

HYD-4 SENSOR UNIT

-THIS MANUAL CONTAINS IMPORTANT SAFETY INSTRUCTIONS-



User manual

HYD-4 Aquatic sensor unit

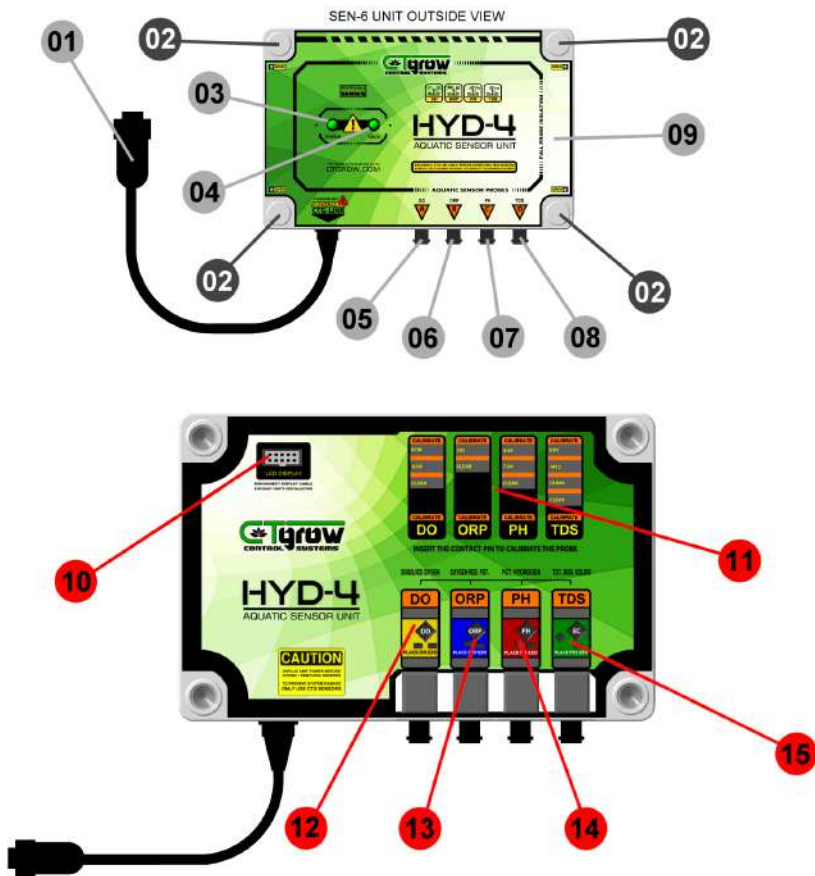
rev 5.0.1



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The HYD-4 Sensor unit explained



HYD-4 Sensor unit (outside view)

- 01: HYD-4 CTG-LINK cable (needs a POWERED CTG-LINK port)
- 02: Cover lid screws (4x) unscrew to access the interior connection panel
- 03: Power ON LED light (when lit the sensor unit has power)
- 04: DATA LED (when flashing shortly ON, unit is sending data)
- 05: BNC connector for Ctgrow Dissolved Oxygen probe
- 06: BNC connector for Ctgrow Oxygen Reduction Potential probe
- 07: BNC connector for Ctgrow Ph probe
- 08: BNC connector for Ctgrow EC/TDS probe
- 09: Sensor unit cover-lid (removable)

HYD-4 Sensor unit (inside view)

- 10: LED display connection port (removable flat-cable for easy access)
- 11: Sensors calibration selection pins (for sensor probes calibration)
- 12: Port for Dissolved Oxygen sensor module (not included)
- 13: Port for Oxygen Reduction Potential sensor module (not included)
- 14: Port for Ph sensor module (not included)
- 15: Port for EC/TDS sensor module (not included)

IMPORTANT SAFETY INSTRUCTIONS

General safety precautions for CTgrow products

Retain the safety and operating instructions provided with the product for future reference. Follow all operating and usage instructions. Observe all warnings on the product and in the operating instructions. To reduce the risk of fire, bodily injury, electrical shock and damage to the equipment, observe the following precautions.

Damage requiring service for CTgrow products

Unplug the product from the electrical outlet / CTG-LINK ports and take the product to an CTgrow authorized service provider under the following conditions:

- **Liquid has been spilled or an object has fallen into the product.**
- **The POWERED CTG-LINK CABLE has been damaged or cut.**
- **The product has been dropped, exposed to water or is damaged in any way.**
- **The product does not operate normally when you follow the operating instructions.**

Servicing

Except as explained elsewhere in the CTgrow documentation, do not service any CTgrow products yourself. Service needed on components inside these compartments should be done by an CTgrow authorized service provider.

Mounting

Do not use the product on an unstable table, cart, stand, wall, or bracket. The product may fall, causing serious bodily injury and serious damage to the product.

Ventilation

Slots and openings in the product are provided for ventilation and should never be blocked or covered, since these ensure reliable operation of the product and protect it from overheating. The product should not be placed in a built-in apparatus such as a bookcase or rack unless the apparatus has been specifically designed to accommodate the product, proper ventilation is provided for the product, and the product instructions have been followed.

Grounded (earthed) products

Only use ground fault circuit interrupters on all outlets that are being used to power Ctgrow devices. CTgrow products are equipped with a three-wire electrical grounding-type plug that has a third pin for grounding. This plug only fits into a grounded electrical outlet. This is a safety feature. Do not defeat the safety purpose of the grounding-type plug by trying to insert it into a non-grounded outlet. If you cannot insert the plug into the outlet, contact your electrician to replace the obsolete outlet.

Water and moisture

When using Ctgrow electrical equipment while working in damp areas, wear insulated footwear and make sure you are always protected by a GFCI. Keep the Ctgrow equipment (except certain waterproof sensors) clear from direct contact with water to prevent any damage or electrical shock hazards.

IMPORTANT SAFETY INSTRUCTIONS

Power sources

The product should be operated only from the type of power source indicated on the product's electrical ratings label. If you have questions about the type of power source to use, contact your CTgrow authorized service provider or local power company. For a product that operates from other power sources, the operating instructions are included with the product.

Extension cable

If an POWERED CTG-LINK extension cable is used, make sure that the total cable length does not exceed 30Ft. Using longer extensions may damage the unit and its connected sensors.

Cleaning

Unplug the product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

Heat, Circulation and cooling

The product should be placed away from radiators, heat registers, stoves, or other pieces of equipment (including amplifiers) that produce heat. Allow sufficient air circulation around the computer during use to ensure adequate cooling of the device. Prevent direct exposure to radiant heat sources.

Replacement parts

When replacement parts are required, be sure the service provider uses replacement parts specified by CTgrow.

Safety check

Upon completion of any service or repairs to the product, have your CTgrow authorized service provider perform any safety checks required by the repair procedure or by local codes to determine that the product is in proper operating condition.

Options and upgrades

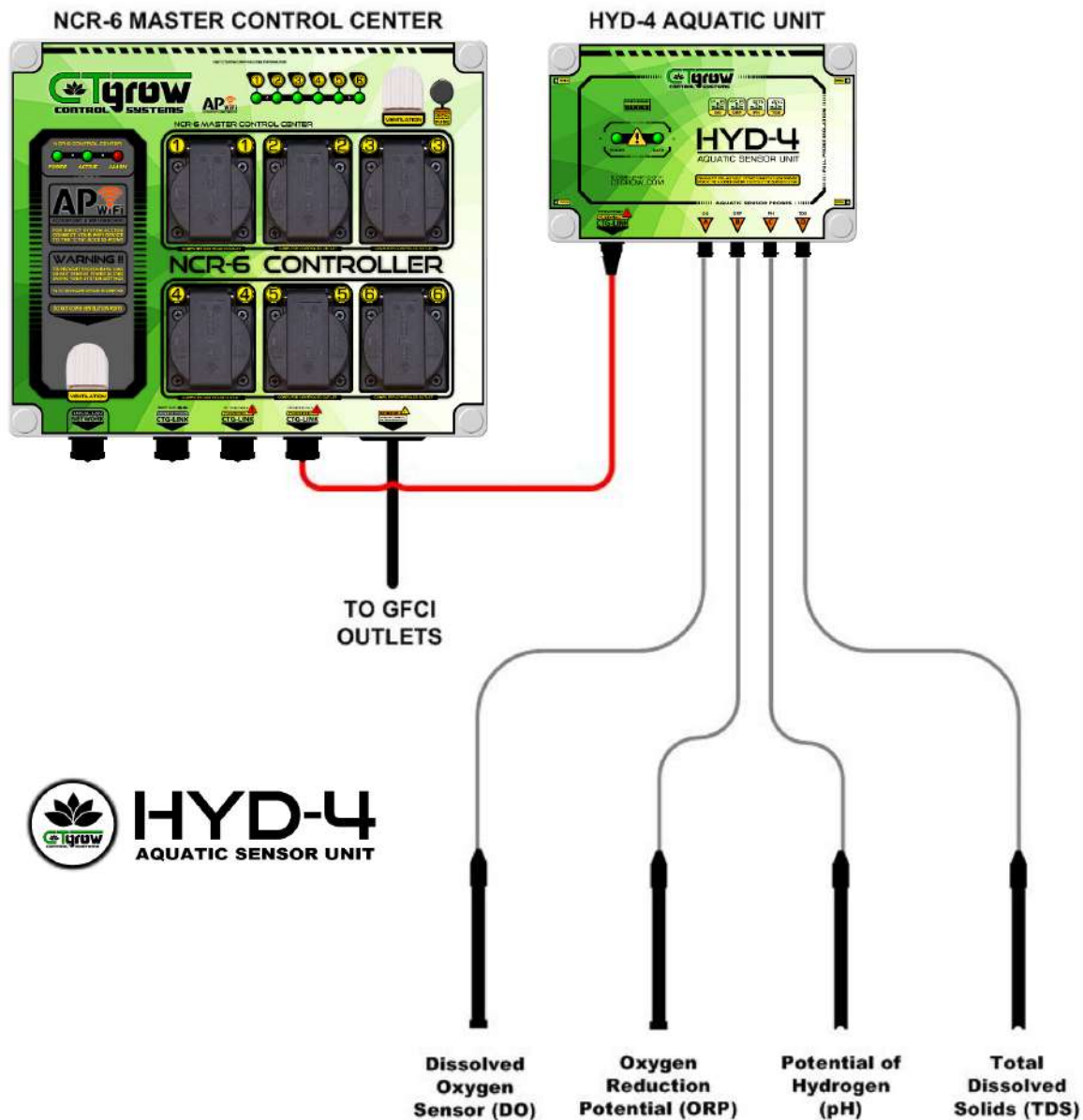
To reduce the risk of fire, bodily injury, electrical shock and damage to equipment only use products and upgrades recommended by Ctgrow.

2: Introduction to the HYD-4 sensor unit

CTgrow's HYD-4 is an advanced Aquatic sensor unit that can be used in combination with our wide variety of switch and control unit's. The HYD-4 unit comes with Ph and EC/TDS EZO Modules and probes, and the HYD-4 unit can be **optionally** outfitted with **Dissolved oxygen** and **Oxygen Reduction Potential** sensors and modules.

The HYD-4 sensor unit and it's sensors are very easy to install/calibrate and offer precise digital measurements. The HYD-4 housing is a special casing designed for easy sensor connection and extreme reliability in warm & humid conditions. The HYD-4 sensor unit can easily be fitted to any grow-room setup and can also be used to measure and monitor large grow setups or massive greenhouse operations.

CTgrow's HYD-4 technology ensures a sensor unit with high reliability, easy calibration and excellent long-term stability.



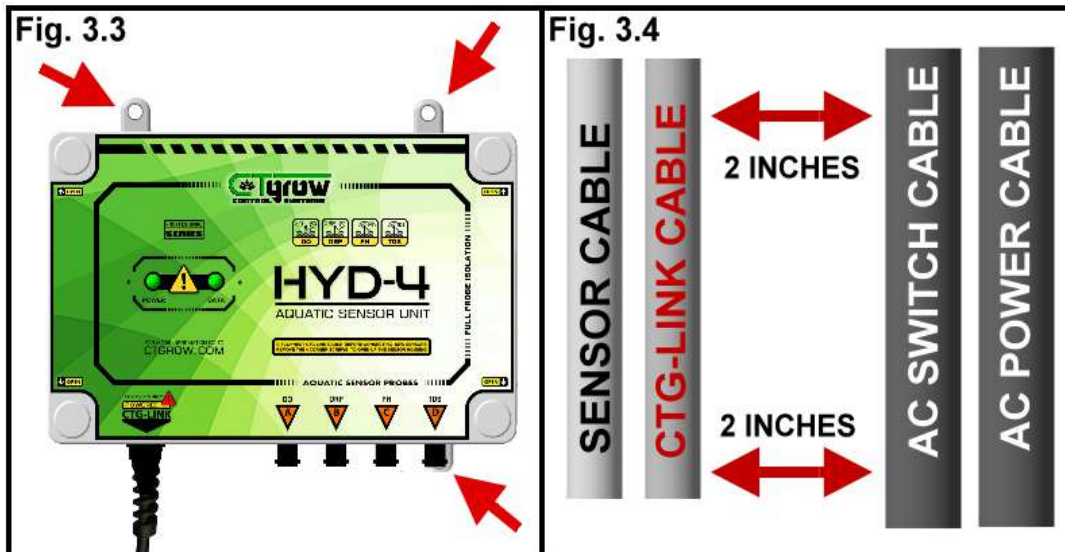
3: HYD-4 unit installation procedure

- 3.1: After unpacking the HYD-4 sensor unit, screw the unit's mounting-tabs on to the HYD-4 back-side. The HYD-4 comes with 3 mounting-tabs and screws included. Use the mounting tabs (top & bottom) to mount the HYD-4 sensor unit to your preferred location. (see fig. 3.1) and (see fig. 3.2)



- 3.2: Screw the mounting tabs on the back-side of the HYD-4 sensor unit (see fig. 3.1) and (see fig. 3.2)
- 3.3: Mount the HYD-4 sensor unit on a safe and firm location using the mounting tabs (see fig. 3.3) (make sure its in cable range of both the controller and the area's that the sensors will be mounted.)
- 3.4: Make sure that sensor cables and CTG-LINK cables are never bundled together with AC power cables (see fig. 3.4) This is very important to prevent sensor and unit malfunctions that can be caused by heavy inductive AC loads!!

(Minimum required space between AC power-cables and sensor/CTG-link cables is 2 inches.)



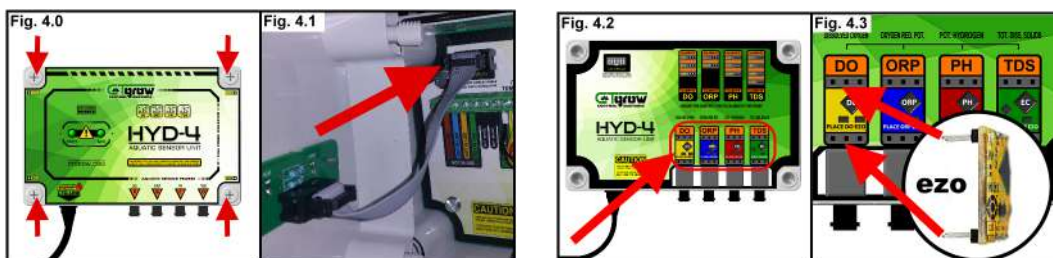
4: Installing EZO modules & Sensor-probes

WARNING !! MAKE SURE THE HYD-4 UNIT IS POWERED OFF BEFORE PROCEEDING WITH ANY SENSOR INSTALLATIONS !!

**EZO module installation: (The following procedure is the same for all 4 sensor-probes)
(MAKE SURE THE HYD-4 UNIT IS POWERED OFF BEFORE PROCEEDING!!)**

- 4.0: Open the HYD-4 unit by unscrewing the 4 corner-screws (right to left) (see fig. 4.0) and disconnect the flat-cable connector-plug from the board connector. (see fig. 4.1) You can now safely remove the sensor unit's cover panel.
- 4.1: The HYD-4 comes with the Ph and EC/TDS EZO modules already installed. To Re-place them or Place The optional Dissolved oxygen or Oxygen Reduction Potential EZO modules, please follow these instructions:

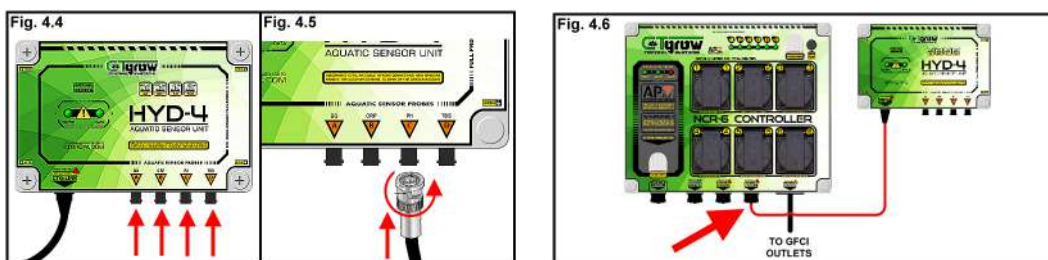
The EZO modules that are used by the Ctgrow HYD-4 are located in the bottom-right of the unit. (see fig. 4.2)



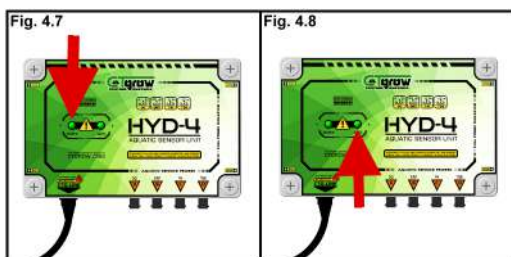
- 4.2: Place the EZO module in its correct slot (see EZO color and module-name) and make sure that the 3 top and 3 bottom EZO pins are in their corresponding 3 hole slots. (see fig. 4.3)

Aquatic sensor-probe installation: (This procedure is the same for all 4 sensor-probes)

- 4.3: Screw the BNC connector-plug (from your sensor probe cable) on it's designated male connector on the HYD-4 bottom-side within the HYD-4 unit. (see fig. 4.6)
Do not screw connector-plugs into connectors that are not labeled for the sensor. (this may damage the HYD-4 unit)



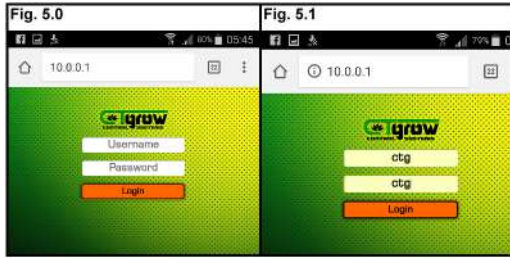
- 4.4: When all available sensor-probes have been correctly installed, Connect the HYD-4 unit's CTG-LINK cable to a powered CTG-LINK port on the NCR-6 or to the RSX-6 or NPX-5 unit(see fig. 4.8)
- 4.5: As soon as the POWER-LED is ON the unit has power and will start to communicate with the NCR-6 controller. (see fig. 4.9) When the unit makes first contact with the NCR-6 master-controller, the DATA-LED will also lite up for about 5 seconds. After this the DATA-LED will only flash every couple of seconds to indicate that sensor data is being send out. (see fig. 4.10)



- 4.5: As soon as the POWER-LED is ON and the HYD-4 communicates with the NCR-6 controller, you can start to setup the sensors software on the NCR-6 master controller. (see chapter 5)

5: Sensor unit system setup procedure

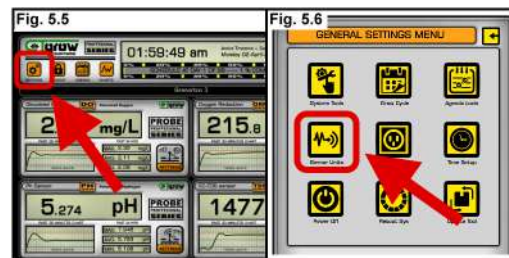
5.0: To control the HYD-4 Sensor-unit, You first need to be logged in to your NCR-6 Master controller. (see fig. 5.0) and (see fig. 5.1)



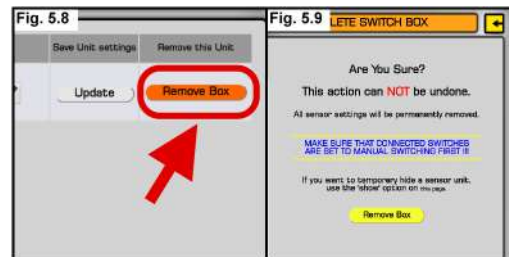
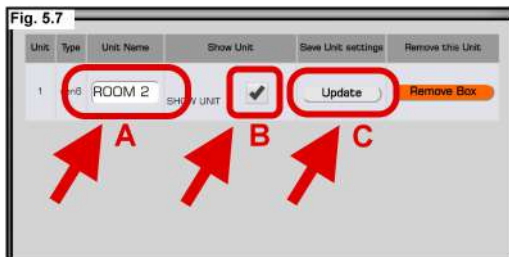
5.1: As soon as the green “DATA” led on the front-side of the HYD-4 Sensor-unit is “ON” the HYD-4 Sensor-unit is ready for usage. Open your NCR-6 Master controller’s main screen (see fig. 5.2) Your HYD-4 Sensor unit should now be visible on your main screen (see fig. 5.2) If the HYD-4 Sensor-unit is not visible you may need to refresh your web-browser or wait for 3 minutes for the browser to automatically refresh itself. (the HYD-4 unit should always be visible within 3 minutes)

AS SOON AS THE HYD-4 SENSOR-UNIT IS VISIBLE ON THE MAIN SCREEN, IT HAS BEEN INSTALLED SUCCESSFULLY AND IS READY FOR OPERATION.

5.2: When you use more than one HYD-4 Sensor-unit, they can be identified by their unit name and number (see fig. 5.3) The unit name can be changed from the NCR-6 Master Controller’s settings menu. (see fig. 4.5) To change the HYD-4 unit’s name press the [MENU] button (see fig. 5.5) and then press the [SENSOR UNITS] button to enter the general Sensor unit menu. (see fig. 5.6) This will open the Sensor unit menu. (see fig. 5.7)



5.3: When you are in the general Sensor-unit menu, fill out the preferred name for your HYD-4 Sensor-unit at the box marked A. (see fig. 5.7) At the (SHOW UNIT) check-box marked B you can choose to hide the sensor-unit from the controller. (all sensors will remain active and functional when hidden) After changes have been made, press the [UPDATE] button marked C to store the new name and the show unit selection. (see fig. 5.7)



WARNING !! BEFORE REMOVAL MAKE SURE THAT ALL SENSORS ARE DISABLED FROM OUTLET PROGRAMS!!

5.4: To remove an external Sensor-unit form the controller, first disconnect the CTG-LINK cable. Next go to the general Sensor unit menu, (see fig. 4.4) and press the corresponding [REMOVE UNIT] button. (see fig. 4.6)

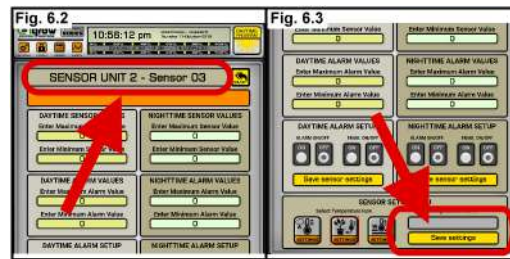
(The unit removal procedure can take up to 30 seconds, please press the buttons only once and wait for the menu to return to the sensor-unit settings page.)

6: HYD-4 general sensor settings

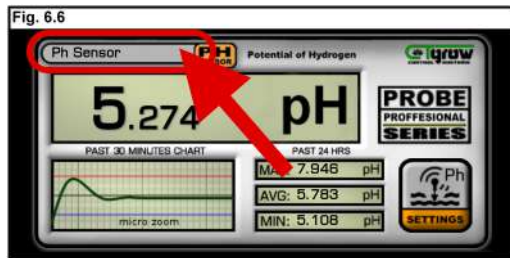
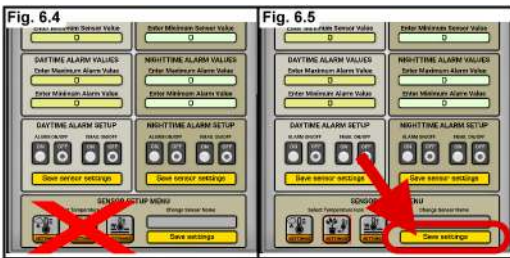
The HYD-4 sensor-unit can handle up to 4 computer controlled sensor probes that can all be setup from within the NCR-6 controller software. The procedure below will explain how the sensors can be setup to be used by the NCR-6 system controller and external switch/control units.

HYD-4 general sensor settings (same procedure for any connected sensor)

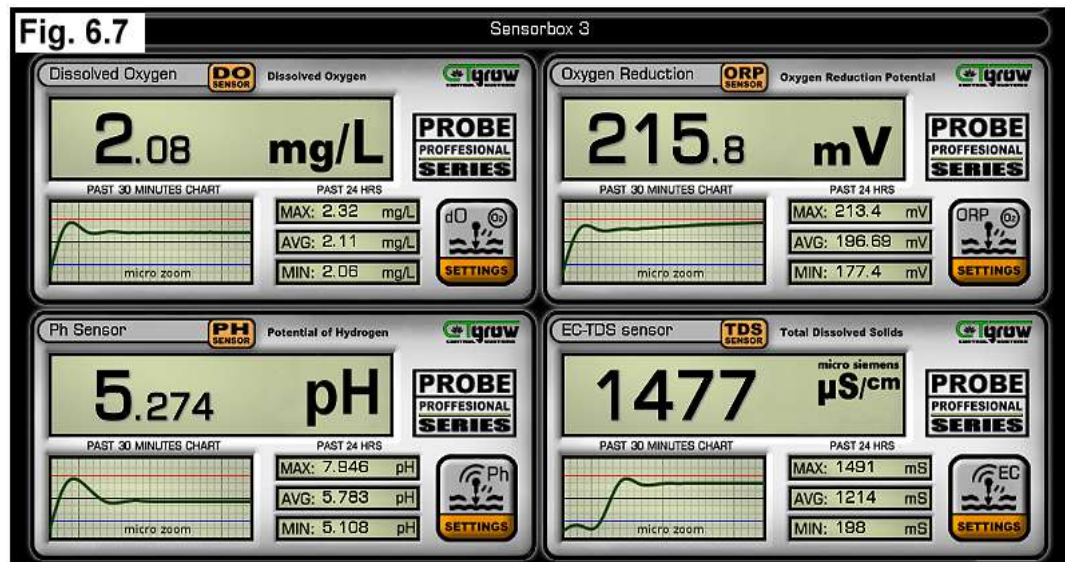
- 6.0 The chart below the sensor value will become automatically active within 10 minutes after sensor-unit installation and shows a automatically zoomed-in chart of the past 30 minutes of average sensor readings. (see fig. 6.0) (charts can take up to 30 minutes to become fully accurate)
- 6.1 Open the selected sensor's menu by pressing the [sensor menu button] (see fig. 6.1)
- 6.2 The sensor unit's id number and the sensors number will be visible the on the top of the sensor-menu. (see fig. 6.2)
- 6.3 To change the default sensor name to your own preferred name, enter the new name in the name-box (see fig. 6.3) and then press the [SAVE SETTINGS] button to save your settings. (see fig. 6.5)
The new name should now be visible on the left-top side of the sensor. (see fig. 6.6)



- 6.4 The temperature icons are NOT available for the HYD-4 sensor unit, and can NOT be changed. (see fig. 6.4)

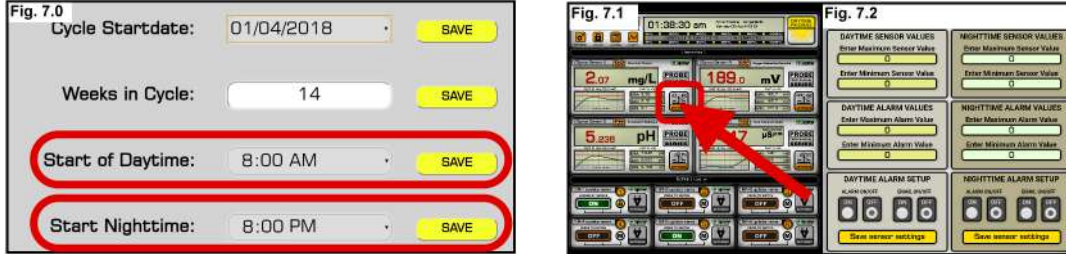


- 6.5 The example below shows the HYD-4 sensor unit with all optional sensors installed. (see fig. 6.7)

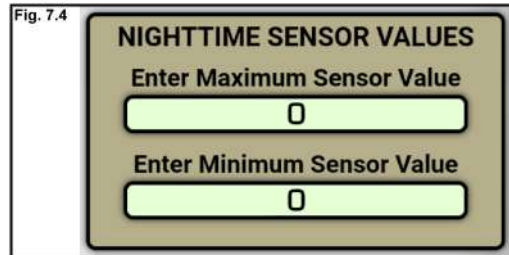
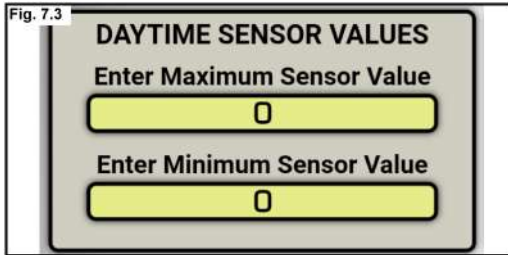


7: Sensor values settings (1)

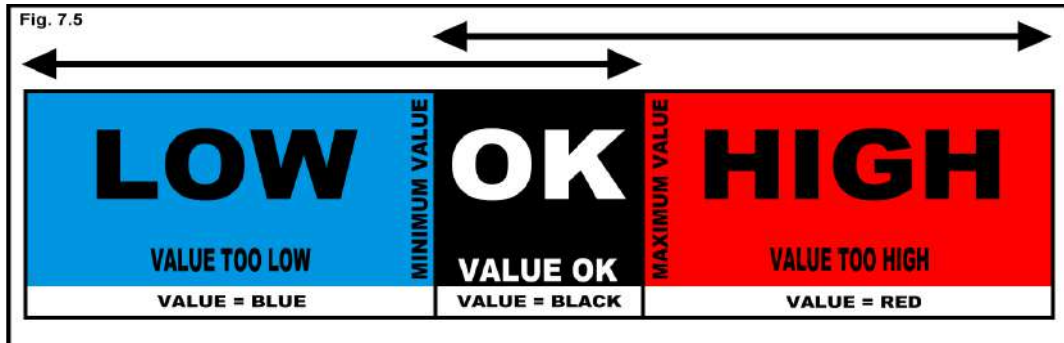
- 7.1: Before proceeding with setting the HYD-4 sensor values, please make sure that your preferred DAY/NIGHT settings are correctly set in the NCR-6 cycle menu. (see fig. 7.0) (check your NCR-6 user manual on how to setup the DAY/NIGHT cycle)
- 7.2: Open the sensor's menu by pressing the [sensor menu button] (see fig. 7.1) this will show the sensors menu (see fig. 7.2)



- 7.3: **SETTING THE SENSOR'S DAY AND NIGHT VALUES (also used to set switches on/off values)**
Enter the preferred maximum and minimum sensor values for normal DAYTIME operations (see fig. 7.3) and then press the [SAVE SENSOR SETTINGS] button to save your settings. If this sensor is used to control a system switch/outlet, these entered values will be the switch/outlet on/off values. (see fig. 7.5) (check your Switch-unit's manual for more about using a switch/outlet with a sensor)
- 7.4: Enter the preferred maximum and minimum sensor values for normal NIGHTTIME operations (see fig. 7.4) and then press the [SAVE SENSOR SETTINGS] button to save your settings. If this sensor is used to control a system switch/outlet, these entered values will be the switch/outlet on/off values. (see fig. 7.5) (check your Switch-unit's manual for more about using a switch/outlet with a sensor)



- 7.5: The value difference between the maximum and minimum sensor values can be very important when setting up a sensor for switching/controlling purposes because of the (dead-band) shown as the black square in the middle of the picture. (see fig. 7.5) The (dead-band) is the space that exists between the sensors minimum and maximum value settings and acts as a space that leaves switches/pumps/controls in their current state. (ON = ON) (OFF = OFF) until the set maximum or minimum values have been reached and the programmed switch operation will be executed. (see the black arrows at fig. 7.5)



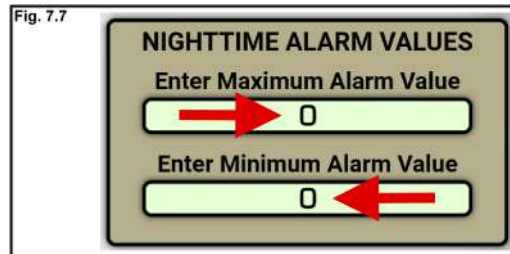
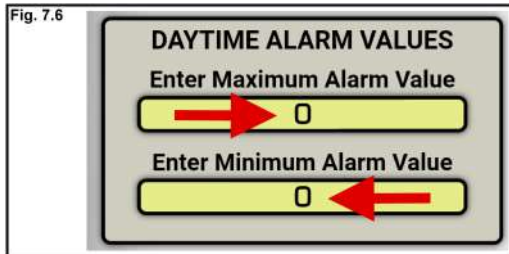
continue to page 10

7: Sensor values settings (2)

IMPORTANT! SENSOR ALARM VALUES AND E-MAIL WARNINGS DO NOT INFLUENCE CONNECTED SWITCHES/OUTLETS

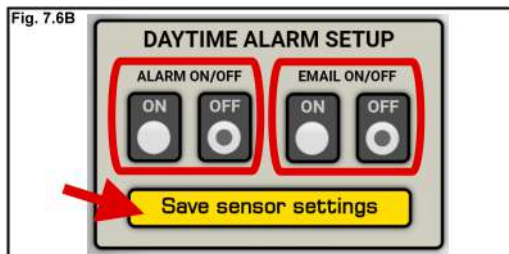
SETTING THE SENSOR'S DAY AND NIGHT ALARM VALUES (OPTIONAL) (leave fields blank if not used)

- 7.6: Enter the preferred maximum and minimum sensor values for the sensor's **DAYTIME ALARM** warnings (see fig. 7.6) and then press the **[SAVE SENSOR SETTINGS]** button to save your settings. These values will be the min/max values at **daytime** for the presented sensor value to start blinking, indicating that daytime alarm values have been reached. (check the NCR-6 manual for more information about setting up day & night cycle's)
- 7.7: Enter the preferred maximum and minimum sensor values for the sensor's **NIGHTTIME ALARM** warnings (see fig. 7.7) and then press the **[SAVE SENSOR SETTINGS]** button to save your settings. These will be the min/max values at **nighttime** for the presented sensor value to start blinking, indicating that nighttime alarm values have been reached. (check the NCR-6 manual for more information about setting up day & night cycle's)

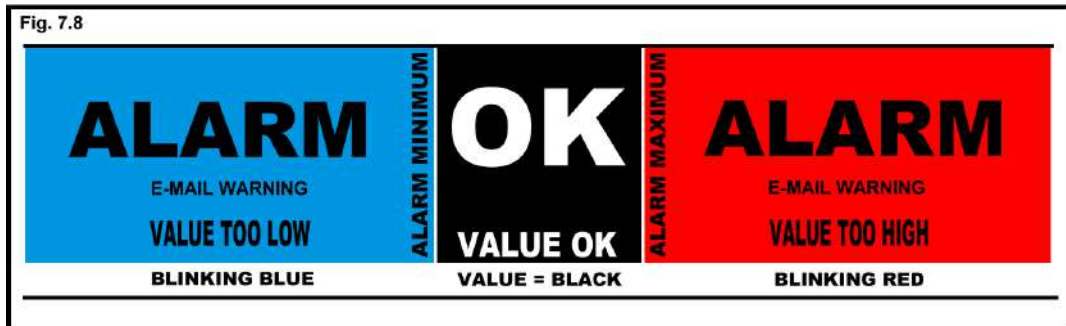


ACTIVATING DAY AND NIGHT ALARMS AND E-MAIL WARNINGS

- 7.6B: To activate the sensor's **DAYTIME ALARM** warnings and indicators, select the **ALARM ON** check-box. (see fig. 7.6B) To receive e-mail warnings about **daytime** sensor alarms, you need to check the **E-MAIL ON** check-box. (see fig. 7.6B) (check the NCR-6 manual for more information about setting up e-mail alarms)
- 7.7B: To activate the sensor's **NIGHTTIME ALARM** warnings and indicators, select the **ALARM ON** check-box. (see fig. 7.7B) To receive e-mail warnings about **nighttime** sensor alarms, you need to check the **E-MAIL ON** check-box. (see fig. 7.7B) (check the NCR-6 manual for more information about setting up e-mail alarms)

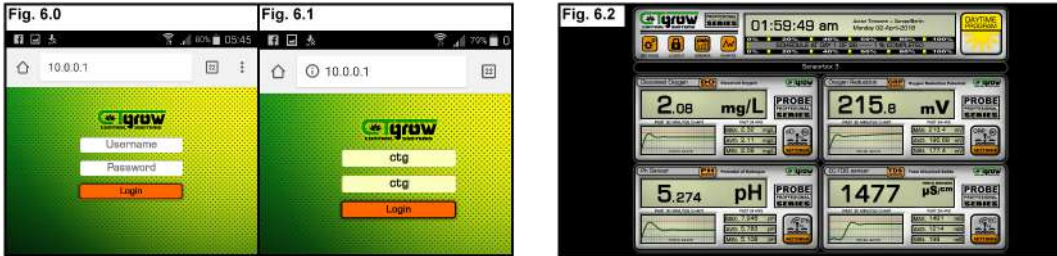


- 7.8: The maximum and minimum alarm sensor values can be setup totally independent from the normal sensor values. In normal operation conditions these alarm values would be set out of the normal sensor range to prevent getting lots of alarm messages from the sensor. The picture below shows how the sensor alarm warnings are handled (see fig. 7.8)

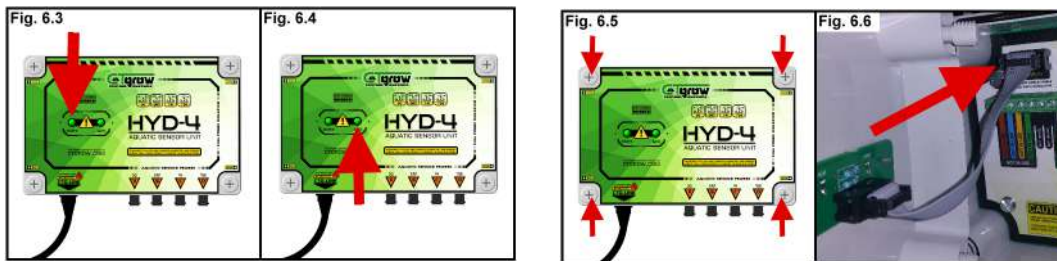


8: Sensor calibration procedure

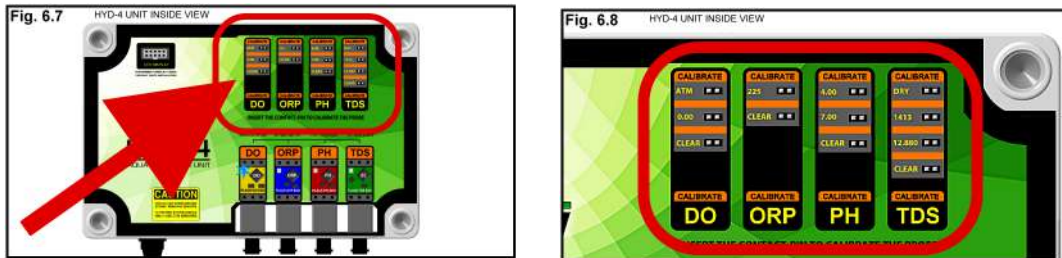
8.0: Calibrating the HYD-4 sensors is very easy to do, just follow the procedure for the sensor you want to calibrate below. To start the calibration procedure, You must first be logged in to your NCR-6 controller main screen. (see fig. 6.0 & 6.1) and (fig. 6.2)



8.0.1: When the green "DATA" led on the front-side of the HYD-4 Sensor-unit is "Flashing" every 4 to 5 seconds the HYD-4 Sensor-unit is ready for usage and/or calibration. (see fig. 6.3 & 6.4)

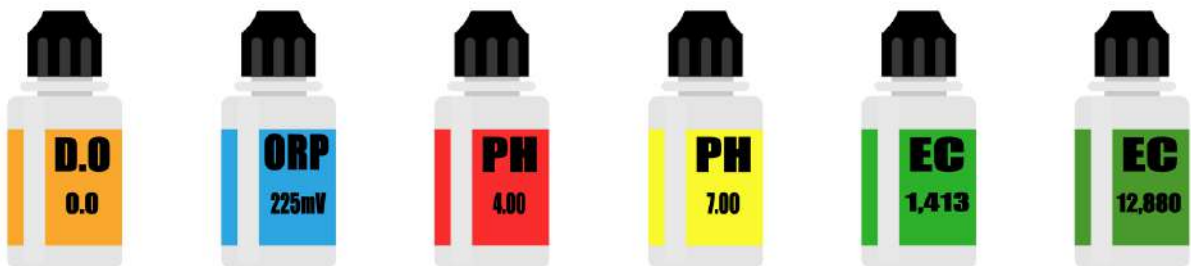


8.0.2: To access the calibration pins, The HYD-4 sensor-unit cover has to be removed. Unscrew the 4 corner screws (see fig. 6.5) and remove the flat-cable connector. (pull the connector from the terminal see fig. 6.6) Now the inside of the HYD-4 Unit will be accessible for sensor calibration. (see fig. 6.7 & 6.8)



WARNING !! BEFORE SENSOR CALIBRATION, MAKE SURE THE SENSOR IS NOT CONTROLLING ANY OUTLET, PUMP OR DOSAGE PROGRAM !!

8.0.3: All HYD-4 sensors have their own easy individual calibration procedure, For the most accurate calibrations make sure to ONLY use Fresh (NEW) calibration fluids. (Using old or re-used fluids may cause wrong calibration & measurement results.) The needed calibration fluids will be shown at the corresponding sensors calibration procedure. Select a sensor that needs re-calibration and follow the procedure for the selected sensor on the next pages.



See pages 12 to 17 for individual sensor probe calibrations

8.1: (DO) Sensor calibration procedure

Dissolved Oxygen Calibration

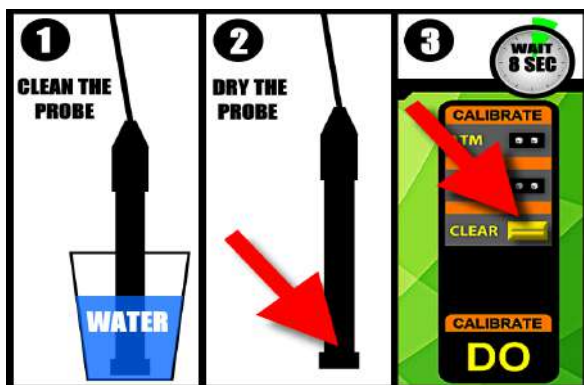
8.1.0: Before an calibration attempt, make sure that all of the needed calibration fluids are at the right temperature ($\pm 71^{\circ}\text{F} / 21.5^{\circ}\text{C}$).

If the water temperature, that the sensor will be measuring in, is normally below $64^{\circ}\text{F} / 18^{\circ}\text{C}$ or above $78^{\circ}\text{F} / 25^{\circ}\text{C}$ you need to bring the calibration fluids up to \pm the same temperature as the water to get the best calibration.

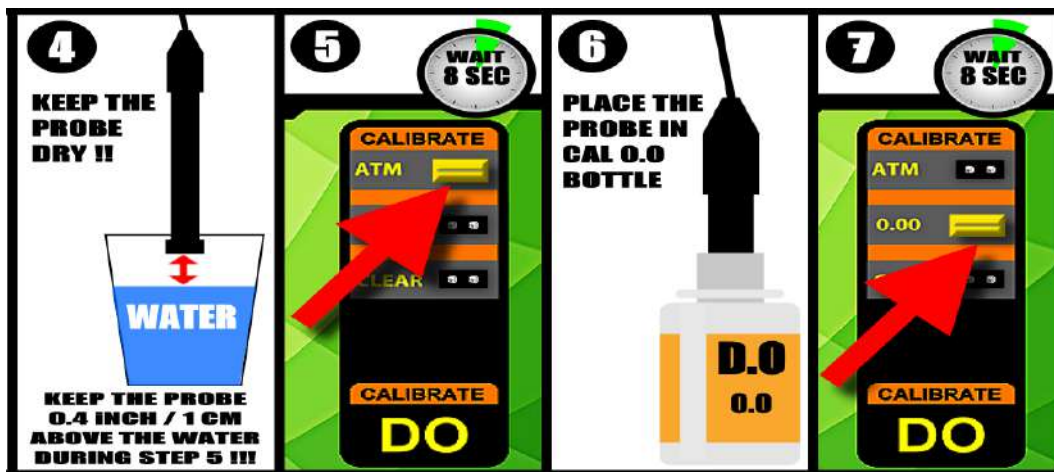
8.1.1: Start with cleaning the DO (Dissolved oxygen) sensor probe with tap water or by using the correct probe cleaner. (see pic 1) make sure that the probe is clean before proceeding to the next step.

8.1.2: Carefully Dry the probe's tip using a soft paper towel. (see pic 2) make sure that the probe is dry before proceeding.

8.1.3: Place the probe on a dry soft paper towel and place the plastic yellow contact-pin over the 2 (CLEAR) pins and wait for about 8 seconds before taking the yellow plastic yellow contact-pin off again. (see pic 3)



8.1.4: Hold the DO probe above a glass of fresh tap water for at least 30 seconds (see pic 5) before placing the plastic yellow contact-pin over the 2 (ATM) pins while keeping te probe above the fresh tap water and wait for about 8 seconds before taking the yellow plastic yellow contact-pin off again. (see pic 5)



8.1.5: Place the DO probe in the (DO 0.0) calibration fluid for at least 3 minutes (see pic 6) before placing the plastic yellow contact-pin over the 2 (ATM) pins while keeping te probe in the calibration fluid and wait for about 8 seconds before taking the yellow plastic yellow contact-pin off again. (see pic 7)

(When the procedure has completed succesfully, The HYD-4 "DO" sensor should now indicate 0.0 oxygen on your controller's mainpage when the probe is placed in the DO 0.0 calibration solution. (see pic 5.2 above)

TIP !! BEFORE CLOSING THE 0.0 CALIBRATION SOLUTION BOTLLE, PUT SOME LIGHTER GAS IN THE BOTTLE TO KEEP AIR OUT OF IT !!

8.2: (ORP) Sensor calibration procedure

Oxidation Reduction Potential

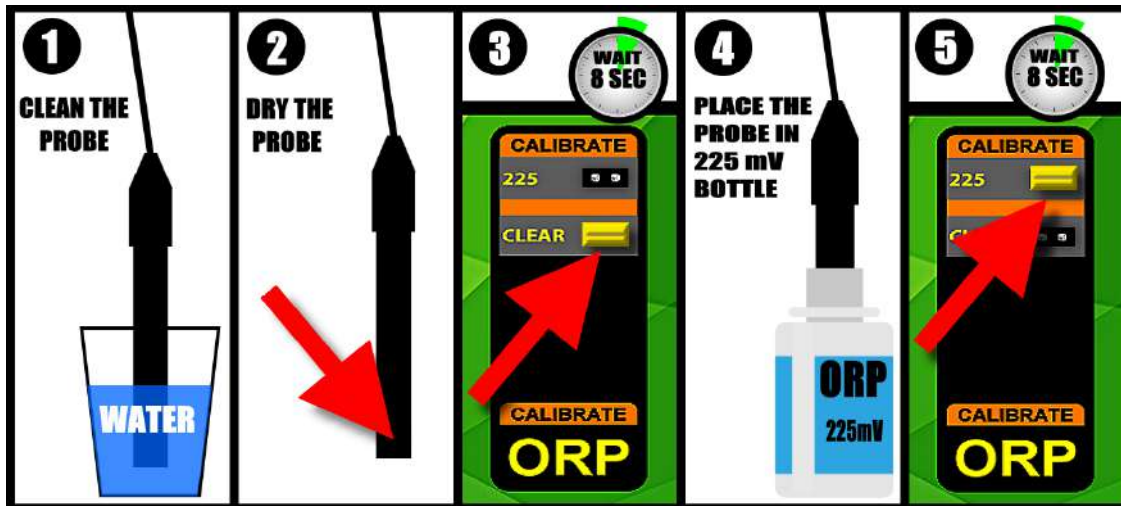
8.2.0: Before an calibration attempt, make sure that all of the needed calibration fluids are at the right temperature ($\pm 71^{\circ}\text{F} / 21.5^{\circ}\text{C}$).

If the water temperature, that the sensor will be measuring in, is normally below $64^{\circ}\text{F} / 18^{\circ}\text{C}$ or above $78^{\circ}\text{F} / 25^{\circ}\text{C}$ you need to bring the calibration fluids up to \pm the same temperature as the water to get the best calibration.

8.2.1: Start with cleaning the ORP sensor probe with tap water or by using the correct probe cleaner. (see pic 1) make sure that the probe is clean before proceeding to the next step.

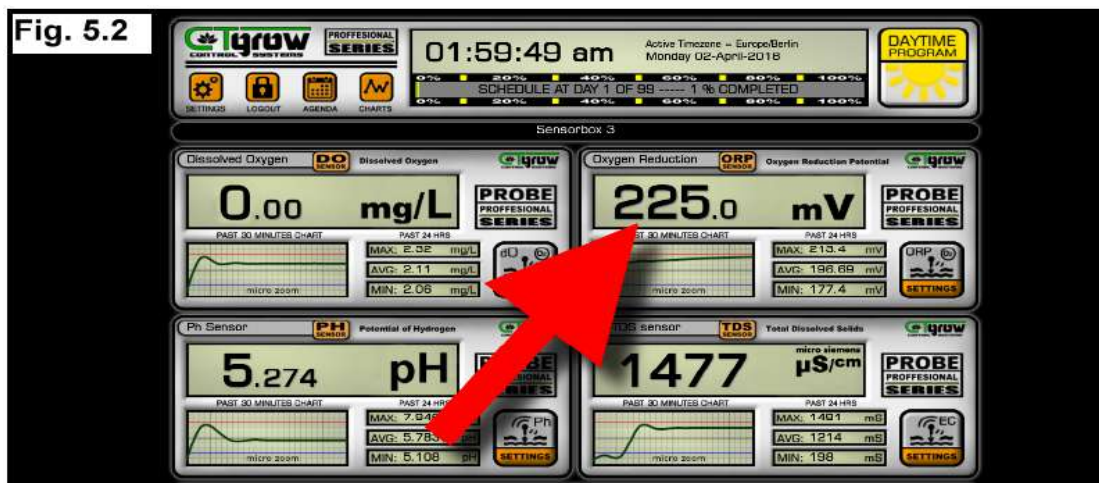
8.2.2: Carefully Dry the probe's tip using a soft paper towel. (see pic 2) make sure that the probe is dry before proceeding.

8.2.3: Place the probe on a dry soft paper towel and place the plastic yellow contact-pin over the 2 (CLEAR) pins and wait for about 8 seconds before taking the yellow plastic yellow contact-pin off again. (see pic 3)



8.2.4: Place the ORP probe in the (ORP 225mV) calibration fluid for at least 3 minutes (see pic 4) before placing the yellow contact-pin over the 2 (225) pins while keeping the probe in the calibration fluid and wait for about 8 seconds before taking the yellow plastic yellow contact-pin off again. (see pic 5)

(When the procedure has completed successfully, The HYD-4 "ORP" sensor should now indicate 225 mV on your controller's mainpage when the probe is placed in the ORP 225mV calibration solution. (see pic 5.2 below)



8.3: (PH) Sensor calibration procedure (Part 1)

THE HYD-4 PH SENSOR PROBE NEEDS A DUAL CALIBRATION WITH PH 7.00 AND PH 4.00 CALIBRATION FLUIDS, PLEASE FOLLOW THE INSTRUCTIONS BELOW TO GET THE MOST ACCURATE CALIBRATION FOR YOUR SENSOR

PH Sensor Calibration (7.00)

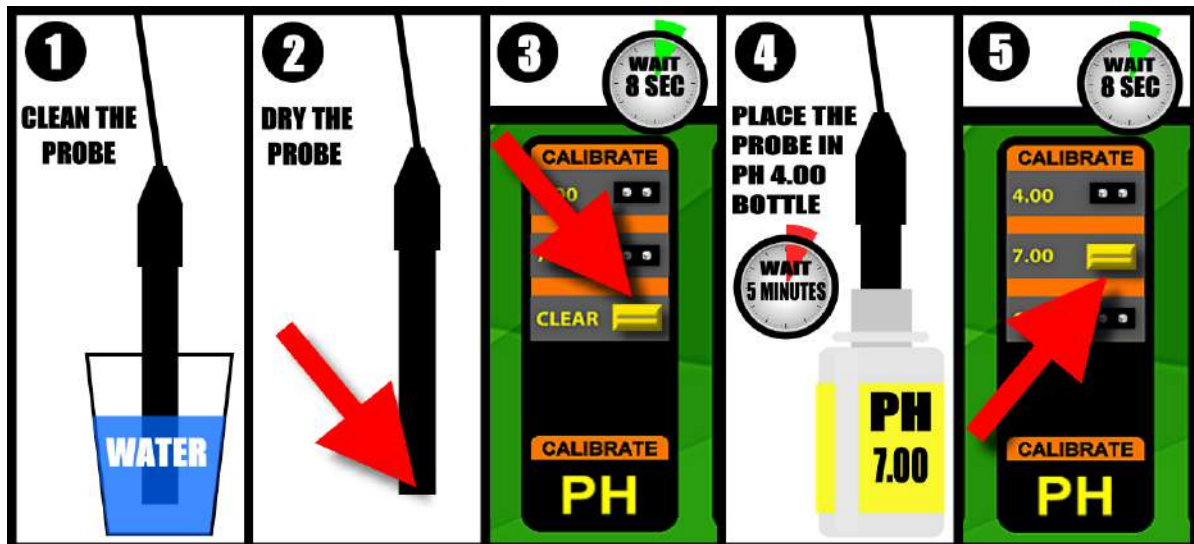
8.3.0: Before an calibration attempt, make sure that all of the needed calibration fluids are at the right temperature ($\pm 71^{\circ}\text{F} / 21.5^{\circ}\text{C}$).

If the water temperature, that the sensor will be measuring in, is normally below $64^{\circ}\text{F} / 18^{\circ}\text{C}$ or above $78^{\circ}\text{F} / 25^{\circ}\text{C}$ you need to bring the calibration fluids up to \pm the same temperature as the water to get the best calibration.

8.3.1: Start with cleaning the PH (Potential of Hydrogen) sensor probe with tap water or by using the correct probe cleaner. (see pic 1) make sure that the probe is clean before proceeding to the next step.

8.3.2: Carefully Dry the probe using a soft paper towel. (see pic 2) make sure that the probe is dry before proceeding.

8.3.3: Place the probe on a dry soft paper towel and place the plastic yellow contact-pin over the 2 (CLEAR) pins and wait for about 8 seconds before taking the yellow plastic yellow contact-pin off again . (see pic 3)



8.3.4: Place the PH probe in the bottle with PH 7.00 calibration fluid stir it a bit to get airbubbles out. (see pic 4)

8.3.5: Leave the probe in the PH 7.00 bottle for 5 minutes and than place the yellow contact-pin over the 2 (7.00) pins (see pic 5) wait for about 8 seconds before taking the yellow contact-pin off again. (see pic 5)

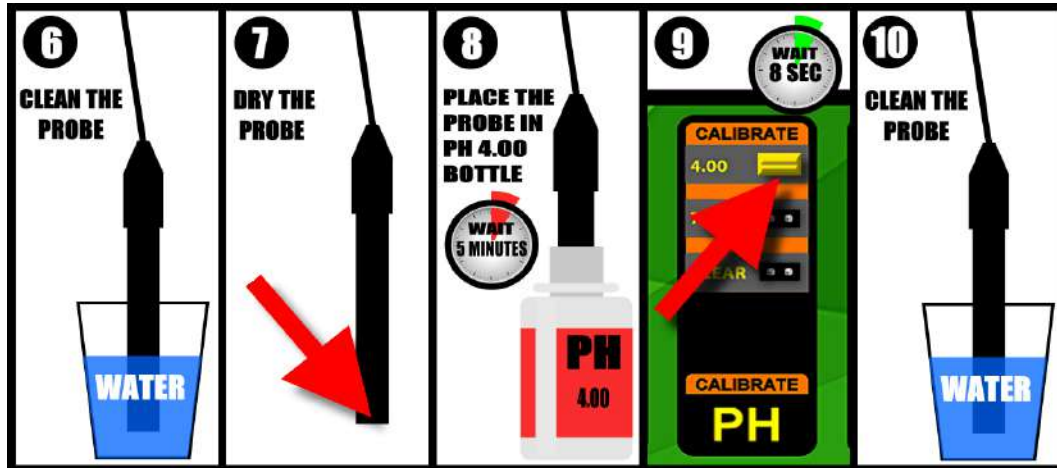
IMPORTANT !!

CONTINUE THIS CALIBRATION PROCEDURE ON PAGE 15 !!

8.3: (PH) Sensor calibration procedure (Part 2)

PH Sensor Calibration (4.00)

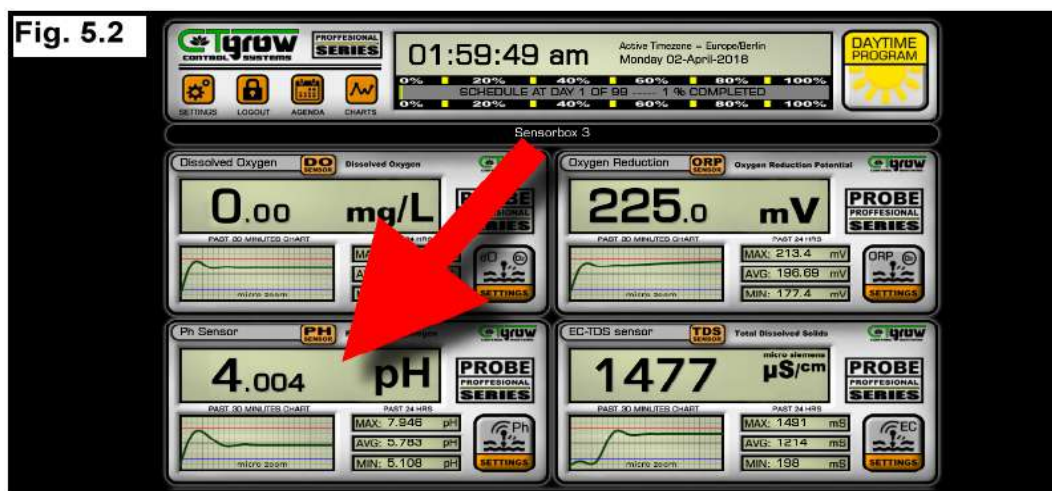
- 8.3.6: clean the PH (Potential of Hydrogen) sensor probe with tap water or by using the correct probe cleaner. (see pic 6) make sure that the probe is clean before proceeding to the next step.
- 8.3.7: Carefully Dry the probe using a soft paper towel. (see pic 7) make sure that the probe is dry before proceeding.



- 8.3.8: Place the PH probe in the bottle with PH 4.00 calibration fluid stir it a bit to get airbubbles out. (see pic 8)
- 8.3.9: Leave the probe in the bottle for 5 minutes and then place the plastic yellow contact-pin over the 2 (4.00) pins (see pic 9) while keeping the probe in the 4.00 calibration fluid and wait for about 8 seconds before taking the yellow plastic yellow contact-pin off again. (see pic 9)

(When the procedure has completed successfully, The HYD-4 “PH” sensor should now indicate 4.00 on your controller's mainpage when the probe is placed in the PH 4.00 calibration solution. (see pic 5.2 below)

clean the PH (Potential of Hydrogen) sensor probe with tap water or by using the correct probe cleaner. This finishes the calibration procedure your sensor and it's ready for usage. (see pic 10)

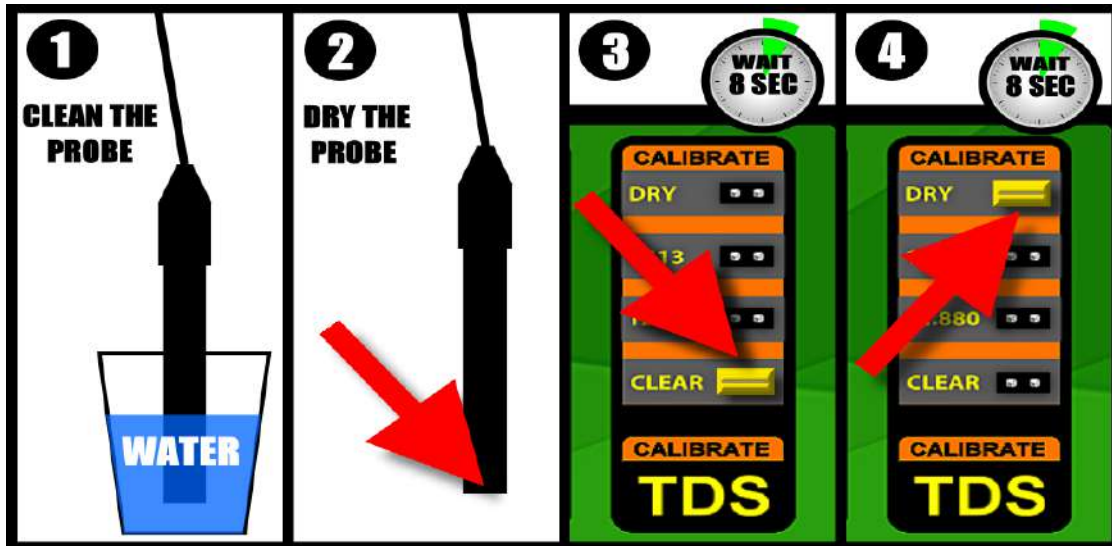


8.4: (EC/TDS) Sensor calibration procedure (Part 1)

THE HYD-4 EC/TDS SENSOR PROBE NEEDS A DUAL CALIBRATION WITH EC 1,413 AND EC 12,880 CALIBRATION FLUIDS, FOLLOW THE INSTRUCTIONS BELOW TO GET THE MOST ACCURATE CALIBRATION FOR YOUR SENSOR

EC/TDS Sensor Calibration (Part 1)

- 8.4.1: Clean the EC/TDS (Electrical Conductivity) sensor probe with tap water or by using the correct probe cleaner. (see pic 1) make sure that the probe is clean before proceeding to the next step.
- 8.4.2: Carefully Dry the probe using a soft paper towel. (see pic 2) make sure that the probe is dry before proceeding.
- 8.4.3: Place the probe on a dry soft paper towel and place the plastic yellow contact-pin over the 2 (CLEAR) pins and wait for about 8 seconds before taking the yellow plastic yellow contact-pin off again. (see pic 3)



- 8.4.4: Keep the probe on a dry soft paper towel and place the plastic yellow contact-pin over the 2 (DRY) pins and wait for about 8 seconds before taking the yellow plastic yellow contact-pin off again. (see pic 3)

IMPORTANT !!

CONTINUE THIS CALIBRATION PROCEDURE ON PAGE 17 !!

8.4: (EC/TDS) Sensor calibration procedure (Part 2)

THE HYD-4 EC/TDS SENSOR PROBE NEEDS A DUAL CALIBRATION WITH EC 1,413 AND EC 12,880 CALIBRATION FLUIDS, FOLLOW THE INSTRUCTIONS BELOW TO GET THE MOST ACCURATE CALIBRATION FOR YOUR SENSOR

EC/TDS Sensor Calibration (Part 2)

8.4.5: Before an calibration attempt, make sure that all of the needed calibration fluids are at the right temperature ($\pm 71^{\circ}\text{F} / 21.5^{\circ}\text{C}$).

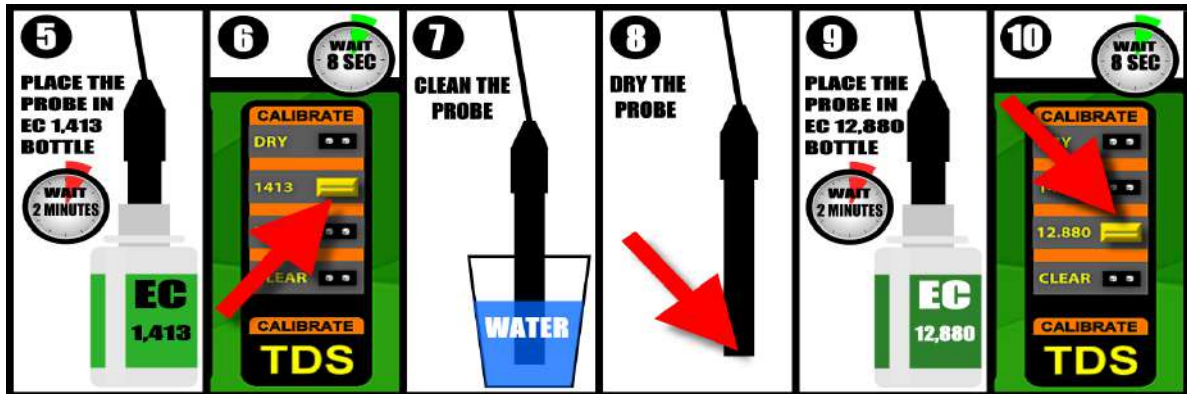
If the water temperature, that the sensor will be measuring in, is normally below $64^{\circ}\text{F} / 18^{\circ}\text{C}$ or above $78^{\circ}\text{F} / 25^{\circ}\text{C}$ you need to bring the calibration fluids up to \pm the same temperature as the water to get the best calibration.

8.4.5: Place the EC/TDS probe in the bottle with EC/TDS 1,413 calibration fluid stir it a bit to get airbubbles out. (see pic 5)

8.4.6: Leave the probe in the EC/TDS 1,413 bottle for 2 minutes and then place the yellow contact-pin over the 2 (1413) pins (see pic 6) wait for about 8 seconds before taking the yellow contact-pin off again. (see pic 6)

8.4.7: Clean the EC sensor probe with tap water or by using the correct probe cleaner. (see pic 7) make sure that the probe is clean before proceeding to the next step.

8.4.8: Carefully Dry the probe using a soft paper towel. Make sure that the probe is dry before proceeding. (see pic 8)

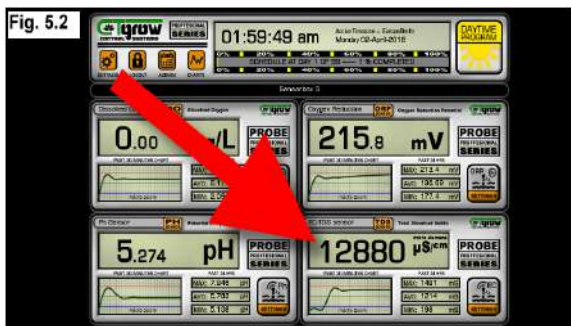


8.4.9: Place the EC/TDS probe in the bottle with EC/TDS 12,880 calibration fluid stir it a bit to get airbubbles out. (see pic 9)

8.4.10: Leave the probe in the EC/TDS 12,880 bottle for 2 minutes and then place the yellow contact-pin over the 2 (12,880) pins (see pic 10) and wait for about 8 seconds before taking the yellow contact-pin off again. (see pic 10)

(When the procedure has completed successfully, The HYD-4 "EC/TDS" sensor should now indicate 12880 on your controller's mainpage when the probe is placed in the EC/TDS 12,880 calibration solution. (see pic 5.2 below)

clean the EC/TDS (Electric Conductivity) sensor probe with tap water or by using the correct probe cleaner. This finishes the calibration procedure your sensor and it's ready for usage.

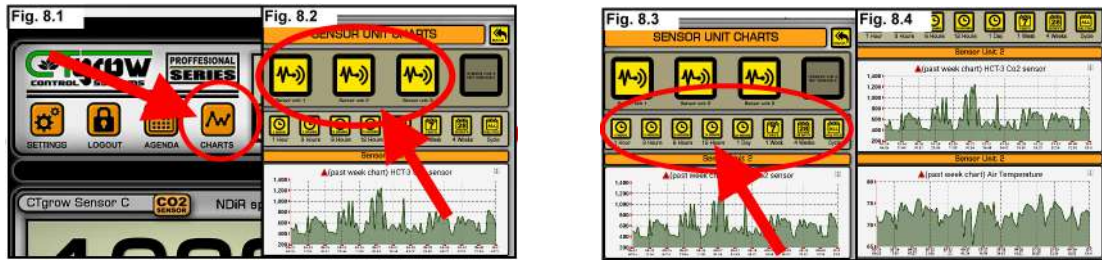


9: Graphical Sensor charts functions

When a sensor unit has been connected to the NCR-6 controller, the graphical charts functions will become available. The controller can show detailed graphical charts of every attached sensor. All sensors-units will have (8) timespan cycles, varying between the last hour up to the full cycle (from start to finish). The charts show details about the sensors values during the cycles and can help growers with real insight about their grow. All our charts are easily zoom-able and offer you the option to download them in .png format for further analysis on other devices. To use the charts function, follow the procedure below.

SELECTING GRAPHICAL SENSOR CHARTS

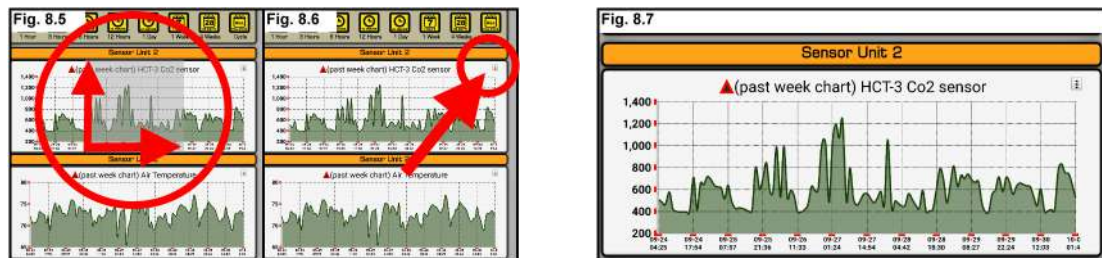
- 9.1a: Press the [CHARTS] button (see fig.8.1) on the top left of the top bar, this will bring up the CHARTS menu. (see fig. 8.2)
- 9.2a: Depending on the number of connected sensor units, the CHARTS menu will show you the units that are connected. Press on the [SENSOR UNIT NR] to select the sensor-unit charts you want to inspect. (see fig.8.2) (sensor unit 1 is default)



- 9.3a: The controller will show the past 1 hour values for all sensors connected to this sensor-unit. Now make a choice from one of the 8 possible timespan selections. (see fig.8.3) and press on it for selection. (NOTE !! loading can take a couple of seconds, depending on the chosen timespan) (selecting the full [CYCLE] option can take up to a minute to load because large amounts of sensor data)
- 9.4a: This will show the Graphical charts of all the selected sensor-unit's sensors. (see fig.8.4) Scroll down the chart screen to view all available charts. Note !! only available sensors will be visible in the 6 block default menu.

ZOOM & PAN ON GRAPHICAL SENSOR CHARTS

- 9.1b: To ZOOM in on any graphical sensor chart, go to the (white) sensor chart field and select and hold the start-point of interest. (see fig.8.5) and drag it to the end-point of interest.
- 9.2b: To PAN (scroll left-right) on any graphical sensor chart, you need to be zoomed in first. Go to the sensor-menu (see fig.8.6) and press the [PAN] button (see fig.8.7) you can now drag the chart to the area of interest.



- 9.3b: To ZOOM back out on any graphical sensor chart, go to the sensor-menu (see fig. 8.6) press the [RESET] button. This should zoom back out on the chart.

SAVING GRAPHICAL CHARTS

- 9.1c: To save any graphical sensor chart, go to the sensor-menu (see fig. 8.6) and click on [SAVE AS PNG] This should automatically downloading the graphical chart to your device.

10: E-mail alerts & sensor warnings

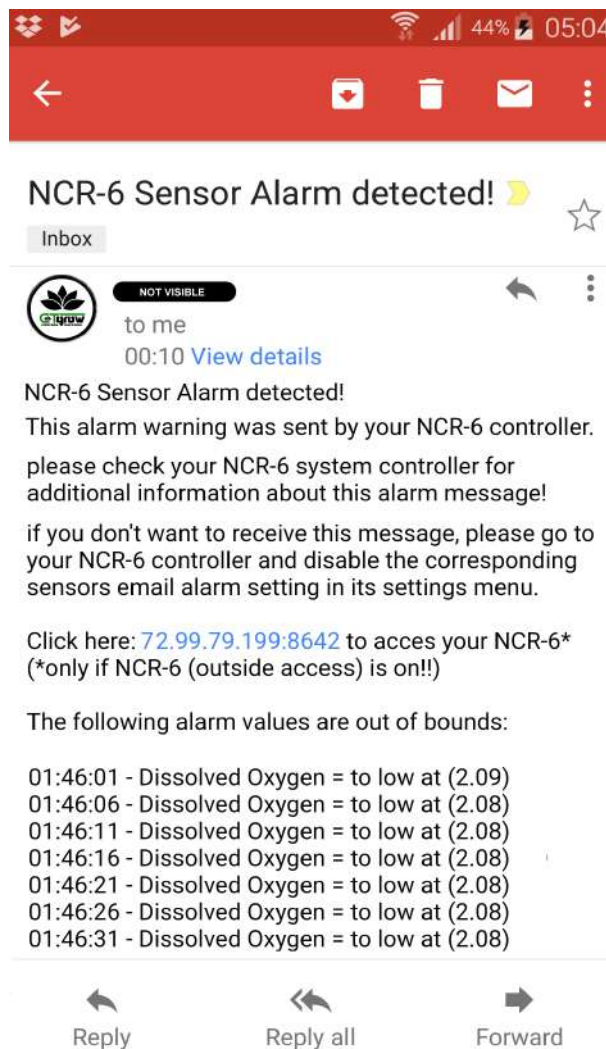
The NCR-6 controller can be used to send alarm warning messages from the HYD-4 sensor-unit to your email address. These alarm messages contain alerts about sensor values that are out of bounds. The received email alarm warnings also give the user the possibility to login to the system directly from the e-mail* (*Google Gmail only!!!) We encourage users to make use of (Google Gmail) because this is the easiest way to use all the extra functions that come with the email warnings function.

(SEE YOUR NCR-6 CONTROLLER USER MANUAL CHAPTER 9 FOR MORE INFORMATION ON SETTING UP E-MAIL ALERTS)

Note !! The NCR-6 controller needs to be connected to the Internet for the alert messages to work.

- 10.1:** When a sensors values goes out of bounds (**sensor alarm values**) the system will send an automated message to your e-mail address containing the sensor data & time that was reported as an alarm. The controller will send an e-mail every 5 minutes for as long as the sensor is out of bounds (**see fig. 9.1**) (ONLY WORKS WHEN THE SENSOR'S ALARMS AND E-MAIL ALERTS ARE ACTIVATED !!)

this is an example e-mail alarm message used with g-mail



11: HYD-4 Specifications and Dimensions

HYD-4 unit Specifications:

Dimensions HxWxD (unit only)	: 13.0 x 18.5 x 10.0	: 5.11 x 7.28 x 3.93
CTG-LINK Cable length	: ± 5 Mtr	: ± 15 Feet
Number of sensors ports	: 4	: 4
Power cable length	: Uses POWERED CTG-LINK	: Uses POWERED CTG-LINK
Unit warm-Up Time	: <120 seconds at 22°C	: <120 seconds at 72°F
Working temperature	: 1°C ~ 60°C	: 33.8°F ~ 140°F
Avg sensor unit lifespan	: >5 years	: >5 years
HYD-4 Sensor unit Warranty	: 1 Year (excl. sensors, EZO's & cables)	: 1 Year (excl. sensors, EZO's & cables)

(OPTIONAL) Ph probe Specifications:

Measurement Range	: 0 ~ 14 Ph	: 0 ~ 14 Ph
Resolution ratio	: 0.001	: 0.001
Cable length probe	: ± 100 Cm	: ± 39.37 Inch
Response Time	: <5 seconds	: <5 seconds
Working temperature	: 1°C ~ 90°C	: 33.8°F ~ 194°F
Max pressure	: 100 Psi	: 100 Psi
Time before re-calibration	: ~ 1 year	: ~ 1 year
Avg sensor lifespan	: >2 years	: >2 years

(OPTIONAL) EC/TDS (K1.0) probe Specifications:

Measurement Range	: 5 – 200,000 µS/cm	: 5 – 200,000 µS/cm
Resolution ratio	: 1 µS/cm	: 1 µS/cm
Cable length probe	: ± 100 Cm	: ± 39.37 Inch
Response Time	: <5 seconds	: <5 seconds
Working temperature	: 1°C ~ 90°C	: 33.8°F ~ 194°F
Max pressure	: 500 Psi	: 500 Psi
Time before re-calibration	: ~ 10 years	: ~ 10 years
Avg sensor lifespan	: ~ 10 years	: ~ 10 years

(OPTIONAL) Dissolved Oxygen probe Specifications:

Measurement Range	: 0 ~ 100 mg/L	: 0 ~ 100 mg/L
Resolution ratio	: 0.001 mg/L	: 0.001 mg/L
Cable length probe	: ± 100 Cm	: ± 39.37 Inch
Response Time	: <5 seconds	: <5 seconds
Working temperature	: 1°C ~ 50°C	: 33.8°F ~ 122°F
Max pressure	: 500 Psi	: 500 Psi
Time to re-calibration / maintenance	: ~ 1 year / 18 months	: ~ 1 year / 18 months
Avg sensor lifespan	: ~ 5 years	: ~ 5 years

(OPTIONAL) Oxygen Reduction Potential probe Specifications:

Measurement Range	: -2000mV ~ +2000mV	: -2000mV ~ +2000mV
Resolution ratio	: 0.1 mV	: 0.1 mV
Cable length probe	: ± 100 Cm	: ± 39.37 Inch
Response Time	: <5 seconds	: <5 seconds
Working temperature	: 1°C ~ 80°C	: 33.8°F ~ 176°F
Max pressure	: 100 Psi	: 100 Psi
Time before re-calibration	: ~ 1 year	: ~ 1 year
Avg sensor lifespan	: >2 years	: >2 years