

# VHTools for DBF Files

**VHTools for DBF Files** is a Windows 95/98/NT/2000 program that provides both interactive and batch conversion of V/H coordinates, to and from latitude/longitude. In this program, the batch conversion is provided for files in DBF form.

## Overview

Throughout the telephone community, the geographic location of elements is typically reported not in degrees of latitude and longitude, but in *V and H coordinates*. The location of a telephone central office, of a remote switch, and even of certain smaller elements of the telephone network are each identified by their *V and H* numbers.

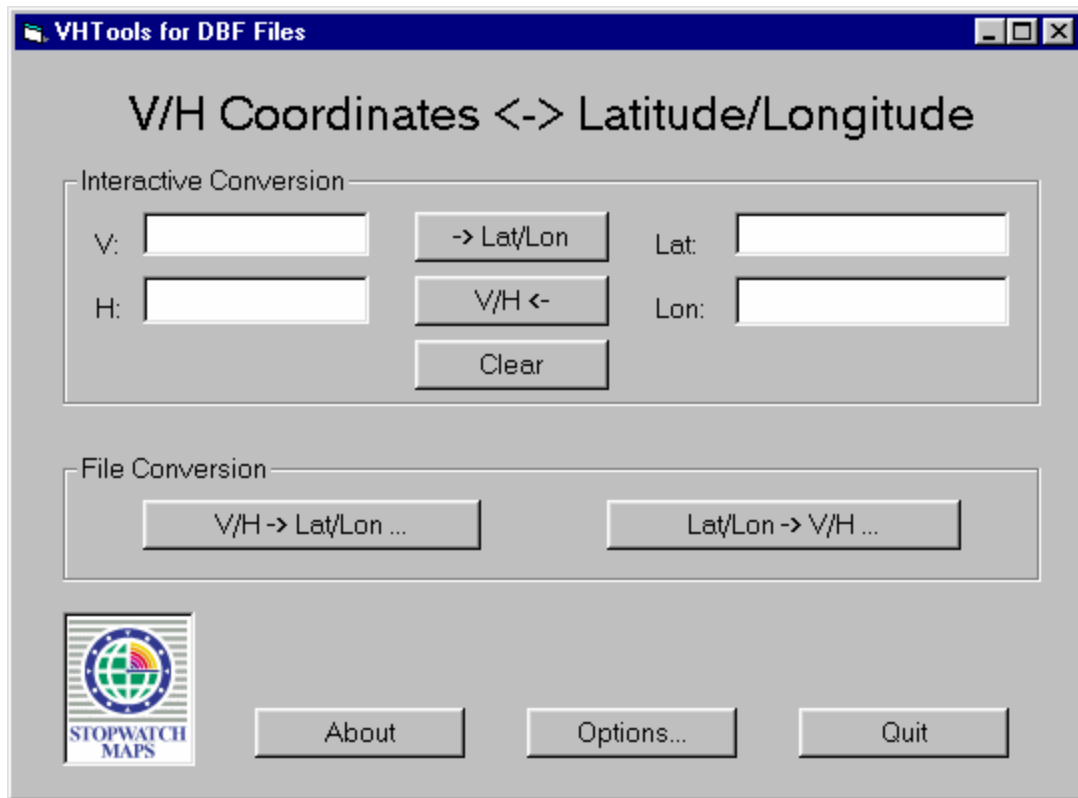
The V/H coordinate system was devised in the 1950's by AT&T as the basis for simple calculation of the distance between two central offices or two switches. In the 1950's, there were no online computers, and no handheld calculators with trigonometric functions, to ease the calculation of distance along the curved surface of the earth, between points whose locations were expressed in latitude/longitude coordinates. But using the specially constructed *vertical (V) and horizontal (H) coordinates* of any two points, the distance between those points could be accurately calculated by a very simple formula (similar to calculating the length of the hypotenuse of a plane triangle). The system was very effective, and it has been with us ever since.

But the use of V/H coordinates for telephone elements poses a geographical problem. People often need to use the location of a telephone element (of a central office, for example) *in connection with* the location of other elements such as customers, roads, and political boundaries. But the locations of these other elements are invariably recorded in the familiar latitude/longitude system. There is really no solution but to convert locations from one coordinate system to the other system. (In practice, the conversion is nearly always from V/H to latitude/longitude, but this program provides for conversion in either direction.)

There is *no closed formula* – nor any simple series of closed formulas – by which the conversion of coordinates from either system to the other can be performed. In fact, each requires a many-step procedure. This is because the V/H system is a *projection* (an “elliptical” projection) as well as a coordinate system. On the other hand, each procedure can be nicely incorporated into a program, and swiftly carried out programmatically. *VHTools for DBF Files* carries out both procedures.

## Starting the VHTools Program

The installation procedure for the VHTools program caused it to be included in the Programs menu. From **Stopwatch Maps** in the Programs menu, choose **VHTools for DBF Files**. The following window is displayed:



Using the Interactive Conversion frame of this window, you can convert the V and H coordinates of a location to latitude/longitude, and convert the latitude/longitude of a location to the equivalent V and H coordinates.

Using the buttons in the File Conversion frame of this window, you can perform a “batch conversion”. Through the dialog reached by the **V/H -> Lat/Lon...** button, you can convert V and H coordinates in every record of a file to latitude/longitude equivalents. Through the dialog reached by the **Lat/Lon -> V/H...** button, you can convert latitude/longitude in every record of a file to V and H coordinate equivalents. In this program, files in which you perform these conversions must be in DBF format.

You can perform any number of interactive and any number of file conversions during a single run of the *VHTools* program.

## Interactive Conversion: V/H to Latitude/Longitude

When the program begins, the **V**, **H**, **Lat**, and **Lon** text boxes are empty, and the cursor is in the **V** text box. Later, if the cursor is elsewhere, you can use the mouse – or successive presses of the **Tab** key – to move the cursor to the **V** text box.

Enter the *vertical* value in the **V** text box. It may be a whole number or may include fractional decimal digits. If it is negative, the negative sign must *precede* the first digit. The vertical value may include only an optional sign, digits, and a decimal point if there is a fractional part.

Use the **Tab** key a single time to move to the **H** text box. Enter the *horizontal* value there. (It too may include only an optional sign, digits, and a decimal point if there is a fractional part.)

To perform the conversion to latitude/longitude, you must activate the **-> Lat/Lon** button. You may left-click on that button with the mouse to activate it. But the *VHTools* program, as soon as it detected any key entry into the **V** or the **H** text box, assumed you would want to convert to latitude/longitude, so it set the **-> Lat/Lon** button as the *default* button. As a result, just pressing the **Enter** key activates that button, and performs the conversion.

The equivalent latitude and longitude now appear in the **Lat** and **Lon** text boxes. The number of fractional digits of latitude and longitude produced is determined by your setting through the **Options** button (see its explanation below). When the product is first installed, the number of fractional digits of latitude/longitude is 6.

The conversion is immediate. As soon as it has occurred the *VHTools* program puts the cursor again at the beginning of the **V** text box and sets the **Clear** button as the default button. A mouse click on the **Clear** button – or just a press of the **Enter** key – clears the **V**, **H**, **Lat**, and **Lon** text boxes, and all is ready for you to enter another pair of V/H coordinates. But if you wish to modify the contents of the **V** or **H** *without* clearing, you may certainly do that. In either case, entry of any character into the **V** or **H** text box causes the **-> Lat/Lon** button to become the default button again.

Here's an example of such a conversion that was performed, of the V/H of a wire center in midtown Manhattan in New York.



The screenshot shows a dialog box titled "Interactive Conversion". It contains four text input fields and three buttons. The "V:" field contains "14994", the "H:" field contains "1407", the "Lat:" field contains "40.753012", and the "Lon:" field contains "-73.984945". The buttons are labeled "-> Lat/Lon", "V/H <", and "Clear".

## Interactive Conversion: Latitude/Longitude to V/H

Converting latitude/longitude to its V/H equivalent is the reverse of the procedure above.

If the cursor is not already in the **Lat** text box, use the mouse – or successive presses of the **Tab** key – to move the cursor to the **Lat** text box. Enter the *latitude* value in the **Lat** text box. The value may include only an optional sign, digits, and a decimal point if there is a fractional part.

Use the **Tab** key a single time to move to the **Lon** text box. Enter the *longitude* value there. (It too may include only an optional sign, digits, and a decimal point if there is a fractional part.)

To perform the conversion to V/H, activate the **-> V/H** button. You may left-click on that button with the mouse to activate it. But the *VHTools* program, as soon as it detected any key entry into the **Lat** or the **Lon** text box, assumed you would want to convert to V/H, so it set the **-> V/H** button as the default button. As a result, just pressing the **Enter** key activates that button, and performs the conversion.

The equivalent V and H coordinates now appear in the **V** and **H** text boxes. The number of fractional digits of V/H produced is determined by your setting through the **Options** button (see its explanation below). When the product is first installed, the number of fractional digits of V/H is 0. (V and H coordinates most often appear as whole numbers.)

The conversion is immediate. As soon as it has occurred the *VHTools* program puts the cursor again at the beginning of the **Lat** text box and sets the **Clear** button as the default button. A mouse click on the **Clear** button – or just a press of the **Enter** key – clears the **V**, **H**, **Lat**, and **Lon** text boxes, and all is ready for you to enter another pair of latitude/longitude coordinates. But if you wish to modify the contents of the **Lat** or **Lon** *without* clearing, you may certainly do that. In either case, entry of any character into the **Lat** or **Lon** text box causes the **-> V/H** button to become the default button again.

Here is another example of a completed conversion, in this case from latitude/longitude to V/H coordinates. This is the location of a wire center in downtown Los Angeles.



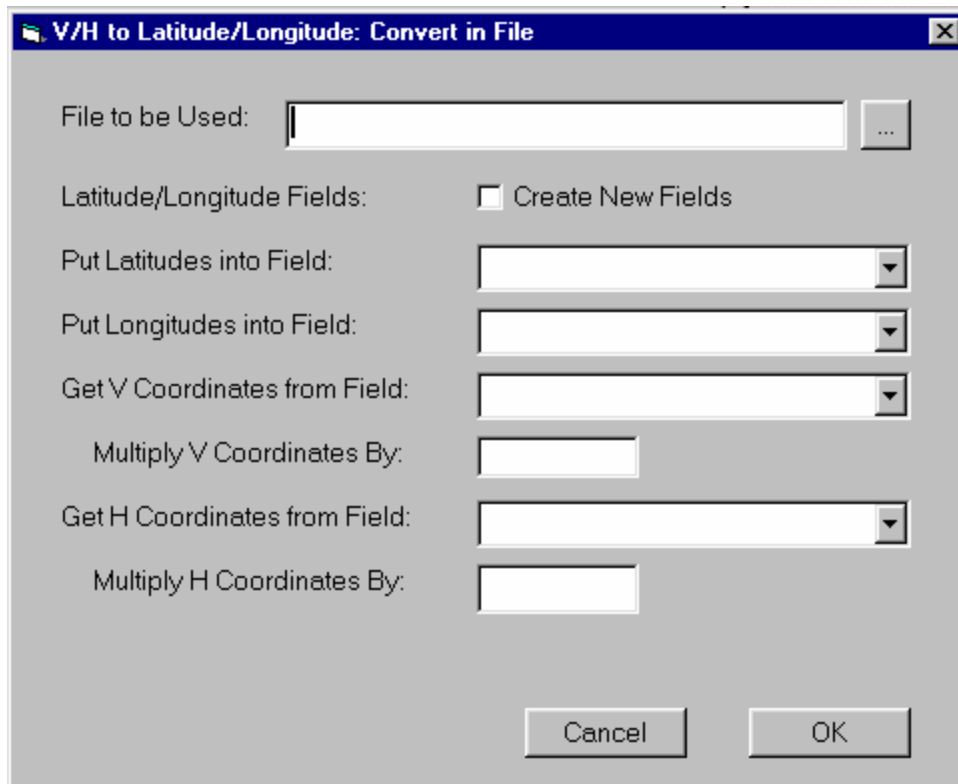
The screenshot shows a dialog box titled "Interactive Conversion". It contains four text input fields and three buttons. The "V:" field contains "9221", the "H:" field contains "7913", the "Lat:" field contains "34.038154", and the "Lon:" field contains "-118.448529". The buttons are labeled "-> Lat/Lon", "V/H <", and "Clear".

Field	Value
V:	9221
H:	7913
Lat:	34.038154
Lon:	-118.448529

## File Conversion: V/H to Latitude/Longitude

This *VHTools for DBF Files* program supports the conversion of V/H coordinates to latitude/longitude in a **DBF** file. No other file types are supported by this version of *VHTools*.

To perform the conversion, for every record of a DBF file, of V and H coordinates to latitude and longitude, click on the **V/H->Lat/Lon...** button in the File Conversion frame. This brings up a dialog for this conversion:



The dialog box above shows all the entry boxes empty. In fact, once you have performed a file conversion (in either direction), the file you last used and the names of the latitude, longitude, V, and H fields you used, are remembered and are displayed initially in these entry boxes, so long as the file is still available. (You might want to perform the same conversion again ... to do so you would just need to press the **OK** button.)

To perform a new file conversion, specify the ***File to be Used*** in one of two ways:

- Key in the file name, with drive and path if necessary, and press **Enter**
- Press the button labeled "... " to browse for the file, using the standard Open Dialog to select it

In either case, the four dropdown list boxes for fields – Latitudes, Longitudes, V Coordinates, and H Coordinates – are automatically filled in with the names and


attributes of *all* the fields in the file you specified. The VHTools program then makes an attempt to *guess* the right field for each, where any of the fields in the file have names that suggest their usage:

- **Put Latitudes into Field:** If any field is named LATITUDE or LAT, that field is the initial choice
- **Put Longitudes into Field:** If any field is named LONGITUDE or LON or LNG, that field is the initial choice
- **Get V Coordinates from Field:** If any field is named V or VCOORD or VC, that field is the initial choice
- **Get H Coordinates from Field:** If any field is named H or HCOORD or HC, that field is the initial choice

Where no field in the file is the obvious initial choice for a dropdown list box, *no* choice appears as the initial value in that dropdown list box.

In any case, you will have to identify the field in the records for each of these four items. Clearly, the fields containing the V and H coordinates must already be present in each record. But the fields to receive latitude and longitude *may or may not* already exist in the records. If they *already* exist (and if they have not already been well chosen by the VHTools program), use the dropdown list box control to specify the field to receive latitude and the field to receive longitude. Each should be a Numeric field capable of receiving the converted result. Each must have at least as many fractional digit positions as you have specified (through **Options**) for latitude and longitude. If the number of fractional digits in a field is *k* digits, the latitude field must have a width of at least ***k* + 4** and the longitude field a width of at least ***k* + 5**.

But if those fields *do not* already exist, the VHTools program can create them for you. Click on the check box that indicates **Create New Fields**. When you do so, the latitude and longitude dropdown list boxes turn to simple text boxes to allow you to specify the names of two new fields to be added to the file:



The screenshot shows a grey panel with the following elements:

- A label "Latitude/Longitude Fields:" followed by a checked checkbox and the text "Create New Fields".
- A label "Put Latitudes into Field:" followed by a text input box.
- A label "Put Longitudes into Field:" followed by a text input box.

Each of these new fields must be given a name one to ten characters long. The first character must be a letter (A-Z). The remaining characters may be letters, digits, and the underscore character. The names may be entered in any combination of upper and lower case ... they will be converted to upper case, in accord with DBF standards. The attributes that will be given to these new fields depend on the number of fractional digit positions you have specified (through **Options**) for latitude and longitude. If that number is *k*, each field will have *k* fractional positions; the latitude field will have a width of ***k* + 4** and the longitude field a width of ***k* + 5**.

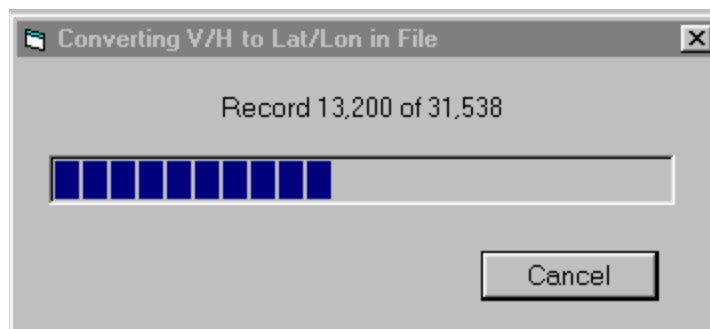
This program does not allow the latitude and longitude fields to be the same fields as the V and H coordinate fields *from* which the conversion is made.

The fields from which to get the V and H coordinates must be chosen using the dropdown list box for each of those specifications (if these were not already well chosen by the *VHTools* program).

In addition, it may be that the values of the V and H coordinates in the file must be *scaled* ... that is, the values might be some multiple or some fraction of the true V and H values, and each must be *multiplied* by some constant *before* the value is converted. (For example, we have seen a widely available file in which each V and each H value is followed by **00**, making it necessary to specify that each should be multiplied by **.01**.) If you leave empty the **Multiply ... By** text boxes, the V and H values are taken just as they appear in the records.

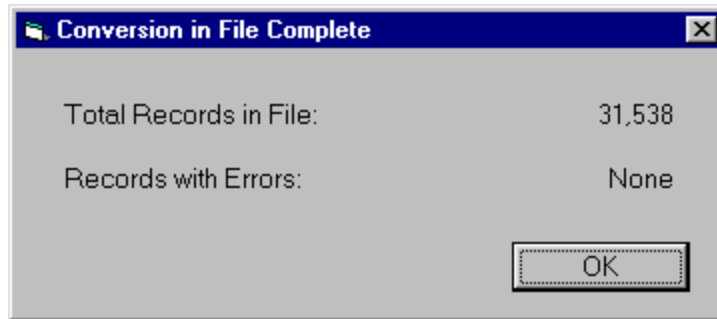
If you should change your mind about performing the file conversion after bringing up the dialog box, you can return to the main window without performing any conversion by pressing the **Cancel** button.

But if you have completed your specifications for the conversion, you start the conversion by pressing the **OK** button. When you do so, a *progress bar* appears, tracking the progress of the file conversion:



The **Cancel** button in this message box allows you to *terminate* the conversion process before it finishes. If the conversion was to generate new latitude and longitude fields, the file being written to is a *temporary* file; canceling the conversion causes this file simply to disappear, and there is no change to the original file. But if the latitude and longitude fields *already* existed in each record, some number of records will have already been converted, even though you have canceled.

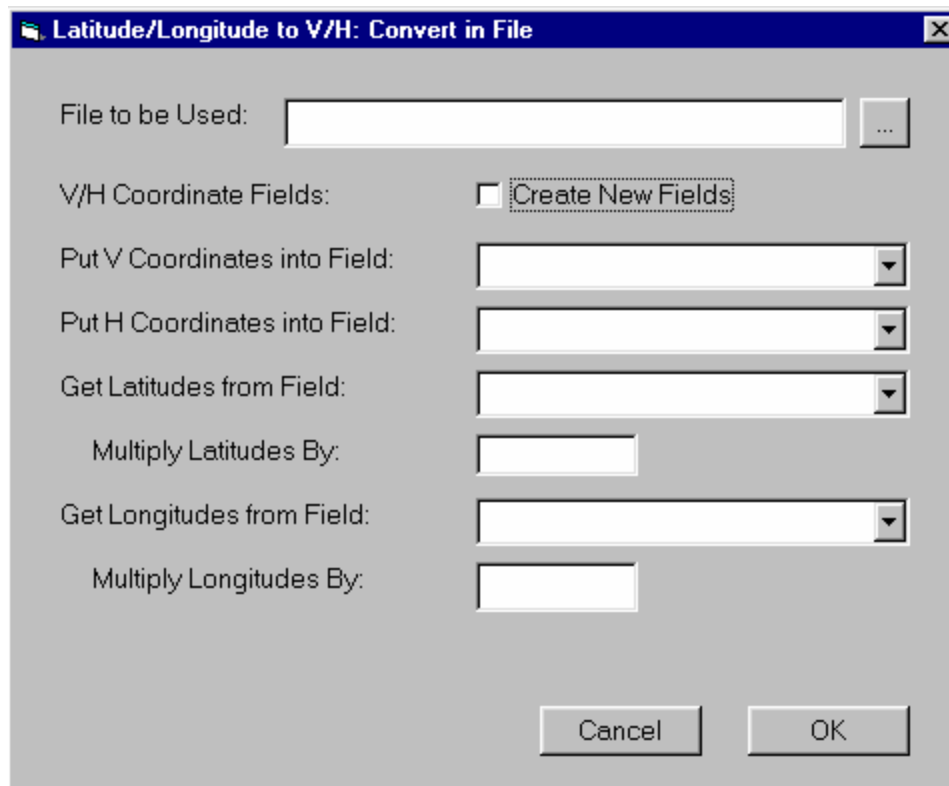
When the conversion is allowed to complete, it displays a summary message box, indicating the number of records converted and the number of errors (if any) encountered. Pressing the **OK** button causes a return to the main *VHTools* window.



### File Conversion: Latitude/Longitude to V/H

This *VHTools for DBF Files* program supports the conversion of latitude/longitude to V/H coordinates in a **DBF** file. No other file types are supported by this version of *VHTools*.

To perform the conversion, in every record of a DBF file, of latitude and longitude to V and H coordinates, click on the **Lat/Lon->V/H...** button in the File Conversion frame. This brings up a dialog for this conversion:



The dialog box above shows all the entry boxes empty. In fact, once you have performed a file conversion (in either direction), the file last used and the names of the V, H, latitude, and longitude fields are remembered and are displayed initially in these entry boxes, so long as the file is still available. (You might want to perform the same conversion again ... to do so you would just need to press the **OK** button.)



To perform a new file conversion, specify the **File to be Used** in one of two ways:

- Key in the file name, with drive and path if necessary, and press **Enter**
- Press the button labeled "... " to browse for the file, using the standard Open Dialog to select it

In either case, the four dropdown list boxes for fields – V Coordinates, H Coordinates, Latitudes, and Longitudes – are automatically filled in with the names and attributes of *all* the fields in the file you specified. The VHTools program then makes an attempt to *guess* the right field for each, where any of the fields in the file have names that suggest their usage:

- **Put V Coordinates into Field:** If any field is named V or VCOORD or VC, that field is the initial choice
- **Put H Coordinates into Field:** If any field is named H or HCOORD or HC, that field is the initial choice
- **Get Latitudes from Field:** If any field is named LATITUDE or LAT, that field is the initial choice
- **Get Longitudes from Field:** If any field is named LONGITUDE or LON or LNG, that field is the initial choice

Where no field in the file is the obvious initial choice for a dropdown list box, *no* choice appears as the initial value in that dropdown list box.

In any case, you will have to identify the field in the records for each of these four items. Clearly, the fields containing latitude and longitude must already be present in each record. But the fields to receive the V and H coordinates *may or may not* already exist in the records. If they *already* exist (and if they have not already been well chosen by the VHTools program), use the dropdown list box control to specify the field to receive the V coordinate and the field to receive the H coordinate. Each should be a Numeric field capable of receiving the converted result. Each must have at least as many fractional digit positions as you have specified (through **Options**) for V and H coordinates. If the number of fractional digits in a field is **k** digits, each field must have a width of at least **5** if **k** is zero, or **k + 6** if fractional digits are to be used.

But if those fields *do not* already exist, the VHTools program can create them for you. Click on the check box that indicates **Create New Fields**. When you do so, the V coordinate and H coordinate list boxes turn to simple text boxes to allow you to specify the names of two new fields to be added to the file:

V/H Coordinate Fields:  Create New Fields

Put V Coordinates into Field:

Put H Coordinates into Field:

Each of these new fields must be given a name one to ten characters long. The first character must be a letter (A-Z). The remaining characters may be letters, digits, and the underscore character. The names may be entered in any combination of upper and lower case ... they will be converted to upper case, in accord with DBF standards. The attributes that will be given to these new fields depend on the number of fractional digit positions you have specified (through **Options**) for V and H coordinates. If that number is **k**, each field will have **k** fractional positions. If **k** is zero, each field will have a width of **5**; if fractional digits are to be used, each field will have a width of **k + 6**.

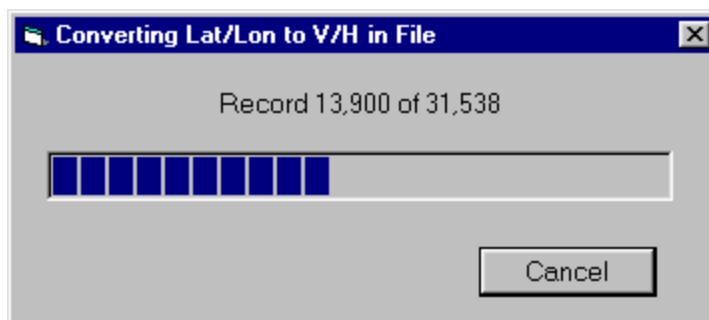
This program does not allow the V and H coordinate fields to be the same fields as the latitude and longitude fields *from* which the conversion is made.

The fields from which to get the latitude and longitude must be chosen using the dropdown list box for each of those specifications (if these were not already well chosen by the *VHTools* program).

In addition, it may be that the values of latitude and longitude in the file must be *scaled* ... that is, the values might be some multiple or some fraction of the true V and H values, and each must be *multiplied* by some constant *before* the value is converted. (For example, we have seen files in which each latitude and longitude appears with 6 fractional digits but *without any decimal point*, making it necessary to specify that each should be multiplied by **.000001**.) If you leave empty the **Multiply ... By** text boxes, the latitude and longitude values are taken just as they appear in the records.

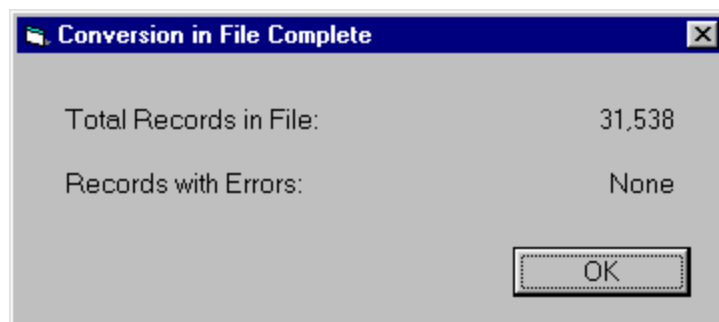
If you should change your mind about performing the file conversion after bringing up the dialog box, you can return to the main window without performing any conversion by pressing the **Cancel** button.

But if you have completed your specifications for the conversion, you start the conversion by pressing the **OK** button. When you do so, a *progress bar* appears, tracking the progress of the file conversion:



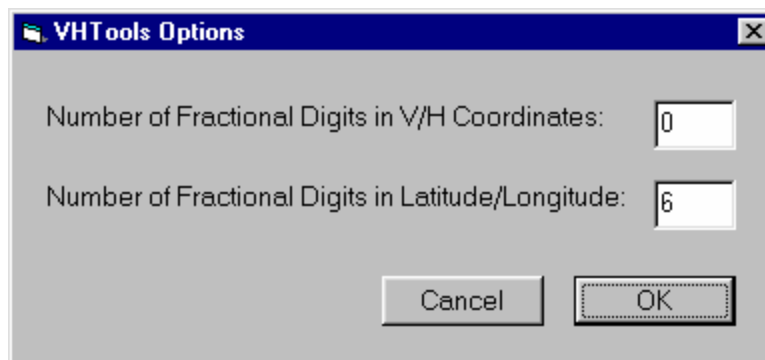
The **Cancel** button in this message box allows you to *terminate* the conversion process before it finishes. If the conversion was to generate new V and H coordinate fields, the file being written to is a *temporary* file; canceling the conversion causes this file simply to disappear, and there is no change to the original file. But if the V and H coordinate fields *already* existed in each record, some number of records will have already been converted, even though you have canceled.

When the conversion is allowed to complete, it displays a summary message box, indicating the number of records converted and the number of errors (if any) encountered. Pressing the **OK** button causes a return to the main VHTools window.



### Options: Setting Fractional Positions

The **Options** button, located near the bottom of the main window, brings up a dialog in which you can specify the number of fractional digits that should appear in converted results. You specify that number separately for V and H coordinates on one hand, and for latitudes and longitudes on the other. This is the dialog:



In each case, the allowed range for number of fractional digits is **0** through **6**. It is typical that V/H coordinates are carried as integers (zero fractional positions), and that latitude/longitude are carried with 6 fractional digits.

If you have reached this dialog and do not wish to make any change, pressing the **Cancel** button returns you to the main window without changing either number of fractional digits.

If you have made a change to either number of fractional digits, pressing the **OK** button records that change and returns you to the main window.

The desired numbers of fractional digits are remembered from one run of the *VHTools* program to another.

### Acceptable Range of Values for V/H and for Latitude/Longitude

The V and H Coordinate System is intended to cover, essentially, North America, the Caribbean, and a number of Pacific islands north of the Equator.

The *VHTools* program accepts, as input to conversion, V/H coordinates and latitudes/longitudes that correspond to the above range of coverage. If an input value is out of range, then:

- In interactive conversion, an error message is displayed, and the conversion does not occur
- In file conversion, the converted *result* values are set to zeros, and the error is counted ... at the end of a file conversion, the number of errors is displayed along with the total number of records

Input ranges supported are:

- **V** coordinate: **-3000** through **14000**
- **H** coordinate: **-5000** through **19000**
- **Latitude**: *Greater* than **0** degrees, up through **90** degrees
- **Longitude**: **-52** degrees up to (but not including) **-180** degrees, and positive **170** degrees through **180** degrees

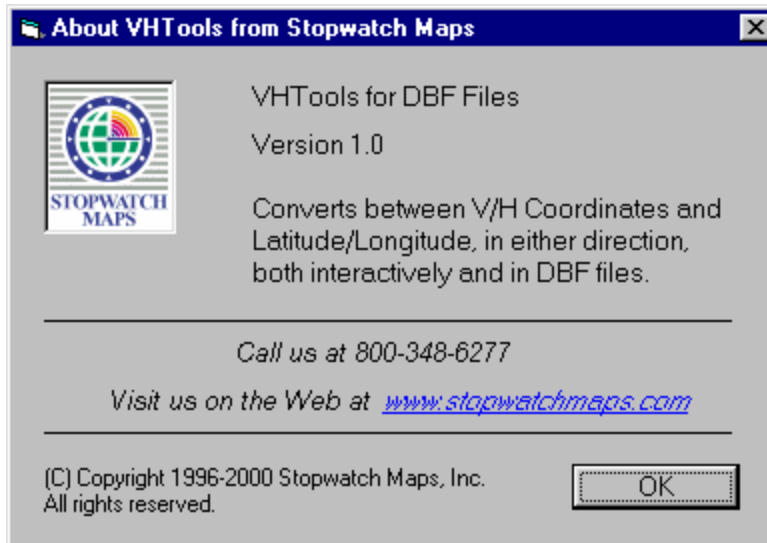
### Ending a VHTools Session

As indicated earlier, in a single run of the *VHTools for DBF Files* program, you can perform any number of interactive conversions and any number of file conversions.

When you are finished using *VHTools*, just press the **Quit** button near the bottom of the main window. This causes the main window to disappear and the program to terminate.

## The About Window

Clicking on the **About** button near the bottom of the main window, or clicking on the Stopwatch Maps logo just to its left, brings up the *About* window:



This window displays the program version and the copyright notice, and also provides contact information for Stopwatch Maps.

Clicking on the Stopwatch Maps domain name ([www.stopwatchmaps.com](http://www.stopwatchmaps.com)), or on the Stopwatch Maps logo in this window, attempts to bring up your Internet browser to reach the Stopwatch Maps web site. There you can learn more about support of this product and about other products offered by Stopwatch Maps.