A PITCH SHIFTER FOR SELECTIVE LEVEL METERS

A variety of surplus SLM's are available on E-Bay or other places. SLM's are excellent receivers, especially for chasing Non Directional Beacons at LF. A number of these SLM's are using a high beat note. The beatnote of the Wandel & Goltermann SPM-3 is 1500 Hz. The HP 3586C has a 1800 Hz pitch. Most people find these high pitches uncomfortable to listen to. However, there is an other reason to use a lower beat note. Consider two non directional beacons, which are 30 Hz apart. At 1500 Hz, this means a 2 percent frequency difference, but at 500 Hz this is 6 percent. Hence the human brain can distinguish much easier between two signals at a 500 Hz pitch, than at 1500 Hz.

Figure 1. shows the BLOCK DIAGRAM of the PITCH SHIFTER.

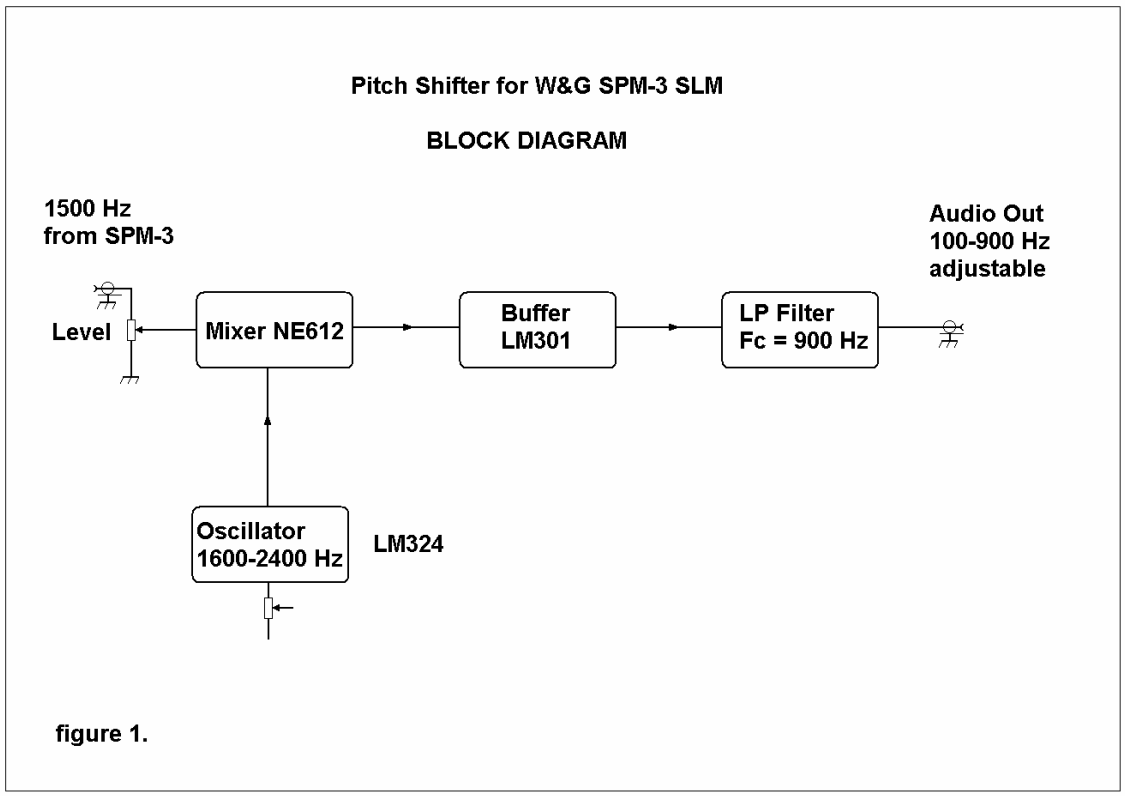

figure 1.

The audio from the SPM-3 or other SLM is fed into the input of a NE612 Gilbert Cell mixer. The Level contol adjusts the input level, which is critical for lowest distortion. A separate Wien Bridge Oscillator generates the required signal to convert the 1500 Hz. The output pitch is dependant from the frequency of the oscillator. The beat note can be set to any frequency in the 100 – 900 Hz range.

Figure 2 is the circuit diagram of the MIXER, BUFFER and LOW PASS FILTER.
The AUDIO IN is connected to pin 1 of the NE612. The other input, pin 2, is connected to ground via a 1 µF capacitor. The 600 mV-tt oscillator signal is connected to pin 7. The balanced outputs, pin 4 and 5 feed the buffer amplifier, a LM301. I used this opamp, because they were available. However any other opamp can be used as well. The LM301 drives the seven element Low Pass Filter with the correct source resistor of 3300 ohm. The output of this filter is terminated by an other 3300 ohm resistor.

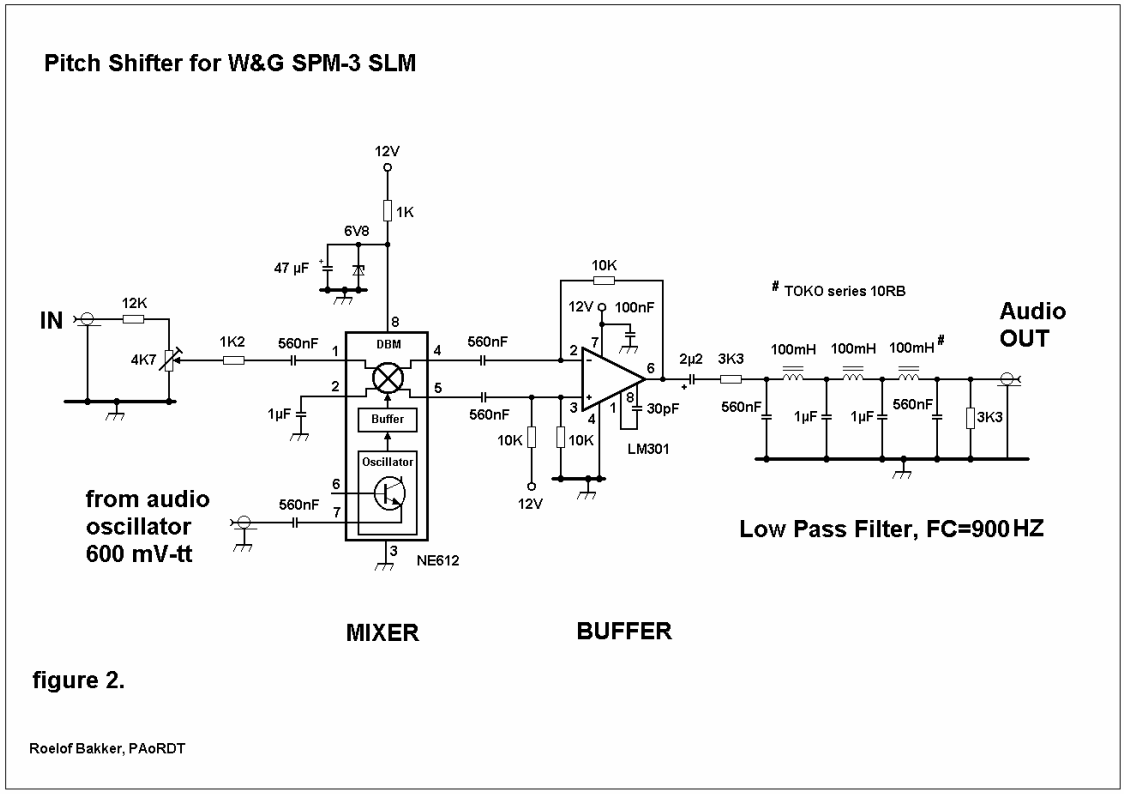

figure 2.

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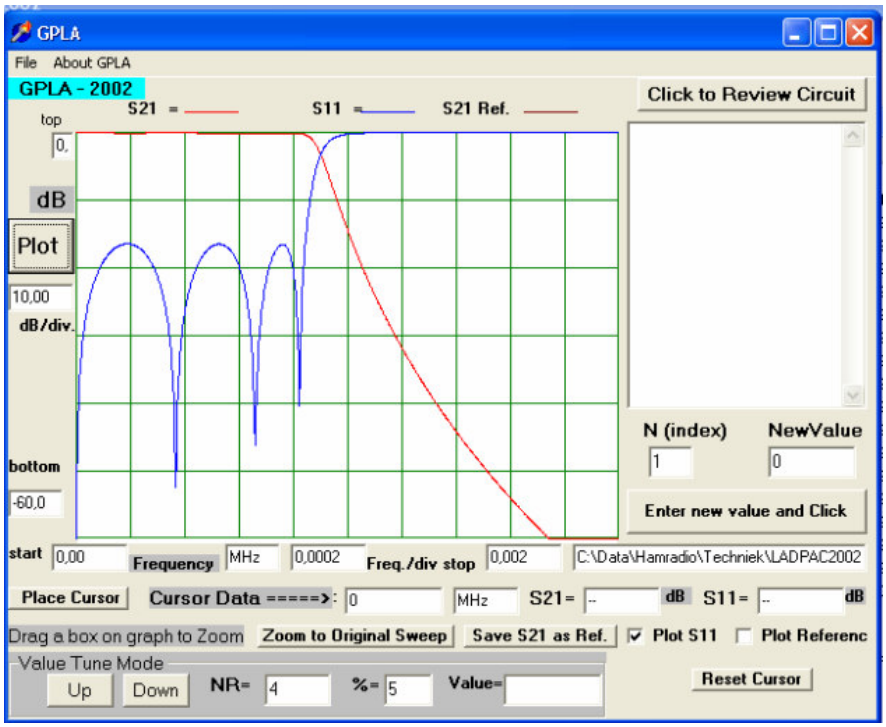
Figure 3 gives a frequency plot of the Low Pass Filter.
The vertical scale is 10 dB/div, the horizontal scale is 200 Hz/div.



The oscillator is a unconventional Wien Bridge Oscillator. Instead of using a twin potentiometer, this circuit needs only one. Thus a ten-turn potentiometer with a precision dial can be used. The tuning speed of the SPM-3 is aproximately 1.2 kHz per revolution. The Wien Bridge Oscillator can be set up for 100 Hz/rev. With proper calibration a 1 Hz read out is possible. See for the circuit diagram figure 4.

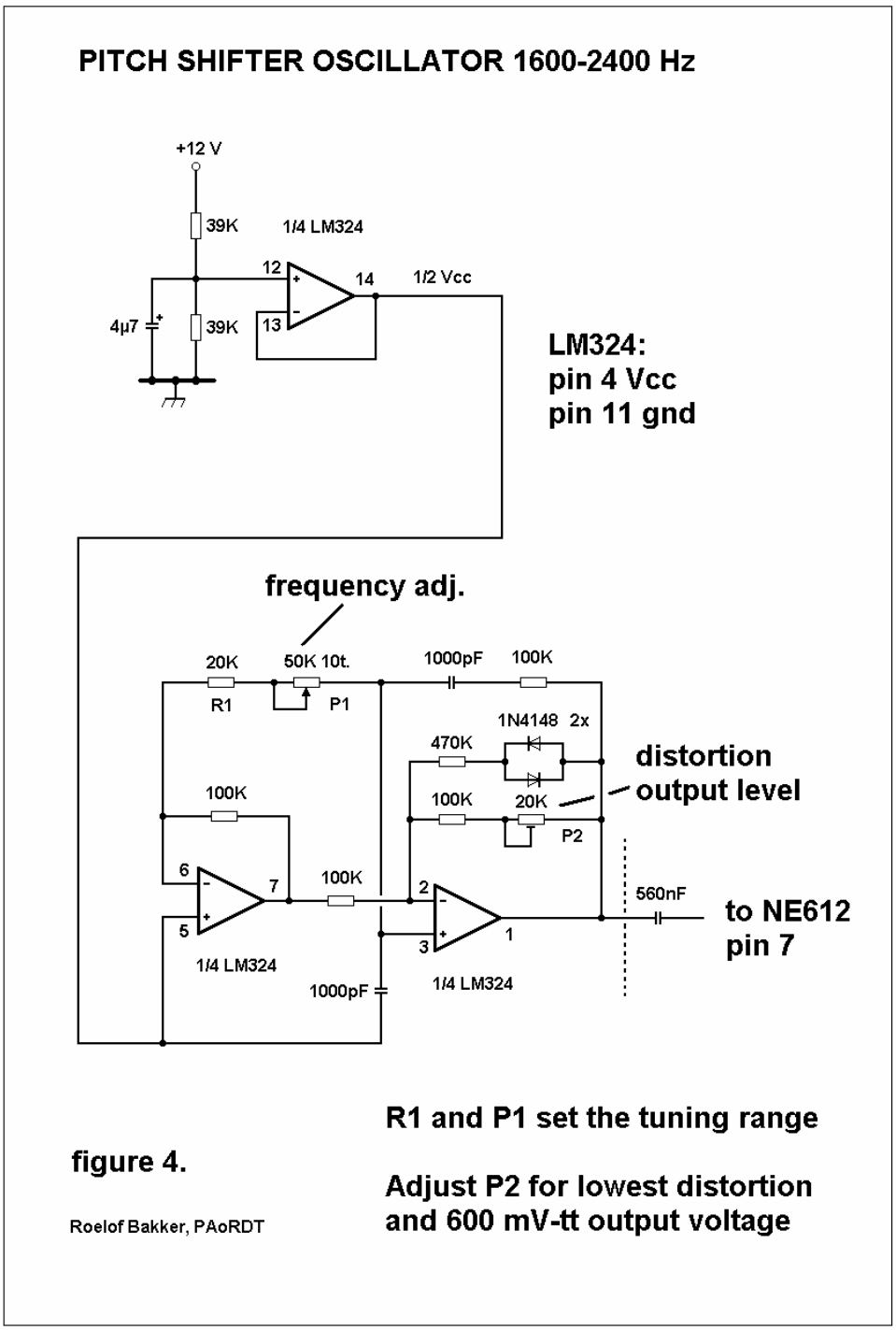


figure 4.

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The described circuit is part of an ad-on unit for a SPM-3. This unit also contains a tuneable pre-amp for LF, a 25 Hz audio LC filter, audio amplifier and a PIC-chip frequency counter. Because the audio filter is centered on 500 Hz, the ten-turn potentiometer has now been omitted and a the pitch is set to 500 Hz. In use it is completely transparent. If you do not know it is there, you would not notice it at all.