MEKATRONIX IR ANALOG HACK

by
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Limited Liability: *The user holds Mekatronix harmless for the consequences of this hack and the user assumes all responsibility thereto.*

Caution*: This hack essentially destroys the digital detection capability of the IR detector. Do not perform it unless you have soldering and manual skills and the objective of creating an analog IR detector.*

1 Instructions for an Analog Hack of the Digital IR Detector

The IR detectors operate as digital devices and can be converted to analog devices. This hack applies to the SHARP GPIU58X (Mekatronix MIR58x32D) or the GPIU58Y (Mekatronix MIR58Y40D).These two parts possess identical electrical characteristics. The hack will produce the Mekatronix parts MIR58x32A and MIR58Y40A, respectively. The three leads of the GP1U58X project from the back of the can in line with the viewing lens. Those of the GP1U58Y project perpendicular to the viewing lens, allowing for easy printed circuit board mounting. The unmodified Sharp has only a single digital output pin. This signal is taken from a Schmitt trigger in series with a 40KHz bandpass filter and signal amplifier. An integration element (0.1µf capacitor) is applied before the Schmitt trigger.

Gain access to the Sharp miniature, internal, printed circuit board by carefully bending the lower lid back. Careful! Bending the lid too many times will cause the metal to fatigue and break, thus, eliminating the lower part of the faraday cage protecting the device from electromagnetic interference. Examine the exposed side of the Sharp printed circuit board. Refer to Figure 1 in the following discussion.
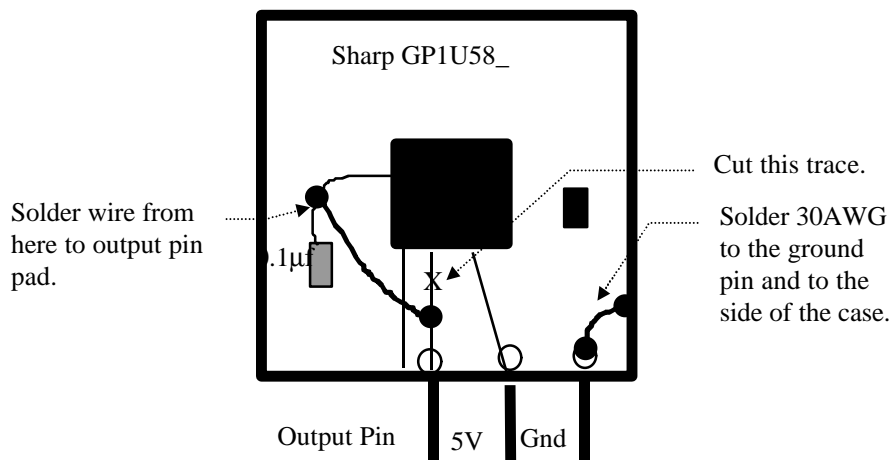

Figure 1 Converting a digital IR sensor to an analog IR sensor requires cutting the trace to the Output pin, soldering the Gnd pin to the side of the case, and connecting the output of the 0.1 µf capacitor to the Output pin.

Place the can so that the wires point toward you (GP1U58X) or up toward you (GP1U58Y). Cut the trace to the output pin (leftmost inside pin). Soldered 30 AWG wire directly to the top of the 0.1 microfarad capacitor on the lower left and to the output pin. Solder the ground pin on the far right to the case with a small piece of wire and a large blob of solder. Be sure to make a good connection. The output pin will now give the analog response. For practicality, it is much easier to solder to the capacitor terminal than the trace itself. Now, close up the can. The hack is complete.

The analog output voltage will vary from about 1.5 volts to 2.5 volts with a rise time of about 100ms and a fall time of about 50ms. The processor A/D converter will typically provide digital outputs in the range 88 to 130, yielding about 5 bits of precision.

The effective range of the hacked IR sensor depends upon the IR emitter illumination level and degree of beam collimation. With a current of 5ma through uncollimated IR emitters, the effective range varies from about 4 inches to 16 inches, ideal for proximity sensing.