



Current dumping is the name given to an entirely new audio amplifier output circuit developed by Acoustical, in which the linearity of the main current-carrying transistors (the current dumpers) has no bearing on the overall amplifier performance, hence the need for biasing and allied problems associated with crossover are eliminated.

The basis of current dumping is 'feed forward error correction', first proposed by Harold Black in 1923, in which a derived error signal is added to

the output signal of an amplifier in exactly the right amount to cancel the distortion produced by the amplifier. While it is relatively easy to add error current to signal current without interaction, as in Black's invention, it is very much more difficult to do so in voltage terms. Loudspeakers require a stiff source and so 'feed forward' has found no successful application in audio amplifiers.

What Quad has done - not quite as easy as it sounds - is to produce a current

controlled amplifier, apply a special type of feed forward current error correction and then apply overall voltage feedback to convert the whole to a voltage amplifier. The result is that the quality is solely dependent upon the performance of a low powered high quality amplifier together with four passive components. When correctly designed, all distortion in the output stage is reduced to zero.

The advantages of this technique are that it is possible to produce an amplifier of very high performance without using

carefully matched relatively fragile output devices. There are no crossover biasing problems, no alignment or adjustment is required to obtain optimum performance and nothing can go out of alignment during life. In the event of component failure, replacement can be effected and performance restored without reassignment.

For further details see 'Current Dumping Audio Amplifier' by P.J. Walker and M.P. Atkinson presented to the 50th convention of A.E.S.

Current Dumping



Specification

Measurements apply to either channel, with or without the other channel operating.

Power Output

The amplifier is intended for use with loudspeakers of 4-16 Ω nominal impedance.

Power and distortion for various frequencies. Continuous sine wave into 8 Ω resistive load.

100 Hz any level up to 100 watts

(0.01% D tot)

1000 Hz any level up to 100 watts

(0.01% D tot)

10,000 Hz any level up to 100 watts

(0.05% D tot)

For other impedances and frequencies see graphs.

Notes:

1. In addition to the performance into a resistive load R_L , the amplifier will maintain full voltage within the same distortion rating into a load $R_L \pm jX$ where X is any value from zero to infinity.

2. With the additional power limiter inserted the maximum output voltage is limited to 20V rms \pm 10% (50 watts @ 8 Ω) all other performance figures unchanged.

Output Impedance and Offset

3.2 Ω in series with 0.50 Ω .

Offset: <1 mV.

Frequency Response

Ref. 1 kHz

Low frequency: -1 dB at 20 Hz

Filter attenuation as curve.

High frequency: -2.5 dB at 20 kHz

-3 dB at 50 kHz

Signal Input Level

0.1V rms \pm 0.3 dB for 100 watts into 8 Ω . Amplifier loads the input by 20K Ω in parallel with 30 pF.

Signal Input Slew Rate Limit

0.1V μ s

Provided the rate of change of input voltage does not exceed this figure and the amplifier is not driven into clipping, then the total of all distortions appearing in the audio range (20-20,000 Hz) due to transient or repetitive waveforms with frequency components inside or outside the audio range will be at least 80dB below full rated power. If the major portion of the input energy is wanted signal then -80dB (0.01%) represents the maximum possible distortion in programme.

Signal Input Overload

Instantaneous recovery up to +35dB overload.

Crosstalk

Input loaded by 1K Ω : -80dB at 100Hz

-70dB at 1 kHz

-60dB at 10kHz

Hum and Noise

(Input loaded by 1kohm)

'A' weighted: -90dB ref full power

Unweighted (15 kHz bandwidth): -80dB ref full power

Protection

The amplifier is suitable for use under the most arduous music conditions and is electrically protected by current limiters; 7 amps in phase current at peak voltage and 3.5 amps at zero voltage. Shorting both outputs simultaneously on signal for an extended period (minutes) is not protected.

Stability

Unconditionally stable with any load and any signal.

Power Input

110-120-130V 250-230-240V

50-60 Hz, 30-350 watts

depending on signal level.

Dimensions

Height

115 mm (4.5")

Width

340.5 mm (13.4")

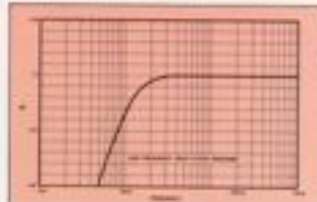
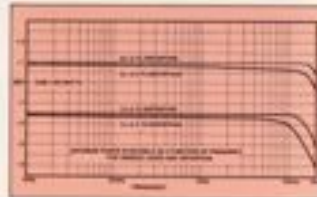
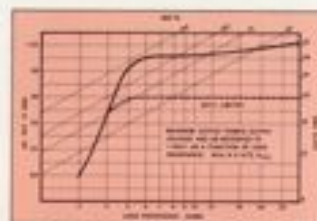
Depth

195 mm (7.7")

allow an extra 38 mm (1.5") for plug and socket.

Weight

9 Kg (20 lbs.)



QUAD 405

The Quad 405 is a two channel power amplifier of high output designed for domestic and professional use employing 'current dumping' which eliminates many of the problems associated with transistor power amplifiers, and provides an exceptionally high level of performance which is entirely predictable and maintained over time.

The amplifier may be used with the Quad 33 control unit or similar high quality pre-amplifier. The high power output makes it suitable for use with many of today's high quality loudspeakers and provides opportunity for further loudspeaker engineering development with less emphasis on efficiency.

The external design continues the Quad tradition of practical simplicity which has won prizes and world-wide acclaim on previous models. A combination of mouldings and extrusions is used to produce a unit which is strong and pleasing both to the eye and the touch.

The internal appearance is unmistakably Quad and reflects concern with economy of manufacture and ease of service.

Not all loudspeakers can safely accept the full power output of the Quad 405, and the amplifier is provided with a power limiter which is fitted internally for use in such cases. The Quad electrostatic loudspeaker can be used safely with the power limiter in.

