

RADIOS AND TNCs FOR USE IN WINLINK 2000 NETWORKING

AUG 23, 2004

VHF/UHF PACKET RADIOS - EVALUATED AT 9600 BAUD

(Edited from a table provided by Mike Tracy, KC1SX, ARRL Lab, August 20, 2004)

Radio Model / QST Issue	RX BER 12 dB SINAD 2M / 70 cm	RX BER 16 dB SINAD 2M / 70 cm	RX BER, -50 dBm 2M / 70 cm	TX BER, 12 dB SINAD 2M / 70 cm	TX BER, SINAD + 30 dB 2M / 70 cm
Kenwood TS-2000 Jul 2001 (hf/vhf/uhf)	7.9 E-5 2.9 E-4	<1.0 E-5 <1.0 E-5	<1.0 E-5 <1.0 E-5	1.7 E-4 1.5 E-4	<1.0 E-5 <1.0 E-5
ICOM IC-208H Oct 2003	9.0 E-5 7.7 E-5	<1.0 E-5 <1.0 E-5	<1.0 E-5 <1.0 E-5	1.3 E-3 4.5 E-4	4.0 E-4 2.4 E-5
Yaesu FT-7800 Apr 2004	1.5 E-3 1.4 E-3	1.4 E-4 1.0 E-4	2.1 E-5 1.7 E-5	4.1 E-3 1.9 E-3	3.5 E-5 <1.0 E-5
Alinco DR-135TP Jan 2001	5.9 E-4 -	1.0 E-5 -	<1.0 E-5 -	2.4 E-3 -	8.5 E-5 -
Alinco DR-235 Nov 2003	3.8 E-3 (223 MHz)	1.4 E-4 (223 MHz)	2.4 E-5 (223 MHz)	2.5 E-3 (223 MHz)	3.4 E-4 (223 MHz)
ICOM IC-910H May 2001 (3 band) (1.2G)	7.4 E-4 7.1 E-4 9.4 E-4	1.1 E-5 1.7 E-5 <1.0 E-5	<1.0 E-5 <1.0 E-5 <1.0 E-5	1.5 E-3 1.6 E-3 1.7 E-3	<1.0 E-5 <1.0 E-5 <1.0 E-5
Kenwood TM-D700A May 2000 (ext. TNC)	8.3 E-4 6.5 E-4	2.4 E-5 3.0 E-5	<1.0 E-5 <1.0 E-5	1.2 E-3 8.6 E-4	<1.0 E-5 <1.0 E-5
ICOM IC-2720H Mar 2003 (sep rcvrs)	5.0 E-4 1.0 E-4	<1.0 E-5 <1.0 E-5	<1.0 E-5 <1.0 E-5	4.4 E-3 9.2 E-4	1.0 E-3 2.0 E-4
Icom IC-706 M II G Jun 1999 (hf/vhf/uhf)	2.2E-3 2.3E-3	4.6E-5 8.4E-5	<1.0E-5 <1.0E-5	4.6E-3 2.8E-3	2.1E-4 1.9E-4
Yaesu FT-817 Apr 2001 (hf/vhf/uhf)	1.7 E-3 1.3 E-3	7.6 E-5 7.2 E-5	<1.0 E-5 <1.0 E-5	7.7 E-4 7.5 E-4	<1.0 E-5 <1.0 E-5
Yaesu FT-857 Aug 2003 (hf/vhf/uhf)	2.8 E-3 3.3 E-3	1.4 E-4 1.5 E-4	<1.0 E-5 <1.0 E-5	7.7 E-4 8.3 E-4	<1.0 E-5 <1.0 E-5
Yaesu FT-897 May 2003 (hf/vhf/uhf)	1.7 E-3 2.3 E-3	7.0 E-5 8.0 E-5	<1.0 E-5 <1.0 E-5	1.0 E-3 8.0 E-4	<1.0 E-5 <1.0 E-5
Yaesu FT-7100M Aug 2001	2.5 E-3 1.9 E-3	5.6 E-4 2.5 E-4	1.6 E-4 8.2 E-5	2.0 E-2 3.4 E-2	1.4 E-2 (see 1.7 E-2 review)
Yaesu FT-1500 Jul 2000	2.5 E-3 -	4.4 E-5 -	1.4 E-5 -	9.3 E-3 -	3.0 E-4 (see note 1)

Notes:

1. Data in red suggests marginal throughput conditions

2. The Yaesu FT-1500 is not really suitable for a packet backbone system because the PLL has a key-down instability problem (insufficient settling time allowed before RF output) that can cause problems with nearby repeater systems.

3. The Bit Error Rate (BER) is the ratio of the number of bits handled in error to the total number of bits transmitted or received in a given test. Thus a BER of 1 E-3 indicates that one out of a thousand bits is likely to fail to pass error free out of 1000 sent. When sending packets of 255 bytes each, this would suggest every third or fourth packet would contain at least one bit error causing the packet to be rejected. Sufficient safety margin in the radio link should exist to ensure minimal rejected packets in order to maintain the data throughput. In other words a BER of 4 E-3 would suggest that no 255 byte packets would likely ever be passed successfully. Radio FSK performance at 9600b degrades as noise becomes present in the recovered received data as well as from bandpass filter effects at low signal levels. Error rates also depend upon the method used to balance the transmitted bit format in the originating TNC as well as the

recovery format used in the receiving TNC. At 9600b data rate the bits are not handled sequentially with audio frequency shift keying as done in 1200 baud applications.

For more information regarding Bit Error Rate testing and radio evaluation see the QST article “‘9600-Ready’ Radios: Ready or Not?” Jon Bloom, KE3Z, ARRL Senior Engineer, May 1995 QST Volume 79, Number 5, available via the search engine on <http://www.arrl.org>, members only.

TNCs RECOMMENDED FOR 9600 BAUD OPERATION

A number of new radios with built-in TNCs have limited buffer size and/or limited computer COM port speed capabilities, which may hinder operation on Winlink 2000 or other (data transfer) applications requiring packet lengths greater than 128 bytes at 9600b data rates. Such radios often have provisions for interfacing external TNCs, which are recommended for such applications.

At 1200b most KISS mode TNCs will work with Paclink, Telpac, Airmail, switch and digipeater applications with the use of the AGW Packet Engine.

TNCs for 9600b:

KPC-9612

PK-96