

QUAD MODEL 306 POWER AMPLIFIER



ELEVEN years ago Peter Walker and Michael Albinson of Quad announced and described a new power amplifier circuit which they had christened after its major feature—"current dumping". Like most brilliant ideas it had a simple foundation, to use two separate and very differently conceived amplifiers working together to produce such advantageous results that they earned Quad the highly prestigious Queen's Award for Technology; and there are not many of those in our industry. For some time the hugely successful Quad 405 power amplifier (some 90,000 units sold so far) was the only representative of this technique, although a few foreign competitors had to have the patents drawn to their attention. Recently several near-copies which slip past the patents have appeared, from both East and West, as the virtues of the basic principles sink home.

In a current dumping amplifier, the lusty output transistors are only there as muscle; the quality is provided by a near-perfect low-power class A amplifier whose job it is to compensate exactly for the clumsy deficiencies of its big brother. Put simply, it is only necessary to aim the current dumpers at the dartboard

and the low-power amplifier will make sure that you get a bullseye every time. There are other practical advantages: no crossover distortion, no adjustments, cheaper unmatched output transistors, less change in performance with temperature and consequently no 'warm up' time, improved reliability; the list is impressive.

Two versions of a professional rack-mounting amplifier using current dumping were added to Quad's product list a couple of years ago and one of them, the stereo Quad 520, was taken up by a number of domestic users who found it superior to the older Quad 405 (now in its improved Mark II version). To those of us who study and prognosticate, the Quad 520 contained more than a few hints at the way future Quad domestic amplifiers might progress and their Quad 306, which is the subject of this report, is an initial confirmation of these trends.

The first thing to be noted is the remarkably small size of this amplifier in relation to what it can accomplish in the way of performance. It achieves this by advancing Quad's oft-quoted theory that practical, cost-effective domestic amplifiers are for reproducing music and not test tones or other continuous duty signals. In fact it is exactly the same size as the Quad 34 control unit and FM4 tuner and the three can be stacked as a 'midi' system or even more handsomely 'floated' in their matching cabinet which tidily hides all the rear connections and leads (see Fig. 1). It is housed in the same stout steel case as the other two units and such multiple usage obviously helps to keep the price down. For some time, Quad has sported a different paint finish in their US market—charcoal grey instead of the familiar two-tone brown. This now becomes universal and, although existing models will be available in both finishes for some time to come, the Quad 306 is the first to be grey only.

Internally the Quad 306 has a deceptively simple construction on a single high-quality printed circuit board. This is dominated by the toroidal power transformer and the four squat electrolytic capacitors which smooth the two split power supplies, one for each channel (a significant change from the single supply of the 405 series—forecast in the 520). The die-cast front panel, a familiar feature of Quad products, forms the

SPECIFICATION

Power output: See Fig. 1
 Total harmonic distortion: less than 0.01%
 Hum and Noise: -f05dB unweighted
 Input sensitivity: 375mV
 Frequency response: -0.25dB at 20Hz and 20kHz; -1dB at 13Hz and 40 kHz
 Stereo separation: 85dB at 1kHz
 Stability: unconditionally stable with any load and any signal
 Dimensions (W x H x D): 321 x 64 x 207mm
 Weight: 4.62kg
 Manufacturer: Quad Electroacoustics Ltd., Huntingdon, Cambs PE18 7DB
 UK retail price: £229

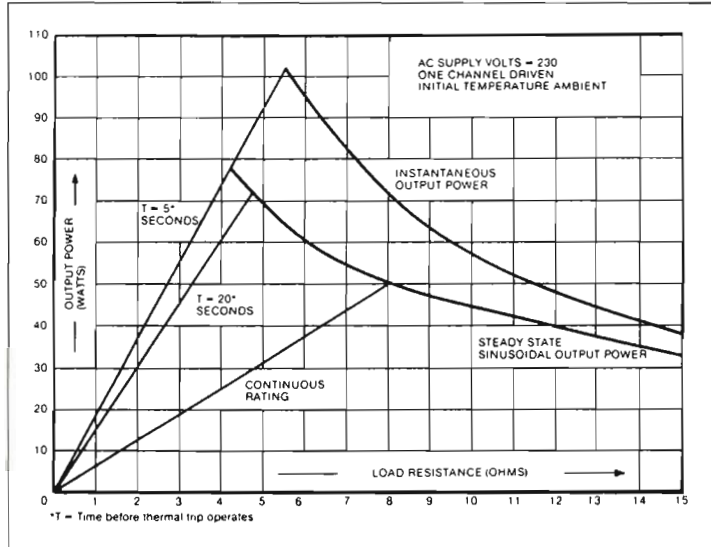


Fig. 2. Power output versus time and load impedance

heat sink for the power transistors and the surface is vanned to assist heat dissipation; it becomes quite warm in heavy use, but never dangerously so as the safety devices incorporated prevent this happening. Bolted to the rear of this panel is a thick section of black anodized aluminium angle. This supports the front edge of the printed circuit board and the eight power transistors (two current dumpers and two class A per channel) are mounted through it in a row. All the small components, including the two bridge power rectifiers, are on the board and there is no internal wiring apart from the transformer lead-outs and the mains linkage. As in all Quad products, everything is to a high standard. The layout is first class and anyone would be pleased to show off this very British amplifier as an example of what we can do. There are some neat tricks in the circuit too which uses some of the less frequently found semiconductor devices, such as constant current diodes, to stabilize performance and simplify production.

Adherence to the requirements of some countries, who now dictate that all mains-driven components must have a separate on/off switch, means that this is the first Quad domestic power amplifier to sport one and it appears incorporated in a neat Quad logo at the lower right corner of the front panel. There is also a green LED which shows when the unit is up and running. The same 'requirements' now prohibit the use of adjustable mains tapplings and so there are 110-120 Volt and 230-240 Volt versions and owners must have

the transformer changed if moving to a 110-Volt country or vice versa. Another change from Quad practice is the use of gold-plated phono sockets for the inputs in place of the four-pin DIN plug (which Quad still think superior, but failed to get adopted as an IEC standard). Standard 4mm sockets are provided for the loudspeaker connections and there is a fused IEC mains socket and also a linked unswitched plug. The earth pins of the latter are connected to the chassis but the signal 'earths' are spaced off by 10 ohms to ward off possible loop problems.

Protection

In this amplifier, Quad have rethought their overload protection arrangements and incorporated a resettable circuit breaker in the mains supply. Unlike the ones which many people have in their domestic electricity supply panels instead of fuses, which operate magnetically, this is a thermally operated device which continuously monitors the current taken by the amplifier. If gross overloading is allowed to take place, or a short circuit occurs at the output, the trip will operate after a time decided by the seriousness of the overload and the amplifier will shut down. It can be restarted by pressing a red button on the rear panel. In normal operation, with regular programme material this will not happen; it has not done so in my three months of fairly constant and sometimes heavy usage. However, if continuous tones are applied, as when making measurements of per-



Fig. 1. Showing the Quad 306 stacked with the Quad 34 and FM4

formance, then frequent tripping will occur.

Because of this it is difficult to state the output power meaningfully and Quad don't. Instead they publish a graph which we reproduce here (Fig. 2). If these technical things put you off, I will attempt to summarize by saying that this is a 50 Watts-per-

channel amplifier which sounds as if it were more than that! As to the quality of the sound, it seems to me to be eminently satisfactory. I personally rated the professional Quad 520 as sonically superior to even the latest version of the dear old Quad 405, and this £160 cheaper Quad 306 sounds to be its equal in every way

(except, of course, power). It is better in one respect, that of background noise, which really is completely inaudible, even with loudspeakers of above average sensitivity. It was no surprise to find 'within the thickness of the pointer' agreement between the readings on my Radford measuring gear and Quad's own specification.

At £229 I have not the slightest hesitation in recommending this Quad 306 to anyone who listens at sensible levels and buys his or her equipment to enjoy music unfettered by the overshoots and exaggerations which some more macho souls associate with hi-fi.

GEOFFREY HORN.

SONY DISCMAN



SPECIFICATION (Test Results in brackets)

Frequency response: 20–20,000Hz \pm 0.3dB (Agreed)
 Total harmonic distortion: 0.0095% (0.008%)
 Signal-to-noise ratio: 90dB (94dB A-weighted)
 Channel separation: not specified (–80dB)
 Output: 1.6V fixed (1.55V)
 Dimensions (W x D x H): 127 x 132.5 x 31.5mm (5 x 5.25 x 1.25 inches)
 Weight: 510g (1lb 2oz)
 Manufacturer: Sony Corporation, Japan
 UK distributor: Sony (UK) Ltd., Sony House, South Street, Staines, Middx.
 TW18 4PF
 UK retail price: £259.95

operating modes are displayed too, a necessary clue as to the status when so many of the selector buttons are dual-purpose.

A mini 3.5mm headphone socket with volume control is situated on the left hand side, and there is a similar 3.5mm line output socket, with no volume control, on the rear panel alongside the power inlet socket. No headphones are supplied with the Discman, though Sony MDR M55 headphones (£39.95) are recommended, and a range of active mini loudspeakers also exists. The connecting cable supplied has the 3.5mm stereo plug at one end and a pair of standard phono plugs at the other. The Discman can therefore do double duty as a battery/headphones portable and a mains home hi-fi CD player.

How it performed

The technical specification, confirmed by my tests, would indicate that there have been no serious compromises in performance resulting from this latest miracle of miniaturization. The Discman can therefore be considered as a highly satisfactory CD deck for using with a full hi-fi home system.



The Sony Discman is surely the most portable CD player on the market, and battery life is 4½ hours

JOHN BORWICK.

NETTLED perhaps by the speed with which other companies brought their (smaller and lighter) portable CD players on to the market following their own 1985 launch of the "world's first" D-50 model (which we reviewed in April 1985, page 1279) Sony have now taken the miniaturisation process even further. The new Sony Discman, or D-50 Mark II, is slimmer than its predecessor and at the same time more technically sophisticated.

One hidden benefit has been a reduced power consumption (2.6W against the D-50's 4W), enabling the Discman to be run for about 4½ hours from its rechargeable battery pack. This has been achieved through the use of a new PWM (Pulse Width Modulation) Integrated Circuit relating to the power supply and the laser pickup controller, and reducing the number of components needed. The Discman can be powered in four ways: 1. from the mains, using the mains adaptor supplied; 2. from the BP-200 clip-on rechargeable battery pack supplied; 3. from eight LR6 size AA batteries using the Sony EBP-380 battery case (£11.95 optional extra); 4. from 12V car battery using the Sony DCC-120 cord (£20 optional extra). Methods 1 and 2 come included in the basic £259.95 price, as do the carrying case, strap and connecting cord, so that most people will not need the optional extras.

On its own, the Discman measures just 127 x 132.5 x 31.5mm deep. Clipping on the battery pack bulks out the depth to about 44mm, and raises the weight from 510g to a fairly hefty 1kg. This is still very

portable, and would not interfere with ordinary use on a train journey, for example. Sony claim to have devised an anti-roll mechanism to allow the player to swing freely from the shoulder without tracking difficulties. In practice I did find that normal walking was possible, and even some swinging around, but of course abrupt banging into obstacles immediately caused track jumping.

When the Discman is hanging by the strap, its control panel faces upwards for easy access to the controls and display. The usual Play, Pause, Stop and Track Skip controls are fitted plus a Key Mode key which is pressed to change the Track Skip buttons into Fast Search controls. In this latter mode, the search is performed at moderately high speed with audible sound. In the Pause mode, the search speed is greater but no sound is heard. There is also a Play Mode button which selects Normal play; Repeat of the whole disc or between selected points A and B, or eliminating an unwanted portion; Random play of up to 16 tracks in any pre-programmed order; and a novel mode called Shuffle Play. This mode is for anyone bored with the predictability of the other modes—and keeps on playing the tracks indefinitely and in a different order each time!

The display normally shows the number of the track being played and its elapsed time in minutes and seconds. A Remain/Enter button changes the display to show how many tracks are remaining and the total time remaining. When Pause is pressed, the time display flashes on and off as a reminder. The various

The frequency response from 20Hz to 20kHz was so flat that it seemed pointless to reprint it here. Interchannel crosstalk was not specified but got close to a respectable –80dB figure over most of the range. The square-wave response showed the usual ringing associated with steep low-pass filtering, but was well up to the standards of equivalent full-size CD players. Signal-to-noise ratio was excellent at 94dB A-weighted. Error correction was just fine, passing all the standard tests. Proof against vibrations was unusually effective, standing up to being shaken back and forth, but not banged sharply. Mechanical noise consisted of a faint sound of the disc spinning—but would be inaudible with headphones on, or at a distance of a couple of metres.

Sound quality through a top grade hi-fi system was excellent: clear and unemphasized treble with well extended bass, good transients, a full stereo spread with good depth of perspective, and of course that silent CD background. I tried some A/B comparisons using two copies of the same disc and the Sony CDP-101 mains player (synchronization was easy of course). To all intents and purposes the quality of sound from the two players—one a fraction of the size of the other—was identical. I had to allow for the slightly lower voltage input from the Discman but, this done, the music was uncannily similar from the two players, with the Discman generally preferred.

On the move

Used on-the-move, the Discman will be a revelation to anyone who has listened only to cassettes or a transistor radio. With any respectable headphones (having a mini jack-plug or adaptor) the sound can reach new heights of portable fidelity. I have not tested the recommended Sony MDR M55 headphones, but results with others in their MDR range suggest that they will be a good choice. At least with the Discman you can take it along to a shop and choose the headphones that suit you by practical listening. The player itself, though not as cheap as some, is strongly recommended.