IR Remote Controls

What do IR Remote controls have in common with Ham Radio?

IR Remote Controls

- Both use codes to communicate

- Both use a modulated carrier

  - Using short and long duration light pulses to send a coded message, much like the Morse code, is not hard to understand, but having these light pulses ride on a carrier wave of a much higher a frequency is curious. In fact, the frequency of the typical IR carrier wave for most IR remotes is around 38 kilohertz. This is much higher than the typical characters per second sent. As you will see, there is a good reason for doing this.

IR interference is all around us
IR controllers must operate under these conditions

Here is how this is done.

- By modulating the pulses of light at a much higher frequency, a smart sensor, like the ones used on many electronic devices can tune to a specific frequency. While there is a lot of IR noise in our environment, little is in the 38 kilohertz range where the sensor is listening.
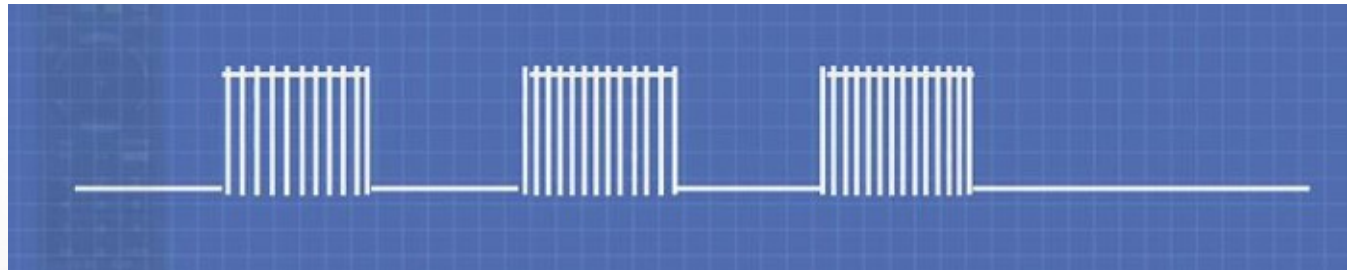
The IR controller works much like Morse Code

- The lower frequency IR pulses, like CW dots and dashes ride on a much higher frequency carrier.

- Ham radio uses many different codes to send messages.
    - We are all familiar with Morse code, but there are others. For example psk31 uses its own unique set of codes to send letters and numbers.
    - The Morse code characters were chosen to be human friendly. Others, like psk31 were chosen to be machine friendly.

How IR controllers work

- Each button on the controller sends out a unique sequence of long and short pulses

- These codes differ from manufacturer to manufacturer,, and for a very good reason.

    - After all, you wouldn't want your Panasonic TV controller inadvertently turning on your Sony stereo when you change the channel on your TV.

The typical IR receiver module

- Decodes the 38 kilohertz signal

- Cleans, amplifies, and then sends data in the form of pulses to software in the controlled device which makes sense of it all and reacts accordingly.

- These receiver modules cost less than a dollar and can be salvaged from most any electronic gear that operates remotely.
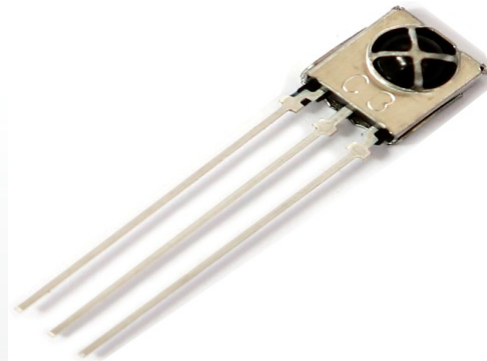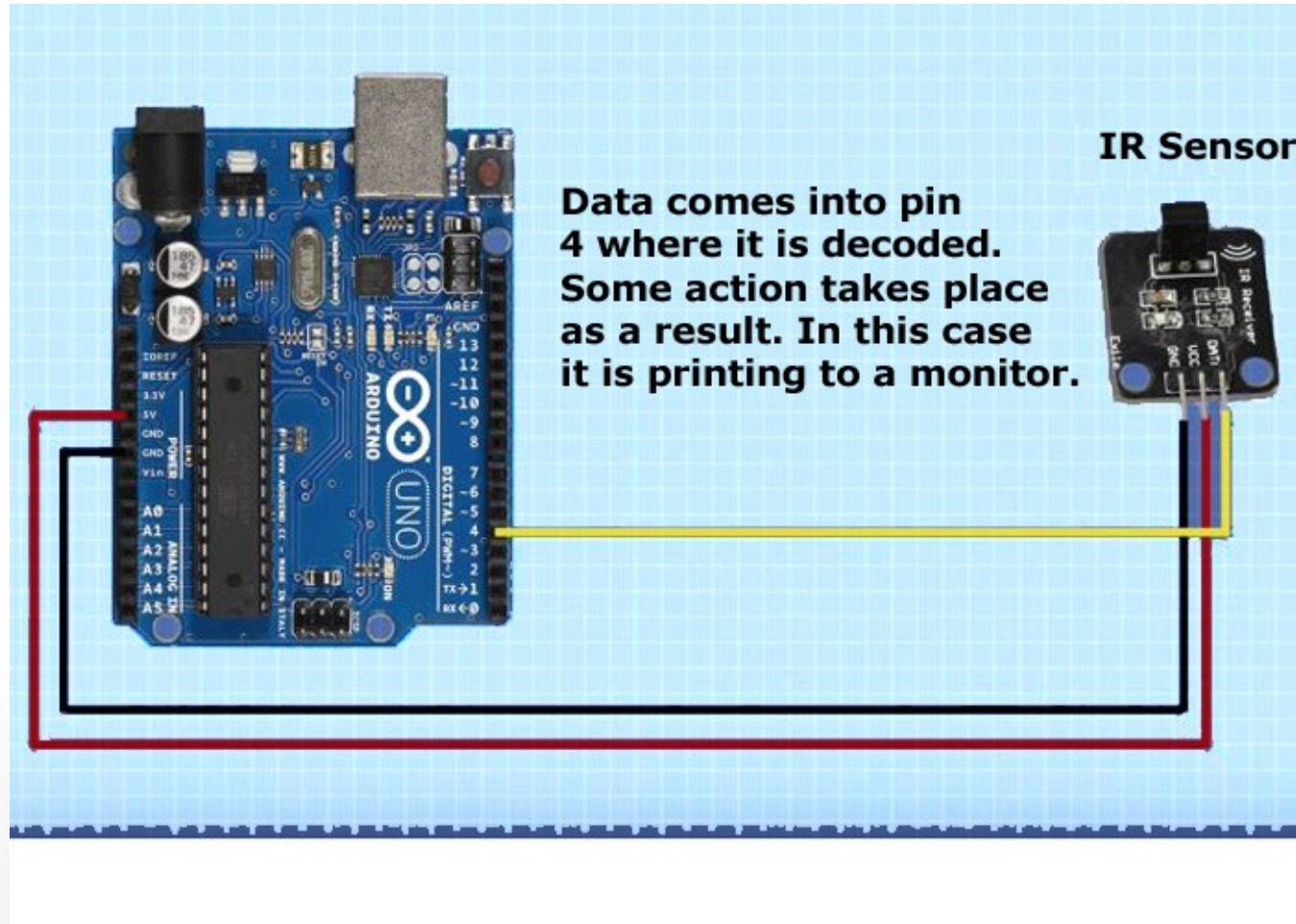
There isn't much to the wiring. There are only three connectors to deal with

- These are + 5 volts, Ground, and Data

- The Arduino micro controller with the proper software can decode the the data coming from the IR module, and respond in some way. In this example, by outputting text to a monitor, depending upon which key is pressed.

Here is the Arduino setup

IR Sensor

Data comes into pin 4 where it is decoded. Some action takes place as a result. In this case it is printing to a monitor.

The software is rather straightforward

- Each button is associated with a hexadecimal code.

- Software on the Arduino is able to read these codes, and react appropriately.

- In this example, each of the buttons from 0 to 9 is associated with a hexadecimal number. And, each hexadecimal number in turn is associated with text.

- Pressing a digit from 0 to 9 results in the text associated with each key being printed to the monitor.

Summary

- Infra red controllers send short and long pulses of modulated IR light, similar to the way CW dots and dashes turn on a carrier wave of a much higher frequency.

- The modulation frequency for the typical IR controller is 38 kilohertz. This is much higher than the typical IR signal pulse rate.

- The modulated IR is picked up by an IR receiver module which is tuned to the 38 kilohertz signal output from the IR controller. Received pulses are cleaned up, amplified, and then sent to a micro controller for further processing.

The IR Remote Show and Tell Setup