Product Manual

ICC2-ATSC 4S/ICC2-ATSC 4

HDTV Tuner/Controller

May 2018

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Setup Guide

All instructions for the ICC2-ATSCS applies to the legacy ICC2-ATSC 4. Setup tools include:

- HD2-RC Remote Mode (accesses On-Screen Graphic Menus and special HD functions)
- IC-RC Remote Mode (accesses on-screen Text Menus)
- Front-Panel Setup
- ICC-Net commands from Display Express, iC Send software, or custom control system

The ICC2-ATSC 4S is designed to offer advanced analog/digital tuning, yet be compatible with existing iCC-Net systems.

IR Remote Operation

The optional HD2-RC IR Remote is designed for control and setup of ATSC-series HDTV tuners, and normally, the tuner will respond to the remote in the same way as other ATSC-series tuners.

There is a special IC-RC mode that can be set from the front-panel menus. This will activate the on-screen text menus to set the device address and control type, and a few other special functions. When the settings are done, the tuner can be set back to normal HD2-RC operation.

Front-Panel Setup

The Front Panel modes are useful for setting tune mode, channel scan, HD output and resolution, switching between IC and HD2 remote modes, and setting the device address and control type, and other options.

IC Send/ICC-Net Control

You'll find the free IC Send program to be a great tool for system setup and testing, especially if the site is using the ICE-HE Head End and your laptop is configured for the site's network. You can also use a PC or laptop via RS-232 with the ICC-HE Head End. Key functions include:

- **On, Off and Tune** commands to test operation to one or all ICC2-ATSC 4S units.
- **IR Mode**. Switch all tuners to IC or HD2 modes.
- **Channel Setup**. Use the T^ Command to force all units to scan channels, then use the XA and XD commands to add and remove channels from the list. If you're using RS-232 control at the head end, have an ICC2-ATSC 4 at that location to check your setup.
- **Tuner Setup.** Use LM and TM commands to configure general tuner operation.
- **Default Input.** Use the ER command to set the default input.
- **Control Type.** Change RS-232 control type and baud rate

Device Address Settings

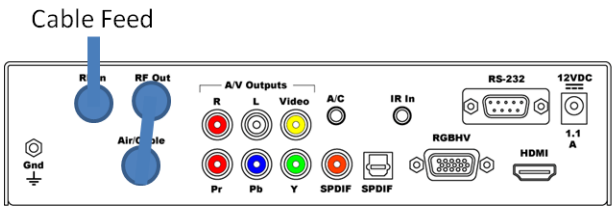
Use the front-panel setting 2 and 3 to set the address. Menu 3 sets the Zone address, and Menu 2 sets the individual number in the zone. For example the system address for a controller is 257, set Menu 2 to 2.1 (1), and Menu 3 to 3.1 (Zone 1, which is address 256), 1 + 256 = 257 system address. The controller will act by itself when you send the unique 257 code, as a zone group when you send 256, or from address 4095 (All).

Zone	1	2	3	4	5	6	7	8
	256	512	768	1024	1280	1536	1792	2048
Zone	**9**	**10**	**11**	**12**	**13**	**14**	**15**	
	2304	2560	2816	3072	3328	3584	3840	

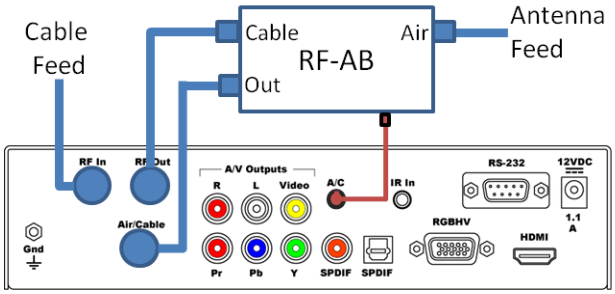
FAQ

Tuning Cable Channels	The 232-ATSC 4S will skip encrypted channels automatically when you activate a channel scan. You can skip scanning analog channels by pressing **Select** after you start the scan. Typically, the digital channels will not use the same Guide numbers as a cable box. If you can't select channels, make sure that the channels have been scanned.
RGB/Component Video	Analog HD is output on either the RGBHV (VGA) or Component output. Use the front-panel menu to select the desired output. There can be "fluttery" lines at the top of the analog video – this is closed captioning data. Go to the Overscan menu and increase the value.
HDMI	HDCP is always off – not required for non-encrypted programs If a monitor has issues with current resolution, 1080p/60 works best for newer models.
Composite Video	Press the RATIO button on the IR remote to select the desired format for NTSC video The onscreen menu also has **Screen Format** settings, generally only used when tuning an analog channel.
Audio	Volume won't affect digital audio in AC-3 or PCM modes, while PCM Variable supports level control. If there is no audio, make sure the volume is all the way up (and not muted). A "motorboat" sound means the source does not support AC-3, change to PCM.
IR Control	There can be interference from room fluorescent lights. Hold down SELECT on the remote. Pressing 4 selects normal 38 KHz IR, pressing 9 selects 57 KHz IR. Check the front-panel R Receive menu to see if it is turned on or off. If there is significant IR interference, an IR-RXC Remote Sensor may be required, and cover the front-panel IR sensor to reduce interference.
RF Network	When the tuner is connected to the RF network and an IC-HE series interface has been installed, the NET LED on the front panel will blink once per second, confirming the unit is receiving the "heartbeat" command. If the NET light does not flash, check the RF connection at the ICE-HE.
Control Codes	The tuner's control type has been pre-set at the factory when shipped. Once you connect the source with an RS-232 cable, the Power button should turn the monitor or projector on and off. There should be a label on the unit that states the current control type, or: • Use front-panel menu 50 to see or change the type • Use the IC-RC mode text menu • Send a T0 command to change the type The control type sets the baud rate to a typical setting for the source, the rate can be changed from the front-pane menu, or an R5 command over RF.
Device Address	If the tuner's NET LED is flashing, but the TX LED does not flash when a command is sent from Display Express or a custom control system – it is likely not at the correct address. If an All Zones command (4095) is sent, and the unit responds – the address is incorrect. Check the settings via the front panel menu, or enable the IC-RC mode to display the current setting using an IR remote.

RF Wiring Options



RF Wiring – Single Feed



RF Wiring – Dual Feed with A/B Switch

There are two ways to wire RF feeds to the ICC2-ATSC 4S.

Single RF Feed

Most applications will use a single RF feed, either Cable or Air (Antenna).

- Connect the RF feed to **RF In** on the top of the tuner. This allows the tuner to receive the iCC-Net control signal.
- Connect the included short RF cable from **RF Out** to the **Air/Cable** RF input.

Dual RF Feed

Other applications will use both Cable and Air (Antenna) feeds. The tuner can switch between both, maintaining separate channels lists for each. You'll need the optional **RF-AB switch,** which has a mini 3.5mm cable that connects to the A/C control output on the back of the tuner. The placement of RF connections on the RF-AB is different than shown – the RF ports above are arranged for clarity.

- Wire the **Cable** feed to the **RF In** input at the top of the back panel. Note that the Cable feed needs to go to **RF In** so the tuner can receive the iCC-Net control channel.
- Connect the **RF Out** to the **Cable** input of the **RF-AB**.
- Connect the **Antenna** feed to the **Air** input of the RF-AB.
- Connect the included short RF cable to the RF-AB switch **RF Out**, then to the **Air/Cable** RF input on the tuner.
- Connect the 3.5mm mini plug to the **A/C** control output.

Front Panel Setup

To Enter Front Panel Programming Mode:

1. Press **and hold** the Power button, then press the **Volume Up (Right Arrow)** button
2. Release all buttons, the ICC2-ATSC 4S will now be in the front-panel programming mode. The Air LED will flash, indicating programming mode.
3. The first two digits show the mode, the second show the option.
4. Changes are saved in non-volatile memory as they are entered.
5. The Volume up/down buttons scroll through programming modes, forward and reverse.
6. The Channel up/down buttons scroll through possible options for each mode.

To Exit the Front Panel Mode, push and release the Power button.

Mode	0-9	Parameters
RF Tune	**0.0**	0=CATV (Default) 1=Off-Air 2=IRC 3=HRC 4=Cable Auto
Baud Rate	**1.N**	1 = 300 6 = 9600 2 = 600 7 = 19200 3 = 1200 8 = 38.4K 4 = 2400 9 = 57.6K 5 = 4800 10 = 115.2K
Unit Number	**2.1**	1-99 To enter a higher device number, use the On-Screen Menu on page 8
Zone Number	**3.0**	1-15 System device number is (Unit + (Zone * 256))
Panel Lockout	**4.0**	Reserved (performed by LM command)
Power-up Volume	**5.0** **5.N**	Restore previous level (default) **1 – 63** sets volume level
Firmware Version	**6.68**	Ex: Version 2.0 – Channel Up/Dwn to see HD firmware (3 digits). When at this menu: Press and hold Channel Up, then Power to restore tuner to default settings Press and hold Channel Up and Down, then Power to scan channels
Captions	**10.0** **10.1**	Captioning off (default) Captioning on
Caption Mode	**11.1** **11.2** **11.3** **11.4** **11.X**	1=Caption 1 (default) 2=Caption 2 3=Caption 3 4=Caption 4 5-8= Text 1-4 (rarely used)
Video Detect	**12.3**	No AV mute (fixed)
AV Status	**13.0**	No AV status (default)
Label Mode	**14.2**	Numeric (fixed)
IR Receive	**15.9**	0= Off, 9=Receive IR
Digital Captions	**17.1**	1-6, Default is 1
IR Remote	**18.1**	0=IC-RC 1=HD2-RC
Tune Control	**19.0**	0=Tune all channels 1= Only tune channels in List
Digital Audio	**47.0** **47.1** **47.2**	0=AC-3– Dolby 5.1 1=PCM (set to this for audio through HDMI) 2=PCM Variable (default)
HD Output	**48.0** **48.2**	RGB (Default) Component
HD Format	**49.0** **49.1** **49.2** **49.3** **49.4**	0=1080i (Default) 1=720p 2=480p 3=480i 4=1080p
Control Type	**50.N**	Current Control type. Refer to next page for a list of types. Use Up/Down to change.

RS-232 Control Library

The ICC2-ATSC 4S includes a full library of make/model codes, noted by the **Type** number. The tuner is shipped pre-set to the type required for the order. The integrator can change the types from the front panel or IC-RC mode with an IR remote, or from a T0 command send to the tuner over RF.

Type	Make	Display	Baud	Notes
0	CR		9600	Test code
1	Sharp	Projector	9600	
3	Sanyo	Projector	19.2K	PLC-WK2500
4	NEC	Monitor	9600	Legacy models with early input commands; not plasma
5	Olevia	Monitor	19.2K	323V – 26 second power-up
6	Panasonic	Monitor	9600	
9	Mitsubishi	Projector	9600	XD560U
10	Samsung EX	Monitor	9600	Ex-Link
11	Samsung	Monitor	9600	400CXn, 460CXn, ME40A, ME46A, ME55A, MD55B
14	NEC	TV	9600	E-series TVs (redundant, this series has onboard tuners)
22	Hitachi	Projector	19.2K	Hitachi CP-S317, CP-S318, CP-X327, CP-X328 , Christie projector LW650, LW750, LS700, DU951, DHD951, LWU501i, LWU504
24	Epson	Projector	9600	VP 595wi, 1925W Projector
27	Samsung	Monitor	9600	LCD 323T and 403T
28	Samsung	Plasma	9600	
29	LG	Monitor	9600	M3201, M4201, 42PM2M
32	NEC	Plasma	9600	Odd Parity
33	Sharp	Monitor	9600	LC46LE820UN
44	Projection Design	Projector	9600	
45	Extron	Wall Panel	9600	Emulates buttons on Pole Vault wall panel
46	Sharp	Monitor	9600	PN-L702B, PN-V601
47	Sharp	Monitor	9600	LC70LE745U, same as 33, but slightly different input selects - Use for all new Sharp monitors
48	NEC	Monitor	9600	M-,P-, V-, X- series monitors
49	Christie	Projector	19.2K	DHD800
50	NEC	Projector	9600	NP-M402H (NEC default is 38.4K, user needs to change baud on projector)
51	Barco	Projector	115.2K	RLS-W12
54	LG	Monitor	9600	
55	Christie 2	Projector	115.2K	DHD850 – different than DHD800
56	Eiki	Projector	19.2K	Eiki VP LC-WNB3000
57	Christie	Projector	9600	FHQ981
58	Panasonic	Projector	9600	PT-RZ660
59	Planar	Monitor	9600	Matrix G3 Video Wall

Input Selects

Inputs can be selected as well, using a 0-NNN channel command, or example 0-211 selects HDMI 1. Some makes will need a 0-200 command to return to the tuner channel, others will switch back to the tuner automatically. Some input number may shift, depending on the model.

200=TV/Tuner
201=Video1
202=Video2
203=Video3
204=S-Video1
205=S-Video2
206=Component1
207=Component2
208=RGB1
209=RGB2
210=RGB3
211=HDMI1
212=HDMI2
213=HDMI3
214=HDMI4
215=HDMI5
220=Display Port DTV
221=Display Port PC

Input Command

You will need to specify the default input for the ICC1-ATSC 4S, so that the unit will return to the correct input. Use On-screen menu, IC-Send or Display Express to send the EI command on page 17 to the tuner once it's on the RF network.

On-Screen Menus (IC-RC Mode)

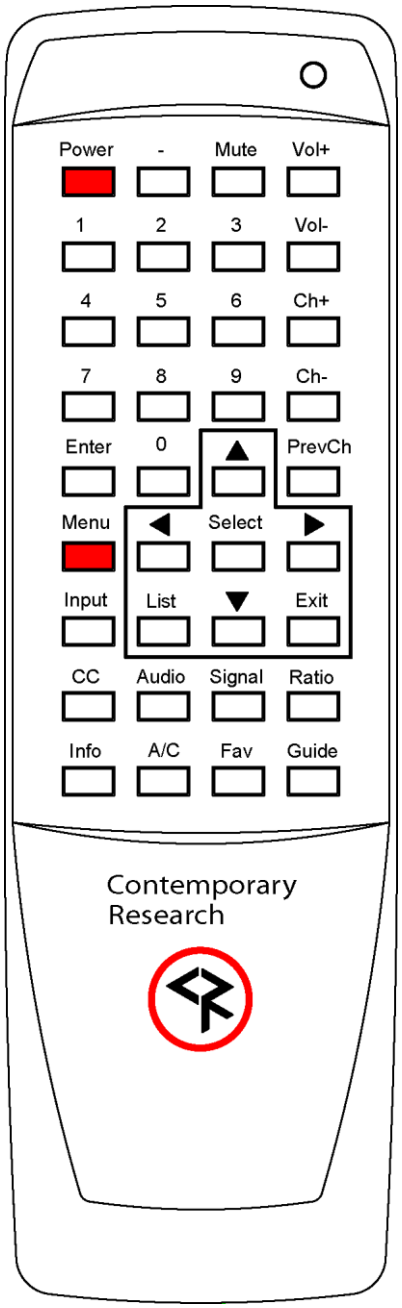
The remaining installation steps use the IR remote and the built-in character generator of the ICC2-ATSC 4S.

1. Touch **Menu**, then **999**, then **Enter**.
2. The text **CR MENU>** should appear on the screen.
3. Key in one of the commands shown below, then press **Enter** to activate.
4. Note that, in Menu mode, the **Channel Down** key acts as a backspace/delete key.

CR Menu Number	Function
Unit Setup	
45678	Display firmware version
45679	Display the unit's device #. At this point, you can use the **Channel Down** key as a Delete key, then enter a new device # with the remote's numeric keypad, then hit **Enter** to save the new number.
45700	Display current make/model control type (VP Type), listed on the previous page. You can use the **Channel Down** key as a Delete key, then enter a new device # with the remote's numeric keypad, then hit **Enter** to save the new number. The setting will use the default baud rate, which can be changed using front-panel menus.
45720	Set Display/Projector Input Enter code 1-19. See page 15 in the **ER** section for input codes
45718	IR Remote Type – if you are done using the IC-RC mode, change this setting back to HD2-RC operation. 0=IC-RC (Only for legacy media retrieval systems) 1=HD2-RC (Always use this setting)
Special Menus	
65478	Reset controller, similar to disconnecting power then restarting.
65487	Initialize to factory default settings: Power on, unlocked, display channel 11, channel ring set to 4, 5, and 11, Group 0. Note that this command works even if TV power is off or control is locked out.
65480	Enable constant Net transmit to the Head-End. This is used for measuring the signal strength of the unit's RF output. Press Enter to stop transmit or the unit will automatically stop after 50 seconds.
65481	Display DA transmitter frequency control voltage – should be 2000 - 3150.
65482	Display iCC-Net RF receive signal strength. Shows **Net RX** if receiving the iC-HE's "heartbeat" pulse once per second, **!NET RX** if not.
65483	Display DF transmitter frequency deviation – should be 245 - 300

HD2-RC IR Remote

The HD2-RC IR Remote can be used to setup the tuner and for daily operation. The IC-RC remote will work as well, the image below shows the function of the keys when the tuner is in the HD2-RC mode.



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

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

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

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

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

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

Special Functions

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

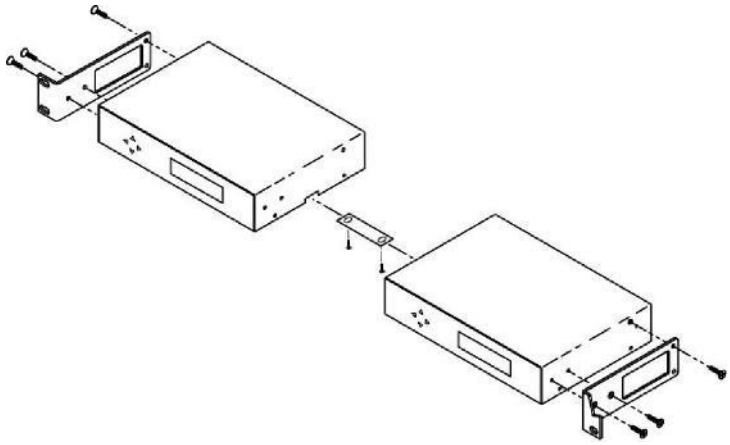
Features of many of the Special Function commands depend on whether the current channel is analog or digital.

RKU Universal Rack Mount Kit

The ICC2-ATSC 4S will now include a Universal Rack Mounting Kit (RKU). The RKU will allow for mounting of a single unit or two units side-by-side in a 19" rack. One Universal Rack Mounting Kit will be included with the purchase of each product and will include the following parts:

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

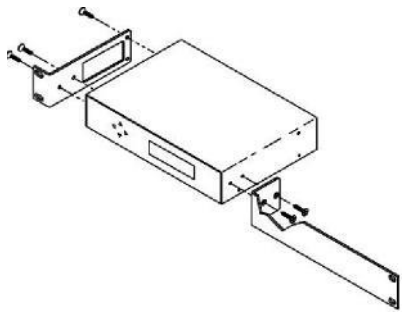
2-Across Mounting



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

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

Single Unit Rack Mounting



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

iCC-Net Control Protocol

Overview

Control for over 4000 TV Controllers is provided through an ICE-HE Head-End Network Controller or ICE-HE DXL Display Control Center that inserts a micro control channel through RF coax. The ICE-HE receives control commands via RS-232 and Telnet, and the ICE-HE-DXL adds a USB port.

Each TV Controller is assigned a unique device number from 257 to 4094. The devices are organized into 16 zones of 255 devices to handle large-scale TV installations. All the devices in each zone will respond to a single "virtual device number" — one device number that represents all devices in each zone. There is also a global device number, 4095, that will command all devices in the system. This feature dramatically speeds up system operation and programming, because one command can affect an entire group of devices—or all. To take advantages of this feature, review the section **iCC-Net Zones** following this section.

In Display Express, we reserve the first group of devices, 1-255 (for which there is no Zone), for components in special applications. Zones 1-15 are used for CR TV Controllers.

The RS-232 port can communicate from 300 to 115.2K baud. The factory default setting is 19.2K baud, 8 data bits, no parity, and 1 stop bit. IP commands can be sent via Telnet to IP port 2728. The USB port is typically used to provide RS-232 control from a PC with Display Express software.

Command String Structure

Characters in command strings are expressed in a combination of hex and ASCII characters. For clarity, the following protocol examples use the following conventions, similar to AMX protocol, most other control systems would use Hex.

- 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 a single decimal 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 are not part of the protocol
- Double quotes enclose the command string, but are not part of the protocol

Command format:

"$A5,<dh>,<dl>,<ncb>,<cmd1>,<parameter> [<cmdN>]"

$A5	Starts the command
<dh>	The zone or high order byte of the device*
<dl>	The unit or low order byte of the device (0 for global zone)
<ncb>	The number of command bytes to follow, the (total bytes) shown after are simply reference
<cmd1>	The first command byte
<parameter>	Command parameters (not used by all commands)
[<cmdN>]	Multiple commands can be concatenated, with byte count added to <ncb>

** iCC-Net devices are arranged with a zone mindset. For example, a command sent to Device 256, which triggers all the units in Zone 1, would be expressed as $A5, 1, 0 (first zone, device zero). A command sent to 257 would be $A5, 1, 1 (first zone, device 1 in the zone). See iCC-Net Zones following this section.*

Writing Your Own Control Code

While most IC systems use our Display Express software to control displays, a growing number of integrators are writing their own control applications, using AMX, Crestron, RTI, or other platforms. We encourage creative solutions, and are happy to support those who take advantage of our protocol.

From our history of support activity, we are providing a few tips to help you on your way.

Device Numbers

iCC-Net devices are arranged with a zone structure, arranged in 15 groups of 256 devices. The first address in the group represents the entire zone. For example, Zone 2's group address is 512 (2*256). When a command is sent to 256, all controllers in that group will respond as one. An ALL command is 4095 (15,255, F FF in Hex) – all controllers will respond.

All commands follow the same structure of:

- Attn = Hex A5
- Zone = 1-15 (hex 1-F)
- Unit = 1-255 (hex 1-FF)
- Bytes = Number of bytes that follow
- Command = 1 byte
- Parameters = 1 to 4 bytes

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

If you plan on using a mixed-format structure for commands, convert the symbols to the types required by your software application. For example, a **Tune Channel 2-3** command to device 260 could be shown several ways:

- AMX Mixed Format = "$A5,1,4,5,'TH',2,2,3"
- AMX Hex Format "$A5 $01 $04 $05 $54 $48 $02 $02 $03"
- Standard Hex (no denotation) = A5 01 04 05 54 48 02 02 03
- Crestron Hex Format = \0xA5\0x01\0x04\0x05\0x54\0x48\0x02\0x02\0x03
- RTI = Select port, Hex mode, enter A5 01 04 05 54 48 02 02 03 - note that when you go back to normal editing mode, the app inserts an \x before each Hex character

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

Command		Description
Control		
Power Off	**P0**	"$A5,<dh>,<dl>,2,'P0' " (6 bytes)
Power On	**P1**	"$A5,<dh>,<dl>,2,'P1' " (6 bytes)
Power Toggle	**PT**	"$A5,<dh>,<dl>,2,'PT' " (6 bytes)
Volume	**VL**	"$A5,<dh>,<dl>,3,'VL',<vol level>" (7 bytes) Sets TV volume level 0 = Mute 1 – 63 = Minimum level (1) to maximum volume (63)
RS-232 Control	**T0**	"$A5,<dh>,<dl>,3, 'T0',<Control Type>" (7 bytes) Change control type – see page 7
IR Remote	**Q8=**	"$A5,<dh>,<dl>,3, 'Q8',<IR Remote>" (7 bytes) 0=IC-RC 1=HD2-RC
Control Lock	**LM**	"$A5,<dh>,<dl>,3,'LM',<control>" (7 bytes) Locks out front panel and IR remote control functions. Bit 7 Selects IR remote control operation (0=enabled, 1=disabled) Bit 6 Selects volume control operation (0=enabled, 1=disabled) Bit 5 - 1 Always 0 Bit 0 Selects front panel buttons operation (0=enabled, 1=disabled)
Operating Parameters	**TM**	"$A5,<dh>,<dl>,3,'TM',<setting>" (7 bytes) Sets up key functions in the unit Bit 0 – Alpha channel labels 0=alpha labels off 1=alpha labels on Bit 1 – Numeric channel labels, 0=num labels off 1=num labels on Bit 2 – Channel up/down operation, 0=Tune Ring, 1=Send IR Keypad response Bit 3-7 = 0
Control String	**UX**	"$A5,<dh>,<dl>,2+string length>,'UX'<string>" (variable bytes) Sends an RS-232 string (ASCII, decimal, or hex) directly to the TV display. **Ex**: "$A5,1,2,6,'UX, 'PON', 13" Sends PON, followed by carriage return (device 258)
Baud Rate	**R5=**	Set Baud Rate 1=300 2=600 3=1200 4-2400 5=4800 6=9600 7=19200
Inputs	**LQ=**	"$A5,<dh>,<dl>,3,'LQ',<IR Code>" (7 bytes) 200=TV/Tuner 209=RGB 2 201=Video1 210=RGB3 202=Video2 211=HDMI1 203=Video3 212=HDMI2 204=S-Video1 213=HDMI3 205=S-Video2 214=HDMI4 206=Component1 215=HDMI5 207=Component2 220=DisplayPort DTV 208=RGB 1 221=DisplayPort PC

Command		Description
Tuning		
Tuning Format	**S0=**	"$A5,<dh>,<dl>,3,'S0',<format>" (7 bytes) 0=CATV 1=Off-Air 2=IRC 3=HRC 4=Cable Auto
Tuning Style	**H1=**	NA
TC Response	**H2=**	NA – When the ICC2-ATSC 4 receives an analog channel command, it will attempt to tune the digital equivalent first. If there is not a matching virtual channel, the unit will tune the analog channel.
Channel Up	**TU**	"$A5,<dh>,<dl>,2,'TU' " (6 bytes) – Tunes to next channel up
Channel Dwn	**TD**	"$A5,<dh>,<dl>,2,'TD' " (6 bytes) – Tunes to next channel down
Prev Channel	**TP**	"$A5,<dh>,<dl>,2,'TP' " (6 bytes) – Tunes to previous channel
Tune Analog Channel	**TC**	"$A5,<dh>,<dl>,3,'TC', <channel>" (7 bytes) – Tunes to a specific channel 2-127
Scan Mode	**D0=**	"$A5,<dh>,<dl>,3, 'D0',<mode>" (7 bytes) – Scan Mode Sets scan mode for digital and analog channels from the T^ or front panel scan command. 0= Scans for analog and digital channels scan (default) 1= Scans for digital only, deletes analog channels 2= Scans for digital only, keeps analog channels 3= Scans for analog only, deletes digital channels 4= Scans for analog only, keeps digital channels
Channel Scan	**T^**	"$A5,<dh>,<dl>,2,'T^' " (6 bytes) – Initiates channel scan
Tune HD Channel	**TH=** **Ex:**	"$A5,<dh>,<dl>,5,'TH',<H1>,<Major>,<Minor>" (9 bytes) The tuner will ignore the first bit (H1), and tune the major (virtual) and minor channels. Values may be in hex or decimal. "$A5,1,4,5,'TH',0,2,3" Device 260, virtual channel 2-3 The LQ command and TH 0-xxx (p7) can select inputs
Add Channel	**XA=**	Not applicable for the ICC2-ATSC 4
Delete Channel	**XD=**	Not applicable for the ICC2-ATSC 4
Tune Control	**Q9=**	Not applicable for the ICC2-ATSC 4
Captions	**Q0=**	"$A5,<dh>,<dl>,3, 'Q0',<on-off>" (7 bytes) 0=Captioning off (default) 1=Captioning on
Caption Mode	**Q1=**	"$A5,<dh>,<dl>,3, 'Q1',<mode>" (7 bytes) 1=Caption 1 (normal setting for most captioning) 2=Caption 2 3=Caption 3 4=Caption 4 5-8= Text 1-4 (rarely used)
Volume	**V9=**	Check with CR Support to see if Control Type supports external volume control 0=Tuner volume 1=External volume (such as video projector)

Command		Description
Tuning		
Input	**EI**	"$A5,<dh>,<dl>,3, 'EI',<Input>" (7 bytes) Sets the input for controlled projector or display. See Input list in ER.
Input Ring	**ER**	"$A5,<dh>,<dl>,<ncb>,'ER', [<input 1>, <input N>]" (variable bytes) Sets a list of inputs that are cycled by the Input command on the IC-IR remote or KK command. Follow the standard list of inputs below, check with CR Support on which are available for your make and model of video display. 1 Video1 — 11 DVI/HDMI1 — 20 Display Port DTV 2 Video2 — 12 DVI/HDMI2 — 21 Display Port PC 3 Video3 — 13 DVI/HDMI3 4 S-Video1 — 14 DVI/HDMI4 5 S-Video2 — 15 DVI/HDMI5 6 Component1 — 16 TV 7 Component2 — 17 TV2 8 RGB1 — 18 1394 9 RGB2 — 19 Memory stick 10 RGB3/DTV **Ex:** "$A5,<dh>,<dl>,6,'ER', 1,4,8,11" sets ring to Inputs 1, 4, 8 and 11.
Text		
Write Text	**DM**	"$A5,<dh>,<dl>,<ncb>,'DM', <start line>,<text color>,<text background color>, <screen background>,<size and shadow>,<timeout>,<message bytes>" (variable bytes) Clears current text, displays text message over video (default) or blank background. The built-in character generator can accept up to 40 characters of text (including carriage returns), 28 characters per line. Use a hex $0D or decimal 13 in the text as a carriage return, which will advance CG to the next line, first space on the right. Start Line - 1-9 Text Color - 1-7= White Text Background Color – 0-7=Transparent (no background) Full screen background – 0=normal insert over video Size and Shadow – 0-3=small text with drop shadow Time-Out – 0=15-second display, 1=persistent Persistent text stays on screen until the next DM, or new Menu or channel. **Ex1:** "$A5,<dh>,<dl>,10,'DM', 2,7,0,0,1,0,'TEST' " displays the word TEST on the second line, white text, inserted over video, small size with drop shadow, and timing out after 15 seconds. **Ex2:** "$A5,<dh>,<dl>,2,'DM' " clears on-screen display, also clears persistent text The ATSC uses white text and clear backgrounds when it receives a Text or Background Color parameter between 1 and 7, and accepts values 0-3 for text size and shadow. This allows compatibility with Smart TVs mixed in the same system that can display other colors and fonts.
Return	**EB**	"$A5,<dh>,<dl>,2,'EB' " (6 bytes) Moves cursor down to the first column of the next row.
Text Timeout	**DQ**	"$A5,<dh>,<dl>,3,'DQ', <time>" (7 bytes) Sets screen timeout to specified time in seconds (1-254). If time is 0 or 255, any text on the screen will persist indefinitely, or until cleared.

HD2-RC Remote Emulation

You can also emulate IR commands sent from the CR HD2-RC Wireless Remote. If you are using the numeric keys to select a channel, the user or program will need to follow the numeric command with an Enter.

.

KK=<key>	"$A5,<dh>,<dl>,3,'KK',<control>" (7 bytes)	
	* = Reserved for future products/applications 0=* 1=* 2=* 3=* 4=* 5=* 6=* 7=* 8=* 9=Power (tog) 10=0 11=1 12=2 13=3 14=4 15=5 16=6 17=7 18=8 19=9 20= 21=Enter 22=Ch Up 23=Ch Dn 24=Vol Up 25=Vol Dn 26=Vol Mute (tog) 27=Power On 28=Power Off 29=Menu 63=Guide 80=Freeze 81=Signal 82=Ratio 85=Audio	88=Favorite 95=List 96=Add/Delete Channel 98=Air/Cable 99=Dash - 100=Info 101=Prev Chan 105=Menu 106=Cur Rt 107=Cur Lt 108=Cur Up 109=Cur Dn 110=Select 111=Exit 115=CC 141=Format 1080i 142=Format 720p 143=Format 480p 144=Format 480i 145=Format 1080p 149=Output RGB 151=Output YPbPr 153=Air 154=Cable 155=Aspect ratio pillar/letter box 156=Aspect ratio full/wide 157=Aspect ratio zoom 158=AC-3(Dolby 5.1) 159=PCM 160=PCM Variable 161=16:9 162=4:3

iCC-Net Response

Response		Description
New Channel	**T**	" '<',<dh>,<dl>,2,'T',<new channel>" (6 bytes) Sent in response to T? command.
IR Function	**R**	" '<',<dh>,<dl>,2,'F',<IR Function>" (6 bytes) Sent when unit receives a new function command is pressed (1-8) or released (0) from the IR remote. 0 = Release 1 = Play 2 = Stop 3 = Pause 4 = Fast Forward 5 = Rewind 8 = Record
IR Key	**K**	" '<',<dh>,<dl>,2,'K',<IR Key>" (6 bytes) Sent when unit receives a new key command is pressed (10-23) or released (0) from the IR remote. 0 = Release 10 - 19 = Numeric keypad entry 0 – 9 21 = Enter106 = Cursor Right 22 = Channel Up 23 = Channel Down 29 = Menu 101 = Previous Channel 102 = Timer 105 = Media Menu 107 = Cursor Left 108 = Cursor Up 109 = Cursor Down 110 = Media Select The 0 – 9, Channel Up/Down functions are sent only if enabled in the TM command (Bit 2 = 1). The Channel Up/Down responses will be sent if the Tune Ring contains no channels – see Ex2 in the Tune Ring command section.
IR Menu	**M**	" '<',<dh>,<dl>,5,'M',<msh>, <msl>, <mph>, <mpl>" (9 bytes) Sent when unit receives a new Menu command is pressed or released (0) from the IR remote. Menu Selection high and low bytes are in <msh> and <msl>. Menu Parameter high and low bytes are in <mph> and <mpl>. A Menu command is initiated by pressing the Menu key, followed by a numeric entry, then the Enter or Channel Up key. During the Menu process, the Channel Down key acts as a backspace or delete key. Some selections that need only a single numeric entry and will have a parameter value of zero (0). Those keys are 0, 8, 9, 18, 20, 30, 900, 911, and 912. Menu selections that will prompt the user to enter a second parameter entry are: 1 = Select Media 2 = Password 3 = Chapter Search 4 = Frame Search 11 = Channel 21 = Page Zone 22 = Page Room 25 = Go 21 = Attach Zone 32 = Attach Room Tip: The Menu entries are active even if the TV power is off.

iCC-Net Zones, Units and Device Addresses

In the front-panel setup instructions, you set the Unit # (1-255), then the Zone # (1-15). This refers to the iCC-Net address structure that includes device number 256 – 4095 that is divided up into 15 Zones.

To simplify controlling large groups of devices, iCC-Net is divided into 15 zones of 255 devices. All the devices within each zone can be controlled simultaneously by sending a command to a single virtual device number.

For example, noting the zone chart below, if we send a Power On command to device #256, all iCC-Net controllers in Zone 1 will turn off at the same time.

This is an immensely powerful feature, because most systems can only address one device at time. If you need to turn off all 50 TV in a zone, you would need to send 50 commands. In addition to the hassles of creating multiple commands, there would be a long delay between the first and last command. One command, instant response is easier.

The Zone number plus the Unit number equals the actual device address.

Zone	Device #	Unit	Total Device #
1	256	1-255	257-511
2	512	1-255	512-767
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	1-255	3841-4094
All Zones	4095		

Tip: While many applications can use just the Zone number, it's a good practice to assign a unique Unit number to each controller in the zone. This allows the system software to address individual controllers if necessary.

System Map

One of the key tasks for iCC-Net integrators is to create a logical **System Map**, assigning device numbers to TV controllers so they fall into physical zones useful to the client. The device mapping could be sorted by type or location; whichever suits the application.

iCC-Net Zone	Zone	Room	Unit	Device
1	W 1st Floor			***256***
		W151	1	257
		W152	2	258
		W153	3	259
		W154	4	260
2	W 2nd Floor			***512***
		W251	1	513
		W252	2	514
		W253	3	515
		W254	4	516
3	E 1st Floor			***768***
		E151	1	769
		E152	2	770
		E153	3	771
		E154	4	772
4	E 2nd Floor			***1024***
		E251	1	1025
		E252	2	1024
		E253	3	1025
		E254	4	1026
5	Cafes			***1280***
		G100	1	1281
		G150	2	1282
		G151	3	1283
6	Entrance			***1536***
		TV 1	1	1537
		TV 2	2	1538
7	Hallways			***1792***
		W1	1	1793
		W2	2	1794
		E1	3	1795
		E2	4	1796
8	Concession			***2048***
		Lower	1	2049
		Upper	2	2050
All Zones	All			***4095***

On-Screen Menus

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

Channel Add/Delete

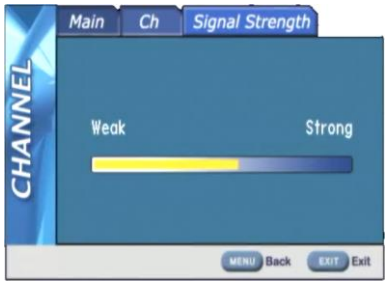
This menu can add or delete a channel accessed from Channel Up and Down.

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

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

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

Signal Strength



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

Caption Menus

This menu accesses captioning features:

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

Version displays current version of tuner firmware

V-Chip Settings Menus

Manages access to programming for US and Canadian standards.

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

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

Screen Format 	Selects between 4:3 and 16:9 aspect ratios. The Ratio command can also adjust the settings. • **4:3 Display** offers three options for 16:9 video: 16:9, 4:3 (stretched vertically), and Zoom (cropped sides) • **16:9 Display** offers three options for 4:3 video: 4:3 (small centered), 16:9 (stretched horizontally), and Zoom (stretched vertically and horizontally) – or 4:3 and 16:9 if the video is 16:9
Time 	Sets time settings for: • **Daylight Saving** – Select and choose on or off Note – The DST trigger comes from the broadcast stations, and may not be in sync with the new US standards. Use On/Off or time zone to offset time • **Time Zone** – Select local time Zone
Time Zone 	Use left-right cursors to select the time zone, Select enters the current zone.
Sound 	Selects a variety of options, each is only active when you are currently tuned into an analog or digital channel: • **Analog MTS** – Mono, Stereo, SAP (same as Audio) • **Multi-Track** – English, French, Spanish • **Digital Out** – AC-3 (Dolby 5.1), PCM, or variable-level PCM. Set to PCM when using audio through the HDMI connection – most displays cannot decode AC-3 (Dolby 5.1). • **Auto Volume** – On or off
Pop-Up Menus	 **Info** **Guide**

Overview

The ICC2-ATSC 4S HDTV Tuner is an HDTV Tuner with built in RS232 control for connected TV monitors and video projectors. The unit can be controlled locally with an IR remote, and can receive remote control commands over the same RF coax that carries the TV channels from an ICE-HE or an ICE-HE-DXL. The ICC2-ATSC 4S fits 2-across in 1RU rack space or can be mounted to a TV monitor or projector.

As a universal TV tuner, the ICC2-ATSC 4S can receive ATSC, NTSC, and clear QAM cable channels, able to decode MPEG-2 and MPEG-4 video. The tuner displays broadcasts through simultaneous HDMI, RGB/Component, and NTSC composite video ports. Full-time audio is available from digital AC-3 HDMI, optical and coax SPDIF ports, as well as variable-level analog stereo audio outputs.

- **Integrated Display Control** - Employs RS-232 control port for integrated display or video projector control, includes onboard database of display control command, integrator can switch to different make/model control types from an onboard library
- **Through-the-RF Coax Networking** - Communicates with Display Express Web software, and custom control systems via iCC-Net RF protocol
- **Universal Tuning** – Handles a mix of ATSC, clear QAM (MPEG and MPEG4 H.264) and NTSC channels, cable or off-air tuning
- **Local Control** - via IR remote (optional) or wired IR from control system or remote IR sensor, or 1-way RS-232 commands
- **Total Video -** Simultaneous HDMI and composite video, switchable RGBHV or Component HD video
- **Total Audio -** Simultaneous digital AC-3/PCM/Variable PCM HDMI, coax, and optical outputs, as well as variable-level analog stereo
- **HD Scaling -** Set HD output from 480p to 1080p, or follow native channel resolution
- **Easy Set-up** - Front-panel programming supported by LCD display, on-screen menus using optional HD2-RC IR remote, and RS-232 control commands
- **Closed Captioning** - Displays analog and digital captioning text
- **On-Screen Menus** - Setup, Electronic Program Guide, Channel, Favorites, and Program Information menus
- **Compact Rack Mounting** - Mounts in 2RU single RK1-HD or dual RK2-HD 19” rack kits
- **Includes** – PS12 1.5 12 VDC 1.4A switching power supply
- **Options** – HD2-RC wireless remote, RK1-HD and RK2-HD rack kits, CC-232 or CC-COM RS-232 control cables, IR-RXC External IR Receiver
- **Green Machine** - Meets RoHS safety and California energy standards

Specifications

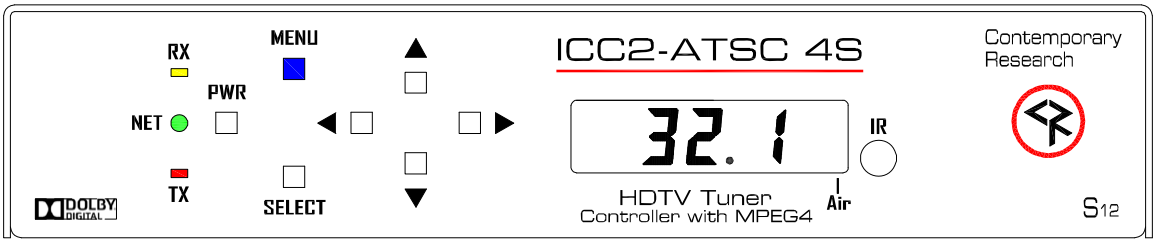
Physical – ICC2-ATSC 4S

Size (HWD): 8.5” [216mm] wide x 1.74” [44mm] height (1 RU) x 8.0” [203mm] deep
Weight: 1.86 lbs [845 g]
Enclosure: Steel with black powder coat paint
Mounting: Rack mounting for one or two units side-by-side optional (RK1, RK2EZ

Physical – ICC2-ATSC 4

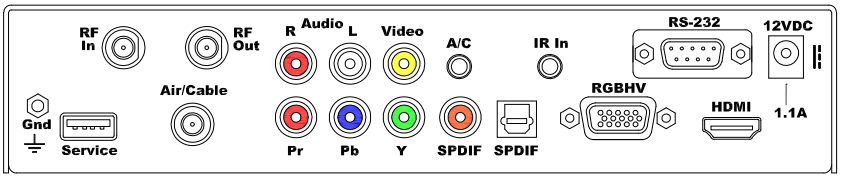
Size (HWD): 8.5” [216mm] wide x 2.0” [51mm] height (1.5 RU) x 8.0” [203mm] deep
Weight: 1.94 lbs [890 g]
Enclosure: Steel with black powder coat paint
Mounting: 1.5 RU rack kits no longer available

Front Panel



Display: Red LED Channel Display, dot separated major and minor channel numbers, dot at end indicates Off-Air tuning
IR: IR sensor
Control: Power, Menu, and Select buttons, navigation using Up and Down (Channel Up and Down) buttons
Left and Right (Volume Down and Up) buttons
LEDs: RS-232 RX (Yellow), RS-232 TX (Red), Net (Green – flashes every second to confirm iCC-Net control signal)

Rear Panel



Service: USB port (not active presently)
RF In: Air/Cable, 'F', female, 75 ohm impedance, -10 to 15 dBmV typical, receives RF control channel
RF Out: 'F', female, Passes RF channels to Air/Cable input, cable included
Air/Cable: 'F', female, 75 ohm impedance, -10 to 15 dBmV typical
A/C Jack: 3.5mm jack for RF-AB Air/Cable Switch
Video Output: Simultaneous HDM and NTSC video, switch between RGB and Component
Video Out: RCA composite video output, 1V p-p at 75 ohm impedance, 480i
Component Out: 3 RCA Y, Pr, Pb outputs (1080p/1080i/720p/480p/480i)
RGB Out: RGBHV DB-15 female (1080p/1080i/720p/480p)
HDMI: HDMI receptacle, Type A, HD video and digital audio, version 1.3 (1080p/1080i/720p/480p)
Use PCM mode if HDMI audio connection is used to most displays (not all have Dolby)
Audio Output: Simultaneous HDMI, Coax, Optical, and Stereo
Digital Audio SPDIF: Coax and TOSlink optical output, Dolby 5.1 AC3/PCM/Variable PCM
Analog Audio Out: Stereo RCA audio, Mono, Stereo, or SAP, variable level
RS-232 Control: DB-9 male, RS-232 data link to control system or PC, up to 9 tuners, 300-115.2K baud
IR In: 3.5mm stereo jack for optional IR-RXC IR Receiver
Sleeve= DC power+ from power jack input, limited to less than 100mA
Ring=DC power– (GND)
Tip= IR data signal
Power In: 2.1mm coaxial jack (inside center conductor positive)
1.1 A maximum, 11.5 to 15 VDC, 12 VDC typical

Tuning

Frequency Range: ATSC and Clear QAM (cable) television 55.25 to 801.25 MHz
TV System: ATSC, NTSC, Cable, and Clear QAM (1080i/720p/480p/480i)
Tuning: Off-air 14-69 (NTSC and 8-VSB) and CATV 1-135 (Analog, 64QAM, 256QAM, 8-VSB)
Aspect Ratio: 4:3, 16:9 (Digital), 4:3, 16:9, Zoom (Analog channels)
Captioning: DTV and analog, set by program or customized for size, font and display attributes
Captioning Data: HDMI, RGB, and Component ports don't have the ability to carry captioning data. The composite video port will carry Line 21 data, but only when tuned to an analog channel
Lock: Parental option for channels and/or rating

iCC-Net

Operation: 1-way control, carried over the same RF coax connection as TV channels
Data Receive: Mid-band VHF, 74.7MHz, sent from ICC-HE, -25 to +35 dBmV signal level

Includes

RKU Universal Rack Kit
Compact Power Supply, 1.5A maximum, 12 VDC
RF Loop Cable for connection of RF Out to Air/Cable input

Options

RK1 Single Rack Kit, 1RU
RK2EZ Dual Rack Kit, 1RU
RF-AB RF A-B Switch, self-terminating, closure controlled (if system has dual Air and Cable feeds)
IR-RXC External IR Receiver
CC-COM or CC-232 RS-232 Control Cable
CC-COM 3.5 or CC-COM 3.5x with 3.5mm mini plug

Safety Instructions and Warranty

Read before operating equipment.

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

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

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

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

Warranty and Return Policy

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

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

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

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

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

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

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

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

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

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

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