

CT Scan Process



General Overview:

In order to fabricate a CBCT based surgical guide we require uncompressed DICOM3 data from a Cone Beam CT or Medical CT. The records and type of scan we require depend upon the software and the technique to be utilized (Table1). The cone beam settings and general scanning instructions however remain consistent regardless of the type of scan. The models or impressions should be of high quality because the accuracy of the surgery depends upon these initial records. The restorative tooth position must be established in the onset of this process using an existing appliance, a denture tooth setup, or a diagnostic waxup. This should be approved by the patient and/or restorative dentist. ROE Dental Lab can be helpful with this diagnostic procedure. In order to begin the diagnostic process we need explicit instructions on the restorative goals and requirements.

	Accurate models or impressions	Diagnostic tooth position information	Scan appliance	DICOM 3 data of patient	DICOM 3 data of patient w/ scan app.	DICOM 3 Data of Appliance Alone
Scan Appliance Technique						
<i>Simplant</i>	X	X	X		X	X
<i>BlueSky Plan</i>	X	X	X		X	X
<i>iDent</i>	X	X	X		X	X
<i>NobelGuide</i>	X	X	X		X	X
No Scan Appliance Technique						
<i>Simplant</i>	X	X		X		
<i>BlueSky Plan</i>	X	X		X		

Table 1

Cone Beam Settings

General

0.4 Voxel
 Scan Time 20 Seconds
 FOV 140 and 170 mm
 Stitched scans on small FOV
 Matrix 512 x 512

System Specific Instruction

Kodak System = Scan Appliance should be scanned at KV 80 Ma 2
Galileos System = Scan Appliance must be scanned inside of the special Sirona Lead Scan cylinder.

General scanning instructions:

- Set the table height so that the mandible or maxilla is centered in the scan field.
- All slices must have the same field of view, reconstruction center and table height.
- Scanning with a field of view that is too large can compromise the resolution of the reformatted images. Scanning with a field of view that is too small can cause the jaw to not fit in all the axial images.
- Not overlapping the axial slices can reduce the quality of the reformatted images.
- Scan all slices of the study in the same direction.
- Scan with the same slice spacing; the slice spacing must be less than or equal to the slice thickness. The slice thickness should preferably not be larger than 1 mm.
- All of the remaining teeth/scan prosthesis should be completely visible in the images up to the occlusal plane.
- The gantry tilt should be 0 degrees.



Figure 1 Patient prepared for the CT scan

Scan Appliance Technique

Overview:

This process requires two scans, one of patient with appliance seated and one of the scan appliance alone. If surgical guides will be made on both arches each arch should be scanned separately to prevent the fiducial markers from interfering with one another. If the patient is edentulous, to stabilize the appliance and prevent movement, we suggest opposing the scan appliance to the patient's denture as long as the prosthesis does not contain any metal.

Preparation of the patient

- Remove any non-fixed metal dentures or prosthesis in addition to any jewelry that might interfere with the region to be scanned. Non-metal dentures may be worn during the scanning.
- If the patient has a scan prosthesis (radiographic template), it should be worn.
- Place the patient supine on the scanner table and move the patient into the gantry, head first.
- Make the patient comfortable and instruct him/her not to move during the procedure. Normal breathing is acceptable, but any other movement, such as tilting and turning the head can cause motion artifacts that compromise the reformatted images, requiring the patient to be rescanned.

Aligning the patient

- For correct alignment, the transaxial CT slice plane should be parallel to the occlusal plane of the upper jaw (see figure). The gantry tilt is 0°. Ideally, you should determine the occlusal plane using the patient's scan prosthesis. If the patient does not have a scan prosthesis, use the existing teeth to align the patient.
- Stabilize the relationship of the jaws during the scan.
- Scan the patient with the arches slightly opened using cotton rolls or a bite registration index (figure 2).



Figure 2 Bite registration separating the arches

Scanning instructions

Positioning for the mandible

- Position the first slice just below to the inferior border of the mandible. Position the last slice just above the lower teeth, or in the absence of teeth, set the last slice just above the superior border of the mandibular ridge. If the patient is wearing a scan prosthesis, position the last slice just above the prosthesis. It is critical you include the entire prosthesis in the scanned study and that no teeth or prosthesis are visible in the last slice.

Positioning for the maxilla

- Position the first slice just below the upper teeth or, in the absence of teeth, if the patient is wearing a scan prosthesis, position the first slice just below the prosthesis. It is critical you include the entire prosthesis in the scanned study. Position the last slice 4 to 5 mm above the floor of the nasal cavity. If planning for zygoma implants, the last slice must be positioned in the middle of the orbita, called the sutura.

Positioning and Scanning the Scan Appliance Separately (without patient)

- The scan appliance should be placed on Styrofoam (Polystyrene), foam, or on the guide holder supplied by the Cone Beam manufacturer (figure 3). The packaging foam included in ROE Dental Laboratory case boxes works well. The appliance should be positioned in the same orientation as scanned in the patient's mouth.

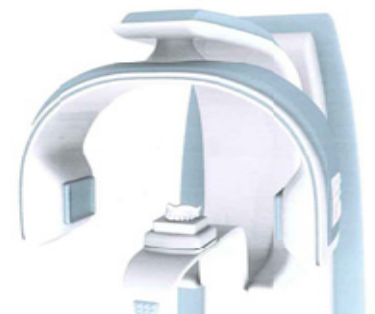


Figure 3 - Styrofoam platform separating the appliance from the chin rest

No Scan Appliance Technique

This technique is available for **BlueSkyPlan** and **SimPlant** only if we are provided models there is no restriction on the number of implants that can be planned with this protocol. Simply send (upload) a CT of the patient, without a scan appliance, along with master casts, a bite registration and our Order Form. During the CT, use cotton rolls to separate the arches. A contraindication for this technique is situations that the patient is completely edentulous or if the patient has extensive fixed, metal-based restorations, as they will produce scatter, rendering the images unusable.

Reconstruction of the images:

- Use a proper image reconstruction algorithm to get sharp reformatted images where you can locate internal structures such as the alveolar nerve. Use the sharpest reconstruction algorithm available (usually described as a bone or high resolution algorithm). Only axial images are required. No dental reformatting of the images is needed.

Data Export:

1. Export the data to an area of your computer that is accessible. It is suggested that a folder is created on the desktop with individual folders inside for each scan (Figure 4).
2. Export the patient's compressed **DICOM 3 multi-file** volume to this folder (named 'patient'). **Do not export viewers, iCAT visions, single file, compressed, or DICOMDIR. These file types are not usable.**
3. Repeat the process above for the dataset that contains the scan of the radiographic appliance only (folder named 'appliance'), if the scan appliance protocol was used.
4. Separate arches should be saved in separate folders indicating the patient name and arch.
5. Place all folders into one master folder with the patient's name.
6. Zip the master folder by right clicking on the folder, scrolling down to Send To, selecting Compressed Zipped Folder. (below image) This will create a Zipped folder (looks like the original with a zipper on the front). It will be located in the same area as the original folder (figure 3).
7. Visit ROE's website called www.dentalimplantplanning.com. On the left of the screen will be an Upload button. Click this, enter your email, the patient name and doctor name and phone number. Then click Browse, search for the zipped folder (should be on your desktop in the folder you created). Double click on this folder and click Send on the web page.

EXPORT Two DICOM Sets



Figure 4 – A sample of the file structure that should be saved and uploaded to ROE.

For assistance call 800-228-6663. Ask for Alan or BJ