

The FlexRadio FLEX-5000A™ Software Defined Radio

High Performance Software Defined Radio at its Best!

FlexRadio Systems introduces the **FLEX-5000™** family of ultra high performance Software Defined Radio transceivers. The **FLEX-5000A** integrates all I/Q data and hardware control over a single FireWire® (IEEE-1394) connection to a user provided computer.

The "workhorse" of the family is the **FLEX-5000A**. The same receiver and transmitter are common throughout the entire FLEX-5000 family, so no matter if you have the FLEX-5000A or the fully integrated FLEX-5000C™, you still have the same outstanding performance and capabilities.



*"I'm stunned at how ***good*** the FLEX-5000 receives! I've had, and still own, some pretty good radios, FT-1000MP Mk-V, TS-950SDX, and a loaded K2, and this rig is just so different, I really can't compare it to a "regular" radio. The noise reduction is just staggering. I live over a two-story commercial building, and I've always been plagued by power line noise. Now, with one mouse click, it's GONE!" Jim, KQ6EA*



A Fully Software Defined Radio (SDR)

Like all SDRs from FlexRadio Systems the **FLEX-5000** is a *fully* software defined radio. The accepted definition of a real software defined radio is one *"where components that have typically been implemented in hardware (e.g. mixers, filters, amplifiers, oscillators, modulators/demodulators, detectors. etc.) are instead implemented using software running on a personal computer or other embedded computing devices"*. The advantages of a SDR over a traditional analog radio, a hybrid DSP/analog radio or "firmware defined radio" are many. Versatility, flexibility and immunity to obsolescence are just a few of the inherent characteristics of fully software defined radios. Don't be misled by other manufacturer's claims that their radios or accessories are "software defined" when they are just really software controlled or have software defined "like" features. If you are looking for the real deal, a genuine software defined radio, then look no further than FlexRadio Systems and the **FLEX-5000**.



Top Performing Narrow-Spaced Two-Tone 3rd Order IMD Dynamic Range of ~100 dB on 14 MHz Using a 2 KHz Spacing. Not the 20 KHz Spacing Like Everyone Else Advertises!

It is becoming evident that close-in dynamic range is the most useful specification to evaluate a receiver's performance. Receiving narrow bandwidth signals under crowded band conditions are where good receivers are separated from the best receivers. Most radio manufacturer's do not publish their 2 KHz two-tone, third-order dynamic range values because it is easier to get better *looking* (higher value) numbers at 20 KHz that are not that applicable to real world operating conditions. The FLEX-5000 at 500 Hz spacing, exceeds traditional radio manufacturer's top of the line performance by as much as 2-25 dB, depending on the model and testing methodology.



Industry Leading Narrow Spaced 3rd Order Intercept Point: Greater Than 39 dBm at 2 KHz Tone Spacing.

A lot of focus in recent years has been put on the third-order intercept point (IP3) to tout a receiver's performance. This specification is not an actual measured number; it is calculated from two other parameters. Therefore the IP3 value can vary dramatically based on the tone spacing used to make the measurements. The \$10,000 radio manufacturers

publish wide-spaced (20 KHz) IP3 values of +40 dBm, but shy away from reporting the "real world" close-in IP3 values. Why? This is because performance degrades dramatically inside their expensive roofing filters.

FlexRadio took a different approach – design the receiver to handle large signals at any spacing. That means that with the FLEX-5000 IP3 and thus third order dynamic range will not degrade as tone spacing (even at 100 Hz) is decreased. In practical terms, that means you can work the weak ones sandwiched between the high powered locals.



Integrated A/D and D/A Converters

The FLEX-5000 has integrated the A/D and D/A processing hardware built inside the radio. An ultra high quality 192 KHz 24-bit ADC and DACs with exceptional performance numbers provides the spectral samples for the DSP to process. The integrated converters also eliminate the cumbersome and problematic audio cabling requirements between the transceiver and PC that were needed with the first generation software defined radios.



True Full Duplex Operation for Simultaneous Transmit and Receive

The FLEX-5000 is a *true full duplex* transceiver with independent transmitter and receiver signal paths. This means that the software can use the transmitter and receiver simultaneously for monitoring one band while transmitting on another when used with the optional full performance second receiver. With external transverters full duplex satellite operation is also possible. On phone and digital modes, you can hear and see the spectrum of your actual transmitted signal. Full duplex operation also facilitates very high speed T/R switching for CW and TOR digital modes.

Additionally, the existing **MultiRX™** capabilities that exist in FlexRadio PowerSDR™, which allows multiple receive "windows" within the passband of the DSP is also available for the main receiver. This unparalleled capability provides the most flexible receiver configuration of any amateur radio transceiver at *any* price!



True Diversity Receiving with the Second Independent Receiver

Using two separate antennas having different orientations with the optional full-featured, second high performance receiver, true **diversity reception** is a reality. Diversity reception is a well know to "top band" operators for improving the readability at the **noise floor**. By phase locking

both receivers to the same frequency you can produce "stereo diversity" which allows your brain to more easily sort the signal from the noise.



FlexWire™ Peripheral Interface Bus

With the introduction of the FLEX-5000 family of transceivers, FlexRadio Systems introduces FlexWire, an intelligent, high speed, bi-directional communications interface that allows FlexRadio PowerSDR to communicate with a host of peripheral devices such as antenna tuners, rotor controllers and band switchers just to name a few. A family of FlexWire peripherals will be forthcoming from the company. Complete specifications and the programming interface will be published to allow home brew and third party add-on products.



Single 1394 FireWire® Connection to your Computer



No longer do you have to use parallel or USB connections to your software defined radio. To fully realize all of the capabilities of the FLEX-5000 and FlexRadio PowerSDR, a high speed RF shielded interface between the computer and the transceiver is a necessity. The FLEX-5000 family of transceivers utilize a single FireWire interface to facilitate access to FlexRadio PowerSDR. FireWire is the optimal technology to interface MIDI radio control and I/Q audio with FlexRadio PowerSDR. It will even allow the future connection of multiple radios to a single PC.



Redesigned 100 Watt 160-6m Power Amp

Completely redesigned from the ground up, the new 100 watt MOSFET push-pull amplifier produces a full 100 watts PEP on 160 to 6 meters (full duty cycle, 100W ICAS). The PA has excellent spectral characteristics with low IMD and exceptional signal-to-noise (S/N) ratio that produces a phenomenally clean signal. The power amp also has the ability to be variably biased for class A or AB operation for use with external linear power amplifiers.



Optimized 11th Order Filters for all Amateur Bands from 160 to 6 Meters

The FLEX-5000 utilizes eleven, individually optimized 11th order front-end filters to cover each of the ham bands between 160 and 6 meters. Since the FLEX-5000 is a full duplex transceiver, there are separate independent filter banks for transmit and receive which is not like other radios where the transmit and receive filters are shared. These individually tuned filters

minimize potential interference from strong out-of-band signals for ultra quiet receiver performance.



Balanced Microphone Input

Operators are increasingly making a serious effort to get the highest quality audio within the recommended 3 KHz bandwidth of a SSB signal. The FLEX-5000 easily facilitates interfacing with signal processing equipment by providing a 1/4" TRS balanced audio line input. Using the balanced line-in with a microphone pre-amplifier will allow you to use a variety of ribbon, dynamic and condenser microphones for the configuration that best fits your operating needs. Or you can achieve studio quality audio by deploying a complex audio chain with equalizers, compressor/limiters, aural exciters and other effects processors.

Note: A microphone is not included with the FLEX-5000A or FLEX-5000C and must be user supplied.



High Stability TCXO for Accurate SSB, VHF+ and Digital Modes

Frequency stability is critical when operating VHF+ or HF digital modes. The FLEX-5000A incorporates a high stability temperature-compensated crystal oscillator (TCXO) which reduces frequency drift to no more than ± 0.5 ppm. For even greater frequency stability, the FLEX-5000 has a software switched, external BNC connector for connecting a 10 MHz GPS disciplined or other high stability clock source.



Three Software Selectable Antenna Connectors

The FLEX-5000 has three independent SO-239 antenna connectors that can be assigned as transmit and/or receive antennas by operating band and mode. This capability provides the ultimate flexibility in contest situations or hunting for that rare DX by being able to change to a different antenna with a click of the mouse.



Separate Dedicated Receiving Antenna

Not all antennas have perfect reciprocal characteristics, meaning that a good transmitting antenna is not necessarily a good receiving antenna. This is especially true at long wavelengths of 80 and 160 meters. Hams that are serious about "top band" operating know the advantage of using a beverage antenna for receiving. They also know that they are very poor for transmitting. To overcome this dilemma, the FLEX-5000 has a

dedicated receiving antenna connector. In fact, it provides both a RX output and a RX input (loop) to allow the use of preselectors and preamps "in-line".



Transverter Ready - Full Duplex 28 MHz IF

The FLEX-5000's incredible receiver is perfect for weak signal VHF+ and WSJT operation as a 28 MHz IF for interfacing to external transverters. The FLEX-5000 will turn your VHF-UHF-microwave setup into the highest performance station around. Full duplex operation opens the door for satellite communications as well.



Three TX Control Lines for Keying Amplifiers, Transverters, Sequencers and Other Accessories

Keying external amps, sequencers and preamps is always a daunting task, but the FLEX-5000 makes it so easy with three user assignable TX control or keying lines with variable time delays. Each TX control line can be configured on a per band basis allowing the control of multiple devices.



No External Calibration Equipment Required

The new FLEX-5000 family incorporates Built-In Test Equipment (BITE). This includes a swept signal generator, power sampler, and transmitted signal spectrum analyzer. The radio is capable of testing and calibrating itself. All models are factory calibrated and aligned to exacting standards.



Audio Line-In and Line-Out Connectors

The FLEX-5000 has consumer level (-10 dBV) line-in and line out RCA type connectors for a variety of uses, such as recording audio from a contest so you can listen to that rare DX to make sure you don't have a busted call or output streaming audio to the web from your FLEX-5000



FLEX-5000A Technical Specifications:

Please refer to the KC article, **FLEX-5000A and FLEX-5000C Transceiver Specifications** for the most current technical specifications. Please note that the specifications for the FLEX-5000A are subject to change at any time without notice.



Made in the USA

All FlexRadio Systems products are designed, manufactured, assembled, quality checked and calibrated in Austin, TX USA.



FlexRadio PowerSDR™ and the FLEX-5000 - An Awesome Combination!

The FLEX-5000™ family comes with FlexRadio PowerSDR software that performs all DSP, modulation, demodulation and control functions for the radio. FlexRadio PowerSDR is the "brains" behind the FLEX-5000's "brawn". With the release of the FLEX-5000, FlexRadio PowerSDR has been significantly upgraded and optimized to use a true multi-threaded architecture that greatly improves transmit and receiver performance. This is most notable when operating semi break QSK at 40 WPM.

Unlike those \$10,000 radios where firmware comes out once a year, FlexRadio Systems provides a constant stream of enhancements that incorporate both internal and customer supplied code. Customers simply download and install free software updates from the FlexRadio website.

Since the software is the other half of a software defined radio, visit the [FlexRadio PowerSDR Details](#) web page to discover the complete set of features the FLEX-5000A supports.