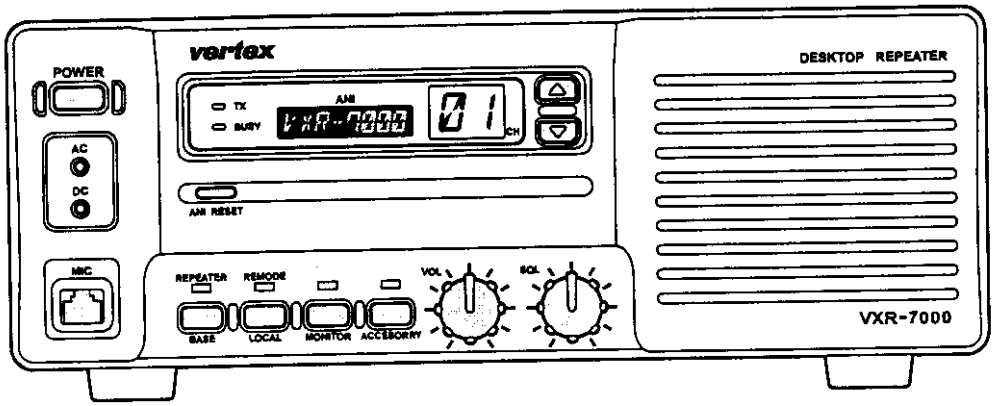
Intrduction



Specifications

General

Frequency Range:	136 ~ 150 MHz or 150 ~ 174 MHz
Number of Channels:	16
Channel Spacing:	12.5/25 kHz
Frequency Stability:	±2.5 ppm
Antenna Impedance:	50 Ω (N-Type)
Tx Activation System:	Carrier-operated, CTCSS tone operated, DCS operated, or remote control
Power Requirements:	115/230 V AC ±10%, 50/60 Hz or 13.8 VDC
Ambient Temperature Range:	-30 °C ~ +60 °C
Dimensions (w/o knobs):	325 x 115 x 391.5 mm (12.8 x 4.5 x 15.4 inches)
Weight (approx.):	11 kg (24.3 lbs.)

Receiver

Receiver Type:	Double-conversion Superheterodyne
Sensitivity:	0.35 µV for 12 dB SINAD, 0.45 µV for 20 dB NQ
Selectivity:	75 dB
Intermodulation:	75 dB
Spurious & Image Rejection:	80 dB
Audio Output:	4 W @ 4 Ω

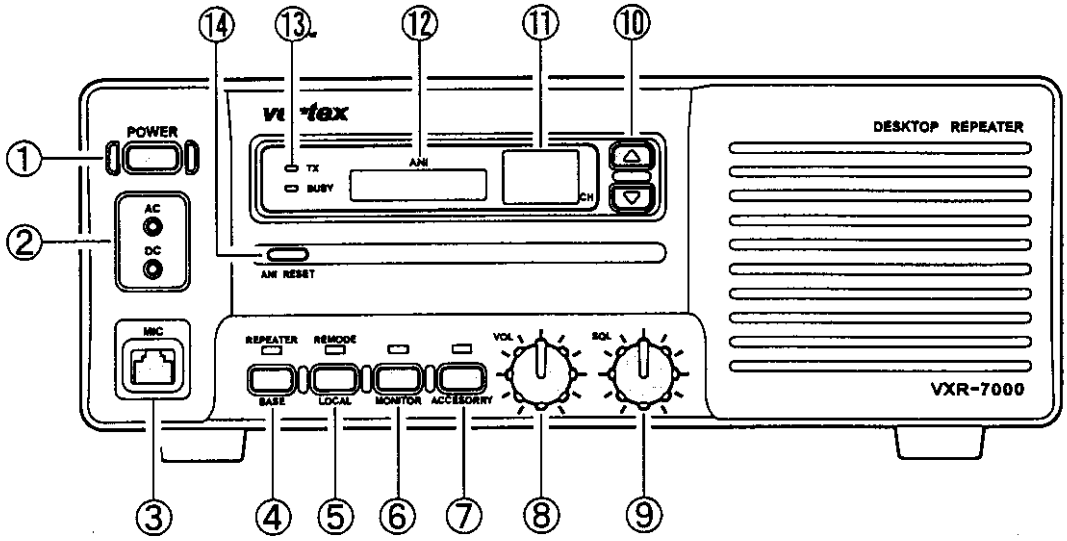
Transmitter

RF Output:	5 ~ 50 W (Adjustable)
Duty Cycle:	100 %
Maximum Deviation:	±5.0 kHz (25 kHz spacing), ±2.5 kHz (12.5 kHz spacing)
Modulation Type:	16K0F3E/11K0F3E
Audio Distortion:	Less than 2.5 % @ 1 kHz
Spurious Emissions:	Better than 75 dB below carrier

OPTION

ACCESSORIES

Front Panel



① **POWER** Switch

This is the main power switch for the repeater.

② LED Indicators

AC: This LED glows green during AC operation.
DC: This LED glows yellow during DC operation.

③ **MIC** Jack

This 8-pin modular jack accepts the microphone input, and provides a standby control line to activate the transmitter when using the *"BASE"* mode of operation. This jack also provides a "Hook" control line, as well as a "Clone Data" line.

④ **BASE/REPEATER** Switch

This switch toggles the operating mode between the *"REPEATER"* mode and the *"BASE"* transceiver mode. When the *"REPEATER"* mode is selected, the LED above it glows green. While in the *"BASE"* mode (the green LED is off), you can speak into the microphone to use it as a transceiver. For normal repeater operation, set this switch to the *"REPEATER"* mode.

⑤ **LOCAL/REMOTE** Switch

This switch toggles the control mode between the *"REMOTE"* mode and *"LOCAL"* mode. When the *"LOCAL"* mode is selected, the LED above it is off, and the repeater operates according to the control data programmed into the repeater. While in the *"REMOTE"* mode, the LED glows green, and the repeater operates according to the control instructions received from an external device (connected to the **ACC** jack on the rear panel).

⑥ **MONITOR** Switch

This switch selects the "Squelch" (receiver mute) mode. When the green LED above it is off, "Tone" or "Coded" squelch is active. When you press this switch *momentarily*, the green LED will glow steadily; in this condition, only "noise squelch" is active, and any signal present on the channel will be heard. If you *press and hold* this switch for more than 1.5 second, the green LED will blink and the squelch will open; in this condition, background noise will be heard if no signal is present.

⑦ **ACCESSORY** Switch

This switch can be set up for special applications, such as High/Low power selection, as determined by your Vertex dealer. The LED above it glows green when this function is activated. For further details, contact your Vertex dealer.

⑧ **VOL** Knob

This control knob adjusts the receiver volume level from the front panel speaker. If desired, this control knob may be set fully counterclockwise when repeater monitoring is not needed.

⑨ **SQL** Knob

This control knob selects the noise squelch threshold level.

⑩ Channel Selector Buttons (▯ and ▯)

Press one of these buttons to select the operating channel.

⑪ Channel Indicator

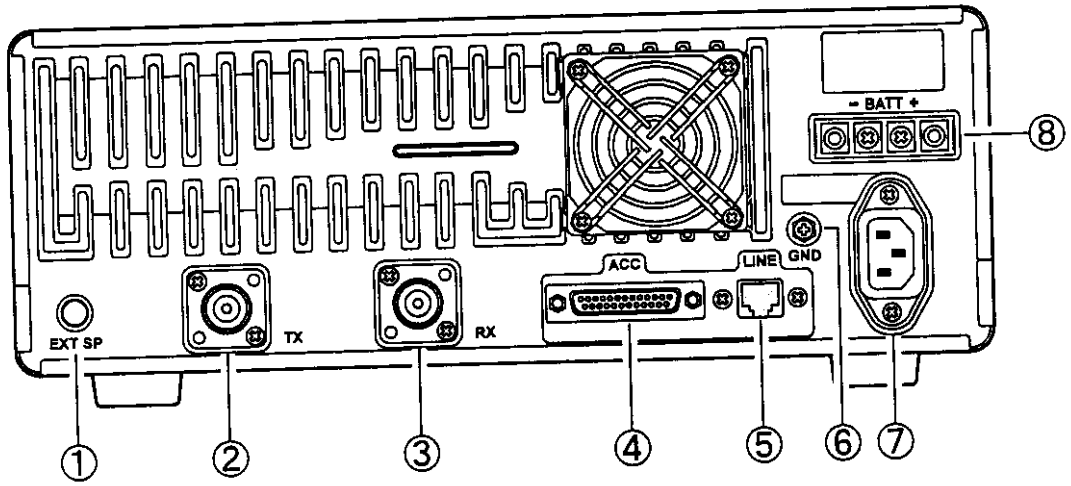
This seven-segment LED indicates the operating channel number.

⑫ ANI Display
The ANI LCD (Liquid Crystal Display) indicates the pre-programmed ANI message according to the ANI code received.

⑬ **TX/BUSY** Indicator
The **BUSY** indicator glows green when the channel is busy, and the **TX** indicator glows red when the repeater is transmitting.

⑭ **ANI RESET** Button
Press this button to clear the message on the ANI display, and turn off the LCD backlight.

Rear Panel



① **EXT SP** Jack
This 3.5-mm, 2-pin jack provides variable audio output for an external speaker. The audio output impedance at this jack is 4 Ω ~ 16 Ω, and level varies according to the setting of the front panel's **VOL** control.

② **TX** Antenna Jack
This N-type coaxial jack provides the transmitting output signal for connection to the transmitting antenna or TX jack on the duplexer, if used. The output impedance requirement is 50 Ω.

③ **RX** Antenna Jack
This N-type coaxial jack accepts the receiver input signal from the receiving antenna or RX jack on the duplexer, if used. The input impedance requirement is 50 Ω.

④ **ACC** Jack
This DB-25 connector provides a data interface between the microprocessor in the VXR-7000 and peripheral devices (such as the VX-TRUNK Unit).

⑤ **LINE** Jack
This 8-pin modular jack is used for remote control and it provides TX and RX audio, TX keying, and squelch status output. The TX and RX audio impedance is 600 Ω.

⑥ **GND** Terminal
For best performance and safety, the GND terminal should be connected to a good earth ground using a short, heavy, braided cable.

⑦ AC Jack
This receptacle accepts the AC power cord, which should be connected to the AC mains supply or wall outlet. The AC line voltage must match that for which the repeater is wired.

⑧ **BATT** Terminal
These terminal posts accept 12~ 15 VDC for operating the repeater from a battery or other DC source. When operating from AC mains, a small trickle current is present at these terminals to maintain battery charge. A battery rated for 12 volts, 55 Ah (minimum) is recommended for short-term emergency/backup operation.

The VXR-7000 repeater is provided with a 25-pin DB-25F female connector for interconnections to accessories. Use a DB-25M 25-pin male connector to connect accessories to the repeater. The pins on the accessory connector are explained in detail as follows:

Pin 1: **GND**
Chassis ground for all logic levels and power supply return.

Pin 2: **+13.8 V** [Power Supply]
This pin provides 13.8 Volts, 1.0 A, regulated DC from the repeater supply. Use a 1 A fuse in the external device's DC line to prevent damage to the repeater.

Pin 3: **TX AF IN** [Analog Transmitter Input]
(Voice Band: 300 ~ 3,000 Hz)
Approximately 0.254 V_{rms} audio input on this pin will produce full system deviation at 1 kHz (±5 kHz deviation with 25 kHz channel spacing, ±2.5 kHz deviation with 12.5 kHz channel spacing). Input impedance is 600 Ω. This audio is injected before the splatter filter stage, so excess signal input levels are clipped.
Use shielded cable to connect to this pin, and connect the shield to **GND**.

Pin 4: **TONE IN** [Transmitter Input]
(Sub-audible Band: 6 ~ 250 Hz)
Applying a 0.1 V_{rms} sub-audible tone produces 10% of full system deviation. The input impedance is 600 W, and has a flat response characteristic (repeater deviation is constant for a given signal level over the frequency range of 6 ~ 250 Hz). Injecting too high a voltage here causes over-deviation of CTCSS or DCS, degrading performance. Use shielded cable to connect to this pin, connecting the shield to **GND**.

Pin 5: **N.C.** *(No connection.)*

Pin 6: **DISC OUT** [Analog Output]
(Wide-Band: 0 ~ 3,000 Hz)
Received signals with full system deviation produce 1 V_{p-p} audio at this pin. The output impedance is 600 Ω, and is extracted before the de-emphasis and squelch circuitry. Use shielded cable to connect to this pin, and connect the shield to **GND**.

Pin 7: **GND**
Chassis ground for all logic levels and power supply return.

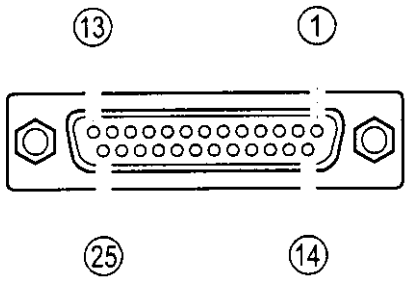
Pin 8: **RSSI** [Analog Output]
A DC voltage proportional to the strength of the signal currently being received (Receiver Signal Strength Indicator) is provided on this pin. This low impedance output is generated by the receiver IF sub-system and buffered by an internal op-amp. Typical voltages are graphed as follows:

information chart here

remember the impedance value

Pin 9: **COAX. SW** [Logic Output (Active Low)]
This output is intended for controlling an external coaxial switching relay. It is an open collector output which can sink approx. 10 mA when active. This signal only switches if the repeater has been programmed for *"SIMPLEX"* mode. If programmed for *"DUPLEX,"* the signal remains open (high impedance) at all time.

Pin 10: **N.C.** *(No connection.)*



ACC Jack
DB-25 Pin Numbering

Pin 11: **NSQ DET**

This is an open-collector, active-low output capable of sinking about 10 mA. It indicates that the receiver squelch is open. If the squelch control is properly set, this indicates a carrier on the receiver channel.

Pin 12: **EXT PTT**

This input is internally pulled up to 5 VDC. When pulled low by an external device, it keys the repeater transmitter while the repeater is operating in the **BASE** mode. Avoid voltage in excess of 5 V on this pin, or internal damage to the microprocessor on the repeater CNTL Unit may result.

Pin 13: **GND**

Chassis ground for all logic levels and power supply return.

Pin 14: **GND**

Chassis ground for all logic levels and power supply return.

Pin 15: **N.C.** (*No connection.*)

Pin 16, 17, 18, & 19: **REMOTE CH DATA**

[Logic Inputs D3, D2, D1, and D0] (*Active Low*)

These inputs are internally pulled up to 5-V DC. When pulled low by an external device, they select one of the 16 pre-programmed repeater operating channels. The logic truth table below shows the combinations for selecting all 16 channels.

In the truth table, "1" represents no connection, and "0" represents a ground connection on the pin.

The channel selection logic is not inhibited while the transmitter is keyed: the repeater will change frequency when instructed, even while transmitting.

Avoid voltage in excess of 5 V on these pins or internal damage to the microprocessor on the repeater CNTL Unit may result.

Channel	Pin 16 (D3)	Pin 17 (D2)	Pin 18 (D1)	Pin 19 (D0)
1	1	1	1	1
2	1	1	1	0
3	1	1	0	1
4	1	1	0	0
5	1	0	1	1
6	1	0	1	0
7	1	0	0	1
8	1	0	0	0
9	0	1	1	1
10	0	1	1	0
11	0	1	0	1
12	0	1	0	0
13	0	0	1	1
14	0	0	1	0
15	0	0	0	1
16	0	0	0	0

Pin 20: **GND**

Chassis ground for all logic levels and power supply return.

Pin 21: **A-OUTPUT** [Logic Output] (*Active Low*)

This open collector logic output is pulled low when the front panel's **ACCESSORY** key is turned on. It can sink approx. 10 mA when active.

Pin 22: **RXD LOW**

[Digital Output for DATA Communications]
(*300 ~ 3,000 Hz*)

This pin is an output for low speed receiving data signals (typically 1200 bps), with the data being extracted after the de-emphasis and low pass filter stages.

Pin 23: **RXD HI**

[Digital Output for DATA Communications]
(*Max.: 5 kHz*)

This pin is an output for high speed receiving data signals (typically 9600 bps), with the data being extracted immediately after the discriminator prior to any de-emphasis).

Pin 24: **TXD LOW**

[Digital Input for DATA Communications]
(*300 ~ 3,000 Hz*)

This pin is intended to be used as a low speed digital data signal input to the repeater (typically 1200 bps). This digital data signal is injected before transmitter pre-emphasis and limiting stage, so excess signal input levels are clipped.

Pin 25: **TXD HI**

[Digital Input for the DATA Communications]
(*0 ~ 5 kHz*)

This pin is intended to be used as a high speed digital data signal input to the repeater (typically 9600 bps). This digital data signal is injected after transmitter splatter filter stage.

LINE Interface Port

The VXR-7000 is provided with an 8-pin modular jack for line interfacing applications. A Western Electric® modular-type RJ45 plug should be used to connect to this jack. The **LINE** jack pin-out is shown below.

Note that there are both 4-line and 8-line types of modular plugs. If a 4-line modular plug is used, only the **LINE OUT** and **LINE IN** connections will be made. An 8-line plug is required to access all lines. In accordance with standard telecommunications interface, the line connections on the **LINE** interface jack are impedance balanced, and are described as follows.

Pins 1 & 2: [**RX SQ**(+), **RX SQ**(–)]

An opto-isolator is provided to facilitate E (EAR) signaling. The opto-isolator comes on when a signal exceeding the receiver squelch appears on the receiver channel (with correct CTCSS tone or DCS code, if enabled). The RX SQ(-) pin is the emitter, and RX SQ(+) is the collector.

Pins 3 & 4: [**LINE IN** (*Tx Line Audio*)]

Analog signals between 300 and 3000 Hz supplied to this pair are fed to the transmitter when the repeater is set to the BASE mode (the **REPEATER** LED is turned off) and keyed either by the TX KEY input signal (see below), or by the EXT PTT signal on pin <<23?>> of the rear panel's **ACC** jack. Full system deviation is obtained with a line level of -10 dBm.

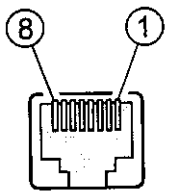
Pins 5 & 6: [**LINE OUT** (*Rx Line Audio*)]

Receiver audio is available from this pair, subject to internal CTCSS or DCS decode if the received signal strength is above the squelch threshold.

As shipped from the factory, a 1-kHz receiver signal with full system deviation gives -10 dBm on the line, but this can be varied over the range -55 dBm to +10 dBm by **VR4002** and **S4001** (on the repeater's CNTL Unit).

Pins 7 & 8 [TX KEY(+), TX KEY(-)]

An opto-isolator is provided to facilitate M (MIC) signaling. That is, a voltage presented to these pins turns on the opto-isolator and keys the transmitter. The TX KEY(+) pin is the anode of the opto-isolator, and RX SQ(-) is the cathode of the opto-isolator.



LINE Jack
Modular Jack Pin Numbering

Antenna Considerations

Repeater operation without a duplexer requires that two antennas be installed, one for receiving and one for transmitting, so that the receiving antenna does not absorb energy from the transmitting antenna. There are a number of ways to do this, depending on the TX/RX frequency separation, and on the locations available for antenna mounting. If a duplexer is used, a single antenna suffices for both transmitting and receiving. If using a reduced-size duplexer, a six-cavity model (minimum) is recommended. Yaesu/Vertex recommends the use of the ??? duplexer. For further details, contact your Yaesu/Vertex dealer.

Regardless of the above choice, it is of paramount importance that the antenna(s) be mounted as high and in the clear as possible, preferably within line-of-sight to all repeater users. Furthermore, losses in the feedline(s) must be minimized, so the feedline(s) should be high quality, and as short as possible. If a long feedline is necessary, use coaxial "hardline" cable to reduce losses.

Repeater antennas should have an impedance of 50 W at the operating frequency. When separate receive and transmit antennas are used, high-Q narrow-band types may serve to minimize interaction. However, when a single antenna is used with a duplexer, it should be a low-Q wide-band type.

> *NEVER TRANSMIT WITHOUT HAVING A TRANSMIT ANTENNA CONNECTED TO THE TX ANTENNA JACK OF THE REPEATER.*

AC Power Supply Voltage Selection

Each repeater is wired for a particular AC mains voltage between 100 and 234 VAC. This should be indicated by a label near the AC jack on the rear panel. If no label is present, or if the AC voltage on the label is different from the local AC line, check the wiring on the REG Unit of the repeater, and change the connections (and label) if necessary, as shown below.

Changing the AC input voltage wiring also requires changing the fuse on the FILTER Unit if the voltage is changed from 100 VAC (100-117 VAC) to 200 VAC (200-234 VAC), or vice-versa. Use a ??-amp fuse for 100 VAC, or a ??-amp fuse for the VAC.

DC Power Supply Backup

For uninterrupted operation during power failures, a 12 volt rechargeable type battery (55-Ah or more recommended) may be connected to the **BATT** terminal posts on the rear panel. While the repeater is operating from the AC source, a slight charging current will maintain battery charge. In the event of an AC power outage, the automatic power control circuit will automatically switch the repeater to the backup battery, and operation will not be interrupted.

After prolonged operation from the battery, it should be disconnected from the repeater and recharged separately before re-connecting, as the trickle charge is not sufficient for recharging a completely discharged battery.

Never reapply AC power to the repeater with a discharged battery connected, as the DC startup current can damage the repeater and battery.

While operating from a battery or DC supply, the repeater requires approximately ?? amperes at 120 Volts during transmit.

Equipment Location

While the operating temperature range of the repeater is quite broad, the best location is one in which the air temperature does not approach the extremes of the specified range, and one that does not change rapidly. Make sure to allow for free air flow around the heatsink on the rear apron at all times. In warm climates, the repeater should not be sealed in a small closed room.

Protect the repeater from wind and rain, and extremes in temperature or humidity that may shorten the useful life of the equipment. Try to locate the repeater in an environment that is also comfortable for service personnel, if possible.

Changing Power Transformer AC Mains Wiring
Before attempting this wire change, remove the AC power cord from the AC jack on the rear panel.

- ❒ Remove the ten screws affixing the top cover of the repeater, and remove the cover.
- ❒ Remove the four screws affixing the Switching Regulator Unit, and remove it (the Switching Regulator Unit is mounted with the FILTER Unit).
- ❒ Referring to Figure 1, remove the four screws and remove the heatsink from the Switching Regulator Unit.
- ❒ Referring to Figure 2, perform the correct jumper wiring on the Switching Regulator Unit for the AC Mains voltage used in your area (100-117 VAC or 200-234 VAC).
- ❒ Replace the heatsink onto the Switching Regulator Unit, then replace the Switching Regulator Unit onto the chassis.
  Replace the AC fuse on the FILTER Unit according to the AC Mains voltage range:
  100 VAC (100-117 VAC): ??A
  200 VAC (200-234 VAC): ??A.
- ❒ Replace the top cover. This completes the wiring change.

Important!: If you change the AC voltage range, you must also change the AC fuse on the FILTER Unit. Do not replace with a slow-blow type fuse.

With the CE-27 Programming Software, you can quickly and easily program the Vertex VXR-7000 repeater's channels and configuration from your personal computer. In the event of an accidental memory failure, repeater memory and configuration data may be re-loaded in a matter of minutes.

The CE-27 Programming Software diskette contains the following files:

- CE-27.EXE
- CE-27.HLP

Before connecting the VXR-7000 for programming, turn off both the computer and the VXR-7000. Now connect the VPL-1 Connection Cable to the computer's serial port and the VXR-7000.

Then it will be safe to restart the computer; turning off the equipment during interconnection avoids the poten- l for damage to the electronics caused by voltage spikes.

Insert the distribution diskette into your 3½" drive (after booting DOS), and make a copy of the diskette; use the distribution diskette for archive purposes, and use the disk copy for programming.

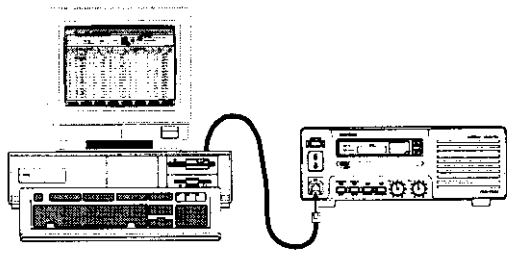
Place the CE-27 (copy) diskette into your 3½" drive (usually "Drive A"), and log onto this drive by typing "A: [Enter]", then load the contents of the CE-27 diskette into a directory named CE27, using the COPY command (e.g. " ").

Now type " [Enter]" to start the program. The introductory screen will appear, and you may press any key to enter the main screen.

Choose the "Help" contents option from the program's Menu for assistance with channel programming or setting of parameters.

Important Note!

Do not work directly with the CE-27 programming diskette. Make a copy of it and use the copy when programming the VXR-7000. Keep it and the original distribution diskette in a safe place in case you need to make another copy of it later.



VXR-7000 Programming Setup

EEPROM DATA EDITOR <CE-27>

KEY HELP
[Esc] Undo [BS] Delete character
0...9, [.] Enter character
[Enter] Accept Entry

Edit: im.rpt Band: VHF
Serial No.: 12345678 COM Port: COM1

Ch	Rx Freq.	W/N	Clk Sft	Noise_SQL Mode	Lv	DCS Typ	DDec Type	Multi Tone	DTMF	Court Blip	Rev Bst	Action Mode
01	161.00000	W	no	Free	48	A	Fixed	no	off	off	off	Duplex
02	161.5	N	yes	Fixed	38	B	Auto	no	off	off	off	Duplex
03	162.00000	W	no	Free	48	A	Fixed	no	off	off	off	Duplex
04	162.50000	N	no	Free	48	A	Fixed	no	off	on	on	Duplex
05	163.00000	W	yes	Free	44	A	Auto	yes	off	on	off	Duplex
06	163.50000	W	no	Fixed	48	B	Fixed	no	off	off	off	Duplex
07	164.00000	W	yes	Free	48	A	Fixed	no	off	off	off	Duplex
08	164.50000	W	no	Free	55	A	Fixed	no	off	on	off	Duplex
09	165.00000	N	no	Free	48	B	Fixed	yes	off	on	off	Duplex
10	160.50000	W	no	Fixed	48	A	Fixed	yes	off	off	on	Duplex
11	160.00000	W	yes	Free	33	B	Auto	no	off	off	on	Duplex
12	159.50000	N	no	Fixed	47	A	Auto	no	off	off	on	Duplex
13	159.00000	W	no	Free	48	A	Fixed	no	off	off	off	Duplex
14	158.50000	W	yes	Fixed	48	A	Fixed	yes	off	on	on	Duplex
15	158.00000	W	no	Fixed	35	A	Fixed	yes	off	on	off	Duplex
16	157.50000	W	no	Free	48	A	Fixed	no	off	off	off	Duplex

1 Help 2 3 4 5 6 7 8 Undo

CE-27 Main Screen

The VXR-7000 is carefully aligned at the factory for the specified performance across the entire operating frequency range. Realignment should therefore not be necessary except in the event of a component failure. All component replacement and service should be performed only by an authorized Yaesu/Vertex representative, or the warranty policy may be void.

The following procedures cover the sometimes critical and tedious adjustments that are not normally required once the repeater has left the factory. However, if damage occurs and some parts subsequently are placed, realignment may be required. If a sudden problem occurs during normal operation, it is likely due to component failure; realignment should not be done until after the faulty component has been replaced.

We recommend that servicing be performed only by authorized Yaesu/Vertex service technicians who are experienced with the circuitry and fully equipped for repair and alignment. Therefore, if a fault is suspected, contact the dealer from whom the repeater was purchased for instructions regarding repair. Authorized Yaesu/Vertex service technicians realign all circuits and make complete performance checks to ensure compliance with factory specifications after replacing any faulty components.

Those who do undertake any of the following alignments are cautioned to proceed at their own risk. Problems caused by unauthorized attempts at realignment are not covered by the warranty policy. Also, Yaesu/Vertex reserves the right to change circuits and alignment procedures in the interest of improved performance, without notifying owners.

Under no circumstances should any alignment be attempted unless the normal function and operation of the repeater are clearly understood, the cause of the malfunction has been clearly pinpointed and any faulty components replaced, and realignment determined to be absolutely necessary.

The following test equipment (and thorough familiarity with its correct use) is necessary for complete realignment. Correction of problems caused by misalignment resulting from use of improper test equipment is not covered under the warranty policy. While most steps do not require all of the equipment listed, the interactions of some adjustments may require that more complex adjustments be performed afterwards.

Do not attempt to perform only a single step unless it is clearly isolated electrically from all other steps. Have all test equipment ready before beginning, and follow all of the steps in a section in the order presented.

Required Test Equipment

- ❒ RF Signal Generator with calibrated output level at 200 MHz
- ❒ Deviation Meter (linear detector)
- ❒ In-line Wattmeter with 5% accuracy at 200 MHz
- ❒ 50 Ω RF Dummy Load with power rating 100W at 200MHz
- ❒ 4 Ω AF Dummy Load
- ❒ Frequency Counter with 0.2ppm accuracy at 200MHz
- ❒ AF Signal Generator
- ❒ AC Voltmeter
- ❒ DC Voltmeter: High input impedance
- ❒ VHF Sampling Coupler
- ❒ SINAD Meter
- ❒ IBM PC/compatible Computer with MS-DOS or later operating system
- ❒ Yaesu VPL-1 Connection Cable & CE-27 Channel/ Alignment Diskette

Alignment Preparation & Precautions

A 50 Ω RF Dummy Load and in-line wattmeter must be connected to the TX antenna jack in all procedures that call for transmission, except where specified otherwise. Correct alignment is not possible with an antenna.

After completing one step, read the following step to determine whether the same test equipment will be required. If not, remove the test equipment (except dummy load and wattmeter, in connected) before proceeding.

Correct alignment requires that the ambient temperature be the same as that of the repeater and test equipment, and that this temperature be held constant between 20 °C and 30 °C (68 °F ~ 86 °F). When the repeater is brought into the shop from hot or cold air, it should be allowed time to come to room temperature before alignment.

Whenever possible, alignments should be made with oscillator shields and circuit boards firmly affixed in place. Also, the test equipment must be thoroughly warmed up before beginning.

Note: Signal levels in dB referred to in the alignment procedure are based on $0dB\mu = 0.5\mu V$.

Set up the test equipment as shown below, and apply AC power to the repeater.

The repeater must be programmed for use in the intended system before alignment is attempted. The frequency and other parameters are loaded from the file during the alignment process.

In order to facilitate alignment over the complete switching range of the equipment it is recommended that the channel data first be uploaded and then stored to disk. Channels at the upper, lower and middle band edges should then be downloaded. The original data can be replaced at the end of the alignment process.

Channel	Frequency
Low band edge	150.000 MHz
Center	162.000 MHz
High band edge	174.000 MHz

Transmitter

Press the **BASE/REPEATER** switch on the front panel of the repeater so as to set it to the *"BASE"* mode if the **REPEATER** LED is on. You should see the **REPEATER** LED turn off, indicating that the repeater is now in the *"BASE"* mode.

PLL VCV (Varactor Control Voltage) Check

- ❒ Connect the DC voltmeter between the VCV check point (on the TX Unit) and chassis ground.
- ❒ Select the High band edge channel, then key the repeater. Confirm that the DC voltmeter reading is 4.4 VDC.
- ❒ Select the Low band edge channel, and confirm that the DC voltmeter reading is 1.9 VDC.

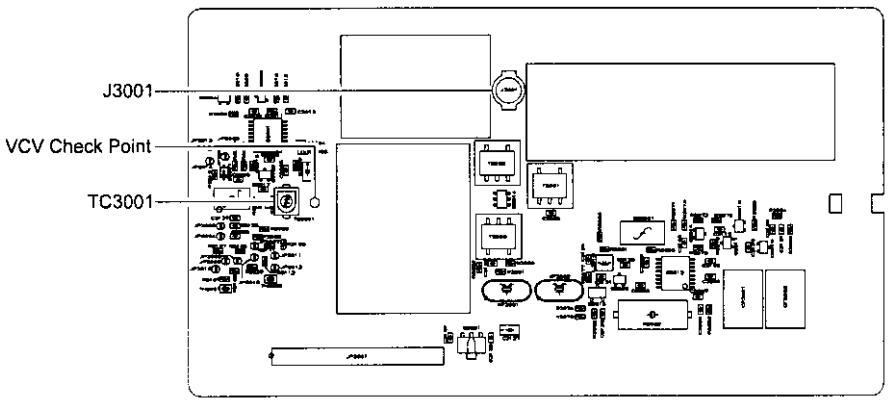
PLL Reference Frequency Adjustment

- ❒ Select the Center channel, then key the repeater.
- ❒ Adjust **TC2001** (on the TX unit), if necessary, so that the frequency counter reading is within ±100Hz of the programmed Center channel frequency.

Transmitter parameters (excluding PLL)

- ❒ The following transmitter parameters can be adjusted from the computer by utilizing the CE-27 Channel/Alignment Diskette. Refer to the onboard help of the CE-27 Channel/Alignment Diskette for details.

TX Parameters	Data
TX Power Level (High)	0 (00h) ~ 255 (FFh)
TX Power Level (Mid 1)	0 (00h) ~ 255 (FFh)
TX Power Level (Mid 2)	0 (00h) ~ 255 (FFh)
TX Power Level (Low)	0 (00h) ~ 255 (FFh)
Maximum Deviation	0 (00h) ~ 255 (FFh)
CTCSS Deviation	0 (00h) ~ 255 (FFh)



RX Unit Alignment Points

DCS Deviation	0 (00h) ~ 255 (FFh)

Receiver

PLL VCV (Varactor Control Voltage) Check

- ❒ Connect the DC voltmeter between the VCV check point (on the RX Unit) and chassis ground.
- ❒ Select the High band edge channel, and confirm that the DC voltmeter reading is 3.0 VDC.
- ❒ Select the Low band edge channel, and confirm that the DC voltmeter reading is 1.1 VDC.

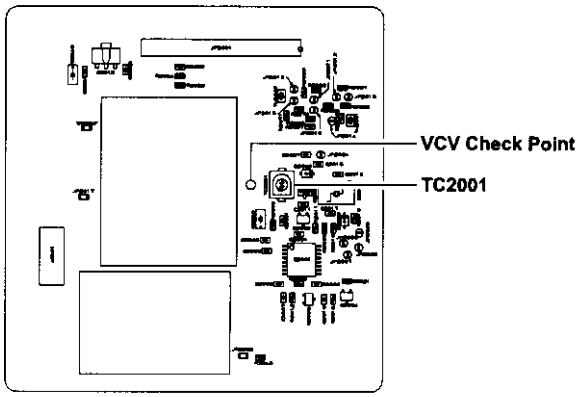
PLL Reference Frequency Adjustment

- ❒ Connect the Frequency counter to **J3001** on the RX Unit.
- ❒ Select the Center channel, adjust **TC3001** (on the RX Unit), if necessary, so that the frequency counter reading is within ±100Hz of the programmed Center channel frequency.

Receiver parameters (excluding PLL)

- ❒ The following receiver parameters can be adjusted from the computer by utilizing the CE-27 Channel/ Alignment Diskette. Refer to the onboard help of the CE-27 Channel/Alignment Diskette for details

RX Parameters	Data
Squelch Threshold Level	0 (00h) ~ 255 (FFh)
Squelch W/N Level	0 (00h) ~ 255 (FFh)



TX Unit Alignment Points

RSSI Threshold Level	0 (00h) ~ 255 (FFh)
RX Tune Level	0 (00h) ~ 255 (FFh)

Repeater Mode

Deviation Adjustment

- ❒ First ensure that the *"DUPLEX"* mode of operation is enabled via CE-27 programming.
- ❒ Set the **BASE/REPEATER** switch on the front panel of the repeater to the *"REPEATER"* mode (the **REPEATER** LED will turn on).
- ❒ Inject a signal on the Center channel frequency at a level of 40 dBμ (1 kHz tone @ ±3 kHz deviation) from the RF Signal Generator into the **RX** antenna jack, and adjust **VR4001** (on the CNTL Unit) so that the deviation meter reading (TX deviation) is ±3.0 kHz (±0.1 kHz) deviation.

Base Mode

Alignment Setup

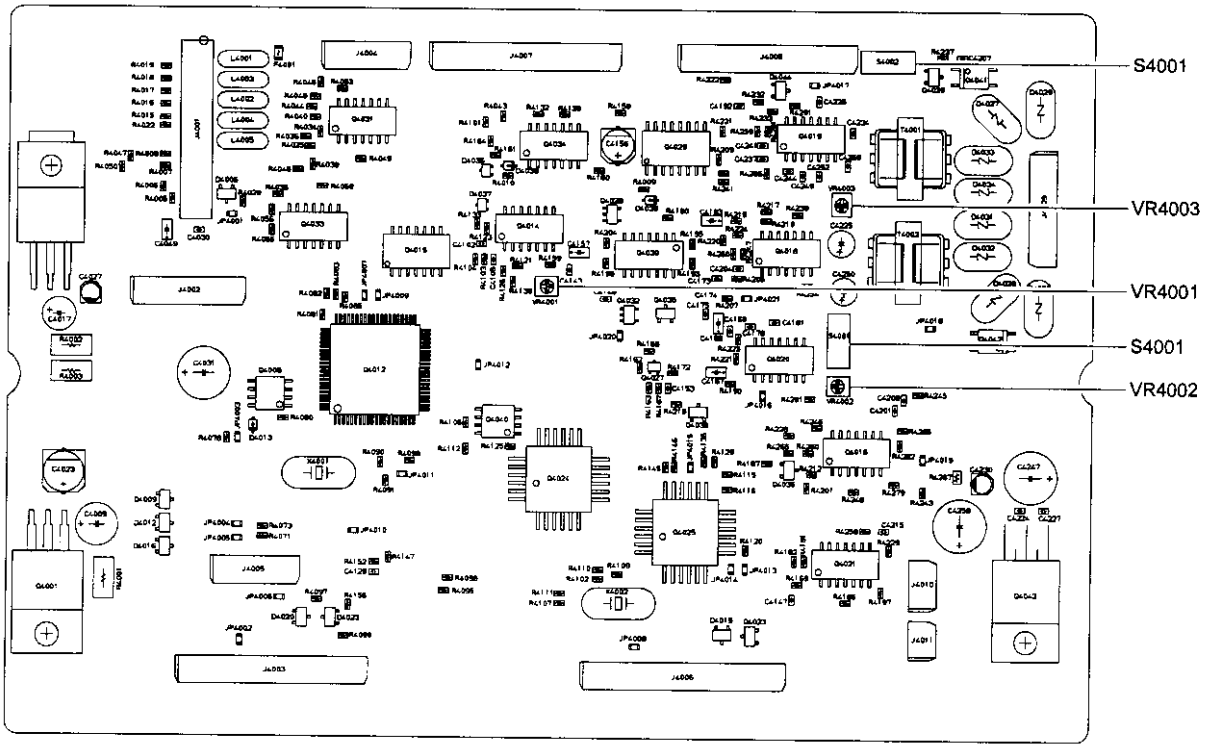
- ❒ Set the **BASE** switch on the front panel of the repeater to the *"BASE"* mode (the **REPEATER** LED will turn off).
- ❒ Press the **LOCAL/REMOTE** switch on the front panel of the repeater to the *"REMOTE"* mode (the **REMOTE** LED will turn on).
- ❒ Set **S4001** and **S4002** (on the CNTL Unit) to the "OFF" position, then select the Center channel.

Audio Level Adjustment (LINE OUT Level)

- ❒ Inject a signal on the Center channel frequency at a level of 40 dBμ (1 kHz tone @ ±3.5 kHz deviation) from the RF Signal Generator into the **RX** antenna jack, and adjust **VR4002** (on the CNTL Unit) so that the "Line Out" audio level (**LINE** jack pins 5 and 6) is -10 dBm (±0.1 dBm).

Deviation Adjustment (LINE IN Level)

- ❒ Connect the AF generator to **LINE** jack pins 3 and 4, and the AF generator output level to 10 dBm, at a frequency of 1 kHz.
- ❒ Key the repeater, and adjust **VR4003** (on the CNTL Unit) so that the deviation meter reading (TX deviation) is 3.0 kHz (±0.1 kHz) deviation.



CNTL Unit Alignment Points