Creating a RIG File Procedure:

RIG files are preset geometery definitions that First Principles uses to express the translation of a body with respect to its six degrees of freedom. Whenever Northern Digital releases a new tool our technical staff follows a similar procedure to the one outlined in this document to create a .rig file. This document has been created to help customers generate their own RIG files after making a custom tool or modifying existing tools to better suit their application. To gain additional insight into this procedure please contact Technical Support at Northern Digital.

1) Create a new experiment in First Principles. After the first dialogue box appears specify whichever coordinate system you would like or is most convenient for your purposes. Please see the figure below.

- Multiple Positi	on Sensor Registration	Query System
	Single Position Sensor detecte Registration is not required. Registration is the process of aligning global coordinate systems to that of o producing a single global coordinate s	multiple Position Sensors' ne Position Sensor,
	can be measured. Current Registration:	
	NONE	C Use Current Registration Perform New Registration
Global Coordin	nate System Alignment	• risgisuoluri
Global Coordin	Alignment is the process of changing to match either an object's coordinate a combination of digitized points.	the global coordinate system system, or that produced by
Global Coordin	Alignment is the process of changing to match either an object's coordinate	the global coordinate system
Global Coordir	Alignment is the process of changing to match either an object's coordinate a combination of digitized points. Current Alignment Default Alignment February 24, 2012 - 11:05:15 AM Position Sensors:	the global coordinate system system, or that produced by C Use Current Alignment G Use Default

2) After specifying the coordinate system in the previous dialogue box connect the rigid body to the communication port on the front of system control unit (SCU). Please see figure below.

Experiment Device Setup	
Experiment Setup Pesee correct the markers and tools to be used in the experiment.	
< Back Next >	Cancel

3) After connecting the new rigid body and proceeding to the next dialogue window you will need to click "Configure Tool/Strobers". In most cases customers do not use smart markers for tools and therefore this configuration step is required. If you are using smart markers a value should be present in one of the ports (under heading "Total Number of Makers Per Strober Port") which should be representative of the number of markers connected to the system (if using smart markers skip step 4). Please see the figure below.

Experiment Setup	
E	xperiment Setup Maker Setup Rijd Body Setup DDAU Setup
	Describe how individual markers are connected to your system. Remember to account for energy marker channels on any connected Diptotal. 3020 strobers Total Number of Markers Per Strober Port Port 3. Port 2. Port 3. Configure Total/Strobers Confection Frane Frequency: 100 Hz Marker Power/Frequency Power:
	< Back Next > Cancel

4) After clicking "Configure Tool/Strobers" in the previous dialogue box the "Advanced Strober Setup" dialogue box appears. Click on the "+" beside the port that the rigid body is connected to and in the bottom left corner specify the number markers and click the "Add Marker" button. Please see the figure below.

- Port 1	Marker Name	Marker Port	Frame of Reference	— Г	Marker Name	Marker Port	Frame of Reference
L Billy					Marker_1 Marker_2 Marker_3 Marker_4	1 2 3 4 5	Global Global Global Global
					6 Marker_6	6	Global
	Switch	Action			Switch 4	lotion	J

5) After adding the required number of markers and closing the "*Advanced Strober Setup*" dialogue box click the "*Next*" button found in the bottom right corner until you reach the last dialogue box which will have a "*Finish*" button located in the bottom right corner. Once the new experiment module closes the "*TextView*" should automatically open and display the position of all markers (*based on the assumption they are in view of the camera*). At this point additional views can be added to suit your preferences and this is also a good point to save your progress. Please see figure below.

Vent1 TextView Type Position Position Position	x [mm] 140.159 160.809 225.025 228.373 184.383	y [mm] 428.315 396.367 393.231 387.962 417.679 422.992	z (mm) -1820/871 -1830/874 -1830/874 -1830/859 -1821/036 -1821/138	
Position Position Position Position Position Position	140.159 136.678 180.809 225.025 228.373 184.383	428.315 398.367 393.231 387.962 417.679	-1820.871 -1830.774 -1830.821 -1830.889 -1821.036 -1821.138	
Position Position Position Position Position	136.678 180.809 225.025 228.373 184.383	398.367 393.231 387.962 417.679	-1830,774 -1830,821 -1830,889 -1821,036 -1821,138	
Position Position Position Position	180.809 225.025 228.373 184.383	393.231 387.962 417.679	-1830.821 -1830.889 -1821.036 -1821.138	
Position Position Position	225.025 228.373 184.383	387.962 417.679	-1830.889 -1821.036 -1821.138	×)
Position Position ent:2 SpatialView	228.373 184.383	417.679	-1821.036 -1821.138	
Position ient:2 SpatialView	184.383		-1821.138	
sent:2 SpatialView		422.992		×
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		+	+ []	+ 8

As an aside if you would like show lines between markers (which makes them easier to see) in the "SpartialView" simply hold the SHIFT key and click on a marker. It will begin to strobe and when you click on another point it will add a line between the two selected points. To exist this mode hold the SHIFT key and click on the last marker.

6) Now ensure that all markers are visible by the system. This can be done based on visual inspection of the "*TextView*" dialogue window. When you move the tool the values that are streaming for the "X, Y, Z" for each marker will change and when the markers are visible you will see a green dot beside each name (*if cannot be seen red dot will be present*). Please see figure below.

Name	Туре	x [mm]	y [mm]	z [mm]
Marker_1	Position	missing	missing	missing
Marker_2	Position	missing	missing	missing
Marker_3	Position	missing	missing	missing
Marker 4	Position	missing	missing	missing
Marker_5	Position	missing	missing	missing
Marker_6	Position	missing	missing	missing
		-	-	

7) Now with the rigid body in the viewing area of the camera go to the bottom of the First Principles screen and set the recording duration to 15 seconds and set a delay of approximately 5 seconds (*to give yourself enough time to get up and move in a suitable recording area in the cameras capture volume*). When ready click the "*Record*" button located in the bottom left corner of the First Principles window. Please see figure below.

	0.000s of 15.000s	Duration: 15 sec Delay: 5	sec	Markers Active	Ext.Trig.
For Help, press F1					

8) Once the set delay time has lapsed start moving the rigid body within the viewing area of the camera and begin to collect data. During this procedure attempt to keep all markers visible at all times and also attempt to illustrate a good range of motion. Please see the figure below.

Session Summary			8
⊡	Marker	Visible	
6MarkerRB_2012_02_28_155819_001.nco	Marker_1	100.00 %	
_	Marker_2	99.73 %	
	Marker_3	99.40 %	
	Marker_4	100.00 %	
	Marker_5	100.00 %	
	Marker_6	100.00 %	
	Frames:	1500	
	Duration:	15.00s	
4	Avg. Visible:	99.86 %	

As an aside the higher the percentages are in the "Visible" column the better.

- 9) Now with the data recorded save your experiment once again.
- 10) After the completing the 9 steps described above successfully launch NDI 6D Architect.
- 11) After launching NDI 6D Architect within the first dialogue box select the "*I want to create a new Rigid Body File*" option under the heading "*RIG File Options*". Please see the figure below.



12) Within the next dialogue box under the heading "*Marker Collection Method*" select the option "*Previously collected NDI Data File(s)* [*C#.n3d.R#.nw*]" and under the heading "*Build Algorithm*" select the "*DYNAMIC*" option. Please see the figure below.

Rigid Body Creation Wizard	Welcome to the Rigid Body File Wizard The Wizard guides you through a Rigid Body Luid. Choose the marker collection method and the deseed build approxime method. Marker Collection Method C Optotrak Collection
	Previously collected NDI Data File(b) [C#,n3d,R#,nw) Previously collected CSV Data File(b) Build Algorithm DYNAMIC Uses collected data of the Rigid Body in motion. C STATIC Uses collected data of the stationary Rigid Body Several trade and the stationary Rigid Body.
	visible in each static position. Example: Trat 1 Pease ensure that your Octorals instem is connected and that all
	Produce induce in the your Optionine system is connected and that as Components an powered on. (Back: Next > Cancel

13) Within the next dialogue box navigate to the directory where the previously recorded (*steps* 7 and 8) data is located in. Once file is found click on the file name in the explorer window and then click the "*Add to Data List*" button. After this is done you should see the files that were previously selected under the heading "*Selected Data File(s)*". Please see the figure below.

Rigid Body Creation Wizard	These files can be in 3D Da	y Marker Data file(s) to use in the ca ta Format or in Full Raw/Raw Form lected, the location of the CAM file	at.
A WARDING	File Browser	3_2012_02_28_1558 💌 🖭	
	GMarkerRB_2012_0	2_28_155819_001.n3d	
-			
		es (C#, n3d,R#, nrw)	Add to Data List
Contraction of the second second	Selected Data File(s)		
	Filename	Properties	
	C: vidigital \collections \	6 MarkerRB_2 6 Markers in 1500	trames at 100.00 Hz
	Move Up Move	Down Remove	View Selected

- 14) Within the next dialogue box "*Build Parameters*" all parameters can be left in there default state unless the user would like to modify them in some way (*i.e. change marker numbering order, etc...*).
- 15) Within the next dialogue box "*Rigid Body Alignment*" you can specify how to align your coordinate system and a variety of other different parameters. If you would like to keep all settings in there default state click "*Next*" and skip to step 17, otherwise click "*Alignment Parameters*" button and continue to step 16. Please see the figure below.

Rigid Body Creation Wizard	coordinate system, use Alignment Methods	the "Alig	ment Methods	" below.	Body to a local	1.1.1
	Alignment Parameters Aligns the Rigid Body onto user-defined axes or planes.		Ě×		zě	
	Manual Transform	ox,	100 mm	(-Z,	Y) 100 mm	
	Performs a user- defined transform (translation and rotation).		::Ľ×		 ×	
11111111	Undo	17			•	
		3D 1	00 mm	OX,-	Z) 100 mm	
	Algorithm	#	X	Y	Z	
	Adjust Constraints	1	-0.0000	0.0000	0.0000	
	Edit the transform	23	-0.0000	31.7327 31.7649	-0.0000	
	algorithm	4	-88.2854	31.8745	10.8860	
	constraints.	5	-88.1674	0.3829	10.9892	

16) After clicking the "*Alignment Parameters*" button the "*Alignment Transformation*" dialogue box will open. At this point a variety of different things can be set or specified by right clicking on a marker under the "*Alignment Positions*" headings. After you have finished configuring your alignment settings click the "*Preview*" button to ensure everything is set in the desirable manner (*if not repeat this set again*). Please see figure below.

	nment			< the marker alignment settin in Origin' column.	ng.
Alignment Position:	S			< 💒 😹 👪 🖪	a-1 3?
# Use in Or	igin	Alignment Se			
1 2 3 4		Used in Origin Unknown			
5 6		X-Axis Y-Axis	X-Ax X-Ax	tis tis (Pos. Only)	_(-Z, Y) 100 mm
Template Mo		Z-Axis XY-Plane XZ-Plane	X-Ax emplate	ris (Neg. Only)	
	106	YZ-Plane	Cancel		The second secon
			A 16.	3D 100 mm	(X,-Z) 100 mm

- 17) After completing the previous step click the "*Next*" button until you have reached the end of the module and click the "*Finish*" button at the end.
- 18) The last step is to save your new rigid body file. The default location that First Principles looks for rigid body files in is the following: *C:\ndigital\rigid,* it is recommended that you save in this directory.

After successfully completing the steps above you will have created a rigid body file that is ready for use. To use this file simply start a new experiment within First Principles connect the tool or rigid body at the prompt, after being given the prompt to connect all tools and markers click on *"Rigid Body Setup"* tab and load the newly created .rig file.