

## ORIGINAL TWIN

### Millennia STT1 Origin Recording Channel

Published in SOS April 2001

**Hugh Robjohns** tests Millennia's flagship STT1 recording channel, which offers elements of their entire product line all in one ultra-flexible box.

Millennia have featured in the pages of *Sound On Sound* several times in the recent past with their various high-end signal processing boxes. I reviewed the NSEQ2 equaliser in July 1999 and the TCL2 compressor in January 2000 — both systems featuring Millennia's famed dual-topology Class-A circuitry allowing the user to select between solid-state or vacuum tube active stages with an otherwise identical signal path. The quality of both of these units was absolutely stunning and the ability to choose the most creatively appropriate amplification technique for the specific source material was a very welcome luxury. I remember being surprised at just what a difference switching between amplifier topologies could make with some sources, and preconceptions of which source would suit which amplification type often proved completely wrong!



Millennia's latest product is the STT1 Origin — an all-in-one recording channel housed in a substantial 2U rackmounting box. It is a single-channel processing chain, optimised for microphone sources, but with the ability to accommodate line or instrument inputs too. There are a number of signal-path options, including transformer or transformerless input coupling, and Class-A discrete solid-state or valve input amplification. The machine also incorporates a four-band parametric equaliser derived from the NSEQ, and an opto-compressor similar to the TCL, the latter being switchable pre- or post-EQ. The equaliser and dynamics sections share a second selectable solid state or valve amplification stage, although this may be bypassed completely if desired. Finally, the STT provides a plethora of I/O options with a direct first-stage preamp output, as well as both unbalanced and balanced main outputs. The flexibility of the STT1 is awesome and the guys at Millennia claim 134 possible signal-path combinations, though I lost count long before that!

### Solid As A Rock

The Origin is a solid piece of machinery — the unit measures 394mm deep and weighs over 12kg. That is a lot to hang from the rack ears, even though the front panel is milled from a very substantial lump of metal, so it is not surprising that Millennia recommend supporting the rear of

the machine as well. As all the amplification operates fully in Class A, and there are five dual-triode valves in the system, a considerable amount of heat is produced. Consequently, the user is also advised to allow 1U of rack space above and below the STT1, and to ensure there is a good flow of air over the rear-panel heat sink.

A quick look at the rear panel hints at the exceptional flexibility of this product. Starting on the right hand side, the balanced microphone input is accommodated with an XLR socket, while a second XLR and a TRS quarter-inch jack socket cater for line-level input. A third input option is provided on the front panel in the form of a quarter-inch tip-sleeve instrument input socket. This is buffered by a 12AT7 dual-triode valve to provide a very high input impedance of over 1M $\Omega$ .

## MILLENNIA STT1

### pros

- Fabulous sound quality.
- Configurable and versatile.
- Choose between valve and solid-state on a whim.
- Selectable transformer coupling.

### cons

- Expensive
- Ergonomics less than perfect
- Many users will require an A-D converter to complete the package.

### summary

The highest of high-end producer channels with a little of everything — equalisation, opto-dynamics, solid-state precision, valve warmth, and even transformer coloration. Every element can be introduced or dismissed with the push of a button, providing the ultimate in sonic control. This unit represents the integrated collection of Millennia's greatest hits!

**SOUND ON SOUND**

A male XLR provides a balanced direct output feed, derived after the input amplification stage but before the equalisation or compression stages, and is buffered by a monolithic output driver. All the XLRs are Neutrik Galvatronic gold-plated types which should, ideally, be mated with gold-plated connectors to avoid damaging the conductive surfaces.

Following the equaliser and dynamics sections, the Origin provides three main outputs. Two are unbalanced (via a paralleled XLR and quarter-inch socket) and driven by a discrete Class-A transistor buffer, while a third XLR output is balanced and driven by another monolithic integrated circuit. A gold-plated phono socket provides a side-chain linking facility for the dynamics circuit, enabling stereo operation with a second STT1, if required.

A sizeable portion of the rear panel is taken up with a heat sink area to cool the power supply voltage regulators — the STT1 draws around 50W of power, a decent proportion of which comes out as heat! An IEC mains inlet contains an integral voltage selector and fuse holder, and an adjacent barrier strip provides a ground lift facility allowing the chassis earth to be isolated from the audio ground, if necessary, to cure hum-loops.

## Black & Blonde

The front panel of the review model was finished in a piano-lacquer black with clear white legends, although an alternative 'platinum blond' finish, like that on the TCL2 and NSEQ2, is available as an option. A lot of controls are packed onto this front panel, though the differently sized knobs and coloured buttons help with navigating around it. That being said, the controls are packed very densely, essentially because a large moving-coil VU meter occupies virtually a third of the panel real estate! I realise the meter is the same as that employed on the TCL2 and other Millennia products, so there is a consistency of style here, but a smaller meter would have allowed a less cluttered feel and made using the Origin a tad easier.

As usual, the layout of the front-panel controls broadly reflects the signal path through the machine. Starting at the left-hand side of the

panel, a column of four buttons and a rotary selector determine the input conditions. The rotary switch selects the signal input source to be one of the rear-panel inputs, or the front instrument input. The four buttons select the vacuum tube or solid-state input amplifier, provide 48V phantom power, reverse the input polarity, and engage the input transformer.

The solid-state input amplifier is based on that used in Millennia's acclaimed HV3B microphone preamp, whereas the valve topology is derived from the company's M2B mic preamp. Having both of these fabulous options on board the STT1 makes this an impressively equipped machine indeed, allowing the initial signal amplification to be optimised to suit virtually any source with the casual press of a button. The nature of the solid-state input, however, warrants the warning in the Owner's Manual to avoid plugging the microphone input while phantom power is switched on, as the resulting voltage spikes can damage the bipolar input transistors.



Historically, Millennia have avoided input transformers, since they inevitably introduce distortion products. The company has always deemed this as inappropriate in a critical signal path where 'acoustic realism and dynamic stability' are the primary objectives. However, Millennia also recognise the value of transformer distortion as a key element in creating a 'bigger than life' sonic signature — it is, after all, the reason why the early Neve consoles sound the way they so famously do.

The result of this dichotomy is that Millennia have, for the first time, developed their own input transformer specifically to introduce a 'colourful sonic personality' as an optional element in the signal path of the STT1. When accuracy is required, the transformer can be bypassed, but when switched into circuit ahead of either the solid-state or valve amplifier, it adds a sonic character which increases with signal level. At nominal levels it remains fairly neutral but becomes a very significant part of the overall sound when driven hard — imposing a kind of 'fat', heavy coloration which certainly helps to give the signal a larger-than-life feel.

## Mix & Match

The next column of controls on the front panel includes separate gains for the solid-state and valve input amplifiers. The instrument input socket is at the bottom and an overload LED at the top starts to illuminate when the direct output reaches +18dBu, increasing in brightness to be fully on at +26dBu. This gradual brightening gives a much better impression of available headroom than the usual on-off peak-overload LED. The valve amplifier provides gain ranging from 22 to 40dB from its 350V supply rail whereas the solid-state amplifier spans 10 to 50dB from its 36V rail. Millennia can also provide a modification to provide an additional 20dB of microphone gain for the solid-state amplifier, if required, bringing the maximum input gain up to 70dB.

As already mentioned, these input stages have been optimised specifically for microphone and instrument levels and the line input is accommodated by reducing the gain controls to their lowest settings, possibly with the output level control also being backed off. Millennia recommend the TCL2 and NSEQ2 units for line-level processing, as these are optimised for this function.

The equaliser section of the Origin is a four-band parametric design with adjustable resonance on the two centre sections, and switchable shelf responses for the outer bands. There is an overall EQ bypass button, as well as individual bypass buttons for each of the four sections. By engaging the equaliser, a second amplifier stage is also introduced — again, selectable between solid-state or thermionic. Both of these amplifiers operate in Class A, with the valve design based around a pair of triode valves on a 350V rail and the solid-state version using JFET transistors in a servo-amplifier configuration on a 50V supply rail. The equaliser electronics are arranged in the feedback loop of the selected amplifier stage and so, when the gain controls are set to the 0dB position, the EQ has negligible effect on the signal path.

The four  $\pm 15$ dB gain controls are arranged in a row along the bottom of the panel, with their corresponding frequency selectors directly above. Associated buttons select the shelf response for the top and bottom bands, and shift the centre frequency by a factor of ten for each of the two middle bands. The LF section is provided with six preset frequencies from 20 to 270Hz. The lower mid-section has a continuously variable frequency control from 20 to 220Hz (or 200Hz to 2.2kHz with the x10 button depressed), while the upper mid-control spans 250Hz to 2.5kHz (or 2.5 to 25kHz). Both of the mid-section Q controls span a range of bandwidths from 0.4 (broad) to 4.0 (narrow). The HF band can be switched between six frequencies, ranging from 4.8 to 21 kHz, and both the outer sections have a fixed resonance.

## Dynamics Duo

Below the buttons for master EQ bypass and amplifier topology selection is a third which can activate either of the two passive optical gain-control elements controlled from the front-panel's compressor section — either that before the equaliser or the one after it. These are employed in a shunt configuration (shorting a portion of the output signal to ground) and so don't require an amplifier in the signal path. Thus, you can either have an entirely passive dynamics section by bypassing the EQ or you can choose between solid-state or valve amplification when the EQ is in circuit.

A column of four rotary controls adjust the compressor functions: Threshold spans +20 to -20dB; Attack ranges from 2 to 100mS; Release covers a broad range from 20mS to 3S; and Ratio can be set between 1.4:1 and 30:1. It's worth remembering that, while compressors based around shunt-connected opto-resistors usually sound extremely good and provide a degree of level control which works well within the context of the musical performance, they cannot provide absolute precision in catching brief peaks and transients.

If you wish, you can switch the compressor to act as a de-esser, which focuses the gain reduction on a selected frequency region in order to tame sibilance. Five sensibly spaced centre frequencies are available between 4.9 and 12 kHz, and the width of the de-esser's notch is effectively linked to the settings of the Threshold and Ratio controls: when they are increased, the Q becomes higher, providing narrower, more selective control. The VU output meter can be switched to show gain reduction for the broad-band compressor mode, but this facility is disabled for the de-essing function.

The final column of user controls consists of three more buttons and another rotary knob. The buttons respectively bypass the dynamics, mute all the main outputs (though not the direct output), and switch the meter to indicate gain reduction rather than output level. The rotary control is a continuous output attenuator, setting the level anywhere from fully off to +10dB. Just above this control is a recessed trimmer, which allows adjustment of the meter zero point for the

gain reduction display. The the mains on/off rocker switch in the bottom right-hand corner completes the controls.

## Catching The Millennia Bug

The STT1 needs a little time to warm up before critical use — again unlikely to be a problem — and I found 15 minutes ample. The equaliser section generally sounds clean and precise, but never clinical or 'digital'. When used with the solid-state amplifier it sounded cleaner and slightly leaner than with the valve option, which was a little 'dirtier' and warmer in comparison. Even though these differences are all fairly subtle, they can take on considerable significance within a mix. I would classify the equaliser very much as a creative tool to enhance a source. Although the mid-bands have adjustable resonance, I found their ability to cure 'difficult' tonal problems, such as strong resonances, room tones and the like, to be limited. That is not surprising with this kind of design and certainly not intended as a criticism, merely to highlight the creative — rather than corrective — aspect of this facility.

The compressor is ideally suited to smoothing out a lone instrument or voice input, in a very complementary way — typical of an opto-compressor. Its relatively weak transient control becomes readily apparent on complex mixed sources but, once again, this is unlikely to become an issue in the prescribed applications for the Origin. The parameter ranges for Attack, Release and Ratio afford excellent flexibility, allowing the STT1 to accommodate everything from bass guitar to voice with ease — both gentle dynamic control and powerful effects can be obtained. The de-esser mode is effective once set up, and certainly a useful adjunct to the system, but a side-chain listen facility would have been helpful in setting up the controls.

The larger machined knobs on the STT1 feel solid and robust, but I found the thinner ones to feel altogether more flimsy — not what is expected of a product at this price. Also, the length of the controls, whilst making them easy to hold, tends to obscure their legends, especially at less-than-ideal viewing angles. I found this to be a difficulty when trying to identify the four compressor controls and the two different input gain knobs. However, greater familiarity with the unit

### Gold-plated Specs

There are clearly a lot of high-specification components in the STT1. For example, Grayhill military-grade gold-plated switches are used for the rotary selectors and conductive plastic potentiometers are employed for the signal path controls. All other signal-path switching is through sealed low-voltage relays, presumably with gold-plated contacts.

As mentioned earlier, the instrument input is buffered with a 12AT7 dual-triode valve for a very high input impedance. The thermionic input amplifier is based around a pair of 12AX7 and 12AU7 valves (ECC82 and ECC83 equivalents), whereas the solid-state input amplifier employs a discrete NPN bipolar transistor in concert with a potted JFET hybrid amplifier, a configuration referred to as the PAM01. As a result of all this, the effective input noise for a 150Ω microphone is -126dB EIN, or -131dB for a shorted input, while the overall noise from the line input is better than -90dB.

The equaliser and dynamics signal amplifiers comprise another pair of 12AX7 and 12AU7 valves, along with an FSA01 potted module — discrete JFETs in a hybrid module — for the solid-state option. The specifications suggest that, in total, there can be up to twenty five transistors (in a combination of NPNs and JFETs) in the signal path with the solid-state amplifier options selected throughout, or five valves with the tube amplifiers engaged. The various monolithic output drivers (all standard eight-pin op amp packages) have had their markings scraped away and replaced with hand-written codes — A, B or C!

The quoted figures for THD and noise indicate that the solid-state signal path, at 0.005 percent, is ten times better than the valve path. The frequency response typically extends between 10Hz and 100kHz at the -0.5 dB points, although this obviously varies with the machine's settings. The valve input stage provides around 6dB less headroom than the transistor design, but still accommodates peak microphone input levels of +9dBu, with +24dBu for the line input.

These figures are without the transformer in circuit, however. This reaches low-frequency saturation by +1dBu for the microphone input — the reason why it asserts its character most when driven hard. This custom input transformer is a very compact design with its screening case measuring just 20mm in diameter and 35mm high. Bespoke line-level transformers need to be considerably larger if such distortion is to be minimised, but this transformer has been designed specifically to introduce the characteristic for the benefit of the signal — what Millennia call 'euphonic coloration'.

The main balanced output is capable of driving up to +32dBu from a low 50Ω source impedance. The circuit design is such that if the balanced output is used in an unbalanced mode, grounding pin three ensures the full output level is retained whereas leaving pin three floating (in other words taking the signal between pin two and pin one only) reduces the output level by 6dB. The unbalanced outputs should also be perfectly capable of feeding balanced inputs (with appropriately wired cables) and in many ways, these provide the preferred option as they are driven by discrete Class-A buffers.

doubtless eases this.

## The Price Of Fame

These niggles aside, the crux of the matter is whether the STT1 is worthy of its high UK price tag. In its chosen role as a specialist high-end producer package, I really don't see any direct competition. The Focusrite ISA430 provides broadly similar core facilities and is a little cheaper here in the UK, but there's no choice between solid-state and thermionic amplification. This is, of course, what makes the Millennia Origin unique, and what must surely justify its asking price. But even if it had only a single signal-path format, the quality of the mic preamp, the sublime sound of the equaliser and the musicality of the compressor would still comfortably warrant its price tag.

There are a large number of people working with digital systems these days, and thus I imagine that many potential users of the STT1 will be faced with having to invest in a separate A-D converter — and one which will not compromise the sound that this unit can convey. Given that there seems to be plenty of space inside the STT1, it seems a little bit of a shame that there is no option to add a really good A-D card. While I understand that the Millennia folk are probably heavily biased towards traditional analogue recording processes (and there is certainly nothing wrong with that!), I think that there would be potential for increasing this machine's market share if a high-quality converter were built in.

This aside, if you wanted to buy just one front-end processor for your recording system, the STT1 could well be the one to go for. It makes a fabulously flexible and sonically excellent input conditioner wherever analogue sources are recorded individually. It manages to combine the best attributes of the company's dedicated mic preamps with their twin-topology equaliser and compressor systems, all in one compact box. The resulting package affords huge scope for experimentation, and sounds utterly fantastic. **SOS**

Published in SOS April 2001