



DRMeter MkII

User Manual

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Table of Contents

Installation & Setup	7
Licensing	7
Online Activation	8
Offline Activation	8
Quick Start	10
Introduction	10
Another Metering Tool?	10
The Evolution of Metering	12
Who Needs DR Metering These Days?	12
Evolution of DR	13
DR Basics	14
Pitfalls of DR measurement	14
Interpreting DR measurements	14
DRM2 Features	14
Main	t14
Unique Features	15
Additional Functions.....	15
The Interface	16
Description of Functionality	17
[1] D-t button (Dynamic Mode)	17
Mode 1 — DR.....	17
Mode 2 — PSR.....	18
Mode 3 — LRA.....	18

[1.1] Numeric Display.....	18
[1.2] D-MODE Bar Graph.....	19
Friedemann’s User Tip #1.....	20
[2] L-MODE button (Loudness Mode)	20
[2.1] Numeric Loudness Displays.....	21
[2.1] L-MODE Bar Graphs.....	22
[2.2 & 2.3] Display Thresholds (Back Panel).....	22
Friedemann’s User Tip #2.....	23
[3] Integrated DRi & LUi/LUFSi.....	23
Friedemann’s User Tip #3.....	23
[3.1] Play/Pause.....	24
[3.2] Auto Mode.....	24
Integrated Measurements	25
[3.3] Gate.....	25
Friedemann’s User Tip #4 — for Advertising Clients	26
[3.4] Gate Enable (Back Panel).....	26
[3.5] DR.....	26
[4] True Peak	27
True Peak Numeric Display	28
True Peak Bar Graph	28
Limiters	29
[4.1] True Peak Enable (Back Panel)	29
[5] True Peak Threshold	29
[6] 0 LU/Target Loudness	29
[6.1] Relative Scale	30
[6.2] Absolute and Relative Switch (Back Panel)	30
[6.1 & 6.2] Absolute Versus Relative	30
[6.3] Relative Scale +9 & +18.....	31
[7] -18 dBFS Reference	32

[8] LINK	33
[9] RESET	33
[10] Digital Silence	33
[11] AAC.....	33
[12] Dynamic Deviation	34
Dynamic Deviation Examples	37
More about Dynamic Deviation	37
Drag & Drop with DRO2	38
Native Standalone Version.....	39
In Use	39
Back Panel Setup	40
[13] Back Panel	40
[14] Scale Range	40
[15] UI Size	40
[16] Tool Tips	40
[17] Horizontal/Vertical Mode	40
[18] Preset Management	40
Preset Files	41
[19] Info Tab.....	41
LUFS/LKFS terminology	41
Specifications	41
System Requirements	42
Supported Platforms.....	42
Supported Sample Rates.....	42
Supported Hosts	42
Updates	42

Support 42

License Central 42

 In Use43

 Controls.....43

 Preferences..... 44

Share The Love..... 44

Credits..... 45

Appendix 1 — GPLs..... 47

About This Manual 55

Installation & Setup

When preparing for installation of your MAAT DRMeter MkII and DRMeter MkII Standalone, we recommend that you quit all applications prior to proceeding. Also, after downloading the installer and prior to installation, let any anti-malware measures you may have running scan the installer. Then, temporarily disable all anti-malware measures once scanning is complete.

To install, simply double click on the downloaded Installer for your particular operating system. The installation process will guide you through the install procedure. If you have an older OS version, restarting your host may be required. Don't forget to reenable anti-malware measures or simply restart your host.

Licensing

MAAT software is licensed through our dongle-free, cloud-based license control framework. If your hosts are net-connected, our licenses "float," making it easy to move from one machine to another. All you have to do is close all MAAT stuff on one machine before you open anything on another. If you're going to use the laptop in an environment where internet is spotty or non-existent, you can also go offline temporarily for up to 30 days.


To license your MAAT purchase, open yours or instantiate an example in your preferred plug-in host. When licensing, we recommend you open a new session in your DAW just for this purpose.



Figure 1: The initial Activation dialog

Online Activation

Once the Activation dialog appears, paste or type in your Product Key supplied at the time of purchase. Then click on Activate/Deactivate Online and follow the prompts.

 **NOTE: THE ONLINE PROCESS REQUIRES A LIVE INTERNET CONNECTION. YOU MUST HAVE AN ACTIVE INTERNET CONNECTION FOR ACTIVATION.**

A feature of our cloud-connected system is that, if you close a DAW session that contains MAAT plug instances, then open that session on another host, the license will “follow” you onto the new host as long as you have live internet.

You can also return or park your license on our licensing server, and pick it up later on another host. Once your product is licensed, click the Activate/Deactivate Online button to deactivate your license, then repeat to reactivate.

Offline Activation

If, for security reasons you have an offline host computer or you plan on working without a reliable internet connection, it is best to go with an offline license. There are two offline options, temporary offline and full offline.

Temporary Offline

If you plan on working without a reliable internet connection, we designed the temporary offline option just for you. The temporary offline process also requires a live internet connection, but only during activation.

A temp offline license has two unique features:

- It can remain offline, without an internet connection, for up to 30 days
- It auto-renews its lease whenever it does make a server connection

So, if your internet is spotty or unreliable, or you're heading temporarily to a location where an internet connection isn't available, the temporary offline option lets you work untethered to the 'net for up to a month.

By clicking the "30 Days Offline" button, your online license will become temporarily offline for a maximum of 30 days. If, however, you use the product while connected to the internet at all during that time, the “lease” duration is automatically reset, extending another 30 days.

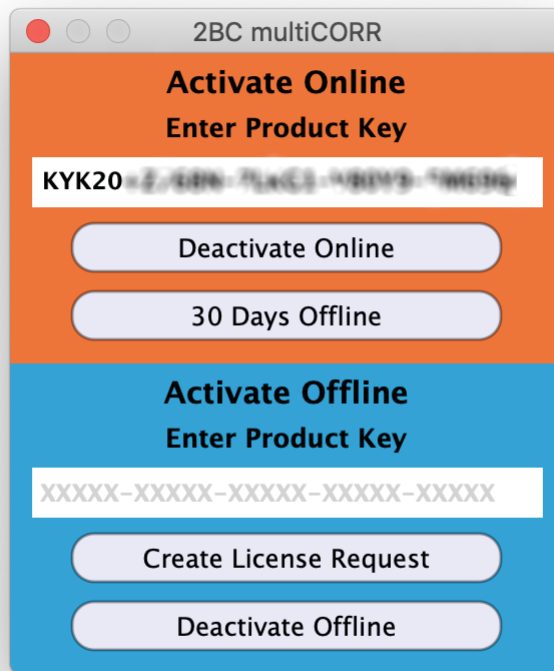


Figure 2: The 30 Days Offline activation option

Full Offline

This will license your MAAT product without the need to periodically contact our licensing server. If you anticipate working without the internet for more than a month at a time or, for security purposes, your studio machine is “air gapped” and has no internet, take a moment to surrender your online license, and replace it with an offline version.

Note: A full offline license does need to be explicitly renewed once a year.

To prepare for offline activation, you will need:

1. Your Product Key!
2. Some method to move your License Confirmation file to the offline host machine.

That latter requirement can be accomplished in any number of ways, but a USB flash drive is often readily available and most convenient. You will also need your Product Key that was supplied to you via e-mail when you purchased your MAAT product.

The offline activation process starts with generating a License Request, with a “maatr” file extension, which is submitted on-line to our server or via e-mail to MAAT Support <support@maatinc.zo-hodesk.com>. A License Confirmation file, with a “maatc” extension, will be returned to you, which will activate your productt.

To proceed, click on the Activate/Deactivate Offline button, and follow the prompts.

In a year’s time, 365 days from the date the maatr file is created, a full offline license must be renewed using the same maatr/maatc method.

Quick Start

A Quick Start guide is installed in the same directory as this user manual. An on-line version is also available for viewing as you learn your way around DRM2 or as a reference while working.

<https://www.maat.digital/support/#manuals>

Introduction

It’s been a long journey to bring this second generation DR Dynamic Range meter to life. We’ve done a lot of research and development in order to create an intuitive and useful multi-measurement tool. DRMeter MkII fills a gap in the landscape of modern audio metering, exceeding current metering solutions with practical audio visualization and parameters.

DRMeter MkII is the big brother of the DRMeter. In turn, DRMeter is the successor of the original TT Dynamic Range Meter. Offering all modern mandated metering standards, DRM2 is compliant with BS.1770, A/85 and R 128, making it your unique metering tool for most all scenarios, from music, drama, commercials and spoken word to post and broadcast.

DRMeter MkII is the first Loudness meter designed for general use and specifically for music production. It’s the only meter that displays channel-specific Loudness trends and events by augmenting the mandated joint measurement with classic L/R metering. DRMeter MkII is also the first plug-in to offer official integrated DR*i* dynamic range measurements!

With this product, MAAT also premieres the Dynamic Deviation™ function, an intuitive approach to comparing current dynamic density to Target Loudness. DRM2 is also the first Loudness meter to display both Relative and Absolute scales simultaneously.

Another Metering Tool?

Do we really need yet another metering tool? Here are five good reasons:

1. It's the first and only EBU R 128-compliant Loudness Meter with fully integrated DR, our well respected real time, estimated DR bar graph. We have also incorporated an integrated DR algorithm, so you can measure official DR_i values while mixing or mastering.
2. Modern mastering comes with the challenge of leveling for multiple audio distribution platforms, each with different Loudness normalization standards. DRMeter MkII makes it easy for you to adjust Loudness regardless of delivery method or platform. This includes a convenient integrated AAC function, which allows you to meter and monitor "round trip" through an iTunes-like codec at the push of a button.
3. With DRM2, you can monitor Short-term or Momentary Loudness per channel while seeing the R128-compliant average value as well. Other Loudness meters measure just a single Short-term and Momentary Loudness value representing both left and right channels for a good reason; ease of interchangeability, especially for multichannel programs. The huge disadvantage of this approach is that the user misses the visualization of energy distribution between left and right channel as we all are used to seeing with old skool "stereo" meters.
4. DRM2 is a highly comprehensive and intuitive design. Easier to interpret, this makes DRMeter MkII the ideal tool to grasp an inclusive concept of mandated BS. 1770-based metering.
5. In the tradition of the DRMeter, we deliver optimum ballistics and low fatigue visuals tightly coupled to perceived audio. We have reduced the UI (user interface) complexity so you can really focus on the important stuff without being distracted by tons of gratuitous visual bling.

We are grateful for the broad acceptance and appreciation of our aim to support higher fidelity and conscientious use of dynamics modification. Thank you for your support and keep at it for a more dynamic and vital musical listening experience. In a world of slowly fading Loudness Wars, unfortunately there are still too many distorted and unpleasant music releases.

Please read on! We know, most manuals suck, but consider reading this tome as an important step to getting the best out of your purchase. Why? Because we're sharing years of experience in the field of metering and psychoacoustics with you. More importantly, metering works best in combination with knowledgeable interpretation. You need to understand there are challenges to effective metering. Using the right metric in the right situation allows you to get the full benefit of interpretation based on your program material.

If you are more of a visual learner, watch our videos! You'll find them linked on the product page of our site. To follow the manual, install the plug-in first so you can check each functions as you read. We also recommend printing out or [opening](#) the Quick Start guide so you can see all the functions and related numbers at a glance. Don't forget to have fun with this tool!

— Friedemann Tischmeyer, along with the MAAT
& Pleasurize Music Foundation teams

The Evolution of Metering

Since the invention of the initial DR meter, things have improved in the global audio metering marketplace. We now have world standards for True Peak, Loudness and Dynamic measurement, defined in ITU BS 1770 and applied in practice courtesy of the European Broadcasting Union's R 128 and the Advanced Television Systems Committee's A/85 standards. Though designed for broadcast audio, this has had a huge impact on the whole world of production and distribution, not only broadcasting. In fact, we now have reliable and predictable algorithms and parameters, interchangeable between studio facilities and countries.

It has brought "Loudness Normalization" into the world of global music distribution! That, in turn, has led to the slow creeping death of the Loudness Wars. However, like all proper zombie hunters, we must remain vigilant!

Throughout this manual, you'll learn to deal with all basic parameters of the new world of metering, including Loudness Units, Short-term and Momentary Loudness, True Peak Level, and Loudness Range.

Who Needs DR Metering These Days?

We had to ask ourselves, "Does the world really need the DRMeter anymore?" The clear answer is, as we to say in California, "Fer sure, dude!" Why? Because LRA or Loudness Range, as specified in BS.1770-4, aims to reflect the dynamics of broadband material being distributed by television broadcasters. The LRA algorithm excludes the top 5% of the dynamic band, which is uninteresting for broadcasters working with generous headroom. However, that same top 5% of the whole dynamic range capacity of a system is essential for music as that content happens almost exclusively in this upper 5% region. Integrated DR is the only algorithm for measuring the dynamic integrity of music releases.

Wait! During the last few years, you can find plenty of meters showing PLR or Peak-to-Loudness Ratio, the difference between Peak and Loudness values. Would PLR be a good alternative? Nope, because PLR reflects the Peak-to-Loudness Ratio all the time. If you have a song with an acoustic guitar intro and a very dynamic interlude, but with a chorus smashed against the ceiling, the PLR would show us a moderately high value due to the dynamic intro and interlude. This is solved with DRMeter MkII as you can actually measure the lack of dynamic range as you hear it.

Do we need the DR value for Loudness normalization of music playlists? Nope, not anymore as an existing integrated Loudness metric, Program Loudness, is the proper algorithm of choice for that function. By “integrated,” we are using engineering shorthand for “integrated over time,” where the measurement duration extends over an entire program, from beginning to end. That may be 15 or 30 seconds for an advertisement, or 30 or 60 minutes for a whole show. Sometimes, Program Loudness is referred to as Integrated Loudness or LUi.

Spotify, YouTube, TIDAL, Pandora and many other streaming music platforms are working with Program Loudness, along with TV broadcasters worldwide plus an increasing number of traditional radio broadcasters and OTT or “Over-The-Top” streaming providers like Netflix and HBO. iTunes Music and iTunes Match use a proprietary algorithm which is pretty close to Integrated Loudness mentioned above. We really don’t need another player in the field of Loudness normalization, which brings us to our original subject; the DR Dynamic Range algorithm!

Evolution of DR

Friedemann Tischmeyer, MAAT co-founder and creator of the Pleasurize Music Foundation, invented the DR system as a way of measuring and comparing dynamic density in pop recordings. This was during the height of the “Loudness Wars” that had started in the late 1970s when AM radio stations were striving to be perceptually louder than their competition. This “louder than everyone else” mentality eventually resulted in the life being crushed out of pop music.

The original TT Dynamic Range Meter was the first implementation of the DR algorithm. DR uses a different algorithm from “R128” or A/85, and is designed to provide meaningful measurement and comparison of pop music releases since they have suffered the most, dynamically speaking, from the Loudness Wars. Tischmeyer later became a member of the EBU’s *ploud* group that developed the R 128 standard. While R 128 was originally developed for the automatic control of subjective loudness for “interstitials,” usually advertisements, DR provides an repeatable, interchangeable, easy to understand integer number that represents the dynamic density or amount of dynamic range compression applied to a clip, song or album.

DR has become a de facto standard in the industry. It is used by engineers, producers and audiophiles to better understand how much the dynamic range of popular music mixes are “crushed” with the use of dynamic range modification tools. The original TT DR also created a database representing the DR values for over 10,000 tracks and albums. The database is used for provenance and comparison purposes across the industry and by consumers.

Note that the DR algorithm is MAAT’s intellectual property, and we have never licensed another company to produce a DR product. Beware of bogus and inaccurate impostors!

DR Basics

Pitfalls of DR measurement

What are DR's shortcomings? Basically, the problem is psychoacoustic. The simple fact is that the absence of transients in some acoustic performances will reflect a very low DR, despite not having compressed dynamic range or hard clipping. Let's say we have a singer accompanied by a string ensemble playing legato notes. The singer is belting out loud legato notes and we will see almost zero dynamic as this kind of sound event is dense by nature. Plus, the absence of transients can't create a space between peak and average loudness. Some audiophile music producers have complained about the inability of DRMeter to reflect this in a fair manner. Sorry, but DR was never intended to measure the dynamic density of classical *a capella* music! It's one of several genres that don't lend themselves to meaningful metering. In fact, there simply is no completely universal and accurate algorithm available at present. Here's the thing: *any metering must be interpreted by a skilled user*. With some "seat time" using DRMeter MkII, that skilled user will be you!

Interpreting DR measurements

The aim of the DRMeter is to offer the best possible algorithm to display the dynamic integrity or dynamic density, with emphasis on mainstream pop and rock music. DR measurements are very precise with low values of DR, from DR2 to DR8, and gradually get more imprecise with increasing values due to psychoacoustic effects, physical laws and other factors. So, here's our recommendation for metering interpretation:

- Given two mixes from the same genre, it's highly likely that a DR10 example has more dynamics, lower dynamic density and less compression than a DR8 mix.
- Always judge DR values within a specific genre and the specific material you are measuring.
- With dance and similar genres, which typically have a limited amount of dynamic changes, an increase from DR4 to DR6 can be an insanely huge improvement. You would have a very hard time creating a DR14 EDM master, which wouldn't make sense anyway, while a DR14 jazz master makes perfect sense.
- Depending on the genre and source material, a DR10 master can sound awesome in terms of dynamics, and sometimes it just isn't appropriate to attempt a DR14 version.

DRM2 Features

Main

- Measurements always run in the background, and all metrics are stored until reset

- DR: MAAT's DR dynamic range standard
- D-MODE: DR, PSR, LRA
- L-MODE: RMS, Momentary Loudness, Short-term Loudness
- Integrated: DR_i, LU_i (Program Loudness)
- DRMeter MkII is highly configurable, with multiple metering modes visible simultaneously
- Plug-in and "Standalone" native versions included

Unique Features

- DRMeter MkII is the first Loudness meter designed for general use and specifically for music production.
- It's the only Loudness meter that displays channel-specific trends and events by augmenting the mandated mono measurement with classic L/R metering.
- DRMeter MkII is also the first plug-in to offer official DR, specifically DR_i, integrated dynamic range measurement like our DROffline utility!
- DRM2 premieres the Dynamic Deviation™ function, an intuitive presentation of current dynamic density compared to Target Loudness.
- DRM2 is also the first Loudness meter with DualVu™, displaying both Relative and Absolute scales simultaneously.

Additional Functions

- R 128-compliant True Peak measurement
- AAC mode measures and monitors signal through a round trip, iTunes-style AACplus encoding cycle
- Adjustable, user defined target Loudness
- Adjustable, user defined maximum True Peak Threshold
- Dynamic Deviation — the difference in LU needed to match user defined target Loudness
- LUFS/LU Mode, LU Mode with +9 and +18 scaling
- LINK mode — links left and right channel Dynamic Display together to show average of L+R
- Play and Pause control for integrated measurement
- 3 automatic modes for integrated measurement: AUTO ON, AUTO RESET OFF, AUTO OFF

- Gate On/Off for downward compatibility
- Gate indicator — shows when the Gate is active for LU integrated measurements
- RESET Button
- Minus infinity ($-\infty$ dB) input indicators
- Alternative horizontal window mode [in future free update]
- Adjustable color thresholds for peak and Loudness bar graphs
- Factory & user presets
- optional -30 dB zoom scale
- 5 different UI sizes for any display size
- TP disable option = SPPM or legacy Sample Peak Program Metering
- Includes DR2rt native standalone realtime metering application

The Interface

DRMeter's user interface (UI) may lack the eye candy associated with some products. For a pro user in a dimly lit room, who's face is pointer toward a display all day, the UI is designed to convey maximum information with minimum visual fatigue.

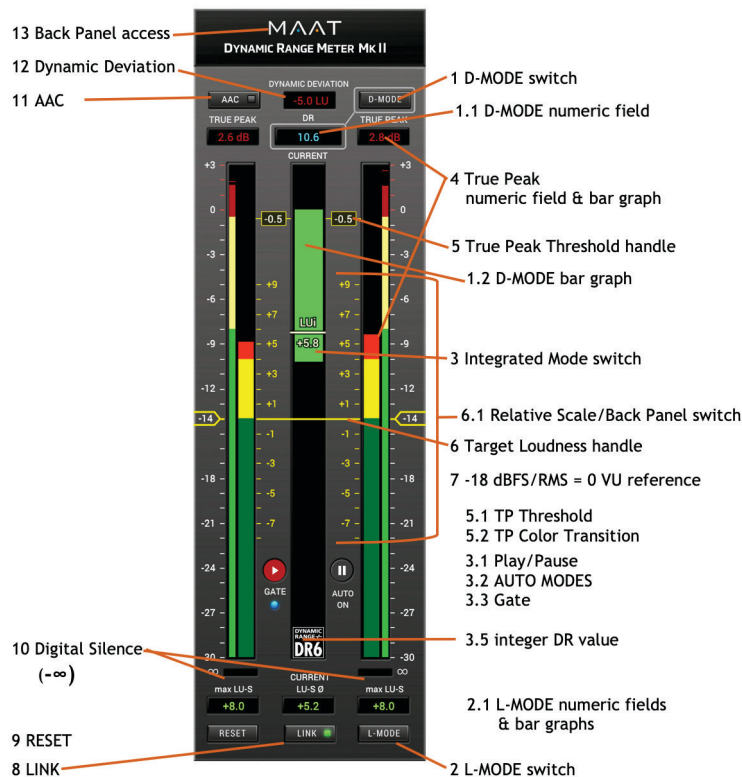


Figure 2: DRMeter MkII's user interface

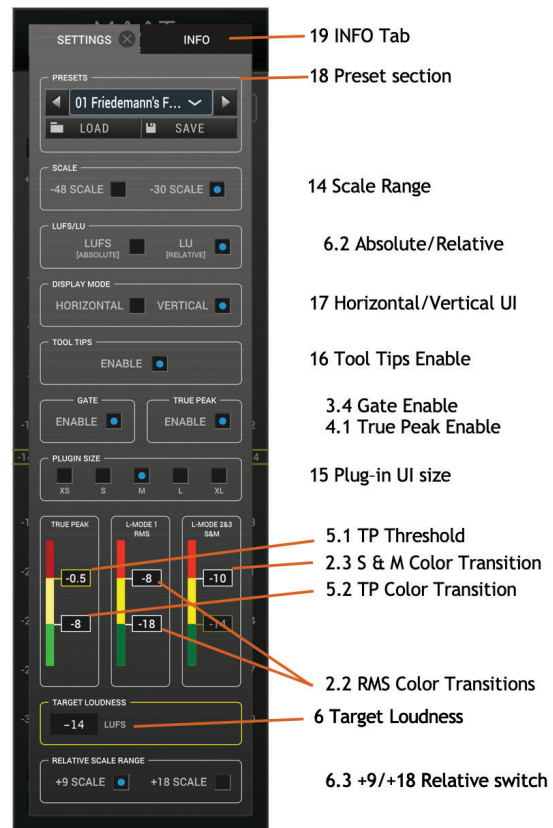


Figure 4: DRMeter MkII's back panel & user preferences

An on-line version of the Quick Start guide, which you can view while reading, is available [here](#). It includes keyed illustrations similar to figures 1 and 2 above.

Description of Functionality

[1] D-t button (Dynamic Mode)

D-MODE stands for "Dynamic Mode" and lets you toggle between these Dynamic and Loudness Range measurement algorithms, displayed in the broader center bar graph [1.2] and in the corresponding numeric field [1.1] above center bar graph in order of appearance:

D-MODE	Numeric Field [1.1]	Bar Graph [1.2]
Mode 1. DR	current values	current values
Mode 2. PSR	current values	current values
Mode 3. LRA	cumulative values	current values

Mode 1 — DR

DR-MODE shows the DR Dynamic Range value introduced by the Pleasurize Music Foundation with the TT Dynamic Range Meter in 2009. DRM2's implementation officially aligns with the original DR standards.

Mode 2 — PSR

The PSR Mode is compliant with the AES e-Brief 373, presented at the 143rd AES Convention in New York in October 2017. It shows the ratio between SPPM (Sample Peak) and Short-term Loudness (according to R128). As opposed to DR, PSR offers no complementary integrated option.

Mode 3 — LRA

The LRA or Loudness Range implementation of the DRMeter MkII is one of the most precise implementation you can find on the metering market and fulfills the EBU requirements with excellence. Note that LRA is cumulative by definition. If you measure a complete song you will always get 100% the same numeric results displayed [1.1] as you would get from a good offline LRA meter.

If you want to compare different readings you can toggle between the three D-MODES without disrupting measurement or resetting the values, unless you:

- a. stop and restart playback or
- b. click on RESET [9]

[1.1] Numeric Display

The central numeric display toggles between:

1. current or approximate DR
2. current PSR (SPPM Peak-to-Short-term Loudness Ratio)
3. LRA (R128 Loudness Range)

Note that, by definition, LRA is cumulative.

The numeric D-MODE display [1.1], with one decimal place, shows current values of DR and PSR but not in LRA Mode. In LRA Mode 3, a summed average value for left and right channel is shown, according to the R128 standard. As mentioned above, the LRA algorithm is cumulative. Therefore the “CURRENT” label, under numeric display 1.1, disappears in LRA Mode 3.

In DR Mode 1 and PSR Mode 2, you can toggle between individual and average channel values by enabling LINK mode [8]. Being the current, ongoing DR value, it's only an estimate of the actual DR_i . For official DR values, always use either the DR_i function [3] for the whole program. Better still, our DROffline and DROffline MkII utilities allow you to rapidly batch measure entire songs (files) or albums (directories). DROffline MkII is specifically designed to work as a companion to DRMeter MkII, with drag and drop integration.

The integer DR_i is measured all the time in the background and promoted to the integer DR value field [3.5] as soon you stop playback. Keep in mind that only entire measured songs can display

the official DR value. The integrated Mode [3] is independent of the D-MODE.

[1.2] D-MODE Bar Graph

The Bar Graph display changes according to the chosen D-MODE. If the LINK mode is inactivate, and you're in Mode 1 (DR) or Mode 2 (PSR), you'll see two bars, side by side, for the left and right channels respectively. In Mode 3 (LRA), as with the numeric display, you're presented with one common bar graph representing a summed average value for left and right channel for the sake of compliance. In Mode 1 (DR), the Dynamic Range bar changes color from green, indicating reasonable dynamic density, through orange or medium density, to red or hyper-compressed dynamic density, as seen in previous versions of DRMeter.

The concept of the central bar graph is to give the user a right brain feel for the dynamics carried by program material, and was first introduced to the world of audio engineering by PMF and MAAT founder Friedemann Tischmeyer. The DR bar graph is dedicated to giving the user an intuitive sense of the degree of dynamic processing through dynamic range reduction tools like compressors and limiters. The algorithm works with a modified Peak to RMS Loudness Ratio formula.

This is important to understand: Bear in mind that a strong legato forte voice, by its very nature, exhibits very low DR/PSR values, due of the absence of peaks contrasting overall loudness, even if its dynamic range has not been reduced. Likewise, a super distorted guitar also shows low DR/PSR values. Not to belabor the point (O.K., we are going to anyway!), but meter reading requires knowledgeable and informed interpretation!

The PSR algorithm is an approach to standardize the commonplace crest factor metric. Many meters, with diverse and non-standard algorithms, are one the market. These non-compliant products increase confusion in the already complex world of audio metering. To shed some light in the darkness, let's delve into a bit of background on PLR or Peak to Loudness Ratio.

For quite some time, PLR was the term used to describe what today is presented as PSR. Lacking a definition of "peak," the problem was one of standardization. When one says peak, do they mean sample peak (SPPM), True Peak (TP), or QPPM quasi-peak program metering? Equally confusing; what is the meaning of "loudness?" Is it RMS with or without a weighting filter, and with which not standardized formula is it calculated? Or, is it short-term or momentary Loudness? Time passed and confusion increased until the folks from the Broadcasting industry decided to standardize "Loudness," defining it as the TP-to-integrated Loudness Ratio. So, if everything works out well and you don't run into an outdated meter, you may find a PLR meter displaying the ratio between True Peak and integrated program Loudness as measured in LUFSi.

Trouble is, this makes no sense for music applications!! Why? Because TP values above 0 dBFS would artificially inflate the LRA value indicating the presence of dynamics, even though values above 0 dB are basically distortion overs. As an engineer doing music production, you can forget about PLR despite the need by broadcasting folks to have a defined version. Standardized PLR is designed to provide the required information to automatically apply gain or leveling changes to broadcast audio files. This makes sense knowing that ATSC A/85-based TV production levels with 2 dB of True Peak headroom and EBU R 128 people use 1 dB of TP headroom. This is something which probably never happen for audio in the music industry. However, for a broadcast engineer, it is useful to know that a film mix has 6 dB of TP headroom when someone needs to raise the level for online distribution to meet a minus 16 LUFS target.

Even if you are not a broadcast engineer, you now know why PLR doesn't make sense anymore for folks in music production. For this reason, we at MAAT have implemented the PSR standard, which makes much more sense for music. Even so, you will find an even more meaningful metric with the DR Dynamic Range algorithm.

The LRA bar graph shows the current LRA...Wait! LRA is cumulative by definition, right? Yes, it is but, just for you, we have bent the standard to display something more useful: The LRA bar graph shows you current LRA, while the numeric value is cumulative and hews to the strict definition. This allows LRA users to simultaneously see the current LRA visually while getting the cumulative numeric values as well. The visual implementation is as precise as you would expect from a MAAT product: The upper edge of the LRA bar graph marks the 5th percentile and the lower edge the 95th percentile of the Loudness range. You can actually see what the algorithm is doing.

Friedemann's User Tip #1

I recommend using DR or PSR for music program. My preference is DR as it gives me more sensible and intuitive feedback. LRA is only useful for TV broadcast applications. If you produce film mixes or commercials, LRA is great but, for music, it is completely useless.

[2] L-MODE button (Loudness Mode)

Loudness Mode or L-MODE lets you toggle between three Modes:

1. RMS
2. LUFS/LU-M (Momentary Loudness, 400 ms integration time frame)
3. LUFS/LU-S (Short-term Loudness, 3 second integration time frame)

The numeric display [2.1] labeling changes according to Mode, so you always know what you're getting.

RMS & Loudness Units

We've mentioned RMS several times...“RMS” measurements aren't as universal as you may think. There is no standard, so you'll find RMS meters with no weighting filters, with unique weighting filters, and even with different measurement algorithms, leading to deviations of up to 3 decibels. For that reason, the ITU has established the B.S. 1770-4 (revision 4) standard, for uniform interchange between studios and continents. This is basically the reason for the invention of the term LU or Loudness Unit. Actually, a 1 LU step size equals 1 dB. The reason for the new term is mainly to indicate that we are in the new world of Loudness metering. Notice, Loudness with a capital “L.” In this manual, we will use capital Loudness to indicate R128-related Loudness, while lower case loudness carries the old skool connotation.

When we talk about LU, everybody knows “Aha, it's about B.S. 1770 or R 128 or A/85.” By the way, R 128 and A/85 both reference B.S. or Broadcast Standard 1770. R 128 and A/85 are the recommendation for putting 1770 into practice; R 128 for Europe and A/85 for the US and a lot of other countries. Basically, the aim of the new Loudness standard is to replace RMS with Short-term Loudness, Momentary Loudness, and Integrated Loudness. RMS is so yesterday, while LU is today and tomorrow!

The R 128 standard stipulates that LU is to be displayed as *a single average value*, regardless of whether you're measuring a mono, stereo, or surround program. This is done for the sake of simplicity and ease of data interchange. This has its benefits but, in practice, this also causes a problem!

Audio engineers got used to seeing an RMS reading for each channel to monitor energy balance between left and right when working in stereo, or multiple channels when in surround. Yes, you could use a Balance Meter, like our free 2BusControl, or a goniometer.

Engineers have gotten accustomed to individual channel readouts and, frankly, it's useful for identifying trends and problem spots. For this reason, DRMeter MkII offers both: RMS, LUFS-M, and LUFS-S as a summed mono numeric value, with one measurement for both channels that conforms to the standard, and as independent numeric maximum values for LUFS-M and LUFS-S. This allows you to make a smooth transition from RMS to LU without changing your habits. You can also get a feel for the differences between the particular algorithms, and transfer years of experience with RMS into the world of LU. Plus, we let you stick to your habit of using individual channel bar graphs as indicators of left-right energy distribution. With DRM2, you can instantly see if your kick suddenly has a left emphasis due to a bogus plug-in setting, an unbalanced FX return or a bad calibrated piece of hardware inserted into the signal path.

[2.1] Numeric Loudness Displays

You've got three numeric Loudness displays: The left for the left channel,

the right for the right channel and the center one for the average of both channels, complying with R128 requirements and because it's certainly useful. The units change according to the L-MODE chosen, and values are displayed with one decimal place.

This is what the numeric fields tell you:

L-MODE	Left & Right	Center
1 (RMS)	current RMS	current average of channels (mono or L+R/2)
2 (Momentary)	Max. Momentary	current Momentary L+R/2
3 (Short-term)	Max. Short-term	current Short-term L+R/2

As soon you stop playback the R128-compliant maximum value (L+R/2) will be displayed in the center numeric field, because with no playback going on, you don't need the current value any more. The display label changes accordingly to avoid confusion. The displayed (L+R/2) max value is 100% EBU compliant and can be reliably used for broadcast deliverables such as commercials and trailers, where max values are relevant.

On the back panel [6.2], you can toggle between absolute LUFS measurements and relative LU. The three numeric Loudness displays [2.1], LUFS or LU, as well as the integrated LU_i/LUFS_i display [3] change accordingly to your set choice. Keep in mind that relative (LU) values are always displayed relative to your set Target Loudness [6], hence the "relative" term. You can reset numeric Loudness values [2.1] by stopping and restarting playback or by clicking the global reset button [9].

[2.1] L-MODE Bar Graphs

The two wider inner bar graphs show Loudness values visually. All bar graphs are equipped with a hold function to allow smooth, eye-friendly meter readings.

[2.2 & 2.3] Display Thresholds (Back Panel)

These defaults define the thresholds where color transitions occur for the L-MODE bar graphs.

[2.2] L-MODE 1 RMS sets the transition thresholds between red/yellow and yellow/green for the RMS bar graph. The default for RMS is -8 dB for red/yellow and -18 dB for yellow/green. You can change these transition thresholds to your liking, though values cannot overlap. Overlapping causes yellow to disappear. Minus 18 dB RMS for the green/yellow transition makes sense as it reminds you that this value equals 0 VU in the analog domain, and is a sweet spot to hit your DAC when you insert analog gear into your signal processing chain.

[2.3] L-MODEs 2 & 3 allow you to set the color transition between red and yellow between -1 and -12 LUFS. Minus 8 is the default. The

color transition between yellow and green is defined by the Target Loudness [6]. Therefore it is ghosted because it's a mirror of the Target Loudness [6] setting.

Friedemann's User Tip #2

The wealth of different information available with DRM2 makes it important to understand what you need in a particular situation. RMS is basically just available for educational purposes. You can compare it to Momentary and Short-term so you get a better sense of the new Loudness metering paradigm.

Momentary is basically designed for EBU broadcast engineers who are required to mix live TV with a maximum tolerance of +/- 1 LU relative to target Loudness. Therefore, they need a Loudness meter which reacts fast. Due to the shorter integration time window of 400 ms it's useful for those live broadcast applications. Producers who need to deliver commercials and trailers to TV broadcast stations may need to read maximum values. Depending on the TV station's specifications, it is most likely Max. Momentary, but sometimes also Max. Short-term. Delivery standards vary from station to station.

Conclusion for music producing engineers: You can ignore Max. Momentary and Max. Short-term stuff as well as Momentary Loudness in general. Simply focus on Short-term for your current Loudness estimation and for the sake of simplicity.

[3] Integrated DR_i & LU_i/LUFS_i

Independent of your D-MODE or L-MODE of choice, you can toggle between two integrated measurements (DR_i & LU_i) by clicking on the small horizontal integrated bar somewhere on the center dynamic bar graph. Clicking on either "DR_i" or "LUFS_i/LU_i" toggles between algorithms. Combining any of the D-MODES with an L-MODE of choice and one of the integrated MODES allows you to focus on the metrics you really need. Don't worry about losing your measurement as you switch, we always measure all metrics all the time in the background, so you can jump from one measurement method to another for comparison.

Note again that the DR_i/LU_i Mode is independent of the D-MODE, which controls what is displayed on the center bar graph [1.2]. By combining DR on the center bar graph (D-MODE 1) and LU_i metering, you can configure your meter for most production situations. The integer DR number will be displayed as a result of the DR_i measurement in the background in field 3.5 as soon you stop playback, or when you are in LU_i Mode.

Friedemann's User Tip #3

This is actually my favorite combination. By having D-MODE in DR Mode, I get the dynamic information I want and, by having in-

egrated MODE in LUi, I can see the deviation between Short-term Loudness on the bar graphs (L-MODE in Short-term) and integrated Loudness. This combination is great for online distribution via YouTube, Spotify, Apple Music and the like. The more macro-dynamics a song has, the more deviation appears between Short-term and integrated Loudness. So, this configuration shows me all this instantly. I know folks, metering is a beast but believe me, metering is like a language. If you speak metering fluently, this will have a positive impact on all areas of audio production. Even if you are more on the artistic engineering side, I encourage you to dig deeper into metering and look out for my upcoming tutorials on that topic. Learning to fluently speak “metering” empowers you in the same way learning a new language opens up a whole world of possibility.

NOTE

LUi relative to target Loudness can be toggled with LUFSi, absolute to Full Scale, by use of the LU/LUFS switch [6.2] on the back panel.

[3.1] Play/Pause

The Play/Pause buttons are for integrated measurements; DRi & LUi. The Play and Pause controls tell you when DRi and LUi is currently measuring or is paused by lighting up accordingly. By default, they work in AUTO ON Mode [3.2], so that the Play [3.1] button lights steadily when you start playback, while the Pause button lights up when you stop playback, pausing measurement automatically. You can take control by clicking Pause manually during playback to stop measurement. Stopping the measurement by hitting Pause may help if you want to measure something which runs in a loop. In AUTO ON mode, the measurement starts and stops automatically and resets automatically with the next play starting from zero. A pulsing Play button indicates that Play is armed and “waiting” for playback to start.

[3.2] Auto Mode

You have three different AUTO MODE options:

1. AUTO ON (Default),
2. AUTO RESET OFF, and
3. AUTO OFF

The three different modes are set by clicking on the AUTO button’s label and cycling through the states. The displayed status represents the active state.

1. AUTO ON is the default: integrated metering starts automatically, stops automatically, and resets automatically with the next start.
2. AUTO RESET OFF will disable the automatic reset after pause, when you start playback again. As with AUTO ON, but without automatic reset so that you can continue metering after pausing playback. This is

useful when you check longer content and want to continue measurement after pausing. Keep in mind that you need to reset manually by clicking the Reset button [9] to start a fresh metering cycle if desired.

3. AUTO OFF deactivates AUTO MODE almost completely, so that you are just measuring integrated values when you manually start playback. In AUTO OFF mode, the measurement pauses automatically when playback is stopped, but will not reset so that you can continue measurement. Integrated measurement starts when you click the Play button, and the meter will wait for a non-zero input to start metering as soon as signal is detected. You can stop measurement by either clicking the Pause button or simply stopping playback.

Integrated Measurements

If you want to take a precise DR_I/LU_i averaged measurement of a particular program, song or A-to-B section, you have to reset the plug-in before starting the measurement in case you are in AUTO RESET OFF or AUTO OFF mode. You can do that by clicking the global reset button.

NOTE!

For 100% accurate and official DR_I or integrated DR values as with our DROffline utility, you must measure the whole program/song/album from start to end! This is also the case for 100% accurate LU_i measurements as well.

[3.3] Gate

The Gate indicator is applicable only in the LU_i Mode, and indicates whether the R128 Gate is active or not. The Gate indicator has a deep implication, as two stacked gates are part of the R128 integrated Loudness measurement standard. The higher amplitude, relative Gate is set to -10 LU.

R128 Gates

R128 specifies two gates as part of measurement. These gates has absolutely no effect on the audio signal! The aim of the Gates is to eliminate “background loudness events” for the purpose of better Loudness normalization results.

As with a noise gate, the collective R128 Gate removes lower amplitude audio that may skew integrated Loudness measurements. The gating temporarily pauses Loudness measurement when the signal falls *below* the threshold. Regarding the “two stacked gates” mentioned above, in addition to the second, -10 relative Gate, R128 also includes a -70 LUFS Absolute Gate which is the first Gate stage and removes extremely low amplitude signals, like analog noise, from being included in the measurement before the second relative Gate is applied. You can learn more about this in upcoming tutorials on our site.

The Gate architecture is very complex, where there is no 100% clear threshold between the Gate On/Gate Off indicator. Rather, it's a dynamic transition between on and off states. We have decided to let the Gate indicate when even a single block is dropped or gated, which may have little impact on the overall measurement result. Only when the Gate indicator is constantly illuminated are all blocks dropped from integrated Loudness evaluation. This has a stronger effect on the integrated measurement, because fully gated sections are fully excluded from integrated Loudness calculations.

When you compare the conservative Gate indicator of the DRM2 with Gate indicator of other Loudness meters, you may observe different behaviors. This is owing to the fact that the indicator is not standardized, and is a matter of interpretation by each plug-in designer.

Friedemann's User Tip #4 — for Advertising Clients

For those of you producing commercials for broadcast, winning the loudness wars might be something your clients requests. The trick is this:

Arrange your sound bed in a way that the Gate is barely off by raising the level so that the Gate indicator just extinguishes. This "saves" Loudness for the show itself, where you can try to win the loudness battle by "banking" or saving your Loudness budget for very loud events. With this approach, your average meets 0 LU or -23 LUFS. When the Gate is off, you won't collect "Loudness credits" because the Gated values are excluded from the integrated Loudness calculation.

Fortunately, the EBU's *ploud* group, the guys that built the R128 standard, introduced Maximum Momentary and Maximum Short-term Loudness for short form program, usually commercials, which allows a maximum of +3 LU Short-term Loudness (= -20 LUFS) and a maximum of +8 LU Momentary Loudness within your commercial as described in R128s1. Rules may vary from station to station but, in general, this avoids an outright loudness war between commercials and stations. By the way, we've specifically added the Max. Short-term and Max. Momentary measurements for those of you doing commercial work, so you'll get the optimum control over these parameters.

[3.4] Gate Enable (Back Panel)

Gated measurement can be disable in the user preferences. This is for completeness and downward compatibility , as some international regions only partially conform to R128 or A/85.

[3.5] DR

Assuming you measure an entire track or album from top to tail, this will display the official, integer DR value.

DR_i or integrated DR: The audio engineering world knows various terms for metering a particular segment or duration from A to B: It is called Program (Loudness), integrated, or cumulative. All terms describe the same thing: The cumulative measurement of a time span of a source. If you measure a song from top to tail in this way, you'll have the same "official" DR value as if you had measured the song with our DROffline utility.

We opted for the term "integrated" to give it a meaningful name, and to make the plug-in compatible when measuring the official DR value as measured from top to tail. If you print a song in real time, this feature makes sense. If you are done with the mastering and have no time left, it doesn't make sense to measure a whole song in real time with the plug-in. For those situations, you're faster doing a batch measurement with DROffline.

However, all integrated program measurements have one thing in common: They get less responsive to actual changes the longer you measure. If you measure a 20 minute song in real time, the DR_i display becomes less responsive the longer the meter runs. It adds value on top of value, and calculates a new total average all the time. You just need to be aware of that when you use the integrated Modes.

Conclusion: It's useful for printing and when you want to get a reliable sense of the official, actual DR_i value of your master during production.

[4] True Peak

First, let's start with some general information about the advantages of True Peak or TP measurement versus classical SPPM or Sample Peak Program measurement. In contrast to SPPM, TP will detect and display "inter-sample overs," trains of samples that, when converted from the digital domain back into analog, may result in amplitudes in excess of a 0 dBFS sample and potentially an overload of the DAC's output stage. Legacy DACs and many modern DACs will clip the output circuitry during an inter-sample over event, result in unintended distortion.

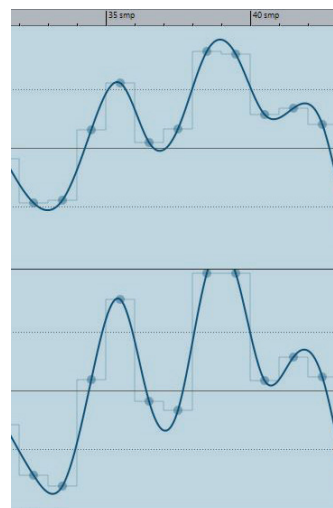


Figure 5: A True Peak example

The above illustration shows an intact waveform in the left channel, and a momentarily clipped right channel. With a properly designed DAC, this clip would be inaudible. In the real world, many consumer DACs would handle this event rather poorly.

Our CTO, Dr. Christoph Musialik, mentions that, “Normally, today’s digital reconstruction filters (also known as anti-image filters) have no problems with overs.” This assumes the designer doesn’t “go by the book” during design and testing, which is assuming a level of expertise that’s often missing from MI and pro audio hardware design. Musialik continues, “If a filter is correctly calculated and the input signal has been properly sampled or generated before, the DAC automatically handles intermediate values which can be much higher than the input samples. However, there’s an additional problem; the Gibbs Phenomena (ringing associated with the sampling process itself) which produces values slightly greater than 1.0 (full scale) and need to be compensated for by proper (internal) scaling.”

True Peak Numeric Display

DRMeter MkII’s numeric display shows maximum TP values with 0.1 dB resolution with an extended range to +3 dB. As mentioned previously, you can individually reset the numeric peak displays by clicking in any numeric field, or globally by using RESET.

If the input exceeds the user’s TP threshold setting, numeric values will appear in red. That visual warning indicator persists even if the input falls back below threshold. Any reset will return the numeric display to green. The user configurable threshold can be specified in the back panel setup menu [5.1] or just by dragging the TP handle [5]. Values in 0.1 increments are accepted, from -2 dBTP, conforming to A/85, up to 0.0 dB. -1 dBTP is the default value conforming to the R128 standard. This threshold is also the TP Threshold defining the top end of your Dynamic Margin™. For more information, see section [12] Dynamic Deviation below.

As with the rest of DRM2, we adhere to BS.1770, so True Peak uses 4x oversampling at the baseband rates of 44.1 and 48 kHz, and 2x oversampling for 88.2 and 96 kHz. For 4x and 8x AES rates; 176.4, 192, 352.8 and 384 kHz, we pass the data through directly to the metering algorithm.

True Peak Bar Graph

While the numeric display gives you the convenience of monitoring your maximum True Peak values, the bar graph continuously shows you what’s going on, letting you spot trends. The Peak Hold function of the bar graphs gives you a persistent display of where you are with your peaks. The bar graph’s tick marks, from 0 to +3, are red to indicate the amplitude may need your attention.

Limiters

Remember, DRM2 is not a limiter, but it does tell you when to work on your limiter setup! It makes sense to set your limiter's output ceiling according to the set TP Threshold of DRMeter MkII. Be aware that DRM2 can show TP values higher than your set output ceiling, even for a high-class brick-wall limiter. This does NOT mean that something is wrong with the DRM2. It means that you've hit the limiter too hard, you need to work on the settings of the limiter or, go get another more reliable true peak limiter if required. For this reason, it's good to have a reliable meter like the DRM2 at hand.

As R128 requires indication of a single maximum True Peak value and we have decided to give you two individual peak meters for stereo, the DRMeter MkII highlights the higher peak value as soon playback stops so that your eye can catch the salient maximum True Peak according to R128 recommendations. As soon playback continues, the meter reverts to showing you channel-specific trends as usual.

[4.1] True Peak Enable (Back Panel)

Though we recommend that you leave True Peak enabled, there may be cases where you need to reserve CPU capability. Disable True Peak to conserve your CPU's capacity. For educational purpose, it's useful to observe the different behaviors of TP versus SPPM metering.

[5] True Peak Threshold

The True Peak Threshold display also acts as a "handle" or control, and is linked to the TP Threshold control [5.1] user preference on the back panel. Drag the handle to change the setting, or use the back panel field by clicking to open the drop down choice of available values.

[6] 0 LU/Target Loudness

The Target Loudness hairline also acts as a handle or control, and is linked to the Target Loudness Threshold user preference [6] on the back panel. As with TP Threshold, drag the handle to change the setting or use the back panel field by clicking to open the drop down choice of available values.

As you would expect, the Target Loudness reference hairline changes according to the Target Level you've set, and the Relative Scale moves accordingly. When Target Level is set to -23 LUFS, you are in R128-compliant mode because -23 LUFS is R128's mandated target Loudness. Broadcast engineers are happy to work within the "Loudness Normalization Paradigm" so that they have a comfortable amount of dynamic headroom when mixing for broadcast. For those of you in that group, in Europe specifically, this should be your orientation to meet target Loudness specs. American broadcast engineers will opt for a Target Loudness of -24 LUFS as mandated by A/85. In both settings, -23 LUFS for R128 and -24 LUFS for A/85, the green/yellow threshold for the Loudness

bar graph is fixed to -23 or -24 LUFS, which equals 0 LU on the Relative Scale in the world of R128.

The Target Loudness control handle sets your Target Loudness according to the media for which you're mixing or mastering. Have a look at our presets to learn more about target Loudness values for various deliver platforms.

Target Loudness defines the lower limit of your Dynamic Margin, the distance or scope between your Target Loudness and the maximum True Peak Threshold you've set. Your set Dynamic Margin is the reference value for positive or negative deviations displayed in the Dynamic Deviation field.

[6.1] Relative Scale

For your convenience, the yellow/golden Relative Scale is displayed all the time, independent from LU/LUFS Scale setting [6.2] on the back panel. The Relative Scale helps you to read deviations relative to your set Target Loudness.

[6.2] Absolute and Relative Switch (Back Panel)

When you are in LUFS Mode [6.2], the white outside numbers to the left and right of the bar graphs are your reference because LU equals dB. LUFS is LU referring to Full Scale and is therefore called absolute scale. Switching to LU puts the meter in "Relative Mode," which means that values deviating from your set target Loudness are displayed as positive or negative variance. The golden/yellow Relative Scale [6.1], inside of both Loudness bar graphs provides visual orientation. In Relative Mode, your target Loudness always equals 0. The Absolute/Relative Switch [6.2] affects how the integrated LUFS/LU values [3] and the three numeric Loudness fields on the bottom [2.1] are displayed.

NOTE

To reduce confusion, the DRMeter MkII always displays LU/LUFS correctly on respective labels. We recommend using the Relative Scale to ease the transition into a Target Loudness mind set.

[6.1 & 6.2] Absolute Versus Relative

Doing the math in Absolute Mode, you're always thinking in absolute terms referenced to full scale. When working in Relative Mode, you're oriented more toward the way of Loudness normalization thinking because your relevant Loudness values will be displayed *relative* to your set Target Loudness.

If DRMeter MkII is set to LUFS on the back panel, the Program Loudness meter [3] will display values in LUFS referenced to full scale; an absolute measurement. If you set it to LU, you enter a relative measurement paradigm, causing Program Loudness to be displayed as a positive or negative deviation from your set Target Loudness.

Absolute vs Relative Examples

Two examples... Let's say you've set your Target Loudness to -12 LUFS and LU_i displays -1 (LU). This would tell you that you need one LU or one decibel more Loudness to match your Target Loudness. It also tells you that your current Program Loudness is -13 LUFS.

Here's another: When your LU_i value shows +2.5, you know that YouTube will dial down gain by 2.5 to match their Loudness normalization standard. Again, bear in mind that you are required to measure a song from start to end to get valid results of the integrated LU metrics!

LUFS/LU Versus LUFS_i/LU_i terminology

LUFS vs. LU always distinguishes between an absolute reference to full scale, or a relative reference to a Target Loudness. Integrated Loudness is usually labeled as "integrated" or "i". You will also find many other labeling versions on different metering products, including EBU-I, integrated, int, i, I, Program Loudness, et cetera.

During your engineering work, it's important to distinguish between Short-term LU-S and LU_i. However, as soon you change the context and speak about the Loudness of a program or a song, one usually talks about "LUFS." You would say, "This song has minus (NN) LUFS." When we do speak about LUFS in the context of a song or program, we always speak about Program Loudness or Integrated Loudness; your choice. This would never be a Short-term Loudness value, because Short-term Loudness is always used only during production, and doesn't "escape" from your studio or control room. Another way to think of this is that Short-term is just to see your current Loudness values in the studio as you craft content. As soon your song or commercial leaves the studio, and you speak about LUFS stuff, you're really talking about integrated Program Loudness, as nobody uses Short-term Loudness to describe the overall Loudness of a program.

[6.3] Relative Scale +9 & +18

For the sake of simplicity in the admittedly complex world of metering, we have reduced complexity as far as possible. As mentioned previously, by switching from LUFS to LU on the back panel, you enter the "fun world" of the new Loudness normalization paradigm. This is a change in mindset as you start to think, mix and master within the confines of Target Loudness instead of pushing everything against the ceiling. The EBU defines two relative scales or scale ranges, which should be visible on any compliant meter. They are called +9 and +18, and they define a positive deviation of +9 or +18 LU from Target Loudness.

With some available Loudness meters, even a +18 scale would be insufficient if your meter is set to a Target Loudness of -23 LUFS and you were mastering Death Magnetic (Sorry Andy, but that product is a standout example). The problem is that even the +18 scale would not accommodate that album's Loudness.

Our R128-compatible metering concept is different from most others in that it's more intuitive and translates easier from the old paradigm into the new world of Loudness metering. This is mainly because you see the whole spectrum from +3 dB True Peak down to -48 dB/LU on the white absolute scale, outside of the peak bar graphs. It's always present to give you an absolute reference. At the same time, you see the Relative Scale *relative* to the Absolute Scale and not detached from the Absolute Scale as it is the case for most Loudness meters on the market.

As the DRMeter MkII is designed to translate better to musical applications than other Loudness meters, it allows you to define your own Target Loudness down to crazy low values such as -5 LUFS which, by the way, is *not* a recommended setting!

Setting a mindful Target Loudness should be the first step when working with DRMeter MkII. For this reason, we picked +9 as the default relative scale, though you can opt for +18 on the back panel. If your Target Loudness is smaller than the scale of choice, such as a Target Loudness of -8 LUFS, any overflowing or out of range numbers will not be visible. The +18 Scale makes sense for Broadcasters with Target Loudness between -24 LUFS (ATSC) or -23 LUFS (EBU).

[7] -18 dBFS Reference

It's not random that minus 18 dB has this subtle visual green tick when L-MODE is set to RMS. When you are aware of proper gain staging during the recording processes and using outboard analog gear, you probably know that -18 dB RMS equals 0 VU in the analog domain. When you setup a microphone, you may use this indication line for setting level, automatically gain staging different sources in a useful manner. If you use analog gear in mastering, it's always good to hit your converter at the sweet spot where it sounds best. You can use this visual marker to recognize whether your signal is too quiet or hot, and adjust gain accordingly. Be aware that this assumes that your analog gear and DA/AD chain is calibrated.

Hugh Robjohns states in a Sound On Sound article: "The basic idea is to treat -18 dBFS as the equivalent of the 0 VU mark on an analogue system's meter, and that's where the average signal level should hover most of the time." The EBU (European Broadcasting Union) standard alignment, officially called R68, specifies 0 dBu analog as equal to -18 dBFS for professional gear.

NOTE!

Be aware that the green -18 dB RMS tick mark refers to L-MODE set to RMS! If L-MODE is set to Short-term or Momentary Loudness, the green indicator is invisible to avoid additional distraction. Momentary and Short-term Loudness also translate to approximately -18 LUFS equals 0 VU, at least on a 1 kHz sine. Lower frequency test tones vary due to the inherent K-Weighting filter applied to Momentary and Short-term Loudness measurements.

[8] LINK

The LINK button controls the visual presentation of the DR bar graph [1.2]. LINK combines the central left and right individual DR bar graphs into one summed graph so it's less fatiguing to track visually. This also allows you to identify global trends. Link works in DR MODE 1 (DR) or DR MODE 2 (PSR). In DR MODE 3 (LRA), the DR bar graph is always linked, according to R128 recommendations.

The default LINK settings:

Mode	LINK
D-MODE 1 (DR):	enabled
D-MODE 2 (PSR):	disabled
D-MODE 3 (LRA):	enabled (disabled not available)

[9] RESET

As the name implies, RESET reinitializes all measured values globally. Clicking in a numeric peak field resets only its value, leaving other fields untouched.

[10] Digital Silence

Digital Silence indicates that “digital black” or null data is present at the input. This is a quick way to see if something in your signal chain is causing excess noise, hum or buzz in situations where the signal is supposed to be $-\infty$ dBFS. Some plug-in modeling geeks are so eager to reproduce an analog original that they introduce noise even when you're not playing anything. This indicator warns you to mute that plug-in or at least switch off the noise option if possible. For example Universal Audio's A800 tape emulation allows you to deactivate noise. Applying a noise gate would be another strategy if the noise is present and unwanted.

[11] AAC

The AAC button makes correct leveling for iTunes mastering simple. Click to only measure through an AAC codec, indicated with a steady on indicator. Right-click to listen *and* measure through the AAC codec in real time. Listen and measure mode is indicated by a blinking indicator. The blinking indicator reminds you to deactivate the mode after verifying the gain structure of your master.

The AAC button is active when the green indicator illuminates and is flashing. This reminds you to switch it off after you've made your appropriate level settings. In AAC mode (right click), you'll hear your signal through a real time “round trip” encode/decode process using an AAC Low Complexity encoder configuration similar to the one adopted by Apple's iTunes team. The AAC encoder [MPEG-4 AAC Profile, including MPEG-2 AAC LC] is in VBR mode and has a bit rate of 256 kbps. This encoder choice is subjectively a very good algorithm, with some

extra word length to create good quality lossy files. Note that the signal quality is transformed by the AAC encode/decode process as long as this function is active.

NOTE!

Due to limitation of the embedded sample rate converter, this function works only with 44.1 to 96 kHz projects. The AAC button grays out and bypasses any AAC processing at sample frequencies higher than 96 kHz. Also note that iTunes-compliant masters are not allowed to show positive True Peak values anywhere in a song or album!

Due to the encoding algorithm, peak values in AAC mode will be increased, and will be reflected accordingly in TP Meter readings. This allows you to have 100% peak level control while producing iTunes-compatible LPCM masters.

iTunes-Specific Mastering Advice

A -0.5 dBTP threshold is recommended for general work as long as we live in the current insanely loudness-driven head space. Regarding iTunes mastering; to deliver compatible masters with exceptional sonic quality, activate the AAC button [11] and make sure to stay at least below -0.1 dBTP. If your source material has not been harmed by prior aggressive peak clipping, you'll get great sounding, transparent results. For best iTunes and multi-format mastering, always go back to the most transparent source you can get in order to avoid damage to consecutive peak samples.

The AAC button is *not* designed to export AAC files, because the AAC delivery is a LPCM file in a specific format (CAF). The sole purpose is seamless leveling of iTunes masters within your workflow.

BEWARE!

Remember: You must switch the AAC button off before any rendering!

LATENCY!

For sample rates above 44.1 kHz, the AAC function introduces a latency due to the encoding/decoding round trip and SRC calculations. With AAC off, DRMeter MkII works with zero latency.

[12] Dynamic Deviation

The DRMeter MkII allows you to navigate within the “gravitation field” between peak and Loudness normalization by setting a personal Target Loudness level and a True Peak Threshold, which is what quality-conscious engineers must do as we transition from a Loudness War mentality to mindful mastering practices. We'll go into more detail about Target Loudness and True Peak Threshold settings later in this manual.

Dynamic Deviation shows you positive or negative differences relative to the Dynamic Margin™ which you have defined on the back panel or by setting TP Threshold [5] and target Loudness [6] via respective handles

on the front UI. Dynamic Margin is bracketed by the True Peak Threshold at the top, and Target Loudness. Specifically, Dynamic Margin = Target Loudness minus TP Threshold.

The use of *deviation* is significant. Positive or green values indicate more dynamic content than the predefined Dynamic Margin, while negative or red values indicate less dynamic content. Note that Dynamic Deviation does *not* distinguish whether you have upwards headroom in peak regions or downwards headroom in Target Loudness areas.

To obtain valid Dynamic Deviation values, follow these steps:

1. Insert a limiter prior to your DRM2 instance, and adjust the limiter's output ceiling according to the set TP Threshold. The limiter's output ceiling and TP Threshold should be equal.
2. Play the loudest part of your song and pre-adjust peak structure so that occasionally the TP Threshold will be hit.
3. Set "Dynamic Margin" by defining TP Threshold and Target Loudness. Control handles for both are on the front panel or settable directly on the back panel.
4. Set D-MODE to Short-term Loudness. This gives you a good estimate of your Loudness structure in conjunction with set Target Loudness.
5. Play the track's loudest part in a loop. Negative or red values indicate the amount of Dynamic Margin which is over-utilized when referenced to your set Target Loudness. A red -2 LU means that your song is about 2 LU louder than your set Target Loudness. Positive or green values indicate that you have not reached the set Target Loudness. +2 LU means that your master is currently 2 LU more dynamic than your set Loudness goal.
6. Use a brick wall limiter and adjust input level and output ceiling while monitoring your maximum peak values and the Short-term bar graphs. The Dynamic Deviation value will guide you towards the proper leveling strategy. Use loudness compensated A/B to make meaningful judgments, and increase "Dynamic Margin" via lower Target Loudness if you feel that your master lacks dynamic integrity.
7. Hit RESET on DRM2 after you've made limiter adjustments to your peak structure.

Here is a starting example; If your True Peak Threshold, the point at which your TP numeric display and bar graph turns red, is set to minus 0.5 dBTP and your Target Loudness is set to minus 12 LUFS, you have Dynamic Margin of 11.5 LU (12 LUFS Target Loudness minus 0.5 TP headroom = 11.5). To work with the Dynamic Deviation function, you need to decide two applicable values:

- a) What Loudness Normalization standard are you targeting? Different music distribution platforms, such as YouTube, Spotify, iTunes Music and TIDAL, each have their own particulars.

- b) What Target Loudness would be a good choice for your mastering project? This is a matter of experience, combined with a cluster of factors including;
- Genre-specific Loudness trends
 - Loudness potential of your mix
 - What the main distribution channels are for your clients
 - How Loudness-driven or fidelity-conscious is your client?

If you master music in the EM genre and DJs and clubs are a key part of the marketing for a particular project, your customer may aim for less dynamics and a higher target Loudness level. To escape the loudness insanity of EM and club music, we recommend measuring a few of your favorite music releases and back off from there by one to two LU. That's all...If your favorite music shows an average Integrated Loudness (LUi) of -6 LUFS, you will arrive at far more transparent results by setting your Dynamic Margin to 7.5 LU. Set the TP Threshold to -0.5 dB and Target Loudness to -8 LUFS. The small decrease in dynamic density will increase the sound quality drastically while allowing DJs to compensate for the Loudness difference of 1.5 to 2 LU by simply moving their level matching fader up a tiny bit!

For all mainstream pop and rock music releases, it's a good starting point to take YouTube's Loudness Normalization standard of -12 LUFS as a reference. By setting TP threshold to -0.5 dB, you will prevent unwanted distortion. Plus, a Target Loudness of -12 LUFS gives you 11.5 LU of Dynamic Margin to work within.

NOTE!

To get the best use of the Dynamic Deviation feature, you need to control the dynamics with a transparent brick wall limiter inserted prior to the DRM2 instance! Make sure to set the Output Ceiling of your limiter to the same value as the True Peak Threshold setting in DRMeter MkII. If DRM2's TP Threshold is set to -0.5 dB, your limiter's output should also be set to -0.5 dB. Control your peaks first! If DRMeter MkII shows max peak values below the set threshold, raise the input gain of your limiter so that the highest peaks of the loudest part of the song hit the -0.5 dB ceiling of the meter. If they hit the -0.5 dB ceiling all the time, your signal is too hot and you need to back off the input amplitude feeding the limiter. If you're rarely hitting the -0.5 dB ceiling, you may lose some Loudness potential. This has to be adjusted carefully in conjunction with focused, loudness compensated A/B listening. After you have controlled the peak structure of your master, you're ready to use the Dynamic Deviation function in the most meaningful way.

Experienced mastering engineers control and manage final Loudness at the end of their processing chain by fine tuning limiter and clip settings when looping the louder parts of a song. This means that Dynamic Deviation comes into play when you are all set with your mastering

processing, and you start focusing on making mindful Loudness decisions based on what is typically the chorus of a particular song. We have to point out that working with Dynamic Deviation on low amplitude intros, bridges or interludes is meaningless for making decisions about dynamic density.

BEWARE!

Watch out for deviation between Short-term Loudness and integrated Loudness with content containing a lot of macro-dynamics:

When making final leveling decisions, change the L-MODE to Short-term to have the best control. Songs with low or no macro-dynamics (relatively constant energy throughout the song) have almost equal Short-term Loudness and integrated Loudness values because no longer portions with less energy will let the LU_i decrease over the whole song. But a song with lots of macro-dynamics (e.g. a song with a pianissimo intro and other parts with less energy than your chorus) will show lower LU_i values which can be up to 4 or more LU lower than the Short-term Loudness on the loudest part of the song. In such cases you may need to allow the Short-term Loudness to exceed set target Loudness so that finally the integrated Loudness hits your set target Loudness. To get a feeling for this Short-term - integrated deviation you should use the integrated LU_i Mode over a longer duration of a macro dynamic song.

For program material with a lot of macro-dynamics, Dynamic Deviation works less reliably.

Dynamic Deviation Examples

The Dynamic Deviation algorithm takes your set Dynamic Margin as a reference, and subtracts your LU-S value minus your True Peak headroom to 0 dBTP.

A Positive Dynamic Deviation Example

If Dynamic Deviation indicates +3 LU, you know that you need to reduce dynamics by 3 dB to fit into your set Loudness Target. You can do that by either addressing the dynamic range from the “top down” through peak limiting, or from the “bottom up” through RMS-style compression or other similar techniques. Positive Dynamic Deviation is indicated in green with a leading plus symbol.

A Negative Dynamic Deviation Example

If Dynamic Deviation shows -2.2 LU, you know that you should back off your limiting/compression by 2.2 dB to stay within your set Target Loudness. It indicates that you are wasting “Dynamic Potential” as your master is already too loud in relation to your set Loudness Target. Negative Dynamic Deviation is indicated in red with a leading minus symbol.

More about Dynamic Deviation

In order to use Dynamic Deviation in a skillful and meaningful manner, you need to get a sense of appropriate Loudness targets for different

music genres. We live in an ever improving world regarding dynamic density, as more and more music distributors apply Loudness normalization. Automatic Loudness normalization defeats very high dynamic density tracks by reducing the gain of high density tracks to below those with lower density. *What was intended to be louder now become quieter!*

The psychoacoustic advantage of masters with lower dynamic density will turn against overly loud tracks as distribution and streaming platforms reduce the playback level of material louder than -12 to -16 LUFS, or whatever the particularly target Loudness is for that platform. This is a gradual process and will require delicacy, diplomacy and patience on your part.

For more background information, please take a look at the PDF, “The Concept of Dynamic Deviation,” available [here](#) or in the Learn More section of our web site.

Drag & Drop with DRO2

If you own a copy of the companion MAAT product, DROffline MkII, you can drag a file from your file system onto a DRM2 instance, and that action will launch DROffline MkII and begin a measurement. If DRO2 is already running, one of two scenarios unfold, based on your Operating System...

- macOS: The existing instance will begin measuring, and the Log will appear when measurement is finished.
- Windows: A new DRO2 instance will open and measurement will begin. The Log will appear when measurement is finished. You may want to quit DRO2 each time you plan on using the drag & drop measurement feature.

Sometimes the DRMeter MkII interface may disappear into the background when a file browser window is clicked on. This behavior may change with different DAWs & Operating Systems. To be able to drag and drop an audio file onto the DRMeter MkII user interface when this happens:

1. In your file browser, click and hold an audio file to begin the drag gesture.
2. While holding the mouse button down, press the Alt key in Windows or the ⌘ (Command) key in macOS, and then tap the Tab key until you cycle back to your DAW application.
3. The DRMeter MkII interface should reappear in view. Simply take the file that is being dragged and drop it onto the plug-in's user interface.

Alternatively, you can drag the DRM2 UI outside of your DAW's visible confines so it stays in sight when you click on another window such as a file browser.

Native Standalone Version

The bundled native version of DRM2, MAAT DRMeter MkII.app, is identical to the plug-in versions with the exception of a Preferences menu for macOS and Audio Setup button at top for Windows. The standalone real time app can be found in the Applications:MAAT folder on macOS, and the Program Files\MAAT folder on Windows.

Setting for the standalone version include I/O, sample rate and buffer size selection. The input selector has a simple, signal presence meter, while the output has an associated Test button. The Test function sends a 440 Hz tone to the designated output port.

Sample rate choices are dictated by your input's capabilities. There is also an audio input mute check box to prevent feedback. This preference is enabled by default on launch when the designated input and output are the same.

In Use

There are several ways to provide an input to DRMeter MkII Standalone, depending on your audio interface. Some hardware drivers have a “loopback” ability. Dig into the documentation on your favorite interface for more information on loopback.

Another approach is to use a virtual audio driver which, in the Windows world, is often referred to as a “virtual soundcard.” Being only a driver, this class of product provides audio routing to and from a virtual (software-only) device. For Windows, we recommend VB-Audio's HIFI-CABLE & ASIO-Bridge, a “donationware” virtual soundcard. See:

<https://vb-audio.com/Cable/#DownloadASIOBridge>

Although that product is cross-platform, for macOS we recommend Existential Audio's free BlackHole:

<https://existential.audio/blackhole/>

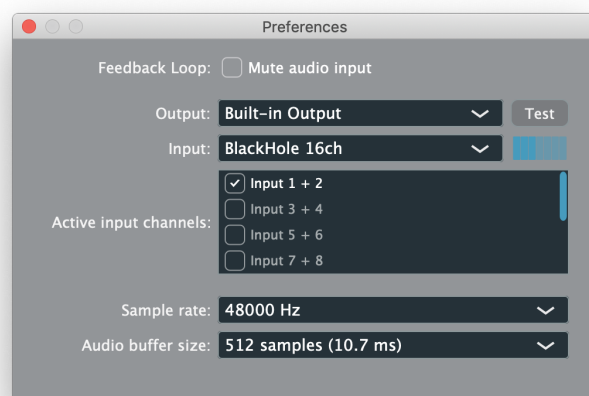


Figure 7: DRM2 Standalone's Preferences window showing routing through a virtual driver

For example, the output of your DAW is routed to the virtual driver. In this case, that's BlackHole. In Figure 7 above using a laptop, DRMeter MkII Standalone's input is set to be the virtual driver, while its output feeds the host's default output/DAC, what would normally be the DAW's output.

Back Panel Setup

[13] Back Panel

Clicking on the MAAT logo opens the "back panel" user preferences.

[14] Scale Range

The default scale range is from +3 to -48 dB. The presence of input signals below -48 are indicated by the $-\infty$ or digital black indicator [10] below the bar graph, which lights as soon input signal exceeds $-\infty$. Switching to the -30 dB scale lets you zoom in on louder content. This scale is useful for music work due to its usually higher amplitude. For broadcast applications, we recommend the -48 dB scale.

[15] UI Size

From the user preferences, the size of the user interface can be switched to one of five sizes: You can also change the UI size by right-clicking on the front UI on the outside frame.

XS	236 x 720
S	270 x 824
M	301 x 920
L	341 x 1040
XL	393 x 1200

[16] Tool Tips

This preference is checked by default, and enables tool tips, or hot help, if you hover your cursor over a particular function or field for longer than 2 seconds.

[17] Horizontal/Vertical Mode

This preference adapts the user interface to your layout and DAW preferences. It switches or alternates between portrait/vertical orientation, or landscape/horizontal.

[18] Preset Management

On top of the general preset functions of any plug-in, you find sixteen factory presets to allow you direct access to configurations for different working situations and applications.

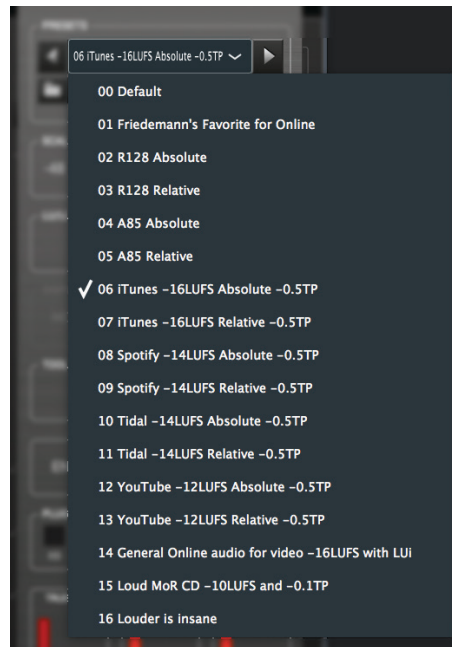


Figure 6: Factory Presets

The Preset section is equipped with common functions. Use the arrow buttons, to the left and right of a preset’s name, to toggle between presets. Use the LOAD button to open a particular preset from the preset folder. The SAVE button opens the preset directory and adds a leading number to the end of the existing preset name to avoid unwanted saving of an existing preset. You can rename the new preset to your liking and save or you can remove the number added to the preset in order to overwrite an existing preset.

Preset Files

DRMeter MkII saves your presets with a “drm2p” file extension, for both macOS and Windows.

[19] Info Tab

Besides reference information and version number, you will find useful links to the manual and further knowledge sources as well as buttons to activate or deactivate your license.

LUFS/LKFS terminology

LUFS are sometimes also known as LKFS, which is the American terminology for LUFS. They are technically identical.

Specifications

Reference input level	-18 dBFS
Reference output level	-18 dBFS

System Requirements

- Mac: macOS 10.8 and newer, 64 bit only
- Win: Windows 7 and newer, 32 & 64 bit
- Pro Tools 10.3.10 and newer
- 4GB RAM minimum

Supported Platforms

- AAX, AU, VST2/3 Mac, VST2/3 Win

Supported Sample Rates

- 44.1 to 384 kHz

Supported Hosts

Ableton Live, Cubase, Logic, Nuendo, Pro Tools, Sequoia, Studio One, Wavelab

Updates

Please always use the latest version of the software! You can find your current version on the Info Tab of the back panel. You can download the latest version simply by visiting:

<http://maat.digital/support/#installers>

For optimal security and stability, you should always stay up to date with Operating System revisions, and we keep up with compatibility changes to our products. We also continue to optimize for reduced CPU load, and this very user manual gets its own improvements.

To stay up to date with the latest version and product releases, please subscribe to our occasional newsletter. You'll find a opt-in form on our [Contact](#) page, or sign up for a copy of our free and very handy 2BusControl plug-in which will also subscribe you. Don't worry, we know you are busy so we only send out an average of 10 or 12 mailings a year.

Support

For product support, please visit:

<https://www.maat.digital/supports>

License Central

License Central, located in MAAT's Shared directory, is a free utility that validates, repairs and logs your MAAT licenses. It also displays what MAAT products you have installed and assists in downloading both updates and demos.

License Central lists all of our products, and shows you:

- If a product is installed and what licenses you have [CLOUD, SUBSCRIPTION, TRIAL, OFFLINE and TEMP OFFLINE]
- What versions are installed, and version installers are available for download

It also provides:

- A one-click download of an update or a demo
- A button to activate or deactivate any of your licenses
- A copyable list of all your Product Keys
- One-click generation of the MAAT diagnostic report

It also fixes license issues automagically.

In Use

When you launch License Central, it scans your host computer and then attempts to match up each product found with a Product Key on our license server. That scanning happens in real time, and the process is shown as a progress bar. When quitting, this process happens in reverse.

Once all the licenses are validated, a list on the left displays all MAAT products, including License Central. Products that are not installed are grayed out, and installed products are displayed in high contrast. To the right of each product entry is a check mark, which indicated that the product is licensed.

Selecting a product entry displays information about the installed version and if an update is available for download.

Controls

There are two persistent buttons along the top. At upper left is Check for Updates, which refreshes the list of installed products, and pings our server again for currently available versions to download. It also recreates your Product Key list.

At upper right, the Activate/Deactivate button brings up the familiar blue and orange MAAT license window, allowing you to deactivate or return your license to the Cloud, and to switch to a 30 day temporary offline license. If you have requested a 365 day full offline license, use the Create License Request function in the MAAT license window, and have received your “.maat” confirmation file, you can also take your license offline. Finally, you can also paste in a Product Key to activate a new license.

Note: Switching to 30 day temp offline requires that your license be already activated. 365 day full offline li-

censes require a license confirmation file as supplied by MAAT's support department.

If any product is out of date, a third Download Update button will appear when that product is selected. This button is an express method for updating you MAAT products.

At bottom left of the License Central window is an Auto-Refresh check box, which is selected by default. Deselecting that will prevent License Central from frequently scanning your host for changes including new installs. It starts a scan every 3 seconds, waiting for completion of that scan, then begins a new 3 second countdown before starting the next scan. If you find that License Central is interrupting you workflow while scanning, then disable Auto-Refresh.

Preferences

In License Central, the Preferences' gear icon brings up the Preferences window with four tabs.

Paths

For those who set up alternate directories for the management of their plug-ins in a DAW, two alternate plug-in paths can be defined. These directories will be also included when License Central searches.

Keys

This tab lists all of your Product Keys that are known to our license server. Please take a moment to copy all of your Product Keys, paste them into a text or word processor file, and print out a hard copy. Your Product Keys are your proof of purchase and, without them, your purchase will not work and we cannot provide product support.

Troubleshooting

The Troubleshooting tab has one button, which generates a Diagnostics Report. This report, automatically written to the Desktop, gathers useful, non-personal information about your machine's state that our support team can use to diagnose any problems.

Info

As with all our products, the Info tab lists credits, copyright information, and the version number you are running.

Share The Love

Would you like to help us in our quest for better sound quality? Help support MAAT by sharing the love...Like us on Facebook!

<https://www.facebook.com/maatdigital/>

and Twitter too:

https://twitter.com/maat_digital

Please tell your friends and colleagues about us. We really appreciate it, and thank you for supporting better quality audio.

Credits

DRMeter MkII overall concept

Friedemann “Mr. T” Tischmeyer; “I pity the fool!”

Plug-in concept & design, DSP algorithms, & project management

MAAT Inc.

Programming

Agent Tad Nicol, MAAT Inc.

Appendix 1 — GPLs

FFmpeg, incorporated into DRMeter MkII, is licensed under the GNU Lesser General Public License (LGPL) version 2.1 or later.

GNU GENERAL PUBLIC LICENSE

Version 3, 29 June 2007

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(1) assert copyright on the software, and (2) offer you this License giving you legal permission to copy, distribute and/or modify it.

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Some devices are designed to deny users access to install or run modified versions of the software inside them, although the manufacturer can do so. This is fundamentally incompatible with the aim of protecting users' freedom to change the software. The systematic pattern of such abuse occurs in the area of products for individuals to use, which is precisely where it is most unacceptable. Therefore, we have designed this version of the GPL to prohibit the practice for those products. If such problems arise substantially in other domains, we stand ready to extend this provision to those domains in future versions of the GPL, as needed to protect the freedom of users.

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

The precise terms and conditions for copying, distribution and modification follow.

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An interactive user interface displays “Appropriate Legal Notices” to the extent that it includes a convenient and prominently visible feature that (1) displays an appropriate copyright notice, and (2) tells the user that there is no warranty for the work (except to the

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The “source code” for a work means the preferred form of the work for making modifications to it. “Object code” means any non-source form of a work.

A “Standard Interface” means an interface that either is an official standard defined by a recognized standards body, or, in the case of interfaces specified for a particular programming language, one that is widely used among developers working in that language.

The “System Libraries” of an executable work include anything, other than the work as a whole, that (a) is included in the normal form of packaging a Major Component, but which is not part of that Major Component, and (b) serves only to enable use of the work with that Major Component, or to implement a Standard Interface for which an implementation is available to the public in source code form. A “Major Component”, in this context, means a major essential component (kernel, window system, and so on) of the specific operating system (if any) on which the executable work runs, or a compiler used to produce the work, or an object code interpreter used to run it.

The “Corresponding Source” for a work in object code form means all the source code needed to generate, install, and (for an executable work) run the object code and to modify the work, including scripts to control those activities. However, it does not include the work’s System Libraries, or general-purpose tools or generally available free programs which are used unmodified in performing those activities but which are not part of the work. For example, Corresponding Source includes interface definition files associated with source files for the work, and the source code for shared libraries and dynamically linked subprograms that the work is specifically designed to require, such as by intimate data communication or control flow between those subprograms and other parts of the work.

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b) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by a written offer, valid for at least three years and valid for as long as you offer spare parts or customer support for that product model, to give anyone who possesses the object code either (1) a copy of the Corresponding Source for all the software in the product that is covered by this License, on a durable physical medium customarily used for software interchange, for a price no more than your reasonable cost of physically performing this conveying of source, or (2) access to copy the Corresponding Source from a network server at no charge.

c) Convey individual copies of the object code with a copy of the written offer to provide the Corresponding Source. This alternative is allowed only occasionally and noncommercially, and only if you received the object code with such an offer, in accord with subsection 6b.

d) Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the Corresponding Source in the same way through the same place at no further charge. You need not require recipients to copy the Corresponding Source along with the object code. If the place to copy the object code is a network server, the Corresponding Source may be on a different server (operated by you or a third party) that supports equivalent copying facilities, provided you maintain clear directions next to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it is available for as long as needed to satisfy these requirements.

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