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PROTON D540 INTEGRATED AMPLIFIER

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Amplifier designers have long recognized the significance and desirability of a high short-term reserve power capability; it is the basis for the dynamic-headroom specification. But Proton's research suggested that the standard EIA 20-millisecond dynamic-headroom tone-burst test signal was unrealistically short in view of the peak-power demands of real-world music signals. Although the maximum amplitudes might last only 20 milliseconds or so, many waveforms decay over a much longer time period and thus could require an amplifier to deliver much more than its rated continuous power for as long as several hundred milliseconds.

To meet this requirement, Proton developed a Dynamic Power on Demand (DPD) system, used in the new D540 integrated amplifier, that allows an amplifier's maximum unclipped output to exceed its continuous-power rating by four times (a 6-dB increase) for considerably more than 20 milliseconds and to decay slowly over a relatively long period before returning to the maximum steady-state output level. While the same capability could have been achieved by several conventional design approaches, another requirement for Proton's designs was that the amplifier be highly efficient and moderately priced.

The D540 is a relatively low-powered amplifier whose output transistors normally operate from a low-voltage power supply although they are capable of much higher power levels. There is also, however, a second, high-voltage supply, together with a power-control circuit that monitors the instantaneous output level from the amplifier. When the D540's output power reaches an internally set threshold level (which is close to the amplifier's continuous-power capability), fast-acting electronic switches connect the high-voltage power supply to the output transistors, increasing their maximum power capability to several times its normal value. Because the high-voltage supply is used infrequently and only for short periods of time, its continuous current rating can be very low. In fact, it merely charges up the capacitors to its full voltage, and when more power is needed the amplifier draws it from those capacitors.

Proton's DPD system calls for storage capacitors large enough that a high short-term power level can be sustained for 200 to 400 milliseconds, after which it gradually declines. If a continuous tone is applied at the highest signal level, the DPD power reserve decreases until the internal switches disconnect it, leaving the amplifier to operate at its rated continuous-power level

while the capacitors recharge (which takes about a second). Because the switching occurs at close to the amplifier's normal full-power level, any switching transients are masked by the program content. And since the power transistors operate at a fraction of their capability under normal conditions, they cannot overheat and therefore require no current limiting or thermal protection systems.

The Proton D540 is a compact but surprisingly heavy unit with a minimum of visible controls on its all-black exterior. Simple pushbuttons turn it on and off and select one or both sets of speaker outputs. Other than the small input-selector pushbuttons, the only visible operating control is the volume knob. The inputs provided are for phono, tuner, CD player (marked DAD, for digital audio disc), and video; each button is duplicated to allow independent selection of sources for listening or tape recording. Similar buttons select playback from either of two tape decks or cross-connect them for dubbing from either machine to the other. There is a small yellow-green power-on pilot light and a red light that glows when the DPD power supply is being used.

Behind a hinged door on the front panel are small center-detented knobs for the bass and treble tone controls and the balance control, buttons for mono mode and loudness compensation, and a BASS EQ button that engages a low-frequency boost circuit to extend the low-frequency response of typical small woofers. The BASS EQ circuit has no effect above 100 Hz, but it boosts