

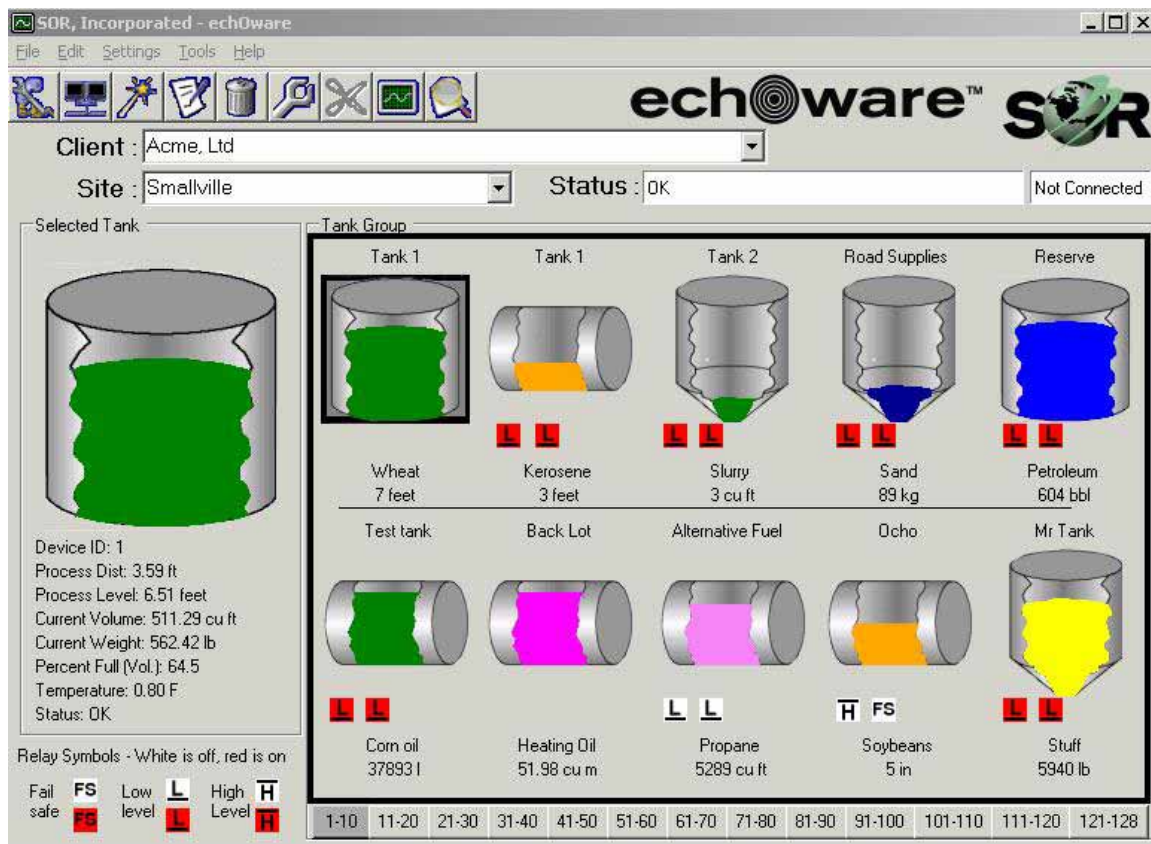


The echOware program is a Windows PC application designed to operate with echOsonix® brand sensors from SOR®. The program allows monitoring and remote control of sensors connected to the PC via a Modbus interface.

The echOware Main Screen

The echOware Main screen provides a quick view of up to 10 sensors at a time. Sensors are organized by site. You can choose the site by clicking on a drop-down menu labeled "Site" near the top of the screen. Sites can be organized by Client, but if there are no clients, you can organize all sites into a single "Client" with your own company name.

A site can have up to 128 tanks defined in it. Because there isn't enough room to display that many tanks on the screen, echOware organizes them into pages. Each page (except the final one) can have up to ten tanks, arranged by tank number. You can select a different page by clicking on one of the tab selections at the bottom of the display.



There are three basic tank configurations, each of which has a symbolic representation in echOware. The three types are cylindrical, bullet-tank, and cone-bottom. The tank symbols are not meant to represent the actual shape of the tank, just an indication of the tank's general category. The tank pictures are cutaway views which show an approximate indication of the level of product within each tank. These levels are updated every few seconds as long as the Modbus connection is active.

If you want to get more detail on a particular tank, just click on one of the ten tanks shown on the current page. A detailed view of this tank will appear in the pane on the left of side of the window. The detail view shows the actual process distance reading from the sensor, the temperature reading, and the estimated volume and weight (assuming you have entered a density value) for the product. At the bottom of the pane is that status of the sensor, which is normally "OK", but can show an error message if the sensor is experiencing any problems. (A tank whose sensor has an error condition will be indicated in the page view by making the inside of the tank picture flash red and white.)

Toolbar and Menus

The echOware program has a standard command menu at the top of the main window. As with most programs, the commands are organized into sub menus. The File menu, for example, provides the usual "Exit" command to close the program, as well as a Connect command to open the connection to the Modbus. The most commonly used commands also have a button on the tool bar. Each button has an icon that represents the associated command. If it isn't clear what the icon means, just move the mouse pointer over the button, and a brief legend will appear.

Some of the icons may change depending on the program's current status. The "Connect" button is represented by a pair of networked computers. After the Modbus connection has been opened, the icon changes to have a red "X" over the picture. This signifies that the action associated with the button is now "disconnect Modbus."

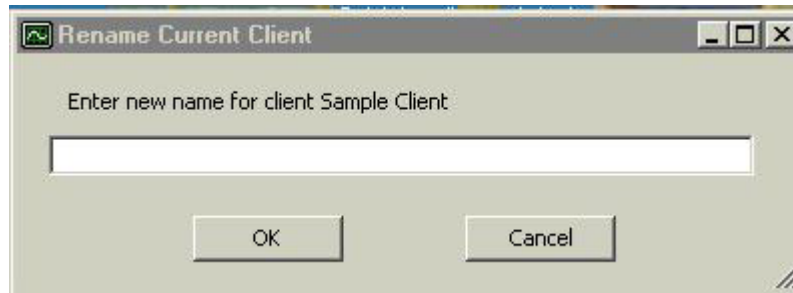
When you click the "connect" button (or select File-Connect from the menu), the status window in the upper right corner will change from "Not Connected" to "Connected." At this point, the program will automatically start polling the sensors on the current page. The status window in the top center of the window shows what sensor is currently being read. If a particular sensor fails to respond, this status window will indicate that the read command failed.

Configuring the Site

When you first install the echOware program, the main window will show a "Sample Site" belonging to "Sample Client", which will be empty. You must add representations of each tank (and the sensor attached to it) that you want to monitor or control through echOware.

There are three main configuration commands, represented by the three tool buttons just right of the Connect/Disconnect button: New, Edit, and Delete. (You can also execute these commands by clicking "Edit" in the main menu at the top.) What these commands create, edit, or delete depends upon what control is currently selected. (A control is selected when you enter it by clicking or tabbing; its contents will then be highlighted.) If the Client control is selected, you can create a new client, change the name of the client, or delete the client. The same applies to the site control. If neither of these is selected, you can create a new tank, edit the tank's configuration, or delete the tank.

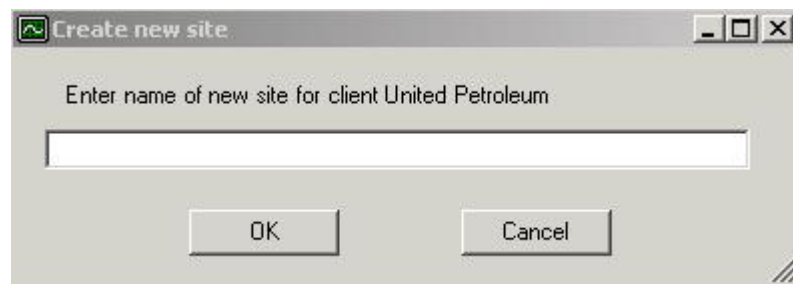
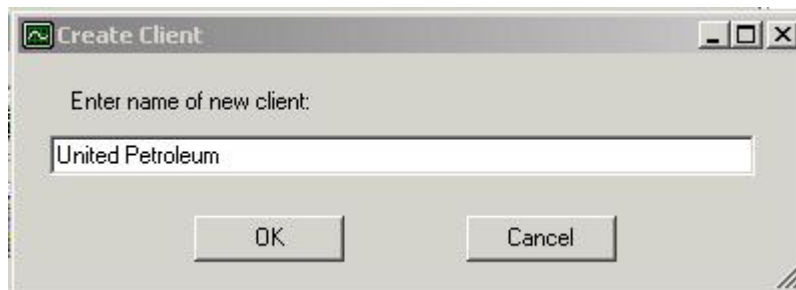
The first step is to rename the sample client and the site. Click on the client control, then on the "edit" button (represented by the "paper and pen" icon.) The following window will appear:



Enter the desired new name for "Sample Client" and click OK. The small window will disappear, and the client name will be changed in the client selection change.

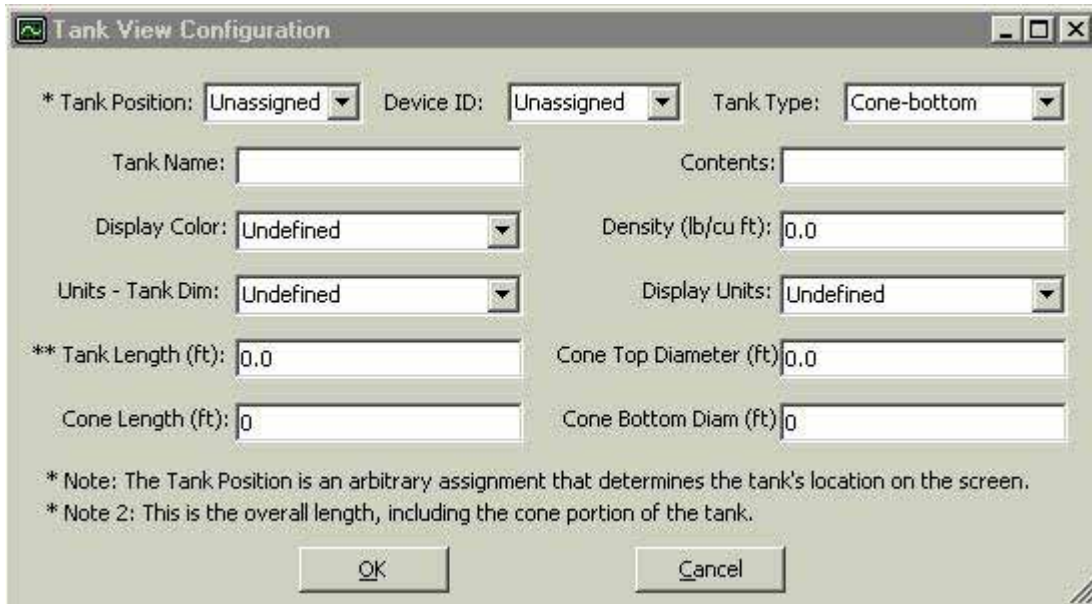
Follow the same procedure to update the sample site's name. Click on the site control, and then the edit button, which brings up a similar window. This window allows you to enter a new name for the sample site.

New clients and sites can be added at any time by selecting the client or site control, and clicking the "New" button on the tool bar (indicated by the magic wand.) A "create client" or "create site" window will appear, similar to the two windows shown below. Just enter the name of the new client or site, and click the OK button. When you create a site, it will automatically be assigned to the currently selected client.



Adding Tanks

You must add a tank record for each tank you wish to monitor with echOware. The procedure is similar to adding a client or site record. First make sure that neither the client control nor the site control is selected. Then click the "New" button (or select Edit-New from the menu.) This time a different window will appear.



The screenshot shows a dialog box titled "Tank View Configuration" with the following fields and controls:

- * Tank Position: Unassigned (dropdown)
- Device ID: Unassigned (dropdown)
- Tank Type: Cone-bottom (dropdown)
- Tank Name: (text input)
- Contents: (text input)
- Display Color: Undefined (dropdown)
- Density (lb/cu ft): 0.0 (text input)
- Units - Tank Dim: Undefined (dropdown)
- Display Units: Undefined (dropdown)
- ** Tank Length (ft): 0.0 (text input)
- Cone Top Diameter (ft): 0.0 (text input)
- Cone Length (ft): 0 (text input)
- Cone Bottom Diam (ft): 0 (text input)

At the bottom, there are "OK" and "Cancel" buttons. Two notes are present:

- * Note: The Tank Position is an arbitrary assignment that determines the tank's location on the screen.
- * Note 2: This is the overall length, including the cone portion of the tank.

These are the controls from the Tank Configuration window:

Tank Position – This is an arbitrary number between 1 and 128 that you assign to the tank. You can type it in or select it from the drop down menu by clicking the down-arrow on the control. This number determines where the tank will display on the screen, and on what page. On the first page, tanks 1 through 5 are displayed from left to right on the top row. Tanks 6 through 10 are shown on the bottom. Tanks 11-20 shown on the second page (which can be selected by clicking the tab marked 11-20 on the bottom), 21-30 on the third page, and so on until 121-128. If you wish, you can move an existing tank to a different part of the display by changing its position number.

Device ID – This is the communications address of the tank's associated sensor, which must be a value from 1-254. (This ID must be manually set in the sensor; because echOware needs this ID to communicate with it.) In the real world, a particular device ID can only be assigned to a single tank within the same RS485 network. However, you can assign the same device ID to more than one tank record. These will be displayed as different virtual tanks, even though they will of course always show the same process distance, temperature, and relay state values.

Tank Type – This determines the picture used to represent the tank in the tank display. As we said before, there are three basic types supposed by echOware – cylindrical, bullet, and cone-bottom. The program uses the tank shape, together with the dimensions you define in the fields below, to compute the product level and an approximation of the volume and/or weight of the product in the tank.

Tank Name – The name can be from 1-20 characters of any text which will describe the tank in the tank display. This name will be shown on the tank page display above the graphic for this tank.

Tank Contents – This is another text field, 1-20 characters long, which can be used to describe the contents of the tank. This text will be shown below the tank graphic.

Display Color - In its tank display, echOware uses a colored region to indicate the level of the product in the tank display. The tank configuration window allows you to select one of twelve colors to represent a product in any given tank. These include all of the basic primary and secondary colors except red and white, which are reserved for the error indication. (The empty portion of a tank is represented in the cutaway view by the light gray background of the tank graphic.)

Density – The application can display an estimated product weight instead of a level or volume. This value will only be meaningful only if the product has a reasonably uniform density. You can enter the density in this field, as a value in pounds per cubic foot, or kilograms per cubic meter, depending upon the whether you select feet or meters for your tank dimension units (see the next field.) You may leave this field set to zero if you don't need an estimated weight display. Otherwise, your entry is limited to twelve characters, including the decimal point, if any.

Units – Tank Dimensions – This lets you choose whether to enter the tank dimensions in feet or meters. This selection does not affect the units used for distance readings returned by the sensor, or the units used to the tank group display to show the estimated tank contents. (See the following control.) Your entry for this and all the following dimensional values is limited to seven characters, including the decimal point. **Warning:** Changing units does not update any dimensions you may have already entered for the tank. A value of 10 feet will stay at 10 and become 10 meters.

Display Units - On the tank group display, the distance reading from each tank's sensor is translated into an approximate measurement of the amount of product in the tank. This can be the height of the product, its volume, or its weight. This control allows the operator to choose a unit for this display. Its choices include both U.S. and metric units of distance, volume, and mass, including feet, inches, meters, centimeters, liters, gallons, bushels, barrels, cubic feet, cubic meters, pounds, kilograms and tons. You do not need to use the same system for tank dimensions and the display; you could dimension the tank in feet and display a volume in liters, for example.

Tank Height (or Length) - This defines the overall height (or length) of the tank in the selected dimensional units (feet or meters.) Only decimal digits, and an optional decimal point, are valid characters to be entered in this control. This value must be nonzero. For a bullet type tank, this will be the tank's length in the horizontal direction. If the tank type is selected as Cone Bottom, this value refers to the overall height of the tank, including the cone portion.

Tank Diameter - This defines the diameter of the tank in the selected units (feet or meters.) Only decimal digits, and an optional decimal point, are valid characters for entry in this control. This value must be non-zero. If the tank type is selected as Cone Bottom, this legend is changed to read "Cone Diameter – Top", which indicates that the diameter of the cylindrical portion of the tank is also the same as the diameter of the cone at the top.

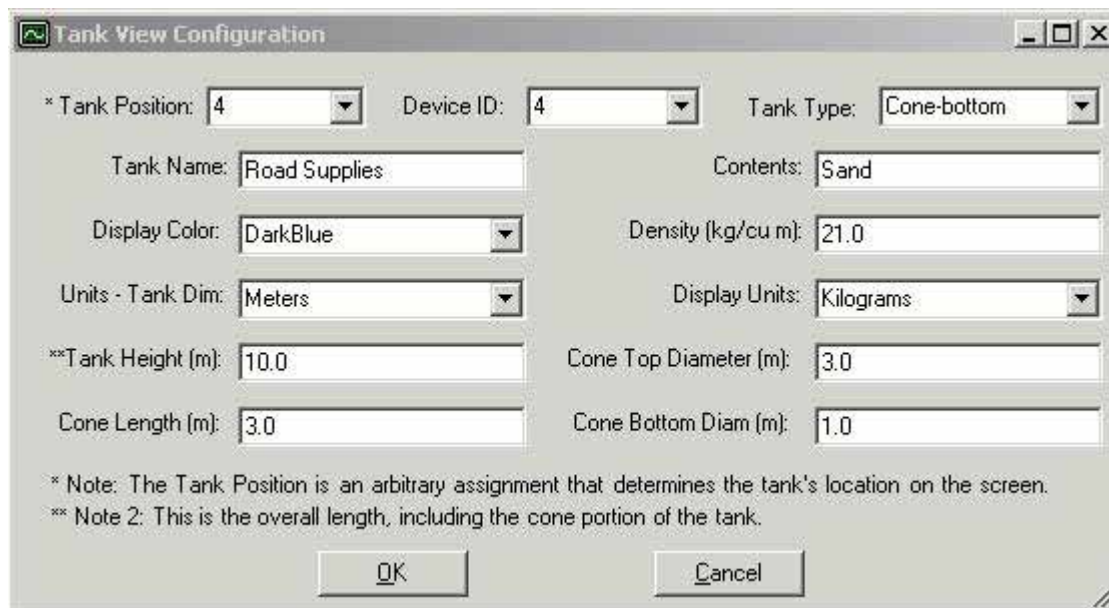
Cone Length - The cone length control is only visible when the selected type is Cone Bottom. This refers to the length of the cone portion of the tank, which must not be greater than the overall tank length defined above. (You can subtract this value from the tank height value to obtain the cylindrical portion of the tank's height.)

Cone Diameter – Bottom - The cone diameter (bottom) control is only visible when the selected type is Cone Bottom. This refers to the diameter of the cone at its bottom, which must not be greater than the top diameter defined above.

Cancel Button – when defining or editing a tank, you can abort the operation by clicking “cancel.” If you were creating a new tank, the tank will not be created. If this was an existing tank, it will keep the old values. If you have changed the tank configuration or started to enter data for a new tank, the program will ask for confirmation (“are you sure?”) before abandoning the data you have entered.

OK Button – the OK button saves the new data, creating a tank and saving its parameters in the data file for the current site. The program requires that there is valid data in each field. The tank name and tank contents field must have at least one character each in them.

You can edit an existing tank configuration by clicking on a tank icon on the current page. (The program shows that the tank is selected by drawing a black box around it.) Then click the “Edit” button on the tool bar (the one with the pen-and-paper icon.) This will display the tank configuration screen with the tank’s current values. See below:



* Tank Position: 4 Device ID: 4 Tank Type: Cone-bottom

Tank Name: Road Supplies Contents: Sand

Display Color: DarkBlue Density (kg/cu m): 21.0

Units - Tank Dim: Meters Display Units: Kilograms

**Tank Height (m): 10.0 Cone Top Diameter (m): 3.0

Cone Length (m): 3.0 Cone Bottom Diam (m): 1.0

* Note: The Tank Position is an arbitrary assignment that determines the tank's location on the screen.
** Note 2: This is the overall length, including the cone portion of the tank.

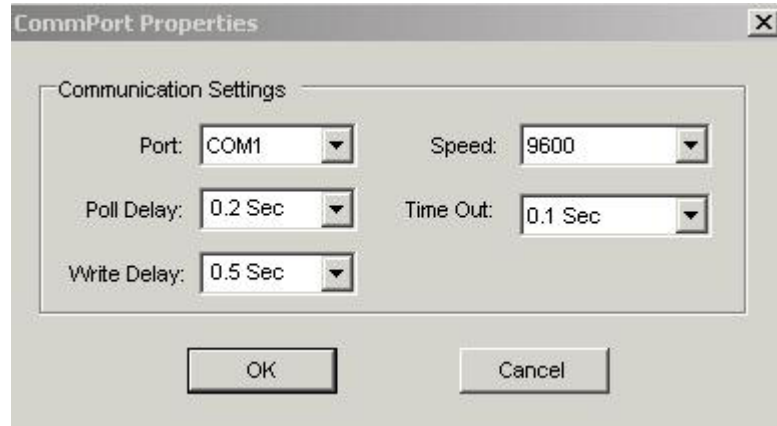
OK Cancel

You can change parameters in the same way you first set them up. Note that you can change the tank position. This will cause the tank entry will be displayed in a different part of the current page, or on a different page if you change to the number past the current range. After you are done changing the settings, you can click OK to save the new settings or Cancel to abandon the changes and keep the old settings.

Communications Setup

Once you have defined one or more tanks, you will need to be able to communicate with them through the Modbus interface. Modbus uses the RS-485 protocol, and allows from 1 to 254 sensors to be attached to the same communications port. You can use an adapter to attach this to your computer's RS-232 port (typically a 9-pin serial “D” connector. If your computer does not have a serial port, you can use a USB-to-serial adapter, or a PC card adapter for a notebook, or an add-on card on a desktop.)

The echOware interface is configured in the same way as any RS-232 serial port. To set up communications click the tool bar button on the far left (with the telephone-and-wrench icon) or choose Settings-Comm Port on the main menu. Doing so brings up the window shown below:



The first two controls are standard serial port settings:

Port - This is a drop-down menu box, which allows the user to select between available PC serial ports such as COM1, COM2, and so on. (Although it is possible to connect more than one Modbus interface if your PC has more than one serial port, echOware can only communicate with one Modbus at a time.)

Speed - This control shows the baud rate at which the sensors communicate. This will normally be 9600 baud, but could be different depending upon your RS-485 adapter.

Other serial port settings – The default communications settings for echOware are 8 bits of data, one stop bit, and no parity. This should normally not need to be changed, but in case your 485 hardware requires it, these settings can be changed by updating a setting in the program's text-based configuration file, echOware.ini. Contact SOR personnel for more information.

The remaining controls are specific to sensor polling operations:

Poll Delay - This control allows you to select the time that the program waits between successive attempts to read the sensors. You can decrease the time to make the application poll the sensors more quickly. On the other hand, if there are communications errors, increasing the poll delay may help eliminate the errors. Values are specified in seconds.

Timeout - This is the amount of time echOware waits if a sensor does not respond to a read or write operation. Increase this time if sensors are far away or slow to respond. Setting a long timeout, however, can greatly increase the polling time when a configured sensor is powered off or in some other non-responsive condition. The available choices for the timeout period range from .01 to 2.0 seconds.

Write Delay – The program allows you to update sensor parameters over the Modbus interface. One of its features is called “restore from backup” which can take the saved configuration parameters from one sensor and write them to another. (This is particularly useful if you must replace a sensor in an existing application.) For this command, echOware will write the configuration register values to the sensor, one at a time. Normally the default write delay parameter should be OK, but if errors result during the restore operation, it may be necessary to increase the time that the program waits between successive write commands to the sensor. This parameter is specified in seconds.

When you are done editing the communications parameters, click OK to save the changed settings, or Cancel to abandon the changes and keep the previous settings.

Tank scanning

When you have configured the comm port, and one or more tank records, you can begin using echOware to monitor the tank sensors in real time. Just click the Connect button on the tool bar to initiate scanning. The program will continuously poll all the sensors of those tanks that are visible on the current page. The status display on the top shows you which device is currently being read, and whether any errors occur. The colored area in each tank graphic shows the approximate level of product in that particular tank. Below the picture it will display the level in the selected units- distance from the bottom, volume, weight, or percent full.

For more detailed information, click on the name or the picture of the tank. A larger view of the particular tank will appear in the pane on the left. It will also display the distance value from the sensor, the volume, the weight (if you entered a density value) and the percent full. At the bottom is the output from the temperature sensor (in degrees C or F, depending on whether your primary display unit is from the metric or the US system.) This detail view is also updated when the Modbus is connected and scanning the current page of the tank view.

In most cases, scanning will stop temporarily when you open a configuration window (such as the Tank Configuration window mentioned above). If you change to a different page, scanning will automatically switch over to the new set of sensors. If a particular sensor fails to respond for more than 10 seconds, it will be flagged as a communications error. The tank picture will alternately flash red and white until the error is fixed.

Sensor setup

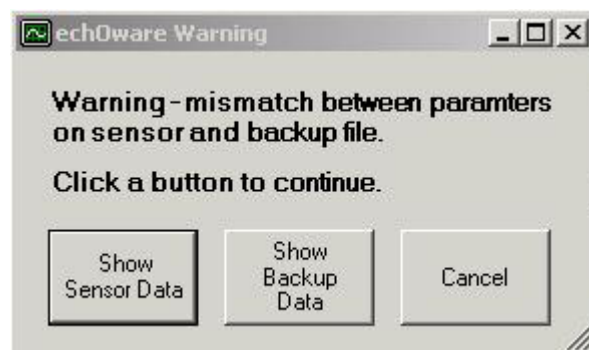
The echOware program allows you to remotely read or modify the settings of echOsonix sensors that are connected to a PC via the Modbus interface. There are two menus for this purpose, Setup and Trim. These are accessible on the tool bar by clicking two different buttons – Setup has a wrench icon and Trim has a scissors. The parameters on Setup are basic operating parameters such as “low level” and “high level”, which may occasionally need to be changed in day-to-day operations. The Trim parameters are more critical and may cause the sensor to stop functioning if set incorrectly. Therefore, access to the Trim screen is controlled with a password. To enter the password, select Tools-Password from the application's main menu. A window will appear labeled “Enter Technician Password.” Enter the password in this window and click OK. Note that when the correct password has been entered, the Trim screen button in the tool bar will be enabled (no longer grayed out.) Once you have entered the password once, the trim screen will be accessible and will remain so until you log out by selecting Tools-Logout from the main menu. Restarting the program will also deactivate the Trim screen button.

To access either the Setup screen or the Trim screen, you must first select a tank. Click a tank icon on the current page. If the tank is not currently displayed, change to the appropriate page using one of the tabs on the bottom of the screen. Then click the Setup button (or Settings-Setup in the main menu) or the Trim button (or Settings-Trim in the main menu.)

Setup Screen

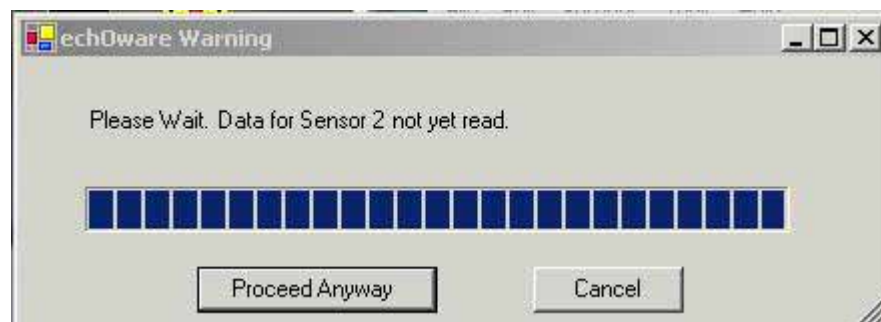
This screen contains sensor parameters that may be safely modified by the average operator. Parameters with a small number of choices are entered using a drop-down menu box. The others are numeric parameters, and are entered using text boxes which accept decimal digits (and sometimes a decimal point) as valid characters. On entering this form, the controls will be initialized with the current values of the sensor parameters. When any particular sensor is selected, the background color will change to light blue, with white text, to make it obvious that this is the current control. The Setup Screen also contains a bitmap with an illustration of a tank so that the level-related parameters can be visually explained. If you click a control which sets one of those parameters (e.g. "End Distance"), the corresponding term will be highlighted in yellow on the tank diagram.

If no tank has been selected, clicking the Setup button will give an error. If a tank is selected, but echOware is not currently connected to the Modbus, the Setup Screen will display the parameters that were most recently saved in the sensor's backup file. (This file is created automatically. Whenever you click on a tank when the Modbus is connected, the program automatically reads all the sensor's configuration registers and saves this data.) If the Modbus connection is active, it will display the parameters as read from the sensor. If the sensor's configuration registers have changed since the backup file was created, the program will display the following message:



This allows you to select which version of the data should be displayed. On the Setup screen, the fields that did not match will be indicated with a colored background.

If the connection to the Modbus is active, and there is any kind of error or failure when echOware is reading the sensor, the sensor data may not be completely read when the user clicks the "setup" button. In this case, the following message will pop up:



If you click the Proceed button, the Setup screen will without waiting to read the sensor, and display the saved data from the sensor's backup file. If you click Cancel, the Setup screen will not be opened. Or you can wait - when echOware is done reading the sensor, the above message will disappear and the Setup form open automatically. If the read operation does not complete in three seconds, the program will display a timeout error message and show the Setup form anyway, but with the sensor's backup data.

The following illustration is a typical setup screen. Note that some of the controls are for information only. The two status controls at the top right show whether or not the program is connected to the Modbus, and whether the most recent read or write operation to the sensor has succeeded or failed. The Serial Number and Model Number fields display information from the sensor that is normally not modified. There is also an illustration of a typical tank, showing the meanings of the different level values that can be entered in this screen.

Please refer to the SOR standard echOsonix documentation for an explanation of the parameters listed in the screen. Any of the parameters that are active (not grayed out) can be modified. If you enter a new value (or make a new selection from a drop-down box), this new value will be written to the sensor when you leave this control (normally by clicking or tabbing to the next one.) In the status window at the top of the screen, echOware shows the register number and the value that was written to it, and whether not the operation succeeded. (Note that the value it shows will frequently not be the same as the one you entered into the control, because the program must translate the values you enter into the special units used by the sensor.)

Alternately, you can write the value that is currently in a particular control by double-clicking (with the left mouse button) on that control. This is useful in the situation where there was a mismatch between current and backed-up configuration parameters, and you want to write a single value to the sensor. You can also do a middle button click (or a mouse wheel click) to a control to reread the register from the sensor and display the newest value in the control.

Clicking on the OK button, the Cancel button, or the "X" button on the window frame will all close the Setup screen. Normally there is no difference between these operations, except in the case of a conflict between sensor values and backed up values. If you are displaying the sensor values only, clicking OK will save these values to the backup file. Clicking Cancel or the "X" button will retain the existing backed-up values.

Serial Number: 12345

Model No (Freq): 5 kHz XDCR

Unit Type: U73

Application Type: Solids

Units: Feet

App Speed (ft/min): 0.0

End Distance (ft): 19.98

Low Level (ft): 18.87

High Level (ft): 3.02

Blanking Dist (ft): 1.32

Dist Offset (ft): 1.21

Damping: 0

Fail Safe Mode: 20 mA

Relay 1 Action: Energized < L1

Relay 2 Action: Failsafe

Relay 3 Action: Energized > L2

Relay 4 Action: Not used

Status: OK | Not connected

Tank Dimensions Diagram: Shows a tank with levels: Lo Level (4 mA), L2 Level (Any Relay), L1 Level (Any Relay), Hi Level (20 mA), and Blanking (No Detection). High Level is 100% and Low Level is 0%.

Relay Settings:

Relay 1 L1 (ft):	6.00	L2 (ft):	7.00
Relay 2 L1 (ft):	0.00	L2 (ft):	0.00
Relay 3 L1 (ft):	1.00	L2 (ft):	19.00
Relay 4 L1 (ft):	0.00	L2 (ft):	0.00

Buttons: OK, Cancel

The following is a list of the fields on the form, with a brief explanation of each. (For a more information, refer to the echOsonix manual.)

Serial Number - Displays the serial number of the selected sensor.

Model Number - Displays model number of selected sensor.

Application Type - Valid choices are solids, liquids, and slurry.

Units - Selects units for display of distance measurements on the sensor's front panel. Valid choices are feet and meters.

Application Speed - This is a numeric value containing the fastest speed the process is expected to move up or down, in either feet per minute or meters per minute, depending on the units selected above. The speed selected here should be slightly faster than the fastest rate expected.

Low Level - This is the distance from the sensor to the lowest level of the product. (Since the sensor is mounted at the top and aimed toward the bottom, this value must be larger than the "high level" value.)

High Level - This is the distance from the sensor to the highest level of the product. (This value must be smaller than the "low level" value.)

Blanking Distance - This is the distance from the sensor within which its distance readings is considered to be invalid. This value should be less than the "high level" value.

Damping - This is a numeric value which is used in computing a running average of the last N readings, based on the formula:

$$\text{Displayed output} = ((\text{Damping} * \text{PreviousDistance}) + \text{NewDistance}) / (\text{Damping} + 1)$$

This is typically set to larger values for solid or turbulent applications.

Distance Offset - The value in this text box is the distance from the transducer face to the minimum expected process material distance. It is subtracted from the material process distance so that the highest process level is given as a distance of 0.00.

End Distance - This value should be at least one foot longer than the longest physical distance in the process. (This helps eliminate secondary echoes by allowing the sensor to reject invalid values.)

Fail Safe Mode - This control is a combo box that allows the operator to select what the analog output will be if the sensor goes into failure mode. Valid choices are 20 mA, 4 mA, Last, < 4 mA and >20 mA.

Relay 1 Action – The echOsonix sensors have either two or four relays attached to them, depending upon the model. This control allows you to select the action of relay number 1 (the state the relay enters when the product level goes above the associated L1 level, and returns to normal when it goes below the L2 level.) This control is a drop-down box with valid selections Off, Failsafe, Energize, and De-energize.

Relay 1 Levels 1, 2 - This pair of text boxes allows you to enter the L1 and L2 levels for relay 1.

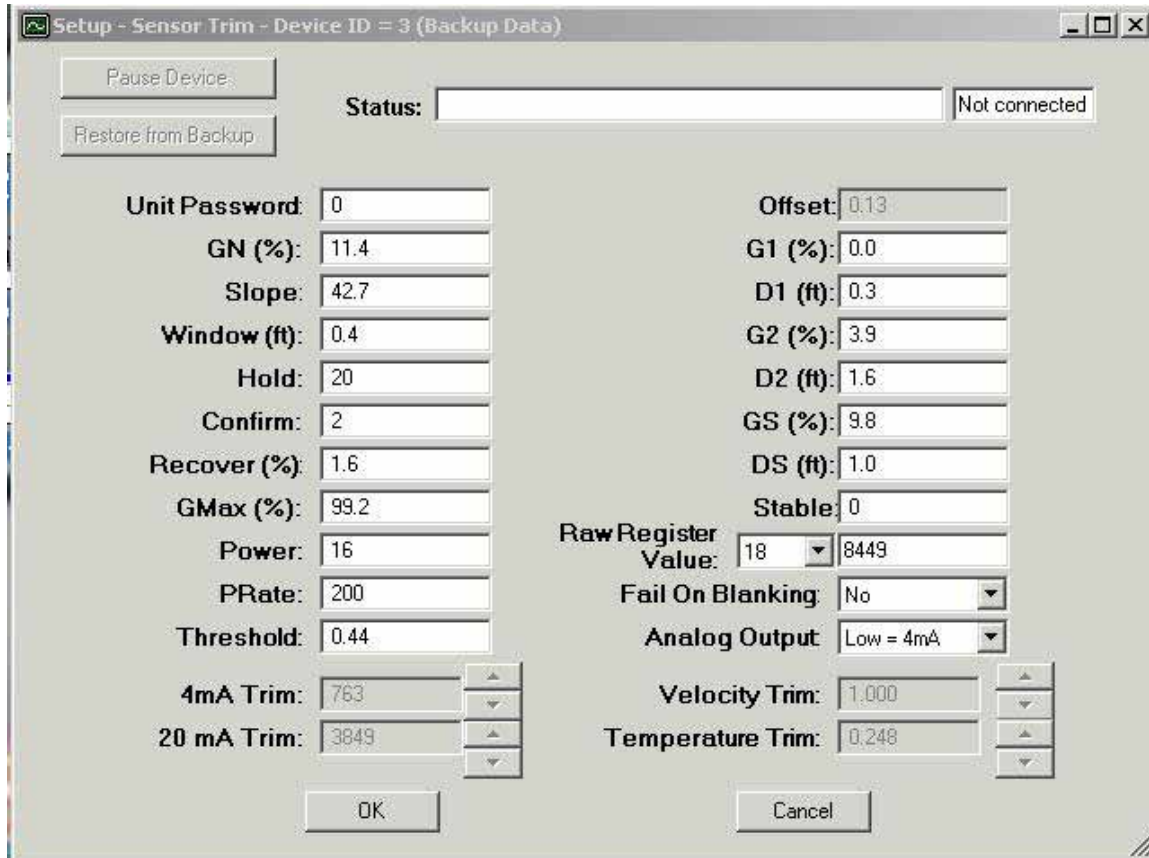
Each of the remaining three relays (or one relay, depending on the sensor model) also has a set of three controls. These controls allow you to select an associated action and an L1 and L2 value for these relays, in the same way as the previous three controls work for Relay 1.

Sensor Trim Screen

This form contains sensor parameters, which should be modified only by operators with proper training and knowledge of sensor configuration. This form is accessible only if the technician password has been entered.

Much of the explanation from the previous section on the Setup Screen also applies to the Trim Screen. You must first select a tank and then click the button. The trim screen will display current sensor data, or backup data, depending on whether the Modbus connection is active. It will display the same three-button prompt form if there is a conflict between the current sensor registers and the saved values in the backup file. And the same "please wait" form with the progress bar will be displayed if the program has not finished reading the sensor at the time you clicked the button to display the screen.

Below is a picture of a typical Trim Screen display. The setup is similar to that of the Setup Screen, without the tank illustration. Most of the entry fields are numeric, although two of them are drop-down selection controls. The Offset register value is not to be modified, so the control that shows the Offset value (top right) is read-only. Another register that cannot be modified through echOware is the sensor's communications address (which is the same as the device ID, shown at the top of this window.) You must change this value manually using the sensor's front panel, because to change this value remotely would make it difficult for the program to maintain communications with the sensor.



The four controls at the bottom should not normally be modified. If they do require adjustment, they should be changed only a little at a time, to give you a chance to verify that the sensor still functions. For this reason, echOware has up/down arrow controls that make it easy for you to adjust the values a little bit at a time. (These controls are all disabled when the Modbus connection is not active.)

Reading from and writing to the different registers on the Trim Screen is also the same as for the Setup Screen. Values will be written when you change the value of a control and leave it, or when you double-click on the control. Controls can be refreshed from the sensor by doing a middle click. Since these are advanced parameters, we will not detail them in this manual. Refer to the echOsonix manual for more information.

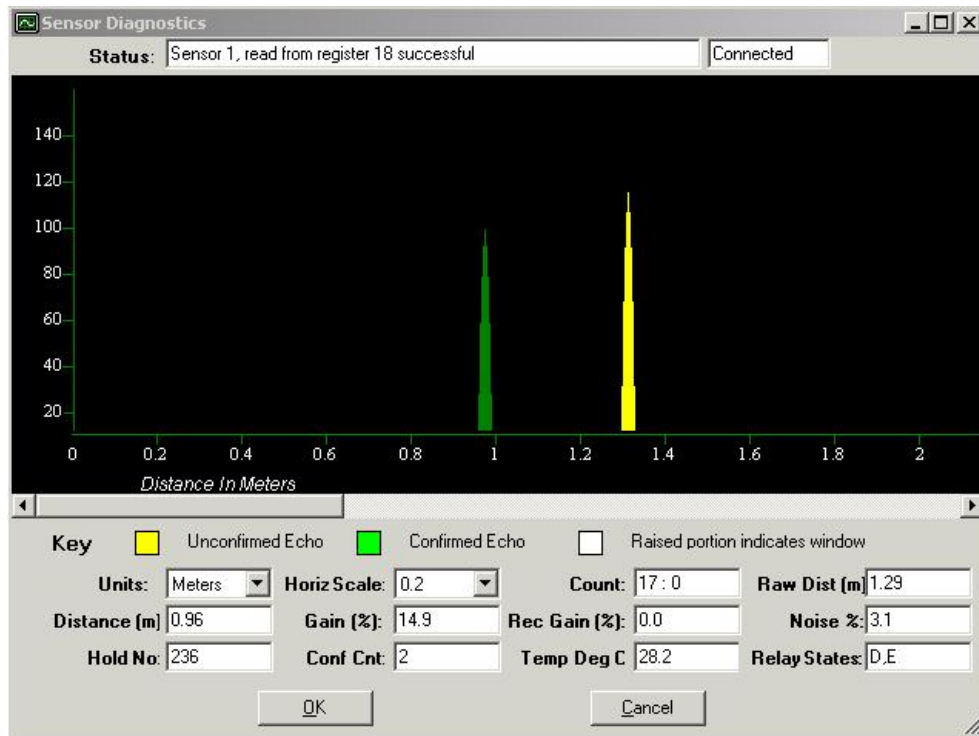
However, the Trim Screen provides additional special commands that are not available on the Setup Screen. Two of these are buttons located on the top left of the screen.

Pause Button - Clicking this button puts the sensor in "pause" mode. Clicking it again un-pauses the sensor. This gives you a way to make the sensor temporarily stop functioning without having to power it down.

Restore from Backup – This command allows you to write all configuration registers to the selected sensor from its backup file. This is useful if a sensor has gotten mis-configured and you want to restore a known good setup, or if you are replacing an existing sensor with a new one. You can also use it to "clone" a sensor's configuration with another one. (Restore does not change the communications address, so the cloned device will keep its same device ID.)

If, when you bring up the trim screen, there is a mismatch between the current sensor configuration and the saved on in backup, make sure you select the backup configuration – otherwise the Restore button will be disabled. When you click the Restore button, the program will display an "Are you sure" message to make sure you didn't click the button in error. If you click "Yes", it will write the configuration registers of the current sensor, one at a time, until they are all updated. (The echOsonix sensor allows multiple registers to be read with a single command, but only one to be written at a time.) If a write command fails, it will retry, up to five times each, before aborting the restore operation. Warning: Once it is begun, there is no way to abort the restore command other than exiting the program. If you exit the trim screen it will continue writing until it is finished or encounters too many errors and is forced to stop. Therefore echOware cannot scan tanks, nor do anything else, while the restore is in progress.

Raw Register Value - The third special control is located in the right column of controls, and has an extra



drop-down box located next to it. It allows you to read any register in the sensor and display its raw value. Select the register number from the drop-down at the left and its value will display in the box to the right. If the register is read-only, the box will be gray. If the box is white, you can change the value and either double-click or click on another control to write it to the sensor. Caution: this feature is for advanced users only. The raw value is not the same as the value displayed in the other controls; for example you must multiply all distance values by a particular constant. This control makes it easy to write a bad value which will mis-configure the sensor and cause it to not function until the configuration is fixed.

Some of the controls on the trim screen are only enabled when the Modbus connection is active. These include the Pause and Restore buttons, and the four trim controls at the bottom of the screen.

Sensor Diagnostics Screen

This form contains an oscilloscope-type display which can be used for diagnostic and troubleshooting purposes. This form can be exited by clicking the "X" button on its window frame. The form contains the following controls:

Oscilloscope Display - This is a simulated oscilloscope display with time values labeled on the horizontal axis and intensity values on the vertical axis. (The background is black and axis lines are white.) Vertical lines on the screen indicate the echoes received and their distance. Echoes shown in yellow are unconfirmed. The green echo is the one the unit has most recently confirmed, and corresponds to the value indicated in the box marked "distance."

Display Controls

Units - This control selects feet or meters as the basic display unit for distances. The temperature display is also updated when the units are changed – degrees C for meters and degrees F for feet.

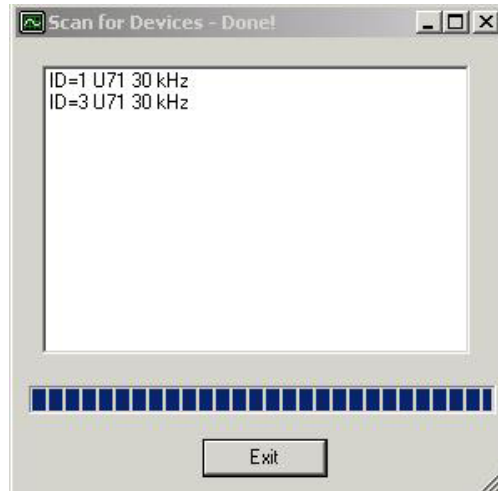
Horizontal Scale - This is a combo box with values that can be selected for the units on the horizontal time scale of the scope display. The selections are multiples of 1, 5, and 10 of whatever the base distance is (in feet or meters)

Troubleshooting Parameters - The following data values are displayed in two horizontal rows at the bottom of the screen, below the scope display.

- **Count:** The count of echoes received. The number following the colon is the count of communications errors.
- **Raw Distance:** The instantaneous distance from the transducer face to the target before any processing or confirmation. This corresponds to the yellow displayed echo.
- **Distance:** The distance in feet or meters from the sensor's transducer face to the product being measure. This corresponds to the green displayed echo.
- **Percent Gain:** The percentage of gain being used for this measurement.
- **Recover Gain:** The gain percentage increase applied to recover from a loss of signal.
- **Percent Noise:** The noise level expressed as a percentage of gain.
- **Hold Count:** The number of "transmit and measure" cycles performed, when no echo is detected, before the unit goes into Recover Mode.
- **Confirm Count:** This is the number of consecutive, consisted echoes that must be received before an echo is confirmed as valid.
- **Temperature:** The current temperature, in degrees Celsius or Fahrenheit (depending on the units selection), measured at the transducer.
- **Relay States:** Displays the states of the 2 or 4 relays on the sensor. The letter "E" indicates Enabled, "D" indicates Disabled. Relay states are listed in numeric order from Relay 1 to Relay 4.

“Scan for Devices” Command

There are situations in which you may not know the ID's of all the sensors connected to a particular Modbus interface. This command allows you to check the Modbus to see what sensors are currently attached, and returns the device ID, model number, and frequency of each. In echOware you can start a scan by clicking the rightmost button on the tool bar. (This is the one with the magnifying glass icon.) This will bring up the following form:



If the Modbus connection is currently active, it will perform the scan, which may take several minutes, and display the sensors in the list as they respond. (If a sensor is turned off or disabled, it will not appear in the list.) You can abort the scan by clicking the Exit button. Otherwise, the scan window will say “Done!” at the top when scanning is complete.

If the Modbus connection is not active, clicking the Scan button will bring up this same window, which will display the devices it discovered in the last scan operation. This saved scan information is automatically erased if you click the Scan button when the Modbus connection is active.

The “About” Window

As with most Windows applications, echOware has an “About” entry under its “Help” menu. This brings up a screen which shows version and copyright information. There is also the URL of the SOR echOsonix sensor website. Clicking this text should launch your system's default browser and load that web page, providing your system is connected to the Internet.

