Lab Receiver Test Data Comparisons

(ARRL QST Review Data, plus some data from Sherwood Engineering)

XX/YY = (preamp-off) / (preamp-on); 14Mhz operation, 500 Hz CW filter, AGC off, High Ip mode.

All measurements in dB. Lab tests and rigs can vary by several dB, so results within 2-3 dB are roughly equivalent.

*Numbers in **RED** indicate data that is 10 dB or more worse than for the K3. (A factor of ten signal power difference.)*

RIG	MDS (dBm) Sensitivity pre off / on	BDR 'Desense' 5 kHz spacing pre-amp off	BDR 'Desense' 20 kHz spacing pre off / on	IMD DR3 'Intermod' 5 kHz spacing pre-amp off	IMD DR3 'Intermod' 20 kHz spacing pre off / on	Ip3 (dBm) 20 kHz spacing 5 kHz spacing pre off / on	Ip2 (dBm) Out of band Signal Rejection pre off / on	Phase Noise (dBc at +4 kHz)	Receive Current (Also see below)
K3 (ARRL) **K3** (Sherwood Eng.)	**-130/-137** **-130/-138**	**139** (2 kHz)	**139/134** **140** (100 kHz)	**102** (2 kHz) **101** (2 kHz)	**103/99** **104**	**+26/+14** **+26 (2 kHz)**	**+79/+79**	**-133** (4 kHz) **-139** (10 kHz)	800 mA
K2	**-130/-136**	**135**	**134 / 126**	**91**	**97 / 95**	**+21/+8** (20kHz) **+21/+8** (5kHz)	**+80 / +79**	**-124**	150-200 mA
Ten-Tec Orion II	-127/-137	136	136/134	96	**92/90**	+20/+6 (20kHz) +20 (5 kHz pre off)	+82/+80	-138	3.6A
FTdx9000D	-122/-134	**127**	138/137	95	99/99	+27/+15 (20kHz) +20/+10 (5 kHz)	**+64/+66**	**-120**	110 V Supply
IC-7800 See Note 2	-127/-138/-142	**115**	137/138/135	**89**	104/103/102	+37/+21/+11 (20kHz) +22/+7.7/+0.5 (5 kHz)	*+98/+87/+84*	**-120**	110 V Supply
Ten-Tec Omni6+ See Note 1	-133	**119**	**123 (nl)**	86	97	**+12** (20kHz)	**+58**	**-117**	2A
Ten-Tec OMNI VII	-130/-140	135	137/134	**84**	**91**/91	**+11/-0.5** **+6.5 (5 kHz)**	+73/+75	**-110**	2.2A
FT-1000MP	-128 /-135	**119**	142 / 137	83	97 / 94	+15 / +5 (20kHz)	+86/+88	**-118**	2.8A
SDR-5000 (Sherwood Eng.)	-123/-135		**123**	96 (2 kHz)	96			**-123** (10 kHz)	
SDR-3000 NEW	-121/-135	**113**	**113**	98	99/99	+26/+14 +22 (2 kHz)	**+69/+45**	**-120**	2.8A
IC-7600 NEW	-131/-139	**113**	**122**	94 (5 kHz) **88** (2 kHz)	106/102	+28/+12 **+10** (5 kHz pre-off)	**+63/+59**	**-118**	2.4A
IC-756PRO III See Note 2	**-131/-139**/-141	**101**	**121**/119/113	**77**	103/100/99	+25/+14/+5 (20kHz) **-17/-29/-35 (5 kHz)**	+73/+71/+68	**-126**	3.4A
IC-756PRO II See Note 2	**-131/-139**/-141	**100**	**118/116/107**	**76**	97/95/91	+20.2/+10.2/-4.1 (20kHz)	+75/+71/+59	-130	3.5A
IC-756PRO See Note 2	**-128 / -136** / *-140*	**104**	127 / 125 / *120*	**80**	95 / 92 / *88*	+15.4 / +4.3 / ***-6.9***	**+64 / +63** / *+43*	-130	3A
IC-746PRO See Note 2	**-132/-140**/-142	**100**	125/123/118	**75**	97/96/92	+13.5/+3.7/-4	+72/70/**+54**	**-123**	1.9A
TS-870	-129 / -139	*not tested*	127 / 123	*not tested*	97 / 95	+16 / +4	**+63 / +63**	**-118**	2A
TS-930	-139	*not tested*	noise limited	*not tested*	**86.5**	**-7.75**	*not tested*	*not tested*	110V supply

See Note 1									
Ten Tec Argo V **Model 516** See Note 1	-132	**67**	**118**	**62**	***85***	**-3.4**	**+47**	**-108**	1A
Ten-Tec Jupiter See Note 1	-135	*not tested*	123(nl)	*not tested*	**85(nl)**	**+7.3**	**+53.6**	-115	1.5A
Ten-Tec Scout See Note 1	**-125**	*not tested*	**119**	*not tested*	**87**	**+5.5**	*not tested*	**-95**	600 mA
Ten Tec Pegasus See Note 1	-132	*not tested*	**110 (nl)**	*not tested*	**77**	**+7.2**	**+44.3**	**-104**	1A
TS-50	-132/-139	*not tested*	**113 / 109**	*not tested*	**90 / 88**	**+3 / -7**	*not tested*	**-115**	800 mA
FT-100 See Note 3	-133/-137	**~100**	+130/+125	**~70**	**94/91**	**+10**/+4.2	**+51.7/+52.8**	**-118**	1.5A
FT-817	-126/-134	*not tested*	**106/104**	*not tested*	**87/84**	**+5/-5.6**	+84/+88.4	**-103**	450 mA
FT-897	-133/-137	**96 (nl)**	**109/106**	**67**	**89/86**	**-1.3/-6.7**	**+67/+62**	**-102**	900 mA
IC-703	-131/-141	**95**	**121(nl)**/122(nl)	**76**	**89/91**	**+11**/+1.9	**+56/+47**	**-118**	320-580 mA
IC-706MKIIG	-136/-142	**86**	**122(nl)** / 120(nl)	**74**	**89 / 86**	**-1.3 / -11**	**+36.4 / +38.5**	**-118**	2A
Kachina 505DSP	-133 / -142	*not tested*	**103 / 103**	*not tested*	99 / 97	+15.5 / +3.5	**+49 / +30**	**-117**	2A

Note 1: *Only one set of numbers is listed because these radios use a fixed gain front end which is not switchable.* Compare their dynamic range and IP3 numbers to other rig's by using similar MDS figures to determine which set of numbers to use (pre-on / pre-off) for comparison.

Note 2: *The IC-7800, IC-756PRO & PROII and IC-746PRO have two different gain preamps. Numbers are for Pre-Off / Pre #1 / Pre #2. Pre #2 adds more RX gain than Pre #1 at the expense of dynamic range. Higher preamp gain reduces strong signal dynamic range. For comparison, Pre-Off and Pre #1 most closely match the K2's and other radio's settings and are the most commonly used positions.*

Note 3: *FT-100 5 kHz dynamic range numbers taken from swept dynamic range graphs in ARRL expanded test report.*

ARRL Results are from QST rig reviews *(K2, 2/04 (K2/100) and 3/00 (K2) reviews); IC756 PRO, 6/00; Omni6+, 11/97; FT1000MP, 4/96; Scout, 12/93; TS-50, 9/93; SGC-2020, 10/98; IC706MKII, 7/99; Ten Tec Pegasus, 2/00; Ten Tec Jupiter, 6/01; TS-930, 1/84; Kachina 505DSP, 5/98; Patcom PC-1600A, 12/00; FT817, 4/01; FT-100, 6/99, Argo V 4/2003; FT-897, 5/2003; IC-703, 7/2003; Orion II 9/06; IC-7800, 8/04; 756PRO-III, 3/05; FTdx9000D, 8/05; SDR-3000, 10/09; IC-7600, 11/09). Sherwood Engineering results are from their receiver test results page. K3 (QST, 4/08) (Sherwood Engineering, 2/08); SDR-5000 (Sherwood Engineering, 2/08); OMNI VII, 7/2007*

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5 kHz Signal Spacing (ARRL Lab Results & Comments)

Rig Minimum Supply Voltage and Current Requirements

RIG	Min. RX Current Drain	Min. Supply Voltage	Notes
K2	**150 mA to 200 mA**	**9V**	**Note 1A, 1B**
FT-1000MP	2.8A	13.5 V	
IC-756 PRO*	3A	11.7 V	
IC-756 PRO II*	3.5A	11.7 V	
Ten-Tec Omni6+	2A	12.0 V	
Ten-Tec Orion	3.1A		
Ten Tec Argo V **Model 516** NEW	1A		
IC-703 NEW	320 mA to 580		

	mA		
FT-897 NEW	900 mA		
TS-870	2A	11.7V	Note 3
TS-930	110 V supply	110 V supply	
Kachina 505DSP	2A	unknown	
Pegasus 550DSP	1A	12V	
Ten-Tec Jupiter	1.5A	12 V	
Patcom PC-1600A	3.3A	unknown	Note 4
FT-817	450mA	8 V	
FT-100	1.6 A	unknown	
IC-706MKIIG	2A	11.7 V	
TS-50	800mA	11.7 V	Note 4
Ten-Tec Scout	600mA	12 V	
SGC-2020	430mA	10.5 V	Note 2

Note 1A (K2 supply voltage): The table below shows the recommended maximum power output setting vs. supply voltage. Supply voltage was measured at K2 DC input jack in transmit mode. (The reverse-polarity protection diode, D10 on the K2 RF board, was a 95SQ015. This diode is supplied with all K2s with s/n 3000 or higher. Older K2s used an SB530 diode; add 0.3 V to the DC voltages in the table in this case. Upgrading to the 95SQ015 diode is recommended for use at low supply voltages.)

DC VOLTAGE	POWER OUTPUT
9.0 V	2.0 W
9.5 V	5.0 W
10.0 V	7.0 W
10.5 V	10.0 W

Note 1B (K2 current drain): 0.15-A minimum receive current is with receiver in OPT BATT (battery save) mode. In OPT PERF (performance) mode, minimum receiver current is approx. 0.2 A. All K2 receiver performance measurements were made using OPT PERF mode (see "ARRL Lab Receiver Test Data Comparisons" table, above).

Note 2 (SG2020): Different user's manual editions claim 11 V or 9 V minimum. SGC tech support says the 9 V claim is incorrect, and that the actual minimum is
10.5 V. This is consistent with the LM2940-10 voltage regulator used. Max power output at reduced voltages not specified.

Note 3 (TS870): Standby current drain shown. Active current drain not specified.

Note 4 (Patcomm, TS-50): Current drain not specified. Used ARRL test data.

Definitions of Receiver Comparison Test Results

nl = *test was noise limited (noise floor rose 1db before 1db of blocking desense occurred)*

MDS = Minimum Discernible Signal (3db increase above noise floor). Larger negative numbers are generally better, but too much sensitivity can reduce strong signal dynamic range and Ip3. Pre-Amp On MDS numbers of -130 dBm or more are more than adequate for most HF band operating, since band noise is typically above this number. *(Lower frequencies need less MDS (more +number) due to an increase in atmospheric noise.)*

IMDDR3 = 2 tone (20 kHz spacing) 3rd order Two tone IMD Dynamic Range. This test shows how the RX performs in the presence of multiple strong nearby signals in relation to its sensitivity (MDS). Higher is better. Pre-Amp Off IMDDR3 numbers of +95dB (20 kHz spacing) and +90 dB (5 kHz spacing) or more are considered good.

Ip3 = 2 tone (20 kHz spacing) 3rd order Intercept Point. This test also shows how the RX performs in the presence of multiple strong nearby signals. Higher is better. Pre-Amp OFF IP3 numbers of +15dBm are good, and +20dBm or more is excellent. *Note: Low RX sensitivity artificially increases the measured Ip3.*

Ip2 = 2 tone (8.020MHz, 6.000MHz) 2nd order Intercept Point This test shows how the RX performs in the presence of multiple strong out of band signals (such as broadcast signals on 6Mhz and 8Mhz creating birdies at 14Mhz). Higher is better. A Pre-Amp OFF IP2 of +55dBm is OK, and +70dBm or more is considered excellent.

BDR = Blocking Dynamic Range (20 kHz spacing). This test shows when the receiver's sensitivity begins to drop in the presence of strong near by signals. (Desense). A Pre-Amp OFF BDR (20 kHz signal spacing) of greater than 120dB is good. Greater than 130dB is considered excellent. BDR decreases on most multi-conversion receivers as the interfering signal spacing from the receiver's listening frequency is reduced. Single conversion receivers like the K2 typically do not see as much of a BDR degradation as interfering signal spacing is reduced.

Phase Noise = value read from ARRL test graph at +10 kHz from the carrier. Numbers are for the worst case band. Larger negative numbers are better. Bad phase noise contributes to poor RX Blocking Dynamic Range (desense from nearby signals) and broadband TX noise. Good values are -130 dBc or better at +10 kHz. See the actual ARRL phase noise plots in each review for details of other spurious phase noise components.

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