Scanning with the Turntable Using *RapidForm 2004*

Basic Steps:
1) Turn on equipment in the proper order
2) Launch Rapidform and load the Vivid Scanner Control.
3) Position object to be scanned on turntable and make necessary adjustment
4) Calibrate
5) Scan
6) Save for further editing in Rapidform or Export to open in another program
7) Turn off devices, transfer your files and delete them from the scanner workstation.

Turning on the Equipment

1.   Turn on the Scanner

- The Power Switch is located on the back of the scanner.
- | is on, O is off

o   To ensure that Windows can recognize the Vivid Scanner, ALWAYS TURN ON THE SCANNER **BEFORE** TURNING ON the COMPUTER.

2.   Open the front Laser Beam Door, located in the front upper right corner.

3.   Turn on the Computer

4. **Turn on the Rotary Turntable Device by plugging it in.**

   ▪ The turntable should be plugged into a dedicated powerstrip which can just be switched on.

   o To ensure that the software program can recognize the Rotary Turntable, ALWAYS PLUG IN THE TURNTABLE **AFTER** TURNING ON THE COMPUTER.

Loading the Vivid Scanner Control

1. **Launch *RapidForm 2004***

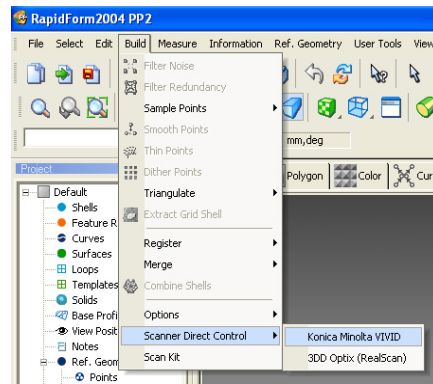   o *RapidForm* is also located under *Programs<INUS Technology*
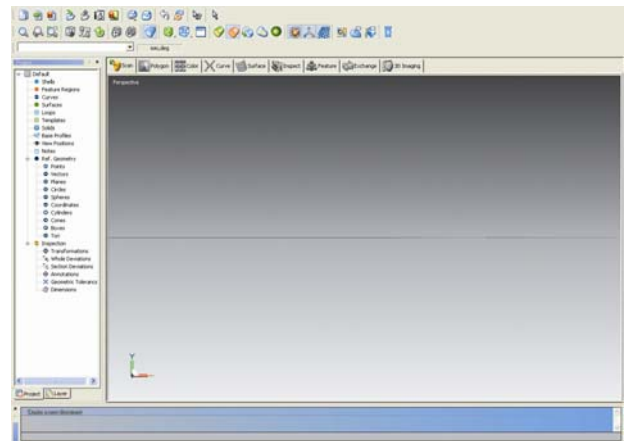
2. **Load the *Vivid Scanner Control***

   ▪ Make sure RapidForm is in *Scan* mode by clicking the *Scan* button in the bottom toolbar

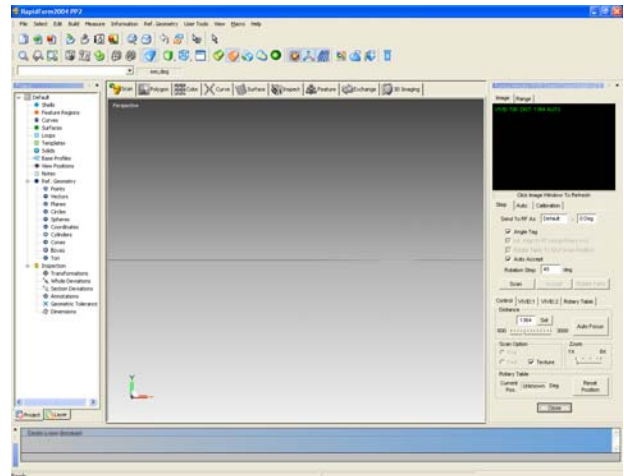- Select from the pull down menu:
  Build >> Scanner Direct Control >> Konica
  Minolta VIVID

  o Note, this pull-down menu is only available
  when you are in *Scan* mode

- The scan window pops up on the right side of
 the screen as shown.

- The scan window has three sets of tabs:

  - The top 2 tabs: **Image** and **Range** control
    viewing options and show the scanning
    preview window
  - The middle 3 tabs – **Step, Auto**, and
    Calibration control scanning functions.
  - The bottom 4 tabs – **Control, VIVID:1,
    VIVID:2**, and **Rotary Table** control
    scanner and turntable options and
    variables.
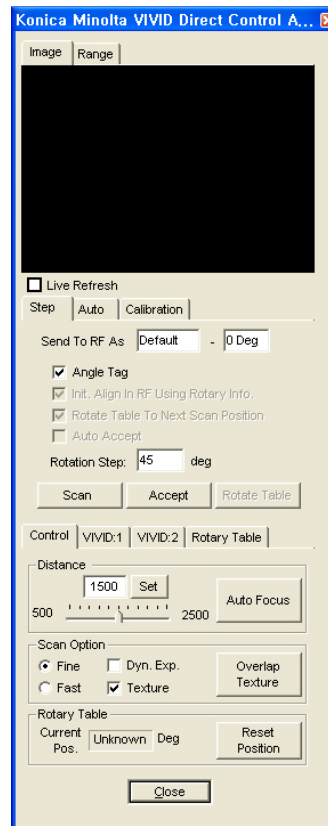
3. **Make sure the Rotary Table is connected.**

- Click on the Rotary Table tab (the last tab located in the bottom set of tabs)
- Turntable settings should be as shown:

  - the **Rotary Table Connection** light should be bright green
  - **Model** should be *ZETA6104(Fast)*
  - **COM** should be *COM1*

- If the light is not bright green, click the **Connect** button to reconnect
- If you put a value in the **Rotate To … Deg** box and click **Move**, the rotary table should be rotated by corresponding degree.

- o If the turntable is not found, check all connections, then try unplugging and then replugging the turntable
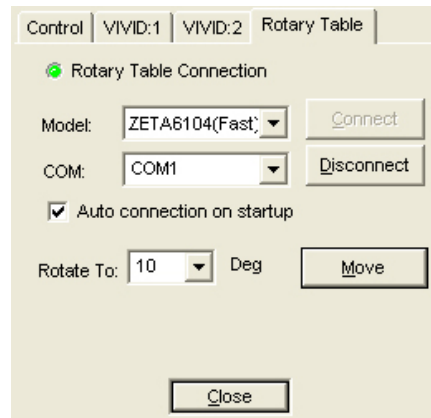
Setting up Object to be Scanned

1. **Set object in place on the turntable**

- Position object to be scanned on turntable and adjust the scanner distance, height, and angle as necessary.

- o The viewfinder on the back of the scanner can be used to help adjust the location of the scanner relative to the object. To preview objects through the scanner viewfinder, on the back of the scanner, press the MENU button, then SELECT "RECORD" - the object should appear in the preview window.

- o Min./max. scan object size: 2.8in x 2.8in to 43.3in x 43.3in
- o Min./max. distance between scanner and object: 23.6in - 98.4in
- o Objects that don't scan well: glass, mirrors or anything reflective, black or blue (low reflectance for red). Shiny objects can be coated with matt paint or powder before scanning.
- o The background needs to be contrasting, so for a light colored object, use a black backdrop; for a darker object, use a white background, etc.
- o For more information on scanning capabilities, see product specs at: http://kmpi.konicaminolta.us/vivid/products/vi700-en.asp#specs

2. **Previewing the scan through the *RapidForm VIVID Scanner Control***

- Under the **Image** tab (located at the top), there is a picture box where you can monitor and preview the scanned object.

  - Click the **Image** Window to refresh
  - If *Live Refresh* is on, the image is refreshed in real-time while the model is being scanned.
  - If the scanner is not connected to your computer, a message is shown here: VIVID Not Found. Check the connections and try restarting the device.

3. **Zooming and Focusing using the *RapidForm VIVID Scanner Control***

- Click **Control Tab** (the first tab in the bottom set of tabs)

- **Focusing**

  - If **Auto Focus** is clicked, the VIVID scanner will focus automatically.
  - Auto Focus may not work if the object is not perfectly centered in the viewing window so it may be necessary to focus manually by sliding the **Distance** slide bar. When Auto Focus is in progress, this slide bar is disabled.
  - For auto focusing whenever you click the scan button, go to the **VIVID: 2** tab and click **Auto Focusing Per Scan**

- **Scan Option**

  - For normal scanning, keep the defaults.
  - The default **Fine** option allows for better quality scanning, but takes more time. **Fast** mode is quicker, but the quality is sacrificed.
  - The **Texture** options toggles whether to scan the texture information or not.

- **Zooming**

  - Sliding the **Zoom** slide bar allows you to zoom in/out an object
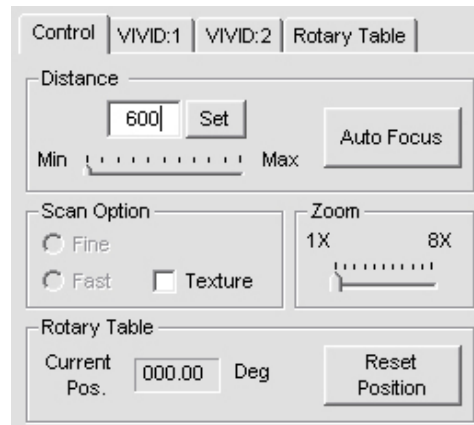
- **Rotary Table**

  - Click **Reset Position** in order to move the rotary table to make sure scanning begins in the initial position of 000.00
  - You can also set the current position of the rotary table in degrees to another position.

o More scanning controls can be set with the **VIVID:1** and **VIVID:2** tabs. See **Special Scanning Adjustments** for explanations of these control panes.
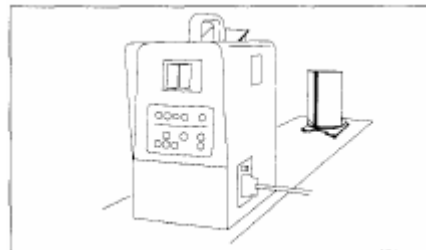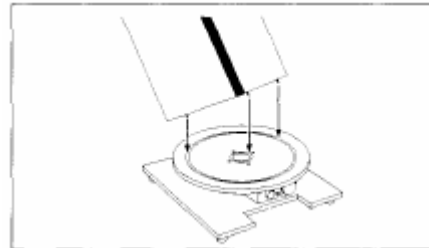
Calibration

1. **Click on *Calibration Tab*** (the last tab located in the middle set of tabs)

    - Each new scanning setup requires a new calibration. The default is the last made calibration.
    - **Calibration State** shows bright green when a calibration is successfully loaded.
    - **Calibration Type** should be **Plate.**
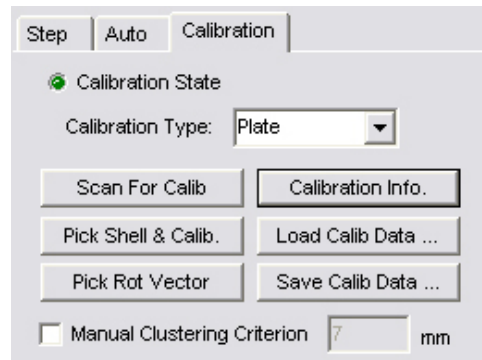
2. **Place Scanning Jig on the Turntable**

    - Place scanning jig onto the turntable so that the black line is perfectly centered and facing the scanner.

3.   Zoom in and focus the scanning jig

- See instructions above on zooming and focusing under **Setting up Object to be Scanned**

**4.   Click Scan for Calib button**

- Click **Scan For Calib** button. The jig used in calibration will be scanned and the scan will be sent to RapidForm.
- A good, well focused scan should show up clearly as shown under the **Range** window (in the top set of tabs in the scanner control) (if it is black, then the scan failed), and will automatically create a model of the jig, as shown in the picture.
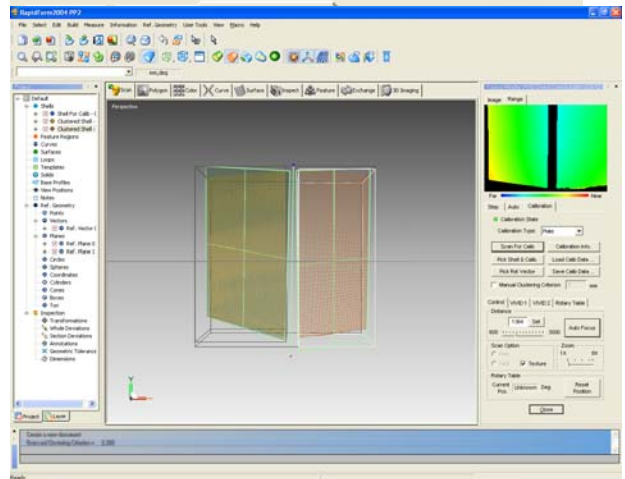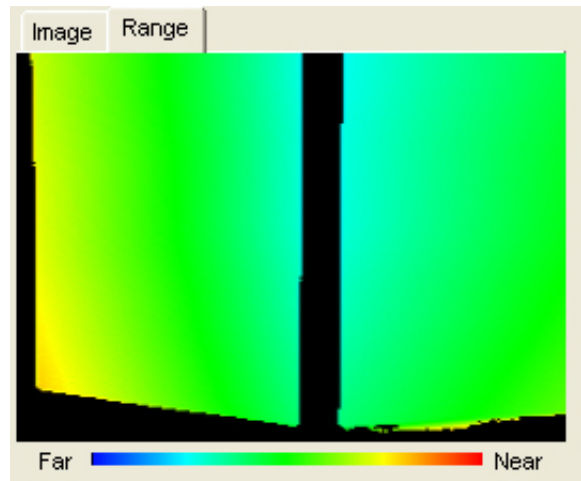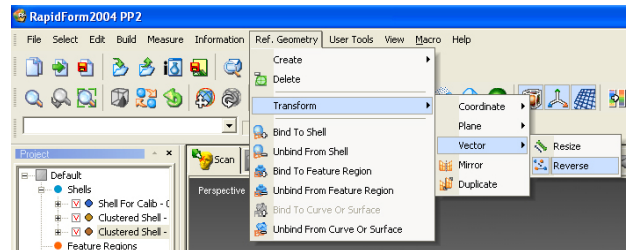
5.   Reverse the rotating vector

- The rotating vector in the center of the model should have the red point on top and the blue point on the bottom.
- In most cases this needs to be reversed because of a glitch in the program
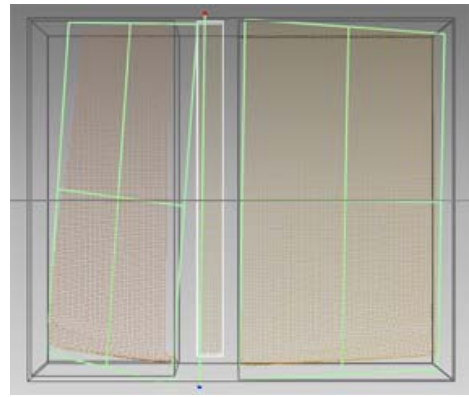
- Go to the pull down menu:

  Ref. Geometry>Transform>Vector>Reverse

- Then click **Pick Rot Vector** on the scanner control,
- Then click the vector.

o In case the scan data contains a lot of noise and the calibration failed, you may need to re-focus and re-scan. Try zooming in or out.

o Sometimes this will still not work. You may either edit the scan data and then make a reference vector in RapidForm. Then click Pick Rot Vector, pick the vector and then click. Or click Pick Shell & Calib. and pick the scan shell to calibrate.

o In some cases (such as when the distance between the scanner and object is too far, calibration through the jig will not work and you may need to align your scans through the alignment tools in Rapidform. See chapter 6 in the Rapidform tutorial manual, "Registration of 2 Shells"

6.   Calibration is done!

- The current Calibration becomes the default calibration.
- You may save (by clicking on **Save Calib. Data**) and reload it, but it is only valid as long as the object and scanner have not been moved, so it is usually not necessary to save.

**7.   Start a new file by going to the pull-down menu, *File<New***

- You do not have to save this scanning session

Scanning

There are 2 possible ways to scan, **Step** or **Auto**. Both are located in the middle set of tabs in the *VIVID Scanner Control*. **Step** scanning allows you to scan each rotated view (or just one view), one at a time (step by step), allowing for more control and fine tuning over the scanning process, whereas **Auto** scanning allows you to set up a completely automatic scanning process with the turntable.
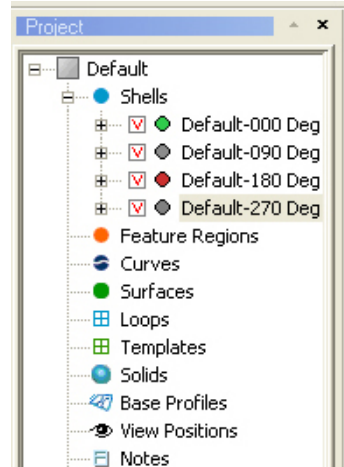
Step Scanning

1. **Under *Rotation Step*, input the desired degrees of rotation.**

   - **Rotation Step** is the relative degree the rotary table rotates in each step.
   - If desired, give the scan a name in the **Send to RF As** boxes

   o These defaults are usually fine to keep for normal scanning.

      - If **Angle Tag** is checked on, the suffix number changes to xxx degree - the current angular position of rotary table.
      - If **Init. Align in RF Using Rotary Info.** is checked on, a rough alignment will be applied to the scan data when **Accept** is clicked. The rotation information related to the corresponding rotary table is used in the alignment process.

2. **Click Scan**

3. **Preview the scan in the Range window (in the top set of tabs) to make sure the scan is acceptable.**

   - This picture shows a good scanning result.

      - Anything black will not be seen by the scanner, as it is out of range
      - The color bar below shows the distances in different colors.

   - You may need to refocus or zoom and rescan until the scan looks good in the **Range** window

4. **Click Accept to send the scan result to RapidForm**

5. **Repeat the *Scan* and *Accept* process for each Rotation Angle**

   - If **Rotate Table To Next Position** is not checked on, you will also have to click the
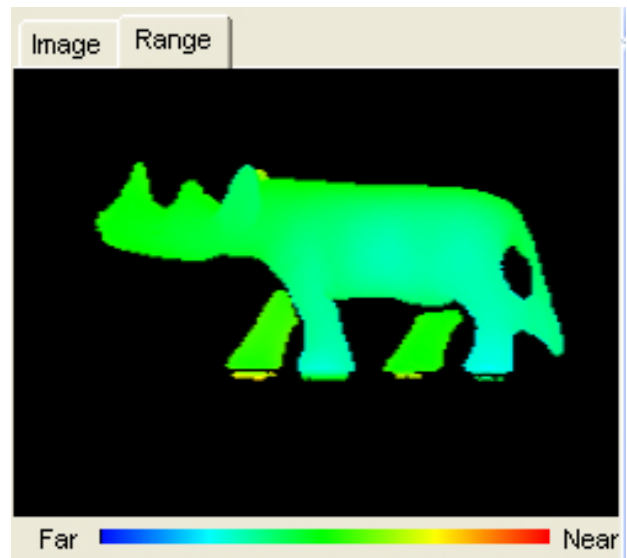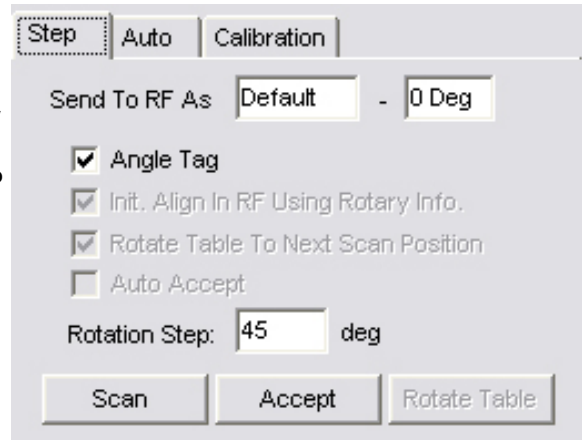
Rotate Table button to rotate the table manually before the next scan is performed.
- If **Auto Accept** is checked on, the scan data from each scan will be automatically sent to RapidForm after you click **Scan** (not giving the option to rescan before accepting the scan)

- Each scanned view will create a named shell (the default name will tag the rotation degree to it). If calibration was done properly, all of the shells should be properly aligned

Step Scanning
1. **Auto Scanning**

   - In **Scan & Rotate** boxes, input a step angle (**Deg**) or the number of rotations (**times**).

     - When one value is changed, the other will be modified to ensure a full 360 degree scan set. For example, if **Deg** is set to 60, the **times** value will be 6; while setting the **times** value to 8 will cause the **Deg** value to be set to 45.

   o Note: more rotations does not necessarily ensure better scanning. 90 degrees with 4 rotations is often sufficient.
   o **Send To RF As** and **Angle Tag** options are same as those under **Step** tab.
   o Make sure that you do not move the object once you start!
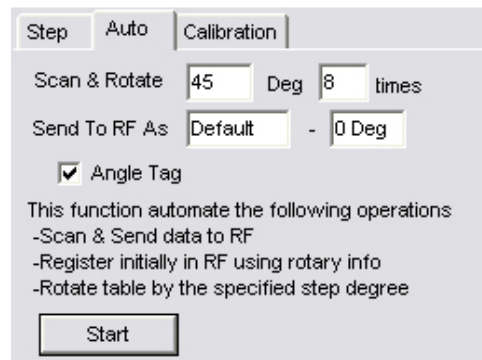
2. **Click Start**

   - The entire scanning process will automatically run, sending all scanning results to **Rapidform**

- Each scanned view will create a named shell (the default name will tag the rotation degree to it)
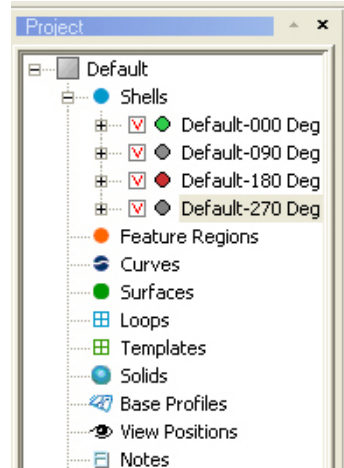
Saving
You have the option of saving your scan for further editing in the RapidFOrm format as a ModelFile (.mdl) or exporting the scan for editing in another program. RapidForm supports exporting in most formats such as .pts, .igs, .stl .wrl, .3dm, .dxf, and many more. Note that some formats preserve the texture bitmap info while some do not.

Merging
Shells can be merged through "Surface Merging" - Build>Merge>Meshes>Surface, select All (Right mouse button) or "Volume Merging" - Build>Merge>Meshes>Volume, select All (Right mouse button)

Special Scanning Adjustments
The **VIVID:1** and **VIVID:2** panes allow you to set up more specialized parameters for scanning.

1.   **VIVID: 1**

   - If **Manual Para.** is checked on, you can adjust the **Laser Power** and **Gain**. **Laser Power** should have a value between 1 and 255. **Gain** decides the sensitivity of the laser sensor. If **Manual Para.** is not checked on, the parameters will be automatically found and the manual parameters will be ignored.
   - If **Manual Color Level** is checked on, you can adjust the scanning color level by typing a value in the box below.
   - Under **Data Import Options**
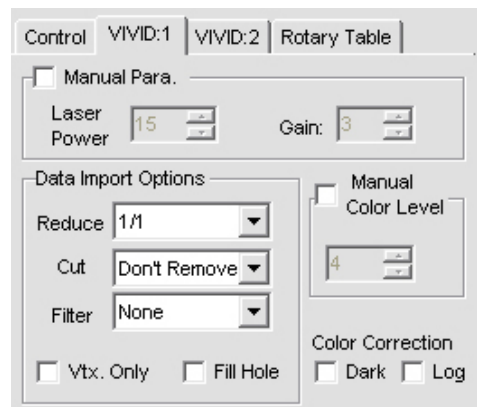
      - **Reduce** decides the sampling ratio used to import the scan data. The default value is 1/1 and the options include 1/1, 1/4, 1/9, 1/16.
      - **Cut** decides the method to remove unnecessary parts while importing the scan data. If **Don't Remove** is selected, no removal is carried out. If **Bound** is selected, the boundary points will be removed. If **Bound & xx Degree** is selected, the boundary points, along with the polygons within the corresponding angular range (5 Degree, 10 Degree, 15

Degree or 20 Degree) to the view vector
will be removed.

- **Filter** decides the filtering method. If
  None is selected, the scan data won't be
  filtered. If **Noise Filter** is selected, the
  noisy vertices will be filtered..
- If **Vtx Only** (Vertex Only) is checked on,
  only the point data without connectivity
  information is loaded.
- If you want to fill holes, you need to check
  on **Fill Hole**.

- **Color Correction** controls the brightness of
  txture. **Dark** makes texture darker. **Log** makes
  texture brighter.

2. **VIVID: 2**

- If **Auto Focusing Per Scan** is clicked, the
  VIVID scanner will execute an automatic
  focusing whenever you press the **Scan** button.
- If **Multi-Depth Scan** is clicked, the scanner
  will execute a multiple scanning while changing
  the distance.

  - For example, if you set Spacing to 20 and
    Scan Num to 3 when the distance is 600,
    the scanning is performed at the position of
    580, 600, and 620, and three shells are
    created in RapidForm working window. The
    shell names are Default - 000deg: 01,
    Default - 000deg: 02 and Default -
    000deg: 03.
  - Note: at the moment this only works for
    single shot scanning, not scanning with the
    turntable

- **VIVID 9i Calibration** does not apply with this
  scanner model