DIRECTV IP v1.3
Module Application Guide

Description

This module allows bi-directional TCP/IP communication with DIRECTV receivers equipped with an Ethernet port or wireless adapter and that utilize the SHEF API. These receivers include the H2x (with the exception of H20), HR2x, HR34, HR44, and HR54. The Genie Cx1 is also supported when attached to a server set top box. The TiVo versions are not supported.

Supported Processors

Any 3-series processor with Ethernet is supported. This module utilizes SIMPL# and will not run on 2-series systems.

Compatibility			Processor Requirements	
3 COMPATIBLE	**NOT COMPATIBLE SERIES**	**Crestron Studio COMPATIBLE**	**Ethernet REQUIRED**	**USB REMOVABLE MEDIA NOT REQUIRED**

Contents

Module Application

Ethernet Configuration

This module utilizes SIMPL# to communicate with the DIRECTV set top box over TCP/IP. To determine the IP Address of the receiver, use the on-screen menu, and navigate to settings, then network. The IP address must be entered into the Server IP Address parameter on the module. Any Genie clients that are connected to this server and that are being controlled by Crestron must use the Genie Server set top box address.

ControlWorks recommends using a wired Ethernet connection to the receiver as well as setting a static IP addresses to the DIRECTV hardware. Testing the module over a wireless connection has proven communication with the receivers to be unreliable.

Genie client (Cx1 set top boxes) control

It's important to note that the Genie clients are simply viewing content on the server, thus the module controls the servers output and *not* the client itself. Certain functionality is lost when the Genie client displays content that is not from the server i.e. a video resolution menu. Additionally, the API provides no means to power a Genie client on from an off state.

- Genie Power Control: If an off command is sent to a Genie client, the client will turn off. If a Genie Client is powered off, there is no way to power it on from the module (there is no method in the API.)
- Genie menus: Certain menus i.e. the video resolution menu are generated by the Genie Client itself, and are locally controlled on the client, and are not controllable by the module.

Receiver Address Parameter

This module can be used to control standalone receivers, Genie servers, and Genie clients. The Receiver Address parameter is what is used to distinguish what type of receiver you are controlling.

For standalone receivers, i.e. H24, HR-24:
  The Receiver Address should be "0"(without quotes.)

For Genie servers, i.e. if controlling the video output of a HR34 or HR54:
  The Receiver Address should be "0"(without quotes.)

For Genie clients, i.e. if controlling the video output of a C31 attached to a HR54:
  The Receiver Address should be the Genie clients MAC address. The MAC address should be entered in all caps without any delimiters, such as "08EB74C1C2F2".

Finding Genie MAC Addresses

You can find MAC address for the Genies clients by one of three ways:

1. **On the Genie client itself:** Using the IR remote control and viewing the video output, press Menu, Settings & Help, Settings. Under the Info & Test tab, the client's information will be displayed, including the MAC address. MAC addresses should be entered into the module in all caps, with no delimiters.

2. **On the Genie Server:** Using the IR remote control and viewing the video output, press Menu, Settings & Help, Settings, Info & Test, More System Info. Scroll down the list to see the info for Genie clients. MAC addresses should be entered into the module in all caps, with no delimiters.
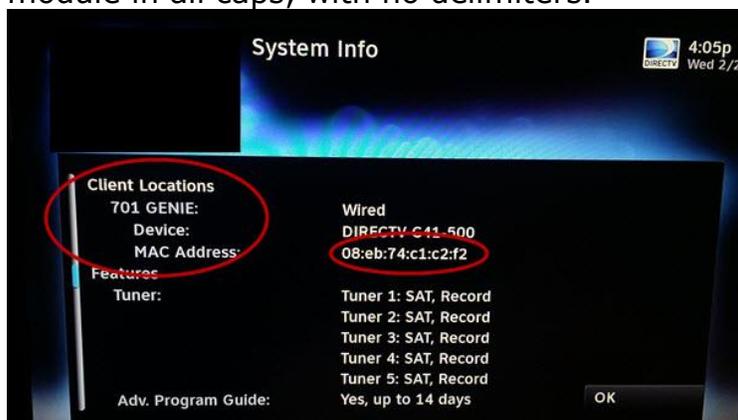
3. **Using the module:** Using the module that is intended to run the main server SET TOP BOX, and with "0" defined in the **Receiver Address** parameter, you can pulse the [poll_connected_devices] digital input. A list of connected devices, their names, and their MAC addresses will be sent to text console for easier copying/pasting.

Permissions

For the module to be fully functional, the Whole Home security settings must be set to "Allow" for external control. On the Server set top box, press Menu->Settings->Whole-Home->External Device->External Access: Allow. Ensure External Access, Current Program, and Recordings are all set to Allow.

Power Saving

Power Saving must be disabled. If power saving is on, the receiver will turn off due to inactivity and the API does not allow Genie clients to be turned on. At the current time of development the Genie clients receivers when powered off do not respond to any commands.

Polling Frequency

The module will poll for current channel info after [poll_current_program_info], any channel up or down release, [ir_previous_channel], [ir_enter], or after 5 seconds of any [ir_key_kp_x] is pressed. It will also poll when any channel is sent via [channel$] or [channel].

Excessive Polling

Testing has revealed that sending an excess of commands for a sustained period of time may cause the set top box to stop responding to requests. The set top box eventually starts responding to commands on its own after a period of inactivity.

Care should be taken to poll the receiver only when needed, and to minimize the amount of commands being sent the receiver.

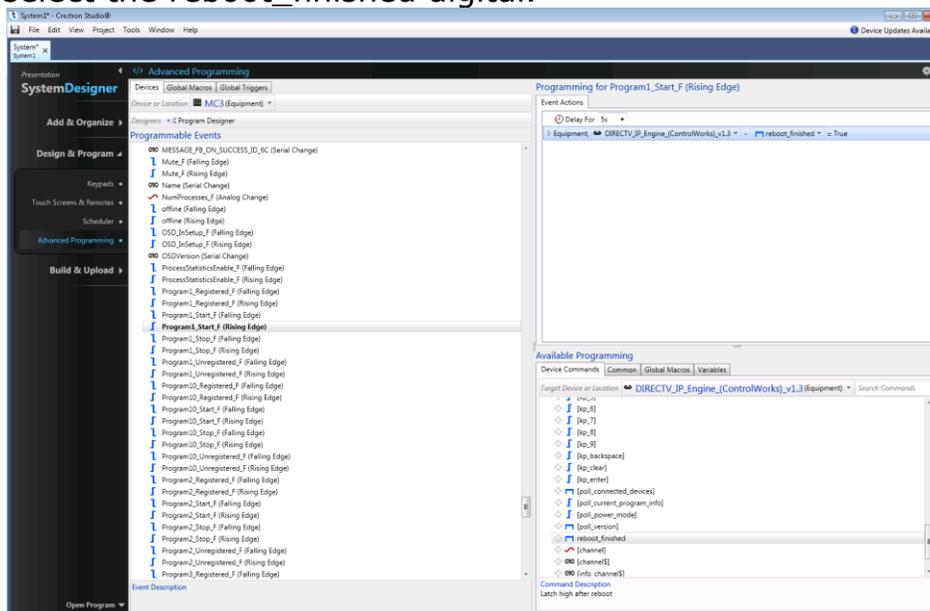## Steps to import the module into Crestron Studio

1. Ensure you have the latest version of the module by logging into your account at www.controlworks.com.
2. Ensure the DIRECTV receiver is on the LAN, and can be reached by the processor by pinging the receivers IP address.
3. Ensure the External Device permissions (described above) are set correctly.
4. Open Crestron Studio and choose File -> Import.
5. Select the module files listed below and click open.
    a. DIRECTV_IP_(ControlWorks)_v1.3.umc
    b. DIRECTV_Engine_v1.3(ControlWorks).usp
6. In the File Import Assistant, for both the SIMPL Plus Module and SIMPL Module choose the appropriate location and action, then click next. The dialog box will indicate a summary of actions taken. You may uncheck the "Open?" checkbox. Click finish. Note that an error will accompany the SIMPL+ import regarding the SIMPL# library.
7. Place the SIMPL# library (DIRECTV_IP_Engine_(ControlWorks)_v1.3.clz) in same directory as the SIMPL+ module. At the time of writing this document, Crestron Studio does not import SIMPL# libraries. Central SIMPL+ modules reside in 'C:\Users\Public\Documents\Crestron\Tools\Modules'.
8. Create a new device. Choose File -> New Project, then select "Device". Name it "DIRECTV_IP_Engine_(ControlWorks)_v1.3" then select New.
9. In the General section, for manufacturer, select "DirecTV"
10. For Device Type, select DVR -> DVR and press OK.
11. Give the device a description if you desire.
12. Under help, browse to the included help pdf file.
13. In the connectivity window, select "Add".
14. The Add Transport dialog will appear, and set transport type to Logic. Press Add.
15. Add the module to the device programming by expanding the user category. Double click DIRECTV_IP_(ControlWorks)_v1.3 and DIRECTV_Engine_v1.3(ControlWorks).
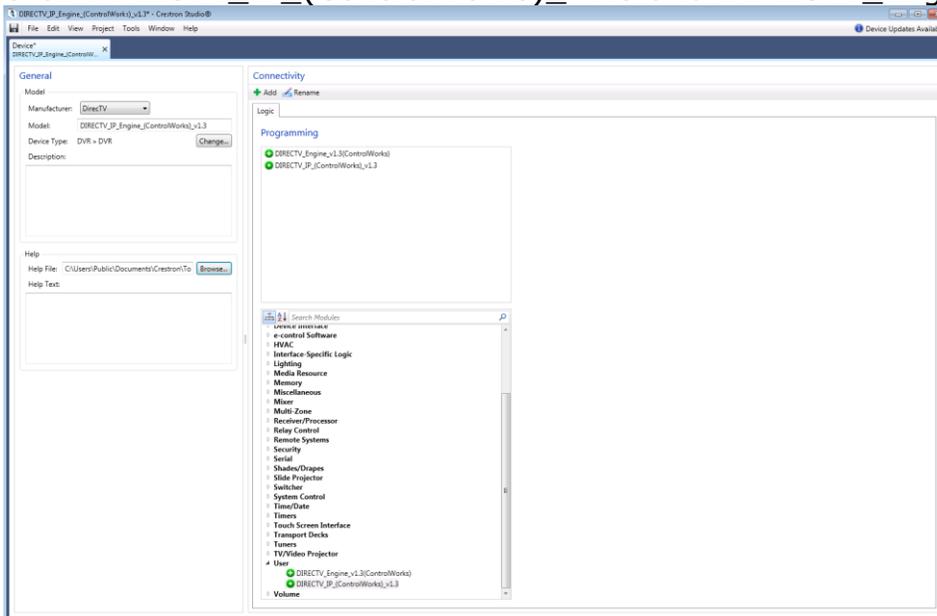
16. Choose File -> Save.

Inserting the device into a Crestron Studio System

1. Open your system.
2. Add the device to the system by selecting Add & Organize - > Devices.
3. Select the room you wish to add the device to.
4. In the Product Browser, select the device type dropdown, and select "User Devices".
5. Add the DIRECTV device to the room by clicking on the + button next to the device.
6. In the Add New Device dialog, select the radio button next to DIRECTV_IP_(ControlWorks)_v1.3.
7. Select the Device added and edit the properties:
   a. Give it a name.
   b. Enter the Receivers Address
   c. Enter the Server's IP Address.
   d. Refer to the module parameters section below for help in regards to these Properties.
   e. Ensure the programmable property, reboot_finished is unchecked.
   f. If desired, ensure Page Generation is enabled.
   g. If desired, select the appropriate TV Preset data.
   h. If desired, for TV Presets Channel Control, set "Trigger_Enter_After_Commands" to yes.
8. Setup the source routes.
9. Add the program started fb to the reboot_finished input of the module.
   a. Select Design & Program, then select Advanced Programming.
   b. Select the Crestron processor, and select the Program_Start_F (Rising Edge) for the appropriate program slot your program will be loaded into.
   c. For event actions, under "Available Programming", choose common, then add a Delay. Enter a startup delay time to allow the module to start up. Each system is different, thus the value may change from system to system depending on processor type, and load.
   d. Under "Available Programming" select the "Device Commands" tab.
   e. Select the device you added.
   f. Then select the reboot_finished digital.

DIRECTV IP V1.3 (ControlWorks)

ControlWorks Consulting, LLC

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Crestron Studio Page Generation

ControlWorks has selected the device type that is most compatible with the DIRECTV Receivers however some controls do not fit in the template. You must manually add some controls such as Advance, Green, enter, and dash.

Signal and Parameter Descriptions

Bracketed signals such as "[signal_name]" are optional signals

DIGITAL INPUTS

reboot_finished .... Latch this signal high after startup is complete. See demo program for example.

[ir_key_xxx] .... Pulse these optional inputs to perform the labeled functions. These emulate the IR commands found on the remote control for the receiver.

[kp_enter] .... Sends the channel number selected using the [kp_x] number keys.

[kp_clear] .... Clears the digits entered on [channel_entered$].

[kp_backspace] .... Deletes the last entered digit on [channel_entered$].

[kp_0]-[kp_9], [kp_-] .... Pulse to enter digits for tuning to a channel. Pulse [kp_enter] to send the command to tune to the entered channel. [channel_entered$] will populate when the keypad inputs are pressed.

[poll_current_program_info] .... Pulse to poll the receiver for information on the currently tuned channel. This module will poll after some commands that could generate a channel change described above. If there is no interaction with those inputs, the module will not automatically poll for current info.

[poll_power_mode] .... Pulse to poll the receiver for the receiver's power state; On or Off.

[poll_connected_devices] .... Pulse to poll the main receiver (server) for any registered or connected devices (Genies). The results will appear in the text console. This can be used to find the MAC address of Genie clients, which is used in the Receiver Address Parameter of the module to control these clients. Main servers use "0" for the Receiver Address Parameter.

[poll_version] .... Pulse to poll the main receiver for version information. Currently, access card number, receiver software version, and protocol version are available.

ANALOG INPUTS

[channel] .... Changes the channel to the specified analog value. Use an INIT to drive this input. Sub channels are not supported with this input. If a sub channel is required, use the [channel$] input.

SERIAL INPUTS

[channel$] .... Input a string containing the channel number to tune the receiver to. Strings should only contain numerals or a "-" and no more than 10 characters. For example, send "215" to tune to channel 215, or "220-1" to tune to 220-1 subchannel. Ensure the entire channel number comes in as one string, and not broken into multiple segments. Using an SIO will ensure proper operation. This input string can be used with the Smart Graphics dynamic channel presets object.

[info_channel$] .... Input a string containing the channel number to query the receiver for program information on a channel other than the currently tuned channel. Strings should only contain numerals or a "-"and no more than 10

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characters. For example, send "215" to tune to channel 215, or "220-1" to tune to 220-1 subchannel. Ensure the entire channel number comes in as one string, and not broken into multiple segments. Using an SIO will ensure proper operation.

DIGITAL OUTPUTS

[off_air_fb] ....Feedback of currently tuned program. Latched high when current program is an ATSC event.

[is_ppv]...Feedback of currently tuned program. Latched high when current program is a pay per view event.

[is_recording]...Feedback of currently tuned program. Latched high when current program is currently being recorded.

[is_vod]...Feedback of currently tuned program. Latched high when current program is a video on demand event.

[parental_control_mode_xxxx] ....Feedback of currently tuned program. Latched high when current program matches one of the parental control modes.

[other_xxx]...Same as above for currently tuned program, except for the channel set by the [info_channel$] input.

[power_on_fb]...High when the receiver is polled for power state, and the receiver reports as on.

[power_off_fb]...High when the receiver is polled for power state, and the receiver reports as off.

ANALOG OUTPUTS

[major_channel_number]...Feedback of currently tuned channel. Contains the major portion of the channel number, not any subchannel. Example 202d

[minor_channel_number]...Feedback of currently tuned channel. Contains the subchannel portion of the channel number.

[duration] ....Analog feedback in minuets for the currently tuned channel. 1d = 1 minute.

[other_xxx]...Same as above for currently tuned channel, except for the channel set by the [info_channel$] input.

[start_time]...Analog output that displays the currently tuned channels shows start time. This output updates after the kp_enter digital is pressed or after the receiver tunes to the channel sent on the [channel_entered$] input. The output is in minuets, 1d = 1 minute. Can be used with the time CIP tag in VTPro-e.

[duration] ....Analog output that displays the currently tuned channels shows duration. This output updates after the kp_enter digital is pressed or after the receiver tunes to the channel sent on the [channel_entered$] input. The output is in minuets, 1d = 1 minute. Can be used with the time CIP tag in VTPro-e.

SERIAL OUTPUTS

[channel_entered$] ....String output that displays the currently entered channel number from the kp_x digital inputs. The output will be cleared on the rising edge of the [kp_clear] or [kp_enter] digitals.

[channel_fb$] ....Serial output that displays the currently tuned channel number. This output updates after the kp_enter digital is pressed or after the receiver tunes to the channel sent on the [channel_entered$] input.

[call_sign$] ....Serial output that displays the currently tuned channels call sign. This output updates after the kp_enter digital is pressed or after the receiver tunes to the channel sent on the [channel_entered$] input.

[station id$] ....Serial output that displays the currently tuned channels station ID. This output updates after the kp_enter digital is pressed or after the receiver tunes to the channel sent on the [channel_entered$] input.

[title$]..Serial output that displays the currently tuned channels show title. This output updates after the kp_enter digital is pressed or after the receiver tunes to the channel sent on the [channel_entered$] input.

[episode_title$] ....Serial output that displays the currently tuned channels shows episode title. This output updates after the kp_enter digital is pressed or after the receiver tunes to the channel sent on the [channel_entered$] input.

[air_date$]..Serial output that displays the currently tuned channels shows air date. This output updates after the kp_enter digital is pressed or after the receiver tunes to the channel sent on the [channel_entered$] input.

[rating$] ....Serial output that displays the currently tuned channels shows rating. This output updates after the kp_enter digital is pressed or after the receiver tunes to the channel sent on the [channel_entered$] input.

[program_id$] ....Serial output that displays the currently tuned channels shows Program ID. This output updates after the kp_enter digital is pressed or after the receiver tunes to the channel sent on the [channel_entered$] input.

[music_station_artist$]..Serial output that will display the current music station artist. Testing has found that when tuning to a music channel, it may take a significant amount of time before the receiver receives the station meta data. Manual polling will be needed to keep this field up to date as songs change.

[music_station_cd$]..Serial output that will display the current music station Cd (Album). Testing has found that when tuning to a music channel, it may take a significant amount of time before the STB receives the station meta data. Manual polling may be needed to keep this field up to date as songs change.

[music_station_title$]..Serial output that will display the current music station title. Testing has found that when tuning to a music channel, it may take a significant amount of time before the STB receives the station meta data. Manual polling may be needed to keep this field up to date as songs change.

[parental_control_mode_text$]..................................Serial output indicating the parental control lock mode.

[other_xxxx$} ....Same as above for currently tuned channel, except meta data is driven from the channel set by the [info_channel$] input.

[access_card_id$]..Serial output that indicates the receiver's access card ID. This serial propagates with the current information when the [poll_version] input is pulsed.

[receiver_id$]..Serial output that indicates the receivers ID. This serial propagates with the current information when the [poll_version] input is pulsed.

[receiver_software_version$] ....Serial output that indicates the receiver's software version. This serial propagates with the current information when the [poll_version] input is pulsed.

[shef_version$] ....Serial output that indicates the receiver's SHEF version. This serial propagates with the current information when the [poll_version] input is pulsed.

PARAMETERS

Receiver Address..Enter "0" for the main server set top box or stand-alone receiver. For Genie clients enter the MAC address of the Genie client without delimiters and in upper case. For information on how to find this, please refer to the module application section of this help file.

Server IP Address ....Enter the IP address of the server set top box. To find the address, visit the module application section of this help file.

Support

This module is supported by ControlWorks Consulting, LLC. Should you need support for this module please email support@controlworks.com or call us at 440-449-1100. ControlWorks normal office hours are 9 AM to 5 PM Eastern, Monday through Friday, excluding holidays.

Before calling for support, please ensure that you have loaded and tested operation using the included demonstration program and touchpanel(s) to ensure that you understand the correct operation of the module. It may be difficult for ControlWorks to provide support until the demonstration program is loaded.

Updates, when available, are automatically distributed via Email notification to the address entered when the module was purchased. In addition, updates may be obtained using your username and password at https://www.controlworks.com/Customers/Login.aspx.

Distribution Package Contents

The distribution package for this module should include:

DIRECTV_IP(ControlWorks)_v1.3.umc ....Crestron User Module
DIRECTV_IP_Engine(ControlWorks)_v1.3.usp ....SIMPL+ file used within the control module
DIRECTV_IP_Engine(ControlWorks)_v1.3.ush ....SIMPL+ header file
DIRECTV_IP_Engine(ControlWorks)_v1.3.clz ....SIMPL# library
DIRECTV_IP_TSW1060_Demo(ControlWorks)_v1.3.vtp ..Demo XPANEL
DIRECTV_IP_Demo_Program(ControlWorks)_v1.3.smw ..Demo program for AV3 processor

Revision History

V1.3 caleb@controlworks.com 2019.01.14
-Complete rebuild utilizing SIMPL# - vast speed improvements, lower overhead, improved error handling, and improved debug information.
-Added in direct tune keypad, was in help file but not implemented on older modules.
-Added episode title output
-Changed start time and duration from serials to analogs.
-Changed behavior of poll_connected_devices to print to console instead of writing to the log.
-Various updates for Crestron Studio.

V1.2 caleb@controlworks.com 2017.11.02
-Fixed issue where after a long period of operation, the module would appear "stuck" and would not send commands to receivers.

V1.1 caleb@controlworks.com 2015.12.11
-Added Sonic Tap outputs
-Improvements on when to poll after issuing channel commands.
-Added work around for a 2-series firmware bug that would require a program restart to reestablish communications with the DIRECTV receiver.

V1.0 gary@controlworks.com 2015.2.25
        -initial release

Development Environment

This module version was developed on the following hardware and software. Different versions of hardware or software may or may not operate properly. If you have questions, please contact us.

Manufacturer Hardware	Software Version
DIRECTV HR44/500	0x114b
DIRECTV C31	0x114b
DIRECTV HR24	0xba2
Crestron Hardware	**Firmware Version**
Crestron AV3 Processor	1.503.3318.24705
Software	**Software Version**
Crestron SIMPL Windows	4.10.07
Crestron Vision Tools Pro-e	6.2
Crestron Database	97.05.001.00
Crestron Studio	1.71.032.00

ControlWorks Consulting, LLC Module License Agreement

Definitions:
ControlWorks, *We*, and *Us* refer to ControlWorks Consulting, LLC, with headquarters located at 701 Beta Drive, Suite 22 Mayfield Village, Ohio 44143-2330. *You* and *Dealer* refer to the entity purchasing the module. *Client* and *End User* refer to the person or entity for whom the Crestron hardware is being installed and/or will utilize the installed system. *System* refers to all components described herein as well as other components, services, or utilities required to achieve the functionality described herein. *Module* refers to files required to implement the functionality provided by the module and may include source files with extensions such as UMC, USP, USH, CLZ, SMW and VTP. *Demo Program* refers to a group of files used to demonstrate the capabilities of the Module, for example a SIMPL Windows program and VisionTools Touchpanel file(s) illustrating the use of the Module but not including the Module. *Software* refers to the Module and the Demo Program.

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Provision of Support
We provide limited levels of technical support only for the most recent version of the Module as determined by Us. We do not provide support for previous version of the module, modifications to the module not made by Us, to persons who have not purchased the module from Us. In addition, we may decline to provide support if the Demo Program has not been utilized. We may withdraw a module from sale and discontinue providing support at any time and for any reason, including, for example, if the equipment for which the Module is written is discontinued or substantially modified. The remainder of your rights and obligations pursuant to this license will not be affected should ControlWorks discontinue support for a module.

Modification of Software
You may not decrypt (if encrypted), reverse engineer, modify, translate, disassemble, or de-compile the Module in whole or part. You may modify the Demo Program. In no event will ControlWorks Consulting, LLC be liable for direct, indirect, incidental or consequential damages resulting from You modifying the Software in any manner.

Indemnification/Hold Harmless
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