



**TECHMOR**

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**SG-1-C**

**STRAIN GAGE AMPLIFIER W/ CAN OUTPUT**

**USER MANUAL**

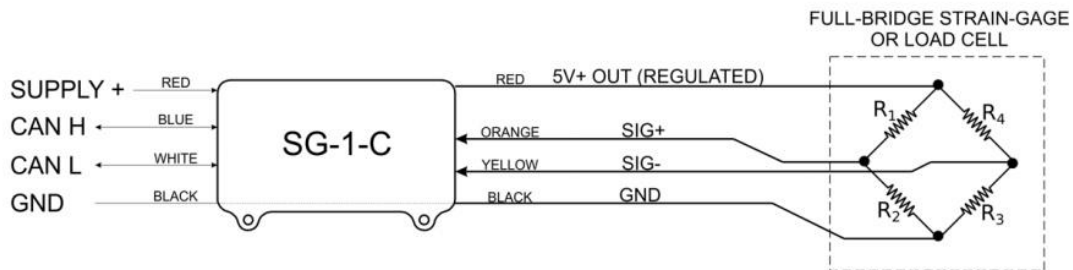
Rev. F 6/15/2023

## Overview

The Techmor SG-1-C is a precision strain-gage (load cell) amplifier with CAN bus output. The SG-1-C supplies a 5 volt excitation for the strain-gage. The CAN ID, CAN bitrate, Message Rate, Gains, and Offset of the unit can be changed via CAN bus configuration messages.

## Connections

All connections to the SG-1-C are through the two multi-conductor cables on either end of the enclosure.



## Input

The SG-1-C accepts a full-bridge four-wire strain-gage or load cell input. The inputs are accessed via the 7-conductor cable on the “Input” side of the enclosure.

## Electrical

The SG-1-C can be supplied with 6-24V DC via the red and black wires on the 4-conductor cable on the “Power/CAN” side of the enclosure.

Supply Voltage	6 - 30	V
Current (No Load)	50	mA
Excitation Voltage	5	V

## CAN Bus Message Format

CAN Message Bits

Message ID	Bits 0-15	Bits 16-23	Bits 24-31	Bits 32-47	Bits 48-63
0xXXX(hex)	Output	1 <sup>st</sup> Stage Gain Code	2 <sup>nd</sup> Stage Gain Code	Offset Code	Serial #

Note: All Messages are Unsigned 16-bit Words (U16)

## CAN BUS Message Decode

Voltage (after amplification and offset)	10,000 Counts = 1.000V
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## Changing the SG-1-C Settings

### CAN ID

The CAN ID of the device can be set by sending a special CAN programming message to the unit. The message format is as follows:

#### Change CAN ID

Message ID	Bits 0-15	Bits 16-31	Bits 32-47	Bits 48-63
0x7FE	0x9269	0x0000	ID to write (0x0 to 0x7FD)	Serial # of device to program

Note: The serial number engraved on the unit is in decimal form, and may need to be converted to hex, depending on your CAN communication tool.

## CAN Bus Bitrate

The CAN Bus Bitrate of the device can be set by sending a special CAN programming message to the unit. The message format is as follows:

### Change CAN Bus Bitrate

Message ID	Bits 0-15	Bits 16-31	Bits 32-47	Bits 48-63
0x7FE	0x9269	0x0001	CAN Bus Bitrate Code (see Table below)	Serial # of device to program

Note: The serial number engraved on the unit is in decimal form, and may need to be converted to hex, depending on your CAN communication tool.

CAN Bus Bitrate	
Bus Bitrate	Code
1Mbit/s	0x0001
500kbit/s	0x0002
250kbit/s	0x0003

**Note: After receiving the CAN Bus Bitrate change message, the device will immediately restart, using the new CAN Bus bitrate. The communication tool's CAN bitrate must be adjusted accordingly to view the new messages.**

## Message Rate

The message rate of the device can be set by sending a special CAN programming message to the unit. The message format is as follows:

### Change Message Rate

Message ID	Bits 0-15	Bits 16-31	Bits 32-47	Bits 48-63
0x7FE	0x9269	0x0003	Message Rate Code (see Table below)	Serial # of device to program

Note: The serial number engraved on the unit is in decimal form, and may need to be converted to hex, depending on your CAN communication tool.

Message Rate	
Message Rate	Code(hex)
200 Samples/s	0x00C8
100 Samples/s	0x0064
50 Samples/s	0x0032
20 Samples/s	0x0014
10 Samples/s	0x000A
5 Samples/s	0x0005

The SG-1-C amplification is controlled by two gain components (1<sup>st</sup> and 2<sup>nd</sup> Stages). The overall gain is calculated by multiplying the 1<sup>st</sup> and 2<sup>nd</sup> Stage gain values. An offset voltage can also be applied to increase the output.

(Examples of offsets: To make a load cell read 0.50V when 0 load is present, or to bias a push-pull type load cell to read 2.50V (middle) when no load is present.)

### Change 1<sup>st</sup> Stage Gain

Message ID	Bits 0-15	Bits 16-31	Bits 32-47	Bits 48-63
0x7FE	0x9269	0x0008	Code from Table 1	Serial # of device to prog.

### Change 2<sup>nd</sup> Stage Gain

Message ID	Bits 0-15	Bits 16-31	Bits 32-47	Bits 48-63
0x7FE	0x9269	0x0009	Code from Table 2	Serial # of device to prog.

### Change Offset

Message ID	Bits 0-15	Bits 16-31	Bits 32-47	Bits 48-63
0x7FE	0x9269	0x000A	Code from Table 3	Serial # of device to prog.

**For Serial Numbers above 2751 (newer units)**

**GAIN VALUES**

**Table 6. First Stage Gain vs. First Stage Gain Code**

First Stage Gain Code	First Stage Gain	First Stage Gain Code	First Stage Gain	First Stage Gain Code	First Stage Gain	First Stage Gain Code	First Stage Gain
0	2.800	32	3.273	64	3.825	96	4.471
1	2.814	33	3.289	65	3.844	97	4.493
2	2.827	34	3.305	66	3.863	98	4.515
3	2.841	35	3.321	67	3.881	99	4.537
4	2.855	36	3.337	68	3.900	100	4.559
5	2.869	37	3.353	69	3.919	101	4.581
6	2.883	38	3.370	70	3.939	102	4.603
7	2.897	39	3.386	71	3.958	103	4.626
8	2.911	40	3.403	72	3.977	104	4.649
9	2.926	41	3.419	73	3.997	105	4.671
10	2.940	42	3.436	74	4.016	106	4.694
11	2.954	43	3.453	75	4.036	107	4.717
12	2.969	44	3.470	76	4.055	108	4.740
13	2.983	45	3.487	77	4.075	109	4.763
14	2.998	46	3.504	78	4.095	110	4.786
15	3.012	47	3.521	79	4.115	111	4.810
16	3.027	48	3.538	80	4.135	112	4.833
17	3.042	49	3.555	81	4.156	113	4.857
18	3.057	50	3.573	82	4.176	114	4.881
19	3.072	51	3.590	83	4.196	115	4.905
20	3.087	52	3.608	84	4.217	116	4.929
21	3.102	53	3.625	85	4.237	117	4.953
22	3.117	54	3.643	86	4.258	118	4.977
23	3.132	55	3.661	87	4.279	119	5.001
24	3.147	56	3.679	88	4.300	120	5.026
25	3.163	57	3.697	89	4.321	121	5.050
26	3.178	58	3.715	90	4.342	122	5.075
27	3.194	59	3.733	91	4.363	123	5.100
28	3.209	60	3.751	92	4.384	124	5.125
29	3.225	61	3.770	93	4.406	125	5.150
30	3.241	62	3.788	94	4.427	126	5.175
31	3.257	63	3.806	95	4.449	127	5.200

**Table 7. Second Stage Gain and Gain Ranges vs. Second Stage Gain Code**

Second Stage Gain Code	Second Stage Gain	Minimum Combined Gain	Maximum Combined Gain
0	10	28.0	52.0
1	16	44.8	83.2
2	25	70.0	130.0
3	40	112.0	208.0
4	63	176.4	327.6
5	100	280.0	520.0
6	160	448.0	832.0
7	250	700.0	1300.0

**For Serial Numbers below SN: 2751 (older units)**

**Table 1**  
**First Stage Gain**

Code	Gain	Code	Gain	Code	Gain	Code	Gain
0000	4	0020	4.503	0040	5.069	0060	5.706
0001	4.015	0021	4.52	0041	5.088	0061	5.727
0002	4.03	0022	4.536	0042	5.107	0062	5.749
0003	4.045	0023	4.553	0043	5.126	0063	5.77
0004	4.06	0024	4.57	0044	5.145	0064	5.791
0005	4.075	0025	4.587	0045	5.164	0065	5.813
0006	4.09	0026	4.604	0046	5.183	0066	5.834
0007	4.105	0027	4.621	0047	5.202	0067	5.856
0008	4.12	0028	4.638	0048	5.221	0068	5.878
0009	4.135	0029	4.655	0049	5.241	0069	5.9
000A	4.151	002A	4.673	004A	5.26	006A	5.921
000B	4.166	002B	4.69	004B	5.28	006B	5.943
000C	4.182	002C	4.707	004C	5.299	006C	5.965
000D	4.197	002D	4.725	004D	5.319	006D	5.988
000E	4.213	002E	4.742	004E	5.339	006E	6.01
000F	4.228	002F	4.76	004F	5.358	006F	6.032
0010	4.244	0030	4.778	0050	5.378	0070	6.054
0011	4.26	0031	4.795	0051	5.398	0071	6.077
0012	4.276	0032	4.813	0052	5.418	0072	6.099
0013	4.291	0033	4.831	0053	5.438	0073	6.122
0014	4.307	0034	4.849	0054	5.458	0074	6.145
0015	4.323	0035	4.867	0055	5.479	0075	6.167
0016	4.339	0036	4.885	0056	5.499	0076	6.19
0017	4.355	0037	4.903	0057	5.519	0077	6.213
0018	4.372	0038	4.921	0058	5.54	0078	6.236
0019	4.388	0039	4.939	0059	5.56	0079	6.259
001A	4.404	003A	4.958	005A	5.581	007A	6.283
001B	4.42	003B	4.976	005B	5.602	007B	6.306
001C	4.437	003C	4.995	005C	5.622	007C	6.329
001D	4.453	003D	5.013	005D	5.643	007D	6.353
001E	4.47	003E	5.032	005E	5.664	007E	6.376
001F	4.486	003F	5.05	005F	5.685	007F	6.4

**Table 2**  
**Second Stage Gain**

Code	Gain
0000	17.5
0001	25
0002	35
0003	50
0004	70
0005	100
0006	140
0007	200

**Table 3**

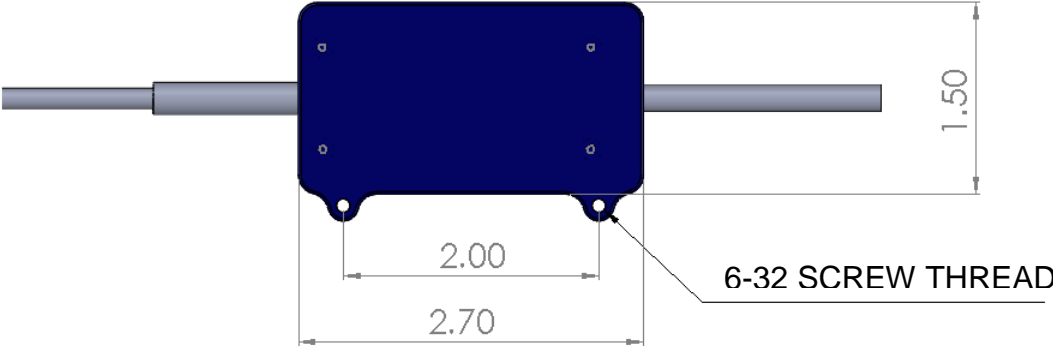
Offset Voltage

Code	Code(hex)	Offset(v)	Code	Code(hex)	Offset(v)	Code	Code(hex)	Offset(v)	Code	Code(hex)	Offset(v)
0	0x 0000	0.000	32	0x 0020	0.625	64	0x 0040	1.250	96	0x 0060	1.875
1	0x 0001	0.020	33	0x 0021	0.645	65	0x 0041	1.270	97	0x 0061	1.895
2	0x 0002	0.039	34	0x 0022	0.664	66	0x 0042	1.289	98	0x 0062	1.914
3	0x 0003	0.059	35	0x 0023	0.684	67	0x 0043	1.309	99	0x 0063	1.934
4	0x 0004	0.078	36	0x 0024	0.703	68	0x 0044	1.328	100	0x 0064	1.953
5	0x 0005	0.098	37	0x 0025	0.723	69	0x 0045	1.348	101	0x 0065	1.973
6	0x 0006	0.117	38	0x 0026	0.742	70	0x 0046	1.367	102	0x 0066	1.992
7	0x 0007	0.137	39	0x 0027	0.762	71	0x 0047	1.387	103	0x 0067	2.012
8	0x 0008	0.156	40	0x 0028	0.781	72	0x 0048	1.406	104	0x 0068	2.031
9	0x 0009	0.176	41	0x 0029	0.801	73	0x 0049	1.426	105	0x 0069	2.051
10	0x 000A	0.195	42	0x 002A	0.820	74	0x 004A	1.445	106	0x 006A	2.070
11	0x 000B	0.215	43	0x 002B	0.840	75	0x 004B	1.465	107	0x 006B	2.090
12	0x 000C	0.234	44	0x 002C	0.859	76	0x 004C	1.484	108	0x 006C	2.109
13	0x 000D	0.254	45	0x 002D	0.879	77	0x 004D	1.504	109	0x 006D	2.129
14	0x 000E	0.273	46	0x 002E	0.898	78	0x 004E	1.523	110	0x 006E	2.148
15	0x 000F	0.293	47	0x 002F	0.918	79	0x 004F	1.543	111	0x 006F	2.168
16	0x 0010	0.313	48	0x 0030	0.938	80	0x 0050	1.563	112	0x 0070	2.188
17	0x 0011	0.332	49	0x 0031	0.957	81	0x 0051	1.582	113	0x 0071	2.207
18	0x 0012	0.352	50	0x 0032	0.977	82	0x 0052	1.602	114	0x 0072	2.227
19	0x 0013	0.371	51	0x 0033	0.996	83	0x 0053	1.621	115	0x 0073	2.246
20	0x 0014	0.391	52	0x 0034	1.016	84	0x 0054	1.641	116	0x 0074	2.266
21	0x 0015	0.410	53	0x 0035	1.035	85	0x 0055	1.660	117	0x 0075	2.285
22	0x 0016	0.430	54	0x 0036	1.055	86	0x 0056	1.680	118	0x 0076	2.305
23	0x 0017	0.449	55	0x 0037	1.074	87	0x 0057	1.699	119	0x 0077	2.324
24	0x 0018	0.469	56	0x 0038	1.094	88	0x 0058	1.719	120	0x 0078	2.344
25	0x 0019	0.488	57	0x 0039	1.113	89	0x 0059	1.738	121	0x 0079	2.363
26	0x 001A	0.508	58	0x 003A	1.133	90	0x 005A	1.758	122	0x 007A	2.383
27	0x 001B	0.527	59	0x 003B	1.152	91	0x 005B	1.777	123	0x 007B	2.402
28	0x 001C	0.547	60	0x 003C	1.172	92	0x 005C	1.797	124	0x 007C	2.422
29	0x 001D	0.566	61	0x 003D	1.191	93	0x 005D	1.816	125	0x 007D	2.441
30	0x 001E	0.586	62	0x 003E	1.211	94	0x 005E	1.836	126	0x 007E	2.461
31	0x 001F	0.605	63	0x 003F	1.230	95	0x 005F	1.855	127	0x 007F	2.480



Code	Code(hex)	Offset(v)	Code	Code(hex)	Offset(v)	Code	Code(hex)	Offset(v)	Code	Code(hex)	Offset(v)
128	0x 0080	2.500	160	0x 00A0	3.125	192	0x 00C0	3.750	224	0x 00E0	4.375
129	0x 0081	2.520	161	0x 00A1	3.145	193	0x 00C1	3.770	225	0x 00E1	4.395
130	0x 0082	2.539	162	0x 00A2	3.164	194	0x 00C2	3.789	226	0x 00E2	4.414
131	0x 0083	2.559	163	0x 00A3	3.184	195	0x 00C3	3.809	227	0x 00E3	4.434
132	0x 0084	2.578	164	0x 00A4	3.203	196	0x 00C4	3.828	228	0x 00E4	4.453
133	0x 0085	2.598	165	0x 00A5	3.223	197	0x 00C5	3.848	229	0x 00E5	4.473
134	0x 0086	2.617	166	0x 00A6	3.242	198	0x 00C6	3.867	230	0x 00E6	4.492
135	0x 0087	2.637	167	0x 00A7	3.262	199	0x 00C7	3.887	231	0x 00E7	4.512
136	0x 0088	2.656	168	0x 00A8	3.281	200	0x 00C8	3.906	232	0x 00E8	4.531
137	0x 0089	2.676	169	0x 00A9	3.301	201	0x 00C9	3.926	233	0x 00E9	4.551
138	0x 008A	2.695	170	0x 00AA	3.320	202	0x 00CA	3.945	234	0x 00EA	4.570
139	0x 008B	2.715	171	0x 00AB	3.340	203	0x 00CB	3.965	235	0x 00EB	4.590
140	0x 008C	2.734	172	0x 00AC	3.359	204	0x 00CC	3.984	236	0x 00EC	4.609
141	0x 008D	2.754	173	0x 00AD	3.379	205	0x 00CD	4.004	237	0x 00ED	4.629
142	0x 008E	2.773	174	0x 00AE	3.398	206	0x 00CE	4.023	238	0x 00EE	4.648
143	0x 008F	2.793	175	0x 00AF	3.418	207	0x 00CF	4.043	239	0x 00EF	4.668
144	0x 0090	2.813	176	0x 00B0	3.438	208	0x 00D0	4.063	240	0x 00F0	4.688
145	0x 0091	2.832	177	0x 00B1	3.457	209	0x 00D1	4.082	241	0x 00F1	4.707
146	0x 0092	2.852	178	0x 00B2	3.477	210	0x 00D2	4.102	242	0x 00F2	4.727
147	0x 0093	2.871	179	0x 00B3	3.496	211	0x 00D3	4.121	243	0x 00F3	4.746
148	0x 0094	2.891	180	0x 00B4	3.516	212	0x 00D4	4.141	244	0x 00F4	4.766
149	0x 0095	2.910	181	0x 00B5	3.535	213	0x 00D5	4.160	245	0x 00F5	4.785
150	0x 0096	2.930	182	0x 00B6	3.555	214	0x 00D6	4.180	246	0x 00F6	4.805
151	0x 0097	2.949	183	0x 00B7	3.574	215	0x 00D7	4.199	247	0x 00F7	4.824
152	0x 0098	2.969	184	0x 00B8	3.594	216	0x 00D8	4.219	248	0x 00F8	4.844
153	0x 0099	2.988	185	0x 00B9	3.613	217	0x 00D9	4.238	249	0x 00F9	4.863
154	0x 009A	3.008	186	0x 00BA	3.633	218	0x 00DA	4.258	250	0x 00FA	4.883
155	0x 009B	3.027	187	0x 00BB	3.652	219	0x 00DB	4.277	251	0x 00FB	4.902
156	0x 009C	3.047	188	0x 00BC	3.672	220	0x 00DC	4.297	252	0x 00FC	4.922
157	0x 009D	3.066	189	0x 00BD	3.691	221	0x 00DD	4.316	253	0x 00FD	4.941
158	0x 009E	3.086	190	0x 00BE	3.711	222	0x 00DE	4.336	254	0x 00FE	4.961
159	0x 009F	3.105	191	0x 00BF	3.730	223	0x 00DF	4.355	255	0x 00FF	4.980

**Mechanical Dimensions**



**DIMENSIONS ARE IN INCHES**

## Ordering and Contact Information

### Ordering Information

SG-1-C

### Company Information

Techmor, Inc. designs, markets, and sells advanced test and measurement equipment. Cornelius, North Carolina-based Techmor is the leader in innovation for aerospace, automotive and industrial systems.

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