EEPROM Programming Software Instructions

To program the Vertex VXR-5000 repeater, you will need the VPL-1 connection cable, programming diskette and an IBM PC/AT or PS/2 -compatible type computer with:

❏ at least 512 K RAM

❏ PC DOS or MS DOS 2.0 or later

❏ one 5-1/4" (360 K or 1.2 MB) floppy drive

❏ a monochrome or color monitor

❏ one serial port (COM 1) with 25-pin connector (or suitable 9-pin adapter).

Of course you also need a printer if you want to get hard copy of the data.

The Vertex programming diskette contains the following files:

❏ CE8.EXE - The EEPROM programming program

❏ CE8.HLP - The help file used by the main program

❏ INSTRUCT.DOC - A text file containing a copy of these instructions (in case you mislay these instructions)

Before connecting the repeater for programming, turn off your computer and the repeater, and connect the VPL-1 programming interface cable to the computer and repeater as shown below. Then restart the computer. Turning off the equipment during interconnection avoids damage to the electronics.
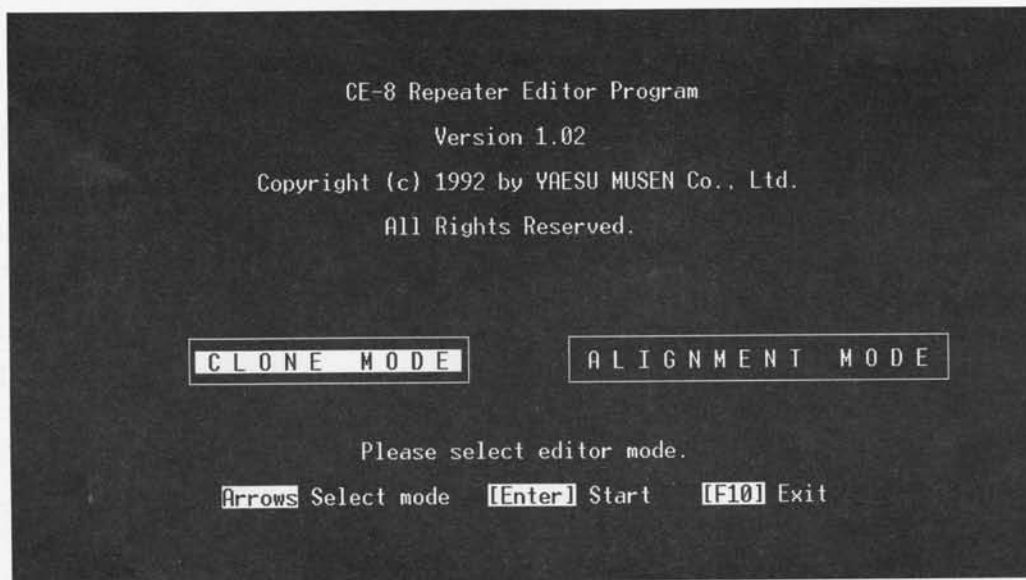
When ready to run the program (after booting DOS), place your copy of the Vertex diskette (not the original!) into drive A, and log on to this drive (type A:Enter). Then type CE8 -A Enter to start the program. You should be greeted briefly by an introductory screen, as shown at the top of the next page. Depending on which data you will be editing in the VXR-5000, you may have to add a different software "switch" to the command line, see the the next page for details.

Important!

Do not work directly with the CE-8 programming diskette! Make a copy of it and use the copy when programming the repeater, since you will be storing data on it. Keep it in a safe place in case you need to make another copy of it later. The manuals that come with your computer should explain how to make a copy of the diskette, using the DOS COPY command. If you want to be able to boot your computer from the programming diskette copy, use the FORMAT command with /S parameter (on a blank diskette) to make a system disk, and then copy the files from the original diskette.

VXR-5000 Programming Setup

```
              CE-8 Repeater Editor Program

                      Version 1.02

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                   All Rights Reserved.




    ┌─────────────────────┐       ┌─────────────────────────┐
    │ C L O N E   M O D E │       │ A L I G N M E N T   M O D E │
    └─────────────────────┘       └─────────────────────────┘


               Please select editor mode.

      [Arrows] Select mode    [[Enter]] Start    [[F10]] Exit
```

CE-8 Introductory Screen (using "-A" switch)

The Programming Screen

The introductory screen (above) prompts you with a choice of "CLONE" or "ALIGNMENT" selections. Clone mode is used to program operating and repeater hardware information (such as channel data, TX/RX frequencies, IF parameters, etc).

The alignment mode is used to change I/O parameters that affect repeater/base station configuration (i.e. remote control, tone squelch settings), and when servicing the repeater (to adjust power output).

For now you will want to start with the CLONE mode. Use your ← → arrow keys to select the appropriate mode and press the Enter key to begin.

CE-8 Software "Switches"

When booting up the CE-8 software, remember that the switch appended to the command line determines which repeater parameters can be viewed and edited via software. There are three "switch" combinations, as follows:

CE8 -A: Selectable Clone or Alignment Mode. Environment Settings (I.F., injection, channel steps, etc.) *cannot* be changed.

CE8 -P: Clone Mode only, Environment Settings can be edited.

CE8 : Clone Mode only, Environment Settings *cannot* be edited.

Main Screen Display (Clone Mode)

The main screen for the CLONE mode includes five major edit items: Environment, Frequency, Timer, Setup, & Option, and, along the bottom of the screen, Function Key Selections. These are described in a bit more detail next.

Main Screen Edit Items

Each edit item at the top of the screen can be selected by using the keyboard (← → arrow) keys, edit programming selections will appear below in the center frame on the screen.

```
┌────────────────────────────────────────────────────┐
│ Environment   Frequency   Timer   Setup   Option   │
├────────────────────────────────────────────────────┤
```

Edit Items

To choose a specific selection for data entry, press the ↑↓ arrow keys to highlight the selection to be edited. If you get lost at any time, the box beneath this screen lists the appropriate keys needed for data entry and toggling item selections. To leave the programming selections at any time to return to the edit items, simply press Esc.

```
VXR-5000 ┬ Simplex Base
         └ Duplex ──────┬ Repeater
                        └ Duplex Base
```

A brief explanation of the five main screen edit items follows:

Environment

Contains operating parameters used by hardware (circuitry) in the VXR-5000, including 1st IF selection, L.O. Injection Side, and Channel Step information. This information is hardware-specific for the repeater version you have, and should not need to be changed, except in the event of hardware or version modification. Changing environment parameters requires the CE8 -P extension when starting the program.

Frequency

Contains channel data information. Up to eight individual Tx and Rx channel frequencies are edited here, and channels can also be locked out, if desired.

Timer

Repeater Time-Out Timer, TX Hang-Timer and Penalty Timers are edited from these selections, time values in seconds or minutes can be entered, while others preset values can be toggled on-off.

Setup

System operating configuration and parameters such as simplex/duplex operation, power output on auxiliary DC power, Hi-Temp power reduction, alarm beeper and TX Hang-Time audio selection are selected and edited here.

Option

CTCSS Tone Encode/Decode frequency selection can be made. One of thirty-nine EIA standard CTCSS tones can be programmed for each channel (TX & RX). CTCSS operation can also be disabled completely for individual or all channels.

Sub Help Messages

In the box below the editing selection are Sub-Help Messages. These briefly instruct you how to select items, enter channel data, toggle default settings on/off and accept changes. New messages automatically appear pertaining to the edit menu and edit item currently selected. Instructions such as frequency entry format, time values and ranges, and keys used to toggle or increment/decrement a setting are given here.


```
Arrows  Select Item   [Enter]  Accept
```

Sub-Help Messages

Function-Key Help Messages

At the bottom of the screen appears Function-Key selections and their corresponding functions. While the Main Edit Item Screen is selected, F1-Help, F2-Print, F3-Upload, F4-Download, F5-Disk Load, F6-Disk Save, F7-Dump and F10-Exit appear showing options available for this screen. When individual programming selection is done, only three options (F1-Help, F2-Print and F10-Exit) are available.

What to do First

Reading data from the Repeater

If you have the repeater connected to the computer, first download the data from the repeater and save it to disk before doing anything else. Press the F4-Down Load key to do this, and follow the prompts. If an error message is displayed when attempting to download data, check the VPL-1 connection cable and connectors at both the computer and repeater. After downloading the data from the repeater, save it to disk right away as described next in *"Saving Data to Disk"*.

Important Note!

Before entering new channel data from the keyboard, you must either download from the repeater, or from a (valid) data file.

Some EEPROM data, such as IF and reference frequencies, is specific to the repeater hardware, and cannot be changed without modifying the circuitry. This data is, however, read-from/written-to the EEPROM. If it does not match the hardware for the repeater to be programmed, the repeater will not operate properly.

Loading Data from Disk

If no repeater is connected to the computer and you just want to view or edit data file already on disk, press F5-Disk Load. A window similar to that below appears, asking for the name of the file to load, which must be the name of a channel data file already on the disk.

```
┌────────────────────────────────────────────┐
│ ▓▓▓▓▓▓▓▓▓    <VERTEX   >                    │
│                                            │
│                                            │
│                                            │
│                                            │
│                                            │
├────────────────────────────────────────────┤
│ File to Load   C:\YAESU\*.rpt              │
└────────────────────────────────────────────┘
```
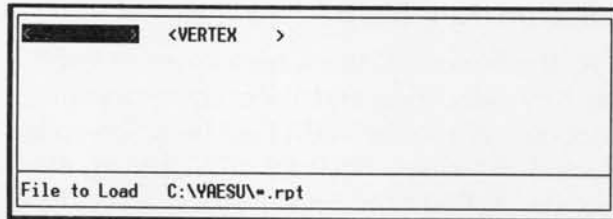
There are no such files provided on the original diskette (you must first download data from the repeater, and save it).

If an error message appears during the loading, either no file could be found on the disk with that name, or the file data was corrupted since the last time it was stored. If the data was corrupted, you will have to build a new file from scratch, or enter another file name. We suggest you erase any corrupted files from the disk to avoid confusion. Just enter DEL filename.rpt Enter from the DOS prompt (substituting the name of your file for *filename*).

Editing Repeater Data

After loading data from a repeater or a data file, you are ready to edit it. Just move the cursor from one field to another, and enter the new data as desired. Refer to the Sub-Help messages and Function-Key functions as you go along. You can always press the F1-Help key for additional help on each field,

Listing Data to Screen or Printer

To get a printed copy of a set of data, or to view data without making any changes, press F2-Print from the main screen. To print a displayed page on the printer, if you have a PC keyboard with the Print Screen key also serving as an asterisk key, press Shift and Print Screen together. Otherwise, if you have an enhanced AT keyboard, just press the Print Screen key.

as needed. The CTCSS decoder/encoder field (under the Option menu) will allow you to choose tone frequencies from a selection table, shown later.

When you have entered all of the channel and operating data as desired, we recommend that you first save it to disk before uploading it to the repeater.

Saving Data to Disk

You can save data to a disk file at any time by pressing the F6-Disk Save function key. A file list window like that illustrated for Disk Load will appear. Remember that you must save a file if you have just edited data and want to see it again later, but we also suggest you do this whenever you have downloaded from a repeater (so you can restore it if a problem develops later). You will be asked for a file name to save to. This can be any valid DOS file name, but we recommend you choose a name that you will be able to recognize easily later, and be careful not to select a name that already exists.

Sending Data to the Transceiver

After editing data and saving it to a file on disk, you can upload to a repeater, if connected. If the cables are not connected, however, you should press F10 - Exit after making sure you have saved any edited data to a file, and then turn off the computer to connect the cable and repeater. Then turn the computer back on, restart the program, reload the saved file from disk (F5-Disk Load), and press function key F4-Download. Follow the prompts on the screen (pressing the spacebar starts the download). If an error message is displayed when attempting to download, check your cables and connections carefully. Any key returns you to the Main Menu where you can try again, if necessary. To program another repeater with the same data, you can change the cable connection without having to reboot and start the program again.

Editing Common Data

Environment Data

Environment Data (most of which cannot be changed without changing the hardware), can be viewed by entering the first Main Menu item. These parameters are stored in EEPROM along with the changeable parameters, but they must match the circuitry of the repeater being programmed.

Remember to be careful whenever editing this data as *entering an incorrect IF frequency or Injection Offset will render the repeater non-operational.* To change any of the environment parameters, you must restart the program with the -P switch ("CE8 -P").

- **1st IF** - should be set to 21.6 MHz for VHF versions, 47.9 MHz for UHF. Do not alter

this setting unless making hardware changes.

- **L.O. Injection**- selectable upper/lower offset determines the local oscillator injection. Can be changed to improve intermodulation performance in urban areas or high RF environments. Do not alter this setting, as receiver re-alignment is necessary.

- **Channel Steps**- determine the minimum channel step size. Select 5 kHz, 6.25 kHz, 10 kHz, or 12.5 kHz, according to your spacing requirements.

- **Serial Number** - up to 12 digits can be entered here to identify the repeater being programmed. We recommend entering the VXR-5000 identification code found on the side panel of the repeater cabinet for easy future reference.

```
Environment  Frequency  Timer  Setup  Option
  SERIAL: 000000000000
  C:\YAESU\CLONE.RPT


              1st IF ............. 47.9MHz
              Inject side ........ Low
              Channel step ....... 10.0,12.5kHz

              Serial Number ...... 000000000000




  [SPACE] Increment or Toggle  [BS] Decrement or Toggle

F1-Help  F2-Print  F10-Exit
```

Repeater Environment Window (using " -P" switch)

```
Environment  Frequency  Timer  Setup  Option
┌────────────────────────────────────────────────────────────┐
│ SERIAL: 000000000000                                       │
│ C:\YAESU\CLONE.RPT                                         │
│                                                            │
│                            [Receive]        [Transmit]     │
│                                                            │
│         Freq. Ch-1 .....   455.67500MHz     461.67500MHz   │
│         Freq. Ch-2 .....   455.75000MHz     461.75000MHz   │
│         Freq. Ch-3 .....   464.50000MHz     464.50000MHz   │
│         Freq. Ch-4 .....   464.51250MHz     464.51250MHz   │
│         Freq. Ch-5 .....   464.55000MHz     464.55000MHz   │
│         Freq. Ch-6 .....   455.77500MHz     461.77500MHz   │
│         Freq. Ch-7 .....   Off              Off            │
│         Freq. Ch-8 .....   Off              Off            │
│                                                            │
│                                                            │
│ ┌────────────────────────────────────────────────────────┐ │
│ │ 0...9 Transmit Frequency  [.] Enter kHz  [SPACE] On/Off │ │
│ └────────────────────────────────────────────────────────┘ │
│                                                            │
│ F1-Help  F2-Print  F10-Exit                                │
└────────────────────────────────────────────────────────────┘
```

Channel Editor Window

Frequency

Channel data (TX and RX) must be entered individually for channels 1 ~ 8, as shown above. Channels are enabled/disabled by toggling the SPACE bar. Frequencies are entered using the numeric keypad or top-row keys. Up to eight digits can be entered and displayed. However, frequencies will be rounded to the nearest channel-step (as set in the environment window). Confirm that the frequencies entered are within the operating range of the repeater version you are programming.

Timer

Time-Out Timer, Hang-Timer and Penalty-Timer settings for both repeater and remote-base operation can be edited in this menu (shown below). These affect overall system operation, and therefore should be configured according to user requirements.

- **Time-Out Timer** - this selects a maximum time period for continuous transmission (1 ~ 60 mins.), or is disabled by pressing the SPACE bar.

- **Hang-Timer** - this controls how long the repeater will remain keyed after a transmitting station's carrier drops (stops transmitting). Hang-Time can be adjusted

```
Environment  Frequency  Timer  Setup  Option
┌────────────────────────────────────────────────────────────┐
│ SERIAL: 000000000000                                       │
│ C:\YAESU\CLONE.RPT                                         │
│                                                            │
│                            [Repeater]       [Base]         │
│                                                            │
│    Time-Out Timer ..........   1min           1min         │
│                                                            │
│    Hang Timer .............    4sec                        │
│                                                            │
│    Penalty Timer ..........    30sec          10sec        │
│                                                            │
│                                                            │
│ ┌──────────────────────────────────────────────────────┐   │
│ │ 0...9 Time out time (1 to 60 minutes)  [SPACE] On/Off │   │
│ └──────────────────────────────────────────────────────┘   │
│                                                            │
│ F1-Help  F2-Print  F10-Exit                                │
└────────────────────────────────────────────────────────────┘
```

Timer Settings Window

from 1 ~ 60 secs. or disabled by pressing the SPACE bar.

- **Penalty-Time** - this determines the repeater "dead"- or penalty-time after the Time-Out Timer has expired before any station can access the repeater again. Timer is adjustable from 10 ~ 360 seconds.

Set Up

The following repeater system operation can be programmed according to user requirements from this menu:

- **Mode** - Use the SPACE bar to toggle between Simplex or Duplex operation.

- **DC RF PWR LVL** - When operation shifts to an auxiliary DC power source, selecting low power results in TX power automatically switching to low power to extend operation time under battery power. Normal selection retains TX power at the default power setting (as set in the alignment mode).

- **Hi Temp Pwr Red** - This feature automatically monitors repeater TX power amplifier temperature, and, if safe operating temperatures are exceeded, reduces TX output power (or disables the transmitter) to prevent damage from over-heating.

- **Alarm Beeper** - Enables/disables the Alarm beep tone about 30 secs. before the Time-Out Timer is about to expire.

- **Hang-Time Audio Sel** - Determines if channel audio (noise) will be heard during TX hang-time (repeater keyed with carrier not present). With *Quiet* selected, receiver audio will remain squelched, *Noise-Out* enables open-channel noise (muted –10 dB) to be heard. Use the SPACE bar to make a selection.

```
Environment  Frequency  Timer  Setup  Option

  SERIAL: 000000000000
  C:\YAESU\CLONE.RPT




              Mode .................. Simplex
              DC RF PWR LVL ......... Normal
              Hi Temp Pwr Red. ...... Enabled
              Alarm Beeper .......... Enabled
              Hang Time Audio Sel. .. Noise Out









  Arrows Select Item  [Enter] Accept

F1-Help F2-Print F3-Upload F4-Download F5-DiskLoad F6-DiskSave F7-Dump F10-Exit
```

Repeater System Configuration Setup

Option

CTCSS tone encode/decode options are selected in this menu. Toggling the SPACE bar enables/disables the encoder/decoder for each channel. CTCSS tone frequencies can then be entered numerically (if the exact frequency is already known), or else selected from a standard tone table by pressing Enter and using the ← → arrow keys to select the desired EIA-standard tone.

```
┌──────────────────────────────┐
│   [Decode]          [Encode] │
│ ┌─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        ││
│ └───────────────────────────┘│
└──────────────────────────────┘
```

CTCSS Tone Selection Window

This completes operational and programming information for the CLONE mode, for repeater internal system alignment and monitoring I/O (input/output) status, proceed with the ALIGNMENT mode covered next.

```
Environment  Frequency  Timer  Setup  Option

  SERIAL: 000000000000
  C:\YAESU\CLONE.RPT


                          [Decode]       [Encode]

            CTCSS Ch-1 .....  103.5Hz        103.5Hz
            CTCSS Ch-2 .....  141.3Hz        141.3Hz
            CTCSS Ch-3 .....   67.0Hz        250.3Hz
            CTCSS Ch-4 .....  Off            Off
            CTCSS Ch-5 .....  Off            Off
            CTCSS Ch-6 .....   91.5Hz         91.5Hz
            CTCSS Ch-7 .....  Off            Off
            CTCSS Ch-8 .....  Off            Off



  Arrows Select Item  [Enter] Accept

F1-Help F2-Print F3-Upload F4-Download F5-DiskLoad F6-DiskSave F7-Dump F10-Exit
```

Option - CTCSS Entry Window

Alignment Mode

This mode is selectable from the introductory screen as selected with the "-A" switch from DOS (type A: CE8 -A Enter), forgetting the "-A" switch permits opening the CLONE mode only. The Alignment Mode enables you to view current repeater I/O status and adjust repeater output power level during battery operation. Two items are selectable here: Status and Alignment (see the full-screen display at the bottom of the next page).

Repeater System Status Display

This window displays three areas: Alarm, Logic In and Logic Out. Note that these parameters cannot be modified, only viewed. Along the bottom of the screen, Function Key selections appear as before. After pressing Enter, a different function key submenu will appear, as shown below.

`F1-Help F2-Print F3-PTT F4-Read F10-Exit`

Alignment Mode Sub-Menu

To monitor the present I/O status of the repeater, press F4. An "Accessing Repeater" message appears briefly as the I/O data is loaded, then all parameters are displayed. This feature is useful for network monitoring, confirming system programming changes, or to assist in troubleshooting in the event that an repeater system alarm is received.

Repeater System Status Parameters

The following table provides brief explanations of system I/O parameters:

VXR-5000 System Parameters

Parameter	Indication	Comment
[Alarm]		
Tx Unlock	Normal / Unlock	TX PLL state
Rx Unlock	Normal / Unlock	RX PLL state
[Logic In]		
BASE	L - base H - rptr	Mode of Operation from pin 13, BASE
PTT	L - tx H - rx	TX keyed from pin 12, PTT
RX MUTE	L -muted H - unmuted	Line audio from pin 19, RX MUTE
TONE OFF	L - off H - on	CTCSS Audio Off from pin 17, TONE OFF
NSQ OFF	L - off H - on	Noise Squelch Off from pin 10, NSQ OFF
SQ LOW	L - low H - high	Squelch Status from pin 20, SQL LOW
HI TEMP	L - norm. op. temp. H - hi-temp. condition	PA Unit High Temp from Thermal Sensor
BATT	L - Battery Operation H - AC Operation	Aux. Battery Oper.
REMOTE	1 - 8	Channel of Operation from pins 21-23, REMOTE D0, D1, D2
[Logic Out]		
TONE DET	L - none H - tone detect	CTCSS Tone Receive
NSQ DET	L - close H - open	Noise Squelch
COAXIAL SW	L -relay de-energized H - relay energized	Antenna Relay from pin 9, COAX SW
TX CNTL	L - rx H - tx	Logic Output from pin 18, TX

```
Status  Alignment

 SERIAL: 000000000000      <PTT Off>
 C:\YAESU\ADJUST.RPT

     === Repeater Status ===

 [Alarm]               [Logic In]          [Logic Out]

 Tx Unlock .......     BASE .........      TONE DET .....
 Rx Unlock .......     PTT ..........      NSQ DET ......
                       RX MUTE ......      COAXIAL SW ...
                       TONE OFF .....      TX CNTL ......
                       NSQ OFF ......
                       SQ LOW .......
                       HI TEMP ......
                       BATT .........
                       REMOTE .......



 Arrows Select Item  [Enter] Accept

F1-Help F2-Print F3-Upload F4-Download F5-DiskLoad F6-DiskSave F7-Dump F10-Exit
```
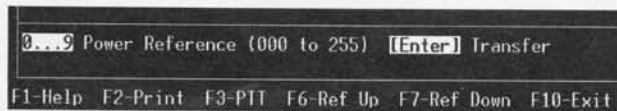
Repeater System Status Window

Power Alignment

When enabled from the CLONE mode, transmitter RF output automatically switches to a reduced level as soon as operation switches to DC (battery) power. In addition, continued transmit capability during a high-temperature condition (HI TEMP) *at reduced power* is possible if this setting is enabled. In either case, the reduced RF power level is set in the alignment mode.
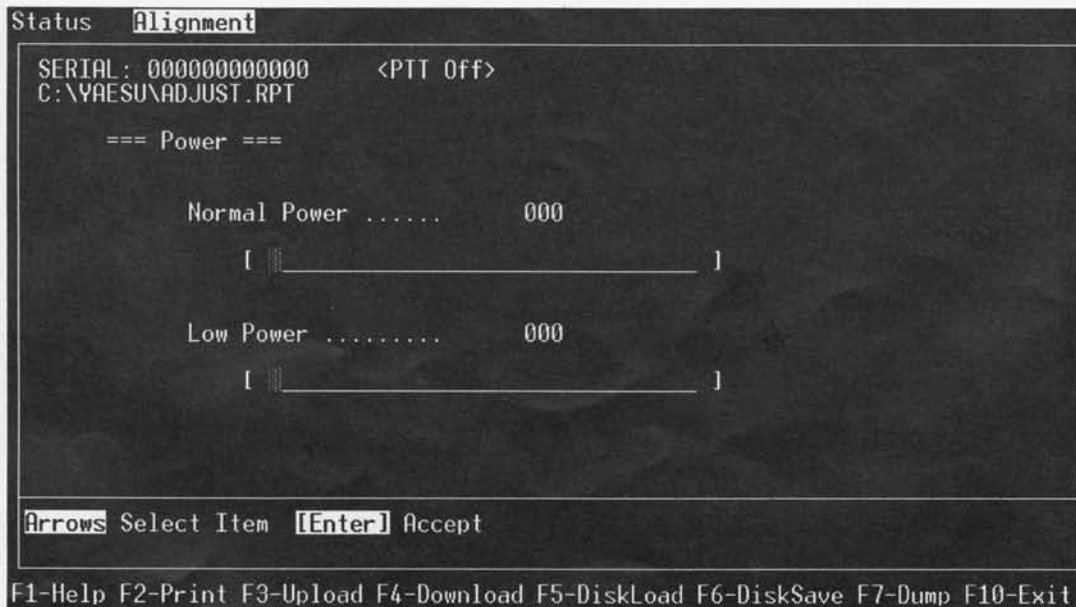
From this window you can view or adjust reduced RF power output level as described above, and the normal RF output power level. Two bargraphs show each RF power output for comparison, along with a discrete power level calibration value (0-255) displayed above the graph (see display at page bottom).

To change either level, press Enter to bring up the function-key sub-menu.

```
0...9 Power Reference (000 to 255)  [Enter] Transfer

F1-Help  F2-Print  F3-PTT  F6-Ref Up  F7-Ref Down  F10-Exit
```

Power Alignment Sub-Menu

Use the F6 & F7 keys to adjust the desired power level, or else you can enter a discrete level from 0-255 using the keyboard and pressing Enter.

Battery Operation

When under battery back-up power, repeater operational time is influenced by three factors:

1. Current capacity of the storage battery (rated in Amp-Hours)
2. Preset RF power output level for DC operation.
3. TX duty cycle

To maximize repeater operational time, we suggest the following:

Utilize a storage battery with a rated load capacity of at least 50-Ah as a minimum back-up supply.

Set the reduced RF power level for DC operation and during HI TEMP conditions to *approximately half* (12 W) or less for conservative operation.

If possible, inform repeater users that the system is under a back-up power source, and to limit non-essential communications to conserve battery life.

To manually key the transmitter, press F3. You can do this now, with a wattmeter connected to the **TX ANT** jack to check actual power against the software reference level. You will also need to do this as part of the transmitter alignment step in the *Alignment* Chapter, covered later.

```
Status    Alignment

  SERIAL: 000000000000       <PTT Off>
  C:\YAESU\ADJUST.RPT

     === Power ===

        Normal Power ......      000

           [ |                              ]


        Low Power .........      000

           [ |                              ]



  Arrows Select Item   [Enter] Accept

  F1-Help F2-Print F3-Upload F4-Download F5-DiskLoad F6-DiskSave F7-Dump F10-Exit
```

Alignment Power Settings Window