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### Under the Hood: XM radio receiver makes waves

By David Carey, Portelligent 11.12.2007 0

Delphi's latest XpressRC satellite radio receiver adds color and light to its lineup of XM radios but still builds around a fairly long-lived [chip](#) set (at least in silicon years) with some modest tweaks to the platform.



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The \$169 MSRP XpressRC, though mobile and small, is designed to be used primarily as a docked device. Because it has no internal battery, power comes by way of automobile power or an optional boom box for home use. An array of channel-select buttons along the bottom join up with a rotary control and a smattering of other buttons to make up the user interface, which is displayed on a 2.8-inch widescreen LCD. An estimated [resolution](#) of 400 x 240 (WQVGA) provides the ability for split-screen [display](#) of both current play and channel guide.

Additionally, the XpressRC allows recording and replay of up to an hour's worth of programming. As with most satellite radio receivers these days, the influence of the portable media player and declining [memory](#) prices have led manufacturers to embed adequate storage for nonrealtime listening of recorded content.

Delphi's XpressRC relies on an included external pickup built around a fairly typical ceramic block antenna. This block mounts to a printed-circuit board containing discrete amplifiers, powered by a [DC](#) bias riding along the lengthy coaxial [cable](#) used to carry the received signal back into the XpressRC.

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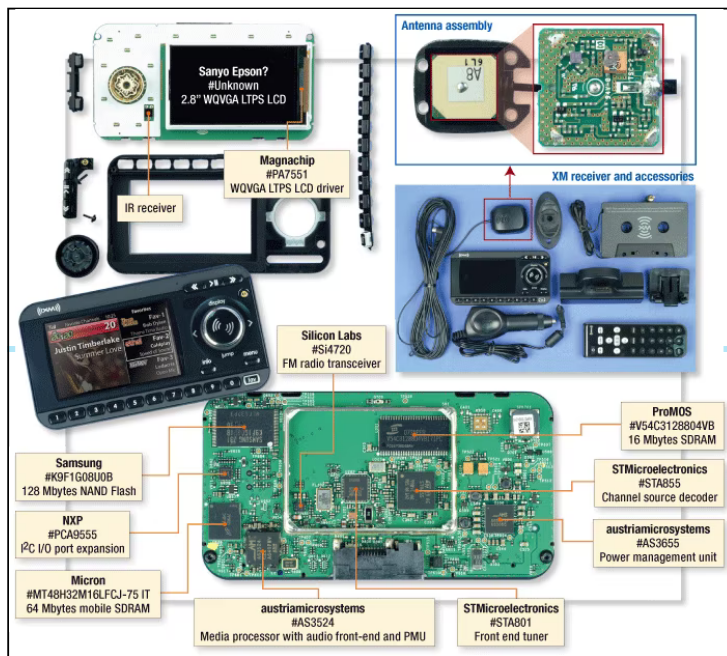
By Ezkey Electronics Co., Ltd 09.28.2023

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Antenna **output** ends up first at an STMicroelectronics #STA801 Front End Tuner, responsible for channel selection and RF demodulation of the incoming S-band (2332.5 to 2345.0 MHz) signals. A single SAW filter from RF Monolithics is used for what appears to be an off-chip filter, but otherwise radio front-end complexity is quite modest in terms of supporting components.

Next is the #STA855 Channel Source Decoder, an ST part integrating 32 kbytes of **EEPROM** in its multichip package, and interfacing to a ProMOS #V54C3128804VB 16-Mbyte SDRAM for working memory. The STA855 handles all elements of **baseband** audio creation, including, presumably, the **authentication** of subscriber information, along with signal decoding.

Two components from austriamicrosystems, the #AS3655 and #AS3524, combine with the ST chip set to form the core of the media player aspects of the XpressRC. The #AS3655 is an integrated power management unit that includes voltage regulators, lighting management, a battery charger, stereo audio DAC and an audio amplifier. The #AS3524 is a single-chip ARM9-based media player with on-chip memory and an audio front-end "optimized for the requirements of portable satellite radio applications," along with additional power and lighting management, according to the manufacturer.



The #AS3524 joins with local processor memory in the form of a Micron #MT48H32M16LFCJ-75 IT 64-Mbyte Mobile SDRAM and a Samsung #K9F1G08U0B 128-Mbyte NAND flash for content storage. The #AS3524 handles LCD control along with digital audio processing, which is likely used to reduce compression artifacts and improve sound quality. The chip's digital audio supplies the #AS3655's DAC for final output.

Because one mechanism of audio transfer to a car audio system is by way of FM-style modulation, the final audio signal is also fed to a Silicon Labs' #Si4720 FM transceiver. Placement on the board and part functionality of the #Si4720 suggest that serial digital audio from the #AS3524 is used as input to the Silicon Labs chip.

Virtually all parts are mounted on one side of the single board of the XpressRC, with only the IR receiver, keypad backlight LEDs, keypad contacts, LCD connector and minimal passives located on the back side.

A significant batch of accessories, including a cassette adapter, mounts, a cigarette-port DC power plug, an antenna and an IR remote control, come in the box, adding a meaningful chunk to the bill of goods. Overall product hardware costs of \$60 to \$70 (estimated) are combined with the \$10 or so of extras against the \$170 retail price, so money is certainly made in the sale of the receiver alone. With XM monthly fees of \$10 to \$13, depending on the duration of the contract, annual service revenue is almost certainly the larger prize.

It will be interesting to see the impact of the potential XM/Sirius merger. More common hardware platforms and lower overhead costs could lead to more aggressive subscriber fee pricing in the long run, although a monopoly on satellite radio may temper price reductions. Cable TV has proven the consumer's willingness to pay for content despite free alternatives, but the user base for satellite radio has a way to go before it reaches cable's penetration.

With complex birds in the air, it will take steady growth to keep the business flying.

**David Carey** is president of Portelligent, an Austin, Texas, company that produces teardown reports and related industry research on wireless, mobile and personal electronics ([www.teardown.com](http://www.teardown.com)).

## Suggested Reading

- [What RF Wireless Needs Now - EE Times](#)
- [Sponsored content Archives - EE Times](#)
- [Energy Needs a Smarter Approach - EE Times](#)
- [China Gears Up for Chip Dumping, Ex-DoC Official Says - EE Times](#)

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