Sonic Studios™ DSD* Hard Disc Portable Recorder Review

*Direct Stream Digital

MODEL: KORG MR-1

NOTICE: **In-Progress and 11/24/2007 #5 Version**

(This review is being written/edited; e-mail suggestions welcome)

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KORG INPUTS PRESET CONTROLS NOISE PLOT BATTERY FIRMWARE REC TIME ADD-ON PREAMP BATTERY INPUT ADAPTER

This review is narrowly focused *ONLY on deck operational features, ease of use, consistent recording ability/quality, and design fault issues related to stereo-surround field recordists with direct connected external mics/Preamp; issues usually not discussed in commercial magazine reviews.*

In other words, *how suitable is the KORG MR-1 as an 'all-in-one' 2-channel stereo deck solution for both amateur / professional field recordist? And if connected to a full featured external preamplifier, how well does it handle the LINE input levels?*

Introduction:

The MR-1 model is KORG's FIRST digital portable recording deck model to enter the market closely followed by its far bigger brother the MR-1000. The MR-1 remains the most popular for being quite small, stylish, moderate priced, and easy to operate.

MOST Unique to portables is ability to record DSD with 10-100k Hz bandwidth (also DFF, WSD, DSF) digital audio. **AND** 10-40k Hz 24 bit PCM wave at *all* standard sample rates from 44.1-to-192k.

MR-1 features include shirt-pocket-size, *bolted inside* rechargeable lithium battery giving <2.5 hours portable power, 3 sec fast boot-up, ~10 second shutdown. Also good size, easy to read LCD/VU, and the low-noise tactile 'transport' buttons are nicely front-panel positioned. Record/pause/stop deck response is quick.

With latest 'Operating System' firmware upgrade v1.5.1 installed, MR-1 tests out to be an excellent choice for higher resolution (HD) audio recordings with most self powered mics, and good for *some* electrets using direct connected 3.3 volt 'plug-in-powering' input feature.

Switch to LINE input connecting to more featured, higher performance external MIC preamp with up to +10.5 dBu *(= +8.2 dBV = 2.83 Vrms)* maximum output.

User MENU process is fast responding, but a bit AWKWARD (ergonomic) *at first*, and might be improved upon in *a version 2*. Menu 'on/back' button seems a little hard to find, and SCROLL/SELECT scrollwheel too easily rotated during push-for-select.

This action needing practice with either TWO HANDED operation using index finger pushing 'slippery rotating' wheel inward, and maybe best to use *with* the case for a far more secure *one-hand* grip using right thumb for both controls. I preferred using one-handed thumb technique over two-handed index finger technique, but only after some practice.

Unique to any portable I remember is dual channel balanced inputs using *3.5 mm 'stereo' jacks*.

Most recordists will need a few different input adapter patch cables *(like that shown at right)* to access MR-1's deck's two balanced stereo minijacks.

3.5mm minijack mic input has menu controlled on/off 3.2 volt power. Not quite enough voltage for powering DPA 4060 series, and my own Sonic Studios DSM™ mics are under-powered by not enough current from a stock MR-1. The powering feature is still adequate for a wide variety of lapel, and most electret condenser types needing direct 'plug-in-mic' type power.

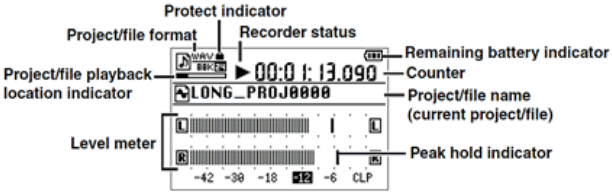
Yes, it's not pretty, and feels like a throwback to early 50-60's stiff, hard-edged cases from the far east, and this type still used for rough treated industrial test instruments, but you get to appreciate the nice vinyl window giving full VU view, and operation of all transport controls while inside. And case gives best

chance of deck surviving being dropped, and getting less wet from rain/being splashed. Still, can't help wishing for softer leather, more flexible vinyl window, and way more accessible Power/Hold slide currently too covered to work without very-hard-pressed applied fingernail.

Case and layout of function buttons are well designed. However, the small size and stylish slippery plastic case is a liability to getting dropped even though MR-1's side panels feature a welcome sculptured 'finger channel' making grip way more secure than otherwise. Still seems wiser using deck with the supplied case.

MR-1 has NO digital audio (SPDIF) input/output. Everything digital is handle by the fast **working** USB-2 port on this deck. All digital deck input/output is handled when computer connected working exactly as an external hard drive storage device.

What's different from Microtrack and some other USB connected decks is NO USB POWER connection. All MR-1 deck power is from either internal battery or external 5 Volt input jack used by the supplied AC adapter. USB 2.0 patch and 5 volt AC adapter is included.



MR-1 LCD display is good size and adequately backlit much like Microtrack's giving bright daylight viewing ability. **Very easy read VU scale**, that's 25% wider, and almost 3 times taller than Microtrack VU.

MR-1 lacks dedicated 'overload' or near clip indication, only slightly thicker '0 dB' end-of-scale segment.

No clip warning less an issue with 24 bit depth dynamics *recording at conservative* levels leaving *plenty* of headroom.

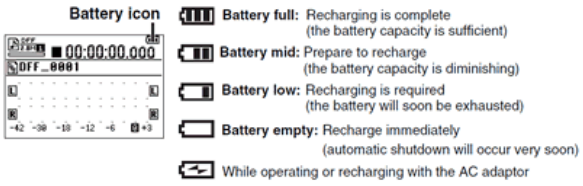
With MR-1 it seems wise not having chance of ANY momentary signal clips; as easy to miss seeing these. **GOOD THING MR-1 now has extended DISPLAY HOLD** setting. This gives more VU peak hold time to notice maximum occurring peak level. Not so useful is choice to set max peak hold time forever. Still, better **not pushing levels on this deck**.

Backlight menu gives 'always on' or choose 'auto turn off' 2 seconds to a minute after working a control.

Backlight power draw is not significant to battery runtime, so use without any *known* liability.

NOT so visible blinking red LED inside REC button gives standby/recording indication.

MR-1 has internal 3.7 volt lithium battery of ~7.5 watt (2100 ma) capacity, and manages *when new* to RECORD for ~2.5 hours (+2.7 hours measured)



When tested while recording, NO blinking last battery bar as manual claims. Stopping the recording with 'low' indication *may* immediately force deck to 'save file/auto shut down' *until external 5V power is restored* 'unlocking' power ON activation.

OPERATING MODE CHART SHOWING EXTERNAL POWER DRAW

DECK MODE	EXT. 5 V AMPS	BATTERY FULL	BATTERY LOW	DESCRIPTION
OFF	0.00	X		Deck OFF, battery is *fully* charged
OFF	0.25		X	Battery *being* charged, deck is off
ON	0.47	X		NO battery charging
ON + REC	0.48	X	~0.6 amps	Charger mostly OFF running REC mode
ON/Stopped or REC in PAUSE	+0.75		X	Deck ON *ONLY* ALLOWS full .25 amp battery charge drawing up to ~0.8 amps for ~5 minutes from external power, then dropping to ~.55 A

NOTE: PCM .WAV recording mode draws *slightly more* power than either DSD or MP3!

External battery models using *non* rechargeable alkaline cells seem best for very long deck running times in remote locations. For most users, the many low cost rechargeable lithium power-pack type products are practical for shorter 4-7 hour runtimes closer to home.

BUYER CAUTION: Some low cost external power packs sold for powering iPOD and other portable devices *may not work* reliably for MR-1 powering.

Deck has momentary high +0.85 amp demands on external power especially during startup *even with fully charged* battery. **AND very quick ~0.75 amp surges** *(HD access)* challenging some external regulated 5 volt sources to *drop below full 5 volts* needed by the deck.

KNOW THE FOLLOWING: MR-1 shuts down *the external supply connection* trying its OWN internal battery (if charged enough) if supply voltage drops at *any time* to ~4.65 volts.

GOOD to know power plug is same exact locking 4.0x1.7 mm barrel type as used for D7 and all later model Sony miniDAT portables. So fitting this deck with external regulated 5 volt @ 1+ ampere battery supply for *potentially* unlimited MR-1 charging/REC time should prove easy. But not all external 5 volt sources prove to work as expected. See table at right.

But battery gage still shows charging(!) *unless* external supply voltage is disconnected, OR external supply drops further to 4.1 volts where MR-1 battery gage shows (no charging) normal 3-bar battery gage display.

So now there's chance of knowing external power with poor load regulation often causes MR-1 to not function at startup, and at times of intensive disk access. Hope users have less problems than before selecting and running MR-1 from 'working' external power supply products in the market. See this TS thread for more.

Summary: KORG MR-1 deck is a very good to excellent 'all-in-one' recorder most useful with external (self-powered) mics, or for connecting the LINE input to the analog output of your favorite external mic preamplifier. Mic preamp inside is very good quality with (mostly right channel) *very low level* to likely be inaudible bands of high frequency noise, so deck's preamplifier seems adequate for not needing external preamplifier for most low noise recording purposes.

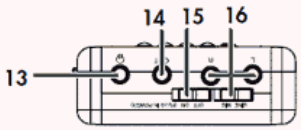
However great the deck overall, most users will desire some kind of external battery supply to extend the limited <2.5 hours typical runtime of the internal battery.

The KORG MR-1 deck has audio inputs for balanced RIGHT/LEFT analog MIC/LINE into separate 3.5mm jacks at top of deck.

The MIC/LINE mode is selected by a SLIDE SWITCH next the input minijacks on the top panel.

Less convenient but still nice was the REC INPUT LEVEL ADJUST function as a quickly accessed *just inside* menu selection.

Top panel



13. Headphone jack (stereo mini)
You can connect a set of headphones here.

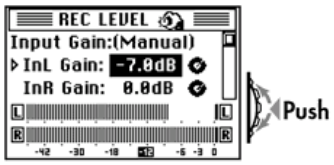
14. Output jack (stereo mini)
The audio is sent out from this jack.

15. Mic power switch
This switch supplies power (+3V) when using a plug-in power type mic. Turn this on if you're using the included mic (CM-2M).

You must leave this off if you've connected a line input or a dynamic type mic. Leaving this switch on could damage your mic or line input device.

16. Input switch / Input jacks L, R
Select either the MIC (mic input) or LINE (line input) position as appropriate for the device that's connected to input jacks L and R.
You can use either balanced or unbalanced devices (→p.15).

Level adjust was *originally* NOT STEREO, but separately +/- gain adjustable (mono) tailored channel gains, and taking several button pushes to control *each* channel, so best was to consider these as PRESETS done BEFORE recording, NOT meant for level tuning DURING a recording. But this limitation became moot with new OS upgrade.



Being a stereo mic remote location recording guy, the stereo channel link feature and ability to quickly access REC level adjustment are the two *most* desired MR-1 features for me found missing with OS 1.0.1 firmware.

One adjustment feature still on the wish list to KORG is ability to individually SET UNEVEN GAIN, and *THEN* LINK the channels.

This allows both inputs custom applied gain (like having *the deck* do the gain matching of stereo mic pairs), and then having *this* set gain locked together in stereo-mode.

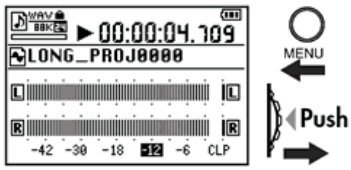
Right now, as it seems when I tried, applied offset gain resets channels to having *equal gain* only whenever stereo mode is engaged, losing the offset calibration!?! Somebody say this isn't so!

Operating System upgrade version 1.5.1 made much about now being able to play MP3 files, but **missed public mention** of stereo linking in new *drop-down box*, and improved the gain adjust mode from *being way too many steps*, and also not so consistent to always directly navigate to desired gain adjustment, to now always be just ONE thumbwheel-CLICK away from the recording screen. *NICE!*

Full OS v1.5.1 features disclosed in this **PDF FILE** also found *inside* the **MR1_Ver_1_5_1.zip** upgrade file on KORG's site.

Also VERY important to recordists, but unannounced, is now claiming ***far fewer*** occasions of the dreaded **"disk too busy"** error message.

Level meter screen



There is a very sophisticated AUTO ADJUST MODE (ALC) on the MR-1. This comes with several advanced-user adjustable settings and seems to me best left alone for experimentation purposes. Suggest determining usefulness of AUTO gain mode to specific requirements where manual control is not practical.

PRESETTING THE RECORDING LEVEL WITH MR-1's *GAIN SET* CONTROLS

MR-1 has independent *and* 'stereo-linked' channel MIC/LINE *gain* settings used for REC Level adjustment operated in a separate menu screen.

MR-1's adjustable LINE GAIN IS DECIBELS CALIBRATED to be nearly EXACT terms of:

(the formula) dBu max input + dB MR-1 GAIN = 0dB.

Knowing your MAX signal input in dB allows simple deck preset. Simply dial in MR-1 (-/+)dB set gain that when added to your input (-/+)dB = 0 dB. Now MR-1 REC level will record near maximum VU reading. In other words, to use MR-1's unique calibration to preset the REC gain, you need know your preamp's max dBu output ability, or your mics max signal at SPL *(peak loudness)*.

Obviously, *its way more difficult presetting* mic inputs verses preset line. *For mic preset, needed before* (above) math figuring giving 0 dB MR-1 set gain, figure first:

MIC sensitivity x max SPL = MIC max signal output

So mic preset is not so practical for most. MUCH easier is knowing your preamp has ability to output ONLY so much (dBu/dBm), and has peak output indications to show it, then you just run it hot with MR-1 gain set to expect near maximum preamp at its line input.

So look up your preamplifier's maximum (clip indication) specs and dial in *(opposite* -/+) dB MR-1 gain to equal zero. Then you will *never* overload MR-1. And only preamplifier adjustments needed for control the recording level. Maybe wise to preset deck gain 2-to-5 dB*less* for having some error headroom.

So what could be simpler than that? Well, it is simple once you understand how simple it really is! And that understanding took me some time!

FOR EXAMPLE: If knowing your external preamplifier has +3 to +4 dBu maximum output, then setting MR-1's LINE SET GAIN to *(opposite sign)* -4 dB will keep deck input maximums *in sync* with preamp's maximum.

With preamp set for maximum output/deck gain set for maximum input, the recordist can expect optimize mic+preamp+deck *system* performance. Good to remember external preamp's clip/overload indication is now also close to deck's maximum input, so preamp's level indications show same or very near to MR-1's VU meter.

MR-1 INPUT/GAIN CHART: ADJUSTMENT RANGE, MIC/LINE INPUT MAXIMUMS

MIC input for 0 dB FS *before* clipping overload at various deck gain settings	MR-1 MIC Input Nominal SPEC: -39 dBV = -36.8 dBu = 11.2mV	MR-1 MAX SPEC -27dBV = -24.8 dBu = .011Volt	KORG Maximum mic input Spec has 2 dB margin if using more common dBu input signal term.
MIC	42	42	30dBu 22 dBu MAX Measured

Just the facts: MR-1 -10 dB gain setting is maximum for this deck.

While MR-1 gain setting has +31.5 to -31.5 dB adjustment range in 0.5 dB steps, the -10 dB MIC/LINE gain is the setting limit that *works* to keep deck input clipping from occurring.

In other words, if at -10 dB deck gain setting *in MIC mode*, AND IF you are getting *overload* VU indications, *go to LINE input mode*, and *increase* MR-1 gain.

If *already in LINE mode* at -10 dB gain, no further MR-1 downward control works, so *decrease external signal level*, or use a passive pad in-series to attenuate the external preamp's line output signal.

LINE mode input gain reads nearly as indicated *(see PRESETTING at left)* in the REC gain adjustment screen.

Good to know MR-1 MIC mode *STARTS* AT +30 dB gain even though gain scale shows mic input gain -/+ 0 dB, it's really +30 dB *actual* gain (see chart below).

Measured MIC mode input overload occurs with anything greater than -22 dBu signal, and LINE mode maximum is +10.5 dBu.

Maximum control range *for both* MIC/LINE shows *same* -10 dB deck gain setting.

TIP: Consider *working* LINE *signal* input maximums of -21 dBu to +10.5 dBu is acceptable with corresponding MR-1 gain settings of +22.5 dB to -10 dB respectively.

MIC mode gain adjustment range *max's out* at -10 dB (+20 dB actual), just where LINE mode highest gain setting *begins* at +22.5 dB. So it seems MR-1 has *continuous* -10 dB to +72 REC (actual) gain adjustment range.

Below photo *somewhat* showing MR-1 input gain *(REC level)* set screen.

SIGNAL		-48	-42	-30dBu		-22 dBu MAX	Measured
MR-1 INPUT GAIN SETTING	+31.5	+22.5	+12 (+42)	0dBm (+30 dB)	-4	-10 (-20)	END of gain adjustment working range
LINE SIGNAL	-29	-21	-13	+1.5dBu	+5.5	+10.5dBu MAX	Measured
LINE input for 0 dB FS *before* clipping overload at various deck gain settings			MR-1 Line Input Nominal SPEC: -6 dBV = -3.8 dBu = -0.5 V			MR-1 MAX SPEC +6 dBV = +8.2dBu = 2.0V	KORG Maximum LINE input Spec has 2+ dB headroom if using most common dBu input signal term.

* NOTES: 0 dBV = 1.00 volt RMS = 2.21 dBu; dBV is used by KORG for MR-1 MAX/Nominal input specifications reference level.

0 dBu = 0.775 volt RMS = 0 dBm = -2.21 dBV *(VERY NICE dB conversion page HERE)*

Noise spectrums of dual balanced/unbal. minijack MIC/LINE inputs

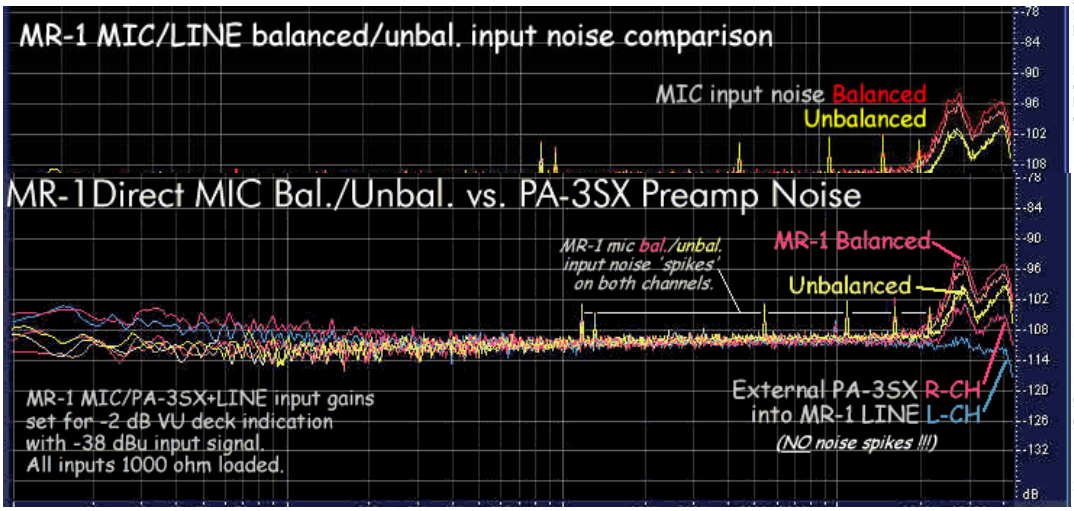
(Inputs loaded with 1000 ohms 1% metal film resistor + input to ground unbalanced, and across -/+ inputs balanced; 24bit/88.2K PCM wav sampled data)

No signal (1K loaded) input noise plot at +6.5 dB (36.5 actual) MIC input gain, and -3.5 dB LINE set gain.

Right channel seems always to have higher average noise, AND large mid-to-high frequency spikes likely from deck's switching power supply.

While inside audible frequency band, and looking kind of bad, the 1K-to 20K Hz noise PEAKS at -114 dB for LINE, and -102dB MIC input *seems too far below* audible levels for concern.

If still looking for input issues with MR-1, consider MIC input >20K Hz noise climbs as high as -95 dB balanced, and maybe less concerning -100 dB unbalanced mode.



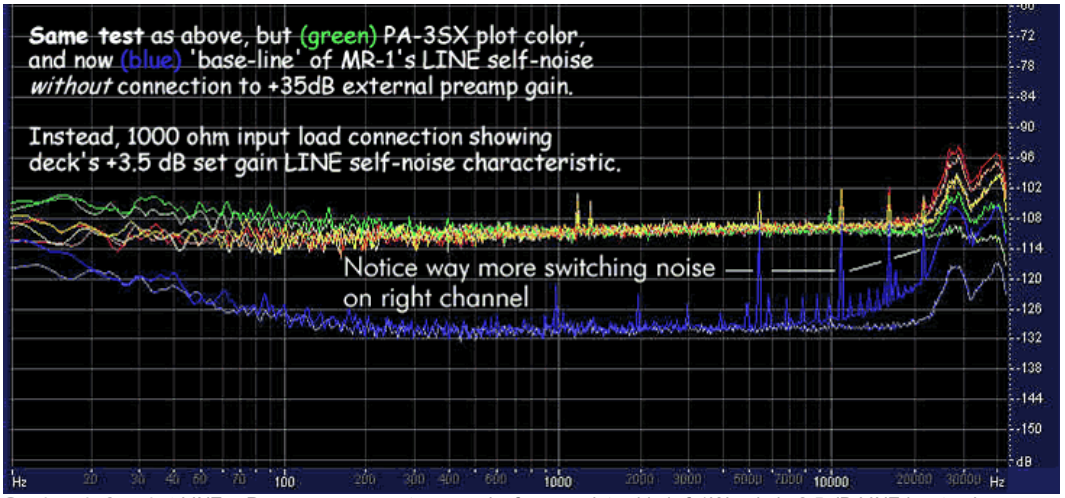
Noise plots at -38 dBv reference input for -2 dB VU; *near* full scale.

MIC balanced/unbal. Input set gain of +6.5 (+36.5 dB total deck gain)

LINE input +3.5 set gain + PA-3SX +35 dB set gain (+38.5 total

applied gain)

MIC POWER OFF

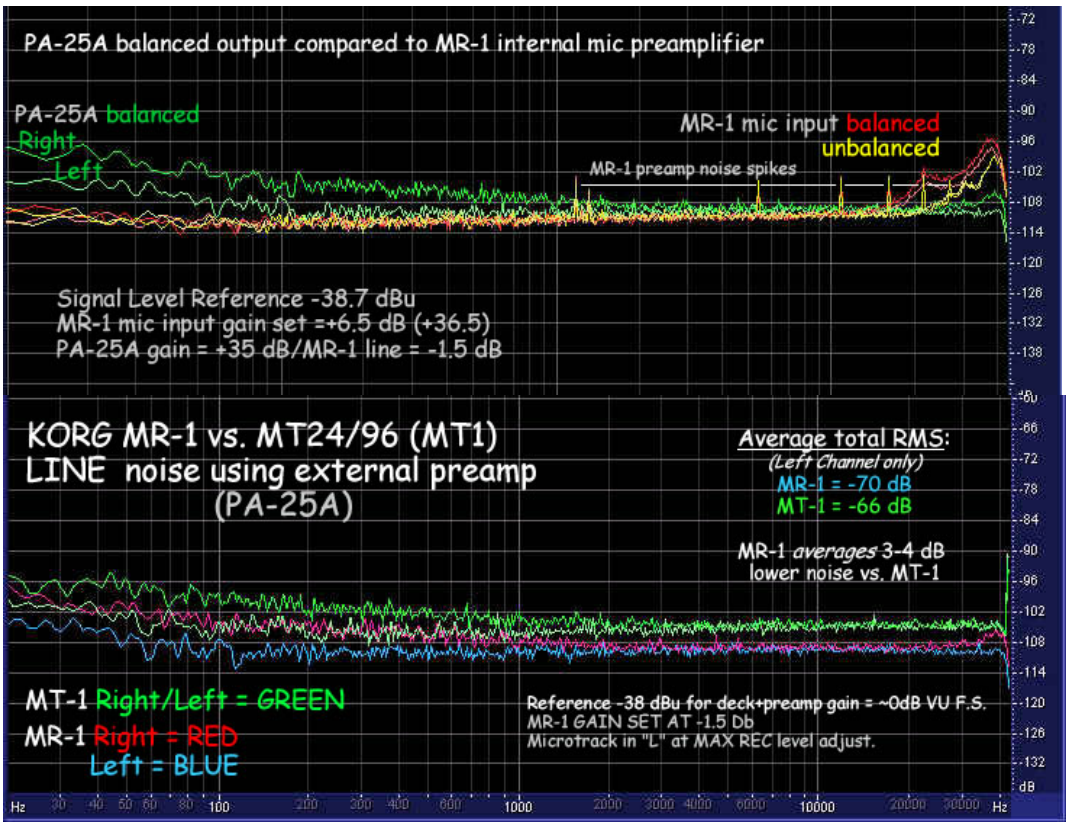


Graph as before, but LINE + Preamp now green trace, and reference plot *added* of *1K* loaded +3.5 dB LINE input gain.

The plots show external preamplifier *lowering* mid-to-high frequency NOISE by up to 16 dB over MR-1's internal mic preamp.

External PA-3SX preamp shows ~4 dB *more* noise at very low frequencies, but still very low at <-103 dB.

MR-1's internal mic preamp noise graphs are RED/YELLOW colors. **External PA-3SX** noise graphs are GREEN single color, but on first plot only are RED=Right, BLUE=Left.



Noise plot comparing PA-25A (prototype) shows lower high frequency noise, no switching noise spikes with external preamp.

However, PA-25A shows *more or less* greater mid-low band noise.

And right channel is *so much more* noisy I am thinking from substandard component needing replacement?

Left PA-25A channel is not half bad in low/mid frequency range maybe showing more expected preamp noise performance for this design.

Again using PA-25A balanced output into BOTH MR-1 and MT-1 decks for comparison.

While my tests may be off by 1-2 dB, MR-1 seems to have general lower noise advantage by 3-4 dB over MT-1 comparing only the better LEFT channel results.

ADVISORY: Some have found the above confusing. Please don' t feel alone with having initial confusion, and take some casual time to reread the data for best chance of getting at least a deck 'working' understanding so settings make sense.

This recording time chart was gleaned from MR-1000 manual, and is useful for MR-1 DSD *2,8 MHz* recording time per 1 Gbyte.

MR-1 has 20 GIG *total* capacity drive, but much less than this available for recorded files. Check in SYSTEM menu list for capacity remaining to know for sure.

Nature recordists be advised, 'maximum *continuous*' recording time is said to be 6 hours.

Recording time for each format (per 1Gbyte)

The following table shows the approximate recording time available in each format per 1 Gbyte of hard disk capacity.

WAV Format		Recordable time	1bit Format		Recordable time
WAV	44.1kHz/16bit	90 minutes	DFF	2.8MHz	22 minutes
WAV	44.1kHz/24bit	60 minutes	DFF	5.6MHz	11 minutes
WAV	48kHz/16bit	85 minutes	DSF	2.8MHz	22 minutes
WAV	48kHz/24bit	55 minutes	DSF	5.6MHz	11 minutes
WAV	88.2kHz/24bit	30 minutes	WSD	2.8MHz	22 minutes
WAV	96kHz/24bit	25 minutes	WSD	5.6MHz	11 minutes
WAV	176.4kHz/24bit	15 minutes			
WAV	192kHz/24bit	13 minutes			

This 11/24/2007 posted review of the KORG MR-1 is *nearly* finished, expect updates

What's on *Sonic Studios* Web Site? *(Click underlined text, and navigation photos)*

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DSM™ Patented Stereo-Surround Microphone Technology

Eyegear/Headband/HRTF Baffle mountable matched omni mics

Stops wind blast noise; transparent acoustic design; records real wind sounds

Passive DSM™ Mic Powering/Bass Filters

for MD, DAT, CF, HD, and Video Field/Event/Studio Recording

Battery Powered-Portable Mic Preamplifiers

High-definition, low noise, very wide bandwidth preamp designs to fit any field/event/studio application using DSM™ stereo-surround mics.

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