

U.S. GEOLOGICAL SURVEY
MARINE OPERATIONS FACILITY
35 W. WOODS HOLE ROAD
FALMOUTH, MA 02540

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INSTRUCTION MANUAL

for

LACOSTE AND ROMBERG, INC.

MODEL G GEODETIC GRAVITY METER NO. 410

Reading Line 2.50

Best Operating Temperature 53.7 °C

612-346-0077

LaCoste & Romberg, Inc.
6606 North Lamar
Austin, Texas 78752

572-453-0000
Mr. A. Perry or
Mr. Sanderson

Operating Instructions

The gravity meter is usually shipped unthermostated. Since the temperature of the LaCoste and Romberg instrument is thermostatically controlled, the first step is to bring the instrument to its operating temperature (shown on the cover page of this manual). The meter should automatically thermostat at this temperature. Connect the power cord from the meter to:

1. The battery eliminator unit (see section "Battery Eliminator-Battery Charger Unit") OR
2. The battery supplied with the gravity meter OR
3. Any 12 volt battery source.

The nickel-cadmium battery normally supplied with the meter has a capacity of 4 ampere hours. The red tag tied to the battery indicates the state of charge. Usually the battery is shipped in a discharged state and must be fully charged before operating the meter from it. See section on battery before charging.

A cable, referred to as an auxiliary battery cable, is supplied for connecting the meter to a 12-volt d.c. power source other than the battery supplied with the meter. Polarity must be observed when connecting this cable.

The gravity meter should be allowed to stabilize at its operating temperature a minimum of two hours prior to use. This is necessary if reliable gravity readings are to be obtained.

The following is a general procedure for obtaining a gravity reading:

1. Place the meter on the concave levelling disc furnished with the meter. (If conditions permit, the operator may prefer not to use the disc.)
2. Turn on the lights for the levels and optical system by means of the switch located on top of the gravity meter.
3. Level the meter using the levelling screws located beneath the meter. Some models in larger cases are leveled by means of knobs on top of the gravity meter.
4. Release the beam of the gravity meter by turning the arrestment knob counter-clockwise to its limit.
5. The position of the beam can be determined by observing the shadow, or crosshair, in the telescope. This crosshair is actually the image of a very fine wire attached to the beam. This image is magnified and then passes through the reticule, or scale, for a reading reference. The total motion of the crosshair is usually about 14 to 16 scale divisions. Normally the downscale, or left edge, of the crosshair is used as the reading edge. See illustration.
6. After steps 1 - 5 have been completed, the actual gravity reading is obtained as follows:

Conversion of Counter Reading to Milligals

To obtain gravity values in milligals from the reading of the counter and dial refer to, Table 1. In Table 1, the value of gravity in milligals is given for each 100 units of the counter (the last digit on the counter indicates tenths). By using this table, and the corresponding factor, the value of gravity for any reading of the counter may be obtained in the following manner:

1. Read the counter (Example: 2654.3).
2. Read the dial (Example: .36) The reading is then 2654.36.
3. From Table I's "Counter Reading" column use the counter reading nearest the example reading (2654.36) but less than it. For this example the counter reading would be 2600. Observe the "Value in Milligals" for a counter reading of 2600 is 2731.10 Mgl's.
4. Obtain the difference in the original Counter-dial reading and the counter reading chosen from Table 1 in Step 3.

$$2654.36 - 2600 = 54.36$$

5. Multiply this difference (54.36) by the interval factor given in the table for a counter reading of 2600.

$$54.36 \times 1.05239 = 57.21$$

6. Add the product obtained in Step 5 to the Milligal value observed in Step 3. The sum thus obtained is the milligal value for the gravity station.

$$2731.10 + 57.21 = 2788.31$$

Example Table I

COUNTER READING	VALUE IN MILLIGALS	FACTOR FOR INTERVAL
2500	2625.88	1.05218
2600	2731.10	1.05239
2700	2836.34	1.05262

TABLE 1

MILLIGAL VALUES FOR LACOSTE & ROMBERG, INC. MODEL G GRAVITY METER #G- 410

COUNTER READING*	VALUE IN MILLIGALS	FACTOR FOR INTERVAL	COUNTER READING*	VALUE IN MILLIGALS	FACTOR FOR INTERVAL
000	000.00	1.05294	3600	3786.15	1.05168
100	105.29	1.05283	3700	3891.32	1.05169
200	210.58	1.05262	3800	3996.49	1.05170
300	315.84	1.05247	3900	4101.66	1.05169
400	421.09	1.05233	4000	4206.83	1.05168
500	526.32	1.05219	4100	4312.00	1.05167
600	631.54	1.05206	4200	4417.17	1.05165
700	736.74	1.05195	4300	4522.33	1.05163
800	841.94	1.05185	4400	4627.49	1.05161
900	947.12	1.05176	4500	4732.65	1.05158
1000	1052.30	1.05168	4600	4837.81	1.05156
1100	1157.47	1.05162	4700	4942.97	1.05152
1200	1262.63	1.05157	4800	5048.12	1.05149
1300	1367.79	1.05153	4900	5153.27	1.05145
1400	1472.94	1.05150	5000	5258.41	1.05139
1500	1578.09	1.05145	5100	5363.55	1.05130
1600	1683.24	1.05142	5200	5468.68	1.05120
1700	1788.38	1.05140	5300	5573.80	1.05109
1800	1893.52	1.05138	5400	5678.91	1.05099
1900	1998.66	1.05136	5500	5784.01	1.05087
2000	2103.79	1.05136	5600	5889.10	1.05076
2100	2208.93	1.05136	5700	5994.17	1.05061
2200	2314.06	1.05137	5800	6099.24	1.05046
2300	2419.20	1.05138	5900	6204.28	1.05028
2400	2524.34	1.05138	6000	6309.31	1.05009
2500	2629.48	1.05140	6100	6414.32	1.04988
2600	2734.62	1.05142	6200	6519.31	1.04965
2700	2839.76	1.05144	6300	6624.27	1.04940
2800	2944.90	1.05146	6400	6729.21	1.04911
2900	3050.05	1.05149	6500	6834.12	1.04883
3000	3155.20	1.05152	6600	6939.01	1.04853
3100	3260.35	1.05155	6700	7043.86	1.04821
3200	3365.50	1.05158	6800	7148.68	1.04788
3300	3470.66	1.05162	6900	7253.47	1.04756
3400	3575.82	1.05164	7000	7358.22	
3500	3680.99	1.05166			

* Note: Right-hand wheel on counter indicates approximately 0.1 milligal.

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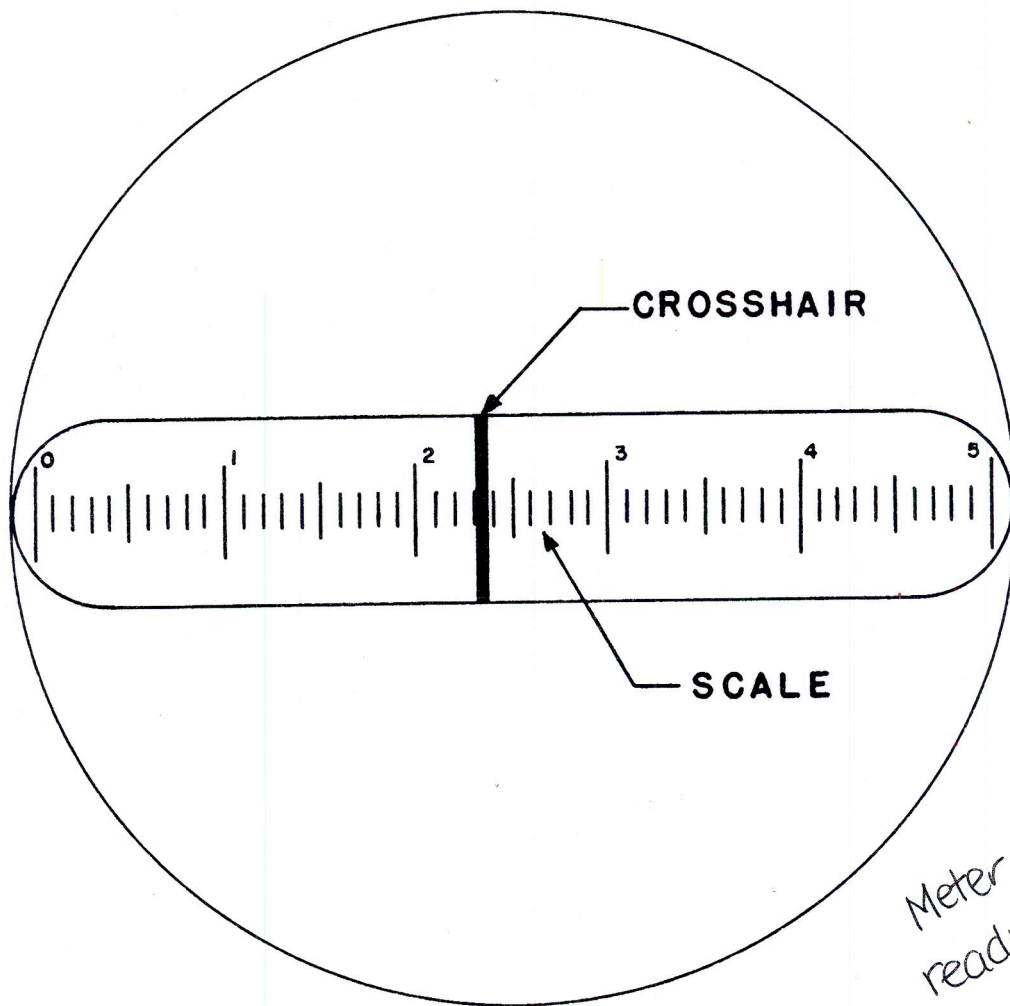
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$$53.22 \times 1.05136 = 55.9533$$

$$64.31 \times 1.05136 = 67.6130$$

$$53.25 \times 1.05136 = 55.985$$

EXAMPLE
READING LINE = 2.3



VIEW AS SEEN IN EYEPIECE

Meter G-410.
reading line is
2.5

- (A) The downscale side of the crosshair is brought to the reading line (as given on the meter) by turning the measuring screw.

To move the crosshair upscale, the measuring screw is turned clockwise, and to move the crosshair downscale the measuring screw is turned counterclockwise. The reading line should be approached by turning the measuring screw in the same direction each time to avoid any possible backlash. (Always recheck the levels before the final reading is taken.)

- (B) Obtain the meter reading from the counter and the dial. The last digit on the counter and the numbers on the dial should correspond and are considered tenths of units. The dial is further divided so that hundredths of units can be read from it.

Example: Counter numbers read 26543 and dial setting 36. This should be read 2654.36 (Note: If the numbers on the dial do not correspond to the last digit on the counter, the dial should be reset. This can be accomplished by loosening the set screws which hold the dial on the measuring screw shaft and turning the dial until it is brought into agreement with the last digit on the counter. Then tighten the set screws.)