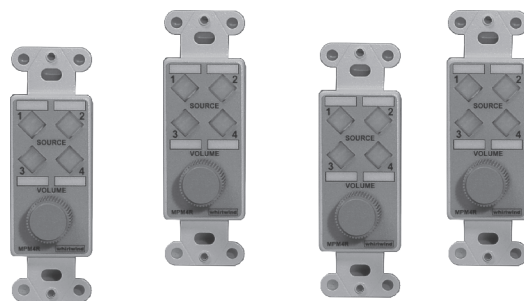


MPM4

FOUR ZONE MUSIC AND PAGING MANAGER



INTRODUCTION

Thank you for selecting the MPM4 music and paging manager. This high quality, versatile device can be used in countless applications to provide comprehensive control of multiple audio sources and distribute them to four separate locations. Features include four stereo inputs for audio connection of CD and MP3 players, radio tuners, TV receivers and DVD players, etc.; four priority inputs which allow paging and automatic music override for announcements or a jukebox, and four mono output zones with balanced and unbalanced connections. A four-band equalizer is provided on each input and output for enhancing the overall sound of the system. The simple and intuitive front panel displays the source routing to each zone with metering to indicate signal levels and presence. Front panel pushbuttons and volume controls, or a remote control in each zone, make source selection and level adjustments easy and convenient. Occupying two rack spaces and designed for continuous operation, the MPM4 includes all the features necessary to operate most multi-zone sound system installations in night clubs, sports bars, health clubs, offices, restaurants or anywhere paging and/or priority inputs are required.

FEATURES

- Simple, convenient controls are easy to use
- Four mono output zones, independently controlled
- Four source inputs assignable from the front panel
- Four priority inputs for paging and audio insertion to each zone
- Separate 4-band EQ on each source input, priority input and zone output
- Input trim gain stages for matching input levels
- Optional remote control of source selection and volume in each zone
- Password protected installation settings
- No computer required for setup or operation

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TABLE OF CONTENTS

Architects Specifications	2	Setup Modes Description	8
Factory Reset Initialization	2	Typical Setup Procedure Guide	9
Operational Summary Reference Guide	3	Block Diagram	10
Normal Mode System Description	4	Theory of Operation	10
Setup Mode Password Access	5	Specifications	12
Rear Panel Description	6	Warranty	12

ARCHITECTS SPECS

The unit shall be a monaural four zone audio routing matrix. Each zone shall have a front panel volume attenuator, controlling both balanced XLR and unbalanced RCA output jacks. There shall be an eleven segment LED meter and a clip LED to monitor the audio output level. The unit shall have four stereo source inputs, via unbalanced RCA jacks, summed to mono and assigned to the zones through a front panel four by four switching matrix. Routing assignments shall be made by an "input first" or "zone first" selection method and illuminated LEDs shall display the active connections. The unit shall have, additionally, four mono priority audio inputs whose signal can override or mix with source inputs in any zone to which the priority input is assigned. The priority inputs shall have a cascading hierarchy. Priority Input 4 shall be overridden by Priority 3, both 3 and 4 overridden by Priority 2, and Priority 1 overrides all others that are assigned to the same Zone. The priority inputs shall have balanced female XLR and TRS, and unbalanced RCA connections. Input select, pad and ducking switches shall be provided on each priority input. The unit shall provide connection to optional remote control accessories for volume and source selection.

The unit shall use digital signal processing to provide functions of input audio level trim on all eight inputs, maximum output level setting on all four outputs, twelve four band equalizers, priority signal output gain and zone assignment with ducking, LED meter monitoring of all functions, four by four source routing matrix, and four zone volume attenuators. All functions shall be adjusted and controlled through front panel controls and rear panel switches. A password lockout feature shall be available to prevent unauthorized alteration of system setup functions. The unit shall store all system settings in non-volatile EEPROM.

The unit shall be standard rack mount, 19" wide 3.5"(2RU) high, with a depth of 10" behind the rack mounting ears. The unit shall operate with 100 to 250 VAC 50/60Hz and be fan cooled. The unit shall be model MPM4.

FACTORY RESET INITIALIZATION

In the event of moving the MPM4 from one installation to another, it may be desirable to return the settings of the unit to their factory default condition. Disconnect the power from the unit and locate the two-pin shorting jumper on the back of the display circuit board behind the LED matrix inside the MPM4. (See diagram on page 5.) Remove the jumper plug and push it onto the Factory Reset pins #1 and #2 located on the three-pin reset header to the left. Apply power, wait for the turn on sequence to complete and remove power. Return the two-pin jumper plug to it's storage pins. This will restore the following initial factory settings.

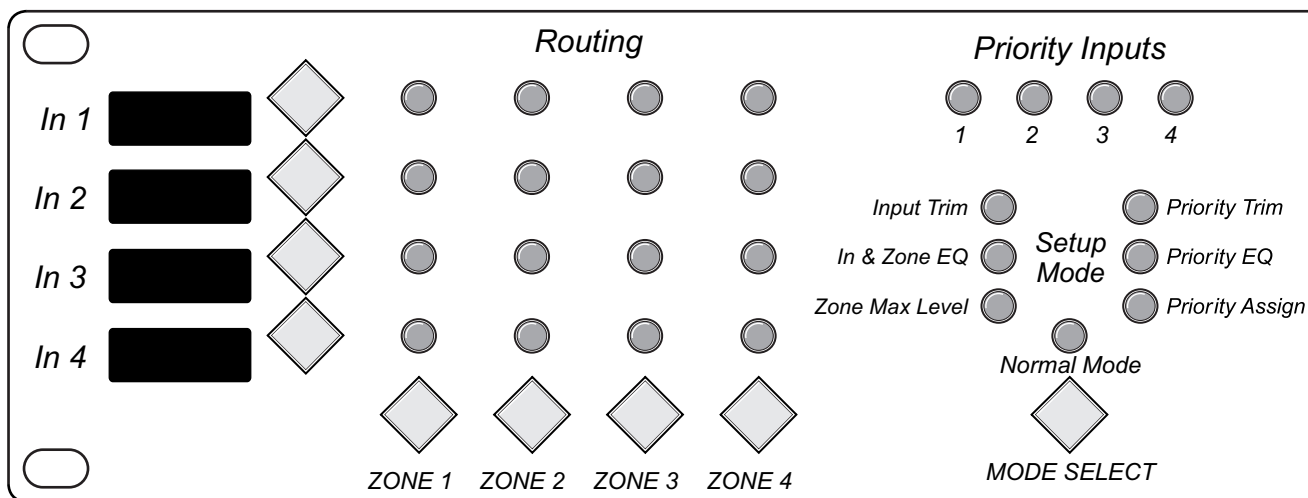
Input Trim Controls	Minimum	Password	Unlocked, Set to (Z1,Z2,Z3,Z4)
In and Zone EQ Controls	Flat	Zone Volume Controls	Maximum
Zone Max Level Controls	Minimum	Source Inputs to Zone Outputs	No Routing Assignments
Priority Trim Controls	Minimum	Priority Assign Controls	No Assignments, Minimum Level
Priority EQ Controls	Flat		

MPM4 NORMAL MODE CONTROL SUMMARY

MODE	MATRIX AREA ACTIONS	ENCODER/METER AREA ACTIONS
NORMAL MODE	There are two methods to assign an input to an output, Input First or Zone First. Press an 'In' button first and it will light. Then press all 'Zone' buttons that you want that input assigned to. Repeat for other inputs. Press the lit input to exit this mode. Press a 'Zone' button first and it will light, then press an 'In' button to assign it to that Zone. This also disconnects any other input assigned to that Zone. Press the lit Zone to exit this mode. The matrix LEDs light to show assignments.	Encoders act as Zone Master Volume Attenuators. The Meters display output level into each Zone normalized to Zone Max Level. Clip LED monitors zone output or the active input to the Zone. Control Range -80dB to 0dB Meter Range -36dB to +12dB
PRIORITY ACTIVE MODE	An incoming priority signal lights the corresponding Priority Input LED. Routing LEDs in the Zones that have this Priority Input assigned to them flash while the Priority Input is active. Any Source Input routed to this Zone is affected by the setting of the rear panel Ducking Level switch. Multiple Priority Inputs assigned to the same Zone operate with cascading hierarchy within that Zone.	Same as normal mode, except for Priority Input 1 and 2 Zone Level Override switches On. In this case their audio is sent directly to the Zone at the Zone Max Level setting and the Volume Controls are inactive. Control Range -80dB to 0dB Meter Range -36dB to +12dB

MPM4 SETUP MODE CONTROL SUMMARY

SETUP	MATRIX AREA ACTIONS	ENCODER/METER AREA ACTIONS
PASSWORD ACCESS	To gain access to Setup Mode, press and hold the Mode Select button until the In and Zone buttons on the left illuminate. Enter the password code sequence on them and then press and release the Mode Select button. To change the password, simultaneously push and release the Zone 1, Zone 4 and Mode Select buttons. Push the desired combination of buttons and enter it by pushing the Mode Select button, which will begin flashing. The password sequence must be correctly repeated and entered with the Mode Select button to validate it.	Encoders act as Zone Master Volume Attenuators. The Meters display output level into each Zone normalized to Zone Max Level. Clip LED monitors zone output or the active input to the zone. Control Range -80dB to 0dB Meter Range -36dB to +12dB
INPUT TRIM MODE	All four 'In' buttons light and stay on until mode is exited. It is not possible to assign anything in this mode	Encoders are input level controls for source inputs 1-4. Meters measure preamp outputs. Clip LED monitors source input only. Control Range -20dB to +20dB Meter Range -36dB to +12dB
IN & ZONE EQ MODE	The flashing 'In' or Zone button indicates which 4 band Equalizer is active through the encoders.	Encoders become four band EQ controls. Meters show the amount of cut or boost. Center LED is flat. Clip LED monitors zone output or the active input to the zone. Control Range -15dB to +15dB Meter Range -15dB to +15dB
ZONE MAX LEVEL MODE	Assign the loudest desired Source or Priority Input to the Zone and set the maximum level by optimizing the output gain of the MPM4 to the inputs of the zone power amps.	Encoders are output gain stage controls for each Zone. Meters show output level. 0 LED is 0dBv at the XLR. Clip LED monitors Zone Output or the active Input to the Zone. Control Range -60dB to +20dB Meter Range -36dB to +12dB
PRIORITY TRIM MODE	All four 'In' buttons flash while this mode is active. It is not possible to assign anything in this mode. Line level inputs will require the rear panel Pad switches to be on.	Encoders are input level controls for Priority inputs 1-4. Meters measure preamp outputs. Clip LEDs monitor Priority Inputs only. Control Range 0dB to +60dB Meter Range -36dB to +12dB.
PRIORITY EQ MODE	The flashing 'In' button indicates which Priority Input 4 band Equalizer is active through the encoders.	Encoders become four band EQ controls. Meters show the amount of cut or boost. Center LED is flat. Clip LED monitors zone output or the active input to the zone. Control Range -15dB to +15dB Meter Range -15dB to +15dB
PRIORITY ASSIGN MODE	The flashing 'In' button designates which Priority Input has been activated and can be assigned to any or all Zones by pressing the 'Zone' buttons. While that Input is active, its level can be set in any Zones that it has been assigned to. In unassigned zones the Control Position Indicator LED is set to minimum. Select other Priority Inputs and repeat the assignment and level setting process.	Encoders are level controls for the active priority input into the zones that it is assigned to. The meters display output level into each zone normalized to zone max level. Clip LED monitors Zone Output or the active Input to the Zone. Control Range -20dB to +20dB Meter Range -36dB to +12dB



NORMAL MODE SYSTEM DESCRIPTION

The MPM4 takes advantage of its comprehensive setup functions to provide the system operator with a simple and intuitive set of controls for selecting audio sources and setting system volumes in any of the four output zones.

Normal Mode

On the left side of the control surface is the Routing section with pushbuttons for each of the four Source Inputs on the left side and each of the four Zone Outputs across the bottom. The Matrix of green LEDs displays the current Input to Output signal connections. Only one In may be assigned to any Zone at a time. Assignments can be made in one of two ways, by first selecting an Input or first selecting a Zone.

Input First

Depress any In button and it will light. This input can now be assigned to any Zone by depressing the desired Zone buttons. Pushing the Zone button a second time will disconnect the In from that Zone. Depress other In buttons for further connections. Depress the lit button a second time to exit this mode.

Zone First

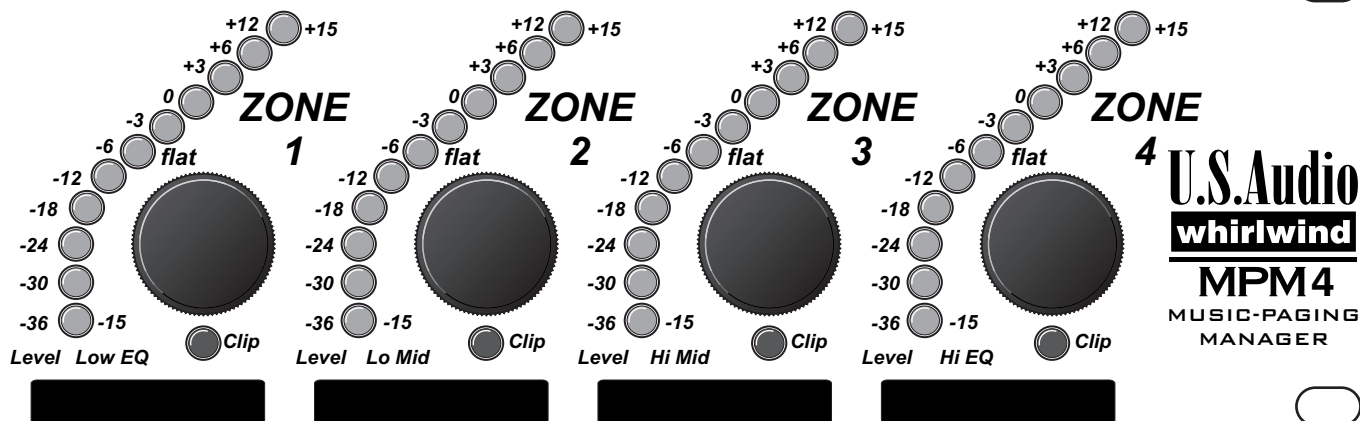
Depress any Zone button and it will light. Any In can now be assigned to this Zone by depressing the desired In button. Pushing the In button a second time will disconnect it from that Zone. Depress other Zone buttons for further connections. Depress the lit button a second time to exit this mode.

On the right side of the control surface are the Level Meters and Volume Controls for adjusting the level in the four Zones. The Level Meters monitor the current amplitude of the audio, relative to the Zone Maximum Level that was preset in the Setup procedure. The Volume Controls, in Normal Mode, are signal attenuators with a range of 0dB to 80dB of attenuation. Turned all the way up, the output level of the MPM4 is determined by the setting of the Zone Max Level control. (See Setup Mode.) When the Volume Controls are moved, the LED meter display dims and a single LED showing the relative position of the Control illuminates brightly. Under each Volume Control is a Clip LED that displays signal clipping at the Zone Output or of any input assigned to that Zone Output.

In the center of the control surface are the Priority Input LEDs and the Setup Mode LEDs. The Setup Mode LEDs are off in Normal Mode.

Priority Active Mode

Priority Inputs replace, or mix with, the Source Inputs in any Zone to which they are assigned. When a Priority Input signal is received, the corresponding Priority Input LED illuminates. The Routing Matrix LEDs in the Zones that have this Priority Input assigned to them flash while the Priority Input is active. Any Source Input routed to this Zone is affected by the setting of the corresponding rear panel Ducking Level switch. There are four Priority Inputs that operate with cascading hierarchy within each Zone. Priority Input 4 is overridden by Priority 3, both 3 and 4 are overridden by Priority 2, and Priority 1 overrides all others that are assigned to the same Zone. Typical Priority Inputs could be prerecorded announcements, a particular music source, such as a jukebox, or a paging microphone. Paging microphones used with the MPM4 should have an ON/OFF switch.



SETUP MODE PASSWORD PROTECTION ACCESS

The MPM4 is equipped with a lockout function to prohibit unauthorized modification of the system setup parameters. Setup Mode is accessible to the system installer in new units and the Mode Select button is illuminated to indicate this condition. A default password sequence (Zone 1, Zone 2, Zone 3, Zone 4) is encoded in the unit, but only becomes effective when the Mode Select button is held in for four seconds, which activates the password and denies access to the Setup mode. The Mode Select light goes out and only Normal Mode is available to the system operator.

Unlocking Setup Mode

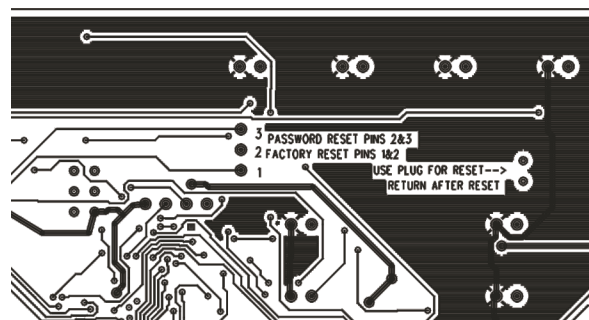
To gain access to Setup Mode, press and hold the Mode Select button until the In and Zone buttons on the left illuminate. Enter the password code sequence on them and then press and release the Mode Select button. The Routing display will blink once if the correct code sequence has been entered, and the Mode Select button will illuminate to indicate that the Setup Mode functions are unlocked. Entering an incorrect code will return the MPM4 to Normal Mode.

Changing the Password

Custom passwords can be created by the system installer to protect the settings of the Setup Mode. Passwords can be from 0 to 8 characters long and are created from pushing a pattern of the In and Zone buttons.

To change the password, simultaneously push and release the Zone 1, Zone 4 and Mode Select buttons. The In and Zone buttons on the left all illuminate. Push the desired sequence of buttons and then activate it by pushing the Mode Select button, which will begin flashing. The password sequence must then be correctly repeated, followed by pushing the Mode Select button to validate it. Successful reentry will cause the Routing display to flash twice and the Mode Select button to be fully illuminated. An incorrect verification sequence will cause the MPM4 to exit the Password Change mode. Setup Mode is still accessible and the previous valid password is still recognized by the MPM4.

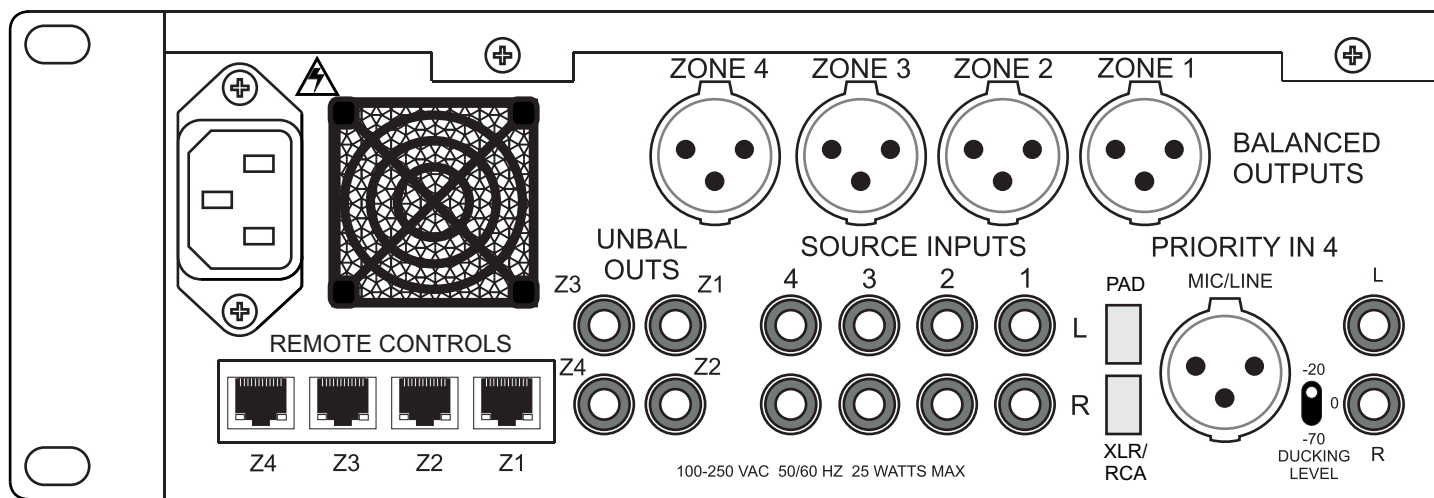
In the event Setup Mode adjustments are required and the password is unknown, it is possible to reset the MPM4 back to the default password. Disconnect the power from the unit and locate the two-pin shorting jumper on the back of the display circuit board behind the LED matrix inside the MPM4. Remove the jumper plug and push it onto the Password Reset pins #2 and #3 located on the three-pin reset header to the left. (See diagram.)



RESET JUMPER VIEW

CAUTION: CONFIRM POSITION OF THE JUMPER PLUG BEFORE REPOWERING WHEN DOING A PASSWORD RESET. IF THE PLUG IS MISTAKENLY PUT ONTO THE FACTORY RESET PINS #1 AND #2, ALL SYSTEM SETTINGS WILL BE RESET TO FACTORY DEFAULTS AND THE CURRENT SETUP WILL BE LOST.

Apply power, wait for the turn on sequence to complete and remove power. Return the two-pin jumper plug to its storage pins. The password is now reset to (Zone 1, Zone 2, Zone 3, Zone 4) and Setup Mode is automatically unlocked.



REAR PANEL CONNECTIONS AND SWITCHES

Source Inputs

The Source Inputs 1,2,3 and 4 are stereo RCA unbalanced jacks, which feed signal to the front panel routing switches. Maximum signal level is +24dB. The Left and Right signals are summed together and the mono signal is distributed to the Zone Outputs.

Unbalanced Outputs

The Unbalanced Outputs are mono RCA jacks that always provide an unbalanced version of the output signal at the balanced XLR jacks. Maximum output level is +16dB.

Balanced Outputs

The Balanced Output jacks are male XLR, pin 2 positive, that deliver the master output signal to the sound system amplifiers. Signal is line level and mono. Maximum output level is +22dB.

Cooling Fan

The Fan is installed to pull clean air into the chassis through the attached filter and exhaust through perforations in the sides of the unit. The filter helps keep the inside of the MPM4 clean and should be removed and washed periodically to maintain optimum performance. Ensure that airflow to the fan and side vents is not restricted.

AC Inlet

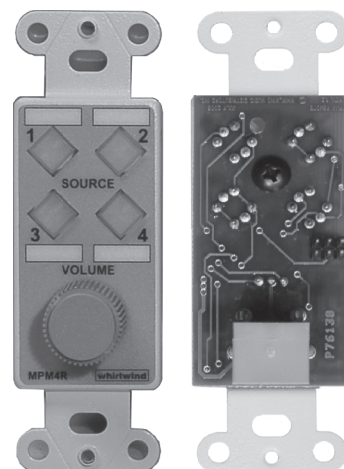
The universal IEC inlet connects to the incoming AC line to the Power Supply. The MPM4 operates with 100-250VAC and is rated at 25 Watts. All settings of the MPM4 are saved in non-volatile memory through power cycling. The MPM4 powers up with the same settings that it had when power was removed. All settings are recorded ten seconds after any control change is made.

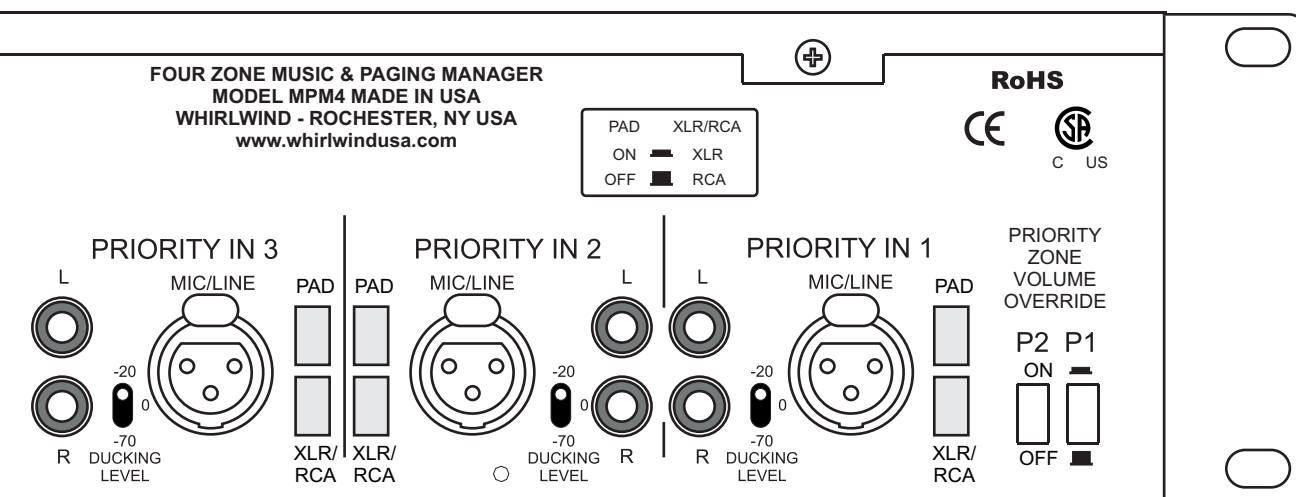
Remote Controls

The Remote Control Connections allow optional MPM4R remote control accessory plates to be used for source selection and volume control. One MPM4R can be placed in each zone using CAT5 cable up to 1500' from the MPM4 master unit. Connectors are 8 pin RJ45 plugs on both ends wired straight through. The MPM4R uses all eight wires in the cable.

MPM4R REMOTE CONTROLS

MPM4R remote control units allow the user to select any of the four Source Inputs and control the audio volume in each Zone without having to access the main MPM4 unit. One MPM4R can be used in each of the four Zones. Connections between the MPM4R and the main unit are made through RJ-45 jacks using CAT 5 wire. Cable length can be as long as 1500 feet. MPM4R remote controls use a Decora style insert plate for easy installation in standard electrical boxes.





Priority Inputs

The MPM4 has four Priority Inputs for the insertion of paging, music, announcement or other audio signals into the Zone Outputs. The audio from the Priority Inputs is added to or replaces Source Input audio in any Zone to which the Priority Input is assigned. The Priority Inputs assigned within each Zone have a cascading hierarchy with signal input on P3 muting P4; input on P2 mutes P3 and P4; and input on P1 mutes all three.

The MIC/LINE female XLR Input accepts balanced mic or line signals with levels up to +24dB. Phantom power is automatically supplied at +15VDC to power most commercial condenser microphones. Paging mics with ON/OFF switches are recommended to prevent the Priority Input from triggering accidentally.

The stereo RCA Inputs accept unbalanced line audio up to +24dB. The Left and Right signals are summed together and the mono signal is distributed to the Zone Outputs.

The DUCKING LEVEL Switch sets the amount of volume reduction of the Source Input in the Zone Outputs when the Priority Input is active. In the 0 position, the source signal and the priority signal are mixed together with no change in the source signal level. At -20 the source signal is reduced by 20dB and at -70 the source signal is effectively turned off leaving only the priority audio signal.

The XLR/RCA Switch selects which input connector feeds audio to the priority signal chain.

The PAD Switch attenuates the incoming audio of either the XLR or RCA inputs by 20dB. This is useful for controlling high level signals that could clip the electronic preamp stages.

The PRIORITY ZONE VOLUME OVERRIDE Switches select how the Priority Input signals from P1 and P2 are delivered to the Zone Outputs. In the OFF condition, the audio from all four Priority Inputs is delivered to the Zone Outputs identically: prior to the current setting of the Zone Volume Controls. This means that the priority signal level will be no louder than the current setting of the Volume Control in each Zone. When the Override switches are on, the Priority Input 1 and 2 audio is fed to the Zone Outputs at the level determined by the setting of the Zone Max Level. This bypasses the current setting of the Zone Volume Control and sets the Ducking Level of any Source Input to 70dB, regardless of the Ducking Level switch position.

SETUP MODE SYSTEM DESCRIPTION AND USER INTERFACE

The MPM4 is a powerful, feature-filled audio router and controller. Using the available control functions, the system installer can make all the adjustments necessary to provide a transparent, simple audio manager for the system operator. Once the system has been properly adjusted, a password lockout code can be enabled to protect the setup from unauthorized alterations. Parameters that can be adjusted include:

Source Input Level Trim. By trimming all of the Source Inputs to the same level, the volume in the zones remains uniform when switching between them. The Trim level adjustment range is $\pm 20\text{dB}$ in 1dB steps. Each encoder detent equals 1dB.

Source Input EQ. A four-band equalizer with a $\pm 15\text{dB}$ range of adjustment is available on each Source Input for optimizing its sound. The Lo Mid center frequency is 600Hz and the Hi Mid is 2.5kHz. These are peaking filters. The Low and Hi frequency bands are shelving types with different characteristics in boost or cut mode. The Low EQ boost curve is a shelving type filter with a nominal roll-off frequency of 80Hz. The Low EQ cut curve has a 12dB per octave slope with a sliding roll-off frequency. As the amount of cut is increased, the frequency shifts upward. Nominal frequency points are 20Hz to 250Hz. The Hi EQ boost curve is a shelving type filter with a nominal roll-off frequency of 8kHz. The Hi EQ cut curve has a 12dB per octave slope with a sliding roll-off frequency. As the amount of cut is increased, the frequency shifts downward. Nominal frequency points are 15kHz to 2.5kHz. The EQ Controls make changes in 1dB increments that are displayed on the Control Position Indicator LEDs. Each 1dB detent in the Control corresponds with a change in the display providing precise adjustment throughout the $\pm 15\text{dB}$ range.

Zone Output EQ. A four-band equalizer is available on each of the mono Zone Outputs. The range of all four bands is $\pm 15\text{dB}$. The Lo Mid and Hi Mid are peaking filters with frequency centers at 250Hz and 1.6kHz. The Low and Hi are shelving filters with corner frequencies of 20Hz and 10kHz. The Lo Mid frequency control peaks at 250Hz, which enhances upper bass in ceiling/wall mount type speakers. The Hi Mid frequency control was chosen at 1.6kHz to enhance voice frequencies. The EQ Controls make changes in 1dB increments that are displayed on the Control Position Indicator LEDs. Each 1dB detent in the Control corresponds with a change in the display providing precise adjustment throughout the $\pm 15\text{dB}$ range.

Zone Max Level. An appropriate maximum volume for the listening environment can be established by setting the audio level going to each Zone Output. This feature allows the installer to determine the maximum level of all audio inputs into each zone by coordinating the output gain of the MPM4 to the inputs of the Zone power amps. This is an analog final output gain stage with 20dB of gain and 60dB of attenuation, adjustable in 1dB steps. Each encoder detent equals 1dB. Unity Gain is at the 0 position of the Control Position Indicator LED. Output gain, in conjunction with the of gain and attenuation in the Input Trim controls and the Priority Assign function allow manipulation of the signal levels to achieve balance throughout the system.

Priority Input Level Trim. The audio level at the Priority Inputs can be adjusted to compensate for varying output levels from different types of sources. The Trim level adjustment range is 0dB to +60dB. Each encoder detent equals 1dB. The available gain is used to increase paging mic signals to line level. Line level inputs will require the use of the Input Pad. This is activated by pushing the rear panel switch associated with each Priority Input.

Priority Input EQ. A four-band equalizer with a $\pm 15\text{dB}$ range of adjustment is available on each Priority Input for optimizing its sound. The Lo Mid center frequency is 600Hz and the Hi Mid is 2.5kHz. These are peaking filters. The Low and Hi frequency bands are shelving types with different characteristics in boost or cut mode. The Low EQ boost curve is a shelving type filter with a nominal roll-off frequency of 80Hz. The Low EQ cut curve has a 12dB per octave slope with a sliding roll-off frequency. As the amount of cut is increased, the frequency shifts upward. Nominal frequency points are 20Hz to 250Hz. The Hi EQ boost curve is a shelving type filter with a nominal roll-off frequency of 8kHz. The Hi EQ cut curve has a 12dB per octave slope with a sliding roll-off frequency. As the amount of cut is increased, the frequency shifts downward. Nominal frequency points are 15kHz to 2.5kHz. The EQ Controls make changes in 1dB increments that are displayed on the Control Position Indicator LEDs. Each 1dB detent in the Control corresponds with a change in the display providing precise adjustment throughout the $\pm 15\text{dB}$ range.

Priority Assign. This feature assigns the Priority Inputs to the Zone Outputs, using the Input First method, and sets the level of each channel of priority audio within each zone. The Routing Matrix is used to make the assignments and the rotary controls are used to set the priority level relative to the Source Inputs. The adjustment range is $\pm 20\text{dB}$ in 1dB steps. Each encoder detent equals 1dB. In unassigned zones, the Control Position Indicator LED on the level controls is set to minimum. Priority Input 1 and Priority Input 2 have an extra switch on the rear panel that allows the Priority Input signal to bypass the current setting of the Zone Volume Controls. With the switches on, Priority Input 1 and 2 audio is sent directly to the Zone Outputs at the level determined by the Zone Max Level setting and all other inputs will be ducked to -70dB regardless of the position of the Ducking Switch.

TYPICAL SETUP PROCEDURE

Installation Tip

To facilitate the most expedient setup experience, it may be desirable to do the initial setup with the MPM4 unit physically in each Zone. If a paging mic is to be used in the zone, that wire can be used with adapters to send the output of the MPM4 back to the power amps in the system equipment location. Pulling a shielded audio pair along with the CAT 5 wire for the remotes would also make this possible. After the initial setup and EQ with the paging mic in each Zone, the MPM4 can be installed in the equipment location and each input adjusted as required.

System Startup

Connect the power amplifiers to the speakers and to the Zone Outputs of the MPM4. LEAVE THE POWERS AMPS OFF. Connect a known reference audio source to one of the Source Inputs. Apply power to the MPM4, turn the Zone Volume Attenuator Controls fully up and enter the Setup Mode. If the Mode Select switch is not illuminated, press and hold it for approximately four seconds to enter the Password Unlock function. Enter the password and press the Mode Select switch again. The switch should illuminate and allow selection of the various Setup Mode functions. Select the Input Trim mode and turn all four level controls down to minimum. Check the settings of the In and Zone EQ, adjust them to flat if they are not. Enter the Zone Max Level mode and adjust the Volume Controls to minimum. Turn on the power amps and turn their input levels up to a desired starting position. Turn on the reference audio source, select Input Trim and set the input level of the to a nominal level, about -6dB. Return to Zone Max Level mode, select the Source Input and slowly bring up the Volume Control for each Zone toward unity gain as indicated by the Control Position Indicator LED. Unity Gain is at the Flat or -6, position. Adjust the amplifier input controls to establish an initial appropriate volume for the coverage area. Use the Zone EQ to optimize the speakers to the listening area. Turn off the Source Input audio.

Priority Setup

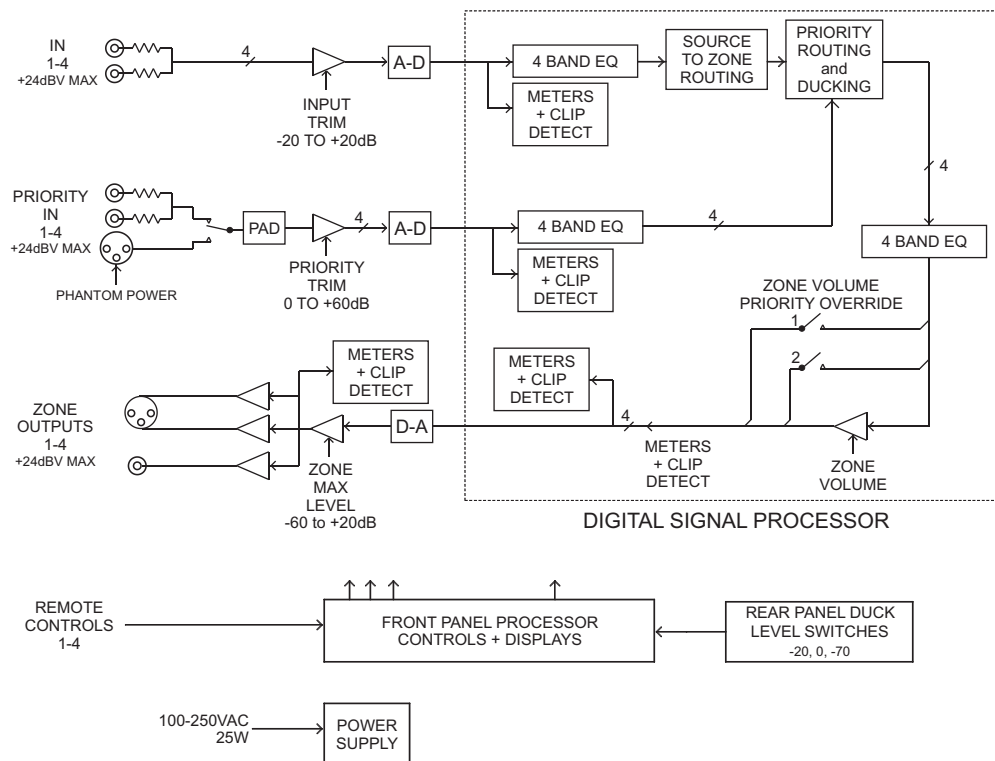
Priority Inputs replace the Source Inputs in any Zone to which they are assigned. The maximum system volume required by the listening environment should be determined by the most important audio source to be heard in each Zone. This could be from a prerecorded announcement, a particular music source or a paging microphone. If a paging microphone is to be used, the system gain structure should be adjusted to optimize the operation of the paging function. For this installation a paging mic is plugged into Priority Input 1. All paging microphones used with the MPM4 should have an ON/OFF switch.

Select the Priority Assign mode and clear all Priority Assignments (all Routing LEDs off) in the desired Zone. Assign Priority In 1 to the Zone and set the level control to minimum. Connect the paging mic to Priority Input 1. Select the XLR with the XLR/RCA switch and switch the Pad Off. Depress the Priority Zone Level Override P1 switch to On. Select Priority Trim Mode and turn on the mic. Adjust the Priority Trim level, leaving enough headroom to avoid clipping with maximum level peaks. Return to Priority Assign mode and make sure that the In 1 Switch is flashing. Slowly bring up the Volume Control in the desired Zone until the microphone audio is at a moderate level. Go to Priority EQ mode and make sure that the In 1 Switch is flashing. The sound of the microphone can be optimized with the 4-band equalizer.

Fully optimizing a paging mic involves properly structuring the gain stages of the MPM4. It is desirable to have a paging mic that operates only when spoken directly into and not be triggered by ambient noise. The Priority Trim gain stage is before the Priority Threshold Trigger. This allows adjustment of the trigger level required to activate the Priority Input. In the Priority Assign mode, the Volume Controls set the level of the Priority Input signal feeding into the Zone Max Level gain stage. Balance the gain between these two stages to achieve adequate headroom and sufficient system drive level. If a hotter drive signal is desired from the MPM4, select Zone Max Level and boost the signal above unity. This process establishes Zone Max Level and all other inputs can now be set up in relation to it.

Source Inputs can be added and balanced at a lower volume. Turn off the Priority Zone Level Override P1 switch on the rear panel. Return to Normal Mode and reduce the Zone Volume Controls. Assign Source Inputs to the desired Zones. Select Input Trim and the turn up the controls from minimum to set the balance of the Source Inputs using the paging mic level as a reference. Other Priority Inputs can be added by balancing the Priority Trim levels with the Priority Assign Volumes to achieve the proper system volume hierarchy. Only the Priority Input being optimized should be routed to that Zone during setup. Use the Input EQ and Priority Input EQ to enhance the sound of each source. With line level signals, the idle noise level (like a jukebox with no music playing) must be well below the fixed detector threshold of -30dB to prevent false triggering.

MPM4 SIGNAL FLOW



THEORY OF OPERATION

The U.S. Audio / Whirlwind MPM4 is designed to present the user with a simple and intuitive analog style interface while employing state of the art digital signal processing for implementation of the signal path. Audio interfacing and user interaction is familiar and easy to use no computer is required, and the digital processing assures precision, consistency and the ability to perform functions that would be difficult or impossible with analog circuitry alone. For the following discussion, it may be useful to refer to the "MPM SIGNAL FLOW" diagram.

Audio Inputs

The Line Level input connections combine the left and right signals into a single mono channel. After buffering, signal passes through a digitally controlled gain amplifier. This provides gain or attenuation to allow normalizing the audio level prior to the Analog to Digital conversion. This assures that the input maintains a wide dynamic range over a range of audio levels up to +24dB maximum. The device used for Level Trims is made by Burr Brown and features precision, very low distortion and minimal noise.

Priority Inputs

Priority inputs are universal, they can accept microphone or line level signals, balanced or unbalanced up to a level of +24dB. The balanced microphone preamp features a discrete transistor front end with digitally adjustable gain. This is followed by a digitally controlled gain amplifier for precise level trim. A 20dB pad is provided to handle line level signals, and the XLR input features 15V phantom power.

Zone Outputs

After conversion from the Digital domain to the analog domain, the output signals pass through a digitally controlled gain amplifier, followed by output buffers. As with the Audio Inputs, the device used for Level Trims is made by Burr Brown. The XLR and RCA outputs use separate buffers. This allows both outputs to be used simultaneously without concern for loading.

Digital Signal Processor

The Whirlwind MPM4 features an Analog Devices SHARC processor. This processor features very high performance and allows the use of 32 bit floating point representation of audio signals. This assures that there is no degradation of audio signals as a result of digital processing. Any artifacts are kept well below the noise levels already present in the source signals.

DSP Metering and Clip detectors

Level detection is done within the DSP and provides accurate and consistent level metering and perfect matching between channels and measurement points. Clip detectors use separate level detectors with very fast response to allow clip detection that recognizes even the shortest periods of clipping. Note that in normal mode, the Zone clip detectors will display not only output clipping, but also any input clipping that is routed to the Zone indicated. This is especially useful during setup. Any clipping that occurs will be displayed and, the operator may then select Input Trim or Priority Input Trim modes to see if they are the sources of clipping.

DSP Input Equalization

By the application of digital filters for equalization, the MPM4 achieves perfect matching and repeatability of equalization that cannot be achieved with analog filters. The equalization curves are modeled after analog equalizers to give the smooth response expected from analog equalizers.

DSP Output Equalization

The output equalizers are similar to the input in design, yet with different curves. The curves chosen for the output are models of the analog equalization in Whirlwind's acclaimed MPM1. The bass curve is especially effective for adding bass to small speakers such as those used typically in ceilings.

DSP Source To Zone Routing

Source to Zone routing behaves like a selector switch for each Zone to select the chosen input. Unlike a simple switch, the MPM4 always switches signals with fades instead of hard switching. This removes any artifacts such as clicks or pops when a different input is selected.

DSP Priority Chain

The Priority handling of the MPM4 is one of the features that makes the system unique and versatile. Each Priority is handled separately and independently. Higher priority inputs will duck both input sources as well as lower priority signals. Zones that are not selected for a given priority remain unaffected when a priority is active. Lower numbered Priorities have the highest priority. The ducking hierarchy is:

P1 > P2 > P3 > P4 > Program Source

so that higher priority inputs duck the program source and any lower priorities that are active when the higher priority occurs.

DSP Priority Signal Detection

Signal level detection for Priority Inputs is independent of the signal detectors used for clipping and level detection. This allows different time constants, optimized for each application to be used in each of the signal detectors.

DSP Priority Ducking

When a Priority input becomes active, any program signal present (or lower active priority signal) is faded down quickly and smoothly to the duck attenuation level where it remains while the priority is active. When the Priority becomes inactive, the ducked signal returns slowly and smoothly back to its level prior to ducking. The delay and slow release means there will be no chattering or other artifacts as a result of the Priority switching off, even when the priority itself may turn on and off due to the source not changing cleanly, for example, noises due to handling a microphone after an announcement.

DSP Priority Gating

Priority Inputs with levels below their threshold of being active are gated off. This keeps any noise from the Priority Input sources from bleeding to the outputs. If, during setup, the installer desires to hear un-gated Priorities, this may be done in Priority Assign mode. In Priority Assign, the selected Priority Input is forced on, and, other priorities are forced off. This means that the Priority signal is routed through to the outputs un-gated.

DSP Priority Output Levels and Priority Override

Priority Levels may be adjusted in Priority Assign mode to set the level of each channel of priority audio within each zone relative to the Source Inputs. When Priority Zone Level Override has been turned on for P1 or P2, the Zone Volume Controls are bypassed and inactive, but Zone Max Level is still in effect.

Remote Control

The MPM4 provides Remote control inputs for each of its four zones. A low power 12V source is provided for each Remote. Communication to the remotes is handled with half duplex communication over RS485 at 9600 baud. The protocol for communicating with remotes is proprietary. The main unit polls each of the remotes and waits for a response. Remotes never initiate communication. This very conservative design allows the remotes to work with a range of up to 1500 ft of CAT-5 cable.

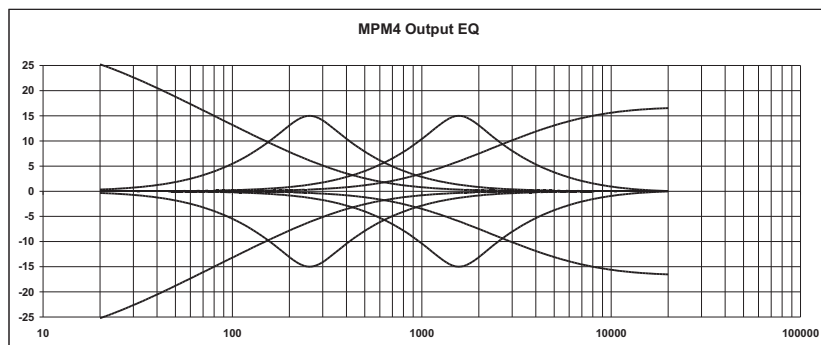
Non-Volatile Settings Memory.

The MPM4 employs a small EEPROM to store front panel settings in the event power is lost. When the unit sits with no interaction for a period of time, it checks to see if any controls have changed since the last time settings were saved. If changes have occurred, the new settings are saved in the EEPROM.

The EEPROM is divided into 2 regions, system and user. As described, the MPM4 saves user settings whenever there are changes and an inactivity period times out. These are stored in the user memory region. The second region is used only for storing setup parameters and is only written to when the installer locks the unit. The concept is that the system region is used infrequently, where as the user region is used as frequently as every time the user changes a zone source or level. EEPROMs have a limited life. However, even with the user region frequency of writes, it is expected that the EEPROM will last 30 years minimum. In the event that there is a failure reading from the user region, the system will load the last settings saved in the system region. This assures that the system will always have a set of useful settings to use on power up.

Power and Thermal

The MPM4 employs a universal input switching supply. This allows the system to operate over a wide variety of power voltages, 100 to 250VAC. This supply also produces less heat because of its efficiency as well as reducing weight compared to a non-switching supply. A 2-speed fan is employed to assure that the system remains cool. At room temperature with no signals present, the fans will generally remain off, or at low speed. For most environments and applications, the fan will only need to run at its low speed. In high ambient temperatures, the high-speed mode may activate. Keeping the system in a cool environment and keeping the fan inlets and vent openings unobstructed helps assure a long uninterrupted service life for the MPM4.

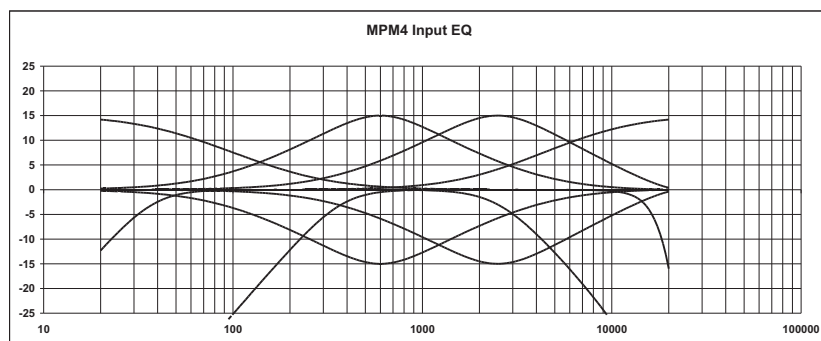


Equalizer Bands

Low Frequency
Lo Mid Frequency
Hi Mid Frequency
High Frequency

Zone Output

20Hz
250Hz
1.6kHz
10kHz



Equalizer Bands

Low Frequency
Lo Mid Frequency
Hi Mid Frequency
High Frequency

In and Priority In

80Hz boost, variable cut
600Hz
2.5kHz
8kHz boost, variable cut

SPECIFICATIONS

Frequency Response

20Hz to 20kHz All I/O

20Hz to 20kHz +/- 0.25dB

Input Impedance

IN 1-4

Priority In RCA, Pad ON

Priority In RCA, Pad OFF

Priority In XLR, Pad ON

Priority In XLR, Pad OFF

10k Ohms

5.3k Ohms

10k Ohms

2.2k Ohms

3.4k Ohms

Maximum Input Level

IN 1-4

Priority In RCA, Pad ON

Priority In RCA, Pad OFF

Priority In XLR, Pad ON

Priority In XLR, Pad OFF

+24dBV

+22dBV

+8dBV

+24dBV

+4dBV

Common Mode Rejection

Priority In XLR, Pad Off

60dB

Crosstalk

Any 2 outputs

-89dB

Output Impedance

RCA

XLR

100 Ohms

200 Ohms

Maximum Output Level

RCA

XLR

+16dBV

+22dBV

Priority Ducking

Threshold (from 0dB on Meter)

Ducking Release Time

-30dB

4 seconds

Dynamic Range

0dBV In, 0dBV Out

Noise Level Out

Dynamic Range:

-82dBV

98dB

Equivalent Input Noise

In 1-4(Z source 150 ohms)

Priority In, XLR Pad Off

Priority In, RCA Pad Off

-98dBV

-125dBV

-119dBV

THD

In 1-4, 20Hz - 20kHz

Priority In

Less than .01%

Less than .01%

Clip Indicator

Illuminates 1dB below 0dBfs

Encoder Control Range (1dB/detent)

Zone Volume Controls

Input Trim Controls

Priority Trim Controls

Priority Assign Level Controls

Zone Max Level Controls

All EQ Band Level Controls

-80dBV to 0dBV

+/-20dBV

0dBV to +60dBV

+/-20dBV

-60dBV to +20dBV

+/-15dBV

AC Voltage Requirement

100-250VAC 50/60Hz

Power Consumption

Less than 25W

Size

Width

Height

Depth

19" (483mm)

3.5" (89mm)

10" (254mm) behind ears,
1" (25.4mm) in front of ears

Weight

10.2 lbs (4.63kg)

WARRANTY

This product is guaranteed to be free from defects in materials and workmanship to the original purchaser for a period of 5 years from the date of purchase. Should service be required, return the unit postage prepaid along with the original sales receipt to:

Whirlwind
Attention - Repair
99 Ling Road
Rochester, New York 14612

The warranty on this product shall not apply to defects or damage resulting from abuse, abnormal use or from repairs or modifications performed by anyone other than Whirlwind. If it is determined a manufacturing defect has occurred, Whirlwind will repair or replace the unit at our option and pay the postage back to you.