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# A Software Controlled Radio Preselector

*A Tunable Bandpass Filter Bank for the
HF Bands (1.8 MHz to 30 MHz).*

The SCR-Preselector prototype is packaged in a Hammond Instruments case.

**Features:**

- PC controlled through a graphical user interface (GUI).
- USB v2.0 compliant, for data communication with PC. Plug and Play feature.
- Tested under Windows XP and Windows Vista32 Operating Systems (OS).
- Can perform its functions as a standalone unit.
- Compatible with software defined radios (SDR).
- Removes the strong signals radiated back to the antenna from quadrature mixers.
- Improves your average receiver or scanner to deal with strong signals, on the most noisy and crowded bands.
- Connected to an exciter as a tunable band pass filter, it reduces harmonics generated in the exciter.
- Complete receiver front-end for your projects.
- Joined to a VFO, the preselector can perform a tracking tuning function.

## The SCR-Preselector — A First Line of Defense Against Interference and Static:

The SCR-Preselector, pictured in the lead photo, is connected in series between the antenna and the receiver. Tuning to desired signal keeps the preselector bandwidth centered at the operating frequency, adding selectivity and protection to your receiver. The SCR-Preselector rejects or reduces out of band unwanted interfering signals, improves signal to noise ratio and protects against interference from strong signals like AM/FM broadcast stations. It can also be helpful in preventing interference during multi-multi contest operations.

The high linearity of the preselector is preserved thanks to a passive design that uses large toroidal cores and reliable mechanical relays for switching functions, instead of nonlinear semiconductors that cause distortion and exhibit low tolerance against strong signals and static.

Direct sampling SDRs are protected against false images since the SCR-Preselector incorporates a low pass filter (LPF) with an enhanced stop band of more than 60 dB. This filter has the ability to provide a very sharp transition from pass band to stop band at a cut-off frequency of 30 MHz, attenuating signals in the VHF region that could mix with the sampling frequency of its analog to digital data converter.

The SCR-Preselector incorporates gas discharge tubes to provide safety against static and voltage transients. Further, the unused antenna input is short-circuited to ground.

## Brief History

In September 2006 I attended a conference at the Whitton Amateur Radio Group, at which Jeffrey Pawlan, WA6KBL, had the kindness to give us during his European tour. The talk was all about Software Defined Radio, and the WinRAD computer programs, how it came about, how it works and where will be going in the future.

Motivated by his speech I became truly interested in SDR. I began playing around with quadrature sampling detectors, also called Tayloe detectors. This is a nice piece of radio technology. Soon I noticed that despite its excellent features, it still needs a good front-end circuit to condition signals before they reach the mixer. I focused my interest on this problem, and with the help of my old friend Xavier Junqué de Fortuny, a

software engineer, we started the job. First of all, because Xavier lives in Barcelona, Spain, and I live in London, England, we established a broadband link through the Internet, with audio/video capabilities. One year later, the SCR-Preselector was born.

## Overview

The core of the SCR-Preselector is the tunable band pass filter bank, which is complemented with the necessary switching, protection, filters, amplifier and control circuitry as shown the block diagram in Figure 1 and the assembled prototype of Figure 2. The incoming signals pass through the antenna selector relay, and then go to the bypass relay. From there, the signals either bypass the preselector or enter a step attenuator that offers a selection of 0 dB, 6 dB, 12 dB or 18 dB. Those attenuation values match the standard calibration of S meters.

Next, the input signals enter a broadcast band (BCB) high pass filter. This is a so-called "brick-wall filter," which attenuates spurious signals from strong AM broadcast stations as much as 120 dB. Such signals are well known enemies of shortwave receivers. I have stretched the effects of this filter into the medium wavelength band. It has a very sharp slope, as Figure 3 shows. The filter has minimum attenuation of all signals at 1.8 MHz and higher frequencies, including the CW portion of the 160 m band.

At this point, the input signals reach the tunable band pass filter bank, which is arranged in five overlapping bands that are user selectable. Each filter is a classic serial tuned LC circuit, and offers narrow bandwidth with little attenuation. A set of eight switchable capacitors of 1 pF, 2 pF, 4 pF, 8 pF, 16 pF, 32 pF, 64 pF and 128 pF emulates the variable capacitor needed to tune the series resonant circuit. The control program

# A Software Controlled Radio Preselector

**M Carnoy**

**A Software Controlled Radio Preselector:**

Radio Receivers for Systems of Fixed and Mobile Communications Vasiliy V. Logvinov,Sergey M. Smolskiy,2022-05-13 The textbook acquaints the reader with the architecture of receivers of analog and digital radio systems helps to study the stages of designing a modern radio receiver and reveals the reasons and methods for its effective operation in networks for various purposes Particular attention is paid to the methods of generating and processing signals in the receivers of digital systems with multiple access which make it possible to provide data transfer rates close to the maximum possible according to Shannon As a textbook for students studying methods of optimal signal reception the book will also be useful to specialists in the field of telecommunications involved in the development of radio receivers The book shows how the development of theoretical circuitry and integrated technologies led to the active introduction of algorithmic methods for signal processing changed both the design of receivers and the methods of forming the information flow in free space MIMO beamforming The creation of a global 5G network based on heterogeneous networks puts forward new requirements for the architecture of receivers which are determined by the requirements to achieve high data rates low time delays or use in networks with coordinated multipoint transmission and reception CoMP To consolidate the knowledge gained the book includes a complete set of materials for online classes including questions and answers a guide to solving problems for each chapter and computer modeling units of receivers in the MicroCAP environment based on preliminary calculations Recent Trends in Communication Networks Pinaki Mitra,2020-08-26 In recent years there has been many developments in communication technology This has greatly enhanced the computing power of small handheld resource constrained mobile devices Different generations of communication technology have evolved This had led to new research for communication of large volumes of data in different transmission media and the design of different communication protocols Another direction of research concerns the secure and error free communication between the sender and receiver despite the risk of the presence of an eavesdropper For the communication requirement of a huge amount of multimedia streaming data a lot of research has been carried out in the design of proper overlay networks The book addresses new research techniques that have evolved to handle these challenges *Software Defined Radio* Walter H.W. Tuttlebee,2002-03-12 Over the past few years software radio has transitioned from an esoteric academic idea to a rapidly commercialising technology that in the coming decade will revolutionise the mobile telecommunications marketplace Written for industry professionals in engineering and commercial roles as well as those in academia and research this book will provide a comprehensive context for all those already active in or entering the field Walter Tuttlebee himself a pioneer of software radio in Europe has gathered contributions from many of the acknowledged world experts in software radio leaders operating at the heart of the software radio world today who share their experience and insight into the background the present and the future evolution of the technology and the industry Contributions from North America Europe and Asia ensure a comprehensive overview of the global SDR scene The structured

approach ensures that the book comprehensively addresses the key issues in the title the origins of software radio what has been and is driving its commercialisation and what is happening on the international scene The book includes a comprehensive review of the origins of software radio in the defence industry an insider s view of the origins evolution role and activities of the SDR Forum a summary of the MIT Sloan study into the drivers of global success in the mobile wireless marketplace a review of end user and mobile network operator perspectives of software radio and what the value it can offer insiders summaries of recent SDR research activities in Europe and Japan coverage of the regulatory issues associated with SDR and the current approaches being taken in North America and Europe with contributions from the regulators themselves a description of the first steps to SDR standards the ETSI MExE standard descriptions of some of the first commercial software defined radio products for both defence and commercial applications Endorsed with a foreword from Joseph Mitola III the father of software radio    *Online Engineering & Internet of Things* Michael E. Auer,Danilo G. Zutin,2017-09-14 This book discusses online engineering and virtual instrumentation typical working areas for today s engineers and inseparably connected with areas such as Internet of Things cyber physical systems collaborative networks and grids cyber cloud technologies and service architectures to name just a few It presents the outcomes of the 14th International Conference on Remote Engineering and Virtual Instrumentation REV2017 held at Columbia University in New York from 15 to 17 March 2017 The conference addressed fundamentals applications and experiences in the field of online engineering and virtual instrumentation in the light of growing interest in and need for teleworking remote services and collaborative working environments as a result of the globalization of education The book also discusses guidelines for education in university level courses for these topics    **Communications Receivers: DPS, Software Radios, and Design, 3rd Edition** Ulrich Rohde,Jerry Whitaker,Andrew Bateman,2000-12-06 The latest in DSP cellular and software radio design From reception basics to cutting edge software radio design Communications Receivers Third Edition brings you a storehouse of task simplifying and task clarifying information examples and tips Written by well known experts Ulrich Rohde Jerry Whitaker and Andrew Bateman this guide covers everything from front end systems to frequency generators and controllers Topics are thoroughly illuminated for you with hundreds of illustrations diagrams and mathematical equations You ll learn the principles and practices involved in receivers and receiver systems antennas and antenna coupling amplifiers and gain control mixers frequency oscillators demodulation and demodulators digital signal processing and much more Discover for yourself why this resource has been prized through two editions by professionals and hobbyists for its ready to use insights on the theory and design of all types of communications receivers including shortwave military broadcast and direction finding This newly revised edition features Advances in DSP cellular and software radio design Details on designing operating specifying installing and maintaining every kind of receiver in common use Specific design approaches circuit examples and component specs Help with microprocessors and logic devices Coverage of important pulse and data operating

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**Table of Contents A Software Controlled Radio Preselector**

1. Understanding the eBook A Software Controlled Radio Preselector
    - The Rise of Digital Reading A Software Controlled Radio Preselector
    - Advantages of eBooks Over Traditional Books
2. Identifying A Software Controlled Radio Preselector
    - Exploring Different Genres
    - Considering Fiction vs. Non-Fiction
    - Determining Your Reading Goals
3. Choosing the Right eBook Platform
    - Popular eBook Platforms
    - Features to Look for in an A Software Controlled Radio Preselector
    - User-Friendly Interface
4. Exploring eBook Recommendations from A Software Controlled Radio Preselector
    - Personalized Recommendations
    - A Software Controlled Radio Preselector User Reviews and Ratings
    - A Software Controlled Radio Preselector and Bestseller Lists

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