THALES
NAVIGATION

6500 & 6300 Series

REFERENCE MANUAL

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IMPORTANT NOTICE

Each country maintains its own rules and regulations with respect to the operation of radio equipment. It is the user's responsibility to assure that proper licensing procedures are followed in accordance with the laws of each country. THALES Navigation may provide licensing assistance for operation of the UHF transmitter.

Operating an unlicensed radio transmitter is a violation of the law. You may be subject to fines or other penalties if you operate a radio transmitter without proper licensing.

FCC statement (USA):

The United States Federal Communications Commission (in 47 CFR 15.105) has specified that the following notice be brought to the attention of users of this product:

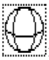
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. 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 interferences 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.

The user may find the following booklet, prepared by the Federal Communications Commission, helpful: How to identify and Resolve Radio/TV Interference Problems. This booklet is available from the U.S. Government Printing Office, Washington, DC. 20402 , Stock No. 004-000-00345-4. Use of a shielded cable is required to comply within Class B limits of Part 15 of FCC Rules. Pursuant to Part 15.21 of the FCC Rules, any changes or modifications to this equipment not expressly approved by THALES Navigation may cause harmful interference and void the FCC authorization to operate this equipment.

Conventions used in this manual:

1. In the description of the User Interface, we use the > symbol to link the names of the commands that you must select one after the other, starting from the icons menu. We also use bold characters for command names. Example:

**>Antenna**

2. The ends of sections are denoted by the ♣ symbol.

THALES Navigation makes no warranty of any kind with regard to this equipment, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. THALES NAVIGATION shall not be liable for errors contained herein or for incidental consequential damages in connection with the furnishing, performance, or use of this equipment

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The information contained in this manual is subject to change without notice.

How to use this manual

Real-time applications

These applications are more particularly described in sections **2** to **7**.

Section 8 is the introduction to **seismic applications** — also based on the use of real-time systems — and for this reason should be read first if you are involved in this type of surveying.

Post-processing applications

Section 9 is the introduction to post-processing-only applications. It is more particularly, but not exclusively, dedicated to 650x MP & SP users. Cross-references are made to real-time systems for common functions.

Detail of the sections

Section 1 describes the equipment provided (standard supply and possible options, main characteristics). This section ends with a table providing clues to product names and basic performance figures.

In **section 2**, you will learn how to set up and operate a 650x SK station. If you are new to our products, you should read **section 7** before reading this section.

Section 3 is a collection of all the field procedures that can be performed with the rover. If you are new to our products, you should read **section 7** first. Obviously, section 3 is the longest section in this manual as there is a potentially large number of field procedures with the rover. Like section 2, section 3 is written in a step-by-step form. If you have difficulty in finding the right use context for a function, you may refer to the scenarios presented in section 4.

Section 4 reviews all the possible scenarios of surveying. Each of these scenarios identifies a typical field procedure. A job may require the execution of several of these scenarios. Section 4 includes seismic-surveying and post-processing scenarios. At the end of section 4, you will find a summary of all the possible file transfers that may be performed between the system and the 3S Pack software package, before and after field surveys.

Section 5 is the “Theory of Operation” section of this manual. It gathers all the notions required to understand how the system basically functions in real-time applications. Reading this section is highly recommended as this will help you optimize the use of your equipment.

Section 6 deals with the office work required before and after field surveying, using KISS. More particularly, this section tells you what to do to write a job into the palmtop, and to retrieve the results of a job stored on the palmtop.

Section 7 focuses on the User interface software used on the palmtop computer. We highly recommend reading this section if you are a new user. Section 7 details the initialization phase in all possible cases of use, presents the main features of the program: how to edit parameters, how to select functions and menus, what the frequently used keys and key combinations are, etc.

If you are an experienced user of the 6001/6002 series, you may not read this section as the operation principle implemented in this former series, as far as the User interface is concerned, has been entirely maintained in this new series. However, ALL users should read the chapter in section 7 that describes the Tools menu —a menu that is present in all cases of use. In fact, Section 7 is the only section in the manual providing a thorough description of this menu.

In Section 7, you will also learn how to install the User interface software using the CD-ROM provided.

Section 8 tells you how to use the system in seismic applications for which the system has to process J0D, J2D or J3D jobs prepared with the SISS software module. In this section, our concern has been to focus on the differences in the User interface between seismic and conventional, real-time, topographic applications. This section describes neither the SISS module, nor file exchanges between SISS and the system. Refer to the 3S Pack documentation for more information about these topics. It is worth noting however that the way jobs and data files are transferred with KISS (see pages 6-11 and 6-14) also applies when working with SISS.

Section 9 introduces the theory of operation in post-processing systems and accurately describes the different possible procedures that can be followed to perform raw data recording.

Finally, **section 10** reviews the means available for implementing the data link from the station to the rover: U-LINK radio of course, which is integral part of our products, GSM (option) or any other external DGPS receiver or transmitter.

Table of contents

1. Equipment description

THALES Navigation reserves the right to make changes to the lists below without notice.

Station

❑ Standard supply

All items are shipped in a black plastic case. This case should be re-used for equipment transportation whenever the station must be moved to another site.

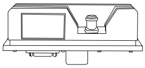
- 1× Receiver Unit of the type CompactPro 1 (6501) or CompactPro 2 (6502) (includes a belt lug)
- 1× transport case (P0100352), dimensions: 490×395×195 mm (L×H×W), weight: 4.5 kg approx. (when empty, with station-specific foam trays)
- 1× GPS antenna NAP001 (L1; P076311B) or NAP002 (L1/L2; P0101158) depending on purchase order
- 1× “stationary kit for 6500/6300 series” (P0100347) consisting of:
  - 1× 5/8-inch tapped adapter (P0101163) for GPS antenna
  - 1× antenna adapter composed of a tribrach (C0000293) and a short 100-mm mast (P0100281):

Antenna adapter =
tribrach (C0000293)
+ short 100-mm mast (P0100281)

  - 1× meter kit (P076601A):

Meter kit
(P076601A)

- 1× coaxial cable, 10 m long, TNC-m / TNC-m (C5050196)
- 1× power cable (P0100349), push-pull type, 4 wires (two independent power sources can be applied via this cable)

- 1× "U-LINK Tx 4812 transmission kit" (P0100348) composed of:
  - 1× UHF transmitter: 
  - 1× rod bracket (P0100255, see photo below) used to fix the UHF transmitter on a mast
  - 1× N-m / FME-m adapter (C0000326) for UHF antenna (see photo below)

Rod bracket (P0100255)

N / FME adapter, Part No. C0000326

  - 1× UHF whip antenna, gain: 0 dB (C0000375 for the band 430-450 MHz, C0000376 for the band 450-470 MHz or C0000377 for the band 410-435 MHz)
  - 1× RS422 cable, 10 m long, DB15HD-m / DB15HD-f, for UHF transmitter (P0100289)
- 1× *Software Package* CD-ROM (P0100436)
- 1× *Guide de Poche* in French, small format (P0101212)
- 1× *Pocket Guide* in English, small format (P0101211).

NOTE : No PC Card provided (PCMCIA). This type of item is provided as standard with 3S Pack software.

Options

- Transmitter cable, 30 m long, DB15HD-m / DB15-f (P0100408)
- "U-LINK Rx 4800 reception kit for 6500 series"
- GSM station kit composed of:
  - 1× GSM module
  - 1× GSM antenna & adapter
  - 1× carrying bag
  - 1× RS232 cable
  - 1× power cable

Rover

Standard supply

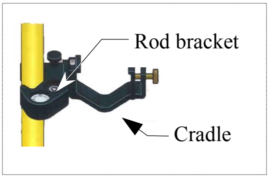
All items are shipped in a black plastic case. This case should be re-used for equipment transportation whenever you leave a working area.

- 1× Receiver Unit of the type CompactPro 1 (6501, 6301) or CompactPro 2 (6502) (includes a belt lug)
- 1× transport case (P0100353) , dimensions: 490×395×195 mm (L×H×W), weight: 4.5 kg approx. (when empty, with rover-specific foam trays)
- 1× GPS antenna NAP001 (L1; P076311B) or NAP002 (L1/L2; P0101158) depending on purchase order
- 1× "U-LINK Rx 4800 reception kit for 6500 series" (P0101204) composed of:
  - a UHF reception board installed in the CompactPro unit
  - a "UHF folding mast kit for 6500 series" (P0100741) including a folding mast (P0100543), a UHF whip antenna (C3310188, C3310190 or C3310196, depending on the UHF frequency used) with FME/TNC adapter, a "metal plate for separate UHF input" (P0101152) and a TNC/TNC coaxial cable with right-angle TNC/TNC adapter.

- 1× “battery & charger kit for 6500/6300 series” (P0100378) composed of:
  - 2× batteries for CompactPro unit (C0000292)(same type of batteries as those used in camcorders)
  - 2× battery chargers (C0000463), camcorder type, powered from AC power line
- 1× RS232 data cable, 1.0 m long, Push-Pull / DB9 (P076501A)
- 1× coaxial cable, 1.5 m long, TNC-f / TNC-f (P0100350)
- 1× *Software Package* CD-ROM (P0100346)
- 1× *Guide de Poche* in French, small format (P0101212)
- 1× *Pocket Guide* in English, small format (P0101211).

Options

- 1× “HUSKY MP2500 terminal kit” (P0100641) consisting of:
  - 1× rod mounting kit (C7510423) composed of a cradle and a rod bracket, fitted with compass & vial, to secure the palmtop on the rod:



  - 1× Husky MP2500 palmtop computer (P0100459), with its battery and battery charger operating from power line
  - 1× DB9 / DB9 serial cable (this cable is used to transfer jobs and results between KISS and the palmtop) (P076502A)

- 1× shoulder strap (P0100395)
- 1× GPS antenna rod (C0000200), two-section, graphite epoxy composite, 2-m fixed height, with male 5/8×11 tip
- 1× rod mounting kit (P0100396) for CompactPro unit including 2× rod brackets (P0100255) + 1×additional belt lug (P0100288)

- 1× “Rucksack kit for 6500/6300 series” (P0100394) composed of:
  - 1× rucksack (P0100429)
  - 1× GPS cable extension (P076510, 0.75 m long) embedded in the rucksack
  - 1× palmtop cable extension (P076509, 0.75 m long) embedded in the rucksack
  - 1×GPS coaxial cable (P076500, 1.5 m), pp/TNC-m
- “Recording” firmware option for 6301 MG (delivered as standard for 6500 series)

  NOTE : PC Card (or PCMCIA) not provided in this option (only provided with 3S Pack software).
- Power cable for CompactPro Unit (P0100349)
- GSM rover kit composed of:
  - 1× GSM module
  - 1× GSM antenna & adapter
  - 1× carrying bag
  - 1× RS232 cable
  - 1× power cable.

CompactPro Receiver Unit

Dimensions (H×D×W): 231×206×54 mm (without battery compartment)
Height with battery compartment: 269 mm
Weight: 1.82 kg without batteries, 2.42 kg with batteries
Power drain: 8 W approx. (dual-frequency) or 7 W (single-frequency)

Rear panel

❑ Mini-panel (indicator lights and push-button)

-1-
SV constellation indicator light

- Lights up at power on
- Flashes during initialization (self-tests, searching for SVs)
- Produces a series of flashes corresponding to the number of received SVs on L1 & L2
- If indefinitely ON, denotes a GPS reception problem

-2-
UHF data link indicator light

- Station: Flashes whenever a corrections data message is transmitted
- Rover: Flashes whenever a corrections data message is properly received and decoded

-3-
Position processing indicator light

- OFF: the receiver is unable to work in the requested operating mode
- Flashing: Internal operations are in progress so that the receiver can soon work in the requested operating mode
- ON: the receiver is now working in the requested operating mode.

ON/OFF push-button

- If the receiver is off, a short press on this push-button will switch it on
- If the receiver is on, a long press (about 3 sec.) on this push-button will cause the receiver to switch off (after releasing the push-button, the session indicator light will flash for a few seconds to confirm that switching-off is in progress)

ON/OFF push-button (cont'd)

- Also used to load receiver's default configuration:
  - The receiver unit being OFF, depress the push-button for about 3 sec. When releasing the push-button, the session indicator light will start flashing
  - Within the next 2 seconds, while the session light is still flashing, depress the push-button again (brief press). This will load the default configuration into the receiver

-4-
Raw data recording indicator light

- OFF: No data recording in progress, no planned recording session pending
- Flashing: At least one recording session is pending
- ON: Data recording in progress

-5-
Session indicator light

- OFF: No planned session, or non-powered receiver, or absence of power source (battery)
- ON: receiver is ON
- Flashing (slow rate): At least one session is pending
- Flashing (equal ON/OFF times): Switching-off in progress
- Flashing (fast rate): Default configuration loading being requested; confirmation needed (see ON push-button above)

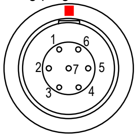
-6-
Not Used

❑ Pin-out information

Receiver-Palmtop socket (port A, RS232)

Pin	Signal	Description
1		
2	RX	Input
3	TX	Output
4	ON	Input (DTR)
5	GND	Ground
6	RTS	Output
7	CTS	Input

RS232 socket, Port A,
Viewed from outside the unit,
Type : LEMO EGG.1K.307.CLLP
(Corresponding plug: FGG.1K.307.CLAC55Z)



RS422 socket (port D, SubD15f)

Pin	Signal	Description
1	TX+	Output
2	TX-	Output
3	RX+	Input
4	RX-	Input
5	Carrier presence	Input
6	GND	Ground
7	GND	Ground

Pin	Signal	Description
8	VIN+	Power output * (15 W peak, 12 V DC - 2 A max, protected) (these 3 pins connected together in receiver)
9	VIN+	
10	VIN+	
11	1PPS+	Output
12	1PPS-	Output
13		
14		
15	GND	Ground

* To use the maximum power available from this output, connect a wire of sufficient section to each of the 3 pins.

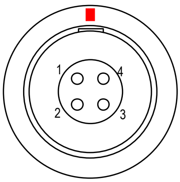
RS232 socket (port B, SubD9m)

Pin	Signal	Description
1	DCD	Input
2	RX	Input
3	TX	Output
4	DTR	Output
5	GND	Ground
6	DSR	Input
7	RTS	Output
8	CTS	Input
9	RI	Input

Power input socket (9.5 to 15 V DC)

Pin	Signal	Description
1	+ Alim	Power input +
2	- Alim	Power input -
3	+ Alim	Power input +
4	- Alim	Power input -

PWR socket, viewed from outside
Type : LEMO EGG.2K.304.CLL
(Corresponding plug:
FGG.2K.304.CLAC55Z + sleeve)



NiMH Batteries & battery charger

The CompactPro receiver used in the 6500/6300 series is operated from two NiMH batteries, of the same type as those used in camcorders. Each of these batteries is delivered together with a suitable charger.

Charging instructions: for example with a VARTA battery, once it has been completely discharged, it will take about 1hr 30 min to recharge it. A “charging” indicator will flash throughout the charging period, then it will stay lit once charging is complete. There is no risk of damaging the battery if you leave it indefinitely connected to the charger once fully charged.

NOTE: As opposed to NiCd batteries (Nickel Cadmium), NiHM batteries do not need to be fully discharged before you start to recharge them. See also CD-ROM provided which contains PDF files about NiHM batteries and charger used.

Palmtop

Battery Cap Ni-Cd Battery Pack

Special key combinations: see page 7-11

To install the User interface on the palmtop, see page 7-24

Battery Pack:

- To avoid pressurization problems inside the palmtop if it is taken on an airline trip, the battery cap has been loosened before shipment. Do not forget to lock this cap as this is required to maintain proper sealing. If you have to travel by air with your equipment, do the same (loosen the cap before take-off, lock it back after landing).

- Do not charge the NiCd battery pack outside the 5 to 40° temperature range.

Temperature ranges:

- Operating: – 20°C to +55°C
- Storage: – 30°C to +70°C

Environment

The palmtop is designed to operate in conditions of up to 90% relative humidity. The internal humidity indicator strip, visible in the bottom-right corner of the display window, should be blue. If it takes on a pinkish color, please remove the Ni-Cd battery and return the palmtop to the servicing department.

Trickle-charged internal battery

A trickle-charged internal battery is fitted, which provides back-up power to preserve the data on the RAM disk for at least 2 weeks if the main power source (i.e. the palmtop battery) is removed. This auxiliary battery, charged with a trickle current from the main battery, does not normally need to be replaced.

Cleaning

Clean the LCD screen with a clean cloth. Do not use solvent cleaners or harsh detergents. If the case is very dirty, make sure the battery cap is tight, then wash it gently under warm running water. Leave it to dry in a warm room. Do not use forced air drying.

Long-term storage

If you intend to store the palmtop for at least 2 months, remove the NiCd battery and fit a fresh set of 3 highest quality Alkaline cells. We recommend storage at a temperature between 10°C and 35°C. Alkaline cells should be changed every 6 months.

After long-term storage:

- Remove the Alkaline cells and insert the NiCd battery after fully charging it.

Changing the NiCd battery:

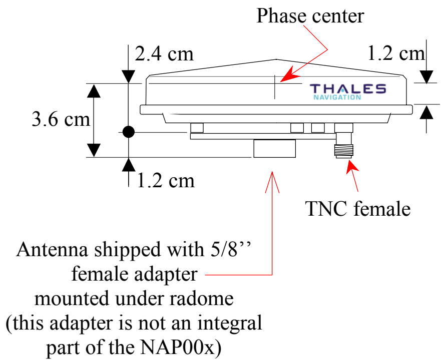
- Turn off the palmtop (press the red key, top right)
- Use a coin to undo the battery cap (turn counter-clockwise)
- Remove the old battery
- Fit in a new battery, positive end first
- Take the battery cap and, with finger pressure only, press it into the battery compartment and turn it clockwise
- Only when the thread is started, use a coin to screw the cap tightly home.

Warning! Ensure that the palmtop uses a rechargeable battery before connecting the charger to the palmtop!

The time required for charging a NiCd battery depends on its actual state when you start charging it, and also on the number of charging/discharging cycles previously undergone by the battery. Allow for a complete night of charging (12 to 14 hr), or even up to 24 hours if it has completely been discharged. The “Charging completed” message will be displayed on the screen at the end of charging.

NOTE: There is no risk of damaging the battery if you leave the palmtop indefinitely connected to the charger once the battery is fully charged.

NAP001/002 GPS antenna



- Dia. 143 mm, Height: 44 mm
- Weight: 342 g
- Power requirement: 5 to 13 V DC - 40 mA (via coax.)
- Gain: 39 dB approx.
- Admissible loss in antenna coax.: 24 dB max. (which means for example a maximum length of 30 meters with RG223-type coaxial cable)
- Temperature ranges: -40°C to +65°C (operating); -40°C to +70°C (storage).

Product name codes & performance figures

6x0x xx

5 : 20-Hz position output frequency (a new solution available every 50 milliseconds)

3 : 0.5-Hz position output frequency (a new solution available every 2 seconds)

1 : Single-frequency GPS receiver (L1)

2 : Dual-frequency GPS receiver (L1/L2)

M : Rover (mobile) unit

S : Station unit

K : Real-time applications (KART, LRK). Accuracy: 2-3 cm. UHF data link implemented between station and rover.

P : Post-processing applications. Accuracy: 1-2 cm. Built-in PC card drive.

G : Real-time applications (DGNSS). Accuracy: 1-2 m. Rover only.

System	Max. coverage for nominal accuracy
6502 SK-6502 MK	Up to 50 km
6502 SP-6502 MP	Depends on post-processing software used
6501 SK-6501 MK	Up to 12 km
6501 SP-6501 MP	Depends on post-processing software used
6301 MG	Regional

♣

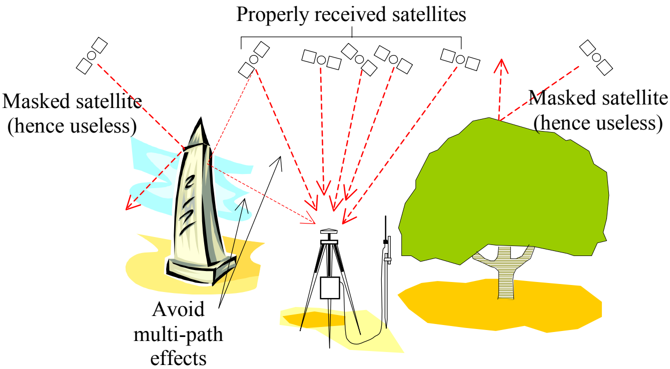
2. Getting the station started

Station set-up

Although installing a station is quite an easy operation, you should however be very careful in every detail. Indeed, how and where you install the station and the antennas will greatly determine the level of performance you can expect from it.

• **GPS antenna**: Consider the following two criteria when installing this antenna, the first one having priority over the second:

1) For best reception, **choose a place providing a full view of the horizon** in all directions, and free of close obstacles liable to produce multi-path effects. In addition, avoid the presence of high-power antennas and radio-transmitters nearby, other than the station's own U-LINK UHF transmitter.



2) **Choose a place the 3D position of which should be known with sufficient accuracy** compared to the level of accuracy expected for your surveys. This position should be expressed in the same coordinate system as the one defined for your jobs. From the operational point of view, this parameter is essential.

   If however the planned site fails to meet the 1st criterion, you will have to choose a site that is more favorable to this 1st criterion… but this may result in a choice in which the 2nd criterion is no longer met.

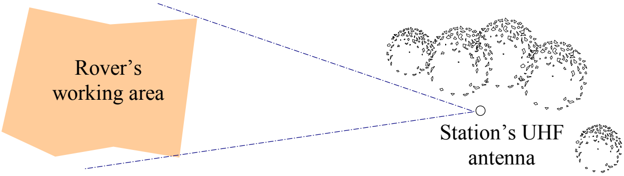
   In the latter case, you will have to operate the station in the so-called *average position* mode to let it determine its own position (see page 2-12 to learn how to operate the station in this mode, and page 5-8 to know the level of accuracy that can be expected for your surveys after the station position has been computed in this way.

***

The GPS antenna is designed to be mounted on top of a short mast secured on a tribrach (see these accessories on page 1-3). The assembly can then be easily fastened onto a tripod.

• **UHF antenna**: Unlike the GPS antenna, the position of the UHF antenna has no particular impact on the system from the operational point of view. In that sense, choosing a site for the UHF antenna is easier. Consider however the following two criteria to ensure the coverage of the U-LINK radio:

1) **Choose a place free of close obstacles in the direction of the working area**.



Note however that compared to optical systems for example, mutual visibility is not required. The presence of obstructions between UHF antenna and working area will admittedly cause the UHF signal to be somewhat attenuated, but in no case will it make the system unusable.

2) **Install the UHF antenna at the highest possible altitude above the working area without being a mask for the GPS antenna**

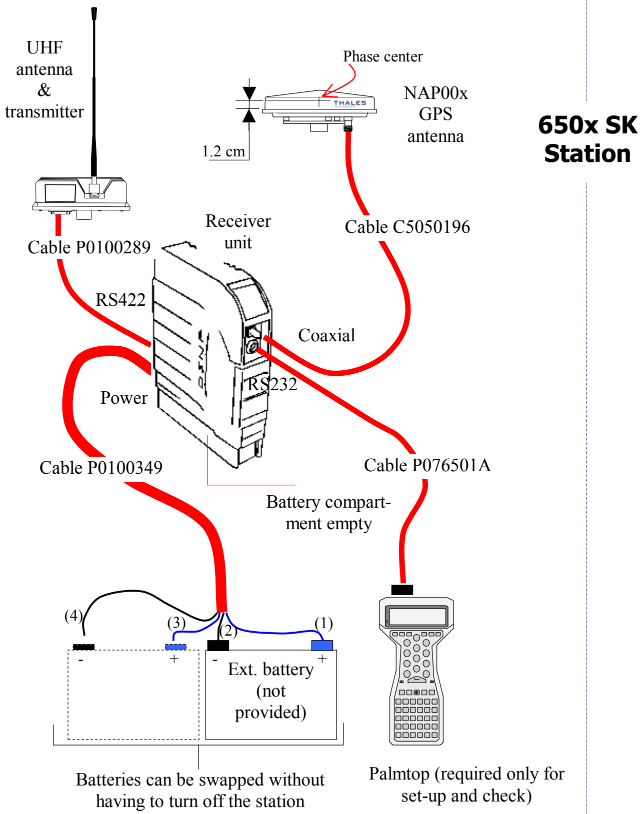
***

The UHF antenna and its transmitter must be mounted on a separate mast. Use the length of cable provided to install the UHF antenna at some distance from the GPS antenna.

An optional cable, 30-metre long, is proposed to install the U-LINK transmitter and its antenna at a further distance from the station. This type of installation is recommended if you try to push further the limits of UHF coverage (the antenna is then raised at the highest possible altitude), or if you want to increase the distance between the UHF and GPS antennas. This may be required if the radiated UHF frequency is liable to disturb GPS reception.

• **Receiver unit**: It can be fastened onto the tripod using its belt lug. Several installation locations on the tripod are possible.

❑ Connections



External battery of minimum 20 Ah in capacity is required as more power is needed due to the UHF (U-LINK) transmitter

Consumption: 15 W on average (DC current under 12 V DC: 1.5 A when station transmits; 1 A the rest of the time). Operating time with 20-Ah battery: between 10 and 12 hours on average

Getting started

❑ Preamble

If the station does not need to be set up (somebody else did it for you), just press the ON/OFF push-button on the angled mini-panel and then wait for the station to reach its operational status before proceeding with your job with the rover (refer to indications on the Mini-panel (indicator lights and push-button), page 1-7 to see if the station operates properly).

If changes have to be made to the set-up of the station, see next page.

❑ Automatic start-up sequence

When starting the User Interface software once the palmtop is connected to a station, you will be guided through three different screens showing the fundamental parameters not to be forgotten before initiating data transmission. This automatic sequence is described below.

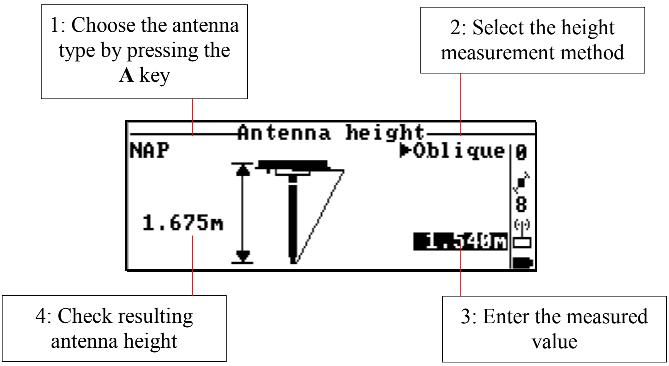
(The functions involved in the start-up sequence are detailed in the next chapter; see page 2-8).

1. Connect the palmtop to the station

2. Switch on the palmtop (depress red key, top right)

3. At the DOS prompt, type “T” (for “Topo”), press and then choose “Station” on the menu. This starts the User Interface software. Wait for the end of the initialization phase. For more information about this phase, or if something wrong happens during this phase, see page 7-1.

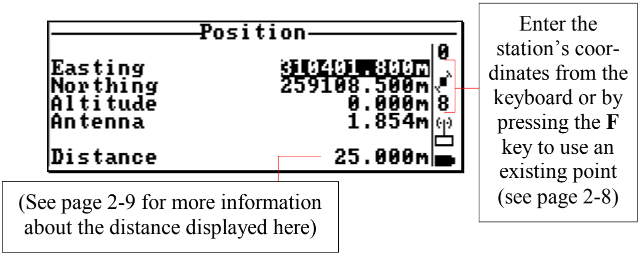
   After successful completion of the initialization phase, a screen appears asking you to specify the type of GPS antenna used as well as its height above the ground. The defaults are logically “NAP” for the GPS antenna and “OBLIQUE” for the height measurement used (see example below showing which data entry should be made on this display).



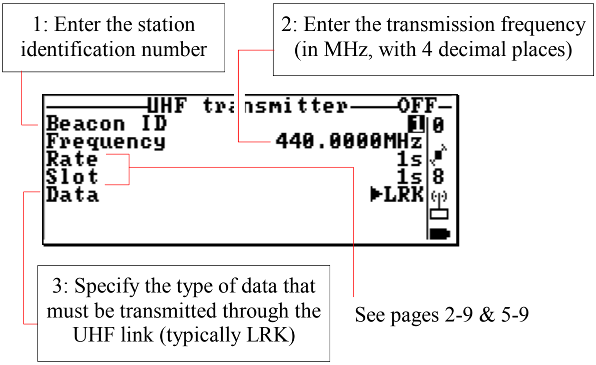
   Note that other measurement methods (and other antennas) are possible: see page 5-6.

4. Press F3 to validate the antenna height.

A new screen appears asking you to specify the exact coordinates of the station. Proceed as indicated below.



5. Press F3 to validate the reference position of the station. A new screen appears asking you to enter the characteristics of the UHF transmitter.



6. Press F3 to enable the station to transmit its corrections data. Transmission is effective immediately after pressing the key, as denoted on top of the screen ("OFF changed to "ON"). Check the indications provided on the angled mini-panel (see page 1-7).

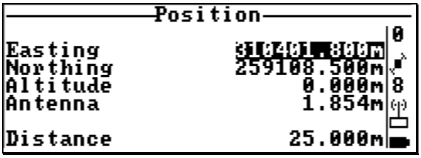
   In this screen context, pressing the **S** key would immediately stop transmission by the station.

7. Press F4 to quit the User Interface, then confirm this choice. Switch off the palmtop and disconnect it from the station. At this stage you can let the station operate on its own and proceed with your job with the rover.

Functions specific to the station

❑ Position

- Select **> Position**. The screen then looks like this:



- Enter the coordinates of the station. These coordinates *must* be expressed in the same coordinate system as that currently used by the station. To know the coordinate system used, select:

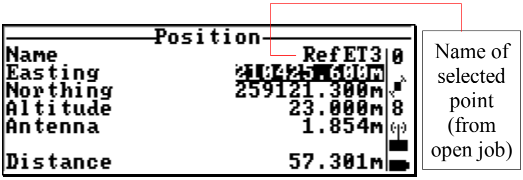
>Planimetry

As prompted on the **Help** menu (**F1**), the following keys can be used:

F3 : Allows you to validate and store the displayed coordinates as the reference position of the station. If a change is really made to the position, then the UHF transmitter function is automatically selected after pressing this key.

F key : (Active only if a job is open and contains target, reference or result points) Allows you to select a point from the open job in order to make this point the position where the station is installed.

After selecting a point, the screen will look like this:



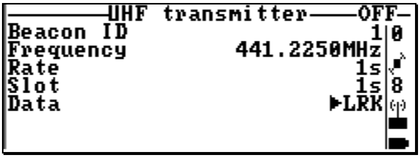
2

After validating the coordinates, and before allowing the station to transmit, check the value displayed at the bottom of the screen. This value represents the distance deviation between the position you have just entered and the conventional-GPS solution, as currently computed by the station for its own location . This deviation should be in the order of the uncertainty inherent in Conventional GPS.

Warning! An inaccurate reference position for the station will not allow the system to operate properly: rover initializations will be longer, or even impossible, and position solutions will be inaccurate as well. If you are not sure about the coordinates of the station, it is advisable to resort to the position averaging function (see page 2-12).

❑ UHF transmitter

- Select > **UHF transmitter**. The screen then looks like this:



- The following parameters can be changed on this screen:

  Beacon ID: Identification number of the station which can be freely chosen between 0 and 99 (if transmitted data: LRK) or 0 and 1023 (if transmitted data: RTCM). Memorize this number! You will need it on the rover to set the UHF receiver.

  Frequency: Enter the frequency on which you are allowed to transmit (a multiple of 12.5 kHz within the UHF band 400 to 470 MHz). Note that system operation may be disturbed for some of these UHF frequencies (see list at the end of the manual). The use of these frequencies is therefore not recommended.

  Rate: Enter the station's transmit rate, i.e. a value between 1 and 6 seconds (if transmitted data: LRK), or between 2 and 6 seconds (if transmitted data: RTCM).

  See page 5-9 how to define this parameter in a multi-station network.

  Slot: Define the station's transmit start time (value between 1 and 6) within the chosen rate. For example, enter "1" to choose the 1st second in the rate cycle, "3" to choose the 3rd second. the **Slot** value is necessarily less than (or equal to) the **Rate** value.

  See also page 5-9 for more information on this parameter.

  Typical values for **Rate** and **Slot**: 6501 or 6502 SK : **Rate**=1 ; **Slot**=1

  Data: Choose the type of corrections data that the station must transmit via the UHF link. The following choices are possible:

  LRK
  RTCM 1,3
  RTCM 9,3
  RTCM 18, 19, 3

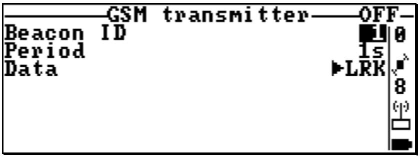
As prompted on the **Help** menu, the following keys can be used:

F3 : Initiates data transmission according to your settings on the screen ("ON" appears on top of the screen)

S key : Stops data transmission ("OFF" appears on top of the screen).

❑ **DGPS transmitter** or **GSM transmitter**

Function almost similar to the previous one (**UHF transmitter**). This function is available when an external transmitter (DGPS or GSM respectively), duly declared in the **Connection** function (see page 7-17), is connected to the system as a complement to the U-LINK radio. Example of display obtained through this function with a GSM module connected to the system



Whatever the type of external transmitter used, the following parameters should be defined:

Beacon ID: Identification number of the station which can be freely chosen between 0 and 99 (if transmitted data: LRK) or 0 and 1023 (if transmitted data: RTCM). Memorize this number! You will need it on the rover to set the corresponding receiver.

Period: Update rate chosen for corrections data (1 second in general)

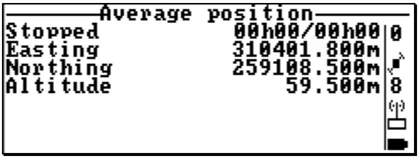
Data: Choose the type of corrections data that the station must transmit. The following choices are possible (same as previous function):

LRK
RTCM 1,3
RTCM 9,3
RTCM 18, 19, 3

❑ Average position

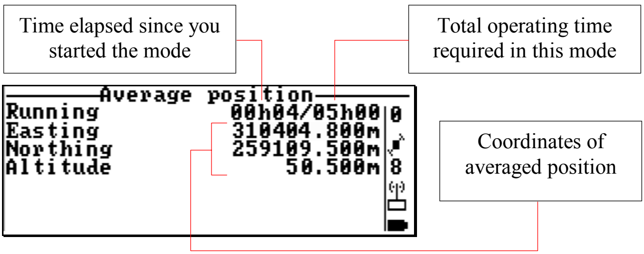
This function can be accessed only if the UHF transmitter is idle (transmission OFF). Otherwise, the message “Access denied” will appear on top of the screen

- Select > **Average Position**. The screen then looks like this:



- As prompted on the **Help** menu, press to ask for the station to operate in average position mode. A dialog box appears in which you must specify the operating time (hh:mm) in this mode:

- Enter this time. If you enter 00:00, the station will operate indefinitely in this mode until you stop it manually (by pressing **S** or **F3**; see below).
- Press again. The screen now looks like this:



- At the end of the requested time, press F3 to declare the resulting coordinates of the averaged position as the new reference position of the station.

THALES NAVIGATION

If you press F3 while the station is still running in the Average Position mode, this will cause the station to quit this mode. In the same time, the current coordinates of the averaged position, displayed on the screen, will be transferred to be used as the real position of the reference station.

If you depress the **S** key while the station is still running in the Average Position mode, you will just cause the station to stop running in this mode.

The position averaging process is performed inside the station. At the end of the process, the result is stored in the station as well. For this reason, the palmtop does not need to stay connected to the station throughout this process.

Consequently, you can disconnect the palmtop once you have started the Average Position mode. When you come back to the station with your palmtop once the position averaging process is finished, you will just have to connect the palmtop to the station, run the User Interface, select the **Average Position** function and accept the result of the process.

Other functions

The following functions are unconditionally accessible when you run the User Interface with the palmtop connected to a station.

As these functions “behave” in the same way as if they were run with the palmtop connected to a rover, and to avoid redundant information in the manual, cross-references are made below to the corresponding pages in the Working in the field with the rover section.

> Raw data (see page 3-58)

>Sessions (see page 3-61)

>Notes (see page 3-63)

>Choose a job (see page 3-52)

>Satellites (see page 3-68)

>SV deselection (see page 3-69)

>Planimetry (see page 3-70). Function restricted to viewing the horizontal system used

>Altimetry (see page 3-71). Function restricted to viewing the vertical system used

>Change to WGS84 (see page 3-77)

>Antenna (see page 3-78).

Functions made available after opening a job

After opening a job, the following functions are made accessible to you:

>Stake out

>Reference points

>Profile

>Choose a file

>Result points

As in standalone operation (see page 7-13), the following actions are then possible on the open job:

- view the lists of target, reference and result points
- view the points coordinates
- view the points graphically on a 2D view
- compute distances and areas
- create target and reference points
- read and create notes. ♣

3. Working in the field with the rover

Rover set-up

❑ How to carry the rover

Rovers of the type 6501 MK, 6502 MK or 6301 MG are generally carried in a backpack. Other ways of carrying the rover are possible, that are especially intended for rovers of the type 6501 MP or 6502 MP (see section 9).

Rover carried in a rucksack

❑ Preparing for carrying the rover in a rucksack

(see illustrations on the next pages)

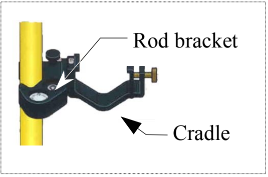
1. Place the batteries in the receiver:

- Open the battery compartment, insert fresh batteries and lock the compartment

2. Install the receiver case in the rucksack:

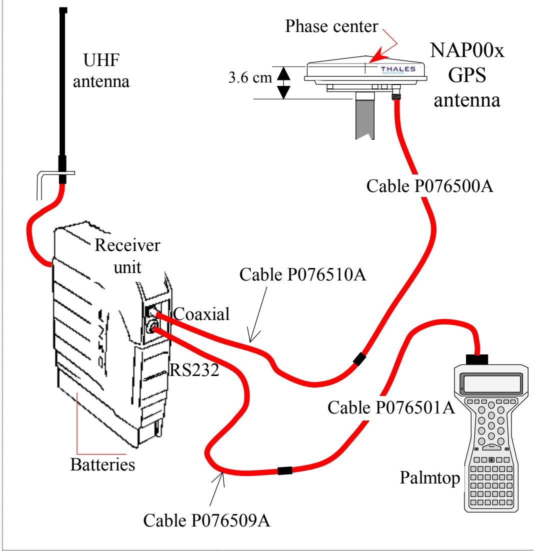
- Connect the free end of the UHF coaxial cable to the UHF input, located on the rear panel, via the right-hand adapter. The other end of the cable is attached to the folding mast (see hereafter)
- Insert the receiver case into the rucksack, with the front panel orientated upwards, taking care to have the coaxial cable running upwards along the inner side of the rucksack and coming out from the top of the rucksack
- Inside the rucksack, fasten the Velcro over the front panel in order to maintain the receiver firmly in position

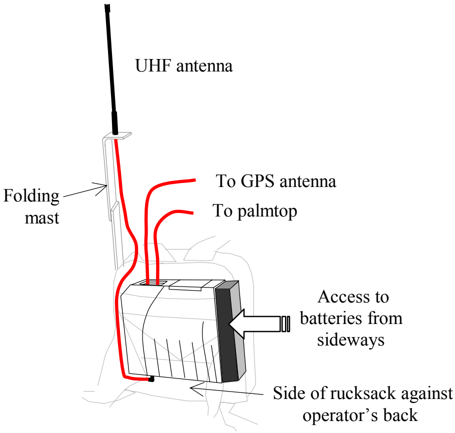
3. Mount the GPS antenna and the palmtop on the rod:
   - Assemble the two elements of the rod together
   - Secure the 5/8-inch adapter under the GPS antenna using the screws and washers provided
   - Mount the GPS antenna on top of the rod
   - Connect one end of the P076500A coaxial cable to the GPS antenna connector
   - Insert the pointed lower end of the rod into the rod bracket item (see opposite)
   - Fasten the rod bracket on the rod at such a height that the palmtop can be easily used once mounted on the bracket.
   - Fasten the palmtop on the cradle (see opposite)



   - Depress the “quick release” button on the rod bracket, insert the cradle tip into the bracket and then release the button
   - Connect the DB9 end of the P076501A cable to the palmtop’s serial port
4. Install the UHF antenna
   - Unfold the mast and tighten the knob after the two elements are aligned
   - Mount the UHF antenna on top of the mast
   - Insert the mast into the rucksack pocket located sideways, insert the Velcro into the lower element of the mast and fasten it so that the UHF mast remains vertical
5. Connect the receiver, palmtop and GPS antenna together:
   - Connect the P076510A coaxial cable to the receiver’s GPS input and then connect its other end to the cable coming from the GPS antenna
   - Connect the P076509A cable to the receiver’s RS232 connector and then connect its other end to the cable coming from the palmtop
6. Place the rucksack on your back. The rover is now ready for use. Refer to page 3-4 to start a job.

Connections in rucksack configuration

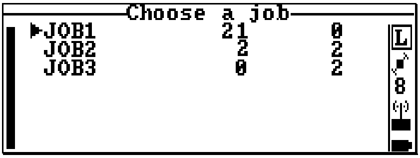




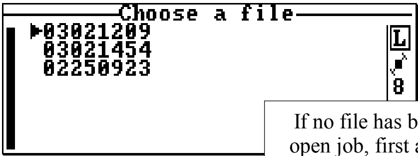
Getting started

1. Switch on the palmtop (depress red key, top right)
2. At the DOS prompt, type “T” (for Topo), press and then choose “Rover” on the menu. This starts the User Interface software. Wait for the end of the initialization phase. For more information about this phase, or if something wrong happens during this phase, see page 7-1.

   After successful completion of the initialization phase, a screen appears, such as the one below, prompting you to choose a job:



3. Move the cursor within the list to select a job and then validate your choice. The User Interface then automatically selects the **Choose a file** function for you to choose one of them. The screen shows the list of files present in the palmtop. Example:



If no file has been created yet for the open job, first a file creation screen is displayed (see also page 3-54). After a file has been created, the palmtop switches to the **Choose a file** screen, such as the one above

4. Move the cursor within the list to select a file and then validate your choice. The screen now shows the main menu with the name of the open job on top.

5. Read the indications provided in the status bar (see also page 7-4).

   - Unless the **L** (or **K**) processing mode is now displayed in this area, wait for this letter to appear before starting your work. When displayed, this letter denotes successful LRK (or KART) initialization and the ability for the rover to perform a job. Proper initialization is necessarily achieved with at least 4 satellites received and used.
   - Check the battery indicator. With fresh batteries, the icon should be filled up (■).
   - Check the UHF reception level. The higher the reception level the better.

****

If the mobile fails to operate properly with the station, check to see if the following parameters have been properly set (refer to instructions in pages 3-49 and 3-50 to access these parameters):

- **Beacon ID**: identification number of the station you are supposed to use
- **Coordinates** of the station (page 3-49)
- **Frequency**: =Transmission frequency of selected station (page 3-50)

Check to see if the following parameters have been properly set (refer to instructions in page 3-64 to access these parameters):

- **Operating mode**: KART/LRK
- **Diff. mode**: UHF receiver
- **Init. mode**: OTF

****

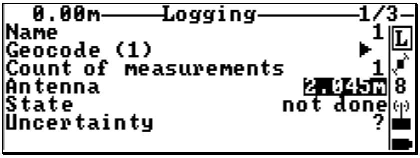
Once the UHF link is correct, choose one of the surveying methods described in the next pages, depending on the type of survey you have to perform (logging, staking-out, trajectory, etc.).

Point logging

(Corresponding to Scenario #1 described in page 4-1)

1. After opening a job and a file (see previous pages), get to the first point you would like to log. If this point is inaccessible, see page 3-16.

2. Select **>Logging**. The screen now looks like this:



The following parameters may be changed before logging: point name, geocode, count of measurements, antenna height.

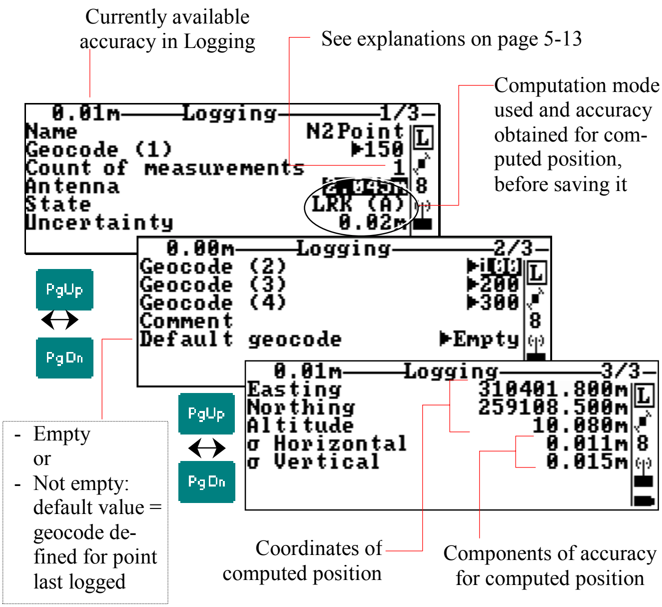
The first default point name is “1”, then “2”, “3”, etc. as you log new points. If you choose another name, a positive increment will also be proposed, based on the name you choose. For example, if the first point is named “sti10”, then the name “sti11” will be prompted for the next point, etc.

3. **Quick Procedure**: Press F3 directly to compute and save your position. A message appears asking you to keep still until the computation is finished. Then walk to the next point and resume this procedure

   or

   Procedure including prior solution checking: Press to start computing a position solution for the location where you are. A message appears asking you to keep still until the computation is finished.

When a solution is valid, it is indicated on the screen, complete with a number of useful information depicting its quality (processing mode, uncertainty). Example:



4. If the solution is worth keeping, press the F3 key to save it to the results file. Otherwise stay where you are and resume the procedure from step **3**.

   If the uncertainty on the solution is greater than the preset upper limits of uncertainty (see page 3-48), then a message will ask you if you really want to save the solution.

5. Go to the point you would like to log next and resume the procedure from step **3**, etc. End of procedure.

NOTE: Whichever of the procedures is chosen, if the uncertainty on the computed position is greater than the preset upper limits of uncertainty (see page 3-48), a message will appear asking you whether you want to keep the solution or not.

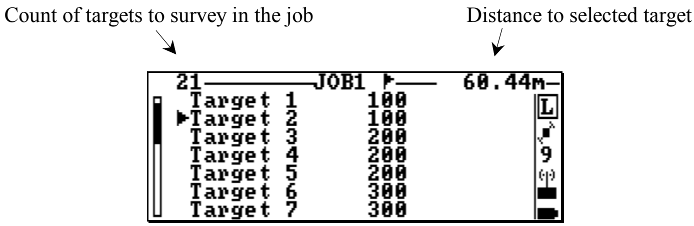
Stake out

(Corresponding to Scenario #2 described in page 4-2)

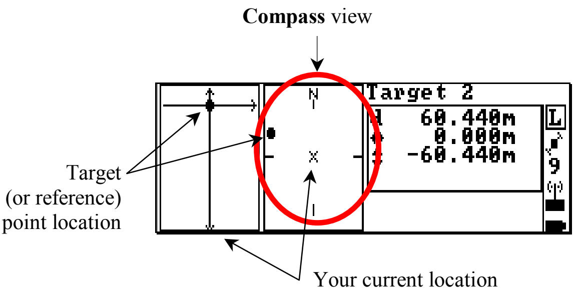
1. Unless already done, open a job and a file (see page 3-52)

2. Select  **>Stake out** for target points (or **>Reference points** for reference points). The screen shows the list of target (or reference) points present in the open job.

   (All screen examples below correspond to target point surveying)



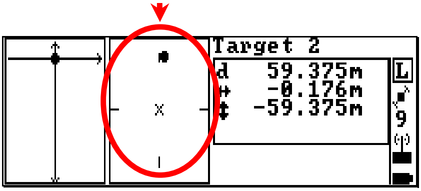
3. Select the point you want to survey first, and then validate it.



The direction to follow is given on the compass view (The North direction can be read on the rod's compass).

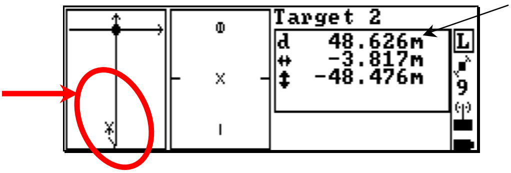
4. Take a few steps forward in the direction of the point. As a result, the **Compass** view no longer shows the North direction but instead, the direction in which you have just walked. The direction of walk will therefore be the right one if the target appears in place of the letter “N” on the compass view. Otherwise correct it so that the target appears at this place.

Compass view definition has changed as explained above



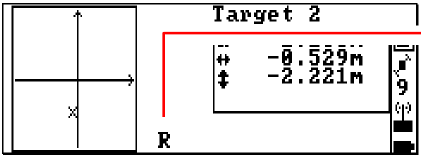
5. Continue to walk in that direction while keeping an eye on the screen. This will help you maintain the right course.

The distance still to go is provided as the “d” parameter on the screen (complete with the cross-track and longitudinal components). The path you follow as you walk toward the point is represented on the left-hand chart by a dotted line starting from the location where you were when selecting the point:



When the distance to the point becomes less than 5 m, the screen changes giving a magnified view of the area around the point (± 5 m along each axis).

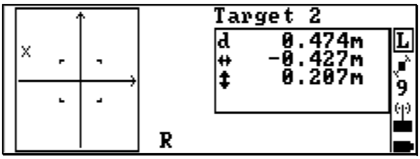
A bleep can be heard when the screen change occurs. The direction of the axis system is given by the direction of the line connecting your location to the point when the screen changed.



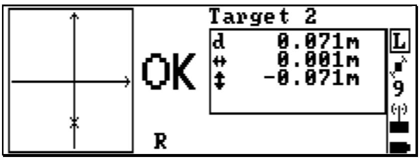
Type of guiding point (press **A** or **R** key for choice). See also page 5-14

If you realize you cannot go to the point (inaccessible point or probable masking there), refer to page 3-21 or 3-23.

6. Continue to move slowly in the direction prompted on the screen. When the distance to the point becomes less than 0.5 m, the screen changes again giving an even more magnified view of the area around the point (± 0.5 m along each axis).



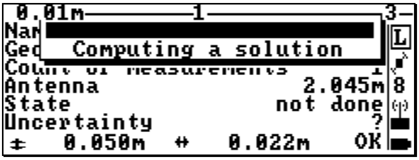
When the distance to the point becomes less than 0.15 m, the view can be magnified again (± 0.15 m along each axis) by pressing the **PgDn** key. To come back to the ± 0.5 m view, press the **PgUp** key.



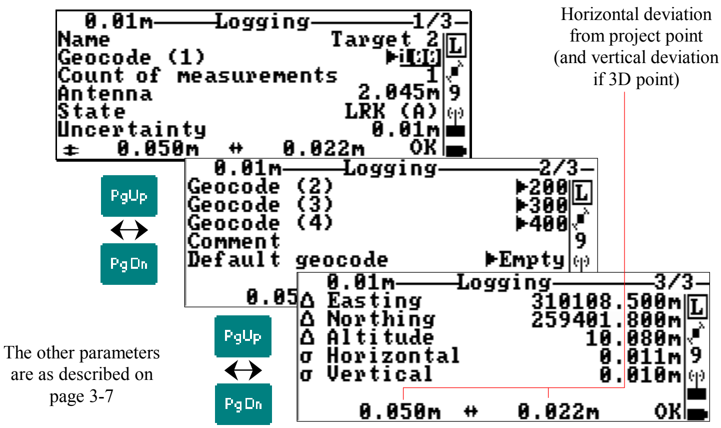
When the antenna position is within the acceptance circle (see definition in page 5-16), the **OK** message appears allowing you to log your current position.

7. Refine the position of the GPS antenna taking care to maintain the rod in vertical position. Try to make the components displayed on the screen as close as possible to “0” . As a result, the “X” symbol on the chart should accurately coincide with the point.

8. Press [enter key] to compute a solution for your current location. In the same time, the Logging screen is accessed and a message is displayed on top of the screen. Stand still until the message disappears.



When a solution is available, it is indicated on the screen, complete with a number of useful information depicting its quality (deviation components, processing mode, uncertainty). Example:



If the count of measurements used in the solution computation is not the one you wanted to use (see explanations on page 5-13), then you can change this parameter on the screen, but you will have to start a new solution computation by pressing [enter key] again.

A new solution computation will also be necessary if the antenna height parameter on screen 1/3 needs to be changed.

On the other hand, you can freely change the geocodes as it has no consequence on the position solution.

9. If the solution is worth keeping, press the F3 key to save it to the results file. Otherwise (the solution is not worth it), resume the procedure from step **7.** to get a better solution and save it.

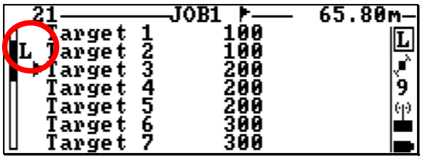
If the uncertainty on the solution is greater than the preset upper limits of uncertainty (see page 3-48), then a message will ask you if you really want to save the solution.

After the solution has been stored, then the next target is automatically selected (see page 3-25 to know how to choose the "next point" search criterion) and the palmtop comes back to the guidance screen now giving instructions to reach that point.

10. Mark the location on the ground (stake) where the GPS antenna rod stood when the rover computed the position solution.

11. Resume the procedure starting from step **4.** for the next target point, etc.

NOTE: To come back to the points list screen from the guidance screen, simply press the **Esc** key.



Note the presence of a letter before each new surveyed point, which indicates the type of processing used to compute its position:

G: Straight GPS with/without EGNOS
D: DGPS
W: WADGPS (DGPS with WAAS/EGNOS)
E: EDGPS
K: KART
L: LRK
O: Through Offset method

If the rover finds that the last initialization made was a false one, then a "**!**" character will appear after the names of all the points surveyed since then.

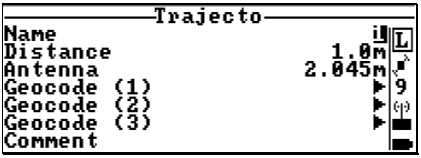
If for example you had to resume the surveying of "target 2", you could do this by selecting this point in the list, then by pressing the **Del** key. As a result, the solution for "target 2" would be cancelled (the "L" before the point would disappear) and you would be allowed to resume the surveying of this point.

Trajecto (surveying a trajectory)

See also page 4-3 for theoretical approach.

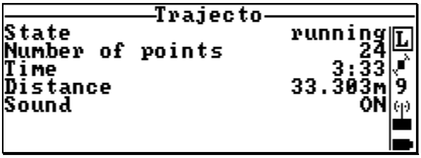
1. Unless already done, open a job and a file (see page 3-52).

2. Select **>Trajecto**. The screen asks you to choose between the Distance or Time mode. Supposing the Distance mode is chosen, the following is then displayed:



The following parameters may be changed before starting to log the trajectory: trajectory name, distance elementary step (or time elementary step if the Time mode had been selected), antenna height, geocodes, comment.

3. Press the F3 key to start logging the trajectory and to access the trajectory screen. After a few minutes operating in this way, the screen will look like this:



As prompted on the **help** menu (**F1**), the following keys can be used in this context:

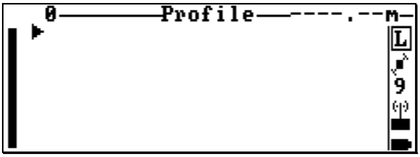
S key	:	to stop definitively the survey of the trajectory
P key	:	to make a pause in the survey of the trajectory
R key	:	to resume the survey of the trajectory following a pause
F3 key	:	to log a point as in page 3-6
B key	:	to enable/disable the emission of a sound every time a new point is logged

Profile (surveying points along a profile)

See also page 4-4 for theoretical approach.

1. Unless already done, open a job and a file (see page 3-52).

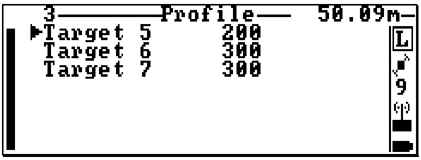
2. Select **>Profile**. If it is the first time that you select this function for the open job, then the list of points making up the profile can only be empty:



3. Insert points into the list in order to create the desired profile. As prompted on the **Help** menu (**F1**), use the following keys:

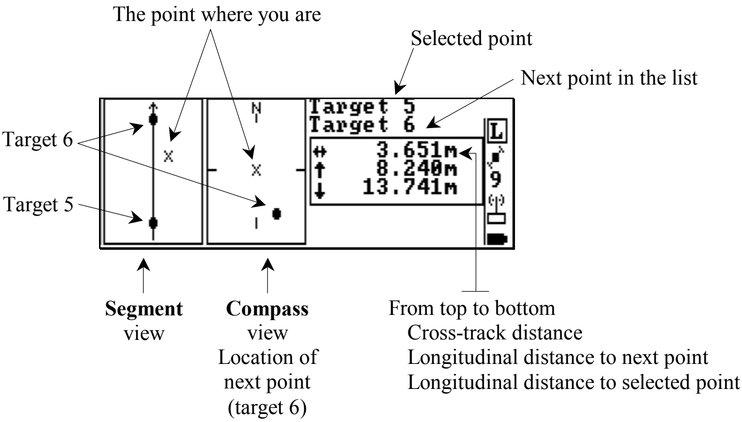
I key	:	to insert a point into the list
F key	:	to insert a series of points into the list (see page 3-44 for more information)
Del key	:	to delete the selected point
Clr key	:	to delete all the points from the list
S key	:	to search for a point according to a number of criteria

The list is updated on the screen as you create it. For example, the following list has been created:



THALES NAVIGATION

4. After selecting a point in the profile, press the  key to access the profile guidance screen. For example, if you select Target 5, the guidance screen will look like this:



As prompted on the **Help** menu (**F1**), you can do the following from within this context:

 key : to log a point as explained in page 3-6

D or **T** key : to survey a trajectory in Distance or Time mode (see page 3-13)

 key : to select the next segment, if any

 key : to select the previous segment, if any

Clr key : to clear the operator’s trace on the segment view

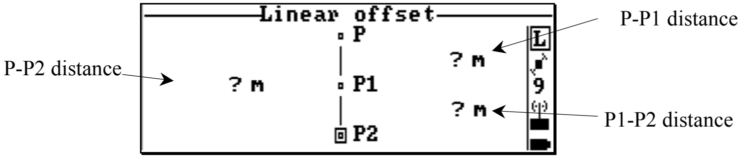
Point logging through offset

❑ Linear offset

See page 5-18 for theoretical approach.

Choose this method if the local environment makes it possible for you to log two points (P1, P2) aligned with the inaccessible point.

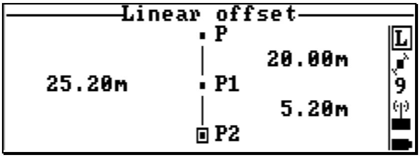
1. Mark two locations in the field that you want to use as P1 and P2, aligned with the inaccessible point (P).
2. Measure and write down the distance between P and P1 for example (using a distance meter or any other measuring device).
   If you use an MDL laser, measuring and entering this distance will be performed at the same time (see **7.** below).
3. On the main menu, select **>Logging with offset>Linear**.
   The screen then looks like this:



4. Go to P1, then select P1 on the screen.
5. Press F3 to compute and save the point position. Stay still until the message disappears.
   This phase could also be performed in two steps:
   - ↵ to run the computation. After reading the result, if okay:
   - F3 to save it
6. Select the P1-P distance field on the screen and enter the distance you have measured in the field (e.g. 20 m).

With an MDL laser, after selecting the field on the palmtop screen, you just have to aim at point P, and then press the push-button on the laser. As a result, the “P1-P distance” field will be automatically completed (the distance measured by the laser will appear in this field).

7. Go to P2 and select P2 on the screen.
8. As previously, stand still at that point, press F3 to compute and save its position.
   (You could also press F3 to compute the position, then F3 to save it).
9. Select P on the screen, then press ↵ to access the logging screen (on which you can change the point name and the other usual parameters)
10. Press F3 to save the position of P (your current location when you do this does not matter). The screen finally looks like that:



End of procedure.

As prompted on the **Help** menu (**F1**), the following operations are possible from within this context:

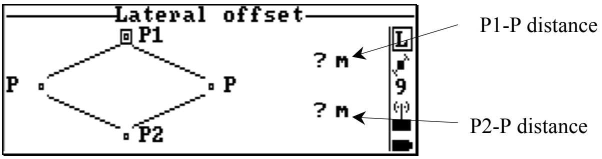
F key	:	to choose a result point to be P1 or P2 (depending on which of these points is currently selected)
V key	:	to view the coordinates of the selected point
Clr key	:	to delete the solutions of all the points previously saved during this offset procedure
Del key	:	to cancel the solution of the selected point

Lateral offset

See page 5-20 for theoretical approach.

Choose this method if the local environment makes it possible for you to log two points (P1, P2) forming a regular triangle with the inaccessible point.

1. Mark two points in the field that you want to use as P1 and P2.
2. Measure and write down the distances P-P2 and P-P1 (using a distance meter or any other measuring device).
   If you use an MDL laser, measuring and entering these distances will be performed at the same time (see **10.** below).
3. On the main menu, select **>Logging with offset>Lateral**.
   The screen then looks like this:



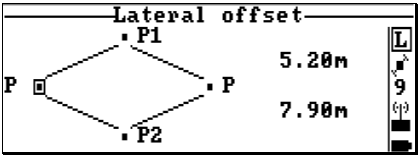
4. Go to P1 and select P1on the screen.
5. Press F3 to compute and save the point position. Stay still until the message disappears.
   This phase could also be performed in two steps:
   - ↵ to run the computation. After reading the result, if okay:
   - F3 to save it
6. Go to P2 and select P2 on the screen.
7. As previously, stand still at that point, press F3 to compute and save its position.
   (You could also press F3 to compute the position, then F3 to save it).

8. Successively select the P1-P distance field (top right) and the P2-P distance field (bottom right) on the screen to enter the distances you have measured in the field (eg 5.20 m and 7.90 m).

   With an MDL laser, after selecting one of these fields, you just have to aim at point P, and then press the push-button on the laser. As a result, the selected field will be automatically completed (the distance measured by the laser will appear in this field).

9. Select the P point on the screen corresponding to the geometry in the field (P is either to the left or to the right of the P1P2 segment).

10. Press ↵ then F3 to save the position of P (your current location when you do this does not matter). The screen then looks like this:



End of procedure.

As prompted on the **Help** menu (**F1**), the following operations are possible from within this context:

F key	:	to choose a result point to be P1 or P2 (depending on which of these points is currently selected)
V key	:	to view the coordinates of the selected point
Clr key	:	to delete the solutions of all the points previously saved during this offset procedure
Del key	:	to cancel the solution of the selected point

3

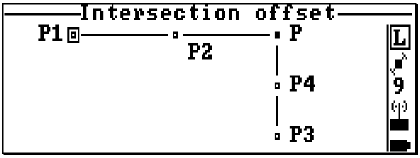
❑ Intersection offset

See page 5-21 for theoretical approach.

Choose this method if the local environment makes it possible for you to log two pairs of points forming two straight lines (P1P2, P3P4) intersecting at the inaccessible point.

1. Mark the four points in the field that you want to use as P1, P2, P3 and P4. P1 and P2 must be aligned with P. P3 and P4 must also be aligned with P. **You do not have to measure any distance with this method**.

2. On the main menu, select **>Logging with offset>Intersection**. The screen then looks like:



3. Go to P1 and select P1on the screen.

4. Press F3 to compute and save the point position. Stay still until the message disappears.

   This phase could also be performed in two steps:

   - ↵ to run the computation. After reading the result, if okay:
   - F3 to save it

5. Resume steps **3.** to **4.** successively for each of the other points (P2, P3 and P4).

6. Select P on the screen, then press ↵ to access the logging screen (on which you can change the point name and the other usual parameters).

7. Press F3 to save the position of P (your current location when you do this does not matter). End of procedure.

   Help menu (**F1**): same as in point logging through linear offset (see page 3-17).

Stake out through offset

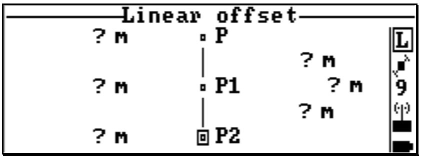
You are surveying a planned point and you realize that you have to resort to an offset method to survey that point (see page 3-10 for work context, just before step **6.**).

In that case, press the **Esc** key to come back to the points list, then use one of the following methods.

❑ Linear offset

Choose this method if the local environment makes it possible for you to log two points (P1, P2) aligned with the target. See page 5-23 for theoretical approach.

1. With the list of target (or reference) points being displayed on the screen —and the target still selected— press the **O** key and select **Linear**. The screen then looks like this:



2. Get to a point in the field that you want to use as P1.

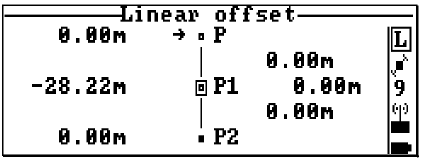
3. Select P1on the screen. Stand still at P1.

4. Press F3 to compute and save the point position. Stay still until the message disappears.

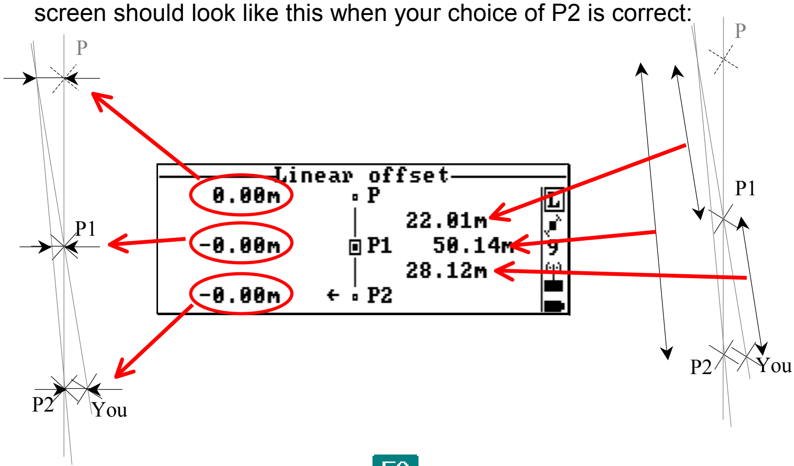
This phase could also be performed in two steps:

- ↵ to run the computation. After reading the result, if okay:
- F3 to save it

The screen then looks like this, prompting you to walk to P2:



5. Walk in order to find a point P2 in the direction of the P1-P straight line where you will be able to compute a solution for that point. P2 will be aligned with the other two points when the indications on the left-hand part of the screen are all “0.0”. The screen should look like this when your choice of P2 is correct:

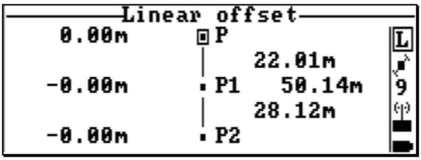


6. Select P2 on the screen. Press F3 to compute and save the point position. Stay still until the message disappears.

   This phase could also be performed in two steps:

   - ↵ to run the computation. After reading the result, if okay:
   - F3 to save it

   The screen is then as follows:



7. Locate the point according to the displayed distances. Mark it.

8. Select P on the screen.

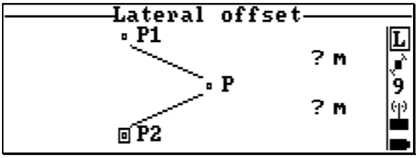
9. Press ↵ to access the logging screen, then F3 to save P as an offset point. End of procedure.

   Help menu (**F1**): same as on page 3-17.

❑ Lateral offset

Choose this method if the local environment makes it possible for you to log two points (P1, P2) forming a regular triangle with the target. See page 5-24 for theoretical approach.

1. With the list of target (or reference) points being displayed on the screen —and the target still selected— press the **O** key and select **Lateral**. The screen then looks like this:



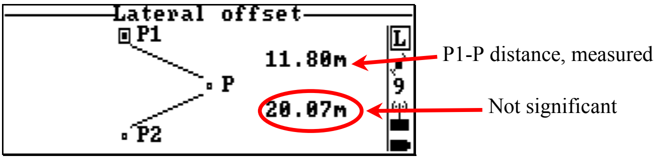
2. Get to a point in the field that you want to use as P1. Select P1 on the screen.

3. Press F3 to compute and save the point position. Stay still until the message disappears.

   This phase could also be performed in two steps:

   - ↵ to run the computation. After reading the result, if okay:
   - F3 to save it

   The screen then looks like this, prompting you to walk to P2:

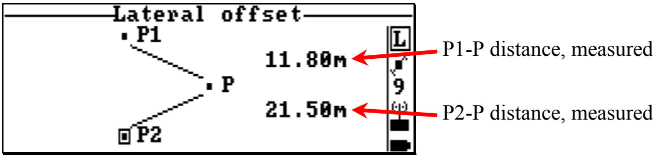


4. Get to a point in the field that you want to use as P2. Select P2 on the screen.
5. Press F3 to compute and save the point position. Stay still until the message disappears.

   This phase could also be performed in two steps:

   - ↵ to run the computation. After reading the result, if okay:
   - F3 to save it

   The screen then looks like this:



6. Locate the point according to the displayed distances. Mark it.
7. Select P on the screen.
8. Press ↵ to access the logging screen.
9. Press F3 to save P as an offset point.

End of procedure.

As prompted on the **Help** menu (**F1**), the following operations are possible from within this context:

F key : to choose a result point to be P1 or P2 (depending on which of these points is currently selected)

V key : to view the coordinates of the selected point

Clr key : to delete the solutions of all the points previously saved during this offset procedure

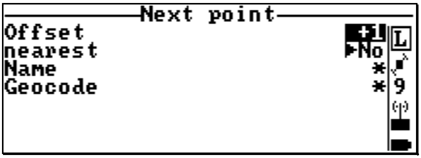
Del key : to cancel the solution of the selected point

Secondary functions

❑ Defining the "next point" search criterion

Contexts of use: A points list is shown on the screen (Scenarios #2, 4, 5; see page 4-2 and next ones).

- Press the **P** key. The screen then looks like this:



As shown on this screen, you can choose one of the following 4 criteria:

- Offset (or Line Increment):

  +1⇒ selects point in next line

  –1⇒ selects point in preceding line, etc.

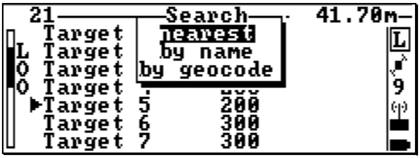
- Nearest non-surveyed point (Yes/No)
- By name (12 characters max.). You can use one or two wild cards ("*"), one at the beginning, one at the end. This symbol can replace one or more characters in a name.
- By geocode (12 characters max.). You can use one or two wild cards ("*"), one at the beginning, one at the end. This symbol can replace one or more characters in a geocode.

Criterion combination is also possible. You cannot however combine the **Nearest** criterion with the **Offset** criterion.

❑ Searching for a point

Contexts of use: A points list is shown on the screen (Scenarios #2, 4, 5; see page 4-2 and next ones).

- Press the **S** key. The following menu appears:



- Select the desired option.

  If you select **nearest**, the search is immediate, the menu disappears and the cursor is moved within the list to indicate the nearest point.

  If you select **by name** or **by geocode**, a new dialog box will appear asking you to specify the search criterion. The wildcard character (*) can be used in this criterion. Once the criterion is validated and after a point is found, the cursor appears before its name in the list.

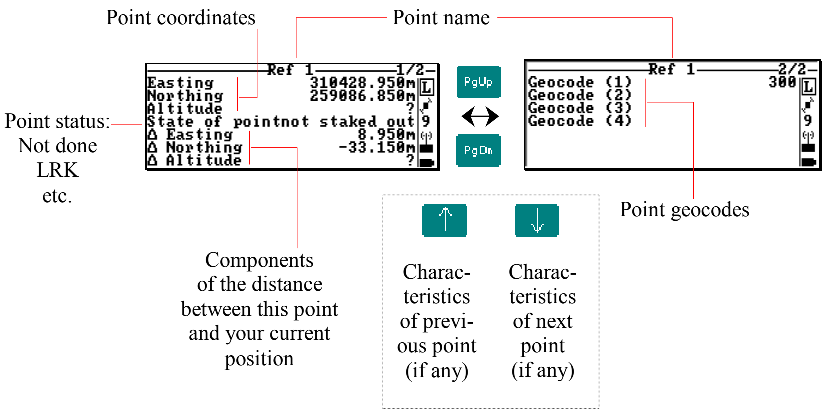
The **Search** and **Next Point** functions are much similar (same purpose, nearly the same criteria). The main difference is that with the **Search** function, you will have to specify a criterion every time you run this function, which is not the case with the **Next Point** function. Another difference is that combining criteria is possible with **Next Point**, not with **Search**.

THALES NAVIGATION

❑ Viewing the characteristics of a point

Contexts of use: A point in a list, or a point involved in an offset procedure, is selected on the screen.

- Press the **V** key to select this function.



Points may be defined as one-dimensional (Altitude), two-dimensional (East, North) or 3-dimensional (East, North, Altitude) points.

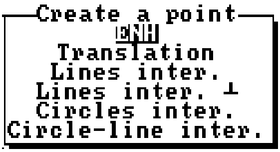
❑ Creating a point

See page 5-25 and next ones for theoretical approach.

Contexts of use: A points list is shown on the screen (Scenarios #2, 5; see pages 4-2 and 4-6).

General procedure:

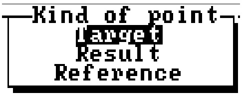
1. A list of points being displayed on the screen, press the **C** key to access the **Create Point** function. The following menu appears:



2. Select the desired point creation method.

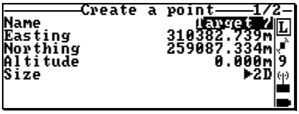
3. Enter the required parameters. Depending on the method chosen, these parameters will fit in between 2 and 4 different screens (see hereafter).

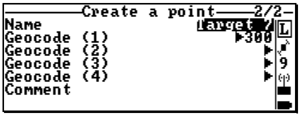
4. When you agree with the definition of the new point, press F3 to create and store the point. You must then indicate the type to be assigned to the created point(s):



A warning message will appear if you try to create a point with the same name as that of an already existing point.

- If you select **ENH**, enter:
  - point name
  - coordinates
  - point size (1D, 2D or 3D)
  - geocodes and possible comments





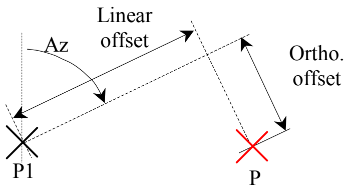
The default values are derived from the point currently selected in the list when you pressed **C**. The default point name will be for example “target 115” if the selected point is “target 114”. Pressing F3 will create and store the point after you assign a type to the point.

3

- If you select **Translation**, enter or specify the following on screen 1/3:

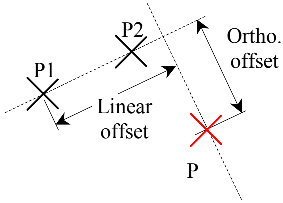
  1. Point name.
  2. Point P1 (default: point currently selected in the list when you pressed **C**). To select another point, press the **F** key, specify the point type (target, result or reference) and select one from the prompted list
  3. Then, if you choose the 1st case (Az, linear offset, ortho. offset), enter:

     - azimuth angle. If a point P2 is specified, you just have to enter a new azimuth to get rid of that point (which is then replaced by a "?")
     - linear offset
     - ortho offset

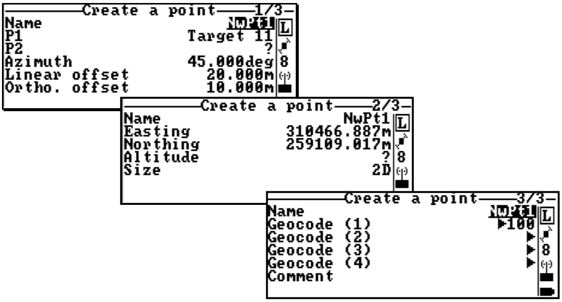


  Or, if you choose the 2nd case (P2, ortho offset), enter or specify:

     - P2. To select P2, press the **F** key once the cursor is on this field, specify the point type (target, result or reference) and select one from the prompted list. As a result, the azimuth field is also updated to reflect the direction of the P1P2 line
     - linear offset
     - ortho offset.



4. Select screen 2/3 and check to see if the resulting coordinates for the new point are consistent (no changes allowed on screen 2/3).Screen examples:

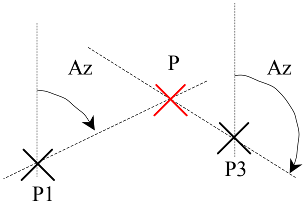


5. Enter geocodes and comments on screen 3/3.

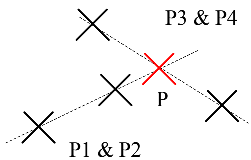
6. Press F3 to create and store the point. Specify a type for the created point.

• If you select **Lines inter**, enter or specify the following on screen 1/3:

1. Point name. The default point name will be for example “target 115” if the selected point is “target 114”.
2. Point P1. To select this point, press the **F** key, specify the point type (target, result or reference) and select one from the prompted list.
3. Then, if you define the 2 straight lines from 2 points and 2 azimuths, enter:
   - Azimuth angle associated with P1. If a point P2 is specified, you just have to enter a new azimuth to get rid of that point (which is then replaced by a “?”)
   - Point P3 and associated azimuth. If a point P4 is specified, you just have to enter a new azimuth to get rid of that point (which is then replaced by a “?”)



   Or, if you define the 2 straight lines from 4 points, specify:
   - P2. To select P2, press the **F** key once the cursor is on this field, specify the point type (target, result or reference) and select one from the prompted list. As a result, the azimuth field is also updated to reflect the direction of the P1P2 line
   - P3 and P4 (same procedure as P2). As a result of these choices, the azimuth field is also updated to reflect the direction of the P3P4 line.



   (You could also specify two points to define one straight line, and 1 point + 1 azimuth to define the other).
4. Select screen 2/3 and check to see if the resulting coordinates for the new point are consistent (no changes allowed on screen 2/3).

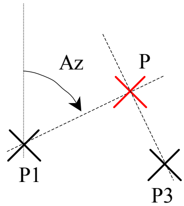
5. Enter geocodes and comments on screen 3/3.

6. Press F3 to create and store the point. Specify a type for the created point.

• If you select **Lines inter ⊥**, enter or specify the following on screen 1/3:

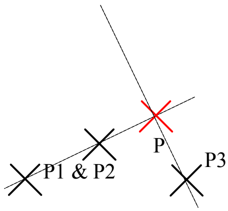
1. Point name. The default point name will be for example “target 115” if the selected point is “target 114”.
2. Point P1. To select this point, press the **F** key, specify the point type (target, result or reference) and select one from the prompted list.
3. Then, if you choose the 1st case (2 points, 1 azimuth), enter:

    - Azimuth angle associated with P1. If a point P2 is specified, you just have to enter a new azimuth to get rid of that point (which is then replaced by a “?”)



   Or, if you choose the 2nd case (3 points), specify:

    - P2. To select P2, press the **F** key once the cursor is on this field, specify the point type (target, result or reference) and select one from the prompted list. As a result, the azimuth field is also updated to reflect the direction of the P1P2 line.



4. Select P3 in the same way as you selected P1 and P2.

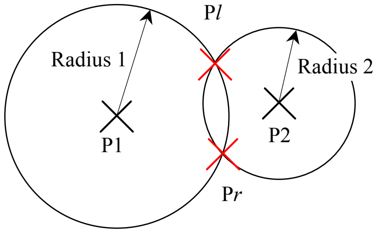
5. Select screen 2/3 and check to see if the resulting coordinates for the new point are consistent (no changes allowed on screen 2/3).

6. Enter geocodes and comments on screen 3/3.

7. Press F3 to create and store the point. Specify a type for the created point.

3

- If you select **Circles inter.**, enter or specify the following on screen 1/4:

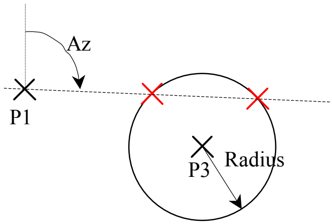


1. Names of right and left points. The default names will be for example “target 115” and “target 116” if the selected point is “target 114”.
2. P1. To select this point, press the **F** key, specify the point type (target, result or reference) and select one from the prompted list.
3. Radius of the circle whose center is P1.
4. P2. To select this point, press the **F** key, specify the point type (target, result or reference) and select one from the prompted list.
5. Radius of the circle whose center is P2.
6. Select screen 2/4 and check to see if the resulting coordinates for the right point are consistent (no changes allowed on screen 2/4).
7. Do the same on screen 3/4.
8. Enter geocodes and comments on screen 4/4.
9. Press F3 to create and store the point(s). Before you are asked to specify the point type, a dialog box is displayed asking you to choose whether the two points, or only one of them should be created. Dialog box example:

• If you select **Circle-Line inter.**, enter or specify the following on screen 1/4:

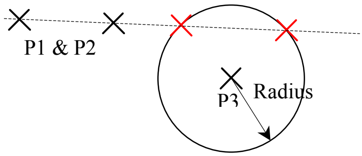
1. Names of the points to be created. The default names will be for example “target 115” and “target 116” if the selected point is “target 114”.
2. P1. To select this point, press the **F** key, specify the point type (target, result or reference) and select one from the prompted list.
3. Then, if you choose the 1st case (2 points, 1 azimuth), enter:

   - Azimuth angle associated with P1. If a point P2 is specified, you just have to enter a new azimuth to get rid of that point (which is then replaced by a “?”)

   Or, if you choose the 2nd case (3 points), specify:

   - P2. To select P2, press the **F** key once the cursor is on this field, specify the point type (target, result or reference) and select one from the prompted list. As a result, the azimuth field is also updated to reflect the direction of the P1P2 line.

4. P3. To select this point, press the **F** key, specify the point type (target, result or reference) and select one from the prompted list.
5. Radius of the circle whose center is P3.
6. Select screen 2/4 and check to see if the resulting coordinates for the first point are consistent (no changes allowed on screen 2/4).
7. Do the same on screen 3/4.

8. Enter geocodes and comments on screen 4/4.
9. Press F3 to create and store the point(s). Before you are asked to specify the point type, a dialog box is displayed asking you to choose whether the two points, or only one of them should be created. Dialog box example:

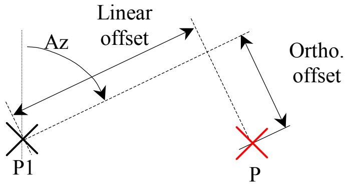
❑ Creating a line

See page 5-28 for theoretical approach.

Contexts of use: A points list is shown on the screen (Scenarios #2, 5; see pages 4-2 and 4-6). Press the **L** key to access the **Create Line** function. The first 3 steps of the procedure resemble that of the **Translation** point creation method.

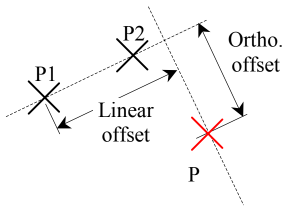
Screen 1/5 is used to define the location and direction of the line. On this screen, enter or specify the following:

1. Line name.
2. Point P1 (default: point currently selected in the list when you pressed **C**). To select another point, press the **F** key, specify the point type (target, result or reference) and select one from the prompted list.
3. Then, if you choose the 1st case (Az, linear offset, ortho. offset), enter:
    - azimuth angle. If a point P2 is specified, you just have to enter a new azimuth to get rid of that point (which is then replaced by a "?")
    - linear offset
    - ortho offset



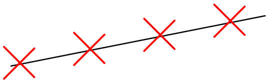
Or, if you choose the 2nd case (P2, ortho offset), enter or specify:

- P2. To select P2, press the **F** key once the cursor is on this field, specify the point type (target, result or reference) and select one from the prompted list. As a result, the azimuth field is also updated to reflect the direction of the P1P2 line
- linear offset
- ortho offset.



3

4. Select screen 2/5. This screen is used to define the line as such.
5. Enter **two** of the following **three** parameters defining the line, the third one being derived from the other two (after you ask for it):
   - Number of points
   - Step
   - Length



6. Choose the right option in the **Computed** field. For example, if you entered the “step” and “length”, then the right option in this field is “Number of points”. As a result, the corresponding field is updated on screen 2/5.
7. Select screen 3/5 and check to see if the resulting coordinates for the first point in the line are consistent (no changes allowed on screen 3/5).
8. Select screen 4/5 and check to see if the resulting coordinates for the last point in the line are consistent (no changes allowed on screen 4/5).
9. Enter geocodes and comments on screen 5/5. These parameters will be associated with every point making up the line.
10. Press F3 to create and store the line. Specify a type of point, which will be assigned to every point making up the line.

❑ Computing a distance

See page 5-29 and next ones for theoretical approach.

Contexts of use: A points list is shown on the screen (Scenarios #2, 5; see pages 4-2 and 4-6).

General procedure:

1. A list of points being displayed on the screen, press the **D** key to access the **Distance** function. The following menu appears:

2. Select the type of distance you want to measure
3. Enter the required parameters. The results are immediately available on the screen.
4. If you want to save these results as a note in the notepad, simply press the **N** key (the store operation is also immediate). The palmtop continues to display the same screen thus allowing you to quickly ask for another distance measurement of this type.

• If you select **point-point**, enter or specify the following:

(As Point P1 is necessarily the point currently selected in the list when you pressed **D**, you do not need to specify this point).

1. Point P2. To select P2, directly press the **F** key, specify the point type (target, result or reference) and select one from the prompted list.

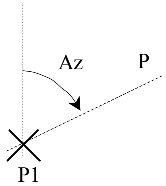
   If you want P2 to be your current position, leave this field blank. If this field has previously been filled, press the **Del** key to empty it (? will then appear in the field).

2. Read the results at the bottom of the screen. If necessary save the results by pressing the **N** key.

• If you select **point-line**, enter or specify the following:

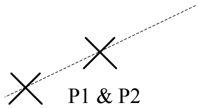
1. Point P. This point is by default the point currently selected in the list before you press **D**. To select another point, press the **F** key, specify the point type (target, result or reference) and select one from the prompted list.
2. Point P1. To select P1, press the **F** key once the cursor is on this field, specify the point type (target, result or reference) and select one from the prompted list.
3. Then, if you choose to define the line with a point and an azimuth, enter:

   - Azimuth angle associated with P1. If a point P2 is specified, you just have to enter a new azimuth to get rid of that point (which is then replaced by a "?")

   Or, if you choose to define the line with two points, specify:

   - P2. To select P2, press the **F** key once the cursor is on this field, specify the point type (target, result or reference) and select one from the prompted list. As a result, the azimuth field is also updated to reflect the direction of the P1P2 line.

4. Read the results at the bottom of the screen. If necessary save the results by pressing the **N** key.

- If you select **point-plane**, specify the following:

  1. Point P. This point is by default the point currently selected in the list before you press **D**. To select another point, press the **F** key, specify the point type (target, result or reference) and select one from the prompted list.
  2. Point P1. To select P1, press the **F** key once the cursor is on this field, specify the point type (target, result or reference) and select one from the prompted list.
  3. Do the same as P1 to select P2 and P3.
  4. Read the results at the bottom of the screen. If necessary save the results by pressing the **N** key.

❑ Computing areas and perimeters

See page 5-32 for theoretical approach.

Contexts of use: A points list is shown on the screen (Scenarios #2, 5; see pages 4-2 and 4-6).

1. A list of points being displayed on the screen, press the **A** key to access the **Area** function. If it is the first time that you select this function for the open job, then the list of points making up the profile can only be empty:

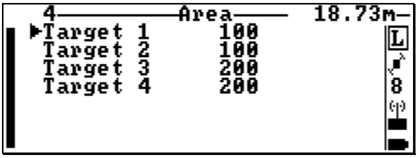
2. Insert points into the list in order to create the desired polygon. As prompted on the **Help** menu (**F1**), use the following keys:

I key	:	to insert a point into the list
F key	:	to insert a series of points into the list
Del key	:	to delete the selected point
Clr key	:	to delete all the points from the list
S key	:	to search for a point according to a number of criteria

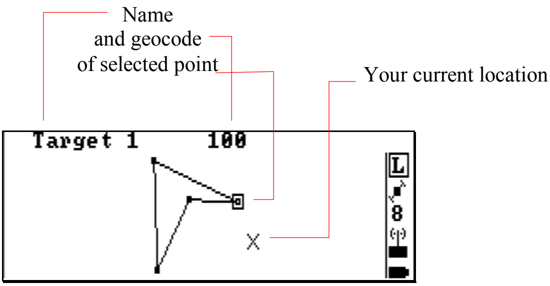
As well as:

V key	:	to view the properties of the selected point
N key	:	to directly select “the next point”
P key	:	to define the “the next point” search criterion
G key	:	to choose which geocode to display
M key	:	to view the polygon on a 2D view

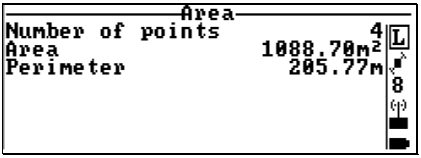
The list is updated on the screen as you create the polygon. For example, the following list has been created:



3. Check to see if the polygon is a single close object by pressing the **M** key. This provides access to the 2 D view. Example of expected polygon:



4. Come back to the points list and press to start the computation. The screen then looks like this:

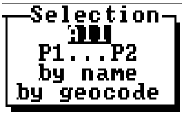


5. Read the results. If necessary save the results by pressing the **N** key (results saved as a note).

❑ Inserting points into a list

Contexts of use: When building a profile; when building a polygon.

- If you press the **I** key, you just have to indicate the type of the point you want to insert (a target, reference or result point). Then you select this point from the proposed list.
- If you press the **F** key, you must also indicate the type of the points you want to insert (they will necessarily be all of the same type). Then a dialog box appears asking you to choose a selection criterion for these points:



Your choice should be made according to what follows:

All: you want to select all the points from the selected list

P1...P2: you want to select all the points between two points which you have then to specify (these two points will also be part of the selection)

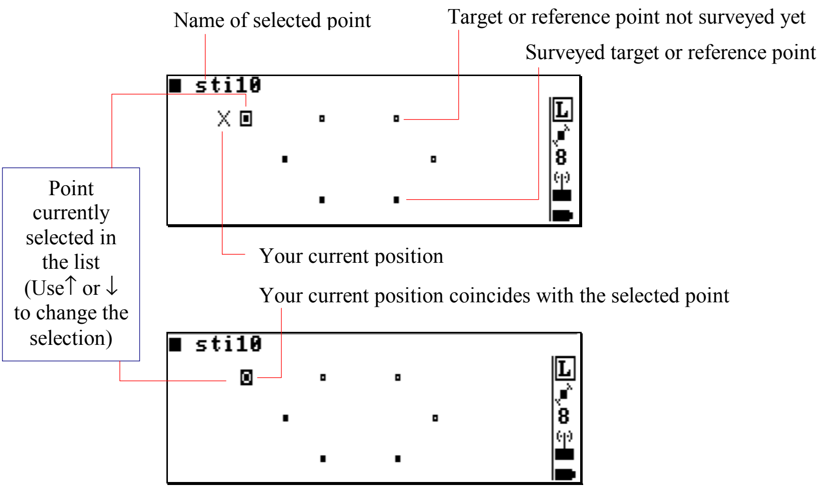
By name: you want to select all points whose names include a string that you must specify (use the wild card symbol * if necessary)

By geocode: you want to select all points whose geocodes include a string that you must specify (use the wild card symbol “*” if necessary).

❑ Viewing the working area in 2D

Contexts of use: A points list is shown on the screen (Scenarios #2, 4, 5; see pages 4-2 and next ones); or you are preparing to compute an area (list of points making up the polygon).

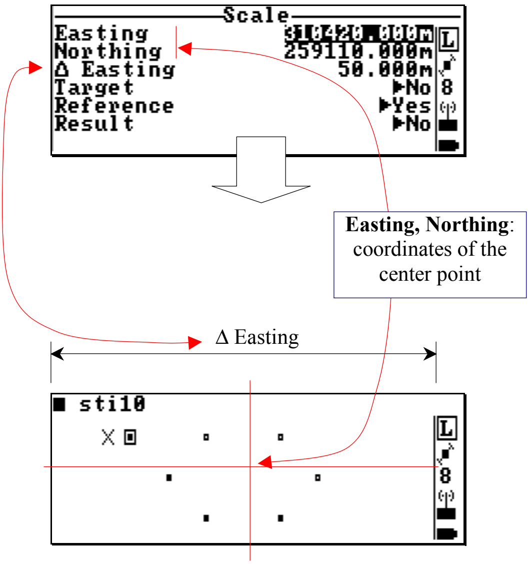
1. Press the **M** key to access the 2D view. Examples:



As prompted on the **help** menu (**F1**), the following keys can be used in this context:

PgUp key	:	to zoom in on the view
PgDn key	:	to zoom out
Clr key	:	to adjust the zoom so that all the points be visible
P key	:	to center the view around the selected point
C key	:	to center the view around your current position
S key	:	to access the scale settings screen
T key	:	to show/hide the target points on the view
F key	:	to show/hide the reference points on the view
R key	:	to show/hide the result points on the view
V key	:	to view the characteristics of the selected point

2. If nothing appears on this view, it's probably because the scale settings are inappropriate. Press the **S** key to access the scale settings screen. Screen example:



3. Change the scale settings (the first 3 parameters) according to the explanations above.

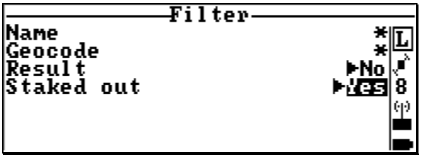
   In addition, you can choose, as with the **T**, **F**, **R** keys previously mentioned, to show or hide each type of point on the 2D view. For each type —target, reference and result— selecting **Yes** will cause the corresponding points to be visible on the 2D view, selecting **No** will hide them.

❑ Placing a filter on a points list

Contexts of use: A points list is shown on the screen (Scenarios #2, 5; see pages 4-2 and 4-6).

This function allows you to apply a “filter” to the points list contained in a job. As a result of the application of this filter, only the points meeting the chosen criteria will appear when displaying the list.

1. Press the **F** key to access the **Filter** screen. Example:



As shown above, there are four possible criteria to filter a points list. These criteria can be combined:

Name: Enter characters, possibly combined with the * wildcard, to set a filter on point names. For example, if you enter “tar*”, then only the points whose names begin with “tar” will be listed.

If you do not want to apply a filter to names, keep the * character in this field.

Geocode: Enter characters, possibly combined with the * wildcard, to set a filter on geocodes. For example, if you enter “300”, then only the points for which one of the geocodes is “300” will be listed.

If you do not want to apply a filter to geocodes, keep the * character in this field.

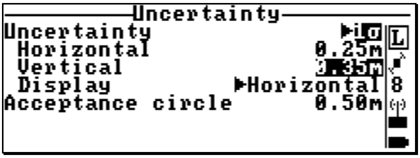
Result: This criterion will apply only if you are working on the result file (scenario #5). If you select **Yes**, then only the result points for the open *file* are listed. If you select **No**, all the result points for the open job are listed.

Staked out: If you select **No**, then only the points still to survey will be listed. If you select **Yes**, all the points (surveyed and non-surveyed) will be listed.

❑ Uncertainties & acceptance circle

Context of use: Logging screen (all scenarios, except #3).

1. Press the **U** key to access the **Uncertainty** screen. Example:



   The following settings can be made on this screen:

   Uncertainty: Tell the system whether standard deviations displayed by the palmtop should be at 1σ or 2σ (default: 1σ)

   Horizontal: Enter the upper limit of admissible horizontal uncertainty on any computed solution

   Vertical: Enter the upper limit of admissible vertical uncertainty on any computed solution

   Display: Choose which value of uncertainty (vertical or horizontal) you wish to display in staking out, at the bottom and at the top of any logging screen 1/3.

   Acceptance circle: Enter the radius of the acceptance circle (see theory page 5-16).

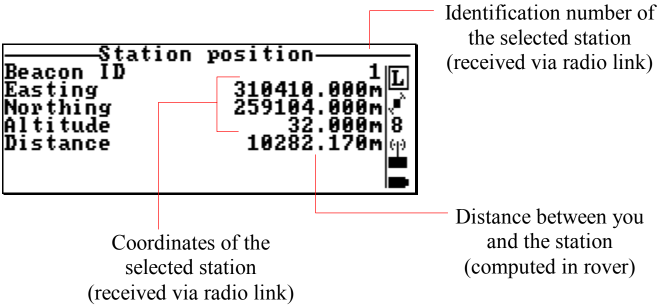
2. After making the desired settings, press the **Esc** key to come back to the logging screen.

Radio link

❑ Station position

This function allows you to check the coordinates of the selected station. If the radio link (U-LINK or other) is not properly established with that station, then nothing will be displayed on this screen.

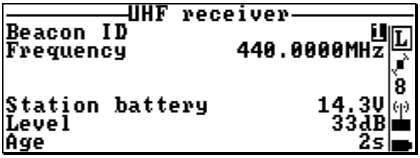
- Select **>Position**. The **Station position** screen appears, as shown in the example below.



No changes can be made on this screen.

❑ UHF receiver (U-LINK)

1. Select >**UHF receiver**. A new screen appears allowing you to check the identification number of the station that the rover's UHF receiver is supposed to receive, as well as the reception frequency setting. Example:



2. If necessary, change these parameters if they are incorrect (you are supposed to know the identification number of the station used, as well as its transmission frequency).

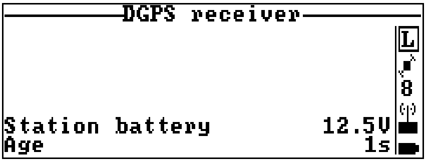
   0 ≤ *Station Number* ≤ 99 (LRK) or 1023 (RTCM)
   400 MHz ≤ *UHF frequency* ≤ 470 MHz, in 12.5-kHz steps

   After the first two parameters have been properly set and the reception level is correct, the other 3 parameters will give useful information about how the station is working (battery voltage) and the quality of the UHF link (signal level at rover's UHF input, and age of corrections).

❑ DGPS receiver

Function available only if an external DGPS receiver, duly declared in the **Connection** function (see page 7-22), is connected to a serial port of the CompactPro unit. This function provides the current voltage of the station battery as well as the age of the data coming from the station.

1. Select >**DGPS receiver**. The screen then looks like this:



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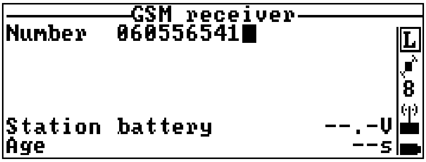
❑ GSM receiver

Function available only if a GSM, duly declared in the **Connection** function (see page 7-22), is connected to a serial port of the CompactPro unit. This function allows you to dial the call number of the station GSM. Once the data link is established, this function provides the current voltage of the station battery, the age of the data coming from the station, and the reception level of the GSM.

1. Select **>GSM receiver**
2. Dial the station call number and validate this entry. Example of call number:



- As prompted on the **Help** menu (**F1**), the following keys can be used in this context:

F3 : to call the station. As previously, once the data link is established, this function will provide the current value of battery voltage at the station as well as the age of the data coming from that station

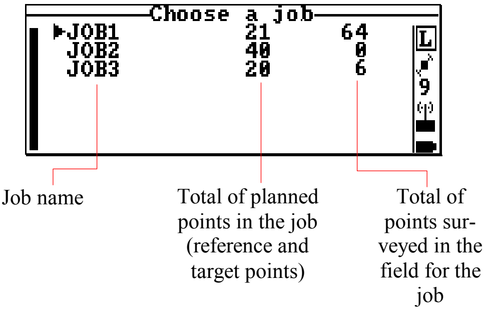
S : to terminate the communication with the station

Q : indicates the GSM reception level BEFORE calling the station. The system returns a figure between 0 and 5. The extreme values should be understood as follows: “0”: no reception (GSM CANNOT be used) ; “5” : reception is optimum.

Job & file management

❑ Working on the jobs list

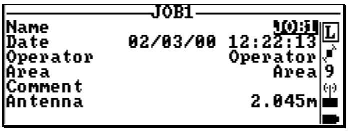
- Select **> Choose a job**. The screen then lists the jobs stored in the palmtop. Example:



- As prompted on the **Help** menu (**F1**), the following keys can be used in this context:

  ↵ : to open the selected job

  V key : to view the properties of the selected job.
  Example (read-only screen):



  E key : to export the results file of the selected job to an SVAR-formatted file (a *.RES file)

  Del key : to delete the selected job

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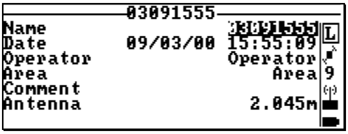
T key : to copy the results file to a PC card (PCMCIA) in SVAR format

C key : to create a new job. The screen then looks like this:



The following parameters can be changed: job name (8 char. max.), operator name (20 char. max.), area name (8 char. max.), comment (48 char. max.) and antenna height.

The default name “mmddhhmm” is the compiled date & time (month, day, hours, minutes) and so is consistent with the **Date** field below.

Once the definition of the new job is complete, press F3 to create the new job. This takes you back to the former screen (now showing the name of the new job).

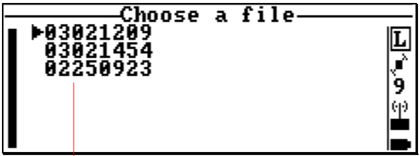
ⓘ The coordinate system that is selected to be used in the created job is:

- the coordinate system used by the receiver unit, if there is one connected to the palmtop
- otherwise, the coordinate system of the open job, if there is any
- otherwise, the WGS84.

3

❑ Working on the files list

- Select **> Choose a file**. The screen then lists the files stored in the palmtop. Example:



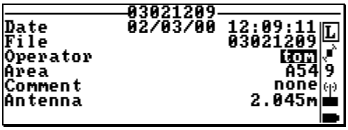
File name

- As prompted on the **Help** menu (**F1**), the following keys can be used in this context:

: to open the selected file

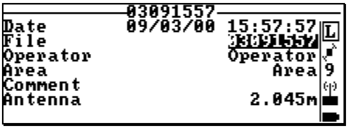
V key : to view the properties of the selected file if it has already been used in the field

Example (read-only screen):



or **V** key : to modify a file if it has not been used yet in the field

C key : to create a new file. The screen then looks like this:



The following parameters can be changed: file name (8 char. max.), operator name (20 char. max.), area name (8 char. max.) and comment (48 char. max.).

The default name is the compiled date & time (“mmddhhmm”) and so is consistent with the Date field above.

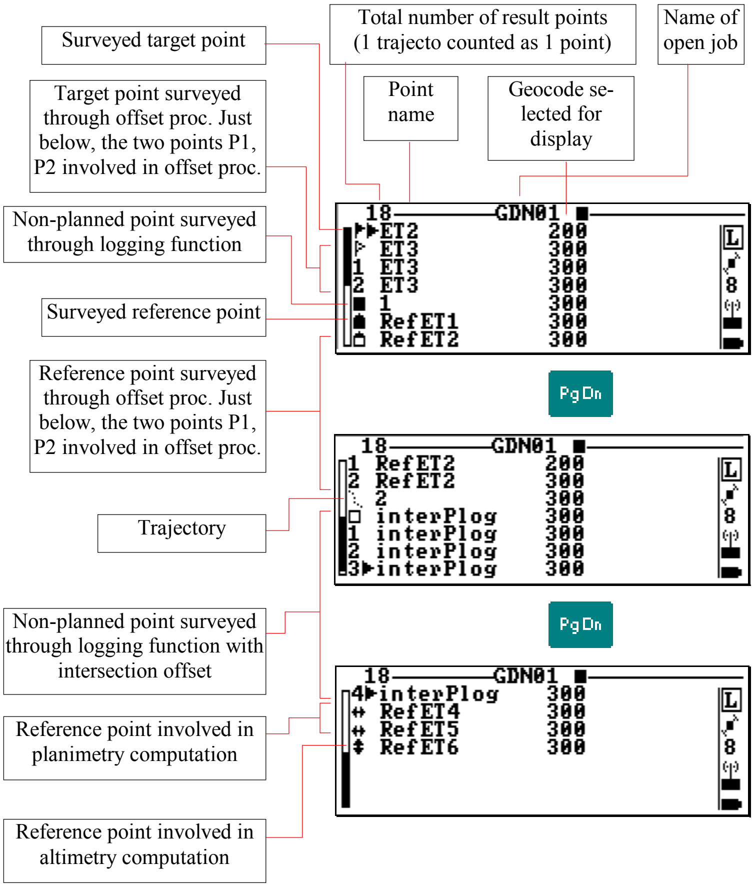
The antenna height is displayed just as a reminder.

Once the definition of the new file is complete, press F3. This takes you back to the former screen (now showing the name of the new file).

Result points

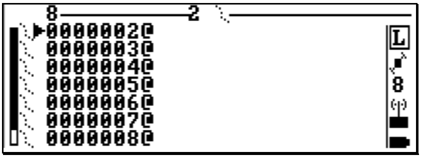
❑ Viewing the result points

- Select > **Result points**. The screen lists all the points surveyed for the open job. Example:



THALES NAVIGATION

- To list the points of a trajectory, select the trajectory name in the list and then press ↵. Example:



❑ Using result points as if they were planned points

(Scenario #5)

- After you have selected **> Result points**, select any point. As you can notice, if you display the associated **Help** menu (**F1**), the allowed functions in this context are roughly those you can use when surveying planned points.

  Most notably, you can access the guidance screen, which will help you go back to a point previously surveyed. The only thing you cannot do is to compute position solutions, wherever you are.

3

Manual raw data recording

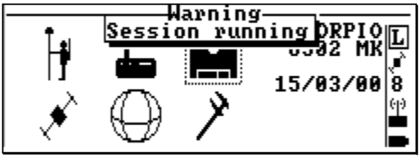
(Available as an option in the 6301 MG)

After inserting a PC card into the drive, manual recording of raw data can be performed in two different ways:

- By simply pressing the push-button located under the PC card drive (accessible only if flap open; see page 1-6). The record file is then created with default characteristics. Then close the flap and let the recording take place. To stop data recording, just open the flap.
- Using the >**Raw Data** function described below. This second method is more flexible as it lets you change the recording characteristics and specify a file name.

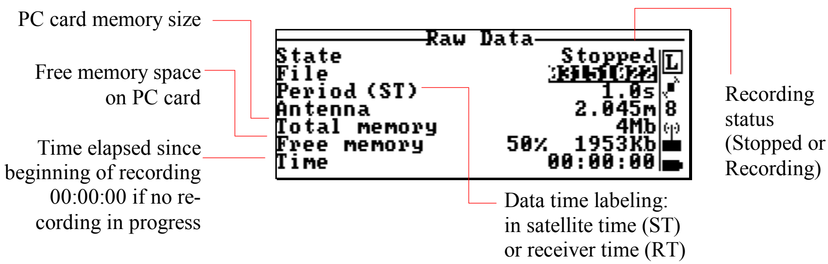
To start and stop a raw data recording sequence, do the following:

1. Select > **Raw data**. The following message may display:



THALES NAVIGATION

In this case, see page 3-61 to learn how to stop the session in progress. Otherwise, the screen should look like this:



2. Set the following 3 parameters:

- **File**: enter a name for the file in which you want to store the raw data (8 characters max.)
- **Period**: enter the data recording rate (from 0.1 s to 99.9 s WITH FASTOUTPUT option; from 1.0 s to 99.9 s WITHOUT this option). The greater this rate, the larger the memory space required for a given time of recording.
- **(ST)** or **(RT)**: data time labeling. Press **#** to choose this parameter: satellite (ST) or receiver (RT) time. Choose “ST” if you wish to post-process the data with 3S Pack.
- **Antenna**: If necessary, correct the antenna height

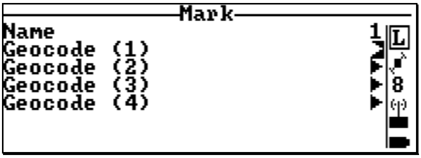
3. Press F3 to start the recording sequence. On the screen, note the changes in the **State, Time** and **Free memory** fields

4. To stop recording, press the **S** key.

3

As prompted on the **Help** menu (**F1**), during a recording sequence, you can create markers.

1. Press the **M** key:



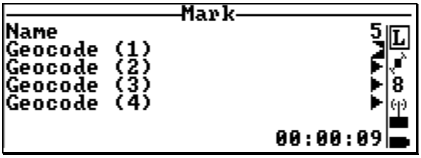
2. Change any of the following if required:
   - Marker name
   - Associated geocodes

For a “short-event” marker:

3a. Press F3. A marker is created. On the screen, the marker name is incremented by one (for next marking operation).

Or, for a “long-event” marker:

3b. Press the **A** key. In the lower part of the screen, a time counter appears, indicating the time elapsed since you pressed **A**.

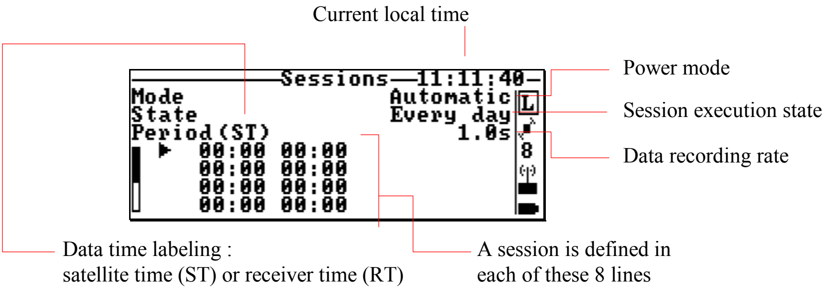


4. At the end of the event, press F3. A marker is created. On the screen, the time counter disappears and the marker name is incremented by one (for next marking operation).

Sessions

See page 5-2 for theoretical approach. In the 6301 MG, the “Recording” option must be installed if you want the system to log raw data during an operating session.

1. Select > **Sessions**. The screen then looks like this:

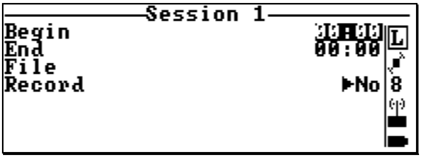


As prompted on the **Help** menu (**F1**), the following functions can be used, depending on context:

F3	:	Starts execution of all programmed sessions (resulting state: **Every day** or **Once**, depending on your choice)
S key	:	Stops execution of all sessions (resulting state: **Stopped**)
↵	:	Edits the selected session line (see next page)
1... **8** keys	:	Assigns a run-time number to the selected session line (the number appears at the beginning of the line)
Del key	:	Removes the selected session from the sequence of sessions to be run (deletes run-time number for this session)
A key	:	Selects automatic power mode (resulting mode: **Automatic**)
M key	:	Selects manual power mode (resulting mode: **Manual**)
P key	:	Edits the recording rate (period) (from 0.1 s to 99.9 s WITH FASTOUTPUT option; from 1.0 s to 99.9 s WITHOUT this option)

2. Check that the session execution state is “Stopped” (2nd line). Otherwise, press the **S** key to stop session execution.

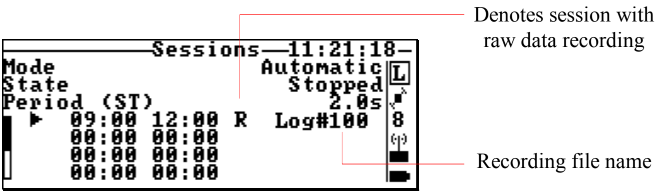
3. Select the first session line and press . The screen then looks like this:



4. Set the following 4 parameters:

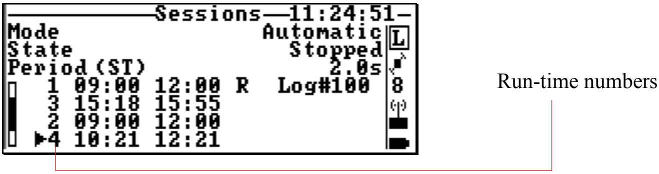
   - **Begin**: Start time of the session (hhmm; use 0-24hr time format)
   - **End**: End time of the session (hhmm; use 0-24hr time format)
   - **File**: Enter a name for the recording file if you want to record raw data during the whole session. Otherwise, leave this field blank.
   - **Record**: Choose **Yes** to allow raw data recording during the session, choose **No** in the contrary case. The data recording rate will necessarily be the same for all sessions with raw data recording (see **P** key in previous page)

5. Press F3 to store the definition of this session. This takes you back to the previous screen on which you can now see the definition of the newly created session. Example of a session with raw data recording:



6. Create other sessions as explained above (steps **2.** to **5.**).

7. Assign a run–time number to each session (see **1**... **8** keys in the previous page). Example:



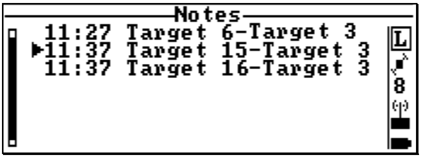
8. Choose a power mode

9. Press F3 to start executing the programmed sessions. Sessions can be stopped any time by pressing the **S** key from the above screen.

Notes

(See also page 5-5)

1. Select **> Notes**, or from anywhere in the program, press **Shift+F1.** The screen then lists all the existing notes. Example:

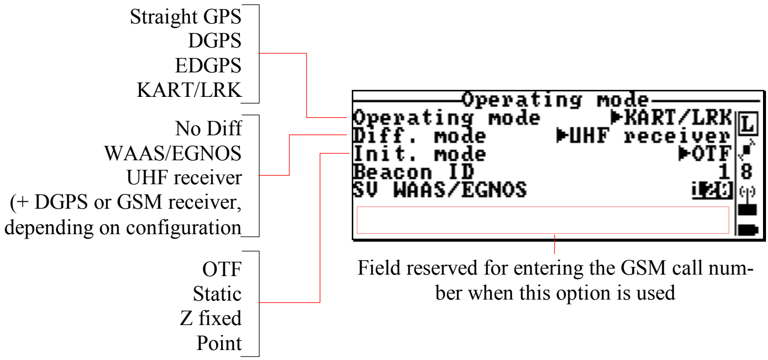


As shown on the associated **Help** menu (**F1**), the following keys can be used:

↵	:	to edit the content of the selected note
C key	:	to create a new note
Del key	:	to delete the selected note
Clr key	:	to delete all notes
T key	:	to copy all notes to the PC card.

Operating mode

- Select > **Operating mode**. The screen then looks like this:



- The following parameters can be changed on this screen:

  Operating mode: Position processing mode used (see possible options above) (see also page 5-10)

  Diff. mode: Differential mode used (see possible options above). The "UHF receiver" option designates the data receiver integrated into the CompactPro unit. The "DGPS receiver" option, which designates an external receiver (RTCM or other), is available when a receiver of this type is declared to be attached to one of the serial port on CompactPro. The same applies for the "GSM receiver" option (see also page 7-17)

  Init. mode: Initialization mode used when KART/LRK selected as operating mode (see possible options above) (see also page 5-12)

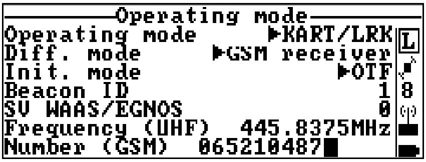
  Beacon ID: Identification number of the station the rover is supposed to work with (if UHF, DGPS or GSM receiver selected in line 2)

SV WAAS/EGNOS: Identification number of the geo-stationary satellite transmitting differential corrections (if WAAS/EGNOS selected in line 2).

Examples:
- No. 120 for Europe
- No. 122 for Canada & the USA
- No. 134 for the Pacific

UHF frequency: Enter the value of carrier frequency used by the UHF transmitter at the station (if “UHF receiver” selected in line 2)

Number (GSM): Station GSM call number if GSM option installed (and selected in line 2). Example:



With a GSM effectively present, and as prompted by the **Help** menu (**F1**), the following keys can be used in this context:

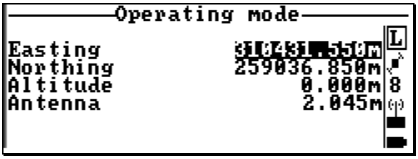
- **F3** : to call the station
- **S** : to terminate communication with station via GSM
- **Q** : allows you to check the GSM reception level BEFORE calling the station. The system returns a figure between 0 and 5. The extreme values should be understood as follows: ”0”: no reception (GSM CANNOT be used); ”5”: reception optimum.

- As prompted on the **Help** menu (**F1**), the following keys can be used:

  ↵ : causes processing to be re-initialized

  I key : views the progress of some parameters during the KART/LRK initialization phase. Screen example:

  P key : If “point” is selected as the **Init. mode** (see previous page), this key allows you to specify the coordinates of the initialization point. The screen then looks like this:



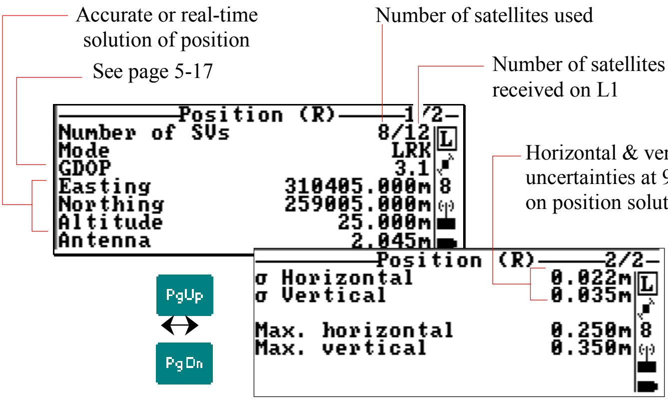
  You can enter each of the coordinates of this point, or select a point from the reference, target or result list of the open job. This second solution is obtained by pressing **F** after pressing **P**. Then you just have to select which list to view and select a point from this list.

  From the screen showing the initialization point, you can ask for a new initialization by pressing F3.

THALES NAVIGATION

Position

- Select > **Position**. The screen then looks like this:



This function is also accessible from anywhere by pressing **F2**.

- As prompted on the **Help** menu (**F1**), the following keys can be used:

  H key : to change the upper limit of admissible horizontal uncertainty on any computed solution

  V key : to change the upper limit of admissible vertical uncertainty on any computed solution

  A key : to view the coordinates of the accurate point on screen 1/2. The accurate point is issued every 1.0 second. See page 5-14.

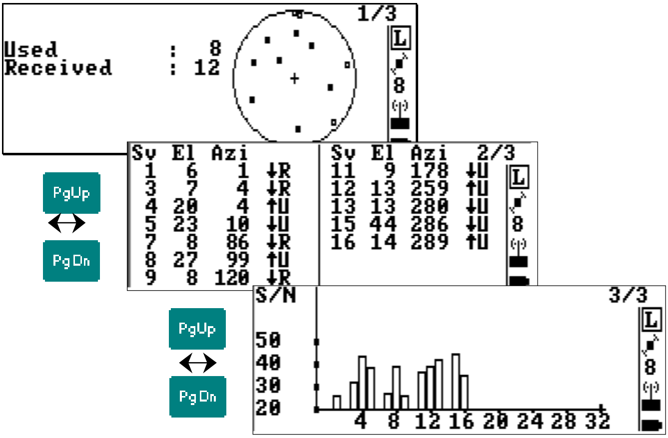
  R key : to view the coordinates of the real-time point on screen 1/2. The real-time point is an extrapolated point issued every 0.5 second. See page 5-14.

The first two parameters can also be changed when a logging screen is displayed (see page 3-48).

The notion of “accurate” and “real-time” solution only exists if the LRK or KART mode is used. For further explanations, see page 5-14. In all other modes, accurate and real-time solutions are the same.

Satellites

- Select > **Satellites**. This function provides information on the GPS satellites visible from your current position. The information is split into three different screens (see example below).



The content of each screen is as follows:

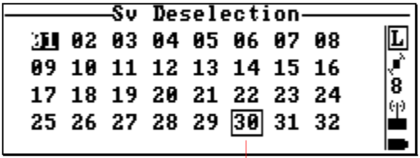
- Screen 1/3 provides a polar view of the constellation (elevation vs. azimuth). Full squares stand for received and used satellites. Empty squares stand for received-only satellites.
- Screen 2/3 provides numerical information on each satellite. From left to right: SV number, elevation angle, azimuth angle, ascending (↑) or descending (↓) orbit, and satellite-use code:

  R: Received
  U: Used in position processing
  S: Being searched
  D: Intentionally deselected
  B: Declared unhealthy by a WAAS satellite

- The chart on screen 3/3 shows the measured S/N ratio (Signal/Noise ratio) for each received satellite.

SV deselection

- Select **> SV deselection**. The screen shows the list of SV numbers corresponding to the full GPS constellation.



Intentionally deselected satellites are those whose SV number appears within a frame

As prompted on the **Help** menu (**F1**), to intentionally deselect a satellite:

- Select the corresponding number on the screen
- Press the **Del** key
- Press to validate all the changes made to the list of satellites
- Press the **Esc** key to leave the function.

To re-select a satellite:

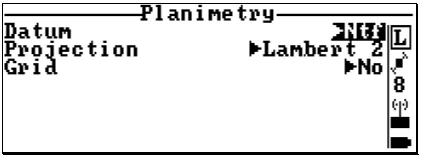
- Select the corresponding number on the screen
- Press the **Del** key
- Press to validate all the changes made to the list of satellites
- Press the **Esc** key to leave the function.

3

Viewing the the coordinate system used

❑ Planimetry

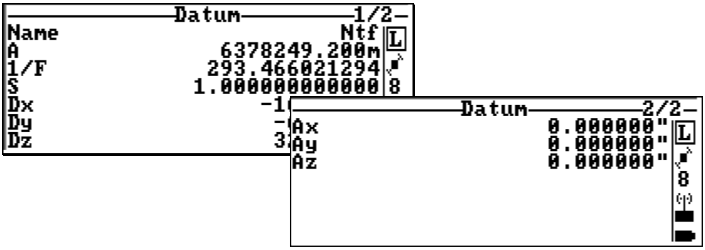
- Select **> Planimetry**. The following is displayed (example):



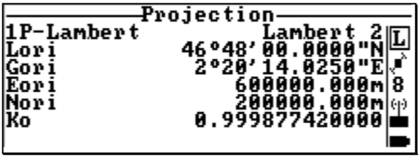
This screen displays the names of the datum and projection chosen at the office when preparing the job with KISS. No other datum or projection can be selected from this screen. You can only view the details of the datum and the projection used.

Once the cursor is on one of these fields, press to view all the parameters relevant to the selected item. Examples:

Datum:



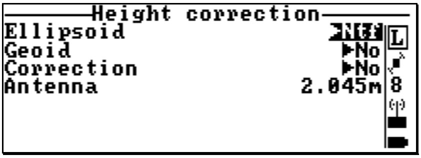
Projection:



Local grid: The screen indicates whether a local grid is used or not. To compute a local grid, see page 3-72.

❑ Altimetry

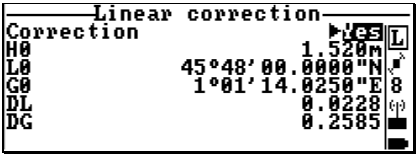
- Select > **Altimetry**. The following is displayed (example):



The ellipsoid used, as well the current value of antenna height above the ground are recalled on this screen. As in the planimetry function, you can only view the characteristics of the ellipsoid. You can however change the antenna height if necessary

This screen also indicates whether the vertical system used refers to a geoid (ICD200 or other) or not (this cannot be changed). If a geoid is used, select this parameter and press → to view its parameters.

If a linear correction is used, select this parameter and press → to view its parameters. Example:



See page 4-8 for more information about the linear correction (local height correction). See also page 3-75 to compute a local correction.

You can change the type of altimetry used by pressing the **H** key. You can choose between:

- Height above ellipsoid used in planimetry
- Height above WGS84 ellipsoid
- Height above user ellipsoid previously loaded into the Compact-Pro unit using **Geoids** software.

The linear correction processing remains possible whatever your choice.

Computing a local grid

Phase 1: Logging the known reference points

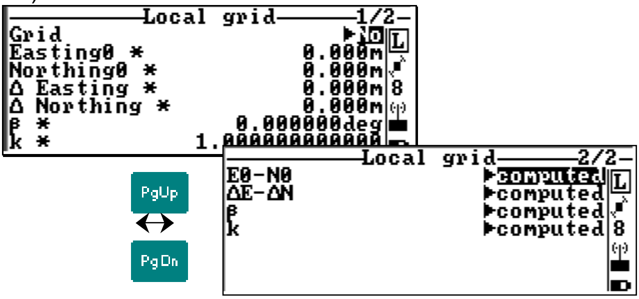
1. Unless already done, open a job and a file (see page 3-52)
2. Select **>Reference points**. The screen shows the list of reference points to be logged before being able to compute the local grid. Example:

3. Go to the selected reference point (it should be materialized in the field).
4. Keep the GPS antenna vertical and immobile above this point.
5. Press . A position computation is then run for this point. Meanwhile, the logging screen is accessed and the message “Computing a solution” appears on top of the screen (same as screen example on page 3-11). Stand still until the message disappears. After a solution is available, you can access the usual parameters on the logging screens (see screen examples on page 3-7). You cannot however change the point name.
6. If the solution is valid, press F3 to store it. The palmtop comes back to the reference points list, prompting you to log the next reference point (the next point in the list is selected, as if you were surveying planned points).
7. Resume step **4.** through step **6.** until all the points are surveyed.

Phase 2: Computing the local grid

8. From the Reference Points list screen, press the **X** key to access the Planimetry screen directly. Check that “No” is the current selection in the **Grid** field (otherwise no computation will be possible).

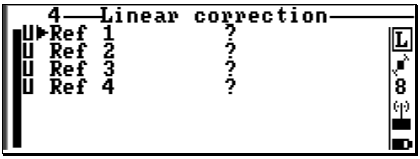
9. Select the **Grid** parameter and press [→]. This displays the characteristics of the still undetermined local grid (all are "0" or "1").



10. On screen 2/2, choose the grid computation options. The usual choice for all parameters is "Computed". In this way, it is the barycenter of the working area (resulting from the selected reference points) that will be used as the origin (E0-N0) of the local grid. If you choose "Non-computed" for some of these parameters, then they will be fixed to their current values shown on screen 1/2.

    All the parameters that have to be determined through the grid computation are indicated by an asterisk on screen 1/2.

11. Press the **C** key to enter the computation phase. The screen shows the list of logged reference points. Example:

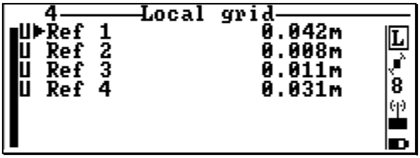


    Note that all these points are automatically selected to be involved in the grid computation (selection denoted by **U** letter before each point name).

    If necessary, to remove a point from the computation which is to be performed, select this point on the screen and then press the **U** key. The **U** letter before the point name then disappears, meaning that the point will not be used in the computation.

3

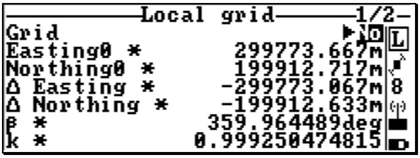
12. Press to launch the grid computation. The results then appear as follows on the screen:



This screen shows the residual for each of the points involved in the least-square processing. The residuals will necessarily be equal to “0.00” if only 3 points are used in the processing. Over 3 points used, the closer to “0.00” the residuals, the better the quality of the grid computation.

The detailed characteristics of the selected point can be viewed by pressing the **V** key. From the above screen, you can directly come back to the reference points list by pressing the **R** key.

13. Now press the **Esc** key to view the characteristics of the local grid. Example:



Phase 3: Validating the newly computed local grid

14. Select the Grid parameter (first line in the previous screen example) and change this field from “No” to “Yes”. The use of the local grid is now effective in the job. End of procedure.

Computing a local height correction

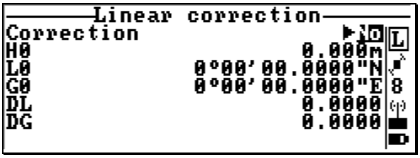
Phase 1: Logging the known reference points

Steps **1.** to **7.**: same as Phase 1 in “Computing a local grid” procedure (see page 3-72).

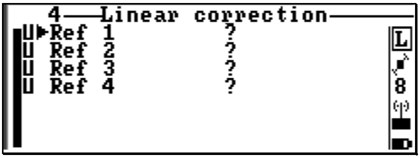
Phase 2: Computing the local height correction

8. From the Reference Points list screen, press the **Z** key to access the Altimetry screen directly. Check that “No” is the current selection in the **Correction** field (otherwise no computation will be possible).

9. Select the **Correction** parameter and press →. This displays the characteristics of the still undetermined correction (all are “0”).



10. Press the **C** key to enter the computation phase. The screen shows the list of logged reference points. Example:

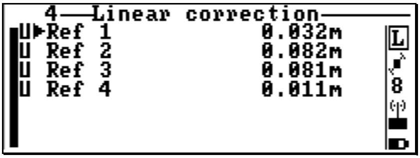


Note that all these points are automatically selected to be involved in the linear correction computation (selection denoted by **U** letter before each point name).

If necessary, to remove a point from the computation which is to be performed, select this point on the screen and then press the **U** key. The **U** letter before the point name then disappears, meaning that the point will not be used in the computation.

3

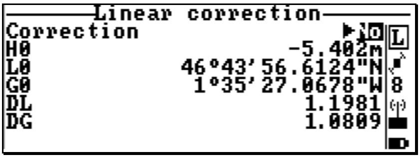
11. Press [enter key] to launch the correction computation. The results then appear as follows on the screen:



This screen shows the residual for each of the points involved in the least-square processing. The closer to “0.00”, the better the quality of the correction computation.

The detailed characteristics of the selected point can be viewed by pressing the **V** key. From the above screen, you can directly come back to the reference points list by pressing the **R** key.

12. Press the **Esc** key to view the characteristics of the local height correction. Example:



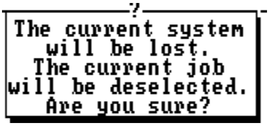
Phase 3: Validating the newly computed local height correction

13. Select the Correction parameter (first line in the previous screen example) and change this field from “No” to “Yes”. The use of the local height correction is now effective in the job. End of procedure.

Change to WGS84

This function allows you to switch from the currently selected coordinate system to the WGS84. As a result, the rover's coordinates are now expressed as a latitude (degr. min. sec.), a longitude (degr. min. sec.) and an altitude (meters). When the WGS84 is selected, you cannot start any job. The only thing you can do is to check the WGS84 coordinates computed for your current position.

- Select > **Change to WGS84**. If a job is currently open, the following message will appear.



- If you press the **Y** key or , then the job will be closed and the WGS84 will be selected as the current system used by the rover.
- If you press the **N** key, the rover will continue to operate with the same coordinate system as before.

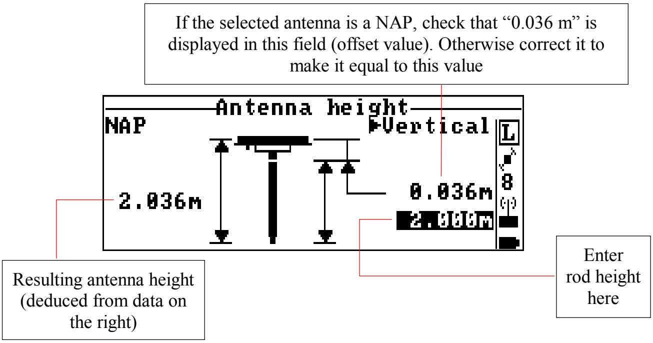
Antenna height

See also page 5-6.

- Select > **Antenna**. This function allows you to enter the height of the GPS antenna's phase center above the ground.

  The measurement method that suits best for the rover is the VERTICAL method as the height of the rod is fixed and known and the height of the phase center with respect to the antenna base is also known.

  With a NAP antenna and a rod 2 meters long, the screen should be completed as follows:



  Note that other measurement methods can be used (see page 5-6).

As prompted on the **Help** menu (**F1**), the following keys can be used in the context:

F3	:	To validate the value of antenna height
A key	:	To change the type of antenna used (NAP, DGU or other)
Clr key	:	To reset all offset values and measurement method to default choices.

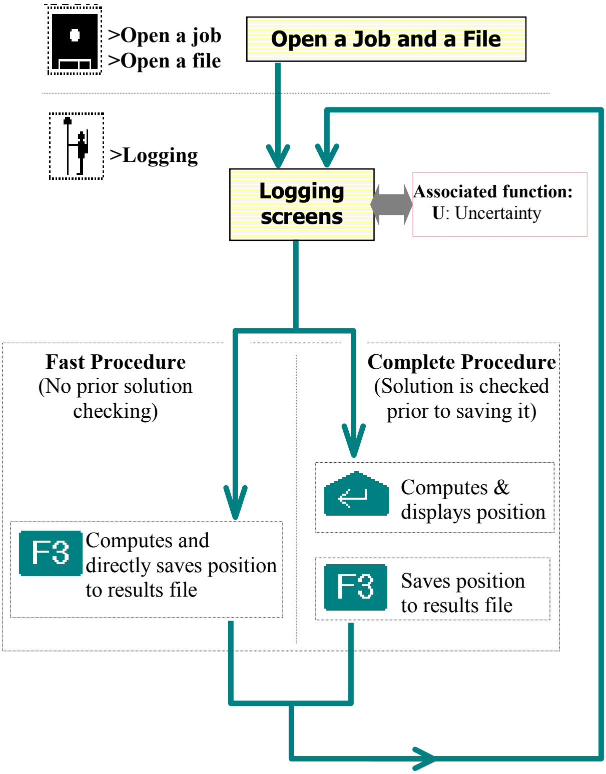
Tools menu

Refer to page 7-14. ♣

4. Typical Surveying Scenarios

Scenario #1: Point logging

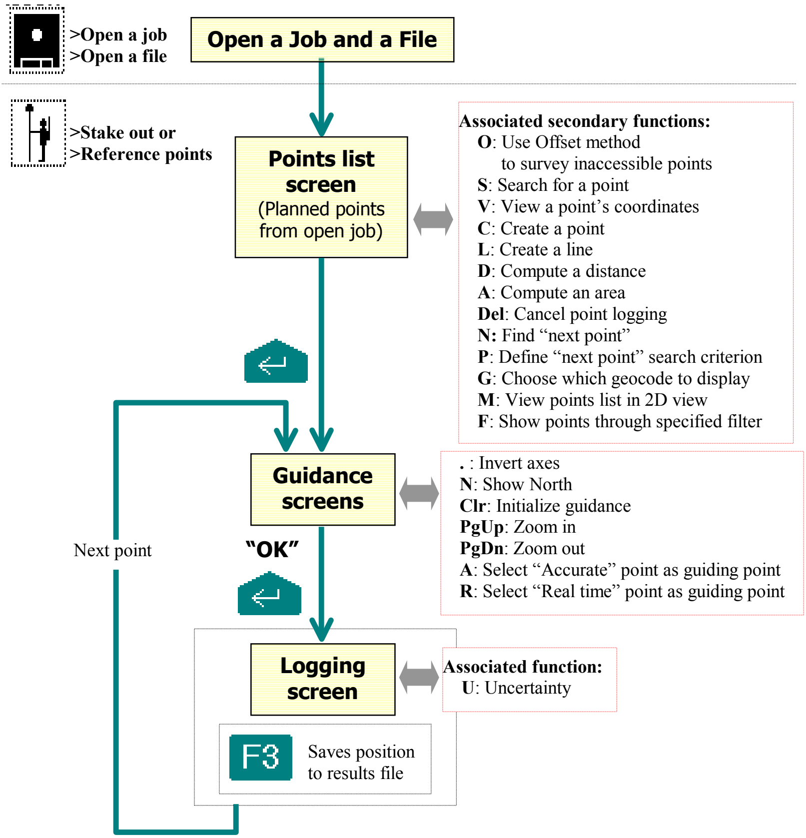
This is the most simple way of using the rover. Once you are in the working area, you simply and freely log all the interesting points, without referring to any list of pre-planned points.



4

Scenario #2: Stake out

This scenario leads you to the points planned by KISS (target or reference points), to materialize their locations in the field, and to log their positions for further cross-checking with KISS.

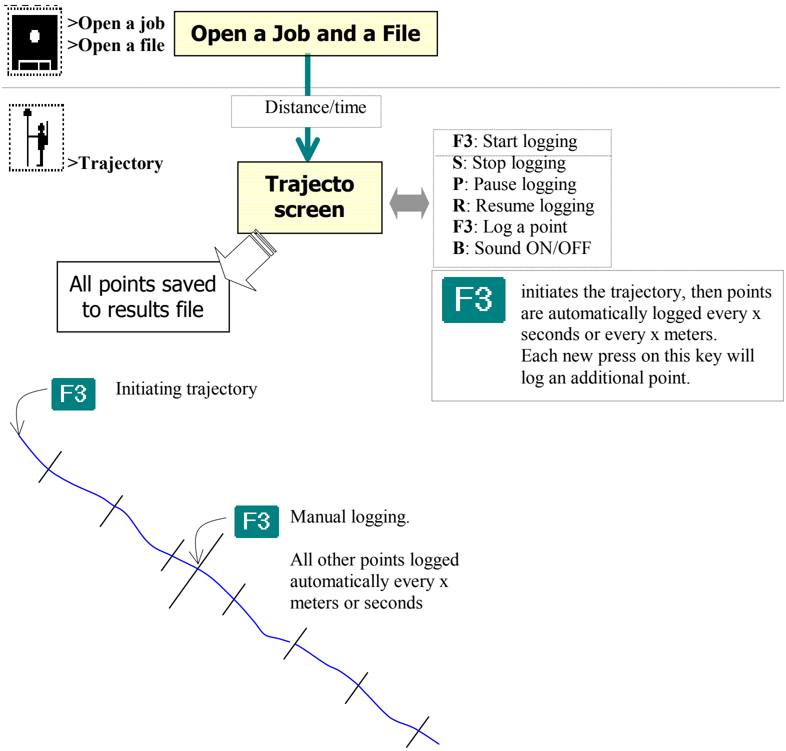


Scenario #3: Surveying a Trajectory

A trajectory can be surveyed in one of the following two modes:

- Distance mode: as you walk along the trajectory, the rover will log your current position every x meters traveled until you stop working in this mode.
- Time mode: as you walk along the trajectory, the rover will log your current position every x seconds until you stop working in this mode.

In both cases and at any time during the survey of the trajectory, you will be allowed to perform the logging of any point. This point will also be part of the series of points making up the trajectory.



4

Scenario #4: Surveying a Profile

This function provides guidance instructions to help you walk along a *profile*. In fact, a *profile* is a series of points you have previously chosen and arranged in a given order (any type of point can be used, i.e. reference, target or result points). The straight line connecting any two consecutive points that are part of the *profile* is called *segment*.

From the profile guidance screen, the following operations can be performed:

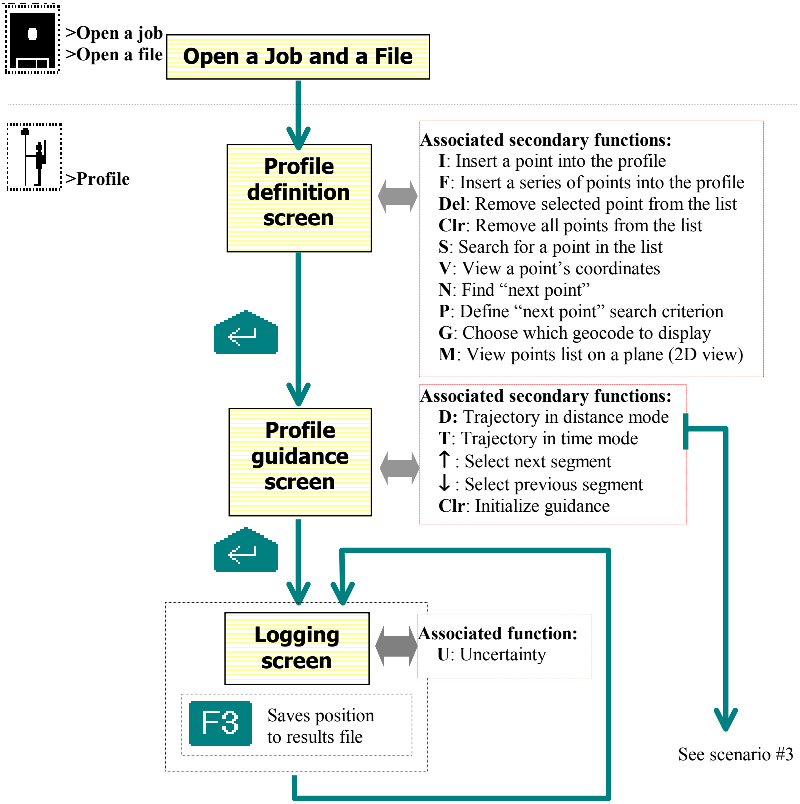
- Logging any point
- Logging a trajectory in distance or time mode
- Manual selection of the next or previous segment.

You cannot create a profile with KISS. Instead, you can anticipate the creation of a profile by creating the corresponding points with appropriate names (i.e. producing the list of points in the desired order when sorting these points into alphabetical order) and by allocating the same geocode to all these points.

Then, with the User Interface, you will be able to quickly retrieve these points through the search command —by specifying the appropriate geocode criterion— so that you can use the resulting list of points directly as a profile.

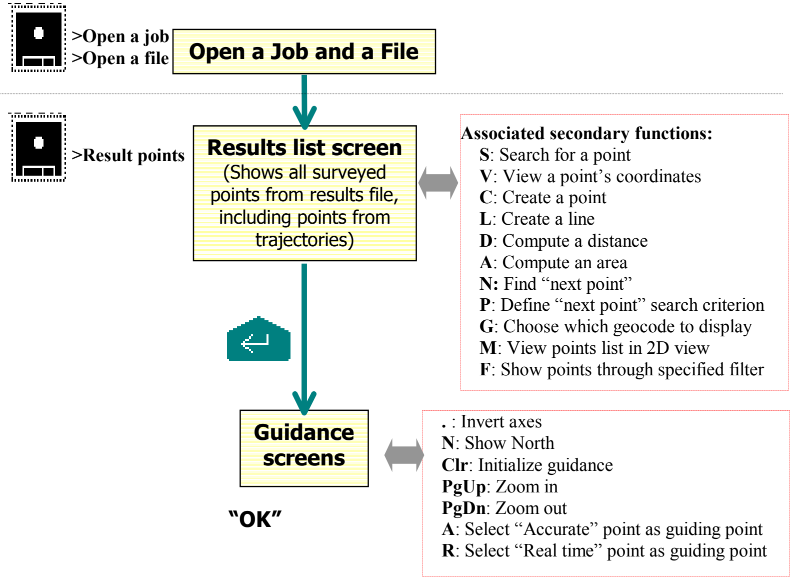
A job can contain only one profile.

Scenario #4:


>Open a job
>Open a file
Open a Job and a File
>Profile
Profile definition screen
Associated secondary functions:
I: Insert a point into the profile
F: Insert a series of points into the profile
Del: Remove selected point from the list
Clr: Remove all points from the list
S: Search for a point in the list
V: View a point's coordinates
N: Find "next point"
P: Define "next point" search criterion
G: Choose which geocode to display
M: View points list on a plane (2D view)
Profile guidance screen
Associated secondary functions:
D: Trajectory in distance mode
T: Trajectory in time mode
↑ : Select next segment
↓ : Select previous segment
Clr: Initialize guidance
Logging screen
Associated function:
U: Uncertainty
F3
Saves position to results file
See scenario #3

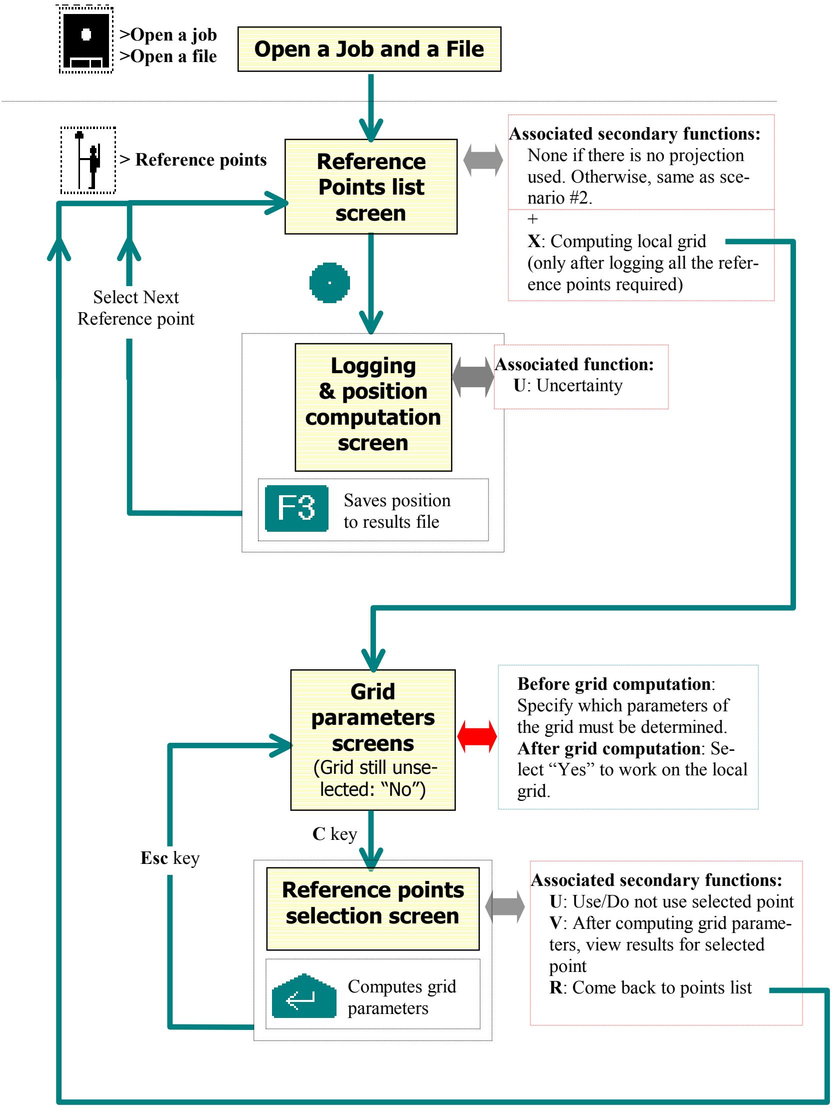
Scenario #5: Using Result Points As Planned Points

Surveyed points can be re-used as planned points just for the sake of being guided back to these points (no position logging allowed).



Scenario #6: Computing a Local Grid

See also page 5-33.



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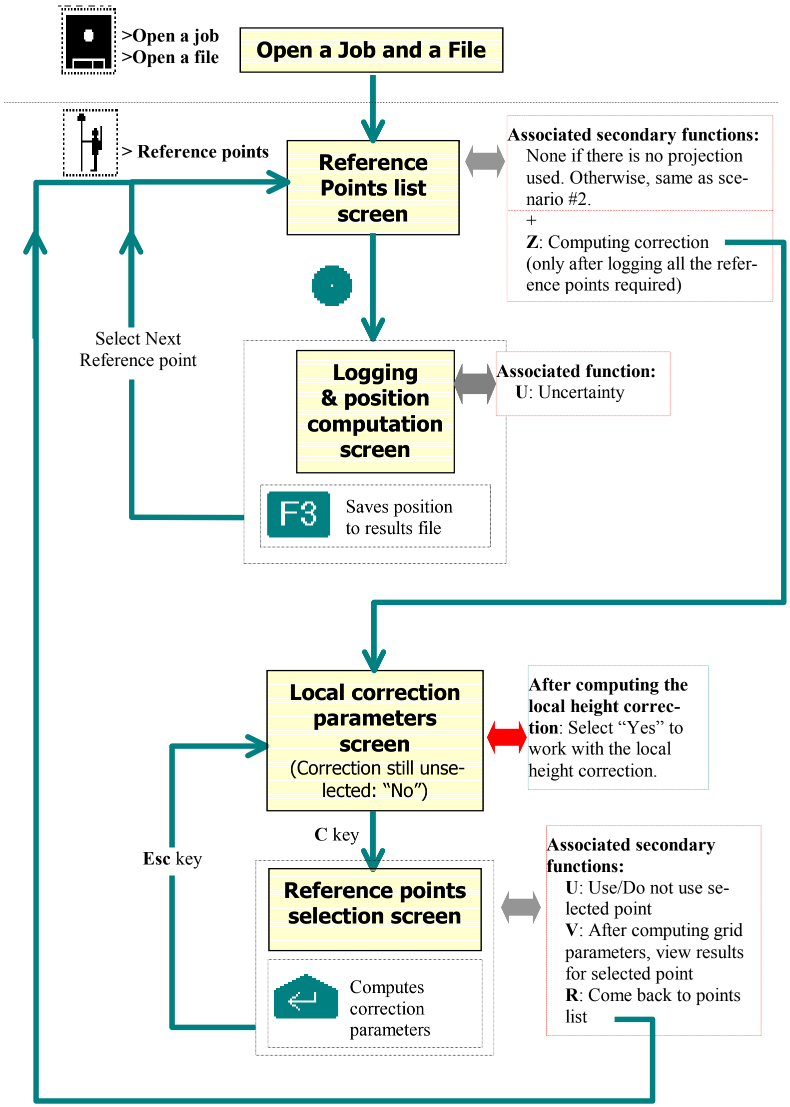
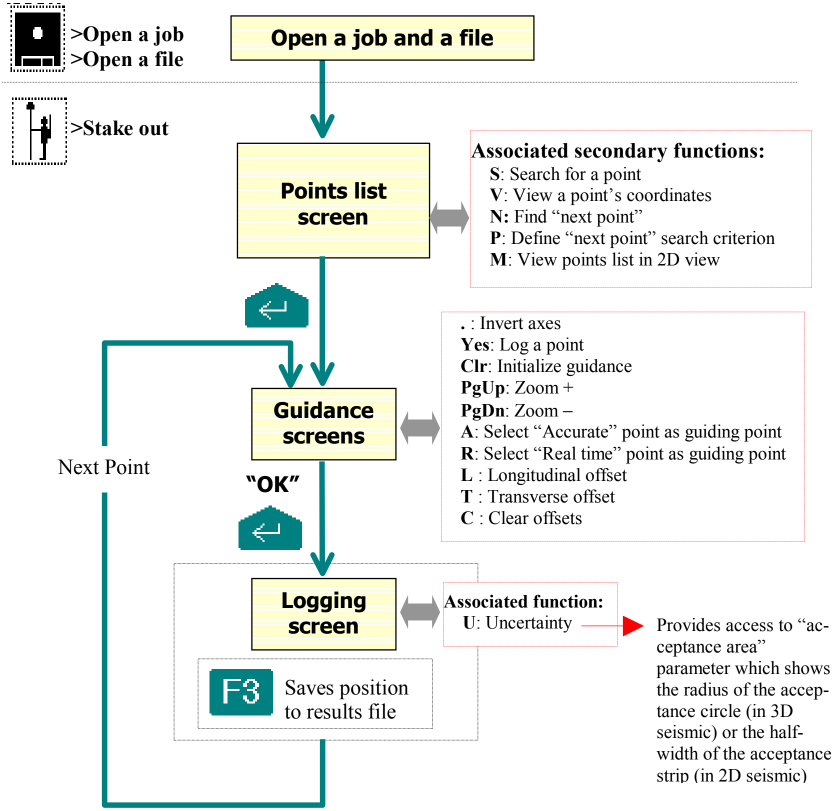
Scenario #7: Computing a Local Height Correction

See also page 5-33.



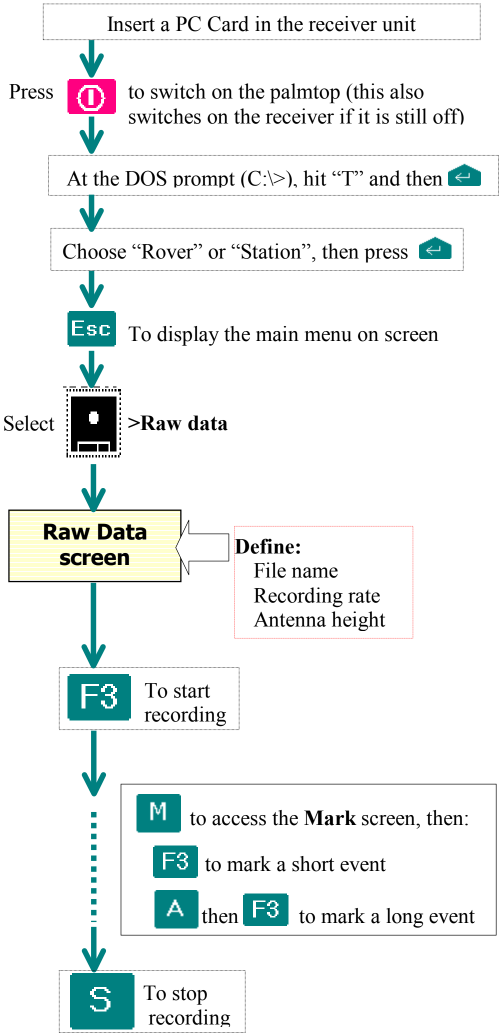
Scenario #8: Seismic staking out

This scenario leads you to the points planned by SISS (target points), to materialize their locations in the field, and to log their positions for further cross-checking with SISS.

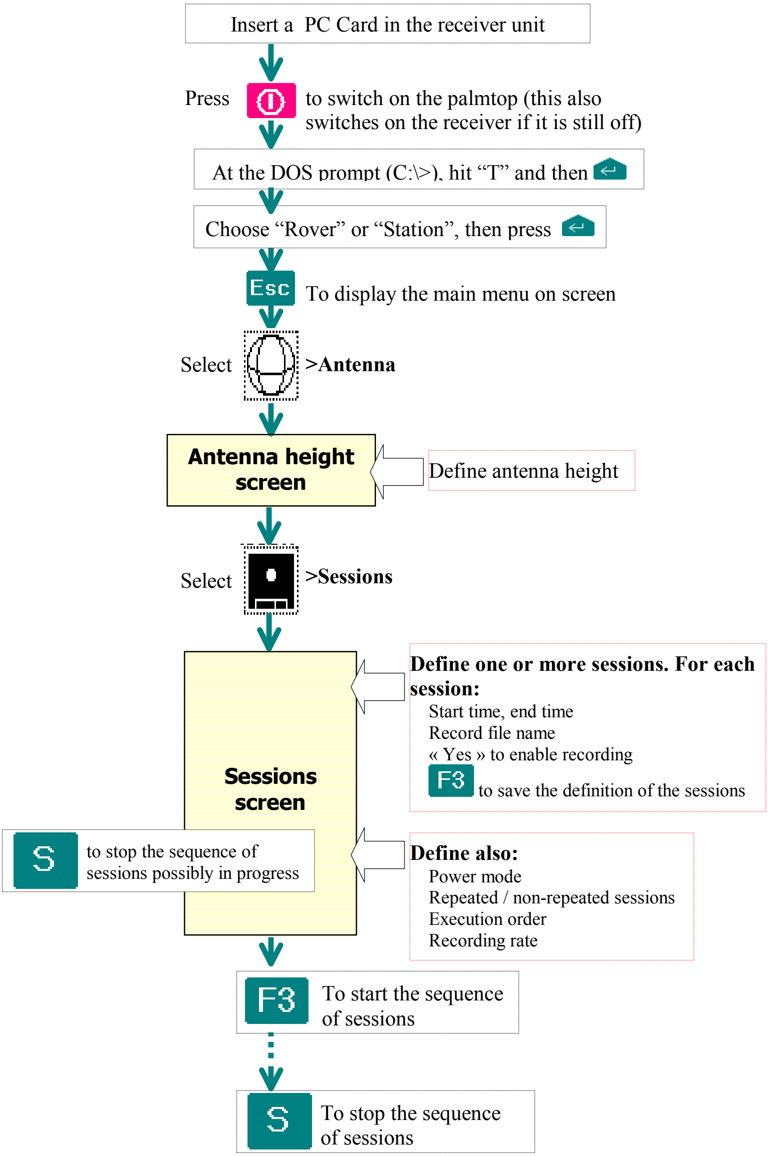


At any time while being guided to a target point, and regardless of whether you are within its acceptance area or not, you can also log the position of any point (the logging screen is accessed directly by pressing on ⏎).

Scenario #9: Immediate, palmtop-controlled recording of raw data



Scenario #10: Programmable raw data recording



4

Scenario #11: Immediate recording of raw data without palmtop

Press  to switch on the receiver

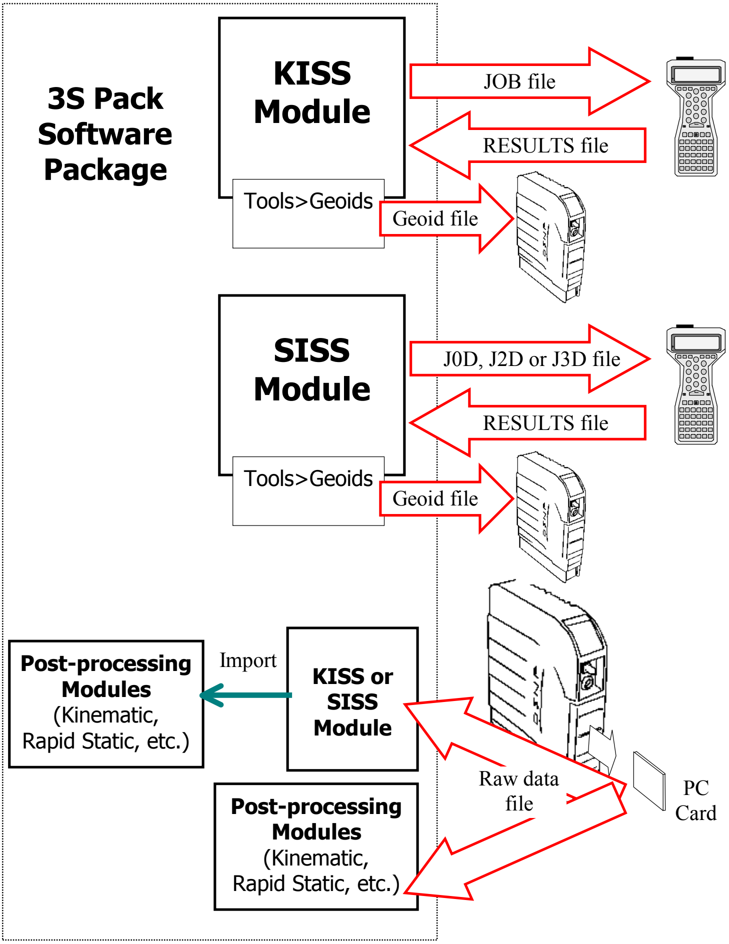
Insert a PC Card in the receiver unit

Press the push-button located under the PC card slot to ask for raw data recording. The indicator light below starts flashing:

Close the PC Card flap. The indicator light remains lit meaning that recording is now in progress

To end recording, open the flap (the indicator light starts flashing again) and press the push-button (the indicator light goes out denoting end of recording).

Possible file transfers between office software and field equipment



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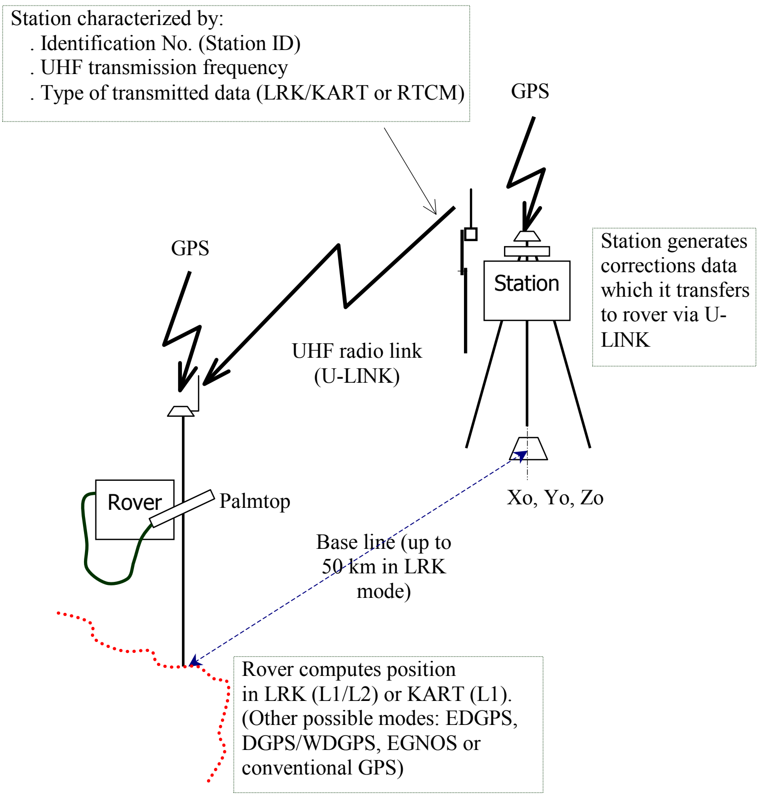
5. 6500/6300 Series Basics

This section gathers all the theoretical notions required for best use of the 6500/6300 series.

Introduction

❑ Real-Time System Block Diagram



5

❑ Sessions, power mode, raw data recording and markers

• Any equipment from the 6500/6300 series, whether a station or a rover, can be operated through sessions.

A session is merely an interval of time during which you wish the equipment to be powered and operated. The rest of the time, the equipment will be in standby mode. Up to 8 different sessions can be programmed.

• Likewise, any equipment, whether a station or a rover, can record raw data if the “Recording” firmware is present (always true in 6500 series, comes as an option in the 6300 series).

Combining sessions and raw data recording is possible: raw data recording can be achieved manually (you control the start and times of recording), or automatically through sessions.

• Another fundamental parameter tied to sessions is the power mode. There are two possible power modes:

- Manual power mode: you keep full control of the receiver power supply independently of the running sessions, if any.
- Automatic power mode: the receiver power supply is under the control of the programmed sessions. The receiver is automatically switched on a few minutes before the beginning of a session and is switched off immediately after the end of the session.

In practical terms, you will do the following, according to the operational destination of your equipment:

- Station, real-time: by way of sessions, you can ask the station to switch on and off automatically at planned times (on a daily basis or not), thus allowing you to save energy from its batteries (this operating mode requires that you choose the **Automatic** power mode).

- Station, post-processing: same approach as in real-time for sessions, except that you will program raw data recording during sessions, as requested by the surveying method used.
- Rover, real-time: using sessions is not appropriate.
- Rover, post-processing: Raw data recording function can be performed either through manual control or through sessions. The first method is however more flexible than the second.

Before doing anything about sessions, you must know that :

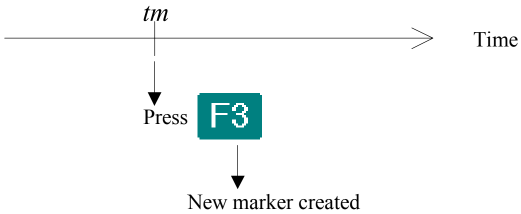
- If you do nothing with sessions, then the receiver will operate on a permanent basis from the moment you switch it manually on until the moment you switch it off manually.
- Changes can be made to sessions only if the sequence of sessions has been disabled.

❑ Markers

Markers can be placed in log files while raw data is being recorded so that particular moments during the recording can easily be retrieved. In fact when you create a marker, a specific data block is inserted into the log file.

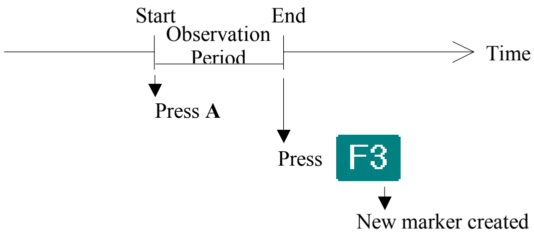
There are two possible types of markers:

- Short marker: you just press the **F3** key at the interesting time *tm* to create the marker.



  For example, this type of marker will allow 3S Pack to compute a position solution for that very particular moment in the recording.

- Long marker: allows you to encompass any observation period. First press the **A** key to indicate the beginning, and then **F3** to indicate the end of this period.



  For example, this type of marker will allow 3S Pack to compute an averaged position solution over this observation period.

Notepad

The notepad is a text file independent of the job under way. It can be used to compile all useful comments and remarks during field operations. The file consists of one or more *notes* which you can create at any time, when needed. It is called note.txt. Notes are added into this file whether the palmtop is used in standalone or is connected to a rover or to a station.

Whenever you create a note, the corresponding text is placed at the end of the file, after the previously created one. The format of each note is the following:

1: Date
2: Time
3: Name of the job in progress
4: Note as such (text), 150 characters max. in length.

Accessing the notepad is simply obtained by the **Shift+F1** key combination from anywhere in the User Interface program. In addition, from within the **Distance** and **Area** functions, you can directly format a new note containing the information computed in these contexts.

After you press **Shift+F1**, the palmtop lists the notes present in the notepad.

❑ Measuring the GPS antenna height above the ground

All systems from the 6500/6300 series need to know exactly the height of the GPS antenna's phase center (PC) above the ground. Three different methods are available in the User interface so that you can properly measure and enter this height:

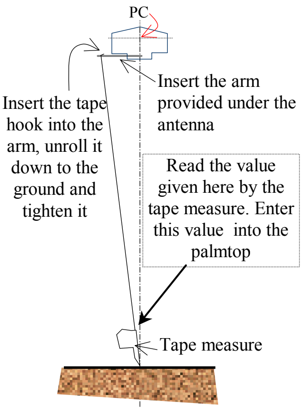
- **Oblique**: you must take down the distance given by the tape measure used as indicated below. <u>This measurement method is only possible with the NAP or some other types of antennas</u>.
- **Vertical**: you must simply measure the vertical distance between the ground and the base of the antenna the height of which is accurately known with respect to the phase center
- **Height**: you must directly measure the true height between the phase center and the ground, which supposes that the location of the phase center is materialized on the antenna

Of these three methods, choose the one that suits best, depending on the type of antenna used and whether you are preparing a station or a rover.

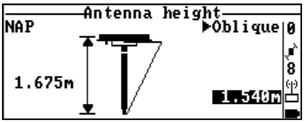
With the NAP antenna, the default measurements are "OBLIQUE" for a station, "VERTICAL" for a rover, with an *offset* —distance between phase center and antenna base— automatically set to the right value (0.036 m) for this second method.

All typical cases of antenna height entries are given below, for both the station and the rover, and depending on the measurement method and antenna type used.

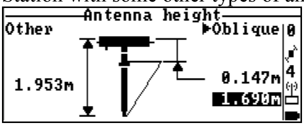
Oblique



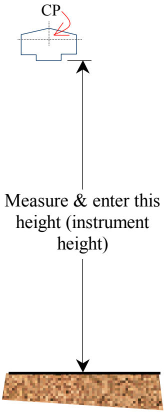
Station with NAP



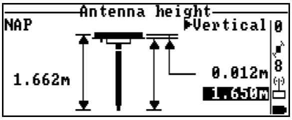
Station with some other types of antennas



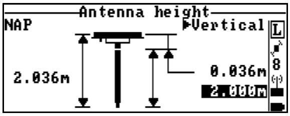
Vertical



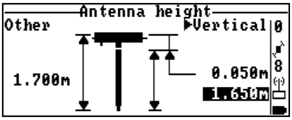
Station with NAP



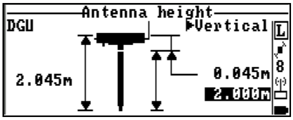
Rover with NAP on 2-m rod



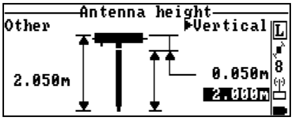
Station with other antenna



Rover with DGU on 2-m rod



Rover with other antenna on 2-m rod

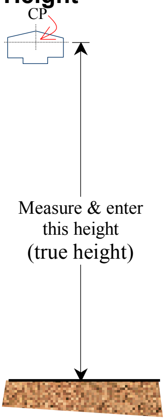


Note that the default offset for a NAP00x is different, depending on whether you are preparing a rover (offset=3.6 cm) or a station (offset=1.2 cm).

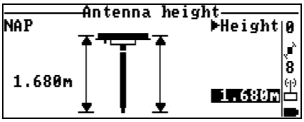
The reason for this is that it is easier at the station to measure the vertical distance between ground and the upper side of the antenna's ground plane, thus resulting in a phase center located 1.2 cm above this part.

On the contrary, with a rover, it is easier to enter the length of the rod used and so to define as offset the distance from the phase center to the base of the 5/8" adapter (3.6 cm).

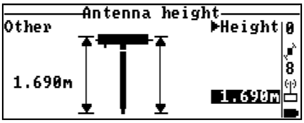
Height



Station with NAP



Station with other antenna



5

Station

❑ Operating modes

Basically, a station can function in two different operating modes:

- The *transmission* mode (via U-LINK UHF radio, or other), the normal operating mode for a 650x SK station, in which the useful data is transmitted to users through the data link. This mode is incompatible with 650x SP stations.
- The *Average position* mode, in which the station is requested to provide a position solution of its own location at the end of a certain time, by continually averaging the position solutions collected over this time (all positions computed in conventional GPS). This operating mode should be run only if the position of the station is unknown or insufficiently known. It should be run for a certain time (see table below). Then the averaged position should be entered as the station's position when preparing the station to operate in *transmission mode*.

Operating time in Average Position mode	Expected uncertainty on the station's coordinates at the end of this time	
	Without SA	With SA
10 min	< 10 meters	< 50 meters
30 min	7 meters	30 meters
1 hour	5 meters	20 meters
12 hours	2 meters	5 to 10 meters
24 hours	< 2 meters	< 5 meters

Using an averaged position as the station's reference position does not allow you to work in absolute mode as the accuracy on this position is poor compared with that of the system.

For this reason, you can only work in relative mode in this case. We mean that the LRK or KART accuracy for example will actually exist on the surveyed points, but only when differencing their coordinates, not in an absolute manner (for each point taken individually). This is due to the fact that the uncertainty on the station position is inherently passed on to all the points you survey in these conditions of work.

❑ Operating several 650x SK stations concurrently

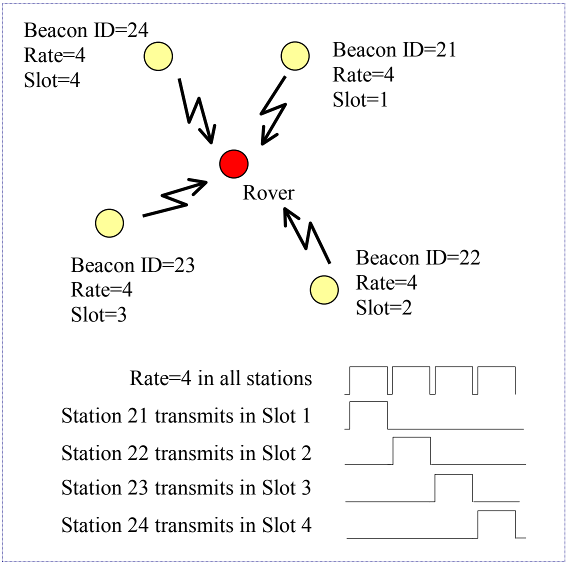
Several 650x SK stations can be operated concurrently, on the same UHF frequency, to cover a working area.

Depending on the rover location within the area, you will use the station within range, the one with the best reception level, and will ignore all the others.

To implement multi-station operation, you must resort to the **Rate** and **Slot** parameters on the UHF transmitter screen (see page 2-9) in each of the stations concerned. The principle is as follows:

- The **Rate** parameter stands for the elementary time interval (6 seconds max.) required for each of the stations to transmit, knowing that the stations transmit their corrections one after the other. Consequently, the same value of **Rate** must be assigned to ALL the stations.
- The **Slot** parameter indicates from which second within the above elementary time interval a station is allowed to transmit. Each station should therefore be assigned a different **Slot** parameter. As the time interval (**Rate**) is synchronous with the GPS time in all stations, stations will transmit without overlapping.

Multi-station network example:



Rover

❑ Position computation mode used at the rover

The following position computation mode should be selected in the rover, depending on the system used:

Real-time system	Computation mode to be used (see page 3-64 >Operating mode)
6502 MK-6502 SK	LRK
6501 MK-6501 SK	KART
6301 MG	WADGPS

The following differential data source should be selected, depending on the computation mode to be used and the hardware configuration of your real-time system:

Computation mode	Source of differential data used (see page 3-64 >Operating mode)
Conventional GPS	No Diff
DGPS, EDGPS, KART, LRK	U-LINK UHF receiver (1)
DGPS, EDGPS, KART, LRK	RTCM or GSM receiver (2)
WADGPS	WAAS EGNOS

(1) Standard supply.
(2) External receiver, not a standard supply. GSM as an option.

The table below summarizes the operational characteristics of the different possible position computation modes.

Computation mode	Processing type	Initialization	Accuracies (1)	Use domain (2)	Position output rate	Latency
GPS	Conventional GPS	Immediate	metric without SA, decametric with SA	- (unlimited)	20 Hz max.	-
DGPS	Differential, code processing, single-frequency (L1)	Immediate	sub-metric: 50 cm + 2 ppm (X-Y) 1 m + 4 ppm (Z)	1000 km	20 Hz max.	< 5 ms
WADGPS (3)	Differential, code processing, single-frequency (L1)	Immediate	< 2 meters	2000 km	20 Hz max.	< 5 ms
EDGPS	Differential, phase processing, single-frequency (L1)	Immediate	20 cm + 2 ppm (X-Y-Z)	a few hundreds of km	20 Hz max.	< 5 ms
KART	Kinematic, phase processing, single-frequency (L1)	5 minutes	**KART, accurate:** 0.5 cm + 0.5 ppm (X-Y) 1 cm + 1 ppm (Z)	12 km	1 Hz	1 s
			KART, real time: 1 cm + 0.5 ppm (X-Y) 2 cm + 1 ppm (Z)	12 km	20 Hz max.	< 5 ms
LRK	Kinematic, phase processing, dual-frequency (L1/L2)	30 seconds	**LRK, accurate:** 0,5 cm + 0.5 ppm (X-Y) 1 cm + 1 ppm (Z)	40 km	1 Hz	1 s
			LRK, real time: 1 cm + 0.5 ppm (X-Y) 2 cm + 1 ppm (Z)	40 km	20 Hz max.	< 5 ms

(1) Measurement conditions: at 1σ, 5 SVs received, PDOP< 4, normal ionospheric conditions, favorable multi-path environment, differential data continuously received. All values expressed in ppm refer to the baseline length (station-to-rover distance).

(2) Distance between user and differential data source (except for WADGPS).

(3) In this computation mode, data is received by the GPS antenna from geostationary satellites (EGNOS for Europe, WAAS for the USA, MSAS for Asia). This data includes **pseudo-ranges** relevant to one or more geostationary satellites (these pseudo-ranges are then inserted into the usual set of pseudo-ranges which the system uses in the position processing), **integrity messages**, which may trigger alarms within seconds, and sets of **differential corrections** of the WADGPS type.

Initialization modes in KART or LRK mode

When starting a survey, you can use one of the following modes to initialize the rover:

OTF : The position processing is started without any reference to an initial point (**OTF** means “**O**n **T**he **F**ly”). OTF is the default initialization mode.

During the survey and in the event of phase loss, OTF will be selected systematically for re-initialization whatever the mode you initially chose.

Static : The position processing is started assuming that, at the beginning of the job, the rover is held still throughout the initialization time.

Z fixed : The position processing is started assuming the Z coordinate is held fixed throughout the initialization time.

Point : The position processing is started, assuming the rover is located on a specified point while being initialized.

To set this parameter, refer to page 3-64.

❑ Computing & logging process

Except in trajectory surveying where logging is immediate, logging a position always takes place in two steps:

- First, you ask the equipment to compute the coordinates of the position where you are.

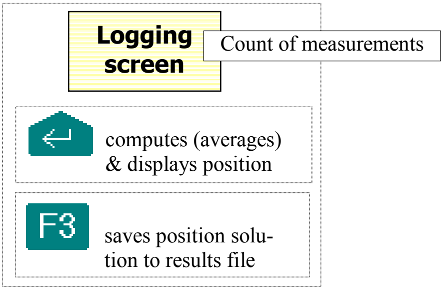
  The computing phase can include an averaging process if you have decided that this must be so. This particular aspect in position computing is controlled by the “Count of measurements” parameter on the Logging screen:

  - If *Count of measurements=1*, there will be no solution averaging. The first solution computed will be the one displayed and proposed for logging. This is the fastest way of working.

  - If *Count of measurements=n (>1)*, the solution proposed for logging will result from the averaging of the *n* requested measurements acquired from the moment you ask for a position solution. Obviously, with this method, the computing time is longer but provides an even more accurate solution.

  So at the end of the computation, the system returns a solution on the screen complete with quality-related data.

- Then, after assessing the quality of the solution, you can decide to save it or to discard it.



In point logging (scenario No. 1), note that the check stage may be bypassed by pressing **F3** directly. This enables computing and saving the position in a single operation.

❑ Logged point versus “guiding point” (or accurate point versus real-time point) in LRK mode

The system computes two types of position solution in LRK mode:

- An “accurate solution” (A), at an update rate of 1 second, available after 1-second processing time
- An extrapolated “real-time solution” (R), at an update rate of 500 milli-seconds

Whenever you log a point, your equipment will invariably save the accurate solution.

When surveying planned points however, you can decide to select the real-time solution to lead you to targets rather than to use the accurate solution.

This choice can be done if you wish to work faster with a lesser level of guidance accuracy.

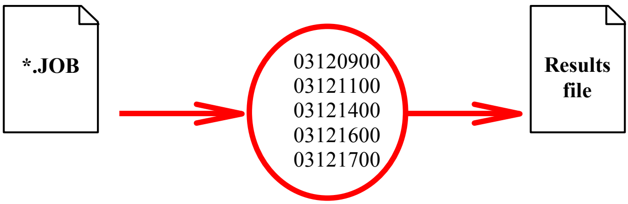
If you make that choice, remember however that the logged solution is still the accurate solution (the latest available), even though the instructions on the guidance screen originate from the real-time solution.

To choose the type of point used on guidance screens, press the **A** key (for accurate) or the **R** key (for real time). Refer to page 3-10 to see how this choice is shown on the screen.

❑ About *jobs* and *files*

Jobs: All instructions for executing a survey are contained in a job file (*.JOB). All data collected during a given job are stored in the same results file.

Files: To run a job, you must create one (or more) files. These *files* are not files in the computer sense, but instead will appear as headers in the results file. Default name: mmddhhmm (month day hours minutes).



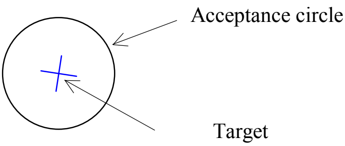
While running a job, the notion of *file* allows you to view just the data relevant to this file, which means a shorter, more legible results list.

Later, KISS will let you retrieve just the data you need by invoking the name of the corresponding *file.*

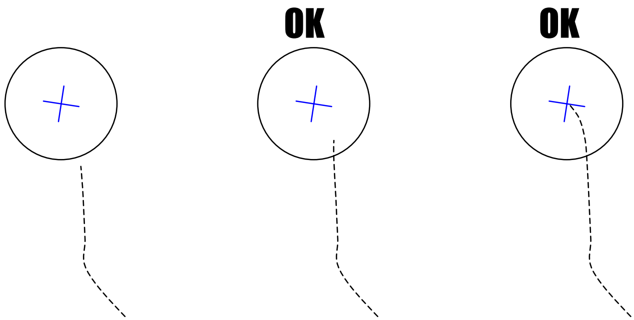
❑ Acceptance circle & uncertainties

The notion of acceptance circle is introduced in planned-point surveying to give the rover a reference from which it can deduce the moment when a valid position for a target can be computed and logged.

As shown below, the acceptance circle is centered around the target.



When you enter the acceptance circle of a target, the User Interface informs you of this event by displaying the “**OK**” message on the screen. The “**OK**” message will remain visible on the screen throughout the computing & logging phase as long as you stay within the limits of the circle.

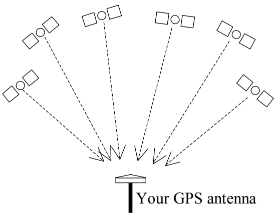


To set the radius of the acceptance circle, select the **Uncertainty** screen (see page 3-48).

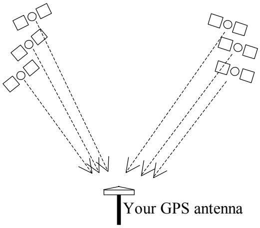
GDOP

This parameter is representative of the GPS satellite distribution in space seen from your GPS antenna.

The lower the GDOP, the better the satellite distribution in space, and therefore the higher the quality of GPS points, irrespective of the computation mode used.



Good distribution
of satellites in space
excellent GDOP
(0<GDOP<5)



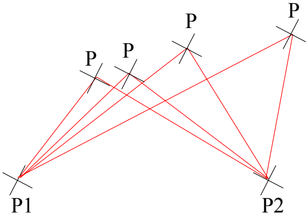
Poor distribution
of satellites in space
poor GDOP
(GDOP>5)

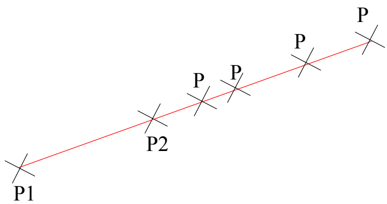
To view the GDOP last computed, see page 3-67.

❑ Offset methods when surveying non-planned points

If you know, or if you realize while walking to a point, that you cannot go to this place —mainly because it is physically impossible or because the antenna will probably be masked there — you can then resort to one of the following three offset methods to survey the point.

Warning! Any support point (P1, P2 and possibly P3 and P4) that you log during an offset procedure will systematically remain indefinitely valid. This is to speed up the surveying of a series of P points based on the same support points.





For this reason, the next time you resort to an offset procedure, if the support points are no longer the right ones, do not forget to delete the solutions attached to these points before you start the offset procedure.

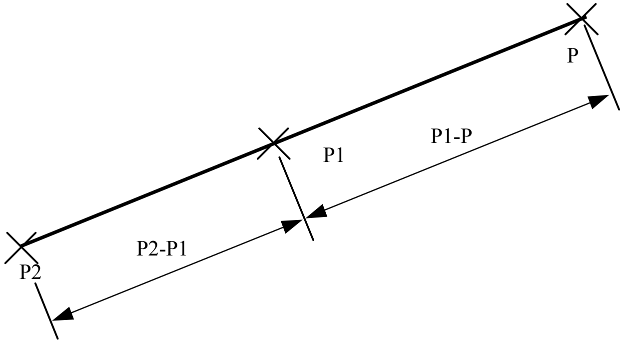
The choice of a method rather than the other depends on the feasibility of computing solutions for the support points, each method proposing a different geometry.

Logging with linear Offset

Through this technique, the location of the inaccessible point (P) will accurately be deduced from two points (P1 and P2) located nearby, properly logged, and both aligned with the point.

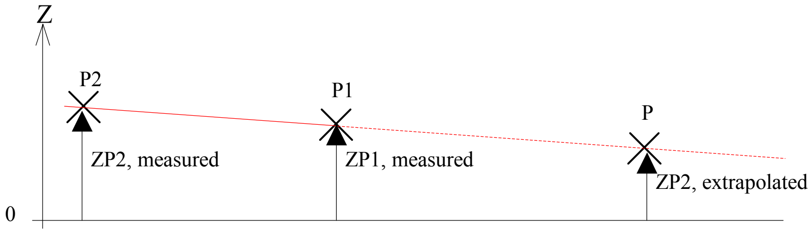
First, you will freely choose two points in the field (P1 and P2) aligned with point P.

After measuring —with other means— one of the distances separating P1 or P2 from P, you will enter this distance in the corresponding field, from which the rover will deduce the position of P.



The above-mentioned distances are all horizontal distances (between points P, P1 et P2).

The system will determine the altitude of P from the altitudes of P1 and P2 through linear extra or interpolation:

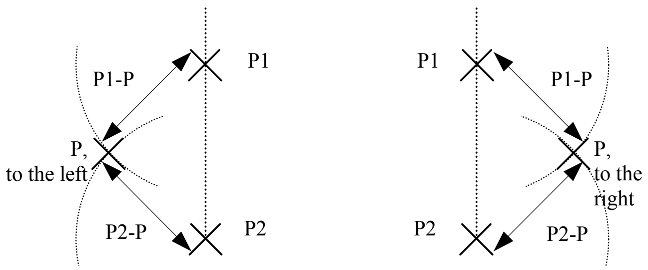


5

Logging with lateral Offset

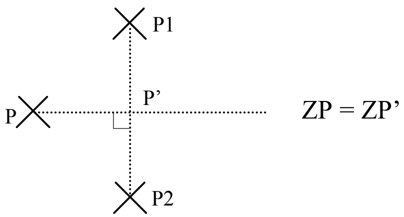
Through this technique, the location of the inaccessible point (P) will accurately be deduced from two points (P1 and P2) located nearby, properly logged, and forming a triangle with P.

First, you will freely choose two points in the field (P1 and P2) forming a "regular" triangle with P (the equilateral triangle provides the best precision possible from the geometrical point of view).



After measuring —with other means— the distances separating P1 and P2 from P, you will enter successively each of these distances when logging these points. You will also have to indicate on which side of the oriented segment P2P1 the P point is located (right or left).

As previously, the above-mentioned distances are all horizontal distances (between points P, P1 and P2). The system will determine the altitude of P from the altitudes of P1 and P2 through linear extra or interpolation along the P1P2 straight line.

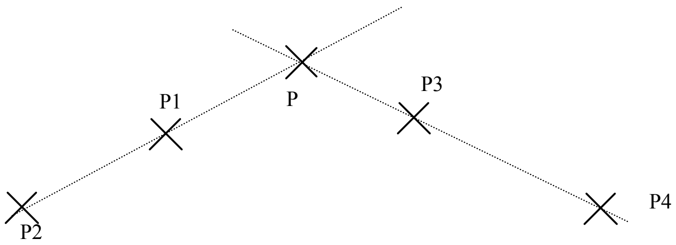


Logging with intersection offset

Through this technique, the location of the inaccessible point (P) will accurately be deduced from two pairs of points (P1,P2) and (P3,P4) defining two lines intersecting at point P.

First, you will freely choose the two pairs of points in the field so that the engendered lines intersect at P.

Then you will successively log the 4 points P1, P2, P3 and P4. The interest of this method lies on the fact that you do not have to measure anything in the field, apart from making sure that first, P1 and P2 are aligned with P, and second, that P3 and P4 are also aligned with P.



The system will determine the altitude of P by averaging the two extra or interpolated values obtained along straight lines P1P2 and P3P4, these two values being determined in the same way as in linear offset.

❑ Offset methods when surveying planned points

If you know, or if you realize while walking to a target, that you cannot go to this place —mainly because it is physically impossible or because the antenna will probably be masked there — you can then resort to one of the following two offset methods to survey the target point.

Warning! Any support point (P1, P2) that you log during an offset procedure will systematically remain indefinitely valid. This is to speed up the surveying of a series of P points (non-planned points) based on the same support points.

For this reason, the next time you resort to an offset procedure, if the support points are no longer the right ones, do not forget to delete the solutions attached to these points before you start the offset procedure.

The choice of a method rather than the other depends on the feasibility of computing solutions for the support points, each method proposing a different geometry.

Staking out with linear Offset

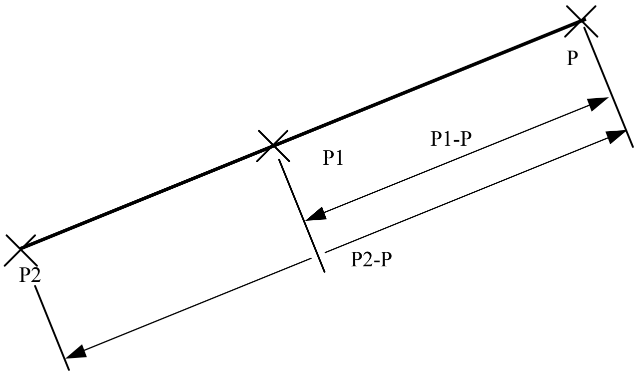
Through this technique, the location of the inaccessible target point (P) will accurately be deduced from two points (P1 and P2) located nearby, properly logged, and both aligned with the target.

First, you will freely choose and log the first point (P1), thus allowing the rover to define the direction of a line to P.

Then the rover will guide you to the other point (P2) in order to align this point with the other two. P2 can be any point on the P1-P straight line as long as a position solution can be computed on that point. You will then log P2.

As a result, the rover will provide the distances separating P1 and P2 from the target.

Finally, by way of external means (a simple meter for example), you will measure one of the distances from P1 and P2 (or the two) to the target to accurately locate this point.



All computed distances are horizontal. The system will determine the altitude of P by interpolating the altitudes of P1 and P2 (see page 5-19).

Staking out with lateral Offset

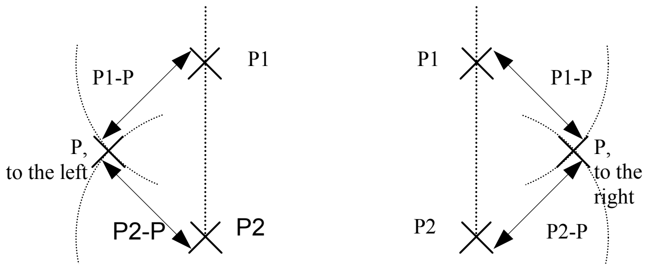
Through this technique, the location of the inaccessible target (P) will accurately be deduced from two points (P1 and P2) located nearby, properly logged, and forming a triangle with P.

First, you will freely choose the first point (P1). You will log this point thus allowing the rover to provide the distance separating this point from P.

Then, you will freely choose the other point (P2), keeping in mind that P1 and P2 should form a "regular" triangle with the presumed location of P (the equilateral triangle provides the best precision possible from the geometrical point of view). You will also log point P2 thus allowing the rover to provide the distance separating this point from P.

As a result, the rover will also indicate the direction of P (to the right or to the left) in reference to the oriented segment P2P1.

Finally, by way of external means (a simple meter for example), you will measure the distances from P1 and P2 to P, drawing two arcs of circles on the ground, the intersection of which (to the right or to the left of P2P1) will provide the exact location of P.



All computed distances are horizontal. The system will determine the altitude of P through linear interpolation along the P1P2 straight line (see page 5-20).

❑ Point creation methods

As you progress in a field survey, you may be interested in creating points, either by entering their coordinates from the keyboard, or by letting the rover deduce them geometrically from target and reference points of your job, or even from the result points currently at your disposal.

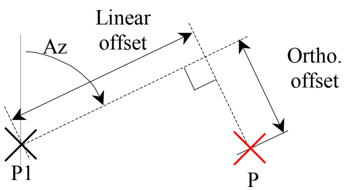
5 geometrical methods are possible to create a point, as described below:

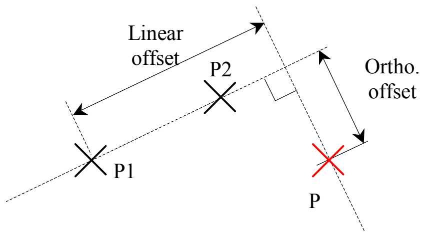
1. Creating a 2D point (E, N) through mathematical translation:

The P point created through this method is situated on a straight line perpendicular to another straight line passing though a given point (P1).

The direction of the line including P1 results either from a given azimuth or from the fact that this line must also pass through another given point P2.

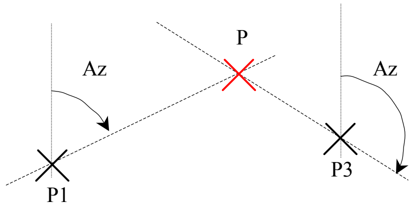
The rover also needs an orthogonal distance (ortho. offset), and a longitudinal distance (linear offset) to be able to complete the creation of the point, as illustrated below:

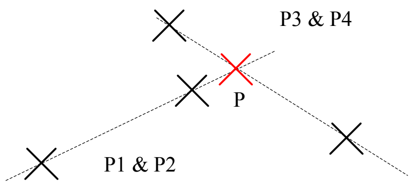




2. Creating a point at the intersection of two straight lines

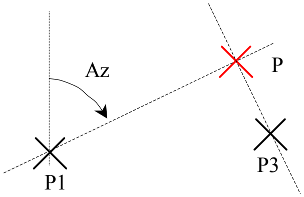
The P point created through this method is situated at the intersection of two straight lines. Each straight line is defined either by a point (P1 / P3) and the azimuth of the line, or by two points (P1 & P2 / P3 & P4).

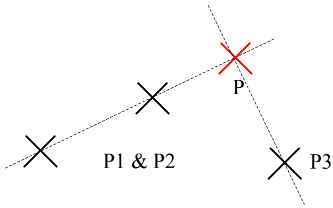




3. Creating a point at the intersection of two orthogonal straight lines

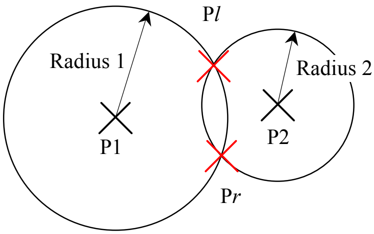
The P point created through this method is situated on a straight line passing through a point P3, perpendicular to another straight line whose direction is defined either by a point (P1) and the azimuth of the line, or by two points (P1 and P2).

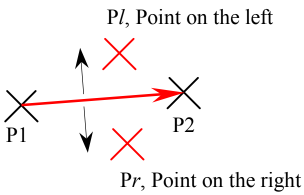




4. Creating points where two circles intersect

The two points that may be created through this method are the intersection points of two circles whose centers are P1 and P2. The radius of each circle must be specified. To discriminate between the two intersection points, the following convention is used: Assuming an observer is on vector P1P2 and oriented in the same direction, then the point seen on the right of P1P2 is P*r*, the point seen on the left is P*l*.

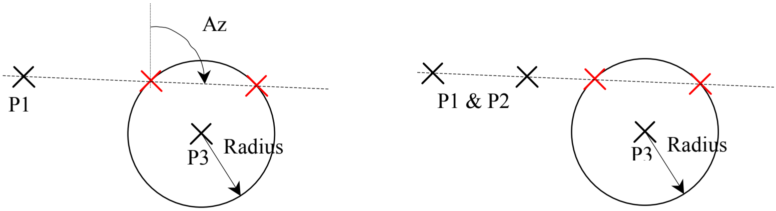




When pressing F3 to create the two points, the User Interface will ask you whether you want to create the two points, or only one of them.

5. Creating points where a circle and a straight line intersect

The two points that may be created through this method are the intersection points of a circle, whose center is P3, and a straight line defined by a point (P1) and the azimuth of the line or two points (P1 and P2). The radius of the circle must be specified.



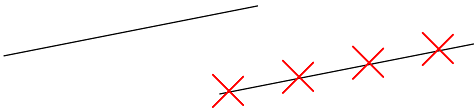
There is no way of differentiating between the two points unless you read their coordinates.

When pressing F3 to create the two points, the User Interface will ask you whether you want to create the two points, or only one of them.

❑ Creating a line parallel to a given direction

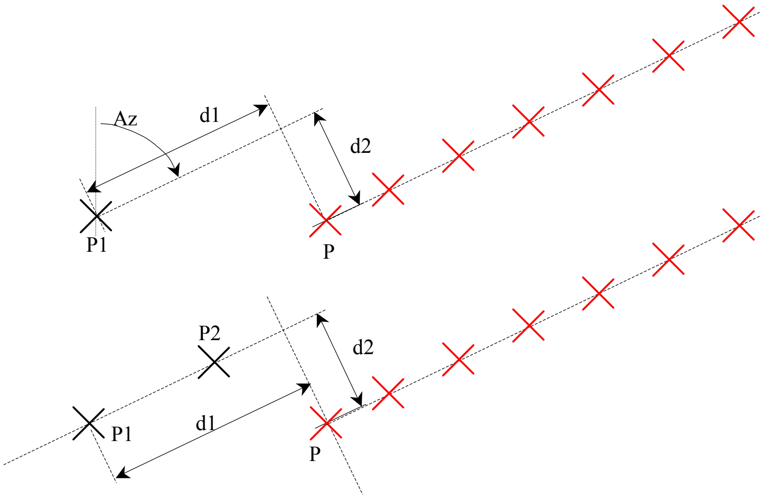
As you progress in a field survey, you may be interested in creating lines parallel to a direction given by target and reference points from your job, or even from the result points currently at your disposal.

The straight line created with this function will be composed of a series of *n* points placed at regular intervals along the line. The line will be parallel to a direction that you should specify (reference line).



The direction of the reference line is deduced from a point P1 and the azimuth at this point, or from two points P1 and P2.

In fact, the first point of the line will occupy the same place as if you were creating this point through mathematical translation (it will be located on a straight line perpendicular to the reference direction at a distance d2 from the reference line).



❑ Computing a distance

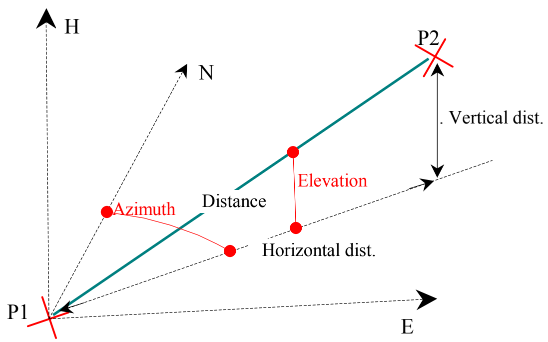
As you progress in a field survey, you may be interested in measuring the distances separating some elements of your survey (points, lines, planes). Three different types of distance computation are possible:

1. Computing the distance between any two points:

The first point (P1) involved in the computation is systematically the point selected before you invoke this function.

The second point (P2) is by default your current position if no P2 is specified, or any other specified point.

The computation result can be saved as a note.



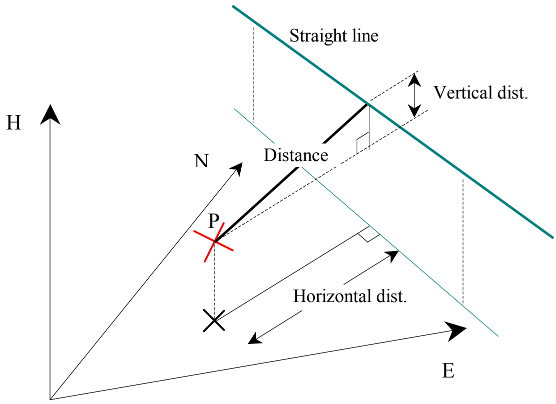
5

2. Computing the distance between a point and a straight line:

The first point (P) involved in the computation is systematically the point selected before you invoke this function.

The line is defined either by a point (P1) and an azimuth, or two points (P1, P2).

The computation result can be saved as a note.

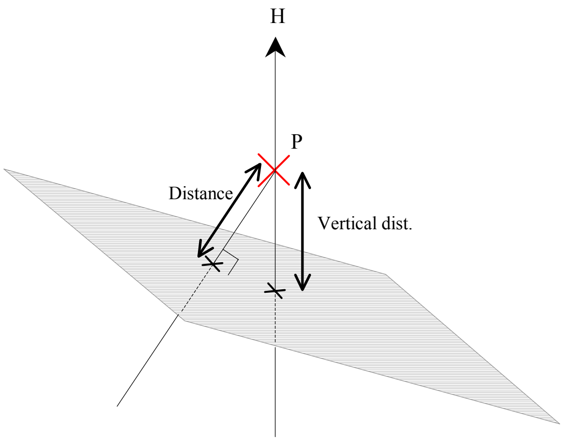


3. Computing the distance between a point and a plane:

The first point (P) involved in the computation is systematically the point selected before you invoke this function.

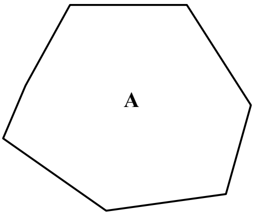
The plane is defined by three points (P1, P2, P3).

The computation result can be saved as a note.

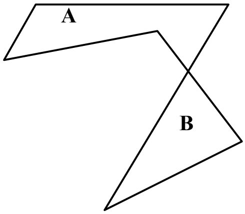


❑ Computing the area and perimeter of a polygon

This function allows you to compute any area defined by any points that you specify. The area is defined taking into account the order in which you select points. If the perimeter you define in this way intersects with itself, the computed area will be equal to the difference of the two close areas then created (in absolute value):



The system will compute the area of "A"



The system will compute $|A - B|$

Building the list of points involved in the computation of an area is similar to building a list of points making up a profile (refer to page 4-4).

❑ Refining the definition of the coordinate system used

When the working area includes reference points whose locations are accurately known in the coordinate system you have to use, and on the other hand some of the characteristics of this coordinate system are not precisely known, then you can rely on the surveying of these points to refine the definition of the coordinate system.

This kind of computation can be performed either by the rover or, when back at the office, by the 3S Pack's KISS module. Refer to the *3S Pack Reference Manual,* KISS module, for more information about geodetic choice issues.

When surveying a point, basically the rover computes the coordinates of this point on the WGS84. Then computations are run to transform these WGS84 coordinates into coordinates expressed on the chosen datum and projection.

If we assume that both the "theoretical" coordinates of a reference point expressed in the partially unknown system and the measured WGS84 coordinates for the same point are error-free, then the rover can refine the coordinate system used so that the "theoretical" coordinates of the point be precisely the coordinates obtained by transforming the measured WGS84 coordinates using the refined coordinate system.

The following operations can be performed by the rover:

- computing a local grid (see scenario #6). 2D or 3D reference points are required to complete this computation.
- computing a local height correction (see scenario #7). 1D, 2D or 3D reference points are required to complete this computation.

Note that a third type of computation is possible using reference points surveyed by the rover. The purpose of this computation, which can only be performed with KISS, is to refine the datum shifts of the system used (if it is a standard one).

Local grid

A local grid is a plane that may be chosen as a job's horizontal system. It is defined in reference to the projection used, by way of the following parameters:

East0, North0	:	Coordinates of the center point where grid rotation is made with respect to the projection used. Coordinates expressed in this projection
$\Delta East$, $\Delta North$	:	East, North deviations of the local grid's center point with respect to the projection used
β	:	Rotation angle
k	:	Scale factor.

Altitude computation modes

Depending on the choices made with KISS when preparing a job, all altitudes computed by the rover will result from one of the four calculations described in the next pages. The different parameters involved in these calculations are:

$Altitude_{WGS84}$	:	Altitude determined by the rover in reference to the WGS84
$Altitude_{Ellipsoid}$	:	Altitude determined by the rover in reference to the ellipsoid used
MSL_{ICD200}	:	Height correction read from the ICD200 model
MSL_{Geoid}	:	Height correction read from the chosen geoid
ΔH	:	Local correction applied to altitude
$H_{antenna}$	:	Height of the GPS antenna above the ground.

Refer to page 5-39 for more information about ΔH.

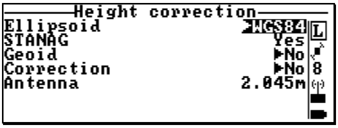
1. Altitude above ICD200 model

The following equation is used to determine the altitude coordinate:

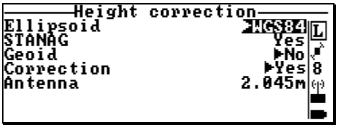
$$Altitude = Altitude_{WGS84} - MSL_{ICD200} - \Delta H - H_{antenna}$$

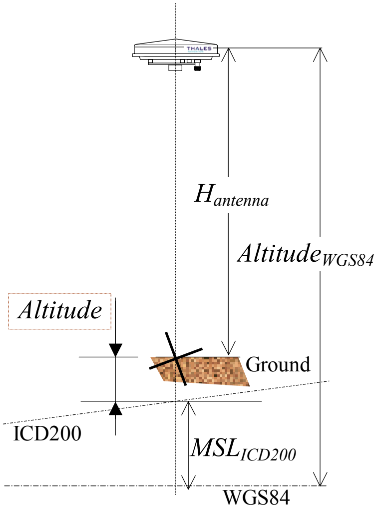
Corresponding altimetry screen on rover:

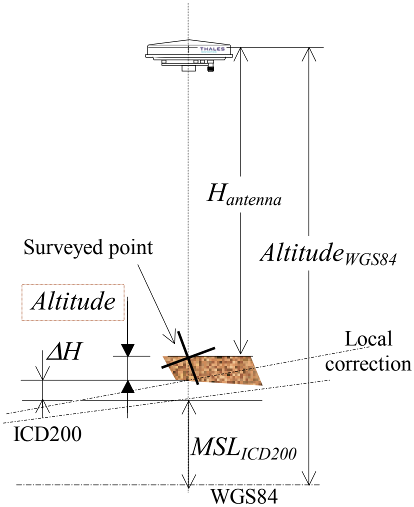
Without local correction (ΔH=0)



Or with local correction (ΔH≠0)







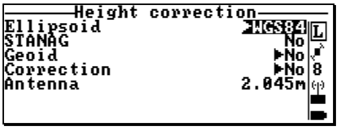
2. Altitude above WGS84 ellipsoid

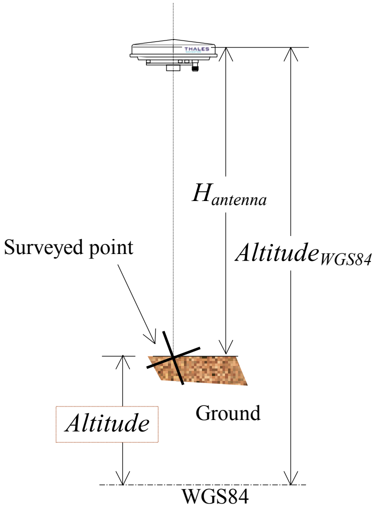
The following equation is used to determine the altitude coordinate:

$$\boxed{Altitude = Altitude_{WGS84} - \Delta H - H_{antenna}}$$

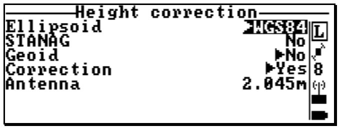
Corresponding altimetry screen on rover:

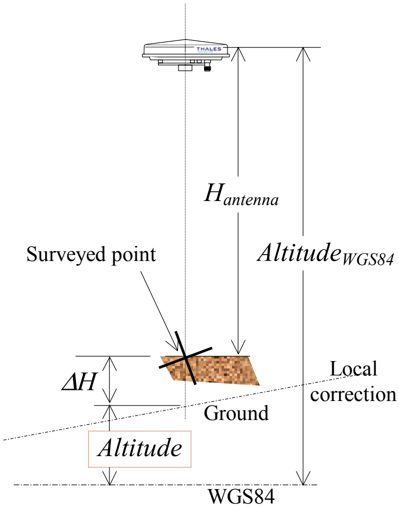
Without local correction (ΔH=0)





Or with local correction ($\Delta H \neq 0$)





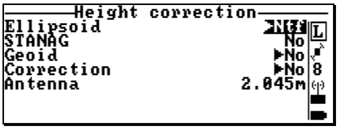
<u>3. Altitude above chosen ellipsoid</u>

The following equation is used to determine the altitude coordinate:

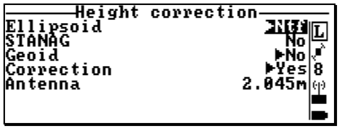
$$\boxed{Altitude = Altitude_{Ellipsoid} - \Delta H - H_{antenna}}$$

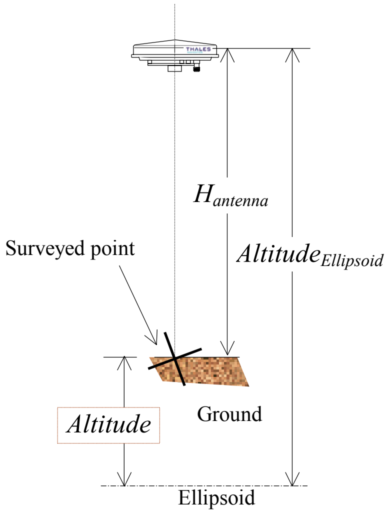
Corresponding altimetry screen on rover (example with NTF):

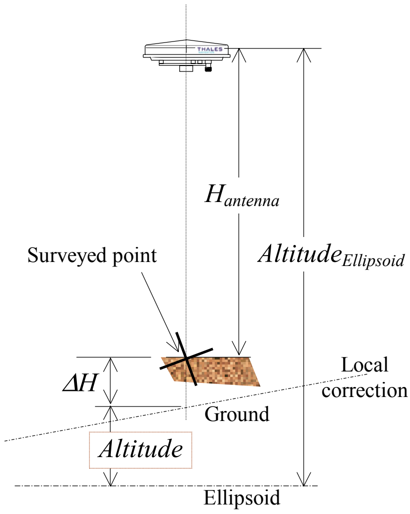
Without local correction (ΔH=0)



Or with local correction ($\Delta H \neq 0$)







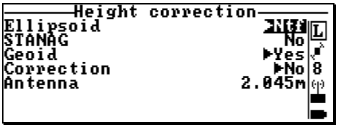
4. Altitude above chosen geoid

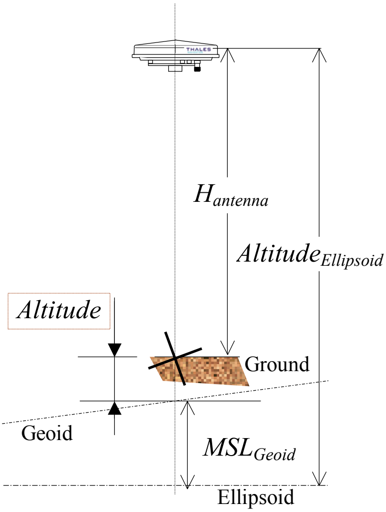
The following equation is used to determine the altitude coordinate:

$$\boxed{Altitude = Altitude_{Ellipsoid} - MSL_{Geoid} - \Delta H - H_{antenna}}$$

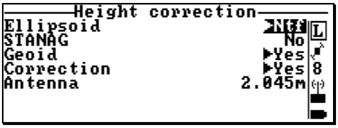
Corresponding altimetry screen on rover (example with NTF):

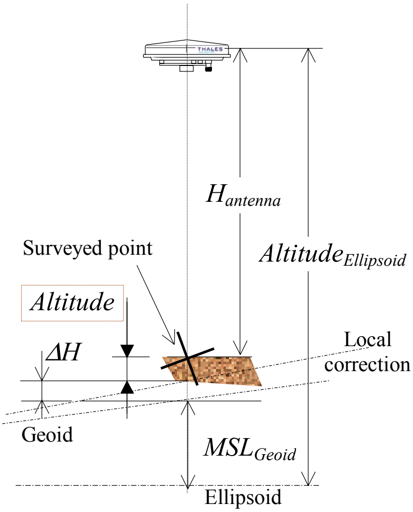
Without local correction (ΔH=0)





Or with local correction ($\Delta H \neq 0$)





❑ Local height correction ΔH

The expression of the local correction (ΔH) is the following:

$$\boxed{\Delta H = H0 + DG \times (G - G0) + DL \times (L - L0)}$$

Where:

- $H0$: Mean altitude at specified local point ($L0,G0$)
- DG : Gradient of longitude
- G : WGS84 longitude of surveyed point
- $G0$: WGS84 latitude of local point where altitude= $H0$
- DL : Gradient of latitude
- L : WGS84 latitude of surveyed point
- $L0$: WGS84 longitude of local point where altitude= $H0$

This is in fact the equation of a plane (z=ay+bx+c)

Depending on the coordinate system chosen for a job, a linear correction may be used or not. If it is used, either it was fully defined with KISS, in which case there is nothing else to do but the job, or the correction is not precisely known, in which case you will have first to refine the different coefficients present in the expression of ΔH through scenario #7 (see page 4-8).

♣

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6. Office work with KISS

Preparing jobs, and later retrieving field results, are operations made using *KISS*, one of the modules available from the THALES Navigation *3S Pack* software package.

In this section, we will just outline the main steps of office work using this module.

It is assumed that the *3S Pack* software package has been properly installed and the software or hardware protection device allowing the PC to run that package has also been installed.

For detailed information on how to install *3S Pack* and how to use *KISS*, please refer to the corresponding manual (*3S Pack Reference Manual*, Part No.0311366).

Preparing a survey

In this phase, KISS is used to prepare a project that describes the survey you have to run.

❑ Creating a project

Assuming KISS is now running on your PC, do the following:

1. In the Toolbar, click  or, from the menu bar select **File** and then **New**, or double-click on the following icon in the Projects window:

2. Start defining your project by completing the **Project Wizard-Welcome** Dialog Box which then appears.

Project	Enter the project name
Region	Enter the region name (optional)
Center Easting	Enter the Easting of the center point
Center Northing	Enter the Northing of the center point
Scale	Choose a pre-defined value from the combo box or type another value in the text box
Distances in	Choose the distance unit from this combo box (meters, US feet or imperial feet)
Angles In	Choose the angle unit from this combo box (degrees or grades)
Notes text box	Add comments or recommendations of any kind which you want to associate to this project (optional).

3. Then, click the **Next>** button.

4. Complete the **Project Wizard-Horizontal System** Dialog Box which then appears. In usual cases, you just have to select a projection from the **Projection** combo box, which lists all the projections available from the 3S Pack database.

   If you do not know which projection should be used, select <Unknown> in the PROJECTION combo box. As a result, KISS will also set the ON DATUM combo box to <Unknown>. You can however change this setting if you know the datum.

   The inverse statement is also possible: you can choose a projection and leave the datum “<Unknown>”.

   As you can see, all the combinations are possible. However the most typical ones remain “projection and datum known” or “projection and datum unknown”.

   When you select a projection or datum, in fact you load it from the 3S Pack database. All the parameters of this projection or datum then appear in the dialog box.

   If necessary, you can adjust the values of some of these parameters. If you do so, we recommend you to change the name of the projection or datum as well (the PROJECTION and ON DATUM combo boxes are also editable fields). In this way, you will never forget that you derived your horizontal coordinate system from a standard one.

WARNING! This new system will be stored in your project only, not in the 3S Pack database.

The different parameters of projections and datums shown in this tab are described below.

PROJECTION Combo box listing the projections stored in the 3S Pack database. Select the name of the projection used. As a result, the rest of the dialog box is updated to match your selection. This combo box is also an editable text box (see above).

Proj Kind	From this combo box, select the kind of projection used. Generally this selection is correct after you choose the PROJECTION name (above)
False East.	Easting of projection center
False North.	Northing of projection center
Central Merid.	Longitude of projection center
Central Lat.	Latitude of projection center (except for 2P Lambert)
Scale	Scale factor (except for 2P Lambert)
North Lat.	Latitude of 1st parallel (for 2P Lambert only)
Ref. Lat.	Latitude of projection center (for 2P Lambert only)
South Lat.	Latitude of 2nd parallel (for 2P Lambert only)
Skew	Azimuth of initial line (for Rect Skew Ortho and Skew Ortho only)

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ON DATUM Combo box listing the datums stored in the 3S Pack database. Select the name of the datum used. As a result, the rest of the dialog box is updated to match your selection. This combo box is also an editable text box (see above).

- **K** Scale factor
- **Dx** X deviation from ellipsoid (signed value in m)
- **Dy** Y deviation from ellipsoid (signed value in m)
- **Dz** Z deviation from ellipsoid (signed value in m)
- **A** Semi-major axis of the ellipsoid, in m
- **1 / F** Inverse flattening coefficient (ellipsoid)
- **Rx** Angular deviation around X axis of ellipsoid (in seconds)
- **Ry** Angular deviation around Y axis of ellipsoid (in seconds)
- **Rz** Angular deviation around Z axis of ellipsoid (in seconds).

5. If a local grid must be used, proceed with the settings below.

WITH LOCAL GRID check button Button cleared: no local grid

Button checked: enter the parameters of the local grid:

- **E0** Easting of origin
- **N0** Northing of origin
- **K** Scale factor
- **DE** Easting shift
- **DN** Northing shift
- **Beta** Rotation angle

6. Then, click the **Next>** button.

THALES NAVIGATION

7. Complete the **Project Wizard-Vertical System** Dialog Box which then appears. In this box, tell KISS whether the altitude of the surveyed points should be expressed in relation to a geoid or a datum (WGS84, or the one selected for the project). For special settings in this dialog box, see below.

HEIGHT EXPRESSED ON Choose the reference upon which the altitudes of the surveyed points will be determined.

If you click the **GEOID** radio button, then the reference can be the ICD200 model or any local model available on your system (RAF98, EGM96, etc.; this may be the complete model or just an excerpt corresponding to the area where you have to work).

If you click the **DATUM** radio button, then the reference can be either the datum used in the horizontal system, or the WGS84 (selection in same combo box nearby).

WITH LOCAL CORRECTION... check button Check this button if corrections have to be made to the selected reference (otherwise keep it cleared):

- **dH** Vertical deviation between vertical system and WGS84 at the origin
- **Gl** Latitude gain (a coefficient)
- **Gg** Longitude gain (a coefficient)
- **L0** Latitude of the origin
- **G0** Longitude of the origin

Before you end the definition of the project, you can still go back to the previous tabs by clicking the **<Back** button if changes have to be made in these tabs. Then use the **Next>** button again until the **Finish** button appears.

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8. Once you agree with the definition of the project, click the **Finish** button. KISS then creates the new project. A map of the region of survey appears in the KISS window. In the same time, the project is saved in the KIS directory.

9. Proceed with the definition of your project as such:
   - Place your reference points on the map (see page 6-7)
   - Place your target points on the map (see page 6-8)
   - Write jobs to the palmtop (see page 6-11).

Terminology used

The term “target” is used in two different contexts:

1. To designate a point whose location is known in theory and which has to be materialized in the field. In this case the term “target” is always associated with the term “point”
2. To designate the supposed (or planned) position of any point, whether a target point or a reference point. In this case, the term “target” is used alone. The main contexts in which “target” appears with this meaning are:
   - In the **General** tab of any dialog box describing a reference point
   - In the **General** tab of any dialog box describing a target point
   - In the **Edit** menu, **Import Target** and **Export Target** commands.

❑ Placing reference points on the map

With your project now open in the KISS window, do the following:

1. In the toolbar, click or from the **Draw** menu, select the **Reference points** command.
2. Move the mouse pointer (then a) onto the map where you want to create a new reference point.

   In the lower part of the window, the status bar helps you locate the point accurately on the map by giving the current coordinates of the mouse pointer as you move it within the window:

3. When the mouse pointer is at the desired location, click with the left mouse button. This causes a dialog box to appear in which you should complete the definition of the point:

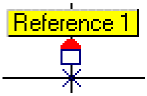
Name	Keep the default name of the reference point or type another name
Code 1... code 4	Optional. Enter or select a geocode from each of these combo boxes. The list of available geocodes is the one you can define from the **KISS Options** dialog box, **General tab** Note that if you place the pointer on the down-arrow of any of these combo boxes, the meaning of the selected geocode will appear in a tip box.
Target/Result/Error radio buttons	At this stage, only the **Target** radio button is checked as the field survey is still to come.
E N H check buttons	They define the type of the reference point. Three types are possible: . **1D** point: Obtained by checking the **H** button and clearing either of the other two buttons. . **2D** point: Obtained by clearing the **H** button and checking either of the other two buttons. The **E** and **N** buttons are then checked. . **3D** point: Obtained by checking the **H** button and either of the other two buttons. All three buttons are then checked.

6

E N H text boxes: Planned coordinates of the reference point resulting from where you clicked on the map. If you change **E** or **N**, the icon will appear at a location different from where you clicked. Any change in these boxes should be consistent with the type of point (1D, 2D, 3D) you choose (see **E N H** check buttons just above).

Notes pane: Add comments or recommendations of any kind which you want to associate to this point (optional).

4. When the definition is complete, click the **OK** button. This causes the dialog box to disappear, and a new Reference Point icon to appear on the map:



5. Create other reference points if necessary using the same procedure. Do not forget to save the project at regular intervals by clicking in the toolbar.

❑ Placing target points on the map

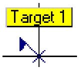
With your project still open in the KISS window, do the following:

1. In the toolbar, click or from the **Draw** menu, select the **Target points** command.

2. Move the mouse pointer (now a) where you want to create a new target point.

   In the right-lower part of the KISS window, the status bar helps you locate the point accurately on the map by giving the current coordinates of the mouse pointer as you move it within the window:

3. When the mouse pointer is at the desired location, click with the left mouse button. This causes a new Target Point icon to appear on the map:



A default name, of the type "Target nn", is assigned to the point. "nn" is the order number (nn=1 if first point created, =2 if second point created, etc.).

Editing the properties of a target point you have just placed on the map:

4. In the toolbar, click  or from the **Draw** menu, choose the **Select** command.

5. Double-click on the icon corresponding to the target point you want to edit. A dialog box appears showing the properties of the target point. At this stage, the dialog box consists of a single tab (General).

Name	Keep the default name of the target point or type another name
Code 1... code 4	Optional. Enter or select a geocode from each of these combo boxes. The list of available geocodes is the one you can define from the **KISS Options** dialog box, **General tab** Note that if you place the pointer on the down-arrow of any of these combo boxes, the meaning of the selected geocode will appear in a tip box.
Target/Result/Error radio buttons	At this stage, only the **Target** radio button is checked as the field survey is still to come
E N H check buttons	They define the type of the target point. Two types are possible: . 2D point: Simply obtained by clearing the **H** button. . 3D point: Simply obtained by checking the **H** button.

6

E N H text boxes	Planned coordinates of the target point resulting from where you clicked on the map. If you change **E** or **N**, the icon will appear at a location different from where you clicked. Any change in these boxes should be consistent with the type of point (2D, 3D) you choose (see **E N H** check buttons just above).
Notes pane	Add comments or recommendations of any kind that you want to associate to this point (optional).
"Target" diagram (on right)	The "target" (planned location) is shown at the center of an oriented circle whose radius is the **Acceptable deviation between target and surveyed coordinates** defined in the **General tab** of the KISS options.

6. Create other target points if necessary using the same procedure. Do not forget to save the project at regular intervals by clicking in the toolbar.

❑ Importing points from a file

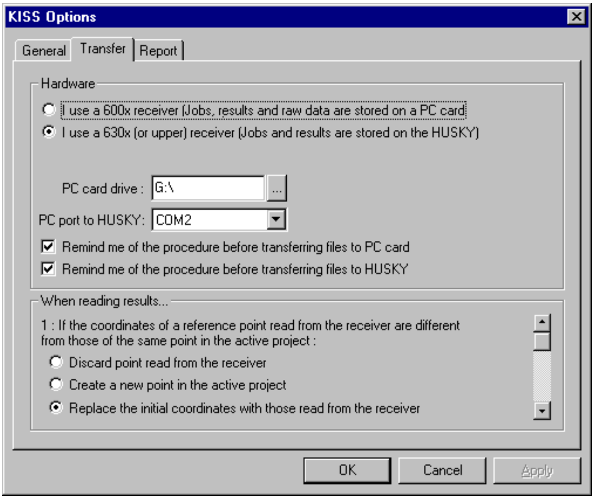
If the points to be surveyed have been entered on another software program and saved in DXF format, they can be easily retrieved and placed on the map of your project, using the import function of KISS, as if you had entered them manually from within KISS. To import a DXF-formatted points file into the open project, do the following:

- On the KISS **Edit** menu, select **Import Targets**
- In the **Import Target Positions** dialog box that opens, select the **Import from File** option in the **Mode** area
- Click on the **Add** button, select the file to be imported and click on **Open**
- In the **Default object** area, tell KISS whether the points to be imported must be target points or reference points (they can only be all of the same type)
- In the **Format** field, specify the format of the file
- Click on the **Go** button to start importing points. Once the import sequence is finished, KISS will re-size the map in order to show all the imported points.

Transferring jobs to the rover's palmtop

The first time you have transfer a job to the rover's palmtop, do this before:

1. Select **Tools>Options>Transfer** tab.
2. In the **Hardware** pane:
   - Click the radio-button corresponding to the unit you are using (a 6301 MG or 650x)
   - If your computer is fitted with a PC card drive, in the **PC card drive:** field, specify the location of this drive on your computer, i.e. the name of this drive (example: "G:\")
   - In the **PC port to HUSKY:** field, specify the PC port used to communicate with the Husky.
3. Set the other parameters shown in this pane (see example below) and then click **OK**.



With your project open in the **KISS** window, do the following:

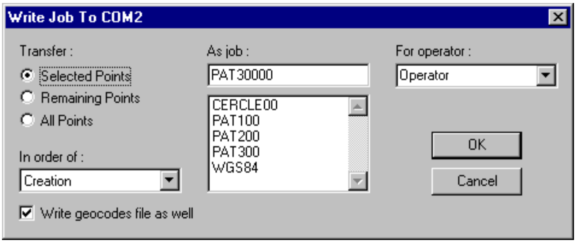
4. If you want to focus on particular points, then select the corresponding icons. If that is not the case, do not make any selection.

5. In the toolbar, click or, from the **Transfer** menu, select the **Write Job** command. The following dialog box appears:

Follow the instructions displayed in this box:

- Connect the Husky to the indicated PC port using a DB9/DB9 serial cable
- Switch on the Husky. At the DOS prompt on the Husky, type "h" or "hcom/c2" and then press . This launches the Hcom transfer utility program
- In the **KISS** window, click **OK** in the above dialog box.

6. In the **Write Job...** dialog box which then appears, enter a name for the file that is going to be created (8 characters max.) or select an existing one from the list box which you will overwrite with the new job:



7. Specify the content of the job by checking one of the following buttons:

Selected Points : This option should logically be checked if you have made a prior selection of objects on the map (option dimmed otherwise)

Remaining Points : Check this option if you want the field operator to deal only with the points not surveyed yet (which supposes that a part of the project has already been made). With this option you do not need to make a prior selection of objects on the map

All Points : Check this option if you want to write the entire project to the palmtop.

8. Specify the order in which the points will be written to the palmtop by making a selection in the following combo box:

In Order of Choose one of the possible ways of arranging the points in the job:

Creation
Name
Kind
Geocode 1...4
Point size
Target East.
Target North.
Target Height

9. From the **For Operator** combo box, enter or select the name of the operator in charge of the job in the field. The list of known operators is defined in the **Options** dialog box, **General tab**.

10. Click the **OK** button to create the job file on the palmtop.

Loading a geoid into the CompactPro unit

- On the KISS **Tools** menu, select **Geoids**. This starts the **Geoids** module.
- In the **Geoids** window, select **File>Open** and choose the geoid you want to load. This function indicates the following: geoid name, limits of geographical area, grid step, file size, number of points.
- Establish a serial link between one of the ports on your PC and, for example, port A on the CompactPro (any RS232 port can be used on this unit), using the appropriate cable.
- In the **Geoids** window, select **Transfer>Write**. A dialog box appears asking you to choose and set the serial port on your PC now connected to the CompactPro unit.
- After setting the port, click on **OK** to start and complete the file transfer.

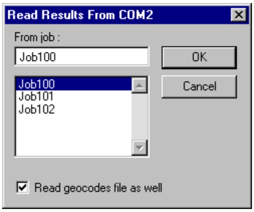
Retrieving job results

Back at the office, after connecting the palmtop to the PC via the same serial link as the one used earlier to transfer jobs (see page 6-11), do the following with your PC:

1. Run **KISS** and open the project corresponding to the job completed in the field
2. In the toolbar, click  or from the **Transfer** menu, select the **Read Results...** command. The **Read Results From...** dialog box then appears.

   (This action is also possible if there is no project open in the KISS window, which will be the case if you work on a PC other than the one used to prepare the job.)

Example:



(If a project is open, this dialog box will list all the job files present in the palmtop for which result files exist. If no project is open, ALL the job files will be listed, regardless of whether result files exist for these jobs or not.)

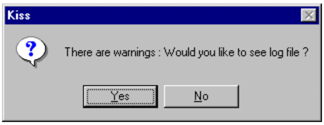
3. In the dialog box, select the job you have just completed and click on the **OK** button.

   (If no project is open and you select a job, or if the open project is incompatible with this job, then KISS will ask you to create a new project on the basis of the selected job. If a result file exists for this job, then the results of this job will be retrieved.)

   Note that during file transfer, format conversion is performed from binary to SVAR (ASCII).

   Once KISS has successfully retrieved the results of the job, these results appear directly on the map. All the points for which solutions are now available are selected (see Graphic Conventions used on page 6-16).

4. On transfer completion, a warning message will appear if particular events occurred during the transfer in relation with the **transfer options** chosen for KISS:

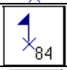


The message will prompt you to open the log file so that you can be informed of the nature of these events. If you click the **Yes** button, the log file will be opened using the WordPad text editor.

Outside this particular context, you cannot open the log file from **KISS**. If you need to open it at another moment, use Windows Explorer (the log file is stored in ...\3S Pack\bin under the name "kiss.log").

Interpreting survey results

❑ Graphic Conventions

Icon	Before surveying	After sur-veying	Definition
	✓		Target point
	✓		Reference point
		✓	Logged point
		✓	Target point, within acceptable deviation (green), known horizontal system
		✓	Target point, outside acceptable deviation (red), known horizontal system
		✓	Reference point, known horizontal system
		✓	Logged point, unknown horizontal system
		✓	Target point, unknown horizontal system
		✓	Reference point, unknown horizontal system
		✓	Reference point, after computing datum shifts and validating the results of the processing
		✓	Reference point, after computing local grid and validat-ing the results of the processing
		✓	Reference point, after computing vertical correction and validating the results of the processing

The color of any icon changes when you select it with the mouse pointer:

- Selected: icon green, point name with dark-blue background
- Deselected: icon dark-blue, point name with yellow background

❑ Editing a point surveyed at the planned location

In the toolbar, select  and then double-click on the surveyed point (whether a reference point or a target point). The dialog box which then appears includes the following additional information, compared with the same dialog box before surveying the point:

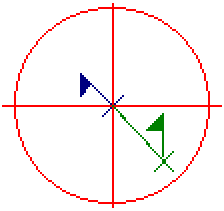
In the **General** tab:

While only the **Target** radio button could be checked before the survey, you can now check the **Result** or **Error** radio button:

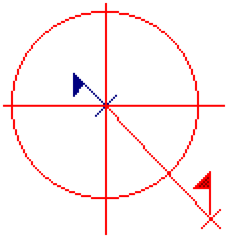
- Checking the **Result** radio button will cause the coordinates of the position solution to appear just below as **E**, **N** and **H**. Note that these coordinates are dimmed (no changes allowed)
- Checking the **Error** radio button will cause the components of the deviation between the planned and measured position to appear just below as **DE**, **DN** and **DH**. The **Delta** figure just below stands for the modulus of the deviation vector

  This figure will be re-computed if you change the type of the point (1D, 2D or 3D for a reference point, 2D or 3D for a target point), which you can easily do by simply checking/clearing the check buttons associated with **DE**, **DN** and **DH**
- In this tab, opposite these results, a diagram illustrates the position solution. In the examples below, the radius of the circle represents the 2D projection of the specified **acceptable deviation**.

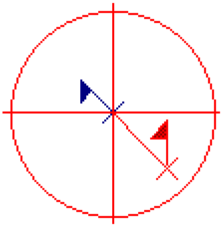
A. Target point whose solution is located within the acceptable deviation limit (vertical flag and segment in green):



B. Target point whose solution is located outside the acceptable deviation limit (vertical flag and segment in red):



C. 3D target point whose solution is located outside the acceptable deviation limit due to the vertical component of the deviation (vertical flag and segment in red although they remain within the circle):



In the **Details** tab:

This new read-only tab is added containing the complete **description of the position solution**:

Date Date & time of survey

Origin Name of the job during which the point was surveyed

Operator Name of the operator who made the job

Process Name of the processing method used (LRK A, LRK R, etc.)

GNSS radio button Check this button to display the WGS84 coordinates of the position solution. This causes the lower part of the dialog box to show all the components of this solution. The definition of the vertical components (H84 and DH) are recalled graphically on the diagram in the right-hand part of the dialog box

L84, G84, H84	WGS84 coordinates of the antenna
DH	GPS antenna height above the ground when surveying the point
Correlation Matrix	Components of the correlation matrix

DGNSS radio button Check this button to display the WGS84 coordinates of the reference station used in the surveying of the point. This causes the lower part of the dialog box to show the identification and coordinates of this station, as received by the roving unit through the data link. The distance and direction to the target point are illustrated on the diagram in the right-hand part of the dialog box.

The illustration includes scale information. The station identification is also recalled in this diagram.

L84, G84, H84	WGS84 coordinates of the reference station, as received by the roving unit
Baseline	Measured distance between target point and reference station
Correlation Matrix	As the correlation matrix in fact qualifies the baseline measurement rather than the position solution alone, it is maintained in the lower part of the dialog box, whether the GNSS or the DGNSS button is checked.

Editing a logged point

Same as a planned point (see page 6-17) except that neither a target nor a deviation error is provided in the **General** tab.

Editing a planned point surveyed through offset procedure

In the toolbar, select  and then double-click on the surveyed point (whether a reference point or a target point). The dialog box which then appears includes the following additional information, compared with the same dialog box before surveying the point:

<u>In the **General** tab</u>:

While only the **Target** radio button could be checked before the survey, you can now check the **Result** or **Error** radio button:

- Checking the **Result** radio button will cause the coordinates of the position solution to appear just below as **E**, **N** and **H**. Note that these coordinates are dimmed (no changes allowed)
- Checking the **Error** radio button will cause the components of the deviation between the planned and measured position to appear just below as **DE**, **DN** and **DH** (necessarily all “0.000 m”). The **Delta** figure just below stands for the modulus of the deviation vector (also “0.000 m”).
- In this tab, opposite these results, a diagram illustrates the position solution (the target and the measured point necessarily coincide).

Additional tabs are shown: **Offsets** , **P1** , **P2** and possibly **P3** and **P4** in the case of “intersection” offset (see next pages).

In the **Offset** Tab:

This tab identifies the type of offset procedure that was performed in the field, provides the coordinates of the points involved in that procedure and locates precisely the planned point with respect to these points.

Mode Lateral, linear or intersection

P1 P2 (P3 P4) radio buttons Check the radio button corresponding to the point you want to display

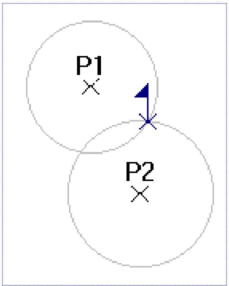
E, N, H Coordinates of the selected point (Pn)

P1P (Lateral or linear offset only) Distance from P1 to the target (P)

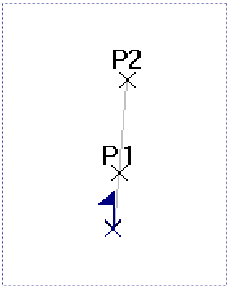
P2P (Lateral or linear offset only) Distance from P2 to the target (P)

P is (Lateral or linear offset only) Gives the location of the target with respect to the “oriented” segment [P2P1]. This means that if an observer is located at P2 and watches P1, then P will be seen either on the left or on the right side of this segment (as explained in the lower pane).

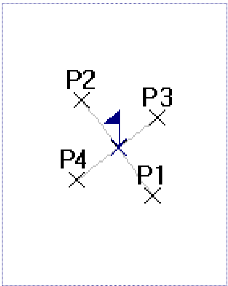
In this tab, opposite these results, a diagram illustrates the position solution. Possible cases of position solution:



Lateral offset



Linear offset



Intersection offset

In the **P1**, **P2**, **P3** or **P4** tab:

Each of these tabs is much similar to the **Details** tab obtained for a point surveyed at its planned location.

Date Date & time of survey

Origin Name of the job during which P1, P2, (P3 or P4) was surveyed

Operator Name of the operator who made the job

Process Name of the processing method used (LRK A, LRK R, etc.)

GNSS radio button Check this button to display the WGS84 coordinates of P1, P2, P3 or P4. This causes the lower part of the dialog box to show all the components of this solution. The definition of the vertical components (H84 and DH) are recalled graphically on the diagram in the right-hand part of the dialog box

- **L84, G84, H84** WGS84 coordinates of antenna at P1, P2, P3 or P4
- **DH** GPS antenna height above the ground when surveying the point
- **Correlation Matrix** Components of the correlation matrix

DGNSS radio button Check this button to display the WGS84 coordinates of the reference station used in the surveying of P(n). This causes the lower part of the dialog box to show the identification and coordinates of this station, as received by the roving unit through the data link. The distance and direction to P1, P2, P3 or P4 are illustrated on the diagram in the right-hand part of the dialog box. The illustration includes scale information. The station identification is also recalled in this diagram.

- **L84, G84, H84** WGS84 coordinates of the reference station, as received by the roving unit
- **Baseline** Measured distance between point and reference station
- **Correlation Matrix** As the correlation matrix in fact qualifies the baseline measurement rather than the position solution alone, it is maintained in the lower part of the dialog box, whether the GNSS or the DGNSS button is checked.

❑ Editing a logged point surveyed through offset procedure

Same as a planned point surveyed in the same context (see page 6-20), except that neither a target nor a deviation error is provided in the **General** tab.

Exporting results

- From the **Edit** menu or from the Map Shortcut menu (accessible from anywhere on the map by clicking the right mouse button), select the **Export Results** command.
- In the dialog box which then appears, select the export mode (**Export to File** or **Export to 3S Pack**). Then do one of the following:

❑ To a File

- Click the **Add** button to choose the point(s) to export from the active project
- Select the surveyed point(s) from the list and click the **OK** button
- Define the export file by specifying its path, name and format (DXF or other)
- Click the **Go** button to start exporting the points.

❑ To 3S Pack database

Same as **to a File**, except that you just need to specify the points

- Click the **OK** button. All points will be exported as Sites. All logged trajectories will be exported as "3S Pack" Trajectories.

❑ Creating new user formats

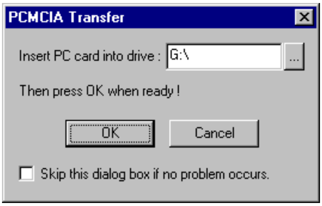
- Click the **User formats** button and then the **New** button. In the dialog box which appears, enter the definition of your format (see *3S Pack Reference Manual*, Part No.0311366, section 3, *Creating a user format*).

Retrieving raw data recorded on a PC card

Raw data can be recorded by the station or the rover provided the recording is performed according to the instructions on page 3-58 or 3-61.

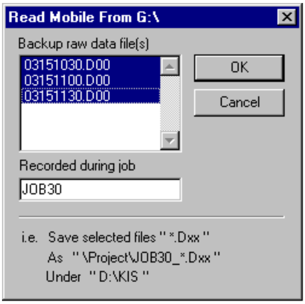
To retrieve the raw data once the survey is complete, do the following at the office:

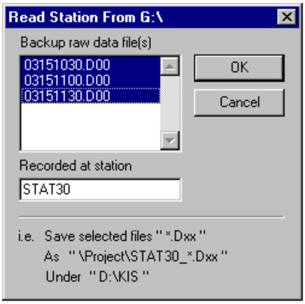
1. Run **KISS**
2. In the toolbar, click or , or on the **Transfer** menu, select the **Read Station** or **Read Mobile** command, depending on where the PC card comes from (i.e. a station or a rover). The following dialog box then appears:



Follow the instructions displayed in this box:

- Insert the PC card into the drive of your computer
- Then click **OK**. One of the following dialog boxes then appears (examples):





- Select the desired files and click **OK** to backup the files on your computer. Files are renamed according to the instructions mentioned in the lower part of the dialog box.

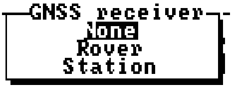
  (Raw data files can then be imported to 3S Pack for post-processing. Station raw data files should be associated with a site, and rover raw data files to a trajectory).

  Warning! Raw data files recorded at a station or by a rover are exactly of the same type. It is therefore the user's responsibility to know the origin of the raw data files. ♣

7. User Interface explained to beginners

Start up

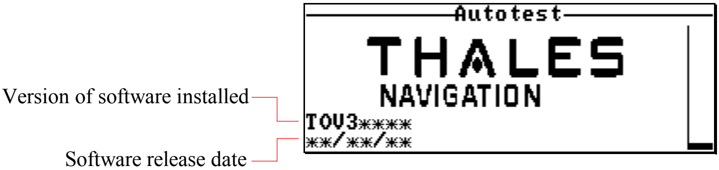
- Press (top right) to switch on the palmtop.
- At the DOS prompt, type “T”, then press . The following menu then appears asking you to indicate the type of unit currently connected to the Husky:



- Choose the right option and then press . If you choose “None”, the Husky will operate in standalone mode.

❑ Initialization phase

The following then appears on the screen, denoting self-tests under way:



In the right-hand part, a vertical bar-graph indicates the progression of the self-tests.

Depending on the presence or absence of a CompactPro unit attached to the palmtop, the following will happen:

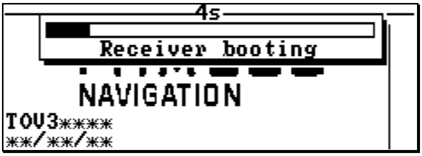
- *Presence of a powered and properly initialized equipment:* the self-tests will normally take place. At the end of the self-tests, the following screen will automatically be accessed:

  **>Antenna** screen if the equipment is a station

  **>Choose a job** screen if the equipment is a rover.

- *Presence of a non-powered equipment:* the equipment will then be automatically switched on from the palmtop.

  The self-tests will be delayed by about 30 seconds, the time for the equipment to properly initialize:

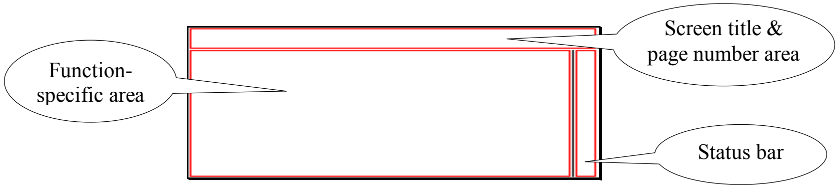
  

  Then the self-tests will normally execute as previously.

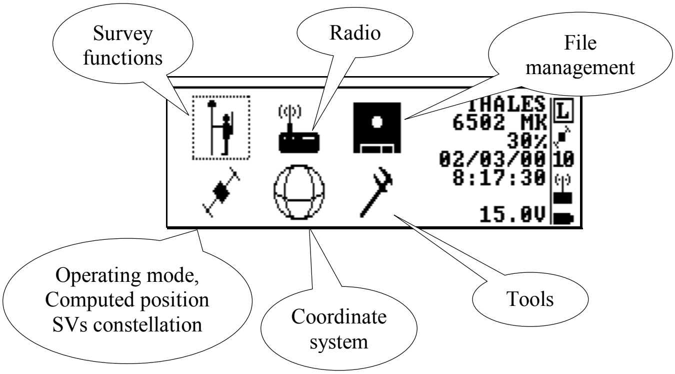
One reason why the self-tests cannot complete normally is the detection of a configuration in the equipment that is different from the expected one. In this case, the palmtop will automatically abort the self-tests and start loading the required configuration into the equipment.

❑ Screen organization

Once the self-tests have been executed successfully, all the displays that follow the welcome screen on the palmtop are made up of three distinct areas as shown below:



❑ Main menu screen (icons menu)



Apart from the status bar (described in the next page) and the icons, the main menu screen provides the following information, from top to bottom:

- Equipment name (except in standalone)
- Free memory space on palmtop (in %)
- Local date (dd/mm/yy)
- Local time (hh:mm:ss)
- Value of receiver battery voltage (except in standalone).

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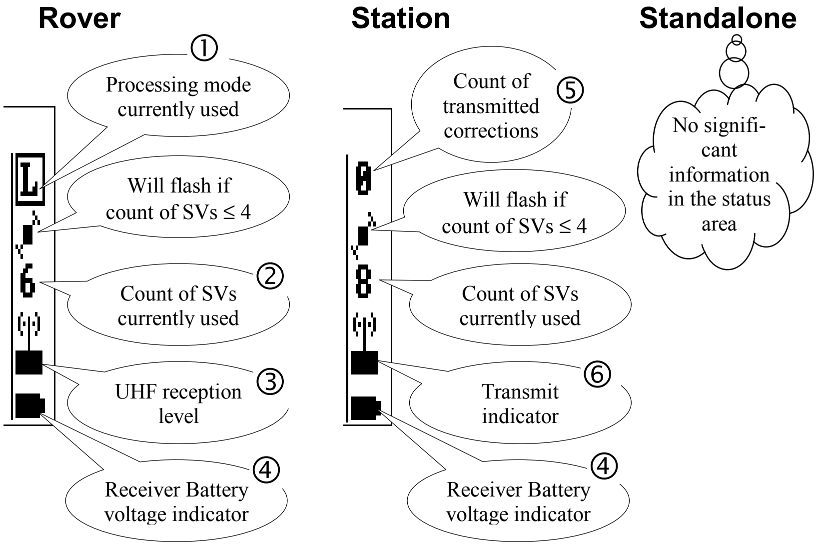
❑ Status bar

Refreshed every 1 second once communication between CompactPro and palmtop is established.



① H : Hold (no position solution)
G : Straight GPS with/without WAAS/EGNOS
D : DGPS
W : WADGPS (DGPS with WAAS/EGNOS)
E : EDGPS (metric accuracy)
I : KART or LRK initialization
K : KART (centimeter accuracy)
L : LRK (centimeter accuracy)

② Count of SVs received on L1 if processing mode is HOLD. Otherwise, count of SVs used

③
: (Flashing)
UHF reception level is only 3dB above operating threshold. System CANNOT operate

: 1/3 full : system can start operating
2/3 full : good operation
Full : optimized operation
(the higher the UHF level, the fuller the icon)

④
: Icon empties as receiver battery discharges
: (Blinking icon) receiver battery voltage has dropped to user-set threshold (a fresh battery is needed)

⑤
$\neq 0$: Count of SV corrections currently transmitted by the station
$= 0$: Transmission OFF (the station is not currently allowed to transmit its corrections)

⑥
: Transmission disabled
: Transmission enabled

Select & Edit instructions

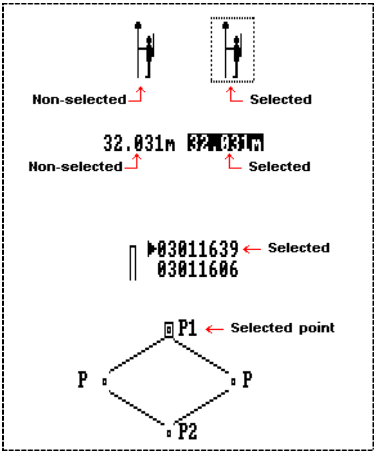
❑ Cursor

The cursor is a kind of pointer that can be moved on the screen. It allows you to select a function, choose an option, access a parameter value, or select a point on a 2D view or when using an offset method.

The cursor can be moved in all directions using the direction keys:

In some cases, only the two vertical-arrow keys can be used.

The cursor shape depends on the nature of the item on which you place it. On an icon, it looks like a dotted rectangle surrounding the icon. On a parameter or a functions menu, it appears in inverse video. In a list of items, it is represented as an arrow pointing to the selected item. On a 2D view, it is represented as a frame surrounding the selected point:



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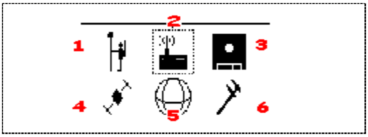
Function Icons

(Only the main menu contains function icons):

- Place the cursor on the desired icon
- Press to validate your choice

Or:

- Directly press the numeral key corresponding to the icon:



- Selecting an icon allows you to access a functions menu.

Other icons

(Non-exhaustive list)

Identifies the list below as the list of target points from the open job

Identifies the list below as the list of reference points from the open job

Non-surveyed point (offset functions, 2D view); or received satellite (polar view)

A solution was determined for this point (offset functions, 2D view); or satellite used (polar view)

Selected point (offset functions, 2D view)

Operator’s location on 2D views (on all guidance screens, except in offset methods)

Target location (on guidance screens)

Planned point surveyed through an offset procedure (in the list of points)

 Trajectory (when listing the content of the results file)

 Point surveyed through Logging function (in the list showing the result points).

Etc.

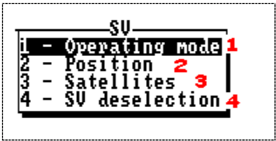
❑ Function menus

After selecting an icon on the main menu, a functions menu appears on which you can note the presence of the cursor. To make a selection in this menu:

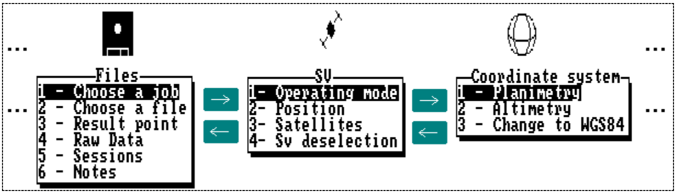
- Move the cursor to highlight the desired function.
- Press ↵ to validate your choice

Or:

- Directly press the numeral key corresponding to the function:



You can directly access the functions menu adjacent to the displayed one by simply pressing → (right-adjacent menu) or ← (left-adjacent one).



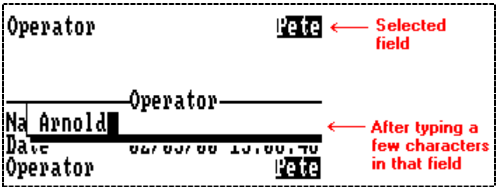
❑ Parameters

Depending on the size and type of the parameters that can be changed, different scenarios will be proposed:

- If the screen contains numerical or alpha-numerical parameters, the cursor will appear on the first of them.

  To change this parameter, simply type in the new value. Note that the position of the field on the screen will be shifted to the left while you edit it.

  If the size of the parameter is relatively long, an edit box will appear in the upper part of the screen to show the entire field while you edit it:



  In both cases, the new value will be validated after you press ↵. Move the cursor by pressing ↓ or ↑ to access the next or previous field respectively.

- If a parameter can only be set to some specific software-set values, then it will be marked with a "▶". To know the possible values and choose one of them, move the cursor by pressing ↓ or ↑ to access the concerned field and then press →. A select box appears showing these values. Example:

  Use ↓ or ↑ to choose the desired value and press ↵ to validate your choice (the select box is removed from the screen at the same time). Alternately, you can directly type the numeral key corresponding to the row in which the desired value is shown (same as function menus).

- Some parameters can only be accessed for editing through one of the commands of the context-sensitive **Help** menu (see hereafter).
- Some geodetic parameters (geoid, projection, grid) are followed by a "▶". Pressing → when one of these parameters is selected will allow you to view all the characteristics relevant to this parameter.

❑ Help menus: F1 key

There is a **Help** menu specific to each function, reminding you of all the possible commands available in the context of this function.

To display the **Help** menu, press the **F1** key. This causes the **Help** menu to appear over the current view on the screen. Then do the following:

- Press the letter key corresponding to the command you wish to run. This will also remove the **Help** menu from the screen.
- or simply press the **Esc** key if you do not want to run any command. Incidentally, this will remove the **Help** menu from the screen.

  You cannot view any **Help** menu while editing a parameter. As function menus, **Help** menus may not fit in a single screen. In this case, use the **PgUp**, **PgDn** keys to browse through the entire menu.

Every time you do not know, or you do not remember, what to do in a given context of work, just press **F1** to display the **Help** menu. This will help you make the appropriate choice to continue with the job.

❑ Other important keys

⇧ : **Shift** key (On either side of the **Yes** key). This key allows you to key in the characters shown above most of the keys (+, -, /, etc.).

Esc : Depending on context, pressing this key:

- will take you back to the preceding screen
- or will remove the **Help** menu from the screen
- or will delete the error or warning message displayed
- or will cancel the change you are making to a parameter
- or, after the self-tests, will allow you to switch from the automatically selected screen to the **main menu** screen.

F2 : (Rover only) From anywhere in the program, pressing this key will allow you to display the last solution computed for your current position (see screen example in page 3-67).

F3 : (Rover only) Used to save position solutions to the results file.

Many other uses (validating markers, raw data recording, sessions, antenna height, etc).

F4 : Pressing this key will allow you to quit the program. Confirm this choice by pressing the **Yes** key (or press **Del** to cancel). Then a message is displayed asking you whether, in the same time, the equipment should be left working (press the **Yes** key) or if it should be turned off (press the **Del** key).

PgUp, PgDn : Three different uses depending on context:

1. When the content of a function or a Help menu cannot fit in a single screen, it is split into several screens which you can access using these keys.

2.When a function shows a list of items that does not fit in the screen, using these keys allows you to quickly scroll the list up and down (as opposed to the cursor which can only be moved by a single line every time you move it up or down).

3. In target point surveying, allows zoom-in (**PgUp**) or zoom-out (**PgDn**) on the guidance screen.

Home : If a list of items is shown, takes you to the top of the list

End : If a list of items is shown, takes you to the end of the list

Del : If a list of points is shown and a surveyed point is selected, deletes the solution computed for this point.

❑ Special key combinations

⇧+F1 : From anywhere in the program, this key combination will allow you to access the palmtop’s notepad (see page 5-5).

☼ + L : Turns on/off screen backlight

☼ + ↑ : In DOS environment, allows line-after-line scroll-up of a list of files (following a DIR command for example)

⇧ + ↑
or **⇧ + ↓** : Adjusts screen contrast

⇧ + ⇧ + ⏻ : Depressed for about 4 seconds, re-boot the palmtop (after a fatal error).

Sound alarms and warning messages

The buzzer will bleep in the following cases:

- After 10 seconds, if communication between the palmtop and the receiver is bad. A bleep will be heard and the "The receiver is not responding" message will appear
- At the end of the self-tests
- In case of invalid data entry, invalid display request or other errors
- In case of “battery is low” status. A bleep will be heard and the “Battery is low” message will appear. The battery icon in the status bar will blink until you change the battery
- If the UHF reception level drops below 3 dB (on rover).

Function inventory & accessibility

<table>
<tr><th>Icon</th><th>Rover</th><th>Station</th><th>Standalone</th></tr>
<tr><td></td><td>Stake out *
Logging *
Reference points *
Trajecto *
Logging with offset *
Profile *</td><td>Stake out *
Reference points *
Profile *</td><td>Stake out *
Reference points *
Logging with offset *
Profile *</td></tr>
<tr><td></td><td>Station position
UHF receiver
(DGPS or GSM
receiver)**</td><td>Position
UHF transmitter
(DGPS or GSM
Transmitter)***
Average position</td><td>No access</td></tr>
<tr><td></td><td>Choose a job
Choose a file
Result points
Raw data
Sessions
Notes</td><td>Choose a job
Choose a file *
Result points *
Raw data
Sessions
Notes</td><td>Choose a job
Choose a file *
Result points *
Notes</td></tr>
<tr><td></td><td>Operating mode
Position
Satellites
SV deselection</td><td>Position
Satellites
SV deselection</td><td>No access</td></tr>
<tr><td></td><td colspan="2">Planimetry
Altimetry
Change to WGS84
Antenna</td><td>Planimetry *
Altimetry *</td></tr>
<tr><td></td><td colspan="3">Time
Geocode
GNSS receiver
Connection
Language & units
Release</td></tr>
</table>

Function names followed by “*” are accessible only if a job has been previously open. Otherwise, these functions will not appear in the menus.
**: depending on the type of external receiver possibly connected to the rover
***: depending on the type of external transmitter possibly connected to the station.

Standalone operation

The User Interface may be run even if the palmtop is not connected to a receiver unit. The following actions are then possible on that job:

- view the lists of target, reference and result points
- view the points coordinates
- view the points graphically on a 2D view
- compute distances and areas
- read and create notes
- create target, reference or result points (by entering their coordinates manually or by geometrical construction).

Tools menu

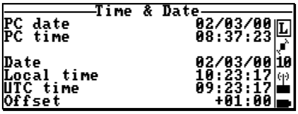
This menu always gives access to the same functions whatever the environment of the palmtop (standalone, attached to a rover or a station). For this reason, the Tools menu is described in this introduction section rather than be part of section 2 or 3.

❑ Time

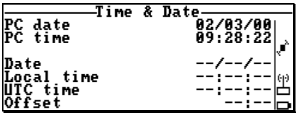
This function allows you to separately make date & time settings in the palmtop as well as in the connected receiver.

- Select **>Time**. The screen then looks like this:

Receiver connected



Standalone



As prompted on the **help** menu (**F1**), the following keys can be used to make changes on this screen:

P key : to change the time in the palmtop

Q key : to change the date in the palmtop

Provided a receiver is really connected to the palmtop, use the following keys to make other changes on this screen

D key : to change the date in the receiver

O key : to change the local-UTC time offset on the receiver (possible values: from –13hr00 to +13hr00)

S key : to set the palmtop time to be in compliance with the receiver local time

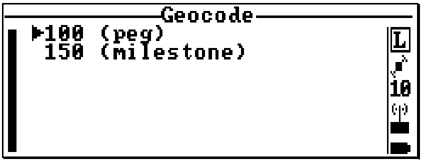
T key : to change the local time in the receiver.

❑ Geocodes

This function shows the list of geocodes currently present in the palmtop. It lets you modify the existing geocodes and also create new ones.

Access to this function is not tied to the presence of an equipment on the palmtop port.

- Select **>Geocode**. The screen then looks like this:



As prompted on the **help** menu (**F1**), the following keys can be used to make changes on this screen:

A key : to add a new geocode to the list (geocode as such + its description)

M key : to modify the selected geocode (only its description can be changed)

Del key : to delete the selected geocode.

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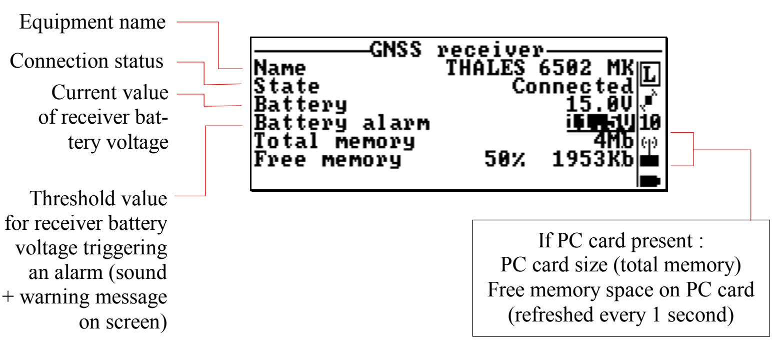
❑ GNSS receiver

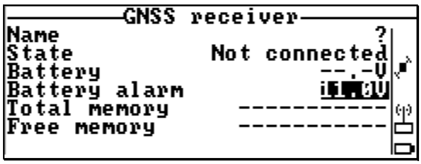
This function allows you to identify the receiver connected to the port.

- Select >**GNSS receiver**. The screen then looks like this:



As prompted on the **help** menu (**F1**), the **C** key can be used in that context to start the self-tests in order to establish, or re-establish, communication with the connected equipment.

The following will be displayed if the palmtop is standalone:



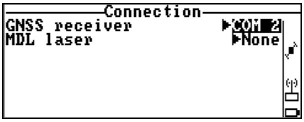
❑ Connection

CAUTION! We suggest that you do not make changes to the following parameters unless you have good knowledge of the system.

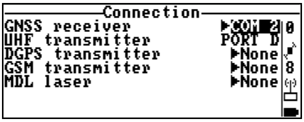
This function allows you to specify which ports should be used to make communication possible between the palmtop, the CompactPro unit and possibly other equipment such as a DGPS receiver or transmitter, a laser distance-meter or a GSM module. It also lets you configure these ports.

- Select **>Connection**. The displayed information then depends on the context in which the palmtop is used. The possible 3 contexts are the following (see detailed description and typical examples in the next pages).

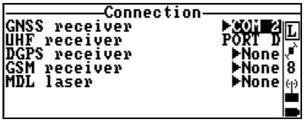
Standalone



Attached to station



Attached to rover

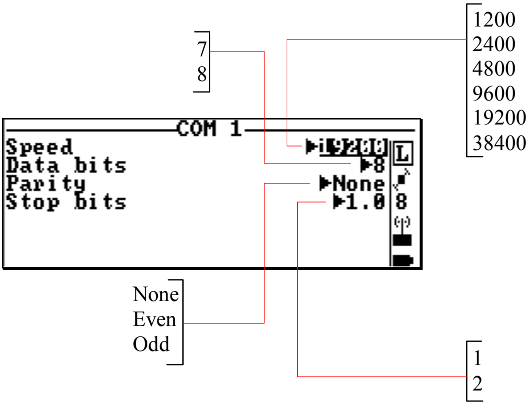


As prompted on the **help** menu (**F1**) associated with this display, the following keys can be used from this display to configure the following ports:

1 key	:	to configure port COM1 on palmtop
2 key	:	to configure port COM2 on palmtop
A key	:	to view the settings of port A on CompactPro
B key	:	to configure port B on CompactPro
D key	:	to configure port D on CompactPro

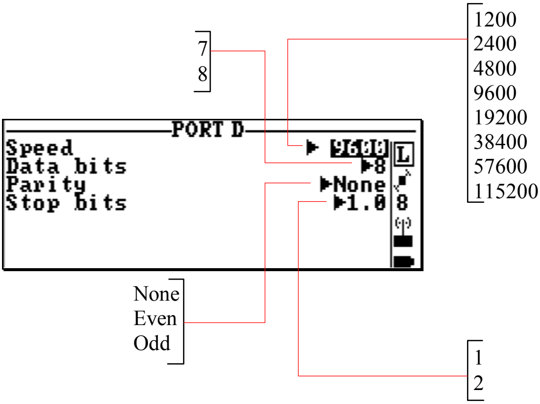
7

Configuring palmtop ports (press **1** or **2** key)



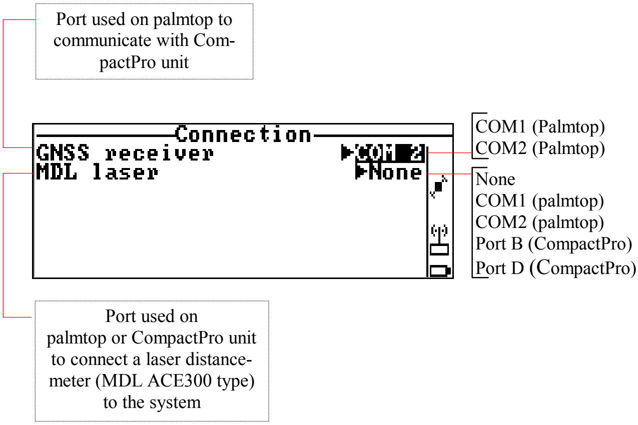
Choosing a 9600 Bd transmission speed is recommended with Husky MP2500.

Configuring CompactPro ports (press **B** or **D** key; press **A** key to view port A configuration)



Palmtop in stand-alone

You can only change the port used on the palmtop for further connection to a CompactPro unit and decide on how you intend to connect a laser distance-meter to the system. These two parameter lines will always be present on this display (as the first and last lines respectively) in ALL palmtop use contexts.

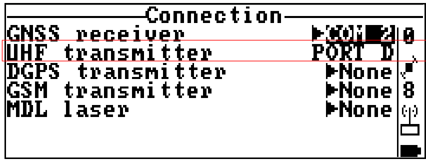


The port used on Husky MP2500 is necessarily port COM2.

Station with THALES U-LINK transmitter (standard case)

- The U-LINK UHF transmitter is always connected to port D (no other possible choice).

- No DGPS transmitter (“None”), no connection to a GSM (“None”).

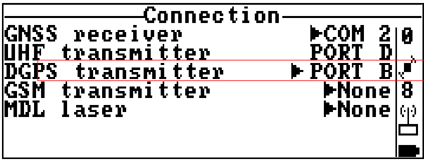


Port D forcibly used on CompactPro to communicate with U-LINK transmitter.
“None” is displayed until the U-LINK transmitter is physically connected to port D

Station with external DGPS transmitter

- DGPS transmitter present on port B (“Port B”).

- No connection to a GSM (“None”).



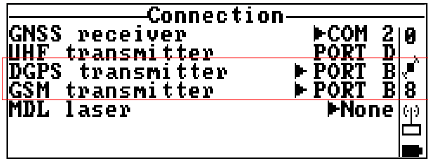
Port used on CompactPro to communicate with external DGPS transmitter (B or D)

- If you connect the external DGPS transmitter to port B, you can then leave the U-LINK transmitter connected to port D (as prompted above). On the other hand, if you connect it to port D, then the connection to the U-LINK transmitter must be removed.

Station with GSM

- GSM module connected to port B ("Port B").

- After declaring the connection to the GSM via a given port, the same port is then automatically selected in the line just above ("DGPS transmitter" line) in order to tell the system which port should be used to route the data to the GSM.



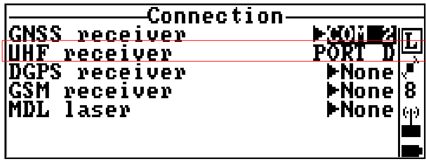
Lower line: port on CompactPro used to communicate with the GSM (B or D)
Upper line: automatically updated to allow station data to be routed to the GSM via the same port

- Same as previously regarding the possible coexistence of connections to the GSM AND to the U-LINK transmitter: if you connect the GSM module to port B, you can then leave the U-LINK transmitter connected to port D (as prompted above). On the other hand, if you connect it to port D, then the connection to the U-LINK transmitter must be removed.

Rover with THALES U-LINK receiver (standard case)

- The U-LINK UHF receiver is incorporated into the CompactPro unit and communicates with this unit via its port D.

- No connection to an external DGPS receiver, a GSM modul or an MDL laser ("None" selected for each of these 3 parameters).



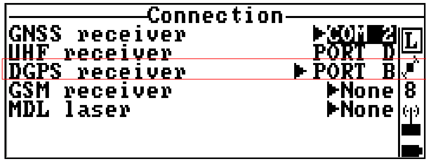
Port used on CompactPro unit to communicate with built-in U-LINK receiver (port D necessarily)
"None" would be displayed if there was no U-LINK receiver inside the CompactPro unit

7

Rover with external DGPS receiver

- DGPS receiver present on port B (“Port B”).

- No connection to GSM or MDL laser (“None”).



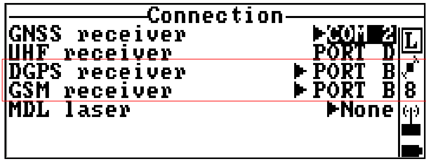
Port used on CompactPro unit to communicate with external DGPS receiver (B in general, possibly D if there was no built-in U-LINK receiver inside the Compact-Pro unit)

- The connection to the internal U-LINK receiver via port D is still indicated. Maintaining concurrently the two connections (DGPS and U-LINK) is not harmful to the system.

Rover with GSM

- GSM module connected to port B (“Port B”).

- After declaring the connection to the GSM via a given port, the same port is then automatically selected in the line just above (“DGPS receiver” line) in order to tell the system which port should be used to acquire the data from the GSM.



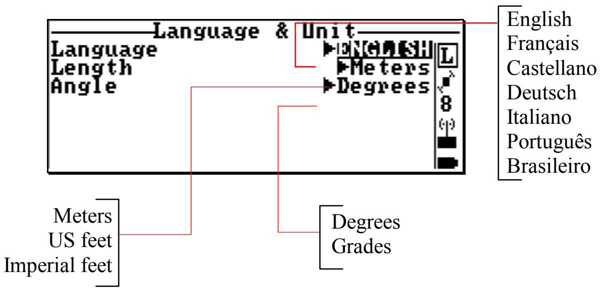
Port used on CompactPro to communicate with the GSM. The upper line indicates the port used to acquire the data from the GSM. Same as previously regarding the choice of port D for this connection

- The connection to the internal U-LINK receiver via port D is still indicated. Maintaining concurrently the two connections (GSM and U-LINK) is not harmful to the system.

❑ Language & Units

This function allows you to choose the interface language as well as the angle and distance units used by the User Interface.

- Select >**Language & Units**. The screen then looks like this:

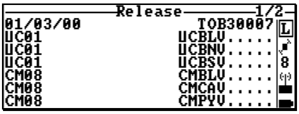


❑ Software versions

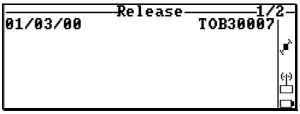
This function shows the release date and software version of the User Interface. If a CompactPro unit is connected, the function also lists the hardware components of the equipment and the corresponding software versions.

- Select >**Release**. The screen then looks like this:

CompactPro connected



Standalone



7

User Interface installation from CD-ROM

Caution! If you use a Husky MP2500, never re-format its hard disk.

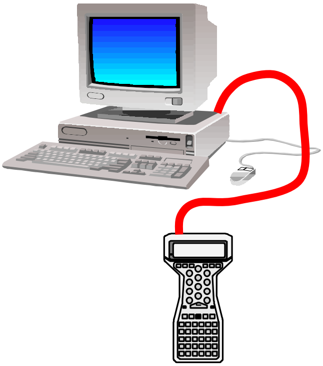
1. Insert the CD-ROM supplied into the drive of your office computer. This automatically starts the Setup.exe program on the CD-ROM resulting in the display of the main menu window.

Software Package CD-ROM

2. On this menu, select **Palmtop Software>Setup Topo TOV3xxxx**. The following dialog box then appears:

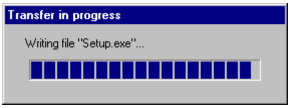
Follow the instructions displayed in this box:

- Connect the palmtop to the office computer via a serial link (for example using the DB9 / DB9 serial cable option). Use one of the available RS232 ports on the office computer (COM1 or COM2). On the palmtop, use the only possible RS232 port (port A).



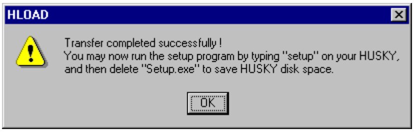
- Switch on the Husky. At the DOS prompt on the Husky, type "h" or "hcom/c2" and then press ↵. This launches the Hcom transfer utility program.

4. On the office computer, click **OK** in the **Husky Transfer** dialog box. This starts the transfer of the Setup.exe file to the palmtop. The following message is displayed:



(This may take a while...)

At the end of file transfer, the palmtop screen shows the DOS prompt and a new message is displayed on the office computer screen:



5. As prompted in this box, type "setup" and press ↵ on the palmtop. This installs the User interface software on the palmtop. Wait for the end of installation.

6. Still on the palmtop, type "cd \" and press ↵ to come back to the root directory.

7. Type "del setup.exe" and press ↵ to delete the setup file.

8. On the office computer, close the CD-ROM menu window, remove the CD-ROM from the drive and put it in a safe place.

♣

8. Real-time seismic applications

8

Introduction

In its 6500 MK-6500 SK real-time versions, the system can be used to perform 2-D or 3-D seismic surveys, using the same User interface software and the same implementation procedures for stations and rovers as in conventional, real-time topographic surveys.

The system will start behaving in a slightly different way only from the time you select a seismic job —rather than a conventional job— from the list of jobs present in the palmtop.

Seismic jobs must be prepared using the 3S Pack's SISS module. In the jobs list shown on the palmtop, they are marked with an "S" placed ahead of the job name. For more information about SISS, please refer to the 3S Pack documentation.

If you are new to the system and you have to perform seismic surveys, we recommend you to read the following sections and pages before doing anything:

- Section 1, which provides a complete description of the equipment provided
- Section 7, to become familiar with the User Interface software running on palmtop
- Section 2, to learn how to implement the station
- In section 3, pages 3-1 to 3-3, to learn how to prepare the rover before field operations
- Page 4-9, which shows the scenario to be followed when running staking out operations for a seismic job.

In the present section cross references are also frequently made to other sections in this manual for the sake of clarity or conciseness.

This section does not deal with all those functions in the User Interface that behave exactly in the same way as the same functions (i.e. with same name) in conventional topographic surveys. For more information about these functions, please refer to sections 2 et 3.

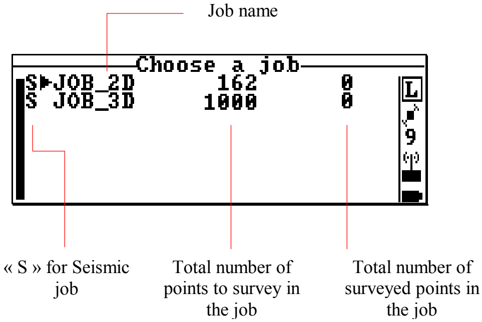
Getting started

After getting the station started (section 2) and after preparing the rover as described on pages 3-1 to 3-3, follow the steps below.

1. Switch on the palmtop (press red key, top right)

2. At the DOS prompt, type in “T”, and press to run the User Interface program. Wait for the end of the initialization phase. For more detail about this phase, or if something wrong happens during this phase, please refer to page 7-1.

   After successful completion of the initialization phase, a new screen appears, such as the one below, prompting you to choose a job:



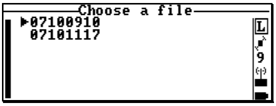
3. Move the cursor on a job name, and press to confirm your choice and open this job.

   Then the palmtop displays one of the following screens, depending on whether files exist or not in the open job (see the notions of *jobs* and *files* on page 5-15).

8

One or more files already exist for this job.

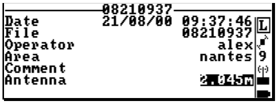
Example:



Move the cursor within the list to select a file then press

to confirm this choice

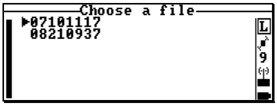
No file exists for this job
(which is always the case when you open a job for the first time). The palmtop will then suggest that you create a new file with default characteristics (refer to page 3-52)
Example:



Modify these characteristics if necessary, then press

F3

to create the new file. The following is then displayed:



to confirm this choice

The screen then displays the main menu. The name of the open job is shown on top.

4. Read the indications provided in the status bar (see also page 7-4).

- Unless the **L** (or **K**) processing mode is now displayed on top of this area, wait for this letter to appear before starting the job. When displayed, this letter denotes successful LRK (or KART) initialization and the ability for the rover to perform a job. Proper initialization is necessarily achieved with at least 4 satellites received and used.
- Check the battery indicator. With fresh batteries, the icon should be filled up (■).
- Check the UHF reception level. The higher the reception level the better.

Logging

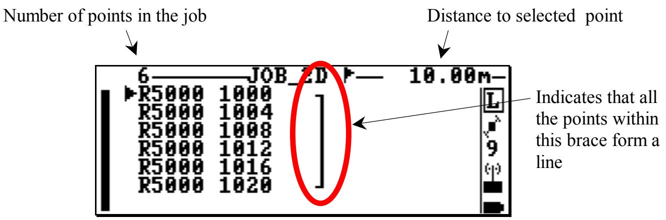
Select **>Logging**. The Logging function in seismic jobs is exactly the same as in conventional jobs. The scenario to be followed is presented on page 4-1 (scenario No. 1), and detailed procedure on pages 3-6 and 3-7.

Stake out

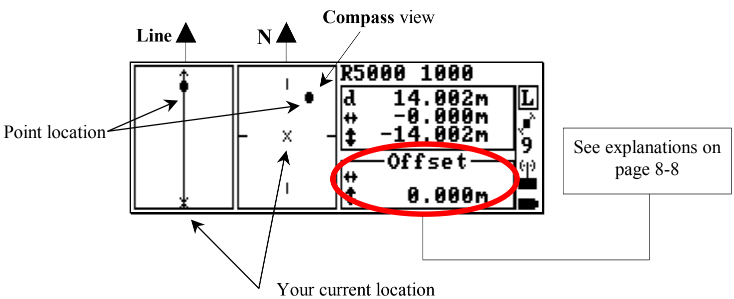
1. Unless already done, open a seismic job and a file.

2. Select **>Stake out**. The screen lists the points present in the open job.

   All screen examples shown below are based on a “2D” type job.

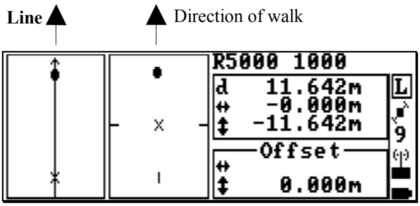


3. Select the first point in the line, then confirm your choice.



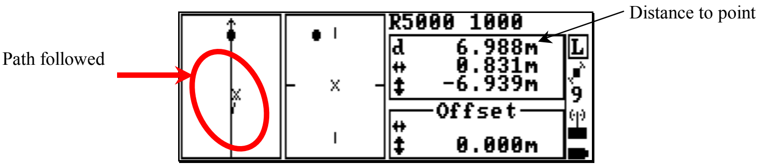
The direction to follow can be deduced from the Compass view (The North direction can be read on the antenna rod’s compass).

4. Take a few steps forward in the direction of the point. As a result, the **Compass** view no longer shows the North direction but instead, the direction in which you have just walked (see screen example below). The direction of walk will therefore be the right one if the target appears in the upper part of the compass view. Otherwise correct it so that the target appears at this place.



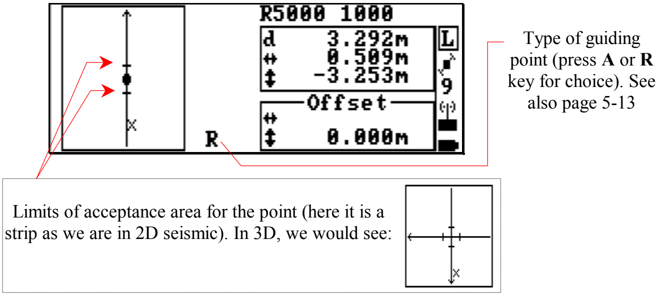
5. Continue to walk in that direction while keeping an eye on the screen. This will help you maintain the right course.

   The distance still to go is provided as the “d” parameter on the screen (complete with the cross-track and longitudinal components). The path you follow as you walk toward the point is represented on the left-hand chart by a dotted line starting from the location where you were when selecting the point:

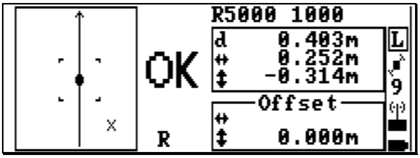


When the distance to the point becomes less than 5 m, the screen changes giving a magnified view of the area around the point (± 5 m along each axis).

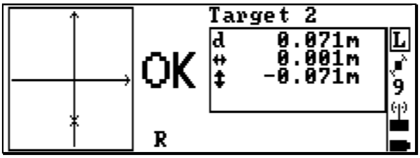
A sound can be heard when the screen change occurs. The direction of the axis system is always the direction of the line. Note the presence of a graduation showing the limits of the acceptance area.



6. Continue to move slowly in the direction prompted on the screen. When the distance to the point becomes less than 0.5 m, the screen changes again giving an even more magnified view of the area around the point (± 0.5 m along each axis).



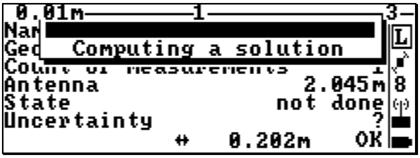
When the distance to the point becomes less than 0.15 m, the view can be magnified again (± 0.15 m along each axis) by pressing the **PgDn** key. To come back to the ± 0.5 m view, press the **PgUp** key.



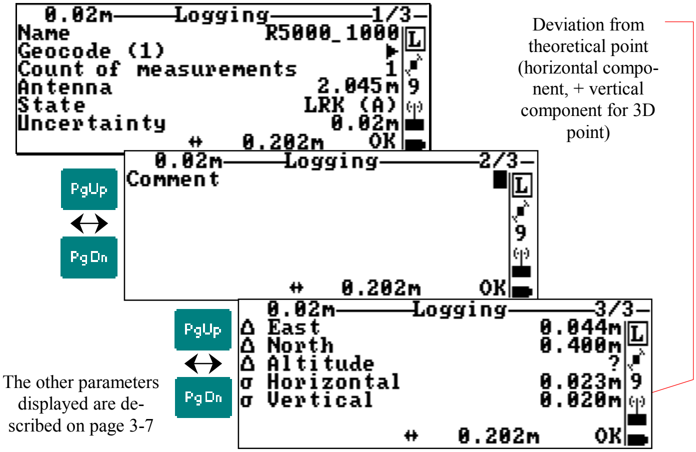
When the GPS antenna enters the acceptance area (a circle or a strip, see definition on page 8-10), the **OK** message appears meaning that you can now compute and save your position.

8

7. Press to compute a solution for your current location. In the same time, the Logging screen is accessed and a message is displayed on top of the screen. Stand still until the message disappears.



When a solution is available, it is indicated on the screen, complete with a number of useful information depicting its quality (deviation components, processing mode, uncertainty). Example:



If the count of measurements used in the solution computation is not the one you wanted to use (see explanations on page 5-13), then you can change this parameter on the screen, but you will have to start a new solution computation by pressing again.

A new solution computation will also be necessary if the antenna height parameter on screen 1/3 needs to be changed.

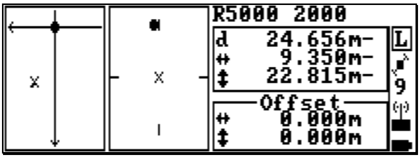
8. Press F3 to save the computed point. End of procedure.

Stake out with offset

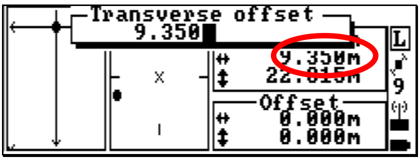
If you cannot reach a target —mainly because it is physically impossible, or because the antenna will probably be masked there — use the “Offset” fields as explained below to survey the target point.

All screen examples shown are based on a 3D seismic job. In 2D, you cannot define a transverse offset.

For example, the screen is as follows somewhere around the inaccessible target. The location where you are offers good GPS and UHF reception conditions, and so makes it possible for you to survey the target through an offset procedure.

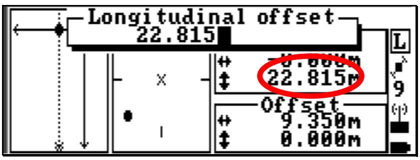


1. Press the **T** key (« T » for transverse) and type in the transverse deviation displayed in the upper-right frame:



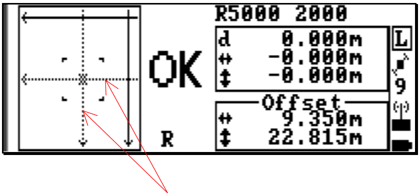
... then press ↵ to confirm this value.

2. Press the **L** key (« L » for longitudinal) and type in the longitudinal deviation displayed in the upper-right frame:



... then press ↵ to confirm this value.

The system now indicates that it is ready to log a point (« OK » is displayed on the screen) as the entered offsets artificially cancel the distance to the inaccessible point:



Dotted lines stand for offset
axis system the origin of which
is your current position

Then the procedure ends as in staking out without offset (see page 8-7), namely:

3. Press ↵ to compute the antenna's current position. Check for good quality of the result.

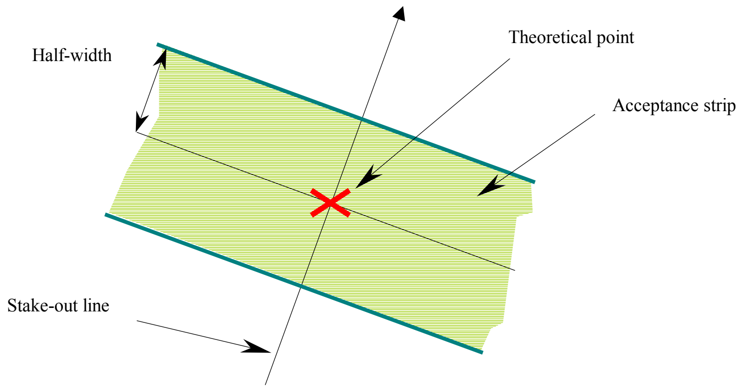
4. Press F3 to save the computed point. End of procedure.

   Offset values are maintained to be used for the next point to be surveyed. To reset them to "0.000", press the **C** key.

Staking out modes in seismic surveys

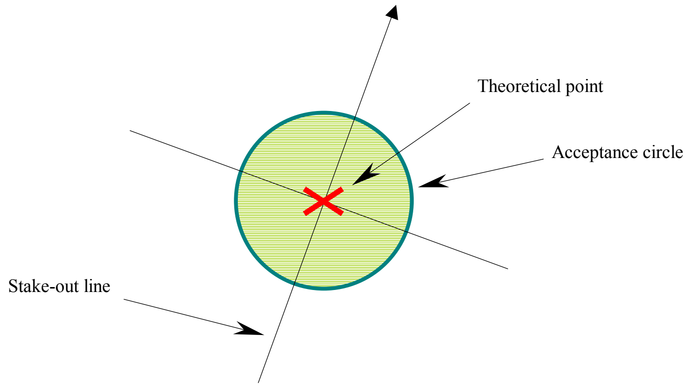
❑ 2D Mode: Staking out a line

The field operator is allowed to survey a point in a line only after entering its acceptance strip the half-width of which was defined when creating the job with SISS. To read the value of this parameter, select the uncertainty screen (see page 3-48). The half-width value appears in the “acceptance circle” field.



❑ 3D Mode: Staking out lines or a grid

The field operator is allowed to survey a point only after entering its acceptance circle the radius of which was defined when creating the job with SISS. Same as above to read the radius of this circle.



Seismic function inventory & accessibility

The User interface on palmtop offers the following functions when a seismic job is open, according to environment.

Icon	Rover	Station	Standalone
	**Stakeout** * Logging*	Stake out *	Stake out *
	Station position UHF Receiver (DGPS or GSM receiver)**	Position UHF transmitter (DGPS or GSM Transmitter)*** Average position	*No access*
	**Choose a job** **Choose a file** * Result points * Raw data Sessions Notes	Choose a job Choose a file * Result points * Raw data Sessions Notes	Choose a job Choose a file * Result points * Notes
	Operating mode Position Satellites SV deselection	Position Satellites SV deselection	*No access*
	Planimetry Altimetry Antenna		Planimetry * Altimetry *
	Date & time Geocode GNSS Receiver Connection Language & units Version		

Functions names followed by “*” can be accessed only if a job is open. Otherwise they will not appear in menus.
Bold characters indicate the functions discussed in this section. For the other functions, please refer to sections 2 and 3.
**: depending on the type of external receiver possibly connected to the rover
***: depending on the type of external transmitter possibly connected to the station.
♣

9. Post-processing applications

Introduction

This section describes the use of the series in post-processing applications. It is particularly intended for owners of 6500 SP & MP systems. From the hardware point of view, what makes these systems different from the real-time systems is the absence of the U-LINK facility between stations and rovers.

It should be noted that all the functions described in this section can be used on real-time systems. In that case, this type of equipment is capable of combining real-time processing and raw data recording (for further post-processing) without making the operator's task more complex.

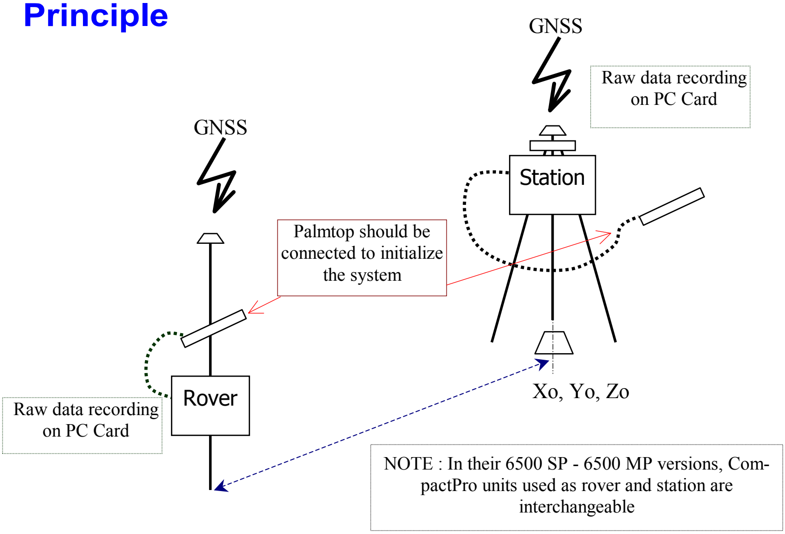
For new users who have to perform "post-processing-only" surveys, we recommend the prior reading of the following sections and pages:

- Section 1, which provides a complete description of the equipment provided
- Section 7, to become familiar with the User Interface software running on palmtop
- Pages 4-10 to 4-12 on which the possible working scenarios are presented, as well as page 4-13, which shows how to transfer raw data to the post-processing software
- Pages 5-2 and next ones to read the principle of sessions, markers, etc.
- Page 5-6 to learn how to measure the antenna height.

In the present section cross references are also frequently made to other sections in this manual for the sake of clarity or conciseness.

This section does not deal with all those functions in the User Interface that behave exactly in the same way as the same functions (i.e. with same name) in conventional topographic real-time surveys. For more information about these functions, please refer to sections 2 et 3.

Principle



The palmtop allows you to set the recording rate and define the antenna height. It is also used to program automatic recording sessions, if you wish to use this function.

To secure the post-processing of raw data, recording on PC card should take place concurrently at the station and the rover.

Data recording can be run :

- In manual or “immediate” mode : the beginning and end of recording are controlled by the operator. This mode is well suited to rovers.
- Or in automatic mode, through prior programming of recording session(s). This method is well suited to stations as it gives a station the capability to operate on its own while allowing it to save battery energy and to optimize the use of the memory space available on its PC card.

Supply

❑ 6500 SP Station

Same as real-time systems (see page 1-1), except for the following:

- No “U-LINK Tx 4812 transmission kit for 6500 series” (P0100348).

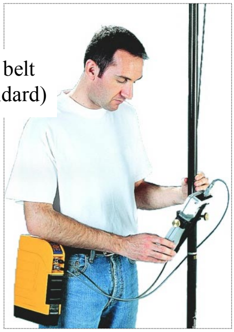
❑ 6500 MP Rover

Same as real-time system (see page 1-3), except for the following:

- No “U-LINK Rx 4800 reception kit for 6500 series” (P0101204).

Carrying modes

On belt (standard)

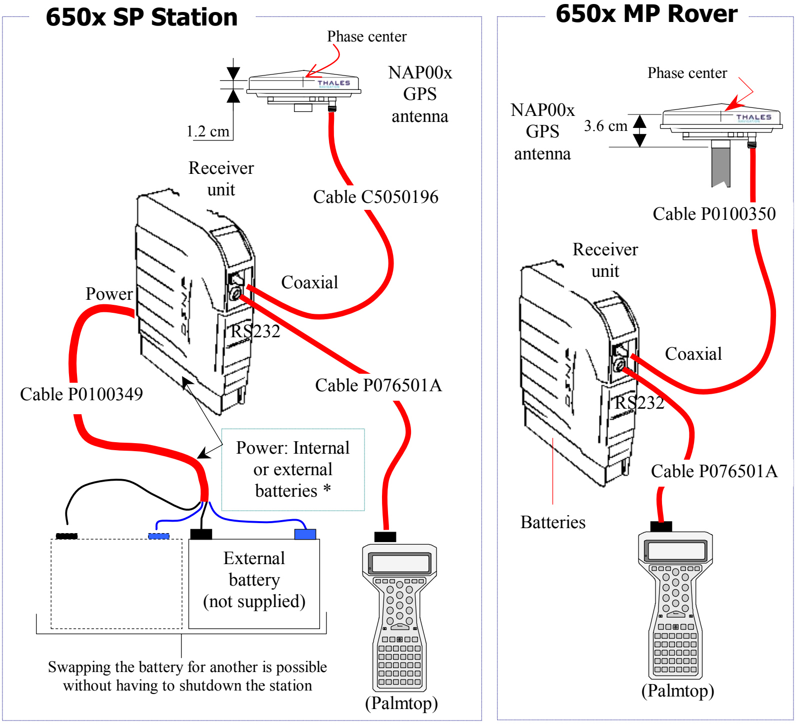


“All-on-a-rod” (option)

On shoulder strap (option)

Backpack (option)

Connections



*: Use either two camcorder-type batteries (not provided with station), or an external battery attached to the **Power** connector (located at the rear of the unit), using the cable provided (P0100349). In that case, make sure the CompactPro battery compartment is empty.

Using the system with a palmtop

In this configuration, data recording may be in "immediate" or automatic mode.

Advantages: provides access to recording parameters for possible changes, allows you to place markers in the recording file.

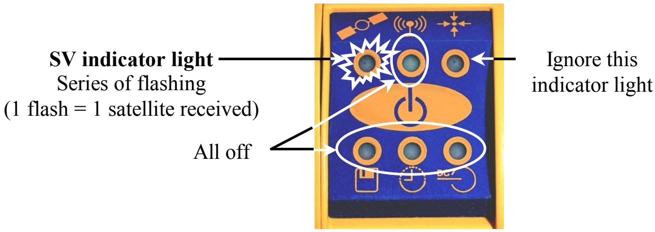
Drawback: requires the presence of a palmtop computer attached to the CompactPro unit for every operator action.

After making the connections described on page 9-4, do the following (both at station and rover).

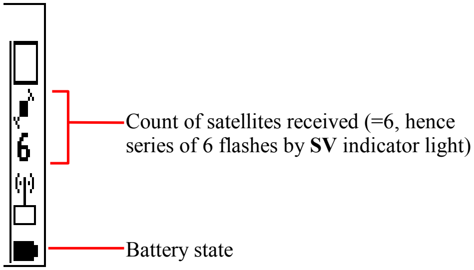
9

❑ Getting started

1. Insert a PC Card into the CompactPro unit
2. Switch on the palmtop. This causes the CompactPro unit to be switched on as well.
3. Hit the "T" key and then press 
4. Choose "Rover" and then press 
5. On the palmtop, press the **Esc** key to display the main menu.
6. Check that the indicator lights on the receiver mini-panel are in the following states after a few seconds of operation:



The palmtop status bar should confirm these indications. Example:



A complete description of the status bar is provided on page 7-4.

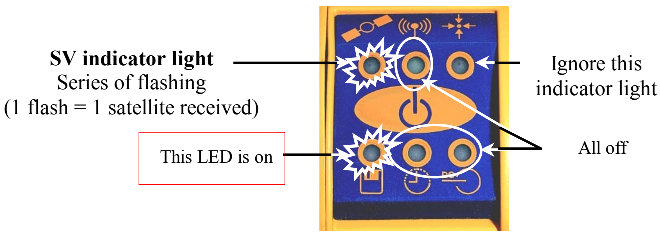
7. Proceed to the recording phase (manual or automatic, see below).

❑ Manual (or immediate) recording

Use the **>Raw data** function of the User interface, as described on page 3-58. On top of this page, the notice shown in a frame is irrelevant to post-processing systems as they are always fitted with a PC card drive. Below is a summary of the procedure to follow, starting from the screen that appears after selecting this function:

1. Specify a filename, the recording rate and the antenna height
2. Start recording by pressing F3

   While recording is in progress, the **Recording** indicator light is on:



3. Markers can be inserted in the recording file by pressing:
   - M to access the **Mark** screen, then:
     - F3 for a short event
     - Or the **A** key at the beginning of a longer event, then F3 at the end of this event
4. Press the **S** key when you want to stop recording.

9

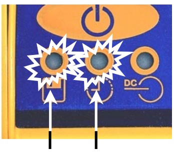
❑ Automatic (or programmed) recording

Use the **>Antenna** function to enter the antenna height.

Then use the **>Sessions** function of the User interface, as described on page 3-61. On top of this page, the notice shown in a frame is irrelevant to post-processing systems as they are always fitted with a PC card drive. Below is a summary of the procedure to follow, starting from the screen that appears after selecting this function:

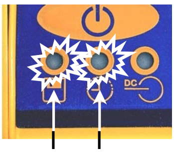
1. First you may have to press the **S** key to stop the sequence of sessions in progress, if any.
2. Edit a session (start and end times, filename, “yes” to enable recording during the session).
3. F3 to save the definition of the session.
4. Choose a power mode (Auto or Manual), see page 3-61, tell the system whether the session must be repeated on a daily basis or not, specify recording rate.
5. F3 to enable the session to be executed. Indicator light states:

Before recording



Flashing Flashing

Recording in progress



On On

A recording session can be cancelled or ended at any time by pressing the **S** key.

Using the system without a palmtop

In this configuration, only manual (or immediate) recording can be run.

Advantage: very easy to use

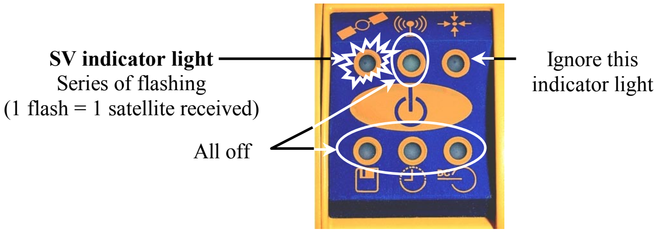
Drawbacks: operates with default recording rate and filenames; no markers can be placed in the recording file.

When working in this way, the antenna height and the recording rate are assumed to be at the expected values (otherwise, you should first use the palmtop to set them).

After making the connections described on page 9-4, do the following (both at station and rover).

❑ Getting started

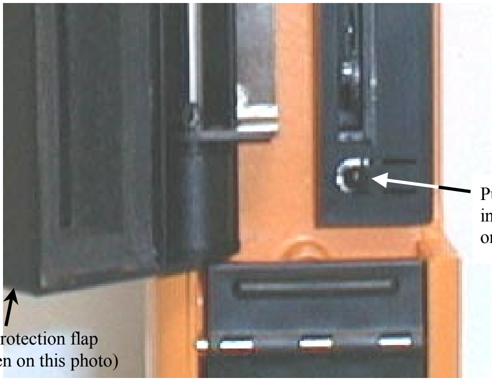
1. Insert a PC Card into the CompactPro unit
2. Press the On/Off push-button on the receiver mini-panel (see page 1-7).
3. Check that the indicator lights on the receiver mini-panel are in the following states after a few seconds of operation:



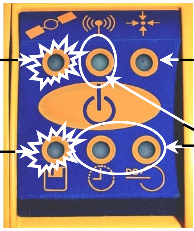
4. Proceed to the recording phase.

❑ Recording

1. Press the push-button under the PC card slot. The indicator light (see below) starts flashing denoting acknowledgement of the recording request
2. Close the protection flap. The indicator light changes from the flashing to the permanently lit state, indicating that data recording has started.



This indicator light will remain lit as long as raw data is being recorded on PC Card:



Opening the flap by accident while data recording is in progress will only suspend recording (indicated by flashing indicator light), which means that recording will continue when closing back the flap (and the indicator light will come back to its normal lit state).

However, data recording will not continue in the same file, but **in another file!!** which means that later, discontinuity is bound to appear in the data post-processing at the time of recording interruption.

If the indicator light starts flashing while recording is underway and the flap is close, it means that the **PC Card is full** and so user intervention is required.

To end data recording in a definitive way, i.e. until the next explicit recording request:

1. Open the flap (indicator light starts flashing)
2. Press the button under the PC Card. Recording stops immediately and the indicator light goes out.

Recording duration and rate

The duration and rate of recording on any point depend on the nature of the post-processing that will follow. For example, with 3S Pack's Rapid Static or LR Rapid Static module, the following is recommended:

Recording rate	
Single-frequency	**Dual-frequency**
6 seconds max. (3 seconds recommended)	

Recording duration	
Single-frequency	**Dual-frequency**
10 minutes + 1 minute per km	5 minutes + 1 minute per km

Collecting raw data recorded on PC card

Insert the PC card containing the raw data files into the PC computer running 3S Pack.

From within **3S Pack Supervisor**, use the command **File>Import GPS data** and select the PC card drive in order to access the raw data files stored on the PC card. Importing raw data amounts to enriching the 3S Pack database with **Observations**, **ephemeris**, **almanacs**,… records.

This can also be performed using the KISS or SISS module (see page 6-24) which copies the files from the PC card directly into the open project. Data can then imported from within 3S Pack as explained above, this time by specifying the KISS or SISS project directory from which to import.

♣

10. Data transmission media

Introduction

As explained in section 5, the theory of operation for real-time applications with the 6500 series (SK-MK) relies, among other things, on the implementation of a data transmission facility between the station and the rover.

As standard in the real-time 6500 series, this function is achieved by the U-LINK radio whose operating conditions are briefly reviewed in this section.

However, other means can be used to fulfill the data transmission function:

- GSM (option)
- Other (for example RTCM-type transmitter & receiver)

At the station, you can even implement simultaneously the U-LINK UHF radio and another transmission medium (like for example a GSM module).

In this configuration, the rover operator will be able to choose the source of corrections data according to her/his own criteria (signal quality and availability for example), simply by setting appropriately the **Diff. mode** parameter in the following function:

 **> Operating mode**

U-LINK

This is the default data transmission medium.

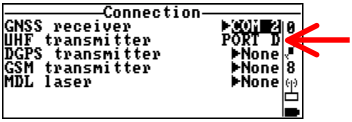
The implementation of the U-LINK transmitter at the station is described in section 2. As for the rover, the U-LINK receiver being completely integrated into the CompactPro unit, there is nothing particular to be done to operate it.

You can check through the following displays that the “U-LINK radio” facility is the one currently used and properly configured:

❑ A the station

- From the moment the U-LINK transmitter is properly connected to the CompactPro unit, it is ALWAYS port D that is selected to allow communication with the U-LINK transmitter. This is shown on the palmtop display after selecting the following function:

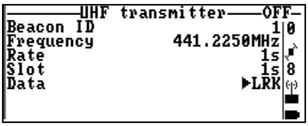
   **> Connection**

- Then select  **> UHF transmitter**.

  Check, and if required, correct the displayed data (station number, transmission frequency, transmit rate and data type).

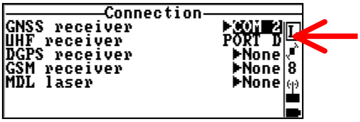
  Check that the station is transmitting (“ON” displayed top right, otherwise press **F3** to start data transmission). Display example:

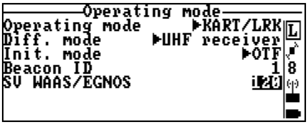
❑ On the rover

- On CompactPro, it is ALWAYS port D that is selected to allow communication with the built-in U-LINK receiver. This is shown on the palmtop screen after selecting the following function:

  > Connection



- Select **> Operating mode**. In the 2nd line, select "UHF receiver", then enter the station number (line 4) and transmission frequency (line 6) of this station. Display example:



The system can now acquire the data from the station via the U-LINK receiver. The survey can now begin.

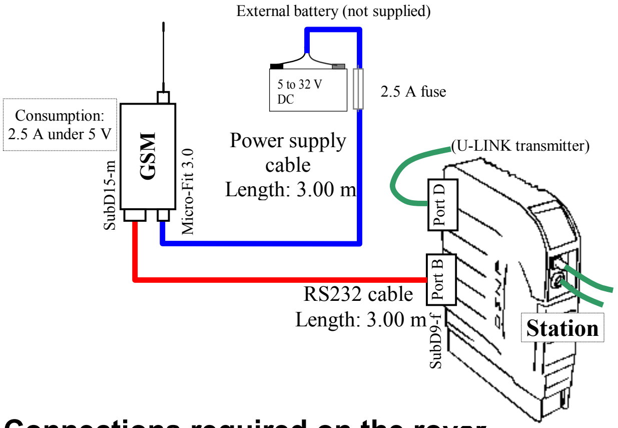
NOTE: the station number and transmission frequency can also be defined from within the following function:

> UHF receiver.

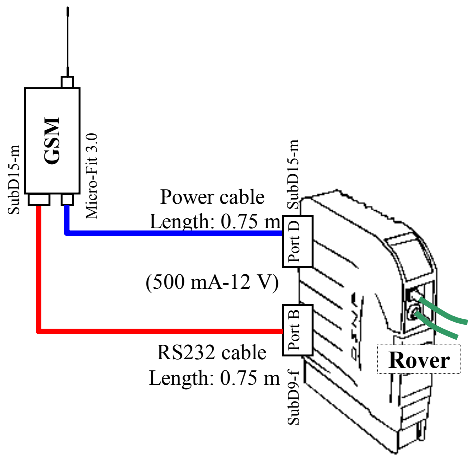
GSM

This transmission medium is available as an option. As opposed to the U-LINK radio which is free of charge once the permission to operate the UHF transmitter is granted, the use of the GSM is subject to bills tied to the amount of data communications performed via this system.

❑ Connections required at the station



❑ Connections required on the rover



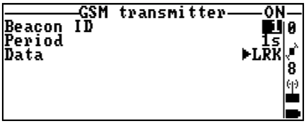
❑ Activating the use of the GSM at the station

- Select  **> Connection** and then select port B in the “GSM transmitter” field. This causes “Port B” to be selected as well in the “DGPS transmitter” field

- Select  **> GSM transmitter**.

  The parameters displayed on this screen (station number, data rate and type) are normally the right ones as they were chosen earlier to operate with the U-LINK radio

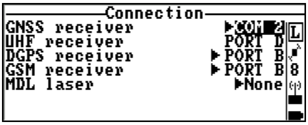
- Press **F3** to allow the station to transmit its data. Example of display then obtained:



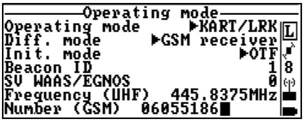
IMPORTANT: The station will actually transmit its data (and so will actually use the GSM) only on rover request.

❑ Using the GSM on the rover

- Select  **> Connection** and then select “Port B” in the “GSM receiver” field. This causes “Port B” to be selected as well in the “DGPS receiver” field



- Select  **> Operating mode**
- Select the desired operating mode (line 1)
- Select “GSM receiver” (line 2)
- Dial the station GSM call No. (line 7). Example:



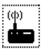
- BEFORE calling the station, you can check the reception level of the GSM signal by pressing **Q**. The system will return a figure between 0 and 5. The extreme values should be understood as follows:

  “0” : no reception → GSM CANNOT be used

  “5” : optimum reception (GSM can be used from 1 to 5)

- Press **F3** to call the station. The survey can now begin.

  NOTE: The call number (and the station number) can also be defined from within the following function:

   **> GSM receiver**

❑ How to stop GSM data communication

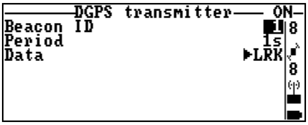
- Select **> GSM receiver** or **> Operating mode**
- Press the **S** key. The system will stop operating with the GSM and will terminate the data communication between the station and the rover.

External DGPS

❑ Activating the use of external DGPS at the station

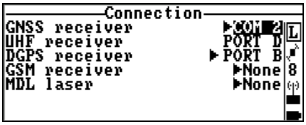
- Select **> Connection** and then select ”Port B” in the “DGPS transmitter” field

- Select **> DGPS transmitter**
- If required, re-define the station number, data output rate and type (KART/LRK or RTCM)
- Press **F3** to allow the station to transmit its data via the external DGPS transmitter. Example of display then obtained:

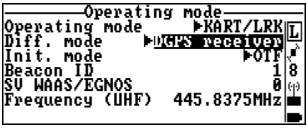


❑ Using an external DGPS receiver on the rover

- Select > **Connection** and then select “Port B” in the “DGPS receiver” field



- Select > **Operating mode**
- Select the desired operating mode (line 1)
- Select “DGPS receiver” (line 2)
- Check the other parameters and correct them if necessary



The survey can now begin. ♣

Non-recommended UHF frequencies

They represent 3% of the available channels in the band 400-470 MHz.

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)
400.0000	420.2500	442.0000	462.0250
403.0000	420.2625	442.3250	462.0375
403.0125	420.2750	442.3375	462.0500
403.0250	420.2875	442.3500	462.0625
403.0375	422.6750	442.3625	464.4500
403.0500	422.6875	442.3750	464.4625
403.0625	422.7000	442.3875	464.4750
403.0750	422.7125	442.4000	464.4875
403.0875	422.7250	442.4125	464.5000
407.9250	422.7375	447.2500	464.5125
407.9375	422.7500	447.2625	464.5250
407.9500	427.5875	447.2750	466.9125
407.9625	427.6000	447.2875	466.9250
407.9750	427.6125	447.3000	466.9375
407.9875	427.6250	447.3125	466.9500
408.0000	427.6375	447.3250	466.9625
409.1500	427.6500	450.0000	466.9750
409.1625	427.6625	452.1625	466.9875
409.1750	429.0000	452.1750	468.0000
409.1875	430.0000	452.1875	470.0000
409.2000	431.2750	452.2000	475.5125
409.2125	431.2875	452.3250	475.5250
409.2250	431.3000	452.3375	475.5375
410.0000	431.3125	452.3500	475.5500
412.8375	431.3250	453.3875	475.5625
412.8500	431.3375	453.4000	475.5750
412.8625	431.3500	453.4125	475.5875
412.8750	432.5000	453.4250	
412.8875	432.5125	453.4375	
412.9000	432.5250	453.4500	
412.9125	432.5375	453.5750	
416.0000	432.5500	455.0000	
417.7500	432.5625	457.0750	
417.7625	432.5750	457.0875	
417.7750	437.4125	457.1000	
417.7875	437.4250	457.1125	
417.8000	437.4375	457.1250	
417.8125	437.4500	457.1375	
417.8250	437.4625	457.1500	
418.9000	437.4750	460.0000	
420.0000	437.4875	460.7875	
420.2125	439.8375	461.9875	
420.2250	439.8500	462.0000	
420.2375	440.0000	462.0125	

Glossary

DGPS	:	**D**ifferential **GPS**
DGNSS	:	**D**ifferential **GNSS**
EDGPS	:	**E**nhanced **DGPS**
EGNOS	:	**E**uropean **G**eostationary **N**avigation **O**verlay **S**ystem
ENH	:	Acronym for **E**ast **N**orth **H**eight
GDOP	:	**G**eometric **D**ilution **Of** **P**recision
GIS	:	Acronym for **G**eographic **I**nformation **S**ystem
GNSS	:	**G**lobal **N**avigation **S**atellite **S**ystem
GPS	:	**G**lobal **P**ositioning **S**ystem
ICD200	:	Name of a well known geoid model (sometimes incorrectly named “Stanag” model) providing an altitude model for the whole Earth planet
KART	:	Acronym for **K**inematic **A**pplication **R**eal **T**ime (L1 kinematic)
LGH	:	Acronym for **L**atitude lon**G**itude **H**eight
LRK	:	Acronym for **L**ong **R**ange **K**inematic
LRK	:	**L**ong **R**ange **K**inematic (L1/L2)
LRK A	:	Qualifies a position solution resulting from accurate LRK mode
LRK R	:	Qualifies a position solution resulting from real-time LRK mode
Multi-path effect	:	Interference between direct and reflected GPS signals making proper determination of the correct signal less precise
NMEA	:	**N**ational **M**arine **E**lectronic **A**ssociation

Non-planned points : All points surveyed in the field other than target and reference points. By definition, non-planned points can be seen in a KISS project only after performing a job in the field

OTF : **O**n **T**he **F**ly

PC : **P**ersonal **C**omputer

PC card : **P**ersonal **C**omputer **M**emory **C**ard **I**nternational **A**ssociation (PCMCIA)

Phase center : A point, in the geometrical sense, providing the actual location of a GPS antenna, more particularly its Z coordinate, with respect to any visible feature of this antenna. Data provided by manufacturer as it is closely linked to the design of the antenna.

Planned points : Target or reference points. Points planned to be surveyed when preparing a project with KISS

PVT : Acronym for **P**osition **V**elocity **T**ime

Result points : Points contained in a result file. All result points are also potentially planned points

RTCM : **R**adio **T**echnical **C**ommission for **M**aritime services

"Surveyed" point : Point whose position was computed and saved through any of the possible surveying scenarios

STANAG : See ICD200

SV : **S**pace **V**ehicle (GPS satellite)

"To log" a point : To compute a point's position and save it

UHF : **U**ltra **H**igh **F**requency

WAAS : **W**ide **A**rea **A**ugmentation **S**ystem

♣

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