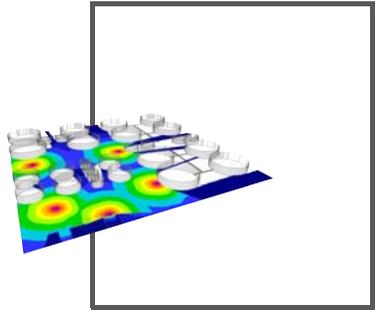


MANUAL

Wireless Network Checker WiNC



WirelessHART

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1 Introduction

1.1 Product Description

The **Wireless Network Checker** (WiNC) is a radio network planning suite. It enables you to create 3-D models of plants and to calculate the wave propagation and connectivity of *WirelessHART* networks based on these 3-D models.

The connectivity suite consists of the following components:

- **WiNCMod** enables you to create and edit 3-D models of almost any plant or building. Depending on your application, you can freely adjust the level of detail of the 3-D models from basic overviews to highly complex structures.
- **WiNCsim** enables you to simulate the wave propagation and connectivity between the individual network nodes. You can import the 3-D models from WiNCMod and simulate different network topologies by placing the *WirelessHART* devices directly into the 3-D model.

2 Installation

2.1 System Requirements

Your personal computer must meet the following requirements in order to run WiNC:

- Operating system: Windows 98 or newer
- Processor: 1 GHz or faster
- Memory: 512 MB or more
- Disk space: 500 MB or more
- Software: DirectX 9 or newer
- Administrator privileges to enable software installation

2.2 Software Installation

This section describes how to install WiNC and the USB license key, which is required to run the complete software without limitations. Note that you must plug the USB license key into your personal computer **before** you start WiNCMod or

WiNCSim. If the USB license key has been recognized, the license key icon  in the taskbar turns green and you can start using WiNCMod or WiNCSim.

If you start WiNCMod or WiNCSim without using a USB license key, the software starts in trial mode with reduced functionality. In trial mode, the size of the 3-D models in WiNCMod is limited and the number of network nodes you can insert into the 3-D model using WiNCSim is limited as well.

Install Components

1. Start the installer by Pepperl+Fuchs.

↳ The **SETUP** window appears.

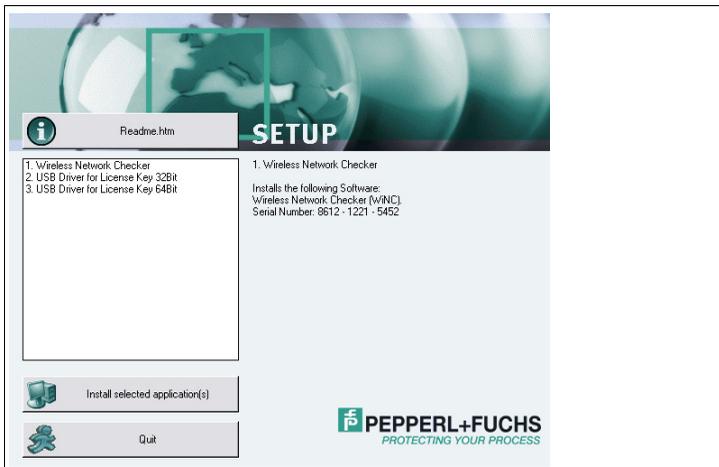


Figure 2.1 Setup window

2. Select **Wireless Network Checker** and select a driver for the USB license key that matches your operating system.
3. Click **Install select application(s)** to continue.
4. In the following popup window, click **Yes** to install WiNC.
5. Click **Next** to continue.
6. If you accept the license agreement, activate the **I accept the terms in the License Agreement** check box and click **Next** to continue.
7. Enter your user name, organization, and the serial number from the **SETUP** screen and choose **Next** to continue.
8. Select a setup type by clicking **Typical**, **Custom**, or **Complete**.
Note that the setup types **Typical** and **Complete** copy all files into the following directory: C:\Program Files\Pepperl-Fuchs\

9. Decide whether you want to create shortcuts and choose **Next** to continue.
10. Choose **Install** to start the installation process.
11. Choose **Finish** to complete the installation process.
↳ WiNC has been installed.
12. In the following popup window, click **Yes** to install the drivers for the USB license key.
13. Choose **Next** to continue.
14. If you accept the license agreement, activate the **I accept the terms in the license agreement** option and choose **Next** to continue.
15. Enter your details in the **User** and **Organization** boxes.
16. Choose **Next** to continue.
17. If required, deselect individual components. We recommend that you use the default settings.
18. Choose **Next** to continue.
19. Choose **Install** to start the installation process.
20. Choose **Finish** to complete the installation process.
↳ The driver for the USB license key is installed.
21. Click **Quit** to close the installer window.
22. Plug the USB license key into your personal computer **before** you start WiNCMod or WiNCsSim.
↳ If the USB license key has been recognized, the license key icon  in the taskbar turns green and you can start using WiNCMod or WiNCsSim.

3 WiNCMod

WiNCMod enables you to create and edit 3-D models of your plants.

3.1 Create New 3-D Model

All elements of a 3-D model are stored in a database. The database contains all objects and properties of the 3-D model.

Create New Database

- 
1. Click  **New Database** or choose **File > New Database**.
↳ The **Select Type of New Database** window opens.
 2. In the **Mode of operation** area, select **Draw manually**.
 3. In the **Material catalogue** area, you can specify an additional material catalog from which you can choose materials for the objects in your 3-D model. See chapter 3.20
 4. Click **OK**.
↳ The **Default Values for New Objects** window opens.
 5. The **Default Values for New Objects** window enables you to define the floors of the working area and the default materials for new walls. Note that you can change these settings later on. To do so, choose **Edit > Default Values**. See chapter 3.2
 6. Click **OK**.
↳ The working area opens.

3.2 Set Default Values for New Objects

The default settings define the material properties and height for new objects.

Set Default Values

1. Choose **Edit > Default Values**.

↳ The **Default Values for New Objects** window appears.

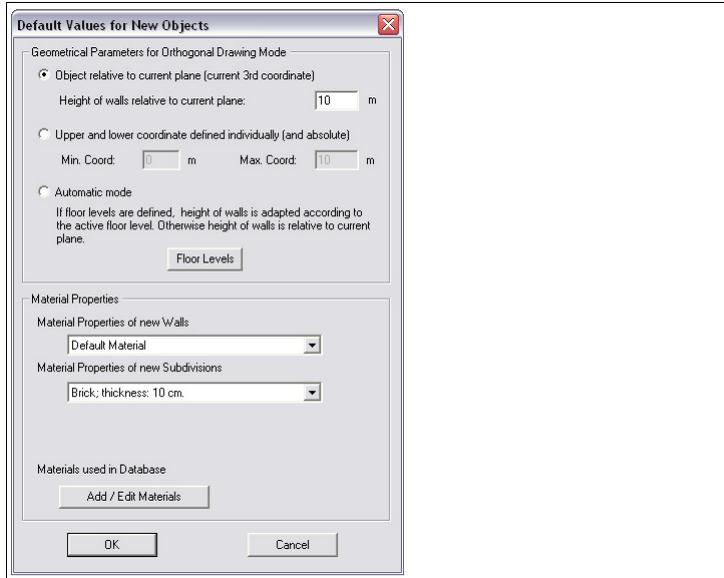


Figure 3.1 **Default Values for New Objects** window

2. Select a drawing mode in the **Geometrical Parameters for Orthogonal Drawing Mode** area.
3. Select the material properties for new walls and subdivisions in the **Material Properties** area.
4. Click **OK** to confirm the default values for new objects.

Geometrical Parameters for Orthogonal Drawing Mode

Option	Description
Object relative to current plane	Enables you to set the height for new objects manually. Note that you must use a dot as decimal separator.
Upper and lower coordinate defined individually	
Automatic mode	All objects on a specific floor level will automatically inherit the height of the floor. To define individual floors, click Floor Levels . See chapter 3.3



Tip

If you define individual floor levels, you can easily switch between different layers in the working area. Note that floor levels are available only if the orthogonal drawing mode is set to **Automatic mode**. See chapter 3.3

Material Properties

Option	Description
Material properties of new walls	Enables you to define the material for new objects and subdivisions. For example, select Stone in the Material Properties of new Walls drop-down list and select Glass in the Material Properties of new Subdivisions drop-down list. To edit the material catalog, click Add / Edit Materials . See chapter 3.20
Material Properties of new Subdivisions	

3.3

Define Floor Levels

Note that floor levels are available only if the orthogonal drawing mode is set to **Automatic mode** in the **Default Values for New Objects**. See chapter 3.2

Define Floor Levels

1. Click **Floor Levels** or choose **Edit > Default Values > Floor Levels** to define individual floors.

↳ The **Floor Levels Above Ground** window appears.

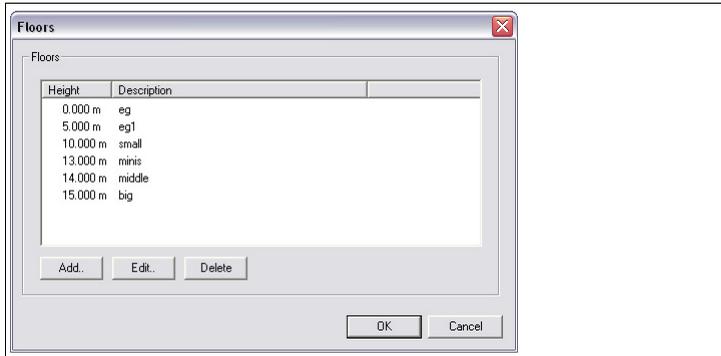


Figure 3.2 Example of different floors. Note that the floors do not have to be identical to the actual levels.

2. Click **Add** to define new floor levels.

3. Enter the height for each floor from ground level. Note that you must use a dot as decimal separator.

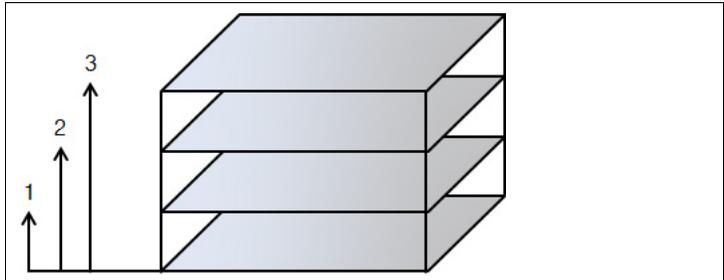


Figure 3.3 Floor heights

4. Enter a description for the new floor level. The description will appear in the **Floor Levels Above Ground** drop-down list of the **View Toolbar**.
5. Click **OK**.
6. After you defined all floor levels, click **OK** to close the **Floor Levels Above Ground** window.

3.4

Convert Existing 3-D Models

As an alternative to creating a whole new database, you can also import and convert existing models from other programs.

You can convert the following data:

- WinProp Indoor Building Data ASCII (*.ida)
- AutoCAD File Format (*.dwg, *.dxf)
- Facet File Format (*.fac)
- Stereolithography File Format (*.stl)
- Nastran File Format (*.nas)
- Wavefront File Format (*.obj)



Convert an Existing 3-D Model

1. Choose **File > Convert Indoor Database > Vector Database**.
↳ The **Conversion of Indoor Vector Database** window appears.
2. Select the format of the source file in the **Format of Database** area.
3. To simplify the database by combining adjacent walls or objects, activate **Simplification of Walls/Objects**. You can define detailed settings for simplification by clicking **Settings**.
4. To display a detailed log during the conversion process, activate **Extended Messages in Progress Window**.
5. To open the database after it has been converted, activate **Load Database after Conversion**.
6. Click **OK**.
7. Select the source file and click **Open**.

8. Enter a new file name for the converted database and click **Save**.
↳ The **Transformation of database** window appears.
9. If required, you can rotate, shift, or scale the objects of the database you are about to convert.
10. Click **OK**.
↳ The **Progress** window appears. Note that depending on the database you convert, further windows may open where you have to define additional settings, such as, the layers that have to be converted, or the height of the converted objects.



Tip

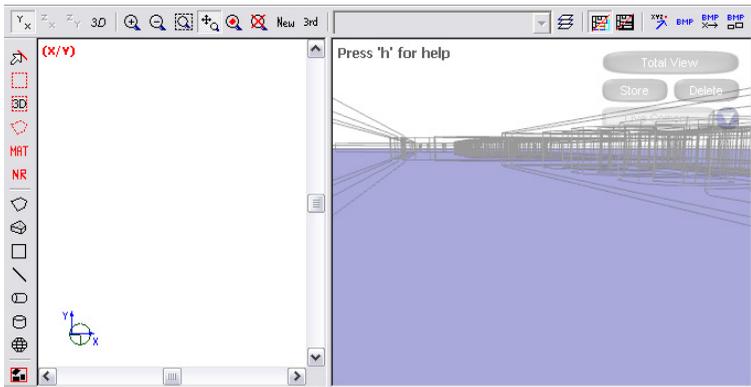


Figure 3.4 3-D view is correct although the XY view plane appears to be empty

If the color of the imported materials is set to white, the working area on the left appears empty although the database has been converted correctly. In this case, click  **Materials used in database** or choose **Edit > Materials** to open the material catalog and edit the color definition. See chapter 3.20

3.5 Define Global Settings

Define Global Settings

1. Click  **Change Settings** in the **Standard Toolbar** or choose **Edit > Settings** to define the global settings.

↳ The **Settings** window appears.

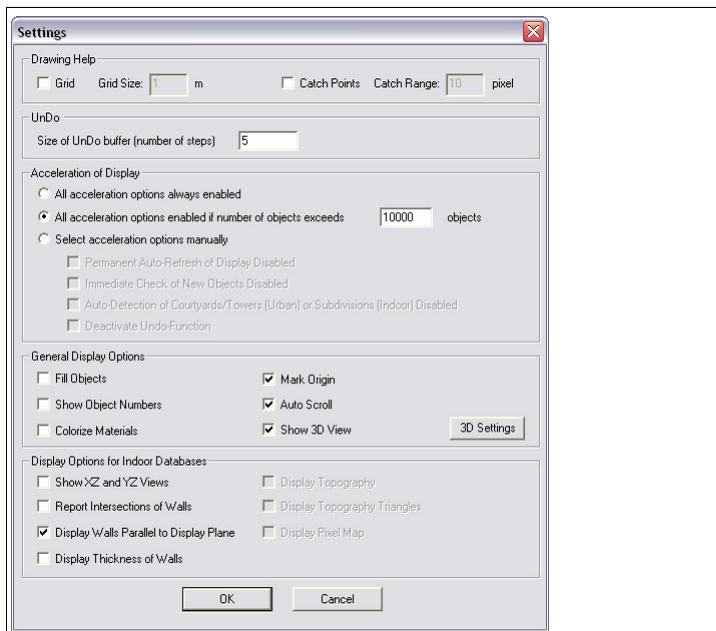


Figure 3.5 Settings window

2. To display a grid in the working area, activate **Grid** in the **Drawing Help** area. Note that you can also use the  **Grid** button in the **View Toolbar** to activate or deactivate the grid directly from the working area.

↳ If **Grid** is activated, you can enter a customized grid size.

3. To make all objects snap to the grid, activate **Catch Points** in the **Drawing Help** area. Note that you can also use the  **Catch Points** button in the **View Toolbar** to activate or deactivate this option directly from the working area.

↳ If **Catch Points** is activated, you can enter a customized catch range.

4. To change the number of steps you can undo, enter a number into the **Size of Undo buffer** box.
5. If necessary, define additional settings in the **Acceleration of Display**, **General Display Options**, and **Display Options for Indoor Databases** areas.

6. Click **OK** to confirm the settings.



Tip

Select the grid size depending on the simulation. For indoor simulations, we recommend that you use a maximum grid size of 0.2 m. In this case, the difference between the real distance of two objects and their distance in the working area is limited to a maximum of 0.4 m. For simulations in large outdoor areas, you can use a larger grid size.

Acceleration of Display

Option	Description
All acceleration options always enabled	Enables all acceleration options.
All acceleration options always enabled if number of objects exceeds a selected number of objects	Enables all acceleration options only if a selected number of objects is reached.
Select acceleration options manually	Enables you to define individual settings for the acceleration and the refresh of the display. We recommend that you change these settings only if you experience performance issues while working with very large databases.

General Display Options

Option	Description
Fill Objects	Switches from transparent wire frame display to non-transparent display.
Show Object Numbers	Displays the object numbers in the working area.
Colorize Materials	Displays each material in the color defined by the material catalog. Note that you can also use the  Indiv. color for each material button in the View Toolbar to activate or deactivate the display of individual material colors directly from the working area.
Mark Origin	Displays the coordinate system in the working area.
Auto Scroll	Activates automatic scrolling when you draw an object that exceeds the working area.
Show 3D View	Activates the three-dimensional view on the right side of the screen.

Display Options for Indoor Databases

Option	Description
Show XZ and YZ Views	Displays all side views in the working area.
Report intersections of walls	Displays a warning message when two walls intersect. Note that the various drawing tools behave differently regarding this setting. Not all tools will automatically report an error message.
Display walls parallel to display plane	Displays walls that are parallel to the current display plane.
Display Thickness of Walls	Displays the thickness of walls in the top view. Note that you can also use the  Show thickness button in the View Toolbar to activate or deactivate the display of the wall thickness directly from the working area.

3.6

Standard Toolbar

The **Standard Toolbar** contains basic commands for database handling and setup.

Command	Description
	New Database This command enables you to create a new database. See chapter 3.1
	Open Database This command enables you to open an existing database.
	Save Database This command enables you to save the current database.
	Print Database This command enables you to print the current database.
	Delete This command deletes currently selected objects.
	Cut This command cuts out currently selected objects.
	Copy This command copies currently selected objects.
	Paste This command inserts an object that has previously been cut out or copied.
	Undo This command enables you to undo the last steps. Note that you can define the number of steps that can be undone in the global settings. See chapter 3.5
	Redo This command enables you to redo a step that you've undone before.
	Materials used in database This command opens the material catalog for the current database. See chapter 3.20

Command	Description
	Open Group Manager This command opens the group manager. See chapter 3.17
	Change Settings This command enables you to define global settings. See chapter 3.5
	About This command displays information about the program and contact information.

3.7

View Toolbar

The **View Toolbar** contains the following tools:

- Display tools that enable you to control the display of objects in the working area
- Layer tools that enable you to edit different layers of the working area
- Additional tools that enable you to control rulers, a background image etc.

Display Tools

Tool	Description
	X-Y Plane This tool enables the XY view of the working area in the currently active window.
	X-Z Plane This tool enables the XZ view of the working area in the currently active window. Note that this tool is available only if Show XZ and YZ Views has been activated in the global settings. See chapter 3.5
	Y-Z Plane This tool enables the YZ view of the working area in the currently active window. Note that this tool is available only if Show XZ and YZ Views has been activated in the global settings. See chapter 3.5
	3D View This tool enables the 3-D view of the working area in the currently active window.
	Zoom In This tool enables you to zoom into the working area of the currently active window.
	Zoom Out This tool enables you to zoom out of the working area of the currently active window.
	Zoom Window This tool enables you to draw a selection area that the window zooms into.
	Mouse Pan and Zoom Tool This tool enables you to displace the working area.
	Zoom Selected Objects This tool makes selected objects of the working area fit into the currently selected window. Note that you must create a selection first.

Tool	Description
	Fit to screen This tool makes all objects of the working area fit into the currently selected window.
	Redraw all objects This tool rebuilds all objects in the working area. If you experience display issues, for example in 3-D mode, choose redraw all objects to refresh the display.

Layer Tools

Tool	Description
3rd	3rd Coordinate Settings This tool enables you to define the 3rd coordinate relative to the current plane. See chapter 3.10
	Floor Levels Above Ground This drop-down list enables you to select a floor level. Note that the drop-down list is available only if the orthogonal drawing mode is set to Automatic mode in the Default Values for New Objects . See chapter 3.3
	Floor Levels This tool enables you to define the floor levels for the automatic orthogonal drawing mode. See chapter 3.3

Additional Tools

Tool	Description
	Indiv. color for each material This tool activates and deactivates the display of individual material colors in the working area. Note that the material colors are defined in the material catalog. See chapter 3.20
	Show thickness This tool activates or deactivates the display of the wall thickness. Note that the wall thickness depends on its material. The thickness of each material is defined in the material catalog. See chapter 3.20
	Goto Position This tool enables you to display a defined position of the working area by entering its X, Y, and Z coordinates.
BMP	Image Configuration This tool enables you to define a background image for the working area. See chapter 3.11
	Move Image This tool enables you to move the current background image. See chapter 3.11
	Scale Image This tool enables you to resize the current background image. See chapter 3.11
	Marker Points This tool enables you to insert marker points in the working area, which enables you to keep track of large projects. To edit an existing marker point, activate Marker Points and right-click the marker point in the working area.

Tool	Description
	Catch Points If activated, each object you draw in the working area will automatically snap to the grip. Note that you can define the size of the grid in the global settings. See chapter 3.5
	Grid If activated, the grid is displayed in the working area. Note that you can define the size of the grid in the global settings. See chapter 3.5
	Call Mouse Meter Tool This tool allows you to measure distances directly in the working area. See chapter 3.18
	Rotate Single Wall View This tool enables you to rotate the currently active window by 90°.
	Rotate Single Wall View This tool enables you to enter a rotation angle for the currently active window.
	Flip Single Wall View This tool enables you to flip the currently active window around its vertical axis.

3.8 Objects Toolbar

The **Objects Toolbar** consists of two parts:

- Selection tools
- Drawing tools

Selection Tools

Tools	Description
	Select Object This tool enables you to select a single object in the current plane.
	Select Multiple Objects This tool enables you to select multiple objects in the current plane. Note that this tool does not select objects that reside above or below the current plane.
	Select Multiple Objects 3D This tool enables you to select multiple objects in all planes, including the objects above or below the current plane. After you created a selection in the working area you can define the height above and below the selection.
	Freehand Selection This tool enables you to create an arbitrary selection to select multiple objects in the current plane.
	Select Objects with same Material Properties This tool enables you to select all objects of the same material in all planes. See chapter 3.15
	Find Object by Number This tool enables you to select a single object by its object number. Note that if the object is located above or below the plane you are viewing, you may not see the selection. See chapter 3.16



Note!

If you use the three-dimensional selection tool or if you select objects by material or number, note that the selection may include objects that are not visible in the current view plane. See chapter 3.10



Tip

To invert the current selection, choose **Objects > Invert Selection**.



Tip

To combine different selections, make the first selection, then press and hold the control key **CTRL** on the keyboard and make another selection.

Drawing Tools

Tool	Description
	Polygonal Object This tool creates a two-dimensional surface of any shape.
	Polygonal Object with Orthogonal Walls and Ceiling This tool creates a three-dimensional cube of any shape.
	Rectangular Object This tool creates a two-dimensional rectangle, such as a floor or a ceiling.
	Orthogonal Object This tool creates a two-dimensional rectangle in an orthogonal plane, such as a wall.
	Pipe This tool creates a three-dimensional, open pipe.
	Cylinder This tool creates a three-dimensional, solid cylinder in an orthogonal plane, such as a reservoir.
	Sphere This tool creates a three-dimensional sphere, such as a gas tank.

3.9 Navigate in Views



Navigate in 2-D Views

1. Use the scrollbars to move the view.
2. Use the mouse wheel to zoom in or out.
3. For more options, use the tools from the **View Toolbar**.



Navigate in 3-D View



Note!

Note that the tools from the **View Toolbar** do not apply to the 3-D view.

1. Click and hold the left mouse button to move the 3-D view.
2. Click and hold the right mouse button to tilt the 3-D view.
3. Click and hold both mouse buttons to rotate the 3-D view.
4. Use the mouse wheel to zoom in or out of the 3-D view.
5. Click **Total View** to restore the initial 3-D view.
6. Click **Store** to store the current 3-D view.
Note that you can store multiple views. Each view is listed in the **Live Camera** drop-down list.
7. Click **Live Camera** to display a drop-down of all 3-D views that have been stored before.
8. To delete a 3-D view that has been stored before, select the view from the **Live Camera** drop-down list and click **Delete**.

3.10 Working with Layers

When creating and editing objects in the working area, be aware that the working area resp. the current view plane is just a single layer of the actual database. You only see the intersections of objects with the view plane. Objects below or above the view plane are invisible. If you want to view or edit an object that is currently invisible, you must move the view plane until it intersects the object.

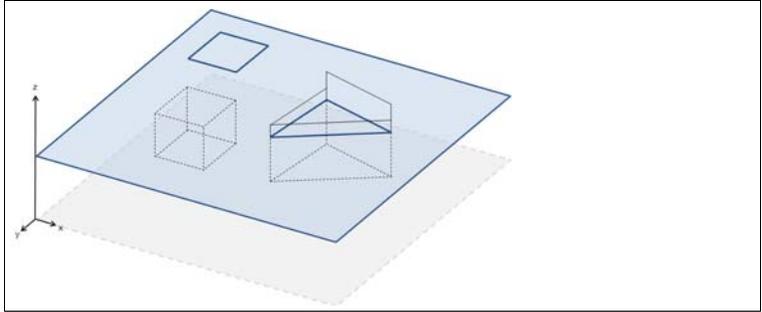


Figure 3.6 Object intersections with the working area

New objects will automatically be placed in the current view plane, because the working area corresponds to the current view plane. You can easily create new objects in different layers by moving the view plane. If you frequently move the view plane, make sure that it is in the right position before you create a new object.

Each window displays a discrete plane, for example the XY plane. By default, each view plane is displayed as a violet layer in the 3-D view.

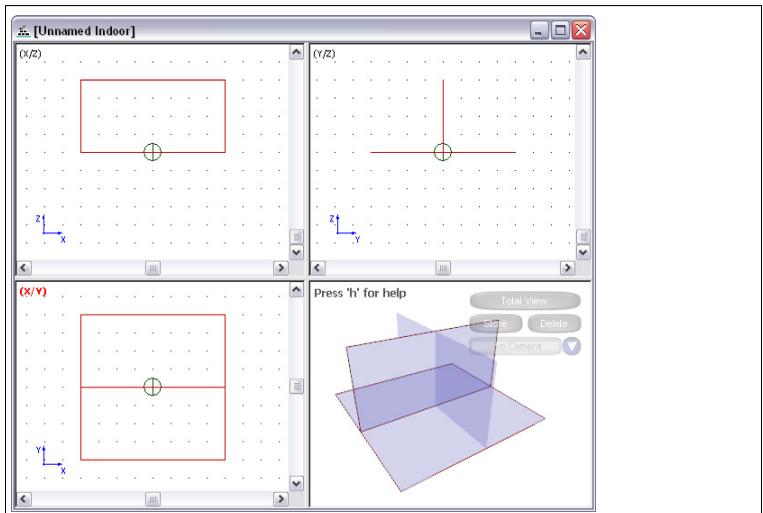


Figure 3.7 XZ, XY, and YZ view planes. Each view plane is displayed as a violet layer in the 3-D view.

You can move each view plane along its third axis. The object intersections are updated while you move the viewing layer.

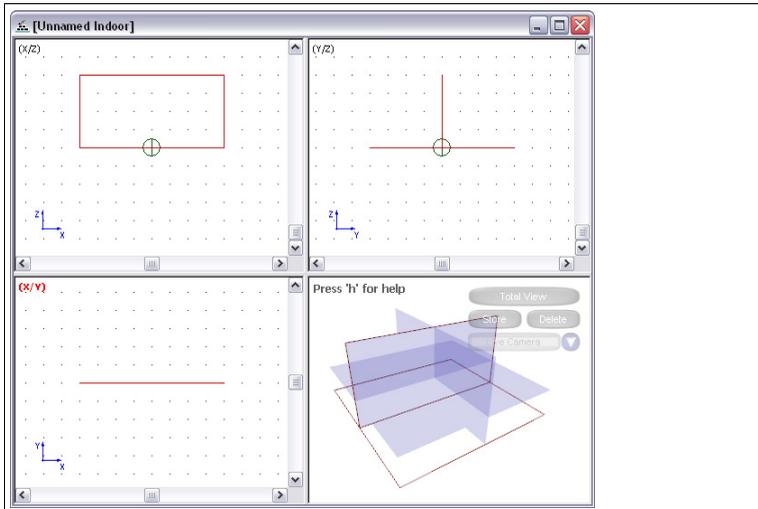


Figure 3.8 XZ, XY, and YZ view planes. The XY view plane has been moved along the Z axis.



Move the Working Area

1. Click **3rd Coordinate Settings**.

↳ The **3rd Coord Settings** window for the currently active window appears.

2. Use the slider to move the view plane. By default, you can move the slider only to the extent that there are objects in the working area. For example, if the height of the highest object is 10 m, you cannot move the slider further than 10 m.
3. To move the view plane stepwise, activate a value in the **Snap** area.
4. To increase or decrease the area in which you can move the current view plane, enter a maximum and minimum value in the **Max** and **Min** fields of the **3rd Coord** area. For example, if you want to create a new object, which is located 5 m above the highest object, you can increase the maximum value by 5 m. Then you can move the view plane to the new maximum value and create the new object.
5. To define an individual anchor, enter a value in the **Marks** area and click **Add Mark**. To move the view plane to a defined anchor, double-click the anchor value in the **Marks** area.
To delete an anchor, select the anchor in the **Marks** area and click **Delete Mark**.
6. Activate **Show Marks in 3D** to display anchors as a red layer in the 3-D view.
7. Activate **Show 3rd Coord in 3D** to display each view plane as a violet layer in the 3-D view.

**Tip**

If you're working in multiple layers and need to change the view plane often, click << to minimize the **3rd Coord Settings** window. This way the window occupies less space and remains on top of the view planes while giving you direct access to the slider.

3.11 Define Background Images

You can define multiple background images for each view plane. The background images of the XY plane are also displayed in the 3-D view.

**Tip**

If you create a new 3-D model of a plant or building, we recommend that you use a floor plan as background image for the XY plane. This enables you to retrace the walls and objects of the floor plan directly in the working area.



Define Background Images

1. Click **BMP Image Configuration** or choose **Images > Configuration** to upload a background image.

↳ The **Image Configuration** window appears.

2. Click **Add** to upload a new background image.
3. Select an image file and click **Open**.
4. To edit the coordinates, width and height settings of an image file, select the image file in the **Image Files** area and edit its settings in the **Image Properties** area.
5. Click **Close**.

If the entire background consists of multiple images, add all images to the **Image File** area and define the coordinates, width and height settings of each image file in the **Image Properties** area. Click **Apply** to confirm the settings before you select another image file.

To move the background image manually without entering its exact coordinates, click  **Move Image** in the **View Toolbar**. Then click into a background image and hold the left mouse button to move the background image in the working area.

To scale the background image manually without entering its exact width and height, click  **Scale Image** in the **View Toolbar**. Then click into a background image and hold the left mouse button to scale the background image in the working area.

3.12 Create Simple Objects

The **Objects Toolbar** enables you to draw basic objects that can represent entire buildings, walls, or furnishings and equipment.

Select the level of detail depending on the simulation. If you simulate wave propagation inside a building, we recommend that you create walls, floors and ceilings by drawing individual objects. If you simulate wave propagation in large outdoor areas where the inside of a building is less important, you can abstract entire buildings by drawing three-dimensional polygonal cubes.

Draw Simple Objects

1. Select a drawing tool from the **Objects Toolbar**.
2. Click into the working area to activate the working area and click again to set the starting point for the object.
3. Click again to draw the object.
If you draw a polygonal object, you can draw an arbitrary number of corners by clicking into the working area. To complete the polygonal object, click into the working area using the right mouse button.

3.13 Create Complex Objects using Subdivisions

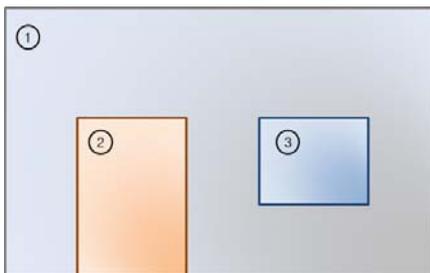
To increase the level of detail, you can add subdivisions to most basic objects. Note that each subdivision can have its own material properties. To change the material properties of the subdivisions, see chapter 3.14.

You can also create holes using subdivisions. You can also turn a subdivision into a hole and vice versa by changing its material properties.



Example!

To create a wall with a door and a window, you draw a regular wall and then you draw subdivisions onto the wall that represents the door and the window.



1. Wall
Material: concrete
2. Subdivision: door
Material: wood
3. Subdivision: window
Material: glass



Create a Subdivision

1. Select an object in the working area using one of the selection tools. For example, select a wall.



Figure 3.9 Wall in the XY view plane

↳ The selected object is highlighted.

2. Double-click the selected wall to switch from top view to side view enabling you to draw a new object on the selected object. You can also switch views using the tools of the **View Toolbar**. See chapter 3.7



Figure 3.10 Wall in the XZ view plane

↳ The view switched from XY plane to XZ plane and you can see the side view of the wall.

3. Select a drawing tool from the **Objects Toolbar**. For example, select the **Rectangular Object** tool.
4. Draw a new object on the first object.

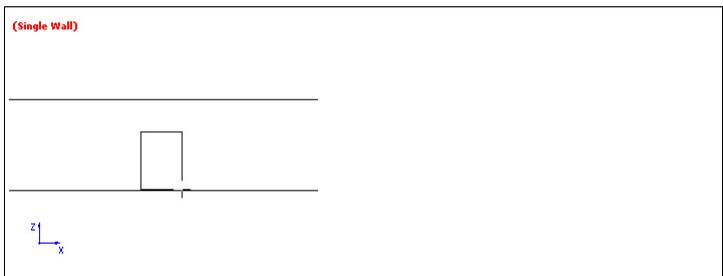


Figure 3.11 Draw subdivision on the object.

↳ The **Insert Subdivision** window appears.

5. Select **Create subdivision with own material properties** to create subdivisions, such as doors, or windows.
Select **Create hole in surrounding wall** to create an opening.
6. Click **OK**.

3.14

Define Object Properties

The object properties define the type of the object, its material, and its spatial definitions.

Define Material Properties



Note!

Note that the choice of materials depends on the material catalog. See chapter 3.20

1. Select an object or subdivision in the working area using one of the selection tools.
↳ The selected object or subdivision is highlighted.
2. Right-click the highlighted object or subdivision and select **Material Properties**.
↳ The **Material Properties** window appears.
3. Select a material from the list and click **OK**.



Define Object Properties

1. Select an object or subdivision in the working area using one of the selection tools.
↳ The selected object or subdivision is highlighted.
2. Right-click the highlighted object or subdivision and select **Properties**.
↳ The **Object Properties** window appears.
3. To turn a subdivision into a hole and vice versa, click **Change Type**.
4. Select a material from the drop-down list in the **Material Parameters** area.
5. You can enter a comment for the selected object in the **Comment** box.
6. You can change the shape of the selected object by adding, removing, and editing the values in the **Corners** area. For example, you can turn a rectangle into a triangle by deleting one of the corners. Note that you must not intersect other objects when editing the shape of the current object.
7. Click **OK** to update the object properties.

3.15 Select Objects by Material



Select Objects by Material

1. Select **MAT Select Objects with same Material Properties** from the **Objects Toolbar** or choose **Objects > Select Multiple Objects (Material)**.

↳ The **Material** window appears.

2. Select a material from the drop-down list.
3. Click **OK**.

↳ All objects with these material properties are selected and highlighted.

3.16 Select Objects by Number

All objects in the working area can be identified by their object number. To display the object number in the working area, activate the option **Show Object Numbers** in the **General Display Options** area of the global settings. See chapter 3.5



Select Objects by Number

1. Select **NR Find Object by Number** from the **Objects Toolbar** or choose **Objects > Select Single Object (Number)**.

↳ The **Find Object** window appears.

2. Enter the object number.
3. To display the object in side view automatically, activate **Switch to single view of this object**.
4. Click **OK**.

↳ The object is selected and highlighted.



Note!

If you did not select **Switch to single view of this object** and if the object is located above or below the plane you are viewing, you may not see the selection. See chapter 3.10

3.17 Create Object Groups

You can combine multiple objects in groups. This allows you to edit multiple objects as a single unit. Furthermore, you can assign material properties to the entire group.



Note!

Objects cannot belong to multiple groups at a time. Each object can belong to a single group only.



Create Groups

1. Select the objects you want to group in the working area.
 - ↳ The selected objects are highlighted in red.
2. Click  **Open Group Manager** or choose **Objects > Group Manager** to open the group manager.
 - ↳ The **Group Manager** window appears.
3. Click **Create** in the **Group Manager** window.
 - ↳ The selected objects create a new group.
4. Click **Close** to close the **Group Manager** window.



Edit Groups

1. Click  **Open Group Manager** or choose **Objects > Group Manager** to open the group manager.
 - ↳ The **Group Manager** window appears.
2. To add additional objects to the group, select the objects in the working area and click **Add** in the **Group Manager** window.
3. To delete an object from the group, select the object in the right column of the **Group Manager** window and click **Del**.
4. To combine multiple groups to a new group, press and hold the control key **CTRL** on the keyboard, select the groups in the left column of the **Group Manager** window, and click **Combine**.
5. To group all objects of the working area by their material properties, click **by Material**. Note that if you group all objects by material, existing groups may be deleted automatically.
6. Click **Close** to close the **Group Manager** window.

3.18 Measure Distances

You can measure distances directly in the working area.



Measure Distances in the Working Area

1. Click  **Call Mouse Meter Tool** in the **View Toolbar**.
2. Click into the working area using the left mouse button to set the starting point for the measurement.
3. Move the cursor to measure the distance between the current cursor position and the starting point.

↳ The distance between the starting point and the current cursor position, as well as the coordinates of the current cursor position are displayed automatically.

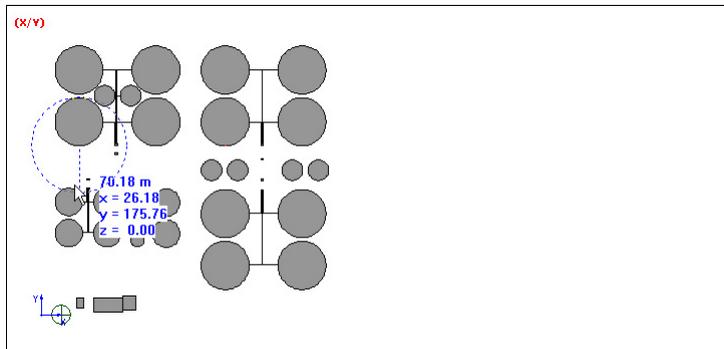


Figure 3.12 Mouse Meter in XY view plane

4. To start a new measurement, click into the working area using the left mouse button.
5. To stop using the Mouse Meter, click into the working area using the right mouse button or press the escape key **Esc** on the keyboard.



Tip

To measure the height of objects, use the Mouse Meter in the side view, for example, in the XZ view plane.

Note that the side views are available only if **Show XZ and YZ Views** has been activated in the global settings. See chapter 3.5

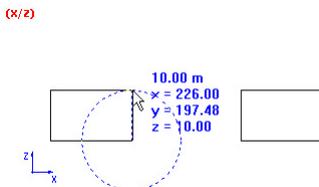


Figure 3.13 Mouse Meter in XZ view plane

3.19 Scale Objects

You can resize all objects in the database including the background images at any time.

Scale all Objects by Drawing a Line



Tip

Scale all objects by drawing a line to create a true to scale representation.

1. Choose **Edit > Scale All Objects**.
 - ↳ The **Scale Objects** window appears.
2. Make sure the option **By drawing a line** is activated in the **Selection of scaling method** area.
3. Deactivate unwanted directions in the **Scale walls** area.
4. If the background image is already true to scale, deactivate **Images** in the **Scale other objects** area.
5. Click **OK** to close the **Scale Objects** window.
6. Click **OK** to close the pop-up window.
7. Draw a line in the working area. For example, redraw a wall in the working area or in the background whose dimensions are known.
 - ↳ The **Scale** window appears.
8. Enter the length of the line you have drawn. All objects will be resized according to the value you specify for this line. Note that you must use a dot as decimal separator.
9. Click **OK** to close the **Scale** window.
10. Click **Yes** to confirm.
 - ↳ All objects in the database have been resized.

Scale all Objects using a Scaling Factor

1. Choose **Edit > Scale All Objects**.
 - ↳ The **Scale Objects** window appears.
2. Activate **With known scaling factor** in the **Selection of scaling method** area.
3. Enter the scaling factor in the **Factor** box. Note that you must use a dot as decimal separator. For example, enter 2 to double the size of all objects in the working area.
4. Deactivate unwanted directions in the **Scale walls** area.
5. If the background image is already true to scale, deactivate **Images** in the **Scale other objects** area.
6. Click **OK** to close the **Scale Objects** window.
7. Click **Yes** to confirm.

↳ All objects in the database have been resized.

Instead of scaling all objects at once, you can also scale selected objects only. Select multiple object in the working area using one of the selection tools. Choose **Objects > Scale selected objects** and proceed as described before.

3.20

Edit Material Catalog

WiNCMod comes with a predefined material catalog, which enables you to select from a wide range of materials when creating your database. Note that each material has its own electrical properties.

If you are missing a special material, you can edit the material catalog and create customized materials.



Edit Materials

1. Click  **Materials used in database** or choose **Edit > Materials** to open the material catalog.

↳ The **Material Catalogue** window appears.

2. To add a new material to the catalog, click **Add material**. To edit an existing material, select the material from the list and click **Edit**.

↳ The **Material Properties** window appears.

3. Enter a name for the material in the **Name** box.
4. The **Propagation phenomena** area enables you to disable specific calculations during the simulation. We recommend that you do not change these settings.
5. Enter a value for the thickness in the **Thickness** box. This value is used to display the thickness of objects in the working area.
6. Because electrical properties depend on the frequency, you can define different properties for different frequencies. To add a new entry, click **Add** in the **Electrical Properties** area. To edit or delete existing entries, select an entry from the list and click **Edit** respectively **Delete**.
7. To select a color for the material, click into the color preview in the **Color of Material** area.
8. To enable the display of objects in the material color, activate **Draw object filled on display if filled mode is selected** in the **Color of Material** area.
9. We recommend that you do not deactivate **Draw objects on screen** in the **Color of Material** area, because once the objects are invisible, they can no longer be selected using the selection tools.
10. Click **OK**.



Tip

If you select one or multiple object in the working area, the selected objects are highlighted in red automatically. To avoid confusion with selected objects, you should refrain from using red as a material color.

You can replace materials from the current material catalog with materials from external material catalogs.

Replace Single Materials

1. Click  **Materials used in database** or choose **Edit > Materials** to open the material catalog.
2. Select the material you want to replace from the list and click **Replace**.
3. Select the material catalog that contains the new material and click **Open**.
4. Select the new material from the list and click **Import**.

↳ The material in the material catalog of the current database has been replaced by the material from the external material catalog.

You can import selected materials from external material catalogs or you can import entire material catalogs.

Import Materials

1. Click  **Materials used in database** or choose **Edit > Materials** to open the material catalog.
2. Click **Import**.
3. To add the comment **[added]** to the name of imported materials, activate **Mark descriptions of affected materials with comments**.
4. To overwrite existing materials with the same description, activate **Overwrite materials with same description**.
5. Select a material catalog and click **Open**.

↳ The **Import material from catalogue** window appears.

6. Select the materials you want to import from the list and click **Import**. Press and hold the control key **CTRL** on the keyboard to select multiple materials simultaneously.
7. Click **Import** to import the selected materials.
8. Click **OK** to close the material catalog.

Export the Material Catalog

1. Click  **Materials used in database** or choose **Edit > Materials** to open the material catalog.
2. Click **Export** to export the material catalog.
3. Enter a file name for the exported material catalog and click **Save**.
4. Click **OK** to close the material catalog.

4

WiNCMod Tutorial

This tutorial contains all major steps that are required to create a new factory site from scratch using WiNCMod. In this example, the factory site comprises a large area with multiple storage basins and a storehouse.



Figure 4.1 Overview

The following table contains some basic dimensions of the objects on the factory site.

Object	Material	Dimensions
Storage basin (small)	Metal	<ul style="list-style-type: none"> ■ Height: 13 m ■ Diameter: 20 m
Storage basin (medium)	Metal	<ul style="list-style-type: none"> ■ Height: 15 m ■ Diameter: 40 m
Storage basin (large)	Metal	<ul style="list-style-type: none"> ■ Height: 15 m ■ Diameter: 70 m
Pipes	Metal	<ul style="list-style-type: none"> ■ Diameter: 0.6 m
Storehouse (ground floor)	Brick	<ul style="list-style-type: none"> ■ Height: 5 m
Storehouse (1st floor)	Brick	<ul style="list-style-type: none"> ■ Height: 5 m

Create New Database

1. Click  **New Database** or choose **File > New Database**.
2. Activate **Draw manually** in the **Mode of operation** area.
3. Click **OK**.
4. Select **Object relative to current plane** in the **Geometrical Parameters for Orthogonal Drawing Mode** area and enter 5 m in the **Height of walls relative to current plane** box.
You can also use a different drawing mode. In this example, this setting is quite handy because each floor of the storehouse will automatically have a height of 5 m. The height of the storage basins can be specified individually when creating the cylindrical objects.
5. Define the default materials for new objects in the **Material Properties** area, for example **Brick; thickness 20 cm** for new walls and **Glass; thickness: 5 mm** for new subdivisions. See chapter 3.13
6. Click **OK**.

Insert Background Image

1. Click **BMP Image Configuration** or choose **Images > Configuration** to upload a background image. See chapter 3.11
2. Click **Add** to upload a new background image.
3. Select an image file and click **Open**.
4. Click **Apply**.
5. Click **Close** to close the **Image Configuration** window.

↳ The background image has been defined.



Figure 4.2 Background image inserted



Setup the Working Area



Tip

We recommend that you insert a floor plan or a map as background image for the working area in the XY view plane. Then you can resize the background image to a true to scale representation, which enables you to use the background as a template for new objects.

1. Click  **Change Settings** in the **Standard Toolbar** or choose **Edit > Settings** to define the global settings. See chapter 3.5
2. Activate **Grid** in the **Drawing Help** area and enter 0.5 m in the **Grid Size** box. Note that you must use a dot as decimal separator.
3. Choose **Edit > Scale All Objects**.
4. Click **OK** to scale all objects including the background image by drawing a line.
5. Click **OK** to close the dialog window.
6. Draw a line in the working area. We recommend that you redraw an object of the background image whose dimensions are clearly defined. In this example, we use the diameter of a large storage basin as a reference point.

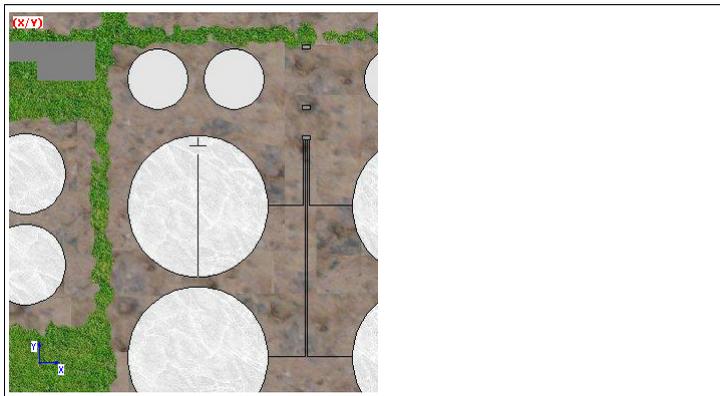


Figure 4.3 Scaling the background

↳ The **Scale** window appears.

7. Enter 70 m in the **Enter length of the specified line** box, because the diameter of the large storage basins is 70 m.
8. Click **OK**.
9. Click **Yes** to confirm.

↳ The background image has been resized to a true to scale representation. If you zoom into the working area, you will notice that the diameter of the small storage basins is made up of 40 dots, which corresponds to 20 m because we defined a grid size of 0.5 m. See chapter 3.9

You can also click  **Call Mouse Meter Tool** in the **View Toolbar** to measure the diameter of the small storage basins. See chapter 3.18

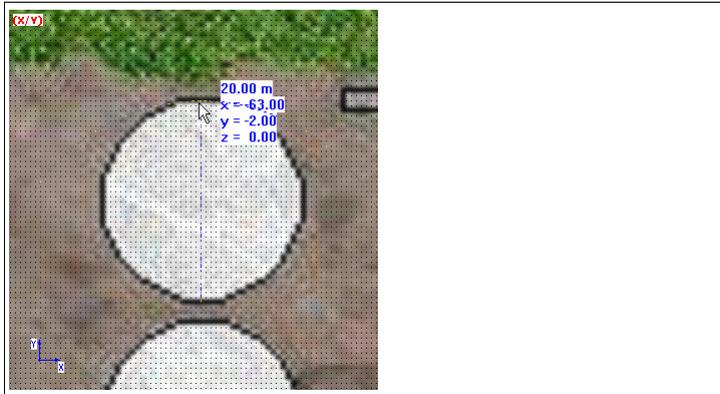


Figure 4.4 True to scale background image

Create Ground Floor of the Storehouse

Because the wave simulation will be performed in the outside area, we can abstract the storehouse by drawing three-dimensional cubes.

1. Click  **Polygonal Object with Orthogonal Walls and Ceiling** in the **Objects Toolbar**.
2. Click into the working area to activate the working area and click again to set the starting point for the object. Click again to define the corners of the building. To complete the polygonal object, click into the working area using the right mouse button.

You can also use other drawing tools. For example, you can draw the walls using the  **Orthogonal Object** tool and add a ground plate and ceiling using the  **Rectangular Object**. See chapter 3.8

↳ In the XY view plane you see the top view of the first building. In the 3-D view you see that you actually created a three-dimensional block. Note that the height of this block is 5 m because we set the default height for new objects to 5 m. See chapter 3.2

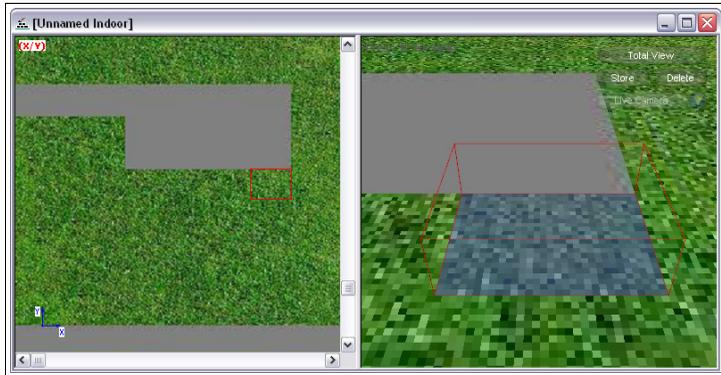


Figure 4.5 Ground floor of the storehouse

3. Proceed in the same way to create the other sections of the building on the ground floor.

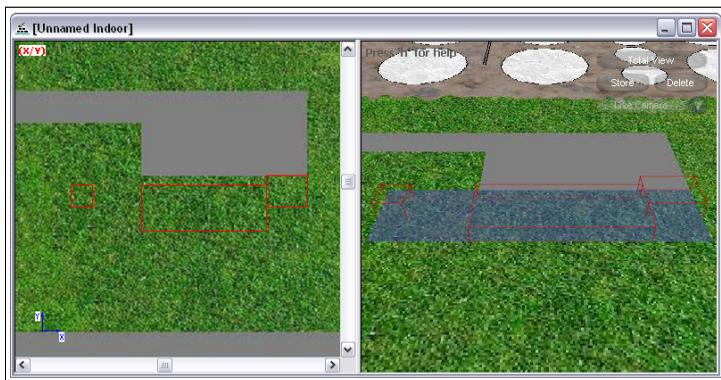


Figure 4.6 Ground floor of the storehouse



Tip

If you notice that the 3-D view does not update automatically, click **Redraw all objects** to update the view manually.



Create First Floor of the Storehouse

The first floor is created in the same way, but on a different height. Therefore you must move the XY plane upwards, along its third axis.

1. Click **3rd Coordinate Settings**.
2. Move the slider upwards until it says 5 m.

↳ The working area in the XY plane is now above the ground floor. The view plane resp. working area is displayed as a violet layer in the 3-D view.

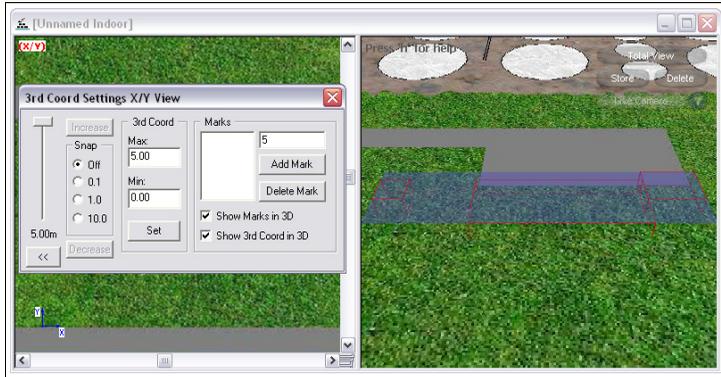


Figure 4.7 Moving the XY view plane along the Z axis

3. Click  **Polygonal Object with Orthogonal Walls and Ceiling** in the **Objects Toolbar**.
4. Click into the working area to activate the working area and click again to set the starting point for the object. Click again to define the corners of the building. To complete the polygonal object, click into the working area using the right mouse button. See chapter 3.8
5. Click **Cancel** in the **Insert Subdivision** window. See chapter 3.13

↳ The first floor of the storehouse is complete.

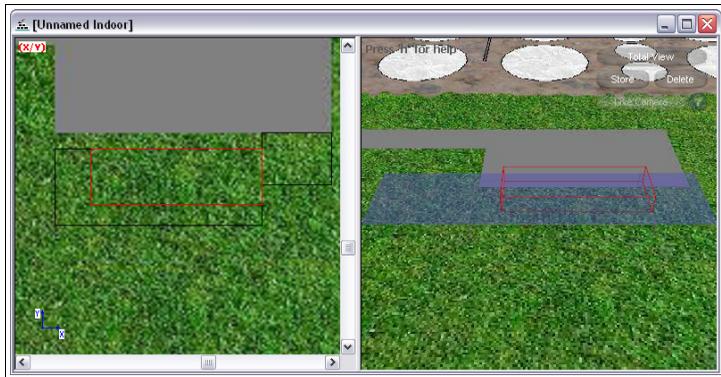


Figure 4.8 First floor of the storehouse



Create Storage Basins

1. Move the slider in the **3rd Coord Settings** window downwards until it says 0 m and the XY plane is on ground level again.
2. Click  **Cylinder** in the **Objects Toolbar**.
3. Click **Material**.
4. Select **Metal; thickness 5mm** and click **OK**.
5. Deactivate **Define radius by mouse click**.
6. Enter 24 in the **number of corners** box to increase the level of detail.
7. Enter 13 in the **height** box and 10 in the **radius** box to create a small storage basin.
8. Click **OK**.
9. Click into the working area using the right mouse button to place the storage basin in the working area. Because the background image has been resized to a true to scale representation, you can place the storage basin directly on its correct location in the background image.

↳ You created a small storage basin.



Figure 4.9 Small storage basin

10. The storage basin is highlighted in red, because it is still selected. If not, use the selection tools to select the storage basin. See chapter 3.8
11. Right-click in the working area and select **Copy** or press **CTRL + C** on the keyboard to copy the selected storage basin.
12. Right-click in the working area and select **Paste** or press **CTRL + V** on the keyboard to insert another storage basin.
13. Click into the working area using the right mouse button to place the storage basin in the working area.
14. Proceed in the same way to create the other storage basins.

↳ The storehouse and the storage basins are complete.

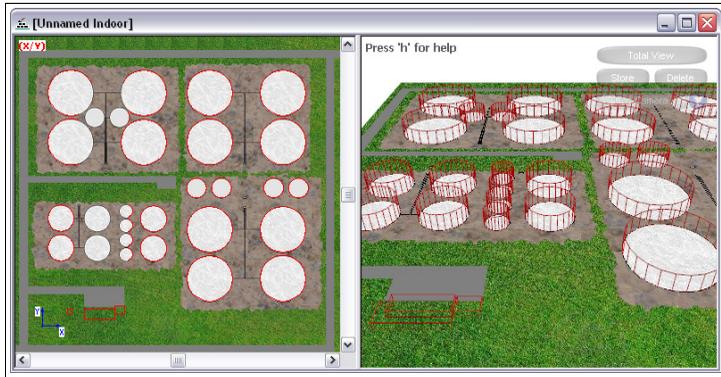


Figure 4.10 Wire frame display of the storehouse and the storage basins



Tip

To move an object in the working area, select the whole object, then click and hold the left mouse button to move the object around. To move an object to defined coordinates, select the whole object, right-click into the working area, select **Move selected Objects**, and enter the coordinates.



Tip

We recommend that you activate **Fill Objects** in the global settings to check if any walls or ceilings are missing. See chapter 3.5



Figure 4.11 Non-transparent display of the storehouse and the storage basins



Create Pipes

1. Click  **Pipe** in the **Objects Toolbar**.
2. Click **Material**.
3. Select **Metal; thickness 5mm** and click **OK**.
4. Enter 0.18 in the **radius** box. Note that you must use a dot as decimal separator.
5. Click **OK**.
6. Click into the working area to set the starting point for the pipe. Click again to draw the pipe.
7. Proceed in the same way to create the other pipes. If there are multiple pipes in parallel, you use copy & paste to insert multiple pipes in parallel.

↳ The 3-D model of the factory site is complete.



Figure 4.12 Overview



Save Database

1. Choose **File > Save Database As** to save the 3-D model for use in WINCSim.
2. Enter a file name and click **Save**.

↳ The **Progress** window appears and WiNCMod saves the 3-D model to the specified file.



Tip

If you're unable to save the database, check whether the database contains problematic intersections of walls with other objects. Remove these intersections and try again.

5 WiNCsim

WiNCsim enables you to import 3-D models from WiNCMod and to simulate wave propagation and connectivity of *WirelessHART* devices in the 3-D model.

5.1 Create a New Project



Import a WiNCMod Database

1. Click **New Project** or choose **File > New Project**.
↳ The **New Project** window appears.
2. Click **Browse** in the **Databases & Parameters** area.
3. Select a WiNCMod database file and click **Open**.
4. WiNCsim creates a new directory for the results by default. If you want to store the results in a different directory, enter path to the directory in the **Result Folder** box in the **Databases & Parameters** area.
5. Click **OK**.
↳ WiNCsim displays the top view of the WiNCMod database.

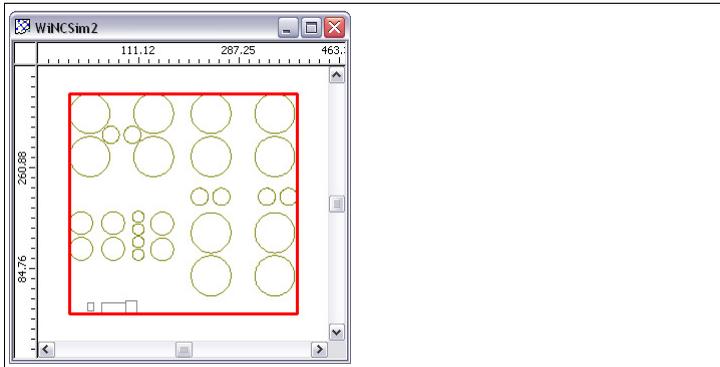


Figure 5.1 Top view

5.2 Standard Toolbar

The **Standard Toolbar** contains basic commands for handling the project files.

Command	Description
	New Project This command enables you to create a new project. See chapter 5.1
	Open This command enables you to open an existing project.
	Save This command enables you to save the current project.
	Print This command enables you to print the top view of the working area.
	About This command displays information about the program and contact information.

5.3 View Toolbar

The **View Toolbar** contains multiple tools that enable you to control the display of the working area.

Tool	Description
	Show Rulers This tool enables you to activate or deactivate the display of the rulers in the working area.
	Zoom In This tool enables you to zoom into the working area.
	Zoom Out This tool enables you to zoom out of the working area.
	Zoom Window This tool enables you to draw a selection area that the window zooms into.
	Zoom Prediction Area This tool makes the entire prediction area fit into the window.
	Total View This tool makes all objects of the working area fit into the window.
	Show 3D View This tool enables you to activate or deactivate the 3-D view.
	Show Legend This tool enables you to activate or deactivate the color legend for the dBm ranges. Note that this tool is available only while viewing the results of the simulation runs.
	Show Information This tool displays basic information on the current database, for example the maximum and minimum height of all objects in the database.
	Mouse Meter This tool allows you to measure distances directly in the working area. See chapter 3.18

5.4 Edit Toolbar

The **Edit Toolbar** enables you to edit the settings and the display of the project file.

Command	Description
	Change Settings This command enables you to define global settings. See chapter 5.6
	Select Objects This is the default cursor and enables you to select objects in the working area.
	Object Info This command enables you to display additional information on the objects in the working area. Activate Object Info and click on a WHART device in the working area.
	Show Paths This command enables you to display the connectivity between the individual nodes of the <i>WirelessHART</i> network. Note that paths can only be displayed after you have successfully simulated network connectivity. See chapter 5.12.2
	Show Threshold This command enables you to enter a threshold value in dBm. Values above this threshold are automatically displayed in green, values below are displayed in red. Note that wave propagation and network prediction must have been performed in order to apply a threshold to the results.

5.5 Project Toolbar

The **Project Toolbar** contains multiple tools to define the network nodes and to simulate the wave propagation and network connectivity.

Tool	Description
	Project Parameter This tool enables you to overview and define basic project parameters. See chapter 5.7
	Define Prediction Area This tool enables you to define the area in which the wave propagation and network connectivity will be simulated. See chapter 5.8
	Insert Object This tool enables you to insert a <i>WirelessHART</i> device into the working area. See chapter 5.9
	Delete Object This tool enables you to delete a <i>WirelessHART</i> device from the working area. To delete a <i>WirelessHART</i> device, click Delete Object and then click the device icon in the working area.
	Move Object This tool enables you to move an existing <i>WirelessHART</i> device in the working area. To move a <i>WirelessHART</i> device, select Move Object and then click the device icon in the working area.
	Edit Object This tool enables you to edit the properties of a <i>WirelessHART</i> device in the working area. See chapter 5.11

Tool	Description
	Compute Propagation This tool enables you to simulate wave propagation within the current prediction area.
	Compute Network This tool enables you to simulate the entire network in the current prediction area. See chapter 5.12.1
	Compute Connectivity This tool enables you to simulate the connectivity between the individual network nodes in the current prediction area. Note that the connectivity calculation is available only after a point-to-point prediction has been performed. See chapter 5.12.2
	Cancel Computation This tool enables you to abort the current calculation. Note that this tool is available only during a calculation. For example, if you notice that the calculation for the current prediction area takes too long, you can abort the calculation, define a different prediction area, and restart the calculation.

5.6 Define Global Settings

Click  **Change Settings** or choose **Edit > Settings** to define the global settings.

The **Settings** window contains the following tabs:

- The **General** tab displays the file path to the directory of the current project file and to the directory in which the results of the simulation are stored. We recommend that you define these settings when setting up a new project and that you do not change these settings later on. See chapter 5.1
- The **Display** tab enables you to control the display of the two-dimensional working area.
- The **Display 3D** tab enables you to control the display of the three-dimensional view.
- The **Computation** tab enables you to control the usage of resources for the simulation run. We recommend that you do not change these settings.
- The **Legend** tab enables you to control the display of the results of the simulation in the working area. Note that the options on this tab are available only after you performed a simulation run.
- The **Information** tab enables you to control the display of system-related parameters.



Define Display Settings for the Working Area

1. Select the **Display** tab.

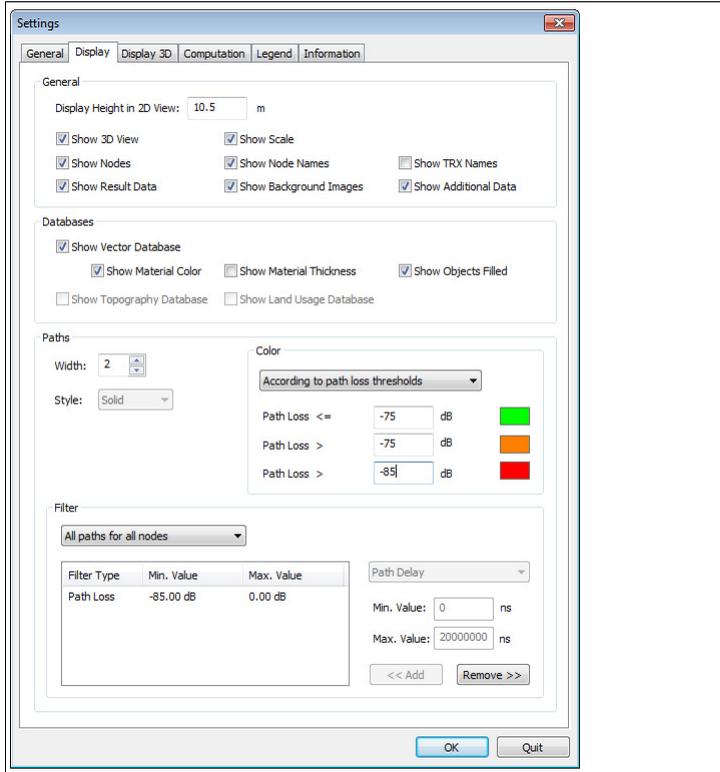


Figure 5.2 **Display** tab

2. In analogy to **WiNCMod** you can define a height for the current view plane of the working area. To do so, enter a value in the **Display Height in 2D View** box in the **General** area. Note that you must use a dot as decimal separator. Note that you only see the intersections of objects with the view plane. If there is no intersection with an object on the specified height, the working area appears empty. See chapter 3.10
3. Furthermore, the **General** area and the **Databases** area enable you to deactivate or activate the display of various objects. For example, you can deactivate the display of the *WirelessHART* devices or deactivate the display of material colors in the working area.
4. The **Paths** area enables you to change the display of the connection paths between the *WirelessHART* devices. You can change the line width and its color and you can select the paths that shall be displayed. If you want to see all available paths, select **All paths for all nodes** from the drop-down list in the **Filter** area.



Define Display Settings for the 3-D View

1. Select the **Display 3D** tab.

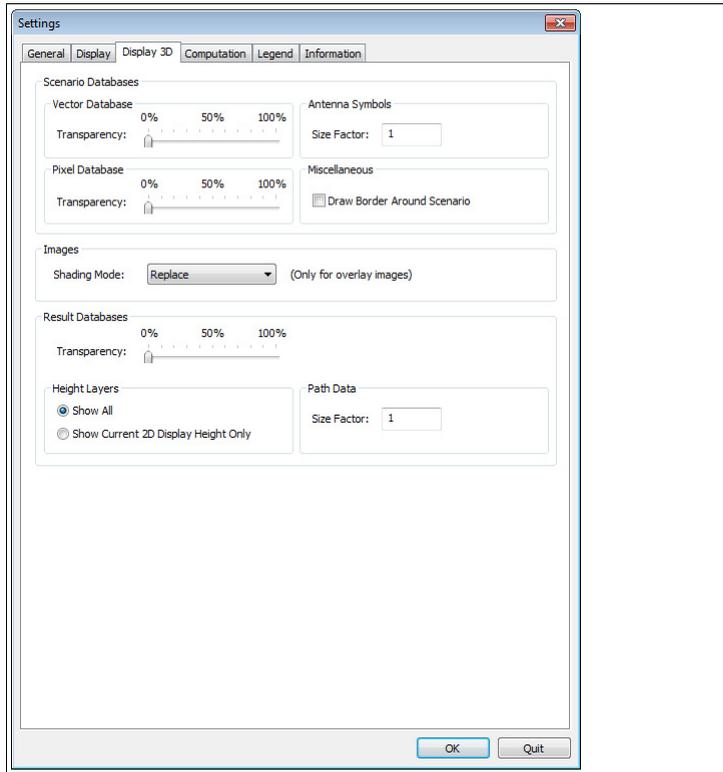


Figure 5.3 **Display 3D** tab

2. To display the objects in transparent mode, increase the degree of transparency in the **Vector Database** area.
To display the results in transparent mode, increase the degree of transparency in the **Result Database** area. For example, if the results are displayed semi-transparent, you can recognize the objects that reside below the result layer in 3-D view.
3. To increase the display of the antennas in the 3-D view, enter a value > 1 in the **Size Factor** box of the **Antenna Symbols** area.
To increase the display of the connection paths in the 3-D view, enter a value > 1 in the **Size Factor** box of the **Path Data** area.
4. To draw a border around the simulation area, activate **Draw Border around Scenario** in the **Miscellaneous** area.

Define Default Values for Results

1. Select the **Legend** tab. Note that the options on this tab are available only after you calculated the network prediction and selected the results in the **File Browser** on the left side of the screen.

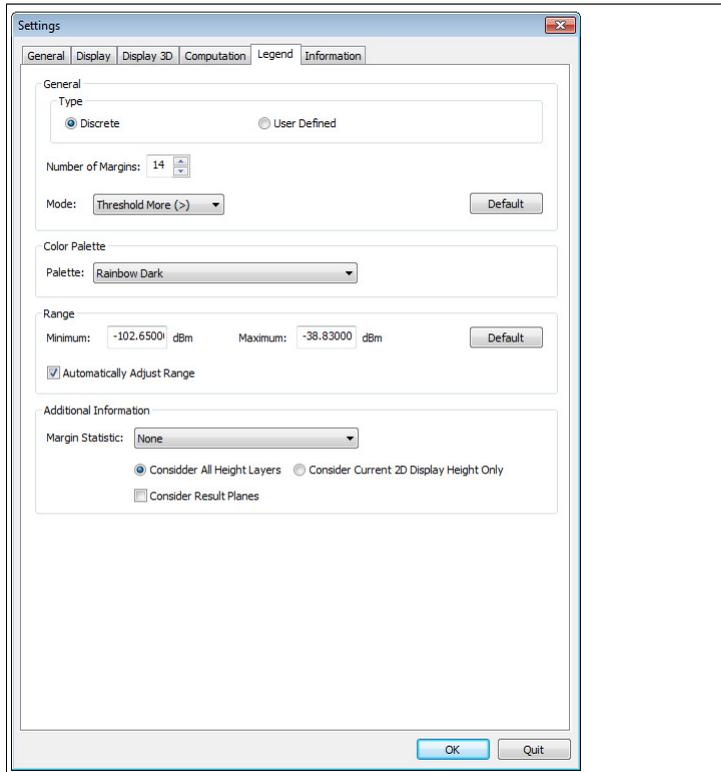


Figure 5.4 Legend tab

2. By default WiNCSim uses 14 colors to display the calculation results. To decrease or increase the number of color ranges, decrease or increase the **Number of Margins** value in the **Type** area. Note that you can reset the settings in the **Type** area by clicking the **Default** button. To define your own color palette, activate **User Defined** and click **Configure**.
3. To use a different color set, select a different palette from the **Palette** drop-down list in the **Color Palette** area.
4. To define the upper and lower end of the scale, enter the minimum and maximum values in the **Minimum** and **Maximum** boxes of the **Range** area. Note that you can reset the settings in the **Range** area by clicking the **Default** button.

5.7 Define Project Parameters and Prediction Parameters

The **System Configuration** window contains the following tabs:

- The **Network** tab displays basic network information, such as the network name and the number of instances that are considered during simulation (time stamps). We recommend that you do not change these settings.
- The **System** tab enables you to define an additional noise level in case of coexisting networks.
- The **Nodes** tab displays an overview of all network nodes respectively all *WirelessHART* devices in the working area. You can edit the device properties directly from this tab page. See chapter 5.11
- The **Prediction** tab enables you to modify the simulation parameters, such as the prediction area (e.g. point-to-point prediction) or the prediction model.



Define Prediction Area and Prediction Model

1. Click  **Project Parameter** in the **Project Toolbar** or choose **Project > Parameter**.
↳ The **System Configuration** window appears.
2. Choose **Prediction**.
↳ The **Prediction** settings appear.

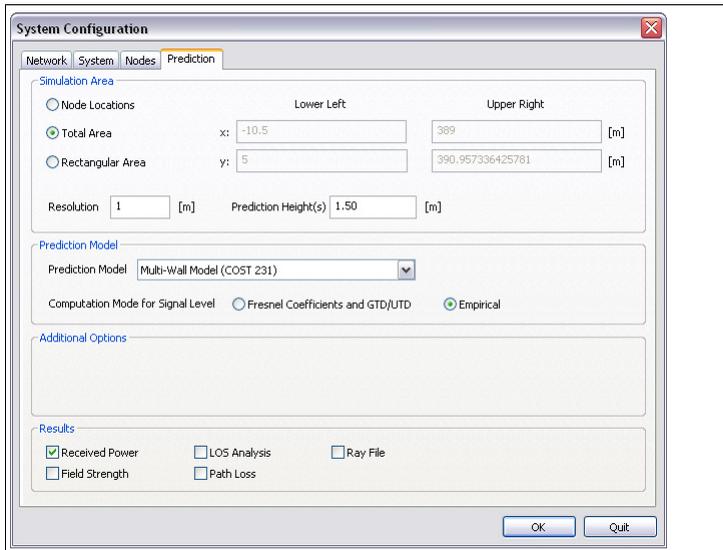


Figure 5.5 Prediction tab

3. To calculate wave propagation for the positions of each *WirelessHART* device, activate **Node Locations** in the **Simulation Area** area.
To calculate wave propagation for the entire simulation area in a defined height, activate **Total Area** in the **Simulation Area** area.
To calculate wave propagation for a selected prediction area in a defined height, activate **Rectangular Area** in the **Simulation Area** area.
If you selected **Total Area** or **Rectangular Area**, you must specify the height for which the results will be calculated. Enter the height in the **Prediction Height(s)** box in the **Simulation Area** area. You can also specify multiple heights at a time. Note that you must use a dot as decimal separator and a space character to separate multiple values. See chapter 5.12
4. Select a prediction model from the **Prediction Model** drop-down list in the **Prediction Model** area.
If you calculate wave propagation for the total area or a selected area, we recommend that you use the **Dominant Path Model (DPM)** or the **Multi-Wall Model (COST 231)**. While the **Multi-Wall Model (COST 231)** only calculates the absorption caused by different materials and structures, the **Dominant Path Model (DPM)** also takes into account the reflections caused by some materials. Thus, the **Dominant Path Model (DPM)** is more accurate but the calculation takes more time.
If you calculate wave propagation for the node locations, we recommend that you use the **3D Standard Ray Tracing (SRT)** model.
5. Enter the resolution for the calculation in the **Resolution** box in the **Simulation Area** area. The smaller the resolution, the more accurate the prediction results. However, the calculation takes more time when increasing the resolution. We recommend that you use a resolution > 1 m.
6. Select the results you want to be calculated in the **Results** area. Note that the calculation process takes more time, the more results you select.
7. Click **OK** to confirm the current settings and to close the **System Configuration** window.

5.8 Define Prediction Area

The prediction area is displayed as a red rectangle in the working area. The default prediction area comprises the entire database you imported from WiNCMod.



Tip

If possible, we recommend that you narrow the prediction area for large databases with a high level of detail to reduce the time for the calculation.



Define Prediction Area

1. Click  **Define Prediction Area** in the **Project Toolbar** or choose **Project > Define Prediction Area (Rectangle)**.
2. Click into the working area and draw a rectangle.
3. Click into the working area to define the new prediction area.

↳ The new prediction area is displayed as a red rectangle in the working area.

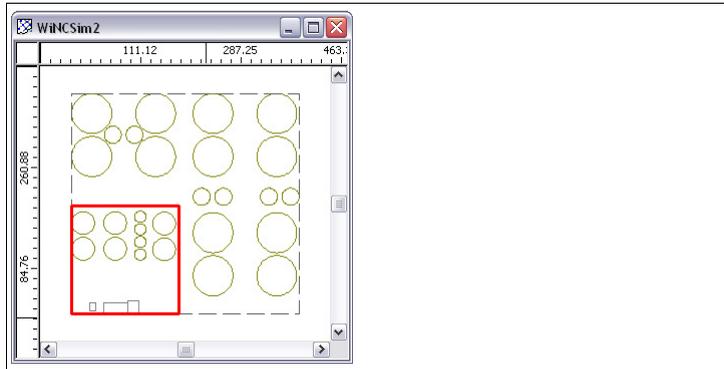


Figure 5.6 Top view

5.9 Insert *WirelessHART* Devices

Available Devices

Device Icon	Description
 WHA GW *	<i>WirelessHART</i> gateway
 WHA ADP *	<i>WirelessHART</i> adapter

Device Icon	Description
 WHA UT *	<i>WirelessHART</i> temperature converter
 WHA Generic *	Generic <i>WirelessHART</i> device

Directional antennas are displayed as an arrow, while omnidirectional antennas are displayed as a circle. Note that the antenna types of the *WirelessHART* gateway, *WirelessHART* adapter, and *WirelessHART* temperature converter are already predefined. You can edit the antenna settings such as its orientation in the object parameters. See chapter 5.11

The following table shows the relationship between the orientation of the device icons in WiNCSim and the actual orientation of the device.

Device Orientation

Icon Orientation	Device Orientation		
	 <i>WirelessHART</i> adapter	 <i>WirelessHART</i> temperature converter	
	 <i>WirelessHART</i> gateway		
	 <i>WirelessHART</i> adapter	 <i>WirelessHART</i> temperature converter	 <i>WirelessHART</i> gateway

For detailed information on the antenna gain, see **Installation > Antenna Characteristics** in the manual of the device.



Insert Device

1. Click  **Insert Object** or choose **Project > Object > Insert** to insert a new device into the working area.
2. Click into the working area to insert a device.
↳ The **Insert new Node** window appears.
3. Enter the height in which the *WirelessHART* device is located in the **z** box.
We recommend that you add 10 cm to the actual height in which the device is located, because the antenna sticks out of the device. Furthermore, if adding 10 cm in height, you can make sure that the device is not located inside a wall or ceiling, which might falsify the results.
If the device is located on a metal surface, we recommend that you add 30 cm to the actual height, to take into account the reflection of the material.
4. Select the device type in the **Object** drop-down list, for example **WHA GW** for a *WirelessHART* gateway.
5. To edit further details, such as the antenna position, click **Edit Settings**. See chapter 5.11
6. Click **OK** to insert the device at the specified location.

↳ The device icon is displayed in the working area.

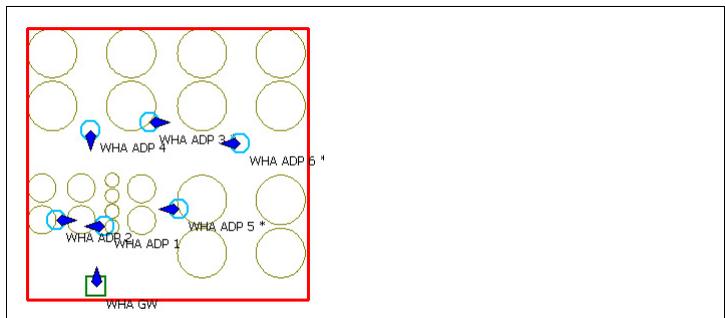


Figure 5.7 Top view of the *WirelessHART* devices

5.10 Import Instrument List from *WirelessHART* Gateway

Instead of inserting the devices manually, you can import an instrument list from the *WirelessHART* gateway.

Import Instrument List

1. You can use the web interface or the device type manager (DTM) of the *WirelessHART* gateway to create an instrument list. If using the DTM, you can also choose **Import Project Tree** to import the devices from the PACTware™ project tree into the instrument list of the *WirelessHART* gateway. For more information, see the manual of the *WirelessHART* gateway.

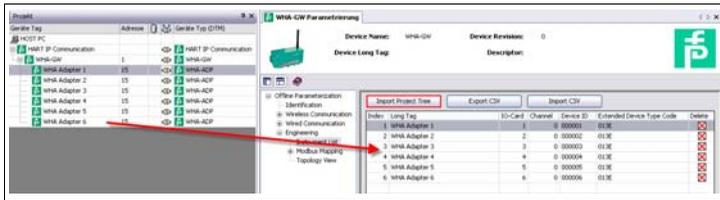


Figure 5.8 Import project tree

2. In the menu tree of the web interface or the DTM of the *WirelessHART* gateway navigate to the **Instrument List** and click **Export CSV** and save the CSV file locally.
3. In WiNCsIm choose **File > Import > Object Data > Customer Specific > Instrument List File** and import the CSV file you exported from the *WirelessHART* gateway.

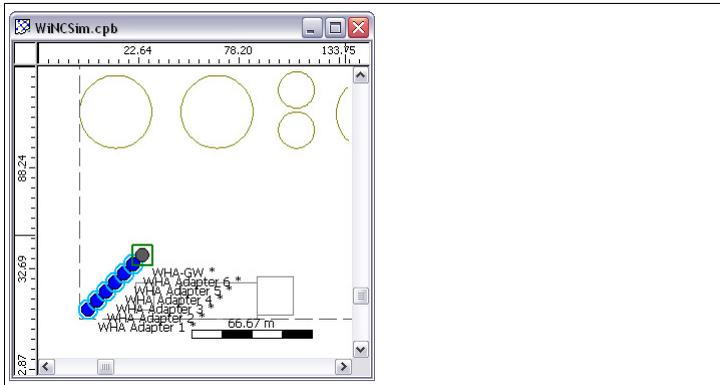


Figure 5.9 Imported instrument list

↳ The *WirelessHART* devices are inserted in the lower left corner of the working area.

4. To move the devices in the working area, use the  **Move Object** button.

- To check the device properties and adjust the height in which the device is located, right-click the device using the  **Select Objects** tool and select **Properties**.

5.11 Edit *Wireless*HART Devices

Edit Device Parameters

- Click  **Edit Object** in the **Project Toolbar** and click a device in the working area or select a device in the working area, then right-click the device and select **Properties**.

↳ The **Node Configuration** window appears.

- Enter a name for the device in the **Name** box in the **General** area. The device name is displayed in the working area.
- To change the device type, select a device type from the **Type** drop-down list in the **General** area.
- To change the location of the *Wireless*HART device, for example, the height in which the device is located, click **Edit** in the **Location** area.

↳ The **Location Configuration** window appears.

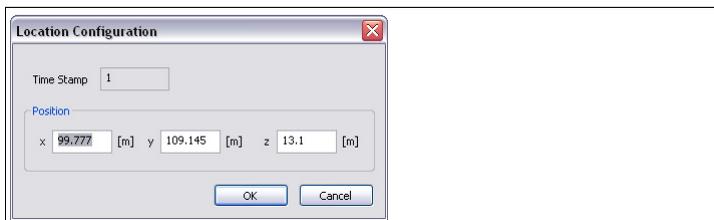


Figure 5.10 **Location Configuration** window

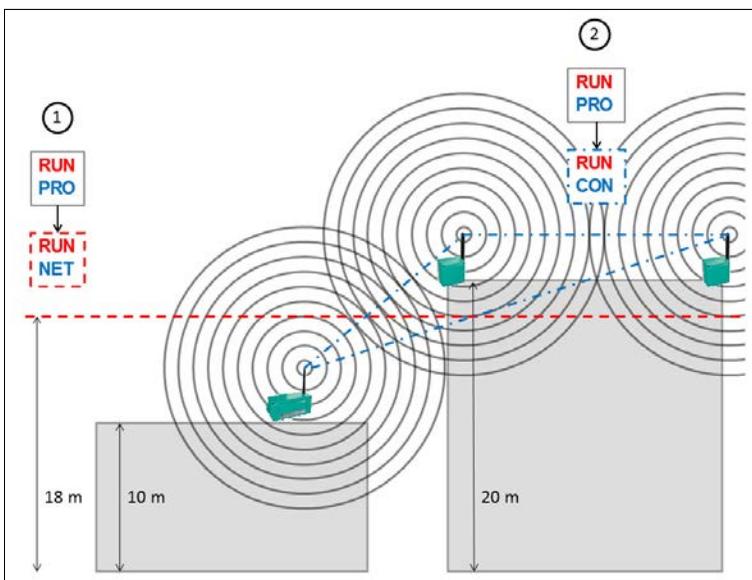
- Specify the coordinates of the device, for example the height in which the device is mounted.
We recommend that you add 10 cm to the actual height in which the device is located, because the antenna sticks out of the device. Furthermore, if adding 10 cm in height, you can make sure that the device is not located inside a wall or ceiling, which might falsify the results.
If the device is located on a metal surface, we recommend that you add 30 cm to the actual height, to take into account the reflection of the material.
Click **OK** to close the **Location Configuration** window.
- To edit the antenna characteristics of a *Wireless*HART device, click **Edit** in the **Transceiver** area.
↳ The **Transceiver Configuration** window appears.
- Make sure that the **Enabled** option in the **General** area is activated. Otherwise the *Wireless*HART device is deactivated.
- The **Transmitter** and **Receiver** areas enable you to define detailed transmission settings.

9. To change the antenna type, select **Directional Antenna** or **Omnidirectional (Isotropic) Antenna** in the **Antenna** area. Note that the antenna types of the *WirelessHART* gateway, *WirelessHART* adapter, and *WirelessHART* temperature converter are already predefined. For devices using a bidirectional antenna, you can specify the antenna orientation in the **Orientation** area.
10. Click **OK** to confirm the current settings and close the **Transceiver Configuration** window.
11. Click **OK** to close the **Node Configuration** window.

5.12

Perform Simulations

After the working area has been configured and the *WirelessHART* devices have been placed into the working area, you can start the simulation runs.



1. **Network Prediction** ^{RUN}NET indicates the overlapping of signals for a defined height, for example, 18 m. Therefore, you must first calculate wave propagation of all signals for the desired height. To do so, calculate **Wave Propagation** ^{RUN}PRO for a selected area using the **Dominant Path Model** or the **Multi-Wall Model (COST 231)**.
2. **Connectivity Prediction** ^{RUN}CON is based on three-dimensional wave propagation. Therefore, you must first calculate three-dimensional wave propagation for each *WirelessHART* device. To do so, calculate **Wave Propagation** ^{RUN}PRO for the node locations using **3D Standard Ray Tracing (SRT)**.

5.12.1 Network Prediction



Simulate Network

1. Click  **Project Parameter** in the **Project Toolbar** or choose **Project > Parameter**.
2. Select the **Prediction** tab.
3. Activate **Total Area** or **Rectangular Area** in the **Simulation Area** area.
4. Enter the height for which the results will be calculated in the **Prediction Height(s)** box. You can also specify multiple heights at a time. Note that you must use a dot as decimal separator and a space character to separate multiple values.
5. Select **Dominant Path Model** or **Multi-Wall Model (COST 231)** in the **Prediction Model** area.
6. Click **OK**.
7. Click  **Compute Propagation** to calculate wave propagation for the selected height.

↳ The calculation is in progress as long as the status bar displays **Engine Busy** .

8. After wave propagation has been calculated, click  **Compute Network** or choose **Computation > Compute All > Network**.

↳ The **Output** window on the bottom of the screen shows the progress of the calculation.

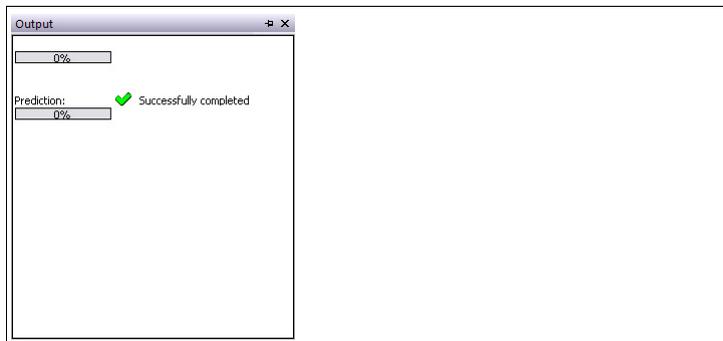


Figure 5.11 Output window



Display Results



Note!

The results of previous simulations are not deleted automatically. Right-click the result folder and click **Erase Data** before you perform a new simulation or if you are using the same folder for different projects.

1. Use the **File Browser** on the left side of the screen to display the results.
2. To display wave propagation for a selected device, select a result from the **propagation** folder.

↳ The propagation for the selected device is displayed.

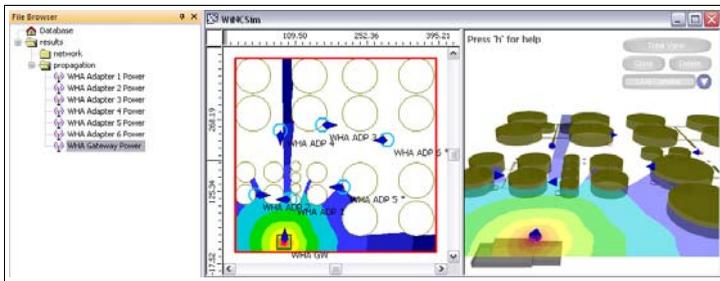


Figure 5.12 Wave propagation for individual devices

3. To display the entire network, select **Max Received DL Power** from the **network** folder.

↳ The network coverage is displayed.

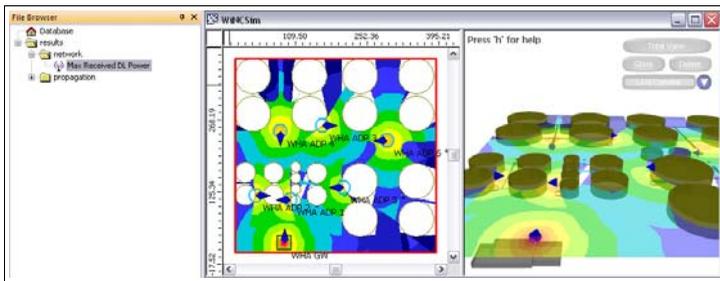


Figure 5.13 Network prediction

5.12.2 Connectivity Prediction



Simulate Connectivity

1. Click  **Project Parameter** in the **Project Toolbar** or choose **Project > Parameter**.
2. Select the **Prediction** tab.
3. Activate **Node Locations** in the **Simulation Area** area and select the **3D Standard Ray Tracing (SRT)** model in the **Prediction Model** area.
4. Click **OK**.
5. Click  **Compute Propagation** to calculate three-dimensional wave propagation for all devices.

↳ The calculation is in progress as long as the status bar displays **Engine Busy Engine Busy**.

6. After wave propagation has been calculated, click  **Compute Connectivity** or choose **Computation > Compute All > Connectivity**.

↳ The **Output** window on the bottom of the screen shows the progress of the calculation.

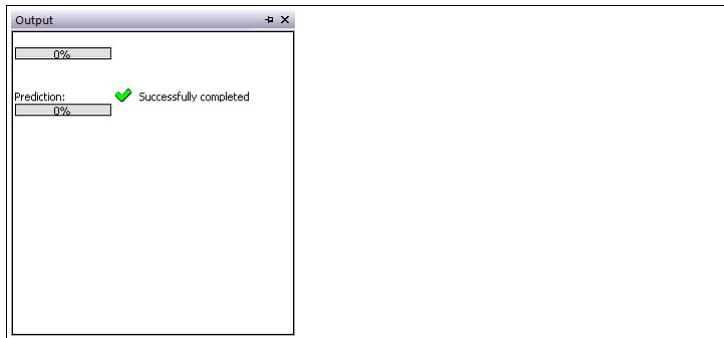


Figure 5.14 **Output** window



Display Results



Note!

The results of previous simulations are not deleted automatically. Right-click the result folder and click **Erase Data** before you perform a new simulation or if you are using the same folder for different projects.

1. Click **File Browser** on the left side of the screen.

↳ The **File Browser** appears.



Figure 5.15 File Browser window

2. Open the **network** folder and select the **WirelessHART Network Connectivity** entry.
3. Click **Show Paths** in the **Edit Toolbar** or choose **Edit > Show Paths**.
4. Select a **WirelessHART** device in the working area to display its connections to other devices.

↳ The connections of the selected device are displayed.

In this example, you can see that the gateway is connected to three adapters **WHA ADP 2**, **WHA ADP 1**, **WHA ADP 5** via direct connections (blue connection lines) and to three more adapters **WHA ADP 4**, **WHA ADP 3**, **WHA ADP 6** via indirect connections (green connection lines).

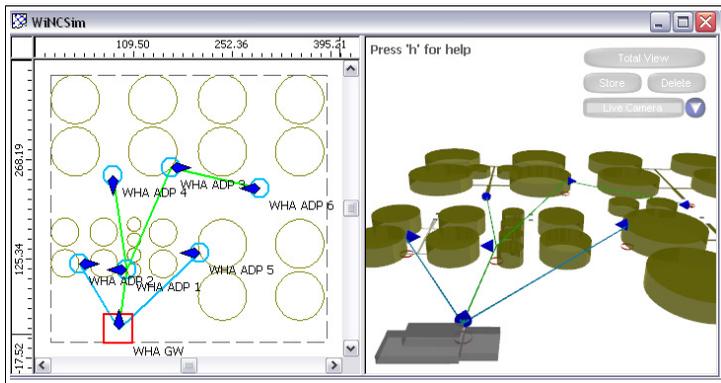


Figure 5.16 Connectivity prediction for *WirelessHART* gateway **WHA GW**

5. You can change the paths that are displayed by changing the **Display** settings in the global settings. See chapter 5.6
For example, if you select **Paths to gateway/router nodes** and select the adapter **WHA ADP 6** you see that it is connected to the gateway via the adapters **WHA ADP 3** and **WHA ADP 1**.

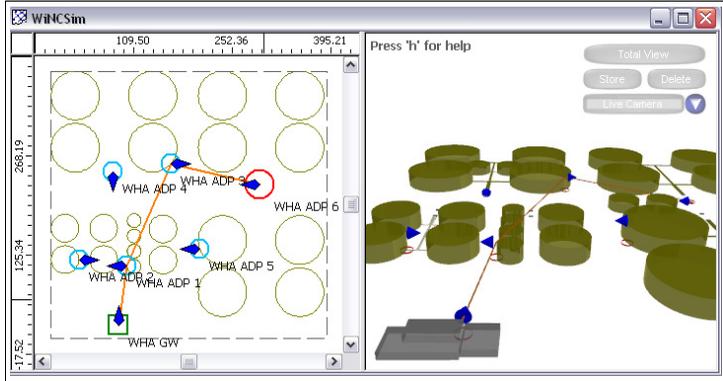


Figure 5.17 Connectivity prediction for *WirelessHART* adapter **WHA ADP6**

5.13

Analyze Results



Use the Color Legend

1. Use the **File Browser** on the left side of the screen to display the network results.
2. Make sure the color legend for the dBm ranges is available. If not, click  **Show Legend** to display the color legend.
3. Use the color legend to identify the transmitter power in a defined area.

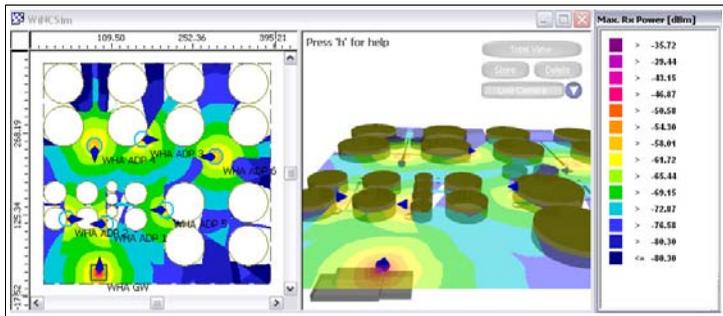


Figure 5.18 Analyze results using the color legend



Tip

You can customize the color legend in the global settings. See chapter 5.6



Use the Status Bar

1. Use the **File Browser** to display the network results.
2. Move the cursor over the results in the working area. The status bar on the bottom of the screen displays the exact dBm value for the current cursor position. This enables you to determine more accurate values for any position in the working area.

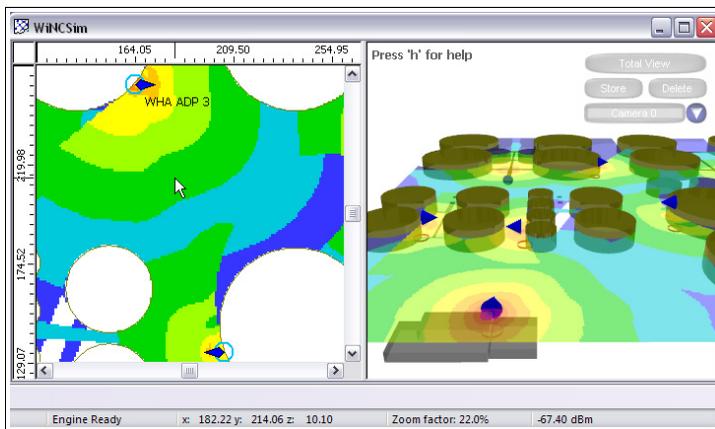


Figure 5.19 Analyze results using the status bar



Note!

Although the status bar provides more accurate results for any position, keep in mind that the overall accuracy depends on the the resolution you defined in the project parameters. See chapter 5.7



Define Signal Threshold

1. Use the **File Browser** to display the network results.
2. Click  **Show Threshold** in the **Edit Toolbar** or choose **Edit > Show Threshold**.
 - ↳ The **Received Power** window appears.
3. Enter a threshold value in the **Value** box. Because the minimum required signal level for the *WirelessHART* adapters is -85 dBm, you can for example define a threshold of -75 bBm.
4. Click **OK** to close the **Received Power** window.
 - ↳ The color legend in the working area and in the 3-D view are updated automatically according to the defined threshold. Values above this threshold are automatically displayed in green, values below are displayed in red.

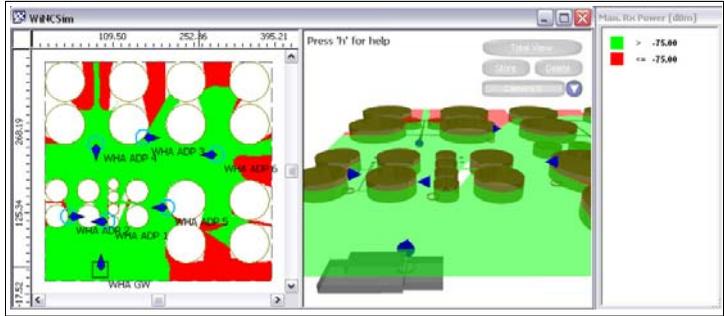


Figure 5.20 Analyze results using a customized color legend



Note!

All results must be considered in connection with the prediction height that you specified in the project parameters. In this example, the prediction height is above the small storage basins (10 m) and the adapter (WHA-ADP 4) is on the ground (0 m). The storage basins are not displayed in the working area, because they are not part of the prediction area, but nevertheless they represent an obstacle for the signal of the adapter. The red area indicates that the signal level is below the selected threshold.

WiNCsim enables you to calculate the results for multiple prediction heights at a time. See chapter 5.7

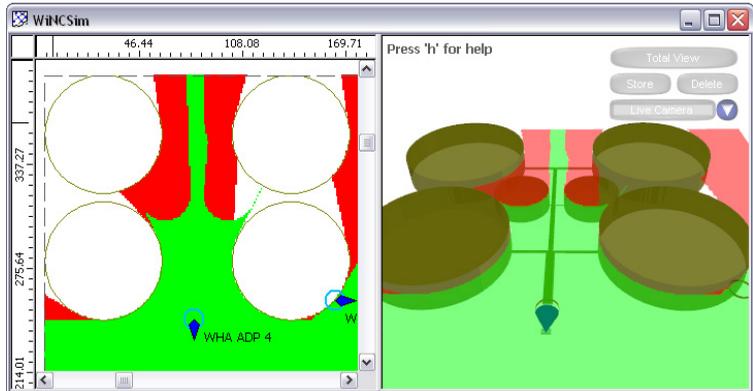


Figure 5.21 Network prediction in a prediction height of 10 m



Use the Log File

1. Go to the result directory that you specified during the creation of the project. See chapter 5.1
2. Open the **network** directory.
3. Open the **MeshLinkData.txt** log file.

↳ This file contains detailed information on each network device, for example the exact coordinates of the mounting positions, or information on the connections to neighboring devices.

```

*****
Service: Default Service
*****
----- Source Node -----
Name: WHA GW
Location: x = 87.555m, y = 24.423m, z = 10.1m

----- Available Links -----
*Name of Target Node      Name of Transceiver      Link Type      Number of Hops[#] Ma
WHA ADP 1  WHA Adapter 1  Direct Neighbour  0      -81.688      2.857e+002
WHA ADP 2  WHA Adapter 2  Direct Neighbour  0      -84.392      3.683e+002
WHA ADP 3  WHA Adapter 3  Multiple Hops     1      -86.089      1.000e+007
WHA ADP 4  WHA Adapter 4  Multiple Hops     1      -86.573      1.000e+007
WHA ADP 5  WHA Adapter 5  Direct Neighbour  0      -87.055      5.368e+002
WHA ADP 6  WHA Adapter 6  Multiple Hops     2      -86.417      2.000e+007
*****

----- Source Node -----
Name: WHA ADP 1
Location: x = 99.777m, y = 109.145m, z = 13.3m

----- Available Links -----
*Name of Target Node      Name of Transceiver      Link Type      Number of Hops[#] Ma
WHA GW      WHA Gateway Direct Neighbour  0      -81.688      2.857e+002
WHA ADP 2  WHA Adapter 2  Multiple Hops     1      -84.392      1.000e+007
WHA ADP 3  WHA Adapter 3  Direct Neighbour  0      -86.089      5.364e+002
    
```

Figure 5.22 Log file

5.14 Export Instrument List and Topology View to the *WirelessHART* Gateway

After you have determined the optimal position for each *WirelessHART* device, you can export an updated instrument list for the *WirelessHART* gateway. In addition to the instrument list, WiNCSim creates a second CSV file containing the positions for each device.



Example!

If you added additional devices during simulation, for example, if you added several adapters that act as repeaters, you can easily import all devices into the instrument list of the *WirelessHART* gateway. Furthermore, you can also update the topology view by importing the CSV file with the device positions.



Update Instrument List of the *WirelessHART* Gateway

1. In WiNCSSim choose **File > Export > Object Data > Customer Specific > Instrument List File**.
 - ↳ WiNCSSim automatically creates two CSV files. The first CSV file contains the instrument list. The second CSV file is automatically gets the extension **Topology** and contains the device positions.
2. In the menu tree of the web interface or the DTM of the *WirelessHART* gateway navigate to the **Instrument List** and click **Import CSV**. Note that the import will overwrite an existing instrument list.
 - ↳ All devices from the working area in WiNCSSim have been transferred into the instrument list of the *WirelessHART* gateway.



Update Topology View of the *WirelessHART* Gateway

1. Make sure you have the CSV file with the extension **Topology** that resulted from the export of the instrument list. If not, choose **File > Export > Object Data > Customer Specific > Instrument List File** in WiNCSSim to create this CSV file.
2. In WiNCSSim choose **File > Export > Map Data > Image File**.
 - ↳ The **Export to Image File** window appears.
3. Enter the path and file name for the background image in the **General** area.
4. Select **Export 2D View** and **Create Geo Reference for Image** in the **Export** area and click **OK**.
 - ↳ The current view of the working area is saved as an image with embedded coordinates.
5. In the menu tree of the web interface or the DTM of the *WirelessHART* gateway navigate to the **Topology View**.
6. Click **Select Map** and open the background image you exported using WiNCSSim.
 - ↳ The background image is integrated into the topology view.

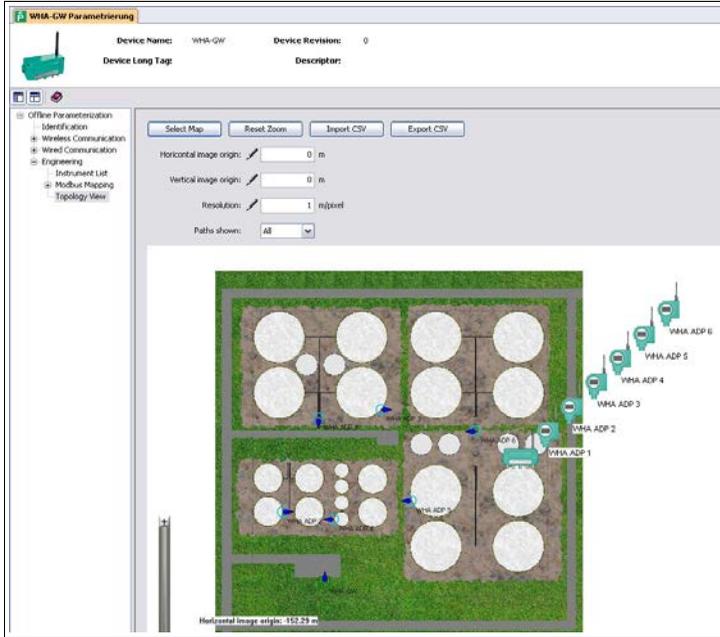


Figure 5.23 Topology View with background image

- Transfer the coordinates that are displayed in the lower left corner of the background image into the **Horizontal image origin**, **Vertical image origin**, and **Resolution** fields.



Figure 5.24 Coordinates for the image origin

- Click **Import CSV** and open the CSV file with the extension **Topology** containing the positions for each device.

↳ The devices are automatically aligned according to the positions that have been determined in WiNCSSim.

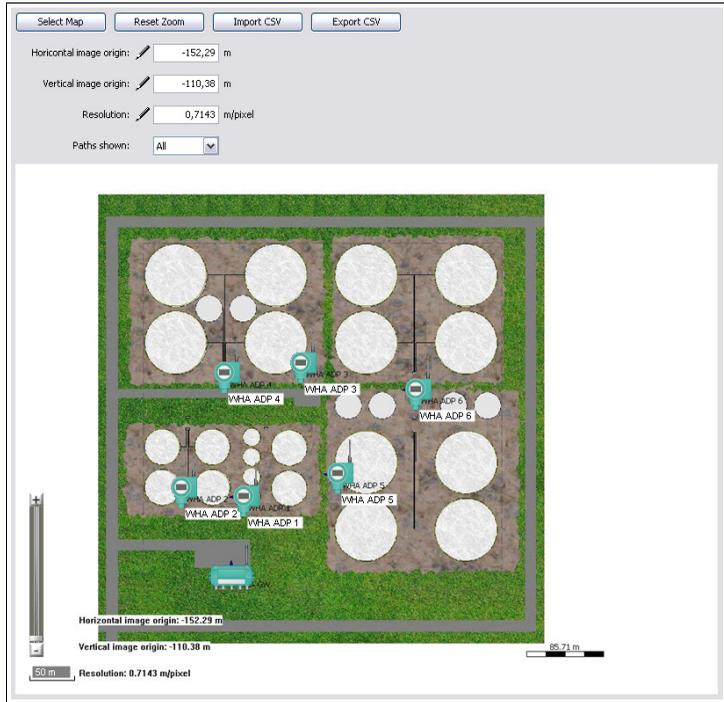


Figure 5.25 *WirelessHART* devices have been aligned in the **Topology View**

6 WiNCsim Tutorial

This tutorial describes how to calculate network prediction and connectivity prediction for the factory site created in WiNCMod.

Create a New Project

Note!

Note that you need a license key in order to handle large projects. If the WiNCMod database is not displayed correctly, check if your USB hardware key is working correctly.

We recommend that you select a display height for the working area that intersects most objects. If you are missing an object in the working area, select another display height. See chapter 5.6

1. Click  **New Project** or choose **File > New Project**.
2. Click **Browse** in the **Databases & Parameters** area.
3. Select a WiNCMod database file and click **Open**.
4. Click **OK**.

↳ The WiNCMod database is displayed in the working area.

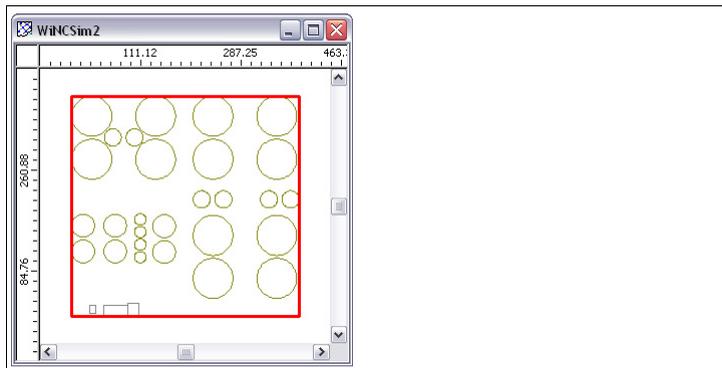


Figure 6.1 Top view

Insert Devices

Note!

Note that you need a license key in order to insert multiple *WirelessHART* devices. If you cannot insert a new device, check if your USB hardware key is working correctly.

1. Zoom into the working area. See chapter 3.9

- Click  **Insert Object** to insert a *WirelessHART* device into the working area.

↳ The **Insert new Node** window appears.

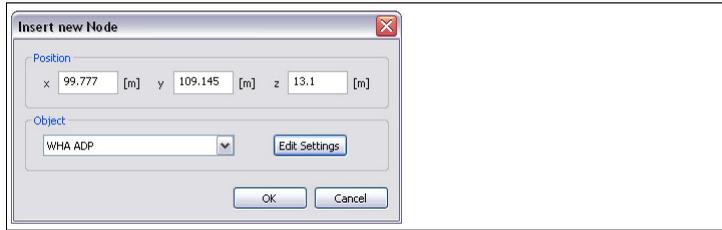


Figure 6.2 **Insert New Node** window

- Enter the height in which the *WirelessHART* device is located in the **z** box, for example 10.10 m for the *WirelessHART* gateway, which is mounted on the roof top of the storehouse (10 m).
We recommend that you add 10 cm to the actual height in which the device is located, because the antenna sticks out of the device. Furthermore, if adding 10 cm in height, you can make sure that the device is not located inside a wall or ceiling, which might falsify the results.
If the device is located on a metal surface, we recommend that you add 30 cm to the actual height, to take into account the reflection of the material.
- Select the device type in the **Object** drop-down list, for example **WHA GW** for a *WirelessHART* gateway. See chapter 5.9
- To edit further details, such as the antenna position, click **Edit**. See chapter 5.11
- Click **OK** to insert the device at the specified location.

↳ The device icon is displayed in the working area.

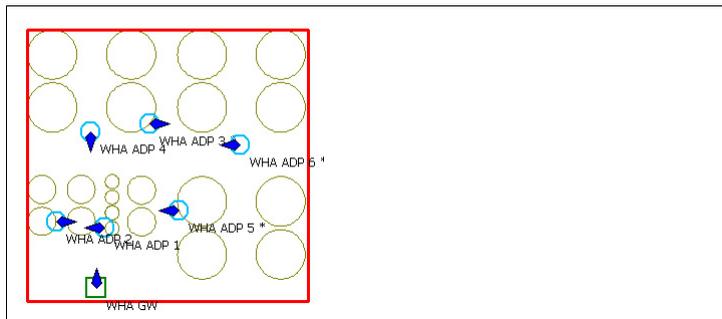


Figure 6.3 Top view of the *WirelessHART* devices

Import Devices from *WirelessHART* Gateway



Note!

Note that you need a license key in order to insert multiple *WirelessHART* devices. If you cannot insert a new device, check if your USB hardware key is working correctly.

1. You can use the web interface or the device type manager (DTM) of the *WirelessHART* gateway to create an instrument list. If using the DTM, you can also choose **Import Project Tree** to import the devices from the PACTware™ project tree into the instrument list of the *WirelessHART* gateway.

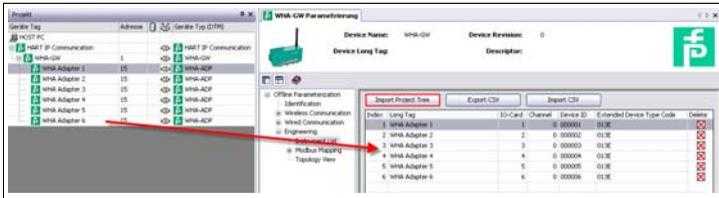


Figure 6.4 Import project tree

2. In the menu tree of the web interface or the DTM of the *WirelessHART* gateway navigate to the **Instrument List** and click **Export CSV** and save the CSV file locally.
3. In WiNCsim choose **File > Import > Object Data > Customer Specific > Instrument List File** and import the CSV file you exported from the *WirelessHART* gateway.

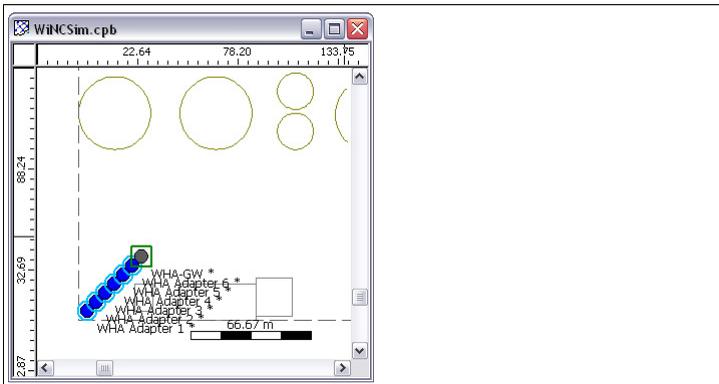


Figure 6.5 Imported instrument list

↳ The *WirelessHART* devices are inserted in the lower left corner of the working area.

4. To move the devices in the working area, use the  **Move Object** button.
5. To check the device properties and adjust the height in which the device is located, right-click the device using the  **Select Objects** tool and select **Properties**.



Simulate Network

1. Click  **Project Parameter** in the **Project Toolbar** or choose **Project > Parameter**.
2. Select the **Prediction** tab.
3. Activate **Total Area** in the **Simulation Area** area.
4. Specify the height for which the results will be calculated, for example 10.10 m because the *WirelessHART* gateway is mounted in this height. Enter the height in the **Prediction Height(s)** box in the **Simulation Area** area.
5. Select **Dominant Path Model** or **Multi-Wall Model (COST 231)** in the **Prediction Model** area. See chapter 5.7
6. Click **OK**.
7. Click  **Compute Propagation** to calculate wave propagation for the selected height.

↳ The calculation is in progress as long as the status bar displays **Engine Busy** .

8. After wave propagation has been calculated, click  **Compute Network** or choose **Computation > Compute All > Network**.

↳ The **Output** window on the bottom of the screen shows the progress of the calculation.

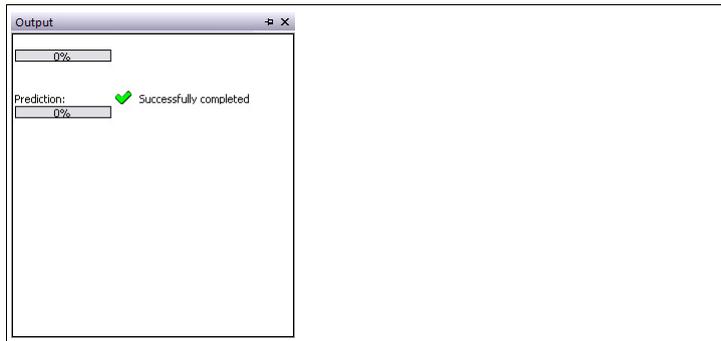


Figure 6.6 **Output** window



Simulate Connectivity

1. Click  **Project Parameter** in the **Project Toolbar** or choose **Project > Parameter**.
2. Select the **Prediction** tab.
3. Activate **Node Locations** in the **Simulation Area** area.
4. Select the **3D Standard Ray Tracing (SRT)** prediction model. See chapter 5.7
5. Click **OK**.
6. Click  **Compute Propagation** to calculate three-dimensional wave propagation for all devices.
↳ The calculation is in progress as long as the status bar displays **Engine Busy** .
7. After wave propagation has been calculated, click  **Compute Connectivity** or choose **Computation > Compute All > Connectivity**.
↳ The **Output** window on the bottom of the screen shows the progress of the calculation.

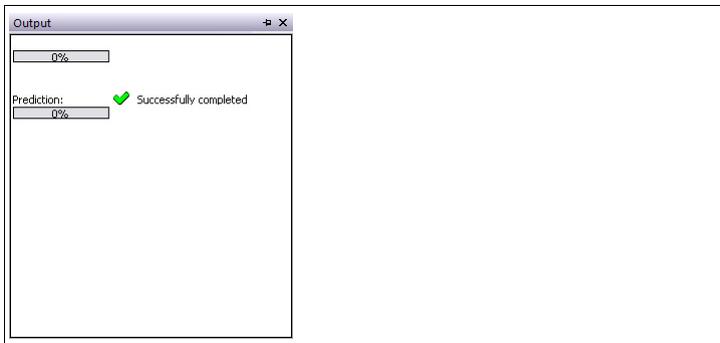


Figure 6.7 **Output** window



Analyze Results

1. Use the **File Browser** on the left side of the screen to display the results.
2. To display wave propagation for a selected device, select a result from the **propagation** folder.

↳ The propagation for the selected device is displayed.

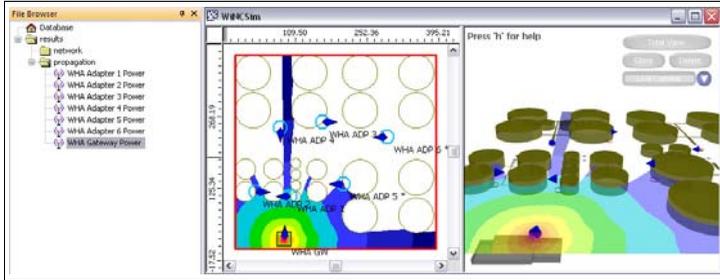


Figure 6.8 Wave propagation for individual devices

3. To display the entire network, select **Max Received DL Power** from the **network** folder.

↳ The network coverage is displayed.

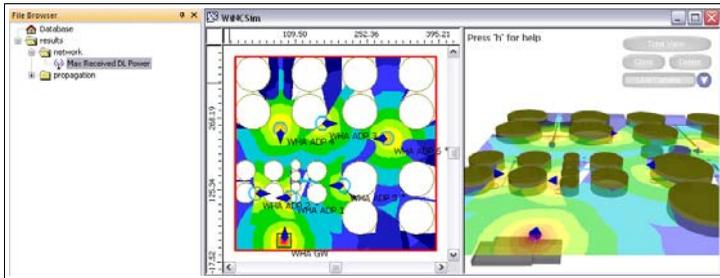


Figure 6.9 Network prediction

4. To display connectivity between the *WirelessHART* devices, open the **network** folder and select the **WirelessHART Network Connectivity** entry.
5. Click  **Show Paths** in the **Edit Toolbar** or choose **Edit > Show Paths**.
6. Select a *WirelessHART* device in the working area.

↳ The connections of the selected device are displayed.

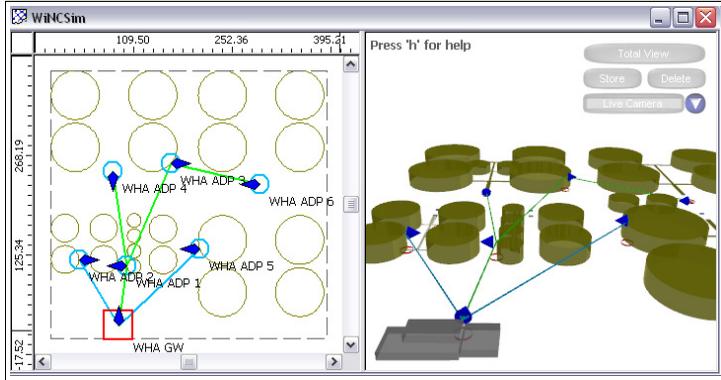


Figure 6.10 Connectivity prediction for *WirelessHART* gateway **WHA GW**



Note!

You can change the display settings and the color palette for the results on the **Display** and **Display 3D** tabs in the global settings. Click  **Change Settings** or choose **Edit > Settings** to define the global settings. See chapter 5.6



Tip

Click  **Show Threshold** in the **Edit Toolbar** or choose **Edit > Show Threshold** to define a signal threshold. Values above this threshold are automatically displayed in green, values below are displayed in red.

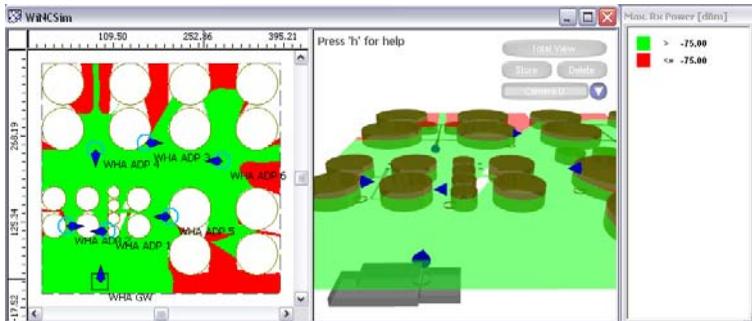


Figure 6.11 Analyze results using a customized color legend



Save Project

1. Choose **File > Save As** to save the project including the results of the simulations.
2. Enter a file name and click **Save**.



Update Instrument List of the *WirelessHART* Gateway

1. In WiNCSim choose **File > Export > Object Data > Customer Specific > Instrument List File**.
↳ WiNCSim automatically creates two CSV files. The first CSV file contains the instrument list. The second CSV file is automatically gets the extension **Topology** and contains the device positions.
2. In the menu tree of the web interface or the DTM of the *WirelessHART* gateway navigate to the **Instrument List** and click **Import CSV**. Note that the import will overwrite an existing instrument list.
↳ All devices from the working area in WiNCSim have been transferred into the instrument list of the *WirelessHART* gateway.



Update Topology View of the *WirelessHART* Gateway

1. Make sure you have the CSV file with the extension **Topology** that resulted from the export of the instrument list. If not, choose **File > Export > Object Data > Customer Specific > Instrument List File** in WiNCSim to create this CSV file.
2. In WiNCSim choose **File > Export > Map Data > Image File**.
↳ The **Export to Image File** window appears.
3. Enter the path and file name for the background image in the **General** area. Select **Export 2D View** and **Create Geo Reference for Image** in the **Export** area and click **OK**.
↳ The current view of the working area is saved as an image with embedded coordinates.
4. In the menu tree of the web interface or the DTM of the *WirelessHART* gateway navigate to the **Topology View**.
5. Click **Select Map** and open the background image you exported using WiNCSim.
↳ The background image is integrated into the topology view.

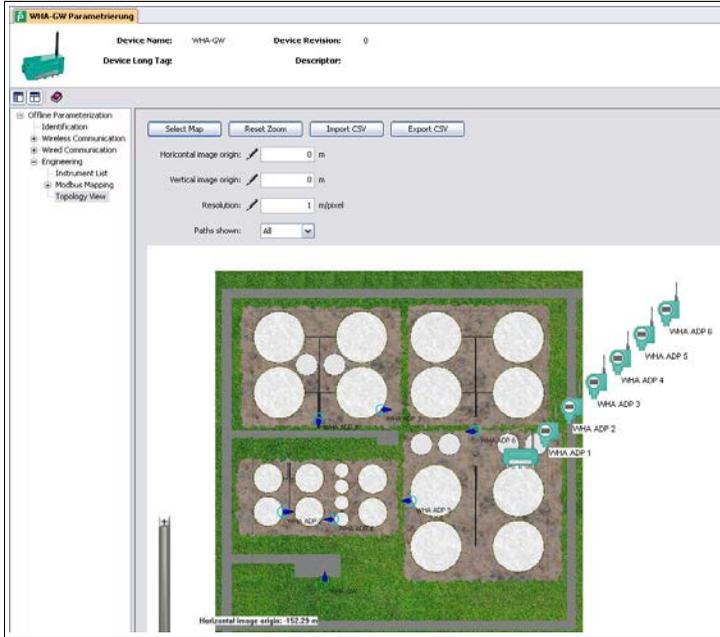


Figure 6.12 Topology View with background image

6. Transfer the coordinates that are displayed in the lower left corner of the background image into the **Horizontal image origin**, **Vertical image origin**, and **Resolution** fields.



Figure 6.13 Coordinates for the image origin

7. Click **Import CSV** and open the CSV file with the extension **Topology** containing the positions for each device.

↳ The devices are automatically aligned according to the positions that have been determined in WiNCsim.

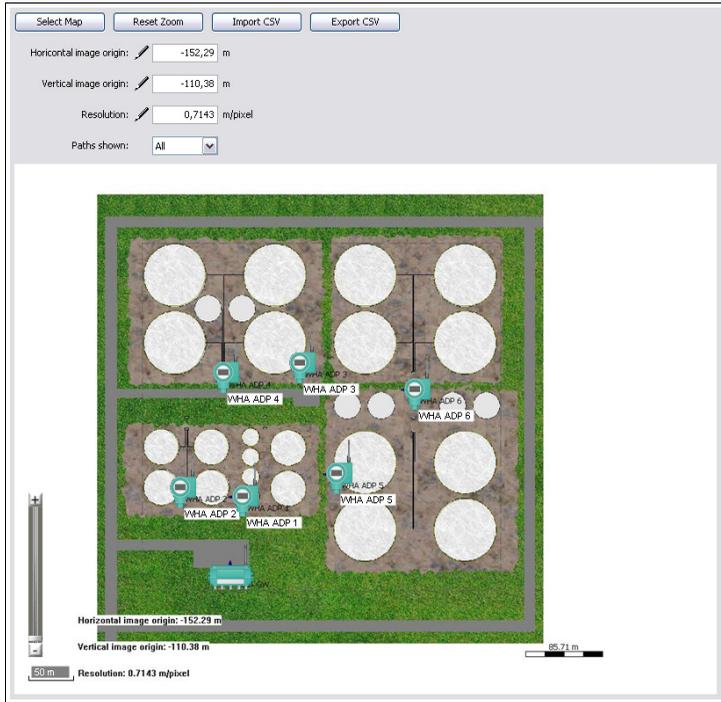


Figure 6.14 *WirelessHART* devices have been aligned in the **Topology View**

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Worldwide Headquarters

Pepperl+Fuchs GmbH
68307 Mannheim · Germany
Tel. +49 621 776-0
E-mail: info@de.pepperl-fuchs.com

For the Pepperl+Fuchs representative
closest to you check www.pepperl-fuchs.com/contact

www.pepperl-fuchs.com

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