



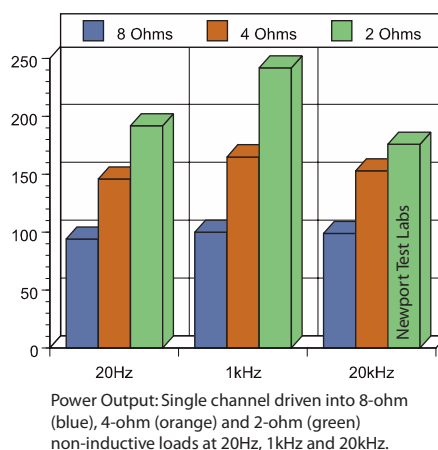
Rotel RA-12

INTEGRATED AMPLIFIER

I have been waiting a long time for Rotel's RA-12 to arrive in Australia. First I had to wait for the company to finalise its move into its new wholly-owned factory in China (along with key personnel from the UK, China and Canada) and then I had to wait for the new 'brainy' version of the RA-12 to progress from the drawing board into production. And then I had to wait for one to become available for review, so I could see hear how it performed. The good news is that it has been worth the wait...

THE EQUIPMENT

And in more good news, the RA-12 has gained some chassis height compared to the

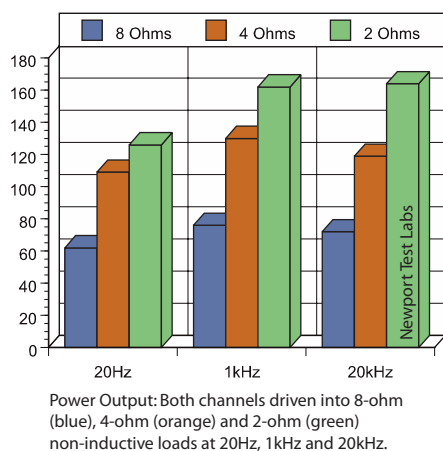


RA-10, which always seemed too low-slung to me. (I also think the new 12 Series components are also nicer-looking than those in the 15 Series, but from conversations with other reviewers, that might just be me.) The third bit of good news is that the RA-12 has gained a boost in power output over its predecessor. Sure the RA-10 always delivered far more power than its modest 40-watt per channel rating, but the RA-12 promises a minimum of 60-watts as its 'spec' and if like every other Rotel amplifier I've ever seen, it delivers far more on test, so much the better. [If you check the tests conducted by *Newport Test Labs* that follow, you'll find that the RA-12 loaned to us for this review delivered

74-watts per channel at 1kHz, both channels driven, into 8Ω... Editor]

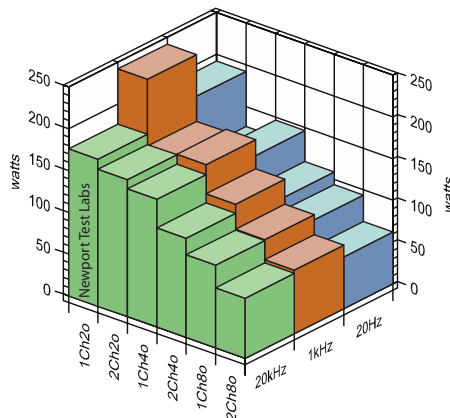
The fourth bit of good news (there's so much good news I am losing count) is that the RA-12 now has a DAC on-board... and not just any DAC, the DAC Rotel is using is the very highly-regarded Wolfson WM8740 24-bit/192kHz, exactly the same DAC used in a great many of the world's 'highest-end' products from companies such as Red Wine Audio, Cambridge Audio and others. Which means, of course, that you can input digital signals from your computer (via USB or SPDIF), as well as the more traditional analogue sources, for which the new RA-12 allows plenty of scope, with four line-level inputs as well as a phono input for those who plan to use a turntable.

The fifth bit of good news—and this will perhaps be of the greatest interest to many readers—is that the RA-12 is now able to be



controlled from an iDevice (i.e. your iPhone or iPad). At least that's what Rotel advertises. The problem is that when you check out the fine print of this advice, you will discover in order for you to be able to do this, you also need to own a Rotel RT-12 Internet Radio/DAB+/FM tuner, which means spending another \$899. But if you do buy an RT-12 you'll find that in addition to being the 'enabler device' that connects the RA-12 to your Wi-Fi network, so the App can control the amplifier, it's not only what its title suggests (an Internet Radio/DAB+/FM Tuner) but also a music server, so you can use it to play audio files stored on UPnP servers.

If, on the other hand, you're perfectly happy using a standard infra-red remote



Power Output: Single and both channels driven into 8-ohm (blue), 4-ohm (orange) and 2-ohm (green) non-inductive loads at 20Hz, 1kHz and 20kHz. [Rotel RA-12]

control to operate the RA-12, one of these is provided with every amplifier for free. However, if you're just looking to stream audio to the RA-12 from your 'phone via Bluetooth, Rotel includes with every RA-12 a Bluetooth 'dongle' that plugs into the USB input on the front panel. As you can see, all of this flexibility makes for a very impressive package.

Operation of the amplifier is superbly intuitive thanks to the 'direct selection' source-select pushbuttons below the front-panel display. And once you've selected a source, your choice is shown in the top left of the display. Your selected volume level is shown in the right of the display, as a read-out from 1 to 95 (if you exceed this limits, the display reverts to instead display 'Min' or 'Max'). This is controlled not only from the volume control, but also from the remote (or your iDevice if you have an RT-12).

Some operations on the RA-12 are not simple direct-select actions, such as those that control treble, bass and balance, for example. Instead, these operations are accessed via the Menu/Up/Down buttons to the right of the display and although the menu is layered, it's really easy to navigate. I really liked the fact that Rotel has included a tone control bypass circuit setting, so after you've preset the bass and treble controls, you can bypass them if you like while still leaving the settings intact, so that when you re-select the tone controls, you'll recover your original settings.

The menu is also used to change the contrast ratio of the front panel display, alter the absolute brightness of the display, choose how your

CD player is connected to the amplifier (Analogue, Coaxial-1 or Coaxial-2) and the power-on volume. I was curious as to why I needed to set a power-on volume until I realised that unlike many modern amplifiers, the Rotel RA-12 does not have an automatic standby mode: users are required to force the amplifier into standby by pressing the 'Off' button on the remote control. Using the power button on the front panel turns the amplifier off completely.

Over to the left of the front panel are a Speaker Selector (offering Off, Speakers A, Speakers B, Speakers A+B) and a headphone

ROTEL RA-12 INTEGRATED AMPLIFIER

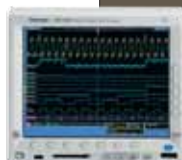
Brand: Rotel
Model: RA-12
Category: Integrated Amplifier
RRP: \$999
Warranty: Three Years
Distributor: International Dynamics Pty Ltd
Address: Level 1, 116 Cremorne Street
 Richmond VIC 3121
 ☎ (03) 9426 3600
 ✉ sales@interdyn.com.au
 🌐 www.interdyn.com.au



- Lovely design
- Clean interface
- Full-featured
- Old-school remote
- Automatic stand-by
- Speaker terminals

LAB REPORT

Readers interested in a full technical appraisal of the performance of the Rotel RA-12 Integrated Amplifier should continue on and read the LABORATORY REPORT published on page 92. Readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.



Lab Report on page 92

socket. Somewhat inexplicably, this socket is the small 3.5mm type instead of the full-sized 6.35mm socket I usually see on hi-fi amplifiers. If there's a MkII version of the RA-12, I'd prefer a full-sized headphone socket. Interestingly, plugging headphones into the socket doesn't mute the speakers: if you want to listen quietly, you'll need to turn the speaker selector to 'Off.' This is actually a really good feature, because if you own supra-aural headphones (which sit on top of the ear), rather than circum-aural (which enclose the ear) or in-ear types, you can wear your headphones and listen to the speakers at the same time. It's not a purist approach, but you'll hear some great sound effects due to the time delays.

Underneath the headphone socket is a standard USB Type B input, which accesses the Wolfson WM8740 DAC within that I mentioned previously. This USB is designed to play music files stored on standard memory sticks and, further, is restricted to playing back only MP3, AAC, WAV and WMA files (16-bit/48kHz maximum). If you want to play higher-res files, or FLAC or ALAC formats, the Wolfson inside the RA-12 can handle them... but only if you use the digital inputs on the rear panel (either optical or coaxial).

Speaking of the rear panel, you can see from the accompanying photograph that it's nicely laid-out with good-quality fittings... though I thought the speaker terminals were a bit dated, even though they did benefit from being gold-plated. In addition to the inputs you'd expect to find given the front-panel layout, you'll also find a dual 12V trigger output, a Rotel Link connector, and a mini-USB socket. This last is not a duplicate of the front-panel USB input, it's designed solely to enable easy software upgrades. There are also pre-out terminals... very nice.

IN USE AND LISTENING SESSIONS

The bass from Rotel's RA-12 was solid and satisfying, I suspect in part because the company places so much importance on its power supply stages, to the extent of manufacturing its own toroidal transformers in its own factory,

■ An amplifier that's not only richly endowed with features—and more powerful than you might guess from the specs—but also sounds excellent.

and having storage capacitors made specifically for it (two 10,000µF ones are used in the RA-12, along with a standard encapsulated rectifier bridge, rather than discrete diodes). Then there's the fact that although Rotel was one of the last hi-fi amplifier manufacturers to release amplifiers with Class-D output stages, the RA-12 has a traditional Class-AB output stage that uses Sanken A1695/C4468 epitaxial planar transistor pairs, all mounted on a very substantial section of good-quality heatsinking, so there's no requirement for fan-cooling.

Play any track with decent bass and you'll hear straight away that the RA-12 responds instantaneously to variations in pace and timing, as well as to the demands of volume level, no matter whether that demand is continuous or transient. Even excessive demands in the bass department didn't unsettle the amplifier's performance in other areas, with the treble in particular remaining sweet and refined. High-frequency extension was exemplary; the RA-12 isn't going to be a weak link in the chain in this regard. The Rotel RA-12 is particularly revealing across the midrange, as I discovered when I played Priscilla White's just-released 'Very Best Of...' CD (and DVD) and found her voice a tad less sophisticated than I recalled (this CD also has a great version of *Alfie*, but Agnetha's my new chanteuse of choice for 'If I Thought You'd Ever Change Your Mind').

I definitely preferred my digital files decoded by the coaxial inputs on the rear panel over both the optical inputs (by a slight margin) and the front-panel USB (by a large margin), but I certainly wouldn't rule out the front USB for 'quick listens'. Although I remain a died-in-the-wool standalone DAC kind of guy (the idea of integrating a DAC inside an amplifier rather irks me, but once again, talking to other reviewers, it seems I'm

again odd man out with this preference too), the performance of the RA-12 was good enough to be tempting... very tempting. If only the internal DAC offered a choice of filters... but I guess that at the price Rotel is asking for this amplifier, that would be too much to ask.

The phono stage in the RA-12 won't tempt true vinyl lovers to ditch their external head amps, but it's very serviceable nonetheless. My prediction is that if you're running a rotating rig whose total price runs less than a grand, you'll be well-pleased with its performance. Speaking of which, I gave the RA-12 a bit of a caning in the listening sessions, during which it got a tad warm, so make sure that (unlike me) you follow the ventilation instructions on the second page of Rotel's *Owners' Manual*.

CONCLUSION

Fifty years on Rotel is still going strong, and with the RA-12 the company has once again proved it can build an amplifier that's not only richly endowed with features—and more powerful than you might guess from the specs—but also one that also sounds excellent. Yet despite all this, it's managed to keep the recommended retail price at less than four figures. Highly recommended. 

Ernest Denman



LABORATORY TEST RESULTS

Newport Test Labs measured the ‘both channels driven’ power output of the Rotel RA-12 as being 76-watts into 8Ω and 130-watts into 4Ω (both results measured at 1kHz). However, according to the Australian Standard, any power output that is claimed must be available anywhere from 20Hz to 20kHz, so with this added qualification the maximum output of the RA-12 becomes 62-watts per channel into 8Ω, which is only just higher than Rotel’s ‘official’ specification of 60-watts per channel into 8Ω (Rotel doesn’t specify a power output into 4Ω for the RA-12).

Although the ‘both channels driven’ figure is the ‘go-to’ specification when evaluating an amplifier’s actual power output, the ‘single-channel’ figure output power gives a very good indication of the amplifier’s ability to deliver short-term power levels, which is what contributes to musical dynamics. And when you look at the table showing the single-channel results that were measured for the RA-12 you can see that even at low frequencies the Rotel RA-12 can deliver 94-watts into 8Ω loads and 146-watts into 4Ω loads, plus it can also deliver more than 100-watts into 8Ω and 4Ω loads at midrange and higher frequencies. This is excellent performance, and means that under real-

world conditions when playing music, you can expect the RA-12 to sound much ‘louder’ than most other ‘60-watt’ amplifiers.

Also important is an amplifier’s ability to drive 2Ω loads, and you can see from the test results that the Rotel RA-12 also excels in this department, being able to deliver more than 120-watts per channel with both channels driven at any frequency from 20Hz right up to 20kHz (though this was the test limit).

■ Also important is an amplifier’s ability to drive 2Ω loads, and you can see from the test results that the Rotel RA-12 also excels in this department.

The bandwidth of the Rotel RA-12 proved to be exceptionally wide during testing, with Newport Test Labs measuring its frequency response at 1-watt as being just 1dB down at 7Hz and 550kHz, and 3dB down at 4.5Hz and 650Hz. However, a part of the reason for this high-frequency extension was a slight rise in the amplifier’s response at ultrasonic frequencies, essentially giving the response a ‘free kick’ in the extension department. Although this rise isn’t really evident in the frequency response graphs (though you can see the start of it at the extreme

right end of the traces shown in Graphs 5&6), it’s this frequency response rise that is responsible for the overshoot that’s visible in the oscillograms showing the RA-12’s performance with square waves.

Within the audio band, the Rotel RA-12’s frequency response was exceptionally flat, as you can see in Graph 5, which shows it as being just 0.2dB down at 20Hz and 0.01dB high at 20kHz, to give a ‘normalised’

overall measured response of 20Hz to 20kHz ±0.1dB. Graph 5 also shows that when you switch out the tone control circuit (with the bass and treble controls set to 0dB) you will get an overall 0.1dB boost in output level. While it could be argued this ‘boost’ would make the amplifier sound better with the tone controls off, because of the increase in level, I think that at just 0.1dB this increase would be too small to be audible... but that’s something you can trial yourself when you’re auditioning. As for the tone controls themselves, they appear to be a standard Baxandall implementation, with excellent high- and low-frequency shelving, but offer only modest levels of boost and cut, amounting to around 4–5dB at both high and low frequencies.

The Rotel RA-12’s frequency response into a simulated loudspeaker load is shown in Graph 6, and you can see that there’s hardly any difference between it and the RA-12’s response into an 8Ω laboratory test load. This is an excellent result because it means that not only will the RA-12’s inherent sound quality remain the same irrespective of the loudspeakers you use with it, but also that the amplifier will maintain very tight control over the bass cones in the event you use it with larger, floor-standing speakers, ensuring there’s no unwanted cone movement to ‘muddy’ the bass.

Overall total harmonic distortion was very low, as shown by the tabulated figures: 0.01%. You can see the harmonic structure of the distortion in Graphs 1 through 4. Graphs 1 and 2 show distortion at an output of 1-watt into 8Ω and 4Ω loads and you can see that performance into an 8Ω load is clearly superior, with just a second harmonic distortion component at –83dB (0.007%), a third at –110dB (0.0003%), a fourth at –98dB (0.001%), a fifth at –112dB (0.0002%) and a sixth at –108dB (0.0003%). The performance into 4Ω is not quite as good, with slightly higher-level harmonics, and more higher-order harmonics.

Rotel RA-12 Integrated Amplifier – Power Output Test Result

Channel	Load (Ω)	20Hz (watts)	20Hz (dBW)	1kHz (watts)	1kHz (dBW)	20kHz (watts)	20kHz (dBW)
1	8 Ω	94	19.7	100	20.0	99	19.9
2	8 Ω	62	17.9	76	18.8	72	18.5
1	4 Ω	146	21.6	165	22.1	153	21.8
2	4 Ω	109	20.3	130	21.1	119	20.7
1	2 Ω	192	22.8	242	23.8	176	22.4
2	2 Ω	126	21.0	162	22.0	164	22.1

Note: Figures in the dBW column represent output level in decibels referred to one watt output.

Rotel RA-12 Integrated Amplifier – Test Results

Test	Measured Result	Units/Comment
Frequency Response @ 1 watt o/p	7Hz – 550kHz	–1dB
Frequency Response @ 1 watt o/p	4.5Hz – 650kHz	–3dB
Channel Separation (dB)	70dB / 71dB / 68dB	(20Hz / 1kHz / 20kHz)
Channel Balance	0.004	dB @ 1kHz
Interchannel Phase	0.12 / 0.00 / 0.18	degrees (20Hz / 1kHz / 20kHz)
THD+N	0.01% / 0.01%	@ 1-watt / @ rated output
Signal-to-Noise (unweighted/weighted)	75dB / 81dB	dB referred to 1-watt output
Signal-to-Noise (unweighted/weighted)	82dB / 95dB	dB referred to rated output
Input Sensitivity (Line Input)	72mV / 552mV	(1-watt / rated output)
Output Impedance	0.01Ω	OC = 2.8170V - 2.8212V-8o
Damping Factor	800	@1kHz
Power Consumption	0.53 / 33.46	watts (Standby / On)
Power Consumption	76.36 / 363.11	watts at 1-watt / at rated output
Mains Voltage Variation during Test	238 – 251	Minimum – Maximum

What is important in both graphs is that the even-order harmonics dominate, as these are the ‘good-sounding’ harmonics. (The human ear perceives an even-order harmonic as the octave of the fundamental, so they’re essentially enharmonic distortions).

Distortion at 60-watts into 8Ω (Graph 3) shows the levels of the second and fourth harmonics do not change significantly with the increased power output, but at this level the sixth increases to -101dB (0.0008%), and there’s now an eighth-order harmonic at -108dB (0.0003%) and other higher-order even-order harmonics out to 20kHz. The odd-order harmonic levels also increase in level and order, but all are more than 110dB down, so individually contribute less than

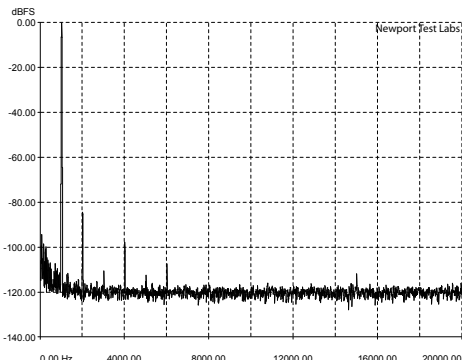
0.003% to the total. On this graph you can additionally see that the noise floor of Rotel’s RA-12 is very low—more than 130dB down at midrange and high frequencies. It’s only at very low frequencies that noise increases, but it’s still approaching -100dB, as you can see from the left edge of the graph. Graph 4 shows the RA-12’s distortion profile when it’s delivering 120-watts into 4Ω and you can see for yourself that given the extremely high power level, distortion is negligible.

Intermodulation distortion (CCIF-IMD) was exceptionally low. There are two IMD components immediately alongside the 19kHz and 20kHz test signals, but they’re both 95dB down. The two other IMD components (at 17kHz and 22kHz) are more

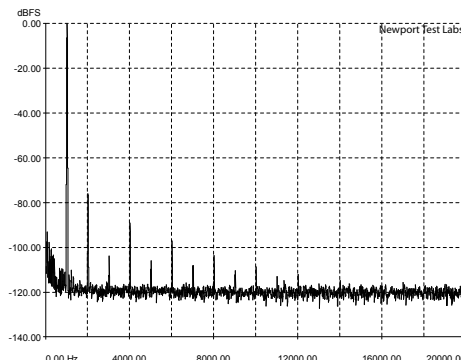
than 110dB down. The unwanted regenerated signal at 1kHz is 92dB down, ‘way too low to be audible. Interestingly there are also regenerated signals at 2kHz and 3kHz. I say ‘interestingly’ because although these signals are too low down to be audible (at -108dB and -112dB respectively), I don’t often see these signals appearing at all in this particular test.

The Rotel RA-12’s A-weighted signal-to-noise ratios were measured by *Newport Test Labs* using its standard procedure as being 81dB (referred to 1-watt) and 95dB (referred to rated output). Both are good results. The differences between the unweighted and A-weighted figures in both instances would seem to suggest there was some mains hum

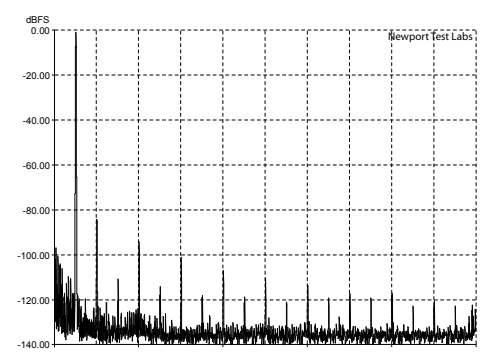
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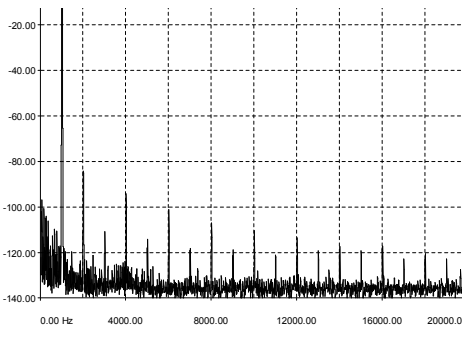
Graph 1: Total harmonic distortion (THD) at 1kHz at an output of 1-watt into an 8-ohm non-inductive load, referenced to 0dB. (Rotel RA-12 Integrated Amplifier)



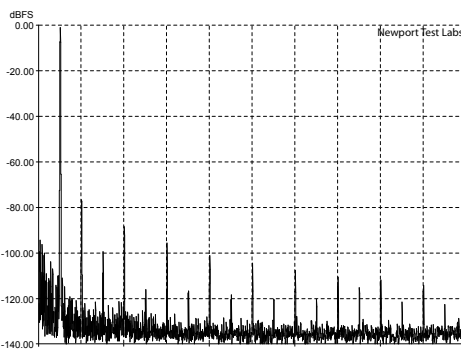
Graph 2: Total harmonic distortion (THD) at 1kHz at an output of 1-watt into a 4-ohm non-inductive load, referenced to 0dB. (Rotel RA-12 Integrated Amplifier)



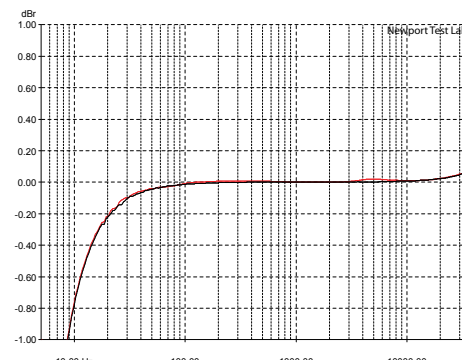
Graph 3: Total harmonic distortion (THD) at 1kHz at rated output (60 watts) into an 8-ohm non-inductive load, referenced to 0dB. (Rotel RA-12 Integrated Amplifier)



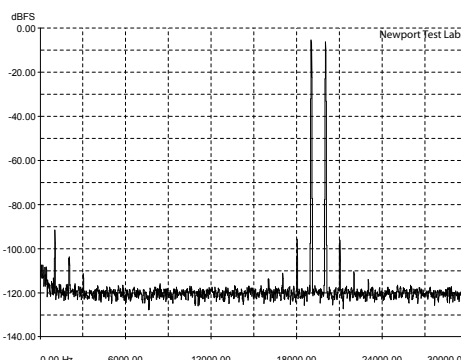
Graph 4: Total harmonic distortion (THD) at 1kHz at rated output (120 watts) into a 4-ohm non-inductive load, referenced to 0dB. (Rotel RA-12 Integrated Amplifier)



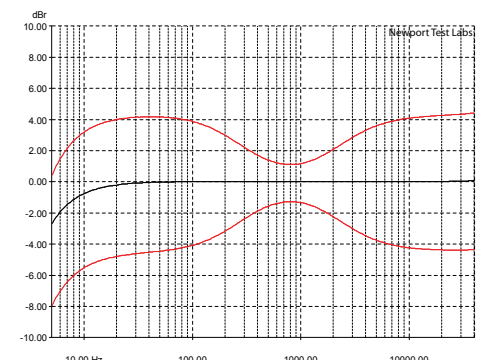
Graph 5: Frequency response of line input at an output of 1-watt output into an 8-ohm non-inductive load with tone controls out of circuit (red trace) and in-circuit, but set at 0dB positions (black trace). (Rotel RA-12 Integrated Amplifier)



Graph 6: Frequency response of line input at an output of 1-watt into an 8-ohm non-inductive load (black trace) and into a combination resistive/inductive/capacitive load representative of a typical two-way loudspeaker system (red trace). (Rotel RA-12 Integrated Amplifier)



Graph 7: Intermodulation distortion (CCIF-IMD) using test signals at 19kHz and 20kHz, at an output of 1-watt into an 8-ohm non-inductive load, referenced to 0dB. (Rotel RA-12)



Graph 8: Tone control action referenced to 0dB at 1kHz. (Rotel RA-12 Integrated Amplifier)

CONTINUED FROM PAGE 93



■ **Overall, the measured performance of the Rotel RA-12 was excellent, with the amplifier returning solid results that ranged from good to exceptionally good.**

present, but this could have been partially caused by earth loops caused by the test set-up itself, so that even-better S/N results could be expected in a home hi-fi set-up.

Channel separation was more than adequate to deliver both excellent separation between channels and excellent stereo imaging, but the figures themselves leave some room for improvements in the design: possibly the track layout of the PCB. Channel phase errors were so low as to be imperceptibly low—indeed the errors measured were so small they'd be influenced by statistical measurement error. Channel balance was superb: I rarely see better than 0.004dB.


Input sensitivity was 72mV for an output of 1-watt and 552mV for an output of 60-watts. This last is a little higher than I might have expected, but not so high as to require anything special by way of source componentry: all standard CD players, DACs, etc will interface perfectly.

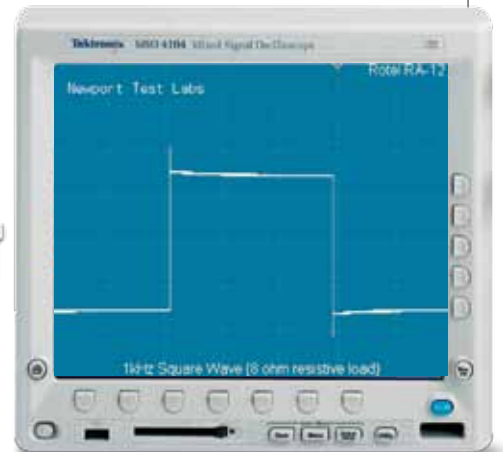
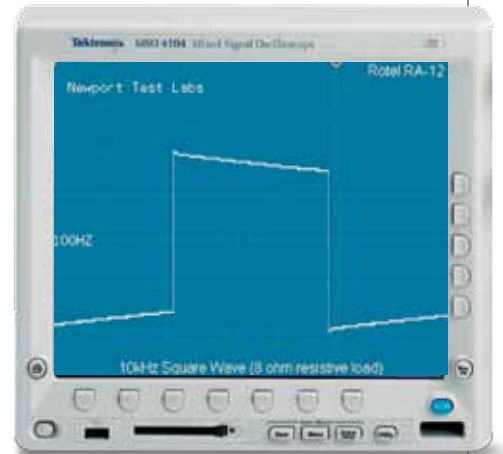
As expected from the lack of differences in the traces shown in Graph 6, the output impedance of the RA-12 turned out to be a very low 0.01Ω, which in turn guarantees a very high damping factor of 800—far more than will ever be necessary, but comfortingly high nonetheless.

As noted earlier, the square wave oscillograms show the presence of a peak in the high-frequency response of the RA-12 (indicated by the overshoot most obvious on the 1kHz and 10kHz spectrograms), but the waveforms are otherwise as expected, with the 100Hz showing a tilt that reflects the non-d.c. low-frequency response (but no phase errors), and the 10kHz oscillogram showing the excellent rise-time I'd expect to see from an amplifier with the RA-12's bandwidth.

The square wave responses at 1kHz (with a standard 8Ω load), and at 1kHz with a highly reactive (2μF//8Ω) load are excellent. This performance, coupled with the RA-12's performance into 2Ω loads—and its high damping factor—mean that the Rotel RA-12 will perform well with even the most demanding loudspeaker loads.

Standby power consumption, at just 0.53-watts, easily met the Australian standard, and typical power consumption during normal day-to-day operation will be around 100-watts, so the RA-12 won't send your power bill soaring.

Overall, the measured performance of the Rotel RA-12 was excellent, with the amplifier returning solid results that ranged from good to exceptionally good.  **Steve Holding**



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