Spartan 20 Phono Stage By Michael Fidler Reviewed

Michael Fidler recently sent over his new phono stage. Hot off the press, it's the first unit to combine both moving magnet and moving coil 'heads' into a single unit. Yet as one might expect from a Fidler design, this is not a moving magnet stage with an extra 20dB of gain for moving coil compatibility. Rather it is a high-end moving magnet phono stage, identical to the Spartan 15, but with the inclusion of a discrete moving coil head optimised for the characteristics of those cartridges.

So discrete, in fact, it has its own input on the rear, allowing two turntables or tonearms to be simultaneously connected and switched via the front panel. Switching is handled by Panasonic relays intended for telecommunications and specified for millions of switching operations, and is carried out not at the fragile input signal but after the MC head where it meets the MM input.

Discrete inputs allow the MM and MC input stages to be optimised for the load requirements of those cartridge types, which are quite different. Input amplifier noise in the MM stage, for example, is matched to the high impedance (typically 47kΩ) of an MM cartridge. The new MC head features the same very-low-noise BC327 and BC337 complementary input transistors, forming current feedback pairs as featured in the MC PRO in a fully-discrete class-A design. Careful adjustment of the bias points, with a generous 80mA bias keeps distortion well below 0.001% at maximum output. It's also just 1dB noisier than the mm input, where levels of 10dB or greater can be expected in lesser, more common designs based around single IC input stages or poorly implemented discrete circuits.

Equally generous current allocation is provided by a discrete, high-impedance constant-current regulator with superior filtering as compared with common RC networks or single-chip voltage regulators. As the regulator is a high-impedance design, a single filter capacitor is able to absorb all of the residual power supply noise.

The Spartan 20 uses the same extruded aluminium case design as the Spartan 30, albeit slightly deeper. Laser-etched lettering, sandblasting and scratch-resistant anodisation have improved fit and finish over previous models, not that Michael has ever given me cause to criticise here. Hex screws hold the enclosure together, but they are perfectly countersunk on the front, and neat domes on the back, that don't detract from the design.

You won't find any bits of sonically superior cardboard, fragile audiophile-grade acrylic or low-noise plastic standoffs in this design. If you want those 'features', and have a mere 25 grand burning a hole in your pocket, buy one of these instead.

The front panel is a chunky 6 mm slab of milled aluminium with softened chamfers and a row of highly tactile toggle switches. The switches, made especially for Classic Audio and rated for a minimum of 50,000 cycles, control power, input, low-frequency crossfeed and mono selection. Low-frequency crossed now uses a three-position switch and provides selectable turnover of 100Hz or 200Hz, with a centre off position. The switches operate with a satisfying 'clunk' and are just lovely to use.

On the back are the aforementioned MM and MC inputs with ground terminal. The terminal takes a 4 mm banana plug, spade connector or stripped wire. A pair of parallel RCA outputs are provided, intended for a signal to be output to a recording device for archival while listening through the primary system. This could also be used to feed 2 systems from the same vinyl front end, or to feed a headphone amplifier. The inputs are additionally labelled up-side-down so you can read them looking over the unit from the front.

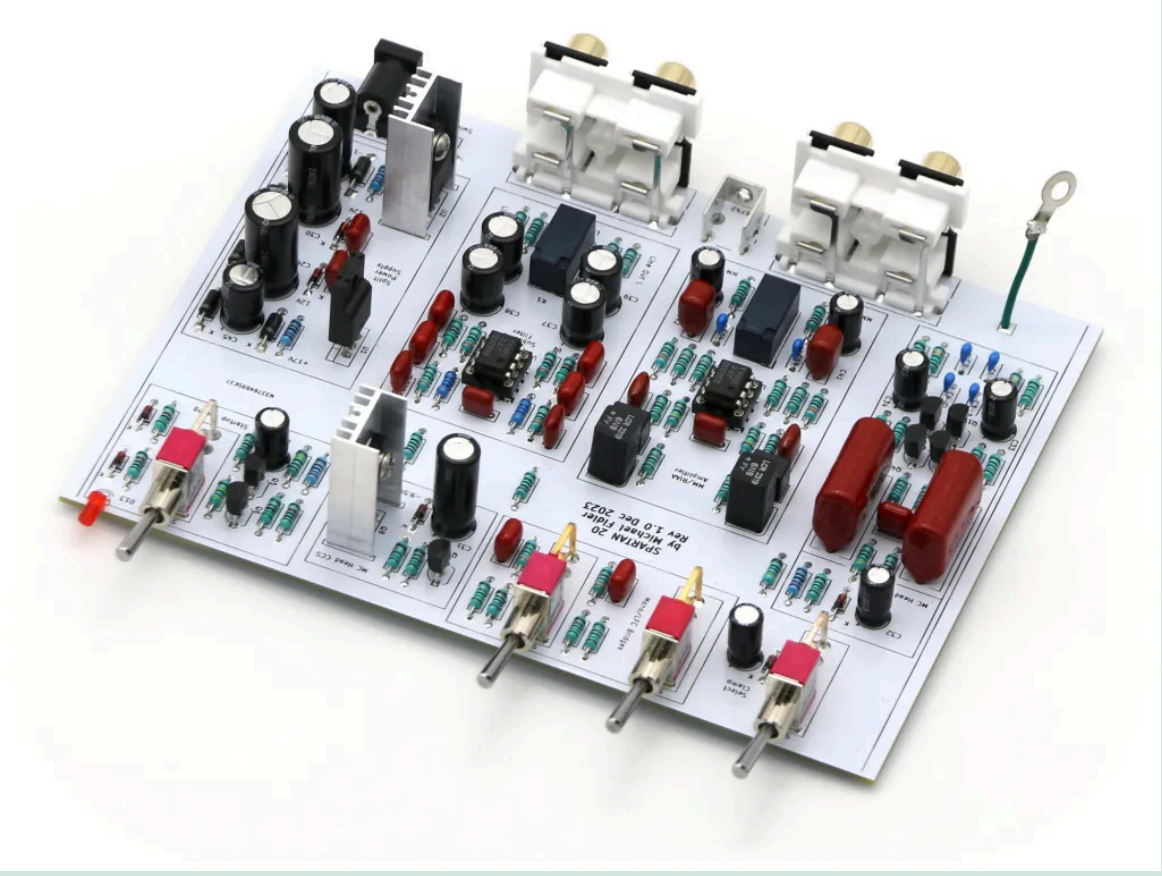
The power input is a 2.5mm barrel jack. The Spartan 20 includes a 9V wall wart linear power supply, which is perfectly sufficient and does not require 'upgrading'. There may be some protection circuitry to guard against accidental (or purposeful) connection of a power supply with too high a voltage added in the future. I'm told Rega's 24V wall wart is the culprit of several past warranty claims. Components that are competently designed do not require power supply upgrades out of the box to perform correctly. Those that do are best avoided.

Inside you find one of Michael's immaculate PCB layouts built on a fibreglass substrate double sided PCB with ground planes on both sides to minimise parasitic leakage. The Spartan 20 uses all through-hole components and everything besides the front switches are readily available from major distributors. Failure is highly unlikely but I can't foresee any issues servicing one of these units 40 years from now, and to that end Michael routinely publishes schematics for discontinued products on his website to aid in 'unauthorised' repair.

The components used are name brand and very high quality; Panasonic electrolytic capacitors, 1% tolerance polypropylene and polystyrene film capacitors in the equalisation and subsonic networks, 1% tolerance metal thin film resistors, NJM audio op-amps socketed

for easy replacement, gold and silver plating on the toggle switches and gold over nickel plated RCA connectors.

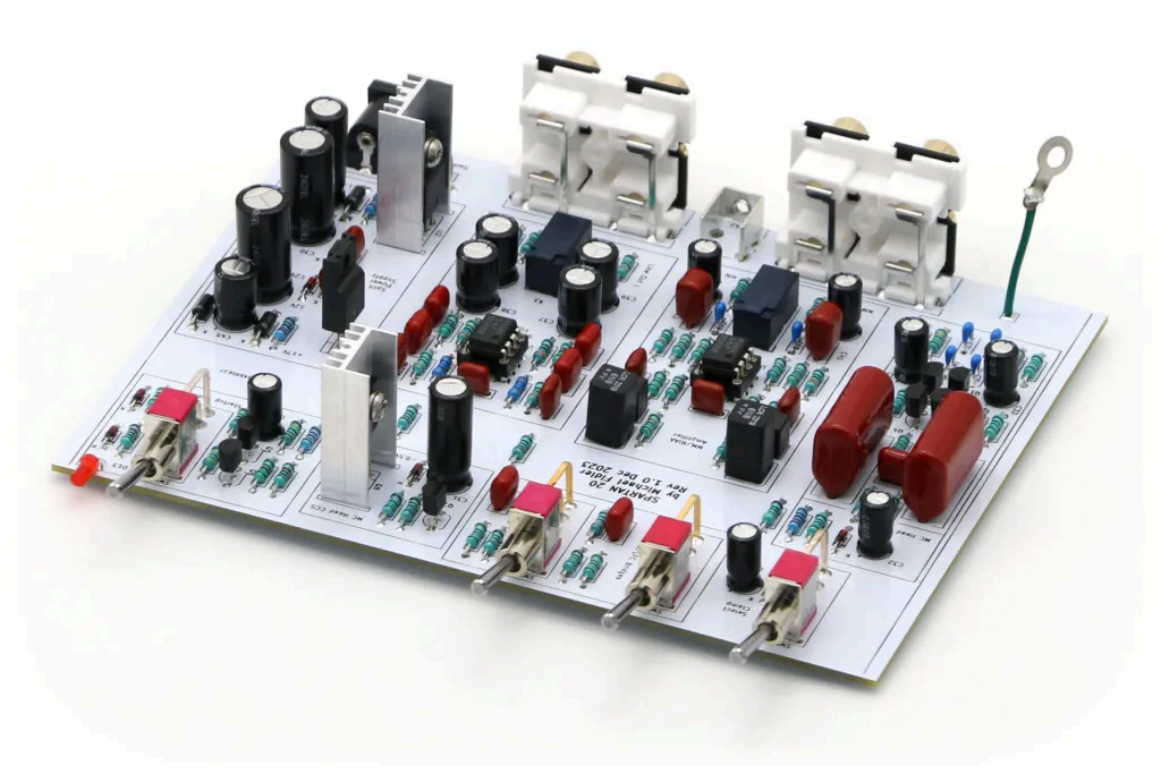
Though the op-amps are socketed, the laughable audiophile practice of so-called ‘op-amp rolling’ is strongly discouraged. Any competent designer carefully selects components for their performance and suitability in the circuit, not for their reputation among the tweaking community. Devices of this level of performance are built following months of late nights, testing, revising, simulating, prototyping and agonising over every component until the circuit is ‘right’. If a better op-amp here or a different resistor value there would have benefitted performance, Michael would have done it already. Op-amp rolling will at best result in decreased performance and at worst (and more likely) circuit instability.



Power supply components are on the left, with discrete full-wave rectifiers and plenty of smoothing for the dual-rail regulated ±17V power supply. There is a 4-second time-delay circuit to mute the outputs via a relay until the amplification has stabilised, preventing thumps and bangs on powering up or down. The input stages are DC-

decoupled and will behave when hot-swapping headshells, with no nasty noises that toast a tweeter or ruin trousers.

The double-stage amplification circuit provides a combined 40.8dB of gain (MM) and 61.6dB (MC) at 1kHz with a 10kΩ line load. It manages 0.0006% THD (6 parts per million) at the maximum output of 10V RMS, all the way to 22kHz, and has more than enough current to drive a pair of 10k inputs in parallel. The low output impedance, 100Ω, keeps insertion loss below 1%.



RIAA accuracy is a specified 0.1dB (40Hz – 22,000Hz), though note that this is the minimum, worst case figure. Contemporary rivals manage 0.5dB at best at this price, and 0.25dB if you splash out. Actual test samples of previous Spartan products have exceeded their specification, and the only products I am aware of with better RIAA specifications are the Pro series phono stages. Likewise channel balance at 1kHz is ±0.1dB with <72dB crosstalk from 20-20,000Hz.

Signal to noise ratio, 220-22,000Hz is 78dB (MM, ref. 5mV cartridge load), and 77dB (MC, Ref. 500µV, 10Ω/22µH). The best vinyl pressings may achieve a 72dB SNR against a 5mV output (4000X). Ideally the phono stage at least doubles this figure so that electric

noise can't exceed that of the groove. 78dB gives 7900X against a 5mV reference. These figures are exceptional and are beaten only by the Pro series and unmatched by anything else that I am aware of.

One of the standout features of Michael's designs is their extreme tolerance for overload. This is important as disturbances in the vinyl, such as ticks, pops and scratches, can cause huge momentary peaks in output that can send a phono stage spiralling into distortion which only makes them more obvious to the listener.

A typical moving magnet cartridge outputs somewhere around 2.5 to 5mV at 1kHz with a groove velocity of 5cm/sec. The Spartan 20 will maintain its specification with a maximum input of 94mV RMS (MM) some 20 times the average output, and 8.5mV RMS (MC), roughly 17 times an average 0.5mV MC cartridge output. At 10kHz maximum input rises to 450mV RMS (MM), and 41mV RMS (MC), 82 times the output voltage of a typical moving coil cartridge. At 20kHz, maximum MM input level reaches 900mV.

The Spartan 20 also exhibits exceptional load-driving abilities, delivering 10V RMS into a 3kΩ load from 60-60,000Hz. This is more than enough to drive most preamplifiers to full output, or a power amplifier to full output via a passive preamplifier, and is achieved with

<0.0006% total harmonic distortion (MM input, 40-22,000Hz). Despite more than 100x increase in gain, distortion at full output from the MC input is still <0.001% (1kHz) and at its worst <0.004% at 10kHz.

MM input loading impedance is fixed at 50kΩ which helps to extend the frequency response of most moving-magnet cartridges, and allows some shortening of the input cables. It is always best practice to cite the phono stage as close to the turntable as possible, within reason, and away from the large power supplies contained within amplifiers, due to the large amounts of gain and resultant susceptibility to noise.

All of these specifications have been confirmed in independent testing by Amir of Audio Science Review, using an Audio Precision analyser. The thread is Here if you'd like to read his review and see visual representations of this data.

MM input capacitance is fixed at 120pF will match well with almost all HiFi cartridges. It's a tad higher than I'd like to see for my preferred Audio-Technica cartridges, but sensible cable choices and short runs keep capacitance well below the specified 200pF maximum and avoid any frequency response anomalies.

Why the fixed loading? The capacitance mainly comes from an effective RF filter that keeps digital and switching hash out of the music. The capacitor that yields most of the input capacitance of 120pF is 100pF, and follows the RF stop resistor to prevent radio-frequency interference in the VHF band from getting onto the input. The extra inductance if it were routed through a switch would make it a less effective shunt to ground.

Think of The 'RF stop resistor as a tiny speed bump or a gate that makes it harder for the high-frequency radio signals to get past. It specifically slows down or resists these fast-moving radio waves.

The capacitor (100pF in this case) is the primary component that deals with the interference. A capacitor, especially one placed correctly, can act like a super-fast shortcut for high-frequency signals. It diverts or ‘shunts’ them directly to ground, effectively steering them away from the sensitive input where your desired signal is. Inductance makes it harder for high-frequency signals to pass through that path, which is the exact opposite of what the capacitor is trying to do (provide an easy path for them to go to ground). This would make the capacitor much less effective at its job of diverting the unwanted radio interference.

MC input loading is also fixed at 120Ω + 800pF. These figures were chosen to give maximally flat RF response with typical cartridge inductances in the specified voltage regions.

The frequency response of a MC cartridge is largely unaffected by loading until the load resistance drops below or becomes equivalent to the coil resistance. A sufficiently low resistance value is necessary to enable the resistor to effectively dampen the resonance created by the cartridge inductor interacting with the load capacitance. To keep insertion loss under 1dB, the highest value load capacitor is chosen to ensure the associated resistance is approximately ten times the coil resistance. With a properly designed input amplifier, the thermal noise

from the coil resistance becomes the dominant noise factor once it exceeds 30 ohms, which helps mitigate the noise penalty associated with insertion loss, especially for higher coil resistance.

Granting users control over the MC load resistance can lead to problems. This typically results in either increased insertion loss, detrimental to the device's signal-to-noise ratio (SNR), or the creation of an underdamped RF peak at the coil-inductance/load-capacitance resonance point, which will turn the input stage into something that looks remarkably like a traditional AM crystal radio receiver, leading to horribly effective RF detection, made even worse by the very high gain. While adjusting the loading only slightly alters the input level, this subtle change might be enough for users to believe they've found a "preferred" setting, potentially leading to unforeseen issues.

Many, if not most, commercial preamplifiers utilise robust (and often noisy) resistive series RF stopper networks on their input amplifiers. These networks prevent resonance from propagating, but come at a significant noise penalty. This trade-off is often deemed acceptable due to low market expectations, coupled with the intuitive but incorrect assumption that lower signal levels inherently equate to higher noise.

Some people have commented on the lack of adjustable loading, particularly in the Pro series designs. While some choice might be nice to have, other factors such as reduced immunity to RF noise, especially noise picked up on the input cables, are important to consider. The fixed values are optimal for most cartridges that you are ever likely to encounter, and any tradeoffs are subtle at best. I have owned both Pro models for some years now and have never encountered a cartridge, be it something modern or decades old, that I felt would benefit from a different set of loading parameters.

Rounding out the features are the 22Hz 3rd order subsonic filter which helps to minimise excessive woofer exclusion which can, dramatically increase loudspeaker distortion and in extreme cases cause damage to the drivers. It can also force amplifiers into clipping. The filter gives over 20dB reduction at 10Hz.

The low-frequency crossfeed circuit implements low-frequency summing of stereo channels below selectable thresholds of 100Hz or 200Hz, exploiting the common-mode nature of vertical stylus modulation to cancel anti-phase noise components such as turntable rumble and vinyl roar. This results in up to 12dB (4×) attenuation of noise at 50Hz, while maintaining full stereo integrity above 200Hz. By effectively lowering the perceptible low-end noise floor, the circuit enhances resolution of low-frequency content, which is especially advantageous for critical headphone listening.

The switchable bridging network introduces a controlled summing path with a maintained inter-channel isolation of >20dB at 1kHz when engaged. When disengaged, it is entirely removed from the signal path to preserve absolute channel integrity. The 100Hz or 200Hz

turnover frequency selection gives a selectable trade-off between low-frequency stereo width and noise suppression in the upper bass range.

So what does it sound like? I'll spare you most of the subjective drivel, in part because I've better things to do with my time than pound subjectivist prose into my keyboard, and partly because there is little to say here. The Spartan 20, like Michael's other phono stages, is neutral, uncoloured and quiet – oh so quiet. Not as quiet as the MM PRO, and noticeably louder than an MC PRO, but not by a lot.

If I didn't have the units side-by-side, connected to the same system with the ability to switch between them at the press of a button, the comparative noise of the Spartan 20 in its MC setting wouldn't be notable at all. It's still quieter than the quietest pressing by some margin.

The advantages of the PRO series are the balanced outputs, slightly better distortion figures and marginally better noise figures. They also benefit from the active loading design on the MM side, which ensures optimal response from the connected cartridge with minimal RF interference. In real world terms, however, you have to listen very closely to hear any difference. Even then you need a very good front end, an impeccable system downstream, and a clean, quiet pressing.

The two turnover frequencies are well chosen and are a feature that I'd sorely miss, in the unlikely event my Fidler phono stages were prised from my grasp. It makes listening with headphones a far more enjoyable experience, removing the distraction of 'road noise' and vastly improving image perception. Setting the turnover to 100Hz shows no audible disadvantage with any of the LPs I played. At 200Hz you do get some narrowing of the stereo image in low-frequency content on some discs, but it's a tradeoff that is sometimes worth having if a disc is particularly noisy.

The subsonic filter is also very well implemented. I played a few badly warped pressings to test it. I favour sealed, acoustic suspension loudspeakers which are affected by unfiltered rumble, particularly at low frequencies outside of the audio band (below 20Hz) which a competent amplifier can still reproduce. Subsonic noise will modulate the output of any loudspeaker, causing undesirable effects, but it's very clearly audible with an acoustic suspension design. I encountered no such issues with the Spartan 20, nor with sensitive planar headphones.

I've had some criticism in the past for the glowing reviews I've given Michael's phono stages, claiming that I am unfairly biased. It's true that I own several of them, and it's true that I don't have a bad word to say about any of them. It's also true that when Michael comes up with, and pitches to me a bad idea or a concept I disagree with, I have no problem making that abundantly clear with my usual tact. I'm sure Michael will confirm that we have disagreed on various points in our communications, but we are able to hold a healthy debate and value an opinion, which is somewhat rare in the audio world. Michael doesn't pay me to write nice things about his products, nor would I take the money if he did.

To put it simply, if Michael made a crap product, I'll be sure to let him, and you, know. Thus far his products have been best in class, and

given his obvious competence in design and engineering, I doubt that will change.

When I reviewed both the MM and MC PRO, I challenged anyone to find me a product that could equal the published (and proven) specifications at any price. So far, nobody has met that challenge. I now add a third challenge – find me a phono stage on the market that can equal or exceed the published, and also independently proven, specifications oof the Spartan 20, at any price.

In a business sense, Michael continually shoots himself in the foot. The earliest Spartan 10 units were so good there is little reason for a user to consider upgrading, even to the newer models. Yet if you don't own one of those, or have the spare cash to support a company bucking audio industry trends and providing real performance for modest money, they're objectively the finest, and subjectively the most uncoloured, phono stages you can buy for any money.