Korg MR-1 Portable DSD Recorder

Mike Rivers

There's certainly no shortage today of pocket sized digital recorders that turn in surprisingly good performance. Now Korg, better known for their musical instruments and multitrack digital workstations, has entered the race, drawing a lot of attention to a pair of new recorders at the October 2006 AES show. What sets the MR-1 (and its big brother the MR-1000) apart from the pack?

The Korg MR-1 uses an internal hard disk drive as the audio storage medium rather than flash memory used by most of the current crop of portable stereo recorders. Flash memory has a lot of plusses – there are no moving parts, the media is removable, and, probably most important, the apparent cost is lower since the user buys the media separately. But the large amount of storage space you have with a disk drive is important for some users, for example, me.

Most of the remote work I do these days consists of recording the full program on a festival stage, throughout a two- or three-day weekend, a total of 20 to 25 hours of material. At a gigabyte per hour (44.1 kHz 24-bit) I'd need two or three 4 GB memory cards per day. Though the memory cards can easily be copied to an off-line disk drive and re-used, at the end of a long day I'm ready for a soak in the hot tub and bed – the last thing I want to think about is having to recycle my memory cards for the next day. The MR-1's 20 GB drive provides sufficient recording capacity for most of my field jobs, and I can unload it when I'm back home and rested.

The other feature that sets the MR-1 apart from the pack is that in addition to recording PCM up to 192 kHz using the Broadcast Wave format, (16- and 24-bit up to 48 kHz, 24-bit only at higher sample rates) it also records three DSD (direct stream digital) formats at 2.8 MHz streaming rate, as well as 192 kbps MP3. With its street price of around $700, the MR-1 is the least expensive way to record a DSD master.

DSD is a high resolution A/D/A conversion process, good for capture and archiving. In its DSDIFF [Direct Stream Digital Interchange Format) incantation, It's the currently preferred format for SACD mastering. Due to the complex layers of coding of an SACD disk (mostly for copy protection), there are presently no home authoring SACD tools. DSD was never intended to be a final delivery format, however it's not difficult to convert a DSD recording to PCM, from which

end products can easily be made. The AudioGate program provided with the recorder converts between DSD and all the standard PCM formats. When new formats appear, (hopefully) an upgrade to AudioGate will get you there from an original DSD recording.

“Future proof” is how Korg sells DSD recording, and in fact, this was one of the driving forces behind Sony’s development of a DSD process for archiving their own masters. There’s a 1-bit Audio Consortium (of which Sony, as well as Korg, is a member) headquartered in Japan that embraces the WSD [Wideband Single-bit Data] format which might eventually become a universal (or “open” depending on where you’re looking from) 1-bit streaming audio format, The MR-1 supports WSD, DSDFF, and DSF [Digital Stream File], a format used in some Sony Vaio computers (Sony gets around).

Features

The MR-1 is powered either from a supplied 5 VDC wall wart or an internal lithium-ion polymer rechargeable battery. Korg estimates that you’ll get 2 to 2.5 hours of continuous recording or playback on a charge. A run-until-dead test gave me 2 hours and 53 minutes recording at 44/16, at which time the MR-1 performed an orderly shutdown, closing its current file so no recorded audio was lost. The LCD backlight and blinking “Record” LED can be switched off to extend battery life, but I didn’t repeat the test to determine how much this matters. The battery isn’t removable so you can’t swap in a spare, and battery replacement requires a trip to an authorized service shop. I never accurately determined the time required for a full recharge, but after about six hours, the battery indicator was only at the “two bars” (out of three) level. I’d count on an overnight recharge. The recorder draws about 450 mA when running, so with a little creativity it wouldn’t be difficult to assemble an external battery pack for longer recording time independent of commercial power.

Has someone ever tripped over your power cord when recording? When running from an external power supply, if the power fails or the power supply is unplugged from the recorder, the battery (assuming it’s charged) takes over seamlessly with no clicks or pops. Likewise, when power is restored, it will switch back from battery power, conserving the battery for the next disaster. This seems like a perfectly reasonable expectation, but surprisingly, some portable recorders quit rather than transfer to battery power when external power is interrupted.

Like most cigarette pack sized recorders, audio gozintas and gozoutas are on 1/8” mini jacks. Rather than the conventional single two-conductor jack for a stereo input, the MR-1 uses a pair of balanced mini jacks (tip positive) for the left and right mic/line inputs. While XLR connectors are too much to ask for in a recorder this small, I’d gladly swap an extra quarter inch all around for more robust and standard ¼” TRS jacks for the inputs. In my experience, mini jacks are not sufficiently reliable connectors in a “no retakes” situation.

A switch selects the input gain range between mic or line level. A second switch applies 3.5V microphone plug-in power. Input impedance, specified as 10 kΩ, actually appears to be closer to 100 kΩ for both the line and mic modes. With neither XLR connectors nor phantom power, a pro user will most likely use the MR-1 with an outboard preamp or feed it from a mixer. The internal preamps have plenty of gain, but at maximum gain (rarely necessary with most mics) they get noticeably noisy.

There are separate stereo (unbalanced) mini jacks for headphone and line level outputs, with the output level of both (together) controlled by a single pair of up/down buttons. I'd prefer a fixed line output level and leave the adjustable output for the 'phones, but given that the MR-1 is basically a consumer product, having the line output adjustable to match levels with other equipment makes a certain degree of sense.

In addition to manual input gain adjustment, there's a quite serviceable automatic gain function that works at both ends of the dynamic range. A peak limiter keeps the record level below the preset maximum. A gain boost is applied when the input drops below a preset threshold The limiter's attack time and threshold are adjustable, as is the gain boost rate (dB per second) and threshold below which gain is boosted.

Markers can be placed in a recording, either while recording or during playback. They can be handy for quickly finding specific portions of a recording when playing back on the MR-1, however the markers are part of the recorder's unique Project file, so they're of no use once the recording is moved to a computer.

The counter (time) display has two modes, one showing absolute time from the start of the current recording, the other displaying the remaining recording time available on the disk, based on the current sample rate and word length. The counter mode can be switched while recording so you'll know if you have enough "tape" for the band's third encore.

All things stored on fixed media eventually have to be removed, and a USB port is provided for transferring audio files from the recorder to a computer. No special software or driver is required. Just plug it in to a Windows or Mac computer, select USB Mode from the menu, and the MR-1's disk drive appears as another drive on the computer. The USB port can also be used to copy files from the computer to the MR-1 for playback, and for updating the system firmware.

Controls

Most of the action is right up front with a set of five conventional "transport" buttons and a backlit LCD. The buttons are tiny, but they're comfortably spaced and have a good tactile feel, even through the clear window in the protective soft

case. Power and USB connectors are on the left-hand edge. The right-hand edge carries the power switch, menu access button, scroll/push wheel, a pair of buttons to adjust the playback level, and an undocumented hole behind which lurks a master reset button in case the recorder completely hangs up. (I didn't have to use it). The scroll wheel fits under the thumb perfectly if you're right-handed. Southpaws will probably find it convenient to scroll with the left middle finger.

Pressing the Record button engages the Record/Pause mode and switches the LCD to the Meters/Counter display. From that display, a single press of the scroll wheel brings ups the Record Level adjustment screen with the scroll wheel serving as the gain control. The current project can be played back simply by pressing the Play button. To play a previous recording, you'll need to visit the Library (another menu) where you can select the recording from a list.

Projects are automatically named as the file format (WAV, DSF, MP3, etc.) followed by a sequential number. Projects can be renamed either character by character using the scroll wheel or from the computer keyboard when connected in the USB mode.

Menu operation is straightforward and intuitive. I only needed to consult the manual to learn the names and characteristics of the DSD formats with which I was unfamiliar. There are two top level "Library" folders, one named MR_PROJ where recordings made on the MR-1 are placed, the other named AUDIO for storing externally created audio files.

Piles of Files

Each recording type (WAV, MP3, DSF, etc.) has its own folder under the MR_PROJ folder. Starting a new recording creates a new Project folder in which audio files as well as a single Project file are stored. Pressing the Pause button closes and saves the current audio file; a new file is opened when recording continues. When the audio file grows to 1 GB, it's saved and a new file is automatically started. Pressing the Stop button closes the current audio file, and the next recording creates a new Project folder. Selecting a recording for playback actually selects the Project (this is what can be renamed) and if the project contains multiple files, they're played back sequentially and seamlessly, even over the automatic 1 GB split. The only time you'll see individual audio files is when browsing through the MR-1's folders with a computer

A folder can display 200 project names. You can (says the manual – I didn't try this) record more than 200 projects of the same file type, however only the first 200 will be displayed from the Library menu. Additional files can be accessed by computer via the USB port. The AUDIO folder can have four sub-folders. Projects and audio files can be entered on a play list for programmed playback – handy for airplane trips.

In Use

The MR-1 is nearly as simple to operate as an old fashioned cassette recorder, a good thing for field work where you don't have time to plod through setup menus. It remembers the last recording mode and gain setting (including automatic gain mode and parameters) and that's how it records until you change something. Going from power-on to recording involves simply pushing the Record and Play/Pause buttons. You can almost push them simultaneously (old school style) but you must press Record first. If you hit Play before Record you'll start playing the current file and drop a marker into it rather than start recording. Yeah, I learned that by experience!

The MR-1 feels good in the hand. There are no wobbly buttons or knobs and I never had the sense that I had to handle it with kid gloves lest some essential control break if I pressed too hard. It's solid, and compact without feeling crowded under the fingers.

While in "reviewer" mode, I was jumping among recording modes and sample rates, and switching between manual and automatic gain modes quite a bit so I spent quite a bit of time in the menus. As a user, you'll probably settle on standard "house" settings and rarely change.

While the buttons on the front panel are well spaced and easy to operate, the mic/line and plug-in power slide switches and the spring-loaded main power switch are recessed (probably a good thing, to avoid accidents) and I needed a fingernail to operate them, particularly with plugs inserted in the jacks.

I recorded a couple of music camp workshops using the supplied stereo condenser microphone (guts from Audio-Technica). The mic sounds fairly good but when placed closer than about five feet from the source, the stereo image tends to wander – small movements of the subject often translate to large apparent movements in the recording. The mic has about 15 dB greater output level than your run-of-the-mill dynamic mic, and there's plenty of gain to record even quiet ambient sounds, an application which seems to be popular among users of this breed of recorder. An L-shaped bracket serves as a table stand for the mic. A ¼-20 threaded hole in its base allows attachment to a camera tripod or, with an adapter (not supplied) to a conventional microphone stand.

The mic's captive cable is only 3.5 feet long, which I found to be an impractical length. It's too short to put the mic on a table and sit back comfortably with the recorder, and when putting the recorder on the table next to the mic, there's a bundle of cable to deal with. With the mic on a stand, the cable is too short to reach the floor so I had to sit by the mic stand, holding the recorder. When making informal recordings, there's something to be said for built-in microphones, a common feature of many similarly sized portable recorders.

How good are the mic preamps? Since they lack phantom power, I couldn't use them with most of the mics I own, but I found that with dynamic and ribbon mics, while there was plenty of gain available, hiss became apparent when recording quiet sources. Quiescent noise at 24-bit resolution with the gain set to maximum (+31.5 dB) and inputs terminated in 150Ω (typical source impedance for a dynamic mic) translates to about –45 dBFS, which is quite audible at a reasonable playback level. If you need this much mic gain, you'd best use an outboard preamp. Quiescent noise for the line inputs at unity gain (0 dB) is a respectable –96 dBFS.

The record gain control works in 0.5 dB steps, so you it won't let you do a smooth fade, and with about 6 dB per thumb-sweep of the scroll wheel, you couldn't do a complete fadeout without a thumb about a yard long. The good news is that the gain adjustment works while recording (on some portable recorders, it doesn't!), and gain adjustment doesn't generate clicks. Gain controls for the two channels can be linked for stereo operation (this was an added feature in the Version 1.5.0 firmware update that I installed during the review) or can be adjusted individually.

Gain adjustment is made on the digital side of the A/D converter, so one must be careful not to feed the recorder a signal that's too hot for the input stage. In the Line mode, the maximum input level before clipping is +10 dBu. While you can keep the meters below full scale by lowering the gain, if the signal at the jack exceeds +10 dBu you'll end up with a high resolution recording of a clipped audio signal. Many mixers and mic preamps have a maximum output level in excess of +20 dBu, so you may need a pad between a line level source and the input jack.

The Auto gain can't prevent the input stage from clipping, but it does a good job as long as the input level doesn't exceed +10 dBu, but it won't. This is an important thing to understand – you can't just set it on Auto, plug it in to an unknown source, and walk away.

With the output level set to maximum (this gives the best signal-to-noise ratio on playback) a full scale digital recording represents +8.5 dBu at the Line Output jack. THD+N at the analog output clocks in at 0.02% at close to full scale.

As far as how it sounds, I have no complaints and only compliments. I used it only as a field recorder, recording with the included mic, a Studio Projects LSD-2 stereo mic through a Mackie Onyx preamp, and from PA consoles. Other than some strange imaging with the Korg microphone, the MR-1 produced excellent results. This is a good recorder, straightforward and easy to use with little fooling around. As long as you're careful with input levels and gain setting, you can make great sounding recordings with it.

Most of my recordings were made at 44.1 kHz, 16- or 24-bit, with excursions to the higher sample rates for comparison. Given the material and the environment in which I was recording, I found no practical need for anything above 44.1 kHz,

but it's nice to know that higher sample rates are available if needed (or requested by the client). Some users have reported that a DSD recording converted to a lower sample rate sounds better than a direct PCM recording at that sample rate, but I couldn't confirm it with my recordings.

AudioGate

The AudioGate program supplied with the MR-1 converts between DSD and PCM formats. It also seamlessly joins multiple files created when an MR-1 recording exceeds 1 GB, and the joined files can be exported to a new, continuous file. It also provides playback and playlist functions, but other than format conversion, the pro user will probably have little use for this program. I found it's slot-machine-like appearance to be rather silly, but the program serves its intended purpose.

Minor Annoyances

If the Library gets too large, it's difficult to locate a recording. Default file names seem to appear in alpha-numerical order, but once you start renaming projects, there seems to be no particular order in which they appear in the Library list, and I could swear that they move around. A Sort function (either manual or automatic) would be a welcome addition.

The power icon on the LCD roughly indicates charge level when operating on batteries, with its bars changing to a sine wave when the MR-1 is connected to external power. It would be nice if the AC/charging icon appeared when the recorder was off but connected to external power, indicating that the battery was being charged (which it is), but it is only visible when the recorder is switched on. With only a couple of hours of battery operating life, you can't afford a charging mishap.

The broadcast wave files that the MR-1 creates are indeed time-stamped as per the BWF specification, however, the time stamp of every file is 00:00:00:00. When a new file in a project is created when the current recording exceeds 1 GB or when recording is restarted after pausing, I expected that the files would be time stamped sequentially, with the time stamp of the second file being the ending time of the first file, but they aren't. Korg told me that they would discuss this with the engineers and perhaps include it in a future firmware update.

Oh, and did I say how much I dislike mini phone jacks?

Summary

Overall, I'm very pleased with the MR-1. It looks and feels great, provides all the functions I need, it's easy to use, and it sounds just fine. At about $700 on the street, it's a bit on the expensive side. I'd jump at it for $500, but at the current

price, its big brother, the MR-1000 at $1200 on the street looks like the better buy for a professional user.

I really wanted to fall in love the MR-1 but it just didn't happen. Its lack of a built-in microphone makes it too cumbersome for casual recording. I can't just whip it out of my pocket and ask a musician to play me a tune I heard him play earlier so I can learn it. I have to fiddle with a mic and cable. The lack of usably clean and quiet phantom powered mic inputs make it cumbersome to use for more serious stereo recording. So while it' feels good and sounds good, it just doesn't meet my needs well enough to want to buy one. But I liked the concept enough so that I ultimately purchased an MR-1000 (at $800 on the street) for my own use and I've been really happy with it.

Update – Korg has recently introduced the MR-2. It's quite similar in concept to the MR-1 but rather than a hard drive, recording media is SD or SDHC flash memory. New styling, too, but pricing is still, I believe, a bit steep, unless you can make use of the DSD recording.

Fast Facts
Applications: Remote recording
Key features: Many recording formats including DSD, small size, ease of use
Price: $700 on the street
Contact: Korg USA 631-390-6500 www.korg.com

Product Points:
Thumbs Up:
Ease of operation, great looks
Excellent sound quality
Plenty of recording capacity without unloading/reloading

Thumbs Down:
Mini jacks for inputs
Battery: Short operating time, long recharge time, non-removeable
Price

Stereo Microphone on Stand

Full House - Crowded for us fat-fingered folk

AudioGate Screen