StudioComm for Surround

Model 65 Bass Manager

STUDIO TECHNOLOGIES INC.

# Model 65 Bass Manager

The Model 65 Bass Manager is designed to enhance the monitoring of multi-channel audio sources during the recording, mixing, mastering, and distribution process. The Model 65 is applicable for any multi-channel monitoring environment where some or all channels are not supported with loudspeakers having extended low-frequency response. Resources are included in the Model 65 to make it appropriate for cinema, music, and broadcast applications. The Model 65's design is oriented toward directly supporting 5.1-type applications. The five main channels are full bandwidth, and use the industry-standard designation of left, center, right, left surround, and right surround. The ".1" channel is designated as LFE, which is also referred to as low-frequency effects, "boom," or subwoofer. The LFE term originated in cinema formats but is now part of music and broadcast formats as well.


The overall goal of the Model 65 is very simple: Ensure that the entire audio bandwidth of all channels can be accurately monitored. Many loudspeaker systems have inherent low-frequency limitations, preventing a true picture of the source material from being presented. To overcome this, the low-frequency energy from the five main channels can be separated and then routed to one or more subwoofer loudspeakers. The Model 65 includes filters to accomplish this, providing a smooth and sonically pleasing crossover of signals being routed to the main and subwoofer loudspeakers.

The Model 65 also supports several format-specific parameters required for accurate LFE channel monitoring. To minimize digital bandwidth, some multi-channel formats restrict the frequency response of the LFE channel. To emulate this process, a low-pass filter can be inserted into the LFE signal chain. For compatibility with some cinema formats, gain can also be added to the LFE signal.

While the Model 65 is intended primarily for use in 5.1 applications, additional specialized features and capabilities are also included. This allows the unit to be configured to meet the needs of a broad range of monitoring applications.

## Main Inputs

The Model 65 contains five full-bandwidth input channels, which are intended for connection to left, center, right, left surround, and right surround sources. The electronically balanced inputs are compatible with balanced or unbalanced sources. Associated with each of the five main inputs is a crossover circuit, created by means of separate high- and low-pass filters. The filters are factory-configured to provide a crossover frequency of 80 Hz. The output of each high-pass filter is routed to the output circuit of its corresponding channel. The output of each low-pass filter can be individually assigned to subwoofer output 1, subwoofer output 2, or subwoofer outputs 1 and 2. To prevent level build up, the signal is attenuated 6 dB when assigned to both subwoofer outputs.

## LFE Input

The Model 65 contains an input channel that is specifically intended for connection to an LFE source. To simulate some multi-channel formats, a low-pass filter can be inserted, using a front-panel switch or remote control signal, into the LFE signal path. The filter, created by cascading four 2nd order low-pass sections, provides a 48 dB-per-octave slope with the –6 dB point at 120 Hz. To allow accurate monitoring of some formats, a front-panel switch allows 10 dB of gain to be added to the LFE signal. This ensures that the proper relative level is maintained between the LFE signal and the low-frequency energy derived from the main inputs. As with the main inputs, the LFE signal can be assigned to subwoofer output 1, subwoofer output 2, or subwoofer outputs 1 and 2.

### Outputs

The Model 65 provides five main and two subwoofer outputs. Each of the outputs is elec-tronically balanced and can be connected to balanced or unbalanced loads. To minimize the chance of loudspeaker damage, power up/power down mute relays are associated with each output. The nominal level of the five main outputs is +4 dBu, maintaining a unity gain input-to-output relationship. The two subwoofer outputs are handled somewhat differently, having nominal output levels of –6 dBu. This reduced operating level allows sufficient audio headroom when phase coherent signals from the main inputs are routed, by way of the low-pass filters, to the subwoofer outputs.

### Support for Two Subwoofers

As previously discussed, the outputs of the high-pass filters associated with the five main inputs are routed to the five main outputs. The outputs of the low-pass filters associated with the five main inputs, along with the LFE signal, can be assigned to either or both of the subwoofer outputs. The two subwoofer outputs allow flexibility when designing a loudspeaker system. A system could be configured to support subwoofers that are position-oriented, such as “sub left front” and “sub right front.” Or, the subwoofers could be configured according to program content, such has having subwoofer 1 handle only LFE information, while subwoofer 2 handles the low-passed signals from the main inputs.

### Bass Management Bypass

A Model 65 feature allows the bass management function to be disabled by means of a front-panel switch. This function can be useful, especially during the monitor system installation and room-tuning process. When the bypass function is enabled, the main input signals route directly to the main outputs. In addition, the outputs of the low-pass filters associated with the main inputs no longer route to either of the subwoofer outputs. However, when the bass management bypass function is active the LFE signal continues its normal flow to one or both of the subwoofer outputs.

### Remote Control

Three remote control functions are available: remote LFE low-pass filter, remote LFE mute, and remote subwoofer output mono. The remote control functions are specifically provided for use during the recording or mixing process. An effective installation could utilize foot switches or console-mounted buttons to allow easy operator access to the remote functions.

Remote control of the LFE low-pass filter allows real-time confirmation of LFE content. Some release formats require that LFE program content be band restricted. Under this condition, a valid audio mix would have no change in its sonic character when the LFE low-pass filter is activated.

When remote LFE mute is active, normal bass management operation continues, but the LFE signal is not routed to either of the subwoofer outputs. This function allows a direct check of the impact an LFE signal is having on an overall mix.

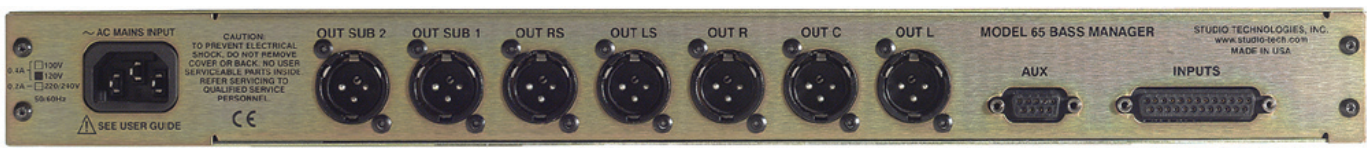
The remote subwoofer output mono function is provided to allow confirmation of the phase-coherency of the two subwoofer outputs. When the function is enabled, the subwoofer signals are combined (summed), attenuated by 6 dB, and fed to both subwoofers.

### Expansion Capability

Provision has been made to allow multiple Model 65 units to be easily interconnected. Using two units, ten main and two LFE inputs are supported, as well as providing ten main and two subwoofer output channels. For other special applications a virtually unlimited number of units can be interconnected.

### Flexibility

The Model 65 is designed to be used directly “out of the box,” providing effective bass management for most 5.1 applications. However, installation-specific requirements, along with the evolving world of multi-channel audio, make flexibility imperative. With the Model 65 you can use it “our way,” or easily perform a minor or major reconfiguration. A competent technician can field-adjust a number of key bass management parameters. The high- and low-pass filter frequencies associated with the main inputs can be individually adjusted. This allows the crossover frequencies to be configured on a channel-by-channel basis. While the



factory default crossover frequency is set for nominally 80 Hz, selecting an alternate crossover frequency, symmetrical or asymmetrical, is simple. To adjust any of these filters requires only changing resistors. Sockets are present in the Model 65's circuit board, eliminating the need to solder.

The high- and low-pass filters associated with the main inputs are implemented by cascading 2nd order Sallen-Key filter circuits. Jumpers on the Model 65's circuit board allow individual selection of 12 dB/octave or 24 dB/octave response. The factory-default configuration for the high-pass filters is 12 dB/octave, complementing the internal filters contained in many amplified loudspeaker systems. Other speaker systems may benefit from the use of the 24 dB/octave setting. In addition, a third jumper position allows the input signal to be directly routed to the output. This "flat" selection supports loudspeaker systems that already contain filters to provide the desired high-pass response. As for the low-pass filters, the factory configuration is 24 dB/octave, supporting the needs of many subwoofer loudspeakers. Alternately, the 12 dB/octave settings can be used to match the Model 65 with other monitor systems.

## Installation

The Model 65 mounts in one space of a standard 19-inch rack. Mains input voltage is factory selected for 100, 120, or 220/240 V, 50/60 Hz, operation. The Model 65's input connector is directly compatible with Studio Technologies' StudioComm for Surround Model 68 Central Controller. The channel layout arrangements of the two systems are identical, making interconnection simple. Other input sources are easily interfaced using wiring compatible with the industry-standard 25-pin connection scheme. The seven out-puts connect to the monitor amplifiers, or amplified loudspeakers, using standard 3-pin XLR-type cables. Each Model 65 also contains a 9-pin D-subminiature connector. Pins on this "D-sub" are used to provide access to the remote control functions as well as link multiple Model 65s.

## Specifications

**Audio Inputs:** 6

**Type:** electronically balanced, compatible with balanced or unbalanced signals

**Impedance:** 24 k ohms

**Nominal Level:** +4 dBu

**Main Input Channel High-Pass Filters:** 5

**Type:** two cascaded 2nd order Sallen-Key; factory configured for 12 dB/octave; field configurable for flat, 12, or 24 dB/octave response

**Response:** –3 dB @ 80 Hz, nominal, 12 dB/octave; –6 dB @ 80 Hz, nominal, 24 dB/octave; field configurable

**Main Input Channel Low-Pass Filters:** 5

**Type:** two cascaded 2nd order Sallen-Key; factory configured for 24 dB/octave; field configurable for 12 or 24 dB/octave response

**Response:** –3 dB @ 80 Hz, nominal, 12 dB/octave; –6 dB @ 80 Hz, nominal, 24 dB/octave; field configurable

**Main Input Channels to Subwoofer Outputs:**

**Overall Gain:** –10 dB, nominal

**Routing:** subwoofer output 1, 2, or both; assigning to subwoofer outputs 1 and 2 implements 6 dB additional attenuation; factory default routing to subwoofer output 1

**LFE Input Channel to Subwoofer Outputs:**

**Overall Gain:** –10 or 0 dB, nominal, switch or remote control selectable

**Routing:** subwoofer output 1, 2, or both; assigning to subwoofer outputs 1 and 2 implements 6 dB additional attenuation; factory default routing to subwoofer output 1

**LFE Input Channel Low-Pass Filter:**

**Type:** four cascaded 2nd order Sallen-Key sections; 48 dB/octave (8th order)

**Response:** –6 dB @ 120 Hz, nominal, field configurable

**Operation:** switch or remote control selectable, on/off

**Audio Outputs:** 7

**Type:** electronically balanced, direct coupled, intended to drive balanced or unbalanced loads of 600 ohms or greater

**Output Impedance:** 50 ohms, nominal

**Nominal Level, Main Channels:** +4 dBu

**Nominal Level, Subwoofer Channels:** –6 dBu

**Maximum Output Level:** +27 dBu into 10 k ohms, +26 dBu into 600 ohms

**Frequency Response:** 20 Hz-20 kHz ±0.1 dB, measured with bass management bypassed

**Distortion (THD+N):** 0.005%, measured at 1 kHz, +4 dBu

**S/N Ratio:** 85 dB, ref +4 dBu out

**Crosstalk:** 78 dB, ref +4 dBu in

**Remote Control Inputs:** 3

**Functions:** remote LFE low-pass filter, remote LFE mute, remote subwoofer output mono

**Type:** +5 V logic, activates on closure to system common

**Expansion Capability:** allows multiple Model 65s to be directly interconnected; user-created interface cable required

**Connectors:**

**Audio Inputs:** 1, 25-pin D-subminiature female

**Audio Outputs:** 7, 3-pin XLR-type male

**Aux (Remote Control/Expansion):** 1, 9-pin D-subminiature female

**AC Mains:** 1, 3-blade IEC-type

**AC Mains Requirement:** 100, 120, or 220/240 V, ±10%, factory configured, 50/60 Hz, 12 W

**Dimensions (Overall):**
19.00 inches wide (48.3 cm)
1.72 inches high (4.4 cm)
6.65 inches deep (16.9 cm)

**Mounting:** one space in a standard 19-inch rack

**Weight:** 7.0 pounds (3.2 kg)

Specifications subject to change without notice.

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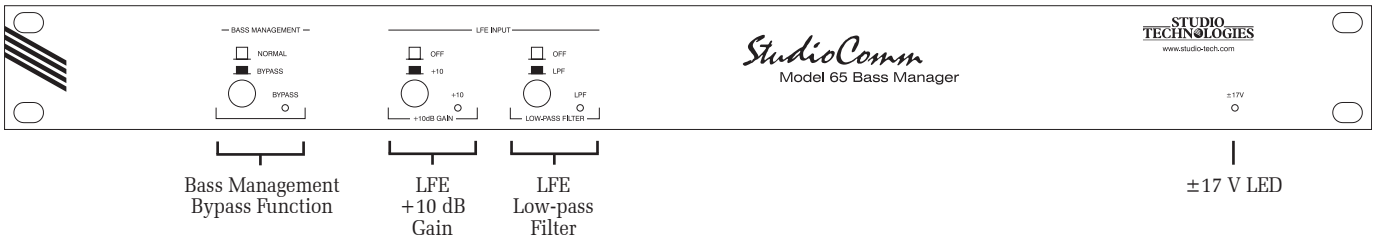
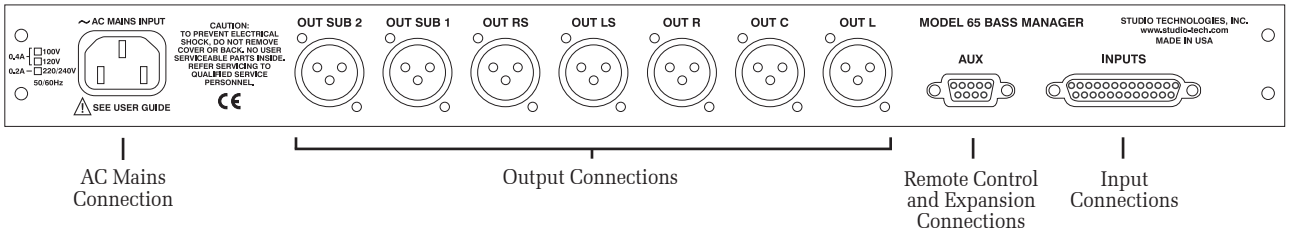
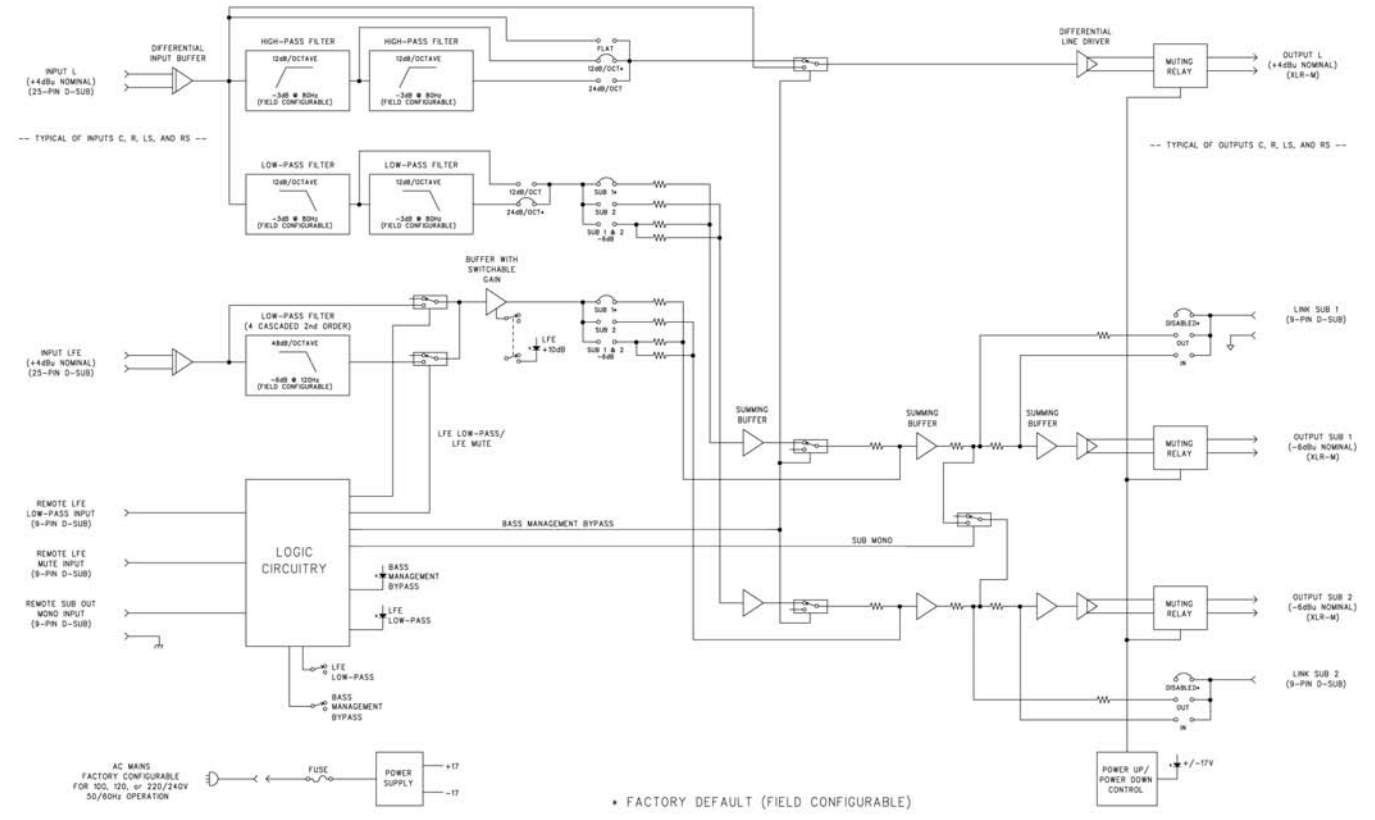
### Model 65 Bass Manager Front Panel




### Model 65 Bass Manager Back Panel




### Model 65 Bass Manager Block Diagram

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