

M-16DX 16-Channel Digital Mixer



M-16DX EQ

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M16DXWS13

About the Workshop Booklets

The EDIROL M-16DX 16-Channel Digital Mixer delivers the power of digital mixing to musicians at an incredibly affordable price. This crystal-clear 24-bit digital mixer supports sample rates up to 96 kHz, and it's extremely flexible, with a wide range of analog and digital inputs and outputs, and effects. The M-16DX's USB connectivity makes it an ideal partner for a computer-based digital audio workstation, and features such as its pro EQ and the innovative Room Acoustic Control make it an excellent live mixer as well.

Each M-16DX Workshop Series booklet focuses on one M-16DX topic, and is intended as a companion to the *M-16DX Owner's Manual*.

The M-16DX Workshop booklets require M-16DX O.S. Version 2.00 or higher. You can download the latest O.S. for free from www.RolandUS.com/EDIROL.

About This Booklet

Equalization, or "EQ," is a critical item in any audio engineer's toolbelt, and the M-16DX provides a complete suite of high-quality EQ tools, from three-band channel EQs with a parametric mid range to the 16-band graphic EQ on the M-16DX's main stereo outputs. This booklet explains the M-16DX's EQ tools and how to use them.

Understanding the Symbols in This Booklet

Throughout this booklet, you'll come across information that deserves special attention—that's the reason it's labeled with one of the following symbols.



A note is something that adds information about the topic at hand.



A tip offers suggestions for using the feature being discussed.



Warnings contain important information that can help you avoid possible damage to your equipment, your data, or yourself.

Hot Links

Each Workshop booklet is meant to be read in order from beginning to end. However, if we mention an upcoming section—and you see this arrow—you can click the arrow to jump there immediately.



Audio Examples

You can click a speaker button like the one shown here to play an example of what's being discussed, in your default Web browser. (An active Internet connection is required for audio examples.)



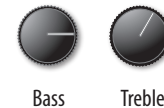
What Is EQ



This section is for readers new to audio and mixing. If you already know what you want to know about EQ, you can skip ahead to the section on using EQ in the M-16DX.



Equalization, or "EQ" for short, lets you shape the tone, or "timbre," of each signal. The treble and bass controls on any music player are a form of EQ, but the M-16DX's EQ is much more precise.



Bass

Treble

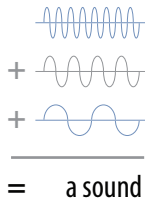
With EQ, you can select any aspect of a sound and make it louder or softer. EQ a kick to make it punchier, bring out a snare's crack, add life to a vocal, or do anything else your mix needs. You can even dig out hard-to-hear sounds—like a conga in a percussion set—or turn others down, using EQ.

How Does EQ Work?

We don't want to get too technical, but here's the little bit of science you really do need to know to get a handle on EQ.

Sound Waves, AKA “Frequencies”

Each sound you hear is actually made up of a bunch of sound waves happening at the same time, with each one humming along at its own speed, or “frequency.” You don’t hear these sound waves separately—but together, they make a sound the way it does.



Sound waves at different frequencies add different things to a sound. For example, the

- *deep parts of a sound*—like the bottom of a bass synth, or the thump of a kick drum, are made by slow, or “low-frequency,” sound waves.
- *in-your-face parts of a sound*—like the notes of a human voice or electric guitar, or the “crack” of a snare, are made by medium-frequency sound waves.
- *bright parts of a sound*—like the breath sound in a voice, the crispy part of a snare, or the sizzle of a cymbal are made by fast, “high-frequency” sound waves.

People usually refer to sound waves by their frequencies. So instead of talking about “low-frequency sound waves,” they’ll talk about “lows.” Mid-frequency sound waves are “mids,” and high-frequency sound waves are—you’ve got it—“highs.”

It Only Hertz When I Laugh

In EQ, sound wave frequencies are described in “Hertz,” which is abbreviated as “Hz.” From 10,000 Hz and up, they’re referred to as “kiloHertz,” “kHz,” or simply “k,” as it is on some M-16DX screens. Numbers, numbers—in the end, you use your ears when you EQ. The numbers just help us talk about it.

The M-16DX’s EQ goes down to 25 Hz, the very bottom of a kick drum thump. It goes up to 20 k, at the very top of a cymbal sound, or the “air” that surrounds acoustic instruments. We’ll talk more about specific frequencies in our tips later on.



Later, the “EQ Tips” section explains how to find what you want to EQ by using your ears, so you don’t have to worry about needing to memorize a lot of specific frequencies.

What EQ Does, Exactly

When you use EQ, you:

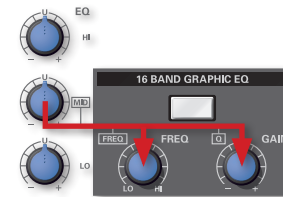
- *select the frequency, or frequencies, whose volume you want to change.*
- *adjust the selected frequencies volume by:*
 - *boosting*—or raising, their volume.
 - *cutting*—or lowering, their volume.

Onscreen, the amount by which you boost or cut a band is shown in deciBel, or “dB,” increments. Okay, science class over.

About Using EQ on the M-16DX

The M-16DX offers two types of EQ tools. The

- *input-channel EQ*—allows you to EQ each individual input signal using the EQ knobs on its channel strip along with the FREQ and Q knobs in the 16 BAND GRAPHIC EQ area of the M-16DX.



Each channel strip’s MID EQ knob works together with the FREQ and Q knobs in the 16 BAND GRAPHIC EQ area.

- *16-band graphic EQ, or “GEQ”*—applies to the M-16DX’s entire stereo main mix. As its name implies, this EQ lets you see all of your EQ settings for the main mix at a glance. To use it, you work with the controls in the 16 BAND GRAPHIC EQ area of the M-16DX.



Using the M-16DX's Input-Channel EQ

EQ for the Eyes

The M-16DX makes it easy to see what you're doing with input-channel EQ. The moment you touch an EQ knob in an input channel strip, the channel becomes selected, and the M-16DX display jumps to a screen whose left side shows the channel's current EQ settings numerically while its right side shows the settings graphically.



The EQ screen before you've applied EQ.



You can also display a channel's EQ by pressing its SEL button, which can toggle the graphic EQ display on and off to reveal other settings.



As we explain input-channel EQ in this section, we invite you to watch the display and try things out as you read—the graphic nature of the M-16DX's display can make EQ that much easier to understand.

How the Input-Channel EQ Works

I'm with the Band

On the M-16DX, each input channel's EQ is divided into three sections, or "bands": HI, MID, and LO. (On the M-16DX display, these are shown as simply "H," "M," and "L.")

The three bands allow you to apply EQ to as many as three different aspects of the channel strip's signal at the same time. Each one targets a frequency within the range its name suggests. The

- *HI band*—can be set anywhere from 400 Hz to 16 k.
- *MID band*—can be set from 200 Hz to 7.4 k.
- *LO band*—can be set from 60 Hz to 2.1 k.

The HI and LO Bands are Shelving EQs

The channel strip HI and LO bands provide "shelving" EQ. The

- *HI band's knob*—adjusts the gain of the signal's high-end frequencies starting with the frequency to which the HI band is set.
- *LO band's knob*—adjusts the gain of the signal's low-end frequencies stopping at the frequency to which the LO band is set.



Here, we've raised the HI band by 6 dB, and lowered the LO band by the same amount



You can see on the display that any change you make with the HI or LO band knob doesn't begin abruptly at the band's selected frequency—it takes effect gradually, starting at that frequency.

The MID Band is a Parametric EQ



The **FREQ•FREQ** and **Q•GAIN** knobs in the 16 BAND GRAPHIC EQ area work with both the input-channel EQ and the 16-band graphic EQ. When the 16 BAND GRAPHIC EQ button is lit, the knobs operate the 16-band graphic EQ, discussed later in this booklet. When it's not, they help control the currently selected channel strip's MID EQ band. For now, turn off the 16 BAND GRAPHIC EQ button if it's lit.

A parametric EQ allows you to zero in on as narrow or broad a range of frequencies as you want. In the M-16DX channel EQs, the MID band has three controls. The

- *MID knob*—on the channel strip adjusts the gain of the selected frequency range.



We've boosted the MID band here.

- *FREQ knob*—in the 16 BAND GRAPHIC EQ area allows you to select the MID band's center frequency. (You'll see what "center frequency" means in the next bullet.)
- *Q knob*—in the 16 BAND GRAPHIC EQ area allows you to select the desired range of frequencies above and below the center frequency for gain adjustment. (Another name for Q is "bandwidth.") Turning the knob to the left adds more frequencies to the selection, while turning the knob to the right narrows the range of frequencies selected.



A wide-Q MID-band cut.



A narrow-Q MID-band cut.



Try this. Turn up any input channel's MID knob a bit. Turn the Q knob left and then right to see how Q widens or narrows the band's frequency range, respectively. Turn the FREQ knob to move up ward or downward within the signal's frequencies.

Using the M-16DX's 16-Band Graphic EQ



Turning on the Graphic EQ

Turn on the 16-band graphic EQ on by pressing the 16 BAND GRAPHIC EQ button so it's lit and the GEQ screen appears.

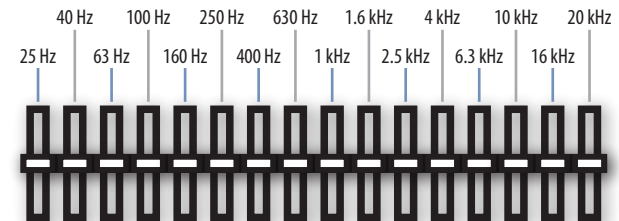


The GEQ Screen

The GEQ screen shows you two rows of virtual sliders—each slider controls a pre-assigned frequency range. The row of sliders on top is for the main mix's left side, and the one on the bottom is for the right side. As you select a slider for adjustment, its frequency range is shown in the lower-left corner of the display. In this illustration, the 250 Hz slider has been selected.



Here are the ranges assigned to the sliders.



Setting the Graphic EQ



When the 16 BAND GRAPHIC EQ button's lit, the GEQ is turned on, even if you're working somewhere else on the M-16DX and something other than the graphic EQ is shown on the display.

- 1 All graphic EQ changes take place on the GEQ screen. If
 - *the 16 BAND GRAPHIC button isn't lit*—press the button to light it and display the GEQ screen.
 - *the 16 BAND GRAPHIC button's lit, but the GEQ screen isn't visible*—press the button once to display the GEQ screen.
- 2 Turn the 16 BAND GRAPHIC EQ area's FREQ knob to select the desired frequency range.



The 1.0 kHz frequency range is selected here.

- 3 Turn the 16 BAND GRAPHIC EQ area's GAIN knob to adjust the level of the selected frequency range, as we have here.



We've raised the level of the 1.0 kHz frequency range by 9 dB.

Turning Off the Graphic EQ

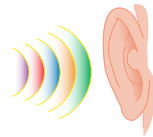
To turn off the graphic EQ, press the lit 16 BAND GRAPHIC EQ button until it's unlit. If you're

- *on the GEQ screen*—press the button once.
- *some other screen*—press the button twice.

EQ Tips

Finding Frequencies By Ear

The best way to find the frequencies you're looking for within a sound is to use your ears. We'll use an input channel's parametric MID band in the following tutorial, as parametric EQ offers the most precision of any type of EQ. After you read through this section, we'll explain how to apply a similar methodology when you're working with the HI and LO shelving input-channel EQ, and with the 16-band graphic EQ.



Before starting, turn down your listening volume a little—the sound can get a bit harsh as you search for frequencies. Also, turn off the 16 BAND GRAPHIC EQ button if it's lit.

- 1 Start by
 - *setting the input channel's MID knob to its center position*—so it's neither boosting or cutting.
 - *setting the 16 BAND GRAPHIC EQ FREQ knob to its center position*—which is 1.0 k.
 - *setting the 16 BAND GRAPHIC EQ Q knob to its center position*—for a band with an average width.
- 2 Send your signal through the channel. You'll need to hear it as you perform the following steps.
- 3 Turn up the MID knob all the way, even if you ultimately intend to lower the level of the frequency you find. This exaggerates the level of the currently selected frequency range, making it easy to hear when we're searching.
- 4 Turn the FREQ knob all the way down, and then turn it up slowly until you hear the portion of the sound you want to EQ. If you need to, sweep up and down until you find what you're listening for.
- 5 Experiment with the Q knob until you hear just as much of the signal as you want to work with.
- 6 Now that you've got your frequencies targeted, bring the MID knob all the way back to its center position so you're no longer boosting or cutting anything, and the signal's back to Square One.
- 7 Slowly boost or cut the select frequency range as desired until you hear the change you want to make.



If you're boosting a frequency, set the MID knob to the amount of boost you want to add, and then back down a little. If you're cutting, set the MID knob the way you want, and then turn it up a tiny bit. After listening really hard while you're hunting down frequencies, you can lose your perspective, and this little trick can help cure this particular form of temporary insanity.



If you'd like to hear an audio example that demonstrates finding a desired frequency range using the M-16DX's parametric MID band, click this speaker button.



Finding Frequencies with Shelving and Graphic EQ

As we said above, the same basic logic applies, though the process with the other types of EQ on the M-16DX is much simpler. With:

- *the HI and LO EQ knobs*—turn up the knob all the way, select the band's current frequency on the display, and use the - and + VALUE buttons to find what you're looking for.
- *16-band graphic EQ*—raise the position of the sliders until you find the frequency you're looking for.

In both cases, once you find what you want, remember to bring your gain back to its starting position, adjust it to create the change you want, and then back off a little bit.

What's Where

While every signal's unique, here are some guidelines for where to start looking for things you may want to EQ.

Kick Drum	
<i>When you want to EQ a kick drum's:</i>	<i>Try this frequency:</i>
thump	100 Hz
skin snap	5.0 kHz

Snare Drum	
<i>When you want to EQ a snare drum's:</i>	<i>Try this frequency:</i>
bang	400 Hz
crack	2.0 kHz
crispness	5.5 kHz

Other Drum Kit Sounds	
<i>When you want to EQ a:</i>	<i>Try this frequency:</i>
drumstick tip hitting the hihat	4.2 kHz
hihat's sizzle	12 kHz
cymbal's sizzle	16 kHz
drumstick tip on a cymbal's bell	1.0 kHz
tom's warmth	300 Hz
tom's skin	6.1 kHz

Singer	
<i>When you want to EQ a singer's:</i>	<i>Try this frequency:</i>
warmth	200 Hz
notes	1.0 Hz
breathiness	12 kHz

Bass	
<i>When you want to EQ a bass's:</i>	<i>Try this frequency:</i>
warmth	150 Hz
notes	500 Hz
bass overtones, or "air"	5.0 Hz

Other	
<i>When you want to EQ:</i>	<i>Try this frequency:</i>
an acoustic guitar's sparkle	10 kHz
an electric piano's tines, or "sparkle"	6.7 kHz
a synth's overtones, or "air"	8.2 kHz

Assorted EQ Tips

Fixing Things with EQ

EQ can be very handy for solving problems. Here are some common examples.

Muddiness

It's not unusual to have several instruments that add lower frequencies to a mix, making the whole bottom end unclear, or "muddy."

If a mix sounds muddy, try cutting the low end of instruments that don't really need to sound warm. Sometimes, an instrument can add low frequencies you can't hear but that muddy-up a mix.



Some engineers and producers routinely cut the bottom—everything below 150 Hz—out of any sound that doesn't really need to have much, such as vocals, guitars, and electric pianos. Obviously, kicks and basses *do* rely on a fat bottom, so don't do this to them.

Dullness

If a signal sounds lifeless or muffled, try adding a 10 kHz boost.

Sibilance

If a singer's "s" sounds are too loud, try cutting the vocal around 7.4 kHz, or just below that. This type of noise is called "sibilance."

Other EQ Ideas

Make Good EQ Neighbors

If different sounds are playing in the same note range, they can get in each other's way, making it hard to hear the sounds clearly. Often you can bring out one sound by EQ-ing another instrument out of its way. Using the technique we described on Page 6, see if cutting frequencies from one sound makes the other one more clear.

Don't Add Mud

Make sure you're not adding mud to the mix by boosting the bottom of your signals too much. Add bottom to sounds in small doses, and listen carefully to avoid problems.

EQ with Complicated Signals

If a signal contains multiple sounds—a drum loop would be a good example—pay attention as you EQ one sound to make sure you're not affecting the signal's other sounds in a way you don't like.

Moving Things Forward and Back

While you use panning to move sounds left and right in a mix, you can use EQ to make sounds seem closer to the listener or farther away. For example, you'd want a lead singer to sound like he or she is at the front of the band—other voices and instruments may sound best "behind" him or her.

To move sounds forward, boost them in the 1-3.2 kHz range. To move them back, cut the same frequencies.

The End

We hope you've found this workshop helpful. You'll find other M-16DX Workshop booklets available for downloading at www.RolandUS.com/EDIROL.