The MotionMonitor xGen Hardware Guide: VICON Cameras - Nexus 2.0 Software with Rigid Body Clusters

Overview

- The MotionMonitor xGen does **not** collect data directly from Vicon cameras. Instead, it receives **position and orientation data of rigid body clusters** from Vicon's **Nexus 2.0** software.

- This data streams via Ethernet from the computer running Nexus 2.0 to The MotionMonitor xGen

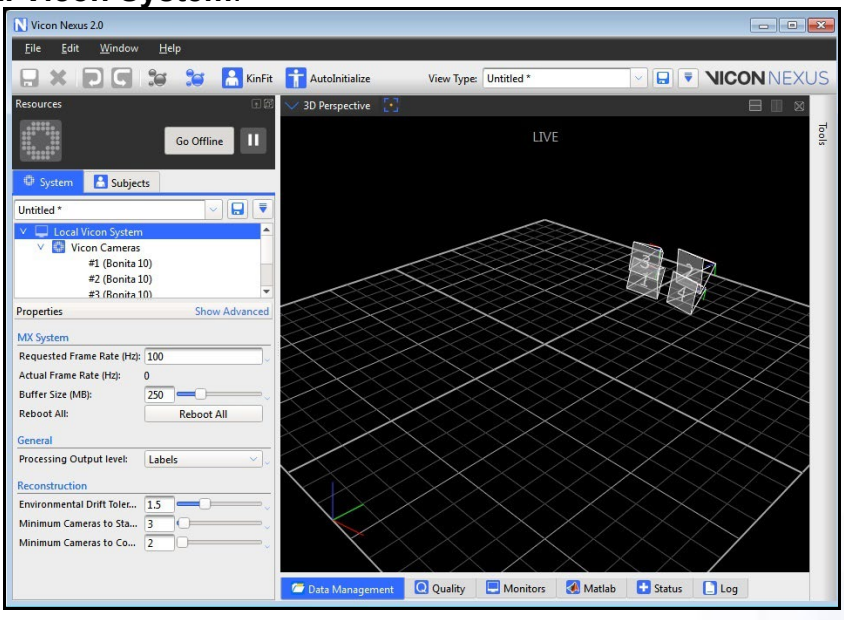
- The guide has 3 sections:
    1. Calibrating Vicon Cameras in Nexus 2.0
    2. Creating Rigid Body Clusters in Nexus 2.0 (done once, pre-configured before shipment)
    3. Configuring The MotionMonitor xGen to receive and use streamed rigid body data

- **Rigid Body Cluster**: A set of 4 markers fixed rigidly to a plate attached to a body segment.

- Assumptions: Cameras are installed, focused, zoomed, and a Nexus 2.0 database exists.

Section 1: Calibrating Vicon Cameras Using Nexus 2.0

1. Launch **Nexus 2.0** and open the *System* tab in the Resources pane. Select **Local Vicon System**.



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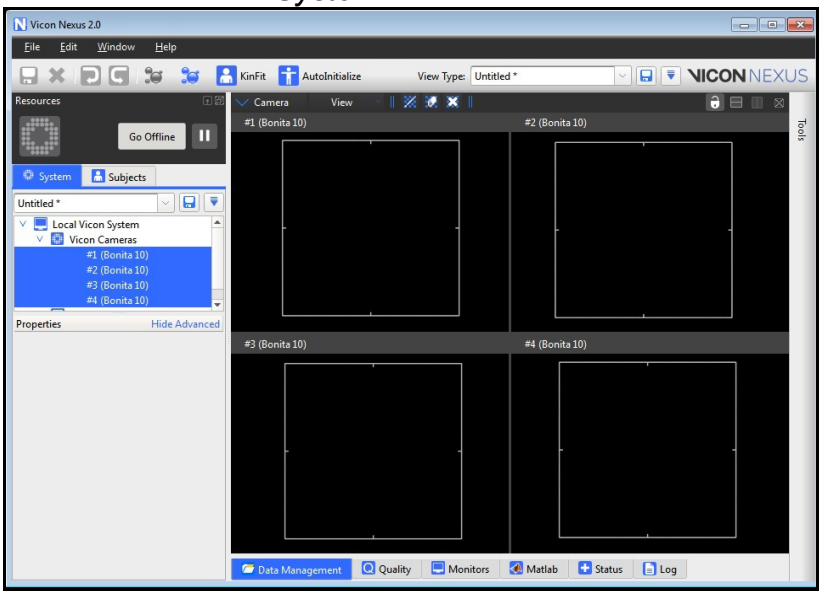
2. Under *Properties*, set:
    - **Requested Frame Rate (Hz)**
    - **Processing Output Level** to **Labels**.

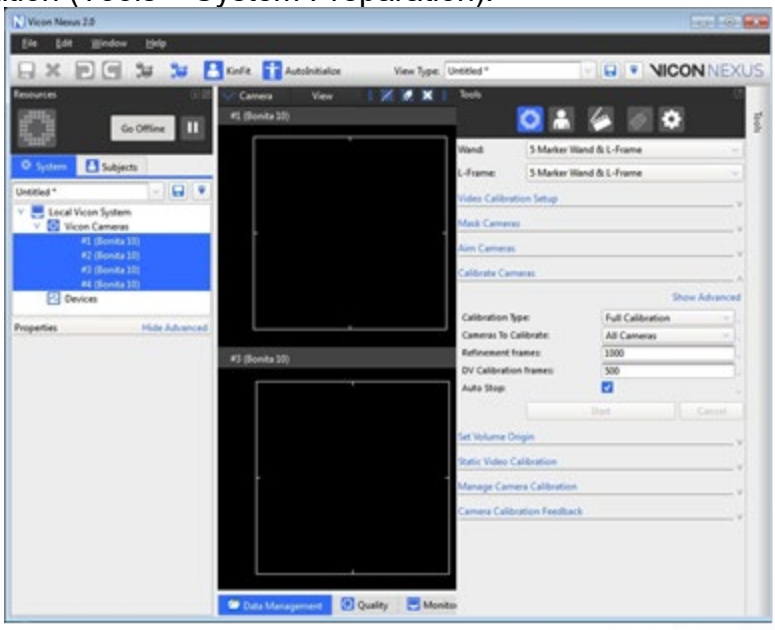
3. Select all cameras under the *System* tab.



4. In the *Animation* pane, choose the **Camera** view.

5. Eliminate unwanted reflections:
    - Use **Create Camera Masks** (Tools > System Preparation) or
    - Use manual masking in the Animation pane.

6. Start calibration (Tools > System Preparation):



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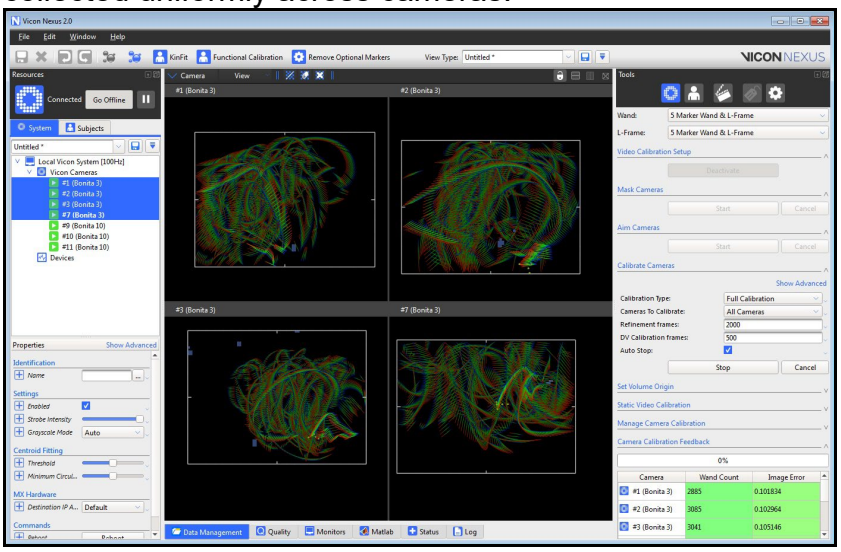
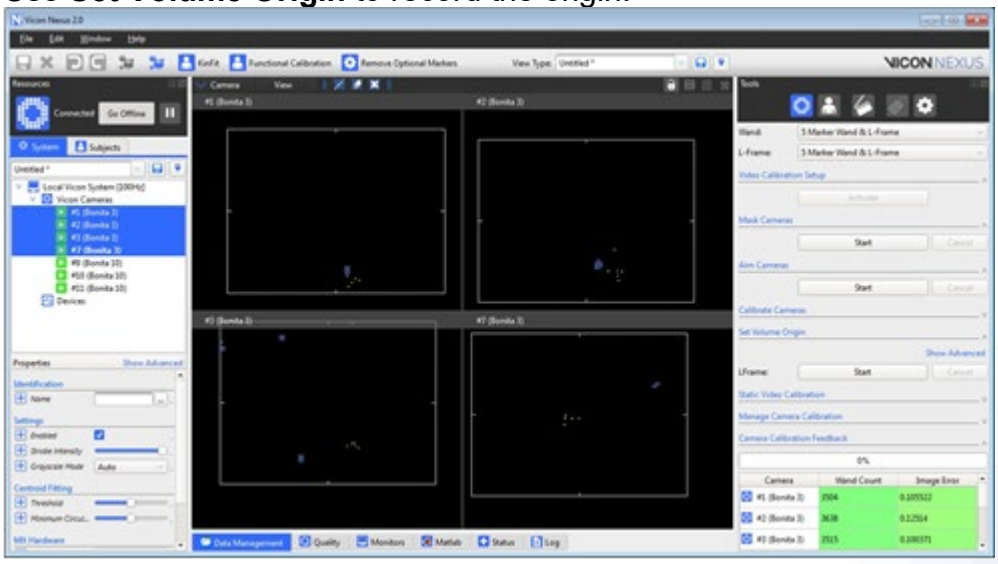
- Confirm correct wand and L-frame type (e.g., “5 Marker Wand & L-Frame”).
- Enter the number of **Refinement Frames** for coverage.
- Enable **Auto Stop**.
- Click **Start**.

7. Move the wand through the capture volume on all 3 axes.
   - Watch the rainbow display showing covered area.
   - Calibration completes automatically after required frames are collected uniformly across cameras.



8. Place the wand at the global coordinate origin.
   - Ensure all 5 markers are visible to all cameras.
   - Use **Set Volume Origin** to record the origin.



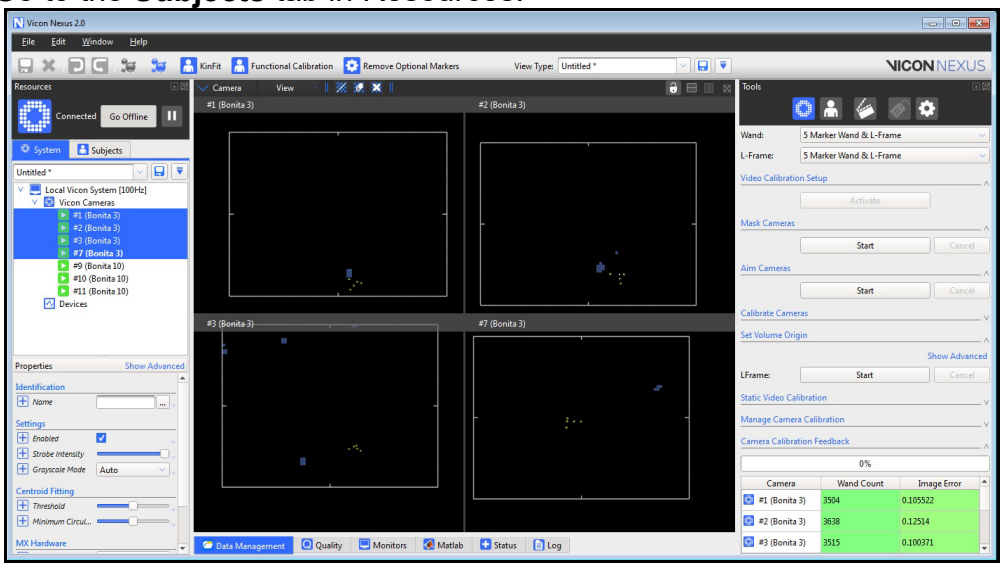
9. Switch the Animation pane to **3D Perspective**.

10. Click **Go Live** if in Offline mode.

11. Confirm that a marker or cluster in the space shows in real-time.

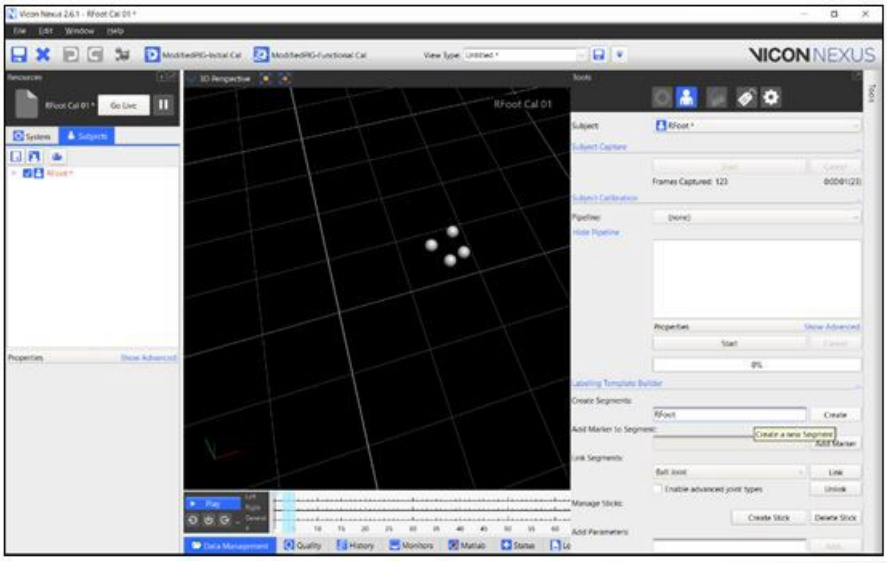
Section 2: Creating Rigid Body Clusters in Nexus 2.0

1. Go to the **Subjects** tab in Resources.



2. Click **Create a Blank Subject**. Name it after the body segment the cluster will track (no spaces).

3. Click **Subject Preparation** in Tools, select the subject template and place the rigid body cluster in the capture volume.



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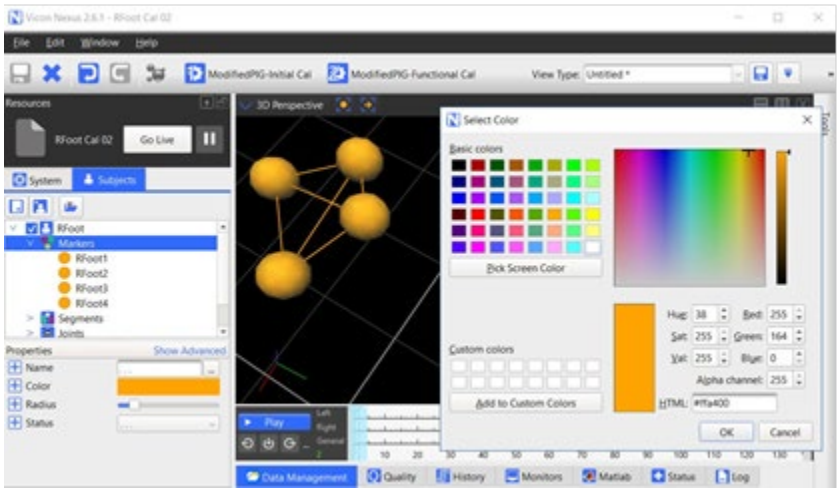
4. Click **Start** in the Subject Capture dialog and move the cluster naturally (like future motions).

5. Collect 10-15 seconds of data, then click **Stop**.

6. If markers don't appear, run the **Reconstruct** pipeline (Tools > Pipeline).

7. Label the cluster:
    - Click the Subject icon in Tools.
    - Enter a segment name and click **Create**.
    - Select the cluster's markers in Animation pane and click **Create** again.

8. Optionally, assign colors to markers for easier identification (under Markers > Color).



9. Apply dynamic calibration:
    - Run **Functional Skeleton Calibration** from Tools > Pipelines.

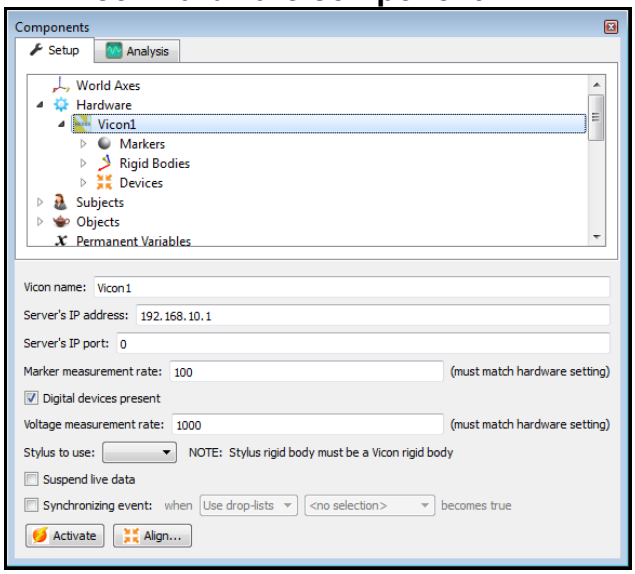
10. Save the calibrated trial and subject:
    - Use the save icon.
    - Right-click the subject in Resources > Subjects and select **Save Subject** and **Save Labeling Skeleton As Template**.

11. Repeat for each rigid body cluster needed.
12. Notes:
    - For streaming rigid body data, **Processing Level** in Nexus must be set to **Kinematic Fit**, not **Labeling**.
    - Press **Ctrl + R** in Nexus to reboot camera processors and re-label markers if marker swapping occurs.
    - If cluster marker positions change, re-run these steps or create a new subject from saved templates.

Section 3: Using Vicon Rigid Body Clusters in The MotionMonitor xGen

1. In The MotionMonitor xGen, go to the **Setup** tab in Components window.

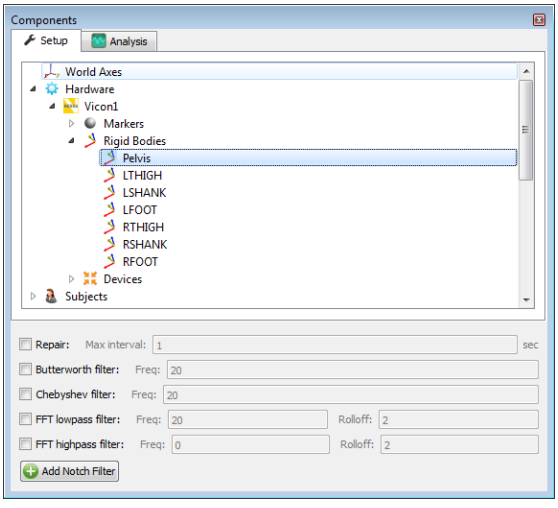
2. Add or select the **Vicon hardware component**.



3. Confirm that settings (frame rate, marker count, IP address) match Nexus 2.0.

4. Click **Activate** to start communication with Nexus.

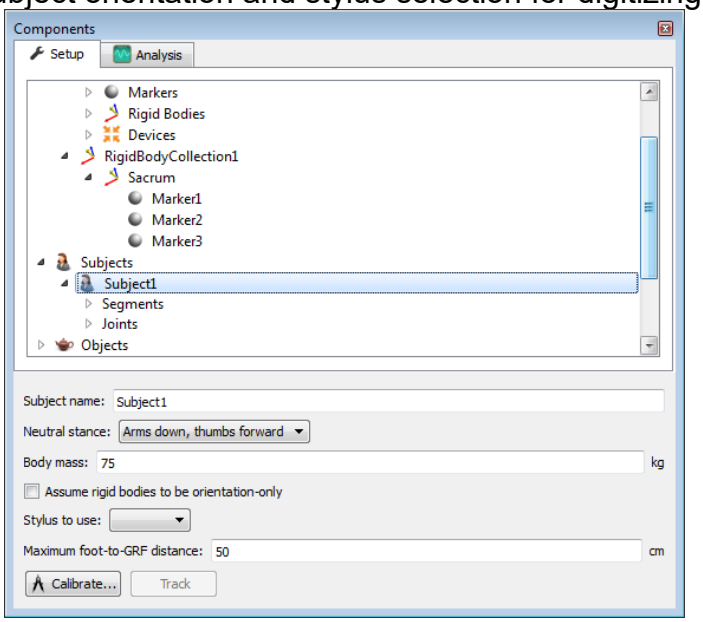
5. After activation, marker and rigid body lists and any analog data will populate in the Vicon component.



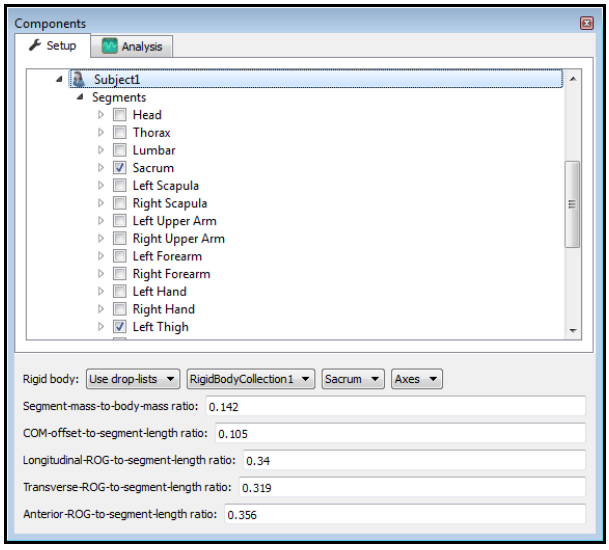
6. You can enable or disable data repair and smoothing here.

7. Confirm the **Processing Level** in Nexus is **Kinematic Fit** to stream rigid body data.

8. Define your biomechanical model in xGen:
   - Right-click **Subjects** in Setup tab and add a new subject.
   - Assign a name and enter basic anthropometric data.
   - Confirm subject orientation and stylus selection for digitizing, if used.

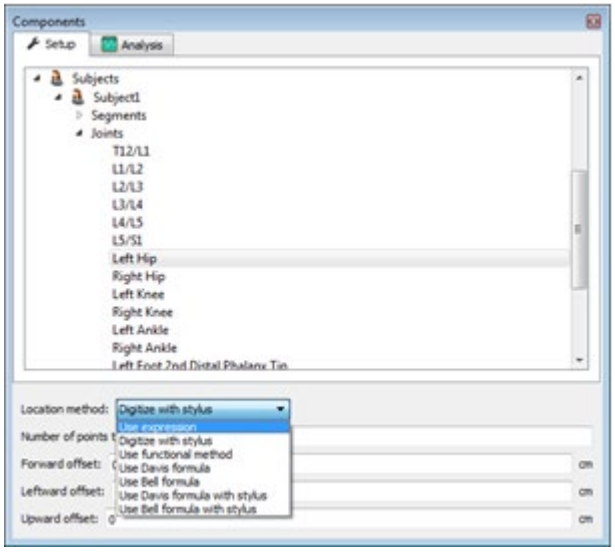


9. Under the subject, enable body segments to track and assign rigid bodies to those segments.



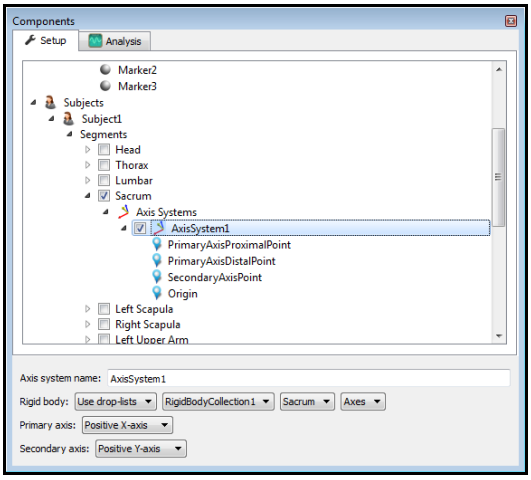
10. Define each segment's proximal and distal joint centers (auto-populated).

11. Joint centers can be defined via digitizing, marker-based expressions, linear regression, or functional methods.



12. Click **Subject Calibrate** to complete the model setup following the on-screen prompts. Warnings appear if definitions are incomplete.

13. Optionally add anatomically based local coordinate systems to segments via **Add Axis System**. Define axes based on marker and landmark positions.



14. The subject model is now ready for recording and computation.

15. Save your setup and subject definition as a workspace for easy reloading in the future:
    - File > Save Workspace As
    - Load later with File > Load Workspace.