RME 12Mic

Digitally Controlled Microphone Preamplifier

RME's 12Mic packs 12 preamps into a single networked box.

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In the live-sound, theatre, broadcast and educational worlds, mic preamps that can feed directly into digital snake systems are both convenient and popular, and RME have recently added to this small contingent with a brand-new, feature-packed, multichannel preamp with comprehensive digital connectivity. Called the 12Mic, the name is a giveaway for the product's first unusual feature: whereas the vast majority of multichannel preamps accommodate eight mic inputs, the 12Mic squeezes 12 channels into a 1U rackmount unit, making it possible to create a 24-channel 'digital stage box' occupying only 2U of rack space.

But that's not the only attraction of the 12Mic. All 12 high-quality preamp channels can handle balanced mic or line inputs (all on XLRs), and they're all digitally controlled. Additionally, the first four input channels are fitted with combi XLR sockets to allow instrument signals to be connected into a high (1MΩ) input impedance using jack plugs. The mic/line inputs accept a maximum signal level of +18dBu (+20dBu on the TRS inputs), and the preamps provide a whopping 0-75 dB gain range (0-42 dB range for the TRS input).

A single multicolour LED above each XLR indicates the signal level, changing from variable to solid bright green at -20dBFS, then to yellow at -5dBFS, and red at -1dBFS. So optimal signal levels would typically produce a solid, bright green display most of the time, with very occasional flickers of yellow for the highest transient peaks. A button above each XLR accesses that channel's parameters on a small colour TFT display for checking and adjustment, and it is also used to group selected channels together for linked gain changes.

Everything is controlled and configured locally via that small colour TFT display screen, with a quartet of soft-buttons to select functions like phantom power, input source connection, polarity and channel grouping, with the appropriate tallies displayed on the left of the screen. An encoder knob serves as the Standby on/off button when held for two seconds, and also changes selected parameters on the four menu pages, which are labelled 'State' (general settings and preset configurations), Clocking, Inputs and Outputs. It's all pretty logical and familiar, especially for anyone already used to RME's more recent hardware products.

The 12Mic also includes a stereo headphone monitoring socket which, in RME's usual way, can also be used as a line output (in either an unbalanced stereo or a balanced mono configuration).

Most functions can be controlled remotely via a browser-based app connected either through the AVB network or a USB 2.0 (B-type) port on the rear panel. This USB port is only used for firmware updates and remote control, though; it does not pass audio.

Digital Connections

When it comes to digital output connectivity, the 12Mic is comprehensively specified. Like most multichannel preamps these days, the 12Mic is fitted with ADAT optical ports. There's a trio of Toslink sockets, in fact, allowing all 12 preamp outputs to be transmitted at either base or double sample rates (the latter using the S/MUX2 format, of course). Quad rates are also supported, although with only six preamp outputs being conveyed across the three ports.

Two pairs of BNC connectors are provided for word clock in and out (for sample-rate synchronisation), and for coaxial MADI in and out. MADI

(Multichannel Audio Digital Interface, or the AES10 format) is still a common means of distributing up to 64 channels of digital audio at standard sample rates within the live sound and broadcast industries. The 12Mic can also operate MADI at double and quad rates using either the S/MUX protocols or the AES10 96K frame format, which supports up to 32 or 16 audio channels, respectively.

Additionally the 12Mic ships with a blanking plug covering a receptacle for an optional 'SFP' (Small Form Pluggable) optical module. This optional accessory is employed on many other RME products too and, when installed, the SFP module conveys MADI over multimode or single-mode fibres using industry-standard LC connectors. If present, the SFP also allows the optical and coaxial MADI connections to be used together, either to pass 128 channels (at base rates) or to serve as a 'main and backup' redundant pair for enhanced reliability. Naturally, the output signals from the 12Mic's internal preamps can be slotted into any desired MADI channel(s), and multiple 12Mic preamps can be chained together to feed into the same MADI network, if required.

A third, and probably less familiar, interfacing option appears in the form of a pair of Ethercon RJ45 gigabit ports, intended as primary and secondary connections for a redundant AVB (Audio Video Bridging) network. AVB is an open-source low-latency Audio-over-IP format, broadly similar in its core functionality to proprietary AoIP formats like Dante and Ravenna (see AVB Networking box). Although other RME products are available with AVB interfaces, this is RME's first to feature dual redundant AVB network ports. The 12Mic can accommodate up to eight Streams in and out from an AVB network, with each Stream carrying up to 16 audio channels in either AMR824 or AAF coding formats. (The CRF clocking stream format is also supported.) So that's up to 128 audio channels in and out via a single Ethernet cable, and with a maximum network latency of 2ms (small-scale installations can be as low as 0.3ms).

Connection redundancy isn't only limited to the MADI and AVB networks; the 12Mic has redundant powering arrangements too. Supplementing the universal (100-240 V AC) mains power IEC inlet (with integrated mains on/off switch on the rear panel), RME's standard bayonet-locking coaxial 12V DC connector is also provided, to accept a secondary power source such as a standard line-lump mains unit or a 12V battery. If one power source fails, the other is automatically selected, and this kind of feature appeals greatly to professionals building 'mission critical' systems.

Everything Into Everything

Given that there's so much by way of digital connectivity, RME have also included an internal 268 x 282 digital routing matrix. Essentially, this allows you to route any signal to any destination. So, assuming everything is working with synchronised sample rates, any internal or connected signal source (the 12 mic preamp outputs, the 64/128 MADI inputs and the 128 AVB input channels) can be routed independently to any of the unit's physical outputs (the 128 AVB output channels, 64/128 MADI outputs, 24 ADAT outputs and the stereo headphone/balanced mono line output). This means that the 12Mic can inject 12 additional analogue sources into MADI, AVB, and ADAT-connected systems, while also serving as a digital format converter to bridge between them all. Setting up a full routing configuration can be a little tedious, but regularly used routing setups can, of course, be saved as presets.

Technology

As always, the 12Mic features RME's familiar SteadyClock FS technology to minimise converter jitter even when synchronised

RME 12Mic
£2399

PROS

- 12 versatile, high-gain clean and quiet digitally controlled preamps in a 1U rack unit.
- Digital interfacing in ADAT, MADI and AVB formats.
- Full remote control options.
- Full redundancy in MADI, AVB and powering connections.
- Optional fibre MADI interfacing.

CONS

- Only two analogue outputs (headphones).
- Configuring extended routing setups using the onboard TFT screen can become tedious.

SUMMARY

The combination of ADAT and MADI interfaces with a 12-channel mic preamp and AVB networking makes for a powerful system — and exactly the kind of stimulation the nascent AVB market requires.

The 12Mic has dual redundant connections for MADI (the optical and coaxial I/O), AVB (dual RJ45 sockets) and power (and IEC mains inlet for the internal PSU, and a DC inlet for an optional external one).

» to an external clock source, and the technical specifications for the internal mic preamps and A-Ds are exemplary. Apparently, the circuit design is derived from the highly regarded UFXII and UFX+ interfaces, but with further enhancements.

I ran my usual bench tests using an Audio Precision test set, and achieved measurements all within a fraction of a decibel of RME's published specifications. Regular readers will know that I routinely use the AES17 dynamic range measurement as a pretty reliable indication of the overall quality of A-D and D-A converters, simply because to achieve good numbers requires considerable attention to detail in every aspect of the design including the power supply, analogue and digital grounding, circuit board layout, analogue stages, clocking and the actual converter chips being used.

In testing the 12Mic, I was not surprised to discover an A-weighted AES17 measurement of 120.4dB, which is very good indeed. It places the 12Mic slightly higher in my testing league table than the Prism Lyra 2 and Titan, Cranborne's 500R8, and Apogee's Symphony. And it's within half a decibel of Grace Design's M108, Merging's Hapi and Focusrite's ISA digital card. This is all solid, high-end equipment. Equally impressive are the THD+N and channel crosstalk figures, which are almost unmeasurably small.

Another interesting aspect of the 12Mic, and one shared with the company's AVB Tool, which is based on much of the same technology, is that to optimise the real-world performance RME have adopted different A-D anti-alias filtering characteristics for different sample rates. At base sample rates the anti-alias filtering prioritises ultra-low latency while maintaining the widest possible audio bandwidth. However, at double and quad rates the filtering is optimised instead to give the best impulse response with minimal ringing. The penalty of this approach is a slightly early but gentle HF roll-off. At double sample rates this starts from about 25kHz, or from 32kHz for quad rates.

RME claim the sonic benefits of this unusual approach easily outweigh the reduced ultrasonic bandwidth and I can certainly see the sense in their argument, since not only are signals above 25kHz inaudible to us mere humans, but most microphones are well into their own mechanical roll-offs by then anyway. And who wants to capture the ultrasonic whistles of switch-mode power supplies and LCD display backlight inverters? However, for those wanting to use the 12Mic to research ultrasonic sounds, RME say they can provide a different firmware which implements more conventional, full-bandwidth, A-D filters at the elevated sample rates.

AVB Networking

Audio-over-IP (AoIP) is rapidly taking over as the best way of transferring very high channel counts between devices using simple Ethernet cabling and infrastructures. Proprietary AoIP formats such as Dante and Ravenna have dominated the scene until recently, but the Audio Video Bridging (AVB) format is quickly gaining ground as a more cost-effective alternative. AVB is an open-source extension of the standard IEEE Ethernet protocols, and RME's implementation is able to route up to 128 separate audio channels in each direction via a single Ethernet cable, supporting all the standard, double, and quad sample rates. Of critical importance in any AoIP system, AVB connections have a guaranteed and fixed network latency which is never more than 2ms, but in small network configurations with only a couple of switches it can be configured to be as low as 0.3ms!

The mention of switches raises an important point: an AVB Ethernet network comprises one or more AVB-capable Switches linking two or more AVB devices, and these AVB-capable Switches are essential: they reserve the required data bandwidth across the network and route the audio packets in specific time slots, to avoid collisions and guarantee the fixed network latency. Each audio source device encodes a nano-second-accurate time-stamp on each audio packet, denoting the exact 'presentation time' that the audio should be replayed by the receiving device. If the network is defined as having a 2ms latency, then the time-stamp will effectively be offset by 2ms from its creation time, ensuring sufficient duration for the packet to transit the network before being replayed.

Different AVB products support different numbers of channels and Streams, but RME's implementation can handle between one and 16 separate audio channels per Stream, at a fixed sample rate, and up to eight Streams in total, allowing a massive 128 channels in each direction. Different Streams can be formatted in different ways, using the standardised AM824 or AFF formats for audio data, or the CRF format for dedicated clocking information.

A Stream is generated by a source device (often called a 'talker'), and can be received by any number of destination or output devices (the 'listeners'). However, the actual signal routing across the network from one to the other is established and managed by a dedicated 'AVDECC controller'. This controller is typically integrated into one of the devices on the network — RME's Digiface AVB interface is capable of serving as an AVDECC controller, for example, while the 12Mic and AVB Tool are not.

In Use

The 12Mic is a unique product, and not least for its provision of 12 preamp channels instead of eight. RME's boffins have clearly put a lot of work into designing and fine-tuning these digitally controlled preamps. They sound extremely clean, neutral and quiet, whilst offering enormous gain with impressive headroom and configurability. The range of digital connection options, and the ability to freely route signals between them, is also impressive, and makes this an extremely versatile device.

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