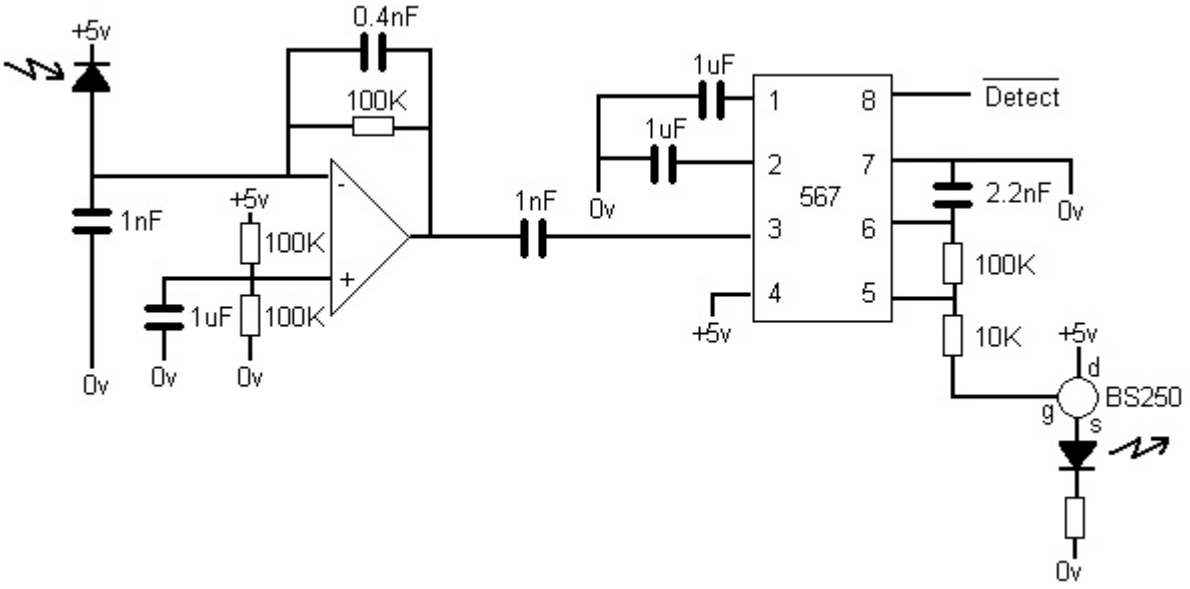
Active Infrared Reflective Detector utilising 567 tone decoder IC

Derived from Matthijs Hajer's 'Infra Red Train Detection Port', http://home.planet.nl/~m.f.hajer/irport.htm.



Like most things this circuit was put together using what I had to hand. A BS250 isn't necessarily the ideal choice but it was the simplest solution to hand for ensuring the transmitter LED came 'on' anti phased to the 567, this being done because the op-amp for the receiver inverts the phase of the received signal. I suspect it's not turning fully on so an alternative part would probably give a stronger signal out of the transmitter?

I didn't bother with the potential divider between +5v and pin 5 of the 567 as Matthijs had things, I couldn't really see much point and things seem to work without it.

I was a little puzzled at Matthijs' choice of RC values for the receiver op-amp as according to the text book I looked in they gave nowhere near a match for the emitter frequency. For my circuit I get:

567 tone frequency = 1/(1.1RC) = 1/(1.1x2.2nFx100K) = 4.132KHz

detector filter frequency = $1/(2\pi RC) = 1/(2\pi \times 0.4nF \times 100K) = 3.979KHz$

To provide 'gap avoidance' I use two receivers spaced a few centimeters apart, using the 1nF capacitor means I simply connect these as a 'wired or' to pin 3 of the 567. I am considering a circuit with two 567 IC's and some logic circuitry so I can get a directional detection signal.

Whilst trying out the detector I noticed at one point when a particular locomotive passed over the transmitter / receiver pair buried under the track I go a loss of detection. On investigation I found this happened as a screw on the underside of the body passed over the detector. I realised that with the transmitter and receiver mounted pointing vertically it is possible to block the receiver's view of the transmitter's beam. I suspect that if they were each mounted 10^{O} off vertical, towards each other, this would no longer happen. Also the received signal should become much stronger.