M-16DX 16-Channel Digital Mixer

Tuning Your Room with RAC

M16DXWS15

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 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

The M-16DX's incredibly handy RAC—"Room Acoustic Control"—feature optimizes the output of the M-16DX for the room in which you're working. When you're recording, this helps ensure that your tracks and mixes sound great everywhere. When you're using the M-16DX for live mixing, RAC helps you get the best sound for your audience. This booklet explains how to use RAC.

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.

Why The World Needs RAC

Just as there are all sorts of speakers in the world, there are even more kinds of rooms in which the speakers get used. Rooms come in every sort of shape and size, and each room contains its own unique mix of furniture, flooring, wall materials, windows, wall hangings, and so on. Every one of these factors affects the sound of the room, often making it tricky to get the sound you're looking for using even the very best speakers.

When You're Recording

The Problem

When you're working in a studio context, the room in which you're listening is likely to cause the sound coming out of the speakers to change in some way, resulting in your not hearing what you're really getting. Some aspects of the sound may seem louder than they really are, or quieter. This can cause you to make serious mistakes during recording and mixing.

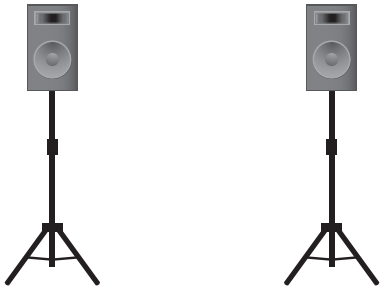
Since everyone who hears your work will be listening in their own unique listening environment, the best strategy is to create a mix that brings to that environment no problems of its own. What you want to hear when you're mixing is as honest a sound as possible. The speakers shouldn't sound *good*, they should sound *accurate*. That way, when your mix sounds good, you can know it's more likely to sound good anywhere.

The RAC Solution

When you've connected your speakers to the M-16DX's CONTROL ROOM L and R outputs, you can apply RAC to them. RAC adds an automatically formulated EQ curve to the CONTROL ROOM outputs that flattens your speakers' frequency response, fixing any problems caused by your acoustic environment. Once you can trust what you hear, you can record and mix with confidence that what you think you've got is, in fact, what you have.

When you're recording, RAC changes only the way you listen to your DAW tracks or mix—by altering the CONTROL ROOM outputs. It doesn't directly affect your DAW tracks or your mix. It just lets you hear them accurately so you can make them sound the way you want them to.

When You're Mixing Live Sound



The Problem

The acoustic oddities of a performance space may result in

- *feedback*—when a a particular frequency range is too loud in a room. This can cause howling when a mic picks up that frequency range and sends it to the speakers, which sends it back into the mic even louder, and round and round. This can cause you to turn the whole mix down just to avoid the problem.
- *poor sound*—when a room just doesn't sound very good. This kind of room, a surprisingly common beast at performance venues, makes everything harder when you're mixing since you're always fighting against the room's own acoustic issues.

The Solution

In live mixing, you connect your house system to the M-16DX's MAIN L and R outputs, and apply RAC to them. RAC identifies any problem frequency ranges in the room, and adds EQ to the MAIN OUT jacks to lower the volume of any frequency ranges that are too loud, and/or increase the volume of any that are too quiet.

In live mixing, RAC is less about creating an accurate listening environment than it is about achieving a good, strong sound right then and there.

If you're unclear about what EQ is, see the *M-16DX EQ* Workshop booklet.

If you'd rather tweak the sound of the MAIN OUT jacks manually, you can use the M-16DX's 16-band graphic EQ, described in the *M-16DX EQ* Workshop booklet.

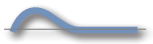
The Three Flavors of RAC

RAC has three different analysis/adjustment routines it can run, depending on what it is you want RAC to do for you.

- *Flat*—strives to make your speakers accurate, with no coloration. You'd use the Flat response curve when you're recording, or when you want your speakers to sound as neutral as possible in live mixing.

- *Bump*—boosts the high-frequency content of your speakers as well as their low end. This response curve is handy for creating especially warm and crisp live mixes.

- *Warm*—brings out the bottom end of a live mix, and is suitable for dance music where you want a deep kick and bass, or for solo or small-ensemble mixes that might otherwise sound thin.



The M-16DX Never Forgets

Once you've performed an RAC analysis and adjustment, the M-16DX stores the resulting response curve for you in its memory. You can quickly recall a response curve whenever you resume work in an environment you've already analyzed and RAC-adjusted. You can store four Flat response curves, four Bump Response curves, and four Warm response curves.

You can also replace individual stored curves as described later on in this booklet. If you like, you can clear out all of your RAC response curves at once using the UTILITY menu's Initialize command set to its ALL or GEQ/RAC setting, as described in the *M-16DX Owner's Manual*.

When you initialize your RAC curves or perform a factory reset, all of your stored curves are permanently erased, so only do this if you're sure you want to.

What Happens In an RAC Analysis and Adjustment

While you'll be able to see what RAC is doing as it runs through its analysis and adjustment, it goes by pretty quickly, so we thought we'd tell you what you'll be seeing before we actually perform the procedure—this gives us a bit more time to explain things. The procedure is pretty much automatic once you get it going, working first on your left speaker, and then on your right. When you initiate an RAC analysis and adjustment procedure:

1. After you select a Flat, Bump, or Warm response-curve memory location to use, the M-16DX sends its test signal to your left speaker and analyzes what it "hears."
2. The M-16DX tries out a handful of corrective EQ curves and listens to each one until it's satisfied that the best curve has been found, which it then writes into the selected response-curve memory location. (You can see the curves it's trying out as it works.)
3. The M-16DX moves on to your right speaker and repeats Steps 1 and 2.

Setting up for an RAC Analysis and Adjustment

Selecting Your Test Mic

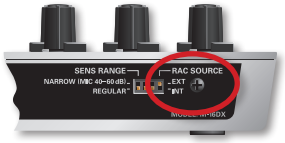
On the back of the M-16DX mixer, you'll find its built-in ROOM ACOUSTIC SENSOR.

The ROOM ACOUSTIC SENSOR is a high-quality mic designed for analyzing your speakers as part of the RAC analysis and adjustment process. You'll typically get great results using the ROOM ACOUSTIC SENSOR.

Using Another Mic from Your Collection

If you'd prefer to use a high-quality mic of your own for this purpose, you can. Here's how:

1. Connect the mic to the Input 1 XLR jack.
2. On the rear of the M-16DX mixer, flip the RAC SOURCE switch up to its EXT position—when you do this, the display shows that Input 1 is being used for RAC analysis.

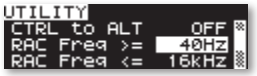


If you try to change any of Channel 1's EQ settings or press its SEL button, the M-16DX reminds you that the channel's currently being used for RAC.

Setting a Frequency Range for Your Mic to Test

When you're using your own mic, you should set the M-16DX to take best advantage of the mic's own frequency range by setting the M-16DX's RAC FREQ UTILITY parameters. Here's how:

1. Hold down the CURSOR BWD and FWD buttons at the same time to display a UTILITY screen.
2. Press FWD and/or BWD until the RAC FREQ >—for "RAC Frequencies Greater Than"—value is highlighted.



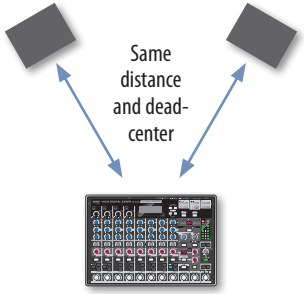
3. Set the parameter to the value closest to the lowest frequency your mic can capture.
4. Press FWD once and set RAC FREQ < ("RAC Frequencies Less Than") to the value closest to the highest frequency your mic can handle.
5. Press DISPLAY•EXIT when you're done.

When you're using the M-16DX's built-in ROOM ACOUSTIC SENSOR, RAC FREQ > should be set to 40 Hz, and RAC FREQ < should be set to 16 kHz.

Positioning the ROOM ACOUSTIC SENSOR or Mic

Place the M-16DX mixer's ROOM ACOUSTIC SENSOR or your mic

- *at an equal distance from, and exactly in the middle of, your two speakers*—with nothing in the way.



This central location is also the best place for you to mix from, of course.

- *at roughly the same height as your ears if possible*—so what RAC picks up most closely resembles what you'll be hearing.
- *where it won't move or resonate during the procedure.*

Setting the M-16DX's Volume

RAC requires a strong signal to work well. While the specific levels you should use depend on your speakers, room, ampilfier settings, and so on, here are some starting points. If you're performing an RAC analysis and adjustment

- *for studio work*—set the MAIN LEVEL knob to its 12 o'clock position, and set the PHONES/CTRL ROOM knob to the same position.
- *for live sound*—set the MAIN LEVEL knob to its 12 o'clock position.

If you need to raise or lower this level, the M-16DX will ask you to.

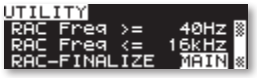
If you raise your output level higher than normal as you perform the RAC analysis and adjustment, *be sure* to turn it back down to a normal listening level before sending any other signals through the M-16DX. Otherwise, you may end up blasting your speakers and yourself.

The RAC Analysis and Adjustment Procedure

Now that you know what to expect, here's how to perform an RAC analysis and adjustment procedure.

Automatic Analysis and Adjustment

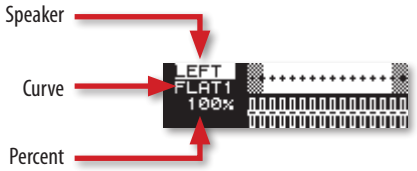
1 Hold down the CURSOR BWD ad FWD buttons together to get to the UTLILITY menu, and cursor to the RAC-FINALIZE value.



2 Set the parameter as desired. If you're working

- *in a studio setting*—set RAC-FINALIZE to CTRL, for "CONTROL ROOM."
- *on a live mix*—set RAC-FINALIZE to MAIN.

3 Press the ROOM ACOUSTIC CONTROL button so it lights, turning on RAC. The M-16DX displays the first RAC screen.



We'll talk about what you see on this screen more later—what you see before doing an RAC analysis and adjustment isn't that meaningful.

4 Use CURSOR FWD to highlight the curve value.

5 Use the - and/or + VALUE buttons to select the desired Flat, Bump, or Warm memory location for the type of RAC adjustment you want.

If you'd like to replace an already-stored response curve, select it now—your new curve will take its place.

6 Hold down the ROOM ACOUSTIC CONTROL button for a couple of seconds until it and the 16 BAND GRAPHIC EQ button blink, and the first analysis screen appears.

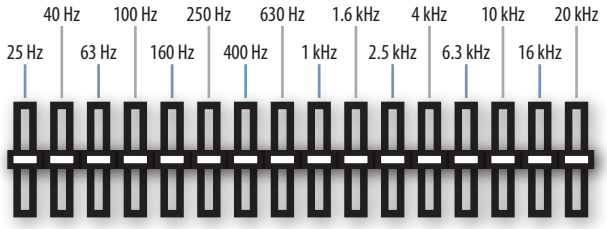
Watch the display as the M-16DX works. If it asks you to turn your output level up or down, do as instructed. If you're working in a studio context, adjust the PHONES/CTRL ROOM knob's setting. If you're doing live sound, adjust the MAIN LEVEL knob's setting.

As the M-16DX analyzes your left speaker's response, it displays "Measuring." Next, it tries out a few corrective response curves until it finds the best one. After it's optimized the M-16DX's output for your left speaker, it repeats the process for your right-hand speaker.

When the analysis and adjustment process is complete, the M-16DX shows you the resulting EQ settings for its left and right outputs.

The upper row of sliders shows the settings for the 16 left-speaker EQ bands. The lower row shows the right speaker's EQ.

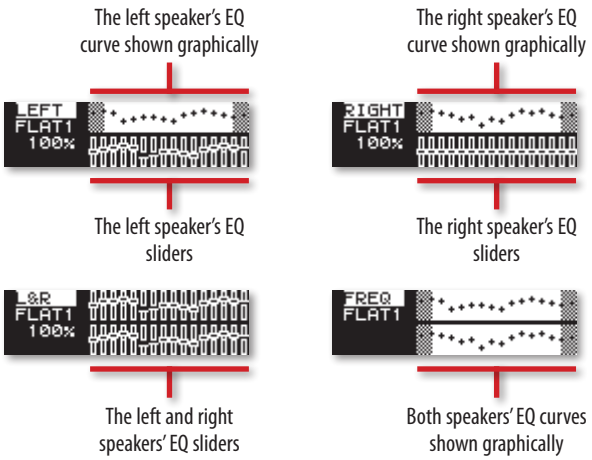
The position of the EQ sliders shows the unique response curve RAC has just created for you. There's not enough space on the display to identify the EQ band associated with each slider, but we can show you here:



7 That's it—the RAC and 16 BAND EQ buttons have stopped flashing and the M-16DX's output is now optimized for your speakers and room.

We know we've said this before, but we can't say it enough. If you've raised your output level for the analysis and adjustment procedure more than you normally would, *make sure* to turn it back down to a normal listening level immediately after performing an RAC analysis and adjustment to avoid damaging your speakers and/or your ears.

8 To give you a good look at your RAC response curve, the M-16DX displays the details on a few different screens. With the top line—usually the speaker name—highlighted, use the - and/or + VALUE buttons to get to these additional views.



On your screen, you'll see your own RAC EQ curves, of course.

To hear the difference RAC is making to your sound, send some audio through the M-16DX and listen to it while turning RAC on and off by toggling the ROOM ACOUSTIC CONTROL button.

Manually Tweaking Your RAC Curve

While you would normally leave your RAC curve as it is for studio work—where you're seeking absolute accuracy—you *can* adjust an RAC curve. In Live mixing, you may well want to tailor the curve to your taste. There are a couple of ways to do this.

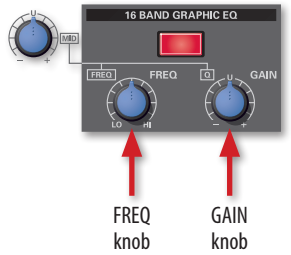
RAC Percentage

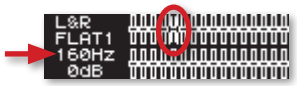
You can set the degree to which you want to use the RAC adjustment curve by cursoring to the RAC percentage value and using the - and/or + VALUE buttons to select the strength with which you want the curve applied.

Tweaking the RAC EQ

If you'd like to make changes to the adjustment curve

1 Turn the 16 BAND GRAPHIC EQ FREQ knob to select the desired frequency range on the left or right side. The currently selected range's slider is highlighted, and its name is also shown in the lower-left of the screen.





2 Turn the 16 BAND GRAPHIC EQ GAIN knob to adjust the level of the selected frequency range.

Using Your Stored RAC Response Curves

You can use your stored RAC curves at any time by pressing the ROOM ACOUSTIC CONTROL button so it lights—this turns RAC on and displays an RAC screen.

To select a different stored curve, highlight the currently selected curve in the RAC screen, and use the - and/or + VALUE buttons to select the one you want.

Press the button again to turn RAC off.

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*.