# Frequently Asked Questions

Hardware

1. Q: When I start a test, the program gives me an error message that the calibration factor is too small. I cannot run the test. I checked the calibration summary table. All values for the calibration factors are there; however the LVDT calibration factor has a negative sign. What's wrong?

   A: The software does not accept zeros or negative numbers for the calibration facto rs in the calibration summary. For convenience, we run the calibration on the LVDT backwards, hence the negative sign for the calibration factor. Remove the negative sign of the calibration factor in the summary table and you should be all set.
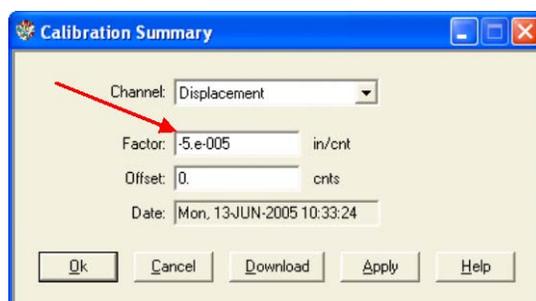
 2. Q: There is no communication between the FlowTrac-II's and the PC. What is going on?

   A: Check that the Node IDs on both FlowTrac-IIs match the ones in the RCON software program:

On the RCON software program go to Options then Hardware:

3. Q: We have several units connected to the same PC. We were running only one of the units, so we shut off the remaining units. Then we got an error message stating that the

unit was not responding. It seems that we lost communication with the unit. What is happening?

A: A temporary loss of communication is a normal thing when you either shut off or boot up another unit connected to the same network. Any time a unit connected to the network is powered down or powered up, the network goes into a re-configuration mode, during which no communication is allowed. Depending on how many other units are on, this process may take some time. If you're lucky, the Windows software will miss it. If you're not so lucky, you get the normal 'FlowTrac-II not responding' message. All you have to do is click the Retry button and you should be all set.

4. Q: I noticed that the engineering readings on the LCD screen are different than the ones on the PC screen. Are they supposed to be the same? Did it affect the results of a test I just ran?

A: First, I would like to assure you that the mismatch of the engineering readings values between the LCD and the PC screens will not affect the results of any test that you have run through the PC software program.

Assuming that your calibration factors are correct, or that you have just finished a new calibration and need to update the calibration parameters on the embedded controller in the FlowTrac-II unit, you can synchronize the engineering readings between the LCD and the PC screen by following these steps.

SYNCHRONIZING LCD AND PC SCREENS

1. Go to the Calibrate Summary menu
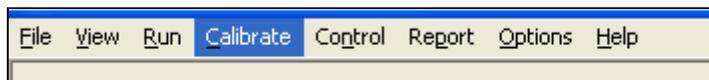
2. Select the sensor that you want to synchronize

3. Click on the Download button. This will automatically transfer (copy and save) the current calibration parameters (Factor and Offset) into the embedded controller.

4. Repeat the above procedure for the other sensors.

You should now see that the PC and LCD screen values match.

5. Q: After an electrical power problem in our building, it seems that the system is not working properly. We suspect that the set-up values on the embedded controller are not correct. How do we revert to the original set-up values or default values set at the factory?

A: The default values may change either after an electrical power problem such a power surge or brown out or due to inadvertent actions by an inexperienced end user.

You will need to revert back to the internal default values of your system by following these steps:

1. Turn off each FlowTrac-II unit.
2. Wait about 10 sec.
3. Turn each back on and immediately press the **ESC** key on the keypad to reset everything back to the imbedded controller default values.
4. Now go to your FlowTrac-II hardware manual. In Sections 2.1.4 (Setup section) you will find a table of default settings for your system. Got through each LCD menu and be sure the settings on the menu agree with those in the table. If a setting does not agree, change it to the one in the manual.
5. If the **Node ID** numbers on your unit were changed (because you are controlling more than one system with your computer), set them to the values they were changed to. (The default values are 66 for the FlowTrac-II unit controlling cell pressure and 67 for the FlowTrac-II unit controlling sample pressure.)

6. Q: Can we turn off the PC while the test is running (because this test is time-consuming)?

A: No, absolutely NOT, but you can use other windows programs while the test is running. Also you can turn off the monitor only.

7. Q: I used our calibrated gauge blocks to check our displacement sensor on the load frame. It appears to give readings roughly one half the actual distance. I double checked that the calibration factor (in/cnt) from the certificate you gave us is in both the load frame and the software (factor = 3.6498841x10-5). Does this factor seem to be off by a factor of two, based on the other similar sensors you have calibrated?

A: The displacement sensor set-up in the FlowTrac-II must be reset to UNIPOLAR instead of BIPOLAR. Please follow these easy steps to change it:

■ Using the keypad and the LCD screen go to option 4. SETUP

```
FlowTrac II.          Rev: xx.xx.xxxx        ID: #
1. Monitor            4. Setup
2. Position
3. Control
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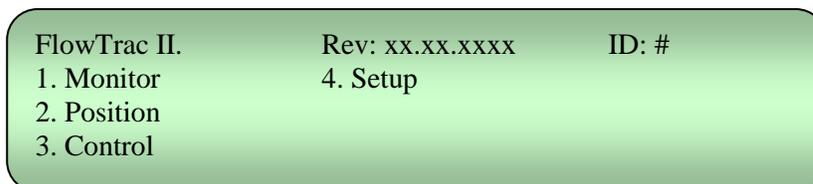
■ Option 3: A/D setup
■ Option 2: Channel 2
■ Option 2: Polarity
■ Select Unipolar

Next turn off the FlowTrac-II and back on for the changes to take effect.

8. Q: Can I use a new calibration factor and apply it to the previous test I have already run and get the correct results?

   A: Yes, you can.

9. Q: The Network LED is RED on the front panel and there is no communication between the PC and the flow pumps. All of our ID numbers are correct. What else should we check?

   A: The network communication cable (gray cable) must be plugged into the Ethernet plug on the back of the PC instead of the network communication card that we provided. Please unplug the cable and replug into the card. The LED should turn into solid green.
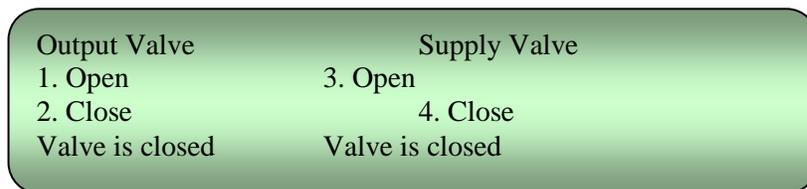

10. Q: How do I saturate the lines and get rid of air bubbles in the cell?

   A: You can saturate the lines and get rid of air bubbles by following the steps shown below.

- Using the keypad and the LCD on the front of the FlowTrac-II go to the main menu

> FlowTrac II.   Rev: xx.xx.xxxx   ID: #
> 1. Monitor   4. Setup
> 2. Position
> 3. Control
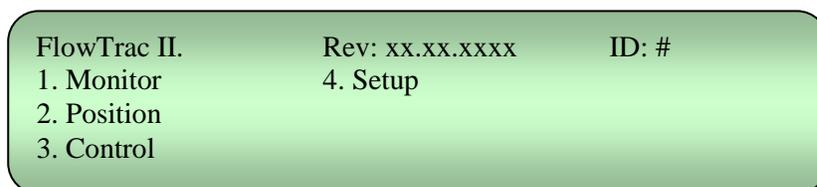
- Then to 2. Position → 5. Control Valves→ 1. Open output Valve and 4. Close the supply valve if it is not already closed.

> Position
> 1. Empty   4. Jog
> 2. Fill   5. Control Valves
> 3. Initialize

> Output Valve   Supply Valve
> 1. Open   3. Open
> 2. Close   4. Close
> Valve is closed   Valve is closed

- Next go back to the main menu using the Esc. Key on the keypad.
- Then to 2. Position→4. Jog→ use the arrow up to push water out of the flow pump into the output line until you see water dripping out. Visually inspect the line and keep on pushing the water out until you get rid of all the air bubbles.

Software

1. Q: After running a successful test we ran into troubles with the report. We were not able to generate a report because all links on the report pull down menu are inactive. Are we missing something, or is the software not entirely installed?

   A: Once a test is finished or even while it is running,

   1. Go to the File menu.
   2. Click on Load; this will load the test data on the open window on the desktop.
   3. Go back to Report. You should see now the Graph, Settings, and Edit menus all activated.
   4. You can change units and scales, and edit the test data points.
   5. Remember that every time you change or edit something, you will need to save the file, and load it again.

2. Q: I noticed that when running a test on a soft soil sample it takes a relatively long time for the load to reach the specified value. How can I change the rate at which the load is applied?

   A: Even though the load PID settings are set for most of the soil types, sometimes for extremely soft or stiff soil, you will have to adjust the cell PID (Proportional Integral Derivative) parameters for the vertical load control.

   These are under Options/PID.

   The PID control parameters are adjustable due to the nature of the different soil types and large variations in their stiffness, from very soft peat and organic soils to highly over - consolidated clays or even soft to medium rocks.
   The max PID value is 5.00 (soft soils) and the minimum is 0.10 (stiff soils).

   PID CONTROL

   Control of the pressure or load is accomplished by using a closed loop controller. At equally spaced time intervals called the control loop period, the controller compares the target load or pressure to the measured load or pressure. The loop error is the difference between the two. The controller uses this error to compute and send a signal to the micro-stepper motor in order to make adjustments to reduce the error by the next loop period.

   The signal to the micro-stepper controls the micro-stepper's position. The loop error computed by the controller at every loop period is nothing but the additional required load or pressure to eliminate the error by the next loop period. In other words, the load rate is the error divided by the loop period.

   Signal = Error / Loop Period / Stiffness

   GP = 1 / Loop Period / Stiffness

Signal (P) = GP * Error

The above equation is the basic idea behind any proportional controller where GP is the proportional gain.

The controller employed by this system is actually a PID controller, where P is for proportional control, I is for integral control and D is the derivative controller.

3. Q: Can the software detect wrong values that are manually entered by the end user?

A: Yes, the software program detects any erroneous data entry; examples include:

1. Negative values for sample dimensions, calibration factors, and PID control parameters
2. Zero values for sample dimensions, calibration factors (except for offset value), and PID control parameters
3. Wrong Node ID number
4. A malfunctioning sensor that it is giving an analog reading of either 0 (the minimum value) or 65535 (the maximum value)
5. Any unit (FlowTrac-II or FlowTrac-II) that is not on.

4. Q: I am running a test right now. Do I need to wait until the end of the test to see the results?

A: You do not need to wait until the end of the test. While the test is running:

1. Go to the File menu.
2. Select and click on Load.
3. Go to the Report menu. You should now be able to see the partial data up to the point when you did the Load.
4. Repeat the above steps as the test progresses.

5. Q: In many of our different test files, the calibration values in the Summary Table and the values in each sensor's individual calibration table are not in sync. Could you please explain which values the program uses, and how to make sure they are correct?

A: All of the Geocomp Corp. control programs have similar menus for performing the calibration of any of the sensors related to the test. However, you must then copy the calibration that you obtained into the Summary Table. (If you have had to repeat the calibration procedure, be sure to use the correct value.)

The calibration factors in the Summary Table are the ones that the particular program uses when running a test.

In the case that you have multiple software test program modules, it is possible to have no calibration data in the calibration menu if a sensor was calibrated with a different one program than the one that you are using. Each program will only use the calibration factors contained in its Summary Table.

6. Q: If we set the maximum time for one loading to 24 hours, will the machine stop the stage after it detects that the displacement reading become constant? We set 10 loadings for the test and now, after almost 16 hours, it reached number 8. Can I know what criteria the machine uses to stop a certain stage?

A: The program computes 100 % primary consolidation in real time (t), and then obtains T100. Once the time reaches T100, the program checks the max, min, and T100 offset times in the Consolidation Table.

If   (t) > Tmin, it will wait an additional time equal to the T100 offset, then automatically move to the next step.

If (t) < Tmin, then it will wait until (t) equals Tmin, wait an additional time equal to the T100 offset, and then automatically move to the next step.

Thus, (t) will always be less than Tmax.
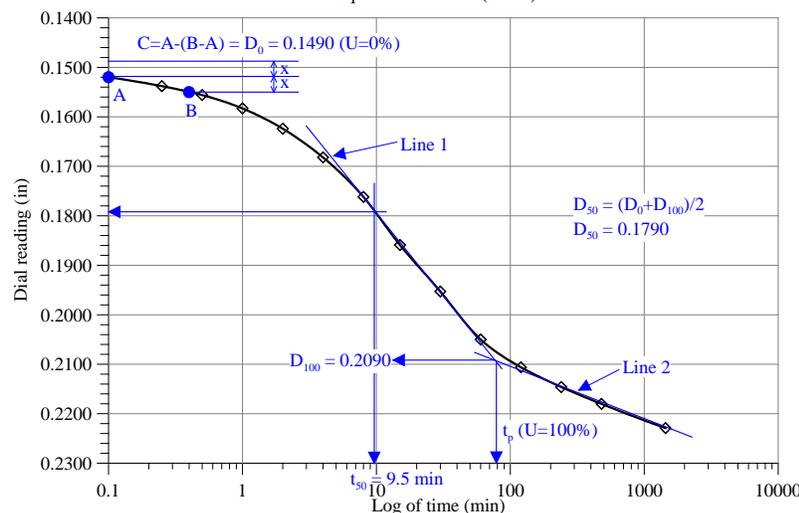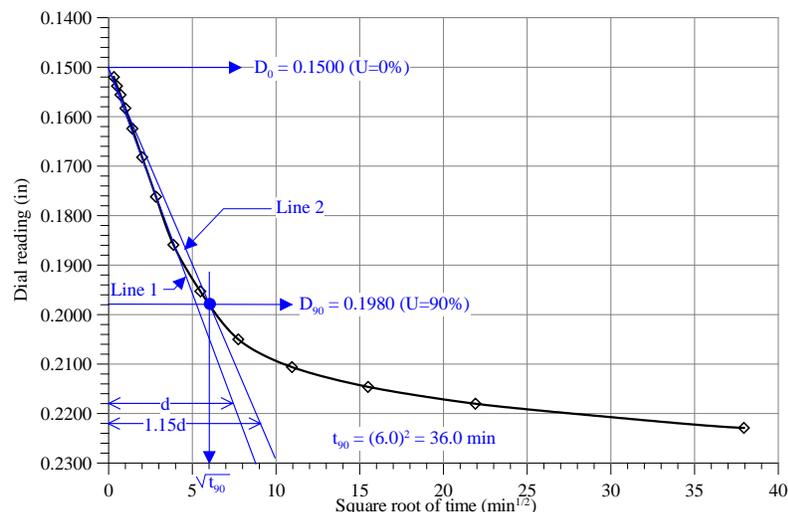
For example, T_{max} = 24 hrs, T_{min} = 1 hr, and T_{100} offset = 2 hr are entered by the end user.

Note: these T values can be different for each step, and the T values for subsequent steps can be changed EVEN during the test.

Case 1: If the T_{100} computed by the program is 1/2 hr, then the step will last 1 hr (T_{min}) + 2 hrs (T_{100} offset) = 3 hrs, which is still less than T_{max} = 24 hrs.

Case 2: If the T_{100} computed by the program is 5 hrs, then the step will last 5 hrs (> T_{min}) + 2 hrs (T_{100} offset) = 7 hrs, which is again less than T_{max} = 24 hrs.

7. Q: Why is my final saturation value higher than 100%?

A: This value is sensitive to several factors:

- The specific gravity of the sample
- The water content
- The exact measurements of the inside diameter and height of the ring. (For instance, the diameter may be 2.489 inches instead of 2.500 inches, and the height may likewise vary. We recommend using precise calipers to measure the dimensions of the ring. This should only have to be done once.)

8. Q: How do you correctly enter the water content information?

A: In order to achieve proper computations of results of the consolidation test, it is important that careful attention to detail is necessary for the entry of data into the computer program.

Specimen

On the tab for specimen in the RCON computer test program, be sure the actual dimensions on the height and diameter of the sample are entered. The actual or specified Specific Gravity value must be inputted. If the Liquid Limit and Plastic limit are known or specified, these two items should be entered for reporting purchase in the printout of the test results produced by the software. Initial Sample Weight should be based on the actual mass of the sample to be tested (do not include the tare value).

Water Content

Proper entries of the correct values as used by the computer program must be entered to allow the program to correctly compute initial water content, final water content and void ratio. In this part of the computer program you will see sections labeled Before Test and After Test. Data entry should be as follows.

Before Test

Tare ID: This the name, number or other identifying label of the tare container itself (e.g., RCON1, Test2, canA, etc.).

Tare Weight: this is the actual weight of the container identified above.

Wet Weight: this is the combined weight of both the tare and portion or trimmings of the wet sample to be tested.

Dry Weight: this is the combined weight of both the tare and portion or trimmings of the oven-dried sample to be tested.

After Test

This portion of the Water Content section has two parts: Specimen weight and Trimmings weight.

Specimen

Specimen Tare ID: insert the label "ring" as you will actually be inserting the weight of the ring without any sample and will clearly identify the actual part of the test apparatus used during the test.

Specimen Tare Weight: insert the weight of the consolidation ring, the separate component into which the test sample is extruded.

Specimen Wet Weight: insert the combined pre-test weight of the ring and the original wet sample (this should not include the weight of the filter papers and porous stones).

Trimmings

Trimmings Tare ID: this is the label name of the container, usually a large evaporating dish.

Trimmings Tare Weight: this is the weight of the tare or container identified above.

Trimmings Wet Weight: this the wet weight of the immediate post test sample plug which has been carefully ejected from the consolidation ring after the top and bottom filter papers have been removed, including the weight of the tare.

Trimmings Dry Weight: this is the oven dried weight of the tare and sample.

The computer program uses the water content of the trimmings to compute the After Test Dry Weight, the final water content of the sample and, together with the initial water content, the void ratio values, dry unit weight and saturation.

9. Q: How do I increase the responding time for the loading in the consolidation ?

A: According to ASTM standard D2435: **Standard Test Methods for**

One-Dimensional Consolidation Properties of Soils Using Incremental Loading, Section 6.0:

> *"Load application generally should be completed in a time corresponding to 0.01 t100 or less. For soils where primary consolidation is completed in 3 min, load application should be less than 2 s."*

It is easy to increase the response time of the closed-loop control by increasing the P-Gain under Options→ PID.

The higher the P-Gain the faster the load is applied; however the control may overshoot the target load depending on the stiffness of the soil.   This gain can be changed on the fly while the test is running if further fine-tuning of the control is deemed necessary.   You should use increments of 0.5 or less at a time. The trade off is that when a load (specially a high one) is applied rapidly, a very soft soil sample can be "shocked", and for a very stiff soil sample, the load may take time to converge to the target value by a steeper over and under shots (see plots below).

Sample stiffness	Recommended P-Gain value
LOOSE /VERY SOFT	5.0
MEDIUM SOFT/MEDIUM	2.5
DENSE/STIFF	0.5

Typical Elastic Moduli E, and Shear Moduli G values for soils are:

SOIL TYPE	Description	E kPa,	G kPa,
CLAY	Soft	1000-15000	500-5000
	Medium	15000-30000	5000-15000
	Stiff	30000-100000	15000-40000
	Very Stiff	> 100000	> 40000
SAND	Loose	10000-20000	5000-10000
	Medium	20000-40000	10000-15000
	Dense	40000-80000	15000-35000
	Very Dense	> 80000	> 35000

The default values are the recommended values that should work fine with the majority of soils. The following diagrams illustrate the effect of the PID control on different soils stiffnesses. See illustrative graphs.

Soft or Loose Soil Samples
Load or Pressure vs. Response Time

P-Gain High = FAST

P-Gain Low = SLOW
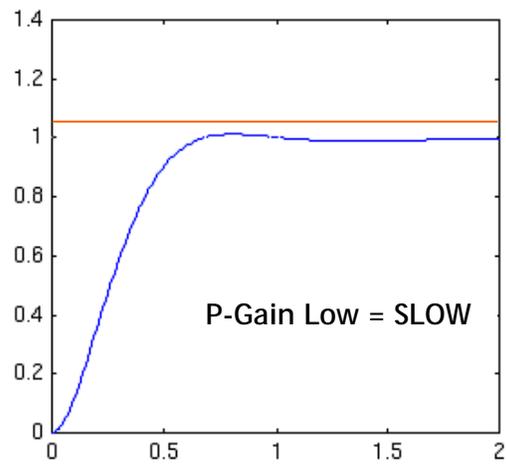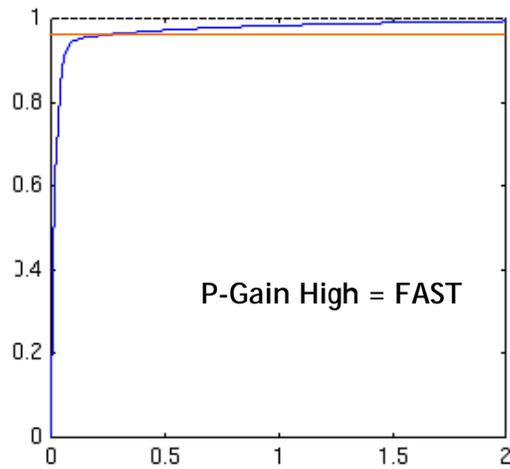
Stiff or Dense Soil Samples
Load or Pressure vs. Response Time

P-Gain High = FAST

P-Gain Low = SLOW
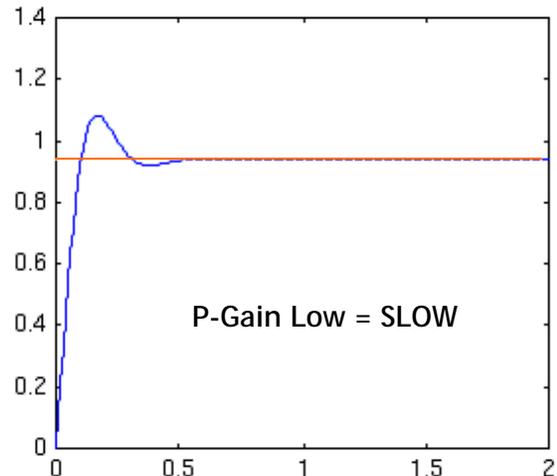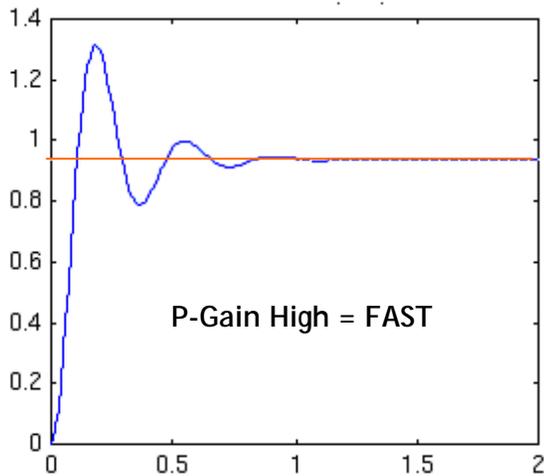
10. Q: What are the advantages of the Rowe cell over conventional consolidation testing?

A: The Rowe Cell system presents some clear advantages over the conventional dead weight system. The vertical pressure is imparted hydraulically through water pressure on a flexible diaphragm.

- The same pressure can be applied to any diameter samples. This permits achieving high loads on large diameter samples.

- Free strain and equal strain can be applied by distributing the water pressure either through a flexible platen or a rigid one.
- The sample is more representative when testing larger diameter soil samples.
- Up to eight different drainage conditions including wick drains are possible either radially or vertically or a combination of both.
- It has the capability to measure sample pore water pressures and volume changes.
- It has back pressure saturation capability.
- Both vertical and horizontal permeability measurements can be made.

11. Q: The "Next Phase" option in the Run menu ends the test. Is this normal?

   A: The only way that invoking the Next Phase will end the test is if, in the next phase table of test parameters, something is missing or wrong. If, for example, all pressure rate is left blank, or the max and min durations are equal and blank, etc.