

## Technical Information

### PLEASE PASS THIS IMPORTANT NOTE TO ALL OPERATORS OF YOUR CG-3 GRAVIMETERS

#### TECHNICAL NOTE #4 TO ALL CG-3 OWNERS

Re: Spring Service Life and Reading Range

The uncorrected gravity reading is obtained from equation (A.4). The gravity reading range has high and low end, the range of which is guaranteed to be 7000 mGal, but is normally much larger. The low end of the gravity measurement range of the CG-3 may be calculated by inserting value (SF/SC)=0.1 into the equation (A.4)

$$SU_{\min}=0.1*GCAL1 + 0.01*GCAL2$$

The average value of  $SU_{\min}$  is about 600 mGal. Depending on the values GCAL1 and GCAL2 this value may differ somewhat for your meter. It is recommended that you calculate this value for your meter, because the gravity readings of the lower values than  $SU_{\min}$ , may not be accurate.

The high end of the gravity measurement range may be calculated by inserting value (SF/SC)=1.457 into the equation (A.4)

$$SU_{\max}=1.457*GCAL1 + 2.123*GCAL2$$

The average value of SU. about is 8800 mGal. Depending on the values GCAL1 and GCAL2 this value may differ somewhat for your meter. It is recommended that you calculate this value for your meter, because the gravity readings of the higher value than  $S_{\max}$  may not be accurate.



#### Head Office

**SCINTREX Limited**  
222 Snidercroft Road  
Concord, Ontario, Canada L4K 1B5  
Tel: +1-905-669-2280  
Fax: +1-905-669-6403  
e-mail:scintrex@scintrexltd.com  
website: www.scintrexltd.com

#### In the U.S.A.

**SCINTREX Inc.**  
900 Woodrow Lane, Suite 100  
Denton, Texas  
76205 U.S.A.  
Tel: +1-940-591-7755  
Fax: +1-940-591-1968  
e-mail:richardj@scintrexusa.com

#### In S.E. Asia

**SCINTREX / AUSLOG**  
P.O. Box 125 Sumner Park  
83 Jijaws Street. Brisbane, QLD  
Tel: +61-7-3376-5188  
Fax: +61-7-3376-6626  
e-mail:auslog@auslog.com.au  
website: www.auslog.com.au

The CG-3 sensor spring position is adjusted during the sensor manufacture in such a way that, on the average, the gravity reading in Toronto (latitude 43.7 degrees) is about 4200 mGal. This, in conjunction with the gravity reading range of about 8000 mGals, assures that newly produced CG-3 may measure the relative gravity anywhere on the surface of the earth, from elevations of a few thousand meters above the equator to sea levels at both poles. For your convenience, values of normal gravity at sea level, as a function of latitude, are listed in Table I.

Because of the positive drift rate of the CG-3 gravity sensor, the uncorrected gravity readings at the fixed locations gradually increase in value. The linear drift of the CG-3 sensor is caused by an unavoidable creep of the quartz spring, whose length under tension increases, on the average, by 0.5 ppm/day at the operating temperature of 60°C. A typical sensor with the drift rate of 0.5 mGal/day will reach the high end of the measurement range, at the latitude of 60 degrees, in about 20 years. If used at lower latitude, as most gravimeters are, the typical CG-3 service life will be even longer.

You may estimate the remaining service life of your meter in the following way:

- a) Calculate the value  $SU_{max}$  for your meter.
- b) Obtain the gravity reading at your location.
- c) If you are planning to use your meter at higher latitudes than your present latitude, evaluate from Table I the gravity difference between your latitude and the highest latitude at which you will be using your meter. Add this difference to the reading obtained in step b) to obtain the value  $SU_m$ .
- d) The remaining service life expressed in days is calculated by dividing the difference ( $SU_{max}-SU_m$ ) by the value of the linear drift rate for your CG-3.

E.g. you have calculated for your meter from equ. (A.4)  $SU_{max}=8800$  mGal, and the drift rate of your meter is 0.51 mGal/day. Assuming that, at your latitude of 50 degrees, you have measured  $SU=5012$  mGal, and that you will be using your meter up to latitudes of 60 degrees, so that  $SU_m=(5012+847)$ mGal, then the number of remaining service days is  $(8800-5012-847)/0.51=5767$  days.

If, after many years of service, your CG-3 has drifted out of range, then the spring position may be reset by a routine procedure at the Scintrex plant. You may use also this occasion to inquire about the available programs to overhaul your meter, to upgrade to latest firmware version or to upgrade to CG-3M accuracy level in case the evaluation at Scintrex proves that the quality of your sensor warrants such an upgrade.

Table I

## NORMAL GRAVITY AT SEA LEVEL (TORGE, 1989, p5l)

$g = g_e * (1 + b * \sin^2(I) - bl * \sin^2(2 * I))$ , gravity at latitude I where:

$g_e = 978.03268$  [GAL], gravity at equator

$b = 0.0053244$

$bl = 0.0000058$

I = latitude

LATITUDE	g (GAL)	g-ge(mGAL)	LATITUDE	g (GAL)	g-ge(mGAL)
1	978.032680	0.000	45	980.619987	2587.307
2	978.034253	1.573	46	980.710488	2677.808
3	978.038969	6.289	47	980.800892	2768.212
4	978.046823	14.143	48	980.891089	2858.409
5	978.057805	25.125	49	980.980970	2948.290
6	978.071902	39.222	50	981.070424	3037.744
7	978.089098	56.418	51	981.159343	3126.663
8	978.109371	76.691	52	981.247618	3214.938
9	978.132697	100.017	53	981.335140	3302.460
10	978.159048	126.368	54	981.421804	3389.124
11	978.188392	155.712	55	981.507502	3474.822
12	978.220695	188.015	56	981.592131	3359.451
13	978.255916	223.236	57	981.675586	3642-906
14	978.294015	261.335	58	981.757765	3725.085
15	978.224944	302.264	59	981.838568	3805.888
16	978.378655	345.975	60	981.917895	3885.215
17	978.425095	392.415	61	981.995650	3962.970
18	978.474208	441.528	62	982.071737	4039.057
19	978.525935	493.255	63	982.146062	4113.382
20	978.580214	547.534	64	982.218535	4185.855
21	978.636978	604.298	65	982.289066	4256.386
22	978.696160	663.480	66	982.357569	4324.889
23	978.757689	725.009	67	982.423960	4391.280
24	978.821489	788.908	68	982.488156	4455.476
25	978.887485	854.805	69	982.550080	4517.400
26	978.955596	922.916	70	982.609654	4576.974
27	979.025740	933.060	71	982.666806	4634.126
28	979.097832	1065.152	72	982.721465	4688.785
29	979.171785	1139.105	73	982.773564	4740.884
30	979.247510	1214.830	74	982.823038	4790.358
31	979.324915	1292.235	75	982.869828	4837.148
32	979.403907	1371.227	76	982.913875	4881.195
33	979.484390	1451.710	77	982.955125	4922.445
34	979.566266	1533.586	78	982.993526	4960.846
35	979.649436	1616.756	79	983.029033	4996.353
36	979.733799	1701.119	80	983.061600	5028.920
37	979.819254	1786.574	81	983.091188	5058.081
38	979.905696	1873.016	82	983.117761	5085.081
33	979.993021	1960.341	83	983.141285	5108.605
9	980.081122	2048.442	84	983.161732	5129.052
40	980.169892	2137.212	85	983.179075	5146.395
41	980.259224	2226.544	86	983.193295	5160.615
42	980.349009	2316.329	87	983.204373	5171.693
43	980.439138	2406.458	88	983.212296	5179.616
44	980.529500	2496.820	89	983.217053	5184.373
45	980.619987	2587.307	90	983.218640	5185.960