

# HIFICRITIC



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# Reference Phono 2

MARTIN COLLOMS TRIES OUT THE LATEST REFERENCE SERIES COMPONENT FROM AUDIO RESEARCH

*"The soundstage and character has a hint of that deep transparent reflection you find with polished grey chrome: sharp, clear, deep and slightly darkened. Compared with most phono stages, it's extraordinarily dynamic, expressing contrasts in loudness with great vitality, and conveying convincing drive and excitement to LP replay."*

Audio Research has made significant progress with its triode based pre-amplification in recent years. While the *Reference 3* line pre-amp (*Vol1 No2*) was an undoubted class leader, its *Reference 5* replacement (*Vol4 No1*) raised the bar significantly, and the introduction of a matching high performance phono stage was clearly on the cards. This *Reference Phono 2* borrows heavily from the *Reference 5* in several respects, including similar circuitry, architecture and structure, but with the '5's volume control and multiple inputs replaced by versatile replay equalisation circuitry plus a pair of low noise multi-FET moving-coil boosters. *Reference Phono 2* may be regarded as a replacement for the original *Reference Phono* which had step-up transformers and was discontinued in 2005.

A large single box unit, available in silver or black. *Reference Phono 2* has two remote selectable single-ended inputs, each with moving-coil and moving magnet gain settings. Very versatile input loading options may also be selected remotely with the system active (a dream for cartridge reviewing!). In addition to standard RIAA, two classic recording equalisations will allow optimal playback of certain vintage Columbia and Decca LPs cut before the present RIAA standard was agreed. All these are provided without the subsequently proposed (but rarely implemented) optional IEC bass roll-off below 16Hz. The equalisation options may be assigned and memorised to one or other input. Loadings comprise 100pf of capacitance plus 50, 100, 200, 500, 1k, and 47k ohms, plus a 'custom' dealer installed setting (including capacitance variations). A very large, easily read green fluorescent display shows all settings, may be progressively dimmed, set to auto-mute, or even switched off, until a further command is received. Outputs are both single-ended and balanced; the latter provides optimum dynamic range, distortion and gain, but it also performs very well single-ended, and both were extensively auditioned.

The six front panel buttons control power, input, gain (high or low), loading, equalisations and mute. The handy light plastic handset works very well, though some might prefer a more pretentious device. A 20A IEC connector with adjacent fuse supplies power. Tube replacement is reckoned at 3-5,000 hours, involves matched sets and is relatively easy to carry out with due care.

With such a versatile range of settings so conveniently available on the remote handset, it was good to know that we failed to trip up the *Reference 2* by deliberately requesting awkward responses, even with the preamp volume at normal settings and

the power amplifier operational. Thankfully much thought has gone into intelligent housekeeping functionality from the on-board microprocessor, this ably managing the correct and safe operational states and combinations.

## Technology

The overall bandwidth is stated at 0.5Hz- 300kHz -3dB with a close +/-0.2dB RIAA tolerance, 10Hz to 60kHz. As our tests showed, over the important audible range it is this accurate. It has two proprietary R-core power transformers (for low noise and vibration): one supplies the relay and valve heater; the other the high performance valve-regulated high-tension line for the amplifier stages proper.

As usual, the balanced outputs add 6dB extra gain. Single-ended 'high gain' supplies 68dB of amplification, which will be enough for virtually any low output cartridge. The 45dB low gain setting is not enough for a direct moving-coil connection in theory, but with the extra 6dB for balanced output (*ie* 51dB), and a pre-amp with healthy gain, it is actually quite loud enough, if not with the very quietest cartridges. Regardless of cartridge, 'low gain' should be chosen for lower listening levels in my opinion.

Four *6H30* double triodes are used in the gain and equalisation stages, working in balanced differential mode with FET current sources. A *6550C* power regulator tetrode controlled by another *6H30* enables the high voltage stabilised power supply. A huge reservoir of multiple capacitors with bandwidth cascaded decoupling finally supplies the active circuits. To avoid a step-up transformer (and consequent issues of impedance matching and preferred ratios), arrays of selected low-noise FETs are used in the high-gain section, run at triode-like portions of their operating curves. It is perhaps surprising that a pretty silent high gain triode based phono equaliser can be built into the same enclosure as three mains transformers.

## Sound Quality

All the phono stages were set to standard RIAA flat equalisation for comparisons, and the already well used *Reference Phono 2* was allowed to settle in. Only a few moments were required to realise that the sound was of the highest quality, infectiously upbeat and entertaining, almost extrovert. Essential elements of the sound picture were so clearly portrayed, it seemed somewhat like a sonic equivalent to the HD element in HDTV.

I found it quite exclusive in character, and cannot easily find a reference for direct comparison; this

is very much an Audio Research original (which is probably just as well). The soundstage and character has a hint of that deep transparent reflection you find with polished grey chrome: sharp, clear, deep and slightly darkened. Compared with most phono stages, it's extraordinarily dynamic, expressing contrasts in loudness with great vitality, and conveying convincing drive and excitement to LP replay.

The *Reference 5* is known for its excellent transparency and the *Reference Phono 2* matches it comfortably. Unmistakably 'high end', it confidently handles rock and classical programme with equanimity. Soundstages are lively dynamic and punchy, with articulate and powerful deep bass, and an open, airy, delicately resolved top end. It helped reveal just how much more information a high end turntable such as the Continuum *Criterion/Copperhead* could wring from cherished LPs.

Unquestionably trademark Audio Research 'high definition', in many situations the performance is likely to be limited by the partnering turntable and cartridge, which is no bad place to be. This design rocks with fine rhythm and timing, rare qualities in so many high end components, and only in this respect does the highly rated Naim *Superline/Supercap* combo match it closely.

The *Reference Phono 2* also excels in that sense of envelopment, with a stereo image that's rich and full of space, depth and detail, imbued with a sumptuous and so very 'analogue' tonality. The bass is truly impressive; you may not have heard the like before, adding a truly punchy quality so often missed in vinyl replay. Vocal articulation is impressive through the midband, and low level resolution is quite remarkable, retrieving micro detail where the operational noise floor is clearly very, very low. No distortion or grain was heard anywhere in the audible range. Even simply scored orchestral passages took on renewed vitality: the contact of tensioned bow on string, the characteristic dynamic quality of vibrato, and the percussive character of pizzicato; all these sounded just right.

It is all too easy to 'undershoot' a listening test with a product of this quality, for example with inadequate cables and supports, and thus fail to find its full measure. RIAA equalizers are delicate devices, and operate with very low level audio signals. Sensible choices for mains and interconnect cables are essential, as is the use of high quality vibration controlling supports. I used both single-ended and balanced working, and while single-ended mode was very good indeed, the balanced output can give further improvement. My sound quality scores therefore need some navigation according to how this unit is used, and with what.

With reference to fine examples of the art such as the Linn *Uphorik*, the Naim *Superline/Supercap*, the *Reference Phono 2* delivered a very fine score of 145 marks for its high gain setting. Confirmation was obtained by comparison with the Audio Note *M9 Phono*, where the substantially less costly *Reference Phono 2* was never very far behind, especially *via* its 'low gain' operating mode. The noise floor is so low that with a somewhat higher specific output than the Koetsu *Urushi Vermilion* moving-coil (ie a Koetsu *Sky Blue* or *Red T*, or similar models of this calibre from other brands), the higher gain setting rarely needs to be invoked, so quiet is the intrinsic noise floor. Here the numerical sound quality rating rises to a mighty impressive 155. The lower gain option sounded still more vital and transparent, and not least, more natural, though at the time it had hardly seemed possible to better what we had already heard on high gain.

I don't have many really old classic LPs with those alternative equalizations, but tried the other two settings anyway, and found that their sound matched the overall quality, while the subtle shifts in timbre they provided were helpful with some recordings. In appropriate circumstances these will be invaluable in getting the sound just right. I suffered no RFI interference effects or strange noises, except a little with that unusually wired Continuum arm cable with its nonstandard ground connection (as reported in that review).

### Test Results

We traced the RIAA, Decca and Columbia frequency responses using the present RIAA pre-equalisation standard as a baseline for comparison (*see response eq. graphs*). The result is quite uniform in the critical 50Hz to 15kHz frequency range, and just a mild 0.4dB down at those lower and higher frequency limits relative to 1kHz. This statement does not fully explain a mild uptilt in the graph, which may result in a slight 'lightening' of tonal balance for critically balanced systems: some 0.35dB of lift is visible from 100Hz to 3kHz; barely perceptible in my opinion.

There is barely any bass roll off below 10Hz, so no hint of a 'rumble' filter. The RIAA replay equalisation stops (as I think it should) above 40kHz, followed by a gentle 6dB/octave roll-off that will keep out ultrasonics and noise. Both the Columbia and Decca responses show a similar mild treble loss compared with RIAA, about -2 dB over the treble range, e.g. by 4kHz relative to the 300Hz prime 'midband' point. Where these two differ from each other is in the low frequencies: compared with RIAA, Columbia has a relatively small (near inaudible) bass droop of say just 1 dB at 50Hz and 2dB by 20Hz; the Decca is 2dB down by 40Hz and -3dB by 20 Hz. Note therefore, for example, that



### The System

Continuum *Criterion/Copperhead* with Koetsu *Urushi Sky Blue* and *Vermilion* cartridges; Linn *LP12/Radikal/Keell/Naim ARO*, with Audio Note *UK IO Gold* and Koetsu *Vermilion* turntables; Naim *Superline/Supercap*, Audio Note *ANS-9/M9 Phono*, Linn *Uphorik* phono stages; Audio Research *Reference 5* and Audio Note *M9* line pre-amps; Krell *Evolution 402e* power amplifier; Avalon *Diamond* and Wilson Audio *Sophia 3* and Lumen White *Silverflame* loudspeakers; mainly Transparent *XL series MM2* cables; Finite Elemente *Pagode* supports.

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an early Decca recording played back on RIAA will be 2-3dB too rich in the bass, and also 2dB bright over the main treble range, rendering the midrange a touch distant. Selecting the correct replay response should bring these recordings into better focus.

Channel balance was an excellent 0.2dB on high gain and 0.15dB on low gain, probably due to the use of carefully selected, matched valves; this accuracy would likely degrade if NOS substitutes were fitted. Sensitivity was 5mV for a 1.83V output on low gain, and the IHF 500uV signal gave 2.72V output on high gain (balanced). Signal-to-noise ratios were very good, for 'moving coil', IHF 72.5dBA, 68dB CCIR 1kHz weighted, with hum levels at the inaudible limit. On low gain the equivalent noise floor is maintained, so we got an excellent 86.5dBA, and even -79dB including hum, unweighted. This very low noise partly explains why the low gain input may be used to such advantage with the healthier output moving-coil cartridges.

Distortion was very low at 1V output: better than 0.1% for high gain, 20Hz to 20kHz, and typically 0.03% midband, while on low gain a very low 0.013% was nearer the mark. Seeking to explain the marginally better low gain sound quality observed, I did find distortion marginally dependent on source impedance on high gain, an effect not significantly found on the low gain setting. Thus on high gain a 600ohm source gave a satisfactory 0.33% high frequency intermodulation, but a 20ohm source (still greater than an average MC cartridge) resulted in an improvement to 0.035% for the measured in-band difference tone (see *IM graph*). Most MC cartridges have a still lower source impedance, so this distortion dependence is not really an issue but simply illustrates an underlying interactive effect. Distortion is naturally lower for balanced output working, -105dB at best for a 20ohm source, just

a trace of third harmonic, and of course no second harmonic, as this is cancelled out in this mode; no higher harmonics were visible.

In my view arguments about tube type and relative linearity are rendered void with such fine results. A still very good -85dB of distortion (including noise) was noted for 600ohm sources (though in practice such a source would have a high enough output to use the low gain setting). These distortion variations may be seen in the printed distortion spectrum for 1kHz; the differences are dominated by noise.

While the *Reference Phono 2* could swing up to 66V balanced mid-band into a 100kohm load at a few per cent THD, the practical low distortion output limit was a still healthy 16V, 20Hz-20kHz. It will not drive a 600ohm studio load very well, and is not designed to do so: here the output is limited to 1.15V and distortion is naturally higher overall. The small signal output impedance is fine at 210ohm (420ohm balanced), and the manufacturers sensibly recommend a load impedance greater than 10kohm with 2,000pF maximum capacitance (including the interconnect cable). The higher this load value the lower the distortion and the better it will sound: in my view a 100kohm load with 500pF or less total load capacitance is ideal.

All those valves take a bit of power. I measured 120W, 150VA power consumption, which is rather more than many low bias transistor power amplifiers. For this and the sake of valve life, turn it off when not playing music. It warms up quite well in the first 10 minutes (though for serious listening give it 30). It also improves gradually over the first 500+ hours of original use; an elapsed time meter keeps you in touch.

### Conclusions

Audio Research continues its winning run, and once again we must sing the praises of yet another top class design that above all delivers infectious musical involvement and high resolution from LP recordings. The *Reference Phono 2* is really hard to fault; all the facilities work as advertised, its great convenience versatility and compatibility is confirmed, and it's clearly ideal for those who alternate between two different cartridges.

This is confident and mature product. It makes no funny noises, needs no special precautions, and treats even a low output moving-coil cartridge as if it was just another line level input, while the low gain setting gives even better sound with medium output moving-coils. This phono stage really is good enough to partner turntable/arm /cartridge systems up to £60,000. Not only very neutral, dynamic and transparent, it's very musical too, and is highly recommended.

#### PHONO STAGE TEST RESULTS

Make Audio Research Corporation Date: 27/10/10

Model REFERENCE PHONO 2 Ser. No. 89404805

Distortion, THD inc noise	20Hz	1kHz	20kHz
At IHF 2.0V out, Disc MM	-82.5dB	-88.3 dB	-81.7 dB
Disc MC	--	-74.3 dB	-72.5 dB
Channel separation Disc MC	66.8 dB	73.2 dB	74 dB
Frequency response (ref: RIAA)			
Disc MC	-0.4 dB	0 dB	-0.4 dB
Overall deviation 30Hz-20kHz	+/-0.21 dB		
Intermodulation Distortion			
19kHz/20kHz 1:1	2V output	1kHz difference tone	
(balanced)	MM -85.5dB	MC -68.3dB	
Signal-to-noise ratio Disc MM	inc hum -79dB	86.5 dBA	85.9 CCIR 1k
Disc MC	inc hum -62dB	72.5 dBA	68.2 CCIR1k
Overload margin IHF MM/MC	28/24 dB	28/26 dB	20/18 dB
Max output level (1% clip, 1kHz) 100kohm load		66V	Bal. 33V SE
Output impedance SE		210 Ohms @100Hz	420 ohm bal
Input Data	Socket   RCA	Gain   (Bal)	Loading
Disc MC (0.5V output) high/low	phono	51/74 dB	Any ohms 100 pf
DC offset	Left 0 mV	Right 0 mV	
Size w, h, d	48 cm	20 cm	44 cm
Price	£ 9,000		