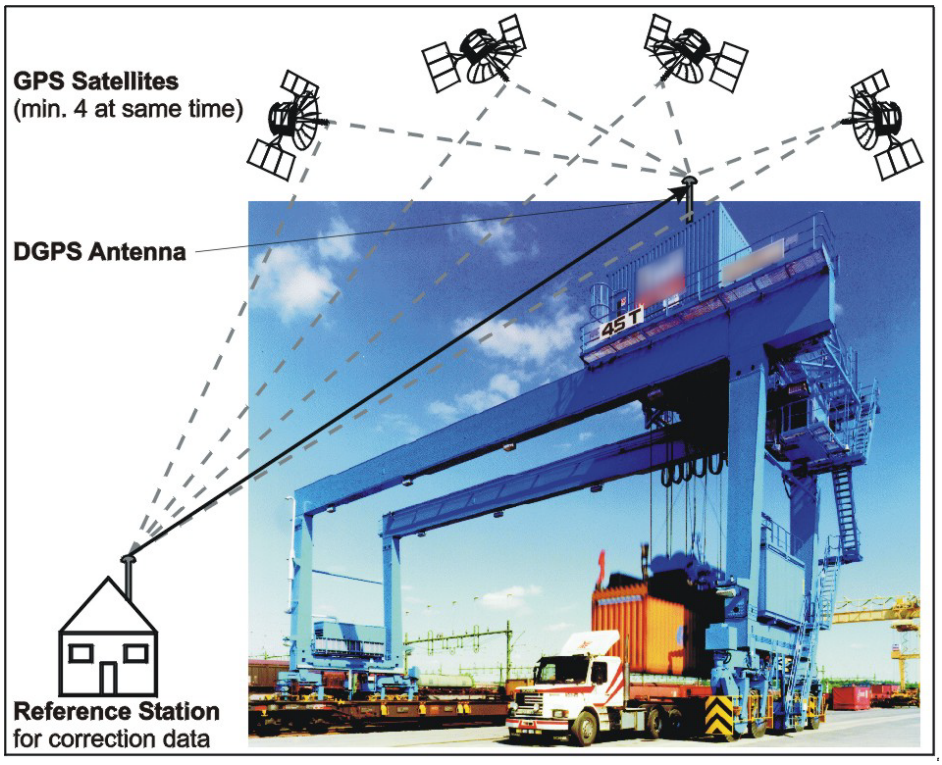

Position Detection System PDS using DGPS

For Container Tracking

S 57632ZA

English, Revision 01	Dev. by: L.M.
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GÖTTING

Contents

1 Introduction

1.1 Systems Function

With the, in general use, Global Positioning System (GPS) it is possible to determine a geographical position. The commonly used standard GPS provides an accuracy of approx. 10 m.

With the help of additional equipment and under certain area conditions it is possible to achieve a geographic position with an accuracy of up to ±30 cm.

1.2 Container Tracking

The temporary storage of containers by use of visual means with manual confirmation leads to an error rate in the storage handling which disrupts the efficient turn over time of the container ships so that therefore it is better to use GPS to control the positioning and documentation of containers within the container port environment.

It has been possible for years for Rubber Tired Gantry Cranes (RTG), working on container transport within a seaport, to communicate with the controlling container management system, via a data Radio Transceiver, when it picks up or sets down a container at a predesignated position within the container yard. This takes some of the load off of the driver as well as reduce the error rate, which a complicated and time exhaustive container search entails.

1.3 DGPS Positioning

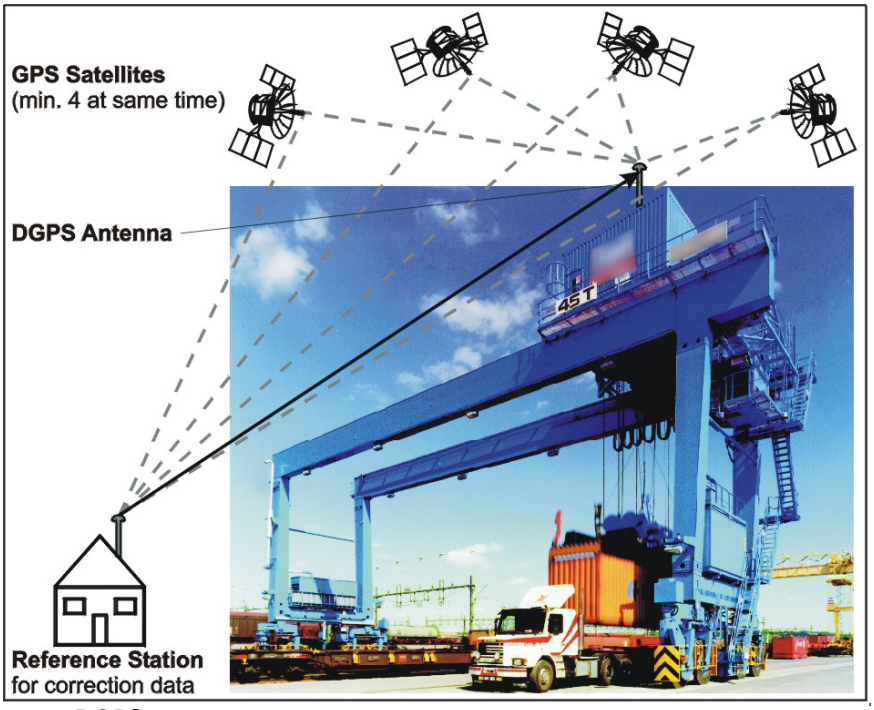


Figure 1 DGPS structure

This accuracy is not enough for the presented system. Therefore alongside the GPS system fitted to the crane (mobile unit) a further stationary GPS system (reference station) is set up. The position of the reference station can be exactly calculated. So it can compare its actual position with the current position identified by the satellite signal and transmits this error factor via a wireless data transceiver to the mobile units. These can then calculate their positions with an accuracy of up to ±30 cm (differential GPS; **DGPS**).

1.4 Preconditions for Operation

It is essential to pay attention to the fact that obstacles, that are higher than the horizon of the GPS antennas, may generally have a bad influence on the satellite reception. As a result of these shadings and/or reflections, the accuracy of the GPS may decrease. Even a total breakdown of the GPS might be possible. Therefore it is advisable, to include the Götting KG already in the project planning phase.

2 Mounting / Cabling

2.1 Components

The device is to be mounted onto a 35 mm top hat rail according to EN50022.

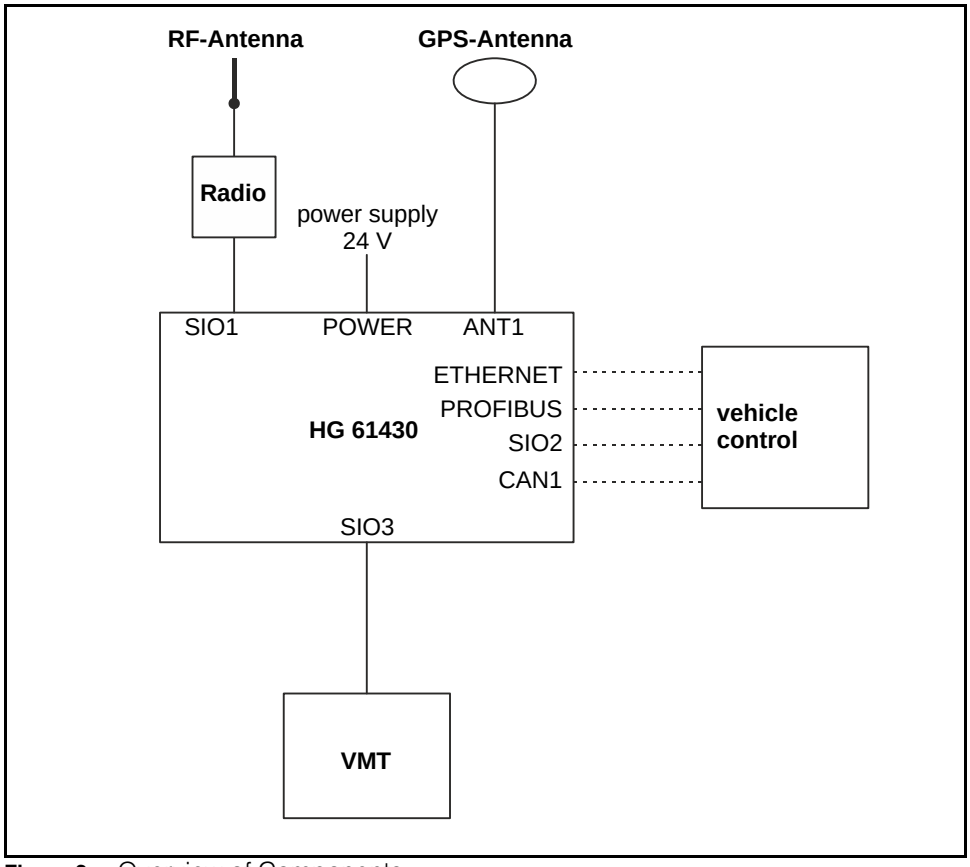


Figure 2 Overview of Components

2.2 Cabling

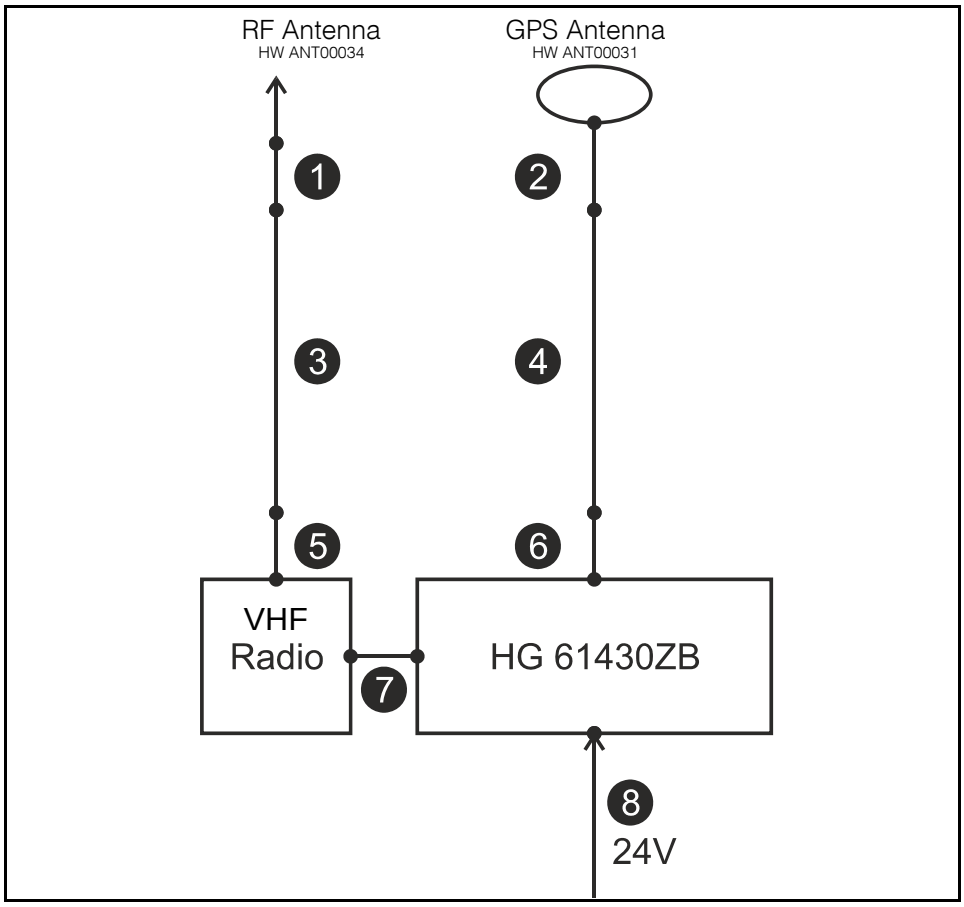


Figure 3 Cabling

- Pos. **1** (HW Cab00055):
  RG58, 2 m
  completely manufactured with TNC assembly socket (straight) and N socket (straight)

- Pos. **2** (HW Cab00042):
  RG58, 0.5 m
  TNC connector (straight) and N socket (straight), attached to the GPS antenna and sealed with heat shrink

- Pos. **3** + **4** (2x HW Cab00079):
  ECOFLEX10, project specific length
  one side with mounted N connector (straight) and one N connector (straight) for on site installation

- Pos. **5** + **6** (2x HW Cab00042):
  RG58, 2 m
  completely manufactured with TNC connector (straight) and N socket (straight)

- Pos. **7** (HW Cab00091):
  Project specific cable supplied by Götting within scope of Radio Modem

- Pos. **8**: (not within scope of supply)
  2 x 0,75 mm^2 onto Phoenix terminal
  Cable for 24 V power supply between UPS and HG 61430

3 Hardware

3.1 Control Unit HG 61430-A

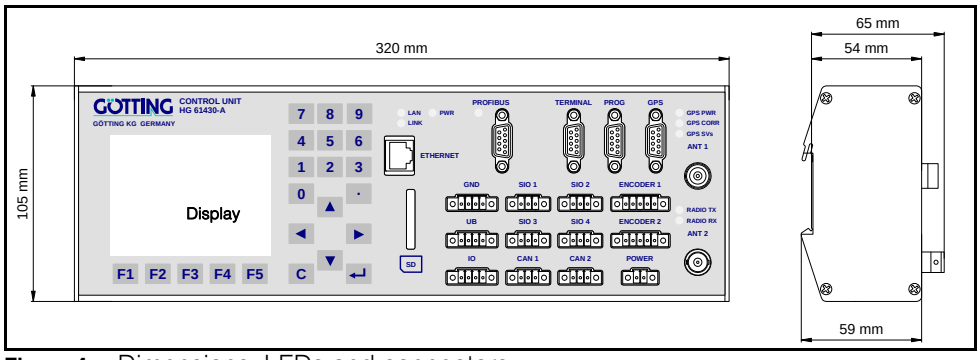


Figure 4 Dimensions, LEDs and connectors

Figure 5 Photo of the Control Unit

3.1.1 Operating Elements

- Membrane keyboard with 22 keys
- Slot for SD Card

3.1.2 Display Elements

- 320x240 pixel graphic enabled LED back-light

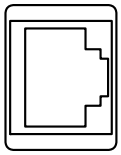
LED	Meaning of illuminated/flashing LEDs
PWR	Power supply OK
LAN	Ethernet communication
LINK	
PROFIBUS	Profibus communication
GPS PWR	Power supply GPS receiver OK
GPS CORR	Receiving DGPS correction data
GPS SVs	Receiving GPS satellites
RADIO TX	Transmitting via radio modem
RADIO RX	Receiving via radio modem

Table 1 Meaning of illuminated/flashing LEDs

3.1.3 Interface Connectors

3.1.3.1 ETHERNET

Figure 6 Draft of ETHERNET connector



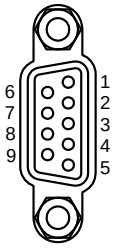
Function: Communication with superior control unit and/or PC

Interface: Ethernet

Connector: RJ-45

3.1.3.2 PROFIBUS

Figure 7 Draft of PROFIBUS connector



Function: Communication with a superior control unit

Interface: Profibus DP

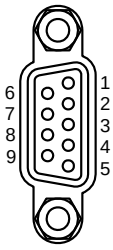
Connector: Sub-D 9pin (DE9) female

Pin	Allocation	Direction
1		
2		
3	Wire B	I/O
4	RTS	O
5	GND	O
6	+5V	O
7		
8	Wire A	I/O
9		

Table 2 Pin Allocation of PROFIBUS connector

3.1.3.3 TERMINAL

Figure 8 Outline of TERMINAL connector



Function: Communication with PC (commissioning and service)

Interface: EIA-232 (ANSI/EIA/TIA-232-F-1997)

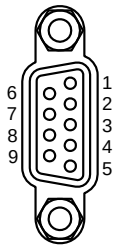
Connector: Sub-D 9pin (DE9) female

Pin	Allocation	Direction
1		
2	TxD	O
3	RxD	I
4		
5	GND	
6		
7		
8		
9		

Table 3 Pin allocation for TERMINAL connector

3.1.3.4 PROG

Figure 9 Outline of PROG connector



Function: Programing interface between PC and HG61430

Interface: EIA-232 (ANSI/EIA/TIA-232-F-1997)

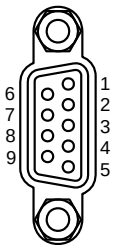
Connector: Sub-D 9 pin (DE9) female

Pin	Allocation	Direction
1		
2	TxD	O
3	RxD	I
4		
5	GND	
6		
7		
8		
9		

Table 4 Pin allocation of PROG connector

3.1.3.5 GPS

Figure 10 Outline of GPS connector



Function: Communication with the GPS receiver (software update and parameter setting)

Interface: EIA-232 (ANSI/EIA/TIA-232-F-1997)

Connector: Sub-D 9pin (DE9) female

Pin	Allocation	Direction
1		
2	TxD	O
3	RxD	I
4		
5	GND	
6		
7		
8		
9		

Table 5 Pin allocation of GPS connector

3.1.3.6 ANT1

Figure 11 Outline of the ANT1 connector

Function: Antenna connection for GPS Antenna 1

Connector: TNC

3.1.3.7 ANT2

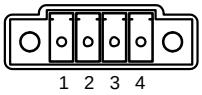
Figure 12 Outline of the ANT2 connector

Function: Not used.

Connector: TNC

3.1.3.8 GND

Figure 13 Outline of the GND connector



Function: GND connectors for IO's

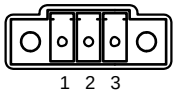
Connector: Phoenix contact MCV1.5/4-GF-3.5

Pin	Allocation	Direction
1	GND	
2	GND	
3	GND	
4	GND	

Table 6 Pin allocation of GND connector

3.1.3.9 SIO1

Figure 14 Outline of SIO1 connector



Function: Serial interface for correction data radio modem

Interface: EIA-232 (ANSI/EIA/TIA-232-F-1997)

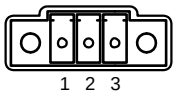
Connector: Phoenix contact MCV1.5/3-GF-3.5

Pin	Allocation	Direction
1	GND	
2	TxD	O
3	RxD	I

Table 7 Pin Allocation of SIO1 connector

3.1.3.10 SIO2

Figure 15 Outline of the SIO2 connector



Function: Communication with superior control unit

Interface: EIA-232 (ANSI/EIA/TIA-232-F-1997)

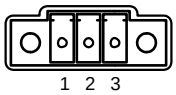
Connector: Phoenix contact MCV1.5/3-GF-3.5

Pin	Allocation	Direction
1	GND	
2	TxD	O
3	RxD	I

Table 8 Pin allocation SIO2 connector

3.1.3.11 SIO3

Figure 16 Outline of the SIO3 connector



Function: Communication with VMT

Interface: EIA-232 (ANSI/EIA/TIA-232-F-1997)

Connector: Phoenix contact MCV1.5/3-GF-3.5

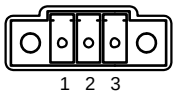
Pin	Allocation	Direction
1	GND	
2	TxD	O
3	RxD	I

Table 9 Pin allocation of SIO3 connector

3.1.3.12 SIO4

NOTE! Do not use! Only internal interface.

Figure 17 Outline of the SIO4 connector



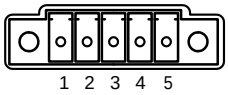
Function: internal interface to the GPS receiver, **do not use!**

Interface: EIA-232 (ANSI/EIA/TIA-232-F-1997)

Connector: Phoenix contact MCV1.5/3-GF-3.5

3.1.3.13 ENCODER1

Figure 18 Outline of the ENCODER1 connector



Function: Not used.

Interface: 5 Volt to 24 Volt

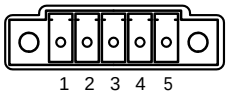
Connector: Phoenix contact MCV1.5/5-GF-3.5

Pin	Allocation	Direction
1	GND	
2	UB (power supply)	
3	+5 Volt (max. 100 mA)	
4	Channel A1	I
5	Channel B1	I

Table 10 Pin allocation of ENCODER1 connector

3.1.3.14 ENCODER2

Figure 19 Outline of the ENCODER2 connector



Function: Not used.

Interface: 5 Volt to 24 Volt

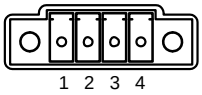
Connector: Phoenix contact MCV1.5/5-GF-3.5

Pin	Allocation	Direction
1	GND	
2	UB (power supply)	
3	+5 Volt (max. 100 mA)	
4	Channel A2	I
5	Channel B2	I

Table 11 Pin allocation of ENCODER2 connector

3.1.3.15 UB

Figure 20 Outline of the UB connector



Function: Power supply for IOs

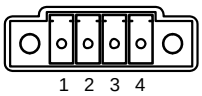
Connector: Phoenix contact MCV1.5/4-GF-3.5

Pin	Allocation	Direction
1	UB (power supply)	
2	UB (power supply)	
3	UB (power supply)	
4	UB (power supply)	

Table 12 Pin allocation of UB connector

3.1.3.16 IO

Figure 21 Outline of the IO connector



Function: switched I/O depending on the application

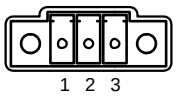
Connector: Phoenix contact MCV1.5/4-GF-3.5

Pin	Allocation	Direction
1	IO1	I/O
2	IO2	I/O
3	IO3	I/O
4	IO4	I/O

Table 13 Pin allocation IO

3.1.3.17 CAN1

Figure 22 Outline of the CAN1 connector



Function: CAN bus for communication with superior control unit

Interface: CAN bus according to ISO 11898-1

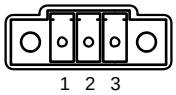
Connector: Phoenix contact MCV1,.5/3-GF-3.5

Pin	Allocation	Direction
1	CAN_GND	
2	CAN_HIGH	
3	CAN_LOW	

Table 14 Pin allocation of CAN1 connector

3.1.3.18 CAN2

Figure 23 Outline of the CAN2 connector



Function: CAN bus **currently not in use**, for future expansions

Interface: CAN bus according to ISO 11898-1

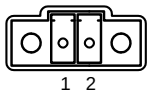
Connector: Phoenix contact MCV1.5/3-GF-3.5

Pin	Allocation	Direction
1	CAN_GND	
2	CAN_HIGH	
3	CAN_LOW	

Table 15 Pin allocation of CAN2 connector

3.1.3.19 POWER

Figure 24 Outline of the POWER connector



Function: Interface of supply voltage

Connector: Phoenix contact MCV1.5/2-GF-3.5

Pin	Pin allocation	Direction
1	GND	
2	UB (power supply 24 Volt)	

Table 16 Pin allocation POWER connector

3.2 Antennas

- The GPS antennas should
  - be installed on top of the RTG
  - be mounted at the highest point of the crane, above all obstacles
  - be separated as far apart as possible
- The RF antenna
  - should be fixed at the highest possible point on the RTG
  - should not tower above the GPS-antennas
  - requires a free line-of-sight in all directions

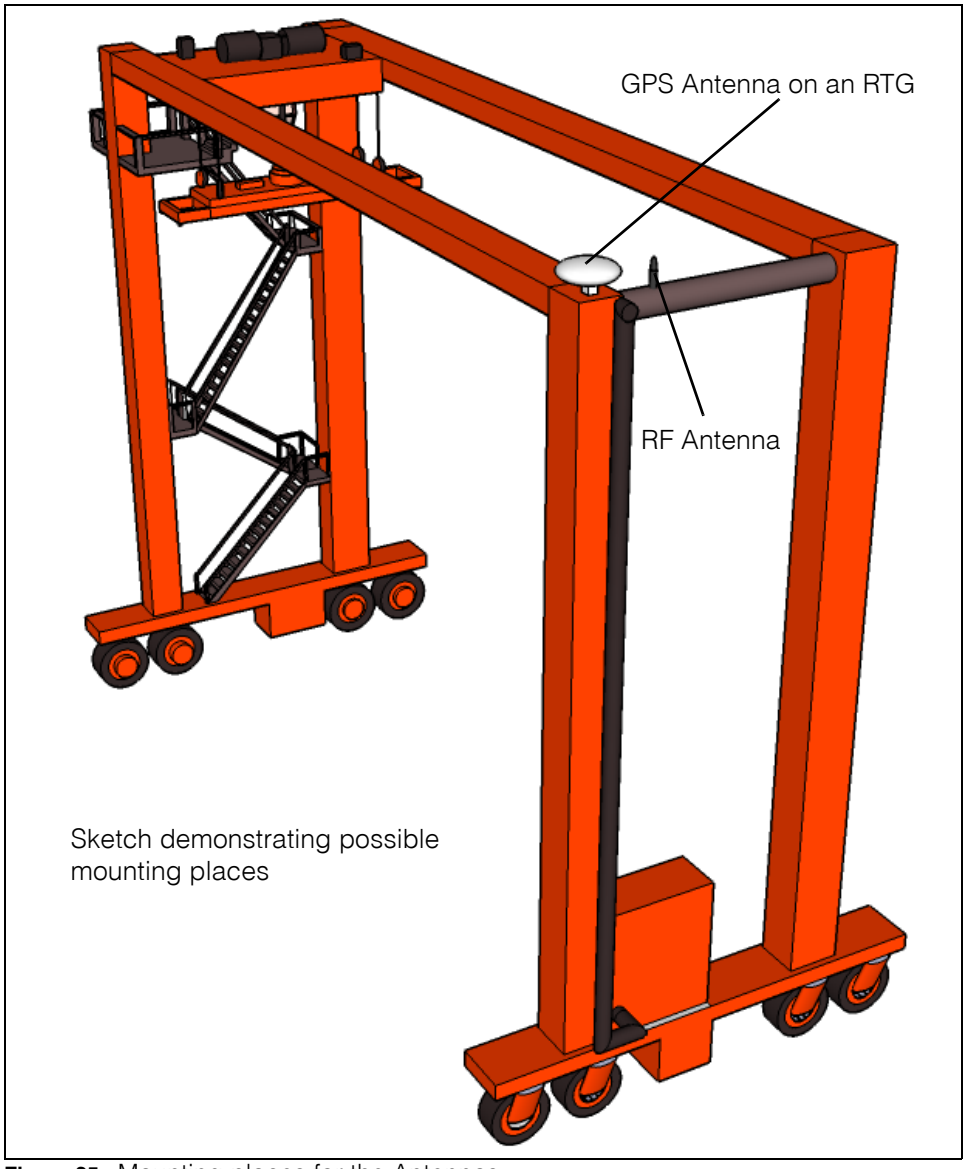


Figure 25 Mounting places for the Antennas

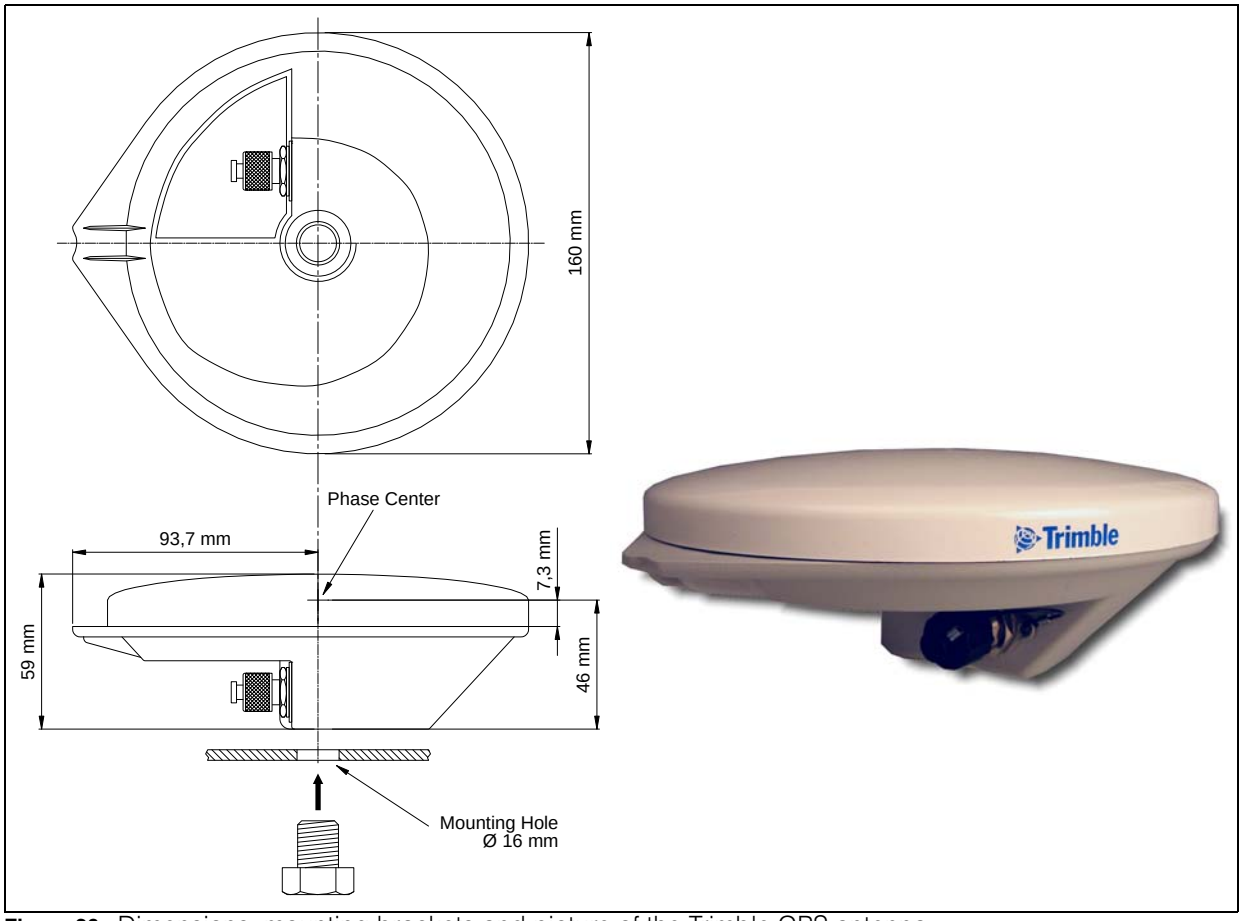


Figure 26 Dimensions, mounting brackets and picture of the Trimble GPS antenna

4 Basic Definitions

4.1 Determining important values for the crane

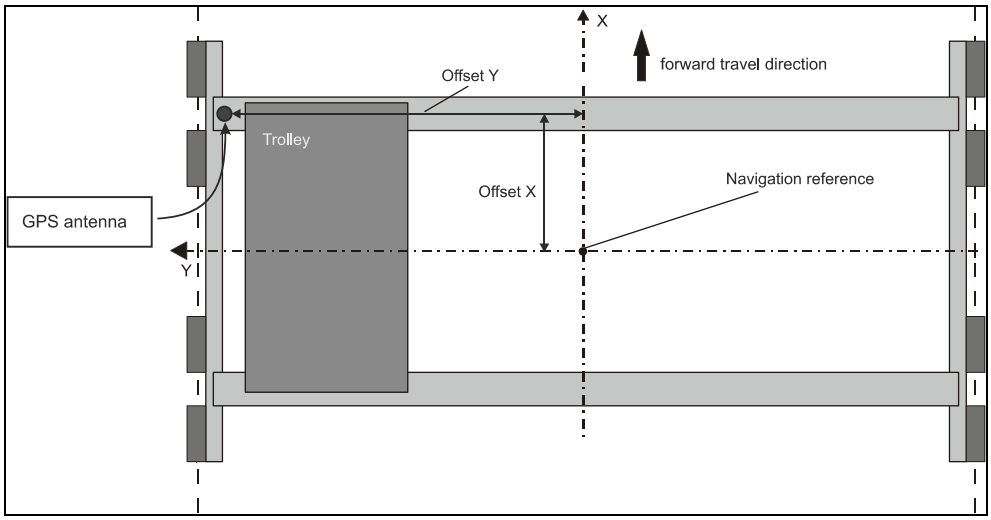


Figure 27 Basic Operational Parameters

Figure 27 shows the values that the system needs to know in order to calculate the geometrical centre point of the crane.

4.2 Determining important values for a block

When defining a block or route which a crane should take, the following values are important:

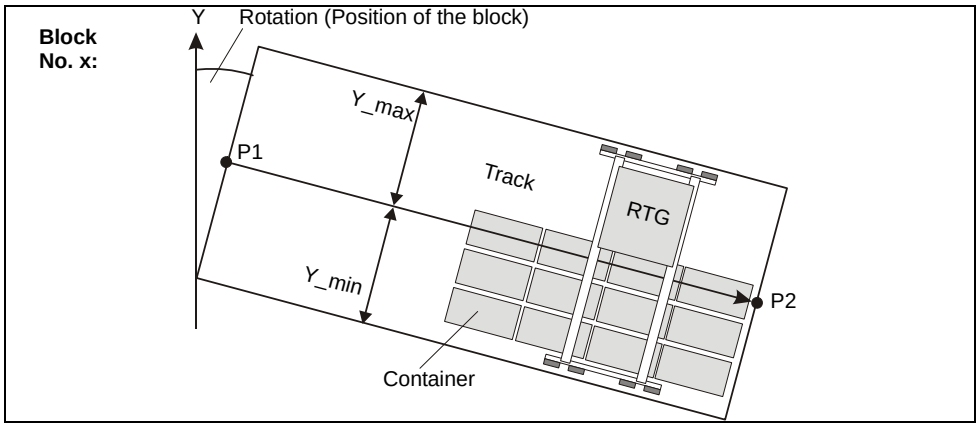


Figure 28 Block Parameters

P1 is the starting point of the crane in this block. Via Y_min and Y_max the system is informed about the sideward expansion of the block. P2 is the end point of the crane in this block. The connection between P1 and P2 indicates the direction of the blocks. It is automatically calculated for every block how much it is rotated towards the base coordinate system.‘

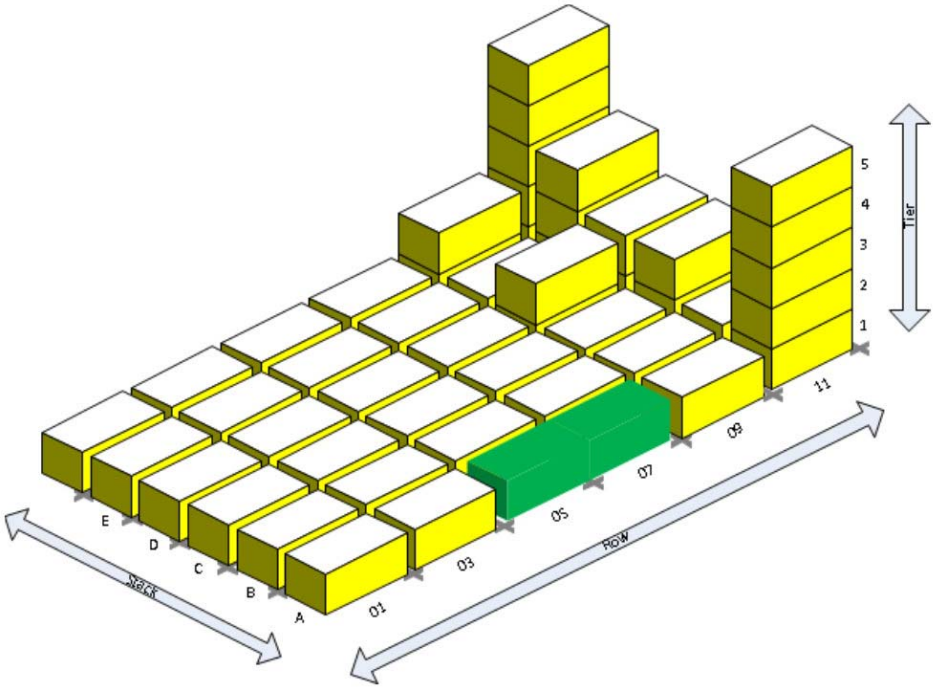


Figure 29 The three block coordinates Stack, Row and Tier

5 Parameter Setting

NOTE! Only especially trained personnel should alter system settings since wrong values can lead to **restricted system functionality** or even **system failure**!

5.1 Service Interface

The service interface is used for setting the parameters and the further system analysis. To do so, connect a terminal with ANSI emulation to the serial interface. The interface parameters are preset at: No parity, 8 data bits and 1 stop bit. It is possible to select difference transmission rates. Please select 115,200 baud.

It is possible to re-output the current display setting by pressing the space key. The password for protected areas is: **3141**.

5.1.1 Main Menu

Terminal (PC) **Control Unit (LCD)**

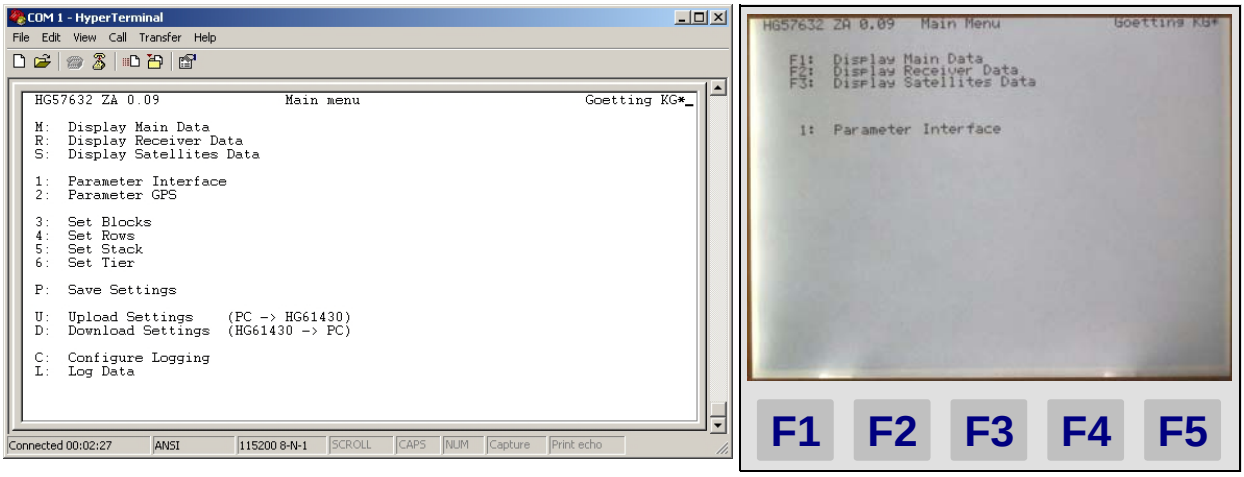


Figure 30 Screenshot: Main menu GPS

Following the system start-up, the main menu is displayed. From this point, it is possible to enter the different functions.

Key	Description
F1 / M	display of all data relevant for sensor fusion
F2 / R	display of GPS position data, fix status and accuracy
F3 / S	display of satellite data
1	parameters of the interface
2	parameters of the GPS

Table 17 Select options of main menu (part 1 of 2)

Key	Description
3	parameters of the blocks
4	parameters of the rows
5	parameters of the stack
6	parameters of the tiers
P	save changed settings
U	transmit parameter file from PC into HG61430
D	transmit parameter file from HG61430 into PC
C	menu for setting parameters for the data recording output
L	data recording

Table 17 Select options of main menu (part 2 of 2)

5.1.2 Display Main Data

This display shows all data that refer to the sensor fusion.

Terminal (PC) **Control Unit (LCD)**

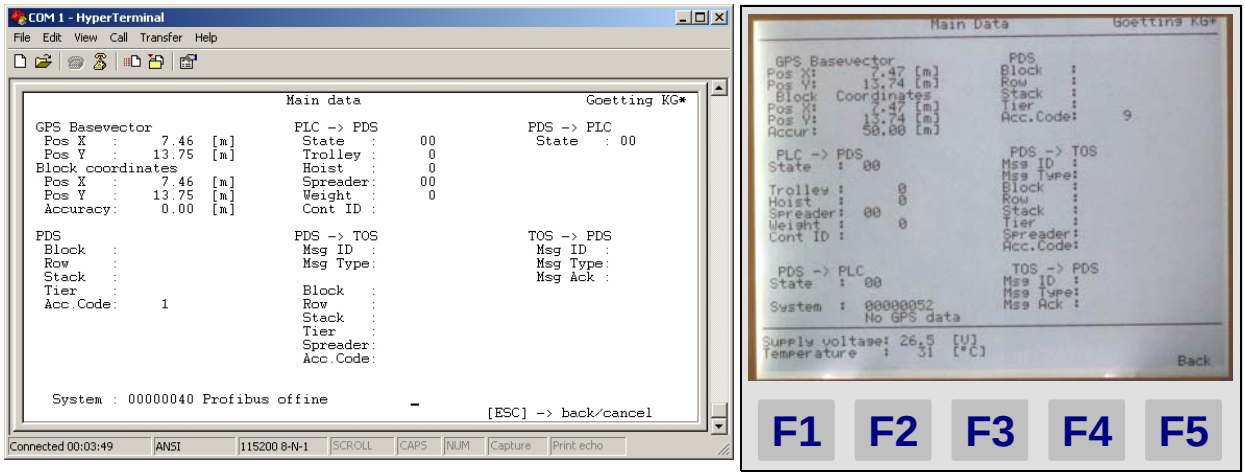


Figure 31 Screenshot: Menu Display Main Data

5.1.2.1 Group GPS Basevector

Text	Description
Pos X	X component of the GPS position with reference to the base coordinate system
Pos Y	Y component of the GPS position with reference to the base coordinate system

Table 18 Menu Display Main Data: Group GPS Basevector

5.1.2.2 Group Block Coordinates

Text	Description
Pos X	X component of the GPS position with reference to the block coordinate system
Pos Y	Y component of the GPS position with reference to the block coordinate system
Accuracy	Accuracy of the GPS system

Table 19 Menu Display Main Data: Group Block Coordinates

5.1.2.3 Group PDS

Text	Description	
Block	Current block name as defined during set-up	
Row	Current row number	
Stack	Current stack number	
Tier	Current tier number	
Acc. Code	Current accuracy according to the following table:	
	1	<= 0.3 m
	2	<= 0.4 m
	3	<= 0.5 m
	4	<= 0.6 m
	5	<= 0.7 m
	6	<= 0.8 m
	7	<= 0.9 m
	8	<= 1.0 m
	9	> 1.0 m

Table 20 Menu Display Main Data: Group PDS

5.1.2.4 Group PLC -> PDS

Text	Description	
State	The following requests are possible	
	01	Set Down
	02	Lift
	04	PDS Req
Trolley	Current trolley position	
Hoist	Current hoist position	
Spreader	Current spreader position	
	01	20 Foot
	02	40 Foot
	03	45 Foot
	04	2 x 20 Foot
	05	2 x 20 Foot L (left aligned)
	06	2 x 20 Foot R (right aligned)
Weight	Current weight of container	
Cont ID	Container ID	

Table 21 Menu Display Main Data: Group PLC -> PDS

5.1.2.5 Group PDS -> PLC

Text	Description	
State	The following acknowledge messages are possible	
	01	Set Down
	02	Lift
	04	PDS Req

Table 22 Menu Display Main Data: Group PDS -> PLC

5.1.2.6 Group PDS -> TOS

Text	Description	
Msg ID	Incremental message number with values from 0 to 9	
Msg Type	PDS event	
	1	Lift
	2	Set Down
Block	Current block name as defined during set-up	
Row	Current row number	
Stack	Current stack number	
Tier	Current tier number	
Spreader	Current spreader position	
	2	20 Foot
	4	40 Foot
	5	45 Foot
	T	2 x 20 Foot
	L	2 x 20 Foot L (left aligned)
	R	2 x 20 Foot R (right aligned)
	0	undefined
Acc. Code	Current accuracy according to the following table:	
	1	<= 0.3 m
	2	<= 0.4 m
	3	<= 0.5 m
	4	<= 0.6 m
	5	<= 0.7 m
	6	<= 0.8 m
	7	<= 0.9 m
	8	<= 1.0 m
	9	> 1.0 m

Table 23 Menu Display Main Data: Group PDS -> TOS

5.1.2.7 Group TOS -> PDS

Text	Description	
Msg ID	Incremental message number with values from 0 to 9	
Msg Type	TOS acknowlegde	
	8	OK
	9	Error
Msg Ack	Last Message ID from PDS (see Table 23 on page 25)	

Table 24 Menu Display Main Data: Group TOS -> PDS

5.1.2.7.1 System state

Hex Value	Description
00000000	system OK
00000001	Parameters faulty
00000002	no data received from GPS receiver
00000004	no base vector from GPS receiver
00000008	no correction data received
00000010	GPS accuracy insufficient for tracking
00000020	CAN 1 communication faulty
00000040	Profibus communication faulty

Table 25 Menu Display Main Data: System state

5.1.3 Display receiver data

This menu shows the current position determined by the DGPS

Terminal (PC) **Control Unit (LCD)**

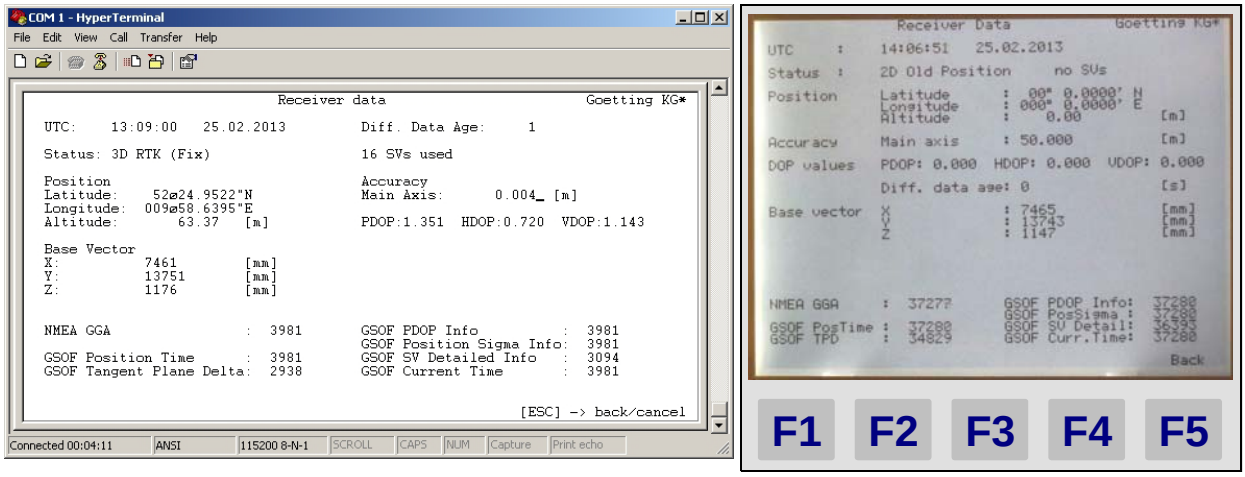


Figure 32 Screenshot: Menu Dsiplay Receiver Data

Text	Description
UTC	Universal Time Coordinated
Diff. Data Age	age of DGPS correction data
Status	GPS system status - autonomous: GPS without base station correction data (accuracy several meters) - DGPS: GPS with base station correction data (accuracy approx. 1 meter) - RTK (Float): GPS with correction data in RTK mode (Real Time Kinematic sub-meter accuracy) - RTK (Fix): GPS with correction data in RTK mode (Real Time Kinematic centimeter accuracy)
SVs used	number of used satellites (space vehicles)
Position	
Latitude	latitude in degrees and minutes (antenna position)
Longitude	longitude in degrees and minutes (antenna position)
Altitude	height above sea level (antenna position)
Accuracy	
Main Axis	accuracy of the GPS position
PDOP	geometrical dilution of precision in cubic space.

Table 26 Menu Display receiver data (part 1 of 2)

Text	Description
HDOP	geometrical dilution of precision in a horizontal layer.
VDOP	geometrical dilution of precision in vertical direction.
Base Vector	
X	distance between mobile GPS antenna and base station GPS antenna in east direction
Y	distance between mobile GPS antenna and base station GPS antenna in north direction
Z	height difference between mobile GPS antenna and base station GPS antenna
NMEA GGA	Number of received messages since last switch-on
GSOF Position Time	
GSOF Tangent Plane Delta	
GSOF PDOP Info	
GSOF Position Sigma Info	
GSOF SV Detailed Info	
GSOF Current Time	

Table 26 Menu Display receiver data (part 2 of 2)

5.1.4 Display satellites data

This menu outputs the satellite data

Terminal (PC) **Control Unit (LCD)**

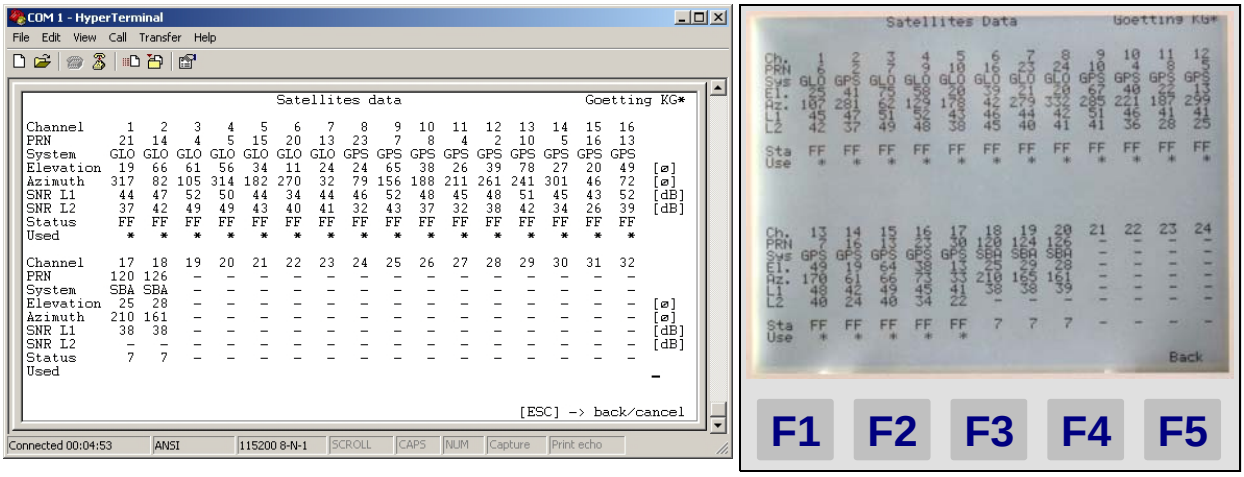


Figure 33 Screenshot: Menu display satellites data

Text	Description
Channel	indicates via which channel the satellite signals are received by the GPS receiver
PRN	number of satellites
System	Shows the satellite system in use, one of: GPS / GLONASS / SBAS correction data
Elevation	angle in degrees, between the horizon and the elevation of the satellite above the horizon.
Azimuth	horizontal angle under which the satellite is received; North is 0°; the angle is rotates clockwise.
SNR L1	signal-to-noise ratio in dB on the L1 frequency; this value is okay whenever it is > 30 for satellites with an elevation < 20° and approx. 50 for satellites with an elevation > 70°.
SNR L2	signal-to-noise ratio in dB on the L2 frequency; this value is okay whenever it is > 30 for satellites with an elevation < 20° and approx. 40 for satellites with an elevation > 70°.
Status	Trimble manual page 6-25
Used	indicates whether the corresponding satellite is used for the current position calculation

Table 27 Menu display satellites data

5.1.5 Parameter Interface

Set the interface parameters

Terminal (PC) **Control Unit (LCD)**

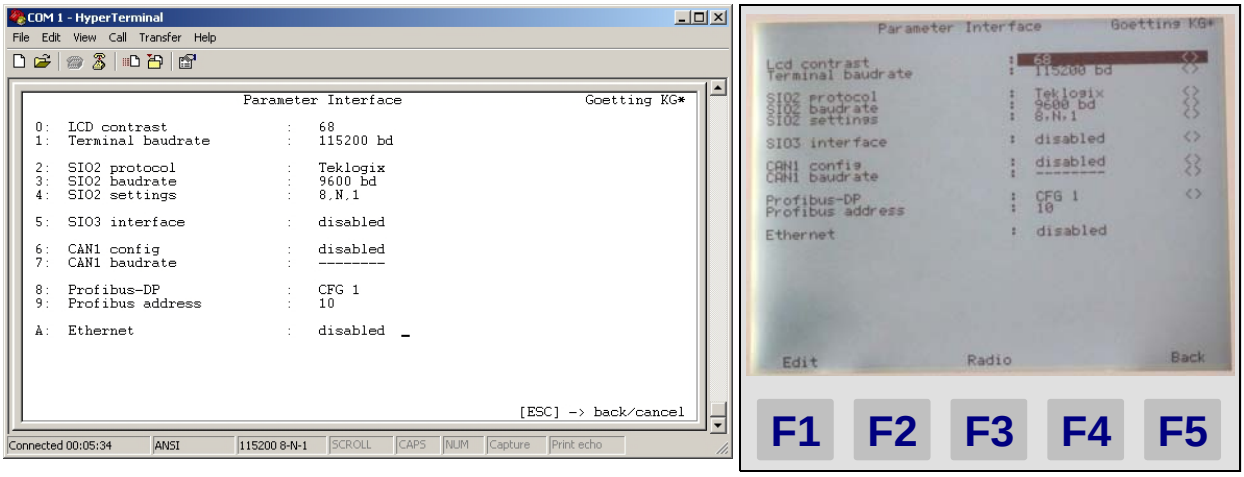


Figure 34 Screenshot: Menu Parameter Main

Input	Description
0	set the HG 614300 display contrast values
1	sets the baud rate of the terminal interface. This change becomes active upon the next switch-on of the unit. In case the baud rate is not known upon connection of the PC, it is possible to read it out of the LCD display of the HG 61430. Other interface settings: 8 data bits, no parity, 1 stop bit, no flow control. It is possible to select one of the following values: - 9600 bd - 19200 bd - 38400 bd - 57600 bd - 115200 bd
2	provides the protocol of the RS 232 interface (SIO2) to the superior computer. The following protocol is available: - Teklogix
3	provides the transmission rate (baud rate) of the RS 232 interface (SIO2) to the superior computer. The following options are available: - 9600 bd - 19200 bd - 38400 bd - 57600 bd - 115200 bd

Table 28 Options in Menu Parameter Main (part 1 of 2)

Input	Description
4	provides the features of the RS 232 interface (SIO2) to the superior computer. The following options are available: - 8,N,1 -> 8 data bits, no parity, 1 stop bit - 8,E,1 -> 8 data bits, even parity, 1 stop bit - 8,O,1 -> 8 data bits, uneven parity, 1 stop bit - 8,N,2 -> 8 data bits, no parity, 2 stop bits - 8,E,2 -> 8 data bits, even parity, 2 stop bits - 8,O,2 -> 8 data bits, uneven parity, 2 stop bits
5	provides the configuration of the RS 232 interface (SIO3) for the connected components. Following options are available: - disabled - Vector Heading
6	provides the transmission rate for the CAN interface 1. The following options are available: - 50 Kbit/s - 125 Kbit/s - 250 Kbit/s - 500 Kbit/s - 1 Mbit/s
7	provides the configuration for the CAN interface 1. The following options are available: - disabled - CFG 1
8	enables or disables the Profibus interface
9	Input of Profibus address: 0 to 126
A	the Ethernet interface is not yet included in the software and it is therefore not possible to set any parameters.
F3	internally, a direct connection between the RF modem and the connector PROG, that is accessible externally, is created (LCD only)

Table 28 Options in Menu Parameter Main (part 2 of 2)

5.1.6 Parameter GPS

Set the GPS parameters.

Terminal (PC)

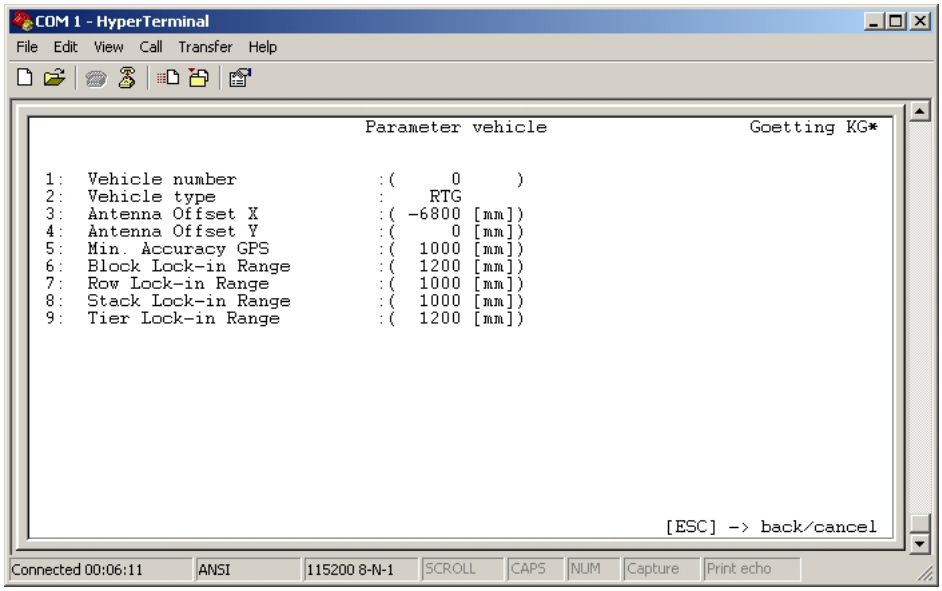


Figure 35 Screenshot: Menu Parameter GPS

Input	Description
1	vehicle number
2	type of vehicle The type of vehicle indicates, which vehicle models are used for the position calculation. Currently the following vehicle models are available: - RTG
3	X offset of the GPS antenna (direction of travel)
4	Y offset of the GPS antenna (crosswise to direction of travel)
5	minimum accuracy of the GPS system
6	The Lock-in range defines the range of tolerance (+/- the value entered) for the measured GPS position compared to the mapped position. This can be set for blocks, rows, stacks and tiers.
7	
8	
9	

Table 29 Options of the menu Parameter GPS

5.1.7 Set Blocks

In this menu, the block coordinate systems are set.

Terminal (PC)

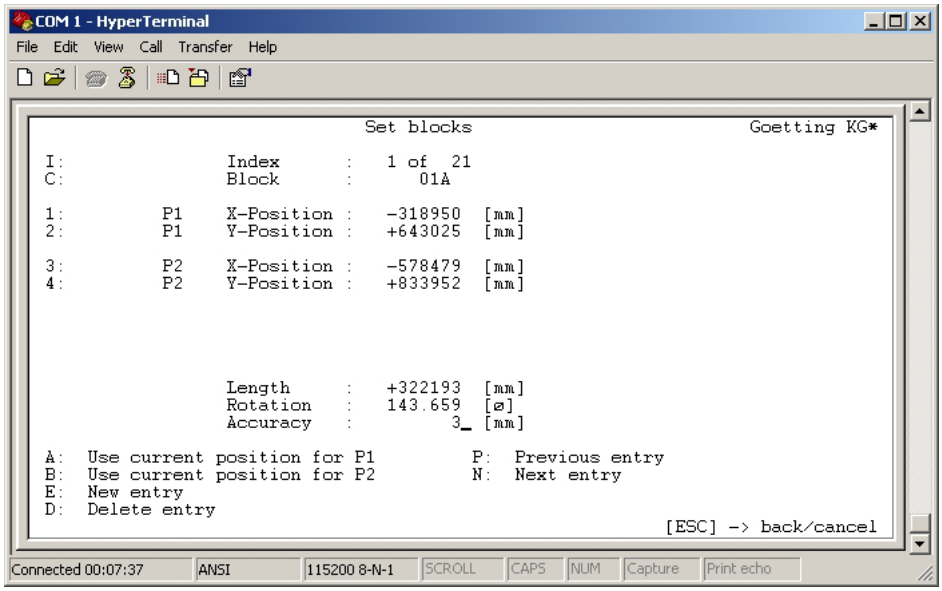


Figure 36 Screenshot: Menu Set Blocks

Input	Description
I	select an existing block
C	code of the block shown under I, that is transferred to the superior control system.
1	X-coordinate of the starting point (P1) of the block number shown under I within the base coordinate system.
2	Y-coordinate of the starting point (P1) of the block number shown under I within the base coordinate system.
3	X-coordinate of end point (P2) of the block number shown under I within the shown base coordinate system.
4	Y-coordinate of end point (P2) of the block number shown under I within the shown base coordinate system.
A	accept X and Y-coordinate of P1 of the block shown under I from current, averaged position
B	accept X and Y-coordinate of P2 of the block shown under I from current, averaged position
E	create new block

Table 30 Options of menu Set Blocks (part 1 of 2)

Input	Description
D	delete block shown under I
P	show the block listed above
N	show the block listed below

Table 30 Options of menu Set Blocks (part 2 of 2)

In case more than one RTG is to be commissioned, it is advisable, to transfer the parameters determined for the first crane to all following cranes. This way, the crane parameters as well as the block parameters are transferred to the other cranes and it is not necessary to map the terminal again with each crane.

5.1.8 Set Rows

In this menu, the row coordinates inside a block are set.

NOTE! Before altering these values the desired block has to be chosen in the menu Set Blocks, see section 5.1.7 on page 33.

Terminal (PC)

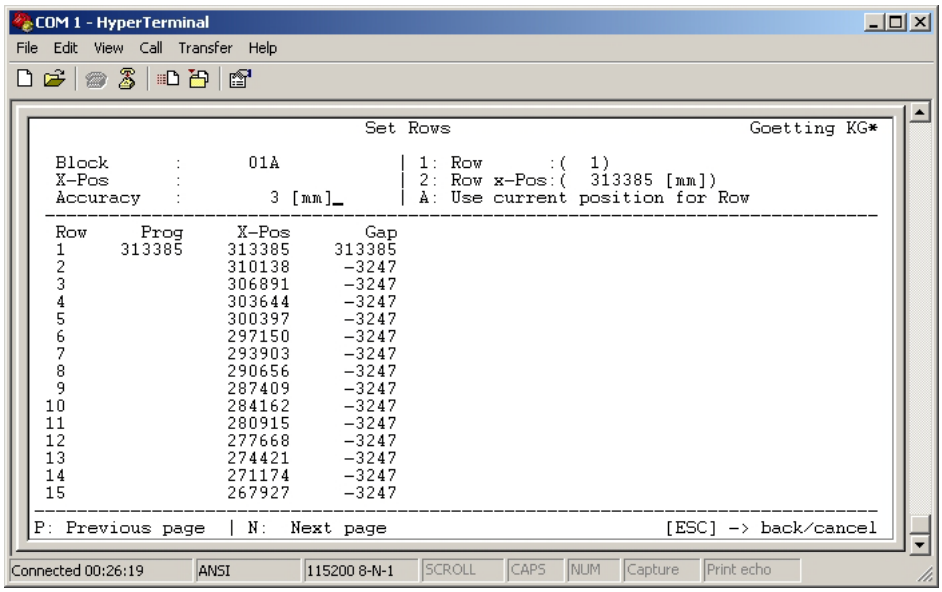


Figure 37 Screenshot: Menu Set Rows

Input	Description
1	Select Row
2	Edit X-Position
A	Capture the current X-Position as measured by the GPS system
P	Go to the previous page
N	Got to the next page

Table 31 Options of menu Set Rows

5.1.9 Set Stack

In this menu, the stack coordinates inside a row are set.

NOTE! Before altering these values the desired block has to be chosen in the menu Set Blocks, see section 5.1.7 on page 33.

Terminal (PC)

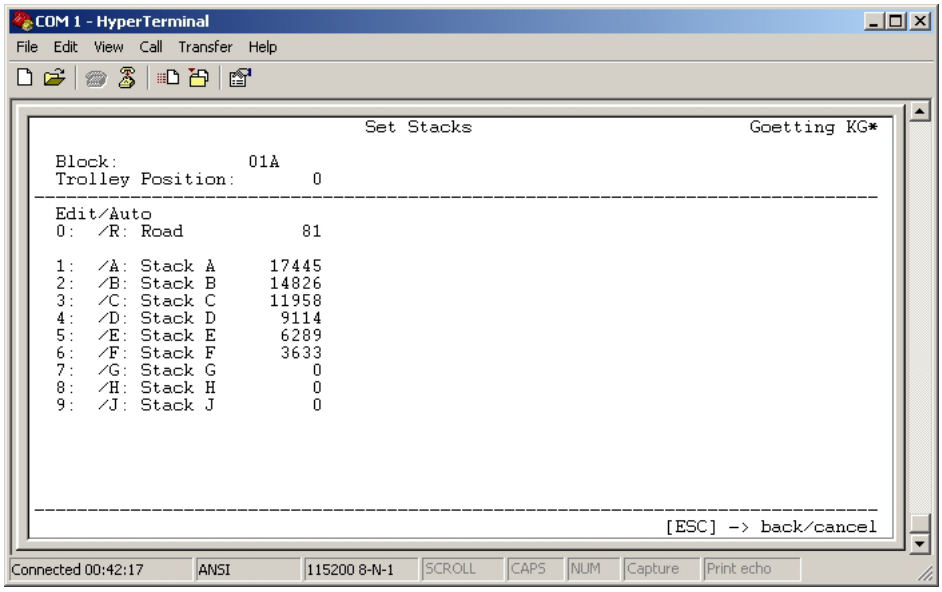


Figure 38 Screenshot: Menu Set Stacks

Manual Input	Use Position from PLC	Description
0	R	Trolley Position Truck Lane
1	A	Trolley Position Stack A
2	B	Trolley Position Stack B
3	C	Trolley Position Stack C
4	D	Trolley Position Stack D
5	E	Trolley Position Stack E
6	F	Trolley Position Stack F
7	G	Trolley Position Stack G
8	H	Trolley Position Stack H
9	J	Trolley Position Stack J

Table 32 Options of menu Set Rows

5.1.10 Set Tiers

In this menu, the tier coordinates are set.

Terminal (PC)

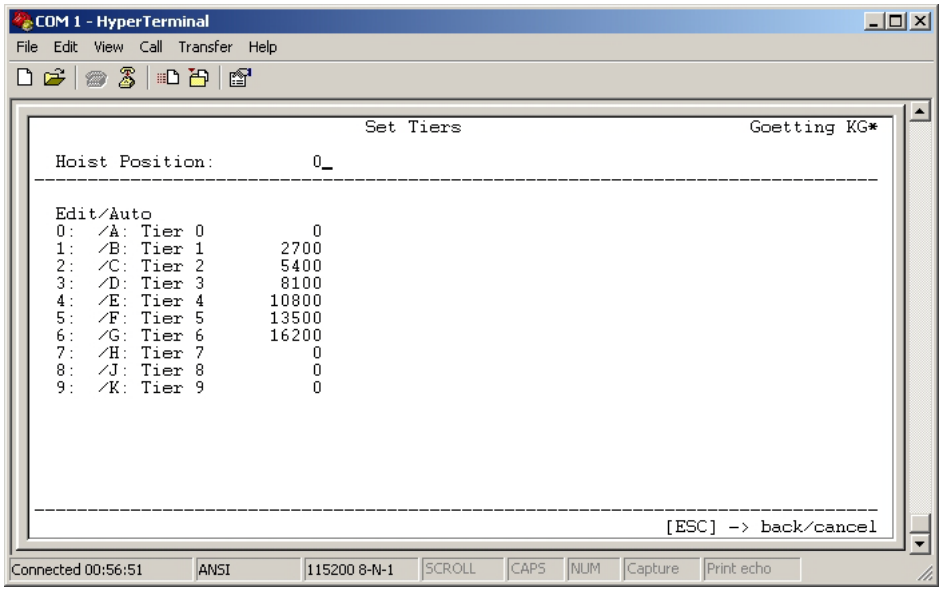


Figure 39 Screenshot: Menu Set Tiers

Manual Input	Use Position from PLC	Description
0	A	Hoist Position Tier 0
1	B	Hoist Position Tier 1
2	C	Hoist Position Tier 2
3	D	Hoist Position Tier 3
4	E	Hoist Position Tier 4
5	F	Hoist Position Tier 5
6	G	Hoist Position Tier 6
7	H	Hoist Position Tier 7
8	J	Hoist Position Tier 8
9	K	Hoist Position Tier 9

Table 33 Options of menu Set Rows

5.1.11 Save Settings

Use this menu in order to save all settings permanently to the non-volatile memory.

5.1.12 Upload Settings (PC –> HG61430)

This update enables uploading the parameter files from the PC to the Control Unit HG 61430.

Terminal (PC)

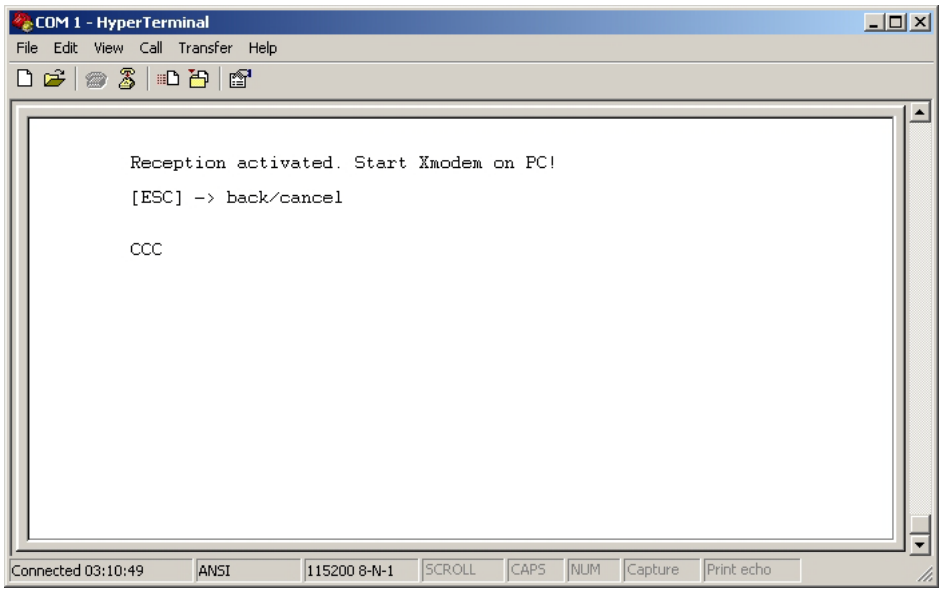


Figure 40 Screenshot: Parameter Update

When the menu shown above appears, the submenu `send file` must be selected from the Hyperterm section DATA TRANSMISSION. It is necessary to set X Modem (not 1K X Modem) as protocol. Select the file to be transmitted and press the button `Send`. This action starts the data transfer.

5.1.13 Download Settings (HG61430 –> PC)

This menu enables downloading parameter files from the Control Unit HG 61430 to the PC.

Terminal (PC)

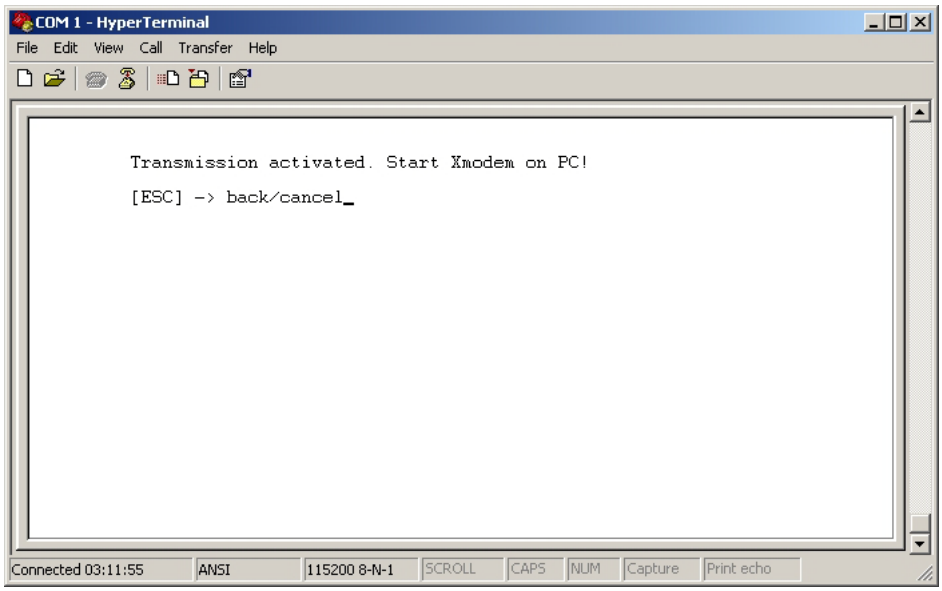


Figure 41 Screenshot: Parameter Download

When the menu shown above appears, the submenu `receive file` must be selected from the Hyperterm section DATA TRANSMISSION. It is necessary to set X Modem (not 1K X Modem) as protocol. Then press the `receive` button, assign a name to the file, e.g. `crane_1.par` and start the data transfer.

5.1.14 Configure Logging

The logging function is a tool for trouble shooting. It is possible to log data from the Control Unit HG 61430 during operation and send them by e-mail to Götting KG. As it is not possible to log all data via the serial interface within a 100 ms pattern, it is necessary to select data that may be relevant.

Terminal (PC)

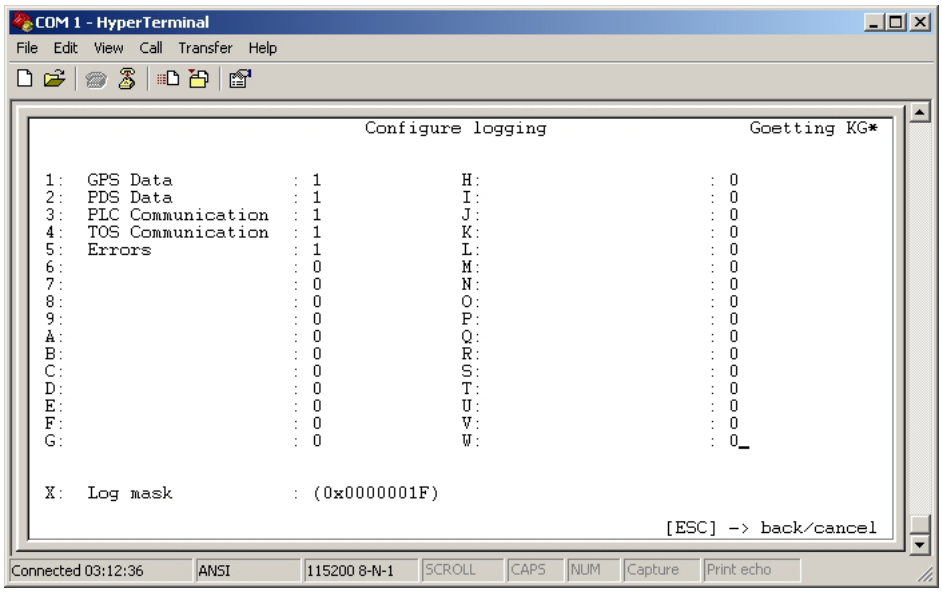


Figure 42 Screenshot: Menu Configure Logging

The menu shown above enables selecting groups of data via keys. All groups marked with a 1 are recorded. E. g. when pressing 2, the group GPS Pos would be unmarked. This means, there would be a 0. The second hit of 2 results in the selection of the group GPS Pos and thus it will again be included in the log file.

An alternative method is to edit the Log mask with the key X. Usually a Götting engineer would give you a matching log mask. Setting a log mask means, that all relevant entries would be set in a single step.

5.1.15 Start Logging

This menu enables recording data during operation, either for trouble shooting or for simple documentation.

Terminal (PC)

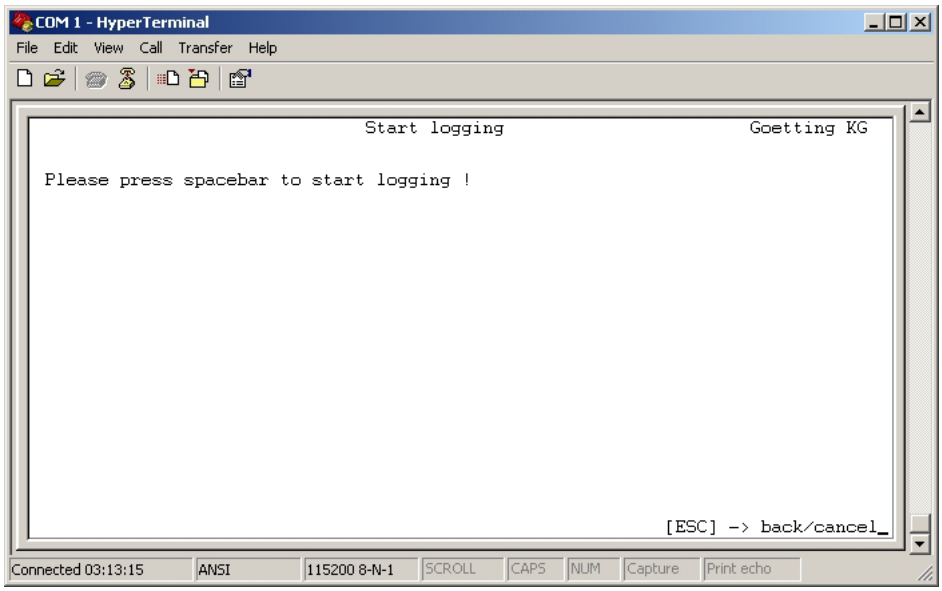


Figure 43 Screenshot: Start Logging

Once the above shown menu appears, it is necessary to start the recording with the submenu `Data Transmission - record text file` in Hyperterm. Then press the space key.

NOTE! If the sequence of these actions is altered, meaning that the space key is pressed first and then the recording started, the headlines are lost and therefore the allocation of the data and columns is lost!

5.2 Trimble GPS Receiver

The following screenshots show how configuration files delivered by Götting are imported into the GPS receiver.

NOTE! This configuration **must not** be altered!

Figure 44 Screenshot: Configuration of the GPS Receiver, step 1

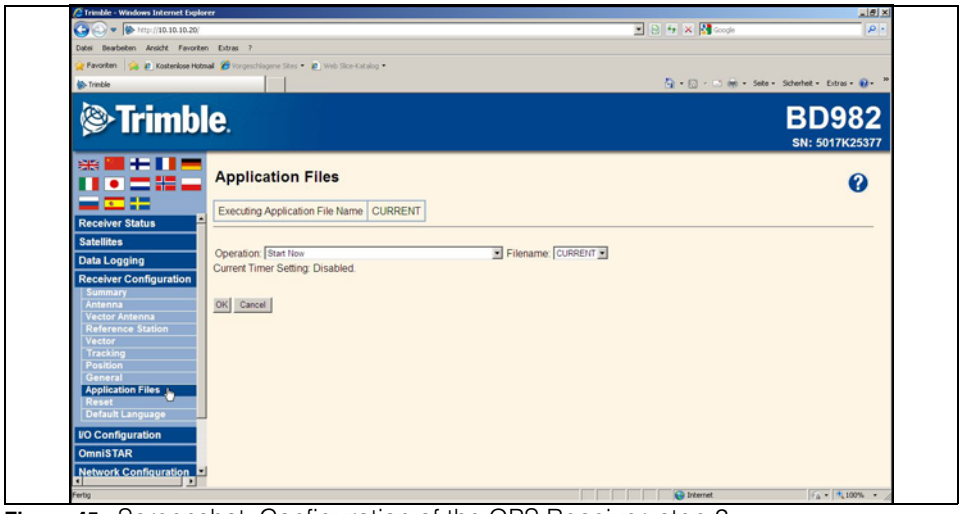


Figure 45 Screenshot: Configuration of the GPS Receiver, step 2

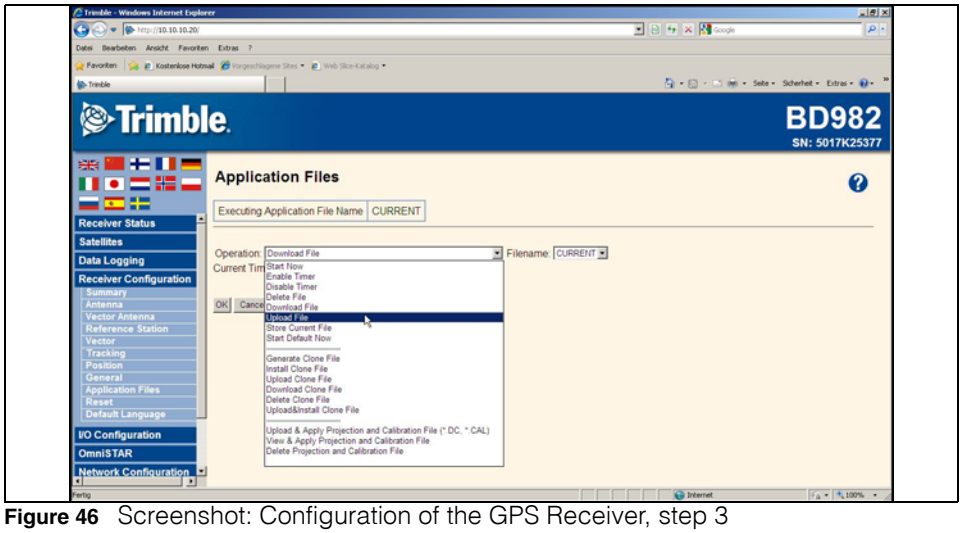


Figure 46 Screenshot: Configuration of the GPS Receiver, step 3

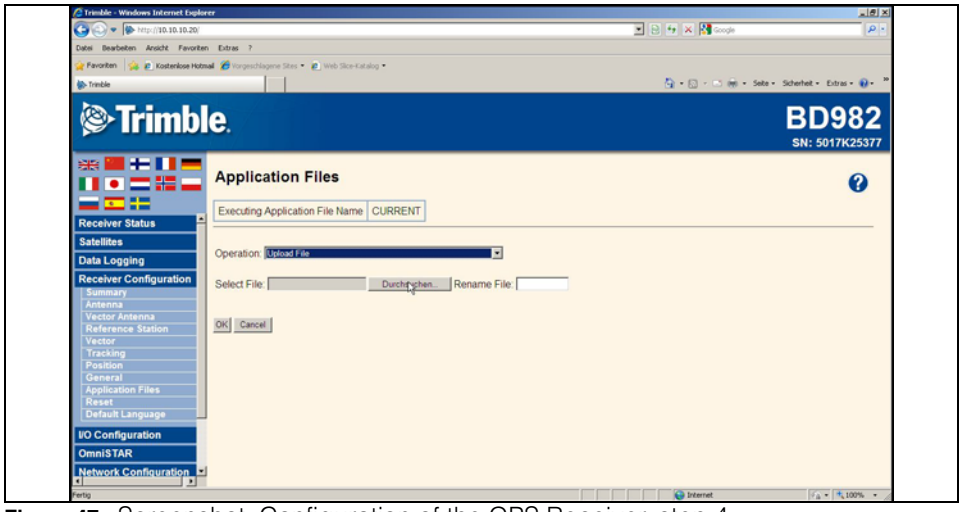


Figure 47 Screenshot: Configuration of the GPS Receiver, step 4

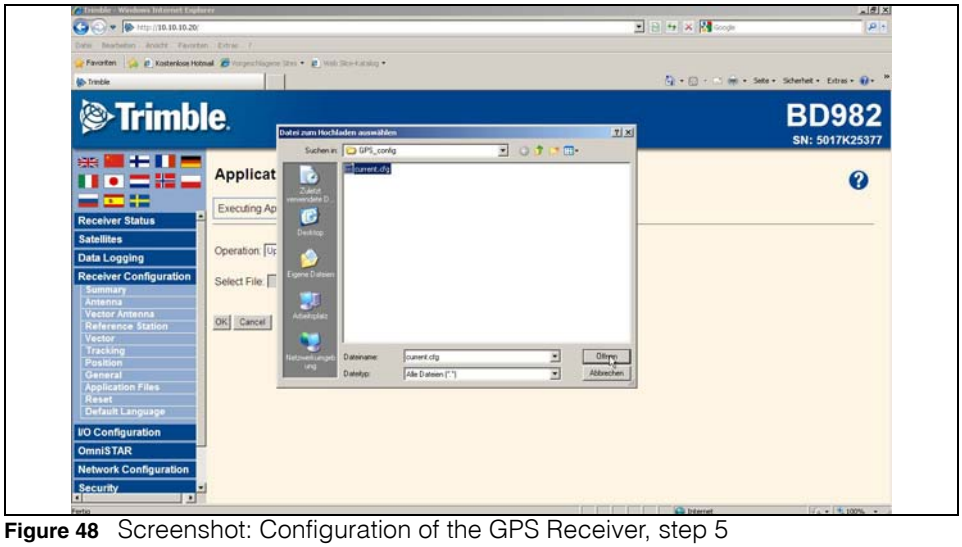


Figure 48 Screenshot: Configuration of the GPS Receiver, step 5

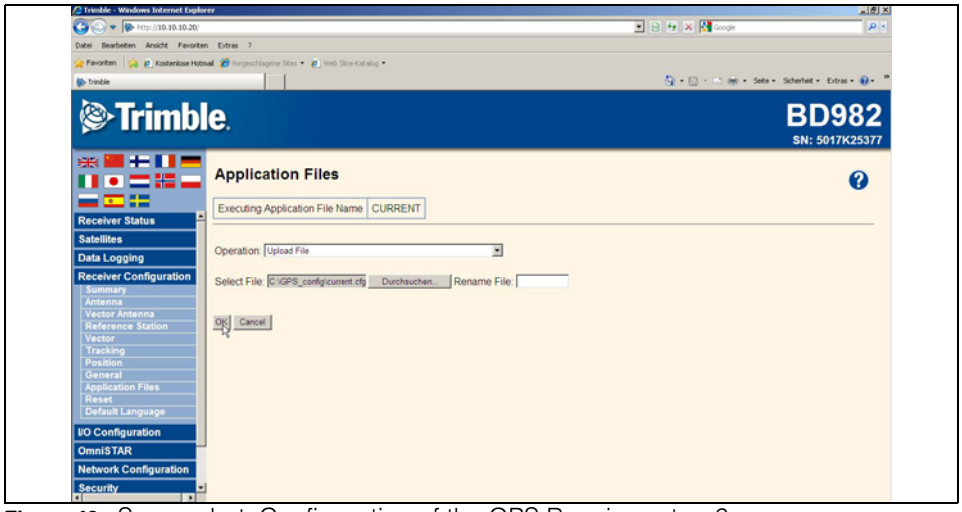


Figure 49 Screenshot: Configuration of the GPS Receiver, step 6

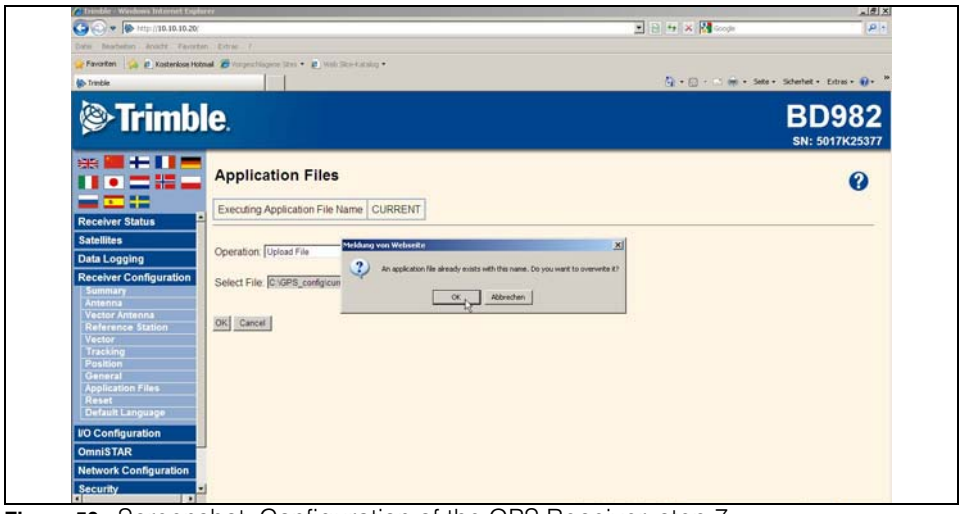


Figure 50 Screenshot: Configuration of the GPS Receiver, step 7

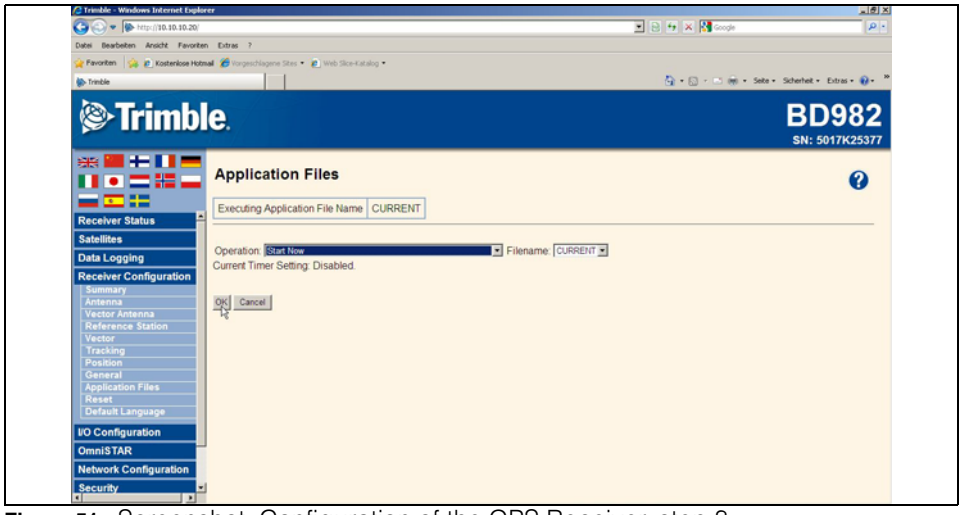


Figure 51 Screenshot: Configuration of the GPS Receiver, step 8

6 Communication Protocol: Profibus

6.1 Direction: PLC –> PDS (Outputs)

Byte-No.	Byte order	Description		
1		PLC Status	Bit	Description
			1	1: Set Down Event (hold 1 until acknowledged by PDS status)
			2	1: Lift Event (hold 1 until acknowledged by PDS status)
			3	1: Force PDS Message (hold 1 until acknowledged by PDS status)
			4	-
			5	-
			6	-
			7	-
			8	-
2	Highbyte	Trolley Position		
3	Lowbyte			
4	Highbyte	Hoist Position		
5	Lowbyte			
6		Spreader Mode	Bit	Description
			1	One 20 footer.
			2	One 40 footer.
			3	One 45 footer.
			4	Two 20 footers: the orientation of the spreader to the yard positions is not known.
			5	The two 20 footers moved were oriented so that the one on the L end of the spreader was in the position with the lowest string value.
			6	The two 20 footers moved were oriented so that the one on the R end of the spreader was in the position with the lowest string value.
7	Highbyte	Container Weight		
8	Lowbyte			

Table 34 Profibus Protocol PLC –> PDS

Byte-No.	Byte order	Description	
9	Container ID ASCII-Code	Example –>	O
10			O
11			L
12			U
13			1
14			2
15			3
16			4
17			5
18			6
19			7

Table 34 Profibus Protocol PLC –> PDS

6.2 Direction: PDS –> PLC (Inputs)

Byte-No.	Byte order	Description		
1		PDS Status	Bit	Description
			1	1: Set Down Event received (hold 1 until Bit cleared in PLC status)
			2	1: Lift Event received (hold 1 until Bit cleared in PLC status)
			3	1: PDS Message sent (hold 1 until Bit cleared in PLC status)
			4	-
			5	-
			6	-
			7	-
			8	-

Table 35 Profibus Protocol PDS –> PLC

7 Maintenance

The system is maintenance free.

8 Technical Data

G_61430-A	
Casing and dimensions	aluminum, see also Figure 4 on page 8
Weight	1350 g
Operating temperature	0 to 70° C
Storage temperature	-25 to 80° C
Protection class	IP30
Relative humidity at 25° C	95 % (without dew)
Interfaces	see section 3.1.3 “Interface Connectors“ on page 13
Power supply	nominal voltage 24 Volt (18 to 30 Volt)
Current consumption	250 mA at 24 Volt

Table 36 Technical Data G_61430-A

9 List of Figures

List of Figures

10 List of Tables

11 Handbook Guidelines

At the time this manual was printed, the following symbols and marks were used in all Götting KG documentations:

- For security advices, the following symbols stand for different degrees of danger and importance:

NOTE!

ATTENTION!

WARNING!

- Further information or advices are indicated as follows:

TIP!

- Program texts and variables are indicated through the use of the `Script Courier`.
- Whenever the pressing of letter keys is required for program entries, the required Letter Keys are indicated as such (for any programs of Götting KG small and capital letters are equally valid).
- Sections, drawings and tables are subsequential numbers throughout the complete document. In addition, each documents includes a list of contents showing the page numbers following the front. If a document exceeds 10 pages, it also has a drawings list and a list of tables on the last few pages. If required, in case a document is correspondingly long and complex, a index is added in the back.
- Each document shows a small table including meta information, such as deveopler, author, revision and date of issue, on the front page. The information regarding revision and date of issue are also included in the bottom line on each page of the document. This way it is possible to clear identify the source document for each bit of information.
- Online version (PDF) and printed handbook are always generated from the same source. Due to the consequent use of Adobe FrameMaker for these documentations, it is possible to use the cross hints and content entries (including page numbers of the index) of the PDF file for automatical transfer to the corresponding content.

12 Copyright and Terms of Liability

12.1 Copyright

12.2 Exclusion of Liability

Any information given is to be understood as system description only, but is not to be taken as guaranteed features. Any values are reference values. The product characteristics are only valid if the systems are used according to the description.

This instruction manual has been drawn up to the best of our knowledge. Installation, setup and operation of the device will be on the customer's own risk. Liability for consequential defects is excluded. We reserve the right for changes encouraging technical improvements. We also reserve the right to change the contents of this manual without having to give notice to any third party.

12.3 Trade Marks and Company Names

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