

30m QRSS beacon: Controller

Written by Hans Summers

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The QRSS controller uses an Electrically Erasable Programmable Read Only Memory (EEPROM) to store the sequence of transmitter states to make up the QRSS message. It is unique amongst QRSS beacon controllers in so far as it does not require a PC to operate or program, and it contains no microcontroller!

The QRSS controller circuit diagram is shown right at the bottom of this page since it is large and may take a while to load if you have a QRS internet connection. It contains a timing chain to generate 10Hz, 1Hz, 3 second and 10 second pulses from a 3.2768MHz crystal.

The heart of the controller is the 28C64 EEPROM which contains the programming information for the QRSS beacon message. The address bus is generated by 3 binary counter chips IC 7,8 and 9. In RUN mode they are clocked automatically by one of the timing chain signals, dependent on bits d1 and d2 of the currently addressed byte. This controls the dot length. In PGM (program) mode the counters are clocked by up/down buttons on the front panel.

Two latches IC12 and IC13 contain the address of the last byte of the message sequence, programmed by a front panel button. Comparators IC10 and IC11 cause the counters to reset when this value is reached in the RUN mode. Necessary switch debouncing is taken care of by IC14. Simple!

Note that this circuit doesn't necessarily represent the optimally efficient way of achieving the desired function. It was one of those circuits (like most of my projects) which didn't start off with a complete design in my head, I just started building it based on rough ideas, and from there it kind of grows by itself. This also explains the appearance on the board of one piggyback mounted 74HC390 IC3, and two small vertical boards for IC2 and IC4. The DAC resistors are on a small board attached to the back of the transmitter partition.

Construction

I used my usual method of plain matrix board point to point wiring for the digital controller section. For the 30m transmitter I used "ugly" construction, with the 74HC240 on its back glued to the unetched PCB. This is important for heat sinking purposes.

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The cabinet for the beacon is also made of SRPB single-sided PCB material. I like this technique because you can quickly and inexpensively build a nice-looking box with the exact dimensions required. The lid is secured by 6 self-tapping screws to wall brackets also made from PCB fragments. Power and output connections are currently via holes in the back wall, awaiting a time when I manage to find some suitable connectors.

Note the space to the right side of the box for future enhancements - perhaps a variable attenuator to reduce the output power?

More photographs, and circuit diagram

`{gallery}qrssctrl{/gallery}`The front panel shows the row of switches and LED's used for programming the EEPROM in PGM mode. In RUN mode, the LED's indicate the current position in the message sequence and exactly what is being transmitted. On the photo showing the underside of the board, you can see what the point wiring on the underside of the controller board looks like. I prefer this method with plain (no copper tracks) matrix board, since it allows a very compact and easily changed layout.