



nanoscope

User Guide



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Overview

nanoScope is a battery powered analyser and pixel mimic for DMX512 and RDM. The only user control is a three way switch on the rear face of the product. In the centre position nanoScope is switched off and the internal batteries are disconnected. Switching to the left selects Pixel mode, while switching to the right selects Analysis mode.

Connections

nanoScope connects via an inbuilt 5-pin XLR. Pins 4 & 5 are not connected. The product has an internal terminator so should be connected in place of an existing terminator during testing.

Power

nanoScope is powered by two AAA batteries. Access to the battery chamber is gained by removing the two screws and gently slipping the module out of the case. Continuous operation of around 48 hours is achieved using good quality batteries. nanoScope implements an advanced power saving system whereby it sleeps in the absence of a DMX512 signal for more than 1 second and immediately wakes when it is plugged into a DMX signal. Sleep mode does consume battery power so owners are advised to switch off the product between uses. It is advisable to remove the batteries if the product is not being used for a long period. If the product strobos when switched on, this means that the batteries are depleted and need changing.

Pixel Mode

At power on, nanoScope indicates Pixel mode is selected with a half-second red flash.

In Pixel mode, nanoScope samples the first three data slots of the zero start code data and displays it as a colour mix as follows:

- Data Slot 1 Red
- Data Slot 2 Green
- Data Slot 3 Blue

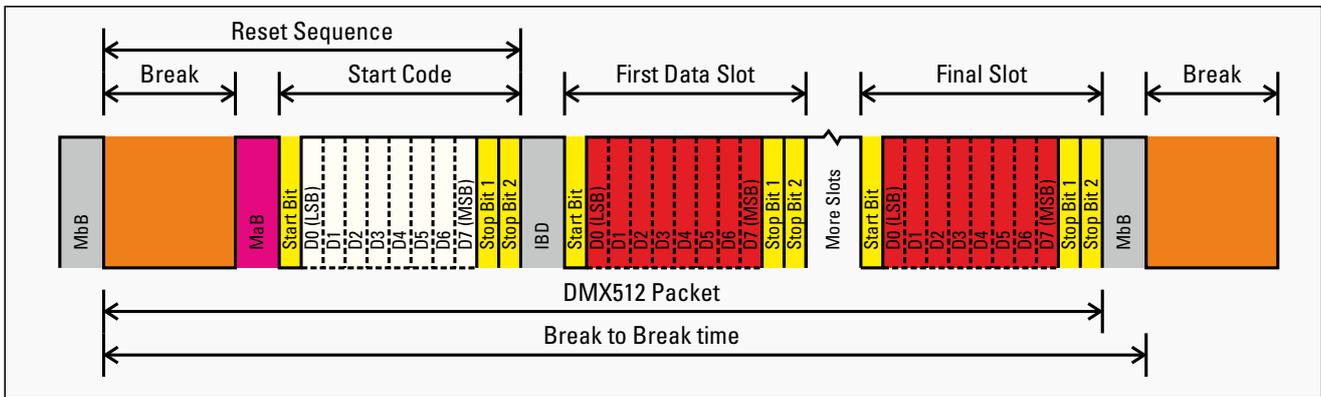
Analysis Mode

At power on, nanoScope indicates Analysis mode is selected with a half-second blue flash.

In Analysis mode, nanoScope samples the DMX512 signal continuously and displays its finding with a multi-coloured pulse sequence.

The sequence always starts with a long (4s) pulse which gives the headline: green is good and red is bad. Additional information on the composition of the DMX512 signal is often available. This is displayed as a sequence of shorter (half-second) pulses as shown on the product label (below). Warm colours are used to indicate problems while cold colours are informational.





The diagram above shows the anatomy of a DMX512 packet. It can be helpful to bear this in mind when interpreting nanoScope's coloured pulse trains (explained in detail below). Note that the same colour coding scheme has been used where relevant.

Orange: Break error

The orange pulse will be displayed if any DMX frames are detected with a break time of under 88µs. The break is a logic low synchronisation signal that flags the beginning of a new frame of DMX512. Modern DMX transmitters generate a break in excess of 176µs. This is because inline processing equipment such as splitters are allowed to shorten the break by up to 88µs. nanoScope's timing analyser is accurate to 500ns.

If a break of less than 88µs is detected, there is a problem. It could be a design flaw in the console or it could be a problem with the splitters.

- ★ Hint 1: Plug nanoScope into the direct output from the console. If that shows no error, move down the DMX distribution until you identify the problem equipment.
- ★ Hint 2: A missing terminator can cause break timing to mis-report.
- ★ Hint 3: See 'Note on mis-wired connectors' (page 7).

Magenta: MaB error

The magenta pulse will be displayed if any DMX frames are detected with a MaB time of under 8µs. MaB stands for Mark after Break. It is the logic high gap between the break and the start code. Modern DMX transmitters generate a break in excess of 12µs.

If a break of less than 8µs is detected, there is a problem. It could be a design flaw in the console or it could be that the console was designed to the original (pre 1990) standard which allowed a MaB of 4µs. nanoScope's timing analyser is accurate to 500ns.

- ★ Hint 1. Plug nanoScope into the direct output from the console. If that shows no error, move down the DMX distribution until you identify the problem equipment.
- ★ Hint 2. See 'Note on mis-wired connectors' (page 7).

Yellow: Framing error

The yellow pulse will be displayed if any DMX frames are detected with a framing error. Each slot of a DMX512 packet is framed by a logic low start bit and two consecutive logic high stop bits. As the stop bits are logic high they are indistinguishable from the inter byte delay.

Many DMX receivers will handle data with only one stop bit although DMX will fail completely if the start bits are missing.

There is one scenario when framing errors are expected and are not a fault. This is in the RDM discovery process.

- ★ Hint 1: If you see Framing errors on a DMX512 network that is not using RDM, it is a fault. Move nanoScope along the DMX distribution until you identify the problem equipment.
- ★ Hint 2: If you see Framing errors when you are using RDM this is expected during discovery. You should see the Framing errors subside once the console has discovered all the fixtures.
- ★ Hint 3: See 'Note on mis-wired connectors' (page 7).

Red: RDM error

The red pulse will be displayed if any RDM frames are detected with errors. A number of specific potential errors are tested:

- RDM Slot 1 Sub-Start Code !=1
 - RDM Slot 2 Message Length field < 24
 - RDM Checksum error
 - RDM PDL (Slot 23) is != (Slot 2) Message Length – 24
 - RDM Command Class (Slot 20) contains an incorrect value
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- ★ Hint 1: RDM errors can be generated by badly wired DMX. See 'Note on mis-wired connectors' (page 7).
 - ★ Hint 2: If the cabling is good, then it is highly likely that the problem is caused by a software fault in either controller or fixtures. Start by connecting nanoScope, in isolation, to the lighting console or Ethernet to DMX node. Gradually connect fixtures until you isolate the culprit.

Pink: Long packet error

The pink pulse will be displayed if any DMX frame with more than 512 data slots is detected. The DMX512 standard allows any number of data slots from 0 to 512 (the lower limit is subject to additional timing constraints).

- ★ Hint 1: Long packets are rarely caused by cable problems and can indicate a damaged line driver in the lighting console or ethernet-to-DMX converter.

Cyan: Short packet advisory

The cyan pulse will be displayed if any zero start code DMX frame with less than 512 data slots is detected. This is an advisory and does not indicate a fault. The DMX512 standard allows any number of data slots from 0 to 512 (the lower limit is subject to additional timing constraints).

- ★ Hint 1: In many instances you will expect equipment to be outputting the full DMX512 payload of 512 data slots (channels). If you see the cyan advisory then check to see if the lighting console is configured to output a smaller number.
- ★ Hint 2: nanoScope only checks the zero start code frames for length.

Warm white: NSC advisory

The warm white pulse will be displayed if any non-zero start code (NSC) packets are detected. This is an advisory and does not indicate a fault. The exception is the following NSC packets, which do not trigger a white pulse as they have their own indicator:

- RDM (Start Code = 204)
- Draft (Start Code = 240)
- Test (Start Code = 85)

- ★ Hint 1: There are numerous fixtures which do not correctly test for start codes. This means that any NSC packets are likely to make the fixture flicker.

Green: RDM controller advisory

The green pulse will be displayed if any RDM packet, sent by a controller, is detected. In this sense, 'controller' means lighting console or network-to-DMX512 converter.

This is an advisory and does not indicate a fault. If the data is faulty then this advisory will be accompanied by the red RDM error indication.

- ★ Hint 1: There are numerous fixtures which do not correctly test for start codes. This means that any RDM packets are likely to make the fixture flicker. If you have flickering fixtures then this is a likely cause. See if you can disable RDM in the controller.
- ★ Hint 2: In a working RDM network you expect fixtures to be responding to these controller packets. So you should expect to see green and blue pulses paired together.

Mint: RDM draft advisory

The mint pulse will be displayed if any Draft RDM packets are detected. Draft RDM uses start code 240 and was used prior to the release of RDM. It is still supported by some manufacturers.

- ★ Hint 1: There are numerous fixtures which do not correctly test for start codes. This means that any RDM packets are likely to make the fixture flicker. If you are fault finding flickering fixtures then this is a likely cause. See if you can disable RDM in the controller.

Blue: RDM responder advisory

The blue pulse will be displayed if any RDM packet, sent by a responder, is detected. In this sense, 'responder' means lighting fixture.

This is an advisory and does not indicate a fault. If the data is faulty then this advisory will be accompanied by the red RDM error indication.

- ★ Hint 1: In a working RDM network you expect fixtures to be responding to these controller packets. So you should expect to see green and blue pulses paired together.

Ice blue: Test packet advisory

The ice blue pulse will be displayed if any DMX test packet is detected.

This is an advisory and does not indicate a fault. If the data is faulty then this advisory will be accompanied by the long red error indication.

Test packets are a special packet comprising all 513 slots set to a value of 85. The value 85 corresponds to an alternating bit pattern which creates the highest frequency DMX512 data. Test instruments such as Micro-Scope 3a can generate continuous streams of test packets. nanoScope can then be used to monitor for good or bad data at different points in the DMX512 distribution system.

nanoScope will register an error if the test packet contains any slot at a value other than 85 or if there are less than 512 data slots in the packet.

- ★ Hint 1: To stress-test a DMX512 distribution system use Micro-Scope 3a in place of the lighting console to generate test packet data. nanoScope can then be plugged into each outlet in the system to check the output.
- ★ Hint 2: Failure on test packets can be caused by bad cable connections and low quality or inappropriate cable (such as microphone cable).

Note on mis-wired connectors

Unfortunately the error checking built into DMX512 is very limited. This means that a mis-wired cable can result in packets that are close to valid.

A very common mis-wire is swapping pins 2 and 3. nanoScope will display this as a combination of Break error, MaB error, Framing error and NSC (non-zero start code) advisory.

Analysis mode hints chart

		Good DMX512 containing 512 data slots
		Good DMX containing less than 512 data slots
		Good DMX containing 512 data slots with Non-zero Start Code packets
		Good DMX containing less than 512 data slots with Non-zero Start Code packets
		Good DMX with active and good RDM communications
		Good DMX with active and good RDM communications including Draft packets
		Good DMX512 with good network test packets containing 512 data slots of 85
		Bad network test packets. Either < 512 data slots or values not equal to 85
		Controller is transmitting bad RDM data and getting no response
		RDM communication between controller and responders contains errors
		Most likely pin 2 & 3 swapped in the DMX cable
		Most likely pin 2 disconnected in the DMX cable

CE Compliance



nanoScope is CE compliant

Warranty

All products are covered from date of purchase by a two-year return to base warranty.

By return to base, we mean that the customer is responsible for all costs of transport to and from Artistic Licence.

Returns will not be accepted without prior authorisation. In order to discuss a request to return goods, please email:

Sales@ArtisticLicence.com

Compliance

All Products manufactured or sold by Artistic Licence Engineering Ltd are fully compliant with the appropriate CE, FCC, and RoHS regulations. Product specific information is available on request.

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Artistic Licence is a member of a WEEE compliance scheme and will happily recycle any of our products that you, at your expense, return to us.



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