Leica iCON grade iCP41 for wheel loader
User Manual

Version 1.2
English

Introduction

Purchase	Congratulations on your purchase of the iCP41. The iCP41 is an ideal tool for increasing productivity in all aspects of the construction earthmoving industry.

This manual contains important safety directions as well as instructions for setting up the system and operating it. Refer to "7 Safety Directions" for further information.
Read carefully through the User Manual before you switch on the product.

To ensure safety when using the system, please also observe the directions and instructions contained in the User Manual and Safety Handbook issued by the:
• Machine manufacturer and
• System manufacturer.

Product identification

The type and serial number of your products are indicated on the label on the base of the unit.
Enter the model and serial number in your manual and always refer to this information when you need to contact your agency or Leica Geosystems authorised service workshop.

Type: iCP41   Serial No.:   _____

Symbols

The symbols used in this manual have the following meanings:

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

Trademarks

- GSM is a trademark owned by the GSM Association.

All other trademarks are the property of their respective owners.

Validity of this manual

This manual applies to the iCP41.

☞

To use the iCP41 efficiently it's unavoidable to refer to the manual provided together with the software running on the iCP41.

Table of Contents

1 Product Overview

1.1 Product Description and Features

General

The iCP41 has a key pad and touch screen for user input. The display is a 7" wide screen and offers state of the art brightness, making it possible to use in sunny environments.

The rugged IP56 enclosure is designed for harsh environments.

Power Supply and Communication

For utmost reliability in harsh and dusty environments, no cables or power supplies are used with the iCP41.

☞ "Cradle" will be used as a short form for MMB1300 cradle throughout this manual.

- The iCP41 is wirelessly powered from the cradle via induction.
- Data are transferred wirelessly via IR between the cradle and the iCP41.
- On the bottom of the iCP41 are SIM card and USB ports.

iCP41
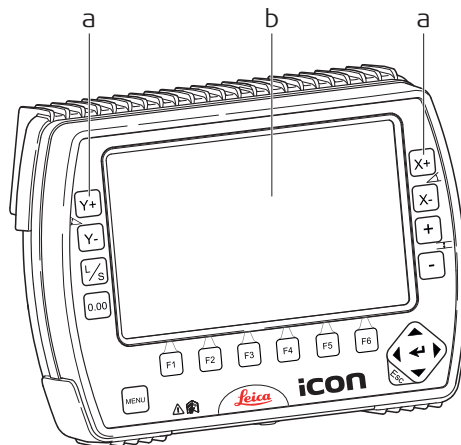
iCP41_001

a) Keypad
b) 7" LCD wide screen display
c) WiFi antenna (not used)
d) IR-Port for data transfer
e) HSPA antenna
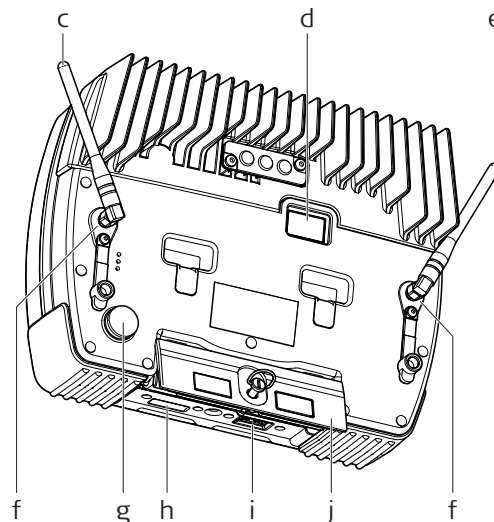
f) Reverse SMA Connectors
g) Ventilation cap
h) SIM card slot
i) USB 2.0 slot
j) Cover for communication ports

☞
- Do not cover the IR-Port for data transfer as this can lead to a transfer interruption.
- Neither the HSPA nor the WiFi antenna are attached to the iCP41 when delivered.
- To store the iCP41 inside the transport case both antennae must be detached.

1.2　Container Contents

Container for instrument and delivered accessories

iCP41_002

a) iCP41
b) User Manual
c) WiFi antenna
d) HSPA antenna
e) Transport case
f) USB memory stick
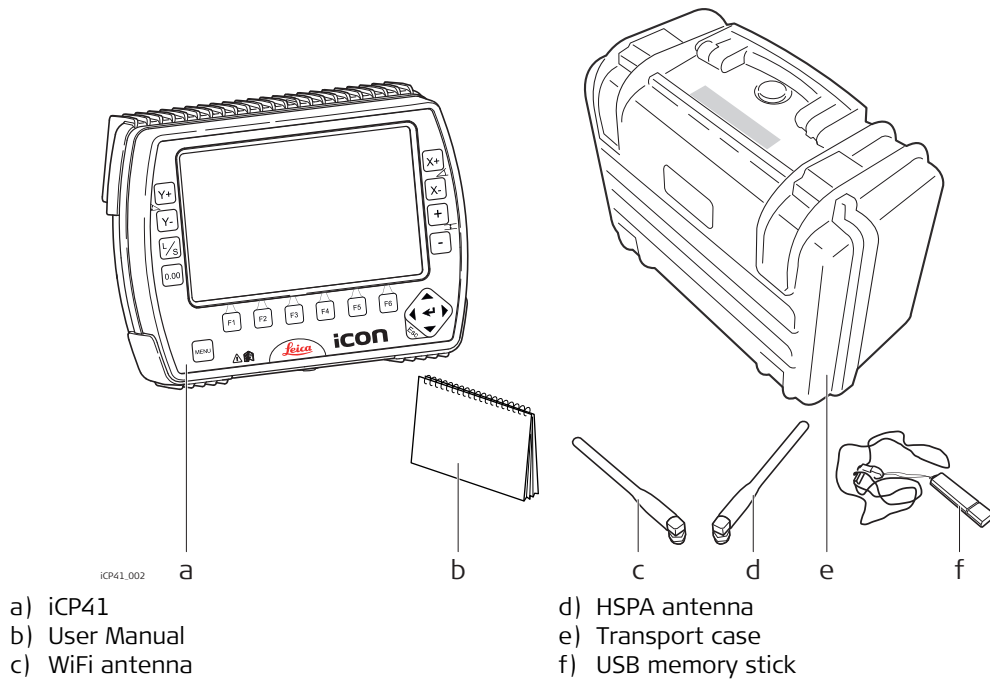
2 Commissioning

2.1 Installation

⚠ **Warning**   This product may be installed on construction equipment only by an appropriately trained and qualified specialist.

⚠ **Warning**   Unauthorized modification of machines by improper mounting of the product may alter the function and safety of the machine.
**Precautions:**
Follow the instructions of the machine manufacturer. If no appropriate instructions are available, ask the machine manufacturer for instructions before mounting the product.

Installation information

The iCP41 is ready to use when delivered from the factory. No installation procedure is needed.
To get the iCP41 started complete the following steps:

1. Snap iCP41 onto cradle.
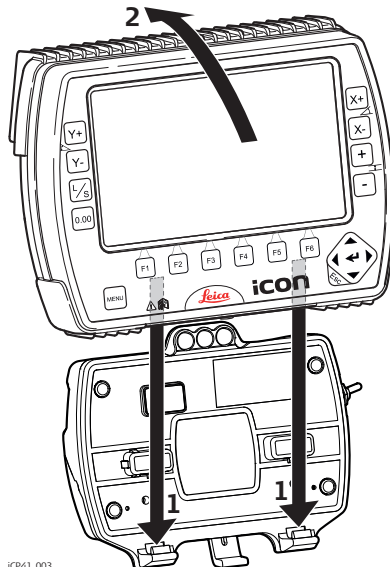
iCP41_003
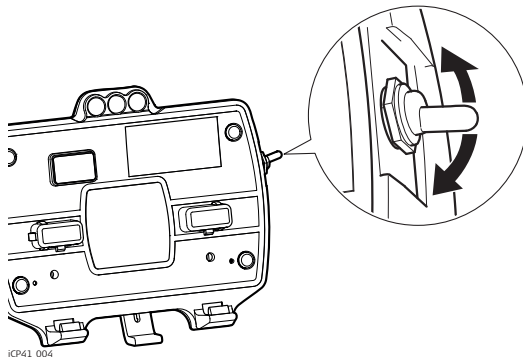
To connect the iCP41 to the cradle:
  1. Put the iCP41 on the holding hooks in the bottom of the cradle.
Then snap the iCP41 onto the cradle by pressing it towards the cradle.

☞ Failure to properly mount the panel to the cradle can result in the panel falling off the cradle, causing damage to the unit.

2. Turn iCP41 on.

iCP41_004

To turn the iCP41 on and off, use the power switch on the right side of the cradle. This is the master switch for the entire system.

☞ Removing the iCP41 will also turn off the power.

iCP41_005
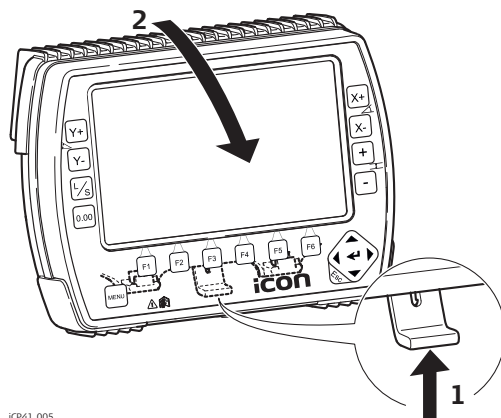
☞ To release the iCP41 simply press the release key at the bottom of the cradle and pull the iCP41 towards you and then lift it up.

2.2 Inserting a SIM card / USB stick

Insert and remove a SIM card/USB-Stick step-by-step

Follow the step-by-step instructions to properly insert a SIM card or USB stick.

☞ To remove the SIM card/USB-Stick place the instrument on a stable surface first. Then follow the following instructions in reverse order.

iCP41_019
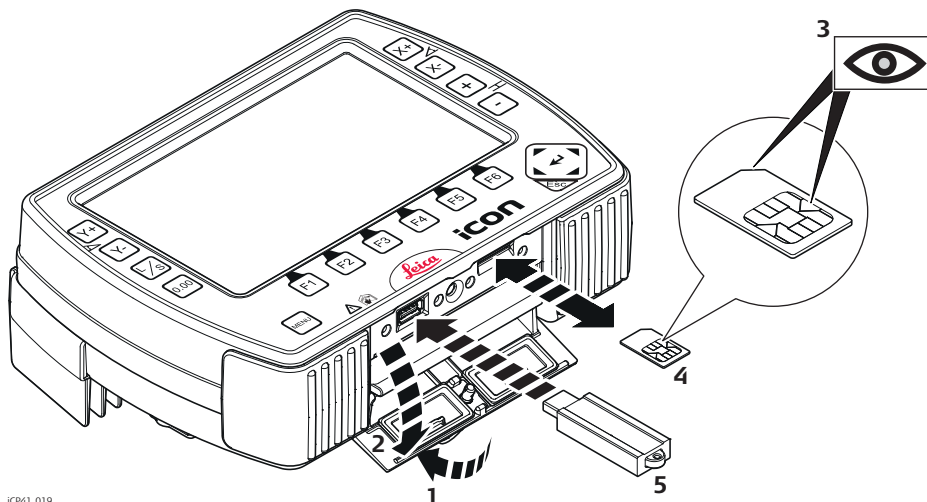
☞ Place the instrument onto a stable surface. (Not illustrated)

Step	Description
1.	Rotate the ring to the left.
2.	Pull the ring to open the protective door.

Step	Description
3.	Orientate the SIM card as illustrated.
4.	Insert the SIM card into the slot and push it in until it locks in place.
5.	Insert the USB-Stick into the USB port and push it in until it locks in place.

The USB is inserted for the following operations:
• When upgrading the software, in which case the system needs to be powered on with the USB stick inserted.
• During normal operations to transfer design files, as explained in chapter 4.13.

2.3 Inspection Prior to Commissioning

Inspection

1. Check that the **cradle on/off switch** is in the **off** position.
2. Check that the iCP41 is **fully seated into the cradle**.
3. Check that the cradle LEDs are operating normally.
   • The top led should blink to show that messages are being transmitted from the CAN bus over the IR link.
   • The middle LED should blink to show that messages are being received from the CAN bus over the IR link.
   • The bottom LED should remain on to show that the cradle has sufficient power.

2.4 Commissioning

Power supply

The iCP41 is powered in the following way:
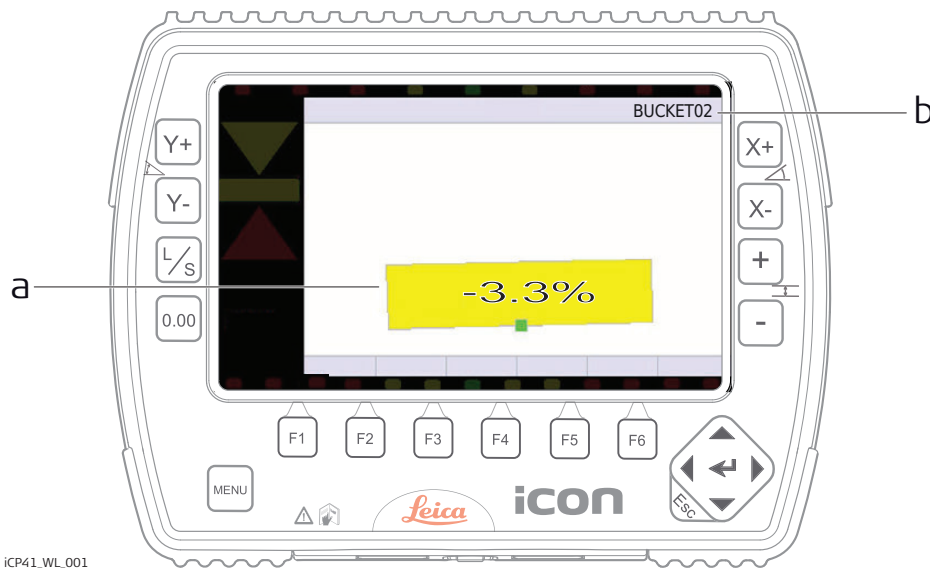• Induction based power through the backside of the iCP41 facing the cradle.

3　2D Run Mode

3.1　Control Box 2D Mode

Control Box　　**Description of display**

iCP41_WL_001

a)　Tilt slope display
b)　Selected bucket

Description of buttons

Button	Description
Y+ Y-	Not used for the wheel loader application.
X+ X-	Not used for the wheel loader application.
+ -	Not used for the wheel loader application.
L/S	Not used for the wheel loader application.
0.00	Reset button. Used for setting the reference level and resetting earlier values in the menu.
MENU	Selecting a bucket.
(navigation button)	Navigation button. Allows you to navigate through the menus. Press left/right arrows to move between bucket items. **Naming convention within this manual:** • ↵ : Enter button • ◀▶ : Left / Right arrow buttons • ▲▼ : Up / Down arrow buttons • Esc : Escape button
F1	Not used for the wheel loader application.
F2	Not used for the wheel loader application.
F6	Not used for the wheel loader application.

3.2 2D User Menu Tree

User Menu tree

```
|—— SETUP SYSTEM
|      |—— UNITS LENGTH
|      |—— UNITS ANGLE
|      |—— BEEP VOLUME
|      |—— LIGHT INTENSITY
|      |—— ALARM HEIGHT
|
|—— SETUP BUCKET
|      |—— CALIBRATE BUCKET
|      |      |—— ^v SELECT BUCKET
|      |      |—— BUCKET LEFT/RIGHT
|      |      |—— TILT
|      |      |—— BUCKET FLAT ANGLE
|      |      |—— FLAT LENGHT
|      |      |—— FLAT HEIGHT
|      |      |—— BUCKET WIDTH
|      |      |—— TILT ZERO
|      |      |—— BUCKET NAME
|      |
|      |—— BUCKET POINT
|      |—— BUCKET INDICATOR
|
|—— SERVICE MENU*
```

* Password protected menu for support personnel only.

3.3	**2D User Menu**

Enter the User Menu

To enter the User Menu, press the Enter button ◄┘.

Select a menu option by pressing the left/right arrows ◄▶.

Press the Enter button ◄┘ to enter the sub-menus.

Change a value by pressing the up/down arrows ◆.

☞ These settings are applied instantly.

3.3.1   SETUP SYSTEM

UNITS LENGTH	This menu option is used to set the length unit. You can choose between meters, inches or feet.
UNITS ANGLE	This menu option is used to set the angle unit. You can choose between per cent, per thousand, gon, degrees or relative.
BEEP VOLUME	This menu option is used to set how loud the iCP41 beeps. You can choose between off, low, normal and loud.
LIGHT INTENSITY	This menu option is used to set the light intensity in the display. You can choose between values from 0 to 15.
ALARM HEIGHT	This menu option is used to set how high up the pivot points are allowed. The value is the distance from the lowest pivot point. You can save the value by moving the bucket to a desired alarm height and pressing the 0.00 button.

3.3.2 **SETUP BUCKET**

CALIBRATE BUCKET In order to calibrate the bucket sensor, you must input some information about the length and angles of the bucket to the iCP41 System.

Follow the instructions below to do so:
1. Press the Enter button ◀┘. You will now enter the User Menu.
2. Select the menu option **SETUP BUCKET**. You select a menu option by pressing the left/right arrows ◀▶.
3. Press the Enter button ◀┘ to enter the menu option **CALIBRATE BUCKET**.
4. Press the Enter button ◀┘ to enter the menu option **^v SELECT BUCKET**.
5. Select the bucket you want to calibrate ▲▼. It is possible to select between 30 buckets.
6. Press the right arrow ▶ to enter the menu option **BUCKET LEFT/RIGHT**.
7. Select whether the bucket sensor is placed left or right ◀▶.
   When making your choice, you must look on the cover of the bucket sensor. If the lid/serial label is facing left, then you must choose LEFT and vice versa.
   Note: if you choose the wrong side, the bucket and the graphics will work upside down.
8. Press the right arrow ▶ until the display shows **TILT**.
9. Select "NO" if the bucket is Not a tilt bucket. Otherwise, select which tilt unit to use with the bucket. The system allows you to associate any one out of 5 tilt units to each bucket. Tilt units can be used with several buckets which is relevant when using a tilt coupling.
10. Press the right arrow ▶ until the display shows option **BUCKET FLAT ANGLE**.
11. Place the bucket in a level position using a spirit level then press the [0.00] button.
12. Press the right arrow key until the display shows **FLAT LENGTH**.
13. Measure the Flat Length (see illustration below) and enter the length using the arrows.
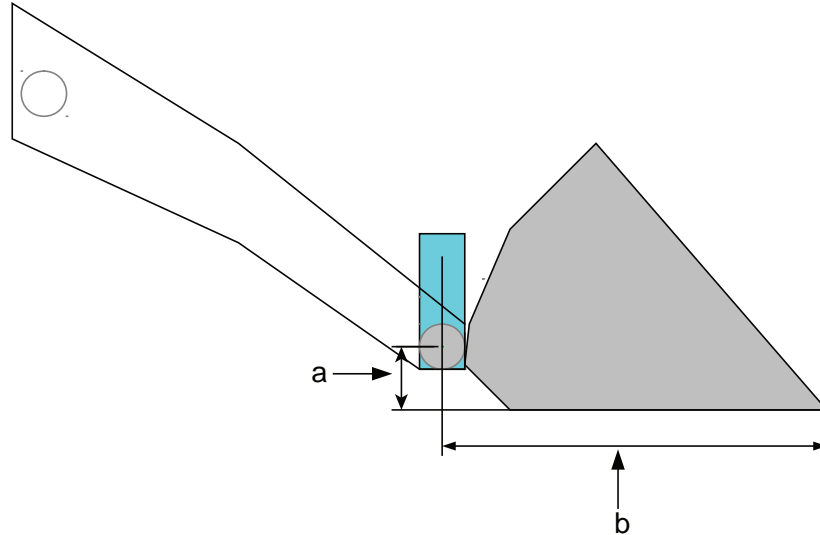
a) Flat Height
b) Flat Length

14. Press the up/down arrows ⬍ until the display shows the distance between the pivot
    point and the edge of the bucket (Flat Length) that you have measured in step 13.
15. Press the right arrow key until the display shows Flat Height.
16. Measure the Flat Height (See illustration above) and enter the height using the arrows.

17. Press the right arrow ▶ until the display shows **BUCKET WIDTH**.

18. **BUCKET WIDTH**

Measure the bucket width and press the up/down arrows ⬍
until the display reads the width.
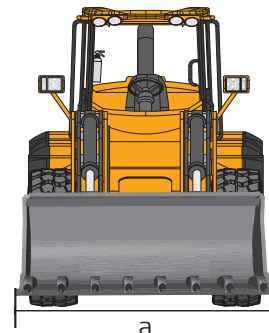
a) BUCKET WIDTH

19. Press the right arrow ▶ until the display shows **TILT ZERO**.

20. **TILT ZERO**

This sub-menu is used to calibrate wear of the bucket
cutting edge. Use it this way:
 1) Open the bucket until the bottom of the bucket is as
close to vertical as possible (move away from a flat posi-
tion).
2) Level the tilt of the bucket using a spirit level and press
the ⌊0.00⌋ button.
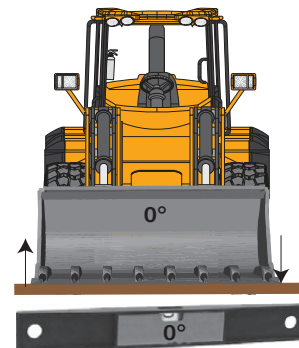
21. Press the right arrow ▶ until the display shows **BUCKET NAME.**

22. **BUCKET NAME**

This sub-menu is used to give the various buckets a name after they have been cali-

brated. If you enter @ as the first letter in the name, the iCP41 will generate the names BUCKET 1, BUCKET 2 etc. according to the number of buckets you have calibrated to the system.

By pressing the left/right arrows ◀▶, you can move the position of the cursor.

By pressing the up/down arrows ▲▼, you can change the letter.

23. Press the F4 button three times to leave the User Menu.

BUCKET POINT

At this option you choose which bucket point is used for height measurements.

You can choose between 5 settings:

• **MIDDLE**, **LEFT** or **RIGHT** side of the bucket as reference point.
  The chosen bucket point is shown with a green indication.

There are 2 other possibilities where the bucket point automatically changes between:

• **Closest**: the bucket point that is closest to the surface, or
• **Lowest**: the bucket point that is lowest without regard to the surface.
  The chosen bucket point is shown with a blue indication.

a) Closest   b) Lowest
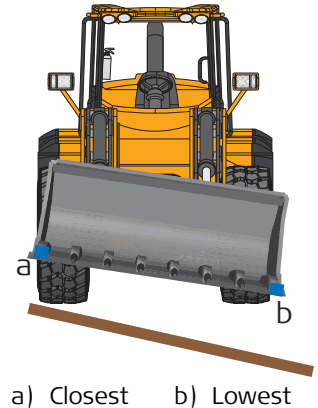
BUCKET INDICATOR

Enables or disables the bucket and tilt angle indicators.

3.3.3 SERVICE MENU

Description Password protected menu for support personnel only.

3.4 Diagnosis screen

Description

This is a diagnostic tool to view the status of sensors and error messages. If a cable breaks or a sensor is not functioning, it is possible to detect where the problem is.

To activate this screen, you must push the left/right arrows ◀▶ at the same time.

Example of a diagnosis screen

```
SENSOR        VALUE    VERSION  ENAB STAT
----------------------------------------
ROLL             -0.05 RS10A200 YES  ON
PITCH             2.20 RS10A200 YES  ON
BOOM1            45.91 XIS1 202 YES  ON
BOOM2             0.00          NO   OFF
STICK             2.77 XIS1L203 YES  ON
BUCKET        * -131.48 IS3 3.01 YES  ON
TILT          !  -0.16 IS2 3.01 YES  ON
XIS1LASER        0x00          OFF
RS10 FLUX       210.78 RS10A200 YES  ON
EXTENSION         0.00          NO   OFF
CABLE DET.          0          NO   OFF
----------------------------------------
XC16 v2.4.0
```

On the diagnosis screen you can see detailed system status information.

The most important columns are the last two: ENAB and STAT.
They will show if there is a deviation.

- **ENAB** tells the setting for the sensor that has been made in the technical menu. When the sensor is activated, YES will be shown.
- **STAT** tells if the sensor is working.
  ON shows that the sensor is working, OFF shows a failure either in the sensor or in the cable connection from the previous sensor. The chain of sensors start by the cabin and moves towards the bucket.
- ***** tells that the Bucket Sensor needs to be recalibrated. Please contact your local dealer.
- **!** tells that the Tilt Sensor is not working correctly. Please contact your local dealer.

4 3D Run Mode

4.1 Control Box 3D

Control Box

Description of display

iCP41_WL_002

a) Bucket's current cross-slope and model's slope by the bucket reference point. Symbol on the left shows direction of slope.

b) CUT/FILL value for left bucket edge. Background is blue for fill, green for inside tolerance and red for CUT.

c) Zoom keys. Touch screen to view keys.

d) Bucket reference point. Toggle right / left arrows on the navigation key.

e) Switch between 2D/3D in plan view.

f) Reference point's stationing in the centre line.

g) Reference point's side distance to centre line.

h) Distance to guide line. Line selection depends on the active reference.

i) CUT/FILL value for right bucket edge. Background is blue for fill, green inside tolerance and red for CUT.
j) Guide line. Viewed as a dashed blue line in the cross-section view.
k) Centre line. Viewed as a black & white line in the cross-section view.
l) Elevation of bucket reference point.
m) GPS status:
   • CQ (precision) for PowerBox, iCG60 and iCG80
   • DOP for other receivers
n) Reference model's height in the bucket reference point's position.

Description of buttons

Button	Description
+ -	These buttons offset the reference model vertically up or down. One push of the button equals 1 cm.
MENU	Opens the wheel loader's internal 2D system with the "select bucket" menu open.
F5	Opens a 2D display window for the wheel loader's internal system. It is not possible to adjust the wheel loader's system settings in this mode. Press the button again to close the window.
F6	Opens the wheel loader's internal 2D system. The system is still in 3D mode (GPS). The wheel loader's system settings can be changed.

Button	Description
	Navigation button. Allows you to navigate through the menus. Press left/right arrows to change the bucket reference point. **Naming convention within this manual:** • ↵ : Enter button • ◀▶ : Left / Right arrow buttons • ▲▼ : Up / Down arrow buttons • Esc : Escape button

4.2 Storing Points

Storing points

1. Press **Tools**.
2. Select **Store point options**.
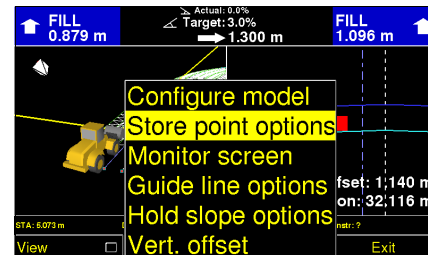
3. Select the **Coordinate file** you wish to store the measured points in.
4. Enter a **Point name**. Point numbers automatically increase by one when a point has been stored.
5. Press **Measure** to store the bucket reference point.
   The colour of this key corresponds to the position quality. The key is green when the position quality is good and red when it is low. In the latter case the function can't be used.
6. Check the **Show in run window** box to use the **Measure** key directly in run mode.
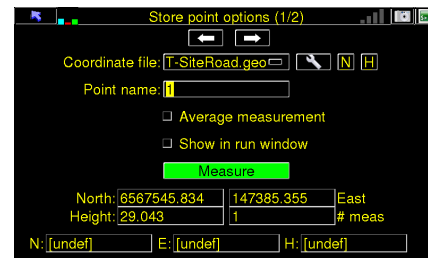
H Pressing this key will bring up the selected coordinate file in the plan view as a help model. Measured points are displayed in plan view.

N Press this key to create a new coordinate file.

4.3   Auto logging function

Using Auto logging

1. To use the auto logging function you must be in run screen and have a fixed position.

1. Press **Tools**.
2. Select **Store point options**.
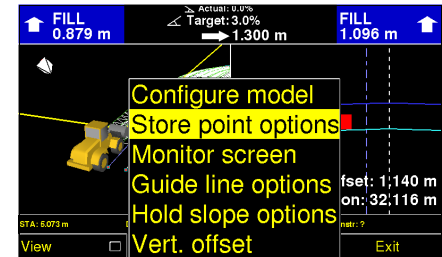
3. Go to the second page (2/2) by pressing the right arrow on the top of the screen.
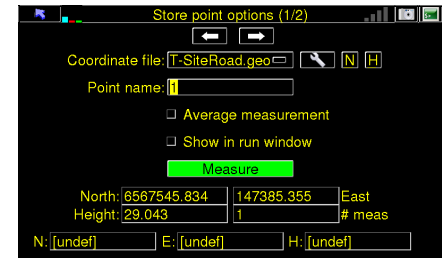
Options in Auto logging   In the auto logging menu you will find various options. You will have to make selections according to how you want to use auto logging.
Below you will find a description of the options that can be set in auto logging:
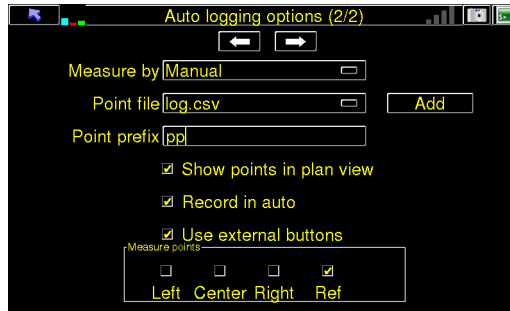
Options that can be set in auto logging

Measure by
1. Select between the four options in the drop down list.
   - **Distance** - point(s) are logged by distance
   - **Manual**
   - **None**
   - **Time** - point(s) are logged by time interval

Point file
1. Create a new point file by pressing the **Add** button or
2. Select an already created file in the drop down list.

Point prefix
1. Enter the prefix for the points you will log. The prefix will be shown in the file when it is opened.

Show points in plan view
1. Mark the check box if you want to see the logged points in the plan view.

Record in auto
1. Mark the check box if you want to have logging started when auto is enabled. (Only Dozer / Grader)

Use external buttons
1. Mark the check box if you want to use external buttons.
   • The external zero button can be used to log single points in Manual mode. You can also press directly on the icon on the screen to log a single point.
   • If you choose **Distance** or **Time** you can also enable/disable auto logging by pressing the external zero button once. You can also press directly on the icon on the screen to enable and disable the auto logging.

It is also possible to use two other external buttons Toggle and Switch (see in the installations manual how to install external buttons).

Measure points
1. Select how you want to measure points.
   • **Left**
   • **Center**
   • **Right**
   • Combination of all above
   • **Ref.** (reference point on bucket) - cannot be used in combination

Examples of settings   Below you will find screens that show examples of how the auto logging can be setup:
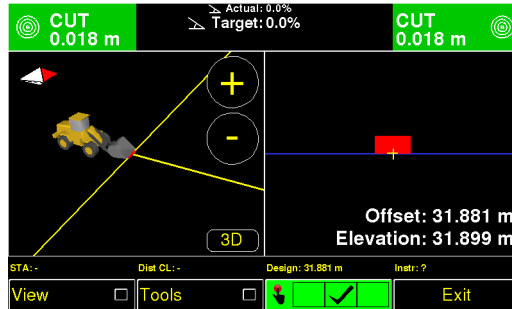
Manual mode ref point in center   **Combination** of Left and Right
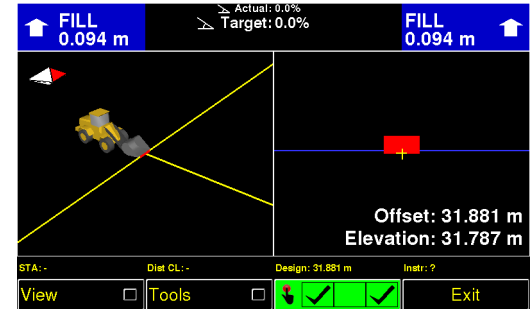
Distance mode ref point in center:
The auto logging function will start logging points for every 1 m the machine is moved. The distance between the log points can be selected.
After the points have been logged, you can enter the Help models to see the points.
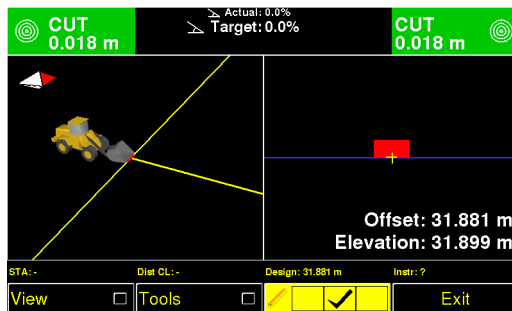
Distance mode ref point in center-
Auto logging OFF
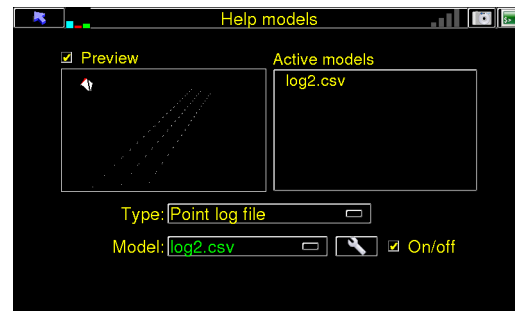
Points shown in the menu Help models

Time mode ref point in center
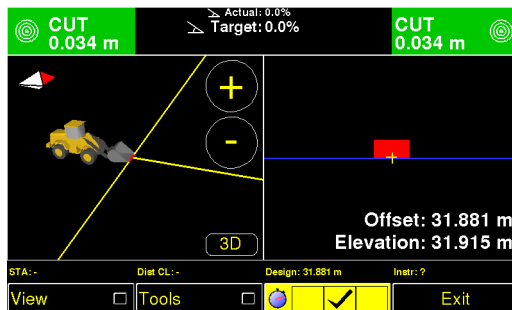
Time mode ref point in center -
Auto logging OFF
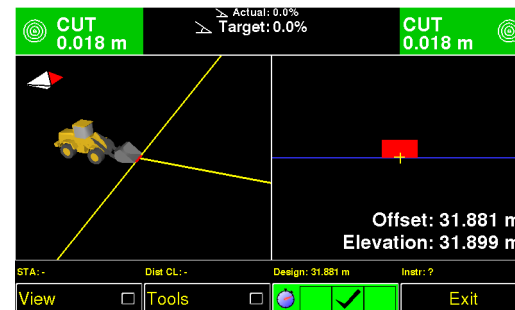
Time mode ref point in center -
Auto logging ON

None mode
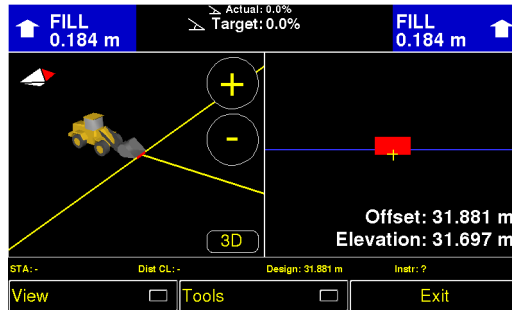
None mode -
Auto logging is disabled

You can now use store point options. Refer to "4.2 Storing Points" for further information.
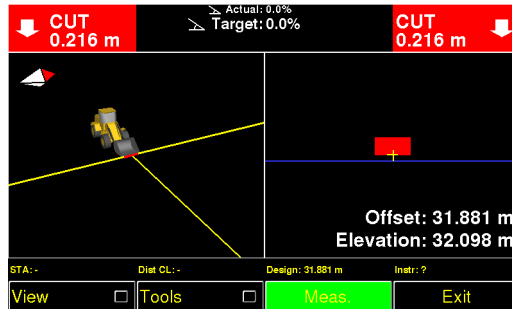
| 4.4 | Avoidance zones |

Description of avoidance zones

Avoidance zones are areas you can specify to give a visual alarm when entered. In an avoidance zone no guidance nor automatic control is possible.
For avoidance zones, the following characteristics apply:

- An avoidance zone is a geo file that is created in iCON office.
- The avoidance zone must be a closed polygon.
- The avoidance zone geo file must be placed in the project.

☞ The avoidance zone geo file must not contain points, lines that are not closed, lines with radius or lines that intersect.

Options in avoidance zones

In the avoidance zone menu you will find various options. You will have to make selections according to how you want to use avoidance zones.

Below you will find a description of the options in avoidance zones:

Type
1. Select **Avoidance zones model** on the drop down list.

Model
1. Select the avoidance zone in the drop down list you want to use, and mark the check box **On/Off**. You will now see the selected model in **Active models**.
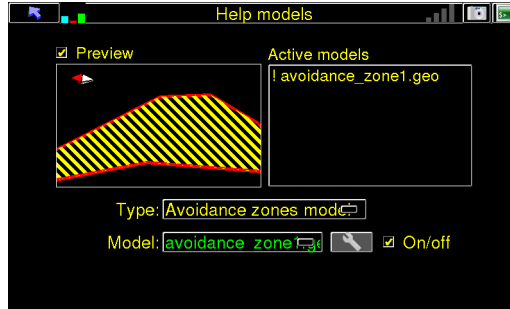
Selected model is shown in **Active models**

Examples

Below you will find screens that show examples of how the avoidance zone can look in the panel:
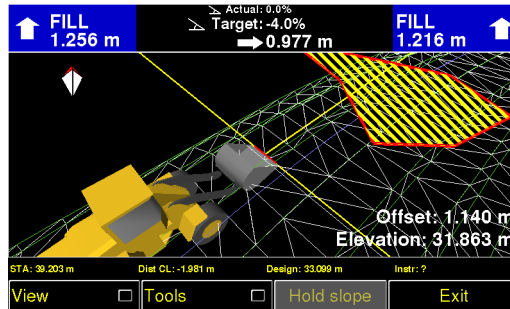
Avoidance zone in front of the machine

The next screen shows that the machine has entered the avoidance zone and a warning will pop up on the screen and an alarm will sound.
When the machine is out of the avoidance zone, the warning and sound will stop.
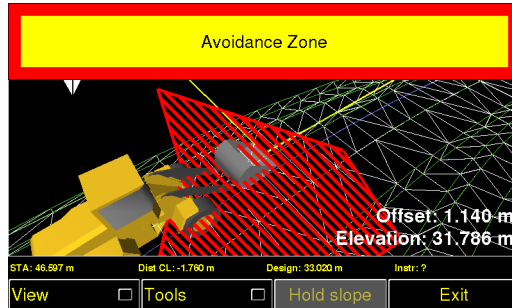
The machine has entered the avoidance zone

4.5   Vertical Offset

☞

This function moves the reference model vertically up or down.

Setting the vertical offset

1. Press **Tools**.
2. Select **Vert. offset**.
3. A window opens on the screen where you can adjust the vertical offset.

4. The CUT/FILL values in the upper corners refer to the offset surface. In the cross-section view it is illustrated by a blue line.
5. The green line represents the original surface level.
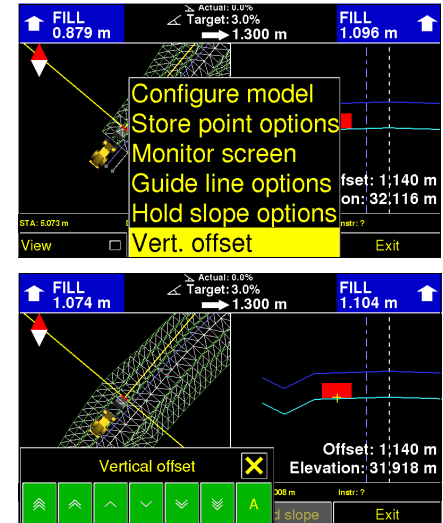
Vertical offset keys

Key	Description
⩘ ⩡	Equals an offset of 10 cm (.3').
⩘ ⩡	Equals an offset of 1 cm (.03').
⌃ ⌄	Equals an offset of 1 mm (.003').
A	The vertical offset is set so that the current CUT/FILL values for the bucket reference point is zero, therefore the reference model "moves" to the bucket.
+ -	On the panel, you can adjust the vertical offset using the + / - buttons. Each button press equals an offset of 1 cm (.03').

4.6   Changing the Bucket Reference Point

Changing the bucket reference point

You can change the bucket reference point by pressing the left/right arrows ◀▶ while in run mode.

4.7   Screen Settings

Background brightness and theme

Background brightness and theme, like colours of the keys, can be adjusted in **Tools** › **Themes** in the main menu.

1. Select a **Theme** from the list.
2. Adjust the screen's background lighting using the **Brightness slider**.
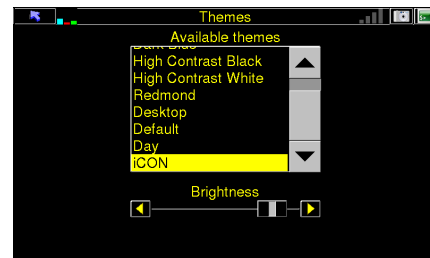
☞ When the brightness is set to max the backlight on the on-panel buttons is turned off. These are the buttons described in chapter "3.1 Control Box 2D Mode".

4.8 Other Settings

Other settings

Other settings such as language, length units etc. can be found in **Settings** › **Other** in the main menu.
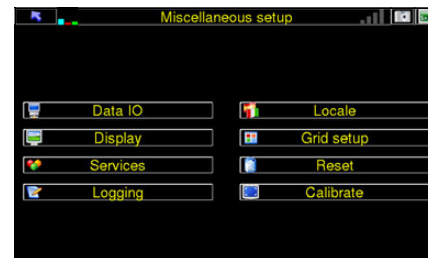
Option	Description
Data IO	Modem settings and viewing data on ports.
Locale	Settings for languages, units, etc.
Display	Advanced run mode settings such as background colour in run mode, point size, cross hair size, hide machine view in run mode, etc.
Grid setup	Settings for handling grid models (modification models).
Services	Advanced iCON telematics settings.
Reset	Reset the configurations: machine settings, instrument settings, etc. are removed. Projects are left intact.
Logging	Activate logging for trouble-shooting. ☞ This is not a function for logging of points.
Calibrate	Calibrate the touch screen. Consult support personnel before calibrating the screen.

4.9 Working with Terrain Models

4.9.1 Guide Line

How to select a Guide line

There are two ways to select a Guide line when working with a terrain model:
- from a file, in LIN format
- graphically by touching the screen, from a file in GEO format.

Selecting a Guide line

1. Press **Tools**.
2. Select **Guide line options**.
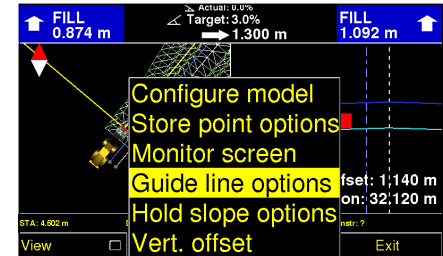
Select Guide line from file

1. Check the box to the right of **Guide line**.
2. In the drop down list, select the file with the relevant guide line.
3. By entering a value for **Horiz. offset**, the line will be moved horizontally at the given value.
4. Press **Match** to set the horizontal offset at the same distance as the bucket's perpendicular distance to the Guide line.
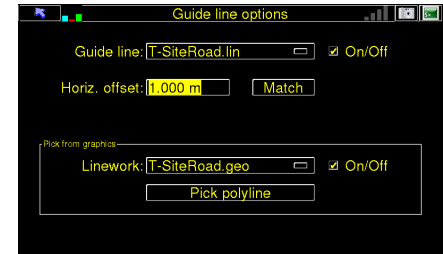
Select Guide line by touching the screen

1. Check the box to the right of **Linework**.
2. In the drop down list, select the file containing the Linework.
3. Press **Pick polyline**.

4. On the touch screen, select the line that is to be used as a Guide line.
5. Press **Go** to activate the selected Guide line and return to run mode.
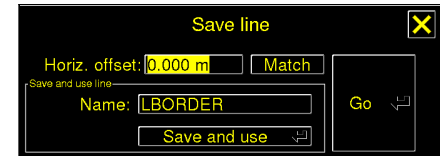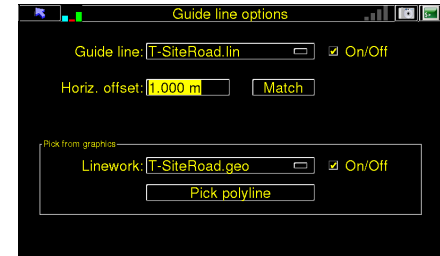
4.9.2   **Locking Cross Slope**

☞   To use this function a centre line needs to be selected in the reference model settings.

Possibilities to hold a   In a terrain model there are two ways to hold a cross slope:
slope
• **From centre line**
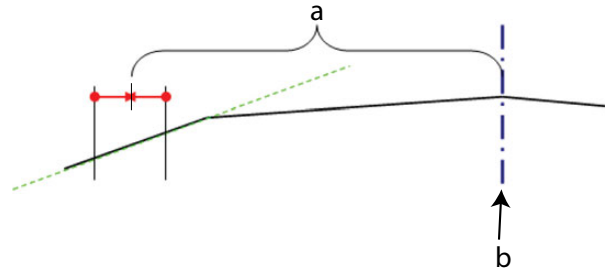
a) Hold slope distance from centre
line
b) Centre line

The slope is calculated between two points at a distance of 25 cm (.75') on each side of the
distance to centre line in the current cross-section.

• **User-defined**
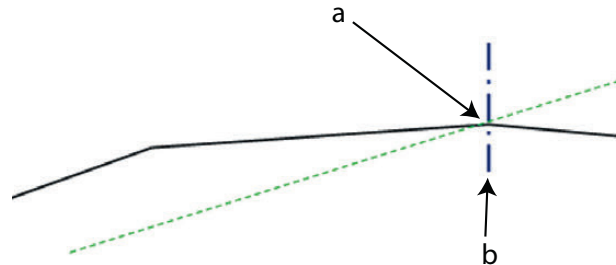
a) The slope is constant along the
centre line and intersects the
centre line at the same level as the
reference surface intersects it.
b) Centre line

Enter Hold slope options

1. Press **Tools**.
2. Select **Hold slope options**.
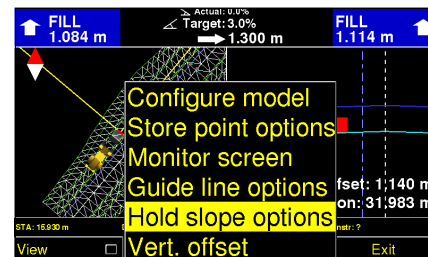
From centre line:

1. Select **From centre line** in **Hold slope mode**.
2. Enter the distance from the centre line where the slope is to be locked. Refer to "From centre line", page 45, for more information.
3. Press **Match** to automatically set the distance to the bucket reference point.
4. Use the Back key to return to run mode.
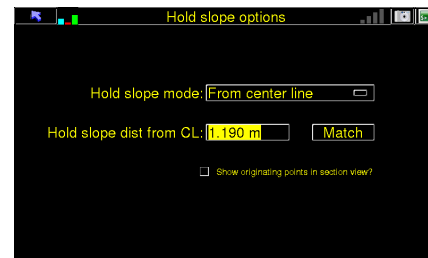
User-defined:

1. Select **User defined** in **Hold slope mode**.
2. Enter a constant slope setting. Refer to "User-defined", page 45, for more information.
3. Use the Back key to return to run mode.

4. In run mode, press **Hold slope** to hold the cross slope according to the settings specified above.
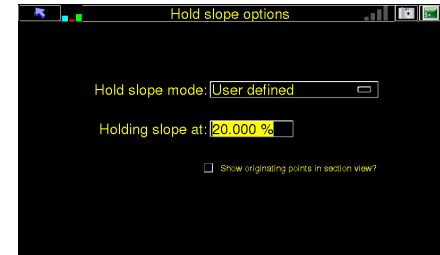
4.10   Working with MBS (Volume Calculation Model)

4.10.1   Selecting a Guide Line

Selecting a guide line

1. Press **Tools**.
2. Select **Guide line options**.

3. Check the box to the right of **Guide line**.
4. Select guide line as: **Centre line**, **Closest element** or **Horizontal intersection**.
5. By entering a value for **Horiz. offset**, the line will move horizontally.
6. Press **Match** to set the horizontal offset to the bucket reference point's current distance from the Guide line.
7. Use the Back key to return to run mode.
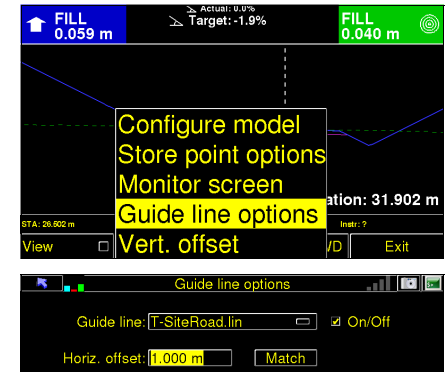
4.10.2   Holding Slopes

Hold the slope   There are two ways to hold the slope when working with an MBS:
• Above the element that the bucket is currently positioned over.
• Hold the slope for a specific element by choosing the element's code. Remember that the element must be coded when creating the MBS in order for this function to be available.

In run mode, press **Lock** to hold the slope. The key turns green when the function is activated.
• The slope above the current element will automatically be held if none of the settings below are adjusted.
• The slope setting for the selected code will be held if the function is activated in the settings. Refer to "Holding slope for an element using a code", page 50, for more information.
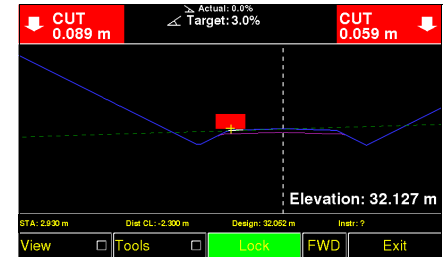
Holding slope for an element using a code

1. Press **Tools**.
2. Select **Configure model**.

3. Check the **Use** box. If the box is left unchecked the slope setting for the element above the bucket's current positioned will be locked.
4. Select a code for the element to be locked in **Lock with code**.
5. Use the Back key to return to run mode.
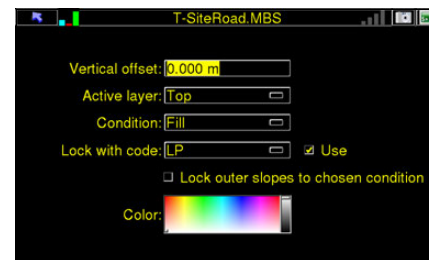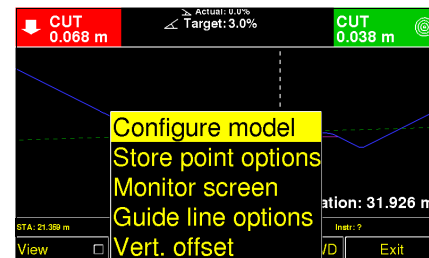
Selecting a layer

1. Press **Tools**.
2. Select **Configure model**.
3. Select **Top layer** or **Bed** in **Active layer**. CUT/FILL values will point towards an active layer.
4. Use the Back key to return to run mode.
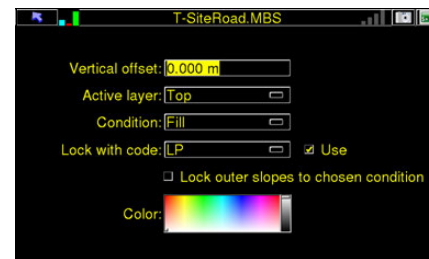
Selecting conditions for outer slope and level of bed

The angle of the outer slopes and levels of the bed will vary depending on the terrain the machine is working in. The steepness of the slope and other design elements are determined when creating the MBS.

If the bucket is positioned above the MBS reference surface, the outer slopes will be calculated under a CUT condition: sloping upwards. If the bucket is under the reference surface, the outer slopes will be calculated for the FILL condition: sloping downwards.

1. Press **Tools**.
2. Select **Configure model**.
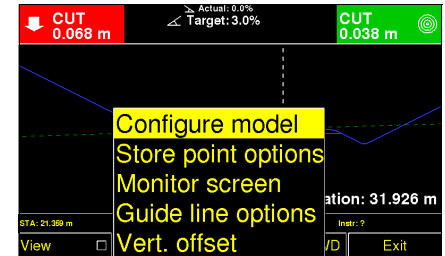
3. For **Condition**, choose between: **Fill**, **Soil**, **Rock**, **User1** or **User2**. The angle of the outer slopes and the level of the bed will vary depending on the selected option.
4. If the **Shaft** box is checked, the outer slopes will be calculated under the FILL condition, even when the bucket is above the MBS's reference surface. This is useful when building up a road bank and you want to fix the outer slopes to point downwards.
5. Use the Back key to return to run mode.
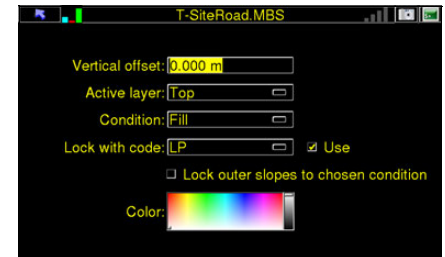
4.11   Working with String Line Models

Selecting a guide line

1. Press **Tools**.
2. Select **Guide line options**.

3. Check the box to the right of **Guide line**.
4. Select guide line as: **Centre line**, **Closest element** or **Horizontal intersection**.
5. By entering a value for **Horiz. offset**, the line will move horizontally.
6. Press **Match** to set the horizontal offset to the bucket reference point's current distance from the Guide line.
7. Use the Back key to return to run mode.
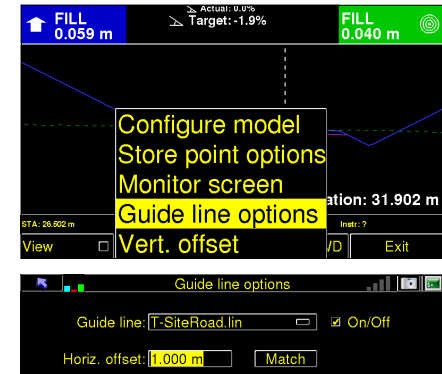
**Terrace offset**   You can move the terrace vertically but not the whole reference surface as is the case with vertical offset. This is practical when building up a road bank with fixed levels.

1. Press **Tools**.
2. Select **Configure model**.
3. Enter the distance the terrace is to be moved. When moving the terrace downward the entered value must be negative (-).
4. Use the Back key [icon] to return to run mode.
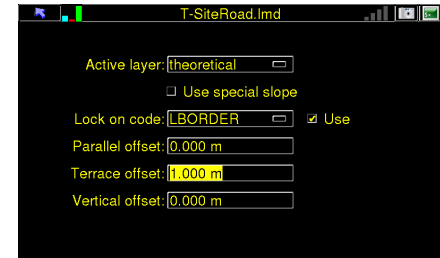
Locking the slope   There are two ways to lock a slope setting when working with a String line model:
- Above the element over which the bucket's reference point is currently positioned.
- Lock the slope for a specific element by choosing the element's code. Remember that the element must be coded when creating the string line model in order for this function to be available.

In run mode, press **Lock** to lock the slope. The key turns green when the function is activated.
- The slope above the current element will automatically be locked if none of the settings below are adjusted.
- The slope setting for the selected code will be locked if the function is activated in the settings. Refer to "Locking slope for an element using a code", page 54, for more information.
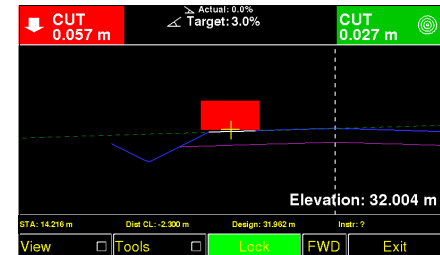
Locking slope for an element using a code

1. Press **Tools**.
2. Select **Configure model**.

3. Check the **Use** box. If the box is left unchecked the slope setting for the element above or below the bucket reference point will be locked.
4. Select a code for the element to be locked at **Lock on code**.
5. Use the Back key to return to run mode.
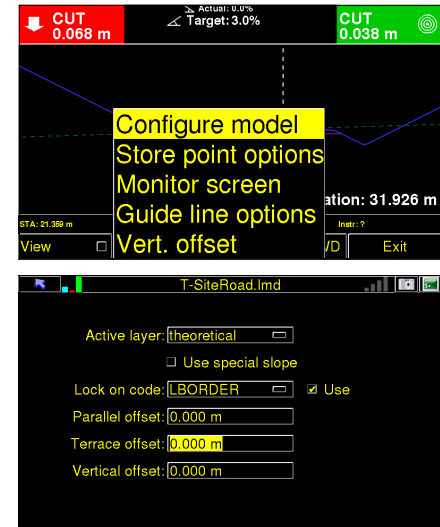
Parallel offset when locking an element

An element can be moved in parallel from the locked element. Observe that this is not the same as vertical offset where the reference surface is moved vertically up or down.

1. Press **Tools**.
2. Select **Configure model**.
3. At **Parallel offset**, enter the distance the locked element is to be moved in parallel.
4. Use the Back key ◀ to return to run mode.
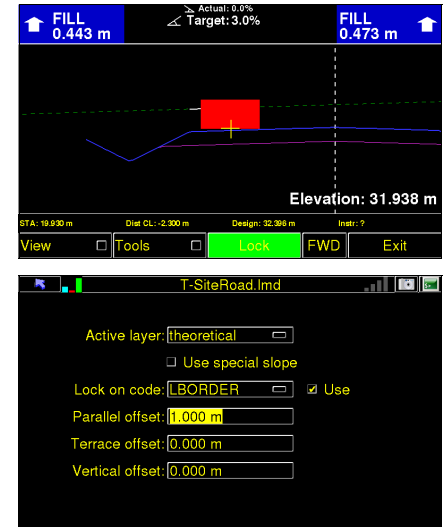
Selecting a layer

When creating a line model it is possible to add information about which build-up layers are available for the model and their thicknesses. If this information is available it is possible to choose which layer the calculations will be based on.

1. Press **Tools**.
2. Select **Configure model**.
3. In **Active layer**, select which capping layer you wish to work with. CUT/FILL values refer to the selected layer.
4. Use the Back key to return to run mode.
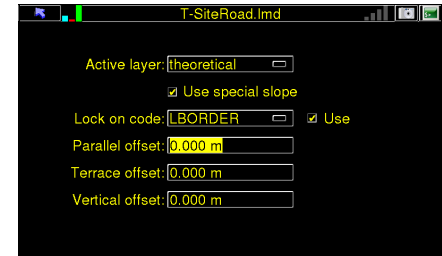
Using special slopes

Special slopes are used for minimising the consumption of expensive material. You can use a cheaper material. The slope of the special slope is set when you create the string line model. In the example below, the surface layer is in blue and the bed is in pink.

Special slope is not activated.
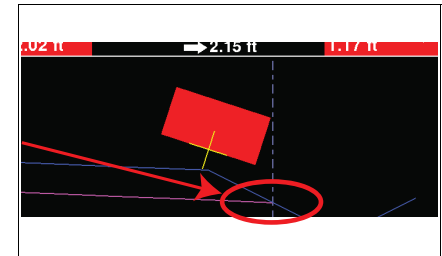
Special slope is activated, cheaper material can be used outside the taper.
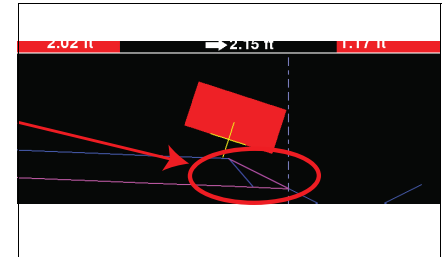
Activating the special slope

1. Press **Tools**.
2. Select **Configure model**.

3. Check the **Use special slope** box.
   Observe that the information about the tapered slope must be added when creating the line model in order for the function to work properly.
4. Use the Back key to return to run mode.
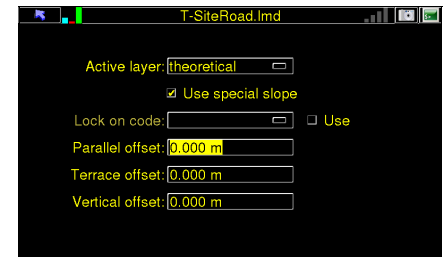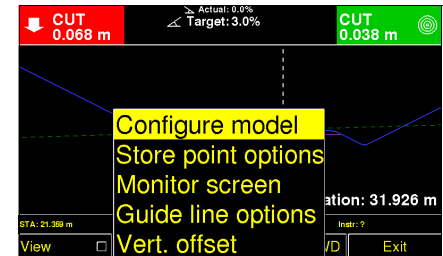
4.12 Monitor Screen

General information

In the monitor screen you can see useful information for controlling the system and for trouble shooting. This information includes GPS status, skyplot (map with satellite coverage), bucket coordinates, system information etc.

Selecting Monitor screen

1. Press **Tools**.
2. Select **Monitor screen**.
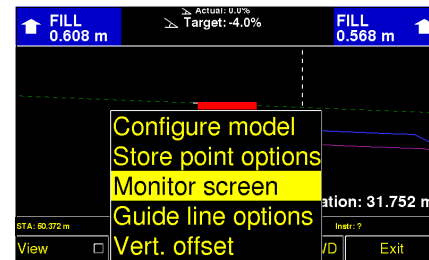
3. There are several pages in the monitor screen. Use the ⬅ and ➡ arrows to toggle between them.
4. Use the Back key ⬉ to return to run mode.
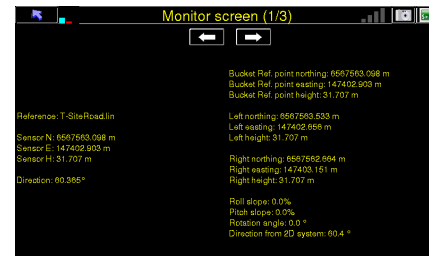
4.13   Transferring Files via USB

Transferring data to Test Project

You can transfer the Example.trm reference model from a personal computer, for example desktop PC or notebook, to a test project using an USB stick.

1. The USB stick must have a **folder** named **in** and one named **out** under the USB stick root.
2. Insert the USB stick into the PC.
3. Create a folder in the **in** folder of the USB stick and name it **Test**.

4. Copy the Example.trm file from the PC and paste it into the Test folder on the USB stick.
5. Remove the stick from the PC.
6. Insert the USB stick into the panel. It can take up to 10 seconds for the USB stick to work.
7. Go to **Tools** › **Data transfer** in the main menu.
8. Press **USB Sync**.
9. Press **OK** when the transfer is complete.
10. You can now work with the Example.trm reference model.
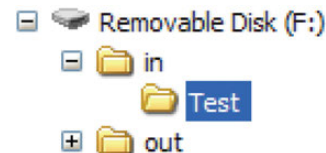
4.14 Selecting Projects and Reference Models

☞ Reference models, localisations (coordinate systems) etc. are stored in a project.

Selecting a project

To select a project, go to **Settings** › **Projects**.
Select a **Project** from the list.
Or:
As the Settings menu can be password protected, you can also select a project in **Projects** in the **main menu**. Preselected reference models and localisations will automatically be activated.
Select a **Project** from the list.
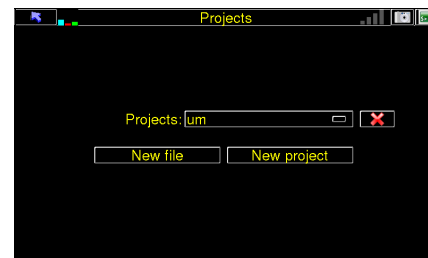
Selecting a reference model

You can select a reference model in **Settings** › **Surface**.
1. Select **Reference type**.
2. Select **Reference**.
3. If you are working with a terrain model you can activate and select a **Centre line**. Locked slopes with terrain models will relate to this line.
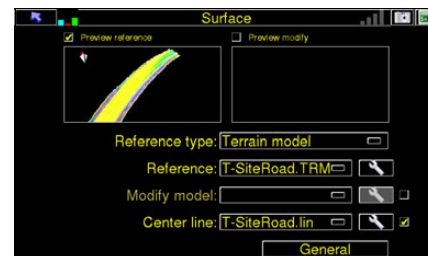
Viewing help models in the graphics window

Background images (help models) can be shown in plan view. Help models are a visual tool only and cannot be used for calculations. Several help models can be viewed at the same time. Examples of help models include road shoulders, power cables, etc.

To select a help model, go to **Settings** › **Help models**.
1. Select the **Type** of file.
2. Select the **Model** you wish to view.
3. Check the **On/Off** box to activate the help model.

Dwg/dxf models can also be used as an ordinary help model. Select the dwg/dxf model like an ordinary help model.
All models in **Active models** can be viewed in the plan view in run mode.

☞ Avoidance zones are set here. Refer to "4.4 Avoidance zones" for further information.
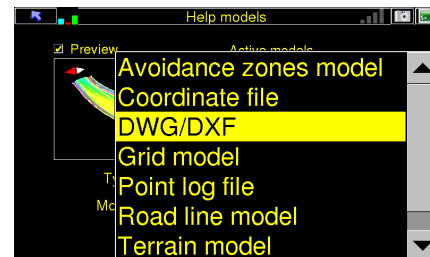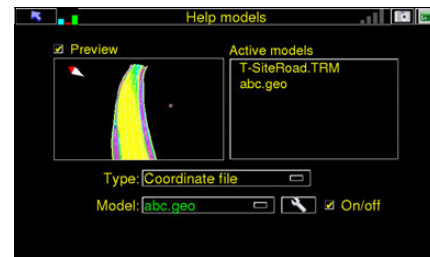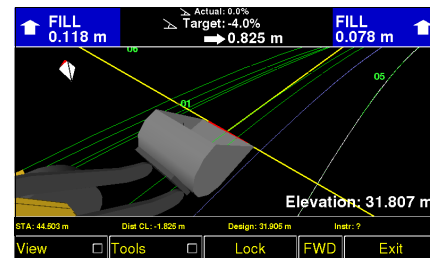
4.15   Localisation Settings (Coordinate Systems)

☞ A localisation is the transformation from global to a local coordinate system and is carried out in iCON 3D. When using the PowerBox the localisation can be done directly in the PowerBox. When using iCON gps 80, localisation must be done in iCON 3D.

Using localisation in iCON 3D LOK format

1. Transfer the LOK file to the current project for example via USB.
2. Go to **Settings** › **Localisation**.
3. Select the appropriate **Localisation** from the list.

If a geoid model is used by the LOK file, it should be saved in the global folder. Refer to "Transferring a geoid model to the system", page 66, for more information.
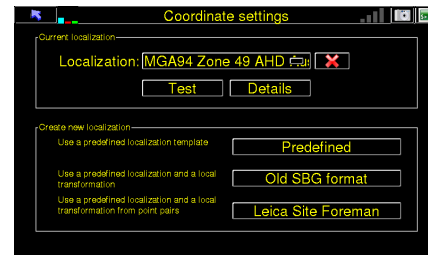
Using predefined coordinate systems

Several national/regional coordinate systems are preinstalled.

1. Go to **Settings** › **Localisation** › **Predefined**.
2. Select **Country/region** and **Coordinate system**.
3. To use a geoid model, check the **Use Geoid model** box and select the appropriate file.

The geoid model must be stored in the global folder. Refer to "Transferring a geoid model to the system", page 66, for more information.
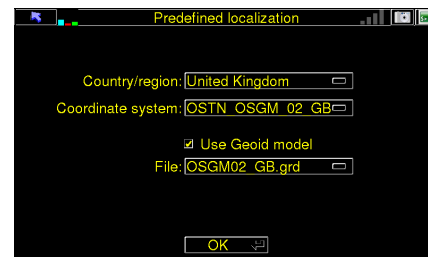
Local transformation in iCON 3D TPF format

1. Transfer the TPF file to the current project for example via USB.
2. Go to **Settings** > **Localisation** > **Old SBG formats** (first page).
3. Select **Country/region** and **Coordinate system** that the TPF file was created in.
4. Select the correct **Transformation file** (TPF).
5. If a geoid model was being used when the TPF file was created, check the **Use Geoid model** box and select the correct file.

The geoid model must be stored in the global folder. Refer to "Transferring a geoid model to the system", page 66, for more information.

SBG .tpf-localization (1/3)

Country/region: United Kingdom
Coordinate system: OSTN_OSGM_02_GB
Transformation file:

☑ Use Geoid model
File: OSGM02_GB.grd

OK
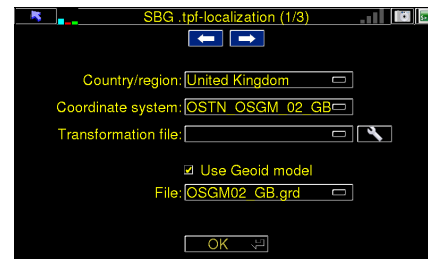
Coordinate systems in old formats (GTR, CSD, GRD, TPF)

1. Transfer coordinate system files to the current project, for example with USB.
2. Go to **Settings** › **Localisation** › **Old SBG formats** (first page).
3. Go to page 2 of this screen using the ⬅ or ➡ arrows.
4. Specify whether the **GTR file** is stored in the global folder or project folder in the list on the left. Select GTR file from the list on the right.
5. Specify whether the **CSD file** is stored in the global or project folder in the list on the left. Select the CSD file from the list on the right.
6. For **local transformations**, check the box on the right, specify if the **TPF file** is stored in the global or project folder in the list on the left. Select the TPF file from the list on the right.
7. If a geoid model is used by the TPF file, check the box on the right, specify if the **Geoid file** is stored in the global or project folder in the list on the left. Select the geoid file from the list on the right. Observe that the geoid file must be stored in the global folder. Refer to "Transferring a geoid model to the system", page 66, for more information.
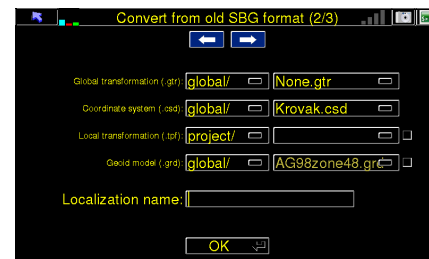
PowerBox: Localisation in the receiver using TRFSET.DAT

It is possible to transfer a Leica localisation file (transformation set, trfset.dat) and its accompanying geoid models (.gem) and correction grids (.csc) to the Leica PowerBox. The localisation must then be selected in the machine control software as per the instructions below. The PowerBox must be connected and plugged in to the power supply.

No localisation in iCON 3D is used when using the PowerBox to transform the coordinates!

1. Transfer the TRFSET.DAT file to the current project for example via USB.
2. Go to **Settings › Instruments**.
3. Press the settings key ![settings icon] to the right of Sensor in the upper box.
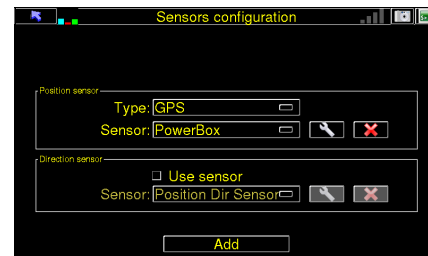
4. Go to page 4 of this screen using the ![left arrow] or ![right arrow] arrows.
5. Select **TRFSET - Use localization in PowerBox**.
6. Press **Send trfset** to upload the TRFSET file to the PowerBox.
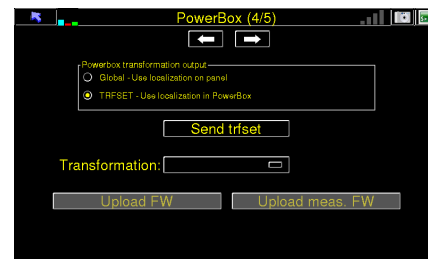
7. Select the appropriate localisation from the Transformation list. Observe that available options in the list are read from trfset.dat, stored in the PowerBox.

☞ If the localisation is performed in the machine control software, **Transformation** must be set to **WGS84**.

Transferring a geoid model to the system

Geoid models must be stored in the global folder.

Upgrade files with geoid models and coordinate systems can be found on the USB memory supplied with the system, downloaded via iCON telematics or from the SBG homepage.

1. Create a folder on a USB stick and name it **system**. You can use any USB stick.
2. Copy the DAT file and paste it into the system folder.
3. In the machine control software, go to **Tools > About > Upgrade**.
4. Press **USB**.
5. Select the appropriate DAT file from the list.
6. Press **OK**.
7. Follow the instructions on the screen.

4.16   iCON telematics
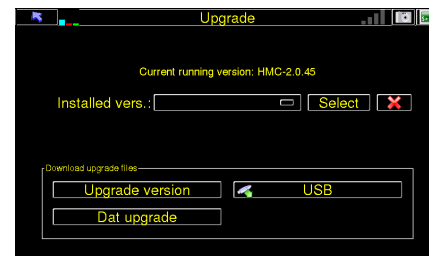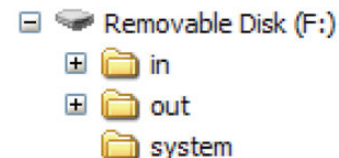
☞   iCON telematics allows for remote version upgrading, remote file transfer, remote screen sharing/controlling and live monitoring of the machine's position for fleet tracking.
This functionality requires an iCON telematics license.

For more detailed information on how to setup iCON telematics, visit the iCON telematics homepage.

Remote file transfer, iCON sync

iCON sync synchronizes the files on the machine with those on the iCON telematics server, meaning that new design files are synchronized to the machine control software and survey files from the machine control software are synchronized to the server.

1. In the machine control software, go to **Tools > Remote sync**.
2. When done, press **OK**.
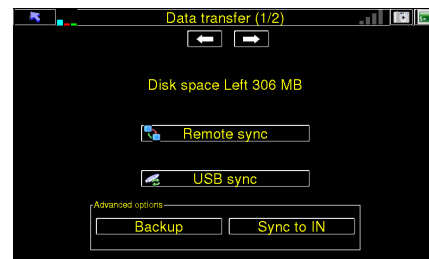
Remote Support, iCON view	iCON view activates remote viewing/controlling of the screen from the iCON telematics server meaning that support personnel can share the same screen as the operator.

1. In the machine control software, go to **Tools** from the main menu.
2. Press **Share screen**.
3. When screen is shared, a pop-up will inform of this. Press **OK**.
4. When done, press the same button again to exit iCON view.
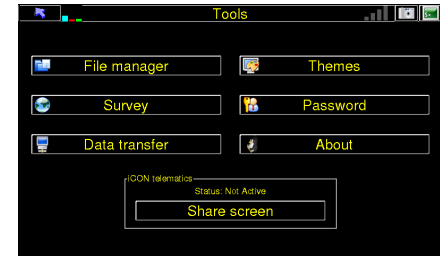
5 iCG80

5.1 The iCG80 GNSS receiver

Description   The iCG80 receiver is a high performance on-machine GNSS receiver and must be connected via CAN to work. Refer to the installation manual for how to properly install it.
iCON 3D automatically detects if an iCG80 unit is connected.

The first time an iCG80 units is detected by iCON 3D it will prompt you to name it and configure it.

☞ All coordinate systems are handled by localisation files (.lok) in iCON 3D.

Operating the iCG80 receiver with the internal radio

The settings for the selected iCG80 profile can be found at:
Main menu > Settings > Instruments

1. Select "Internal Radio" as RTK device.
   The RTK message is automatically detected.
2. Select the brand of the RTK base sensor.
   If it is a Leica Base you can select "Auto detect".
3. Enter the settings by pressing the ![button] button.

4. Set the correct radio channel.
5. Enter the radio protocol used.
6. Enter which mode for the connection base ID is used.
7. Exit the settings page by pressing the ![button] button. You will be asked to save the settings. Press "Yes" if the settings are correct. Pressing "No" will undo the settings.
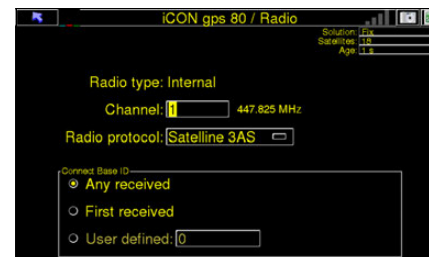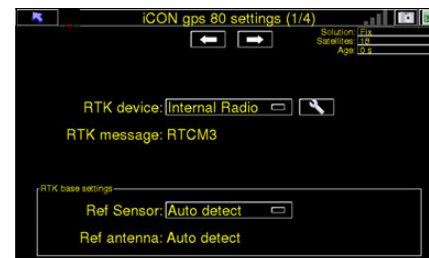
☞ All settings that are done, are immediately applied onto the receiver.

☞ Ask the site supervisor about the radio connection details used.

Operating the iCG80 receiver with external radio

The settings for the selected iCG80 profile can be found at:
Main menu > Settings > Instruments

1. Select "External Radio (P2)" as RTK device.
   The RTK message is automatically detected.
2. Select the brand of the RTK base sensor. If it is a Leica Base you can select "Auto detect".
3. Enter the settings by pressing the button.

4. Set the correct baud rate of the external radio.
5. Enter flow control ON/OFF.
6. Enter which mode for the connection base ID is used.
7. Exit the settings page by pressing the button. You will be asked to save the settings. Press "Yes" if the settings are correct. Pressing "No" will undo the settings.

☞ All settings that are done, are immediately applied onto the receiver.

☞ Ask the site supervisor about the radio connection details used.

Operating the iCG80 receiver using NTRIP

The settings for the selected iCG80 profile can be found at:
Main menu > Settings > Instruments

1. Select "NTRIP" as RTK device.
   The RTK message is automatically detected.
2. Select the brand of the RTK base sensor.
   If it is a Leica Base you can select "Auto detect".
3. Enter the settings by pressing the ![button] button.
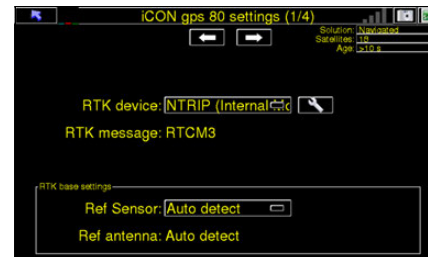
4. Enter the PIN code of the SIM card.
   The symbol ![check] indicates a correct PIN code and the symbol ![cross] indicates an incorrect PIN code. You have three attempts before the SIM card must be unlocked by the PUK code.
5. Enter the APN settings provided by the SIM card provider:
   • APN
   • User name
   • Password
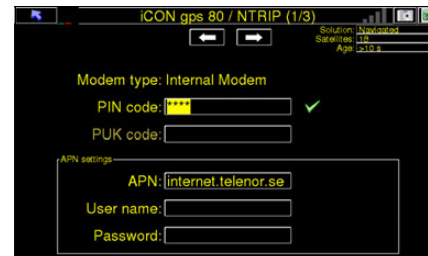
6. Press the ⬅ and ➡ arrows to change pages.
7. Select the reference network used by the RTK service.
8. Enter the NTRIP server details:
   • Server
   • Port
   • User name
   • Password
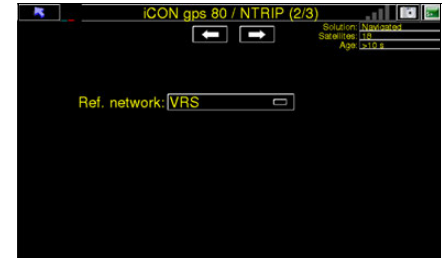
☞ Ask the SIM card provider for data connection details and the person in charge of NTRIP account for details on the RTK connection.

9. Select the mount point used. The mount point list can be retrieved by pressing "List".
10. Exit the settings page by pressing the ⬉ button. You will be asked to save the settings. Press "Yes" if the settings are correct. Pressing "No" will undo the settings.
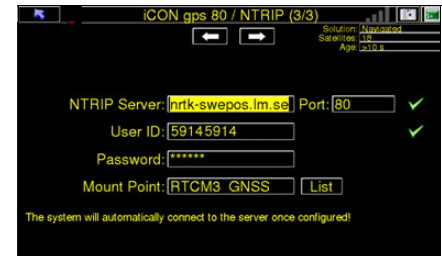
☞ All settings that are done, are immediately applied onto the receiver.

| **Changing the GNSS antenna** | The settings for the selected iCG80 profile can be found at: **Main menu > Settings > Instruments** |

1. Press the ⬅ and ➡ arrows to change pages.
2. In the antenna list, select the GNSS antenna connected to the receiver.
3. Exit the settings page by pressing the 🔳 button. You will be asked to save the settings. Press "Yes" if the settings are correct. Pressing "No" will undo the settings.

If the system is used on an Excavator or Wheel Loader, please follow the procedure below:

1. Check the "Dual GPS" check box.
2. Enter the GPS Dir. Correction.
   This value is calculated when calibrating the machine.
3. Select the Ref. antenna.
   This is the dual GNSS antenna connected to the receiver.
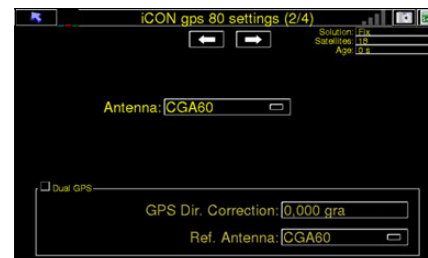
☞ All settings that are done, are immediately applied onto the receiver.

Selecting GLONASS and changing CQ value

The settings for the selected iCG80 profile can be found at:
Main menu > Settings > Instruments

1. Press the [←] and [→] arrows to change pages.
2. To select/deselect using GLONASS for the position calculations on this machine, use the "Use GLONASS" check box.
3. To decrease/increase the Coordinate Quality (CQ) value, enter the new value into the "Max CQ" field. A higher value means that iCON 3D will accept a lower coordinate quality before warning about too high CQ value in run mode.
4. Exit the settings page by pressing the [↖] button. You will be asked to save the settings. Press "Yes" if the settings are correct. Pressing "No" will undo the settings
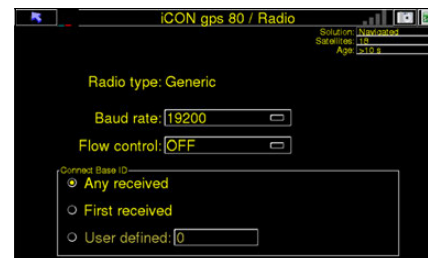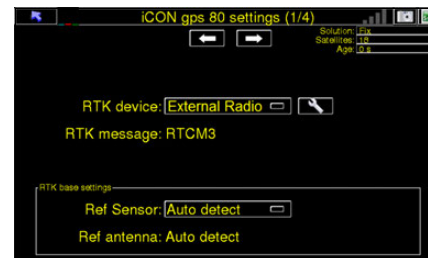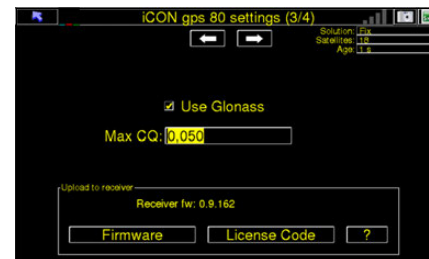
☞ All settings that are done, are immediately applied onto the receiver.

6 Care and Transport

6.1 General Notices

General information Servicing the system only requires a minimum of time. All electronic components are enclosed in robust housings to safeguard them against mechanical damage.

Periodic checks If any iCP41 components are subjected to severe impact, be sure to check for proper operation prior to performing any work with the system.

6.2 Transport

Transport in the field When transporting the equipment in the field, always make sure that you carry the product in its original transport container.

Transport in a road vehicle Never carry the product loose in a vehicle, as it can be affected by shock and vibration. Always carry the product in its transport container and secure it.

Shipping When transporting the product by rail, air or sea, always use the complete original Leica Geosystems packaging, transport container and cardboard box, or its equivalent, to protect against shock and vibration.

6.3 Storage

Product   Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to "8 Technical Data" for information about temperature limits.

6.4 Cleaning and Drying

Product
- Blow off dust.
- Use a clean, soft, lint-free cloth for cleaning. If necessary, moisten the cloth with water or pure alcohol.
  Do not use other liquids; these may attack the polymer components.

Cables and Plugs   Keep plugs clean and dry. Blow away any dirt lodged in the plugs of the connecting cables.

Damp products   Dry the product, the transport container, the foam inserts and the accessories at a temperature not greater than +40°C / +104°F and clean them.
Always close the transport container when using in the field.

Connectors with dust caps   Wet connectors must be dry before attaching the dust cap.

7 Safety Directions

7.1 General

Description

The following directions should enable the person responsible for the product, and the person who actually uses the equipment, to anticipate and avoid operational hazards.

The person responsible for the product must ensure that all users understand these directions and adhere to them.

7.2 Intended Use

Permitted use

- Determine the position of a dozer/grader blade or excavator/wheel loader bucket.
- Calculate the distance between the blade/bucket and a reference model (surface, line or point).
- Automatic adjustment of a dozer/grader hydraulic system in order to match the blade to the reference model.

Reasonably foreseeable misuse

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

- Inadequate safeguards at the work site, for example working on roads.
- Controlling of machines, moving objects or similar monitoring application without additional control- and safety installations.

7.3 Limits of Use

Environment

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

⚠️ **Danger**

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

7.4 Responsibilities

Manufacturer of the product

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

Person responsible for the product

The person responsible for the product has the following duties:
- To understand the safety instructions on the product and the instructions in the user manual.
- To ensure that it is used in accordance with the instructions.
- To be familiar with local regulations relating to safety and accident prevention.
- To inform Leica Geosystems immediately if the product and the application becomes unsafe.
- To ensure that the national laws, regulations and conditions for the operation of e.g. radio transmitters are respected.

⚠ **Warning** This product may be installed on building machinery only by an appropriately trained and qualified specialist.

7.5 Hazards of Use

⚠ **Warning** Only Leica Geosystems authorised service workshops are entitled to repair these products.

⚠ **Warning** Unauthorised modification of building and construction machines by mounting or installing the product may alter the function and safety of the machine.
Precautions:
Follow the instructions of the machine manufacturer. If no appropriate instructions are available, ask the machine manufacturer for instructions before mounting or installing the product.

⚠ **Caution** Installing near mechanically moving machine components may damage the product.
Precautions:
Deflect the mechanically moving machine components as far as possible and define a safe installation zone.

⚠ **Warning** Beware of inadequate steering if machine is defective like after a crash or other damaging events or alterations to the machine.
Precautions:
Periodically perform control measurements and field adjustments on the machine as specified in the User Manual. While working, construction and grading should be checked by appropriate means, for example spirit level, tachymeter, before and after important measuring tasks.

⚠️ **Warning**	While steering or navigating the machine accidents may occur due to a) the operator not paying attention to the surroundings (persons, ditches, traffic, etc.), or b) malfunctions (...of a system component, interference, etc). **Precautions:** The operator assures that the machine is operated, guided and monitored by a qualified operator. The user has to be able to take emergency measures, for example an emergency stop.
⚠️ **Warning**	When working near magnetic fields or objects which might influence the magnetic field, check results for accuracy.
⚠️ **Warning**	The absence of instruction, or the inadequate imparting of instruction, can lead to incorrect or adverse use, and can give rise to accidents with far-reaching human, material, financial and environmental consequences. **Precautions:** All users must follow the safety directions given by the manufacturer and the directions of the person responsible for the product.
⚠️ **Caution**	Watch out for erroneous measurement results if the product has been dropped or has been misused, modified, stored for long periods or transported. **Precautions:** Periodically carry out test measurements and perform the field adjustments indicated in the user manual, particularly after the product has been subjected to abnormal use and before and after important operations.

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

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

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

| ⚠ **Caution** | If the accessories used with the product are not properly secured and the product is subjected to mechanical shock, for example blows or falling, the product may be damaged or people may sustain injury. |

Precautions:
When setting-up the product, make sure that the accessories, for example tripod, tribrach, connecting cables, are correctly adapted, fitted, secured, and locked in position.
Avoid subjecting the product to mechanical stress.

⚠ **Warning**
If the product is improperly disposed of, the following can happen:
- If polymer parts are burnt, poisonous gas are produced which may impair health.
- If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.
- By disposing of the product irresponsibly you may enable unauthorised persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.

Precautions:

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

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

7.6	**Electromagnetic Compatibility EMC**

Description

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

⚠ **Warning**

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

⚠ **Caution**

There is a risk that disturbances may be caused in other equipment if the product is used in conjunction with accessories from other manufacturers, for example field computers, personal computers, two-way radios, non-standard cables or external batteries.
Precautions:
Use only the equipment and accessories recommended by Leica Geosystems.
When combined with the product, they meet the strict requirements stipulated by the guidelines and standards. When using computers and two-way radios, pay attention to the information about electromagnetic compatibility provided by the manufacturer.

⚠ **Caution**

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

⚠ Warning	If the product is operated with connecting cables attached at only one of their two ends, for example external supply cables, interface cables, the permitted level of electromagnetic radiation may be exceeded and the correct functioning of other products may be impaired. **Precautions:** While the product is in use, connecting cables, for example product to external battery, product to computer, must be connected at both ends.
Radios	Use of product with radio devices:
⚠ Warning	Electromagnetic fields can cause disturbances in other equipment, in installations, in medical devices, for example pacemakers or hearing aids and in aircraft. It can also affect humans and animals. **Precautions:** Although the product meets in combination with radio devices recommended by Leica Geosystems the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment may be disturbed or that humans or animals may be affected. • Do not operate the product with radio devices in the vicinity of filling stations or chemical installations, or in other areas where an explosion hazard exists. • Do not operate the product with radio devices near medical equipment. • Do not operate the product with radio devices in aircraft.

7.7 ICES-003 Statement, Applicable in Canada

⚠ Warning	This Class (A) digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe (A) est conforme à la norme NMB-003 du Canada.

7.8	**FCC Statement, Applicable in U.S.**

Applicability

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

⚠️ **Warning**

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

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

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

⚠️ **Warning**

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

Labelling Control Box
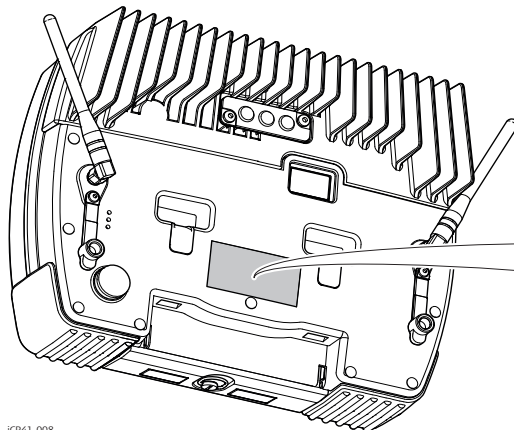
iCP41, 3D Panel Excavator w. C. Case
P/N: 797048

S/N: xxxxx

Leica Geosystems AG
CH - 9435 Heerbrugg
Made in Denmark 20XX

CE

Power
12 - 24 V DC, 6A max.

iCP41_008

Labelling Cradle

TYPE: MMB1300
P/N: 764910

S/N: XXXXXXXX

Leica Geosystems AG
CH - 9435 Heerbrugg
Made in Denmark 20XX

CE

Power
12 - 24 V DC, 6A max.

iCP41_009

Labelling Junction Box
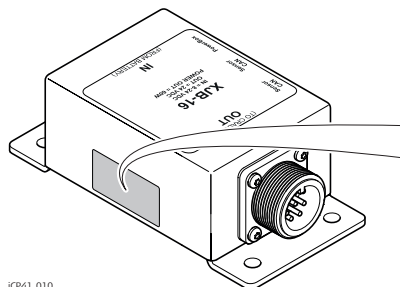
TYPE: XJB-16
P/N: 779080

S/N: XXXXXXXX

Leica
Leica Geosystems AG
CH - 9435 Heerbrugg
Made in Denmark 20XX

iCP41_010

Labelling Boom 1 Sensor
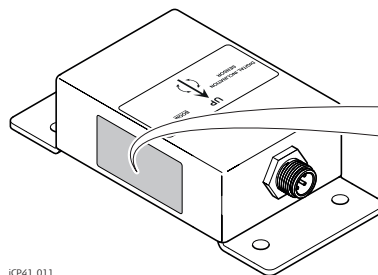
TYPE: MSS300
P/N: 761693

S/N: XXXXXXXX

Leica
Leica Geosystems AG
CH - 9435 Heerbrugg
Made in Denmark 20XX

Power
12 - 24 V DC, 6A max.

iCP41_011

Labelling Bucket Sensor
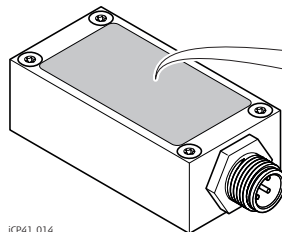
MSS310 360 deg. bucket sensor
P/N: 795199

S/N: XXXXXXXX

Leica Geosystems AG
CH - 9435 Heerbrugg
Made in Denmark 20XX

CE

Power
12 - 24 V DC, 6A max.

iCP41_014

Labelling Compass and Pitch/Roll Sensor
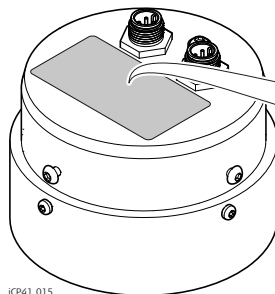
TYPE: MRS300
P/N: 761696

S/N: XXXXXXXX

Leica Geosystems AG
CH - 9435 Heerbrugg
Made in Denmark 20XX

CE

Power
12 - 24 V DC, 6A max.

iCP41_015

Labelling Can Junction Box
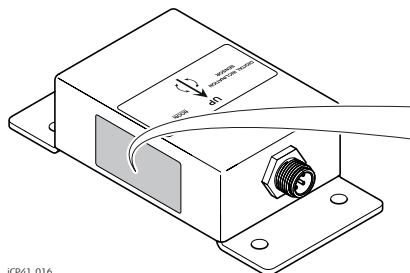
TYPE: MJB300
P/N: 761697

S/N: XXXXXXXX

Leica Geosystems AG
CH - 9435 Heerbrugg
Made in Denmark 20XX

CE

Power
12 - 24 V DC, 6A max.

iCP41_016

Labelling Tilt Bucket Sensor
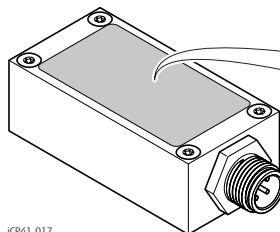
MSS309 Tilt bucket sensor
P/N: 795200

S/N: 131441XX

Leica Geosystems AG
CH — 9435 Heerbrugg
Made in Denmark 20XX

CE

Power
12 — 24 V DC, 6A max.

iCP41_017

8　　　　　Technical Data

8.1　　　　iCP41 Technical Data

☞ The iCP41 is designed to operate from standard vehicle power systems at 24V DC - check to ensure proper connection and polarity.

Instrument ports

Name	Description
SIM card port	• 1 x SIM card support • This port is located at the base of the instrument.
USB port	• 1 x USB 2.0 port • This port is located at the base of the instrument.
HSPA Modem	• HSPA modem for GPRS/GSM/EDGE/HSPA/UMTS communication. • This port is housed within the instrument.
WLAN	• WiFi IEEE 802.1 a/g controller • This port is housed within the instrument.

Instrument dimensions

Length [mm]	Height [mm]	Thickness [mm]
222	170	88

Weight 1.8 kg

Power

External supply voltage (cradle):　Nominal voltage 24 V DC, Range 20 V-28 V
Power consumption:　1.1 A @ 24 V cradle and iCP41

Antennas	• 1 x WiFi antenna reverse SMA connector • 1 x HSPA antenna reverse SMA connector

Environmental specifications

Temperature

Type	Operating temperature [°C]	Storage temperature [°C]
Instrument	-25 to +55	-40 to +85

Protection against water, dust and sand

Type	Protection
Instrument	IP56 (IEC 60529)

Humidity

Type	Protection
Instrument	Max 95% non condensing The effects of condensation are to be effectively counteracted by periodically drying out the instrument.

Miscellaneous

Input and buttons*
• 4 buttons on each side of the display
• 6 function buttons under the display
• Navigation, Menu, Enter and ESC buttons

* The assignment of these buttons can vary depending on the software running on the iCP41.

CPU, Chipset, VGA and Audio
• ADLink ETX667-423
• Intel Celeron M 1Ghz 1Mb L2
• NXP lpc2300 microcontroller

Memory
• SDRAM SO-DIMM

IDE port
• Compact FLASH

8.2 General Technical Data

Protection class

Unit	Protection class
All Sensors	IP68
Cradle	IP54
Junction Box	IP68
Can Junction Box	IP68

Temperature

Unit	Operating temperature [°C]	Storage temperature [°C]
All Sensors	-20 to +70	-40 to +80

Cradle

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	< 2.5A with control box connected and no load at 12 V
Output	2 x RS232, RX, TX, 12V/2Amp, GND, 2 x CAN and J1939
Communication (Infrared)	1 Mbit
Dimensions	12.4 x 15.2 x 4.4 cm
Weight	0.320 kg

Bucket Sensor

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	0,2A @ 24VDC
Interfaces	1x CAN M12
Dimensions	2.5 x 2.5 x 5 cm
Weight	0.100 kg

Tilt Bucket Sensor

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	0,2A @ 24VDC
Interfaces	1 x CAN M12
Dimensions	2.5 x 2.5 x 5 cm
Weight	0.100 kg

Rotation Sensor

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	0,2A @ 24VDC
Interfaces	2 x CAN M12
Dimensions	ø 7 cm, hight incl. Mast: 80 cm
Weight	0.500 kg

CAN Junction Box

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	0,2A @ 24VDC
Interfaces	2 x CAN M12
Dimensions	8 x 12 x 3 cm
Weight	0.750 kg

Angle sensor

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	0,2A @ 24VDC
Interfaces	2 x CAN M12
Dimensions	8 x 12 x 3 cm
Weight	0.750 kg

8.3 **Conformity to National Regulations**

Conformity to national regulations

- FCC Part 15, 22 and 24 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the iCP41 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC and other applicable European Directives. For the declaration of conformity please contact your Leica Geosystems distributor.

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

- The conformity for countries with other national regulations not covered by the FCC part 15, 22 and 24 or European directive 1999/5/EC has to be approved prior to use and operation.

Frequency band

Type	Frequency band [MHz]
WLAN	2412 - 2483.5
HSPA	**GSM, GPRS, EDGE** 850 MHz, 900 MHz, 1800 MHz, 1900 MHz
	UMTS WCDMA, HSDPA, HSUPA 800 MHz, 850 MHz, 900 MHz, 1900 MHz, 2100 MHz
	Receive diversity: Optimised for diversity on 800, 850, 900, 1900 and 2100 MHz

Output power

Type	Output power [dBm]
WLAN	15 @ 54 Mbps
EGSM 900/GSM 850 Power Class 4	2 W / 33 dBm
GSM 1800/1900 Power Class 1	1 W / 30 dBm
EDGE Power Class E2 for 850/900	0.5 W / 27 dBm
EDGE Power Class E2 for 1800/1900	0.4 W / 26 dBm

Antenna

WLAN: Gain: 2dBi at 2.4GHz
HSPA: Gain: 2dBi at 2.4GHz

| 9 | International Limited Warranty, Software License Agreement |

International Limited Warranty

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- when it has to be **right**

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