



eDMX PRO
LeDMX PRO
ultraDMX2 PRO
eDMX Trigger

Record Playback



USER MANUAL – Firmware v3.3 - Windows Utility v1.16

TABLE OF CONTENTS

Introduction	1
Features	1
Supported Devices	2
SD Card.....	2
Compatible SD Cards.....	2
Installation / Removal	2
Concepts	5
Basic Setup.....	5
Show Recording	7
Basic Operation	7
Indicator States	7
Record Triggering	8
Show Playback	9
Basic Operation	9
Playback Triggering	9
Playback External Trigger	10
Playback Completion Action	11
Playback Automation	12
Show end script.....	12
Master show script format	12
Example show scripts.....	13
Last show recall.....	13
Multicast Output.....	14
Art-Net Control	14
File Access	15

INTRODUCTION

All eDMX PRO, LeDMX PRO and ultraDMX2 PRO products are capable of recording any incoming Art-Net or sACN stream sent from your lighting control system. DMXking recorders are built right into the output node, unlike other standalone recorder products, which not only removes another layer of equipment and cost but also provides distributed highly scalable near unlimited universe playback count. What you see at the output node is exactly what gets recorded.

Minimum firmware required v3.0+ Update to the latest firmware using eDMX Configuration Utility v1.14+ (Windows).

This user manual is written for v3.3 firmware with eDMX Configuration Utility v1.16 (Windows version). We recommend you update to the latest available firmware and utility.

FEATURES

- On-Node recording and playback without additional hardware
- Records whatever universes are configured on the device (i.e. eDMX4 PRO 4 universes, LeDMX4 PRO 16 universes)
- Up to 255 shows
- Scripted show playback
- Last show recall upon startup
- Blackout show after Stop command for static/blackout look
- Distributed recording and playback
- High capacity SD cards supported 32GB and beyond
- All protocols and merging supported by the device are also supported for recording
- Live merge with playback
- Record from Art-Net and/or sACN sources simultaneously
- Multicast sACN playback to network
- Record DMX-IN ports for playback as DMX-OUT
- Record USB DMX sources (ultraDMX2 PRO and eDMX2 PRO only)
- Show playback can be triggered on:
 - Power up
 - ArtTrigger commands (broadcast and unicast)
 - Playback universe Art-Net, sACN or DMX512 IN
 - External contact closure (check hardware for accessory port support)
 - Reception of broadcast by a master external contact closure unit.



eDMX Trigger – Accessory port external contact closure module

SUPPORTED DEVICES

Most DMXking nodes also support record/playback. All hardware versions of the following products have support when updated to latest firmware.

Record/playback supported

- eDMX4 PRO
- eDMX2 PRO
- eDMX4 PRO DIN
- LeDMX4 PRO
- ultraDMX2 PRO

Record/playback **not** supported

- eDMX1 PRO

SD CARD

COMPATIBLE SD CARDS

For performance reasons we only recommend Samsung PRO+ SD cards which have been extensively tested in DMXking hardware under maximum throughput conditions.

- Samsung PRO+ 32GB Model Code: MB-MD32GA
- Samsung PRO+ 64GB Model Code: MB-MD64GA
- Samsung PRO+ 32GB Model Code: MB-SD32D
- Samsung PRO+ 64GB Model Code: MB-SD64D

We anticipate adding more verified SD cards in the future however use the specification of Samsung PRO+ cards as a guideline and don't buy anything cheaper! The above list is current as of July 2018.

Most SD cards come pre-formatted FAT32 or exFAT file system. Both are FAT32 and exFAT are supported by the DMXking recorder system however we highly recommend exFAT because file sizes >4GB are supported. All 64GB cards come pre-formatted exFAT however most 32GB are supplied as FAT32 and should be re-formatted to exFAT before use. This is particularly important if your application uses a large number of universes over a long record duration.

Due to inconsistent read performance we no longer recommend the Samsung EVO+ SD card models. We are re-evaluating 2017 model EVO+ 64GB and larger cards.

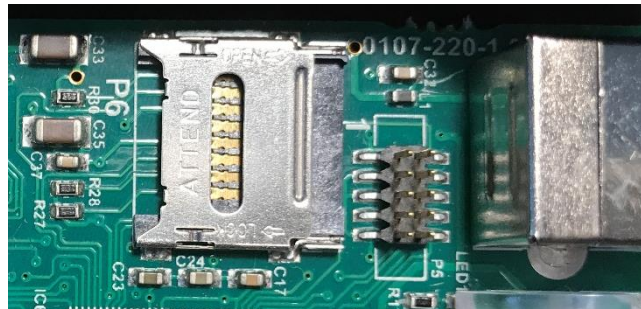
INSTALLATION / REMOVAL

Access to the internal SD card holder may require partial disassembly of the DMXking unit. This should be performed by a competent technician or DMXking distributor. Antistatic precautions should be taken and power down the unit first.

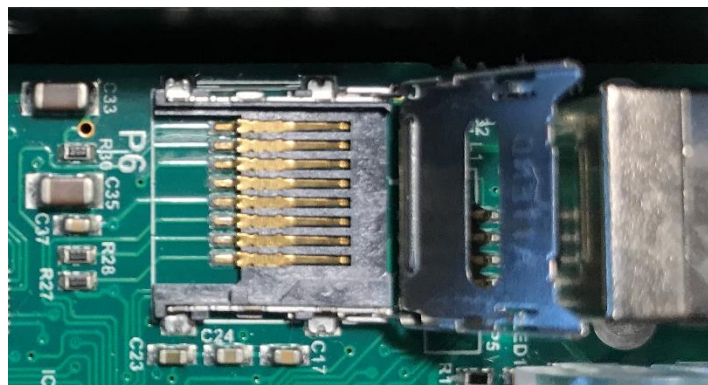
Take care to operate the SD card holder correctly. Observe Open and Lock arrows and slide the top cover in the applicable direction before hinging upwards. There is a reasonable force required to slide the top cover Open or Locked however almost no force is required to hinge it upwards when Open.



Socket empty and in Locked state



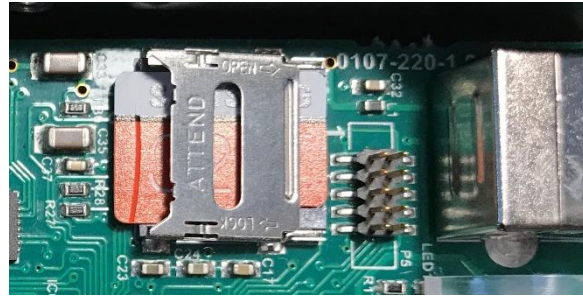
Socket cover moved to Open position



Cover hinge rotated upwards



MicroSD card placed on holder



Cover rotated down. Note it springs up a little so press it down before sliding to Lock position



Cover in Lock position. MicroSD card secured

CONCEPTS

Each node is capable of storing up to 255 show files and show duration is limited only by available space and maximum 4GB file size if FAT32 is used. In most applications with 32GB+ SD cards it is unlikely your shows will run out of space. As a rough guide use 140MB per universe per hour @ 40fps to calculate file size.

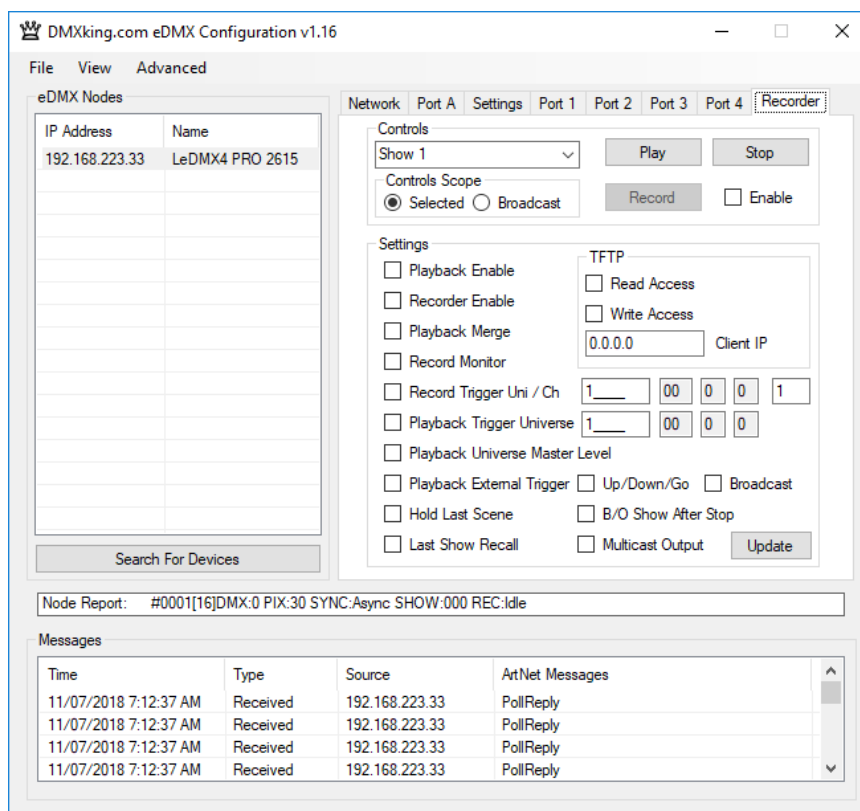
Network streams arriving at the node are timestamped and recorded into the selected show file. Whatever streams arrive at the node which would potentially appear on an output will be recorded regardless of whether another higher priority stream or merged source is also present. Non-network DMX-IN and USB-IN sources may also be recorded. File format is pcap and can be opened in Wireshark.

Playback of show files replicates the same network streams with all sACN priority and other merging still occurring exactly the same as live output. Live universe streams may be merged with playback or completely take over output(s) if higher priority for example. Any re-configuration of an output node such as assigning a different universe or pixel mapping will take effect because the recorded show file maintains universe specific information. A show file may be copied to another SD card where identical playback is required on many nodes.

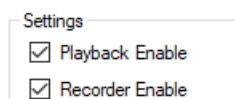
Show recording and playback are mutually exclusive. Only 1 show can be recorded or played back at a time and initiating a different show playback will immediately stop the previous activity.

BASIC SETUP

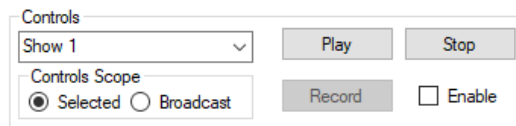
To configure record/playback features use eDMX Configuration v1.14+ (Windows OS only for now). Firmware v3.0+ is required.



The Recorder tab contains all settings and manual controls required for operation of the record/playback features. There are other methods of control and triggering which are presented in other sections.



Playback Enable and Recorder Enable provide device wide control over what actions may occur through other controls or triggers. By default, both options are disabled and typical usage would be enabling both during show recording activities then disabling Recorder once the show(s) are stable so no accidental overwriting occurs.



The screenshot shows a 'Controls' panel with the following elements: a dropdown menu currently set to 'Show 1', a 'Controls Scope' section with two radio buttons ('Selected' is selected, 'Broadcast' is unselected), and four buttons: 'Play', 'Stop', 'Record', and 'Enable'. The 'Record' and 'Enable' buttons are currently disabled (greyed out).

The Controls panel contains a Controls Scope selection. You can direct Control commands to either the Selected Device or All Devices on a local area network segment through broadcast commands. Manual control operation sequence: Select a Show from the dropdown list followed by Play or Record. Stop will immediately stop either playback or recording.

```
Node Report: #0001[137]DMX:0 PIX:30 SYNC:Async SHOW:000 REC:Idle
```

A brief Node Report is updated each time a node is polled. Although not real time the information can be helpful to assess the current status of an eDMX/LeDMX PRO unit. SHOW:nnn indicates which show has been selected. REC: indicates what the recorder is currently doing. If you have no SD card or it cannot be mounted this will be indicated too.

SHOW RECORDING

BASIC OPERATION

Show recording can be initiated through the Controls panel or via network by Art-Net Trigger commands (refer to section on Art-Net Control).

The screenshot shows two panels: 'Controls' and 'Settings'.
Controls Panel:
- A dropdown menu showing 'Show 1'.
- 'Play' and 'Stop' buttons.
- 'Controls Scope' section with radio buttons for 'Selected' (selected) and 'Broadcast'.
- 'Record' and 'Enable' buttons.
Settings Panel:
- 'Playback Enable' (checked), 'Recorder Enable' (checked), 'Playback Merge' (unchecked), 'Record Monitor' (unchecked).
- 'Record Trigger Uni / Ch' (1), 'Playback Trigger Universe' (1), 'Playback Universe Master Level' (unchecked).
- 'Playback External Trigger' (unchecked), 'Up/Down/Go' (unchecked), 'Broadcast' (unchecked).
- 'Hold Last Scene' (unchecked), 'B/O Show After Stop' (unchecked).
- 'Last Show Recall' (unchecked), 'Multicast Output' (unchecked).
- 'TFTP' section: 'Read Access' (unchecked), 'Write Access' (unchecked), 'Client IP' (0.0.0.0).
- 'Update' button.

Steps required to record a show:

- Verify your universe stream source(s) are functioning by observing DMX512 and/or Pixel outputs.
- Select Show number from dropdown dialogue. Show 255 is the “Blackout” show.
- Enable the Record button by selecting the adjacent Enable box.
- Start your universe stream sources(s) and click Record.
- Click Stop once the sequence/show has completed.

At this point you have generated a show file on the SD card which can be played back upon demand. If you select the same show number and Record again it will overwrite the existing show no questions asked. To prevent accidental overwriting of shows, untick the Recorder Enable setting and click Update.

By default, during recording DMX512 and Pixel ports are disabled. By selecting the Record Monitor setting you can observe the output during recording. With LeDMX4 PRO configured for maximum pixels on every output with full pixel mapping depending on universe update rate there may not be sufficient processing capacity to record and output simultaneously. It is not recommended to enable Record Monitor for 8+ universes of incoming data on LeDMX4 PRO hardware but there are many factors such as update rate and pixel type that will affect this.

Stream recording starts from the first Art-Net or sACN message received after Record is clicked.

INDICATOR STATES

Port status indicators are used to show record and playback activity. Because all ports are active as record/playback at once the indicators will operate in unison however where only 1 common indicator exists, such as on LeDMX4 PRO, it's not possible to distinguish between states beyond slow or fast flashing however this is usually adequate to determine action is occurring.

Port Indicators State	Meaning
Slow flash Green / Red	Selected show does not exist
Slow flash Green	Show selected
Fast flash Green	Playing show
Fast flash Red	Recording show

RECORD TRIGGERING

Usually a show or lighting sequence has a definite start and finish state and it may be a little tricky to start the show and click Record then Stop at a precise moment especially if the show is intended to be looped for example without noticeable transition.

Record Trigger Uni / Ch

By selecting Record Trigger Universe / Channel the show recording will not occur unless the specified channel is above 0%. Universe is sACN 1-63999 with Art-Net equivalent displayed adjacent (note all DMXking products call Art-Net 00:0:0 universe 1). Channel can be entered in the right-hand box 1-512. Record Trigger Universe is independent of any other configured universe on the device and in larger systems would be broadcast or multicast to multiple devices in order to synchronize recordings. The specified channel is the right-hand textbox.

Steps required to record a show with triggering:

- Enable Record Trigger Uni/Ch, enter the applicable universe and channel. Click Update.
- Verify your universe stream source(s) are functioning by observing DMX512 and/or Pixel outputs.
- Select Show number from dropdown dialogue.
- Enable the Record button by selecting the adjacent Enable box.
- Click Record. (Nothing is recorded yet unless your stream sources are already active)
- Start your universe stream sources(s) including the Record Trigger universe.
- Stream recording is only active when the Trigger Universe/Channel is above 0%.
- Click Stop. (Your Record Trigger already stopped stream recording prior to this if the channel level returned to 0%)

SHOW PLAYBACK

BASIC OPERATION

Show playback can be initiated through the Controls panel or via network through Art-Net Trigger commands (refer to section on Art-Net Control).

The screenshot shows two panels: 'Controls' and 'Settings'.
The 'Controls' panel includes a dropdown menu for 'Show 1', 'Play' and 'Stop' buttons, a 'Controls Scope' section with 'Selected' (selected) and 'Broadcast' radio buttons, and a 'Record' button with an 'Enable' checkbox.
The 'Settings' panel includes a 'Playback Enable' checkbox (checked), 'Recorder Enable', 'Playback Merge', 'Record Monitor', 'Record Trigger Uni / Ch' (1 00 0 0 1), 'Playback Trigger Universe' (1 00 0 0), 'Playback Universe Master Level', 'Playback External Trigger' (checked) with 'Up/Down/Go' and 'Broadcast' checkboxes, 'Hold Last Scene', 'Last Show Recall', 'B/O Show After Stop', 'Multicast Output', and an 'Update' button. A 'TFTP' section includes 'Read Access', 'Write Access', and a 'Client IP' field with '0.0.0.0'.

Steps required to play back a show:

- Ensure Playback Enable is selected.
- Select Show number from dropdown dialogue.
- Click Play.
- To stop playback before the show has finished click Stop.

Playback Merge

Selecting Playback Merge permits live network streams to be merged in with play back streams or completely take over depending on sACN Priority setting. Note that device limitations such as number of merge stream sources still apply regardless of live or playback source (i.e. you can't HTP/LTP merge 2 live streams with 1 playback stream since 3 streams exceeds the merge source limit of 2). There are no limits on the number of different sACN Priority streams and a scenario might be looped playback at priority 99 for standalone lighting which is overridden by a lighting console at priority 100 (when present) which is overridden by an iPad for rigging at priority 101 (when present).

PLAYBACK TRIGGERING

The screenshot shows the 'Playback Triggering' settings section with the following options:
 Playback Trigger Universe 17 00 1 0
 Playback Universe Master Level
 Playback External Trigger Up/Down/Go Broadcast

A dedicated Playback Trigger Universe can be enabled. This is independent from any configured universes for DMX512 or Pixel outputs. Typically, this universe would be broadcast or multicast to multiple devices for synchronized playback triggering from a lighting console or other Art-Net/sACN source however unicast is also supported.

Configuring a node port for DMX-IN on the same universe as the Playback Trigger Universe permits a DMX512 source to trigger show playback.

Mapping of the Playback Trigger Universe channels to Show number is as follows:

- Playback Master Level = Channel 1 (only applicable to LeDMX4 PRO pixel outputs v3.3+ firmware)
- Show 1 = Channel 2
- Show 2 = Channel 3
- [Show 4 thru Show 253]
- Show 254 = Channel 255
- Show 255 is the Blackout show and cannot be run through Playback Universe control (v3.3+ firmware)
- Show 0 (script run) = Channel 257

Channel levels are split into 3 ranges to allow various options for playing back a show. Stop, Continue, Start.

- 0-33% Stop show
- 34-66% Continue show
- 67-100% Start show

This mapping allows a slider to be used to active a show (67-100%) then whilst it runs move to Continue (34-66%) so it runs to the end and finally upon completion it can be moved to the Stop position (0-33%). Optionally the same show can be looped by simply leaving the channel in Start show range (67-100%). At any time, a show may be stopped with the channel in Stop (0-33%).

The lowest Channel takes precedence thus setting Channel 2 & 3 to 100% will run Show 1 but if Channel 2 is stopped (level 0%) then Show 2 will run since it was the next highest channel with a Start level.

PLAYBACK EXTERNAL TRIGGER

Simple contact closure external triggering is supported on DMXking interface units which have an RJ11 accessory socket. Not all devices have this feature which is being progressively rolled out over most of the product range. We recommend using the DMXking eDMX Trigger module P/N 0114-1.0 for screw terminal connections along with built in push buttons. The module can be DIN rail mounted alongside other products as shown below. Connectors are RJ12 / 6P6C type and the eDMX Trigger module is supplied with a 30cm long cable. We do not recommend long cable runs beyond a few meters.



eDMX Trigger module alongside LeDMX4 PRO

There are 2 modes of operation for contact closure external triggering. Simple Show 1, 2, 3, script and up/down/go mode. Note the later mode was introduced in firmware v3.1 and as always, we recommend using the latest available firmware version.

Up/down/go mode will only function on consecutive show numbers. For example, if you record show001, show002 and show004 the last one won't be accessible because show003 is missing.

Enable Playback External Trigger and Up/Down/Go to select this mode.

External Trigger Broadcast allows a single eDMX/LeDMX PRO node on the network to broadcast the Show run commands to other units on the same Local Area Network.

Playback External Trigger Up/Down/Go Broadcast

Trigger port pin mapping:

- I/O Port 1 = Show 1 / Up
- I/O Port 2 = Show 2 / Down
- I/O Port 3 = Show 3 / Go
- I/O Port 4 = Script Run / Black Out

RJ11 Pin mapping:

RJ11 Pin number	Function
1	+5V (do not connect!)
2	I/O Port 1
3	I/O Port 2
4	I/O Port 3
5	I/O Port 4
6	GND

To trigger and input connect the I/O Port to GND (pin 6). Lowest I/O Port takes priority. Not sure which pin is Pin 1? Use a multimeter to check for a positive voltage between 1 and 6.

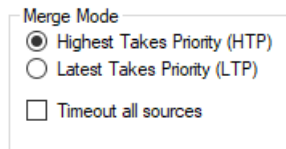
PLAYBACK COMPLETION ACTION

When show playback reaches the end of a show file there are several things which determine what happens next on the DMX512 and/or Pixel outputs.

Hold Last Scene B/O Show After Stop

Enabling Hold Last Scene will maintain whatever the last channel states were present at the end of a show file. If those states were blackout or sACN stream terminate then outputs will of course be off already before the hold.

Enabling Blackout Show After Stop causes show255 (a special show assigned to Blackout) to be run immediately after a Stop command is received through any of the show triggering mechanisms. Rather than just forcing everything to black/off the ability to record your own "Blackout" show provided flexibility to handle whatever fixtures are connected and provide a non-blackout condition if desired. The Blackout show does not automatically run after a show ends normally however this can be scripted by calling show255 as the show end action.



Depending on the status of DMX Output Merge Mode configuration an output may timeout as it usually would when network stream data ceases. Selecting Timeout All Sources will shut down playback sources after 3 seconds of no stream activity. Leave this unchecked and Hold Last Scene checked if you want the last show state to hold after playback completes.

When a Stop command is received output states are set to zero / blackout unless the Blackout show is enabled then states are whatever is recorded.

PLAYBACK AUTOMATION

Firmware v3.0 through v3.3 includes a basic scripting mechanism intended to run a sequence of show files optionally looped and optionally auto-run at power on. The script format is fairly rigid but fully functional for the intended purpose. Using Art-Net Trigger messages a more sophisticated playback automation system can be achieved.

Firmware v3.3+ added a per-show end action script as well.

A special file named "show000.txt" contains the master show script which is accessed through a TFTP file transfer session. In a future eDMX Configuration Utility version a simple user interface for updating script files will be available. Note because TFTP protocol does not include a file delete command a special upload filename format provides the ability to perform deletions.

Files names "showNNN.txt" where NNN is between 001 and 254 are the Show End Script files.

SHOW END SCRIPT

Each show from show001 through show254 can have an associated Show End Script file. These are named show001.txt, show002.txt and so on. File contents are ASCII text and must contain only 1 line consisting of the next show to be called.

File: show001.txt

show002

File: show002.txt

show255

After show001 finishes show002 would be called. After show002 finishes show255 (Blackout show) will be called.

MASTER SHOW SCRIPT FORMAT

The master show script file show000.txt is in ASCII text and for v3.0 through v3.3 firmware must start with the following lines:

```
DMXKING  
VER=0.1
```

Followed by either:

```
AUTORUN or AUTOOFF
```

A list of shows:

```
show001
show002
show006
```

And finally, to loop the show list (optional):

```
show000
```

EXAMPLE SHOW SCRIPTS

Run master script upon power up, show001 looped.

File: show000.txt

```
DMXKING
VER=0.1
AUTORUN
show001
show000
```

Run script only upon Play of show000. Starts with show006 followed by show002 followed by show006 followed by show003 then stop.

File: show000.txt

```
DMXKING
VER=0.1
AUTOOFF
show006
show002
show006
show003
```

*Note each line must contain CR+LF characters at the end. Windows Notepad generates CR+LF on line ends however you'll need to check your Linux/OS X text editor is configured to do this.

Show001 loop forever when called. Note this is not associated with the master script.

File: show001.txt

```
show001
```

LAST SHOW RECALL

Some installations require dynamic recall of the last selected show upon power up. This can be achieved using the Last Show Recall option.

Last Show Recall

Each time a show is selected through the various triggering mechanisms this is automatically recorded as the last show. Any shows that follow this selected show via scripting are not the selected show and are not recorded as the last show.

MULTICAST OUTPUT

When sACN E1.31 streams are recorded they may be multicast back onto the network during playback. This can be useful when a single eDMX/LeDMX PRO node is acting as the master with several slaves mimicking the same lighting. It is also possible to record a Playback Trigger Universe which is played back with multicast output controlling other nodes via Playback Triggers.

Multicast Output

All sACN packets multicast during playback have both CID and Source Name fields re-written to ensure uniqueness and identifiability on the network.

ART-NET CONTROL

Underlying record/playback is controlled by ArtTrigger commands. See the latest version of the ArtNet specification for details of the exact message format.

OEMCode 0xFFFF or 0x6A6B are accepted through either unicast or broadcast ArtTrigger messages.

Key = 3, SubKey = show number (0 – 255 where 0 is the script file “show”)

Key = 2, SubKey = command (see table below)

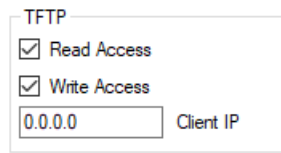
SubKey value (for Key = 2)	Command
'G' (Hex 0x47)	Show GO
'S' (Hex 0x53)	Show STOP
'R' (Hex 0x52)	Show RECORD
'P' (Hex 0x50)	Show PAUSE (not implemented)

Typical ArtTrigger command sequences:

Sequence of ArtTrigger messages	Action
ArtTrigger Key = 3, SubKey = 1 + ArtTrigger Key = 2, SubKey = 'G'	Start playback of show001
ArtTrigger Key = 2, SubKey = 'S'	Stop playback or recording of current show (if any)
ArtTrigger Key = 3, SubKey = 99 + ArtTrigger Key = 2, SubKey = 'R'	Start recording show099
ArtTrigger Key = 3, SubKey = 0 + ArtTrigger Key = 2, SubKey = 'G'	Start script file playback

If you plan on implementing ArtTrigger in your own software use WireShark to observe messages generated by the eDMX Configuration Utility when Select Show (Key 3) and Play/Stop/Record (Key 2) are clicked to verify your own code is generating the correct message format.

Low level file access to the SD card is available through TFTP protocol. All files are stored in the root directory and may also be externally manipulated/copied/deleted using any computer capable of mounting FAT32 or exFAT volumes. For large show files of many GB size the speed of transfer is not great since the DMXking device only have a fraction of the computing power a typical desktop computer has.



By default, TFTP file access is disabled. Read Access and Write Access is controlled separately and a specific Client IP may be specified to limit connections to only 1 computer. Setting Client IP to 0.0.0.0 allows any computer on the network access.

Microsoft Windows OS does not come with a TFTP Client program enabled. You can enable this application through Control Panel. Search “Turn Windows features on or off” and locate “TFTP Client” in the list.

It is recommended a folder is created under the root directory for storing show and script files. For example C:\shows. Then create sub folders for each DMXking device using whatever naming convention suits your application (e.g. C:\shows\LeDMX-Unit-1)

To write a master show script file using Windows TFTP Client perform the following steps:

- Open a Command Prompt window.
- Type `cd c:\shows\LeDMX-Unit-1`
- Type `tftp -i 192.168.0.113 PUT show000.txt show000.txt`

Of course, you would need to have created the file show000.txt first on the computer and saved it in the c:\shows\LeDMX-Unit-1 folder. Also, the IP address of your unit may well be different from the example of 192.168.0.113 so change accordingly.

To read a master show script file:

- Open a Command Prompt window.
- Type `cd c:\shows\LeDMX-Unit-1`
- Type `tftp -i 192.168.0.113 GET show000.txt show000.txt`

The show000.txt file can be opened with Notepad, edited and the PUT back again as above. Obviously once the Command Prompt window is open and in the correct folder location you can skip those steps and just run tftp commands. Writing a few simple batch files can help simplify this upload process.

To delete a file:

Because the tftp protocol does not support deleting of files we have included a specially named file upload mechanism to perform deletions. Uploading a filename starting with _DEL will cause the matching file to be deleted. _DEL001.txt will delete show001.txt and _DEL055.cap will delete show055.cap for example.

- Open a Command Prompt window.
- Type `cd c:\shows\LeDMX-Unit-1`
- Create a blank txt file named `_DEL001.txt`
- Type `tftp -i 192.168.0.113 PUT _DEL001.txt _DEL001.txt`

To read the SD card root directory file list:

- Type `tftp -i 192.168.0.113 GET files.txt files.txt`

This is a special file that is dynamically generated upon request since the TFTP protocol does not support directory listing by itself. Open `files.txt` in Notepad to view the directory listing along with free space information.

You can use any TFTP Client application you like and for large file transfers the Windows TFTP Client doesn't actually comply with wraparound block counts so fails miserably. Our recommendation is the haneWIN TFTP implementation which can be found here <https://www.hanewin.net/tftp-e.htm> however take note the command line switch options are different.

Ignore file datetime stamps because the internal clock does not have battery backup and simply resets to 01/01/2000 each power up.