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# How Stuff Works: How Dog ID Chips Work

*By Marshall Brain*
*HowStuffWorks.com (MCT)*

Last month the Brain family adopted a dog from the local animal shelter. And when we picked her up after being spayed, we discovered that she had been "chipped." In other words, the shelter had inserted a microchip under the skin in her neck. By holding a scanner over her, the vet could read her new ID number on the screen.

The reason why the shelter does this is because the shelter wants to return as many stray dogs as possible. At our local shelter, they have to kill an average of 500 dogs and cats every month because of overcrowding. Any dog or cat that they can return to its owner is one less animal they have to kill. Tags on collars can get lost or mangled. The microchip can't get lost and will last for decades. And it is so small--about the size of a grain of rice--that the dog doesn't even know it is there.

The technology behind these chips is fascinating. They are called Radio Frequency Identification, or RFID, chips. Sealed inside a tiny glass cylinder is an even tinier radio transmitter along with an incredibly small computer. The computer contains the unique ID number. It sends the number to the radio transmitter, which broadcasts it to the scanner. Obviously this tiny radio is not very powerful, so the scanner has to be just an inch or two away for it to pick up the transmission. But it is a transmission nonetheless. So the scanner picks up the radio's signal, decodes the number and displays it.

But where do the computer and radio transmitter get their power? There is no battery embedded in the dog's neck. This is the ingenious part of an RFID chip. The scanner actually sends out a fluctuating **magnetic** field into the dog. The RFID chip contains another antenna that picks up this **magnetic** energy and converts it into electricity. This electricity then powers the computer and radio transmitter. So the dog's chip is sitting there, doing nothing, until a scanner comes along. The scanner provides the chip with the wireless power it needs to send out its unique ID number. Then the chip goes dormant once again.

It's funny to think that dogs were one of the very first users of RFID technology. Today RFID chips are appearing in all sorts of places because the technology gets less and less expensive every day. For example, you may use a badge at work that lets you "badge in" to different parts of the building. The badge contains an RFID chip, and you hold your badge up to an RFID scanner. You may have a parking pass that works the same way.

If you frequently go through toll booths for a bridge or a road, you may have an RFID chip on your windshield that makes payment automatic. And many cars now use RFID chips in the key.

Lots of credit cards now contain RFID chips as part of a system called Paypass.

You wave the card over an RFID reader to make a payment.

But the place where RFID is expected to really shine is in the grocery store. Right now your local grocery or discount mart is using bar codes to scan items. And you might have noticed that these bar codes are not perfect, especially if you have ever tried your hand at scanning them in a self-checkout

line. You have to find each bar code and hold it right in front of the scanner at the correct angle. Even so, you may be to present it two or three times for the bar code scanner to see it.

Soon the price of RFID tags will fall so low that every item in the store will have one. Simply putting the items on the conveyor belt at the check out line will get the RFID chips scanned automatically. Today many stores are already using RFID at the case level in the warehouse or stockroom, because RFID speeds up the whole inventory tracking process.