Product Manual

232-ATSC 4

HDTV Tuner

January 10, 2016

Contemporary Research

4355 Excel Pkwy, Suite 600, Addison, TX, 75001
Phone: 972-931-2728 • Toll-Free: 888-972-2728 • Fax: 972-931-2765
E-Mail: Sales@crwww.com • Website: www.crwww.com

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Overview

The 232-ATSC 4 HDTV Tuner, our 4th-generation ATSC HDTV tuner, adds new capabilities to the industry-standard 232-ATSC series. New features include tuning MPEG-4 programs, up to 1080p output, and more efficient operation. The new tuner is fully compatible with control commands for previous models.

The integrator-friendly HDTV tuner is controllable with 2-way RS-232, IP Telnet and UDP, as well as wireless and wired IR commands. An onboard Web page enables remote Web control. A new menu-driven display simplifies setup, and a front-panel USB port makes firmware updates a snap. The new compact enclosure allows mounting of two tuners in a single rack space.

A universal TV tuner, the 232-ATSC 4 can receive both analog and digital MPEG-2/MPEG-4 channels, in ATSC, NTSC, and clear QAM formats. Using an optional RF switcher, the tuner can switch between antenna and cable feeds.

- Tunes analog and digital channels in ATSC, NTSC, and clear QAM formats
- Accepts MPEG-4 TV channels, as well as standard MPEG-2
- Scales video output from 480p to 1080p
- 1080p set to 60Hz for more universal applications, 1080i and 720p can be set to 60 or 59.94
- Simulcasts from HDMI and composite video ports, as well as stereo, and digital coax and TOSlink optical audio ports
- Switches to RGBHV or Component output from front-panel settings, Web page or control commands
- Dolby® 5.1 or PCM/Variable PCM digital audio formats for digital audio ports and HDMI
- Allows Consumer or Pro settings for digital audio, Auto or manual DVI compatibility
- Front-panel text and on-screen menus for tuner setup
- Web pages for remote setup and control
- Supports dual Air/Cable tuning with optional RF switch
- Analog and digital closed captioning
- Internal scaler displays channels at selected resolution
- Rack-mountable two across in 1RU
- Full ASCII 2-way RS-232/USB commands, AMX, Crestron, and RTI modules available, discrete IR commands
- RS-232 can be daisy-chained to control up to 9 tuners from a single RS-232 port, or control any number of tuners via IP
- Update firmware via front-panel USB port (S37) and memory stick (HD firmware)
- Meets RoHS and California energy-saving standards
- Includes HD2-RC IR remote and 12 VDC power supply
- Options for single and dual rack mounts, external RF-AB RF switch, also we can provide a PS-6-4Y 6A power supply that can power groups of up to 4 tuners at time of order

Setup

There are 3 ways you can change the settings:

- **Front Panel.** Press the red **SETUP** button use the Up/Down buttons to move through menus, Left/Right to change settings, then press **SELECT** to store the changes at each step.
    - Press **SETUP** to access the front-panel menus
    - Use the **Up** and **Down arrows** to step through each menu
    - Use the **Left** and **Right arrows** to choose an option
    - Click **SELECT** to save the changes for each menu
- **MENU or IR**. Use the included IR remote to turn on/off, scan for channels and access on-screen menus. Pressing the **blue MENU** button will access the on-screen menus, using the direction buttons.
- **Ethernet**. Access the onboard Web pages for Control and Setup pages. **New in V2.24 – press and hold SETUP to see the current IP address.**

Front-panel Setup

HD Output	Select RGBHV or Component for HD analog output, also sets colorspace for HDMI HDMI and composite video are always active.
HD Resolution	Cycle through the list of resolutions from 1080p to Auto (Native resolution). The Component output supports 1080p
Tune Mode	Select CATV, Air, IRC, HRC, or CATV Auto. • IRC has the same channel map as standard CATV, except for 5 and 6. • The HRC channel map uses completely different frequencies than the others. • CABLE AUTO looks at the first few channels to determine the right format.
Digital Audio	AC-3– Dolby 5.1, PCM (default), PCM Variable
Refresh Rate	Sets 59.94 or 60 Hz or 1080i and 720p, 1080p is fixed at 60 Hz
Baud Rate	**300 – 19200**, default is 9600
Unit Number	Primarily for daisy-chain operation, 1-9, default is 1
Panel Lockout	None, Ch+Menu, Vol+Menu, Ch+Vol+Menu, Power, Setup, Menu, All, Setup+Menu, Pwr+Setup+Menu
Backlight	Display brightness 1-10
LCD Contrast	Contrast 1-9
IR Receive	IR On, IR Off
Captions	On, Off (default)
Caption Mode	CC1, CC2, CC3, CC4, Text 1, Text1, Text3, Text4 (Text options rarely used)
Digital Captions	Service 1-6, Default is 1
Scan Mode	Page down a number of menus to the **Scan Mode** menu. The **Left** or Right keys will select several options • Analog+Digital (standard full scan) • Digital – Delete Analog (scan for digital, delete any analog channels) • Digital – Keep Analog (scan for digital, but keep all analog channels) • Analog – Delete Digital (scan for analog, delete any digital channels) • Analog – Keep Digital (scan for analog, but keep all digital channels)
Channel Scan	Press **SELECT** to start scanning. There won't be any LCD text or feedback to confirm that the scanning is in progress. On on-screen list displays a list of found channels The tuner scans analog channels first, then digital. Press Select to skip the analog scan.
Overscan	Selects % overscan for all channels, 0-9, 0 is default
Digital Audio	Select AC-3, PCM, or PCM Variable – volume Up/Down won't affect the first two options
IP Port	IP Telnet port – click or hold Up or Down to set. 23 is default
IP Mode	Select Static or DHCP For a Static IP, switching from DCHP will keep Gateway and Subnet Mask settings
IP Address	Automatic for DHCP, Use Left/Right and Up/Down arrows to manually set a static address, **Select** saves
IP Gateway	Automatic for DHCP, Use Left/Right and Up/Down arrows to manually set a static address, **Select** saves
Subnet Mask	Subnet has a limited range of combinations, so this function is simplified Left/Right steps through each group, click Up or Down for options
IP Address	Left/Right steps through each group, click Up or Down to step one at a time, hold down to move faster.
MAC/SN	Shows network MAC address, Displays Mac address - the last 3 pairs identify the serial number
UDP Reply	Sets UDP Reply on or off
Clear	Clears network password (set Web page password from Settings page)
HDMI-DVI	Select Auto, HDMI. or DVI (DVI does not hot-patch, may need to reboot source in DVI mode)
HDMI Audio	Turns HDMI audio on or off (On is default)
Digital Audio	Consumer(default) or Pro for digital audio
AC3 Cmpr Audio	**Line | RF** Compression mode downmix to stereo (RF enhances dialog)

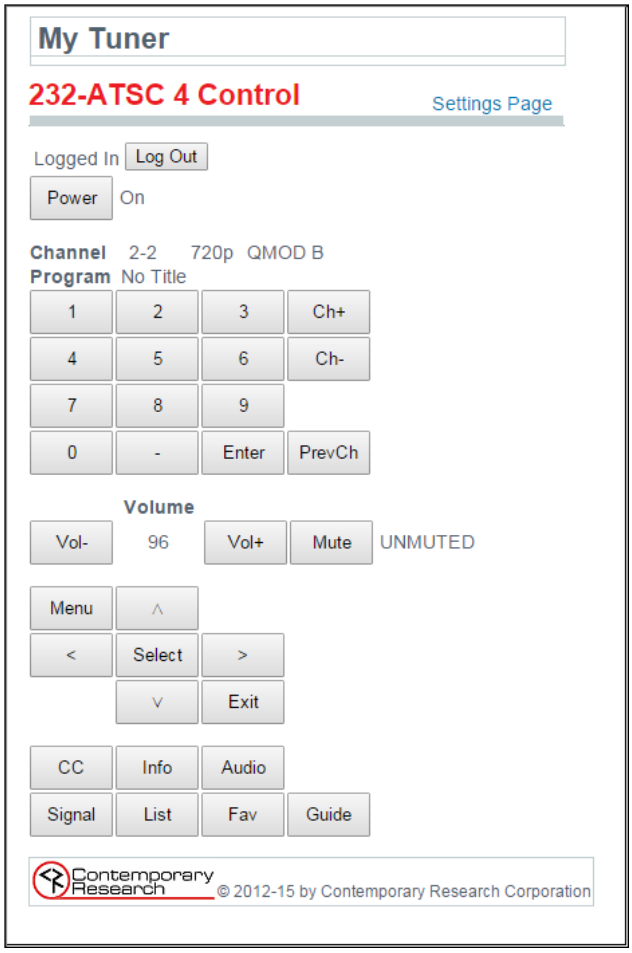
FAQ

Tuning Cable Channels	The 232-ATSC 4 will skip encrypted channels automatically when you activate a channel scan. You can skip scanning analog channels by pressing **Select** after you start the scan. Typically, the digital channels will not use the same Guide numbers as a cable box. If you can't select channels, make sure that the channels have been scanned.
RGB/Component Video	Analog HD is output on either the RGBHV (VGA) or Component output. Use the front-panel menu to select the desired output. There can be "fluttery" lines at the top of the analog channel – this is closed captioning data. Go to the Overscan menu and increase the value.
HDMI	HDCP is always off – not required for non-encrypted programs If a monitor has issues with current resolution, 1080p/60 works best for newer models.
DVI	DVI compatibility is normally supported; you can manually select DVI from the HDMI-DVI menu.
Composite Video	Press the RATIO button on the IR remote to select the desired format for NTSC video The onscreen menu also has Screen Format settings, generally only used when tuning an analog channel
Audio	Volume won't affect digital audio in AC-3 or PCM modes PCM Variable supports level control If there is no audio, make sure the volume is all the way up (and not muted). Digital audio is sent as Consumer format, the Digital Audio menu can change to Professional format A "motorboat" sound means the source does not support AC-3, change to PCM.
Power/AV	If the LCD shows only **Power On**, call CR Support for solutions If the LCD shows **Power Off** and panel buttons are unresponsive, open up case and check ribbon cables If you can't change volume or channels and there is no video, first try an alternate power supply, call Support if needed. The tuner will display "Voltage Low" if the power supply is failing or low. Press SETUP, go to the Firmware menu, and then press the Right arrow several times to see the exact voltage. There is a "Voltage High" warning if the supply is significantly higher than 12 VDC.
IR Control	There can be interference from room fluorescent lights. Hold down SELECT on the remote. Pressing 4 selects normal 38 KHz IR, pressing 9 selects 57 KHz IR. Check the front-panel IR Receive menu to see if it is turned on or off. If there is significant IR interference, an IR-RXC Remote Sensor may be required, and cover the front-panel IR sensor to reduce interference
Captioning	If the tuner is feeding a digital channel modulator, use Composite video to send captioning data. If the site wants to see captioning on all TVs, turn the feature on in the tuner.
S37 Installation	See Support Blog on Windows 8-10 settings for S37 installation.

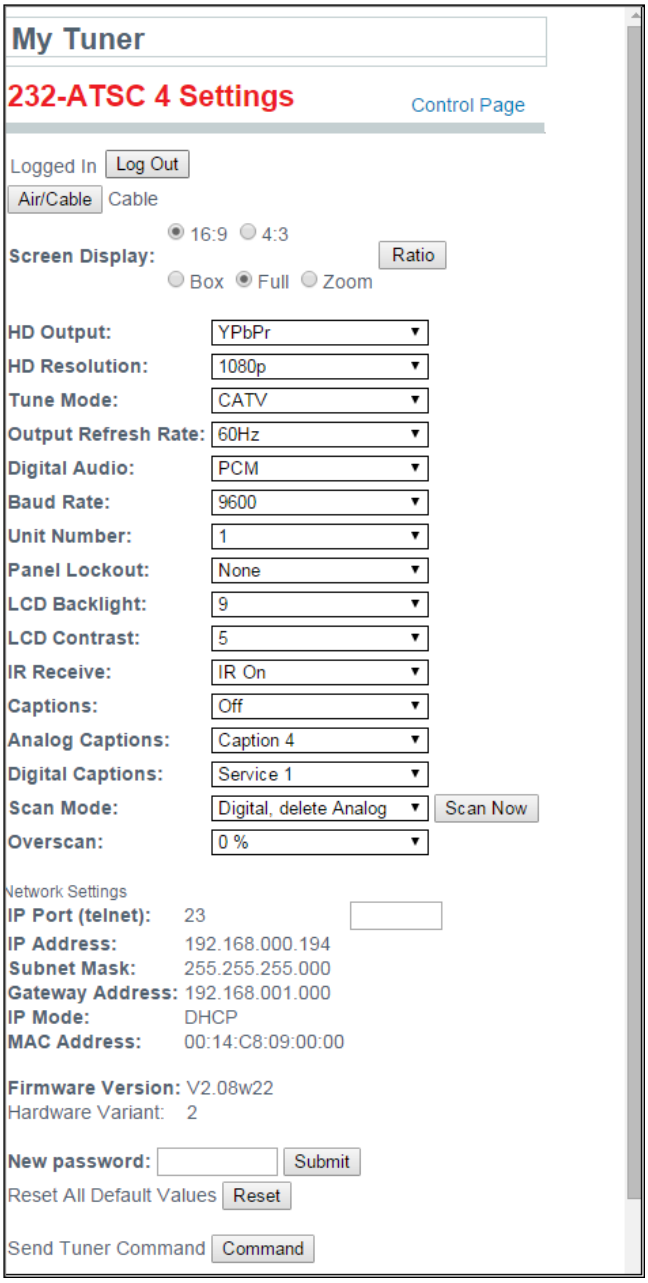
Front-Panel Button Sequences

- Pressing **Up** and **Down** keys toggles air/cable tuning
- Pressing **Left** and **Right** keys toggles mute on/off
- If the **Setup** key is locked out, pressing **Setup** and the **Right** key will unlock setup until the tuner resets, and turns the tuner on if it is off (even if the Power button is locked)
- Press **Power** and **Up** together when at **Setup:Firmware** menu to reset to default settings
- Remove power, hold **Up** and **Down** together, repower, then release to force S37 firmware load

Web Pages



Control Page



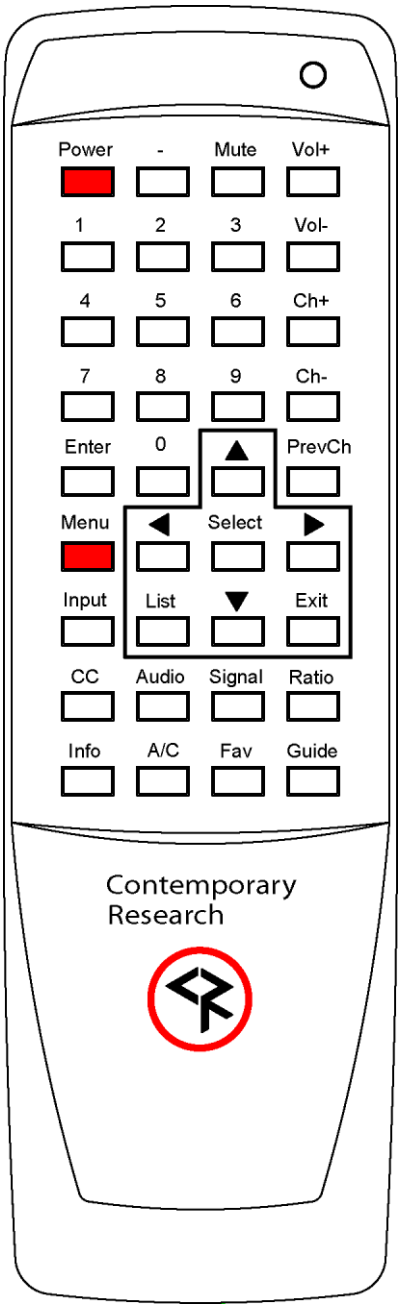
Settings Page

The 232-ATSC 4 features Web pages accessible by any browser over IP. The Control page features a full array of control options with interactive status feedback, including the native resolution of the program and if no signal is present. The Settings page can change all aspects of tuner setup and operation. The name of the tuner can be changed by clicking on the name at the top of the page.

The Web password is set on the Settings page. To change the password, the user will need to know the current password.

HD2-RC IR Remote

The HD2-RC IR Remote included with the 232-ATSC 4 can be used to setup the tuner and for daily operation. All of the functions on the remote have equivalent commands in RS-232, Ethernet, and Wired IR formats. In addition, the 232-ATSC 4 front panel buttons can perform Power, Channel, and Volume control.



Power
Turns tuner on and off. Discrete on and off IR commands are available as a download.

Volume Control
Use the **Vol+**, **Vol-** and **Mute** buttons.

Channel Selection
The key change in digital tuning is the need to add a dash (**-**) and number after the traditional channel number. Analog channels are accessed using XX-0, digital channels using XX-1 (or -2, -3, etc).

Ch+, Ch- and PrevCh can be used to access and recall channels.

Menu Operation
Press Menu to access the on-screen menus.

- Use the directional **Arrows**, **Select** and **Exit** to navigate the menus.
- **List** displays the list of all channels, arrow keys add/remove channels, set Favorite Channel list
- **Exit** steps backwards out of menus
- **Enter** selects menu choice

Special Functions

- **CC** steps through available closed-captioning options
- **Audio** selects audio and SAP modes
- **Signal** displays channel signal level
- **Ratio** steps through aspect ratios, options depend on channel and output types
- **Info** launches on-screen information window
- **A/C** selects Air or Cable tuning
- **Fav** Displays list of favorite channels
- **Guide** displays on-screen Guide

Features of many of the Special Function commands depend on whether the current channel is analog or digital.

Tip: The output rules behave differently for digital and analog channels. When you set up the tuner, use the RATIO button to set image output for a digital channel, then tune to an analog channel and set that to 16:9 or 4:3. The same rule applies to the Menu/Setup/Screen Format menus. Set for analog and digital.

Pressing Select and 4 together outputs 38 KHz IR, Select and 9 outputs 57 KHz IR, useful when there is IR interference.

Firmware Updates

- On the tuner, select Setup/Firmware to view current S37 and HD Load firmware – click the Right arrow twice to view the HD Load version
- Download the firmware from the 232-ATSC 4 Product page
    - Browse to www.crwww.com
    - Select **Products**, then choose the 232-ATSC 4
    - Select the **Downloads** tab and download the latest firmware pack
    - Extract the ZIP folder, usually on your Desktop or in the Downloads folder
- Install the S37 firmware first, then update HD Load
- See Support Blog on Windows 8-10 settings for S37 installation.

System Firmware over Front-Panel USB

The system firmware (S37) is a simple, fast update. It's a small file and doesn't take too long to update.

Connect USB cable as shown above

In the 232-ATSC 4 /ATSC-SDI 4, you won't need an RS-232 port. Just copy or drag the S37 Update file to a pop-up file window, just as if the tuner was a memory stick.

- Connect your PC to the front panel USB port of the 232-ATSC 4 .
- Copy the S37 file in the Firmware Pack folder
- Select the red **Setup** button on the ATSC front panel, then go to the **Setup: Firmware** setting
- Click **Setup** and **Power** together – a file folder will open on your desktop and the front panel of the tuner will display **Firmware Loader.** Some PCs are set to not automatically open the folder – you may need to look for the folder in Windows Explorer.
- Paste or drag the S37 file into the folder
- The front panel will show **File Loading**, then **Copying Image.**
- When the process is complete, the display will change to **Firmware Loader**
- Press the **Left** to exit the mode, no need to exit **Setup** or reset power

The S37 firmware load can also be forced by removing power, holding **Up** and **Down** together, repower, then release.

USB Memory Stick for HD Firmware

- Copy the file HD4_V6xx.rom or HD4SDIV3.xx to the root of a memory stick. Make sure that it is the only *.rom file on the stick.
- Memory formatted as FAT, FAT16, or FAT32, not NTFS
- Place USB memory stick in the back USB port of the 232-ATSC 4 /ATSC-SDI 4
- Power on tuner.
- Press Setup, and then select the **Firmware** menu. Press the right arrow twice to display the current **HD Version**. Press both **SETUP** and **POWER** buttons at the same time. The update takes about one minute.

RS-232/Telnet/UDP Control Protocol

The 232-ATSC 4 full duplex RS-232/Telnet protocol enables a system programmer to control all TV Tuner functions as well as monitor TV Tuner status. All commands are sent as ASCII strings. No delays between characters or commands are required, as data is interrupt driven and buffered.

The 3 status groups are: Channel/Source Select, Audio Levels/Mode and Front Panel. The Power button-function status from the 232-ATSC 4 front panel has been grouped with the Channel/Source for simplicity in the most common modes of operation. Each of the groups has one ASCII status response string containing all of the status data for that group. The current status string of a group is sent from the whenever a valid command for that group is received by the 232-ATSC 4 RS-232 port or front panel. A group's status may be requested at any time via the RS-232 port. Status of all 3 groups is sent at power up. The format of each group's status response string remains the same always.

Up to 9 232-ATSC 4 units may be cabled together and addressed for individual control from a single RS-232 port. Each 232-ATSC 4 is assigned a unique unit code.

Communications parameters (Front Panel Mode 1) are 300 to 19200 baud, 8 data bits, No parity, and 1 stop bit. Factory default is 9600 baud, Unit#1. All settings are saved to NVRAM in the 232-ATSC 4 . The tuner will accept non-standard RS-232 control such as voltage that swings from 0 to +5 VDC, commonly found when IR ports are used to send RS-232 commands.

The same commands can be sent over IP Telnet (up to two sessions) and via UDP to the tuner's IP to port 31931 (fixed) with status feedback on port 31932. Port 31932 is disabled by default, send ">UO" command (UF turns UDP status feedback off) or set with front-panel menu. See our Support Blog How to Test 232-ATSC 4/ATSC+1 UDP Control to learn more about UDP control.

General protocol specifications
Characters in command strings to the 232-ATSC 4 are common ASCII keyboard characters.

Command strings sent to the 232-ATSC 4 begin with the ASCII > (greater than symbol) as an 'Attention' character and end with carriage return - ASCII CR, Hex $0D, or keyboard Enter - as an 'End-of-command' character.

Responses from the 232-ATSC 4 begin with the ASCII < (less than symbol) as an 'Attention' character and end with a carriage return followed by line feed an ASCII LF or Hex $0A as 'End-of-command' characters.

A carriage return is required at the end of each command and is assumed in all examples.

Command String Structure

[Attention] (Unit#) [Command] (Parameters) [Return]

Attention	Single character (>) starts the string
Unit#	The Unit# is expressed as an ASCII 0-9 when used in multiple tuner applications. To address all units, use a Unit # of 0 (Zero) No unit number will default to Unit#1
Command	A two-character command
Parameters	Added attributes to some commands
Return	A carriage return ends the command string, you may use ASCII CR, Hex $0D, or keyboard 'Enter' in programming. For simplicity, the programming examples in the manual will not show the 'CR' – so remember, you'll need to add it in your control code.

Command and Status Response
Commands can be sent back to back at any time without any delay. To allow for rapid, multiple commands, status responses are intentionally delayed by about 125mS, sending the most current status in response to control commands or user actions.

Control Commands

Code	Function	Operation
	Front Panel	
S4=	Set front panel lockout mode	0 =None 6 = Menu 1 = Ch+Menu 7 = All 2 = Vol+Menu 8 = Setup+Menu 3 = Ch+Vol+Menu 9 = Pwr+Setup+Menu 4 = Power 5 = Setup – Press Select and Right key to unlock temporarily
Q5=	Set IR Receive mode	0 - No IR reception 9 - CR 9 (Default)
KK=105	Menu	Opens on-screen menus
KK=106	Right	Left
KK=107	Left	Down
KK=108	Up	Up
KK=109	Down	Down
KK=110	Enter	Enter
KK=111	Exit	Exits menus
KK=95	List	Displays on-screen list to select favorite channels
P1	Power On	On
P0	Power Off	Standby, mutes audio and video
PT	Power Off/On	Power toggle
	Tuning	
TC=	Select channel	Tunes analog and digital channels, leading zeros OK, up to 4 characters for analog or single-unit digital channel, 3 characters for major and minor channels. *Examples:* '>TC=28:1', '>TC=28-1' Selects channel 28-1 '>TC=32' Selects 32-1, 32-0 if no digital
TU	Tune channel up *Example:* '>3TU'	Selects next higher channel in channel list Bumps Unit#3 tuned channel up
TD	Tune channel down	Selects next lower channel in channel list
TP	Previous channel	Selects previously viewed channel
T^	Start Channel Scan	Initiates new channel scan for analog and digital channels, scan operation set by D0 and S0.
S0=	Tuning Format	0=CATV (Default) - Switches to Cable, sets scan mode 1=Off-Air - Switches tuner to Air RF input and channels 2=IRC - Switches to Cable, sets scan mode 3=HRC - Switches to Cable, sets scan mode 4=Cable Auto - Switches to Cable, sets scan mode
D0=	Set Channel Scan Mode	Sets scan mode for digital and analog channels from the T^ or front panel scan command. 0= Scans for analog and digital channels scan (default) 1= Scans for digital only, deletes analog channels 2= Scans for digital only, keeps analog channels 3= Scans for analog only, deletes digital channels 4= Scans for analog only, keeps digital channels A scan must be triggered by T^ or front panel before the onscreen Menus will scan following D0 rules.
XD=	Channel delete	XD=<major>,<minor> removes channel from channel list. *Example:* '>XD=0,0' removes current channel
XA=	Channel add	XA=<major>,<minor>,<physical> adds channel *Example:* '>XA=38,1,0' Physical channel will be same as major
NC=	Channel name status	>NC returns channel name, up to 7 characters
NP=	Program name status	>NP returns program name, up to 30 characters, 15 more if there are non-ascii characters, such as ñ

Code	Function	Operation
	Output	
KK=149	RGB Out	Selects RGB output and colorspace
KK=151	YPbPr Out	Selects Component (YPbPr) output and colorspace
D4=	Overscan (0-9)%	Removes upper scan lines that may appear in RGB output, affects all outputs, 0% is default setting. *Example:* '>D4=3' Overscan by 3% (typical solution)
KK=82	Ratio	Steps through aspect ratios, options depend on channel and output types
KK=81	Signal	Displays signal Strength
KK=100	Info	Launches on-screen information window
KK=63	Guide	Displays Electronic Program Guide
KK=115	CC – Closed captions	Steps through captioning options
Q0=	Caption Mode Off (0-2) Example: '>Q0=0' or '>Q00'	Sets captioning mode 0=Captioning off (default) 1=Captioning on Captioning off
Q1=	Analog Captioning Type (1-8)	Turns on captioning type 1=Caption 1 4=Caption 4 2=Caption 2 5-8= Text 1-4 (rarely used) 3=Caption 3
Q7=	Digital Caption Service	Set to 1-6 (1 is default)
	Audio	
VU	Ramp volume up	Starts volume ramping up
VD	Ramp volume down	Starts volume ramping down
VH	Sets volume level 0-100	Volume level, scaled in 100 steps
VL	Sets volume level 0-63	Volume level, scaled in 63 steps, as other 232 tuners
VX	Volume Mute off	Restores audio volume to previous level
VM	Volume Mute on ***Example:*** '>VM'	Turns off audio outputs Mutes audio outputs
VV	Stop volume ramp	Stops volume ramping
VT	Toggle Volume Mute	Alternates audio mute on and off
DL=	Set Power-Up volume	Not supported
KK=85	Audio Mode	Step through audio mode options for mono, stereo, SAP
	Status Request	
SQ	Request Q Mode status	Unit sends "Q" Mode status string
SS	Request Front Panel status	Unit sends "S" Front Panel status string
ST	Request Channel status *Example:* '>ST'	Unit sends "T" Channel/Source status string Returns Channel/Source status response string
SV	Request AV status	Unit sends "V" Audio status string
	IP Setup	
IP=	IP Address	IP returns the current MAC address, current IP address, subnet mask, and gateway. Response example (S or D at end of IP signifies DHCP or Static address): $MAC=0014C8090001 $IP=192.168.001.231S IG=000.000.000.000 IM=255.255.255.000 IY=1 IP=xxx.xxx.xxx.xxx Defines IP address, then sends status (0.0.0.0 = DHCP)
IG=	IP Gateway	IG Returns current MAC address and IP information IG=xxx.xxx.xxx.xxx Defines IP gateway, then sends status
IM=	IP Subnet Mask	IM Returns current MAC address and IP information IM=xxx.xxx.xxx.xxx Defines IP subnet mask, then sends status
IY=	IP Mode	IY Returns current mode IY=1 Static (default) IY=2 DHCP
IX=	Telnet Port	IX Returns current Telnet port (00023 default) IX=xxxxx Defines Telnet port
U_	UPD Reply Port 31932	UO Turns UDP Reply port on UF Turns UDP Reply port off

Code	Function	Operation
NW= **NM=**	Tuner Name	Sets name of tuner on Web page Set name: >NW=Tuner 1 Get name: >nm Reply: <1NMTuner1
M0=	LCD Backlight	0-9
M8=	LCD Contrast	0-8
R_	Refresh Rate	R6 = 59.94 Hz RM= 60 Hz
DH=	HDMI Audio Mute	Turns HDMI audio on or off 1=Audio mute on 0=Audio mute off (default)
DI=	HDMI Mode	0=Auto (default), 1=HDMI, 2=DVI

A carriage return is required at the end of each command and is assumed in all examples. The '=' sign for parameters may be omitted if desired, though it is helpful for clarity in checking programming.

Terminal Communication Commands

EF	Echo Off	Characters received will not be re-transmitted (power up default).
EN	Echo On	Characters received will be re-transmitted. *Example: '*>EN' Characters received will be re-transmitted.
ID	Product ID	Returns the product model number and firmware version.
Z!	Zap	Reconfigures unit for all factory default settings.
Z]	Reboot	Emulates a reboot from power

HD2-RC Remote Emulation

You can emulate IR commands sent from the CR HD2-RC Wireless Remote.

KK=<key>	* = Reserved for future products/applications 0=* 1=* 2=* 3=* 4=* 5=* 6=* 7=* 8=* 9=Power (toggle) 10=0 11=1 12=2 13=3 14=4 15=5 16=6 17=7 18=8 19=9 20= 21=Enter/Select 22=Ch Up 23=Ch Dn 24=Vol Up 25=Vol Dn 26=Vol Mute (tog) 27=Power On 28=Power Off 29=Menu 63=Guide 80=Freeze 81=Signal 82=Ratio 85=Audio	May need Enter for channel entry 88=Favorite 95=List 96=Add/Delete Channel 98=Air/Cable 99=Dash - 100=Info 101=Prev Chan 105=Menu 106=Cur Right 107=Cur Left 108=Cur Up 109=Cur Down 110=Enter/Select 111=Exit 115=CC 141=Format 1080i 142=Format 720p 143=Format 480p 144=Format 480i 145=Format 1080p 146=Format Auto 149=Output RGB 151=Output YPbPr 153=Air 154=Cable 155=16:9 Ratio Pillar Box 4:3 Ratio Letterbox 156=16:9 Ratio Full Wide 4:3 Ratio Full 157=16:9 Ratio V Zoom 4:3 Ratio H Zoom 158=AC-3(Dolby 5.1) 159=PCM 160=PCM Variable 161=Display 16:9 162=Display 4:3

Response Strings

Response Strings

Typical: [Attention] [Unit#] [data ...data] [cr] [lf]

232-ATSC+ status response strings contain ASCII characters similar to those used for the same functions in command strings. An ASCII 'carriage return' and 'line feed' follow each response string. Functions shown as N/A are not applicable or available in the 232-ATSC 4; characters will appear in status strings as lower-case x.

Channel/Source Status Response String (T):

Start	#	CMD	Power	Major Channel	Video Mute	Input	RF	Received Resolution	Minor Channel	NA	Function
	1-9		U=On M=Off	3 digits	Un- muted	0=RF	A=Air C=Cable	0=1080i 1=720p 2=480p 3=480i N=No Sig	3 digits		0=None
<	**1**	**T**	**U**	**032**	**U**	**0**	**A**	**0**	**002**	**x**	**0**

For compatibility with 232-series tuners, the 232-ATSC 4 channel status is split into Major Channel and Minor Channel sections. The Minor Channel will always be 000 for analog channels. The Minor Channel status will display "F00" if the Major channel is a special "one-part" digital channel. Also, as one-part channels can go higher than 999, the Minor status will tell you how many thousands (up to 63) you add to the Major number. So, channel 1032 would show 032 Major F01 Minor. Two-part channels are limited to 999-999.

Audio Status Response String (V):

Start	Unit	CMD	Power	Volume 1	Volume Mute	Stereo	Volume 2
	1-9		U=On M=Off	0-63 Emulated level 2 digits	U=Unmuted M=Mute	N/A	0-100 Actual level 3 digits
<	**1**	**V**	**U**	**63**	**U**	**x**	**100**

Volume 1 emulates 232-series volume level for compatibility with existing applications.
Volume 2 shows actual 232-ATSC 4 level, from 0-100 steps. Mute status will be sent if a user mutes volume from an IR remote.

Front Panel Mode Status Response String (S):

Start	Unit	CMD	Audio	Tune Mode	Lockout	Bass	Treble	Output	Output Resolution	Output Setting	NA
	1-9		N/A	0=Cable 1=Air 2=IRC 3=HRC 3=Auto	0-7	Fixed 2 digits	Fixed	0=RGB 2=YPbPr	0=1080i 1=720p 2=480p 3=480i 4=1080p	0=1080i 1=720p 2=480p 3=480i 4=1080p 5-Auto	4 digits
<	**1**	**S**	**x**	**1**	**0**	**08**	**4**	**2**	**0**	**0**	**xxxx**

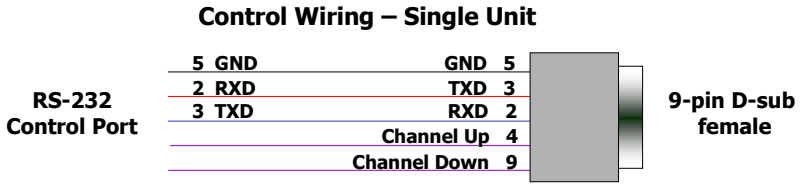
Current Ratio is the actual output ratio; Ratio Mode is the selected mode (see chart on page 9)

Q Mode Response String (Q):

Start	Unit	CMD	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	NA
	1-9		CC 0=Off 1=On	CC Type 1-8	Video Detect (fixed)	AV Detect (fixed)	Label (fixed)	IR 0=Off 9=Normal	1 digit	Digital CC 0=Off 1=On	Digital CC Services 1-6	2 digits
<	**1**	**Q**	**1**	**1**	**3**	**0**	**2**	**9**	**0**	**1**	**1**	**xx**

RS-232 Cable Connections

Single Tuner



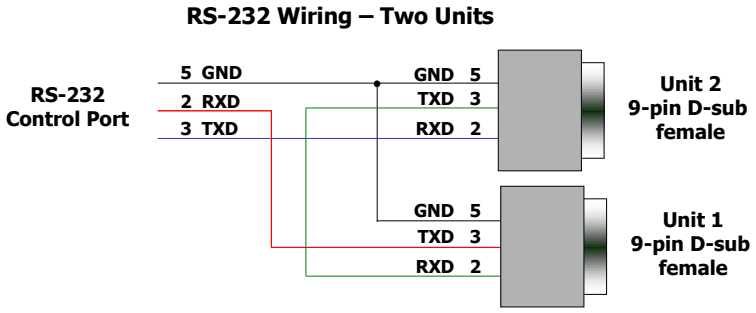
Contact closures on Pins 4 and 9 can be used with GND for channel up/down control. Using a fully wired null model cable will not trigger the closure functions.

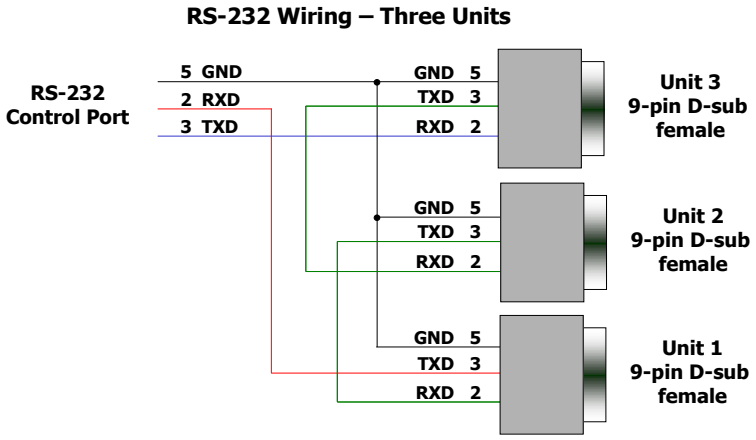
Multiple Tuners

The easy way is to use an inexpensive IP switch to a control system to connect all the tuners; then use the control system's Telnet control setting for the RS-232 commands. No need for Unit numbers, just different URL addresses.

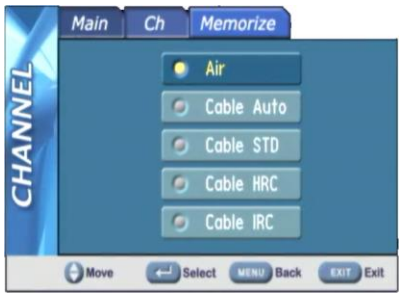
Up to nine tuners can be daisy-chained from one RS-232 control port. Remember that you will need to use the Unit# address in your programming when you control more than one tuner from the same control port.

Set the first unit in the RS-232 chain to the highest Unit#, then wire in sequence to the last tuner in the chain. The reason for this is that CR tuners use an intelligent data bus - the highest number tuner receives all commands, and then passes on commands addressed to tuners with lower unit numbers. The next tuner in the chain does the same, and so on until the last unit.





On-Screen Menus

Main Menu	
	Selects sub-menus. • Arrow keys highlight option • Select (or Enter) chooses option • Menu steps back or exits menus • Exit exits all menus • Some options are only available if you are currently tuned to an analog or digital channel
Channel Menus	
	Sub-Menu for Channels offers options for: • **Channel Auto-Scan** • **Favorite Channel Selection** • **Add/Delete Channels** • **Fine Tune** (If tuned to an analog channel) • **Signal Strength Meter**
Auto-Scan 	Starts scan of analog and digital channels for: • **Air** – looks for NTSC and ATSC channels • **Cable Auto** – looks for analog and digital QAM cable channels, as well as all frequency plans • **Cable STD** - standard cable spacing • **Cable HRC** – HRC cable spacing • **Cable IRC** – IRC cable spacing ***Tip***: Normally, use Auto. Most cable channels will be in standard frequencies. If all the channels tune in STD but channels 5 and 6, scan for IRC. If few channels can be found, scan for HRC.
Favorite Channels 	Menu is also displayed from the List command, selects channels advanced by the FAV favorite channel command. Use the Up, Down arrows to move through the list, press Select to add a channel to Favorites.

Channel Add/Delete

This menu can add or delete a channel accessed from Channel Up and Down.

You can tune to a channel you want to delete, then press Menu/Channel/Add-Delete. Press Select to delete the channel. You can also keep the page on screen as you step through channels, adding and deleting as desired. If the channel has a good signal, it will be displayed in the background.

Note that HDTV channels are broadcast on UHF frequencies. The Add/Delete will show the name of the digital channel, as well as the actual UHF channel used for broadcasting.

You can delete one of a digital channel's sub-channels without affecting the others.

Signal Strength

This page also displays from the Signal remote command. The graphic shows the current signal strength, and changes in real time. This allows you to monitor the strength of a channel as you adjust the antenna for best reception.

Caption Menus

This menu accesses captioning features:

- **On/Off** – turn captions on/off – *other options are not available if captions are off.*
- **Analog Mode** - CC 1-4 and Text 1-4
- **Digital Mode** – Service 1-6
- **Digital Font Options**
  - **Size** – Standard (15 pixels), Large (21 pixels), or Small (11 pixels)
  - **Style** – 1-6
  - **Color** – 8 shade of background, foreground and edge colors
  - **Opacity –** foreground and background
  - **Edge –** 6 style options

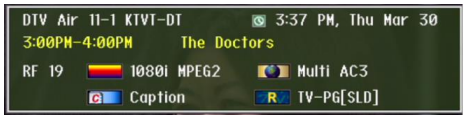
Version displays current version of tuner firmware

V-Chip Settings Menus

Manages access to programming for US and Canadian standards.

The default PIN number for access is **0000** (four zeros).

Change PIN 	Enter and confirm new PIN for access.
US Rating 	Use arrows and Select functions to select level of Movie and TV rating allowed.
Canada Rating 	Use arrows and Select functions to select level of Movie and TV rating allowed.
Setup Menus	
	This series of menus select the options for tuner operation: • **Screen Format** – 16:9 or 4:3 NOTE: Set when tuned to a digital channel, again when tuned to an analog channel – these are two different settings! You can use RATIO on the remote – does the same setting. • **Time** • **Sound Settings** • **Video Noise Reduction** - On/Off (if tuned to analog) Set to On – helps to clean up analog channels • **Menu Language** – English, Spanish, French
Screen Format 	Selects between 4:3 and 16:9 aspect ratios. The Ratio command can also adjust the settings. • **4:3 Display** offers three options for 16:9 video: 16:9, 4:3 (stretched vertically), and Zoom (cropped sides) • **16:9 Display** offers three options for 4:3 video: 4:3 (small centered), 16:9 (stretched horizontally), and Zoom (stretched vertically and horizontally) – or 4:3 and 16:9 if the video is 16:9

Time 	Sets time settings for: • **Daylight Saving** – Select and choose on or off Note – The DST trigger comes from the broadcast stations, and may not be in sync with the new US standards. Use On/Off or time zone to offset time • **Time Zone** – Select local time Zone
Time Zone 	Use left-right cursors to select the time zone, Select enters the current zone.
Sound 	Selects a variety of options, each is only active when you are currently tuned into an analog or digital channel: • **Analog MTS** – Mono, Stereo, SAP (same as Audio) • **Multi-Track** – English, French, Spanish • **Digital Out** – AC-3 (Dolby 5.1), PCM, or variable-level PCM. Set to PCM when using audio through the HDMI connection – most displays cannot decode AC-3 (Dolby 5.1). • **Auto Volume** – On or off
Info 	New Info pop-up (HD6.36) adds more data on stream format (MPEG2-MPEG4) and physical channel ID.
Guide 	Shows a list of current channels

Specifications

Physical

Size (HWD): 8.5” [216mm] wide x 1.75” [44mm] height (1RU) x 8.0” [203mm] deep
Weight: 2.25 lbs [1 kg]
Enclosure: Steel with black powder coat paint
Mounting: 1RU Rack mounting for one or two units side-by-side (RK1, RK2EZ)
Cooling: Not required for normal applications, where there many tuners in one rack, a rack fan is recommended to add air flow

Front Panel

Display: Text Display, white text on blue LCD:
Top line indicates channel number
Lower line indicates if RGB or YPbPr output is active, resolution of current channel, and Air/Cable tuning
IR: IR sensor
Control: Power, Menu, Setup and Select buttons
Up and Down (Channel Up and Down) buttons
Left and Right (Volume Up and Down) buttons
Mini USB Port: for drag-and-drop firmware updates

Back Panel

Ethernet and Web page: RJ-45 10/100 Ethernet connector for Web pages, Telnet and UDP control
Service: Female USB-A port for memory stick HD processor updates
Air/Cable: ‘F’, female, 75 ohm impedance, -10 to 25 dBmV typical
Supports dual Cable and Air tuning with optional RF-AB RF A-B Switch
Video Output: Simultaneous HDMI and NTSC video, switch between RGB and Component HD analog
Video Out: RCA composite video output, 1V p-p at 75 ohm impedance, 480i
Component Out: 3 RCA Y, Pr, Pb outputs (1080p/1080i/720p/480p/480i)
RGB Out: RGBHV DB-15 female (1080p/1080i/720p/480p, 59.94/60 Hz)
HDMI: HDMI receptacle, Type A, HD video and digital audio, version 1.3 (1080p/1080i/720p/480p)
Use PCM mode if HDMI audio connection is used to most displays (not all have Dolby)
. **Audio Output:** Simultaneous HDMI, Coax, Optical, and Stereo, Consumer or Pro for digital outputs
Digital Audio SPDIF: Coax and optical output, Dolby 5.1 AC3/PCM/Variable PCM 44 KHz/44.1 KHz
Analog Audio Out: Stereo RCA audio, Mono, Stereo, or SAP, variable level
Control Options:
RJ-45: 10/100 Ethernet connector, Telnet control and onboard Web page. Supports 2 Telnet sessions, UDP control to port number of 31931, reply at 31932
RS-232: DB-9 male, RS-232 data link to control system (protocol is the same for RS-232 or Telnet)
300 to 19,200 baud (9600 default), 8 data bits, no parity, 1 stop bit
Control up to 9 tuners using daisy-chain wiring between ports
IR In: 3.5mm stereo jack for optional IR-RXC IR Receiver
Sleeve= DC power+ from power jack input, limited to less than 100mA
Ring=DC power– (GND)
Tip= IR data signal
Air/Cable (A/C): 3.5 mm output to operate the RF-AB RF A-B Switch
Power In: 2.1mm coaxial jack (inside center conductor positive) 1.1A maximum, 11 to 14 VDC, 12 VDC typical
13.2W 45 BTU, 15.2 W 52 BTU including power supply, current draw 0.198A@114 VAC with power supply

Tuning

Frequency Range: ATSC and Clear QAM (cable) television 55.25 to 801.25 MHz
TV System: ATSC, NTSC, Cable, and Clear QAM (1080i/720p/480p/480i)
Tuning: Off-air 2-69 (NTSC and 8-VSB) and CATV 1-135 (Analog, 64QAM, 256QAM, 8-VSB)
Aspect Ratio: 4:3, 16:9 (Digital), 4:3, 16:9, Zoom (Analog channels)
Captioning: DTV and analog, set by program or customized for size, font and display attributes
Lock: Parental option for channels and/or rating

Captioning

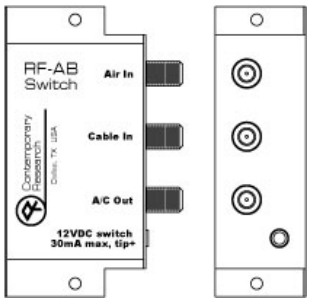
On-Screen: Displays on-screen analog and digital captioning on all video ports.
Captioning Data: HDMI, RGB, and Component ports don't have the ability to carry captioning data. Captioning data from analog and digital channels will be expressed as Line 21 captioning on the composite video port.

Includes

HD2-RC IR Tuner Remote, 4 AAA batteries
Power Supply, 1.5A maximum, 12 VDC

Options

PS12-8Y 8A power supply with Y cable to drive 2-4 QMODs (free at time of order)
RK1 Single Rack Kit, 1RU
RK2EZ Dual Rack Kit, 1RU



RF-AB RF A-B Switch, self-terminating, included 3,5mm cable connects to A/C DC output on tuner
IR-RXC External IR Receiver
CC-COM RS-232 Null Modem Cable

Trademarks

- VGA and XGA are trademarks of International Business Machines
- SVGA is a trademark of the Video Electronics Standard Association
- HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

DOLBY. DIGITAL

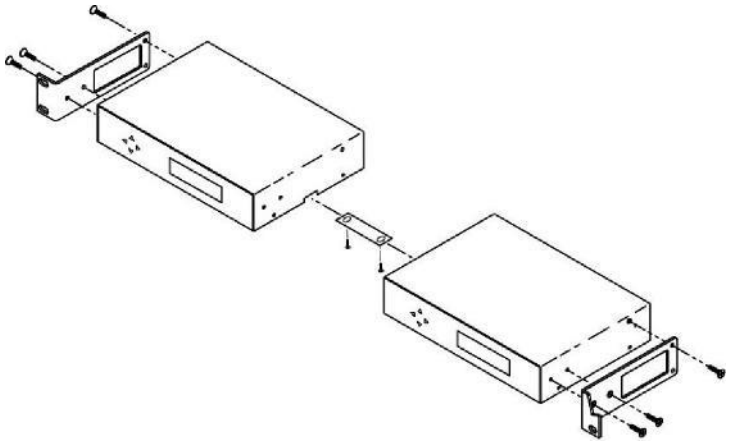
Manufactured under license from Dolby Laboratories, Dolby and the double-D symbol are trademarks of Laboratories

RKU Universal Rack Mount Kit

All Contemporary Research rack-mountable products will now include a Universal Rack Mounting Kit (RKU). The RKU will allow for mounting of a single unit or two units side-by-side in a 19" rack. One Universal Rack Mounting Kit will be included with the purchase of each product and will include the following parts:

- Two (2) Short Rack Ears
- One (1) Long Rack Ear
- One (1) Center Mount Tie-bar
- Six (6) 8-32 x 1/4" Screws
- Two (2) 4-40 x 3/16" Screws

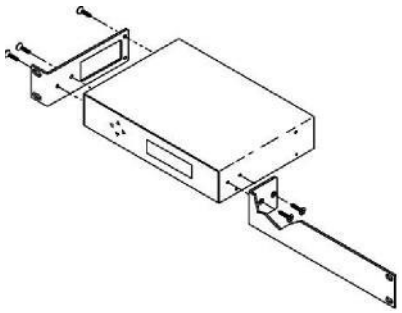
2-Across Mounting



When mounting two components in one RU rack space, use the two short rack ears and the tie bar assembly.
Note that the QDA4-45 and QCA9-33 have solid side panels and should not be mounted next to components with the ventilation holes, as that will block airflow.

- Check that your enclosures have the tie bar slot.
- Slide the included tie bar into the side of one unit and attach with one included 4-40 x 3/16" screw, but do not tighten.
- Slide the other unit into the tie bar, attach with the second 4-40 x 3/16" screw, and tighten both screws.
- Add the rack mounts to the sides using the six 8-32 x 1/4" screws.

Single Unit Rack Mounting



Attach a long and short rack ear to each side at the front of the unit, using five of the 8-32 x 1/4" screws.

Safety Instructions and Warranty

Read before operating equipment.

- Cleaning - Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
- Power Sources - Use supplied or equivalent UL/CSA approved low voltage DC plug-in transformer.
- Outdoor Antenna Grounding - If you connect an outside antenna or cable system to the product, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges. Section 810 of the National Electrical Code, ANSI/NFPA No. 70, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.
- Lightning - Avoid installation or reconfiguration of wiring during lightning activity.

Power Lines - Do not locate an outside antenna system near overhead power lines or other electric light or power circuits or where it can fall into such power lines or circuits. When installing an outside antenna system, refrain from touching such power lines or circuits, as contact with them might be fatal.

- Overloading - Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.
- Object and Liquid Entry - Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short out parts, resulting in a fire or electric shock. Never spill liquid of any kind on the product.
  Servicing - Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.
- Damage Requiring Service - Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
- When the power supply cord or plug is damaged.
- If liquid spills or objects fall into the product.
- If the product is exposed to rain or water.
- If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions. An improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
- If the video product is dropped or the cabinet is damaged.
- When the video product exhibits a distinct change in performance, this indicates a need for service.

* Note to CATV system installer: This reminder is provided to call CATV system installer's attention to Article 820-40 of the National Electrical Code (Section 54 of Canadian Electrical Code, Part I), that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building as close to the point of cable entry as possible.

Warranty and Return Policy

Warranty: Three (3) year limited warranty on all parts and labor for Contemporary Research manufactured products. Contemporary Research warrants its manufactured products against defects in materials and workmanship for a period of three years from the day of purchase by authorized dealer. If Contemporary Research receives notice of such defects during the warranty period; Contemporary Research, at its option, will repair or replace products that prove to be defective.

Exclusions: The above warranty shall not apply to defects resulting from improper or inadequate maintenance by the customer, customers applied software or interfacing, unauthorized modifications or misuse, mishandling, operation outside the normal environmental specifications for the product, use of the incorrect, modified or extended power supply, acts of God, weather, or improper site operation and maintenance. *Please note Contemporary Research SSV-DX Display Express PC product carries a six month limited warranty.*

Product Service: Contemporary Research will test, repair, or replace the product or products without charge if the unit is under warranty. If the product is out of warranty, Contemporary Research will test, and then repair the product or products. The parts and labor charge will be estimated by a technician and confirmed by the customer prior to repair. All components must be returned for testing as a complete unit. Contemporary Research will not accept responsibility for shipment after it has left the premises.

Technical Support: Contemporary Research technicians will determine and discuss with the customer the criteria for repair and/or replacement. Contemporary Research Technical Support can be contacted through one of the following resources: e-mail support at support@crwww.com or phone at: 972-931-2728

Return Material Authorization (RMA) Number: Before returning a product for repair or replacement, request an RMA from Contemporary Research's technical support. Provide tech support with a return phone number, e-mail address, shipping address, product serial numbers and original purchase order number. Describe the reason for repairs or returns as well as the date of purchase. See the General RMA Terms and Procedures section for more information. RMA's are valid for 30 days and will be issued to authorized Contemporary Research dealers only. End users must return products through authorized Contemporary Research dealers. Include the assigned RMA number in all correspondence with Contemporary Research. Write the assigned RMA number clearly on the shipping label of the box when returning the product. All products returned for credit are subject to a restocking charge without exception.

Voided Warranty: The warranty does not apply if the original serial number has been removed or if the product has been disassembled or damaged through misuse, accident, acts of God, weather, modifications, use of incorrect, modified or extended power supply, or unauthorized repair.

Shipping and Handling: Contemporary Research will not pay for inbound shipping transportation or insurance charges or accept any responsibility for laws and ordinances from inbound transit. Contemporary Research will pay for outbound shipping, transportation, and insurance charges for all items under warranty, but will not assume responsibility for loss and/or damage by the outbound freight carrier. If the return shipment appears damaged, retain the original boxes and packing material for inspection by the carrier. *Contact your carrier immediately.*

Products not under Warranty: Payment arrangements are required before outbound shipment for all out of warranty products.
General RMA Terms and Procedures: RMA's are valid for 30 days and will be issued only to authorized active Contemporary Research dealers only.

- End users must return products through authorized Contemporary Research dealers. End users may be eligible for a RMA at the discretion of CR Technical Support.
- Before a defective product can be authorized to send in for repair, it must first go through the troubleshooting process with a member of the Contemporary Research Technical Support team.
- Products authorized for repair must have a valid RMA (Return Material Authorization) number.
- Contemporary Research Technical Support will approve the issue of an RMA number.
- An RMA number is to be included in all correspondence with Contemporary Research.
- The RMA number must appear clearly on the shipping label when the product is returned.
- A packing slip must be included on the inside of the box with the RMA number listed and reason for RMA return.
- Products received at Contemporary Research that do not have a valid RMA number clearly marked on the outside of the shipping container may be refused and returned to sender.
- Boxes showing external damage will be refused and sent back to the sender regardless of the clearly marked RMA number and will remain the responsibility of the sender.

Advanced Replacement Policies:
For Contemporary Research manufactured products, advance replacement will be provided for "out-of-the-box" failures up to thirty (30) days after the initial shipment of products.

Shipments of equipment that are refused upon attempted delivery, for any reason, are subject to restocking charges.