

Quad 77 integrated amplifier

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The Quad 77 integrated amplifier is not what it seems." The opening sentence of Quad's brochure for the new 77 series invites us to read on because of what at first sight appears to be a somewhat frugal product. With just two line-level inputs and a tape loop plus volume and balance controls—no phono input, no tone controls, no filters—it is frugal indeed; minimalist even. Hardly a Quad, surely? Well yes it is and clearly there is a need to elaborate.

At the back of the unit, amid the usual array of rear panel terminals, is a multi-pin connector labelled QUADLINK. When the amplifier is used as part of a 77 system, this "data bus", as it is known, routes audio, digital and control signals between the various units, everything being under control of a comprehensive remote handset. The amplifier forms the centrepiece of the system, accepting any number of 77 inputs, whilst its three standard inputs remain available for non-77 products. Since the amplifier is the first 77 product to be released, this review will concentrate on its use as a stand-alone unit. No doubt we shall return to it in due course in the context of a 77 system. QUADLINK and the 77 remote control handset are discussed in detail in a separate feature on page 125.

First of all, this is Quad's first integrated amplifier: inputs, control circuits and power output circuits combined in the one cabinet. All previous Quad series have had separate pre- and power amplifiers. It is a very capable unit, rated at 84 watts per channel into 8 ohms (115W into 4 ohms) with a high peak current capability of 11 amps per channel. All Quad power amplifiers since the famous 405, introduced in 1975, have employed a feed-forward power amplifier circuit for which the name Current Dumping was coined. In this, a small Class A stage supplies the finesse and a rugged output transistor pair the muscle. It is a fascinating, if in some circles controversial circuit which won for the company The Queen's Award for Technological Achievement.

For the 77, Quad's young Danish circuit designer, Jan Ertner,

has abandoned Current Dumping in favour of a new, outwardly more conventional arrangement which takes full advantage of modern semiconductor components. In essence there are two main types of power amplifier output configuration: Class A and Class B. Very high quality results can be obtained with the former but it is grossly inefficient since the output transistors conduct fully at all times regardless of the signal; energy not required for the loudspeakers is dissipated as heat. In Class B the work is shared, with the positive-going half of the waveform handled by one transis-



tor (or a group of transistors) and the negative-going by the other. It is efficient but the output devices need to be very closely matched and made very linear to avoid so-called crossover distortion (which becomes relatively more intrusive with reducing signal level). The usual compromise is to 'bias' the circuit a little towards Class A, thus smoothing out the crossover glitch, hence the commonly used description Class AB. Ertner has exploited the latest, closely matched, high speed, high gain output devices in his very symmetrical circuit, and with careful control of the bias point stability has been able to achieve optimum results using Class B—distortion is negligible at less than 0.005% at any

level up to 70 watts. The efficiency is therefore very good, which is why it has been possible to build this powerful amplifier into such a remarkably compact cabinet.

As always with Quad, the 77 is quite beautifully made. The front



panel, top and sides are formed from a single die-casting, finished in grey Nextel (a suede-like textured paint). Integral internal support panels form mounts for the output transistors and there are webbed sections out from these to the case proper to dissipate heat evenly and avoid hot spots. The fascia is a blue-grey plastics panel which has cut-outs for the control buttons and the display window. All panel legends are white. The rear panel and base-plate are of black-painted folded steel.

Almost the whole circuit is mounted on a single double-sided board and this, together with the large toroidal mains transformer which occupies the remaining space, is mounted upside down on supports in the roof of the die-casting. A small subsidiary board holds the LED display and control buttons with their associated circuitry and the infra-red remote control transceiver. The rear panel is inset some 30mm so that the connectors are substantially hidden from view. Five pairs of gold-plated phono sockets handle the conventional source inputs, the tape connections and an output from the preamplifier stage (this could be used to feed a second power amplifier if required). Provision is made for just one set of loudspeakers and the outputs are on substantial binding posts. Because of the 1996 EEC requirements (whose exacting specifications will cause mayhem in a number of quarters in the audio industry) bungs will be fitted to the binding posts of non-UK models to prevent the insertion of 4mm plugs. The preferred connection in this case is made with bare twisted or soldered wire ends. Mains input is via a fused two-pin IEC mains socket (the unit is double-insu-

lated) with an adjacent rocker on/off switch. It is normally left powered-up and put in and out of standby from a control on the fascia. A small coaxial socket carries a DC supply for charging the batteries of the 77 remote handset, and the panel is completed by the 15-pin QUADLINK socket.

There are just seven fascia controls, dark maroon-coloured rubberized pushbuttons, five of which—Standby, Balance, Source 1 and 2 and Tape—have integral LED indicators. The remaining two normally adjust the volume but are also used in shifting the left-right balance. When control is via these buttons the LEDs show red; when the remote handset is used they are green. A two-digit seven-segment red LED display is used to indicate volume level in 32 steps or balance (1-9 left or right shift, with 00 centred). There is no headphones socket.

As with the 34, 44 and 66 preamplifiers, all signal switching is handled by solid-state switches. CMOS devices are used once again but here they are used in an optimal virtual earth configuration which renders them effectively transparent to the signal (it is an arrangement which also circumvents the limitations of their inherent voltage 'window'). All op-amps are specialist OP275GP types and the volume control is the very high quality Crystal CS3310 device under control of the microprocessor. Great care has clearly been taken in the design and layout of these line-level stages. Separate windings on the mains transformer supply the microprocessor and analogue circuits and also the 30V AC for the QUADLINK bus. The tape outputs are fully buffered and are at the same level as the selected input.

The 77 is unconditionally stable with any load and any signal. It is protected against short-circuits and against gross overload by current-sensing detectors on the power rails. The internal temperature is also monitored and if it rises too much through inadequate ventilation the drive is removed; under normal conditions its Class B operation assures that it is exceptionally cool-running.

Performance

Used as part of a complete 77 series system, the amplifier forms the "bus master", its microprocessor building a dynamic computer model of the complete system and coordinating all operations, as described on page 125. The on-board microprocessor also controls the local switching, volume

Audio

and balance when the amplifier is used as a stand-alone unit. Changing sources is entirely devoid of switching clicks because the volume is automatically ramped down to mute during the process. Changing the volume is similarly 'zipper' noise free since the gain switching is always managed at the audio signal's zero-crossing point. The volume control has just 32 steps but the gain is tailored to provide a subjectively comfortable rate of change: 1dB steps for the top seven increments, 2dB for the next few, then 3, 4 and 5dB further down. This works well and there is of course virtually perfect tracking between the two channels. The settings increment immediately a button is pressed and continue counting if it is held in, slowly at first (rather too slowly to my mind, about once per second) and then accelerating to a blur. Channel balance is beautifully tailored as well, subjectively ideal in its change of gain and/or attenuation. As supplied the input sensitivity of the three inputs is set at 300mV. These can be changed individually from the remote handset (only) to 100mV or 775mV. The last-used settings for all of these are recalled when the unit is next brought out of standby.

Up and running in my system, the 77 gave a really first-rate

account of itself. There is an impressive solidity about the image it projects, a very well focused, stable sound-stage, creating the firm impression of control and power in reserve. Tonally it seems to me flawless: the bass is full and tight (it is a little disconcerting to be able to experience so much energy coming from so compact a unit), the midrange sweet and the top-end delicate, open and detailed and quite without sibilant emphasis.

Traditionally Quad have set little store by subjective impressions of this kind, electing to design amplifiers which satisfy technical parameters that are 'bound' to yield subjectively perfect results, which indeed emulate the ideal "piece of straight wire with gain". Theoretically, this approach is incontrovertible, so such subjective findings would be anticipated. My own feeling is that the technical performance required to guarantee sonic perfection is actually a little more exacting than was once assumed, that imperfections which were formerly thought to be so minute as to be inaudible do compromise the performance in ways that the ear is capable of detecting and are being addressed to beneficial effect by the best of today's engineers.

There's no doubt that the 77 is a very good amplifier. As a stand-alone unit its spartan complement of just three line-level inputs clearly limits its currency: a logical set-up might comprise a CD player, a tuner and a cassette deck. It will drive any loudspeaker that I have yet tried with it (Castle Durham 900, KEF Reference Series Model Three, Quad ESL-63, Spendor SP7/1) with assurance and authority. Of

course it will really blossom as the focal point of a 77 system. Any number of 77 source units can be accommodated, from a phono cartridge equalizer (which is apparently on the way) to a digital satellite receiver to some kind of digital recorder; what and when is up to Quad, but the 77 tuner and CD player are already in the wings. Certainly this is an integrated amplifier with tremendous potential **Ⓢ**

Specification

Power output 84W into 8 ohms for <0.05% THD; 115W into 4 ohms

Maximum current output 11A peak per channel

Signal bus QUADLINK for any number of Quad 77 series products

Standard inputs two line-level plus tape

Input sensitivity/impedance line-level and tape 300mV/33k ohms standard (can be changed to 100mV or 775mV from 77 remote control)

Frequency response 3Hz-50kHz, -3dB (10Hz-20kHz, -0.3dB)

Crosstalk < -90dB at 1kHz

Hum and noise -105dB ref 75W (22kHz measurement bandwidth, unwt'd)

Total harmonic distortion 20Hz <0.005%; 1kHz <0.005%; 20kHz <0.05% continuous sine wave into 8 ohms resistive load, any level up to 70W

Signal-to-noise ratio >100dB (A wtd ref 775mV)

Outputs preamp 775mV from 850 ohms source impedance; tape same as input level from 300 ohms source impedance

Residual noise -105dB with v/c at minimum, A wtd

Interchannel balance ±0.3dB with v/c varied from max to -70dB

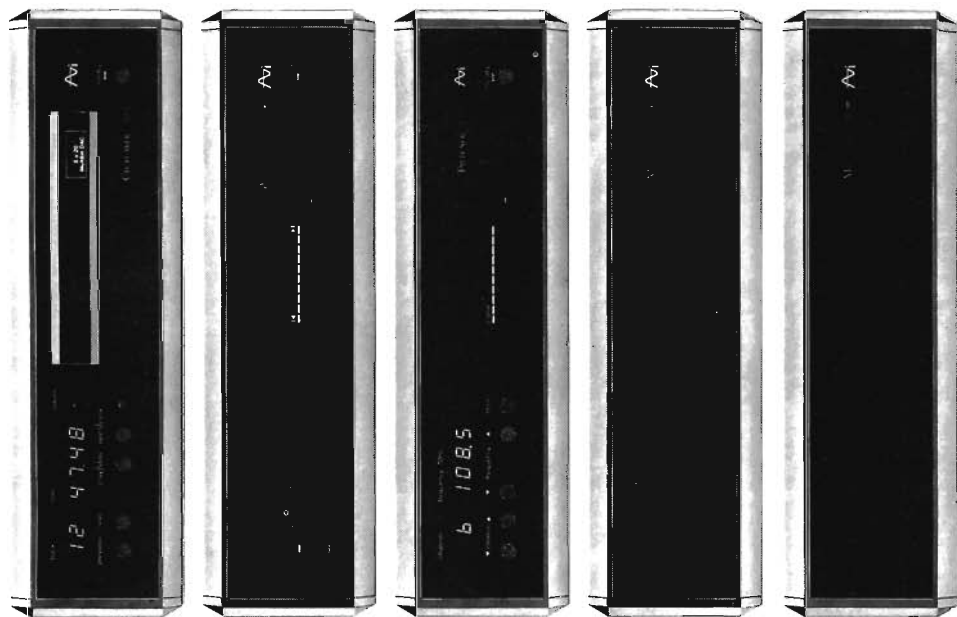
Dimensions (W x H x D) 321 x 65 x 300mm

Weight 6.3kg

Manufacturer Quad Electroacoustics Limited, Huntingdon, Cambridgeshire PE18 7DB. Telephone 01480 52561

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