GRASS VALLEY GROUP

Instruction Manual

software release **1.0**

2010/2011RDA
DUAL/QUAD AES/EBU RECLOCKING DA

Contacting Grass Valley Group

Region	Voice	Fax	Address	Web Site
North America	(800) 547-8949 530-478-4148	(530) 478-3347	Grass Valley Group P.O. Box 599000 Nevada City, CA 95959-7900 USA	www.grassvalleygroup.com
Pacific Operations	+852-2585-6688 Support: 852-2585-6579	+852-2802-2996		
U.K., Europe, Asia, Middle East	+44 1753 218 777	+44 1753 218 757		
France	+33 1 45 29 73 00			
Germany	+49 221 1791 234	+49 221 1791 235		

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AES/EBU Reclocking DA**

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Preface

About This Manual

This manual describes the features of a specific module of the 2000 Series Modular Products family. As part of this module family, it is subject to Safety and Regulatory Compliance described in the 2000 Series frame and power supply documentation (see the *2000 Frames Instruction Manual*).

2010/2011RDA Dual/Quad AES/EBU Reclocking DA

Introduction

This manual covers both the 2010RDA (Dual) and 2011RDA (Quad) AES/EBU Reclocking DA modules. Both versions of the module share the same circuit board with additional circuitry added for the quad channels.

The 2010RDA is a Dual AES/EBU Reclocking Distribution Amplifier providing two independent digital audio streams. The module can be configured for single or dual operation. The following 2010RDA models are available:

■ 2010RDA with 75 Ω (unbalanced) BNC connector passive rear module (COAX PRM) provides connections for a single input with 8 outputs or 2 inputs with four outputs each, or

■ 2010RDA-110 with 110 Ω (balanced) D-connector passive rear module (2000PRM) provides connections for a single input with 16 reclocked outputs or 2 inputs with 8 reclocked outputs each.

The 2011RDA-110 is a Quad AES/EBU Reclocking Distribution Amplifier providing four independent digital audio streams. The module can be configured for single, dual or quad operation. The passive rear module has 110 Ω D-connectors and can provide a single input with 16 reclocked outputs, dual inputs with 8 reclocked outputs each, or quad mode with 4 inputs with 4 outputs each.

The 2010RDA, 2010RDA-110, and 2011RDA-110 modules feature:

■ Single, dual, and quad (2011RDA-110 only) modes,

■ 75 Ω unbalanced (2010RDA only) or 110 Ω balanced input/output I/O,

■ Reclocking at sample rates of 32, 44.1, 48 or 96 kHz, and

■ Remote control and monitoring.

Installation

Installation of the 2010/2011RDA module is a process of:

■ Placing the passive rear module in a rear frame slot,

■ Placing the media module in the corresponding front slot, and

■ Cabling and terminating signal ports.

The 2010/2011RDA module can be plugged in and removed from a 2000 Series frame with power on. When power is applied to the module, LED indicators reflect the initialization process (see *Power Up on page 8*).

Module Placement in the 2000 Frame

There are twelve slot locations in both the front and rear of a 3RU frame to accommodate 2000 Series modules. The 2010/2011RDA module set consists of a front media module and a passive rear module that can be plugged into any of the 12 frame slots. Each 2010/2011RDA front media module plugs into the front of the 2000 frame mid-plane. The passive rear module plugs into the corresponding rear slot to provide the input and output interface connectors.

To install a 2010/2011RDA module set in the frame:

1. Locate a vacant slot in the rear of the 3 RU frame (Figure 1).

Figure 1. 3 RU Frame, Rear View

Mid-frame motherboard with power and communication buses

Rear media module slots 7 – 12   Rear media module slots 1 – 6

8025-04
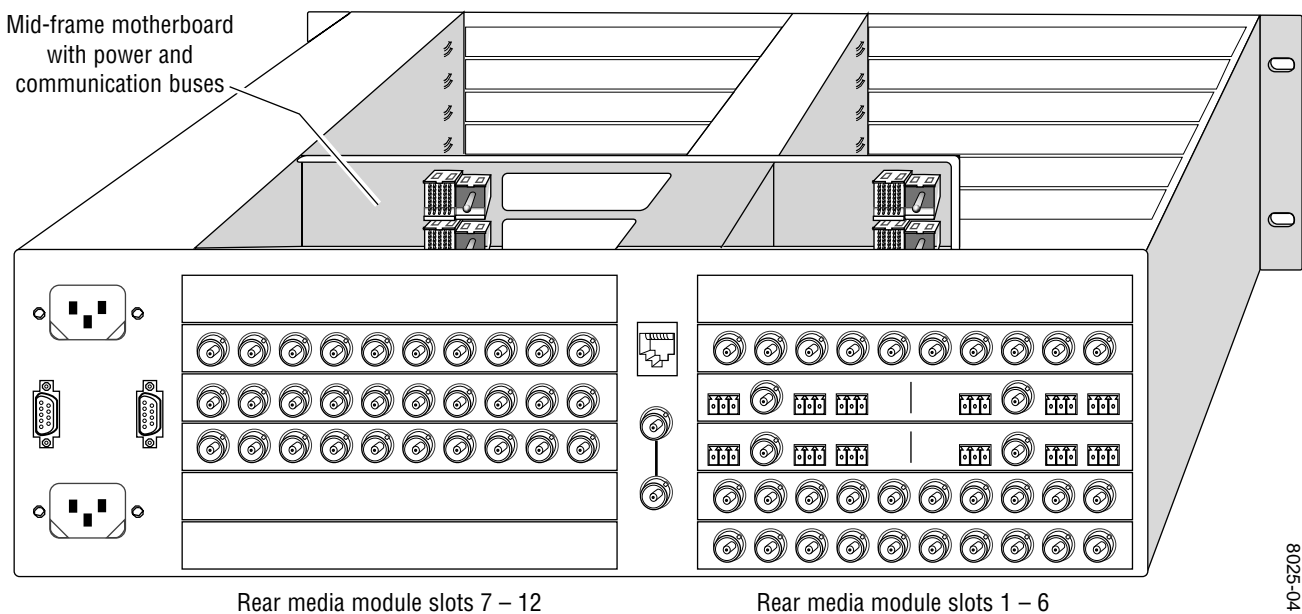
2. Insert the passive rear module into the vacant rear slot of the frame as illustrated in Figure 2 (2000PRM-D shown here).

Figure 2. Installing Passive Rear Module

2000PRM-D Passive Rear Module Shown
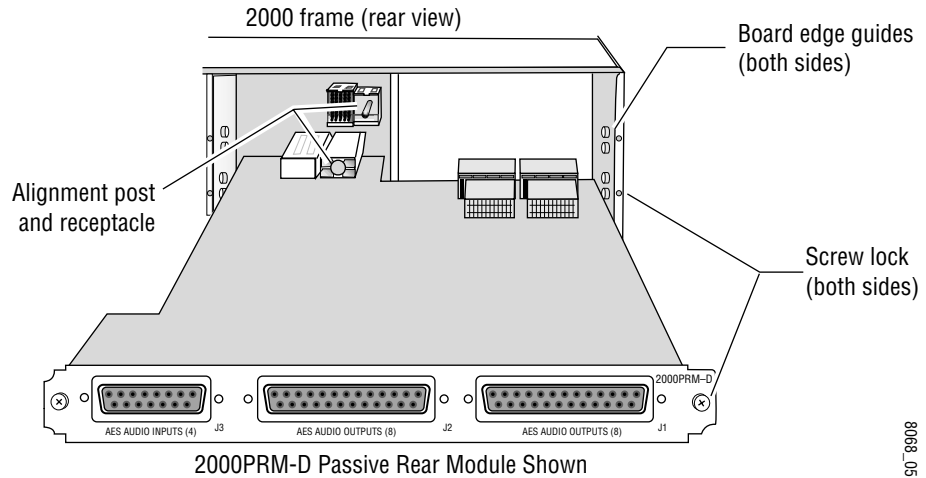
3. Verify that the module connector seats properly against the midplane.

4. Using a crossblade screwdriver, tighten the two screw locks to secure the module in the frame.

5. Locate the corresponding front slot in the frame. The 3 RU frame front view is illustrated in Figure 3.

Figure 3. 2000 Series 3 RU Frame, Front Slots
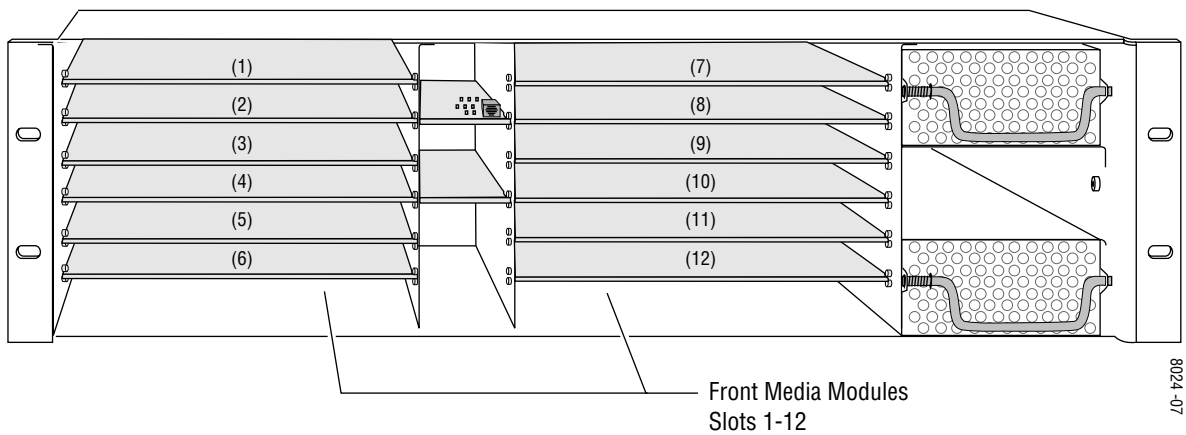
6. With the component side up, insert the front media module in the corresponding front slot (see Figure 4).

7. Verify that the module connector seats properly against the midplane and rear module connector.

8. Press firmly on both ejector tabs to seat the module.

Figure 4. Installing Front Media Module
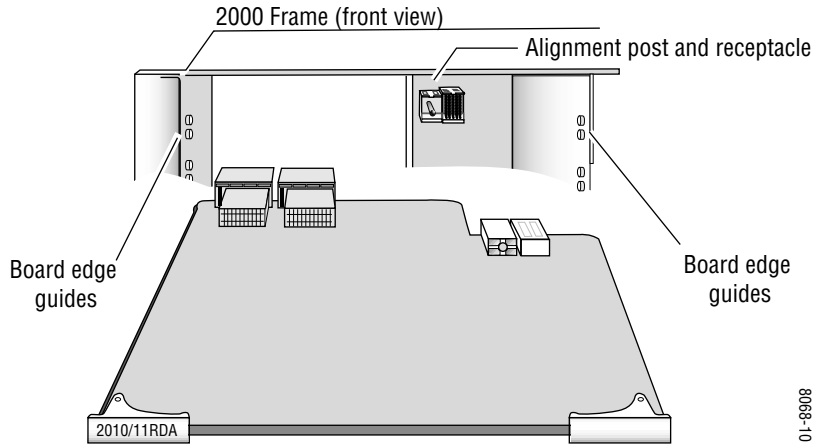
Cabling

All cabling to the modules is done on the corresponding passive rear module at the back of the 2000 frame. There are two versions of passive rear modules available for the 2010RDA, the COAX PRM with 75 Ω BNC I/O (Figure 5) and the 2000PRM-D with 110 Ω D-connector I/O (Figure 6). The 2011RDA-110 uses only the 2000PRM-D passive rear module.

Refer to the instructions that follow for cabling either the COAX PRM or 2000PRM-D passive rear modules for single, dual or quad mode.

2010RDA COAX PRM Passive Rear Module

The COAX PRM module provides ten 75 Ω (unbalanced) BNC connectors for single or dual operation with the 2010RDA. Refer to Figure 5 for an illustration of the COAX PRM passive rear module.

The module must be jumpered during configuration for the desired mode of operation. Refer to *Set Operating Mode on page 10*.

Figure 5. COAX PRM Passive Rear Module
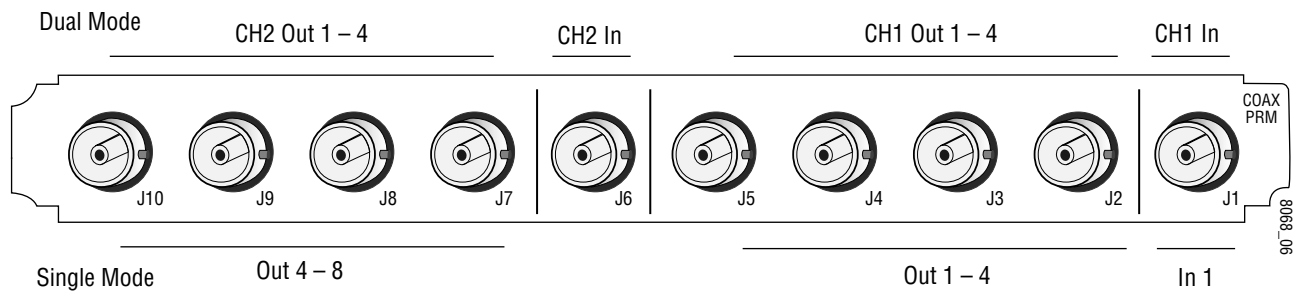
Refer to Table 1 for single and dual channel cabling.

Note   At the back of this manual are overlay cards that can be placed over the BNC connectors to identify specific single or dual connector function.

Table 1. COAX PRM Cabling Pinouts

Connector	Single Mode	Dual Mode
J1	Ch 1 In	Ch 1 In
J2	Ch 1 Out 1	Ch 1 Out 1
J3	Ch 1 Out 2	Ch 1 Out 2
J4	Ch 1 Out 3	Ch 1 Out 3
J5	Ch 1 Out 4	Ch 1 Out 4

Table 1. COAX PRM Cabling Pinouts

Connector	Single Mode	Dual Mode
J6	–	Ch 2 In
J7	Ch 1 Out 5	Ch 2 Out 1
J8	Ch 1 Out 6	Ch 2 Out 2
J9	Ch 1 Out 7	Ch 2 Out 3
J10	Ch 1 Out 8	Ch 2 Out 4

2000PRM-D Passive Rear Module

The 2000PRM-D passive rear module with 110 Ω D-connectors (Figure 6) provides a single 15-pin input D-connector and two 25-pin output D-connectors for single, dual (2010RDA-110 or 2011RDA-110) or quad (2011RDA-110 only) operation.

The module must be jumpered during configuration for the correct mode of operation. Refer to *Set Operating Mode on page 10*.

Figure 6. 2000PRM-D Passive Rear Module Backplane

Figure 7. 2000PRM-D Cabling Pinouts
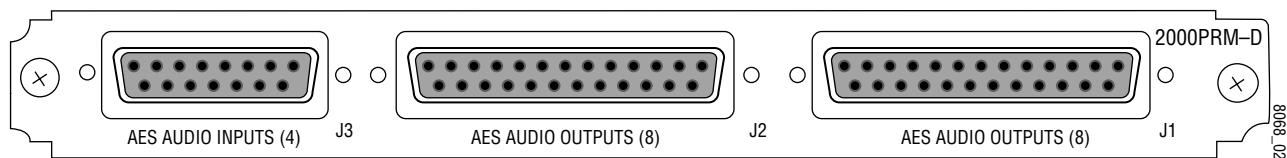
The pinout diagram for the 2000PRM-D module is silkscreened on the component side of the front media and the 2000PRM-D passive rear module and is shown in Figure 7.

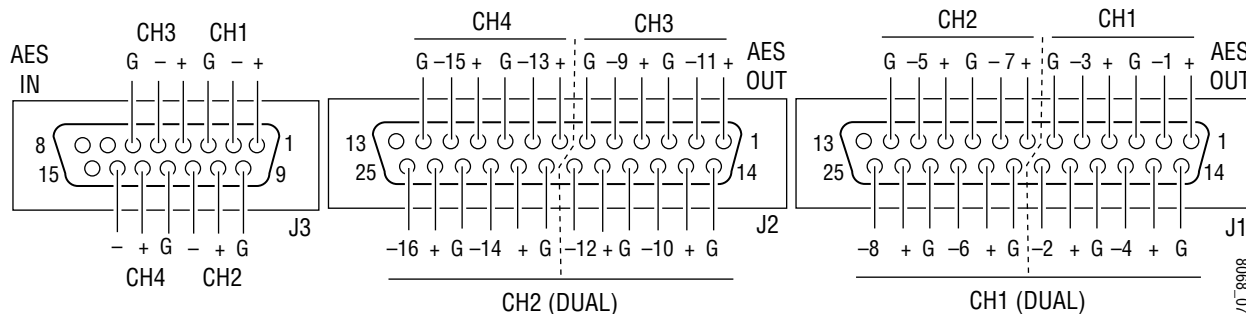Refer to Table 2 below for a guide to 2000PRM-D passive rear module cabling in single, dual (2010RDA-110 or 2011RDA-110) or quad (2011RDA-110 only) mode. Note that pins numbers are given in G (ground), – and + sequence.

Table 2. 2000PRM-D Cabling

Silkscreen Label	Pin Numbers (G – +)	Single Mode	Dual Mode	Quad Mode (2011RDA)
J1 (25-pin D-connector)				
G, –1, +	3, 2, 1	Ch 1 Out 1	Ch 1 Out 1	Ch 1 Out 1
G, –2, +	17, 18, 19	Ch 1 Out 2	Ch 1 Out 2	Ch 1 Out 2
G, –3, +	6, 5, 4	Ch 1 Out 3	Ch 1 Out 3	Ch 1 Out 3
G, –4, +	14, 15, 16	Ch 1 Out 4	Ch 1 Out 4	Ch 1 Out 4
G, –5, +	12, 11, 10	Ch 1 Out 5	Ch 1 Out 5	Ch 2 Out 1
G, –6, +	20, 21, 22	Ch 1 Out 6	Ch 1 Out 6	Ch 2 Out 2
G, –7, +	9, 8, 7	Ch 1 Out 7	Ch 1 Out 7	Ch 2 Out 3
G, –8, +	23, 24, 25	Ch 1 Out 8	Ch 1 Out 8	Ch 2 Out 4
J2 (25-pin D-connector)				
G, –9, +	6, 5, 4	Ch 1 Out 9	Ch 2 Out 1	Ch 3 Out 1
G, –10, +	14, 15, 16	Ch 1 Out 10	Ch 2 Out 2	Ch 3 Out 2
G, –11, +	3, 2, 1	Ch 1 Out 11	Ch 2 Out 3	Ch 3 Out 3
G, –12, +	17, 18, 19	Ch 1 Out 12	Ch 2 Out 4	Ch 3Out 4
G, –13, +	12, 11, 10	Ch 1 Out 13	Ch 2 Out 5	Ch 4 Out 1
G, –14, +	20, 21, 22	Ch 1 Out 14	Ch 2 Out 6	Ch 4 Out 2
G, –15, +	12, 11, 10	Ch 1 Out 15	Ch 2 Out 7	Ch 4 Out 3
G, –16, +	23, 24, 25	Ch 1 Out 16	Ch 2 Out 8	Ch 4 Out 4
J3 (15-pin D-connector)				
CH1 G – +	3, 2, 1	Ch 1 In	Ch 1 In	Ch 1 In
CH2 G – +	9, 10, 11	–	Ch 2 In	Ch 2 In
CH3 G – +	6, 5, 4	–	–	Ch 3 In
CH4 G – +	12, 13, 14	–	–	Ch 4 In

Power Up

The front LED indicators and configuration jumper are illustrated in Figure 8. Upon power-up, the green PWR LED should light and the yellow CONF LED should illuminate for the duration of module initialization.

Operation Indicator LEDs

With valid input signals connected, the green PWR LED and the green LOCK LED 1–4 should be on for each channel.

Figure 8. Operation Indicator LEDs

FAULT (red)
COMM (yellow)
CONF (yellow)
PWR (green)
LOCK 1 (green)
LOCK 2 (green)
LOCK 3 (green) 2011RDA only
LOCK 4 (green) 2011RDA only

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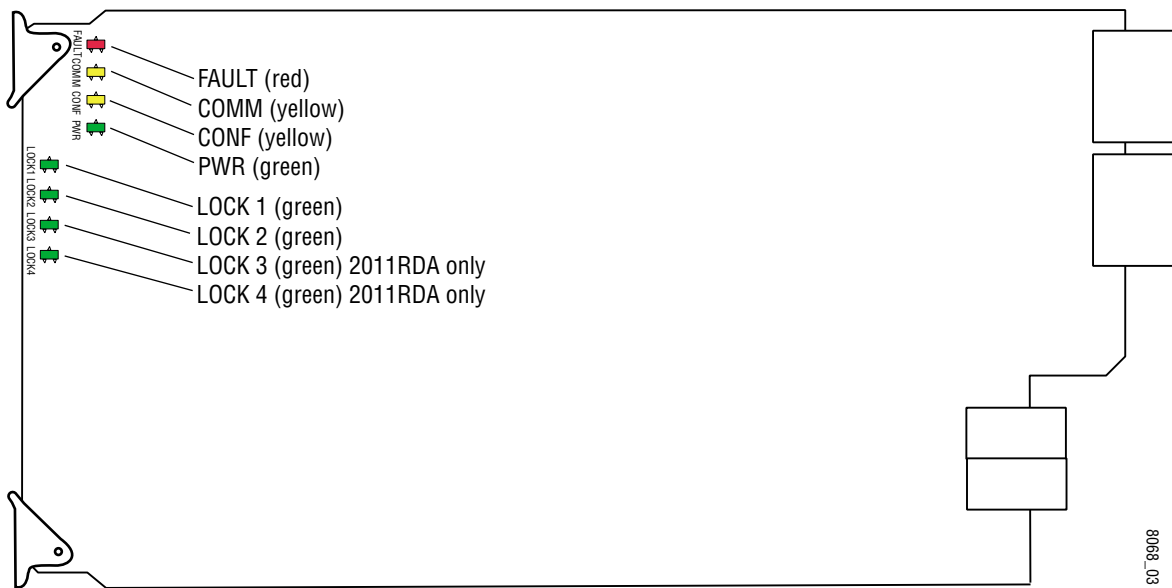
A red FAULT LED indicates an error situation and, with the other LEDs, can indicate the operational conditions presented in Table 3. The table describes signal output and LED indications for various input/reference combinations and user settings.

Table 3. Indicator LEDs and Conditions Indicated

LED	Indication	Condition
FAULT (red)	Off	Normal operation.
	On continuously	Module has detected an internal fault.
	Flashing	Reference input is faulty or not present.
COMM (yellow)	Off	No activity on frame communication bus.
	Long flash	Location Command received by the module from a remote control system.
	Short flash	Activity present on the frame communication bus.
CONF (yellow)	Off	Module is in normal operating mode.
	On continuously	Module is initializing, changing operating modes or updating firmware. Simultaneous CONF and FAULT LEDs on indicate FPGA load error.
	Flashing	Indicates rate of change of paddle-controlled analog setting.
PWR (green)	Off	No power to module or module's DC/DC converter failed.
	On continuously	Normal operation, module is powered.
LOCK 1 (green)	Off	Module does not detect a valid AES in reference signal on channel 1.
	On continuously	Valid AES in reference signal is present on channel 1 and module is locked to it.
LOCK 2 (green)	Off	Module does not detect a valid AES in reference signal on channel 2.
	On continuously	Valid AES in reference signal is present on channel 2 and module is locked to it.
LOCK 3 (green)	Off	Module does not detect a valid AES in reference signal on channel 3.
	On continuously	Valid AES in reference signal is present on channel 3 and module is locked to it.
LOCK 4 (green)	Off	Module does not detect a valid AES in reference signal on channel 4.
	On continuously	Valid AES in reference signal is present on channel 4 and module is locked to it.

Note LOCK 3 and LOCK 4 LEDs will only be active on the 2011RDA-110 module.

Configuration and Monitoring

Configuring the 2010/2011RDA consists of setting the operating mode to single, dual or quad input/output with an on-board jumper.

Local Onboard Module Configuration

The 2010/2011RDA module is configured locally using the jumper shown in Figure 9. The CONF LED indicates status of the configuration process.

Figure 9. Module Configuration Switches and LEDs
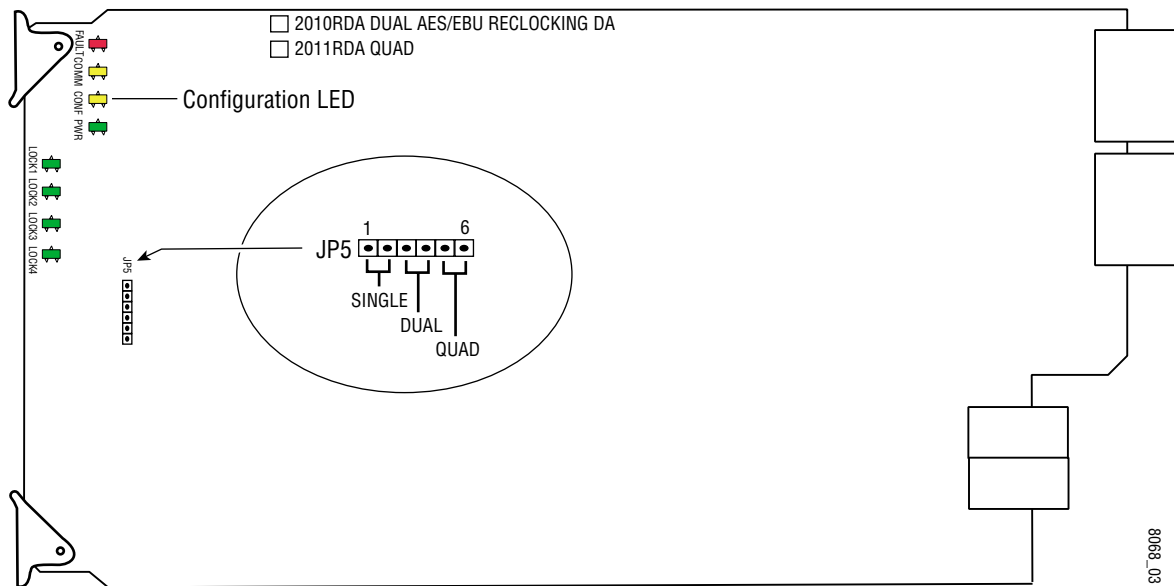
Set Operating Mode

Set jumper JP5 for one of the following operating modes:

Single (pins 1/2)

■ 1 input by 8 outputs (COAX PRM), or

■ 1 input by 16 outputs (2000PRM-D).

Dual (pins 3/4)

■ 2 inputs by 4 outputs (COAX PRM), or

■ 2 inputs by 8 outputs (2000PRM-D).

Quad (pins 5/6)

■ 4 inputs by 4 outputs (2011RDA-110 module only)

Remote Configuration and Monitoring

Monitoring of the 2010/2011RDA can be performed remotely using the 2000NET interface (see Figure 10). This section describes the GUI access to the module configuration functions. Refer to the 2000NET Network Interface Module Instruction Manual for information on setting up and operating the 2000 frame network.

Note   The physical appearance of the menu displays shown in this manual represent the use of a particular platform, browser and version of 2000NET module software. They are provided for reference only. Displays will differ depending on the type of platform and browser you are using and the version of the 2000NET software installed in your system.

The 2000 modules can be addressed by clicking on a specific module icon in the frame status display or on a module name or slot number in the link list on the left.

Figure 10. 2000NET GUI

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

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

Module Configuration Displays

The 2000 GUI provides the following links and displays for the 2010/2011RDA module (Figure 11):

- Module Configuration displays showing status and slot configuration information (location and user assigned names),

- Input Status Output Mode display, and

- Software Update display.

The Module Configuration displays operate in the same manner for all remote controllable 2000 modules. Refer to the 2000NET manual for more information on these displays. Some functions listed may not be supported by a particular module. These will be indicated as not supported.

Figure 11. 2010/2011RDADisplay Links
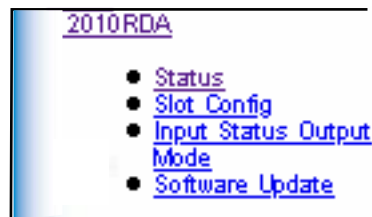
Software Update Display

The Software Update display allows you to download new software versions for the module. Refer to the 2000NET manual and the Grass Valley Group web site at http://www.grassvalleygroup.com for complete details and new software versions.
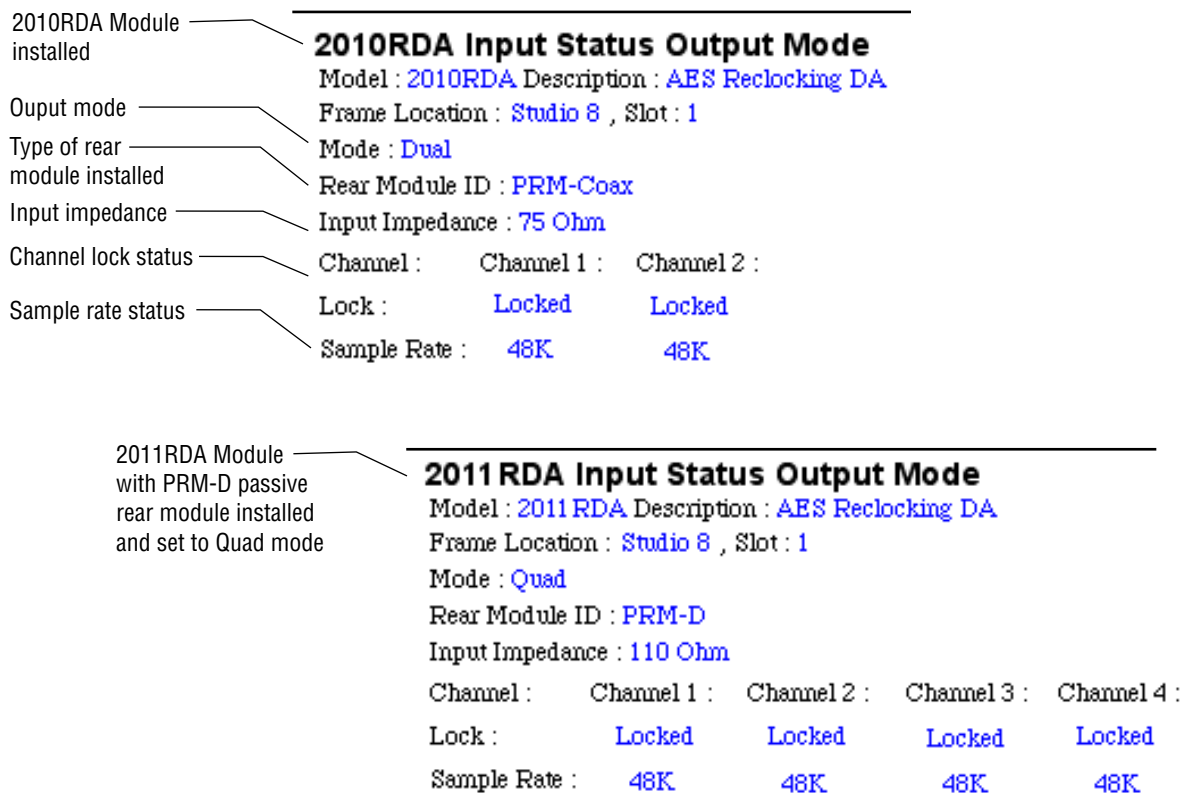
Input Status Output Mode Display

This section discusses the Input Status Output Mode display available to monitor the 2010/2011RDA module status remotely.

Use
This
Link
- Status
- Slot Config
- Input Status Output Mode
- Software Update

The **INPUT STATUS OUTPUT MODE** display (Figure 12) provides the following status reporting items for the module:

- **MODE** indicates whether the on-board jumper is configured for **SINGLE**, **DUAL** or **QUAD** output mode. (Refer to *Set Operating Mode on page 10*.)

- **REAR MODULE ID** indicates whether the 2000PRM-D (**PRM-D**) or COAX PRM (**PRM-COAX**) passive rear module is installed. (Refer to *2000PRM-D Passive Rear Module on page 6* or *2010RDA COAX PRM Passive Rear Module on page 5*.)

- **INPUT IMPEDANCE** indicates the input impedance of the passive rear module installed as **75 OHM** (COAX PRM) or **110 OHM** (2000PRM-D).

- **CHANNEL LOCK** indicates whether each channel is **LOCKED** (valid AES reference signal is present and module is locked to it) or **UNLOCKED** (module does not detect a valid AES reference signal).

- **SAMPLE RATE** indicates the current input sample rate being detected by each channel as one of the following: **OUT OF RANGE**, **32K**, **44.1K**, **48K**, **88.2K** or **96K**.

Figure 12. 2010/2011RDA Input Status/Output Mode Display

2010RDA Module installed —

Ouput mode —

Type of rear module installed —

Input impedance —

Channel lock status —

Sample rate status —

2010RDA Input Status Output Mode
Model : 2010RDA Description : AES Reclocking DA
Frame Location : Studio 8 , Slot : 1
Mode : Dual
Rear Module ID : PRM-Coax
Input Impedance : 75 Ohm

Channel :	Channel 1 :	Channel 2 :
Lock :	Locked	Locked
Sample Rate :	48K	48K

2011RDA Module with PRM-D passive rear module installed and set to Quad mode —

2011 RDA Input Status Output Mode
Model : 2011 RDA Description : AES Reclocking DA
Frame Location : Studio 8 , Slot : 1
Mode : Quad
Rear Module ID : PRM-D
Input Impedance : 110 Ohm

Channel :	Channel 1 :	Channel 2 :	Channel 3 :	Channel 4 :
Lock :	Locked	Locked	Locked	Locked
Sample Rate :	48K	48K	48K	48K

Specifications

Table 4. 2010/2011RDA Specifications

Parameter	Value
AES/EBU Inputs (2010RDA COAX PRM)	
Signal type	AES3id – 1992
Number of inputs	2 (jumper selectable for single or dual)
Connector type	75 Ω BNC (COAX PRM passive rear module)
Common mode range	± 10 V
Differential voltage range	200 mV to 12 V p-p
Sample rate	32 kHz, 44.1 kHz, 48 kHz, or 96 kHz
Input return loss	>15 dB (100 kHz – 10 MHz)
Maximum jitter	< 6 ns RMS
AES Output (2010RDA COAX PRM)	
Signal type	AES3id – 1992
Number of outputs	8
Connector type	75 Ω BNC (COAX PRM passive rear module)
Output level	Unbalanced 1 V ± 0.1 p-p terminated in 75 Ω
Rise/fall time	30 to 44 ns (across 75 Ω load)
Sample rate	32 kHz, 44.1 kHz, 48 kHz, or 96 kHz
Input return loss	>15 dB (100 kHz – 6 MHz)
Maximum jitter	< 6 ns RMS
AES/EBU Inputs (2010/2011RDA-110 2000PRM-D)	
Signal type	AES3 – 1992 (transformer coupled)
Number of inputs	4 (jumper selectable for single, dual or quad)
Connector type	15-pin 110 Ω D-connector (2000PRM-D)
Common mode range	± 10V
Differential voltage range	200 mV to 12 V p-p
Sample rate	32 kHz, 44.1 kHz, 48 kHz, or 96 kHz
Input return loss	>15 dB (100 kHz – 10 MHz)
Maximum jitter	< 6 ns RMS
AES Output (2010/2011RDA-110 2000PRM-D)	
Signal type	AES3id – 1992 (transformer coupled)
Number of outputs	16
Connector type	25-pin 110 Ω D-connector (2000PRM -D)
Output level	Balanced -2 V to 7 V p-s (terminated in 110 Ω)
Rise/fall time	5 to 30 ns (across 110 Ω load)
Sample rate	32 kHz, 44.1 kHz, 48 kHz, or 96 kHz
Input return loss	>15 dB (100 kHz – 6 MHz)
Maximum jitter	< 6 ns RMS
Performance	
Module insertion to operation	< 1.5 seconds

Table 4. 2010/2011RDA Specifications - (continued)

Parameter	Value
DC offset	<±1 mV
Electrical length (delay)	560 ns
Static withstand	5 kV (330 Ω, 150 pF) any input or output
Environmental	
Frame temperature range	0 to 40° C
Operating humidity range	0 to 90% non-condensing
Non-operating temperature	-10 to 70° C
Mechanical	
Frame type	2000 Series
Power Requirements	
Supply voltage	+24 V
Power consumption	<3.3 Watts

Service

The 2010/2011RDA modules make extensive use of surface-mount technology and programmed parts to achieve compact size and adherence to demanding technical specifications. Circuit modules should not be serviced in the field unless directed otherwise by Customer Service.

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

■ Check frame and module power. If power is not present, check the fuse on the +24 V input to the module as illustrated in Figure 13.

■ Check for presence and quality of input signals.

■ Verify that source equipment is operating correctly.

■ Check cable connections.

Figure 13. Location of Module Fuse

Fuse: 2 A FAST, 125 V

F1

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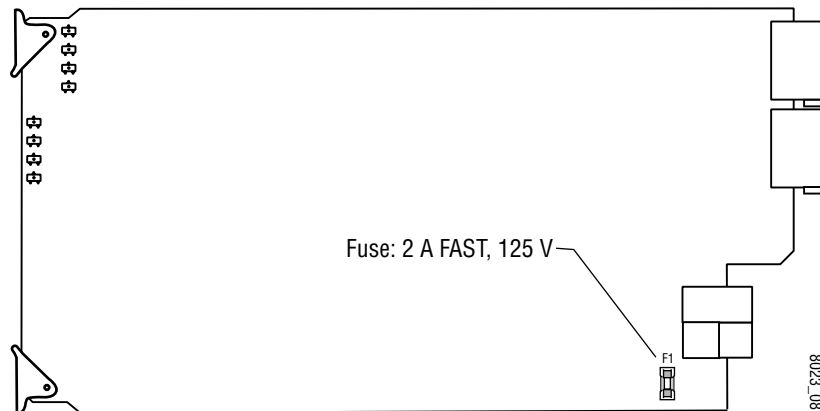
Refer to Figure 8 for the location of PWR LED and Table 3 on page 9 for proper LED indications.

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

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

Functional Description

The functional description for the 2010RDA and the 2011RDA-110 are nearly identical except for the passive rear modules and the number of audio channels available. Refer to the block diagram for the type of module you are using. The block diagram in Figure 14 represents the 2010RDA with the COAX PRM 75 Ω passive rear module. The block diagram in Figure 15 represents the 2010RDA-110 and the 2011RDA-110 with the 2000PRM-D 110 Ω passive rear module.

The 2010/2011RDA modules reclock and distribute AES/EBU digital audio. The 2010RDA has two independent streams of video and the 2011RDA-110 has four independent streams. The modules are configured with jumpers to operate in single, dual or quad (2011RDA-110 only) mode.

Figure 14. 2010RDA with COAX PRM
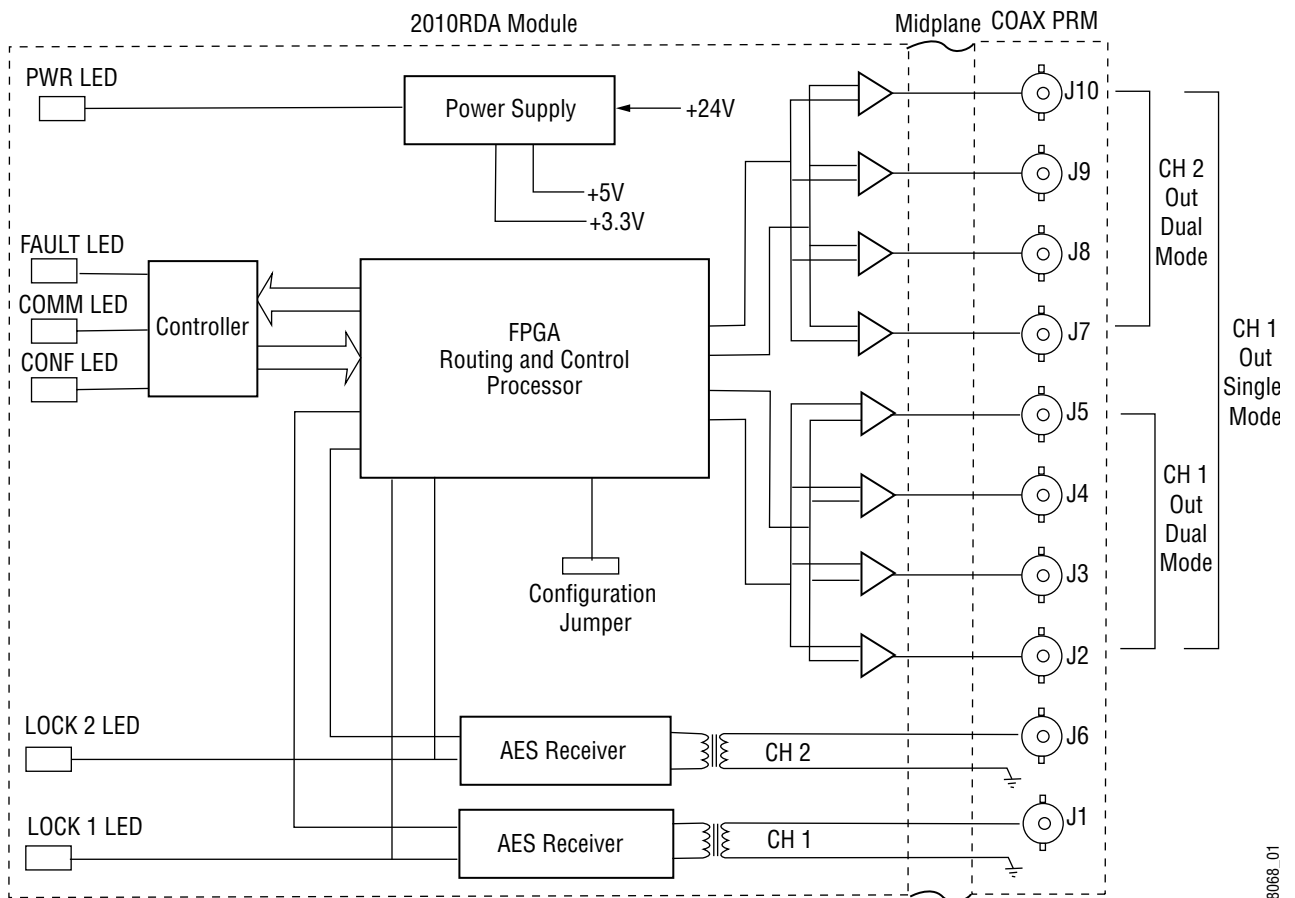
AES Receivers

Each channel of AES3 audio is fed to the modules through an isolation transformer into a crystal receiver IC where the data is reclocked by means of a phase-locked-loop (PLL). Each AES Receiver controls the LOCK LEDs which indicate when the receiver IC is locked to an incoming data stream. The reclocked signal is then fed to the FPGA for routing and control.

Figure 15. 2010RDA-110/2011RDA-110 with 2000PRM-D
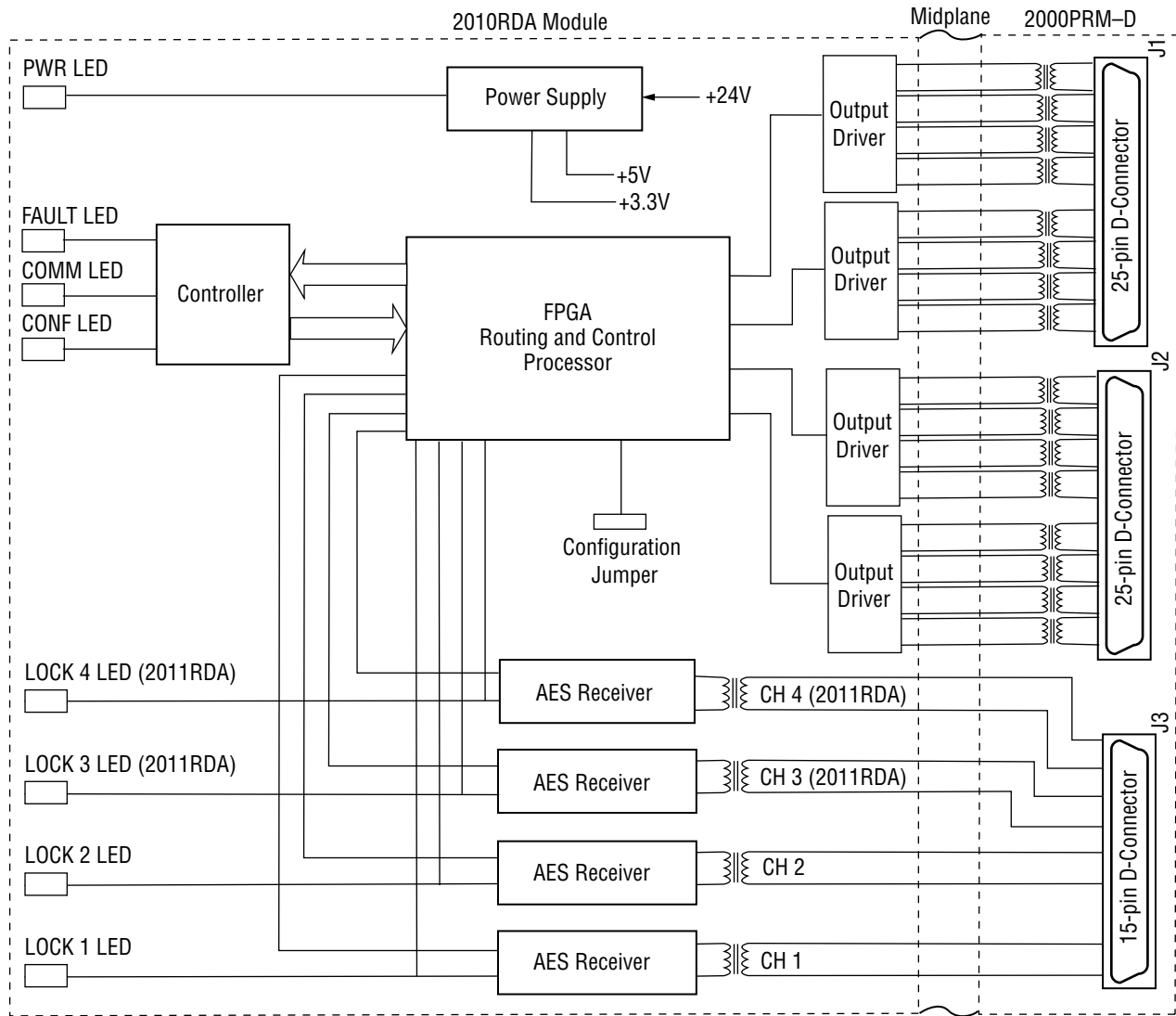
Routing and Control FPGA

The signals from the AES receiver ICs are applied to the Routing and Control FPGA. The signal routing is determined by the setting of the on-board configuration jumper at the front of the module. After processing, the signals are embedded into an AES stream and applied to the Output Drivers.

The Routing and Control section also drives the front panel LEDs and interfaces to the Controller section.

Controller

The Controller interfaces with the Routing and Control FPGA, the EEPROM and the 2000 Frame Bus. The Controller also provides the FPGA code that is downloaded to the FPGA during boot-up.

The Controller section handles local control and monitoring, as well as remote control and monitoring via the frame bus (when an 2000NET module is installed in the frame). Module settings are stored in the EEPROM for power up recall.

Power Supply

Power is fed from +24 V rails of the frame's switching power supply. Each stage of the module receives its own, separate, highly regulated and filtered power source.

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