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Artec RAY II

Calibrate
Check & Adjust



English

Version 2025.05A

In this document you will find the method how to calibrate the Artec Ray II scanner.

Overview

Artec 3D scanners are manufactured, assembled, adjusted and calibrated to the best possible quality. Nevertheless, extreme temperature changes and hard shocks can cause deviations and influence the system's accuracy. 3D laser scanners that are exposed to such harsh conditions should be checked periodically to ensure that the measurement results meet the specifications. This periodical check can be performed in the field by running through a specific Check & Adjust procedure.

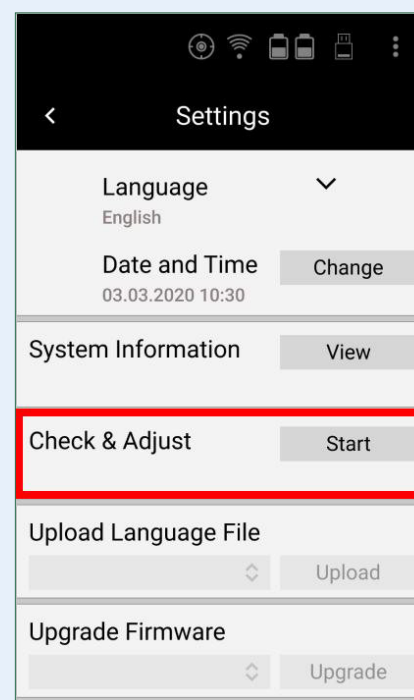
Check & Adjust

Check & Adjust procedure is a smart and user-friendly solution. It does not require a specific measurement field containing a prescribed configuration of targets, which makes Check & Adjust a quick and fully automated procedure that

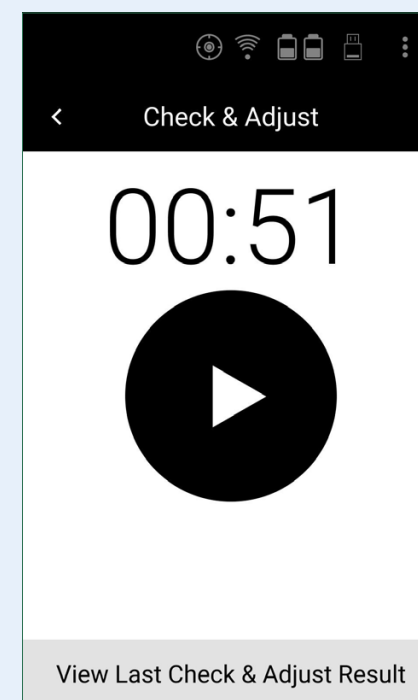
allows the user to:

1. Check the current angular accuracy of the scanner.
2. Adjust the angular parameters to improve the angular accuracy of the scanner.

To start the Check & Adjust procedure, simply open the Check & Adjust screen from the Settings screen by pressing the Start button. Then, press the red Start button to start the scanning process.



Check & Adjust in Settings screen.



Check & Adjust screen.

After the double scan is completed, it is verified if the scanned environment meets the requirements of the Check & Adjust procedure. There are three possible outcomes of a check:

1. If the environment is not sufficient, a pop-up message informs the user to repeat the scan at a different location.
2. If the environment meets the requirements for the Check of the scanner the current angular accuracy of the scanner is displayed.
3. If the environment meets the requirements to Check and Adjust the angular accuracy of the scanner, the current (Check) and adjusted (Adjust) angular accuracy of the scanner is displayed. The newly determined angular parameters can be permanently stored on the instrument. At any time, the angular calibration parameters can be reset to the values determined in the factory.

After each completed Check & Adjust procedure, a PDF report is generated and stored on the USB stick. The full Check & Adjust procedure is completed in less than 6 minutes

Measurement environment

General

Advised

- Solid and stable surfaces in range of up to 20 m
 - Surfaces at higher elevation angles (>50°) at the distance of at least Li m
 - Diverse geometry
-

Avoid

- A lot of moving objects and vegetation
 - A lot of high-reflective surfaces such as mirrors and glass walls
 - Unstable ground and environments with vibrations or other disturbances
 - Objects at range less than 1.5 m
-

Indoor environment

Advised

- Spacious place
 - Horizontal distances of at least 9 m
 - Vertical distances of Li m above the scanner
 - Position the scanner in a corner, but at least 1.5 m away from any wall
 - Lower the tripod to increase the distance to the ceiling
-

Avoid

- A lot of moving objects
 - A lot of high-reflective surfaces such as mirrors and glass walls
 - Unstable ground and environments with vibrations or other disturbances
-

Outdoor environment

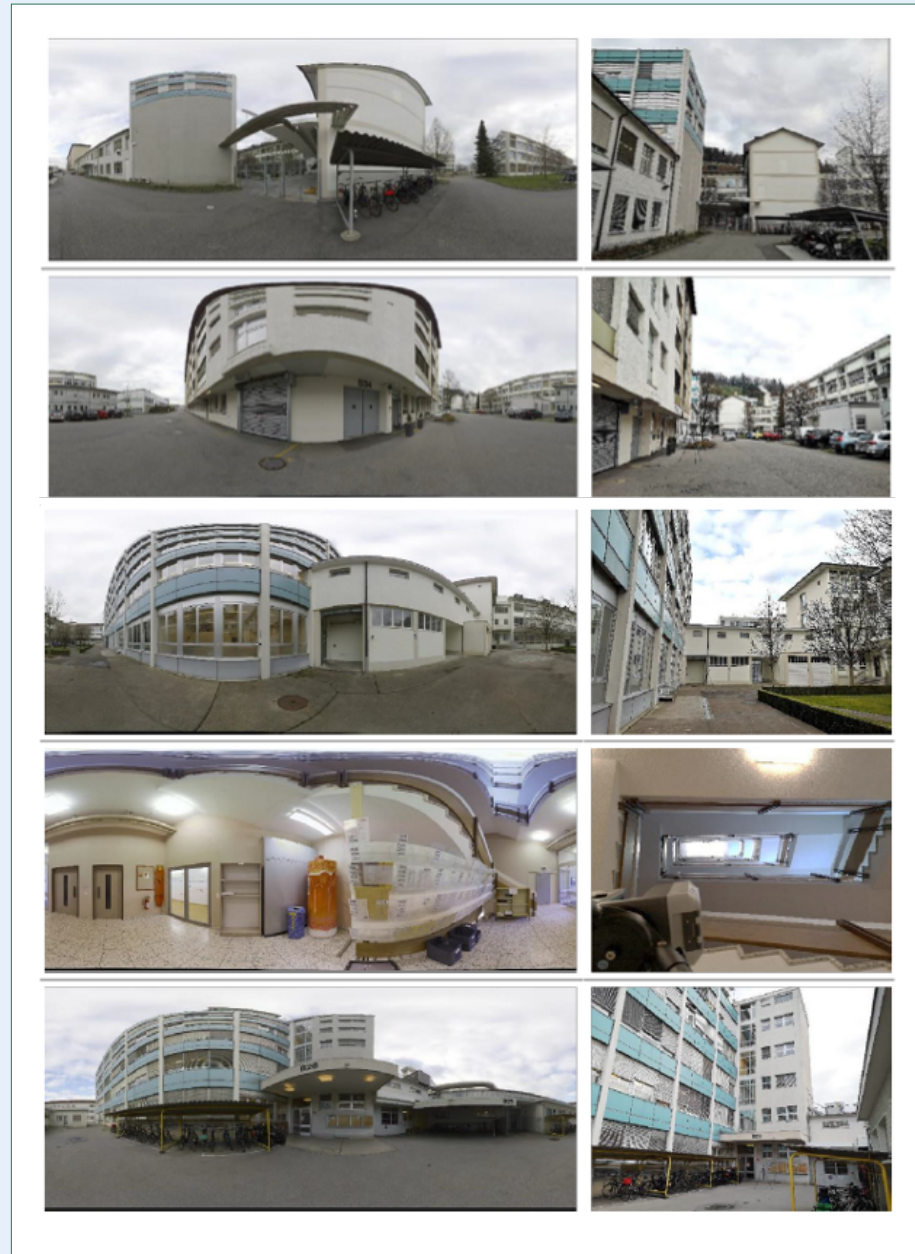
Advised

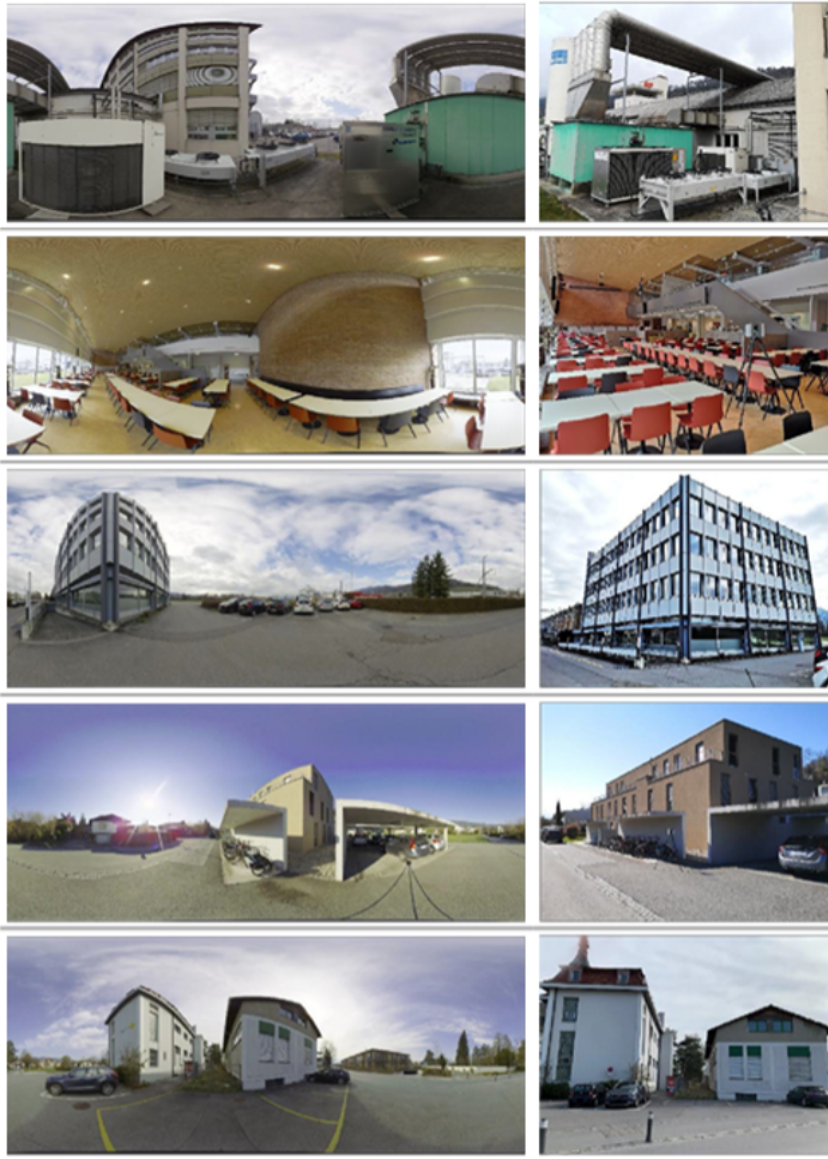
- Tall buildings
- At corner of tall buildings

Avoid

- Open spaces without solid objects
- A lot of moving objects and vegetation

Voorbeelden van omgevingen doe goed zijn om Check & Adjust uit te voeren, waarbij de linker afbeelding een scan panorama van de omgeving is en rechts een foto van de situatie:





Check & Adjust workflow

Check & Adjust is a guided procedure, which consists of the following steps.

Let op

Before starting the Check & Adjust procedure, the scanner must be acclimatized to the ambient temperature. Approximately two minutes per 1 °C temperature difference from storage place to working environment, but at least 15 minutes should be considered.

The scanner should be protected from direct sunlight in order to avoid thermal warming in general and especially on one side of the scanner housing. It is also recommended to avoid strong heat shimmer and air turbulence. The best conditions can be found, usually in the morning and with an overcast sky.

The tripod and the ground should be stable and secure from vibrations or other disturbances.

Do not remove the USB stick during the Check & Adjust procedure.

Step 1.

Define a Check & Adjust setup location according to the guidelines described in section **Measurement Environment**.

Step 2.

Set up the scanner on the tripod and make sure that the scanner is roughly levelled.

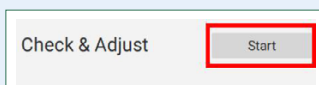
- Ensure that all the locking screws of the tripod legs are securely tightened.
- The tripod and the ground should be very stable and secure from vibrations or other disturbances. .

Step 3.

Boot the scanner and keep it powered on in order to acclimatise to the ambient temperature. .

Step 4.

Start the Check & Adjust procedure by tapping the Start button in the Settings screen.



Step 5.

Check & Adjust screen

In the Check & Adjust screen the user can:

- Start the Check & Adjust procedure.
- View the last Check & Adjust result.

Tap the Start button to start the Check & Adjust scan.

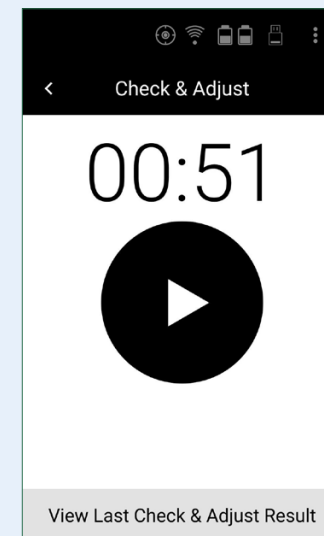
After tapping the Start button step away from the scanner and wait until the scan is finished.

Tap the View Last Check & Adjust Result button at the bottom of the screen to open a panel with the results of the last Check & Adjust exertion.

Tap the Back arrow (<) in the top left corner of the screen to exit the Check & Adjust procedure and return to the Settings screen.

The View Last Check & Adjust Result panel displays:

- Last Check result
- Last Adjustment result
- Reset to Factory Calibration button



Last Check

Date and time of the Last Check of the scanner.

Values of the **Horizontal and Vertical Angular Accuracy**¹ of the Last Check of the scanner.

Fields are empty when Check & Adjust has not been performed yet.

Last Adjustment

Date and time of the Last Adjustment of the instrument.

Values of the **Horizontal and Vertical Angular Accuracy**¹ of the Last Adjustment of the scanner.

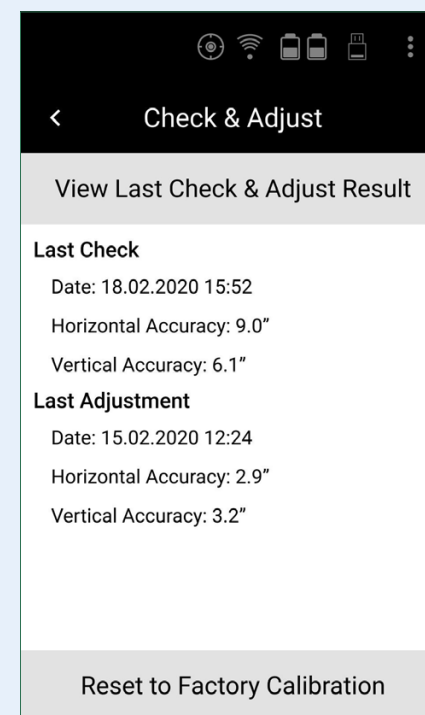
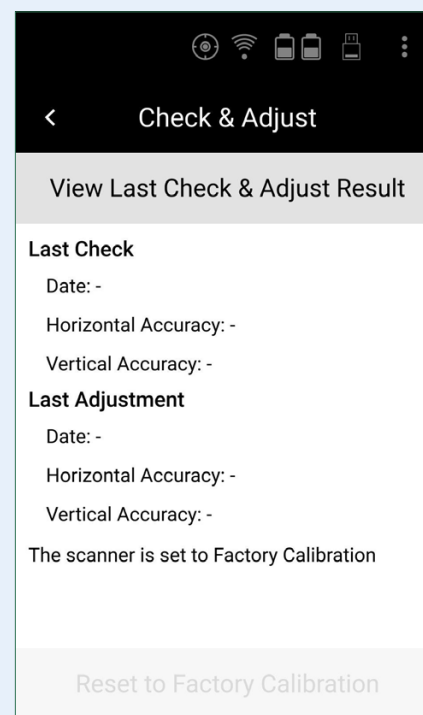
Note

Fields are empty if the Check & Adjust parameters have not been applied yet or the scanner is set to the Factory Calibration.

Tap the **Reset to Factory Calibration** button to set the current angular parameters back to the factory calibration angular parameters.

Tap the **View Last Check & Adjust Result** button to return to the Check & Adjust measurement screen.

Tap the **Back arrow** (<) in the top left corner of the screen to exit the Check & Adjust procedure and return to the Settings screen.



Left > Result Panel firsttime use. Right > Result Panel next ime use

1 - All accuracy specifications are on a level of confidence of 68% according to the Guide of the Expression of Uncertainty in Measurement (JCGMI00:2008) unless otherwise noted.

Step 6.

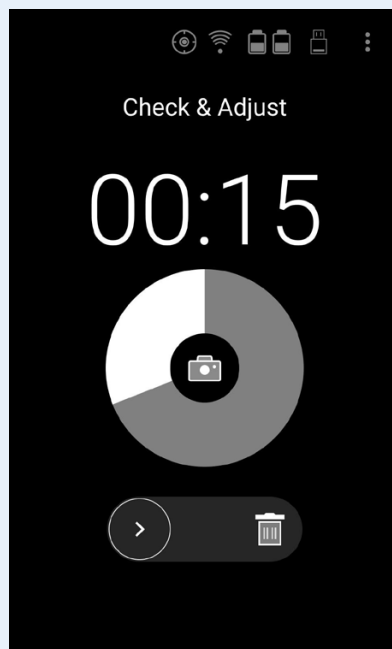
Check & Adjust measurement screen

The estimated scan time left is displayed as a countdown.

The Check & Adjust measurement can be cancelled by dragging the arrow to the right.

Note

During scanning, stay away from the scanner and wait until the measurement is completed.



The different processing steps are indicated below the spinning wheel:

- Preparing Data for Import
- Calculating Environment Classification
- Calculating new Check & Adjust Parameters ...

Attention

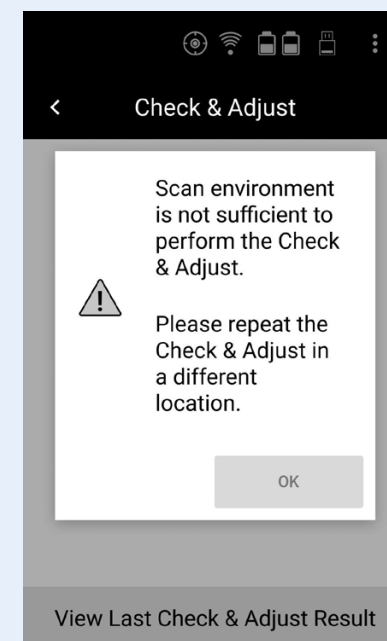
The calculation can take a few minutes.

The processing phase has four different possible outcomes.

Outcome 1.

Scan environment is not sufficient to perform Check & Adjust.

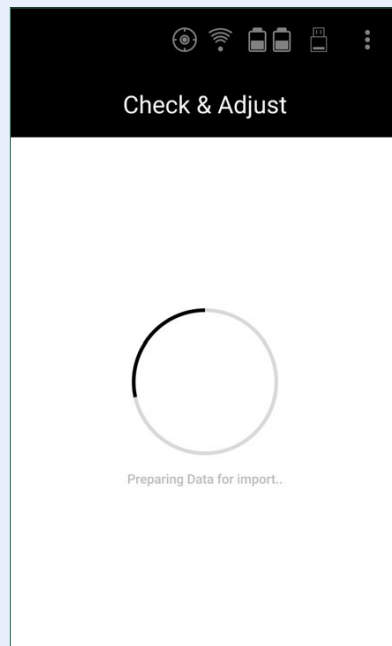
The environment of the selected location does not provide enough information to perform the Check & Adjust. Please choose a different location as described at the beginning of this document and repeat the scan.



Step 7.

Processing the Scan

After the double scan has finished, the software automatically proceeds with processing the scan data, which is indicated by the spinning wheel on the screen.



Tap the OK button to close the information message. The user is automatically redirected to the Check & Adjust screen (step 5).

Outcome 2.

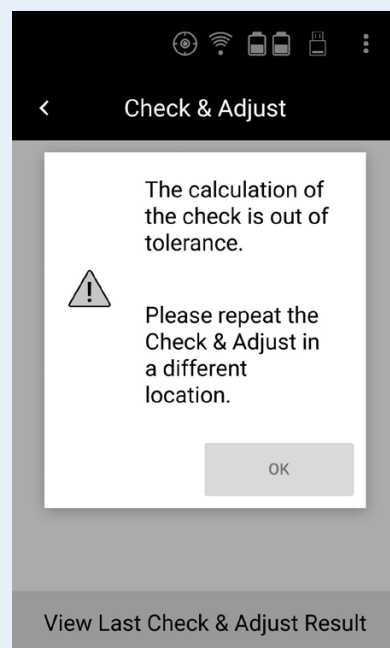
The calculation of the check is out of tolerance.

The environment of the selected location is accepted by the algorithm and provides enough information to continue the calculation of the angular parameters. But the confidence level of the computed angular parameters does not meet the requirements.

Please repeat the measurement.

If the message persists, choose another location and repeat the measurement.

Tap the OK button to close the information message. The user is automatically redirected to the Check & Adjust screen (step 5).



Outcome 3.

Adjusting the parameters is not possible.

After the calculation only the current angular accuracy of the scanner is displayed in the Check & Adjust Results screen. The environment of the selected location does not provide enough information to Adjust the angular parameters. Please choose another location and repeat the scan.

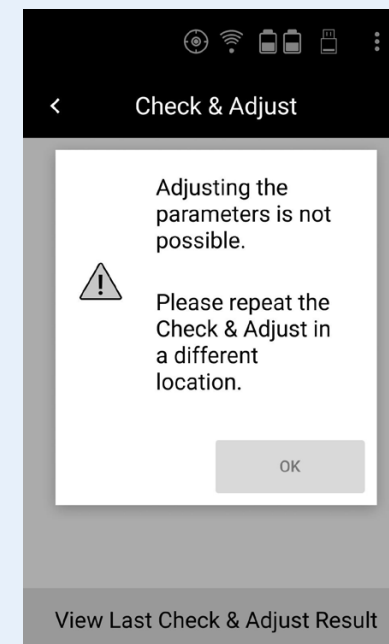
Tap the OK button to close the information message and continue to the Check & Adjust Results screen (step 8).

The Check & Adjust Report is created and stored on the USB stick.

Outcome 4.

The current and adjusted angular accuracy is calculated.

After the calculation both the current angular accuracy and adjusted angular accuracy of the scanner are displayed in the Check & Adjust Results screen. The new parameters can be stored permanently on the scanner.



After the processing step, the Check & Adjust Results screen is shown immediately (step 8). The Check & Adjust Report is created and stored on the USB stick.

Step 8.

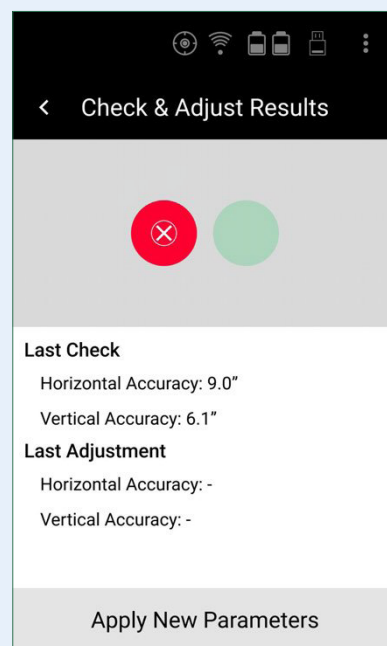
The Check & Adjust Results screen displays:

- A graphical indicator of the **Check & Adjust** solution
- The **Current Angular Accuracy (Check)** of the scanner
- The **Adjusted Angular Accuracy** of the scanner
- The **Apply New Parameters** button

Graphical indicator:



Calculated solution in this individual environment does not allow the Adjustment of the angular parameters. Apply New Parameters button is deactivated. The Check of the scanner is valid for the individual environment.



It is recommended to perform a Check of the scanner in an environment where also Adjustment is possible.

Only Current Angular Accuracy (Check) of the scanner is shown.



Calculated solution allows the Adjustment of the angular parameters. The Adjustment is done by tapping the Apply New Parameters button.

Current (Check) and Adjusted Angular Accuracy of the scanner are shown.

Check

Current values of **Horizontal and Vertical Angular Accuracy**¹ of the scanner, calculated in this environment before applying the new angular parameters.

Adjustment

Values of Horizontal and Vertical Angular Accuracy¹ of the scanner after applying the new parameters in this environment.

¹ - All accuracy specifications are on a level of confidence of 68% according to the Guide of the Expression of Uncertainty in Measurement (JCGMI00:2008) unless otherwise noted.

Tap the Apply New Parameters button to permanently apply the newly calculated angular parameters. After applying the new angular parameters Check & Adjust Results screen is closed and user is returned to the Settings screen.

The adjusted angular parameters will be permanently stored and automatically applied to all the following scans.

Step 9.

Tap the Back arrow at the top of the screen to return to the Check & Adjust screen to repeat the Check & Adjust procedure (step 5).

Tap the Close (X) button at the top of the screen to close the Check & Adjust Results screen without applying the newly calculated angular parameters and return to the Settings screen.

Step 10.

Archiving the Check & Adjust Report.

After completing the Check & Adjust, a PDF report is automatically created and stored in the "Reports" folder on the attached USB stick.

The name of the PDF report is composed with the prefix "CheckAndAdjustReport_ ..." and a time stamp, e.g. "CheckAndAdjustReport_2020-02-17 14-44-28.pdf".

Note

It is recommended to copy and archive the Check & Adjust Report on your local drive.

Check & Adjust Report

For each completed **Check & Adjust** procedure where the adjusted angular accuracy and/or current angular accuracy is calculated, a **Check & Adjust Report** is automatically created and stored in a PDF file in the "Reports" folder on the attached USB stick.

Check & Adjust

Check & Adjust report for ArtecRay-7250998

Scanner Information

Project Name:	CheckAndAdjustProject 001
Scan Name:	Scan 001
Scanner Type:	ArtecRay
Serial No:	7250998
Firmware Version:	6.97.123
Current Check & Adjust date:	2023-07-12 17:56:53
Previous Check & Adjust date:	2023-07-12 16:54:09

Check & Adjust Procedure Information

The angular parameter check as part of the Check & Adjust procedure determines the Checked Angular Accuracy and/or Adjusted Angular Accuracy of the laser scanner. The Check & Adjust procedure enables the user to understand if the angular parameters of the laser scanner are still within the specified angular accuracy of 18 arc seconds as specified in the product specifications document. Before calculating and displaying the Checked Angular Accuracy and/or Adjusted Angular Accuracy, the Check & Adjust procedure will analyse the setup location and determine if the environment is suitable to perform the Check & Adjust.

Check & Adjust Environment Overview



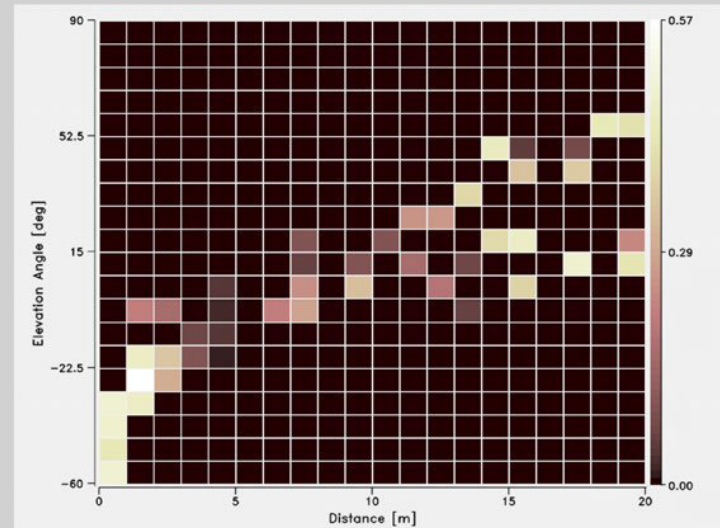
Quality

	Check	Adjustment
Horizontal angular accuracy (1 sigma)	5.6 arcsec	4.8 arcsec
Vertical angular accuracy (1 sigma)	4.5 arcsec	4.2 arcsec

The Check & Adjust Report contains the following information:

- Project and Scan name
- Scanner type
- Serial No.
- Firmware version
- Current Check & Adjust date
- Previous Check & Adjust date
- Preview of the Check & Adjust double scan
- Visualisation of distribution of points used in the **Check & Adjust procedure**.

Visualisation of location of points used for the Check & Adjust procedure:




The graph above represents the distribution of the points used for the calculation of the angular accuracy during the Check & Adjust. The colouring represent the weight given to the point in the Check & Adjust algorithm. The black color represents unused points and the white color represents high weighted points.

- Quality table with horizontal and vertical:
 - Current angular accuracy¹ (Check)
 - Adjusted angular accuracy¹

Quality		
	Check	Adjustment
Horizontal angular accuracy (1 sigma)	5.6 arcsec	4.8 arcsec
Vertical angular accuracy (1 sigma)	4.5 arcsec	4.2 arcsec

Result statement

- States if the newly calculated Check & Adjust parameters have or have not been applied.
- States if the current or adjusted angular accuracy is or is not within the specified angular accuracy of the scanner, stated in the product specifications. This state is also indicated with the green check mark or the red x mark icon, for within and out of specifications respectively.

Result	
	The new calculated Check & Adjust parameters have not been applied.
	According to the calculation of the Check & Adjust, the angular accuracy is within the specified angular accuracy of the laser scanner, stated in the product specifications.

1 - All accuracy specifications are on a level of confidence of 68% according to the Guide of the Expression of Uncertainty in Measurement IJCGM100:2008 I unless otherwise noted.

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ARTEC RAY II



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