



X-22

2D Excavator Indicate System



User's Manual



X-22

Excavator Indicate System

User's Manual

Part Number 7010-1020

Rev A

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June, 2011

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Preface

Thank you for purchasing your Topcon X-22 2D Excavator Indicate System, product or accessory (the “Product”). The materials available in this manual (the “Manual”) have been prepared by Topcon Positioning Systems, Inc. (“TPS”) for owners of Topcon products. This Manual is designed to assist owners with the use of software (the “Software”) to be used with the Product and its use is subject to these terms and conditions (the “Terms and Conditions”).



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Manual Conventions

This manual uses the following conventions:

Example	Description
File ▶ Exit	Tap the File menu and tap Exit.
Enter	Indicates the button or key labeled Enter.
<i>Topo</i>	Indicates the name of a dialog box or screen.
<i>Notes</i>	Indicates a field on a dialog box or screen, or a tab within a dialog box or screen.



Supplementary information that can help you configure, maintain, or set up a system.



Supplementary information that can have an affect on system operation, system performance, measurements, personal safety.

Introduction

Congratulations on your new X-22 System. You are now ready for quicker, safer and more accurate work with your new workmate, X-22.

This manual contains descriptions of the user interface and ideas for working with the X-22 System. But don't let this limit your use of X-22. X-22 can almost certainly be used in ways we have not thought of or described in this manual.

When on site, you are the expert – all we have done is offer you the best workmate an excavator driver could wish for.

Enjoy your work!

Operating Principle

The X-22 software was designed to give you all necessary information for the current job, just by glancing at the screen. Some of the information, such as the height alarm, is also provided by X-22 in the form of sound signals.

To give you this information X-22 needs your help. To get started, you first have to tell X-22 what type of work or project you intend to carry out. You then tell X-22 where this work is to be done by referencing.

With this complete, the excavator is able to sit with its undercarriage in one place while you dig and swing the superstructure to your heart's content. X-22 has complete control over where the machine is in relation to the project.

If the undercarriage moves, for instance, because you have transferred to a new location, you must tell X-22 this by referencing again. Once referencing is complete, continue digging, and X-22 continues to make the right measurements.

This is how daily work proceeds, and in this way X-22 helps you by displaying the excavator in terms of work, height, length, slope and

whatever else you need to carry out your work to a centimeter's precision.

Updating the Software

You can see which version of the software you have in the top right-hand corner of the **Main Menu** (e.g. “v1.6.0.1”).

You can also check if you have the latest version by visiting www.topconpositioning.com

How to Update the Software

1. To download the “X-22_Update.exe” program onto your computer, laptop or workstation using Windows, click the link to the latest program version on www.topconpositioning.com . Contact your dealer if you have not been given a username and password.
2. Insert a USB flash drive into the computer.
3. Run the “X-22_Update.exe” program.
4. Click **Next**.



Figure 1-1. Updating the X-22 Software.

5. Click **Browse...**, and select the location of USB flash drive. Then, click **Install** to allow the program to copy the necessary files to the USB flash drive, after it checks for enough free space. When the program is finished, you have the option of reading the release notes.

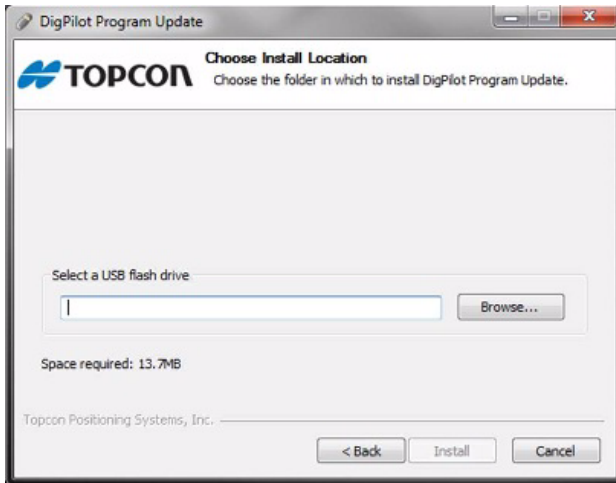


Figure 1-2. Updating the X-22 Software.

6. Plug the memory stick into the X-22 Display, and select **Main menu** ▶ **Setup** ▶ **Hardware** ▶ **Computer** ▶ **Update software**.

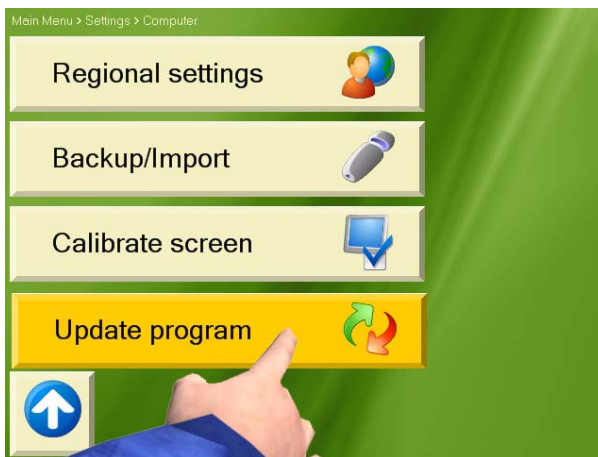


Figure 1-3. Updating the X-22 Software.

Getting Acquainted

The following chapter describes the basic features of the X-22 excavator indicate system software.

The Digging Window

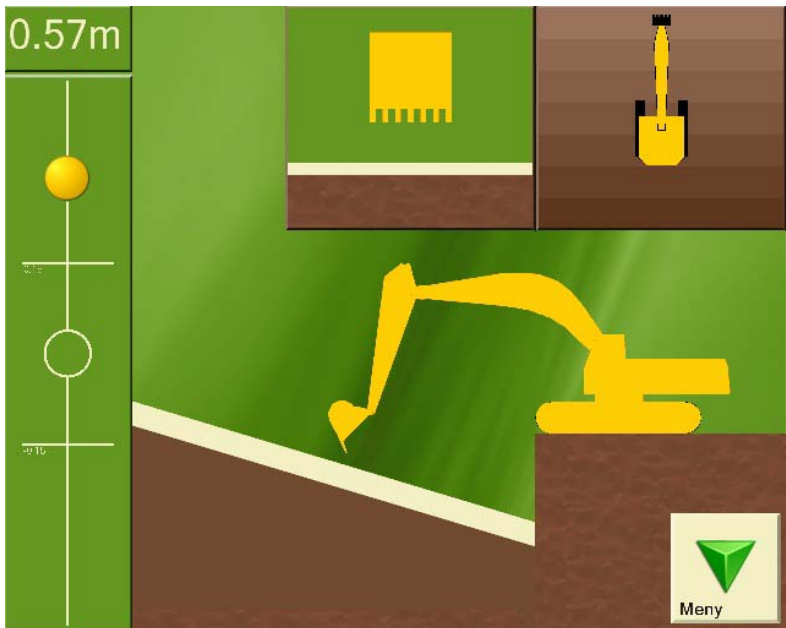



Figure 2-1. Digging Window

In the *Digging Window*, you will find all the information you need for digging. You can also choose what you would like to see displayed for optimal adaptation of the screen to you and your needs. This chapter describes what you will see in the *Digging Window* and how you can use it.

Target ball

On the left side of the *Digging Window* (Figure 2-1 on page 2-1) you will see the **Target Ball** . This functions as a zoom. As the bucket tip approaches the digging depth, the ball begins to move. When the **Target Ball** is in the center of the circle, the bucket tip is exactly at the desired digging depth. The two horizontal lines show the working area.

Bucket Height

The top left-hand corner of the *Digging Window* (Figure 2-2) shows the vertical distance from the measurement point on the bucket tip to the entered digging depth.

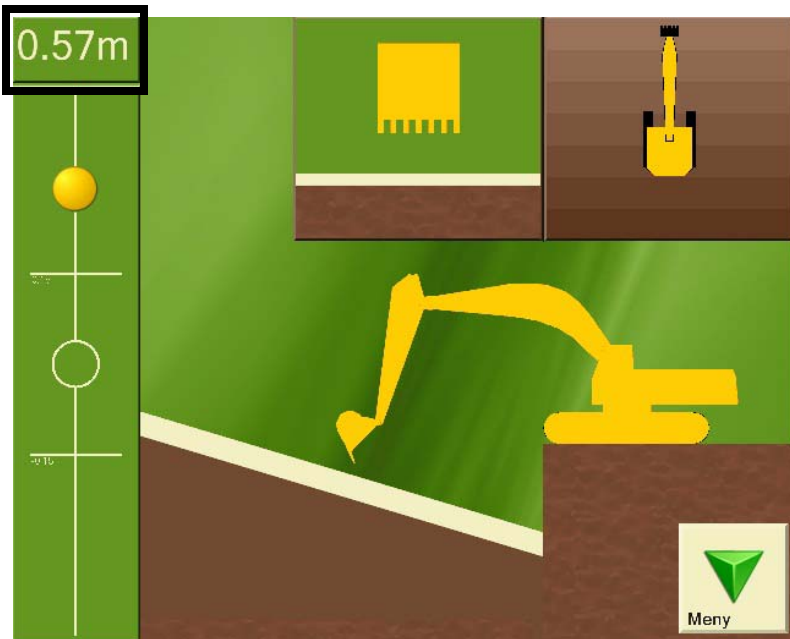


Figure 2-2. Bucket Height

Top View of Machine

At the top right-hand of the *Digging Window* (Figure 2-3) the excavator and the project are viewed from above. This can be very helpful for returning to a lengthways direction, for example in the case of a trench.

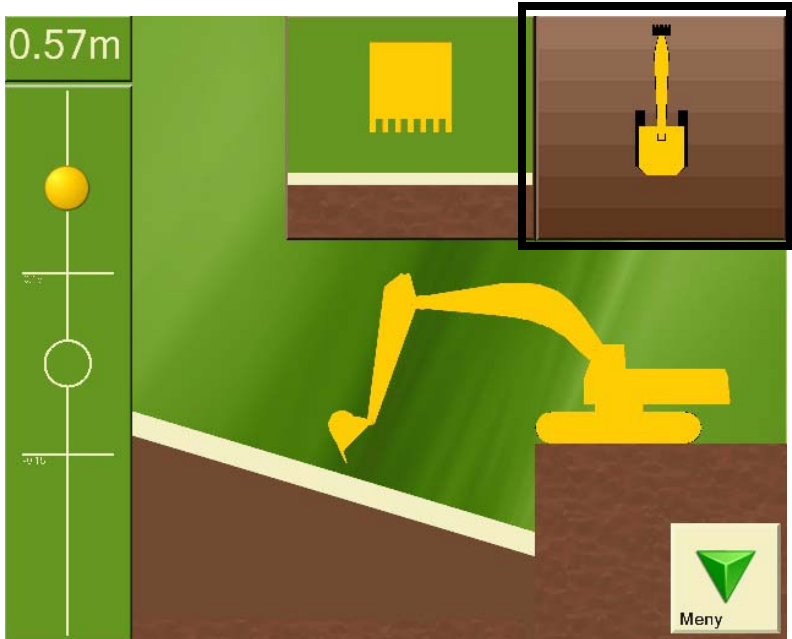


Figure 2-3. Top View

Bucket View

In the top center of the *Digging Window* (Figure 2-4) the bucket is displayed as viewed from the driver's cab with the project below. This window is particularly useful if you have a tilt bucket and tilt sensor. It shows both the tilt angle on the bucket and the gradient/slope of the project perpendicular (90 degrees) to the direction of the boom. The bucket in the window can also change color to show that the tilt angle on the bucket is too small, too large or correct for the project.

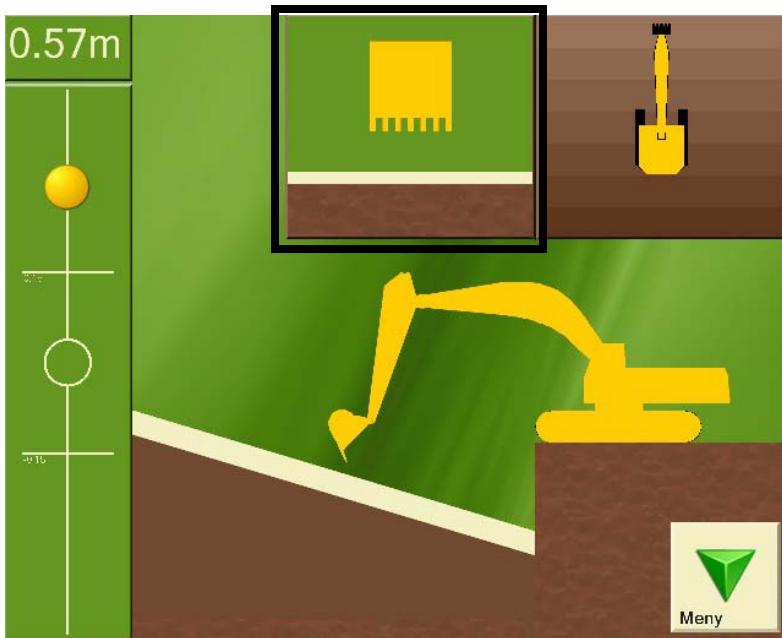


Figure 2-4. Bucket View

Length

You can also bring up the length from a given point to the bucket tip. The length will be shown in yellow text under the bucket height. Length is a separate referencing system which measures the horizontal distance from the length referencing point to the bucket tip. The distance is measured with respect to the circle center on the undercarriage, so that the measured length does not alter as the superstructure swings around.

This can be very useful when laying pipes for example. Press **Graphics** and then choose *Visible elements* to turn on length referencing.

Side View of Machine

Being able to see the excavator from the side during the project is probably the most important function for you as driver, and is therefore the main focus in the *Digging Window*.

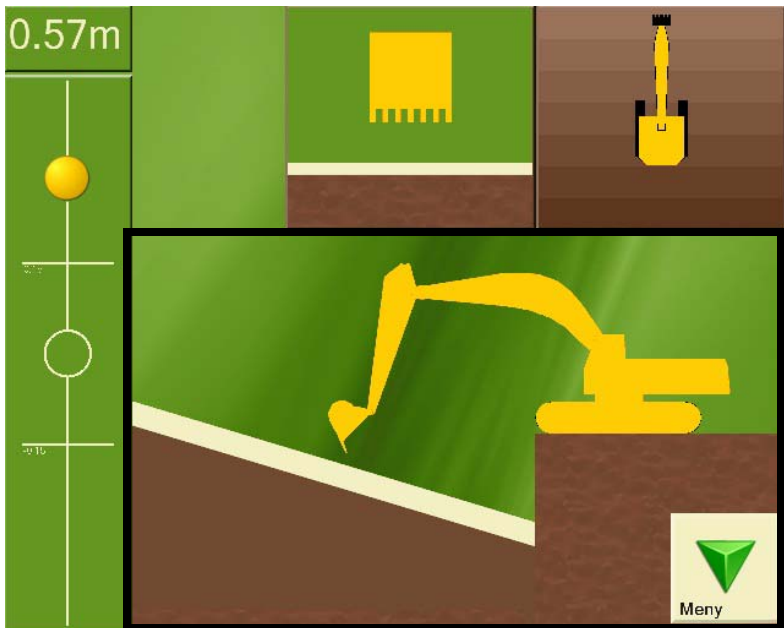


Figure 2-5. Side View

Digging Window Buttons

The menu in the *Digging Window* has a large number of functions that are just a click away.

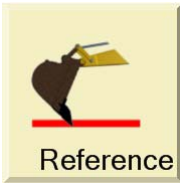
Menu



This button opens and closes the Menu.

Reference

Benchmark



If you have chosen benchmark as your referencing method, the reference button will show the image of a bucket.

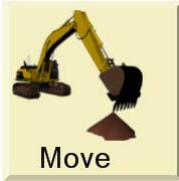
Laser



If you have chosen laser as your referencing method, the reference button will show the image of a laser.

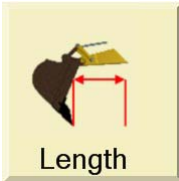
Press the reference button to perform a new reference, and follow the on-screen instructions.

Swap Point



Press this button (**Move**) to use the swap point function and follow the on-screen instructions.

Length Referencing



Place the bucket tip on the reference point and press this button to start measuring the horizontal distance from the reference point to the bucket tip.

This button only appears on the Menu when length referencing is turned on. Press **Graphics** and then choose *Visible elements* to turn on length referencing.

Measure



Place the bucket tip on the reference point and press this button to start measuring length, height, distance and gradient/slope from the reference point. Press the button once more to return to the project you are working on.

Verify



Pressing this button gives you access to a procedure which lets you verify whether X-22 is measuring accurately or not.

If it is not doing so, you can also press **Verify**, and select *Troubleshooting* to identify and correct any errors.

Work/Project



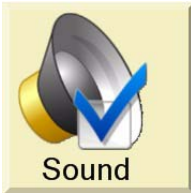
Press this button to view and alter settings on the project you are working on. If you wish to start a new project, this can also be done here.

Graphical Settings



By pressing this button you can change what is displayed in the *Digging Window* and how it is displayed.

Sound Settings



Press this button to change when X-22 will give a sound signal during digging. The settings for the height alarm are also located here.



The sound integrated in X-22 is very quiet. External beeper with a loud sound can be purchased from your dealer.

Types of Work/Projects

X-22 allows you to select the following types of work:

- Flat plane
- Single slope
- Dual slope
- Trench
- Profile
- Channel
- Embankment
- Bucket-defined slope

The type of work is also called a project. The following sections contain a description of the different projects and what settings need to be entered.

Flat Plane



Figure 2-6. Flat Plane Surface

A flat plane is a horizontal surface without gradient in any direction. This means you only need to set two things in X-22:

- The referencing method
- The reference height (vertical distance from reference point to digging depth)



In flat-plane digging the *Digging Window* does not show the machine from above. On a flat plane the vertical distance from the bucket tip to the digging depth is the same whatever direction the superstructure is facing.

Single Slope



Figure 2-7. Single Slope Surface

A single slope is a surface with a gradient in one defined direction. In X-22 you must set the following to work on single slopes:

- The referencing method
- The reference height (vertical distance from reference point to digging depth)
- The gradient/slope
- Direction of gradient/slope (if compass is turned on)

Dual Slope



Figure 2-8. Dual Slope Surface

A dual slope is a surface with a gradient both lengthways and sideways. In X-22 you must set the following to work on dual slopes:

- The referencing method
- The reference height (vertical distance from reference point to digging depth)
- Gradient/slope in lengthways direction
- Gradient/slope to the side
- Direction of gradient/slope in lengthways direction (if compass is turned on)



If you enter the sideways gradient as zero, the project will be the same as a single slope.

Trench



Figure 2-9. Trench

A trench is a single slope of limited width. The limitation lies in the width of the trench base and the walls sloping up from the base. A trench has the following settings:

- The referencing method
- The reference height (vertical distance from reference point to trench bottom)
- Gradient/slope in lengthways direction
- Width of trench
- Gradient/slope of trench walls
- Direction of gradient/slope in lengthways direction (if compass is turned on)

Profile



Figure 2-10. Profile

A profile consists of two horizontal surfaces of different height with a single slope between them. In X-22 you must set the following to work on a profile:

- The referencing method
- The reference height (vertical distance from reference point to digging depth)
- Gradient/slope in lengthways direction
- Height from starting point to base of profile
- Direction of gradient/slope in lengthways direction (if compass is turned on)

Channel



Figure 2-11. Channel Surface

A channel consists of three horizontal surfaces with single slopes between them as shown on the illustration opposite, and has the same gradient on both sides of the channel base. With a channel the following settings must be entered:

- The referencing method
- The reference height (vertical distance from reference point to digging depth)
- Gradient/slope in lengthways direction
- Length of channel base
- Height from starting point to base of channel
- Direction of gradient/slope in lengthways direction (if compass is turned on)

Embankment

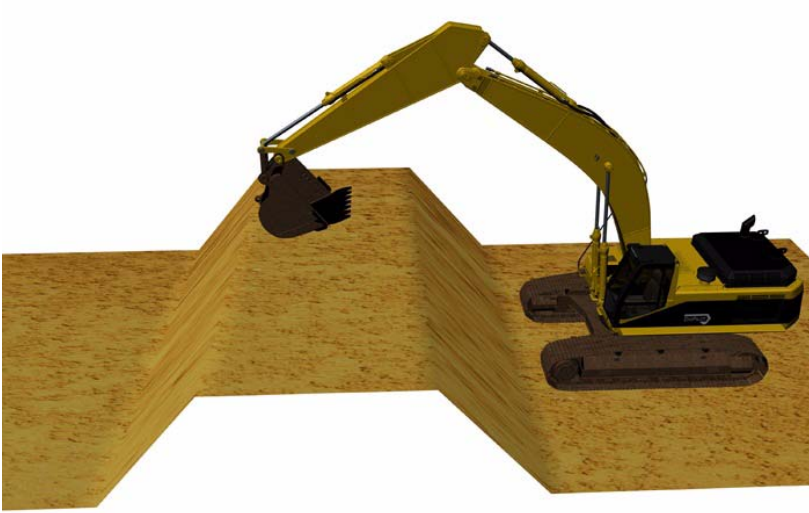


Figure 2-12. Embankment Surface

An embankment consists of three horizontal surfaces with single slopes between them as shown on the illustration opposite, and has the same gradient on both sides of the embankment top. With an embankment the following settings must be entered:

- The referencing method
- The reference height (vertical distance from reference point to digging depth)
- Gradient/slope in lengthways direction
- Length of top of embankment
- Height from starting point to top of embankment
- Direction of gradient/slope in lengthways direction (if compass is turned on)

Bucket-defined



Figure 2-13. Bucket-defined Single Slope Surface

Bucket-defined is used to indicate a single slope using the bucket tip. This can be useful, for instance when forming a single slope up to the foundations of a garage.

By referencing the bucket tip to two different points, X-22 will calculate the gradient, direction of gradient and digging depth and store these settings in the same way as for a single slope.



Do not rotate the superstructure until you have referenced both points.

X-22 Setup

The following chapter describes how to setup the X-22 software.

Work/Project Settings

Many of the settings entered are the same for the different projects. Selecting a new project in X-22 guides you through the setup procedure for these settings using images and text.

This chapter also gives a detailed description of the most important project settings.

Reference Height

The reference height is the vertical distance from the reference to the digging depth. If you use a rotating laser for referencing, the laser plane will be the reference and if you use the bucket tip for referencing, the benchmark you place the bucket tip on will be the reference.



Notice that the reference height will be positive if the digging height lies below the reference. A reference height of 1.0 m (3.28 ft.) will thus result in a digging depth of 1.0 m (3.28 ft.) below the reference.

You can use the reference height actively when working on a project. Say you have set the reference height to 1.0 m and have finished levelling out a site foundation. If your next task is to lay 10 centimeters of crushed stones on the foundation base, you can change

the reference height to 0.9 m and use X-22 to check that the layer of crushed stones has the correct height/thickness.

If you have been given the heights as elevations and have benchmarks at a particular elevation, you can use X-22's integral calculator to work out the reference height.

Gradient/Slope in Lengthways Direction

This is the gradient in the direction of the boom when *Direction of slope* is entered.

Gradient/Slope to the Side

This applies only to *Dual slope* and is the gradient perpendicular (90 degrees) to the lengthways direction. For all other projects, the gradient/slope to the side is zero.

Direction of Slope

This is the lengthways direction of the slope and is indicated by pointing the boom in the lengthways direction of the slope. When you press OK on the screen, X-22 stores this direction using the compass.

Referencing

X-22 always knows where the bucket tip is in relation to the rotation center of the undercarriage, but in order to know where the rotation center and thus the bucket tip is in relation to the project, X-22 must be referenced. This is done with a benchmark or a rotating laser.



If the excavator is standing in loose material, the machine may creep. X-22 will not notice this and you should therefore re-reference if the machine is creeping a great deal.

Once you have created a new project you are automatically invited to reference when you go into the *Digging Window*. To perform a new reference, press **Reference** in the *Digging Window* menu.

Referencing with Benchmark

A benchmark is a point with a known height in relation to the digging depth of your current project.



If you have chosen *Profile*, *Channel* or *Embankment*, the benchmark must also have a known position in relation to the project. See the screen images for the current project for further details.

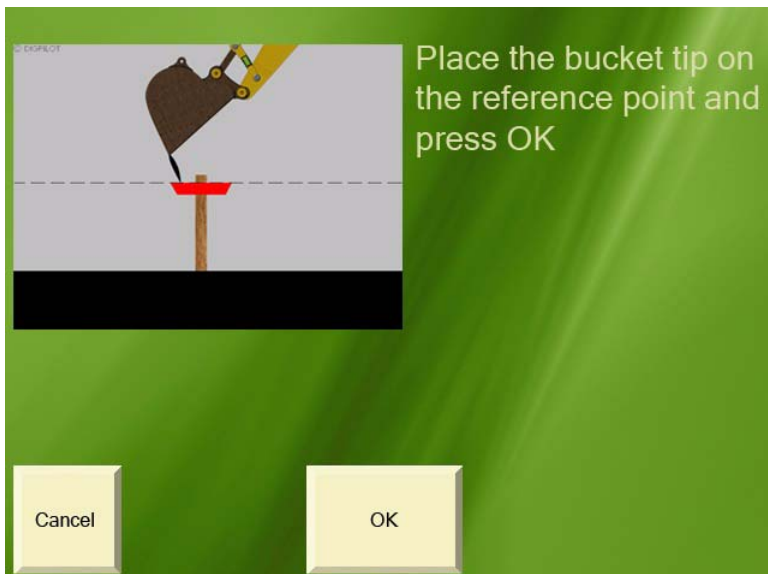


Figure 3-1. Benchmark Reference

Place the bucket tip on the benchmark, and press **OK**.

Referencing with Laser

X-22 can also be referenced by detecting the laser ray from a rotating laser with the laser receiver on the arm sensor.



The laser must be set with exactly the same gradient/slope and direction as entered for the project in X-22.

During referencing, the screen will show where the laser ray has hit the laser receiver.

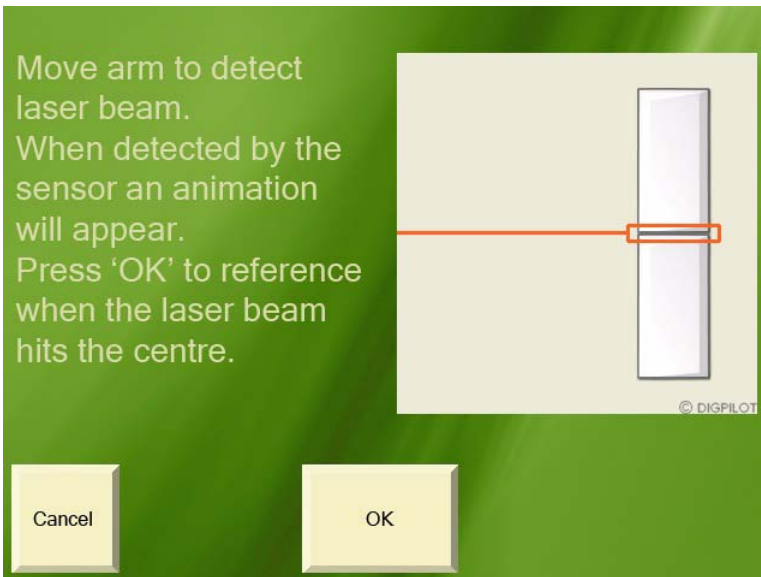


Figure 3-2. Laser Reference

Press **OK** when the laser ray touches the center point.



The advantage of a rotating laser is that it can cover large areas with very high accuracy. You avoid having to use many benchmarks and avoid the risk of losing accuracy when moving the excavator. Contact your dealer for offers of X-22 quality lasers.

To find the laser plane as quickly as possible, you can first move the arm relatively quickly through the area you expect to find the laser ray in, while simultaneously watching the screen for a hit. When the laser ray hits its target, go back to the correct height and adjust until the laser ray touches the center.

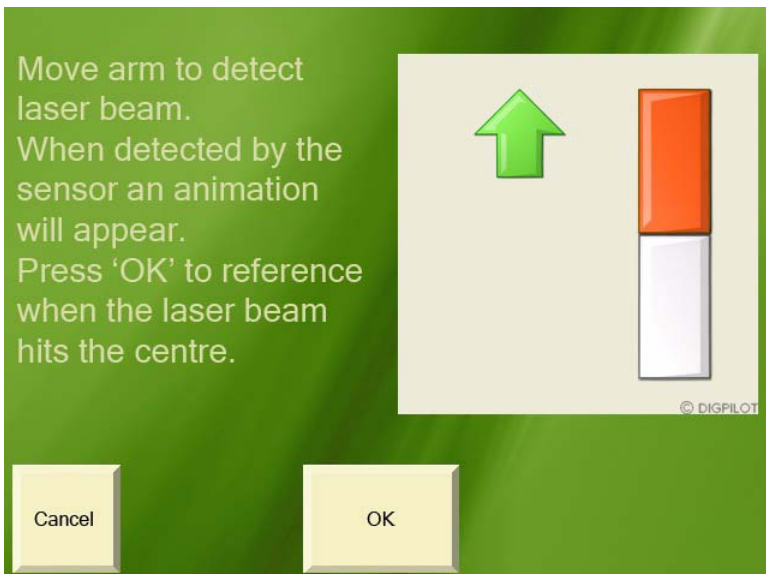


Figure 3-3. Laser Reference

Digging Slopes

All projects except *Flat plane* include surfaces with a slope.

The gradient/slope is entered in X-22 as a percentage (%), unless *Bucket-defined* project is selected. If the gradient/slope has been specified as a ratio (e.g. 1:8) or in degrees (e.g. 12.5) you can use X-22's integral calculator to translate these values into percentages.

Enter the direction of the slope by pointing the boom in the lengthways direction of the slope.



A slope has the gradient you entered, in the lengthways direction entered. Using its compass, X-22 constantly calculates the gradient in the boom direction as the superstructure swings around. This applies to all projects with a slope.

This is illustrated by a single slope in Figure 3-4 on page 3-7. In this image, the superstructure is in line with a single slope of 30% gradient.

In Figure 3-5 on page 3-7, the superstructure has rotated through 90 degrees. As can be seen from the images, the gradient/slope in the boom direction displayed under the machine changes from 30% to 0% (zero).

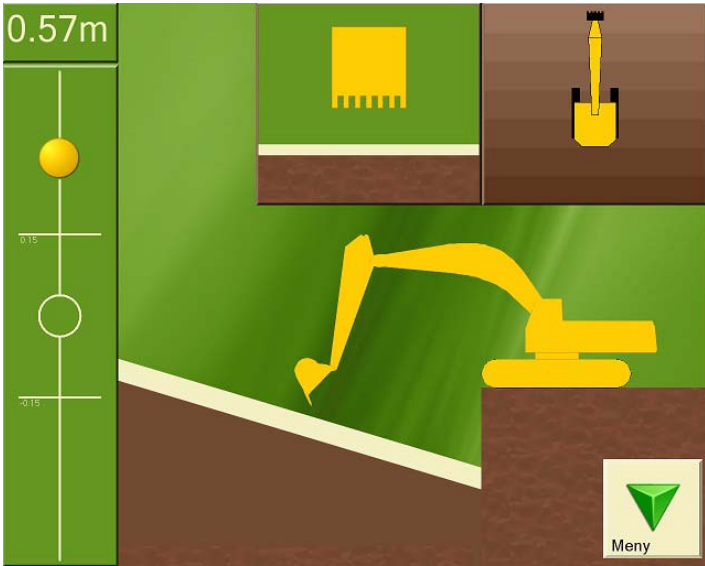


Figure 3-4. Example of 30% Single Slope in Digging Window

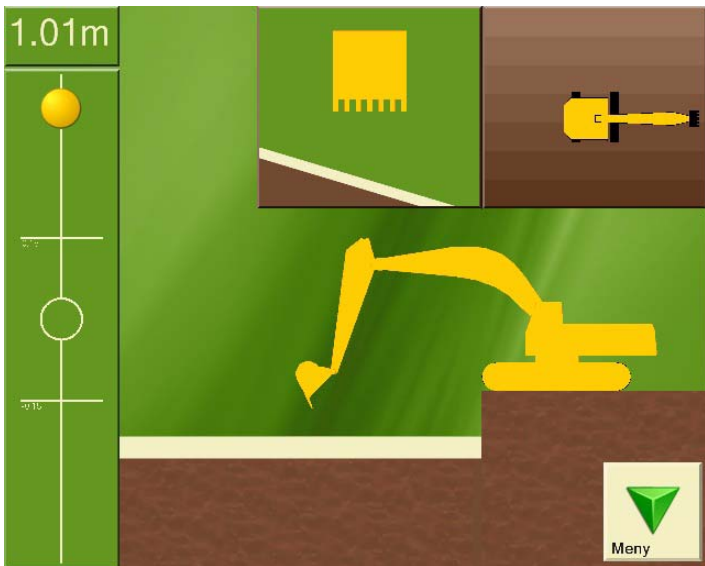


Figure 3-5. Example of 0% Single Slope in Digging Window

Moving the Undercarriage

When you have referenced and finished digging at the point where the undercarriage is standing and need to move to a new location, you will need to inform X-22. The following describes three ways you can do this.

Option 1: New Reference

After moving the undercarriage to a new position you can re-reference to a benchmark or laser plane.

Option 2: Retain the Same Height

If you have been digging down to the desired depth, you can continue referencing this digging depth instead of the benchmark or laser plane you started with. You can do this by altering the reference height in the project to zero, selecting benchmark as the referencing method and then referencing the bucket tip on the excavated area after moving the machine.

Option 3: Swap Point Function

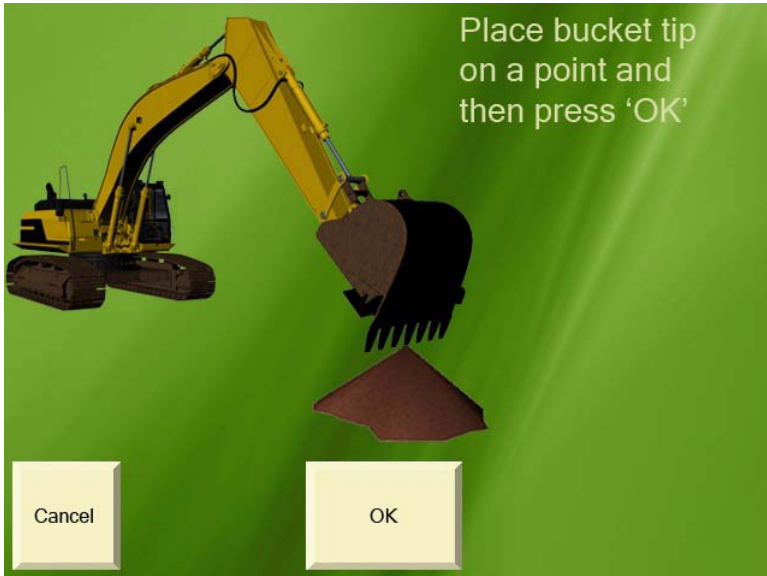


Figure 3-6. Swap Point Function

The swap point function is available for projects *Flat plane*, *Single slope* and *Dual slope*. Before you move the undercarriage, place the bucket tip on a point which can also be reached from the place you will be moving the undercarriage to. Press “OK” on the screen. Move the undercarriage and position the bucket tip on the same point. Press “OK” on the screen again.

Graphical Settings

By pressing **Graphics** you access a menu on which you can choose the appearance of the *Digging Window* in order to adapt it optimally to you and your needs at any time.

Measurement Point of Bucket

Here you can choose whether to use the middle of the bucket tip, or the left or right bucket tip as reference point.



The bucket measurement point is used everywhere in X-22 where you are asked to use the bucket tip.

Visible Elements

Here you can select which elements are to be shown in the *Digging Window*.

Brightness of Digging Window

X-22 has a so-called transreflective screen to give you the best possible picture when sunlight is directly on the screen. If it is dark outside and you find the light from the screen too bright, you can dim it here. Note that it takes approx. 10 seconds to open the *Digging Window* while the screen is being dimmed.

Angular Difference for Bucket Warning

You can use this function if you have a tilting bucket and tilting sensor. In the window showing the bucket from the driver's cab, the color of the bucket will change to show that the sideways angle of the bucket blade is too large, too small or correct for the project. Here you can enter how large an angular difference you will accept before the bucket changes colour.

Working Area

The size of the working area determines when the target ball will start to move and when the “*Color warning*” will be given. By increasing the size of the working area you make the target ball less sensitive.



If X-22 is correctly installed, it will measure to an accuracy of one centimeter on a normal excavator. The size of the working area will not affect measurement accuracy.

Focus

Here you can choose whether you want the excavator undercarriage to be stationary while you work or if you want the bucket to remain stationary while the rest of the excavator and the project move around.

Color Warning

Here you can select whether X-22 will give you a color warning when the measurement point on the bucket tip is above or below the indicated working area. You can choose between a color change on the background to the screen, to the whole excavator or just the bucket.

Size of Excavator

Here you can select how much space the excavator will take up on the screen by increasing or reducing its size.

Position of Excavator

Here you can move the excavator around the screen.

Appearance of Excavator

Here you can select how the excavator will look from the side. Change the appearance to a small machine if you have a small excavator with the boom fixed in front of the driver's cab.

Sound Settings

Sound signals can be a useful aid in addition to the screen display. Here you can decide whether you want a sound signal when the measurement point on the bucket tip is in or under the working area. The height alarm also has a sound signal.

Height Alarm

The height alarm will warn you if the top of the arm or bucket is over a certain height above the underside of the tracks. To turn the height alarm on, you need to enter two extra excavator dimensions and indicate the alarm height.



Note that the height alarm is indicated in relation to the underside of the excavator tracks and not in relation to the project.

Using the Compass

In order to make full use of X-22 when excavating sloping projects, it is essential that the compass gives an accurate measurement. It is therefore important that the compass is well calibrated.



Note that the compass is at its most accurate when the undercarriage is horizontal.

However, sometimes the compass may not give an accurate reading even when the undercarriage is level. The greater the gradient/slope in the project, the greater the error in bucket height will be if the compass is measuring incorrectly.

When excavating across large slopes you should therefore consider turning off the compass and keeping track of the direction yourself. You can turn off the compass by selecting **Main menu ▶ Setup ▶ Hardware ▶ Sensors** and marking the PitchRollCompass sensor. Select *Details*. Then select *Compass on* and press **Change**.

Speed of Sensors

Excavators may vibrate a great deal or very little, depending on rpm, size, age, make etc. and this will affect the sensors' angular measurements. X-22 has been designed to ensure the sensors give the optimum in stable, quick and accurate angular measurements in all types of excavators.

It is therefore possible to alter the sensitivity and damping of the sensors for the best possible match with your excavator. At the factory the sensors are set with the aim of being stable when the excavator is stationary, but reacting immediately when the machine moves.

To make changes to this, select **Main Menu ▶ Setup ▶ Hardware ▶ Sensors**, and press **Sensitivity**.

Sensitivity

Sensitivity indicates how strong the vibrations in the excavator must be before X-22 interprets this as a movement of the machine.

By increasing the sensitivity, smaller vibrations in the machine may be interpreted as a movement of the machine.

Reducing the sensitivity means that it will take larger vibrations to be interpreted as a movement of the machine.

Damping

Damping indicates how much the angular measurements will be filtered when the excavator is stationary. Filtering makes the angular measurements stable and accurate despite vibrations.

By increasing the damping, X-22 will react more slowly to small and limited movements in the machine.

By reducing the damping, X-22 will react more quickly to small and limited movements in the machine.

Damping is set high at the factory and can thus be probably adjusted downwards.

Troubleshooting

In this section you will find answers to the following questions:

The X-22 Display is not responding, what should I do?..... page 4-1

The sensors are not responding, what should I do?.....page 4-1

A sensor is damaged, what should I do?.....page 4-1

How do I recalibrate a sensor?.....page 4-1

The system is not measuring accurately, what should I do?....page 4-2

The compass is measuring incorrectly, what should I do?.....page 4-2

The laser sensor is not working, what should I do?.....page 4-2

The X-22 Display is not responding, what should I do?

Most X-22 problems can be solved by turning the X-22 Display off and on.

The sensors are not responding, what should I do?

If you are having problems making contact with the sensors, proceed as follows: Turn the X-22 Display off and put all the sensors in the charger for a few minutes. The sensors will then be reset while they are being charged. Take all the sensors out of the charger and turn the X-22 Display back on.

A sensor is damaged, what should I do?

You can obtain a new sensor by contacting your dealer. Delete the damaged sensor from the X-22 Display before entering the new one.

How do I recalibrate a sensor?

If you have already calibrated the sensors and want to recalibrate one, proceed as follows: Select **Main menu ▶ Setup ▶ Hardware ▶ Sensors** and highlight the sensor you want to calibrate. Select **Details**. Then select *Calibrated* and press **Change**.

The system is not measuring accurately, what should I do?

If the system is not measuring accurately, a dimension or calibration value is probably wrong. Select **Verify**



from the menu in the

Digging Window, and press **Troubleshooting**. X-22 will then help you identify the problem and rectify it. Follow the on-screen instructions.

The compass is measuring incorrectly, what should I do?

The compass in the PitchRollCompass sensor is magnetic and has to be calibrated in order to measure correctly.

Therefore try recalibrating the compass to see if this helps. Select **Main Menu ▶ Setup ▶ Hardware ▶ Sensors ▶ PitchRollCompass ▶ Details**. Then select *Calibrated*, and press **Change**.

If you want to check how well the compass is calibrated, you can select **Main Menu ▶ Setup ▶ Hardware ▶ Sensors ▶ PitchRollCompass ▶ Verify**. When the machine is stationary and the superstructure is rotated, the compass measurements should ideally form a perfect circle with the center at the origin.

In certain special circumstances the magnetic compass can be disrupted so much that it should not be used. In this situation the heading on the screen can change even if the machine is at a complete standstill.

If this happens, the compass should be turned off. Select **Main menu ▶ Setup ▶ Hardware ▶ Sensors** and highlight the PitchRollCompass sensor. Select “*Details*”. Then select “*Compass*”

on” and press “*Change*”. All the software functions that use the heading measurements from the compass will now disappear and you will have to keep track of the heading yourself.

In situations where there are large fluctuations in the magnetic field around the machine all the time, the compass calibration will not be able to compensate for the disturbances. An example of such a situation is if the machine is close to a railway line that is in use: Trains are surrounded by a strong magnetic field, which will badly disrupt the compass measurements whenever a train goes past. In this case the heading displayed on the screen could change even if the machine is at a complete standstill.

Working in the vicinity of high-voltage cables can also cause problems for the magnetic compass.

The laser sensor is not working, what should I do?

The laser sensor may have problems detecting the laser beam in strong sunlight, particularly if the sun is shining straight into the photoelectric cell. If this happens, the amount of sunlight hitting the cell will have to be reduced by turning the sensor away from the sun, for example.

If the laser sensor is exposed to strobe lighting, a rotating flashing light or the like, the sensor may be misled into thinking that it has detected the laser.

If the laser sensor does not respond to the laser beam at all, even at close range, the photoelectric cell has probably been damaged. In this case you will have to contact your dealer to have the sensor replaced.

Specifications

X-22 Sensor

The following section provides specifications for the X-22 Sensor.

Table A-1. X-22 Sensor General Specifications

General Details	
Enclosure	Xenoy CL 100 Polycarbonate Resistant to hydraulic fluids, diesel and UV exposure IP67
Color	Topcon Yellow
Dimensions	W: 112 mm x H: 48 mm x D: 68 mm W: 4.4 in. x H: 1.89 in. x D: 2.68 in.
Weight	230g (standard sensor) 0.5 lbs.
Battery	Operating time: Up to four weeks with normal use Material: Lithium-ion polymer Nominal capacity: 5600mAh Charging time: Overnight Expected battery life: Beyond 3 years
Operating temperature	-20°C to +60°C -4°F to +140°F
Charging temperature	+5°C to +35°C -41°F to +95°F
Storage temperature	-20°C to +35°C -4°F to +95°F
Radio	Range: Over 50m (164 ft) line-of-sight Frequency: 2.4 GHz license-free ISM-band Proprietary packet radio protocol

Table A-1. X-22 Sensor General Specifications (Continued)

Connectors	2 charging pins (6V DC input, no polarity)
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X-22 Display

The following section provides specifications for the X-22 Fanless 8.9" WSVGA TFT Multifunctional Touch Panel PC.

Table A-2. X-22 Sensor General Specifications

Display Screen	
LCD Size	8.9"
Display Type	WSVGA TFT
Resolution	1024 x 600
Color	256K
Pixel Pitch	0.1905mm (H) x 0.189mm (V)
Luminance	220cd/m ²
Contrast Ratio	500
Viewing Angle	50 (U), 60 (D), 70 (L), 70 (R)
Response Time	30ms
Backlight	LED
Touch Screen	5-Wire Resistive
Light transmission	80%
Touch Interface	USB Onboard Touch Interface
System	
CPU	Onboard AMD Geode LX800 @ 0.9W 500MHz with 128K L2 Cache CPU
Cooling Method	Passive CPU Heatsink
System Chipset	AMD Geode LX800/ CS5536

Table A-2. X-22 Sensor General Specifications (Continued)

System Memory	Onboard 512MB DDR Memory
SSD	One CF Socket by IDE Secondary Slave Channel Supports Type I/II Compact Flash Card
Rear Panel I/O	
Serial Port	1 x RS-232, 1 x RS-232 or Optional RS-422/ 485
Ethernet	2 x RJ-45 (Realtek RTL8101L LAN)
WIFI	Optional USB WiFi 802.11 b/g (Occupies One USB Port)
VGA	1 x DB-15
Audio	Line-out, Mic-in
USB	2 x USB 2.0
Mouse & K/B	1 x PS/2 Keyboard Connector
Environment & Mechanical	
Color	Front Panel Black; Rear Panel Black
Mounting	Wall/ Stand/ VESA 75mm x 75mm
Power Input	100 ~ 250Vdc/ 47 ~ 63Hz
Power Output	+12Vdc/ 5A (60W)
Operating Temperature	-10°C ~ 60°C 14°F to +140°F
Storage Temperature	-20°C ~ 70°C -4°F to +158°F
Relative Humidity	10% to 95% @ 40°C, Non-condensing
Dimension	W: 225mm x H: 139mm x D: 38.9mm W: 8.86 in. x H: 5.47 in. x D: 1.53 in.
Weight	1.26Kgs (2.78 lbs.)

Safety Warnings

General Warnings

1. Read and become familiar with the machine manufacturer's operating instructions, including safety information, before installing or using your Topcon equipment.
2. Use extreme caution on the jobsite. Working around heavy construction equipment can be dangerous.
3. DO NOT attach system brackets while the machine is running.
4. DO NOT allow any X-22 system component to limit the visibility of the operator.
5. Use Ty-wraps, to keep hoses and wires secured and away from possible wear or pinch points.
6. Use eye protection whenever welding, cutting, or grinding is being done on the machine.
7. Protect yourself at all times, and wear protective clothing, when working on or near hydraulic lines. Avoid direct exposure to your eyes when using laser control.



DO NOT stare into the laser beam or view the beam directly with optical equipment.

-
8. Use appropriate welding precautions and practices when welding. After welding, all paint all affected areas with a rust inhibitor.



DO NOT weld near hydraulic lines or on any equipment when in operation.



Disconnect all Topcon system electrical cables prior to welding on the machine.



All mounting bracket welds must be secure and strong to prevent sensor equipment from vibrating excessively or from becoming detached at the weld during operation.

-
9. To prevent vandalism or theft, do not leave removable Topcon components on the machine at night. Remove the components each evening and store appropriately in the carrying case.
 10. Keep the carrying case dry at all times.



DO NOT allow moisture to get inside the case. Moisture trapped in the case can adversely affect components.

If moisture does enter the carrying case, leave it open and allow it to thoroughly dry before storing any components.

Sensor Warnings



Never attempt to open the X-22 sensors! Lithium-Ion batteries can be dangerous if mishandled!



Do not incinerate or heat battery pack above 212 degrees fahrenheit (100 degrees celsius). Excessive heat can cause serious damage and possible explosion.



Tampering with the batteries by end users or non-factory authorized technicians will void the battery's warranty.

- Do not attempt to open the sensors.
 - Do not disassemble the sensor.
 - Do not charge in conditions different than specified.
 - Do not use other than the specified battery charger.
 - Do not short circuit.
 - Do not crush or modify.
-

Usage Warnings



If this product has been dropped, altered, transported or shipped without proper packaging, or otherwise treated without care, erroneous measurements may occur.

The owner should periodically test this product to ensure it provides accurate measurements.

Inform Topcon immediately if this product does not function properly.



Only allow authorized Topcon warranty service centers to service or repair this product.

Regulatory Information

The following sections provide information on this product's compliance with government regulations for use.

FCC Compliance

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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

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

- Reorient or relocate the receiving antenna.
- Move the equipment away from the receiver.
- Plug the equipment into an outlet on a circuit different from that to which the receiver is powered.
- Consult the dealer or an experienced radio/television technician for additional suggestions.



Any changes or modifications to the equipment not expressly approved by the party responsible for compliance could void your authority to operate such equipment.

FCC Compliance

This equipment complies with FCC radiation exposure limits set forth for uncontrolled equipment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated with at least 20cm and more between the radiator and person's body (excluding extremities: hands, wrists, feet and ankles). This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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

If this equipment does cause interference to radio or television equipment 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.
- Move the equipment away from the receiver.

- Plug the equipment into an outlet on a circuit different from that to which the receiver is powered.
- Consult the dealer or an experienced radio/television technician for additional suggestions.



Any changes or modifications to the equipment not expressly approved by the party responsible for compliance could void your authority to operate such equipment.

Federal Communication Commission Declaration of Conformity (DoC) Statement



Model No: HiPer II

Trade Name	Topcon
Responsible Party	Topcon Positioning Systems, Inc.
Address	7400 National Drive, Livermore, CA 94550
Telephone No	+925-245-8300

Canadian Emission Labeling Requirements

This equipment complies with IC radiation exposure limits set forth for uncontrolled equipment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated with at least 20cm and more between the radiator and person's body (excluding extremities: hands, wrists, feet and ankles).

1. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
2. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.
3. This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte conform a la norme NMB-003 du Canada.

IC RF Radiation Exposure Statement

This installer of this device must ensure that the antenna is located or pointed such that it dose not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website at www.hc-sc.gc.ca/rpb.

Community of Europe Compliance

The product described in this manual is in compliance with the R&TTE and EMC directives from the European Community.

European Community Declaration of Conformity with R&TTE Directive 1999/5/EC

The following standards were applied: (R&TTE Directive 1999/5/EEC)

- EN 301 489-1 V1.8.1 (2008-04)
- EN 301 489-17 V1.3.2 (2008-04)
- EN 300 328 V1.7.1 (2006-10)
- EN 60950-1:2001 + A11:2004

The following CE mark is affixed to the device:



Declaration of Conformity with Regard to the R&TTE Directive 1999/5/EC

<p>cs Český [Czech]</p>	<p>(Topcon) tímto prohlašuje, že tento (HiPer II) je ve shod se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.</p>
<p>da Dansk [Danish]</p>	<p>Undertegnede (Topcon) erklærer herved, at følgende udstyr (HiPer II) overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.</p>
<p>de Deutsch [German]</p>	<p>Hiermit erkläre (Topcon) dass sich das Gerät (HiPer II) in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.</p>
<p>et Eesti [Estonian]</p>	<p>Käesolevaga kinnitab (Topcon) seadme (HiPer II) vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.</p>
<p>en English</p>	<p>Hereby, (Topcon) declares that this (HiPer II) is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.</p>
<p>es Español [Spanish]</p>	<p>Por medio de la presente (Topcon) declara que el (HiPer II) cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.</p>
<p>el [Greek]</p>	<p>ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ (Topcon Positioning Systems, Inc.) ΔΗΛΩΝΕΙ ΟΤΙ (GRX1) ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.</p>
<p>fr Français [French]</p>	<p>Par la présente (Topcon) déclare que l'appareil (HiPer II) est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.</p>

<p>it Italiano [Italian]</p>	<p>Con la presente (<i>Topcon</i>) dichiara che questo (<i>HiPer II</i>) è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.</p>
<p>la Latviski [Latvian]</p>	<p>Ar šo (<i>Topcon</i>) deklar, ka (<i>HiPer II</i>) atbilst Direktvas 1999/5/EK btiskajm prasbm un citiem ar to saisttajiem noteikumiem.</p>
<p>li Lietuvi [Lithuanian]</p>	<p>Šiuo (<i>Topcon</i>) deklaruuoja, kad šis (<i>HiPer II</i>) atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.</p>
<p>nl Nederlan ds [Dutch]</p>	<p>Hierbij verklaart (<i>Topcon</i>) dat het toestel (<i>HiPer II</i>) in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.</p>
<p>mt Malti [Maltese]</p>	<p>Hawnhekk, (<i>Topcon</i>) , jiddikjara li dan (<i>HiPer II</i>) jikkonforma mal-tijiet essenzjali u ma provvedimenti orajn relevanti li hemm fid-Dirrettiva 1999/5/EC.</p>
<p>hu Magyar [Hungarian]</p>	<p>Alulírott, (<i>Topcon</i>) nyilatkozom, hogy a (<i>HiPer II</i>) megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak.</p>
<p>pl Polski [Polish]</p>	<p>Niniejszym, (<i>Topcon</i>) , deklaruje, e (<i>HiPer II</i>) spenia wymagania zasadnicze oraz stosowne postanowienia zawarte Dyrektywie 1999/5/EC.</p>
<p>pt Português s [Portugues]</p>	<p>(<i>Topcon</i>) declara que este (<i>HiPer II</i>) está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.</p>
<p>sl Slovensk o [Slovenian]</p>	<p>(<i>Topcon</i>) izjavlja, da je ta (<i>HiPer II</i>) v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.</p>
<p>da Slovensy [Slovak]</p>	<p>(<i>Topcon</i>) týmto vyhlasuje, že (<i>HiPer II</i>) spa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.</p>

fi Suomi [Finnish]	<i>(Topcon)</i> vakuuttaa täten että <i>(HiPer II)</i> tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
sv Svenska [Swedish]	Härmed intygar <i>(Topcon)</i> att denna <i>(HiPer II)</i> står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

WEEE Directive

Following information is for EU-member states only:

The use of the symbol below indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, to help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about the take-back and recycling of this product, please contact a supplier where you purchased the product or consult.



Warranty Terms

TPS laser and electronic positioning equipment are guaranteed against defective material and workmanship under normal use and application consistent with this Manual. The equipment is guaranteed for the period indicated, on the warranty card accompanying the product, starting from the date that the product is sold to the original purchaser by TPS' Authorized Dealers.¹

During the warranty period, TPS will, at its option, repair or replace this product at no additional charge. Repair parts and replacement products will be furnished on an exchange basis and will be either reconditioned or new. This limited warranty does not include service to repair damage to the product resulting from an accident, disaster, misuses, abuse or modification of the product.

Warranty service may be obtained from an authorized TPS warranty service dealer. If this product is delivered by mail, purchaser agrees to insure the product or assume the risk of loss or damage in transit, to prepay shipping charges to the warranty service location and to use the original shipping container or equivalent. A letter should accompany the package furnishing a description of the problem and/or defect.

The purchaser's sole remedy shall be replacement as provided above. In no event shall TPS be liable for any damages or other claim including any claim for lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, the product.

1. The warranty against defects in a Topcon battery, charger, or cable is 90 days.



Topcon Positioning Systems, Inc.

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800-443-4567 www.topconpositioning.com



ISO 9001:2000
FM 68448

X-22 User's Manual

P/N: 7010-1020 Rev A 06/11

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