GUIDE TO OPERATING THE PARALIGN

General Application & Set Up

FLUKE RELIABILITY

Contents

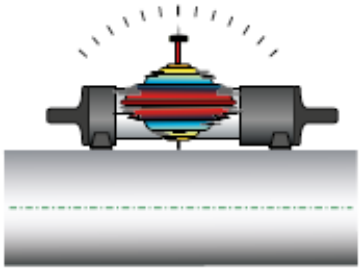
GUIDE TO SETTING UP AND USING THE PARALIGN

1. UNDERSTANDING THE PARALIGN

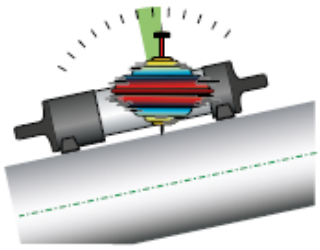
PARALIGN® is a unique device using inertial technology designed to measure the parallelism of rolls in production installations in the paper, print, converting and steel industries.

What is inertial technology?

Inside the PARALIGN® measurement system are three highly precise ring-laser gyroscopes. Such gyroscopes keep their rotation axis unchanged due to mass inertia, even if their base is shifted. This way, the angle of inclination along the rotation axis can be determined. The three gyroscopes in the PARALIGN® system are arranged along three dimensions in space (x, y and z). The three angles – roll, pitch and yaw – that are determined by the system give its exact position in space. This means that PARALIGN® can identify its relative position in space at any time. The same technology is commonly used in aerospace navigation systems.



While its base is being shifted, the gyroscope stays in the same axis, which results in an angle of inclination along the rotation axis.



The PARALIGN® device is swept across the roll's surface or held against the roll's surface and rotated with the roll.

Why PARALIGN®?
Fastest measurement method – more than 100 rolls a day
Instant on-site results and evaluation
Resolution: 4 µm/m (0.05mils/ft)
No line of sight required
No baseline required

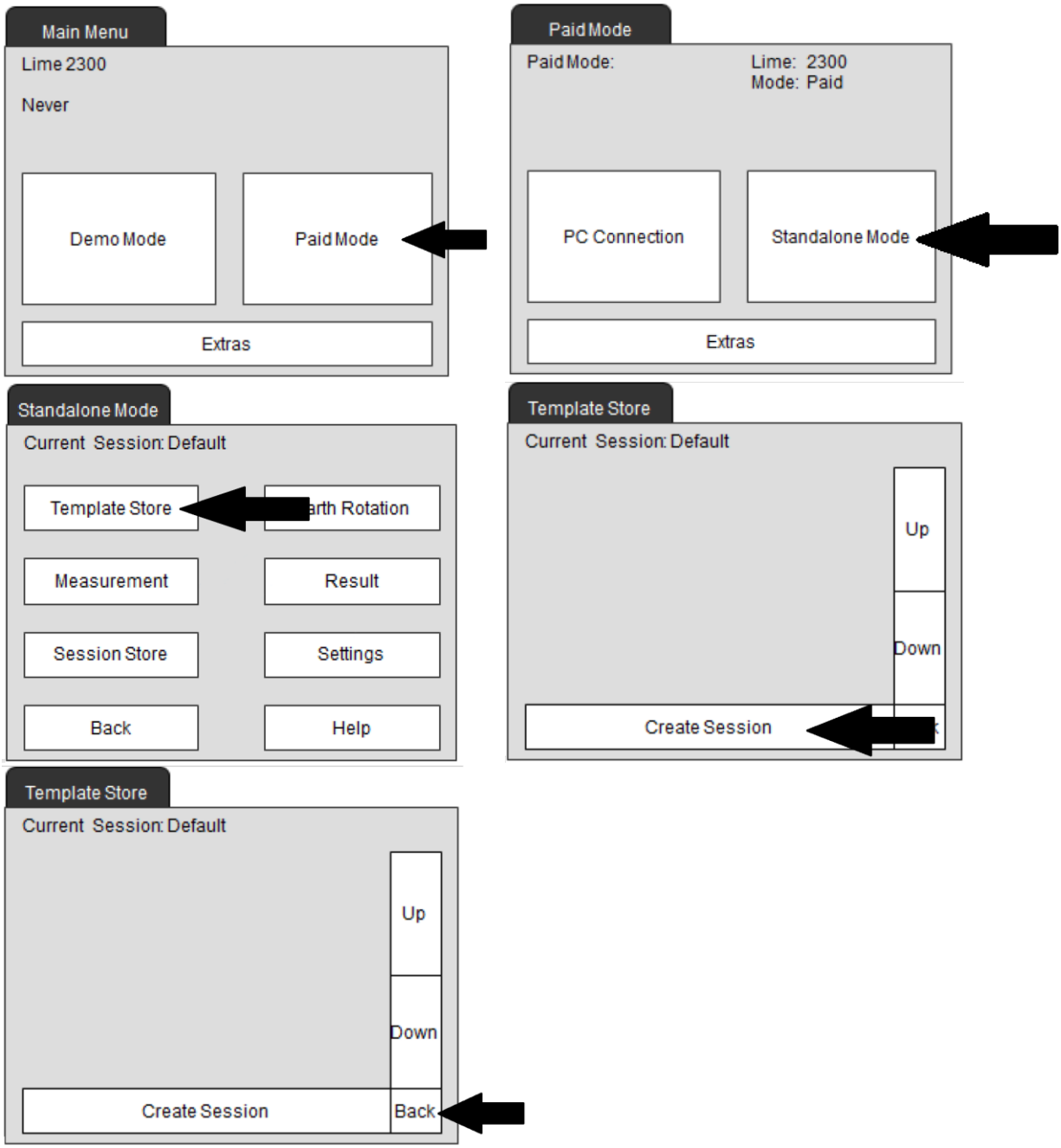
2. SETTING UP THE PARALIGN

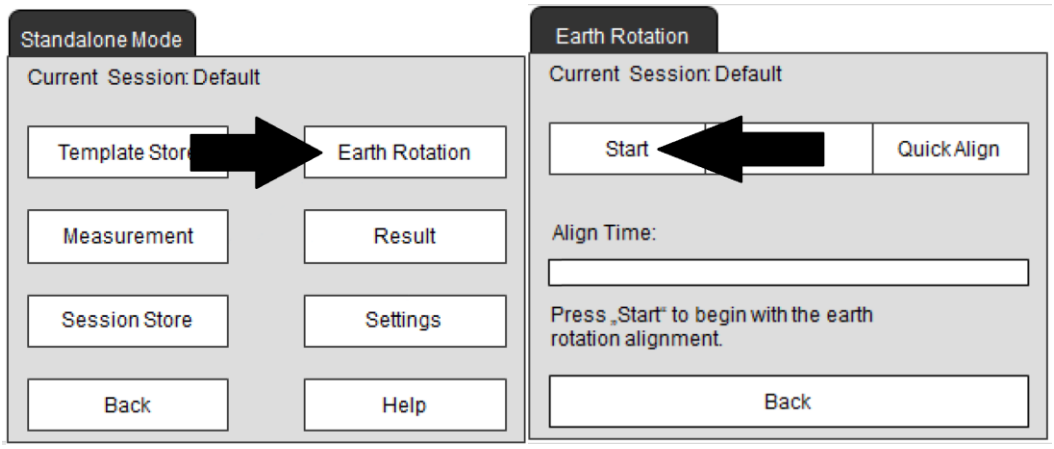
TURNING ON THE DEVICE:

1. Find a secluded area that is reasonably flat.
2. Wipe the ground clean for debris.
3. Remove the PARALIGN from the case.
4. Orientate it so the green end with the screen is on the operator's side of the machine and red is on the drive side of the machine. (Try to make the PARALIGN as parallel to the rolls surface as you can with your eye)
5. Push down on the PARALIGN on all for corners to check for solid contact with the floor. (If it wobbles pick a different spot.)
6. Press the power button on the side and wait a few seconds for the device to turn on.

STARTING A NEW TEMPLATE SESSION:

Follow the pictures illustrating the procedure.

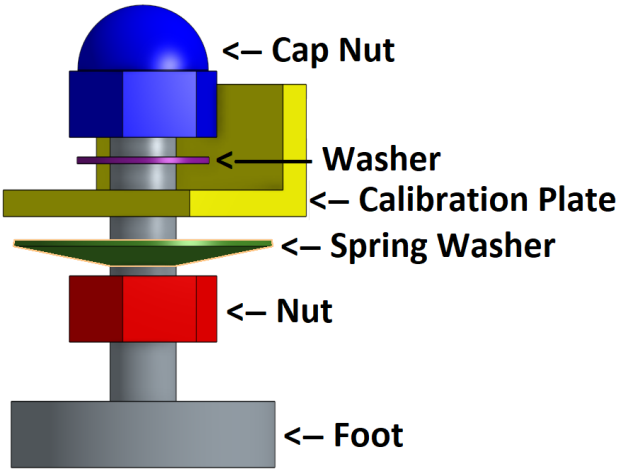




As the PARALIGN is running an Earth Rotation set up the Calibration Plate.

SETTING UP THE CALIBRATION PLATE:

1. Find a secluded area near a power source that is reasonably flat.
2. Wipe floor to ensure no debris is found for good adhesion of the feet.
3. Place 3 feet into the Calibration Plate. (3rd Gen PARALIGN's use furthest hole & 2nd Gen PARALIGN's use closest hole)
4. Assemble the feet according to the diagram.



5. Put the Nut to 7/8 of the way down the threads.
6. Ensure the Spring Washer is oriented with the dish facing up to the Calibration plate.
7. Insert Foot through bottom of Calibration Plate.
8. Orientate the washer with the sharp side facing down towards the Calibration Plate.
9. Screw Cap Nut on until hand tight ensuring there is a gap between Cap Nut and the Calibration Plate.
10. Run the bottom Nut up until hand tight, then check to see the level of the Calibration Plate **with the single foot on the Drive side.**

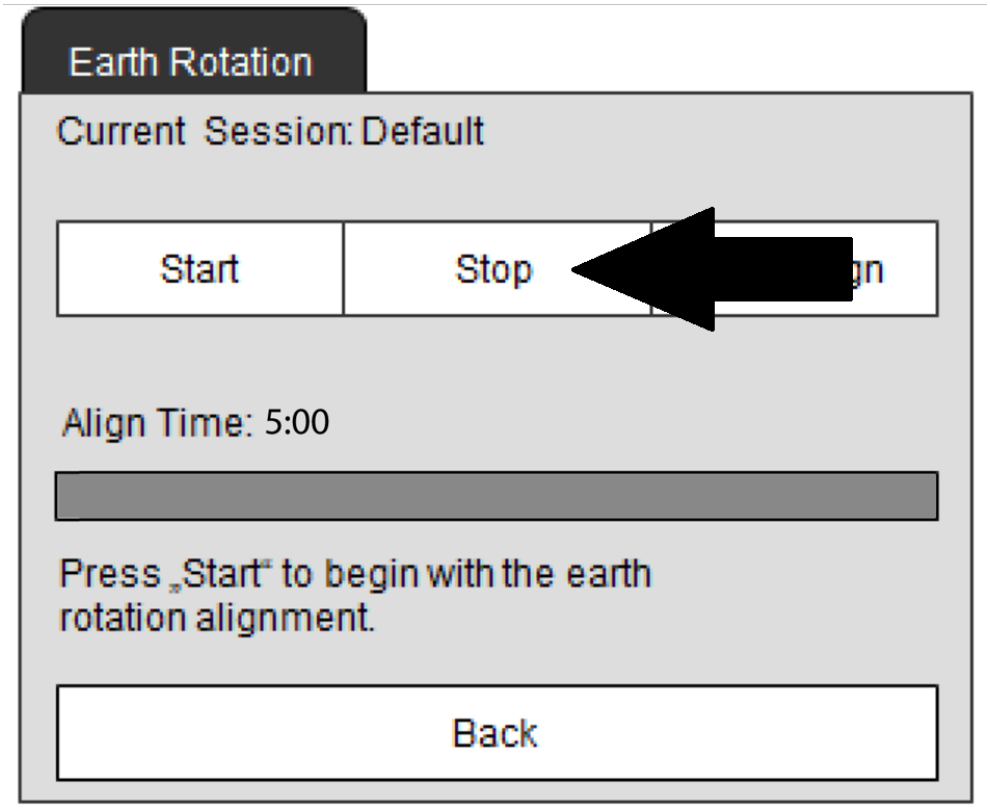
11. Once initially leveled tighten the two feet that are on the same side as each other leaving the 3rd foot just hand tight.

PICKING A SUITABLE LINK ROLL:

1. Fairly accessible.
2. Doesn't move. (no hydraulics, slides, airbags, etc.)
3. Very good roll surface, perfect cylindricity, and very high repeatability of measurements.
4. Not a necessity but free spinning.
5. Close to Calibration Plate.
6. Mark a spot on the Link Roll to ensure the same sweep angle.

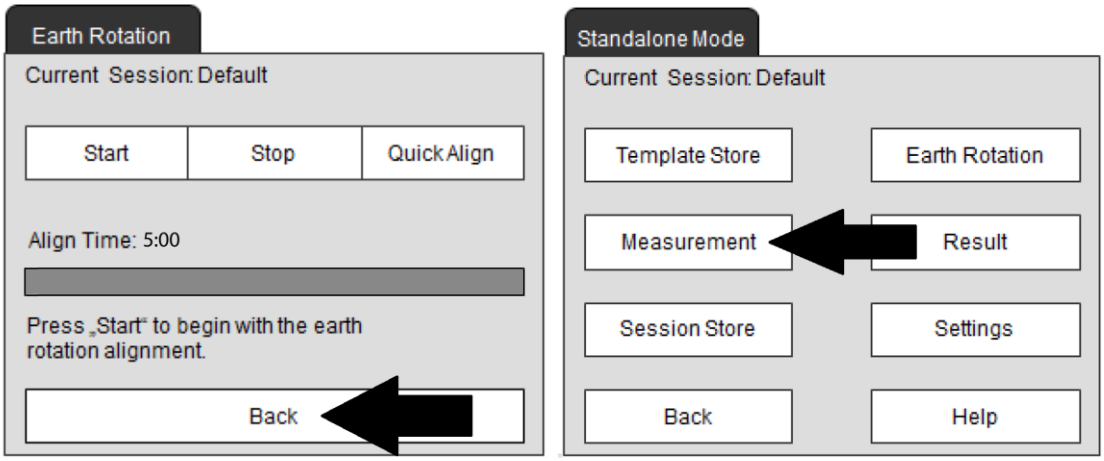
TAKING AND SELECTING LINK ROLL MEASUREMENTS:

After the Calibration Plate is set up, a Link Roll is picked and marked, and its been 5 minutes or longer go back to the PARALIGN and stop the Earth Rotation like so.



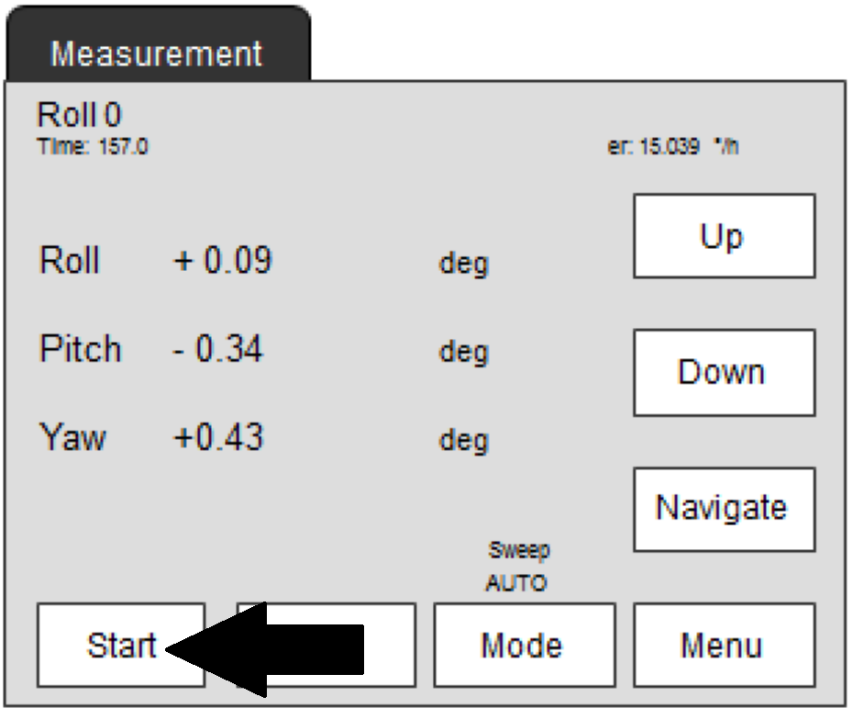
The results should read between **15.031°/h to 15.051°/h.** If it is not within the set values start another Earth Rotation.

Once a valid value is obtained proceed with the diagrams.



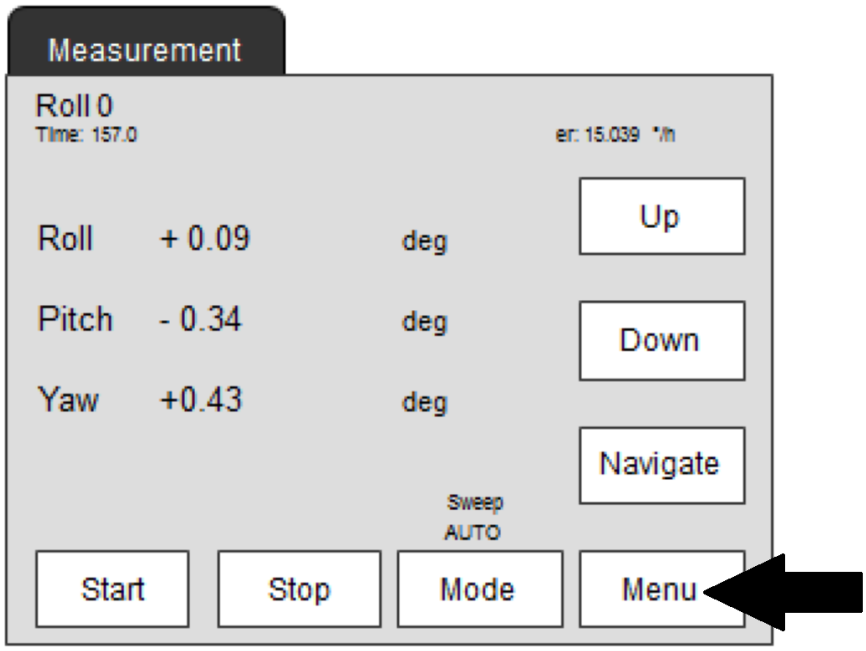
Now bring the PARALIGN over to the Link Roll making sure you don't turn the PARALIGN away from being parallel with the machine. (The green side must never get turned so it is on the drive side of the machine!)

Gently place it on the Link Roll and orient it in the middle of the roll where you marked previously. Then press **Start** and begin your slow sweep up the roll and back down again past where you started.

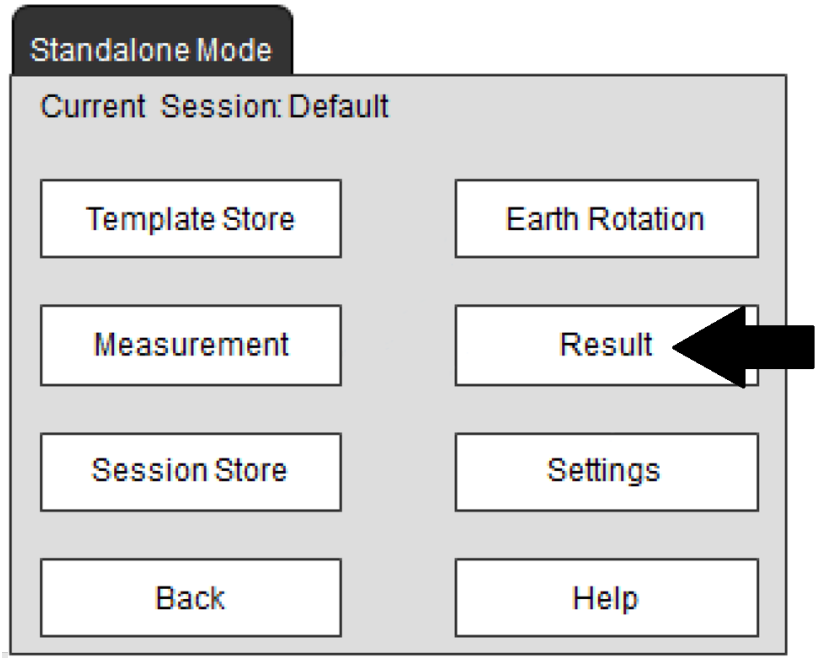


The PARALIGN will automatically stop measuring once it has collected enough points. Simply lift the PARALIGN off the rolls surface momentarily and place it back down in the same spot. (This simulates coming back in the future for link roll measurements) Click **Back** and then **Start** again. Do this twice after the initial measurement.

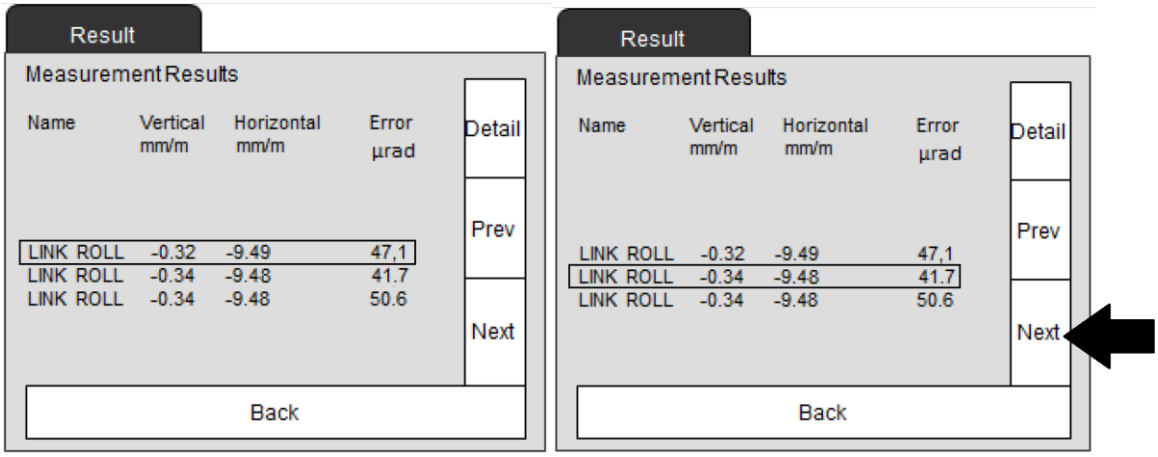
Once 3 measurements have been collected press **Menu.**



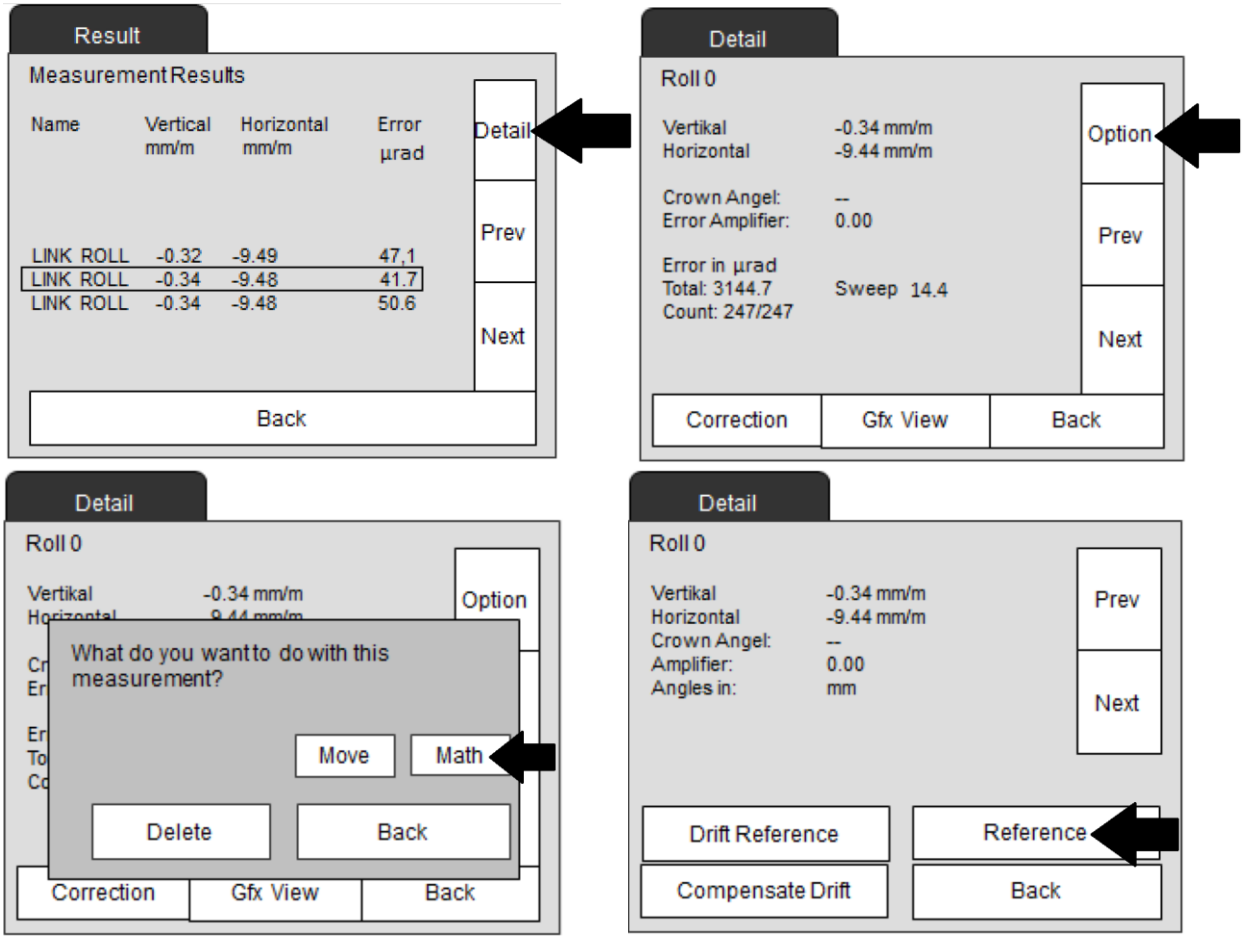
Now it is time to check the results.

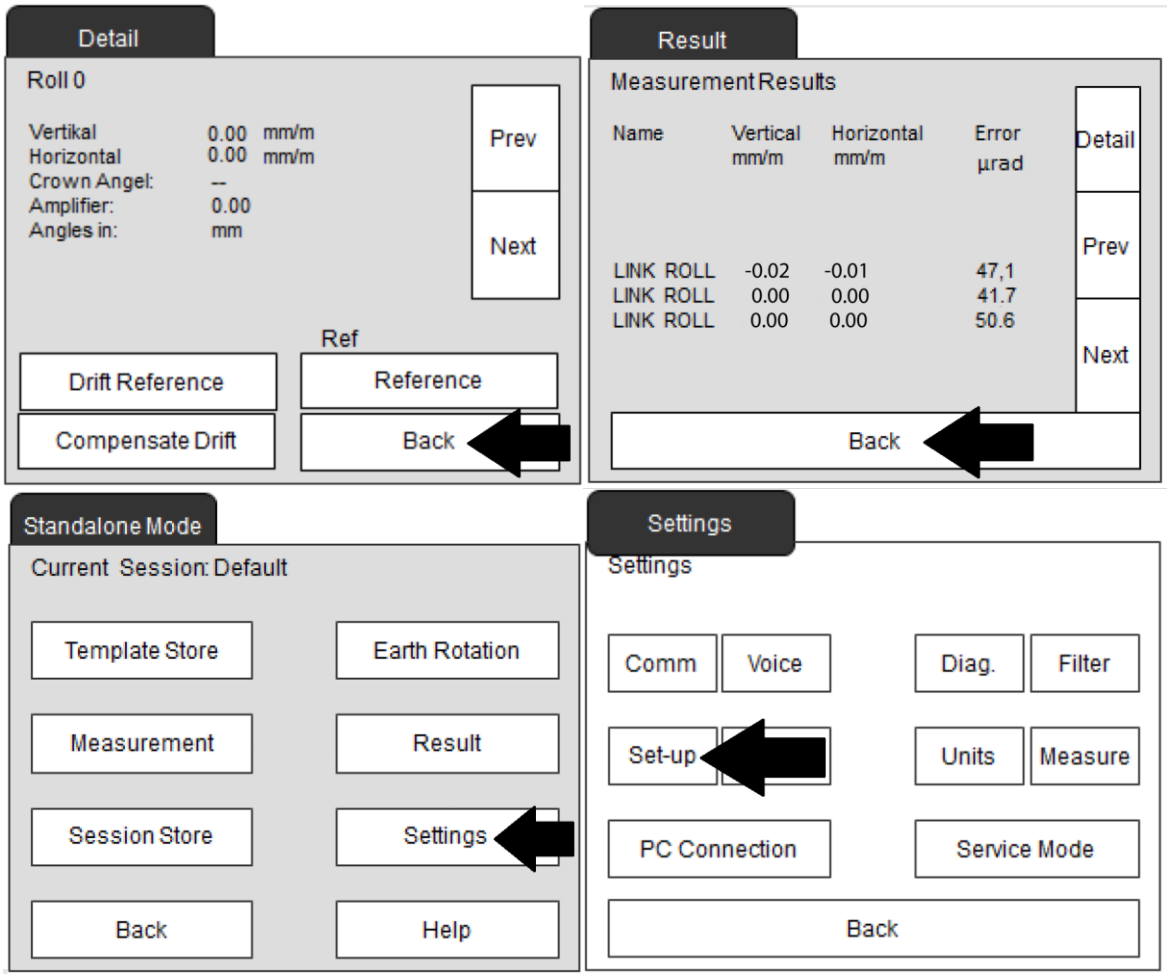


Verify the measurements taken are within **0.05 mm/m** of all the **Vertical** values and **0.05 mm/m** of the **Horizonta**l values. Then highlight the one with the **lowest Error**.



Next Click **Detail** on the screen to select that measurement and follow the diagrams.

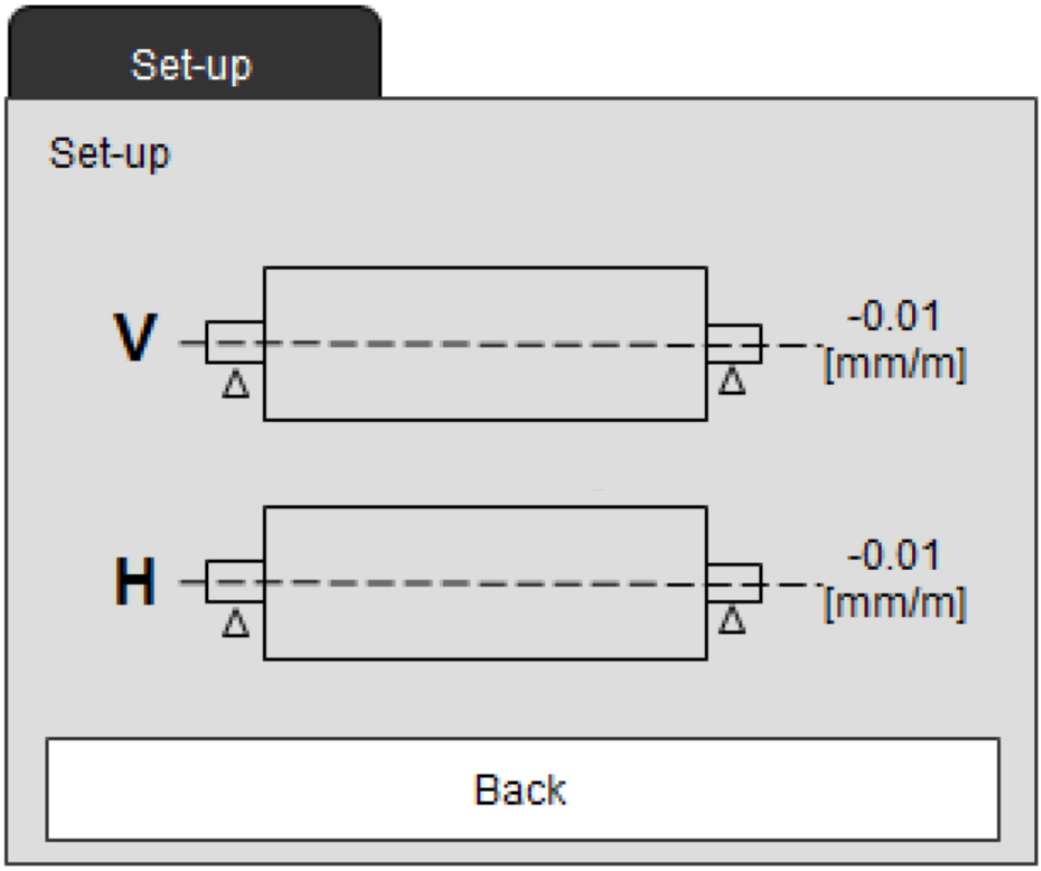




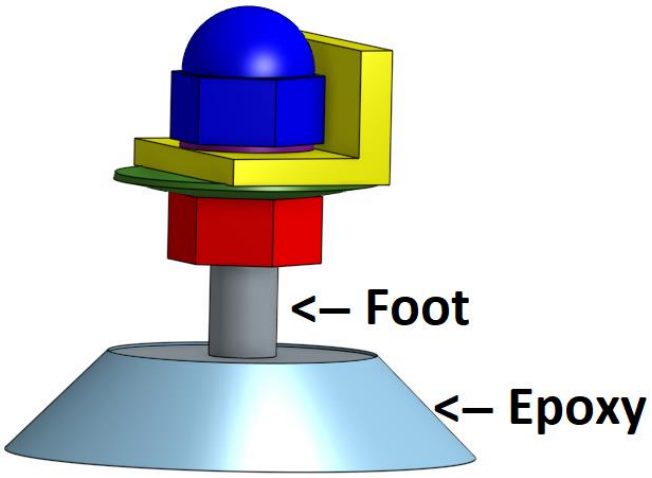
SETTING PLATE TO LINK ROLL:

1. Place the PARALIGN onto the plate and lock it closed. (Note the orientation of the side with the single foot)
2. At this time have the 2nd person start mixing a half stick of epoxy while wearing nitrile gloves.
3. Align the PARALIGN horizontally to make the roll on the screen go straight.
4. Look at the vertical position of the PARALIGN. The read out should be a **Positive value**.
5. If the read out is a **Negative value** take the PARALIGN out of the plate and flip the plate around. (This should give you a positive value on the vertical adjustment.)
6. Next loosen the bottom locking nut and unthread the single foot a half rotation at a time between rechecking the vertical position.
7. Once the vertical position is under **+/- 0.10 mm/m**, lock the nut down with the wrench.
8. Mark the position of the plate with masking tape to ensure setting it back down in the same location.
9. Pick up and flip over the PARALIGN and Calibration Plate together by grabbing the Calibration Plate. (Never pick up the PARALIGN and Calibration Plate together by the PARALIGN!)
10. At this time the epoxy should be thoroughly mixed and ready to be placed on the feet.
11. Have the other person divide the epoxy in 3 equal segments.

12. Smush the epoxy into each foot while making it resemble a Hershey kiss.
13. Line up the Calibration Plate and PARALIGN with the marked location.
14. Ensure the **Horizontal is under +/- 0.10 mm/m** before setting all the feet on the floor.
15. Push a little down on the Calibration Plate on the two corners on the lowest side.
16. Push down a lot on the highest side while moving side to side a little bit. (This ensures good adhesion to the feet and floor.)
17. Adjust as necessary to get both Horizontal and Vertical values to **0.00 mm/m**

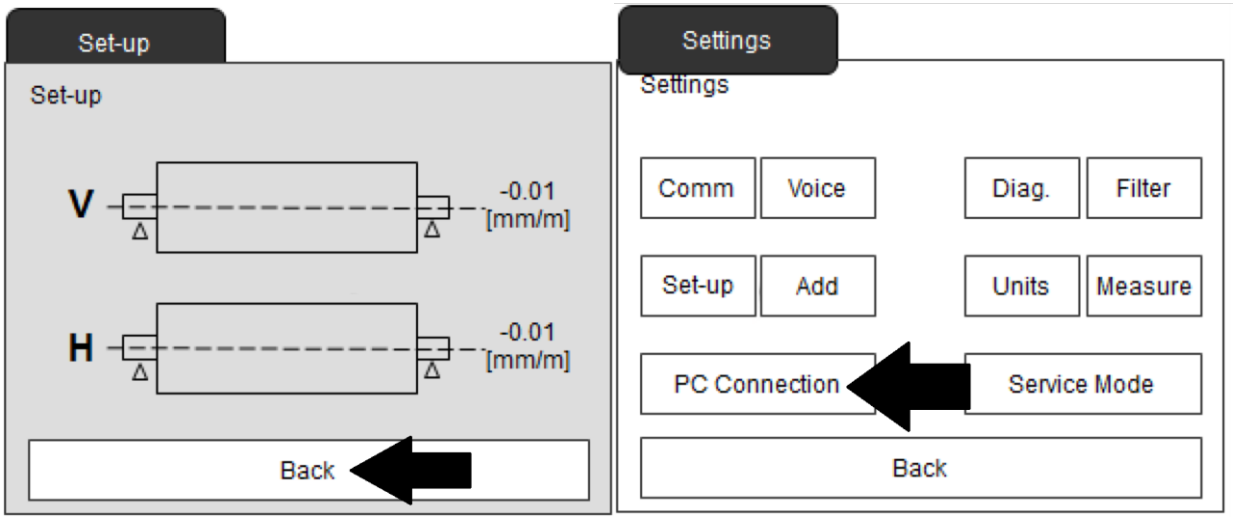


18. Shape the epoxy around the feet. Make diagonal sloped sides to the floor on all 3 feet to ensure good contact and a strong hold. Wait until the epoxy has hardened. (roughly 30-45 min.)

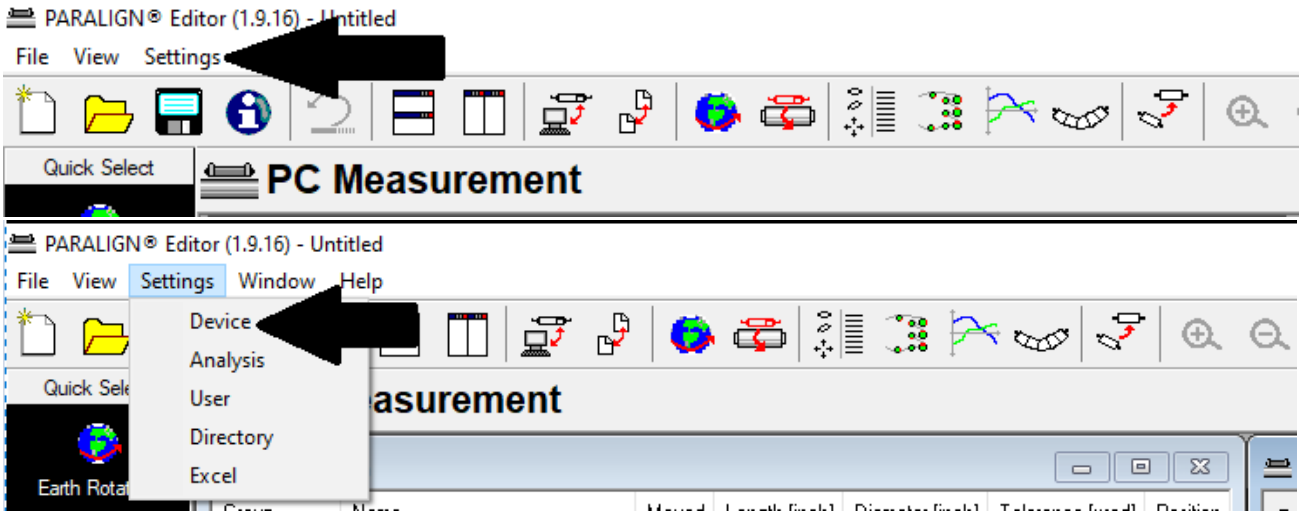


CONNECTING THE PARALIGN TO THE COMPUTER:

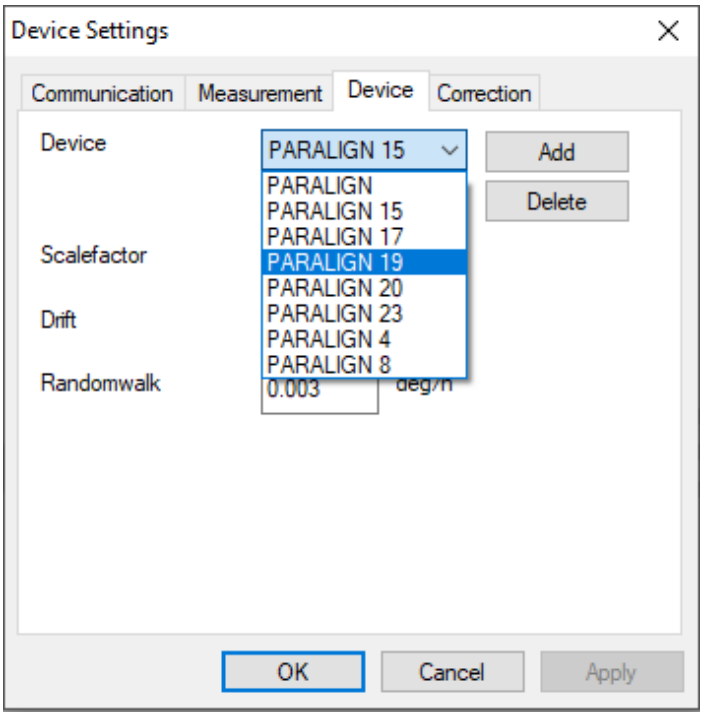
1. Once the epoxy has hardened click **Back** and then **PC Connection.**



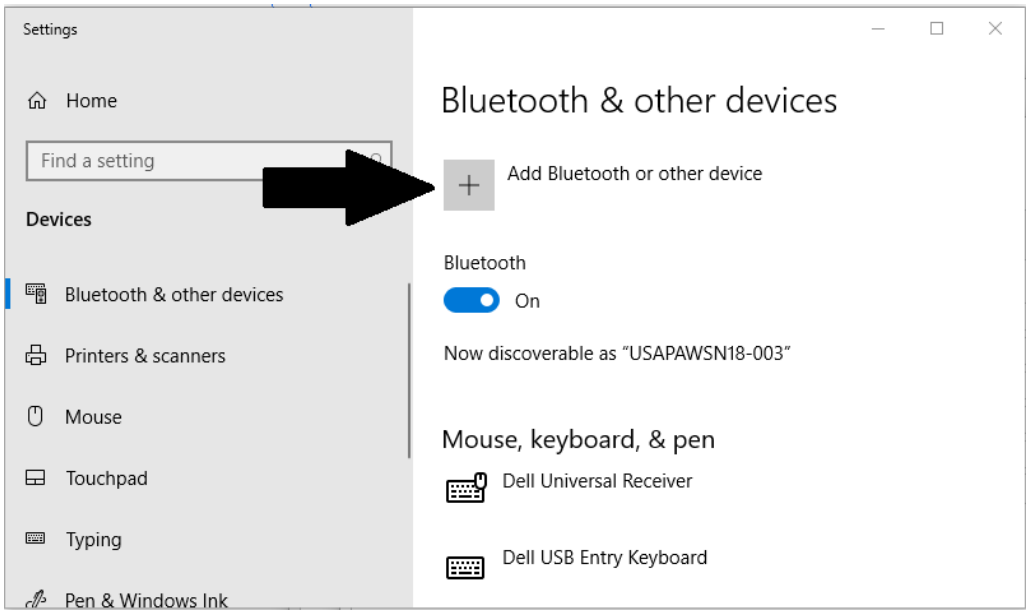
2. Open the corresponding PDA for the service being attended.
3. Click **Settings** then **Device.**



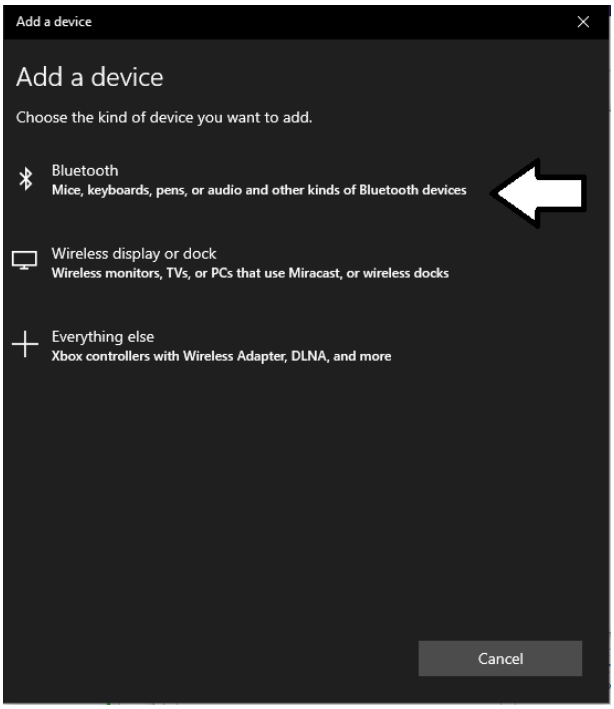
4. If this computer has never been connected to this PARALIGN before click **Add.** Type PARALIGN and the number that is labeled on the under side of the PARALIGN. (If it is not the first time simple select it from the drop-down menu.)



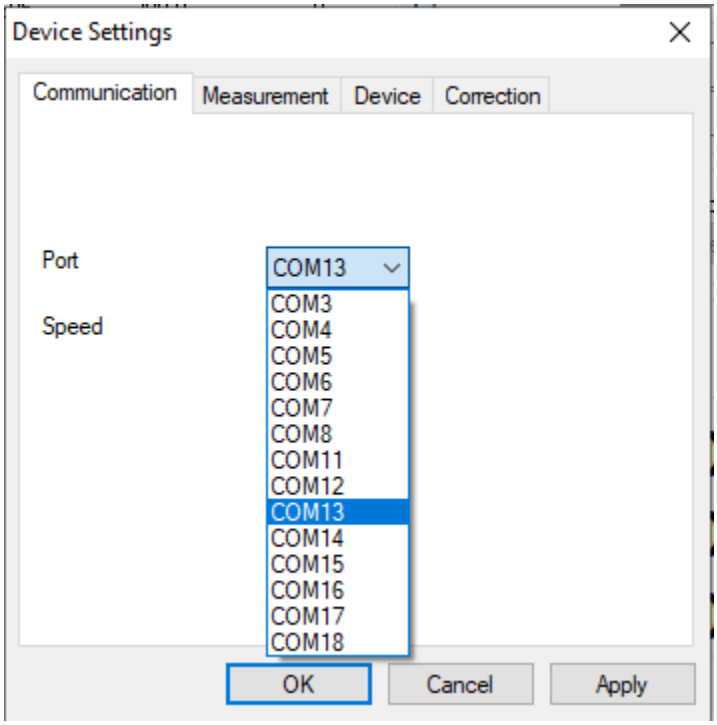
5. Next open **Bluetooth & other devices** in the computer settings.
6. Click **Add Bluetooth or other Device**.



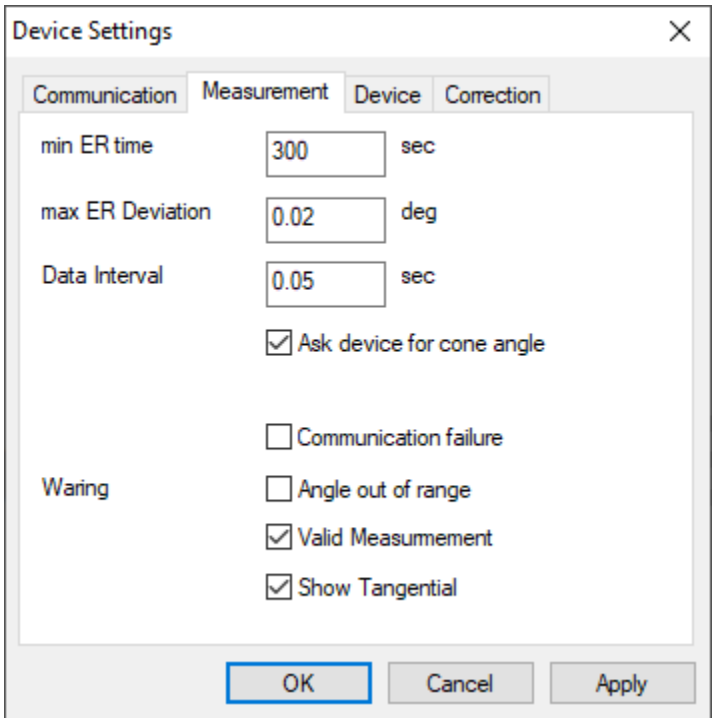
7. Click Bluetooth and then select the PARALIGN device name.



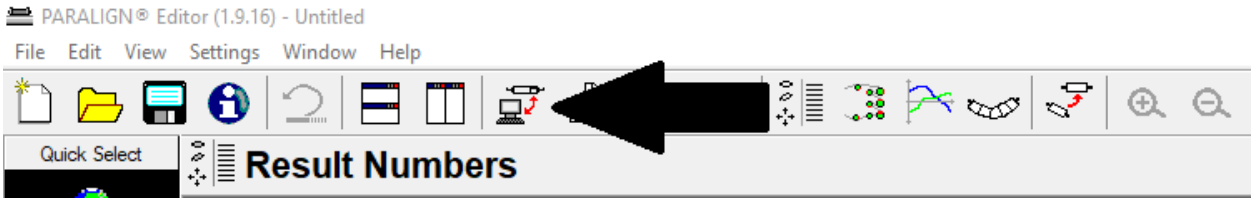
8. Going back to the Editor Software Make sure you select the right COM Port. (COM Ports can be found in the Bluetooth settings of the computer.)



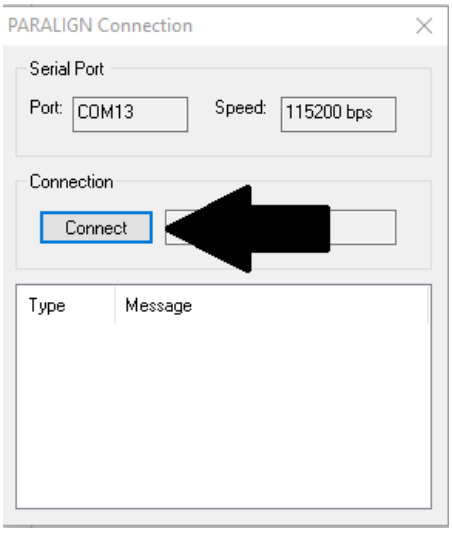
9. Click the **Measurement** tab and verify the box marked **Ask device for cone** angle is checked. Then click **Apply** & **OK**.



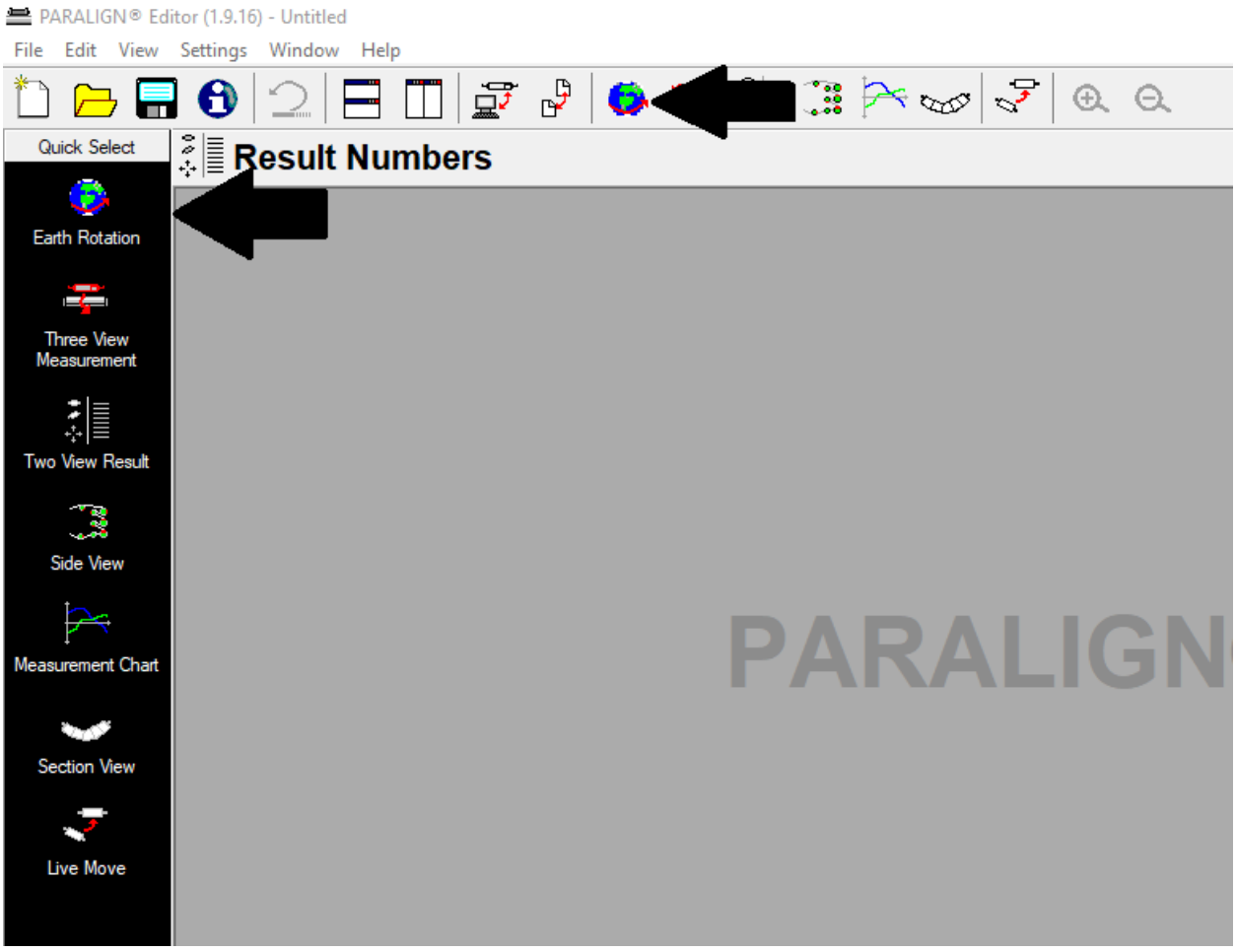
10. Click the button shown below.

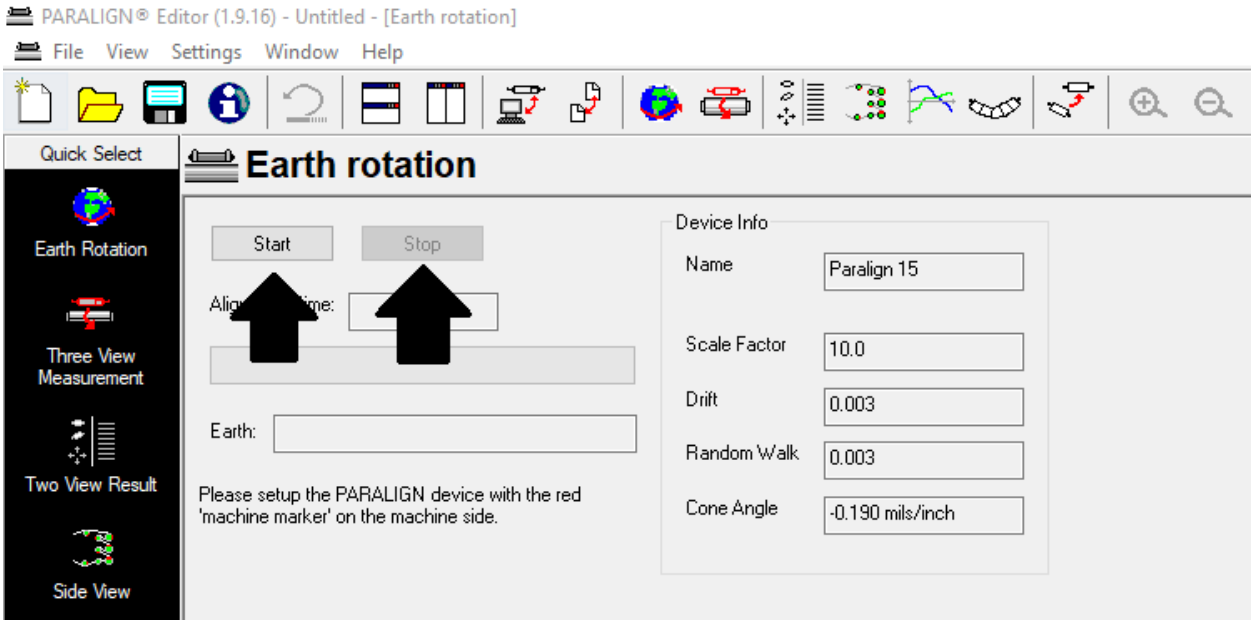


11. Click **Connect** and wait for the box to say Connected.

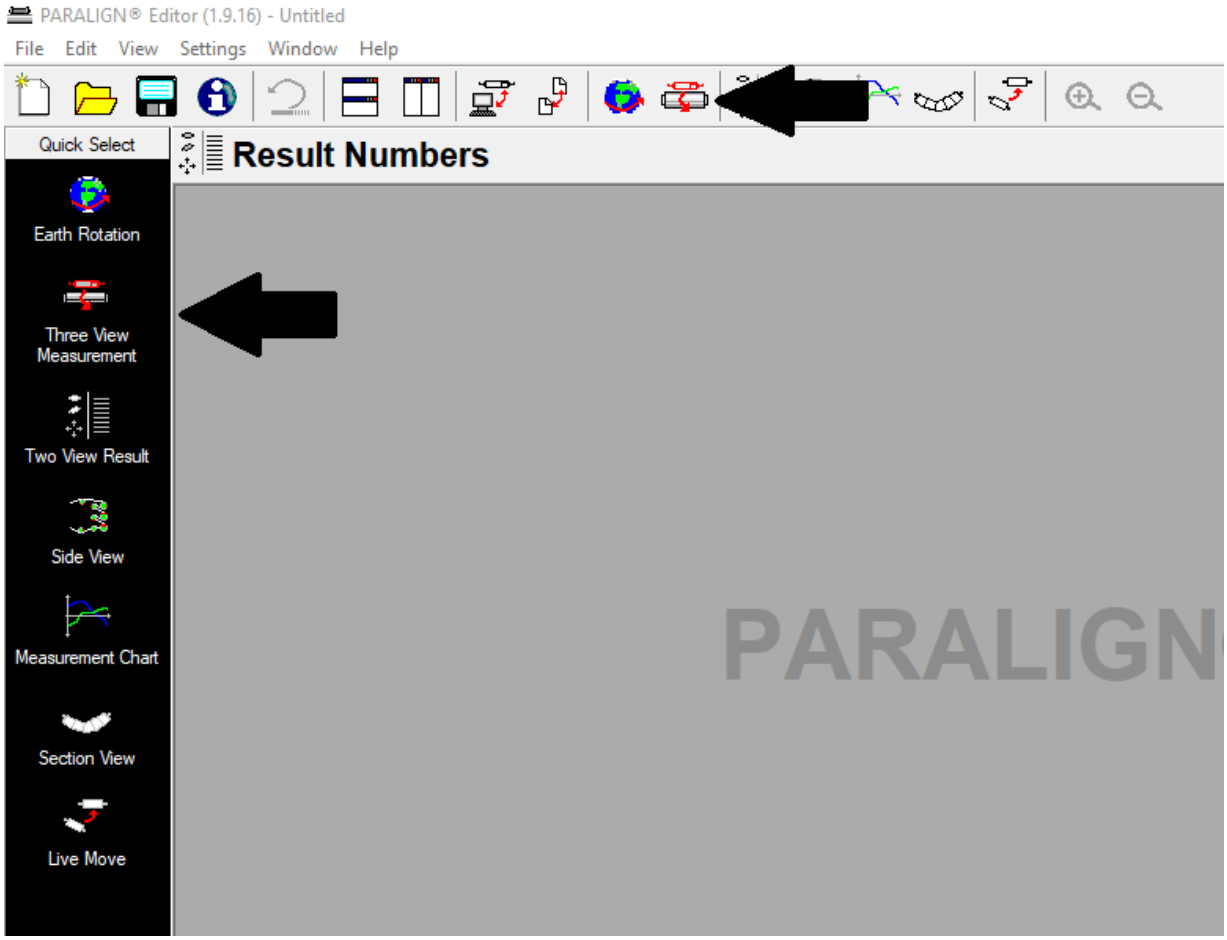


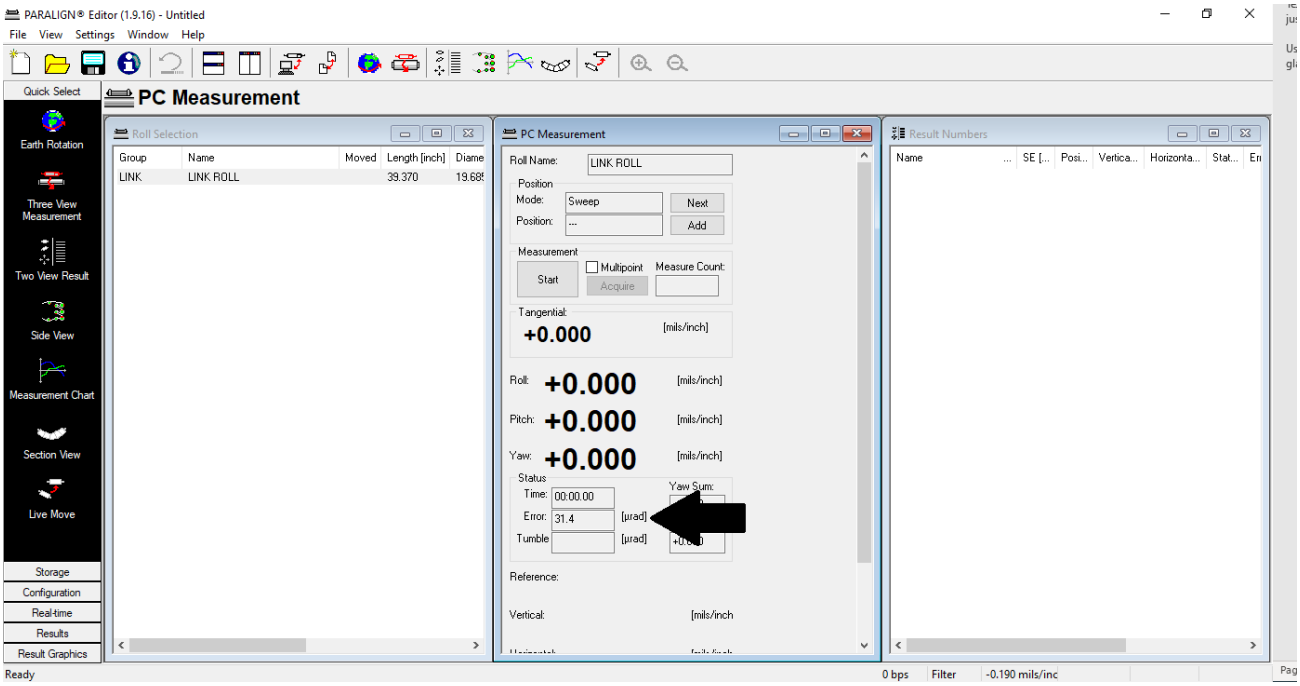
12. Click the **Earth Rotation** button and Click **Start**, **Stop**, and **Start** again. (This resets the timer)





13. Verify on the **Three View Result** page that the Error is slowly climbing in the low 30's. (If not restart the Earth Rotation)

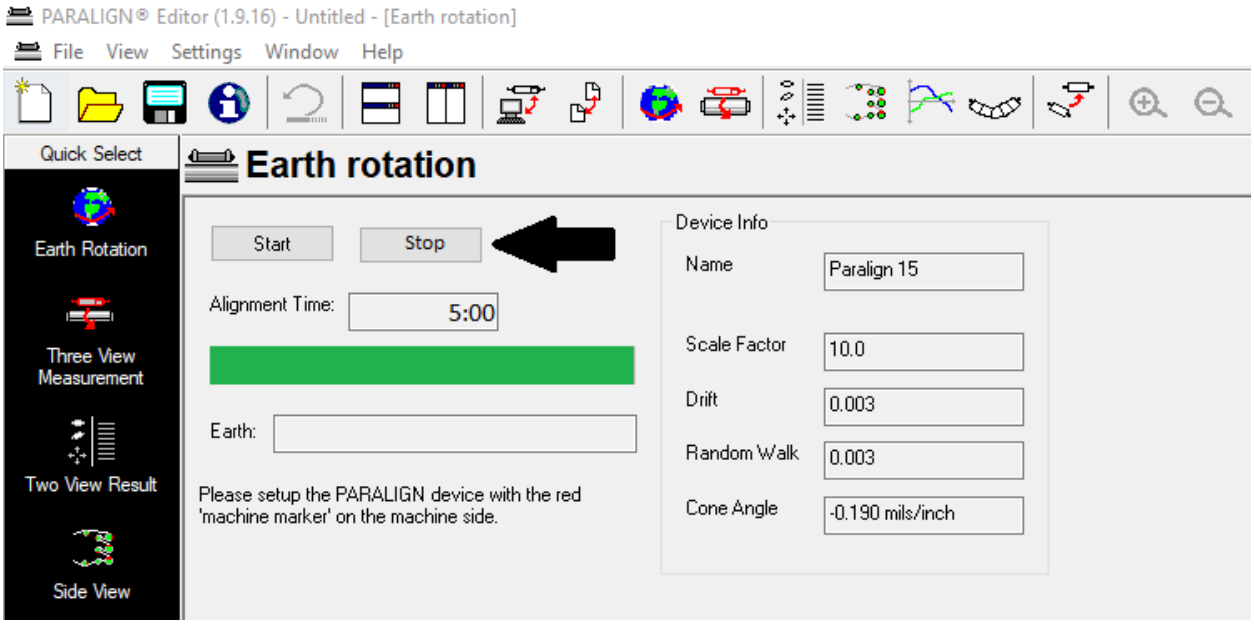


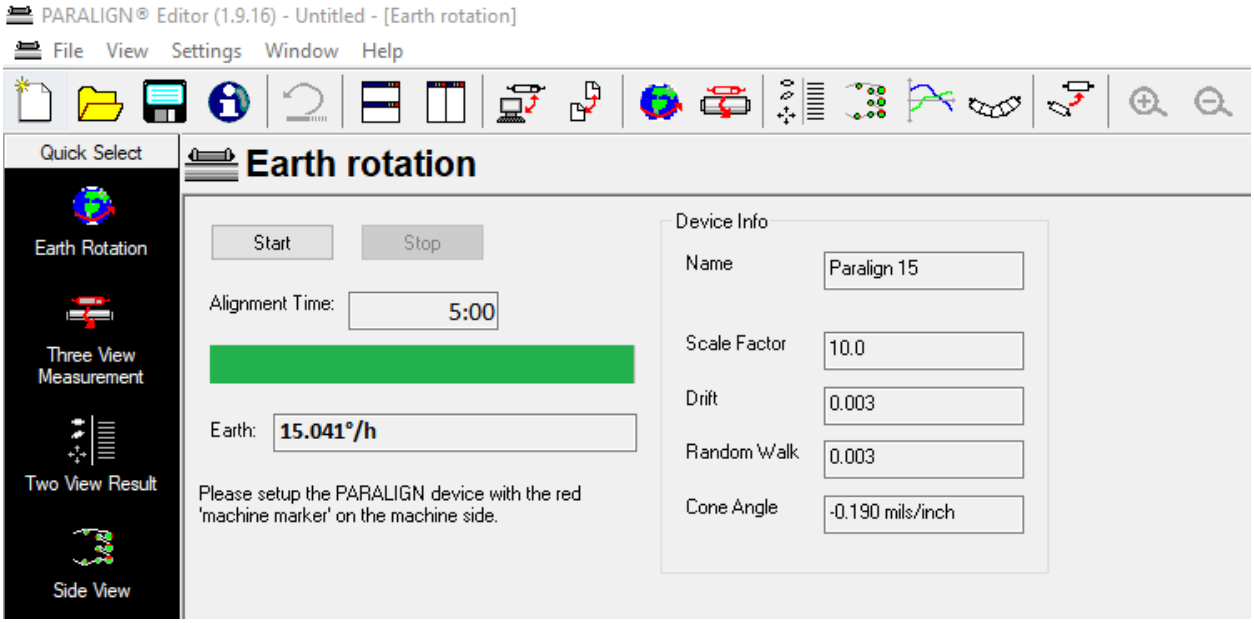


3. PERFORMING THE SERVICE

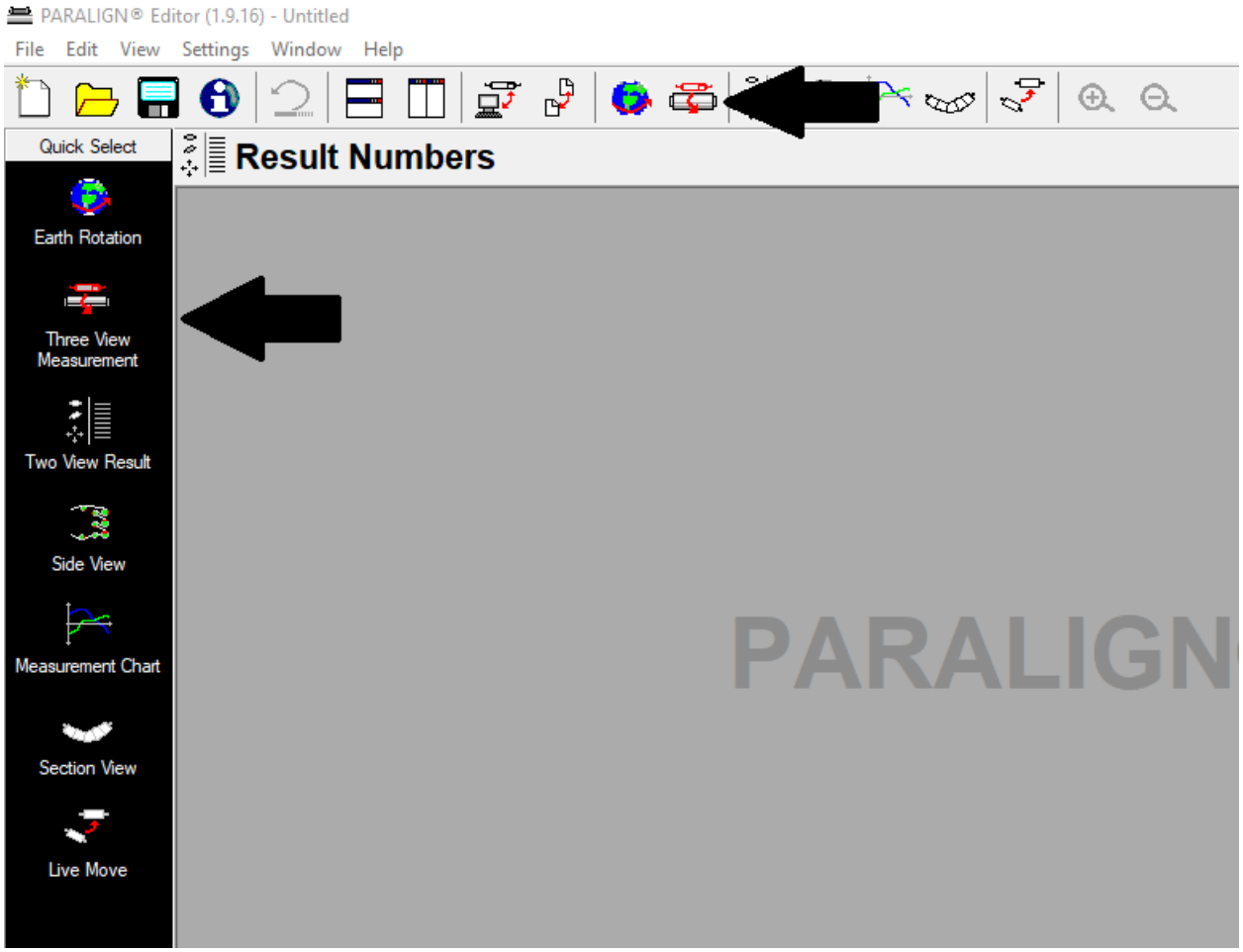
BASIC SERVICE OPERATIONS:

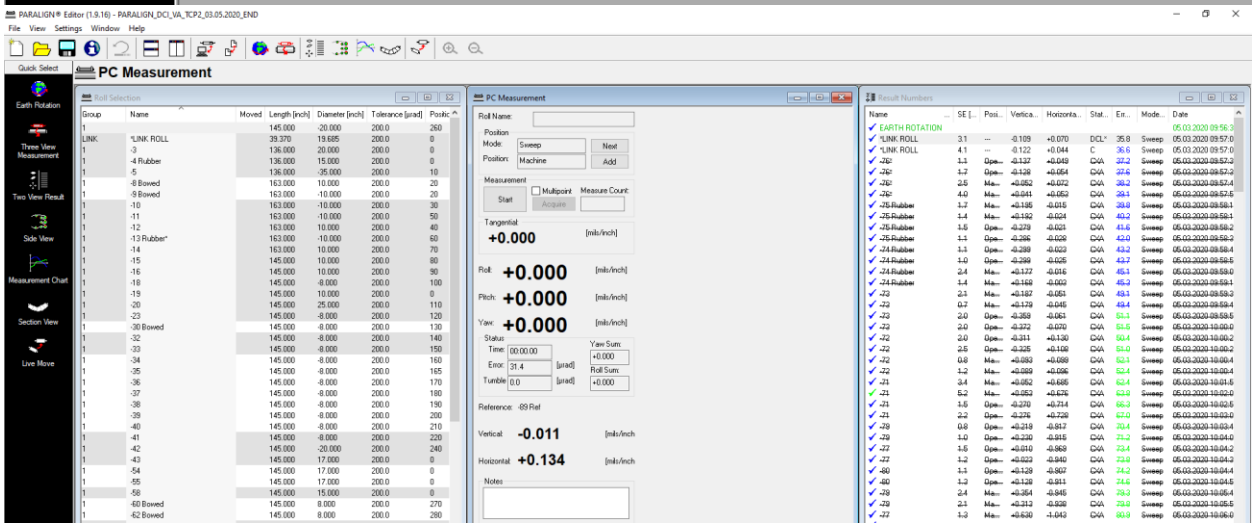
1. While the Earth Rotation is running measure the length of some rolls. (Most should be roughly the same length and only some sections should be different)
2. Stop the Earth Rotation. Verifying that the degrees per hour are in the accessible limit



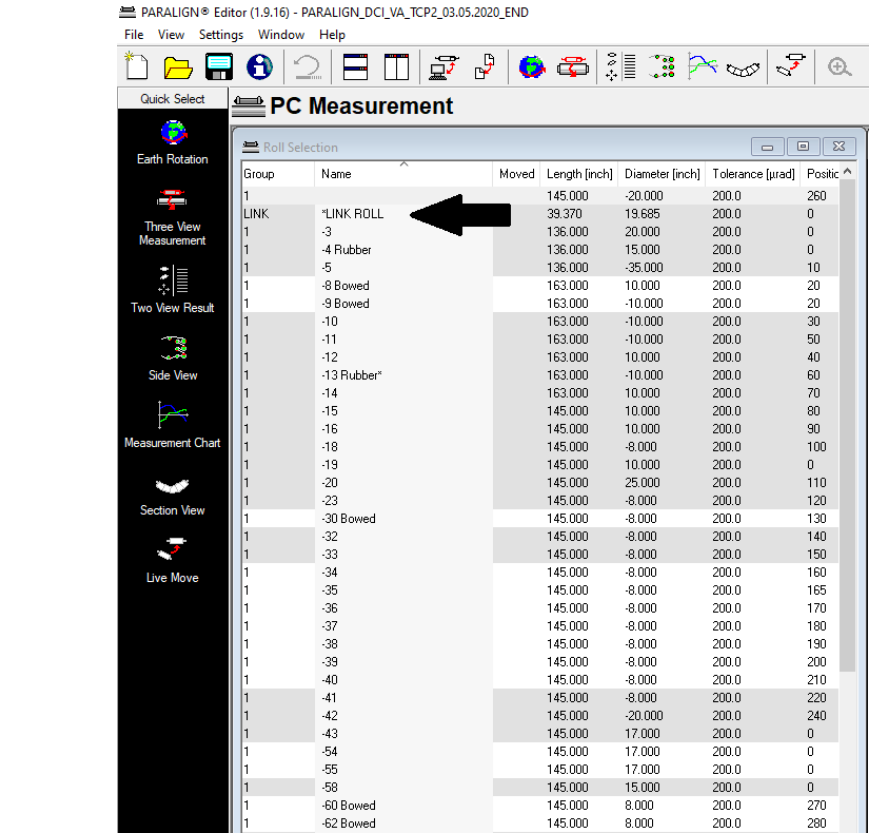


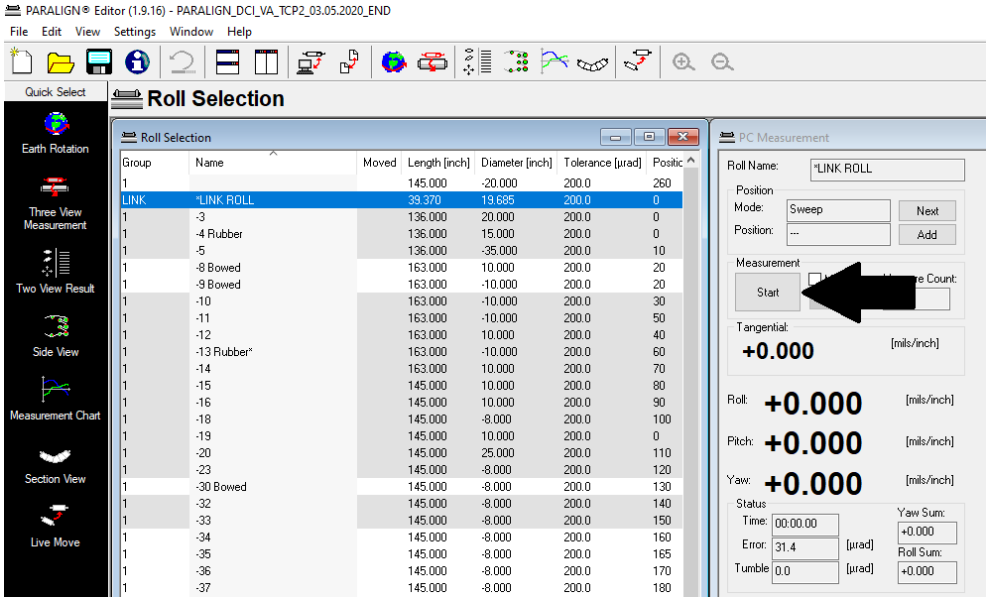
3. Head over to the Link Roll and using the computer click **Three View Measurement** twice. This brings the rolls up as list instead of a sideview.



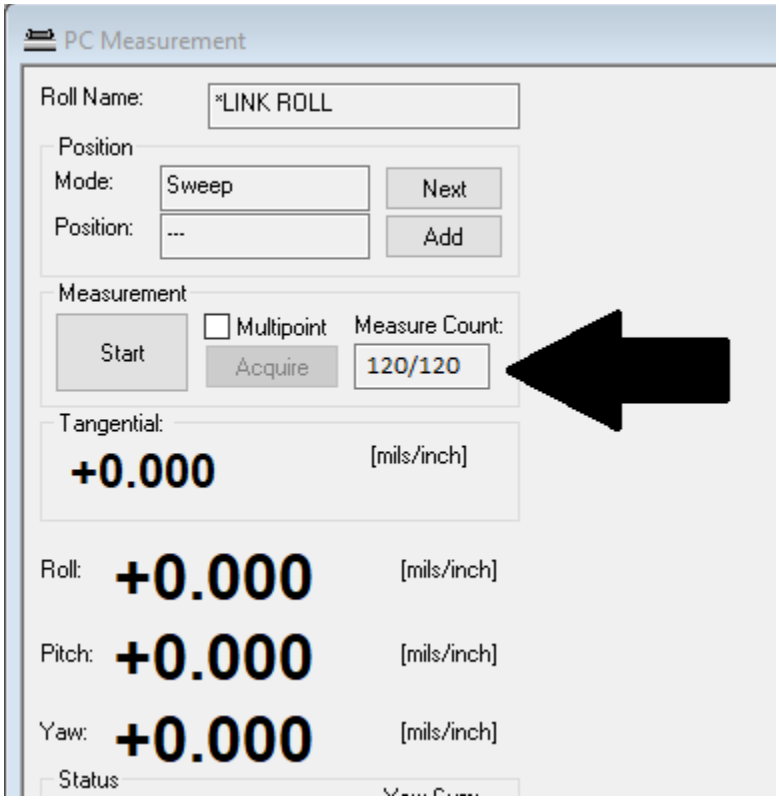


4. Click the **LINK ROLL.** Then click the **Start** button when the other person is on the marked spot of the LINK Roll and ready for the measurements to begin. (It is crucial to be in constant communication with the person using the PARALIGN!)

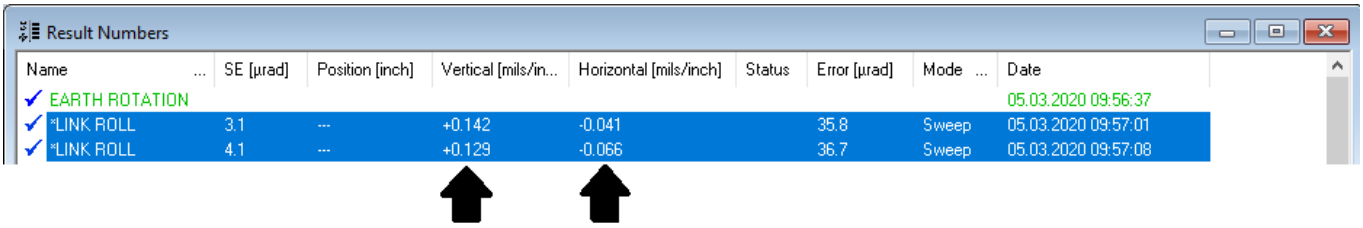




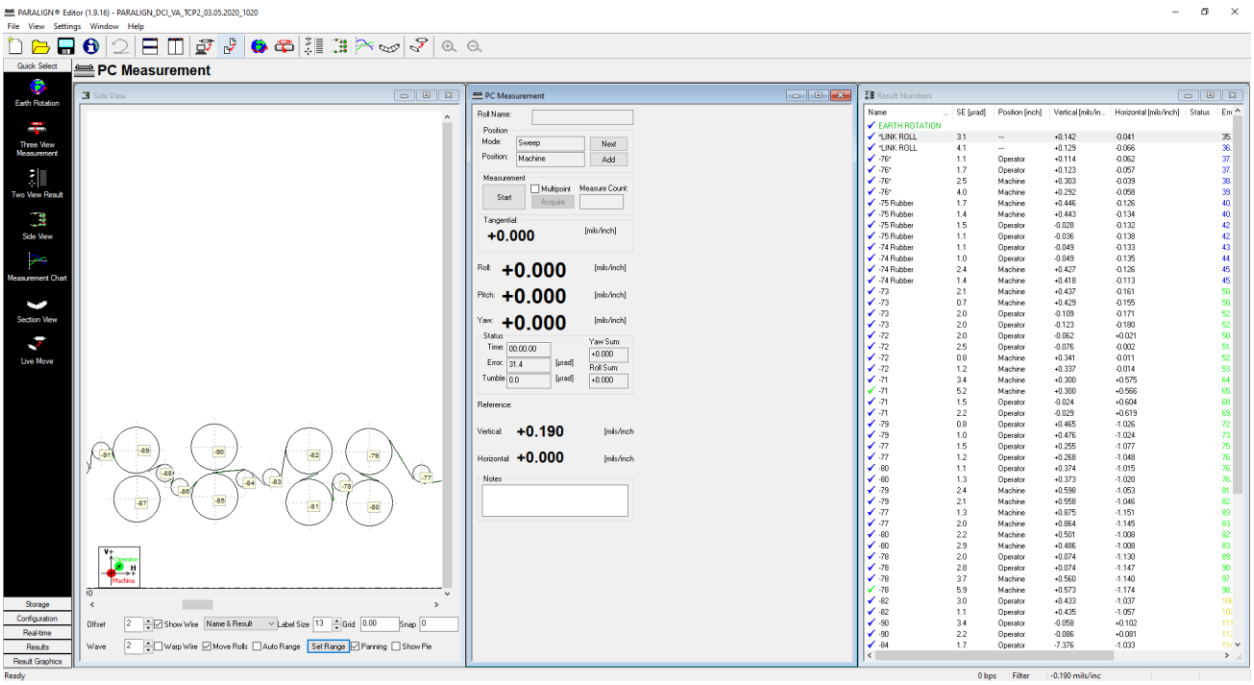
5. While the other person is sweeping the PARALIGN. Wait until the **Measurement Count** reaches at least **120.** Then hit the space bar 3 times. This stops and starts the next measurement. (Always take at least two acceptable measurements per roll.)



6. Once the second measurement has enough points tap the space bar just 2 times to end the measurement. Verify the results are in an acceptable range. (Initial LINK ROLL measurements must be obtained within 3-minutes of stopping the Earth Rotation!)



7. LINK ROLL Measurements must have a blue check mark. (No other color is acceptable for LINK ROLLS)
8. Verify the **Vertical** results are repeatable between the two measurements. (They should be **+/- 0.05 mils/inch**)
9. If they are acceptable pick the one with the lowest **Error** and click **D** and **L** on the keyboard. (This will start the Drift Compensation for all other LINK ROLL measurements.)
10. Now Click on the **Three View Measurement** tab to get back to a sideview of the drawing.



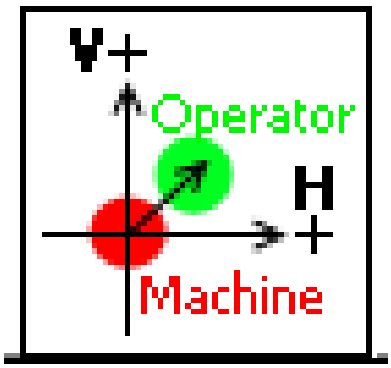
11. From here locate the first roll you would like to measure.
12. Click a roll and follow the same procedure as the LINK ROLL. (Only a minimum of 90 points and green check mark is needed)
13. Compare the two measurements for repeatability and then select another roll to measure.
14. There is a 20-minute window from the time of stopping the **Earth Rotation** to measuring your **LINK ROLL** for the second time at the end of the measurement cycle.
15. When approaching the 17-minute mark think about a stopping point. (There must be enough time left in the 20-minute measurement cycle to measure the LINK ROLL again.)
16. After remeasuring the LINK ROLL and verifying repeatability find the lowest error LINK ROLL measurement and click **D** & **C** on the keyboard. (This factors out the drift of the gyros during the measurement cycle.)
17. Place the PARALIGN back in the Calibration Plate, lock it in, and plug the charging cable in.
18. Start an Earth Rotation. Click **Save As** and save this measurement cycle with the current time in 24-hour format.
19. Repeat these steps for the rest of the service.
20. If adjustments are being made during the service color coding measurements make reporting quick and easy.

Initial measurements

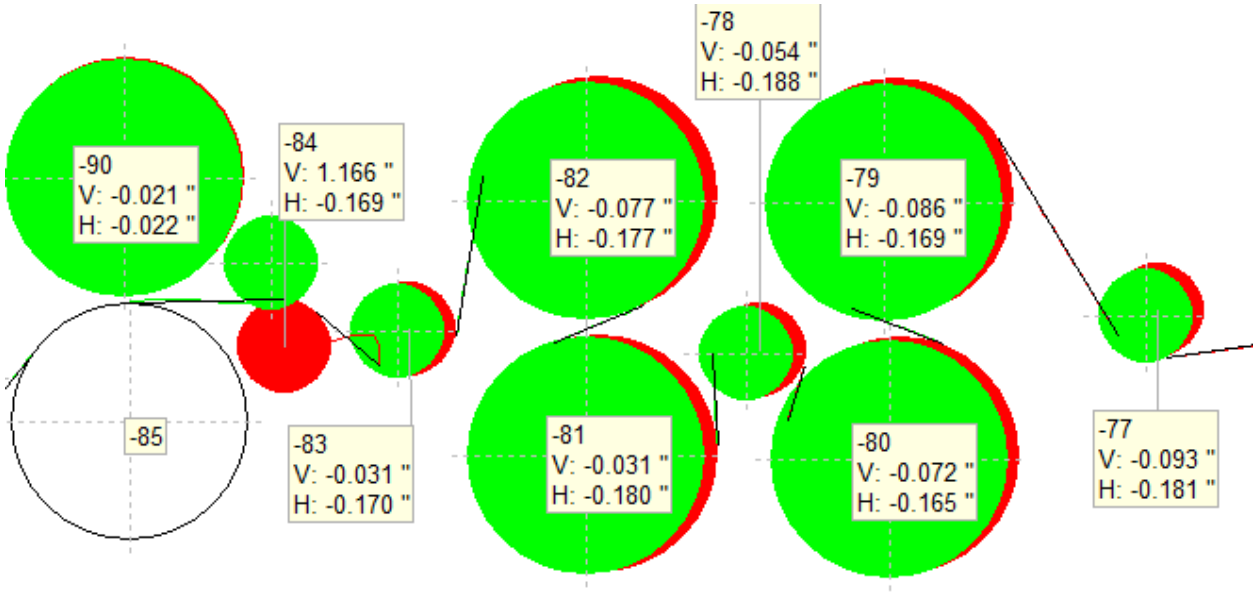
Intermediate measurements

Final corrected measurements

21. To change the color of the measurement, highlight the measurements and right click them. Then click **Change Color.** Pick one of the three colors listed for the appropriate type of measurement.
22. To read the side view drawing look at the key in the lower left-hand corner of the Editor software window.



23. This depicts how the measurements are orientated. The Green circle is the Operator side and the red is the Drive side. (Just like markings on the PARALIGN)
24. A Positive Vertical value is if the Operator side is higher than the Drive side and a Positive Horizontal value is if the Operator side is to the right of the Drive side.



OTHER MEASUREMENT MODES:

If a roll is more than 120” in length or is crowned (intentionally or due to wear). The roll must be measured in two locations, **Machine & Operator**.

1. To add Machine & Operator modes to a roll, go to the Three View Measurement tab.
2. Select the desired roll and then click **Add** on the middle window.
3. From there click **Next** until Machine pops up and click **OK**.
4. Repeat process for the Operator side.

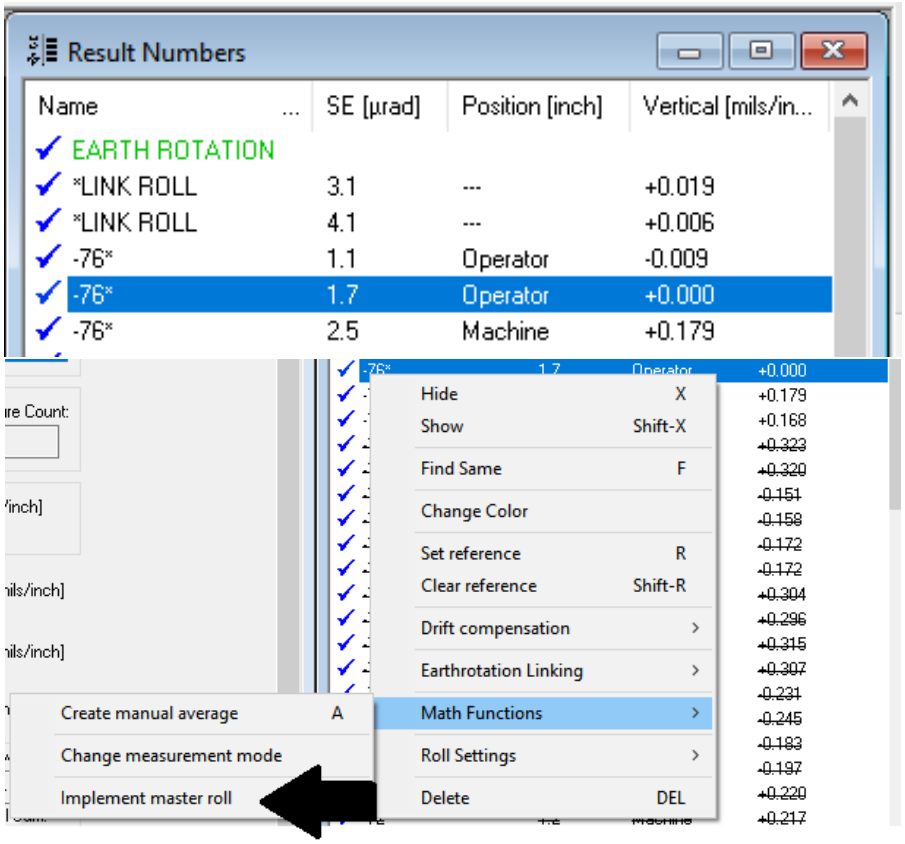
5. Once the measurement cycle is finished and the measurements are compensated, The Machine and Operator measurements must be averaged together.
6. Simply highlight the four measurements and press A on the keyboard.
7. **Make sure the measurements were Drift Compensated before averaging!**

If a roll is crowned or poor surface quality a **Crowned Sweep** may be necessary.

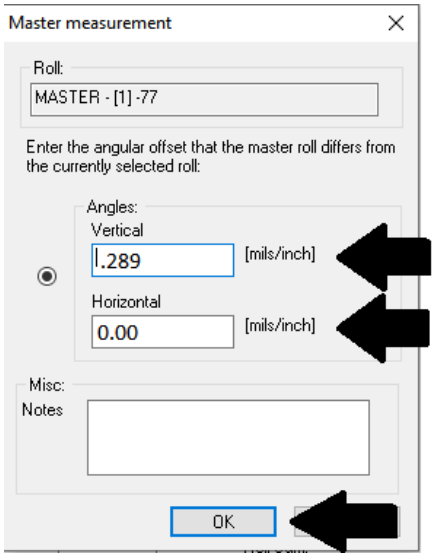
1. To add Crown Sweep mode to a roll, go to the Three View Measurement tab.
2. Select the desired roll and then click **Add** on the middle window.
3. From there click the drop-down menu that says **Sweep** then click **Crown Sweep** and **OK**.
4. Crown Sweeps require at least 150° of rotation.
5. Standard practice is to strap the PARALIGN with the V-Blocks to the surface of the roll and rotate the roll.

4. TIPS AND BEST PRACTICES

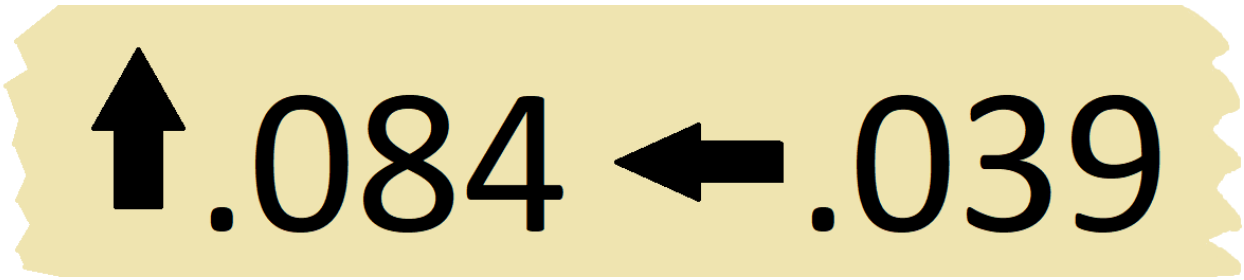
1. Always trust in the PARALIGN. The device is seldom wrong. If there is an issue with the results it most likely there are other factors at play. Look for loose mounting points, swinging or sliding frames, and roll surface condition. User error is also a key factor. Was the proper technique and measurement mode used? Was there enough sweep angle? Did the person lift off the roll surface briefly? These are all things that will affect the results.
2. When setting up the Calibration Plate apply masking tape on the bottom of the feet and on the floor where the PARALIGN will be set up. This makes for a quick removal and won't damage the customers floor.
3. If an Earth Rotation is unobtainable on the floor during initial set up place the PARALIGN on the unglued down plate.
4. If after 4 attempts to get an Earth Rotation fail it is recommended to turn the PARALIGN off and change batteries. (Low batteries make the PARALIGN act up.)
5. Sometimes sweeping back and forth gives poor measurement results. Try the **Start Stop Method**. Place the PARALIGN at either the top or bottom of the roller. (Generally, the top) then signal to the person on the computer to start measuring. Very slowly sweep the PARALIGN as far as possible while maintaining good contact. Once reached signal the computer person to stop measuring and hold the device in that spot until they confirm.
6. It is wise to bring a precision level with to the service. Measure a roll with no crown to it. Place the level in the dead center of the roll. Then put the air bubble in the middle of the hash marks on the little level perpendicular to the roll. Now read the air bubble in the main chamber. One graduation mark is equal to 0.005" (Starrett 98) Flip the level 180° and verify the air bubble is still in the same orientation. (If not, then the precision level is out of calibration) Next implement a Master Roll
7. Implementing a Master Roll is easy. First go to Three View Measurement tab. Then find the roll that was measured with the precision level on the right under **Result Numbers**. Highlight the measurement and press **R** on the keyboard. Then right Click the **measurement**, click **Math functions**, and click **Implement A Master Roll**.

8. 

Now put in the measurement obtained with the precision level for the Vertical Box. Place a zero in the Horizontal Box. Then Click OK. (It may be necessary to flip the Vertical measurement to a negative value depending the orientation of the PARALIGN)



9. To expedite the service while making moves write out on a piece of making tape how much the roll needs to move and include arrows. It may be necessary to mark the Drive side. If this occurs be sure to flip the directions of movement. Here is an example of a written directions on a piece of masking tape.



10. In the beginning of the service measure a few rolls on Machine and Operator side to check for crowning and sag.
11. Verify the frames are anchored down on new installs and the mechanics have retightened the bearing housing after a move is made before remeasuring for the final time.
12. Measuring rubber rolls can be difficult to obtain repeatable results. If the roll is free spinning place the PARALIGN down and hold it into place and don't move it or the pressure applied to the PARALIGN while measuring both sets. (Strapping the PARALIGN to the roll is sometimes necessary) If the roll isn't free spinning. Gently place the PARALIGN on the upper part of the roll. **Don't** push the PARALIGN into the roll. Brace it so the feet just make light contact with the roll. Then sweep downwards very slowly. End the measurement once at the farthest point down to measure.
13. The best way to win a customer over is to show interest in their facility. Ask questions about the line, what they make, how it's used, and a basic explanation of how the machine works.
14. Observe the mechanics using Dial Indicators. The tip of the arm of the dial indicator should be at a 90° of the roll surface. Ensure there is enough travel of the arm to obtain the full move needed.

5. SUMMARY / CHEAT SHEET

1. The PARALIGN utilizes 3 ring lasers gyros.
2. Setting up the PARALIGN
    a. Turn it on
    b. **Paid Mode**
    c. **Standalone Mode**
    d. **Template Store**
    e. **Create Session**
    f. **Back**
    g. **Earth Rotation**
    h. **Start**
    i. Wait 5 min
    j. **Stop, Back**
    k. **Measurement**
    l. Measure the link roll

m. **Start**
n. **Back**
o. 2 more times
p. **Menu**
q. **Result**
r. Use **Next** and **Prev** to select the measurement with lowest error.
s. **Detail**
t. **Option**
u. **Math**
v. **Back**
w. **Reference**
x. **Back**
y. **Back**
z. **Set UP**

3. Setting up the calibration plate.
    a. Install the feet into the plate.
    b. Level plate and lock down the two feet that are on the same side.
    c. Place PARALIGN on plate and lock it in.
    d. Adjust the Vertical to match the LINK ROLL.
    e. Lock the last foot down.
    f. Cover the bottom of the feet with epoxy.
    g. Place PARALIGN and plate down aligned to link roll.
    h. Wait for epoxy to harden.
    i. Connect to laptop.
    j. Run an earth rotation.

4. Conducting a service.
    a. Never spin the PARALIGN more than 180°
    b. 20-minute measurement cycles.
    c. Measure link roll before and after measurements.
    d. Drift link and compensate the lowest error link measurements.
    e. Average after drift compensation.
    f. After measurement cycle always start an earth rotation first, then save as a new file, and then change colors and average out the measurements if needed.

5. Other Measurement modes.
    a. Machine and Operator.
    b. Crown sweep.