



MM 42

PERSONAL MONITOR PROCESSOR



IMPORTANT SAFETY INSTRUCTIONS



1. Read these instructions.
 2. Keep these instructions.
 3. Heed all warnings.
 4. Follow all instructions.
 5. Do not use this apparatus near water.
 6. Clean only with a dry cloth.
 7. Do not block any ventilation openings. Install in accordance with manufacturer's instructions.
 8. Do not install near any heat sources such as radiators, registers, stoves, or other apparatus (including amplifiers) that produce heat.
 9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
 10. Protect the power cord and plug from being walked on or pinched particularly at plugs, convenience receptacles, and the point where it exits from the apparatus.
 11. Only use attachments and accessories specified by Rane.
 12. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
 13. Unplug this apparatus during lightning storms or when unused for long periods of time.
 14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
 15. The plug on the power cord is the AC mains disconnect device and must remain readily operable. To completely disconnect this apparatus from the AC mains, disconnect the power supply cord plug from the AC receptacle.
 16. This apparatus shall be connected to a mains socket outlet with a protective earthing connection.
 17. When permanently connected, an all-pole mains switch with a contact separation of at least 3 mm in each pole shall be incorporated in the electrical installation of the building.
 18. If rackmounting, provide adequate ventilation. Equipment may be located above or below this apparatus, but some equipment (like large power amplifiers) may cause an unacceptable amount of hum or may generate too much heat and degrade the performance of this apparatus.
 19. This apparatus may be installed in an industry standard equipment rack. Use screws through all mounting holes to provide the best support.
- WARNING:** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture. Apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

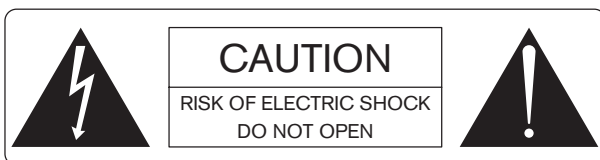
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CAUTION: Changes or modifications not expressly approved by Rane Corporation could void the user's authority to operate the equipment.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

WARNING



To reduce the risk of electrical shock, do not open the unit. No user serviceable parts inside. Refer servicing to qualified service personnel.

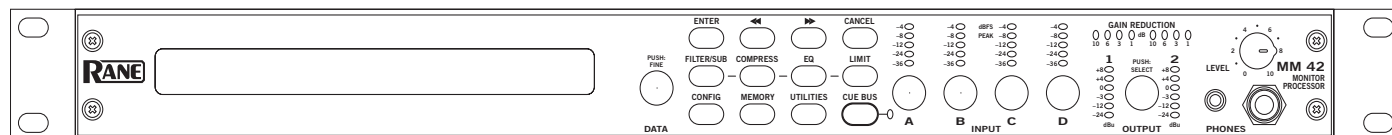
The symbols shown below are internationally accepted symbols that warn of potential hazards with electrical products.



This symbol indicates that a dangerous voltage constituting a risk of electric shock is present within this unit.



This symbol indicates that there are important operating and maintenance instructions in the literature accompanying this unit.



Quick Start

We know you're excited about the purchase of your new MM 42. But trust us: take your earphones out for a moment and read this Quick Start. It covers the basics to get you tweaking your ear mixes into submission in no time. The following paragraphs assume you're working with a stereo (left/right) mix. For more advanced applications you'll have to dig a bit deeper into this manual.

First, the hardware. Connect the console aux/groups corresponding to the left and right ear mixes to the MM 42's **LINE INPUT A** and **LINE INPUT B** respectively. Send the MM 42 a good, healthy signal, aiming to keep the loudest peaks around the **-8 dBFS** mark (yellow LEDs) on the **INPUT meters**. Running the Inputs "into the red" is only cool with old-school analog gear. If needed, make further adjustments using the **INPUT** controls.

Turn the **PHONES LEVEL** all the way down and plug your earphones or headphones directly into either the 1/4" or 1/8" **PHONES** jack. Slowly turn up the **PHONES LEVEL** to a comfortable listening volume. Not hearing anything? Press the **CUE BUS** button.

Press the **COMPRESS** button and use the Previous ◀ and Next ▶ cursor keys to navigate to the **M-BAND** page. Rotate the **DATA** control clockwise until **SET** starts flashing. Don't panic; instead, press the **ENTER** key to go to the Crossover Frequency page. Adjust the frequency splits for each range, pushing and turning the **DATA** control to make fine adjustments. Press the **ENTER** or **COMPRESS** key to return to the Compressor page. Adjust the **THRESH** parameter until you see a few blinky lights on the **GAIN REDUCTION** meter. Press the **COMPRESS** button again to move on to band 2, and again to move to 3, merrily making adjustments. No, you're not hallucinating — the **GAIN REDUCTION** meter does indeed switch automatically to show you what's happening within each frequency band.

Okay, if you're comfortable with getting around the various pages then the dry run is over. If you're using a wireless transmitter, connect the MM 42's main **OUT 1** and **OUT 2** to the inputs of the transmitter and adjust the transmitter's input gain to a nominal level. If you're using a hardwired beltpack, connect the MM 42's main Outputs directly to the beltpack inputs, making sure the beltpack level is turned all the way down. Plug your earphones into the beltpack and *slowly* turn its level up to a comfortable listening volume.

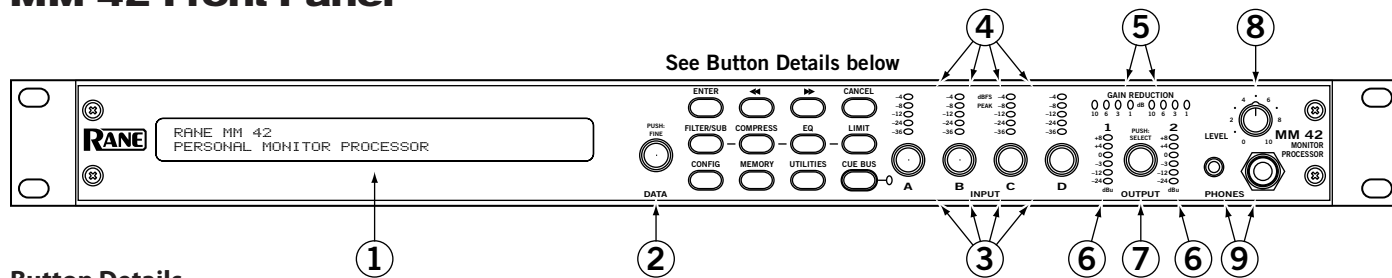
That's it! You're ready to rock. Or folk. Or country. Or polka....whatever your musical style. Tweak each processing section to taste, making sure you go to the **MEMORY** page once satisfied and store your hard work to one of the 16 available (preset) locations.

There's plenty more you can do with the MM 42. The rest of this manual covers important topics like using the SUB Output to augment an earphone mix with onstage subwoofers or "shakers", handling two independent mono mixes with one MM 42, linking and unlinking parameters, connecting multiple MM 42s together via the Cue Bus, and the wonderful world of MIDI, just to name a few. So don't stop here — keep reading! You still have 3 hours until show time.

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MM 42 Front Panel

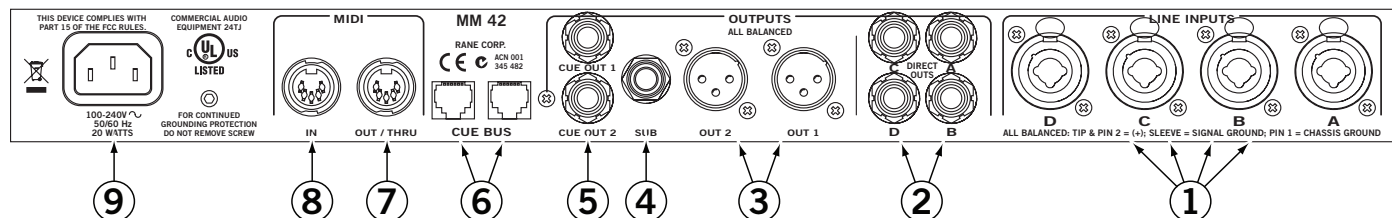


Button Details

- **ENTER:** Press this button to confirm flashing selections.
- **◀ ▶ Cursor buttons:** The Previous ◀ and Next ▶ buttons move the cursor through each of the parameter fields on a page. Alternately, push and release the DATA (2) control to “bump” from one field to the next. The currently selected parameter field is always displayed with either an underscore or with “<” and “>” brackets.
- **CANCEL:** Exits the current edit page and displays the welcome page. Also used to abort various operations.
- **FILTER/SUB:** Displays the edit pages for the Filter and Subwoofer sections.
- **COMPRESS:** Displays the edit pages for the 3-band Compressor.
- **EQ:** Displays the edit pages for the 5-band Parametric Equalizer.
- **LIMIT:** Displays the edit pages for the 3-band Limiter.
- **CONFIG:** Displays the edit page for Input and Output routing.
- **MEMORY:** Displays the edit page for storing and recalling Memories (Presets).
- **UTILITIES:** Displays the edit pages for Cue Bus Configuration, Gain Reduction Meter, MIDI Configuration, MIDI Transfer, Name Device and Firmware Update functions.
- **CUE BUS:** Activates the selected Output(s) on the Cue Bus for soloing purposes. The CUE BUS indicator lights when the Cue Bus is active.

- ① **Edit Pages:** The 2x40 backlit LCD screen displays the edit pages for all MM 42 functions.
- ② **DATA control:** Adjusts the currently selected parameter. Turning the DATA control clockwise increases the parameter, and turning it counterclockwise decreases the parameter. Push and turn the DATA control for fine adjustment of some parameters. The DATA control can also be “bumped” (push and release) to move the cursor between parameter fields.
- ③ **INPUT Level controls:** are digital trims to adjust each of the four Input gains.
- ④ **INPUT Meters:** are peak-reading, showing input headroom in dBFS. 0 dBFS equals +24 dBu.
- ⑤ **GAIN REDUCTION Meters:** Show the amount of gain reduction being applied to the currently selected Compressor or Limiter band, or the overall Compressor + Limiter gain reduction. (Depends on the currently selected Meter Mode. See the Gain Reduction Meter Mode section on page Manual-15 for details).
- ⑥ **OUTPUT Meters:** Averaging (rms) meters showing output level in dBu.
- ⑦ **OUTPUT Level.** Digital trim adjusts the main output levels. Also selects Outputs for cueing and editing in 2-Mono mode.
- ⑧ **PHONES Level.** Analog trim adjusts level of front panel PHONES jacks.
- ⑨ **PHONES jacks.** Stereo ¼" and ⅛" jacks allow direct connection of headphones or earphones to monitor the CUE BUS.

MM 42 Rear Panel



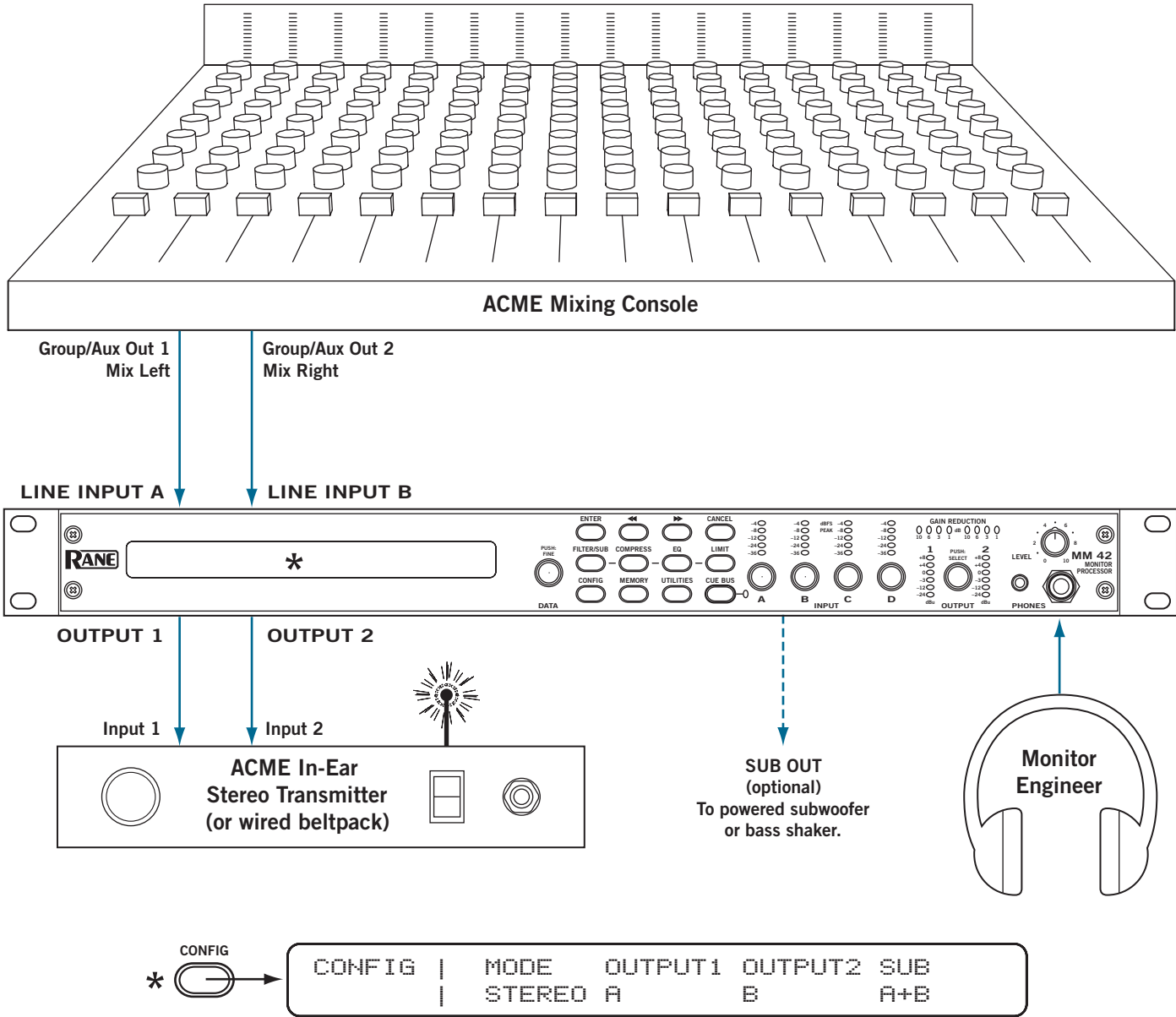
- ① **LINE INPUTS A through D:** Accept balanced or unbalanced, ¼" phone or XLR-style line-level inputs.
- ② **DIRECT OUTS A through D:** are active balanced pass-throughs of corresponding Line Inputs. Use the DIRECT OUTS to daisy-chain common mixes to multiple MM 42s.
- ③ **Main OUTPUTS:** Balanced, line-level, XLR connections for OUT 1 and OUT 2. Wiring convention is pin 2 positive, pin 3 negative (return), pin 1 is shield chassis ground. Refer to the *Sound System Interconnection* RaneNote (included with this manual) for correct wiring when connecting to unbalanced destinations.
- ④ **SUB Output:** is balanced (tip-ring-sleeve). Connect to a subwoofer, amp/speaker combination or tactile “shakers” to add low-end thump to ear mixes. Refer to the *Sound System Interconnection* RaneNote when connecting to an unbalanced destination.
- ⑤ **CUE OUT 1 and 2:** is a balanced (tip-ring-sleeve), line-level Cue Bus Output. Connect to a spare transmitter or console inputs to monitor the Cue Bus signal. Signal is identical to the front panel PHONES jacks. The Cue Out level is not affected by the Phones Level control.
- ⑥ **CUE BUS jacks:** are RJ12 (telephone-style) for interconnecting multiple MM 42s for cueing (soloing) purposes.
- ⑦ **MIDI OUT/THRU jack:** Incoming MIDI data is automatically merged with outgoing MIDI data and passed to the OUT/THRU if MIDI Merge mode is set to ON (see page Manual-15).
- ⑧ **MIDI IN jack:** Connect this input to the output of another MIDI device (sequencer, controller, MIDI-equipped PC, another MM 42, etc.) to accommodate data transfers, firmware updates, and external control.
- ⑨ **Power connector:** Uses the standard cord provided. The MM 42 has a universal internal switching power supply that accepts 100 to 240 VAC at 50 to 60 Hz, allowing it to work in most countries.

Connection Examples

The MM 42 is intended to be connected in-line between a mixing console and a wireless transmitter, hardwired beltpack or headphone amplifier.

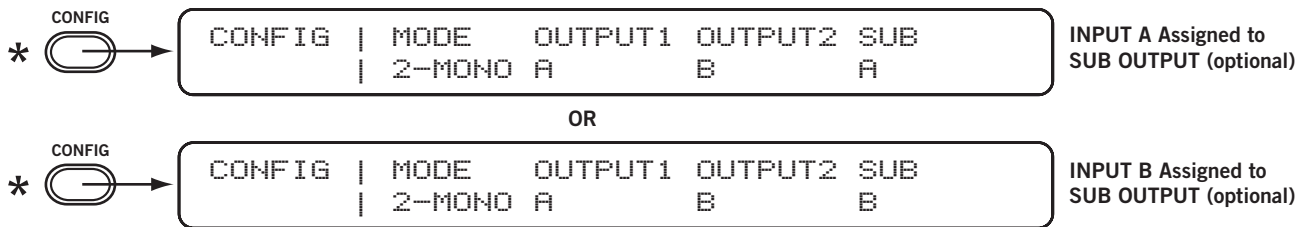
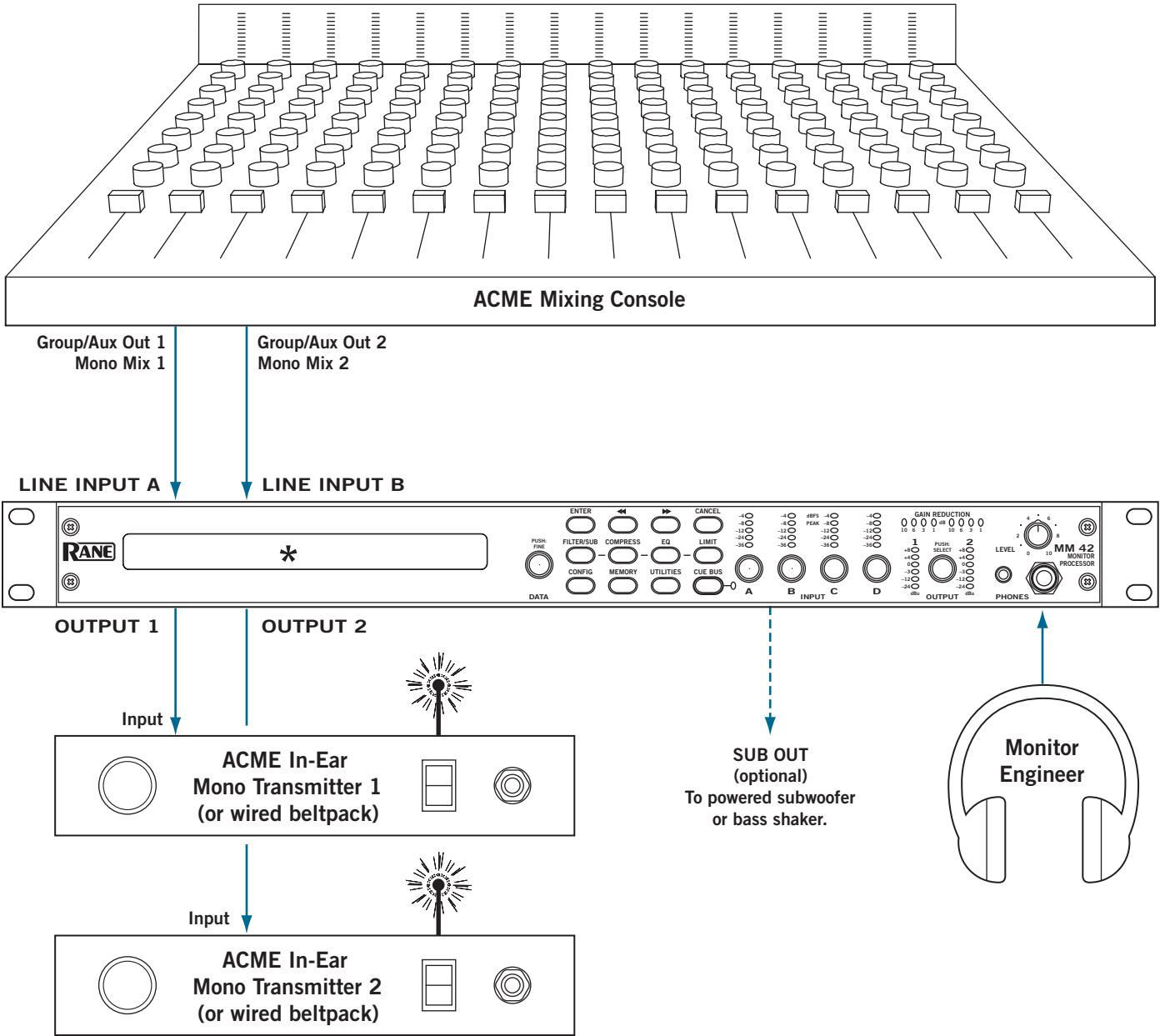
Stereo Mix with Optional Mono Subwoofer Output (default)

In this configuration a standard Left/Right mix from the console is processed. The Left and Right signals (Inputs A and B) are summed to mono and assigned to the SUB Output.



Two Independent Mono Mixes with Assignable Subwoofer Output

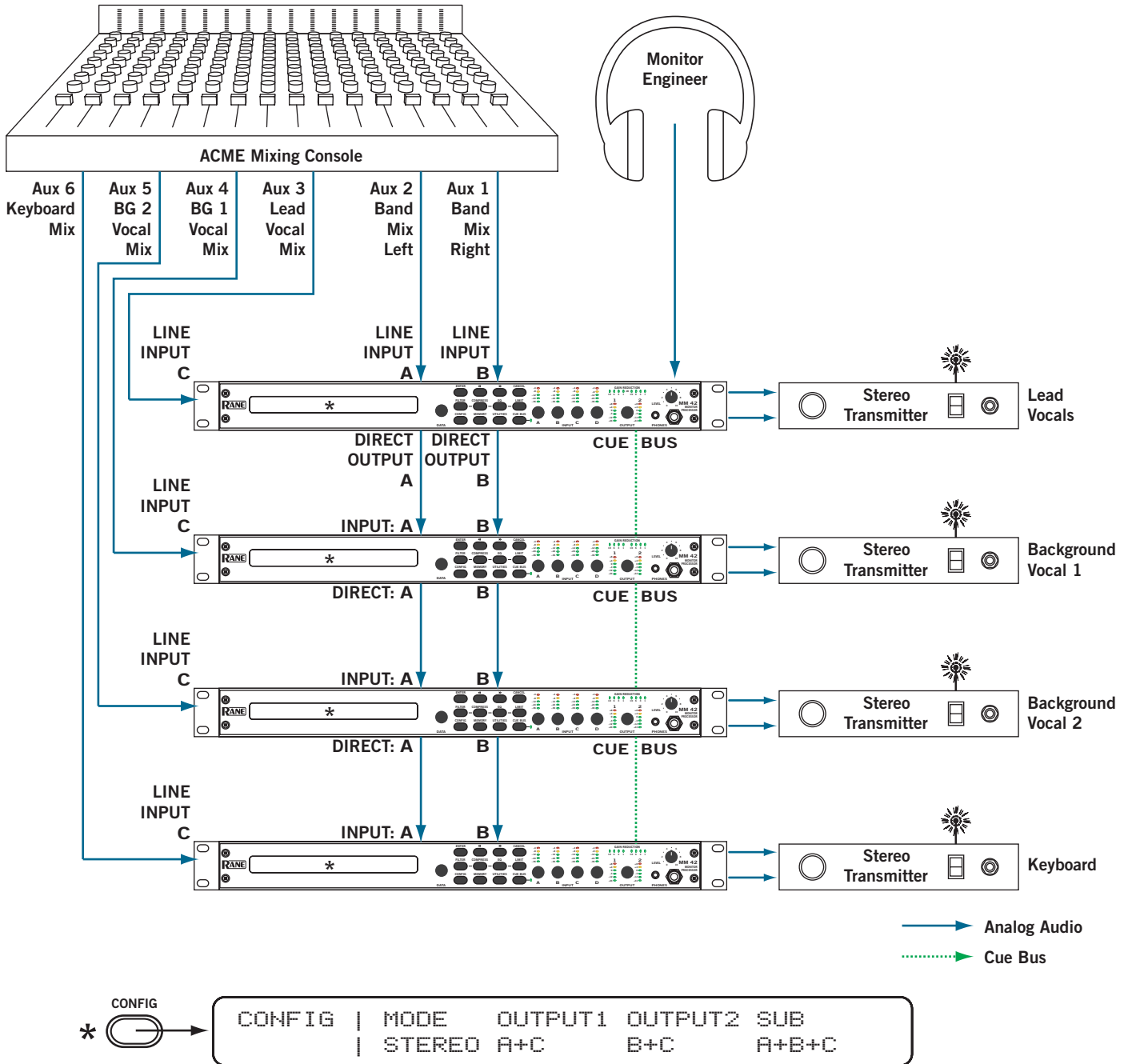
In this configuration two independent mixes are processed separately. The SUB Output is fed from either Input A or Input B.



Using the Direct Outputs

The rear panel Direct Outputs provide a unity-gain pass-through of each input signal, *pre-processing* — allowing you to share a common aux/group feed across multiple MM 42s or to feed elsewhere.

For example, create a single or stereo “full band” mix for a group of background singers, and send this feed from the console to Line Inputs A and B of the MM 42. Augment each person’s mix with an individual feed to Line Input C of each MM 42. Connect Direct Outs A and B to Inputs A and B of another MM 42. Repeat the process to daisy chain multiple MM 42s together. Use the front panel Input Levels to set the relative balance between mix elements (full band versus solo instrument) for each performer.



MM 42 Welcome Page

RANE CORPORATION MM 42
PERSONAL MONITOR PROCESSOR

The welcome page displays the device name. This is the default page on power-up and any time the CANCEL button is pressed. The Name Device page of the UTIL menu is used to enter custom text to suit your liking – “MY GOLDEN EARS,” for example. See page Manual-16 for details.

Basic Navigation & Editing

The Previous ◀ and Next ▶ buttons move the cursor through each of the parameter fields on a page. Parameter values are changed by rotating the DATA control.

Repeatedly pressing a button cycles through all pages associated with a particular function. Each of the five Parametric EQ filters is a separate page within the EQ section, for example.

In most cases parameter changes happen – and are heard *instantly*. In the few cases where they are not (when you are first prompted to answer a question, for example) the value flashes until the ○ ENTER button is pressed. Pressing the ○ CANCEL button on a flashing parameter automatically discards that parameter change.

Coarse versus Fine Parameter Adjustment

Parameters covering a large range – frequencies from 20 Hz to 20 kHz, or a Compressor Threshold from 0 dB to -60 dB for example – are adjustable in coarse and fine increments. Coarse adjustments help get you “in the ballpark” quickly, and are made by turning the DATA control in its normal *out* position. Fine adjustments allow you to really hone in on the parameter of interest (if you prefer the sound of 631 Hz instead of 630 Hz, for example) and are made by pushing *in and holding* the DATA control while turning it.

The steps for coarse adjustment of frequencies follow the soundperson-friendly, 1/3-octave ISO (International Standards Organization) values you can probably recite in your sleep: 40, 50, 63, 80, 100, 125, 160, 200, 250...and so on. The steps for fine value adjustment of frequencies are broken into three ranges, as follows:

Range	Coarse	Fine
20 - 999 Hz	ISO centers 20 - 800 Hz	1 Hz
1.0 kHz - 9.9 kHz	ISO centers 1k - 8k	0.1 kHz
10 kHz - 20 kHz	ISO centers 10k - 20k	1 kHz

If a frequency is currently set to a non-ISO value, making a coarse adjustment bumps the frequency to the next ISO center. For example, if a frequency is set at the non-ISO value of 75 Hz, increasing it by one coarse adjustment changes the frequency to the next ISO center of 80 Hz.

Output Chain Configuration

The MM 42 features four line-level Inputs, labeled A through D, which are assignable in any combination to either or both of the output signal chains and the SUB Output. Such an arrangement allows tremendous flexibility in setting up mixes. Press the CONFIG button. The default configuration is:

CONFIG	MODE	OUTPUT1	OUTPUT2	SUB
	STEREO	A	B	A+B

Output Chain Configuration		
Parameter	Value	Description
MODE	Stereo	Stereo mode; parameters within each processing section are automatically linked as OUT1+2.
	2-Mono	Dual mono mode; parameters within each processing section are automatically unlinked as separate OUT1 and OUT2.
OUTPUT1	A, B, A+B, A+C, A+D, etc. Any Input or combination of Inputs (15 options total).	Sets Input assignment for the Output 1 signal chain.
OUTPUT2		Sets Input assignment for the Output 2 signal chain
SUB		Sets Input assignment for Sub Output signal chain.

The MODE parameter is highlighted by default. Rotate the DATA control to select between STEREO and 2-MONO (two independent mono mixes) mode.

Assign one of the fifteen (!) input combinations to each output by selecting OUTPUT 1 or OUTPUT 2 and turning the DATA control to scroll through the various combinations. Repeat the process for the SUB output, if this output is being used to drive an external subwoofer or bass shaker.

Adjusting Input Levels

The Input Levels page is automatically displayed any time an INPUT A/B/C/D control is adjusted.

INPUT	A	B	C	D
LEVELS	0.0dB	0.0dB	0.0dB	0.0dB

Input Levels		
Parameter	Value	Description
INPUT A/B/C/D	+12.0 dB to -40.0 dB	Input level adjustment. Turn INPUT Level for 1 dB increments. Push and turn for 0.5 dB increments.

Adjusting Output Levels

The Output Levels page is automatically displayed any time the OUTPUT control is adjusted. This page differs slightly depending on the currently selected configuration mode. In STEREO mode, use the ◀ and ▶ keys or bump (push and release) the OUTPUT control to navigate between the Output LEVEL and Left/Right BALANCE parameters. Rotate the OUTPUT control to adjust each parameter.

OUTPUT	LEVEL	<BALANCE>
LEVEL	0.0dB	<----- ----->

Output Levels (Stereo Mode)		
Parameter	Value	Description
OUTPUT LEVEL	+12.0 dB to -40.0 dB or off	Stereo output level adjustment. Turn OUTPUT Level for 1 dB increments. Push and turn for 0.5 dB increments.
BALANCE	Full left to full right	Stereo balance.

In 2-MONO mode, use the ◀ and ▶ keys or bump (push and release) the OUTPUT control to navigate between the Output 1 and Output 2 Level parameters. Rotate the OUTPUT control to adjust each parameter.

OUTPUT	1	2
LEVELS	0.0dB	0.0dB

Output Levels (2-Mono Mode)		
Parameter	Value	Description
OUTPUT 1 LEVEL	+12.0 dB to -40.0 dB or off	Output 1 level adjustment. Turn OUTPUT Level for 1 dB increments. Push and turn for 0.5 dB increments.
OUTPUT 2 LEVEL		Output 2 level adjustment. Turn OUTPUT Level for 1 dB increments. Push and turn for 0.5 dB increments.

To view a level setting without changing it simply push and release the control without turning it. The DATA control has no effect when adjusting Input and Output levels.

Signal Processing

Overview

So what does the MM 42 have under the hood you ask? Plenty! Routing options allow the assignment of any combination of the four Inputs to any of the three Outputs: OUT 1, OUT 2 and SUB.

Each of the processing chains for OUT 1 and OUT 2 features (in this order): Shelf/Cut Filters, a 3-band rms Compressor with fully adjustable crossover frequency points, 5-band fully Parametric EQ, and a 3-band Peak Limiter, also with fully adjustable crossover frequency points. The SUB output processing chain is completely independent of the main outputs and features adjustable Low- and High-Cut Filters for maximizing onstage thump.

Why is the Output Level located *before* the Limiter?

Placing the Output Level before the Limiter allows you to turn up a compressed and equalized mix while maintaining the Limiter's brick wall protection. Note that there may be some interaction between the output level and limiter, depending on how the limiter is set. For example, if the limiter is set up to catch the occasional peak and you then turn the output level up by 6 dB, expect to see more limiting as the entire mix is now 6 dB closer to the threshold.

Linking and Unlinking Parameters within Processing Sections

Parameters within each processing section can be linked or unlinked, depending on the application. Adjusting parameters in linked mode affects both outputs simultaneously and is particularly useful when working with Stereo mixes, as it allows you to change one set of parameters and affect both sides of the mix identically. Unlinking parameters allows you to make individual adjustments to each side of a stereo mix, (to account

for an artist's hearing difference between right and left ears, for example) or to process two completely independent mono mixes.

To Link or Unlink an individual processing section:

1. Select the desired processing section.
2. Navigate to the Selected Output(s) field
3. Rotate the DATA control to select between adjusting parameters for OUT1+2 (linked) operation, OUT 1 only, or OUT 2 only.

PEQ ON	EQ	GAIN	FREQ	BW (Q)
OUT 1+2	1	0dB	100Hz	1/3 (4.3)

When OUT1+2 is selected, Output 2's parameters are set to match those of Output 1. *Note that OUT 2's settings are not permanently overwritten. Switching back to OUT 2 restores them to their previous values.*

Bypassing Processing Sections

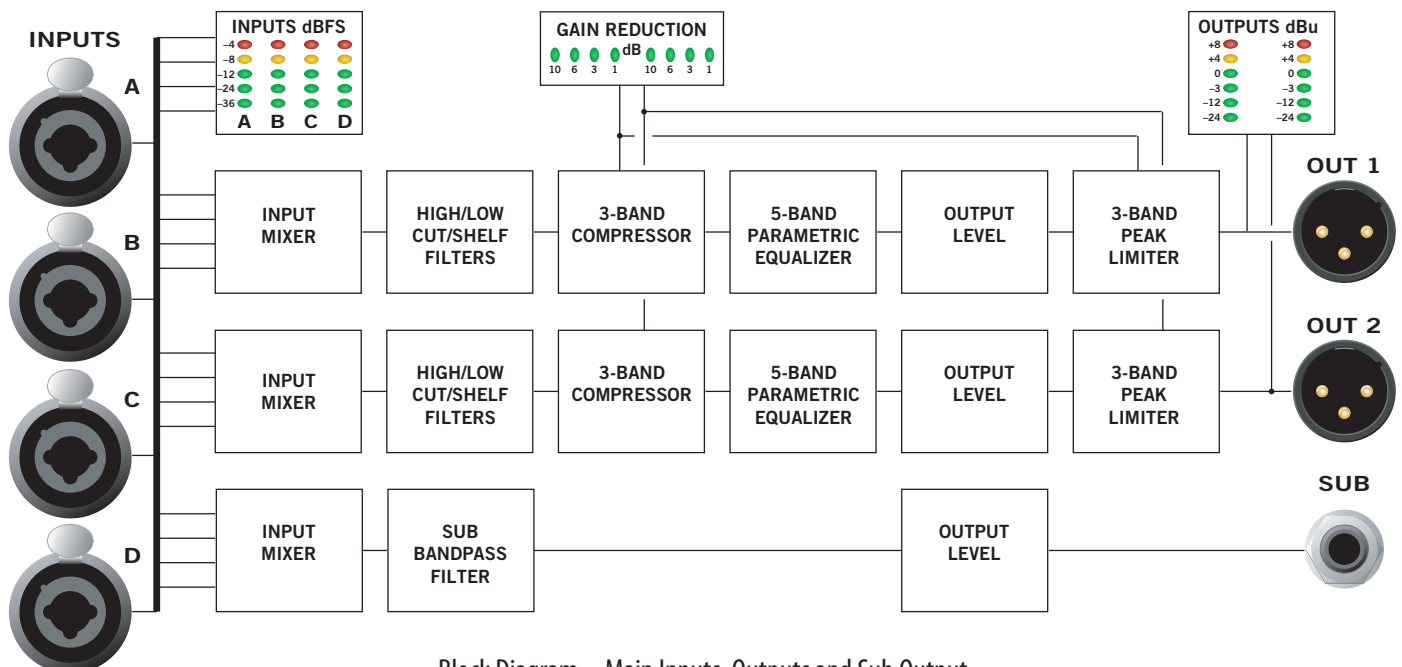
A wise man once said "it's not a feature if you can't turn it off." Each processing section in the MM 42 can be turned off, allowing for quick before-and-after comparisons, or to bypass an unused section altogether.

To bypass a processing section:

1. Navigate to the status area of the processing section.
2. Rotate the DATA control counter-clockwise until off is displayed.

PEQ off	EQ	GAIN	FREQ	BW (Q)
OUT 1+2	1	0dB	100Hz	1/3 (4.3)

If parameters are unlinked (OUT 1 or OUT 2, instead of OUT1+2), only the processing section for the currently selected output is bypassed.



Block Diagram – Main Inputs, Outputs and Sub Output

Filters & Subwoofer

Parameters

Pressing the FILTER/SUB button displays this edit page:

```
FLT ON | LOW SHELF  HIGH SHELF
OUT 1+2 | 100Hz    0dB  10kHz   0dB
```

Filters: Main Settings Page 1 of 2		
Parameter	Value	Description
FLT status	ON	Turns Filters ON for the selected Output(s).
	off	Turns Filters OFF (bypass) for the selected Output(s).
	RST (Reset)	Select and press ENTER to restore default settings.
Selected Output(s)	OUT1+2	View and adjust parameters for both Outputs simultaneously. "Linked" mode.
	OUT 1	View and adjust parameters for Output 1 only.
	OUT 2	View and adjust parameters for Output 2 only.
LOW Filter	SHELF	Enables the Low Shelf Filter.
	CUT	Enables the Low Cut Filter.
	off	Disables the Low Cut/ Shelf Filter.
Low frequency	20Hz to 1.0kHz	Sets the Filter corner frequency.
Low gain (Shelf mode only)	-15dB to +12dB	Amount of cut or boost.
HIGH Filter	SHELF	Enables the High Shelf Filter.
	CUT	Enables the High Cut Filter.
	off	Disables the High Cut/ Shelf Filter.
High frequency	1.0kHz to 20kHz	Sets the Filter corner frequency.
High gain (Shelf mode only)	-15dB to +12dB	Amount of cut or boost.

Pressing the FILTER/SUB button again displays the SUBWOOFER SETTINGS edit page:

```
SUB | LOW CUT  HIGH CUT  LEVEL
    | 20Hz    200Hz    0.0dB
```

Filters: Subwoofer Settings Page 2 of 2		
Parameter	Value	Description
LOW CUT frequency	20Hz to 1kHz	Sets the Filter corner frequency. Can't be set greater than the High Cut frequency.
HIGH CUT frequency	20Hz to 1kHz	Sets the Filter corner frequency. Can't be set lower than the Low Cut frequency.
LEVEL	+12dB to -40dB or off	Amount of boost or cut.

Description

Shelf/Cut Filters tailor the upper and lower frequency ranges of personal in-ear monitors.

A Low-Cut (aka High-Pass) Filter is often used to remove frequencies below the lower limit of the transducer. Use the Low-Cut Filter to remove low frequencies that tend to bottom out less expensive earphones. Judicious use of the Low-Cut Filter together with the SUB Output and a tactile thumper or seat shaker can tidy up an in-ear mix considerably.

A High-Cut (aka Low-Pass) Filter is used to remove frequencies above a particular frequency. You might use the High-Cut Filter to limit the frequency range to the upper cutoff of 15 kHz common to many wireless transmitters.

Low- and High-Shelf Filters are similar to the simple bass and treble tone controls found on most home stereos. Due to those pesky laws of physics, some in-ear monitors benefit from a slight boost in the bottom end using the LOW SHELF filter centered around 100 Hz or so. Similarly, a slight boost in the 8 kHz to 12 kHz range of the HIGH SHELF filter helps brighten and add some "air" to the overall mix.

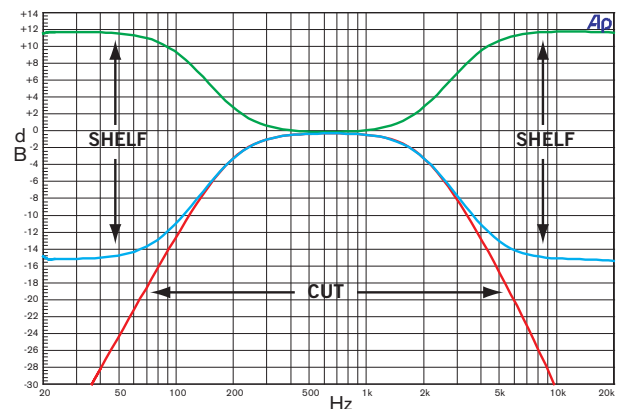


Figure 1. Shelf/Cut Filter Characteristics

Multi-Band Compressor

The Compressor may be used in either full-range (M-BAND off) or multi-band (M-BAND on) modes. Repeatedly press the COMPRESS button to move through each frequency band when M-BAND is set to ON.

Pressing the COMPRESS button displays the following:

```
CMP ON | BND THRSH RTO ATCK REL M-BAND
OUT 1+2 | 1 0dB 2.0 10ms 100ms ON
```

Compressor		
Parameter	Value	Description
CMP status	ON	Turns Compressor ON for the selected Output(s).
	off	Turns Compressor OFF (bypass) for the selected Output(s).
	RST (Reset)	Select and press ENTER to restore default settings.
Selected Output(s)	OUT1+2	View and adjust parameters for both Outputs simultaneously. "Linked" mode.
	OUT 1	View and adjust parameters for Output 1 only.
	OUT 2	View and adjust parameters for Output 2 only.
BND (Band)	1, 2, 3	Repeatedly pressing the COMPRESS button cycles through each of the 3 Compressor bands when M-BAND is ON.
THRSH (Threshold)	-60dB to 0dB	The signal level above which compression occurs.
RTO (Ratio)	1.0 to INF	Amount of output volume reduction per input volume increase above the Threshold. 1.0 = no reduction, INF = hard compression.
ATCK (Attack)	0.5ms to 100ms	Determines how quickly the output volume is reduced once the input volume exceeds the Threshold.
REL (Release)	1ms to 5sec	Determines how quickly the output volume returns to normal (unity) once the input volume drops below the Threshold.
M-BAND	ON	Turns Multi-Band mode ON.
	SET	Select and press ENTER to view or adjust the multi-band crossover frequencies.
	off	Turns Multi-Band mode OFF. Compressor works over the entire 20 Hz to 20 kHz range.

* **Important note:** the front panel Gain Reduction meter automatically switches to display the amount of gain reduction being applied to the **currently selected band**.

Adjusting Crossover Points in Multi-Band Mode

To view or adjust crossover frequencies:

1. Navigate to the M-BAND parameter.
2. Rotate the DATA control to select SET and press ENTER.
3. Select a band crossover point and adjust with the DATA control. Press ENTER to return to the COMPRESSOR.

```
CMP |-----X-----X-----|
OUT 1+2 | BND1-2=200Hz BND2-3=2.0kHz
```

Multi-Band Frequency Page		
Parameter	Value	Description
BND1-2 (Band 1-2)	20 Hz to 20 kHz	Low/Mid Crossover Frequency. Can't be set greater than the BND2-3 Frequency.
BND2-3 (Band 2-3)	20 Hz to 20 kHz	Mid/High Crossover Frequency. Can't be set lower than the BND1-2 Frequency.

Description

Custom tailoring of the program material dynamics is possible using the multi-band compressor. The audio signal is divided into distinct frequency ranges, which are then individually compressed as desired before being recombined to form the processed signal.

A common application for multi-band compression is to compress low frequencies more (or otherwise differently) than the mid and high frequencies. How many times have you heard this: *"Why do the vocals disappear with every bass drum hit? It gives my mix this weird pumping sound."* This phenomenon is likely due to using a full-range (broadband) compressor across the entire mix. In this scenario the low frequency energy from the bass drum triggers the compressor, dragging *all* frequencies down evenly with every hit.

Multi-band compressor to the rescue! Try adjusting the compressor's crossover frequency point to compress just the low frequency range (say, 200 Hz and below) while keeping the vocals and guitars strong and present.

The multi-band compressor used in the MM 42 is of the rms (root mean square) variety with a soft-knee characteristic for a pleasant, musical response.

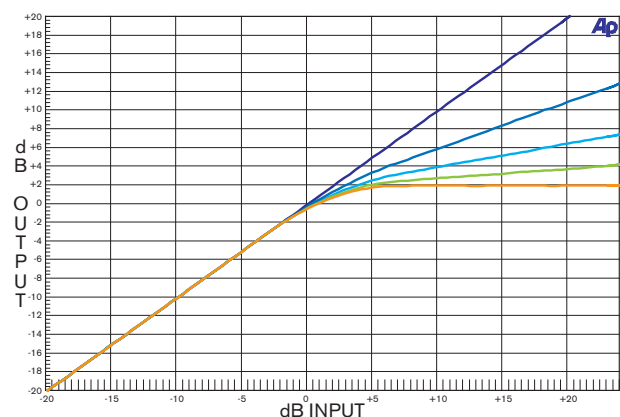


Figure 2 Compressor Characteristic (various Ratios)

Parametric Equalization

Parameters

Repeatedly press the EQ button to move through each of the five EQ bands.

PEQ ON EQ	GAIN	FREQ	BW (Q)
OUT 1+2 1	0dB	100kHz	1/3 (4.3)

Parametric Equalization		
Parameter	Value	Description
PEQ status	ON	Turns PEQ ON for the selected Output(s).
	off	Turns PEQ OFF (bypass) for the selected Output(s).
	RST (Reset)	Select and press ENTER to restore default settings.
Selected Output(s)	OUT1+2	View and adjust parameters for both Outputs simultaneously. "Linked" mode.
	OUT 1	View and adjust parameters for Output 1 only.
	OUT 2	View and adjust parameters for Output 2 only.
EQ	1, 2, 3, 4, 5	Repeatedly pressing the EQ button cycles through each of the five EQ bands.
GAIN	-15dB to +12dB	Amount of boost or cut.
FREQ (Frequency)	20Hz to 20kHz	Filter center frequency.
BW (Bandwidth)	1/24 to 4 octaves	Filter bandwidth (Q).

Description

Use the 5-bands of parametric equalization (PEQ) to smooth out the frequency response of personal monitors, to sweeten the overall mix, or to compensate for an artist's hearing loss.

Handy tip: You can equalize each side of a stereo mix differently by selecting and adjusting the OUT1 and OUT2 parameters individually instead of selecting OUT1+2.

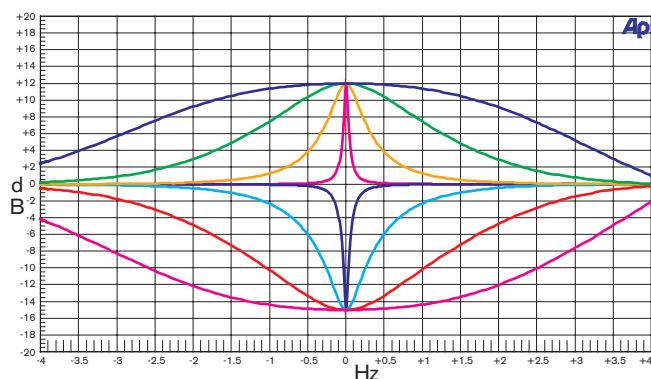


Figure 3 Parametric EQ (various Q settings)

Multi-Band Peak Limiter

Parameters

The Compressor may be used in either full-range (M-BAND off) or multi-band (M-BAND on) modes. Repeatedly press the COMPRESS button to move through each frequency band when M-BAND is set to ON.

Pressing the LIMIT button displays this edit page:

LIM ON BND	THRSH	ATCK	REL	M-BAND
OUT 1+2 1	0dB	10ms	100ms	ON

Peak Limiter		
Parameter	Value	Description
LIM status	ON	Turns Limiter ON for the selected Output(s).
	off	Turns Limiter OFF (bypass) for the selected Output(s).
	RST (Reset)	Select and press ENTER to restore default settings.
Selected Output(s)	OUT1+2	View and adjust parameters for both Outputs simultaneously. "Linked" mode.
	OUT 1	View and adjust parameters for Output 1 only.
	OUT 2	View and adjust parameters for Output 2 only.
BND (Band)	1, 2, 3	Repeatedly pressing the LIMIT button cycles through each of the 3 Limiter bands (when M-BAND is set to ON).
THRSH (Threshold)	-60dB to 0dB	The signal level above which limiting occurs.
ATCK (Attack)	0.5ms to 100ms	Determines how quickly the Limiter's output volume is reduced once the input volume exceeds the Threshold.
REL (Release)	1ms to 5sec	Determines how quickly the Limiter's output volume returns to normal (unity) once the input volume drops below Threshold.
M-BAND	ON	Turns Multi-Band mode ON.
	SET	Select and press ENTER to view or adjust crossover frequencies.
	off	Turns Multi-Band mode OFF. Limiter works over the entire 20 Hz to 20 kHz range.

* **Important note:** the front panel Gain Reduction meter automatically switches to display the amount of gain reduction being applied to the **currently selected band**.

Adjusting Crossover Points in Multi-Band Mode

To view or adjust crossover frequencies:

1. Navigate to the M-BAND parameter.
2. Rotate the DATA control to select SET and press ENTER.
3. Select a band crossover point and adjust with the DATA control. Press ENTER to return to the LIMITER page.

```
LIM |-----X-----X-----|
OUT 1+2 | BND1-2=200Hz  BND2-3=2.0kHz |
```

Multi-Band Frequency Page		
Parameter	Value	Description
BND1-2 (Band 1-2)	20 Hz to 20 kHz	Low/Mid Crossover Frequency. Can't be set greater than the BND2-3 Frequency.
BND2-3 (Band 2-3)	20 Hz to 20 kHz	Mid/High Crossover Frequency. Can't be set lower than the BND1- 2 Frequency.

Peak Limiter Description

The three-band peak Limiter sets the maximum signal level allowed to pass through to the main Outputs. Unlike a Compressor, which acts to maintain an average (rms) signal level about a Threshold, the Limiter acts quickly to prevent *any* signal — such as the transient from unplugging a phantom-powered microphone — from exceeding a set Threshold. As is done in the Compressor section, the signal is split into three user-defined ranges, each with its own Threshold, Attack and Release controls. The Limiter and Compressor *do not share* a common crossover. It is possible to choose completely different frequency settings for the Limiter than the Compressor.

Handy tip: For vocal-heavy mixes try limiting the mid frequencies slightly more than the low and high frequencies. This should help smooth things out during the loud part at the song's climax, just before the big key change.

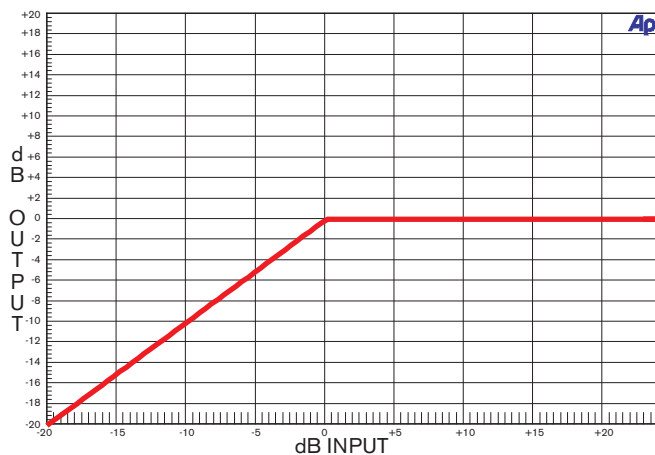


Figure 4 Peak Limiter Characteristic

Using the Cue Bus

Monitor engineers rejoice! The on-board CUE BUS allows you to solo mixes from one or more MM 42s without having to constantly re-patch headphones between units. Simply connect the multiple MM 42s together using the CUE BUS jacks, plug your headphones into any MM 42 (it doesn't matter which one), and press the front panel CUE BUS button on the unit you wish to monitor. The signal from that unit is automatically routed to the Cue Bus and can be monitored from *any* MM 42 using the PHONES or CUE OUTs.

See the Cue Bus Configuration section on page Manual-14 for details on setting up the various Cue Bus functions and operating modes.

Connecting Multiple MM 42s

Connect multiple MM 42s together on the Cue Bus using the included telephone-style cable. There are no dedicated "in" or "out" connections — either jack can be used to daisy-chain the Cue Bus of one MM 42 to the next.

Note: it is NOT necessary to create a loop between the first MM 42 in the chain and the last.

There's no need to panic if you happen to lose a Cue Bus cable while on tour in Boise, Idaho...at 8 PM...on a Sunday. Simply find the nearest unused telephone and borrow the cable. Check to make sure the cable has at least the four middle conductors (metal prongs) connected on each end. And don't forget to return the cable at the end of the tour.

Using the Cue Bus Outputs (rear panel)

In addition to appearing on the front panel PHONE jacks, the CUE BUS signal appears on the rear panel CUE OUT 1 (left) and CUE OUT 2 (right) jacks.

Connect these Outputs to a spare transmitter/beltpack so you always monitor the signal *exactly* as the artist hears it. Also, should the artist's transmitter or receiver ever fail, you can save the day (and ensure your position as monitor engineer to the stars for years to come) by cueing up their MM 42 mix, running onstage in the official "crouched roadie" position, and swapping in the spare beltpack.

Alternately, connect the CUE OUTs to unused inputs on the monitor console so you can cue individual input channels (kick, snare, etc.) and the processed ear mixes directly from the mixing console. Simply solo the appropriate channels on the monitor console, then use the MM 42's front panel CUE BUS button to switch between different mixes.

Working in 2-MONO mode

When working in 2-MONO mode the Cue Bus signal automatically follows the currently selected output. To select an output to monitor and/or edit:

- Change the Selected Output parameter on any processing page - Filter/Sub, Compress, EQ, Limit; or
- Quickly double-bump (push-release, push-release) the OUTPUT control.

Storing and Recalling Memories (Presets)

The current CONFIG settings and parameters for all processing sections (filter/sub, compressor, EQ, and limiter) are saved when you store a Memory. Input and output levels and all UTILITIES settings are not stored.

Pressing the MEMORY button displays this edit page:

MEMORY | STORE : 1 STEREO DEFAULT
| RECALL: 1 STEREO DEFAULT *MOD

MEMORY		
Parameter	Value	Description
STORE	1 to 16	Memory location stored to.
RECALL	1 to 16	Memory location recalled from.
*MOD		The *MOD flag appears when parameters have been changed since the last Memory Recall or Memory Store.

- To store all processing and configuration settings to a Memory location:**
1. Press the ◀ key once to navigate to the STORE field.
 2. Rotate the DATA control to select a Memory number to STORE to and press ENTER, producing this screen:

NAME MEMORY 1: MEM 1

CANCEL

3. Give the Memory a meaningful name. Use the ◀ and ▶ keys to move between character fields. Select the characters by rotating the DATA control. A maximum of 16 characters is permitted.
4. Press ENTER to move the cursor to the flashing STORE field. Press ENTER to complete the operation.

The Memory store operation can be cancelled at any time by pressing (you guessed it) the CANCEL button.

- To recall a stored Memory:**
1. Navigate to the RECALL field.
 2. Rotate the DATA control and select the Memory to recall.
 3. Press ENTER.

The audio outputs mutes briefly when a Memory is recalled.

Warning: the current processing and configuration settings will be overwritten with the content of the selected Memory.

Utilities

Repeatedly pressing the UTILITIES button cycles through the following useful pages.

Cue Bus Configuration

CUE BUS | CUE/PHONES PROCESSING MODE
1ON BUS | STEREO POST LATCH

Utility: Cue Bus Configuration Page 1 of 6		
Parameter	Value	Description
ON BUS	1 to 4	Number of MM 42s connected to the cue bus.
CUE/ PHONES	STEREO	Left/right mix (OUT 1/OUT 2 assignment) is sent to the Cue/Phones.
	MONO 1	OUT 1 is sent to both channels of the Cue/Phones.
	MONO 2	OUT 2 is sent to both channels of the Cue/Phones.
PROCESSING	PRE or POST	Selects whether the Cue/Phones signal is pre- or post processing.
MODE	LATCH or MOMENT	Selects between latching or momentary Cue Bus mode.

On Bus

When connecting multiple MM 42s via the Cue Bus, set each unit's ON BUS parameter to match the number of connected units, to a maximum of 4. For example, if three MM 42s are connected, set the ON BUS parameter of all units to 3. This parameter is especially important if you need to precisely match the gain settings of a spare transmitter/beltpack to those of the primary transmitter/beltpack.

It is possible to connect more than four MM 42s to the Cue Bus, but be aware that there will be a slight loss in the Cue/Phones signal for each additional connected device. This loss equates to 6 dB per doubling of the number of devices, and can be compensated for by turning up the PHONES level or by adjusting the input gain of the spare transmitter/beltpack if using the CUE outputs.

Important note: The main outputs (OUT 1, 2 & SUB) are **not affected** by adding or removing MM 42s to or from the CUE BUS. Only the front panel PHONES and rear panel CUE OUTs are affected.

Processing

The PROCESSING parameter determines whether the cued signal is monitored pre- or post-processing. This feature is especially useful for doing a before-and-after comparison to hear the effect of the channel processing and *only affects the Phones and CUE Outputs* – the Main Outputs (OUT 1, OUT 2) and SUB Output are always post-processing. *Did you really get that low-end compression properly dialed in? Is the PEQ adding enough air to the mix?* Use the pre/post feature to hear for yourself – without disrupting the artist's mix.

Mode

When LATCH mode is selected, pressing the CUE BUS button once routes the MM 42's signal to the Cue Bus and the front panel PHONES jacks. Pressing the CUE BUS button again removes the signal from the Cue Bus. It is possible (but potentially confusing) to have multiple MM 42s active on the Cue Bus at the same time. To avoid audio mayhem, always remember to deactivate one MM 42 (by pressing its CUE BUS button) before cueing another.

When MOMENTARY mode is selected the MM 42's signal is routed to the Cue Bus and front panel PHONES jacks only as long as the CUE BUS button is pressed and held. Use this mode once the mixes are fully dialed in and you just need to do the occasional spot check.

Gain Reduction Meter Mode

GAIN | <METER MODE>
REDUCTN | COMPRESSOR+LIMITER

Utility: Gain Reduction Meter Page 2 of 6		
Parameter	Value	Description
METER MODE	COMPRESSOR + LIMITER	Displays maximum gain reduction of all Compressor and Limiter bands.
	COMPRESSOR	Displays maximum gain reduction of all Compressor bands.
	LIMITER	Displays maximum gain reduction of all Limiter bands.

Important note: When the Compressor or Limiter is being edited, the Gain Reduction meter automatically switches to display the amount of gain reduction being applied to the currently selected band of that processing section. At all other times the Gain Reduction meter follows the selected METER MODE in the UTILITY menu.

MIDI Configuration

MIDI | Rx Tx MERGE/THRU
CONFIG | OMNI 1 off

Utility: MIDI Configuration Page 3 of 6		
Parameter	Value	Description
Rx	off, 1 to 16, OMNI	MIDI receive channel
Tx	off, 1 to 16	MIDI transmit channel
MERGE/THRU	off, ON	MIDI merge/thru status

MIDI Rx (receive): in OMNI mode the MM 42 will respond to MIDI data received on all MIDI channels.

MIDI MERGE/THRU: if MERGE/THRU is ON, incoming MIDI data is merged with MIDI data from the MM 42 and sent to the MIDI OUT/THRU port.

MIDI Transfer

It is possible to transfer an individual Memory or all Memories from the MM 42 to another MM 42 or other MIDI device.

MIDI | MODE MEMORY
TRANSFR | SEND 1 SEND

Utility: MIDI Transfer Page 4 of 6		
Parameter	Value	Description
MODE (Transfer Mode)	SEND or RECEIVE	Set the transmitting unit to SEND, set the receiving unit to RECEIVE.
MEMORY	1 to 16, ALL	Memory location to be sent / received.
SEND / RECEIVE	(action is flashing)	Select action and press ENTER to begin transfer.

Transferring Memories between MM 42s

Connect the MIDI OUT/THRU of the transmitting MM 42 to the MIDI IN of the receiving MM 42.

*Be sure the MIDI Rx and Tx of both units is **not** set to off.*

On the receiving MM 42:

1. Set the receiving device to RECEIVE mode on the MIDI TRANSFER page.
2. Select the MEMORY (1 through 16 or ALL) location in which to store the incoming data.
3. Select the RECEIVE action (flashing) and press ENTER. The following screen appears:

AWAITING MIDI DATA
PRESS CANCEL TO ABORT

On the transmitting MM 42:

1. Select SEND mode on the MIDI TRANSFER page.
2. Select the MEMORY (1 through 16 or ALL) location to send to the receiving MM 42.
3. Select the SEND action (flashing) and press ENTER. The sending MM 42 says SENDING MIDI DATA.
4. When incoming MIDI is detected the receiving MM 42 says RECEIVING MIDI DATA.
5. When the transfer is complete both units display:

MIDI TRANSFER COMPLETE
PRESS CANCEL TO CONTINUE

If the following horrifying display appears on either unit during the transfer there has been an error. Don't get mad, just check all connections and settings and try again:

MIDI TRANSFER FAILED
PRESS CANCEL TO CONTINUE

TIP: Memory locations in the transmitting device can be stored to any Memory location in the receiving device. For example, the screens to store Memory location 1 from the transmitting device to Memory location 3 in the receiving device (so as not to overwrite Memory 1 in the receiving device) would be as follows:

Transmitting MM 42:

```

MIDI | MODE   MEMORY
TRANFR| SEND   1      SEND

```

Receiving MM 42:

```

MIDI | MODE   MEMORY
TRANFR| RECEIVE 3      RECEIVE

```

Backing up Memories to a PC or other MIDI Device

*Be sure the MIDI Tx of the MM 42 is **not** set to off.*

1. Connect the MIDI OUT of the transmitting MM 42 to the MIDI IN of the receiving MIDI device.
2. Place the receiving device into “record” or “receive” mode. Memories are stored as MIDI System Exclusive (SysEx) data, so be sure to turn off any SysEx filters that may be in place during record or playback. Consult the Owner’s Manual of your MIDI device.

On the *transmitting* MM 42:

3. Select SEND mode on the MIDI TRANSFER page
4. Select the MEMORY (1 through 16 or ALL) location to send to the receiving MIDI device.
5. Select the SEND action (flashing) and press ENTER. The screens are the same as when transmitting between MM 42s (see above).

Name Device

An unnamed MM 42 will default with this display:

```

RANE CORPORATION MM 42
PERSONAL MONITOR PROCESSOR      STORE

```

1. Rotating the DATA control under each character lets you rename your unit to anything you wish. Use the ◀ and ▶ keys to move between character fields. A total of 52 characters (2 lines of 26 characters each) is permitted.
2. Press ENTER to move the cursor to the STORE field. Press ENTER to complete the operation.

The Name Device operation can be cancelled at any time by pressing the CANCEL button.

Firmware Update

Firmware updates may be made available periodically to address new features or fix reported problems. You can perform the update using any MIDI device capable of playing back a downloaded MIDI SysEx data file.

You can run the firmware updater file using any computer equipped with a MIDI interface. In Windows, the default .MID player (such as Windows Media Player) works if the correct MIDI output is selected in Control Panel > Sounds and Audio Devices > Audio > MIDI Music Playback. Refer to your MIDI software or interface instructions.

To update firmware:

1. Download the latest firmware MIDI file (MM42*.MID) from www.rane.com/mm42.html.
2. Press the UTILITIES button several times until the UPDATE DEVICE FIRMWARE page is displayed.
3. Rotate the DATA control to select YES and press ENTER.

```

UPDATE DEVICE FIRMWARE? YES
CURRENT FIRMWARE VERSION *.*

```

4. Re-confirm the action. Rotate the DATA control to select YES and press ENTER.

```

UPDATE DEVICE FIRMWARE:
ARE YOU SURE? YES

```

The MM 42 eagerly awaits for the incoming data...

```

AWAITING MIDI DATA
PRESS CANCEL TO ABORT

```

5. Now play the MM42*.MID file. When incoming MIDI data is detected the MM 42 displays:

```

FIRMWARE DOWNLOAD IN PROGRESS

```

...wait while the firmware is loaded...

...followed by a success message with the new version:

```

MM 42 FIRMWARE UPDATE SUCCESSFUL
VERSION *.*

```

Restoring Factory Defaults

IMPORTANT: the following procedure resets *all* parameters in the MM 42, **INCLUDING all stored Memory locations** (Presets). Follow the instructions in the MIDI Transfer section for details on backing up user Memory locations **before** resetting the unit.

We also recommend removing your earphones or otherwise turn the signal DOWN before performing a reset.

The MM 42 can be restored to its original state (minus the new audio gear smell, of course) by doing the following:

1. Press and hold the UTILITIES button.
2. Simultaneously press both the ◀ and ▶ keys.

The following screen appears:

RESET TO FACTORY CONFIGURATION? NO

Rotate the DATA control to select YES and press ENTER.

3. The following screen appears:

RESET TO FACTORY CONFIGURATION:
ARE YOU SURE? NO

Rotate the DATA control to select YES and press ENTER to re-confirm the action.

MM 42 RESET TO FACTORY CONFIGURATION

Mission accomplished! The MM 42 is now reset to its original factory settings.

Appendix: Additional Resources

Hearing Conservation

Hearing Education & Awareness for Rockers (H.E.A.R.)

PO BOX 460847

San Francisco, CA 94146

Phone: 415-409-EARS or (3277)

Email: hear@hearnet.com

Web: www.hearnet.com

Earphone Manufacturers (Custom and Universal Fit)

Future Sonics Incorporated

P.O. Box 187

Pineville, PA 18946-0187

Phone: 877-FSI-EARS or Outside USA +01.598.8818

Email: info@futuresonics.com

Web: www.futuresonics.com

Sensaphonics

Hearing Conservation

660 North Milwaukee Ave.

Chicago, IL 60622

Phone: 877-848-1714

Email: saveyourears@sensaphonics.com

Web: www.sensaphonics.com

Ultimate Ears

2657 Windmill Parkway #391

Las Vegas, NV 89074

Phone: 702-263-7805

Toll Free: 800-589-6531

Email: ultimate@ultimateears.com

Web: www.ultimateears.com

Westone Laboratories, Inc.

P.O. Box 15100

Colorado Springs, CO 80935

Phone: 719-540-9333

Email: music@westone.com

Web: www.westone.com/music

Bass Shaker / Tactile Transducer Manufacturers

Clark Synthesis, Inc.

Clark Synthesis Tactile Sound

8122 Southpark Lane Suite 110

Littleton, CO 80120

Phone: 303-797-7500

Phone: 800-898-1945

Web: www.clarksynthesis.com

The Guitammer Company Inc.

Post Office Box 82

Westerville, OH 43086

Phone: 614-898-9370

Phone: 888-676-2828

Email: info@clarksynthesis.com

Web: www.guitammer.com

Function		Transmitted	Recognised	Remarks
Basic Channel	Default Changed	1 1-16, OFF	OMNI 1-16, OFF	Sysex 1-16: transmitted OFF: not transmitted
Mode	Default Messages Altered	Mode 4 x x	Mode 2 x x	
Note Number		x	x	
Velocity	Note ON Note OFF	x x	x x	
Aftertouch	Key Channel	x x	x x	
Pitch Bender		x	x	
Control Change	3-11	x	o	See CC chart below
Program Change	True Number	x x	o 1-16 (0-15)	Memory 1-16 Recall
System Exclusive		o	o	Universal Sysex File Dump Manuf. ID=000017H Product ID=OAH
System Common	Song Pos. Song Sel. Tune	x x x	x x x	
System Real Time	Clock Commands	x x	x x	
Aux Messages	Local Control All Notes Off Active Sense Reset	x x x x	x x x x	

Mode 1: Omni On, Poly
Mode 3: Omni Off, Poly

Mode 2: Omni On, Mono
Mode 4: Omni Off, Mono

Controller		MM 42 Parameter		MIDI Range
Dec	Hex			
3	3	Cue / Phones	Cue Off / On	0-63 = Cue OFF; 64-127 = Cue ON
4	4		Stereo / Out 1 / Out 2	0-42 = Stereo; 43-85 = Out 1; 86-127 = Out 2
5	5		Processing Pre / Post	0-63 = Pre; 64-127 = Post
6	6	Input Levels	A	0-13 = -40 dB; 14-93 = -40 dB to -0.5 dB in 0.5 dB steps; 94-102 = 0 dB; 103-127 = 0 dB to 12 dB in 0.5 dB steps.
7	7		B	
8	8		C	
9	9		D	
10	A	Output Levels	Out 1 (2-Mono) / Level (Stereo)	0-12 = off; 13-93 = -40.5 dB to -0.5 dB in 0.5 dB steps; 94-102 = 0 dB; 103-127 = 0 dB to 12 dB in 0.5 dB steps.
11	B		Out 2 (2-Mono) / Balance (Stereo)	For Out 2 level control (2-Mono): Same as above. For Balance (Stereo) Control: 0-21 = Right channel -40 dB to -19 dB at 1 dB step per val; 22-57 = Right channel -18 dB to -1 dB at 1 dB step per 2 val; 58-69 = Center, Left / Right channel 0 dB; 70-105 = Left channel -1 dB to -18 dB at 1 dB step per 2 val; 106-127 = Left channel -19 dB to -40 dB at 1 dB step per val.