Contents

Overview

The 232-ATSC 4K HDTV Tuner, our 5th-generation ATSC HDTV tuner, adds new capabilities to the industry-standard 232-ATSC series. New features include tuning H.264 programs up to 1080p and output scaling up to 4K. 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.

A full-featured, commercial grade HDTV tuner, the 232-ATSC 4K can receive both analog and digital MPEG-2/H.264 channels, in ATSC, NTSC, and clear QAM formats. Using an optional RF-AB switch, the tuner can switch between antenna and cable feeds.

- Tunes analog and digital channels in ATSC, NTSC, and clear QAM formats

- Accepts H.264 TV channels, as well as standard MPEG-2

- Scales video output from 480i to 2160p

- 1080p and 2160p set to 60Hz for more universal applications, 1080i and 720p can be set to 60 or 59.94Hz

- Simultaneous output from HDMI and composite video ports, as well as analog stereo, and digital coax and TOSlink optical audio ports

- Switches to RGBHV or Component output from front-panel settings, Web page, or control commands

- AC-3 or PCM/Variable PCM digital audio formats for digital audio ports and HDMI

- 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-AB 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/Telnet commands

- RS-232 can be daisy-chained to control up to 9 tuners from a single RS-232 port

- Meets RoHS and California energy-saving standards

- Includes RKU universal rack mount kit, HD2-RC IR remote, and PS12-1.5 VDC power supply

- Options for single and dual rack mounts, external RF-AB switch, and a PS-8-4Y 8A power supply that can power up to 4 tuners in lieu of individual power supplies at time of order

Setup

There are 3 ways available to change the settings:

- **Front Panel**
    - Press the red **SETUP** button to access the front-panel menus
    - Press the **Left/Right** arrows to step through each menu
    - Press the **Up/Down** arrows to view the settings
    - Press the **Left/Right** arrows to step through the setting options
    - Click **SELECT** to save the changes for each menu

- **Menu or IR**
    - Use the included IR remote to turn on/off, access on-screen menus, and scan for channels
    - Press the blue **MENU** button on the front panel to access the on-screen menus
    - Use the **Up/Down** and **SELECT** buttons to navigate the menus
    - Press the blue **MENU** button to exit the on-screen menu

- **Ethernet**
    - Open and Internet browser and type in the tuner's IP address in the address bar to access the onboard Web pages for Control and Setup
    - If needed, press and hold **SETUP** to see the current IP address

A/V Setup	*Factory Defaults are shown in* **Bold**.
HD Output	Select RGBHV or **YPbPr** for analog HD output. This also sets color space for HDMI. *HDMI and analog HD video outputs are always active.*
HD Res	Sets the output resolution from 480i to 2160p or Auto (Native resolution).
Tune Mode	Select **CATV** | Air | IRC | HRC | CATV Auto
RefreshRate	**59.94** | 60 Hz for 1080i and 720p *1080p and 2160p are fixed at 60 Hz.*
Digital Audio	PCM | **PCM Variable** | AC-3
Captions	On | **Off**
ACap Mode	**CC1** | CC2 | CC3 | CC4 | Text1 | Text2 | Text3 | Text4
Dcap Mode	**Service 1** | Service 2 | Service 3 | Service 4 | Service 5 | Service 6
Scan Mode	**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. *No LCD text or feedback will be displayed to confirm that the scanning is in progress. The on-screen menu will display a list of channels as they are found. The tuner scans analog channels first, then digital.* Press **SELECT** to skip the analog scan.
Overscan	**0**–9 *Selects percentage of overscan for video output.*
HDMI-DVI	**Auto** | HDMI | DVI *DVI does not hot-patch, may need to reboot tuner in DVI mode.*
HDMI Audio	**On** | Off
AC3 Cmpr	**Line** | RF *Compression mode for AC-3 downmix to stereo (RF enhances dialog).*
System Setup	
Baud Rate	1200 | 2400 | 4800 | **9600** | 19200 | 38400 | 115K | 230K
Unit Number	**1**–9 *For RS-232 daisy chain operation.*
Panel Lockout	**None** | Ch+Menu | Vol+Menu | Ch+Vol+Menu | Power | Setup | Menu | All | Setup+Menu | Pwr+Setup+Menu
Backlight	1–10
LCD Contrast	1–10
IR Receive	**IR On** | IR Off
Firmware	**Right** or **Left** arrow scrolls through firmware versions and displays power supply voltage. *Example:* 232-ATSC 4K_V1.04a — Control Firmware BL Ver V0.11C — Bootloader Firmware HD Version 7.08 — HD Firmware Volt in = 11.8
Network Setup	
IP Address	**192.168.1.231**
IP Mode	**Static** | DHCP *IP address, gateway, and subnet cannot be changed in DHCP mode.*
IP Gateway	**192.168.1.0**
Subnet Mask	**255.255.255.0**
IP Port	**23** *Telnet port*
MAC/SN	**00:14:C8:14:**xx:xx
UDP Reply	On | **Off**

Front-Panel Button Sequences

Air/Cable Tuning

Pressing the **Up** and **Down** keys toggles air/cable tuning.

Audio Mute

Pressing the **Left** and **Right** keys toggles mute on/off.

Unlock Front-Panel

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).

Factory Reset

Press **Power** and **Up** together when at the **System: Firmware** menu to reset to the default settings.

Display IP Address

Hold **Setup** to display the IP address.

Setup Notes

Tuning Cable Channels

The 232-ATSC 4K will skip encrypted channels automatically when a channel scan is initiated. Scanning analog channels may be skipped by pressing SELECT after the scan has started. Typically, the digital channels will not use the same Guide numbers as a cable box.

RGB/Component Video

Analog HD output is available on either the RGBHV (VGA) or Component jacks. Use the front-panel menu to select the desired output mode. When selected, YPbPr is also available on the HD15 connector.

DVI

DVI compatibility is normally supported.   Forced DVI may be manually selected from the HDMI-DVI menu. DVI does not hot-patch, so the tuner may need to be rebooted after DVI mode is selected.

Audio

The volume settings do not affect digital audio in AC-3 or PCM modes. PCM Variable supports volume control. The analog audio outputs always follow the volume settings. If there is no audio, make sure the volume is all the way up (and not muted). A "motorboat" sound means the display does not support AC-3, and the mode should be changed to PCM.

IR Control

- Interference from room fluorescent lights can cause problems with IR remote operation. If this occurs, the frequency of the IR can be changed. Hold Select on the remote and press "9" to set the IR frequency at 57 KHz. Hold Select and press "4" to set the IR to the normal 38 KHz frequency.

- Check the front-panel menu to see if IR Receive is turned on or off.

- If there is significant IR interference, an IR-RXC Remote Sensor may be required. Cover the front-panel IR sensor to reduce interference.

Captioning

Line 21 captioning data is available on the Composite video output. If the tuner is feeding a digital encoder or encoder/modulator, use Composite video to send captioning data. On-screen captioning may be enabled from the on-screen menu, IR remote, or RS-232 commands.

Web Pages

MyTuner

232-ATSC 4K Control

Settings Page

Power   On

Channel   1080i DTV
Program   No Title

1	2	3	Ch+
4	5	6	Ch-
7	8	9	
0	-	Enter	PrevCh

Volume

| Vol- | 57 | Vol+ | Mute | UNMUTED |

Menu	∧
<	Select	>
	∨	Exit

| CC | Info | Audio |
| Signal | List | Fav | Guide |

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MyTuner

232-ATSC 4K Settings

Control Page

Air/Cable   Cable

Screen Display: ○ 16:9 ○ 4:3   Ratio
○ Box ● Full ○ Zoom

HD Output:	YPbPr ▼
HD Resolution:	Auto ▼
Tune Mode:	Off-Air ▼
Output Refresh Rate:	59.97Hz ▼
Digital Audio:	AC-3 ▼
Baud Rate:	115K ▼
Unit Number:	1 ▼
Panel Lockout:	None ▼
LCD Backlight:	4 ▼
LCD Contrast:	3 ▼
IR Receive:	IR On ▼
Captions:	On ▼
Analog Captions:	Caption 1 ▼
Digital Captions:	Service 1 ▼
Scan Mode:	Digital, delete Analog ▼	Scan Now
Overscan:	0 % ▼

Network Settings
IP Port (telnet):
IP Address:
Subnet Mask:
Gateway Address:
IP Mode:
MAC Address:

Firmware Version: V0.11d
Hardware Variant: 0
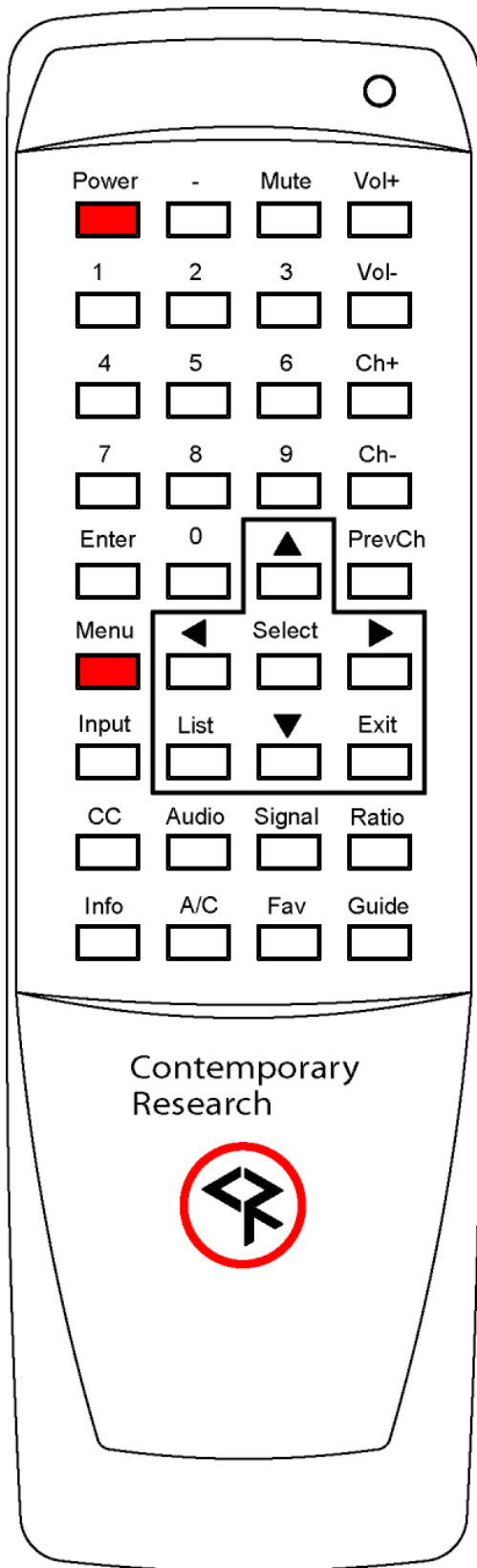
Reset All Default Values   Reset

Send Tuner Command   Command

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Control Page   **Settings Page**

The 232-ATSC 4K includes Web pages accessible by any browser over IP. Open a web browser and type in the tuner's IP address in the address bar. The tuner's IP address may be found by holding down the **SETUP** button. The **Control Page** features a full array of control options with interactive status feedback, including channel name, program name, and the native resolution of the program. The **Settings Page** can change any 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.

HD2-RC IR Remote

The HD2-RC IR Remote included with the 232-ATSC 4K 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 4K front panel buttons are available for Power, Channel, Volume, Menu, and Select. The tuner will display a "^" symbol in the upper right corner of the front panel display when an IR command is received.

Power

Turns the tuner on and off.

Volume Control

Use the Vol+, Vol- and Mute buttons to control the volume.

Channel Selection

Two-part digital channels are accessed using XX-1 (or -2, -3, etc.).

Single-part digital and analog channels are accessed using XX.

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 brings up the Favorite Channels menu.
• Exit closes the on-screen menu.
• Menu reverts to the previous menu or closes the on-screen menu from the Main Menu.
• Enter selects the 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.
• Info launches the on-screen information window.
• A/C selects Air or Cable tuning.
• Fav displays a list of favorite channels.
• Guide displays the on-screen guide. When the guide is displayed, pressing Info displays the program description.

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

Hold the Select button and press "9" to set the IR frequency to 57 KHz. Hold the Select button and press "4" to set the IR to the normal 38 KHz frequency.

RS-232/Telnet/UDP Control Protocol

The 232-ATSC 4K 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.

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

Communications parameters are 1200 to 230,400 baud, 8 data bits, No parity, and 1 stop bit. Factory default is 9600 baud. All settings are saved to NVRAM in the 232-ATSC 4K tuner. 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 address 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 *Testing 232-ATSC Series UDP Control* to learn more about UDP control.

General Protocol Specifications

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

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

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. ASCII CR, Hex $0D, or keyboard 'Enter' may be used in programming. For simplicity, the programming examples in the manual will not show the 'CR'.

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 = IR disabled 1 = IR enabled
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-part digital channel, 3 characters for major and minor channels. *Examples:* '>TC=28:1', '>TC=28-1' Selects digital channel 28-1 '>TC=32' Selects digital channel 32, analog channel 32 if no digital '>TC=32-0' Selects analog channel 32
TU	Tune channel up	Selects next higher channel in channel list. Example: '>3TU' Unit#3 incremented to next highest channel
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 — Switches to Cable, sets to standard channel spacing 1 = Off-Air — Switches to Air input and channel spacing 2 = IRC — Switches to Cable, sets to IRC channel spacing 3 = HRC — Switches to Cable, sets to HRC channel spacing 4 = Cable Auto — Switches to Cable, sets channel spacing automatically *A scan must be triggered by T^ or front panel following a S0 command.*
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 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 following a D0 command.*
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' *If physical channel is 0, it will be the 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 additional if there are non-ASCII characters, such as ñ
Output		
D4=	Overscan (0-9)%	Selects percentage of overscan for video output.
Q0=	Caption Mode Off/On	0=Captioning off 1=Captioning on
Q1=	Analog Captioning Type (1-8)	1-4 = Caption 1-4 5-8 = Text 1-4
Q7=	Digital Caption Service	Set to 1-6

Code	Function	Operation
Audio		
VU	Ramp volume up	Starts volume ramping up
VD	Ramp volume down	Starts volume ramping down
VV	Stop volume ramp	Stops volume ramping
VH	Sets volume level 0-100	Volume level, scaled in 100 steps
VL	Sets volume level 0- 63	Volume level, scaled in 63 steps (compatibility mode)
VX	Volume Mute off	Restores audio volume to previous level
VM	Volume Mute on	Mutes audio outputs
VT	Toggle Volume Mute	Alternates audio mute on and off
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	Unit sends "T" Channel/Source status string
SV	Request AV status	Unit sends "V" Audio status string
IP Setup		
IP=	IP Address IP=xxx.xxx.xxx.xxx Defines IP address, then sends status	IP returns the MAC address, current IP address, subnet mask, and gateway. *Example:* $MAC=0014C8140001 IP=192.168.001.231 IG=000.000.000.000 IM=255.255.255.000 IY=1
IG=	IP Gateway IG=xxx.xxx.xxx.xxx Defines IP gateway, then sends status	IG returns the MAC address and IP information.
IM=	IP Subnet Mask IM=xxx.xxx.xxx.xxx Defines IP subnet mask, then sends status	IM returns the MAC address and IP information.
IY=	IP Mode	IY returns current mode. IY=1 Static IY=2 DHCP
IX=	Telnet port IX=xxx.xxx.xxx.xxx Defines Telent port	IX returns current Telnet port (00023 default).
UO UF	UDP Reply Port 31932	UO turns UDP Reply port on. UF turns UDP Reply port off.
MISC Commands		
NW=	Sets tuner name	*Example:* >NW=Tuner 1 Sets tuner name to 'Tuner 1'
NM=	Gets tuner name	*Example:* >NM Returns '<NMTuner 1'
M0=	LCD Backlight	1-10
M8=	LCD Contrast	1-10
R6	Refresh Rate	Sets to 59.94 Hz
RM	Refresh Rate	Sets to 60 Hz
DH=	HDMI Audio Mute	0=Audio Mute Disabled 1=Audio Mute Enabled
DI=	HDMI/DVI Mode	0=Auto 1=HDMI 2=DVI
EF	Echo Off	Characters received will not be re-transmitted (power up default).
EN	Echo On	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 a hard power cycle.

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.

HD-RC Remote Emulation

IR commands sent from the CR HD2-RC Wireless Remote may be emulated.

KK=<key>	9=Power (toggle)	101=Prev Chan
	10=0	105=Menu
	11=1	106=Right
	12=2	107=Left
	13=3	108=Up
	14=4	109=Down
	15=5	110=Enter/Select
	16=6	111=Exit
	17=7	115=CC
	18=8	141=Format 1080i
	19=9	142=Format 720p
	21=Enter/Select	143=Format 480p
	22=Ch Up	144=Format 480i
	23=Ch Dn	145=Format 1080p
	24=Vol Up	146=Format 2160p
	25=VolDn	147=Format Auto
	26=Vol Mute (toggle)	149=Output RGB
	27=Power On	151=Output YPbPr
	28=Power Off	153=Air
	29=Menu	154=Cable
	63=Guide	155=16:9 Ratio Pillar Box
	81=Signal	4:3 Ratio Letterbox
	82=Ratio	156=16:9 Ratio Full Wide
	85=Audio	4:3 Ratio Full
	88=Favoirite	158=AC-3
	95=List	159=PCM
	96=Add/Delete Channel	160=PCM Variable
	98=Air/Cable	161=Display 16:9
	99=Dash	162=Display 4:3
	100=Info	

Response Strings

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

232-ATSC 4K 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 4K. Characters will appear in status strings as lowercase '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	Unmuted	0=RF	A=Air C=Cable	0=1080i 1=720p 2=480p 3=480i 4=2160p N=No Sig	3 digits		0=None
<	1	T	U	032	U	0	A	0	002	x	0

The 232-ATSC 4K 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 indicate how many thousands (up to 63) should be added to the Major number. *Example: Channel 1032 would return 032 for the Major Channel and F01 for the Minor Channel.* 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 legacy 232-series volume level for compatibility with existing applications.

Volume 2 shows actual 232-ATSC 4K level, from 0-100. Mute status will be sent if a user mutes volume from an IR remote.

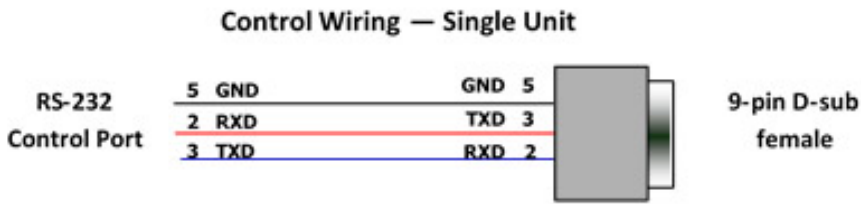## Front Panel Mode Status Response String (S):

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 4=Auto	0-7	Fixed 2 digits	Fixed	0=RGB 2=YPbPr	0=1080i 1=720p 2=480p 3=480i 4=1080p 5=2160p	0=1080i 1=720p 2=480p 3=480i 4=1080p 5=2160p 6=Auto	4 digits
<	1	S	x	1	0	08	4	2	0	0	xxxx

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

Control Wiring — Single Unit

RS-232 Control Port			9-pin D-sub female
5 GND		GND 5	
2 RXD		TXD 3	
3 TXD		RXD 2	

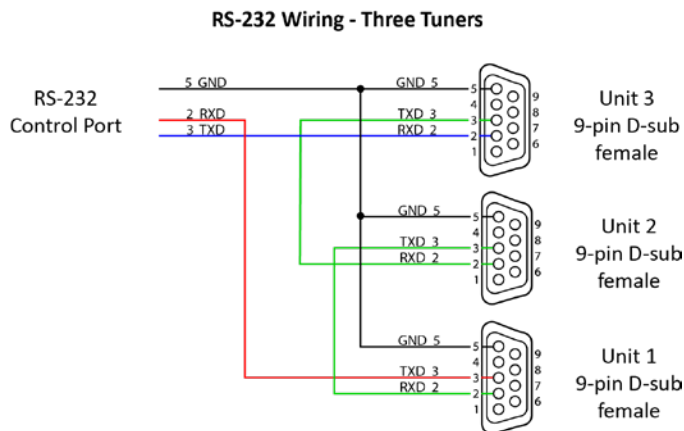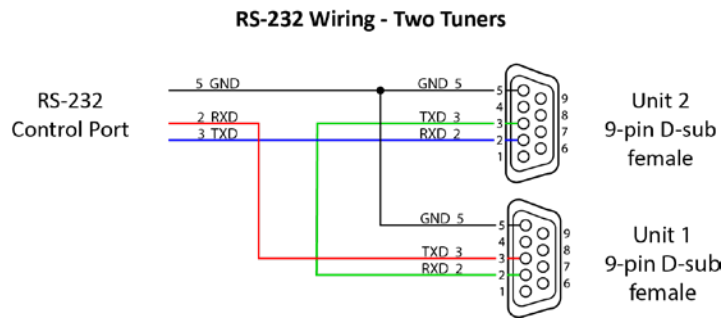**Multiple Tuners**

Up to nine tuners may be daisy-chained from one RS-232 control port. Unit# addresses are required in command strings when more than one tuner is controlled 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. Contemporary Research tuners use an intelligent data bus in which the tuner with the highest Unit# receives all commands then passes through commands to tuners with lower unit numbers. The next tuner in the chain does the same, and so on.

RS-232 Wiring - Two Tuners

RS-232 Control Port
5 GND
2 RXD
3 TXD

GND 5 — Unit 2 9-pin D-sub female
TXD 3
RXD 2

GND 5 — Unit 1 9-pin D-sub female
TXD 3
RXD 2

RS-232 Wiring - Three Tuners

RS-232 Control Port
5 GND
2 RXD
3 TXD

GND 5 — Unit 3 9-pin D-sub female
TXD 3
RXD 2

GND 5 — Unit 2 9-pin D-sub female
TXD 3
RXD 2

GND 5 — Unit 1 9-pin D-sub female
TXD 3
RXD 2

On-Screen Menus

Main Menu

Displays sub-menu options.

- 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 currently tuned to an analog or digital channel
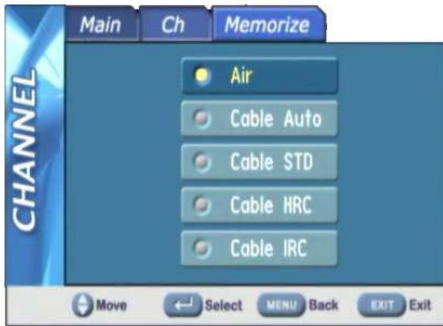
Channel Menus

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 except 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.

If a channel needs to be deleted, tune to that channel, press Menu → Channel → Channel Add/Delete. Press Select to delete the channel. The page can remain on the screen while additional channels are added or deleted as needed by stepping through the channels. If the channel has a good signal, it will be displayed in the background.

The Add/Delete will show the name of the digital channel as well as the actual RF channel used for broadcasting.

A digital channel's sub-channels may be deleted 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. The strength of a channel may be monitored as the antenna is adjusted for best reception.

Caption Menus

This menu accesses captioning features:

- **On/Off** — turns captions on/off

  Note: 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**

  o **Size** — Standard (15 pixels), Large (21 pixels), or Small (11 pixels)

  o **Style** — 1-6

  o **Color** — 8 shades of background, foreground, and edge colors

  o **Opacity** — foreground and background

  o **Edge** — 6 style options

- **Version Information**— Displays the version of tuner firmware

V-Chip Settings Menus

This menu manages access to programming for US and Canadian standards.

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

Change PIN

Enter and confirm a new PIN for access.

US Rating

Use arrows and Select functions to select the level of Movie and TV rating allowed.

Canada Rating

Use arrows and Select functions to select the 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: The screen format must be set separately for digital and analog channels. Ratio on the remote provides the same function.

- **Time**

- **Sound Settings**

- **Video Noise Reduction** — On/Off (if tuned to analog)

  Setting to On helps clean up analog channels.

- **Menu Language**— English, Spanish, French

Screen Format

Selects between 4:3 and 16:9 aspect ratios. *Ratio on the remote provides the same function.*

- **Screen Format 4:3**

    o   For 4:3 Programs — **4:3** only

    o   For 16:9 SD Programs — **4:3** only

    o   For 16:9 HD Programs — **4:3** compresses Horizontally *(no picture info lost)*, **16:9** Letterbox, **Zoom** stretches Horizontally

- **Screen Format 16:9**

    o   For 4:3 Programs — **4:3** Pillar Box, **16:9** Stretches Horizontally, **Zoom** Stretches Horizontally and Vertically

    o   For 16:9 SD Programs — **4:3** compresses Horizontally, **16:9** Normal, **Zoom** Stretches Vertically

    o   For 16:9 HD Programs — **4:3** compresses Horizontally, **16:9** Normal

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. Use On/Off or Time Zone to offset time.*

- **Time Zone** — Select local Time Zone.

Time Zone

Move cursor left and right to select the time zone. **Select** enters the current zone.

Sound

Selects a variety of options, each is only active when currently tuned to an analog or digital channel:

- **Analog MTS —** Mono, Stereo, SAP (same as audio)

- **Multi-Track** — English, French, Spanish

- **Digital Out —** AC-3, PCM, or variable-level PCM. Set to PCM when using audio through the HDMI connection — most displays cannot decode AC-3.

- **Auto Volume** — On or Off

Info

Activated from the **Info** command

- **Channel** — Virtual channel number and name

- **Time** — Current time and date

- **Program** — Duration and name

- **Additional Info** — Physical RF channel, resolution, encoding format, audio format, caption availability, and ratings

Guide

Shows a list of programs for the next 12 hours.

Specifications

Physical

Size (HWD):	8.5" [216mm] wide x 1.75" [44mm] high (1RU) x 8.0" [203mm] deep
Weight:	1.81 lbs [822 g]
Enclosure:	Aluminum 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 are multiple tuners in one rack, forced air ventilation is recommended to add air flow.

Front Panel

Display:	Text display, white text on blue LCD
	Top line indicates channel number and name.
	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
USB:	Mini USB-B port for future use.

Back Panel

Ethernet:	RJ-45 10/100 Ethernet connector for Web page access, Telnet, and UDP control
Service:	USB-A port for future use
Air/Cable:	'F', female, 75 ohm impedance, -10 to 25 dBmV typical
	Supports dual cable and air tuning with optional RF-AB 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 YPbPr outputs (1080p/1080i/720p/480p/480i)
RGBHV:	RGB Out HD-15 female (1080p/1080i/720p/480p/480i)
HDMI:	HDMI receptacle, Type A, Version 1.3 (2160p/1080p/1080i/720p/480p/480i)
Resolutions and Frame Rates:	

480i — 29.97 Hz

480p and 720p — 59.94/60 Hz

1080i — 29.97/30 Hz

1080p — 60 Hz

2160p — 60 Hz   *HDMI only*

Audio Output: Simultaneous HDMI, SPDIF, and Analog Stereo

      HDMI: AC-3/PCM/PCM variable level

      Digital Audio SPDIF: Coax and optical output, AC-3/PCM/PCM variable level

      Analog Audio Out: Stereo RCA variable level

RS-232:   DB-9 male, RS-232 data link to control system, 1200 to 230K baud (9600 default), 8 data bits, no parity, 1 stop bit

IR In: 3.5mm stereo jack for optional IR-RXC IR Receiver

      Sleeve = DC power+ from power jack input, limited to less than 100 mA

      Ring = DC power– (GND)

      Tip = IR data signal

A/C: 3.5mm control output to operate the RF-AB Air/Cable Selector 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 54 to 866 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, and Zoom

Captioning: DTV and Analog

Lock: Parental option for channels and/or rating

Captioning

On-Screen: Displays on-screen analog and digital captioning on all video ports

Captioning Data: Captioning data from analog and digital channels will be provided as Line 21 captioning on the composite video port

Includes

HD2-RC IR Tuner Remote, 4AAA batteries

PS12-1.5 Power Supply, 1.5A maximum, 12 VDC

RKU Universal Rack Kit

Options

PS12-8Y 8A power supply with Y cable may be ordered with every 3-4 tuners in lieu of PS12-1.5 power supplies

RK1 Single Rack Kit, 1RU

RK2EZ Dual Rack Kit, 1RU

RF-AB Air/Cable Selector Switch (includes 3.5mm cable, connects to A/C control port on tuner)

IR-RXC External IR Receiver

CC-COM-B RS-232 Null Modem Cable

Trademarks

VGA and XGA are trademarks of International Business Machines

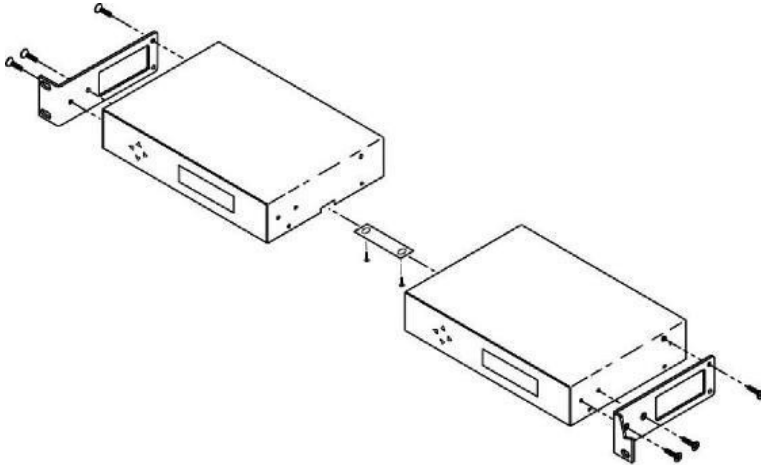SVGA is a trademark of the Video Electronics Standard Association

HDMI, the HDMI logo, and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing, LLC.

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
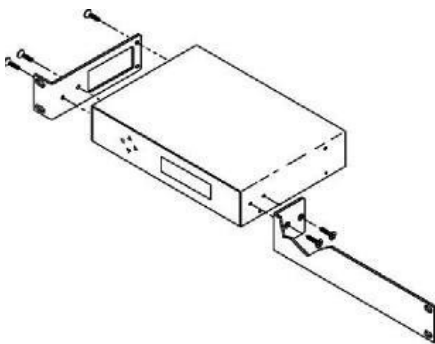- Six (6) 8-32 x 1/4" Screws

- 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 older versions of 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.

1. Check that the enclosures have the tie bar slot.
2. 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.
3. Slide the other unit into the tie bar, attach with the second 4-40 x 3/16" screw, and tighten both screws.
4. 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 product exhibits a distinct change in performance, this indicates a need for service.

- Heat – This product should be situated away from heat sources such as radiators, heat registers, stoves, or other products (including amplifiers) that produce heat.

* 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: 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 and distributors.

- 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.