Leica GPS900
User Manual

Version 2.0
English

- when it has to be **right**

Leica Geosystems

Introduction

Purchase

Congratulations on the purchase of a GPS900 series instrument.

This manual contains important safety directions as well as instructions for setting up the product and operating it. Refer to "9 Safety Directions" for further information. Read carefully through the User Manual before you switch on the product.

Product identification

The type and serial number of your product are indicated on the type plate. Enter the type and serial number in your manual and always refer to this information when you need to contact your agency or Leica Geosystems authorized service workshop.

Type: _____

Serial No.: _____

Symbols used in this manual

The symbols used in this manual have the following meanings:

Type	Description
⚠ **Danger**	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ **Warning**	Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury.
⚠ **Caution**	Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in minor or moderate injury and/or appreciable material, financial and environmental damage.
☞	Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

☞

- The RX900 controller is available as RX900 or as RX900c. The name RX900 is used througout the manual and may also represent the RX900c.
- A GPS900 real-time rover can only be made up of an ATX900 GG GNSS antenna together with the RX900 controller, the GFU radio and the GHT56 holder.
- A GPS900 real-time reference station can only be set up using an ATX900 GG GNSS antenna and the RX900 controller, the GFU radio and the GEV205 cable.

The RX900 controller.

The radio housing includes the integrated GFU radio.

Trademarks

- Windows and Windows CE are a registered trademark of Microsoft Corporation
- Bluetooth is a registered trademark of Bluetooth SIG, Inc

All other trademarks are the property of their respective owners.

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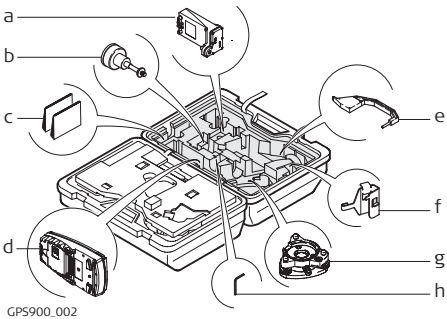
1 Unpacking the Container

1.1 Container Contents

Description

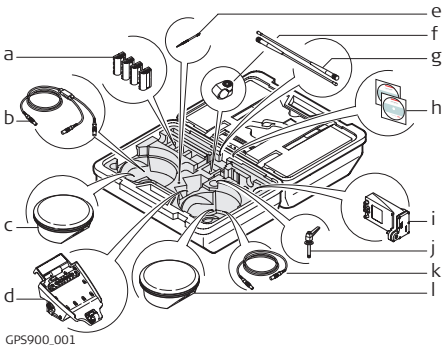
The main components required for the cableless GNSS real-time system are combined in one transport container.

Container for GPS900 and delivered accessories part 1 of 2



a) Radio housing
b) GRT146 carrier
c) GPS900 User Manual
d) RX900
e) Height hook
f) GHT58 tripod bracket for radio housing
g) Tribrach
h) Adjusting pin

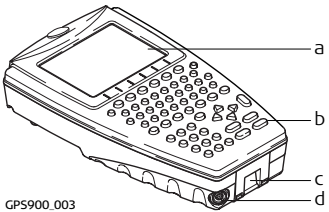
Container for GPS900 and delivered accessories part 2 of 2



a) GEB211 batteries for ATX900 GG and RX900
b) GEV205 Y-cable
c) ATX900 GG
d) GHT56 holder for RX900
e) Stylus for touch screen
f) GHT52 clamp
g) Radio antennas
h) CD ROM
i) Radio housing
j) Tightening screw for GHT52
k) GEV173 ATX900 GG-RX900 cable
l) ATX900 GG

1.2 Components of the RX900 Controller

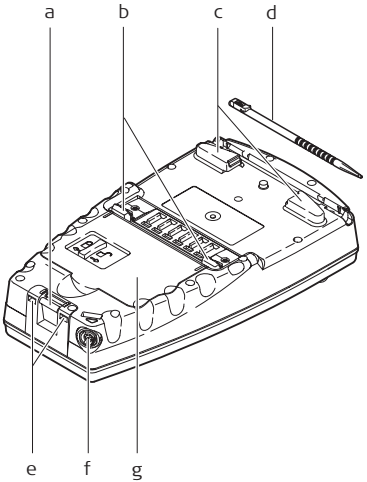
Upperside of RX900



GPS900_003

a) Touch screen
b) Keyboard
c) Hand strap bottom clips
d) LEMO port, with integrated USB port

Underside of RX900



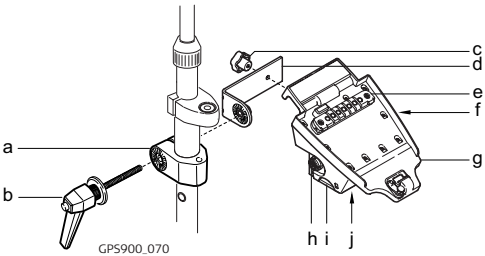
a) Bottom spring clip for pole holder
b) Top clips for pole holder
c) Hand strap top clips
d) Stylus for touch screen
e) Hand strap bottom clips
f) LEMO port, with integrated USB port
g) Battery compartment
   For RX900c with CompactFlash card compartment

A Bluetooth port is included inside RX900, to facilitate connectivity to ATX900 GG.

1.3 Components of the GHT56 Holder and GHT52 Clamp

Components of the GHT56 holder and GHT52 clamp

The GHT56 holder and GHT52 clamp both consist of a number of components, as shown in the diagram.



GHT52 clamp

a) Pole clamp
b) Clamp bolt

GHT56 holder

c) Tightening screw
d) Mounting arm
e) Clip-on-contacs for connecting RX900
f) LED
g) Mounting plate
h) Battery compartement
i) Locking mechanism for battery
j) Space for clip-on-housing with LEMO port

1.4 Available Documentation and CD ROM Contents

Available product manuals

Three product manuals are available for GPS900:

Name of manual	Description of manual	Manual format	
		PRINTED	PDF
User Manual	All instructions required in order to operate the product to a basic level are contained in the User Manual. Provides an overview of the product together with technical data and safety directions.	✓	✓
Quick Guide	Provides an overview of the product and selected program functions.	✓	
Tutorial Manual	Step-by-step instructions, explaining/showing how to complete various survey tasks.		✓
Technical Reference Manual	Overall comprehensive guide to the product and program functions. Included are detailed descriptions of special software/hardware settings and software/hardware functions intended for technical specialists.		✓

CD ROM contents

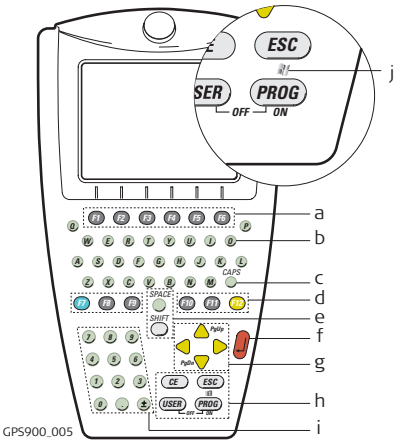
The GPS900 CD ROM contains software and documentation specific to GPS900:

Type	Description
Software	System software
	Language software
	Application programs
	GPS900 Simulation
Documentation	GPS900 User Manual
	GPS900 Tutorial Manual
	GPS900 Technical Reference Manual
	GPS900 Equipment List

2 Using the RX900 Controller

2.1 The Keyboard

Keyboard display



a) Function keys **F1**-**F6**
b) Alpha keys
c) **CAPS**
d) Hot keys **F7**-**F12**
e) **SPACE**, **SHIFT**
f) **ENTER**
g) Arrow keys
h) **CE**, **ESC**, **USER**, **PROG**
i) Numeric keys
j) Windows key symbol.
This is the Microsoft flag logo located between **PROG** and **ESC**.

Special Keys

Key	Function
Hot keys **F7**-**F12**	User definable keys for access to any application, configuration or function.
PROG (**ON**)	If the receiver is off: press and hold for 2 s to turn it on. If the receiver is on: press at any time to access the Programs screen, where a program can be selected.
USER	User definable menu for quick access anytime and access to all STATUS panels.

Other Keys

Key	Function
CAPS	Switches between upper case and lower case letters.
CE	Clears all entry at the beginning of user input. Clears the last character during user input.
ENTER	Selects the highlighted line and leads to the next logical menu / dialogue. Starts the edit mode for edit fields. Opens a choicelist.

Key	Function
ESC	Leaves the current menu or dialogue without storing any changes. Turns receiver off when held for 2 s in the Main Menu screen.
SHIFT	Switches between the first and the second level of function keys.
SPACE	Enters a blank.
Arrow keys	Moves the focus on the screen.
Alpha keys	To type letters.
Function keys **F1**-**F6**	Correspond to six softkeys that appear on the bottom of the screen when the screen is activated.
Numeric keys	To type numbers.

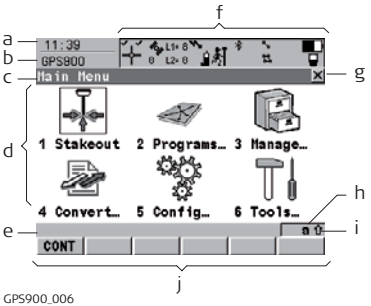
Key combinations

Key	Function
PROG plus **USER**	Turns receiver off when held in the Main Menu screen.
SHIFT △	Pages up.
SHIFT ▽	Pages down.

Key	Function
SHIFT PROG ( )	Displays the Windows CE task bar and start menu.

2.2 The Screen Display

Screen



GPS900_006

a) Time
b) Caption
c) Title
d) Screen area
e) Message line
f) Icons
g) ESC ☒
h) CAPS
i) SHIFT icon
j) Softkeys

Elements

Type	Description
Time	The current local time is shown.
Caption	Shows location either in the Main Menu screen, under **PROG** key or **USER** key.
Title	Name of the screen is shown.
Screen area	The working area of the screen.

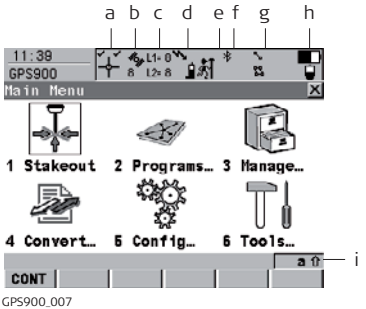
Type	Description
Message line	Messages are shown for 10 s.
Icons	Shows current status information of the receiver. Can be used with touch screen to access the subsequent screen.
ESC ☒	Can be used with touch screen. Same functionality as the **ESC** fixed key. The last operation will be undone.
CAPS	The caps mode for upper case letters is active. The caps mode is activated and deactivated by pressing **UPPER (F5)** or **LOWER (F5)** in some screens.
SHIFT icon	Shows the status of the **SHIFT** key; either first or second level of softkeys is selected. Can be used with touch screen and has the same functionality as the fixed key **SHIFT**.
Softkeys	Commands can be executed using **F1** - **F6** keys. The commands assigned to the softkeys are screen dependent. Can be used directly with touch screen.

2.3 The Icons - Showing Receiver Status

Description

Icons show infomation about the current status of the receiver.

Position of the icons on the screen



GPS900_007

a) Position status
b) Number of visible satellites
c) Contributing satellites
d) Real-time status
e) Position mode
f) Bluetooth
g) Data management
h) Battery
i) **SHIFT**

Position status

Displays the status of the current position.
Touch screen: Tapping the icon leads to **STATUS Position**.

Icon	Description
No icon	No position available.

Icon	Description
	Autonomous solution available.
	Code solution available.
	Phase fixed solution available. The ticks indicate that an ambiguity check is being made.

Number of visible satellites

Displays the number of theoretically visible satellites above the configured cut off angle according to the current almanac.
Touch screen: Tapping the icon leads to **STATUS Satellites**.

Icon	Description
	The number of satellites being tracked.

Contributing satellites

Displays the number of satellites that are contributing to the currently computed position solution.

Touch screen: Tapping the icon leads to **STATUS Satellites**.

Icon	Description
L1= 8 G= 8 L2= 8 R= 2	When a position status icon is displayed, the number of satellites currently used for the position computation are shown. If no position is currently available but satellites are being tracked then the L1 and L2 values (GPS only) or the G and R values (GPS & GLONASS) show how many satellites are being tracked. ☞ The number of contributing satellites can differ from the number of visible satellites. This may be either because satellites cannot be viewed or the observations to these satellites are considered to be too noisy to be used in the position solution.
G= 5 R= 0	☞ The number of contributing GLONASS satellites could be zero if five or more GPS satellites are used for the position computation. The processing algorithm automatically selects the best possible set of satellite combinations for the position computation. A position computation with R = 0 is certainly within the specified reliability.

Real-time device and real-time status

Displays the real-time device configured to be used and its status.
Touch screen: Tapping the icon leads to **STATUS Real-Time Input**.

Real-time mode: Reference
An arrow pointing up indicates a reference configuration, it does not indicate if the device is working. The arrow flashes when a real-time message is sent. When two real-time devices are configured, then the icon for the real-time 1 device is shown.

Icon	Description
	Radio transmitting

Real-time mode: Rover
An arrow pointing down indicates a rover configuration. The arrow flashes when real-time messages are received.

Icon	Description
	Radio receiving.

Position mode

Displays the current position mode depending on the configuration defined. Symbols are added to the basic position mode icon when logging of auto points is configured. As soon as this icon becomes visible the receiver is in a stage where practical operation can commence.

Icon	Position mode	Point occupation	Logging of auto points	Move antenna
	Static	Yes	No	No
	Moving	No	No	Yes
	Moving	No	By time	Yes
	Moving	No	By distance or height or by user decision	Yes
	Moving	No	By stop & go	Yes

Bluetooth

The status of each Bluetooth port and any Bluetooth connection is displayed.
Touch screen: Tapping the icon leads to **STATUS Bluetooth**.

Icon	Description
	Bluetooth is integrated.
	A Bluetooth connection is established and active.
	Bluetooth connection not established. Bluetooth port 1, 2 and 3 are down.
	Bluetooth connection established. Bluetooth port 1, 2 and 3 are active.

Data management

The number of lines and areas currently open in the active job is displayed.
Touch screen: Tapping the icon leads to **MANAGE Data: Job Name**

Icon	Description
	The active job in Data Management.

Battery icons

The status of the battery is displayed. The remaining power in the battery is indicated by six levels.
Touch screen: Tapping the icon leads to **STATUS Battery & Memory**.

Icon	Description
	Internal battery is in use.

SHIFT

The status of the **SHIFT** key is displayed.
Touch screen: Tapping the icon shows additional softkeys.

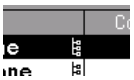
Icon	Description
	Additional softkeys are available in the currently visible screen.
	The **SHIFT** key has been pressed.

2.4 The Symbols - Showing Receiver Settings

Description

Symbols show information about current receiver settings.

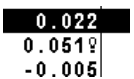
Attributes

Symbol	Description	Example
	The attribute symbol is displayed in the MANAGE Codes screen to indicate codes that have attributes attached.	

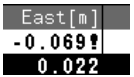
Filter

Symbol	Description	Example
	The filter symbol is shown on the Points page if a stakeout filter is active.	

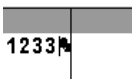
Limits

Symbol	Description	Example
	The limits symbol indicates that a defined limit has been exceeded. For example, the exceeding of a residual limit in the Determine Coordinate System program.	

Largest residual

Symbol	Description	Example
!	The largest residual symbol is used to indicate the largest residual in the Determine Coordinate System program - DET C SYS Step 4: Check Residuals.	

Staked out

Symbol	Description	Example
⚑	The staked out symbol is used in the MANAGE Data: Job Name screen to indicate points which have been staked out.	

3 Using the ATX900 GG Antenna

3.1 Understanding Antenna Heights

Description

- The height of the GNSS antenna above the point consists of three components:
  - the vertical height reading,
  - the vertical offset,
  - the vertical phase centre variations.
- For most operations, pre-configured standard settings in RX900 can be used. They automatically take the vertical phase centre variations into account.

MRP

GPS900 accepts vertical height readings to the **M**echanical **R**eference **P**lane, MPR.

Vertical phase centre variations

These are handled automatically in the standard antenna records. The antenna calibrations to determine the phase centre variations were executed by Geo++® GmbH.

Pillar setup. For other than the GRT146 carrier, the dimensions must be determined and the vertical offset must be adapted.

Tripod setup. For height measurement devices other than the height hook, the dimensions must be determined and the vertical offset must be adapted.

Pole setup. For other than Leica poles, the dimensions must be determined.

3.2 The Mechanical Reference Plane, MRP

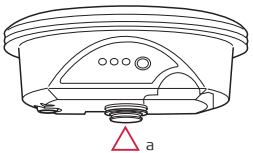
Description

The **M**echanical **R**eference **P**lane:

- is where the antenna heights are measured to.
- is where the phase centre variations refer to.
- varies for different antennas.

MRP for ATX900 GG

The MRP for ATX900 GG is shown in the diagram.

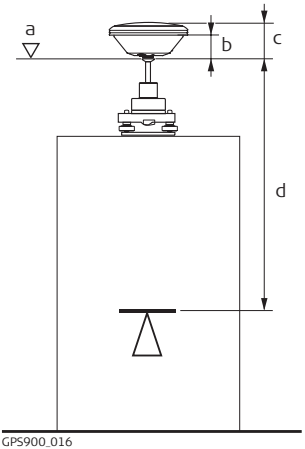


a) The mechanical reference plane is the underside of the threaded metal insert.

3.3 Measuring the Antenna Height for a Pillar Setup

Measuring the antenna height, a quick overview

Setup type	Antenna name	The required measurement
Pillar	ATX900 GG Pillar	the vertical height reading to the MRP.

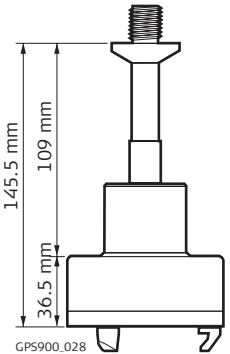


GPS900_016

a) Mechanical reference plane MRP
b) Vertical phase centre offset for L1
c) Vertical phase centre offset for L2
d) Vertical Height Reading

The Vertical offset = 0.00

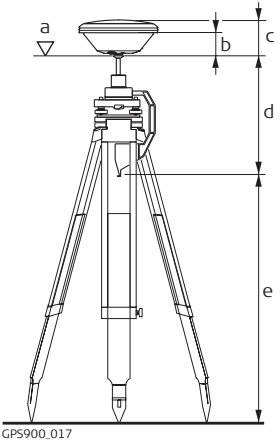
Determining the antenna height with the GRT146 carrier step-by-step

Step	Description
1.	Measure a height from the pillar benchmark to a surface on the carrier. 
2.	Use the appropriate measurement from the diagram above, to determine the height difference between the measured surface on the carrier and where the MRP of the ATX900 GG antenna sits on the carrier.
3.	The vertical height reading = adding the values in step 1. and step 2.

3.4 Measuring the Antenna Height for a Tripod Setup

Measuring the antenna height, a quick overview

Setup Type	Antenna type	The required measurement
Tripod	ATX900 GG Tripod	the vertical height reading from the height hook.



GPS900_017

a) Mechanical reference plane MRP
b) Vertical phase centre offset for L1
c) Vertical phase centre offset for L2
d) Vertical offset
e) Vertical Height Reading

Vertical offset = 0.36

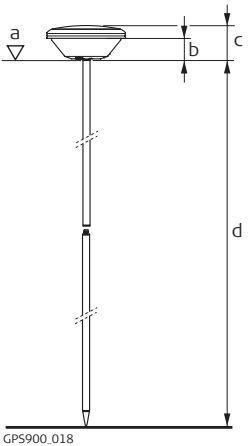
Determining the antenna height with the height hook step-by-step

Step	Description
1.	The vertical height reading = vertical height reading from the height hook. • The vertical height reading is the height difference between the ground mark and the bottom end of the height hook. • The vertical offset of 0.36 m is automatically stored in the antenna setup record for a tripod setup and will automatically be taken into account. It does not need to be entered.

3.5 Measuring the Antenna Height for a Pole Setup

Measuring the antenna height, a quick overview

Setup Type	Antenna type	The required measurement
Pole	ATX900 GG Pole	the vertical height reading of the pole.



a) Mechanical reference plane MRP
b) Vertical phase centre offset for L1
c) Vertical phase centre offset for L2
d) Vertical Height Reading

Vertical offset = 0.00

Determining the antenna height step-by-step

Step	Description
1.	The vertical height reading = • **2.00 m** for the Leica threaded aluminium pole consisting of an upper half and a lower half. • **3.00 m** for the Leica threaded aluminium pole consisting of an upper half and a lower half, with an additional 1.00 m pole section. • **2.00 m** for the fully extended Leica telescopic carbon-fibre pole.

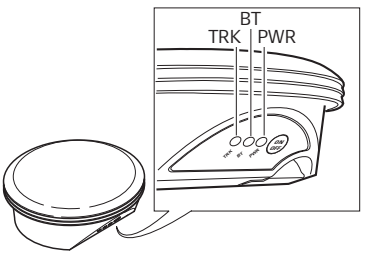
3.6 The LED Indicators on the ATX900 GG Antenna

LED indicators

Description

ATX900 GG has **L**ight **E**mitting **D**iode indicators. They indicate the basic antenna status.

Diagram of the LED indicators



GPS900_59

TRK	Tracking LED
BT	Bluetooth LED
PWR	Power LED

Description of the LED indicators

IF the	is	THEN
TRK	off	No satellites are tracked.
	flashing green	Less than four satellites are tracked, a position is not yet available.
	green	Enough satellites are tracked to compute a position.
	red	ATX900 GG is initialising.
BT	green	Bluetooth is in data mode and ready for connecting.
	purple	Bluetooth is connecting.
	blue	Bluetooth has connected.
	flashing blue	Data is being transferred
PWR	off	Power is off.
	green	Power is okay.
	flashing green	Power is low. The remaining time for which enough power is available depends on the type of survey, the temperature and the age of the battery.

4 Turning On / Turning Off

4.1 Turning On/Off, Switching to Desktop

Turning RX900 on

- Press and hold **PROG** (ON) for 2 s. (RX900 must have a power supply).

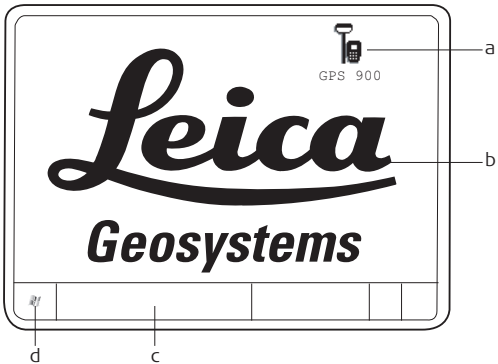
Turning RX900 off

- RX900 can only be turned off in the Main Menu screen.
  - Press the **USER** and **PROG** keys simultaneously, or
  - Hold **ESC** for 2 s.

Putting RX900 into sleep mode

- In sleep mode, RX900 shuts down and reduces power consumption. Rebooting from sleep mode is quicker than a cold start after turning off.
- RX900 can only be put into sleep mode in the Main Menu screen.
- Press **SHIFT SLEEP (F3)** to put RX900 into sleep mode.

Switching between Leica software and the Windows CE desktop



a) Icon to start Leica software
b) Windows CE desktop
c) Task bar
d) Windows CE start button

Accessing the Main Menu screen

IF	THEN
RX900 is started	• the Leica software starts up automatically.
Windows CE desktop is active	• double click to display the Leica software, or

IF	THEN
	• press **SHIFT PROG** ( ) to display the Leica software.
Leica software is minimised	• double click to maximise it, or • select **GPS900** in the task bar to maximise it.

Accessing the Windows CE desktop

IF	THEN
Leica software is to be minimised	**SHIFT MINIM (F5)** in the Main Menu screen.
Leica software is to be closed	**SHIFT EXIT (F6)** in the Main Menu screen.
Windows CE task bar is to be displayed	**SHIFT PROG** ( ).

4.2 Operating by Keyboard or Touch Screen

Operating with the keyboard and the touch screen

The user interface is operated either by the keyboard or by the touch screen, with supplied stylus. The workflow is the same for keyboard and touch screen entry, the only difference lies in the way information is selected and entered.

Operation by keyboard
Information is selected and entered using the keys. Refer to "2.1 The Keyboard" for a detailed description of the keys on the keyboard and their function.

Operation by touch screen
Information is selected and entered on the screen using the supplied stylus.

Operation	Description
To select an item	Tap on the item.
To start the edit mode in input fields	Tap on the input field.
To highlight an item or parts of it for editing	Drag the supplied stylus from the left to the right.
To accept data entered into an input field and exit the edit mode	Tap on the screen outside of the input field.

5 Understanding the Main Menu

Description

The Main Menu is the first screen displayed when the instrument is switched on.

The Main Menu screen

CONT (F1)
To select the highlighted option and to continue with the subsequent screen.

SHIFT OFF (F2)
To completely turn RX900 off.

SHIFT SLEEP (F3)
To put RX900 into sleep mode.

SHIFT MINIM (F5)
To minimise Leica software.

SHIFT EXIT (F6)
To close Leica software.

Description of the Main Menu functions

Main menu function	Short description of functions
Stakeout	• To start staking out.
Programs...	• To select and start programs.

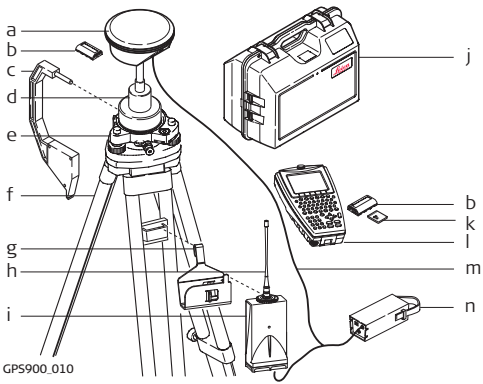
Main menu function	Short description of functions
 **Manage...**	• To manage jobs and their data, codelists and coordinate systems.
 **Convert...**	• To export data from a job on RX900 to a file in the internal memory (RX900) or on the CF card (RX900c) in a customised ASCII format or in DXF format. • To import ASCII, GSI or DXF data from a file in the internal memory (RX900) or on the CF card (RX900c) to a job on RX900. • To copy points between jobs.
 **Config...**	• To access all configuration parameters related to a survey, RX900 and the radio.
 **Tools...**	• To format the memory device. • To transfer non data related files between RX900 and internal memory (RX900) or CF card (RX900c). • To upload files relevant for RX900 and ATX900 GG functionality, for example, firmware and language files.

Main menu function	Short description of functions
	• To perform arithmetic operations such as addition, subtraction, multiplication, division, statistical functions, trigonometric functions, conversions or roots. • To view files in the internal memory (RX900) or CF card (RX900c). • To manually type in or upload a licence key.

6 Setting Up and Starting Up

6.1 Setting Up as a Real-Time Reference

Diagram showing real-time reference setup



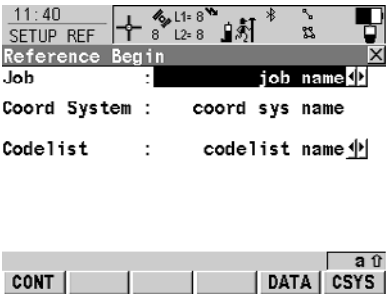
a) ATX900 GG
b) GEB211 battery for ATX900 GG and RX900
c) Height hook
d) GRT146 Carrier*
e) Tribrach
f) Tripod
g) GHT58 tripod bracket
h) Radio antenna
i) Radio housing
j) Transport container
k) CompactFlash card
l) GEV205 Y-cable
m) GEB171 external battery

* The GRT146 carrier has a screw fitting. ATX900 GG fits directly onto this fitting.

Setup and Startup for real-time reference step-by-step

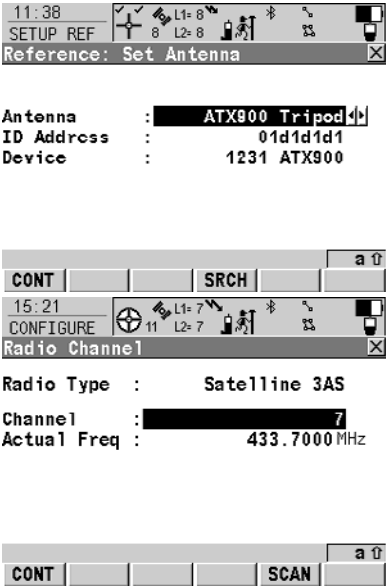
Step	Description
1.	**Setting Up the Equipment**
	• Set up the tripod, mount and level the tribrach onto the tripod.
	• Check that the tribrach is correctly centred over the marker.
	• Place and lock the carrier into the tribrach.
	• Insert the battery into ATX900 GG and screw ATX900 GG onto the carrier.
	• Check that the tribrach is still correctly positioned and levelled.
	• Hang the external battery onto a tripod leg.
	• Hang the tripod bracket onto a tripod leg and attach the radio housing onto the tripod bracket. Make sure that the radio antenna is screwed onto the radio housing.
	• Take the Y-cable.
	• Attach the connector with the 8 pin plug to ATX900 GG.
	• Attach the connector with the 5 pin plug to the external battery.
	• Attach the connector without pins to the radio housing.
	• Insert the CompactFlash card into RX900 (for RX900c only).
	• Insert the battery into RX900 and turn on RX900 and ATX900 GG.

Step	Description
2.	**Starting Up with the Setup Reference Program**



2.a Selecting the Job

- Select a Job.
- Press **DATA (F5)** to check all of the points in the selected job.
- Press **CONT (F1)** to continue.

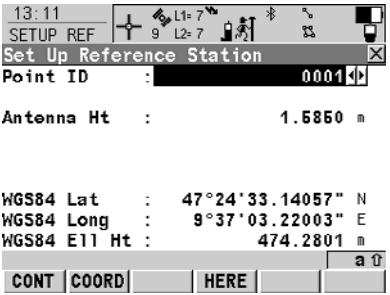


2.b Selecting the Antenna

- Select the antenna.*
  For a pillar setup, select ATX900 GG Pillar.
  For a tripod setup, select ATX900 GG Tripod.
- Press **SRCH (F4)** to start searching for the antenna, via Bluetooth.
- Press **CONT (F1)** to continue.

2.c Setting the Radio Channel**

- Enter the radio channel. It is important to remember that the radio at the reference and the radio at the rover must be set to the same frequency.
  Press **SCAN (F5)** to scan for the radio at the reference.
- Press **CONT (F1)** to continue.



2.d Selecting the Reference Point

- Select the known point.***
- Enter the antenna height.
  For a pillar setup, this will be the vertical height reading to the MRP.
  For a tripod setup, this will be the vertical height reading from the height hook.
- Press **HERE (F4)** to use the current navigated position for the setup.
- Press **CONT (F1)** to continue.

2.e Completing the Setup

- Press **FNSH (F1)** to continue and return to the Main Menu screen.

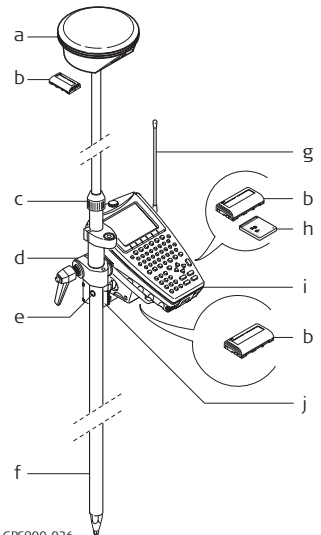
* Refer to "3 Using the ATX900 GG Antenna" for further information on antennas and antenna heights.

** Depending on the radio attached the screen content slightly differs.

*** When setting the reference point for the setup, the selected point must be able to be viewed as WGS1984 coordinates.

6.2 Setting Up as a Real-Time Rover

Diagram showing real-time rover setup

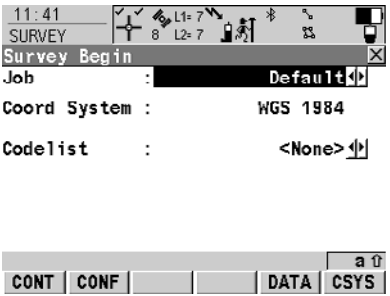


a) ATX900 GG
b) GEB211 battery for ATX900 GG, RX900 and radio
c) Compression lock of the pole
d) GHT56 holder for RX900
e) Snap-lock of the pole
f) GLS30 telescopic carbon-fibre pole
g) Radio antenna
h) CompactFlash card
i) RX900
j) Radio

Setup and Startup step-by-step

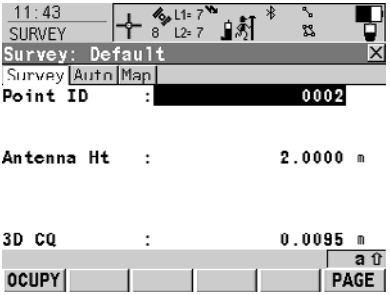
Step	Description
1.	**Setting Up the Equipment**
	• Insert the battery into ATX900 GG.
	• Screw ATX900 GG onto the top of the telescopic pole.
	• Ensure that the compression lock is not clamped.
	• Fully extend the telescopic pole and ensure that the snap-lock clicks into its position. The snap-lock ensures that there is no slipping of the telescopic pole.
	• Clamp the compression lock. The compression lock maintains straightness.
	• Remove the plastic sleeve from the clamp. Slide the clamp onto the bottom part of the telescopic pole.
	• Fix the holder to the clamp with the tightening screw. Before tightening, ensure that the holder is at a comfortable working height and angle. This can be achieved by sliding the clamp along the pole and rotating the holder about the clamp. Tighten the tightening screw.
	• Insert the CompactFlash card into RX900 (for RX900c only).
	• Insert the battery into RX900.

Step	Description
	• Clip RX900 onto the holder and lock into position. Refer to "Attaching RX900 to the GHT56 holder step-by-step" for further information.
	• Turn on ATX900 GG and RX900.
2.	**Starting Up with the Survey Program**



2.a Selecting the Job

- Select the Job Default.
- Select the WGS1984 coord system.
- Press **CONT (F1)** to continue.



2.b Surveying the Point

- Move to the point, enter the point ID.
- Enter the antenna height.
  For Leica standard poles = 2.00 m.
- Press **OCUPY (F1)** to start measuring the point.*,**,***
  Press **STOP (F1)** when enough data is collected for the point.
  Press **STORE (F1)** to store the point.
- Are more points to be surveyed?
  If yes, repeat the first three points.
  If no, continue with the next point.
- Continue to press **ESC** until the Main Menu screen appears.

* Before the point is measured, the position mode icon is the moving icon, indicating that the rover can still be moved around.

** As the point is being measured, the position mode icon changes to the static icon, indicating that the rover should remain stationary.

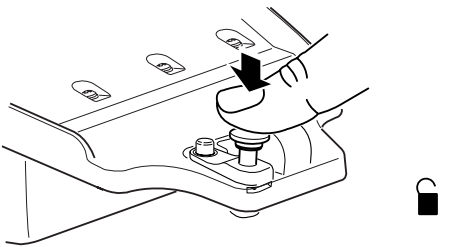
*** **SHIFT QUIT (F6)** always terminates the survey operation. In this case all data collected since pressing **OCUPY (F1)** is lost.

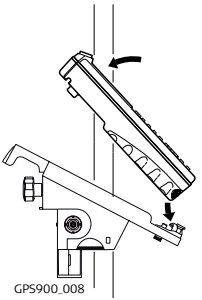
Attaching the GHT56 holder to the left or right side of the pole

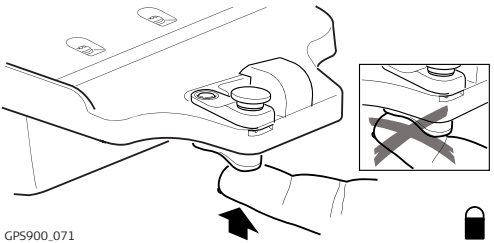
The GHT56 holder can be attached either to the left side or right side of the pole.

Step	Description
☞	Refer to "1.3 Components of the GHT56 Holder and GHT52 Clamp" for further information on the holder.
1.	Remove the thumb screw from the mounting plate.
2.	Remove the mounting arm from the mounting plate and re-position it.
3.	Re-fix the mounting arm to the mounting plate with the tightening screw.

Attaching RX900 to the GHT56 holder step-by-step

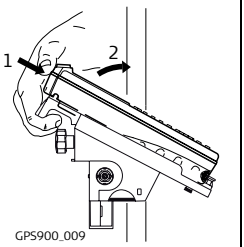
Step	Description
☞	A locking mechanism is incorporated in the mounting plate of the holder.
1.	Before RX900 is placed onto the mounting plate ensure that the locking pin is put into the unlocked position. To unlock the locking pin, push down the red button situated on top of the mounting plate.  GPS900_072
2.	Hold RX900 above the holder and lower the end into the holder.

Step	Description
3.	Apply slight pressure in a downward direction and then lower the top part of RX900 until the unit is clicked into the holder. The guides of the holder aid in this action.  GPS900_008

Step	Description
4.	After RX900 is placed onto the mounting plate ensure that the locking pin is put into the locked position. To lock the locking pin, push up the red button from below.  GPS900_071

Detaching RX900 from the GHT56 holder step-by-step

Step	Description
1.	Unlock the locking pin by pushing down the red button situated on top of the mounting plate.
2.	Place the palm over the top of RX900 until the fingers grip the bar of the holder under RX900.
3.	Push the top of RX900 toward the bar of the holder.

Step	Description
4.	While in this position, raise the top of RX900 from the holder. 

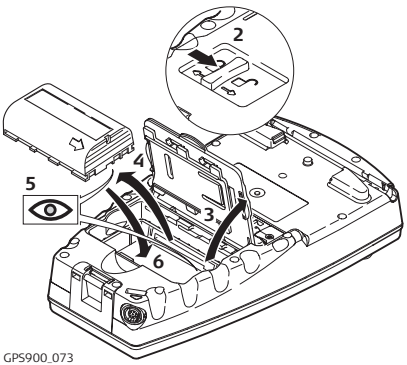
6.3 Connecting to the ATX900 GG Antenna with Bluetooth

Communicating via Bluetooth step-by-step

Step	Description
1.	Select Main Menu: 
2.	Select Comm: Bluetooth.
3.	Press **SRCH (F4)** to search for Bluetooth devices. The ATX900 GG antenna must be turned on.
4.	The **CONFIGURE Search Bluetooth Device** screen appears. All available Bluetooth devices are displayed.
5.	Highlight and select the antenna to be used.
6.	Press **CONT (F1)**. Press **CONT (F1)** to return to the Main Menu screen.
☞	If the antenna selected is connected for the first time, a Windows CE authentication request comes up. Type in 0000 as identification number for Leica's Bluetooth and click **OK**.
☞	Once the Bluetooth connection is established, the Bluetooth LED on the antenna starts flashing in blue.

6.4 Changing the Battery on the RX900 Controller

Changing the battery on RX900 step-by-step



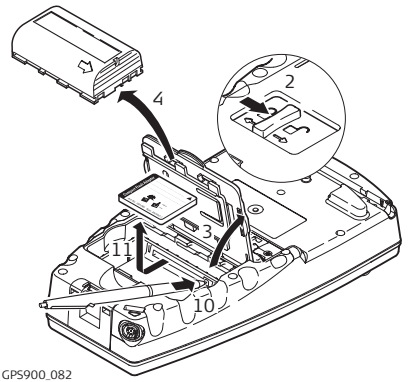
GPS900_073

Step	Description
1.	Turn RX900 over to gain access to the battery compartment.
2.	Push the slide fastener in the direction of the arrow with the open-lock symbol.
3.	Open the battery compartment.

Step	Description
4.	Pull the battery from the battery compartment.
5.	A polarity of the battery is displayed inside the battery compartment. This is a visual aid to assist in placing the battery correctly.
6.	Place the battery into the battery compartment, ensuring that the engraved arrow symbol is pointing toward the battery contacts.
7.	Close the battery compartment by pushing the slide fastener in the direction of the arrow with the close-lock symbol.

6.5 Changing the CompactFlash card on the RX900c Controller

Changing the CompactFlash card on RX900c step-by-step



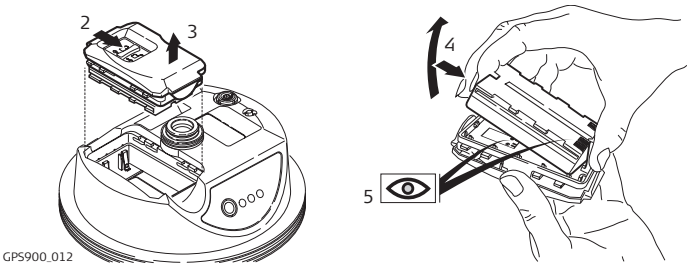
GPS900_082

Step	Description
☞	The CompactFlash card is inserted into a slot inside the battery compartment (only valid for RX900c).
1.	Turn RX900c over to gain access to the battery compartment.

Step	Description
2.	Push the slide fastener in the direction of the arrow with the open-lock symbol.
3.	Open the battery compartment.
4.	Pull the battery from the battery compartment.
5.	☞ The card should be held with the label for the care instructions upwards and the contacts facing the slot.
	Slide the card firmly into the slot until it clicks into position.
6.	Place the battery into the battery compartment, ensuring that the engraved arrow symbol is pointing toward the battery contacts.
7.	Close the battery compartment by pushing the slide fastener in the direction of the arrow with the close-lock symbol.
8.	To remove the card, open the cover of the battery compartment.
9.	Pull the battery from the battery compartment.
10.	Press the eject button on the right side of the card slot twice.
11.	Pull out the CompactFlash card and close the compartment cover.

6.6 Changing the Battery on the ATX900 GG Antenna

Changing the battery on ATX900 GG step-by-step



Step	Description
1.	Turn ATX900 GG over to gain access to the battery compartment.
2.	Open the battery compartment by pushing the slide fastener in the direction of the arrow with the open-lock symbol.
3.	Pull out the battery housing. The battery is attached to the housing.
4.	Hold the battery housing and pull the battery from the battery housing.
5.	A polarity of the battery is displayed inside the battery housing. This is a visual aid to assist in placing the battery correctly.

Step	Description
6.	Place the battery onto the battery housing, ensuring that the contacts are facing outward. Click the battery into position.
7.	Close the battery compartment by pushing the slide fastener in the direction of the arrow with the close-lock symbol.

6.7 Essential Battery Operating Principles

Primary Use/Charging

- The battery must be charged prior to using it for the first time because it is delivered with an energy content as low as possible.
- For new batteries or batteries that have been stored for a long time (> three months), it is effectual to make only one charge/discharge cycle.
- For Li-Ion batteries, a single discharging and charging cycle is sufficient. We recommend carrying out the process when the battery capacity indicated on the charger or on a Leica Geosystems product deviates significantly from the actual battery capacity available.
- The permissible temperature range for charging is between 0°C to +40°C/ +32°F to +104°F. For optimal charging we recommend charging the batteries at a low ambient temperature of +10°C to +20°C/+50°F to +68°F if possible.
- It is normal for the battery to become warm during charging. Using the chargers recommended by Leica Geosystems, it is not possible to charge the battery if the temperature is too high.

Operation/Discharging

- The batteries can be operated from -20°C to +55°C/-4°F to +131°F.
- Low operating temperatures reduce the capacity that can be drawn; very high operating temperatures reduce the service life of the battery.

6.8 Using Licence Keys

Description

A licence key can be used to activate protected programs and protected receiver options and can be used to define the expiry date of the software maintenance.

Protected programs

A licence key is required for the following protected programs:

Protected programs
• DTM Stakeout
• DXF Export
• Reference Line
• RoadRunner
• Volume Calculations

Protected receiver option

A licence key is required for the following protected receiver option:

Protected receiver option
• 2 Hz update rate
• 5 Hz update rate
• 5 km RTK range
• GLONASS option

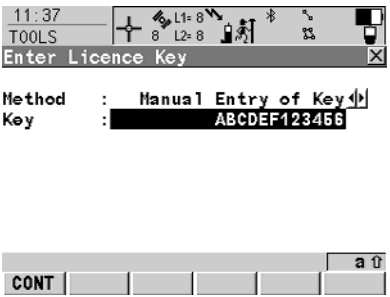
Access

- 

, or
- Select a program on RX900 which is not yet activated.

Entering/Loading a licence key

- A licence key file can be uploaded to RX900. To upload a licence key file the file should be located on the \SYSTEM directory of the internal memory (RX900) or the CompactFlash card (RX900c). Licence key files use the naming convention L_123456.key, where 123456 is the instrument serial number.
- Licence keys can also be typed in manually.



CONT (F1)
To accept changes and return to the Main Menu screen or continue with the program.

SHIFT DEL (F4)
To delete all licence keys on RX900.

Field	Description of Field
Method	• The method used to input the licence key to activate the program or the protected options or the software maintenance. • **Upload Key File**. The licence key file is uploaded from the internal memory (RX900) or the CompactFlash card (RX900c). The licence key file must be stored in the \SYSTEM directory in the internal memory (RX900) or the CompactFlash card (RX900c). • **Manual Entry of Key**. Allows the licence key to be typed in manually.
Key	• Available for <Method: Manual Entry of Key>. The licence key required to activate a program. Entry is not case sensitive.

The next step

IF a licence key is to be	THEN
uploaded	select the method used to input the licence key and press **CONT (F1)**.
deleted	press **SHIFT DEL (F4)**.

6.9 Checking and Adjusting the Circular Level of the Tribrach

Description

- The adjustable circular level on the tribrach is used to level the ATX900 GG antenna over the observation point. An incorrectly adjusted circular level means that the ATX900 GG antenna is not properly positioned over the point, which means that another point on the ground is observed.
- The tribrach should be checked and adjusted:
  - at regular periods,
  - before the first use,
  - after long periods of transport,
  - after long periods of work,
  - if the temperature changes by more than 20 °C.

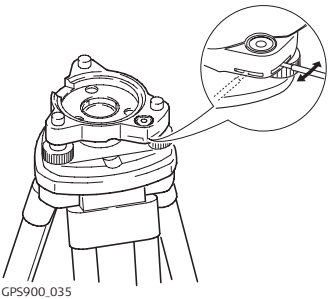
Equipment checklist

The required equipment for the checking and adjusting of the circular level are:

- Tripod,
- Tribrach,
- A carrier, with a precision bubble checked and adjusted or a TPS instrument,
- Adjusting pin.

Checking and adjusting the circular level step-by-step

Step	Description
1.	Set up the tripod.
2.	Screw the tribrach onto the tripod.
3.	Fix the carrier/instrument onto the tribrach.
4.	Level the tribrach using the precision bubble on the carrier or the precision bubble on the instrument.
5.	Is the circular level on the tribrach centered and not extended beyond the enscribed circle? • If yes, no adjustment is required. The procedure is finished. • If no, the bubble requires adjusting. Continue with step 6.
6.	Remove the carrier/instrument.

Step	Description
7.	Centre the circular level using the adjustment pin in conjunction with the adjustment screws on the underside of the casing of the circular level.  GPS900_035
8.	Fix the carrier/instrument onto the tribrach.
9.	Repeat steps 4. to 5.

6.10 Checking and Adjusting the Circular Bubble of the Pole

Checking and adjusting the circular bubble

It is important that the adjustable circular bubble of the pole is kept in adjustment. Whenever the GPS900 equipment is sent for servicing to a Leica Geosystems authorized service workshop, it is recommended that the pole is also sent for servicing.

6.11 Guidelines for Correct Results with GNSS Surveys

Undisturbed satellite signal reception

Successful GNSS surveys require undisturbed satellite signal reception, especially at the receiver which serves as a reference. Set up the receivers in locations which are free of obstructions such as trees, buildings or mountains.

Steady antenna for static surveys

For static surveys, the antenna must be kept perfectly steady throughout the whole occupation of a point. Put the antenna on a tripod or pillar.

Centred and levelled antenna

Centre and level the antenna precisely over the marker.

7 Connecting a Computer with ActiveSync

Description of ActiveSync

To transfer data to or from the office computer, the RX900 controller must be connected to the office computer (optional for the RX900 controller with color screen) using Microsoft ActiveSync. Microsoft ActiveSync is the synchronization software for Windows mobile-based pocket computers.

Installing ActiveSync

Before data can be transferred, the ActiveSync software must first be installed on the office computer. The ActiveSync software is freeware and is supplied on the GPS900 CD ROM. Translated versions can be downloaded from the Microsoft website.

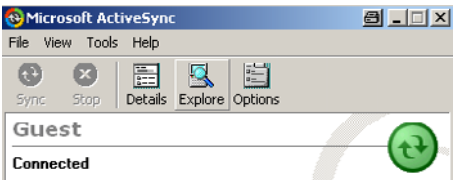
Installing the USB Driver using the GEV161 USB cable step-by-step

Step	Description
☞	This procedure is only required when connecting for the first time.
1.	Start the office computer.
2.	Turn on RX900 by pressing and holding **PROG** (ON) for 2 s.
3.	Connect the USB cable to RX900 and to the office computer.
4.	**Installing the USB driver**
	• The **Found New Hardware Wizard** appears on the office computer. Select the **No** option (Windows Updates), click **Next** to continue.
	• Select **Install from a list or specific location**, click **Next** to continue.

Step	Description
	• Insert the GPS900 CD ROM, which contains the necessary USB driver.
	• Select **Search removable media**, click **Next** to continue.
	• The system will search and install the USB driver from the CD ROM. A confirmation window may appear, click **Continue Anyway**.
	• Click **Finish** to complete the process.

Connecting to a PC using the GEV161 USB cable step-by-step

Step	Description
1.	**Setting up the RX900 controller**
	• Turn on RX900 by pressing and holding **PROG** (ON) for 2 s.
	• Connect the USB cable to RX900 but not to the office computer.
2.	**Setting up ActiveSync for USB connection**
	• Start Microsoft ActiveSync on the office computer.
	• From the **File** menu, select **Connection Settings**. Ensure that the **Allow USB connection with this desktop computer** is checked. Click **OK** to close the dialogue.
	• Connect the USB cable into a USB port on the office computer.

Step	Description
	• The **New Partnership** wizard appears on the office computer. Select the **No** option and click **Next** to continue.
	• RX900 is connected to ActiveSync as a guest. The following screen indicates a successful connection. 
3.	**Transferring Data**
	• When the USB connection is established, data files can be transferred between RX900 and the office computer.
	• In the Microsoft ActiveSync window, click **Explore** to open an Explorer window.
	• The RX900 folders are displayed under **Mobile Devices**.
	• The RX900 internal memory (CF card for RX900c) is displayed under **StorageCard**.

Ensure that RX900 has been configured to connect to the computer with USB cable. The settings can be checked from **Start/Settings/Control Panel/PC Connection**.

Connecting to a PC (LEICA Geo Office) using the GEV161 USB cable step-by-step

Step	Description
1.	**Setting up the RX900 controller**
	• Turn on RX900 by pressing and holding **PROG** (ON) for 2 s.
	• Connect the USB cable to RX900 but not to the office computer.
2.	**Setting up ActiveSync for USB connection**
	• Start Microsoft ActiveSync on the office computer.
	• From the **File** menu, select **Connection Settings**. Ensure that the **Allow USB connection with this desktop computer** is checked. Click **OK** to close the dialogue.
	• Connect the USB cable into a USB port on the office computer.
	• The **New Partnership** wizard appears on the office computer. Select the **No** option and click **Next** to continue.
	• RX900 is connected to ActiveSync as a guest.
3.	**Setting up LEICA Geo Office**
	• Start LEICA Geo Office on the office computer.
	• Open Data Exchange Manager from the Tools menu.

Step	Description
	• Click **Refresh (F5)** on the ActiveSync folder.

Connecting to a PC using Bluetooth step-by-step

Step	Description

1.	**Activating Bluetooth on the office computer**
	• The steps required depend on the Bluetooth driver and other computer specific configurations. On the office computer, always ensure that:
	  • the correct COM port is defined.
	  • the COM port is configured as incoming, which allows Bluetooth devices to detect the computer.

2.	**Activating Bluetooth on RX900**
	• Turn on RX900 by pressing and holding **PROG** (ON) for 2 s.
	• Go to **Start/Settings/Control Panel/Bluetooth Device**.
	• Click **Scan Device**.
	• Highlight the service required in the **Untrusted** box.
	• Click the **- ->** arrow to move the service to the **Trusted** box.

Step	Description
	• Highlight the service required in the **Trusted** box.
	• Right mouse click to access the context menu.
	• Tick **Active**.
	• Go to **Start/Settings/Control/System/Device Name** to give RX900 a specific name.
	• Go to **Start/Settings/Control Panel/PC Connection**.
	• Select **Bluetooth** from the combo box.
	• Go to **Start/Programs/Communication/ActiveSync** to initialise the communication.
	• As soon as the communication is initialised on RX900, ActiveSync establishes the link between the office computer and RX900.
3.	**Setting up LEICA Geo Office**
	• Start LEICA Geo Office on the office computer.
	• Open Data Exchange Manager from the Tools menu.
	• Click **Refresh (F5)** on the ActiveSync folder.

8 Care and Transport

8.1 Transport

Transport in a road vehicle	Never carry the product loose in a road vehicle, as it can be affected by shock and vibration. Always carry the product in its transport container and secure it.
Shipping	When transporting the product by rail, air or sea, always use the complete original Leica Geosystems packaging, transport container and cardboard box, or its equivalent, to protect against shock and vibration.
Shipping, transport of batteries	When transporting or shipping batteries, the person in charge of the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping, contact your local passenger or freight transport company.

8.2 Storage

Product

Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to "10 Technical Data" for information about temperature limits.

Li-Ion batteries

- Refer to "10 Technical Data" for information about storage temperature range.
- A storage temperature range of -20 to +30°C/-4 to 68°F in a dry environment is recommended to minimise self-discharging of the battery.
- At the recommended storage temperature range, batteries containing a 10% to 50% charge can be stored for up to one year. After this storage period the batteries must be recharged.
- Remove batteries from the product and the charger before storing.
- After storage recharge batteries before using.
- Protect batteries from damp and wetness. Wet or damp batteries must be dried before storing or use.

8.3 Cleaning and Drying

Product	Use only a clean, soft, lint-free cloth for cleaning. If necessary, moisten the cloth with water or pure alcohol. Do not use other liquids; these may attack the polymer components.
Damp products	Dry the product, the transport container, the foam inserts and the accessories at a temperature not greater than 40°C / 108°F and clean them. Do not repack until everything is completely dry.
Cables and plugs	Keep plugs clean and dry. Blow away any dirt lodged in the plugs of the connecting cables.

9 Safety Directions

9.1 General Introduction

Description

- The following directions should enable the person responsible for the product, and the person who actually uses the equipment, to anticipate and avoid operational hazards.
- The person responsible for the product must ensure that all users understand these directions and adhere to them.

9.2 Intended Use

Permitted use

- Measuring raw data and computing coordinates using carrier phase and code signal from GNSS (Global Navigation Satellite System) satellites.
- Carrying out measurement tasks using various GNSS measuring techniques.
- Recording GNSS and position related data.
- Computation and evaluation by means of software.
- Data exchange via wireless communication.

Adverse use

- Use of the product without instruction.
- Use outside of the intended limits.
- Disabling safety systems.
- Removal of hazard notices.
- Opening the product using tools, for example screwdriver, unless this is specifically permitted for certain functions.
- Modification or conversion of the product.
- Use after misappropriation.
- Use of products with obviously recognizable damages or defects.
- Use with accessories from other manufacturers without the prior explicit approval of Leica Geosystems.
- Inadequate safeguards at the surveying site, for example when measuring on roads.

- Controlling of machines, moving objects or similar monitoring application without additional control- and safety installations.

⚠ Warning

Adverse use can lead to injury, malfunction and damage.
It is the task of the person responsible for the equipment to inform the user about hazards and how to counteract them. The product is not to be operated until the user has been instructed on how to work with it.

9.3 Limits of Use

Environment

Suitable for use in an atmosphere appropriate for permanent human habitation: not suitable for use in aggressive or explosive environments.

Danger

Local safety authorities and safety experts must be contacted before working in hazardous areas, or in close proximity to electrical installations or similar situations by the person in charge of the product.

9.4 Responsibilities

Manufacturer of the product

Leica Geosystems AG, CH-9435 Heerbrugg, hereinafter referred to as Leica Geosystems, is responsible for supplying the product, including the user manual and original accessories, in a completely safe condition.

Manufacturers of non Leica Geosystems accessories

The manufacturers of non Leica Geosystems accessories for the product are responsible for developing, implementing and communicating safety concepts for their products, and are also responsible for the effectiveness of those safety concepts in combination with the Leica Geosystems product.

Person in charge of the product

The person in charge of the product has the following duties:

- To understand the safety instructions on the product and the instructions in the user manual.
- To be familiar with local regulations relating to safety and accident prevention.
- To inform Leica Geosystems immediately if the product and the application becomes unsafe.
- To ensure that the national laws, regulations and conditions for the operation of radio transmitters are respected.

Warning

The person responsible for the product must ensure that it is used in accordance with the instructions. This person is also accountable for the training and the deployment of personnel who use the product and for the safety of the equipment in use.

9.5 International Warranty, Software Licence Agreement

International Warranty

The International Warranty can be downloaded from the Leica Geosystems home page at http://www.leica-geosystems.com/internationalwarranty or received from your Leica Geosystems dealer.

Software Licence Agreement

This product contains software that is preinstalled on the product, or that is supplied to you on a data carrier medium, or that can be downloaded by you online pursuant to prior authorization from Leica Geosystems. Such software is protected by copyright and other laws and its use is defined and regulated by the Leica Geosystems Software Licence Agreement, which covers aspects such as, but not limited to, Scope of the Licence, Warranty, Intellectual Property Rights, Limitation of Liability, Exclusion of other Assurances, Governing Law and Place of Jurisdiction. Please make sure, that at any time you fully comply with the terms and conditions of the Leica Geosystems Software Licence Agreement.

Such agreement is provided together with all products and can also be found at the Leica Geosystems home page at http://www.leica-geosystems.com/swlicense or your Leica Geosystems dealer.

You must not install or use the software unless you have read and accepted the terms and conditions of the Leica Geosystems Software Licence Agreement. Installation or use of the software or any part thereof, is deemed to be an acceptance of all the terms and conditions of such licence agreement. If you do not agree to all or

some of the terms of such licence agreement, you may not download, install or use the software and you must return the unused software together with its accompanying documentation and the purchase receipt to the dealer from whom you purchased the product within ten (10) days of purchase to obtain a full refund of the purchase price.

9.6 End User Licence Agreement EULA

EULA terms

- You have acquired a device RX900 that includes software licenced by Leica Geosystems from an affiliate of Microsoft Corporation ("MS"). Those installed software products of MS origin, as well as associated media, printed materials, and "online" or electronic documentation ("SOFTWARE") are protected by international intellectual property laws and treaties. The SOFTWARE is licenced, not sold. All rights reserved.
- IF YOU DO NOT AGREE TO THIS END USER LICENCE AGREEMENT ("EULA"), DO NOT USE THE DEVICE OR COPY THE SOFTWARE, INSTEAD, PROMPTLY CONTACT Leica Geosystems FOR INSTRUCTIONS ON RETURN OF THE UNUSED DEVICE(S) FOR A REFUND. **ANY USE OF THE SOFTWARE, INCLUDING BUT NOT LIMITED TO USE ON THE DEVICE, WILL CONSTITUTE YOUR AGREEMENT TO THIS EULA (OR RATIFICATION OF ANY PREVIOUS CONSENT).**
- **GRANT OF SOFTWARE LICENCE**. This EULA grants you the following licence:
  - You may use the SOFTWARE only on the DEVICE.
  - **NOT FAULT TOLERANT**. THE SOFTWARE IS NOT FAULT TOLERANT. Leica Geosystems HAS INDEPENDENTLY DETERMINED HOW TO USE THE SOFTWARE IN THE DEVICE, AND MS HAS RELIED UPON Leica Geosystems TO CONDUCT SUFFICIENT TESTING TO DETERMINE THAT THE SOFTWARE IS SUITABLE FOR SUCH USE.
  - **NO WARRANTIES FOR THE SOFTWARE**. THE SOFTWARE is provided "AS IS" and with all faults. THE ENTIRE RISK AS TO SATISFACTORY QUALITY,

PERFORMNCE, ACCURACY, AND EFFORT (INCLUDING LACK OF NEGLIGENCE) IS WITH YOU. ALSO, THERE IS NO WARRANTY AGAINST INTERFERENCE WITH YOUR ENJOYMENT OF THE SOFTWARE OF AGAINST INFRINGEMENT. **IF YOU HAVE RECEIVED ANY WARRANTIES REGARDING THE DEVICE OR THE SOFTWARE, THOSE WARRANTIES DO NOT ORIGINATE FROM, AND ARE NOT BINDING ON, MS.**

- No Liability for Certain Damages. **EXCEPT AS PROHIBITED BY LAW, MS SHALL HAVE NO LIABILITY FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES ARISING FROM OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE SOFTWARE. THIS LIMITATION SHALL APPLY EVEN IF ANY REMEDY FAILS FOF ITS ESSENTIAL PURPOSE. IN NO EVENT SHALL MS BE LIABLE FOR ANY AMOUNT IN EXCESS OF U.S. TWO HUNDRED FIFTY DOLLARS (U.S.$250.00).**
- **Limitations on Reverse Engineering, Decompilation, and Disassembly.** You may not reverse engineer, decompile, or disassemble the SOFTWARE, except and only to the extent that such activity is expressly permitted by applicable law notwithstanding these limitation.
- **SOFTWARE TRANSFER ALLOWED BUT WITH RESTRICTIONS.** You may permanently transfer rights under this EULA only as part of a permanent sale or transfer of the Device, and only if the recipient agrees to this EULA. If the SOFTWARE is an upgrade, any transfer must also include all prior versions of the SOFTWARE.
- **EXPORT RESTRICTIONS.** You acknowledge that SOFTWARE is subject to U.S. and European Union export jurisdiction. You agree to comply with all applicable

international and national laws that apply to the SOFTWARE, including the U.S. Export Administration Regulations, as well as end-user, end-use and destination restrictions issued by U.S. and other governments. For additional information see http://www.microsoft.com/exporting/.

9.7 Hazards of Use

Warning

The absence of instruction, or the inadequate imparting of instruction, can lead to incorrect or adverse use, and can give rise to accidents with far-reaching human, material, financial and environmental consequences.
Precautions:
All users must follow the safety directions given by the manufacturer and the directions of the person responsible for the product.

Warning

Watch out for erroneous measurement results if the product has been dropped or has been misused, modified, stored for long periods or transported.
Precautions:
Periodically carry out test measurements and perform the field adjustments indicated in the user manual, particularly after the product has been subjected to abnormal use and before and after important measurements.

Danger

Because of the risk of electrocution, it is very dangerous to use poles and extensions in the vicinity of electrical installations such as power cables or electrical railways.
Precautions:
Keep at a safe distance from electrical installations. If it is essential to work in this environment, first contact the safety authorities responsible for the electrical installations and follow their instructions.

Warning

By surveying during a thunderstorm you are at risk from lightning.
Precautions:
Do not carry out field surveys during thunderstorms.

Warning

During dynamic applications, for example stakeout procedures there is a danger of accidents occurring if the user does not pay attention to the environmental conditions around, for example obstacles, excavations or traffic.
Precautions:
The person responsible for the product must make all users fully aware of the existing dangers.

Warning

Inadequate securing of the surveying site can lead to dangerous situations, for example in traffic, on building sites, and at industrial installations.
Precautions:
Always ensure that the survey site is adequately secured. Adhere to the regulations governing safety and accident prevention and road traffic.

Warning

Only Leica Geosystems authorized service workshops are entitled to repair these products.

Warning

If computers intended for use indoors are used in the field there is a danger of electric shock.
Precautions:
Adhere to the instructions given by the computer manufacturer with regard to field use in conjunction with Leica Geosystems products.

Caution

If the accessories used with the product are not properly secured and the product is subjected to mechanical shock, for example blows or falling, the product may be damaged or people may sustain injury.
Precautions:
When setting-up the product, make sure that the accessories, for example tripod, tribrach, connecting cables, are correctly adapted, fitted, secured, and locked in position.
Avoid subjecting the product to mechanical stress.

Warning

If an external antenna is not properly fitted to vehicles or any other means of transportation it can be torn off by mechanical shock, vibration or wind, possibly causing accident and injury.

Precautions:

Attach the external antenna professionally. The external antenna must be secured additionally, for example by use of a safety cord. Ensure that the mounting device is correctly mounted and able to safely carry the weight of the external antenna (>1 kg).

Caution

The product uses the GPS P-Code signal which by U.S. policy may be switched off without notice.

Caution

During the transport, shipping or disposal of batteries it is possible for inappropriate mechanical influences to constitute a fire hazard.

Precautions:

Before shipping the product or disposing of it, discharge the batteries by running the product until they are flat.

When transporting or shipping batteries, the person in charge of the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping contact your local passenger or freight transport company.

Warning

Using a battery charger not recommended by Leica Geosystems can destroy the batteries. This can cause fire or explosions.
Precautions:
Only use chargers recommended by Leica Geosystems to charge the batteries.

Warning

High mechanical stress, high ambient temperatures or immersion into fluids can cause leackage, fire or explosions of the batteries.
Precautions:
Protect the batteries from mechanical influences and high ambient temperatures. Do not drop or immerse batteries into fluids.

Warning

Short circuited battery terminals can overheat and cause injury or fire, for example by storing or transporting in pockets if battery terminals come in contact with jewellery, keys, metallized paper or other metals.
Precautions:
Make sure that the battery terminals do not come into contact with metallic objects.

Warning

If the product is improperly disposed of, the following can happen:

- If polymer parts are burnt, poisonous gases are produced which may impair health.
- If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.
- By disposing of the product irresponsibly you may enable unauthorized persons to use it in contravention of the regulations, exposing themselves and third

parties to the risk of severe injury and rendering the environment liable to contamination.

Precautions:

The product must not be disposed with household waste. Dispose of the product appropriately in accordance with the national regulations in force in your country. Always prevent access to the product by unauthorized personnel.

Product specific treatment and waste management information can be downloaded from the Leica Geosystems home page at http://www.leica-geosystems.com/treatment or received from your Leica Geosystems dealer.

⚠ Danger

If the product is used in exposed locations, for example on masts, mountains or buildings, it is at risk from lightning. Danger from high voltages also exists near power lines. Lightning, voltage peaks, or the touching of power lines can cause damage, injury and death.

Precautions:

- Do not use the product in a thunderstorm as you may increase the risk of being struck by lightning.
- Be sure to remain at a safe distance from electrical installations. Do not use the product directly under or in close proximity to power lines. If it is essential to work in such an environment contact the safety authorities responsible for electrical installations and follow their instructions.

- If the product has to be permanently mounted in an exposed location, it is advisable to provide a lightning conductor system. A suggestion on how to design a lightning conductor for the product is given below. Always follow the regulations in force in your country with regard to grounding antennas and masts. These installations must be carried out by an authorised specialist.
- To prevent damages due to indirect lightning strikes (voltage spikes) cables, for example for antenna, power source or modem should be protected with appropriate protection elements, like a lightning arrester. These installations must be carried out by an authorized specialist.
- If there is a risk of a thunderstorm, or if the equipment is to remain unused and unattended for a long period, protect your product additionally by unplugging all systems components and disconnecting all connecting cables and supply cables, for example, receiver - antenna.

Lightning conductors

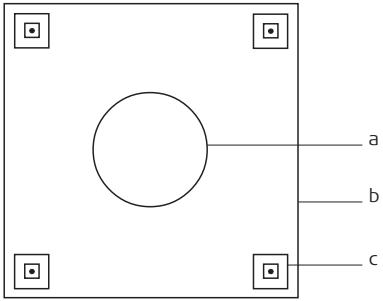
Suggestion for design of a lightning conductor for a GPS system:

1. On non-metallic structures
   Protection by air terminals is recommended. An air terminal is a pointed solid or tubular rod of conducting material with proper mounting and connection to a conductor. The position of four air terminals should be uniformly distributed around the antenna at a distance equal to the height of the air terminal.
   The air terminal diameter should be 12 mm for copper or 15 mm for aluminium. The height of the air terminals should be 25 cm to 50 cm. All air terminals should

be connected to the down conductors. The diameter of the air terminal should be kept to a minimum to reduce GPS signal shading.

2. On metallic structures
   Protection is as described for non-metallic structures, but the air terminals can be connected directly to the conducting structure without the need for down conductors.

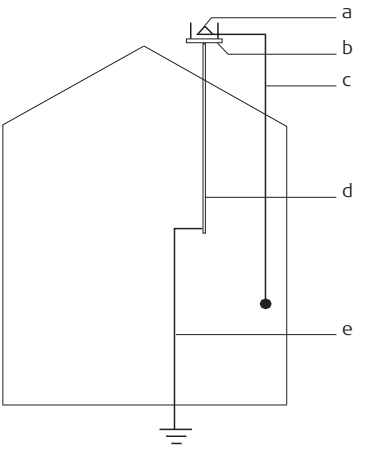
Air terminal arrangement, plan view



GPS900_033

a) GPS antenna
b) Support structure
c) Air terminal

Grounding the receiver/antenna



GPS900_034

a) GPS antenna
b) Lightning conductor array
c) Antenna/receiver connection
d) Metallic mast
e) Connection to earth

9.8 Electromagnetic Compatibility EMC

Description

The term Electromagnetic Compatability is taken to mean the capability of the product to function smoothly in an environment where electromagnetic radiation and electrostatic discharges are present, and without causing electromagnetic disturbances to other equipment.

Warning

Electromagnetic radiation can cause disturbances in other equipment.

Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment may be disturbed.

Caution

There is a risk that disturbances may be caused in other equipment if the product is used in conjunction with accessories from other manufacturers, for example field computers, personal computers, two-way radios, non-standard cables or external batteries.

Precautions:

Use only the equipment and accessories recommended by Leica Geosystems. When combined with the product, they meet the strict requirements stipulated by the guidelines and standards. When using computers and two-way radio, pay attention to the information about electromagnetic compatibility provided by the manufacturer.

⚠ Caution

Disturbances caused by electromagnetic radiation can result in erroneous measurements. Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that the product may be disturbed by very intense electromagnetic radiation, for example, near radio transmitters, two-way radios or diesel generators.
Precautions:
Check the plausibility of results obtained under these conditions.

⚠ Warning

If the product is operated with connecting cables attached at only one of their two ends, for example external supply cables, interface cables, the permitted level of electromagnetic radiation may be exceeded and the correct functioning of other products may be impaired.
Precautions:
While the product is in use, connecting cables, for example product to external battery, product to computer, must be connected at both ends.

Radios or digital cellular phones

⚠ Warning

Use of product with radio or digital cellular phone:

Electromagnetic radiation can cause disturbances in other equipment, in installations, in medical devices, for example pacemakers or hearing aids and in aircraft. It can also affect humans and animals.

Precautions:

Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment may be disturbed or that humans or animals may be affected.

- Do not operate the product in the vicinity of filling stations or chemical installations, or in other areas where an explosion hazard exists.
- Do not operate the product near to medical equipment.
- Do not operate the product in aircraft.
- Do not operate the product for long periods immediately next to your body.

9.9 FCC Statement, Applicable in U.S.

Applicablility

The grayed paragraph below is only applicable for products without radio.

Warning

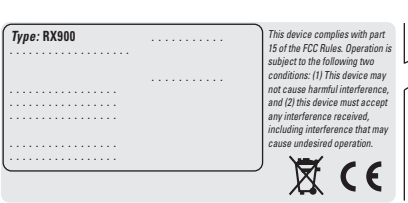
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules.
These limits are designed to provide reasonable protection against harmful interference in a residential installation.
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

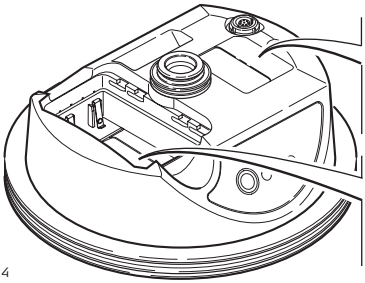
Warning Changes or modifications not expressly approved by Leica Geosystems for compliance could void the user's authority to operate the equipment.

Labelling RX900



GPS900_013

Labelling ATX900 GG

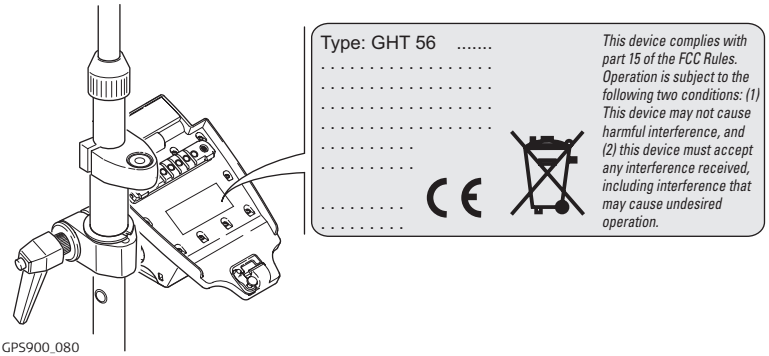


GPS900_014

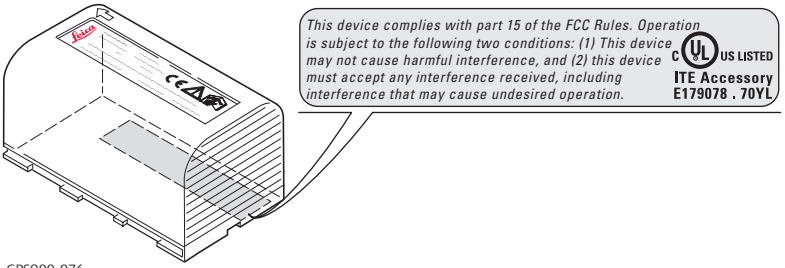
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Type: AT... *Art.No.: .....*
Equip.No.: XXXXXX S.No.: .....
Power: 12V⎓, nominal 1/0.5A max.
Leica Geosystems AG
CH-9435 Heerbrugg
Manufactured: 2004
Made in Switzerland S.No.: .....

Labelling GHT56

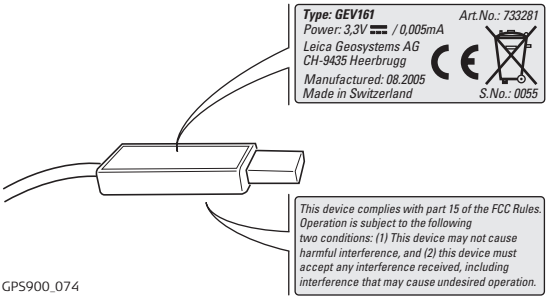


Labelling battery GEB211



GPS900_076

Labelling
USB cable GEV161



10 Technical Data

10.1 RX900 Technical Data

Design

Glass reinforced polymer housing with integrated battery.

Control unit

Display:	1/4 VGA (320 x 240 pixels), monochrome (RX900) or color (RX900c), graphics capable LCD, illumination, touch screen
Keyboard:	62 keys including 12 function keys, illumination
Angle Display:	360°'", 360° decimal, 400 gon, 6400 mil, V %
Distance Display:	m, ft int, ft us, ft int inch, ft us inch
Touch screen:	Toughened film on glass

Dimensions

Type	Length [m]	Width [m]	Thickness [m]
RX900	0.218	0.123	0.047

Weight

Type	Weight [kg]/[lbs]
RX900 with GEB211 battery	0.741/1.634

Recording

For RX900, data can only be recorded on the internal memory while for RX900c, data can only be recorded on the CompactFlash card.

Type	Capacity [MB]	Data capacity
Internal memory	• 256	256 MB is sufficient for about 360000 real-time points with codes
CompactFlash card	• 64 • 256 • 1024	256 MB is sufficient for about 360000 real-time points with codes

Power

Type	Consumption [W]	External supply voltage
RX900/ RX900c	1.1/ 1.4 Bluetooth to ATX900 GG, radio receiving data	Nominal voltage 12 V DC (⎓) Voltage range 11.5 V-28 V

Internal battery

Type	Battery	Voltage	Capacity	Operating time, typical
RX900/ RX900c	Li-Ion	7.4 V	GEB211: 1.9 Ah	11 h/ 10 h Bluetooth to ATX900 GG

Environmental specifications

Temperature

Type	Operating temperature [°C]	Storage temperature [°C]
RX900	-30 to +65 Bluetooth: -25 to +65 Color display: -30 to +50	-40 to +80
Internal battery	-20 to +50	-40 to +70

Protection against water, dust and sand

Type	Protection
RX900	IP67 (IEC60529) Dusttight Waterproof to 1 m temporary immersion

Humidity

Type	Protection
RX900	Up to 100 % The effects of condensation are to be effectively counteracted by periodically drying out RX900.

Interfaces

Type	RS232 No handshake	USB	Bluetooth
RX900	LEMO port	LEMO port	Class 2

Data format for RS232

The default values are:

Baud rate: 115200
Parity: None
Terminator: CR/LF
Data bits: 8
Stop bits: 1

Ports

Type	8 pin LEMO-1
RX900	For power and/or communication

10.2 ATX900 GG Technical Data

10.2.1 Tracking Characteristics

Receiver technology

SmartTrack+

Satellite reception

Dual frequency

Receiver channels

14 channels continuous tracking on L1 and L2 (GPS); twelve channels continuous tracking on L1 and L2 (GLONASS).

Supported codes

GPS

L1	L2
Carrier phase, C/A code	Carrier phase, C code (L2C) and P2 code

GLONASS

L1	L2
Carrier phase, C/A code	Carrier phase, P2 code

Carrier tracking

GPS

Condition	ATX900 GG
L1, AS off or on	Reconstructed carrier phase via C/A code
L2, AS off	Reconstructed carrier phase via P2 code
L2, AS on	Switches automatically to patented P code-aided technique providing full L2 reconstructed carrier phase

GLONASS

Condition	ATX900 GG
L1	Reconstructed carrier phase via C/A code
L2	Reconstructed carrier phase via P2 code

Code measurements

GPS

Condition	ATX900 GG
L1, AS off L1, AS on	Carrier phase smoothed code measurements: C/A code
L2, AS off	Carrier phase smoothed code measurements: P2 code
L2, AS on	Carrier phase smoothed code measurements: Patented P code-aided code

GLONASS

Condition	ATX900 GG
L1	Carrier phase smoothed code measurements: C/A code
L2	Carrier phase smoothed code measurements: P2 code

Carrier phase and code measurements on L1 and L2 are fully independent with AS on or off.

Satellites tracked Up to 14 simultaneously on L1 and L2 (GPS) + up to 12 simultaneously on L1 and L2 (GLONASS)

10.2.2 Accuracy

Accuracy is dependent upon various factors including the number of satellites tracked, constellation geometry, observation time, ephemeris accuracy, ionospheric disturbance, multipath and resolved ambiguities.

The following accuracies, given as **r**oot **m**ean **s**quare, are based on measurements processed using LGO and on real-time measurements.

Differential code

The baseline precision of a differential code solution for static and kinematic surveys is 25 cm.

Differential phase in real-time

Static		**Kinematic**	
Horizontal	**Vertical**	**Horizontal**	**Vertical**
5 mm + 0.5 ppm	10 mm + 0.5 ppm	10 mm + 1 ppm	20 mm + 1 ppm

10.2.3 Technical Data

Dimensions

Height:	0.089 m
Diameter:	0.186 m

Connector

8 pin LEMO-1

Mounting

5/8" Whitworth

Weight

1.1 kg including internal battery GEB211

Power

Power consumption:	1.8 W typically
External supply voltage:	Nominal 12 V DC (⎓), voltage range 5-28 V DC

Battery internal

Type:	Li-Ion
Voltage:	7.4 V
Capacity:	GEB211: 1.9 Ah
Typical operating time:	5 h

Electrical data

Type	ATX900 GG
Voltage	-
Current	-

Type	ATX900 GG
Frequency	GPS L1 1575.46 MHz GPS L2 1227.60 MHz GLONASS L1 1602.5625-1611.5 MHz GLONASS L2 1246.4375-1254.3 MHz
Gain	Typically 27 dBi
Noise Figure	Typically < 2 dBi
BW, -3 dBiW	-
BW, -30 dBi	-

Environmental specifications

Temperature

Operating temperature [°C]	Storage temperature [°C]
-40 to +65 Bluetooth: -30 to +65	-40 to +80

Protection against water, dust and sand

Protection
IP67 (IEC 60529)
Dusttight
Protected against water jets
Waterproof to 1 m temporary immersion

Humidity

Protection
Up to 100 %
The effects of condensation are to be effectively counteracted by periodically drying out the antenna.

10.3 GHT56 Technical Data

Dimensions	Length:	0.169 m
	Width:	0.123 m
	Thickness:	0.130 m
Connector	• 8 pin LEMO-1 • 7 pin clip-on-contacts	
Weight	0.460 kg including internal battery GEB211	
Power	Power consumption:	Nominal voltage 7.4 V DC (⎓) / 2.0 A max
Battery	Type:	Li-Ion
	Voltage:	7.4 V
	Capacity:	GEB211: 1.9 Ah, GEB221: 3.8 Ah
	Typical operating time:	The given operating times are valid for • one fully charged GEB221 battery. • 25°C. Operating times will be shorter when working in cold weather. • good data link. GFU14, receive only mode: 14.5 h

Environmental specifications

Temperature

Operating temperature [°C]	Storage temperature [°C]
-20 to +65	-40 to +80

Protection against water, dust and sand

Protection
IP67 (IEC 60529)
Dusttight
Protected against water jets
Waterproof to 1 m temporary immersion

Humidity

Protection
Up to 100 %
The effects of condensation are to be effectively counteracted by periodically drying out the antenna.

10.4 Conformity to National Regulations

10.4.1 RX900

Conformity to national regulations

- FCC Part 15 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the RX900 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. The declaration of conformity may be consulted at http://www.leica-geosystems.com/ce.

Class 1 equipment according European Directive 1999/5/EC (R&TTE) can be placed on the market and be put into service without restrictions in any EU Member state.

- The conformity for countries with other national regulations not covered by the FCC part 15 or European directive 1999/5/EC has to be approved prior to use and operation.

Frequency band	Bluetooth	2402 - 2480 MHz
Output power	Bluetooth	2.5 mW

Antenna

Type	Antenna	Gain [dBi]	Connector	Frequency band [MHz]
RX900, Bluetooth	Integrated antenna	-	-	-

10.4.2 ATX900 GG

Conformity to national regulations

- FCC Part 15 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the ATX900 GG is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. The declaration of conformity may be consulted at http://www.leica-geosystems.com/ce.

Class 1 equipment according European Directive 1999/5/EC (R&TTE) can be placed on the market and be put into service without restrictions in any EU Member state.

- The conformity for countries with other national regulations not covered by the FCC part 15 or European directive 1999/5/EC has to be approved prior to use and operation.

Frequency band

Type	Frequency band [MHz]
ATX900 GG	1227.60 1575.42
ATX900 GG	1246.4375 - 1254.3 1602.4375 - 1611.5
Bluetooth	2402 - 2480

Output power	GNSS Bluetooth	Receive only 5 mW
Antenna	GNSS Bluetooth	Internal GNSS antenna element (receive only) Type: Internal Microstrip antenna Gain: 1.5 dBi

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Total Quality Management: Our commitment to total customer satisfaction.

Leica Geosystems AG, Heerbrugg, Switzerland, has been certified as being equipped with a quality system which meets the International Standards of Quality Management and Quality Systems (ISO standard 9001) and Environmental Management Systems (ISO standard 14001).

Ask your local Leica Geosystems dealer for more information about our TQM program.

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- when it has to be **right**

Leica Geosystems