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CABLE CONTROVERSIES PART 1

Martin Colloms begins the first of a multi-part investigation into the Physics and Sonics of hi-fi cables

KRELL 202 PRE-AMPLIFIER

Krell's brand new two-box pre-amplifier in the Evolution series gets the in depth CRITIC subjective and technical treatment

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Four reviewers assess the Solo – will there be any common ground?

QUAD 2805

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MUSIC & MORE

Krell EVO-202 pre-amplifier

MARTIN COLLOMS SCRUTINISES KRELL'S LATEST EVOLUTION PRE-AMPLIFIER
IN A FULL TECHNICAL AND SUBJECTIVE REVIEW



A year ago I assessed Krell's flagship *Evolution One* and *Two* audio components for *Hi-Fi News*, comprising a visually arresting array of no fewer than eight units, finished diamond milled bright alloy, and providing 400W per channel of stereo pre- and power amplification. Commenting that this pair represented Porsche *911 Turbo* pricing, results were nevertheless spectacularly good, achieving the top scores needed to justify Krell's reputation, their huge cost, and also the substantial design effort involved. In this instance, a variety of original techniques had been employed to deliver the required sonic results, while also meeting all the new regulations for harmonic noise production (which may leak out the mains cable into the street connection), and the use of recyclable materials (including the absence of lead in solder, components and board tinning).

The Krell component reviewed here is drawn from the next tier down. The two-box *202* line pre-amplifier carries the *EVO* logo, and is built to partner the 400W/ch *402* one-box stereo power amp. Both components carry UK prices of £13,000. The new construction and the imposition of the latest regulations make these designs more costly than their equivalent predecessors:

for example, the *402* is nearer in cost to a *FPB 700*, but actually replaces the *400cx*.

Dropping the number of boxes from four to two helps reduce the pre-amp's price down to £13,000 or thereabouts, in the Conrad Johnson *ACT Two* league, but the diamond milled finish remains (alongside a black anodised option). Whereas the *Evolution One* is double-mono in construction, the *EVO-202* is a stereo chassis partnered by a matching, stacking power supply. The umbilical power link is short so these two units must be kept close together unless another cable is made up. Locating the power unit on a separate platform might boost the sound quality, but it's probably not worth the trouble, as a shielding plate keeps induced hum out of the pre-amp above.

While the pre-amp is line level only, self-powered outboard vinyl cartridge stages are also available. Three types of line connections are accommodated: Krell's proprietary *CAST* is a balanced current drive interface with great immunity to cable variations; the balanced XLR type is the traditional voltage variety; and there's the traditional RCA-phono single-ended unbalanced option. (No slur is implied by the term unbalanced.)

A powerful microprocessor oversees all operations. The 152-step electronic volume control reads out in dB or plain numbers. Input sensitivities and channel balance are programmable, as is the custom naming of individual inputs. Display brightness is adjustable, and the volume control has variable rate sensing. Inputs comprise three single ended, two balanced and two *CAST*. There is also a tape monitor input and loop, plus absolute phase and mute controls. Outputs include 'theatre direct', variable XLR balanced, *CAST* and single-ended RCA-phono, plus tape. Any input format is automatically converted into any of the output formats.

Tech Talk

It all begins at the power supply, which features correction for mains distortion prior to a generous 170VA power toroid transformer and a 40,000uF reservoir capacity for the amplifying sections – larger than some smaller power amplifiers. The influence of power supplies is becoming better understood, and the *EVO 202* uses special discrete-component regulators with much higher performance than the usual integrated circuit types. The wide-bandwidth supply control amplifiers drive the five pairs of 40MHz/8 amp output transistors that feed the analogue circuits.

The amplifying circuits therefore operate with fast clean power lines. In stand-by, the full operating currents are maintained but the voltage is reduced to save power. A fast recovery to a good operating condition is assured.

All the amplifying circuits operate in class A mode, and are built using discrete components (no integrated circuits). Low noise and very wide bandwidths are achieved thanks to symmetrical, current-mode operation. Single-ended and balanced inputs pass through a complementary bi-polar buffer, which nulls common-mode signals and feeds current signals in balanced mode down the chain. No loop feedback is employed, and an intrinsic linearity of 0.007% is claimed without the need for global feedback. Top quality bifurcated gold-contact relays provide signal switching. The volume control has a 16-bit array of precision resistors, selected via solid-state switches, and designed to maintain a consistent performance across a wide range of volume settings. For *CAST* inputs and outputs, the signals remain in pure balanced current-mode throughout.

Sound Quality

Run in for 50 hours or so, and initially tried with a conrad johnson 350 SA power amp, the first impression

of significant brightness was coupled with some forward, moderately zingy high frequencies. The overall sound has a remarkably vibrant energy, and the explosive bass has a lean muscularity. Transient edges were sharpened, giving a hyper-real, exciting, attention-grabbing character. Very high resolution was also obvious, and considerable detail was apparent at all frequencies, with strong central focus, fine ambience and reverberation recovery, and depth rated better-than-good. The sound is moderately upbeat, with quite good rhythm and good timing, showing decent transient synchronicity over the whole frequency range. Initially, however, the total effect was also a little restless: certainly stimulating after a glass of red, but perhaps not quite so satisfying for longer, more introspective listening.

More than for most components, the *202* seemed quite critical of set up, and a series of adjustments to the system and its connections led to significant variations in sound quality. Similar sensitivity was also found with the conrad johnson *ACT-2*, indicating that really good products may also be highly strung.

At this quality level, small variations can have quite an effect. My equipment layout is designed to minimise cables lengths, and places the equipment stands central to and behind the loudspeakers. Although there is inevitably some acoustic and vibrational interaction between speakers and electronics, really subtle variations are nevertheless audible.

Through the almost accentuated clarity of the *EVO-202*, there was also a perceptible thickening in the lower midrange (below middle C) vocal lines. While not severe, its importance at this quality level was illustrated when by chance a magazine was (ill-advisedly) left on top of the preamplifier. I heard an immediate improvement in midrange clarity, marginally improved timing and greater soundstage depth. Such an observation should not be taken too seriously, since nearly all audio equipment shows similar acoustic coupling effects to a greater or lesser extent: in this case it was all the more obvious because of the *EVO 202*'s remarkable clarity. Experience with components like Naim's *CD555* and *CDS3* CD players, where exceptional attention has been paid to vibration isolation, has made it possible to recognise the subtle effects that acoustic feedback and vibration coupling can have on sound quality. Since the *202*'s top plate is noticeably resonant when tapped, there may well be some room for improvement here.

Recognising current EU regulations concerning harmonics drawn from the mains power connection, the power cables are not grounded and operate alongside



input filters in the equipment plus the special power supply input circuitry.

Checking the 202 for hum-free operation and negligible chassis currents, I had used a convenient off-the-shelf mains cable, and set the Conrad Johnson SA350 power to ground-lifted mode. I then installed the 202's manufacturer-supplied moulded-plug power cord. There's always some difference when this is done: sometimes barely perceptible, sometimes for the better, sometimes for the worse, sometimes just different. In this case the perceptible treble 'bleaching' and some of that projected hyper reality, described by one listener as comparable to solarisation with photographic images, was now significantly moderated. A further test with the good value DNM single strand power cable showed some further improvement. The difference heard was significant in the context of our high performance system, representing perhaps 5% of overall sound quality. No matter how good the supply regulation, the intrinsic rejection of line noise by symmetrical and balanced circuit configurations, and the new input filtering all exemplified in this sophisticated design, choice of mains cord may still materially affect the results.

The Krell 202 received an overall sound quality score of 70. Compared to the Conrad Johnson ACT 2 (a more specialised component limited to single-ended RCA phono inputs and outputs only), the Krell had tighter,

more focused bass, more obvious specific detail, and was clearly lighter in texture, more brilliant through the treble. While the ACT 2 has some mildly excessive 'sparkle', the Krell was more 'open' – perhaps too much so for some, but maybe just right for others. The Conrad Johnson perspectives were more distant and spacious, whereas the 202 gets you closer to the action. Whereas the Conrad Johnson excels in natural micro-dynamics and an upbeat, expressive tempo, it will need some tube maintenance every year or two, while the Krell will likely march on, more or less, forever.

Much as I like the Transparent XL Reference interconnect cables, particularly with Krell's FPB700cx, my preferred choice amongst many for the 202's single-ended phono connection was for the quieter, more introspective Cardas Golden Cross.

I now powered up Krell's partnering EVO-402 stereo power amplifier, primarily to investigate the performance via the latest CAST connection, using Transparent cables for both CAST and speaker connections: all mains cables were now standard Krell items.

Having experienced CAST connections over nearly a decade of development, I find the differences between this 'current mode' approach and the more usual voltage drive fascinating. Certainly CAST is supported by very good technical arguments: very wide bandwidth; immunity from cable length and resistance; excellent noise rejection;

and the suppression of subtle contact defects which may induce noise and distortion. It is thus likely to be more reliable over long periods.

However, each interconnection method has its own implications for cable and circuit practice and these inevitably affect sound quality. The latest *CAST* was true to form, sounding slightly detached yet with impressive transparency and liquidity, neutral in timbre, and with exceptional dynamic range. *CAST* delivers a most elegant sound with natural extended bass and really low overall coloration. Perhaps the variations in sound heard via the other inputs are really to do with artefacts of the cables used, though I still have a soft spot for the extra drive and rhythm which I find with single-ended phono interconnection. The *402* is scheduled for review in HiFi News. For the record, it complemented the *202* well, which I have not always found with earlier Krell pre-/power combinations.

Lab Report

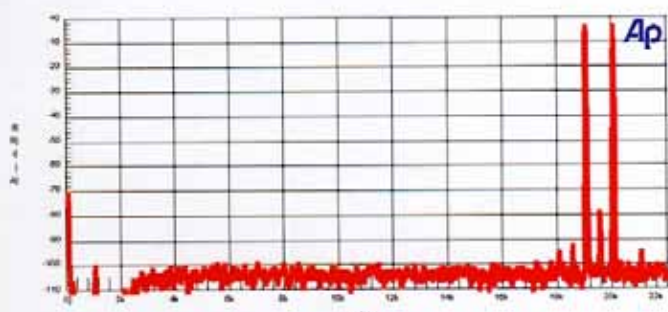
This two-box design places the preamplifier on top of its power supply, linked by a short power line umbilical. Temporarily swinging the pre-amp away during measurement confirmed negligible breakthrough hum from the supply transformers.

The *CAST* connection could not be measured directly, but on past experience it rates at least as well as the balanced interface, and there was no significant performance difference between the balanced and single ended connections, apart from the expected greater

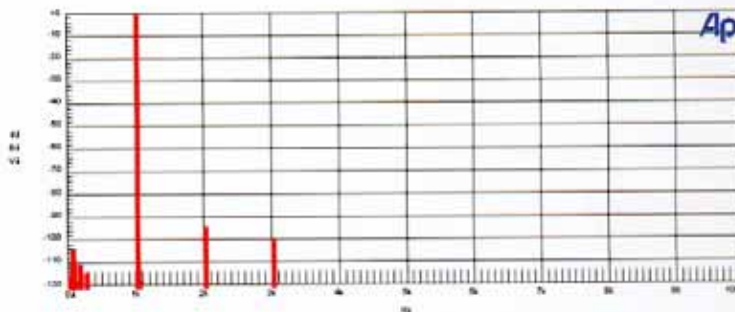
PREAMPLIFIER TEST RESULTS

Make		KRELL		Date:
Model: EVO 202		Ser. No. 1676050040		10/9/06
Distortion, THD inc noise	20Hz	1kHz	20kHz	
At IHF 0.5V out, 0.5V line in	>-94 dB	>-98.5 dB	>-94 dB	
At IHF 2.0V out, 2.0V line in	n/a	-96dB	n/a	
Channel separation				
IHF, 0.5V	Aux	>110 dB	>110 dB	104 dB
Frequency response (see text)				
IHF, 0.5V	Aux	0 dB	0 dB	0 dB
Intermodulation Distortion				
19.5kHz/20.5kHz 1:1 0.5V output			1kHz difference tone	
Aux				-100 dB
Signal to noise ratio				
IHF, 0.5V	Aux	98.6 dBA, 89.2dB CIR (1k)		
Input overload	SE	Line 7V 24dB IHF		
Channel Balance over volume range				
R ch is reference	at 0 dB			0.02 dB
	at -20dB			0.02 dB
	at -40dB			0.03 dB
	at -60dB			0.04 dB
Maximum output level (1% clip)				
	100k Ohm load			8 V SE, - V Bal
	600 Ohm load			8 V SE, - V Bal
Output impedance				
	SE			22 Ohms
	Balanced			44 Ohms
Input Data				
	Aux input balanced			125 mV, 76.8 kohms
	Aux input single ended			125 mV, 38.4 ohms, 0.38 nF
	DC offset			Left 0.6 mV, Right 0.4 mV
	Size (two boxes, W x H x D)			438 x 95 x 470 mm
	Price			£13,500

level 202 IHF 0dB 10/20kHz



Krell 202 1v 1kHz distortion



see HIFICRITIC's sound quality rating archive at www.hificritic.com



"It has no significant noise or distortion, no bandwidth or level-related changes in timbre or coloration, and has an accurate high-resolution volume control."

headroom and output deriving from balanced working.

With conventional super-symmetrical high gain circuitry, an intrinsic harmonic spectrum devoid of even-order components might be expected, perhaps with a very low level of odd order residuals. This is not the case with the *202*, whose intrinsic bandwidth and linearity is extraordinary; this essentially zero loop feedback design has a low order harmonic distortion spectrum, rather reminiscent of a triode valve amp. Fig 1 shows second and third harmonics following the preferred decreasing trend, with higher harmonics undetectable at better than 120dB down. High frequency intermodulation shows similarly good linearity: in Fig 2 the IHF full level tones at 19 and 20kHz result in a first rate -100dB difference tone at 1kHz.

DC output offsets are less than 0.6mV (single-ended) and the output is DC restored for small input signal offsets. Channel separation was excellent, better than 110dB at lower frequencies and still 104 dB by 20kHz. Channel balance was held to an excellent 0.03dB, while volume/channel tracking held within an additional 0.04dB right down to -60dB attenuation. The 152-step volume control showed no missing codes and gave typically 0.5 dB resolution over the top 30dB. At volume settings below -50dB, the step size increases to an acceptable 1dB, and then resolution rapidly decreases over the final few digits of the numeric readout, leading to -94dB before full extinction at '0' (technically -113dB, and actually residual noise). This is undoubtedly a well designed control.

Absolute phase correct, the phase-invert mode operated with no measurable change in performance. Maximum output was 8V single-ended and 16V XLR, enough for any conceivable load, and the source impedance was a very low 22 ohms, ensuring good load and cable independence. The single-ended line input impedance was a satisfactorily high 38.4kohm shunted by 380pF capacitance (the latter a bit higher than the usual 100pF, presumably to improve the electromagnetic compatibility performance). Frequency response was an extraordinarily wide 0.8Hz - 350kHz for -0.5dB, and 0.1 Hz - 1.1MHz for -3dB. No conceivable audible coloration or phase error could be ascribed to such a generous bandwidth. A generous +24dB IHF or 7V input overload improves on previous Krell designs, above which there is some increasing soft distortion, but no clipping till 10V (20V balanced). Hardly worth measuring, the recorded figures for total harmonic distortion were around -96 dB including noise, or a miniscule 0.0015%. Single-ended noise levels were low: -89.2dB for the

psychoacoustic CCIR 1kHz weighting, -98.6dB A-weighted, and -87.7dB unweighted (showing a very minor hum residual).

These are excellent results for a universal line pre-amplifier capable of accurately routing and controlling inputs and outputs in three signal connection formats. There is nothing in these results which is likely to limit the potential sound quality, which must therefore defer to the subjective analysis.

Conclusion

Krell's new *EVO-202* has borrowed much from the top of the line *Evolution One*. Not only does it provide very good sound quality – a substantial improvement over models like the *KCT 28* my past experience – it has an essentially perfect technical performance. One which removes any doubts about which input to use, what levels are compatible, and what loading questions may arise for either the input or output. It has no significant noise or distortion, no bandwidth or level-related changes in timbre or coloration, and has an accurate high-resolution volume control. Absolute phase correction and input gain matching is provided, and the whole is achieved while complying with the potentially troublesome lead free directive.

Subjectively it doesn't quite hit the absolute reference level for rhythm and tonal neutrality, but in a given system this may not be the defining issue: matching considerations can easily dilute and modify such subtleties of subjective sound quality. Conversely, clarity, resolution, and an exceptionally crisp, neutral and extended bass are hallmark characteristics, together with trouble free system matching.

Experience indicates that it comfortably achieves 'reference' status, and while its particular character will be a matter of personal choice, this versatile high precision design can supply the heart of a very good sound system indeed.

THE SYSTEM

PRE-AMPS: conrad johnson *ACT-2*, conrad johnson *CT5*, Audio Research *Reference 3*, Krell *Evolution One*,

POWER AMPS: Krell *EVO-402*, *FPB700cx*, conrad johnson *350SA*,

SPEAKERS: Avalon *Eidolon Diamond*, Quad *2805*, Sonus Faber *Amati Homage Anniversario*

CABLES: Transparent *XL reference*, Cardas *Golden reference*, Krell and Transparent for *CAST*, Kimber *KS-3035*.