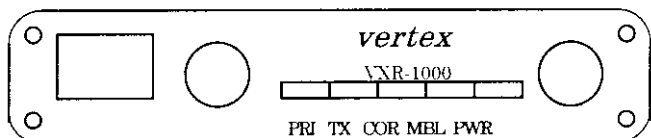


# vertex

## VXR-1000 OPERATING MANUAL

EIA 12dB SINAD	0.30 $\mu$ V
20dB Quieting	0.10 $\mu$ V
Threshold Squelch	0.2 $\mu$ V to 2 $\mu$ V
Adjacent Channel Selectivity	60dB
Intermodulation Rejection	60dB
Spurious and Image Rejection	60dB
Conducted Spurious Emissions	-57dBm
Audio Output	1W into 8 ohms W/<5% THD
Hum and Noise	40dB



The VXR-1000 Series is designed to provide extended handheld coverage by repeating transmissions in both directions through an existing high power mobile radio.

Reliability is assured by a highly integrated surface mount circuit design and a aluminum extrusion chassis. Important channel frequency data is stored in EEPROM, and is easily programmable by dealers using a personal computer and the Vertex VPL-1 Programming Cable and CE-22 Software.

Please take a few minutes to read this manual carefully. The information presented here will allow you to derive maximum performance from your VXR-1000. After reading it, keep the manual handy for quick reference, in case questions arise later on.

We're glad you joined the Vertex team. Call on us any time, because our business is communications. Let us help you get your message across.

This device complies with Part 15 of the FCC rules. Operation is subject to the condition that this device does not cause harmful interference.

## Specifications

### General

Frequency Range	150 - 171MHz
Number of Channels	16 Channels
Channel Spacing	12.5 / 25kHz
Supply Voltage	13.8V DC
Ambient Temperature Range	-30°C to +60°C
Frequency Stability	2.5ppm
RF Input-Output Impedance	50 $\Omega$
Audio Output Impedance	8 $\Omega$

### Receiver

Circuit Type	Double Conversion Superheterodyne
Sensitivity	

### Transmitter

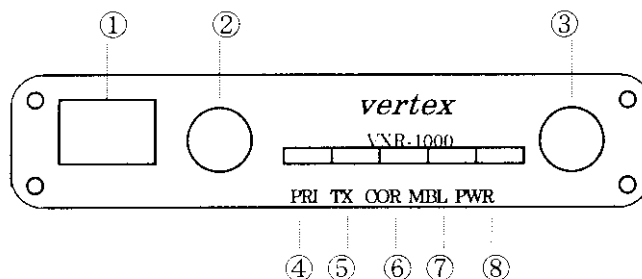
Power Output	5 / 2.5 / 1 / 0.5W
Modulation	16K0F3E / 11K0F3E
Maximum Deviation	$\pm$ 5kHz / $\pm$ 2.5
Conducted Spurious Emissions	60dBc
FM Hum and Noise	40dB

### Physical

Dimension	25.4mm(h) $\times$ 111mm(w) $\times$ 136mm(d)
Weight	400g

## CONTROL & CONNECTORS

### Front panel



#### ① Microphone Jack

Connect the microphone plug to this jack.

#### ② CHANNEL Selector Knob

This knob selects the operating channel.

#### ③ VOLUME Knob

This knob adjusts the receiver volume.

#### ④ PRI

When on, "PRI" indicates that the unit is at priority count zero and will repeat all transmissions.

#### ⑤ TX

When on, "TX" indicates that the repeater is transmitting to the handheld.

#### ⑥ COR

This lamp blinks red when the VXR-1000 is receiving a signal from a handheld, and glows red while VXR-1000 is receiving a sub-audible tone from the hand-held.

### ⑦ MBL

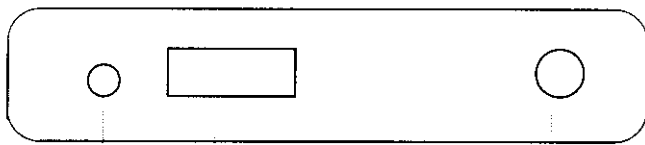
This lamp blinks red when Mobile is receiving signal from repeat or base, and glows red while Mobile is transmitting to the repeat or base.

### ⑧ PWR

This is the main "Power On" indicator for the VXR-1000.

Error Message	
No Channel Data (Operating Channel is Vacant)	TX,COR.and PWR Indicators Blinks
ARTS Out of Range	PWR Indicator Blinks

### Rear



①

②

③

### ①EXT SP (External Speaker)

An external loudspeakers may be connected to this 2-contact, 3.5-mm mini-phone jack.

### ②DSUB 9-Pin Accessory Connector

External TX audio line-input, PTT, external RX audio line-output, and other signal may be obtained from this connector for use with accessories.

Pin Assignments		Pin1	GND
Pin2	Mobile Transmit Audio	Pin3	Power Supply Control
Pin4	Mobile PTT Output	Pin5	Vcc (13.8V DC)
Pin6	Mobile Receive Audio	Pin7	Mobile COR Detect
Pin8	Mobile Microphone Audio	Pin9	Mobile TX Detect/Mobile Microphone PTT

### ③Antenna Socket

The Antenna socket is a standard 50-ohm BNC antenna connector

### Functional Description

When the user leaves the vehicle, they activate their mobile radio via its front panel or a separate switch. When the mobile radio is receiving a signal, the VXR-1000 will begin transmitting on the hand-held's receive frequency. The user is able to hear and respond to all radio traffic, including other hand-helds on the same frequency. The repeater jumpers and potentiometers are custom configured for use with the particular mobile radio to which it will be connected. The CE-22 software is used to program the repeater for the required operating parameters.

### NOTICE

There are no user-serviceable points inside this transceiver. All service jobs must be referred to your Authorized Service Center or Network

Administrator.

### Trunking Operation

When the radio is connected to a trunking mobile you wish to access the system from your handheld radio, key the handheld briefly then release the PTT key. The radio will attempt to acquire a voice channel on the trunking system by keying the mobile for 200mS and monitoring the "on-air detect" line from the mobile. If the VXR-1000 does not see the radio transmit at all (system is busy), it will send a low tone to the handheld to alert you that the system is busy. The radio will automatically retry every 5 seconds and send a "busy" tone to the handheld with each unsuccessful attempt, to indicate progress of the call attempt. If unsuccessful after 30 seconds, the radio will transmit an "intercept" tone to alert the handheld that the call attempt failed.

When the VXR-1000 detects that the mobile is transmitting, it will continue to monitor the "on-air detect" line until the transmitter remains keyed for at least 250mS to determine if the radio is merely handshaking or retrying. After successful acquisition of a voice channel, it will continue to hold the mobile's PTT active for 2 seconds and transmit a "go-ahead" blip to the handheld. You may then key their handheld to speak on the voice channel. If you do not key up within the 2-second period, the radio will unkey the mobile and send the "intercept" tone, as before.

### Optional Accessories

MH-25A8J	Microphone
MSL-100	External Loudspeaker
VPL-1	Programming Cable
CT-29	Programming Interface Box
CE-22	Programming Software (for IBM PC/compatibles only)
CT-52	T9101482 Programming Connection
Cable	Radio-to-Radio Cloning Connection Cable
T9101411	

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## Alignment

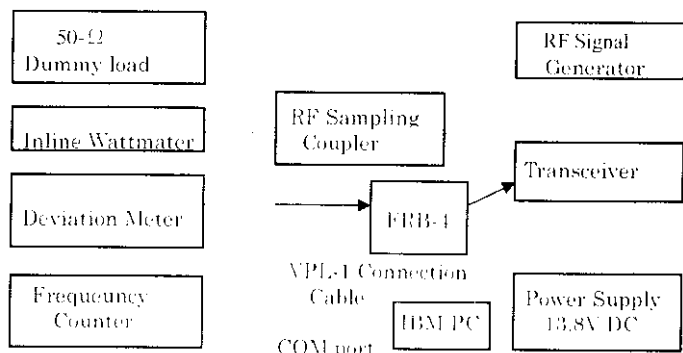
The VXR-1000 has been aligned at the factory for the specified performance across the frequency range specified for each version.

Realignment should therefore not be necessary except in the event of a component failure, or after alteration of the repeater version. All component replacement and service should be performed only by an authorized Yaesu representative, or the warranty policy may be voided.

The following test equipment is required for alignment:

- IBM PC/compatible computer w/Yaesu VPL-1 cable,FRB-4 and CE-22 channel programming diskette.
- RF signal generator: calibrated output level at 1000 MHz ( $0\text{ dB}\mu = 1.0\ \mu\text{V}$  - closed circuit)
- Deviation meter (linear detector)
- Oscilloscope
- AF millivoltmeter
- SINAD meter
- Inline wattmeter: 1000 MHz,10W scale
- Regulated DC power supply: adjustable from 10 to 17 V, 3 A
- 50-ohm non-reactive dummy load: 10 W at 1000 MHz
- Frequency counter: 0.2 ppm accuracy at 1000 MHz
- AF signal generator
- DC Voltmeter: high impedance
- RF Sampling Coupler (attenuation pad)

Before beginning, connect the transceiver and PC using the VPL-1 cable and FRB-4 as shown below and download the EEPROM data from the transceiver to the computer.



Store this data in a disk file so that it can be saved and retrieved later. Using the table below, program the channel, CTCSS, and DCS alignment settings for your transceiver version. Upload this file to the transceiver.

Alignment Channel Frequencies (MHz)

	CH 1	CH 2	CH 3	CH 4	CH 5
Freq.	150.00	174.00	162.00	162.00	162.00
CTCSS	OFF	OFF	OFF	151.4 Hz	OFF
DCS	OFF	OFF	OFF	OFF	023
POWER	5.0W	5.0W	5.0W	5.0W	5.0W

### PLL & Transmitter

Set up the test equipment as shown for Transmitter & PLL alignment. Adjust the supply voltage to 13.8 V for all steps. Refer to the Tx & PLL Unit Alignment Points photo for alignment locations.

### PLL Reference Frequency

- Tune the transceiver to the channel,#3,connect an attenuator pad and frequency counter between the ANT connector and dummy load, key the transmitter, and adjust TC2001 on the MAIN Unit for precisely 162.00MHz ( $\pm 100$  Hz).

### PLL VCV

- Connect the RF sampling coupler in-line between the antenna jack and the RF dummy load. Connect the frequency counter to the coupler.
- Connect the DC voltmeter between VCV test point TP2006 on the PCB(Printed Circuit Board) and chassis ground.
- Set the transceiver to *high band edge* channel,#2. Key the transmitter and adjust T2001 on the PCB for 4.3 V on the voltmeter.
- Select *high band edge* channel,#2, and confirm the low-end VCV is at  $0.6\text{ V} \pm 0.2\text{ V}$ .

### Transmitter Output Power

- Select channel,#3, transmit and adjust the output power level for 5.0 watts by the the PC.

### CTCSS Modulation Level

- Select channel,#4, with 151.4 Hz CTCSS encode. Transmit and adjust VR1006 on the PCB for  $0.75\text{ kHz} \pm 0.05\text{ kHz}$  deviation as indicated on the deviation meter.

### DCS Modulation Level.

- Select channel,#5, with DCS 023 enabled. Transmit and adjust VR1009 on the PCB for  $0.75\text{ kHz} +0.1\text{ kHz}$  deviation as indicated on the deviation meter.

### Microphone Audio Modulation Level

- Select channel,#3, and adjust the AF generator for 40 mV output at 1 kHz to the **MIC** jack.
- Transmit and adjust VR1005 on the PCB for  $4.0\text{ kHz} \pm 0.1\text{ kHz}$  deviation as indicated on the deviation meter.

### Squelch Threshold

- Select channel.#3, and adjust SG level for  $0\text{ dB}\mu$  ( $1.0\ \mu\text{V}$ ).
- Adjust the squelch threshold level by the PC so that it just closes (**RX** LED turns off).

### Receiver

- Set up the test equipment as shown for receiver alignment, and construct the audio test adapter as described in the box below.
- With the transceiver set to band center CH 3, and the RF

signal generator tuned to the same frequency, set the generator for  $\pm 3.0\text{kHz}$  deviation (for 25kHz steps) with 1kHz tone modulation, and set the output level for  $100\ \mu\text{V}$  at the antenna jack.

- Adjust T2002, T2003, T2004 and T2005 on the Main Unit for optimum SINAD, reducing SG output level as necessary for proper meter deflection.
- After the previous step, final signal generator level should be less than  $0.30\ \mu\text{V}$  for 12dB SINAD.