Digital Scanning | Guidelines

Table of Contents

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Overview

For more than a decade, Cascade Dafo has been utilizing a digital manufacturing process that results in an exceptionally accurate brace fit. This approach streamlines the ordering process, allowing practitioners to send digital scans rather than shipping casts to Cascade Dafo. We will continue to update our digital scanning guidelines and recommendations as scanning becomes a more common practice in the O&P industry and as the technology advances.

Benefits of Digital Scanning

- Eliminates transportation time to Cascade Dafo
- No cost for shipping casts to Cascade Dafo
- Same excellent Cascade quality and Full (90-Day) Warranty
- Available order status from your e-Order Dashboard

Scanning Resources

For detailed techniques, take our **free** ABC-approved online course — **Casting and Scanning for DAFOs** — on the Cascade Dafo Institute.

For more info, including how-to videos, **visit**: cascadedafo.com/digital-scanning

Potential Physical Models

Click to see tips:

* ☑ Outside of fiberglass cast
- ☑ Plaster positive mold
- ☑ Patient foot/leg

Scanning Equipment

- The scanner you are using should have a tolerance level of +/-2mm, usually found in scanners using white light or laser technology.
- Follow the manufacturer's recommendations for setup, use, care and maintenance including regular calibration.
- The best resource for information about scanning equipment is directly from the manufacturer for this rapidly evolving technology.
- Please note: The infrared iPad scanners currently on the market do not meet our criteria for an incoming scan tolerance of +/-2mm when used at the distance required for scanning AFOs.

Accepted File Format

Please convert your file to one of these file types before sending:

* ☑ **.stl** ☑ **.obj** ☑ **.ply**

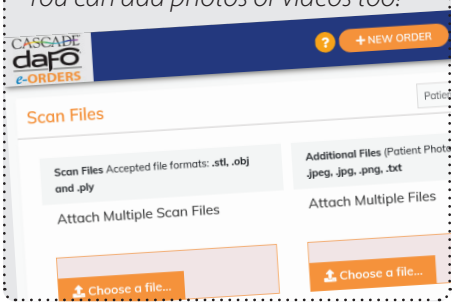
File sizes between 1-25 MB.

Save the scan file in **millimeters** to ensure it imports to proper scale.

How to send us your files

Enter the order details directly into our e-Orders system and upload your digital scan files to: orders.cascadedafo.com

You can add photos or videos too!



Support

If you have any questions contact:

Customer Support
customersupport@dafo.com
800.848.7332 | fax: 877.856.2160
intl: +1 360 543 9306

* Recommended

Tips for Scanning

Secure the fiberglass cast or plaster positive to a fixed location (if scanning a patient, ensure they can hold still). Position the physical model to capture all planes with the toes pointed up to expose the dorsum of the foot. We recommend scanning the outside of the cast to accurately capture the desired position of function while minimizing the prep work necessary to send an order to Cascade Dafo.

Tips for Scanning Each Model Type

✻ ☑ Outside of fiberglass cast:

- 2" or 3" white fiberglass wrap
- Wrap 2-3 layers of wrap - less than 4mm thick
- Close cut seam
- Trim loose wrap
- Use calipers to measure cast thickness. See "How to measure cast thickness" video
- Click to see Suggested Scanning Setup

☑ Plaster positive mold:

- Secure physical model to strong anchor point
- Remove fiberglass remnants

☑ Direct scan of patient:

- Patient needs to be able to sit still
- Foot and ankle maintain intended position of function without manipulation
- Plexiglass surface recommended to simulate weight bearing and capture intended brace angles
- Evaluate scan while patient is still present to rescan if needed

✻ Recommended

Scanning and Software

We have tested a number of scanner and software combinations and found that the volume of the scan can vary from the physical model. In general, we have noticed that the higher end scanners have a greater accuracy. Factors to consider before selecting a scanner and software combination include number of patients, practitioners, technicians, workspace, etc.

Examples of Scanning Setups

☑ Phone:

- Recommend iPhone 11 or newer
- *Comb Scanning App*
- Using a rig to scan

Advantages:

- Freedom of movement - no wires from device to computer
- Provides on-line live training
- Scans unaffected by:
  - Lighting
  - Cast Color
  - Tape
  - Staples

Disadvantages:

- No built in CAD software
- Requires use of web portal to access scans

☑ Handheld:

- White light scanner
- Using a rig to scan

Advantages:

- White light scanner has years of use in the industry
- Supplied with CAS software included

Disadvantages:

- Limited mobility - wired connection to computer
- High initial price point
- Typically additional cost per scan
- Can affect scan:
  - Over-lighting
  - Dark color cast
  - Dark color tape

* ☑ Rig for scanning outside of fiberglass cast:

- Calipers: to measure cast thickness
  - *iGaging 6" Digital Electronic Outside External OD Caliper*
- Gooseneck phone holder: allows adjustable angle for scanning casts.
  - *Cell Phone Clip on Stand Holder - with Grip Flexible Long Arm Gooseneck Bracket Mount Clamp*
- Turntable: allows ease of cast rotation to capture all planes.
  - *Lipper International Acacia Wood 18" Lazy Susan Kitchen Turntable*
- Clamp: to secure cast to gooseneck to avoid unwanted movement.
  - *Cheaplights - Heavy Duty Muslin Clamps 4 1/2 inch*

Cast clamped on rig

* Recommended

Scanning and Software continued

Common Scanners Used in O & P

- **Comb App**
  - Phone
  - *https://www.combscan.com/the-comb-app*
- **WillowWood Omega 3D**
  - Handheld
  - *https://www.willowwood.com/products-services/omega/hardware/omega-scanner-3d/*
- **Vorum Spectra 3D**
  - Handheld
  - *https://vorum.com/spectra-3d-scanner/*
- **Techmed 3D BodyScan**
  - Handheld
  - *https://techmed3d.com/products/bodyscan-scanner/*

Suggested Software

- * **Meshmixer**
  - Open source allows you to crop, fuse, and evaluate scan of your physical model
  - *https://www.meshmixer.com/*
- **Blender**
  - Open source with steep learning curve
  - *https://www.blender.org/*
- **Canfit**
  - License required
  - *https://vorum.com/canfit-op-cad-software/#*

* Recommended

Accuracy Review

A difference in measurements between scan and physical model affects the volume and the intended fit of the DAFO. All scanners have the potential to create a scan that can pass a visual identification check, yet have a dimensional difference greater than +/- 2mm. The only way to identify this issue is to measure scan dimensions against the physical model. We recommend measuring at three points or at minimum the m/l metheads.

Tips to resolve:

- Could be an isolated issue that can be resolved with a rescan.
- Follow scanner manufacturer guidelines for troubleshooting and calibration process.

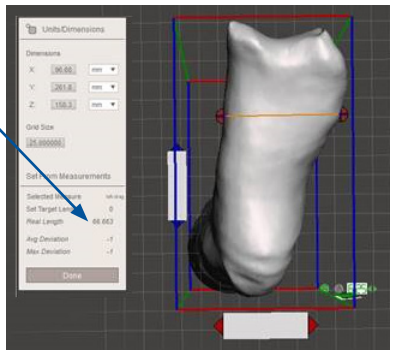
Physical Model

Scan

*** m/l met. heads**

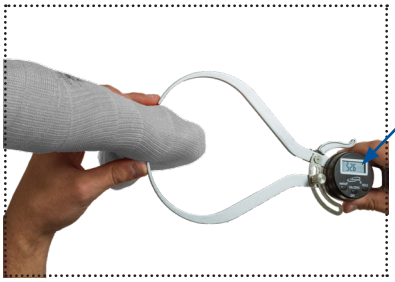
67.3

66.8



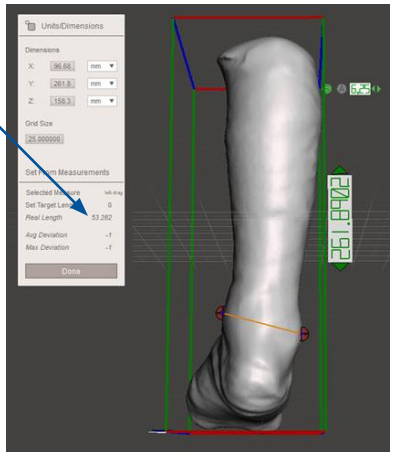
✓ 0.5mm difference

m/l malleoli



52.6

53.2

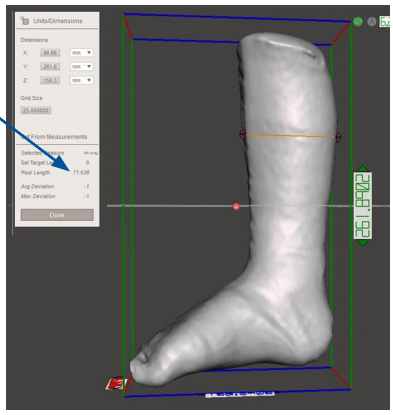


✓ 0.6mm difference

a/p calf

71.5

71.6



✓ 0.1mm difference

* Recommended

Scan Evaluation

We have identified anomalies which can occur during the scanning process that may not affect our ability to fabricate a well-fitting DAFO. There are times when the anomaly is too great and requires a rescan of the physical model. The following are examples of what we are able to correct, not able to correct, and tips to resolve.

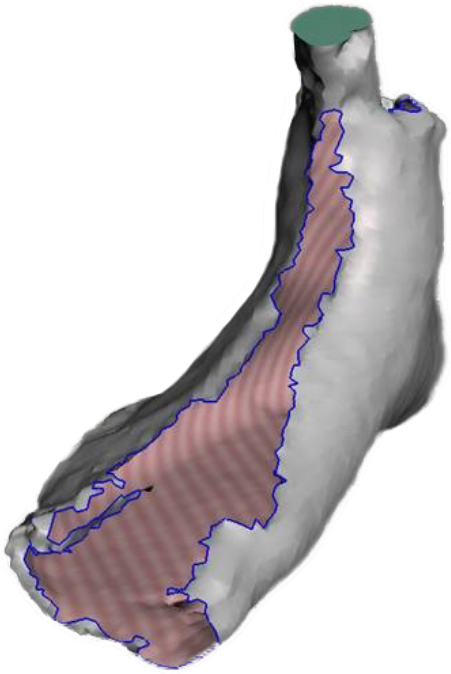
Holes: Pockets of missing data in the scan from the physical model.

Able to correct:

- Minimal missing data
- Limited guesswork of physical model
- All anatomical features are fully represented

Unable to correct:

- Large area(s) of missing data
- Not able to recognize anatomical features



Tips to resolve:

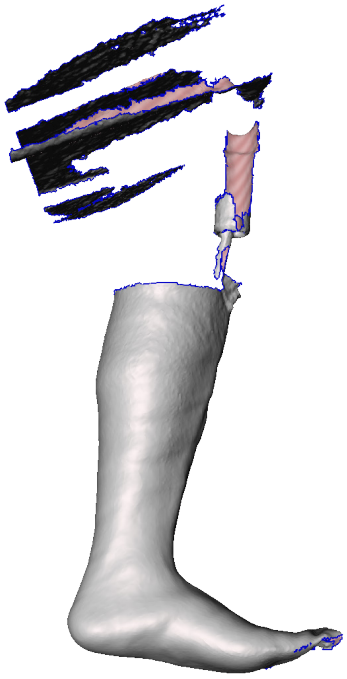
- Adjust angle of rig to allow scanner to fully capture all planes of physical model and then rescan
- Utilize "Watertight", "Make Solid", "Solidify" or similar feature within scanning/CAD software

Scan Evaluation continued

Untrimmed: Scan has extra data not related to the physical model.

Able to correct:

- When extra data can be trimmed without losing or altering the intended physical model



The physical model and scanning rig are separable

Unable to correct:

- When an object and the physical model are scanned together and inseparable without creating a large unusable hole

Physical model and hand fused together

Physical model and table fused together

Tips to resolve:

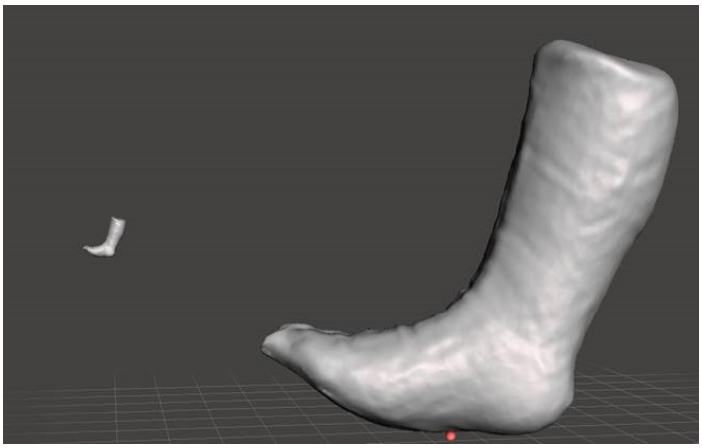
- Remove unneeded remnants of loose fiberglass from cast or plaster positive mold and rescan
- Clear scanning area of everything except the scanning rig and physical model
- Prior to finalizing, identify unneeded scan data and trim:
  - Aspects of scanning rig (if scanning cast/plaster positive)
  - Frame of plexiglass plate (if scanning patient directly)

Scan Evaluation continued

Scale Issue: The exported dimensions are saved as an increment other than millimeters (mm) which results in the scan being sized differently than the physical model.

Able to correct:

- A scan exported in identifiable units, inches (in) or centimeters (cm)



Measurements scaled in centimeters (left) or millimeters (right)

Unable to correct:

- A scan exported in units greater than inches, as this creates guesswork for the amount needed to enlarge the scan and could result in low resolution scan issues

Tips to resolve:

- Adjust scanning/CAD software settings to mm

Unfused: The independent shapes are not combined into a single digital object.

Able to correct:

- When the software is able to stitch separate data points into a single digital object

Unable to correct:

- Algorithm fails to stitch separate data points together

Tips to resolve:

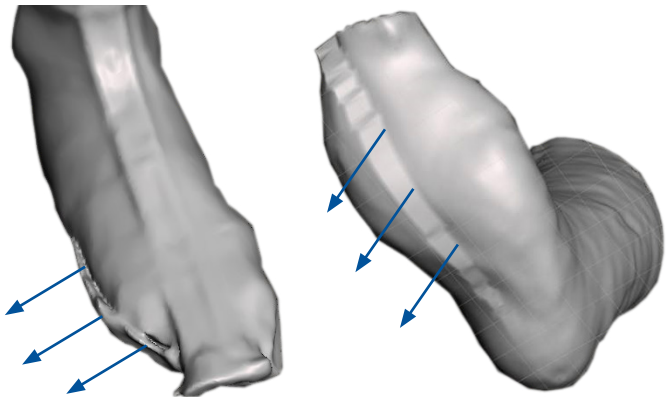
- Utilize "Watertight," "Make Solid," "Solidify," or similar feature within scanning/CAD software

Scan Evaluation continued

Drifted: During the scanning process, aspects of the physical model shifted in one or more planes affecting the anatomical features.

Why unable to correct:

- Drifted amount is inconsistent along scan
- Inaccurate anatomical features



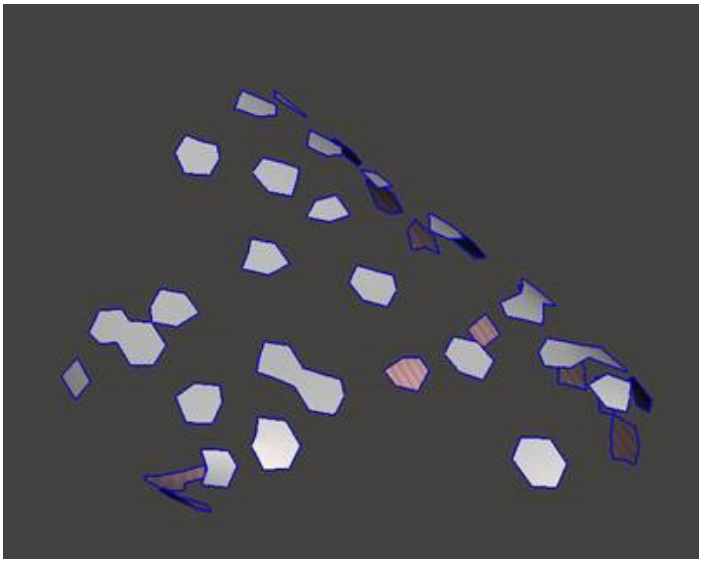
Tips to resolve:

- Secure physical model to a fixed position and rescan
- While scanning, allow slow movement in transition from medial/lateral to anterior/ posterior to dorsal/plantar aspects

File Corruption: Scanning software error resulting in an unrecoverable scan file.

Why unable to correct:

- File contains no usable data



Tips to resolve:

- Rescan

Scan Evaluation continued

Low Resolution: Scan shape with large polygons distorting the details of the physical model.

Why unable to correct:

- Not able to recognize anatomical features
- Volume of scan does not match volume of physical model

Tips to resolve:

- Set resolution in scanning/CAD software to a higher resolution
- Adjust export settings to allow for 1 - 25 MB file size

Unclosed Seam: Physical model was scanned with the cut seam open.

Why unable to correct:

- Unknown volume added to open portion of scan

Tips to resolve:

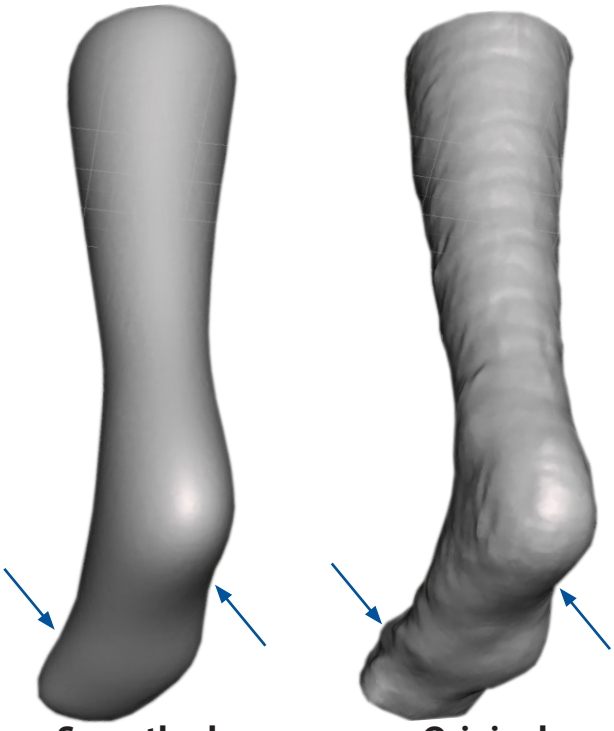
- Align cast wrap, close seam with staples or tape, and then rescan

Scan Evaluation continued

Over-Smoothed: The loss of anatomical features during a smoothing process.

Why unable to correct:

- Unable to estimate original features of physical model
- Entire volume of scan changed due to reducing high points and increasing low points



Smoothed **Original**

Flattens concave arches and bony prominences such as malleoli, heels, and metheads

Tips to resolve:

- Turn off automated smoothing process within the scanning/CAD software and rescan
- Do not apply smoothing tool/feature to scan