GeoSIG
swiss made to measure

GMS-TIM

User Manual

Document Revision

Version	Date	Modification	Prepared	Checked	Released
0	2023-10-03	First issue	KEC	TAB	ALB

GeoSIG Ltd

Switzerland

Table of Contents

Warnings and Safety

- ***The GPS system is operated by the government of the United States of America, which is solely responsible for its accuracy and maintenance.***
- ***GPS provides only UTC time at 0° Greenwich meridian without daylight savings time adjustment.***
- ***GMS-TIM offers concurrent reception of up to 3 GNSS (GPS, Galileo, GLONASS, BeiDou).***

Symbols and Abbreviations

Instrument	GeoSIG Recorder, Digitiser or Data Acquisition system
GPS	Global Positioning System
UTC	Universal Time Clock

1. Introduction

This document describes the principle of operation and installation instructions of the timing receiver.

The timing receiver is used with GeoSIG Instruments to provide the accurate date and time to the Instruments and the GNSS coordinates of the antenna. It's very useful for precise synchronisation of one or several interconnected Instruments.

☞ ***GNSS provides only UTC time at 0° Greenwich meridian without daylight savings time adjustment.***

The timing receiver is provided in a box with a cable length to be defined at the time of order or provided by the customer.

2. GMS-TIM Cable

Two different cables can be used according to connection:

- GPS - RS-232 (standard): Up to 70 meters of cable length
- GPS - RS-485: Up to 300 meters of cable length

2.1. RS-232 cable

For the RS-232 connection, the cable used by default is:

☞ *GeoSIG standard cable type:* ***XY DIN 5 x 0.25 mm² gr UL style 2464****.*

Figure 1. Example of timing receiver device RS-232 assembled with 20 m of cable for an Instrument

2.2. RS-485 cable

For the RS-485 connection, the cable used by default is:

☞ *GeoSIG standard cable type:* ***LiY(St)CY 300V 4 x 2 x 0.25 mm² gr UL Style 2464****.*

Figure 2. Example of timing receiver device RS-485 assembled with 20 m of cable for an Instrument

3. Mounting the Timing Receiver Box

☞ ***It is recommended to perform a check of the GNSS function before mounting the box to its final location, as described in section 5.***

The timing receiver device box can be fixed to various locations. The position of the box should be defined according to a position where the antenna can easily get the satellite signals. Typically, the box is fixed on an outside wall or on a roof. This is an important point as the antenna should receive signals from at least 3 satellites for synchronisation of the instrument.

☞ ***Make sure that at least 75% of the sky is visible at all times over the timing receiver box.***

Fixation of the housing should be done with M4 screws with spacing and locations as shown in Figure 3 and Figure 4. Type of screw depends on the type of surface where the box will be fixed.

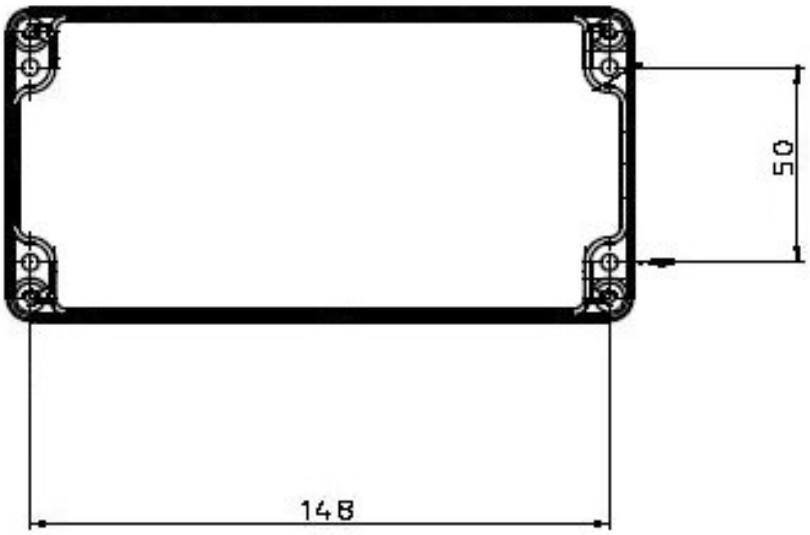


Figure 3. Mechanical fixation of housing

Figure 4. Inside view of the GMS-TIM housing

4. Electrical Connection

4.1. Timing Receiver Main Connector Pin Assignment

4.1.1. With RS-232 connection

The device is provided with an 8-pin main connector inside the box, supplied already connected.

Table 1. Electrical connections of the RS-232 timing receiver connector

Pin	Signal	Standard cable Colours	Comment
1	GPS_RX_P	White	Reception signal from instrument
2	GPS_TX_P	Brown	Transmit GNSS signal
3	GPS_1PPS_P	Green	1 PPS signal of GNSS
4	V_MAIN	Yellow	12V power from instrument
5	GPS_1PPS_N	N/A	Only used for RS-485
6	GND	Grey	Ground from instrument
7	GPS_RX_P	N/A	Only used for RS-485
8	GPS_TX_N	N/A	Only used for RS-485

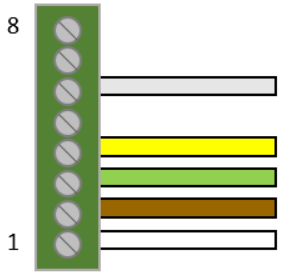


Figure 5. Connector wiring

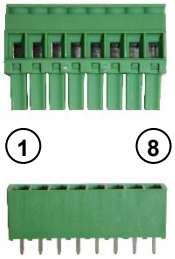


Figure 6. Connector pin out

4.1.2. With RS-485 connection

The device is provided with an 8-pin main connector inside the box, supplied already connected.

Table 2. Electrical connections of the RS-485 timing receiver connector

Pin	Signal	Standard cable Colours	Comment
1	GPS_RX_P	White	Reception signal from instrument+
2	GPS_TX_P	Green	Transmit signal of GNSS+
3	GPS_1PPS_P	Grey	1 PPS signal of GNSS+
4	V_MAIN	Red	12V power from instrument
5	GPS_1PPS_N	Pink	1 PPS signal of GNSS-
6	GND	Blue	Ground from instrument
7	GPS_RX_N	Brown	Reception signal from instrument-
8	GPS_TX_N	Yellow	Transmit signal of GNSS-

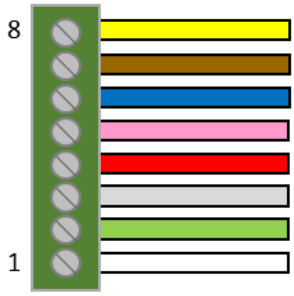


Figure 7. Connector wiring

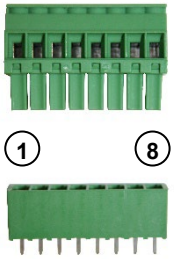


Figure 8. Connector pin out

4.2. Mating Connector at the Instrument Side

A mating connector must be used for connecting the timing receiver to an Instrument. This connector is already assembled when the timing receiver is ordered together with the Instrument.

4.2.1. GXR-XX Device

4.2.1.1. Mating Connector at the Instrument Side for RS-232 connection

Table 3. Electrical connections of an Instrument's timing receiver input connector

Pin	Signal	Standard Cable Colours	Comment
1	GPS_RXD	White	Transmit signal of GSR
2	GPS_TXD	Brown	Reception signal of GSR
3	GPS_STDBY	N/A	Not connected
4	GND	N/A	Not connected
5	GPS_1PPS	Green	1 PPS signal from GPS
6	V_MAIN	Yellow	12V power from instrument
7	GND	Grey	Ground from instrument

Figure 9. RS-232 Binder connector

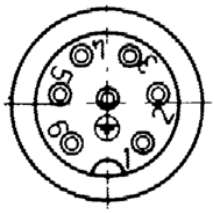


Figure 10. RS-232 Connector pin out

4.2.1.2. Mating Connector at the Instrument Side for RS-485 connection

Table 4. Electrical connections of an Instrument's timing receiver input connector

Pin	Signal	Standard Cable Colours	Comment
1	N/A	N/A	Not connected
2	SYNCI_RX+	White	GNSS Transmit signal+
3	N/A	N/A	Not connected
4	SYNCI_RX-	Brown	GNSS Transmit signal-
5	GPS_1PPS	Green	1 PPS signal from GNSS
6	V_EXT_GPS	Yellow	12V power from instrument
7	GND_EXT	Grey	Ground from instrument

Figure 11. RS-485 Binder connector

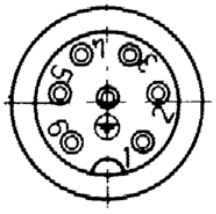


Figure 12. RS-485 Connector pin out

4.2.2. GMS Devices

This includes the instruments GMS-XX and GMSplus.

4.2.2.1. Mating Connector at the Instrument Side for RS-232 connection

Table 5. Electrical connections of an Instrument's timing receiver input connector

Pin	Signal	Standard Cable Colours	Comment
1	GPS_RXD	White	Reception signal from instrument
2	GPS_TXD	Brown	Transmit signal of GNSS
3	GPS_STDBY	N/A	Not connected
4	GND	N/A	Not connected
5	GPS_1PPS	Green	1 PPS signal from GNSS
6	V_MAIN	Yellow	12V power from instrument
7	GND	Grey	Ground from instrument

Figure 13. RS-232 Binder connector

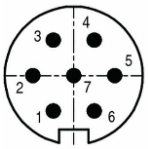


Figure 14. Connector pin out

4.2.3. scai – GMS series or nair – GMS series Device

4.2.3.1. Mating Connector at the Instrument Side for RS-232 connection

Table 6. Electrical connections of an Instrument's timing receiver input connector

Pin	Signal	Standard Cable Colours	Comment
1	GPS_1PPS+	Green	1 PPS signal from GNSS
2	GPS_1PPS-	N/A	Not connected
3	TX+	Brown	Transmit signal of GNSS
4	TX-	N/A	Not connected
5	RX+	White	Reception signal from instrument
6	RX-	N/A	Not connected
7	SUPPLY+	Yellow	12V power from instrument
8	SUPPLY-	Grey	Ground from instrument

Figure 15. RS-232 ***scai / nair*** connector

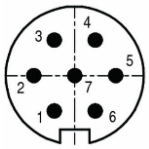


Figure 16. Connector pin out

4.2.3.2. Mating Connector at the Instrument Side for RS-485 connection

Table 7. Electrical connections of an Instrument's timing receiver input connector

Pin	Signal	Standard Cable Colours	Comment
1	GPS_1PPS+	Grey	1 PPS signal from GNSS (positive)
2	GPS_1PPS-	Pink	1 PPS signal from GNSS (negative)
3	TX+	Green	Transmit signal of GNSS (positive)
4	TX-	Yellow	Transmit signal of GNSS (negative)
5	RX+	White	Reception signal, GNSS (positive)
6	RX-	Brown	Reception signa, GNSS (negative)
7	SUPPLY+	Red	Supply positive (12V power)
8	SUPPLY-	Blue	Supply negative (Ground)

Figure 17. RS-485 ***scai / nair*** connector

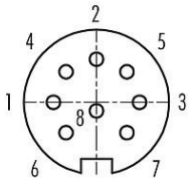


Figure 18. Connector pin out

4.2.4. CR-5 Device (legacy)

4.2.4.1. Mating Connector at the Instrument Side for RS-232 connection

Table 8. Electrical connections of an Instrument's timing receiver input connector

Pin	Signal	Standard Cable Colours	Comment
1	GPS_1PPS+	Green	1 PPS signal from GNSS
2	TX+	Brown	Transmit signal of GNSS
3	RX+	White	Reception signal from instrument
4	SUPPLY+	Yellow	12V power from instrument
5	SUPPLY-	Grey	Ground from instrument

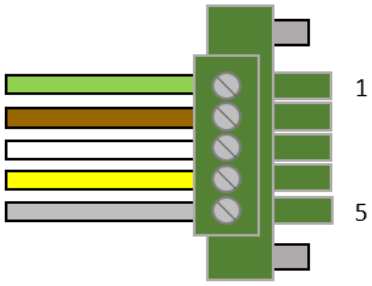


Figure 19. RS-232 CR-5 connector

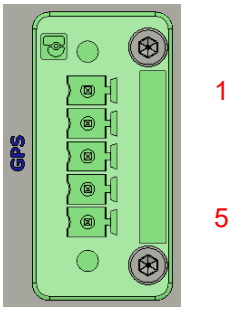


Figure 20. Connector pin out

4.2.5. CR-6 / CR-6plus Device (legacy)

4.2.5.1. Mating Connector at the Instrument Side for RS-232 connection

Table 9. Electrical connections of an Instrument's timing receiver input connector

Pin	Signal	Standard Cable Colours	Comment
1	RX+	Brown	1 PPS signal from GNSS
2	TX-	White	Transmit signal of GNSS
3	GPS_1PPS	Green	Reception signal from instrument
4	V_EXT_GPS	Yellow	12V power from instrument
5	GND_EXT	Grey	Ground from instrument

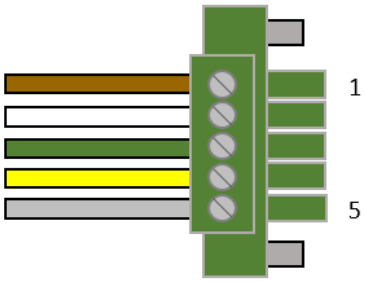


Figure 21. RS-232 CR-6 connector

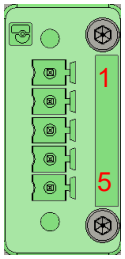


Figure 22. Connector pin out

4.2.5.2. Mating Connector at the Instrument Side for RS-485 connection

Table 10. Electrical connections of an Instrument's timing receiver input connector

Pin	Signal	Standard Cable Colours	Comment
1	RX+	White	1 PPS signal from GNSS
2	RX-	Brown	Transmit signal of GNSS
3	GPS_1PPS	Green	Reception signal from instrument
4	V_EXT_GPS	Yellow	12V power from instrument
5	GND_EXT	Grey	Ground from instrument

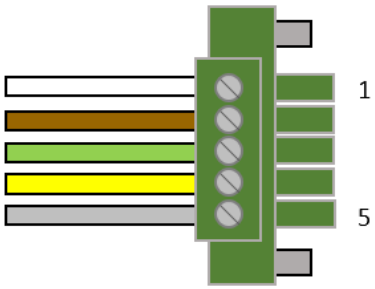


Figure 23. RS-232 CR-6 connector

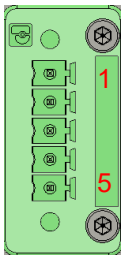


Figure 24. Connector pin out

4.2.6. fora – CR series Device

4.2.6.1. Mating Connector at the Instrument Side for RS-232 connection

Table 11. Electrical connections of an Instrument's timing receiver input connector

Pin	Signal	Standard Cable Colours	Comment
1	GPS_1PPS+	Green	1 PPS signal from GNSS
2	GPS_1PPS-	N/C	Not connected
3	TX+	Brown	Transmit signal of GNSS
4	TX-	N/C	Not connected
5	RX+	White	Reception signal from instrument
6	RX-	N/C	Not connected
7	SUPPLY+	Yellow	12V power from instrument
8	SUPPLY-	Grey	Ground from instrument

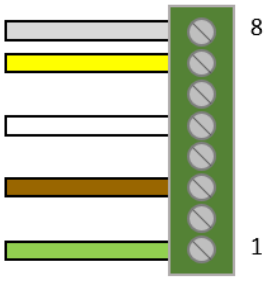


Figure 25. RS-232 ***fora – CR series*** connector

Figure 26. Connector pin out

4.2.6.2. Mating Connector at the Instrument Side for RS-485 connection

Table 12. Electrical connections of an Instrument's timing receiver input connector

Pin	Signal	Standard Cable Colours	Comment
1	GPS_1PPS+	Grey	1 PPS signal from GNSS (positive)
2	GPS_1PPS-	Pink	1 PPS signal from GNSS (negative)
3	TX+	Green	Transmit signal of GNSS (positive)
4	TX-	Yellow	Transmit signal of GNSS (negative)
5	RX+	White	Reception signal, GNSS (positive)
6	RX-	Brown	Reception signa, GNSS (negative)
7	SUPPLY+	Red	Supply positive (12V power)
8	SUPPLY-	Blue	Supply negative (Ground)

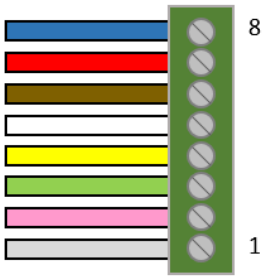


Figure 27. RS-485 ***fora – CR series*** connector

Figure 28. Connector pin out

5. Configuration and Checking

5.1. With a GXR-XX

In order to synchronise a GeoSIG GSR-xx with the GNSS, appropriate configuration should be made in the Instrument. Once power supply, computer and GPS are connected to the Instrument, such configuration and checks can be performed by logging into the Instrument using GeoDAS.

For more details about the GNSS options, please consult GeoDAS and relevant Instrument manuals.

At first installation or after a major (>2'000 km) relocation, it may take up to 5 minutes for the GNSS to correctly compute the exact location of the antenna.

The following is a brief instruction to check whether everything is operational in terms of the GNSS:

On "Instrument" tab, "Garmin GPS" option should be ticked as a peripheral device, as shown on Figure 29.

On the "Date and Time" tab, as shown on Figure 30, GPS status should read "Enabled"; if not, press the "Enable GPS" button.

Note that if GPS is enabled, this button reads "Disable GPS".

When GNSS is synchronised, the date and time of the GNSS can be seen in the "Date and Time" tab and the global coordinates of the antenna can be seen in the "Station" tab, as shown on Figure 31.

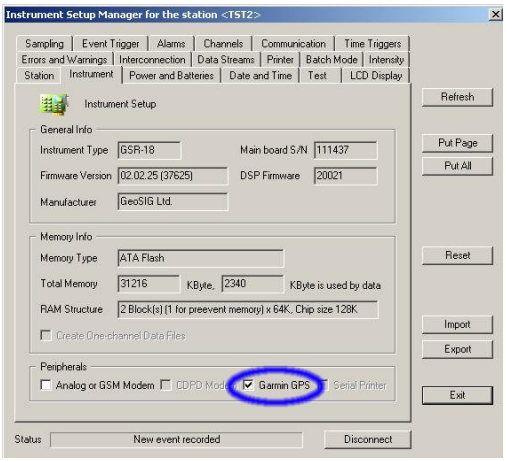


Figure 29. Selecting GPS as peripheral device

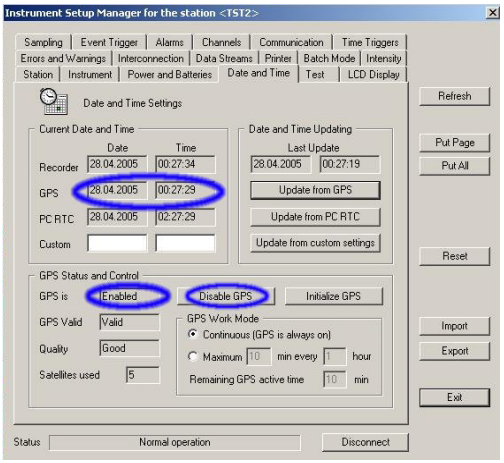


Figure 30. GPS enabling and checking

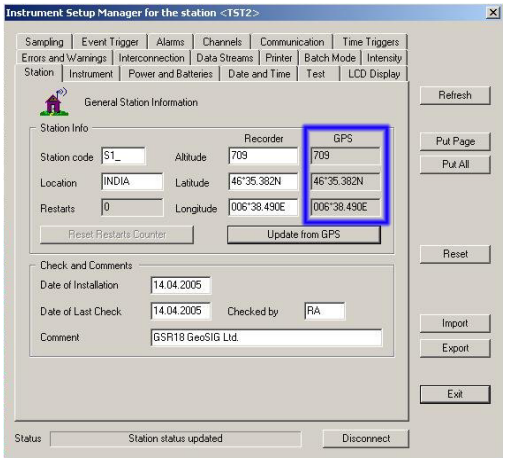


Figure 31. GPS time and position checking

5.2. With a GMS-XX or a GMSplus or a scai or a nair

5.2.1. Configuration of GPS

In order to synchronise a GeoSIG GMS-xx, GMSplus, *scai* or *nair* with the GNSS, appropriate configuration should be made in the Instrument. Once power supply, computer and GNSS are connected to the Instrument, such configuration and checks can be performed by logging into the Instrument using GeoDAS.

In the Web Interface

- Go to ***Configuration***
- In Data Acquisition tab go to ***Miscellaneous Parameters***
- Go to ***Time synchronisation***
- In Time synchronisation menu shown in Figure 32, change the ***Time source*** to GPS
- Configure the options if necessary
- Finally click on ***Apply and Restart*** to apply the latest options to the device

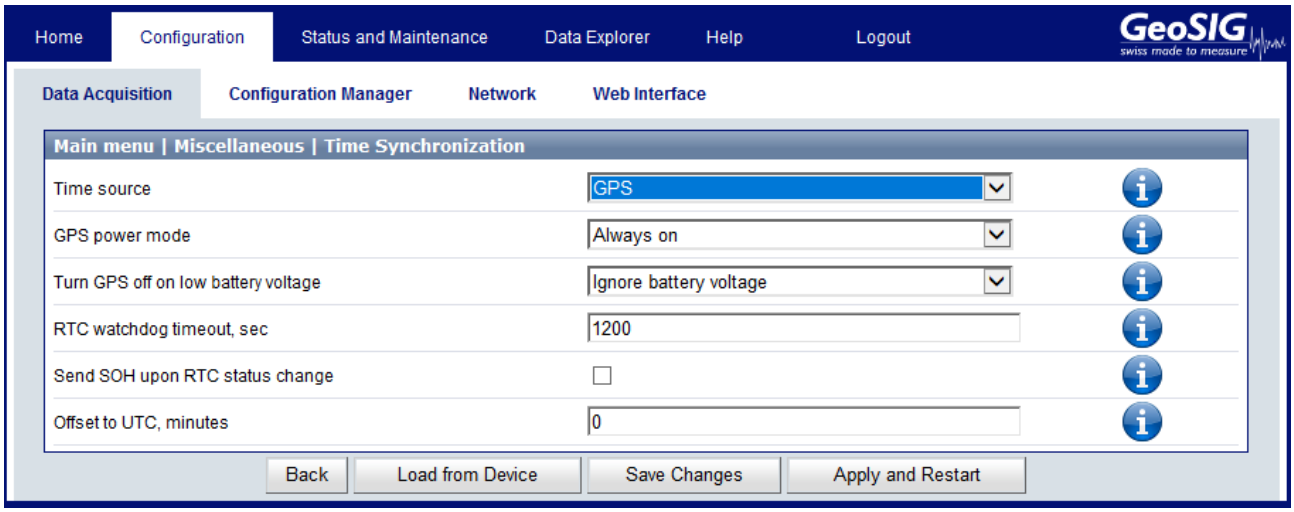


Figure 32: Time Synchronisation menu

Some GPS options should be updated if necessary; the web interface offers some information about these options.

Click on this icon next to the option to see a summary of the option

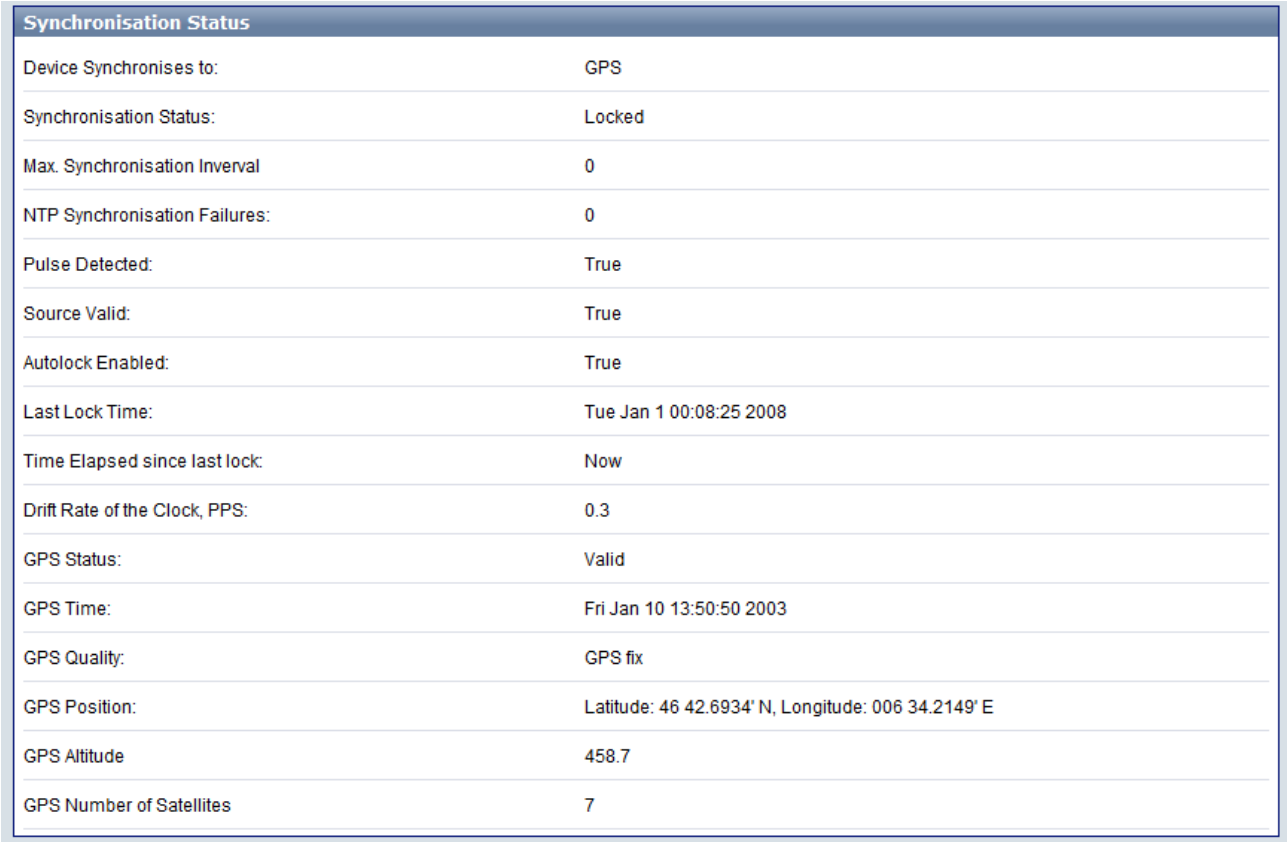
GPS configuration is explained in detail in the time synchronisation subchapter of the User Manual.

5.2.2. Check GPS data

In order to verify the GPS in a GeoSIG GMS-xx, GMSplus, *scai* or *nair*, appropriate configuration should be made in the Instrument. Once power supply, computer and GPS are connected to the Instrument, such checks can be performed by logging into the Instrument using GeoDAS.

In the Web Interface:

- Go to ***Status and Maintenance*→ *Recording Status*** tab
- Check data in the ***Synchronisation Status*** panel shown in Figure 33



Synchronisation Status	
Device Synchronises to:	GPS
Synchronisation Status:	Locked
Max. Synchronisation Inverval	0
NTP Synchronisation Failures:	0
Pulse Detected:	True
Source Valid:	True
Autolock Enabled:	True
Last Lock Time:	Tue Jan 1 00:08:25 2008
Time Elapsed since last lock:	Now
Drift Rate of the Clock, PPS:	0.3
GPS Status:	Valid
GPS Time:	Fri Jan 10 13:50:50 2003
GPS Quality:	GPS fix
GPS Position:	Latitude: 46 42.6934' N, Longitude: 006 34.2149' E
GPS Altitude	458.7
GPS Number of Satellites	7

Figure 33: Synchronisation Status to verify the GPS data

5.3. With a CR-5P (legacy)

In order to synchronise a GeoSIG CR-5P (legacy) with the GPS, appropriate configuration should be made in the Instrument. Once power supply, computer and GPS are connected to the Instrument, such configuration and checks can be performed by logging into the Instrument using GeoDAS.

For more details about the GPS options, please consult GeoDAS and relevant Instrument manuals.

At first installation or after a major (>2'000 km) relocation, it may take up to 5 minutes for the GPS to correctly compute the exact location of the antenna.

The following is a brief instruction to check whether everything is operational in terms of the GPS:

- While adding the CR-5P under "Channels of Digitizers", make sure 'External SYNC Signal' is selected as Time source, as shown in Figure 34.
- After adding the CR-5P to GeoDAS, restart the software; the window "Stations: Data Stream" will appear.
- When GPS is synchronised, the 'GPS status' will read "Locked to GPS", as shown in Figure 35. The data stream in the 'Data Monitor' will be in yellow, as shown in Figure 36.

Note that if no GPS is connected, GPS status will read "No Lock" and the colour of the data stream will be white.

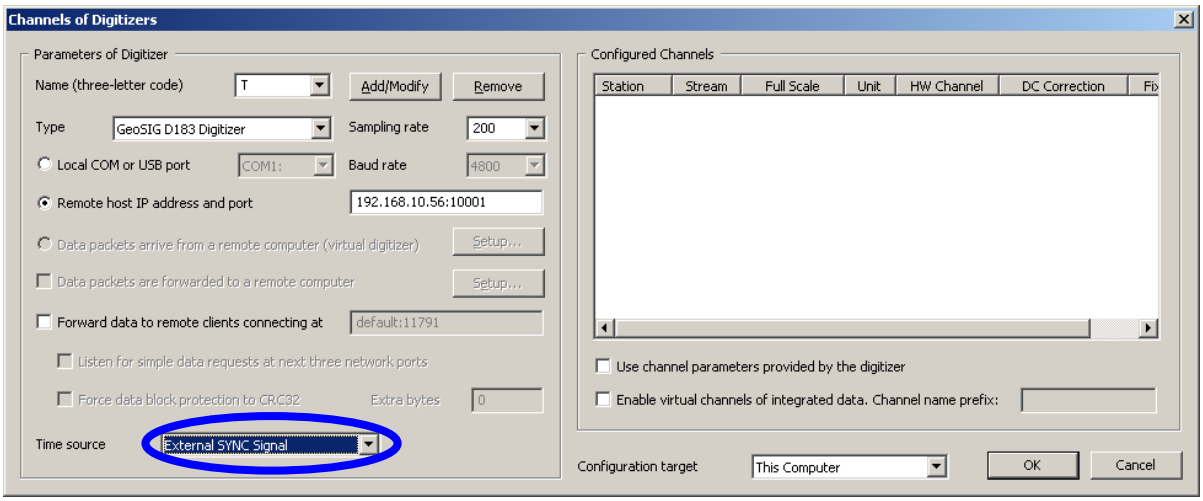


Figure 34. Set 'External SYNC Signal' as Time source

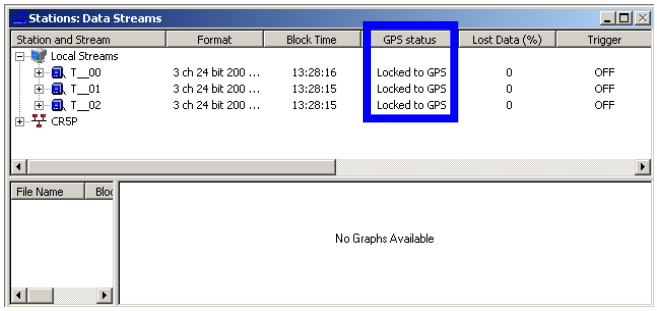


Figure 35. GPS status as 'Locked to GPS'

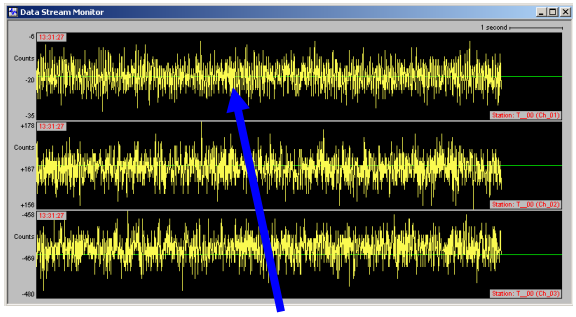


Figure 36. Data stream is in yellow

5.4. With a CR-6/CR-6plus (legacy) or a fora – CR series

5.4.1. Configuration of GPS

In order to synchronise a GeoSIG CR-6/CR-6plus (legacy) or *fora – CR series* with the GPS, appropriate configuration should be made in the Instrument. Once power supply, computer and GPS are connected to the Instrument, such configuration and checks can be performed by logging into the Instrument using GeoDAS.

In the Web Interface

- Go to ***Configuration***
- In Data Acquisition tab go to ***Miscellaneous Parameters***
- Go to ***Time synchronization***
- In Time synchronisation menu shown in Figure 37, change the ***Time source*** to GPS
- Configure the options if necessary
- Finally click on ***Apply and Restart*** to apply the latest options to the device

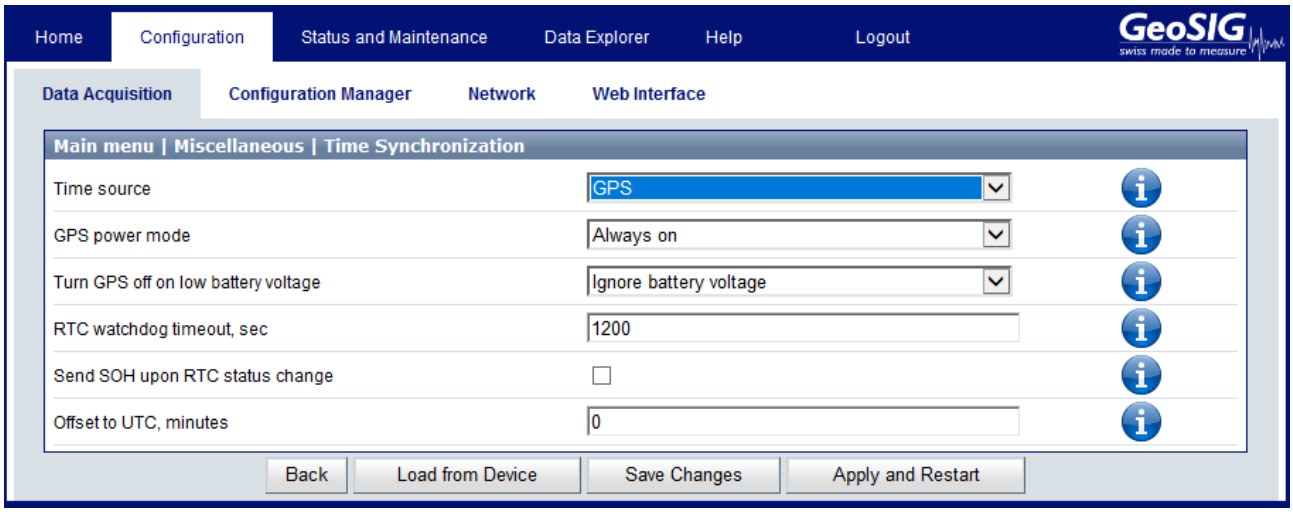


Figure 37: Time Synchronisation menu

Some GPS options should be updated if necessary; the web interface offers some information about these options.

Click on this icon next to the option to see a summary of the option

GPS configuration is explained in detail in the Time synchronization subchapter of the User Manual.

5.4.2. Check GPS data

In order to verify the GPS in a CR-6/CR-6plus (legacy) or *fora – CR series*, appropriate configuration should be made in the Instrument. Once power supply, computer and GPS are connected to the Instrument, such checks can be performed by logging into the Instrument using GeoDAS.

In the Web Interface:

- Go to ***Status and Maintenance*→ *Recording Status*** tab
- Check data in the ***Synchronisation Status*** panel shown in Figure 38

Synchronisation Status

Device Synchronises to:	GPS
Synchronisation Status:	Locked
Max. Synchronisation Inverval	0
NTP Synchronisation Failures:	0
Pulse Detected:	True
Source Valid:	True
Autolock Enabled:	True
Last Lock Time:	Tue Jan 1 00:08:25 2008
Time Elapsed since last lock:	Now
Drift Rate of the Clock, PPS:	0.3
GPS Status:	Valid
GPS Time:	Fri Jan 10 13:50:50 2003
GPS Quality:	GPS fix
GPS Position:	Latitude: 46 42.6934' N, Longitude: 006 34.2149' E
GPS Altitude	458.7
GPS Number of Satellites	7

Figure 38: Synchronisation Status to verify the GPS data