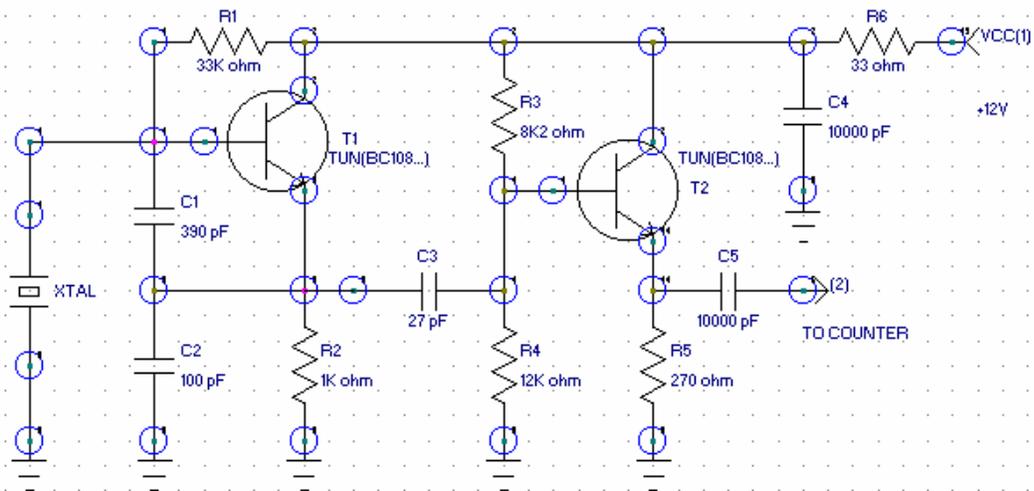


# Crystal Filter with Variable bandwidth for CW/SSB

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I like to have crystal filter with variable bandwidth which will satisfy SSB/CW use and I try some design with ladder crystal filter .I felt disappointment with results ,first filter insertion loss was change very much with change of bandwidth and second input/output impedance was far away from 50 Ohms. I adore modules with 50 Ohms impedance because it is very easy to “play” and make new receiver/transmitter design on board it’s like RF “LEGO” brick. Here is results of design, see figure 1, I made in very mighty RF CAD Program Microwave Office 2001 which is possible to free download on address [http:// www.mwoffice.com](http://www.mwoffice.com) as 30 days trial version. Practically I made this crystal filter, some kind of half lattice filter ,and agreement with design was very good. To obtain good agreement it is necessary to match crystal units in some kind test oscillator see figure 2 During the matching crystal units we are measuring frequency on the counter and the difference between units for good match is less than 60-80Hz. Crystal units are very cheep about 1.5 DEM or less and it is possible to use this design for any crystal frequency in crystal fundamental mode practically to the 25-30 MHz .Also is possible to use crystal units from old PC boards than the price is practically near zero(be careful PC crystals are sometimes third overtone (24MHz example) and sometimes are not good for filter use because of spurious response(parasitic pass close to the working frequency)). Crystal filter is near 50 Ohm system and it is possible to cascaded to obtain better filter skirt. I suggested that crystal filters are between IF amplifier (very easy build with MMIC MAV11 from Mini Circuits or similar type ) . Varactor diodes are from the FM receiver BB204 (104)type, it is two diodes type in one package and for this purpose I connected this two diodes in parallel . Control voltage is changing on R potentiometer from 1V to 10V and I appreciate to use stabilised voltage .If we have intension to use crystal filter only for CW work it is possible to decrease bandwidth (-3dB) down to 200Hz or even less if we connect parallel C to diodes (for example 47pF) than the relative change of filter bandwidth will be reduced also we shall increase insertion loss .One more thing for CW detection it is necessary to use USB carrier. Also if we don’t like to have variable bandwidth it possible to use fixed capacitors instead varactor diodes .Experimentally it is necessary to determinate fixed capacitors because values depend from crystal type and wanted bandwidth .Some practical guide for SSB C have to be small( typically around 33-47p) and for CW (C around



CRYSTAL TEST OSCILLATOR

100-330pF) .I made few crystal filters of this type for other frequencies (8MHz ,10.7MHz and 20MHz)with fixed bandwidth and filters are very good especially for the CW use. GL with construction 72/73 Tasa YU1LM/QRP

