How To Guide

This document provides a simple introduction to general DMX and a user guide to setting up and using the UC-DMX-2xx with the configuration tool.

If you are new to DMX, we strongly encourage you to read the brief DMX overview as a lack of understanding of DMX is often the underlying issue when questions are asked of support.

If you DO need support, please contact us on support@ultamation.com and provide as much detail as you can to describe your problem. Simply saying "I can't get it to work, why?" is obviously not sufficient 😉

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UC-DMX MODELS

The original model was the UC-DMX-200. There is now a hardware equivalent UC-DMX-210.

Both models support the full 512 channels of a single DMX universe and provide pattern generators.

The UC-DMX-200 provides 8 pattern generators with overlay pattern options.

The UC-DMX-210 provides 2 pattern generators without overlay options, but benefits from on-board smooth dimming management.

DMX… HOW DOES IT WORK?[1]

DMX is an old serial control protocol that was originally developed for stage lighting control. It's also popular in LED lighting control because it's simple to understand, and setup up – if you do it right!

DMX itself is a CONSTANT stream of data, going in ONE direction from the controller (in our case, the UC-DMX-2xx) out on a 2-wire data bus, with messages sent 20 time per second.

Technical Note

DMX is plain and simple RS485 – running at 250K baud (which is not a common rate). RS485 is half-duplex, and in the case of DMX-512, one way – the controller being the master and each DMX device (e.g. a light) is a slave device.

As such – there is no "RX" and "TX" as you may be familiar with in normal RS232 serial control. Instead the two wires are Data+ and Data- and to work correctly, they are dependant upon each other. If either wire is not connected, shorted to ground, or crossed over at a device, the ENTIRE DMX bus will NOT WORK.

Ground is often applied as the "3rd wire" and while this isn't part of the communications bus, it is important in reducing interference. Ground should be connected to the shield of the cable at ONE end of the bus. You may also need terminating resistors for longer DMX runs. This document doesn't go into that level of detail, but the Internet has plenty of information about DMX termination, and why and when you may need it.

DMX data is simply a block of 512 bytes. Each byte represents a "channel" or "address" starting from 1 and ending at 512. A DMX fixture is assigned a base address – this is the DMC channel the device will pick up data for as the data is transmitted by the controller,

The data is transmitted repeatedly, regardless of whether the data changes. If a device is disconnected from the DMX bus, it will stop receiving data, and how the device will respond to this is device dependent.

[1] We're concerned with the plain, single universe, RS485 DMX-512 protocol here – not any extensions for two-way device discovery or Ethernet derivatives of DMX.

For a single channel DMX fixture (e.g. a white light) then it will listen to a single DMX address. However, if your fixture is more complex – for example it is an RGB fixture – then it will use more than one channel - typically one channel per property.

This table illustrates some common (or not so common!) DMX slave devices, how many channels each might use, and an example of the actual DMX channels used for a hypothetical base address.

Example Type	Channels used	Hypothetical Base Channel	Example DMX Channels Used (inclusive)
Warm White	1 (brightness)	1	1
Cool White	1 (brightness)	123	123
RGB	3 (red, green, blue)	11	11-13
RGBW	4 (r, g, b, white)	25	25-28
RGBWW	5 (r, g, b, ww, cw)	29	29-33
Fibre optic starfield	Say, 5 (r, g, b, w, sparkle)	101	101-105

It is (hopefully!) obvious that channels MUST NOT overlap – you cannot have 3 RGB fixtures on channels 1, 2 and 3!

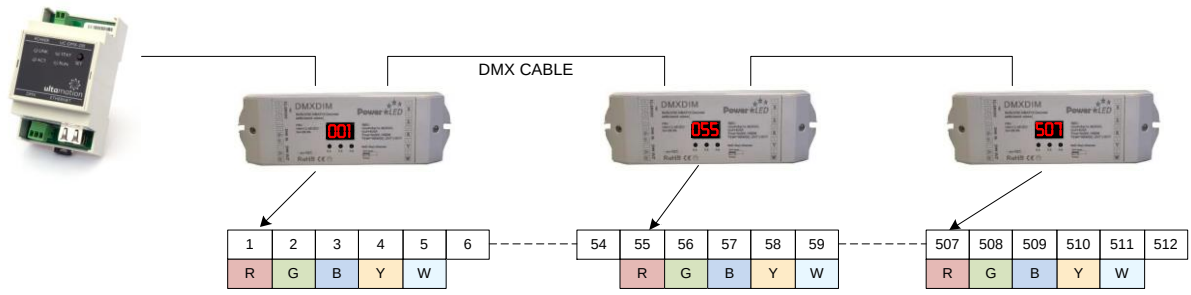
DMX Address	1	2	3	4	5	6
Fixture 1 (Addr 1)	R	G	B			
Fixture 2 (Addr 2)		R	G	B		
Fixture 3 (Addr 3)			R	G	B	

This is BAD.

DMX Address	1	2	3	4	5	6	7	8	9	10
Fixture 1 (Addr 1)	R	G	B							
Fixture 2 (Addr 4)				R	G	B				
Fixture 3 (Addr 7)							R	G	B	

This is GOOD.

The image below illustrates how, as each packet of 512 data bytes flows from the UC-DMX-2xx, each DMX decoder "sees" the data for its assigned addresses (this example shows 5-channel (RGBYW) decoders). Note – the last decoder could NOT take an address beyond 508, as the 5 channels would overflow 512!



Technical Note

DMX is a DATA protocol. The specification does not cover power. Please pay close attention to the power requirements of your DMX fixtures. Many people make the mistaken assumption that LED is low power. This is true for a single lamp when compared to older technologies, but when you consider long runs of LED tape, the current can quickly build up and lead to problems with driving the tape, and also dimming of the LEDs along the tape run as voltage drops.

The UC-DMX-2xx does NOT provide power for the DMX fixtures.

As mentioned earlier, each DMX channel is a single byte (though some decoders provide for doubling up of channels to create 16-bit resolution).

A byte has a value between 0 and 255,

The actual meaning of the value in DMX is dependent upon the DMX slave device being controlled.

For dimming applications, 0 will (almost certainly!) mean OFF and 255 will mean FULLY ON. Values in between will generally represent a dimmed value between OFF and ON though this is rarely linear and – in the case of LEDs – rarely provides for very low dimmable levels. This is a challenge associated with LED technology and how dimming is accomplished, not a problem with DMX.

For other devices, the values can mean different things – for example – a sparkle wheel might take discrete values for speed (e.g. 0-7) and some devices have colour changing presets where the value dictates how the light fixture will cycle through colours.

The UC-DMX-2xx Can set any channel to any value, and the configuration tool provides a convenient way to experiment with those values, as described later in this document.

CONNECTING UP THE UC-DMX-2XX

Connecting the UC-DMX-2xx is very simple.

- Ethernet – connect the device to your network. The device is NOT a PoE device.
- Power – the 2-pin phoenix connector will accept 9-24VDC (or AC). This was designed to be easily compatible with common 24VDC power supplies found in lighting cabinets (such as Crestron).
- DMX connector – the 3-pin connector is wired D+/D-/GND.[2]

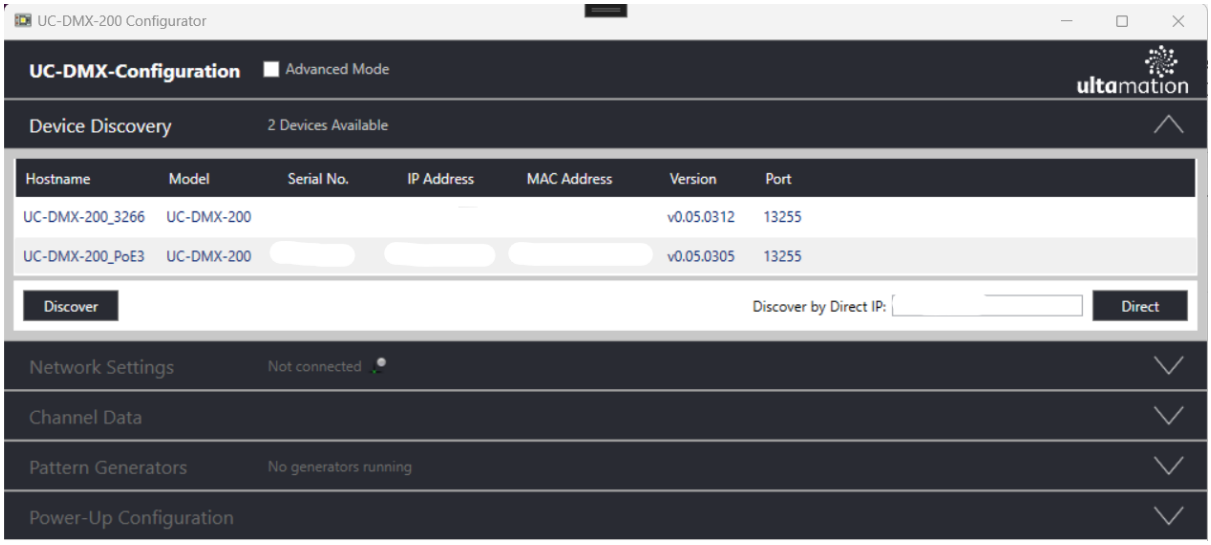
Once connected to your DMX devices, they should not flicker, as the UC-DMX-2xx will already be outputting '0' values to all 512 channels.

USING THE UC-DMX-2XX

Depending on how you will be using the UC-DMX-2xx, there may be very little setup required. If you are simply controlling DMX channels from another application (e.g. Crestron Home or Crestron Custom) then you probably only need to set the device's IP address to a static (or configure your router with a MAC reservation).

The UC-DMX-2xx does not know, or care, about what devices are connected – it simply manages the block of 512 bytes of DMX data.

To set the UC-DMX-2xx device's IP address, run the UC-DMX-2xx Configurator tool. If your device is connected to the network correctly and you do not have any firewall software blocking the configurator, you will see your UC-DMX-2xx device listed under device discovery.



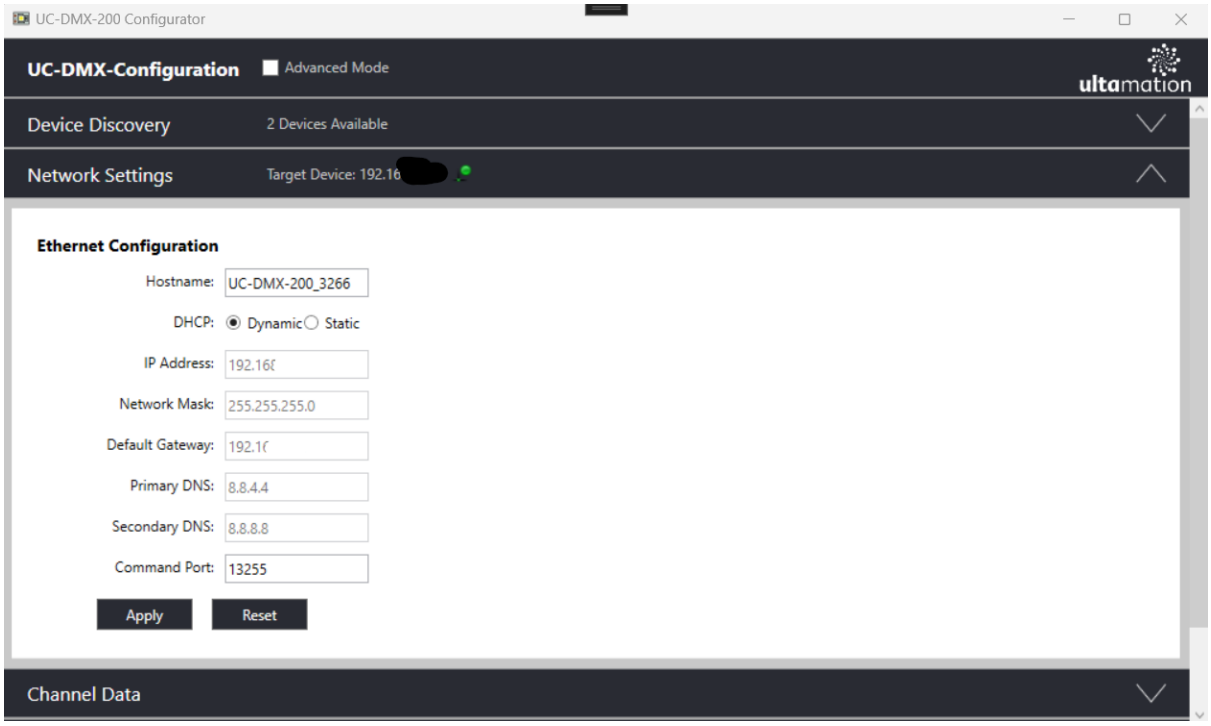
If you know the IP of a device on a remote network, you can "Discover by Direct IP" by entering the known IP address, and select "Direct".

[2] Apologies – this is labelled Rx/Tx/Gnd on the lower, visible, part of the board, though it is also labelled D+/D-/GND above the connector… you just can't see it. This was a labelling issue during manufacture.

Once discovered, you can select a device by clicking on the entry in the table.

Once connected, other sections will then become available.

Select “Network Settings”.



You can now select a static IP for the UC-DMX-2xx and hit apply. Don’t forget to correctly set the network mask and gateway.

You shouldn’t need to change the control port, but you can if you wish.

The device will reboot when network settings are changed.

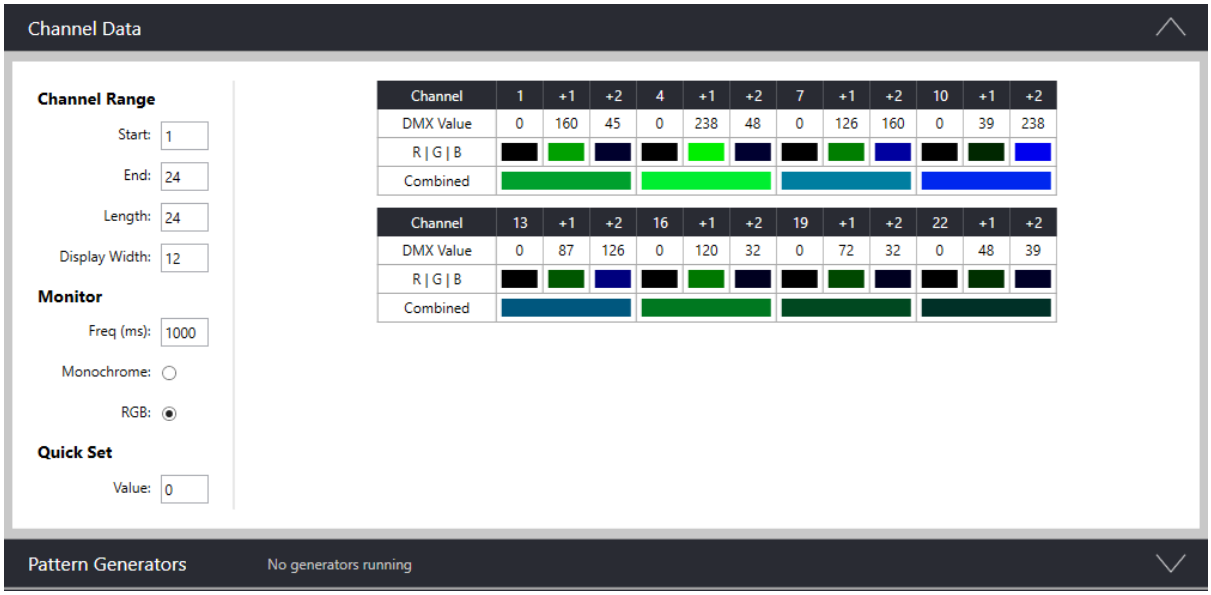
In many situations, this is all that’s required. The controlling software will instruct the UC-DMX-2xx which values to assign to which channels.

However, the configuration tool also provides useful diagnostics tools if you are struggling to test your DMX devices.

Setting and Reviewing Channel Data

The "Channel Data" section serves two functions.

1. It allows you to see what the UC-DMX-2xx is currently outputting on the DMX data bus. For example, the image below shows that we are sending various values out on channels 1-24. Here, DMX address 2 (=1+1) is set to 160, and address 21 (=19+2) is set to 32.
2. It allows you to SET channel values directly by setting legal values against DMX addresses. This means you can try different values with a DMX slave device in real-time to see how it reacts.



The configuration values on the left are for real-time/viewing only.

Start/End/Length simply define which segment of the DMX 512 range you wish to view. This is limited to a maximum of 99 channels.

Display Width is used to define the layout on the page – in this example, we're viewing 12 channels on each row. This is purely for visual convenience.

Monitor Frequency – this is the time between updates from the UC-DMX-2xx. The minimum allowed value is 50ms (i.e. 20 updates per second) which is also the maximum speed that full-frame DMX data is transmitted.

Monochrome/RGB is also just a convenience setting so that you can view RGB values together – this only works in the limited case of RGB fixtures.

Quick Set – with Quick Set, you can initialise the selected channel range to a single value. This is useful for all on/all off testing.

To set a SINGLE channel value, simply click on the "DMX Value" box for the desired channel, type in a value between 0-255 and click outside the box. The value will now be transmitted.

The Pattern Generators

This is where the UC-DMX-2xx can provide unique colour changing functionality, but also the most complex element of configuration.

Differences in Model Capabilities

The original UC-DMX-200 is capable of running 8 pattern generators simultaneously with an assortment of modes to create interesting visual effects.

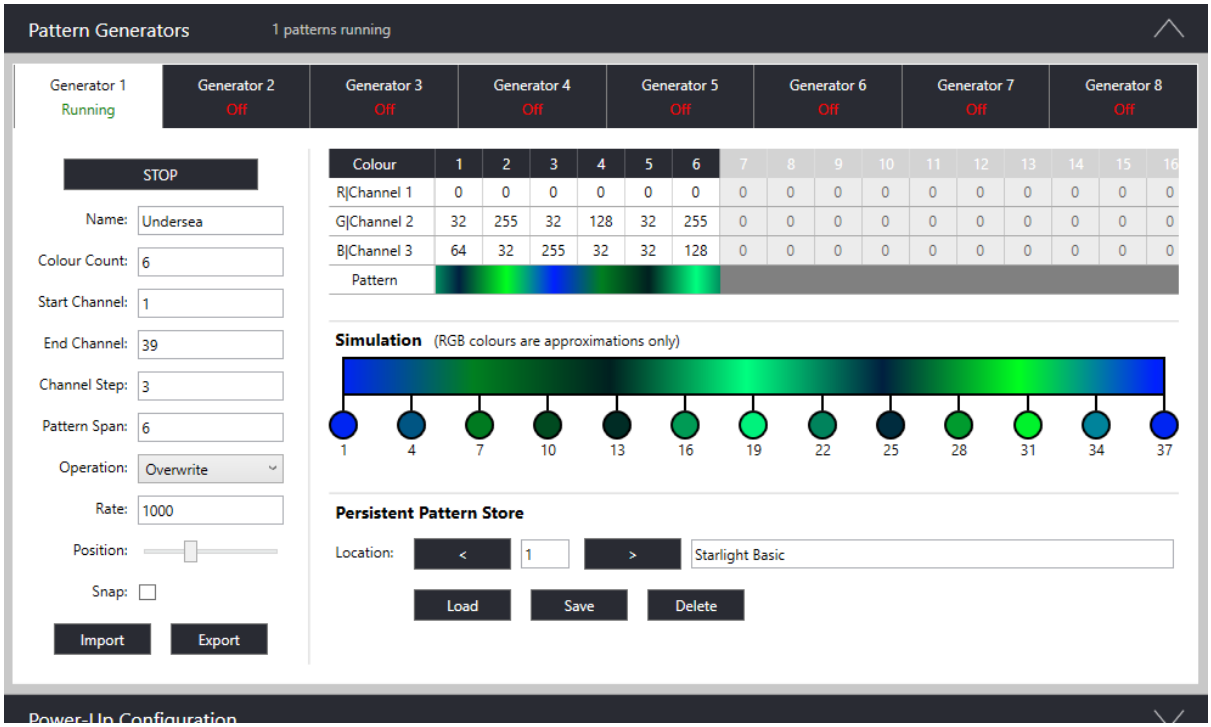
The UC-DMX-210 has had the pattern generators reduced to 2, and they will only run the basic overwrite mode. This simplification was made to allow the controller to incorporate on-board smooth dimming.

If you have a UC-DMX-210 but **REQUIRE** the full 8 pattern generators **INSTEAD OF** on-board dimming, please contact support@ultamation.com

If you only need to set colour values or presets, then you probably DON'T need the pattern generators. If you would like to play a sequence of colours over a range of DMX lights, then you probably DO.

There are some constraints that should be considered:

- The pattern generators were designed to work with RGB fixtures. Although interesting effects can be created with other DMX devices, this is beyond the scope of this guide.
- If you wish to play patterns across multiple DMX devices, they MUST be evenly spaced. E.g.. all 3 channels apart. They CAN be further apart – for example, you may wish to play a pattern over RGBW fixtures – but they would then be 4 channels apart, and the pattern generator would "skip" the "W" channel.
- The pattern generator has a maximum size of 16 colours.
- UC-DMX-200 ONLY: There are EIGHT independent pattern generators. They CAN be run over the same channel ranges to create interesting effects, but this is an advanced subject and not covered by this guide.



The example above shows a pattern made up of 6 colours – blending between blues and greens. Colour Count determines how many of the 16 available colour pots are used in the pattern.

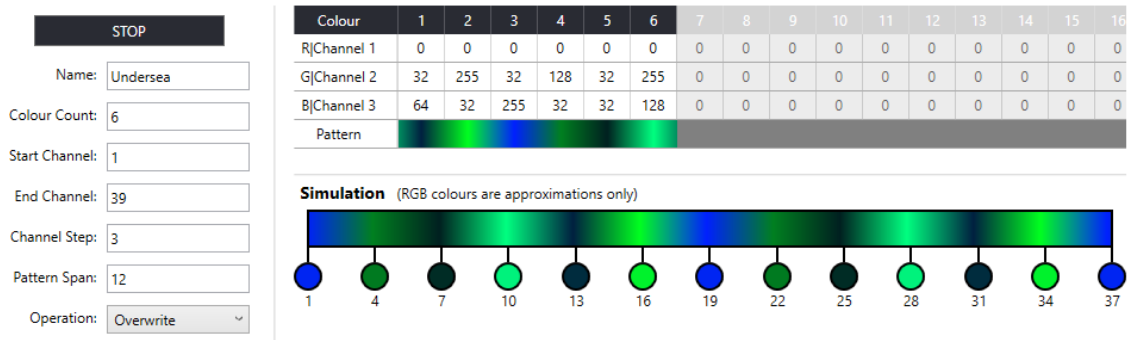
The Start and End Channels determine the range (inclusive) of DMX channels over which the pattern will be played. The Channel Step determines the "gap" between each consecutive DMX device base channel. In this example, we are running channels 1 through 39, with a step of 3.

That results (as shown by the "simulation" pane) in 13 DMX devices, each of 3 channels with base addresses of 1, 4, 7, 10.. and so on up to 37 which, being RGB, covers addresses 37, 38 and 39.

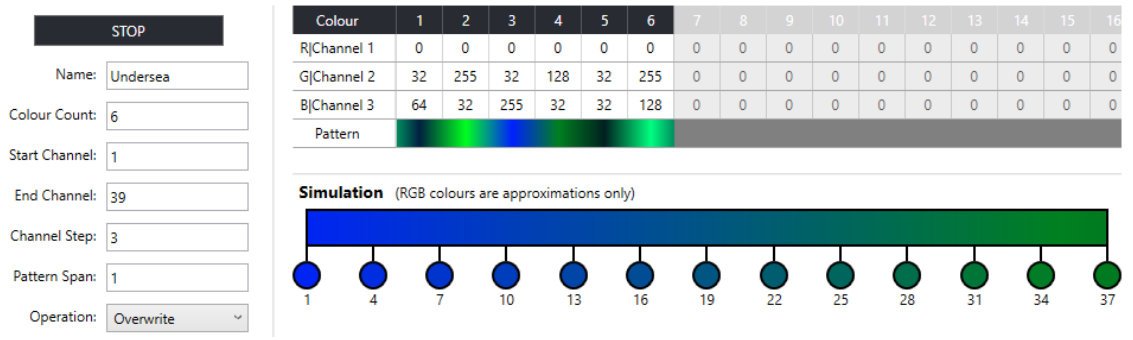
Pattern Span defines how many of the colour steps in the pattern are spread across the full range of channels.

In this case, we've set it to the same as number of colours (Pattern Span = Colour Count) so the pattern will cycle across the DMX devices without any noticeable join.

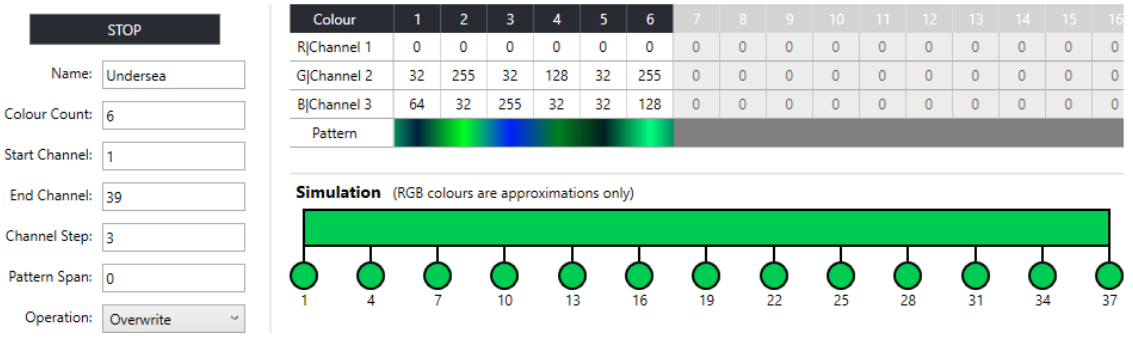
If we set this value to 12 (double 6) then the pattern would be repeated TWICE across the fixtures, as shown below.



Or if we set it to 1, then a SINGLE colour transition will spread across the range.



You can even set Pattern Span to 0 and then every DMX fixture will take on the same colour.



The Operation setting specifies HOW the pattern data will affect the channels it's being written to. The setting you will almost always use is "Overwrite". On the UC-DMX-210, this parameter is not shown as the pattern generator is limited to Overwrite only.

Rate specifies how fast the pattern will run. The range of values is -32768 to +32767. Larger numbers move the pattern more quickly and negative numbers run the pattern backwards.

Position is only really used in the Simulation, but you can move the pattern across its complete range by adjusting the slider. Note that, as you move the slider, this will ALSO update the DMX data for the UC-DMX-2xx in real-time too, so you will be able to see the results on the actual DMX devices as you move the slider.

Snap – this disables the colour blending between colour pots and will "snap" the fixed colours on each DMX fixture as the pattern moves.

The Persistent Pattern Store allows you to save and recall pattern definitions on the UC-DMX-2xx non-volatile memory. There are 255 slots in which you can store your patterns and then recall them at run time from a control system.

Custom Crestron also provides a module which allows you to modify pattern properties at run time.

Import and Export allows you to read and write pattern definitions to the file system.

CRESTON HOME SETUP

With the release of Crestron Home OS4, the capability to add 3rd-party lighting as native fixtures allows the UC-DMX-2xx products to be truly integrated into a customer's lighting control solution.

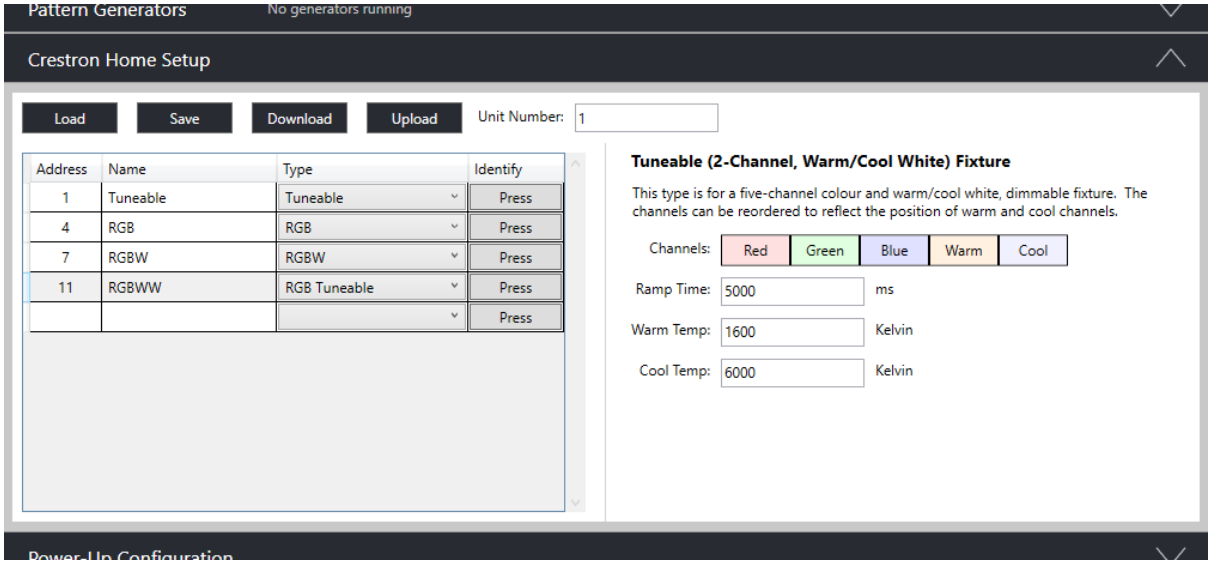
To facilitate this we have developed a completely new driver for Crestron Home which can be found within the Crestron Home drivers catalogue under "Platform", "Ultamation", "UC-DMX Controller"

Using this tool, a configuration file can be created and uploaded to the Crestron Home processor. Once the config is read, the driver will create all of the lighting loads you have defined, with the correct types, DMX addresses, and other relevant info (Colour Temp calibration, channel ordering, ramp time, etc.)

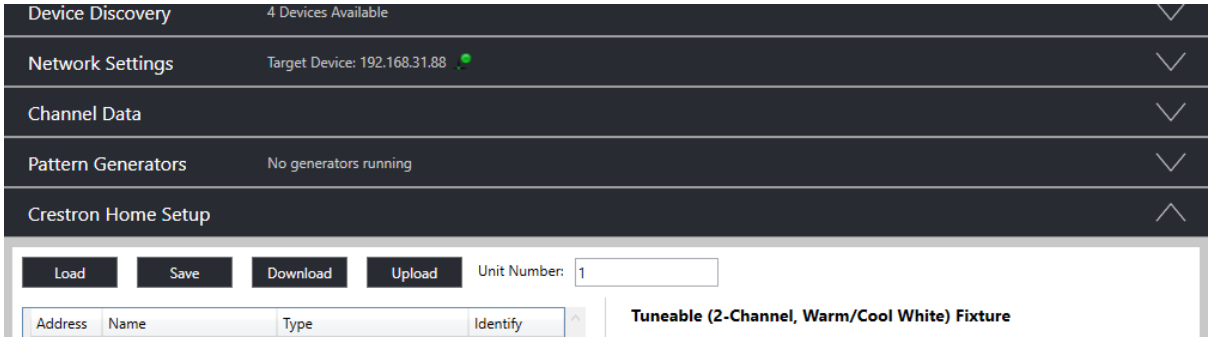
Please refer to the Crestron Home driver documentation for more information on how to install and configure the driver. This document will focus on creating the configuration file.

Open the "Crestron Home Setup" tab – this can be done both when connected to a UC-DMX-2xx OR in an offline mode to allow the configuration file to be generated before commissioning.

The table on the left hand side of the window represents a list of lighting fixtures configured for a single DMX controller. Simply click on the empty row to add a new fixture. If you already have another fixture selected, the new fixture will adopt the same type and the first free DMX address will be allocated automatically. You can always change the fixture type later if needed, or overwrite the DMX address.



If you are connected to a UC-DMX-2xx (as shown below by the green icon next to the IP address) then each fixture can be tested by clicking on the "Identify" button on the appropriate row – for example – Clicking "Press" next to the RGBW fixture will briefly cycle through the 4 channels 7, 8, 9 and 10 so you can verify the light is correctly wired and addressed.



Each fixture has the following properties:

Address	This is the base address of the fixture – simple, single channel fixtures will only use one address. RGB fixtures will start from the base address and cover the next two addresses.
Name	This is a friendly name for the light that will be displayed in Crestron Home.
Type	You should select the correct type of light for the fixture so that channels and other settings can be modelled correctly.
Channels	Each type of fixture has one or more channels. By default, these are arranged in a standard order, but you can drag and drop these channels to any order you wish. This allows for non-standard channel ordering or, if the installation has been carried out poorly, correct for channel wiring errors.
Ramp Time	Each fixture also has a ramp time – this is the full scale ramp time in milliseconds.
Warm Temp	For fixtures with tuneable white, this is the warm colour temperature point in Kelvin (WARM is the lower figure of the two)
Cool Temp	For fixtures with tuneable white, this is the cool colour temperature point in Kelvin (COOL is the higher figure of the two)

Each configuration also requires a "Unit Number" this allows multiple configurations to be installed on a single Crestron Home processor so that each UC-DMX-2xx can pick up the correct configuration. This number MUST be correct BEFORE uploading to the processor, and MUST match the unit number assigned when the driver is added to the system.

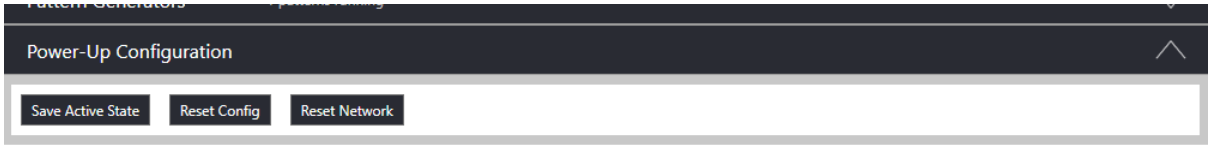
Finally, you can manage your configurations with:

Load	Load a previously created configuration from a file.
Save	Save the current configuration to a file.
Download	Extract an existing configuration from a Crestron Home processor.
Upload	Upload the current configuration to a Crestron Home processor.

After uploading a config to a processor, the driver will automatically pick up any changes. Fixtures are uniquely identified by their DMX address so if this changes, the light should be removed from Crestron Home and re-added.

POWER-UP STATE

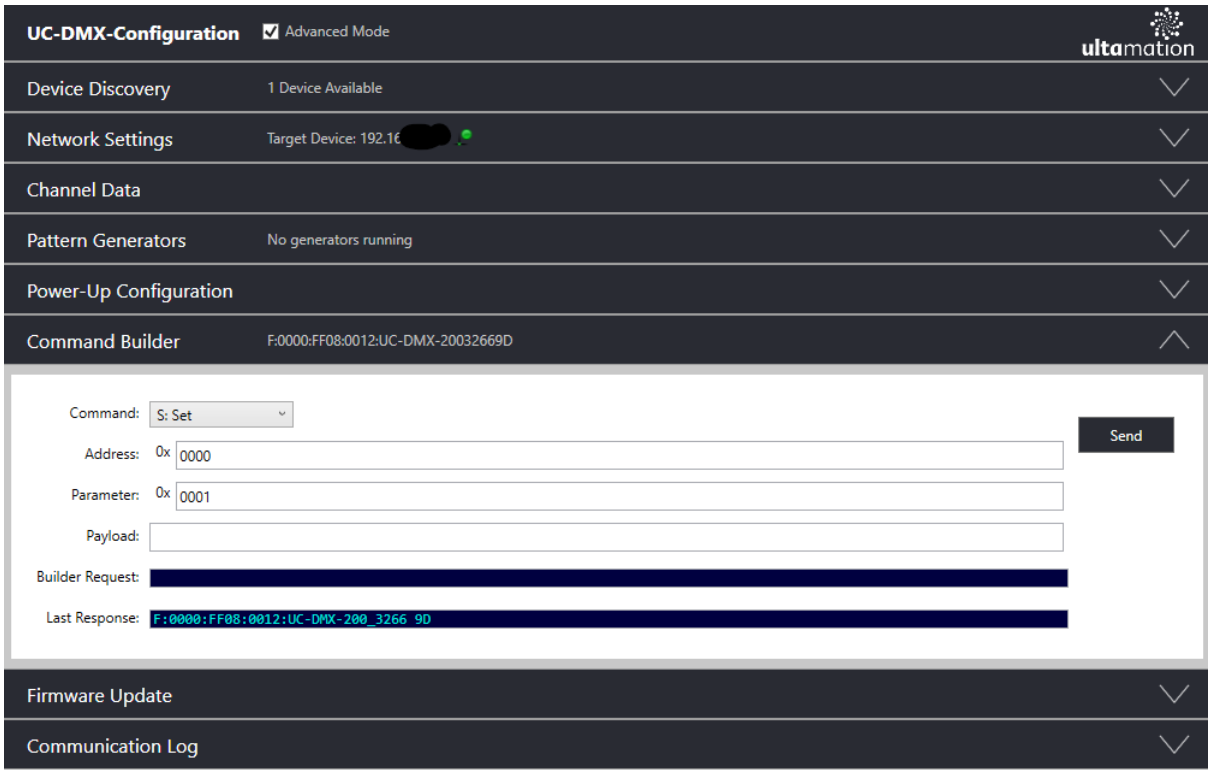
If you would like the UC-DMX-2xx to power up with a particular pattern generator state (e.g. specific patterns running on boot) you can save the active state under the “Power Up Configuration” section.



This section also provides a facility to reset the device config to factory defaults, or just reset the network back to DHCP.

ADVANCED MODE

The tool also includes a set of Advanced Features.



The Command Builder allows you to send command directly to the UC-DMX-2xx – you will need to understand the UC-DMX-2xx command profile for this (documentation is available from the product page).

The Firmware Update section is only for use when instructed by Ultamation.

The Communication Log can be used for debugging commands – this is of limited value in general usage of the UC-DMX-2xx.

Remember – if you still need additional support after following this document, please contact Ultamation on support@ultamation.com.

APPENDIX: THE STATUS INDICATOR AND SET BUTTON

The UC-DMX devices have a number of indicator LEDS and a "SET" button. The following section outlines what these represent.

LEDs

LINK	The LINK LED will illuminate when the device has an established Ethernet link with the switch. This LED is identical to the left LED on the Ethernet jack.
ACT	The ACT(ivity) LED will flicker when the device sends or receives Ethernet traffic. This will normally flash intermittently (subject to network setup) but a solid light would suggest networking issues, and this may impact connection to the device. This LED is identical to the right LED on the Ethernet jack.
RUN	The RUN LED will pulse when the device is running normally. When power is first applied, the RUN light will flash rapidly – this indicates the device's bootloader is running normally.
STAT	The STAT LED flashes at approximately 3 second intervals. The number of flashes indicates how many active TCP connections are in service. The UC-DMX-2xx can accept a maximum of 2 concurrent connections. If this light does not flash, then nothing is connected.

Set Button

When the device is running the set button performs the following function:

UC-DMX-200	Nothing – sorry!
UC-DMX-210	On press, will set the STATUS light on and the first 3 DMX channels to 255 for testing. On release, will unset the STATUS light and reset the first 3 DMX channels to 0. This can provide a simple test to confirm that DMX cabling is satisfactory.

The SET Button has a special function during boot up which provides a way to factory reset the device.

1. With the unit powered OFF
2. Press and hold the SET button
3. Apply power on the unit
4. The STATUS light will turn ON
5. Wait for 4 seconds
6. The STATUS light will blink OFF and then go ON again. This indicates you have activated factory reset mode.
7. Release the SET button
8. The device will now return all Ethernet settings to factory defaults (i.e. DHCP)
9. The device will reboot.