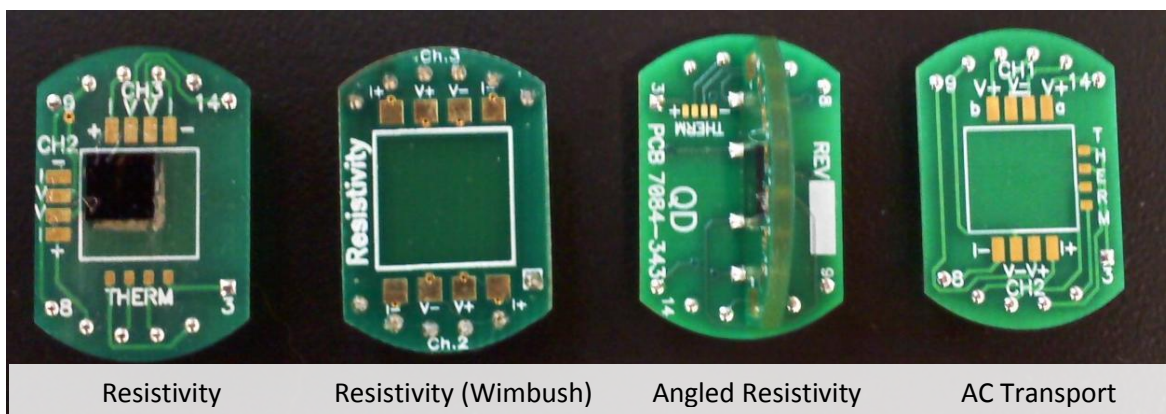


Physical Property Measurement System (PPMS) – Horizontal Rotator (HR)

The Horizontal Rotator is not technically an option; it is an accessory which can be used in conjunction with the Resistivity and AC Transport options. Any measurement that can be made with those options can be made with the rotator, with two exceptions: the current limit is reduced from 2 A to 0.5 A in ACT, and only two channels are available in Resistivity. The Horizontal Rotator consists of a motor and the rotator body. The motor is always connected to the system and active, and simply needs to be mounted on the system and coupled to the rotator body (which is installed in the probe space) in order to be used. It can also be rotated manually outside the system using the sliver motor coupling. The positions are defined such that the sample faces up at 0° and forward at 90°. Slightly more than one full rotation is possible so that the end positions are defined as -10° (going past 0 to 350 on the dial) and 370° (going past 0 to 10). An on-board thermometer is used for all measurements rather than the main PPMS system thermometers.

Sample Preparation

The Horizontal Rotator uses special sample holders rather than the pucks which are used with the Resistivity or AC Transport options. Samples can be connected to them in the same manner as the pucks, and connections can be tested in the user bridge via the appropriate adapter (all parts referred to in this section are kept in the Horizontal Rotator accessory kit). The sample holders are shown below.



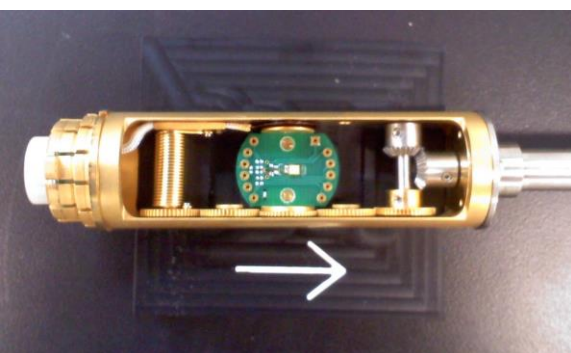
Resistivity – Channel 1 is designated for the thermometer – DO NOT USE THESE PADS. Channels 2 and 3 are for 4-point resistance measurements.

Resistivity (Wimbush) – Third-party version of the Resistivity holder with several improvements: larger sample area, clear “Resistivity” label, larger contact pads, and no exposed thermometer pads.

Angled Resistivity – Identical connections to the Resistivity holder, but with a second perpendicular board coming out of the main board so that the sample can be rotated within its own plane.

AC Transport – For 5-point Hall measurements, Channel 1 must be used; for other measurements, either Channel 1 or 2 may be used. Only the voltage pads are associated with the specific channels, and there are only two current leads which are shared by the channels and used for the active measurement at any given time. See page 7-4 of the AC Transport manual for details.

Once the sample is mounted to the holder, the holder must be attached to the rotator. Manually set the rotator position to 90° and use the rotator support tool to securely rest it on the table as shown to the left. Then, press the sample holder into the rotator to engage the pins; note that the pin configuration is asymmetric, so it will only attach in one orientation. The sample removal tool is designed for this purpose and can grip the sample holders at the curved edges.



Rotator Insertion and Motor Set-up

1. Click `Utilities - Activate Option...` and open the connection diagram for the appropriate rotator/option combination and connect all cables accordingly.
2. If necessary, select and activate the Resistivity or AC Transport option.
3. If necessary, vent the system and remove the flange/baffle rod assembly.
4. Visually verify that there is not a puck in the system, and if there is, remove it.
5. Place the rotator motor assembly on top of the system. Do not secure the flange yet. Move the motor off to one side as shown to the right.
6. Turn the rotator to -10° .
7. Carefully insert the rotator into the probe space. After the o-ring engages in the motor support, lift the support slightly so that it sits freely between the o-ring and the indicator dial. Turn the entire rotator until it the key engages and it drops into place. Then, firmly push it down to engage the pins.
8. Push the motor assembly down to re-engage the o-ring, then push the wings in to secure the flange.
9. Next, the rotator's on-board thermometer must be activated. Open the program PPMS Rom Config 32 (taskbar icon with magnifying glass and chip) and click the "Diag. all" check box. Then, click `Send to PPMS - Send Config` and open the appropriate configuration file (HRE-442 for Resistivity or HREACT-442 for ACT). The User temperature on the Model 6000 will now be active, and the temperature in MultiVu will match it.
10. Open the motor control window by clicking `Instrument - Motion...`. The full range of -10° to 370° should be indicated on the scale, as well as the current motor position. Click `Go to Index` to move the motor to the end position of -10° .
11. The motor and the rotator should now be in the same position and can be coupled by moving the motor to the center and lowering it onto the coupler.



Rotator Control

The control window described in step 8 above is used for immediate control of the rotator. To move to an angle, simply type the desired angle in the "Move to:" box and click `Set`. At this point, an immediate measurement can be made using the active option as described in the appropriate option procedures. Note that there is a slight backlash, so a given position may differ by a few degrees depending on from which direction it is approached. **Do not use "Redefine Current Position:"**. If you think something is wrong with the position definitions, consult the facility staff. When using sequences, "Set Position" and "Scan Position" are available in the command menu; these are used similarly to the equivalent commands for temperature and magnetic field.

De-activation and Removal

1. First, the on-board thermometer must be de-activated. Open the program Mon6000 (taskbar icon with a blue 32) and enter the command line "usertemp 0". The User temperature on the Model 6000 will now be blank.
2. Vent the system.
3. Lift the motor to de-couple it from the rotator and move it to the side.
4. Carefully remove the rotator from the probe space, turn it to 90° , and set it on the rotator support tool on the table.
5. Remove the motor assembly from the flange and hang it from the designated hook on the wall.
6. Insert the flange/baffle rod assembly and purge and seal the system.
7. If necessary, de-activate and disconnect the active measurement option as described in the option procedures.
8. Remove your sample from the rotator and leave the rotator in the storage cabinet.