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# Seeking the secrets of a satellite receiver

DIRECTV SET-TOP-BOX DESIGN FOCUSES ON MODULARITY FOR THE MASS MARKET.

**R**endered redundant by the acquisition of a more advanced unit, a DirecTV D11-100 satellite-set-top box gets the Prying Eyes treatment for your voyeuristic enjoyment. Peer inside the svelte, silver case to see how the box's creators used modularity to make a common base design amenable to multiple markets.

The multimedia-processing heart of the D11-100 is a Broadcom BCM7312—a single-chip, satellite-set-top-decoder IC that integrates an RF tuner; an all-digital, variable-rate receiver with 7-bit ADCs and an FEC (forward-error-correction) decoder; a data-transport processor with security capabilities; MPEG-ATSC-compliant audio/video decoders; a 2-D, multilayer graphics engine; and, coordinating the whole show, a 266-MHz MIPS32 core.

The memory subsystem includes a Hynix 256-Mbit DDR SDRAM and a BGA-packaged device with an “FW603” firmware code and handwritten “FT” (firmware tested?) initials on its top. Because DirecTV set-top boxes are field-reprogrammable, it's likely that the BGA device is at a minimum a single-die flash memory. It might also be a dual-die flash memory with redundancy to enable a fail-safe upgrade methodology or a combination of SRAM and flash memory.

A clever “light pipe” routes power-on illumination from an LED on the system board to the front panel. Modularity allows the D11-100 design to morph to suit the varying cosmetic tastes of multiple markets through the use of interchangeable front panels.

Analog-modem hardware, which allows the D11-100 to periodically dial home for program-guide, firmware, and other updates, also resides on a separate daughtercard.

Given all the attention to design efficiency elsewhere, the inclusion of two sets of composite audio/video outputs is baffling. Because the unit has only one tuner and one decoder, the outputs can't deliver separate programs. So, why did DirecTV shoulder the additional hardware cost? (Go to [www.edn.com/070118pry](http://www.edn.com/070118pry) for some speculation and to post your own thoughts.)

A Samsung “can” tuner allows the D11-100 to tune in an over-the-air NTSC transmission or UHF- or VHF-packaged analog video from another source and also broadcasts the outgoing RF video on VHF channel 3 or 4. The device is on a modular daughtercard, suggesting that lower cost boxes using the same base design might not include the RF video-input feature.

