**Manuals+** — User Manuals Simplified.



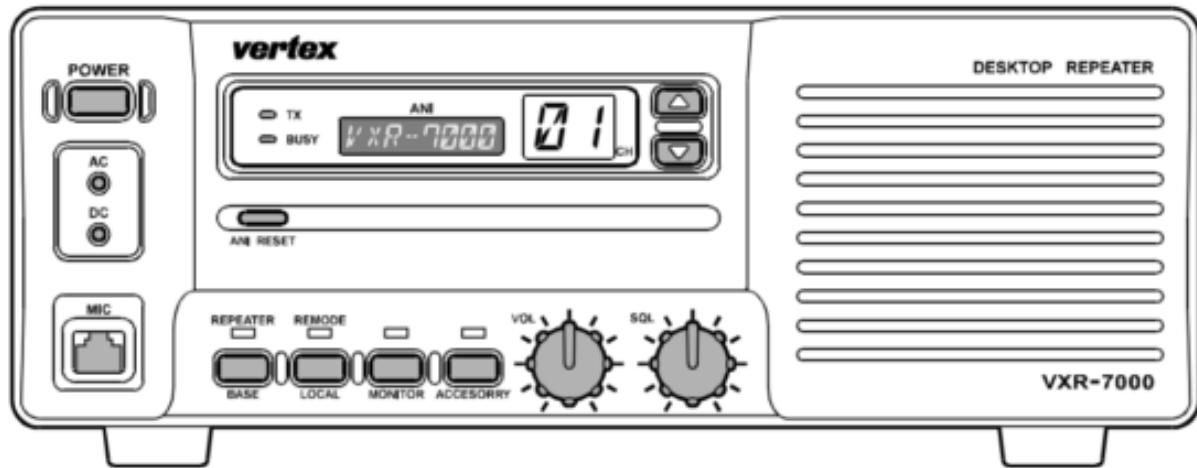# Vertex Standard VXR-7000 Desktop Repeater/Base Station User Manual

**Contents**

## Vertex Standard VXR-7000 Desktop Repeater/Base Station



## Introduction
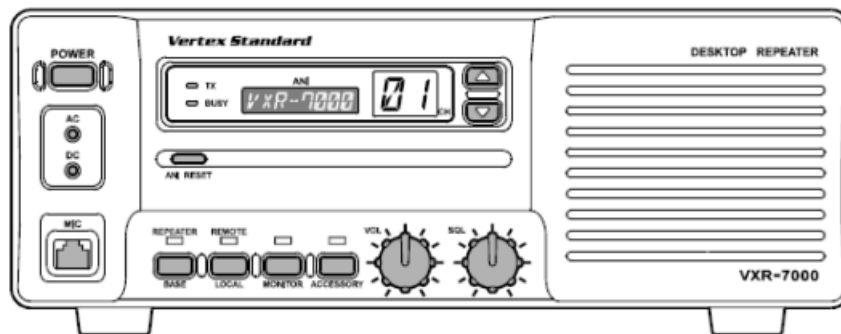


The VXR-7000 is commercial quality 50-watt FM repeater designed to provide reliable, continuous-duty two-way communications over a wide range of environmental conditions. Designed to be a stylish base station, with high-grade components utilized throughout, the VXR-7000 utilizes the latest computer-aided design and manufacturing processes to ensure a high level of reliability for users. Important channel frequency data is stored in EEPROM, and is easily programmable by a Servicing Technician or Dealer using an IBM compatible personal computer and the FIF-10A (or FIF-12) + CT-104A USB Programming Interface and CE27 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-7000. After reading it, keep this manual handy for quick reference, in case questions arise later on. Important Note: Internal service work, programming, and accessory installations should only be performed by your authorized Vertex Standard Dealer. Dangerous conditions and/or possibly illegal operation may result from improper setup, programming, or internal modifications.

## Controls & Connectors

**Front Panel**
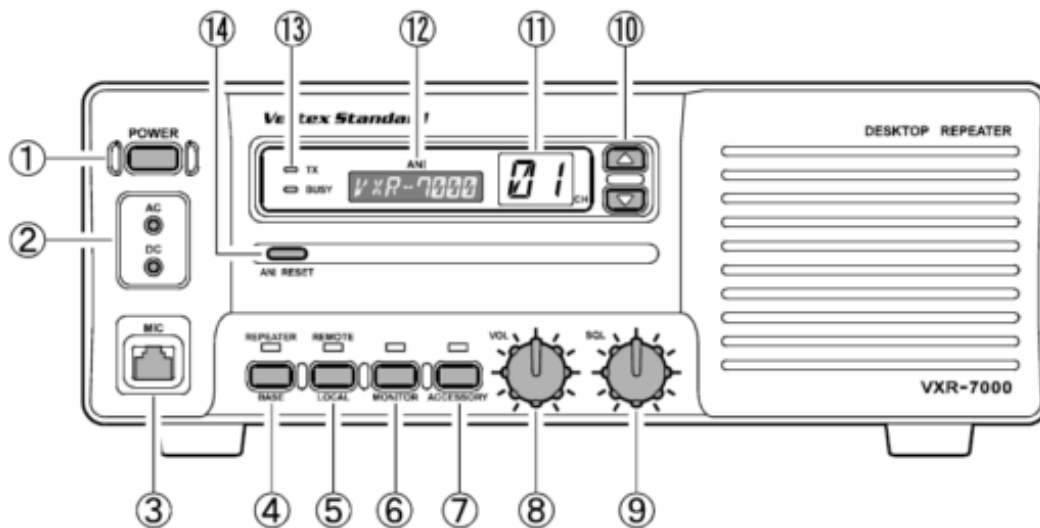


**POWER** Switch

This is the main power switch for the repeater.

**LED** Indicators

AC: This LED glows green during AC operation.

DC: This LED glows yellow during DC operation.

**MIC** Jack

This 8-pin modular jack accepts the microphone in-put, 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.

**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 "RE-PEATER" mode.

**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 instruc-tions received from an external device (connected to the ACC jack on the rear panel).

**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 2 second, the green LED will blink and the squelch will open; in this condition, background noise will be heard if no signal is present.

**ACCESSORY** Switch

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

**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 re-peater monitoring is not needed.

**SQL** Knob

This control knob selects the noise squelch threshold level. Set it to a position just above the point where the BUSY lamp goes out when no signal is present.

**Channel Selector Buttons**

Press one of these buttons to select the operating channel.

**Channel Indicator**
This seven-segment LED indicates the operating channel number.
**ANI Display**
The ANI LCD (Liquid Crystal Display) indicates the pre-programmed ANI message according to the ANI code received.
**TX/BUSY Indicator**
The BUSY indicator glows green when the channel is busy, and the TX indicator glows red when the repeater is transmitting.
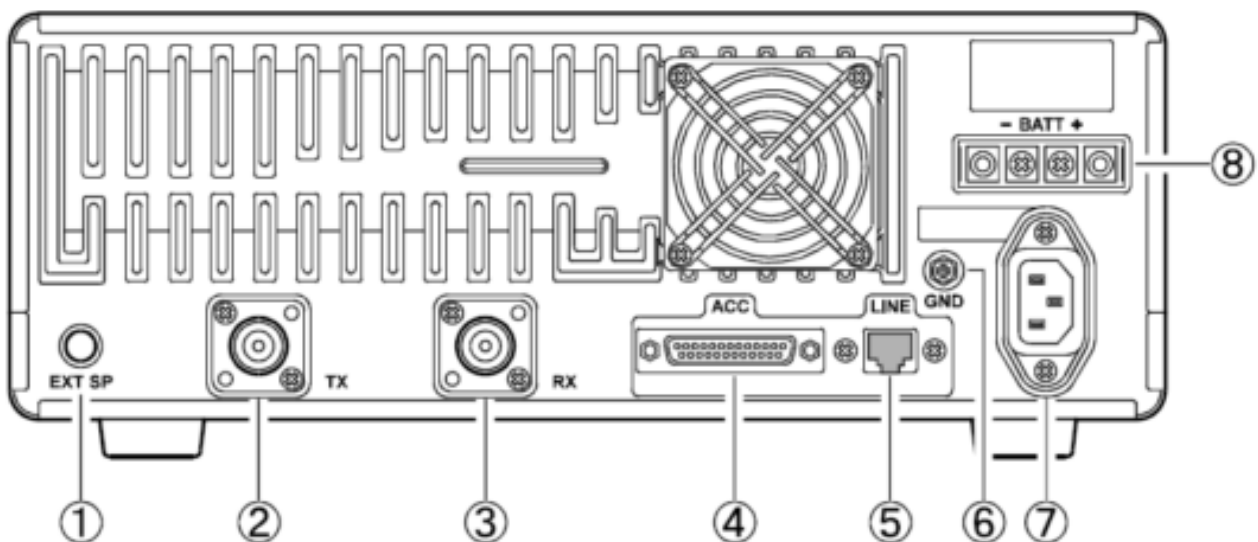
**ANI RESET Button**

- ANI

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

- ENI

  Press this button to turn off the Alert tone. Press this button again 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 con-trol.

2. **TX** Antenna Jack

   This N-type coaxial jack provides the transmitting output signal for connection to the transmitting an-tenna or TX jack on the duplexer, if used. The out-put 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 be-tween the microprocessor in the VXR-7000 and pe-ripheral devices (such as the VX-TRUNK Unit).

5. **LINE** Jack

   This 8-pin modular jack is used for remote control. It provides TX and RX audio, TX keying, and squelch status output. The TX and RX audio imped-ance 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 operat-ing the repeater from a battery or other DC source. When operating from AC mains, a small trickle cur-rent is present at these terminals to maintain bat-tery charge. A battery rated for 12 volts, 55 Ah (mini-mum) is recommended for short-term emergency/backup operation. Never short-circuit these terminal while operating from AC mains.

## ACC Connector Port

The VXR-7000 repeater is provided with a 25-pin DB-25F female connector for interconnections to accesso-ries. 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 sup-ply 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 ex-ternal device's DC line to prevent damage to the re-peater.

Pin 3: TX AF IN [Analog Transmitter Input]

- (Voice Band: 300 ~ 3,000 Hz) Input impedance is approx. 600 Ω. This audio is in-jected before the splatter filter stage, so excess sig-nal input levels are clipped. Use shielded cable to connect to this pin, and con-nect the shield to GND.

Pin 4: TONE IN [Transmitter Input]

- (Sub-audible Band: 6 ~ 250 Hz) The input is high impedance (approx. 22 kΩ). In-jecting too high a voltage here causes over-devia-tion 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 standard deviation produce approx. 1 Vp-p audio at this pin. The output imped-ance is approx. 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 sup-ply return.

Pin 8: RSSI [Analog Output]

- A DC voltage proportional to the strength of the sig-nal 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:
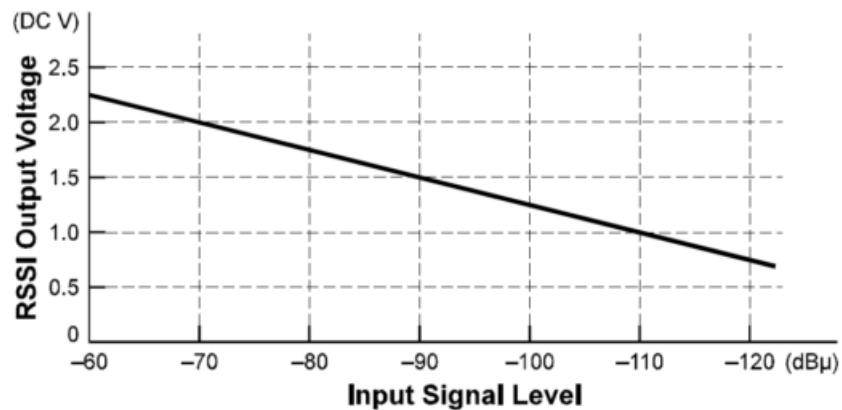


Pin 9: COAX. SW [Logic Output (Active Low)]

- This output is intended for controlling an external coaxial switching relay. It is an open collector out-put which can sink approx. 10 mA when active. This signal only switches if the repeater has been pro-grammed for "SIMPLEX" mode. If programmed for "DUPLEX," the signal remains open (high im-pedance) at all time.

Pin 10: N.C. (No connection.)
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.
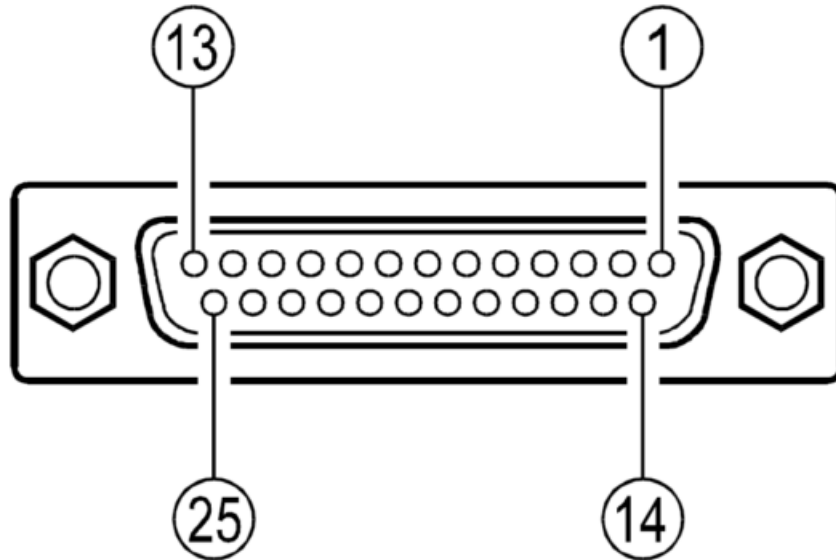
Pin 13: GND

- Chassis ground for all logic levels and power sup-ply return.

Pin 14: GND

- Chassis ground for all logic levels and power sup-ply 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 com-binations 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 in-ternal 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 sup-ply 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, with the data being extracted after the de-emphasis and low pass filter stages.

Pin 23: RXD HI

- [Digital Output for DATA Communications] This pin is an output for high speed receiving data signals, 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. 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] This pin is intended to be used as a high speed digi-tal data signal input to the repeater. 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 modu-lar 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 connec-tions 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 sig-nal 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.
  Maximum Voltage: 20 V, Maximum Current: 7 mA.

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 re-peater 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 12 of the rear panel's ACC jack. Standard 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 sig-nal strength is above the squelch threshold. As shipped from the factory, a 1-kHz receiver sig-nal with standard deviation gives −10 dBm on the line, but this can be varied 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. Maximum Voltage: 20 V, Maximum Current: 4 mA.
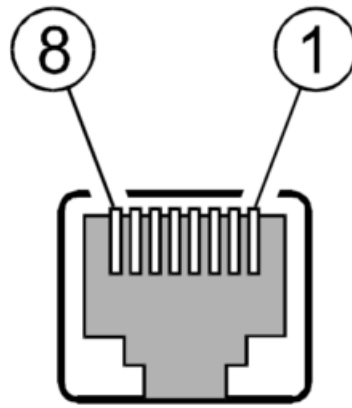


**LINE Jack
Modular Jack Pin Numbering**

**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 ab-sorb 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 an-tenna suffices for both transmitting and receiving. If using a reduced-size duplexer, a six-cavity model (mini-mum) is recommended. Vertex Standard recommends the use of the duplexer. For further details, contact your Vertex Standard dealer. Regardless of the above choice, it is of paramount im-portance 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 Ω 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 volt-age between 100 and 253 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 inside the Switching Regulator Unit of the repeater, and change the connections (and label) if necessary, as shown next page. Changing the AC input voltage wiring also requires changing the fuse on the FILTER Unit if the voltage is changed from 100 VAC (100-127 VAC) to 200 VAC (207-253 VAC), or vice-versa. Use a 5-amp fuse for 100 VAC, or a 3-amp fuse for the 200 VAC.

**DC Power Supply Backup**
For uninterrupted operation during power failures, a 12 volt rechargeable type battery (55-Ah or more rec-ommended) 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 main-tain battery charge. In the event of an AC power out-age, the automatic power control circuit will automati-cally switch the repeater to the backup battery, and op-eration will not be interrupted. After prolonged operation from the battery, it should be disconnected from the repeater and recharged sepa-rately before re-connecting, as the trickle charge is not sufficient for recharging a completely discharged bat-tery. Never reapply AC power to the repeater with a dis-charged battery connected, as the DC startup current can damage the repeater and battery. While operating from a battery or DC supply, the re-peater

requires approximately 7 amperes at 12 Volts dur-ing 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 re-peater 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 person-nel, if possible.

Changing Switching Regulator unit AC Mains Jumper Wiring Before attempting this jumper wire change, remove the AC power cord from the AC jack on the rear panel.

- Referring to Figure 1, remove the 14 screws affixing the top and bottom covers of the repeater, and re-move the covers.
- Remove the eight screws affixing the shield cover for the FILTER Unit, and remove the cover (see Fig-ure 1).
- Disconnect all wires and connectors from the FIL- TER Unit, then remove the six screws affixing the Switching Regulator Unit, and remove it (the Switch-ing Regulator Unit is mounted with the FILTER Unit: Figure 2).\
- Referring to Figure 3, remove the four screws and remove the heatsink from the Switching Regulator Unit.
- Referring to Figure 4, perform the correct jumper wiring on the Switching Regulator Unit for the AC Mains voltage used in your area
    - (100-127 VAC or 207-253 VAC).
-  Replace the heatsink onto the Switching Regulator Unit, then replace the Switching Regulator Unit onto the chassis, and connect all wires and connectors to the FILTER Unit.
- Replace the AC fuse (FH6001) on the FILTER Unit according to the AC Mains voltage range:
    - 100 VAC (100-127 VAC): 5A
    - 200 VAC (207-253 VAC): 3A.
- Replace the shield cover and replace the top and +bottom covers. 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.

FILTER Unit

Switching Regulator Unit

Figure 2



Figure 3



100-127 VAC
207-253 VAC

Switching Regulator Unit
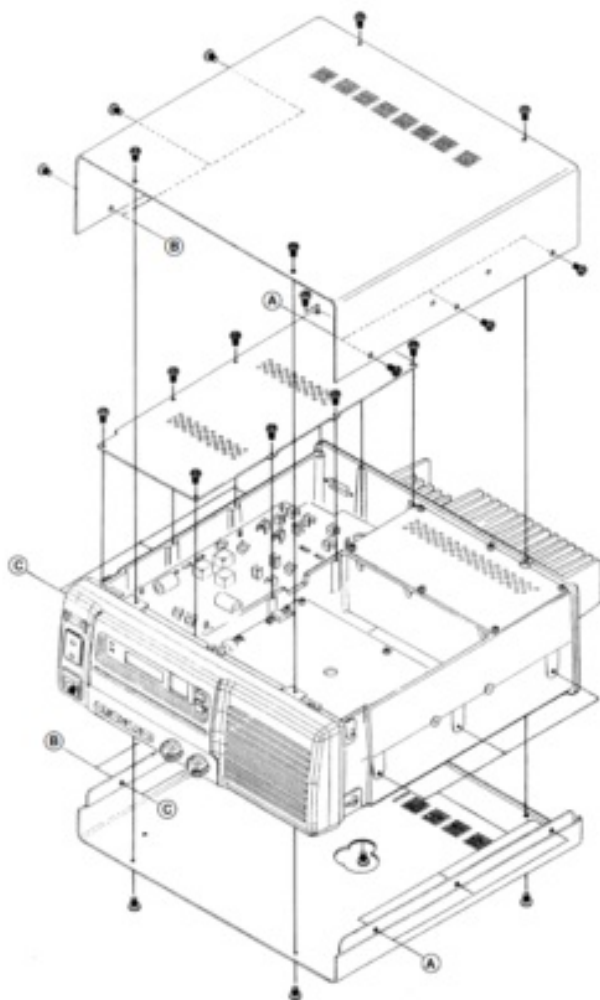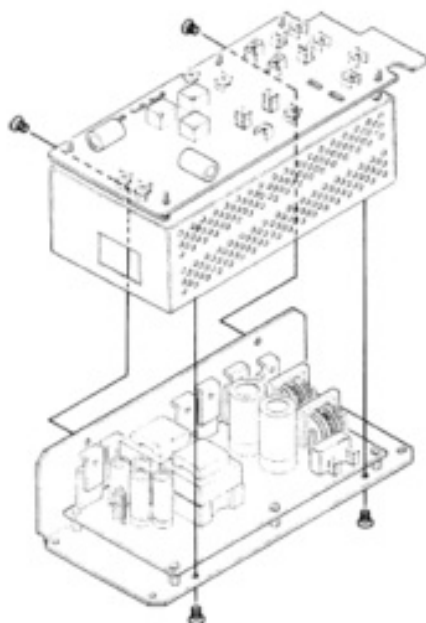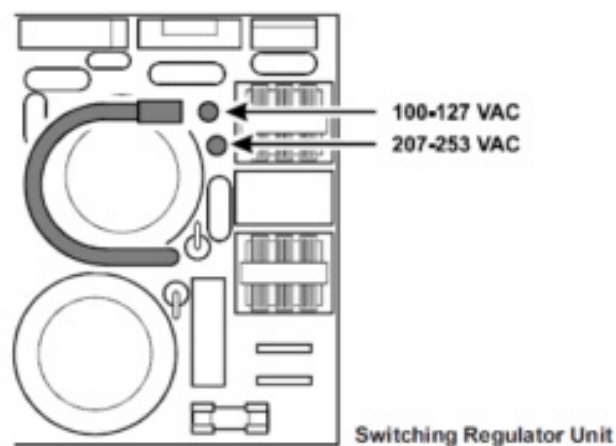
Figure 4

## CE27 Programming Software Instruction

With the CE27 Programming Software, you can quickly and easily program the Vertex Standard VXR-7000 repeater's channels and configuration from your per-sonal computer. Channel data programming format is identical for VHF and UHF repeaters. In the event of an accidental memory failure, repeater memory and con-figuration data may be re-loaded in a matter of min-utes. The CE27 Programming Software diskette contains the following files:

- CE27.EXE
- CE27.HLP

Before connecting the VXR-7000 for programming, turn off both the computer and the VXR-7000. Now connect the FIF-10A (or FIF-12) + CT-104A USB Programming Interface to the computer's USB port and the VXR-7000's MIC jack. Then it will be safe to restart the computer; turning off the equipment during interconnection avoids the po-tential for damage to the electronics caused by voltage spikes. Insert the distribution diskette into your 3½" drive (af-ter booting DOS), and make a copy of the diskette; use the distribution diskette for archive purposes, and use the disk copy for programming.
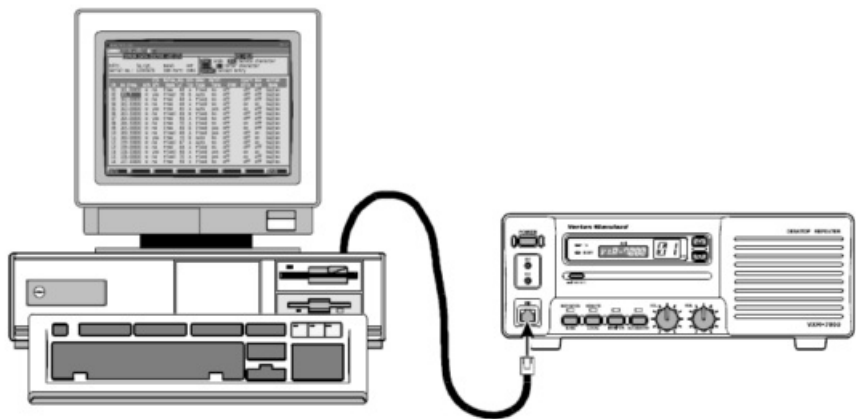


**VXR-7000 Programming Setup**



**CE27 Main Screen (Left)**

Place the CE27 (copy) diskette into your 3½" drive (usu-ally "Drive A"), and log onto this drive by typing "A: [ENTER]", then load the contents of the CE27 diskette into a directory named CE27, using the COPY command (e.g. "COPY A:*.* C:\CE27").Now type "CE27 [ENTER]" to start the program. The in-troductory screen will appear, and you may press any key to enter the main screen.Choose the "Help" contents option (F1) from the program's Menu for assistance with channel program-ming or setting of parameters.

**Important Note!**

- Do not run the CE27 programming software di- rectly from the original distribution diskette. Copy the programming software to your computer's hard disk, then run the software from the hard disk only. Keep the original dis-tribution diskette in a safe place in case you need to make another copy of it at a later date.

- Before creating the programming data for your VXR-7000 via the CE27 programming software, upload the current factory hardware environ-ment data from the VXR-7000, using the [F5](ReadRom) command. Use this data profile to create the programming data for this repeater.

Channel Data Items Ch: Channel Number This 2-digit number (01 – 16) is used to identify the chan-nel. Channel numbers occur in sequence, and their or-der can not be changed. Rx Freq.: Edit Receive (or simplex) Frequency Use the [0] – [9] keys to enter the desired channel fre-quency directly, and press the [ENTER] key. CTCSS Decoders: Toggle CTCSS Decoder ON/OFF, sets CTCSS Frequency Press the [SPACE] bar to

```
┌──── Tone Select ─────┐
│  67.0   69.3   71.9   74.4 │
│  77.0   79.7   82.5   85.4 │
│  88.5   91.5   94.8   97.4 │
│ 100.0  103.5  107.2  110.9 │
│ 114.8  118.8  123.0  127.3 │
│ 131.8  136.5  141.3  146.2 │
│ 151.4  156.7  162.2  167.9 │
│ 173.8  179.9  186.2  192.8 │
│ 203.5  210.7  218.1  225.7 │
│ 233.6  241.8  250.3  159.8 │
│ 183.5  189.9  196.6  199.5 │
│ 206.5  229.1  254.1 │
└────────────────────┘
```

toggle the CTCSS Decoder "on" or "off," or press the [ENTER] key to display the "TONE SELECT" window, from which you may select a CTCSS frequency using the [ARROW] key; press [EN-TER] again to accept the selected tone, or press [ESC] key to cancel. DCS Decoders: Toggle DCS Decoder ON/OFF, sets DCS Code # Press the [SPACE] bar to toggle the DCS Decoder ON or OFF, or press the [ENTER] key to display the "CODE SE-LECT" window, from which you may select a DCS code using the [AR-ROW] key; press [ENTER] again to accept the selected code, or press the [ESC] key to W/N: Wide/Narrow Channel Spacing This function selects the channel spacing environment in which the VXR-7000 operates.

```
┌──── Code Select ──────────────────┐
│ 023  025  026  031  032  036  043  047 │
│ 051  053  054  065  071  072  073  074 │
│ 114  115  116  122  125  131  132  134 │
│ 143  145  152  155  156  162  165  172 │
│ 174  205  212  223  225  226  243  244 │
│ 245  246  251  252  255  261  263  265 │
│ 266  271  274  306  311  315  325  331 │
│ 332  343  346  351  356  364  365  371 │
│ 411  412  413  423  431  432  445  446 │
│ 452  454  455  462  464  465  466  503 │
│ 506  516  523  526  532  546  565  606 │
│ 612  624  627  631  632  654  662  664 │
│ 703  712  723  731  732  734  743  754 │
└────────────────────────────────┘
```

- W (Wide) = 25 kHz Channel Spacing, ±5 kHz De- viation.
- N (Narrow) = 12.5 kHz Channel Spacing, ±2.5 kHz

Press the [SPACE] bar to select the desired channel spac-ing environment. Clk Sft: Enable/disable the CPU Clock Shift This function is only used to move a spurious response "birdie" should it fall on a current frequency.  Press the [SPACE] bar to toggle "yes" or "no."NSQ Mode: Noise Squelch Mode This command selects the manner of setting of the Squelch threshold level.

- User = The squelch threshold level is fixed via the "NSQ Lv" parameter (NSQ Lv: 0 [min.] ~ 255 [max.]).
- Prpgm = The squelch threshold level determined via the dealer programming.

Press the [SPACE] bar to select the desired NSQ Mode. NSQ Lv: Noise Squelch threshould level Use the [0] – [9] keys to enter the desired Squelch thresh-old level directly, and press the [ENTER] key. Available values are 0 (min.) ~ 255 (max.). Court Blip: Courtesy Blip When this parameter is set to "on," this function causes the VXR-7000 to send out a "blip" on the portable/mo-bile radio is frequency each time the portable radio is unkeyed. This provides audible confirmation to the user that the VXR-7000 was able to receive the transmission from theportable. Press the [SPACE] bar to toggle "on" or "off."

```
MS-DOS - CE27                                                         _ □ ✕

┌─ EEPROM DATA EDITOR <CE-27> ─────────────────┬──────── KEY HELP ────────┐
│                                              │ [SPACE] Toggle Action Mode│
│ Edit:        noname.rpt   Band:      VHF     │         Simplex/Duplex    │
│ Serial No.:  12345678     COM Port:  COM1    │                           │
└──────────────────────────────────────────────┴───────────────────────────┘

         Action                     Encoders Base Base          TX  TOT  RptTOT  RPT RPT
  Ch     Mode      Tx Freq.    CTCSS DCS   TOT  Guard LOUT Pwr  Mute Use Beep  HT  GT
  01     Duplex    161.50000   88.5  off   no   no    off  Hi   off  no  no    no  no
  02     Duplex    161.55000   100.0 off   no   no    off  Hi   off  no  no    no  no
  03     Duplex    161.60000   off   023   no   no    BTLO Lo   off  no  no    no  no
  04     Duplex    161.65000   off   155   no   no    BTLO Lo   off  no  no    no  no
  05     Duplex    161.70000   off   155   no   no    off  Hi   off  no  no    no  no
  06     Duplex    161.75000   88.5  off   no   no    off  Hi   off  no  no    no  no
  07     Duplex    161.80000   114.8 off   no   no    off  Hi   off  no  no    no  no
  08     Duplex    161.85000   off   351   no   no    off  Hi   off  no  no    no  no
  09     Duplex    161.90000   off   506   no   no    off  Hi   off  no  no    no  no
  10     Duplex    161.95000   off   off   no   no    BCLO Hi   off  no  no    no  no
  11     Duplex    162.00000   100.0 off   no   no    off  Hi   off  no  no    no  no
  12     Duplex    162.05000   88.5  off   no   no    off  Hi   off  no  no    no  no
  13     Duplex    162.10000   103.5 off   no   no    off  Hi   off  no  no    no  no
  14     Duplex    162.15000   off   off   no   no    off  Hi   off  no  no    no  no
  15     Duplex    162.20000   79.7  off   no   no    off  Hi   off  no  no    no  no
  16     Duplex    162.25000   off   off   yes  yes   BCLO Hi   on   yes yes   yes yes

1Help      2Common    3DiskLoad 4DiskSave 5Read ROM 6WriteROM 7PrintOut 8Quit
```

**Rev Bst:** Reverse Burst. When this parameter is set to "on," the CTCSS tone signal's phase is inverted just before the repeater turns to receive. This allows the portable/mobile station's CTCSS Decoder to begin switching off, thus reducing the transition time required. Press the [SPACE] bar to toggle "on" or "off."
**DCS Typ:** DCS Format This command is effective only when DCS is chosen for squelch control.

- = "Normal" DCS
- = "Inverted" (complement) DCS

Press the [SPACE] bar to select the desired DCS Type. DDec Type: DCS Decoder Type This command selects the manner in which DCS is to be decoded.

- Fixed = Decodes only the type selected in above pa- rameter (DCS Typ: Normal or Inverted).
- Auto = Both types (Normal and Inverted) will be decoded.

Press the [SPACE] bar to select the desired DCS Decoder Mode.
**Multi Tone:** Enable/disable Multi Tone Operation Press the [SPACE] bar to toggle Multi Tone Operation between selections "yes" and "no."

```
┌─ Multi Tone Select(CH-1) ──────────┐
│              Decoders      Encoders │
│           CTCSS  DCS     CTCSS  DCS │
│  Tone 01 :  88.5  ---      88.5  ---│
│  Tone 02 : 100.0  ---     100.0  ---│
│  Tone 03 : ---.-  023     ---.-  023│
│  Tone 04 : 114.8  ---      88.5  ---│
│  Tone 05 : 203.5  ---      88.5  ---│
│  Tone 06 : ---.-  155     ---.-  155│
│  Tone 07 : ---.-  351     ---.-  023│
│  Tone 08 : ---.-  506     ---.-  506│
│     ▼                               │
└─────────────────────────────────────┘
```

Press the [ENTER] key to display the "MULTI TONE SELECT" win-dow, from which you may select a CTCSS tone or DCS code; move the cursol to the appropriate field you using the [ARROW] key, then press the [ENTER] key to open the "TONE SELECT" or "CODE SELECT" window. Now select the desired CTCSS tone or DCS code using the [ARROW] key, then press the [ENTER] key again to accept the se-lected tone or code, or press the [ESC] key to cancel. You may set as many as 16 CTCSS tones and/or DCS codes. Note that, if you do not yet program a CTCSS tone or DCS code in the "MULTI TONE SELECT" window (when the "MULTI TONE SELECT" window data is not pro-grammed), press the [SPACE] bar to display the "MULTI TONE SELECT" window directly. CWID ANI/ENI: Select the Identifier mode Press the [SPACE] bar to toggle the selections "CW ID," "ANI/ENI," or "Off." To select this feature to the "CW ID" or "ANI/ENI," the "CW ID" parameter must be en-abled via the dealer programming.

**Action Mode:** Select the repeater operation mode Press the [SPACE] bar to toggle between "Duplex" op-eration or "Simplex" operation.
**Tx Freq.:** Edit Transmit Frequency Use the [0] – [9] keys to enter the desired channel fre-quency directly, and press the [ENTER] key. CTCSS Encoders: Toggle CTCSS Encoder ON/OFF, sets CTCSS Frequency Press the [SPACE] bar to

```
┌─ Tone Select ──────────────────────┐
│   67.0   69.3   71.9   74.4         │
│   77.0   79.7   82.5   85.4         │
│   88.5   91.5   94.8   97.4         │
│  100.0  103.5  107.2  110.9         │
│  114.8  118.8  123.0  127.3         │
│  131.8  136.5  141.3  146.2         │
│  151.4  156.7  162.2  167.9         │
│  173.8  179.9  186.2  192.8         │
│  203.5  210.7  218.1  225.7         │
│  233.6  241.8  250.3  159.8         │
│  183.5  189.9  196.6  199.5         │
│  206.5  229.1  254.1                │
└─────────────────────────────────────┘
```

toggle the CTCSS Encoder "on" or "off," or press the [ENTER] key to display the "TONE SELECT" window, from which you may select a CTCSS frequency using the [ARROW] key; press [EN-TER] again to accept the selected tone, or press the [ESC] key to cancel.
**DCS Encoders:** Toggle DCS Encoder ON/OFF, sets DCS Code # Press the [SPACE] bar to toggle the DCS Encoder "on" or "off," or press the [ENTER] key to display the "CODE SELECT" window, from which you may select a DCS code using the [AR-

```
┌──────── Code Select ────────┐
│ 023  025  026  031  032  036  043  047 │
│ 051  053  054  065  071  072  073  074 │
│ 114  115  116  122  125  131  132  134 │
│ 143  145  152  155  156  162  165  172 │
│ 174  205  212  223  225  226  243  244 │
│ 245  246  251  252  255  261  263  265 │
│ 266  271  274  306  311  315  325  331 │
│ 332  343  346  351  356  364  365  371 │
│ 411  412  413  423  431  432  445  446 │
│ 452  454  455  462  464  465  466  503 │
│ 506  516  523  526  532  546  565  606 │
│ 612  624  627  631  632  654  662  664 │
│ 703  712  723  731  732  734  743  754 │
└──────────────────────────────┘
```

ROW] key; press [ENTER] again to accept the selected code, or press the [ESC] key to cancel.

**Base TOT:** Enable/disable the Time-Out Timer while in the "BASE" station mode Press the [SPACE] bar to toggle the TOT feature selects "yes" and "no." The TOT time is determined via dealer programming.

**Base Guard:** Enable/disable the Base Guard Feature When this parameter is set to "yes," the transmitter will be inhibited for a few seconds before the repeater (in the "BASE" station mode) turns to receive. The inhibit time is determined via dealer programming.

**LOUT:** Select the Lock Out Feature's mode Press the [SPACE] bar to toggle the Lock Out Feature be-tween "BCLO," "BTLO," or "off," then press the [En-ter] key to accept the setting. "BCLO" inhibits trans-mitting while there is carrier present. "BTLO" inhibits transmitting while there is carrier present unless there also is a valid tone present.

**TX Pwr:** Transmitter Power Output Selection This parameter selects the desired power output from the VXR-7000 on the current channel. The available val-ues are HIGH and LOW. Press the [SPACE] bar to select "Hi" or "Lo."

**TOT Mute:** Enable/disable the TOT (Time-Out Timer) beep monitoring When this parameter is set to "on," the alert beep will sound from the front panel speaker before the repeater turns itself off.

**RptTOT Use:** Enable/disable the Time-Out Timer while op-erating in the repeater mode Press the [SPACE] bar to toggle the Repeater TOT selects "yes" or "no." The TOT time is determined via dealer programming.

**RptTOT Beep:** Enable/disable the TOT beep Transmission Press the [SPACE] bar to toggle the TOT beep selects "yes" or "no." When this parameter is set to "yes," the alert beep will be sent out on the air before the repeater turns itself off, while oprtating in the "REPEATER" mode.

**RPT HT:** Enable/disable the Repeater Hang-on Timer Press the [SPACE] bar to toggle the Repeater Hang-on Timer selects "yes" or "no." When this parameter is set to "yes," the repeater will remain keyed for a desired seconds after a receiving carrier is dropped. The Hang-up time is determined via dealer program-ming.

**RPT GT**: Enable/disable the Repeater Guard When this parameter is set to "yes," the transmitter in-hibit few second before the repeater is unkeyed. The inhibit time is determined via dealer programming.

## Duplexer Installation

**Important Notes!**

Please refer to the operating manual for your Duplexer for details regarding maximum power input, TX/RX con-nector locations, etc) before installing the Antenna Duplexer. Be certain to observe and comply with the specifications for frequency separation and maximum transmitter power for the duplexer connected to the VXR-7000, particularly when using the VXD-40xx internal duplexer. When the VXD-40xx is used, the frequency separation must be 5 MHz (minimum) to 10 MHz (maximum), and the maximum transmitter power output allowed is 40 Watts.

If the VXR-7000 output power (50 Watts) is in excess of the range of the duplexer's capability, you may reduce the TX output power of the VXR-7000 before installing the Antenna Duplexer, using the following procedure:

1. Connect the VXR-7000's TX antenna port to a watt-meter and dummy load (the duplexer must not be connected at this point). Connect any Vertex Stan-dard microphone to the MIC jack, and place the BASE/REPEATER switch in the "BASE" position. Select Channel 1 for alignment purposes.

2. Press and hold in the ACCESSORY switch for two seconds to enter the adjustment mode. The channel number will begin to blink.

3. Press and hold in the PTT key on the microphone. The display will indicate "Po" while transmitting. Observe the power output as indicated on the watmeter.

4. Keep the holding in the PTT key, press the (UP: increment) or (DOWN: decrement) button (to the right of the channel display) repeatedly to adjust the TX output power to 40 Watts (or less).

5. Keep the holding in the PTT key, press and hold in the ACCESSORY button for at least two seconds to save the new setting and exit to the normal opera-tion.

6. Release the PTT key.

7. Repeat steps 2. through 6. (above) for any other channels (2 through 16) if they are to be used.

8. Re-test each channel in the normal operating mode to confirm the proper power output. You may now disconnect all test equipment.

9. The duplexer may now be installed.

The above procedure should only be performed by your Authorized Vertex Standard Dealer or a qualified radio technician, in order to ensure accurate calibration. Please consult with your Authorized Vertex Standard Dealer for assistance with procurement of a suitable duplexer.

**Installations**

1. Remove the 14 screws affixing the top and bottom covers of repeater, and remove the covers (Figure 1).

2. Turn the repeater upside down.

3. Referring to Figure 2, remove the upper screw in either side of the front panel, and loosen the lower screw in either side of the front panel, then slide the front panel forward slightly.

4. Remove the coaxial cables connected to the TX and RX antenna jacks of the repeater.

5. Install the duplexer into the compartment on the bottom side of the repeater, using the four screws and antenna cable provided in the CT-68 Hardware Kit (Figure 3). Some duplexers may not line up with the threaded mounting holes in the repeater's chas-sis. In this case, use the supplemental mounting brackets supplied with the CT-68 Hardware Kit (Fig-ure 4).

6. Connect the optional Antenna Cable CT-68 between the TX antenna jack of the repeater and ANT (cen-ter) jack of the duplexer.

7. f your repeater's Tx/Rx frequency relationship is "upper shift" type (TXf > RXf), connect the coaxial cable from the RX Unit to the LOW PASS jack of the duplexer and connect the coaxial cable from the PA Unit to the HIGH PASS jack of the duplexer.
   If your repeater's Tx/Rx frequency relationship is "lower shift" type (TXf < RXf), connect the coaxial cable from the RX Unit to the HIGH PASS jack of the duplexer and connect the coaxial cable from the PA Unit to the LOW PASS jack of the duplexer. Note: Route the TX coaxial cable from the PA Unit as far as possible from the RX coaxial cable from the RX Unit.

8. uplexer installation is now complete. Replace the front panel back into place, and replace the top and bottom covers.
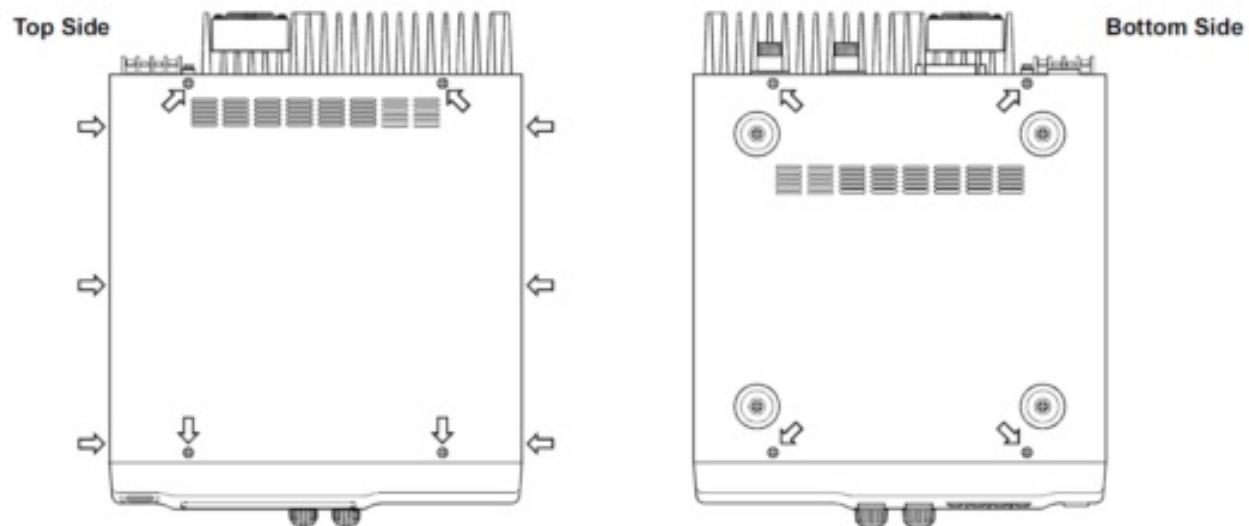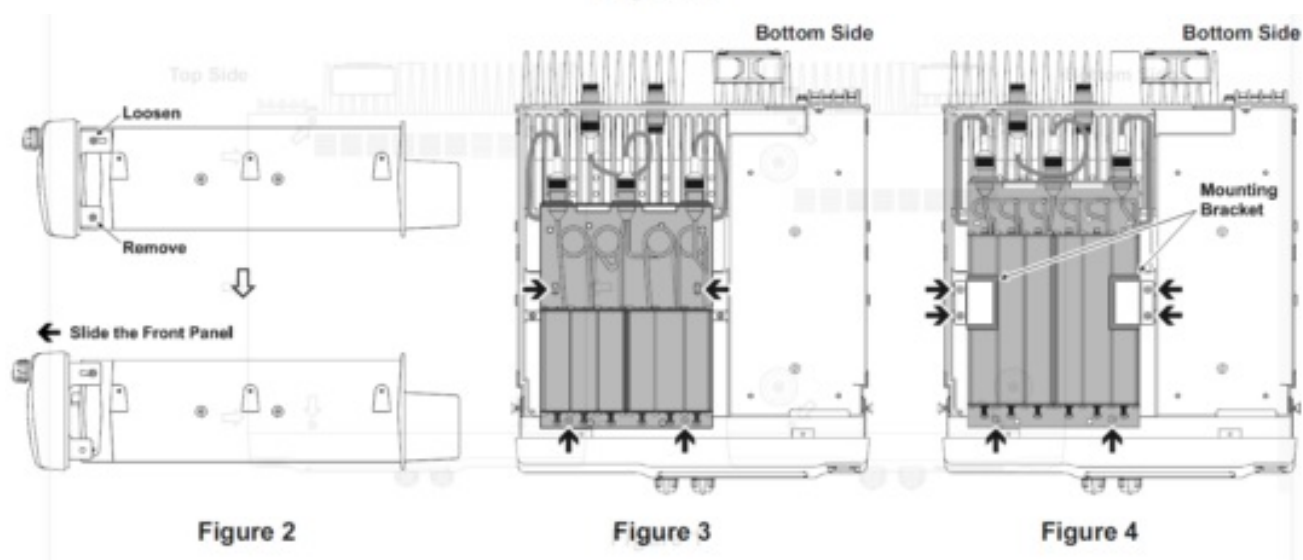
Top Side

Bottom Side

Figure 1

Loosen

Remove

Slide the Front Panel

Top Side

Bottom Side

Bottom Side

Mounting Bracket

Figure 2

Figure 3

Figure 4

## Specifications

### General

| | |
|---|---|
| Frequency Range: | VXR-7000v  136 ~ 150 MHz (A) or 150 ~ 174 MHz (C) |
| | VXR-7000u  400 ~ 430 MHz (A), 450 ~ 480 MHz (D), or 480 ~ 512 MHz (F) |
| Number of Channels: | 16 |
| Channel Spacing: | 12.5/25 kHz |
| Frequency Stability: | VXR-7000v  ±2.5 ppm |
| | VXR-7000u  ±1.5 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.): | 10 kg (22 lbs.) |

### Receiver

| | |
|---|---|
| Receiver Type: | Double-conversion Superheterodyne |
| Sensitivity: | VXR-7000v  0.25 µV for 12 dB SINAD, 0.35 µV for 20 dB NQ |
| | VXR-7000u  0.3 µV for 12 dB SINAD, 0.4 µV for 20 dB NQ |
| Selectivity: | 80 dB |
| Intermodulation: | VXR-7000v  80 dB |
| | VXR-7000u  85 dB |
| Spurious & Image Rejection: | VXR-7000v  95 dB |
| | VXR-7000u  85 dB |
| Audio Output: | 4 W @ 4 Ω |

### Transmitter

| | |
|---|---|
| RF Output: | 10 ~ 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: | VXR-7000v  Better than 80 dB below carrier |
| | VXR-7000u  Better than 75 dB below carrier |

*Specifications are subject to change without notice or obligation.*

### Supplied

| Item | Quantity |
|---|---|
| AC Cord (T9013282) | 1 |
| Spare 5A AC Fuse (Q0000005) | 1 |
| Spare 20A DC Fuse (Q0000079) | 1 |

### Options

| | |
|---|---|
| MD-12A8J | Desktop Microphone |
| CT-68 | Antenna Cable w/mounting screw (for the Antenna Duplexer) |
| FIF-10A | USB Programming Interface |
| FIF-12 | USB Programming Interface |
| CT-104A | PC Programming Cabel (for FIF-10A and FIF-12) |
| MR-3 | 19" Cabinet Rack-Mount Unit |

## WARRANTY POLICY

Vertex Standard warrants, to the original purchaser only, its Vertex Standard manufactured communications products against defects in materials and workmanship under normal use and service for a given period of time from the date of purchase.
Limited Warranty Details:

- North America customers (USA and Canada): **http://www.vertexstandard.com/lmr/warranty-terms.aspx**
- Customers outside of North America: contact the authorized dealer in your country.

## Documents / Resources

| | |
|---|---|
| Vertex Standard VXR-7000<br>Operating Manual<br><br>Vertex Standard LMR, Inc. | **Vertex Standard VXR-7000 Desktop Repeater/Base Station** [pdf] User Manual<br>VXR-7000, Desktop Repeater Base Station, VXR-7000 Desktop Repeater Base Station |