ICE-HE-DXL Display Control Center

Product Manual



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Overview

The ICE-HE-DXL Display Control Center is an integral component of the iCC-Net over-the-coax RF display control solution. The unit is the required interface between an AV control system and the ICC1-IRX and ICC1-232 display controllers and the ICC1-TC tuner/controllers. The unit receives the iCC-Net control command data from the control system and processes it for transmission in a narrow band RF signal in the gap between RF channels 4 and 5. Control command data may be received by TCP over the Ethernet connection or RS-232 via the DB-9 connector or USB virtual com port.

iCC-Net Control commands may originate from a Display Express server PC, the embedded Display Express Lite web page, or a third-party control system.

An on-board web server hosts the Display Express Lite control software. The software is accessible using an internet browser from a tablet, smart phone, or computer. The software is easy to configure and may be used for control of up to 128 display controllers or tuner/controllers. Control functions include power on/off, volume and channel selection from up to 32 source channels.

The ICE-HE-DXL may also be used as the control interface in a hybrid RF/IPTV or IPTV only distribution system along with QIP-D or QIP-DVX IPTV decoder/controllers.

Features

- For insertion of ICC-Net control signal into CATV distribution system
- One-way control for over 4000 displays over RF coax network
- Compatible with ICC1-IRX, ICC1-232 display controllers and ICC1-TC tuner/controllers
- Simultaneous iCC-Net control data packets broadcast over IP
- Compatible with QIP-D and QIP-DVX IPTV decoder/controllers
- Display Express Lite control software accessible from built-in webserver
- Accepts iCC-Net control commands from Display Express Server PC or third-party control system
- Receives iCC-Net control commands via RS-232 or TCP
- Front panel LCD display with 6-button keypad for configuration and status monitoring
- Front and rear panel USB virtual com ports
- Firmware updatable over RS-232 or Ethernet
- Convenient 1 RU half width chassis with rack mount kit included.

Installing the ICE-HE-DXL

The ICE-HE-DXL may be placed freestanding on a suitable surface or installing in a standard EIA 19" equipment rack with the included RKU rack mount hardware. The RKU rack mount hardware facilitates mounting of ICE-HE-DXL in one rack space by itself side by side with another Contemporary Research half rack width product in a single rack space.

Front Panel Operation



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

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

USB Service
USB mini-B jack virtual com port for control, configuration, and firmware updates.

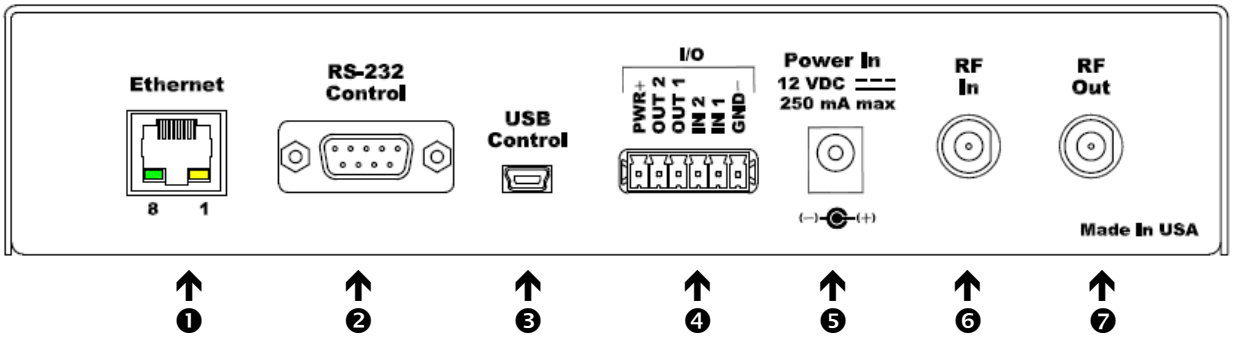
LCD Display Status Indicators

232	Rx or Tx will flash indicating RS-232 data activity
USB	Rx or Tx will flash indicating front panel or rear panel USB data activity
IP	Rx or Tx will flash indicating IP data activity
N	iCC-Net status, blinks once per second indicating transmission of iCC-Net "heartbeat" data
C	Command indicator will flash indicating transmission of valid iCC-Net command
E	Error in ICC-Net data transmit RF frequency, may appear briefly on power up, contact CR Support for service if indicator remains lit

Front Panel Setup Menus

System	*Factory Defaults settings are shown in* **Bold**
Baud Rate	2400 | 4800 | 9600 | **19200** |38400 | 115K
Pnl Lockout	**None** | Setup *Press **Setup** and **Right** simultaneously to temporarily unlock*
Backlight	1 - 10
LCD Contrast	1 - 9
RF Level dB	14 - 45
Fact Dfault	Y | N
Firmware	***Right** or **Left** arrow scrolls through firmware versions.* *Example:* ICE-HE-DXL 2.09 — System Firmware Bootloader V1.00 — Bootloader Board Rev C1 – Hardware version
Network	
IP Address	**192.168.1.251**
IP Mode	**Static** | DHCP
Gateway	**000.000.000.000**
Subnet Mask	**255.255.255.000**
MAC/SN	0:14:C8:10:xx:xx
UDP Reply	On | **Off**
UDP Control	**On** | Off
Command	
Power All	On | Off *Sends Power command to all display controllers*
Volume All	Mute | Low | Medium *Sends Volume level command to all display controllers*
Send IR Typ	Dev#:xxxx Type:xx *Sends display type command to specified display controllers. For ICC1-IRX and QIP-DVX only. Refer to ICC-1-IRX or QIP-DVX product manual for display type codes.*
Send 232 Typ	Dev#:xxxx Type:xx *Sends display type command to specified display controllers. For ICC1-TC, QIP-D and QIP-DVX only.*

Rear Panel Connections



❶ Ethernet
RJ-45 jack, 100Mbps for control, web page access, configuration, and firmware updates

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

❸ USB Control
USB mini-B jack virtual com port for control, configurations, and firmware updates

❹ I/O
Logic control port 6-pin captive screw terminal

1 – PWR+	Power, 12 VDC, 250 mA max (using the included 500 mA power supply)
2 – OUT2	Output 2
3 – OUT1	Output 1
4 – IN2	Input 2
5 – IN1	Input 1
6 – GND-	Ground

❺ Power In
2.1 mm coaxial jack (inside center conductor positive), 11 to 18 VDC, 12 VDC typical, 250 mA maximum

❻ RF In
'F' female 75 ohm impedance for future use

❼ RF Out
'F' female, 75 ohm impedance, RF to CATV distribution system
Data Transmit: Mid-band VHF, 74.7 MHz, +14 to +45 dBmV, adjustable from front panel

Setup Notes

Interfacing with a Control System
The unit may receive iCC-Net command strings from a Display Express server PC or a third-party control processor. The command strings may be received at the following interfaces.

- TCP at port 2728
- RS-232 via the DB-9 port
- RS-232 via either USB virtual com port

Only one TCP socket is supported. The buffered data bus allows for commands to be received concurrently from any of the interfaces.

Display Express Lite
The ICE-HE-DXL includes an embedded web server that hosts the Display Express Lite web page. Display Express Lite supports basic control of power, volume, and channel selection for any combination of up to 128 display controllers, tuner/controllers, or IPTV decoder/controllers. The web page may be accessed from the web browser of a connected device either wired or through a Wi-Fi access point.

IP Network Settings
The IP Address, Default Gateway, and Subnet Mask may be set in the front panel Network menu or via RS-232 command. The current IP address may be displayed on the front panel by holding the Setup button. The default IP address is 192.168.1.251. Changes to any of network settings require a power cycle or reboot.

RS-232
The DB-9 RS-232 port may be used for control, configuration, and firmware updates. The baud rate settings apply to the DB-9 RS-232 port and the rear panel USB virtual com port. Baud Rate settings are available in the front panel System menu or may be changed via RS-232 or telnet serial command. The default baud rate is 19,200. Changes to the baud rate setting is instantaneous and no power cycle or reboot is required.

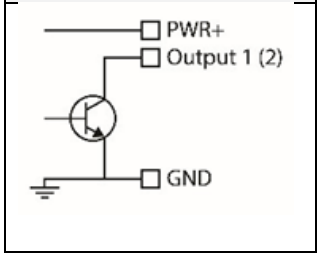
USB Virtual Com Ports
The front and rear panel USB virtual com ports may be used for control, configuration, and firmware updates. Windows 10 will automatically load the appropriate driver. The baud rate setting applies to the rear panel USB port. The baud rate for the front panel USB port is fixed at 115.2K.

UDP Control
The iCC-Net commands that are transmitted via the RF output may be duplicated and transmitted as UDP directed broadcast data packets for control of QIP-D and QIP-DVX IPTV decoder/controllers and 232-ATSC 4i and ATSC-SDI 4i HDTV tuners. This function may be enabled or disabled in the front panel menu or via RS-232 command. It is enabled by default.

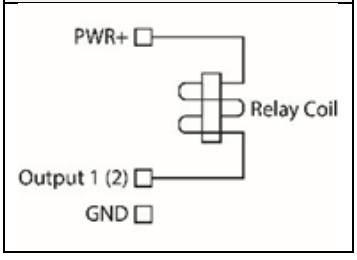
I/O Port
Inputs may accept a 0-24 VDC control voltage or contact closure to ground. A closed contact closure creates a logical low, an open contact closure creates a logical high.

Outputs are open collector and may require a pull-up resistor; 28 VDC max, 200 mA max. A logic level high turns on the transistor and creates a current path to ground.

Simplified Output Circuit



Typical Application



RF Output Level
The RF output will be connected to the input of a combiner to insert the iCC-Net data channel into the RF distribution system. The RF output level adjustment has a range from 14 to 45 dBmv. The default setting is 29 dBmv. The RF level should be set to match the level of the modulators or CATV channels as they enter the combiner. Typically, when used with QMOD modulators, the RF output level will not need to be changed as the QMOD default RF level of 29 dBmv matches the default RF level of the ICE-HE-DXL.

RS-232/Telnet Two-Way Communication Protocol

The ICE-HE-DXL full duplex RS-232/Telnet protocol is available for configuration and status monitoring. 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 19,200 baud. All settings are saved to NVRAM in the decoder. 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). The default telnet port is 23.

General Protocol Specifications
Characters in command strings to the ICE-HE-DXL are common ASCII keyboard characters. Command strings sent to the ICE-HE-DXL begin with the ASCII > (greater than symbol) as an 'Attention' character and end with carriage return - ASCII CR, Hex $0D, or keyboard Enter - as an 'End-of-command' character.

Responses from the ICE-HE-DXL begin with the ASCII < (less than symbol) as an 'Attention' character and end with a carriage return followed by a line feed - ASCII LF or Hex $0A as an 'End-of-command' character.

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

Command String Structure
[Attention][Unit #] [Command] (Parameters) [Return]

Attention	Single character (>) starts the string
Unit #	The unit number is fixed at Unit #1, omitting unit number will default to Unit #1
Command	A two-character command
Parameters	Added attributes to some commands
Return	A carriage return ends the command string. ASCII CR, Hex $0D, or keyboard 'Enter' may be used in programming. For simplicity, the programming examples in the manual will not show the 'CR'.

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

String Example
The example below is a command to set the subnet mask followed by the response string.
>IM=255.255.254.000
<1$MAC=0014C810003C IP=192.168.1.251 IG=192.168.0.1 IM=255.255.254.000 IY=1

RS-232 Commands

Code	Function	Operation
	Front Panel	
M0=	LCD Backlight	Sets LCD display backlight brightness 0-9
M1=	LCD Contrast	Sets LCD display contrast 0-8
S4=	Set Front Panel Lockout Mode	0=None 1=Setup Press Select and Right key to unlock temporarily

Code	Function	Operation
		Network Setup
IP=	Sets IP Address	IP=xxx.xxx.xxx.xxx Defines IP address, then returns status IP returns the current MAC address, current IP address, subnet mask, and gateway. Response example : $MAC=0014C810001B IP=192.168.001.251S IG=192.168.001.001 IM=255.255.255.000 IY=1. S or D 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. Defines subnet mask IM returns the current MAC address, current IP address, subnet mask, and gateway. Response example : $MAC=0014C810001B IP=192.168.001.251S IG=192.168.001.001 IM=255.255.255.000 IY=1. S or D at end of IP indicates DHCP or Static address. 000.000.000.000 indicates DHCP, but no DHCP server detected.
IG=	Default Gateway	IG=xxx.xxx.xxx.xxx. Defines default gateway IG returns the current MAC address, current IP address, subnet mask, and gateway. Response example : $MAC=0014C810001B IP=192.168.001.251S IG=192.168.001.001 IM=255.255.255.000 IY=1. S or D at end of IP indicates DHCP or Static address. 000.000.000.000 indicates DHCP, but no DHCP server detected.
IY=	IP Address Mode	1=Static 2=DHCP
MC	MAC Address	Returns the MAC address
IX=	Telnet Port	IX=xxxxx Defines Telnet port
		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	1=2400 4=19.2K (Default) 2=4800 5=38.4K 3=9600 6=115.2K
		Miscellaneous Commands
NW=	Set Name	Sets the ICE-HE-DXL name. Limited to 20 characters
NM	Get Name	Returns the ICE-HE-DXL name
ID	ID	Returns the product model and application firmware version
IB	Bootloader	Returns the bootloader firmware version
HR	Hardware	Returns the hardware revision
Z!	Reload factory default settings	Reconfigures unit for all factory default settings. IP address will not revert to default until after a Z] command or power cycle.
Z]	Reboot	Emulates a reboot from a hard power cycle
		I/O Port
PS=	Set Output Pin	0=Out 1 Low, Out 2 Low 1=Out 1 High, Out 2 Low 2=Out 1 Low, Out 2 High 3=Out 1 High, Out 2 High
PG	Get Input Pin Status	0=In 1 Low, In 2 Low 1=In 1 High, In 2 Low 2=In 1 Low, In 2 High 3=In 1 High, In 2 High

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. Separate dedicated control wiring for each component is not required. The user will be able to control the content on the displays via channel commands as well as volume and power. The video distribution system may be CATV channels delivered over coax, MPEG-TS IPTV streams delivered over an Ethernet network, or a combination of both.

The structure of the iCC-Net protocol command strings allows for independent control of large numbers of display controllers, HDTV tuner/controllers, IPTV decoder/controllers, and HDTV tuners.

For RF based CATV applications, an ICE-HE-DXL display control center is required. The RF output of the ICE-HE-DXL carrying the control data is combined with source channels to be distributed through the RF system. The control interface for the ICE-HE-DXL may be the embedded Display Express Lite web application, a Display Express server PC, or a third-party control system. Each iCC-Net device will be assigned a 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 string with a device number value that matches its configured device number. All other devices will ignore the command string.

The command string data is modulated and transmitted over a low bandwidth RF data channel. The data channel is at 74.7 MHz in the gap between channels 4 and 5. The RF output of the ICE-HE-DXL is combined with the CATV channels at the head end prior to distribution.

When connected to an IPTV network, the ICE-HE-DXL will simultaneously send the same iCC-Net command strings as a UDP broadcast data packets for control of compatible IPTV decoder/controllers and HDTV tuners. This allows for the creation of hybrid RF/IP systems with seamless control.

Building an RF Based Control System

The RF based system will comprise of a control system interface to execute the commands, an ICE-HE-DXL Display Control Center, and any combination of display controllers and tuner/controllers.

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

- Display Express Server PC
- Display Express Lite web page embedded in the ICE-HE-DXL
- Third-party control processor

The ICE-HE-DXL Display Control Center is required to process the iCC-Net data from the control system and allow it to be inserted into the CATV RF distribution system.

Display control is accomplished using display controllers and HDTV tuner/controllers. Display controllers and tuner/controllers in any combination are utilized to receive the iCC-Net command strings and process the display specific commands for display control.

The display controllers have an RF pass-through for connection to the display's integrated tuner. The tuner/controller replaces the function of a display's integrated tuner for receiving and decoding the CATV channels in addition to provided display control. The display controllers or tuner/controller include the following listed below.

- ICC1-232 display controller for RS-232 control of video displays with integrated tuner
- ICC1-IRX display controller for IR control of video displays with integrated tuner
- ICC1-TC tuner/controller for RS-232 control of video displays without an integrated tuner

Compatible RF Control System Components

Display Express Server PC

The Display Express Server PC may be used as the control system interface. The Display Express Server PC hosts a web server. Users can log into the web server either locally or remotely using a web browser to access the control pages. The Display Express Server PC connects to the ICE-HE-DXL via RS-232 port, USB virtual com port, or via Ethernet TCP port 2728.

- Independent controls of over 4000 displays
- Displays may be controlled as individual units, as defined groups, as zones, or as all
- Supports hundreds of source channels
- Supports multiple schedules
- Supports control presets and macro presets
- Allows for multiple users with unique customizable control pages and privileges
- Allows forwarding of custom strings to RS-232 controlled displays for advanced control
- Emergency alert presets may be manually or externally triggered

Display Express Lite

Display Express Lite is a web page that is hosted in the ICE-HE-DXL Display Control Center and can be accessed by any device with an internet browser. The Display Express Lite web page is accessed by entering the IP address of the ICE-HE-DXL in the browser's address bar.

- Simplified control of display power, channel, and volume
- Control for up to 128 displays
- Displays may be controlled as individual units, as defined groups, or as all
- Supports up to 32 source channels

Third-Party Control System

A third-party control system may be used as the control system interface. The control system processer may connect to the ICE-HE-DXL Display Control Center via RS-232 port, USB virtual com port, or via Ethernet TCP port 2728.

ICC1-232 Display Controller

The ICC1-232 is used as an interface device for control of a video display with integrated tuner via RS-232. The unit is inserted between the CATV drop and the RF input on the display.

- Receives ICC-Net RF commands over the coax
- RF loop out for connection to display
- RS-232 port for display control
- RS-232 protocols for display selected via firmware.
- Firmware available for control of many common makes and models of flat panel displays
- Display device number assigned using DIP switches on bottom of unit

ICC1-IRX Display Controller

The ICC1-IRX is used as an interface device for control of a video display with an integrated tuner via IR. The device is inserted between the CATV drop and the RF input on the display.

- Receives ICC-Net RF commands over the coax
- RF loop out for connection to display
- IR output port for display control
- IR libraries for many common makes and models of displays are stored in memory
- IR display type selectable using command from the ICE-HE-DXL front panel, iCC-Net command to the ICE-HE-DXL, or DIP switches on bottom of unit
- Display device number assigned using DIP switches on bottom of unit
- Display power sense input port

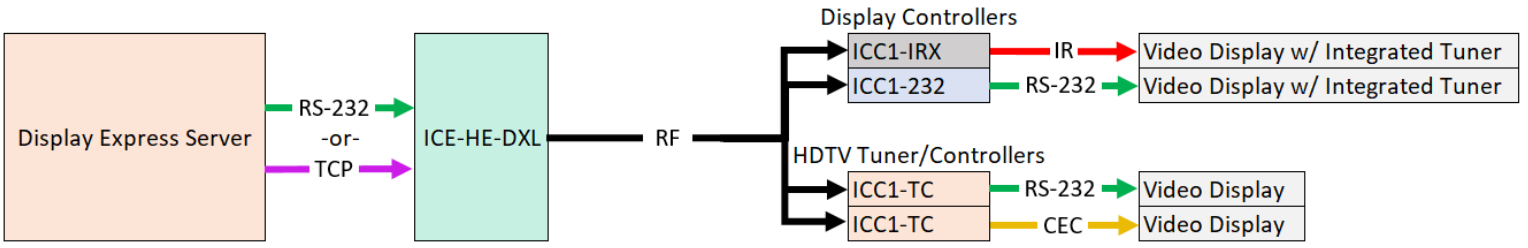
ICC1-TC Tuner/Controller

The ICC1-TC is a full functioned HDTV tuner equipped with display controller to be used for applications where the display does not have an integrated tuner.

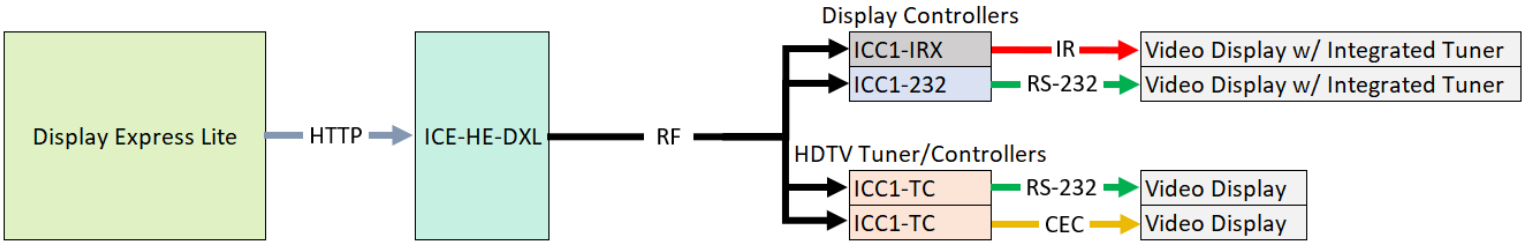
- Receives ICC-Net RF commands over the coax
- RS-232 port or HDMI CEC for display control
- Contains RS-232 protocols for many common makes and models of flat panel displays and video projectors in on board memory
- RS-232 display type selectable using on-screen communication menu, command from the ICE-HE-DXL front panel, iCC-Net command to the ICE-HE-DXL, or RS-232 command via the serial port
- HDMI CEC configurable using on-screen communication menu, command from the ICE-HE-DXL front panel, iCC-Net command to the ICE-HE-DXL, RS-232 command via the serial port
- Display device number assigned using on-screen communication menu

RF System Control Data Flow Examples

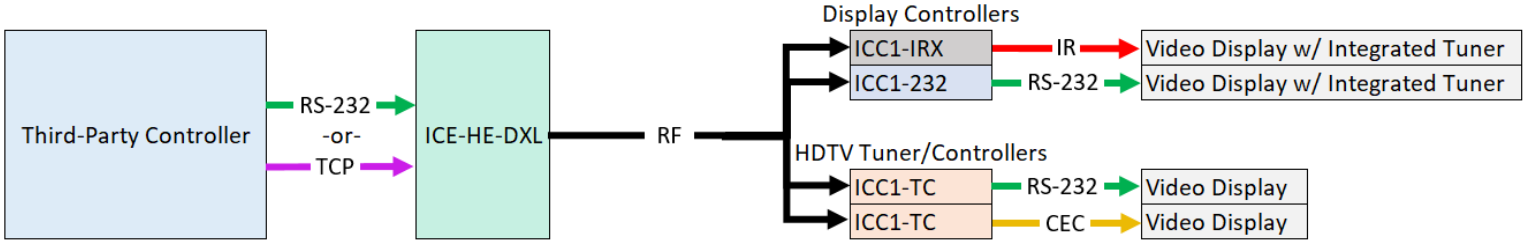
iCC-Net Control Data Flow with RF System Using Display Express



iCC-Net Control Data Flow with RF System Using Display Express Lite



iCC-Net Control Data Flow with RF System Using Third-Party Control



Building an RF/IPTV Hybrid Control System

The iCC-Net control strings are agnostic as to whether the source channels are delivered over a CATV RF network or IPTV network. When using the components of the RF based system, it is possible to have components of an IPTV based system operating in parallel using the same control interface. The iCC-Net commands will be sent via the RF out and simultaneously as UDP broadcast data packets.

The latest generation Contemporary Research QMOD encoder/modulators or compatible encoder/modulators from other manufacturers may simultaneously provide RF CATV channels and MPEG-TS IPTV streams of the exact same video content. The user may not be able to distinguish whether the source channels are delivered over RF or IP.

The Hybrid RF/IPTV based system will comprise of a control system interface to execute the commands, an ICE-HE-DXL Display Control Center, and any combination of display controllers, tuner/controllers, IPTV decoder/controllers, or tuners.

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

- Display Express Server PC
- Display Express Lite web page embedded in the ICE-HE-DXL
- Third-party control processor

The ICE-HE-DXL Display Control Center is required to process the iCC-Net data from the control system and allow it to be inserted into the CATV RF distribution system. The iCC-Net commands that are delivered to the RF system are automatically duplicated and sent as UDP broadcast data packets to the IPTV decoder/controllers and tuners on the IPTV network.

Display control is accomplished using display controllers and HDTV tuner/controllers, IPTV decoder/controllers, and HDTV tuners. Display controllers, tuner/controllers, IPTV decoder/controllers, or tuners in any combination are utilized to receive the iCC-Net command strings and process the display specific commands for display control.

The display controllers have an RF pass-through for connection to the display's integrated tuner. The tuner/controller replaces the function of a display's integrated tuner for receiving and decoding the CATV channels in addition to provided display control.

The RF display controllers or tuner/controller include the following listed below.

- ICC1-232 display controller for RS-232 control of video displays with integrated tuner
- ICC1-IRX display controller for IR control of video displays with integrated tuner
- ICC1-TC tuner/controller for RS-232 control of video displays without an integrated tuner

The IPTV decoder/controllers will receive and decode the IPTV channels in addition to providing display control. The compatible RF tuners can receive the iCC-NET UDP broadcast data packets and respond to power, volume, and channel commands. Limited display control is available.

IPTV decoder/controllers and tuners include the following listed below.

- QIP-D IPTV decoder/control for RS-232 control of video displays
- QIP-DVX IPTV decoder/control for IR or RS-232 control of video displays
- 232-ATSC 4K HDTV tuner with HDMI CEC display control of compatible displays
- ATSC-SDI 4i HDTV tuner

Compatible IPTV Control System Components

Display Express Server PC

The Display Express Server PC may be used as the control system interface just as in the RF control system. The Display Express Server PC hosts a web server. Users can log into the web server either locally or remotely using a web browser to access the control pages. The Display Express Server PC connects to the ICE-HE-DXL via RS-232 port, USB virtual com port, or via Ethernet TCP port 2728.

- Independent control of over 4000 displays
- Displays may be controlled as individual units, as defined groups, as zones, or as all
- Supports hundreds of source channels
- Supports multiple schedules
- Supports control presets and macro presets
- Allows for multiple users with unique customizable control pages and user privileges
- Allows forwarding of custom strings to RS-232 controlled displays for advanced control
- Emergency alert presets may be manually or externally triggered

Display Express Lite

Display Express Lite is a web page that is hosted in the ICE-HE-DXL Display Control Center and can be accessed by any device with an internet browser. The Display Express Lite web page is accessed by entering the IP address of the ICE-HE-DXL in the browser's address bar. Display Express Lite by default will send the iCC-Net control commands via RF and UDP broadcast data packets.

- Simplified control of display power, channel, and volume
- Control for up to 128 displays
- Displays may be controlled as individual units, as defined groups, or as all
- Supports up to 32 source channels

Third-Party Control System

A third-party control system may be used as the control system interface. The control system processer may connect to the ICE-HE-DXL Display Control Center via RS-232 port, USB virtual com port, or via Ethernet TCP port 2728.

QIP-D IPTV Decoder/Controller

The QIP-D is a combination IPTV decoder/controller. The unit is a full functioned MPEG-TS IPTV decoder equipped with a display controller.

- Receives ICC-Net IP commands
- RS-232 port or HDMI CEC for display control
- Contains RS-232 protocols for many common makes and models of flat panel displays and video projectors in on board memory
- RS-232 display type selectable using on-screen communication menu, web page, command from the ICE-HE-DXL front panel, RS-232 command via serial port or Telnet
- HDMI CEC configurable using on-screen communication menu, web page, or RS-232 command via serial port or Telnet
- Display device number assigned using on-screen communication menu, web page, or RS-232 command via serial port or Telnet

QIP-DVX IPTV Decoder/Controller

The QIP-DVX is a combination IPTV decoder/controller. The unit is a full functioned MPEG-TS IPTV decoder equipped with a display controller.

- Receives ICC-Net IP commands
- RS-232 port, IR output, or HDMI CEC for display control
- Contains RS-232 protocols for many common makes and models of flat panel displays and video projectors in on board memory
- RS-232 display type selectable using on-screen communication menu, web page, command from the ICE-HE-DXL front panel, RS-232 command via serial port or Telnet
- Contains IR libraries for many common makes and models of flat panel displays and video projectors in on board memory
- IR display type selectable using on-screen communication menu, command from the ICE-HE-DXL front panel, or RS-232 command via serial port or Telnet
- I/O and SPDIF optical inputs for display power sense
- HDMI CEC configurable using on-screen communication menu, web page, or RS-232 command via DB-9 or Telnet
- Display device number assigned using on-screen communication menu, web page, or RS-232 command via DB-9 or Telnet

232-ATSC 4K HDTV Tuner

The 232-ATSC 4K is a full featured HDTV tuner. Although it cannot be used to receive IPTV streams, it can accept iCC-Net protocol IP commands on UDP port 31934.

- Receives ICC-Net IP commands
- Responds to commands for power, channel, volume, and other tuner related functions
- Display device number assigned using front panel controls, web page, or RS-232 command via serial port or Telnet
- Supports HDMI CEC for display power control

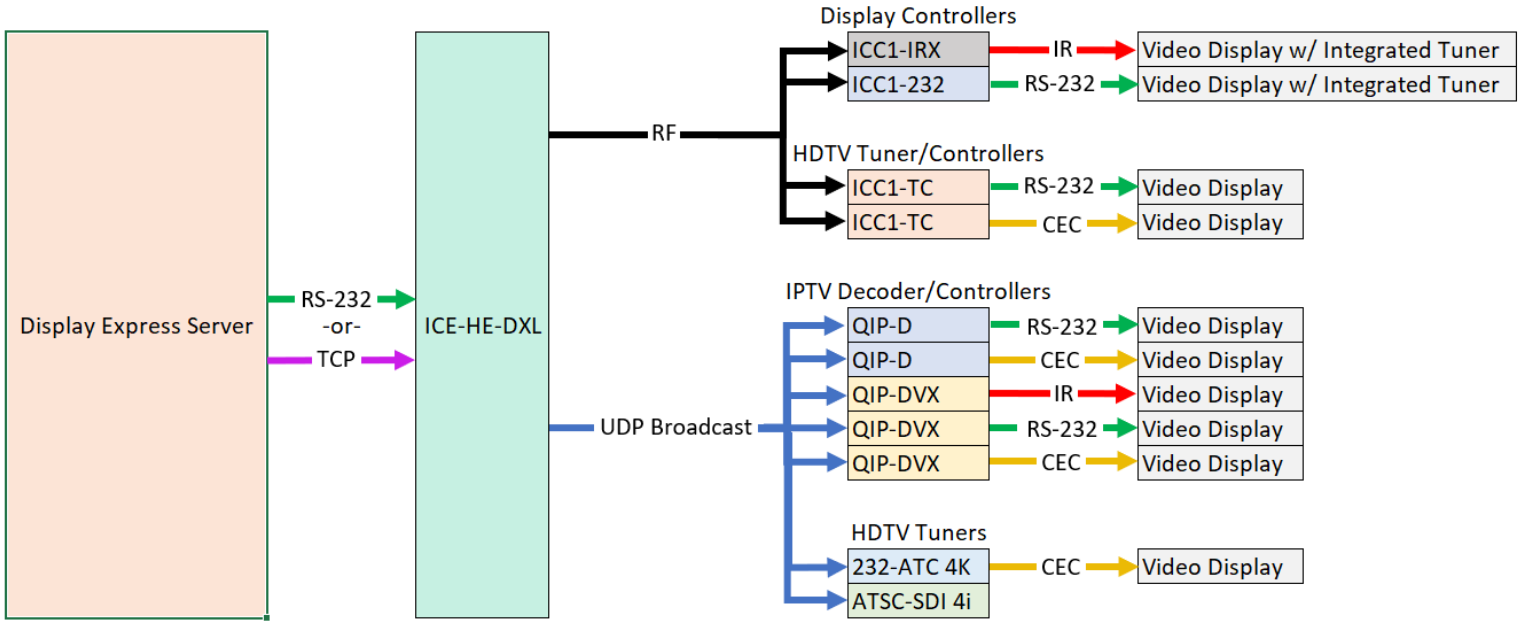
ATSC-SDI 4i HDTV Tuner

The 232-ATSC 4K is a full featured HDTV tuner with SDI output. Although it cannot be used to receive IPTV streams, it can accept iCC-Net protocol IP commands on UDP port 31934.

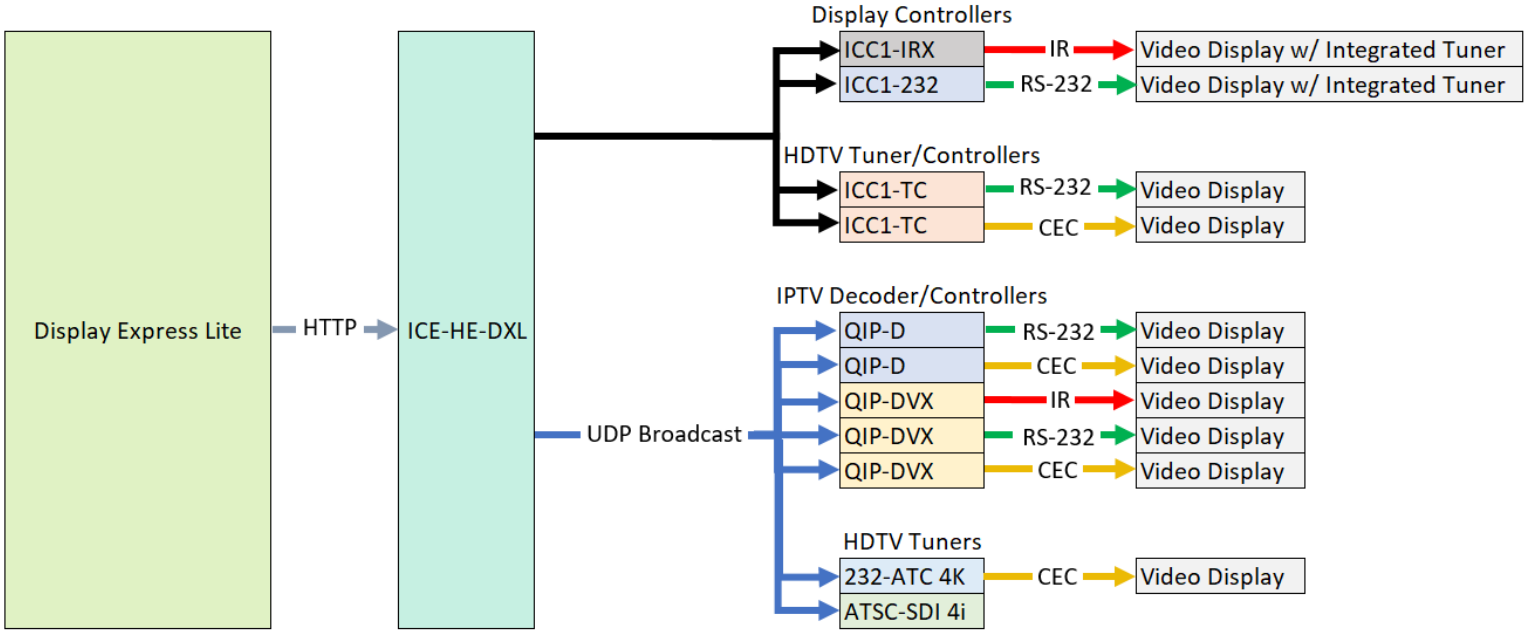
- Receives ICC-Net IP commands
- Responds to commands for power, channel, volume, and other tuner related functions
- Display device number assigned using front panel controls, web page, or RS-232 command

RF/IPTV Hybrid System Control Data Flow Examples

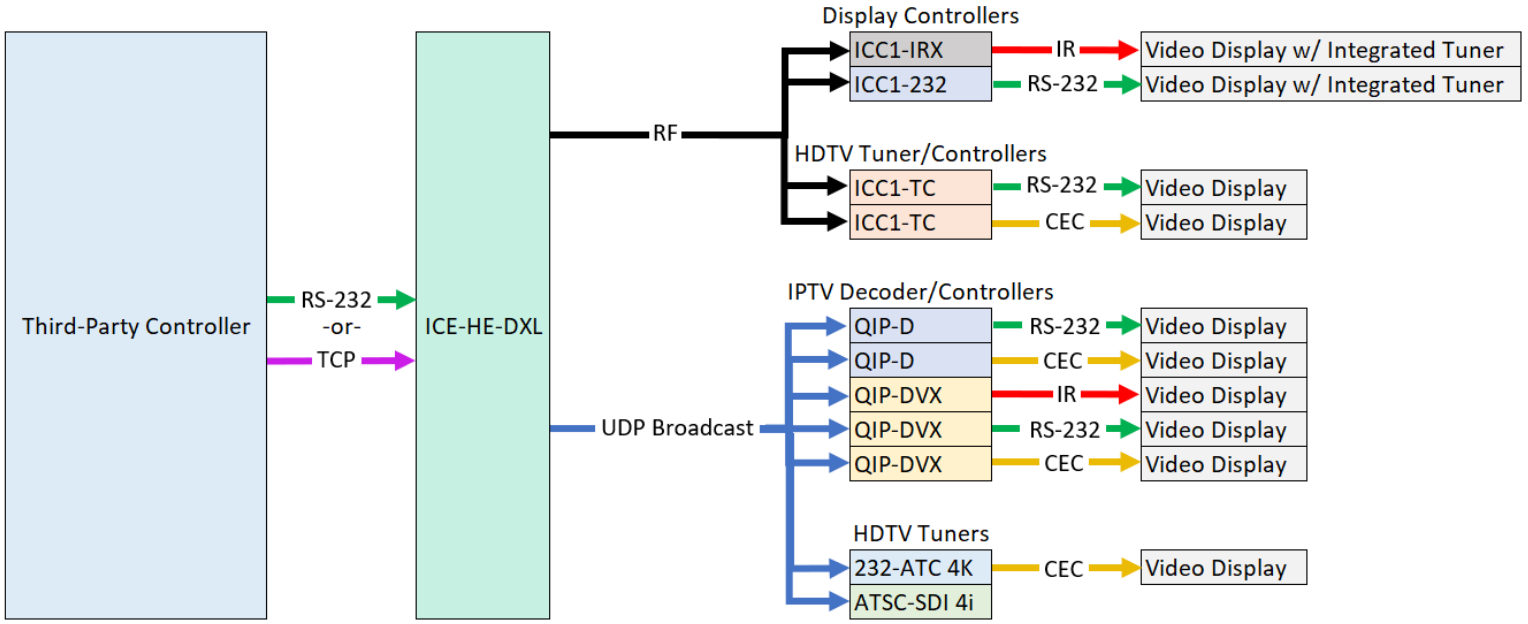
iCC-Net Control Data Flow with RF/IPTV Hybrid System Using Display Express



iCC-Net Control Data Flow with RF/IPTV Hybrid System Using Display Express Lite



iCC-Net Control Data Flow with RF System Using Third-Party Control



iCC-Net Protocol

The main components of the iCC-Net command string include the display device number, the command, and command parameters if required.

Explanation of 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		

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.

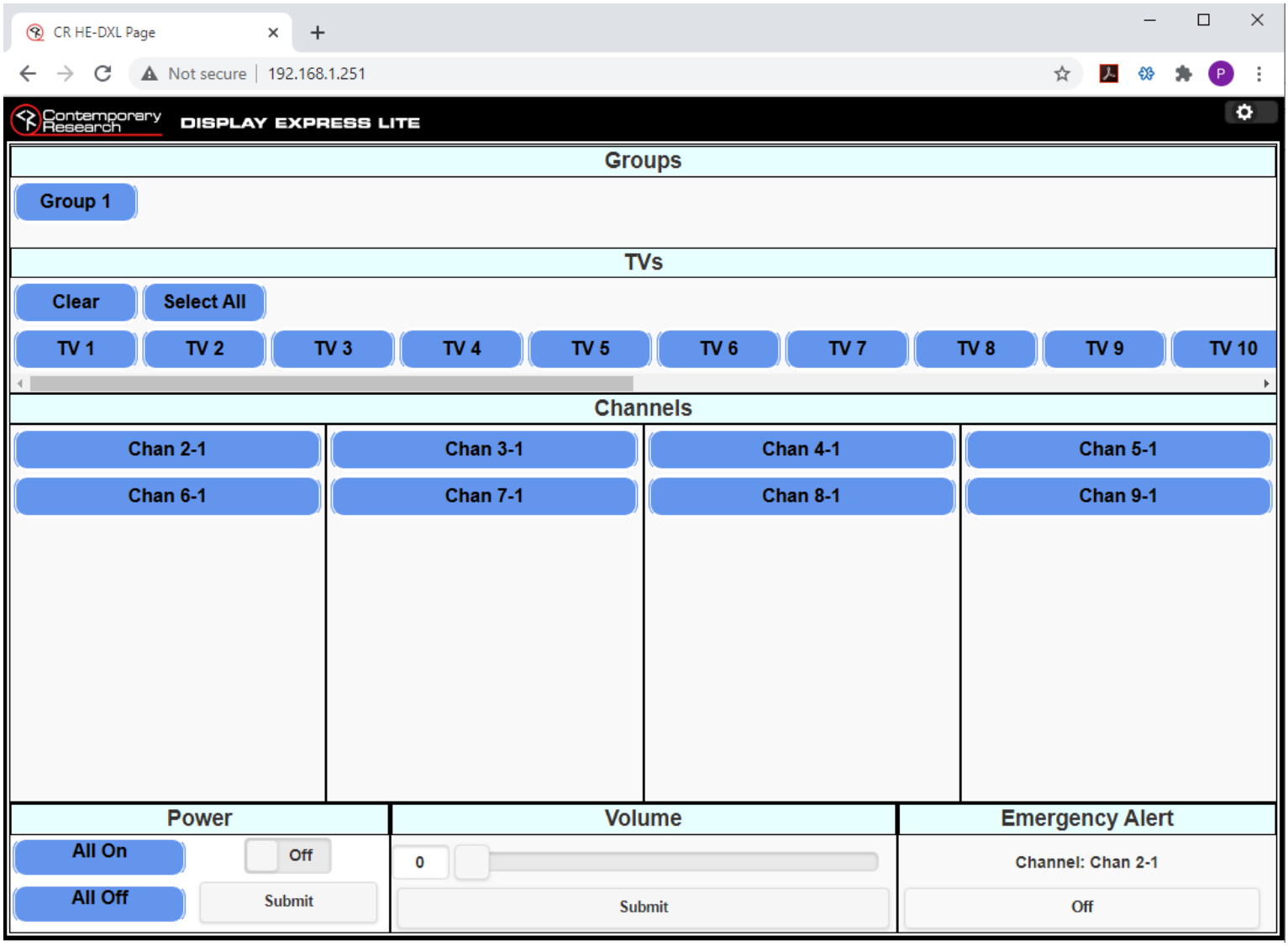
Go to www.asciitable.com for a handy Decimal/ASCII/Hex conversion chart.

Common iCC-Net Commands

The commands listed in the following table apply to all display controllers, tuner/controllers, IPTV decoder/controllers, and tuners. Refer to the product manual for each unit for a more complete list of 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)
		Channel Selection
TH=	Set Digital Channel	"$A5,<dh>,<dl>,5,'TH',<H1>,<Major>,<Minor>" (9 bytes) Sets digital channel with one-part virtual channel numbers and two-part channel numbers up to 255-255 <H1> Tuning Style 0=No Change in tuning style 1=Five digit one-part channel (Major=high byte, Minor=low byte) Formula: (high byte x 256) + low byte = channel number 2=Two-part virtual channel number (Major-Minor) 3=Two-part physical channel number (Major-Minor) *Examples:* "$A5,1,4,5,'TH',2,2,3" Device 260, virtual channel 2-3 "$A5,1,4,5,'TH',1,1,69" Device 260, channel 325 (256+69)
TJ=	Set Digital Channel	"$A5,<dh>,<dl>,6,'TJ',<Major high>,<Major low>,<Minor high>,<Minor low>" (10 bytes) Sets digital channel with two-part virtual channel numbers up to 999-999 Formula: (high byte x 256) + low byte = channel number *Example:* "$A5,2,44,6,'TJ',1,40,0,1" Device 580, channel 296-1
		Audio
VL=	Volume	"$A5,<dh>,<dl>,3,'VL',<Level>" (7 bytes) Sets volume in 64 steps 0 - 63. For ICC1-IRX, volume will ramp to lowest setting, then ramp up to specified level.

Display Express Lite



Display Express Lite is a web page that is hosted in the ICE-HE-DXL Display Control Center and can be accessed by any device with an internet browser. This will allow for easy system control from any computer, smart phone, or tablet. The Display Express Lite web page is accessed by entering the IP address of the ICE-HE-DXL in the browser's address bar. The page will scale to fit the screen of the control device.

Operation is simple. Select a Group, TV, or multiple TVs and select an action. The action can be a channel selection, volume, or power command. Selecting the Clear button will clear the selected Groups or TVs.

Display Express Lite by default will send the iCC-Net control commands via RF and UDP broadcast data packets.

Display Express Lite supports control of up to 128 of any combination of display controllers, tuner/controllers, IPTV decoder/controllers, or tuners. The display controllers, tuner/controllers, IPTV decoder/controllers, or tuners are represented by the TV buttons on the screen. The user can select from up to 32 source channels as well as control volume and power for the displays. For convenience, global All On and All Off buttons are available.

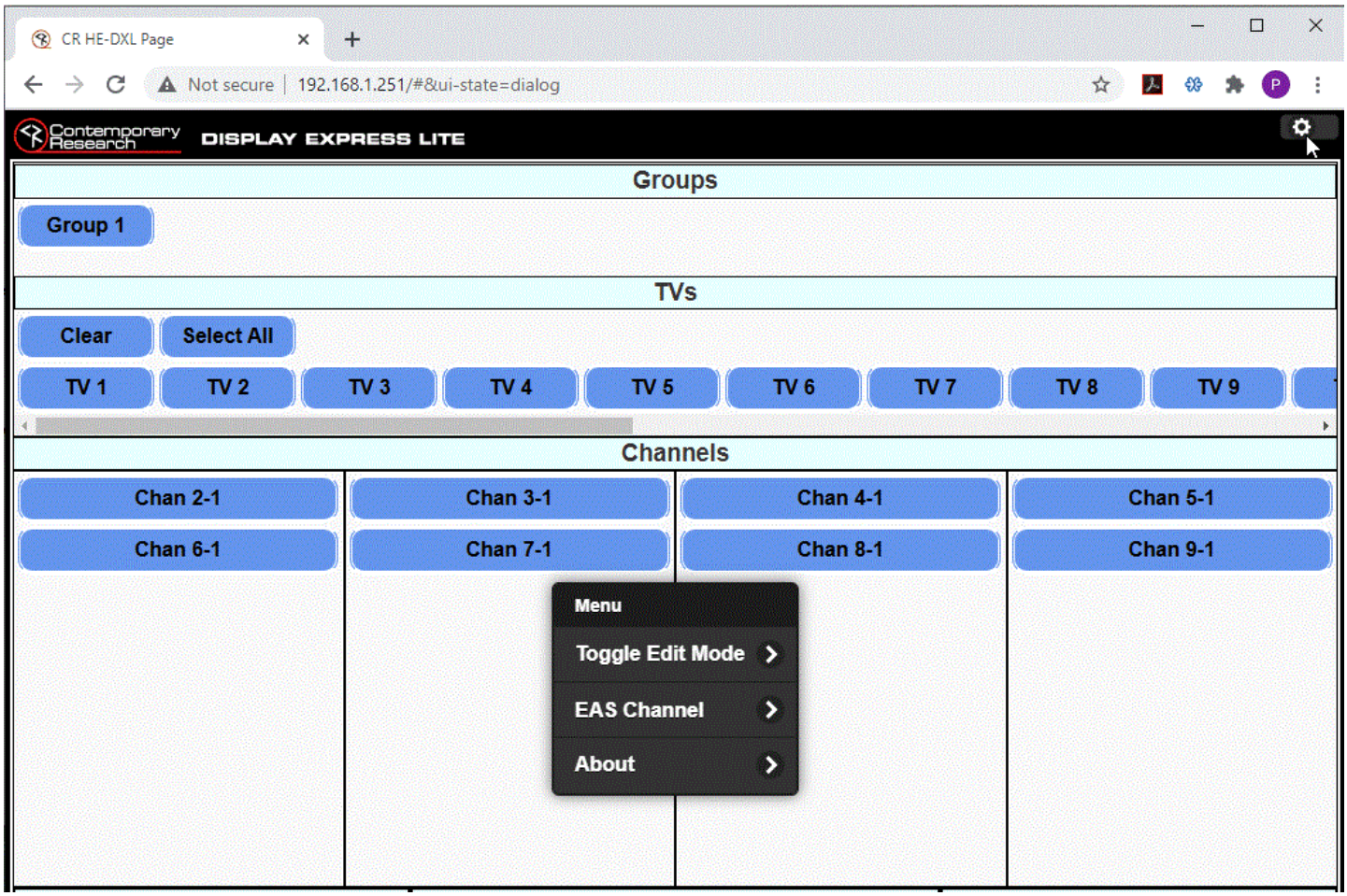
The default configuration has 20 TVs in one group and 8 source channels.

Configuring Display Express Lite

To configure Display Express Lite, the web page will need to set to Edit Mode. Edit Mode allows for the Group, TV, and Channel buttons to be edited, renamed, added, and deleted. The procedure to exit Edit Mode is identical to the procedure to enter Edit Mode.

To enter/exit Edit Mode:

- Click on the cogwheel icon in the upper right corner
- Select **Toggle Edit Mode** from the pop-up menu



TVs

TVs may be added, deleted, and assigned to Groups. Each TV button may be renamed. The Label field supports up to ten characters. Each TV button will be assigned an address. The address will match the display device number of the display controller, tuner/controller, IPTV decoder/controller, or tuner to be controlled by that button. The address is expressed as a three-digit number with a range from 257 to 384. For display controllers and tuner controllers that are configured using a Zone and Unit number, the address corresponds to Unit numbers 1 to 128 in Zone 1.



Groups

Individual TVs must be assigned to a group. A minimum of one group is required. Each Group button may be renamed. The Label field supports up to ten characters. To create a new group, just assign a TV to a group number that is not used. To delete a group, reassign all TVs in that group to another group.



Channels

Channels may be added or deleted. Each Channel button may be renamed. The Label field supports up to ten characters. To add a channel, select an existing channel, modify it with the new channel settings and click **Add**. The new channel will be added in the same column as the initial channel that was selected for modification.



Display Express Lite will automatically format the iCC-Net channel command string with the correct tuning style based on the settings entered in the Edit Channel window. Special 0-xxx two-part channel commands are supported for display input selection, captions, and other functions.

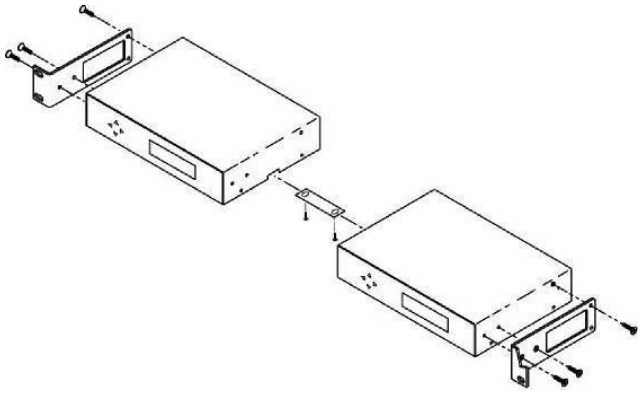
Channel Type	Major #	Minor #
Two-part Digital	<0-999>	<0-999>
One-part Digital	<1-9999>	Leave Blank
Analog	<2-135>	<0>

RKU Universal Rack Mount Kit

All Contemporary Research rack-mountable products will now include a Universal Rack Mounting Kit (RKU). The RKU will allow for mounting of a single unit or two units side-by-side in a 19” rack. One Universal Rack Mounting Kit will be included with the purchase of each product and will include the following parts:

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

2-Across Mounting

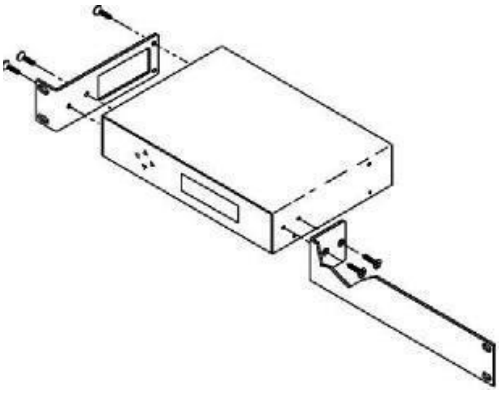


When mounting two components in one RU rack space, use the two short rack ears and the tie bar assembly.

Note that older versions of the QDA4-45 and QCA9-33 have solid side panels and should not be mounted next to actively cooled components with the ventilation holes, as that will block airflow.

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

Single Unit Rack Mounting



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

Specifications

Physical

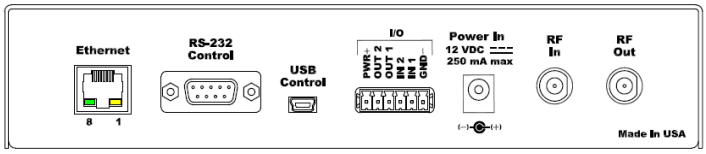
Size (HWD): 8.5” [216 mm] wide x 1.73” [44 mm] high (1 RU) x 8.0” [203mm] deep
Weight: 1.88 lbs [854 g]
Enclosure: Aluminum with black powder coat paint
Mounting: 1 RU Rack mounting for one- or two-units side-by-side (RKU, RK1, RK2EZ)
Cooling: Active cooling not required for normal applications.

Front Panel



Display: Text display, white text on blue LCD
Control: Setup, Select, and Up/Down/Left Right navigation buttons
USB: Mini USB-B virtual com port for control, configuration, and firmware updates

Rear Panel



Ethernet: RJ-45 10/100 Ethernet connector for Web page access, Telnet, UDP control, and IPTV Streaming
RS-232: DB-9 male, RS-232 data link to control system, 1200 to 115.2K baud (19.2K default), 8 data bits, no parity, 1 stop bit
USB Control: Mini USB-B virtual com port for control, configuration, and firmware updates
I/O: Logic control port 6-pin captive screw terminal

1 – PWR+	Power, 12 VDC, 250 mA max (using the included 500 mA power supply)
2 – OUT2	Output 2
3 – OUT1	Output 1
4 – IN2	Input 2
5 – IN1	Input 1
6 – GND-	Ground

Power In: 2.1mm coaxial jack (inside center conductor positive), 1.1 A maximum, 11 to 18 VDC, 12 VDC typical, 250 mA maximum, 45 BTU
RF In: ‘F’ female 75 ohm impedance for future use
RF Out: ‘F’ female, 75 ohm impedance, RF to CATV distribution system
Data Transmit: Mid-band VHF, 74.7 MHz, +14 to +45 dBmV, adjustable from front panel
±80 KHz max carrier deviation

Includes

PS12-500 Power Supply, 500 mA maximum, 12 VDC (5400-001)
RKU Universal Rack Kit

Options

RK1 Single Rack Kit, 1RU (5008-001)
RK2EZ Dual Rack Kit, 1RU (5008-015)
CC-COM-B RS-232 Null Modem Cable (5061-003)

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, pro- vides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.

- Lightning - Avoid installation or reconfiguration of wiring during lightning activity.

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

- Overloading - Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.

- Object and Liquid Entry - Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short out parts, resulting in a fire or electric shock. Never spill liquid of any kind on the product.

- Servicing - Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.

- Damage Requiring Service - Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

    - When the power supply cord or plug is damaged.

    - If liquid spills or objects fall into the product.

    - If the product is exposed to rain or water.

    - If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions. An improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.

    - If the video product is dropped or the cabinet is damaged.

    - When the product exhibits a distinct change in performance, this indicates a need for service.

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

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

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

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

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

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

Return Material Authorization (RMA) Number: Before returning a product for repair or replacement, request an RMA from Contemporary Research's technical support. Provide tech support with a return phone number, e-mail address, shipping address, product serial numbers and original purchase order number. Describe the reason for repairs or returns as well as the date of purchase. See the General RMA Terms and Procedures section for more information. RMA's are valid for 30 days and will be issued to authorized Contemporary Research dealers only. End users must return products through authorized Contemporary Research dealers. Include the assigned RMA number in all correspondence with Contemporary Research. Write the assigned RMA number clearly on the shipping label of the box when returning the product.

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

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

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

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

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

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

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