

# FreeSpace® E-4 Business Music System

## OWNER'S GUIDE



**BOSE®**

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## 1.0 Introduction

### 1.1 The Bose® FreeSpace® E-4 business music system



The Bose FreeSpace E-4 system is an integrated four-channel digital signal processor and 400-watt power amplifier for 70/100V business music applications.

The E-4 system has a total of four source inputs, including two Line In, one Mic/Line and one Mic/Page/Line, to provide the inputs needed for most business music installations. The system also has a direct input which can override the sources playing on all four output channels.

The E-4 system has four amplifier output channels which can be configured for different zones. A Music on Hold output is also provided for simple integration into a phone system.

In a single chassis, it provides all of the processing and control features required for one-to-four zone business music applications. These features include:

- **Auto Volume:** When used with the optional FreeSpace system Auto Volume Sense Mic, E-4 system electronics dynamically control the program level in each zone so your customers can always hear it, regardless of the background noise
- **Scheduling:** Allows you to program the E-4 system electronics for automated on/off control, source changes, and volume changes according to time of day or day of week

- **Opti-Voice® Paging:** Provides the appropriate sound level regardless of variations in speech projection
- **Source Leveling:** Automatically compensates for variations in source input levels
- **Dynamic Equalization:** Maintains tonal balance at all listening levels
- **Room Equalization:** Provides easy adjustment of tonal balance in each zone
- **Signal Routing:** Meets the demands of most four-zone systems, allowing for an input source to be routed to any of the four amplifier outputs
- **Serial Data Interface:** RS-232 serial port for easy interfacing to your PC
- **Contact Closure Input:** Accepts a remote STANDBY switch

The integrated 400-watt power amplifier features a patented power-sharing technology which dynamically allocates power to each output.

For example, if you have a two-zone system that requires 5 watts in Zone 1 and 395 watts in Zone 2, the FreeSpace E-4 system electronics distributes the power based on those needs.

The E-4 also includes an easy-to-replace memory module, which holds the system configuration settings and design file uploaded by the FreeSpace *Installer*™ software (see page 14).

### 1.2 E-4 system accessories

Optional Bose accessories for the E-4 system are available.

- **FreeSpace E-4 System User Interface Kit (U.S.) (PC029856)**  
A wall-mountable keypad that fits into a standard U.S. single-gang junction box. It provides buttons for volume up/down control, 1-3 source selection, and mute.
- **FreeSpace E-4 System User Interface Kit (Euro) (PC029857)**  
A wall-mountable keypad that fits into a standard Euro single-gang junction box. It provides buttons for volume up/down control, 1-3 source selection, and mute.

## 1.0 Introduction

- **FreeSpace® E-4 System Auto Volume Interface Kit (U.S.) (PC030101)**

A wall-mountable keypad that fits into a standard U.S. single-gang junction box. It provides buttons for volume up/down control, 1-3 source selection, and Auto Volume on/off.

- **FreeSpace E-4 System Auto Volume Interface Kit (Euro) (PC030102)**

A wall-mountable keypad that fits into a standard Euro single-gang junction box. It provides buttons for volume up/down control, 1-3 source selection, and Auto Volume on/off.

- **FreeSpace E-4 System Auto Volume Mic Kit (U.S.) (PC029859)**

One sensing microphone that can be mounted as is or in a standard U.S. single-gang junction box.

- **FreeSpace E-4 System Auto Volume Mic Kit (Euro) (PC029860)**

One sensing microphone that can be mounted as is or in a standard Euro single-gang junction box.

- **FreeSpace E-4 System Accessory Kit (U.S.) (PC030105)**

Supplemental rear panel mating connectors and non-skid feet.

- **FreeSpace E-4 System Rack Mount Kit (PC029858)**

One pair of rack ears.

### 1.3 FreeSpace *Installer*™ software



Bose® FreeSpace *Installer* software is included with every E-4 system. The *Installer* software allows you to configure hardware devices such as the E-4 system. The *Installer* software is designed for use on a PC that is connected to the E-4 system through a serial data interface.

The *Installer* software requires a computer system with the following minimum requirements:

- 400 MHz Pentium®-based PC
- 256 MB of RAM
- 50 MB of available hard-drive space
- RS-232 serial port
- 800 x 600 display
- 4x CD-ROM drive
- Microsoft Windows® 98, Windows® 98SE, Windows® NT, Windows® 2000

## 2.0 Designing with the E-4 System

### 2.1 Introduction

This section describes the basic steps for designing an E-4 system and includes an example. It is assumed that a complete loudspeaker design and layout has already been created.

### 2.2 Basic design steps

There are five basic steps in designing an E-4 system.

#### 2.2.1 Step 1 – Determine source routing

Decide which sources will be played in each area. Create a “source map” such as the following one that shows which sources will be played in each major area of the facility.

	Source 1	Source 2	Source 3	Source 4
Area 1	●		●	
Area 2	●	●		●
Area 3	●		●	
Area 4	●			
Area 5	●			

#### 2.2.2 Step 2 – Determine Auto Volume requirements

Identify which areas will use Auto Volume. Each Auto Volume zone must use one Auto Volume user interface and one Bose® sensing microphone to control the volume. A 70/100V volume control cannot be used.

When using Auto Volume, remember that you will be adjusting the volume of an overall area. Imagine that you have a dining area and a bar adjacent to one another. If the sensing microphone is placed above the bar, the music may become too loud in the dining area. Likewise, if you place the sensing microphone above the dining area, the music may never be heard in the bar.

### Guidelines for establishing Auto Volume zones

Speaker height is...	Background noise is uniform	Background noise is non-uniform
>25 ft (7.6 m)	Not recommended	
12-25 ft (3.7-7.6 m)	One Auto Volume zone for every 3600 ft <sup>2</sup> (324 m <sup>2</sup> )	One Auto Volume zone for every 1800 ft <sup>2</sup> (162 m <sup>2</sup> )
<12 ft (3.7 m)	One Auto Volume zone for every 1800 ft <sup>2</sup> (162 m <sup>2</sup> )	One Auto Volume zone for every 900 ft <sup>2</sup> (81 m <sup>2</sup> )

Speaker mounting height and the overall quality of the background noise is used to determine the Auto Volume zoning requirements. Uniform background noise is found in an area where no part of the area is louder or quieter than any other. A room with non-uniform background noise would seem louder in some areas (people talking, machinery running, etc.) and quieter in others.

#### Mounting guidelines for sensing microphones

- The sensing microphone must be mounted at the same height as the loudspeakers or higher. A sensing microphone must never be mounted lower than the speaker height.
- In all cases, there must be 6 ft (1.8 m), minimum, between the loudspeaker and the sensing microphone. This is so that the microphone does not receive signals only from a loudspeaker.
- There must be 35 ft (10.7 m), minimum, between the sensing microphones of two adjacent Auto Volume zones.
- Avoid placing the microphone near unique noise sources like HVAC equipment, dishwashers, motors, etc.

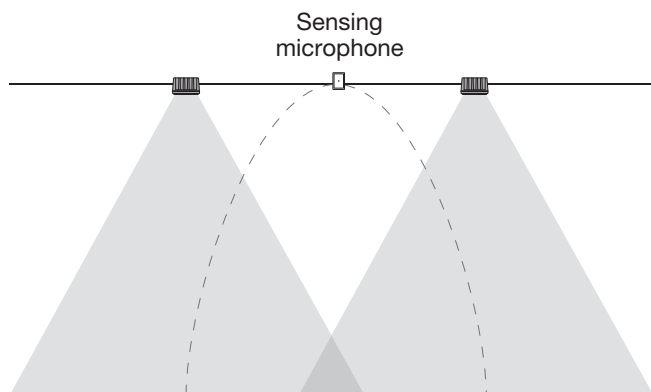
Separating the microphones as much as possible for two zones is the best practice. Consider the previous example of the dining area and a bar adjacent to one another. If each of these areas uses Auto Volume, it is possible to create a situation in the dining area where the music is too loud simply because the microphone is too close to the bar.

## 2.0 Designing with the E-4 System

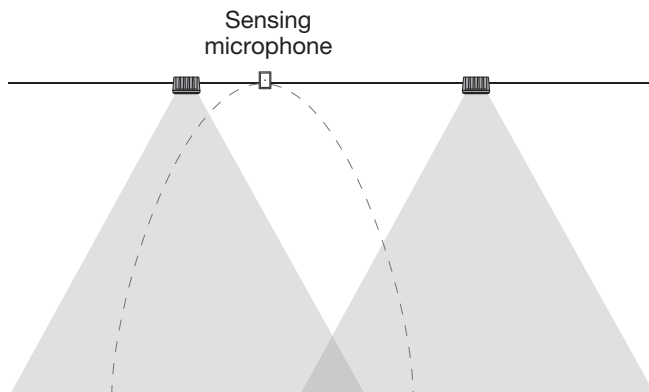
The following are examples of correct and incorrect sensing microphone placements:

### Ceiling Flush

Correct placement

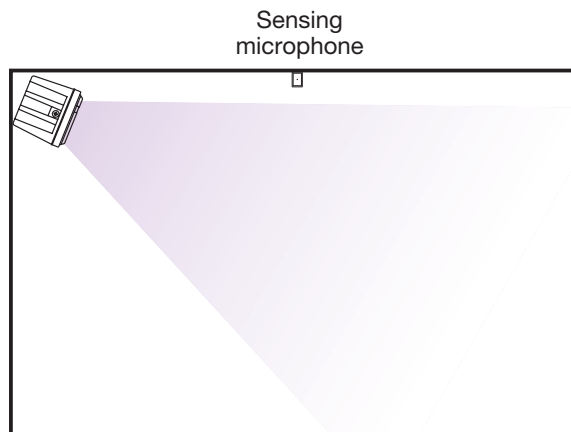


Incorrect placement

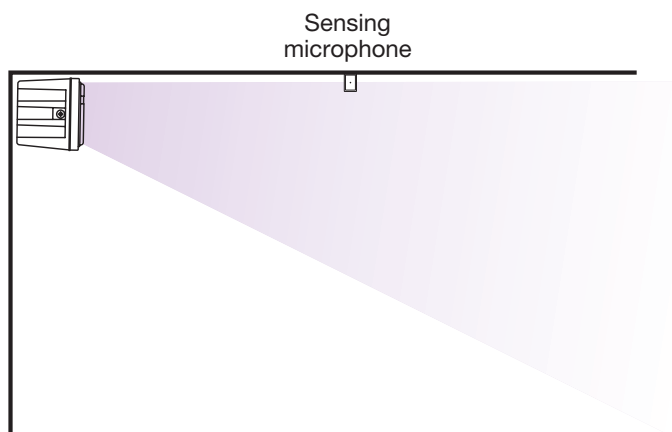


### Wall Surface

Correct placement



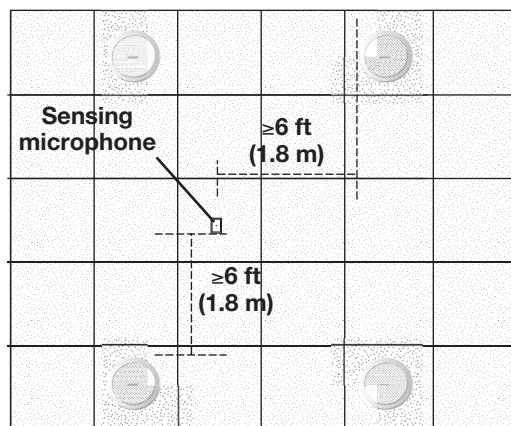
Incorrect placement



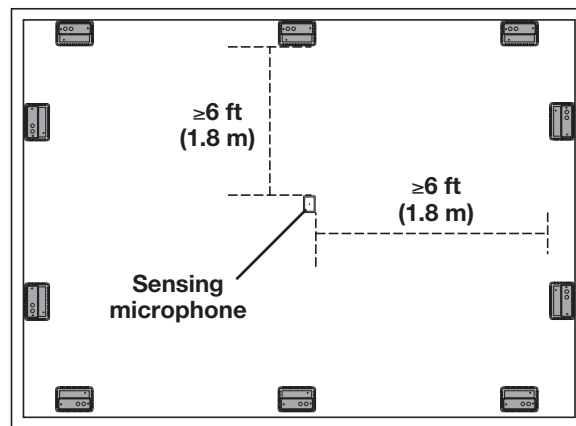
## 2.0 Designing with the E-4 System

When mounting sensing microphones, always maintain a distance of 6 feet (1.8 m) minimum between the microphone and the speaker.

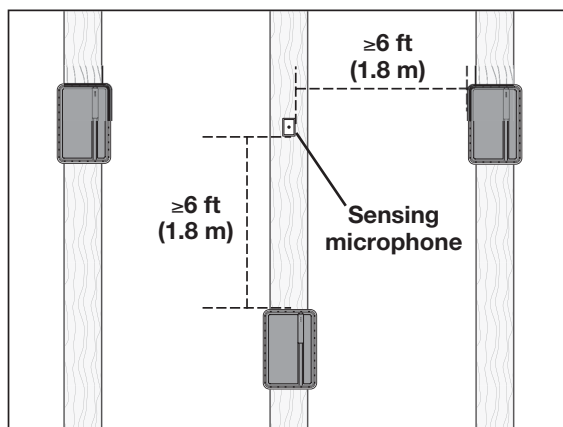
**Ceiling Flush**



**Wall Surface**



**Ceiling Surface**





## 2.0 Designing with the E-4 System

### 2.2.3 Step 3 – Determine volume control requirements

Decide which areas will have volume controls. Create a control map, such as the following, showing the types of controls that will be used, and the areas in which they will be installed.

	Auto Volume Interface 1	Auto Volume Interface 2	70/100V Volume Control 1	70/100V Volume Control 2
Area 1	●			
Area 2				●
Area 3		●		
Area 4			●	
Area 5			●	

Standard and Auto Volume interfaces are available for use with the E-4 hardware. Each offers control over source selection and volume. The Standard interface contains a Mute button, and the Auto Volume interface contains an Auto Volume on/off button. If you have identified an area that uses Auto Volume, you must use an Auto Volume interface to control this zone.

It is also possible to use 70/100V volume controls between the amplifier output and the speaker input. If you plan to use 70/100V controls, be aware that they cannot be used in zones where either Auto Volume or Dynamic EQ is used. Auto Volume and Dynamic EQ monitor the amplifier output and make adjustments accordingly. Using a 70/100V volume control would cause these functions to operate improperly.

When determining the placement or physical location of the controls, first think about how the control is used. If the control is very rarely used or it requires a secure location, it should be placed with the equipment. If the control is for an area that requires frequent adjustments, then it is best to place the control in the area being controlled.

### 2.2.4 Step 4 – Determine the speaker requirements

Determine the speaker coverage required for the design. Consider the following points as you do this:

- Each Auto Volume function requires a separate zone. Each Auto Volume zone requires the dedicated use of one E-4 output channel.
- Each type of actively equalized speaker requires the dedicated use of one E-4 output channel. If you are designing a system that uses actively equalized speakers, such as the 102®F speaker, Model 32, Model 32SE, or Model 8, you must dedicate one E-4 output channel for each speaker type. If you have a system that uses passive speakers, such as the FreeSpace 3® system, Model 16 or 302™A speaker, you can mix and match them on an E-4 output channel.

Create a speaker map, such as the following, and match the speaker models to areas (Speaker Qty x Tap = Zone Power required):

	Model 32SE	FreeSpace 3-I	Speaker Qty	Tap	Area Power
Area 1		●	2	50	100
Area 2	●		5	8	40
Area 3		●	1	50	50
Area 4	●		3	4	12
Area 5	●		6	8	48

## 2.0 Designing with the E-4 System

### 2.2.5 Step 5 – Determine the E-4 requirements

Once you have identified the areas that use Auto Volume and unique loudspeakers, you can combine different areas based on the types of sources and controls they are using.

Now we can take a look at how the maps we created can help us determine the quantity of E-4s we will need.

	Sources				Controls				Loudspeakers			
	1	2	3	4	AV1	AV2	VC1	VC2	M32SE	FS3	Total W	E-4 Ch.
Area 1	●		●		●					●	100	1
Area 2	●	●		●				●	●		40	2
Area 3	●		●			●				●	50	3
Area 4	●						●		●		12	4
Area 5	●						●		●		48	4

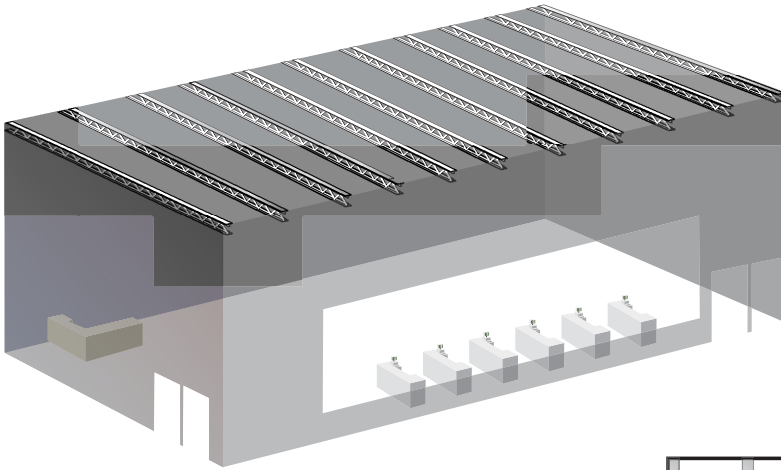
**Total System Power = 250W**

By combining the maps you can easily combine sources, speaker types, and control types. The information placed in this table suggests that Area 1 and Area 3 need to be grouped separately because they are Auto Volume zones requiring separate E-4 system outputs. Area 2 uses one standard volume control requiring one E-4 output channel. Areas 4 and 5 share a common volume control and can be combined on a third E-4 output channel. Since only four outputs are required and the total combined power requirement is less than 400W, only one E-4 unit would be needed for this system.

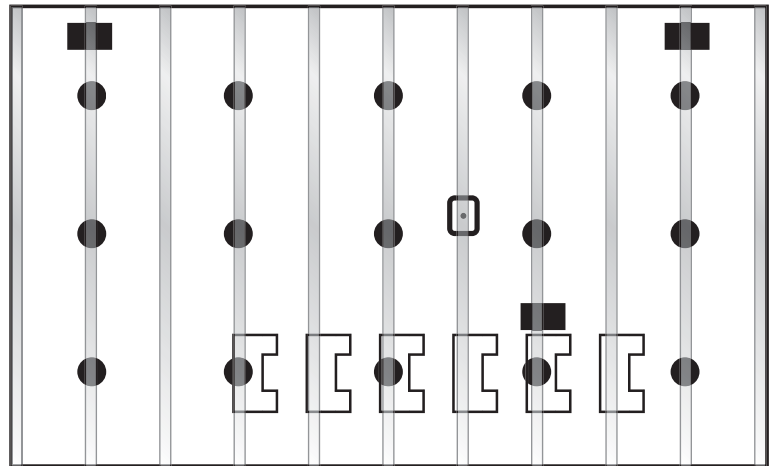
## 2.0 Designing with the E-4 System

### 2.3 Auto Volume layout examples

Large, open retail space with single music source

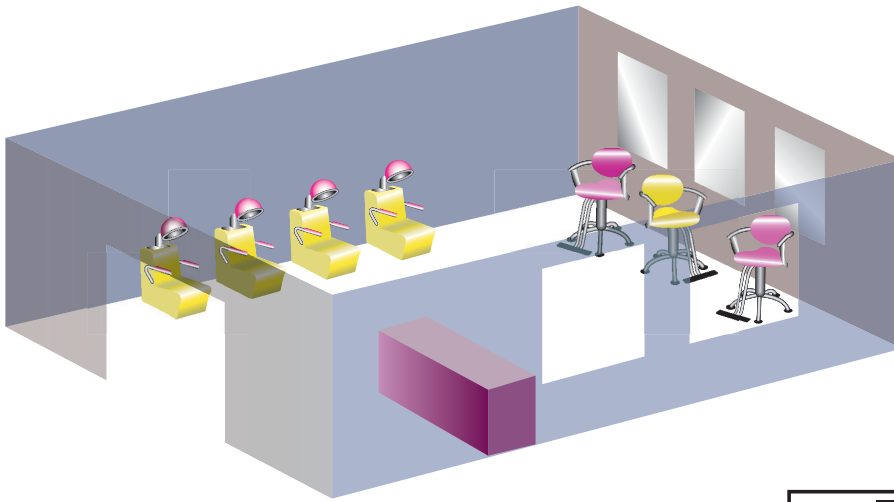


- FreeSpace® Acoustimass module
- Model 16 (pendant mounted)
- Sensing microphone

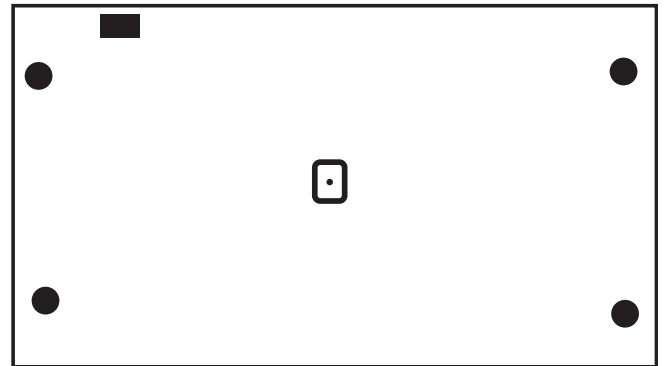


## 2.0 Designing with the E-4 System

### Hair salon (Small space with specific noise)

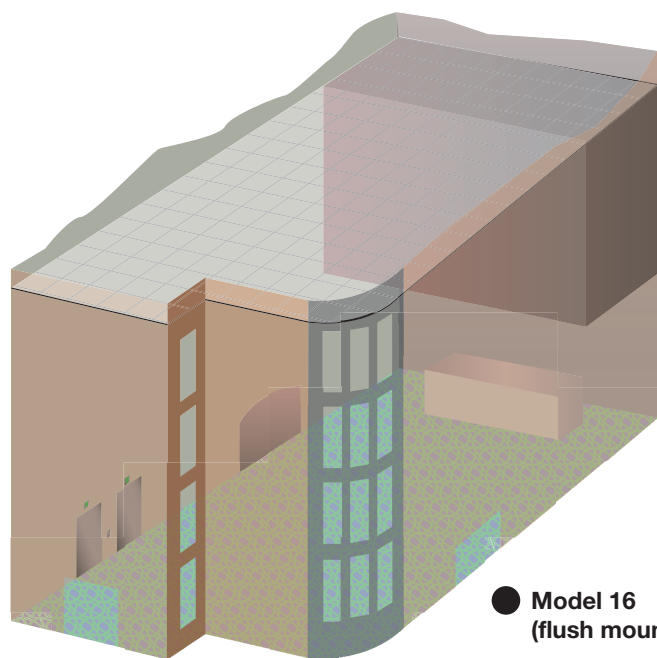


- ■ FreeSpace® 3 system
- Sensing microphone

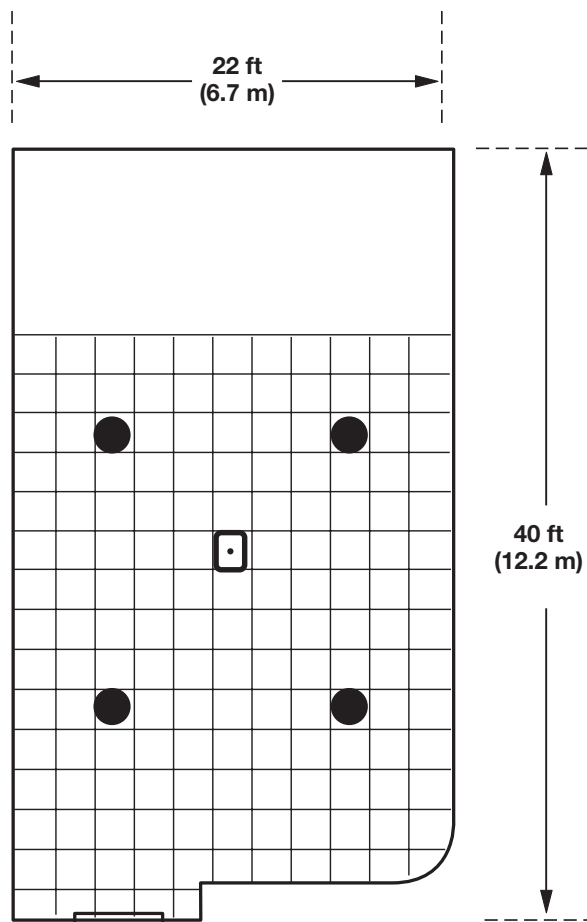


## 2.0 Designing with the E-4 System

### Hotel lobby



- Model 16 (flush mounted)
- Sensing microphone





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268134 AM Rev.01 JN31022