



SPARTAN 15

Low frequency crossfeed MM phonostage

User Guide

RIAA Accuracy	0.1dB, 40Hz to 22kHz
Channel balance	0.1dB, 40Hz to 22kHz
Signal to noise ratio, ref 5mV MM cartridge	78dB, MM cartridge load, flat 220Hz-22kHz
Total harmonic distortion	<0.0006%, 40Hz to 22kHz, 10V RMS output
Maximum output	10V RMS, 20Hz to 60kHz, 3kΩ load
Maximum input at 1kHz	94mV RMS
Maximum input at 10kHz	450mV RMS
Overload margin, ref 5mV	25.5dB
Gain at 1kHz (nominal gain)	40.8dB, 110x
Minimum load impedance	3kΩ
Output impedance	100Ω
Input impedance	50kΩ//120pF
Subsonic filter	22Hz, 3 rd order, for -20dB at 10Hz
Dimensions (W*H*D)	172*60*110mm
Power consumption	2W at full output, 0.2W powered off

Introduction

Thank you for your confidence in buying the SPARTAN 15. A complete reworking of the well-received double-stage topology featured in its predecessor, it presses on from many years of research and development of moving magnet phonostages. Consequently, it offers superb RIAA accuracy, very low noise and distortion, and a sophisticated low frequency filter that keeps subsonic disturbances from wreaking havoc further down the signal path, with LF XFEED permitting audible cancellation of vertical noise well into the audio band.

By re-imagining the SPARTAN 10's circuit topology using equally economical and readily available 2068 amplifier ICs as used in the SPARTAN 5, while borrowing the more sophisticated higher voltage split power supply circuit of the PRO series preamplifiers, the SPARTAN 15 takes yet another step forward with both lower distortion and greater headroom.

New amplifier ICs, selected especially for their perfect match of input voltage and current noise against a high impedance moving magnet cartridge, offer very low input noise. The 2068s can be much more sensitive to loading than the 5532/4 amplifiers used previously, but with careful adjustment of the impedances of the RIAA network and subsonic filter networks, they are made to perform without complaint, all while driving over 10V RMS into a 3k Ω line load, equivalent to more than 3 standard 10k Ω line inputs in parallel.

A greater sharing of the gain between each of the two amplifier stages, with the last 10.7dB of gain being made up in the subsonic filter amplifier, ensures that even the most powerful subsonic disturbances don't eat into the total overload margin. This prevents the linearity bottleneck found in more traditional designs that make up all the gain on the front end.

Polypropylene and polystyrene film telecommunications capacitors, with a 1% value tolerance, ensure accurate RIAA equalisation to ± 0.1 dB, for a balanced and uncoloured frequency response. Hand-matched polypropylene film capacitors in the subsonic filter maintain this level of accuracy down to 40Hz, keeping the low frequency response as flat as possible in the audio band, before savagely attenuating subsonic artefacts by ten times.

Low frequency crossfeed is also carried forward and implemented at 140Hz across the subsonic filter, curtailing vertical low frequency noise by a factor of 3 at 50Hz, while maintaining 24dB of channel separation at 1kHz. Previously hidden bass detail is revealed and low frequency 'road noise' takes a serious step back, especially when using headphones.

The new ± 17 V power supply allows for a further expansion of headroom and a double digit output voltage, while also reducing power consumption. The linear design precludes high frequency hash and switching noise from getting into the audio path, providing reliable use for decades to come. Finally, a startup muting relay ensures no thumps and bangs at switch on. I hope that all this will combine to take your listening experience to the next level!

Happy listening,

Michael Fidler – Classic Audio Ltd.

Test results (use -20dB input attenuator, 34dBu single ended mode)

Serial number		
Power up and noise tests	Time	Noise
1kHz to 10kHz RIAA, crosstalk, and THD tests	1kHz	10kHz
100Hz RIAA, LFC, and THD tests	THD	LFC
20Hz to 10Hz subsonic filter tests	20Hz (+N)	10Hz
Date of test		

Instructions

Having exercised the wise and chaste discretion in purchasing this product over many others, it should be a given that the user knows what they're doing, however for the sake of completeness instructions for basic use are as follows:

- Remove the unit from its packaging and place in proximity to the setup
- Attach the turntable ground wire to the binding post labelled 'GND'
- Connect the turntable's RCA low-level output to the inputs labelled 'RCA IN'
- Using an RCA cable, connect the 'RCA OUT' outputs to a suitable amplifier line input
- Connect the supplied 9V AC power supply to the SPARTAN 15's 'PSU' barrel jack socket
- Switch the SPARTAN 15 on by moving the 'POWER' toggle switch to the 'ON' position
- Within 3 seconds the circuitry will stabilise and the 'READY' LED will illuminate
- For mono discs, great reductions in noise and distortion from the record can be obtained by moving the front panel switch downward to the 'MONO' position
- For stereo pressings, LF XFEED will allow significant reduction of 'vinyl roar', while mono mode will inherently completely cancel all noise vertical artefacts
- Hot-swapping of cartridge headshells is possible while the phono stage is powered on

Try to keep the SPARTAN 15 in as close proximity to the turntable as possible so as to minimise the lengths of the turntable output leads and avoid hum pickup, the excess length being ideally coiled and then flattened with a cable tie to minimise the loop area.

After prioritising the input side, choose as short a cable as possible between the SPARTAN 15 and the amplifier to once again minimise the size of the potential ground loop and avoid hum pickup. Likewise, keep as much distance between the input cabling and mains or digital cables to avoid interference.

The input loading is fixed at $50k\Omega//120pF$; a load acceptable to the vast majority of cartridges when including 50-100pF of tonearm and RCA cable capacitance. Low capacitance shielded cables are recommended. A slightly higher input resistance of $50k\Omega$ is employed to extend frequency response when using short cables from the turntable.

Cautions

Some of these appear obvious but have to be included for the usual reasons:

- Keep the linear AC adapter away from water, in a well ventilated space
- Do not use the SPARTAN 15 outdoors, as surprisingly it is intended for indoor use only
- For best results keep the SPARTAN 15 out of close proximity to switching/power electronics to avoid pickup of interference, likewise maximise the distance between the SPARTAN 15 and its AC adapter to realise the full magnetic benefit of a remote PSU
- Make sure that the RCA and PSU connectors are clean before making connection, dirt on the connectors may abrade the connector plating, reduce the effective contact area and introduce noise and blocking distortion in extreme cases
- Please see warning label on the AC adapter for further instruction on safe use

On a more technical note, it may be very tempting to try swapping the op-amps in the SPARTAN 15 as they're in turned sockets. The circuit design has been designed specifically for the 2068 IC. Substituting others will lead to poor compromises and worse performance. In the unlikely event that the 2068 becomes unavailable and a replacement part is needed, it is also possible to use the 4580 op-amp, albeit with slightly higher distortion.

The NE5532, LM4562, and almost any devices other than those specified are not suitable for this design. Substituting op-amps not intended for audio use is highly inadvisable, particularly those of the high speed variety. There is a popular saying in analogue design; those who ask for more bandwidth than they need get what they deserve. Not heeding this warning, especially with some of the more exotic devices out there, may provoke circuit instability, turning your phonostage into a self-destructive radio transmitter, dramatically degrading the performance, potentially damaging your power amplifier and possibly your loudspeakers and headphones.

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