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## Taking the iPhone Apart

An analysis from teardown firm Portelligent estimates that the new smartphone costs Apple a mere \$220 to make

by [Arik Hesseldahl](#)

As the creator of the iPhone, the most highly anticipated piece of consumer-electronics equipment in a decade or more, Apple ([AAPL](#)) certainly has much riding on the device's success. So too, in turn, do Apple's many, mostly anonymous suppliers.

Apple, always secretive and tight-lipped about its supply-chain and manufacturing arrangements, almost never says anything in public about its suppliers, not even to disclose names. The exceptions are Intel ([INTC](#)), the chipmaker that supplies the microprocessors for Apple's Macintosh computers, and NVIDIA ([NVDA](#)) and ATI ([AMD](#)), which supply the graphics chips for those same computers.

So it's left to teardown firms such as Austin-based Portelligent, to sleuth out not only who supplies all the parts but what it costs to make a device. And David Carey, Portelligent's CEO, did something that few others in the country did after buying an iPhone: He took it apart.

### A HEARTY MARGIN

Portelligent estimates that the cost of the materials used in the iPhone add up to about \$200 for the 4-gigabyte version, which sells for \$499 and about \$220 for the 8-gigabyte version, which sells for \$599. Their estimate doesn't include costs of final assembly, but it does give some insight into the gross margin on the device. Historically Apple's gross margins have run ball park of 50% plus or minus a few points. "We had taken a speculative stab at what the costs would be back in January, when the phone was first announced and we were pretty close to the mark," Carey says (see [BusinessWeek.com](#), 9/20/06, "[The Skinny on Apple's New nanos](#)").

The most expensive component on the phone, Carey says, is the touch screen, for which Apple tapped a little-known German concern called [Balda](#) (see [BusinessWeek.com](#), 4/5/07, "[Balda: The iPhone's German Accent](#)"). The estimated cost of \$60 per unit is mostly an educated guess. "This screen is like nothing I've ever seen before," says Carey.

Even the fact that Balda made it, is in fact, an educated guess. Carey told *BusinessWeek* that his analysis found no apparent markings that identified the screen's origin. But Balda's role in the screen has been something of an open secret in the wireless industry since the iPhone was first announced by Apple CEO [Steve Jobs](#) in January. Even so, Apple apparently took steps to make the source of the screen hard to identify.

## HOW THE CHIPS FALL

Another big winner is [Samsung](#), which supplied the main microprocessor chip. It was stamped with an Apple logo, but with a serial number that matches closely a chip that Samsung sells. Samsung also supplied the NAND-type flash memory that stores data on the phone, including songs, video, and pictures.

Samsung's microprocessor chip, interestingly, is based on a core design that is owned by the British chip technology licensing firm ARM Holdings ([ARMHY](#)), which is another big winner among the iPhone suppliers. Instead of selling chips, ARM licenses its patented designs for "cores," or the central working brain of a chip. Customers take those core designs and then build their own chips around them. At least one other ARM-based chip, from [NXP Semiconductor](#), the former chip division of Royal Philips Electronics ([PHG](#)), shows up in the iPhone. Other chips might have some ARM technology on them as well, Carey says.

Apple recently announced that it had improved the talk time on the iPhone's battery to eight hours. At least some of this improvement was accomplished by paying close attention to power management. Three chips are involved in that function: one from Philips, one from Texas Instruments ([TXN](#)), and one from Linear Technology ([LLTC](#)).

Handling various aspects of the wireless communications on the iPhone, from connection of AT&T's ([I](#)) wireless voice and data network to local Wi-Fi networks, are components from Infineon ([IFX](#)), Skyworks ([SWKS](#)), RF Micro Devices ([RFMD](#)), and Marvell Technology Group ([MRVL](#)). [Cambridge Silicon Radio](#) supplied chips that connect the iPhone to wireless headsets.

An accelerometer—a chip that senses motion—from STMicroelectronics ([STM](#)) helps the iPhone sense when its orientation has changed, which causes the orientation of pictures and video being displayed on the screen to change accordingly. Also handling various aspects of the display are chips from National Semiconductor ([NSM](#)), Broadcom ([BRCM](#)), and NXP. Idaho-based Micron Technology ([MU](#)) supplied the imaging chip that is central to the camera.

## MYSTERIOUS MAKER

Carey points out that the chip-packed iPhone offers "a very calm and serene user experience" that belies its internal complexity. "A great deal went into the internal mechanics and how it all came together," he observes. "There are lots of tiny nooks and crannies where things have to be very precisely tucked in to make it all fit together."

The complex design calls for equally complex manufacturing, which dictated that the iPhone be made outside of the U.S. "You have to build something like this in a place where labor is inexpensive," says Carey, which in this case means China. But Carey says it's unclear who manufactured the iPhone: "There are no markings indicating exactly who built it."

Apple's iPods have been built by [Hon Hai Precision Industry](#) and its Foxconn operating unit. *BusinessWeek* reported in January that Hon Hai had won the contract to manufacture the iPhone (see *BusinessWeek.com*, 1/10/07, "[Apple iPhone: Sweet Ring Tone for Hon Hai](#)"). But last month Samuel Chin, CEO of Foxconn, told investors that the company would not be making the iPhone. "Previous devices that Foxconn had made for Apple had their markings stamped all over the place," Carey says. "We just don't know who's making this one yet."

Apple had come under fire in 2006 for doing business with Hon Hai after allegations emerged in a British newspaper that its employees worked under sweatshop conditions (see *BusinessWeek.com*, 6/29/06, "[Fixing Apple's 'Sweatshop' Woes](#)"). Subsequent Apple investigations found some problems that it insisted be fixed and were fixed (see *BusinessWeek.com*, 8/21/06, "[Hon Hai: Vindicated by Apple Report?](#)").

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