Control 4 Envy Driver Documentation

Revision 0.85

SETUP

Install the Envy unit per the installation guide. The Control 4 driver relies upon the Wake on Lan feature to bring the Envy online or out of sleep. This requires the Control 4 unit running director to be on the same LAN segment as the Envy. Most residential installs this is not an issue but be careful if there are VLANs, multiple routers, or other sophisticated network configuration. This is no different from any other device that uses WOL.

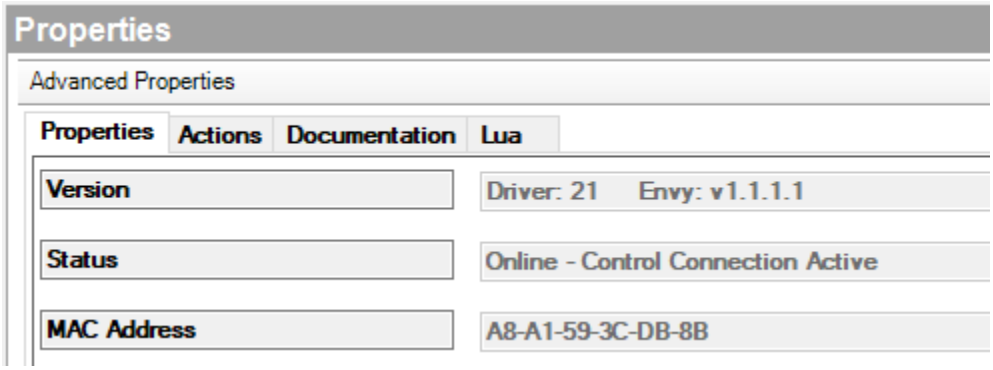
After installing Envy and connecting to the display and the network, it is recommended to reserve the Envy's MAC address to a fixed IP address in the customer's DHCP server so that it always returns to the same IP. If the IP changes Control 4 will lose the ability to communicate with it.

Next install the driver and make appropriate control connections for HDMI input and output. While an avswitch proxy is used, Envy does not support any switching. A typical install will have the Envy positioned between the receiver/preamp and a display. The preamp output connects to the Envy INPUT. The Envy OUTPUT will connect to the display.

Should the customer desire a reduced latency connection for gaming or other purposes, the PASSTHROUGH output can be connected a secondary input on the main display. It may be best in this case to not make the connection in composer and fire the input display command on the display in programming. A non-delayed copy of the input signal always appears on the PASSTHROUGH output. This change in video latency can be significant, it is recommended that the setup be tested as there may need to be changes in the audio system to account for lip sync delay between the two outputs.

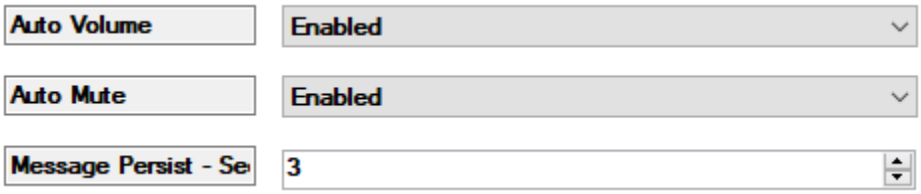
Configurations with Envy before, after or between HDMI switches should technically work but will complicate the installation. Using a local HDMI switch to switch between two displays (Flat panel and drop-down projector for instance) would be fine if it supports 18Ghz. Same for input switching with a local 18Ghz capable switch. HDMI matrix distribution switches should most likely be avoided due to EDID complications. When connecting to a projector over a long HDMI cable, hybrid fiber optic cables fully rated for 18Ghz are recommended. For short cables 2m 18Ghz qualified HDMI cables are recommended.

With the Envy powered on and on its permanent IP address, go to Connections > Network in composer and connect it as you would any device. The driver will immediately connect to the Envy and learn its MAC address. The **Status** property should show an online connection and the **MAC Address** property should be filled in with the unit's MAC address. Communications are fully established with the Envy.



DISPLAY FEATURES

The Envy supports display of Volume level, mute state, and arbitrary messages. The Auto Volume property enables binding of the Envy's **room's Video's Audio End Point 1** for both volume level and mute. If the volume overlay is disabled on the audio processor this prevents triggering of aspect ratio changes while adjusting volume. Display of mute and volume can be enabled/disabled independently.



Should the Envy not be in the same C4 room as the audio endpoint, the **VOLUME_DISPLAY** variable is writable and could be linked to another device's volume variable in programming. A Mute on/off command is available via programming commands to toggle the mute display on and off.

Envy also supports writing of arbitrary messages to the display. For example, an alert such as "Doorbell Rang" etc. could be written to the screen. This can be done by either writing to the **DISCRETE_MESSAGE** variable or by using the "Display Discrete Message" command. The command supports a time variable for display of that message. Messages written with the variable use the **Message Persist** time.

Examples can be found in the Programming Examples section below.

REMOTE KEY ASSIGNMENTS

A secondary sub-proxy is provided which allows control of the Envy via the SR-260 remote or touch panel. Most of the keys have been exposed as assignable in this mode. Guide is mapped to the Menu command or Hamburger, and the settings menu is mapped to Menu on the SR260. To use this, the Envy OSD proxy must be exposed under Navigation > Watch for the room.

Remote Key Assignments

INFO	Toggle DebugOSD
RECALL	None
PVR	Profile Menu
NUMBER_1	Aspect 4:3
NUMBER_2	Aspect 16:9
NUMBER_3	Aspect 2.35:1
NUMBER_4	Aspect 2.00:1
NUMBER_5	Aspect 2.20:1
NUMBER_6	Aspect 2.40:1
NUMBER_7	Aspect 2.55:1
NUMBER_8	Aspect 2.76:1
NUMBER_9	None
NUMBER_0	None
STAR	Aspect Auto
POUND	Aspect Hold
PAGE_UP	None
PAGE_DOWN	None

Any additional commands can be assigned to the SR260 at the room level for aspect ratios etc. via programming for use with other sources active.

CALIBRATION MODE

The calibration mode prevents any command other than heartbeats to be sent to the Envy. This is a convenience for calibrators that may need to guarantee the control system does not send any commands to the Envy. This prevents having to disconnect the Envy from Control 4 during calibration runs. At this time, the Envy remote must be used. Re-enabling allows commands to be sent to the Envy again.

PROFILES

Almost all configuration on the Envy is managed via profiles. Full documentation on profiles is available at the Envy web site. Please refer to the Profiles user guide at https://madvrenvy.com/#downloads for more details. A quick primer follows.

Profiles are groups of settings that are applied based either on a condition (attribute of incoming signal), manually by the user (via remote), or automatically by Control 4 or other automation system. Profiles are additive in the sense that several can be active at one time and only settings specifically enabled on the profile are set when that profile is activated. Settings can conflict and override each other, however in practice this is not generally an issue. Profiles are combined into groups. Within a specific Profile Group **ONLY ONE PROFILE IS ACTIVE AT ANY TIME**. Profiles can only be activated, not deactivated**. To deactivate a profile, another profile in the group must be activated or the entire group must be deactivated.**

There are three categories of profiles:

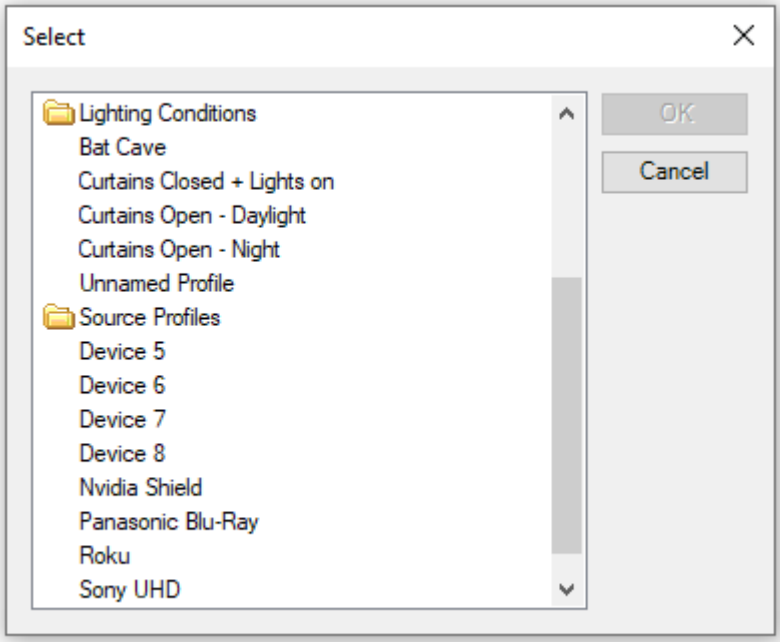
Built in profiles not for external interaction - These are typically automatically detected by some attribute such as frame rate, color space, HDR flag etc. By design they are not exposed for integration. Should there be a need to make a programming change such as changing a profile on a projector that does not observe HDR flags, that should be done via variable programming as described later in the document. Profiles in the following groups are internal only:

- Incoming Resolution
- Incoming Frame Rate
- Incoming Aspect Ratio
- Incoming Colorimetry
- Incoming Flags

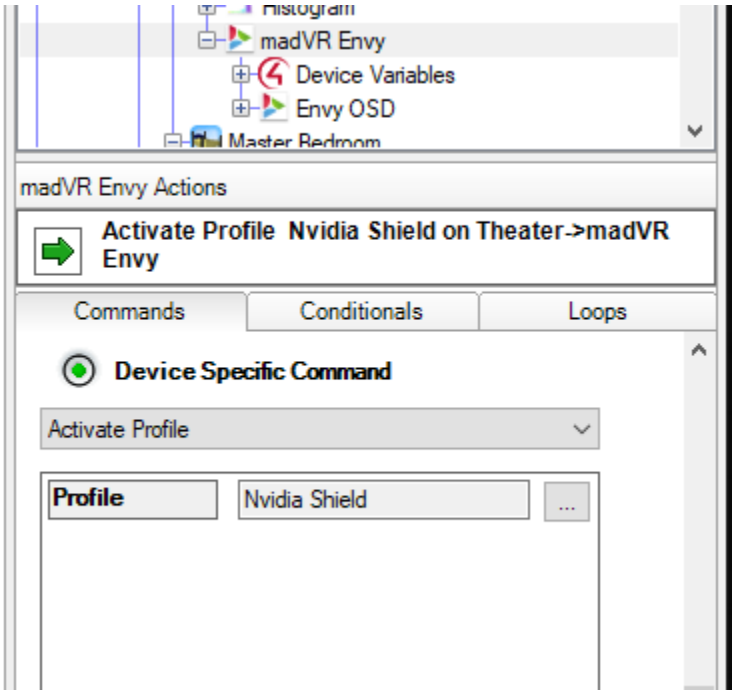
Built in profiles needing external interaction - There are two groups of profiles that should be automated externally. For example, if a customer has two displays and an external HDMI switch is used to connect them, programming in composer should force a display profile change. The display profile may have a different 3DLut for each display. These profiles are pre-defined but re-namable on the Envy and accessible via programming. You can both activate these profiles as well as program off local activation on the Envy via events.

- Source Profiles 1-8
- Display Profiles 1-4

Profiles can be activated via programming. In the below example the first four Source profiles had been renamed. Display profiles 6-8 have not been renamed. It is much nicer to work with the properly named profiles.



To activate a given source profile when the room source is changed via the Watch activity, you can use the CURRENT_SELECTED_DEVICE room variable to send the "Activate Source Profile" command in programming. A more complete example is in the programming examples later in the document.



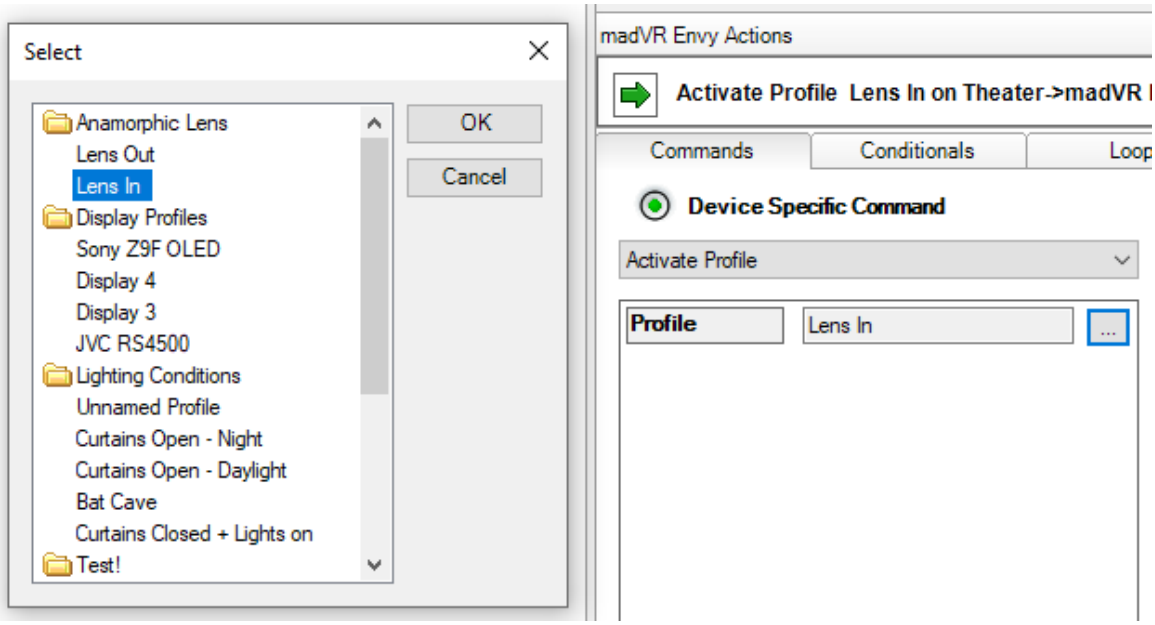
Custom profiles - Custom profiles can be triggered either on the Envy or via programming in Composer. These profiles are user defined and re-namable on the Envy and accessible via programming. You can activate these profiles via Control 4 programming. For example, if a customer has an anamorphic lens on a sled and prefers to move the lens manually based on content, when the command to the sled is sent, a profile can be applied that appropriately enables or disables anamorphic stretch on the Envy. The same user may also have blinds and lighting controlled by Control 4 and would like to optimize their HDR tone mapping based on the perceived brightness and contrast based on lighting conditions. By using two custom profile groups, one for lighting and one for the lens, only one of each type of profiles would be active at any given time. These settings do not conflict with each other and would make an exceptionally clean install**. It is HIGHLY RECOMMENDED that custom profiles are given custom names via USB keyboard or the "Envy IP Control" PC application.**

Example Envy Custom profiles and groups:

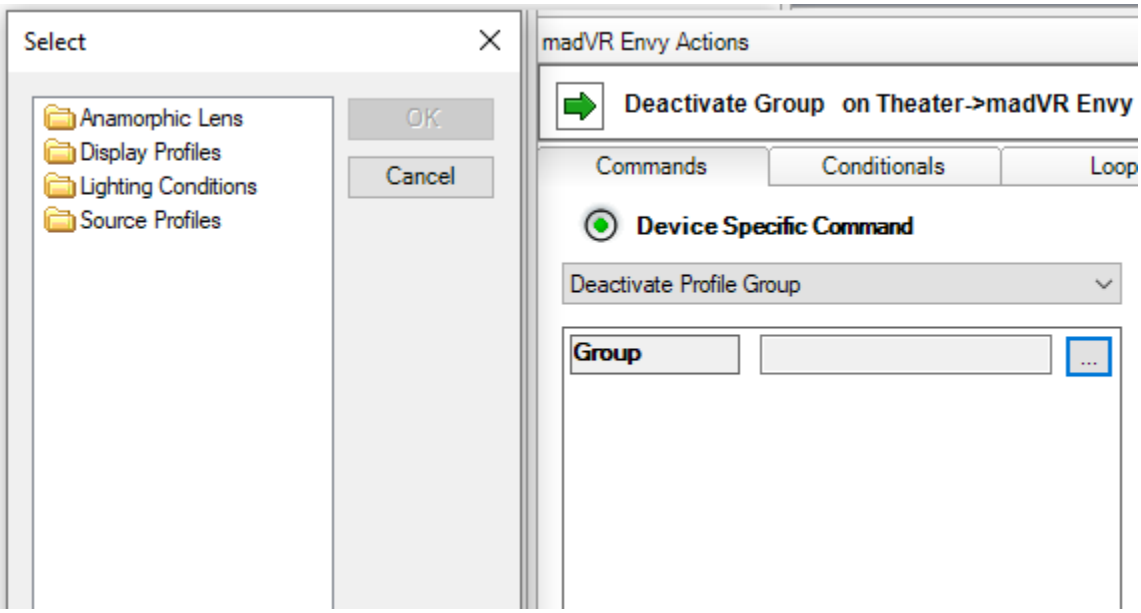
Profile Group Anamorphic Lens
- **Profile** Lens In
- **Profile** Lens Out

Profile Group Lighting Conditions
- **Profile** Curtains Open - Daylight
- **Profile** Curtains Closed + Lights on
- **Profile** Curtains Open - Night
- **Profile** Bat Cave

Group appearance in Composer:



For programming, the custom and built in profiles are activated on the Envy by selecting the Activate Profile Device Specific Command. The command can then be associated with any normal programming in Composer.



Groups work in the same way. Groups are only used from Control 4 if there is a need to disable all profiles within a group. In the above example, it may be desirable to deactivate all lighting profiles by deactivating the group “Lighting Conditions”. It is unlikely the user would want to deactivate the Anamorphic profile as the correct one needs to be enabled depending on which position the lens is in.

Should the profiles in the driver come out of sync with the Envy, the "Refresh Profiles" button on the Actions tab will re-synchronize the Driver's profiles with the Envy. If profiles have been added and deleted to the Envy it may be necessary to manually delete programming that is orphaned because the associated profiles on the Envy have been removed.

Best practice is to determine the profiles required by the customer and build them on the Envy first, test them manually, then assign programming based on the desired automation.

UPDATE ENVY LICENSE

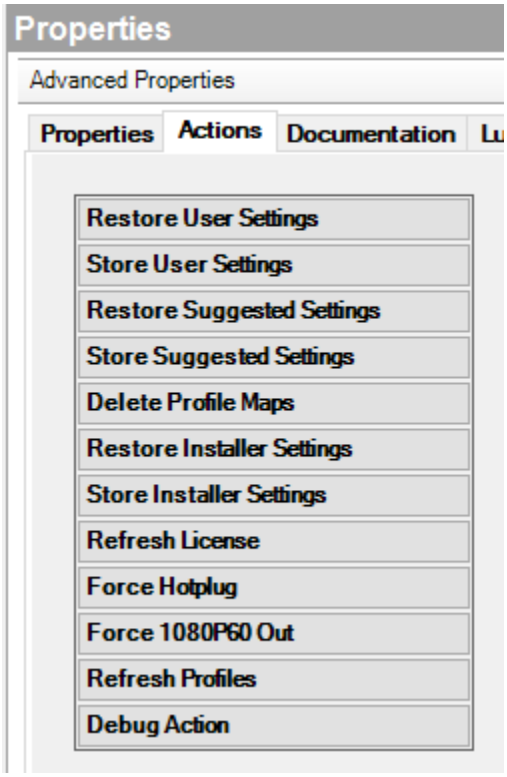
The Envy license entitlement can be updated via a "Refresh License" button under the Action tab.

HOTPLUG and 1080P OUTPUT

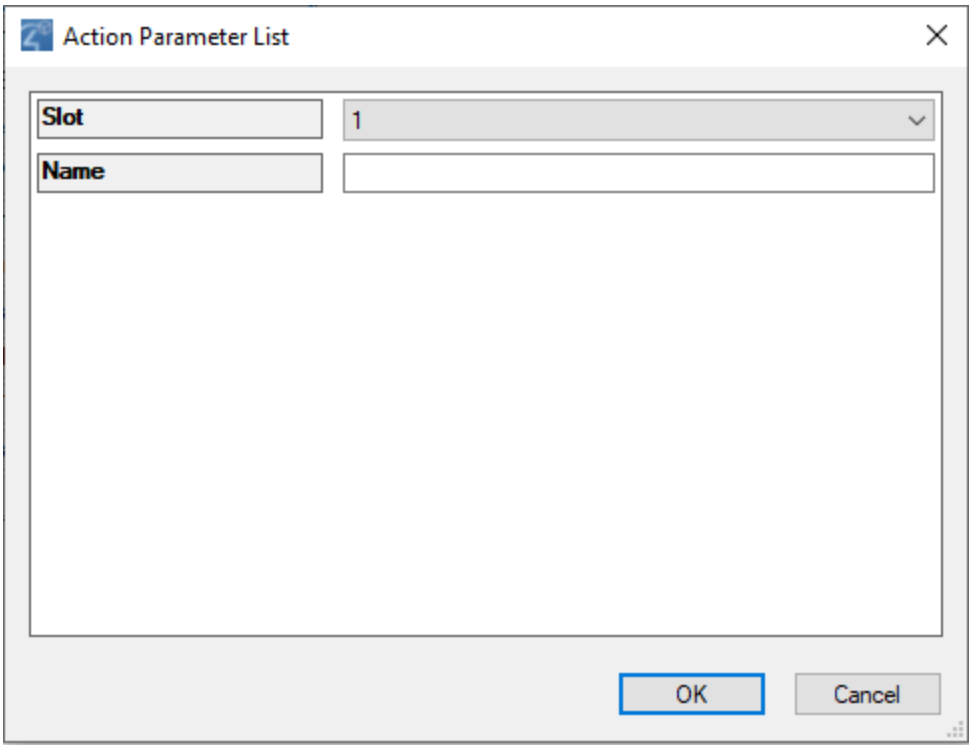
Both HDMI Hotplug on input and 1080P 60 output can be forced. This is sometimes handy when installing and moving cables around. These can also be fired programmatically and have corresponding event triggers.

STORING AND RESTORING ENVY CONFIGURATIONS

The Envy allows user settings to be stored and fallback settings to be stored to installer and suggested settings via buttons under the Action tab.



Storing of user settings prompts for a slot and a user-friendly name. These can be seen on the Envy menu. Restoring only prompts for the slot.



The installer and suggested settings require a password to store but may be restored without the password at any time.

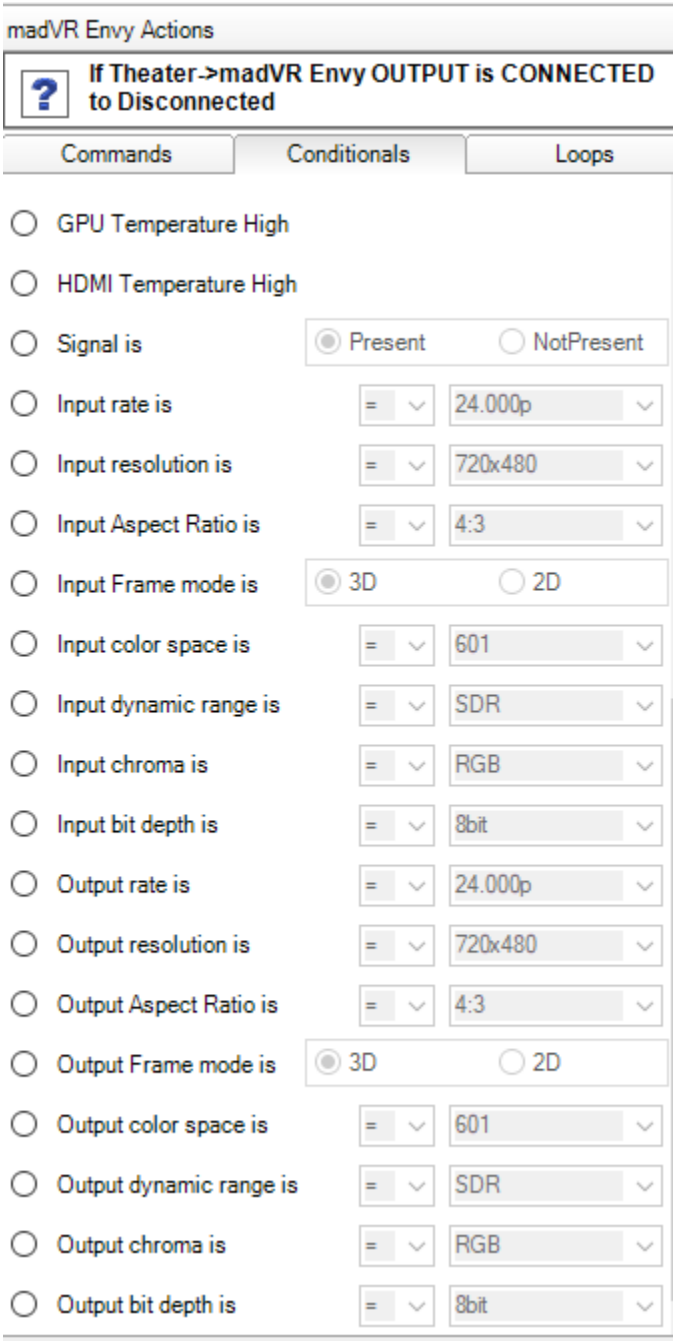
VARIABLES, COMMANDS, AND PROGRAMMING

All video attributes detected by the Envy are exposed for programming. These variables are **READ ONLY**. They may be used to automate external devices based on the input and output video. For example, there may be a need to change color space or activate a high lamp mode for HDR content. Those automations should be programmed from these variables.

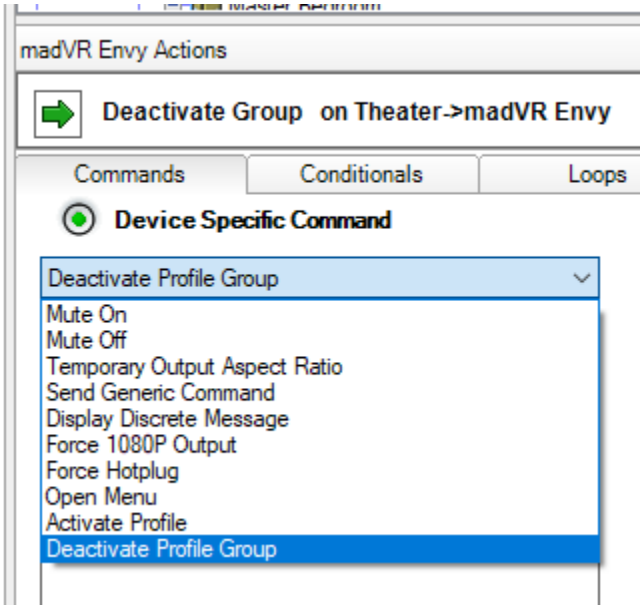
Additionally, two **WRITABLE** variables are exposed for programming convenience DISCRETE_MESSAGE and VOLUME_DISPLAY. Any text written to DISCRETE_MESSAGE will be written to the display in the same way as the Discrete Message command. The display time is set by the global property Hangtime. VOLUME_DISPLAY is provided to allow linking the volume output of some component into the volume display. Mute display is ONLY available via the MuteOn and MuteOff commands.

Variable	Potential Values
DISCRETE_MESSAGE	<Writable string>
VOLUME_DISPLAY	<Writable string>
INPUT_STATUS	Signal| NoVideo
INPUT_3D_MODE	2D | 3D
INPUT_ASPECT	16:9 | 4:3
INPUT_BIT_DEPTH	12bit | 10bit | 8bit
INPUT_BLACK_LEVEL	TV | PC
INPUT_CHROMA	444 | 422 |420 | RGB
INPUT_COLOR_SPACE	601 | 709 | 2020 | PAL | DCI
INPUT_DYNAMIC_RANGE	SDR | HDR10 | HLG
INPUT_RATE	23.976p | 24.000p | 30.000p | 60.000p | 59.940p | 23.970p
INPUT_RESOLUTION	3840x2160 | 1920x1080 | 720x480
OUTPUT_3D_MODE	2D | 3D
OUTPUT_BIT_DEPTH	12bit | 10bit | 8bit
OUTPUT_BLACK_LEVEL	TV | PC
OUTPUT_CHROMA	444 | 422 |420 | RGB
OUTPUT_COLOR_SPACE	601 | 709 | 2020 | PAL | DCI
OUTPUT_DYNAMIC_RANGE	SDR | HDR10 | HLG
OUTPUT_ADJUSTED_ASPECT	119, 133, 137, 143, 166, 175, 178, 185, 200, 220, 235, 239, 240, 255, 266, 276
OUTPUT_SUBT_MASK_ASPECT	119, 133, 137, 143, 166, 175, 178, 185, 200, 220, 235, 239, 240, 255, 266, 276
OUTPUT_RATE	23.976p | 24.000p | 30.000p | 60.000p | 59.940p | 23.970p
OUTPUT_RESOLUTION	3840x2160 | 1920x1080 | 720x480

To simplify programming, conditionals are provided for the above variables.



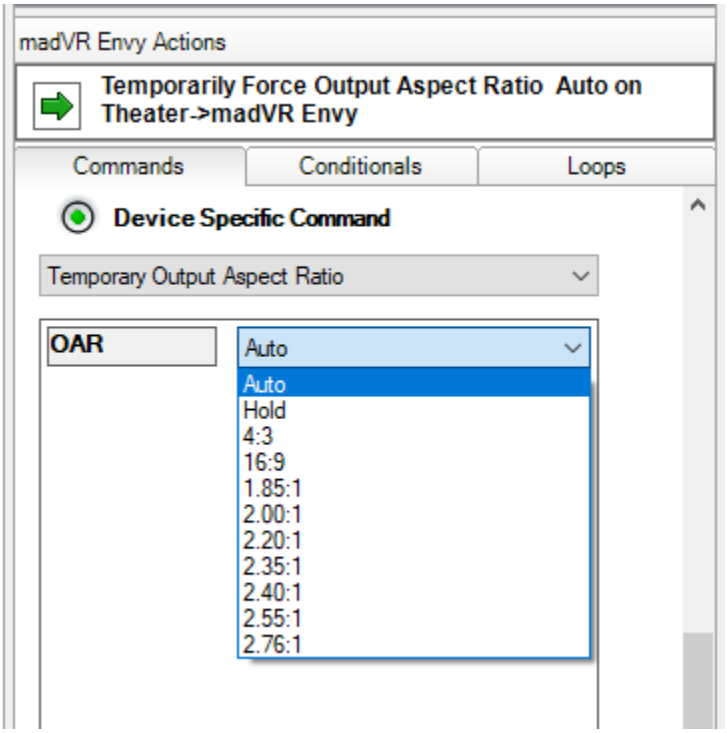
Almost all Envy features can be automated by commands. These commands can be used to provide control of envy at the room level on SR260 and NEEO remotes.



Send Generic Command allows all remote buttons to be send and mapped to SR260 buttons for other sources at the room level.

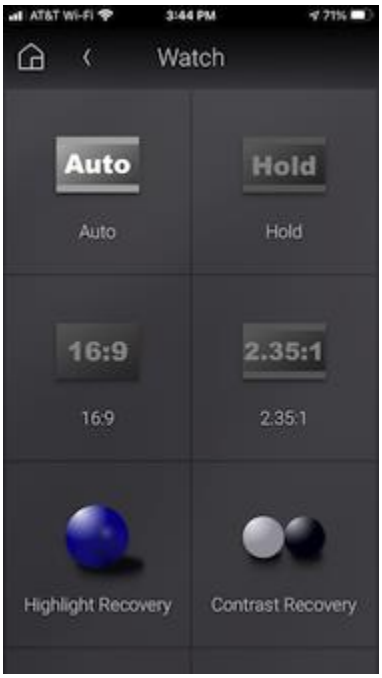
Open Menu allows for direct opening of the Envy's menus.

The Temporary Output Aspect Ratio command will temporarily override the aspect ratio envy has detected. A customer with a Constant Image Height (CIH) setup may want the ability to override the detected aspect ratio. It may be desirable to use standard C4 programming to map Auto, Hold etc. to the 3 custom buttons or other unused buttons. The temporary override will continue until the video has changed resolution/refresh or Envy has detected a content change. Some configurations that minimize projector resyncs may need more manual oversight than other systems. Custom Experience buttons have also been provided for these functions as documented below.



EXPERIENCE BUTTONS

Several Experience buttons have been created to provide a UI for some of the most common functions a user might want while Enjoying their Envy or for demoing the advanced features offered by the Envy at the touch of a button. The experience buttons must have their ENVY_LINK control connection linked to the main Envy driver in programming.



Aspect Ratio - The Aspect Ratio experience button is a single driver that represents the common aspect ratios as well as the two special Hold and Auto settings. When added to the project it will be named "Off". Select the AR this button is to represent. This will rename the driver and update the icon set for that AR. When that override is active, it will light up. Only one AR will be active at a time. This provides a "radio button" type interface for managing aspect ratio while viewing video. It may be desirable to favorite these buttons to the room.

Highlight Recovery - Toggle the Highlight recovery setting for demonstration purposes.

Shadow Recovery - Toggle the Shadow recovery setting for demonstration purposes.

Contrast Recovery - Toggle the Contrast recovery setting for demonstration purposes.

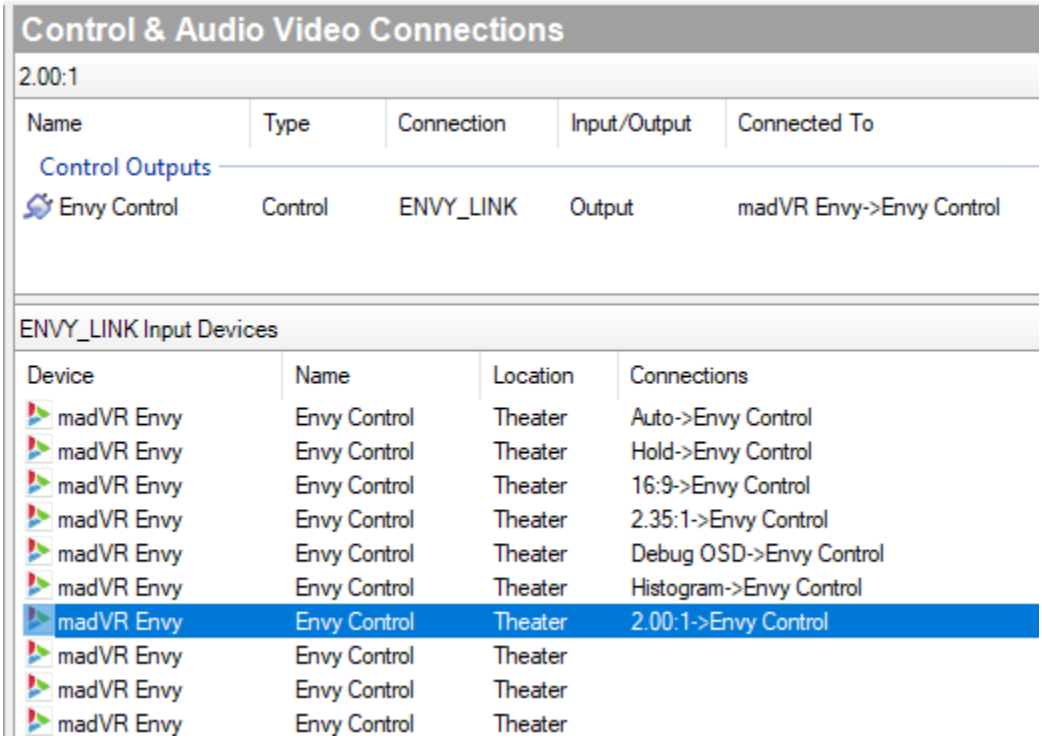
Toggle Tone Mapping - Toggle the Tone Mapping for demonstration purposes.

Toggle Histogram - Toggle the Histogram display.

Toggle DebugOSD - Toggle the Debug display.

Toggle 3DLut - Toggle the 3DLut on and off.

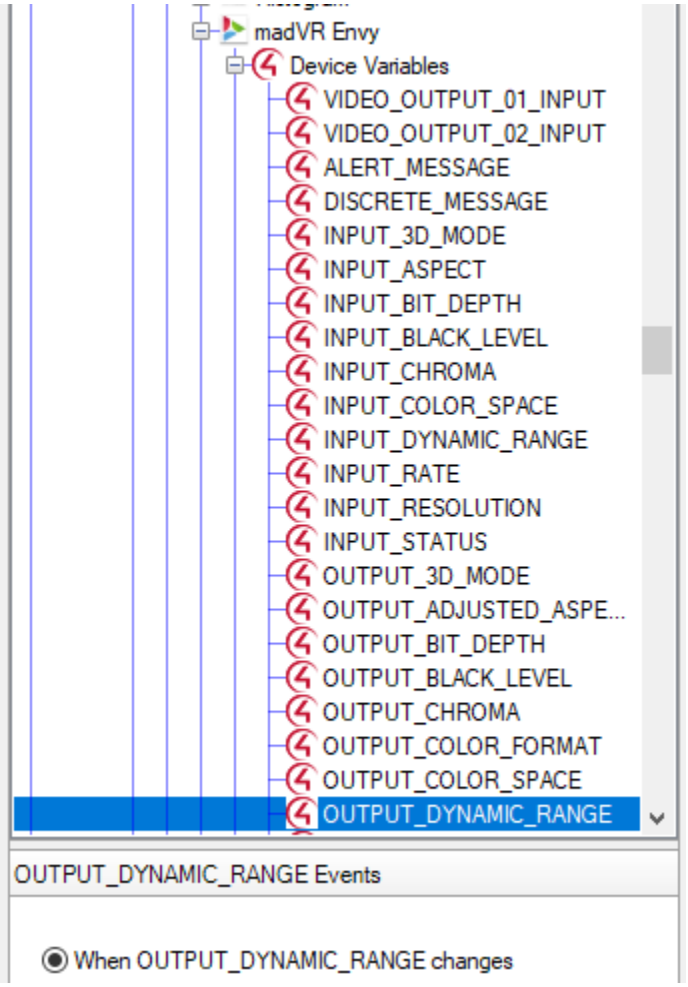
The Experience buttons must have a control link connected to the Envy driver. It's easiest to insert the toggle Experience Buttons and select the aspect ratio for the Aspect Ratio button, then go into connections and link them to a control connection in the same way you would link a mini driver. No programing is required.



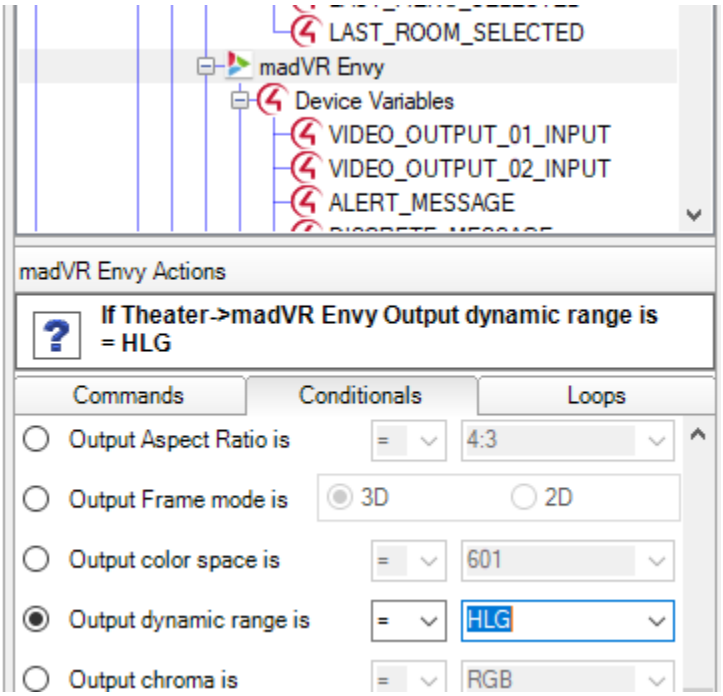
PROGRAMMING EXAMPLES - Triggering projector settings

You may need to trigger various projector settings from video variables. For example, to change the gamma table or picture mode on the connected projector, find the OUTPUT_DYNAMIC_RANGE variable in Device Events. Then, find the Envy and conditionals tab, select "Output dynamic range is" and drag over the necessary options. In this example a different gamma table is desired for SRD, HDR, and HDR10. Next, go to the projector and drag the commands for the desired picture settings to be fired when the desired output signal is sent. Beware some projectors ignore commands during resync so a delay may be needed. In this example we want to alter the gamma table on our projector depending on the content being in SDR, HDR, or HLG.

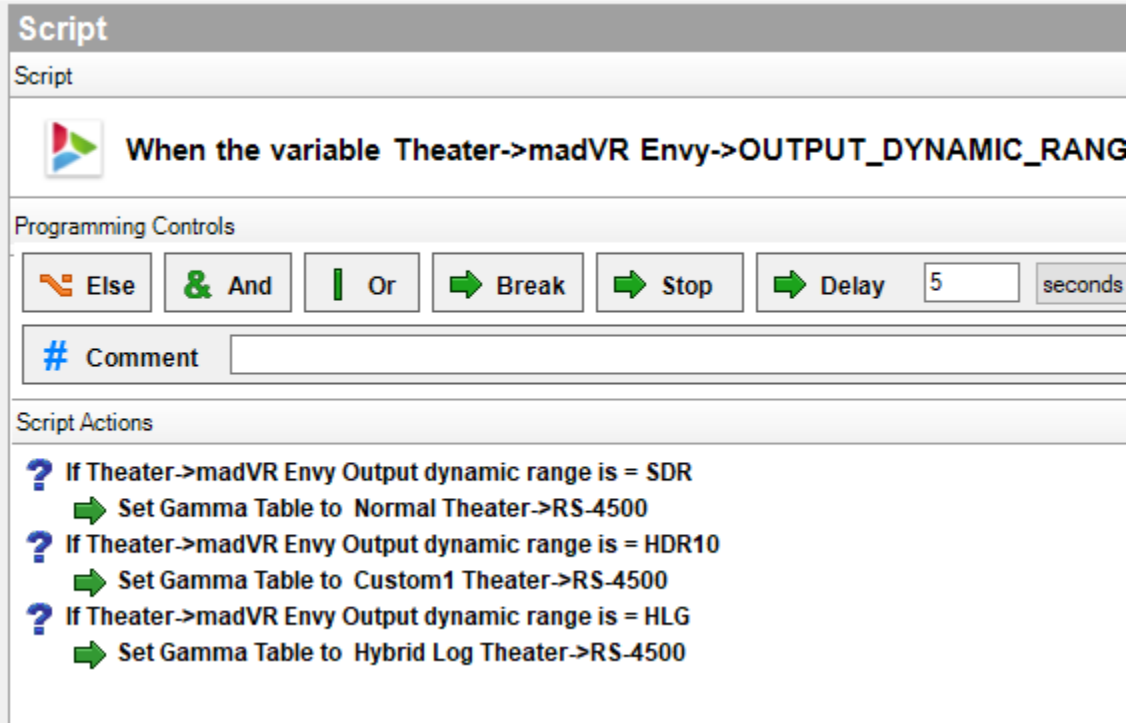
First, select the attribute that triggers the change. In our case, OUTPUT_DYNAMIC_RANGE variable on the main Envy proxy tracks this attribute.



Next, select the appropriate conditional

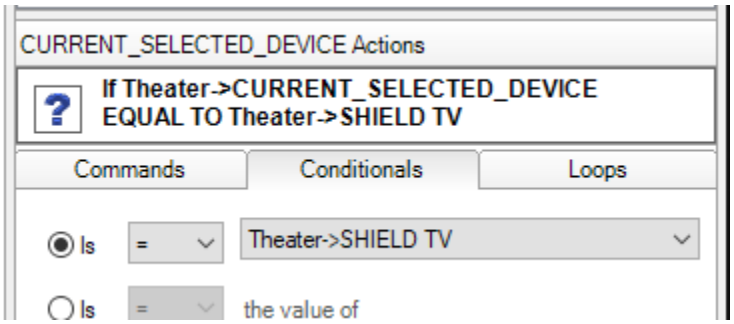


Then assign commands to set the proper gamma table on the projector in response to the conditional.

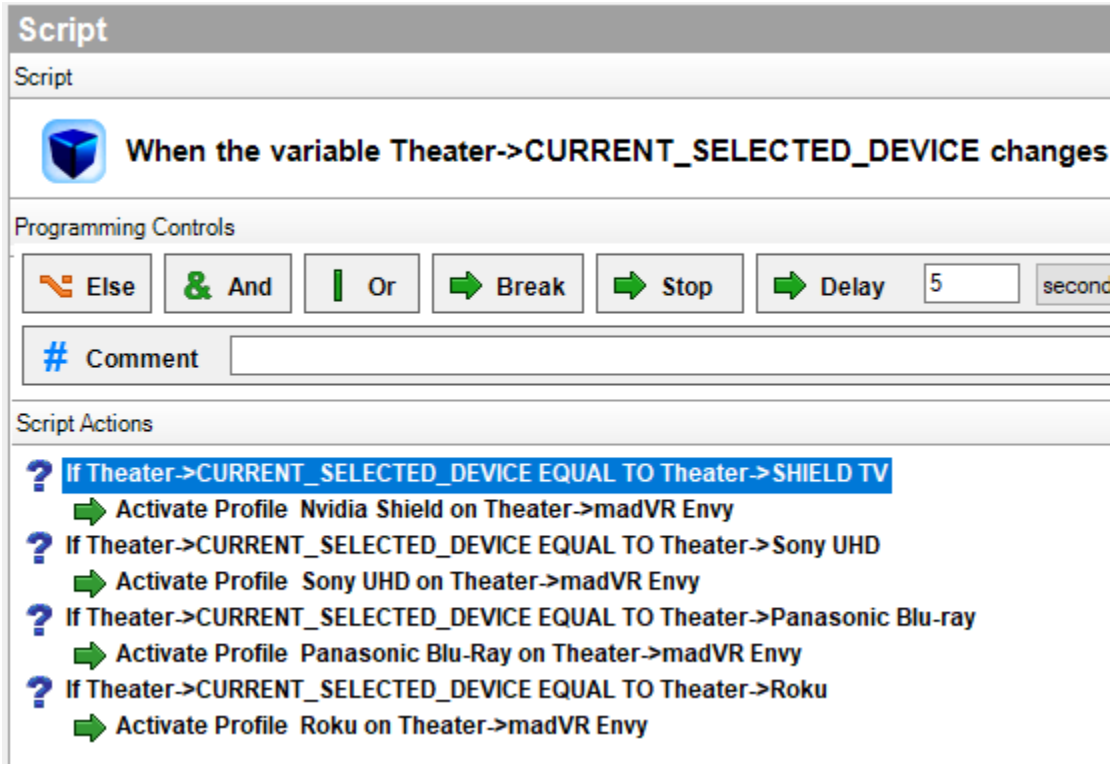


PROGRAMMING EXAMPLES - Associating Source Profiles and deactivating groups

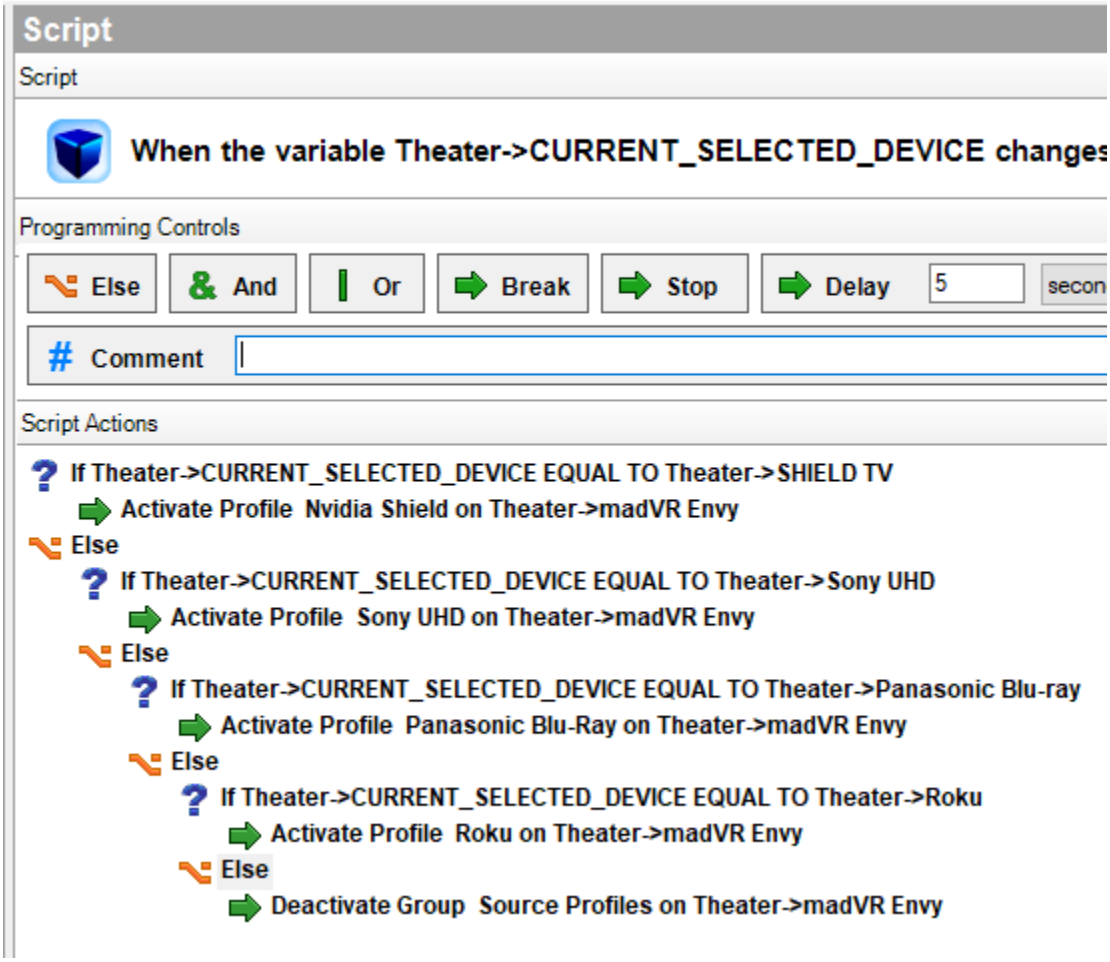
The CURRENT_SELECTED_DEVICE room variable can be used to trigger source profiles on the Envy. Select CURRENT_SELECTED_DEVICE under device events, then select the same under device actions, then under conditionals select "is =" the desired sources and drag them into the page script. Then select the Envy and use the Device Specific Command "Activate Source Profile" to associate the correct source profile to the correct input.



Given named source profiles, the correct programming is illustrated below:



If there are specific settings but the base profile is adequate for other sources, the Source group can be deactivated if no specific matching source is selected by using else commands.

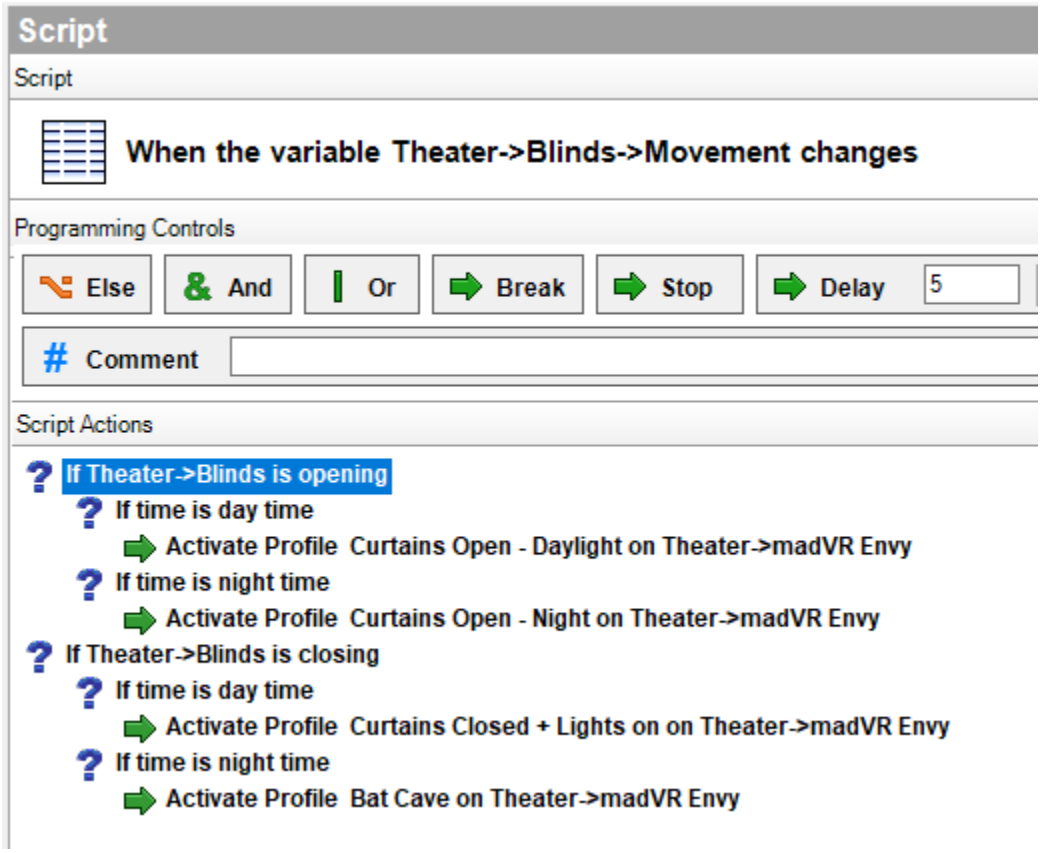


PROGRAMMING EXAMPLES - Activating custom profiles

If a customer has a room with changing lighting levels, there may be a desire to alter HDR tone mapping etc. based on lights and window covering status. This can be achieved by assigning different groups based on light levels or blind positions. Assume the following groups:

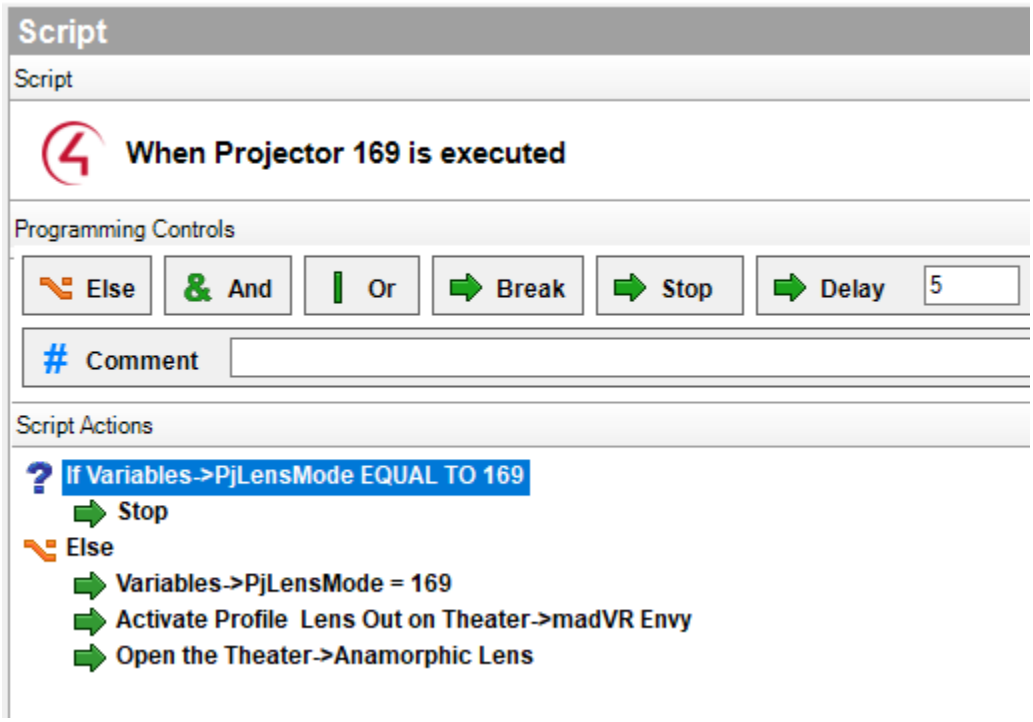
Profile Group Lighting Conditions
- **Profile** Curtains Open - Daylight
- **Profile** Curtains Closed + Lights on
- **Profile** Curtains Open - Night
- **Profile** Bat Cave

The profiles are assigned to the various shade positions. When any profile in the "Lighting Conditions" group is activated the rest are deactivated. When the group is deactivated, none of the settings in any of the profiles in the group apply. And commands may be used to get super fancy and account for lighting as well as window covering position. This can get complicated and should be built as a macro so that it could be tied to all the lights and window coverings the customer might manupulate.

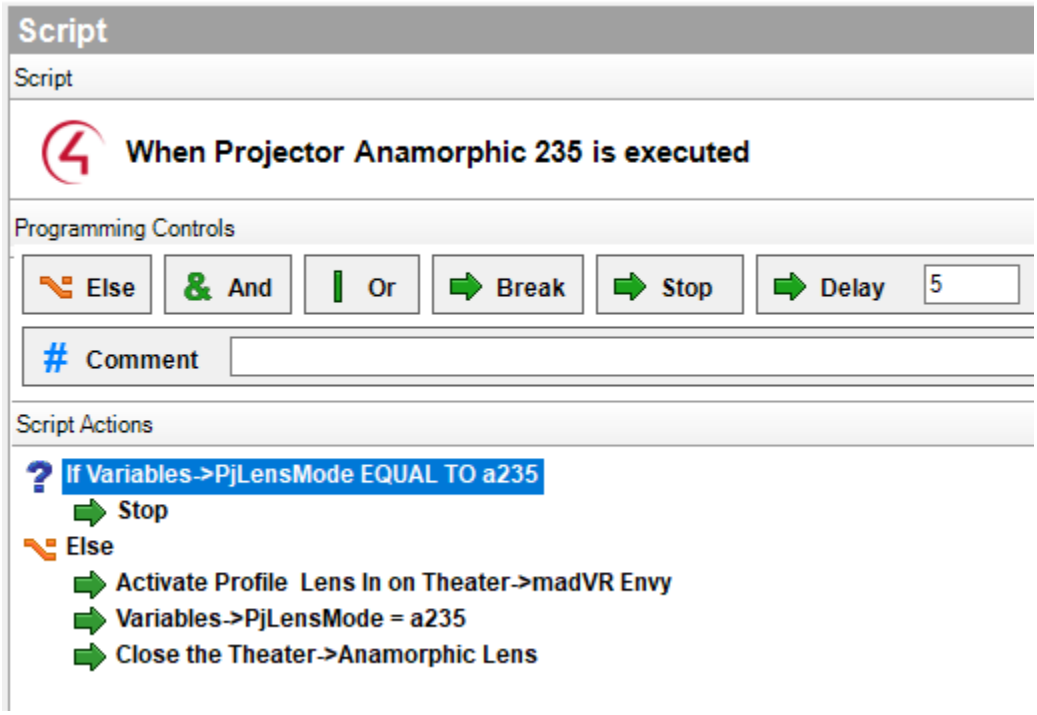


PROGRAMMING EXAMPLES - Anamorphic Lens

To program an anamorphic lens, its best to create macros for each state. In this instance a relay on the EA is used to control the lens sled. A variable is used to track the state of the lens. This requires the addition of the Variables agent and the creation of a STRING type variable. In our case we have called it **PjLensMode**. The variable is optional but prevents triggering unnecessary commands/relay activations. The following macro is for 16:9 image with lens out of the light path. If the lens is already in the 16:9 position, do nothing, otherwise set the variable to 169, Activate the profile "Lens Out" on the Envy, and open the relay to move the lens out of the light path.



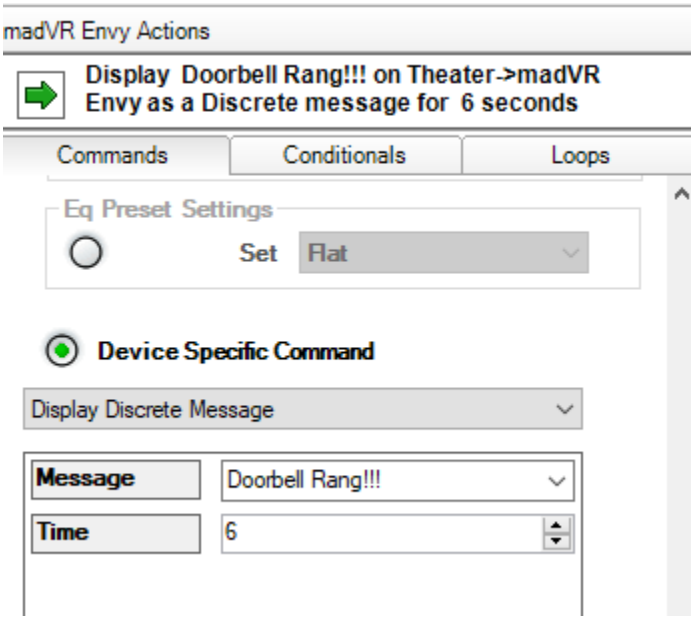
The reciprocal macro is for 2.35:1 image with anamorphic lens in the light path.



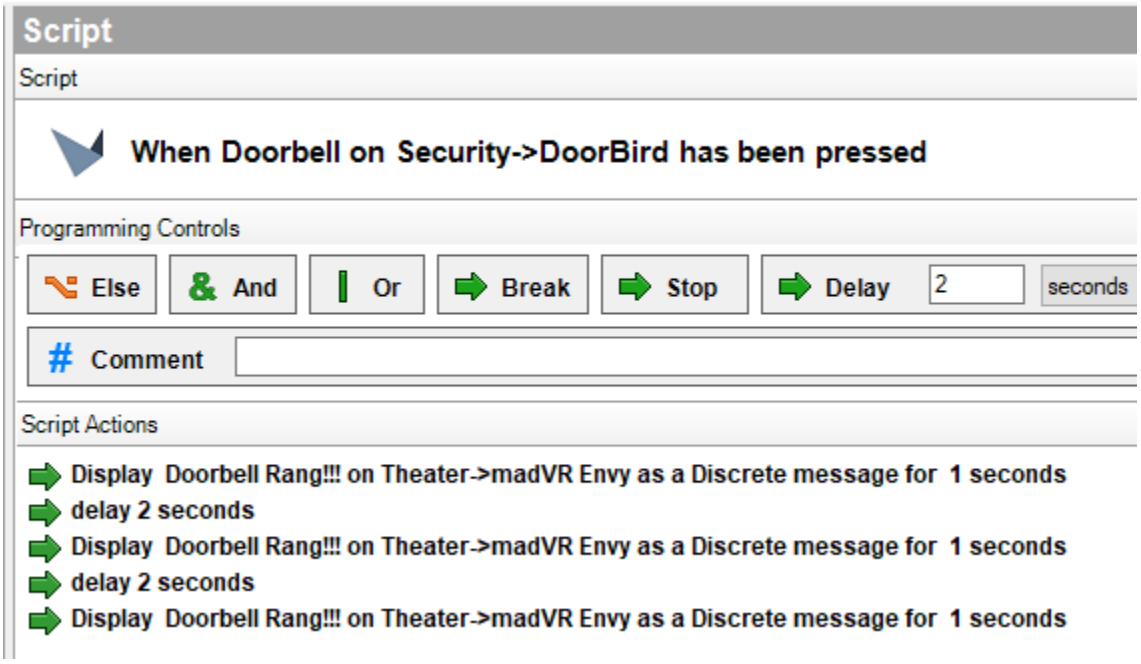
The Macros can now be executed manually via button press or upon source selection with standard C4 programming.

PROGRAMMING EXAMPLES - Notification

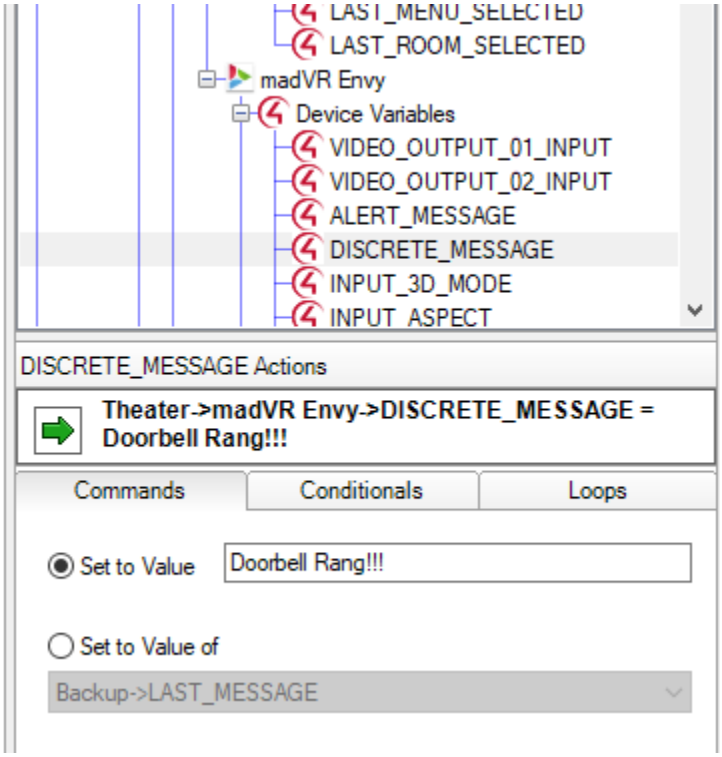
To program a notification for a door station or doorbell, simply use the Display Discrete Message command with the text of your choice in the script box for the button pressed event:

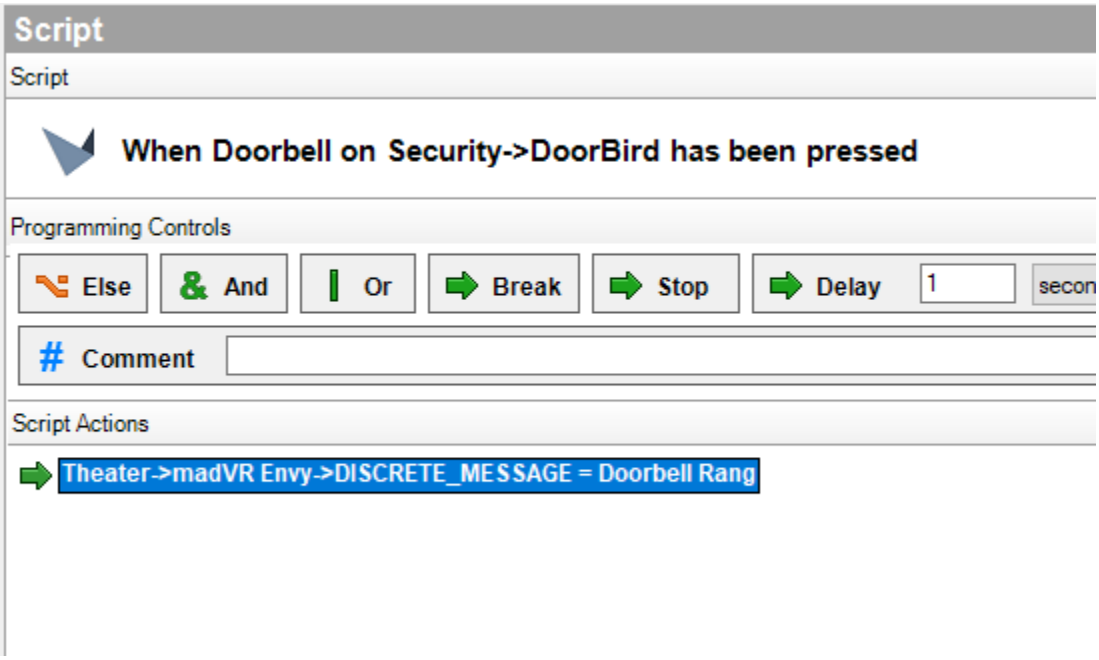


A more blinking style announcement could be sent by reducing the display time and inserting delays as follows. This creates a one second on/one second off blink. The delay is for two seconds because the madVR is given the command to display the message for one second, at the same time the EA begins it's timer, one second for the message and another second for the "off" time", repeating as many times as needed.:

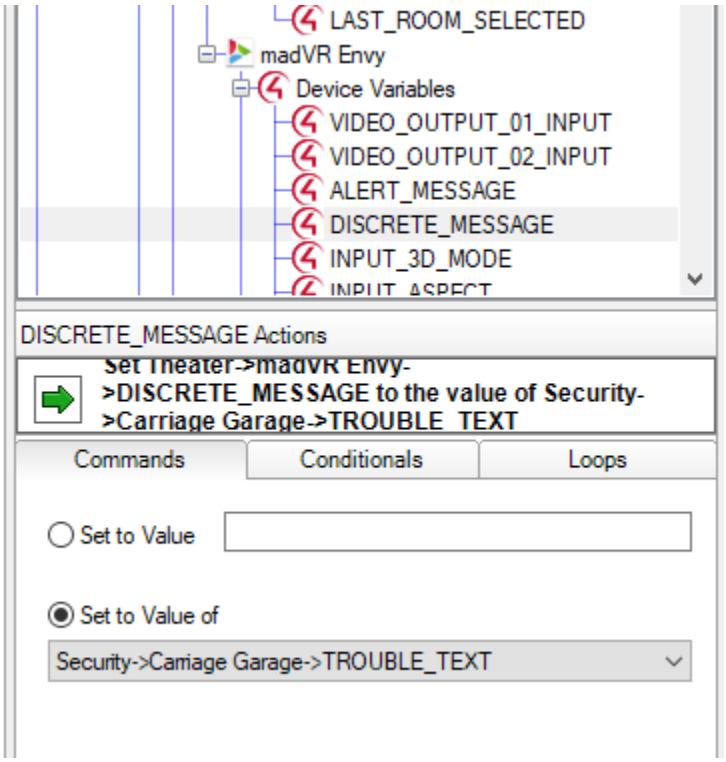


If you prefer to write to the variable DISCRETE_MESSAGE this syntax will also work. The display time is set globally in properties as Hangtime.





Variables can also be used to supply the text of the notification. For example with an alarm system, the TROUBLE_TEXT message may indicate when a sensor is opened, however we only want to display this if the alarm activates:



Then associate the variable write with the proper trigger on the customer's alarm panel.