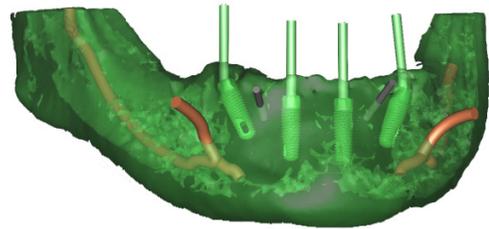


Cone Beam Implant Planning Manual

(Everything you want to know about CBCT planning)



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Implant surgical guides using Cone Beam Computed Tomography is the most advanced process of predictably planning dental implant placement. ROE Dental Laboratory’s Dental Implant Planning Service is a nationally recognized all-inclusive, turn-key solution to supporting dentists in surgical guidance. We offer treatment planning, diagnostic work-up and evaluation, CBCT technical support, live on-line meetings, surgical guides, surgical reports, and final restorations. By selecting ROE to support your practice, you chose an experienced team that has completed many thousands of successful cases. It is important to know that our service is compatible with all implant systems and nearly all guided surgical kits.

Significant advancements in cone beam planned surgical guides during the past few years have allowed surgical guidance to be more affordable and accessible. With our service you can create surgical guides for any type of treatment from single nit placement to immediate-load “All-on-4”. We accommodate all implant systems and provide surgical guides that accommodate your existing armamentarium and all guided surgical kits. This manual will lead you through the CT process, beginning with guide choice.

Choose the type of Guide

The first step in the process is to choose the type of surgical guide to create. There are three basic

Basics Box : Guide type - when questions arise, call our CT department and discuss the options.

guides to choose from, tooth, tissue, and bone supported. The choice depends upon how the patient presents and they type of surgery to be performed. If the patient is dentate and will remain dentate during the procedure, choose a tooth supported guide. If the patient is edentulous, then you can choose between tissue and bone supported. These two surgeries are quite different and may require an on line meeting to decide the course of action (tissue thickness, bone quantity, shape of ridge etc). We also fabricate bone reduction guides either stand alone, or in conjunction with a guide.

			
tooth supported partially edentulous	tissue supported w/ optional stabilization pins	bone supported fully flapped	CombiGuide w/ bone reduction

Choose the software

Basics Box : Guide Software - BlueSkyPlan is ROE’s primary software today

Once the guide type is selected we will need to decide which software is the best choice for your particular case. Nearly all cases today are fabricated using BlueSkyPlan, a free software that any doctor can own. Visit BlueSkyBio and click software to choose the right version for your computer system. This is optional, as almost all cases planned today with ROE are planned in live on line sessions. This method will save you planning time and learning software.



Decide if you need a Scan Appliance

Basics Box : No-Scan-Appliance - is possible if you are restoring 1 - 5 implants, patient is dentate, and there are minimal metal-based restorations present. Simply send us a CT scan, models and SUREguide CT Form.

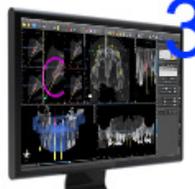
Scan Appliance - is needed if patient is edentulous, mostly edentulous, or needs more than 5 implants, or presents with many metal-based restorations. Send us models to create a scan appliance.

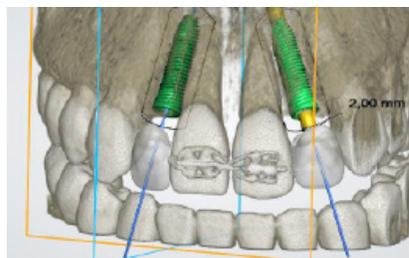
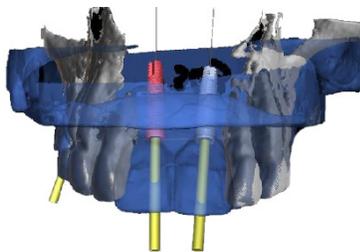
The No-Scan-Appliance Technique

If you are planning a case that involves 1-5 implants, the patient is dentate, and the patient presents with little-to-no little metal-based restorations, simply capture a CT scan, keeping the arches separated by cotton rolls, capture a master impression(s), and a bite registration when needed. Send a study model if you deem appropriate. Upload the DICOM through our web site or include a disc with your impressions (or models) and include our *SUREguide CT Order Form*. We will preplan your case according to your instruction, call you for an on line meeting to finalized the plan, and fabricate and send your guide(s).

If your patient presents with many metal-based restorations, then scatter may prevent the no-scan-appliance planning. You have an option. You can order Memosil II from us. This is a clear bite registration material that suppresses scatter. Coat the restorations with a few layers and leave the bite in the mouth during the scan, and upload. Or you can move to the Scan Appliance Technique.

Quick Steps

 <p>1</p>	 <p>1</p>	 <p>3</p>	
<p>scan patient - separate arches with cotton rolls</p>	<p>send models, or upload a digital impression</p>	<p>meet us on line</p>	<p>receive guide(s)</p>



Snapshot of no scan appliance technique. Model serves as soft tissue, digital diagnostic work-up serves as future tooth positions.

Scan Appliance Technique - Indications & Protocols:

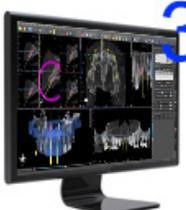
Page 4 Scan Appliance Technique

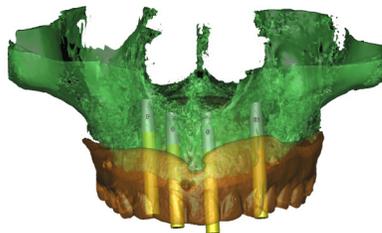
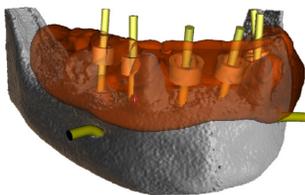
When is a Scan Appliance required?

A scan appliance (a.k.a. radiographic guide) is a rigid acrylic appliance which fits over the existing teeth and/or tissue. It represents the teeth to be restored and includes radiopaque markers for registering the appliance in the CT. The proper fabrication of the scan appliance is the critical first step CT planning.

Tooth position and scanning accuracy are crucial to guided surgery planning and implant position. Final impressions and master casts must be precise to ensure surgical guides fit at the time of surgery. Material thickness and density, proper placement of radiopaque markers, and adequate tooth and tissue coverage for guide sleeves are all important. Scan appliance fabrication protocols are available, however it is our experience that better outcomes are achieved when they are fabricated through our laboratory. Turnaround time is 4 laboratory days, and scan appliances can be fabricated, when treating a mostly dentate patient, from digital impressions. See page 10 for details.

Quick Steps

 1	 2	 3	
Sent models and bite for guide fabrication, or upload a digital scan when indicated.	Capture 2 CT Scans 1) Scan Patient 2) Scan the Appliance	Join ROE on line for a live treatment planning session	Receive SUREguide



Snapshots of scan appliance registered to the patient. Implant positions are now planned based upon tooth position and screw access.

Scan Appliance – Fabrication Instructions:

Basics Box : Scan Appliance fab is critical to the success of the case. We highly recommend using our lab-to-fab.

Impression Material & Models

Whether you make the radiographic guide yourself or plan to use our laboratory (recommend, as scanning appliance creation is very specific), the impression is the critical first step in the process. This will ultimately affect the overall accuracy of the surgical guide that is created. We recommend VPS or similar material to be used to take the impression. You must capture full arch impression. When a patient is edentulous, the impression must capture all the land areas, similar to a full denture case. The entire impression should be free of pulls and bubbles. If the model is not accurate the fit of the radiographic guide will be compromised.



Guide Material

The radiographic guide should be fabricated from clear orthodontic acrylic. Do not use vacuform or any other non-rigid material. These material are too thin and do not exhibit the proper density for scanning.

Making the Guide

A diagnostic wax-up or denture teeth are used to fabricate the radiographic guide. The wax or teeth should be distinctly represented in all aspects. Facially, the crowns of the guide adjacent to existing teeth should adjoining the guide via a diagonal span of acrylic. The guide should cover the occlusal surface of the full arch. The guide should extend over gums on the lingual/palatal side. The flange should be at least 3 mm thick. The replacement teeth on the guide should touch tissue in edentulous areas. The guide should not have any gaps between the gingiva and the guide. It is important to be aware that the surgical guide will be an exact duplicate of the radiographic guide. For edentulous patients, the guide digitally becomes the surgical guide, meaning the material thicknesses are paramount.



Radiopaque Markers

The appliance should have six, 1.5-2mm round radiopaque markers set in sticky wax, available from ROE, or gutta percha placed into the appliance (#5 bur). These markers are utilized in the data merging process following the CT scan. We suggest six markers be randomly placed tongue side of the denture just below the teeth. To eliminate the possible effects of scatter, markers should be placed 10mm away from any metal restorations or objects.

Proper Fit

Because the surgical guide will be an exact duplicate of the radiographic guide, the guide should fit securely on the patient's teeth and/or tissue. If the guide does not fit securely, the guide must be remade. The guide does not need to have perfectly balanced occlusion. Cotton rolls or a radiolucent bite must be used to separate the arches during the scan.

Duplicating an Existing Prosthesis

The patient's existing denture, or duplicate of the denture, may be used as the scan appliance¹. Six gutta-percha markers are placed on the lingual/palatal side of the prosthesis and two within the buccal flanges. If the denture does not fit properly it is recommended that a hard acrylic relined be performed. This will ensure an ideal fit of the surgical guide. If you or the patient prefers not to add the markers to the patient's current denture, a putty flask of the denture can be sent to us for duplication. A simple flasking technique is shown below. This minimizes in-office work and the need for the patient to spend time without their denture.

Steps to Duplicating a Full Denture

<p>1</p>  <p>Silicone Material</p>	<p>2</p>  <p>Accelerant</p>	<p>3</p>  <p>Knead together</p>	<p>4</p>  <p>Force into intaglio surface</p>
<p>5</p>  <p>Force into ridge area</p>	<p>6</p>  <p>Cut edges straight (optional)</p>	<p>7</p>  <p>Ease cast separation</p>	<p>8</p>  <p>Apply to silicone</p>
<p>9</p>  <p>Wax balls for spruing</p>	<p>10</p>  <p>More silicone</p>	<p>11</p>  <p>Force Silicone into palate</p>	<p>12</p>  <p>Complete the silicone flask</p>
<p>13</p>  <p>Silicone flask complete</p>	<p>14</p>  <p>Separate and remove denture</p>	<p>15</p>  <p>Send to Lab</p>	 <p>ROE Dental Laboratory 9565 Midwest Ave Garfield HTS, OH 44125 800 228 6663 www.roedentallab.com</p>

CT Scan: General Instructions

Overview:

In order to fabricate a CBCT based surgical guide we require uncompressed, multi-slice DICOM data from a Cone Beam CT or Medical CT. The cone beam settings and scanning instructions mostly remain consistent regardless of the type of scan (variances in the box to the right). The models or impressions should be of high quality because the accuracy of the surgery depends upon these initial records. When scanning with a scan appliance, be sure to follow a dual scan protocol (page 8). It is important that the appliance fits with no rock, the appliance has been approved by the dentist, and that the appliance has the radiopaque markers, which are often small and transparent.

General scanning instructions:

- Scan the patient using protocols instructed by the CBCT equipment manufacturer
- It is important to center the patient and not ‘cut-off’ areas of interest (common mistake)
- It is important to scan a complete arch. Quadrant scans will not work for CT planning, as digital tripodding is not possible. When the system allows, ‘stitch’ quadrants together to attain the full arch. Both arches in one scan are acceptable.
- Patients must bite on cotton rolls or a scan bite. Opposing teeth must be separated in order to complete registration.
- Cases involving a scan appliance must follow the dual-scan protocol (page 8). This means the patient is scanned with the appliance seated, while biting on cotton rolls. The second scan is of the appliance alone, on a piece of packing foam, in the relative same position it was in the mouth.

<p><u>PlanMeca</u> Scan Appliance - KV 70 Ma 10</p> <p><u>Galileos System</u> Scan Appliance - must be scanned inside of the special Sirona aluminum scan cylinder Part # – 6299759 Settings: 42 MAS w/o Hi Contrast</p> <p><u>Kodak Systems</u> Patient Scan - KV 80 Ma 2 Scan Appliance - KV 75 Ma 10</p> <p><u>XG 3D</u> Large Patient - 42 MS, MAS - 35 or 42</p>	<p><u>Medical CT Scanner</u> General 0.4 Voxel Scan Time 20 Seconds FOV 140 and 170 mm Stitched scans on small FOV Matrix 512 x 512</p>
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CT Scan: Capturing the CT

When a scan appliance will be used, two scans are required, one of the patient with the appliance seated and one of the scan appliance alone. If surgical guides will be made on both arches, each arch should be scanned separately, or have the patient open biting on cotton rolls.

Preparation of the patient

- If the patient has a scan prosthesis (radiographic template), it should be worn. Ensure there is not rock. Adjust if needed

Aligning the patient

- For correct alignment, the trans-axial CT slice plane should be parallel to the occlusal plane of the upper jaw (see figure 2). The gantry tilt is 0°.
- Scan patient with arches opened using cotton rolls or a bite registration index (figure 2).

Scanning instructions

Scan 1 Positioning for the mandible

- Position the first slice just below 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.



always separate arches with cotton rolls

Scan 1 Positioning for the maxilla

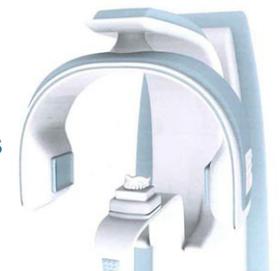
- Position the first slice just below the upper teeth. In the patient is edentulous, and is wearing a scan prosthesis, position the first slice just below the prosthesis. It is critical you include the entire prosthesis in the scanned study. Position the last slice 4 to 5 mm above the floor of the nasal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



Scan appliance scan, use cotton rolls to separate arches

Scan 2 Positioning and Scanning the Scan Appliance Separately (without patient)

- The scan appliance should be placed on cotton rolls, styrofoam, or on the guide holder specifically designed for this purpose supplied by the conebeam manufacturer. 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.

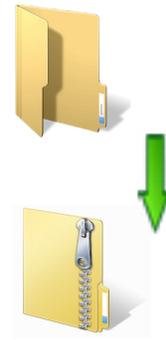


Scan appliance in same position as in mouth on foam

Data Export & Upload - ROE provides complete support:

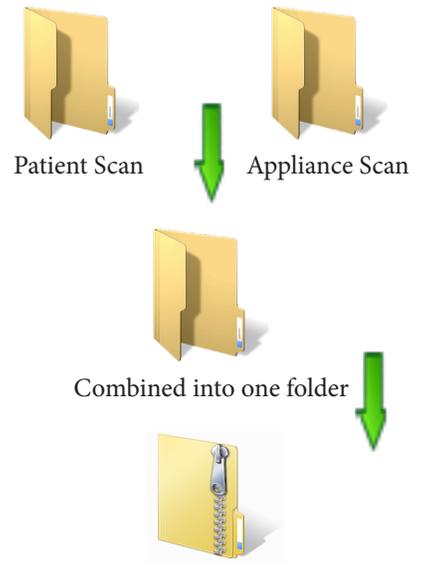
Basics Box : Capture CT of patient, export DICOM to a folder on your desktop, zip, and upload through our web site. **No Scan Appliance Technique**
 If you have a scan appliance, follow the dual scan technique and upload both scans. **Export DICOM to a Folder**

1. Export the data from within your CT scanner’s software to an area of your computer that is accessible. We suggest that a folder is created on the desktop with individual folders inside – one for each patient with sub folders for the scan(s) (Figure 6).
2. Export the patient’s uncompressed 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. When both arches are being planned for implants, scan them separately and save in them in separate labeled folders.
5. Place all folders into one master folder with the patient’s name.
6. Zip the master folder by right clicking it, scroll down and click Send To Compressed (Zipped) Folder (figure 7). 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 www.dentalimplantplanning.com. Click the Upload button, and follow the instructions. 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.



Zip the Folder and Upload

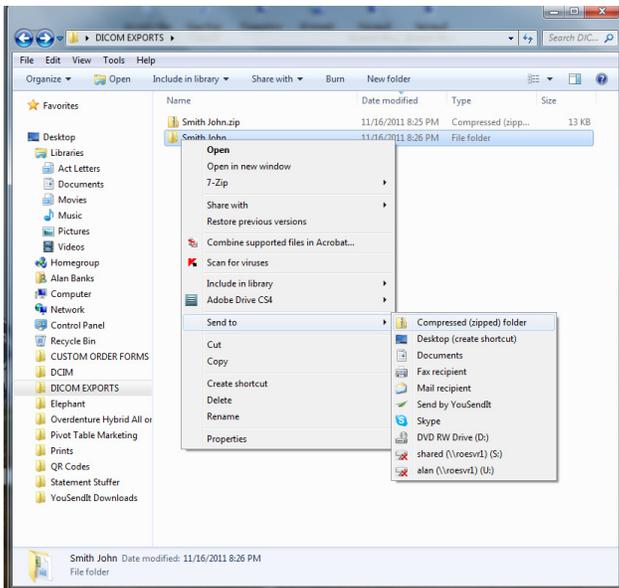
Scan Appliance Technique



Zip the Folder and upload

Figure 6 – A sample of the file structure that should be saved and uploaded to ROE.

Figure 7 – To upload your DICOM, the containing folder must be zipped. Right click on the folder and cursor down to ‘Send to’, cursor to the right and click



‘Compressed (zipped) folder. A new folder will be created next to the original folder. When you browse from our web site www.dentalimplantplanning.com you will double click on this zipped folder to attach.

Page 10 Immediate Implant Provisionals

Figure 7 – To upload your DICOM, the containing folder must be zipped. Right click on the folder and cursor down to 'Send to', cursor to the right and click 'Compressed (zipped) folder'. A new folder will be created next to the original folder. When you browse from our web site www.dentalimplantplanning.com you will double-click on this zipped folder to attach.



Immediate Implant Provisionalization

Today guided cases can include immediate provisionals. The restorations are designed from a diagnostic wax-up or digitally created on a virtual study cast. The digital design is imported into the planning software where the implants are placed in conjunction with the final restorative position. You then have the option of receiving shells, in the case of crown and bridge, or screw retained provisionals. As a full service laboratory, we are adept in all areas of restorative solutions for your immediate cases.



Digital Impression Welcome

ROE is a full service, digital dental laboratory. With digital impressions we offer CT Planning integration (simply upload your scan and reference CT planning). This service can expedite cases and create a more convenient service. We accept digital impressions from all systems. There are varying protocols for digital companies. Call with any questions on how to upload your scans to ROE.



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