

Portico 542

500 Series Tape Emulator

By:



RUPERT NEVE DESIGNS

Serial #:



Operations Manual

PORTICO 542: 500 SERIES TAPE EMULATOR

Thank you for your purchase of the 542: 500 Series Tape Emulator. Everyone at Rupert Neve Designs hope you enjoy using this tool as much as we have enjoyed designing and building it. Please take note of the following list of safety concerns and power requirements before the use of this or any Portico Series product.

SAFETY

It's usual to provide a list of "do's and don'ts" under this heading but mostly these amount to common sense issues. However here are some reminders:

Don't operate your Portico™ module in or around water! Electronic equipment and liquids are not good friends. If any liquid is spilled such as soda, coffee, alcoholic or other drink, the sugars and acids will have a very detrimental effect. Sugar crystals act like little rectifiers and can produce noise (crackles, etc.). SWITCH OFF IMMEDIATELY because once current starts to flow, the mixture hardens, can get very hot (burnt toffee!) and cause permanent and costly damage. Please contact support as soon as possible at support@rupertneve.com for resolution.

- 1) Read these instructions.
- 2) Keep these instructions.
- 3) Heed all warnings.
- 4) Follow all instructions.
- 5) Do not use this apparatus near water.
- 6) Clean only with dry cloth.
- 7) Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- 8) Do not install near any heat source such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- 9) Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- 10) Do not expose this apparatus to rain or moisture.

542 DESCRIPTION

As a follow up to the Portico 5042, the 542 delivers a remarkable simulation of true tape sound through the inclusion of genuine tape drive circuitry, while also incorporating a number of new controls for adding analogue color and tone to individual tracks or mixes. The Portico 542's "True Tape" emulation circuit provides the nostalgic rounding and compression usually only achieved by the use of tape, and can offset the harshness often found in digital recordings. Unlike digital emulations, the "True Tape" drive circuit works by feeding a tiny magnetic "record head", which in turn is coupled to a correctly equalized, replay amplifier. As the voltage rises on the "record head", saturation increases, and a soft clip circuit engages at higher levels to round off peak transients. The sound of the tape circuit can be further modified with selectable 15 / 30 IPS modes and a pre / post tape

blend control. In addition to the tape circuit, the 542 also has the variable Silk / Texture found in the Portico II series of modules, which allows the engineer to fine tune the harmonic ratio and tonality on the output transformer.

PORTICO 542: FRONT PANEL

Trim
+/- 12dB Pre-Tape Level Control

Saturation
Controls the level being sent to the "True Tape" circuit

Blend
Determines the balance pre and post tape signals

Texture
Determines the amount of the Silk effect

Power LED
Indicates power from 500 Series Rack

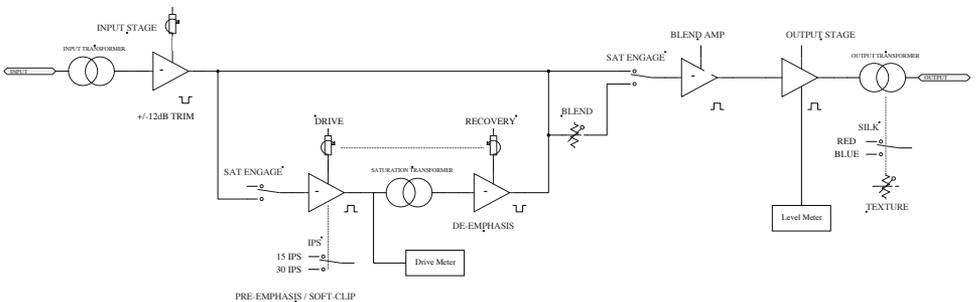
Tape Effect In
Engages the tape circuit

Drive Meter
Shows the signal level on the "Record Head" The soft clip engages at 5

15 / 30 IPS
Selects the tape characteristic

Silk Red / Blue
Toggles between Silk Red, Blue, and Silk Off

PORTICO 542: BLOCK DIAGRAM



NOTES ON TAPE

Tape Recorders were first used by professional recording studios in the late 1940's, soon after WW2. They were adapted from the German Magnetofon that had been used by the German Navy to improve security of communications with their submarines.

It could be claimed that the magnetic tape recorder was the device that really made the modern music recording industry possible. Before that time recordings were cut on lacquer or wax master disks. Although the sound quality of the long playing record achieved a very high standard, no editing or "dubbing" was practical.

The tape recording channel consisted of a "Drive" amplifier that fed the magnetic "Record" head winding through a constant current circuit. A replay amplifier, connected to the "Playback" head, with suitable equalization, then amplified the very small signals from this "Playback" head to restore line level. Because of the high impedances and the impossibility of controlling this dynamic process by, for example using negative feedback, the process was somewhat non-linear, exhibiting compression at high levels, noise at low levels and considerable 3rd harmonic distortion at the low frequencies. The frequency response depended on many factors such as the quality of tape, the head design and, not least, frequent expert maintenance required to optimize the performance on a daily basis.

In spite of the limitations, "Tape" sound, in the hands of a professional who knew how to get the best from the medium, was pleasant, enhancing the sound of many instruments and smoothing over deficiencies in some of the more aggressive sounding microphones. With these factors in mind, together with nostalgic memories of tape recordings over many years, we set about reproducing the classic sound of tape!

Because of the non-linearity referred to, tape distortion varies with signal level. When the level is very high, the signal is compressed and if it is too high it will clip. (which is a highly unpleasant sound!) In order to avoid the need for adjustment of both record and playback levels, these two controls have been ganged on the 542 so that as the record level is increased, the replay level is decreased. The tape level meter provides a good reference that, with care, will indicate the approximate maximum record level of an actual recorder.

542 USAGE NOTES

While in the olden days, tape's non-linearity was generally looked upon as more of a curse than a "feature", the advent of digital systems that operate in a completely linear fashion has made many appreciate the quirks of non-linear audio processing. Unlike linear designs, non-linear devices require the user to actively experiment with gain staging to find the "sweet spot" of the circuit. Although this requires a small amount of effort on part of the engineer, if used properly, the effect can add a dynamic aspect to performances that can enhance the impact of a song.

The non-linearity in the 542's "True Tape" circuitry and Saturation control necessitate taking note of both drive and input levels. How levels are staged into

the 542's tape circuit can significantly impact tone, depending on the position of the saturation control and the drive level on the tape circuit. As saturation is increased, low frequency compensation is decreased, and at a drive level of 5 the soft clipper enters the circuit. Finding the best balance point between low frequency response, total harmonic distortion, and desired soft clipping require playing with a combination of the saturation, trim and blend controls, and may also include using dynamics processing and proper gain staging before the 542.

As a rough guide, we recommend starting with an input signal from around -20dBu and applying saturation, 15 / 30 IPS, Silk, and blend to taste. It does however also behoove the engineer to experiment with the balance between the pre-tape signal level and the level of the saturation control to find the best results for each source.

To get a better idea of what is happening at different saturation and "Tape Head" levels, look through the frequency response and THD by frequency response graphs in the Technical Specifications section at the end of the manual.

Also, like a real tape machine, the flux loops in the "True Tape" circuitry can pick up signals from strong nearby magnetic fields (The most likely sources are nearby power supplies, power amplifiers and computer monitors). Although, we have shielded both the unit as a whole and the tape circuit to minimize stray inductance, if you have issues with hum when engaging the tape circuit, try moving the 542 to other spots away from magnetic field radiators until the hum subsides.

542 FEATURES

TAPE IN

Sends the signal through the "True Tape" circuitry, which is affected by the saturation, blend and 15 / 30 IPS controls.

TRIM

Provides +/- 12dB adjustment of level on incoming signal levels, prior to the tape circuit.

SATURATION

Controls the signal level being sent to the magnetic Tape Head. As the saturation level increases the level on the "record" head rises, and the replay gain is reduced so that the overall output signal level remains more or less constant. In a real tape recorder, you would adjust the record and replay gain controls separately, however in the 542 the record and replay gain controls are coupled so that the overall signal level only varies as the "Tape" saturation level changes. As you approach maximum saturation setting, the output signal level will drop due to the effect of extreme saturation and soft clip.

Additionally, to compensate for low frequency loss at low "record head" levels, the saturation knob also controls a low frequency compensation circuit that boosts low frequencies more at low saturation levels, and tapers off at higher levels. This

function can be useful on many sources like bass and kick drum to find the balance between a clean, boosted low end (low saturation) and a denser, more saturated low end (high-saturation).

15/30 IPS

Selects the pre-emphasis / de-emphasis, record / replay tape characteristic. The 15IPS mode has a significant “head bump” in the low frequencies centered around 60Hz, as well as a more pronounced roll off in the high frequencies. The 30 IPS mode is generally a flatter response through the high-end with a “head bump” around 120Hz. See the frequency plots on pages 10 & 11.

BLEND

Controls the mix of pre and post tape signals. This allows the engineer to dial in a subtle amount of the tape effect, to better control the amount of saturation, tone and soft clipping in the post blend signal. As the signal gets more saturated, dialing back the blend can be a great way to impart the feel of tape, while maintaining a similar level of detail and transparency. NOTE: The blend control does not effect the Silk and Texture controls.

SOFT CLIP

A soft clip engages in the “True Tape” circuitry when the drive meter hits 5 (first yellow LED), and becomes more apparent at higher levels. The soft clip can be used as a way to tame overly transient material like drums, and can be controlled further by using the blend control.

SILK / TEXTURE

Pushing the Silk button engages the Silk Red circuit, and pushing it a second time introduces Silk Blue circuitry. Silk reduces the negative feedback on the output transformer, adding harmonic content as the texture is increased. Silk Blue mode features more saturation in the lows and low mids, where as Silk Red accentuates the saturation in the high-mids and highs.

Both Silk modes are modified and fine tuned by the “Texture” control. By manipulating the Texture control, the amount of Silk can be changed from essentially absent, to roughly four times the amount of coloration found in Silk from the original Portico Series. With Silk / Texture engaged, the distortion characteristic and harmonic content of the unit are very reminiscent of many of Rupert’s class-A vintage designs. These controls add another realm of tonal control to the 542, and should be explored creatively in conjunction with the “True Tape” for best effect.

LEVEL / DRIVE METERS

Two eight segment LED bar-graph meters are fitted to the 542 for output level and drive metering. The level meter shows the output level of the 542 before the Silk circuit, and the drive meter reflects the level on the “record head” when the tape effect is engaged. The soft clip circuit is present at Drive levels above 5.

SPECIFICATIONS

LINE AMP SPECIFICATIONS (Measurements with tape circuit disengaged)

NOISE:

Measured at Main Output, un-weighted, 20Hz-22kHz, Input Terminated 40 Ohms.

Unity Gain Better than -100dBu

FREQUENCY RESPONSE

Measured at +10dBu, trim at unity.

Main Output +/- 0.25dB from 5Hz to 60Khz
-2dB @ 120KHz

MAXIMUM OUTPUT LEVEL

23.25dBu

TOTAL HARMONIC DISTORTION AND NOISE:

@ 1kHz, +20dBu output level Better than 0.0025%
@ 20Hz, +20dBu output level 0.07% Typical (2nd and 3rd harmonic)

TAPE FX SPECIFICATIONS

NOISE:

Measured at Main Output, un-weighted, 20Hz-22kHz, Input Terminated 40 Ohms.

Saturation @ minimum Better than -100dBu
Saturation @ maximum Better than -100dBu

FREQUENCY RESPONSE:

15 IPS, Input @ -0 dBu -3dBu @ 28kHz
Saturation @ minimum 0dBu @ 10Hz
+5dBu Peak @ 60Hz

Saturation @ maximum -3dBu @ 20kHz
-3dBu @ 12.5Hz
+2.4dBu Peak @ 60Hz

30 IPS, Input @ -0 dBu
Saturation @ minimum

-3dBu @ 120kHz
-3dBu @ 10Hz
+3.15dBu Peak @ 125Hz

Saturation @ maximum

-3dBu @ 100kHz
-3dBu @ 12.5Hz
+1.3dBu Peak @ 110Hz

TOTAL HARMONIC DISTORTION AND NOISE

Refer to sweeps on page10

15 IPS, Input @ -0 dBu

0.4% @ 3kHz to 1% @
175Hz typical

Saturation @ minimum

Greater than 1% below
175Hz typical

Saturation @ maximum

1% at 6kHz typical
0.3% @ 1kHz to 3% @
50Hz typical

30 IPS, Input @ -0 dBu

1% at 1kHz typical

Saturation @ minimum

0.6% @ 400Hz to 5% @
20Hz typical

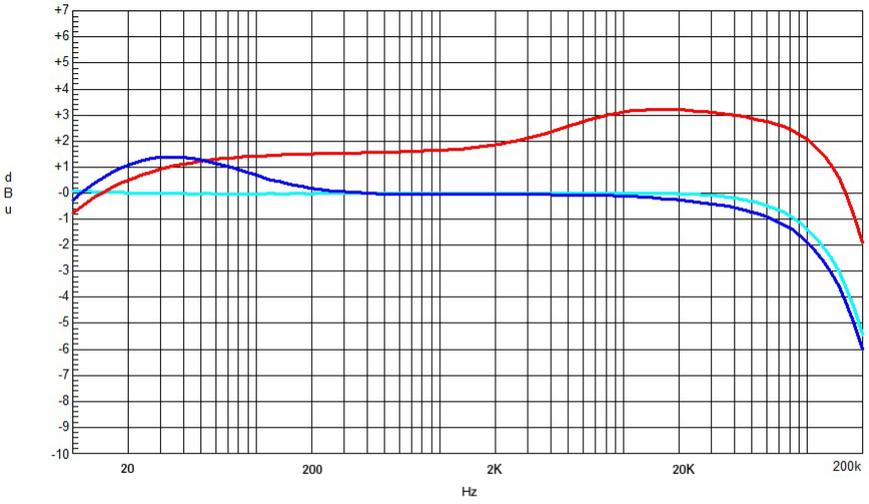
Saturation @ maximum

1.5% @ 20kHz to 0.4% @
1kHz typical
0.4% @ 1kHz to 2% @
50Hz typical

POWER REQUIREMENTS:

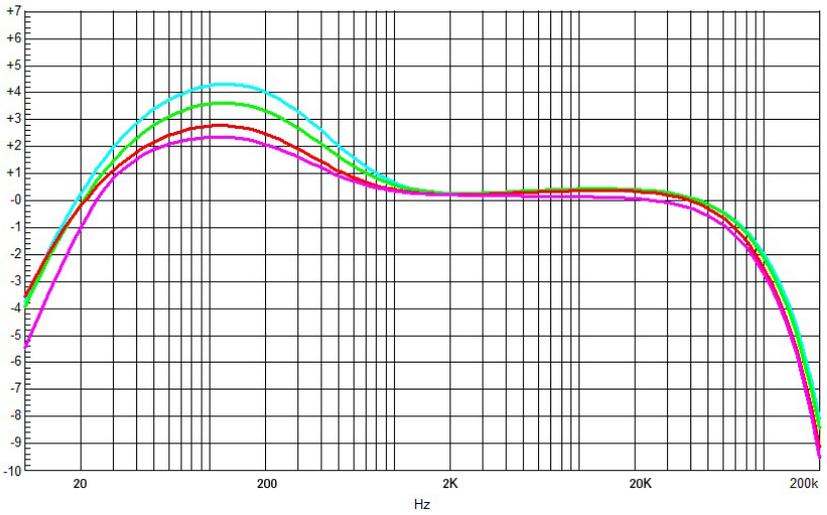
Supplied by 500 series rack with 110-125 mA @ +/- 16V DC

FREQUENCY RESPONSE (TAPE OUT)



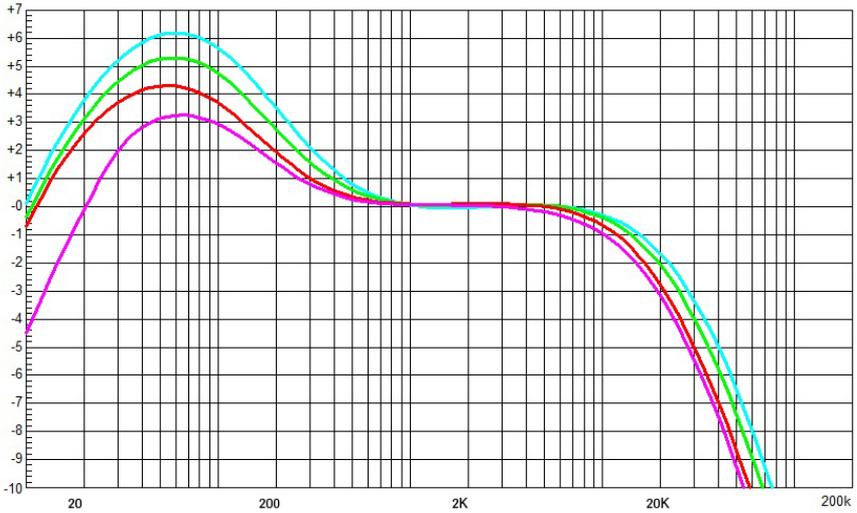
Cyan: No Silk
 Blue: Silk Blue Max Texture
 Red: Silk Red Max Texture

FREQUENCY RESPONSE BY SATURATION LEVEL: 30 IPS



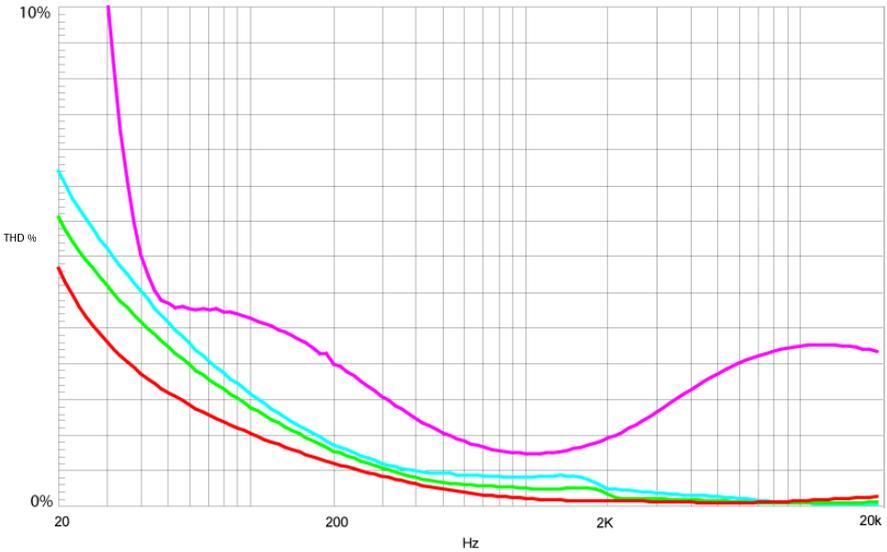
Magenta: Saturation Max
 Red: Saturation @ 2 o'clock
 Green: Saturation @ 10 o'clock
 Cyan: Saturation @ Min

FREQUENCY RESPONSE BY SATURATION LEVEL: 15 IPS



Magenta: Saturation at Max
 Red: Saturation at 2 o'clock
 Green: Saturation at 10 o'clock
 Cyan: Saturation at Min

TOTAL HARMONIC DISTORTION BY "RECORD HEAD" LEVEL



Red: Input 0dBu Saturation at Min (Drive = 2)
 Green: Input 0dBu Saturation @ 10 o'clock (Drive = 2)
 Cyan: Input 0dBu Saturation @ 2 o'clock (Drive = 3)
 Magenta: Input 0dBu Saturation @ Max (Soft Clipping Drive = 6)

PRODUCT WARRANTY

Rupert Neve Designs warrants this product to be free from defects in materials and workmanship for a period of three (3) years from date of purchase, and agrees to remedy any defect identified within such three year period by, at our option, repairing or replacing the product.

LIMITATIONS AND EXCLUSIONS

This warranty, and any other express or implied warranty, does not apply to any product which has been improperly installed, subjected to usage for which the product was not designed, misused or abused, damaged during shipping, damaged by any dry cell battery, or which has been altered or modified in any way. This warranty is extended to the original end user purchaser only. A purchase receipt or other satisfactory proof of date of original purchase is required before any warranty service will be performed. THIS EXPRESS, LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, TO THE EXTENT ALLOWED UNDER APPLICABLE STATE LAW. IN NO EVENT SHALL RUPERT NEVE DESIGNS BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THIS PRODUCT. Some states do not allow the exclusion or limitation of consequential damages or limitations on how long an implied warranty lasts, so this exclusion may not apply to you.

WARRANTY SERVICE

If you suspect a defect in this product, please call us at 512-847-3013 or contact our support staff (service@rupertneve.com) for troubleshooting. If it is determined that the device is malfunctioning, we will issue a Return Material Authorization and provide instructions for shipping the device to our service department.



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