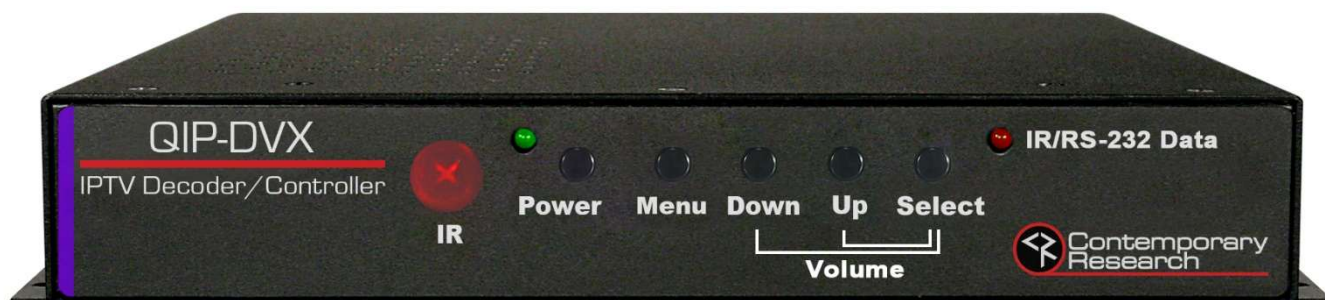




QIP-DVX IPTV Decoder/Controller

Product Manual



Contents

1. Overview3

2. Installing the QIP-DVX4

3. IPTV – Unicast/Multicast4

4. Channel List4

5. QIP-DVX Control and Setup5

6. Front Panel Operation5

7. Rear Panel Connections.....6

8. Setup Notes7

9. On-Screen Text Menus9

10. HD3-RC Handheld IR Remote11

11. On-Screen Graphical A/V Menu12

12. Edit IP Address Settings14

13. Web Pages14

14. Creating and Loading the Channel List18

15. RS-232/Telnet/UDP Bidirectional Control Protocol.....20

16. iCC-Net Control Overview.....25

17. iCC-Net Unidirectional Control Protocol30

18. Firmware Update.....34

19. QIP-DVX Specifications35

20. Safety Instructions and Warranty.....37

1. Overview

The Contemporary Research QIP-DVX IPTV Decoder/Controller is an MPEG-TS video decoder with an integrated display controller. The QIP-DVX accepts MPEG-2 or H.264 encoded UDP and RTP transport streams up to 1080p/60.

The QIP-DVX IPTV Decoder/Controller features an HDMI output with video scaling from 480i to 2160p. Users may select channels, volume, and power from the front panel controls, handheld IR remote, web page, or external control system.

When used as part of an IP based iCC-Net control system, the decoder/controller will respond to power, channel and volume commands and the integrated display controller may be used to control power and source selection on the connected display device.

The integrated display controller allows for RS-232 or IR control of the connected display device when used in conjunction with the Display Express Lite application included with an IP-DXL or ICE-HE-DXL Display Control Center, Display Express software, or a third-party control system. HDMI CEC display control may be used in lieu of RS-232 or IR for display power functions only in conjunction with compatible display devices.

The QIP-DVX IPTV Decoder/Controller has an on-board control database of RS-232 protocols and IR libraries for many common displays and video projectors. The display type may be selected when configuring the unit. As a result, custom programming is not required for display control when used with Display Express, or an IP-DXL or ICE-HE-DXL display control center with Display Express Lite.

Operation requires that a channel list of 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 QIP-DVX units. Individual channels may be added to or deleted from the list using CR Toolbox software or via RS-232 command.

Features

Decoding

- MPEG-2 or H.264 video up to 1080p
- Decodes MPEG-1 Layer 2, or AAC audio formats
- SPTS or MPTS

Stream Protocols

- MPEG-TS
- UDP or RTP
- Multicast or Unicast
- IGMP v2, v3

Video

- HDMI Type A, Version 1.4b
- Output scaling to 480i, 480p, 720p, 1080i, 1080p, and 2160p
- Adjustable overscan

Audio

- HDMI embedded AC-3, PCM Fixed, or PCM Variable
- S/PDIF optical AC-3, PCM Fixed, or PCM Variable
- Variable Analog stereo

Closed Captions

- Decodes digital closed captioning

Setup and Control

- Control via front panel, on-board web pages, RS-232 commands, or optional HD3-RC IR remote
- Channel list loaded or updated using CR Toolbox. May be edited using RS-232 commands
- Two-way control via RS-232, telnet, or UDP for use with third-party control systems
- One-way control via iCC-Net UDP control commands for power, channel selection, volume, and display control functions
- RS-232 or IR output for display control
- CEC control available on HDMI output for most CEC enabled displays
- Setup via on-screen menus, web pages, or RS-232 serial commands
- Firmware updateable over Ethernet using CR Toolbox software for PC

2. Installing the QIP-DVX

The slim profile of the QIP-DVX allows for mounting behind a flat panel display. The unit may be attached to the flat panel display with user provided hook and loop fastener adhesive tape or attached to the wall using the mounting ears. The unit may also be set on a suitable shelf or other stable flat surface.

Connect the HDMI output to a video display, video matrix/router, or video encoder. Analog and S/PDIF digital audio outputs are available for connection to an amplifier, audio system processor, or other compatible audio input. Connect the Ethernet port to the IPTV network switch or directly to the output of an IPTV encoder. The QIP-DVX will need to be connected to an appropriate power source. The unit may be powered from a PoE injector or PoE enabled network switch through the Ethernet port, or the optional PS12-1.0 power supply.

After the QIP-DVX is connected, a channel list will need to be uploaded to the unit prior to viewing programs.

3. IPTV – Unicast/Multicast

The QIP-DVX can receive an IPTV MPEG-TS transport stream that is transmitted as unicast or multicast. Network switch considerations should be based on which method will be required for the intended application.

Unicast

Unicast communication is used when the IPTV stream is to be transmitted directly from one encoder to one decoder. Only one decoder can view the content of the IPTV stream at a time. The encoder may be connected to the QIP-DVX directly or through an unmanaged or managed 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 may 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 encoders is assigned a unique IP destination address and port in the range reserved for multicast. An IPTV stream is not forwarded by the switch to a decoder 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 QIP-DVX. 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.

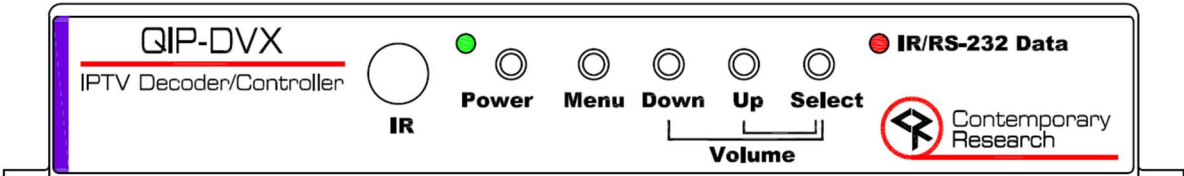
Refer to Section 14 for more information.

5. QIP-DVX Control and Setup

The control and setup functions of the QIP-DVX may be accessed by multiple means:

- Front Panel or Handheld IR Remote
- Wired IR from a control system interface.
- Two-way RS-232 Serial Commands directly via rear panel 3.5mm TRS RS-232 jack, Telnet, or UDP.
- One-way RS-232 Serial Commands through an ICE-HE-DXL or broadcast UDP. Reply strings are not returned.
- Web Pages – Enter the QIP-DVX IP address in the address bar of an internet browser on a connected device. The default IP address is 192.168.1.241. The Control web page mimics the optional HD3-RC handheld IR remote.

6. Front Panel Operation



Front Panel Button Operation

Button	Operation
Power	Toggles On Off
Menu	Push to display on-screen Audio/Video menu Hold and release to display on-screen Communication Setup menu
Down	Channel Down
Up	Channel Up
Select	Displays on-screen info banner, Hold and release to display IP address
Select + Down	Volume Down
Select + Up	Volume Up
Down + Up	Toggles Audio Mute
Select + Menu	Reset A/V to factory settings
Up + Menu	Unlocks previously locked buttons until power cycle

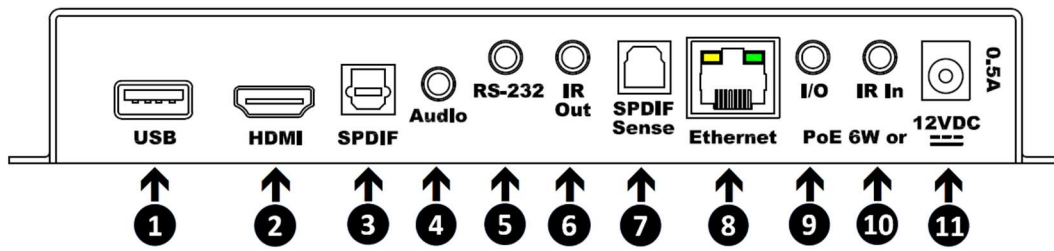
Power LED Operation

Mode	Status
Red Solid On	Unit is Off
Green Solid On	Receiving valid video input stream
Green Slow Blink	Waiting for valid video stream (one second on, one second off)
Green Fast Blink	Powering up (¼ second on, ¼ second off)
Red Flash	IR remote button press
Green, Staggered Blink	On-screen Menu (Blink-Blink-Pause sequence)
Red Fast Blink	Bootloader Mode (uses RS-232 connector)
Red/Green Alternating	Firmware Update Mode

IR/RS-232 Data LED Operation

Mode	Status
Red Flash	IR / RS-232 Data Transmit

7. Rear Panel Connections



- 1 USB**
USB-A service port. May be used as an alternate method for updating decoder firmware.
- 2 HDMI**
HDMI output receptacle, Type A, Version 1.3. The output normally automatically detects a DVI display. The output mode may be set to Auto, HDMI, or DVI. The audio format follows the digital audio output settings.
- 3 SPDIF**
JIS F05 jack for optical digital audio output. The format of the output follows the digital audio settings.
- 4 Audio**
3.5 mm TRS stereo output for variable level stereo analog audio.
- 5 RS-232**
3.5 mm TRS jack RS-232 data link to control system or for display control. Supports two-way communication for use with a third-party control system processor or one-way communication for video display control. Baud rate is user configurable, 8 data bits, no parity, 1 stop bit. When the QIP-DVX is configured for RS-232 display control, the port becomes transmit only and the port settings are automatically configured depending on the display device type selected unless otherwise noted.
Tip= Data Transmit
Ring= Data Receive
Sleeve= Ground
- 6 IR Out**
3.5 mm TRS jack for IR display control. For use with optional CC-IRE infrared emitter or other compatible infrared emitter.
Tip= Output
Ring= N/C
Sleeve= Ground
- 7 SPDIF Sense**
Input available for display power sense. The input detects S/PDIF activity from the display to determine the display power status.
- 8 Ethernet**
RJ-45 jack, 100 Mbps, PoE
- 9 I/O**
Logic input may be used to detect display power status. Optional CC-USB Power Sense Cable (5061-013) may be used or other voltage source. Logic output function is not currently supported.
Tip= N/C
Ring= Input 5 to 12 VDC
Sleeve= Ground
- 10 IR In**
3.5 mm TRS jack for optional external IR receiver or wired IR from a control system processor.
Tip= 5 VDC (50 mA max)
Ring= Input
Sleeve= Ground

11 12VDC

Power input 2.1 mm coaxial jack (inside center conductor positive). May be used in lieu of Ethernet PoE.

8. Setup Notes

HDMI Output

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

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

The default aspect ratio is 16:9. The aspect ratio of 4:3 is supported. This setting is available in the on-screen graphical AV Setup menu.

The HDMI digital audio format follows the digital audio output format setting in the A/V Setup Menu.

Video Resolution and Frame Rate

Available video resolutions and frame rates are shown in the table below. The default setting is 720p/59.94.

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

Audio Output

The HDMI digital audio and S/PDIF digital audio outputs have three available formats. The setting applies to all digital audio outputs.

- PCM Variable
- PCM
- AC-3 (Digital Passthrough)

The volume level setting does not affect digital audio in AC-3 (Digital Passthrough) or PCM formats. PCM Variable enables volume control on all audio outputs. The analog audio output is always active. The analog audio outputs always follow the volume control settings. If there is no audio, verify the volume is all the way up (and not muted).

IR Control

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

The power LED indicator will flash red when an IR command is received.

IR control data may be received via the front panel IR sensor or an IR-RXD or equivalent remote IR sensor connected to the rear panel IR port. IR control may be disabled in the on-screen System Setup text menu, System web page, or RS-232 serial command. Disabling IR control applies to both the front panel IR sensor and the rear panel IR port.

Web Pages

The QIP-DVX has on-board web pages for control and configuration. The web pages may be accessed by the internet browser of any device on the network by entering the unit's IP address in the browser address bar. All web page access is password protected by default. Various web page modes are available.

- Password required to access all web pages.
- Free access to tuner control web page, but password required to access configuration web pages.
- Free access to all web pages, no password required.
- Disable all web page access.

RS-232 Control Port

Depending on the application, the RS-232 port may be configured for one-way or full two-way communication. For installations which the QIP-DVX will be used for controlling the display device, the RS-232 port will be transmit only. Control strings will be sent to the display, but the unit will not respond to any response data on the receive pin from the display. The RS-232 Data LED however will flash green when data is received which may be useful for troubleshooting purposes.

Two-way communication will allow for full control of the QIP-DVX from a third-party control system processor when display control is not desired.

To configure the RS-232 port for one-way communication, an RS-232 display device type must be entered when configuring the QIP-DVX. Compatible display device types are listed in the table on page 29. To configure the RS-232 port for two-way communication, enter 0 for the display device type.

Network Addressing

Below are the default IP settings.

- IP address 192.168.1.241
- 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 **Select** button on the front panel. 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, there are two internal 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 A/V Settings

The video and audio default settings may be restored from the front panel should a resolution be selected that is not supported by the connected display. The default output resolution is 720p/59.94 as this is supported by a wide variety of display types.

The default AV settings may be restored by simultaneously pressing **Menu** and **Select** buttons on the front panel.

Restore Factory Default Settings

The password will be reset to the default by reloading the factory default settings. This may be performed from the **System** web page. Click on the **Restore** button next to **Restore Factory Default Values**. It is recommended to perform a hard power cycle after the default settings are restored.

If access to the web page is not available, the factory default settings may be restored from the on-screen text **System Setup** menu. Follow the steps below to reload the factory default settings.

- Hold and release the **Menu** button to display the on-screen text menu.
- Press **Up** or **Down** to step through the menu options until **System Setup** is displayed, then press **Select**.
- Press **Up** or **Down** until **Firmware** is displayed, then press **Select**.
- Press **Up** or **Down** until **QIP-DVX V3.xx** is displayed in the lower row of text.
- Simultaneously press **Power** and **Up**.

Alternately, the factory default settings may be reloaded by RS-232 serial command. Refer to Section 15 for additional information.

9. On-Screen Text Menus

The on-screen text menus contain settings for communication and control as well as some A/V related settings. The menus may be accessed by holding and releasing the **Menu** button on the front panel. The menus may also be accessed using the HD3-RC handheld IR remote by pressing the **Menu** button twice.

On-Screen Setup Menu Button Operation

Button	Function
Power	Exit OSD Menu Mode
Menu	Hold to enter OSD Menu Mode Push to exit OSD Menu Mode
Down	Next menu item
Up	Previous menu item
Select	Data Entry Mode <i>See table below</i>

Data Entry Mode Button Operation

Button	Function
Menu	Go to previous field or back to Menu
Up / Down	Change selected data
Select	Go to next field or save selected data and go back to Menu

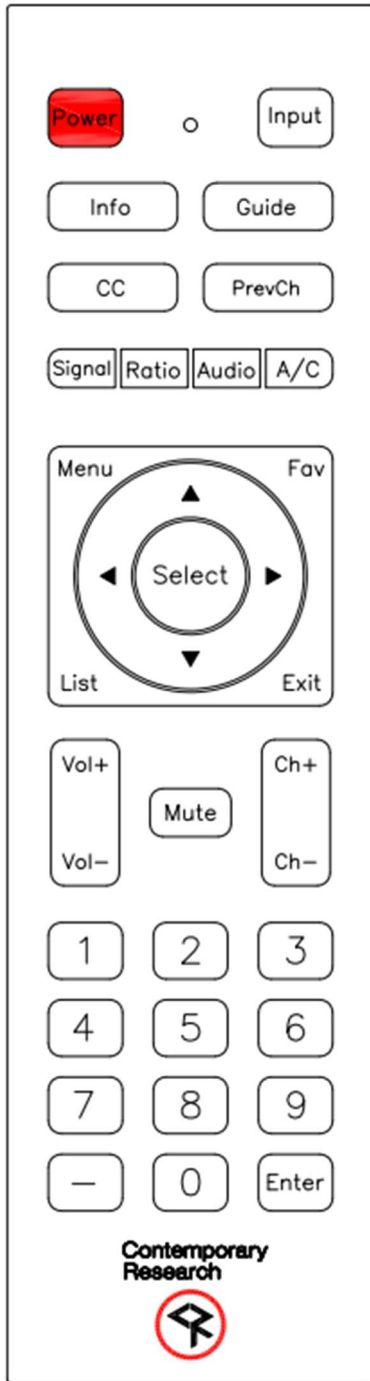
On-Screen Text Configuration Menus

Setting	Options (default settings shown in Bold)
System Menu	
Baud Rate	1200 2400 4800 9600 19.2K 38.4K 115.2K 230.4K
Comm Params	8 N 1 7 S 1 7 M 1 8 S 1 8 M 1 7 N 2 7 E 1 7 O 1 8 N 2 8 E 1 8 O 1
Pnl Lockout	None Ch+Menu Vol+Menu CH+Vol+Menu Power Menu All Pwr+Menu
IR Receive	On Off
TV Control	None CEC RS-232 IR <i>If RS-232 is selected, the RS-232 port will be transmit only and receive will be disabled</i>
CEC TV Ctl Mode	Disabled Display On Display On/Off <i>Menu item available only if TV Control is set for CEC</i>
232 TV Ctl Type	Display type for RS-232 control <i>Menu item available only if TV Control is set for RS-232</i>
IR TV Ctl Type	Display type for IR control <i>Menu item available only if TV Control is set for IR</i>
Firmware	Firmware versions <i>Press Select, then Up/Down to scroll through versions</i> QIP-DVX V3.43 – System Firmware HW Rev A2 – Hardware Version Boot Ldr V1.02 – Bootloader Version Decoder V1.45 – Decoder Firmware

Setting	Options (default setting shown in Bold)
A/V Menu	
Output Resolution	480i 480p 720p 1080i 1080p 2160p60 Auto 2160p30
HD Output	YPbPr RGB
Refresh Rate	59.94Hz 60Hz <i>Not applicable to 480i, 480p</i>
Overscan %	<i>Set the image overscan 0 – 9%</i>
HDMI-DVI	Auto HDMI DVI
HDMI Audio	On Off
AC3 Cmpr Mod	<i>Set the compressor mode for the AC-3 downmix</i> Line RF
Channel Box Enable	<i>Enable the channel box on-screen graphic that appears during a channel change</i> On Off
Network Menu	
IP Address	192.168.1.241
IP Mode	Static DHCP <i>Gateway and Subnet Mask settings are retained when toggled from DHCP to Static</i>
Gateway	192.168.1.1
Subnet Mask	255.255.255.0
IP Port	0023 (0 – 16535)
iCC-Net Dev	Enter display device number (1 - 4000)
UC Dst Addr	Set the destination address to receive unicast streams <i>Must be different than unit's IP address</i>
MAC/SN	00:14:C8:19:xx:xx
UDP Reply	On Off
HTTP Disable	<i>Disable web page access</i> On Off
Clear Network Password	<i>Press Select to clear the password for web page access</i>

10. HD3-RC Handheld IR Remote

The optional HD3-RC IR Remote (5024-005) may be used for setup and daily operation of the QIP-DVX. The QIP-DVX is equipped with a front panel IR sensor and a rear panel IR input jack for connection to an optional IR-RXD (5034-001) or compatible remote IR receiver. Each of the functions on the remote have equivalent commands in RS-232, Ethernet, and wired IR formats.



Power

Press to toggle on and off.

Volume Control

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

Channel Selection

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

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

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

Menu Operation

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

- Use the directional arrows, **Select** and **Exit** to navigate the on-screen menus.
- **Exit** closes the on-screen menu.
- **Menu** reverts to the previous menu or closes the on-screen menu from the Main Menu.
- **Enter** selects the menu choice.

Special Functions

- **CC** steps through available closed-captioning options.
- **Ratio** steps through aspect ratio options.
- **Info** launches on-screen information banner.
- **Input** steps through display inputs set with iCC-Net ER command.

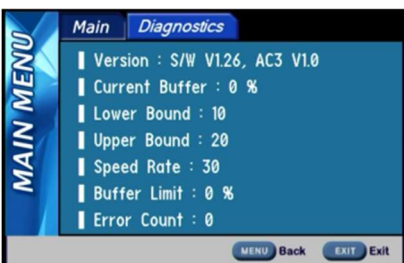
Some features of the special function commands may only be available if supported in the received IPTV stream.

11. On-Screen Graphical A/V Menu

Press **Menu** on the front panel, Control web page, or optional HD3-RC handheld infrared remote to access on-screen AV Menu. The action may be emulated from a control system processor via the wired IR input.

Main Menu The screenshot shows the 'Main Menu' interface. On the left, a vertical blue bar contains the text 'MAIN MENU'. The main area has a blue background with three white buttons: 'Caption', 'Setup', and 'Diagnostics'. At the top, there are tabs for 'Main' and 'Cap'. At the bottom, a control bar includes a 'Move' button, a 'Select' button, and 'MENU Exit' and 'EXIT Exit' buttons.	Select Sub Menus • Down or Up highlights option • Select + Down moves left (front panel control only) • Select + Up moves right (front panel control only) • Select chooses Option • Menu steps back or exits menu
Caption Menu The screenshot shows the 'Caption Menu' interface. On the left, a vertical blue bar contains the text 'CAPTION'. The main area has a blue background with three white buttons: 'On/Off', 'Service Mode', and 'Digital Font Options'. At the top, there are tabs for 'Main' and 'Cap'. At the bottom, a control bar includes a 'Move' button, a 'Select' button, and 'MENU Back' and 'EXIT Exit' buttons.	This menu accesses captioning features: • 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 • 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' interface. On the left, a vertical blue bar contains the text 'SETUP'. The main area has a blue background with four white buttons: 'Screen Format', 'Time', 'Sound', and 'Menu Language'. At the top, there are tabs for 'Main' and 'Setup'. At the bottom, a control bar includes a 'Move' button, a 'Select' button, and 'MENU Back' and 'EXIT Exit' buttons.	Select Sub Menus • Screen Format • Time • Sound • Menu Language
Screen Format The screenshot shows the 'Screen Format' interface. On the left, a vertical blue bar contains the text 'SETUP'. The main area has a blue background with the text 'Select Display' and two options: '4:3' and '16:9'. At the top, there are tabs for 'Main' and 'Screen Format'. At the bottom, a control bar includes a 'Move' button, a 'Select' button, and 'MENU Back' and 'EXIT Exit' buttons.	Set the aspect ratio of the connected display device. The Ratio command can also toggle through the available options for each display setting. • 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 	Sub menus for time settings. Time data is extracted from the System Time Table in the digital channel's transport stream if available. When Daylight Saving is enabled, the decoder will adjust the time as needed if the daylight savings flag is enabled in the System Time Table.
Time Zone 	Options for Time Zone Front panel navigation • Select + Down to move left • Select + Up to move right
Sound Menu 	The Sound menu allows for access to sound related settings: • Digital Output – Select PCM, or PCM Variable • Auto Volume – Enable/Disable dynamic range compression
Menu Language 	Options for on-screen AV menu language • English • Spanish • French

Diagnostics 	Displays decoder firmware versions, current buffer usage, buffer parameters, and error count.
--	--

Info Banner	
	On-screen Info banner may be accessed by the following: • Info button press on IR remote or control web page • Hold Select button on the front panel • Serial command

12. Edit IP Address Settings

The IP address settings may be edited using the on-screen text menu. The IP mode is set to static by default.

Follow the steps below to edit the static IP address settings.

- Hold and release the **Menu** button to display the on-screen text menu.
- Press **Up** or **Down** to step through the menu options until **Network Setup** is displayed, then press **Select**.
- Press **Down** if needed to step through the menu until **IP Address** is displayed.
- Press **Select** to activate the cursor. Press **Up** or **Down** to edit each digit, then press **Select** to move to the next digit to continue the process. Press **Menu** to back up if needed.
- Scroll down and repeat the process for the Subnet and Gateway.
- Press **Menu** twice to exit the on-screen menu.

Follow the steps below to enable DHCP.

- Hold and release the **Menu** button to display the on-screen text menu.
- Press **Up** or **Down** to step through the menu options until **Network Setup** is displayed, then press **Select**.
- Press **Up** or **Down** to step through the menu until **IP Mode** is displayed.
- Press **Select** to activate the cursor. Press **Up** or **Down** to toggle from Static and DHCP, then press **Select**.
- Press **Menu** twice to exit the on-screen menu.

The IP address settings may also be edited using RS-232 serial command strings. Refer to Section 15 for more information.

13. Web Pages

The QIP-DVX 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 tuner.

The default IP address is 192.168.1.241. The unit's current IP address may be found in the on-screen text **Network Setup** menu. Hold and release the front panel **Menu** button and select the **Network Setup** menu. The IP address is the first menu item displayed.

The web pages may be disabled if desired. Two methods are available for disabling access to the web pages.

- HTTP Disable setting in on-screen Network Setup text menu.
- >DH=1 RS-232 serial command. Refer to Section 15 for more information.

Beginning with Application firmware v3.28, access to the on-board web pages will be password protected by default.

Three modes of protection are available.

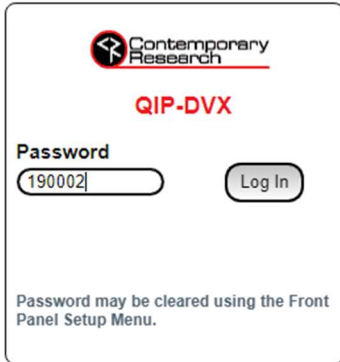
- Password will be required to access all web pages (default).
- Free access to the Control web page, but password will be required to access all other web pages.
- Free access to all web pages.

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

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 information is also available in the on-screen text **Network Setup** menu. To access the on-screen text **Network Setup** menu, follow these steps below.

- Hold and release the **Menu** button to display the on-screen text menu.
- Press **Up** or **Down** to step through the menu options until **Network Setup** is displayed, then press **Select**.
- Press **Up** or **Down** to step through the menu until **MAC/SN** 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 characters should be entered with no punctuation or spaces. Letters should be entered as upper case. i.e.: 19013C

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.

Free Access to Control Web Page Only

An option is available that will allow password free access to the Control web page while maintaining password protected access to the web pages related to setup and configuration. To enable this option, log in and navigate to the **System** web page. Click the checkbox next to **Decoder Control while logged out** near the bottom of the page.

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.

Free Access to All Web Pages

Clearing the password will allow password free access to all 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 on-screen text **System Setup** menu. Follow the steps below.

- Hold the **Menu** button to display the on-screen text menu.
- Press **Up** or **Down** to step through the menu options until **Network Setup** is displayed, then press **Select**.
- Press **Up** or **Down** until **Clear Network Password** is displayed.
- Press the **Select** button to clear the password.

Reset Default Password

The password will be reset to the default by reloading the factory default settings. This may be performed from the **System** web page. Click on the **Restore** button next to **Restore Factory Default Values**. It is recommended to perform a hard power cycle after the default settings are restored.

If access to the web page is not available, the factory default settings may be restored from the on-screen text **System Setup** menu. Follow the steps below to reload the factory default settings.

- Hold the **Menu** button to display the on-screen text menu.
- Press **Up** or **Down** to step through the menu options until **System Setup** is displayed, then press **Select**.
- Press **Up** or **Down** until **Firmware** is displayed, then press **Select**.
- Press **Up** or **Down** until **QIP-DVX V3.xx** is displayed in the lower row of text.
- Simultaneously press **Power** and **Up**.

Alternately, the factory default settings may be reloaded by RS-232 command. Refer to Section 15 for additional information.

Control Web Page

QIP-DVX

QIP-DVX-0002

CONTROL SYSTEM NETWORK CHANNELS A/V ABOUT

Log Out

Power

On

Channel

35-1

1080p

QMOD-B

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

Contemporary Research

© 2022 Contemporary Research Corporation

System Web Page

QIP-DVX

QIP-DVX-0002

CONTROL SYSTEM NETWORK CHANNELS A/V ABOUT

Log Out

Baud Rate:

9600

Panel Lockout:

None

IR Receive:

IR On

Dev Num:

257

TV Control:

RS-232

TV 232 Ctl Type:

53

Application Version:

V3.271

Bootloader Version:

V1.02

HD Firmware Version:

1.39

Hardware Revision:

A2

Input Voltage:

11.3

Restore Factory Default Values

Restore

Send Decoder Command

Command

Decoder Cntl while logged out

☐

New password:

Change

Contemporary Research

© 2022 Contemporary Research Corporation

Channels Web Page

QIP-DVX

QIP-DVX-0002

CONTROL SYSTEM NETWORK CHANNELS A/V ABOUT

Log Out

Channel List

Num	Name	Pgm	Prot	IP Address	Port
34-1	QMOD-A	1	UDP	239.027.000.027	1234
35-1	QMOD-B	1	UDP	239.027.000.028	1234
35-2	QMOD-C	2	UDP	239.027.000.029	1234

Contemporary Research

© 2022 Contemporary Research Corporation

Network Web Page

QIP-DVX

QIP-DVX-0002

CONTROL SYSTEM NETWORK CHANNELS A/V ABOUT

Log Out

Browser Address:

192.168.000.052

IP Address:

192.168.001.241

IP Mode:

Static

Gateway Address:

192.168.000.001

Subnet Mask:

255.255.252.000

IP Port (telnet):

23

MAC Address:

00:14:C8:19:00:02

UDP Reply:

On

Unicast Addr:

000.000.000.000

Contemporary Research

© 2022 Contemporary Research Corporation

A/V Web Page

QIP-DVX

QIP-DVX-0002

CONTROL

SYSTEM

NETWORK

CHANNELS

A/V

ABOUT

Log Out

16:9

4:3

Screen Display:

Ratio

Box

Full

Zoom

HD Output:

YPbPr

HD Resolution:

1080p

Output Refresh Rate:

60Hz

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

Contemporary Research

© 2022 Contemporary Research Corporation

About Web Page

QIP-DVX

QIP-DVX-0002

CONTROL

SYSTEM

NETWORK

CHANNELS

A/V

ABOUT

QIP-DVX

Version: V3.27I

<http://contemporaryresearch.com>

Libraries used by this product

FNET

Copyright © 2005-2018

by Andrey Butok, FNET Community

Licensed under Apache 2.0

Contemporary Research

© 2022 Contemporary Research Corporation

14. Creating and Loading the Channel List

A list of available channels will need to be uploaded to the QIP-DVX prior to viewing the IPTV streams. Each channel entry will include UDP/RTP, channel number, IP address and port, program number, and channel name. Each channel's IP address may be that of a unicast or multicast stream. The list may 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 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.

The channel list may be entered three ways.

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

RS-232

A minimum of two command strings are required when adding channels via RS-232. A 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.)*

The example below shows the command and response strings for adding a new channel to the QIP-DVX.

```
>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 QIP-D' dropdown, an 'In File' section with a file path and buttons, and an 'Add/Modify' section with input fields for channel details.

Channel	Channel Name	Prog	Mode	IP Address	Port
☐ 1	Fox	1	UDP	239.27.0.101	1234
☐ 2	CNN	1	UDP	239.27.0.102	1234
☐ 3	Weather	1	UDP	239.27.0.103	1234
☐ 4	KOBJ	1	UDP	239.27.0.104	1234
☐ 5	ESPN	1	UDP	239.27.0.105	1234
☐ 6	Bloom	1	UDP	239.27.0.106	1234

From QIP-D: [Dropdown]

In File: C:\CR Data\Toolbox\Qipd\CH List Manual.txt [Create File] [Get File]

Add/Modify: Channel [1] Channel Name [Fox] Prog [1] Mode [UDP] IP Address [239.27.0.101] Port [1234]

Remove: [Button]

Send Channel List: [Button]

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 QIP-D/DvX tab in the device section to view the list of QIP-D/DVX units. Click on the Channel 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.

Once the channel list is complete, it will need to be uploaded to the QIP-D/DVX units. In the device list, click on the checkbox to select the QIP-D/DVX units to receive the channel list. Click on the Send Channel List button to send the channel list.

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

Text Editor

Notepad or other text editor may be used to create a channel list. 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 QMOD/QIP encoders, the default Program ID for Program A is 1, and 2 for Program B. In the alternate format, the udp://@ may 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
```

The QIP-DVX 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.

```
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/Qipd folder. The list may be opened in CR Toolbox using the **Get File** button. In the device list, click on the checkbox to select the QIP-D/DVXs to receive the channel list. Click on the **Send Channel List** button to send the channel list.

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

The QIP-DVX 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 commands can be sent over IP Telnet (up to two sessions) and via UDP to the decoder/controller's IP address to port 31934 (fixed). The default Telnet port is 23. Setting the Telnet port to 0 disables telnet communication. UDP responses are disabled by default. UDP responses may be enabled in the web page Network Settings menu or RS-232 command. Responses will be sent to port 31933 at the broadcast IP address of the decoder/controller's subnet.

General Protocol Specifications

Command strings sent to the QIP-DVX 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 QIP-DVX 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

Usually, commands may be sent back-to-back at any time without any delay. For the case of sending many commands, such as writing a long channel list, a delay of 50msec between command strings is needed. To allow for rapid, multiple commands, status responses are intentionally delayed by about 125 mS, sending the latest status in response to control commands or user actions.

String Example

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

```
>TC=6-2
<1TU006Uxx1002x0
```

The status of a setting may be queried by omitting the = (equals symbol). The following command queries the 64-step volume level.

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

Table of RS-232 Control Commands

Code	Function	Operation
Front Panel		
P1	Power On	Bring unit out of standby
P0	Power Off	Place unit in standby, mutes audio and video
PT	Power Toggle	Toggle standby mode
S4=	Front Panel Lockout Mode	0=None 1=Ch+Menu 2=Vol+Menu 3=Ch+Vol+Menu 4=Power 6=Menu 7=All 9=Power+Menu Press Menu and Up key to unlock temporarily
Q5=	IR Receive Mode	0=IR receive disabled 1=IR receive enabled This setting applies to front panel IR sensor and rear panel IR input jack
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	Example: DC=8-2 deletes channel 8-2
WC	Write Channel List to NVRAM	Save list - Required after channel add or delete
CC	Clear Channel List	Clear channel list from NVRAM
LC	Print Channel List	Returns channel list
Channel Selection		
TC=	Select Channel	Select IPTV stream based on channel number entered in channel list
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 non-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	1=Caption 1 2=Caption 2 3=Caption 3 4=Caption 4 5=Text 1 6=Text 2 7=Text 3 8=Text 4
Q7=	Digital Caption Service	1=Service 1 2=Service 2 3=Service 3 4=Service 4 5=Service 5 6=Service 6
KK=141	Output Resolution	Set to 1080i
KK=142	Output Resolution	Set to 720p
KK=143	Output Resolution	Set to 480p
KK=144	Output Resolution	Set to 480i
KK=145	Output Resolution	Set to 1080p
KK=146	Output Resolution	Set to 2160p
R6	Refresh Rate	Set to 59.94 Hz
RM	Refresh Rate	Set to 60 Hz
D0=	Channel Change Box	Display on-screen channel number graphic during channel change 0=Disable 1=Enable (Default)

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=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=	Sets IP Address	IP=xxx.xxx.xxx.xxx Defines IP address, then sends status IP returns the current MAC address, current IP address, subnet mask, and gateway. Response example: \$MAC=0014C81A001B IP=192.168.001.241S IG=192.168.001.001 IM=255.255.000 IY=1. S or D at end of IP signifies DHCP or Static address. 000.000.000.000 indicates DHCP, but no DHCP server detected.
IM=	Subnet Mask	IM=xxx.xxx.xxx.xxx. Define subnet mask
IG=	Default Gateway	IG=xxx.xxx.xxx.xxx. Define default gateway
IY=	IP Address Mode	1=Static 2=DHCP
MC	MAC Address	Return the MAC address
IX=	Telnet Port	IX=xxxxxx Define Telnet port
UN	UDP Reply Enable	Enable UDP replies on port 31934
UO	UDP Reply Disable	Disable UDP replies on port 31934 (Default)
UA=	Unicast Address	UA=xxx.xxx.xxx.xxx. Define the address for receiving unicast IPTV streams.
DH=	Disable HTTP	Disable access to web pages 0=Enable web pages 1=Disable web pages
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

Response Strings

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

QIP-DVX status response strings contain ASCII characters similar to those used for the same functions in command strings. An ASCII 'carriage return' and 'line feed' follow each response string. Functions shown as N/A are not applicable or available in the QIP-DVX; 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 QIP-DVX channel status is split into Major Channel and Minor Channel sections. The Minor Channel will always be 000 for analog channels. The Minor Channel status will display “F00” if the Major channel is a special “one-part” digital channel. Also, as one-part channels may 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 QIP-DVX level, from 0-100 steps. Mute status will be sent following mute command from an IR remote, front panel, or web page.

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	0-9	Fixed 2 digits	Fixed	0=RGB 2=YpPr	0=1080i 1=720p 2=480p 3=480i 4=1080p 5=2160p	0=1080i 1=720p 2=480p 3=480i 4=1080p 5=2160p	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

16. iCC-Net Control Overview

iCC-Net is a unique and proprietary control command protocol from Contemporary Research for sending one-way control commands to display controllers, HDTV tuner/controllers, IPTV decoder/controllers, and HDTV tuners over new or existing video distribution infrastructure. The video distribution system may be for delivery of CATV channels over coax, MPEG-TS IPTV streams delivered over an Ethernet network, or a combination of both. The user will be able to select the channel that is shown on each display as well as control power, volume and other display related control functions.

The display controllers, HDTV tuner/controllers and IPTV decoder/controllers will receive an iCC-Net command string and translate it to the IR or RS-232 protocol required for control of the connected video display. The control interface may be a Display Express server, embedded Display Express Lite in an ICE-HE-DXL or IP-DXL display control center, or a third-party control processor.

The structure of the iCC-Net command string allows for independent control of over 4000 individual display controllers, HDTV tuner/controllers, IPTV decoder/controllers, and HDTV tuners in any combination. The display controllers, HDTV tuner/controllers, IPTV decoder/controllers, and HDTV tuners will each be configured with a unique display device number. As the command strings are broadcast to all devices on the distribution network, a device will only respond when it receives a command string with a device number value that matches its configured device number. All other devices will drop the command string without responding.

Building an IPTV Based Control System

The IPTV based iCC-Net system will comprise of a control system interface to execute the commands, and any combination of IPTV decoder/controllers and tuners.

The control system requires a control system interface to execute the commands. The control system interface can be any of the following.

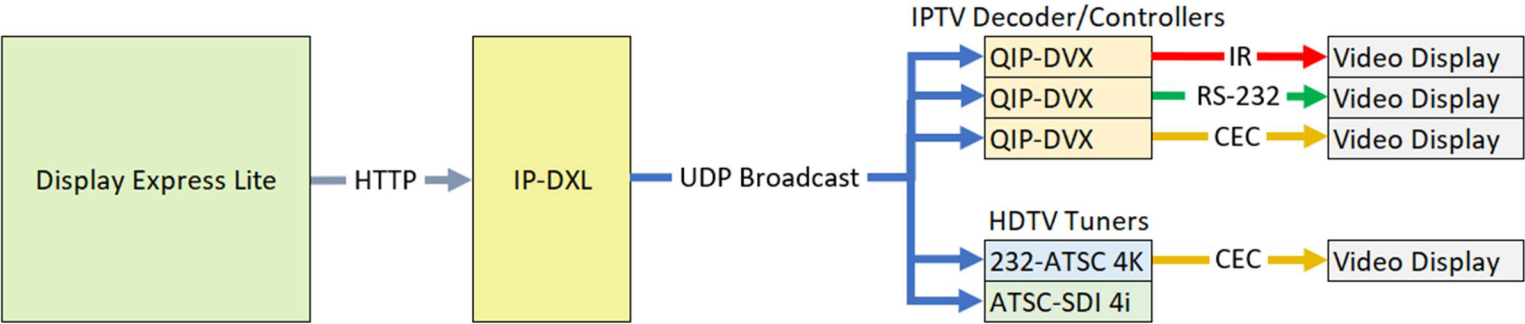
- Display Express Lite web page embedded in the ICE-HE-DXL or IP-DXL display control center
- Display Express Server PC with or without an ICE-HE-DXL or IP-DXL display control center
- Third-party control processor with or without an ICE-HE-DXL or IP-DXL display control center

The QIP-DVX receives the command strings as UDP IP data packets at port 31934 of its configured IP address.

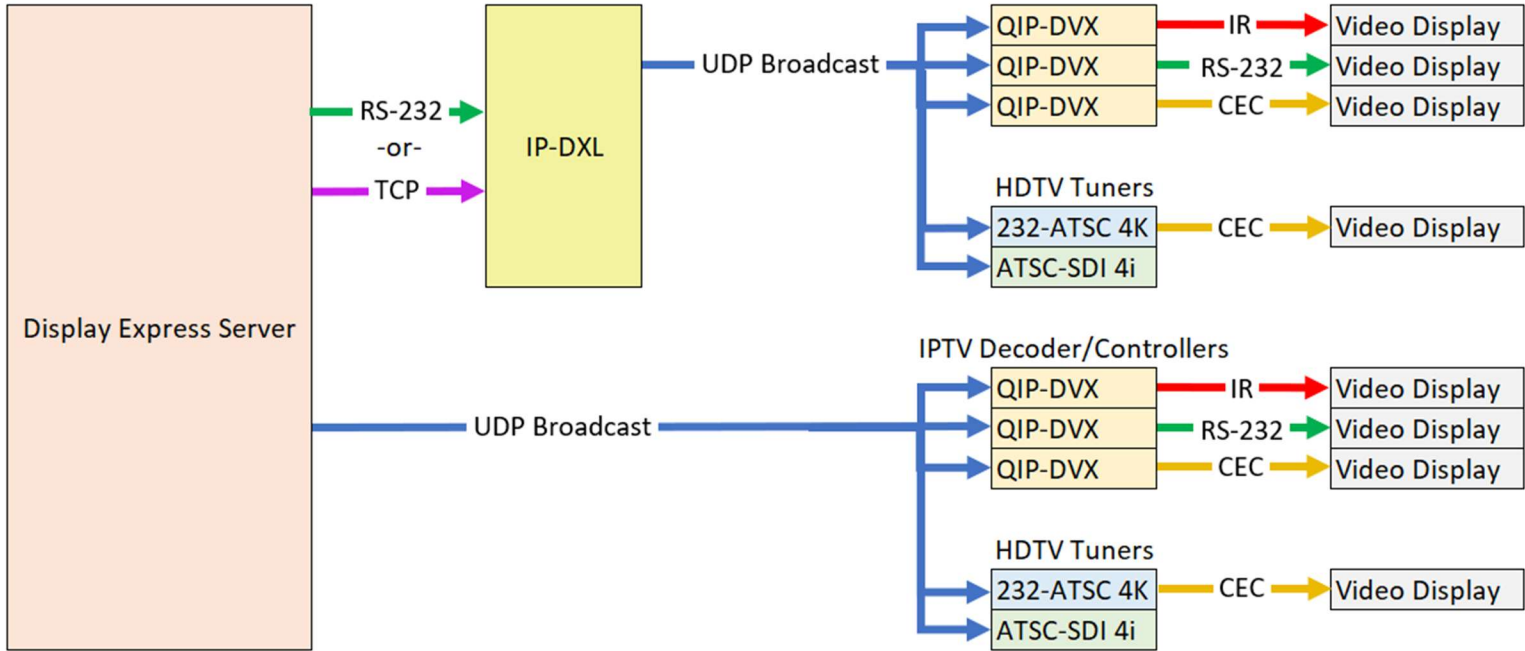
The ICE-HE-DXL and the IP-DXL will send the command strings to the broadcast IP address of its subnet. For IPTV based applications, the ICE-HE-DXL and IP-DXL are functionally equivalent. The ICE-HE-DXL is required for hybrid RF/IPTV applications. The embedded Display Express Lite web page may be used as the user interface. The units may also receive iCC-Net command strings via RS-232 or as TCP IP data packets from a Display Express PC or third-party control system processor. The received command strings will be resent as UDP data packets to the broadcast IP address of its subnet.

The Display Express Server PC may be configured to send the data packets to the broadcast IP address of up to 10 specified subnets. The Display Express PC may also be used in conjunction with the ICE-HE-DXL or IP-DXL display control center. Communication may be RS-232 or TCP. Up to 10 ICE-HE-DXL or IP-DXL units are supported via TCP.

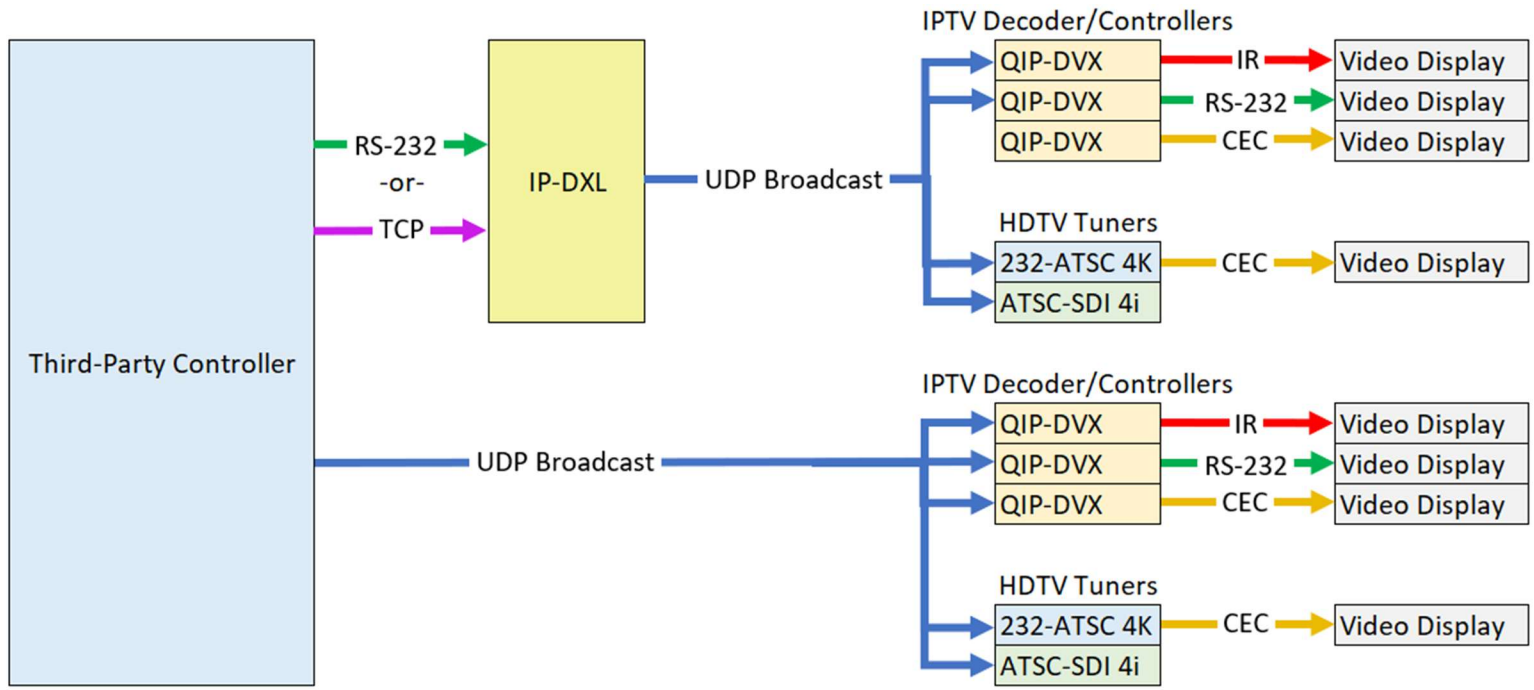
Control Data Flow with IPTV System Using Display Express Lite



Control Data Flow with IPTV System Using Display Express



Control Data Flow with IPTV System Using Third-Party Controller



Integrated Display Controller

The QIP-DVX supports sending control commands to the connected display using RS-232, IR, or HDMI CEC. When enabled, the power state of the display will follow the power state of the QIP-DVX. When the QIP-DVX receives a power command from any source, including the front panel, web page, or external control, it will send the appropriate power command to the connected display.

When used as part of an iCC-Net control system, more display control functions are available. If the display is controlled via IR, the functions include power and input source selection depending on the display. If the display is controlled via RS-232, the control functions include power, source selection, and the ability to pass through custom RS-232 strings from the control system to the display.

Display control may be enabled in the on-screen communication menu, web page, or via RS-232 command. The options are HDMI CEC, IR, or RS-232. If RS-232 is selected, two-way control RS-232 control of the QIP-DVX will be disabled and the RS-232 port will function to control the display.

The IR libraries and RS-232 protocols for many common TV and display makes and models are built into the QIP-DVX application firmware.

HDMI CEC Control

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

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

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

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

IR Display Control

IR display control is available through the rear panel IR Out jack. The IR output may be used for sending power and source selection commands to the display. The IR Out is compatible with the optional Contemporary Research IR Emitter (5033-001) or many commonly available IR emitters from other manufacturers.

The IR display (TV) type will need to be selected via the on-screen communication menu, web page or RS-232 command. Refer to the table for a list of the supported display types. If the desired display type is not listed, contact Contemporary Research support for assistance.

Display Power Sense

Some display manufacturers do not offer discreet IR commands for power on and power off, but instead use a power toggle command. A situation may occur where the power state of the display and the power state of the QIP-DVX can become out of synchronization. It is possible for the QIP-DVX to detect the power status of the display and prevent an unintentional power command. Either the I/O port or the SPDIF Sense input may be used to detect the display power status.

The I/O port has a voltage sensitivity range of 5 to 12 volts DC. The rear panel I/O port may be used in conjunction with the optional Contemporary Research CC-USB Power Sense Cable (5061-013) to sense the power state of the display. The CC-USB cable will connect to an available USB port on the display. The I/O port will detect voltage on the +5v pin of the USB port to determine the display power status. The I/O port will also work with a connection to the 12 volt screen output of a video projector.

The SPDIF Sense port will detect activity on the S/PDIF output of the display to determine the display power status.

Codes for IR Control Display Types

Type	Make	Display	Power	Notes
21	LG	Monitor	Discrete	Input Selects
25	Samsung	Monitor	Discrete	
37	NEC	Monitor	Toggle	
43	Sony	Monitor	Discrete	FWD-50PX2
44	Vizio	Monitor	Discrete	Input Selects, Send N1=2 to shorten IR pulse length
45	Panasonic	Monitor	Discrete	Input Selects
46	Sharp	Monitor	Discrete	
48	Toshiba	Monitor	Discrete	
49	Phillips	Monitor	Discrete	
53	Samsung	Monitor	Discrete	
58	NEC	Monitor	Toggle	E- Series
59	Sunbrite	Monitor	Discrete	

Contact Contemporary Research Technical Support if the desired display type is not listed.

RS-232 Display Control

One-way RS-232 serial display control is available through the rear panel 3.5 mm TRS RS-232 port. The RS-232 port may be used to send commands for power and input source selection. When used with Display Express or a third-party control system using iCC-Net protocols, it is possible to forward custom RS-232 strings to the display. Most displays with a DB-9 RS-232 port are compatible with the optional Contemporary Research CC-COM 3.5 (5061-009) serial cable. Some displays with 3.5 mm TRS RS-232 ports may need a custom cable that has the conductors for the tip and ring swapped on one end.

The RS-232 display (TV) type will need to be selected via the on-screen communication menu, web page or RS-232 command. Refer to the table for a list of the supported display types. If the desired display type is not listed, contact Contemporary Research support for assistance. The com port parameters will automatically be changed to match the requirements of the selected display type.

Available RS-232 Display Control Commands

QIP-DVX Control Source	RS-232 Commands
Front Panel, IR	Power On Power Off
Web Page	Power On Power Off Custom RS-232 Strings
Two-Way RS-232	None
Telnet, UDP	Power On Power Off Custom RS-232 Strings
Display Express Lite via ICE-HE-DXL	Power On Power Off
Display Express Software via ICE-HE-DXL or Broadcast UDP	Power On Power Off Custom RS-232 Strings
3rd Party Controller via ICE-HE or Broadcast UDP	Power On Power Off Custom RS-232 Strings

Codes for RS-232 Control Display Types

Type	Make	Display	Baud	Notes
10	Samsung	Monitor	9600	Ex-Link
11	Samsung	Monitor	9600	
14	NEC	Monitor	9600	E- Series
22	Hitachi / Christie	Projector	9600	Hitachi CP-S317, CP-S318, CP-X327, CP-X328 Christie LW650, LW750, LS700, DU951, DHD951, LWU501i, LWU504
24	Epson	Projector	9600	VP 595wi, 1925W
33	Sharp	Monitor	9600	LC46LE820UN
46	Sharp	Monitor	9600	PN-V601
47	Sharp	Monitor	9600	
48	NEC	Monitor	9600	M-, P-, V-, X- Series
49	Christie	Projector	19.2K	DHD800
50	NEC	Projector	9600	NP-M402H (set baud rate in projector to 9600)
51	Barco	Projector	115.2K	RLS-W12
54	LG	Monitor	9600	
55	Christie	Projector	115.2K	DHD850
57	Christie	Projector	9600	FHQ981

Contact Contemporary Research Technical Support if the desired display type is not listed.

17. iCC-Net Unidirectional Control Protocol

The iCC-Net command string includes 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-D decoder/controller, QIP-DVX decoder/controller, or tuner to which control commands are addressed. The displays are organized into 16 zones of up to 255 devices each.

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

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

Example:

Zone 3 = hex 03

Unit 201 = hex C9

Display Device 969 = Hex 03 C9

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

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

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

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

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

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

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

Setting the Display Device Number via Web Page

The device number may be set in the **System** web page or on-screen **Network** text menu. The display device number is entered in four-digit decimal format.

iCC-Net Command String Protocol

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

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

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

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

A Decimal/ASCII/Hex conversion chart may be found at www.asciitable.com.

String Format

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

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

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

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

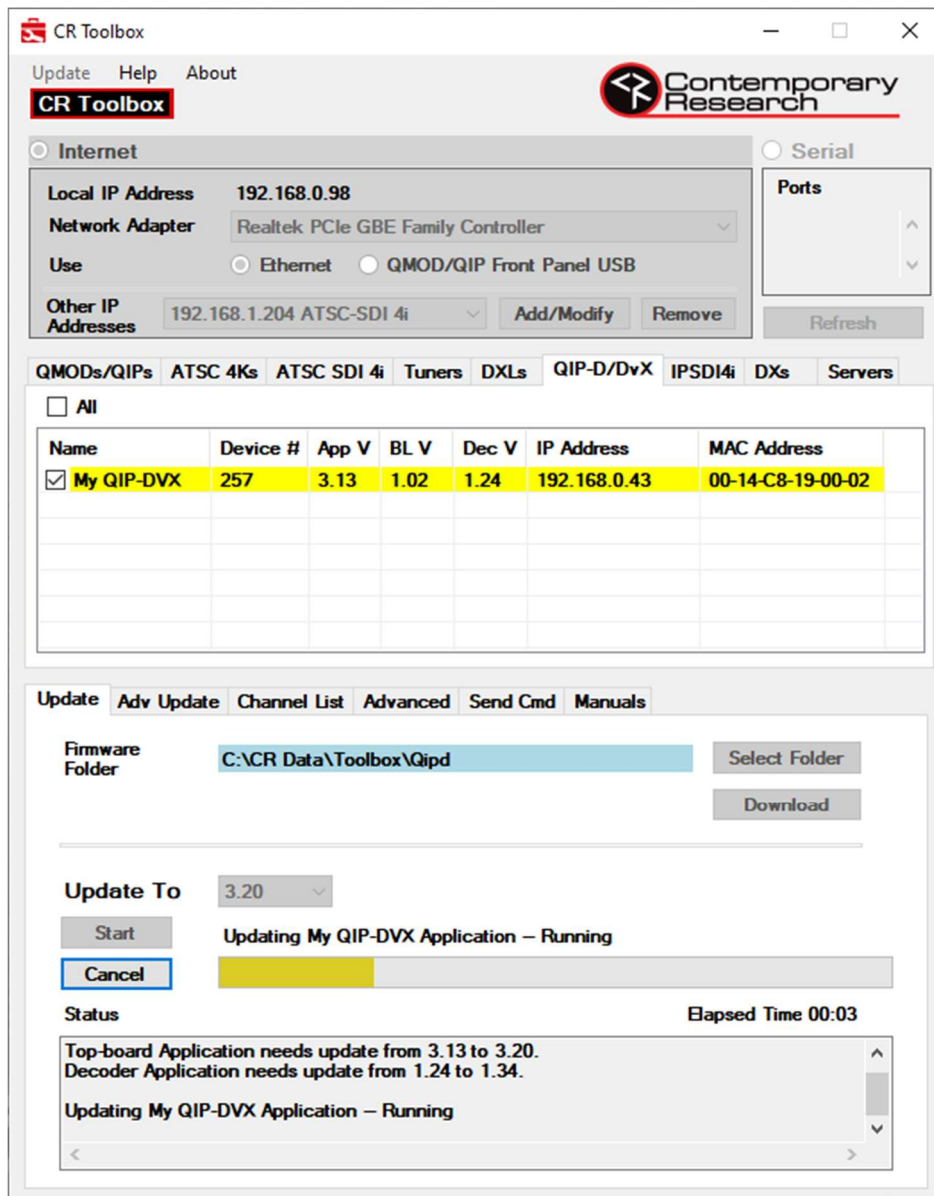
Go to www.asciitable.com for a handy Decimal/ASCII/Hex conversion chart.

Table of iCC-Net Control Commands

Code	Function	Operation
Power		
P1	Power On	"\$A5,<dh>,<dl>,2,'P1'" (6 bytes)
P0	Power Off	"\$A5,<dh>,<dl>,2,'P0'" (6 bytes)
PT	Power Toggle	"\$A5,<dh>,<dl>,2,'PT'" (6 bytes)
Channel Selection		
TH	Select Channel	"\$A5,<dh>,<dl>,5,'TH',<H1>,<Major>,<Minor>" (9 bytes) Select channel with one-part virtual channel numbers and two-part channel numbers up to 255-255. <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) 3=Two-part physical channel number (Major-Minor) <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)
TJ	Select Channel	"\$A5,<dh>,<dl>,6,'TJ',<Major high>,<Major low>,<Minor high>,<Minor low>" (10 bytes) Select channel with two-part virtual channel numbers up to 999-999 Formula: (high byte x 256) + low byte = channel number. <i>Example:</i> "\$A5,2,44,6,'TJ',1,40,0,1" Device 580, channel 296-1
H1	Tuning Style	"\$A5,<dh>,<dl>,3,'H1',<Style>" (7 bytes) 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. <Style> 1=Five digit one-part virtual channel number 2=Two-part major-minor virtual channel number 3=Two-part major-minor physical channel number
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	"\$A5,<dh>,<dl>,3,'VL',<Level>" (7 bytes) Set volume in 64 steps, 0 - 63.

Code	Function	Operation
Display Device Control Configuration		
T0	RS-232 Display Type	"\$A5,<dh>,<d1>,3,'T0',<Type>" (7 bytes) Set Display type for RS-232 control.
T1	IR Display Type	"\$A5,<dh>,<d1>,3,'T1',<Type>" (7 bytes) Set Display type for IR control.
N0	IR Pulse Interval	"\$A5,<dh>,<d1>,3,'N0',<Length>" (7 bytes) Set IR pulse interval in 50ms increments. <Length> 1 - 6
N1	IR Pulse Length	"\$A5,<dh>,<d1>,3,'N1',<Length>" (7 bytes) Set IR pulse length in 100ms increments. <Length> 1 - 6
N6	IR Pulse Length	"\$A5,<dh>,<d1>,3,'N1',<Length>" (7 bytes) Set IR pulse length in 50ms increments. <Length> 1 - 6
Serial Communication		
UX	Send String	"\$A5,<dh>,<d1>,2+string length,'UX',<String>" (variable bytes) Send an RS-232 string directly to the display. Example: "\$A5,1,183,10,'UX','m c 00 AF',\$0D" Display 439, sends command in hex 6D 63 20 00 20 AF 0D. This is the string for an LG TV to set the display to zoom mode.
Miscellaneous		
ZW	Save	"\$A5,<dh>,<d1>,2,'ZW'" (6 bytes) Save current channel and power status in NVRAM of the controller.
ZR	Restore	"\$A5,<dh>,<d1>,2,'ZR'" (6 bytes) Restore channel and power status previously saved in NVRAM of the controller.

18. Firmware Update



CR Toolbox software for Windows will be required for full firmware updates to the QIP-DVX 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 for that device on the Contemporary Research cloud firmware database. If newer firmware is available for download, the **Download** button will turn red.

Click on the **QIP-D/DvX** tab to view 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 QIP-D/DVX devices are set for the same subnet.

Follow this procedure to perform a firmware update:

- Click the checkbox for the QIP-D or QIP-DVX 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

19. QIP-DVX Specifications

Physical

Size (HWD): 7.25" [184 mm] wide (7.85" [200 mm] including wings) x 1.150" [29 mm] height x 3.6" [91 mm] deep

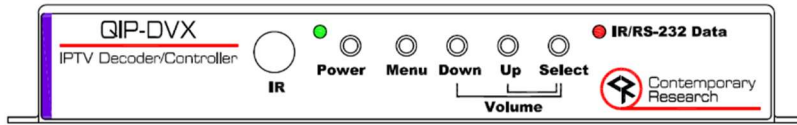
Weight: 13 oz [369 g]

Enclosure: Aluminum with black powder coat paint

Mounting: Hook-and-loop fasteners or screw attachment

Power: PoE, 6 W or 11 to 14 VDC at 0.5 A max

Front Panel



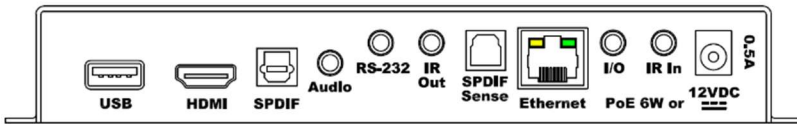
IR: IR Sensor

Status: Red/green status LED

Control: Push buttons for Power, Menu, Down, Up, Select

IR/RS-232 Data: Red/green data activity indicator

Rear Panel



USB: USB-A port for alternate decoder firmware update

HDMI: HDMI output receptacle, Type A, Version 1.3

Video Resolutions and Frame Rates:

- 480i — 29.97 Hz
- 480p and 720p — 59.94/60 Hz
- 1080i — 29.97/30 Hz
- 1080p — 60 Hz
- 2160p — 60 Hz

Audio Formats:

- PCM/PCM variable level

SPDIF: Optical digital audio output

- PCM/PCM variable level

Audio: 3.5 mm TRS analog stereo jack variable level

RS-232: 3.5 mm TRS jack data link to control system or for display control

Tip= Data Transmit

Ring= Data Receive

Sleeve= Ground

IR Out: 3.5 mm TRS jack for display control

Tip= Output

Ring= N/C

Sleeve= Ground

SPDIF Sense: Input for display power sense

Ethernet: RJ-45 connector, 100 Mbps, PoE

I/O: 5 to 12 VDC input for display power sense

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

Tip= +5 VDC (50 mA max)

Ring= Input

Sleeve= Ground

12VDC: Optional power input

2.1 mm coaxial jack (inside center conductor positive), 0.5 A max

Stream Protocols

- MPEG-TS Ethernet Streams
- UDP, RTP
- Multicast or Unicast
- IGMP v2, IGMP v3

Decoding

- Decodes MPEG-2 (480i, 480p, 720p, 1080i), H.264 video (480i, 480p, 720p, 1080i, 1080p)
- Decodes MPEG-1 Layer 3, AAC audio
- Supports single program or multiple program transport streams
- On board closed caption decoder supports EIA-608 and EIA-708 embedded closed captions

Options

CC-IRE IR Emitter with 3.5 mm plug (5033-001)

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

PS12-1.0 Power Supply (5401-001)

CC-COM 3.5 Serial Cable (5061-009)

IR-RXD External IR Receiver (5034-001)

CC-USB Power Sense Cable (5061-013)

Trademarks



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

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.



3220 Commander Drive, Suite 102

Carrollton, TX 75006

Ph. 888-972-2728

www.contemporaryresearch.com