# Sherwood Engineering HF Test Results

Model Icom IC-9100 Serial # 02001488 Test Dates: 09/09 & 09/14/2015

| | | |
|---|---|---|
| Dynamic Range of radio, no preamp, 20 meters | | |
| Dynamic Range 20 kHz | 101* | dB |
| Dynamic Range 10 kHz | 87^ / 90# | dB |
| Dynamic Range 5 kHz | 77# / 79* | dB |
| Dynamic Range 2 kHz | 71* | dB |

# Combination of phase noise and 3rd order product
* Consisted of phase noise only
^ Spurious signals on the low side at 9, 10 and 11 kHz

| | | |
|---|---|---|
| Dynamic Range of radio, no preamp 6 meters | | |
| Dynamic Range 20 kHz | 98 * | dB |
| Dynamic Range 10 kHz | 93* | dB |
| Dynamic Range 5 kHz | 79* | dB |
| Dynamic Range 2 kHz | 70 * | dB |

*Consisted of phase noise only

| | | |
|---|---|---|
| Dynamic Range of radio, preamp ON by default, 2 meters | | |
| Dynamic Range 20 kHz | 91# | dB |
| Dynamic Range 10 kHz | 88* | dB |
| Dynamic Range 5 kHz | 76* | dB |
| Dynamic Range 2 kHz | 68* | dB |

# Combination of phase noise and 3rd order product
* Consisted of phase noise only

| | | |
|---|---|---|
| Dynamic Range of radio, preamp ON by default, 70 cm | | |
| Dynamic Range 20 kHz | 88* | dB |
| Dynamic range 10 kHz | 82* | dB |
| Dynamic range 5 kHz | 68* | dB |
| Dynamic Range 2 kHz | 60* | Db |

*Consisted of phase noise only

| | | |
|---|---|---|
| Phase noise (normalized) at 2.5 kHz spacing: | -103 | dBc |
| Phase noise (normalized) at 5 kHz spacing: | -108 | dBc |
| Phase noise (normalized) at 10 kHz spacing: | -119 | dBc |
| Phase noise (normalized) at 20 kHz spacing: | -130 | dBc |
| Phase noise (normalized) at 30 kHz spacing: | -133 | dBc |
| Phase noise (normalized) at 40 kHz spacing: | -134 | dBc |
| Phase noise (normalized) at 50 kHz spacing: | -136 | dBc |
| Phase noise (normalized) at 80 kHz spacing: | -137 | dBc |
| Phase noise (normalized) at 100 kHz spacing: | -139 | dBc |
| Phase noise (normalized) at 200 kHz spacing: | -141 | dBc |

| | | | |
|---|---|---|---|
| Phase noise (normalized) at 300 kHz spacing: | | -142 | dBc |
| Phase noise (normalized) at 400 kHz spacing: | | -143 | dBc |
| Phase noise (normalized) at 500 kHz spacing: | | -144 | dBc |
| | | | |
| Noise floor, SSB bandwidth 14 MHz, no preamp | | -126 | dBm |
| Noise floor, SSB bandwidth 14 MHz, Preamp 1 On | | -134 | dBm |
| Noise floor, SSB bandwidth 14 MHz, Preamp 2 On | | -135 | dBm |
| | | | |
| Sensitivity SSB, 14 MHz, no preamp | | 0.36 | uV |
| Sensitivity SSB, 14 MHz, Preamp 1 On | | 0.15 | uV |
| Sensitivity SSB, 14 MHz, Preamp 2 On | | 0.135 | uV |
| | | | |
| Noise floor, 500 Hz, 14.2 MHz, no preamp | | -133 | dBm |
| Noise floor, 500 Hz, 14.2 MHz, Preamp 1 On | | -141 | dBm |
| Noise floor, 500 Hz, 14.2 MHz, Preamp 2 On | | -143 | dBm |
| | | | |
| Noise floor, SSB, 50.125 MHz, no preamp | | -124 | dBm |
| Noise floor, SSB, 50.125 MHz, Preamp 1 | | -133 | dBm |
| Noise floor, SSB, 50.125 MHz, Preamp 2 | | -135 | dBm |
| | | | |
| Sensitivity, SSB, 50.125 MHz, no preamp | | 0.47 | uV |
| Sensitivity, SSB, 50.125 MHz, Preamp 1 | | 0.18 | uV |
| Sensitivity, SSB, 50.125 MHz, Preamp 2 | | 0.145 | uV |
| | | | |
| Noise floor, 500 Hz, 50.125 MHz, no preamp | | -131 | dBm |
| Noise floor, 500 Hz, 50.125 MHz, Preamp 1 On | | -139 | dBm |
| Noise floor, 500 Hz, 50.125 MHz, Preamp 2 On | | -141 | dBm |
| | | | |
| Noise floor, SSB, 144.125 MHz | | -135 | dBm |
| Sensitivity, SSB, 144.125 MHz | | 0.130 | uV |
| Noise floor, 500 Hz, 144.125 MHz | | -141 | dBm |
| | | | |
| Noise floor, SSB, 432.1 MHz | | -135 | dBm |
| Sensitivity, SSB, 432.1 MHz | | 0.130 | uV |
| Noise floor, 500 Hz, 432.1 MHz | | -142 | dBm |
| | | | |
| Signal for S9, no preamp, 20 meters | -72 / 56 | dBm / | uV |
| Signal for S9, Preamp 1 | -80 / 22 | dBm / | uV |
| Signal for S9, Preamp 2 | -88 / 9 | dBm / | uV |
| | | | |
| Signal for S9, 2 meters | -92 / 6 | dBm / uV | |
| Signal for S9, 70 cm | -97 / 3 | dBm / uV | |
| | | | |
| Gain of preamps, 20 meters | | | |
| Preamp 1 | | 10 | dB |
| Preamp 2 | | 16 | dB |

| | | |
|---|---|---|
| AGC threshold at 3 dB, no preamp | 2.4 | uV |
| AGC threshold at 3 dB, Preamp 1 ON | 1.0 | uV |
| AGC threshold at 3 dB, Preamp 2 ON | 0.39 | uV |

Test equipment information and other comments.

On 20 meters my standard ZHL-32A buffered HP 8642A signal generators were used, including 15-MHz low-pass filters. Levels set with an HP 3586C level meter. Combiner is a ZFC-4-1 200-MHz 4-way combiner, unused ports 1 & 4 terminated.

No low pass filters were available on 2 m or 70 cm.
On 2 meters, the 150-MHz buffer amps were used with a ZSC-2-1 400-MHz combiner.
On 70 cm, two HP 8447A buffer amps were used, plus a ZFSC-2-4 1-GHz combiner
Levels were set with a Boonton 9200A RF Millivoltmeter.

DR3 measurements were broadband (500 Hz) using an HP 3400A RMS meter.

Sensitivity on SSB (2.4 kHz bandwidth) is the value in microvolts for a 10 dB S+N/N ratio.

AGC threshold is reference -33 dBm (S9+40) vs. the level in microvolts where the audio output drops 3 dB.

Dynamic range values for 20 m, 2 m and 70 cm compare quite well with data published in RSGB (Peter Hart) and Adam Farson (VA7OJ).

The 9100 tested had the optional Icom FL-431 nominal 3-kHz roofing filter installed. No significant difference was measured in DR3 since phase noise (RMDR) dominates over third-order intermod. Additional insertion loss of the 3-kHz filter is 1.5 dB, but it did not affect the noise floor measurement. This filter is only available on HF and 6 meters.

The low-side spurious noted during the 10-kHz DR3 measurement was mostly eliminated by enabling the 3-kHz roofing filter. It is doubtful this minor change would be noted on-air.

The measured bandwidth of the 3-kHz filter is 8.2 kHz at -6 dB, and 7.3 kHz at -3 dB. This is similar to the bandwidth measured on an IC-7410 that clocked in an 8.7 kHz at -6 dB.

The weakest area of performance is clearly the phase noise of the synthesizer.

Rev B