Startup sequence

When mains voltage is applied, the IC charges up its large supply capacitor via trickle-start circuitry inside the power supply controller IC. Once a preset voltage threshold is reached on the cap, the IC shuts off the trickle start and begins switching the power supply FETs. Once the supply is running, an auxiliary winding on the transformer powers the controller IC. Thus, an auxiliary supply is not needed for BOP because the main supply is able to start itself. While the DSP is booting, audio is muted since the DSP is not passing any signal. After booting, the DSP has an additional 4.5 second delay before the amplifier comes out of muting, to allow all internal voltages to fully settle.

Power supply

The BOP's switch mode power supply is a regulated, fixed frequency, active-clamped flyback. It is similar to a typical flyback converter except that when the main switch is off another switch turns on and recovers the transformer energy into a resonant tank. A typical flyback power supply has good cross-regulation and can operate over a wide input voltage range, but the power dissipation of a passive clamp limits the power level a flyback can reasonably output; adding the active clamp allows a flyback converter to scale to much higher power levels. Because the power supply accepts universal AC voltages, the incoming mains voltage is bridge rectified to DC and stored in a bank of 2 primary capacitors in parallel. This rectified voltage varies directly with mains voltage. The main and clamp FETs, operating at 200kHz, couple energy to the secondary diodes through the transformer. The regulated ±85V secondary voltage is stored in a pair of secondary capacitors, one per rail. Regulation is taken across the entire +170V secondary voltage, relying on proper circuit operation to keep the rails balanced. Adjusting the duty cycle of the PWM signal driving the power supply FETs keeps the power supply's output voltage constant regardless of changes to input voltage or load.

Housekeeping voltages of ±15V and +7V nominal are created with separate transformer windings from the main secondary rails, but all windings are tied together at ground. Under load, the amplifiers will pull energy from the main rails and the power supply will increase the duty cycle to compensate and keep the main rails at ±85V; this means the housekeeping voltages increase under load.