

Preamplifier for RF Sweep Generator



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The RF sweep frequency generator ('wobulator') published in the October 2008 issue of Elektor has a receiver option that allows the instrument to be used as a direct-conversion receiver. This receiver does however have a noise floor of only -80 dBm, which really should have been -107 dBm to obtain a sen-

sitivity of 1 μ V. So, for a good receiver some more gain is required. A wideband amplifier, however, generates a lot of additional noise as well and as a consequence will not result in much of an improvement.

As an experiment, the author developed a selective receiver with a bandwidth of about 4 MHz. Because a gain of at least 35 dB is

required, the preamplifier consists of two amplifying elements.

The input amplifier is designed around a dual-gate MOSFET, type BF982. This component produces relatively little noise but provides a lot of gain. The output stage uses a BFR91A for some additional gain.

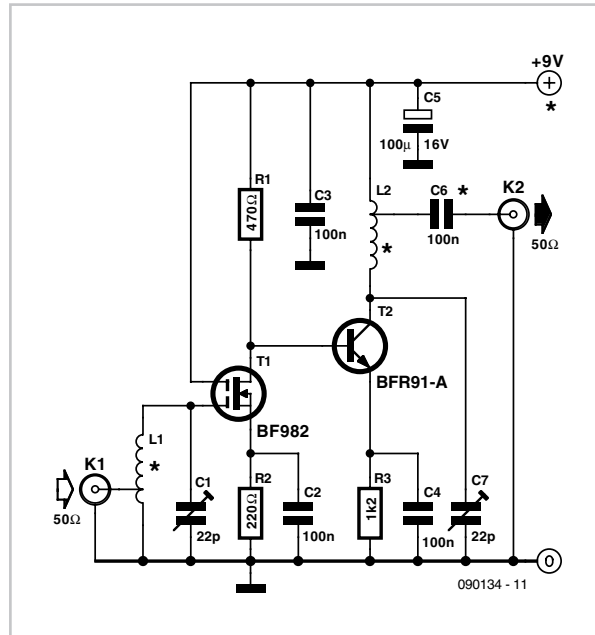
Preamplifiers where both the gate and the drain are tuned often struggle with feedback via their internal capacitance. Here, the drain circuit has a relatively low impedance, which prevents this from happening. In the prototype that was tested, the input and output are located at right angles with respect to each other to prevent inductive coupling (see photo). Despite the high gain, the amplifier was perfectly stable even without any shielding.

The two air-cored coils in the circuit both consist of 4 turns and have an internal diameter of 6 mm, made from 1-mm diameter silvered copper wire and with a tap after 1 turn.

The amplifier is mainly intended for the 144 MHz amateur band, but with other coils can also be used for the FM broadcast band, for example. FM detection is achieved by tuning near the edge of the IF filter.

At an offset of 15 kHz this is only a few dB lower than at the centre of the pass-band, so that damping is not noticeable. The measured sensitivity in the 2 m band was about 1 μ V (6 dB).

A good antenna always contributes to the reception, of course. A wideband (scanner)



outdoor antenna will give good results. Adding this wobulator/receiver option results in a nice monitor receiver. By setting the scan frequencies of the spectrum analyser to 144 and 146 MHz (or 148 MHz where applicable), any signal within this range is directly visible. When a signal is detected it is merely a case

of clicking the scan stop button and then clicking on the signal in the display window using the right mouse button. After this, the receiver switches directly to this frequency and you can listen to the signal. You can subsequently resume the scanning so that you can continue to look for other signals.

For narrowband FM detection you need to select the FMN button in the window for the receiver and this then provides the required offset for the edge detection at 25 kHz bandwidth. This value is adjustable via the 'setting' menu (default is 12,500 Hz) and can be changed experimentally for best results.

To power the circuit you can use a 9-V battery. It is also possible to power the amplifier directly from the RF sweep generator, if output capacitor C6 is replaced with a link; in the 'options' menu you will then have to select the option 'use probe'.