Alignment

Introduction

The VX-600/900 is carefully aligned at the factory for the specified performance across the frequency range specified for each version. Realignment should therefore not be necessary except in the event of a component failure, or when altering the version type. All component replacement and service should be performed only by an authorized VERTEX STANDARD representative, or the warranty policy may be voided.

The following procedures cover the sometimes critical and tedious adjustments that are not normally required once the transceiver 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 VERTEX STANDARD service technicians who are experienced with the circuitry and fully equipped for repair and alignment. 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, VERTEX STANDARD 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 transceiver are clearly understood, the cause of the malfunction has been clearly pinpointed and any faulty components replaced, and realignment determined to be absolutely necessary.

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.

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.

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-Ohm RF Dummy Load with power rating 10W at 200 MHz
- ❐ 16-Ohm AF Dummy Load

(Attention : Audio output is BTL output; do not short "shield" to ground!)

- ❐ Regulated DC Power Supply (standard 7.5V DC, 3A)
- ❐ Frequency Counter with 0.2 ppm accuracy at 200 MHz
- ❐ AC Voltmeter
- ❐ DC Voltmeter
- ❐ UHF Sampling Coupler
- ❐ IBM PC / compatible Computer with Microsoft DOS v3.0 or later operating system
- ❐ Vertex Standard CT-71 Connection Cable and SVC39 Alignment program

Alignment Preparation and Precautions

A 50-Ohm RF Dummy Load and in-line wattmeter must be connected to the main 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 transceiver and test equipment, and that this temperature be held constant between 20° and 30°C (68° ~ 86°F). When the transceiver is brought into the shop from hot or cold air, it should be allowed time to come to room temperature before alignment.

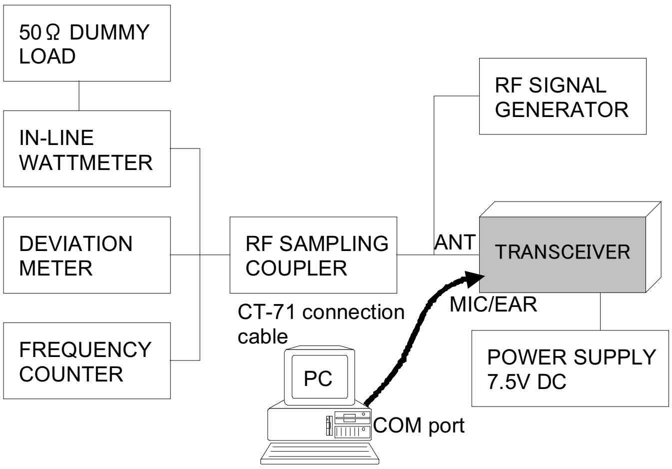
Whenever possible, alignments should be made with oscillator shields and circuit boards firmly affixed in place. Also, the test equipment must be thoroughly warmed up before beginning.

Note: Signal levels in dB referred to in the alignment procedure are based on 0 dBμ EMF = 0.5 μV (closed circuit).

Important Note

When connecting the CT-71 plug into the MIC/SP jack of the VX-600/900, you must remove the plastic cap and its mounting screws prior to programming. Please remember to re-attach the cap and screws when the programming is complete.

Set up the test equipment as shown for transceiver alignment, and apply 7.5V DC power to the transceiver.



The transceiver must be programmed for use in the intended system before alignment is attempted. The RF parameters are loaded from the file during the alignment process.
In order to facilitate alignment over the complete operating range of the equipment, it is recommended that the channel data in the transceiver be preset as per the chart below.

Channels	Frequency (Simplex)
Band-LOW	134.000 MHz
Band-MID	147.000 MHz
Band-HIGH	160.000 MHz

The alignment tool outline

Installation of the Alignment Tool

The "alignment mode" is a software-based protocol, accessed by an "Alignment Mode" command from the computer while switching the transceiver on. It is operated by the alignment tool automatically. During use of the alignment mode, normal operation is suspended. The alignment tool program provides all needed operation capability.
The alignment tool consists of an executable file "SVC39.exe" and an accompanying configuration file "SVC39.cfg" which should be loaded per standard DOS procedures. Create a suitable directory, then copy these files from the distribution diskette into the new directory. For example, if copying the file from Drive A, use the following DOS command sequence:

c:¥ mkdir align900 [enter]
c:¥ cd align900 [enter]

c:¥align900¥ copy a:SVC39.*

No further installation steps are required. If you wish to utilize a different name for the alignment directory, it will not matter to the executable file.

Booting the Alignment Tool

Change to the “Align900” directory (or the directory name you utilized in the previous section). Now type on the command line: SVC39 [ENTER] to boot the alignment tool.

Entering the Alignment Mode

To enter the alignment mode, turn the transceiver off, then press [0] on the computer keyboard. Now, turn the transceiver back on. When the command has been successful, a message on the computer screen will confirm that the transceiver is now in the “Alignment” mode.

Action of the Switches

When the transceiver is in alignment mode, the [PTT], [MON], and [DIAL] switches, as well as the Dial, are disabled. In the Alignment mode, all of the transceiver’s operation is remotely controlled by the PC.

Alignment Sequence

Although the data displayed on the computer’s screen during alignment is temporary data, it is important that you follow the basic alignment sequence precisely, so that the displayed data and the data loaded into the transceiver are identical.

Basic Alignment Sequence

1. Enter the alignment mode
2. Upload data from transceiver
3. Align data
4. Download data to transceiver

Alignment Tool Menu

Common Data

The parameters in this section represent "common" data for all channels. Once these "Common Data" parameters are correctly aligned, the "Tx Power," "Max Dev," and "Sub Audio Dev," can be trimmed for each channel, if needed.

During alignment, each parameter is adjusted for a higher or lower value via the computer’s [▲] and [▼] keys. When the desired value is reached, type [ENTER] to lock in the new value.

<u>(0) Common Tx :</u>

The first alignment section adjusts transmit-mode parameters which are common to all channels.

- [0] Frequency

This parameter is used to adjust the PLL reference frequency. From the "(0) Common Tx" section, press [0] to activate this alignment sequence.

・Press the [space] key on the keyboard to activate the transmitter.

・Press the [▲] or [▼] key, as needed, so the counter frequency is within 100 Hz of the channel center frequency for the MID channel.

・When the precise frequency is attained, press [ENTER] to lock in the new data.

・Now verify that the HIGH and LOW channels are also within tolerance.

- [1] High

This parameter is used to align Tx High power (5W). From the "(0) Common Tx" section, press [1] to activate this alignment sequence.

・Use the [◀] or [▶] key to select the "MID" frequency channel in the alignment range.

・Press the [space] key on the keyboard to activate the transmitter.

・Press the [▲] or [▼] key, as needed, to set the power output to 5 Watts, as indicated on the external wattmeter.

・When the 5 Watt level is attained, press [ENTER] to lock in the new data.

- [2] L1

This parameter aligns the L1 power (0.25 W) level. From the "(0) Common Tx" section, press [2] to activate this alignment sequence.

・Press the [space] key on the keyboard to activate the transmitter.

・Press the [▲] or [▼] key, as needed, to set the power output to 0.25 W, as indicated on the external wattmeter.

・When the 0.25 W level is attained, press [ENTER] to lock in the new data.

- [3] L2

This parameter aligns the L2 power (1 W) level. From the "(0) Common Tx" section,

press [3] to activate this alignment sequence.
・Press the [space] key on the keyboard to activate the transmitter.
・Press the [▲] or [▼] key, as needed, to set the power output to 1 Watt, as indicated on the external wattmeter.
・When the 1 Watt level is attained, press [ENTER] to lock in the new data.

- [4] L3

This parameter aligns the L3 power (2.5 W) level. From the "(0) Common Tx" section, press [4] to activate this alignment sequence.
・Press the [space] key on the keyboard to activate the transmitter.
・Press the [▲] or [▼] key, as needed, to set the power output to 2.5 W, as indicated on the external wattmeter.
・When the 2.5 W level is attained, press [ENTER] to lock in the new data.

- [5] Maximum Deviation

This section adjusts the transmitter's voice deviation level. From the “(0) Common Tx” section, select [5] to enter this alignment sequence.
・Use the [◀] or [▶] key to select the "MID" frequency channel in the alignment range.
・Disable any subaudible tone signaling on this channel, if present.
・Press the [space] key on the computer keyboard to start alignment. This activates the transmitter, and injects a 1 kHz test tone.
・Press the [▲] or [▼] key, as needed, to set the deviation to the desired value (typically 3.9 ~ 4.2 kHz, or 2.0 ~ 2.3 kHz for “narrow band” channels).
・When the desired deviation level is attained, press [ENTER] to lock in the new value.

- [6] MIC Gain

This parameter is used to align MIC Gain level. From the "(0) Common Tx" section, press [6] to activate this alignment sequence.
・Use the [◀] or [▶] key to select the channel on which you wish to adjust the MIC Gain.
・Press the [space] key on the computer keyboard to start alignment. This activates the transmitter, and injects a subaudible test tone.
・Use the [▲] or [▼] key to find the desired MIC Gain level is achieved.
・Press the [ENTER] key on the computer keyboard to lock in the new MIC Gain level.

- [7] Sub Audio Deviation

This section adjusts the transmitter's subaudible tone deviation level. From the "(0) Common Tx" section, select [7] to enter this alignment sequence.

・After setting the Maximum Deviation in the previous section, it is now time to align the subaudible signaling deviation level.

・Use the [◀] or [▶] key to select the channel on which you wish to adjust the Subaudible Deviation.

・Press the [space] key on the computer keyboard to start alignment. This activates the transmitter, and injects a subaudible test tone.

・Press the [▲] or [▼] key, as needed, to set the deviation to the desired value (typically 0.6±0.1 kHz, or 0.4±0.1 kHz for "narrow band" channels).

・When the desired deviation level is attained, press [ENTER] to lock in the new value.

(1) Common RX :

- [0] Tight Noise Squelch

This parameter is used to align the "Tight Noise Squelch" level. From the "(1) Common Rx" section, select [0] to enter this alignment sequence.

・Set the signal generator output level to -0dBμ EMF (0.5 μV).

・Press the [ENTER] key on your computer keyboard to set the "Tight" squelch level.

- [1] Threshold Noise Squelch

This parameter is used to align the squelch threshold level. From the "(1) Common Rx" select [1] to enter this alignment sequence.

・Set the signal generator output level to -10 dBμ EMF (0.16 μV).

・Press the [ENTER] key on your computer keyboard to set the squelch "Threshold" level.

- [2] RSSI (Received Signal Strength Indicator) Squelch

This section allows adjustment of the RSSI level. From the "(1) Common Rx" section, press [2] to enter this alignment sequence.

・Set the signal generator output level to +3.0 dBμ EMF (0.7 μV).

・Press the [ENTER] key on the computer keyboard to set the RSSI squelch level.

- [3] Tx Save

This section allows adjustment of the Tx Save activation threshold (reducing the transmitter power in strong-signal environments). From the "(1) Common Rx" section, press [3] to enter this alignment sequence.

・Set the Signal Generator output level to +15 dBμ EMF (2.8 μV).
・Press the [ENTER] key on the computer keyboard to lock in the TX Battery Saver threshold level.

Channels

The following parameters may be adjusted individually for each channel. For example, minor variations in the power output across the operating band may be equalized by following this section's instructions.

(2) Channels TX :

- [0] Tx Hi Power Trim

This parameter is used to trim Tx power on the displayed channel. From the "(2) Channels Tx" section, select [0] to adjust the "Tx Hi Power Trim" setting(s).
・Use the [◀] or [▶] key to select the channel to be adjusted.
・Press the [space] key on the keyboard to activate the transmitter.
・Press the [▲] or [▼] key, as needed, to trim the power output to the power that is programmed by CE39 channel editor, as indicated on the external wattmeter.
・Press [ENTER] to lock in the new data.

- [1] Tx Low Power Trim (L1, L2 or L3)

This parameter is used to trim Tx power on the displayed channel. From the "(2) Channels Tx" section, select [1] to adjust the "Tx Low Power Trim" setting(s).
・Use the [◀] or [▶] key to select the channel to be adjusted.
・Press the [space] key on the keyboard to activate the transmitter.
・Press the [▲] or [▼] key, as needed, to trim the power output to the power that is programmed by CE39 channel editor, as indicated on the external wattmeter.
・Press [ENTER] to lock in the new data.

- [2] Maximum Deviation Trim

This parameter is to trim maximum deviation on the displayed channel. From the "(2) Channels Tx" section, select [2] to adjust the deviation level.
・Use the [◀] or [▶] key to select the channel on which you wish to adjust the deviation.
・Press the [space] key on the computer keyboard to start alignment. This activates the transmitter, and injects a 1 kHz test tone.
・Press the [▲] or [▼] key, as needed, to set the deviation to the desired value (typically

3.9~4.2 kHz, or 2.0~2.3 kHz for "narrow band" channels).
・When the desired deviation level is attained, press [ENTER] to lock in the new value.

- [3] Sub Audio Deviation Trim
This parameter used to is to trim Subaudible deviation on the displayed Sub-audio channel. From the "(2) Channels Tx" section, select [2] to adjust the Subaudible Deviation level.
・Use the [◀] or [▶] key to select the channel on which you wish to adjust the Subaudible Deviation.
・Press the [space] key on the computer keyboard to start alignment. This activates the transmitter, and injects a subaudible test tone.
・Press the [▲] or [▼] key, as needed, to set the deviation to the desired value (typically 0.6±0.1 kHz, or 0.4±0.1 kHz for "narrow band" channels).
・When the desired deviation level is attained, press [ENTER] to lock in the new value.

<u>(3) Channels Rx :</u>
- [0] Manual Tuning
This parameter is used to tune the RF front-end components for the current channel manually. From the "(3) Channels Rx" section, select [0] to peak the receiver performance.
・Use the [◀] or [▶] key to select the channel on which you wish to adjust the front end alignment.
・Connect the signal generator to the Antenna jack, and set its level to +20 dBμ EMF (5 μV).
・Press [ENTER] to lock in the new data.

<u>(4) Other :</u>
- [0] Battery Warning Level
This parameter sets the battery warning level. From the "(4) Other" section, select [0] to align the battery warning voltage sensor.
・Set the DC supply voltage to 6.5 Volts.
・Press [ENTER] to lock in the new data.