1. **Introduction**

   1.1   X-Ray equipment, if not properly used, may cause injury. The GE eXplore Locus utilizes a radiation emitting x-ray source and complies with US and Canadian cabinet x-ray standards which allow the system to be safely operated without additional x-ray shielding.

   1.2   Use of the RS scanner is restricted to individuals that have had documented safety, operation, and maintenance training of the RS scanner by a facility technician (Joseph Umoh). If necessary, animal technicians execute procedures related to animal preparation and decontamination of the area in compliance with local policies from *The University of Western Ontario Council for Animal Care* (UCAC).

   1.3   The eXplore Locus (RS) MicroCT scanner is used in conjunction with the RS control console to scan, acquire, and reconstruct specimens for in-depth three-dimensional analysis. A series of two-dimensional projections captured during the acquisition process are reconstructed into a three-dimensional volume at the RS console using GE eXplore software.

   1.4   The methods described outline the sequence of a typical scanning procedure that is only applicable for scans performed by the RS scanner. The laboratory area where the scans are performed will vary between a Containment Level 1 or Containment Level 2 laboratory depending on the specimen being scanned. Analysis methods and techniques on full-resolution reconstructed regions of interest will not be outlined.

2. **Procedure for Changing the Data Directory**

   2.1   Goto **Start → Program Files → GE Medical Systems** and run **GEMS eXplore System Controls**.

   2.2   Type in the new working directory. The drive can only be switched between D: and R:.

3. **Console Scanning Procedure**

   3.1   Run **eXplore Scan Utility**

   3.2   Choose **Scan New Subject** or **Add to Existing Subject**. Record the scan number that is shown. The number becomes the directory whereby the acquired images will be located.

   3.3   Enter a descriptive name for the scan and click **Accept**.

   3.4   Select the scanning protocol.

   3.5   Click **Fluoro** to view the position of the specimen. It may take a few minutes.

   3.6   Move the acquired bed view to centralize the ROI.

   3.7   Close the window to proceed.

   3.8   Click **Start** to begin scanning. This may take 10-15 mintues depending on the number of frames being acquired, and other protocol parameters.

4. **Reconstruction Procedure**

    4.1   After images have been acquired from the RS scanner, the array of two-dimensional projections needs to be combined into a three-dimensional volume.

    4.2   Load and correct the scan images:

        4.2.1   Run **eXplore Reconstruction Utility**.
        4.2.2   Click **Load Scan** to load the log file pertaining to your scan. This log file will be found under the directory that corresponds to the scan number.
                   NOTE: All log files are named evolver.log by default.
        4.2.3   Click **Correct**.

    4.3   Obtain the calibration values:

        4.3.1   Click **Advanced**.
        4.3.2   Select **Reconstruction**.
        4.3.3   Select **32-bit slice.**
        4.3.4   Click **Recon**. eXplore MicroView is launched automatically once reconstruction is complete.
        4.3.5   Use the '7' and '8' keys to select a rectangular region of air in the volume. Press 'M' to display the average ADU value of the region. Record this value.
        4.3.6   Repeat step 5.3.5 to obtain the ADU values for regions of water and bone.
        4.3.7   Click **Advanced**.
        4.3.8   Select **Reconstruction**.
        4.3.9   Enter the recorded ADU values as the calibration values.
        4.3.10 Click **OK**.

    4.4   Adjust the center of rotation (COR):

        4.4.1   Check the **Mini Volume** checkbox.
        4.4.2   Click **Thumbnail**.
        4.4.3   Get a 2D slice.
        4.4.4   Click **Recon**. This will give you a thumbnail view of a 2D slice.
        4.4.5   Notice the direction of the wisps. If the wisps are to the left, the COR value will need to be increased. If the wisps are to the right, the COR value should be decreased.
        4.4.6   Click **Advanced**.
        4.4.7   Select **Reconstruction**.
        4.4.8   Change the COR value. Click **OK**.
        4.4.9   Repeat steps 5.4.4-5.4.8 until the COR is well adjusted.

    4.5   Reconstruct a region of interest (ROI):

        4.5.1   Check the **Mini Volume** checkbox.
        4.5.2   Click **Thumbnail**.
        4.5.3   Click **Recon**. eXplore MicroView is launched automatically once a reconstruction is complete.
        4.5.4   Press 'Ctrl+7' to designate the intersection of the three planes as the first corner.
        4.5.5   Move the three planes to define the second corner.
        4.5.6   Press 'Ctrl+8' to designate the intersection of the three planes as the second corner.
        4.5.7   Press 'S' to save the region coordinates.
        4.5.8   Press **Load Crop** to load the saved coordinates.
        4.5.9   Uncheck the **Mini Volume** checkbox.
        4.5.10 Press **Full Volume.** Click **Recon**.

4.6   Queue reconstruction jobs

     4.6.1   It is useful to queue reconstructions to save time for an operator.

     4.6.2   Click **Append** to move a reconstruction job into the job queue. More jobs can be subsequently added by clicking **Append**.

     4.6.3   Click **Job Manager** to view the job queue.