1. Policy

1.1. Any person working off this protocol has previously received training on this specific piece of equipment by the RESTORE Lab Manager or Technical Director with explicit instruction for independent equipment usage. Any persons operating equipment without prior training and/or permission will be removed from the facility immediately.

1.2. No food or drink within any of the RESTORE facility.

2. Purpose

2.1. The purpose of this procedure establishes standardized requirements for the safe and proper operation of Quantum GX3 microCT to ensure data quality, user safety, instrument integrity, and regulatory compliance.

3. Responsibilities

3.1. The equipment operator is responsible for the proper handling, care, and oversight of all samples, animals, and associated materials while they are under the operator's control during use of the instrument.

4. Procedure

4.1. <u>System Power Status</u>

- If the computer is OFF (unusual condition):
  - Press the large green power button located on the front of the CT scanner.
  - Log in using the following credentials:
    Username: CTADMIN
    Password: ct2admin
- If the computer is ON (normal condition):
  - Open the Quantum GX3 software from the desktop, should appear as **Figure 4.1**.
  - Note*** upon opening software the previous user's acquisition will load in. make sure you create a new database or open a previous database (read section 4.4 below on instructions)

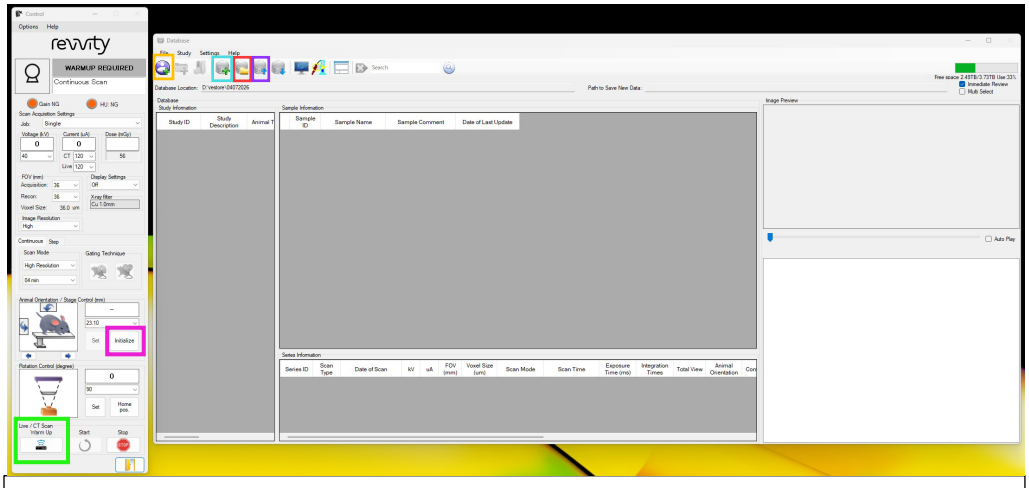


Figure 4.1: Software startup interface with the Control Panel on the left and Database window on the right.

4.2. CT Scanner Warm-Up (Required Before Imaging)

- On software, bottom left, select "live/CT scan Warm up (**Green Box in Figure 4.1**)"
  - Remaining time will be listed on top of control panel.
- For live animal imaging:
  - Verify that the isoflurane vaporizer is adequately filled prior to starting the experiment.
- System warm-up time may take up to 2 hours, depending on the time since last use. If the system has been used within the past month, a 20-minute warm-up is typically sufficient.
- Verify that the small specimen bore cover (without tubing) and the Cu 1.0 filter are installed from the prior shutdown as shown in **Figure 4.2**.
  - You may need to slide door to view (**Figure 4.3**).
- In the software, confirm the selected filter is Cu 1.0

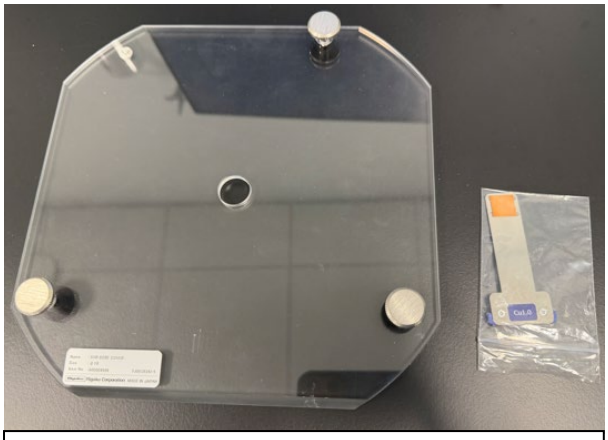


Figure 4.2: Small specimen bore cover (left) and Cu 1.0 filter (right) for warmup.

4.3. Installing the Cu 1.0 Filter and Small Specimen Bore Cover (if not already installed)

- Slide open the outer system door. Unscrew and carefully remove the existing bore cover horizontally, ensuring it does not contact internal system components.
- Locate the Cu 1.0 filter in the designated filter storage box (**Figure 4.4**). Remove the filter from its plastic bag, taking care not to touch the copper filter surface.
- Slide out the currently installed filter: Place it into a clean plastic bag for storage. Install the Cu 1.0 filter with the label facing upward. (NEVER touch the actual filter) When handling the filter grab from the base where the letters are. Confirm correct installation by verifying the filter is recognized in the software.
- Install the small specimen bore cover. Close the system door.

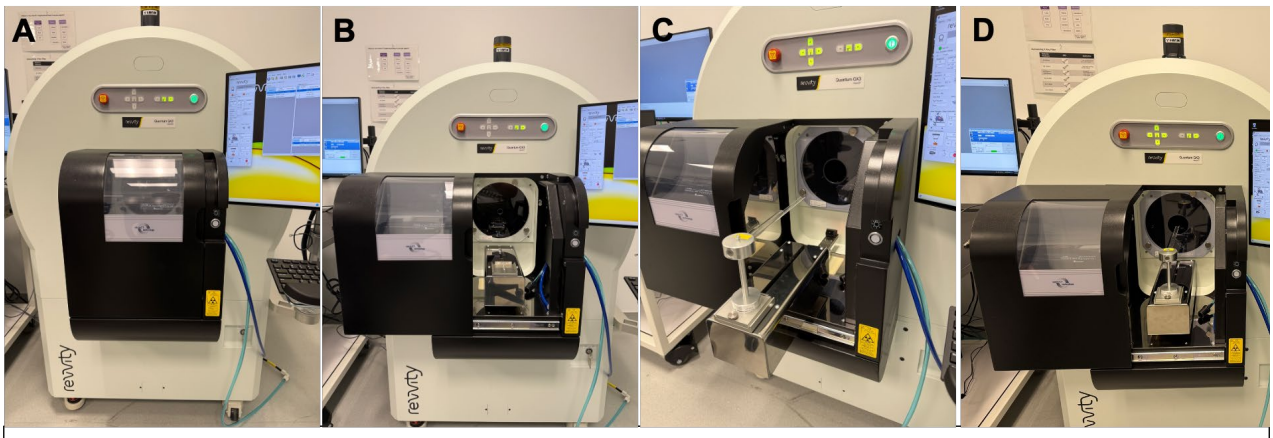


Figure 4.3: GX3 with (**A**) door closed (**B**) door open (**C & D**) specimen bed installed.

4.4. Create a New Database

- In the Database window, click New Database (**Blue Box Figure 4.1**) *(or File → New Database)*.
- In the dialog box: Enter a database nameL
- Click Browse, choose the save location (Save to PI named folder or create PI named folder), click OK.
- Click Create. Confirm the database appears in the Database window.

4.5. Connect to an Existing Database

- In the Database window, click open existing Database (**Red Box Figure 4.1**)
  If the database is listed:
- Double-click it or select it and click Connect

If the database name is not listed:

- Click Browse, and navigate to the database location and select the database file.
- Click OK, then Connect**.**

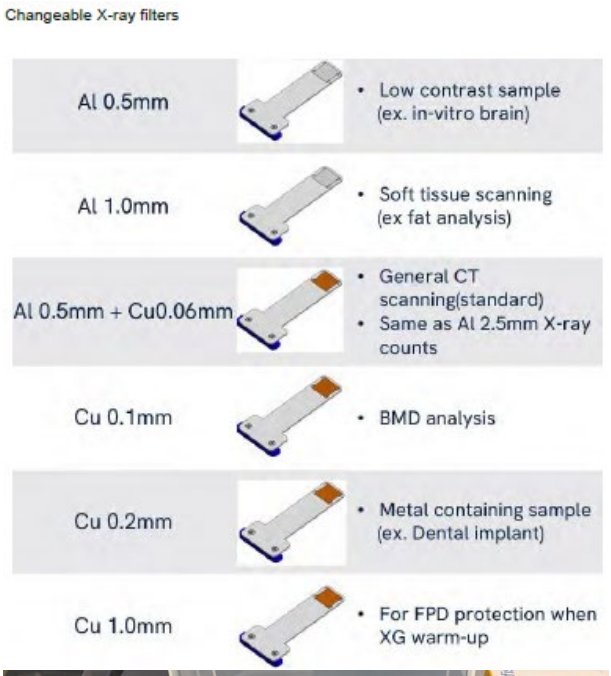
Setting up your new study

- Select "add New Study" (**Orange Box Figure 4.1**)
- Fill in important details about your sample, select "ok"
  - Then hit "start" from the live/CT scan section on the Database window

4.6. Sample Placement

- Click Initialize in the Control Panel (bottom left under "*animal orientation/stage control*" section), See **Pink Box in Figure 4.1**).
- Make your selection of auto sensing X-ray filter (**Figure 4.4**)

- When choosing a sample bed and bore cover for your sample, consider the size of the sample and the field of view (FOV). (**Figure 4.5 & 4.6**) Please be very careful inserting and removing the bore cover as you want to avoid touching any internal components of the machine.
  - At this point you can remove the bore cover and replace the "small" one with your ideal size for best FOV.
  - Ensure that the sample bed is secured to the stage via screw on back end.



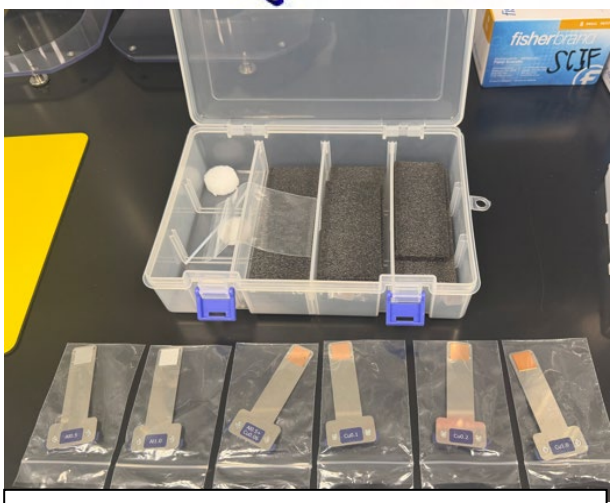


Figure 4.4: (Top) Filters and associated uses (Bottom) Designated storage box and all associated filters.

- Move the sample bed into the bore using one of the following methods:
  - Front panel of Quantum GX3 find Z-axis controls.
    - Press and hold Fast, then press the left or right Z-axis arrow ensure your sample is positioned over the internal sensor and close door

Figure 4.5: Bore covers from right to left. 86mm FOV bore cover, 18 mm FOV bore cover, 8mm FOV bore cover

4.7. Viewing Sample/Capturing Image

- On software screen select live/CT scan "live mode" (**Green Box in Figure 4.1 after warm up)**. (light will turn on and image will load)
  - If you stay on live mode too long (~2 min), it will turn off
  - You will need to select "Live mode" again to view sample
  - If sample image background appears to be bright red this is indicative of saturation.
    - You may need to lower the voltage and/or current
    - You may need to change the filter (you should have an idea of the best practice filter to use for your sample)
- Using the image on screen, move your sample to the center of FOV (depicted as the blue square and yellow cross hairs)
  - Set rotation to 90˚ to ensure that your sample maintains center FOV
  - Once centered select "Stop"
- To start Image acquisition click start at the bottom middle of the control panel. The remaining time to capture the image will be listed at the top of the control panel.

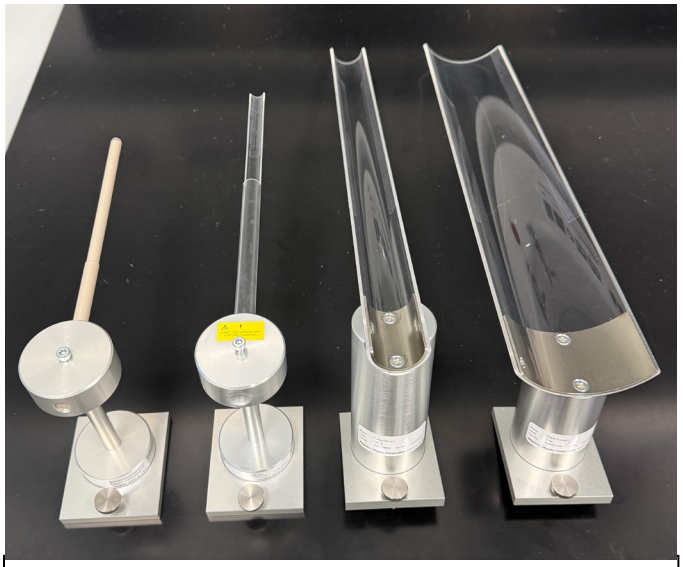


Figure 4.6: Sample beds from right to left. Rat Bed, mouse bed, 18mm FOV bed, 8mm FOV bed.

4.8. Export Data

- Select the series for export in the Database window. (**Purple Box Figure 4.1**)
- Alternatively using the toolbar button select File → Export File on the menu bar.
- In the dialog box that appears, confirm the default name or enter a different name for the new folder where the data will be copied.
- To decide what file format to export consult the table below.
- Sample analysis must be done independently or on our RESTORE workstation.

File Format	Description
CT image with a SimpleViewer	Exports the 3D reconstruction (vox) along with the SimpleViewer.
DICOM (16bit, Single page) Tiff (16bit, Multi page) JPEG Bitmap PNG	Exports individual slices in a file format common for medical imaging. Exporting to DICOM format creates a folder of .dcm files, one file per slice. Exporting to Tiff format creates a single file which includes all of the slices.
AVI	Exports the selected images in a video file format.