July 2012

Issue: 2

THE FLEX INSIDER

A Word from our CEO

Dear Customer,

Welcome back to the ***FLEX INSIDER***. It's hard to believe a month has gone by since our last edition. Taking a new radio to market is always an exciting time for a company. Many things are happening quickly and there are bound to be surprises. We had some very pleasant surprises this week so we had to share them with you: Check out the articles below on our recent Phase Noise measurements and our EMC compliance pre-screening results. These are two very important milestones and we've passed with flying colors! Stay tuned for more excitement and surprises as we march toward first shipments of the FLEX-6000 Signature Series.

73,

Gerald Youngblood, K5SDR
President & CEO

FLEX-6000 Signature Series - Antenna Considerations

Virtually every ham that has owned an HF radio is familiar with antennas and how to connect antennas to a radio. In most HF transceivers, there is a single receiver and one or more antenna ports on the rear of the radio. The radio may also use a front panel selection to control one or more relays to select the antenna the operator wants to use. The receiver can only actually receive from one antenna at a time regardless of the number of antenna ports. Further, the radio can only listen to one band on the selected antenna at a time. In radios with multiple receivers, the problem is the same except there are two receivers and you can typically select two antennas, one for each receiver.

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Upcoming Events

August 3-4, 2012
Summerfest
Austin, TX

August 17-19, 2012
Huntsville Hamfest
Huntsville, AL

August 24-25, 2012
Joplin Hamfest
Joplin, Missouri

August 24-26, 2012
Boxboro Hamfest
Boxborough, Mass

September 1-2, 2012
Shelby Hamfest
Dallas, N.C.

This antenna paradigm, combined with the desire for high performance antennas, has led to the development of both the monobander antenna working on a single band, and the adjustable antenna allowing operation on one band at a time, but tunable across a number of bands. The SteppIR™ is one example. Each of these antennas is designed for a world where an antenna need only serve a single band at a time.

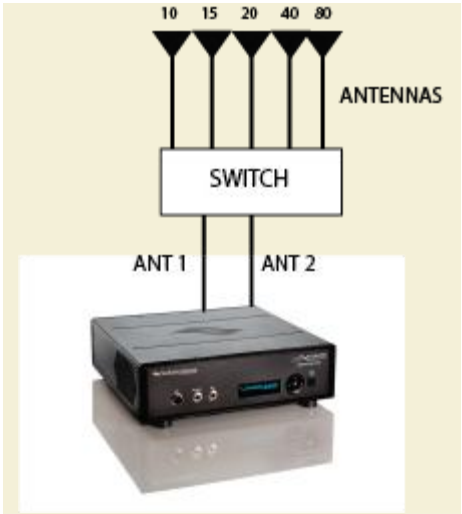

Figure 1

In the wide-band world of the FLEX-6000 Signature Series radios, the landscape is very different. The ability to put multiple slice receivers on a single antenna is a key capability of the radio. Let's talk a little about how this works: In the FLEX-6000, the radio contains one or more Spectral Capture Units (SCU) which collect the entire HF spectrum from one antenna. Then, in the bandwidth collected by the SCU, multiple receivers can be created anywhere in that HF bandwidth. So how does this apply to modern antennas?

Let's say that you have a 20m monobander. If you connect this to an SCU you could still place multiple receivers in the 20m band. But if you were to place slice receivers outside of 20m, the performance of the antenna on other bands could adversely affect the receiver's capabilities. If your 20m monobander is 30dB down (30dB worse in performance) on 28MHz, placing slice receivers in the 10m band would yield a lower system performance than most would prefer. Since a given SCU (of which there is one in the FLEX-6500 and two in the FLEX-6700) can only connect to one antenna, you could have multiple antennas connected to the radio but they might not help you take advantage of the capabilities of the receiver if they only function on a single band at a time.

Now let's say you have five monobanders, one each on 80m, 40m, 20m, 15m, and 10m as shown in figure 1. For the FLEX-6700, you could place slice receivers anywhere in two of these bands (each SCU is connected to a single antenna and hence one band). But with eight slice receivers, you might like to place one in each of these five bands to be able to watch them. This says that in order to watch more than two bands at once, you really need to have antennas that are resonant on more than one band at a time. If you do have monobanders, it says you might also want to have a single multi-band antenna in addition to the monobanders.

In the case where you have multiple monobanders and a

single multi-band antenna such as a beverage, you could place one SCU on the beverage and then connect the monobanders to other antenna ports or an external antenna switch. In this configuration (see figure 2), you could place multiple slice receivers across multiple bands using the beverage while focusing your transmit and narrow-band receiving activities on the other SCU connected to your monobanders. FLEX-6500 owners can use the same configuration to receive on the beverage then transmit or work narrow band with the monobanders. While gain and other performance numbers may be compromised on a multi-band antenna, it is generally an acceptable compromise compared to listening to a mono-band antenna outside of the band where it's tuned.

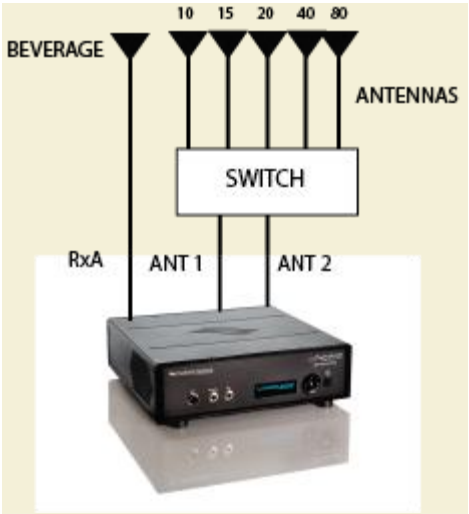

Figure 2

The recommendation, then, is to have access to at least one multi-band antenna such as a long wire, beverage, multi-band vertical, log periodic or similar antenna so you can take full advantage of the new capability of listening on several bands at once. Receive only antennas can also be connected to the RxA or RxB ports connected directly to the SCUs.

As the FLEX-6000 Signature Series radios begin to ship later this year, we will be interested to hear about how your antenna configuration takes full advantage of the FLEX-6000 Signature Series multi-band capabilities.

SmartSDR™ Software Update

Since we developed the initial SmartSDR GUI prototype earlier this year, we have received numerous inquiries as to the status of GUI development. Relative to this we would like to take a moment to explain the differences between a PowerSDR platform and the new SmartSDR platform and how that impacts development timing. Since Dayton we have focused almost all of our engineering resources on the software and FPGA code that runs inside the radio. SmartSDR is like an iceberg - 80% of the software is below the surface. Unlike virtually all other amateur radio SDR products on the market, including PowerSDR, most of SmartSDR runs on the radio's DaVinci™ digital media processor and the Virtex 6™ FPGA. The FLEX-6000 Series products operate as network radio

servers that perform all digital signal processing and control functions within the radio. SmartSDR's graphical user interface (GUI) functions as a "thin client" to perform only the display and control interface functions required to run the radio. There are even some applications envisioned where no graphical interface will be needed. Because of this "thin client" architecture, the GUI is the last thing to be completed in the development cycle as it depends on all of the underlying processing and control functions currently being coded into the radio. All we can say it that work is progressing well on the 80% under the surface and as always our engineers are working diligently to bring you a product that you will be proud to own and operate.

FlexRadio Signs Manufacturing Partner

FlexRadio Systems is pleased to announce that is has selected a manufacturing partner for the FLEX-6000 Signature Series. Austin Manufacturing Services (AMS) is located in the same business complex with FlexRadio - only a quarter mile from our office. AMS is a high quality contract manufacturer of board and system level electronic assemblies. The company began in 1994 as a captive manufacturing arm of a major DRAM module manufacturer and has grown into a broad based manufacturer for start-ups to Fortune 100 companies. AMS builds according to all of the internationally recognized quality standards and is ISO 9001:2008 certified. The FLEX-6700 and FLEX-6500 build package was released this week to AMS for materials procurement and pre-production engineering start-up.

AMS facility

FLEX-6000 Series Clears EMC Emissions Pre-screening

We are pleased to report that the new FLEX-6700 transceiver passed EMC radiated emissions pre-screening on the first pass with significant headroom. This is a significant milestone in that this is the most difficult of the EMC tests to complete and can take the most time to diagnose/correct if problems are found. While other tests are required, this is the one typically with the highest design risk. We will be required to repeat all of the tests on the final production units when they roll off the line in early fourth quarter but the hard part is behind us!

FLEX-6000 Phase Noise Measurements

In modern receivers, one of the most important specifications for real world performance is phase noise dynamic range (reciprocal mixing). Any noise on the receiver's oscillator(s) in turn modulates out of band strong signals to produce interference to adjacent signals of interest. This in turn limits the receiver's ability to hear weak signals in the presence of strong signals. Also, the same noise on a transmitter's oscillator(s) will in turn cause wide band transmitted noise. This noise becomes quite evident in multi-multi events such as Field Day or contest station operation.

The preliminary specifications provided in the FLEX-6000 Signature Series brochure projected an industry leading phase noise of -147 dBc/Hz at a 10 KHz offset and -152 dBc/Hz at a 100 KHz offset. After detailed phase noise measurements in the lab, lets just say we have a great big smile on our face! More details will be provided in an updated brochure upon shipment of the radio.

FLEX-6000 Frequently Asked Questions

Are the FLEX-6000 Series radios Part 90 (Land Mobile Radio) certified?
The FLEX-6500 and FLEX-6700 are designed to meet FCC Part 97 amateur radio emissions requirements.

I understand the FLEX-6000 Signature Series radios are direct sampling and the FLEX-Series radios (FLEX-5000, FLEX-3000, FLEX-1500) are direct conversion. Can you highlight the differences in these two architectures?
The FLEX-Series (1000, 1500, 3000, 5000) radios employ a direct conversion receiver architecture. The RF signal is amplified and then presented to a Quadrature Sampling Detector or QSD. The QSD circuit operates at the desired RF frequency to covert the incoming signal to a pair of wide bandwidth audio outputs. The phase of this output is offset by 90 degrees, known as Quadrature. These I and Q signals are then sampled in real time using high performance audio frequency Analog and Digital Converters (ADC) to create a digital stream representing the bandwidth of the receiver. QSD receivers are characterized by very high dynamic range and exceptional linearity because there are no intermediate frequency stages to distort the signal. QSD receivers are only limited by the bandwidth of the audio ADCs and balance issues in the detector because the QSD is a balanced mixer of sorts.

By comparison, the FLEX-6000 Signature Series takes the conversion of RF to digital to a new level - Direct Sampling. Using state of the art high bandwidth ADCs, the entire HF spectrum from 10kHz to 77MHz is sampled at the same time (plus 135MHz-165MHz in the FLEX-6700). In the FLEX-6000, the Spectral Capture Unit (SCU) performs this function in real time delivering the

digitized RF spectrum to the radio's Field Programmable Gate Array (FPGA) for additional processing. Direct Sampling in the SCU is characterized by extremely linear signal recovery and very low distortion. After all, there are NO MIXERS in the FLEX-6000. It's this Direct Sampling architecture in our SCUs coupled with SmartSDR that allows the FLEX-6000 Series to be "everywhere at once".

Will there be an interface similar to Virtual Audio Cable (VAC)?
Digital modes are extremely popular in amateur radio today and we believe the FLEX-6000 Series will be a stellar performer in these modes. Because there are so many different digital mode programs currently available that expect a connection to a sound card, there will always be a need for some form of sound card emulation. Virtual Audio Cable (VAC), developed by Eugene Muzychenko, has been the staple for sound card emulation with our existing FLEX-Series radio products. VAC is a Windows driver that is installed on the client PC then configured to act as an audio tunnel between programs that interface to sound cards. Once VAC and the client programs are configured, the operation is seamless. The FLEX-6000 will initially ship with the SmartSDR Windows interface. This means the thin client portion of SmartSDR will run on the same PC as your digital mode program. Programs like VAC can be used today to perform the sound card emulation interface.

We recognize that Windows drivers such as VAC require a certain amount of initial setup so we are working on new technology to integrate sound card emulation directly into the SmartSDR ecosystem, making digital mode setup even simpler. Stay tuned! We'll let you know as this technology matures. In the meantime, there is an existing reliable solution to get you on the air with your favorite digital mode program.

Can I do diversity reception with the FLEX-6500 using two slice receivers or will I need a FLEX-6700 with two SCUs?
True diversity type reception requires reception from two unique antennas. In the Direct Sampling world of the FLEX-6000 Signature Series radios, each SCU is connected to its own antenna. This means that a FLEX-6700 with its two SCU front ends is required for enhanced diversity modes such as null steering and beam forming.

Will the FLEX-6000 have TNF?
FlexRadio's unique Tracking Notch Filter (TNF) software technology will be implemented in SmartSDR!

Will the FLEX-6000 ATU have the advanced tuning algorithm that expanded the matching range like what was done for the FLEX-3000?
We are leveraging the advanced tuning algorithms developed for the FLEX-3000 in the FLEX-6000 ATU. Additionally, we have enhanced the power detection circuitry to dramatically improve tuning time and accuracy.

Can an additional SCU be added to a FLEX-6500 to make it a FLEX-6700?
No. The Spectral Capture Units in the FLEX-6000 Series are very complex RF digitizer subsystems. It's just not practical from an engineering standpoint to make this an upgrade option on the FLEX-6500. Additionally, the FLEX-6700 uses higher performance FPGA and DaVinci media processors to handle the additional load of two SCUs.

Do I need a PC to operate the FLEX-6000 or will it run "stand alone"?
The answer to both halves of this question is YES. The initial release of SmartSDR with the FLEX-6000 Signature Series radios will include a "thin client" user interface connected via Ethernet running on a Windows PC. This is a fancy way of saying the user interface for the FLEX-6000 will run on your PC. But unlike our current FLEX-Series of radios running PowerSDR, all the complex digital signal processing, including demodulation, filtering, and even display processing, will run directly on the FLEX-6000. This means that all of the radio functionality will continue to operate even if the client is disconnected. Why is this important? In future versions of SmartSDR, you will have the ability to do advanced remote networking where the client isn't in the same room or even city as the FLEX-6000. This is an exciting part of the FLEX-6000's future.

End of FLEX-6000 Signature Series Limited Edition Promotion

As announced on July 18, 2012, FlexRadio Systems will be ending the FLEX-6000 Signature Series Limited Edition Promotion at 11:59pm, August 5, 2012. Starting August 6, 2012 all orders placed will be for the standard version of the radio platform and will not include the Limited Edition benefits specified below. In addition, the introductory pricing being offered on all models will end and price increases will go into effect. New retail pricing on the various models will be as follows -- FLEX-6500: $4299,
FLEX-6700R: $6399 and the FLEX-6700: $7499.

To recap, on May 18th, 2012, FlexRadio Systems introduced the addition of the FLEX-6000 Signature Series line of radios to our product offering. The initial offering included 3 radios, the FLEX-6500 and FLEX-6700 transceivers, plus the FLEX-6700R high performance receiver.

Since the announcement, FlexRadio Systems has been offering a Limited Edition version of all three platforms. Priced as follows: FLEX-6500: $3999, FLEX-6700R: $5999, FLEX-6700: $6999, the Limited Edition versions include the following:

1. A place in the queue for shipments targeted to begin in Q4 2012
2. A Limited Edition branded radio with developer's signatures
3. Free major/minor software updates and FlexAdvantage Help Desk support during second year of ownership.
4. FLEX-6700 customers also receive a FLEX-6700 Signature jacket with name and call sign
5. Regular communications regarding progress of the new radios

All three platforms will begin Limited Edition shipments in the fourth quarter of 2012. Be sure to pass the word to friends and family so they can take advantage of the Limited Edition pricing. Or, if you're interested in upgrading, now is the time to lock in your low rate.

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