

Table of Contents

1 Notice.....	1
1.1 Safety instructions.....	2
2 GPS or IRIG synchronized time base generator.....	6
2.1 Features	6
2.2 Specifications.....	7
2.2.1 Shock & Vibration.....	7
3 Device overview.....	8
3.1 GPS based operation.....	8
3.2 IRIG based operation.....	8
3.3 LED Description.....	9
3.3.1 Power (green).....	9
3.3.2 Status (red).....	9
3.4 Mounting the aerial.....	9
3.5 Warm-Up time.....	9
3.6 Scope of supply.....	10
3.7 Connection.....	11
3.7.1 Front Connectors.....	11
3.7.1.1 LEDs.....	11
3.7.1.2 Aerial connector.....	11
3.7.1.3 IRIG connector.....	11
3.7.2 Rear Connectors.....	11
3.7.2.1 Multi I/O Connector.....	12
Multi I/O Cable.....	12
3.7.2.2 Mini USB connector.....	12
3.7.2.3 ORION-DSA-SYNC connector.....	12
3.8 Installation.....	12
3.9 Connecting the DS-CLOCK to the DAQ-System.....	13
3.9.1 Synchronization to system with Clock and Trigger.....	13
3.9.2 Synchronization to DEWE-ORION-DSA series.....	13
3.10 Configuration of DEWESoft for the DS-CLOCK.....	13
3.10.1 Update rate.....	14
3.10.2 Maps directories.....	14
3.10.3 Timing settings.....	14
3.10.3.1 Input settings.....	15
Time source.....	15
Code type.....	15
Modulation.....	15
Output settings.....	15
3.11 Channel setup.....	15
3.12 Measurement setup.....	17
3.13 Time code restore.....	18
4 Version History.....	20

1 Notice

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Warranty Information:

A 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 this link: <http://www.dewesoft.com/support> and select *Find dealers* on the left navigation bar.

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.

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Service/repairs

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.

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1.1 Safety instructions

Your safety is our primary concern! Please be safe!

Safety symbols in the manual

<p>WARNING</p> 	<p>Calls attention to a procedure, practice, or condition that could cause body injury or death.</p>
<p>CAUTION</p> 	<p>Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.</p>

General Safety Instructions

<p>WARNING</p> 	<p>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 GmbH assumes no liability for the customer's failure to comply with these requirements.</p>
---	---

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

Environmental Considerations

Information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

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 an 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














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 about our environment and the product is lead free.

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, 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 advices 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 authorised 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, et etcetera.
-  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-circuit, 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 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.
-  DO NOT service or adjust alone. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
-  If you assume a more risk less use is not provided any more, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more risk less operation is not possible any more, if
 -  the system is damaged obviously or causes strange noises.
 -  the system does not work any more.
 -  the system has been exposed to long storage in adverse environmental.
 -  the system has been exposed to heavy shipment strain.
-  DO NOT touch any exposed connectors or components if they are live wired. The use of metal bare wires is not allowed. There is a risk of short cut and fire hazard!
-  Warranty void if damages caused by disregarding this manual. For consequential damages NO liability will be assumed!
-  Warranty void if damages 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 gases, 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 to the specification of the system only. Fire hazard in case of overload!
-  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. Acclimatise 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 equipments 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 at 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 advices of the connected systems.

This product has left the factory in safety-related flawless and in proper condition.

In order to maintain this condition and guarantee safety use, the user has to consider the security advices and warnings in this manual.

2 GPS or IRIG synchronized time base generator

2.1 Features

-  Absolute time accurate, wireless synchronisation between data acquisition systems
-  **Clock output**
 -  Output clock rate of up to 10 MHz
 -  Synchronization of DEWE-ORION-DSA systems
 -  Continuous synchronization to absolute GPS or IRIG time
 -  Absolute long time stable
 -  High frequency accuracy without GPS or IRIG (A/B) signal
-  **GPS engine**
 -  PPS accuracy of 250 ns
 -  1 Hz update rate
 -  Supports differential GPS (SBAS)
-  **IRIG engine**
 -  PPS accuracy of 250 ns
 -  IRIG-A/B DC/AC as input signal (isolated)
 -  IRIG-B/DC as output signal (GPS synchronised)

2.2 Specifications

IRIG Input Specifications	
Supported codes	IRIG code A or B / AM or DC
Compatibility (AM code)	0.5 V _{pp} to 10 V _{pp}
Ratio (AM)	3:1 ±10 %
Compatibility (DC code)	DC Level Shift TTL / CMOS compatible
Impedance	20 kΩ
Isolation	150 VDC
Trigger accuracy	1 μsec
IRIG output specifications	
Supported codes	IRIG code B, DC
Isolation	None
Accuracy	< 1 μsec (delay to GPS PPS)
GPS specifications	
General	12 channel, L1 frequency receiver
PPS accuracy	100 ns
Refresh rate	1 Hz
Position accuracy	Horizontal CEP
	Autonomous 3.0 m
	Differential 1.0 m
Trigger accuracy	1 μsec
System specifications	
Clock accuracy locked	without drift
Clock accuracy unlocked	< 10 ppm
Input	SMA for GPS antenna, BNC for IRIG I/O
Output: Trigger:	Clock and Trigger for DAQ-systems on DB9 connector
Scan clock:	PPS (pulse per second), rising edge on time, 75 msec high time, TTL level compatible
ORION-DSA-SYNC:	10 Hz to 10 MHz, rising edge synchronized, 50 % duty cycle, TTL level compatible
Power supply	LVDS compatible on RJ45
	USB powered, max. current 500 mA
Environmental specifications	
Operation temperature	-5 °C to +70 °C
Storage temperature	-20 °C to +85 °C
Humidity	10 % to 80 %; non condensing
Dimensions (W x D x H)	133 x 104 x 43 mm (5.23 x 4.1 x 1.7 in.)
Weight	approx. 330 g (0.72 lb)

2.2.1 Shock & Vibration

European Standard	Vibration Tests		Shock Test
	EN 600068-2-6	EN 60721-3-2 Class 2M2	EN 60068-2-27
Shape	Sine	Random	Half-sine
Frequency	0 Hz to 150 Hz	10 - 200 Hz	
Power spectral density	1 m/s ² / Hz from 10 – 200 Hz	1 m/s ² / Hz from 10 – 200 Hz	
Acceleration amplitude			15 g
Duration	30 Minutes per axis	30 Minutes per axis	11 ms
Test in 3 axis, 3 shocks in each axis and direction			

3 Device overview

The DS-CLOCK is a synchronized time base generator capable of using either GPS or IRIG as time source. This allows completely synchronized data acquisition of multiple systems whether they are mobile or stationary. Additionally the DS-CLOCK can also be used as an IRIG time code generator (output IRIG B/DC) synchronized to the GPS time.

The time synchronization is supported for the whole DEWE-ORION series as well as for many 3rd party A/D-boards.

The diagram below outlines the basic functionality of the DS-CLOCK:

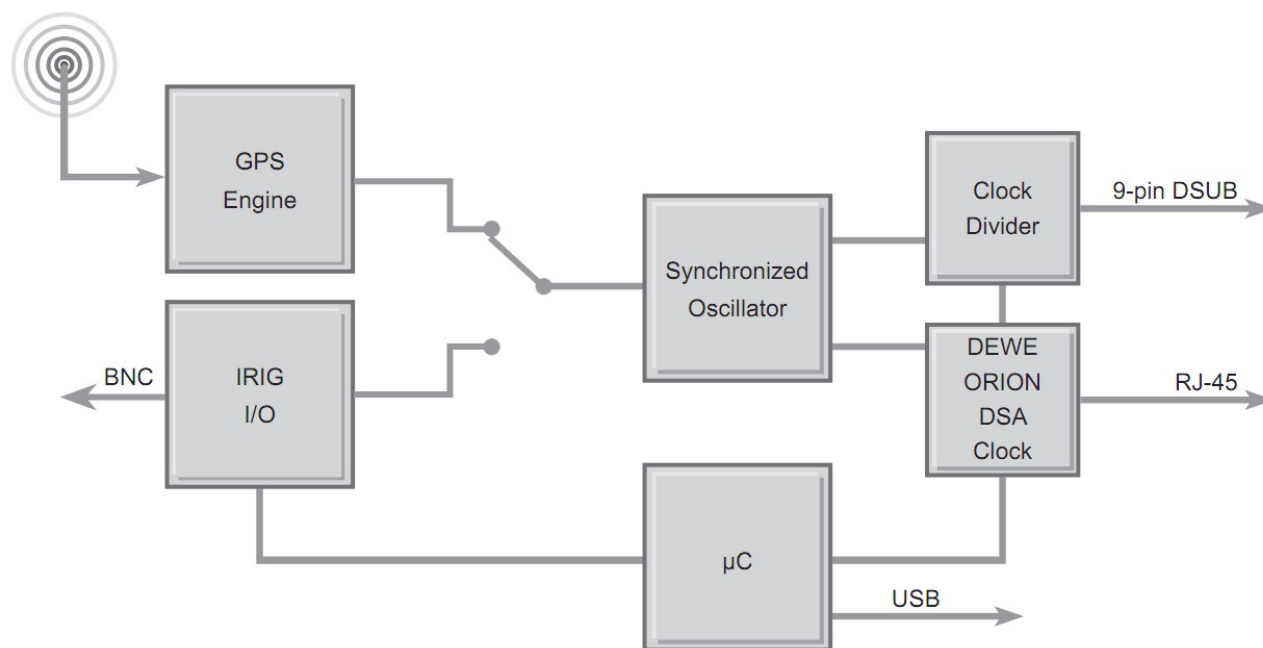


Illustration 1: Basic Block Diagram

3.1 GPS based operation

The base of any GPS receiver is precise time measurement. In addition to the position information a precise PPS (pulse per second) is generated by the GPS engine. This pulse is used to synchronize a 40 MHz oscillator with software PLL (phase locked loop). The result is an ultra-stable 40 MHz clock source which is completely free of drift over time.

Out of this 40 MHz base clock, the programmable clock divider generates the clock frequency for the standard data acquisition system which is being output on the 9-pin DSUB connector.



For A/D-boards with over-clocked delta sigma converters (e.g. DEWE-ORION-DSA series), a special output clock is required for synchronized sampling. This is available on a RJ45 connector.

The communication to the host is provided over USB interface.

3.2 IRIG based operation

The IRIG signal contains the binary-coded time (year, day of year, hours, minutes, seconds, fractions of a second) modulated on a sine wave carrier. This signal is decoded to the PPS and the drift-free 40 MHz clock.

The following IRIG time codes are supported:

-  IRIG-A (10 Hz)
-  IRIG-B (1 Hz)

3.6 Scope of supply



Illustration 4: Scope of supply

3.7 Connection

3.7.1 Front Connectors

3.7.1.1 LEDs

See 3.3 LED Description on page 9

3.7.1.2 Aerial connector

Connect the GPS antenna to the SMA connector.



3.7.1.3 IRIG connector

Connect the IRIG signal to the BNC connector.

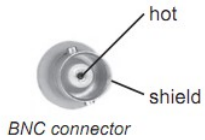


Illustration 5: Front Connectors

3.7.2 Rear Connectors

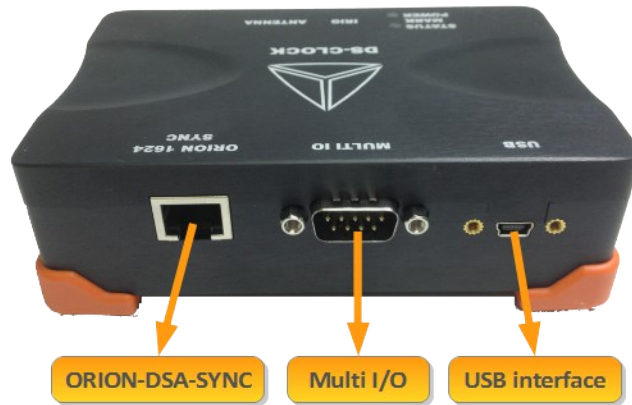


Illustration 6: Rear Connectors

3.7.2.1 Multi I/O Connector

Pin	Name	Description	Cable Colour
1	n.c.	Not connected	
2	n.c.	Not connected	
3	Clk Out	Scan clock output	yellow
4	n.c.	Not connected	
5	n.c.	Not connected	
6	PPS	Pulse Per Second	green
7	n.c.	Not connected	
8	DGND	Ground	white
9	n.c.	Not connected	

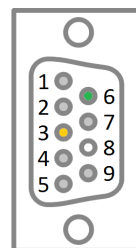


Illustration 7: DSUB9 connector (male)

Multi I/O Cable

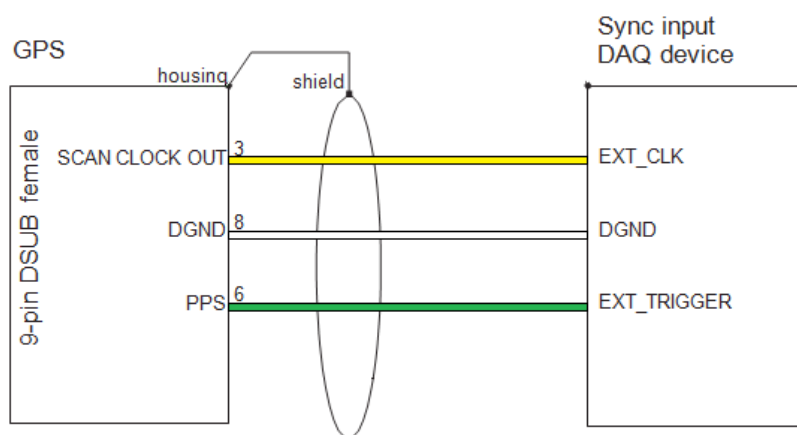
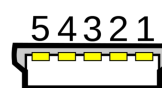


Illustration 8: MULTI I/O cable

3.7.2.2 Mini USB connector

The Mini-USB interface connectors meets standard USB pin assignment.

Pin	Name	Description
1	+5V	+5 Volt
2	D-	Data -
3	D+	Data +
4	ID	host cable identification
5	GND	Ground



Mini-B

Illustration 9: Mini USB connector

3.7.2.3 ORION-DSA-SYNC connector

This connector is used for synchronizing any ORION-DSA data acquisition card to the DS-CLOCK. For this purpose the DS-CLOCK is equipped with a RJ45 connector for connection to the DEWESoft™ data acquisition system. A standard CAT5e or CAT6 Ethernet cable with up to 30 m can be used for connection.

3.8 Installation

The hardware drivers for the DS-CLOCK is automatically installed together with Dewesoft. There is no additional SW needed.

You can start the software in the Windows start menu or use the icon created on your desktop. For more information about the DEWESoft installation please refer to the DEWESoft Software Users Manual

3.9 Connecting the DS-CLOCK to the DAQ-System

3.9.1 Synchronization to system with Clock and Trigger

To synchronize standard data acquisition systems a start trigger and the possibility of external clocking is required. This input needs to be connected to the output of the DS-CLOCK sync signals of the 9-pin DSUB female (signal Scan Clock Output and PPS).

3.9.2 Synchronization to DEWE-ORION-DSA series

One of the unique features of the DS-CLOCK is the possibility to synchronize also data acquisition systems using delta sigma ADC technology like DEWE-ORION-DSA. The main challenge is to produce the up to 256 times over sample clock used for these types of analogue to digital converters. For this purpose the DS-CLOCK is equipped with a RJ45 connector for connection to the Dewesoft data acquisition system. A standard CAT5e or CAT6 Ethernet cable with up to 30 m can be used for connection.

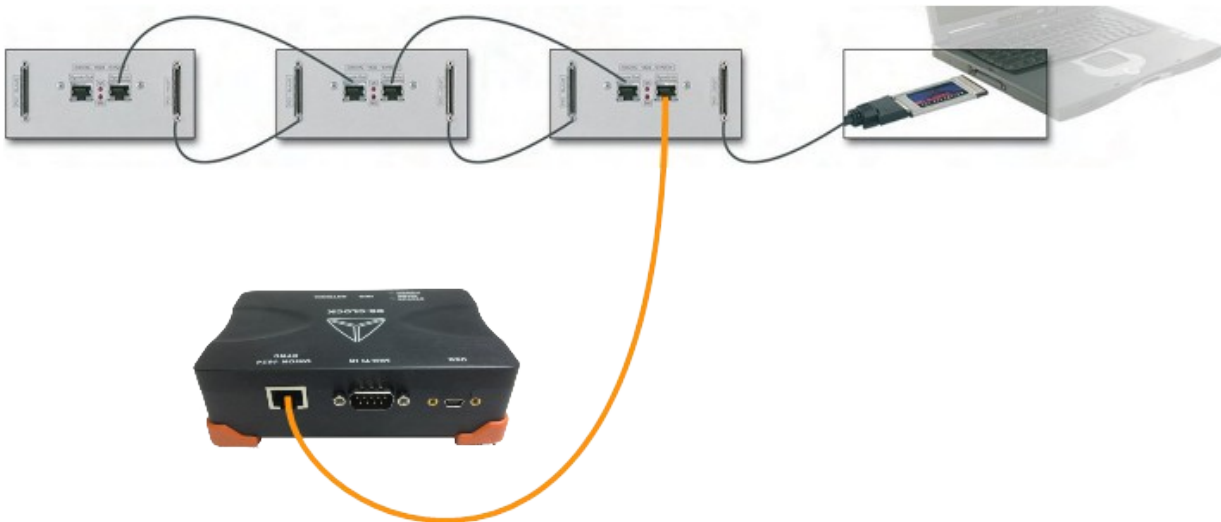


Illustration 10: ORION synchronisation

IMPORTANT



Please note that also the data acquisition has to be provided ORION-DSA-SYNC option for having access to the synch bus of the board.

3.10 Configuration of DEWESoft for the DS-CLOCK

To unlock the GPS functionality in DEWESoft™ the GPS has to be configured in the Hardware Setup screen (System - Hardware Setup – GPS):

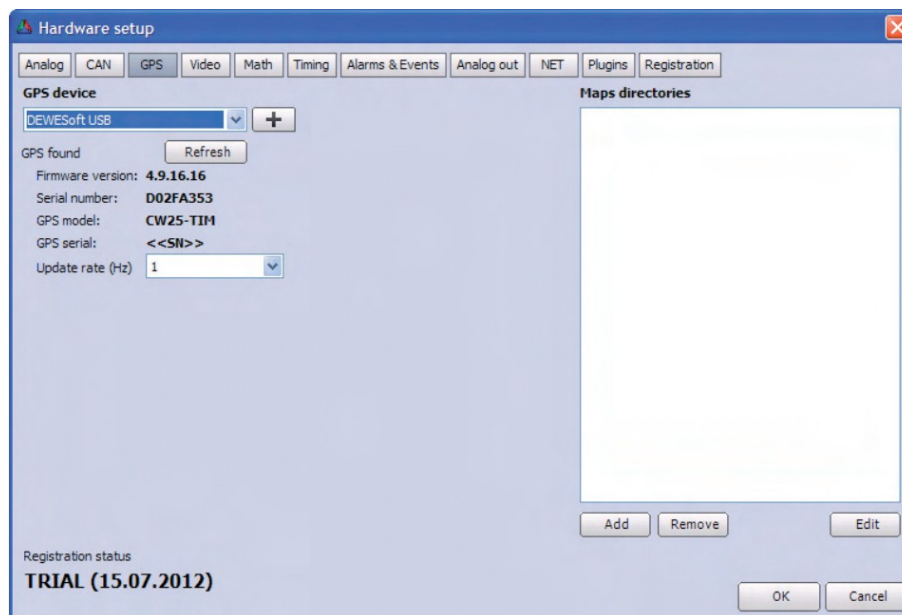


Illustration 11: GPS setup

Select *DEWESoft USB* from the GPS device drop-down menu. DEWESoft™ will automatically start searching for a connected device.

3.10.1 Update rate

The update rate is fixed at 1 Hz.

3.10.2 Maps directories

Select the directories, where you stored your maps. You can copy your maps into this directory, add individual directories or remove unused directories from the box. Convert the maps to .jpg or .bmp format before selecting them.

3.10.3 Timing settings

When you want to use the DS-CLOCK as high precision timing device for synchronized data acquisition, you need to enable this in the Timing section (System Hardware Setup Timing).

If you want to use the DS-CLOCK as high precision timing device for synchronized data acquisition, you need to enable this in the Timing section (System Hardware Setup Timing).

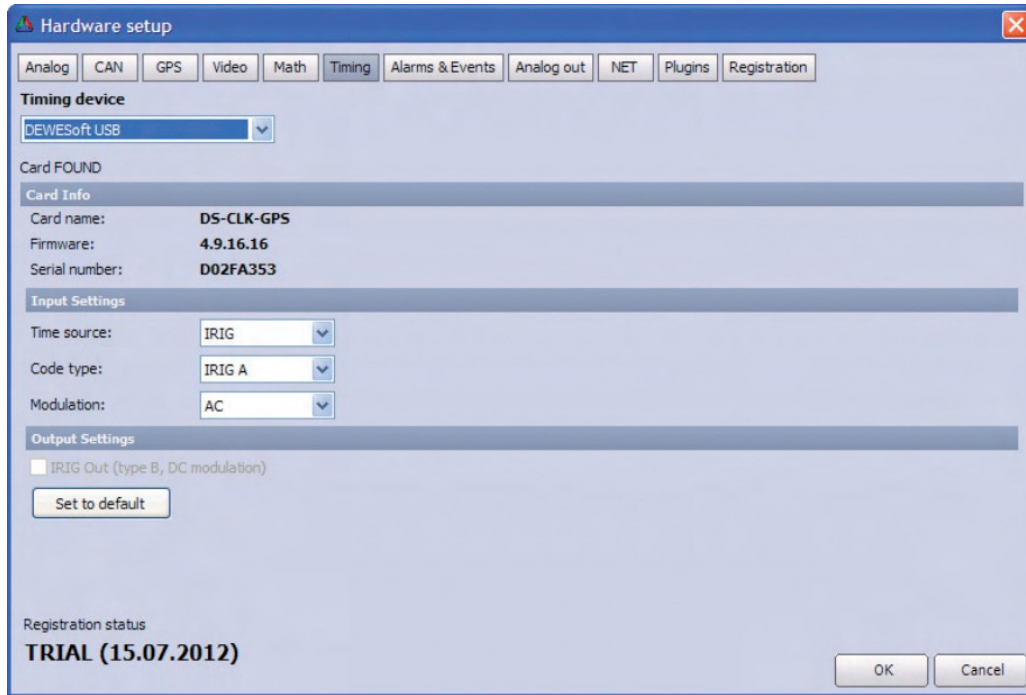


Illustration 12: Input Settings

3.10.3.1 Input settings

Time source

Here you can select which input signal (GPS or IRIG) is used for the time source.

Code type

If IRIG mode is selected as time source, this drop-down menu defines the used code type (IRIG-A, IRIG-B or IRIG-G).

Modulation

This selects the modulation type (AC or DC) of the IRIG input signal.

Output settings

The check-box “IRIG Out” enables the output of the internally generated IRIG signal on the BNC connector of the DS-CLOCK.

Please note that only IRIG-B with DC modulation is supported as output signal.

Set do default Button

This button defines the current input- and output settings as power on default settings. This way the DS-CLOCK will always start up with the predefined settings.

3.11 Channel setup

The screen-shot below shows the channel setup screen of the DS-CLOCK when it was selected as GPS device. In the column ON/OFF you can select the channels for storing during the measurement. The default channel names are displayed in the column NAME. You can change them with a double click on it. Beside the channel names the actual

value is displayed.



Illustration 13: Channel Setup

- X absolute: Longitude component of position in degrees, minutes and fraction of minutes
- Y absolute: Latitude component of position in degrees, minutes and fraction of minutes
- Z: Altitude in meters above sea level
- Velocity: Speed over ground (vector of all 3 dimensions)
- Direction: True track over ground
- Used sat.: Numbers of satellites used for calculation of position and speed
- Current sec: Seconds since midnight (UTC)
- NMEA log: The raw NMEA string from the GPS receiver

The circle on the right gives an overview of the satellites in view of the GPS receiver and which of them are used from the receiver. The colour of the shown satellites indicates the signal strength of them. From grey to dark green which is the strongest signal. Satellites shown in the centre of the circle are directly above the GPS-aerial. Satellites shown at the border of the circle are near the horizon.

The field <PPS sync> and <Not fixed> change their colour from grey to green depending if the appropriate feature is available at the moment (green means available).

The PPS sync is used for hardware synchronisation to analogue channels. This will eliminate the time shift caused due the calculation time of the GPS receiver and of the data transfer time of the USB interface.

The button “NMEA log” shows/hides the raw NMEA data stream from the GPS receiver.

3.13 Time code restore

For synchronizing the internal oscillator with the PPS signal at least 4 satellites are required. If the GPS or IRIG signal is lost during acquisition the DS-CLOCK continues sourcing the data acquisition system with a precision clock source. Without synchronising to the GPS or IRIG signal, the oscillator may drift. Therefore the absolute time synchronisation cannot be guaranteed any more. However, as soon the GPS or IRIG signal is available again, the DS-CLOCK recognizes a possible drift and tries to correct this inaccuracy. If the drift during the free-run time is higher than 200 ms, a new data file is automatically generated with exact time stamping.

The graph below gives an idea how the DS-CLOCK behaves when the GPS or IRIG signal is lost during data acquisition. In this example the drift of the oscillator is smaller than the allowed 2 ms (fixed).

- A) This state shows the normal operation. The internal clock is synchronized to the GPS/IRIG once per second.
- B) At this point the time source signal is lost.
- C) In the free-run operation the oscillator drift is obvious.
- D) After the time source signal is received again, the error during the free run cycle is calculated.
- E1) Because the oscillator drift is smaller than 200 ms, the DS-CLOCK automatically corrects the drift for getting again time synchronized data. So the data acquisition is not interrupted although the time source signal was lost. The correction is done with the maximum rate of 5 μ s/sec.

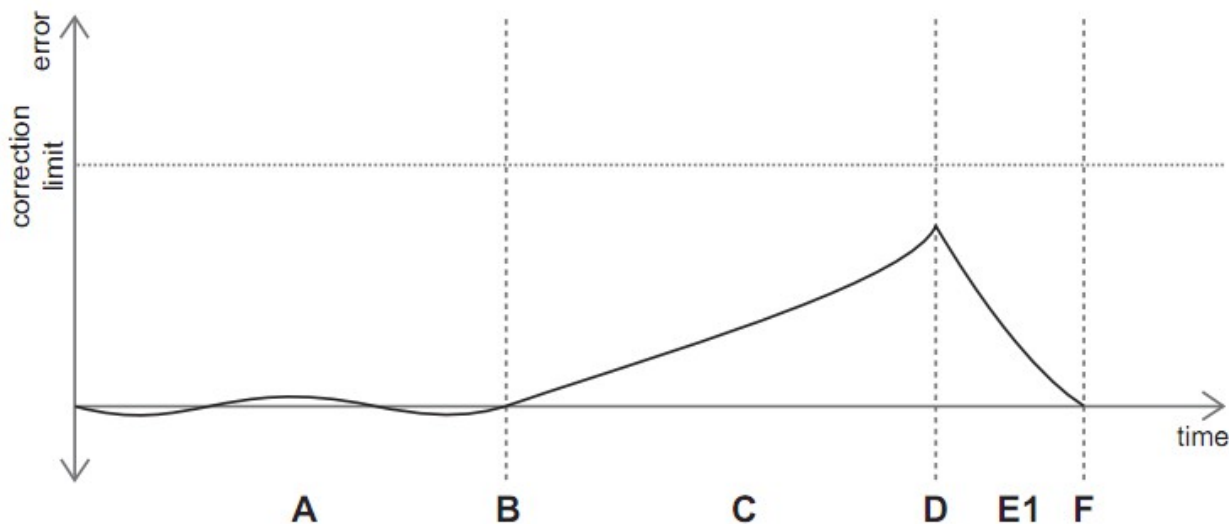


Illustration 15: Timing Correction

However if the time source signal is lost for too long, the oscillator drift may be higher than 200 ms. In this case automatically the existing data file is closed and a new file is generated with adding “Lost” of the current file-name: “DataFilenameLostX” where X is a running number for each time source signal loss.

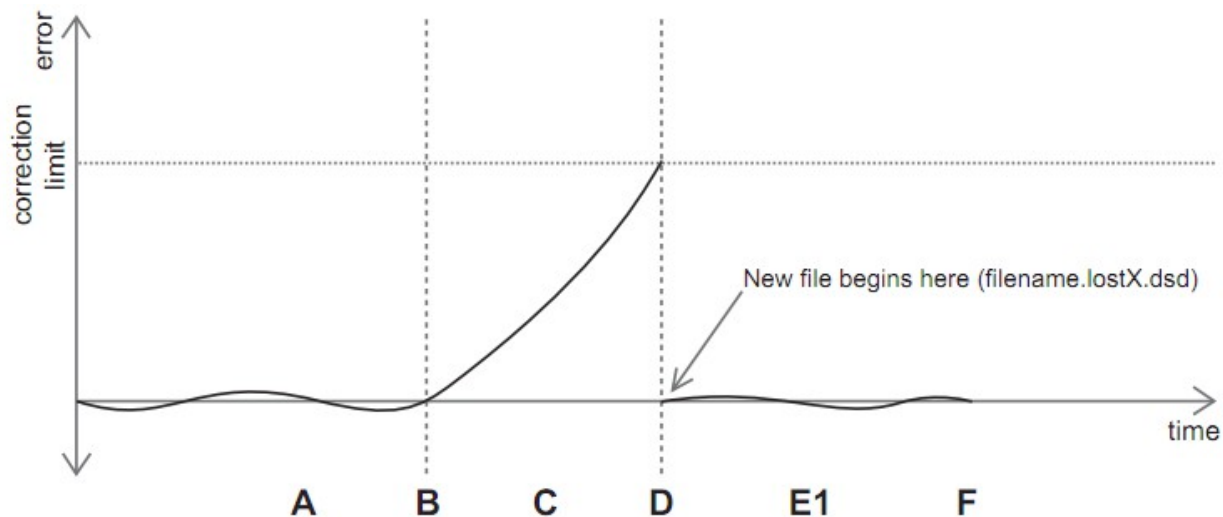


Illustration 16: Timing Correction Long

As soon the timing device is selected DEWESoft automatically sets the data acquisition hardware to external clocking for receiving the sample frequency out of the DS-CLOCK. In addition, each measurement starts synchronized with the PPS signal. The time information of the data file is taken out of the GPS- or IRIG-time and not from the local PC time any more.

4 Version History

Revision number: 57

Last modified: Wed 04 Sep 2013, 11:02

Doc-Version	Date [dd.mm.yyyy]	Notes
1.0.0	04.09.2013	initial version 1.0.0