

## 2.4 Check and adjust alignment

While the Pivot Plate, Sensor Plates and Eddy Damper Plates were aligned with the Pendulum Assembly prior to shipment, it is possible that some of the position setting screws shifted in transit. In this section you will check the mechanical alignment of these components and adjust them if necessary.

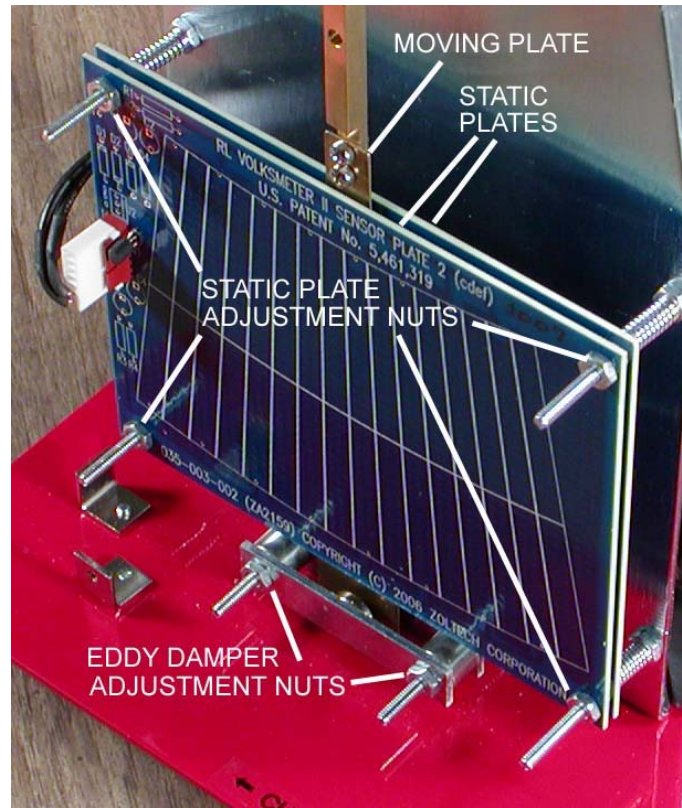
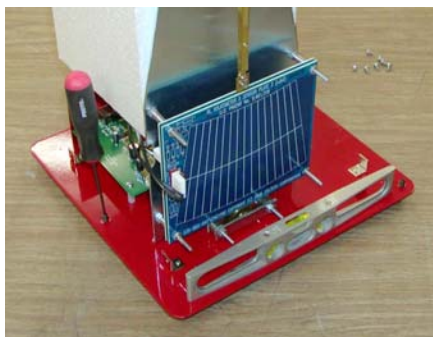
As suggested in prior sections, the VolksMeter should be on a hard, level, well lit surface, preferably a table or bench that allows easy inspection of the movement and clearances of the parts. Follow the procedure below to check the sensor alignments.

1. Level the Base. This initial leveling is most easily done with a small (~8" long) carpenter's bubble level or equivalent (user supplied). Use the 3/32" Hex Driver included in the tool kit. Note that the Base has three leveling screws:



two in corners and one in the middle of the opposite edge. Place the level between the two corner screws first and adjust these screws as required to level that edge.

Then place the level parallel with an edge of the Base perpendicular to the edge between the corner screws. Use only the middle screw to level this edge. Move the level back to the original edge to make sure that edge is still level. Repeat as necessary. The Base of the instrument should now be level enough to check the alignment of the pendulum (or pendulii).

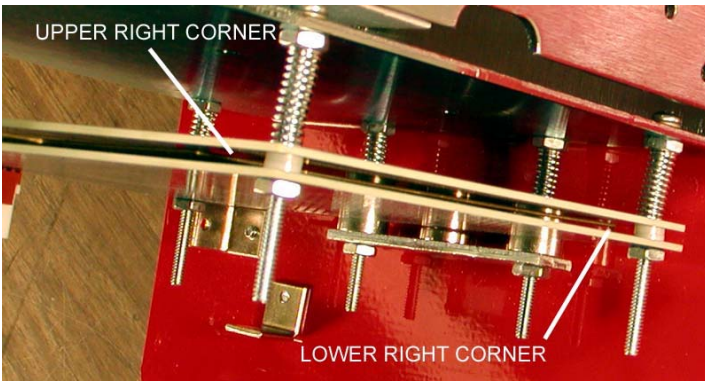


Examine the position of the Moving Plate at the end of the Pendulum Rod. If nothing shifted in transit, the Moving Plate should be parallel to the Static Plates and roughly centered between them. (Since, due to the manufacturing process, the Moving Plate is rarely perfectly flat, it is not possible to perfectly center it between the Static Plates at all points across its' surface, nor is this necessary for the proper operation of the instrument.) More importantly, the Moving Plate must not be in contact with either Static Plate. Under correct alignment, the Moving Plate will be able to swing freely through its' entire arc (which is limited by the tab at the bottom of the Moving Plate and the spacers at each end of the Eddy Damper Plates).

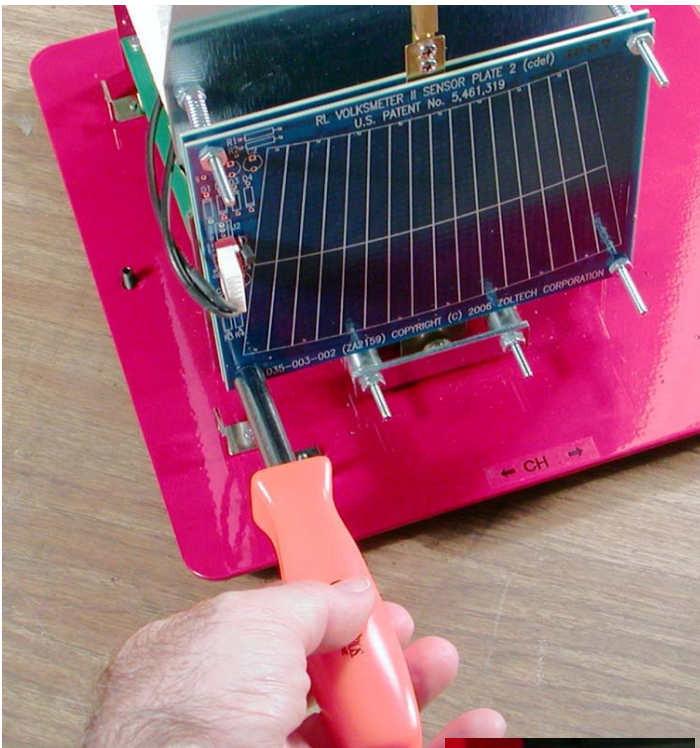
Generally, if you look at each corner of the main body of the Moving Plate; two top corners and two bottom corners, and they are not in contact with either Static Plate, then the Moving Plate as a whole will not be in contact with the Static Plates. If the Moving Plate is touching one or both Static Plates, the position of the Static Plates can be adjusted by using the Multi-tool's 5/16" nut driver to turn the adjustment nuts at each corner of the outer Static Plate. If the Moving Plate is touching

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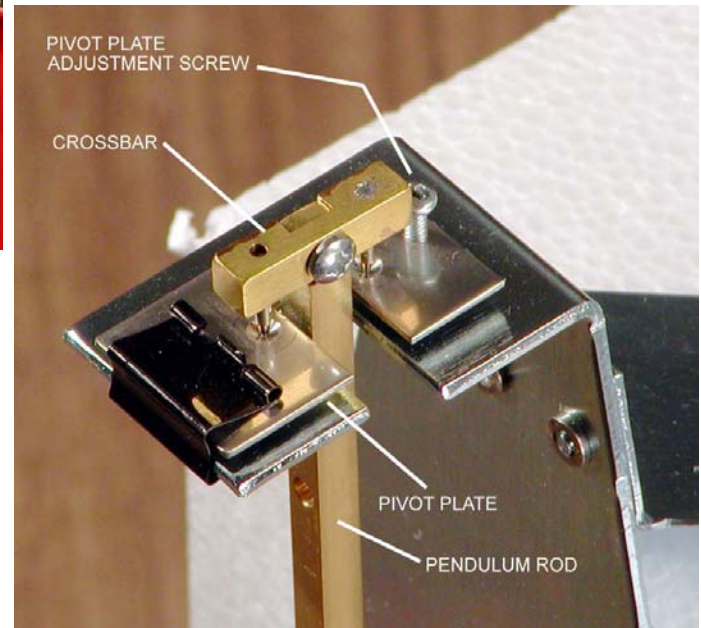
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the outer Static Plate at a corner near an adjustment nut, turn that nut counter-clockwise to move that corner away from the Post and the Moving Plate. Turn the nut clock-wise to move the Static Plates toward the Post at that corner. Repeat as needed at each corner. This is an iterative process, since freeing one corner may cause the other corners to shift.



Once the moving plate is aligned with the fixed plates, check the Pivot Plate at the top of the Pendulum Rod.



If the Pivot Plate is level, then both Pivot Points will be resting in the bottoms of the two cups in the Pivot Plate. Confirm this by gently applying torque (twisting) to the Crossbar in a plane parallel to the Pivot Plate. If the Pivot Plate is level, the Crossbar will not twist under gentle torque. If one of the Pivot Points is not resting on the bottom of its' cup, the Crossbar WILL twist about the Pivot Point that is at the bottom of its' cup.

If the Pivot Plate requires leveling, use the small Phillips screw driver from the Multi-tool to turn the Adjustment Screw. Turning the Adjustment Screw clockwise will raise that side of the Pivot Plate. Note that adjusting the Pivot Plate may shift the Moving Plate at the bottom of the Pendulum Rod with respect to the Static Plates. Thus, after leveling the Pivot Plate, you should confirm that the Moving Plate is still centered between the Static Plates and re-adjust the Static Plates if necessary.

Repeat the adjustment of the Pivot Plate and the Static Plates as necessary to have a level Pivot Plate and the Moving Plate centered between the Static Plates.

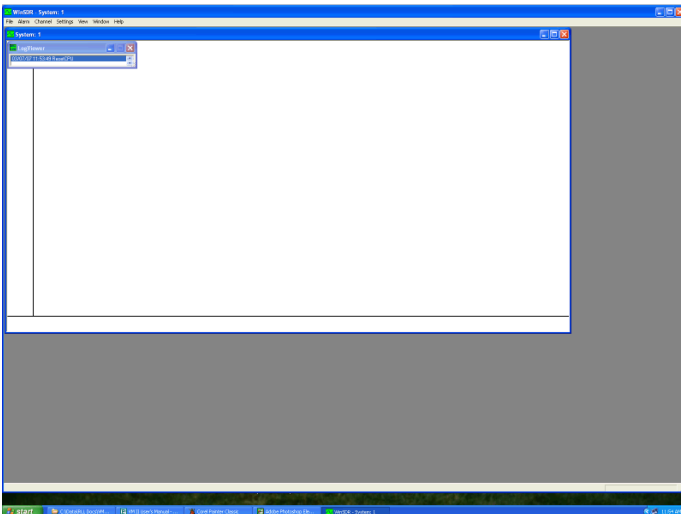
Repeat the Static Plate alignment and Pivot Plate leveling on the second channel sensor, if present.

## 2.5 Configure WinSDR

Now you will run the WinSDR software and configure its' parameters to talk with the VolksMeter. This is just an initial configuration, enough to verify operation of the VolksMeter. More complete WinSDR configuration, for long-term data recording, is discussed in Chapter 3.

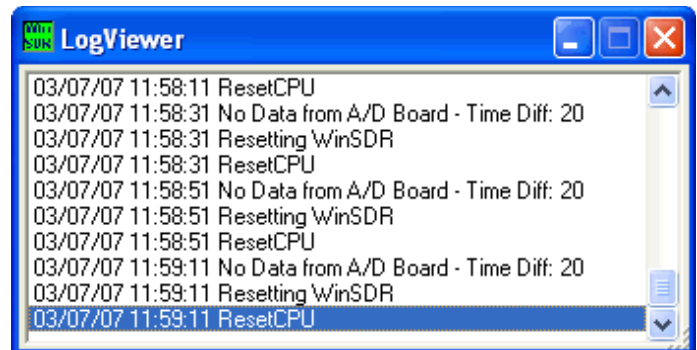
Confirm that power is applied to the instrument by observing the status LED next to the PWR connector on the I/O Panel is blinking. Verify that the communications cable (USB or RS232) is connected to both the VolksMeter and the support computer.

Start the WinSDR program for the first time (if you did not do so during the software installation, you may want to place a copy of the WinSDR icon on the Windows Desktop to facilitate subsequent startups).



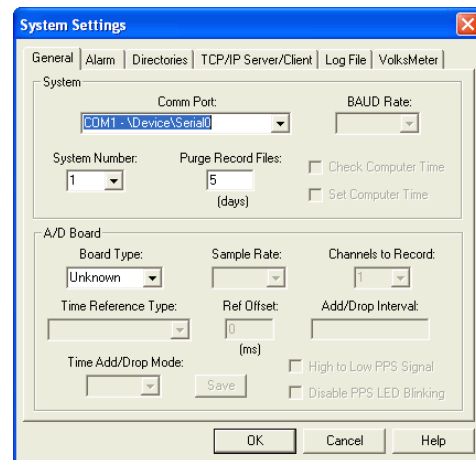
The program will attempt to initialize and communicate with the VolksMeter. The program defaults will probably not match your actual hardware configuration and this attempt will fail.

The Log Viewer window, when expanded, will repeatedly display its' attempts to communicate with the instrument.



This is normal for a new installation.

Click on the System: 1 Menu Bar to change focus to the main window. Bring up the **System Settings** dialog box by pressing the [F6] key or, on the Menu Bar, click **ALARM | System Settings**. In the **System Settings** dialog box, click the **General** tab.



In the **System** box;

If the VolksMeter is connected to the support computer via an RS232 cable, select the **Comm Port**, from the drop down list, to which the cable is connected. The default is COM1.

If the VolksMeter is connected via a USB cable, then open the **Comm Port** list and select the “Virtual” Comm Port associated with the USB port. This port is usually listed in the form: “COMx - \Device\NCPx” (**VCP** stands for **V**irtual **C**omm **P**ort). Usually there will be only one VCP entry on the list. Select it. If there is more than one VCP

entry, select the last one (most recently installed) on the list.

In the **A/D Board** box;

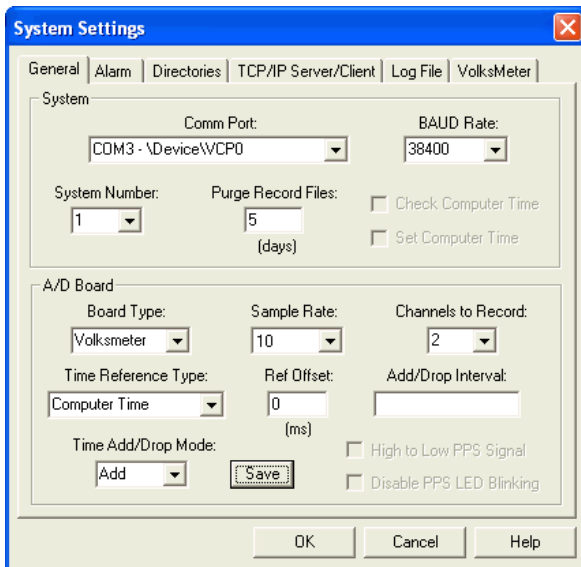
From the **Board Type** list, select **VolksMeter**. The default is Unknown.

Set the **Sample Rate** to **10**. Default is 25.

Set **Channels To Record** to **1** or **2** to match the number of channels on your VolksMeter. Default is 1.

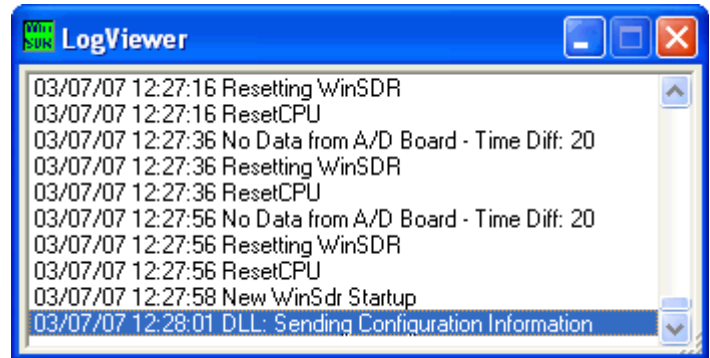
Back in the **System** box;

Once you have selected the **Board Type** in the **A/D Board** box, the **Baud Rate** setting becomes available. The default is **38400**. Unless you set the Interface Board in the VolksMeter to a different value, leave the **Baud Rate** at its' default value. Otherwise, change the **Baud Rate** to match the Interface Board. The value of the **Baud Rate** setting does not matter if you are using a USB connection .



Click **OK** at the bottom of the **System Settings** box to save the new settings. You will get a warning about the old data not being viewable with the new settings. Click **OK** again to continue.

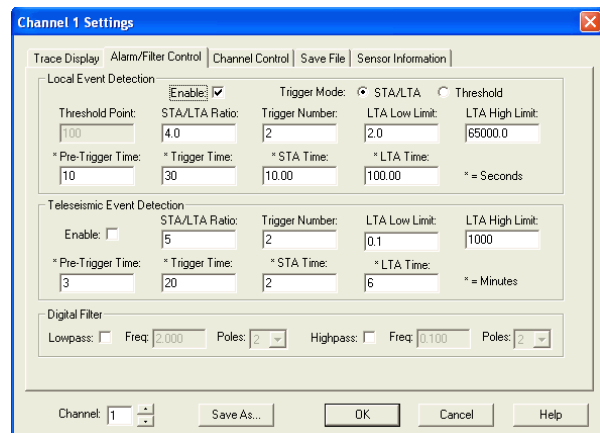
If all is well, at this point the Log Viewer should display: “DLL: Sending Configuration Information”.



and the Real-Time (System: 1) window should begin updating the time display at the bottom. Depending on the display settings, you may or may not see the VolksMeter output data trace in the window. Also, the Log Viewer may begin displaying various system status messages every few seconds. Close the Log Viewer window or move it out of the way.

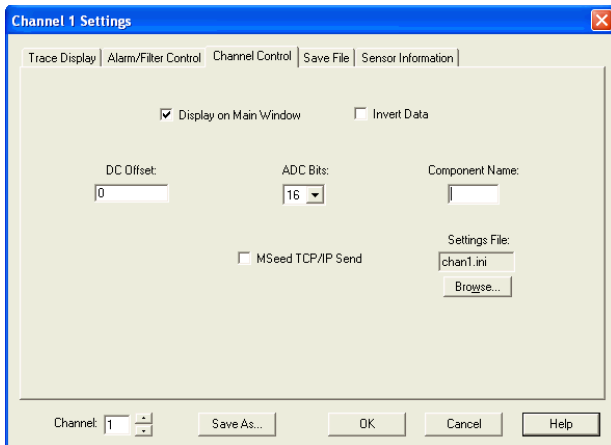
The default settings for the Real-Time (System: 1) window are X:4 (the X-axis is 4 minutes wide before a new line is started) and Y-CH1: 100 (the Y-axis for Channel 1 has a compression factor of 100). Initially (before rough leveling), the data will typically be off-scale, too positive or too negative to appear on the display at this point.

Open the **Channel 1 Settings** box by pressing **[Ctrl+1]** (press and hold the CTRL key and then press the 1 key) or Menu Bar **SETTINGS | CH1**. Click the **Alarm/Filter Control** tab.



In the **Local Event Detection** box, disable Local Event Detection by unchecking the **Enable** box. In the **Telesismic Event Detection** box, **Enable** should also be unchecked. The **Digital Filters, Lowpass and Highpass** should be unchecked.

Select the **Channel Control** tab. **DC Offset** should be 0 (zero). Change the **ADC Bits** value to **16**.



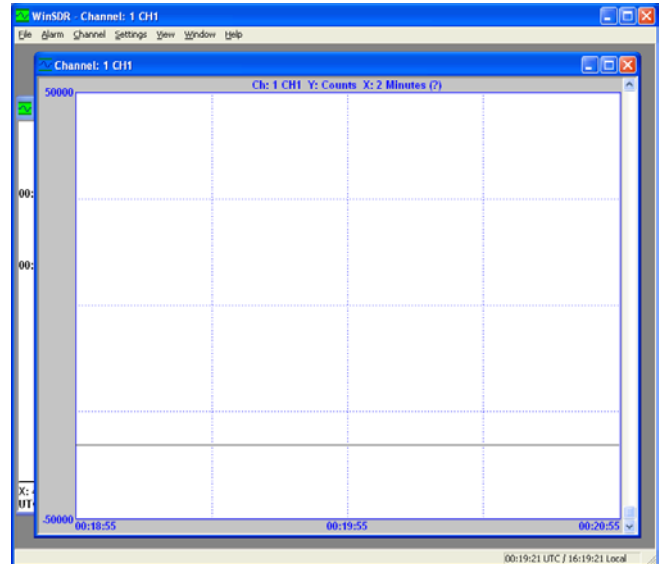
Click **OK** at the bottom of the box to save the new settings.

At this point WinSDR should be properly configured to communicate with the VolksMeter , acquiring and recording data from the sensor.

## 2.6 Verify Operation and Rough Level

In this step, you will use the WinSDR program to display the sensor readings, use the Base leveling screws to perform “rough” leveling and verify the basic operation of the system.

Open the **Single Line** display window by clicking on Menu Bar **VIEW | Single Line Display**. Move the Vertical Scroll Bar slider to the bottom of the screen. The output data trace for channel 1 will appear on the screen. Right-click on the Single Line Display , select **Last** from the context menu and click on **1 Min**. This will set the horizontal scale of the Single Line Display window to one minute, making it easier to see changes in the data .



In the **Single Line** display window, the position of the Vertical Scroll Bar slider controls the Y-scale of the window. This scale ranges from  $\pm 1$  when the slider is at the top of the window to  $\pm 50,000$  when the slider is at the bottom of the window. When the VolksMeter is the sensor being displayed, the Y-units are “counts” and represent the measured capacitance value of the sensor array. Changes in this value result from accelerations and tilts applied to the instrument.

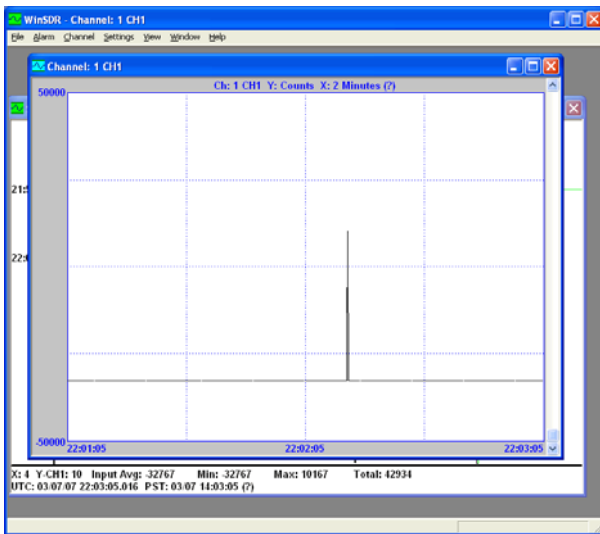
When the **ADC Bits** are set to **16**, the limits of the **count** range are  $\pm 32,767$ . Thus the data trace is guaranteed to appear on the **Single Line** display if the Y-scale is set wide enough.

The **Last** selection in the context menu (right-click in the Single Line display) allows you to specify the horizontal scale of the display in terms of time. The range is 1 minute to 12 Hours.

Click and hold the lower right corner of the Single Line display window and drag it toward the upper

left so that at least the bottom two text lines of the Real Time window are visible when the Single Line display window is on top. This will allow you to observe the actual (1-second averaged) value of the displayed data. This value is labeled “Input Avg” on the bottom of the Real Time window.

If you specified 2 Channels to Record in the System Settings earlier, then both channels are being displayed in the Real-Time window and data values for an individual channel is NOT being displayed. In this case, click on the Real-Time window to bring it to the top, right-click in the window to activate the context menu, select Display Channel and click on CH1 in the drop-down list. The data value for channel 1 will now be displayed at the bottom of the window. Click on the Single Line display window to bring it back to the top.



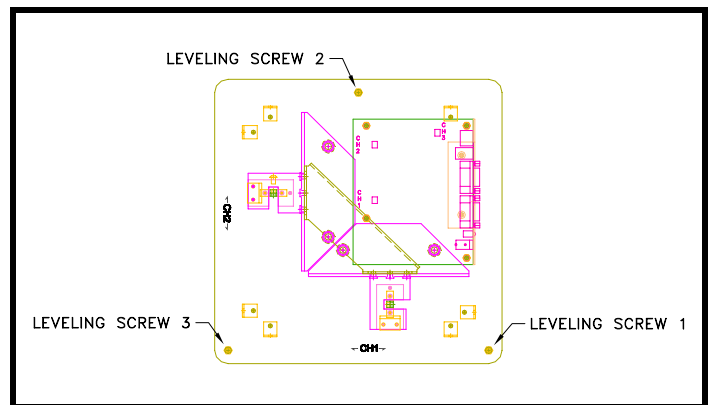
Slowly move the Vertical Scroll Bar slider toward the top of the window until the data trace is visible at the top or bottom edge of the window. Assuming that you are seeing a data trace that is not absolutely flat, you have now verified the basic operation of your VolksMeter: The instrument, the cable, the support computer and the WinSDR software are all working!

The screenshot above shows the data value “pinned” at -32768 due to the Base being a bit high on the left

of the channel 1 sensor assembly, even after “initial” leveling with a bubble level. The spike resulted from a gentle tap on the Pendulum Rod causing it to swing and return to its’ stable position. The spike also serves to verify the correct operation of the system.

If the data trace appears completely flat and does not respond to gentle finger pressure on the Base or the Pendulum Rod, then the Moving Plate is probably touching one of the Static Plates. Readjust the sensor assembly as described in section 2.4 until the Moving Plate is free and the data trace responds to movement of the Pendulum. If the data trace does not change when the Pendulum is moved, then check the cable connections at the right edge of the sensor array Static Plates (inner and outer plates) and at the Interface Board. If that does not fix the problem, refer to the Troubleshooting section on the website.

You may now “Rough” level the instrument. (The leveling you did with the bubble level in section 2-4 is considered “Initial” leveling.) Use the 3/32” Hex Driver provided in the tool kit to turn the Leveling Screw corresponding to the channel you are observing. Level channel 1 first, then, if present, channel 2.

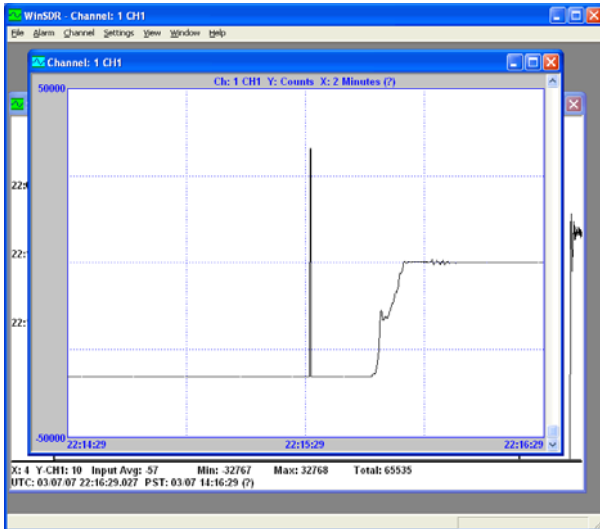


Channel 1 is located between the Leveling Screws in the corners of the Base (screws 1 & 3 in the figure). If you have a 2-channel VolksMeter, it is best to level channel 1 by adjusting screw 1, since this will have the minimum effect on channel 2.

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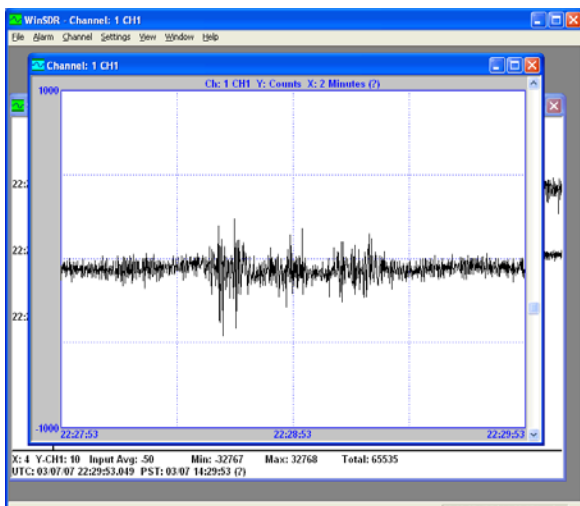
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Slowly turn the leveling screw until the data trace is even with the center line in the Single Line display window. Note that there is some lag in the update of the display (it is refreshed once per second) and there is backlash in the leveling screws. It may take a couple of tries to get the trace centered.



The screenshot above shows the data trace visually centered (with a Y-scale at  $\pm 50000$ ) and the Input Avg value at  $-57$ . At this stage, if the Input Avg value is in the range of  $\pm 500$ , that is acceptable.

Now move the Vertical Scroll Bar slider upward until the data trace is on or near one of the plus or minus 50% of scale lines on the Single Line display or until the width of the trace (due to noise) is about 5% of the height of the window.



The larger spikes around the center of the display are not an earthquake but are caused by my typing the previous paragraph while the VolksMeter operates on a table next to the computer.

Notice that the Y-scale in the previous screenshot is now  $\pm 1000$ , a 50X magnification over the  $\pm 50000$  Y-scale in the initial displays.

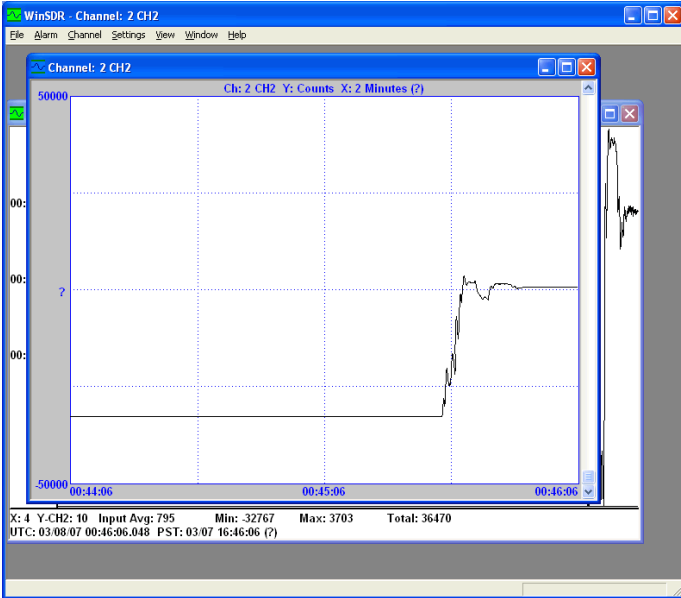
Once again, adjust the leveling screw to place the data trace on the center line of the window and get the Input Avg value as close to zero as practical. Getting the value to stay in the range of  $\pm 100$  at this stage is acceptable,  $\pm 50$  is very good.

Getting used to the display lag, the backlash in the leveling screw and the overall response of the sensor to small adjustments will take a few tries. Don't worry about getting right on. This process will have to be repeated when the VolksMeter is placed in its' permanent location. Right now you are just verifying operation and getting a feel for the sensitivity of the instrument.

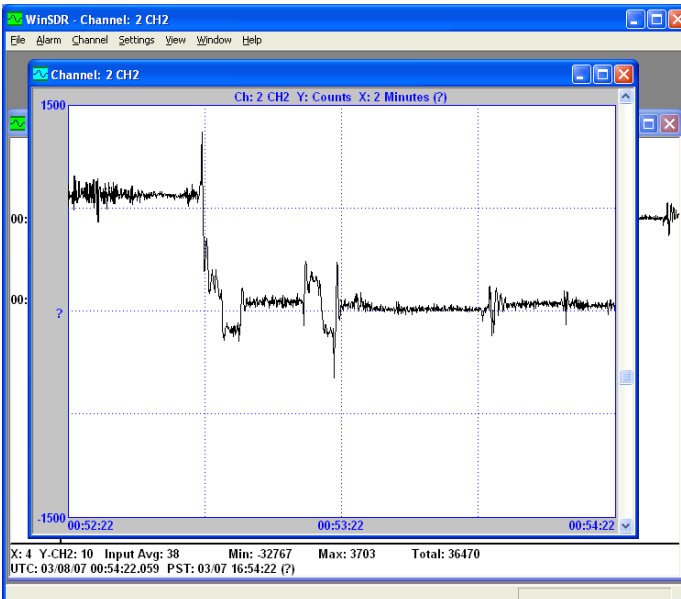
Some tips: Do not put weight on the leveling screw through the tool. Do not lean or rest your hand on the surface holding the instrument. Your very presence (weight on the floor) near the instrument will be detected and recorded. When you move away from the VolksMeter (just a few feet) after carefully centering the data trace, the trace will shift. This is normal and will be compensated for once the instrument is placed in its' permanent location.

If you have a 2-channel VolksMeter, you should now "rough" level channel 2. Click on the Real-Time window to bring it to the top. Right-click in the Real-Time window to activate the context menu and select CH2 from the Display Channel list. Click on the Single Line display window to bring it back to the top. Right-click in the Single Line display window to get its' context menu and select CH2 from the Channel list to begin displaying the channel 2 data trace.

If the trace is not visible, drag the Vertical Scroll Bar slider downward to increase the Y-scale range until the trace is visible. Confirm that channel 2 is being sensed by gently tapping the Pendulum Rod. The displayed data trace should react to the pressure. Using Leveling Screw #2 this time, center the CH 2 data trace to  $\pm 100$  or better.



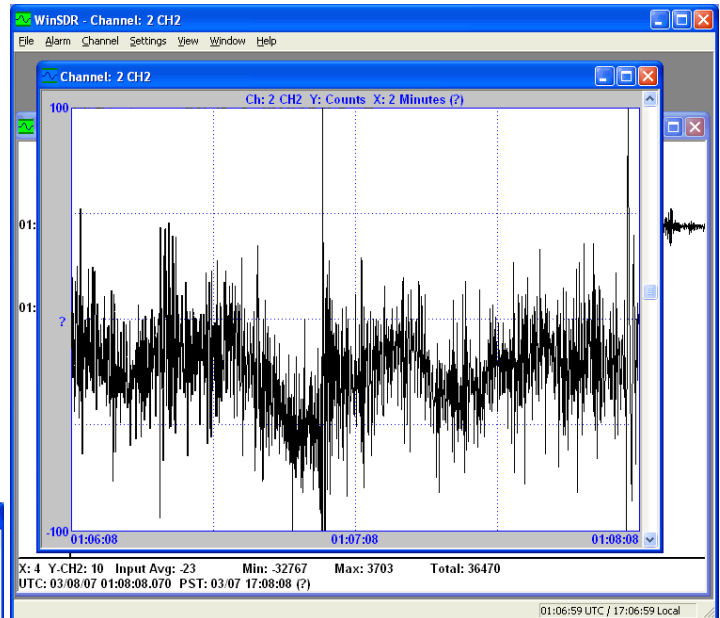
This screenshot shows the Y-scale at  $\pm 50000$ . The CH2 Input Avg value started at  $-32768$  and, after a couple of overshoots and readjustments, settled at a value of 795.



In the next step, the Y-scale is changed to  $\pm 1500$ . Notice how the initial data value (on the left edge of the window) is still about +795 average, but is now slightly above the upper grid line, which represents a value of +750 (half of +1500). The Leveling Screw is adjusted, very gingerly, to bring the CH2 Input Avg value into the  $\pm 50$  range.

Now switch the Single Line display back to CH1 (right-click, Channel | CH1) and see how much its'

value has changed. If necessary, readjust Leveling Screw #1 to bring the CH1 value back to  $\pm 100$  or better. Repeat with CH2. Note how much the value changes just from the weight of the tool in the Leveling Screw socket. See how much it changes if you walk a few feet away, wait for the value to stabilize and then walk back.



In this screenshot, the Y-scale is only  $\pm 100$ . A few tens of counts of high-frequency and low-frequency noise are normal at 16 bit resolution in an uncovered table-top environment with someone (you) moving around nearby.

You have now verified the proper operation of your VolksMeter. Proceed to section 2.7 Select Permanent Site.