

GMS-TIM User Manual





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Warnings and Safety



If 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

GeoSIG Recorder, Digitiser or Data Acquisition system Instrument Global Positioning System GPS 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.

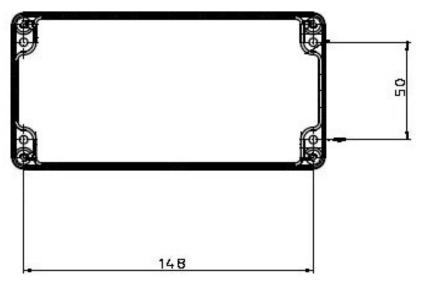


Figure 3. Mechanical fixation of housing



Figure 4. Inside view of the GMS-TIM housing

4. Electrical Connection

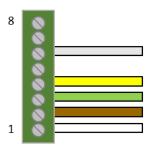
4.1. Timing Receiver Main Connector Pin Assignment

4.1.1. With RS-232 connection

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

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

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



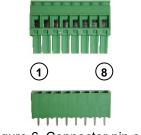


Figure 6. Connector pin out

Figure 5. Connector wiring

4.1.2. With RS-485 connection

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

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-

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

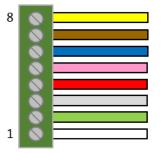


Figure 7. Connector wiring

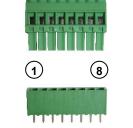


Figure 8. Connector pin out

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

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





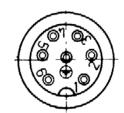


Figure 9. RS-232 Binder connector

Figure 10. RS-232 Connector pin out

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

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



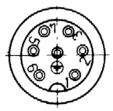


Figure 12. RS-485 Connector pin out

Figure 11. RS-485 Binder connector

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

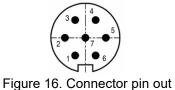
4.2.3. scai - GMS series or nair - GMS series Device

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

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



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

Table 7. Electrical compactions of an Instrument's timing reasing	an innut compositor
Table 7. Electrical connections of an Instrument's timing receiv	er 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)



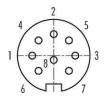


Figure 18. Connector pin out

Figure 17. RS-485 scai / nair connector

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 timina	receiver input connector
	moduline in o uning	

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

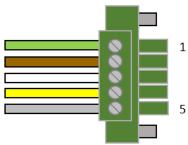


Figure 19. RS-232 CR-5 connector

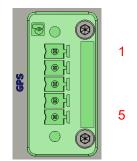
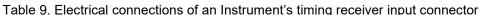


Figure 20. Connector pin out

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

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

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



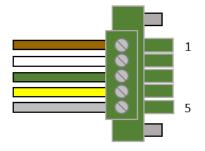


Figure 21. RS-232 CR-6 connector



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

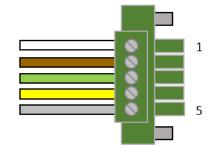




Figure 24. Connector pin out

Figure 23. RS-232 CR-6 connector

4.2.6. fora – CR series Device

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

Table 11 Electrical	l commontione of on	In a two was a wat a time in a	receiver input connector
Table LL Electrica	l connections of an	insirumeni s umino	receiver input connector
		mod armonic o arming	

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

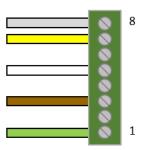


Figure 25. RS-232 fora - CR series connector



Figure 26. Connector pin out

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

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)



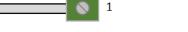




Figure 28. Connector pin out

Figure 27. RS-485 fora - CR series connector



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.

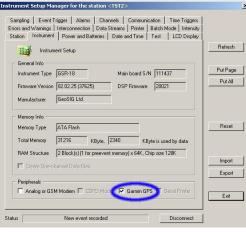
The following is a brief instruction to check whether everything is operational in terms of the GNSS:

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.

IF 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.



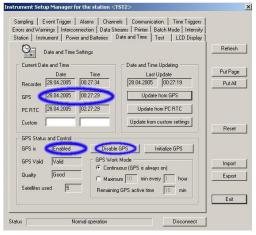


Figure 29. Selecting GPS as peripheral device

Figure 30. GPS enabling and checking

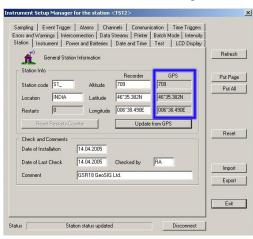


Figure 31. GPS time and position checking

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

i

- 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

Home	Configu	iration	Status and Mainte	enance	Data Explorer	Help	Logout	
Data A	cquisition	Confi	guration Manager	Network	Web Inter	face		
Main	menu Mi	scellane	ous Time Synch	ronization		_		
Time	source				GPS		×	1
GPS	power mode				Always or	ı	~	1
Turn	GPS off on lov	v battery v	voltage		Ignore bat	tery voltage	~	1
RTC	watchdog tim	eout, sec			1200			1
Send	SOH upon R	TC status	change					1
Offse	t to UTC, mini	utes			0			1
			Back Load	I from Device	Save	Changes	Apply and Restart]

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.

Channels of Digitizers	×
Parameters of Digitizer	Configured Channels
Name (three-letter code) T Add/Modify Remove	Station Stream Full Scale Unit HW Channel DC Correction Fib
Type GeoSIG D183 Digitizer Sampling rate 200 💌	
C Local COM or USB port COM1: Saud rate 4800	
Remote host IP address and port 192.168.10.56:10001	
C Data packets arrive from a remote computer (virtual digitizer)	
Data packets are forwarded to a remote computer Setup	
Forward data to remote clients connecting at default:11791	
Listen for simple data requests at next three network ports	Use channel parameters provided by the digitizer
Force data block protection to CRC32 Extra bytes 0	Enable virtual channels of integrated data. Channel name prefix:
Time source	Configuration target This Computer OK Cancel

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

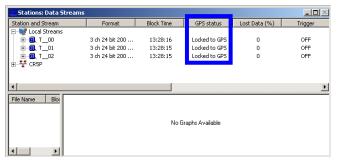


Figure 35. GPS status as 'Locked to GPS'

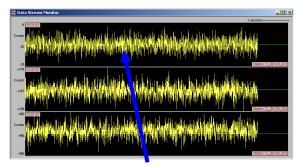


Figure 36. Data stream is in yellow



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

Home	Configuration	Status and Maintenance	Data Explorer	Help	Logout	
Data Ac	quisition Conf	iguration Manager Netwo	rk Web Interf	ace		
Main	menu Miscellane	ous Time Synchronization	1			
Time s	ource		GPS		\checkmark	①
GPS po	ower mode		Always on		\checkmark	1
Turn G	Turn GPS off on low battery voltage			ery voltage	\checkmark	1
RTC w	RTC watchdog timeout, sec					1
Send S	Send SOH upon RTC status change					1
Offsett	o UTC, minutes		0			1
		Back Load from Device	ce Save C	Changes	Apply and Restart	

Figure 37: Time Synchronisation menu

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

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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