8010SFAGB02

OPERATING INSTRUCTIONS

Aardvark Permeameter Module

January 2012

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TABLE OF CONTENTS

UNPACKING

The Aardvark Module in our SimplyDATA software and the Record It in a Flash (RIF) USB Flash Drive were thoroughly tested before shipment. When packed, they were in perfect working order. Follow the instructions carefully in order to assure long, trouble-free service.

Any damage found upon receipt should be reported immediately to the transport carrier for claim. It is important to save the shipping container and all evidence to support your claim. Be sure to read all operating instructions thoroughly before operating the unit.

WARRANTY & LIABILITY

Eijkelkamp Agrisearch Equipment (EAE) warrants all products manufactured by E A E to be free from defects in materials and workmanship under normal use and service for twelve (12) months from the date of invoice provided the section below has been met.

Eijkelkamp (EAE) is not liable for any damages, actual or inferred, caused by misuse or improper handling of its products. EAE products are designed to be used solely as described in these product operating instructions by a prudent individual under normal operating conditions in applications intended for use by this product.

GENERAL SPECIFICATIONS

The SimplyDATA Suite of software programs was written for use in a Windows Operating system; it will not function on any other platform.

APPLICABLE TO ALL SIMPLYDATA SUITE PROGRAMS

Every SimplyDATA Suite application comes with a sample data set which will open automatically when the application starts, until the user saves collected data. Then, the most recently saved file will become the default file to open when the program starts.

REQUIREMENTS FOR USE

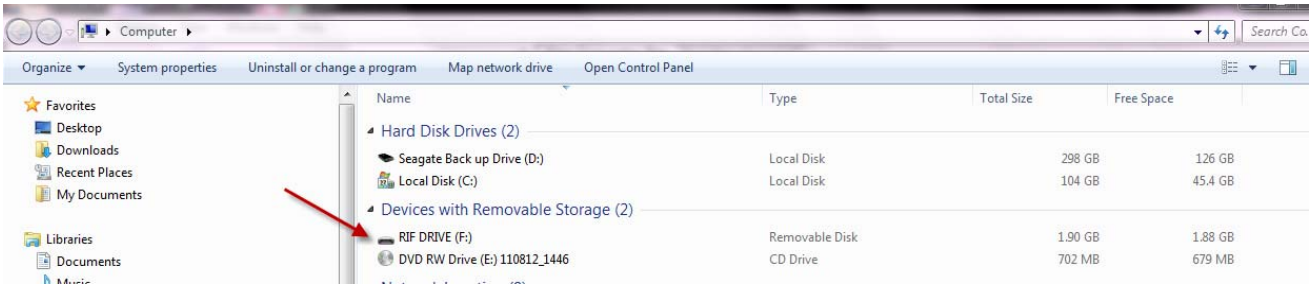
When you run the setup program, to install the SimplyDATA Suite software, only a limited amount of files are installed on your computer. The USB Flash drive provided must always be inserted in a USB port on your computer or laptop to run the program.

If you wish to export any of your files, you will need Microsoft Excel® installed on your computer or laptop.

HOW TO INSTALL THE SIMPLYDATA SOFTWARE SUITE

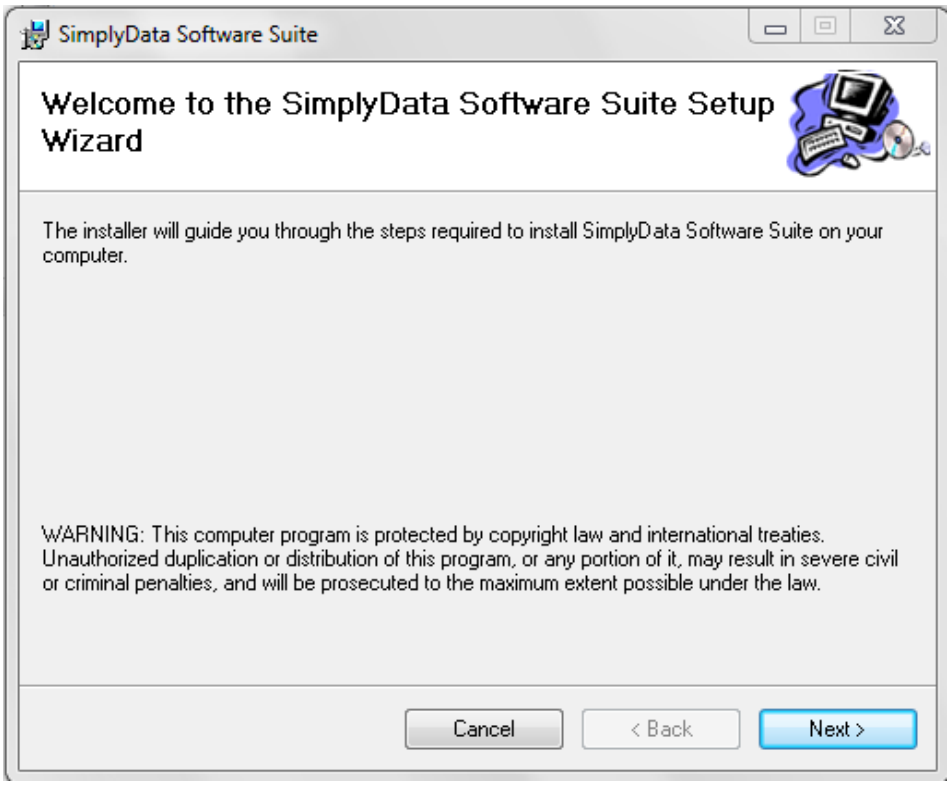
Insert the Soilmoisture USB Flash Drive into any available USB port on your computer. The Flash Drive has been named "RIF Drive".

You can locate the SimplyDATA setup file by opening Windows Explorer, search for the RIF Drive, open the file and select setup.exe from the Flash Drive.

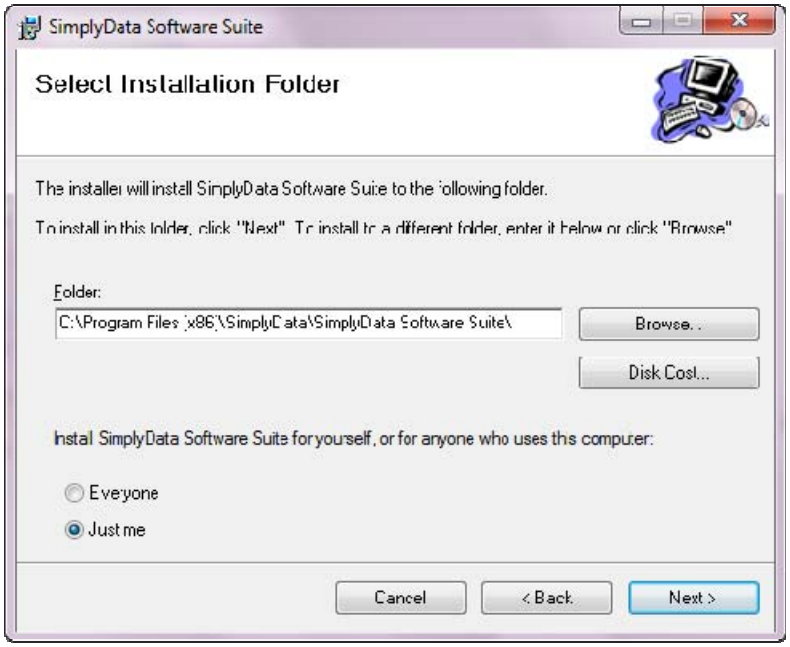


Once you have located the setup.exe file on the Soilmoisture USB flash drive, double click it and the SimplyDATA Software Suite Setup Wizard window will open and you will see the Welcome Screen.

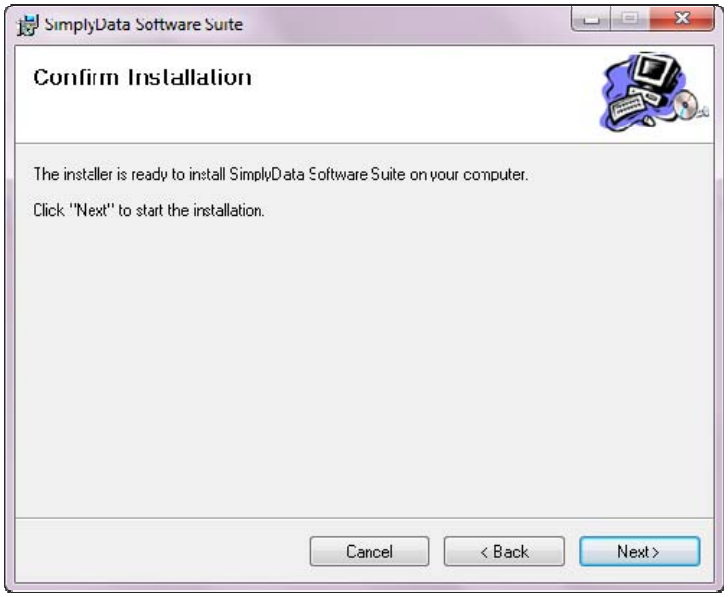
Click "Next" to start the installation.



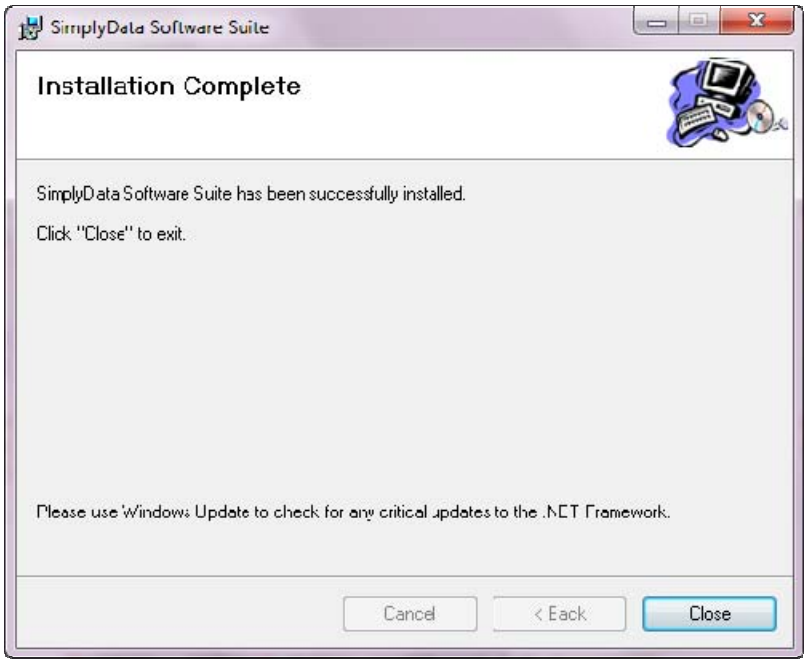
In the "Select Installation Folder" window, select the folder where you want to install the program. You have two options: you can make the program available to only yourself or you may share the program with other users of the computer by selecting the option "Everyone". After you have made your choice, click "Next".



The "Confirm Installation" window will appear; click "Next" to install the SimplyDATA Software Suite to your computer.



When the installation is complete, the "Installation Complete" window will appear on your screen. Click "Close" to complete the installation. A shortcut will be placed on your Desktop called "Shortcut to SimplyDATA Software Suite".



To run the SimplyDATA program, double click on the shortcut placed on your Desktop. The "Navigating Console" window opens. Click on the Aardvark Permeameter icon in the top left corner to run the program (shown highlighted below).

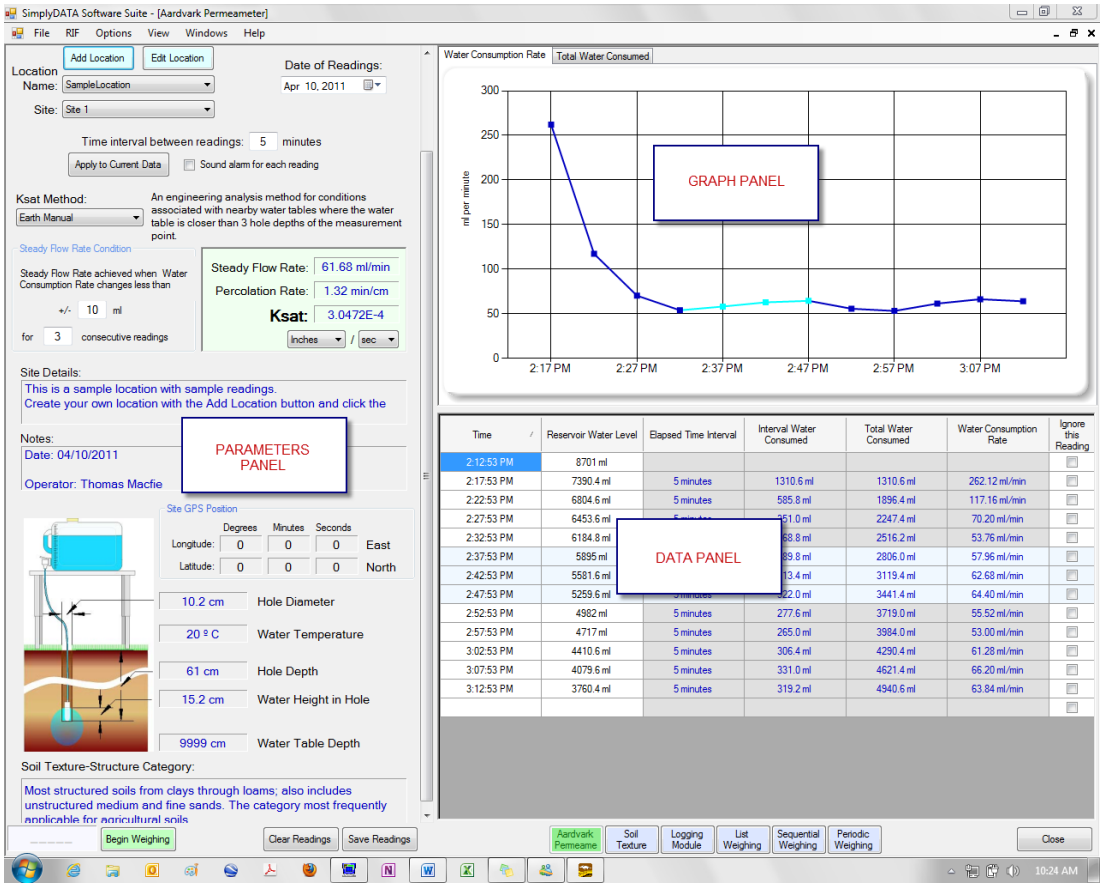
AARDVARK PERMEAMETER APPLICATION

NOTE: In order to properly view the Aardvark Permeameter Screens, your Windows® Screen Resolution on your monitor or display must be set to 100%.

How to Perform Calculations Using the Aardvark Permeameter Program

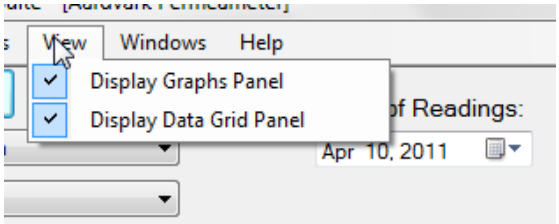
NOTE: To properly view the Aardvark Permeameter Screens, your Windows® Screen Resolution on your Display must be set to 100%.

The Aardvark Main Screen is comprised of three panels: "Parameters", "Graph" and "Data".



The Data Panel is used to store reading data (manually or automatically) and the Graph Panel will display a graph of the data collected over time.

NOTE: If you wish, you may hide either the Graph or Data panel or both. To do this, click on the "View" tab on the Tool Bar and deselect the check box next to the Panel(s). To view either or both Panels again, simply select them by clicking in the check box next to the Panel to be viewed (see below).



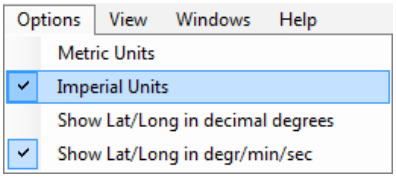
Prior to Making Measurements

Enter Date of Sampling

Before you use the Aardvark software program, you will need to enter the date you will take your measurements. By default, it will show the current date, but can be changed if the date of sampling is different.

Units of Measurement

As a default, all measurements made will be saved in metric. The only Parameters that can be changed from metric to imperial are: Hole Diameter, Water Temperature, Hole Depth and Water Height in Hole. To change these from metric to imperial go to the Options drop down menu and select "Imperial". The check box will change from unchecked to checked (see below).

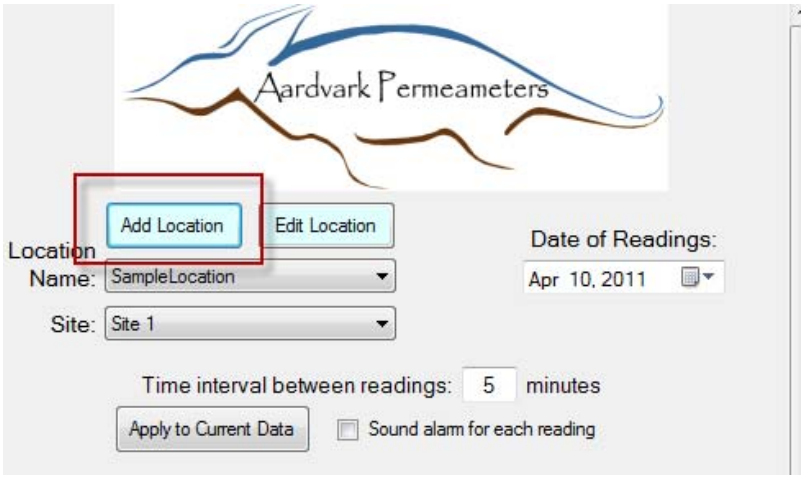


Once changed, all the fields in the "Parameters" panel and "Add a New Location" screens will change from "cm" to "inches", and temperature will now show in degrees Fahrenheit. For the purposes of this manual, we will only use metric units in our examples.

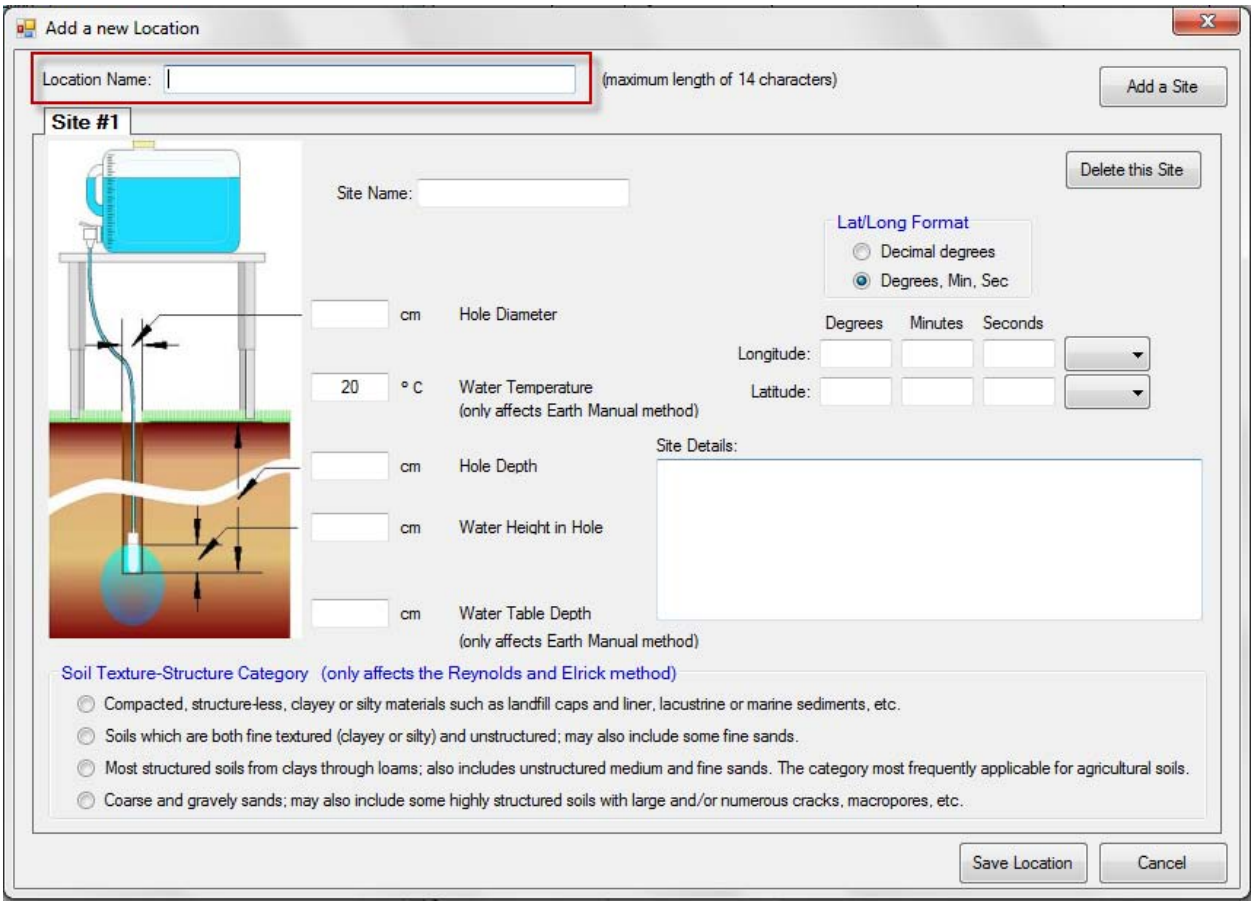
Add Location(s)

To add Location(s) and Site nomenclature, this can be done either in the laboratory or in the field using a laptop computer.

To add a location, click on the "Add Location" button at the top left of the screen (red square).



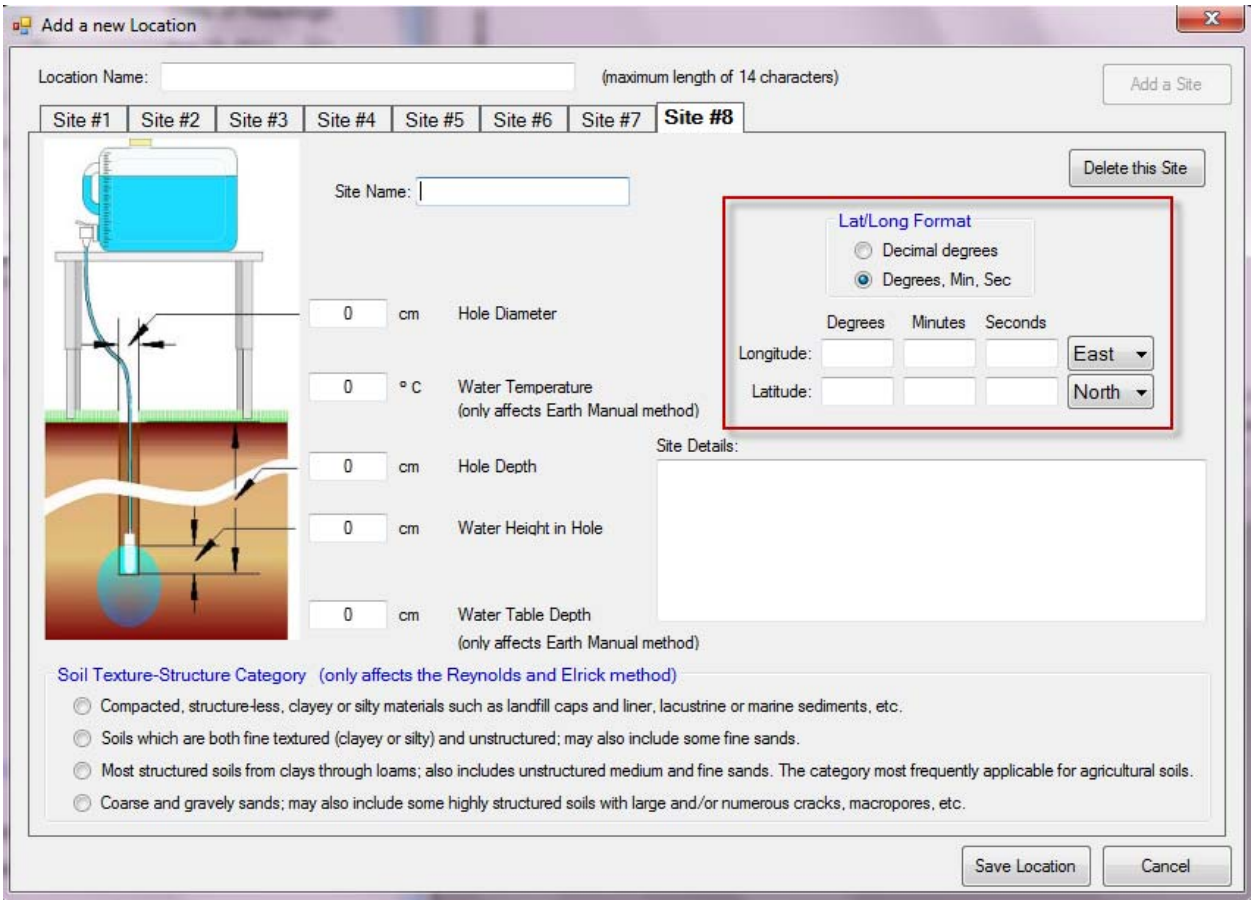
The "Add a new Location" screen will open. Enter the desired name for your sampling location in the "Location Name" textbox (see red box below).



NOTE: Once a Location Name is added, it **cannot** be deleted. Each Location must also always have one site.

Each Location may have up to 8 Sites. You can add or delete Sites using the "Add a Site" or "Delete a Site" buttons on the upper right side of the window (see below). Enter the desired Site Name in the Site Name Box.

As an added option, you may also enter the Longitude and Latitude of the sampling site in the corresponding textboxes (show in red box below). Click the radio button of the desired format of either "Decimal degrees" or "Degrees, Min, Sec." Use the drop-down menus to the right of the Longitude and Latitude values to set North, South, East, and West.



Next, enter the Borehole diameter in cm. (*The Aardvark Permeameter standard Borehole diameter is 10.16 cm, but you can enter another number for the diameter.*)

Then enter the water temperature in the borehole. (*This information is only used in the "Earth Manual" method and has no effect on the calculations of other methods.*) Because the viscosity of water affects its infiltration rate in soil, the software corrects the K_{sat} for water viscosity in different temperatures. If you do not know what the water temperature is, you may enter "20" in the "Water Temperature" box. Viscosity of pure water in 20° C is equal to one and therefore will not affect the K_{sat} value. (If you are using "Imperial" units, then enter "70").

Next, enter the Borehole depth in cm in the "Hole Depth" text box. Enter the constant water head height in cm in the "Water Height" text box.

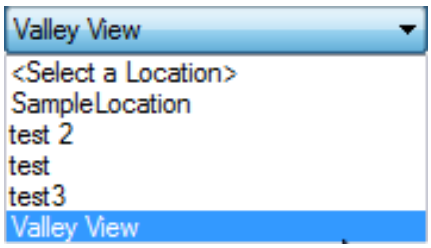
Enter the depth of the soil water table or impervious layer in cm in the "Water Table Depth" text box. (*This information is only used in the "Earth Manual" method and has no effect on the calculations of other methods.*)

Enter the soil's Texture-Structure Category. (*This information is only used in the "Reynolds and Elrick" method and has no effect on the calculations of other methods.*)

You have the option to add any notes for each site in the "Notes" text box.

Finally, click "Save Location" to save your data. The "Add a New Location" window will close and return you to the Permeameter screen.

NOTE: After entering new location data, at least two locations will be stored: the Sample Location that comes pre-installed with the Aardvark program and any location(s) that may have been entered. After saving and closing the "Add Location" screen, the "Sample Location" will be the default location displayed. To view the new locations just entered, go to the Location drop-down menu and select the desired location. In the screen below, we have just entered the Location "Valley View" and now want to view it in the main Aardvark Screen.



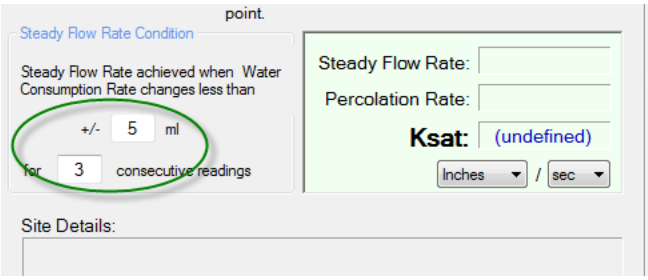
Next, enter the appropriate interval time between readings in the specified box. For most soils an interval between 5 and 10 minutes is sufficient. **NOTE:** The interval entered must be an integer number of MINUTES; 1 minute is the minimum.

In general, shorter intervals and shorter numbers of readings always yield more accurate and reliable results. However, small intervals can create more "noise" in the data, making it harder to get a Steady Flow Rate. To compensate, you can change the interval to a larger interval *after* the data has been gathered (you cannot change to a smaller interval after data collection).

A good example is if there are data points every 2 minutes and there is too much noise, you can set the interval to 4 minutes and every other reading will be hidden; data will appear as if it had originally been gathered at a 4-minute interval. To see all data points again, reset the interval back to 2 minutes and all data will reappear.

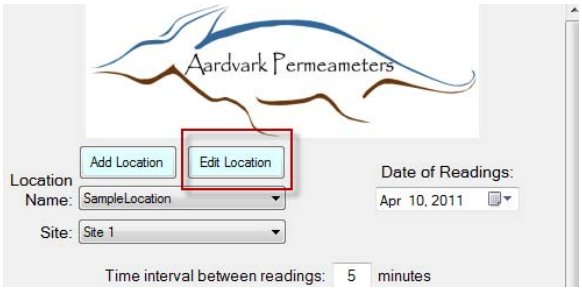
If you are not sure which interval would be best, use a smaller interval and you can expand the data later to smooth out the graph and achieve a better steady flow rate.

Next, you will need to instruct the program how to determine the "Steady Flow Rate". In the Main Aardvark Screen, enter "5" in the first box and "3" in the second box in the Steady Flow Rate Condition area (see green circled area below). This will tell the program to average the first 3 consecutive readings that have less than a 5 cm^3 difference in "Water Consumption Rate" to determine the "Steady Flow Rate". You can change these parameters based on the reading's level of accuracy and soil type (For more information, see the section "*Determining the Steady Flow Rate (Q)*" in the Aardvark Permeameter Operating Instructions).

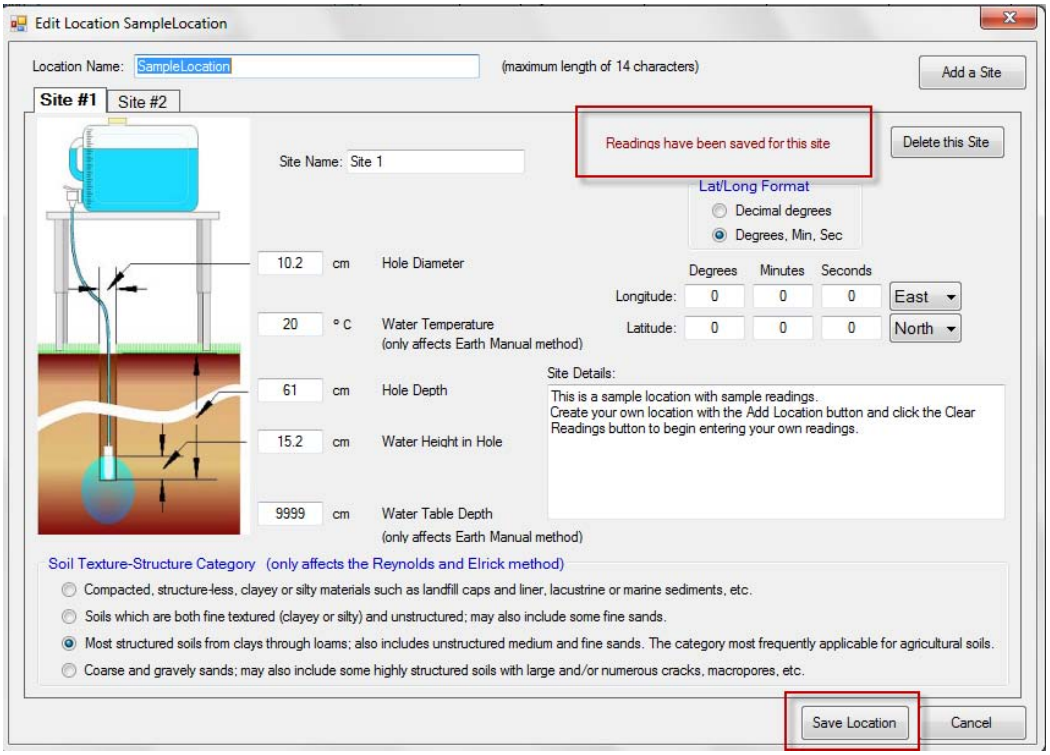


Edit an Existing Location

To edit a Location, first select the Location and Site to be edited so the data is showing in the screen. Then click on the Edition Location button.



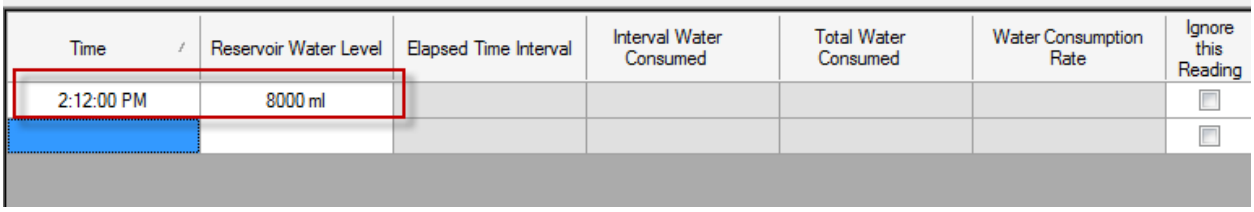
The Edit Location window will open and alert you that readings have been saved for this site. Make the desired changes and then click Save Location.



Manually Entering Data

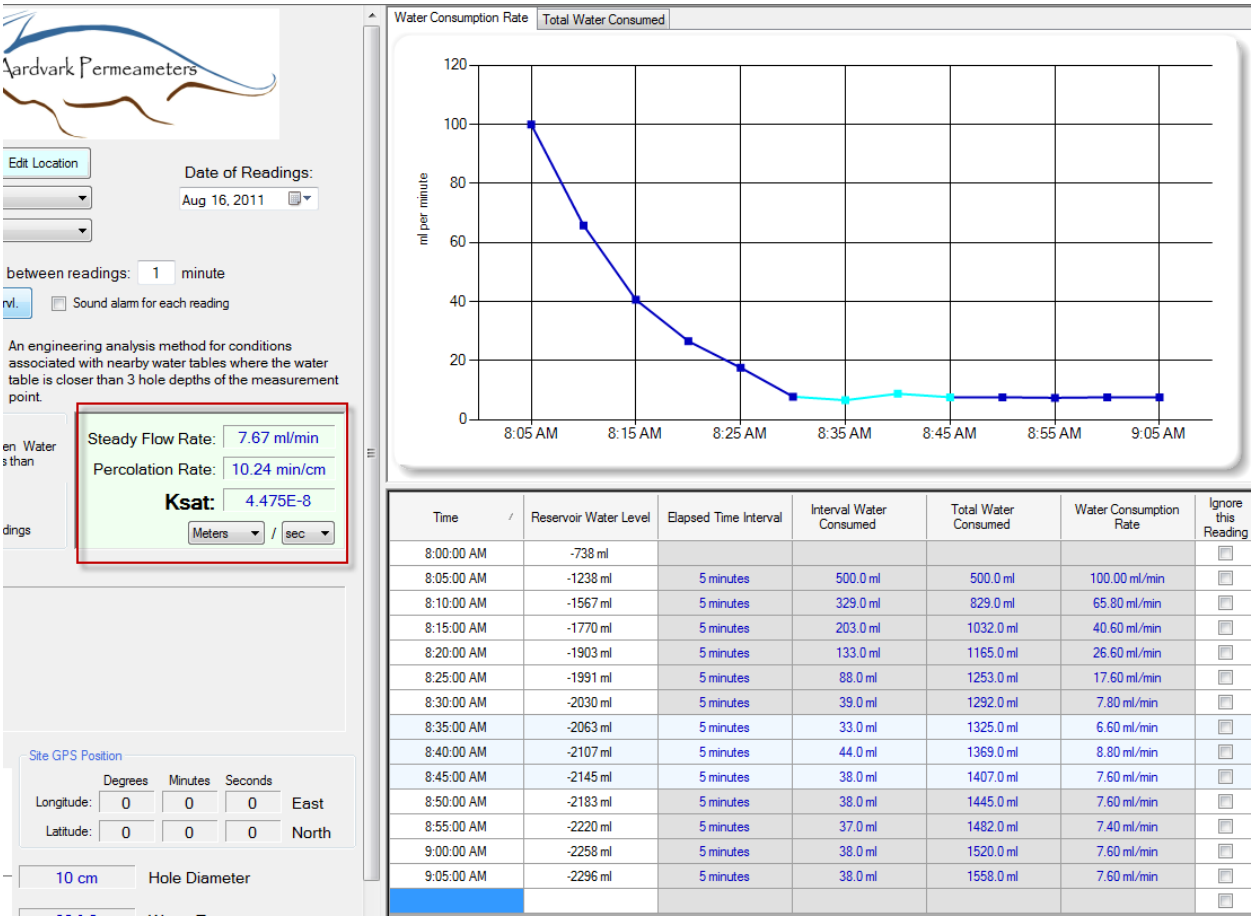
Now that location, site, and other required parameters have been entered, readings can now be entered manually.

Enter the Time and Reservoir water level for each reading in the corresponding columns in the "Data" panel. Note that the values in the Reservoir Water Level can be either positive or negative numbers.



Time	Reservoir Water Level	Elapsed Time Interval	Interval Water Consumed	Total Water Consumed	Water Consumption Rate	Ignore this Reading
2:12:00 PM	8000 ml					

As you manually enter data, all the other columns will be calculated automatically and the data will be plotted in the Graph Panel. Once the "Steady Flow Rate Condition" is "true", the K_{sat} (Coefficient K) is calculated and shown in the corresponding box (see red box below).



Time	Reservoir Water Level	Elapsed Time Interval	Interval Water Consumed	Total Water Consumed	Water Consumption Rate	Ignore this Reading
8:00:00 AM	-738 ml					
8:05:00 AM	-1238 ml	5 minutes	500.0 ml	500.0 ml	100.00 ml/min	
8:10:00 AM	-1567 ml	5 minutes	329.0 ml	829.0 ml	65.80 ml/min	
8:15:00 AM	-1770 ml	5 minutes	203.0 ml	1032.0 ml	40.60 ml/min	
8:20:00 AM	-1903 ml	5 minutes	133.0 ml	1165.0 ml	26.60 ml/min	
8:25:00 AM	-1991 ml	5 minutes	88.0 ml	1253.0 ml	17.60 ml/min	
8:30:00 AM	-2030 ml	5 minutes	39.0 ml	1292.0 ml	7.80 ml/min	
8:35:00 AM	-2063 ml	5 minutes	33.0 ml	1325.0 ml	6.60 ml/min	
8:40:00 AM	-2107 ml	5 minutes	44.0 ml	1369.0 ml	8.80 ml/min	
8:45:00 AM	-2145 ml	5 minutes	38.0 ml	1407.0 ml	7.60 ml/min	
8:50:00 AM	-2183 ml	5 minutes	38.0 ml	1445.0 ml	7.60 ml/min	
8:55:00 AM	-2220 ml	5 minutes	37.0 ml	1482.0 ml	7.40 ml/min	
9:00:00 AM	-2258 ml	5 minutes	38.0 ml	1520.0 ml	7.60 ml/min	
9:05:00 AM	-2296 ml	5 minutes	38.0 ml	1558.0 ml	7.60 ml/min	

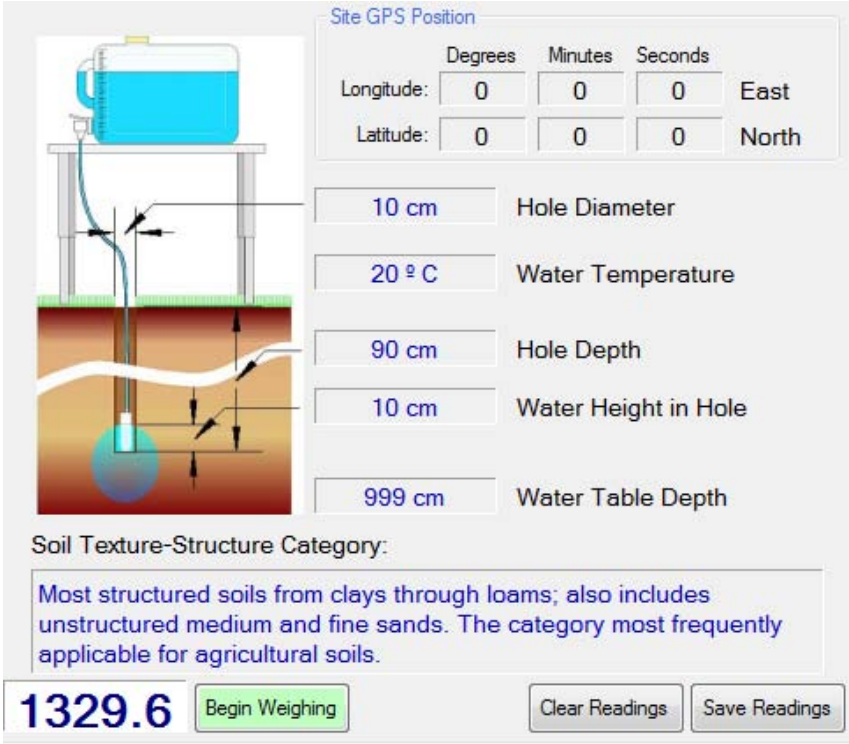
The software is capable of calculating K in three different methods (Earth Manual[1], Glover Solution[2] and Reynolds & Elrick[3]). Note that there is no direct way to calculate K from Q, and different calculation methods will lead to different results. It is the responsibility of the user to select the proper method of calculation for his/her application. One can easily change the K_{sat} unit using the drop-down lists below it (image above). Two graphs from related parameters are generated automatically: "Water Consumption Rate" and "Total Water Consumed". Both can be viewed in the "Graph" panel, by clicking on the tab about the Graph Panel.

How to Make Automatic Readings

If you will be using the SimplyDATA Digital Scale (7201W10) to automate taking Aardvark readings, you will need to follow the steps as outlined in the previous section to set up your parameters.

Follow these additional steps to take automatic readings:

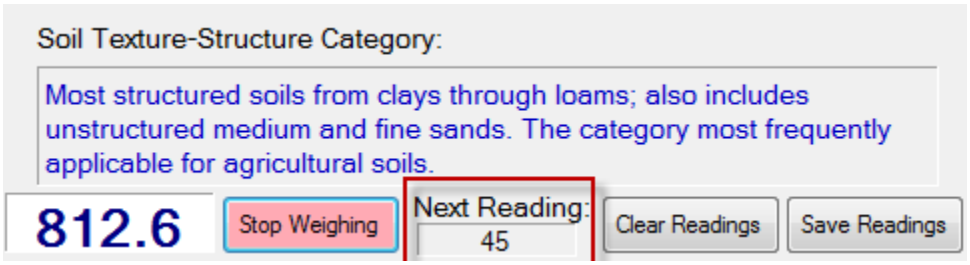
- Verify the correct location and site have been selected before starting the measurement process.
- Check that the desired reading interval time has been entered.
- The scale is powered on and you have followed the instructions in the "*Digital Scale Operating Instructions*" for proper setup. If the Scale is off or not connected, the box will display grey dashes instead of numbers (see red box below indicating no scale is connected).



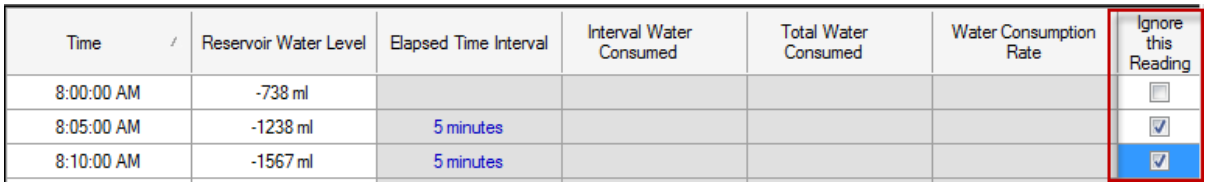
To start the automated reading, click on the "Begin Weighing" button (see red arrow above). In the lower-left corner of the "Display" panel, you can observe the real-time reading of the Scale.

The first reading appears at once in the first row of the data table and the "Begin Weighing" button will change to "Stop Weighing".

If you click on the "Stop Weighing" button before you want to stop the measurement process, you will not be able to resume taking measurements. You will need to delete all the data in "Display" panel before starting the automated reading process again. (You will, however, be able to save the data before deleting). There is a countdown timer (see red box below) beside the "Begin/Stop Weighing" button. It always shows the time remaining to the next automated reading. Time will show in hours, minutes, seconds as applicable.

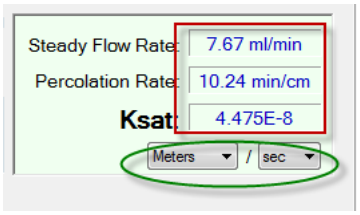


False readings will occur when refilling the Reservoir or changing out an empty container for a full one. False readings can also occur when the Table setup is shaking due to wind or any other reason. You can tell the program to ignore these readings by checking the "Ignore this Reading" box next to each false reading as shown in the image below.

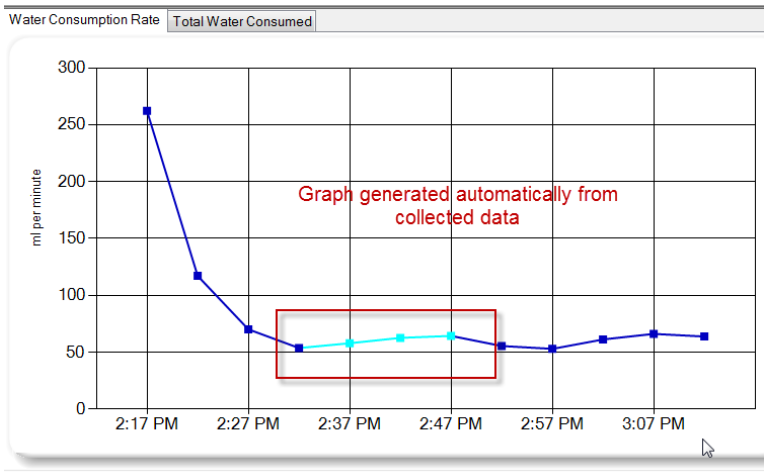


Time	Reservoir Water Level	Elapsed Time Interval	Interval Water Consumed	Total Water Consumed	Water Consumption Rate	Ignore this Reading
8:00:00 AM	-738 ml					☐
8:05:00 AM	-1238 ml	5 minutes				☑
8:10:00 AM	-1567 ml	5 minutes				☑

Once the "Steady Flow Rate Condition" is "true" K_{sat}, the Saturated Hydraulic Conductivity is calculated and shown in the corresponding box (see red box below). One can easily change the K_{sat} unit using the drop-down list (See green circle in image below).



A graph of the collected data will be generated automatically in the "Graph" Panel (see sample below).



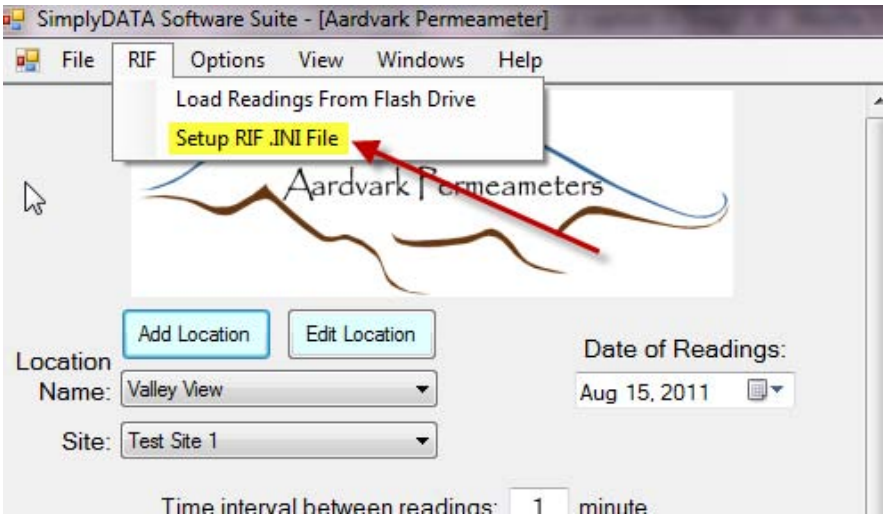
Time	Reservoir Water Level	Elapsed Time Interval	Interval Water Consumed	Total Water Consumed	Water Consumption Rate	Ig t Re
2:12:53 PM	8701 ml					
2:17:53 PM	7390.4 ml	5 minutes	1310.6 ml	1310.6 ml	262.12 ml/min	
2:22:53 PM	6804.6 ml	5 minutes	585.8 ml	1896.4 ml	117.16 ml/min	
2:27:53 PM	6453.6 ml	5 minutes	351.0 ml	2247.4 ml	70.20 ml/min	
~~2:32:53 PM~~	~~6184.8 ml~~	~~5 minutes~~	~~268.8 ml~~	~~2516.2 ml~~	~~53.76 ml/min~~	
2:37:53 PM	5895 ml	5 minutes	289.8 ml	2806.0 ml	57.96 ml/min	
2:42:53 PM	5581.6 ml	5 minutes	313.4 ml	3119.4 ml	62.68 ml/min	
2:47:53 PM	5259.6 ml	5 minutes	322.0 ml	3441.4 ml	64.40 ml/min	
~~2:52:53 PM~~	~~4982 ml~~	~~5 minutes~~	~~277.6 ml~~	~~3719.0 ml~~	~~55.52 ml/min~~	
2:57:53 PM	4717 ml	5 minutes	265.0 ml	3984.0 ml	53.00 ml/min	
3:02:53 PM	4410.6 ml	5 minutes	306.4 ml	4290.4 ml	61.28 ml/min	
3:07:53 PM	4079.6 ml	5 minutes	331.0 ml	4621.4 ml	66.20 ml/min	
3:12:53 PM	3760.4 ml	5 minutes	319.2 ml	4940.6 ml	63.84 ml/min	

When Steady State is reached the readings that represent "steady state" will be highlighted in the table and the readings representing the Steady Flow Rate will change to light blue points on the graph (see red boxes in image above). However many intervals specified in the Parameter Panel's Steady Flow Rate Condition area, there will be an equal amount of blue lines/points. It is important for the user to look at the graph and/or data to make sure that this is an appropriate place for the Steady Flow Rate to be. It is possible to get a false Steady Flow Rate at the beginning of the test at the steep part of the curve. If that happens, the user can force the program to look for a Steady Flow Rate at a later point by ignoring those points.

How to Set Up the Flash Drive for Use with Record It in a Flash (RIF)

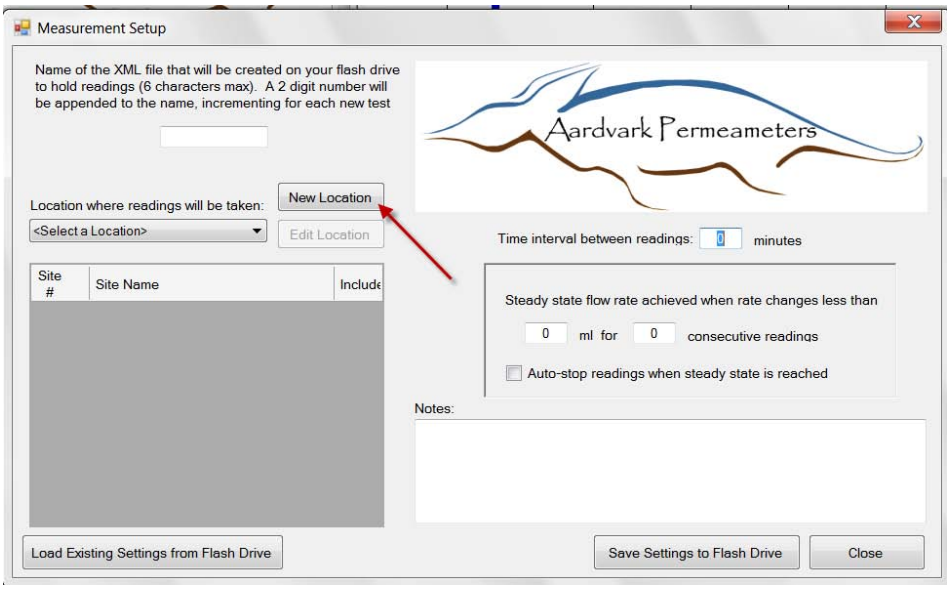
Start the Aardvark Permeameter Program as outlined above.

The RIF.INI File that will be stored on the Flash Drive must be set up first. To do this, click on RIF in the Menu Bar, and select Setup RIF.INI File.

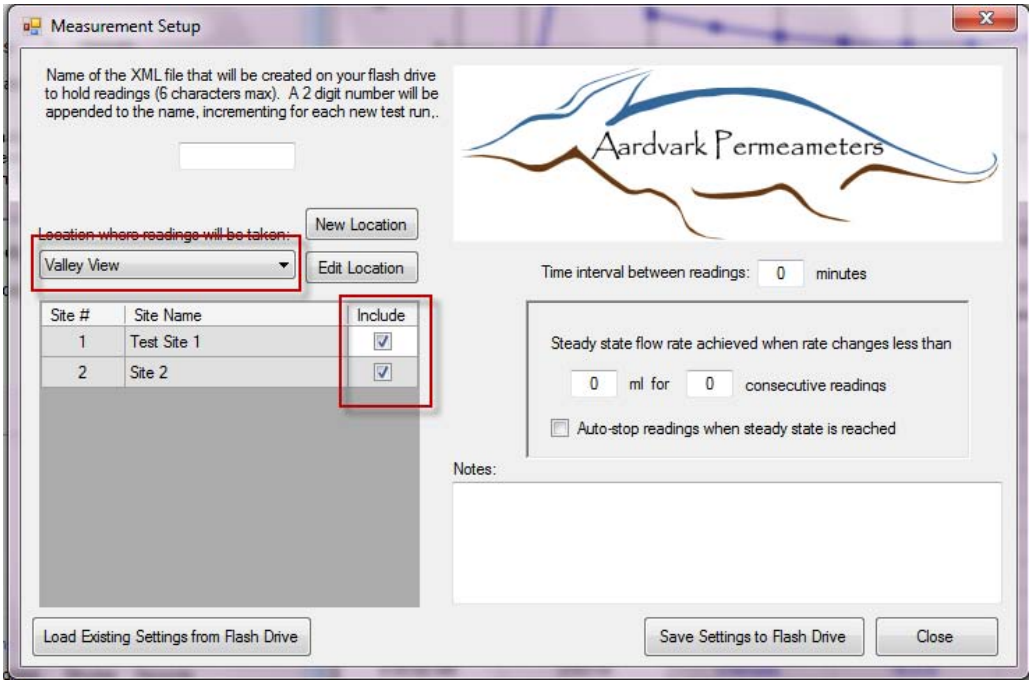


Once you select "Setup RIF.INI File" the "Measurement Setup" window will open.

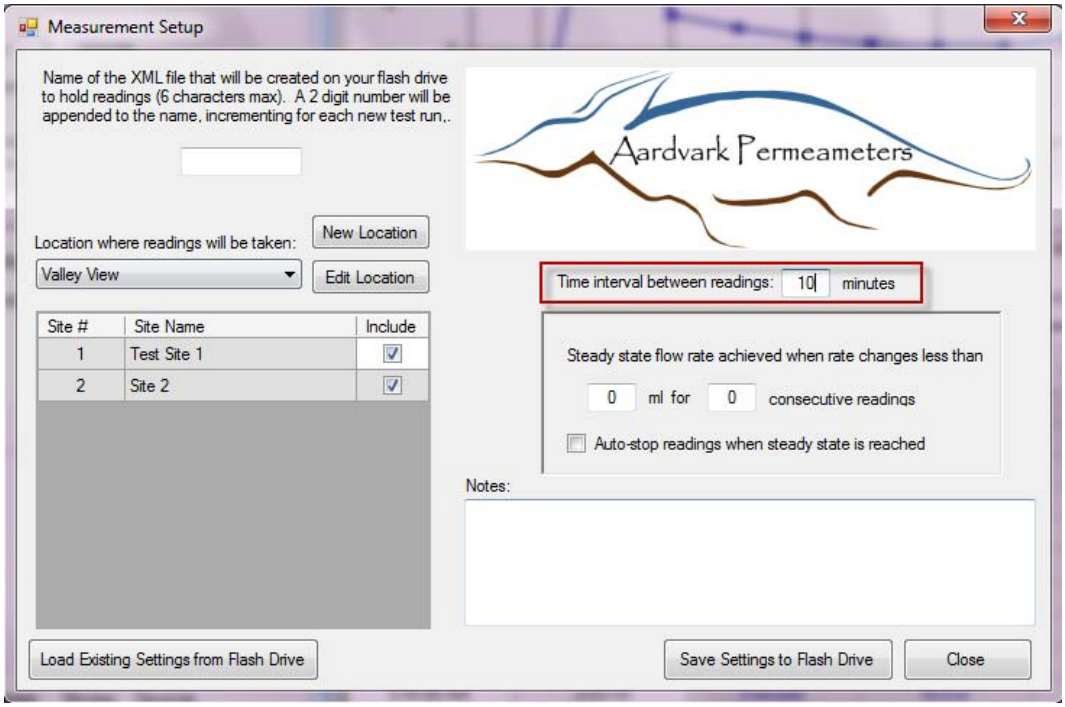
In the "Measurement Setup" window, enter the name of the XML file that will be automatically created by the "Record It in a Flash" unit (6 characters maximum). If you haven't already created a location, you can add a Location with one or more Sites by clicking on the "New Location" button.



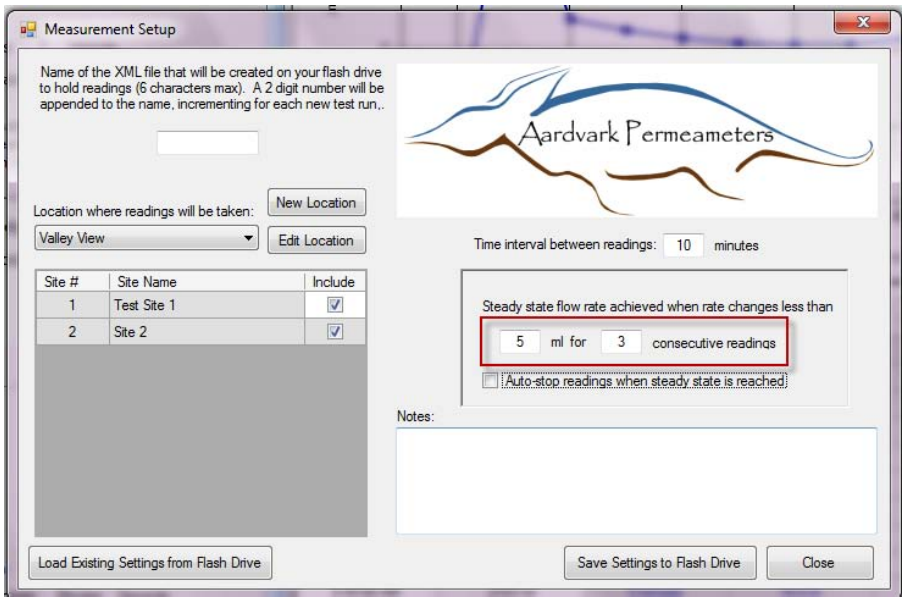
Select the desired Location from the specified dropdown menu. Once you have selected a location, all sites defined for that location will be listed. Use the "Include" check box to include the sites that you need for measurement. These are the sites where you will be taking measurements.



Next, enter the desired sampling interval in the specified box. We have entered 10 minutes here as an example.

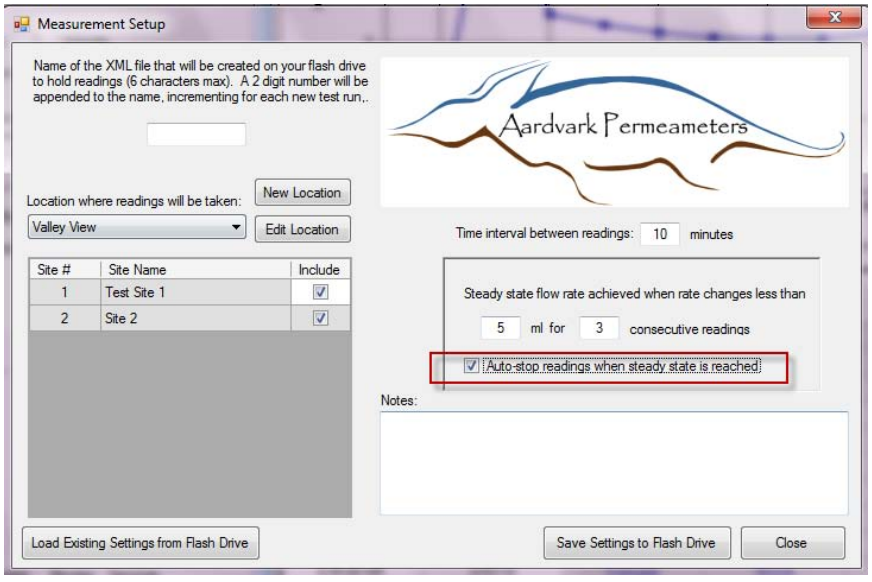


Then, you will need to set the Steady Flow Rate Condition using the designated boxes. We have entered "5" for ml and "3" for consecutive readings. Please refer to the section "*How to Make Automatic Readings*", page 12, for more details.



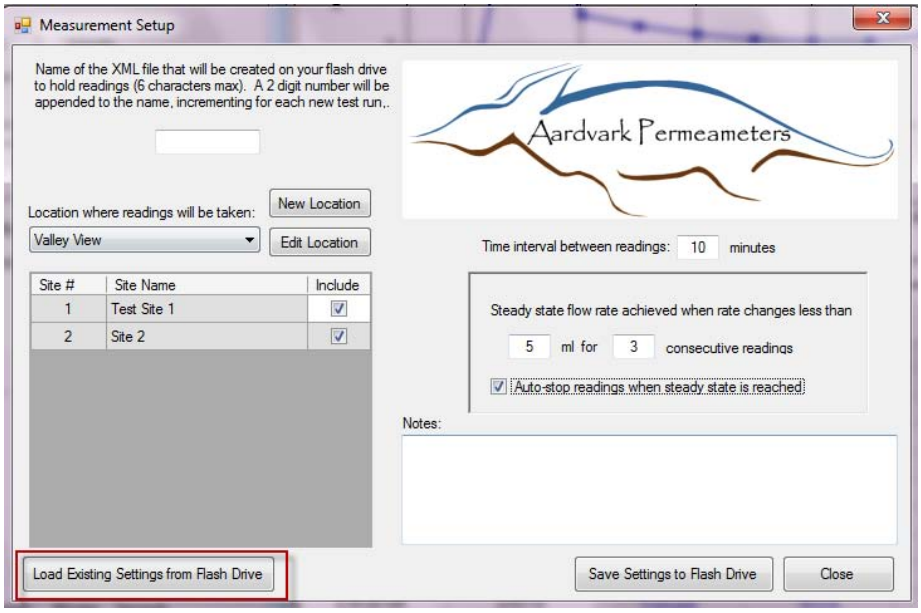
You can also check "Auto-stop readings…" (See red box below) to stop readings when a steady flow rate is established (not recommended).

NOTE: The steady flow rate information is optional if the auto-stop is <u>not</u> checked. If auto-stop *is* checked, then it is required. This information will be loaded to the main Aardvark screen when the data is loaded from the flash drive. The user can change the steady flow rate at any time, and you may prefer to set it AFTER looking at the data and see what makes sense.



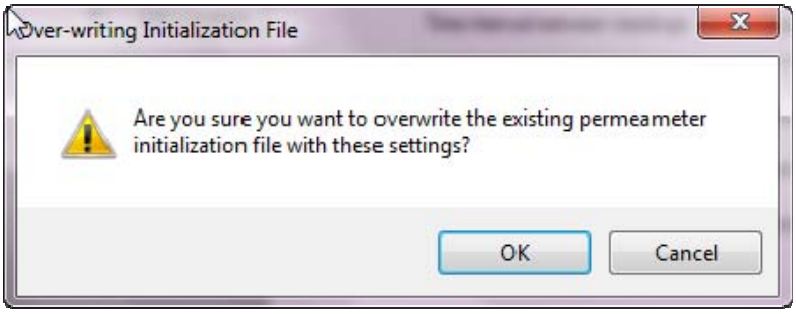
You can add notes in the "Notes" section if needed. This note is different from Site note. It is actually related to the Flash Drive and gives you the opportunity to add comments to the RIF.INI file.

NOTE: If you have already gone through the setup previously, and you simply want to set a different location, but don't want to reenter the interval and stead flow rate or notes, you can simply click the "Load Existing Settings from Flash Drive", change the location, and then save it back to the Flash Drive. This will replace the notes, reading interval, and steady state fields with the information that is stored on Flash Drive.



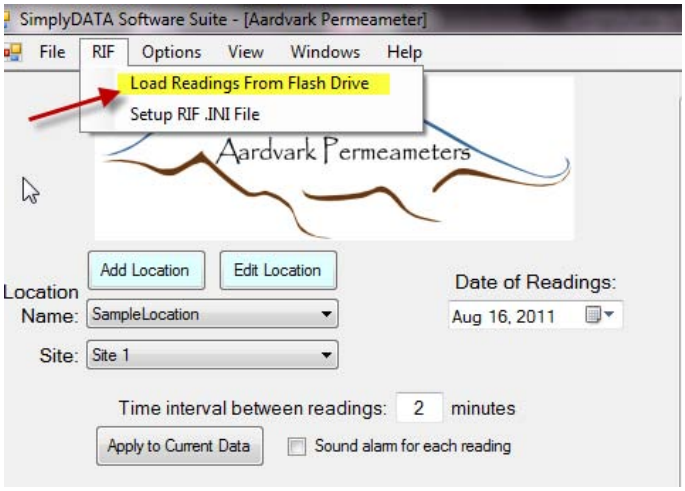
To save your new settings, click the "Save Settings to Flash Drive" button. Your Flash Drive is now ready to use with the RIF.

If you have already previously loaded data onto the Flash Drive, you may get the following warning. Click "OK" if you wish to overwrite the existing file; click Cancel if you do not. If you click OK, the window will close and your flash drive is ready to be used with the RIF.

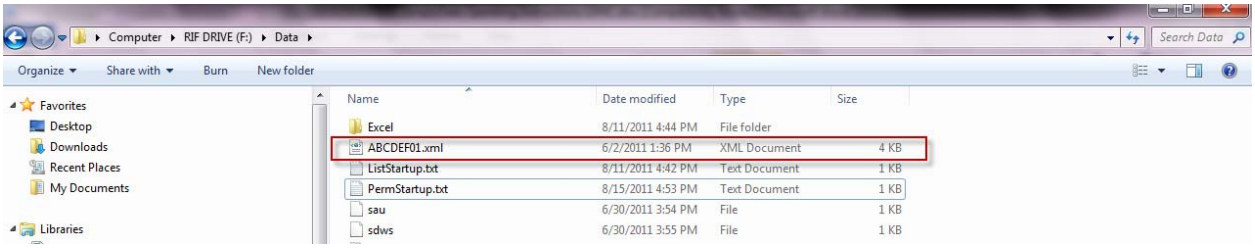


How to Import Data from the Flash Drive to the Aardvark Program

In the "RIF" menu, click on "Load Readings from Flash Drive".



You will then need to navigate to the RIF Flash Drive and select the .xml file you want to load.



The saved Aardvark Permeameter measurement files have the 6-character name that you entered previously with a two-digit sequence number appended to it, and an .xml extension. The RIF unit appends "01" to end of the file name. This makes the total file name length 8 characters. For the second set of readings, RIF will append "02" to the end of file name and so forth. This way you can distinguish different readings from one site to another. For more details, please refer to the "Record It in a Flash" Operating Instructions.

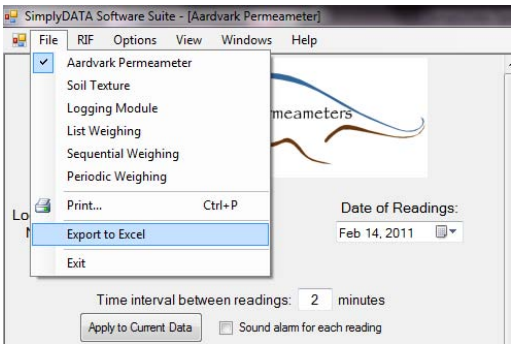
Double click on the file to open it.

NOTE: Once the data is loaded, you are free to work with it just as you would manually-entered data. You can choose to ignore bad data points, change the steady flow rate condition, or even expand the interval to a larger number, reducing the number of data points displayed.

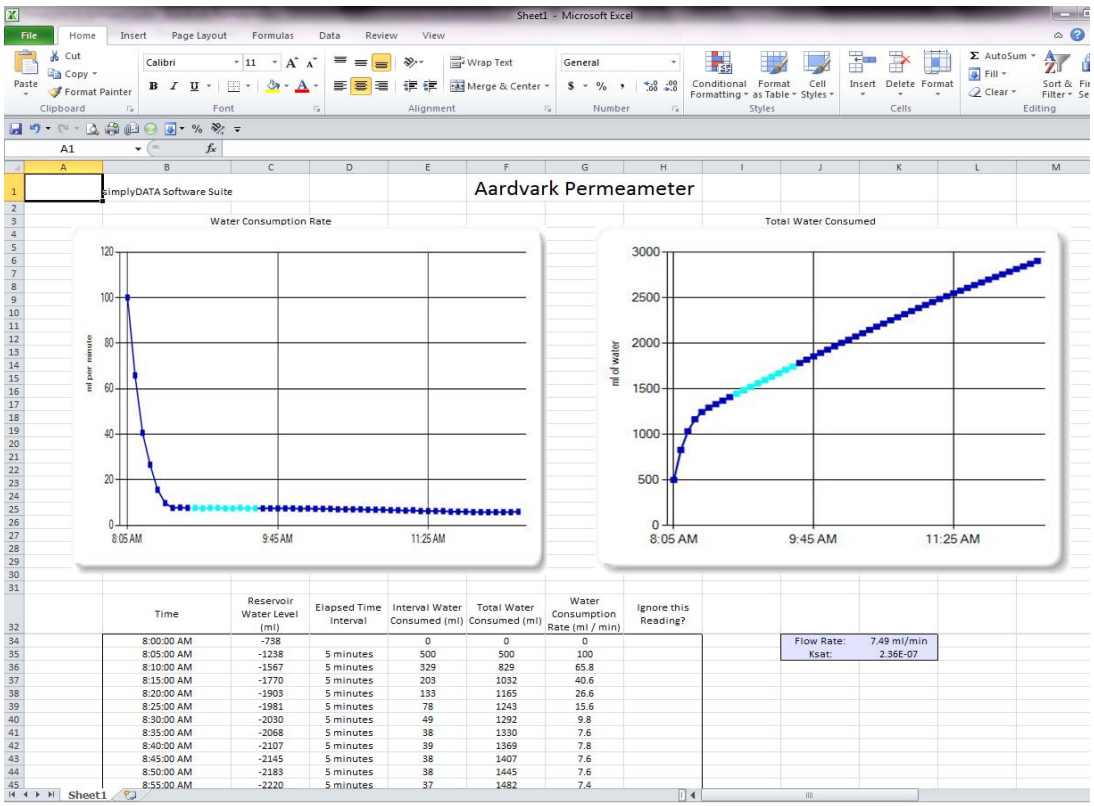
How to Export Data to Excel

All data files are stored on the Soilmoisture Flash Drive (SFD) and the program will not allow you to save them to any other location. However, the SimplyDATA Software Suite makes it possible to export the data from your measurements to Microsoft Excel®. To do this, you must have Excel® already installed on your computer. To export your data, follow these simple steps:

Select the Location and Site you want to export using the Location and Site drop-downs on the Parameter panel. Once your readings are showing in the Data and Graph panels, from the "File" menu, select "Export to Excel".



After few seconds, an Excel® file containing your data will appear on the screen.



Modify the Excel® file and then save it with a descriptive name. This name can be a combination of Location name, Site name and the date of sampling. We highly recommend that you always add notes to your Excel® file identifying where and when the data was taken.

NOTE: while SimplyDATA will only save user data files to the SFD, as mentioned in the previous page, the user can also go into Windows® Explorer and copy those files to another hard drives, etc. for archival purposes. On the SFD, there is a folder called Data. Within that folder data is stored in .XML files. We highly recommend that the user back up this file to another drive in case the SFD is damaged and becomes unreadable or lost.

Helpful Hints During Normal Use

The SimplyDATA Software Suite is supplied to you on an SFD. The Flash Drive also serves as a Hardware Key. Therefore it is necessary to have the SFD connected to your PC every time you run the software. It is possible to install the software to many computers suing the same SFD.

Deleting Readings Only

The SFD can hold about 50 million readings, however if you have saved or store non-SimplyDATA data on the drive and want to save space you can clear all readings from the SFD. To do this, go to the main Aardvark screen, and select the location/site to pull up the existing readings to be cleared. Next, locate and click on the "Clear Readings" button. Then Click "Save Readings".

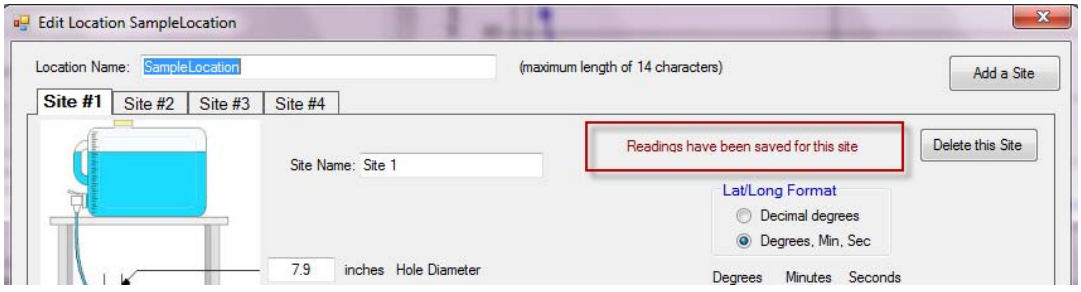
All readings for that site are now gone, but the site will still exist.

Deleting Readings and Sites

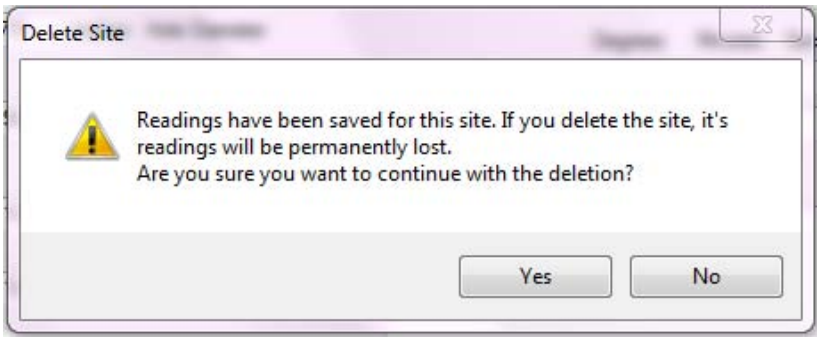
There is no direct way to delete a Location-Site data file from the SFD, but it is possible to clear all of its readings and all but one Site for each Location.

NOTE: Each location must always have one site, and so the last site cannot be deleted, but the readings for that site can be erased.

Click on the "Edit Locations" button, the Edit Location form will open so that sites can be added, modified, or deleted. Each location must have 1 site, but no more than 8. If readings have been stored for a particular location, you will see the message "Readings have been saved for this site" in RED just to the left of the "Delete this Site" button.



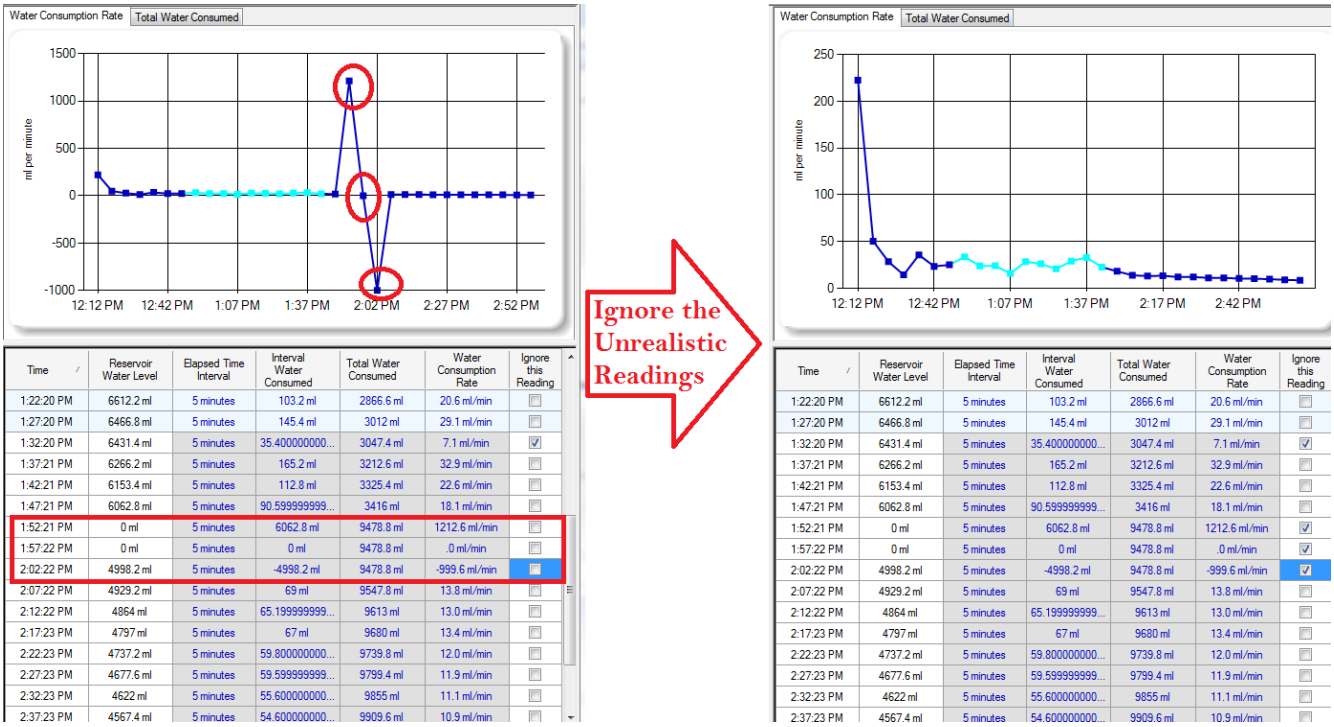
To delete the readings *and* site, press the "Delete this Site" button. A window will pop up asking if you wish to continue and delete the site and all its readings.



If you press "Yes", then the site and all readings will be permanently erased.

Unrealistic Readings Due to Maintenance Activities

During the sampling period, The Aardvark software continuously reads data from the Scale based on the designated reading interval. Therefore, some activities, for example refilling the Reservoir, will create some false readings and they should, therefore, be ignored. Distinguishing these readings from true readings is an easy task. They are very different from their adjacent readings and have extraordinary values and ignoring them would give the graphs a much smoother and reasonable trend and most importantly, they have been generated during refilling of the Reservoir, checking the system or some similar activity.



Time	Reservoir Water Level	Elapsed Time Interval	Interval Water Consumed	Total Water Consumed	Water Consumption Rate	Ignore this Reading
1:22:20 PM	6612.2 ml	5 minutes	103.2 ml	2866.6 ml	20.6 ml/min	☐
1:27:20 PM	6466.8 ml	5 minutes	145.4 ml	3012 ml	29.1 ml/min	☐
1:32:20 PM	6431.4 ml	5 minutes	35.400000000...	3047.4 ml	7.1 ml/min	☑
1:37:21 PM	6266.2 ml	5 minutes	165.2 ml	3212.6 ml	32.9 ml/min	☐
1:42:21 PM	6153.4 ml	5 minutes	112.8 ml	3325.4 ml	22.6 ml/min	☐
1:47:21 PM	6062.8 ml	5 minutes	90.599999999...	3416 ml	18.1 ml/min	☐
1:52:21 PM	0 ml	5 minutes	6062.8 ml	9478.8 ml	1212.6 ml/min	☐
1:57:22 PM	0 ml	5 minutes	0 ml	9478.8 ml	.0 ml/min	☐
2:02:22 PM	4998.2 ml	5 minutes	-4998.2 ml	9478.8 ml	-999.6 ml/min	☐
2:07:22 PM	4929.2 ml	5 minutes	69 ml	9547.8 ml	13.8 ml/min	☐
2:12:22 PM	4864 ml	5 minutes	65.199999999...	9613 ml	13.0 ml/min	☐
2:17:23 PM	4797 ml	5 minutes	67 ml	9680 ml	13.4 ml/min	☐
2:22:23 PM	4737.2 ml	5 minutes	59.800000000...	9739.8 ml	12.0 ml/min	☐
2:27:23 PM	4677.6 ml	5 minutes	59.599999999...	9799.4 ml	11.9 ml/min	☐
2:32:23 PM	4622 ml	5 minutes	55.600000000...	9855 ml	11.1 ml/min	☐
2:37:23 PM	4567.4 ml	5 minutes	54.600000000...	9909.6 ml	10.9 ml/min	☐

Time	Reservoir Water Level	Elapsed Time Interval	Interval Water Consumed	Total Water Consumed	Water Consumption Rate	Ignore this Reading
1:22:20 PM	6612.2 ml	5 minutes	103.2 ml	2866.6 ml	20.6 ml/min	☐
1:27:20 PM	6466.8 ml	5 minutes	145.4 ml	3012 ml	29.1 ml/min	☐
1:32:20 PM	6431.4 ml	5 minutes	35.400000000...	3047.4 ml	7.1 ml/min	☑
1:37:21 PM	6266.2 ml	5 minutes	165.2 ml	3212.6 ml	32.9 ml/min	☐
1:42:21 PM	6153.4 ml	5 minutes	112.8 ml	3325.4 ml	22.6 ml/min	☐
1:47:21 PM	6062.8 ml	5 minutes	90.599999999...	3416 ml	18.1 ml/min	☐
1:52:21 PM	0 ml	5 minutes	6062.8 ml	9478.8 ml	1212.6 ml/min	☑
1:57:22 PM	0 ml	5 minutes	0 ml	9478.8 ml	.0 ml/min	☑
2:02:22 PM	4998.2 ml	5 minutes	-4998.2 ml	9478.8 ml	-999.6 ml/min	☑
2:07:22 PM	4929.2 ml	5 minutes	69 ml	9547.8 ml	13.8 ml/min	☐
2:12:22 PM	4864 ml	5 minutes	65.199999999...	9613 ml	13.0 ml/min	☐
2:17:23 PM	4797 ml	5 minutes	67 ml	9680 ml	13.4 ml/min	☐
2:22:23 PM	4737.2 ml	5 minutes	59.800000000...	9739.8 ml	12.0 ml/min	☐
2:27:23 PM	4677.6 ml	5 minutes	59.599999999...	9799.4 ml	11.9 ml/min	☐
2:32:23 PM	4622 ml	5 minutes	55.600000000...	9855 ml	11.1 ml/min	☐
2:37:23 PM	4567.4 ml	5 minutes	54.600000000...	9909.6 ml	10.9 ml/min	☐

Unrealistic Readings Due to Lack of Constant Water Head Establishment

In some cases, the "Steady Flow Rate Condition" (see "*How to Make Automatic Readings*", page 12) may become "true" before establishing an actual constant water head. The "Steady Flow Rate Condition" acts like a switch and if it becomes "true", it instructs the software to calculate the Steady Flow Rate and Coefficient K and enter the data in the corresponding box. In such a case, the calculated K value is not realistic. A common example is when the Aardvark Permeameter is installed in a wide Borehole, or in a soil with extreme hydraulic conductivity, or when the intended water head height is relatively high. In these circumstances, it may take several readings before the constant water head is established. During this period of time, the Aardvark Permeameter will have its maximum flow rate which is also steady. Therefore a steady flow rate and a K value may be calculated which are not realistic. Please keep in mind that a steady flow rate close to the Aardvark Permeameter maximum water supply rate is probably an indication that a constant water head has not been established yet. This can be verified in shallow measurements by looking down the Borehole and checking to see if the constant water head has been established (the water level has met the Constant Head Water Mark on the unit).

A more accurate way is to continue the readings to see if the Water Consumption Rate slows over time by looking at the real time Water Consumption Rate graph. In the case that the Water Consumption Rate reduces over time, continue the readings until the Water Consumption Rate has stabilized and then use those readings to calculate the Steady Flow Rate by checking the ignore checkbox on the earlier readings.

If the Water Consumption Rate continues to stay close to the Aardvark Permeameter's maximum water supply rate (see the section "Determining the Aardvark Permeameter's Maximum Water Supply Rate"), there is a possibility that the constant water head is not achievable in that soil due to the soil's excessive hydraulic conductivity. This problem can be addressed to some extent by increasing the Aardvark Permeameter's water supply rate. Moving the Reservoir to a higher elevation will increase the Aardvark Permeameter's water supply rate.

NOTE: Never try to pump air into the reservoir to increase the water supply rate.

Determining the Aardvark Permeameter's Maximum Water Supply Rate

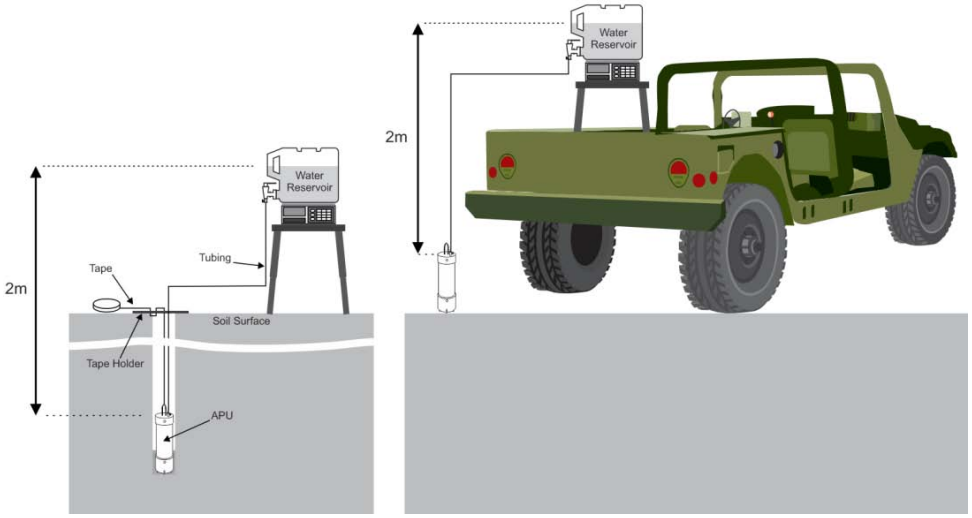
When taking shallow measurements in soils with extremely high hydraulic conductivity, there is a chance that a constant water head cannot be achieved. In that case, knowing the Aardvark Permeameter's maximum water supply rate can help detect this problem (see section *"Unrealistic Readings Due to Lack of Constant Water Head Establishment"*, page 21 for more details).

In shallow measurements, the Aardvark Permeameter's maximum water supply rate will vary according to its overhead pressure (the vertical distance between water surface in the Reservoir and the Aardvark Permeameter Module). The Aardvark Permeameter's minimum water supply rate is about 1200 ml/min. This is when the overhead pressure is about 60 cm (2 ft.) of water column. Also its maximum water supply rate is about 1500 ml/min. This is when the Aardvark Permeameter Module is used with the Regulator Unit in Deep Measurements or when in shallow measurements the overhead pressure is maximum (about 3.44 m [11.3 ft.] of water

column).You can also determine the Aardvark Permeameter's maximum water supply rate following these steps:

The following test is used when you have a laptop connected to a Digital Scale in the field. If you are using the RIF box/flash drive method, you will need to go to the setup RIF.INI, select the proper location and Max Flow Rate Test site, and set the 1 minute interval, and save those settings to the flash drive. Then load the flash drive back to the computer after the test to see the results.

1. Set up the system so that the vertical distance between the Reservoir and the Aardvark Permeameter is equal to what it should be in the actual setup. For example, if you want to install the Aardvark Permeameter at a depth of 1 m and the Reservoir height from the soil surface is 1m (illustration below, left) set up the system so that the vertical distance between the Aardvark Permeameter and the Reservoir is 2m (illustration below, right).



2. Prepare and install everything to start measuring: Assemble and connect all the components (Table, Scale, Aardvark Permeameter, Tubing, and Software).
3. Start the Aardvark Permeameter program in the SimplyDATA Software Suite.
4. Enter today's date (the current date is the default date).
5. If you haven't already created a location as described in the instructions above, create a site within that location named "Maximum Flow Rate Test".
6. Enter "1 minute" in the "Time interval between readings" box. This will tell the program to read the Scale every minute. NOTE: 1 minute is the minimum interval available.
7. Click "Begin Weighing" and open the Reservoir Valve (you will have 1 minute to do this).
8. Allow the software make four or five readings.
9. Close the Valve.
10. Click the "Stop Weighing" button.
11. Ignore the first reading and calculate the average of "Water Consumption Rate" of the other readings. This will give you a good estimate of the maximum flow rate of the system in the specified depth.