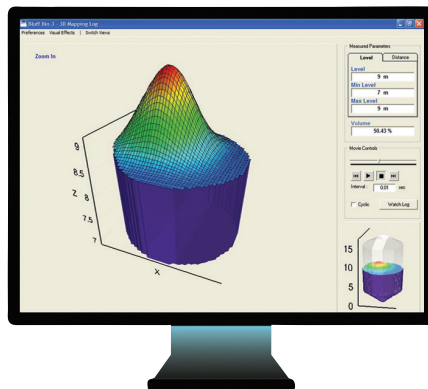


# 3D Level Scanner

# S-M-MV

## Software Operating Instructions

- **Non-contact**
- **Dust-penetrating**
- **Multiple-point measurement**
- **Optional 3D visualization**



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# 1 About this Document

This manual provides detailed product related information, installation, configuration and operation instructions for 3DLevelManager software. The manual is designed for trained personnel. Please read it entirely and carefully before proceeding with installation of the product.

## 1.1 Symbols in use

The following symbols indicate different sections of additional information as follows:



**IMPORTANT:** An indication for additional information, tips, hints or an indication of helpful additional knowledge.



**WARNING:** Indication of a potentially dangerous situation, which could result in serious injury to persons and/or damage.

## 1.2 For your safety

### Authorized Personnel

All operations described in this manual should be performed by authorized and trained personnel only. For safety and warranty reasons, any internal work on the devices must be performed by manufacturer authorized personnel only.

### Appropriate Use

The 3DLevelScanner™ is a device designed for continuous level or volume measurement.

## **Warning about Misuse**

Inappropriate or incorrect use of the device can give rise to application-specific hazards, e.g. vessels overflow or damage to system components through incorrect mounting or adjustment.

## **General Safety Instructions**

The 3DLevelScanner™ is a high technology device which requires strict observance of standard regulations and guidelines. The user must take note of the safety instructions detailed in this manual, as well as country-specific installation standards, and all common safety regulations and accident prevention rules.

---

## 2 3DLevelManager™ Overview

### 2.1 Overview

The 3DLevelManager™ software is a configuration and monitoring™ tool for managing 3DLevelScanner™ devices.

The software supports various methods for connecting to the scanners, monitoring their measurement readings, configuring their various parameters, log results and produces various types of graphical reports.

### 2.2 Features

Major features of the 3DLevelManager software:

- Supports HART, RS-485/Multi-drop, GSM, GPRS and TCP/IP communication interfaces to the linked scanners
- Supports all 3DLevelScanner models (S, M, MV and MVL) in a single or multiple scanner arrangements
- Easy to use wizard-based parameter configuration including graphical presentation and configuration aids
- Various logging options and displaying log information as time-lined graphs
- 3-Dimensional, animated graphical presentation of filling/emptying processes
- Built-in advanced analysis tools
- Fully adaptable to user preferences (measurement units, display modes)

### 2.3 System requirements

The following minimum computer system characteristics are required for 3DLevelManager to install and run properly:

#### Hardware:

- Processor: Pentium 1GHz
- Graphic resolution: Minimum 800x600
- CD-ROM drive
- Log file: 5MB/day

- At least one serial port (built in RS-232 / USB)

**Memory:**

- RAM: Minimum 64MB
- Hard drive: Minimum 1GB free memory on HD per year (if log file is enabled)

**Operating systems:**

- Windows XP SP2 with Microsoft .NET Framework 3.5 SP1 and Windows 7

---

## 3 Installation

### 3.1 Installing the software

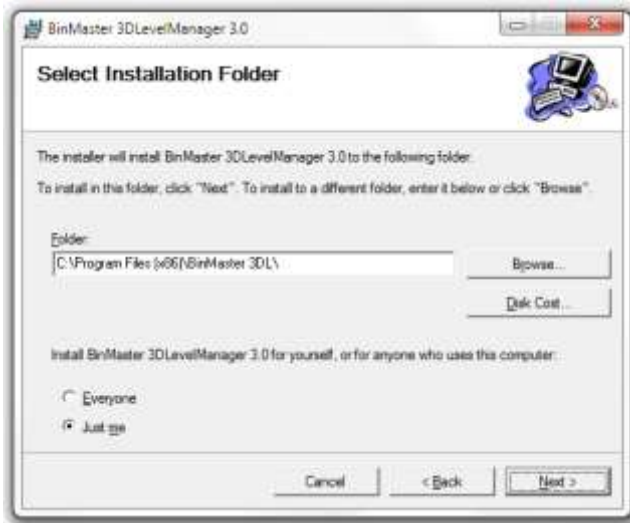
- 1 Insert the BinMaster software CD into the computer.
- 2 Auto run should start automatically (if enabled in your computer). Otherwise, browse to the CD and execute the file *BinMaster Level Scanner.msi*. The setup wizard appears as shown:



**NOTE:** If a previous version of the software is already installed on your computer, you will be offered with Repair and Remove options, for installing an updated version or completely uninstalling the software.

- 3 Click **Next** to proceed with the installation. The following screen appears:

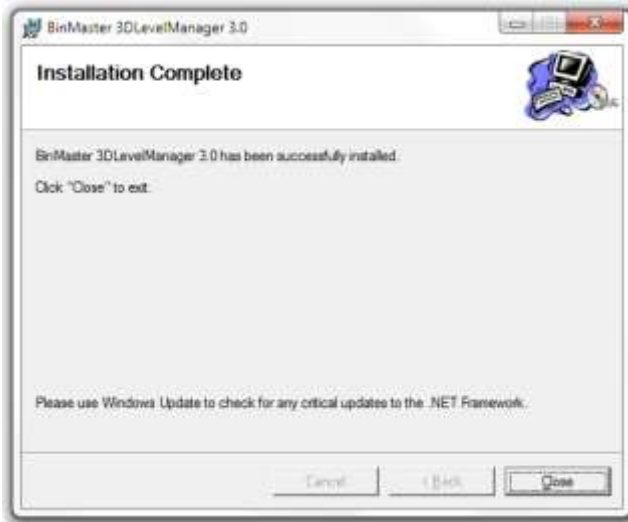




- 4 Press **Browse** to select a different installation folder if needed.
- 5 You may allow other users of this computer accessing the software by selecting **Everyone**, or limit the access for yourself only by selecting **Just me**.
- 6 Press **Next** to proceed.
- 7 Press **Next** in the Confirm Installation window appearing next, to start the installation. Wait until the installation progress is complete:



- 8 The software installation is in process, and all the necessary files are being installed in your computer. The following confirmation screen appears:



- 9 BinMaster 3DLevelManager software installation is complete. Press **Close** to exit the installation wizard.

Note the BinMaster 3DLevelManager shortcut icon which has been added to your desktop.



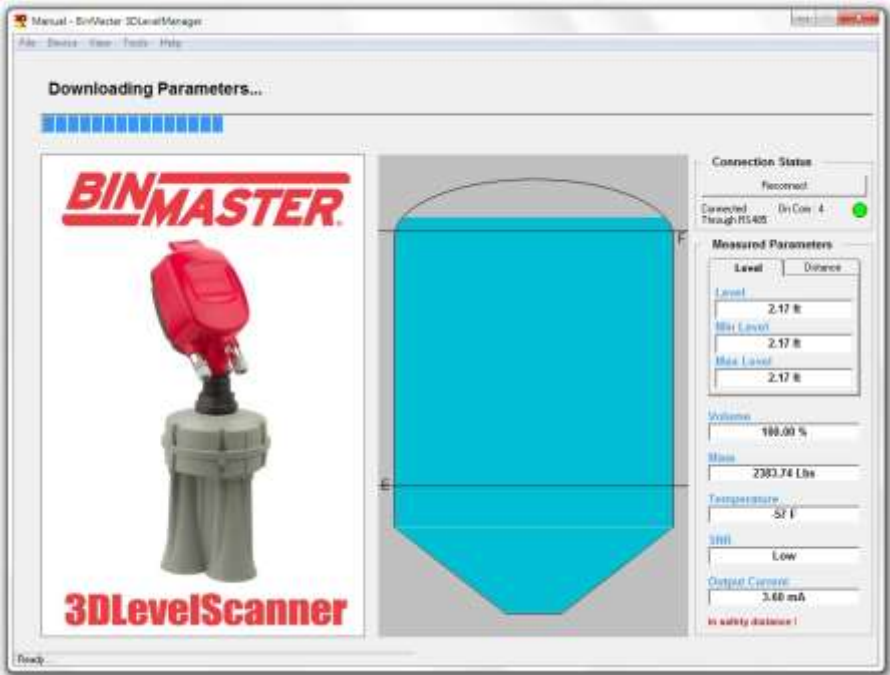
## 3.2 Understanding 3DLevelManager Basics

The 3DLevelManager software is designed for both users and technical personnel. This chapter includes an overview of the user interface and general details regarding the two modes of operation.

### Connection Status

Once a connection is established, the software downloads all parameters from the scanner. The download process may take a few seconds, during which the software will not respond and cannot be accessed.

Once a 3DLevelScanner is connected to the computer running the 3DLevelManager software, a proper connection is indicated by a green light in the Connection Status field on the upper right side of the screen in the figure below.



## Device Info

The following device information is displayed on the upper part of the screen:

- Electronic card serial number
- Firmware version of the device electronic card
- Hardware version of the device electronic card
- Hardware interfaces supported by the device
- Device type (S/M/MV/MVL)
- Communication traffic load
- Device polling address

Device Info		Hardware Interface	HART	RS-485	Traffic Load	100
Serial Number	709003549		4-20mA		Poling Address	10
Firmware Version	2.9.988		GSM + GPRS			
Hardware Version	20	Device Type	MV			

*The Device Information area*

## Measured Parameters

The following device measured parameters are displayed on the right area of the screen as shown to the right:

- **Distance** (tab): Average distance between the top of the scanner body and the material.
- **Min Distance**: Minimum distance between the top of the scanner body and the material.
- **Max Distance**: Maximum distance between the top of the scanner body and the material.
- **Level** (tab): Average level between all echoes, measured from vessel bottom.
- **Min Level**: The distance between the lowest measured echo to the vessel bottom.
- **Max Level**: The level from vessel bottom to the material's highest point (equals Empty Calibration–Min Distance).
- **Volume**: Material volume inside the vessel, in percent.
- **Mass**: Material weight/mass inside the vessel (by user chosen units). A custom field which may display mass or volume data, according to the 3DLevelScanner configuration.
- **Temperature**: Temperature level around the antennas inside the vessel.
- **SNR**: Signal-to-Noise Ratio measured inside the vessel in

Connection Status	
Reconnect	
Connected	On Com: 4
Through RS485	
Measured Parameters	
Level	Distance
Level	2.17 ft
Min Level	2.17 ft
Max Level	2.17 ft
Volume	100.00 %
Mass	2383.74 Lbs
Temperature	-57 F
SNR	Low
Output Current	3.60 mA
In safety distance !	

decibels (dB). The SNR indicates the scanner signal compared to the acoustic noise inside the vessel.

- **Output Current:** 4-20mA analog output current.

## Technician Mode

Technician mode allows configuration of advanced parameters which are not available under Viewer mode (the default operating mode). Switching to Technician mode requires a password.

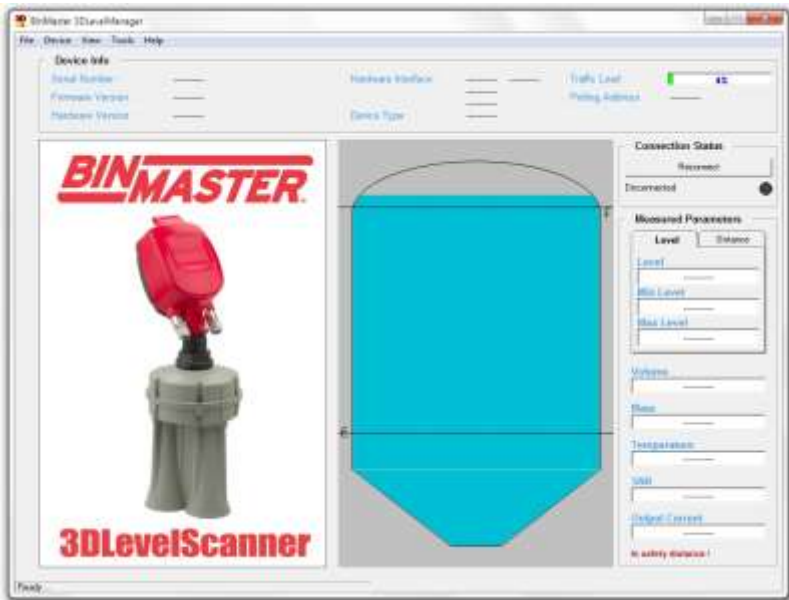
To switch to Technician mode, choose Tools → Technician Mode. You will be prompted with the Password Request box. Enter Technician mode password and press the **OK** button. The Technician mode password is **techAPM**, and it can not be changed.

For Switching back to Viewer mode, select Switch to Viewer Mode from Tools menu (no password required).

In Technician mode, there are 6 more tabs at the left area of the screen. These tabs allow viewing of parameters, modifying part of them and other useful tools such as False Echo Mapping, this document describes how to work in technician mode.

## Viewer Mode

Viewer mode is the default operating mode of the software. This mode allows connecting and disconnecting the scanner, viewing log graphs, 3D image and performing basic grades analysis. Advanced parameters configuration is disabled for this mode.



*The 3DLevelManager in Viewer Mode*

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## 4 Connecting to 3DLevelScanner™

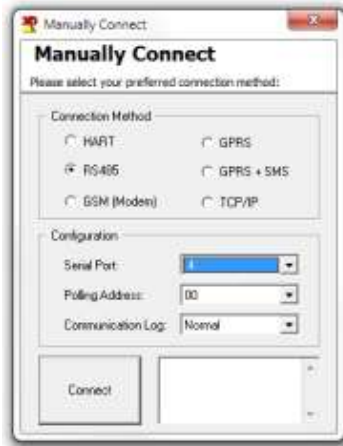
### 4.1 3DLevelScanner Connection Options

The 3DLevelManager Software enables communication with 3DLevelScanner devices using different methods: RS-485, HART, GSM Modem, GPRS Modem and TCP/IP. Communicating using an RS-485 is much faster than GSM, GPRS or via a HART connection, therefore it is recommended to use standard RS-485 as communications infrastructure.

#### Establishing a Connection

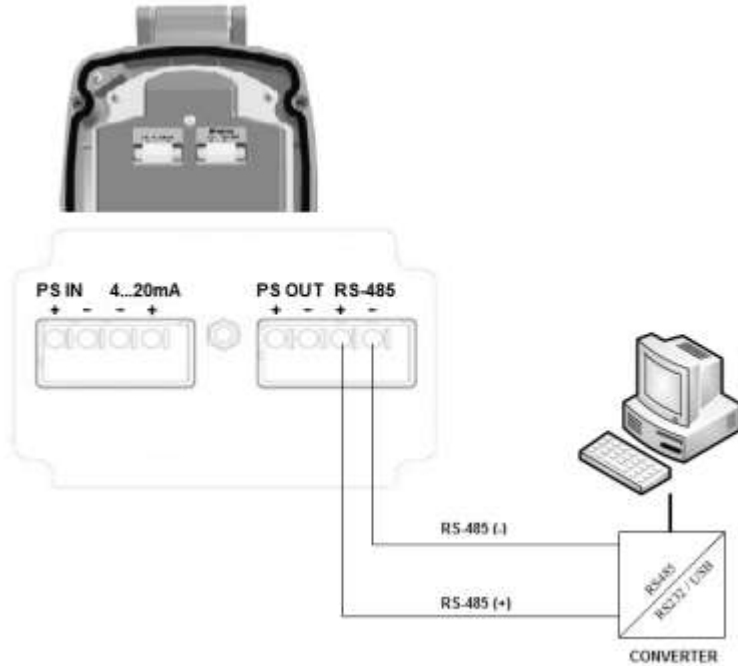
Press **Device** → **Manually Connect...** (or, click the **Reconnect** button or press **Ctrl+M**) to initiate a connection between the 3DLevelManager and the connected scanners. This opens the connection box which lets you set the required communication properties and to establish a data connection between the software and the scanner.

In the **Connection Method** field, select the communications interface used for connecting the scanner to the computer and the software. For detailed information regarding the communication options and settings, refer to *page 33: Manually Connect... / Disconnect*.



## RS485 Connection

The figure below shows a schematic connection between a PC running the 3DLevelManager software and a 3DLevelScanner, using an RS-485 connection. For more information about physical connections, refer to the *BinMaster 3DLevelScanner Operating Instructions manual*.

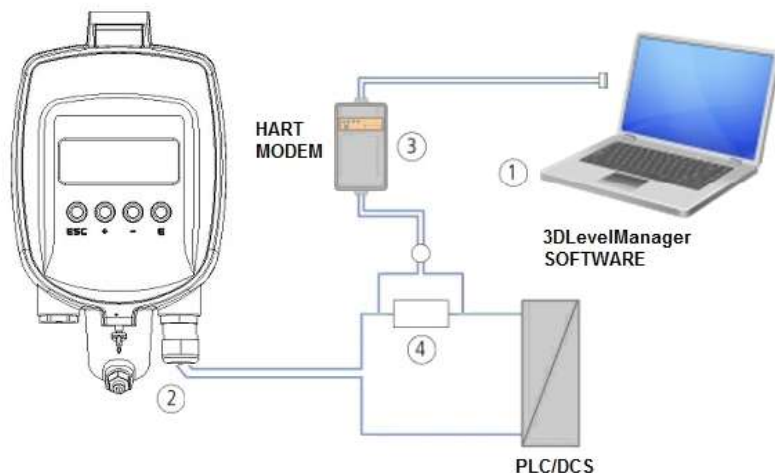


RS-485 Connection

## HART Connection

When using an RS-232/USB HART Modem, no hardware installation is required.

The figure below shows a local connection between a PC running the 3DLevelManager software and a 3DLevelScanner, using a HART modem connection.



*HART Modem Connection*

In this figure:

- 1 RS-232/USB Connection
- 2 3DLevelScanner
- 3 HART Modem
- 4 HART Resistor - 250 ohm, can be mounted on any of the 4-20mA lines

## GSM

The GSM option enables a modem to modem communication. This type of connection requires a GSM modem connected to the scanner on one side, and a GSM modem connected to the computer on the other side. The user should have the telephone number of the modem connected to the scanner.

## GPRS

The GPRS option allows IP connection to a remote 3DLinkPro with GPRS enabled. When selecting this option, a TCP port must be opened in the local network and be forwarded to the computer running the 3DLevelManager. On pressing **Connect**, an SMS message should be sent manually to the 3DLinkPro in the following format:

CALLAPM,[external IP address],[TCP Port],[APN],

A comma must end the SMS message.



## **TCP/IP**

The TCP/IP option allows converting and transferring the RS-485 data over TCP/IP using compatible converter. When establishing a connection to the TCP/IP converter, the local IP address and the TCP port values must be set to as defined in the converter.

## **GPRS Using SMS Server**

This option creates a GPRS connection without the need to send an SMS message manually. A 3DLinkPro must be connected to the local computer running the 3DLevelManager software in order to send the SMS message to the 3DLinkPro connected to the scanner.

## **Multiple Scanner Connection**

When connecting several scanners in a Daisy-Chain, the 3DLevelManager can be connected to all scanners and specific scanner may be chosen to be viewed any time. For this type of connection, each scanner must be set with a different polling address. One scanner must be set with a polling address of 00.

## **Using the Phonebook**

The 3DLevelManager stores a file named phonebook.txt which contains all connections and their properties. This feature can be used for GSM, GPRS or TCP/IP connection options.

For viewing and editing the phonebook, select **Browse to local folder** from the **File** menu, and select the file 'phonebook.txt'. Each connection entry should start in a new line and with a different name.

---

# 5 First-time Configuration

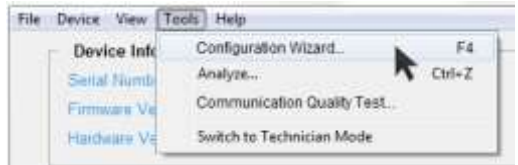
## 5.1 Configuration Wizard

Use the 8-stage configuration wizard for first-time configuration of the 3DLevelScanner.



**NOTE:** Prior to 3DLevelScanner configuration, verify that the 3DLevelScanner has the most recent firmware version installed.

From the menu, select **Tools** → **Configuration Wizard...** (or press **F4**) to activate the wizard.



The configuration wizard appears, starting at its first stage. During wizard navigation, the following options are available at any stage:

- Click **←Previous** to switch to previous stage.
- Click **Cancel** to exit the wizard without completion. No parameter will be modified or saved to the scanner.
- Click **Next→** to continue to the next stage.

### Step 1/8: Set System Parameters

Step 1 allows choosing device name and preferred measurement units.

- 1 Set the device name/identity in the **Tag Name** field. This name is displayed on the scanner screen and in the software window title once the device is connected. The tag name field is limited to 16 characters.
- 2 Choose the preferred distance measurement unit in the **Distance Unit** field. The available options are: meters, centimeters, millimeters, feet and inches.
- 3 Choose the preferred temperature measurement units in the **Temperature Unit** field. The available options are: Celsius and Fahrenheit.
- 4 Click **Next**.



Set System Parameters stage

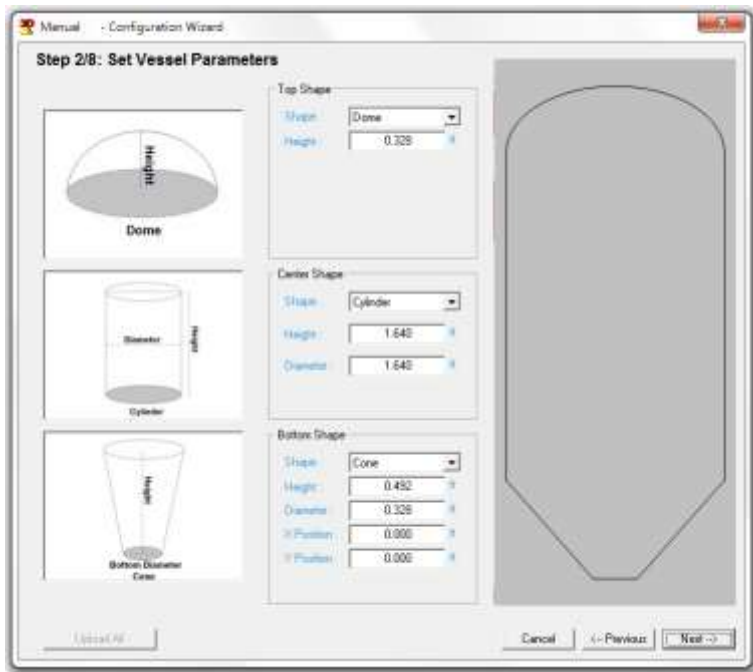
## Step 2/8: Set Vessel Parameters

Step 2 allows identifying the vessel geometry including with a specific shape for exact volume analysis.

The vessel major parts (top, center and bottom) schematic geometry can be chosen and dimensions can be defined.

- ① Choose the proper shape for the vessel top from the **Top Shape** field. The options are: Flat, Cylinder, Dome, or Pyramid. Set the dimensions:
  - For a cone shape, set the height and the top diameter of the cone.
  - For a dome shape, set the radius of the dome.
  - For a pyramid shape, set the top section height, width and length of the vessel top at the X and Y directions.
- ② Choose the proper shape for the vessel center from the **Center Shape** field. The options are: Cylinder or Cube. Set the dimensions:
  - For a cylinder shape, set the height and the diameter.
  - For a cubic shape, set the height, width and length of the vessel according to the X and Y axis, respectively.

- 3 Choose the proper shape for the vessel bottom section from the **Bottom Shape** field. The options are: Flat, Cone, Dome, or Pyramid. Set the dimensions:
- For a cone shape, set the height and the bottom diameter of the vessel bottom section.
  - For a dome shape, set the dome height.
  - For a pyramid shape, set the height, width and length of the vessel bottom section at the X and Y directions.
  - If the vessel shape is asymmetrical, for both cone and pyramid shapes, it is possible to set the bottom center as an offset from the entire shape center. The X Position and Y Position are the offset of the bottom section from the center.
- 4 Click **Next**.



*Set Vessel Parameters stage*

### Step 3/8: Set the Device Position

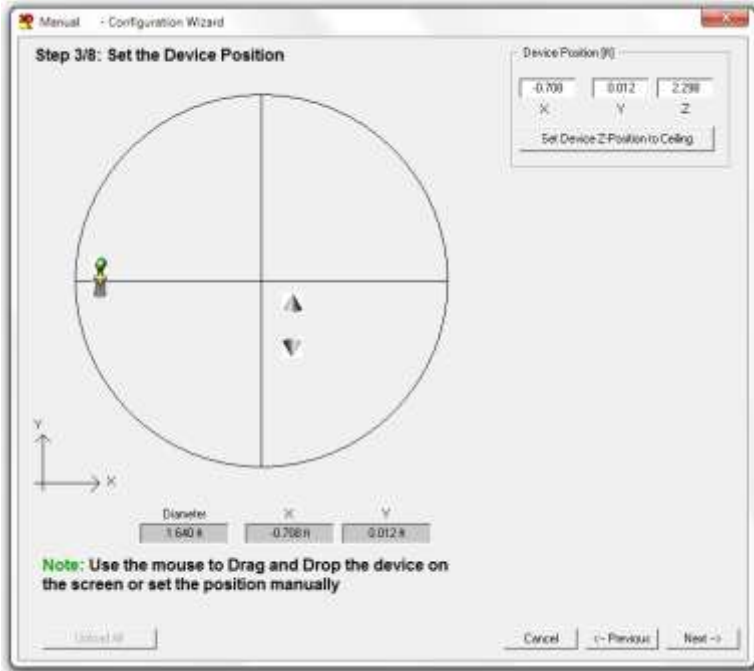
This stage allows specifying the exact location of the scanner on the vessel.

- 1 Set the device location according to the previously defined top vessel shape using one of the methods:
- Drag the device on screen, or
  - Enter the X, Y and Z coordinates in **Device Position** fields at the top right corner.



**NOTE:** It is possible to set the device Z position over the Z axis on the vessel ceiling, by clicking **Set Device Z-Position** to Ceiling.

2 Click Next



Set the Device Position stage

### Step 4/8: Set the Device View Point

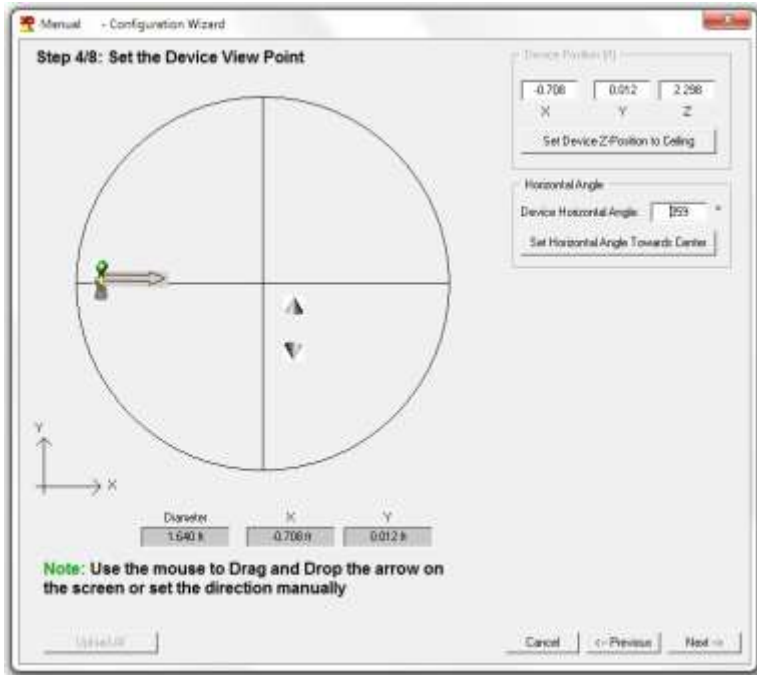
In this stage you have to specify the device mounting horizontal angle.

The device should be mounted facing the center point of the vessel. For more information, refer to the *BinMaster 3DLevelScanner Operating Instructions Manual*.

The following figure describes a schematic top view of the vessel and the scanner position.

- 1 Based on the location of the scanner and its direction, set the Horizontal angle accordingly by positioning the scanner icon until the arrow points toward the direction of the coordinates center ( $0^\circ$ ) using one of the following methods:
  - Rotate the arrow icon until it points toward the  $0^\circ$  point, or
  - Press the Set Horizontal Angle Towards Center button, or
  - Input the degree value in the **Device Horizontal Angle** filed on top right.

2 Click **Next**



Set the Device Position stage

### Step 5/8: Set Filling Points

This stage allows configuration of the vessel filling points. Up to 10 filling points may be defined. The following figure describes a schematic top view of the vessel and the filling point locations.

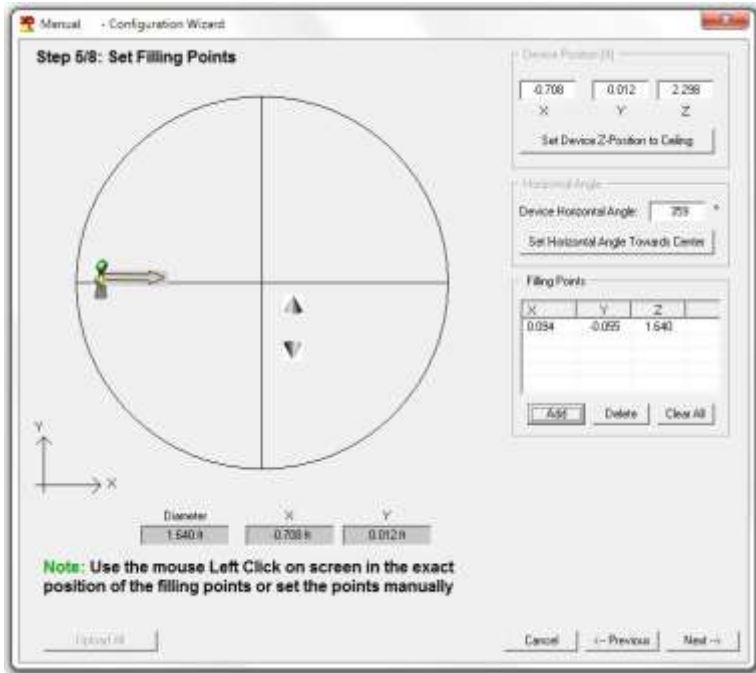
- 1 Set the filling points using one of the following methods:
  - Bring the cursor to the desired location over the vessel top shape and left-click the mouse to set the filling point, or:
  - Press **Add** and enter the (X,Y,Z) coordinates in the **Filling Points** table and press **Enter** button.

To edit a field: double click the field, enter the required value and press enter.

To delete a filling point, mark the corresponding row and click **Delete**.

To delete the full list of filling points, click **Clear All**.

- 2 Click **Next**.



Set the Filling Points

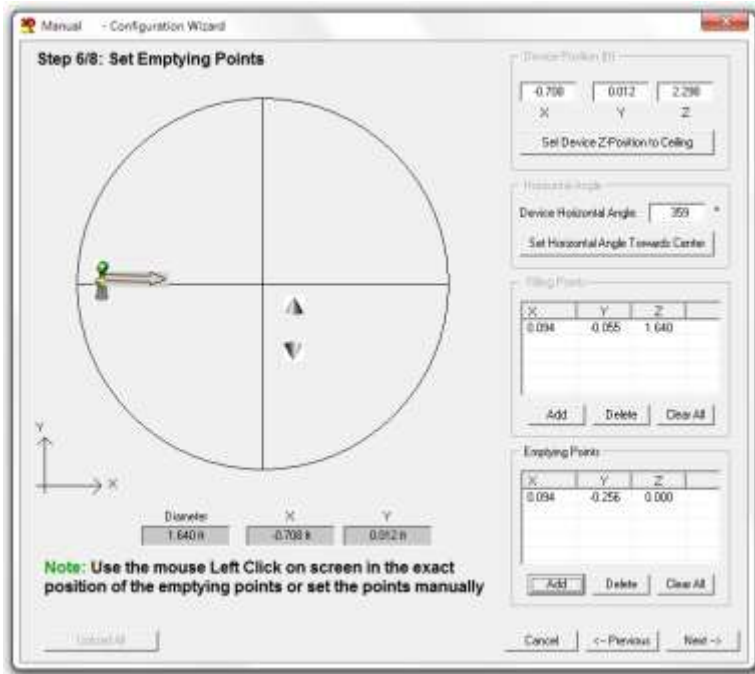
### Step 6/8: Set Emptying Points

This stage allows configuration of the vessel emptying points. Up to 10 emptying points may be defined. The following figure describes a schematic view of the vessel and the emptying point locations.

- 1 Set the emptying point or points using one of the following methods:
  - Bring the cursor to the desired location over the vessel top shape, or
  - Press **Add** and enter the (X,Y,Z) coordinates in the **Emptying Points** table and press **Enter**.

To delete an emptying point, mark the corresponding row and click **Delete**.

To delete all the emptying points, click **Clear All**.
- 2 Click **Next**.



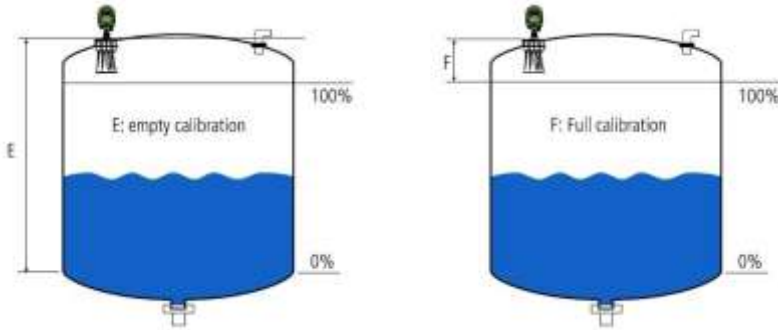
Set the Emptying Points

## Step 7/8: Set Basic Settings and Linearization

In this stage you can configure the vessel's basic settings.

- ① Set the distance from the flange to the material 100% level (see figure below) using the **Full Calibration** field.
- ② Set the distance from the flange to the material 0% level (see figure below), using the **Empty Calibration** field.





Empty and Full Calibration



**NOTE:** The full and empty calibration levels determine the 100% and 0% accordingly and set the 4-20mA output current accordingly.

3

Set the process description:

- Set the maximum emptying rate inside the vessel in the **Max. Emptying Rate** [tons/hour] field.
- Set the maximum vessel filling rate in the **Max. Filling Rate** [tons/hour] field.
- Set the vessel total material capacity in the **Max. Capacity** [tons] field.



**NOTE:** The **Max Capacity** shown in this screen is used only for volume change rate calculation, based on the emptying/filling rate values.

For example, setting the **Max Capacity** to 1000 tons and restricting the emptying rate to a maximum of 200 tons/hour and the filling rate to a maximum of 100 tons/hour. This results in material change rate of 10 hours to fill the vessel and 5 hours to empty the vessel.

4

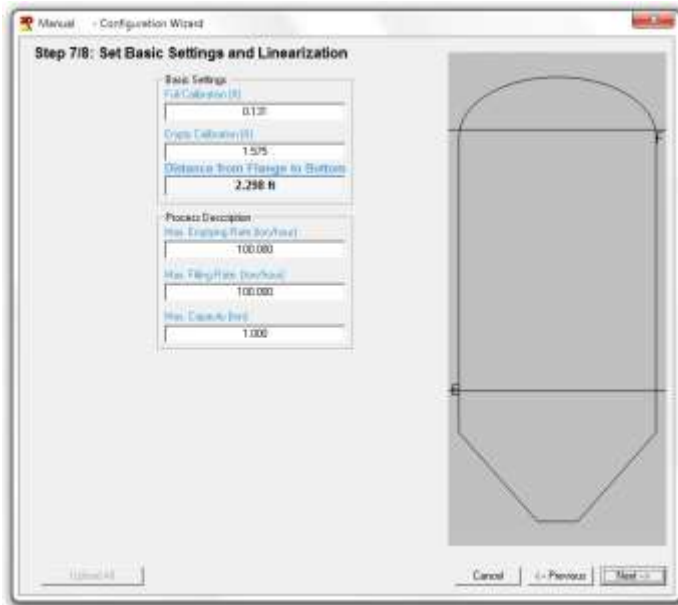
Click **Next**.



**NOTE:** When the 3DLevelManager is connected to 3DLevelScanner with FW version lower than 3.0.0, an additional two fields appear: **Process Condition** and **Frequency**.

**Process Condition** – Not to be changed. The default value is standard.

**Frequency** – Allows the selection between Low, Medium and High. The default value is Medium.



Basic Settings and Linearization

### Step 8/8: Set Advanced Linearization

The last stage of the wizard allows configuring additional mass or volume to be displayed on the main screen and setting the linearization table of the vessel. The linearization table (also referred to as a strapping table) allows the scanner to convert the average Level calculation into Mass or Volume values.

**Linearization:** Determines the mode: Linear, Custom Automatic or Custom Manually.

**Customer Unit:** Sets the desired units. The available options are: Percent (%),  $m^3$ , Liters, Tons, Gallons, lbs.,  $ft^3$  or Bushels.

**Max Capacity / Density:** The identifier shown is depending on the selected customer unit.

- When selecting **Linear** mode, **Max Capacity** sets a maximum value, which represents 100% of the stored material.
- When selecting **Custom Automatic**, the **Density** sets the density of the material in the case where Tons or lb. were selected in customer unit.

**Linearization:** There are 3 linearization modes:

- **Linear:** The output is set in reference to the material level and not to the volume. The measured volume is proportional to the measured material level (between full and empty calibration values), regardless the vessel shape.
- **Custom Automatic:** Generates an automatic linearization table with a reference between the level and Volume/Mass, in percentage according to the vessel geometry

defined in step 2/8. The linearization table is being generated automatically according to the shape parameters (the table cannot be manually modified). When selecting one of the options, an additional field appears in the main screen of the software showing the calculated number, whether it is mass or volume.

- **Custom Manually:** Allows manual entering of a linearization table values by the reference between the material level and the selected **Customer Unit**. The table can be populated with up to 32 points starting at 0, 0 and ending on the topmost level according to the requirement. The 3DLevelManager will display the Mass calculated according to the linearization table values only.



**NOTE:** All Customer Units (% , m<sup>3</sup>, ft<sup>3</sup>, lb., Liters, Tons, Gallons, and Bushels) in all modes could be chosen and then displayed in the main screen of the program.

The output is generated according to the linearization table produced at the selected Linearization mode.



**NOTE: Customer Manually**

The vessel shape is taken into consideration in the volume/mass calculation. Level points not included in the table are linearly calculated according to the level between the two nearest points.

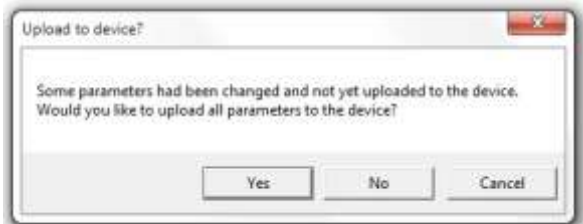
Although entering less than 32 points is possible, BinMaster recommends entering points as many as possible in order to increase measurement accuracy.

With lb. units, the maximum weight entry allowed is 2,000,000 lb.

Regardless of the mode, the output volume is presented in percents by default. When a different unit (other than percents) is selected, the volume/mass value is displayed under the volume (%).

- Click **Upload All** to upload all configured wizard parameters to the scanner, or click **OK** to upload the parameters to the scanner and to close the wizard.

If parameters were modified and not uploaded to the scanner, the following box appears (figure to the right) offering an option to upload all parameters to the device.



- Click **Yes** to upload parameters to the scanner and to close the wizard.
- Click **No** to close the wizard without uploading parameters to the scanner.
- Click **Cancel** to close the window and stay in the wizard.

## 5.2 Advanced Configuration Parameters

Following the completion of the configuration wizard of the 3DLevelScanner, open the advanced parameter window (press **Device→Advanced Parameters...**) in order to set general parameters such as Material Slope and Dumping Time. Other parameters may be configured and fine adjustments can be done at a later stage. Refer to *page 29: Advanced Parameters* for detailed instructions and descriptions.

## 5.3 Grades Analysis

Once configuration is done, a Grades analysis should be performed in order to view the returned echoes from the material surface and to use it to adjust the scanner. Refer to *page 41: Analyze... menu* for detailed instructions.

## 5.4 False Echo Mapping

In vessel installations with high sockets, struts or agitators, as well as with material buildup and welded joints on the vessel walls, can cause reflection interference which may result in erroneous measurements. The False echo mapping feature detects and marks these false echoes to be ignored during volume measurement. It is advised to generate the false echo mapping when the vessel is empty for detection of all potential interfering reflections.

The false echo mapping feature is located under the **Extended Calibration** tab, and allows automatic scanning (enter a range to scan), manual scan (enter the range and threshold) and to reset all false echo mapping.

## 5.5 Log Viewer

The 3DLevelManager collects all data received from the scanner and stores it on the local computer hard drive. Selecting **View→Log File...** or pressing **CTRL+W** opens the logs view application. When a scanner is connected, the log graph starts building from the connection point. Browsing old logs can be done by pressing the browse button [...] and selecting the folder for viewing the log file contents.

The logs are saved in HTML format and are stored in a folder labeled with the connection time and date. For more information, refer to *page 37: Log File (Ctrl+W)*.

## 5.6 3D Image Profile

The 3DLevelManager is equipped with a highly useful feature of generating and displaying a 3-dimensional, graphical representation of the visual mapping contour of the stored material as scanned by the 3DLevelScanner MV and MVL models. For more information, refer to *page 39: Visual Mapping*.

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## 6 Software Menus

This chapter describes the different functions available under the software menus and sub-menu options, ordered as they appear in the menu.

### 6.1 File menu

#### **Load parameters for Browsing...**

Opens a saved parameters file (.APM file) for browsing only. Uploading to the scanner is not allowed. Shortcut key: **Ctrl+B**.

#### **Load Parameters to Device...**

Opens saved parameters file to upload to a connected scanner and for browsing. Shortcut key: **Ctrl+D**.

#### **Save Configuration...**

Saves all parameters (Basic settings, Safety settings, Linearization, Extended calibration, Output, Display, System Parameters, 3D Mapping and Advanced parameters) to an APM type file. You can choose the location and the file name to be saved. Shortcut key: **Ctrl+S**

#### **Browse to Local Folder...**

Open the local 3DLevelManager Application Data folder. This folder includes different log files and grade analysis files.

#### **Generate a New Log File**

Stops storing data on current log file and generates new file with updated time and date stamp. A new log folder will be created under the installation directory, for storing log files with all data from the scanner. At least 2MB/day free hard drive space should be reserved for the logging activity in normal operation connection (not Verbose).

#### **Exit**

Exit the 3DLevelManager software. Shortcut key: **Ctrl+X**

## 6.2 Device Menu

This menu allows accessing to advanced configuration options. Some of the menu options are disabled on Viewer mode, and become available under Technician mode.

### Advanced Parameters

Opens the 'Advanced Parameters' box, where the algorithm parameters can be adjusted. This window is available under Technician mode only.



The various fields can be downloaded or uploaded from/to the scanner. Any modified settings can be discarded using the **Cancel** button at the bottom.

When connecting to a 3DLevelScanner with earlier firmware version (before v3.0.8), the Advanced Parameters window looks slightly different, as follows:

- **Output Dumping Time:** Sets the history dump window time of the scanner. This parameter increases stability and improves the SNR. Default value: 300 seconds, minimum value: 60 seconds.
- **Steepest Material Slope:** Set the maximum material slope. The scanner verifies all echoes for not exceeding the slope. Default: 35°. Recommended setting: between 30° to 45°.

- **Offset:** Sets the scanner installation offset distance from the mounting flange. Possible values are ranged at -1m (-3.28ft) to 1m (3.28ft). It is recommended to leave this value at 0m (0ft) and to set the offset in the configuration wizard, by manual setting the Z position of the scanner.

When connecting to scanners with FW versions under 3.0.0, the three parameters above are set in the **Extended Calibration** tab in the main screen

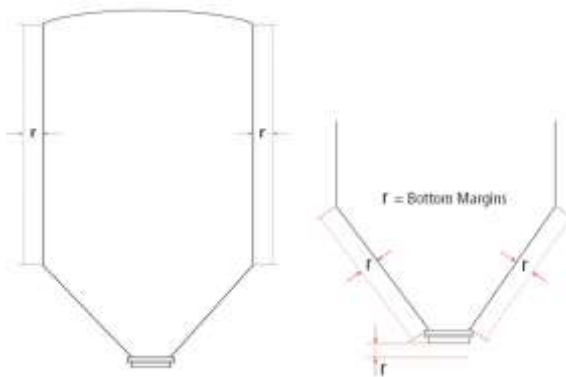
- **Minimal SNR [dB]:** The lowest SNR threshold. Below this level, the sensor does not measure and the reading remains unchanged. Default: 13dB.
- **Auto False Echo Recognition:** Do not change this parameter.
- **False Echo Sensitivity:** The minimum extra gain required to distinguish between real echoes and mapped false echoes. If false echoes prevent the device from tracking the true level, decrease the sensitivity. If false echoes are not ignored, increase the sensitivity. Default: 1.2
- **Restrain coefficient [%]:** Sets the level of preference of echoes from shorter distances over echoes from farther distances. 100% = no preference of closer echoes. 0% = total preference of the first echo. Default: 10% in FW lower than 3.0.0, 12% in new FW.
- **Side Margins [m/ft]:** Allows tolerance in echo recognition to the sides of the vessel (see figure).

Used for creating a tolerance in case of unknown vessel width/diameter, and when a tolerance is required for detecting points from the sides of the vessel.

Echo within the tolerance/margin range is transformed to the side of the vessel on the X-Y plane and will not be eliminated in calculation. Default: 1m (3.28 ft.).

- **Bottom Margins [m/ft]:** Allows adding a tolerance in echo recognition from the bottom shape (but not flat) (see figure).

This is used for creating a tolerance in the case of unknown vessel dimensions, and when a tolerance is required for detecting points from the bottom of the vessel. Default: 1m (3.28 ft.).



- Top Dead Band** [Discard/Don't Discard]: To be used only when canceling echoes with a mapping range for short distances is not possible. The unit discards all echoes up to the full calibration. Default: Don't Discard. **Discard**: The sensor scans material only at a distance larger than full calibration distance. **Don't Discard**: Distances smaller than full calibration distance are scanned as well. If measured distance to the content is smaller than full calibration, the full calibration distance is presented.

**Historic Log Sampling Period:** Sets the interval between measurements that are saved into the local memory. By default, the scanner does not store the log. The settings are ranged between 1 to 60 minutes. If the scanner has been reset due to powering off or via the software, this parameter resets to its default value and the log will not proceed with data accumulation. When connecting to a scanner of an older FW version, the following advanced parameters are available. The following descriptions refer to parameters which were not mentioned above.

Parameter	Value	Unit
Side Margins	1.000	m
Bottom Margins	1.000	m
Auto False Echoes Recognition	1.200	
Activate Extrapolation	No	
False Echo Sensitivity	1.200	
Top Dead Band	Don't Discard	
Restrain Coefficient	10	%
Max. Emptying Rate	100.000	ton/h
Max. Filling Rate	100.000	ton/h
Max. Capacity	100.000	ton
Window Size	100.000	m
Good SNR	18	dB
Minimal SNR	13	dB
Exceeding Filling Rate After Echo Loss	Yes	
Use Compressed Pulses	No	
Steepest Material Slope	35.000	
Historic Log Sampling Period	Do not generate log	

Buttons: Download All, Upload All, Cancel

- Activate Extrapolation** [Yes/No]: setting the scanner to 'Yes' activates extrapolation where volume calculation is based on the entire surface. A 'No' setting causes the scanner to calculate the volume based on the mapping points received. Default: 'No'.
- Max Emptying Rate** [tons/hour] (The maximum emptying rate), **Max Filling Rate** [tons/hour] (The maximum filling rate) and **Max Capacity** [tons] (The total capacity of material within the vessel) are set in the Configuration Wizard step 7/8.



- **Window Size** [m/ft]: **Not to be changed** in FW version earlier than 3.0.8. Default value is 100m (328ft).
- **Good SNR** [dB]: The threshold of the good SNR. Above this level, the sensor increases its measurement speed. Default: 18dB.
- **Exceeding Filling Rate After Echo Loss** [Yes/No]: Don't Discard / Discard tracking rates following a long echo loss. This function enables faster recovery to correct volume reading following a long period of echo loss. Default: Yes.
- **Use Compressed Pulses** [Yes/No]: Default: Yes. Pulse compression starts functioning for distances larger than 9m (30ft) (in versions earlier than 3.0.0). Activating this feature allows a better resolution. It is recommended to set the **Auto False Echo Recognition** to 0 when the pulse compression is on.
- **Download All**: Downloads all parameters from the scanner to the software.



**NOTE:** There are three ways for downloading all parameters from the device: using the Main Screen, using the Device menu and using this Advanced Parameters window.

- **Upload All**: Upload all parameters from the software to the scanner.



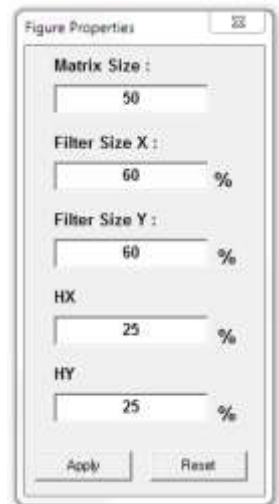
**NOTE:** There are four ways for uploading all parameters to the device: using the Main Screen, using the Device menu, using this Advanced Parameters window and using the last step of the wizard.

- **Cancel**: Close the Advanced Parameters windows without up/downloading from/to the scanner

## Figure Properties

These parameters define the settings for the 3-Dimensional image.

- **Matrix Size**: default: 50. Defines the X, Y matrix. A value of 50 (X and Y = 50) means 2500 resolution points. A larger value requires many more points and more computer resources to generate the 3D image.
- **Filter Size X, Y**: default: 60%. The 3D image of the material surface is generated using a mathematical algorithm which takes each creates a cone around each echo received. Each cone is calculated and summed with its neighboring cones. The filter determines the cone width to be used for the calculation.
- **HX, HY**: default: 25%. Determines the widening of the cone described above.





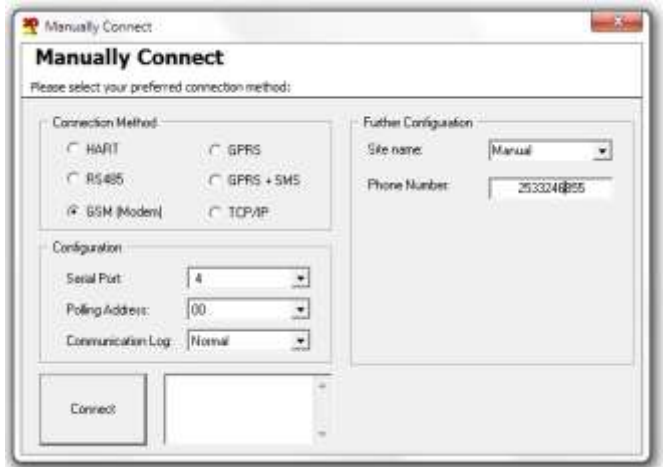
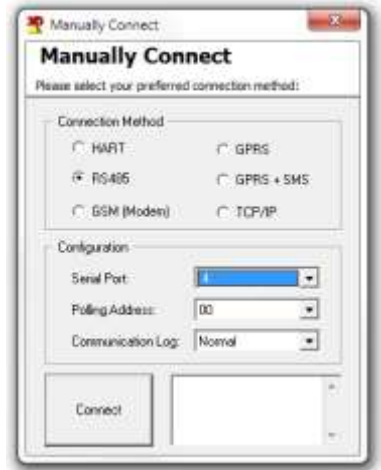
**NOTE:** It is recommended to leave the values at their defaults. Modification of these values should be done with understanding the implications of each modification on the resulting output.

## Manually Connect... / Disconnect

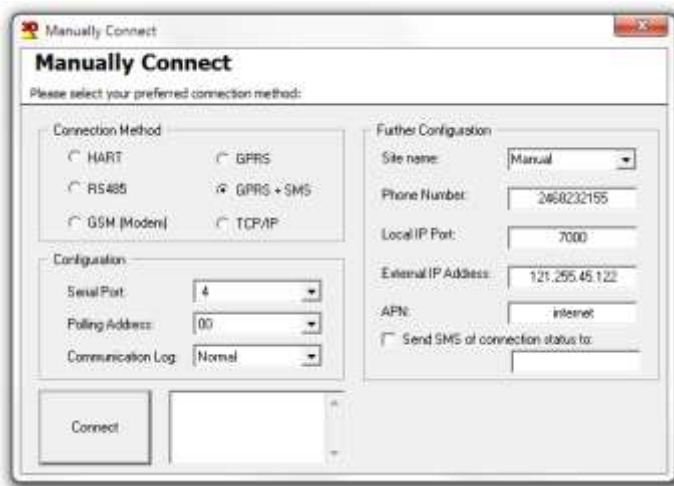
Opens the connection box which allows setting the required link and communication properties and to establish a data connection between the software and the scanner.

In the Connection Method field, select the communications interface used for connecting the scanner to the computer and the software. The available options are:

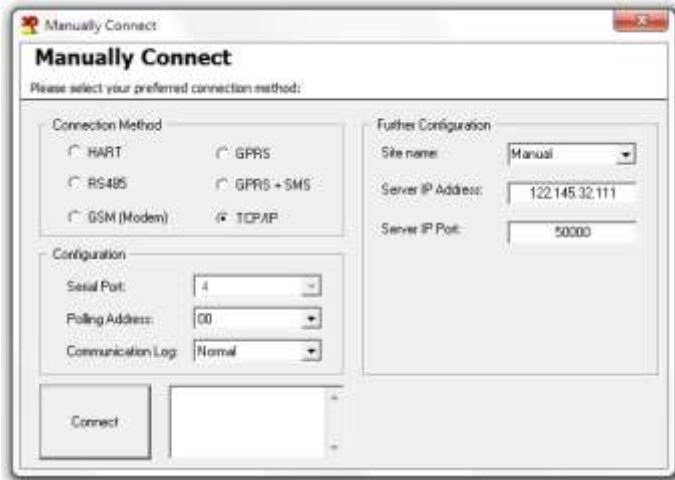
- **HART:** The scanner is connected using a HART modem.
  - Select the serial COM port number the HART modem is connected to, and enter the scanner polling address.
  - Click **Connect**.
- **RS485:** Connection over RS-485 bus.
  - Select the serial COM port number the RS-485 Converter is connected to, and enter the scanner polling address.
  - Click **Connect**.
- **GSM (Modem):** The scanner is connected using a local GSM modem.
  - Select the serial local COM port number and enter the scanner polling address.
  - At the right pane, enter the site name and the phone number of the other side modem.
  - Click **Connect**.



- **GPRS:** The scanner is connected through the internet over GPRS using 3DLinkPro.
  - Enter the local IP port number and the scanner polling address.
  - Click **Connect**.
  - Send an SMS message to the scanner to initiate the connection.
- **GPRS + SMS:** The scanner is connected via the internet using 3DLinkPro. The link uses SMS messages over a local GSM modem connected to the computer.
  - Select the serial port of the 3DLinkPro connected to the computer.
  - Select the scanner polling address.
  - At the right pane, enter the site name.
  - Set phone number of the 3DLinkPro connected to the scanner.
  - Set the computer local IP port.
  - Set the external IP address (usually the router IP address).
  - Set the APN word of the 3DLinkPro connected to the scanner.
  - Click **Connect**.



- **TCP/IP:** The scanner is connected via a TCP/IP network to an RS-485 connection.
  - Select the scanner polling address.
  - In the right pane, set the site name.
  - Set the Server IP address and IP port number. Server IP is the device converting RS-485 to TCP/IP.
  - Click **Connect**.
- **Polling Address:** Enter the scanner polling address when connected via daisy-chain connection (RS-485 Multi-drop). Address range: [00 to 63 or Multiple]. When selecting Multiple, each scanner must have its own, unique address.



## Disconnect

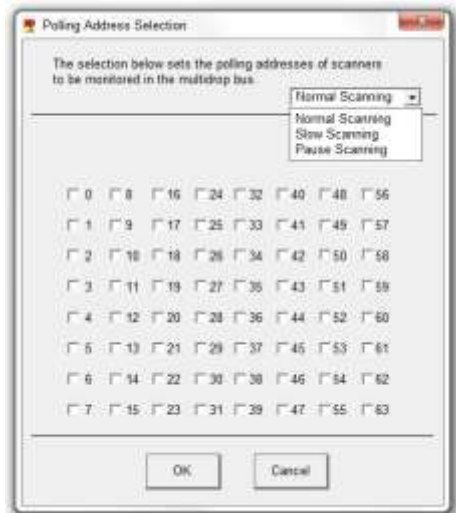
Disconnect software communication to the device.

## Polling Address Selection

Use the dialog box to set polling address of multiple 3DLevelScanner scanners to be monitored using an RS-485 Multi-drop connection.

Check the check-boxes with the polling address per each scanner to be monitored. Log files will accumulate data for all selected scanners.

- **Normal Scanning** scans all the selected scanners. This is the default value and should not be changed.

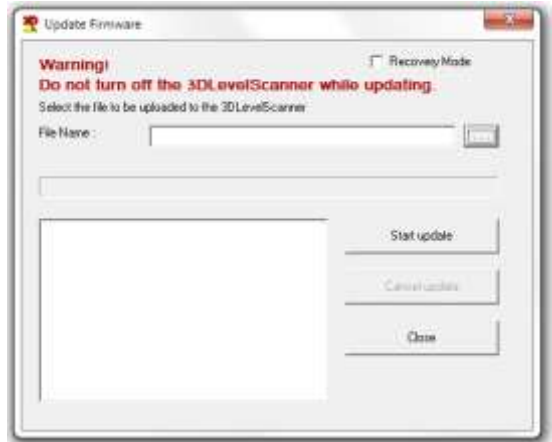


**NOTE:** The scanning option parameter selection on top-right exists only on older software versions, and should not be modified.

## Update Firmware

Uploads a new firmware to the device electronic card.

- Click the [...] browse button to select the APM file (\*.ldr) to upload to the device.
- Click **Start Update** to upload the file to the device.
- Click **Cancel Update** to stop the update process.
- Click **Close** to close the window.



**IMPORTANT:** Once the firmware update process is complete, reset the device to factory settings by clicking **Reset to Factory Settings** in the Advanced Parameters – Cont. screen, described in page 29). When using software version 3.0.0 and above and upgrading to FW 3.0.8 and above, it is not necessary to reset the device to factory defaults since all settings are done automatically.

Downgrading a scanner firmware from version 3.0.0 and above to older versions such as 2.9.843 is not recommended. On such downgrading, the scanner will return to its factory defaults and an upgrade to the original version will be necessary. Please contact BinMaster support when facing such requirement.

## Upgrade/Downgrade

Upgrades or downgrades between S, M and MV versions.

- Select the relevant type to be upgraded to.
- Click **OK**.
- A password is required for upgrading to a higher type (M/MV). The password can be supplied by your local distributor as a text file, or acquired from BinMaster. Copy the password from the text file (license number) into the empty field in the dialog box.





**Note:** Once the upgrade process is complete, the device will automatically reset and initialize itself.

## Device reset

Resets the device. The initializing process takes about 30 seconds. The scanner will perform a new search for the correct measurement.

- **Restart Scanner:** sends a restart command to the scanner. The internal DSP will boot and start building the auto false echoes and dumping values.
- **Reset to Factory Defaults:** Resets all system parameters to their default factory settings, and resets the 3DLevelScanner resets. All the parameters must be re-defined following this operation.
- **Reset Advanced Parameters:** Reset all advanced parameters, available only with firmware versions above 3.0.0

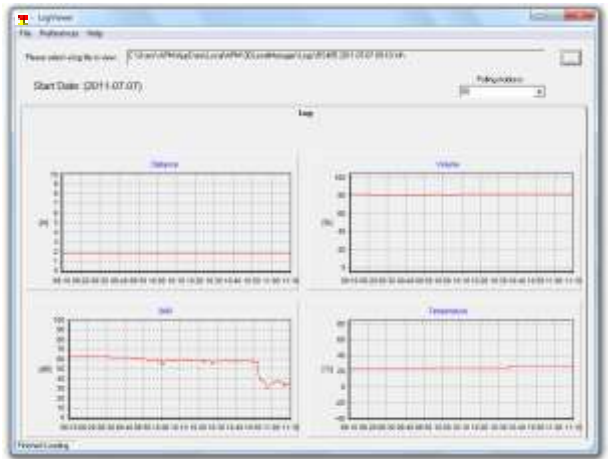
## 6.3 View Menu

### Log File (Ctrl+W)

Loads a log file and displays graph presentation.

- The Log option displays charts for Distance (m/ft), Volume (%), SNR (dB) and Temperature (°C/°F) over a time line as shown. Log files are saved as the connection is established. The files are saved in a local folder.

For viewing older log files, press the [...] browse button. A browsing window opens, showing the **Logs** folder for choosing a different log file. The file names include the date and time of the connection.



*Log File graph representation*

In Multiple Mode, the software monitors all the scanners selected in the Polling Address Selection (see page 35). For viewing a different scanner log file, select the scanner **Polling Address** in the drop-down list at the top-right corner.

Use the preference menu for displaying logs in different distance units (m, cm, mm, ft., inch), different temperature units (Celsius, Fahrenheit), different time zone (hours difference) and different regional settings (using dots or commas as digit separators).

### Historic Log...

The scanner allows storing logs in its local memory. Use the Historic log settings in the **Advanced Parameters** feature to enable this option. To view the log from the scanner memory, select the **Historic Log...** option.

When selecting the Historic log, a box appears asking for selection of the required log time to be retrieved from the scanner. Once download is complete, a log viewer window opens displaying the logs. The log data is then saved under the Historic log folder.



**Note:** This option allows choosing a 3D Log option which creates a 3-Dimensional representation of the log. This option is not available under Technician Mode.

### Communication Log File...

The Communications Log File contains logged data corresponding to the communications between the software and the scanner connected to it. Selecting this option opens the file in an Internet browser window. The file format is HTML and it might be required for tech support use.

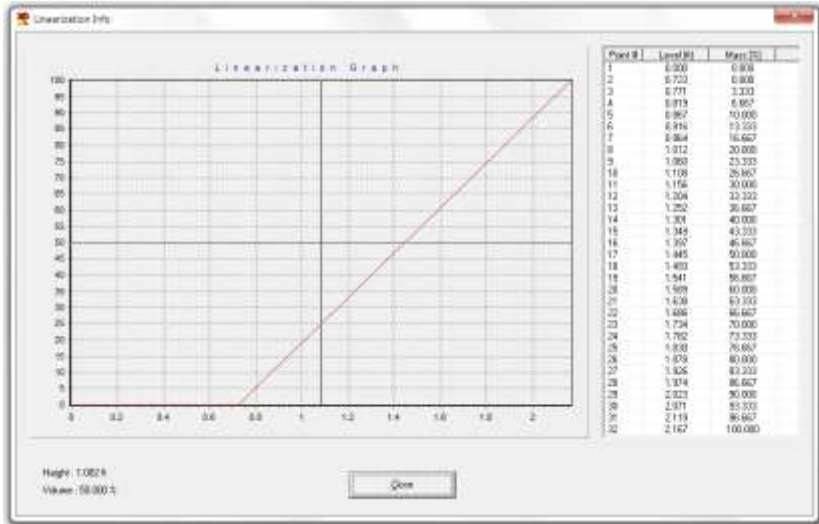
### Communication History...

The Communications History contains logged data corresponding to the communications events between the software and the scanner connected to it. Selecting this option opens the file in an Internet browser window. The file format is HTML and it might be required for tech support use.

## Linearization Info

Outputs a graphical representation of the linearization line of the vessel as configured in the **Configuration Wizard**, which represents the volume/mass related to the level (as displayed in step 8/8 in the wizard, page 25). In addition, the scanner divides the vessel into 32 points, assigning each point with a level and a corresponding volume/mass value. The points table is displayed to the right of the graph (see figure below).

This window is for reference only. All changes can be done in the **Configuration Wizard** step 8/8.



Linearization table

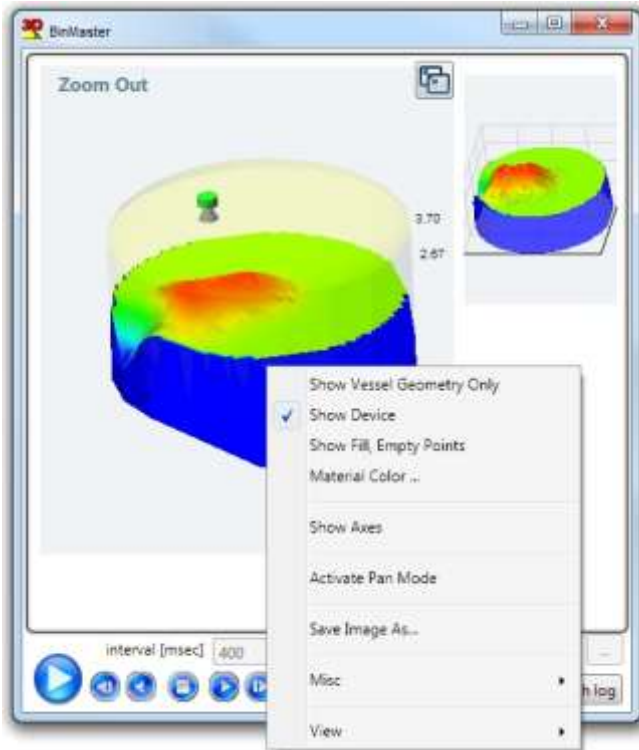
## Visual Mapping

Generates and displays a 3-dimensional graphical representation of the visual mapping contour as scanned by the 3DLevelScanner MV or MVL.

The legend scale to the right side displays the measured level.

- To rotate the 3D image, press and hold the mouse left key and drag over the image at the desired rotation direction.
- The Manager application generates 3D mapping frames depending on the connection rate. To watch the animation, click **Watch Log**, a new 3D image and a browse window opens. Select the desired log folder, located under the **Logs** folder. Use the video controls to play, stop, move backward or forward or scroll along the time line. The interval (msec) sets the frame time interval. The minimum value is 1msec.
- For switching between a zoomed-out view of the silo and a zoomed-in view of the material surface, click the top right button or double-clicking the 3D image itself.





*Visual mapping window*

Right-click the mouse to open the additional features menu:

- **Show legend:** Displays the level scale on top right corner.
- **Show Material Surface Only:** Displays the surface of material only.
- **Show Vessel Geometry Only:** Displays the vessel geometry without material.
- **Show Device, Fill, Empty points:** Displays the device, filling and emptying points relative to the vessel geometry.
- **Material Color...:** Choose a desired material color.
- **Show Axes:** Displays the x-y-z axes.
- **Activate Pan Mode:** Switch from image rotation to panning.
- **Save Image As...:** Performs a screen capture of the entire window.
- **Misc:** Opens a sub-menu with the following options:
  - **Show Silo Dimensions Wall:** Displays a grid with dimensions, same as with the zoomed in image.
  - **Draw Silo Grid (Wireframe):** Displays a wireframe over the material surface.

- **Show Solid Material Color:** Displays the material in a solid color.
- **Fill Bounds with Material:** Shows the complete material around the surface, or the surface only.
- **Hide Top Shape:** Hides the top part of the vessel (if not flat).
- **3D Algorithm Accuracy:** Controls the number of points in the image. Available options are: Normal, Good and Best. The default option is Normal. Changing the option is not recommended, since such change will consume most of the graphic card resources.
- **View:** Opens a sub-menu with different viewing angle options.

## 6.4 Tools Menu

### Configuration Wizard (F4)

The configuration wizard provides a wizard-based, graphical-aided tool for configuring a connected 3DLevelScanner. At the first run after software installation or following a new scanner connection, all wizard steps must be followed and all parameters should be configured according to the Installation Preparation Form (IPF) filled prior to the installation and approved by the BinMaster Customer Support or by your local distributor.

Refer to *page 17: Configuration Wizard* for a detailed description regarding the configuration wizard.

### Analyze...

The Analyze tool allows a selection of different signal types downloaded from the scanner at a preferred time resolution and generates a chart-type report for each scan. On choosing this menu option, the following box appears:

- Select **All Grades Info** or **Grades** or **False Echoes** to analyze the scanner behavior in the vessel.
- Click **Start** to begin the analysis once the desired options are checked. The analyze tool will then start downloading the signals from the scanner. This stage takes a few seconds or minutes to complete, depending on the communication speed. Once completed, the analysis results window appears.
- Click **Cancel** to stop the download.



- Click **Close** to close the **Analyze...** window.
- Click **Load From Files** and select the file from the appropriate folder for uploading a certain signal (channels, grades, or false echoes).

**All Grades Info:** Checking this option causes the analyze tool to download the Grades, Grades Threshold (controlled by an automatic algorithm), False Echoes and Auto False Echoes. The files are saved under a separate folder named with the tag name, date, and time. Note that when checking this option, the rest of the options cannot be selected.

- **Grades:** Checking this option causes the analyze tool to download all the echoes received by the scanner (energy values returned from each object in the vessel). The file is saved under a separate folder, named with the tag name, date and time.
- **False Echoes:** Checking this option causes the analyze tool to download all false echoes mapped under the False Echoes Mapping. This reveals the strength of each false echo at each distance. The file is saved under a separate folder, named with the tag name, date and time.
- **Continuous Grades:** This feature allows running the grades analysis continuously for later viewing of the changes in material and scanner behavior over time for an in-depth analysis. The Continuous Grades feature is also possible with all scanners connected in multi-drop connection. Use the **Every** field for setting the pause interval between two scans, the minimal value is 3 minutes between scan stop to new scan that starts.

**Channels / Raw Data:** Checking this option causes the analyze tool to download the nine signals returned to the transducers. Enter the maximum scanning range in the **Max Range** field. All files are saved under a separate folder, named with the tag name, date and time.

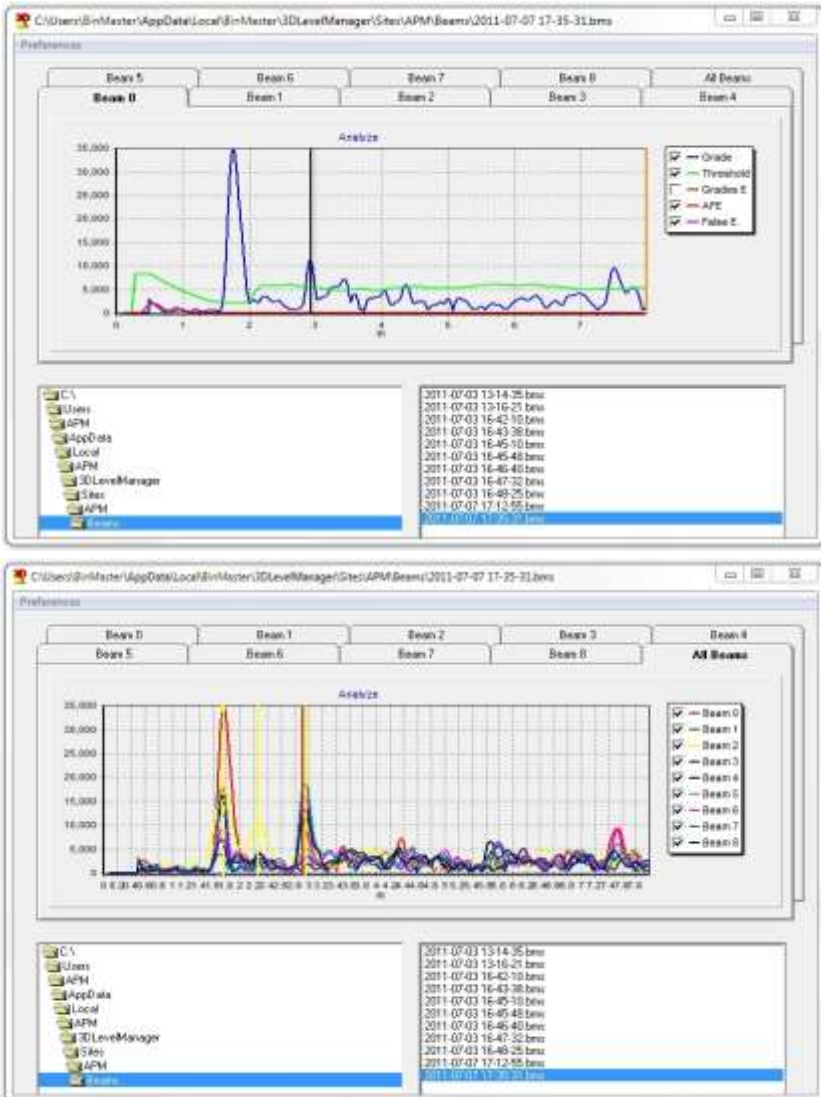
The **Raw Data** option is to be used only when an BinMaster Technical Support personnel requires this operation. This feature is intended for engineering use only.



**NOTE:** A multiple selection of the **Grades**, **False Echoes** and **Channels/Raw Data** options can be made, by checking the desired signal type to download. In such case all files are saved under the same folder (named with the tag name, date and time).

**NOTE:** Measurements are freezing during the raw data extraction process.

**NOTE:** **Grades** and **False Echoes** functions are compatible with FW versions prior to 3.0.0.



*All signals output result charts*

The above analysis result charts represent a single beam analysis and all-beams analysis.

The X axis represents the distance from the device flange.

The Y axis represents a grade parameter assigned to each echo by the algorithm.

The echo signals for the different beams are presented with lines of different colors. Unchecking a beam/feature at the legend box to the right hides the corresponding beam or characteristic.

### Communication Quality Test

Analyzes the connection quality of the RS-485 cable connected between the computer and the scanner. If packets not answered, or received with errors, the cable must be checked for existence of proper resistors on both sides and verified to be of shielded and twisted-pair type.

An example for a good test result: an averaged delay of 97msec (very low), no lost packets and no errors received.

- Click **Restart Test** to restart testing. The test will cycle through until terminated.
- Click **Close** to terminate and close the window.



### Switch to Viewer Mode

Switching to Viewer Mode disables parameter modifications. Switching from viewer mode to technician mode requires a password.

### Senior Technician Mode

Switch to Senior Technician Mode allows advanced parameter changes. Switching to senior technician mode requires a password.

### Working with the Graphs

Zoom-in, zoom-out and pan options are available for all charts created by the 3DLevelManager: Grades Analysis, Log and Historic log.

- **Zoom-In:** Choose a rectangular area you wish to zoom in and place the mouse cursor on the top left corner of it. Left click the mouse and drag it to the bottom right corner of the required area, making sure not to release the mouse button until the entire required area is selected.
- **Zoom-Out:** Place the cursor of the mouse inside the graph, left click the mouse and move it from bottom right to top left and release the mouse button.
- **Pan:** Right click the mouse button and hold it inside the graph area. While moving the mouse, the graph will pan to the sides.
- **Back to default view:** In the Grades Analysis window, double clicking the graph will pop up a window asking to confirm the reload of the data.

---

## 7 Advanced Functions

### 7.1 Firmware update

Upload a new firmware to the 3DLevelScanner. For instructions, refer to *page 36: Update Firmware*.

### 7.2 Model Upgrade

Upgrading or downgrading the 3DLevelScanner model between S, M and MV versions. For instructions, refer to *page 36: Upgrade/Downgrade*.

### 7.3 Continuous Grades

This feature allows running the grades analysis continuously for later viewing of the changes in material and scanner behavior over time, for an in-depth analysis. Usage is also possible with all scanners connected in multi-drop connection. Use the **Every** field for setting the pause interval between two scans and check the **Enable Multidrop** box. For more details, refer to *page 27: Grades Analysis*.

### 7.4 View Multiple Logs - Log Viewer

When connecting to the scanner or to scanners connected in multi-drop, a new folder is created containing all data from the scanners. The 3DLevelManager allows viewing of multiple log folders at once. For viewing multiple logs, create a specific folder with a unique name, and copy all required folders to the new folder. Open the Log Viewer (Ctrl+W), press the browse button [...] in the log viewer application and browse for that folder. When selecting the folder, the log viewer starts displaying the logs data. Wait until loading is complete.

### 7.5 Historic Log

For retrieving and viewing stored logs data from the scanner, select **View→Historic Log**.

The Historic log contains historical scanner activity data. The Historic log feature must be activated in order to view its contents. For activating the Historic log, select from **Advanced Parameters** the period between two stored logs. The options vary from 1 minute to 60 minutes. Allow storing the log between 3 days to 180 days accordingly.

In the Historic log window, select Log and press **Start**, or select log and Partial log, set the number of days and hours calculated back from the current time. Performing partial log may be faster than trying to receive all data.

## 7.6 Play a 3-Dimensional Movie

The Visual Mapping feature allows building and viewing a movie based on the generated 3D representations as frames. When activated, a player window opens for selecting the desired log folder for generating the movie.

The 3D movie feature works only with MV or MVL scanner model logs, refer to *page 39: Visual Mapping*.

## 7.7 Using the Tabs

In technician mode, there are 6 tabs available on the main software screen:

- **Output:** the Output tab is designed to control the 4-20mA output signal, in this tab there are two functions:
  - **Simulation:** Simulating of the output current can be changed by Level (m), Volume (%), or current (mA). This feature is useful for synchronizing the PLC and verifying of identical read values for both the scanner and the PLC. When the simulation is on, a red blinking signal appears, indicating: **Simulation is Active**.
  - **Current Output Mode:** Allows setting the output to send the standard 4-20mA signal or optionally to send a reverse signal: 20-4mA. The last option sets the scanner to output a fixed value.



**NOTE:** Notice the simulation indicator which is shown when the simulation is active.

- **Display:** Allows setting the 3DLevelScanner onboard display. It allows setting the **Back to Home** time (default: 300 seconds), the **Number of Digits** to display after the decimal point and turning the display off.
- **System Parameters:** Read-only. Settings are allowed in the configuration wizard's first step.
- **Basic Settings:** Displays the full and empty calibration levels, which can be set in step 7/8 in the configuration wizard.
- **Linearization:** Displays the settings of the linearization as configured in step 7/8 in the configuration wizard.
- **Extended Calibration:** Allows viewing the **Output Dumping Time**, **Offset** and **Steepest Material Slope** (in firmware versions lower than 3.0.0, these fields can also be changed).
- **False Echo Mapping:** refer to *page 27: False Echo Mapping*.

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# Appendix A: End-User License Agreement

## Terms of Use & End User License Agreement

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