ARES LS1 OPERATION

WARNINGS

- So as to not damage the force transducer, air bearings, and motor it is critical to follow the startup and shutdown steps in order. For detailed explanations see the full instrument manual.

- The geometry of all the measuring tools is very precise. *Take great care* not to drop them, scratch them, corrode them, or otherwise damage the measuring surfaces or the way that they align. (Surfaces can be stainless steel or titanium.)

- Allow for thermal expansion/contraction if operating at other than ambient conditions. This is not only for setting gaps, but for insertion and removal of tools.

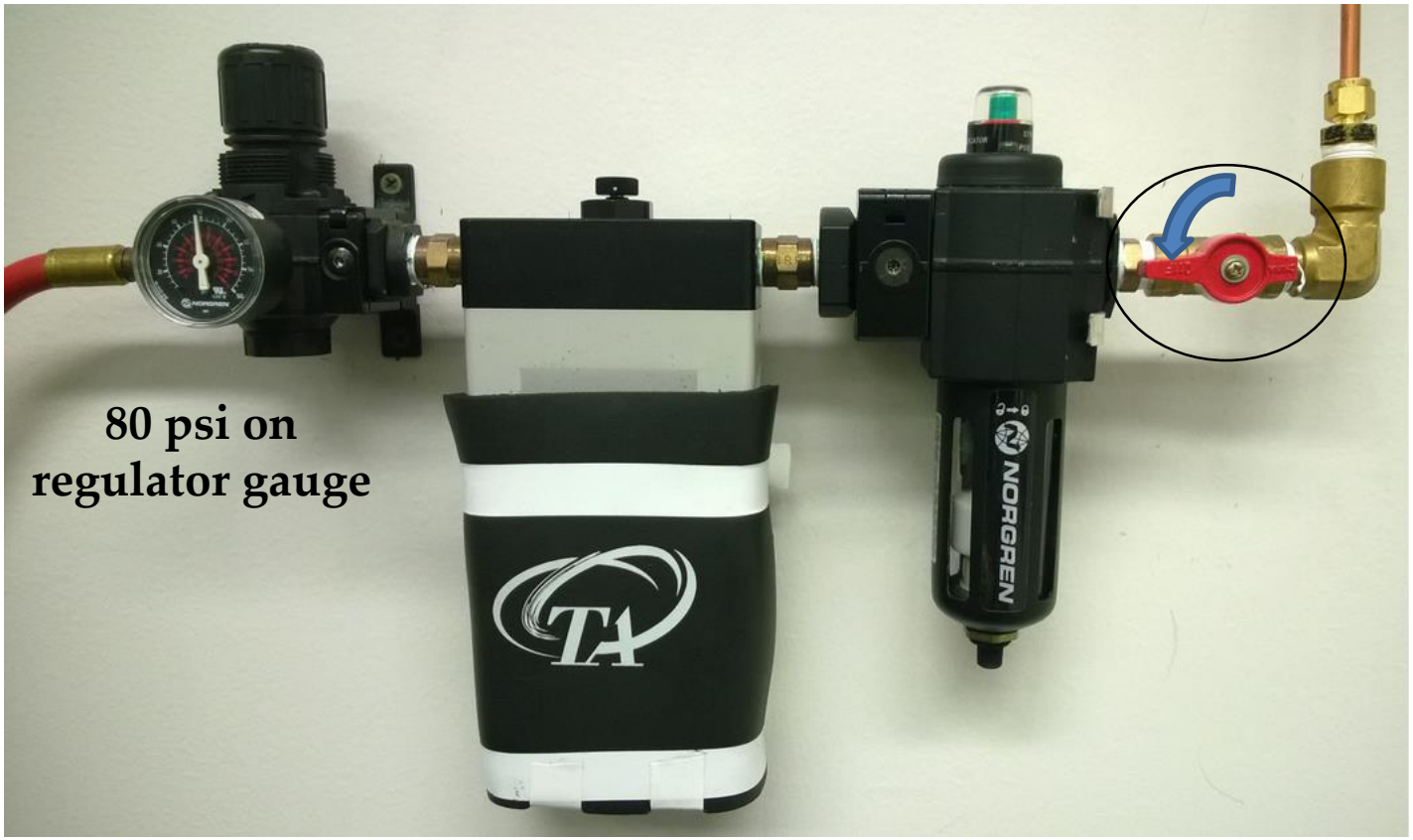
- And of course, contamination of the instrument (transducer, motor, electronics) must be avoided. Keep the sample in the measuring tools. Dirty hands or gloves should be cleaned before touching the keyboard, transducer, or anything else!

STARTUP

1. Turn on and check the air supply and distribution
2. Unlock the transducer
3. Turn on instrument power, check LCD display
4. Insert the lower tool
5. Start Circulator
6. Open the Orchestrator program
7. Select Transducer 2 (high range)
8. Insert the upper tool
9. Wait for temperature to stabilize
10. Set the gap

Air Supply – Part 1

Red Valve in line to turn on air supply



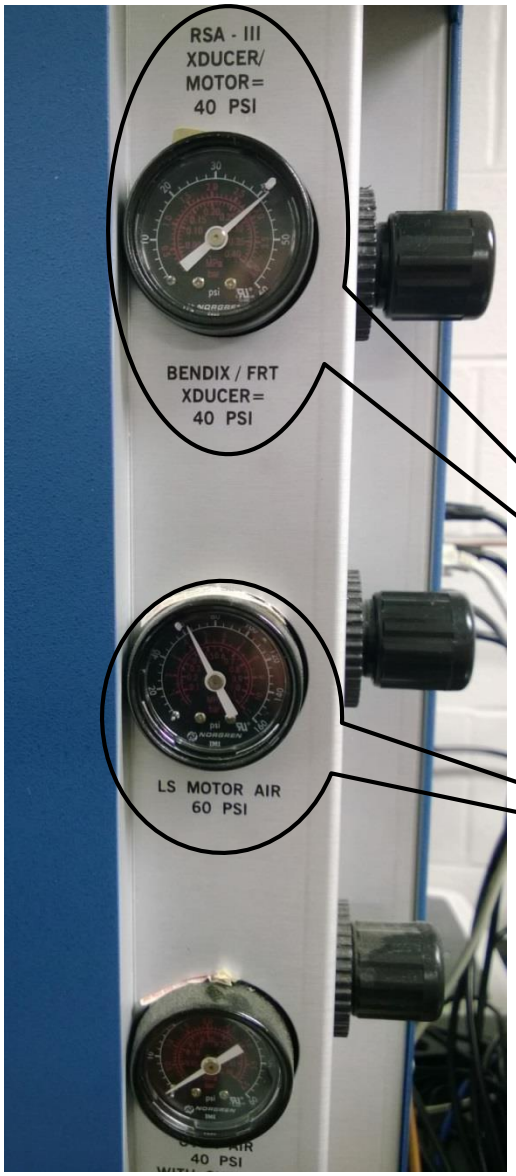
Air Supply – Part 2

Realistically, there should never be moisture in the NRF air supply.

But check the filter/separator before use for any visible signs of moisture droplets.

Inform staff immediately in any moisture is present in the filter/separator.

Air Distribution



CHECK THE AIR PRESSURES FOR THE TWO COMPONENTS AT THE RIGHT REAR OF THE ARES:

RSA III: ~40 PSI

LS MOTOR: ~60 PSI

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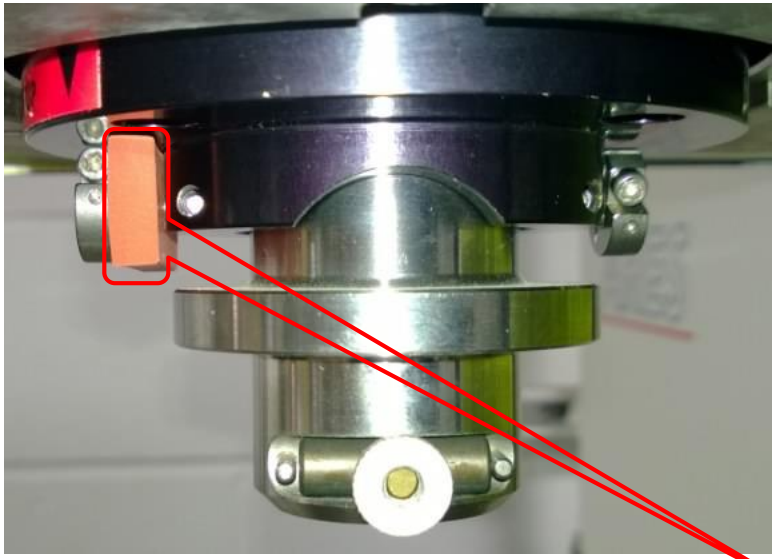
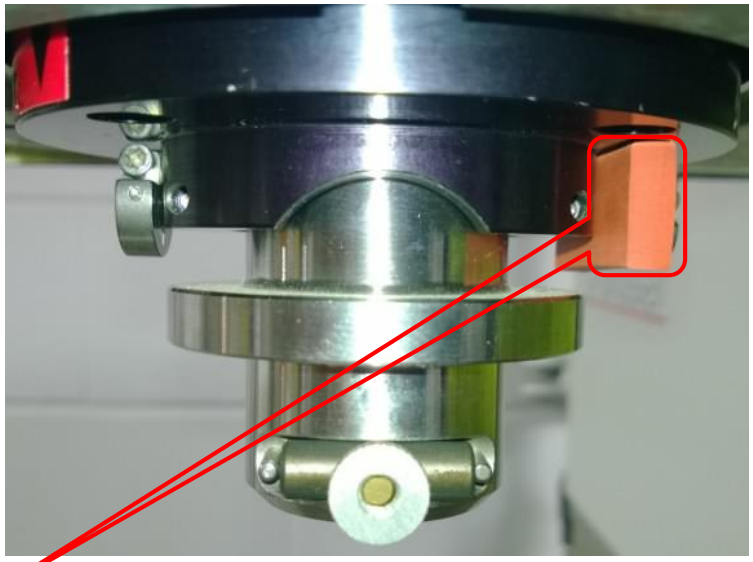
Transducer locking/unlocking

Do not touch the transducer lock unless there is compressed air at the rheometer!

Locked



Unlocked



Rubber Spacer

FRONT OF ARES

Pin should move freely except when caught at indents

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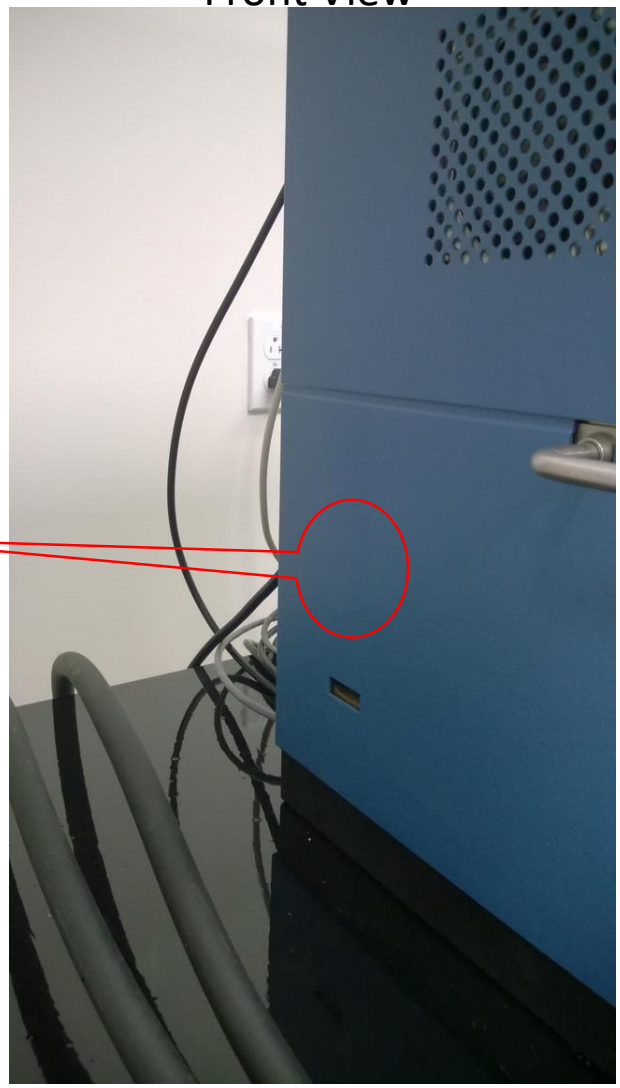
Instrument Power

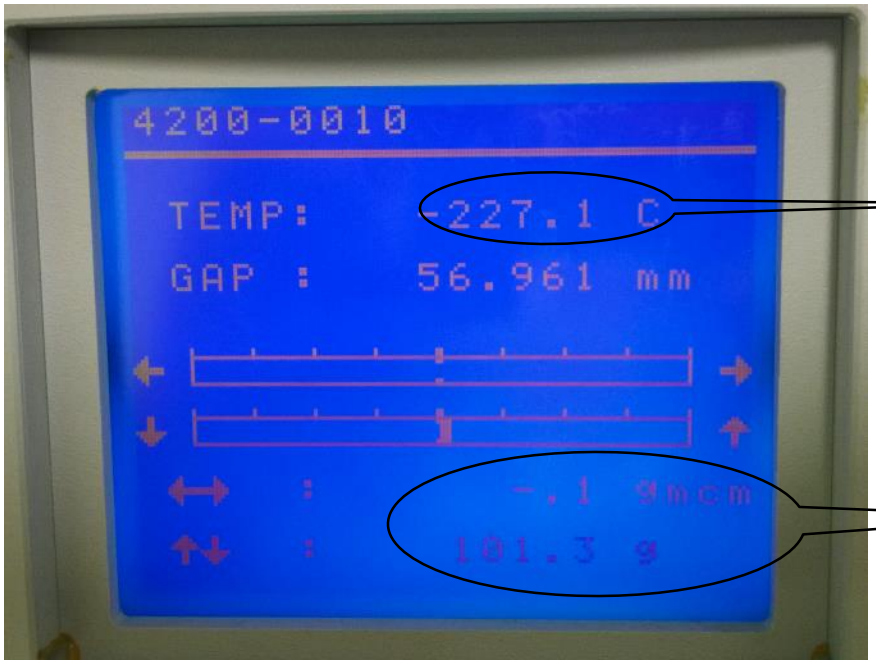
Rear View

Main Power Switch

Front View



Check LCD Display



No PRT present

Values should be fairly stable, changes in the tenths per minute. Pin should have moved freely

If the instrument is sticky, or if the pin did not move easily, or if the torque and/or normal force values are drifting, contact staff before continuing!

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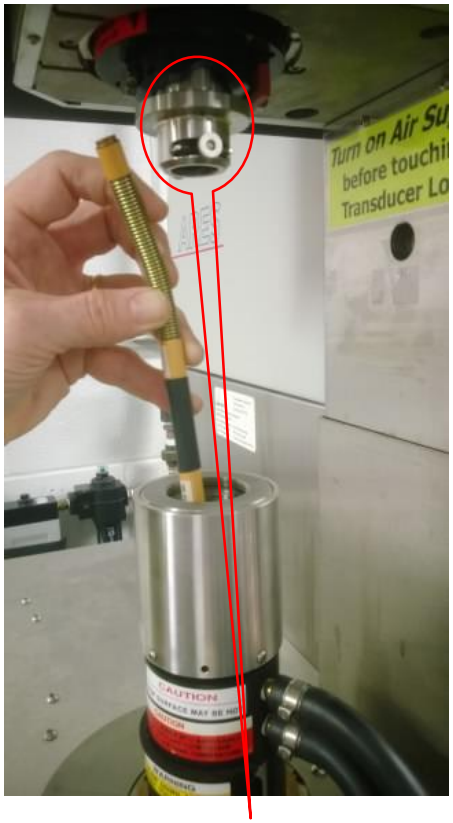
Lower Tool Installation

Long PRT Insertion



Avoid touching the transducer while inserting.

Long PRT Installed

Rotate the PRT until it drops into place, then press down slightly.

Bottom Plate Insertion

Bottom Plate Installed

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Circulator

1 – Power Switch

3 – Control I/O

2 – Control Source

Result:
Control and Heating Lights on

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Initial Orchestrator

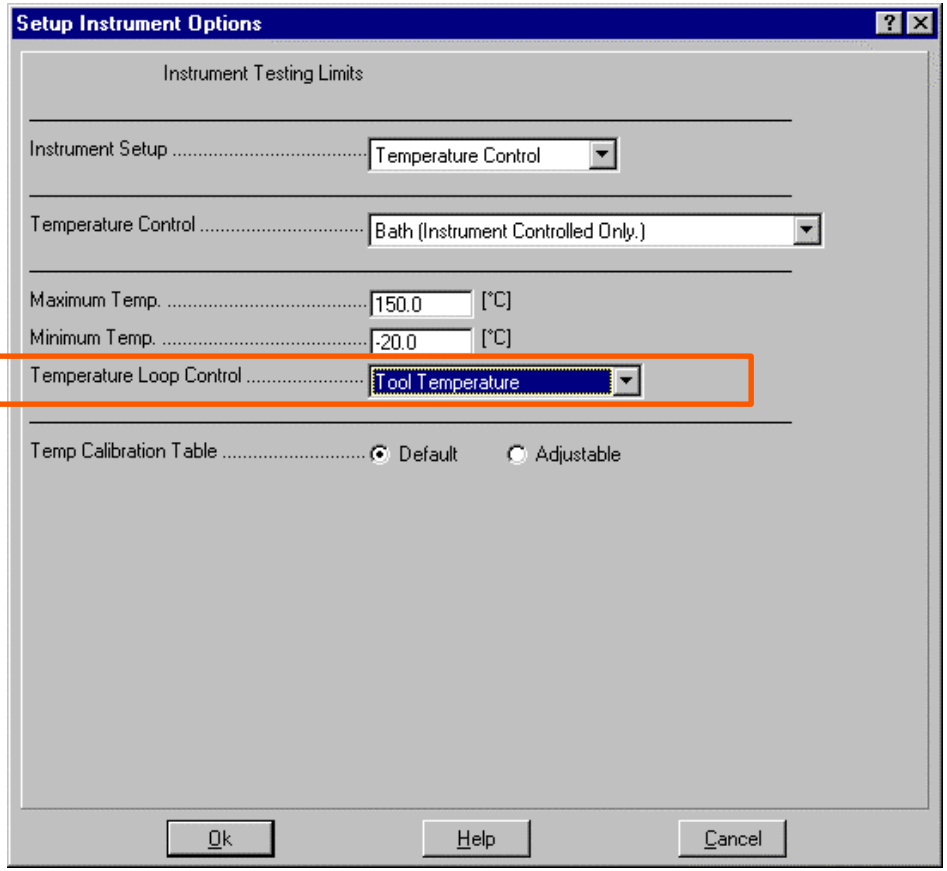
Right now we want to be sure that our temperature control is set up and that we can insert the upper tool.
So once you've opened Orchestrator go to "**Utilities**", "**Service**", "**Transducer**" and check that the "**Transducer Selected**" is set to "Transducer 2". This will almost always be the case, but it is best to check before inserting or removing the upper tool.

Next, go to "**Utilities**", "**Service**", and "**Instrument configuration**" then under "**Temperature Loop Control**" select "**Circulator temperature**". This should be the default. Later, after the bath temperature is stable you can return to this and select "Tool Temperature" if you need better than a tenth of a degree of temperature drift over hours of run time.

Finally, go to control, then "set test conditions" and change the temperature to 25.4, or to whatever test temperature you want to use plus a few tenths of a degree to even a degree. This offset is due to the heat loss experienced by the fluid from the bath to the tool and is more pronounced as the control temperature is increased. Starting with "circulator temperature control" and the offset will minimize the time required to reach a steady state temperature.

Temperature Control

Under “Utilities”/”Service”/”Instrument Configuration there is a box for “Temperature Loop Control”. To get the temperature at the tool quickly to say 25°C have this set on “Bath Temperature” with “Set Test Conditions” at 25.3 or 25.4°C. After the temperature stabilizes, if doing a long run, then switch to “Tool Temperature” control so that the temperature doesn’t drift as small changes in room temperature, tubing temperatures, etc. occur.



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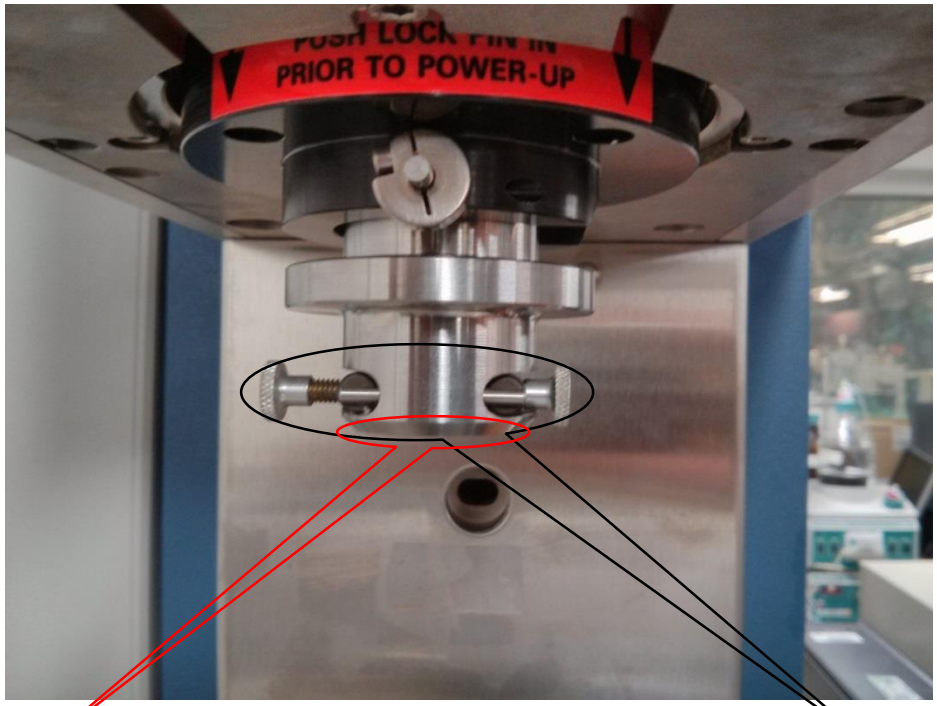
Upper Tool Installation



INSERT THE UPPER TOOL HERE.

EVENLY TIGHTEN THESE THUMBSCREWS TO LOCK THE TOOL.

1 - **ALWAYS SUPPORT THE TOOL WHILE TIGHTENING OR LOOSENING THE THUMBSCREWS.**

2 – **GENTLY! STAY CLOSE TO ZERO ON THE TRANDUCERS**

STARTUP

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3. Turn on instrument power
4. Insert the lower tool
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6. Open the Orchestrator program
7. Insert the upper tool
8. Wait for temperature to stabilize
9. Set the gap

Set Gap

Now that the upper tool is in place, we need to be able to reproducibly place the upper tool in relation to the lower tool. To do this, open the "**Gap/Instrument Control Panel**" by clicking the icon; or (if the software is enabled) by hitting one of the manual stage control buttons.

Offset the force and torque to zero. The torque should be close to zero already, but the normal force value will vary depending upon the last upper tool used. Change the commanded gap to that appropriate for your test geometry. And limit the Max allowed force to 50 g.

Next, manually bring the stage down so that there is approximately one millimeter or less between the upper and lower tools. Realize that the indicated gap on the display might be totally off (for example, someone used a couette system last) and that the middle of a 50 mm parallel plate is over a millimeter farther down than the edge.

Finally, hit the "Zero Fixture" button which will automatically lower the stage to contact, then position to the commanded gap.

For you as a new user, go to the "Advanced" button and enable the check box for "automatic activation of this control panel"

Edit/Start Instrument Test

The first block is fairly straightforward. What are you going to call the test? Where is it going to be stored? Who ran the test? And a place for test notes (was the sample drying out?).

The second block is sample geometry. Predefined geometries are generic, and indicate what the instrument is capable of. We currently have parallel plate, cone and plate, and couette geometries.

Stored geometries are those that have been edited and then stored. They have the actual dimensions. Note that when you edit a geometry you can enter values for dynamic tests (where the temperature is ramped) or for tool inertia. More detailed descriptions may be found in the ARES LSI pdf manual.

Similarly we can have test setups that are predefined and stored. Again, for details go to the ARES LS1 pdf manual and to relevant literature. But tests can be strain or stress controlled, dynamic, steady, or transient. Each type of test will have its own parameters to change.

If you turn the motor on and it turns out that the motor rapidly vibrates, **Stop the motor** (instrument front panel "motor" button), go to the "Control" tab on the menu bar and change to the opposite type of test (steady state or oscillatory). Go to the "Gap Instrument Control Panel" and turn the motor on (the motor may move, but should not vibrate). Then repeat to return to the original test.

TESTS

1. Motor should be on.
2. After test setup, raise the stage
3. Add sample
4. Close to specified gap (take care not to exceed the normal force limits, eject sample, or trap air bubbles)
5. Start test
6. Run test(s)
7. Turn off motor
8. If working at anything other than ambient, let the tools cool enough to handle safely before removing
9. Clean and dry the tools

ARES SHUT DOWN

1. Send head to the top
2. Turn motor off (if not off already)
3. Let the tools cool to a safe temperature
4. Select Transducer 2
5. Remove the upper tool
6. Instrument Off Line, Close Orchestrator
7. Turn off the circulator
8. Remove the lower tool
9. Turn off instrument power
10. Check that all surfaces are clean and dry

    If cleaning supplies are needed for the rheometer, call 352-846-1733 or 352-281-8262 or e-mail gscheiffele@perc.ufl.edu
11. Lock the transducer
12. Shut off air supply