Pacific Sun

kHLab

Liquid left:94%
Days left: 142

Kore 7th
Ultimate dosing station
User Manual
ver. 2.1
Android / iOS interface

www.Pacific-Sun.eu

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1. Introduction

Congratulations on your Purchase!

The Pacific Sun Kore 7th dosing station and kHLab module are made with the highest quality materials, and are built to last, helping you to take your reef to the next level!

The Pacific Sun Research and Development team is continuously testing, developing and releasing new products with new features.

This document serves to cover the basics of the Kore 7th dosing station and the kHLab module. Details will be made available about additional new products and features as they are released.

For questions, please contact us at *service@pacific-sun.eu*.

Product Information and Features

Why the Kore 7th/kHLab was developed?

The kHLab module automatically measures seawater alkalinity in the reef aquarium and maintains the KH set value by automatically controlled Kore 7th doser pumps performance.

What distinguishes Kore 7th dosing station and kHLab from the competition's products is that it regulates the dosing of Alkalinity Additive solution (Sodium Bicarbonate or Carbonate) as well as Calcium (Ca) and Magnesium (Mg) fluids and Mineral Salt.

Another important feature of kHLab/Kore 7th is ability to control external calcium reactors by controlling CO_2 dosing into the reactor chamber.

The Kore 7th/kHLab device and device performance should be monitored and serviced on a regular basis. This includes service activities such as regular pH probe calibration (in 4.0pH and 7.0pH solutions) and checking the dosing efficiency of channels #1 and #2 as these can have a big impact on accuracy and proper device operation.

An incorrect and/or unstable alkalinity level or sudden and/or accidental alkalinity level changes in the aquarium water can significantly affect the condition/life of demanding corals such as SPS which are becoming increasing popular in home aquariums. A correctly configured and programmed device will quickly became a necessary tool for the aquarist in maintaining alkalinity at a proper and stable level.

The Kore 7th /kHLab Edition Package

The Kore 7th / kHLab includes:
- Kore 7th dosing station
- 12V/2A Power supply (USA/EU/AUS)
- High Quality Lab Grade pH Probe
- Wi-Fi antenna for Kore 7th dosing station
- Connection tubings for kHLab
- 4.0pH and 7.0pH Calibration Fluids
- 2x500ml Concentrated Reagent for Alkalinity tests. (1 liter allows to prepare 5 liters ready for use reagent solution and 1 liter allows for about 100 tests).
- kHLab module with control connection cable
- Precise Digital Scale with calibration holder/stand for very precise fluids calibration
- Dedicated calibration/measuring cylinder
- Syringes and precise dosing applicator tips
- Magnetic stirring bar/pellet (inside kHLab module cylindrical chamber)
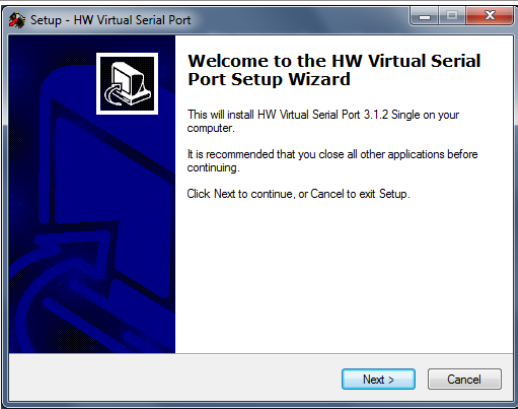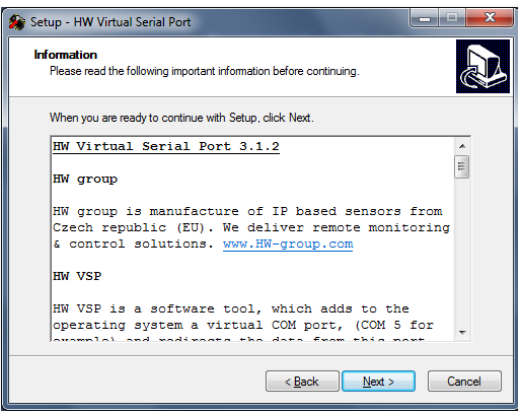
2. Kore 7th Setup and Application Options

Starting the software

The software installation creates a shortcut to Pacific Sun software in your Start menu but before starting the installed Kore 7th application make sure that the following steps in the next section "Wi-Fi Network Setup" have been completed.

Wi-Fi Network Setup and Connection to Kore 7th

To control your doser, you will need to connect it to your computer first.

	Download HW VSP software: SW version: HW VSP3 Single **Free Virtual Serial Port** to connect any TCP/IP Terminal server to your Windows as a virtual serial port (e.g. COM 7). Produced by www.HW-group.com.
	Run the "**hw-vsp3s_3-1-2.exe**" installation program. The welcome screen is displayed. Click "**Next**" to proceed to the next step of the installation.
	The basic product information is displayed. Follow the "**Next**" step of the installation process. Confirm the installation.
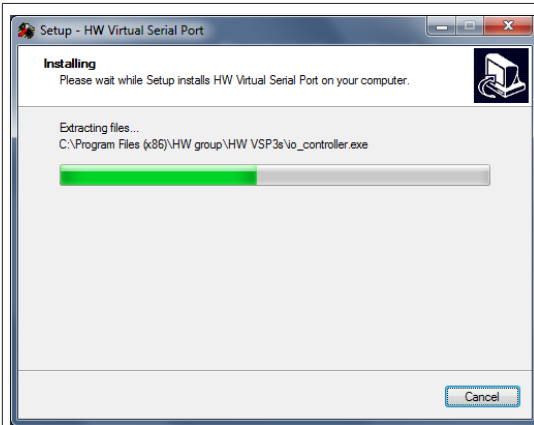
Wait until the installation process is completed.
It's not necessary to restart the computer after the installation.
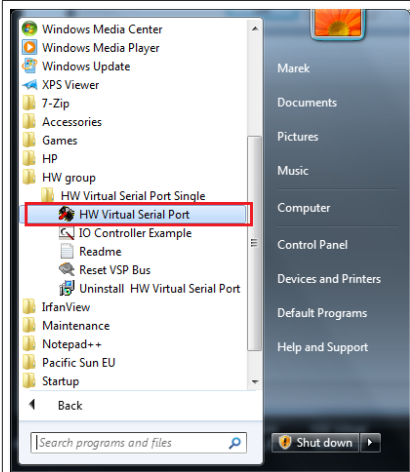
Go to Windows "**START**", select and run the "**HW Virtual Serial Port**" software or start **HW VSP** by clicking the "**VSP**" icon (icon with a red arrow).
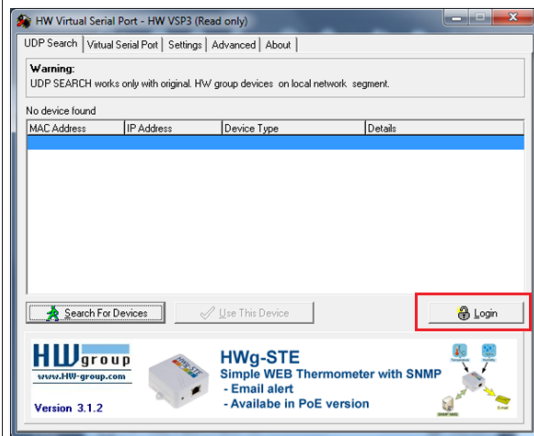
"**HW Virtual Serial Port**" application will open and after that click "**Login**" button.
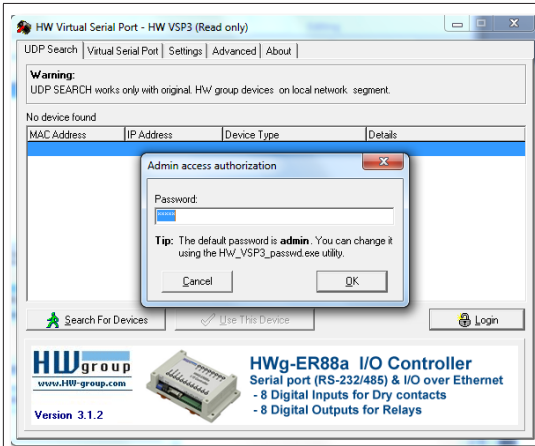
All configuration settings in **HW VSP3** are password-protected. To enter the password, press the **Login** button. The default password is "**admin**".
Click "**OK**" button.
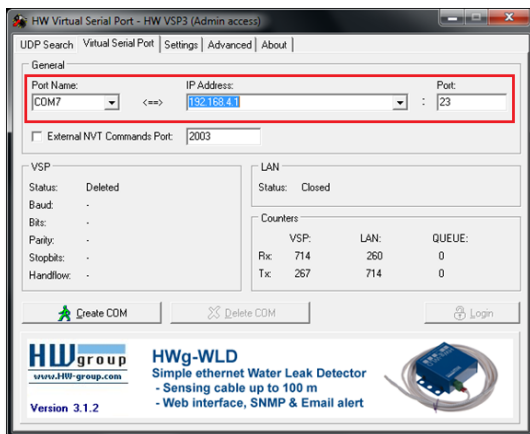
Select from the "**Port Name**" list COM port number (available, **NOT** used by any other device) and specify the default **Kore7th** "**IP Address**" (**192.168.4.1**).
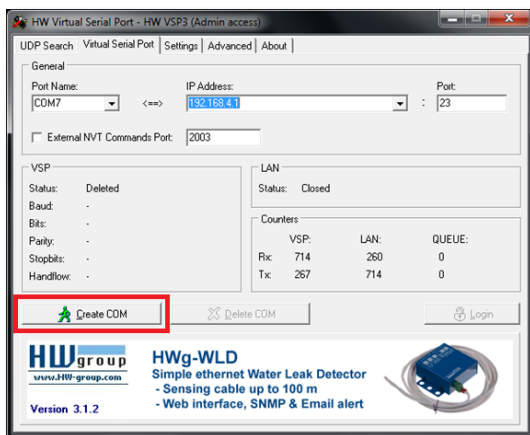
Click "**Create COM**" button.
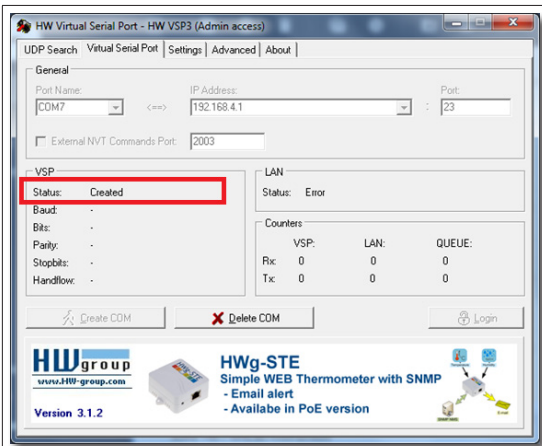
HW VSP status will change to **"Created"**.

After **"HW Virtual Serial Port"** application setup connect to the Kore 7th Wi-Fi Network.
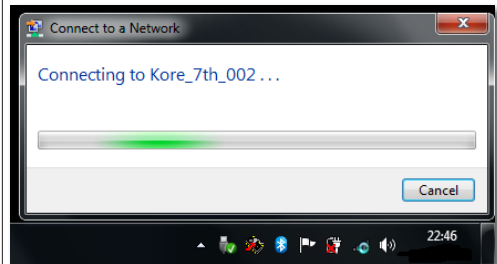
Connecting to the Kore 7th Dosing Station.

The Kore 7th dosing station is **connected** to your Laptop/PC.

NOTE:
The indication of *"**No Internet access**"*. Laptop/PC is no longer connected to your Wi-Fi Internet Router providing Internet access.
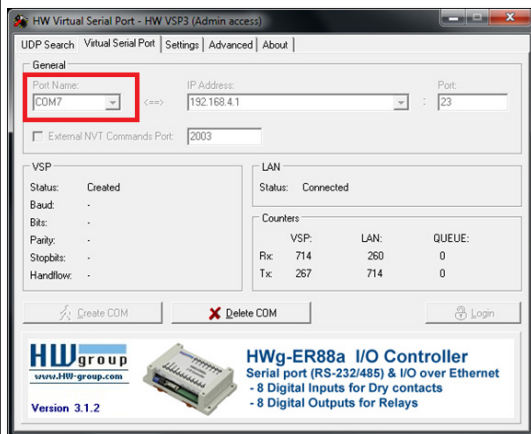
Verify the COM port **number** from the "**HW Virtual Serial Port**" application (VSP number). In this example, **COM7**.
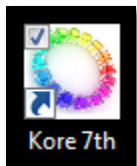
Start the Pacific Sun Kore 7th Application.
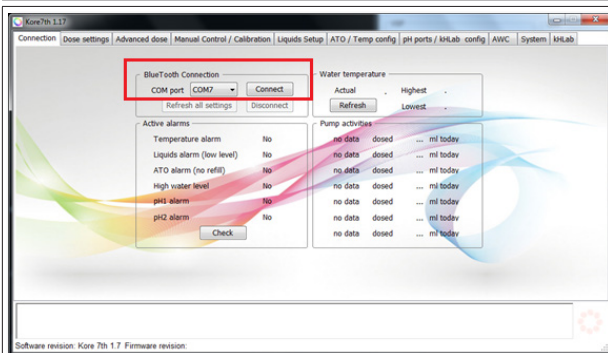
After opening the Pacific Sun Kore 7th Application, select correct **COM** port **number** for your Kore 7th from the drop down (number from the HW VSP application) and click "**Connect**".

Note:
You can also type the COM port in manually in the drop down.
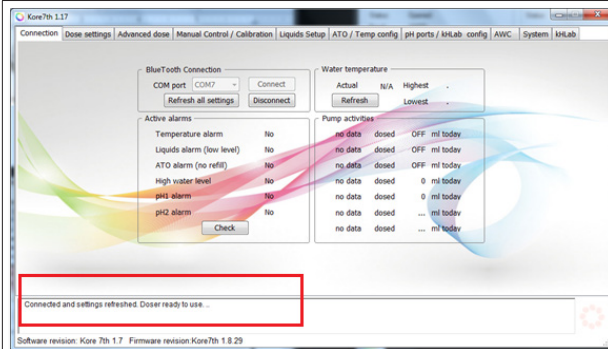
Kore 7th application will indicate "**Connected and settings refreshed. Doser ready to use ...**".
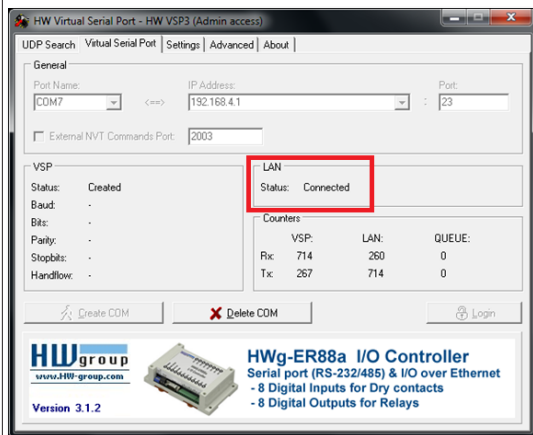
Note that the "**HW Virtual Serial Port**" application" changed the LAN Status to "**Connected**".
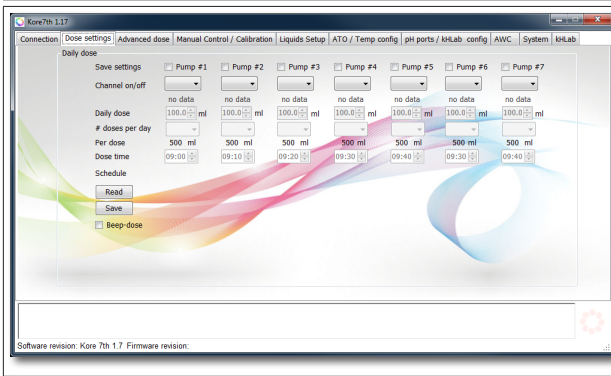
Now you can begin Kore 7th dosing station normal configuration process.

Important!

If the software is unable to connect to doser at first, try a few more times – you can also try moving closer to the doser for better signal between the doser and your computer.

Connection
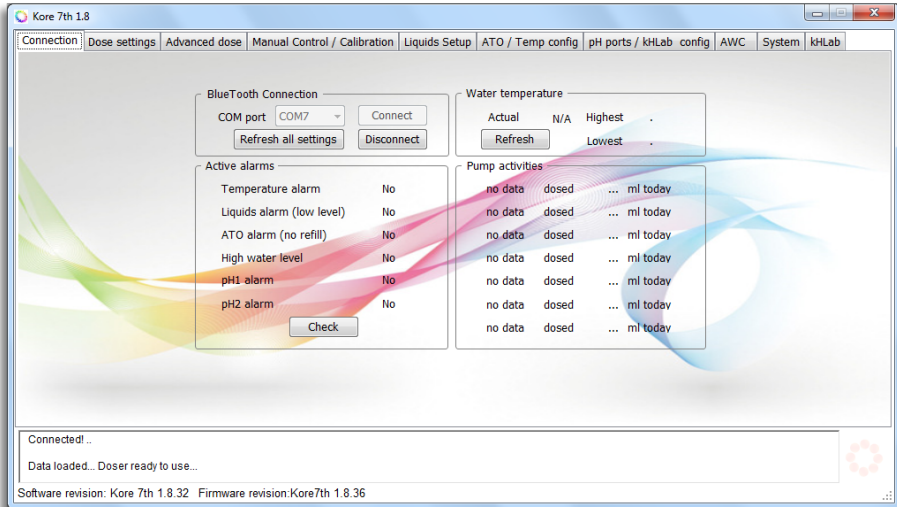
BlueTooth Connection group box

Connect	Allows establishing the connection with doser on the choose COM port nr (this port is assigned to doser during the installation process).
Disconnect	Close connection/communication with doser.
Refresh all settings	By pressing this button you can **refresh/load** all important doser settings. It can take up to two-three minutes.

Active Alarms group box

This group box shows all active alarms on doser:

Temperature alarm	If that alarm is active it mean that your water temperature is above or below maximum/minimum settings (check this on **ATO/Temp config**).
Liquids alarm (low level)	If active – liquid level (in any container) reached minimum level (configured in **ATO/Temp config**).
ATO alarm (no refill)	Active when ATO tried refill four times without success. Check that your DC pump is working or refill container isn't empty.
High water level	Your sump water level is too high(above top floating level switch). It can be also activated by optical sensor working as a safety sensor (you can set working mode for the optical sensor in the last **Service** TAB).
pH1 alarm	Active when pH is Lower than **pH#1** set in "pH ports / kHLab config" TAB.
pH2 alarm	Active when pH is Lower than **pH#2** set in "pH ports / kHLab config" TAB.

Water temperature group box

If your temperature sensor is connected properly, you will see your:

Actual, **Lowest** and **Highest** temperature measured by the sensor. By using **Refresh** button you can read actual temperature settings set in "ATO Temp config" TAB.
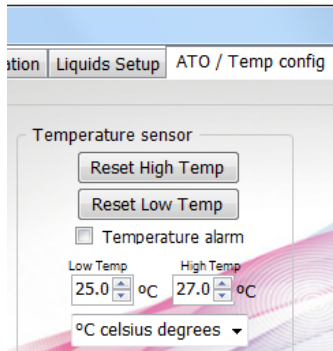
Pump activities group box

You can see there information about pumps activities in actual day (from 00:01 time to now).

Important!

To initialize connection with doser you should choose proper COM port and push Connect button. Within a few seconds your computer should establish connection with your doser. In the Status window you will see:

"Connected! and settings refreshed.

Data loaded... Doser ready to use... "

Now you are connected to the doser and can program and modify settings.

Dose settings
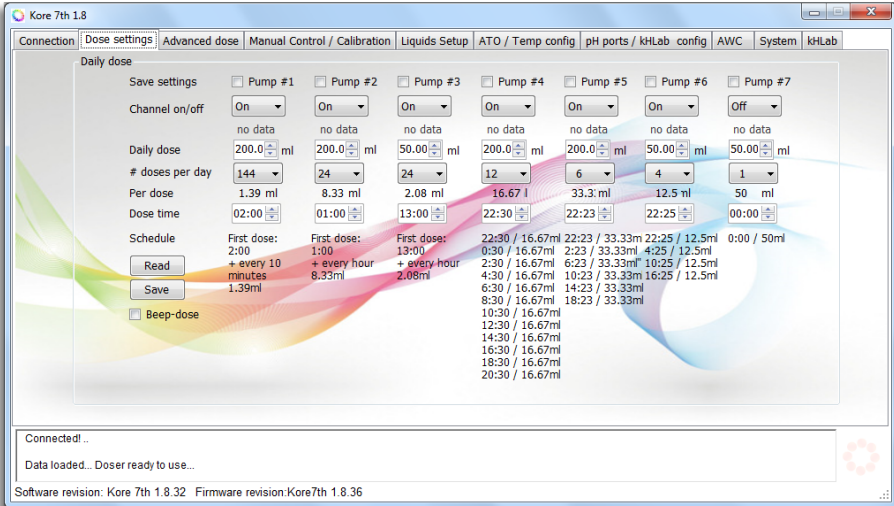
Daily dose group box

Here you can set a daily amount of dosed liquid for each dosing pump.

Channel on/off	Turns off/on the corresponding channel.
Daily dose	Determine the appropriate daily dose which will be divided into a number of dosing (depending on the doses per day). Minimum single dose – 0.01ml (for channel #1 – 0.1ml).
# doses per day	You can set 1,2,4,6,12, or 24 doses per day. Additional special dosing programs: - **C5** – 5 doses hour by hour etc... - **144** – only pump **#1** and **#4** – 144 doses during the day (each dose every 10 minutes).
Per dose	Single dose of fluid [in ml].
Dose time	Initial dosing time for each pump. Pacific Sun software will automatically calculate the following times to dose the liquids.
Read	Read pump setting from doser memory.
Save	Save pump settings (daily dose, doses per day, time schedule) to doser internal memory for each pump where check-box in "**Save settings**" row is **checked**. Save one pump/channel at a time. Example: Checked Pump #1 check-box only will overwrite Pump #1 settings.
Beep-dose	If checked - doser will generate short "beep" signal (sound type configured in "**ATO/Temp config**" TAB) after each single dose.

Advanced Dose
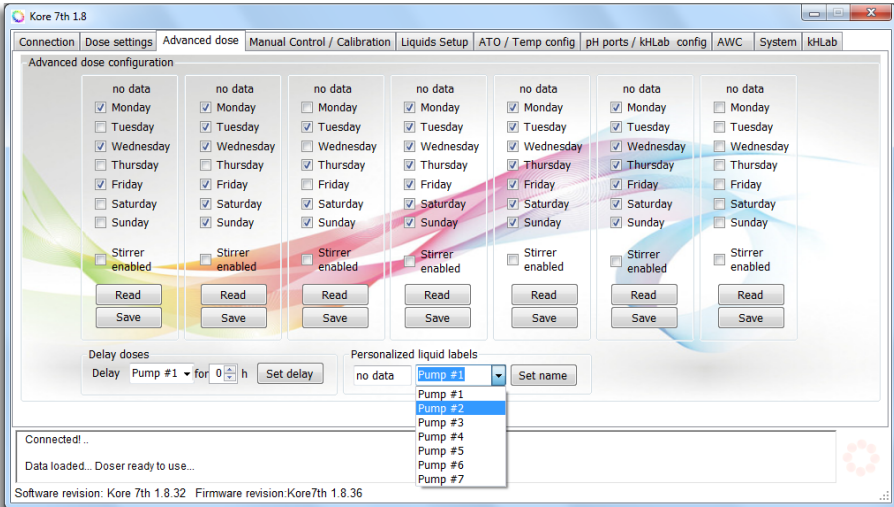
Advanced Dose configuration group box

Allows you to set which days of the week each pump have to work.

Read	You can read schedule from doser memory.
Save	You can save schedule to doser memory. It should be done for each channel separately.

Delay doses group box

You can set delay time (in hours) how long pumps (exact channels) will be turned off. After this time doser will start scheduled doses automatically.

Personalized liquid labels group box

You can give your own name for the dispensed fluids. This names are written in doser RAM memory so after power failure they will be lost. Maximum length is **16** characters.

Manual Control / Calibration
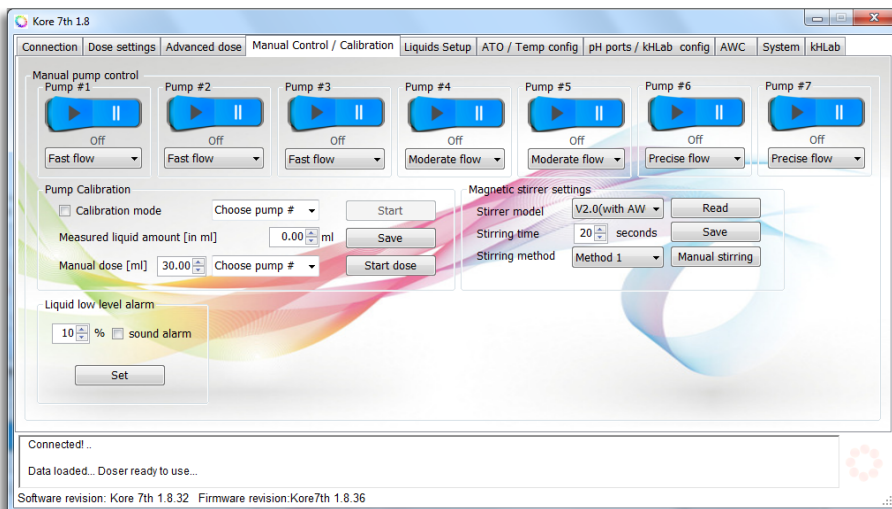
Manual pump control group box

Allows you to manually control the various pumps and their calibration.

Pump flow	There are three modes to choose from: 1. Fast flow 2. Moderate flow 3. Precise flow

Depending on the tubing used, you have the option to achieve the following performance:

a) high flow Pharmed/Viton/Santoprene
- Fast flow - maximum average flow 110ml/min
- Moderate flow - maximum average flow 60ml/min
- Precise flow - not suggested (in-regular flow depending from material hardness. The best for precise dose is silicone tubing.

b) high flow special silicone tube (thick)
- Fast flow - maximum average flow 140ml/min
- Moderate flow - maximum average flow 110ml/min
- Precise flow - maximum average flow 50ml/min

c) precise flow special silicone tube (thin)
- Fast flow - maximum average flow 600ml/min
- Moderate flow - maximum average flow 26ml/min
- Precise flow - maximum average flow 10ml/min (!)

Pump Calibration group box

Pump Calibration Procedure

1) Connect tubes to the pump entrance and pump exit and then place the pump entrance tube in the proportioned liquid.
2) Remove air from the tubes by manual activation of the pump.
3) Set up proportioning velocity (it is recommended to use **Fast Flow** for tubing typically embedded in the pump heads).
4) Select the **calibration mode**.
5) **Select a number of the pump** that is to be calibrated.
6) Arrange a proportioning vessel, preferably a measuring cylinder.
7) Press **Start** button.
8) Upon completion, read accurate amount of the liquid in the measuring cylinder and then enter it's amount to the **Measured liquid amount field [in ml]**.
9) Save the calibration by pressing **Save** button.
10) Use **Manual dose** option to check the calibration correctness.
11) Should the amount of proportioned liquid differ from the value that has been saved during the calibration check, it will be necessary to repeat calibration paying attention to air bubbles in the tubes. The entire tubing shall be filled in with the liquid.
12) Calibration shall be carried out for all the pumps individually and the results shall be entered upon its completion.

Manual dose [ml]	Allows manual dispensing of a specified quantity of fluid.

Liquid low level alarm group box

Allows you to set an alarm for a minimum level of dispensed liquids. You can also turn on/off sound alarm for low level of liquid in bottles.

Magnetic Stirrer settings group box

Allows for configure proper version of **Magnetic Stirrer** and set stirring time before doses.

Stirrer model	V1.0 – it's the first generation of stirrers without external power supply (power taken from Kore 5th dosing station). V2.0 – it's the new, next generation stirrer, with own power supply.
Stirring time	Stirring time before starting dose. Minimum 5s – maximum 60s. We suggest between 30 and 40 seconds (depend from liquid density/type).
Stirring method	7 different stirring programs. Different speed and variable „pulsations" mode. Help choose the best one for used bottle type and liquid density. Test before the **save**. Magnetic pellet should spin without any obstacles or bouncing.
Manual stirring	Allows to run manual stirring.

Liquid Setup
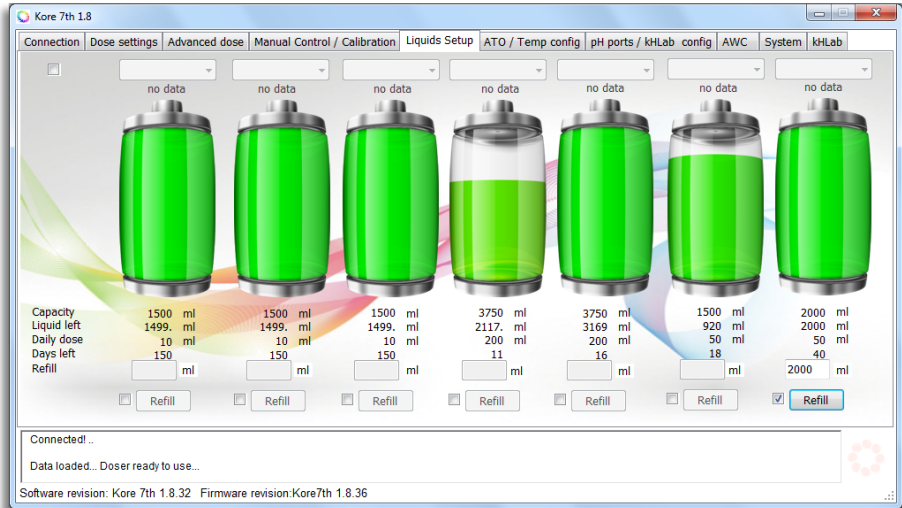
By clicking on each of the **bottles**, you can check the current level of the fluid. Below you will find information about:

Capacity	Initial bottle capacity.
Liquid left	Calculated actual liquid level (in ml).
Daily dose	Information about daily dose from each bottle (for each pump).
Days left	Approximate time left to empty bottle (in days).
Refill	Refill each bottle/container by placing the amount of liquid in the **text box** (below each bottle). EXAMPLE: If you have 3 liters container – place there 3000 (in ml) The setting is saved by pressing "Refill" button

ATO / Temp config

DC pump group box

Refill time (in seconds)	Time in seconds defining how long the DC pump will work when water low level sensor is activated. After four unsuccessful attempts the pump will be turned off (to prevent damage). It's highly advised to select „Unsuccessful water refill Alarm check-box so you can be notified upon failure.
Manual turn on/off	Allows selecting the flow rate manually (flow adjust in 40-100% range).
Short beep after proper refill	Enabling this option will cause a beep after each refill of water.
Sound alarm	Turn on/off sound alarm when high level sensor is activated.
Choose alarm type	Allows you to select sound signal generated by the doser.
Test alarm	Test sound alarm
Reset ATO alarm	Allows resetting the ATO after four unsuccessful refills.

Temperature group box

Reset High/Low temp	Erase highest/lowest temperature record from doser memory.
Temperature alarm	Turn on/off sound alarm for temperature settings

pH ports / kHLab config
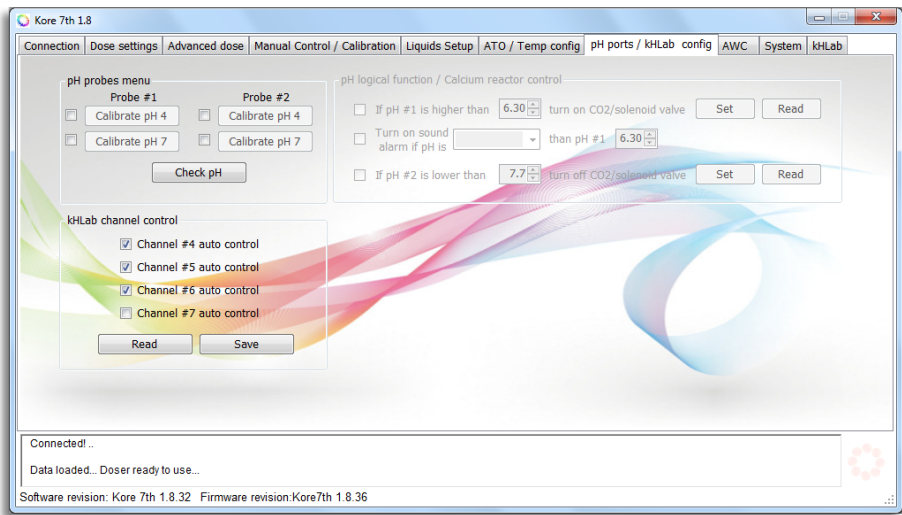
pH probes menu group box

Probe #1	Allows you to calibrate pH probe #1 with pH 4.0 and 7.0 calibration solutions.
Probe #2	Allows you to calibrate pH probe #1 with pH 4.0 and 7.0 calibration solutions.
Check pH	Allows you to check pH

kHLab channel control group box

Channel #4 auto control Channel #5 auto control Channel #6 auto control Channel #7 auto control	You can select which channel can be control when doser is switched to alkalinity control mode.

pH logical function / Calcium reactor group box

Set / Read	If pH #1 is higher than for example 6.3, turn ON CO2/solenoid valve.
Set / Read	If pH #2 is lower than for example 7.7, turn OFF CO2/solenoid valve.

AWC
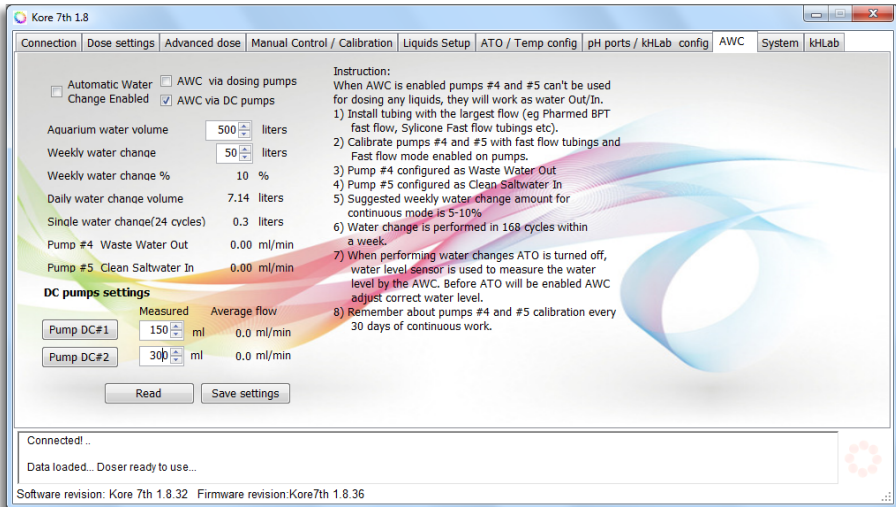
AWC allows you to program automatic water changes. To configure AWC enter the following data:

Aquarium water volume – your aquarium water volume together with sump

Weekly water change – we suggest 5-7% changes

AWC will perform 24 water changes daily(168 weekly). AWC allows maintaining stable water parameters due to constant swapping on fresh saltwater.

Pumps connection:

pump #4 – waste water out

pump #5 – fresh water in

When AWC is enabled pumps #4 and #5 can't be used as dosing pumps (will be disabled).

Use **Save** button to write settings in doser memory and **Read** when you want load it from memory to application.

When the water change procedure start (waste water out) ATO will be disabled. After successful fresh water refill ATO will be enabled again.

You can also configure AWC using additional AWC DC pump set. It allows for much faster water change(up to 250l/h) and with that set your pumps from channel #4 and #5 can still be used as dosing pumps.

Connect DC Pumps to output port on back side of doser. Using two attached tubings connect pump #1 to drain(waste water out) and pump #2 as „fresh" water refill

DC Pump #1 – Waste water out

DC Pump #2 – Fresh water in

You can test/recognize them using test buttons(Test DC#1/Test DC#2).

DC AWC pump calibration procedure

1) Connect tubes to AWC pump set.
2) Immerse both pumps into water.
3) Activate the pump by pressing DC#1 and DC#2 to remove air from the pumps and tubes.
4) Arrange an accurate measuring vessel and then insert the exit tube from DC 1 pump into it.
5) Press DC#1 again, wait until proportioning is complete and then read amount of measured water.
6) Amount of water shall be entered into Measured upper field [ml].
7) Evacuate the measuring vessel and place the tube from the other pump into it.
8) Press DC#2 again, wait until proportioning is complete, and read amount of measured water.
9) Amount of measured water shall be entered into Measured lower field [ml].
10) Save the calibration by pressing **Save** settings.

If you need technical support - please contact with service@pacific-sun.eu!

System
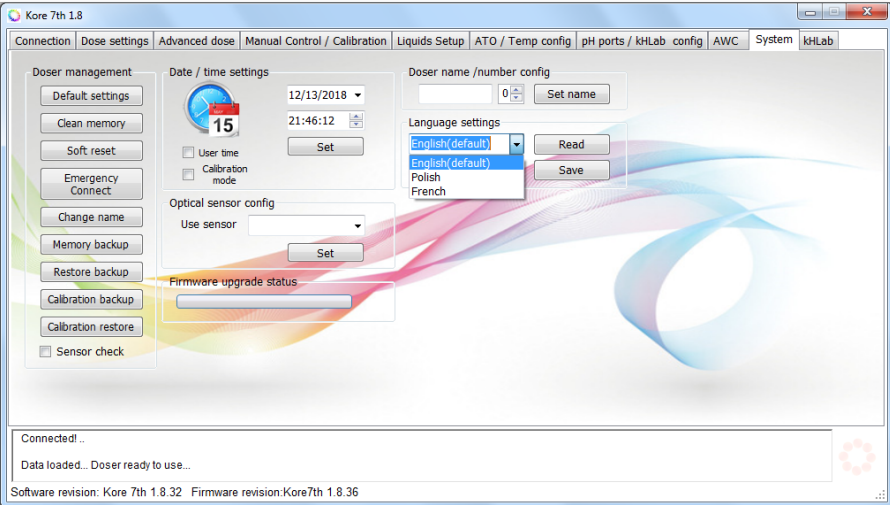
Doser management group box

| **Default settings**	Program doser with default settings. We suggest use this button if your doser after firmware upgrade not work properly.
Clean memory	Erase doser memory. Should be only performed after Pacific Sun Service request.
Soft reset	Generate reset signal for doser.
Emergency connect	Should be performed if software can't connect with doser due firmware incompatibility. After connection firmware update (with proper corresponding to software firmware) should be performed.
Memory backup	Generate .mbf file(memory backup file). This file can be send to our service for diagnose (if something not work properly).
Restore backup	Allow import .mbf file to doser memory.
Calibration backup	Generate file with pump calibration config.
Restore calibration	Allow import calibration backup file to doser memory.
Sensor check	When enabled (check-box) on LCD screen show floating level sensor status. Can be used for diagnose proper switch connection/ readings.

Date/time settings group box

Once software is connected to the doser:

1) By default, the system date and time is displayed. Click on **Set** date/time to set the same date and time on your doser.
2) To select a date and time other than system date and time, check the box next to **User time**, and type the date and time you would like to set. Click on **Set** date/time to save these settings to your doser.

Calibration mode – show actual time (hours/hh:mm:ss format). To back for normal dose mode – uncheck box.

kHLab
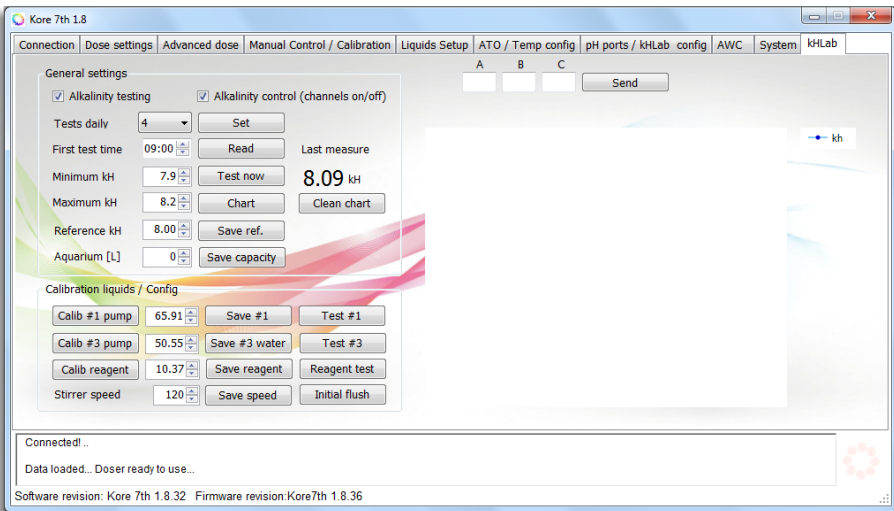
General Settings group box

Alkalinity testings	Enabling Alkalinity testing with kHLab Module
Alkalinity control (channels on/off)	Enabling Alkalinity control in your aquarium.
Tests daily	Allows to **Set** Alkalinity tests in different time intervals: x1, x2, x8, x12 times per day.
First test time	Allows to Set Alkalinity **First test time**.
Minimum kH	Allows you to Set **Minimum** kH value for Alkalinity control.
Maximum kH	Allows you to Set **Maximum** kH value for Alkalinity control.
Reference kH	Allows you to Set **Reference kH** value.
Aquarium [L]	Allows you to set aquarium water volume.
Test now	Starting Alkalinity test manually.

Kore 7th Connection Ports

USB	Port for Firmware upgrade.
DC pump	Port for DC pump(ATO refill pump).
Optical sensor	Connection port for optical sensor (used for ATO/AWC).
Temp sensor	Digital temperature sensor port.
Floating sensors port	Not used in newest version of software/firmware and designed for future applications (alkalinity module etc).
Antenna port	External antenna port. Required for proper work!
Reset button	Hardware reset switch (short push generate reset signal to main CPU).
Power supply port	Required 12V 1A/2A power supply with 2.1mm plug.
kHLab Digital I/O port	Used for connection Magnetic Stirrer, DC AWC pump etc.
pH #1	Connection port for pH probe nr 1 (kHLab module).
pH #2	Connection port for pH probe nr 2 (Calcium Reactor).

Kore 7th / kHLab Device Feature

The kHLab has an ability to measure alkalinity with lab grade accuracy. It can provide KH measurement values with 0.1 dKH accuracy. It's a minimal confirmed resolution during continuous device function. In the case of performing tests manually (in a small time intervals) resolution can be greater.

kHLab Device Technical Specifications

- Systematic error ISO: ±0.03ml
- Numeric division: 0.05ml
- Random error: ≤ 0.05ml
- Alkalinity range: 5 to 15 dKH
- Resolution: 0.1 dKH
- Device can work in two modes:
    1. **Monitoring** mode
    2. **Control** mode
- kHLab dimensions: L105 x D95 x H172 mm (L4-1/8 x D3-3/4 x H6-3/4 in) – w/out pH probe
- Kore 7th dimensions: L510 x D120 x H50 mm (L20-1/8 x D4-3/4 x H2 in)

Monitoring (passive) and **Control** (active) modes:

1. **Monitoring mode**
   During this Monitoring mode the device measures Alkalinity level and registers all the values in memory and displays them on doser LCD screen. It makes no adjustments to Alkalinity level.

2. **Control mode**
   During Control mode device automatically adjusts the amount of dosing fluids in channels 4/5/6/7 (Alk/Ca/Mg/Mineral Salt) to control Alkalinity level. Channels are simultaneously controlled (at the same time).
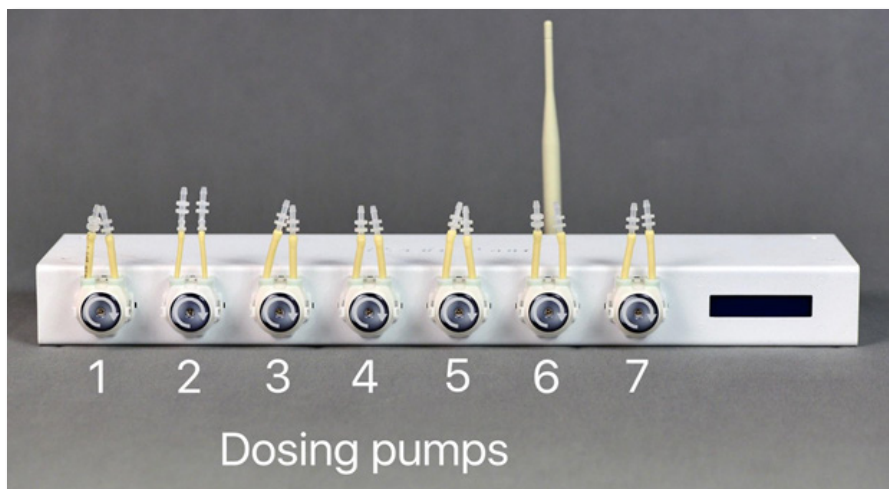
Kore 7th ultimate Wi-Fi dosing station

3. Kore 7th / kHLab Device configuration

Proper device setup

For optimum performance, the height difference between the kHLab device and the water level surface from where the device will take the water sample for testing should NOT exceed about 50-60cm (20-24") and connection tubing length between kHLab module and Kore 7th doser should NOT exceed 100cm (59").

The kHLab device can be mounted directly on a wall with the supplied wall mount, or it can operate sitting on a flat surface.

Important!

1. Make sure that a water mixing magnetic stirrer bar/pellet is put inside kHLab module test cylindrical chamber.
2. Make sure to connect silicone tubing properly to individual Kore 7th dosing pumps:
   – Pump nr 1 - **supplies water sample (aquarium water)** to kHLab test chamber. Do NOT exceed 100cm (39") length between the place of taking test water and the kHLab device.
   – Pump nr 2 - **supplies reagent solution** for testing. Try to place the reagent solution bottle as close as possible to the doser and at a similar level.
   – Pump nr 3 - **removes waste water (tested water)** from the kHLab test chamber. This water can be drained to aquarium (we suggest near the pump sucking in water to the protein skimmer). The length of the silicone tubing from the pump outlet should not exceed 150cm (59").
3. Make sure to connect the control cable between the kHLab device and the Kore 7th dosing station.
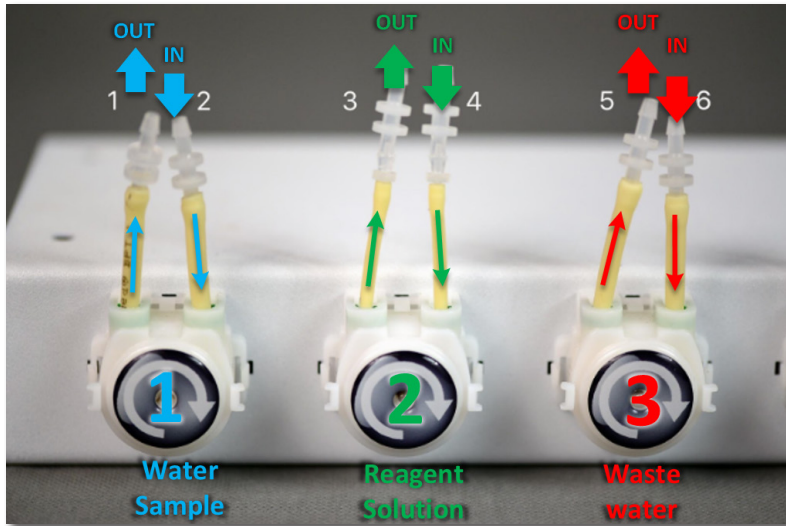
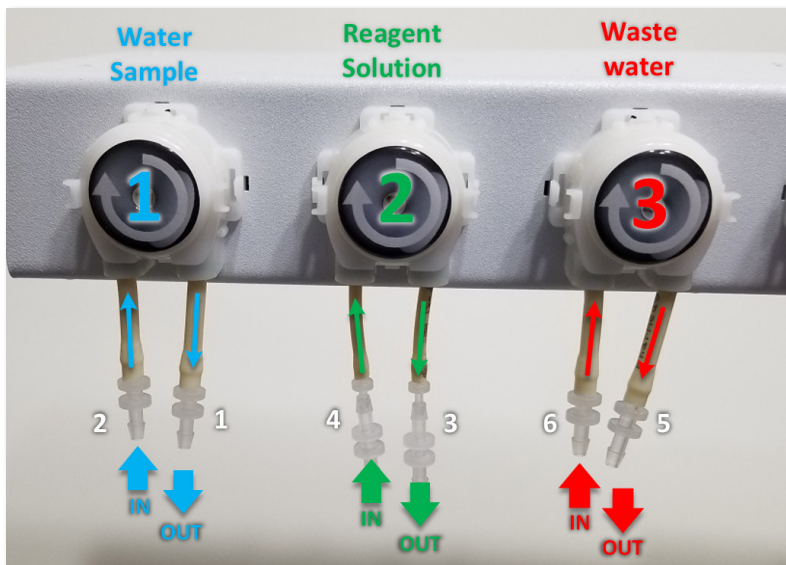# Tubing and cables connection
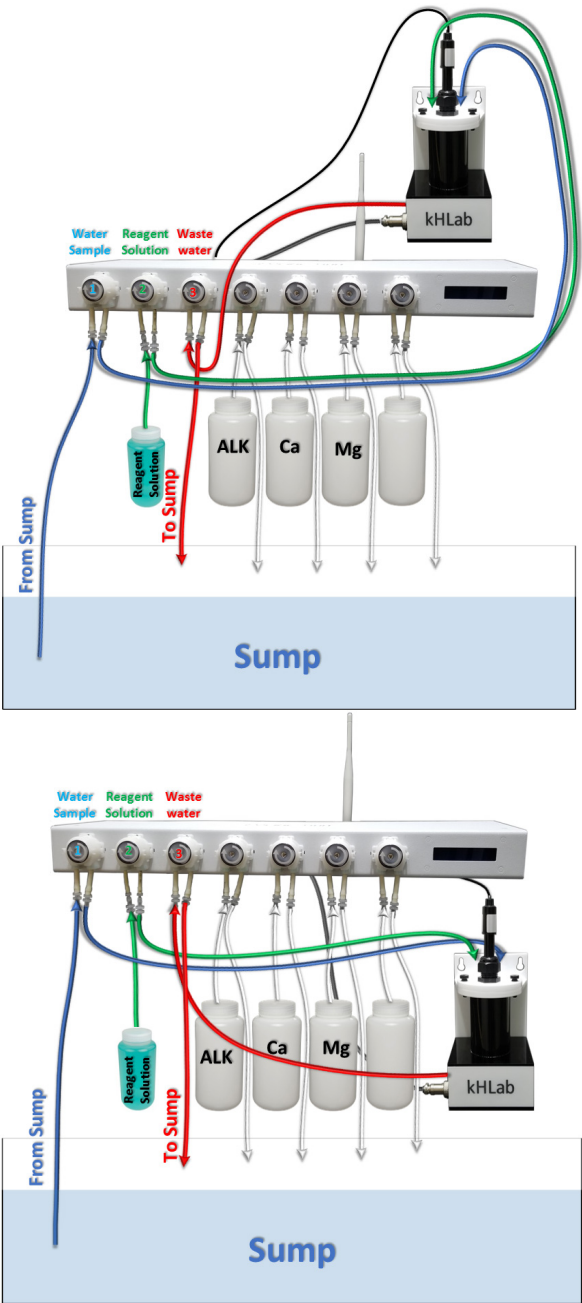
Kore 7th and kHLab connection setup examples
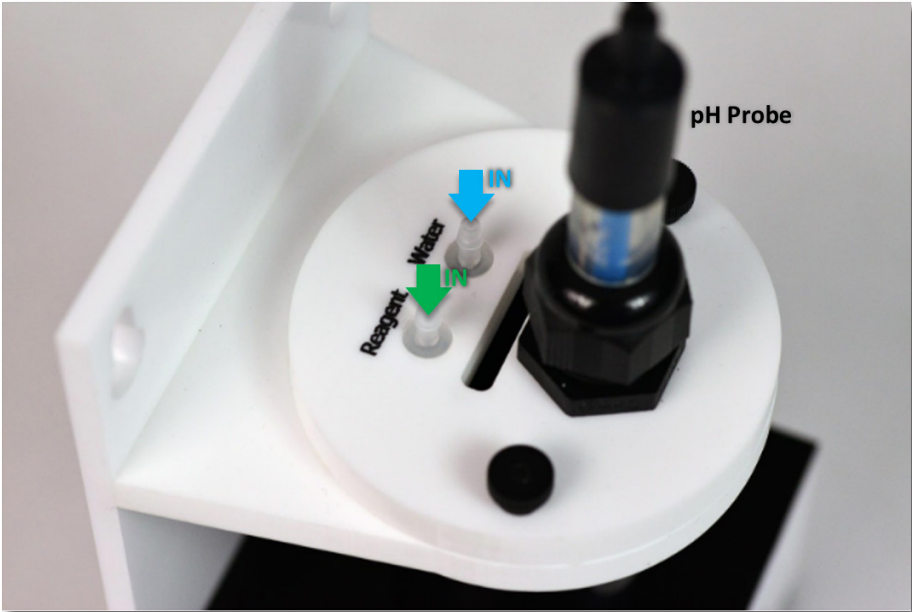
Note:

Pumps heads can function with all connectors facing UP (first picture) or DOWN (second picture).

Pumps with connectors facing UP

Pumps with connectors facing DOWN

kHLab module – top view

kHLab module – side view

Connector 1 OUT – Test Water sample outlet to the kHLab module - using a silicone tubing, connect to the Water port at the top of the kHLab module.

Connector 2 IN – Test Water sample inlet from the sump - connect the silicone tubing to the acrylic tubing holder and make sure the tubing end is always under water, including during aquarium maintenance or any aquarium service work when the main return pump is OFF.

Connector 3 OUT – Reagent Solution outlet to kHLab module - connect to kHLab top connector with label "Reagent".

Connector 4 IN – Reagent Solution inlet - connect to the container/bottle with reagent solution - make sure that the silicone tubing END is right at the container/bottle bottom and NEVER exposed to air. Make sure that the container/bottle is never empty.

Connector 5 OUT – Waste Water (tested) outlet from kHLab mode - connect silicone tubing and place to the sump close to the skimmer pump inlet. Do not slide in the tubing to the skimmer pump inlet.

Connector 6 IN – Waste Water (tested) outlet from the kHLab module - connects the kHLab module to connector with label "Waste".

Application Installation and Dosing Station Communication Setup

After connecting the Kore 7th Dosing Station to the kHLab Module and connecting tubing to all connectors, follow these steps:

1) Download the control application for the Kore 7th Dosing Station from the Apple Store for iOS devices or Google Play for Android devices.
2) Open the Pacific Sun Kore 7th application on your iOS or Android device and install.
   NOTE: You may be prompted to install additional system software necessary for the application to work properly. You will need to agree to Terms of Use to install those packages.
3) Open the Wi-Fi network settings on your device and select from the Wi-Fi list the network labeled **Kore 7th _xxxx** (where xxxx is a Kore 7th serial number). The default network IP address for Kore 7th is **192.168.4.1**.
4) Click the Connect button and wait a few moments to connect to the device. Your screen will display the message of **successful connection** to the device. Now you can start setup and configuration.
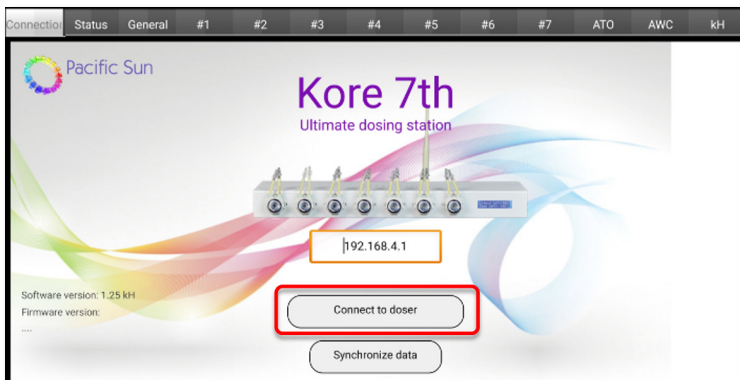
Note:

Remember to check the initial dosing pumps calibration, especially pump #1 and pump #2 several times (chapter 3) and also check pH Probe Setup, Maintenance and Calibration (see chapter 4).

4. Doser Pumps Calibration and Accuracy Check

Calibration Using the Calibration/Measuring Cylinder

This calibration method has been described in the Kore 7th configuration section.

Calibration with precise digital scale and stand/holder
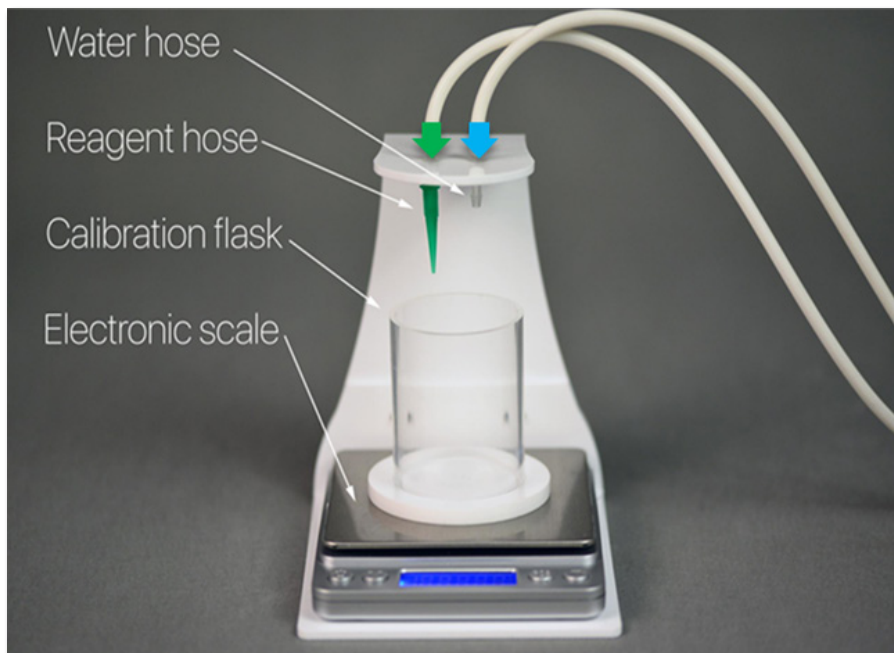
Calibration station setup

Important!

Dosing pumps calibration in channel #1 and #2 should be performed/ checked every 2 to 4 weeks.

Preparation for the calibration procedure by using a precise digital scale:
1) Connect the silicone tubing coming out from the pump #1 (test water sample outlet coming from Connector 1 OUT) to the calibration stand connector (NO green tip).
2) Connect the second silicone tubing coming out from the pump #2 (reagent solution outlet coming from Connector 3 OUT) to the calibration stand connector with the green tip.

Calibration steps:
1) Place the digital scale on the calibration stand.
2) Place a dedicated calibration cylinder (vial) on the digital scale.
3) Start Channel #1 pump (Menu - Manual mode in the application). The pump will start to pump the test water sample into the calibration vial. When you see that the test water sample is coming out uniformly, stop the pump by clicking the "Manual button" in the application.
4) Dispose of the fluid from the calibration cylinder (vial), and repeat, exactly the same calibration procedure for the reagent solution. Remember to run, in this case Channel #2 pump until the reagent solution is coming out from the green tip uniformly.

Important!

Do NOT add back tested reagent solution from the calibration cylinder (vial) to the reagent solution bottle/container!

Make sure that the calibration cylinder (vial) is empty, dry it with a clean paper towel and place it again on digital scale.
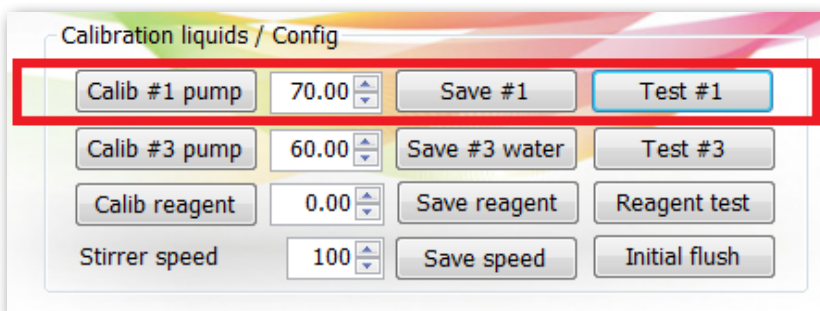

Digital Scale

Important!

Do NOT add back tested reagent solution from the calibration cylinder (vial) to the reagent solution bottle/container!

Starting the Channel #1 Calibration Process (Water Sample)

Channel #1 is dedicated for **Water Samples**. To calibrate the pump#1 in this channel follow the steps below. Refer to the picture above for using the digital scale.

1) Turn ON the digital scale.
2) Wait a few seconds and next then zero-out the digital scale by clicking the **T (Tare)** button. Before starting measurements, the digital scale has to display 0.00g on the LCD screen.
3) Make sure that digital scale is displaying [**g**] as the weight unit. If not then press the **M (Units)** button until you see [**g**] gram unit on the LCD screen.
4) From the Application, under the "kHLab" TAB, click the "**Calib #1 pump**" button. The pump will start adding **water** to the calibration cylinder (vial).

5) After few dozen seconds **pump #1** will stop automatically. Write down the value displayed on the digital scale LCD screen.
6) Dispose of the fluid from calibration cylinder (vial) and repeat above calibration steps few times (recommended **five** times). Sort the results from highest to lowest, ignore the highest and lowest and use the middle three results to determine the average pump performance value.

EXAMPLE:

If after eliminating the highest and lowest recorded results you're left with results of: 70.98g, 70.61g, 71.39g, add them and divide by 3 and calculate arithmetic average.
This would be calculated as: (70.98g + 70.81g + 71.05g) / 3 = 212.84g / 3 = **70.95g**

7) **Save** the calculated value by placing the final number in the field next to "**Calib #1 pump**" button in the application window and click "**Save #1**".
8) **Channel #1** calibration process has been completed.

Checking Water Sample (Channel #1) Accuracy

1) Place digital scale on the **calibration stand**.
2) Dispose of any water from calibration cylinder (vial) and place the cylinder on the digital scale.
3) Turn ON the digital scale.
4) Wait a few seconds and then zero-out the digital scale by clicking (**T**) **Tare** button. Before starting any measurements, the digital scale LCD display must read 0.00g.
5) Make sure that digital scale is showing [**g**] as the weight unit. If not then start clicking (**M**) button until you see [**g**] gram unit on the display.
6) From the application, under the "kHLab" TAB, click "**Test #1**" – **pump #1** will start adding **70ml** of water from **Channel #1** to the calibration cylinder (vial).
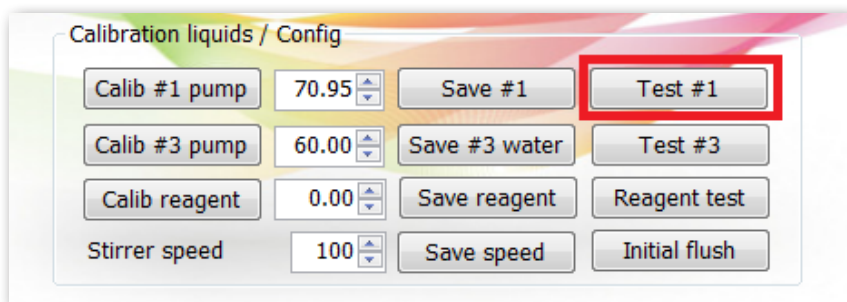
7) Read the result in grams [**g**] from the digital scale LCD display. **This is the dosed amount of water in ml by dosing station in channel #1.**

> **Important!**
>
> The number from the "**Test #1**" process should be in the range of **69.20 - 70.80 ml** (at ±1% measurement accuracy). If the calculated number is out of this range than the calibration procedure must be repeated.

The minimum allowed measurement accuracy is ±2ml (which gives a 3% accuracy of the alkalinity measurement/reading).

Starting the Channel #3 Calibration Process (Waste Water)

Channel #3 is dedicated for **Waste Water**. Preparation for the Channel #3 calibration procedure by using a precise digital scale:

1) Disconnect the silicone tubing connected to the calibration stand/holder connector (NO green tip) and connect back to the "**Water**" port at the top of the kHLab module.
2) Connect the silicone tubing coming out from the pump #3 (Waste Water outlet from kHLab mode from **Connector 5** OUT) to the calibration stand connector (NO green tip).
3) If the kHLab module test/mixing cylindrical chamber is empty then add aquarium water sample to the chamber (about 3/4 capacity).

To calibrate the **pump #3** in this channel follow the steps below. Refer to the picture in "Calibration with precise digital scale and stand/holder" for using the digital scale.

1) Turn ON the digital scale.
2) Wait a few seconds and next then zero-out the digital scale by clicking the **T (Tare)** button. Before starting measurements, the digital scale has to display 0.00g on the LCD screen.
3) Make sure that digital scale is displaying [**g**] as the weight unit. If not then press the **M (Units)** button until you see [**g**] gram unit on the LCD screen.
4) From the Application, under the "**kHLab**" TAB, click the "**Calib #3 pump**" button. The pump will start adding water to the calibration cylinder (vial).
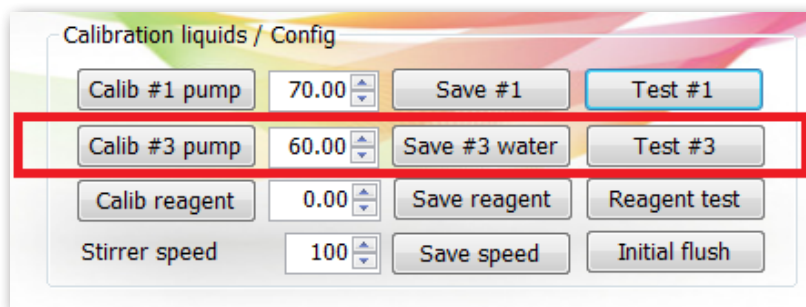
5) After few dozen seconds **pump #3** will stop automatically. Write down the value displayed on the digital scale LCD screen.
6) Add aquarium water sample to the kHLab module test/mixing cylindrical chamber (about 3/4 capacity).
7) Dispose of the fluid from calibration cylinder (vial) and repeat above calibration steps few times (recommended five times). Sort the results from highest to lowest, ignore the highest and lowest and use the middle three results to determine the average pump performance value.

EXAMPLE:

If after eliminating the highest and lowest recorded results you're left with results of: 54.46g, 54.67, 54.37g, add them and divide by 3 and calculate arithmetic average. This would be calculated as: (54.46g + 54.67g + 54.37g) / 3 = 163.5g / 3 = 54.5g

8) Save the calculated value by placing the final number in the field next to "**Calib #3 pump**" button in the application window and click "**Save #3 water**".
9) Channel #3 calibration process has been completed.

Checking Waste Water (Channel #3) Accuracy

1) Place digital scale on the **calibration stand**.
2) Dispose of any water from calibration cylinder (vial) and place the cylinder on the digital scale.
3) Turn ON the digital scale.
4) Wait a few seconds and then zero-out the digital scale by clicking (**T**) **Tare** button. Before starting any measurements, the digital scale LCD display must read 0.00g.
5) Make sure that digital scale is showing [**g**] as the weight unit. If not then start clicking (**M**) button until you see [**g**] gram unit on the display.
6) If the kHLab module test/mixing cylindrical chamber is empty then add aquarium water sample to the chamber.
7) From the application, under the "**kHLab**" TAB, click "**Test #3" – pump #3** will start adding **60ml** of water from **Channel #3** to the calibration cylinder (vial).
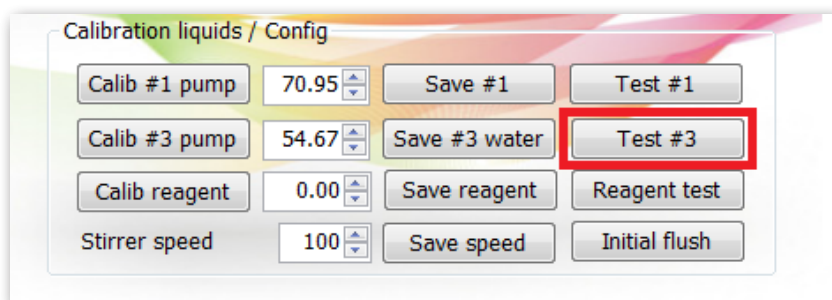

8) Read the result in grams [g] from the digital scale display. **This is the dosed amount of water in ml by dosing station in channel #3.**

Starting the Channel #2 Calibration Process (Reagent)

Channel #2 is dedicated for the Reagent solution. To calibrate the pump #2 in this channel follow the steps below. Refer to the picture in "Calibration with precise digital scale and stand/holder" for using the digital scale.

1) Turn ON the digital scale.
2) Wait a few seconds and then zero-out the digital scale by clicking the **T (Tare)** button. Before starting measurements, the digital scale has to display 0.00g on the LCD screen.
3) Make sure that digital scale is displaying [**g**] as the weight unit. If not then press the **M (Units)** button until you see [**g**] gram unit on the LCD screen.
4) From the Application, under the "**kHLab**" TAB, click the "**Calib reagent**" button. The pump will start adding **reagent solution** to the calibration cylinder (vial).
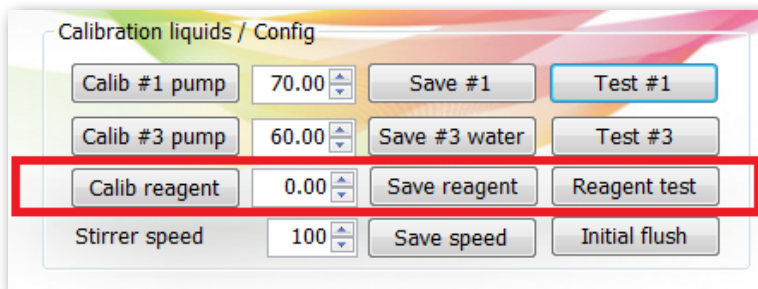
5) After 500 cycles pump #2 will stop automatically. **The number of cycles will be displayed on the dosers LCD screen:**

Write down the value displayed on the digital scale LCD screen e.g. 8.98g.

6) Dispose of the fluid from the calibration cylinder (vial) and repeat the above calibration steps 5 times. Sort the results from highest to lowest, ignore the highest and lowest and use the middle three results to determine average performance value.

EXAMPLE:

If after eliminating the highest and lowest recorded results you're left with results of: 8.94g, 9.12g, 9.01g, add them and divide by the count of that series of values, which is 3 and calculate **arithmetic average**.

This would be calculated as: (8.94g + 9.12g + 9.01g) / 3 = 27.07g / 3 = **9.02g**

7) **Save** the calculated value by placing the final number in the field next to "**Calib reagent**" button in the application window and clicking "**Save reagent**".
8) Channel #2 calibration process has been completed.

Checking Reagent Solution (Channel #2) Accuracy

1) Place digital scale on the **calibration stand**.
2) Dispose of water from calibration cylinder (vial) and place the cylinder on the digital scale.
3) Turn ON the digital scale.
4) Wait a few seconds then zero-out the digital scale by clicking (**T**) **Tare** button. Before starting any measurements, the digital scale LCD display must read 0.00g.
5) Make sure that digital scale is showing [**g**] as the weight unit. If not then start clicking (M) button until you see [**g**] gram unit on the display.
6) From the application, under the "**kHLab**" TAB, click "**Reagent test**" – pump #2 will start adding reagent solution from **Channel #2** to the calibration cylinder (vial).

7) Read the result in grams [g] from the **digital scale** display and compare with the number from **dosing station LCD screen**.

Allowed measurement error (between the values read from digital scale and dosing station LCD screen) CANNOT be more than ±2%.

5. pH Probe Setup, Maintenance and Calibration

Use only dedicated Pacific Sun pH probes for these calibrations. If you use probes from another manufacturer, Pacific Sun cannot guarantee the accuracy that measured results will match actual conditions. Typical lifespan for a pH probe in kHLab is about 16-18 months, but this time can be shortened in the case of long-term exposure to seawater. The safe replacement time guaranteeing high accuracy is 12 months.

> **Warning!**
>
> Do NOT let the tip of the pH probe dry out as damage to the probe will result. The clear cap (small container) protects the pH probe from drying out.

In order to obtain accurate measurements and best performance, the pH probe needs to be calibrated at two points - pH 4.0 and pH 7.0. Remember to use only dedicated calibration fluids at aquarium water temperature before performing pH probe calibration. Closed bottles with calibration fluid for both pH 4 and pH 7 can be placed in aquarium water to acclimate them to the system temperature.

> **Warning!**
>
> The pH probe must always be calibrated before using. Remove the clear cap (small container) from the pH probe before starting the calibration process and before use of the pH probe.
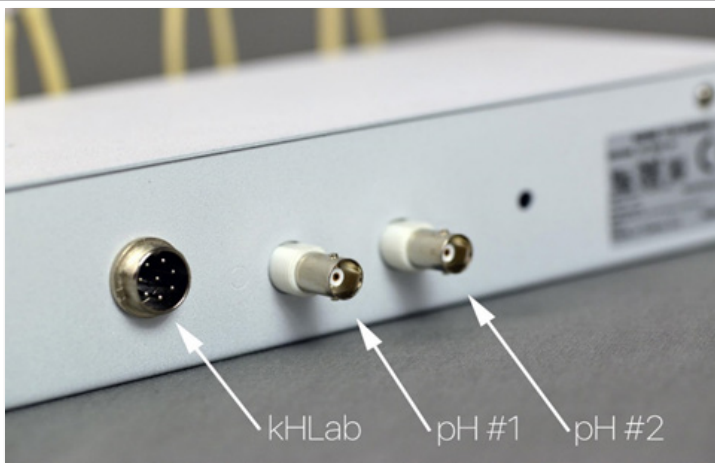
Kore 7th Dosing Station back panel

## Initial pH Probe Calibration Procedure - First Use After Purchase

Calibration steps:
1) Remove the clear cap (small container) from the pH probe.
2) Immerse the pH probe in RO water to a minimum 4cm (1.5") depth (maximum 9cm (3.5")) for a few minutes (about 3-5 minutes). Gently move and rotate the pH probe several times in the water.
3) Never expose pH probe to the air for more than 3-4 minutes. The pH probe should be always in the water or in its transport protection container.
4) After removing pH probe from RO water, gently shake the excess water and wipe using a fresh paper towel. Never wipe the end probe tip. Just dry by gently touching/ dabbing the end tip with paper towel.
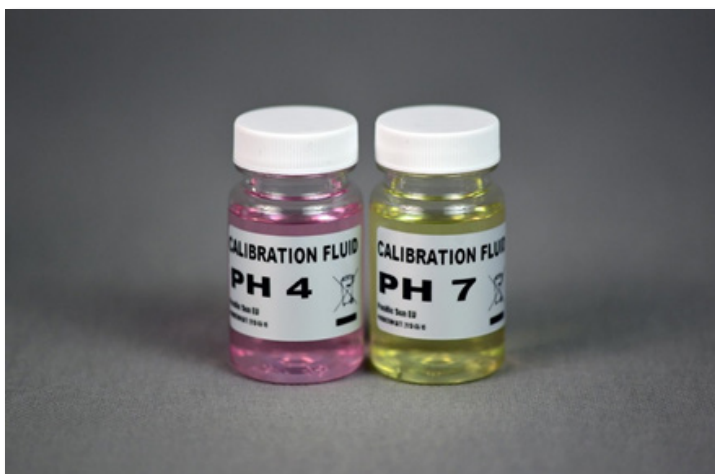
pH 4.0 and pH 7.0 calibration solutions

Calibration Procedure With pH 4.0 Solution

1) Immerse the pH probe in the calibration fluid **pH 4.0** to a minimum 3 cm (~1 inch) depth.
2) The pH probe should be in the solution for about 4-5 minutes. During this period gently move and rotate the probe every few seconds, keeping the pH probe immersed in the calibration solution.
3) After 5 minutes, in the application, under the "**pH ports / kHLab config**" TAB, click "**Calibrate pH 4**".
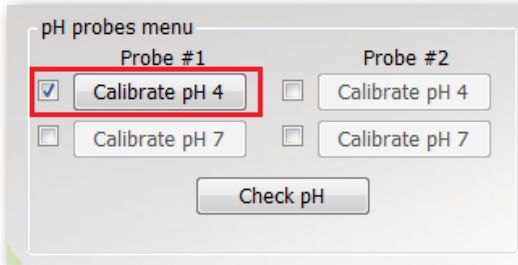
4) The calibration process for the first point with **pH 4.0 solution** has been completed.
5) Remove the pH probe from the **pH 4.0** solution, and rinse it in RO water (or tap water) for at least 2-3 minutes and dry the probe the same way as described above.

Calibration Procedure With pH 7.0 Solution

1) Immerse the pH probe in the calibration fluid **pH 7.0** to a minimum 3cm (~1in) depth.
2) The pH probe should be in the solution for about 4-5 minutes. During this period gently move and rotate the probe every few seconds, keeping the pH probe immersed in the calibration solution.
3) After about 5 minutes, in the application, under the "**pH ports / kHLab config**" TAB, click "**Calibrate pH 7**".
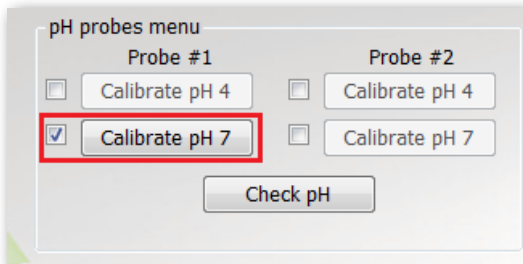
4) The calibration process for the second point with **pH 7.0** solution has been completed.
5) Remove the pH probe from the **pH 7.0** solution, and rinse it in RO water (or top water) for at least 2-3 minutes and dry the probe the same way as described above.
In the case when obtained Alkalinity values are not as expected (e.g. confirmed by a precise laboratory test), make sure that the pH probe is properly calibrated by running the calibration procedure again.

Important!

Due to its physicochemical properties, the pH probe will take some time to stabilize and provide accurate/repeatable results. Consequently, it is recommended that during the first days/weeks of using the pH probe, the calibration procedure be carried out more frequently than recommended.

6. kHLab Magnetic Stirrer Preparation

Make sure that inside the kHLab module test/mixing cylindrical chamber is a dedicated water mixing magnetic stirrer bar/pellet (small white bar). That bar/pellet is necessary for proper water sample mixing during perform tests. Also, connect the kHLab module to the Kore 7th dosing station by using the dedicated 8-pin plug cable.

7. Reagent Solution Preparation

This device preparation step is very important. If the reagent dilution ratio is not correct, the tested results may differ from the actual alkalinity levels. To obtain accurate results, we strongly suggest using the digital scale for reagent dilution.

Important!

The 1000ml (2x500ml) of Concentrated Reagent included in the package has to be diluted with RO/DI water before use in 1:4 ratio.
EXAMPLE: 100ml of concentrated reagent has to be added to 400ml of RO/DI water.

Before beginning the reagent solution preparation steps, prepare two containers:
   — **Measuring Container** - must have a minimum of 100ml capacity for measuring the correct amount of concentrated reagent and RO/DI water;
   — **Target Reagent Solution Container** - must have a minimum of 500ml capacity for mixing concentrated reagent with RO/DI water.

Warning!

The pH probe must always be calibrated before using. Remove the clear cap (small container) from the pH probe before starting the calibration process and before use of the pH probe.

To prepare ready to use 500ml of reagent solution follow these steps:
1) Prepare empty **Measuring Container**.
2) Place the **Measuring Container** on the digital scale.
3) Turn ON digital scale.
4) Wait a few seconds and then zero-out the digital scale by clicking (**T**) **Tare** button. Before starting reagent measurement, the digital scale must show 0.00 g on the LCD display.
5) Make sure that digital scale is showing [**g**] as the weight unit. If not then start clicking (**M**) button until you see [**g**] gram unit on the display.
6) Measure exactly 100g of reagent (from 1000ml bottle with concentrated reagent included in the package).
7) Pour out the measured amount into the **Target Reagent Solution Container**.
8) Place the empty **Measuring Container** back on the digital scale.
9) Wait a few seconds and then zero-out the digital scale by clicking (**T**) **Tare** button.
10) Pour in exactly 100g of RO/DI water into the **Measuring Container**, then add that measured RO/DI water into the **Target Reagent Solution Container**.
11) Repeat the procedure three times (add up to 400g of RO/DI water together to the **Target Reagent Solution Container**.
12) After adding the whole (100ml of concentrated reagent and 400ml of RO/DI water) mix everything by shaking the **Target Reagent Solution Container** several times.

The prepared reagent solution is ready for use. We recommend preparing no more than 1000ml of ready to use reagent solution. This amount of solution can last for up to 25-30 days of performed Alkalinity tests.

8. Device Working Modes

As mentioned earlier, the Kore 7th/kHLab can work in two modes.

Monitoring Mode

In **Monitoring** mode, the device can be used to measure alkalinity and display the results on the dosing station LCD screen. The device will NOT take any action on individual channels and dosing pumps, will not turn ON/OFF individual channels or change any defined dosing pumps performance/schedule.

Control Mode

In **Control** mode, the device can be used to:
— **stop** dosing **Alkalinity supplement** and other fluids from channels #4, #5, #6 and #7, when tested Alkalinity value exceeding set KH value in the application "**Maximum kH**".
— **start** dosing **additional dose** of "Alkalinity supplement" when tested KH value falls below the value set in the application "Minimum KH" and all the other fluids set dosage values are not able to keep Alkalinity on desired level.

Note:

As a good practice it's recommended that before using "Control mode", run "Monitoring mode" for at least few days to make sure the device is working correctly and the alkalinity measurements are as expected.

9. Alkalinity Test Intervals

The Kore 7th dosing station can perform Alkalinity tests in different time intervals: **one, two, four, eight** and **twelve** times per day (**x1, x2, x8, x12**). Keep it in mind that, by nature, alkalinity continuously changes, and because of that it's necessary to compare the test results performed at the same time each day.

For the **Monitoring mode**, we recommend performing tests **two** or **four** times per day and for the **Control mode** we recommend performing tests **four**, **eight** and even **twelve** times per day.

10. Device Working Stages

The device works through the following stages:

a) Initial Flush

The purpose of this stage is to initially fill a kHLab device test chamber and prepare the device to work in continuous stage. In this stage the kHLab module is filling and emptying a chamber with aquarium test water multiple times.

b) Emptying flask (Cylinder)

In this stage the test water is being disposed from the kHLab module test chamber and the magnetic stirrer is staying ON.

c) Microflush

In this stage, the kHLab test chamber is rinsed several times with aquarium water and prepared for alkalinity testing.

d) EMV Stabilize

During this stage, the device reads the pH probe measurement and waits for the reading to stabilize before starting the actual test.

e) Preparing for Standby

This mode prevents pH probe damage between tests by filling in the kHLab module test chamber with aquarium water.

11. Carbonate Solution Preparation

In order for the device to be able to maintain water alkalinity at a given level, prepare the alkalinity supplement based on the following formula by using KH buffer (i.e. Aquaforest):
1) Prepare a 1500ml capacity (or larger) container.
2) Dissolve 80g of KH Buffer in 1000ml of RO/DI water.

The final 100ml of KH buffer solution will increase alkalinity by 2.6dKH in 100 liters (26 Gall US) of aquarium water and the KH buffer solution based on this recipe will ensure proper device operation (keeping the defined KH value in case of the alkalinity dropping below the pre-set "**Minimum KH**" limit value).

The following tables show recipes with supplements from other manufacturers which will work correctly with the Kore 7th/kHLab device.

Recipe based on $NaHCO_3$/Na_2CO_3		
RO/DI water	$NaHCO_3$	Na_2CO_3
1000ml	66g	10g

Recipe based on Na_2CO_3	
RO/DI water	Na_2CO_3
1000ml	52g

12. Parallel Calibration

In addition to the kHLab test and calibration processes, it is recommended that the kHLab alkalinity test results be checked periodically via a second calibration using a basic alkalinity titration test kit. This second calibration serves to validate that the kHLab is working correctly, given that it's results show alkalinity around the same range.

13. Kore 7th Software and Firmware Upgrade

Warning!

Switching off the power supply during the Firmware updating process may damage your doser CPU. Uploading wrong Firmware may damage your doser and void your warranty. The damage may require returning the doser to our service department to restore it's original functionality.
Use only **dedicated firmware upgrade software** available for download on www.Pacific-Sun.eu in **Download** section.

	Connect your Laptop/PC to the Kore 7th dosing station via USB port.
	Operating System (Windows/ Mac OS) should be able to discover and install the new USB device (Kore 7th) and show the communication COM port number. If for the first time, the new device Kore 7th will not be able to install (especially under Window 7) then download from the Internet and install the USB-to-Serial Converter Drivers: https://www.ftdichip.com/Drivers/VCP.htm (CDM v2.12.28 WHQL Certified)
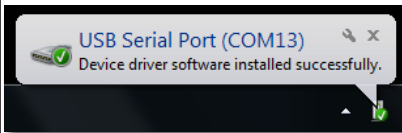
Windows Operating System has the two following options to verify the correct USB Serial Port COM **number**:

1. "**Device Manager**"
2. "**Devices and Printers**"
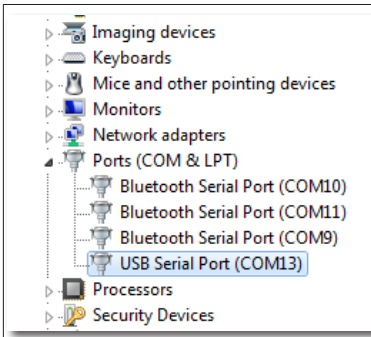
	Option 1: Verify the USB Serial Port COM **number** under "**Device Manager**".
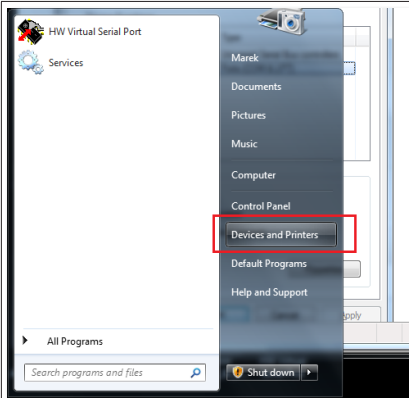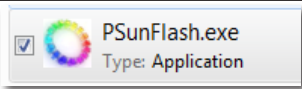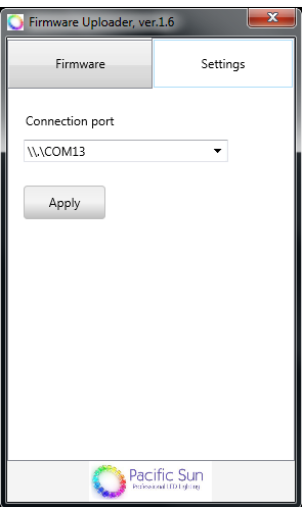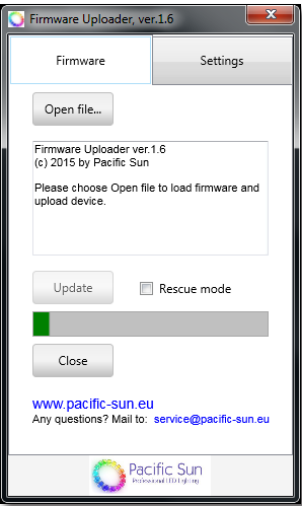
Option 2:
Verify the USB Serial Port COM **number** under from "**Devices and Printers**".
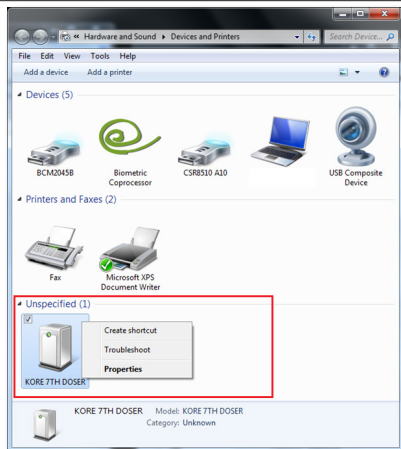
Right Click on the Kore 7th Doser Device and select "**Properties**".
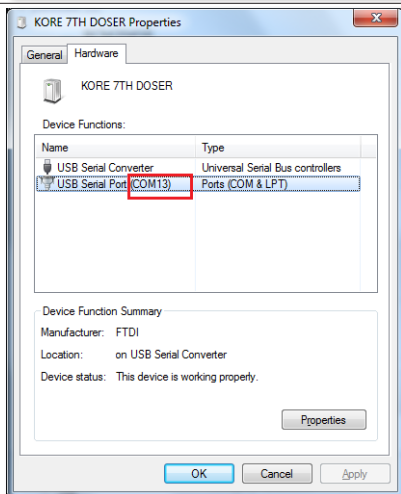
USB Serial Port COM **number** will be visible under Kore 7th Doser Properties.

PSunFlash.exe Type: Application	Obtain the "**Firmware Updater**" application form Pacific Sun website: http://pacific-sun.eu/firmware_update/ Unpack the file and run the "F**irmware Updater**".
Firmware Uploader, ver.1.6 Firmware Settings Connection port \\.\COM13 Apply Pacific Sun	In the "**Settings**" tab, choose the port COM **number** the device is installed on the computer and click "**Apply**" button. For the Mac OS version, select the device you want to update from the list.
Firmware Uploader, ver.1.6 Firmware Settings Open file... Firmware Uploader ver.1.6 (c) 2015 by Pacific Sun Please choose Open file to load firmware and upload device. Update ☐ Rescue mode Close www.pacific-sun.eu Any questions? Mail to: service@pacific-sun.eu Pacific Sun	Go to the "**Firmware**" tab and click "**Open file...**" button.
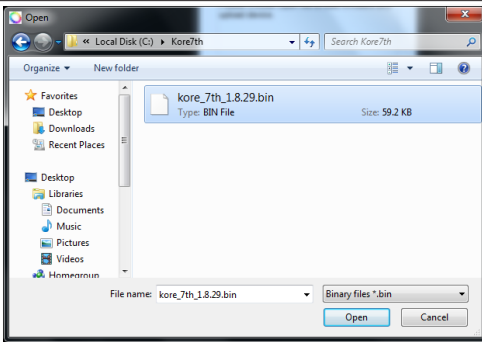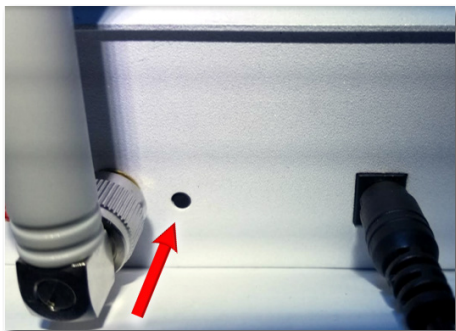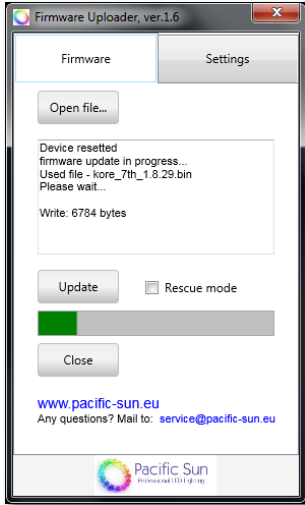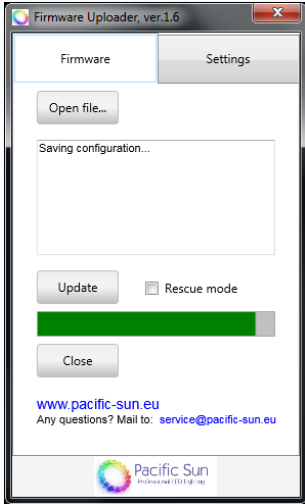
Select the previously downloaded Firmware file and click **"Open"** button.
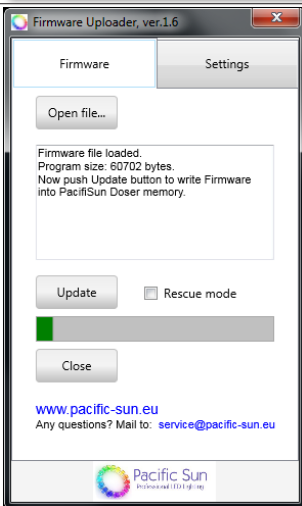
Click **"Update"** button.
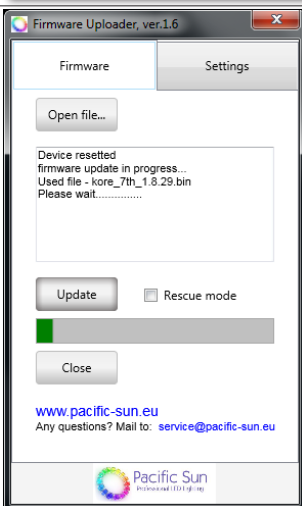
Firmware upgrade will be in progress with massage **"Please wait........"**

| | Now, press the **RESET** push button on the Kore 7th dosing station back panel. |
| | The Firmware writing process will start and the number in bytes will be increasing. |
| | The Firmware upgrade status will be indicated with the green progress bar. |

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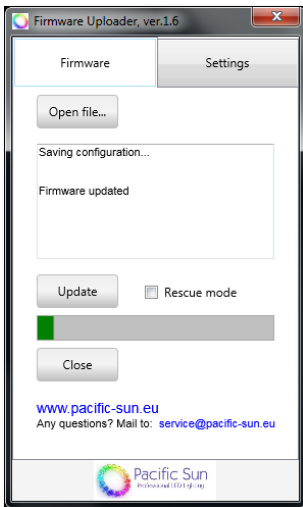
1. At the end of the Firmware writing process program will show "**Firmware updated**".
2. Disconnect USB cable from your laptop/PC and Kore 7th dosing station.
3. Disconnect Kore 7th from the power source for a few seconds and connect the power back.
4. The Firmware upgrade process has been completed.

Connect to the Kore 7th Wi-Fi Network.
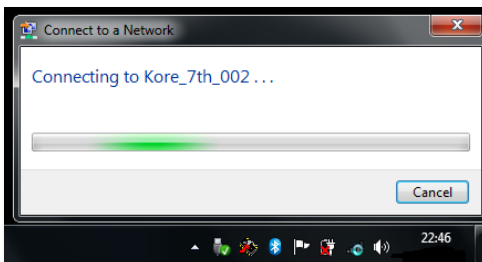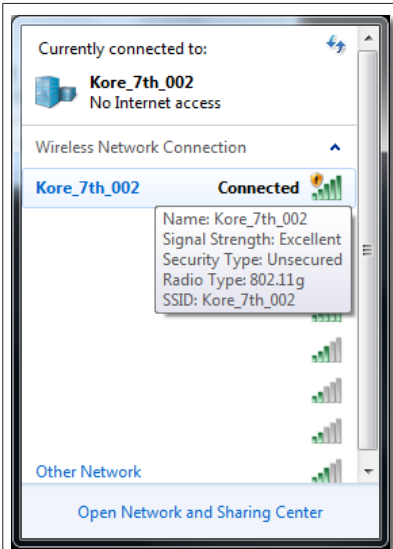
Connecting to the Kore 7th Dosing Station.
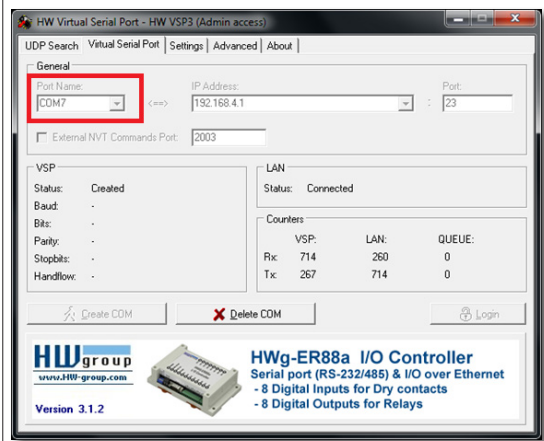
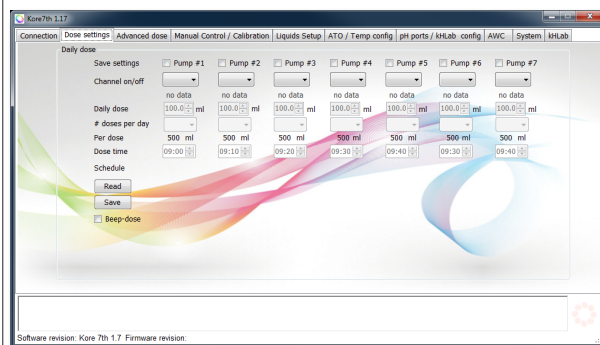|	
	The Kore 7th dosing station is **connected** to your Laptop/PC. **NOTE**: The indication of "**No Internet access**". Laptop/PC is no longer connected to your Wi-Fi Internet Router providing internet access.
	Verify the COM port **number** from the "**HW Virtual Serial Port**" application (VSP number).
	Start the Pacific Sun Kore 7th Application.
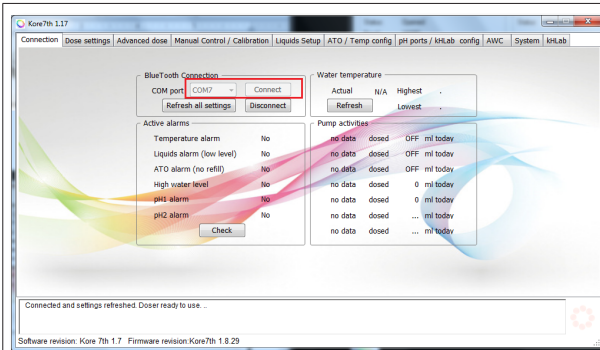
Now, open the Pacific Sun Kore 7th Application, select correct port **COM number** (VSP number) and "**Connect**" to the doser.
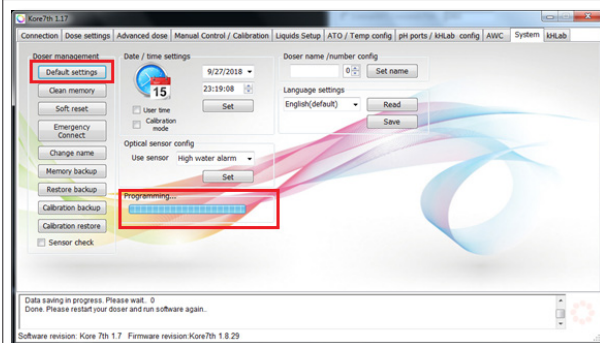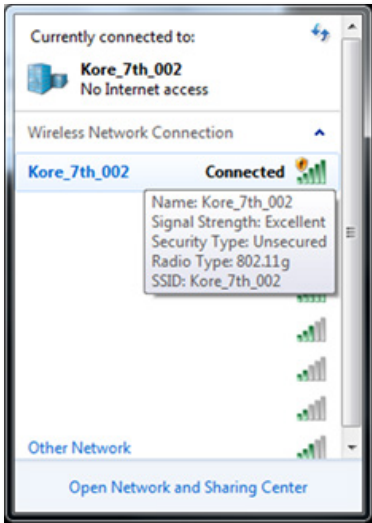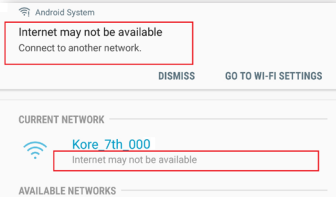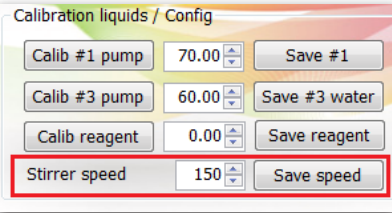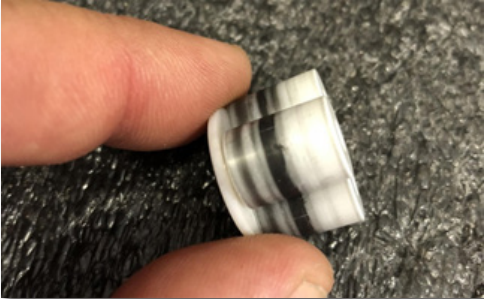
Load device default settings by clicking the "**Default settings**" from the "**System**" Tab.

Start normal configuration after Firmware upgrade.

14. Troubleshooting

Problems	Solutions
Device is not accurate	Make sure that pump #1 and pump #2 are correctly calibrated, and that there is no air (long air gaps) inside the silicone tubing. Small air bubbles inside the tubing don't impact measurement accuracy.
	Make sure that the magnetic stirring bar/pellet for mixing tests fluid is inside kHLab cylindrical test chamber per the instructions.
	Make sure that silicone tubing supplying reagent and test water are submerged below reagent solution and aquarium water levels.
	Make sure that the **green** tip under the kHLab module chamber cover is submerged below test water level when alkalinity test is in progress.
	When replacing dosing pumps PharMed tubing, the device may initially perform slightly different from before tubing replacement but should go back to the same accuracy after a few days without any problem. During that time next pump calibration is **not** recommended. New pump calibration is required when the new tubing has different diameter than previous, original one or has different nominal flow, i.e. tubing from a manufacturer other than Pacific Sun.
Problem with communication between the dosing station and application	Make sure that the dosing station is connected to your PC/Laptop through Wi-Fi network:

	Make sure that correct communication COM port number is selected in the application on your PC. Note that after connecting mobile device to Kore 7th will be no Internet access on your mobile device through Wi-Fi network (communication only between mobile device and Kore 7th):
Spinning problem with the magnetic stirrer bar/pellet	If the water mixing magnetic stirrer bar/pellet is not spinning then in the Application, under the "**kHLab**" TAB, increase the "Stirrer speed" from the default 100 to e.g. 150, save "Save speed" it and test again. If the water mixing magnetic stirrer bar/pellet is spinning to fast then can go out of synchronization with kHLab module and hit the wall and pH probe. As a solution decrease the "Stirrer speed", save "Save speed" it and test again.
Widely varying measured alkalinity results	Make sure that the pumps heads rollers are clean - no black buildup, dust or lubricant/grease on rollers. The picture below shows a pump head with dirty rollers. If rollers are dirty, remove the dosing pump head and clean the rollers. You can use a fresh paper towel and alcohol or different solvent solution.

If you need technical support - please contact with *service@pacific-sun.eu*