Introduction to Digital Dentistry

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Learning Outcomes for students

By the end of this course, students should be able to:

1. To understand the different file extensions and scanning equipment used in Digital Dentistry
2. To use the intraoral and extraoral scanners independently in their provision of treatments to patients
3. To discuss the advantages and disadvantages of digital impression in comparison with the analogue
4. To understand the basic principles of designing RBB using Exocad
5. To be able to perform zirconia polishing inside and outside clinic

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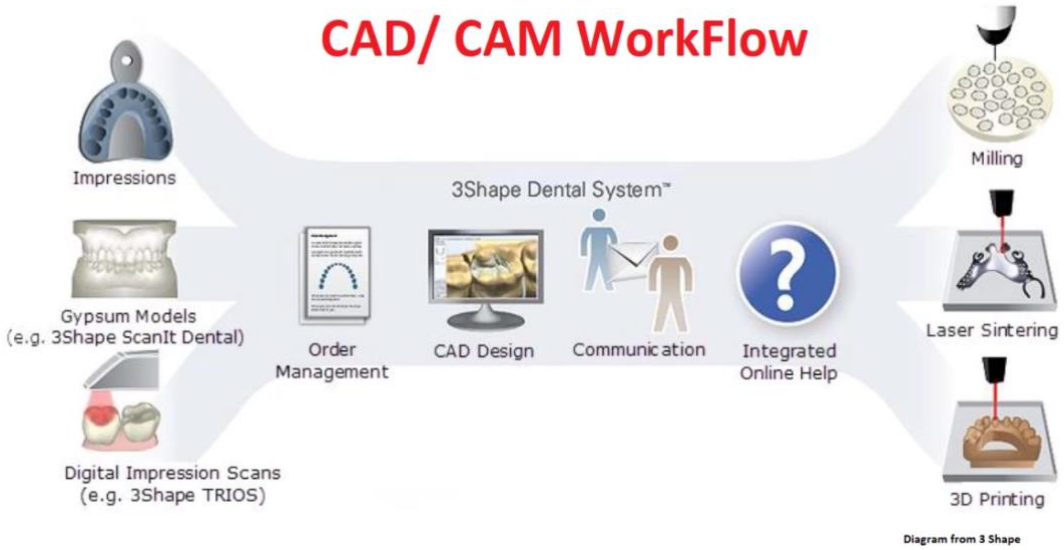
File Systems in Digital Dentistry

Open and closed systems



In digital dentistry, a few different machines and software are involved in the fabrication of the final prosthesis. These include the intraoral/extraoral scanner, the design software, the nesting software and the milling machine or 3D printer. There are many brands of these machines and softwares on the market. It is important to distinguish between open systems and closed systems, as the different brands may not be compatible with each other.

Definitions from the Glossary of Digital Dental Terms:

- *Closed architecture*: Software or hardware restricted to a specific company's digital equipment or digital workflow.
- *Open architecture*: A digital process or workflow that can be performed on various digital platforms, as opposed to closed architecture processes. These are workflows that can only be performed on a specific platform. STL is an example of open architecture.

In simpler terms, open systems are those which allow exporting of files to a standardized file extension (such as .stl file), whereas closed systems do not. This means that if you purchase an intraoral scanner from a closed system, you have to do your design, nesting, and milling on the same system. On the other hand, an open system has the following advantages:

- A wider variety and choice of compatible machines, software, and materials
- More dental laboratories would be able to work with your scanned file
- More versatility and potential for innovative designs
- Potential cost reduction

In PPDH, the intraoral scanners (3shape trios), desktop scanners (3shape D2000, Zfx), design software (Zfx exocad), nesting software (hyperDENT), and milling machines (Arum) are open system.

Common file extensions in digital dentistry

File extension	Stands for	What is it?
.stl	Standard tessellation language	Describes the geometry of a 3D object using triangles, without color or texture. No scale information. Most common file extension for scanners, including 3shape trios and the desktop scanners. (Open system)
.ply	Polygon file format	Describes the geometry of a 3D object using flat polygons. Contains information on color, transparency, and texture. Can be exported by 3shape trios and some other intraoral scanners. (Open system)
.dcm	Dicom format	Describes all the information obtained with the TRIOS intraoral scanner, including shade measurement, HD photos, color imaging, margin line, annotations, and patient data along with its color digital impressions. Can only be exported by 3shape trios. (Closed system)
.nc, .gcode, .mpt, .mpf	G-code	A computer numerical control (CNC) programming language used in CAM to describe instructions for milling and 3D printing. The hyperDENT nesting software outputs .nc file. (Open system)

References

1. https://www.3shape.com/en/news/2017/export-stl-files-from-your-3shape-trios
2. https://www.follow-me-tech.com/wp-content/uploads/hyperDENT-HandbookENG.pdf page 119
3. https://www.hindawi.com/journals/jhe/2017/8427595/
4. Glossary of Digital Dental Terms https://onlinelibrary.wiley.com/doi/pdf/10.1111/jopr.12532
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5727697/

Intra-oral Scanning with 3shape TRIOS®

Indications of use

- Implants
- Inlays/ onlays
- Veneers
- Single crowns
- Post and core restorations
- Bridges
- Orthodontics

Contents in the BOX

- Instruction manual
- Protection tip (without mirror in it): used when scanner is not in use
- Scanner tips (with mirror in it)
- Sterilized scanner tips: use when performing digital scan intraorally on patients
- Adapter/ holder for color calibration
- 3D calibration tip
- Color calibration kit (with color calibration target inside)

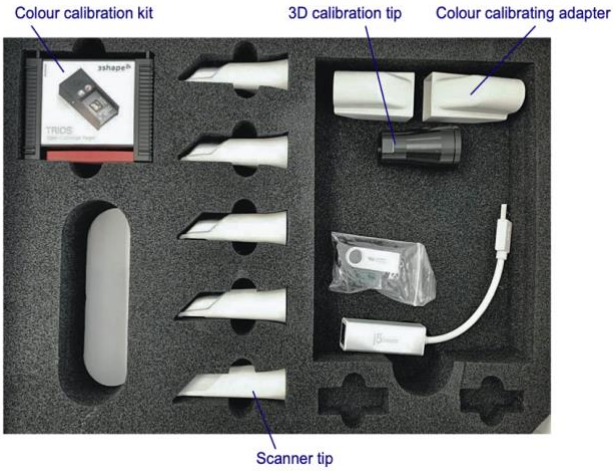


Figure 1 - TRIOS Box content: Top layer

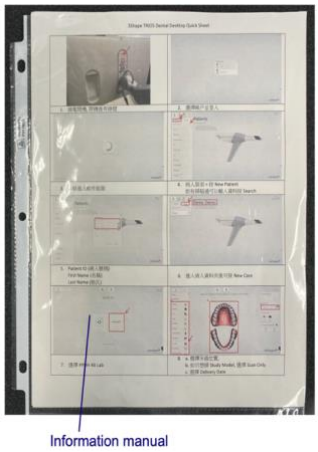


Figure 2- Information Manual

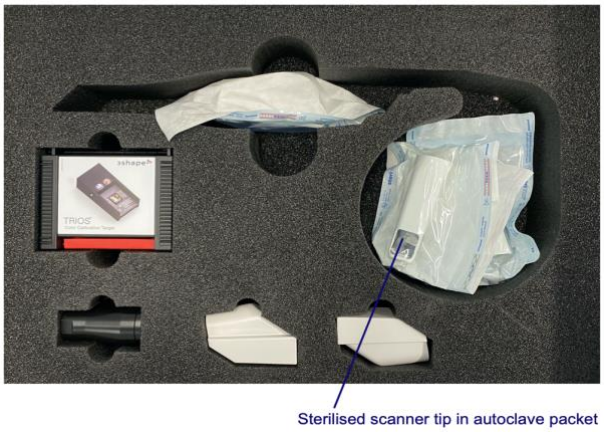
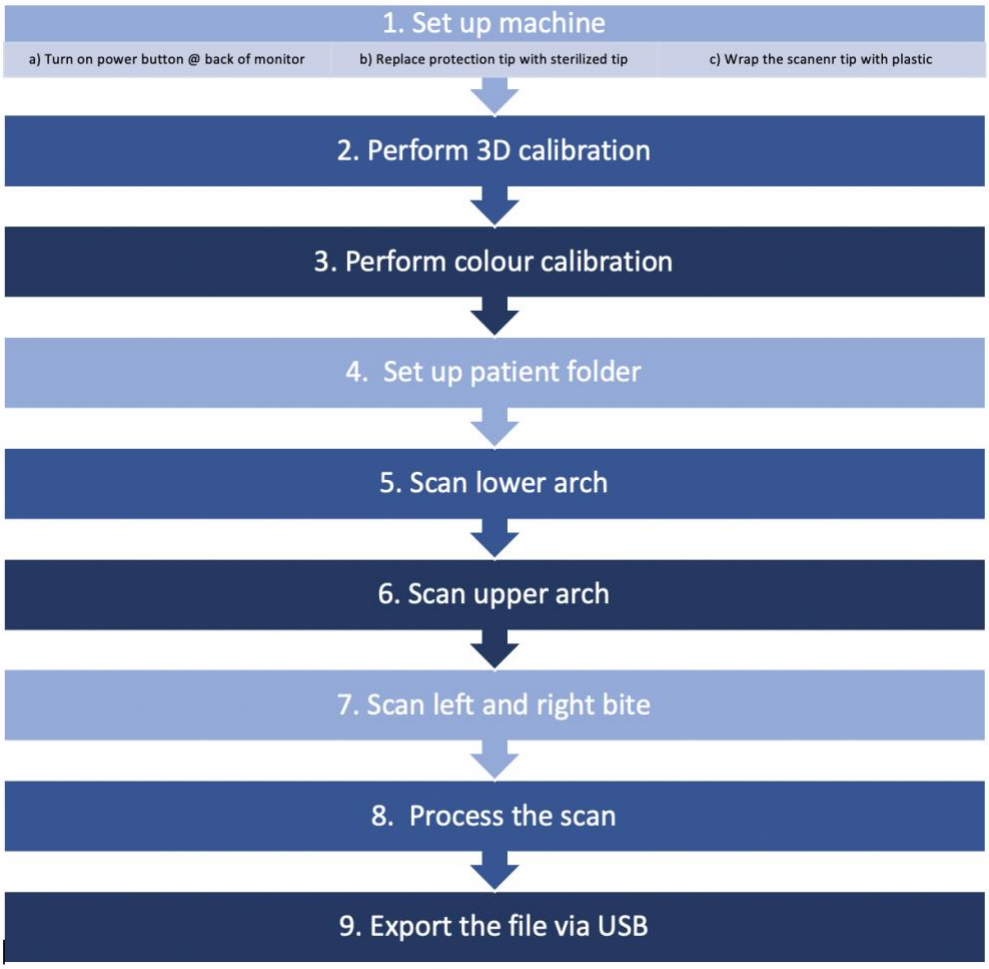


Figure 3 - TRIOS box content: Bottom layer

Workflow for students



A. START-UP SYSTEM

1. Power up the system by pressing on 'power button' located at the back of scanner + start-up TRIOS application software

Figure 4 - power button at the back of scanner

2. Replace protection tip with sterilized scanner tip w/ tip facing down
3. Wrap scanner in plastic
4. Return the scanner to scanner-mount on the cart

B. CALIBRATING SYSTEM

- Calibrate it for first time and every 8 days during regular use or when scan quality degrades

3D calibration - adjusts the optics of scanner for generating 3D images

Replace scanner tip with 3D calibration tip
Go to 'configure' page of your TRIOS system
Select 'Scan'→ '3D calibrate scanner'
Follow on-screen instructions
Wait for system to calibrate device
Once process is completed, replace 3D calibration tip with sterilized scanner tip

Color calibration - adjusts color recognition for particular scanning tip

Mount the color calibration adapter onto scanner tip
Locate the color calibration target from the kit and insert into the color calibration adapter with the color side facing up
Open 'scanning settings' page→ 'color calibrate scanner'
Wait for system to calibrate device
Detach the color calibration target, flip over the target with gray side face upwards then, reattach it to the color calibration adapter
Once completed, remove the calibration target and adapter from the scanner tip and put the calibration target into its sleeve/ kit

C. SET UP PATIENT FOLDER AND PATIENT PREPARATION

1. Set up patient folder by adding a 'new patient'
2. Enter patient details on-screen followed by, send to '3shape'
3. Prior to taking intraoral digital scan, prepare the patient's teeth by drying the teeth lightly with the 3-in-1 air syringe
4. If scanning a prepared tooth, possible to place gingival retraction cord(s) to retract gingiva and remove the cord(s) before scanning
5. Avoid pointing light from dental chair lamp directly into patient's mouth as may affect color quality of scan

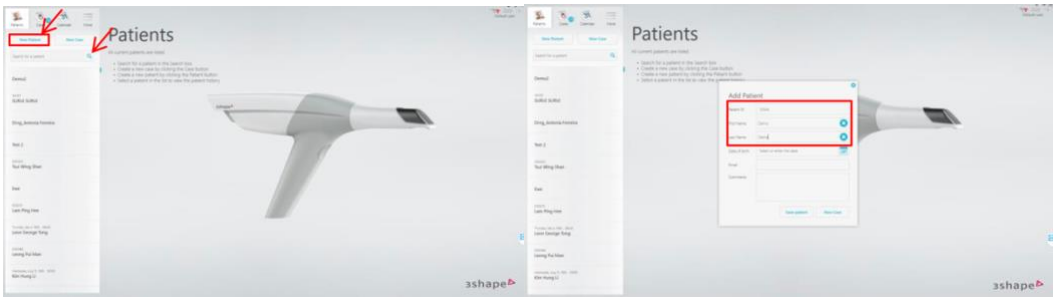


Figure 5 and 6 - patient folder set up page

D. TAKING A DIGITAL SCAN

1. Once ready, press the 'scan' button ( ) in workflow bar at top of screen
2. Select the button representing 'lower jaw' first followed by, 'upper jaw' and 'occlusion'

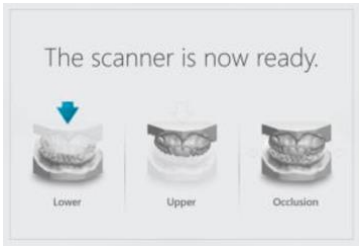


Figure 5- button representing 'lower jaw', 'upper jaw' and 'occlusion' from left to right

3. Insert scanner tip into patient's mouth and point at area to scan
4. Start scanning at tooth preparation or molar whilst keeping scanner head at 0-5 mm away from teeth
5. Once ready to scan, press the 'scan activation button' on scanner or alternatively, press 'scan button' at bottom of screen
6. Move the scanner slowly and smoothly whilst changing scanning angle to 35-55 degrees during scanning
   a. Keep lips, cheeks and tongue out of scanner's view by using finger, dental mirror or lip or cheek retractor

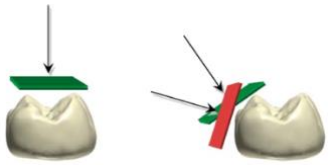
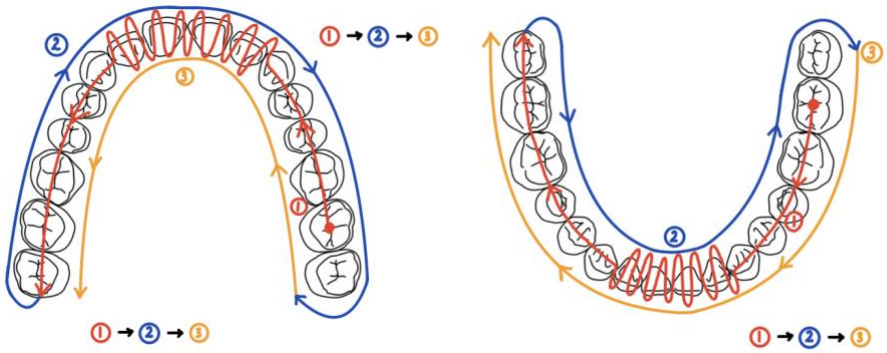


Figure 6- distance between scanner head and tooth surface

7. Scan in the entire arch in the following order:



Upper jaw			Lower jaw		
1	Occlusion	Palm grip	1	Occlusion	Palm grip
2	Buccal		2	Lingual	
3	Palatal		3	Buccal	

**Note: Possible to change position of scanner tip depending on jaw you are about to scan*

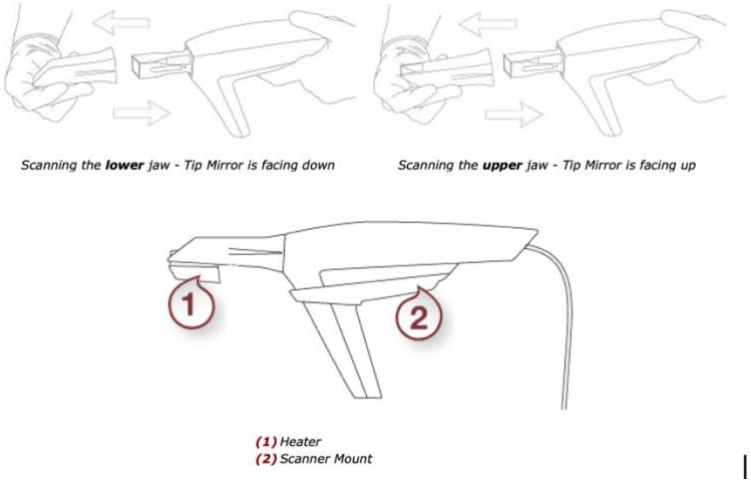


Figure 7- position of scanner tip depending on jaw to be scanned

8. If alignment has been missed (or when sound disappears), rollback to previous spots or move back to premolar or molar areas
9. Repeat steps 4-8 for upper arch
10. Inspect the result by rotating the scan on screen
11. If preparation is being scanned, check that following are recorded:
    a. Margin line
    b. Contact points
    c. Occlusal surfaces
12. If missing area found (area will be show in **green**), scan area until scanner detects location

Figure 8- scanned lower arch

E. TAKE BITE SCAN/ OCCLUSION

1. Take ‘bite 1 (right bite)’ first by pressing on ‘bite 1’ on the screen followed by, ‘bite 2 (left bite)’
2. Insert scanner tip into patient’s mouth at buccal side of teeth
3. Retract patient’s cheek with scanner tip and instruct patient to bite into MIP
4. Once ready to scan, press the ‘scan activation button’ on scanner
5. Move the scanner slowly and smoothly towards mesial direction
6. Center 2D image on occlusal plane and make sure there is equal coverage of upper and lower teeth
7. Best to scan 4 teeth for optimal alignment
8. Press ‘done’ button once completed
9. Repeat steps 2-6 for ‘bite 2 (left side)’ on opposite side

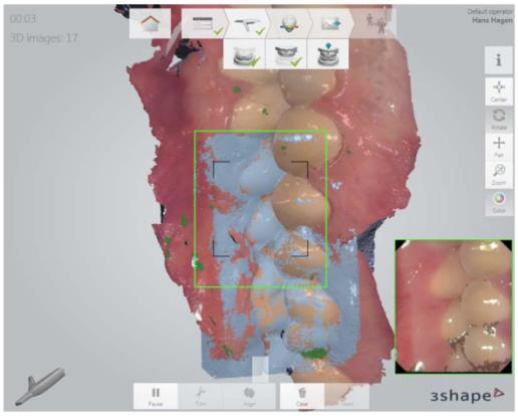


Figure 9 - page showing left bite scan

F. PROCESS THE SCAN

Once ready, proceed to processing the scan

G. EXPORT THE FILE

1. To export the file, plug your USB pendrive at the back of the scanner
2. Find the the ‘scan only’ button below patient folder on screen

3. Click on ‘export’ → ‘scans’
4. Click on your USB→ name the file→ ‘save’ (works like a Windows computer)

H. DISINFECT SYSTEM AND STERILIZE SCANNER TIP

1. Disinfect system
2. Send scanner tip for sterilization

Please watch the videos on setting up, preparation and intraoral scanning in the video library

References

1. https://www.danedentallab.com/uploads/7/5/9/2/7592248/_trios_3_shape_manual.pdf

Extra-oral Scanning

Recommended videos before reading:

1. 3shape trios scan strategy https://www.youtube.com/watch?v=IGzf9qkztMo
2. 3shape D2000 desktop scanner https://www.youtube.com/watch?v=LwUFSVyEhYE
3. Occlusion setup tool https://www.youtube.com/watch?v=E49mlNgSR4k

a

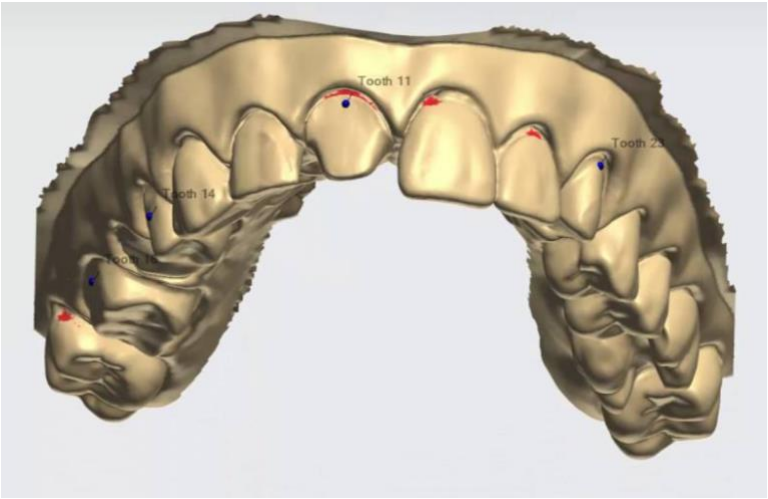
With an extra-oral scanning method, an impression will first have to be taken. There are then several ways to proceed:

1. Scanning the impression.
2. Pouring a cast from the impression and then scanning the cast, either by a handheld scanner or a desktop scanner.

The advantage of using an extra-oral scanning protocol is that the clinician does not have to purchase or have access to an intraoral scanner to be able to use CAD-CAM technology in designing and making crowns and bridges. Instead, the lab should be equipped with a machine capable of scanning impressions or casts.

Scanning impressions

This method is not often done in PPDH. The main reason is that the scan quality is often not as good as with a stone cast. The scanner often cannot access undercuts areas in the impression. With this method, the operator takes the impression and sends it to the lab, where instead of pouring a gypsum cast, the lab scans the impression directly on a desktop scanner such as 3shape D2000. The software will then be able to generate a digital model directly from the scanned impression.

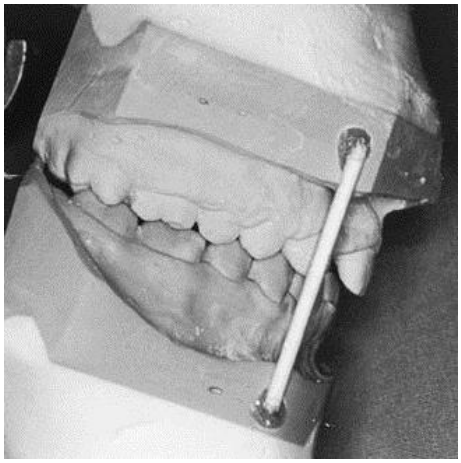


Handheld scanner for casts

The same handheld system (3shape trios) from intra-oral scanning can also be used on the casts, but you will find this technique much easier than in the mouth. Place the casts on the table or in your hand and scan the casts, similar to what you would do inside the mouth, being careful not to accidentally block the scanner with your finger. After the upper and lower casts have been scanned, you may proceed to scan the jaw relationship between them. You should be able to complete the whole process (from setting up to saving the stl file) within 5 to 10 minutes.

If the casts cannot be hand articulated, it can first be mounted on an articulator (using a jaw relationship record). Then close the articulator and use the handheld scanner to scan the occluding casts while on the articulator. Alternatively place the casts in occlusion using the jaw relationship record and fix with a rigid object (such as a bur with a long shank) and sticky wax. If the casts can be hand articulated, you may choose not to mount the casts on an articulator and simply hold them together in MIP with your hand, rubber band, or fixed with a rigid object (bur with long shank) and sticky wax.

Then use the handheld scanner to scan the buccal relationship of the upper and lower casts. Save the files on the system and you may export it as an .stl file and send the files to a laboratory.



Fixing the casts with a rigid object and sticky wax for scanning occlusion

Desktop scanner for casts

As with the intraoral scanner, these scanners have to be calibrated from time to time, using the provided calibration plates. From past experience they are calibrated approximately once a month. In PPDH, there are currently 2 desktop scanners and they can be found in the lab, the 3shape D2000 scanner and the zfx Evolution Plus scanner. The 3shape scanner is newer and undergraduate dental students are recommended to use it over the zfx scanner as the zfx scanner occasionally has difficulty in scanning proximal undercut surfaces on teeth and the user may have to adjust the orientation and position of the cast to scan the proximal surfaces properly. This means the zfx scanner generally takes a bit longer than the 3shape scanner. Even though the zfx scanner is slightly more accurate than the 3shape scanner in theory, this extra accuracy is not clinically significant in routine crown and bridgework and not worth the extra time and effort. Only cases requiring additional accuracy such as some implant prostheses and

full arch reconstructions may benefit from this. In this section we will discuss in detail the usage of the 3shape scanner only.

Zfx Evolution plus scanner

3shape D2000 desktop scanner

With the 3shape scanner, you have a choice to use the occlusion setup tool and you will then be able to scan both upper and lower casts as well as the bite together at the same time, and a separate bite scan is not required. However that means the placement of the casts on the interface plates has to be precise and you have to be careful not to accidentally displace the cast while transferring the plates to the scanner. Unfortunately, the technicians' experience is that there are frequent errors with the occlusion setup tool, and now they prefer to scan the bite separately. Both methods are presented below, and both of them take about 5 minutes. After scanning, you can then design the restoration on the software or export it as an stl file. The software also has a virtual articulator where you can visualize both the static and dynamic occlusion.

Using 3shape scanner with the occlusion setup tool

First fix the lower cast onto the lower interface plate (the flattened edge of the plate should be posterior) with blue tack and insert it in the occlusion setup tool between the three alignment points, with the flattened edge facing outwards. Lock the plate with the locking mechanism. Then place the upper cast on top of the lower cast in the correct occlusion, and close down the upper plate and blue tack onto the upper cast. Both casts should now be attached to the interface plates. Double check the occlusion is correct. Open the locking mechanism and remove the casts which should be attached to the plates. Insert the casts and plates into the desktop scanner, with the upper model on the right and the lower model on the left. Click "Scan" on the software and choose "Occlusion setup tool" on the interface plate drop-down menu. Follow the instructions on the software to complete the scanning. Typically we choose to scan the whole arch (by choosing RPD in the options provided even if you are planning to do a fixed prosthesis), but you can also choose to scan a specific area of the cast. The software will automatically align the casts according to the occlusion you have set in the occlusion setup tool.

The occlusion setup tool

Using 3shape scanner without the occlusion setup tool

Fix the casts onto the interface plates with blue tack and place them in the scanner, with the upper model on the right and the lower model on the left. Choose “none” on the interface plate drop-down menu and start the scan. When the software is done scanning the upper and lower casts, you can remove the casts, articulate them together by hand or with a bite registration record, and fix them together with a rigid tool (such as a bur or toothpick) and sticky wax. Then place in the scanner again to scan the bite.

Workflow for BDS students in PPDH

On your patients, these are the steps you have to follow to use this method.

1. Take a putty-and-wash impression. Check your impression and make sure you are satisfied that it does not have any critical errors (the margin should be clearly seen, there should not be any bubbles on the abutments, etc) and then have your tutor verify. Decide whether jaw relationship records and mounting on an articulator is necessary. Then send the materials to the lab.
2. The technician will pour a working cast.
3. HKU staff will approve/reject the working cast. If rejected, start again from step 1.
4. The technician may mount the casts using the jaw relationship record provided if you have instructed him/her to do so.
5. You can then scan the casts using the handheld scanner or desktop scanner, depending on your preference and availability of machines.

Computer-aided Design of RBBs

The CAD-CAM lab in PPDH uses the Zfx exocad system to design zirconia RBBs. We strongly recommend that you go to Vox and watch the video about designing RBBs on exocad before reading this section. This section is a written summary of the steps involved and is meant to be a useful and practical reference when you forget some of the steps.

Here are some basic tips on using it:

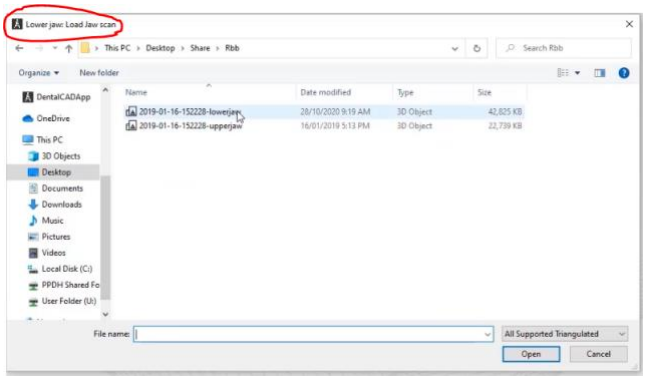
Hold down right click and drag	Rotating the cast
Hold down left and right click at the same time and drag	Translation of the cast
Scrolling up and down	Zooming in and out of the cast
Pressing “a” on keyboard	Show/Hide opposing cast
Pressing “s” on keyboard	Show/Hide current working cast

STEPS TO DESIGN A RBB ON EXOCAD

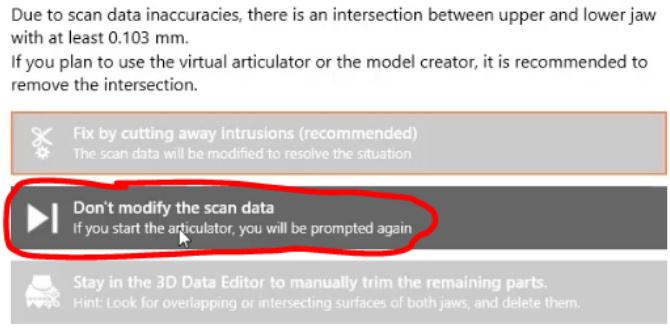
A. Preparation

1. Create a new project, with the patient’s name and patient number. Select “digital impression scan” for the antagonist type.
2. Select the abutment tooth. Under “Worktype group”, select “inlays, onlays and veneers” and then select “offset inlay”. Pick the appropriate material (Zfx Zirconium). Make sure the minimal thickness is set at 1mm, and click “apply”.
3. Select the pontic. Under “Worktype group”, select “pontics” and then select “anatomic pontic”. Pick the appropriate material (Zfx Zirconium). Click “apply”.
4. Select the opposing teeth to the RBB. Under “Worktype group”, select “residual dentition” and then select “antagonist”. If the RBB is not opposing any natural teeth, you can select “missing tooth” instead. Click “apply”.
5. Click on the button on the right which opens the Zfx design CAD software

6. Load the scan files of the lower and upper jaws according to the title on the top left of the dialog which pops up. Adjust the orientation of the scans to ensure you are looking at the occlusal surface and not the underside of the teeth.



7. Sometimes, the system detects intersections between upper and lower jaw scans. In that case, click “Don’t modify the scan data”.



B. Retainer design

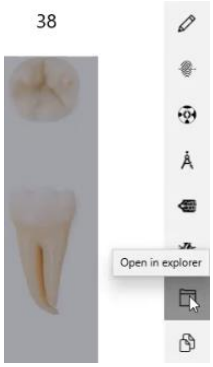
1. Outline the margin line for the retainer. Make sure you do not extend the margins into undercuts! You can check this by rotating the cast until you can see all of the margins from one view. Click “next”.
2. Set the insertion direction, click “next”.
3. Set the parameters for cement gap (0mm), border (horizontal 0.1mm, angled 0.1mm, angle 45°, vertical 0mm). Then block the undercuts (angle 0°, size 0mm). Click “apply” then “next”.
4. Do some free-forming of the retainer by first using the “smooth” function and then using the “add” function until you get a minimal thickness of 1mm throughout the retainer. The parts of the retainer with sufficient thickness is shown in yellow, and the parts with inadequate thickness is shown in orange. You may adjust the brush size and strength to your advantage. Click “next” when you are satisfied with the retainer.

C. Pontic design

1. Adjust the size, position, and angulation of the pontic. Make sure you verify the position from different directions. A tip: You may click on the “A” key on the keyboard to view the opposing cast as well. Click “next”.
2. Adjust the cervical part of the pontic to achieve a good emergence profile from the soft tissue. Also double check that the interdental space is cleansable with an interdental brush. Click “next”.
3. Now adapt the pontic to the gingiva, the opposing tooth, and the adjacent tooth. This is done by clicking “adapt to gingiva” on the “pontic” menu, “cut intersections” on the “occlusal” menu, and “cut intersections” on the “approx” menu. Click “next”.

D. Connector design

1. Add the connector in the correct position. Click “next” and use the free-forming tools to make the connector as thick as possible (to the reader: do you remember why this is important?), and then smoothen it. You can measure the occluso-gingival height and bucco-lingual width of the connector by pressing the “cut view” on the right panel.
2. Check your design again (refer to checklist below) and once you are satisfied, save the project. To access the CAD file of the RBB you just designed, click on this button on the right panel. Now your RBB is ready for nesting and milling.



Please watch the videos on designing RBB in the video library

CHECKLIST

Framework

- ❑ Framework extension has been maximized and any planned resistance features are present.
- ❑ The retainer is of sufficient thickness (minimum 1mm with zirconia).

Pontic

- ❑ Pontic is in the planned size, shape, position, and angulation.
- ❑ Pontic has good emergence profile from soft tissue.
- ❑ Pontic has the correct marginal ridge height. Try to match with adjacent teeth.
- ❑ Pontic has the planned buccal overjet and overbite.
- ❑ Check the esthetics from the frontal view.

Others

- ❑ The embrasure is contoured correctly and is cleansable with an appropriately sized interdental brush.
- ❑ The connector has sufficient width and height.
- ❑ There are no high spots in occlusion.

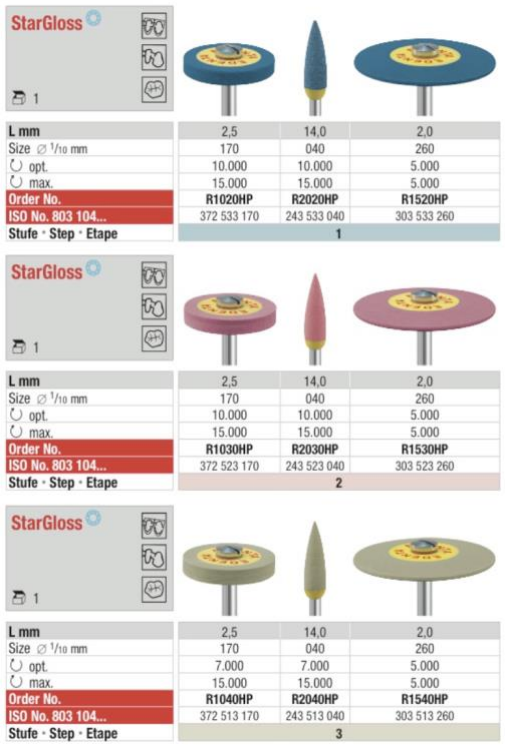
Zirconia Polishing

In the DTU, zirconia prostheses are polished using StarGloss HP (Edenta). If you would like to do chairside polishing in the clinics, Maestro Porcelain Polishing Kit (Henry Schein) is also available in 4A pros clinic.

StarGloss HP (Edenta)

According to the manufacturer's manual (2021-2022), these polishers have diamond grit with a highly condensed, long-mesh synthetic bonder to produce an outstanding surface texture. They are guaranteed to polish all-ceramics zirconia gently and successfully without the need for an extra glaze firing.

Step 1 = Blue	**Coarse grit** For pre-grinding, for quick and bulk material reduction
Step 2 = Pink	**Medium grit** For smoothing the surfaces and preparation for final glaze
Step 3 = Grey	**Superfine grit** For high shine polishing without additional final glaze



From “Edenta Dental (2021-2022)”

Maestro Porcelain Polishing Kit (Henry Schein)

With reference to the Henry Schein Dental Merchandise Catalog (2020), these are hard-flexible, silicone polishers with diamond abrasive embedded. They can be used to polish ceramic, metal, and zirconia without paste.

Porcelain Polishers Shaping - Coarse

3 per Pkg.
Rec. RPM: 7,000-12,000

Style:	Wheel	Small Point	Point	Cup	Disc
Item Code:	112-5715	112-5716	112-5717	112-5719	112-5720
Shank:	HP	RA	RA	RA	RA
Price:					

Porcelain Polishers Smoothing - Medium

3 per Pkg.
Rec. RPM: 7,000-12,000

Style:	Wheel	Small Point	Point	Cup	Disc
Item Code:	112-5721	112-5722	112-5723	112-5724	112-5725
Shank:	HP	RA	RA	RA	RA
Price:					

Porcelain Polishers High Shine - Fine

3 per Pkg.
Rec. RPM: 7,000-12,000

Style:	Wheel	Small Point	Point	Cup	Disc
Item Code:	112-5726	112-5727	112-5728	112-5729	112-5730
Shank:	HP	RA	RA	RA	RA
Price:					

From Henry Schein Dental Merchandise Catalog (2020)

Flexible radial disc (Dumont)

For areas not accessible by a regular polisher, a flexible radial disc (Dumont) can be used. Similar effect can also be obtained using diamond paste with a bristle brush.

Please watch the videos on zirconia polishing in the video library

Intraoral Digital Impression vs Conventional Analogue Impression

Highlights of the advantages and disadvantages of intraoral digital impression technique will be summarized below and the comparison of the accuracy between the two techniques is discussed in greater detail.

Advantages of digital impression

- More comfortable for patients - e.g. more comfortable breathing, avoid gag reflex
- Possible to overwrite only the part where the impression is not clear
- Reduce total clinical treatment time
- Do not occupy physical space
- Allow quick access to 3D diagnostic information
- Eliminate fabricating errors - e.g. distortion of impression material

Disadvantages of digital impression

- Expensive
- Lower accuracy and detail reproduction, but still sufficiently accurate for production of short span fixed prosthesis
- Might require more gingival retraction of the prepared teeth in order to capture margin well

Accuracy of digital impression

Generally speaking, conventional impressions using high-precision impression materials (e.g. polyether, polyvinyl siloxane) produce a **higher accuracy** than intraoral digital impressions but **both techniques produce acceptably accurate impressions for short span prosthesis**. Besides, **desktop scanners** exhibit a higher degree of accuracy than intraoral scanners [1].

The comparison can be made on three different aspects - **trueness, precision** and **fitting** of the fabricated crowns using the two techniques. Trueness refers to the ability for the impression technique to capture the real entity of a measure. Precision is defined as the reproducibility of the measure with repeated impression taking. Conventional analogue impressions show a superiority over the digital ones [2]. Nonetheless, both techniques could produce **acceptably accurate impressions for fixed partial edentulous prosthesis** [1,3] **and crowns** and therefore **digital impression is a reasonable alternative** [2]to conventional analogue impression. In regard to marginal fit and internal fit of the crowns fabricated , limited evidence suggested that both techniques **perform equally well** [4]. All marginal gaps were shown to be less than 120 μm when digital impression technique is used [5]. However, no sufficient data provided to compare the occlusal contact and interproximal fit [4].

Possible factors that affect the accuracy of the digital scanning are:

- Scan range
  - The longer and larger the scanned region, the larger the error [1–2]
  - Therefore, substantial correction has to be made when a cross-arch fixed prosthesis or full arch prosthesis is fabricated according to a digital impression.
- Scan substrate
  - **Buccal surface of anterior** and **molar region** are more difficult to capture accurately [2]
    - More difficult to get rid of tooth surface saliva in the region
    - Tooth anatomy harder to capture - e.g. complex angle and undercut surfaces of molars
  - Higher accuracy for scanning **prepared teeth** than intact teeth ; **composite** than amalgam, **dentine** than enamel [6]
  - Lower precision is also anticipated when the **margin of tooth prep is closer than 0.5 mm to the gingival tissue**

- Surface property [1]
  - Objects that **do not reflect laser well** are difficult to capture into to the digital scanner
  - Presence of **blood, saliva flow, crevicular fluid** covering tooth surfaces induce scanning errors
  - **Smooth, undercut-free** tooth preparation are preferred in order to be captured accurately
- Illuminance and colour temperature
  - **3900K** and **500 lux** is the most appropriate lighting condition for taking a digital impression [1]
- Manufacturer (trueness ranked from highest to lowest, discrepancy shown in bracket) [1]
  - Partial edentulous model : **Trios (**20.6μm) , True Definition (23.2μm), iTero (31.7μm), Cerec (36.4μm)
  - Total edentulous model : **True definition** (32.1μm), Trios (55.3μm), iTero (94.5μm), Cerec (98.3μm)
  - **Trios has the best performance** closest to a desktop scanner

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