

# Use GPS for Timing and Synchronization

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## How-to Guide

GPS timing and synchronization module V22-1



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## 2. About this document

This is the users manual for the GPS timing and synchronization module.

## 2.1. Legend

The following symbols and formats will be used throughout the document.



## Important

It gives you important information about the subject.  
Please read carefully!



### Hint

It gives you a hint or provides additional information about a subject.



## Example

Gives you an example of a specific subject.



Image 1: Independent systems with GPS PPS synchronization

In the graphic above you see independent measurement systems, synchronized per GPS. Basically the DEWESoft device needs the PPS (pulse per second) output from the GPS, to correctly synchronize the AD clock to it. Also a single system can use the GPS time as a timebase for the measurement.

Either **internal GPS** (DEWE-101, S-BOX) or **external GPS** (DS-GPS-SYNC) can be used.

This document lists first the different GPS (depending if 1 Hz, 20 Hz or 100 Hz option, internal or external GPS), then the sync port and timing setup is described.

### 3. GPS settings

If you already have a DEWE-101 (Minitaur) or S-BOX with integrated GPS, you need to check the correct GPS setting in DEWESoft first (should be correctly setup by delivery). Go to Settings -> Devices -> Add device (+). Depending on the used GPS type one of the following settings will work:

#### 3.1. 1Hz internal GPS

For the 1 Hz GPS option you have to add NMEA GNSS and the following Init String must be entered in hardware setup to correctly setup the PPS output. Enable the checkbox "Send init string", then copy line by line sequentially into the text field. Some Init Strings are already preset for other Dewesoft GPS devices (you can add and save a custom preset by yourself with option "Manage presets").

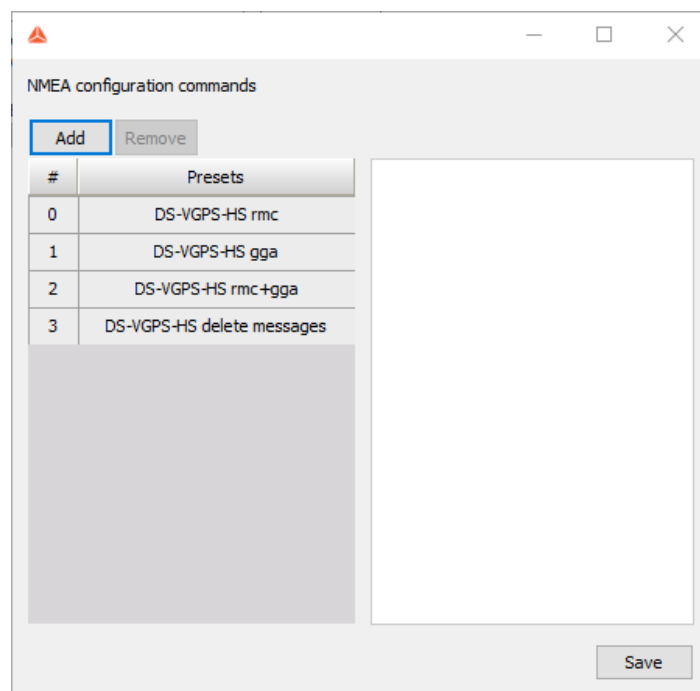


Image 2: Managing the preset

```
$PRTHS,U10P,ALL=0,GGA=1,GSV=1,RMC=1
$PRTHS,PPSG,ENABLE
$PRTHS,PPSO,0,0,500000000
```

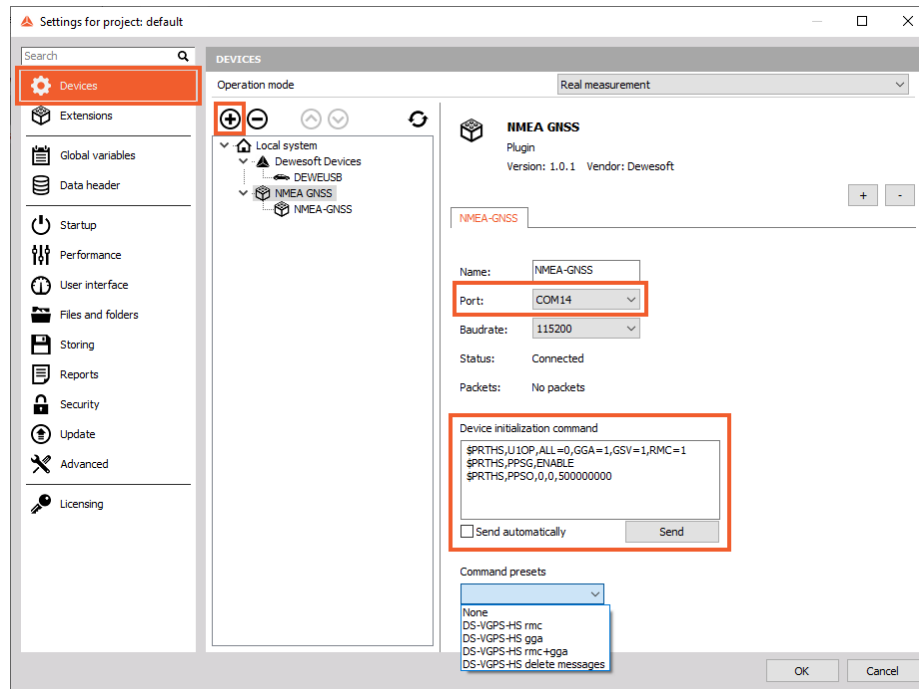


Image 3: Sending the Init String for enabling GPS PPS pulse

## 3.2. 20Hz internal GPS

For 20 Hz GPS select the Dewesoft RS232 (Topcon/Javad/NVS) device (higher update rates are selectable but cannot be applied).

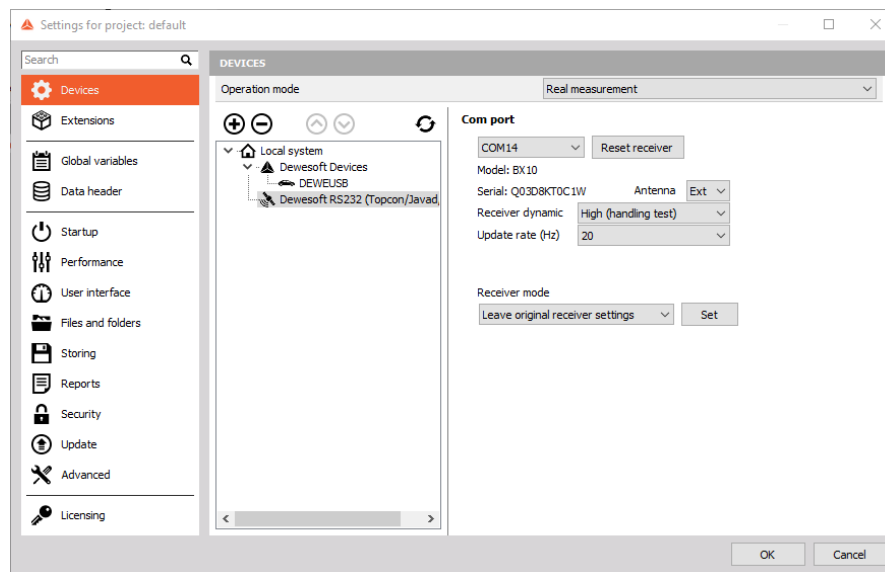


Image 4: Settings for 20Hz internal GPS

### 3.3. 100Hz internal GPS

Also for 100 Hz GPS select the Topcon/Javad device.

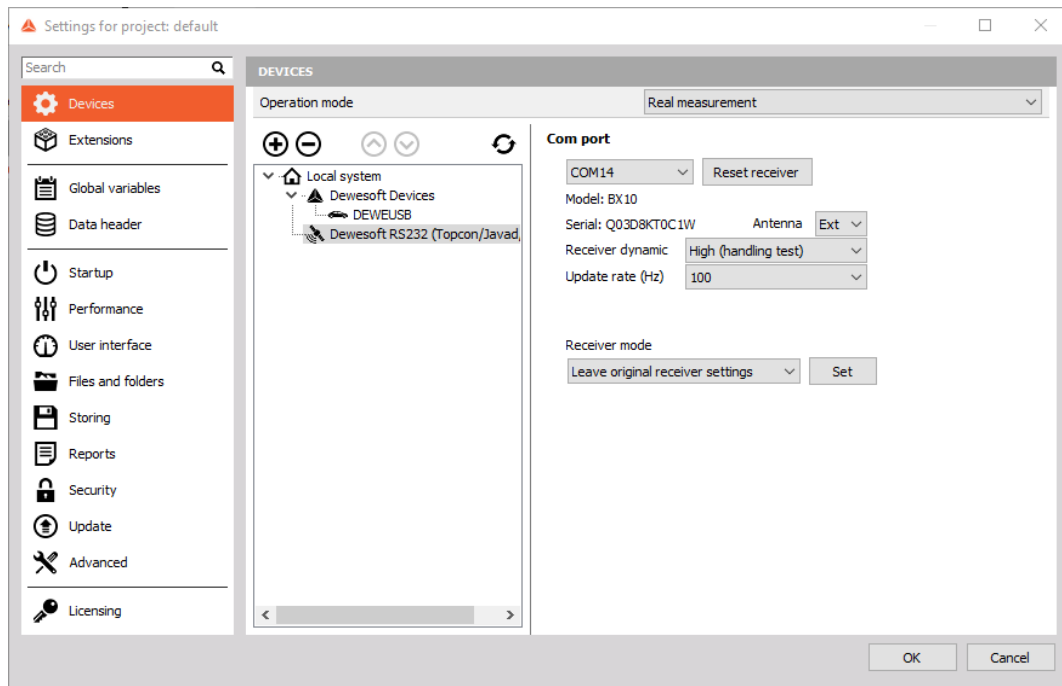


Image 5: Settings for 100Hz internal GPS

### 3.4. DS-GPS-SYNC

For the clocking of single slices or a DEWE-43, use the DS-GPS-SYNC kit available at DEWESoft, which consists of an external GPS (with PPS out functionality), which you just need to connect; all the cabling is already done.

Connect the D-SUB9 to the CAN port, the GPS mouse will be powered from the (often not used) CAN port. The 00 Lemo cable is connected to the Sync connector for the TTL PPS signal. The serial communication to the GPS is done over USB by using an additional RS232-to USB converter (included in the set).





Image 6: Typical configuration with DS-GPS-SYNC

Install the driver for the RS232-to-USB converter (you can find it also on the USB Stick included in the shipment, in the folder „\Extras\USB-to-Serial\_Converter“)

Sometimes it happens that the mouse cursor starts jumping after the GPS is connected (this is depending on your Windows version); to fix it please follow these steps:

- As soon as the Mouse pointer starts jumping, disconnect the D-SUB RS232 connection between the GPS and the USB converter (but do not disconnect the USB converter!)
- Enter the Windows device manager (right-click on Computer, choose “manage” and select device manager)
- In the list of devices go to “Mice and other pointing devices”, right-click on “Microsoft serial ballpoint” and choose “**deactivate**” (do **not** choose deinstall!)

Then go to the Settings, Devices and Add NMEA GNSS, choose the correct COM port the driver is using and a baud rate will be automatically found by the plugin.

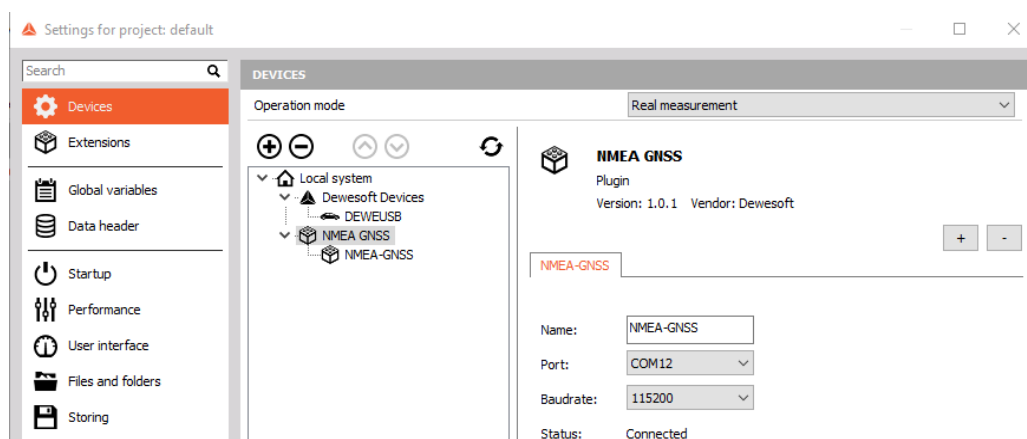


Image 7: Adding DS-GPS-Sync to DewesoftX

## 4. Sync port setting

Go to Settings -> Devices -> Local system; Your Dewesoft device will be automatically found; the Time source is set to Dewesoft DAQ Devices and Clock provider should be set to „Standalone“.

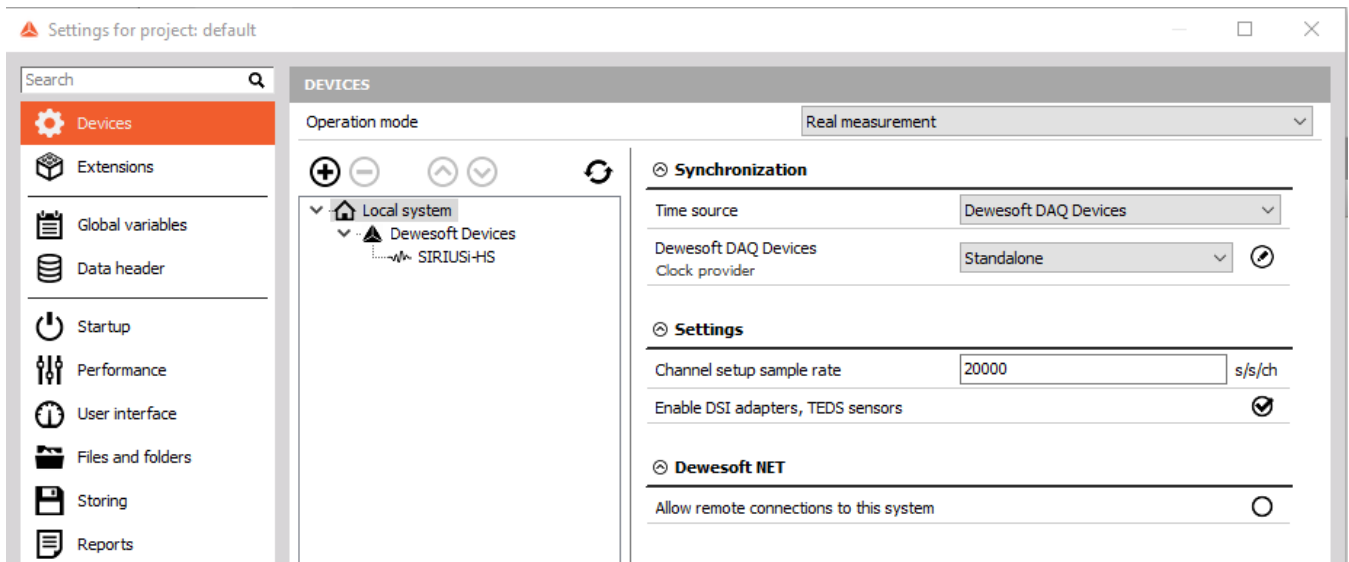


Image 8: Standalone Device sync setting

### 4.1 Using device plugin for clock provider

We can use different device plugins as clock providers, such as Navion i2, DS-IMU, NMEA compatible GPS, NMEA GNSS.

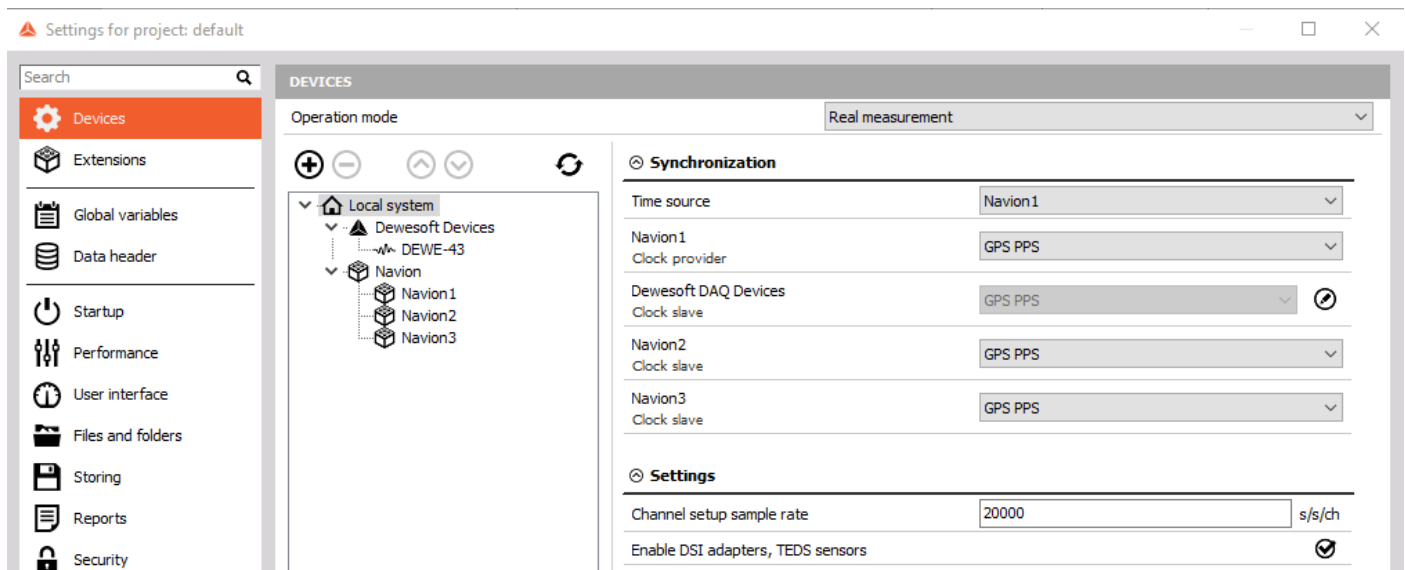


Image 9: Device plugin as clock provider



## 5. Timing setting

Select the „Time source“ tab, choose „NMEA-GNSS“ for the time source and „GPS PPS“ as the synchronization method; the clock slave will be automatically set to GPS PPS input:

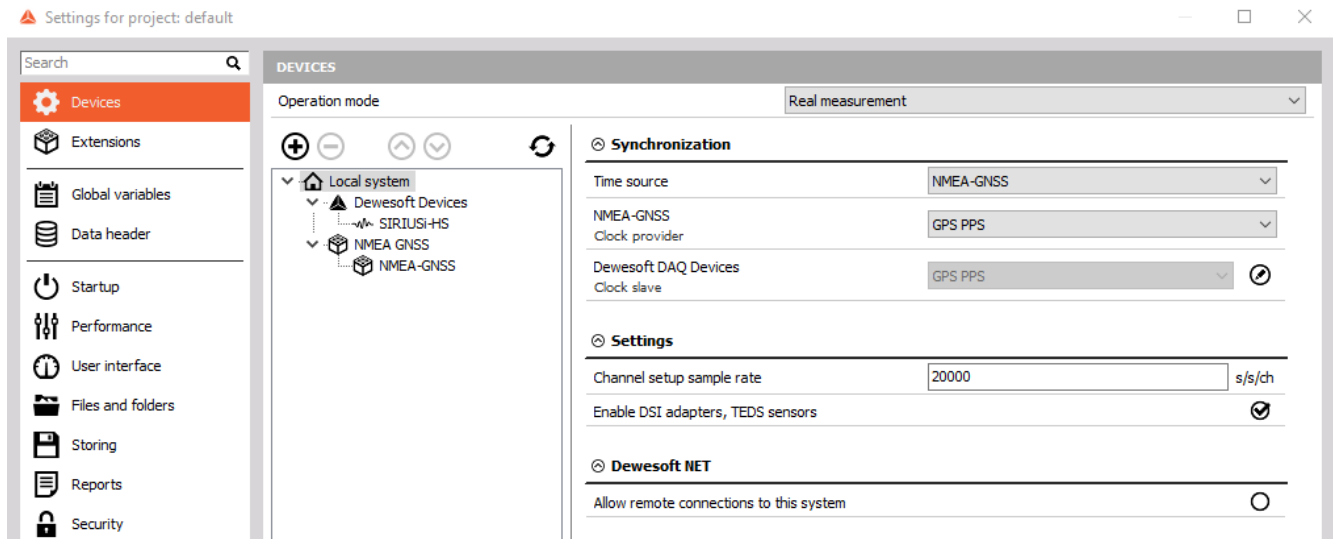


Image 10: GPS PPS clock provider

## 6. Measurement

Exit the Hardware-Setup with OK, go back to Channel Setup – GPS screen and check if the GPS has found several satellites, shows the coordinates and “PPS sync” is green:

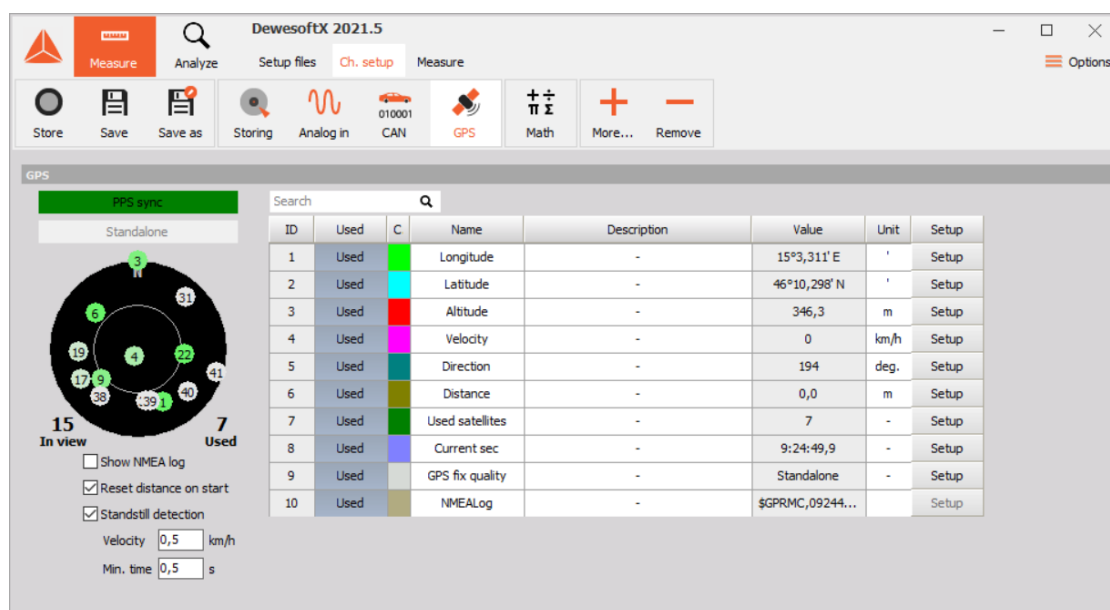


Image 11: PPS synchronization available

Go to measure mode, the green Clock on top shows that the synchronization works ok.

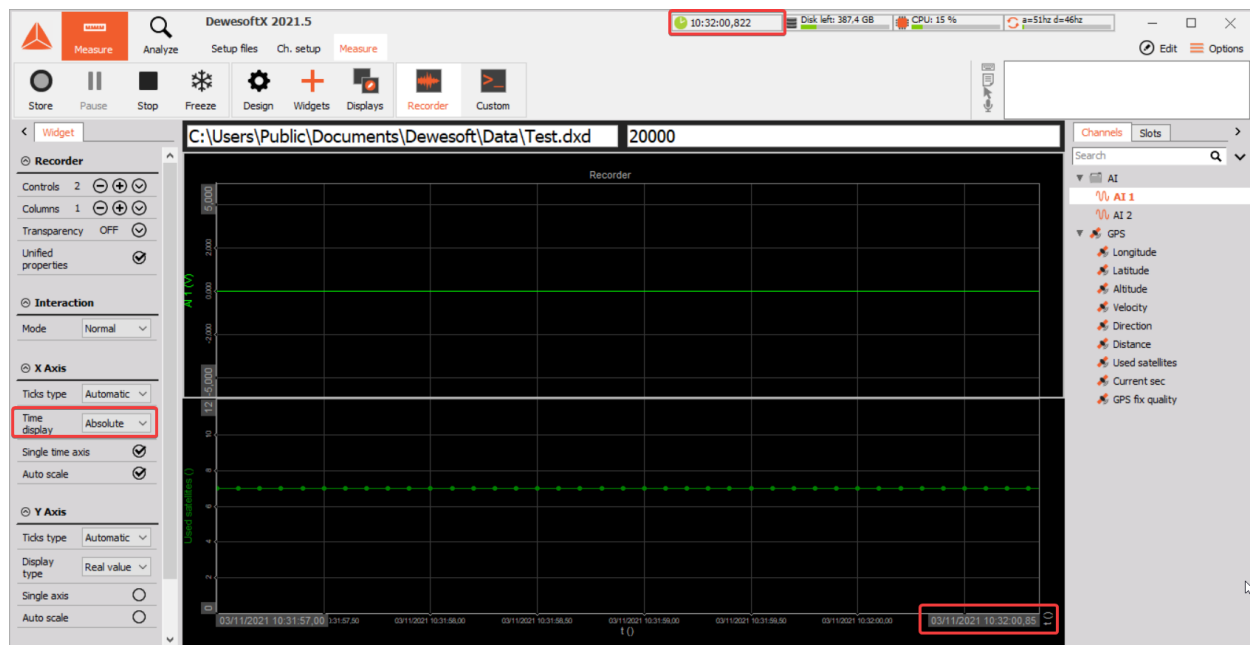


Image 12: GPS clock with PPS pulse



Starting from DEWESoft X2 it is possible to import data from independent measurement stations into ONE datafile. When the datafiles have the same time stamping (synchronized measurement), you just import and Dewesoft aligns them correctly.

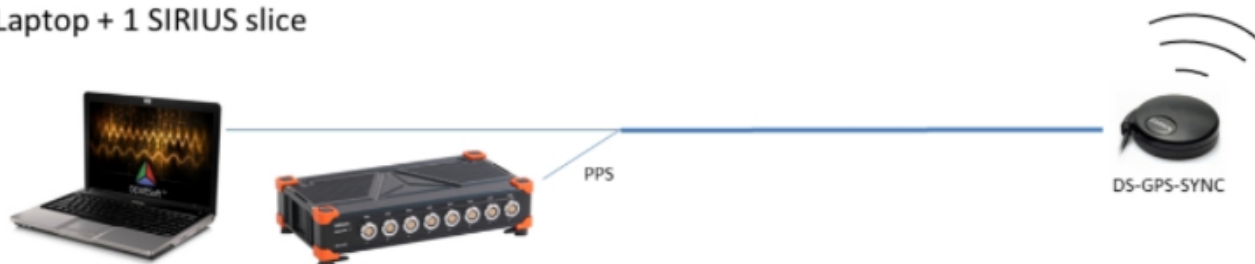
Some example configurations are presented in the next chapter.

## 7. Example configurations

Directly synching to external GPS is working using 1 Dewesoft device. If you use e.g. 2 separate SIRIUS slices, synched by sync cable, the sync port is already in use for the internal synchronization between the slices. Therefore the DS-CLOCK has to be used to convert the GPS signal to IRIG.

Using the internal GPS of a “multislice” device for timing (SBOX + multiple SIRIUS slices in one aluminum chassis) works because the connections are done internally.

## Laptop + 1 SIRIUS slice



## Laptop + separate SIRIUS slices



## SBOX + SIRIUS slices in one housing



Image 13: Few typical configurations

## 8. Warranty information

### Notice

The information contained in this document is subject to change without notice.

### Note:

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The copy of the specific warranty terms applicable to your Dewesoft product and replacement parts can be obtained from your local sales and service office. To find a local dealer for your country, please visit <https://dewesoft.com/support/distributors>.

### 8.1. Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

### 8.2. Support

Dewesoft has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or Dewesoft directly.

Dewesoft d.o.o.  
Gabrsko 11a  
1420 Trbovlje Slovenia

Europe Tel.: +386 356 25 300  
Web: <http://www.dewesoft.com>  
Email: [Support@dewesoft.com](mailto:Support@dewesoft.com)  
The telephone hotline is available Monday to Friday from 07:00 to 16:00 CET (GMT +1:00)

### 8.3. Service/repair

The team of Dewesoft also performs any kinds of repairs to your system to assure a safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly on <https://dewesoft.com/support/rma-service>.

### 8.4. Restricted Rights

Use Slovenian law for duplication or disclosure. Dewesoft d.o.o. Gabrsko 11a, 1420 Trbovlje, Slovenia / Europe.

### 8.5. Printing History

Version 2.0.0, Revision 217 Released 2015 Last changed: 23. July 2018 at 16:54.

### 8.6. Copyright

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### 8.7. Trademarks

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## 9. Safety instructions

Your safety is our primary concern! Please be safe!

### 9.1. Safety symbols in the manual



#### Warning

Calls attention to a procedure, practice, or condition that could cause the body injury or death



#### Caution

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

### 9.2. General Safety Instructions



#### Warning

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Dewesoft d.o.o. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as an option and will not be shipped as standard parts.

### 9.2.1. Environmental Considerations

Information about the environmental impact of the product.

### 9.2.2. Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

### 9.2.3. System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid unnecessary pollution of the environment and to keep natural resources.



This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further information about recycling on the Dewesoft web site [www.dewesoft.com](http://www.dewesoft.com)

 Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment and is outside the scope of the 2002/95/EC RoHS Directive. However, we take care of our environment and the product is lead-free.

### 9.2.4. General safety and hazard warnings for all Dewesoft systems

Safety of the operator and the unit depend on following these rules.

- Use this system under the terms of the specifications only to avoid any possible danger.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- You may not connect higher voltages than rated to any connectors.
- The power cable and connector serve as Power-Breaker. The cable must not exceed 3 meters, the disconnect function must be possible without tools.
- Maintenance must be executed by qualified staff only.
- During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advice for using the system.
- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non-interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals.
- Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.



- The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.
- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorized personnel only.
- Adverse environmental conditions are Moisture or high humidity Dust, flammable gases, fumes or dissolver Thunderstorm or thunderstorm conditions (except assembly PNA) Electrostatic fields, etc.
- The measurement category can be adjusted depending on module configuration.
- Any other use than described above may damage your system and is attended with dangers like short-circuiting, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until the safe operation can be verified by service-trained personnel. If necessary, return the product to Dewesoft sales and service office for service and repair to ensure that safety features are maintained.
- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more riskless operation is not possible anymore if the system is damaged obviously or causes strange noises. The system does not work anymore. The system has been exposed to long storage in adverse environments. The system has been exposed to heavy shipment strain.
- Warranty void if damages caused by disregarding this manual. For consequential damages, NO liability will be assumed!
- Warranty void if damage to property or persons caused by improper use or disregarding the safety instructions.
- Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE).
- Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
- Prevent using metal bare wires! Risk of short circuit and fire hazard!
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
- Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
- DO NOT use the system in rooms with flammable gasses, fumes or dust or in adverse environmental conditions.
- Avoid operation in the immediate vicinity of high magnetic or electromagnetic fields, transmitting antennas or high-frequency generators, for exact values please refer to enclosed specifications.
- Use measurement leads or measurement accessories aligned with the specification of the system only. Fire hazard in case of overload!

- Lithium ion batteries are classified as not hazardous when used according to the recommendations of the manufacturer described in Battery Safety Data Sheet, which is available for download from [this link](#).
- Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatize the system unpowered to room temperature.
- Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.
- The electrical installations and equipment in industrial facilities must be observed by the security regulations and insurance institutions.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use in humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already- lower level may damage your system.
- Please also consider the detailed technical reference manual as well as the security advice of the connected systems.
- This product has left the factory in safety-related flawlessness and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advice and warnings in this manual.

### EN 61326-3-1:2008

IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1.

Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally well-tried”, are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for the protection of buildings, are excluded from the scope of IEC 61326-3-1.

## 10. Documentation version history

Version	Date	Notes
V21-1	29. Oct 2021	- New template
V22-1	09. Aug 2022	- Updated images - Added Navion