



232-ATSC 4K HDTV Tuner

Product Manual



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1. 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 decoding H.264 programs up to 1080p, output scaling up to 4K, and IPTV output stream. The tuner is fully compatible with RS-232 control commands for previous models.

The integrator-friendly HDTV tuner is controllable via 2-way RS-232, IP Telnet and UDP, as well as wireless and wired IR commands. Onboard web pages enable remote configuration, control, and monitoring from a web browser.

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 separate antenna and cable feeds.

Features

Tuning

- ATSC air and Clear QAM cable channels
- NTSC analog air and cable channels
- Air channels 2-69
- Cable channels 2-135, Standard, HRC, and IRC

Decoding

- MPEG-2 or H.264 digital channels
- Supports Dolby Audio, MPEG-1 Layer 2, or AAC audio formats
- Supports multiple audio programs

Video

- HDMI Type A, Version 1.4b
- Analog component RCA and HD15 RGBHV (VGA) outputs, selectable YPbPr or RGB
- Analog composite video output
- Output scaling to 480i, 720p, 1080i, 1080p, 2160p or Auto
- All video outputs continuously active

Audio

- HDMI embedded Dolby Audio pass-through, PCM Fixed, or PCM Variable
- S/PDIF coaxial and optical Dolby Audio pass-through, PCM Fixed, or PCM Variable
- Variable Analog stereo

Closed Captions

- Decodes analog and digital closed captioning
- Caption data available as Line 21 closed caption data on composite video output

Setup and Control

- Control via front panel, optional IR remote, on-board web pages, or RS-232 commands
- Two-way control via RS-232, Telnet, or UDP for use with third-party control systems.
- RS-232 can be daisy-chained to control up to 9 tuners from a single RS-232 port
- CEC control available on HDMI output for most CEC enabled displays.
- Setup via Front panel menu, On-screen menu, web pages, or RS-232 commands.
- Compatible with iCC-Net protocol control commands over Ethernet for power, channel selection, and volume
- Firmware updateable over Ethernet with CR Toolbox software

IPTV Output

- Passes through IPTV stream from received digital channel
- Stream all programs, individual program, or tuned program

2. Installing the 232-ATSC 4K

The 232-ATSC 4K may be placed freestanding on a suitable surface or installed in a standard EIA 19" equipment rack with the included RKU rack mount hardware. The RKU rack mount hardware kit facilitates mounting of a single tuner in one rack space or two tuners side by side in a single rack space.

Connect the HDMI output or other available output to a video display, video matrix/router input, or video encoder input. Analog and S/PDIF digital audio outputs are available for connection to an amplifier, audio system processor, or other compatible audio input. Connect a coaxial cable from the CATV or antenna source to the Air/Cable input. The 232-ATSC 4K will need to be connected to an appropriate mains power source using the included external power supply or equivalent.

A channel scan will need to be performed prior to viewing programs once the 232-ATSC 4K is connected. The channel scan may be initiated from the on-screen menu, front panel setup menu, RS-232 command, or web page.

3. Setup

Several options are available to access control functions and configuration settings for the 232-ATSC 4K:

Front Panel

For normal operation, the **Up/Down** buttons step through the channels in the channel memory. **Left/Right** buttons are used to control the variable audio output level.

Front Panel Menu

Configuration settings for AV setup, System setup and Network setup are available on the front panel LCD display.

- Press the red **SETUP** button to access the front-panel menus.
- Press the **Left/Right** arrows to step through each configuration menu category.
- Press **SELECT** to enter the menu.
- Press the **Up/Down** arrows to view the settings.
- Press the **Left/Right** arrows to step through the setting options.
- Press **SELECT** to save the changes for each menu.
- Press **SETUP** to back out of a menu or exit configuration settings.

On-Screen Menu

Many of the common AV settings can be configured in the on-screen menu. Buttons on the front panel or HD2-RC handheld remote may be used.

- Press **MENU** to bring up the on-screen menu.
- Press **Up/Down** to step through each menu category.
- Press **SELECT** to enter the menu.
- Press the **Up/Down** arrows to view the settings.
- Press **SELECT** to select a setting.
- Press **MENU** to back out of a menu or exit the on-screen menu.

Web Pages

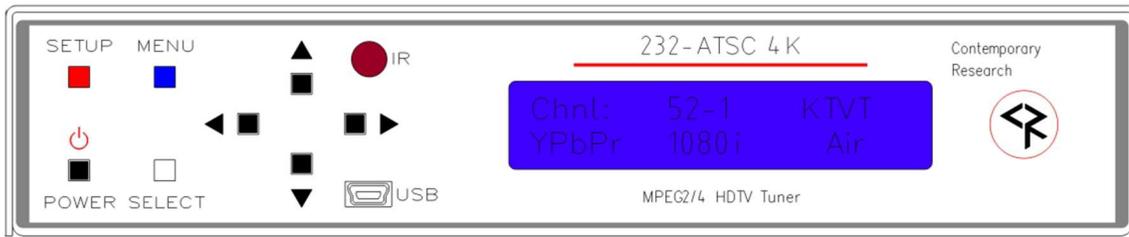
On board web pages are available control and configuration. Connect the ethernet port of the 232-ATSC 4K to a PC. A crossover cable is not required. Open a web browser in the PC and enter the IP address of the 232-ATSC 4K into the address bar to access the web pages. The tuner's current IP address may be displayed on the front panel by holding the **Setup** button.

RS-232 Control

The 232-ATSC 4K may be controlled and configured using RS-232 ASCII strings from a terminal program or control system processor. Connection to the unit for RS-232 communication can be through the DB-9 connector on the rear panel, Telnet, or UDP.

Up to nine individual tuners may be controlled using one RS-232 serial port of a control system processor. Each tuner will need to be configured with a unique unit number. A daisy chain serial cable will be required.

4. Front Panel Operation



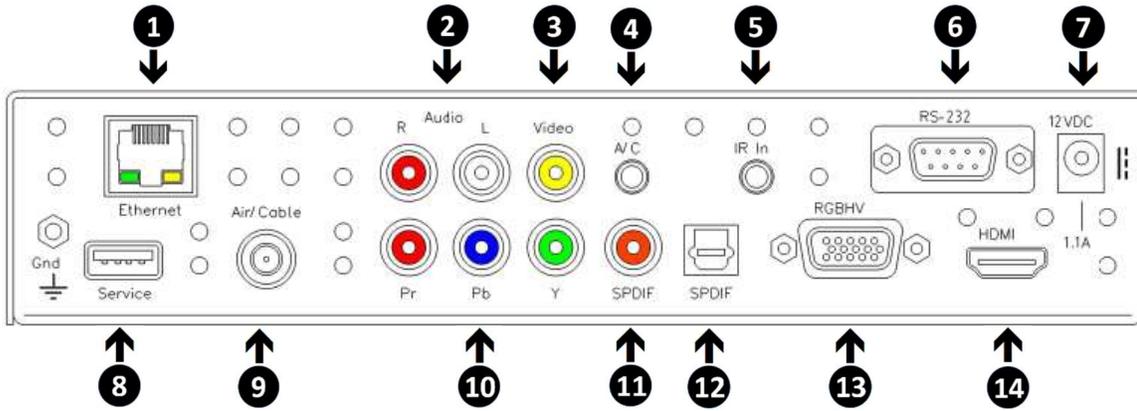
Button	Operation
Power	Toggle On Off
Setup	Push to enter front panel Setup menu Push to back out of Setup menu selection Push to exit Setup menu Hold and release to display current IP address
Menu	Push to display on-screen Graphical Audio/Video menu
Select	Push to select new Setup menu item Push to display on-screen Info Banner
Down	Channel Down
Up	Channel Up
Left	Volume Down
Right	Volume Up
Up + Down	Toggle Air Cable mode
Left + Right	Toggles Audio Mute
Setup + Right	Unlocks previously locked Setup button until power cycle

5. Front Panel Setup Menus

A/V Setup	Options <i>Factory defaults are shown in Bold</i>
HD Output	YPbPr RGB <i>Set color space for HDMI and analog HD outputs</i>
HD Res	1080i 1080p 2160p60 auto 2160p30 480i 480p 720p
Tune Mode	CATV Off-Air IRC HRC CATV Auto <i>Set the tune mode for the channel scan</i>
Refresh Rate	59.94Hz 60Hz <i>Applicable to 720p, 1080i, and 1080p only</i>
Daudio Out	PCM Variable Digital Pass PCM Variable
Captions	Off On
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 Digital - Delete Analog Digital - Keep Analog Analog - Delete Digital Analog - Keep Digital
Channel Scan	Press Select
Overscan	0 to 9 %
HDMI - DVI	auto HDMI DVI
HDMI Audio	On Off
AC3 CmprMod	Line RF
Channel Box	Enable Disable

System Setup	Options <i>Factory defaults are shown in Bold</i>
Baud Rate	1200 2400 4800 9600 19200 38400 115K 230K
Unit Number	1 to 9
Pnl Lockout	None Ch+Menu Vol+Menu Ch+Vol+Menu Power Setup Menu All Setup+Menu Pwr+Setup+Menu
Backlight	1 to 10
LCD Contrast	1 to 10
IR Receive	IR On IR Off
CEC Mode	Disable Turn Display On Turn Display On/Off
Firmware	232-ATSC4 K_V2.61 - <i>Application Firmware Version</i> BL Ver V1.03 - <i>Bootloader Version</i> Enter Boot Mode HD version 7.44 - <i>HD (Decoder) Firmware Version</i> Hardware Rev G0 - <i>Hardware Revision</i> volt in = 11.8 - <i>Power Supply Voltage</i>
Network Setup	Options <i>Factory defaults are shown in Bold</i>
IP Address	192.168.1.231
IP Mode	Static DHCP
Gateway	192.168.0.1
Subnet Mask	255.255.255.00
IP Port	23 - <i>Sets Telnet Port</i>
iCC-Net Dev	00257 - <i>Set the Display Device Number for iCC-Net Control</i>
MAC/SN	00:14:C8:14:XX:XX
UDP Reply	Off On
Clear Network Password	<i>Press Select to clear Network Password</i>
IPTV Setup	Options <i>Factory defaults are shown in Bold</i>
IPTV Out:Enable	Off On Intvl Eq
IPTV Out:Dest Addr	192.168.1.232
IPTV Out: Dest Port	0
IPTV Out: Program	All , Program Select, Tuned Program

6. Rear Panel Connections



1 Ethernet

RJ-45 jack for 100Mbps, web page access, Telnet and UDP control, IPTV streaming output.

2 Audio

RCA jacks for analog stereo variable level audio output.

3 Video

RCA jack for analog composite video output.

4 A/C

3.5mm TRS jack, Air/Cable control output for RF-AB coax switch.

5 IR In

3.5mm TRS jack, input for optional external IR-RXC IR receiver or wired IR from a control system processor.

Tip= IR Data Input

Ring= Ground

Sleeve= +12v DC (100mA max)

6 RS-232

DB-9 port for RS-232 data link to control system, 1200 to 230K baud, 8 data bits, no parity, 1 stop bit.

Pin 2= Data Receive

Pin 3= Data Transmit

Pin 5= Ground

7 12 VDC

Power input 2.1mm coaxial jack (inside center conductor positive).

8 Service

USB-A service port. May be used for tuner/decoder firmware updates.

9 Air/Cable

"F" female connector for RF Input to tuner.

10 YPbPr

RCA jacks for component YPbPr/RGB video output.

11 SPDIF

RCA jack for coaxial S/PDIF digital audio output. The audio format follows the digital audio output format setting.

12 SPDIF

JIS F05 jack for optical S/PDIF digital audio output. The audio format follows the digital audio output format setting.

13 RGBHV

HD-15 female jack for HD analog RGBHV/YPbPr video output.

14 HDMI

HDMI receptacle, Type A, Version 1.4b. The output normally automatically detects an HDMI or DVI display. The audio format follows the digital audio output format setting.

7. Setup Notes

Channel Scan

A channel scan will be required prior to initial use and subsequently following any changes to the received channel line-up. The channel scan may be initiated in the on-screen setup menu, front panel A/V setup menu, A/V web page, or by RS-232 command. The desired Air or Cable scan mode should be selected for the intended application prior to initiating the scan.

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** the front panel or IR remote after the scan has started. Typically, the unencrypted digital cable channels will not use the same Guide numbers as a cable box.

Air/Cable

The 232-ATSC-4K has separate channel memories for air and cable channels. It is possible to toggle between the two channel memories. A separate channel scan for each mode will be required.

The Air/Cable mode may be toggled by:

- **A/C** button on optional HD3-RC infrared remote control
- **A/C** button on Control web page
- **Air/Cable** button on A/V web page
- Press **Up + Down** simultaneously on the front panel
- RS-232 command

If the air and cable channels are delivered on two separate coax cables, the accessory RF-AB selector switch may be utilized. The control cable to the RF-AB selector switch will connect to the A/C jack on the rear panel of the tuner. The input selection of the RF-AB selector switch will follow the Air/Cable toggle command received by the tuner.

HDMI Output

The HDMI output conforms to HDMI Version 1.4b. The HDMI output is always active. The YPbPr/RGB colorspace follows the YPbPr /RGB configuration setting in the AV Setup menu.

The output normally automatically detects an HDMI or DVI display when the HDMI-DVI Output mode is set to Auto. Manual selection of HDMI or DVI mode is available in the front panel AV Setup menu, AV Setup web page, or via RS-232 serial command.

The HDMI digital audio format follows the digital audio output format setting in the AV Setup Menu.

RGBHV/Component Analog HD Video Outputs

Analog HD video output is available on both the HD15 RGBHV (VGA) and the YPbPr Component jacks. The outputs are always active. The YPbPr/RGB configuration setting applies to both sets of analog HD outputs.

Composite Video Output

The composite video output is always active. The composite video output carries embedded Line 21 analog closed caption data when available from the broadcaster. The output is fixed at 480i/29.97.

Video Resolution and Frame Rate

Available video resolutions and frame rates are shown in the table below. The default setting is 1080i/29.97.

Resolution Frame Rate	HDMI Only 2160p	1080p	1080i	720p	480p	480i
29.97Hz	✗	✗	✓	✗	✗	✓
30Hz	✓	✗	✓	✗	✗	✗
59.94Hz	✗	✗	✗	✓	✗	✗
60Hz	✓	✓	✗	✓	✓	✗

Note that 2160p is only available on the HDMI output. For the analog HD outputs, if 2160p/30 is selected, the output will be 1080i/30. If 2160p/60 is selected, the output will be 1080p/60.

Audio

The analog audio output is always active. The analog audio outputs always follow the volume control settings.

The digital audio outputs have three available modes. The setting applies to all digital audio outputs.

- PCM Variable
- PCM
- Digital Passthrough

The volume level setting does not affect digital audio in Digital Passthrough or PCM modes. PCM Variable enables volume control on all audio outputs. If there is no audio, verify the volume is all the way up (and not muted).

IR Control

The tuner supports infrared control from the HD3-RC handheld infrared remote or equivalent. The 232-ATSC 4K is backwards compatible with the HD2-RC IR remote. The tuner will also respond to a programmable remote with the TV type set for Sharp.

The tuner will display a “^” symbol in the upper right corner of the front panel display when an IR command is received.

IR control data may be received via the front panel IR sensor or an IR-RXC remote IR sensor connected to the rear panel IR port. IR control may be disabled in the front panel System Setup menu, System web page, or RS-232 serial command.

Captioning

Embedded Line 21 captioning data is available on the Composite video output. If the tuner is feeding a compatible digital encoder or encoder/modulator, the Composite video output may be used as the source of the captioning data.

On-screen captioning may be enabled from the on-screen menu, IR remote, web page, or RS-232 commands. For CEA-708 digital captions, options are available in the on-screen menu for font, color, style, and other appearance settings.

Consumer Electronics Control

Consumer Electronics Control (CEC) is available for use with the HDMI output for power control of compatible displays.

HDMI CEC may be selected for sending power commands to the display. No other control functions are available for CEC control. HDMI CEC sends standardized control commands over the HDMI cable. CEC functionality is available in many TVs and displays designed for the consumer market. If control of the TV or display via HDMI CEC is desired, it is important to check the TV or display’s documentation to determine if CEC is supported.

It is common for manufacturers to use their own unique term to refer to HDMI CEC. For example, Samsung refers to CEC as Anylink. LG refers to it as SimpLink.

CEC will likely need to be enabled in the display. Some displays will automatically detect that a CEC supported device has been connected and prompt for confirmation.

Although the industry strives for standardization relating to CEC, it is possible that some or all CEC control communication between the ICC1-TC and connected display may not function depending on display make and model. In this situation, RS-232 is recommended for reliable display control.

When enabled, the options are:

- The display will turn on when the tuner receives a power on command, but will not turn off with a tuner power off command
- The power state of the display will follow the power state of the tuner

Front Panel Lockout

The front panel buttons of the tuner may be locked out to prevent unwanted tampering. The available button lockout combinations include:

- Channel + Menu
- Volume + Menu
- Channel + Volume + Menu
- Power, Setup, Menu
- All buttons
- Setup + Menu
- Power + Setup + Menu.

The front panel **Setup** button may be temporarily unlocked by simultaneously pressing the **Setup** and **Right** buttons.

Restore Factory Default Settings

The unit may have the configuration restored to the factory default settings. The channel list is not changed as this data is stored in separate memory. It is recommended to perform a hard power cycle after the factory default settings are restored. Some settings may not revert to the default until after a hard power cycle.

The factory default settings may be restored using the front panel menu, RS-232 command, or **Reset** button in **System** web page.

The factory default settings may be restored using the front panel Setup menu. Follow the steps below.

- Press **Setup** on the front panel.
- Navigate to **System Setup** and press **Select**.
- Scroll up or down to navigate to **Firmware**.
- Simultaneously press the **Power** and **Up** buttons.
- **Restore Defaults** will flash briefly on the screen to confirm.

The factory default settings may be restored via the RS-232 command '>Z!'. This function may be performed from the **Send Cmd** page in CR Toolbox or a terminal emulation program. Note that the RS-232 port settings will be changed if different than the default and the RS-232 communication will be lost. If using a Telnet connection to send the command, the IP address of the tuner will not revert to the default until after a hard power cycle.

The factory default settings may be restored in the **System** web page by clicking on the **Reset** button. Note that the IP address of the tuner will not revert to the default until after a hard power cycle.

8. IPTV Streaming

The 232-ATSC 4K can passthrough the MPEG transport stream of the received digital RF channel as a UDP MPEG-TS IPTV stream via the Ethernet output. The settings for the IPTV streaming output are available in the front panel IPTV Setup menu and the tuner's IPTV web page. RS-232 serial commands are also available for configuring the IPTV settings.

The destination IP address may be a unicast or multicast address. The allowable range for the destination port is 1 to 65534.

For received channels with multiple programs or sub-channels, options are available for selecting which programs will be included in the IPTV output stream. The options are as follows.

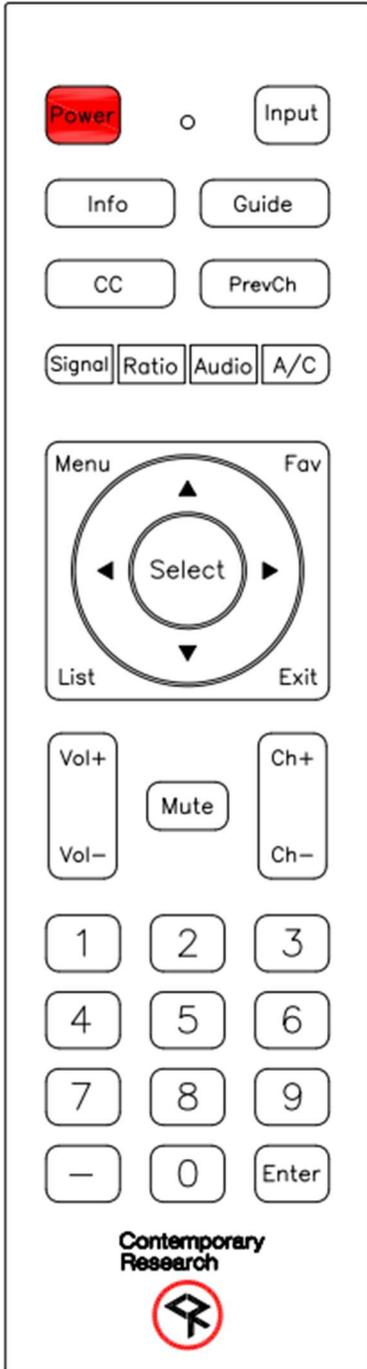
- All Programs
- Selected Program
- Program of Tuned Digital Channel

For a source RF channel that has multiple programs and the output stream is configured for all programs, the MPTS (multiple program transport stream) output will include each of the received programs of the original RF broadcast. The entire PSIP (Program and System Information Protocol) information present in the broadcast will be included unaltered in the IPTV stream.

If an individual program is selected, the SPTS (single program transport stream) will contain an individual program. All the tables in the PSIP except the PAT (Program Association Table) and PMT (Program Map Table) of the selected program will be stripped from the IPTV stream.

8. HD3-RC Handheld IR Remote

The optional HD3-RC IR Remote (5024-005) can be used for setup and for daily operation. All 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, Setup, 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

Press to toggle on and off.

Volume Control

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

Channel Selection

Two-part major/minor channel numbers are separated by a – (dash). Example 21-3.

One-part channels are accessed by directly entering the channel number.

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 on-screen menus.
- **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** steps through main and SAP audio options.
- **Signal** launches up on-screen signal strength meter (digital channels only).
- **Ratio** steps through aspect ratio options.
- **Info** launches on-screen information banner.
- **A/C** toggles air or cable tuning.
- **Fav** displays list of favorite channels.
- **Guide** launches on-screen guide, select a program and press **Info** to display program information.

Some of the Special Function commands may not be available on all channels.

9. On-Screen Menus

<p>Main Menu</p> 	<p>Main on-screen menu accessible front panel Menu button or menu command. Select Sub Menus</p> <ul style="list-style-type: none"> - Down or Up highlights option - Select chooses Option - Menu steps back or exits menu - Exit closes on-screen menu
<p>Channel Menus</p> 	<p>Sub menu for Channels offers options for:</p> <ul style="list-style-type: none"> - Channel Auto Scan - Favorite Channels - Channel Add/Delete - Fine Tune Channel (Analog Channels Only) - Signal Strength (Digital Channels Only)
<p>Auto Scan</p> 	<ul style="list-style-type: none"> - Press Up/Down to highlight scan mode - Press Select to initiate channel scan <p>Analog channels will be scanned first, then digital channels. The channel list will be populated as channels are found. Press Select during scan to skip analog channels.</p>
<p>Favorite Channels</p> 	<p>Menu page for creating a list of favorite channels. Channels will be advanced by FAV button or favorite channel command</p> <ul style="list-style-type: none"> - Press Up/Down to highlight channel - Press Select to Add//Delete from list
<p>Channel Add/Delete</p> 	<p>Channels may be added or deleted from the list of memorized channels. Channel Up/Down will step through the physical RF channels displaying the virtual channel numbers of received channels. Select will add or delete the selected channel. Note that in the case of multiple sub channels on a physical channel, only the displayed sub channel will be added or deleted.</p>

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
 - Size — Standard (15 pixels), Large (21 pixels), or Small (11 pixels)
 - Style — 1-6
 - Color — 8 shades of background, foreground, and edge colors
 - Opacity — foreground and background
 - Edge — 6 style options

Version Info



Displays the hardware type of the decoder/demodulator board and HD firmware version. Also displays the AC-3 firmware version.

V-Chip Menus



This menu manages access to programming based on US and Canadian ratings standards. A PIN number is required to access any of the sub menus. The default PIN number for access is 0000 (four zeros).

- Changing PIN accesses menu to create new PIN
- Open V-chip Setting clears all rating settings

US Rating Setting



Use navigation and Select buttons to select/deselect options. The padlock symbol indicates channels with the selected rating will be blocked and the PIN will be required for viewing.

Canada Rating Setting



Sub menu equivalent to US Rating setting for Canadian applications.

Setup Menus



This series of menus select the options for tuner operation:

- Screen Format — 16:9 or 4:3
- Time
- Sound Settings
- Video Noise Reduction — Available only for analog channels
- Menu Language

Screen Format



Select the appropriate aspect ratio for the connected display.

Time



Sub menus for time settings.

Time data is extracted from the System Time Table in the digital channel's transport stream. When Daylight Saving is enabled, the tuner will adjust the time as needed if the daylight saving flag is enabled in the System Time Table.

Time Zone



Move cursor left and right to select the time zone. **Select** stores the highlighted zone.

Sound



Select from a variety of options:

- Analog MTS — Mono, Stereo, SAP
- Multi-Track Sound — English, French, Spanish
- Digital Out — Digital Pass, PCM, or variable-level PCM.
- Auto Volume — On or Off

Menu Language



Select the appropriate language for the on-screen menus.

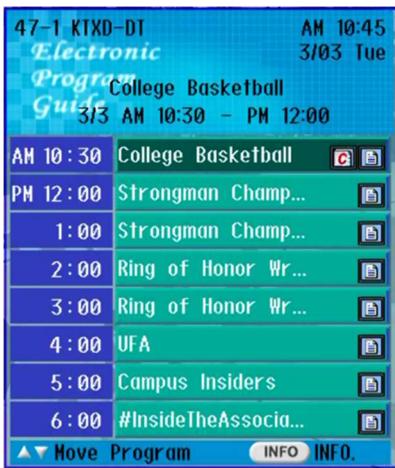
Info Banner



On-screen Info banner may be accessed by the following:

- **Info** button press on IR remote or control web page
- Hold **Select** button on the front panel
- Serial command

Guide



On-screen Guide with a list of upcoming programs may be accessed by the following:

- **Guide** button press on IR remote or control web page
- Serial command

Use **Up/Down** to highlight a program. **Info** button press or equivalent will bring up a program description. Guide list is limited to twelve hours of programming.

10. Web Pages

The 232-ATSC-4K has on-board web pages for control, monitoring, and configuration. The web pages may be accessed by a web browser by entering the unit's IP address in the browser's address field. The web pages may also be accessed through CR Toolbox. Double-clicking on a tuner in the equipment list will launch the default web browser and navigate to the tuner.

The on-board web pages will be password protected by default.

Three modes of protection are available.

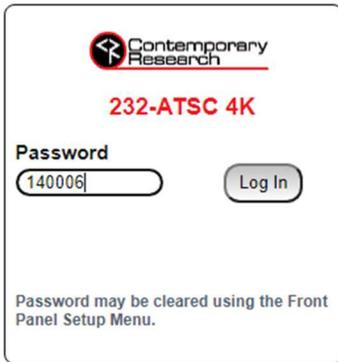
- Password will be required to access all web pages (default).
- Free access to the Control web page, but password will be required to access all other web pages.
- Free access to all web pages.

For increased security when password protection of the web pages is desired, it is recommended to lock out the **Setup** button on the front panel of the tuner.

Default Password

The default password is based on the last six digits of the unit's MAC address. The MAC address may be found on the SN/MAC sticker on the rear of the tuner. The MAC address may also be displayed in the front panel LCD menu under **Network Setup**. Follow the steps below to display the MAC address

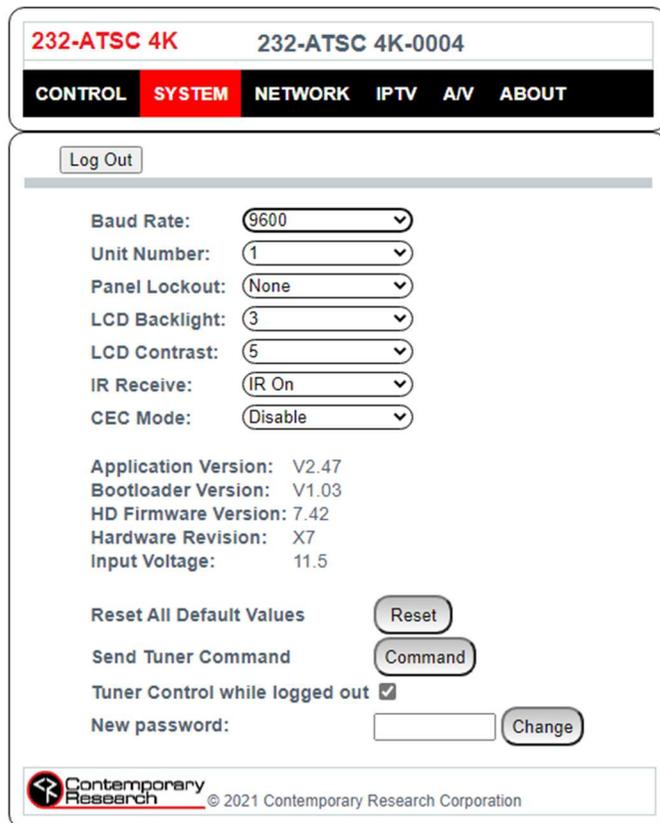
- Press **Setup** on the front panel.
- Press **Left** or **Right** to until **Network Setup** is displayed, then press **Select**.
- Press **Up** or **Down** until the MAC address is displayed.



When the web page is first accessed, the browser will be directed to the login page. Enter the last six digits of the MAC address in the password field, then click the **Log In** button. The digits should be entered with no punctuation or spaces. Letters should be entered as upper case. i.e.: 142C1A

Update Password

The password can be updated in the **System** web page. Enter the new password in the **New Password** field and click the **Change** button. The password may consist of up to 20 characters. The characters can be any combination of numbers, upper- and lower-case letters, and special characters.



Allow Free Access to Control Web Page Only

An option is available that will allow password free access to the **Control** web page allowing users to change channels and check tuner status. Access to the web pages related to setup and configuration may be accessed by pressing the **Login** button and entering the password. To enable this option, log in and navigate to the System web page. Click the checkbox next to **Tuner Control while logged out**.

If this option is enabled, a **Tuner Control** button will appear on the log-in page. Clicking on the **Tuner Control** button will navigate to the **Control** web page without entering a password. Log in will be required to navigate to any other web page.

Clear Password

Clearing the password will allow password free access to any of the tuner's web pages.

The password may be cleared in the **System** web page. Clear the contents of the **New Password** field and click the **Change** button.

The password may also be cleared in the tuner's front panel **Setup** menu. Press the **Setup** button and navigate to the **Network Setup** menu. Scroll up or down until **Clear Network Password** is displayed. Press the **Select** button to clear the password.

Reset Default Password

The password may be reset to the default by reloading the factory default settings. Refer to the previous section in this document relating to restoring the factory default settings.

Control Web Page

232-ATSC 4K
232-ATSC 4K-0004

CONTROL
SYSTEM
NETWORK
IPTV
A/V
ABOUT

No Password

Power On

Channel 44-1 1080i NTD_TV
Program NTD News Today

1

2

3

Ch+

4

5

6

Ch-

7

8

9

0

-

Enter

PrevCh

Volume

UNMUTED

Menu

^

<

Select

>

List

v

Exit

CC

Audio

Signal

Ratio

Info

Air/Cbl

Fav

Guide

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A/V Web Page

232-ATSC 4K
232-ATSC 4K-0004

CONTROL
SYSTEM
NETWORK
IPTV
A/V
ABOUT

Screen Display: 16:9 4:3

Box Full Zoom

HD Output:

HD Resolution:

Tune Mode:

Output Refresh Rate:

Digital Audio:

Captions:

Analog Captions:

Digital Captions:

Overscan:

HDMI Output Mode:

HDMI Audio:

Digital Audio Compression Mode:

Channel Change Box:

Channel Scan Mode:

Air

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Network Web Page

232-ATSC 4K
232-ATSC 4K-0004

CONTROL
SYSTEM
NETWORK
IPTV
A/V
ABOUT

Browser Address: 192.168.001.014
IP Address: 192.168.001.231
IP Mode: Static
Gateway Address: 192.168.001.001
Subnet Mask: 255.255.255.000
IP Port (telnet):
iCC-Net Device:
MAC Address: 00:14:C8:14:00:04
UDP Reply:

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IPTV Web Page

232-ATSC 4K
232-ATSC 4K-0004

CONTROL
SYSTEM
NETWORK
IPTV
A/V
ABOUT

No Password

Stream Mode:

Destination Addr:

Destination Port:

Stream Program:

TS Bitrate KB/s: 18687

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About Web Page

232-ATSC 4K
232-ATSC 4K-0004

CONTROL
SYSTEM
NETWORK
IPTV
A/V
ABOUT

232-ATSC 4K

Version: V2.47
<http://contemporaryresearch.com>

Libraries used by this product

FNET
Copyright © 2005-2018
by Andrey Butok, FNET Community
Licensed under Apache 2.0

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11. Bidirectional RS-232/Telnet/UDP Control Protocol

The 232-ATSC 4K full duplex RS-232/Telnet protocol enables a system programmer to control all tuner functions as well as monitor 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 nine 232-ATSC 4K units may be cabled together and addressed for individual control from a single RS-232 serial port. A unique unit number will be assigned to each 232-ATSC 4K tuner and an individual tuner will only respond to command strings that include the matching 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). UDP responses are disabled by default. UDP responses may be enabled in the front panel, web page Network Settings menu, or RS-232 command. Responses will be sent to port 31932 at the broadcast IP address of the tuner's subnet. See our Support Blog [Testing 232-ATSC Series UDP Control](https://contemporaryresearch.com/testing-232-atsc-udp-control/) at <https://contemporaryresearch.com/testing-232-atsc-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. The '=' sign for parameters may be omitted if desired, though it is helpful for clarity in checking programming.

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 applications with multiple tuners controlled from one serial port.

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 recent status in response to control commands or user actions.

String Example

The example below is a command for a channel change to 6-2 followed by the response string.

```
>TC=6-2
```

```
<1TU006Uxx1002x0
```

The status of a setting may be queried by omitting the = (equals symbol). The following command example queries the overscan percentage and shows the returned response.

```
>D4
```

```
<1D4=3
```

Table of Control Commands

Code	Function	Operation
Front Panel		
P1	Power On	Bring unit out of standby
P0	Power Off	Place unit in standby, mutes audio and video
PT	Power Toggle	Toggle standby mode
S4=	Set Front Panel Lockout Mode	0=None 1=Ch+Menu 2=Vol+Menu 3=Ch+Vol+Menu 4=Power 6=Menu 7=All Press Menu and Up key to unlock temporarily
Q5=	Set IR Receive Mode	0=IR receive disabled 1=IR receive enabled
M0=	LCD Backlight	Set LCD display backlight brightness 1-10
M8=	LCD Contrast	Set LCD display contrast 1-10
Tuning		
TC=	Select Channel	Tune analog and digital channels, leading zeros allowed, up to 4 characters for analog or one-part digital channel, 3 characters each for digital two-part major and minor channels. For two-part channel commands, the major and minor channel numbers may be separated by a colon or dash. <i>Examples:</i> '>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	Select next higher channel in channel list <i>Example:</i> '>3TU' Unit#3 incremented to next highest channel
TD	Tune channel down	Select next lower channel in channel list
TP	Tune previous channel	Select previously viewed channel
NC	Channel Name status	Return channel name as entered in channel list, up to 7 characters
NP	Program Name status	Returns program name, up to 30 characters, 15 additional if non-ASCII characters are present, such as ñ
T^	Start Channel Scan	Initiate a new channel scan, scan operation set by D0 and S0
S0=	Tuning Format	Set tuning format for channel scan initiated from T^ command or front panel Setup Menu 0=CATV -Cable Mode, set standard channel spacing 1=Off-Air -Air Mode 2=IRC -Cable Mode, set IRC channel spacing 3=HRC -Cable Mode, set HRC channel spacing 4=Cable Auto -Cable Mode, auto detect channel spacing
D0=	Analog/Digital scan mode	Set channel type for channel scan initiated from T^ command, front panel Setup Menu, or web page 0=All -Scan for analog and digital channels, delete existing analog and digital channels (default) 1=Digital -Scan for digital channels only, delete existing analog channels 2=Digital -Scan for digital channels only, keep existing analog channels 3=Analog -Scan for analog channels, delete existing digital channels 4=Analog -Scan for analog channels, keep existing digital channels
XA=	Channel add	XA=<major>,<minor>,<physical> Add channel to list <i>Examples:</i> >XA=38,1,0 adds 38-1, physical channel 0 will be the same as major >XA=8,0,13 adds virtual channel 8, found on physical channel 13
XD=	Channel delete	XD=<major>,<minor> Remove channel from list

Code	Function	Operation
Video Output		
D4=	Overscan	Select Overscan percentage 0-9
Q0=	Display Closed Captions	0=Captions off 1=Captions on
Q1=	Analog Caption Service	Select analog caption service 1-8 1=Caption 1 5=Text 1 2=Caption 2 6=Text 2 3=Caption 3 7=Text 3 4=Caption 4 8=Text 4
Q7=	Digital Caption Service	Select digital caption service 1-6 1=Service 1 4=Service 4 2=Service 2 5=Service 5 3=Service 3 6=Service 6
R6	Refresh Rate	Set to 59.94 Hz
RM	Refresh Rate	Set to 60 Hz
KK=149	Output RGB	Set colorspace to RGB
KK=151	Output YPbPr	Set colorspace to Component
HD=	HDMI/DVI mode	0=Auto 1=HDMI 2=DVI
OD=	On-screen Channel Display	0=Disable 1=Enable
Audio Output		
VU	Ramp volume up	Start volume ramping up
VD	Ramp volume down	Start volume ramping down
VV	Stop volume ramp	Stop volume ramping
VH=	Set volume level	Volume level, scaled 0 to 100
VL=	Set volume level	Volume level, scaled 0 to 63 (compatibility mode)
VM	Volume Mute Enabled	Mute all audio outputs
VX	Volume Mute Disabled	Restore audio to previous level
VT	Toggle Volume Mute	Toggle mute mode
LT=	Lip Synch Tolerance	20-1000 incremented in mSec
KK=158	AC-3	Set the digital audio outputs to AC-3
KK=159	PCM	Set the digital audio outputs to PCM fixed
KK=160	PCM Variable	Set the digital audio outputs to PCM Variable
HA=	HDMI Audio Mute	0=Audio mute disabled 1=Audio mute enabled
Status Request		
ST	Request T Mode status	Return T Channel/Source status string
SV	Request V mode status	Return V Audio status string
SS	Request S Mode status	Return S Front Panel status string
SQ	Request Q Mode status	Return Q Mode status string
Network Setup		
IP=	Set IP Address	IP=xxx.xxx.xxx.xxx Define IP address, then sends status >IP returns the current MAC address, current IP address, subnet mask, and gateway. Response example: \$MAC=0014C81A001B IP=192.168.001.241S IG=192.168.001.001 IM=255.255.255.000 IY=1. S or D at end of IP signifies DHCP or Static address. 000.000.000.000 indicates DHCP, but no DHCP server detected.
IM=	Subnet Mask	>IM=xxx.xxx.xxx.xxx. Define subnet mask
IG=	Default Gateway	>IG=xxx.xxx.xxx.xxx. Define default gateway
IY=	IP Mode	1=Static 2=DHCP
IX=	Telnet Port	>IX=xxxxx Define Telnet port
UO	UDP Reply	Enable reply strings to UDP port 31932
UF	UDP Reply	Disable reply strings UDP port 31932 (default)
DH=	Web Page Disable	0=Web Page Access Enable 1=Web Page Access Disable
CP	Clear Password	Clear the password for web page access

Code	Function	Operation
IPTV Setup		
GE=	Stream Enable	0=Off 1=On
GA=	Destination Address	>GA=xxx.xxx.xxx.xxx. Define IPTV destination address
GP=	Destination Port	1-65534
GL=	List Stram Programs	Return a list of programs on a received digital channel
GN=	Set Stream Program	1-254 0=All 255=Tuned Program
GR	IPTV Bitrate	Return the current IPTV stream bitrate in KB/s
Serial Communication		
EN	Echo On	Echo On This command is not available for Telnet. Enable local echo in the terminal program.
EF	Echo Off	Echo Off
R5	Baud Rate	0=1200 4=19.2K 1=2400 5=38.4K 2=4800 6=115.2K 3=9600 (Default) 7=230.4K
Miscellaneous Commands		
HE	Help	Return a list of serial commands
NW=	Set Name	Set the ATSC-mini name. Limited to 20 characters
NM	Get Name	Return the ATSC-mini name
ID	ID	Return the product model and application firmware version
Z!	Reload factory default settings	Reconfigure unit for all factory default settings. IP address will not revert to default until after a Z] command or hard power cycle.
Z]	Reboot	Emulate a reboot from a hard power cycle
CE=	HDMI CEC Power	Manually send HDMI CEC power command 3=Display Off 4=Display On

Code	Function	Operation	
HD2-RC IR Remote Emulation			
KK=	Emulate HD2-IR Button Press	9=Power Toggle	105=Menu
		11=1	107=Left
		12=2	108=Up
		13=3	109=Down
		14=4	110=Enter/Select
		15=5	111=Exit
		16=6	115=CC
		17=7	141=Output Resolution 1080i
		18=8	142=Output Resolution 720p
		19=9	143=Output Resolution 480p
		21=Enter/Select	144=Output Resolution 480i
		22=Channel Up	145=Output Resolution 1080p
		23=Channel Down	146=Output Resolution 2160p/60
		24=Volume Up	147=Output Resolution Auto
		25=Volume Down	148=Output Resolution 2160p/30
		26=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=Favorite	157=16:9 Ratio V Zoom		
95=List	4:3 Ratio H Zoom		
96=Add/Delete Channel	158=Dolby Audio Passthrough		
98=Air/Cable	159=PCM		
99=Dash	160=PCM Variable		
100=Info	161=Display 16:9		
101=Previous Channel	162=Display 4:3		

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	Unit	CMD	Power	Major Channel	Video Mute	Input	RF	Received Resolution	Minor Channel	N/A	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=1080p N=No Sig	3 digits		0=None
<	1	T	U	032	U	0	C	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. Audio status will be sent automatically following a volume toggle command from front panel control, IR remote, or RS-232- command.

Front Panel Mode Status Response String (S):

Start	Unit	CMD	Audio	Tune Mode	Lockout	Bass	Treble	Output	Output Resolution	Output Setting	N/A
	1-9		N/A	0=Cable 1=Air 2=ORC 3=HRC 4=Auto	0-9	Fixed 2 digits	Fixed	0=RGB 2=YpPr	0=1080i 1=720p 2=480p 3=480i 4=1080p 5=2160p/60 7=2160p/30	0=1080i 1=720p 2=480p 3=480i 4=1080p 5=2160p/60 6=Auto 7=2160p/30	4 digits
<	1	S	x	x	0	08	4	2	0	0	xxxx

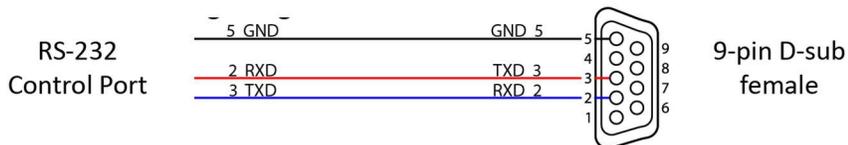
Closed Caption Mode Response String (Q):

Start	Unit	CMD	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	N/A
	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

13. RS-232 Serial Port Connections

Single Tuner

RS-232 Wiring - Single Tuner

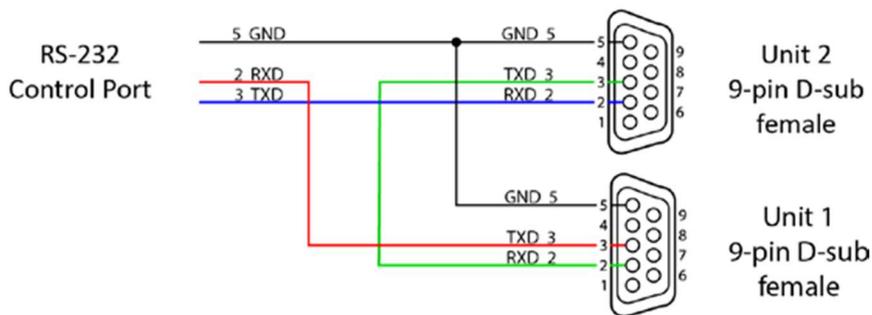


Multiple Tuners

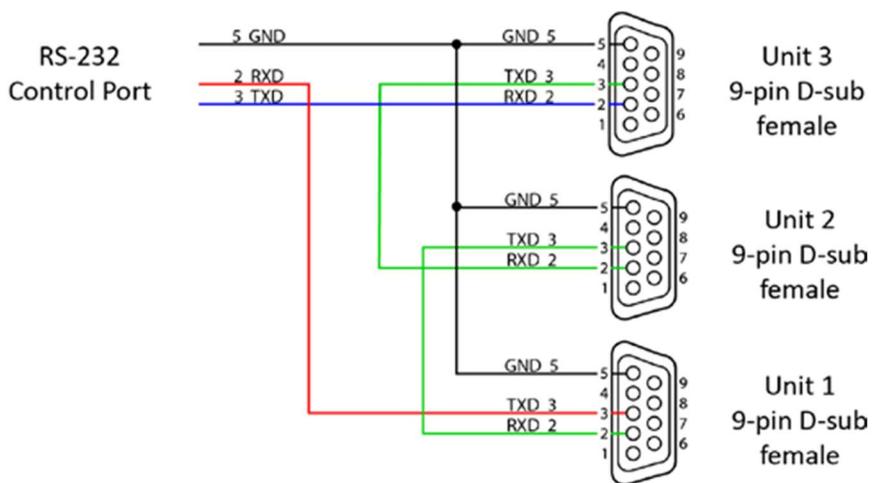
Up to nine tuners may be daisy-chained and controlled from one RS-232 port on a control processor. Unit # addresses are required in command strings when more than one tuner is controlled from the same control port.

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 Wiring - Three Tuners



14. Unidirectional iCC-Net Control Protocol

The 232-ATSC 4K will respond to iCC-Net protocol command strings sent from an ICE-HE-DXL, IP-DXL, Display Express Server, or third-party control system processor. The 232-ATSC 4K is compatible with iCC-Net commands sent via Ethernet. The unit is not compatible with iCC-Net commands sent over the RF coax network.

The 232-ATSC 4K does not have a built-in display controller, so a limited set of commands is supported.

The unit will receive the iCC-Net commands via Ethernet at UDP port 31934. The data packets may be sent as unicast or broadcast.

The iCC-Net command string is composed of segments that include the display device number, the command, and command parameters if required.

Display Device Numbers

A unique display device number from 1 to 4094 is assigned to each TV controller, tuner/controller, QIP-DVX decoder/controller, or tuner to which control commands are addressed. The displays are organized into 16 zones of up to 255 devices each.

The Zone/Unit concept is used with Display Express, Display Express Lite, and when writing command strings for third-party control systems. Display Express Lite is limited to 128 display devices in zone 1. Unit numbers are restricted to the range of 1 to 128 corresponding to display device numbers 257 to 384.

The display device number is represented in the iCC-Net command string by the zone number and the unit number. The hex equivalent of the zone number and the unit number is equal to the hex equivalent of the display device number.

Example:

Zone 3 = hex 03

Unit 201 = hex C9

Display Device 969 = Hex 03 C9

The device number can be calculated in decimal using the formula: '(zone number x 256) + unit number = display device number'

All display controllers in a zone will respond to a command sent to unit number 0. All display controllers will respond to a command sent to Zone 15, Unit 255.

Zone #	Zone x 256	Unit #	Display Device #
0	0	1-255	1-255
1	256	1-255	257-511
2	512	1-255	513-767
3	768	1-255	769-1023
4	1024	1-255	1025-1279
5	1280	1-255	1281-1535
6	1536	1-255	1537-1791
7	1792	1-255	1793-2047
8	2048	1-255	2049-2303
9	2304	1-255	2305-2559
10	2560	1-255	2561-2815
11	2816	1-255	2817-3071
12	3072	1-255	3073-3327
13	3328	1-255	3329-3583
14	3584	1-255	3585-3839
15	3840	1-254	3841-4094
All Zones	4095		

Reserved Device Numbers – Send Command to All Display Controllers in a Zone

Display device numbers that have a valid zone number and a unit number of 0 are reserved and should not be assigned to a display controller. Display device numbers that have a unit number of 0 have a special purpose. All display controllers in a zone will respond to a command sent to that zone number and unit number 0.

Reserved Device Numbers – Send Command to All Display Controllers in All Zones

Display device number 4095 (Zone 15, Unit 255) is reserved and should not be assigned to a display controller. This display device number has a special purpose. All display controllers will respond to a command sent to this display device number.

Setting the Display Device Number via Web Page

The device number may be set in the **Network** web page. The display device number is entered in a four-digit decimal format.

Setting the Display Device Number via Front Panel Menu

The display device number may be set in the front panel menu. The display device number is entered in a four-digit decimal format. Follow these steps below to set the display device number.

- Press **Setup** button on the front panel to display the menu.
- Press **Left** or **Right** to scroll through the menu categories. When **Network Setup** is displayed, press **Select**.
- Scroll down until **iCC Net Device** is listed. Press **Select** and enter the desired display device number.
- Press **Setup** to back out of the menus.

iCC-Net Command String Protocol

“\$A5,<dh>,<dl>,<ncb>,<cmd1>,<parameter>[<cmdN>]”

\$A5	Starts the command
<dh>	The zone or high order byte of the display device
<dl>	The unit or low order byte of the display device (0 for global zone)
<ncb>	The number of command bytes to follow
<cmd1>	The first two-character command
<parameter>	Command parameters (not used in all commands)
[<cmdN>]	Multiple commands can be concatenated, with byte count added to <ncb>

Characters in command strings are expressed in a combination of hex and ASCII characters. For clarity, the following protocol examples use the following conventions:

- Single-byte hex numbers are preceded by the ‘\$’ symbol.
- ASCII characters or strings are enclosed in single quotes.
- Numbers not marked as hex or ASCII are the decimal equivalent of a single hex byte.
- Parameters shown in < > brackets are single byte.
- A series of multiple commands or parameters are set apart by [] brackets.
- Commas separate the bytes, but they are not part of the protocol.
- Double quotes enclose the command string, but they are not part of the protocol.

String Format

Every software application has a different denotation for handling hex, ASCII, and decimal formats. The examples in this manual are in AMX format, which is understood by many in the control industry:

- Hex values begin with a dollar (\$) symbol
- ASCII values are enclosed in single quotes
- Decimal values are shown as normal

When planning to use a mixed-format structure for commands, convert the symbols to the types required by your specific software application. For example, a **Tune Digital Channel 12-3** command to display device 280 could be shown several ways:

- AMX Mixed Format = “\$A5,1,24,5,'TH',2,12,3”
- AMX Hex Format “\$A5,\$01,\$18,\$05,\$54,\$48,\$02,\$0C,\$03”
- Standard Hex (no denotation) = A5 01 18 05 54 48 02 0C 03
- Crestron Hex Format = \0xA5\0x01\0x18\0x05\0x54\0x48\0x02\0x0C\0x03
- RTI = Select port, Hex mode, enter A5 01 18 05 54 48 02 0C 03 - Note that when you go back to normal editing mode, the app inserts a \x before each Hex character.

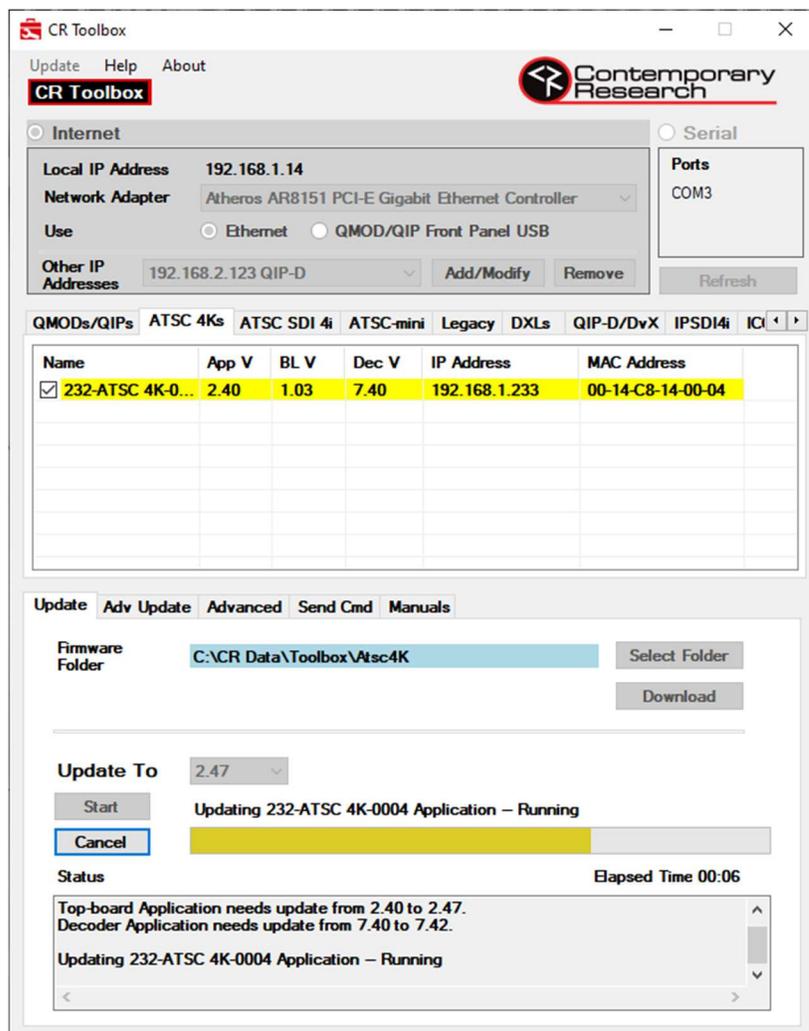
Go to www.asciitable.com for a handy Decimal/ASCII/Hex conversion chart.

Table of iCC-Net Control Commands

Code	Function	Operation
Power		
P1	Power On	"\$A5,<dh>,<dl>,2,'P1'" (6 bytes)
P0	Power Off	"\$A5,<dh>,<dl>,2,'P0'" (6 bytes)
PT	Power Toggle	"\$A5,<dh>,<dl>,2,'PT'" (6 bytes)
Channel Selection		
TH=	Set Digital Channel	<p>"\$A5,<dh>,<dl>,5,'TH',<H1>,<Major>,<Minor>" (9 bytes)</p> <p>Set digital channel with one-part virtual channel numbers and two-part channel numbers up to 255-255.</p> <p><H1> Tuning Style 0=No Change in tuning style 1=Five digit one-part channel (Major=high byte, Minor=low byte) Formula: (high byte x 256) + low byte = channel number 2=Two-part virtual channel number (Major-Minor)</p> <p><i>Examples:</i> "\$A5,1,4,5,'TH',2,2,3" Device 260, virtual channel 2-3 "\$A5,1,4,5,'TH',1,1,69" Device 260, channel 325 (256+69)</p>
TJ=	Set Digital Channel	<p>"\$A5,<dh>,<dl>,6,'TJ',<Major high>,<Major low>,<Minor high>,<Minor low>" (10 bytes)</p> <p>Set digital channel with two-part virtual channel numbers up to 999-999 Formula: (high byte x 256) + low byte = channel number</p> <p><i>Example:</i> "\$A5,2,44,6,'TJ',1,40,0,1" Device 580, channel 296-1</p>
H1=	Tuning Style	<p>"\$A5,<dh>,<dl>,3,'H1',<Style>" (7 bytes)</p> <p>Set the tuning style used with the TH channel command. This setting is stored in memory and only needs to be sent one time. Subsequent TH channel commands may have the <H1> byte set to 0.</p> <p><Style> 1=Five digit one-part virtual channel number 2=Two-part major-minor virtual channel number</p>
TU	Channel Up	"\$A5,<dh>,<dl>,2,'TU' " (6 bytes)
TD	Channel Down	"\$A5,<dh>,<dl>,2,'TD' " (6 bytes)
TP	Previous Channel	"\$A5,<dh>,<dl>,2,'TP' " (6 bytes)
Audio		
VL=	Volume	<p>"\$A5,<dh>,<dl>,3,'VL',<Level>" (7 bytes)</p> <p>Set volume in 64 steps 0 - 63.</p>

15. Firmware Update

CR Toolbox software for Windows will be required for full firmware updates to the 232-ATSC 4Ki as well as other supported Contemporary Research products. CR Toolbox is available for download free of charge at <https://www.contemporaryresearch.com/products/cr-toolbox/>.



The firmware update process updates the Application firmware, Bootloader firmware and Decoder firmware. Any existing firmware versions that are up to date will be skipped. The full firmware update can be performed over an Ethernet connection. A partial firmware update can be performed via an RS-232 serial connection. The RS-232 serial connection does not support the update of the Decoder firmware.

- Launch CR Toolbox. Select the desired connection method. After device discovery is complete, click on the **ATSC 4Ks** tab. The software will check for firmware updates. If the **Download** button is red, a new firmware version is available for download
- **Select Folder** to specify where on the PC to copy the downloaded firmware files. It is recommended to use the default location.
- Click on the **Download** button.
- To update, select the firmware package version to update to from the **Update To** drop-down menu. Reverting a tuner to previous firmware is allowed, if desired.
- Click on the checkbox next to the unit or units to be updated.

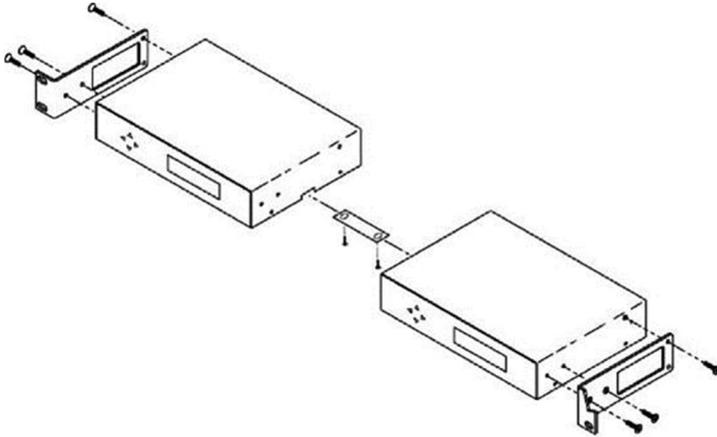
- Click **Start** to initiate the update process. The status bar shows the update progress. If multiple devices are selected, they will be updated in sequence.
- **Cancel** will stop the current update and any following updates.

16. 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

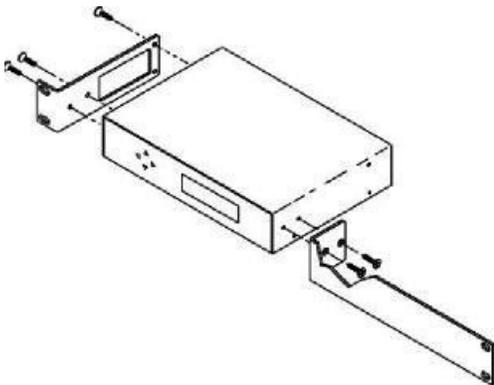


When mounting two components in one RU rack space, use the two short rack ears and the tie bar assembly.

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.

17. Specifications

Physical

Size (HWD): 8.5" [216 mm] wide x 1.75" [44 mm] high (1 RU) x 8.0" [203 mm] deep

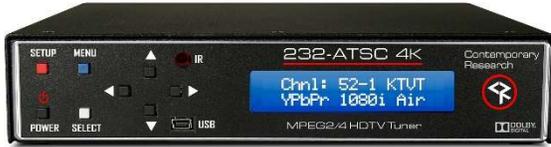
Weight: 1.81 lbs [822 g]

Enclosure: Aluminum with black powder coat paint

Mounting: 1 RU Rack mounting for one unit or two units side-by-side (RKU, RK1, RK2EZ)

Cooling: Not required for normal applications. For installations with multiple tuners in a rack closely spaced, forced air ventilation is recommended.

Front Panel



Display: Text display, white text on blue LCD

Top line indicates channel number and name.

Lower line indicates if RGB or YPbPr color space 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 virtual com port

Rear Panel



Ethernet: RJ-45 10/100 Ethernet connector for Web page access, Telnet, UDP control, and IPTV Streaming

Service: USB-A port for alternate HD firmware update

Air/Cable: 'F', female, 75 ohm impedance, -10 to 25 dBmV typical

Video Output: Simultaneous HDMI and NTSC video, select 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 1.4b (2160p/1080p/1080i/720p/480p/480i)

Resolutions and Frame Rates:

- 480i — 29.97 Hz
- 480p, 720p — 59.94/60 Hz
- 1080i — 29.97/30 Hz
- 1080p — 59.94/60 Hz
- 2160p — 29.97/30/59.94/60 Hz HDMI only

Audio Output: Simultaneous HDMI, S/PDIF, and Analog Stereo

HDMI: Dolby Audio/PCM/PCM variable level

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

Analog Audio Out: RCA stereo 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: 3.5 mm 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: 3.5 mm control output to operate the RF-AB Air/Cable Selector Switch

Power In: 5.5 mm OD, 2.1 mm ID coaxial jack (inside center conductor positive), 1.1 A maximum, 11 to 14 VDC, 12 VDC typical, 13.2 W 45 BTU, 15.2 W, 52 BTU including power supply, current draw 0.198 A@114 VAC with power supply

Tuning

Frequency Range: 51.0027 to 864 MHz

TV System: ATSC 1.0, clear QAM, NTSC

Channels: Air 2-69 (8-VSB and NTSC) and CATV 2-135 (QAM-64, QAM-256, 8-VSB, and NTSC), Standard, IRC, HRC

V-Chip: Supports parental channel block based on US and Canadian ratings

Decoding

Video: MPEG-2 (480i, 480p, 720p, 1080i, 1080p), H.264 (480i, 480p, 720p, 1080i, 1080p)

Audio: Dolby Audio, MPEG-1 Layer 2, AAC

Captions

Analog: Decodes Line 21 captions

Digital: Decodes CEA-608 and CEA-708 captions, CEA-708 captions may be customized for font size and style

Embedded Caption Data: Received caption data will be output as Line 21 caption data on the composite video output

Includes

PS12-1.5 Power Supply, Input: 100 to 240 VAC autosensing, Output: 1.5 A maximum, 12 VDC (5402-001)

RKU Universal Rack Kit

Options

HD3-RC IR Tuner Remote, 2 AAA batteries (5024-005)

PS12-8Y 8 A power supply with Y cable (5404-001), may be ordered with every 3-4 tuners in lieu of the included PS12-1.5 power supplies

RK1 Single Rack Kit, 1RU (5008-001)

RK2EZ Dual Rack Kit, 1RU (5408-015)

RF-AB Air/Cable Selector Switch (5077-001), includes 3.5 mm cable, connects to A/C control port on tuner

IR-RXC External IR Receiver (5032-001)

CC-COM-B RS-232 Null Modem Cable (5061-003)

Trademarks

VGA and XGA are trademarks of International Business Machines

SVGA is a trademark of the Video Electronics Standard Association

HDMI

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

Dolby Audio

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

Country of Origin

The 232-ATSC 4K is manufactured in the USA at our facility in Carrollton, Texas.

FCC Class A Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. The Class A limits provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause interference. This interference must be corrected at the expense of the user.

18. 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 and Luxul Managed Switch products carry 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.

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 Contemporary Research dealers only.

- End users must return products through authorized Contemporary Research dealers.
- 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.



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