

LaCoste & Romberg

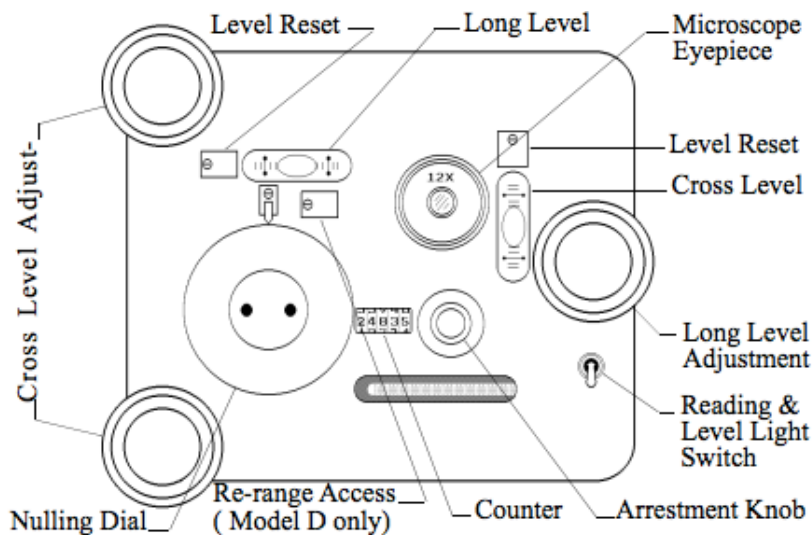


Instruction Manual Model G Gravity Meter G-509

A SUMMARY OF: <http://www.ifg.tu-clausthal.de/java/grav/gdmanual.pdf>

TAKING THE FIRST READING

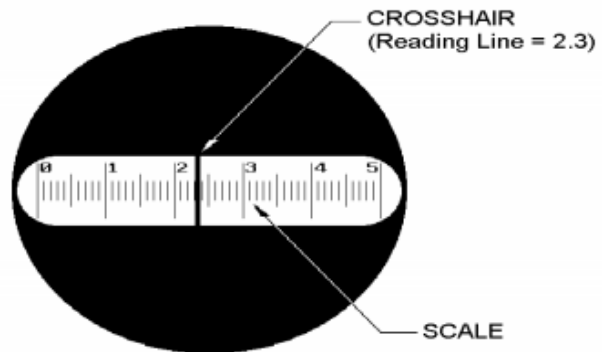
- Level and stabilize the aluminum base plate. Ensure that it will not move when the meter is placed on it, or collecting accurate readings will not be possible.
- Turn on the light, only if you are unable to clearly see the levels. Do not leave the light turned on for a prolonged time, especially in hot weather.



- GENTLY slide the meter in the concave base plate until the meter levels indicate the meter is approximately level. Fine-tune the leveling using the three leveling screws of the meter. Suggestion: only turn the top-left and middle-right level adjustments – this greatly simplifies and speeds up the leveling process than adjusting all three screws.
- Once the meter is level, release the internal beam and quartz spring of the gravity meter by turning the knurled arrestment knob counterclockwise to its limit. The knob is located on the near side of the microscope eyepiece.
- The position of the beam is determined by the image of the crosshair in the microscope. The crosshair is a very fine wire attached to the beam. A scale is placed in the optical path for a reading reference. The total range of motion of the beam is 14 small-scale divisions. The left side of the crosshair is used as the reading edge.

MODEL G-509 METER

- The small placard on the G-509 gravimeter lid indicates its reading line as **3.4**. In the example to the right, the reading line is 2.3.
- Bring the crosshair from the left side of the scale to the reading line by turning the nulling dial. If crosshair needs to move to the right, turn clockwise. If it needs to move to the left, turn counterclockwise.
- To take a reading, always have the crosshair approach the reading line from left to right, (turning clockwise). If coming from the right side (counterclockwise), turn the dial about a quarter turn past the reading line and re-approach clockwise. The play or slack in the gears and universal joint may induce measurement errors if the reading line is not consistently approached from the same side of the scale.
- Be patient in bringing the crosshair to the reading line. There is a time -lag between turning the null dial and the response of the crosshair. Make small, slow adjustments when the crosshair begins to approach the reading line. The crosshair may drift back and forth after a large adjustment; wait until it settles down before continuing to guide it towards the reading line.
- Obtain the reading from the counter and nulling dial. The last digit on the counter should correspond with the number on the nulling dial. This number is considered tenths of units. The dial is further divided so that hundredths of units can be read, e.g. 3154.32.
- It is good practice to double check the levels, the reading, and the field notes after each reading to verify measurement precision. 2-4 readings at each station should suffice.
- After obtaining a reading, IMMEDIATELY clamp the meter by turning the arrestment knob clockwise to the end of travel (about 3 full turns) before moving the meter.
- Lift the gravimeter and re-level to take additional readings. Once readings are consistent (i.e. 2-4 readings), CLAMP the meter and move to the next gravity station.



MODEL G-509 METER

Important things to remember:

- Keep gravimeter plugged in to the battery at all times to keep it at a constant internal temperature of 54.4°C (G-509). If the meter goes above or below this temperature, there will be intolerable instrumental drift. If a change in the internal temperature is observed, place the meter in a location of nominal temperature (i.e. heated/air conditioned building or vehicle) until the internal temperature returns to normal.
- When taking readings, try to shield the meter from the elements. Wind and precipitation can cause vibrations that can make readings difficult to accurately obtain. In warm weather, try to keep the meter shaded to avoid overheating.
- The quartz spring is EXTREMELY fragile, so always make ABSOLUTELY sure that the arrestment knob is in a locked position (knob counterclockwise to its limit) before attempting to move the meter.
 - Only unlock the arrestment knob (knob turned counterclockwise to its limit) when you are entirely leveled and ready to take the measurement.
 - Do not re-level or move the gravimeter when it is in an unlocked position. If you need to re-level, lock the arrestment knob first.
- Only turn on the light when leveling and taking a reading (looking through eyepiece) to prevent overheating and excessive draining of battery power.
- Check temperature and battery voltage periodically.
- It's critical to have an acquisition time recorded for every station. For consistency, recording the time of the first reading (of the 2-4 readings) at each station will suffice.

PERFORMING THE SURVEY

- Survey practices are outlined in *Applied Geophysics*, 2nd ed., Telford et al. Pages 19-24.
- Each morning (and evening) before (and after) conducting your gravity survey, take a gravity measurement at your known base station (this information is available at http://geomaps.wr.usgs.gov/gump/gravity_base_stations/index.html).
- Take measurements at each desired gravity station.
- Record your location (i.e. X,Y,Z; Lat,Lon,Elev) at each station. A handheld GPS (3-meter position accuracy) may be used for reference while taking readings, but note that positioning must eventually be recorded at centimeter-level precision for proper gravity processing/corrections.
- 2-hour loops are sufficient for drift correction (see *Applied Geophysics* for description). Approximately two hours after taking your first measurement, return to this first station and take another measurement. This is called a “loop closure.” After completing this loop, you may now start another loop in the exact same fashion. To illustrate, let’s say you are going to acquire 25 stations in one day. You start by acquiring Stations 1-8 in two hours. You then need to return to Station 1, take a gravity measurement, and then move on to Station 9. After the next two hours of acquisition, let’s say you acquire Stations 9-18. You then go back to Station 9, take a measurement, and then move on to station 19, and the cycle continues. In this case, say you complete Stations 19-25 within another 2-hour increment. You then close your final loop by getting a reading at Station 19, and your survey day is complete! *REMEMBER, in this illustration you would take a base station reading before starting your first loop of the day (before your first reading at Station 1), and then take a base reading after your last loop closure of the day (after your second reading at Station 19). The daily base loop and the 2-hour loops give you everything you need to correct for drift.*

SETTING UP YOUR FIELD NOTEBOOK

This follows the example under the final bullet on the previous page.

Title of Survey (location)

Group Member Names

Meter Number (G-509)

Date

Station	Time (1st rdg)	Reading (2-4 per station)	Longitude (or Easting, X...)	Latitude (or northing, Y...)	Elevation
<i>Base Station</i>	<i>08:08</i>	<i>####.## ####.##...</i>			
<i>G1</i>	<i>09:15</i>	<i>####.## ####.##...</i>			
<i>G2</i>	<i>09:22</i>	<i>####.##...</i>			
<i>...</i>	<i>...</i>	<i>...</i>			
<i>G8</i>	<i>11:20</i>	<i>####.##...</i>			
<i>Loop Closure (G1)</i>	<i>11:29*</i>	<i>####.##...</i>			
<i>G9</i>	<i>11:37</i>	<i>####.##...</i>			
<i>G10</i>	<i>11:43</i>	<i>####.##...</i>			
<i>...</i>	<i>...</i>	<i>...</i>			
<i>G18</i>	<i>13:25</i>	<i>####.##...</i>			
<i>Loop Closure (G9)</i>	<i>13:31</i>	<i>####.##...</i>			
<i>G19</i>	<i>13:45</i>	<i>####.##...</i>			
<i>G20</i>	<i>13:50</i>	<i>####.##...</i>			
<i>...</i>	<i>...</i>	<i>...</i>			
<i>G25</i>	<i>14:48</i>	<i>####.##...</i>			
<i>Loop Closure (G19)</i>	<i>15:01**</i>	<i>####.##...</i>			
<i>Base Station Closure</i>	<i>16:10</i>	<i>####.##...</i>			

* Notice that this closure exceeds 2 hours by a few minutes. That is okay – closure time just needs to be approximately 2 hours. 15-20 more minutes are of no concern. 30 extra minutes is excessive, but still useable.

** This loop is well under 2 hours. That is also fine, the key is to close every loop.