Artec Ray II
Check and Adjust
User Manual

Artec 3D

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. 30 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 (Figure 1) by pressing the Start button. Then, press the red Start button (Figure 2) to start the scanning process. The Check & Adjust procedure collects a double scan with a resolution of 12 mm @ 10 m without images. Just one double scan in a suitable environment is required to calculate the angular accuracy of the scanner.

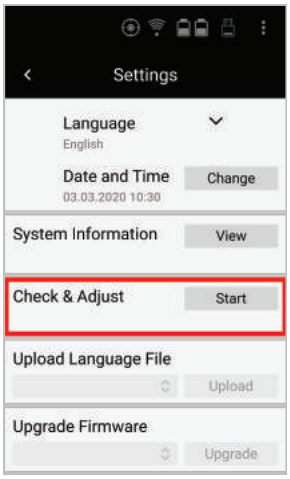


Figure 1: Check & Adjust in Settings screen.

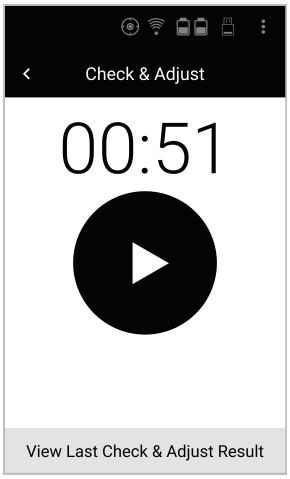


Figure 2: Check & Adjust screen.

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:

- If the environment is not sufficient, a pop-up message informs the user to repeat the scan at a different location.
- If the environment meets the requirements for the Check of the scanner the current angular accuracy of the scanner is displayed.
- 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

The environment of the scan used for Check & Adjust has an important role throughout the procedure.

To get the best results, select a suitable location, to perform the Check & Adjust, by following the guidelines specified below.

	Advised	Avoid
General	• 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	• 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	• 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	• 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	• Tall buildings • At corner of tall buildings	• Open spaces without solid objects • A lot of moving objects and vegetation

5 mHz

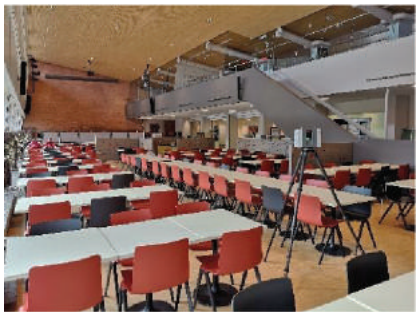
Measurement environment

Examples of suitable Check & Adjust environments:

Scan panorama of the environment	Image of the situation
	
	
	
	
	

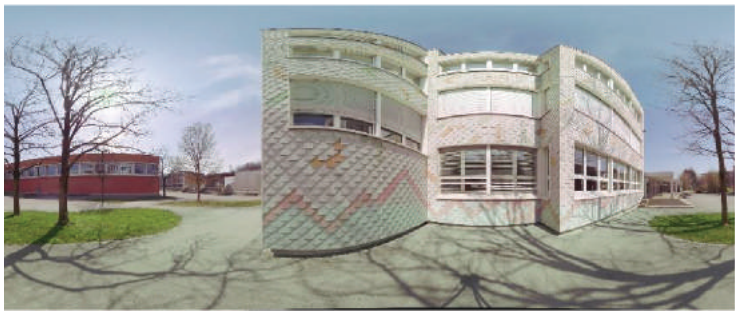
Measurement environment

Examples of suitable Check & Adjust environments:

Scan panorama of the environment	Image of the situation
	
	
	
	
	

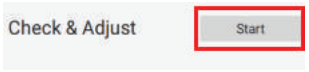
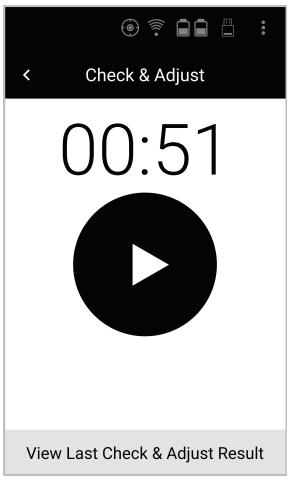
Measurement environment

Examples of suitable Check & Adjust environments:

Scan panorama of the environment	Image of the situation
	
	
	
	

Check & Adjust workflow

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

Step	Description
⚠	☞ Before starting the Check & Adjust procedure, the scanner must be acclimatised 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 turbulences. 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.
1.	Define a Check & Adjust setup location according to the guidelines described in section Measurement Environment.
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.
3.	Boot the scanner and keep it powered on in order to acclimatise to the ambient temperature.
4.	Start the Check & Adjust procedure by tapping the Start button in the Settings screen. 
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. 

Step	Description
5.1	The View Last Check & Adjust Result panel displays: • Last Check results • Last Adjustment results • Reset to Factory Calibration button

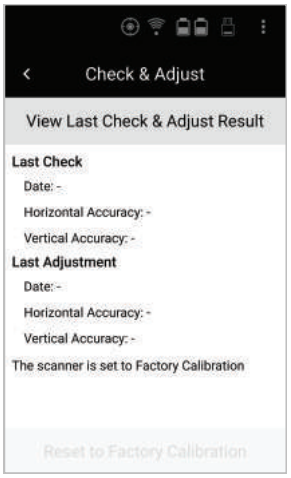
Field	Description
Last Check	Date and time of the Last Check of the scanner. Values of the Horizontal and Vertical Angular Accuracy[1] of the Last Check of the scanner. ☞ Fields are empty when Check & Adjust has not been performed yet.
Last Adjustment	Date and time of the Last Adjustment of the instrument. Values of the Horizontal and Vertical Angular Accuracy[1] of the Last Adjustment of the scanner. ☞ Fields are empty if the Check & Adjust parameters have not been applied yet or the scanner is set to the Factory Calibration.

[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.

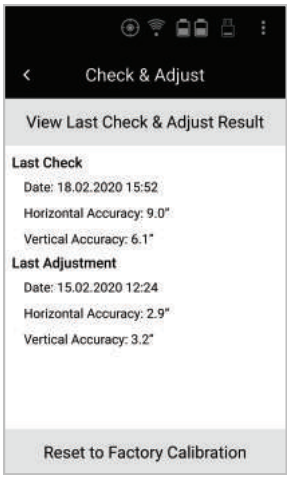
Tap the Reset to Factory Calibration button to set the current angular parameters back to the factory calibration angular parameters.

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

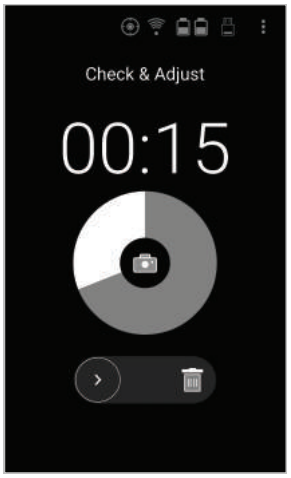
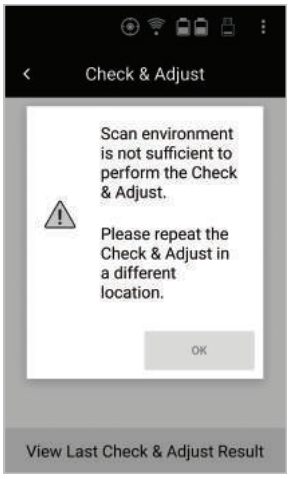
Tap the Back arrow (<) in the top left corner of the screen to exit the Check & Adjust procedure and return to the Settings screen.

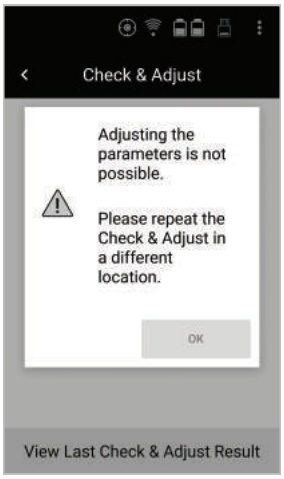


View Last Check & Adjust Result panel in case that Check & Adjust has not been performed yet.



View Last Check & Adjust Result panel.

Step	Description	
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. ☞ During scanning, stay away from the scanner and wait until the measurement is completed.	
7	Processing 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. The different processing steps are indicated below the spinning wheel: • Preparing Data for Import... • Calculating Environment Classification ... • Calculating new Check & Adjust Parameters ... ☞ The calculation can take a few minutes. The processing phase has four different possible outcomes. They are described in steps 7.1, 7.2, 7.3 and 7.4.	
7.1	Scan environment is not sufficient to perform the Check & Adjust. The environment of the selected location does not provide enough information to perform the Check & Adjust. Please choose another location (according to the guidelines in chapter 2.1) and repeat the scan. Tap the OK button to close the information message. The user is automatically redirected to the Check & Adjust screen (step 5). ☞ The calculation can take a few minutes. The processing phase has four different possible outcomes. They are described in steps 7.1, 7.2, 7.3 and 7.4.	

Step	Description
7.2	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). 
7.3	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. 
7.4	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	Description
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:

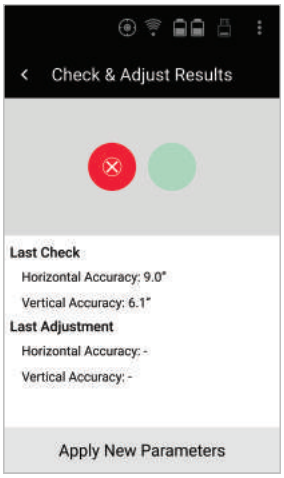
Icon	Description
	Calculated solution in this individual environment does not allow the Adjustment of the angular parameters. Apply New Parameters button is deactivated. The Check of the scanner is valid for the individual environment. ☞ It is recommended to perform a Check of the scanner in an environment 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.

Field	Description
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.

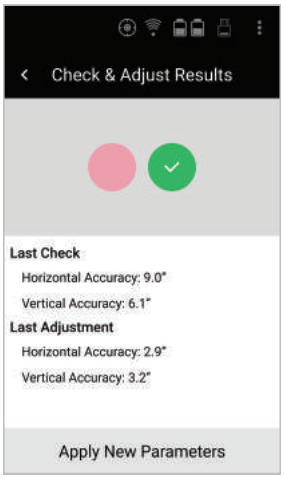
[1] All accuracy specifications are on a level of confidence of 68% according to the Guide of the Expression of Uncertainty in Measurement (JCGMI00:2008) unless otherwise noted.

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 following scans.



Check & Adjust Results screen in case of Check only.



Check & Adjust Results screen in case of Check and Adjustment.

Step	Description
8	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.
9	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-l 7 14-44-28.pdf". ☞ 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.

The name of the PDF report is composed with the prefix "CheckAndAdjustReport_ ... " and a time stamp, e.g. "CheckAndAdjustReport_2020-02- l 7 14-44-28.pdf".

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

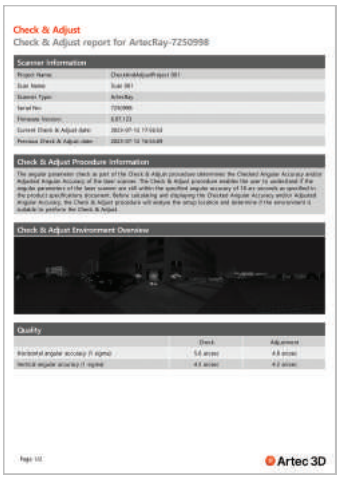
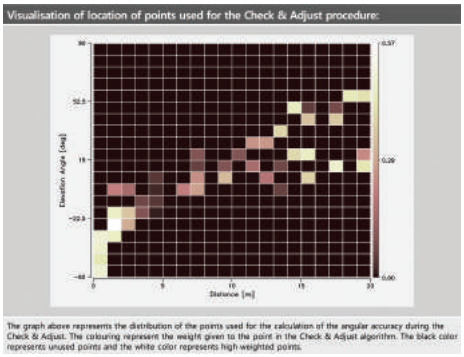


Figure 1: Check & Adjust in Settings screen.

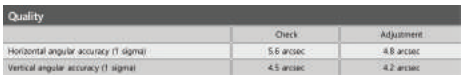
The Check & Adjust Report contains following information:

- 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

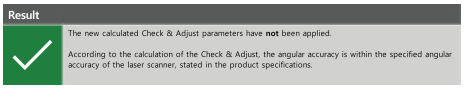


- Quality table with horizontal and vertical
  - Current angular accuracy[1] (Check)
  - Adjusted angular accuracy[1]



[1] All accuracy specifications are on a level of confidence of 68% according to the Guide of the Expression of Uncertainty in Measurement IJCGMI00:2008 I unless otherwise noted.

- 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.



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