

**Dedicated to the lives, memory, and families of  
Chris Camacho and Gabe Weiner — two young men  
who shared a passion for great audio,  
and who left us much too soon.**

<b>Gabe</b>	<b>1970-1997</b>
<b>Chris</b>	<b>1959-1999</b>

# READ THIS FIRST!

Any changes or modifications not expressly approved by MILLENNIA MEDIA, SPC. could void your authority to operate this equipment under the EC or FCC rules.

1. Copyright: You acknowledge that no title to the intellectual property in the STT-1 is transferred to you.
2. Inspection: Inspect packing box(es), STT-1, and cable(s) for damage, unusual marks, or shortages. It is your responsibility to report damage, shortage, or misshipments in a timely manner. Millennia Media and/or its dealers will not be responsible for claims arising from damage in shipping, nor will claims for shortage or misshipments be honored, more than 10 days after ship date.
3. Read this manual carefully and completely before attempting to use the STT-1. Improper operation could result in damage to the product. It is the user's responsibility to understand the safe use and operation of this device.
4. The shipping box of the STT-1 system will include (1) Owner's Manual, (2) STT-1, (3) a UL approved power cord, (4) Owner's Registration Card. Fill out the Owner's Registration Card and return to Millennia Media at your earliest ability.

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*STT-1* and *Origin* are trademarks of Millennia Media, SPC. All other trademarks are property of their respective holders. Serial numbers are located on the rear left side of each unit. We suggest that you record the serial numbers in the space provided below. Refer to it whenever you call an authorized Millennia Media repair facility or the manufacturer. Make sure that you return your completed warranty card immediately.

Features and specifications subject to change without notice.

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Serial Nos. \_\_\_\_\_

Purchase Date \_\_\_\_\_

Where Purchased \_\_\_\_\_

# SAFETY PRECAUTIONS

For your safety and the safety of others, be sure to read and understand all safety and operational instructions before attempting to use the STT-1. **WARNING: *The STT-1 internal circuitry carries lethal voltages.*** Carefully observe all warnings, precautions, and instructions on the STT-1 and as described in the instructions supplied with the unit.

## 1. WATER, MOISTURE, AND SPILLAGE

Do not attempt to use the STT-1 in, near, or around water or in unusually moist environments, such as near a sink or swimming pool. Prevent liquids or any other materials or objects from spilling or falling into the STT-1 unit.

## 2. HEAT AND VENTILATION

Be sure to allow adequate ventilation to STT-1 and avoid using or installing unit in close proximity to heat sources, such as heaters, stoves, radiators, power amplifiers, spotlights, or other heat-producing appliances or equipment.

## 3. POWER SOURCES AND POWER CORD PROTECTION

The STT-1 Power Supply should be connected to a power source only of the type described in the operating instructions or as marked on the Power Supply. Route the power cord so that it is not likely to be walked on or pinched by having objects placed on it. Pay particular attention to plugs, receptacles, and the point where the AC power cord exits the STT-1.

## 4. GROUNDING

For your safety, it is extremely important that the grounding pin of the 3-wire power cable (included with unit) be inserted into a grounding type 3-pin power outlet. If you are unable to insert the plug into an existing outlet, contact an electrician to install a properly grounded 3-pin power outlet, preferably that with OFI protection, if available.

## 5. DAMAGE REQUIRING SERVICE

This unit should be repaired or serviced by qualified personnel whenever:

- The AC power cord has been damaged, or
- A microphone cable has been damaged, or
- Objects have fallen or liquid has spilled into any STT-1 unit, or
- The unit does not function properly or exhibits a marked change in performance, or
- The unit has been abused, dropped, or damaged, or
- The unit has been exposed to rain or moisture

## 6. SERVICING

***Deadly voltages are found inside the STT-1 chassis.*** The user should not attempt to repair or service this unit. All servicing and/or repairs should be referred to Millennia Media.

If, after reading all instructions, precautions, and warnings, you have remaining questions, please contact Millennia Media directly before attempting to use your STT-1. Retain this owner's manual as a record of your purchase to aid positive identification in the event of loss.

## QUICK START

*READ THIS!! The STT-1 operates with lethal operating voltages — the voltage inside the STT-1 can kill you. Never, under any circumstances, remove the top cover. Refer to a qualified electronics technician any and all servicing and other operations which require the top cover to be removed.*

Congratulations on your purchase of the Millennia Media STT-1 *Origin* tracking and post system. The STT-1 is the culmination of meticulous listening tests on innumerable circuit, topology, and packaging designs over many years of product design and development. Your STT-1 is a finely tuned instrument intended for critical professional applications — we feel it offers the world's most sonically versatile "all-in-one channel strip" audio signal path, with the added benefits of selectable transformer-coupling and vacuum tubes when "euphonic enhancement" is desired. With the emergence of 24+ bit digital audio, recording engineers are faced with a new requirement for undistorted dynamic range. The STT-1 meets this challenge exceptionally well.

Before connecting power to the STT-1, assure that the rear panel voltage selection fuse block switch is set correctly. In the USA, the STT-1 is shipped with the voltage selection block set to 100-120 VAC. If you change the voltage selection block to 200-240 VAC usage, be sure to change both fuses to the correct types. See "Rear Panel" instructions for proper fuse requirements.

The STT-1 enclosure measures approximately 19" wide x 3.5" high x 15.5" deep and is designed for mounting into a standard 2U, 19" equipment rack. If the STT-1 is mounted in a road case or other rack which is prone to strong vibration or shock, it is highly recommended that the rear of the STT-1 be supported or otherwise reinforced to withstand such conditions. The STT-1 contains a significant number of high voltage vacuum tubes and discrete transistors, all running in pure Class-A mode. As such, the STT-1 *Origin* runs warm and should be mounted with at least one rack screw space open above and below the unit. The rear panel heat sink should also be given adequate exposure to unrestricted air movement.

The STT-1 is designed on a common ground topology. For high quality operation, and for your own safety and the safety of others, *do not defeat* the purpose of the earth grounding pin.

## STT-1 FRONT-END PROTECTION

Millennia Media enjoys a reputation for what many top engineers and producers call the world's most musically accurate and dynamically consistent microphone preamplifier — the HV-3. But this unique design is not achieved without certain operating criteria. Back-to-back Zener diodes protect the super-matched discrete bipolar input transistors against high transient energy spikes common when inserting and extracting XLR connectors. To maintain top performance and protect the STT-1's sensitive HV-3 front-end, it is advised that you do not insert or extract XLR connectors with phantom power on. Get in the habit of turning phantom power off and waiting about thirty seconds for the phantom power to ramp down before inserting or removing a microphone. This is good advice for protecting a microphone, as well.

# INTRODUCTION (see block diagram)

The STT-1 Origin is a collection of Millennia's essential product line *combined into one box*. You might call it our "greatest hits" compilation. The STT-1 is a single channel (mono) processing chain with various signal path topologies (vacuum tubes, discrete transistors, audio transformer, transformerless) all selectable at various functions. The STT-1 offers an entirely discrete, entirely Class-A direct signal path from input to output. The signal path can be variously selected to use vacuum tubes or transistors, transformer or non-transformer coupling. The STT-1 also offers additional monolithic utility outputs. There are (yes, we counted) at least 134 different product combinations available in the STT-1 Origin — ranging from the most musically transparent, sonically accurate, and dynamically stable audio circuits, to sublime levels of vacuum tube and transformer 'euphony', *and everything in between*. The possibilities afforded the creative engineer, producer, and musician are virtually endless. The STT-1 includes the following functions, employing the essential topology of Millennia products as noted by name:

- 1.) HV-3 discrete hybrid solid state microphone preamplifier *-or-*
- 2.) M-2 vacuum tube microphone preamplifier
- 3.) Vacuum tube instrument DI input, routable into M-2 vacuum tube *-or-* HV-3 solid state gain amplifiers
- 4.) Balanced line level (+4) input, routable into M-2 vacuum tube *-or-* HV-3 solid state gain amplifiers
- 5.) NSEQ four-band parametric EQ, selectable via vacuum tube *-or-* discrete solid state audio topology
- 6.) TCL opto-compressor/limiter/de-esser, selectable via vacuum tube, solid state, *or non-amplifier* topology
- 7.) All paths selectable via transformer *-or-* transparent transformerless input signal path

The STT-1 Origin has three available audio inputs.

- 1.) Line Input (XLR or 1/4" phone, rear panel)
- 2.) Mic Input (XLR, rear panel)
- 3.) Instrument DI Input (1/4" phone, front panel)

A user must select one of the above three inputs via the "SOURCE" rotary switch. The above inputs cannot be combined or mixed internally. Polarity of any input can be flipped 180 degrees, if desired. The mic input can also receive +48V Phantom power, if required.

All input sources (mic, line, DI) are routed directly to the front-end gain amplifiers. A front-end gain amplifier is selectable as either vacuum tube (M-2) or solid state (HV-3). Each front-end gain amplifier has its own gain adjustment potentiometer (approximately +10 dB to +50 dB solid state range and +20 dB to +40 dB vacuum tube range). A user can select one front end gain amplifier, only (VT or SS) — front end gain amplifiers cannot be mixed or used simultaneously. Additionally, a Millennia MIT-01 audio-path transformer is selectable at all inputs (mic, line, DI) to the gain amplifiers. Use the transformer when you want to add an enhanced, "in-your-face" euphonic personality to high-level input signals. The MIT-01 input transformer remains relatively uncolored and sonically neutral with nominal signal levels.

The front-end amplifiers feed two areas simultaneously: (1) a direct utility output and (2) the EQ/Dynamics section. The direct output is placed before the EQ and Dynamics sections. The direct output is FET-based, monolithic, balanced, and always active. The EQ and Dynamics sections can share the same amplifier stage (selectable as vacuum tubes or field effect transistors), which opens up some interesting operational features. The ORIGIN's Opto-Dynamics functions can be used with vacuum tube amplification, solid state amplification, *or with no additional amplification whatsoever*. See page 16 for important detail on EQ and Dynamics co-operation.

The STT-1 has three other 'main' outputs: (1) monolithic XLR balanced, (2) discrete 100% Class-A 1/4" unbal, and (3) discrete 100% Class-A XLR unbalanced. Main outputs sit at the back end of the STT-1, following all functions. An additional RCA phono jack provides a linking function for stereo operation of two STT-1 Dynamics sections. The large scale VU meter is a true audio responding level meter which can be selected to measure the main output level or Dynamics gain reduction.

## STT-1

## STT-1 REAR PANEL

### (1) MICROPHONE INPUT "MIC INPUT"

Conventional 3-pin female XLR input jacks for use with all standard balanced microphones, both phantom and non-phantom powered. Provides +48 Volts DC Phantom powering via front panel switch. Input impedance is approximately 6,200 ohms with phantom power switched in. Microphone input is selected via a front panel rotary switch marked "Source - MIC." Pin 2 is positive polarity. Pin 3 is negative polarity. Connector contacts are Neutrik Galvatronic gold plated. It is suggested that XLR cable connectors used with the STT-1 employ identical plating. This input feeds either the vacuum tube gain amplifier (M2) or solid state gain amplifier (HV-3), with or without transformer coupling, depending on the status of front panel Twin Topology "TT" and "XFMR" switches. With non-transformer coupling, the maximum microphone *input* levels are +3 dBu (vacuum tube) and +14 dBu (solid-state). For reference, a Neumann U87Ai directly in front of a screaming vocalist (127 dB SPL) will output approximately -6 dBu. (NOTE: Do not let the front panel "overload indicator" LED fool you. It begins to turn on with a mic preamp *output* of +18 dBu. When you first see the red LED turn on dimly, you have 14 dB of output headroom remaining.)

### (2) LINE LEVEL INPUT "LINE INPUT"

Conventional 3-pin female XLR connector for use with balanced line level audio signals. A line level signal is defined here as nominal +4 dBu operating level. Pin 1 is ground. Pin 2 is positive polarity. Pin 3 is negative polarity. A 1/4" phone jack is wired in parallel with the XLR (Tip=pin 2, Ring=pin 3, Sleeve=pin 1). Input impedance is approximately 2,200 ohms (x2). Line level input is selected via a front panel rotary switch marked "Source - LINE." This input feeds either the vacuum tube gain amplifier (M-2) or solid state gain amplifier (HV-3), with or without transformer coupling, depending on the status of front panel Twin Topology "TT" and "XFMR" switches. Minimum line input gain is achieved when amplifier gain controls are set fully counter-clockwise. Maximum line level input level is +30 dBu into the solid state gain amplifier and +19 dBu into the vacuum tube gain amplifier. Unbalanced "semi-pro" (-10 dBv) signals should be tried in both the front panel DI input and the line level input — select the input which sounds best. Line level input XLR connector contacts are Neutrik Galvatronic gold plated. It is suggested that XLR cable connectors used with the STT-1 employ identical plating.

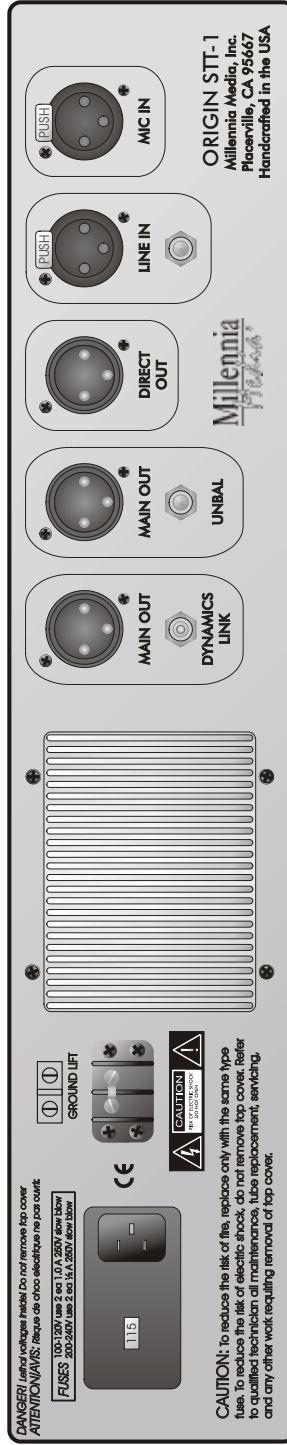
### (3) FRONT END DIRECT OUTPUT "DIRECT OUT"

Conventional three pin male XLR connector providing balanced, line level output directly from the front-end amplifiers (MIC, LINE, DI). This output is configured before the EQ, Compressor, De-esser, and main outputs. This direct output is essentially equivalent to the output on an HV-3 micamp and can be used in addition to the main outputs (below). Pin 1 is ground. Pin 2 is positive polarity. Pin 3 is negative polarity. This line level output is capable of driving <600 ohm loads and long, high capacitance cables. Outputs may be configured in an unbalanced configuration by grounding pin 3, or taking pin 2 directly as an unbalanced signal while floating pin 3. In the former configuration, the output is automatically increased by 6 dB. Connector contacts are Neutrik Galvatronic gold plated. It is suggested that XLR cable connectors used with the STT-1 employ identical plating.

### (4) MAIN OUTPUT #1 "MAIN OUT - BAL"

Conventional three pin male XLR connector providing balanced, line level output from *all* stages of the STT-1. Can be used simultaneously with all other outputs. Pin 1 is ground. Pin 2 is positive polarity. Pin 3 is negative polarity. This monolithic-based, balanced line level output is capable of driving <600 ohm loads and long, high capacitance cables and has a maximum output level of +32 dBu. Outputs may be configured in an unbalanced pin-2-hot configuration by either grounding pin 3, or taking pin 2 directly as an unbalanced signal while floating pin 3. In the latter configuration, the output is decreased by 6 dB

# STT-1



# STT-1 Origin Rear Panel

### (5) MAIN OUTPUT #2 "MAIN OUT - UNBAL"

Conventional three pin male XLR connector providing unbalanced, line level output from *all* stages of the STT-1. Can be used simultaneously with all other outputs. This XLR sits directly above the 1/4" unbalanced output connector. Pin 1 is ground. Pin 2 is positive polarity. Pin 3 is ground. This output is all discrete, pure Class-A, and is capable of driving < 600 ohm loads and long, high capacitance cables. This output should drive a balanced destination with no interface concerns. In the rare instance where a balanced destination exhibits difficulty with an unbalanced source, use the balanced output (#4 above). Connector contacts are Neutrik Galvatronic gold plated. It is suggested that XLR cable connectors used with the STT-1 employ identical plating.

### (6) MAIN OUTPUT #3 "MAIN OUT - UNBAL"

Conventional 1/4" female phone connector providing unbalanced, line level output from *all* stages of the STT-1. Can be used simultaneously with all other outputs. Tip is signal positive polarity, Sleeve is ground. This output is all-discrete, pure Class-A and is capable of driving < 600 ohm loads and long, high capacitance cables. This output should drive a balanced destination with no interface concerns. In the rare instance where a balanced destination shows difficulty with an unbalanced source, use the balanced output (#4 above). This output is paralleled with Output #5 (above).

### (7) DYNAMICS LINK "Dyn Link"

Conventional RCA-style phono jack providing a connection to the dynamics side chain circuit. Use to link dual STT-1 units for stereo operation. Any conventional RCA phono cable should work appropriately.

### (8) EARTH/AUDIO GROUND JUMPER

A barrier terminal which ties earth ground to audio ground. If ground "hum" loops are experienced when using the STT-1, removing this jumper may help. Using this jumper to lift ground, the integrity of the chassis/earth ground connection is never compromised. **Do not defeat the earth grounding pin on the AC plug.**

### (9) AC VOLTAGE MAINS SELECTION "100-120" or "200-240"

A power entry module with a removable fuse holder block. This fuse holder block is selectable for 100 - 120 Volt or 200 - 240 Volt worldwide mains powering. The fuse block contains two fuses — one fuse is in series with the hot power line while the other fuse is in series with the neutral power line. Both fuses *must* be installed. To change the mains voltage selection, remove IEC power connector and assure that the STT-1 is not connected to mains power. With a non-conductive tool, gently pry the fuse block away from the power entry module. Remove the two fuses and replace both with type as shown below. Slide out the internal PC Board, turn it over, and reinsert the PCB so that the desired AC mains voltage appears in the viewing window. Double check that the fuses installed correspond to the AC mains voltage range which appears in the viewing window. Gently push the fuse block back until flush and snug.

#### FUSES:

For 100-120 VAC mains, use two 5 x 20 mm, 1A, slow blow, 250 V, Littelfuse 218 or equiv.

For 200-240 VAC mains, use two 5 x 20 mm, 500 mA, slow blow, 250 V, Littelfuse 218 or equiv.

### (10) POWER ENTRY "IEC Power Receptacle"

An IEC-type AC line-power receptacle for use with removable cords. Use only the power cord provided



# STT-1 FRONT PANEL — FRONT END

## (1) FRONT-END AMPLIFIER SELECT SWITCH - *TWIN TOPOLOGY*<sup>™</sup>

Pushbutton switch which selects the front-end gain amplifier as either entirely vacuum tube (VT) or entirely solid state (SS). When used as a microphone preamp, the solid state amplifier is essentially identical to the front-end found on Millennia's acclaimed HV-3 — used by a who's who in critical acoustic recording worldwide. The vacuum tube amplifier is essentially identical to the front-end of Millennia's sublime M-2b. The DI instrument input uses a tested and selected low noise, high voltage (300+ Volts) 12AT7 vacuum tube for impedance buffering, which then feeds either the VT or SS gain amplifiers. There's also an unusual twist here. To further enhance the Origin's sonic palate, we have included something that Millennia has historically avoided — *a switch selectable audio path transformer*. Here's why...

Audio designers know that audio transformers add various types of sonic color (distortion) to an audio path — especially at high dynamic levels and wide frequency excursions. This is why, to date, Millennia has avoided audio path transformers. In our opinion, audio transformers simply have no place in a critical signal path when acoustic realism and dynamic stability are primary objectives.

That said, it is also widely known that audio transformer distortion can add "artistic personality" to audio signals. For decades, creative engineers and producers have selected various transformer-coupled audio paths to achieve a marked sonic signature. A good example is found in Rupert Neve's original Class-A, all-discrete designs from the 1960s. Mr. Neve's early console modules (1272, 1073, etc.) are in demand today due to their ability to "cut through" a mix and present a "bigger than life" sonic signature. Hugely unnatural, and delightfully so! What causes these audio artifacts? *It's predominantly the transformers*. We can thank Rupert's old audio path transformers for most of that familiar euphonic coloration and pleasing distortion.

Millennia enjoys a fine collection of these 1960's era console modules. We use them on pop recording dates (by choice, however, more than 90% of our recording schedule remains acoustic classical, jazz, and ethno-eclectic; where we use HV-3 and M-2b micamps exclusively). We know intimately the "sound" that a purposefully designed audio path transformer can deliver. It is with this understanding and mission that Millennia presents our first product with an audio path transformer.

Numerous listening tests were performed on a wide range of off-the-shelf transformers. We couldn't find a stock transformer that had the particular "sound" we were searching for. We then embarked upon a design effort to create our own unique transformer. Developed for its ability to deliver a "bigger than life" sonic signature when hit high input levels, the new Millennia MIT-01 audio input transformer is *not* intended for acoustic reality nor musical accuracy. Rather, when used with higher input levels, the MIT-01 offers a colorful sonic personality that engineers and producers of popular music will likely find both highly artistic and eminently useful. This transformer can be switched in and out of the front-end audio path; selectable via a front panel switch (see #4). The transformer can be used with all input types (microphones, line-level, and instrument-DI), but will likely be most sonically pronounced when used with condenser microphones. When used with nominal input levels, the transformer exhibits modest sonic coloration. The remaining functional areas of the STT-1, including the vacuum tube or solid state EQ, dynamics, and output sections, remain inherently transformerless.

## (2) PHANTOM POWER SELECT SWITCH (" +48V")

Pushbutton switch which provides phantom power (+48 Volts DC) to the microphone. When this switch is depressed (illuminated red), phantom power is applied simultaneously through dual 6.81k ohm resistors to pins 2 and 3 of the three pin female XLR mic input. Use phantom power with condenser and other microphones requiring traditional phantom supply. CAUTION: Applying phantom power to ribbon microphones could damage them. Do not use phantom with ribbons, moving coil, and other microphones which do not require phantom power. Use care, as well, not to insert or extract mic cables from

### (3) POLARITY REVERSE SWITCH "POL REV"

A pushbutton switch which, when depressed and illuminated, reverses the polarity (180 degree inversion) of all input signals, including the DI, mic input, and line input.

### (4) TRANSFORMER SELECT SWITCH "XFMR IN"

A pushbutton switch which, when depressed and illuminated, places the Millennia MIT-01 audio path transformer in the front-end circuit. When used with high level signals, such as when using a pair of STT-1 units for mixdown applications, the engineer may notice a marked 'enhancement' in sonic signature when the transformer is inserted. We have designed this transformer to provide a unique, "fat" sonic coloration with condenser microphones which gives the engineer a richer, fuller, 'bigger-than-life' image when used with aggressive sources such as drums and electric bass. Read more about this transformer in section (1).

### (5) OVERLOAD INDICATOR "OL"

A single red LED (light emitting diode) which begins turn-on (most dim) around +18 dBu and becomes fully illuminated at +24 dBu at the direct output. The gradual illumination feature offers better indication of approximate direct output level when compared with a typical "on/off" LED.

### (6) VACUUM TUBE GAIN CONTROL "VACUUM TUBE GAIN"

A potentiometer which offers a front-end vacuum tube gain range of approximately 18 dB, being an absolute gain range of approximately +22 dB to +40 dB at the direct output. When Line Input is used, it is recommended that this Gain Control remain fully CCW with the Output Master Level control set between 12 o'clock and 3 o'clock as a starting point. If less gain is required, lower the Master Level. If additional gain is required for line level signals (such as unbalanced "-10" signals), raise the level using use the Vacuum Tube Gain Control. Line level signals sound fantastic in the Origin, but for *optimized* performance of EQ and Compressor with line level sources, the stand-alone NSEQ-2 and TCL-2 *Twincom* stereo products offer slightly improved specifications. This is due to the additional (and required) interface circuitry found in the Origin. NOTE: We did not attempt to unify the rotational position or resolutions of the SS and VT gain controls. That is, the user cannot place each gain potentiometer at the same angular setting and expect the same gain. Rather, we have optimized each gain amplifier unto itself, not in relation to the other gain amplifier.

### (7) SOLID STATE GAIN CONTROL "SOLID STATE GAIN"

A potentiometer which offers a front-end solid state gain range of 40 dB, being an absolute gain range of approximately +10 dB to +50 dB at the direct balanced output. The Origin is optimized for mic-level and instrument-level signals. When Line Input is used, it is recommended that this Gain Control remain fully CCW with the Output Master Level control set between 10 o'clock and 2 o'clock as a starting point. If additional gain is required for line level signals, raise the level using use the Gain Control. Line level signals sound fantastic in the Origin, but for *optimized* performance of EQ and Compressor with line level sources, the stand-alone NSEQ-2 and TCL-2 *Twincom* stereo products offer slightly improved specifications. This is due to the additional (and required) interface circuitry found in the Origin. NOTE: We did not attempt to unify the rotational position or resolutions of the SS and VT gain controls. That is, the user cannot place each gain potentiometer at the same angular setting and expect the same gain. Rather, we have optimized each gain amplifier unto itself, not in relation to the other gain amplifier. NOTE: An approximate 20 dB of additional solid state gain is available if necessary. Contact Millennia for customization information.

### (8) SOURCE SELECT SWITCH "SOURCE: MIC - LINE - DI"

Rotary switch (Grayhill, military-spec, gold plated) which selects the front-end input source as either microphone, line level, or 1/4" DI (instrument, keyboard, etc.). Mic, Line, and DI inputs all feed the same front-end amplifiers (selectable via switches as either vacuum tube or solid state, transformer-coupled or transformerless). When used as a solid state amplifier, the circuit is essentially identical to the front-end found on Millennia's acclaimed HV-3. When used as a vacuum tube amplifier, the circuit is essentially identical to Millennia's sublime and musically euphonic M-2b front-end. The DI input offers a standard 1/4" phone jack exhibiting a very high input impedance via a single 12AT7 vacuum tube circuit.

# PARAMETRIC EQUALIZER SECTION

## (9) BAND IN/OUT SWITCH "IN"

Pushbutton switch which places its associated EQ band in circuit or out of circuit. There are four bands of equalization on the STT-1 Origin. The four frequency bands are labeled LF (low frequencies), LM (low-mid frequencies [20 Hz - 2.5 kHz]), HM (high-mid frequencies [250 Hz - 2.5 kHz]), and HF (high frequencies). An EQ band is in circuit when its associated band switch is depressed and LED is illuminated. Because of the equalizer's unique network-shunt design, EQ bands should have no detectable sonic signature when they are in circuit as long as the boost/cut control is set at zero. Band In/Out switches are provided both for comparing a single EQ band setting versus flat-band response, and for bypassing the EQ entirely.

## (10) FREQUENCY SELECT SWITCH

Rotary switch (Grayhill, gold contacts, military spec) which selects fixed high and low band frequencies. LF control center frequencies are set to 20, 34, 56, 100, 180, and 270 Hz. HF control center frequencies are set to 4.8k, 5.8k, 8.0k, 10k, 16k, and 21 kHz.

## (11) PEAK/SHELF SELECT SWITCH

Pushbutton switch which selects LF band and HF band curve shape. When switch is depressed and LED is illuminated, EQ is shelving at 6 dB per octave. When switch is not depressed, EQ is peaking with a fixed "Q" of 1.0.

## (12) BOOST/CUT CONTROL

Conductive plastic rotary potentiometer offering up to +15 dB of boost and -15 dB of cut. Boost/Cut potentiometer has 21 detented positions for accurate repeatability and session logging.

## (13) PARAMETRIC FREQUENCY CONTROL

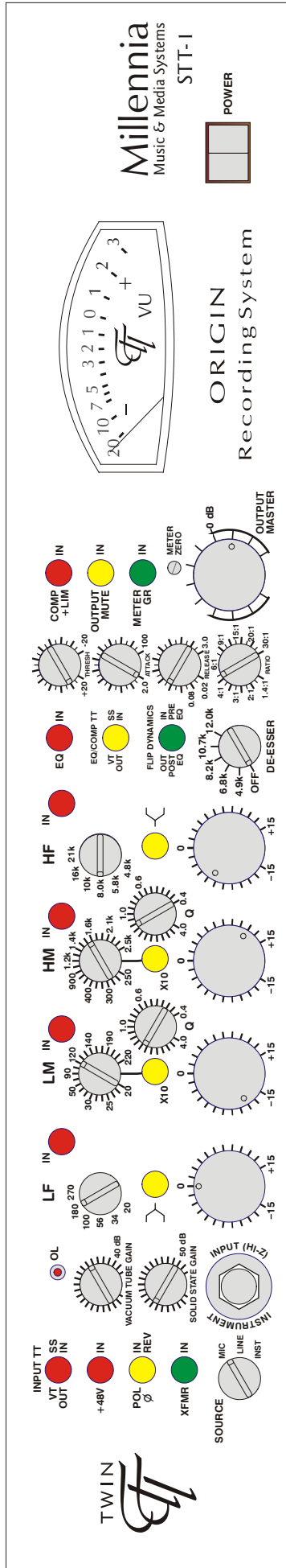
Conductive plastic rotary potentiometers (2) which sweep all center frequencies from 20 Hz to 25 kHz. The low-mid band ("LM") sweeps 20 Hz to 220 Hz *-or-* 200 Hz to 2.2 kHz, depending on the status of Frequency Range Switch (below). The high-mid band sweeps 250 Hz to 2.5 kHz *-or-* 2.5 kHz to 25 kHz, depending on the status of Frequency Range Switch (below). This control is optionally available with 21-step detents for accurate repeatability and logging.

## (14) PARAMETRIC FREQUENCY RANGE SELECT SWITCH "10X"

Pushbutton switch which selects 1X or 10X parametric frequency range. When switch is depressed and corresponding LED is illuminated, frequencies as shown on front panel legend are multiplied by 10X. When switch is not depressed and LED is not illuminated, frequencies are as shown on front panel legend.

## (15) PARAMETRIC *QUALITY* CONTROL "Q"

Conductive plastic rotary potentiometer which sweeps "Q" (Quality factor) from 0.4 to 4.0. "Q" is defined as the ratio of the center frequency to the bandwidth. For example, a filter boost setting with "3 dB down points" near 100 Hz and 1000 Hz exhibits a "Q" of approximately 0.4. This control is optionally available with 21-step detents for accurate repeatability and session logging.



# ORIGIN STT-1 FRONT PANEL

### (16) EQUALIZER IN/OUT SELECT SWITCH "EQ IN"

Pushbutton switch which places the single (yes, *only one*) active EQ amplifier in the signal path. Because of this equalizer's unique design, the four bands of active filters are not technically 'in' the direct audio signal path. Rather, the filter bands exist *within* the shunt network of a single audio amplifier. Hence, an active filter is only effecting audio when its associated Boost/Cut control is in a position other than "0" — that is, when a Boost/Cut control is boosting or cutting. If all Boost/Cut controls are set to "0" (12:00 o'clock position), even though the EQ IN switch and all four EQ Band switches are engaged, there will be no noticeable sonic difference until a Boost/Cut control is adjusted away from its "0" position.

### (17) TWIN TOPOLOGY™ SELECT SWITCH "EQ/COMP TT"

Pushbutton switch which selects the amplifier topology to be used by the equalizer and compressor, vacuum tube or solid state. When switch is depressed and LED is illuminated, EQ and compressor are routed via a 100% Class-A solid state FET amplifier. When switch is not depressed and LED is not illuminated, EQ and compressor are routed via a 100% Class-A vacuum tube amplifier. EQ and compressor amplifier path topologies cannot be selected separately. Not a gimmick, *Twin Topology* is designed around two world class, musically optimized amplifiers — one amplifier is based upon twin triode 300+ Volt vacuum tubes, while the other is based upon all discrete Class-A biased J-FET servo amplifiers. Like having two distinctly different equalizer path amplifiers and two distinctly different opto-compressor path amplifiers in one chassis. We do not "match" inherent gains between the vacuum tube and solid state amplifiers — a small gain differential between topologies (generally 1 or 2 dB) is not unusual.

## COMPRESSOR / LIMITER SECTION

### (18) THRESHOLD CONTROL "THRESH"

Conductive plastic rotary potentiometer offering a continuously variable compression threshold adjustment range of approximately -20 dBu to +20 dBu. Threshold is most sensitive when control is turned fully CW.

### (19) ATTACK TIME CONTROL "ATTACK"

Conductive plastic rotary potentiometer offering a continuously variable attack timing. When fully CCW, the fastest attack time is achieved (2 mS). When fully CW, the slowest attack time is achieved (100 mS). Opto-resistive gain reduction, as found in the Origin STT-1, is ideal for virtually all program material, including tracking of vocals, guitars, keyboards, and most acoustic music. Moreover, when a pair of STT-1 units are combined, the opto-compressor can be used for stereo program mixing, post production, and so forth. Opto-electronic gain reduction is not the fastest known method of compression attack, but based on many years of listening experience with every gain reduction technology, we feel that well designed opto-resistive compression is the most sonically transparent method.

### (20) RELEASE CONTROL "RELEASE"

Conductive plastic rotary potentiometer offering continuously variable compression release timing. When fully CCW, the fastest release is achieved (20 mS). When fully CW, the slowest release is achieved (3 seconds). Note that release times below 80 mS are normally used only during de-essing. It is recommended that broadband compression use >80 mS release times.

### (21) RATIO CONTROL "RATIO"

Conductive plastic rotary potentiometer offering continuously variable compression ratio. When fully CCW, the lowest and most gentle compression ratio is achieved (1.4:1). When fully CW, the highest and most pronounced compression ratio is achieved (30:1). A compression ratio of approximately 10:1 or higher is typically called "limiting" hence the STT-1 dynamics section is properly called a "compressor/limiter."

### (22) PRE / POST DYNAMICS SELECT SWITCH "FLIP DYNAMICS"

Pushbutton switch which determines the order in which the dynamics section is placed in the audio signal path. When switch is depressed and LED is illuminated, the dynamics section precedes the EQ section. When switch is not depressed, the dynamics section follows the EQ section. Use this switch to achieve desired sonic objectives. In some cases, compressing equalized program can offer an "effect" not achievable with pre-EQ compression. When the Equalizer is not enabled (EQ IN switch is disabled), pre/post selection is also disabled.

### (23) DE-ESSER SELECT ROTARY SWITCH "DE-ESSER"

Rotary switch which selects the notching frequency of an opto-electronic de-esser. De-esser provides selective filtering of particularly "sibilant" frequencies, such as found on overly breathy singers, RF "hissing" artifacts encountered with certain wireless mic receivers during dropout, and so forth. Compressor/limiter "dynamics" switch (#24) must be active to achieve de-essing function.

Origin's de-essing function employs the same opto-resistive gain reduction elements used by the broadband compressor/limiter. The de-essing function can be used simultaneously with the parametric equalizer (pre or post), and can be used with the additional solid-state audio path amplifier, vacuum tube audio path amplifier, or with no additional amplifier in the audio path. The de-esser and broadband compressor/limiter cannot be used simultaneously.

When the "Comp/Lim In" switch (#24) is active and illuminated, and the de-essing rotary switch is fully counter-clockwise, the broadband compressor/limiter is active and the de-essing function is off. As the de-essing switch is rotated clockwise, the broadband compressor/limiter is disabled and the de-esser becomes active at the center frequency noted on switch. When any de-essing frequency is selected, the meter Gain Reduction function is disabled.

The de-esser works in conjunction with the compressor/limiter's dynamics controls (threshold, attack, release, ratio) and signal input level. At lower input, threshold, and ratio levels, the de-essing function is less prominent. At higher levels, de-essing becomes more pronounced. The de-esser in the Origin is intended for modest de-essing duties. For more aggressive sibilance, a dedicated de-essing unit with greater flexibility is suggested.

At low settings (fully CCW) of threshold and ratio, the de-esser function is essentially off. For instance, at 1.4:1 ratio, the de-essing notch is very broad with minimal cut. As the ratio and threshold controls are increased clockwise, the de-essing notch becomes more pronounced with an apparent tighter "Q". It is recommended that the fastest attack and release be used as a starting point; the user should then experiment with different settings of attack and release to achieve optimal de-essing performance. The Origin de-esser has also been found effective on RF microphone "envelope hiss," guitar fret squeek noise, and such.

**(24) DYNAMICS IN/OUT SWITCH "COMP + LIM IN"**

Pushbutton switch which places an opto-compressor/limiter into the signal path. When switch is depressed and LED is illuminated, opto-electronic gain reduction elements are activated. When pushbutton switch is not depressed, gain reduction is not in circuit. Opto-compressor/limiter can be used with or without additional active amplifier stage (vacuum tube or solid-state).

**(25) MUTE SELECT SWITCH "OUTPUT MUTE"**

Pushbutton switch which mutes all main outputs, balanced and unbalanced. When switch is depressed and LED is illuminated, audio signal is muted at the main outputs. Does not effect Direct Output from the front end amplifiers. When switch is not depressed, muting is not active.

**(26) VU METER FUNCTION SELECT SWITCH "METER GR"**

Pushbutton switch which determines the VU meter function. When switch is depressed and LED is illuminated, VU meter indicates the amount of dynamics gain reduction. When switch is not depressed, VU meter indicates the actual output level of the balanced main outputs. A meter reading of 0 VU is equivalent to a balanced output of +4 dBu. NOTE: Unbalanced main output is 6 dB lower output than shown on VU meter. Gain reduction metering is disabled when de-esser is enabled.

**(27) MASTER LEVEL CONTROL "OUTPUT MASTER"**

Master output level control. Fully CCW is fully off. Fully CW offers an additional 10 dB of gain relative to the front-end amplifier circuits. Unity output level is achieved when this control is approximately 2:00 o'clock (at the tip of the right "bat wing"). At 10:00 o'clock, output level is attenuated approximately -16 dB.

**(28) VU METER ADJUSTMENT "METER ZERO"**

Inset multi-turn trimmer potentiometer which adjusts the VU meter zero point when meter is set to Gain Reduction. Use insulated "wand" tool designed for trimpot adjustment. Allow ample time (1/2 hour recommended) for the STT-1 Origin circuits and chassis to 'warm up' and reach a stable operating temperature before attempting to set the GR zero point of VU meter.

**(29) VU METER**

True analog-level meter providing indication of output level or gain reduction. Meter is backlit. Meter backlighting also serves as operational 'pilot' light.

**(30) POWER SWITCH "POWER"**

Rocker switch for switching AC line power on and off.

**(31) TEMPLATE**

(not shown) A logging template for use with the STT-1 Origin is available for download on the Millennia web site at: <http://www.mil-media.com/origin.html>

## COMPRESSOR T/T OPERATION

Please review the STT-1 block diagram. You'll note that the opto-compressor gain reduction "shunt" elements, both pre-EQ and post-EQ, are passive. This means that no additional audio path amplifiers are required for dynamics control, though an additional 10 dB of "make up gain" can be achieved via the master output buffer amplifiers if required. In some cases, the sound of an additional Class-A biased amplifier in the dynamics signal path may be preferred. As such, the STT-1 ORIGIN opto-compressor can be selected to use *three* different signal paths, follows:

- 1.) With vacuum tube signal path amplifier, or
- 2.) With solid-state signal path amplifier

The opto-compressor and parametric equalizer can share the same Class-A signal path amplifier (selectable as vacuum tube or solid-state). To use the compressor with the additional signal path amplifier, assure that the "EQ IN" switch is depressed and illuminated. If no EQ is desired (compressor only), assure that all four "EQ Band" switches are disabled — this will effectively remove all EQ function while allowing the dynamics processing to traverse an additional vacuum tube or solid state amplifier signal path. In practice, this additional amplifier would usually be selected as a vacuum tube path for heightened sonic coloration.

- 3.) Without any additional signal path amplifier

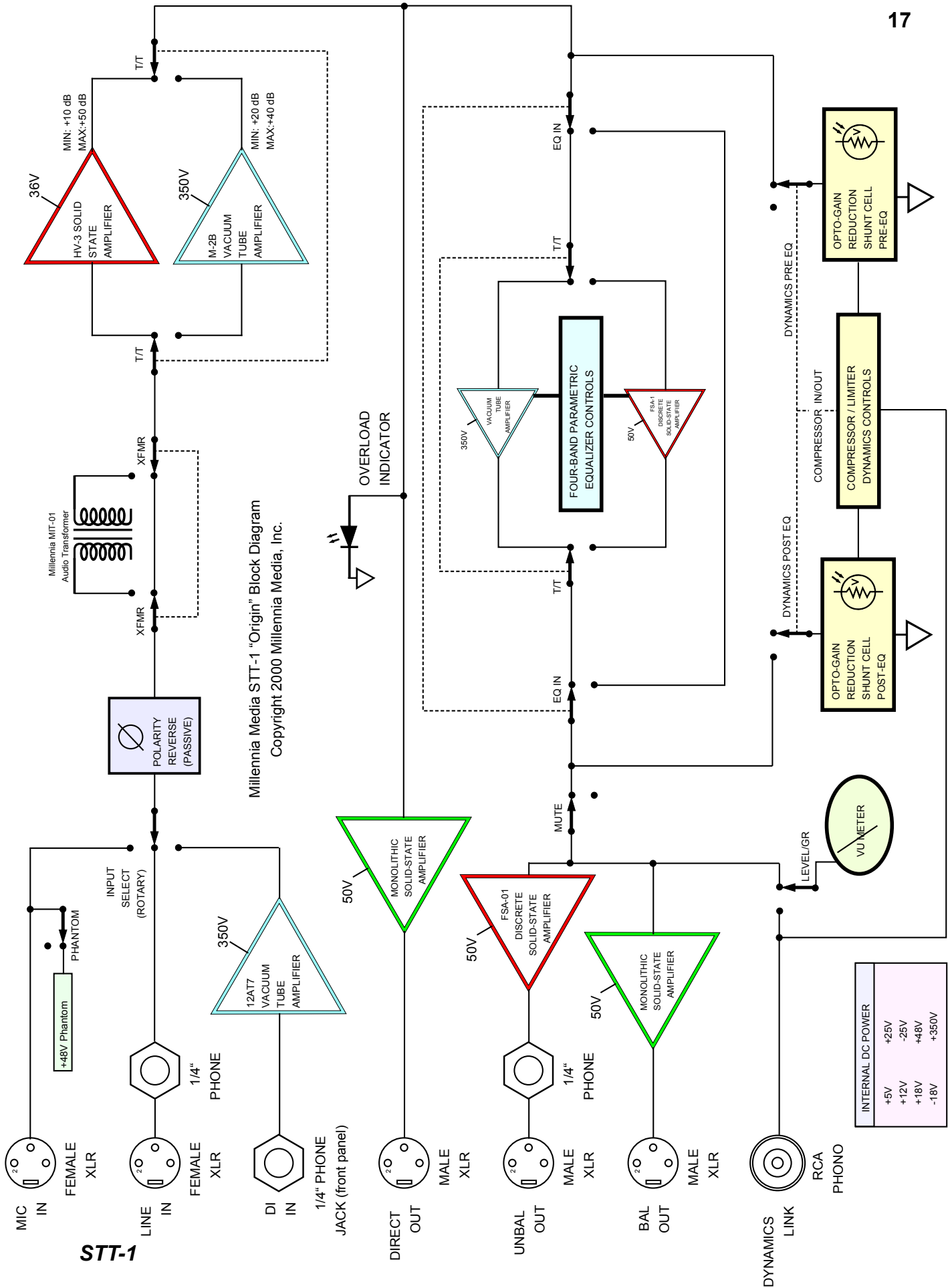
The opto-compressor function is passive, meaning that no additional signal path amplifiers are required for dynamics operation. Passive opto-resistive elements are oriented as "variable resistors" to ground, achieving broad levels of gain reduction. To use passive opto-compression, whether pre-EQ or post-EQ, simply assure that the "EQ IN" switch is not depressed.

We feel this unique design approach offers maximum flexibility in achieving the widest range of dynamics sonic possibilities, from straight-wire 'minimalist' design to variously applied Class-A amplification paths. Note that EQ and compressor control switches give visual indication of the functions described above.

## SUMMARY

The STT-1 ORIGIN could very quickly become among the only front-end analog paths you'll ever need. With over 130 different product and topology combinations in one 2U rack chassis, and the inherent range of sonic possibilities, the STT-1 is designed for the producer/engineer/musician who doesn't have large amounts of time to spend patching and repatching racks of analog front-end gear trying to achieve "*that sound*." Now, in one chassis, it's possible to easily and quickly patch vacuum tube equipment with discrete solid state Class-A equipment, transformer-coupling and non-transformer coupling, various inputs and outputs, even dispensing with certain signal path amplifiers altogether if not desired. It's —*all*— here in one compact chassis. The STT-1 vastly expands the range of every artist's sonic palette at a price/performance level previously unknown in professional audio. STT-1 — Straight to Tape. Or for those no longer using tape, Straight to Track!





STT-1

INTERNAL DC POWER	
+5V	+25V
+12V	-25V
+18V	+48V
-18V	+350V

## TYPICAL SPECIFICATIONS

Instrument DI Input Amplifier	Selected 12AT7 dual triode vacuum tube
Solid State Input Amplifier	Discrete NPN Transistor Hybrid (HV-3 PAM-01)
Vacuum Tube Input Amplifier	Selected 12AX7 & 12AU7 vacuum tubes
EQ and Dynamics Amplifiers	Selected 12AX7 & 12AU7 vacuum tubes — or FSA-01 J-FET all-discrete semiconductors
Total Vacuum Tubes	Five (5)
Total Discrete Transistors (FET & NPN)	Twenty five (25) in audio path
THD + Noise, 20 Hz - 30 kHz	.005% typical SS, .05% typical VT
Frequency Response -3 dB points	3 Hz to 200 kHz, typical. Varies with topology
Frequency Response, +/- 0.5 dB	10 Hz to 100 kHz typical. Varies with topology
Maximum Balanced Mic Input Level	+14 dBu (SS), +3 dBu (VT), non-xfmr
Maximum Balanced Line Input Level	+30 dBu (SS), +19 dBu (VT), non-xfmr
Maximum Mic Input to Transformer	+1 dBu @ 30 Hz, +20 dBu @ 1 kHz (3% THD)
Maximum Output Level	+32 dBu, main balanced output
Maximum System Gain	60 dB, main balanced output.
Input Impedance	6,200 ohms, nominal, microphone input 2,200 (x2) ohms, line input > 1 megohm, instrument DI input
Output Impedance	24.3 (x2) ohms balanced. 49.9 ohms unbalanced
Noise (Common source, mic in)	-71 dB @ 50 dB gain (-121 dB EIN), solid state
(30 ohm source, mic in)	-68 dB @ 50 dB gain (-118 dB EIN), solid state
(150 ohm source, mic in)	-66 dB @ 50 dB gain (-116 dB EIN), solid state
Noise (Line in, EQ in, dynamics in)	better than -90 dB, varies with topology
Common Mode Rejection Ratio, mic in	> 50 dB, 100 mV CM, varies with topology > 80 dB typical @ 60 Hz. varies with topology
Three-pin XLR Polarity	Pin 2 = positive polarity, Pin 1 = ground
1/4" Phone Polarity	Sleeve = ground, Tip = positive polarity unbal

## DYNAMICS SPECIFICATIONS

Threshold Range	40 dBu, Continuously Adjustable
Attack Range	2 mS to 100 mS, Continuously Adjustable
Release Range	20 mS to 3.0 S, Continuously Adjustable
Compression Ratio Range	minimum 1.4:1 (6:1 at 12 o'clock pot setting) maximum 30:1 Continuously Adjustable
De-essing Frequencies	Off, 4.9k, 6.8k, 8.2k, 10.7k, 12.0 kHz
Dynamics pre/post EQ selection?	Yes
Twin Topology Selection (EQ In)	TT Switch In = FET Signal Path Amplifier TT Switch Out = Vacuum Tube Signal Path Amplifier
EQ Select Switch Out	"Passive" Opto-Compression Shunt Network (see instructions pg 16 for details on EQ and Dynamics co-operation)

# EQUALIZER SPECIFICATIONS

Maximum Boost & Cut	+/- 15 dB (21 step detent)
Parametric "Q" Adjustment Range	Q = 0.4 to 4.0, sweepable
Low-Mid (LM) Parametric Sweep Freqs	20 Hz to 220 Hz <i>-or-</i> 200 Hz to 2.2 kHz
High-Mid (HM) Parametric Sweep Freqs	250 Hz to 2.5 kHz <i>-or-</i> 2.5 kHz to 25 kHz
Low (LF) Range Fixed Frequencies	20, 34, 56, 100, 180, 270 Hz
High (HF) Range Fixed Frequencies	4.8, 5.8, 8.0, 10, 16, 21 kHz
Low/High Range Fixed "Q"	Q = 1.0
Parametric Frequency Multiplier (10X?)	Yes
Peak/Shelf Selection on Hi & Lo bands?	Yes
Bypass Selection on Each Band?	Yes
Twin Topology Selection	Switch In = FET Signal Path Amplifier Switch Out = Vacuum Tube Signal Path Amplifier

# ELECTRO-MECHANICAL SPECIFICATIONS

Power Consumption	50 Watts, nominal
Power Requirements	100VAC to 240VAC, 50/60Hz, selectable
Fuses (2 required)	2 ea 1A with 100-120VAC mains (5x20mm, slow-blow, 250V) 2 ea 500mA with 200-240V mains (5x20mm, slow-blow, 250V)
Internal DC Power	+350V, +50V, +25V, -25V, +18V, -18V, +12V, +5V
Dimensions	19" W x 15.5" D x 3.5" H
Net Weight	approximately 25 pounds

Millennia Media reserves the right to change specifications, delivery, and pricing without notice.

## World Wide Warranty

We will repair our products, free of charge, in the event of defect of materials or workmanship for two (2) years following date of purchase.

This limited warranty covers failures due only to defects in materials and workmanship which occur during normal, intended use and does not cover damage which occurs in shipment or failures which are caused by products not supplied by Millennia Media.

This limited warranty does not cover failures which arise from accident, misuse, abuse, neglect, mishandling, misapplication, faulty installation, improper adjustment, alteration or modification of product, incompatibilities, line-power surges, lightning strikes, acts of God, or service performed by anyone other than Millennia Media or its authorized agent.

Limits and Exclusions – There are no express warranties except as listed above. Millennia shall not be liable for special, subsequent, incidental, consequential, or punitive damages, including, but not limited to: damage to recordings, broadcasts, microphones, mixing consoles, or any associated equipment, downtime costs, loss of goodwill, or claims of any party dealing with purchaser for such damages resulting from the use of this product. All warranties express and implied, including the warranties of merchantability and fitness for a particular purpose are limited to the applicable warranty period set forth above. Vacuum tube and bulb failures are not covered under warranty. Shipping costs to/from factory are not covered under this

warranty. International warranty law may vary from country to country, and Millennia will abide by the law of each country from which the product was initially sold.

For North American repairs and service, contact Millennia (tech@mil-media.com) to obtain a Return Authorization number. Please include your shipping address, daytime phone number and description of the problem. Outside of North America, please contact your local Millennia Distributor.

## Discarding Units

In the event that any Millennia equipment manufactured after July 1, 2006 needs to be discarded, you must return it to Millennia, at our headquarters in California, USA. Please contact the distributor in your country or Millennia directly for instructions. We will make arrangements to have the equipment shipped to us at no cost to you, and we will dispose of it in a manner that complies with whatever regulations are in existence at that time.

Millennia Media, SPC  
6411 Capitol Avenue  
Diamond Springs, CA 95619 USA  
TEL: 001-530-647-0750  
Email: sales@mil-media.com

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