



SPARTAN 15 Mk2

Low frequency crossfeed MM phonostage

User Guide

RIAA Accuracy	0.1dB, 40Hz to 22kHz
Channel balance	0.1dB at 1kHz
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 Mk2. A complete reworking of the well-received double-stage topology featured in the SPARTAN 10, it makes further progress on many years of research and development in moving magnet phono stages. 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 the addition of two defeatable low frequency crossfeed settings for this Mk2 version.

By re-imagining the SPARTAN 10's circuit topology using purpose-designed 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.

The new amplifier ICs were selected especially for their perfect match of input voltage and current noise against a high impedance moving magnet cartridge. Although 2068s are more sensitive to loading than the 5532/4 amplifiers used previously, careful adjustment of the impedances of the RIAA network and subsonic filter networks allows them to outperform the original design without complaint, with enough left over to drive 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 diabolical of subsonic disturbances can't eat into the total overload margin. It also precludes the linearity bottleneck found in more traditional designs that do all the gain work on the front end.

Polypropylene and polystyrene film telecommunications capacitors, with a 1% value tolerance, realise 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 literally decimating the worst artefacts in the 10Hz region.

Low frequency crossfeed is optionally bridged across the subsonic filter at either 100 or 200Hz, curtailing vertical low frequency noise by a factor of 2 or 4 at 50Hz, depending on listener preference and disc quality. Bass detail previously swamped in noise is revealed, with low frequency 'road noise' taking a serious step back, especially when using headphones.

A new ± 17 V power supply allows for a further expansion of headroom and a double-digit output voltage, with reduced power consumption. The linear design prevents high frequency hash and switching noise from getting into the audio path, offering reliable use for decades to come. Finally, a startup muting relay ensures no thumps and bangs at switch on. I hope that all of 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, THD, and shake tests	100Hz	Shake
Low frequency crossfeed tests	100Hz	200Hz
20Hz to 10Hz subsonic filter tests	20Hz (+N)	10Hz
Date of test		

Instructions

Having exercised considerable discretion in purchasing this product over many others with an abundance of both overt and covert marketing, it should be a given that the user knows what they're doing. For the sake of completeness, however, instructions for basic use are as follows:

- Remove the unit from its packaging and place in proximity to the setup
- Attach the turntable ground connection to the binding post labelled 'GND'
- Connect the turntable's RCA moving magnet output to the inputs labelled 'MM IN'
- Using an RCA cable, connect the 'LINE OUT' outputs to a suitable amplifier line input
- Connect only the supplied 9V AC power supply to the SPARTAN 15's rear 'PSU' 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
- On stereo pressings, LF XFEED will allow significant reduction of 'vinyl roar', with stronger reduction at 200Hz vs 100Hz at the expense of proximal channel separation
- Hot-swapping of cartridge headshells is possible while the phonostage 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. Excess length should be coiled and then flattened with a cable tie to minimise the magnetic 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. It is also a good idea to 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:

- To avoid mutual destruction of both the SPARTAN 15 and an inappropriate power supply, use only the optimal 9V AC power supply included at sale
- 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 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, as dirt on the connectors may abrade the connector plating, reduce the effective contact area, and in extreme cases introduce noise and blocking distortion

On a more technical note, the ill-advised may be tempted to try swapping the op-amps in the SPARTAN 15, as they're in turned sockets. The circuit design has been optimised 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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