PowerDrive *S*

A Bright Idea from NAD's Director of Advanced Development, Bjorn Erik Edvardsen

Performance, Value, Simplicity

NAD challenged NAD's Director of Advanced Development to develop a less expensive amplifier that did not compromise NAD's renowned audio performance in any way. The C316BEE is the result of this challenge and it features a new simplified variant of NAD's very successful PowerDrive technology.

As NADophiles know, the key benefits of PowerDrive are high levels of dynamic power combined with very low distortion when driving difficult low impedance loads. This simplified version of PowerDrive technology aims to maximize the available dynamic power while minimizing cost. This breakthrough allows for unprecedented power and performance in the "budget amp" category.

Historical Precedent

This principle was first used in an earlier generation NAD amplifiers, the 3225 PE (and others in the series) and consists of providing two different supply voltages to the output stage, roughly in the proportion 1.4:1. In the case of the C 316BEE V2 both supplies are fed from a low resistance150VA toroidal transformer but the higher voltage winding has PTC (Positive Temperature Coefficient) resistances in series. In the early generation "simple PE" amps, we used polymeric positive temperature coefficient thermistors, but these had some undesirable characteristics and were expensive, pushing us further away from the budget sector.

A Light Switched On

Amazingly, modern long life quartz light bulbs fit the bill more ideally. What we aim for in this design is to maximize available dynamic power (10-100ms bursts) according to a typical music envelope for a given maximum output stage dissipation. The light bulbs have very low resistance (<1 Ohm) when cold so drop very little voltage on short peaks. At 7 V, after a few hundred milliseconds, the resistance rises to an ideal 4 Ohms.

Dynamic Power Performance

For short peaks of 5 milliseconds, the C 316BEE V2's undistorted peak power is > 110W into 8 Ohms, 190W into 4 Ohms and 270W into 2 Ohms. This is from an amplifier rated for 40W Continuous Power into 8 Ohms! This gain in usable dynamic power on music is very nearly equivalent to a conventional amplifier rated at 80W Continuous Power at 8 Ohms!

The chart below shows C 316BEE V2 IHF Dynamic Power (20 ms) with and without PowerDrive S.

IHF DYNAMIC POWER	WITH POWER-DRIVES	WITHOUT
8 Ohms	90W	60W
4 Ohms	120W	85W
2 Ohms	170W	120W

Reliability

We all know that light bulbs don't last forever but we obviously consider reliability to be a very major consideration for our customers. The light bulbs are rated for 5,000 hours. But in the C 316BEE V2 circuit the light bulbs are used at a maximum of 60% of rated voltage (35% of rated power) and that is only reached on sine wave testing, or in music on sustained high-level notes, and even then at a low overall duty-cycle. Under these conditions the life conservatively extends to 15,000 hours. Thus if played at high volume levels for 3 hours a day every day of the week it would take 14+ years before replacement is required. In the unlikely event of a bulb failure, the amplifier will still give 30W in 8 Ohms and 40W in 4 Ohms – or in other words, perform like an ordinary amplifier of its size and price. Replacement of the bulbs is simple and the part is commonly available for a few dollars.

S is for Simplicity

NAD's highly regarded PowerDrive circuitry, as used in the more expensive NAD amplifiers, has a highly sophisticated impedance sensing and thyristor switching of the high voltage supply. This adds cost equivalent to a whole price point in retail terms (although it is still a performance bargain).

The chart below compares the parts required for PowerDrive S and PowerDrive circuits.

C316BEE POWERDRIVE S	C326BEE POWERDRIVE
Halogen Lamps X 2	OP Amps X 2
	Thyristors X 4
	Current Sense Resistors X 4
	Transistors X 10
	Resistors X 20
	Capacitors X 6

Supply Rejection

Typically, using such a "soft" supply in an amplifier is very demanding on its ability to reject interference and distortion by power supply modulation and back EMF from the loudspeaker. As was the case with the 3020, careful engineering results in a supply rejection ratio that is very high (>75dB) across the audible frequency range ensuring tight bass and no measurable distortion from supply modulation. Furthermore, the idling current is extremely tightly stabilised so kept constant with temperature and supply voltage changes. This eliminates the major limiting factor for Class AB amplifiers: transient crossover-over distortion.

Conclusion

Over fourty years ago, NAD's 3020 amplifier redefined performance and value, and did so by keeping things simple and to the point. As time progressed subsequent generations of NAD amplifiers continued to raise the ante on the competition using technological innovation to continually improve the really important aspects of amplifier performance. PowerDrive S is one more step ahead for music lovers with a budget.

The chart below compares key performance characteristics of the 3020 and the C 316BEE V2.

	NAD C 316BEE V2 (2018)	NAD 3020 (1978)
Output power, 8 ohms, 20-20k	40W	20W
Clipping power (0.1% THD)	45W	28W
Dynamic Power (20ms) 8/4/2	90W/120W/170W	40W/58W/72W
THD and IMD 20-20/8ohms	<0.01%	<0.02%
Peak current 1 ohm	+26A/-26A	+15A/-10A
S/N IHF re 1W	-95dB	-80dB
Price (corrected for inflation)	US$379.00	US$427.71 ($113.99 in 1978)