1. 1.01 LIGHTING SYSTEM AND ACCESSORIES

A. A. General

1. 1. The lighting control desk shall be a microprocessor-based system specifically designed to provide complete control of stage, studio, and entertainment lighting systems. The desk shall be the Eos Titanium as manufactured by Electronic Theatre Controls, Inc., or equal.

2. 2. The system shall provide control of 4,096 or 24,576 outputs on a maximum of 32,768 control channels, which may be patched to any number from 1 to 99,999. Systems that require external co-processing to control 24,576 outputs shall not be acceptable. Output shall be distributed over a 10/100 Mbit Ethernet network using Net3/ACN, ETCNet 2, Avab and/or Art-Net (multi-cast) protocols. The user shall be able to control the application of protocols at an individual address level.

3. 3. The system shall support full bi-directional RDM communication with compatible devices via Net3 DMX/RDM Gateways. RDM communication shall adhere to ANSII standard E1.20-2006 Entertainment Technology – RDM – Remote Device Management over DMX512 Networks. Supported RDM features shall include:

a. a. Discovery and Identification of RDM capable devices

b. b. Setting of start addresses, operating modes and additional settings as exposed by connected devices and controllable via RDM

c. c. Viewing of Sensor data as provided by connected devices

d. d. Error reporting as provided by connected devices

4. 4. A maximum of 10,000 cues, 999 cue lists, 1000 groups, 1000 presets, 4 x 1000 palettes (Intensity, Focus, Colour and Beam), 99,999 macros, 1000 effects, 1000 curves, 1000 colour paths and 1000 snapshots may be contained in non-volatile electronic memory and stored to an on-board solid-state hard drive or to any USB storage device.

5. 5. Recorded cue lists may be played back simultaneously on a maximum of 200 faders. Channels shall, by default, respond to cue information by last instruction, with discrete rate control provided for all cues. The device may be placed in Tracking or Cue Only mode by the user as a system default and overridden on individual record actions as required. HTP/LTP intensity flags, assert, proportional, intensity master or manual master fade control and priority status may be placed on each cue list. It shall also be possible for a cue list to contribute to playback background states or to withhold such contributions.

6. 6. A Master Playback fader pair shall be provided. The 100 mm motorized fader pair may execute move fades, state fades or all fades, with IFCB cue level timing,

7. 7. Ten 100mm motorized faders shall be user configurable across 100 pages and provide additional playback faders (up to 200), additive, inhibitive or effect submasters (up to 999), and one grand master. Presets and IFCB palettes may be loaded to faders for playback control, either individually or in user-defined groups. Virtual fader control is also provided.

8. 8. The system shall have two integral 18.5” articulating multi-touch screens. Content posted to these displays shall be user definable and the displays shall support multiple interpreted simultaneous touches.

9. 9. A high-resolution level wheel shall be provided to control intensity for selected channels and scrolling/zooming of selected displays. Two high-resolution encoders shall be permanently mapped to pan/tilt control. Four page-able high-resolution encoders shall be provided for control of other non-intensity parameters. Non-intensity encoders may be operated in coarse or fine mode, with the amount of movement per revolution of the encoders in coarse mode definable by the user. Tactile feedback for full frame (colour or image) operations shall be provided. The expand function for frame table devices shall provide a graphic representation of all images and colours in the associated device for instant selection. A graphical shutter representation shall provide additional control of shutter parameters. The associated multi-touch display shall also provide an indication of the current value for the displayed parameters, based on channel selection. A high-resolution rate wheel, which may also be used for fader paging, is provided.

10. 10. Control surface buttons shall be backlit. The backlighting shall provide indication of functional states. Backlight intensity shall be user configurable and shall automatically dim after defined period of inactivity.

11. 11. Control and programming features for automated fixtures shall also include: a standard library of fixture profiles, the ability to copy and edit existing profiles and create new profiles, patch displays including channel and output addressing, 16-bit fade resolution, colour characterization allowing colour mixing and matching to colour media data.

12. 12. System information, including playback status, live output and blind values for all record targets shall be displayed on a maximum of three external high resolution Display Port monitors, which may also be single or multi-touch displays. All displays may also be routed to two of the integral multi-touch screens. Every display shall support three user definable work spaces. Each of these workspaces shall provide individually configured frames, with size/scaling controls.

13. 13. A context sensitive on-line Help feature shall explain and provide an example of the operation of each feature of the system. This help system shall be integrated into the on-board user manual via hyperlinks.

14. 14. A fully integrated Virtual Media Server feature shall allow the user to map images and animations to a rig array. 40 such maps may be created, each with 12 layers. Systems that rely on external hardware or software for this functionality shall not be acceptable.

15. 15. User-definable, interactive displays may be created. These displays, which can be used in live and blind operating modes, allow graphical layout of channels, desk buttons and programming tools. Standard symbols are provided, and the user may import their own symbols or graphics. Each symbol may be individually defined with data feedback characteristics. Non-interactive status information, such as a mirror of other user's command lines, may also be included in the display. A graphical browser is provided for fast selection of these views. Multiple zoom factors and placements may be stored and recalled for each display.

16. 16. A fully-function external backlit alphanumeric keyboard shall be provided in a keyboard drawer under the main programming keypad. The keyboard shall allow labelling of all show content. The central touch screen shall also repaint to access a virtual alphanumeric keyboard.

17. 17. Software upgrades shall be made by the user via USB flash drive. It shall be possible to install software updates in all desks, processor units and video remotes from one device over the network.

18. 18. The device operating software shall be loaded into program execution memory from the internal hard drive when the desk is powered. In the event of an uncontrolled shutdown, the device shall return to its last output state when power is restored. Devices requiring a UPS to provide such protections shall not be acceptable.

19. 19. Integrated dimmer monitoring features shall be provided (in conjunction with ETC's Sensor+, Sensor 3 or FDX dimming systems) to allow indication of dimming system status, error states and dimmer load monitoring. Adjustment of dimmer configuration from the console shall also be supported. Communications with the dimming system shall utilize ANSI E1.17 2006 - Entertainment Technology - Architecture for Control Networks.

20. 20. Show data may be created and modified on a personal computer, using Windows 7 or higher operating systems, with a free offline editing application. The offline editor may also run natively on Intel-based Macintosh platforms using OS 10.11 (El Capitan) or later. The program shall also allow output to visualization software supporting the same protocols as the lighting system.

21. 21. A PC using Windows 7 or higher or an Intel-based Macintosh computer using OS 10.11 running a client software application shall be able to connect to a control system via the network and view or modify current show data in an independent display environment, using an ETCnomad key. When connected without the key, the computer shall operate in Mirror Mode, with the device to be mirrored selectable by the user. Systems that do not provide client software that may run natively on the Apple platform in this environment shall not be acceptable.

22. 22. Synchronised backup shall be provided via another full desk on the network, a remote processor unit or a PC/Mac using ETCnomad. The backup unit shall maintain synchronised playback with the master and shall take over control of the lighting system upon loss of communication with the master, either automatically or upon user confirmation. Use of two RPUs to service and backup system output is also supported.

23. 23. A maximum of 99 users may access and interact with show data simultaneously. Each user shall have an individual workspace. User identification may be assigned to more than one control device, allowing users to work in tandem, or allowing a designer/ALD to mirror the current display format, mode and command line of the associated programmer. Partitioned control allows discrete control of channel/parameter groupings by user. Partitioned control may be easily enabled and disabled with no need to merge show data from multiple users.

24. 24. Show files are saved across the system to all available integral hard drives simultaneously.

25. 25. The system shall support up to 32 individual simultaneous Time Code inputs or Event lists.

B. B. Controls and Playback

1. 1. Manual Control and Programming Section

a. a. The programming keyboard shall be grouped by function. Major groupings shall be record target functions, numeric keys, level assignment functions, display navigation functions and controls, as well as non-intensity parameter controls.

b. b. The command keypad shall be fully interactive with direct selects and other virtual controls, which provide “one touch” selection of channels, groups, palettes, presets, snapshots and macros.

c. c. Non-intensity parameters may be set numerically via an extensible keypad on the central LCD. This control shall be fully interactive with the page-able encoders. The multi-touch screen associated with the encoders shall display the current encoder function. The touch screen shall also access available modes for each parameter type, min and max values for each parameter as applicable, as well as home position on a parameter basis. Tactile encoder feedback shall indicate full and half frame positioning of certain controls.

d. d. Only those parameters available for control in the active lighting system shall be displayed for control. Displays shall lowlight parameters not available to selected channels. Alternatively, the encoders may be placed in a state allowing parameters not applicable to the current selection to be suppressed.

e. e. Lamp controls provide direct access to luminaire functions such as striking and dousing arc lamps and calibrating entire fixtures or individual mechanisms of fixtures, as provided by the luminaire manufacturer. User access to these features is normalized across all manufacturers for ease of use. Use of a “control channel” for accessing these functions shall not be required and systems requiring use of control channels for these functions shall not be acceptable.

f. f. Fan functions shall be provided both via command line operation and through encoder controls.

g. g. Highlight shall be supported, with user definable highlight values. Lowlight conditions may be defined for selected, but not specified channels. Rem Dim commands, at specific levels by channel, may be optionally and automatically called with the highlight command.

h. h. Fixtures with colour mixing may be set with direct additive or subtractive encoder controls or the command line, as well as via the colour pickers. Six optional colour spaces are supported, as well as tinting tools, and spectrum tools for systems with more than three colour mixing elements. Colour may also be set directly to a gel match via a graphic selection tool or from the command line. The gel picker shall support tools for identifying similar colours, show favourites, and graphic indications of gel locations. The white point of fixtures may be determined in patch. Colour Path tools, with intensity dampening, shall be provided.

i. i. The Virtual Media Server function shall allow the user to create layouts of devices, identified as pixel maps. Media content (images, movies, text and procedurally generated effects) may then be applied, manipulated and stored. Stock content is provided and the user may import custom imagery and animations.

j. j. Macros may be set to run as default. Default macros called manually shall post to the command line, but executed via cue lists shall run in the background. The user may override this behaviour by defining the macro to always execute in the foreground or background, regardless of the recall method. Start-up, Shutdown and Disconnect macros may also be defined.

2. 2. Playback Section

a. a. The playback faders shall consist of a motorized 100mm Master Fader pair with associated Load, Go and Stop/Back buttons and a 10 x 100 page fader array.

b. b. Up to 200 playback faders may be defined on the fader array. Each playback shall have an associated 100mm motorized potentiometer and three control buttons.

c. c. Faders may be grouped for playback, with sliders and button action defined by the user.

d. d. It shall be possible to instantaneously halt an active cue, back to the previous cue, manually override the intensity fade or manually override the entire fade or go to a cue at a specified percentage of completion.

e. e. It shall be possible for a cue list to contribute to the background state or for the contents of each cue list to be withheld from such. Priority and background priority states may be established.

f. f. Playback faders shall have the following associated controls:

1. 1) Freeze, which halts the output of the fader
2. 2) Stop Effect, which stops the action of an effect
3. 3) Filter, to assign filter states to a fader
4. 4) Go To Cue 0, to reset a cue list
5. 5) Off, to turn off the contents of a playback, releasing control to the background state or to set to null.
6. 6) Assert, to replay an active cue
7. 7) Release, to release control to the background and reset the cue list
8. 8) Timing Disable, channel filters and independent status may also be defined.
9. 9) The potentiometer shall be configurable as a proportional master, an intensity master, or manual master. Support for rate, effect rate, effect size and Master Only controls is also provided. Filtered manual timing masters and effects masters may be configured.
10. 10) Rate override and fader paging are supported with a wheel encoder and associated controls.

3. 3. Submasters

a. a. Up to 999 proportional, fully overlapping additive, effect or inhibitive submasters may be defined. Submasters shall have coloured LEDs to indicate submaster status. Each submaster may have fade up, dwell and down fade times. Submasters may be set to priority and background priority status.

b. b. Submasters may be set to HTP or LTP intensity. Non-intensity parameters on submasters shall be LPT only.

c. c. Exclusive mode for a submaster shall prohibit the live contribution of that submaster from storing to cues or other submasters. Shield mode prohibits access of associated channels from any other playback or manual control operations.

d. d. A submaster potentiometer may be defined as proportional, master only or intensity master. When set as an Intensity Master, a mark and unmark feature is supplied.

e. e. Motorized faders shall set submasters to required positions as fader pages are changed.

f. f. The submaster blind buffer shall be linked directly to live playback.

g. g. It shall be possible to set submaster values directly from the command line.

h. h. LTP submasters may be set to fade to background or to minimum value when the fader is returned toward zero.

i. i. Submaster values may contribute to the background state or withheld from such.

4. 4. Grand Master Fader

a. a. The location of the Grand Master shall be user definable. The grand master shall have associated blackout and blackout enable buttons.

b. b. Blackout shall send all associated intensity outputs to zero. Non-intensity outputs shall not be affected.

c. c. Motorized faders shall set grand masters to required positions as fader pages are changed.

C. C. Display Controls

1. 1. Format shall change the view of selected displays.

2. 2. It shall be possible for the user to choose which parameter categories or parameters (s) he wishes to display.

3. 3. Flexichannel modes shall change which channels are viewed in selected displays, as follows:

a. a. No modes

b. b. Masters only/cells only

c. c. Use Partitions

d. d. Flexichannel states shall change which channels are viewed in selected displays, modified by the flexi modes, as follows:

e. e. All channels

f. f. Patched channels

g. g. Show channels

h. h. Active/Moved channels

i. i. Selected channels

j. j. Manual Channels

k. k. View channels (user identified list)

l. l. Channels with discrete timing

1. 1. 4. Expand shall extend the selected view sequentially across connected displays.

1. 4. [Time] depressed shall display discrete timing data. [Data] suppressed shall display absolute values of referenced data. These controls may be latched.

2. 5. Displays may also be toggled to show stored data currently manually overridden, the source of the current parameter data, output level, patch assignment, part structure and referenced marking data.

3. 6. User definable magic sheets shall provide alternative display of and access to channels and record targets. Multiple magic sheets may be created, each with a variety of zoom and placement factors for rapid recall of the required view.

4. 7. Playback status displays are provided with a variety of different formats. Indications are provided per cue for live moves (lights fading from zero and also moving non-intensity parameters) and dark moves (inactive lights which have stored non-intensity parameter moves). The user may select a static or dynamic time display in the cue list itself.

5. 8. Display content including which of the workspaces is in focus on any of the five monitors and what views are docked in those workspaces may be instantly recalled using snapshots.

B. D. Operating Modes

1. 1. Live Mode

a. a. Channel lists may be constructed using the +, -, and Thru keys as well as the direct selects. Channel selection is fully interactive, regardless of the method used.

b. b. Levels may also be set with the keypad, level wheel and non-intensity encoders. “Selected” channels shall be those last addressed and under keypad control. Controls are provided for single button access to the last selected channel list, all channels with manual levels and all active channels.

c. c. Channels may be set at a user defined default level using the Level key. +% and -% keys adjust channels quickly by user definable values.

d. d. Channels and/or channel parameters may be captured. Capture mode shall allow the user to selectively capture channel data at specific levels. Captured data shall be indicated on the Live display.

e. e. Sneak shall be used to restore specified channels to background states, default values, or to send them to specified values, in user specified times.

f. f. Selected channels may be set at a level or held to current values while all other channels are set to zero using Rem Dim. Toggling Rem Dim shall restore all unselected channels to original levels. The Rem Dim level shall be user definable via the command line or with a default setup value.

g. g. Channels may be recorded into groups for fast recall of commonly used channels. 1000 groups shall be available. Groups shall store selection order and subgrouping functions. The Offset function supports rapid creation of ordered groups, including reverse and random order.

h. h. Parameter settings may be stored to Intensity, Focus, Colour and Beam Palettes and to Presets. All referenced data may be stored to whole numbers or to up to 99 decimal places between each whole number.

i. i. The following conditions may be placed on a channel or channel parameter to be included with a cue record action.

1. 1) Discrete fade time and/or delay
2. 2) Block flag
3. 3) Assert flag
4. 4) IFCB Filters, which may be set at a parameter level.
5. 5) Release and Restore

j. j. 999 cue lists may be stored. Cues may be recorded in any order. Up to 99 decimal cues may be inserted between any two whole number cues. Each cue may contain a maximum of twenty parts.

k. k. It shall be possible to record cues and cue parts with the following information:

1. 1) Any collection of channel data, as determined by the use of “Record”, “Record only” or selective store commands, combined with parameter filters.
2. 2) Cue Level timing and delays for Intensity Up, Intensity Down, Focus, Colour and Beam.
3. 3) Follow or hang time
4. 4) Link instruction
5. 5) Loop value
6. 6) Block, Assert, Preheat, and/or Mark Flag
7. 7) Curve
8. 8) Allfade
9. 9) Label and note
10. 10) Execute list to trigger other activity (execute cue lists, cues, macros and snapshots). Cue list partitions shall be available to curate list content.

l. l. Non-intensity channel parameters may be marked (preset), in two ways. Automark presets any parameters transitions in the cue just prior to intensity becoming active. Automark may be disabled on a cue or cue part basis, enabling a “live” move. Alternatively, non-intensity parameters may be marked to a specific cue with a single command instruction. It shall not be necessary to store or update these parameters directly into the cue in which the movement is to occur.

m. m. Any channel parameter may be stored with an effect instruction. These effects may contain relative offsets from current value, or absolute instructions. Effects may be progressive action or on/off states. Entry and exit behaviours shall modify the channel parameters activity when beginning and ending the effect. Channel and cue level overrides are provided.

n. n. Update may be used to selectively add modified parameter data quickly to that parameter’s current source. Trace may be used to modify the data to the original source of its move instruction. It shall be possible to update inactive record targets. A context sensitive display provides detailed information regarding the results of the update command.

o. o. Recall From quickly pulls specified data from record targets or other channels into the current view. Recall on an HTP basis shall be provided.

p. p. Copy To quickly copies selected data to specified channels or other record targets.

q. q. Address and channel check functions shall be provided.

r. r. Channel parameters may be “parked” at levels. Those levels are not added to any live record operations, nor may they be changed until the parked element is “un-parked”. Scaled park provides real time proportional adjustment of stored intensity values. Address Park shall also be provided.

s. s. About shall provide detailed status of selected channels or specified record targets. This shall include current source, current value, discrete timing, parked value, marked to and for indications. Background levels and current DMX output are also displayed. Channel usage indicates submaster and cue information and also provides a "dark moves" report on a per channel basis.

t. t. 1000 snapshots may be stored which instantly recall specified front panel and display configurations.

u. u. Live data may be displayed in a summary view, detailed table orientation or a user-defined magic sheet.

v. v. Query shall allow selection of channels by their current or possible state. Keywords and fixture types shall allow quick access to fixtures.

w. w. User definable home positions, on a per channel basis, may be defined.

x. x. Undo shall be used to sequentially step back through manual operations or to undo record and delete actions. It shall be possible to undo multiple commands in one action.

2. 2. Blind Mode

a. a. The Blind display allows viewing and modification of all record targets without affecting stage levels.

b. b. Record target data may be displayed in a summary view, a detailed table orientation or a spreadsheet view, which allows quick data comparisons, move and replace functions.

c. c. Changes to blind data shall be automatically stored. Range selection of both record targets and channels shall be supported.

3. 3. Patch Display

a. a. Patch shall be used to display and modify the system control channels with their associated library data.

b. b. Each channel may be provided with a proportional patch level, curve, label, White Point, swap and invert functions, Live/Dark flag enable/disable, as well as keywords to service Query.

c. c. A full library of profiles is provided, with the ability for the user to define “favourites” for fast selection.

d. d. Offset functions in patch shall allow selection of channel ranges and shall allow the user to establish a “custom” footprint for any device output.

e. e. Custom colour wheels, colour scrolls and gobo wheels shall be defined in patch. These devices shall be created with a simple table and graphical user interface supported by images of major manufacturers.

f. f. RDM discovery, patching and device monitoring shall be supported.

g. g. Copy to, Swap and Move functions shall be supported in patch.

4. 4. Setup/Browser

a. a. Setup shall access system, user and device configurations.

b. b. It shall be possible to partially merge show files. Users shall be able to select as much or as little of the show file as required, with renumber tools.

c. c. It shall be possible to import ASCII and Lightwright data files. It shall be possible to export as ASCII or .csv.

d. d. Setup shall also access show data storage, import, export, print to .pdf and clear functions, as well as show data utilities.

e. e. The system shall support programming and playback of real time clock events, including cue, submaster and macro execution at specific times of specified days or at a time based on astronomical events.

f. f. A control screen shall be provided for network configuration, selecting date/time, software update controls, selecting functional language and/or keyboard for labelling option, as well as other system level tools.

g. g. Available languages for prompts, advisories and help messages shall include English, Bulgarian, German, Spanish, French, Italian, Japanese, Korean, Russian, Chinese, simplified and Chinese, traditional.

h. h. Supported keyboards shall include American, United Kingdom, French, German, Italian, Korean, Norwegian, Russian, Slovakian, Turkish, Swiss, Swedish, Finnish and Bulgarian

C. E. Dimmer Monitoring and Configuration

1. 1. The lighting control system shall provide communication with an ETC Sensor+, Sensor3 or FDX dimming system for remote monitoring and configuration of show specific functions from within the software application.

2. 2. Circuit level configuration and monitoring functions shall include but not be limited to:

a. a. Control mode (dimmable, switched, latch-lock, always on, off or fluorescent).

b. b. Curves

c. c. Control threshold

d. d. Min and Max Scale Voltage

e. e. Preheat

f. f. Scale load

3. 3. Rack status messages shall include but not be limited to:

a. a. State of UL924 panic closure

b. b. DMX port error/failure

c. c. Network error/failure

d. d. A, B, C Phase below 90 or above 139 volts and headroom warning

e. e. Ambient temperatures out of range

4. 4. Circuit status shall include but not be limited to:

a. a. Module type and location

b. b. Output level

c. c. Control Source

d. d. Over-temperature

5. 5. Advanced circuit feedback shall include but not be limited to:

a. a. Load higher or lower than recorded value

b. b. DC detected on output

c. c. SCR failed on/off

d. d. Breaker trip

e. e. Module has been removed

f. f. Load failure

g. g. Shutdown due to Over-temperature

D. F. Interface Options

1. 1. The device shall support a variety of local interfaces.

a. a. AC input

b. b. USB (a minimum of 11 ports shall be provided for connecting devices such as an Alpha-numeric keyboard, mouse, touch screens, USB Flash drive, etc.)

c. c. Ethernet (two ports): 802.3af compliant PSE. Each port is individually configurable.

d. d. Three Display Port video output connectors supporting Windows 7 compatible monitors at 1280x1024 resolution minimum. Touch and multi-touch support of any/all of these monitors is provided.

e. e. Four DMX512A/RDM Ports

f. f. Contact Closure Trigger via D-Sub connector

g. g. OSC and UPD Transmit/Receive

E. G. Accessories

1. 1. ETCpad (ETC Portable Access Device)

2. 2. iRFR and iRFR Preview (applications for iPhone, iPod Touch and iPad units)

3. 3. aRFR (application for Android devices)

4. 4. Net3 Remote Video Interface 3

5. 5. 20 Fader or 40 Fader non-motorized wings

6. 6. 10 Fader or 20 Fader motorized wings

7. 7. Gateways

a. a. Net3/ETCNet 2 to DMX/RDM Gateways (one to four ports)

b. b. Show Control Gateway

c. c. I/O Gateway with 12 analogue inputs, 12 SPDT contact outputs, RD232 interface

8. 8. ETCnomad (offline, client and/or backup operation)

F. H. Synchronized Backup

1. 1. An optional Backup system shall consist of one of the following combinations of devices:

a. a. Two networked desks.

b. b. One (or more) desk with one Remote Processor Unit (RPU)

c. c. One (or more) desk with two Remote Processor Units (RPUs)

d. d. One (or more) desk with ETCnomad

G. I. Physical and Acoustical

1. 1. All operator controls and electronics for a standard system shall be housed in a single desktop unit, 1003mm wide, 667mm deep, 370mm high, weighing 38.6 kg.

2. 2. Power shall be 90 – 240V AC at 50 or 60Hz, supplied via a detachable power cord.

3. 3. At typical CPU utilisation, the unit shall operate at ≤ 22 dBA.