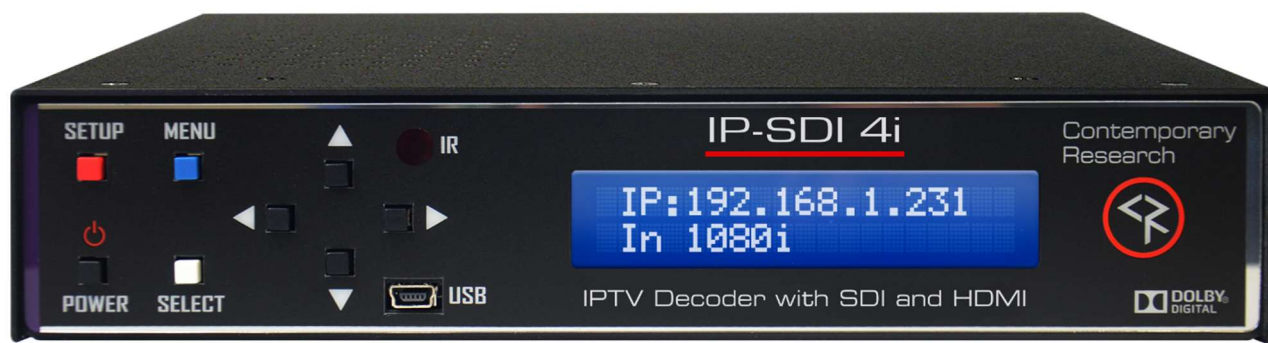




IP-SDI 4i IPTV Decoder

Product Manual



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1. Overview

The Contemporary Research IP-SDI 4i Decoder is a professional MPEG-TS IPTV video decoder in a convenient half width single space rack mount package. The IP-SDI 4i accepts MPEG-2 or H.264 encoded UDP and RTP transport streams up to 1080p/60. The unit features simultaneous SDI and HDMI outputs with video scaling from 480i to 1080p. The user can select channels, volume, and power from the front panel controls, handheld IR remote, onboard web page, or external control system.

Operation requires that a channel list of source program streams be entered in the unit's memory. The entry for each IPTV program will include a channel number by which it may be selected for viewing using the optional handheld IR remote, web page, or external control command. Channel up/down commands will step through the channels in the list. CR Toolbox software is a free PC application designed to connect and update CR products. It may be used to create and edit the channel list and upload the list to one or more IP-SDI 4i units. Individual channels may be added to or deleted from the list using CR Toolbox software or via RS-232 command.

Features

Decoding

- MPEG-TS IPTV streams
- MPEG-2 or H.264 video up to 1080p/60
- Supports AC-3, MPEG 1 Layer 2, and AAC audio formats
- Multicast or Unicast
- SPTS or MPTS

Video

- HDMI Type A, Version 1.4b
- SDI output SD/HD/3G
- Output scaling to 480i, 720p, 1080i, 1080p, or Auto

Audio

- SDI embedded AC-3 pass-through, PCM Fixed, or PCM Variable assigned to pair 1
- HDMI embedded AC-3 pass-through, PCM Fixed, or PCM Variable
- S/PDIF coaxial and optical AC-3 pass-through, PCM Fixed, or PCM Variable
- Variable Analog stereo

Closed Captions

- Decodes digital closed captioning
- Closed caption data available as EIA-708 caption data on SDI output

Setup and Control

- Front panel control for Power, Channel, Volume, Menu and Setup
- Control via optional HD2-RC handheld IR remote
- Two-way control via RS-232 serial commands, Telnet, or UDP for use with third-party control systems.
- On board web pages for control, configuration, and status
- One-way control via iCC-Net UDP control commands for power, channel selection, and volume
- Channel list loaded or updated using CR Toolbox. May be edited using RS-232 commands
- Channel selection by direct channel entry or channel up/down command
- Setup via Front panel menu, On-screen menu, web pages, or RS-232 serial commands
- Firmware updateable over Ethernet with CR Toolbox software

2. Connecting the IP-SDI 4i

Connect the HDMI or SDI output to a compatible video display. Analog and S/PDIF optical digital audio outputs are available for connection to an amplifier or audio system processor. Connect the Ethernet port to a network switch or directly to the output of an IPTV encoder. Connect the external power supply to an appropriate power source.

After the IP-SDI 4i is connected, a channel list will need to be uploaded to begin viewing programs.

3. IPTV – Unicast/Multicast

The IP-SDI 4i can receive an MPEG-TS IPTV transport stream that is transmitted as unicast or multicast. Network switch considerations should be based on which method will be implemented.

Unicast

Unicast communication is used when the IPTV stream is to be transmitted from one encoder directly to one decoder. Only one decoder can view the content of the IPTV stream at a time. The encoder can be connected to the IP-SDI 4i directly or through a network switch. This mode is for simple one-to-one communication from the encoder to the decoder. The unicast stream will be received at the IP address specified in the unit's configuration. The unicast IP address must be different than the unit's normal IP address.

The unicast stream can be SPTS (single program transport stream) or MPTS (multiple program transport stream). Each program will be able to be accessed by direct channel entry or channel up/down.

Multicast

Multicast communication allows for an IPTV stream from one or many encoders to be viewed by one or many decoders while minimizing network traffic. Multicast communication requires a Layer 2 managed network switch. The network switch will need to have IGMP snooping enabled. The IPTV stream from the encoder is assigned a unique IP destination address and port in the range reserved for multicast. An IPTV stream is not forwarded by the switch until it receives a request from the decoder.

Each multicast stream may be SPTS (single program transport stream) or MPTS (multiple program transport stream). The programs will be able to be accessed by direct channel entry or channel up/down.

4. Channel List

A channel list will need to be uploaded to the IP-SDI 4i. The channel list will contain a channel number, channel name and related information for each IPTV stream that is to be available for viewing.

The available IPTV streams are referenced by their channel number. An IPTV stream may be selected for viewing by entering the associated channel number from the web page, IR remote, or other control source. Channel Up/Down from the front panel, web page, IR remote, or other control source will step through the channels entered in the channel list.

The channel list can be uploaded through an Ethernet connection using CR Toolbox software, or by a terminal emulator over telnet or RS-232.

Refer to Section 12 for more information.

5. Setup

Several options are available to access control functions and configuration settings for the IP-SDI 4i.

Front Panel

For normal operation, the **Up/Down** buttons step through the entries in the channel list that has been loaded into the unit's memory. **Left/Right** buttons are used to control the variable audio output level.

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

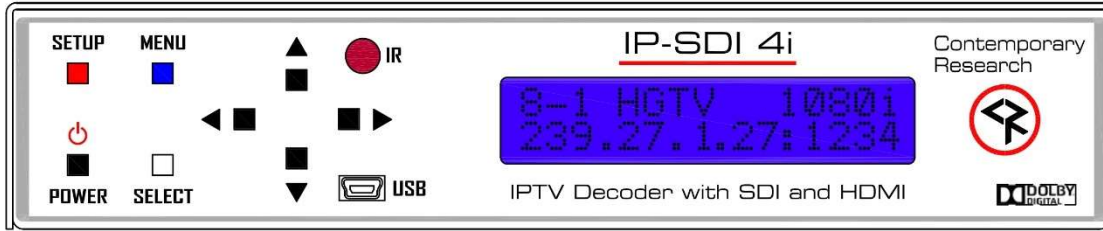
Web Pages

On board web pages are available control and configuration. Connect the Ethernet port of the IP-SDI 4i to a PC. A crossover cable is not required. Open a web browser in the PC and enter the IP address of the IP-SDI 4i into the address bar to access the web pages. The default IP address is 192.168.1.231. The current IP address may be displayed on the front panel by holding down the **Setup** button.

RS-232 Serial Control

The IP-SDI 4i supports full two-way control and configuration via RS-232 serial ASCII strings from a terminal program or control system processor. Connection to the unit for RS-232 communication may be through the DB-9 connector on the rear panel, Telnet, or UDP port 31931.

6. Front Panel Operation



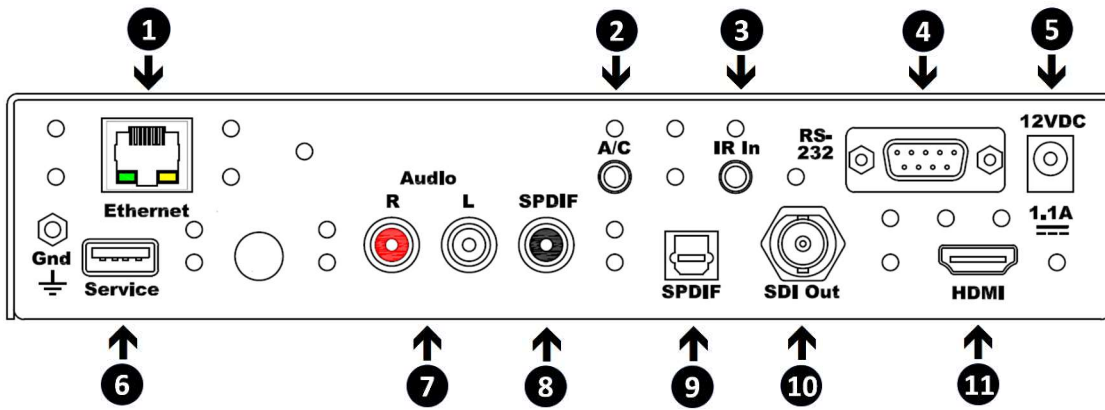
Button	Operation
Power	Toggle On Off
Setup	Push to enter front panel Setup menu Push to back out of Setup menu selection Push to exit Setup menu Hold and release to display current IP address
Menu	Push to display on-screen Graphical Audio/Video menu
Select	Push to select new Setup menu item Push to display 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

7. Front Panel Setup Menus

A/V Setup - Factory Defaults are shown in Bold	
HD Res	Sets the output resolution from 480i to 1080p
RefreshRate	59.94 60 Hz
Digital Audio	PCM PCM Variable AC-3
Captions	On Off
ACap Mode	CC1 CC2 CC3 CC4 Text1 Text2 Text3 Text4
Dcap Mode	Service 1 Service 2 Service 3 Service 4 Service 5 Service 6
Overscan	0 –9 <i>Selects percentage of overscan for video output.</i>
HDMI-DVI	Auto HDMI DVI .
HDMI Audio	On Off
AC3 Cmpr	Line RF <i>Compression mode for AC-3 downmix to stereo (RF enhances dialog).</i>
Channel Box	Enable Disable

System Setup	
Baud Rate	1200 2400 4800 9600 19200 38400 115K 230K
Panel Lockout	None Ch+Menu Vol+Menu Ch+Vol+Menu Power Setup Menu All Setup+Menu Pwr+Setup+Menu
Backlight	1–10
LCD Contrast	1–10
IR Receive	IR On IR Off
Firmware	Right or Left arrow scrolls through firmware versions and displays power supply voltage. <i>Example:</i> IP-SDI 4i_V3.17 — Control Firmware BL Ver V1.01 — Bootloader Firmware HD Version 1.09 — Decoder Firmware Hardware Rev E1 Volt in = 11.8
Network Setup	
IP Address	192.168.1.241
IP Mode	Static DHCP <i>IP address, gateway, and subnet cannot be changed in DHCP mode.</i>
IP Gateway	192.168.1.1
Subnet Mask	255.255.255.0
IP Port	23 <i>Telnet port</i>
MAC/SN	00:14:C8:1A:xx:xx
Unicast IPA	xxx.xxx.xxx.xxx <i>Sets the destination address to receive unicast streams</i>
UDP Reply	On Off <i>Enables UDP replies from port 31932</i>
Clear Network Password	Clear Network Password for web page access.

8. Rear Panel Connections



1 Ethernet

RJ-45 jack, 10/100Mbps for IPTV output, control, web page access, configuration, and firmware updates.

2 A/C

3.5 mm TRS jack, not used.

3 IR In

3.5 mm TRS jack for optional external infrared receiver or wired IR from a control system processor.

Tip – IR Data

Ring - Ground

Sleeve - +12 VDC (100 mA max)

4 RS-232

DB-9 male RS-232 data link for control, configuration, and firmware updates.

5 12VDC

2.1 mm coaxial jack (inside center conductor positive), 11 to 14 VDC, 12 VDC typical, 1.1 A maximum.

6 Service

USB-A port for decoder firmware updates.

7 Audio L, R

RCA jacks for stereo analog audio output. The analog audio level will follow the volume control settings.

8 SPDIF

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

9 SPDIF

EIAJ optical jack for S/PDIF digital audio output. The audio format follows the digital audio output settings.

10 SDI Out

BNC female jack for SDI video, audio, and embedded closed caption data.

12 HDMI

HDMI receptacle for HDMI video and audio output, Type A, Version 1.3a.

9. Setup Notes

SDI and HDMI Outputs

The SDI and HDMI outputs are active simultaneously. The table below shows the available resolution and frame rate combinations.

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

DVI

The HDMI output is compatible with DVI input devices using an appropriate adaptor cable. DVI mode is normally automatically detected when Auto is selected in the HDMI-DVI menu. Forced DVI or forced HDMI may be selected from the HDMI-DVI menu setting.

Audio

All audio outputs are active simultaneously. The audio format options are AC-3, PCM, and PCM variable. The volume level settings do not affect the level of digital audio when set for AC-3 or PCM. PCM Variable supports volume control on all audio outputs. The analog audio output will follow the volume level settings and is independent of the audio format selected. If there is no audio, make sure the volume is all the way up (and not muted). A “motorboat” sound may indicate that the display does not support AC-3, and the mode should be changed to PCM or PCM variable.

SDI audio will be embedded on pair one. If AC-3 is selected in the configuration menu, the audio will be encoded as Dolby E.

IR Control

The IP-SDI 4i supports infrared control from the HD3-RC handheld infrared remote or equivalent. The unit is backwards compatible with the HD2-RC IR remote. The decoder will also respond to a universal programmable remote with the TV type set for Sharp.

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 captioning data is available on the SDI video output as EIA-708 caption data. On-screen captioning may be enabled from the on-screen menu, IR remote, web page control, or RS-232 commands.

Front Panel Lockout

The front panel buttons of the decoder may be locked out to prevent unwanted tampering. The setting is available in the front panel System Setup menu, System web page, or may be configured by RS-232 serial command. The 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 allowing full access to the setup menus.

Network Addressing

Below are the default IP settings.

- IP address 192.168.1.231
- Subnet Mask 255.255.255.0
- Default Gateway 192.168.1.1

The current IP address can be found on the front panel by holding the **Setup** button. If the IP mode is set for DHCP and no DHCP server is available, the IP address of 000.000.000.000 will appear.

Although the unit has only one physical Ethernet connection, internally there are two network interfaces. Traffic to each interface is automatically managed.

The primary network interface is for communication, control, and firmware updates and will have the IP address assigned to the unit. The MAC address will be 00:14:C8:17:xx:xx. The second network interface is for the IPTV traffic. The MAC address will be 24:F5:7E:xx:xx:xx.

If no unicast IPTV stream is in the channel list, it is best practice to set the Unicast Destination Address to the default setting of 000.000.000.000. This should prevent any potential unintended IP address conflicts.

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 by RS-232 command. The command may be sent via the RS-232 serial port, Telnet, or UDP. The command may also be sent from the **Send Cmd** tab in CR Toolbox. Note that if the connection is via the RS-232 port and the baud rate setting is different than the default 9600, the connection will be lost as the baud rate will immediately revert to the default.

- Send the command string '>Z!'
- Send the command string 'Z]' to emulate a hard power cycle. The default IP communication settings will be restored, so the current Telnet session may be ended.

To restore the factory default setting from the System web page, follow the steps below.

- Click on the **Reset** button next to **Reset All Default Values**.
- To emulate a hard power cycle from the web page, click on the **Command** button next to Send Decoder Command. Enter 'Z]' in the pop-up field and click OK. The default IP communication settings will be restored, so the web page access may be lost.

10. Web Pages

The IP-SDI 4i has on-board web pages for control, monitoring, and configuration. The web pages may be accessed using 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 decoder in the equipment list will launch the default web browser and navigate to the decoder.

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 front panel **Setup** button.

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 decoder. 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** 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.: 1A0C2A

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.

System Web Page

IP-SDI 4i

IP-SDI 4i-0003

CONTROL

SYSTEM

NETWORK

CHANNELS

A/V

ABOUT

Log Out

Baud Rate:

9600

Panel Lockout:

None

LCD Backlight:

6

LCD Contrast:

5

IR Receive:

IR On

Application Version:

V3.17

Bootloader Version:

V1.00

HD Firmware Version:

1.09

Hardware Revision:

E1

Input Voltage:

11.3

Restore Factory Default Values

Restore

Send Decoder Command

Command

Decoder Cntl while logged out

☒

New password:

Change

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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 decoder 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 **Decoder Control while logged out**.

If this option is enabled, a **Decoder Control** button will appear on the log-in page. Clicking on the **Decoder 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 decoder’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 decoder’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.

Restore Default Password

The password may be reset to the default by reloading the factory default settings. Refer to the previous section in page 8 of this document relating to restoring the factory default settings.

Control Web Page

IP-SDI 4i

IP-SDI 4i-0003

CONTROL

SYSTEM

NETWORK

CHANNELS

A/V

ABOUT

Log Out

Power

On

Channel

1-1

720p

Fox

Program

No Title

1

2

3

Ch+

4

5

6

Ch-

7

8

9

0

-

Enter

PrevCh

Volume

90

Mute

UNMUTED

Menu

^

<

Select

>

v

Exit

CC

Audio

Info

Ratio

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Network Web Page

IP-SDI 4i

IP-SDI 4i-0003

CONTROL

SYSTEM

NETWORK

CHANNELS

A/V

ABOUT

No Password

Browser Address:

192.168.001.013

IP Address:

192.168.001.235

IP Mode:

Static

Gateway Address:

192.168.001.001

Subnet Mask:

255.255.255.000

IP Port (telnet):

23

iCC-Net Device:

257

MAC Address:

00:14:C8:1A:00:03

UDP Reply:

Off

Unicast Addr:

000.000.000.000

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Channels Web Page

IP-SDI 4i

IP-SDI 4i-0003

CONTROL

SYSTEM

NETWORK

CHANNELS

A/V

ABOUT

No Password

Start-up Channel Select: Last Viewed

Channel List					
Num	Name	Pgm	Prot	IP Address	Port
1	Fox	1	UDP	239.027.000.101	1234
2	CNN	2	UDP	239.027.000.102	1234
3	Weather	1	UDP	239.027.000.103	1234
4	KOBJ	2	UDP	239.027.000.104	1234
5	ESPN	1	UDP	239.027.000.105	1234
6	Bloom	2	UDP	239.027.000.106	1234
7	Sign 1	1	UDP	239.027.000.107	1234
8	Sign 2	2	UDP	239.027.000.107	1234

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A/V Web Page

IP-SDI 4i

IP-SDI 4i-0003

CONTROL

SYSTEM

NETWORK

CHANNELS

A/V

ABOUT

Log Out

16:9

4:3

Screen Display:

Box

Full

Zoom

Ratio

HD Resolution:

1080i

Output Refresh Rate:

59.94Hz

Digital Audio:

PCM

Captions:

Off

Analog Captions:

Caption 1

Digital Captions:

Service 1

Overscan:

0 %

HDMI Output Mode:

Auto

HDMI Audio:

On

AC3 Compression Mode:

Line

Channel Change Box:

Enable

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About Web Page

IP-SDI 4i

IP-SDI 4i-0003

CONTROL

SYSTEM

NETWORK

CHANNELS

A/V

ABOUT

IP-SDI 4i

Version: V3.30

<http://contemporaryresearch.com>

Libraries used by this product

FNET

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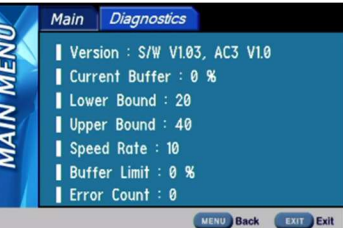

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11. On-Screen AV Menu

Press Menu on the front panel or optional HD3-RC handheld infrared remote to access On-Screen AV Menu.

Main Menu  The screenshot shows the 'Main' menu with a blue background. On the left, a vertical bar says 'MAIN MENU'. The main area has three buttons: 'Caption', 'Setup', and 'Diagnostics'. At the bottom, there are navigation buttons: 'Move', 'Select', 'MENU', 'Exit', and 'EXIT'.	<p>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 all menus
Caption Menu  The screenshot shows the 'Cap' menu. On the left, a vertical bar says 'CAPTION'. The main area has three buttons: 'On/Off', 'Service Mode', and 'Digital Font Options'. At the bottom, there are navigation buttons: 'Move', 'Select', 'MENU', 'Back', and 'EXIT'.	<p>This menu accesses captioning features:</p> <ul style="list-style-type: none">• On/Off – turns captions on/off – <i>other options are not available if captions are off</i>• Service Mode – Service 1 – 6• Digital Font Options<ul style="list-style-type: none">• 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 or Background• Edge – 6 style options
Setup Menu  The screenshot shows the 'Setup' menu. On the left, a vertical bar says 'SETUP'. The main area has four buttons: 'Screen Format', 'Time', 'Sound', and 'Menu Language'. At the bottom, there are navigation buttons: 'Move', 'Select', 'MENU', 'Back', and 'EXIT'.	<p>Select Sub Menus</p> <ul style="list-style-type: none">• Screen Format• Time• Sound• Menu Language
Screen Format  The screenshot shows the 'Screen Format' menu. On the left, a vertical bar says 'SETUP'. The main area has a 'Select Display' label and two buttons: '4:3' and '16:9'. At the bottom, there are navigation buttons: 'Move', 'Select', 'MENU', 'Back', and 'EXIT'.	<p>Set the aspect ratio of the connected display device. The Ratio command can also toggle through the available options for each display setting.</p> <ul style="list-style-type: none">• 4:3 Display offers three options for 16:9 video: 16:9 (letterboxed), 4:3 (stretched vertically), and Zoom• 16:9 Display offers three options for 4:3 video: 4:3 (pillar boxed), 16:9 (stretched horizontally), and Zoom
Time Menu  The screenshot shows the 'Time' menu. On the left, a vertical bar says 'SETUP'. The main area has two buttons: 'Daylight Saving' and 'Time Zone'. At the bottom, there are navigation buttons: 'Move', 'Select', 'MENU', 'Back', and 'EXIT'.	<p>Configures time settings:</p> <ul style="list-style-type: none">• Daylight Saving• Time Zone <p>Note: Time data is derived from STT data in received IPTV stream if available.</p>

<p>Sound Menu</p> 	<p>The Sound menu allows for access to sound related settings:</p> <ul style="list-style-type: none"> • Multi-Track Sound – Select available audio tracks • Digital Output – Select AC-3, PCM, or PCM Variable • Auto Volume – Enable/Disable dynamic range compression
<p>Menu Language</p> 	<p>Select the language for the on-screen AV menus and graphics.</p>
<p>Caption Menu</p> 	<p>This menu accesses captioning features:</p> <ul style="list-style-type: none"> • On/Off – turns captions on/off – <i>other options are not available if captions are off</i> • Service Mode – Service 1 – 6 • Digital Font Options <ul style="list-style-type: none"> • 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 or Background • Edge – 6 style options
<p>Diagnostics</p> 	<p>Displays decoder firmware and AC-3 software versions, current buffer usage, buffer parameters, and error count.</p>
<p>Info Banner</p> 	<p>On-screen Info banner may be accessed by the following:</p> <ul style="list-style-type: none"> - Info button press on IR remote or control web page - Hold Select button on the front panel - RS-232 serial command

12. Creating the Channel List

A list of available channels will need to be entered into the IP-SDI 4i prior to viewing IPTV streams. The list will include an entry for each channel. The entry for each channel will include UDP/RTP, channel number, IP address and port, program number, and channel name. Each channel's IP address can be that of a unicast or multicast stream. The list can contain a mix of unicast and multicast addresses. An entry will need to be made for each program of a multiple program transport stream.

In the case of a unicast stream, the IP address in the channel list will need to match the unicast address entered in the Network menu of the web page, front panel Network Setup menu or by RS-232 command. The unicast address cannot be identical to the IP address of the unit.

A channel number is assigned to each IPTV stream and is used for identification. The channel number is used to recall a channel directly either by the optional handheld remote, web page, or a command from a control system processor. One-part and two-part channel numbers are supported. The valid range for one-part channel numbers is 1 to 9999, and the valid range for two-part channel numbers is 1-1 to 999-999. Two-part channel numbers are useful in the situation where an RF encoder/modulator is used as the channel's source, and the output is set for a simultaneous RF and IP stream.

The channel name is limited to seven characters.

There are three ways to enter the channel list.

- Individual channels can be added using the AC command via the RS-232 serial port or Telnet.
- Individual channels can be added using CR Toolbox software
- A list of channels can be added by creating a text document of the entire channel list and uploading the list using CR Toolbox.

RS-232

Two commands are required when adding channels via RS-232. The channel is added using the AC command and stored in NVRAM using the WC command. Multiple channels may be added before sending the WC command.

The order of information is UDP/RTP, multicast or unicast address, port, program ID, channel number, name. *(A colon separates all fields except UDP/RTP and IP address octets.)*

Example of the commands and the response strings from the IP-SDI 4i:

```
>AC=U239.27.1.101:1234:1:1:Fox
<AC=OK
>WC
<WC=OK
```

CR Toolbox

The screenshot shows the CR Toolbox software interface with the 'Channel List' tab selected. The interface includes a table of channels, a 'From Unit' dropdown menu, and a 'Send Channel List' button.

Channel	Channel Name	Prog	Mode	IP Address	Port
<input type="checkbox"/> 1	Fox	1	UDP	239.27.0.101	1234
<input type="checkbox"/> 2	CNN	1	UDP	239.27.0.102	1234
<input type="checkbox"/> 3	Weather	1	UDP	239.27.0.103	1234
<input type="checkbox"/> 4	KOBJ	1	UDP	239.27.0.104	1234
<input type="checkbox"/> 5	ESPN	1	UDP	239.27.0.105	1234
<input type="checkbox"/> 6	Bloom	1	UDP	239.27.0.106	1234

From Unit: **MY IP-SDI 4i**

File path: **C:\CR Data\Toolbox\IpSDI4i\Channel List.txt**

Buttons: **Create File**, **Get File**

Form fields for adding/modifying channels:

Add/Modify	Channel	Channel Name	Prog	Mode	IP Address	Port
Remove	<input type="text"/>	<input type="text"/>	<input type="text"/>	UDP	<input type="text"/>	<input type="text"/>

Send Channel List to MY IP-SDI 4i – Done

CR Toolbox may be downloaded from the Software Product section of the Contemporary Research website. Once launched, CR Toolbox will look for Contemporary Research devices on the network. CR Toolbox can also connect with individual devices through an RS-232 serial port.

Click on the IP-SDI 4i tab in the device section to view the list of IP-SDI 4i units. Click on the Ch List tab to create a channel list. Channel information will need to be entered in the appropriate fields for each IPTV stream. After the fields are complete, click on the Add/Modify button and the channel list will be updated. The IP-SDI 4i supports one-part or two-part channel numbers to be compatible with hybrid IP/RF systems. Two-part channel numbers are entered as X-X.

Once the channel list is complete, it will need to be uploaded to each IP-SDI 4i. In the device list, click on the checkbox to select the IP-SDI 4i units to receive the channel list. Click on the Send Channel List button to send the channel list.

The channel list can be saved as a text file for later recall by clicking on the Create File button.

Text Editor

Notepad or other text editor can be used to create a channel list to be viewed or uploaded using CR Toolbox. The following is an example list of eight channels. The order of information is UDP/RTP, multicast address, port, program ID, channel number, then name. For Contemporary Research QMOD/QIP encoders, the default Program ID for Program A is 1, and 2 for Program B. In the alternate format, the udp://@ can be shortened to start with U or R (RTP).

```
udp://@239.027.0.101:1234 :1 :1 :Fox
udp://@239.027.0.102:1234 :2 :2 :CNN
udp://@239.027.0.103:1234 :1 :3 :Weather
udp://@239.027.0.104:1234 :2 :4 :KOBJ
udp://@239.027.0.105:1234 :1 :5 :ESPN
udp://@239.027.0.106:1234 :2 :6 :Bloom
udp://@239.027.0.107:1234 :1 :7 :Sign 1
udp://@239.027.0.107:1234 :2 :8 :Sign 2
```

Alternate format:

```
U239.027.0.101:1234 :1 :1 :Fox
U239.027.0.102:1234 :2 :2 :CNN
U239.027.0.103:1234 :1 :3 :Weather
U239.027.0.104:1234 :2 :4 :KOBJ
U239.027.0.105:1234 :1 :5 :ESPN
U239.027.0.106:1234 :2 :6 :Bloom
U239.027.0.107:1234 :1 :7 :Sign 1
U239.027.0.108:1234 :2 :8 :Sign 2
```

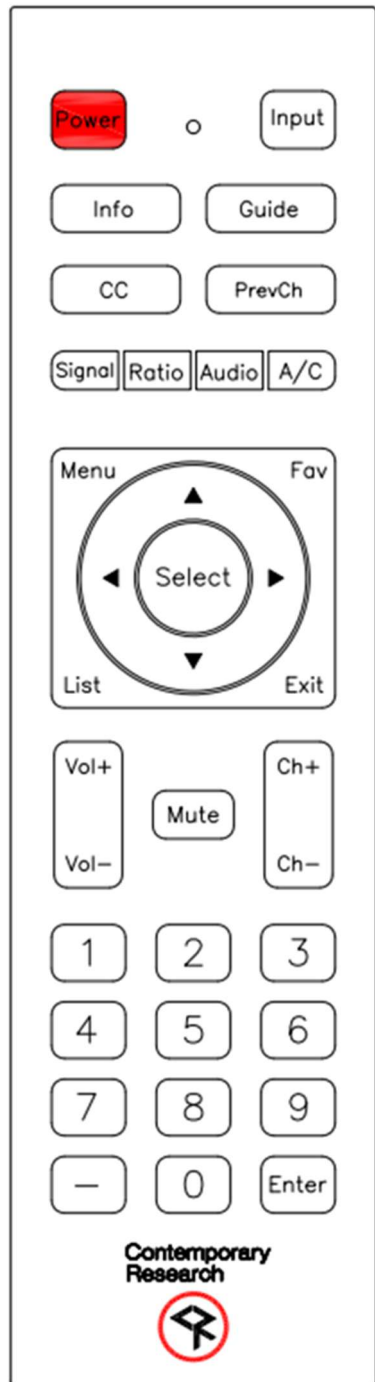
Example showing two-part channel numbers:

```
udp://@239.027.001.030:5010 :3 :5.1 :KXAS-DT
udp://@239.027.001.030:5010 :4 :5.2 :COZI-TV
```

Save the list as a .txt file to the C:/CR Data/Toolbox/IpSDI4i folder or other location. The list can be opened in CR Toolbox using the Get File button. In the device list, click on the checkbox to select the IP-SDI 4i units to receive the channel list. Click on the Send Channel List button to send the channel list.

13. HD3-RC IR Remote

The optional HD3-RC IR Remote can be used for setup and for daily operation. All functions on the remote have equivalent commands in RS-232, Telnet, and wired IR formats. In addition, the IP-SDI 4i front panel buttons are available for Power, Channel, Volume, Menu, Setup, and Select. 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 audio level.

Channel Selection

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

One-part channels are accessed using XX.

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

Menu Operation

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

- Use the directional arrows, **Select** and **Exit** to navigate the 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 available MTS audio programs
- Ratio steps through aspect ratio options.
- Info launches on-screen information banner.

Some features of the special function commands may not be available if unsupported in the IPTV stream.

14. RS-232/Telnet/UDP Control Protocol

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

Communications parameters are 1200 to 230,400 baud, 8 data bits, no parity, and 1 stop bit. Factory default is 9600 baud. The RS-232 port will accept non-standard 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 control communication is possible via IP Telnet (up to two sessions) and via UDP to the decoder's IP address to port 31931 (fixed) with status feedback to port 31932. Status feedback to port 31932 is disabled by default, send ">UO" command (UF turns UDP status feedback off) or set with front-panel menu. The default Telnet port is 23.

General Protocol Specifications

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

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

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

Command String Structure

[Attention]	[Command] (Parameters) [Return]
Attention	Single character (>) starts the string
Command	A two-character command
Parameters	Added attributes to some commands
Return	A carriage return ends the command string (ASCII CR, Hex \$0D, or keyboard Enter) may be used in programming. For simplicity, the programming examples in the manual will not show the 'CR'.

Command and Status Response

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

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).

```
>VL  
<VL=62
```

Table of RS-232 Serial Control Commands

Code	Function	Operation
Front Panel		
P1	Power On	Bring unit out of standby
P0	Power Off	Place unit in standby, mute audio and video
PT	Power Toggle	Toggle standby mode
S4=	Set Front Panel Lockout Mode	0=None 5=Setup 1=Ch+Menu 6=Menu 2=Vol+Menu 7=All 3=Ch+Vol+Menu 8=Setup+Menu 4=Power 9=Power+Setup+Menu Press Select and Right 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=	LCDC Contrast	Set LCD display contrast 1-10
Channel List		
AC=	Add Channel to list	The order of information is UDP/RTP, source address, port, program ID, channel number, name. Example: >AC=U239.27.1.101:1234:1:1:Fox
DC=	Delete Channel from list	<i>Example: DC=8-2 deletes channel 8-2</i>
WC	Write Channel List to NVRAM	Save list - <i>Required after channel add or delete</i>
CC	Clear Channel	Clear channel list from NVRAM
LC	Print Channel List	Return channel list
Channel Selection		
TC=	Selet Channel	Direct channel entry
TU	Tune channel up	Select next higher channel in channel list
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	Return program name, up to 30 characters, 15 additional if there are not-ASCII characters, such as ñ
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
KK=141	1080i	Set the output resolution to 1080i
KK=142	720p	Set the output resolution to 720p
KK=144	480i	Set the output resolution to 480i
KK=145	1080p	Set the output resolution to 1080p
R6	Refresh Rate	Set to 59.94 Hz
RM	Refresh Rate	Set to 60 Hz

Code	Function	Operation
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=	Sets volume level 0-100	Volume level, scaled in 100 steps
VL=	Sets volume level 0-63	Volume level, scaled in 63 steps (compatibility mode)
VM	Volume Mute Enabled	Mute all audio outputs
VX	Volume Mute Disabled	Restore audio to previous level
VT	Toggle Volume Mute	Toggle mute mode
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
Status Request		
SQ	Request Q Mode status	Return Q Mode status string
SS	Request S Mode status	Return S Front Panel status string
ST	Request T Mode status	Return T Channel/Source status string
SV	Request A mode status	Return V Audio status string
Network Setup		
IP=	IP Address	IP=xxx.xxx.xxx.xxx Define IP address >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. D or S at end of IP indicates 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=xxxxxx Define Telnet port
UA=	Unicast Address	UA=xxx.xxx.xxx.xxx Define the address for receiving unicast IPTV streams
DH=	Disable Web Page	0=Web Page Access Enable 1=Web Page Access Disable
CP	Clear Password	Clear the password for web page access
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 IP-SDI 4i name, limited to 20 characters.
NM	Get Name	Return the IP-SDI 4i 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 power cycle.
Z]	Reboot	Emulate a reboot from a hard power cycle

Code	Function	Operation	
HD2-RC IR Remote Emulation			
KK=	Emulate HD2-IR Button Presses	9=Power Toggle	101=Previous Channel
		10=0	105=Menu
		11=1	106=Right
		12=2	107=Left
		13=3	108=Up
		14=4	109=Down
		15=5	110=Enter/Select
		16=6	111=Exit
		17=7	115=CC
		18=8	141=Output Resolution 1080i
		19=9	142=Output Resolution 720p
		21=Enter/Select	144=Output Resolution 480i
		22= Channel Up	145=Output Resolution 1080p
		23=Channel Down	155=16:9 Ratio Pillar Box
		24=Volume Up	4:3 Ratio Letterbox
		25=Volume Down	156=16:9 Ratio Full Wide
		26=Mute Toggle	4:3 Ratio Full
		27=Power On	157=16:9 Ratio V Zoom
		28=Power Off	4:3 Ratio H Zoom
		29=Menu	158=AC=3
		63=Guide	159=PCM
		81=Signal	160=PCM Variable
		82=Ratio	161=Display 16:9
		99=Dash	162=Display 4:3
		100=Info	

Response Strings

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

IP-SDI 4i 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 for the IP-SDI 4i; characters will appear in status strings as lower-case x.

Channel/Source Status Response String (T):

Start	Unit	CMD	Power	Major Channel	Video Mute	Input	RF	Received Resolution	Minor Channel	NA	Function
	Fixed		U=On M=Off	3 digits	Unmuted	N/A	N/A	0=1080i 1=720p 2=480p 3=480i 4=1080p N=No Sig	3 digits		0=None
<	1	T	U	032	U	x	x	0	002	x	0

The IP-SDI 4i channel status is split into Major Channel and Minor Channel sections. For one-part channels 999 or lower, the channel number will be displayed as the major channel, the minor channel will display "F00". As one-part channels can go higher than 999, the Minor status will indicate how many thousands (up to 63) to be added to the Major number. As an example, channel 1032 would be represented as Major channel 032 and Minor channel F01. Two-part channel numbers are limited to 999-999.

Audio Status Response String (V):

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

Volume 1 emulates 232-series volume level for compatibility with existing applications.

Volume 2 shows actual IP-SDI 4i level, from 0-100 steps. Audio status will be sent if the audio is muted by any means.

Front Panel Mode Status Response String (S):

Start	Unit	CMD	Audio	Tune Mode	Lockout	Bass	Treble	Output	Output Resolution	Output Setting	NA
	Fixed		N/A	N/A	0-7	Fixed 2 digits	Fixed	0=RGB 2=YpBPr	0=1080i 1=720p 3=480i 4=1080p	0=1080i 1=720p 3=480i 4=1080p	4 digits
<	1	S	x	x	0	08	4	2	0	0	xxxx

Q Mode Response String (Q):

Start	Unit	CMD	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	NA
	Fixed		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

15. RS-232 Connection Wiring Diagram

Control Wiring - Single Decoder



16. Unidirectional iCC-Net Control Protocol

The IP-SDI 4i 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 IP-SDI 4i 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 IP-SDI 4i 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, IP-SDI 4i decoder, 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.

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.

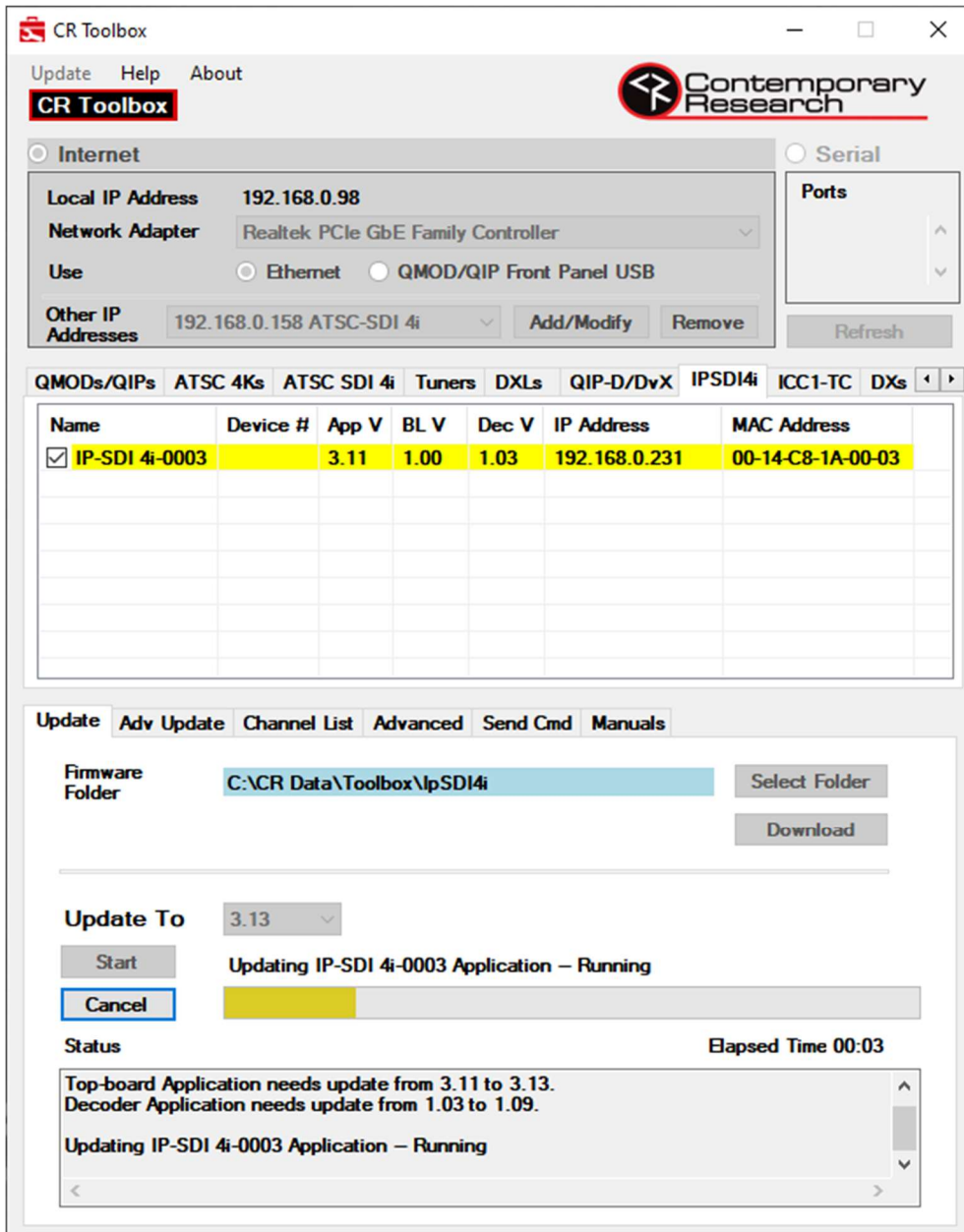
Go to www.asciitable.com for a handy Decimal/ASCII/Hex conversion chart.

Table of iCC-Net 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>

17. Firmware Update

CR Toolbox software for Windows will be required for full firmware updates to the IP-SDI 4i 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/>.



It is best for an internet connection be available when using CR Toolbox. Upon launch, CR Toolbox will scan the local subnet for supported Contemporary Research devices. When a device tab is selected, CR Toolbox will compare the firmware available if any on the local hard drive with the firmware available on the Contemporary Research cloud firmware database for that device. If newer firmware is available for download, the **Download** button will turn red.

Click on the **IP-SDI 4i** tab to view a list of connected devices. If no devices are found, verify the appropriate network adaptor has been selected from the drop-down menu and that the network adaptor and IP-SDI 4i devices are set for the same subnet.

Follow this procedure to perform a firmware update:

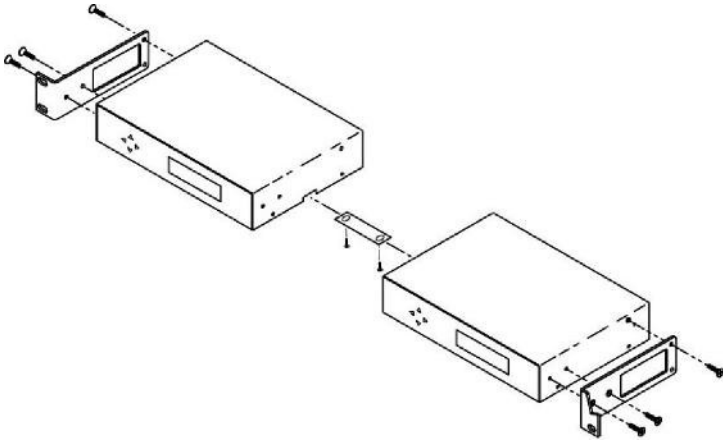
- Click the checkbox for the IP-SDI 4i units to be updated
- Select the desired version from the **Update To** drop down menu
- Press **Start** to initiate the update
- Status of the update will be displayed in the Status box.
- When the process is complete, the status bar will turn green.
- The status bar will turn red if any part of the firmware update fails

18. Universal Rack Mount Kit

The IP-SDI 4i is shipped with 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 Rack Mounting

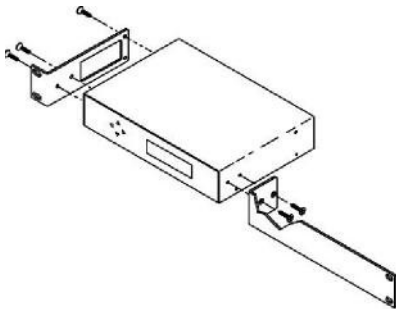


When mounting two components in one RU rack space, use the two short rack ears and the tie bar assembly.

Note that the early QDA4-45 and QCA9-33 units have solid side panels and should not be mounted next to components with the ventilation holes, as the airflow will be blocked.

- 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.

19. IP-SDI 4i Specifications

Decoding

- Accepts UDP and RTP MPEG-TS Ethernet IPTV streams
- Decodes MPEG-2 or H.264 IPTV streams with AC-3, MP1/2, or AAC audio
- Supports single program or multiple program transport streams
- On board closed caption decoder supports EIA-608 and EIA-708 embedded closed captions

Physical

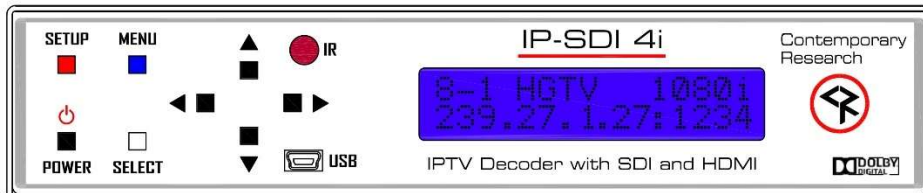
Size (HWD): 8.5" [216 mm] wide x 1.75" [44 mm] height (1 RU) x 8.0" [203 mm] deep

Weight: 1.85 lbs [841 g]

Enclosure: Aluminum with black powder coat paint

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

Front Panel



Display: Text display, white text on blue LCD

Top line indicates channel number, channel name and resolution.

Lower line indicates IP address and port number of IPTV stream.

IR: IR Sensor

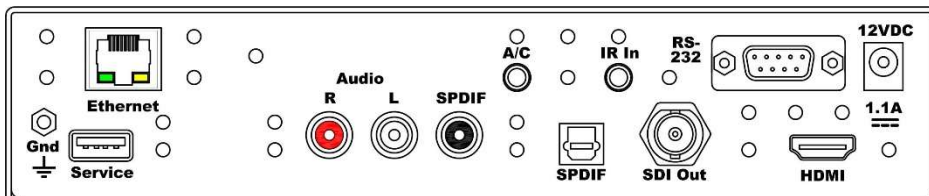
Control: Power, Menu, Setup, and Select buttons

Up and Down (Channel Up and Down) buttons

Left and Right (Volume Up and Down) buttons

USB: For future use

Rear Panel



Service: USB-A port - Decoder firmware updates

Ethernet: RJ-45 connector, 10/100 Mbps

Audio: RCA analog stereo variable level

SPDIF: Coaxial digital audio output

SPDIF: Optical digital audio output

IR In: 3.5 mm TRS jack for optional external IR receiver or wired IR

Tip= IR Data

Ring= Ground

Sleeve= Power+ from 12 VDC input, 100 mA max

A/C: N/A

SDI Out: SD/HD/3G Level A

HDMI: Type A, HD video and digital audio

RS-232: DB-9 male data link to control system

12VDC: 2.1 mm coaxial jack (inside center conductor positive), 1.1 A max

Includes

PS12-1.5 Power Supply, 1.5 A maximum, 12 VDC (5402-001)

RKU Universal Rack Kit

Options

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

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

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

RK2EZ Dual Rack Kit, 1 RU (5008-015)

IR-RXC External IR Receiver (5032-001)

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

Trademarks



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

20. Safety Instructions and Warranty

Read before operating equipment.

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

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

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

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

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

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

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

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

Return Material Authorization (RMA) Number: Before returning a product for repair or replacement, request an RMA from Contemporary Research's technical support. Provide tech support with a return phone number, e-mail address, shipping address, product serial numbers

and original purchase order number. Describe the reason for repairs or returns as well as the date of purchase. See the General RMA Terms and Procedures section for more information. RMA's are valid for 30 days and will be issued to authorized Contemporary Research dealers only. End users must return products through authorized Contemporary Research dealers. Include the assigned RMA number in all correspondence with Contemporary Research. Write the assigned RMA number clearly on the shipping label of the box when returning the product. All products returned for credit are subject to a restocking charge without exception.

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

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

Products not under Warranty: Payment arrangements are required before outbound shipment for all out of warranty products.

General RMA Terms and Procedures: RMA's are valid for 30 days and will be issued only to authorized active Contemporary Research dealers and distributors.

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

Advanced Replacement Policies:

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

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



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