User Manual

EZDig PRO

Advanced Mode

Content

EZDig PRO

```
USER MENU
Display
Machine
Setup
Advan.Mode     OFF
```

From any operating screen, press & hold **Enter** until the USER MENU page appears.

```
USER MENU
Display
Machine
Setup
Advan.Mode     OFF
```
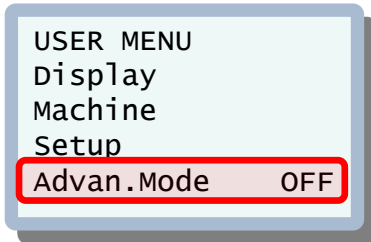
Move down to "Advan.Mode" with ▼⁻ .

Select "Advan.Mode" by pressing **Enter** to be able to select "ON" with ▼⁻ or ⁺▲ .

```
USER MENU
Display
Machine
Sensor Check
Setup
Advan.Mode      ON
```
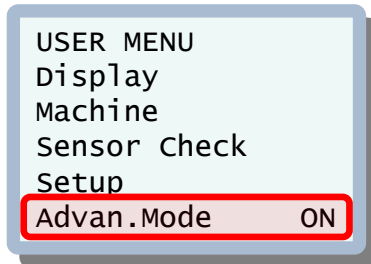
Once selected, you'll see a new menu point ("Sensor Check") appear, and one of the 3 bottom LEDs on the remote display will light up.

```
USER MENU
Display
Machine
Setup
Advan.Mode     OFF
```
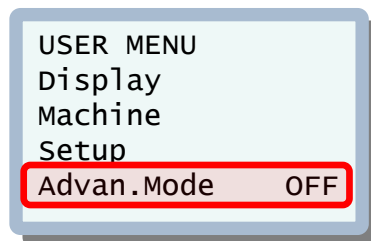
You can disable the advanced mode again by choosing "OFF" in the "Advan.Mode" setting.
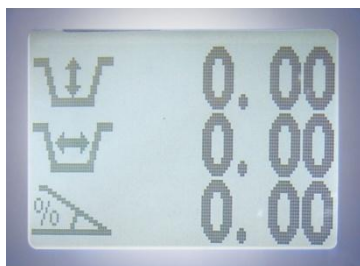
Exit the User Menu by pressing & holding **0** .

[advanced mode] Extra Functions

EZDig PRO

Once you enabled the advanced mode, you'll have the following extra functionality on hand:

REMOTE DISPLAY

Depth

Red: too high, move the bucket down.

Green: on grade.

Red: too low, move the bucket up.
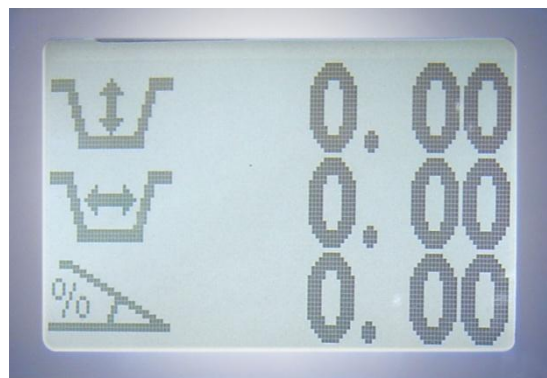
Advanced Mode only:

Reach Information

Controlbox

Reach information:
Indicates the <u>horizontal</u> distance of the bucket tip or blade in relation to a previously defined point.
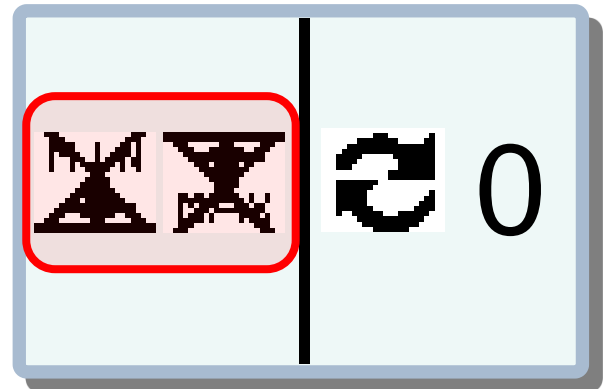
Depth

Reach

Slope

Beside the new display options, you'll also have additional new functions:

Max. Height / Max. Depth Alarm:

Max. Height / Max. Depth Alarm:
Informs the operator optically and acoustically if a previously defined max. height or max. depth has been reached or exceeded.
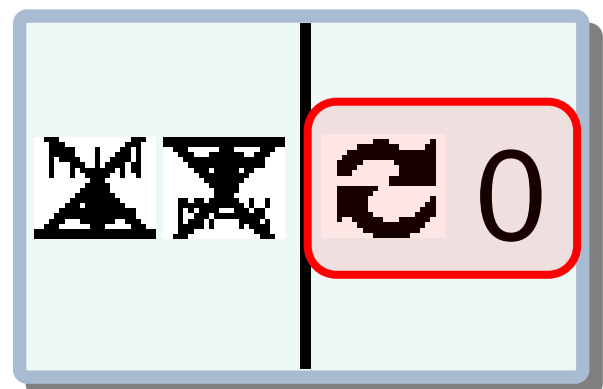
Caution:
<u>Although you can use this function to set a maximum height warning, this is not a fail-safe security function and can't replace systems that have automatic shut-off.</u> If you are working in a hazardous area, such as under power lines, you should be using a more secure warning system.

Memory:

Memory:
Enables the operator to compensate a machine's elevation change, if he intends (or is forced) to work without a rotating laser.

Caution:
<u>Although you can use this function to compensate a machine's elevation change without using a rotational laser, it is not recommended in general, as this principle easily leads to inaccuracies.</u> Better use the laser receiver to compensate.

Beside the new display options, you'll also have additional new functions:

Pitch Sensor:

Pitch Sensor:
A fourth or fifth sensor may be used as a pitch sensor to compensate tilting forward or backward movements of the whole machine.

```
Calibration:
DogBone
Bucket
Booms
Laser
Pitch
```

Caution:
Although you can use this function to compensate tilting forward or backward movements of the whole machine, the pitch sensor is NOT able to compensate a chassis rotation while you're working with a preset slope.

Profile:

Profile:
Enables the operator to define and work in a profile.

[advanced mode] Extra Functions

EZDigPRO
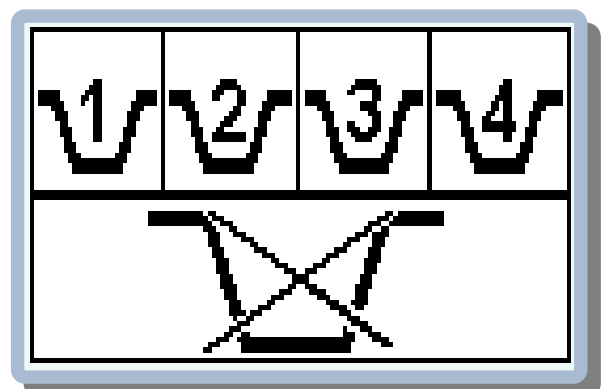
Beside the new display options, you'll also have additional new functions:

User Menu:

Sensor Check:

Sensor Check:
Supplies sensor informations about the actual angle measured, and a digital battery level information.

```
USER MENU
Display
Machine
Sensor Check
Setup
```

Setting Menu:

Setting Menu:
Accessible after selecting SETUP in the User Menu.

Sensor Assignment:
To add or change the sensor assignment of the individual elements.

Calibration:
To access the calibration section incl. the new manual calibration section and the pitch sensor calibration.

Copy Calibration:
To copy a machine's calibration to another machine #.

Load Default:
To reset the system to its factory settings.

SAVE:
To save the actual machine's calibration.

MMI Parameters:
To change certain settings for the system's display behavior.

Service Paramet.:
Fundamental system settings, password protected. Should be only accessed by EZDigPro service partners.

Set Passw.:
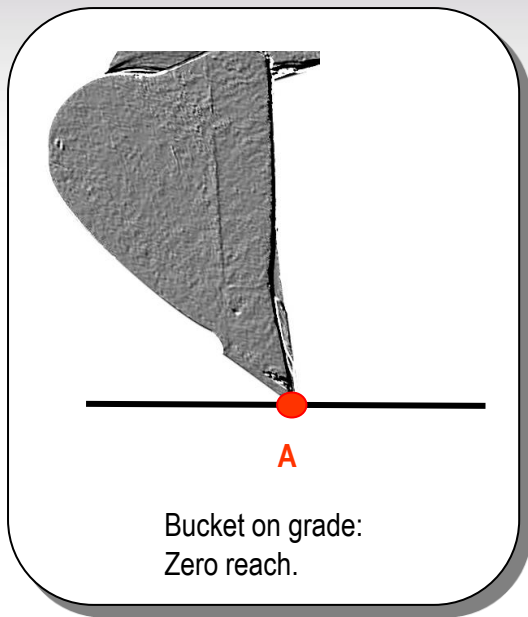To set a password to protect the system from overwriting calibration data.

```
USER MENU
Display
Machine
Sensor Check
Setup
```

```
SETTING MENU
Sensor Assignm.
Calibration
Copy Calibration
Load Default
SAVE
MMI Parameters
Service Paramet.
Set Passw.      0
```
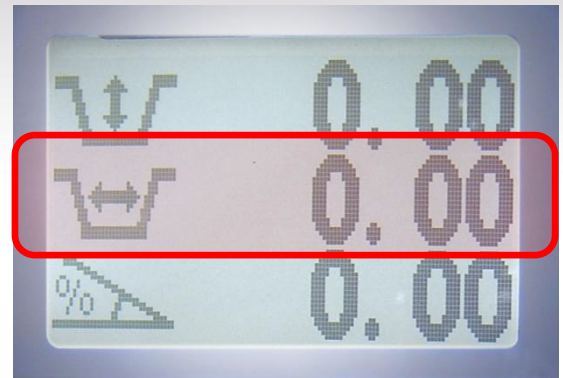
REACH →

Bucket on grade:
Zero reach.

Position the bucket on the ground on a desired reference point and press & hold the 0 key for a couple of seconds to zero the reach value.

Now the reach value will be zero at that distance (even in other depth positions) and the distance value to that point will be shown if the bucket is further away (positive) or closer (negative) to the cab.

Bucket on the reach
zero reference

Bucket too far,
Positive reach

Bucket too close.
Negative reach

Advanced Mode
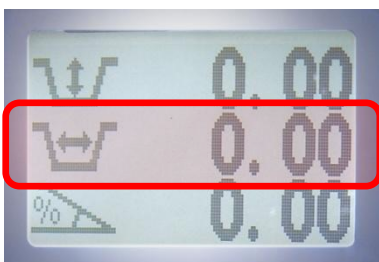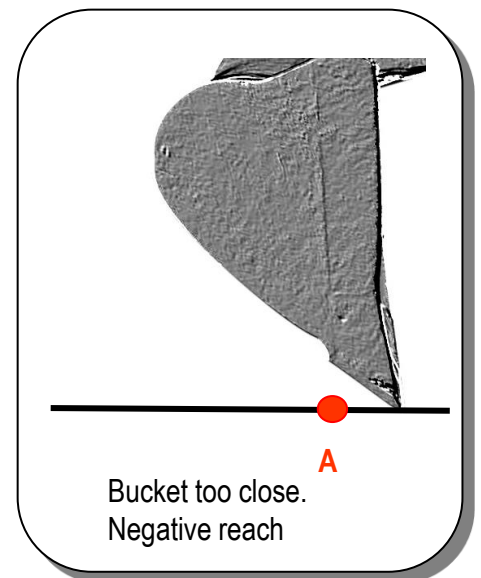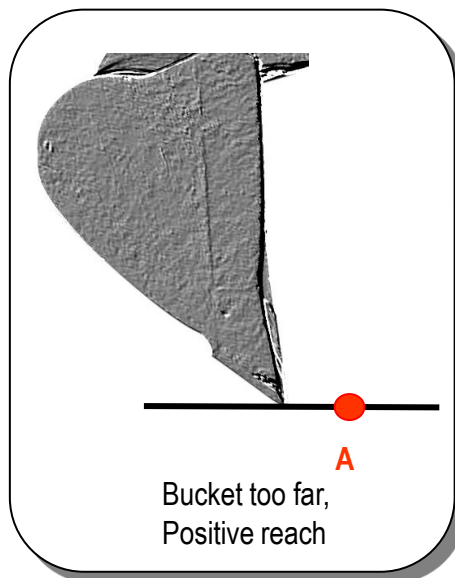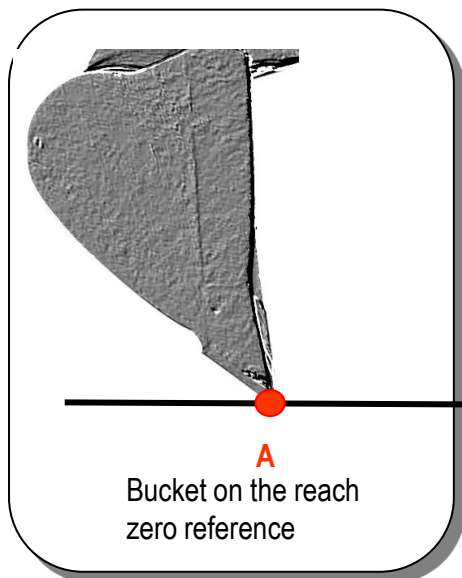
REACH →

Press & hold [⊔] to enter the reach setting mode. The correspondent value will flash.

To set the reach reference, use these buttons:

Press [▼⁻] or [⁺▲] to set the desired value.

Press [⊔] to invert the sign (positive / negative).

Press [0] to zero the value.

Press [Enter] to confirm the value and end the setting mode.

The shown reach is now the distance from the actual bucket position to the target reach.

If the bucket is closer to the cab in respect to the target reach, the value is negative and vice-versa.

Note: The direction of the reach is indicated by the reach icon (arrow), based on the assumption that the control box is mounted on the right-hand side of the driver in the cab. Same for the remote display's LED indication.
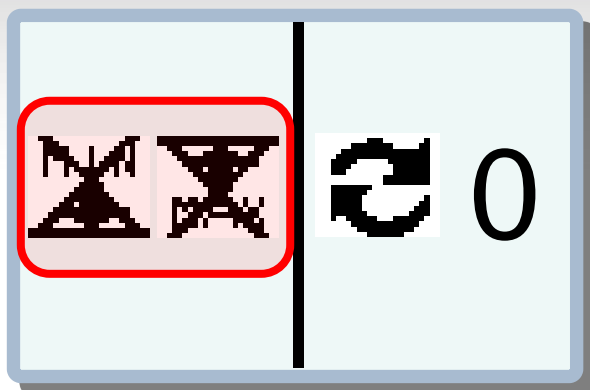
Caution:

Although you can use this function to set a maximum height warning, this is not a fail-safe security function and can't replace systems that have automatic shut-off. If you are working in a hazardous area, such as under power lines, you should be using a more secure warning system.

 Function disabled.
There's no max height set.

 With the icon flashing, move the boom to the maximum height that you want or can reach safely depending on your work environment.
Press to set this point as maximum height.

 Function enabled (in use)
When the highest machine pivot is as high or higher than the max height set, an alarm will sound and the display will have the following warning:

Move the booms down to return to the previous screen (max height not reached).

To disable the Max Height function once the alarm is activated, press and hold .

The icon will appear on the Max. Height settings page as a confirmation.

To disable the Max. Height function in general, enter with the arrow keys the according screen, press to make the Min./Max. Height screen blink, press once the right up arrow key and confirm with .

The following screen confirms that you've disabled the Max. Height alarm:
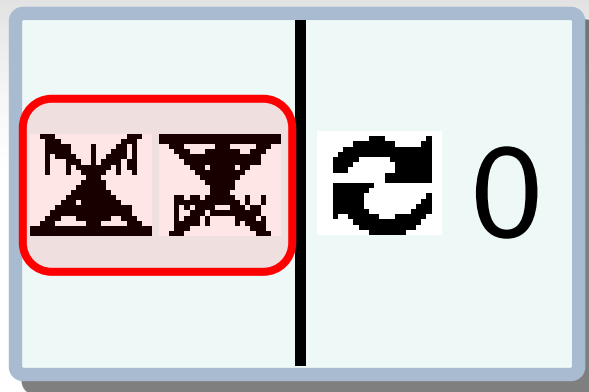
Caution:

Although you can use this function to set a maximum depth warning, this is not a fail-safe security function and can't replace systems that have automatic shut-off. If you are working in a hazardous area, such as around gas lines, you should be using a more secure warning system.

Function disabled.
There's no max depth set.

SET MIN With the icon flashing, move the bucket to the maximum depth that you want or can safely reach depending on your work environment.
Press **Enter** to set this point as the maximum depth (which means the same as "minimum height" MIN).

MIN Function enabled (in use)
When the bucket blade (or teeth) is at the same depth or lower than the maximum depth set, an alarm will sound and the display will have the following warning:

Move the booms down to return to the previous screen (max depth not reached).

To disable the Max Depth function once the alarm is activated, press and hold **0**.
The icon will appear on the Max. Depth settings page as a confirmation.

To disable the Max. Depth function in general, enter with the arrow keys the according screen, press **Enter** to make the Min./Max. Height screen blink, press once the left up arrow key and confirm with **Enter**.

The following screen confirms that you've disabled the Max. Depth alarm:
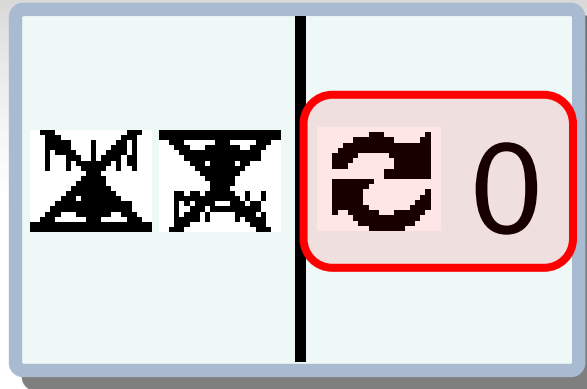
Although not often used, the memory function provides a way to move the excavator when you are not using a laser as a reference (eg: moving the excavator on its tracks to dig to the same level at a different location on the site).

No Reference: Memory function is not in use.

1.) Use [▼] to move to the Memory Function (lower right quadrant of the screen will have a bold border).

2.) Then, press (Enter) to enter this mode. The bold border will flash and the symbol changes to

3.) Press (Enter) again to begin setting the reference point. The bold border around stops flashing.

4.) "**Set Reference:**" Position the bucket tip on a reference point. Choose anything stable that can also be accessed from the next location. After moving the excavator, you will need to use this same reference point (or another point that is at exactly the same elevation).

5.) "**Keep Reference:**" Press (Enter) to save the value at this reference point. The bold border will flash again and the symbol changes to

6.) Move the excavator to your next position. Place your excavator bucket tip on that same reference point used in Step 4. Press (Enter) to acquire the value.

7) The arrow is replaced by an excavator symbol. **The memory function is in use** (the system understands that the elevation of the excavator has changed) and you can continue working.

To disable the Memory Function:

Press (Enter) and the excavator symbol will flash; press again and the arrows icon replaces it ("No Reference").

First location   Same reference point, accessed from both digging sites   Second location

HOW TO SELECT A PROFILE

Figure P1

Press & hold
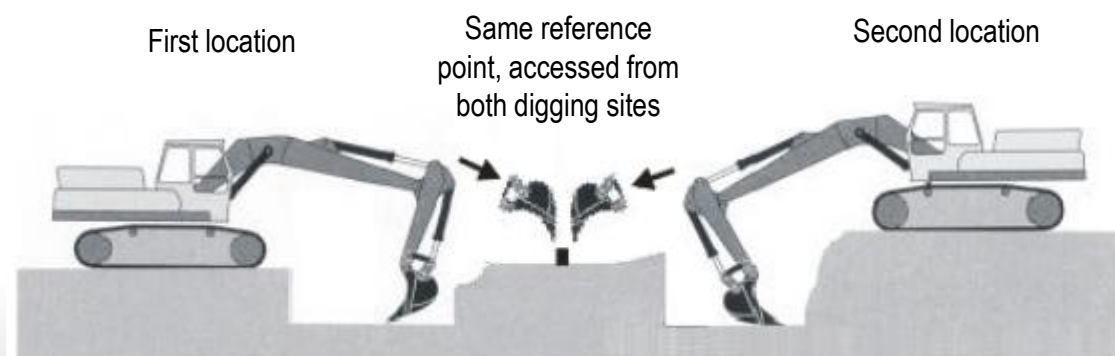
Figure P2

Enter
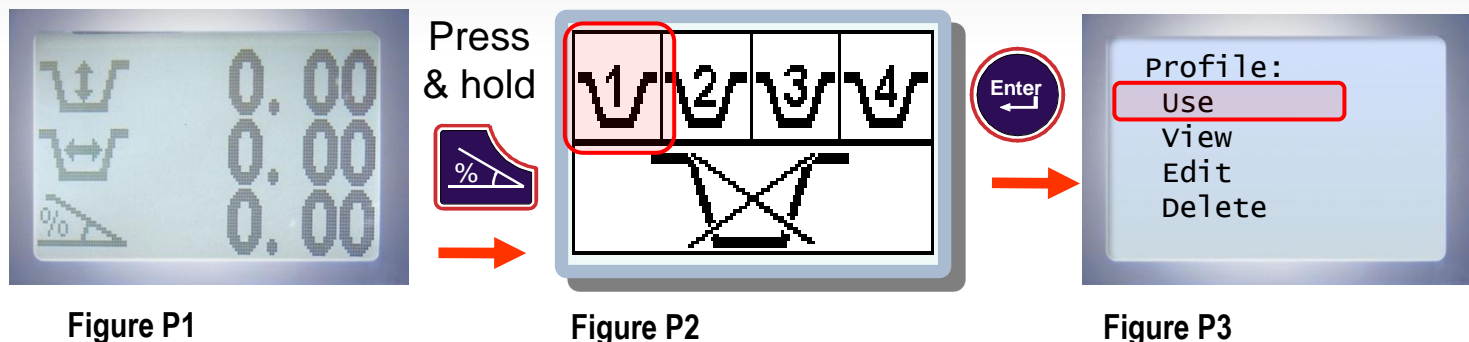
Figure P3

Press and hold ![icon] to enter the profile setting mode. The page represented in figure P2 will show.

Press ![down] or ![up] to select the desired profile.

Press ![Enter] and the page in figure P3 will be shown.

Note: If no icon is selected, the profile mode will be disabled and the panel will return to the main operator page.

Use – Start to work with the selected profile. No further settings, and the system will return in the working page.

View – To view a drawing of the selected profile.

Edit – Enter a new shape for the selected profile or edit the actual shape. This can be done manually or by copying an existing shape. See next page.

Delete – Delete all values set of the selected profile.

If the control box is using a profile instead of the single slope to calculate the actual depth, the slope icon on the working page will appear as follows:
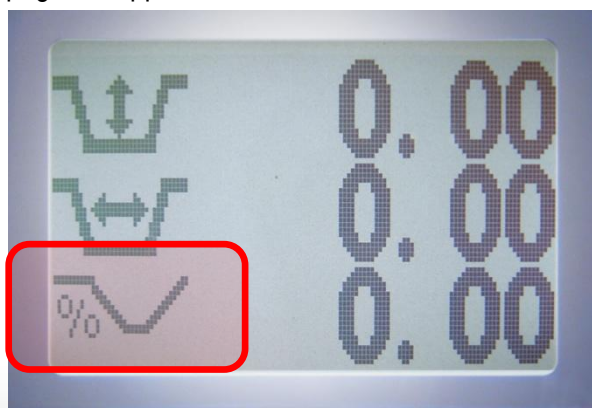
ENTER A PROFILE BY COPYING EXISTING JUNCTION POINTS

```
Profile:
  Use
  View
  Edit
  Delete
```
Figure P3

Enter →

```
Set the profile:
  Automatic
  Manual
```
Figure P4

Enter →
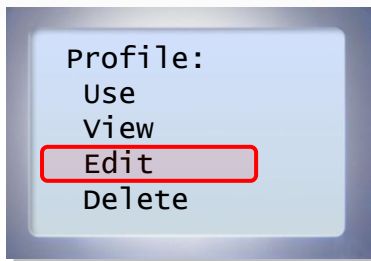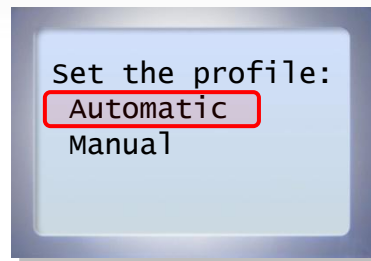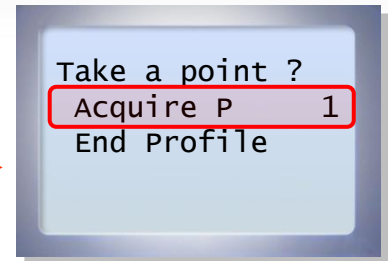
```
Take a point ?
  Acquire P    1
  End Profile
```
Figure P5

Start by putting the bucket on any profile point (e.g. the point furthest away from the cab), zeroing the depth and reach value on the main operator working screen (figure P1 on earlier page). Choose this point carefully, as this will be the point you'll need to refer on each time you move your machine. Select the desired profile as described previously to reach Figure P2.

Press **Enter** with the cursor over "Automatic" to enter into the profile "self learning" mode.

Press **Enter** with the cursor over "Acquire P" to acquire the actual bucket position as the selected profile point.

You can now move the bucket to the next point (actual point number is shown on the same line). When the last point has been taken, stop the acquisition by choosing "End Profile."

Note: If the points are not in sequence, the display will show an error screen

The profile shape will be shown on the screen. See "Profile View" page.
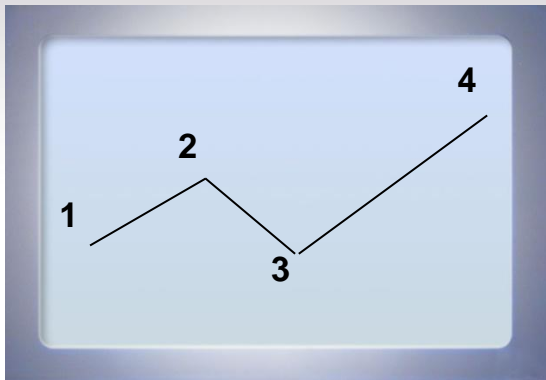
On this page, you can see a graphical summary of the profile set.

Starting from the left side of the screen (point 1), the line follows the settings done.

You can zoom in / zoom out on the graph with ▼ **-** or **+** ▲ buttons.

Press **0** to exit to the profile menu page and select "Use" to use the previously defined profile.

Once you moved your machine, you are able to define your new position to the profile by pressing the **0** button.

If you set your profile the automatic (self-learning) way, after pressing the **0** button, your actual bucket tip's position will be the zero point you defined prior to entering the profile mode, zeroing the depth and reach value on the main operator working screen (figure P1 on earlier page).

If you set your profile the manual way, after pressing the **0** button, your actual bucket tip's position will be the point with the coordinates 0/0.

ENTER A PROFILE BY MANUALLY SETTING DEPTH & REACH VALUES

```
Profile:
  Use
  View
  Edit
  Delete
```

Figure P3

```
Set the profile:
  Automatic
  Manual
```

Figure P6

```
PROFILE:        1
Point:          1
Depth       0.000
Reach       0.000
Slope        0.00
```
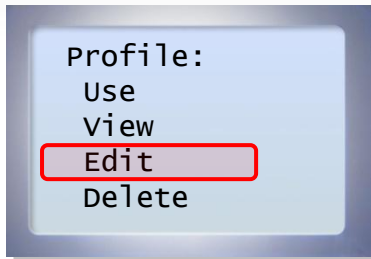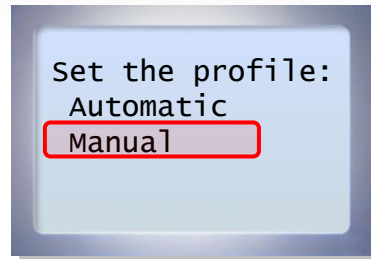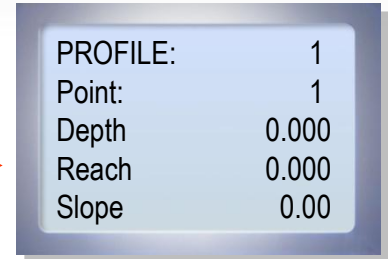
Figure P7

Select the desired profile as described previously to reach Figure P2.

Press **Enter** with the cursor over "Manual" to enter the profile "manual" mode.

Press **Enter** with the cursor over "Depth" to set the depth of the selected profile point.

Press **Enter** with the cursor over "Reach" to set the reach of the selected profile point.

Note: The slope value is calculated automatically by the software referring to the previous point in the profile. You are not able to edit or change this value.

Note: Choose the 0/0 point carefully, as this will be the point you'll need to refer on each time you move your machine.

Use ▼ at the end of the page to set the next point.

When all settings are done, press **0** to exit from the profile setting mode.

The profile shape will be shown on the screen. See "Profile View" page.

Another short press on **0** leads you back to the profile menu.

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Before calibrating, you must assign the sensors to each element and then place them in position. You can choose any element, except for the laser receiver (select the best location as described on page 11-17 under "Components Installation" of the Basic User Manual).

1. Select one of the sensors.

2. Put it in a horizontal position and make sure the other sensors are all in vertical position. To do this, you can leave the others in the case in their vertical slots, and lay the selected sensor flat on top of the case foam or on the ground.

   The sensors should be at least 1 meter (3 ft.) away from the remote display when assigning them.

   There must be only *one* sensor in horizontal position during sensor assignment. If any of the others are horizontal, it will cause problems. Even if there is no error message shown, you may get errors during calibration or operation.

3. Follow the menu prompts on the next page.

4. Put that sensor on the boom or location you assigned before proceeding to the next sensor.
   For the greatest capture range, the laser receiver sensor should be placed on the boom so that the detection window will be 90° to the laser plane. For the other sensors, it does not matter how they are oriented.

5. Take another sensor and follow the same procedure, until all are assigned and in position on the excavator.

Programming condition: <u>**only**</u> one sensor horizontal.
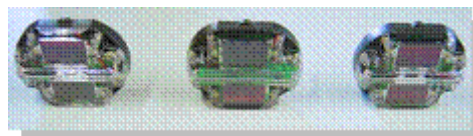
Work condition: all sensors vertical

<u>Note:</u> If there are sensors on other machines or in carrying cases within the radio reception area, they also must be vertical while you are assigning your horizontal sensor.

<u>Note:</u> Don't assign a sensor to an element which already has a sensor assigned to it. A dedicated graphic (shown on the next page) shows you which elements already have a sensor being assigned to.

<u>Note:</u> The sensors only communicate with the system when they're vertical – <u>except</u> during sensor assignment.

<u>Note:</u> If a sensor can't be found during the assignment procedure, and you're sure it's fully charged, try to take out the sensor battery and put it back in after 5 seconds. This will reset the sensor.

EZDig PRO

Follow these menu prompts to assign each sensor:

```
SENSOR ASSIGNM.
Put one sensor
horizontal.
ENTER: continue
ZERO: exit
```

Enter

```
SENSOR ASSIGNM.
Wait Please...
```
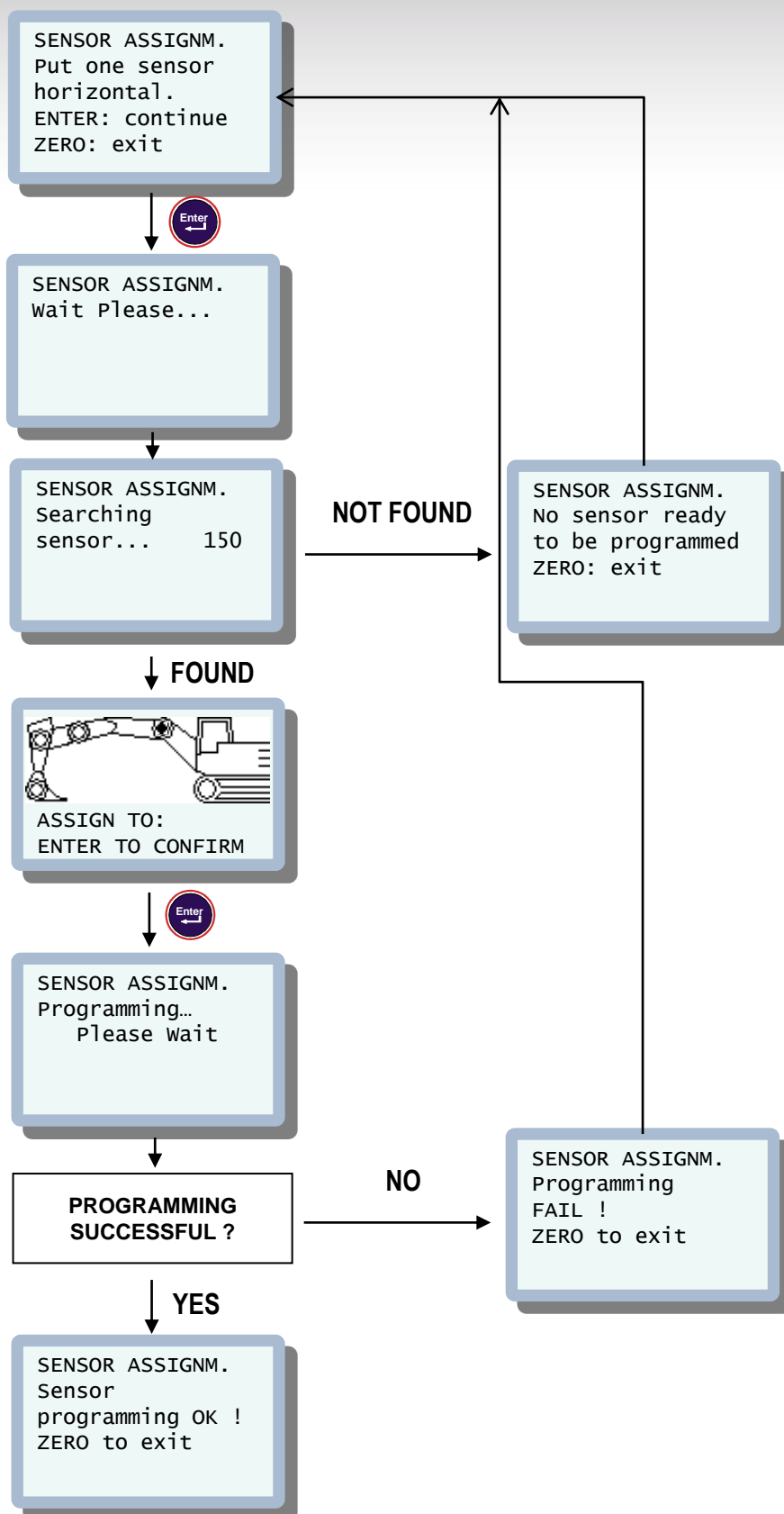
This seeking process usually only takes 10-20 seconds. Only in case of communication problems it might take longer.

```
SENSOR ASSIGNM.
Searching
sensor...   150
```

NOT FOUND →

```
SENSOR ASSIGNM.
No sensor ready
to be programmed
ZERO: exit
```

↓ **FOUND**

Sensor blinking: Actual assignment proposal.
Sensor black: Already another sensor being assigned to.
Sensor white: Free element to assign the actual sensor to.


```
ASSIGN TO:
ENTER TO CONFIRM
```

Enter

This programming routine usually also only takes 10-20 seconds. Only in case of communication problems it might take longer.

```
SENSOR ASSIGNM.
Programming…
    Please Wait
```

PROGRAMMING SUCCESSFUL ? — **NO** →

```
SENSOR ASSIGNM.
Programming
FAIL !
ZERO to exit
```

↓ **YES**

```
SENSOR ASSIGNM.
Sensor
programming OK !
ZERO to exit
```

After the sensor assignment – or before the next-day setup – you can verify the sensor assignment with the help of the Sensor Check section on page 45 by rotating a sensor (in vertical) with your hand. The value that changes the most indicates which sensor you're actually using.

```
USER MENU
Display
Machine
Sensor Check
Setup
```

From the working screen (operator mode) or the alarm page, press & hold **Enter** to enter into the USER MENU.

Scroll the cursor down with **▼** to reach the "Setup" line. Press **Enter** to enter into the setting menu.

```
SETTING MENU
Sensor Assignm.
Calibration
Copy Calibration
Load Default
```

Scroll the cursor down to "Calibration" and press **Enter** to enter into the calibration menu.

```
CALIBRATION
PIN :          0
Confirm
```

If a calibration password is not needed (default mode), skip this part.
If a password has been set, the system will prompt for it.
Scroll to Confirm and press **Enter**
If the password is incorrect, the message "Access denied!" will be displayed.
Press the **0** button to return to the operation mode.
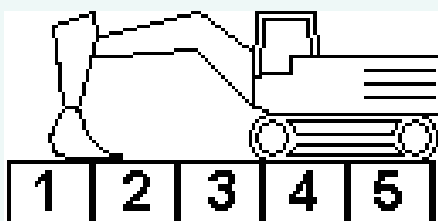
Machine selection page at the beginning of the calibration section.
Please refer to the basic user manual (starting at page 19) how to perform the automatic calibration.
This advanced user manual will continue to describe the manual calibration and the pitch sensor calibration.

```
1 2 3 4 5
```

```
Calibration:
 Automatic
 Manual
```

Select the manual calibration.

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```
Calibration:
 DogBone
 Bucket
 Booms
 Laser
 Pitch
```

In the manual calibration section you're able to calibrate all elements (Dog Bone, Bucket, Booms (Dipper Stick, Articulated Boom, Main Boom), Laser Receiver and the Chassis (Pitch Sensor) manually.

```
Calibration:
 DogBone
 Bucket
 Booms
 Laser
 Pitch
```

Select "DogBone" to proceed to the manual Dog Bone calibration.

DOG BONE - Bucket Sensor mounted on the Bucket Leverage

Note: The Dog Bone calibration must be done <u>before</u> the bucket calibration.
Changing the dog bone calibration means that the bucket calibration has to be done again.

```
DOG BONE CALIBR.
Seg1Length 0.000
Seg2Length 0.000
Seg3Length 0.000
Seg4Length 0.000
Seg1Angle   0.00
-Offset     0.00
-Actual     0.00
Seg2Angle   0.00
-Offset     0.00
-Actual     0.00
```
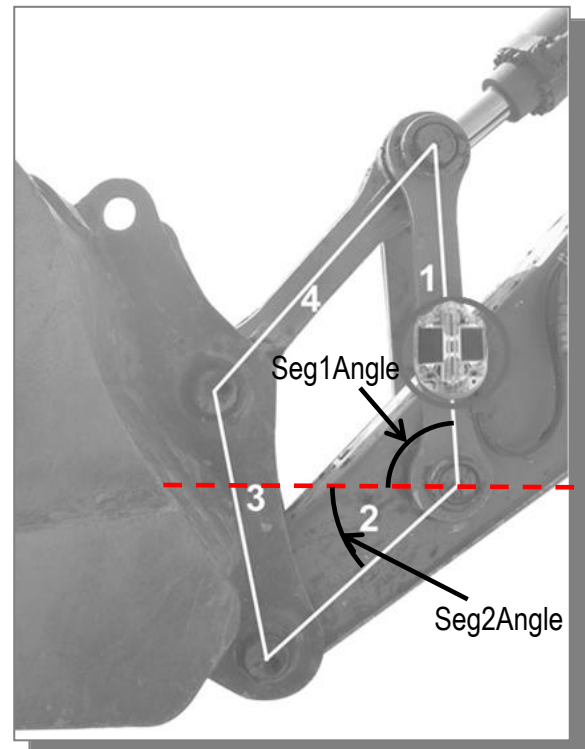

Seg1Length (Seg2Length – Seg3Length – Seg4Length)
Measure the four segments (the bones) of the dog bone and set into the proper line referring to the picture.

Seg1Angle:
Measure the real segment 1 angle, use same techniques used to measure machine's booms angles from pivot to pivot.
Press (Enter) when ready to take the correct offset value.
Seg2Angle:
Measure the real segment 2 angle as done above for segment 1.

(To measure the angles correctly, use as an example the above drawing:
Seg1Angle = + 85°; Seg2Angle = - 40° (Watch the signs!))

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BUCKET

```
Calibration:
 DogBone
 Bucket
 Booms
 Laser
 Pitch
```

Select "Bucket" to proceed to the manual bucket calibration.

The system can store up to 8 different buckets for each machine (from 1 to 8). Choose your desired bucket number by pressing ▼⁻ Or ⁺△ and confirm with Enter

SENSOR   SIDE   SENSOR   SIDE

Choose the side on which the bucket sensor is installed.

BUCKET - LENGTH

Measure accurately the length of the bucket currently installed from the center of pin (L) to the tip of the tooth (M).

Move the cursor to highlight **Length,** press Enter and set the exact value expressed in the selected unit of measure with ⁺△ . You may use the button to move through the individual digits. Confirm with Enter .

```
BUCKET CALIBRAT.
Actual       37.49
Length       1.480
Angle         0.00
Calc Offset
```

EZDig PRO
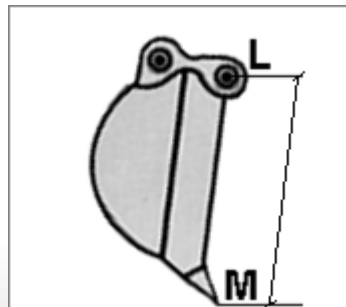
BUCKET - ANGLE

```
BUCKET CALIBRAT.
Actual        37.49
Length        0.000
Angle          0.00
Calc Offset
```


+90.0°

0.0°

-90.0°

L

M
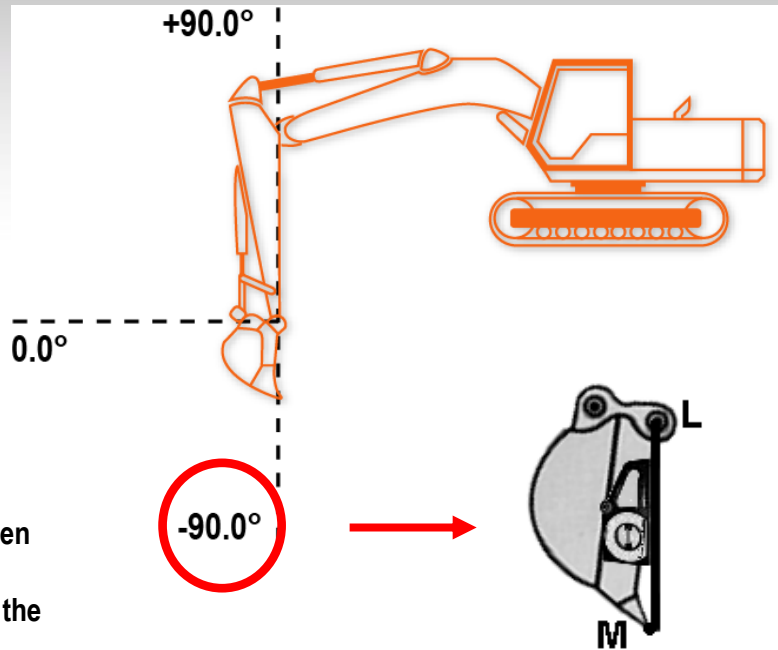
Note: Only the bucket's angle is relevant when calibrating the bucket. E.g. the dipper stick doesn't need to be vertical while calibrating the bucket.

Measure accurately the angle of the bucket currently installed between the center of pin (L) to the tip of the tooth (M).

Move the cursor to highlight **Angle,** press [Enter] and set the exact value with [+▲] or [▼-]. You may use the [⊔] button to move through the individual digits. Confirm with [Enter].

```
BUCKET CALIBRAT.
Actual        37.49
Length        1.480
Angle        -79.60
Calc Offset
```

Move the cursor with one press on the [▼] button to "Calc Offset" and confirm with [Enter].

```
BUCKET CALIBRAT.
Actual        37.49
Length        1.480
Angle        -79.60
Enter to Confirm
```

Press again [Enter] to confirm, or [0] to change again a value.

```
BUCKET CALIBRAT.
Actual       -79.60
Length        1.480
Angle        -79.60
Done!
```

Bucket calibration "Done" and confirmed. You may now exit the manual bucket calibration with a long press on [0].

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BOOMS

```
Calibration:
 DogBone
 Bucket
 Booms
 Laser
 Pitch
```

Select "Booms" to proceed to the manual calibration of the dipper stick, articulated boom and main boom.
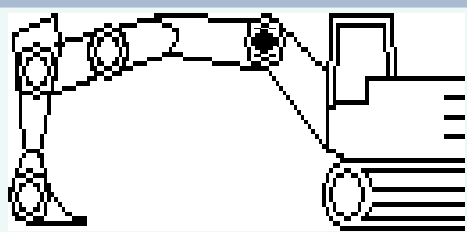
BOOM SELECTION

Choose either the main boom, articulated boom or dipper stick.
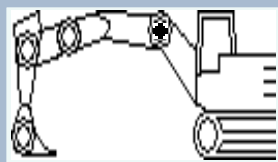
SENSOR SIDE   SENSOR SIDE

Choose the side on which the sensor is installed.

Depending on your choice, please proceed on the following pages:

Main Boom: Page 25
Articulated Boom: Page 26
Dipper Stick: Page 27

Refer to page 18 of the Basic User Manual in case of uncertainties about the individual element's names.

Main Boom - LENGTH

Measure accurately the length of the main boom between the center of pivot A and the center of pivot B.

Move the cursor to highlight Length and set the exact value expressed in the selected unit of measure.

```
Main B.CALIBRAT.
Actual        16.60
Length         6.680
Angle          0.00
Calc Offset
```
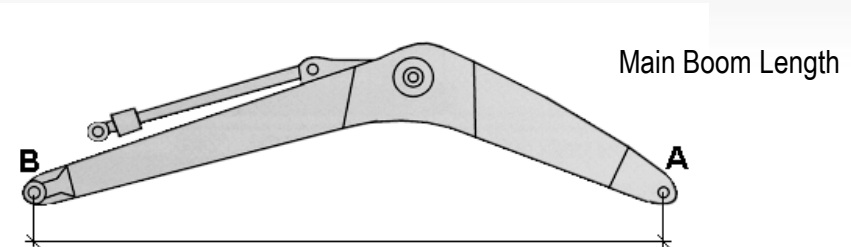

Main Boom Length

Main Boom - ANGLE

Goniometric level

Reference strap

```
Main B.CALIBRAT.
Actual        37.49
Length         4.480
Angle         15.90
Calc Offset
```

Measure accurately the angle of the main boom between the centers of pins A and B.

Move the cursor to highlight **Angle,** press [Enter] and set the exact value with [▼ -] or [+ ▲]. You may use the [⊔] button to move through the individual digits. Confirm with [Enter].

```
Main B.CALIBRAT.
Actual        37.49
Length         4.480
Angle         15.90
Calc Offset
```

Move the cursor with one press on the [▼ -] button to "Calc Offset" and confirm with [Enter].

```
Main B.CALIBRAT.
Actual        37.49
Length         4.480
Angle         15.90
Enter to Confirm
```

Press again [Enter] to confirm, or [0] to change again a value.

```
Main B.CALIBRAT.
Actual        15.90
Length         1.480
Angle         15.90
Done!
```

Main Boom calibration "Done" and confirmed. You may now exit the manual main boom calibration with a long press on [0].

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Articulated Boom - LENGTH
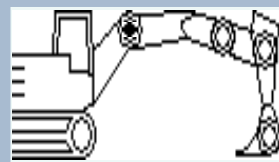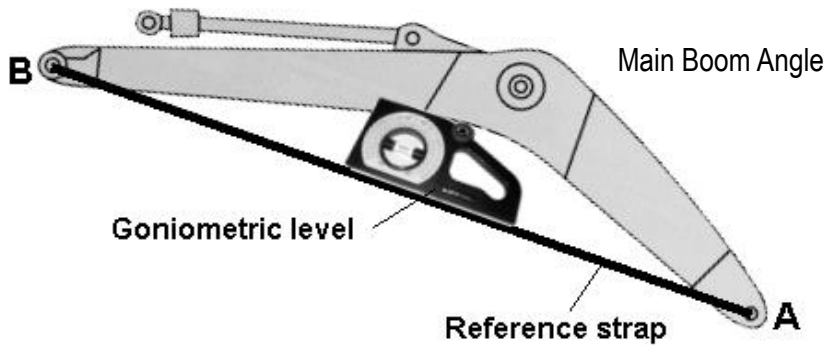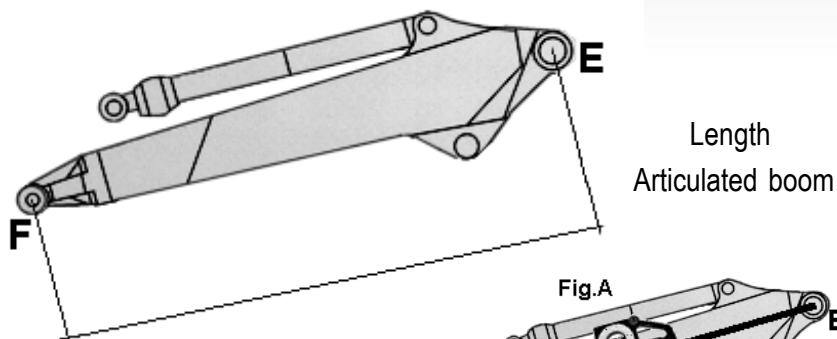
Measure accurately the length of the articulated boom between the center of pivot E and the center of pivot F.

Move the cursor to highlight Length and set the exact value expressed in the selected unit of measure.

```
Art. B.CALIBRAT.
Actual      -9.60
Length       2.340
Angle        0.00
Calc Offset
```

Length
Articulated boom

Fig.A

Angle
Articulated
boom

Goniometric
level

F   Reference
strap

Fig.B

F
Reference
strap

Goniometric
level

E

Articulated Boom - ANGLE

```
Art. B.CALIBRAT.
Actual      -9.60
Length       2.340
Angle       -15.90
Calc Offset
```
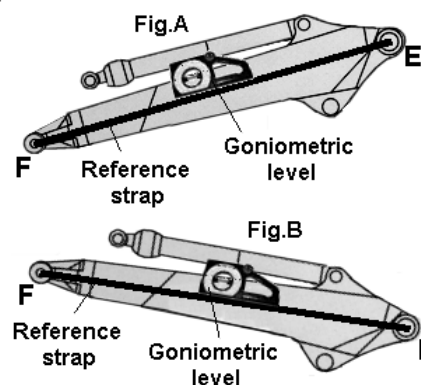
Measure accurately the angle of the main boom between the centers of pins E and F.

Move the cursor to highlight **Angle,** press [Enter] and set the exact value with [▼-] or [+▲]. You may use the [⊔] button to move through the individual digits. Confirm with [Enter].

```
Art. B.CALIBRAT.
Actual       16.60
Length       2.340
Angle       -15.90
Calc Offset
```

Move the cursor with one press on the [▼-] button to "Calc Offset" and confirm with [Enter].

```
Art. B.CALIBRAT.
Actual       16.60
Length       2.340
Angle       -15.90
Enter to Confirm
```

Press again [Enter] to confirm, or [0] to change again a value.

```
Art. B.CALIBRAT.
Actual      -15.90
Length       2.340
Angle       -15.90
Done!
```

Articulated Boom calibration "Done" and confirmed. You may now exit the manual articulated boom calibration with a long press on [0].

Dipper Stick - LENGTH

Measure accurately the length of the dipper stick between the center of pivot G and the center of pivot H.

Move the cursor to highlight Length and set the exact value expressed in the selected unit of measure.
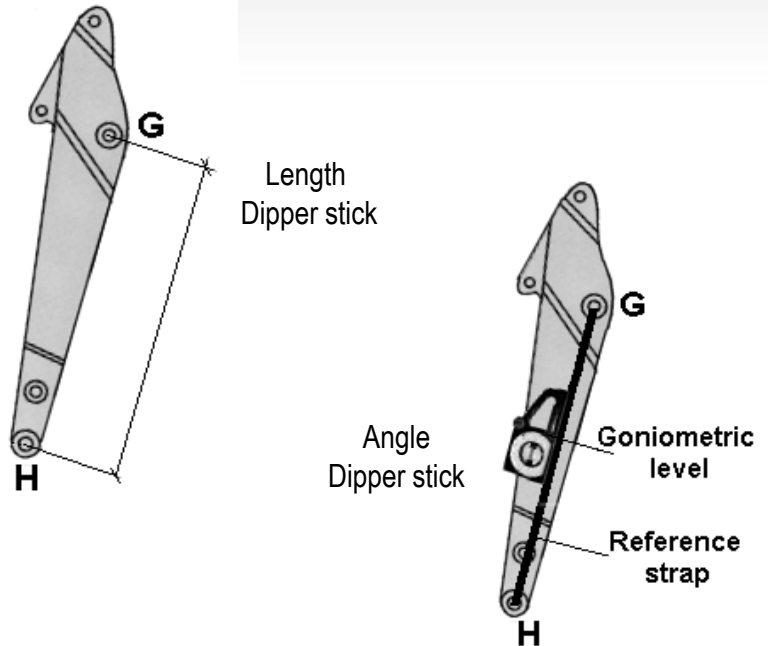
```
DIPPER CALIBRAT.
Actual      -66.66
Length       3.010
Angle         0.00
Calc Offset
```

Dipper Stick - ANGLE

Length
Dipper stick

Angle
Dipper stick

Goniometric
level

Reference
strap

```
DIPPER CALIBRAT.
Actual      -66.66
Length       3.010
Angle       -85.87
Calc Offset
```

Measure accurately the angle of the dipper stick between the centers of pins G and H.

Move the cursor to highlight **Angle,** press 🔵 Enter and set the exact value with ▽⁻ or ⁺△ . You may use the ⎍ button to move through the individual digits. Confirm with 🔵 Enter .

```
DIPPER CALIBRAT.
Actual      -66.66
Length       3.010
Angle       -85.87
Calc Offset
```

Move the cursor with one press on the ▽⁻ button to "Calc Offset" and confirm with 🔵 Enter .

```
DIPPER CALIBRAT.
Actual      -66.66
Length       3.010
Angle       -85.87
Enter to Confirm
```

Press again 🔵 Enter to confirm, or 🟧 0 to change again a value.

```
DIPPER CALIBRAT.
Actual      -85.87
Length       3.010
Angle       -85.87
Done!
```

Dipper Stick calibration "Done" and confirmed. You may now exit the manual dipper stick calibration with a long press on 🟧 0

MEASURING ANGLES

METHOD 1

Place a straight edge from center of pivot A to center of pivot B and using an inclinometer, read the actual angle (Fig.2).
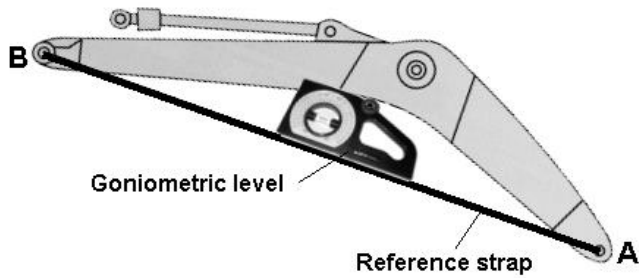

Fig.2

METHOD 2

If a tripod with laser transmitter and visible beam is available, the previous procedure could be executed by the alignment of the points A and B to the horizontal plane of the transmitter; first by pointing the beam on point A (moving up and down the laser) and then moving the boom until the point B is again spotted by the beam. In this case the angle value to be entered is 0.0 (0 degrees).

The same procedure could be used for other booms. If it is not possible to reach the horizontal position, rotate the laser 90 degrees in order to generate a vertical plane and align the boom A and B point (i.e. stick or bucket) to a vertical plane again by fixing A point first and then B. In this case the angle value to be entered is −90.0 degrees. Watch the sign!
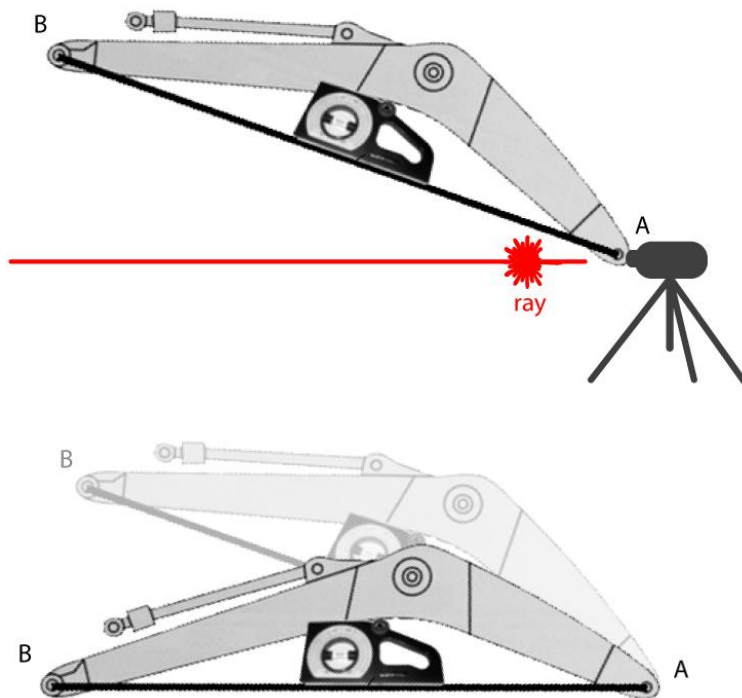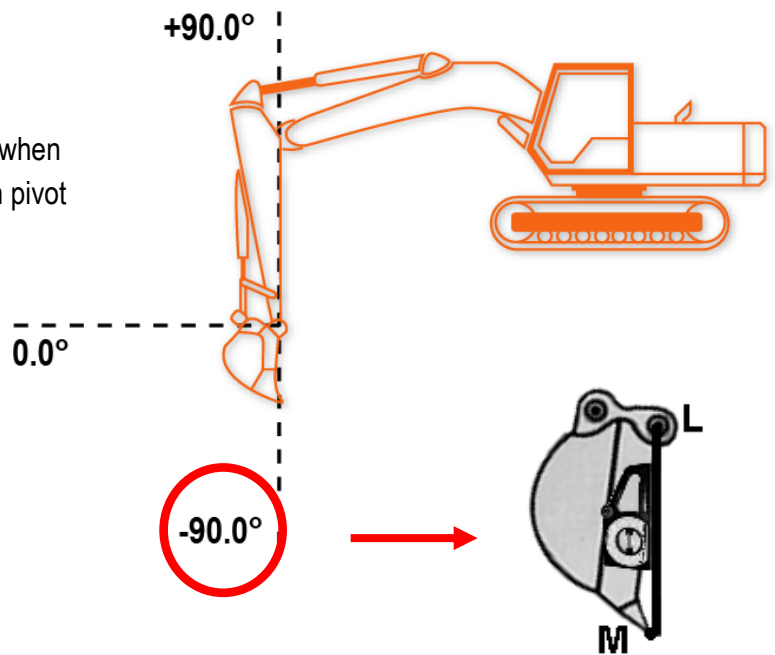
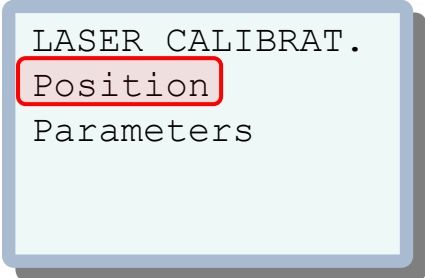## MEASURING ANGLES

METHOD 3
The vertical alignment could be also obtained by using the plumb bob method.
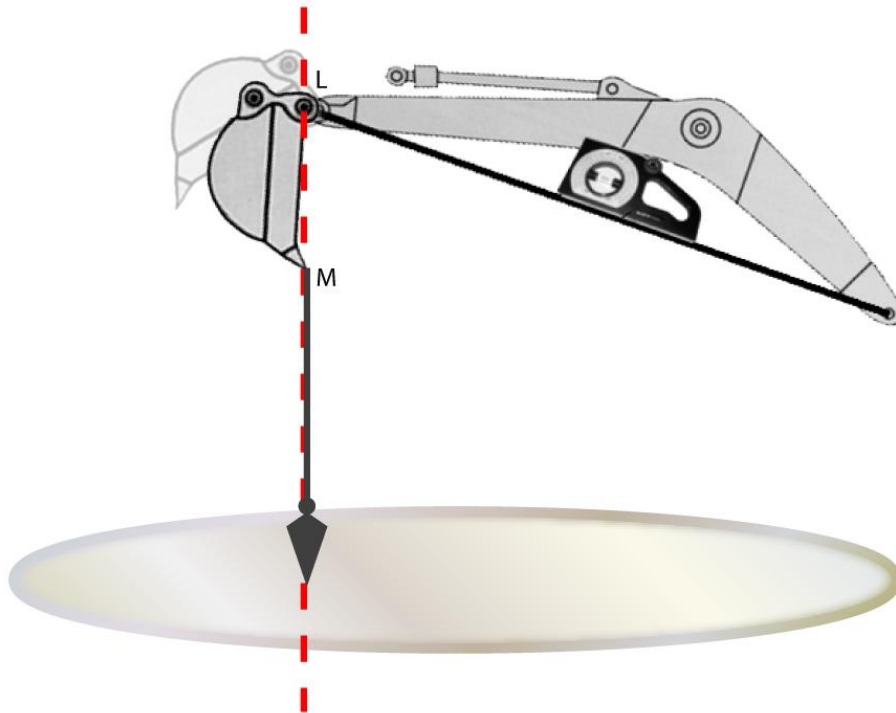
Note: When the boom is horizontal the angle is zero; when pivot M is lower than L, the angle is negative and when pivot M is higher than L, the angle is positive.
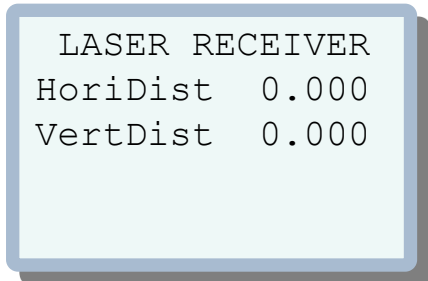
EZDig PRO

LASER RECEIVER

```
LASER CALIBRAT.
Position
Parameters
```

Choose "Position" to start to calibrate the laser receiver.

Boom Selection
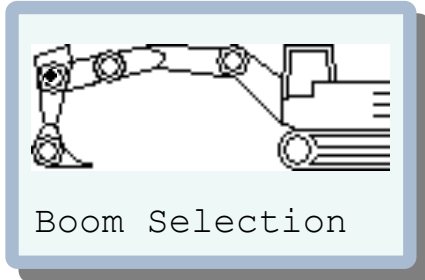
Choose with the up and down arrow keys on which element the laser receiver is attached to. Confirm with **Enter** .

HoriDist

This value indicates the distance between A and C (ref. drawings in fig 11 – fig 20 in the following pages). This point is obtained at the intersection on the projected line A-B by the perpendicular through center of the Laser Receiver. Insert the relevant value in meters or feet.

```
 LASER RECEIVER
HoriDist  0.000
VertDist  0.000
```

VertDist

This value corresponds to the distance between E and D (center of Laser Receiver to point D on projection AB, ref. Fig.11 – Fig.20).
Insert the relevant value in meters or feet.

Confirm each setting with **Enter** and leave the page by pressing 3 times **0**

Note: Be careful to dial in the correct sign especially for the vertical distance (E-D). Refer to the following drawings.

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LASER RECEIVER

```
LASER CALIBRAT.
Position
Parameters
```

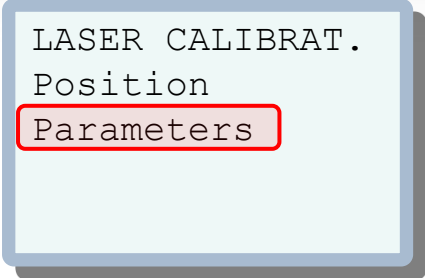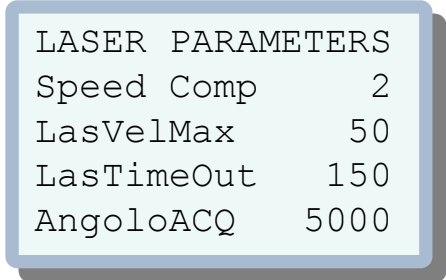Choose "Parameters" to change the settings of the laser receiver.

```
LASER PARAMETERS
Speed Comp      2
LasVelMax      50
LasTimeOut    150
AngoloACQ    5000
```

Speed Comp:

A default, well tested, speed compensation value to minimize errors resulting out of a dynamic laser catch, using the laser rabbit mode. Refer to page 55 of the basic user manual. It is recommended not to change this value.

LasVelMax:

Maximum accepted vertical speed of the laser during the laser catch. Increasing this value will increase the max. accepted speed.

LasTimeOut:

The time the system waits for the laser beam to touch the laser receiver after pressing the laser button. Default setting: 150 (15 seconds).

AngoloACQ:

Max. accepted angle of the laser receiver during the laser catch. Default setting: 500 (45°). It is recommended not to change this value.

REFERENCE DRAWINGS TO DETERMINE POSITION OF LASER RECEIVER

MAIN BOOM
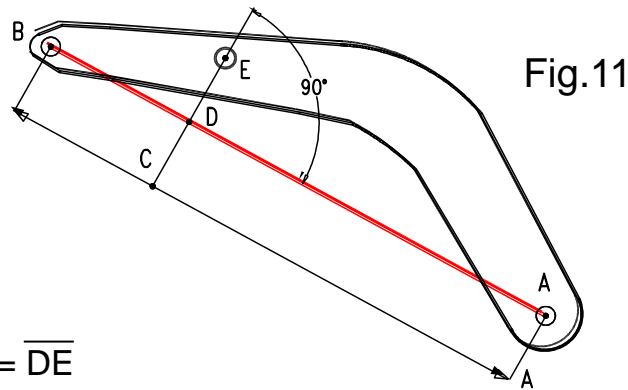
Fig.11

VERTICAL DISTANCE = $\overline{DE}$

HORIZONTAL DISTANCE = $\overline{AC}$

Note: In the example drawing above (Fig. 11), $\overline{AC}$ is positive and $\overline{DE}$ is positive

REFERENCE DRAWINGS TO DETERMINE POSITION OF LASER RECEIVER

ARTICULATED BOOM

Fig.15
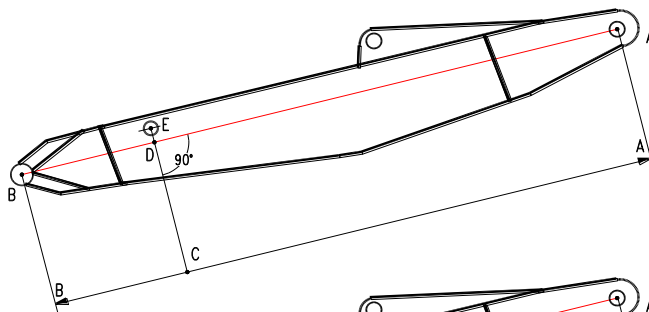
VERTICAL DISTANCE = $\overline{DE}$ = Positive

Fig.16

VERTICAL DISTANCE = $\overline{DE}$ = 0

Fig.17

VERTICAL DISTANCE = $\overline{DE}$ = Negative

HORIZONTAL DISTANCE = $\overline{AC}$

Note: In the example drawings above, $\overline{AC}$ is always positive

EZDigPro

REFERENCE DRAWINGS TO DETERMINE POSITION OF LASER RECEIVER

DIPPER STICK

Fig.18   Fig.19   Fig.20

VERTICAL DISTANCE = $\overline{DE}$ = Positive   VERTICAL DISTANCE = $\overline{DE}$ = Negative
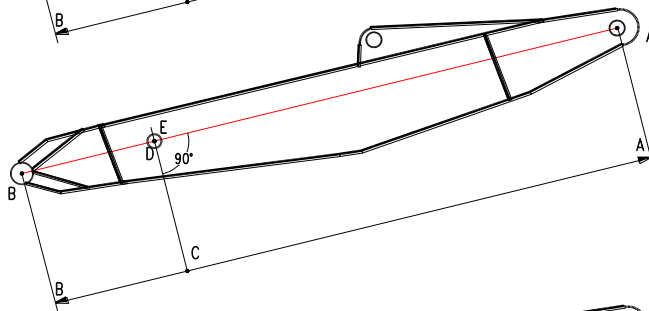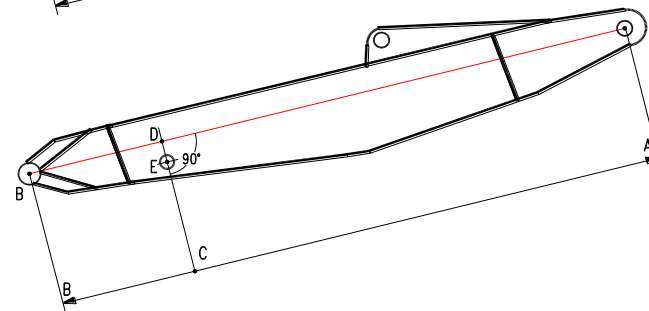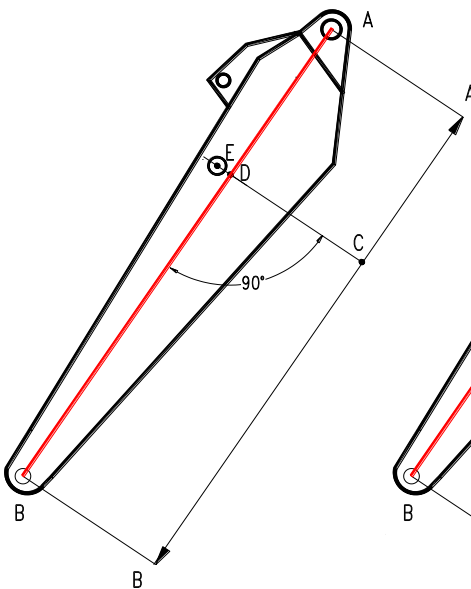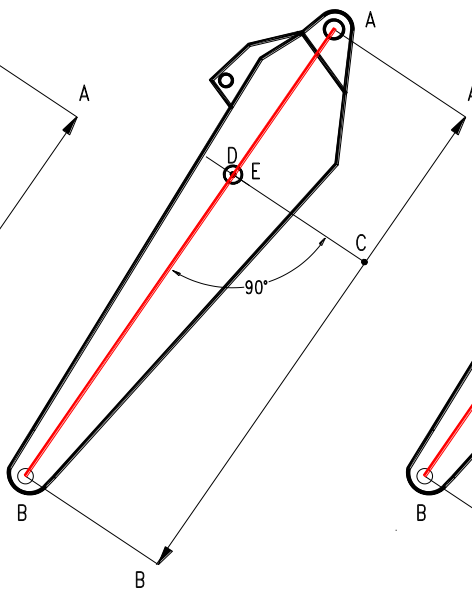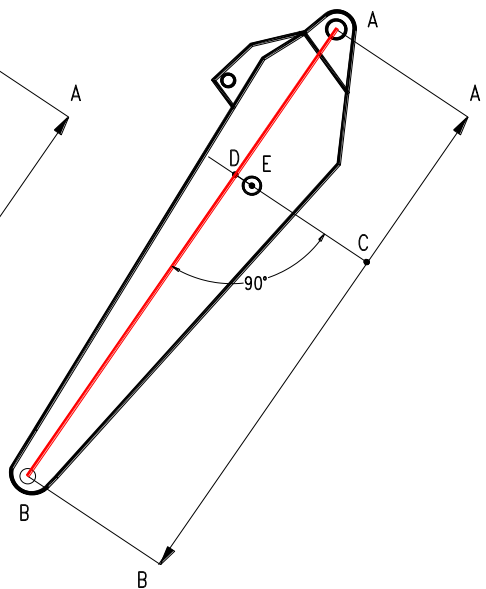
VERTICAL DISTANCE = $\overline{DE}$ = 0

HORIZONTAL DISTANCE = $\overline{AC}$

Note: In the example drawings above, $\overline{AC}$ is always positive

If a rotation of the chassis during operation shall be compensated, you may use a fourth (or fifth) sensor as a "pitch" sensor for the chassis. This will automatically correct forward and backward tilting movements of your machine as well as rotation effecting your actual depth information.
The following section describes how to install, calibrate and (de-)activate the pitch sensor.

Note: In order to use the pitch option, your system needs to contain 4 (if your machine just has one main boom) or 5 (if your machine has an additional articulated boom) sensors in total. If you're missing this one extra sensor, simply order it at your local EZDigPro dealer.

Note: The pitch **calibration** section is only available if using the "Advanced Mode". After calibration you may **use** the pitch sensor as well in the "Basic Mode".
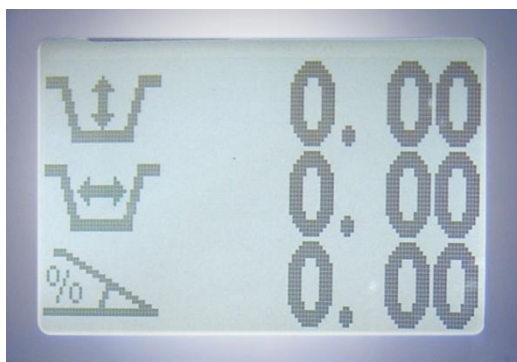
From the working screen (operator mode) or the alarm page, press & hold (Enter) to enter into the USER MENU.

```
USER MENU
Display
Machine
Sensors Check
Setup
```
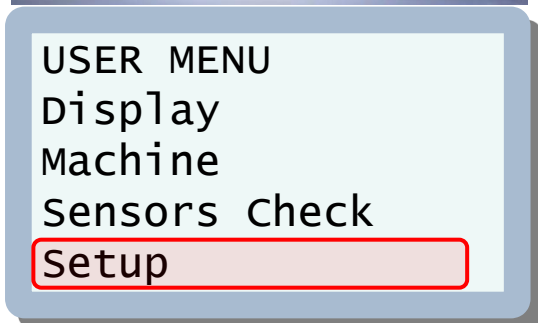
Scroll down to "Setup" and confirm with (Enter).

```
SETTING MENU
Sensor Assignm.
Calibration
Copy Calibration
Load Default
```
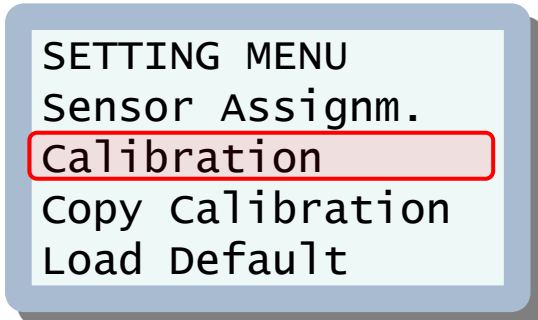
Scroll down to "Calibration" and confirm with (Enter).
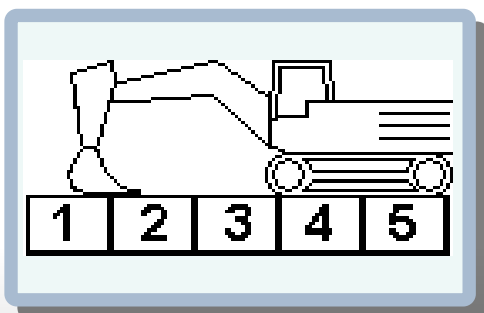
Select your machine #.

1 2 3 4 5

This Machine is
already cal.
-Sel. New Mach
-Overwrite

If the machine selected already contains calibration data (which should be the case if you want to add the pitch sensor to an already calibrated system), the system informs you accordingly. Choose "Overwrite".

This Machine is
already cal.
-Sel. New Mach
Enter to Confirm

"Overwrite" asks you to confirm your choice by pressing

Machine:
 3 Elements
 4 Elements

Select and confirm the number of elements you have on your machine.

3 Elements: If your machine has just one main boom.

4 Elements: If your machine has an additional articulated boom.

ENTER: CONTINUE

Perform & pass the vibration test.

Refer to the vibration test section in the basic user manual for details.

RPM
MAX
MIN   MAX

ENTER: CONTINUE

Note: The pitch sensor should be in a horizontal position during this whole preparation process.

40 %
Please Wait...

Calibration:
 Automatic
 Manual

Choose & select "Manual".

```
Calibration:
 DogBone
 Bucket
 Booms
 Laser
 Pitch
```

Choose & select "Pitch".

```
PITCH CAL.
Assignment
Easy Calib.
Manual Calib.
Enable      OFF
```

Choose & select "Assignment".

If your chassis sensor has been already assigned during a previous calibration (e.g. on another machine), you may skip this section and continue to the calibration part.

```
SENSOR ASSIGNM.
Put one sensor
horizontal.
ENTER: continue
ZERO: exit
```

Assign the pitch sensor.

Refer to the assignment section of this advanced user manual for details.

After you've performed the assignment, attach the chassis sensor on any place at the chassis (upper cab – NOT lower cab!) in a way, that it's vertically orientated such as the other sensors on the booms.

Note: DO NOT attach the sensor to the chassis with the "nose" pointing down (to the ground)!

BAD   GOOD   GOOD   GOOD
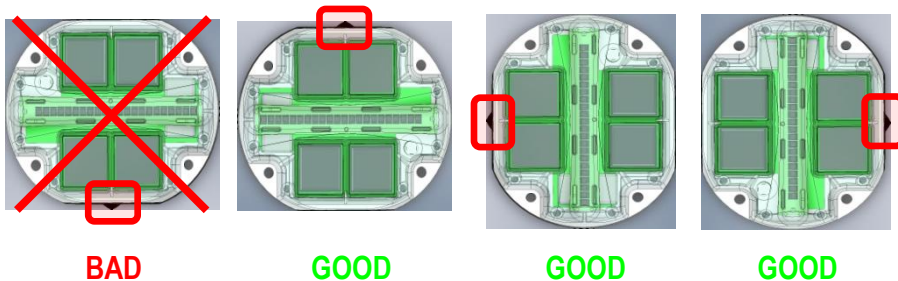
```
PITCH CAL.
Assignment
Easy Calib.
Manual Calib.
Enable      OFF
```

You may now calibrate the chassis sensor with an "Easy Calibration" (recommended) or "Manual Calibration". The "Manual Calibration will be described at page 40. Choose & select "Easy Calib."


```
    SENSOR   SIDE
```
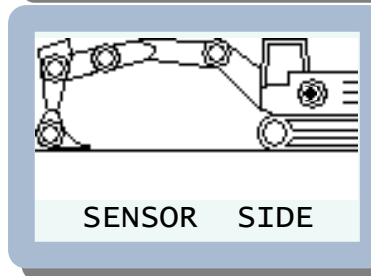
Choose on which side of the chassis you've attached the pitch sensor.

```
PITCH CALIBRAT.
Seg. AB    0.000
Seg. BC    0.000
Continue
```

Refer to the drawing on the next page which values to put in for "Seg. AB" and "Seg. BC".

Examples:

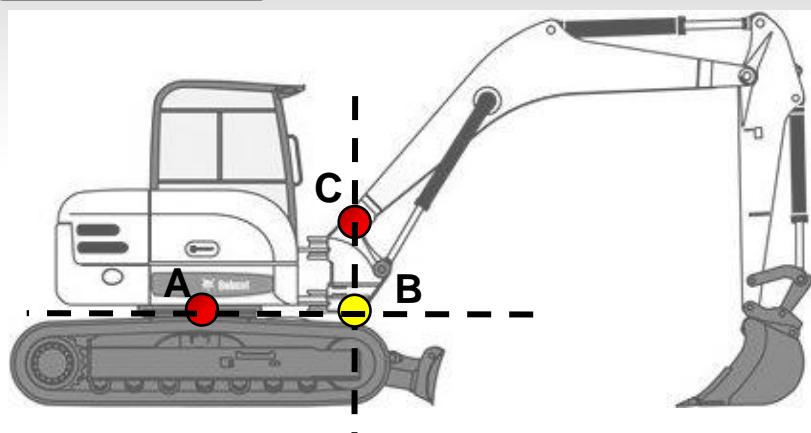A: Rotational center of the machine (in the example on the left the pivot point of the chassis to the undercarriage)

C: Pivot point of the main boom and the chassis

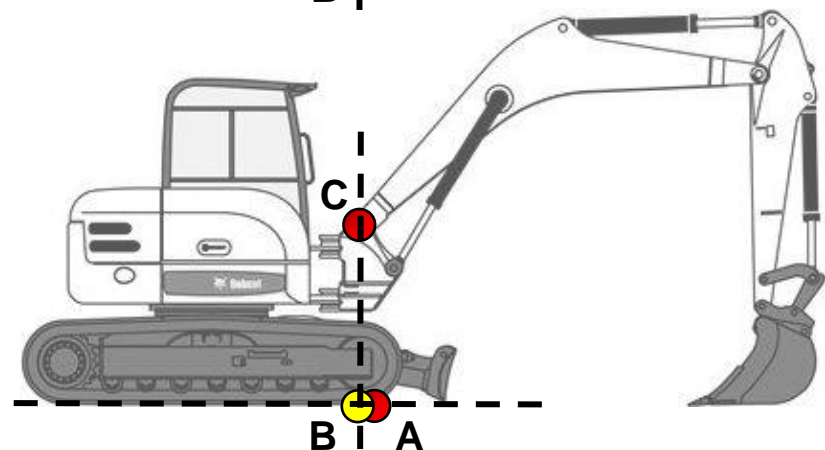B: Intersection of the horizontal axis going through "A" and the vertical axis going through "C"

Note: AB is positive, if B is more in front of the machine. BC is positive, if C is higher than B – in this case both are positive.
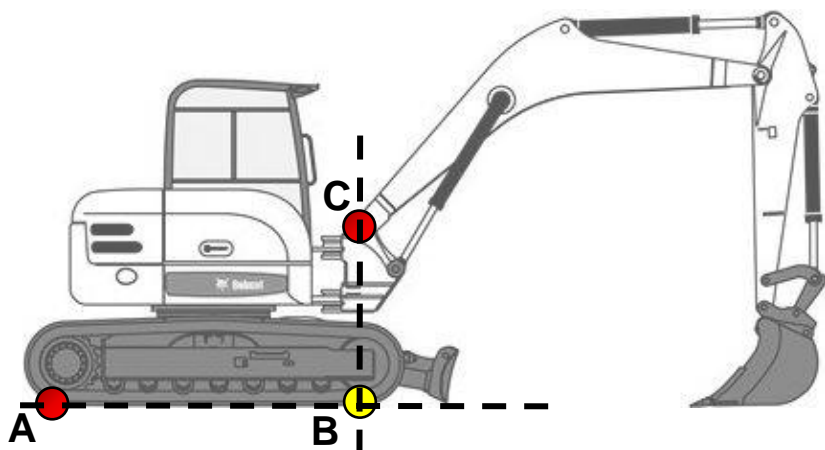
If you'd like to compensate tilting movements rotating over the back of the tracks, choose "A" as shown on the example on the left.

AB = positive

BC = positive

If you'd like to compensate tilting movements rotating over the front of the tracks, choose "A" as shown on the example on the left.

AB = negative

BC = positive

Note: AB and BC are only related to the machine itself – NOT the location of the chassis sensor!

```
PITCH CALIBRAT.
Seg. AB    0.250
Seg. BC    0.840
Continue
```

Measure and dial in AB & BC as prompted.

Select and confirm "Continue"

Note: You may change this values any time again, depending which tilting movements you'd like to compensate.

EZDig PRO

```
      [STOP]

ENTER: CONTINUE
```

Final step is to calibrate the pitch's offset angle. For this you need to rotate the machine's cabin (only the upper cab) 180° after getting prompted for it. So be sure to have your machine (not moving, with an adequate machine engine speed) in an according position to be able to rotate later, prior to pressing (Enter) Press (Enter) to confirm the 1st position.

```
ROTATE COCKPIT
     180°

ENTER: CONTINUE
```
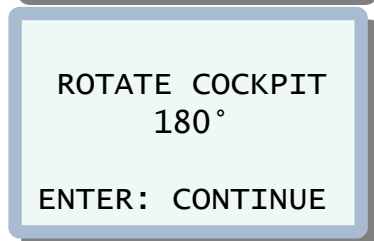
Rotate only the cabin 180°. All the other elements may be moved as well to ensure not to accidentally touch anything around.

```
      [STOP]

ENTER: CONTINUE
```

Press (Enter) to confirm the 2nd position.

```
Calibration
   Done!
```
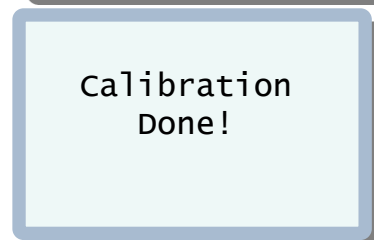
You successfully calibrated the pitch sensor.

```
PITCH CAL.
Assignment
Easy Calib.
Manual Calib.
Enable        ON
```
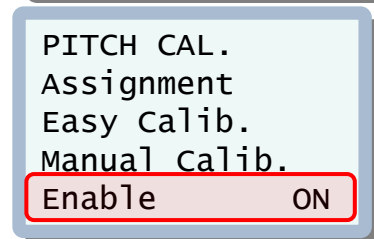
The pitch calibration screen appears again. Note, that the pitch sensor is automatically enabled ("ON"). You may disable the pitch sensor any time by scrolling to "Enable" and set the value to "OFF".

```
SaveCalibration?
Yes
NO
```
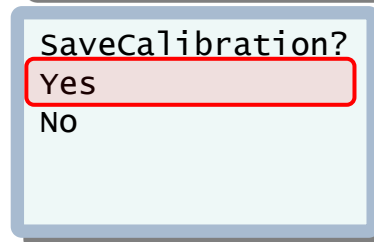
You may exit the pitch calibration screen by short-press of (Enter) (2 times) and save your new calibration.

Manual Pitch Calibration

```
PITCH CAL.
Assignment
Easy Calib.
Manual Calib.
Enable      OFF
```

After you've performed the assignment, attach the chassis sensor on any place at the chassis (upper cab – NOT lower cab!) in a way, that it's vertically orientated such as the other sensors on the booms.

You may now calibrate the chassis sensor with an "Easy Calibration" (recommended) or "Manual Calibration". The "Manual Calibration will be described now. Choose & select "Manual Calib."

```
PITCH CALIBRAT.
SIDE:          L
Seg. AB    0.000
Seg. BC    0.000
Act. Ang.-179.81
Angle      -0.09
Calc Offset
```

Choose on which side of the chassis you've attached the pitch sensor. On the left (L) or on the right (R).

```
PITCH CALIBRAT.
SIDE:          L
Seg. AB    0.250
Seg. BC    0.840
Act. Ang.-179.81
Angle      -0.09
Calc Offset
```

Refer to the drawing on page 38 which values to put in for "Seg. AB" and "Seg. BC".

```
PITCH CALIBRAT.
SIDE:          L
Seg. AB    0.250
Seg. BC    0.840
Act. Ang.-179.81
Angle      77.50
Calc Offset
```

Measure accurately the angle between AC and the horizontal axis.

Move the cursor to highlight **Angle,** press [Enter] and set the exact value with [▽−] or [+△]. You may use the [⊔] button to move through the individual digits. Confirm with [Enter].

```
PITCH CALIBRAT.
Seg. BC    0.840
Act. Ang.-179.81
Angle      77.50
Calc Offset
```

Move the cursor with one press on the [▽−] button to "Calc Offset" and confirm with [Enter].

```
PITCH CALIBRAT.
Seg. BC    0.840
Act. Ang.  77.50
Angle      77.50
Done!
```

Press again [Enter] to confirm, or [0] to change again a value. "Done!" indicates the success of your manual pitch calibration.

EZDig PRO

```
USER MENU
Display
Machine
Sensor Check
[Setup]
```

From the working screen (operator mode) or the alarm page, press & hold [Enter] to enter into the USER MENU.

Scroll the cursor down with [▼] to reach the "Setup" line. Press [Enter] to enter into the setting menu.

```
SETTING MENU
Sensor Assignm.
Calibration
[Copy Calibration]
Load Default
```

Scroll the cursor down to "Copy Calibration" and press [Enter] to enter this menu point.

```
MACHINE COPY
[Copy from:      2]
[Paste to :      5]
COPY
SAVE
```

Select "Copy from" with the arrow keys and confirm with [Enter]. Change the machine # with the arrow keys, e.g. to machine #2 and confirm with [Enter].
Select "Paste to" with the arrow keys and confirm with [Enter].
Change the machine # with the arrow keys, e.g. to machine #5 and confirm with [Enter].

```
MACHINE COPY
Copy from:       2
Paste to :       5
[COPY]
SAVE
```

Perform the copy operation by selecting "COPY" with the arrow keys and press [Enter].

When prompted "Enter to Confirm", re-confirm by pressing [Enter]

"Done!" communicates the success of your operation.

```
MACHINE COPY
Copy from:       2
Paste to :       5
COPY
[SAVE]
```

Select "SAVE" with the arrow keys in case you want to save your new setting.
Perform the save operation by selecting "COPY" with the arrow keys and press [Enter].
When prompted "Enter to Confirm", re-confirm by pressing [Enter].
"Done!" communicates the success of your operation.

```
SETTING MENU
Sensor Assignm.
Calibration
Copy Calibration
Load Default
```

After saving your new settings, the system returns to the Setting menu.

```
USER MENU
Display
Machine
Sensor Check
Setup
```

From the working screen (operator mode) or the alarm page, press & hold [Enter] to enter into the USER MENU.

Scroll the cursor down with [▼] to reach the "Setup" line. Press [Enter] to enter into the setting menu.

```
SETTING MENU
Sensor Assignm.
Calibration
Copy Calibration
Load Default
```

Scroll the cursor down to "Load Default" and press [Enter] to enter this menu point.

```
SETTING MENU
Sensor Assignm.
Calibration
Copy Calibration
Enter to Confirm
```

When prompted "Enter to Confirm", re-confirm by pressing [Enter]
Note: Pressing [Enter] will delete all your previous settings & calibrations and will reset the system to its factory settings!
Short-press [0] not to reset the system and to return to the user menu.

After you've confirmed the reset of the system, the software will save the new status and the screen on the left will come up next to ask for a new sensor assignment.

SAVE

```
SETTING MENU
Sensor Assignm.
Calibration
Copy Calibration
Load Default
SAVE
```

Choosing "SAVE" in the user menu enables you any time to save previously done changes in the calibration or settings of the system which have not been saved before.

EZDigPRO

```
USER MENU
Display
Machine
Sensor Check
Setup
```

```
SETTING MENU
Sensor Assignm.
Calibration
Copy Calibration
Load Default
SAVE
MMI Parameters
```

```
MMI PARAMETERS
DeadBaF       0.010
DeadBaM       0.025
DeadBaC       0.050
LedDeDw       0.500
LedDeUp      -0.100
LedReGr       0.050
LedReRe       0.100
BuzMode           0
BuzRanMin     0.025
BuzRanMax     0.500
BuzFreMax        15
BuzFreDW          4
BuzFreUP          2
GraphBarR.    0.200
DepthIconR    0.030
ReachIconR    0.050
```

From the working screen (operator mode) or the alarm page, press & hold (Enter) to enter into the USER MENU.

Scroll the cursor down with ▼ to reach the "Setup" line. Press (Enter) to enter into the setting menu.

Scroll the cursor down to "MMI Parameters" and press (Enter) to enter this menu point.
This menu point is to change certain settings for the system's display behavior.
Caution:
Changing values in the MMI parameters has a big effect on the performance of the system. Only access this menu area after you've carefully read the following section!

DeadBaF / DeadBaM / DeadBaC
The defaults for the 3 dead bands (fine, medium, or coarse) are listed in "Usage - Dead Band Selection" on page 59 of the basic user manual. The defaults preset are +/-1, 2.5 & 5cm (0.5, 1 & 2"). You may change these defaults in this screen.

LedDeUp / LedDeDw / LedReGr / LedReRe
Depth and reach indication limits of the Remote Display.
The default presets are 50cm (20") (going down – coming from the top) and 10cm (4") (going up – coming from the bottom) for the depth and +/-5cm (2") for the on-grade & 10cm (4") coming from the front or back in reach.

BuzzMode
0: the tone of the buzzer "beep" becomes faster going close to the zero value.
1: the tone isn't related to the distance from zero but is different if the bucket is higher or lower to the zero. This mode can be personalized using the following parameters:
BuzRanMin value indicates when the buzzer sound will become continuous or On-Grade. **BuzRanMax** value indicates when the buzzer sound will come On or go off. From the value BuzRanMin to the BuzRanMax value the buzzer sound is beeping related to the parameter **BuzFreUp**. Below zero values are complementary and the buzzer frequency is related to the **BuzFreDw** parameter.

GraphBarR.
Visualization limit of the depth graph bar shown in the 2nd operator screen. Default setting: +/-20cm (8").

DepthIconR
Below this value the depth icon on the left of the depth number in the 1st operator screen shows that the bucket is on grade. Default: 3cm (1").

ReachIconR
Below this value the reach icon on the left of the reach number in the 1st operator screen shows that the bucket is on grade. Default: 5cm (2").

EZDigPRO

LedDeUp

Dead Band

LedDeDw

LedReRe

LedReGr
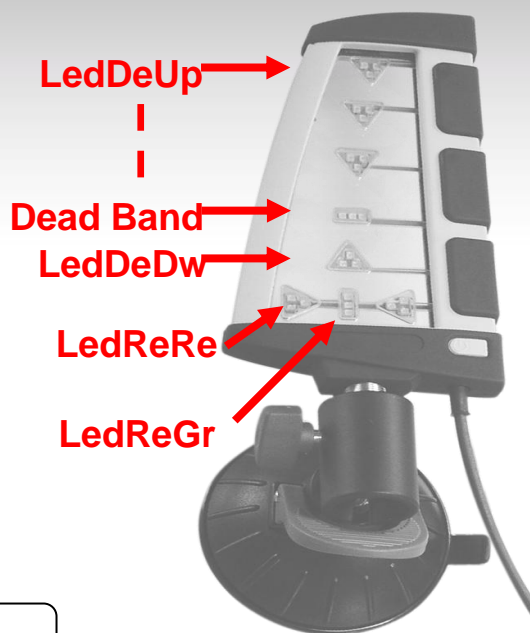
Service Parameters

```
USER MENU
Display
Machine
Sensor Check
Setup
```

From the working screen (operative mode) or the alarm page, press & hold **Enter** to enter into the USER MENU.
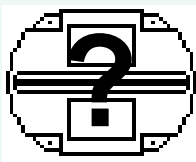
Scroll the cursor down with ▼ to reach the "Setup" line. Press **Enter** to enter into the setting menu.

```
SETTING MENU
Sensor Assignm.
Calibration
Copy Calibration
Load Default
SAVE
MMI Parameters
Service Paramet.
```

Scroll the cursor down to "Service Paramet." and press **Enter** to enter this menu point.

This menu point is to change certain settings for the system's performance in general.

Caution:

Changing values in the Service parameters has a big effect on the performance of the system. Only EZDigPro service personal should access this menu area.

```
SERVICE
PIN :          0
Confirm
```

A pin code is required to access this functions. Please refer to the Service Manual which is available for service authorized distribution partners only.

Set Password

```
SETTING MENU
Sensor Assignm.
Calibration
Copy Calibration
Load Default
SAVE
MMI Parameters
Service Paramet.
SetPassw.        0
```

Scroll the cursor down to "SetPassw." and press [Enter] to enter this menu point. "0" will start blinking.
You may enter up to 4 digit pin code to protect your system's settings against unwanted modifications.
Each press of the up arrow [+▲] changes the actual digit selected.
Pressing [▽] moves to the next digit.

Once done, press [Enter] to confirm your setting. If your password set shall be valid also after a reboot of the controlbox, choose and perform a "SAVE" of the new setting.

To disable the password protection, set the "SetPassw." back to "0" and "SAVE".

Sensor Check

```
USER MENU
Display
Machine
Sensor Check
Setup
```

From the working screen (operative mode) or the alarm page, press & hold [Enter] to enter into the USER MENU.

Scroll the cursor down with [▼-] to reach the "Sensor Check" line.
Press [Enter] to enter into the sensor values page.

```
SENSORS VALUES
A. Bucket      9491
A. Dipper    -13257
A. M.Boom    -16827
A. Ar.Boom    -5033
A. Pitch         -1
B. Bucket         94
B. Dipper         98
B. M.Boom        100
B. Ar.Boom        93
B. Pitch          -1
Laser              0
```

The next page will show you the actual angles "A." and battery status "B." of the individual sensors.

The angle ("A.") values flickering up to +/-10 points means, that the sensors are working properly.
"-1" indicates a non-existing (not assigned to the system) sensor – in the example on the left the pitch sensor.

The battery ("B.") values indicate the charging status of the individual sensors.
100: Full, 50: Half full, 1: Almost empty, -1: non existing (see above)

The "Laser" Value is the position in mm where the laser beam has been taken the last time inside the receiver bar. The range is - 40 to +40.