Instruction Guide

PHOTON SYSTEMS INSTRUMENTS

PlantPen NDVI & PRI

Please read the Guide before operating this product

Manual Version: 2025/01

www.psi.cz

TABLE OF CONTENT

1 INFORMATION BEFORE USING PLANTPEN DEVICE

Read this manual carefully before operating the device. If you are not sure about something in the manual, contact the manufacturer for clarification.

	By accepting the device, the customer agrees to follow the instructions in this guide.

Always follow corresponding manuals while working with the PlantPen device or doing the maintenance.
It is forbidden to interfere with the hardware or software of the PlantPen device in any way without previous agreement with the manufacturer.

The following table presents basic highlight symbols used in this manual:

Symbol	Description
	Important information, read carefully.
	Complementary and additional information.

2 GENERAL DESCRIPTION

The PlantPen model **PRI 210** measures **Photochemical Reflectance Index** (PRI) in two narrow wavelength bands centered close to 530 nm and 590 nm. The photochemical reflectance index ((R531 – R570) / (R531 + R570))2 correlates with the epoxidation state of xanthophyll cycle pigments and photosystem efficiency in many studies under diverse conditions, such as different 1. PRI is sensitive to changes in carotenoid pigments that are indicative of photosynthetic light use efficiency, the rate of carbon dioxide uptake, or as a reliable water-stress index. As such, it is used in studies of vegetation productivity and stress.

The PlantPen model **NDVI 310** measures **Normalized Difference Vegetation Index**, which is an important indicator of chlorophyll content in plants. The pigment in plant leaves, chlorophyll, strongly absorbs visible light (from 0.4 to 0.7 µm) for use in photosynthesis. The cell structure of the leaves, on the other hand, strongly reflects near-infrared light (from 0.7 to 1.1 µm). The differences in plant reflectance in the visible and near-infrared wavelengths is used to calculate NDVI index as follows: NDVI=((NIR-VIS)/((NIR+VIS)), where VIS and NIR stand for the spectral reflectance measurements acquired in the visible (red) and near-infrared regions, respectively. NDVI is directly related to the photosynthetic capacity and hence energy absorption of plant canopies 2. The **NDVI 310** device compares reflected light at two distinct wavelengths, 635 and 760 nm.

PlantPen can be operated as a stand-alone instrument and thus is ideal for field studies. The reflectance signals are detected at the wavelengths of the dual light source 530 nm and 590 nm, which are close to the PRI equation values based on Sellers, P. J. (1985)2. Measured data are sequentially stored in the internal PlantPen memory. Data transfer is via USB or Bluetooth communication. Comprehensive FluorPen 1.1 software provides data transfer routines and many additional features for data presentation in tables and graphs.

1 John Gamon, Josep Penuelas, and Christopher Field (1992). A narrow-waveband spectral index that tracks diurnal changes in photosynthetic efficiency. Remote Sensing of environment, 41, 35-44.
2 Sellers, P. J. (1985) 'Canopy reflectance, photosynthesis, and transpiration', International Journal of Remote Sensing, 6, 1335-1372.

2.1 TECHNICAL SPECIFICATION

PlantPen PRI and PlantPen NDVI		
Protocols	PlantPen PRI 210	Photochemical Reflectance Index PRI = (R531 - R570) / (R531 + R570); Reference: Sellers et al. (1985)
	PlantPen NDVI 310	Normalized Difference Vegetative Index NDVI = (R740 – R660) / (R740 + R660); Reference: Rouse et al. (1974)
LED emitter	PlantPen PRI 210	Dual wavelength light source GREEN = 530 nm, YELLOW = 590 nm
	PlantPen NDVI 310	Dual wavelength light source RED = 635 nm, NIR = 760 nm
Detector	PIN photodiode with bandpass filters From 500 to 600 nm (PRI 210) From 620 to 750 nm (NDVI 310)	
Internal memory capacity	Up to 16 Mb	
Internal data logging	Up to 100,000 measurements	
Data transfer	USB cable Bluetooth (transfer up to 3 Mbps for distance up to 20 m)	
PC software	FluorPen 1.1 (Windows 7 and higher)	
Battery	Li-Ion rechargeable battery Capacity 2000 mAh Max. charging current 0.5 A Charging via USB port - PC, power bank, USB charger, etc. 70 hours typical with full operation Low battery indicator	
Sample holder	Mechanical leaf-clip	
Display	Graphical display	
Keypad	Sealed, 2-key tactile response Turns off after 5 minutes of no use	
Built in GPS module	Ultra-high sensitivity down to -165 dBm High accuracy of < 1.5 m in 50 % of trials	
Size	135 x 65 x 33 mm	
Weight	188 g	
Operating conditions	Temperature: 0 to +55 °C Relative humidity: 0 to 95 % (non-condensing)	
Storage conditions	Temperature: -10 to +60 °C Relative humidity: 0 to 95 % (non-condensing)	
Warranty	1-year parts and labor	

Bluetooth module compliance data		
Category	Country	Standard
Radio	USA	FCC Part 15 Subpart B: 2008 Class B FCC CRF Title 47 Part 15 Subpart C
	FCC ID:	T9J-RN42
	Europe	ETSI EN 301 489-1 V1.8.1 ETSI EN 301 489-17 V2.1.1 ETSI EN 300 328 V1.7.1
	Canada	IC RSS-210 low power comm. device
	Certification number:	6514A-RN42
EMC	USA	FCC CFR47 Part 15 subclass B
	Europe	EN 55022 Class B radiated EN61000-4-2 ESD immunity EN61000-4-3 radiated field EN61000-4-6 RF immunity EN61000-4-8 power magnetic immunity

3 DEVICE DESCRIPTION

Fig. 1 Device description.

3.1 LIST OF EQUIPMENT AND CUSTOMER INFORMATION

Carefully unpack the carton. You should have received the following items:

- PlantPen PRI 210/PlantPen NDVI 310,
- carrying case,
- textile strap for comfortable wearing,
- PlantPen Operating Manual (on a USB flash disc),
- FluorPen software and driver (on a USB flash disc),
- USB cable,
- self-adhesive rubber pads for optics protection.

Other Accessories or Optional Features (according to your specific order).

	For data download via USB connection, the USB driver needs to be installed on the PC. It can be found on the installation disk (USB driver folder). If any item is missing, please, contact the manufacturer. Also check the carton for any visible external damage. If any damage is found, notify the carrier and the manufacturer immediately. The carton and all packing materials should be retained for inspection by the carrier or insurer. For customer support, please contact our technical support through the Service Portal: https://psi.cz/support/service-portal/ or write to: support@psi.cz

3.2 CARE AND MAINTENANCE

Plant Pen

- Never submerge the device in water!
- The device should not come in contact with any organic solvents, strong acids or bases.
- Keep the optical part clean and dry. If cleaning is needed, use soft, non-abrasive tissue.
- Battery charge lasts approximately 48 hours when the PlantPen is operated continuously.
- If the battery can no longer be charged, please contact PSI for replacement battery and installation instructions.

Li-ion battery

- Avoid fully discharging of the battery.
- Do not keep the battery at full charge for all the time.
- Keeping at high temperatures shortens battery life.

Regular service

Regular servicing is essential to ensure reliable and long-term operation of the equipment. For optimal care, maintenance should be conducted by an authorized service center. The recommended service interval is at least once every two years.
For more details or to schedule a service, please contact our technical support through the Service Portal: https://psi.cz/support/service-portal/

4 PRINCIPLE OF MEASUREMENT

PlantPen is a reflectance-based device that provides a convenient method of measuring the relative chlorophyll content of a leaf sample.

The **PlantPen** model **PRI 210** (Fig. 2) measures **Photochemical Reflectance Index (PRI)** by comparing leaf reflectance in two narrow wavelength bands centered close to 530 nm and 590 nm. PRI is sensitive to changes in carotenoid pigments that are indicative of changes in photosynthetic light use efficiency, the rate of CO2 uptake and as a reliable water-stress index. As such, it is used in studies of vegetation productivity and stress.

Fig. 2 PlantPen PRI 210.

The **PlantPen** model **NDVI 310** (Fig. 3) measures Normalized Difference Vegetation Index (NDVI), which is an important indicator of chlorophyll content in plants. The pigment in plant leaves, chlorophyll, strongly absorbs visible light (from 0.4 to 0.7 µm) for use in photosynthesis. The cell structure of the leaves, on the other hand, strongly reflects near-infrared light (from 0.7 to 1.1 µm). The differences in plant reflectance in the visible and near-infrared wavelengths are used to calculate NDVI index. NDVI is directly related to the photosynthetic capacity and hence energy absorption of plant canopies.

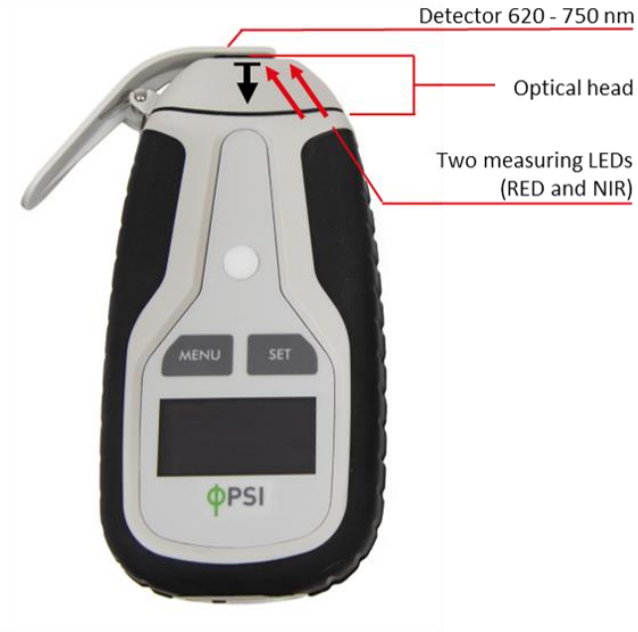


Fig. 3 PlantPen NDVI 310.

5 GETTING STARTED

The PlantPen device is powered with built in Li-Ion battery. Before use, make sure the battery is fully charged. You can charge the PlantPen by connecting it to a PC using a USB cable or to an AC outlet via a USB adapter (not included) and the provided cable.

The PlantPen is operated using two buttons:

- **MENU** key: Navigate through menu options displayed on the screen or turn off the device by holding the button for 3 seconds.
- **SET** key: Turn on the device by holding the button for 3 seconds, or select a menu option indicated by the cursor (>).
- For a detailed overview of the PlantPen's tree menu structure, please refer to Chapter 6.

5.1 CALIBRATION

Calibration assures you that your measurements are accurate within the specification limits that led you to select the instrument in the first place. It is better to calibrate your device before every set of samples. For Calibration of PlantPen use white reflectance standard. The calibration of the white reflectance standard is an indispensable part of a correct calculation of PRI or NDVI.

	It is necessary to calibrate PlantPen after every switch ON.

Prior measurement perform the calibration as follows:

- For calibration use white reflectance standard (It is part of leaf clip)
- Turn ON device – hold SET button for 1 sec.
- Close the leaf clip (white standard is on bottom part of the leaf clip)
- Go to Calibration ("Insert white sample" appears on display)
- Press SET button to confirm the calibration and wait until the calibration step is completed.
- Calibration is automatically stored into the device memory.
- The device is now ready to measure other samples.

5.2 MEASUREMENT

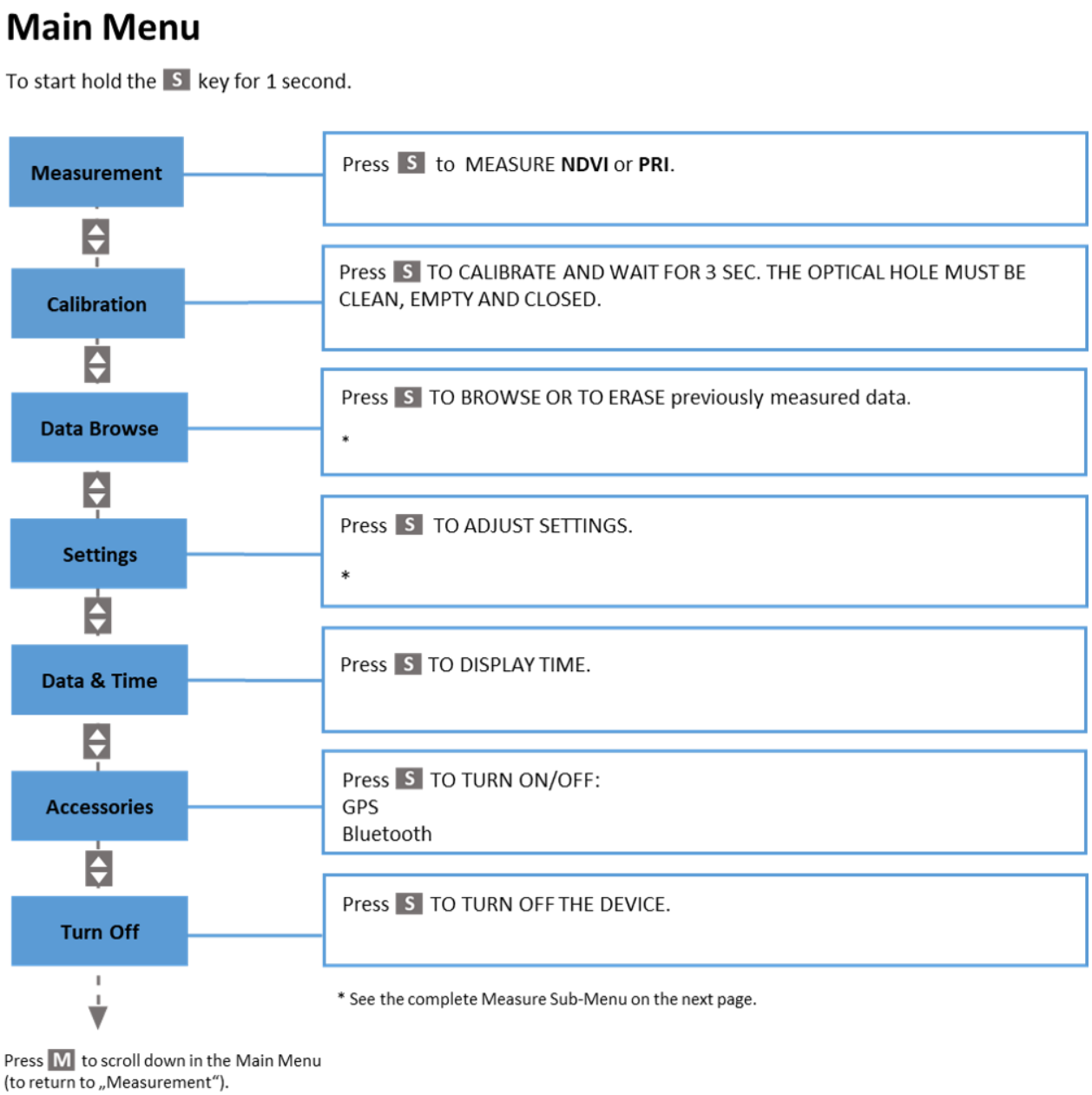
Please follow these instructions to perform a measurement:

- Insert a leaf sample into the leaf clip. The leaf clip is important for the sample stabilization.
- Go to **Measurement**.
- Press **SET** to confirm.
- PlantPen measures predefined index (PRI or NDVI).
- Value of the index appears on display after measuring.
- During the measurement all data are stored into the device memory.

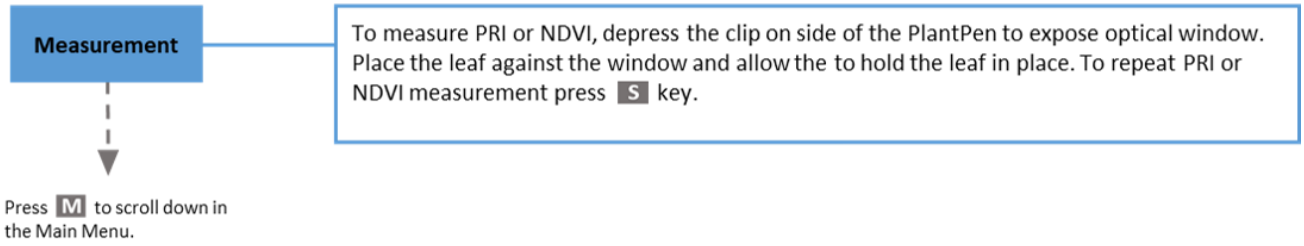
6 CONTROL MENU TREE

The next few pages of this manual show the structure of the menu and explain in a schematic way the operation of the PlantPen. The schematic diagrams show the Main Menu, first-level Sub-Menus and second-level Sub-Menus.

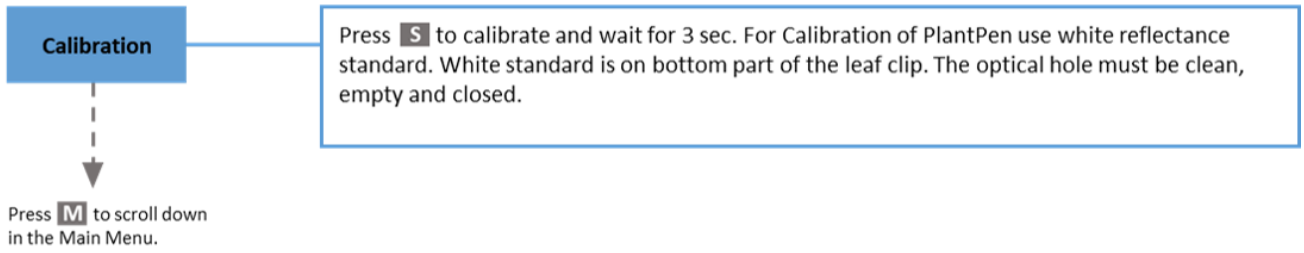
- The blue color represents the Main Menu and its Options.
- The yellow color represents the first-level Sub-Menus and their Options.
- The green color represents the second-level Sub-Menus and their Options.
- Full-line arrows are used to indicate the **SET** key operations.
- Dashed-line arrows are used to indicate the **MENU** key operations.



Measurement Sub-Menu

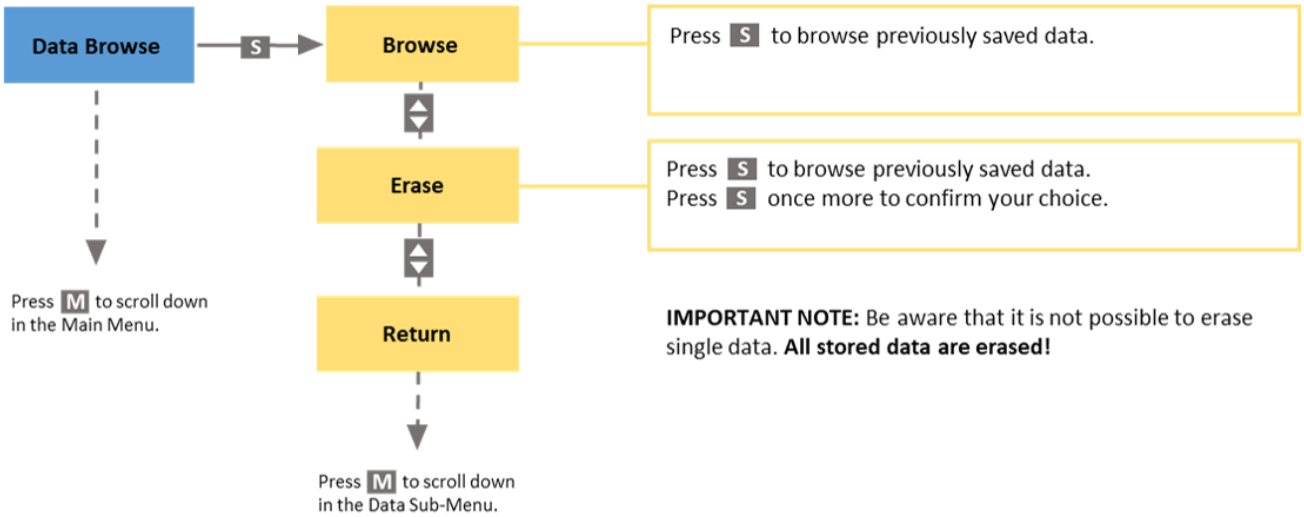


Calibration Sub-Menu



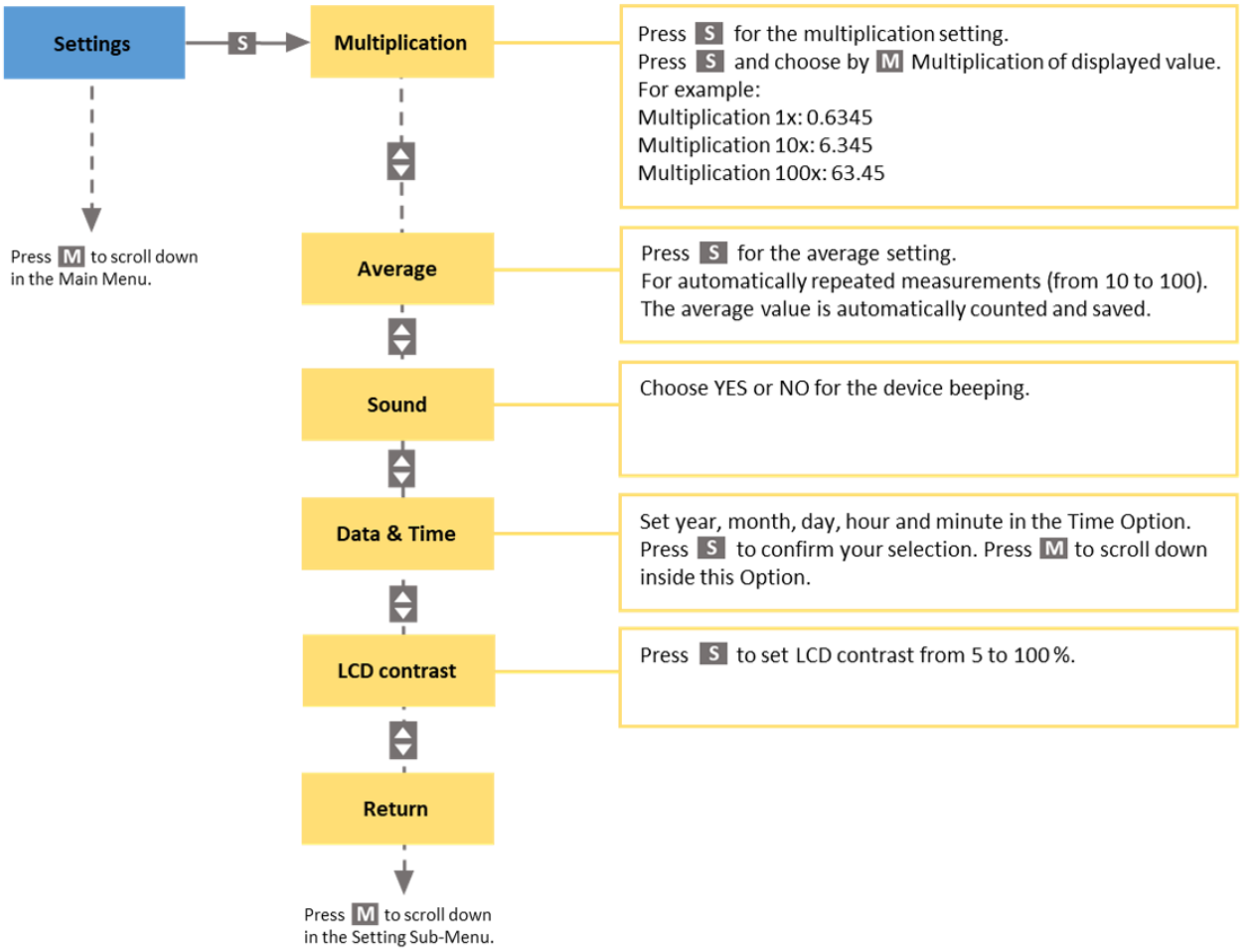
Data Sub-Menu

Use the Data Sub-Menu when browsing or erasing previously measured data.



Setting Sub-Menu

Use the Setting Sub-Menu to set the light color, light intensity, number and frequency of measurements, date, time, or the sound mode.



7 USB CONNECTION

PlantPen comes with the USB cable that is required for charging of the Li-ion battery and can also be used for data transfer to the PC after completion of measurements. To connect the USB cable with the PlantPen device follow the picture instructions below. Please note that a lock in system is used to secure the USB cable to the PlantPen and extreme caution has to be used when setting up this connection to avoid damage to the cable pins.

⚠	When connecting the USB cable take extra caution to prevent damage to the cable connector pins. Ensure correct orientation of the cable as shown in the pictures below so the circled portion of the plug and the cable in photo A and B are perfectly lined up prior to pushing them together. Once this connection is achieved the cable may be secured in position by turning the metal cover of the cable and locking the cable in position.

To connect PlantPen with your computer please follow steps below:

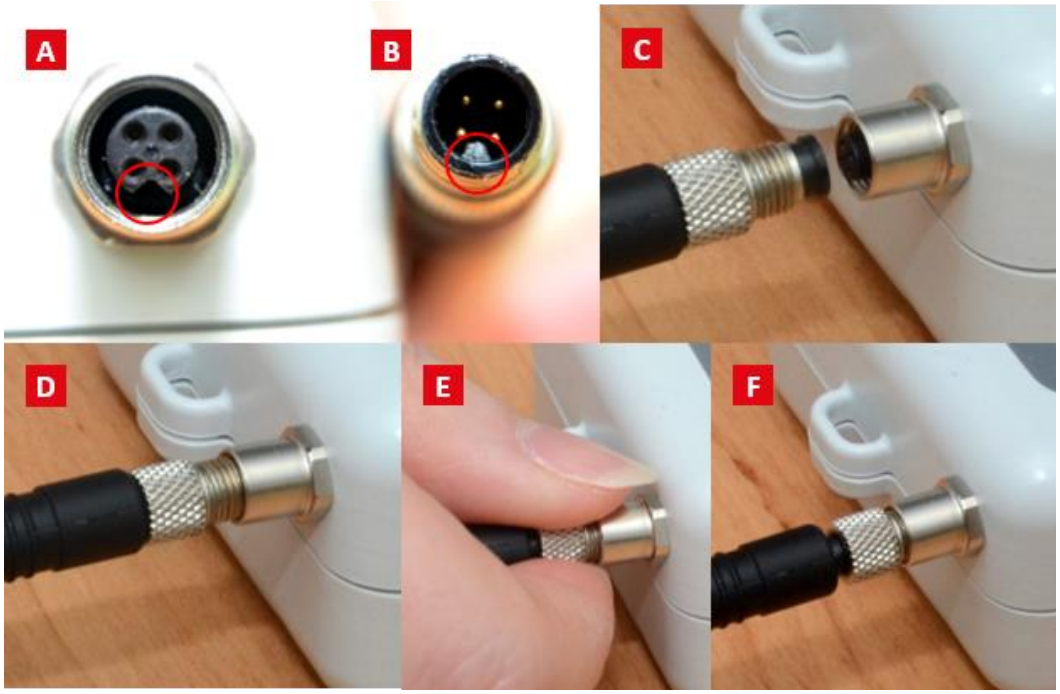


Fig. 4 How to connect PlantPen with PC.

A) Connector of the PlantPen. B) The USB cable connector with pins. C – E) Place the cable horizontally and line up the red circled parts of the cable and the connector, plug in the inlet and screw the securing screw. F) Correct connection of the USB cable and Pen device.

Once the cable is securely attached to the PlantPen the other end may be connected to the USB port on a PC. The PlantPen **switches ON** automatically after connecting the cable to the PC. For the USB connection to be successful the USB driver and the FluorPen software need to be installed on the PC. Both may be found on the installation disk (USB driver folder) delivered with the device. Once the USB driver is installed the Device Manager in Windows will list the USB serial port in the device tree. The USB driver may also be downloaded from PSI websites www.psi.cz. Once the driver is installed correctly the connection between the PlantPen and the computer is initiated by selecting in the software on the computer **Setup > Device ID.**

For more information about FluorPen software see chapter 9.

8 BLUETOOTH CONNECTION

In addition to data transfer via USB the PlantPen may be connected to the software via Bluetooth for data transfer. Before setting up the Bluetooth connection between the PlantPen and the PC, ensure the following components are in place:

Bluetooth hardware installed on the computer

The PC must support Bluetooth wireless technology, either through integrated hardware or a Bluetooth card. Make sure that the PC's Bluetooth is set to "discoverable" mode, allowing it to appear in the list of available devices during a Bluetooth search. Refer to the user guide for your PC or Bluetooth card for instructions on enabling this setting.

Setting up Bluetooth configuration software on the PC

The Bluetooth software included with your PC or Bluetooth card must be activated to enable proper functionality. As this software differs depending on the manufacturer, refer to the Bluetooth documentation provided with your PC for specific setup instructions.

Activating and making Bluetooth visible on both devices

To pair the PlantPen with another Bluetooth device, such as a computer, ensure that Bluetooth is switched on and set to visible mode on both devices.

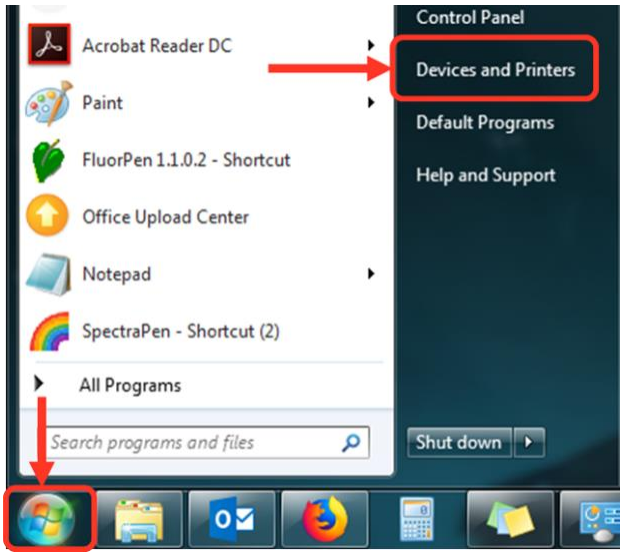
8.1 BLUETOOTH PAIRING

Enabling Bluetooth in the PlantPen

- Turn **ON** the PlantPen by pressing and holding the **SET** key for 1 s.
- Scroll to the Accessories menu by pressing the **MENU** key, then select **Accessories** by pressing the **SET** key.
- Locate Bluetooth in the menu. Press the **MENU** key to select it, then enable Bluetooth by pressing the **SET** key.

⚠	Keep in mind that the PlantPen turns off automatically after approximately 8 minutes of inactivity. When the PlantPen powers off, Bluetooth is also automatically disabled.

Starting Bluetooth Application on the PC



The following steps outline how to set up the Bluetooth connection between the PC and the device. These instructions may vary for other Windows versions:

- **Windows 7:**
  Go to: **Start > Devices and Printers** (Fig. 5).
  Alternatively, access the Bluetooth application through the Control Panel: **Start > Control Panel > Hardware and Sound > Devices and Printers**.
- Windows 11:
  Open **Settings > Bluetooth & devices > Devices**.
  Ensure that Bluetooth is enabled (Fig. 6Fig. 6 Starting the Bluetooth application – Windows 11.). Then modify the Bluetooth devices discovery from **Default** to **Advanced** (Fig. 7).

Fig. 5 Starting the Bluetooth application – Windows 7.

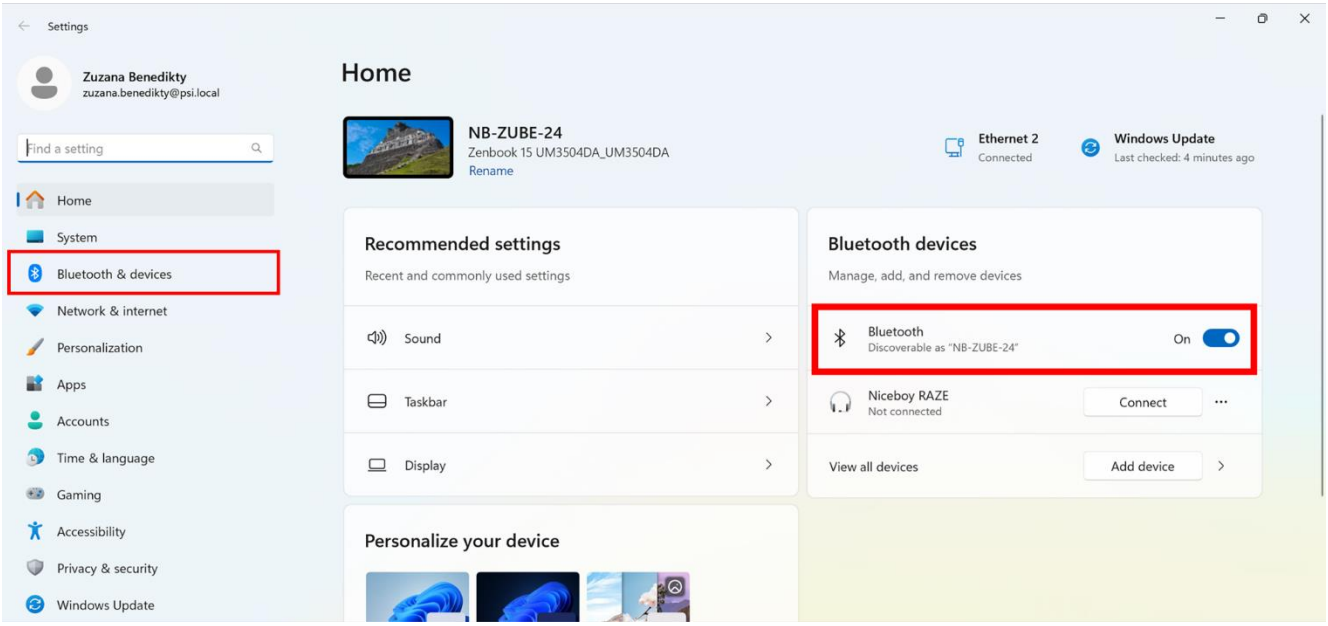


Fig. 6 Starting the Bluetooth application – Windows 11.

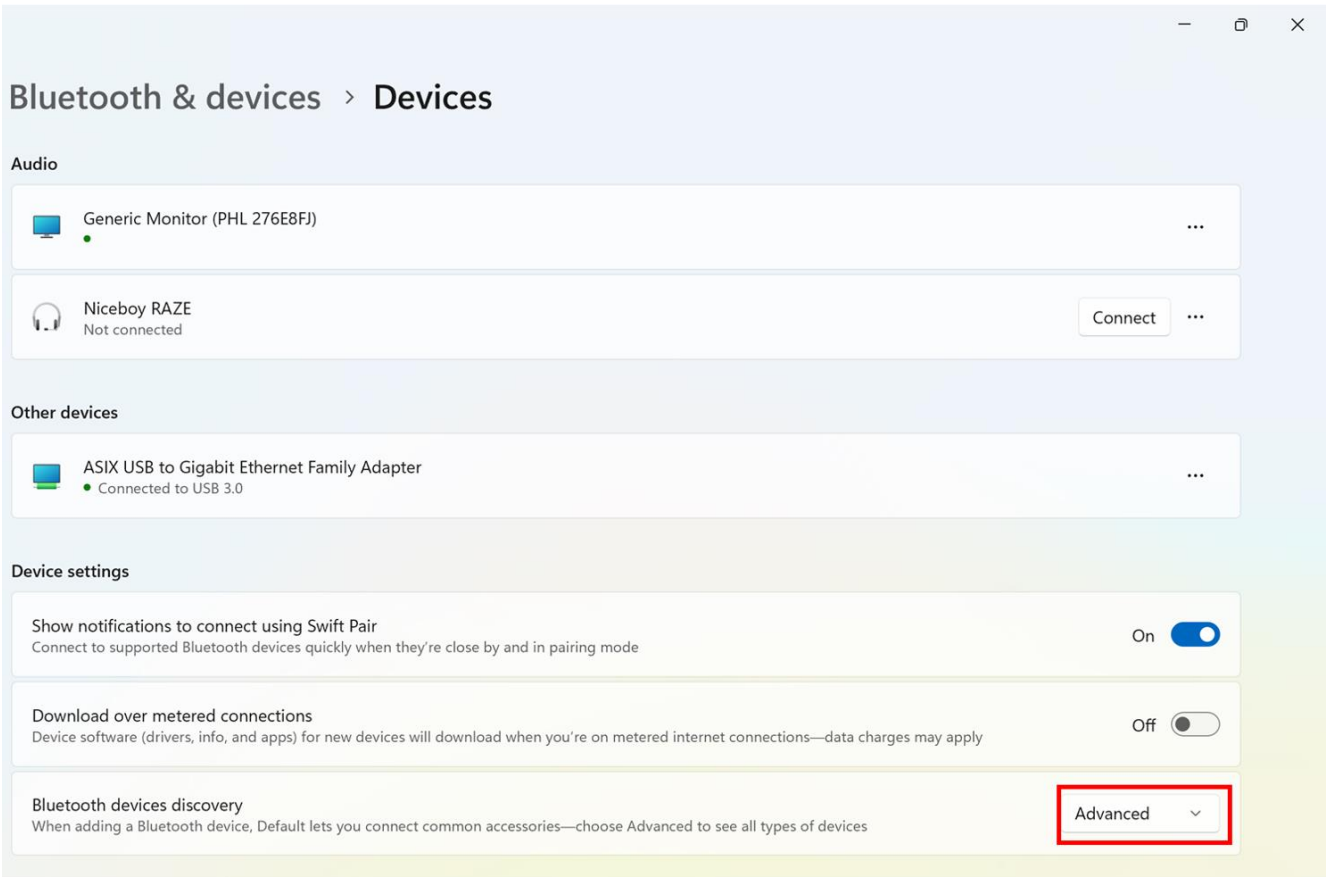


Fig. 7 Windows 11 – Advanced Bluetooth devices discovery.

Adding a Bluetooth device to the computer

- Click "**Add a device**" to begin searching for new Bluetooth device (Fig. 8, Fig. 9).
- Ensure the PlantPen is set to discoverable mode before proceeding.
- Select: PSI PlantPen icon.
- Click: Next (Fig. 10).

Fig. 8 Bluetooth – add a device.

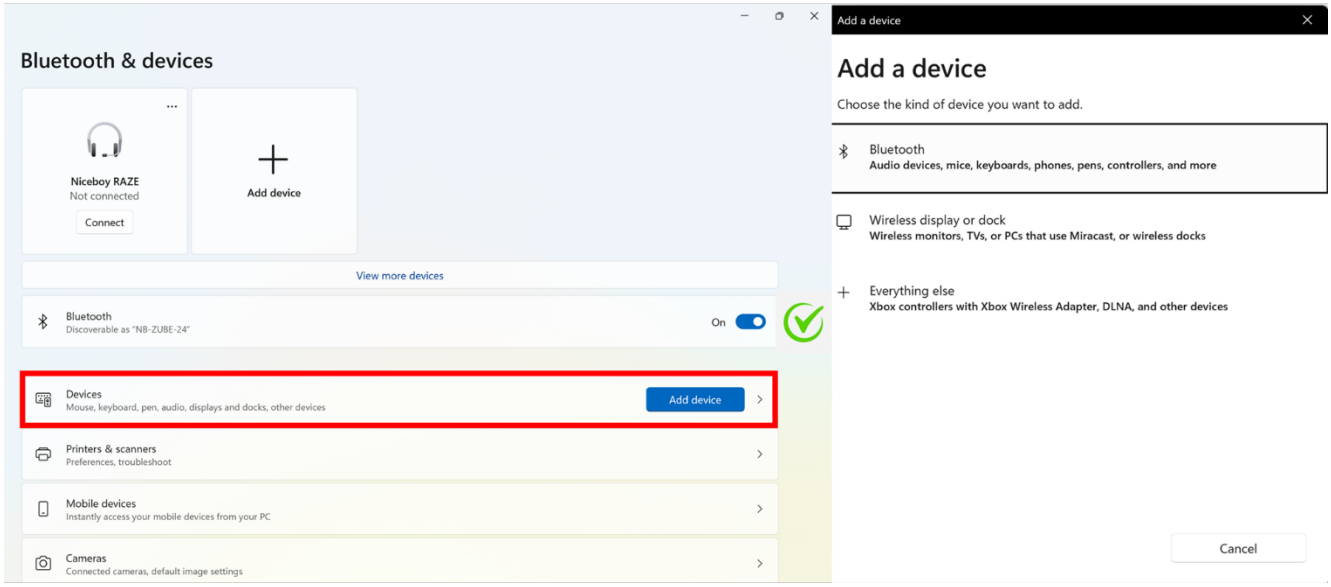


Fig. 9 Bluetooth – add a device for Windows 11.

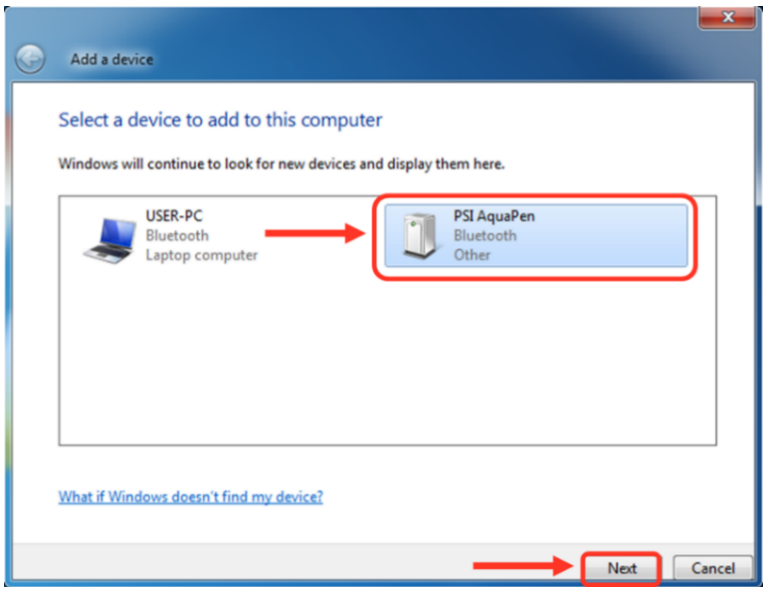


Fig. 10 Bluetooth – PlantPen selection.

Starting the Pairing Process

The steps to start pairing differ between the older and newer versions of the PlantPen, as they are equipped with different Bluetooth modules.

Old version of PlantPen PRI 200 and NDVI 300:

The Bluetooth Pairing Code is 0000.

- Select: “Enter the device’s pairing code”.
- Enter: 0000 (four digits).
- Click: Next (Fig. 11).

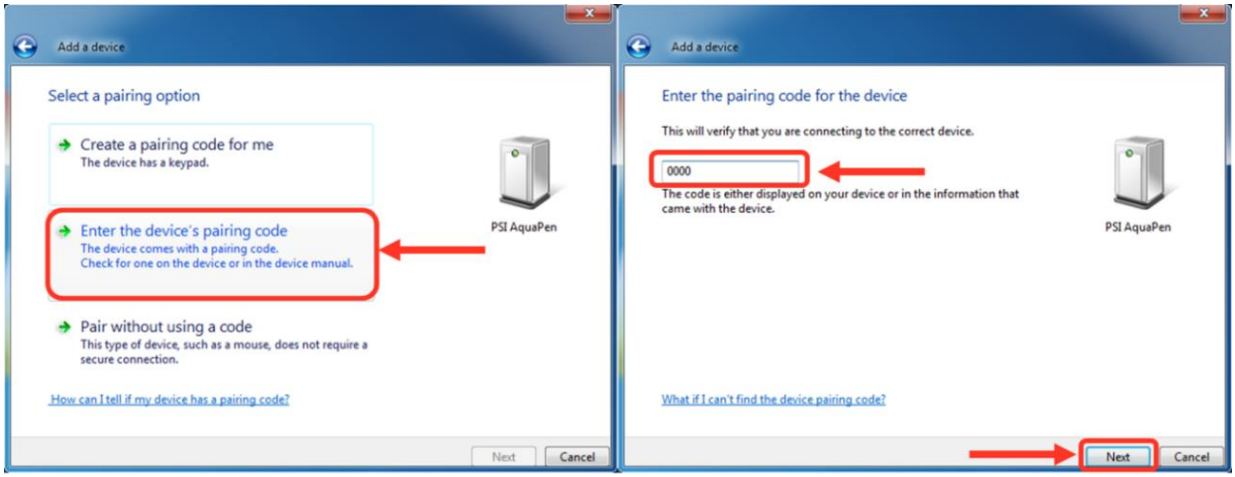


Fig. 11 Bluetooth - pairing process.

New version of PlantPen PRI 210 and NDVI 310:

- Select: Yes (Fig. 12).

Please note that the PlantPen device does not display the verification number. The verification code is not important for the Bluetooth connection.

- Select: Next to proceed.

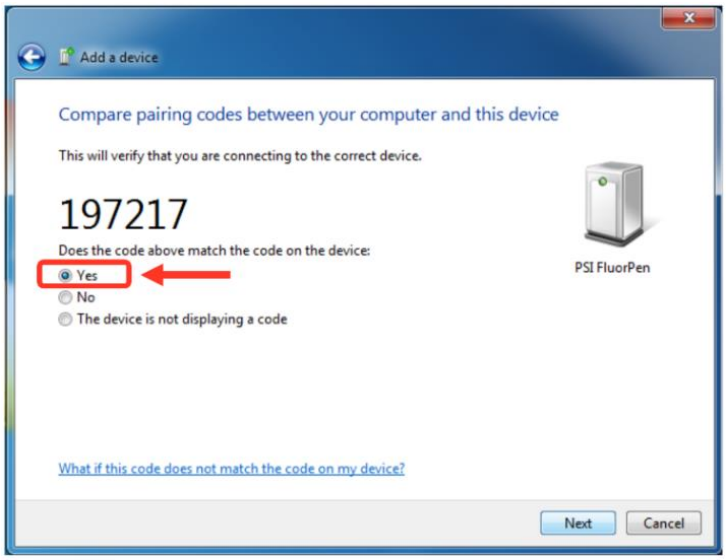


Fig. 12 Bluetooth – pairing verification.

Completing the PlantPen Pairing

- Click: Close (Fig. 13) to finish the Bluetooth pairing process.

The Bluetooth pairing is now complete, and the next step is to open the FluorPen software (included on the delivered USB flash disk). For detailed information on using the FluorPen software, refer to Chapter 9.

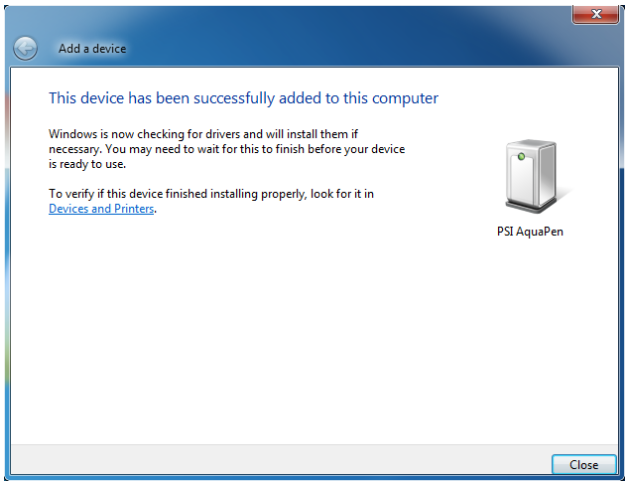


Fig. 13 Bluetooth – pairing completion.

9 FLUORPEN SOFTWARE

9.1 SOFTWARE INSTALLATION

1. Copy the FluorPen software provided on the USB flash disk to your computer and launch the FluorPen program.
2. To connect and recognize the PlantPen device in the FluorPen software, proceeds first with the registration of the FluorPen software (Fig. 14).

- Select: **Help > Register**
- Enter: your serial registration number (found in a text file on the USB flash disk drive included with the device).
- Select: OK

Fig. 14 Software registration.

	Please note that the serial (registration) number for the PlantPen may be found in the file SN.txt, which is included on the enclosed USB flash disk. Please Note: it is not possible to download data from the PlantPen device without software registration.

3. Switch on the PlantPen and enable Bluetooth or connect USB cable to the PC.
4. Ensure the PC and the PlantPen are properly paired (see chapter 7 and 8 for complete information on USB and Bluetooth pairing).
5. In the software select: **Setup > Device ID (Ctrl+I).** If properly connected, the message “Device: PlantPen” appears in the bottom part of the screen (Fig. 15). If the connection is not successful then message “Device not found” will appear. In the latter case check all the connections (USB) and Bluetooth pairing.

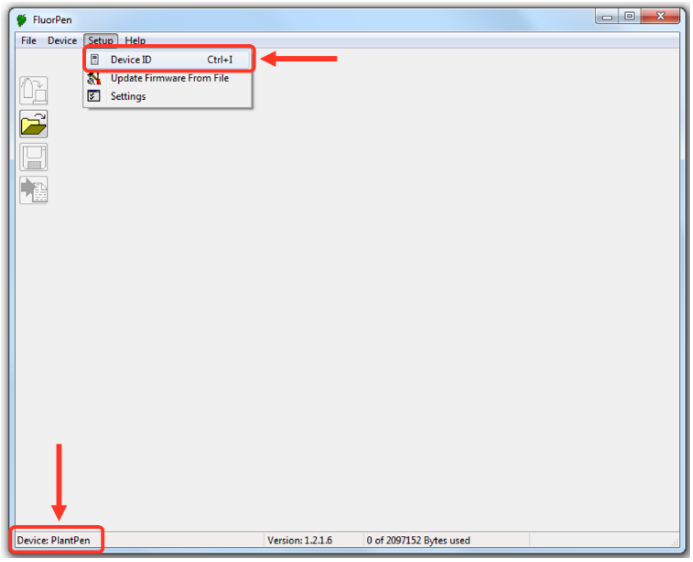


Fig. 15 Connecting PlantPen with software.

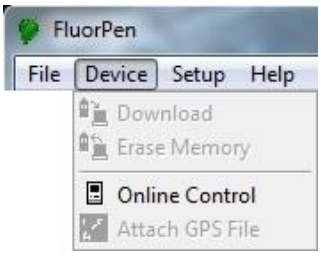
9.2 MENU AND ICONS EXPLANATION

9.2.1 MAIN MENU

MENU: File

Load	Loads previously saved data files.
Save	Saves data to hard disc.
Export	Exports data in .txt format.
Export to JSON	Exports data in JavaScript Object Notation.
Close	Closes the current experiment.
Close All	Closes all running experiments.
Exit	Exits the program.

MENU: Device



Download	Downloads data from the PlantPen to your PC.
Erase Memory	Erases data from the PlantPen memory.
Online Control	Online control of PP device.
Attach GPS File	Used for download data from GPS module (active only in PlantPen versions PRI 200 and NDVI 300).

MENU: Setup

Device ID	Detects the connected device.
Update Firmware	Used for firmware updates.
Settings	Used for modification of the program settings.

MENU: Help

About	Offers basic information about the program.
Register	Used for the FluorPen software registration.

Icon Explanation:

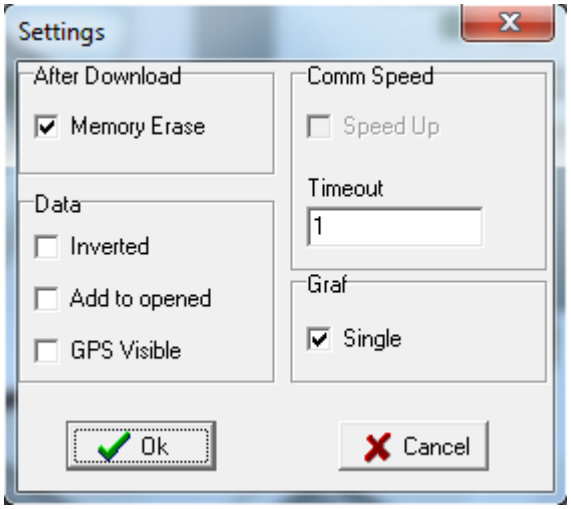
Download	Downloads data from the PlantPen to PC.
Load	Loads (opens) previously saved data files.
Save	Saves data to hard disc.
Export	Exports data in .txt format.

9.2.2 MENU SETTINGS

MENU > Setup > Settings (Fig. 16)

After Download – Memory Erase
If the box is checked the PlantPen memory is erased after each data download.

Data – Inverted
If the box is checked the polarity of data is inverted, e.g., multiplied by -1. This feature can be helpful for a certain type of experiment when the measured data are undesirably interpreted as negative values.



Data – Add to opened
If the box is checked the downloaded data are added to that of the current opened experiment.

Data – GPS Visible
This option is active only in older PlantPen versions PRI 200 and NDVI 300. In new versions the GPS data are automatically downloaded and paired with protocol measurements.

Graf – Single
This function is not available for PlantPen PRI or NDVI.

Fig. 16 Settings.

9.2.3 MENU: ONLINE CONTROL

The Online Control feature allows remote management of the PlantPen device via a PC connection.

Online Control – Switches

Access this function through the following path:
MENU > Device > Online Control > Switches (Fig. 17)

Sound On/Off
This option enables or disables the device beeping sound when the MENU and SET buttons are pressed.

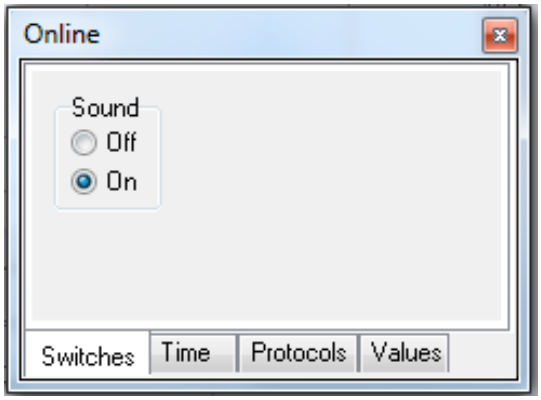
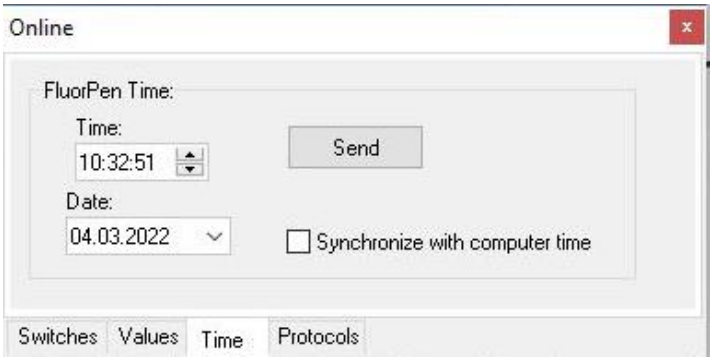


Fig. 17 Online control – Switches.

Online Control – Time

MENU: Device > Online Control > Time (Fig. 18)



The window allows you to configure the PlantPen's time and date settings.
Manual Adjustment: You can manually set the time and date by entering the desired values and saving them.
Automatic Synchronization: To synchronize the PlantPen's clock with your computer, tick the synchronization box.

Note that synchronization occurs only once at the time of selection and does not continuously update the clock.
Proper time and date settings are crucial for accurate GPS data acquisition and are therefore strongly recommended.

Fig. 18 Online Control – Time.

Online Control – Protocols

MENU: Device > Online Control – Protocols (Fig. 19)

Choose the protocol for measuring. PlantPen device start to measure.
Once the measurement is completed, the resulting data is automatically saved to the device's memory and can be downloaded to the PC at a later time.

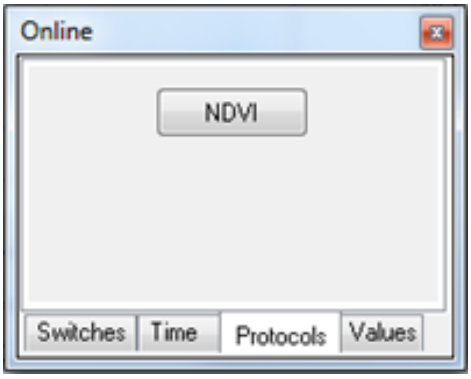


Fig. 19 Online Control – Protocols.

Online Control – Values

This function is not available for PlantPen PRI or NDVI.

9.3 DATA DOWNLOAD AND EXPORT

1. Perform a measurement with your PlantPen.
2. Click the **Download** icon or select **Device > Download**.
3. The Data table appears (Fig. 20).

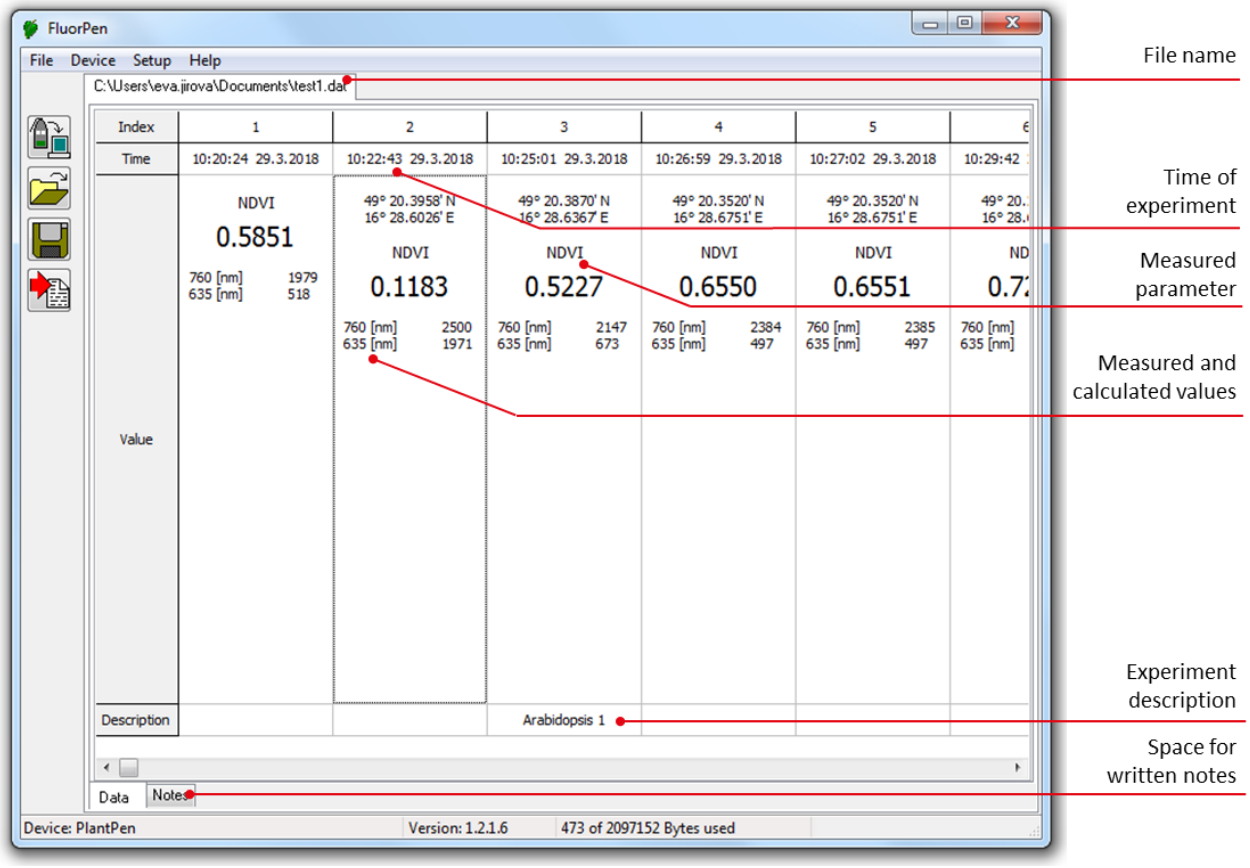


Fig. 20 Example of data transfer.

4. To **export** data from the FluorPen software select **File > Export** or **Export** icon. Select data type to export (NDVI or PRI), see Fig. 21.

Selected only – exports only one measurement that is selected by mouse, otherwise it will export everything.
Source data – exports raw data.
Description – exports the data description if any.
Computed values – export calculated data.

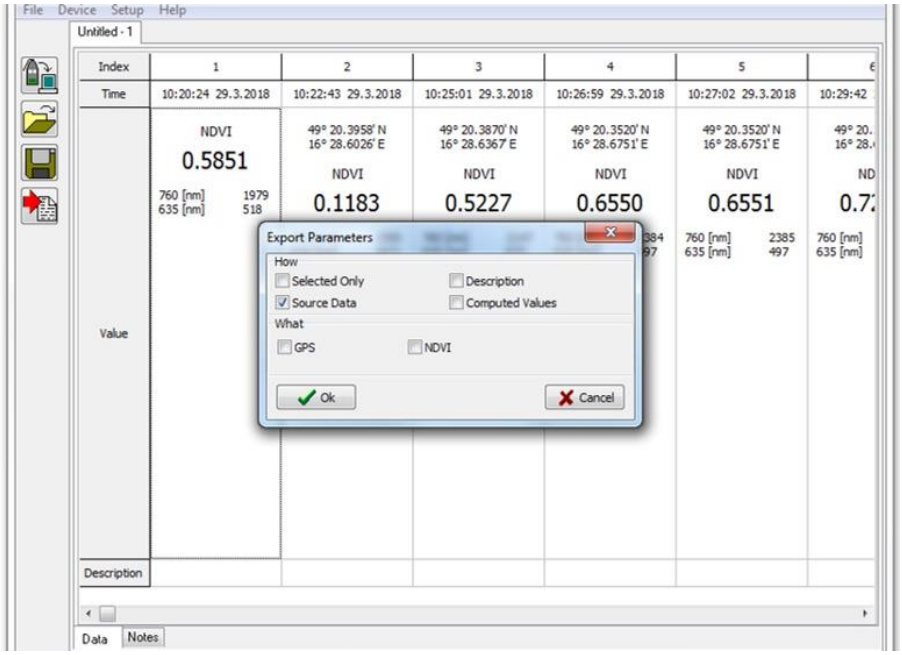


Fig. 21 Data export.

9.4 FIRMWARE UPDATE

⚠	All data in the PlantPen memory are erased during the firmware update! Before starting any firmware update, download all your data from the PlantPen memory to the computer!

1. Starting Update: Select **Setup > Update Firmware From File** (Fig. 22).

Fig. 22 Firmware Update.

2. Warning: Select **OK** to start update (Fig. 23).

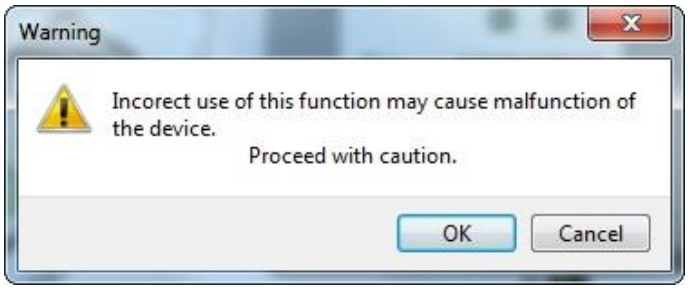


Fig. 23 Warning.

3. Selecting **.bxn file**

Find firmware update file (a binary file with the extension .bxn provided from PSI) and select **Open** (Fig. 24).

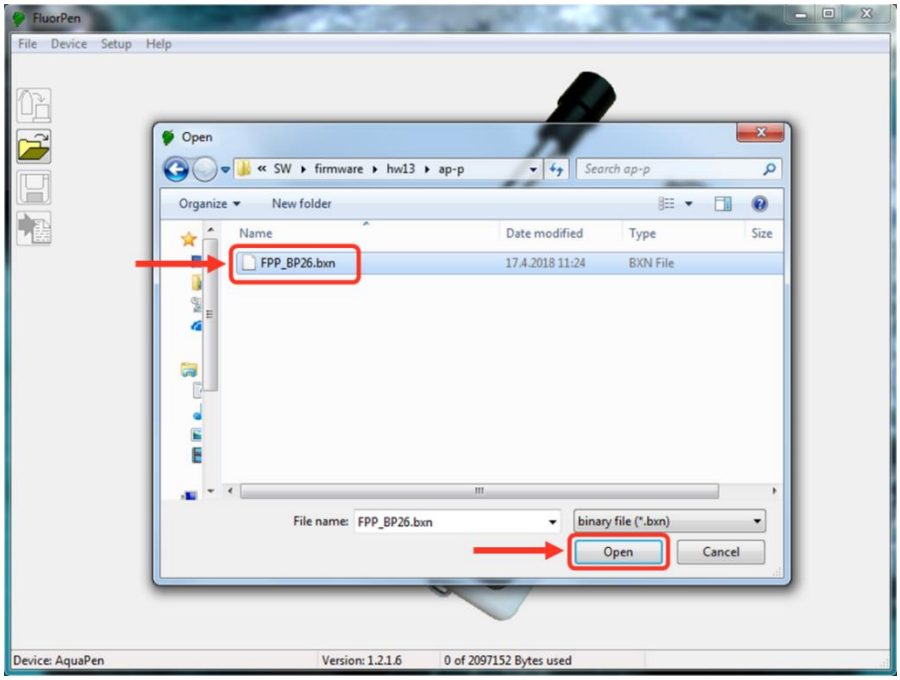


Fig. 24 Selection of the firmware file.

4. Finishing Upload

Select **OK** to start uploading of the update (Fig. 25).

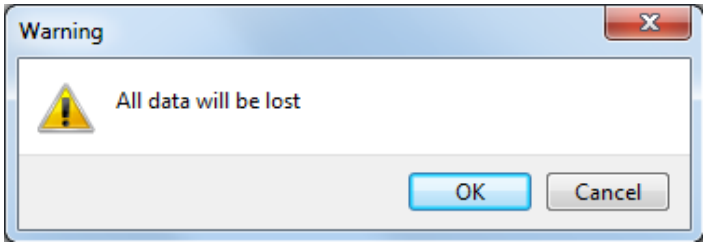


Fig. 25 Data loss warning.

The bottom bar indicates the upload progress (Fig. 26).

Fig. 26 Firmware upload progress.

Press **OK** to finish the upload (Fig. 27).

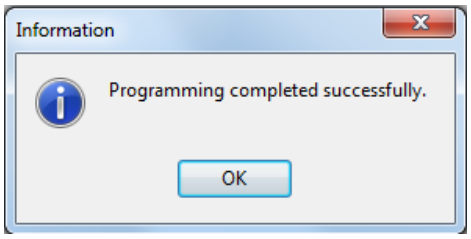


Fig. 27 Firmware upload finishing.

10 GPS MODULE

The new versions of the PlantPen device (PRI 210 and NDVI 310) have integrated GPS module which can be turned on during the measurements. When GPS module is turned on the map coordinates will be automatically saved with all collected data and will be downloaded during data download.

	For proper GPS reading, the time in your PlantPen and in your computer must be synchronized. Preset time and time zone must correspond to GPS time (time zone) in your location.

10.1 GPS/PLANTPEN OPERATION

1. Check the time setting on the PlantPen device: **Settings > Date & Time**
2. Switch the GPS module "ON" on the PlantPen device by following these steps in the menu:

- Select: **Accessories > GPS**
- Press **SET** to confirm.
- Wait until the GPS position is found – **"Starting GPS".**
- The GPS module is ready when the icon in upper panel changes as shown on Fig. 28.

Fig. 28 GPS icons.

3. If the picture on the display of the device does not change then proceed to **Accessories > GPS > Location** selection in the menu and manually map the GPS by pressing SET. **"GPS Acquisition**" message will appear followed by coordinate. If the GPS module has difficulties mapping the coordinates, a message stating **"GPS not locked"** will appear on the display. It may be necessary to take the device outside into a location that is easily accessible by the satellite (clear sky view) and repeat the process of mapping.
4. Once the GPS has been turned on and successfully activated proceed to **Measurement** and select required protocol.

	For prompt determination of the coordinates use the option Accessories > GPS > Location.

	The device may need a clear view of the sky to acquire satellite signal. Keep in mind that the PlantPen turns off automatically after about 8 minutes of no action. Turning off the PlantPen always turns off GPS module.

10.2 DATA DOWNLOAD

1. **Enabling Communication**:
- Switch on the computer and the PlantPen software.
- Enable Bluetooth or connect the device with computer via communication cable (see instructions on pg. 16).

2. **Downloading Data** from the PlantPen:
- Start FluorPen program.
- Connect PlantPen device with software: **Setup > Device ID (Ctrl+I).**
- Download data from the PlantPen to your PC by clicking the download icon. Data measured with activated GPS module are downloaded with GPS coordinates (Fig. 29).

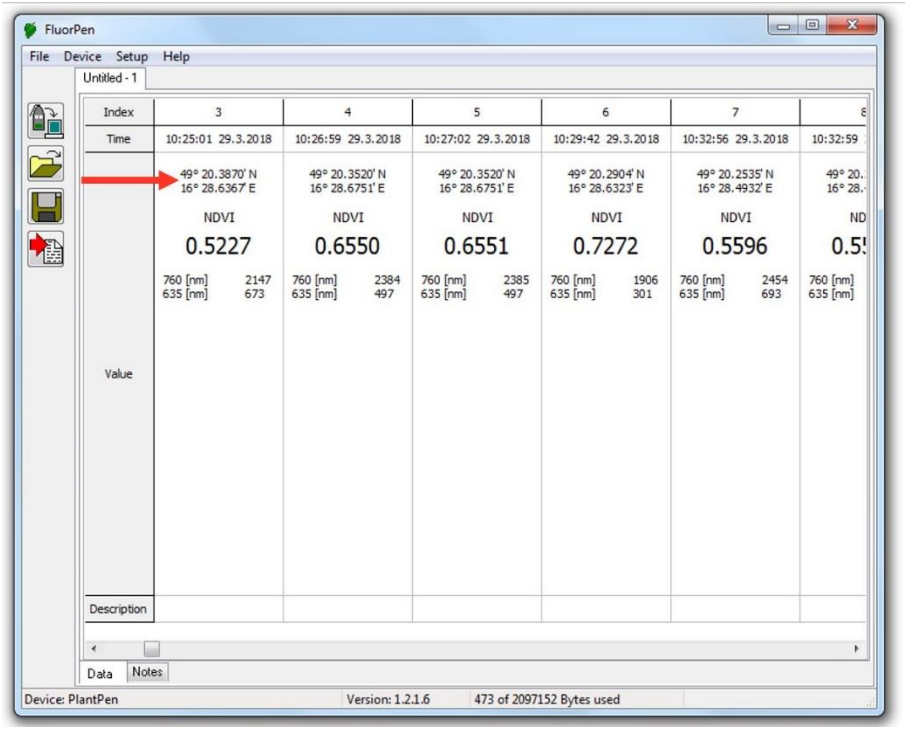


Fig. 29 GPS coordinates.

11 WARRANTY TERMS AND CONDITIONS

- This Limited Warranty applies only to the PlantPen device. It is valid for one year from the date of shipment.
- If at any time within this warranty period the instrument does not function as warranted, return it and the manufacturer will repair or replace it at no charge. The customer is responsible for shipping and insurance charges (for the full product value) to PSI. The manufacturer is responsible for shipping and insurance on return of the instrument to the customer.
- No warranty will apply to any instrument that has been (i) modified, altered, or repaired by persons unauthorized by the manufacturer; (ii) subjected to misuse, negligence, or accident; (iii) connected, installed, adjusted, or used otherwise than in accordance with the instructions supplied by the manufacturer.
- The warranty is return-to-base only and does not include on-site repair charges such as labor, travel, or other expenses associated with the repair or installation of replacement parts at the customer's site.
- The manufacturer repairs or replaces faulty instruments as quickly as possible; the maximum time is one month.
- The manufacturer will keep spare parts or their adequate substitutes for a period of at least five years.
- Returned instruments must be packaged sufficiently so as not to assume any transit damage. If damage is caused due to insufficient packaging, the instrument will be treated as an out-of-warranty repair and charged as such.
- PSI also offers out-of-warranty repairs. These are usually returned to the customer on a cash-on-delivery basis.
- Wear & Tear Items (such as sealing, tubing, padding, etc.) are excluded from this warranty. The term Wear & Tear denotes the damage that naturally and inevitably occurs as a result of normal use or aging even when an item is used competently and with care and proper maintenance.

12 TROUBLESHOOTING AND CUSTOMER SUPPORT

In case of problems with the PlantPen visit **FAQ** on our websites (http://psi.cz/support/faq) or contact customer support by email to support@psi.cz , or contact your local distributor.

13 LIST OF FIGURES