

BCD frequency counter

Written by Hans Summers

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This frequency counter isn't the easiest to read, nicest, best frequency counter you can build. But if all you can find is a few 74HC390 and some ordinary 5mm red LED's, it does the job and is easy and fast to make! This counter reads 0 - 40MHz to a resolution of 100Hz. Readout is binary coded decimal (BCD), with the least significant bits at the top. The photo at top left shows the counter reading its own internal 2MHz clock. The display shows 020001, meaning: 2,000,100 Hz. The least significant digit (100Hz) rounds UPWARDS (receives one more pulse than it should) due to the way the gating logic is implemented. In actual use this should not be a serious problem.

I used a 2MHz crystal because that was what was available. Each half-74HC390 (dual decade counter) block divides the 2MHz oscillator by 10. At the output of IC1b (pin 6) is a 5Hz signal consisting of 20ms high, 180ms low. The leading edge is differentiated by the 33n / 4k7 RC combination, and provides a reset pulse to the display counters IC5-7. The signal is further gated by IC1c, producing a 10ms low period at its output pin 8, followed by a 190ms high period. This is then OR'ed with the input signal such that counting can only occur for 10ms. The count sequence therefore consists of:

1. Reset pulse, followed by 10ms wait
2. Counting period, 10ms long
3. Display period, 180ms long

There are therefore five measurements per second. Since there is no latch, the display flickers at a rate of 5 times per second. During the 20ms flicker period, half of the time is spent actually counting, so a faint blur is visible on the unlit LED's due to this counting period. I did say, it isn't the nicest, best, etc. The IC layout and circuit diagram are shown below (click for larger images).

{gallery}bcdfreq/circuit{/gallery}

Construction

The sides of the case are made from a half-sized (200g) Heinz baked bean tin, soldered to a 2-sided PCB rectangular frame (made from two L-cuts). The half-sized tins (200g) are better for homebrew enclosures, since the full size ones have corrugated sides for strength. The half-sized ones do not have this corrugation and perfect sheet metal can easily be cut from them! It was very easy to cut a strip of tin about 15mm wide, and solder it to both sides of the PCB frame.

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The IC's are stuck upside-down on the rear of the front panel, using glue. The LED's are on the front panel, with two small holes drilled through for their leads, one of which is countersunk to insulate it from the groundplane. The result is quite compact and easy to build. When the case (tin sides soldered to rectangular PCB frame) was complete, I soldered it to the rear of the front panel. Note the label on the tin side of the case, written in solder "ink", which says "G0UPL 2006".

Finally I cut a lid from a piece of old single-sided PCB (phenolic material), and screwed it to the frame using six self-taping screws. Two small holes carry the DC supply and signal input into the box.

{gallery}bcdfreq/photos{/gallery}