Sherwood Engineering HF Test Results for RDI

Mode: Flex-5000A Serial # 3207-5025 Test Date: 08/15/2007

IF BW 6.6 kHz –6 / -60, kHz	6.60 / 6.74		Ultimate	86 noise	dB
IF BW 2.4 kHz –6 / -60, kHz	2.39/ 2.54		Ultimate	90 noise	dB
IF BW 500 Hz –6 /-60, Hz	500 / 640		Ultimate	98 noise	dB
Front End Selectivity (A – F)			11th order low pass		B+
First IF image Rejection @ +/- 18 kHz			90		dB
Dynamic Range 50 kHz		dB	IP3		dBm
Dynamic Range 20 kHz	96	dB	IP3	+29	dBm
Dynamic Range 5 kHz	96	dB	IP3	+29	dBm
Dynamic Range 2 kHz		dB	IP3		dBm
Dynamic Range 1 kHz		dB	IP3		dBm
Blocking above noise floor at 100 kHz spacing w/ 1.0 uV signal			123		dB
Phase noise (normalized) at 10 kHz spacing:			-123 (flat)		dBc*
Noise floor, SSB bandwidth 14 MHz, preamp off / on			-115/-127		dBm
Noise floor, CW bandwidth 14 MHz, preamp off / on			-123/-135		dBm
Sensitivity at 14 MHz, preamp off / on			1.3 / 0.3		uV
Noise floor, SSB, 10 MHz			-128		dBm
Noise floor, CW, 10 MHz			-135		dBm
Sensitivity 10 MHz			0.25		uV
Noise floor, SSB, 5 MHz			-128		dBm
Noise floor, CW, 5 MHz			-135		dBm
Sensitivity 5 MHz			0.25		uV
Noise floor, SSB, 2 MHz			-122		dBm
Noise floor, CW, 2 MHz			-130		dBm
Sensitivity, 2 MHz			0.6		uV
Noise floor, SSB, 1 MHz			-122		dBm
Sensitivity, 1 MHz			0.5		uV
Noise floor, SSB, 200 kHz			-122		dBm
Sensitivity, 200 kHz			0.6		uV
AGC Threshold at -3 dB, preamp off / on			2.0 / 0.5		uV

(Depends on setting of AGC threshold / RF gain setting)
(Was set at 100 out of max setting of 120)

Drift	1 Hz
Notch filter (auto notch)	35 dB
Preamp	16 dB
Attenuator	None

Distortion:	SSB	AM	AM Sync
100 Hz	<0.1 %	<0.3 %	<0.3 %
200 Hz	<0.1 %	<0.3 %	<0.3 %
400 Hz	<0.1 %	<0.3 %	<0.3 %
1 kHz	<0.1 %	<0.3 %	<0.3 %
2 kHz	<0.1 %	<0.3 %	<0.3 %
3 kHz	<0.1 %	<0.3 %	<0.3 %

*Phase noise:
The phase noise shows a flat characteristic to at least 100 kHz, rather than falling off at 6 dB per octave. The factory believes this problem is caused by jitter in the A/D clock.

Comments:

The Flex Radio SDR-5000A is the next iteration following from the SDR-1000 transceiver. Introductory pricing of the 100 watt version was $2499.00, with the regular pricing as of October 2, 2007 at $2799.00. The older 1000 was tested for comparison purposes only, since it was discontinued when the 5000 was announced. SDR stands for Software Defined Radio.

The SDR-5000A has only one Firewire connection between the radio "box" and the computer. A Firewire driver must be installed before the 5000A is connected, and then the PowerSDR software installation must be run.

How did the SDR-5000A perform in the lab? Filter ultimate rejection was phase noise limited between 86 and 98 dB, depending on mode / filter bandwidth. The skirts were as close to vertical as one could ever hope for.

As this is radio converts RF directly to the 9 kHz DSP IF, the 18 kHz image rejection was a respectable 90 dB.

Due to the design of the radio, the dynamic range is constant, regardless of signal spacing. There is no up-conversion or first-IF filter ahead of a 2nd or 3rd mixer. The receiver measured 96 dB, phase noise limited, at both 20 and 5 kHz test spacings. The factory spec is somewhat higher, but uses a different test method.

Blocking was a rather low number, in comparison to the other parameters, which were excellent. Phase noise normally falls off with greater frequency separation, but in the case of the 5000A, the noise was constant, at least out to 100 kHz.

As with many software run radios, this radio can be a knob-twiddlers delight. Actually in this case, the changes are on the computer screen. The only area the reviewer felt compelled to play with the settings was on the AGC, in order to slow it down to be less aggressive. Even the Long AGC setting was too fast for the reviewer on weak signals. As with the review of the ICom R9500, listening to S5 signals in S5 static (QRN) was more annoying than in a pure analog receiver. This problem may possibly be mitigated by further adjustment of the AGC attack and decay settings.

Tuning the radio is generally done with a mouse, often by sliding the background frequency on top of the IF passband. One can also enter in a discrete frequency, or tune with the mouse wheel. The step size is completely adjustable in decades from 1 MHz per step down to 1 Hz per step. One can also place the cursor on a frequency digit, and use the mouse wheel to step the radio in larger steps, without having to change the default step size.

The SDR-5000A was tested with a both the DC7600 and a slightly newer DC7700 Core-2 Duo, with 2.13 GHz dual cores and 2 GB of ram. Many programs today do not utilize dual cores particularly well, and this may also be true of the PowerSDR software. While the CPU utilization of the Flex 5000A was under 20% with both PCs, at times, when tuning the radio rapidly, the 5000A would freeze for a moment. According to the manual, adjustments to buffer size can minimize this issue, but the reviewer was not successful in mitigating the problem.

A major feature of the high-end Icom radios, and most computer-controlled radios, is the inclusion of a spectrum scope. The scope in the SDR-5000A is outstanding in its resolution. The fidelity of a SSB signal is obvious on the screen. If the audio on screen is extends beyond the selected bandwidth, it is clear that selecting a wider filter may be desirable. A muffled signal also shows up on screen, with few high frequency components. Depending on the span setting, signals as close together as 100 Hz can be clearly resolved on screen. A carrier basically shows up as a vertical “stick”.

Distortion was extremely low, and in the case of the AM measurements, was measuring the distortion of the modulated generator.

The 5000 offers AM sync, and passband tuning on AM. One simply sides the passband around on screen to adjust the passband position. The AM sync mode held lock well during selective fades. It was best to start with the passband centered, and then when one desires to listen to a station for an extended time, adjust the passband tuning after the signal is locked. Tuning would normally be done with the sync turned off to avoid heterodynes from an out-of-lock condition.

There are some spurs in the 5000A from the DDS local oscillator, but to a significantly lower level than its predecessor. While most spurs were down in excess of 80 dB, some spurs were noted at higher levels. The factory says they will be implementing what they call “spur buster” in coming versions of the software to null out known spurs.

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