



# ARRAY SPEAKER SYSTEM FOR LED SCREEN DEDICATED SURROUND-SCREEN COAXIAL ADJUSTABLE COVERAGE



**Designed for LED screen**

**Integration of audio and video**



-CADA RSP88/RSP1616-  
SPEAKER PROCESSOR



-FCL18SA-  
ACTIVE SUBWOOFER

-FCL804A-  
SURROUND-SCREEN COLUMN SPEAKER



-FCL806A-  
SURROUND-SCREEN COLUMN SPEAKER



- Used anywhere
- Adjustable coverage
- Sound-image synthesis algorithm
- Sound image position shift



# R & D BACKGROUND

Since the 1970s, the development of LED technology at home and abroad is rapid, and the market popularization and application fields are increasingly widespread. At present, the technology of LED screen has reached the highest level. The fusion technology of LED audio and video has become the mainstream demand of the development of LED market, but up to now, LED is still an isolated product display mode. There is no speaker in the domestic and foreign market that can integrate LED into one, so that LED display technology can reproduce its technical charm. Especially, the content of LED is not synchronized with audio system for a long time, the matching of audio equipment is unreasonable, the use is not standard, the system is messy, the operation is complex, the construction of project is difficult, the cost is high, the installation and debugging time is long. These are the troubles caused by the long-term separation of the LED display industry and audio technology, which make users always have no satisfactory solution to the LED audio system.

In 2016, we started to research the solution of surrounding audio system for LED digital movies. At the same time, special audio system for LED display is also formally set up as a scientific and technological project. After more than 5 years of research, development, various kinds of tests and various environments, different forms of high intensity detection, we have successfully completed the solution of the world's first LED digital movie surrounding audio system. Thus, a scientific and technological achievement has been created for the audio-video solution that integrates LED screen and audio system in different market areas and different projects. With this coaxial adjustable coverage audio system, the LED display will provide a wider space for the high quality development of the market. It creates a predictable and promising market prospect for the transformation of existing huge stock markets and the development of emerging markets.



# HONORS AND PATENTS

## Innovative Technology    International Patent

The array speaker system with dedicated surround-screen coaxial adjustable coverage for LED screens is composed of a beam steering active coaxial surround-screen array speaker and its associated multi-channel processor. This is a high-tech product with audio-video integration tailored for LED screens by Chinese and foreign R&D teams for many years. Seven international patents have been obtained, filling the international market gap.

**Invention patent: A Formation Method of Surround-screen Speaker Array and Virtual Source (Patent No.:2018110283965)**

**Invention patent: A Directional Surround-screen Speaker Array and Its Control Method ( Patent No. :2018110275653)**

**Invention patent: A Digital Cinema Sound System and Its Control Method ( Patent No. :201811027562X)**

**Invention patent: An Algorithm for Immersion Sound Return System of Speaker Array and Its Application (Patent No.:2021105852351)**

**Invention patent: An Object-based Motion Source Composition Algorithm for Surround-screen Speaker Array and Its Application (Patent No.:202110583827X)**

**Invention patent: An Object-based Algorithm for Sound-image Synthesis of Surround-screen Speaker Array and Its Application (Patent No.:202110582455)**

**Utility model: A Round-screen Speaker Array ( Patent No. :2018214422943)**





# TECHNOLOGICAL INNOVATIONS

- Technology for distributing multiple coaxial active array speakers tightly and evenly around the screen using non-transparent materials. Install separate transducer, amplifiers and DSP processors for each loudspeaker in the column speaker. It also makes the speaker array adjustable by big data arithmetic, which solves the difficulties that can not be solved in the industry where LED display and speaker are integrated.
- The speaker array can achieve adjustable directivity and effectively enhance the coverage angle of the sound field. Without changing the position of the device, only through software adjustment, can different frequency bands or different signals form different directivity, and can also increase the coverage angle of the speaker array, to achieve a uniform distribution of sound field in the audience area, to adapt to different use environments.
- Once the audio system is integrated with the LED, there is no need to install the monitor speakers around the stage, including in front of it. Very clear and even sound field effect can be obtained in the center of the stage, which makes the whole project audio system simpler, safer and more reliable, and easy to operate.
- This technology system has built-in special anti-screaming technology, which enables the speaker to fuse with the LED and use all kinds of pickup microphones directly in front of the LED. This solves the problem that microphones will scream.
- This technology, combined with SOUNDKING Internet of Things cloud platform, power manager terminal and other devices, can achieve 24-hour local and remote AI operation and maintenance, and ensure the stable operation of the devices.
- This technology provides a perfect audio and video rendering scheme for any large and medium-sized LED screen indoors and outdoors, making the video content point to the audio system through coaxial adjustable to achieve perfect sound quality and sound environment effect, and providing a more immersive viewing experience for the playback content of LED.
- This technology has obtained a number of international patents, filling the gap in the international technology which integrates LED display and audio, and is an innovative technology in the field of audio and video.

# SYSTEM FUNCTIONS

The system is a set of integrated solutions for audio-video fusion system tailored for different fields and specifications of LED screens.

- One-click switching achieves a variety of scene audio effects such as conference, performance, training and so on.
- It enables audio and video signals to play simultaneously.
- The adjustable-coverage active coaxial array speaker and LED are combined in the same frame and embedded invisible installation to achieve the effect of audio and video integration.
- The sound system has built-in microphone scream-free technology, which does not produce a scream anywhere on the stage.
- There is no need to install any monitor speakers in the stage. The center of the stage has a powerful and clear sound amplification effect.
- Install cloud Internet system for local and remote operation and device management.

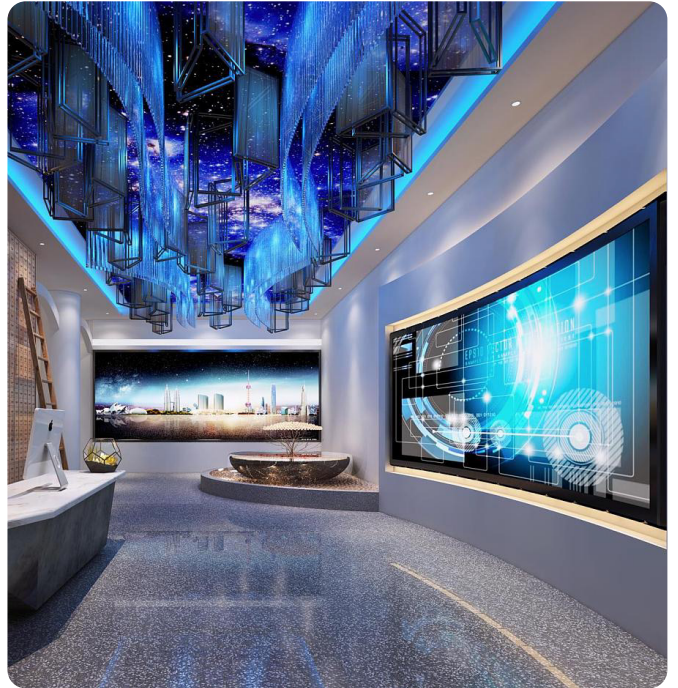


# APPLICATIONS

Medium and large command centers, theme parks, multi-functional art halls, medium and large open-air LED advertisements, TV station studios, TV station high-level approval hall, medium and large conference rooms, medium and large report halls, government and enterprise multi-function digital cinema, museums, exhibition halls.



Medium and large lecture halls



Exhibition halls



Multi-functional art halls



Medium and large conference rooms



## FCL804A · 4" Surround-Screen Coaxial Speaker

### PRODUCT INTRODUCTION/SPECIFICATION

2-way independent DSP module technology for each speaker

Suitable for small LED screen system below 10m

FCL804A is an active surround-screen array speaker. The enclosure is made of birch plywood, lightweight and rugged. Active surround-screen speakers offer a frequency range of 65Hz-20KHz with smooth frequency and phase response. Twenty-four 1-inch neodymium dome tweeters and eight 4-inch neodymium mid-woofers make up a very large dynamic balance. The coaxial array of tweeters is arranged above the mid-woofer, which enables more accurate sound image positioning and improves the far and near field uniformity and clarity of the line array speakers. The speaker is equipped with 16-channel high power amplifier and DSP. The speaker can be adjusted independently. The number of connections is configured according to the size of the actual situation, which makes the on-site sound amplification extremely flexible and convenient. The power amplifier part uses high efficiency switching power supply with built-in DSP module, which has functions such as processing crossover, EQ, pressure limit, delay, volume, etc. The speaker uses DANTE digital network transmission, each channel can be controlled independently, delay and amplitude can be adjusted.

<b>Style</b>	Master speaker	<b>Delay accuracy</b>	1 sample (sampling rate 48kHz)
<b>Frequency response</b>	65Hz-20kHz	<b>Delay between channel</b>	0
<b>Rated power</b>	800W	<b>Adjustment range of each channel level</b>	-∞~0 (without increase or decrease)
<b>Input sensitivity</b>	0dBu	<b>Channel level adjustment accuracy</b>	0.1dB
<b>Max. SPL</b>	126dB	<b>Channel joint debugging</b>	Channel delay and level parameters can be adjusted simultaneously
<b>Horizontal coverage</b>	100°	<b>Save parameter</b>	All parameters can be stored in real time and saved as a scene to call at any time
<b>Vertical coverage</b>	Free adjust within +/-45°	<b>Interface</b>	Dante/AES67
<b>Transducer</b>	8x4" mid-woofers+24x1" dome tweeters	<b>Dimension (LxWxH)</b>	1101x185x310mm
<b>Independent delay adjustable range for each channel</b>	0~30ms	<b>Weight</b>	Net weight:25kg Gross weight: 29kg



Structural Diagram



## FCL806A · 6.5” Surround-Screen Coaxial Speaker

### PRODUCT INTRODUCTION/SPECIFICATION

2-way independent DSP module technology for each speaker

Suitable for small LED screen system below 10m

FCL806A is an active surround-screen array speaker. The enclosure is made of birch plywood, lightweight and rugged. Active surround-screen speakers offer a frequency range of 55Hz-20kHz with smooth frequency and phase response. Thirty-two 1-inch neodymium dome tweeters and eight 6.5-inch neodymium mid-woofers make up a very large dynamic balance. The coaxial array of tweeters is arranged above the mid-woofer, which enables more accurate sound image positioning and improves the far and near field uniformity and clarity of the line array speakers. The speaker is equipped with 16-channel high power amplifier and DSP. The speaker can be adjusted independently. The number of connections is configured according to the size of the actual situation, which makes the on-site sound amplification extremely flexible and convenient. The power amplifier part uses high efficiency switching power supply with built-in DSP module, which has functions such as

<b>Style</b>	Master speaker	<b>Delay accuracy</b>	1 sample (sampling rate 48kHz)
<b>Frequency response</b>	55Hz-20kHz	<b>Delay between channel</b>	0
<b>Rated power</b>	2500W	<b>Adjustment range of each channel level</b>	-∞~0 (without increase or decrease)
<b>Input sensitivity</b>	0dBu	<b>Channel level adjustment accuracy</b>	0.1dB
<b>Max. SPL</b>	133dB	<b>Channel joint debugging</b>	Channel delay and level parameters can be adjusted simultaneously
<b>Horizontal coverage</b>	100°	<b>Save parameter</b>	All parameters can be stored in real time and saved as a scene to call at any time
<b>Vertical coverage</b>	Free adjust within +/-45°	<b>Interface</b>	Dante/AES67
<b>Transducer</b>	8x6.5" mid-woofers+32x1" dome tweeters	<b>Dimension (LxWxH)</b>	1380x205x70mm
<b>Independent delay adjustable range for each channel</b>	0~30ms	<b>Weight</b>	Net weight:39kg Gross weight: 45kg



Structural Diagram

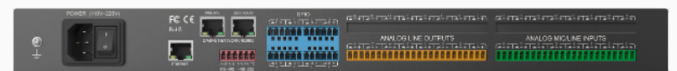


It is a leading ADI DSP SHARC 21489,40bit audio processor with multiple algorithm groups running on the same platform, specially developed for LED surround screen speakers. The maximum operating frequency of the DSP floating-point operation engine is 450MHz. Provides AFC, AGC, AEC, ANC, AM, ANS core processing modules, with a very large number of unique technical systems, such as: user interface, control capabilities of sound, light, electricity, etc. It can meet the needs of large and medium-sized projects which integrate all kinds of LED screens with surround-screen audio system, and make audio and video play synchronously perfectly to achieve the best experience.

<b>Processor</b>	ADI SHARC 21489	<b>Input dynamic range</b>	110dB
<b>Sampling Rate/Quantization Bits</b>	48K/24bit	<b>Output dynamic range</b>	112dB
<b>Channel number of Analog input/output</b>	8 x 8(RSP88) 16x16(RSP1616)	<b>Channel isolation @1kHz</b>	108dB
<b>Input gain</b>	0/3/6/9/12/15/18/21/24/27/30/33/36/39/42/4548 dBu	<b>Input impedance (balance)</b>	5.4KΩ
<b>Phantom power</b>	+48V/10mA max	<b>Output impedance (balance)</b>	600Ω
<b>Frequency response</b>	±0.3dB	<b>System delay</b>	<3ms
<b>Max. Level</b>	+18dBu	<b>Power supply</b>	AC110~240V,50Hz/60Hz
<b>THD+N</b>	<-94dB @17dBu	<b>Dimension (LxWxH)</b>	482x260x45mm
	110dB	<b>Weight</b>	Net weight 4kg



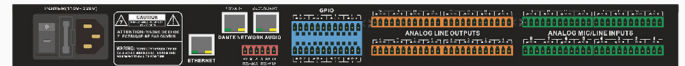
RSP88



Rear



RSP1616



Rear



# FCL18SA · Active subwoofer

## PRODUCT INTRODUCTION/SPECIFICATION

Active subwoofer is specially developed for LED surround-screen audio system. Composed of one  $\phi$  100 core 18" low frequency transducer; LF transducer uses a special aluminum modulation ring, which significantly reduces distortion and effectively improves the voice coil heat dissipation capacity. 4" high temperature resistant voice coil, long stroke design, greatly improving power endurance. Class-D amplifier enables power up to 1500W with strong carrying capacity, stable performance, low distortion and high efficiency.

<b>Model</b>	FCL18SA	<b>Input power</b>	230V
<b>Frequency response</b>	35Hz-200Hz	<b>Crossover</b>	80Hz-100Hz
<b>Amplifier power</b>	1500W	<b>Transducer</b>	18"x1
<b>Input sensitivity</b>	0dBu	<b>Connector</b>	XLR
<b>Max. SPL output</b>	134dB	<b>Dimension(LxWxH)</b>	545x677x690mm
		<b>weight</b>	Net weight 45kg Gross weight 50kg



Active subwoofer



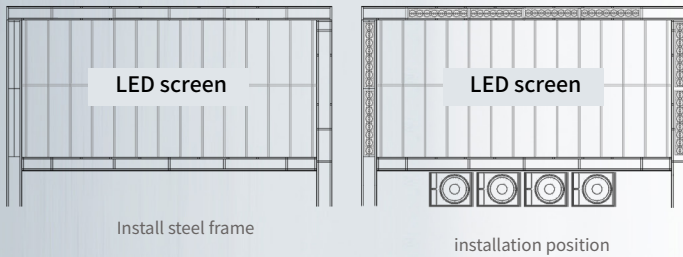
Rear



# INSTALLATION METHOD

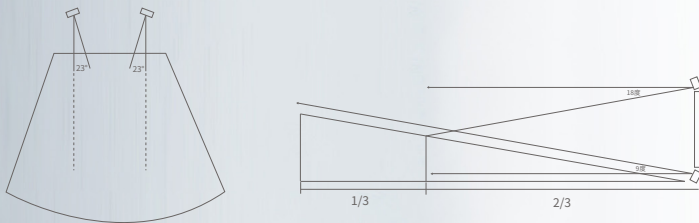
## Step 1:

Install surround-screen system



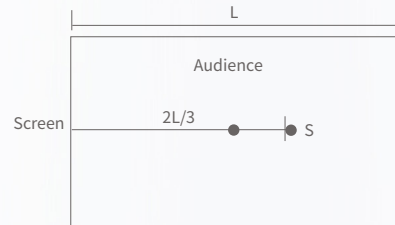
## Step 3:

Make the center position of top/bottom/ left /right speaker array point to the best listening point. As shown in the following figure:



## Step 2:

Select the best listening point at the center of two-thirds of the director of the cinema, as shown in the following figure, point S is the best listening point.



## Step 4:

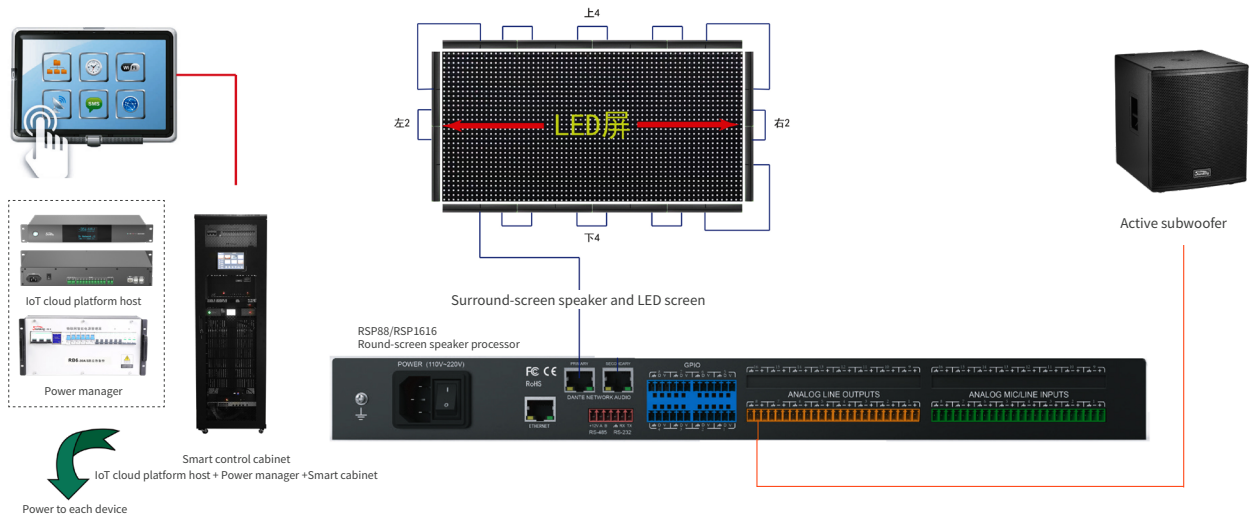
### Live Tuning

- Make the sound pressure levels of all speakers consistent
- Arithmetic processing (delay and amplitude adjustment, etc.) for surround-screen speaker array;
- Select the best listening point at the center of two-thirds of the director of the cinema
- Pink noise is played on left speaker array, top and bottom (center) speaker array, and right speaker array, respectively.
- Measure the frequency response at the best listening point so that the left, middle and right channels meet the cinema standards.
- Play pink noise, calibrate the level of the main channel, with a base sound pressure level of 85dB





# APPLICATION AND INTELLIGENT CONTROL SYSTEM



Advantages of the IoT control: Cloud Computing System Platform with the functions of remote control of devices, remote debugging of devices, after-sale operation and maintenance services of devices, statistical analysis of device energy consumption, safety management of device power consumption, large data analysis, etc.

## Screen System Configuration with Different Specifications

Item	Unit	LED width 4.5m-7m (quantity)	LED width 7.5m-10m (quantity)	LED width 11m-16m (quantity)	LED width 16m-20m (quantity)
Processor-RSP88	EA	1	1	1	0
Processor-RSP1616	EA	0	0	0	1
Coaxial speaker-FCL804A	EA	6	10	16	0
Coaxial speaker-FCL806A	EA	0	0	0	18
ubwoofer-FCL18SA	EA	2	4	6	8
Smart control cabinet (IoT cloud platform host + Power manager +Smart cabinet)	EA	1	1	1	1
8-port Gigabit Switch-S5720S-28P-LI-AC	EA	1	1	1	1



# MIXING SOFTWARE-MIXER USAGE INSTRUCTIONS

## Software function

Mixer is a software for operating the output mixing matrix of the 8-channel input and output module of the speaker. The position of the output mixing matrix in the whole module is shown in Figure 1 (brown part)

In addition to mixing, it can also perform volume adjustment and delay in the digital domain for each input signal. The function of this software is to complete operations such as mixing, volume adjustment and delay settings, and can import and export data.

The mixing matrix is in 8X8 format, that is, 8 inputs and 8 outputs. The 8-channel input corresponds to the 8-channel I2S signal of the receiving part, and the 8-channel output is the I2S (TDM) output corresponding to the data line of the hardware module

## Software interface | operation

### 1. Select and connect device

**Select Device:** After double-clicking to open Mixer, the interface is as shown in the figure below. The switch in the green box at the bottom left is gray, indicating that no device is connected. "All online devices can be found in the device list box in the red box in the lower left corner. The selected device is the device to be operated currently, and its corresponding IP address is below the list box.

**Connect Device:** Click the switch in the green box on the right side of the device list, and the switch turns green. The online operation is completed. All the operations since then have been performed for this online device. Interface after device connection as shown in Figure 2

Each vertical column (blue arrow) corresponds to one receiving channel, and each horizontal row corresponds to one mixing output (yellow arrow). The rectangular box on the cross point can operate whether a receiving channel is output on a certain output, and how much volume and delay to output.

For example, you can manipulate whether Rx3 will output on Route 3 by using the cells in Column 3 and Row 3 where the red box is in the diagram. This output is turned on when the green switch in the short box is on, and the sound of Rx3 can be heard on Out3 where the green box is located. Now the interface represents the default settings of the module. Each output is mixed with only one receiving channel. Only Rx1 can be heard on Out1, only Rx2 can be heard on Out2, and so on.

### 2. Cell Operation

The text above the cell represents the receiving channel and output channel operated by this unit. As shown in Figure 3, it is the relevant setting of operating Rx4 on output channel 3.

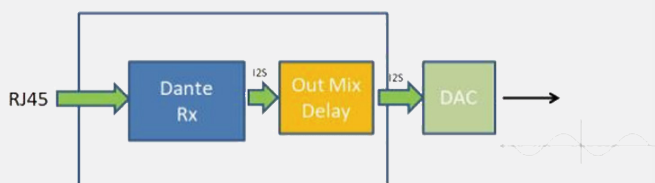


Figure. 1

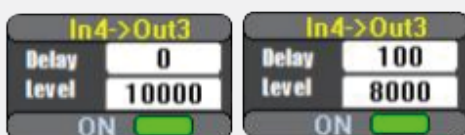


Figure. 3

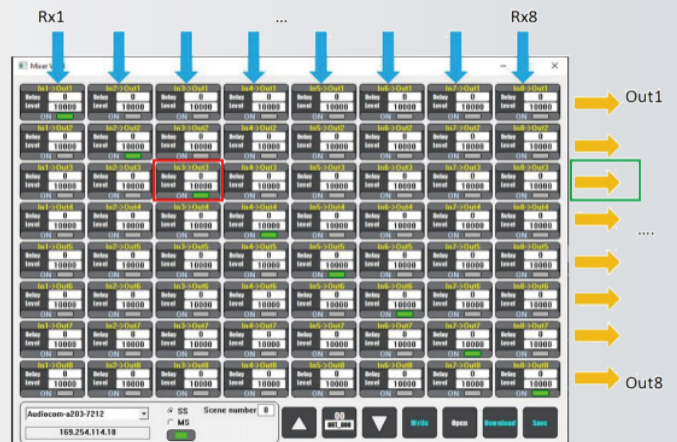


Figure.2



The Delay and Level values in the cell are hexadecimal digits (0-9, A-F), meaning:

1. Level is the volume value, 0x10000 represents the original volume, 0x8000 represents 6dB volume attenuation, 0x4000 represents 12dB volume attenuation, and so on. The maximum 0x3FFFF represents a 12dB increase in volume.

Delay is the number of Samples with sound delay, which can be calculated based on the sampling rate. If the sampling rate is 48K and Delay is set to 0x100, or 256 Samples, the corresponding delay time is 5.3 ms (256/48). In the setting on the left, the green switch is on, indicating that Rx4 will output on Out3 with Level value of 0x10000, volume will output as received, Delay value of 0, no delay.

3. In the setup on the right, Rx4 outputs on output channel 3 with a volume decay of 6dB and a delay of 0x100 samples, approximately 5.3ms.

Specific operation: Mixer switch can be turned on or off by clicking with the mouse. Delay and volume values are entered manually after clicking on the corresponding edit box, and the Enter key confirms, which takes effect immediately. However, it is not saved at this time. If you need to save the current settings, click the Write button below.

### 3. Scene operation

Scene: All settings of the 8X8 matrix on the interface are called a scene. The module has 16 scenes by default and the current scene is 0. By importing files, you can have up to 100 scenes.

Scene mode: The scene mode refers to whether a single scene (SS) or a multiple scene (MS) is used. A single scene always uses one scene data. Multi-scene refers to switching by a specified time interval using pre-stored multiple scene data.

Scene mode is switched by SS and MS radio buttons.

In single scene mode, the scene currently in use is displayed, the scene used can be replaced by the up and down scene button, the data of each cell can be set, and when the setting is complete, click the Write button to save.

Show as Figure 4

After switching to multi-scene mode, the interface is as follows. The start and end scene numbers are used to specify the minimum and maximum scene numbers, and the switching interval is 10ms. As shown in the figure, the six scenarios, 0-5, are recycled and switched every 100ms. Show as Figure 5

### 4. Input/ output data

Scene data can be exported or saved on a computer (file name defaults to module name, extension scn). You can also open a data file and import it. The following three buttons are used to open the data file, import the file data, and export the current device scene data. Export data must be connected to the device before it can be operated.

To open files and import data, disconnect the device. Show as Figure 6

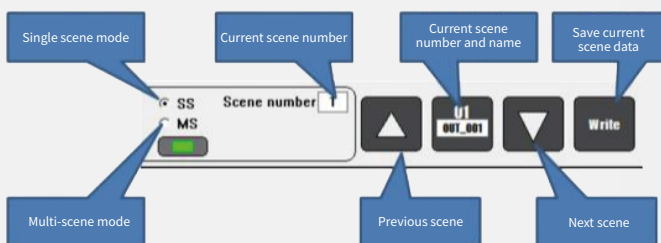


Figure. 4

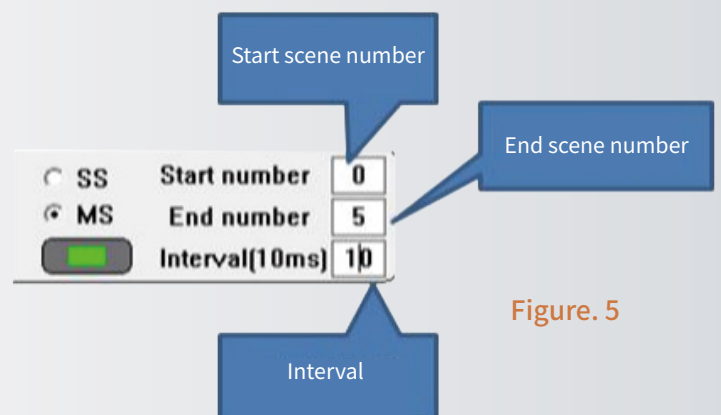


Figure. 5



Figure. 6





# OPTIONAL ACCESSORIES

## Presenter SuperCue mini/SuperCue basic version



Presenter parameter	Receiver function	SuperCue mini	SuperCue basic version
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<b>Size</b>	81x48x17mm	<b>Size</b>	38x17.5x7mm	218x130x35mm
<b>Power supply</b>	7th lithium battery	<b>Application</b>	Small and medium meeting room/classroom	Small and medium meeting room/classroom
<b>Weight</b>	140g	<b>Power supply</b>	USB	12V
<b>Material</b>	Soft rubber	<b>Communication technology</b>	433MHz Digital Communication	433MHz Digital Communication
<b>OLED screen</b>	Yes	<b>Transit distance</b>	200m	200m-500m
<b>Buttery type</b>	Lithium battery	<b>State</b>	Indicator	Indicator
<b>Replaceable</b>	Yes	<b>Control number</b>	1	6
<b>Rechargeable</b>	Yes	<b>Cascade function</b>	No	Yes
<b>Working time</b>	Yes	<b>Touch screen</b>	No	Yes
<b>Power display</b>	Yes	<b>Countdown function</b>	No	Yes
<b>Channel setting</b>	Yes	<b>Timing function</b>	No	Yes
<b>Channel number</b>	65536	<b>Call Timing Template</b>	No	Yes
<b>Timing tips</b>	Yes	<b>Quick preview</b>	No	Yes
<b>Laser power</b>	30mw	<b>Jump to specified page</b>	No	Yes
<b>Notify vibrate</b>	Yes	<b>Present from</b>	Yes	Yes
<b>Ergonomics</b>	Yes	<b>current page</b>	Yes	Yes
<b>Weight</b>	Mini net weight 0.09kg	<b>Channel setting</b>	1	1
	Basic net weight 1.4kg	<b>Channel numbe</b>	No	65536
		<b>HDMI output</b>	No	No
		<b>Idiot board</b>	No	No

# OPTIONAL ACCESSORIES

## Wireless cast SK-T1/SK-T2/SK-T4



<b>OS</b>	Windows 7/8.1/1032 and 64-bit MAC OS10. 10/10.11/10.12 and above ios9/ios10/ios11. os10.10/10.11/10.12 and above Android 5.0 and above versions (requires APP, ESHOW)	<b>Temperature</b>	Operation: +5°C~+40°C Storage: -20°C~+60°C
<b>Video output</b>	The same content can be output simultaneously through HDMI and VGA and the output resolution can be different. Output resolution up to 1080p/1920X1200 Number of video sources displayed simultaneously on the screen: maximum support for 4 split screens and 16 simultaneous connections	<b>Humidity</b>	Storage :0~90% relative humidity, no condensation Operation :0~90% relative humidity, no condensation
<b>Frame number</b>	30 frames per secondieee	<b>Certification</b>	CCC/CE/ROHS
<b>Wireless transmission protocol</b>	802.11ac/802.11n	<b>Dimension (LxWxH)</b>	188x152x34mm
<b>Transmit distance</b>	Maximum distance between transmitter and receiver is 30m Simultaneous-frequency transmission delay <100m (average)	<b>Power consumption</b>	Receiver: 12V/1A, average consumption 5W; Transmitter: 5V/500mA, average consumption 1.5W
<b>Frequency band</b>	2.4hz or 5g (default 5GHz)	<b>Net weight</b>	0.5kg