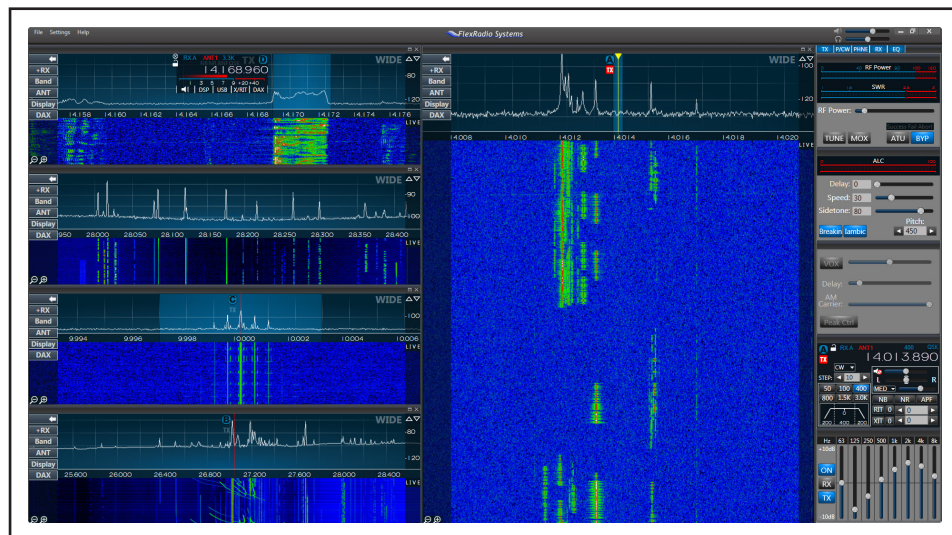# SmartSDR™ for the FLEX-6000 Signature Series

SmartSDR software solutions for the FLEX-6000 Signature Series transceivers allow you to rediscover amateur radio in a new visual experience.


Get ready for high definition visual radio. Finally, radios that "see" as well as they hear. A decade ago FlexRadio Systems pioneered software defined radio for the amateur market and set the standard for visual radio interaction. Today, SmartSDR™ sets a new bar for visual radio display and control. Following the *simple is better rule*, we built a new graphical interface that is easy to learn and use. Multiple high-definition, real-time spectral displays are at the heart of the SmartSDR experience. Intuitive controls are hidden from view to minimize clutter yet are instantly available when needed.

SmartSDR is the core of the Signature Series family, organizing all of the signal processing power in the FLEX-6000 Signature Series radios into an advanced reusable framework. First the receiver subsystems including preselectors, preamplifiers and digitizers in the FLEX-6000 are virtualized as reusable hardware blocks called Spectral Capture Units (SCUs) with specific capabilities. SmartSDR understands the capabilities of each SCU and how to harness its power.

Each SmartSDR SCU is then carved into panadapters and waterfalls, providing the operator with detailed views of the spectrum in both a real-time and a historical perspective. This allows the operator complete awareness of the spectrum where they are operating and in other bands they are monitoring. Full-performance direct digital down conversion receivers, called slice receivers, each with the capability of operating in different modes, different filtering characteristics, etc., are created out of those same SCUs. Each slice receiver can be directed to the speaker or headphones for listening, or can be streamed as digitized RF to external digital applications. Many simultaneous operating styles can be supported through the creation of multiple, operator tailored slice receivers.

What distinguishes SmartSDR is the simplification of these advanced concepts into an elegant graphical user interface that places the operator in complete control. Want to create an additional Panadapter to watch for possible 10m band openings? No problem, simply click to add the Panadapter and SmartSDR directs everything from the advanced signal processing software down to the filters in the SCU to form an optimized receiver. Want to decode all of the CW signals on 40m while working DX on 20m? It's just a few clicks away.
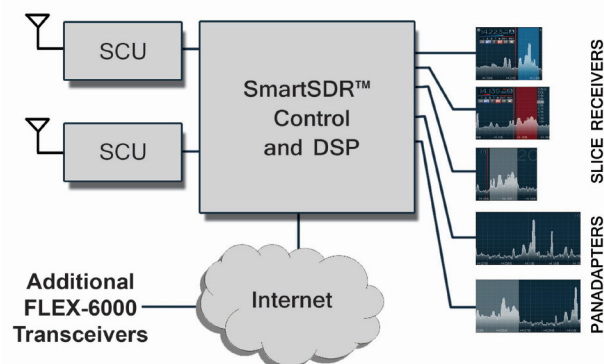
Built for Networking

SmartSDR is built from the ground up optimized for network bandwidth and control. By placing key processing elements inside the radio hardware, SmartSDR can reduce the amount of data transmitted over the Ethernet network that connects the radio to the client software. Because of the concentration of data that occurs before data is sent to the client, SmartSDR performs seamlessly in network situations where other radios simply cannot perform. SmartSDR's networking capabilities, now and in the future, will enable use in the shack, across the house or around the world.

Brick Wall Filters

SmartSDR sets a new standard in "brick wall" filtering. With industry leading filter shape factors such as 1.04 in 500Hz CW, SmartSDR filters are the best available. But SmartSDR goes beyond brick wall filters by providing dynamically adjustable filters in both width and depth. SmartSDR automatically sets the filter depth, or shape factor, tailored to the specific demands. For example, a steep filter may be required for RTTY at the same time that a low-latency filter is required for PACTOR. This enables operators to use the best filtering available on one receiver at the same time as a low-latency filter.
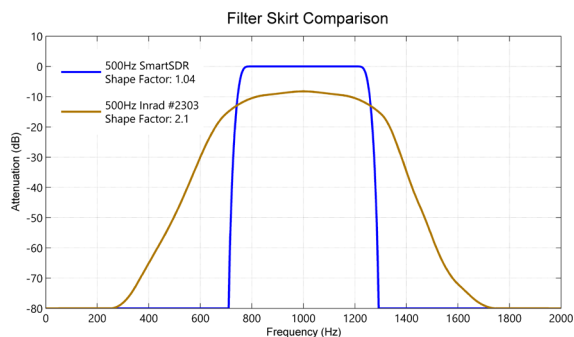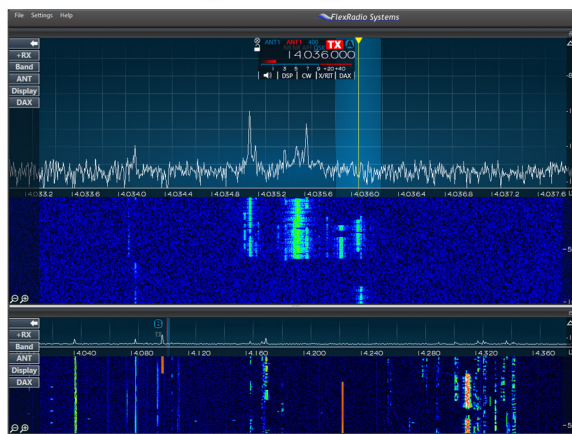

High Definition Displays

While other radios are designed at one single resolution for all window sizes or zoom depths, SmartSDR uses variable resolution displays that allow you to see the close-in action and zoom out to broad swaths of the radio spectrum. Because SmartSDR allows you to use

more than one panadapter or waterfall at a time, you are able to do both. So you can place a CW pileup occurring in 1kHz of bandwidth across your entire screen or look at the entire HF spectrum to visualize the MUF or band conditions... or both at the same time.

Working DX showing just a few kHz of bandwidth

Monitoring all of 20m (350kHz) at the same time in HD

Next Generation Waterfall

Just like the high definition displays mentioned above, the SmartSDR next generation waterfall also benefits from SmartSDR variable resolution capability so both zoomed in and zoomed out present the best detail. Unlike old waterfalls, SmartSDR shifts and resizes the waterfall, always keeping waterfall data aligned with the panadapter to provide the clearest view of the available data. Whenever possible, SmartSDR works to provide data on either end of the visible waterfall so that as you tune, waterfall data is already available and is automatically shifted into the display.
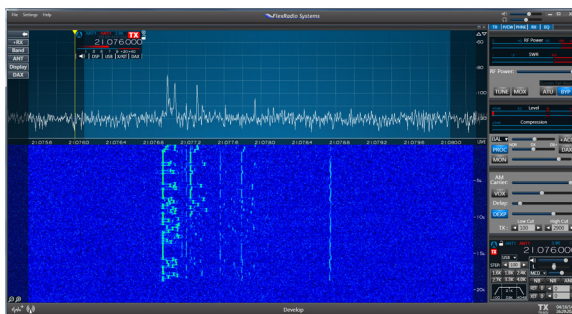
Watching JT65 and JT9 signals well into the noise on 15m

Tracking Notch Filter (TNF™)

Invented by FlexRadio Systems in 2011, the Tracking Notch Filter, better known as TNF, is capable of notching out a specific RF frequency independent of the current mode or receive frequency. With a TNF, objectionable carriers are notched from the passband regardless of the current RF dial freqency. This means that as you tune across the spectrum, objectionable carriers are continually filtered and not head. TNFs may be variable in width and depth and can be remembered so that persistent carriers will always be notched.

Quick Record/Playback

Quick Record and Playback provide the capability to record both receive and transmit audio and then play the audio back at a later time. This can be used to replay key sections of audio off air or to record another operator's transmissions and then play them back to facilitate equipment setup. Net controls can even record traffic on one channel while listening to another and then later play back for details.

Seamless Integration

SmartSDR is designed from the ground up to be integrated with existing and future applications. While traditional transceivers often require a plethora of cables to connect the radio to control software and digital programs, SmartSDR is designed to seamlessly integrate without the use of external cables and sound card devices.

CAT Integration

SmartSDR supports the legacy CAT interface which can be used to control many features of the radio as if the radio were a traditional superheterodyne transceiver. The CAT application runs alongside SmartSDR providing virtual serial ports that can connect directly to applications that traditionally connect to a serial port.

Digital Audio Exchange (DAX)

Before SmartSDR's DAX, operating digital modes such as PSK31, RTTY and JT65 required numerous cables, sound card interfaces and control hardware. DAX eliminates all of the external hardware and cables and provides a single application on the PC. Now, digital mode programs can connect directly to DAX audio channels and CAT on the PC for complete audio and control without a single cable or external device. All software required for DAX operation is included in SmartSDR. Digital modes have never been easier!
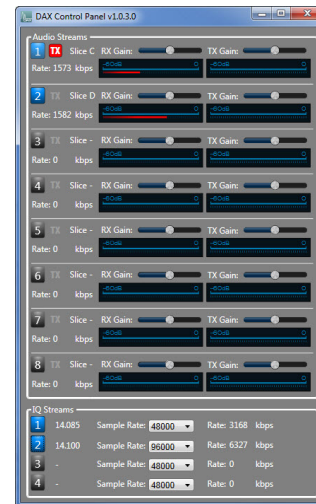
In addition to the DAX audio devices, DAX provides up to four DAX IQ devices that can stream raw I/Q samples from the radio to programs that can accept raw I/Q data such as CW Skimmer. This provides a convenient way to decode up to four (4) bands of CW or digital data in an external computer with all data coming from your FLEX-6000. This capability is provided for use at the same time the radio is used for normal transceiver operation.

Application Program Interfaces

SmartSDR currently has three convenient APIs which can be used to further expand the capabilities of the FLEX-6000 family of radios. Current API interfaces include FlexLib, a Microsoft.NET library of convenient access to all radio functions, the SmartSDR TCP/IP and UDP/IP interfaces, also providing complete radio control and data functionality and a third party iOS library is now available for use in development of applications on Apple platforms. Each of these interfaces allows control of the FLEX-6000 that goes way beyond the control functions available in more primitive interfaces like CAT.

FlexRadio Systems®
Software Defined Radios

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