



Dealer Support Manual V1.2



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Just Add Power 2G OSD Messages



- *Splash screen at boot up*

Trying to find the gateway... – This means no Transmitter detected on the same VLAN. Check the network settings. Using a direct connect CATX cable (one TX to one RX) can be used to prove it is a network problem.

Found {Transmitter IP}, starting link.. – This means a Transmitter was found.

Gateway may have rebooted - standby – Self explanatory (the Gateway is typically a Transmitter)

HD_OVER_IP initialized. – Self explanatory, the Transmitter and Receiver have established a link

All services initialized - please standby... – Self explanatory, usually happens when the HDMI source boots up slowly

Waiting for video source – please standby... – Self explanatory, often caused by a slow player

HD_OVER_IP stopped! – Self explanatory, may be caused by an IP command to the Transmitter to shut down video.

ERROR! HD_OVER_IP failed? Stop the link – Self explanatory, probably a hardware problem.

System stopped! – Self explanatory, may be caused by IP command to Receiver

All services are stopped – Self explanatory, probably a hardware problem

Gateway is not ready yet – Self explanatory, wait for Transmitter to finish booting up



- *The HDMI source is set at something not supported* – change to 480, 720, or 1080 if possible. We have used a computer to test the 2G solution to confirm compatibility with the following common graphics resolutions: 1920*1080, 1680*1050, 1600*1200, 1440*900, 1366*768, 1360*1024, 1360*768 and 1280*1024. Of course the target display must be compatible with the same.



- *The HDMI source was power cycled or the HDMI cable was unplugged*

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Simple Type 1 Serial Communications using RS232 over IP ports

The 2G's have been shipped with the RS232 ports set for Type 1 ASCII mode. There is also a Type 2 BINARY mode option, but that is a bit more complicated (more on BINARY mode later). In order to "connect" a Transmitter RS232 port to a Receiver RS232 port in ASCII mode you do the following:

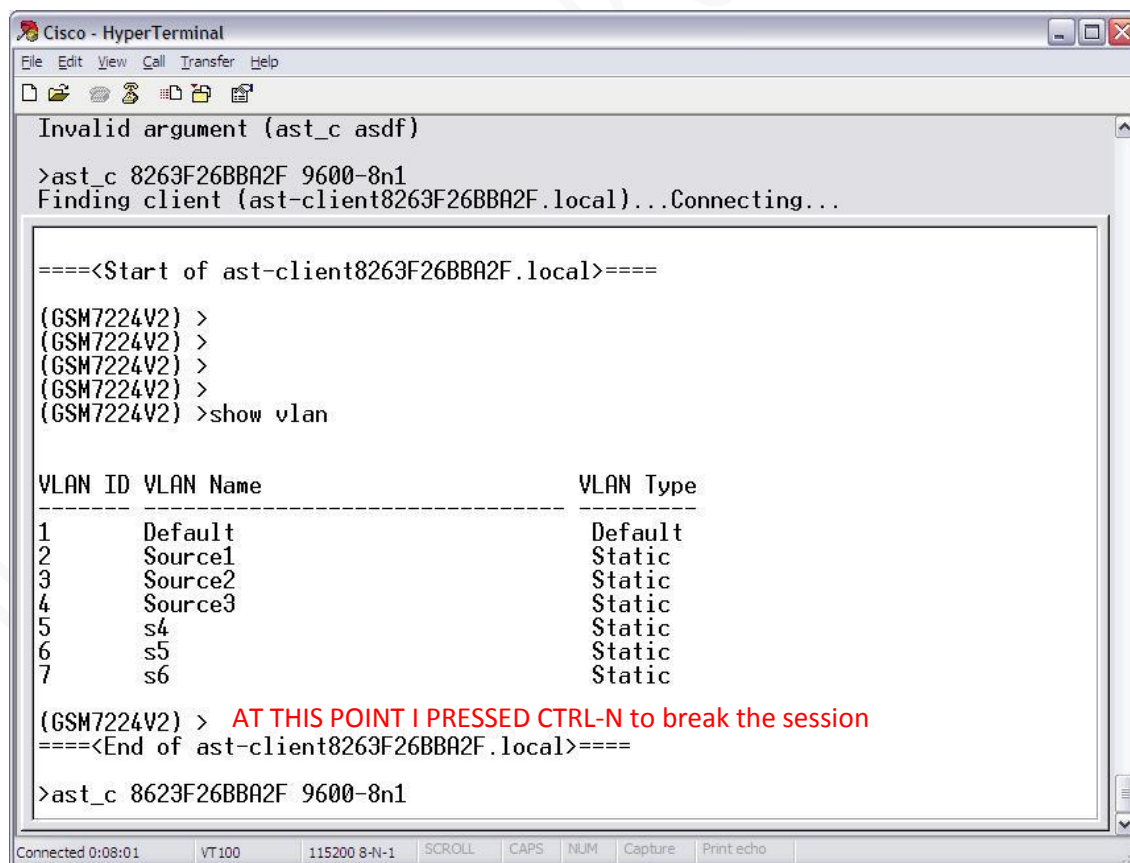
1. Enter client access mode by sending the byte "0x0E" (Ctrl-N, aka hex 0E) to the Transmitter RS232 port. This will break an existing link to another Receiver.
2. Link to the Receiver Mac Address with the ASCII Terminal Connect command (ast_c). The Receiver Mac Address is shown on the TV status screen in the lower right hand corner as CLIENT ID. Baud rates up to 115200 are supported.

a. ast_c <macaddr><baudrate><break code override><enter>

- b. For example, if your Receiver Mac Address is ABCD12345678 and you are wanting a typical 9600, 8, N, 1 connections you would issue the command

ast_c ABCD12345678 9600-8N1 [ENTER]

- c. In the example below we see a HyperTerminal session where I used 2G RS232 Over IP to connect to my Netgear switch RS232 port and issued the SHOW VLAN command.



```
Cisco - HyperTerminal
File Edit View Call Transfer Help
Invalid argument (ast_c asdf)
>ast_c 8263F26BBA2F 9600-8n1
Finding client (ast-client8263F26BBA2F.local)...Connecting...

====<Start of ast-client8263F26BBA2F.local>====

(GSM7224V2) >
(GSM7224V2) >
(GSM7224V2) >
(GSM7224V2) >
(GSM7224V2) >show vlan

VLAN ID  VLAN Name                VLAN Type
-----
1         Default                        Default
2         Source1                       Static
3         Source2                       Static
4         Source3                       Static
5         s4                            Static
6         s5                            Static
7         s6                            Static

(GSM7224V2) > AT THIS POINT I PRESSED CTRL-N to break the session
====<End of ast-client8263F26BBA2F.local>====

>ast_c 8623F26BBA2F 9600-8n1
```

Connected 0:08:01 VT100 115200 8-N-1 SCROLL CAPS NUM Capture Print echo

3. You should now be connected to the terminal prompt from the attached RS232 device connected to the Receiver. The session will stay connected until you issue the hex 0E command (Ctrl-N) again. This does mean you cannot use hex 0E for any ASCII control commands during a communications session, which may be a minor inconvenience for some RS232 devices. You can overcome this limitation by using the optional "break code override" function when you establish the link to the target. For example: "ast_c 0200000000e1 9600-8n1 f0" to set "f0" as the break code of this link session. The new break code is only applied to the current link session. After the current link session is disconnected, the break code will reset to the default "0E". The valid break code range is any character from 01 to ff hex.

NOTE: The Break Code Override function was introduced with firmware A1.32. Older firmware does not support this function. Always check your firmware version before attempting to use new features.

Now it gets interesting. With one RS232 connection to your host processor device, you can have a 2G Transmitter dedicated to serial communications. You can think of this as sort of a serial master device. As long as there is no HDMI source connected to the serial master, it can be on the same VLAN as another Transmitter and there will be no disruption to the HDMI content being watched on the Receiver. With typical switches, this means you will need to issue a SWITCHPORT command to get the serial master on the same VLAN as the target Receiver before you issue the "ast_c" connect command.

Type 2 Binary Serial Communications using RS232 over IP ports

The 2G's have been shipped with the RS232 ports set for Type 1 ASCII mode. There is also a Type 2 BINARY mode option. Details on how to change the serial port from Type 1 to Type 2 are provided later on in this document.

With Type 2 serial communication there is no manual initiation of the link between the Transmitter and Receiver. Instead, the Transmitter is always trying to talk to all the Receivers simultaneously, until one Receiver echoes a response to the Transmitter. Then a point-to-point bidirectional link is established that will break after a user specified period of no data activity designated by the ASTPARAM variable 'soip_type2_token_timeout'. This form of communications is intended for advanced RS232 devices that need to talk to each other in Binary mode. Using an isolated VLAN would be one method of having more specific control over which Receiver(s) can respond to the RS232 transmission.

Advanced Controls Overview:

This section of the Dealers Manual document describes the advanced commands which can be used with the Just Add Power 2G processor console. The 2G processor uses Linux OS and the console is driven by a BusyBox shell. The debug console is set to UART port 2 using baud rate at 115200-8n1 (requires a special cable to connect to the PCB). Through console APIs, developers can control certain 2G firmware features and functions

Notation:

- Console commands starting with "\$": Means they are global console commands. This kind of command is executed under Linux shell console from any location.
- Console commands starting as "\$./": Means they are exclusive console commands and must be executed within the path "/usr/local/bin". These commands must be prefaced with "./" (dot-slash).

How to Access the Console:

There are two ways to access the console:

1. UART2 debug port on the 2G printed circuit board: It is a RS232 interface using 115200-8n1 baud rate settings. Developers can attach to this debug port to access console. This RS232 Console port requires a special cable.
2. Use telnet: Every 2G Transmitter/Receiver has Telnetd and a telnet client built in (port 24 is the open port, 'root' is the userid, and there is no password). Developers can use one 2G telnet client to connect to any other 2G board on the same VLAN or write their own program using telnet protocol to connect to any 2G board through an Ethernet network.

How to determine the 2G board's IP address:

The 2G firmware default setting is for "autoip" mode and uses the 169.254.xxx.xxx private IP domain range. The IP of target 2G boards is resolved by its hostname using mDNS protocol. If you have access to the InstallerPro software utilities (licensed separately) It is possible to use "static IP" or "DHCP" instead of "autoip", but it is not recommended for most users. If a developer chooses "static IP" or "DHCP", they must be responsible to maintain their own IP mapping to know which 2G board is using which IP address. When using the recommended "autoip" mode there are several supported methods available to resolve the IP addresses:

1. 2G Receiver's HDMI GUI: The 2G Receiver's HDMI GUI will display the Receiver's IP address and the connected Transmitter's IP address.
2. Console APIs: Two console APIs are provided:
 - a. `astresname`: use this command to resolve a target's IP address by providing target's hostname.
 - b. `node_list`: use this command to list all found 2G boards' hostname and IP address.
3. Use mDNS protocol tools. For example:
 - a. Bonjour: <http://developer.apple.com/networking/bonjour/> or <http://www.science.uva.nl/research/air/wiki/mDNSResponderInstallation>
 - b. pyZeroConfig: <http://sourceforge.net/projects/pyzeroconf/files/>

FAQs:

General Configuration:

- 1) How can I discover all the other 2G boards on the same LAN?
 - Use the telnet or debug console to attach to the target board
 - Login as “root” and then change directory “cd usr/local/bin”
 - Start discover all: `./node_list`
 - Start discover hosts: `./node_list -t host`
 - Start discover clients: `./node_list -t client`
 - The result will be shown on the console, where hosts are 2G Transmitters and clients are 2G Receivers
- 2) How do I read/write target board's UART port 1 (/dev/ttyS0)?
 - Use telnet or debug console to attach to target board
 - Use stty to configure the UART port 1. Ex: `$stty 115200 -F /dev/ttyS0 =>` set UART port 1's baud rate to 115200.
 - To start read: `$cat /dev/ttyS0 & =>` UART data will be redirected to console
 - To stop read: `$pkill cat`
 - To start write: `$cat > /dev/ttyS0 =>` console input will be redirected to UART
 - To stop write: press “ctrl+c” (0x03)
- 3) What if I need to include “ctrl+c (0c03) in my RS232 command string?
 - You can use the console function `$printf` instead to send commands out port 1 (/dev/ttyS0)
 - Example: **`$ printf "\x02 PLAY \x03" > /dev/ttyS0`**
- 4) How do I configure UART port 1 (/dev/ttyS0) for non-"Serial over IP" usage?
 - UART port 1 is typically used for "Serial over IP" feature. Developers who want to manually control UART port 1 need to disable the "Serial over IP" feature.
 - To configure UART port 1, please use "stty" command. See "Console APIs Description" below for details.
- 5) How do I change the IP Address and Netmask of the Transmitters or Receivers
 - Use InstallerPro software utilities – InstallerPro is purchased separately and has a one time license fee for authorized dealers.

Console APIs Description:

Debug Console APIs:

- ❖ Turn on/off RS232 Console application debug message
 - NAME: setconsole
 - EXAMPLE:
 - Turn off: \$setconsole /dev/ttyS1
 - Turn on: \$setconsole -r
- ❖ Turn on/off RS232 Console kernel debug message
 - NAME: dmesg
 - EXAMPLE:
 - Turn off: \$dmesg -n 1
 - Turn on: \$dmesg -n
- ❖ Reboot system
 - NAME: reboot
 - EXAMPLE: \$reboot
- ❖ Telnet client
 - NAME: telnet
 - EXAMPLE:
 - telnet to IP 169.254.0.101 port 24
 - \$telnet 169.254.0.101 24
 - telnet to ast-client0000.local port 24
 - \$telnet ast-client0000.local 24
- ❖ List all 2G devices
 - NAME: node_list
 - OPTIONS
 - -t : specify the device type to list
 - EXAMPLE
 - List all clients:
 - \$./node_list -t client
 - List all hosts:
 - \$./node_list -t host
- ❖ Get IP from hostname:
 - NAME: astresname
 - EXAMPLE:
 - Get "ast-gateway0001.local"'s IP address:
 - \$./astresname ast-gateway0001.local
- ❖ To kill a running process by process name:
 - NAME: pkill
 - EXAMPLE:
 - kill a process named "abc"
 - pkill -9 abc

Configurations APIs:

- ❖ Access configurations from flash:
 - NAME: astparam
 - OPTIONS
 - r : read from RO section
 - g : read from RW section
 - s : write to RW section
 - flush : clear all settings in RW section including random generated MAC address
 - save : saves changes to flash memory
 - EXAMPLE:
 - read "no_soip" setting from RO section:
 - `./astparam r no_soip`
 - read "s0_baudrate" setting from RW section:
 - `./astparam g s0_baudrate`
 - write "soip_type2" setting as "y" to RW section:
 - `./astparam s soip_type2 y`
 - clear all settings in RW section:
 - `./astparam flush`
 - clear "no_soip" setting in RW section:
 - `./astparam s no_soip`
- ❖ Reset setting to factory default:
 - NAME: reset_to_default.sh
 - DESCRIPTION: resets the RW section but keeps the random generated MAC address. A system reboot is required to take effect.
 - EXAMPLE:
 - `./reset_to_default.sh`

UART Port 1 APIs:

- ❖ Setup /dev/ttyS0:
 - NAME: stty
 - DESCRIPTION: used to configure terminal parameters, such as baud rate and whether characters will be echoed
 - Example: set baudrate to 115200
 - `$stty 115200 -F /dev/ttyS0`
 - Reference http://linux.about.com/od/lna_guide/a/gdelna38t01.htm for more details on stty

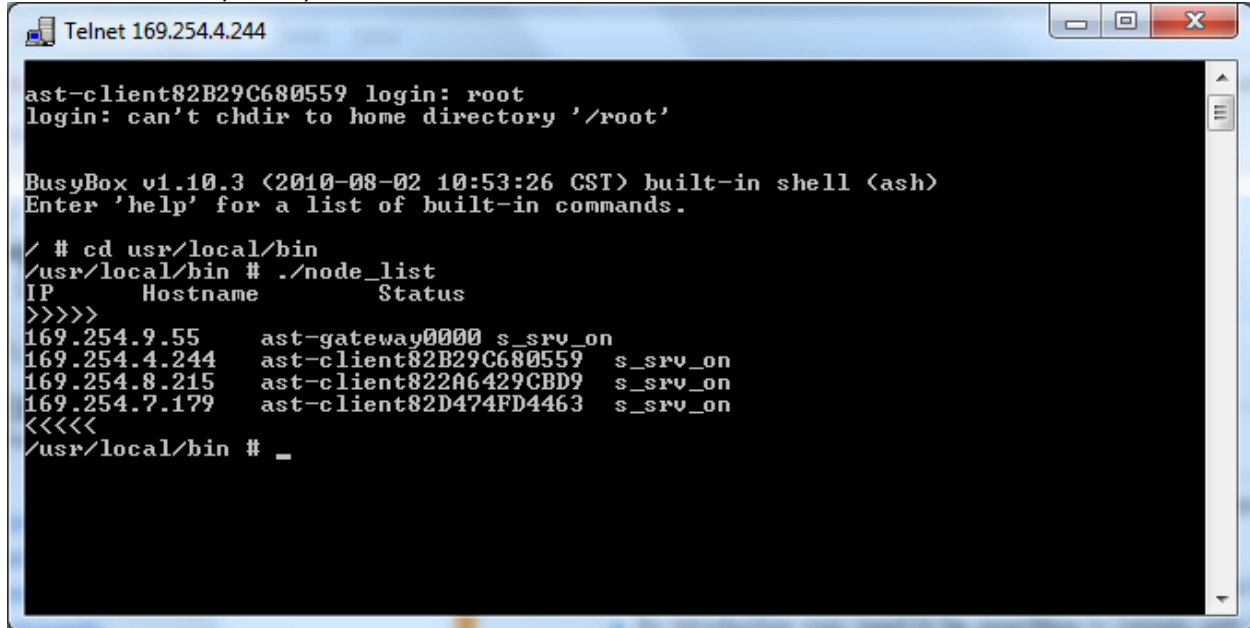
Configuration Options List:

Configuration options are settings saved in flash memory. These settings are used by the 2G firmware. The 2G firmware reserves two flash partitions for this purpose. One is read only (RO), the other one is a read-writable (RW) partition. The Just Add Power factory default settings are saved in the RO partition. Changes are saved in the RW partition. When the same configuration name is defined in both partitions, the setting in RW partition will be used (unless especially noted otherwise).

- ❖ `s0_baudrate`
 - DESCRIPTION: The static baud rate used under RS232 over IP Binary mode. For example: "115200-8n1" means using "115200" baud rate with data bits "8", parity "None" and stop bits "1".
 - DEFAULT: 115200-8n1
 - PARTITION: RO, RW
- ❖ `no_soip {y/n}`
 - DESCRIPTION: Used to turn ON/OFF the external RS232 UART1 serial over IP port.
 - DEFAULT: n (the port is enabled as Type 1 ASCII RS232 in the factory)
- ❖ `soip_type2 {y/n}`
 - DESCRIPTION: Used to change the external RS232 UART1 serial port mode where type 1 is ASCII and type 2 is BINARY
 - DEFAULT: n (the port is enabled as Type 1 ASCII RS232 in the factory)
- ❖ `soip_type2_token_timeout`
 - DESCRIPTION: Used to set the idle activity timeout disconnect function for Type 2 RS232
 - DEFAULT: 3 seconds
 - This variable can be set to whole numbers 1 or higher representing whole second increments
 - `$/astparam r soip_type2_token_timeout 1`

Example console session for visual learners:

The following is an example of actual console commands being issued from a Telnet session (logged into IP 169.254.4.244 on port 24):



```
Telnet 169.254.4.244

ast-client82B29C680559 login: root
login: can't chdir to home directory '/root'

BusyBox v1.10.3 (2010-08-02 10:53:26 CST) built-in shell (ash)
Enter 'help' for a list of built-in commands.

/ # cd /usr/local/bin
/usr/local/bin # ./node_list
IP      Hostname      Status
>>>>>
169.254.9.55    ast-gateway0000 s_srv_on
169.254.4.244  ast-client82B29C680559 s_srv_on
169.254.8.215  ast-client822A6429CBD9 s_srv_on
169.254.7.179  ast-client82D474FD4463 s_srv_on
<<<<<
/usr/local/bin # _
```

Take note that the node_list command was issued from /usr/local/bin and was prefaced with “dot-slash”. The response indicates that there were 3 Receivers and 1 Transmitter (the gateway) on that LAN/VLAN.

Practical application examples:

- 1) Change the external serial-over-ip UART1 port to Type 1 ASCII mode

```
./astparam s no_soip n    // enable serial over ip port
./astparam s soip_type2 n // “no” to Type 2 means “yes” to type 1
./astparam save           // save to flash
reboot                   // reboot and load new parameters
```
- 2) Change the external serial-over-ip UART1 port to Type 2 BINARY mode

```
./astparam s no_soip n    // enable serial over ip port
./astparam s soip_type2 y // “yes” to Type 2
./astparam save           // save to flash
reboot                   // reboot and load new parameters
```

Diagnostic Console access without InstallerPro UART2 console cables

This process describes how to collect basic diagnostic information from Just Add Power 2G devices. This method is presented for dealers who have not purchased the InstallerPro authorized dealer support kit and cables.

While it may help us to solve a problem, the InstallerPro console cables collect much more data and can help us to more quickly identify and solve problems.

1. Reboot the Receiver and wait for the splash screen to pass. Then take note of the LOCAL IP. This is the IP Address of the Receiver attached to that screen.
2. Connect a PC to an Ethernet port on the LAN switch that is on the same VLAN as the Receiver.
3. Start a TELNET session
4. Within TELNET issue the command “SET LOGFILE DEBUG.TXT”
5. Within TELNET issue the command “SET LOGGING”
6. Now link to the device to be analyzed with the O command using port 24. For example, if the IP Address of the target Receiver is 164.264.4.244 you would issue the command “o 169.254.4.244 24”.
7. If you have everything correct you will now see a LOGIN prompt like this:

```
ast-client82B29C680559 login:
```

8. Login to the 2G box with userid “root”, you should see something like this:

```
login: can't chdir to home directory '/root'
BusyBox v1.10.3 (2010-08-02 10:53:26 CST) built-in shell (ash)
Enter 'help' for a list of built-in commands.
```

9. Now enter the 2G Console command “dmesg” (a ton of data will fly by and be copied to debug.txt)
10. Now enter the 2G Console command “exit”
11. You should be back to TELNET. Enter the TELNET command “q” to QUIT.
12. Locate the DEBUG.TXT file on your PC and email it to SUPPORT@JUSTADDPower.COM
13. We will analyze the results and advise you what can be done to solve the problem

WARNING: If you run the diagnostic on multiple transmitters or receivers you should rename DEBUG.TXT to a name that will be easy to associate with the device being analyzed (i.e. call it Bedroom-TV-debug.txt or PS3-debug.txt).

Using IR Manager VBS-HDMI-IR104 with 2G RS232 ports



Features:

- 1 * RS232 port for control (can be attached to the 2G TX or RX RS232 port)
- 1 * IR Learning Eye on the front (most other companies sell their learning eye as an add on)
- 4 * IR Blaster 3.5 mm ports on the back that are addressed discretely
- 4 * IR Blasters to connect to the 3.5 mm ports with adhesive pads
- 4 * IR Confirmation LED's on the front that "flash" when learning or sending (can be disabled for rooms wanting no flashing lights)

Function:

The IR MANAGER device has an IR memory and the ability to "learn" 32 commands for each Blaster port (128 IR commands total). The 4 IR Blaster ports can be addressed individually. For example, I can tell the box to send command a command out to IR Blaster 4, and the other 3 IR Blasters will remain "dark", until they are also addressed. The "learned" IR commands are stored on the primary IC and will not be lost if there is a power outage. The IR Memory can be copied/pasted between IR managers - single commands or entire blocks.

Usage Example:

Sports Bar - In a sports bar you could teach this device the key commands to control 4 different TV's (ON, OFF, MUTE, INPUT SELECT, etc.). The IR Blasters can be extended with standard 3.5mm stereo cables up to 200' (probably longer). Taking advantage of the 2G RS232 Automation Matrix this device would allow the user to send discrete IR control commands to each TV individually. One IR MANAGER is easily able to control 4 TV's. Using 3.5mm splitters and TV's with different IR commands you can control even more screens with one IR Manager.

Distributed Resource Control - Imagine there is a TV and a Blu-Ray player at one end of the house and the owner wants to watch/operate that from another room. You can teach this device the necessary commands to control the TV, Blu-Ray Player, and perhaps 2 other sources in that remote location. Taking advantage of the 2G RS232 Automation Matrix this device would allow the user to send discrete IR control commands to the Blu-Ray, and could also control the TV.

Essentially you have got a "learning" universal remote control can work with any control system with RS232 support that can be addressed from anywhere else. Control4, Crestron, AMX, RTI, URC, Savant, etc. There will probably be a tangent market for the IR MANAGER for use in non HD over IP installations. This device will be very simple to support with our MediaSwitcher software which can be operated on PC, Linux, Mac, and portable devices such as iPhone and iPads.

❖ IR Manager Internal Memory Characteristics

- IR Manager has 4 memory blocks, which can store Short or Long IR commands. The default value is Short Data (448Byte), which is enough for IR control of most consumer electronic equipment. The Long Data (704 Byte) is provided for unique requirements. When the IR command uses Short Data (448Byte), it can support 32 commands per block; when it is Long Data, (704 Byte), it can support 16 commands per block

❖ IR Learning Mode and the Power LED

- When IR Manager executes the learning function, the Power LED will flash off, and on again while waiting for the IR command to be received by the IR eye. You can use the Power the
- Power LED to see if the learning function is successful. The light will stay ON when the command is accepted into memory. It will turn OFF if the command is not learned within the allotted time.

❖ Using RS-232 to write IR commands to the IR Manager

- When the IR Manager Memory is successfully updated the Power LED will flash once, which means the data is accepted; if the Power LED flashes 6 times this means the write to flash memory has failed, most likely due to a data error.

❖ IR-1, IR-2, IR-3, IR-4 LED function:

- The LED will flash ON when the IR command is being sent successfully. If you try to send a command from a memory block that does not contain a learned IR command the port's LED and the Power LED will flash 6 times, which means this port has not learned any IR data for that command. The IR-1, IR-2, IR-3, and IR-4 LED's can be disabled by removing the associated jumpers on the IR Manager printed circuit board.

VBS-HDMI-IR104 RS232 Command List:

❖ RS232 Communications Protocol Baud Rate: 9600,n,8,1

Adjust IR Command Length (Short vs. Long)

➤ Command Length: 6-Bytes

➤ Command Syntax: **[V][0x00][0x0B][0x03][KEY GROUP][LENGTH]**

[KEY GROUP] : Corresponds to the 4 IR device memory blocks

Code	Call for	Description
0x00	Group 1	IR Device IR-1
0x01	Group 2	IR Device IR-2
0x02	Group 3	IR Device IR-3
0x03	Group 4	IR Device IR-4

[LENGTH]: Key data Length

Code	Code Type	Description
0x00	Short Data	IR device data length 448 Byte
0x01	Long Data	IR device data length 704 Byte

Remarks:

- (1) When the IR device key data is set to be **448** Bytes, IR Manager can support **32** keys of IR learning commands (Learn/ Send/ Dump...).
- (2) When the IR device key data is set to be **704** Bytes, IR Manager can support **16** keys of IR learning commands (Learn/ Send/ Dump...).
- (3) The default data length is Short Data.

IR Control Commands

- Command Length: 6-Bytes
- Command Syntax: **[V][0x00][0x0B] [MODE] [KEY GROUP] [KEY#]**

[MODE]: IR Mode (Transmit, Receive, or Dump)

Code	Mode	Description
0x00	TX	IR Sending mode
0x01	RX	IR Learning mode
0x02	DUMP	IR Key data reading mode

[KEY GROUP]: 4 IR Device Code

Code	Call for	Description
0x00	Group 1	IR Device IR-1
0x01	Group 2	IR Device IR-2
0x02	Group 3	IR Device IR-3
0x03	Group 4	IR Device IR-4

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[KEY #]: Key Number Hex codes chart

Hex Code	IR KEY #	Hex Code	IR KEY #	Hex Code	IR KEY #	Hex Code	IR KEY #
0x00	Key 1	0x08	Key 9	0x10	Key 17	0x18	Key 25
0x01	Key 2	0x09	Key 10	0x11	Key 18	0x19	Key 26
0x02	Key 3	0x0A	Key 11	0x12	Key 19	0x1A	Key 27
0x03 *	Key 4 *	0x0B	Key 12	0x13	Key 20	0x1B	Key 28
0x04	Key 5	0x0C	Key 13	0x14	Key 21	0x1C	Key 29
0x05	Key 6	0x0D	Key 14	0x15	Key 22	0x1D	Key 30
0x06	Key 7	0x0E **	Key 15 **	0x16	Key 23	0x1E	Key 31
0x07	Key 8	0x0F	Key 16	0x17	Key 24	0x1F	Key 32

* The memory location 0x03 (Key 4) is not available when using 2G IP Telnet mode. This is because 0x03 is the reserved code to break a Telnet connection.

** The memory location 0x0E (Key 15) is not available when using 2G Type 1 RS232 mode. This is because 0x0E is the reserved code to break a Type 1 connection.

+ 2G Binary Mode (Type 2) is able to access all 32 IR Keys.

RS-232Port IR Memory Write Command

- Can be used to load the IR Manager memory with data from an IR Library
- Command Length: 455-Bytes OR 711-Bytes
- Command Syntax: **[V][0x00][0x0B][0x04][KEY GROUP][KEY #][LENGTH][IR DATA]**

[KEY GROUP] : 4 IR Device codes

Code	Call for	Description
0x00	Group 1	IR Device IR-1
0x01	Group 2	IR Device IR-2
0x02	Group 3	IR Device IR-3
0x03	Group 4	IR Device IR-4

[KEY #] : Key Number Hex codes chart (reference the chart above)

[LENGTH]: Key Data Length

Code	Code Type	Description
0x00	Short Data	IR device data length 448 Byte
0x01	Long Data	IR device data length 704 Byte

[IR DATA]: (448** Bytes or **704** Bytes).**

Remarks: Each command must send **448** Bytes or **704** Bytes as a complete code. When the IR Data is sent OK, the IR104 system will respond with **0xFE**. The program being used to write the IR memory must wait for the 0xFE response before sending the next command

APPLICATION SENDS THE COMMAND

VBS-HDMI-IR104 RESPONSE

[V][0x00][0x0B] [0x04] [00] [01][00][CODE] →	wait ←<0xFE>
[V][0x00][0x0B] [0x04] [00] [02][00][CODE] →	wait ←<0xFE>
[V][0x00][0x0B] [0x04] [00] [03][00][CODE] →	wait ←<0xFE>

HDMI Video Resolutions supported:

Horizontal	Vertical	Rate	Hor. Polarity	Ver. Polarity	ScanMode
/* HDTV Timing */					
640	480	60	NegPolarity	NegPolarity	Progressive
720	480	60	NegPolarity	NegPolarity	Progressive
720	480	60	NegPolarity	NegPolarity	Progressive
1280	720	60	PosPolarity	PosPolarity	Progressive
1920	1080/2	60	PosPolarity	PosPolarity	Interlaced
1440	480	60	NegPolarity	NegPolarity	Progressive
1440	480	60	NegPolarity	NegPolarity	Progressive
1920	1080	60	PosPolarity	PosPolarity	Progressive
720	576	50	NegPolarity	NegPolarity	Progressive
720	576	50	NegPolarity	NegPolarity	Progressive
1280	720	50	PosPolarity	PosPolarity	Progressive
1920	1080/2	50	PosPolarity	PosPolarity	Interlaced
1440	576	50	NegPolarity	PosPolarity	Progressive
1440	576	50	NegPolarity	PosPolarity	Progressive
1920	1080	50	PosPolarity	PosPolarity	Progressive
1920	1080	24	PosPolarity	PosPolarity	Progressive
1920	1080	25	PosPolarity	PosPolarity	Progressive
/* VESA Digital Timing */					
640	350	85	PosPolarity	NegPolarity	Progressive
640	400	85	NegPolarity	PosPolarity	Progressive
720	400	85	NegPolarity	PosPolarity	Progressive
640	480	60	NegPolarity	NegPolarity	Progressive
640	480	72	NegPolarity	NegPolarity	Progressive
640	480	75	NegPolarity	NegPolarity	Progressive
640	480	85	NegPolarity	NegPolarity	Progressive
800	600	56	PosPolarity	PosPolarity	Progressive
800	600	60	PosPolarity	PosPolarity	Progressive
800	600	72	PosPolarity	PosPolarity	Progressive
800	600	75	PosPolarity	PosPolarity	Progressive
800	600	85	PosPolarity	PosPolarity	Progressive
848	480	60	PosPolarity	PosPolarity	Progressive
1024	384	87	PosPolarity	PosPolarity	Interlaced
1024	768	60	NegPolarity	NegPolarity	Progressive
1024	768	70	NegPolarity	NegPolarity	Progressive
1024	768	75	PosPolarity	PosPolarity	Progressive
1024	768	85	PosPolarity	PosPolarity	Progressive
1152	864	75	PosPolarity	PosPolarity	Progressive
1280	768	60	PosPolarity	NegPolarity	Progressive
1280	768	60	NegPolarity	PosPolarity	Progressive

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Horizontal	Vertical	Rate	Hor. Polarity	Ver. Polarity	ScanMode
1280	768	85	NegPolarity	PosPolarity	Progressive
1280	960	60	PosPolarity	PosPolarity	Progressive
1280	960	85	PosPolarity	PosPolarity	Progressive
1280	1024	60	PosPolarity	PosPolarity	Progressive
1280	1024	75	PosPolarity	PosPolarity	Progressive
1280	1024	85	PosPolarity	PosPolarity	Progressive
1360	768	60	PosPolarity	PosPolarity	Progressive
1400	1050	60	PosPolarity	NegPolarity	Progressive
1400	1050	60	NegPolarity	PosPolarity	Progressive
1400	1050	75	NegPolarity	PosPolarity	Progressive
1400	1050	85	NegPolarity	PosPolarity	Progressive
1440	900	60	PosPolarity	NegPolarity	Progressive
1440	900	60	NegPolarity	PosPolarity	Progressive
1440	900	75	NegPolarity	PosPolarity	Progressive
1440	900	85	NegPolarity	PosPolarity	Progressive
1600	1200	60	PosPolarity	PosPolarity	Progressive
1600	1200	65	PosPolarity	PosPolarity	Progressive
1600	1200	70	PosPolarity	PosPolarity	Progressive
1600	1200	75	PosPolarity	PosPolarity	Progressive
1600	1200	85	PosPolarity	PosPolarity	Progressive
1680	1050	60	PosPolarity	NegPolarity	Progressive
1680	1050	60	NegPolarity	PosPolarity	Progressive
1680	1050	75	NegPolarity	PosPolarity	Progressive
1680	1050	85	NegPolarity	PosPolarity	Progressive
1792	1344	60	NegPolarity	PosPolarity	Progressive
1792	1344	75	NegPolarity	PosPolarity	Progressive
1856	1392	60	NegPolarity	PosPolarity	Progressive
1856	1392	75	NegPolarity	PosPolarity	Progressive

/* VESA New */

800	600	120	PosPolarity	NegPolarity	Progressive
1024	384	87	PosPolarity	PosPolarity	Progressive
1024	768	120	PosPolarity	NegPolarity	Progressive
1280	768	120	PosPolarity	NegPolarity	Progressive
1280	800	60	PosPolarity	NegPolarity	Progressive
1280	800	60	NegPolarity	PosPolarity	Progressive
1280	800	75	NegPolarity	PosPolarity	Progressive
1280	800	85	NegPolarity	PosPolarity	Progressive
1280	800	120	PosPolarity	NegPolarity	Progressive
1280	960	120	PosPolarity	NegPolarity	Progressive
1280	1024	120	PosPolarity	NegPolarity	Progressive
1360	768	120	PosPolarity	NegPolarity	Progressive
1366	768	60	PosPolarity	NegPolarity	Progressive

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Horizontal	Vertical	Rate	Hor. Polarity	Ver. Polarity	ScanMode
1366	768	60	PosPolarity	PosPolarity	Progressive
1400	1050	120	PosPolarity	NegPolarity	Progressive
1440	900	120	PosPolarity	NegPolarity	Progressive
1600	900	60	PosPolarity	NegPolarity	Progressive
1920	1080	60	PosPolarity	PosPolarity	Progressive
/* VESA CVT Timing */					
640	480	50	NegPolarity	PosPolarity	Progressive
640	480	60	NegPolarity	PosPolarity	Progressive
640	480	75	NegPolarity	PosPolarity	Progressive
640	480	85	NegPolarity	PosPolarity	Progressive
640	480	60	PosPolarity	NegPolarity	Progressive
800	600	50	NegPolarity	PosPolarity	Progressive
800	600	60	NegPolarity	PosPolarity	Progressive
800	600	75	NegPolarity	PosPolarity	Progressive
800	600	85	NegPolarity	PosPolarity	Progressive
800	600	60	PosPolarity	NegPolarity	Progressive
1024	768	50	NegPolarity	PosPolarity	Progressive
1024	768	60	NegPolarity	PosPolarity	Progressive
1024	768	75	NegPolarity	PosPolarity	Progressive
1024	768	85	NegPolarity	PosPolarity	Progressive
1024	768	60	PosPolarity	NegPolarity	Progressive
1280	960	50	NegPolarity	PosPolarity	Progressive
1280	960	60	NegPolarity	PosPolarity	Progressive
1280	960	75	NegPolarity	PosPolarity	Progressive
1280	960	85	NegPolarity	PosPolarity	Progressive
1280	960	60	PosPolarity	NegPolarity	Progressive
1400	1050	50	NegPolarity	PosPolarity	Progressive
1400	1050	60	PosPolarity	NegPolarity	Progressive
1600	1200	50	NegPolarity	PosPolarity	Progressive
1600	1200	60	NegPolarity	PosPolarity	Progressive
1600	1200	75	NegPolarity	PosPolarity	Progressive
1600	1200	85	NegPolarity	PosPolarity	Progressive
1600	1200	60	PosPolarity	NegPolarity	Progressive
1280	1024	50	NegPolarity	PosPolarity	Progressive
1280	1024	60	NegPolarity	PosPolarity	Progressive
1280	1024	75	NegPolarity	PosPolarity	Progressive
1280	1024	85	NegPolarity	PosPolarity	Progressive
1280	1024	60	PosPolarity	NegPolarity	Progressive
1280	768	50	NegPolarity	PosPolarity	Progressive
1280	768	60	PosPolarity	NegPolarity	Progressive
848	480	50	NegPolarity	PosPolarity	Progressive
848	480	60	NegPolarity	PosPolarity	Progressive

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Horizontal	Vertical	Rate	Hor. Polarity	Ver. Polarity	ScanMode
848	480	85	NegPolarity	PosPolarity	Progressive
848	480	60	PosPolarity	NegPolarity	Progressive
1064	600	50	NegPolarity	PosPolarity	Progressive
1064	600	60	NegPolarity	PosPolarity	Progressive
1064	600	75	NegPolarity	PosPolarity	Progressive
1064	600	85	NegPolarity	PosPolarity	Progressive
1064	600	60	PosPolarity	NegPolarity	Progressive
1280	720	50	NegPolarity	PosPolarity	Progressive
1280	720	60	NegPolarity	PosPolarity	Progressive
1280	720	75	NegPolarity	PosPolarity	Progressive
1280	720	85	NegPolarity	PosPolarity	Progressive
1280	720	60	PosPolarity	NegPolarity	Progressive
1360	768	50	NegPolarity	PosPolarity	Progressive
1360	768	60	NegPolarity	PosPolarity	Progressive
1360	768	75	NegPolarity	PosPolarity	Progressive
1360	768	85	NegPolarity	PosPolarity	Progressive
1360	768	60	PosPolarity	NegPolarity	Progressive
1704	960	50	NegPolarity	PosPolarity	Progressive
1704	960	60	NegPolarity	PosPolarity	Progressive
1704	960	75	NegPolarity	PosPolarity	Progressive
1704	960	85	NegPolarity	PosPolarity	Progressive
1704	960	60	PosPolarity	NegPolarity	Progressive
1864	1050	50	NegPolarity	PosPolarity	Progressive
1864	1050	60	NegPolarity	PosPolarity	Progressive
1864	1050	75	NegPolarity	PosPolarity	Progressive
1864	1050	85	NegPolarity	PosPolarity	Progressive
1864	1050	60	PosPolarity	NegPolarity	Progressive
1920	1080	50	NegPolarity	PosPolarity	Progressive
1920	1080	60	NegPolarity	PosPolarity	Progressive
1920	1080	75	NegPolarity	PosPolarity	Progressive
1920	1080	85	NegPolarity	PosPolarity	Progressive
1920	1080	60	PosPolarity	NegPolarity	Progressive
768	480	50	NegPolarity	PosPolarity	Progressive
768	480	60	NegPolarity	PosPolarity	Progressive
768	480	75	NegPolarity	PosPolarity	Progressive
768	480	85	NegPolarity	PosPolarity	Progressive
768	480	60	PosPolarity	NegPolarity	Progressive
960	600	50	NegPolarity	PosPolarity	Progressive
960	600	60	NegPolarity	PosPolarity	Progressive
960	600	75	NegPolarity	PosPolarity	Progressive
960	600	85	NegPolarity	PosPolarity	Progressive
960	600	60	PosPolarity	NegPolarity	Progressive

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Horizontal	Vertical	Rate	Hor. Polarity	Ver. Polarity	ScanMode
1152	720	60	NegPolarity	PosPolarity	Progressive
1152	720	75	NegPolarity	PosPolarity	Progressive
1152	720	85	NegPolarity	PosPolarity	Progressive
1152	720	60	PosPolarity	NegPolarity	Progressive
1224	768	50	NegPolarity	PosPolarity	Progressive
1224	768	60	NegPolarity	PosPolarity	Progressive
1224	768	75	NegPolarity	PosPolarity	Progressive
1224	768	85	NegPolarity	PosPolarity	Progressive
1224	768	60	PosPolarity	NegPolarity	Progressive
1536	960	50	NegPolarity	PosPolarity	Progressive
1536	960	60	NegPolarity	PosPolarity	Progressive
1536	960	75	NegPolarity	PosPolarity	Progressive
1536	960	85	NegPolarity	PosPolarity	Progressive
1536	960	60	PosPolarity	NegPolarity	Progressive
1680	1050	50	NegPolarity	PosPolarity	Progressive
1680	1050	60	PosPolarity	NegPolarity	Progressive
1728	1080	50	NegPolarity	PosPolarity	Progressive
1728	1080	60	NegPolarity	PosPolarity	Progressive
1728	1080	75	NegPolarity	PosPolarity	Progressive
1728	1080	85	NegPolarity	PosPolarity	Progressive
1728	1080	60	PosPolarity	NegPolarity	Progressive
/* PC Timing */					
640	350	70	PosPolarity	NegPolarity	Progressive
720	400	70	NegPolarity	PosPolarity	Progressive
1024	384	87	PosPolarity	PosPolarity	Progressive
640	480	67	NegPolarity	NegPolarity	Progressive
834	624	75	NegPolarity	NegPolarity	Progressive
1024	768	60	NegPolarity	NegPolarity	Progressive
1024	768	75	NegPolarity	NegPolarity	Progressive
1152	870	75	NegPolarity	NegPolarity	Progressive
/* SPWG Panel Timing */					
1024	768	60	NegPolarity	NegPolarity	Progressive
1400	1050	60	NegPolarity	NegPolarity	Progressive
1600	1200	60	NegPolarity	NegPolarity	Progressive
1280	800	60	NegPolarity	NegPolarity	Progressive
1440	900	60	NegPolarity	NegPolarity	Progressive
1680	1050	60	NegPolarity	NegPolarity	Progressive
/* GTF */					
1024	768	75	PosPolarity	NegPolarity	Progressive
1280	800	75	PosPolarity	NegPolarity	Progressive
/* CEA-861-D Timing */					

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Horizontal	Vertical	Rate	Hor. Polarity	Ver. Polarity	ScanMode
1280	720	25	PosPolarity	PosPolarity	Progressive
1280	720	30	PosPolarity	PosPolarity	Progressive
1920	1080	30	PosPolarity	PosPolarity	Progressive
1920	540	50	PosPolarity	NegPolarity	Interlaced
/* CEA-861-D Timing with very high refresh rate */					
1920	540	100	PosPolarity	PosPolarity	Interlaced
1280	720	100	PosPolarity	PosPolarity	Progressive
720	576	100	NegPolarity	NegPolarity	Progressive
720	576	100	NegPolarity	NegPolarity	Progressive
720	288	100	NegPolarity	NegPolarity	Interlaced
720	288	100	NegPolarity	NegPolarity	Interlaced
1920	540	120	PosPolarity	PosPolarity	Interlaced
1280	720	120	PosPolarity	PosPolarity	Progressive
720	480	120	NegPolarity	NegPolarity	Progressive
720	480	120	NegPolarity	NegPolarity	Progressive
720	240	120	NegPolarity	NegPolarity	Interlaced
720	240	120	NegPolarity	NegPolarity	Interlaced
720	576	200	NegPolarity	NegPolarity	Progressive
720	576	200	NegPolarity	NegPolarity	Progressive
720	288	200	NegPolarity	NegPolarity	Interlaced
720	288	200	NegPolarity	NegPolarity	Interlaced
720	480	240	NegPolarity	NegPolarity	Progressive
720	480	240	NegPolarity	NegPolarity	Progressive
720	240	240	NegPolarity	NegPolarity	Interlaced
720	240	240	NegPolarity	NegPolarity	Interlaced

NOTES: