RANGEVISION

Setup and calibration

NEO

Contents

Introduction

Thank you for choosing RangeVision NEO 3D scanner!

Please read this manual before using RangeVision 3D scanner. Here are described the procedures for preparing the scanner, installing the required drivers, calibration procedure, scanning procedure, and tips for acquiring high-quality three-dimensional object model.

Information may be amended from time to time. These changes will be inserted into the new versions of the manual, or in the additional documents and publications.

Warning!

1. Do not expose the scanner to liquids.
2. Do not use liquid cleaners or aerosol cleaners.
3. Do not store or use the scanner in dusty or humid environments.
4. Do not expose the scanner and its components to contamination, shock or drops.
5. Do not connect power to a faulty wall outlet.
6. Do not aim the scanner at people and animals in order to avoid directing the bright projectors light at the eyes.
7. Patterns and holes are provided for ventilation of the scanner to ensure its reliable operation and to prevent overheating. Do not block or cover the openings.

Technical specifications

Model	NEO
Camera resolution	2 Mpix
Diagonal of the matrix	1/3”
Texture scanning	yes
FOV	300x240x240 mm
3D point accuracy	0.06 mm
3D resolution	0.18 mm
Working distance	45 cm

System requirements

- operating system - Windows 7/8/10 64bit,
- processor - Intel Core i3/i5 1.8 GHz and better,
- graphics card with HDMI output,
- RAM - Not less than 8 GB,
- 2 USB-ports.

Preparing for work

Package contents

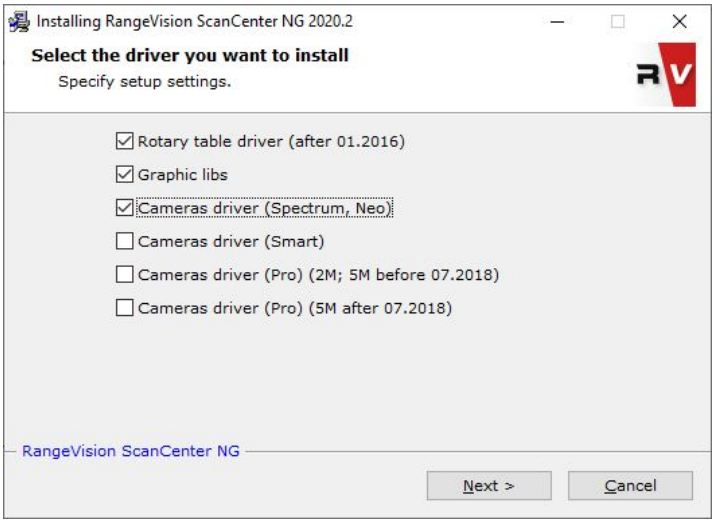
RangeVision NEO 3D scanner is supplied in a protective hard road case.

FOV is represented by a calibration plate and a stand for the calibration plate, which are used to calibrate the scanner.

№	Name	qty.
1	Scanning module:	
	Mounting structure with projector	1
	Cable kit for PC connection (USB + HDMI)	1
2	Tripod	1
3	Calibration plate	2
4	Stand for the calibration plate	1
5	Turntable	1
6	Power adapter for the turntable	1
7	Usb cable for the turntable	1

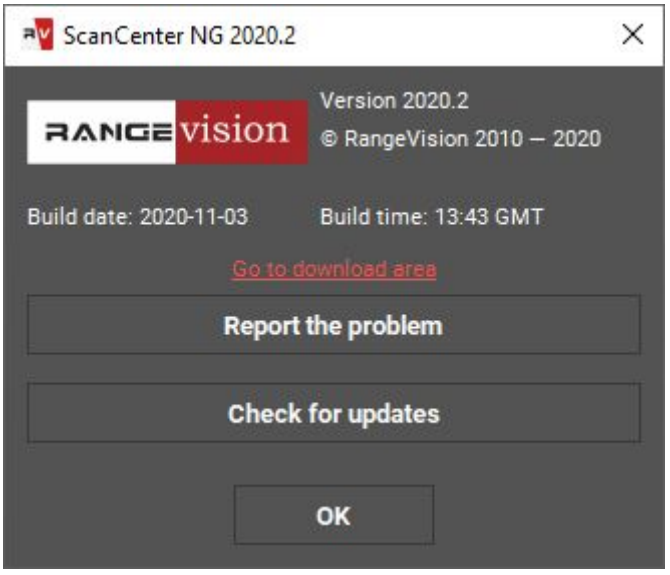
Installing software and drivers

Get the RangeVision software (equipped with the scanner) and run the installer RangeVision ScanCenter setup.



Following the prompts, select the desired language, type and path for installation. After the files have been copied install drivers and graphics libraries, necessary for the correct operation of RangeVision 3D scanner.

If you have access to the Internet RangeVision ScanCenter NG will automatically notify you when updates are available. You can check for updates manually by clicking About → Check for Updates



Setting up your computer for work with the scanner

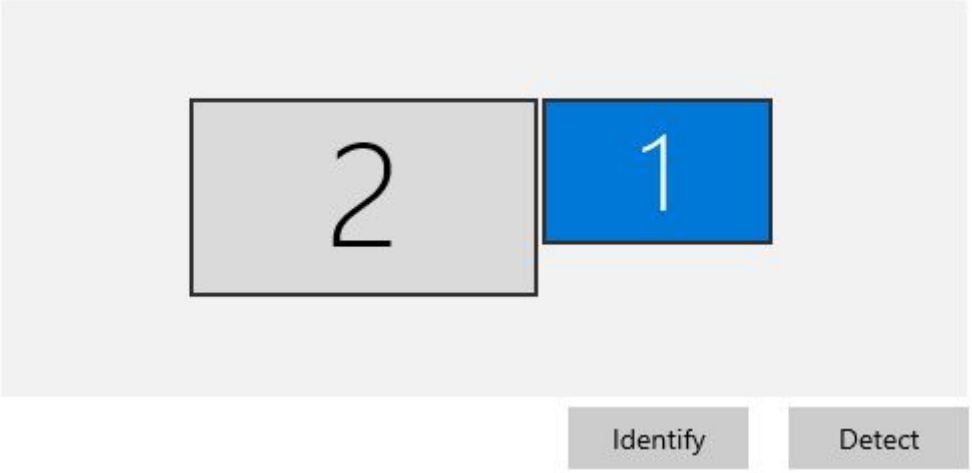
For the correct operation of Rangevision 3D scanner you will need to setup your computer. This procedure is performed once before the first use of the scanner .

Connecting projector

First, connect the USB to power up the projector and then connect it to the HDMI-port of your video card. After connecting the projector, it should be displayed in the system. If the computer has several video outputs, define the one to be used.

If the second monitor (projector) is not defined by the system, check the cable connections and restart the computer. Also, try to connect the cable to your computer when the projector is on, if it was off earlier.

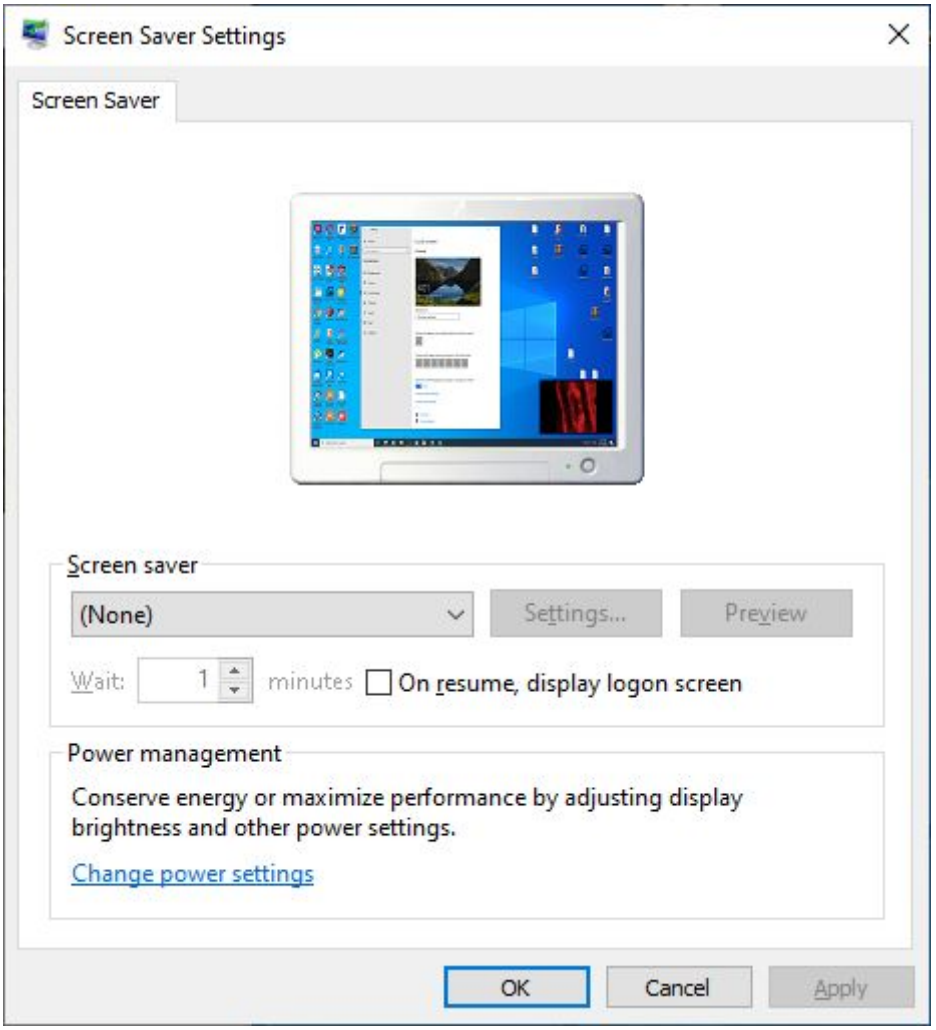
1. Right click on the desktop, select Screen resolution.
2. Make sure that the projector has been successfully recognized by the system and that both connected screens are displayed.

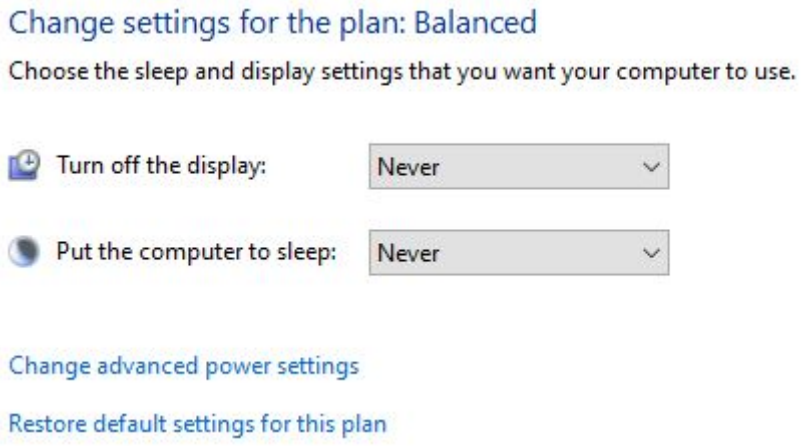


Configuring computer parameters

To avoid a recurrence of the problems during the scanner operation, you must turn off the screensaver and sleep mode.

Go to Screen Saver Settings menu and turn off the screen saver, disable turning off the display and putting the computer in sleep mode.





Scanner assembly:

1. Install the scanning module onto the tripod.
2. Connect USB cable to your PC.
3. Connect HDMI cable to your PC.

4. When using the turntable, connect it to the power source, then connect the USB cable to your PC and turn the table on using the power switch.

Calibrating the scanner

You need to perform calibration in order to ensure the work of the scanner after the adjustment of lenses. Specifically for this purpose we use the calibration plate, which is pre-measured with high accuracy . Scanning software analyzes the image of the plate, obtained from the cameras and compares it with the mathematical model, marked by the algorithm.

There are 3 types of calibration: Full calibration, automatic calibration, fast calibration (orientation) and Calibration of turntable (finding the table axis).

Full and automatic calibrations are used:

- before work with the scanner,
- after transporting the scanner.

Fast calibration is used:

- if you suspect that the camera moved due to unreliable mounting,
- if you want to check the accuracy of performed calibration.

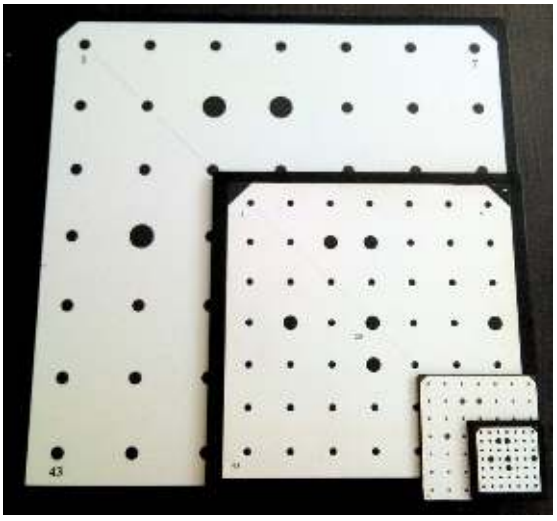
Calibration of rotary table is performed:

- in case of any change in the position of the rotary table to the scanner (when scanning on the turntable).

Calibration of rotary table is described in the Scanning on the turntable section.

Calibration plate

Calibration plate is a special plate with markers, the distance between which is measured with high accuracy. It is used for setting up a scanner and its calibration.



Full calibration

Calibration should be performed in the same light, in which an object will be scanned. If there is too much change of level in lighting conditions it is necessary to recalibrate the system. It is not allowed to carry the calibration procedure on direct sunlight.

The full calibration dialogue can be accessed from Calibration → Calibrate menu.

Calibration procedure:

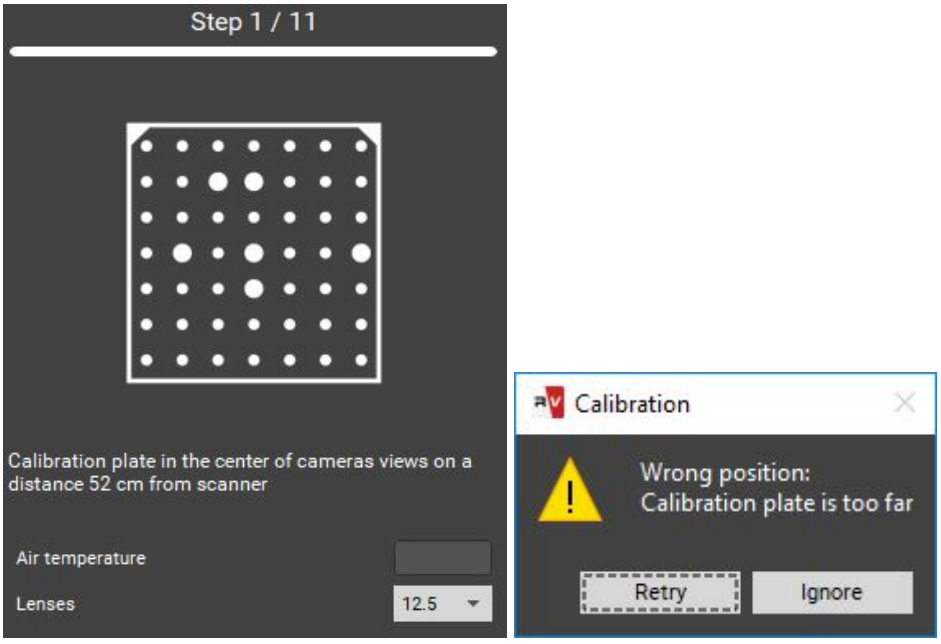
1. In the drop-down list choose the correct calibration plate size, specified on the back side of the plate, or add a new one.

Make sure that the plate size specified in the software matches the actual plate size written on its back side. Incorrect size may cause errors and geometric distortions on meshes.

It is possible that camera images in the software will be swapped or flipped from the start. In this case, go to Hardware settings -> Cameras menu and use Rotate and Swap cameras buttons to set the images in proper positions.

Camera image interpolation can be turned on and off in Hardware settings → Cameras using Preview smoothing option. In some cases interpolation can make it easier to determine if the image is sharp or not.

2. In accordance with the text prompt and symbol image install the calibration plate in the desired position. The brightness of the images of calibration plate can be adjusted with exposure slider. You should not allow very dark images or images with excessive brightness areas. Press the Capture button. Original plate position - the position at the working distance from the scanner (marking on the view from cameras matches the markers on the plate), the cross is projected on the central marker.
3. If the plate placement is incorrect, an error message will appear. Correct the placement and repeat the step.



In case if not all marks are found on the image, you will also see the error message. It may mean the following:

- not all markers are visible on one of the snapshots,
- not all markers are lit by the projector,
- calibration plate is placed at large angle to the scanner,
- plate is too close or too far from the scanner - the image is not sharp,
- the plate is damaged or dirty.

Correct all deficiencies and press Capture.

Calibration is carried out by the results of 11 snapshots. Carefully observe the position of the plate during each capture! In some positions it will be necessary to switch the bottom side of the plate.

After all the necessary snapshots are taken, calibration module will start automatically. Resulting accuracy of calibration is specified in pixels. A good result is accuracy no worse (not higher) than 0.2 pix. If you get a higher value, repeat the calibration, carefully making sure that the plate is sharp, bright and correctly positioned.

Calibration result in pixels is not equal to scanner accuracy in millimeters!

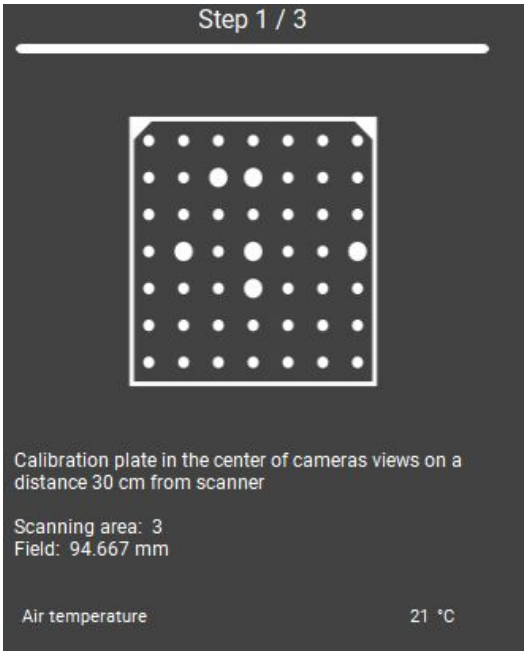
Some advice on calibration:

- do not change the distance from the center of the plate to the scanner when turning the plate. The exception are only snapshots in positions 10 and 11,
- do not rotate the plate at a very high angle. Ensure that all marks on the plate are visible from both cameras, when you turn the table,
- be careful with calibration plates! It is not permitted to contaminate or perform any mechanical damage to the surface with the marks. After the use store the plates in designated case,
- before the calibration procedure ensure that cameras and cables are secure in the designated position.

Fast calibration (orientation)

When scanning large objects and moving the scanner frequently, the scanner eventually may report that it cannot find markers. In such case you need to perform fast calibration.

Orientation is carried out by the results of 3 snapshots. Orientation is done with the same conditions as the last calibration. The corresponding controls in the dialog are disabled.



The orientation can be started from the Calibration window on the Start screen.

- place the calibration plate at the working distance to the scanner (the first calibration position),
- press the Capture button,
- next, following the steps, make two more shots.
- after this the accuracy of orientation will be shown. It should be approximately equal to the accuracy value of the last calibration.

If the accuracy during orienting starts to be very different from the original one, you need to re-calibrate the equipment.

Example: The initial accuracy is 0.084, accuracy after orientation is 0.25. The value exceeded 0.2, re-calibration is required.

After calibration or orientation, the calibration plate should be removed in order to avoid the damage or contamination!

Automatic calibration

The automatic calibration can be started from the Calibration window on the Start screen, but it is only accessible when turntable is connected and recognized by the software.

Automatic calibration serves the same purpose as full calibration, but it is easier to perform, because it uses turntable to shift the calibration plate between positions.

WEEE Statement

The following information is only for EU-members States: The mark shown to the right is in compliance with Waste Electrical and Electronic Equipment Directive 2002/96/EC (WEEE).
The mark indicates the requirement NOT to dispose the equipment as unsorted municipal waste, but use the return and collection systems according to local law.