Channel 1 and Channel 2.
Invert Left & Right - Right Mono	Inverts Left (Channel 1) and Right (Channel 2) then Right (Channel 2) is sent to both Channel 1 and Channel 2.
Invert Left & Right - Sum	Inverts Left (Channel 1) and Right (Channel 2) then Left (Channel 1) and Right (Channel 2) are combined.
Invert Left & Right - Swap	Inverts Left (Channel 1) and Right (Channel 2) then Left (Channel 1) and Right (Channel 2) are swapped.
Invert Left - Left Mono	Inverts Left (Channel 1) no effect on Right (Channel 2) then Left (Channel 1) is sent to both Channel 1 and Channel 2.
Invert Left - Sum	Inverts Left (Channel 1) no effect on Right (Channel 2) then Left (Channel 1) and Right (Channel 2) are combined.
Invert Left - Swap	Inverts Left (Channel 1) no effect on Right (Channel 2) then Left (Channel 1) and Right (Channel 2) are swapped.
Invert Right - Right Mono	Inverts Right (Channel 2) no effect on Left (Channel 1) then Right (Channel 2) is sent to both Channel 1 and Channel 2.
Invert Right - Sum	Inverts Right (Channel 2) no effect on Left (Channel 1) then Left (Channel 1) and Right (Channel 2) are combined.
Invert Right - Swap	Inverts Right (Channel 2) no effect on Left (Channel 1) then Left (Channel 1) and Right (Channel 2) are swapped.

ASCII Characters

Table 11. ASCII Character Table

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	0	NUL	26	1A	SUB	52	34	4	78	4E	N	103	67	g
1	1	SOH	27	1B	ESC	53	35	5	79	4F	O	104	68	h
2	2	STX	28	1C	FS	54	36	6	80	50	P	105	69	i
3	3	ETX	29	1D	GS	55	37	7	81	51	Q	106	6A	j
4	4	EOT	30	1E	RS	56	38	8	82	52	R	107	6B	k
5	5	ENQ	31	1F	US	57	39	9	83	53	S	108	6C	l
6	6	ACK	32	20		58	3A	:	84	54	T	109	6D	m
7	7	BEL	33	21	!	59	3B	;	85	55	U	110	6E	n
8	8	BS	34	22	"	60	3C	<	86	56	V	111	6F	o
9	9	TAB	35	23	#	61	3D	=	87	57	W	112	70	p
10	A	LF	36	24	\$	62	3E	>	88	58	X	113	71	q
11	B	VT	37	25	%	63	3F	?	89	59	Y	114	72	r
12	C	FF	38	26	&	64	40	@	90	5A	Z	115	73	s
13	D	CR	39	27	'	65	41	A	91	5B	[	116	74	t
14	E	SO	40	28	(	66	42	B	92	5C	\	117	75	u
15	F	SI	41	29	)	67	43	C	93	5D	]	118	76	v
16	10	DLE	42	2A	*	68	44	D	94	5E	^	119	77	w
17	11	DC1	43	2B	+	69	45	E	95	5F	_	120	78	x
18	12	DC2	44	2C	,	70	46	F	96	60	`	121	79	y
19	13	DC3	45	2D	-	71	47	G	97	61	a	122	7A	z
20	14	DC4	46	2E	.	72	48	H	98	62	b	123	7B	{
21	15	NAK	47	2F	/	73	49	I	99	63	c	124	7C	
22	16	SYN	48	30	0	74	4A	J	100	64	d	125	7D	}
23	17	ETB	49	31	1	75	4B	K	101	65	e	126	7E	~
24	18	CAN	50	32	2	76	4C	L	102	66	f	127	7F	DEL
25	19	EM	51	33	3	77	4D	M						

Terminal/Computer Interface Protocol

Protocol

The Terminal/Computer Interface (T/CI) is an asynchronous serial ASCII command protocol that is used for control of the Acappella router using the RS-422/485 9 pin D connector on the rear of the router.

Commands may be issued to control the router by either an operator entering commands manually (using a terminal interface like hyperterminal), or by an automation system. This connection is point-to-point; a cable from the serial connector on the Acappella router to the command Input device. Only the connected router is controlled.

An Acappella router can physically be either a single frame, or a combination of frames. The virtual maximum size of the router and the number of Levels are determined by the product specifications. Therefore, an Acappella router can be controlled by a single serial connection, irregardless of its physical configuration.

T/CI Protocol commands allow control of the router signal paths and allow control of the all Level Output (destination) protect feature of the Acappella.

[Table 14](#) lists variables used in the commands provided.

Table 12. Variables

Variable	Represents	Description
on	Output Number	Used to indicate a specific Output.
in	Input Number	Used to indicate a specific Input.

Table 12. Variables

Variable	Represents	Description
ln	Level Number	Used to indicate a specific Level.
[]	Optional Parameter	Indicates parameters that may be added to a command string but are not required.
<n1>	New Line	Indicates where new lines will appear in the reply to a command.
!Enn	Terse Error Message	Indicates an Error message with number and short description.
<cr>	Carriage Return	Indicates the ASCII carriage return, which terminates the command entry string.

The names of the commands are chosen to be easily remembered, see [Table 13](#).

Table 13. Command Characters

First Character	Represents	Second and Third Characters	Represents
C	Clear	IN	Inputs in use
D	Display	PO	Protected Output
S	Set	OS	Operational Switch
T	Take		

The first character of a command indicates the type of action taken. The second and third characters indicate on what the action is taken.

The ASCII upper case or lower case alpha characters may be used for the commands.

The original GVG T/CI protocol included two Operational Switches. Acappella ignores the Operational Switches commands. Operational Switch 0 is for the choice of numeric or transcoded Input names. Acappella uses only numeric Input names. Operational Switch 1 is for the choice of verbose or terse replies to Error codes. Acappella uses only terse replies. Result is same as if COS0 and SOS1 was commanded.

Table 14. T/CI Protocol Commands

Command Name	Parameters	ACTION
CPO	on	Clear Protected Outputs
DIN	[on1][,on2][,ln]	Display Inputs in use
DPO	[on]	Display Protected Outputs
SPO	on	Set Protected Outputs
TIN	on,in[,ln]	Take Input to in use
COS	0 or 1	Clear Operational Switch (ignored)
SOS	0 or 1	Set Operational Switch (ignored)

Description

Commands and responses exchanged by the Acappella router and its user consist of blocks of asynchronous serial ASCII characters.

Each character consists of a start bit, either seven or eight data bits, and even parity bit, an odd parity bit, or no parity bit followed by either one, one and one half, or two stop bits. The number of data bits and stop bits and the type of parity and baud rate used is selectable during web page based configuration.

Commands are sent to the router only after the prompt is issued. This prompt is three-ASCII-character sequence as follows:

- ASCII carriage return (code 0x0D)
- ASCII line feed (code 0x0A)
- ASCII greater than > (code 0x3E)

Incoming command strings are terminated using carriage return. As the router receives each character of the command string, it echoes it as an indication that it was received. This echo is the feedback that will be a flag that communication is without error. Parity, baud rate, and data bit errors will affect this echo. After the command reply is completed the new line <n1> sequence will be issued to indicate the next command is ready to be processed. It is not mandatory that echo be received before the next command character is sent. However, arriving characters are only saved and processed between the time the router issued the <n1> and the time the router receives the carriage return that terminates the command. The Acappella router will process a stream of commands without the sending computer waiting for the new line prompt after a reply. The overflow limit is to be determined.

An ASCII backspace (code 0x08) is allowed if any characters have already received. The most recently received character is removed.

An ASCII NAK (code 0x15) causes any partially received command to be discarded and the two-character sequence ^U (code 0x5E and 0x55) echoed before the issue of the <n1> prompt.

XON/XOFF flow control is implemented on both receive and transmit.

Parameter Type Description

Most T/CI commands will accept parameters to control their operation.

Parameters are a sequence of ASCII characters which are delimited by a space or a comma. These parameters convert into a decimal router Output, Input, or Level numbers. In the Acappella router the numbers always start with zero (0 based), not one, as the first Output, Input or Level.

A command string allows a space between the three alpha triplet and the first parameter. This space is removed for processing, so the presence of this space is ignored. However, using a comma between the three alpha triplet and the first parameter is significant in the DIN command and the use of comma delimiter is important to flag skip of a parameter.

(DIN 3<cr> is same as DIN3<cr> is same as din3<cr>)

(DIN 3<cr> is not the same as DIN,3<cr>)

(DOP 3<cr> is same as DOP3<cr> is same as dop3<cr>)

(DOP 3<cr> is the same as DOP,3<cr>)

Table 15. Parameters

Parameter Object	Parameter Range ^a	Example
Output number	0 to 15	0, 001, 10, 015 (1 to 3 digit)
Input number	0 to 15	0, 1, 013, 015 (1 to 3 digit)
Level number	0 to 3	0, 1, 2, 3 (1 digit only)

^a The range may be restricted or expanded by the actual hardware configuration.

T/CI Command Descriptions

TIN

COMMAND

TIN on,in[,ln]<cr>

Description: Take Input to in use.

This command modifies a signal path in the router matrix.

Both a router Output number and a router Input number are required parameters. Optionally, a control Level number may be included. If the Level is omitted, the command will affect all control Levels present in the router.

This command response has two formats:

- An All Level Take of Input numbers on an Output, or
- A single Level Take of an Input number on an Output.

If the optional Level parameter is omitted, the response is:

<nl>nnn: in0 in1 in2 in3

Where nnn is replaced by the Output number, and in0 in1 in2 in3 is replaced by the 3 digit Input number in use on each control Level for this Output. Three spaces follow each Input number.

If the Level number is included in the command, the response is:

```
<nl>nnn: in
```

Where again nnn is replaced by the Output number, and in is replaced by only the 3 digit Input number in use on the specified Level of this Output.

Errors:

If the indicated Output and Level have no crosspoint, the Input number is replaced by --- (3dashes).

If the Output number is omitted, the following error message is returned:

```
!E12 (Output number required)
```

If the Output number is greater than 15 (or future maximum), the following error message is returned:

```
!E02 (Output number too big or invalid format)
```

If the Output specified is protected, the following error message is returned:

```
!E75 (Output protected and will not change the current  
Input in use)
```

If the Input number specified is omitted, the following error message is returned:

```
!E13 (Input number required)
```

If the Input number is greater than 15 (or future maximum), the following error message is returned:

```
!E07 (Input number too big or invalid format)
```

If the Level number is present, but is greater than 3, the following error message is returned:

```
!E04 (Level number too big or invalid format)
```

After issuance of any of the above error messages, the command terminates.

Examples:

TIN4 2 1<cr>	Command line
<nl>004: 002	Response shows only Level 1 of Output 4 is taken to Input 2
<nl>>	Greater than > is prompt character
tin 13 4<cr>	Command line
<nl>013: 004 004 004 ---	Response shows all Levels of Output 13 is taken to Input 4
<nl>>	However, Level 3 has no crosspoints

DIN**COMMAND**

DIN [on1][,on2][,ln]

Description: Display Inputs in use.

The response to this command is the router matrix current status.

This response is in one of two forms:

- An All Level status of Input numbers on an Output, or
- A single Level status of Input numbers on an Output.

Omitted (on1) will default to Output = 0.

Omitted (on2) will default to Output = maximum.

Omitting the Level (ln) parameter creates an All Level status.

With no Level parameter, the response will start with the selected Output in router (on1), with multiple Inputs (in0–3) indexed in the line behind the colon. The first Input number is always level0, next is level1, level2, level3.

```
<nl>nnn: in0 in1 in2 in3
<nl>nnn: in0 in1 in2 in3
...
<nl>nnn: in0 in1 in2 in3
```

Where nnn is replaced by the Output number, and in0 in1 in2 in3 is replaced by the 3 digit Input number in use on each control Level for this Output. Three spaces follow each Input number.

The selection of which and how many Output number lines replied are set by the choice of on1 and on2 to create the range of desired Outputs. If on1=1 and on2=3 Output lines start with 1 and end at 3. If on1 is skipped

(*din* ,3) using a comma, the Output lines start with 0 and end at *on2*=3. If *on1*, *on2*, *ln* are missing the default is multiple lines of all Outputs and all 4 Levels per line.

If the Level number (*ln*) is included in the command, the response is:

```
<nl>nn: in
```

Where *nnn* is replaced by the specified Output number, and *in* is replaced by the 3 digit Input number in use on control Level (*ln*) for this specified Output.

Errors:

If the indicated Output and Level have no crosspoint, the Input number is replaced by --- (3dashes).

If the optional Output number is greater than 15 (or future maximum), the following error message is returned:

```
!E02 (Output number too big or invalid format)
```

If the Level number is present, but is greater than 3, the following error message is returned:

```
!E04 (Level number too big or invalid format)
```

Examples:

<i>din</i> <cr>	Command line omits on1 , on2 , and ln parameters
<nl>000: 012 012 012 012	Output 0 has Input 12 on all Levels 1,2,3,4
<nl>001: 014 008 008 008	Output 1 has Input 14 on Level 0, but Input 8 on Levels 1,2,3
...	Lines 002 to 014 are omitted for this example of 16 Output router
<nl>015: 001 002 003 004	
<nl>>	Greater than > is prompt character
<i>DIN</i> 3<cr>	Command line has on1 , but omits on2 and ln parameters
<nl>003: 010 010 010 010	
<nl>>	
<i>DIN</i> 3,4<cr>	Command line has on1 and on2 , but omits ln parameter
<nl>003: 010 010 010 010	Output 3 is starting Output and finish at Output 4
<nl>004: 011 012 013 014	
<nl>>	

DIN, 1<cr>	Command line has skipped on1 , has on2 , and omits ln parameter
<nl>000: 000 000 000 000	Output 0 is starting Output and finish at Output 1
<nl>001: 001 002 003 004	
<nl>>	
DIN, , 2<cr>	Command line skips on1 , on2 , but has ln parameter
<nl>000: 013	Output 0 has Input 13 on Level 2
<nl>001: 014	Output 1 has Input 14 on Level 2
.....	Lines 002 to 014 are omitted for this example of 16 Output router
<nl>015: 001	Output 15 has Input 1 on Level 2
<nl>>	
DIN 5, , 1<cr>	Command line skips on2 , but has on1 and ln parameter
<nl>005: 015	Output 5 has Input 15 on Level 1
<nl>>	
DIN, 1, 3<cr>	Command line has skipped on1 , has on2 , and ln parameter
<nl>000: 012	Output 0 has Input 12 on Level 3
<nl>001: 008	Output 1 has Input 8 on Level 3
<nl>	
DIN 1, 2, 3<cr>	Command line has on1 , has on2 , and ln parameter
<nl>001: 008	Output 1 has Input 8 on Level 3
<nl>002: 002	Output 2 has Input 2 on Level 3
<nl>	

DPO

COMMAND

DPO [on]

Description: Display Protected Outputs

The response to this command is the protect status of the router Output.

This response is in one of two forms:

- If the optional Output number parameter is omitted, the response will be multiple lines, one for each Output in router, with bit per Level status in the line behind the colon.

Note This router will only protect All Levels as a monolith. Individual Levels cannot be separately protected if other Levels of this same Output are not.

Thus, abcd is always 0000 (not protected), or 1111 (protected) in the response.

```
<nl>nnn: abcd
<nl>nnn: abcd
...
<nl>nnn: abcd
```

Where nnn is replaced by the Output number, and abcd is replaced by the protect status on each control Level for this Output.

- If the Output number is included in the command, the response is a single line

```
<nl>nnn: abcd
```

Where nnn is replaced by the specified Output number, and abcd is replaced by the protect status on each control Level for this specified Output.

The first protect status bit number is always level0, next is level1, level2, level3.

a is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 0.

b is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 1.

c is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 2.

d is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 3.

Errors:

If the optional Output number is greater than 15 (or future maximum), the following error message is returned:

```
!E02 (Output number too big or invalid format)
```

Examples:

DPO<cr>	Command line
<nl>001: 0000	Shows this Output is not protected on all Levels
<nl>002: 1111	Shows this Output is protected on all Levels
<nl>003: 0000	
<nl>004: 0000	
<nl>>	Greater than > is prompt character
dpo 3<cr>	Command line
<nl>003: 0000	Shows this Output is not protected on all Levels
<nl>>	
dpo2<cr>	Command line
<nl>002: 1111	Shows this Output is protected on all Levels
<nl>>	

SPO

Command

SPO on

Description: Set Protected Outputs

This command protects the state of a router Output by preventing the change of current Input.

A router Output number must be specified. All control Levels present for the specified Output are protected.

This command response produces a single line indicating Levels of the specified Output are protected after the execution of the command.

Note This router will only protect All Levels as a monolith. Individual Levels cannot be separately protected if other Levels of this same Output are not.

Thus, abcd is always 0000 (not protected), or 1111 (protected) in the response.

```
<nl>nnn: abcd
```

Where nnn is replaced by the specified Output number, and abcd is replaced by the protect status on each control Level for this specified Output.

The first protect status bit number is always level0, next is level1, level2, level3.

a is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 0.

b is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 1.

c is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 2.

d is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 3.

Errors:

If the optional Output number is greater than 15 (or future maximum), the following error message is returned:

```
!E02 (Output number too big or invalid format)
```

Examples:

spo2<cr>	Command line
<n1>002: 1111	Response shows this Output number 2 is protected on all Levels
<n1>>	

CPO

Command

CPO on

Description: Clear Protected Outputs

This command removes protect from a router Output, thus allowing the change of current Input.

A router Output number must be specified. All control Levels present for the specified Output are unprotected.

This command response produces a single line indicating Levels of the specified Output that are unprotected, or possibly still protected via some possible override, after the execution of the command.

Note This router will only unprotect All Levels as a monolith. Individual Levels cannot be separately unprotected if other Levels of this same Output are otherwise.

Thus, abcd is always 0000 (not protected), or 1111 (protected) in the response.

```
<n1>nnn: abcd
```

Where nnn is replaced by the specified Output number, and abcd is replaced by the protect status on each control Level for this specified Output.

The first protect status bit number is always level1, next is level2, level3, level4.

a is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 0.

b is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 1.

c is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 2.

d is replaced by ASCII 0 or 1 (0=not protected, 1=protected) for Level 3.

Errors:

If the optional Output number is greater than 15 (or future maximum), the following error message is returned:

`!E02 (Output number too big or invalid format)`

Examples:

<code>cpo2<cr></code>	Command line
<code><n1>002: 0000</code>	Response shows this Output number 2 is unprotected on all Levels
<code><n1>></code>	

T/CI Error Messages

These are the error messages that can be issued by the T/CI. In this T/CI version only the !Enn code is returned as an error response. Each error code is described with its meaning and possible corrective action.

!E01 Unrecognized Command

This code is issued if the first three characters of a command are not recognized as a valid T/CI triplet. This could be the result of a communications error on the serial link. Another possible cause is the incompatibility between the software versions of T/CI used in this Acappella router and the T/CI version used for the GPI in Horizon systems. Many Horizon router features like Salvos, Exclusions, and Time are not implemented in Acappella.

!E02 Output Number too big or Invalid Format

May be issued by TIN, DIN DPO, SPO, CPO command response. Indicates this Output number specified in the command was not recognized as a valid router Output number. Output numbers must be 1 or 2 decimal digits. T/CI is 0 based format, thus Output number zero is valid. Acappella hardware has 1 based labels on Outputs and Inputs. Note maximum valid T/CI Output number for a 16 Output system is 15. To change Output 1 on Acappella, use T/CI Output number 0.

!E04 Level Number too big or Invalid Format

May be issued by TIN command response. Indicates this Level number specified in the command was not recognized as a valid router Level number. Level numbers must be 1 decimal digit, i.e. 0,1,2,3. T/CI is 0based format, thus Level number zero is valid.

!E07 Input Number too big or Invalid Format

May be issued by TIN command response. Indicates this Input number specified in the command was not recognized as a valid router Input number. Input numbers must be 1 or 2 decimal digits. T/CI is 0based format, thus Input number zero is valid. Acappella hardware has 1based labels on Outputs and Inputs. Note maximum valid T/CI Input number for a 16 Input system is 15. To change Input 1 on Acappella, use T/CI Input number 0.

!E12 Output Number Required

May be issued by TIN, SPO, or CPO commands. Indicates that the Output number parameter required for this command was not found.

!E13 Input Number Required

May be issued by TIN command. Indicates that the Input number parameter required for this command was not found.

!E75 Output Protected from Change to a Different Input

May be issued by TIN command. Indicates that the Output is protected. This is a simple Output protection that will not allow any change of Input until the protection is removed. There is nothing special about who did the protection. If the Output is protected, even the panel that caused the protect must remove the protection before any change can be made.

Glossary

1080i

An abbreviated term for a high definition digital video signal as defined by SMPTE 274M. 1080i signals have 1920 pixels per horizontal line, 1080 active lines, and are interlace with two fields per frame.

720p

An abbreviated term for a high definition digital video signal as defined by SMPTE 296M. 720p signals have 1280 pixels per horizontal line, 720 active lines, and are progressive scan.

Analog

A continuously variable signal that conveys information. Conventional Definition Television (NTSC, PAL, etc.) is analog.

ATSC

Advanced Television Systems Committee, developer of the HDTV standards recommended to the FCC for adoption.

Backlight

Dimmest light setting used mostly when panels are located in dark control rooms.

Bit Rate

The number of bits per second passed from one point to another.

Chop

A toggle between two Sources to a single Destination.

Closed Network

A network that is kept separate from other Local Area Networks and the Internet.

Continuous Feed AES Signal

An audio signal that is constant like a tone, that can be used for audio timing.

Destination Gang:

Two or more Destinations that are grouped into a gang by pressing and holding Destination buttons.

Digital

A signal that employs discrete levels corresponding to logic 1 or 0 to convey information.

Dual Stream AES

Two Levels of AES audio in a router.

Dual-format Routers

A router that has video signals on one side and audio signal on the other side.

Field

One scan of an interlaced video image. In interlace systems (1080i, for example) two fields are required to make a complete picture (video frame) because alternate lines are scanned. Note that on progressive systems (720p, for example), one scan contains all the image information, and so this single scan is called a frame rather than a field.

Frame

One complete scan of a video image. For progressive video, all the lines in a frame are scanned successively from top to bottom. For interlace video, alternate lines are scanned, and so a frame containing all the picture information consists of two fields.

HDTV

See High Definition Television.

High Definition Television (HDTV)

Television with a resolution approximately four times that of Conventional Definition Television and a 16:9 (H x V) picture aspect ratio.

High Tally

Brightest light setting on panel buttons used to indicate activate status

Interlace

A system of video scanning where the odd and even numbered lines of a picture are presented consecutively as two separate interleaved fields. The two fields required to make a complete picture are called a frame.

Local Panel

A panel that is built into the router frame.

Low Tally

Light setting used to indicate inactive or change in status

Matrix

An array of input and output signal lines whose intersections form crosspoints.

NetConfig

Network Configuration Tool used to view information about devices on a network, load software to devices, and to accept user configuration changes.

Progressive

Scanning every line of a video picture in sequential order to create a complete picture. Each complete scan is a frame.

Reclocking

The process of clocking the data with a regenerated clock to remove jitter.

Remote Panel

A panel that is separate from the router frame.

Serial Digital Video

Passing video data bits in serial form (one bit after another), along a single wire. High Definition serial digital (1080i and 720p as defined by SMPTE 292M) operates at 1.485 Gbs. (2 x 74.25 MHz x 10 bits). In comparison, Standard Definition serial digital video (SMPTE 259M) operates at 270 Mbs (2 x 13.5 MHz x 10 bits).

Serial Interface

An interface which allows the router to be controlled remotely by a computer editor or other serial controller. Data is passed serially between the editor and the router at selectable baud (transmission) rates.

Single Stream AES

One Level of AES audio in a router.

Single-format Routers

A router that has either video or audio on one side and is blank on the other side.

Standard Definition Television (SDTV)

A digital television system with quality approximately equivalent to that of NTSC.

Sync

(1) General term for a synchronizing signal or signal component. Digital systems generally employ an analog external timing reference signal (such as color black or tri-level sync) to synchronize different pieces of equipment. Within the digital signal itself, however, synchronizing information is carried by special digital codes inserted at the beginning and end of each active line.

(2) In analog television systems, sync is the portion of the video signal which occurs during blanking and is used to synchronize the operation of cameras, monitors, and other equipment. Horizontal sync occurs within the blanking period in each horizontal scanning line, and vertical sync occurs within the

vertical blanking period. A color black signal is often used for synchronizing different pieces of analog equipment.

Tally

A light which lights up to indicate that the associated button has been selected.

Terminate, Termination

To complete a circuit by connecting a resistive load to it.

Tri-Level Sync

An analog synchronizing signal used with HDTV, as defined in SMPTE 240M and 296M. Tri-level sync signals can be used to synchronize different pieces of HDTV equipment.

Vertical Interval

The portion of the video signal that occurs between the end of one field or frame and the beginning of the next.

Video

An electric signal that carries transient visual images. Video generally involves the movement of visual information from a single source location to a single destination, or to a small number of destinations. Many different types of analog and digital video signals exist.

Wideband

Also called high resolution or high definition signals, a wideband router can handle the complete range of video signals from 143 Mbs to 1.485 Gbs.

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