WWVB updated re-modulator for classic clock systems

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Outline

This is a reasonably simple system that gives excellent results in restoring classic WWVB clock systems to operations. The concept is very simple. Using a single chip clock IC that delivers the cmos level timecode simply re-modulate a locally generated carrier with that data. It will absolutely not fix the phase tracking receivers used for phase comparison.

Currently tested clocks are Spectracom 8170, Netclocks, and TrueTime DC 60. The system can support many receivers at one time. It has 6 outputs. More could be added easily. It also has pull down resistors for those clocks looking for an antenna connection.

Details

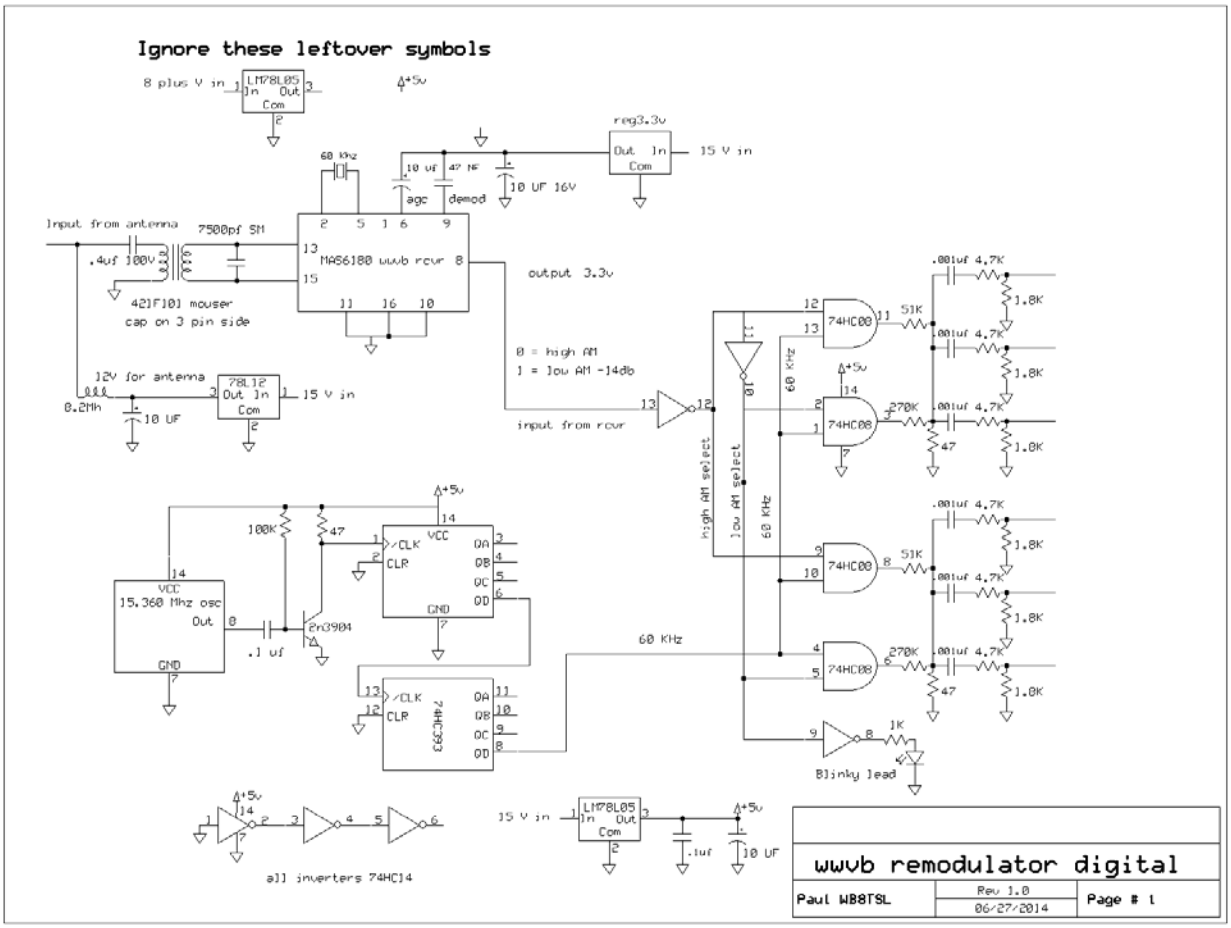
This system uses the MAS6180 wwvb clock chip. Previously released a CME6005 receiver that works equally as well. However both chips are difficult to obtain today and the good news is that many of the wwvb clock time units available in stores can be used. To be described later.

As with all of my projects there are no guarantees, minor support and will never be a kit. They are a way for the user to get an idea about how to solve a problem.

A comment on the schematic there are several symbols in the upper left corner that popped in and I can not remove. Please ignore them. The 5V regulator and ground. I am using ExpressPCB a free application for the drawing.

Picture below of the remodulator the blackbox and the working clocks. The spectracom 8170 is in another rack.

Schematic



Description

Starting on the left side is the receiver input IC typically these use a loopstick. However in my system I use a 10’ X 10’ square shielded loop antenna with active preamp. Therefore the 12 volt regulator feeds that antenna with about 10 ma of current. This antenna makes a massive difference on the east coast of the US and also reduces interference from Rugby England also on 60 KHz. It couples to an isolation transformer and into the MAS6180 IC. This IC uses 3.3V as the supply. Its output is a cmos 0-3.3V signal.

This feeds a 74HC14 inverter to be converted to a 5V cmos signal for the remodulator. As much as I would have liked an all 3.3V system the cmos logic needed 5V for the first stage at 15.360 MHz from the clock oscillator.

The remodulator consists of the 74HC08 and two sections for selecting full carrier or a carrier 14 DB lower. This could have been created a number of different ways with selector logic. But this works very well. The 51K and 270K resistor work with the 47 ohm resistor to act as an attenuator of the overall signal. Its about 1-3mv at the summing point. I added additional attenuation and signal splitting to get down into the 300uv range. Literally the 3mv overloaded the receivers. This divider also consists of a

1.8K ohm resistor to ground to provide a pull down for active antenna checking by the netclock radios as an example.

There are no LC filters on the output. Each receiver does a fine job of cleaning up the signals internally.

The system draws 30 ma at 15 V. Most wasted in the regulators power and blinky LED.

Other receivers

It seems that many of the commercial cheap atomic clocks you find in the stores could be pressed into service. I have looked at several $6 approx from discount stores and they consist of 2 boards.

The receiver and the clock. The receiver seems to take 3 V and has 4 wires.

+3	less then 1 ma
Ground	
Timecode	cmos level
Power on	pull low to turn on the chip. Takes about 2-3 minutes to acquire the signal.

If you can figure out this combination then the receiver can be used. You may need to invert the signal to the remodulator. But there are leftover sections in the 74HC14 that can be used.