



WORLD
PRECISION
INSTRUMENTS

INSTRUCTION MANUAL

pH-LUX

Fiber Optic pH Sensor and System

Serial No. _____

www.wpiinc.com

071720

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ABOUT THIS MANUAL

The following symbols are used in this guide:



This symbol indicates a CAUTION. Cautions warn against actions that can cause damage to equipment. Please read these carefully.



This symbol indicates a WARNING. Warnings alert you to actions that can cause personal injury or pose a physical threat. Please read these carefully.

NOTES and TIPS contain helpful information.



Fig. 1—pH-Lux instrument with on/off switch and fiber optic SMA connector

INTRODUCTION

The pH-Lux™ instrument and its fiber optic sensors detect pH changes through measuring the luminescence intensity. The newly developed instrument reduces the effect of photobleaching and stray light, which are problems found in many conventional sensors.



Fig. 2—The fiber optic pH sensor is housed in a 19 Gauge hypodermic needle. Light travels through an optical fiber to the sample and back.

Notes and Warnings



CAUTION: Dropping, hitting or bumping the sensor tip can cause permanent damage to the sensor. The sensor tip is fragile and can break. When the pH sensor is not in use, always protect the tip with the plastic guard provided.



CAUTION: Always store the fiber optic sensors in protective sleeves when they are not used, and do not bend them sharply or drop heavy objects on the fiber optic cable. Damaging the optical fibers causes loss of light transmission.

Parts List

After unpacking, verify that there is no visible damage to the sensor. Verify that all items are included:

(1) pH-Lux instrument

(1) Power supply

(1) CAT 5 (or above) network cable

Instruction manuals are available online at www.wpiinc.com/manuals.

Unpacking

Upon receipt of this instrument, make a thorough inspection of the contents and check for possible damage. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed damage should be reported at once to the carrier and an inspection requested. Please read the section entitled "Claims and Returns" on page 23 of this manual. Please contact WPI Customer Service if any parts are missing at (941) 371-1003 or customerservice@wpiinc.com.

Returns: Do not return any goods to WPI without obtaining prior approval (RMA # required) and instructions from WPI's Returns Department. Goods returned (unauthorized) by collect freight may be refused. If a return shipment is necessary, use the original container, if possible. If the original container is not available, use a suitable substitute that is rigid and of adequate size. Wrap the instrument in paper or plastic surrounded with at least 100mm (four inches) of shock absorbing material. For further details, please read the section entitled "Claims and Returns" on page 23 of this manual.

INSTRUMENT DESCRIPTION

Setup Connections

The power supply connects to the USB port of the pH-LUX instrument. The optical sensor connects to the SMA terminated fiber optic input.

Connecting to pH-LUX Device

Switch the instrument ON and wait for one minute for the system to start up. You can connect to it in three different ways. We recommend connecting via LAN (b) to get a fast and reliable connection

- Connect via Wi-Fi
- Connect via LAN (with DHCP-Server in your network)
- Connect via LAN cable directly to your PC

Connect via Wi-Fi

- Open your Wi-Fi-Manager on your laptop or mobile device and connect to WPIpHLUX (or a similar name).
- Use *wpiphluxwifi* as passphrase. (Your device might note that there is no working internet connection, but just continue.)
- Open your browser and type *http://192.168.4.1* in the address bar (Chrome, Firefox, Safari, Edge and mobile versions should work.)

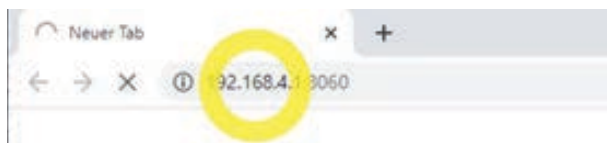


Fig. 3—Enter the IP address of the sensor into a browser address bar.

Connect via LAN (with DHCP-Server in your network)

Connect the pH-LUX to your network using the supplied Ethernet cable. To find the IP address of your device you should connect via Wi-Fi (a) first. The LAN IP address is shown in the lower right (e.g. *http://192.168.160.65*).

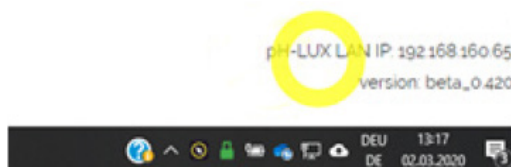


Fig. 4—The LAN IP address of the device is shown in the lower right corner.

Connect via LAN cable directly to your PC (only for advanced users)

To connect your PC to the pH-LUX directly, your PC needs a fixed IP address. To change your PC settings (Windows 10), please follow these steps.

NOTE: These instructions should only be followed by advanced Windows users or a system administrator.

1. Right click on your Windows *Start* button.

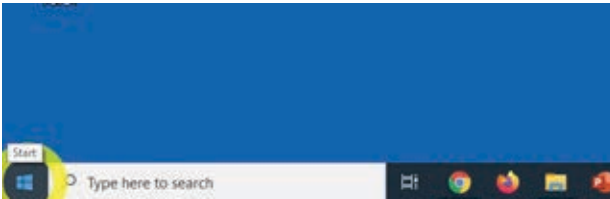


Fig. 5—Click on the Window Start button.

2. Choose *Network Connections*.

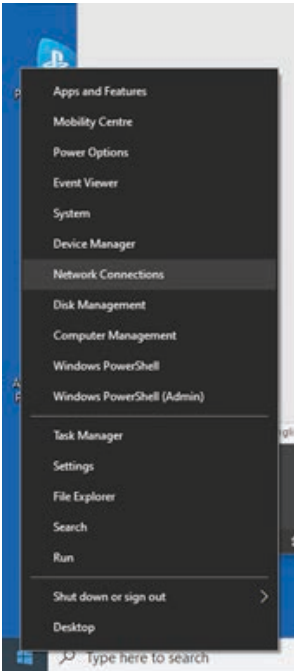


Fig. 6—Network Connections opens a Settings window.

3. Click on *Ethernet*.

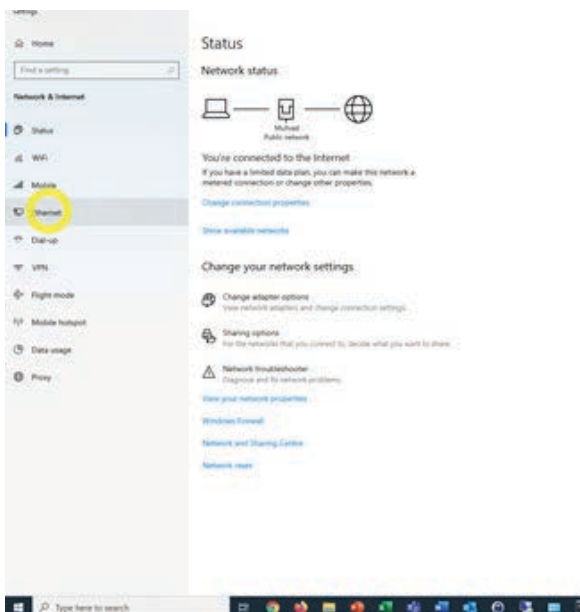


Fig. 7—The Ethernet tab shows the status of your network.

4. Click on *Change adapter options* on the upper right side.

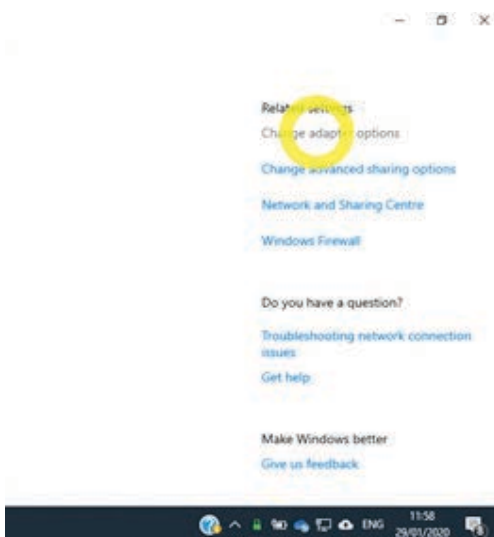


Fig. 8—Change the adapter options

5. Right click on your Ethernet connection, then choose *Properties*.

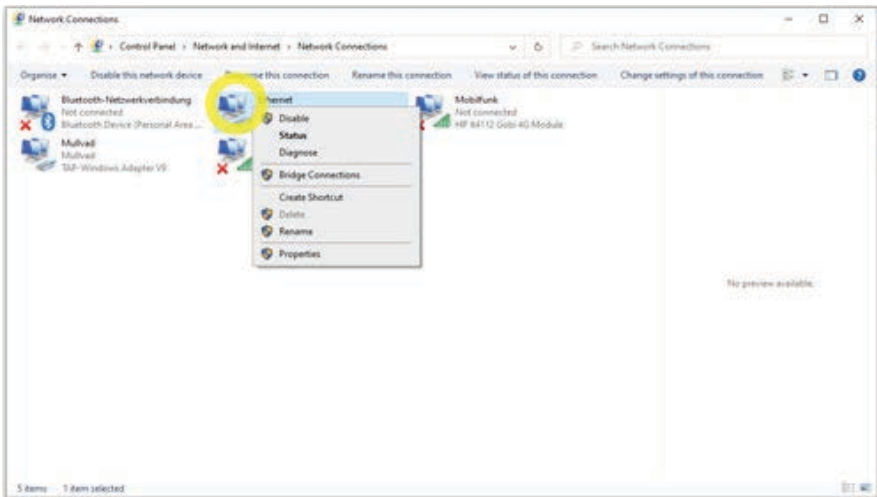


Fig. 9—Right click to open the popup menu.

6. Double click on *Internet Protocol Version 4*.

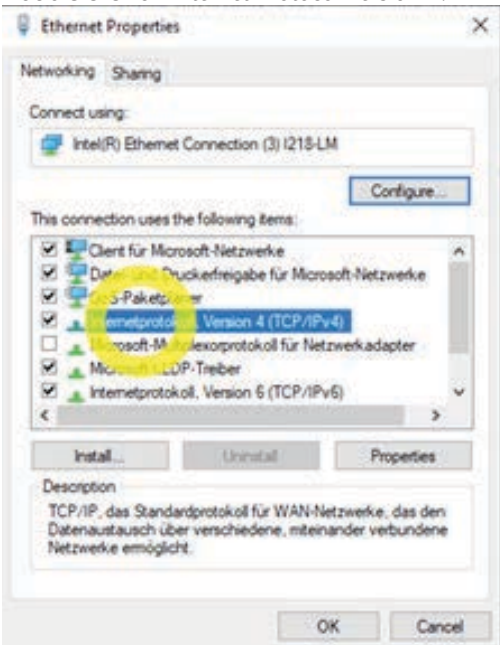


Fig. 10—Ethernet Properties window

7. Change the settings as shown below. After your measurement, make sure to change the settings back to *Obtain an IP address automatically*.

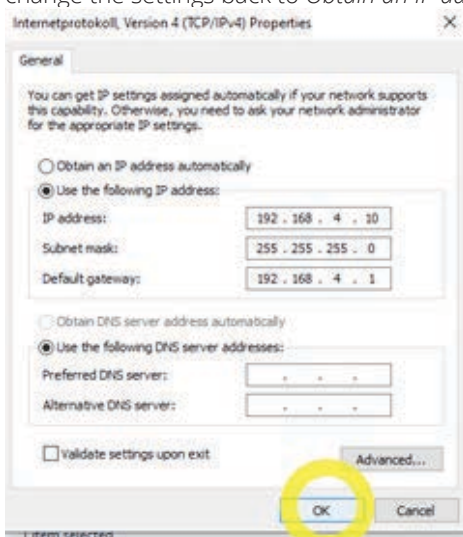


Fig. 11—Use these settings and press OK.

8. Press OK. Then, press OK in the *Ethernet Properties* window.
9. Open your browser and type *http://192.168.4.2:8060* in the address bar. (Chrome, Firefox, Safari, Edge and mobile versions should work.)

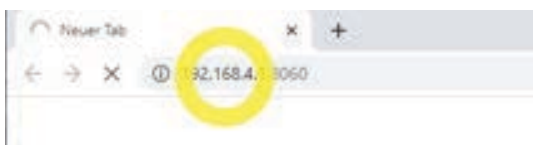


Fig. 12—Enter the IP address into the address bar of your browser.

OPERATING INSTRUCTIONS

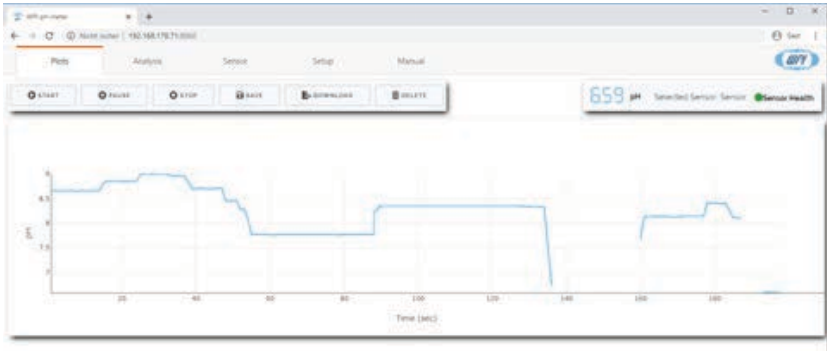


Fig. 13—Web interface to pH-LUX instrument.

pH Sensors and Taking Measurements

The pH sensor is a syringe sensor style design. The sensor tip is housed inside a hypodermic needle to secure it from accidental damage and too allow for easy penetration of a septum or for measuring inside a sealed vial or a similar application.



Fig. 14—Sensor secured with protective cover and position lock.



Fig. 15—Sensor with protective cover and position lock removed, but retracted.



Fig. 16—Sensor with sensor tip extended about 10 mm out of the syringe needle.

During transport and when not in use, the sensor should be secured with the protective cover and locked. When the sensor is to be used, the protective cover is removed, the lock tubing is withdrawn from the syringe and the sensor is extended from the needle.

A simple indicator that the sensor is extended is the position of the black syringe seal. If it is up, then the sensor is inside the syringe, if it completely pressed down, the sensor tip is about. 10 mm extended from the sensor tip.



Fig. 17—The pH sensor tip is extended and ready for use.

To take a measurement, simply immerse the tip is in a sample solution.



CAUTION: It is imperative that the fiber optic sensor is handled gently.



Fig. 18—A typical calibration setup has five buffered pH solutions.



Fig. 19—The pH sensor at the tip is delicate.



CAUTION: For all measurements WPI recommends using a sensor holder (e.g. stand or micromanipulator).

1. Carefully extend the optical fiber from the syringe needle! (Avoid mechanical stress to the optical fiber.) Accurate measurements are only possible if the sensor tip is completely extended!

CAUTION: During all measurements ensure that only the sensor tip is dipped into the aqueous solution or pH buffer and not the syringe needle!

CAUTION: Do not retract the sensor without cleaning the tip in distilled water! Salt crystallization might destroy the sensor tip.

2. Clean the sensor tip in distilled water and then retract it into the syringe needle.
3. Store the sensors in a dark and dry environment.

Calibrate a sensor

To calibrate your sensor correctly you need five different, uncolored pH buffer solutions. We recommend using buffers near pH 5, pH 6, pH 7, pH 8 and pH 8.5.

1. To calibrate a sensor, change to the *Sensor* tab and enter the sensor serial number of the sensor (or enter a name of your choice) and press *Next*.

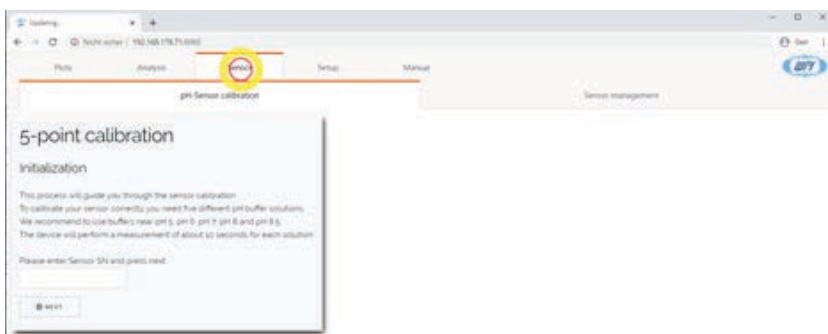


Fig. 20—On the *Sensor* tab, enter your sensor serial number.

2. Enter the pH values of your buffer solutions.

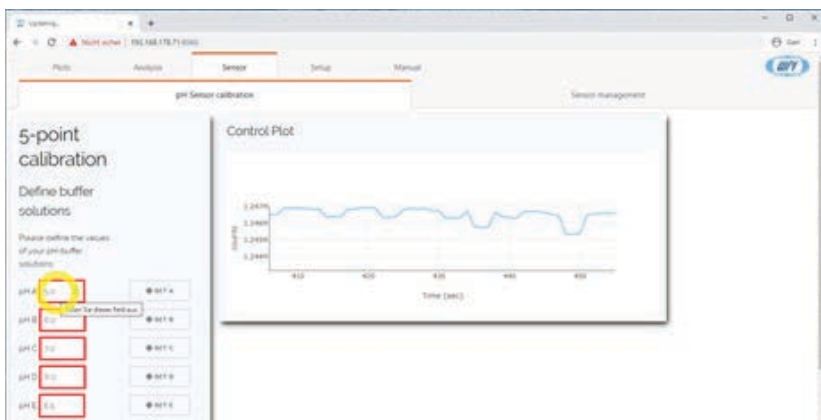


Fig. 21—Enter the pH values for your calibration buffer solutions.

3. Place the sensor in first calibration solution, e.g. pH 5.0, wait until the readings stabilize (approximately 30 seconds) and click *Set A*. The system will perform a measurement of 10 seconds for each solution.
4. Place the sensor in next calibration solution, e.g. pH 6.0, wait until the readings stabilize (approximately 30 seconds) and click *Set B*.
5. Place the sensor in next calibration solution, e.g. pH 7.0, wait until the readings stabilize (approximately 30 seconds) and click *Set C*.
6. Place the sensor in next calibration solution, e.g. pH 8.0, wait until the readings stabilize (approximately 30 seconds) and click *Set D*.
7. Place the sensor in next calibration solution, e.g. pH 8.5, wait until the readings stabilize (approximately 30 seconds) and click *Set E*.
8. When all measurements have been completed, press the appearing *Finish Calibration* button. You get a popup message if the process was successful.
9. The new sensor is automatically set as active. You can now change to the *Plot* tab to perform measurements.
10. Clean the sensor tip in distilled water and then retract it into the syringe needle.

When should a sensor be recalibrated?

- When a new sensor is connected to the instrument
- At the beginning of each workday
- After disconnection from the instrument

Testing a Sensor

The pH sensor is a fluorescence intensity-based sensor with an ultra low bleaching dye.

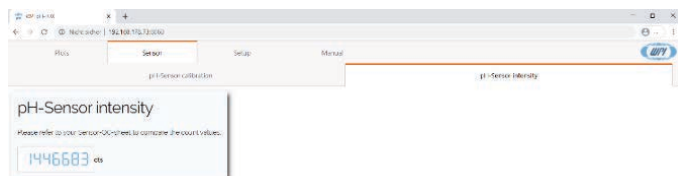


Fig. 22—

The performance, and therefore the health, of the sensor can be tested using this procedure:

1. Insert the sensor into a pH-5 buffer that is used for calibration.
2. Read the fluorescence intensity of the sensor in the **Sensor>pH-Sensor Intensity** tab.
3. Compare the reading with the valid range of the sensor at pH 5 that is defined on the Certificate of Product Performance sheet supplied with each sensor.
4. If the readings are too low, verify that the sensor is properly connected to the optical pH meter and that the sensor tip is extended out of the syringe needle and dipped into the pH buffer solution.
5. If the sensor fails to conform to the specified valid range, it must be replaced.

Starting and Pausing the Measurement

To start the measurement, change to the *Plots* tab and press the *Start* button.

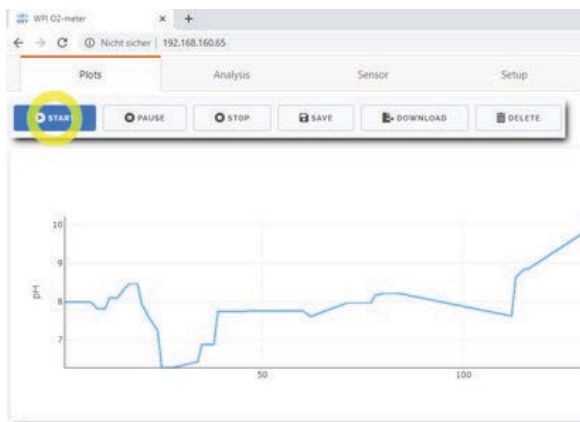


Fig. 23—The *Plots* tab lets you make measurements.

To pause the measurement press the *Pause* button. The *Stop* button is not in use in this state.

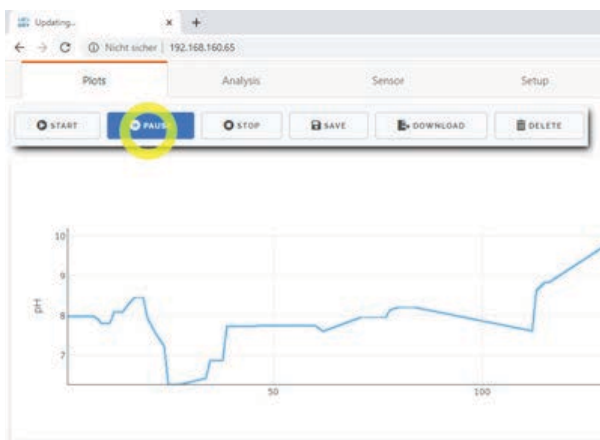


Fig. 24—Press *Pause* to temporarily stop making measurements.

Downloading and Deleting the Data

If you want a local copy of the data set press the *Download* button. A Microsoft® Excel file (*.xlsx) is downloaded into your local *Downloads* folder. The file contains the data set with timestamp, sample time, pH and amplitude in counts. Please note that a series can only be deleted when the measurement is not in progress.

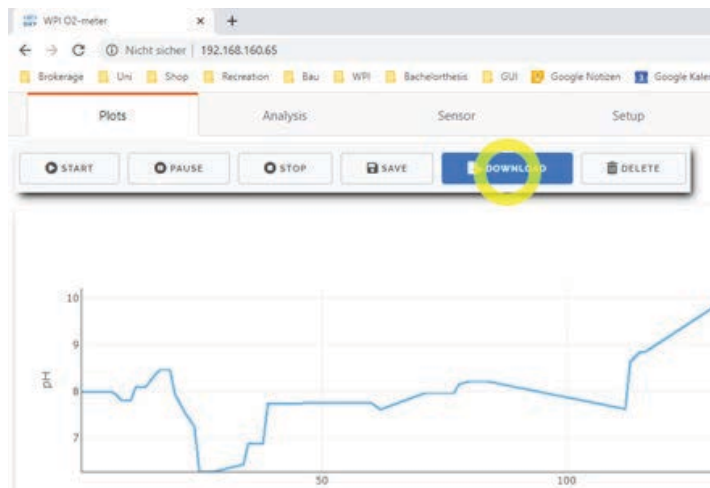


Fig. 25—Press *Download* to save a copy of the data in an Excel format.

	A	B	C	D	E	F	G	H	I	J	K	L
1	timestamp	time	pH	amplitude								
2	2020-02-25 10:30:05	1	7,99	2944883								
3	2020-02-25 10:30:06	2	7,99	2944745								
4	2020-02-25 10:30:07	3	7,99	2944731								
5	2020-02-25 10:30:08	4	7,99	2944855								
6	2020-02-25 10:30:09	5	7,99	2944835								
7	2020-02-25 10:30:10	6	7,99	2944610								
8	2020-02-25 10:30:11	7	7,93	2856952								
9	2020-02-25 10:30:13	8	7,81	2702222								
10	2020-02-25 10:30:14	9	7,81	2701940								

Fig. 26—A sample data file is shown here.

Sensor Management

The active sensor can be changed in Sensor Management. Please choose the desired sensor and click *Use select sensor*. Please note that a sensor can only be deleted when it is not set as active.

Plots Analysis Sensor Setup

Sensor Management

Sensor select

Basic Sensor Data

Enhanced Sensor Data

Sensor ID	Calibration Date
Sensor	2020-01-07 10:14:14.000000000
F45	2020-02-25 10:32:15.000000000
vsdr	

USE SELECTED SENSOR

DELETE SELECTED SENSOR

Plot settings

Sample Speed

Select

Viewer mode (not in use)

Continuous view

You have selected "continuous"

Fig. 27—Sensor Management area

Setting Sampling Rate

To change the sample speed, open the dropdown menu in *Plot Settings* and chose the desired speed. The rate will change instantly.

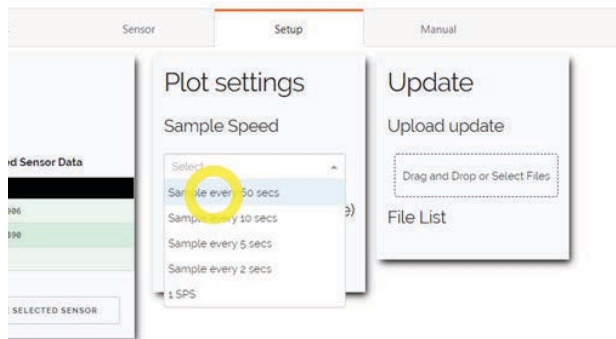


Fig. 28—Change the sampling speed in the Plot Settings area.

Updating the Firmware

If you need to update the firmware, drag and drop the provided zip file to the designated window. Please use ONLY files provided by WPI. The device will apply the firmware and reboot. The process should be finished within 2 minutes.

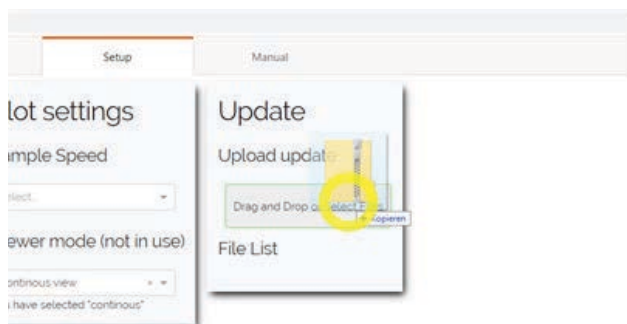


Fig. 29—Drag the zip file with the firmware update to the Update area.

Advanced Settings (Instrument Date and LED Power)

The power level of the LED excitation can be adjusted. The default level is 30%. If your sensor amplitude is weak, increase the power level and re-calibrate the sensor. Please remember to reduce the power level back to 30% when a new sensor is connected.

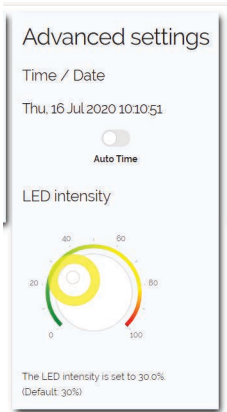


Fig. 30—Advanced Settings.

MAINTENANCE

Cleaning the Tip

1. Do not retract the sensor without cleaning the tip in distilled water! Salt crystallization might destroy the sensor tip.
2. Clean the sensor tip in distilled water and then retract it into the syringe needle.
3. Store the sensors in a dark and dry environment.

ACCESSORIES

Part Number	Description
SYR-STAND	Stand for Syringe Style Probes

TROUBLESHOOTING

Issue	Possible Cause	Solution
Can't find instrument with tablet or PC	This instrument is not switched on.	Check the power connection and switch the instrument on at the ON/OFF switch. The switch will illuminate
	The instrument is not connecting to your readout device.	See "Setup Connections" on page 3, and follow the instructions to setup your device.
No pH signal or unstable signal	Sensor is not immersed.	Ensure that the sensor is extended out of the needle and immersed a minimum of 2-3 mm in the sample.
	Sensor is broken or has reached the end of its life.	Check the sensor performance at pH 5. See "Testing a Sensor" on page 12. If necessary, replace the sensor.
		Check if SMA connector is properly inserted and secured
	Sensor or sample is moving.	Use an x/y/z stage for positioning and holding the sensor in place during the measurement
pH offset between calibration solution and sample	Different salinity between calibration solution and sample solution.	Adjust salinity solutions so they match.
	Temperature between sample and calibration solution is different.	pH and temperature are linked. Ensure that calibration and sample solutions have the same temperature.
pH reading is drifting	Instrument has not yet warmed up.	Ensure that your instrument warms up for 30 minutes before you make drift-sensitive measurements.
Tips of probe break	The sensor tips are very fragile and also very sensitive.	Use the holder assembly for calibration and an x/y/z stage for positioning the sensor in your sample.

NOTE: If you have a problem/issue with that falls outside the definitions of this troubleshooting section, contact the WPI Technical Support team at 941.371.1003 or technicalsupport@wpiinc.com.

SPECIFICATIONS

This unit conforms to the following specifications:

Optical Basics	Fluorescence detector
Optical Input	SMA 905
Dynamic Range	Sensor dependent
Resolution	± 0.02 pH (in pH7)
Accuracy	± 0.04 pH (in pH7)
Analog Output	0 to 1 V with 0.1 V/pH unit
Dimensions (WHD)	200 x 40 x 125 mm
Weight	500 g
Power	MicroUSB, 2.5 A
Connectivity	Wifi, LAN via DHCP and LAN direct
Software	Web interface
No Cross Sensitivity	Electromagnetic fields
Warm Up Time	10 seconds (30 minutes for low drift pH measurements)

Typical Sensor Performance

This is a typical sensor performance as determined at 25°C.

Measurement Range	pH 5.5 to pH 8.5
Response Time (t_{90})	< 3 sec.
Resolution	± 0.02 pH (in pH7)
Accuracy	± 0.04 pH (in pH7)
Drift	< 0.05 pH/h (in pH7; sample interval 1 sec.)
Fiber Length	2.5 m
Fiber and Tip Diameter	400 μ m and 50 μ m
Sensor Length	10 mm protrusion out of the protective syringe needle
Cleaning	Rinse with distilled water
Calibration	Sensors are pre-calibrated; re-calibration is recommended to receive maximum measurement accuracy

DECLARATION OF CONFORMITY

**WORLD PRECISION INSTRUMENTS, LLC.**

175 Sarasota Center Boulevard
Sarasota, FL 34240-9258 USA
Telephone: (941) 371-1003 Fax: (941) 377-5428
E-mail: wpi@wpiinc.com

DECLARATION OF CONFORMITY CE

We: World Precision Instruments
175 Sarasota Center Boulevard
Sarasota, FL 34240-9258 USA

As the **manufacture/distributor** of the apparatus listed, declare under sole responsibility
that the product(s):
pH-LUX

To which this declaration relates is/are in conformity with the following standards or
other normative documents:

Safety:
EN 61010-1:2010+A1:2019

EMC:
EN 61326-2-3:2013, EN 61326-1:2013
EN 61000-3-2:2014, EN 61000-3-3:2013+A1:2019

And therefore conform(s) with the protection requirements of Council Directive
2014/30/EU relating to electromagnetic compatibility and Council Directive 2014/35/EU
relating to safety requirements and Council Directive 2011/65/EU relating to hazardous
substances:

Issued on: **JUNE 16, 2020**


President of WPI





WARRANTY

WPI (World Precision Instruments) warrants to the original purchaser that this equipment, including its components and parts, shall be free from defects in material and workmanship for a period of 30 days* from the date of receipt. WPI's obligation under this warranty shall be limited to repair or replacement, at WPI's option, of the equipment or defective components or parts upon receipt thereof f.o.b. WPI, Sarasota, Florida U.S.A. Return of a repaired instrument shall be f.o.b. Sarasota.

The above warranty is contingent upon normal usage and does not cover products which have been modified without WPI's approval or which have been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. The above warranty will not apply if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electric power, air conditioning, humidity control, or causes other than normal and ordinary usage.

To the extent that any of its equipment is furnished by a manufacturer other than WPI, the foregoing warranty shall be applicable only to the extent of the warranty furnished by such other manufacturer. This warranty will not apply to appearance terms, such as knobs, handles, dials or the like.

WPI makes no warranty of any kind, express or implied or statutory, including without limitation any warranties of merchantability and/or fitness for a particular purpose. WPI shall not be liable for any damages, whether direct, indirect, special or consequential arising from a failure of this product to operate in the manner desired by the user. WPI shall not be liable for any damage to data or property that may be caused directly or indirectly by use of this product.

Claims and Returns

Inspect all shipments upon receipt. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. All claims for shortage or damage must be made within ten (10) days after receipt of shipment. Claims for lost shipments must be made within thirty (30) days of receipt of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim is settled. In some instances, photographic documentation may be required. Some items are time-sensitive; WPI assumes no extended warranty or any liability for use beyond the date specified on the container

Do not return any goods to us without obtaining prior approval and instructions from our Returns Department. Goods returned (unauthorized) by collect freight may be refused. Goods accepted for restocking will be exchanged or credited to your WPI account. Goods returned which were ordered by customers in error are subject to a 25% restocking charge. Equipment which was built as a special order cannot be returned.

Repairs

Contact our Customer Service Department for assistance in the repair of apparatus. Do not return goods until instructions have been received. Returned items must be securely packed to prevent further damage in transit. The Customer is responsible for paying shipping expenses, including adequate insurance on all items returned for repairs. Identification of the item(s) by model number, name, as well as complete description of the difficulties experienced should be written on the repair purchase order and on a tag attached to the item.

** Electrodes, batteries and other consumable parts are warranted for 30 days only from the date on which the customer receives these items.*

USA

175 Sarasota Center Blvd., Sarasota FL 34240-9258
Tel: 941-371-1003 • Fax: 941-377-5428 • E-mail: sales@wpiinc.com

UK

1 Hunting Gate, Hitchin, Hertfordshire SG4 0TJ
Tel: 44 (0)1462 424700 • Fax: 44 (0)1462 424701 • E-mail: wpiuk@wpi-europe.com

Germany

Pfingstweide 16, D-61169 Friedberg (Hessen), Germany
Tel: +49 (0)6031 67708-0 • Fax: +49 (0)6031 67708-80 • E-mail: wpide@wpi-europe.com

China & Hong Kong

WPI Shanghai Trading Co., Ltd.
Rm 27A, Liangfeng Building, No 8, Dongfang Road, Pudong New District, Shanghai, PR China
Tel: +86 21 6888 5517 • Toll Free: 400 688 5517 • E-mail: chinasales@china.wpiinc.com

Brazil

Av. Conselheiro Nébias, 756 sala 2611, Santos-CEP: 11045-002, São Paulo Brazil Tel: (013) 406-29703 • E-mail: info@brazil.wpiinc.com

Internet

www.wpiinc.com • www.wpi-europe.com • www.wpiinc.net • www.wpibrasil.com.br