



# ICE-HE-DXL User Manual



# Overview



The ICE-HE-DXL Display Control Center is an intelligent solution for “over-the-coax” RF display control to any combination of ICC1-IRX Controllers, ICC1-232 Controllers, and ICC2-ATSC4S Tuner/Controllers. Control commands are sent over RF by inserting a micro data channel in the gap between channels 4 and 5. In addition, its flexibility allows it to communicate with individual displays, groups, zones, or all displays using any one of three software options: the onboard **DX Lite web page**, **Display Express Software** from Contemporary Research, or **third-party control systems**.

## DX Lite Web Page

The DX Lite web page can be configured to control up to 128 TVs, 16 channels, and 16 groups. No additional software is required, and the entire system can be controlled from any web-enabled device such as a smartphone or tablet.

## Display Express Software

By purchasing the additional Display Express Software which resides on a PC, the Display Control Center can be expanded to support up to 4000 TVs and 256 channels. The software offers increased flexibility by providing the ability to define presets, perform advanced scheduling, configure multiple user levels, zones, etc.

Note: DX Lite does not convert to Display Express. The user must reconfigure the complete system with the new software. If using Display Express Software, please refer to the “Display Express Software Manual” for detailed instructions.

## Custom Control Systems

Custom control systems can connect to the Display Control Center through RS-232, front or rear panel USB, or Telnet, sending commands via the published Contemporary Research ICC-Net protocol, controlling all TVs through a single control port.

Front-panel menus and the USB Service port simplify setup and firmware updates. In addition, a Display Express PC or other external control system may be connected via the Ethernet, RS-232, or USB port on the back panel.

Note: The RS-232, front USB, and rear USB ports all perform the same function, but the front USB port is faster for firmware updates.

# Specifications



## Physical

Size: 8.5" [216mm] wide x 1.73" [44mm] high (1RU) x 6" [152mm] deep

Weight: 1.38 lbs. [628g]

Enclosure: Aluminum with durable black powder coat paint

Mounting: Shelf or 19" equipment rack using RK1 or RK2EZ rack mount kit

## Front Panel

Display: Text Display, white text on blue LCD

Control Buttons: SETUP, SELECT, and Up/Down/Left/Right arrows

Mini-B USB Port

## Rear Panel

**Control Connections** – Ports can operate simultaneously.

Ethernet: 10/100BASE-T RJ-45 jack

RS-232: DB9 female, RS-232 data link

2 – Rx

3 – Tx

5 – GND

USB: Mini-B USB Port

I/O 1 & 2: 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

*Both the front and rear panel USB ports and the RS-232 port all perform the functions of control and firmware updates. However, the front panel USB performs faster firmware updates.*

## iCC-Net Connections

RF In: 'F', female, 75 ohm impedance, RF and iCC-Net from CATV system  
(Only for legacy 2-way applications)

Data Receive: Carried over the same RF coax connection as TV channels  
Return signal from system controllers  
Sub-band, 5.6 MHz, narrow-band signal below standard sub-band channels  
-15 to +35 dBmV signal level (0 to +15 dBmV nominal)

RF Out: 'F', female, 75 ohm impedance, RF to CATV distribution to controllers

Data Transmit: Mid-band VHF, 74.7 MHz, narrow-band signal between channels 4 and 5  
 $\pm 80$  KHz max carrier deviation  
+14 to +45 dBmV, adjustable from front panel

## Power Connections

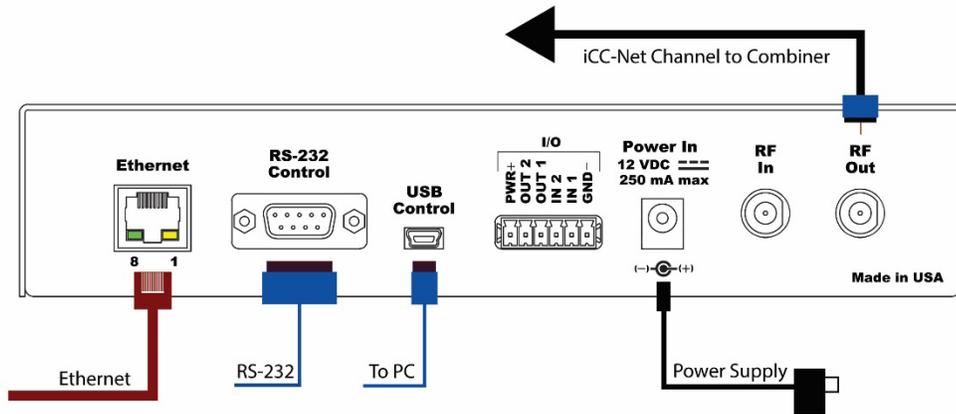
Power In: 2.1 mm coaxial jack (inside center conductor positive), 11 to 18 VDC, 12 VDC typical, 250 mA maximum

## Includes

12 VDC Power Supply, 500 mA 110/220VAC, 60/50 Hz

Embedded DX Lite software

# Installation



## Remote Control Connection

There are three types of control ports:

- **RS-232:** Attach a null modem cable to the port. The default setting is 19.2K baud and can be changed via the front panel setup.
- **USB:** Connect a mini-B USB cable from a Display Express PC or other control system. It shows up as FT230X UART in Windows/Devices.
- **Ethernet:** Connect to an IP network port to access the internal DX Lite webpage, or use the port for telnet control or connection to a Display Express server.

## RF Coax and iCC-Net Operation

- Connect an RF coax feed from **RF Out** to the system's RF combiner, mixing the iCC-Net Out signal with the other CATV channels. The iCC-Net Out channel operates at 74.7 MHz, between cable channels 4 and 5.
- When combining the RF output with QMOD modulators, the internal attenuator should be set to 29 dBmV to match the modulator's level. 29 dBmV is the factory default setting.
- Do not connect any feeds to **RF In** in normal operation. It is used only for legacy 2-way applications.

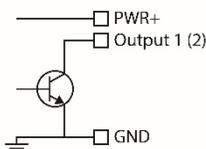
## AC Power

- Insert the DC power supply plug into the **Power In** jack.
- Plug the power adapter into an AC wall outlet. The front panel display should turn on.

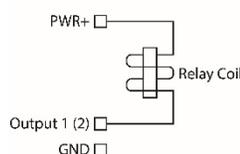
## I/O Port

- Inputs are 0-24 VDC 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. Turning on the output turns on the transistor and creates a current path to ground.

## Simplified Output Circuit



## Typical Application

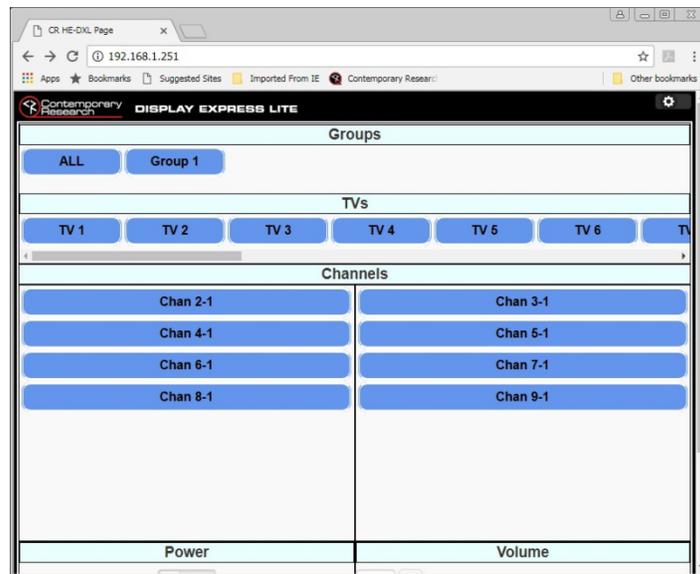


# ICE-HE-DXL Setup



## Basic Network Setup

- Connect the Display Control Center to the network.
- Press the red **SETUP** button.
- Press the **Down** arrow until “Network” is displayed then press the white **SELECT** button.
- Use the **Down** arrow to view “IP Mode”.
- Use the **Left** or **Right** arrow to show “DHCP” then press the **SELECT** button to save the setting.
- To create a static IP address, choose “Static” mode and manually set an IP address. The unit will use the gateway settings it captured in “DHCP”.
- Press **SETUP** then **SELECT** to show the IP Address.
- A PC’s Ethernet port may be directly connected to the ICE-HE-DXL’s Ethernet port. A cross-over cable is not required.



- Enter the IP Address of the ICE-HE-DXL into the top entry bar on your browser.
- The DX Lite home page will appear on your screen.
- If the ICE-HE-DXL is connected to a network with Wi-Fi access, the unit may also be accessed from the browser on a tablet or smart phone.

# Front Panel Display



During normal operation, the ICE-HE-DXL displays the above text on the LCD display. The top line shows communication ports as well as network and control status. “Rx” or “Tx” appears briefly under the three external ports (232, USB, IP) to show I/O activity, and a white cursor will blink under the three status options (**N**etwork, **C**ommunication, **E**rror).

- 232 – Active RS-232 port
- USB – Active USB data port
- IP – Active Ethernet port
- N – ICC-Net status, blinking once per second, sending the “heartbeat” command to all TV controllers.
- C – Valid ICC-Net command. The processor evaluates the syntax, and confirms when it is valid.
- E – Error in ICC-Net control frequency. The unit auto-corrects the frequency, so you may see the error status briefly, such as when the unit is powered up. If the status stays constant, contact CR Support for service.

## ICE-HE DXL Setup Menus

Press the **SETUP** button to enter the menus. Use the **Up/Down** arrows to move through menus and the **Left/Right** arrows to change settings. Press **SELECT** to store the changes at each step.

- Select a menu group (“System”, “Network”, “Command”) then **SELECT** to view that group’s menus.
- Press **SETUP** to move back to other menu groups.
- Pressing the **Left/Right** arrows together will reboot the unit.

<b>System</b>	<i>Factory Defaults are shown in <b>Bold</b>.</i>		
<b>Baud Rate</b>	2400   4800   9600   <b>19200</b>   38400   115K <i>This setting is for rear USB and DB9.</i>		
<b>Pnl Lockout</b>	<b>None</b>   Setup <i>Press setup and right arrow key to temporarily unlock.</i>		
<b>Backlight</b>	Display brightness 1-10 ( <b>9</b> )		
<b>LCD Contrst</b>	Contrast 1-9 ( <b>5</b> )		
<b>RF Level dB</b>	14-45 in 1 dB steps ( <b>29</b> ). Use 29 when combining with QMODs, 14 when connecting to QCA9-33 Low RF Input.		
<b>Fact Dfault</b>	<b>Confirm: N</b>   Confirm: Y <i>Restores factory default settings.</i>		
<b>Firmware</b>	Displayed as ICE-HE-DXL<X.YY> <i>L/R arrows may be used to view boot-loader and board rev.</i>		
<b>Network</b>			
<b>IP Address</b>	<b>192.168.1.251</b>		
<b>IP Mode</b>	<b>Static</b>   DHCP <i>Note: Changing IP address, gateway, &amp; subnet are not permitted in DHCP Mode.</i>		
<b>Gateway</b>	<b>0.0.0.0</b>		
<b>Subnet Mask</b>	<b>255.255.255.0</b>		
<b>IP Port</b>	<b>23</b>	<i>Telnet Port</i>	
<b>MAC/SN</b>	<b>00:14:C8:10:xx:xx</b>		
<b>Command</b>			
<b>Power</b>	All:On   <b>All:Off</b>		
<b>Volume</b>	<b>All:Mute</b>   All:Low   All:Medium		
<b>Send IR Type</b>	<b>Zn: ALL,01-15</b>	<b>Un: ALL,001-255</b>	<b>Ty: 1-99(21)</b> <i>Zone, Unit, Type (IR Type)</i>
<b>Send 232 Typ</b>	<b>Zn: ALL,01-15</b>	<b>Un: ALL,001-255</b>	<b>Ty: 1-99(21)</b> <i>Zone, Unit, Type (RS-232 Type)</i>

Note: In the version of firmware available at this time, the "Send 232 Typ" command is supported only with the ICC2-ATSC 4S Tuner/Controller. It is not yet functional with the ICC1-232 Controller.

### Send IR Type / Send 232 Typ Commands



In the **Command** section of the menu above, **Send IR Type** and **Send 232 Typ** are used to match the controllers to the specific TV models and location on the network. There are three parts to the command, selected by moving the **Left/Right** arrows to each value, then using the **Up/Down** arrows to set a number. Press **SELECT** to store the changes.

The following is a description of those commands.

All ICC-Net controllers have a display ID that is made up of two values: **Zone** and **Unit**. The displays are organized into 16 Zones of 255 displays each. The display number is equal to the Zone number plus the Unit number. For example: Display 258 is Unit 2 (2) of Zone 1 (256).

Zn:	Press the Right arrow to select the Zone, use the Up/Down arrow to select the Zone number. Zn = (0-15, or ALL). <i>ALL TV Controllers will respond to a command sent to Zone ALL.</i>
Un:	Press the Right arrow again to select a Unit number 1-255 or ALL (all the controllers in that Zone)
Ty:	For a full list of IR codes, refer to the ICC1-IRX manual. Popular codes include:  21=LG            44=Vizio  25=Samsung    45=Panasonic  43=Sony        46=Sharp  For a full list of 232 codes, contact Contemporary Research Support. Popular codes include:  54=LG            47 = Sharp  11=Samsung    13=Panasonic
Se- lect	Press the white <b>SELECT</b> button to send the command
Test	Use the <b>Power</b> command menu to test operation

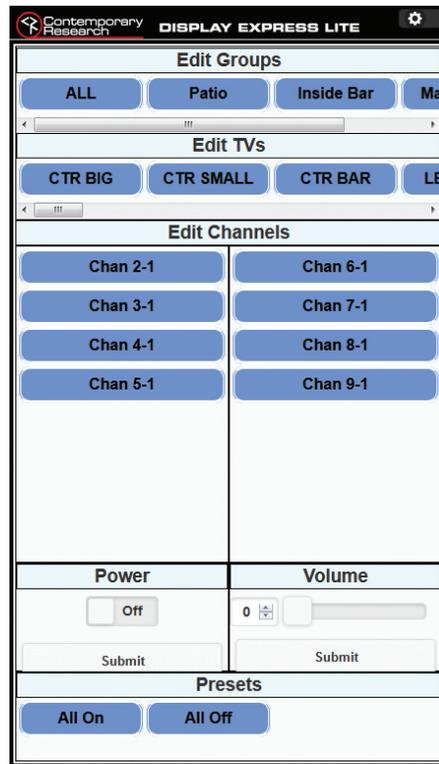
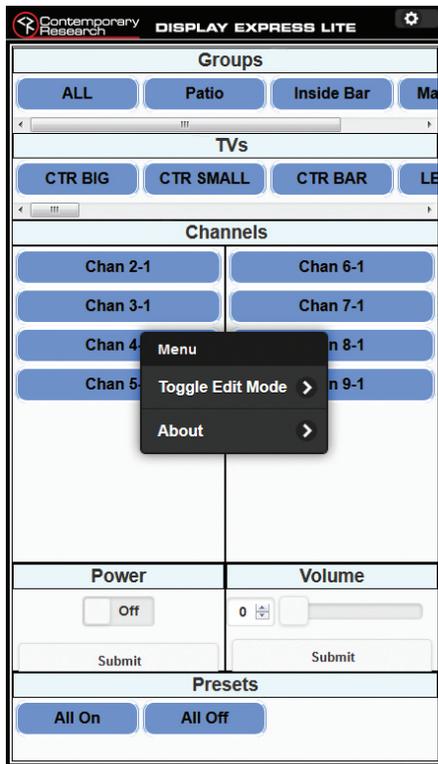
# Display Express Lite



The Display Express Lite web page in the ICE-HE-DXL Display Control Center is a compact version of full Display Express software that runs on a PC. The Lite version is focused on one task – tuning channels for a selected group of TVs, with the added options for TV power and volume, and turning all the TVs on and off.

The page will scale to fit your screen, whether on a smartphone, tablet, or PC.

# Programming Display Express Lite



The first 20 TVs and 8 channels have been pre-defined for ease of installation, but they may be modified.

To customize the settings, click on the settings icon at the top right and select “Toggle Edit Mode” from the pop-up.

The page will change as shown, enabling the user to edit Groups, TVs, and Channels. **(Turn off the edit mode when changes are complete.)**

TV

Label

Group

Address

Group

Label

Group

Channel

Label

Major Num

Minor Num

## TVs

Display Express Lite supports up to 128 controlled TVs in the system. When you choose to edit a TV, you can do the following:

- Change the label to your preferred name.
- Assign a Group. Adding a new group number creates a new group.
- Change the address if needed.

## Groups

Groups are created with the group number in the TV buttons. The name of the group can be updated here.

## Channels

Display Express Lite supports up to 16 channels. Click on a channel button to change the name or the channel number. Refer to the table below for channel number conventions.

Channel Type	Major #	Minor #
2-part digital	<0-135>	<0-256>
1-part digital	<1-9999>	Leave Blank
Analog	<2-135>	0

# RS-232 ICE-HE-DXL Commands

The following commands apply to the ICE-HE-DXL only. Commands addressed to controllers are included in the section for RS-232 Controller Commands.

All commands follow the same structure:

- Command strings begin with ASCII > (greater than symbol).
- Command strings end with a carriage return. ASCII CR, Hex 0D, or keyboard “Enter” are acceptable.
- Responses begin with ASCII < (less than symbol).

Example string: “>ID” will return “<ID-IC-HE 1.05”

Command	Name	Description
EF	Echo Off	Disables terminal character echo (default).
EN	Echo On	Enables character echo so you can see typed characters on screen. Or use the Terminal settings to Local Echo.
ID	ID and Version	Returns the product model number and firmware version.
IB	HE Bootloader Version	Displays HE Bootloader Version
IP	MAC, IP/Gateway/Mask Address	IP returns the MAC address, current IP address, gateway, subnet mask, and IP mode. Response example: <1\$MAC=0014C8100004 IP=192.168.001.221 IG=000.000.000.000 IM=255.255.255.000 IY=2 IP=xxx.xxx.xxx.xxx sets IP address, then sends status (0.0.0.0 = DHCP)
IG	MAC, IP/Gateway/Mask Address	IG returns MAC address and current IP information – the same as IP command IG=xxx.xxx.xxx.xxx sets gateway address, then sends status
IM	MAC, IP/Gateway/Mask Address	IM returns MAC address and current IP information – the same as IP command IM=xxx.xxx.xxx.xxx sets subnet mask, then sends status
IY	IP Mode (1 Static, 2 DHCP)	IY returns the current IP mode IY=n sets IP mode, where n = 1 is static and n = 2 is DHCP
IX	IP Port	IX returns current IP port for Telnet communication IX=n sets port number
MC	MAC Read	MC returns the current MAC address. Response example: <1MAC=00:14:c8:10:00:04
R5	Baud Rate (1-6)	Set Baud Rate 1 = 2400 2 = 4800 3 = 9600 4 = 19200 (default) 5 = 38400 6 = 115200
S4	Front Panel Lockout	Set Front Panel lockout mode 0 = None 1 = Setup Press Select and Right key to unlock temporarily

Z!	Restore Factory Settings	Reconfigures unit for all factory default settings															
Z]	Reset Processor	Reboots the unit															
M0	LCD Backlight	Sets LCD backlight value: 0-9															
M8	LCD Contrast	Sets LCD contrast value: 0-8															
NM	Returns Unit Name	Reads unit name <1NMunitname															
NW	Writes Unit Name	Sets unit name >NW=unitname															
HR	Get Board Hardware Revision	xy where x is A-Z, and y is 0-9															
PS	Set Output Pins	<table border="0"> <thead> <tr> <th></th> <th><u>Out 1</u></th> <th><u>Out 2</u></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Low</td> <td>Low</td> </tr> <tr> <td>1</td> <td>High</td> <td>Low</td> </tr> <tr> <td>2</td> <td>Low</td> <td>High</td> </tr> <tr> <td>3</td> <td>High</td> <td>High</td> </tr> </tbody> </table>		<u>Out 1</u>	<u>Out 2</u>	0	Low	Low	1	High	Low	2	Low	High	3	High	High
	<u>Out 1</u>	<u>Out 2</u>															
0	Low	Low															
1	High	Low															
2	Low	High															
3	High	High															
PG	Get Input Pins	<table border="0"> <thead> <tr> <th></th> <th><u>In 1</u></th> <th><u>In 2</u></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Low</td> <td>Low</td> </tr> <tr> <td>1</td> <td>High</td> <td>Low</td> </tr> <tr> <td>2</td> <td>Low</td> <td>High</td> </tr> <tr> <td>3</td> <td>High</td> <td>High</td> </tr> </tbody> </table>		<u>In 1</u>	<u>In 2</u>	0	Low	Low	1	High	Low	2	Low	High	3	High	High
	<u>In 1</u>	<u>In 2</u>															
0	Low	Low															
1	High	Low															
2	Low	High															
3	High	High															

# RS-232 Protocols for Custom Control Systems

## Overview

RS-232 control for over 4000 TV Controllers is provided through an ICE-HE-DXL Display Control Center. The ICE-HE-DXL manages ICC-Net communication over RF coax to ICC1-IRX and ICC1-232 Controllers as well as ICC2-ATSC 4S Tuner/Controllers.

Connection from the control system can be made through the RS-232 Control Port or Telnet. The default setting for the RS-232 Control Port is 19.2K baud, 8 data bits, no parity bit, and 1 stop bit. For testing purposes, a connection can be made through the front or rear panel USB mini-B connector from a Windows PC. This connection will appear as a virtual COM port in Windows and can be used with the IC Send software from Contemporary Research or a terminal emulation program.

## Display Numbers

Each TV Controller is assigned a unique display number from 1 to 4094 to which control commands are addressed. The displays are organized into 16 zones of 255 displays. All TV controllers in a zone will respond to a command sent to display 0. ALL TV controllers will respond to a command sent to Zone 15, Display 255.

Zone	Zone*256	Unit	Display #
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 Structure

All commands follow the same structure:

- Attn - Hex A5
- Zone - 1-15 (Hex 01-0F)
- Unit - 1-255 (Hex 01-FF)
- Bytes - Number of bytes that follow
- Command - 1 byte
- Parameters - 1 to 4 bytes

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 a single decimal byte.
- Parameters shown in < > brackets are single byte.
- A series of multiple commands or parameters are set apart by [ ] brackets.
- Commas separate the bytes, but they are not part of the protocol.
- Double quotes enclose the command string, but they are not part of the protocol.

### Command Format

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

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

### String Format

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

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

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

- AMX Mixed Format = “\$A5,1,4,5,'TH',2,2,3”
- AMX Hex Format = “\$A5 \$01 \$04 \$05 \$54 \$48 \$02 \$02 \$03”
- Standard Hex (no denotation) = A5 01 04 05 54 48 02 02 03
- Crestron Hex Format = \xA5\x01\x04\x05\x54\x48\x02\x02\x03
- RTI = Select port, hex mode, enter A5 01 04 05 54 48 02 02 03

*Note: When returning to normal editing mode, the app inserts an \x before each hex character.*

Go to [www.asciitable.com](http://www.asciitable.com) for a handy Decimal/ASCII/Hex conversion chart.

# RS-232 Controller Commands for ICC1-232, ICC1-IRX, and ICC2-ATSC4s

Command	Description
<b>Power Off</b>	<b>P0</b> "\$A5,<dh>,<dl>,2,'P0' " (6 bytes)
<b>Power On</b>	<b>P1</b> "\$A5,<dh>,<dl>,2,'P1' " (6 bytes)
<b>Power Toggle</b>	<b>PT</b> "\$A5,<dh>,<dl>,2,'PT' " (6 bytes)
<b>Volume</b>	<b>VL</b> "\$A5,<dh>,<dl>,3,'VL',<vol level>" (7 bytes) 0 = Mute 1 - 63 = Minimum volume level (1) to maximum volume level (63)
<b>RS232 Type</b>	<b>T0</b> Sets RS-232 display type. Currently only for ICC2-ATSC4s. Available in Phase2 for ICC1-232.
<b>IR Type</b>	<b>T1</b> "\$A5,<dh>,<dl>,3,'T1',<type> " (7 bytes) Sets IR display type Identical to using DIP switch to set IR control codes. Specify value to match IR code type. Note: "Discrete" types always ignore the sensor input. However, if the type is specified as "Sensor", add 64 to the IR code to set the ICC1-IRX to ignore the power sensor.
<b>Tuning Format</b>	<b>S0=</b> "\$A5,<dh>,<dl>,3,'S0',<format>" (7 bytes) 0 = CATV 1 = Off-Air 2 = IRC 3 = HRC 4 = Cable Auto Not always used by modern displays – normally set by TV on-screen menus
<b>Tuning Style</b>	<b>H1=</b> "\$A5,<dh>,<dl>,3,'H1',<style>" (7 bytes) 1 = 5-digit CableCard style tuning (1-9999) 2 = Virtual HD Major-Minor tuning (tunes to virtual channel ID in display) 3 = Physical HD Major-Minor tuning (physical channel, minor digital)
<b>TC Response</b>	<b>H2=</b> "\$A5,<dh>,<dl>,3,'H2',<response>" (7 bytes) Pre-sets how the ICC1-232 will respond to TC tuning commands. 0= Ignore, use current settings 1= Analog Only 2= Digital (For CableCard applications only)
<b>Control String</b>	<b>UX</b> "\$A5,<dh>,<dl>,<2+string length>,'UX',<string>" (variable bytes) Sends an RS-232 string (ASCII, decimal, or hex) directly to the TV display. Ex: "\$A5,1,2,6,'UX', 'PON', 13" Sends PON, followed by carriage return (display 258)
<b>Force Channel</b>	<b>TC</b> "\$A5,<dh>,<dl>,3,'TC', <channel>" (7 bytes) Tunes to a specific channel 2-127
<b>Select Channel</b>	<b>TT</b> "\$A5,<dh>,<dl>,3,'TT', <channel>" (7 bytes) Selects a specific channel 2-127
<b>Tune HD</b>	<b>TH</b> "\$A5,<dh>,<dl>,5,'TH',<H1>,<Major>,<Minor>" (9 bytes) Digital Tuning Normally, the H1 parameter is 0, allowing the ICC1-232 to use the current H1 tuning format, but it could be used to force a different tuning option. When the display is set to the H1=1 mode, 1-part digital channel, the first byte is (X*256), and the last byte is the value you add to state the channel number. In H1=2 or 3 modes, the bytes represent the Major and Minor channel numbers. "\$A5,1,4,5,'TH',1,2,3" Display 260, channel 515 (512 +3) "\$A5,1,4,5,'TH',2,2,3" Display 260, virtual channel 2-3 "\$A5,1,4,5,'TH',3,2,3" Display 260, physical channel 2, minor 3
<b>Tune Ring</b>	<b>TR</b> "\$A5,<dh>,<dl>,<ncb>,'TR', [<chan 1>, <chan N>]" (variable bytes) This command stores a Tune Ring, <b>Analog channels only</b> , a series of preset channels accessed by channel up/down commands. This is only for old Smart TVs. Ex1: "\$A5,<dh>,<dl>,6,'TR', 5,4,8,11" sets ring to channels 5, 4, 8 and 11 Tip: The ring follows the stored order. Channels do not have to be in ascending order. Ex2: "\$A5,<dh>,<dl>,8,'TR', \$82,5,\$87,11" sets channels 2-5 and 7-11. A range can be specified using MSB bit for the first channel; the next byte is the last.

<b>Control Lock</b>	<b>LM</b>	<p>"\$A5,&lt;dh&gt;,&lt;dl&gt;,3,'LM',&lt;control&gt;" (7 bytes)</p> <p>0 = Off (unlocked)</p> <p>1 = On (locked)</p> <p><i>Locks out display commands from an IR remote or front-panel buttons. Feature is not available for all models of displays. Check with CR Tech Support if this function is important to your application.</i></p>
<b>Sharp Tuning</b>	<b>H9</b>	<p>"\$A5,&lt;dh&gt;,&lt;dl&gt;,3,'H9',&lt;control&gt;" (7 bytes) <i>Used for Sharp control firmware 3.2.</i></p> <p>H9,1 = Sharp -1 tuning fix (set cannot tune a -1 channel, does fine on others)</p> <p>H9,0 = Standard Sharp control</p>
<b>Send IR</b>	<b>LQ=</b>	<p>"\$A5,&lt;dh&gt;,&lt;dl&gt;,3,'LQ',&lt;IR Code&gt;" (7 bytes)</p> <p><i>Emulates an IR command for special applications:</i></p> <p>100=Info</p> <p>115=Captions</p> <p>22=Channel Up</p> <p>23=Channel Down</p>