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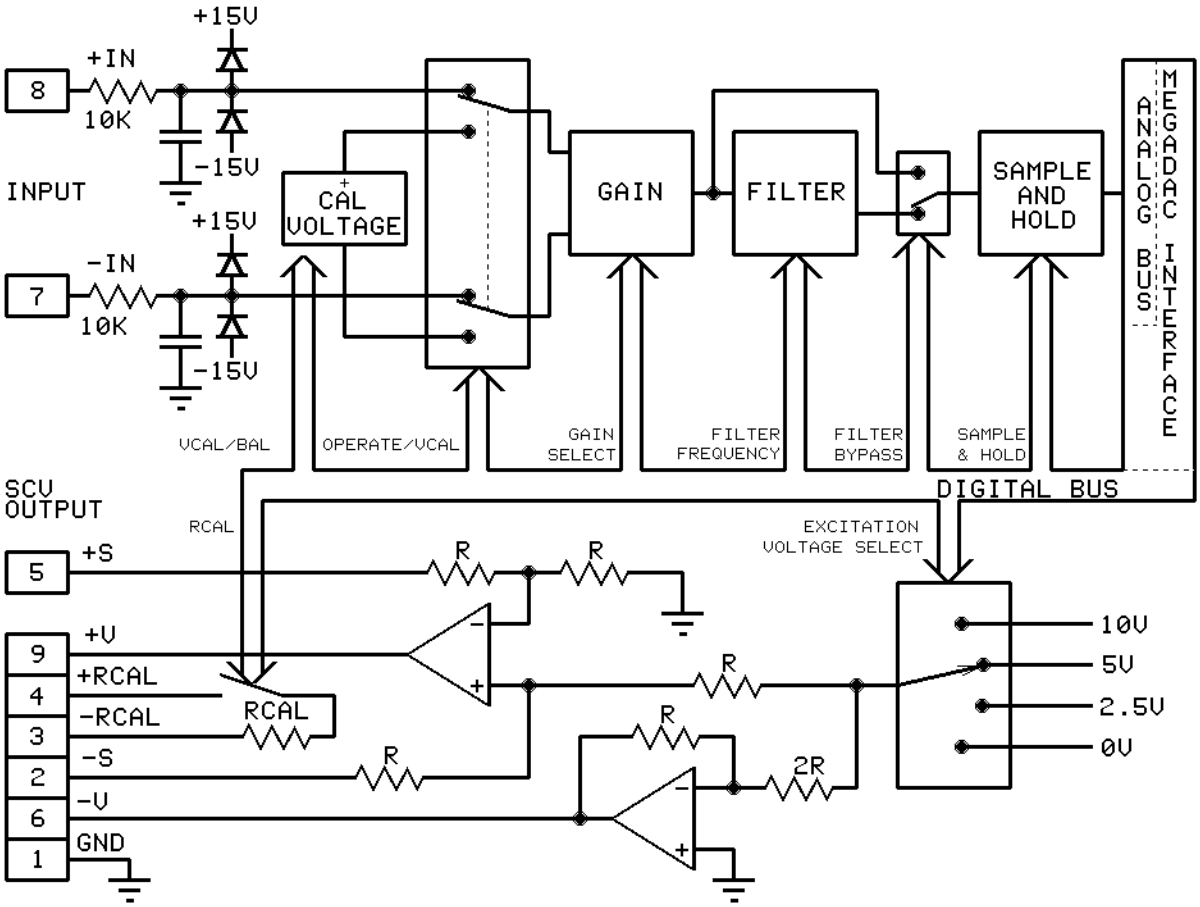
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AD 682SH-1

SPECIFICATIONS

The AD 682SH-1 Analog Input Module has two independent channels. Figure 1 shows one of the channels with differential input, input protection, computer controlled gains from 1 to 4000, a computer controlled 8-pole filter, simultaneous Sample-and-Hold, computer controlled constant voltage excitation, VCAL, and RCAL shunt calibration. Detailed specifications are in Table 1.

FIGURE 1 AD 682SH-1 CHANNEL DIAGRAM



INSTALLATION

The channel address jumpers must be installed before putting the module in your MEGADAC.

CHANNEL ADDRESS Each module must have a different address. Install the address jumpers according to Figure 2 and Table 2. Label the module front panel with its address.

Your ADC module must be in the leftmost position. Put the AD 682SH-1 in any other available slot. Press firmly to fully seat the module, and tighten the top and bottom screws. Enter your AD 682SH-1 into the MEGADAC Map.

TABLE 1 AD 682SH-1 SPECIFICATIONS

INPUT

Input impedance	> 100 megOhms
Full-scale input voltage	+/- 10 V
Input protection	+/- 50 V continuous brief surges to 1000 V
Common mode range	+/- 10 V
Common mode rejection	> 80 db (gains 1 to 8)
(DC to 60 Hz)	> 100 db (gains 10 to 80) > 115 db (gains 100 to 800) > 125 db (gains 1000 to 4000)
Input noise	0.2 uV p-p at 0.1 to 10 Hz
Offset (RTO)	< 5 mV + 2 uV * gain
Offset tempco (RTI)	30 uV/°C (gains 1 to 8) 3 uV/°C (gains 10 to 80) 0.3 uV/°C (gains 100 to 800) 0.15 uV/°C (gains 1000 to 4000)

GAIN

Gain steps	1, 2, 4, 8, 10, 20, 40, 80, 100, 200, 400, 800, 1000, 2000, 4000
Gain accuracy	400 ppm (gains 1 to 80) 500 ppm (gains 100 to 800) 700 ppm (gains 1000 to 2000) 1100 ppm (gains 4000)
Gain stability	100 ppm/year
Gain tempco	6 ppm/°C
Gain nonlinearity	120 ppm
Max bandwidth	150 kHz (-3 db) (gains 1 to 800)
Slew rate	4 V/uS
Settling time	15 uS to 0.01% (gains 1 to 400) 45 uS to 0.01% (gain 800 to 4000)

FILTER

Type	8-pole Butterworth
Frequency	Computer controlled 20 Hz - 10 kHz, other ranges special
Rolloff	48 db/octave
Passband	0.1 db
Stopband	86 db
Frequency accuracy	2% of computer setting
Gain accuracy	150 ppm
Offset (RTO)	< 5 mV
Offset tempco	60 uV/°C

TABLE 1 CONTINUED AD 682SH-1 SPECIFICATIONS

FILTER

Distortion	150 ppm
Nonlinearity	300 ppm
Noise (RTO)	300 uV rms

SAMPLE-AND-HOLD

Droop	1 uV in 25 channels
Noise (RTO)	230 uV rms

EXCITATION

Type	Constant voltage with +/- sense, unipolar or bipolar
Settings	+10, +5, +2.5, 0 volts +/-5, +/-2.5, +/- 1.25, 0 volts
Accuracy	600 ppm
Output tempco	25 ppm/°C

RCAL

Type	Resistor shunt, computer controlled, 81.6 kilOhm (easily changed)

VCAL

Type	Voltage substitution, three voltages, internal or external and balance
Internal Voltages	1 V, 100 mV, 10 mV
Accuracy	600 ppm (gains 1 to 100) 900 ppm (gains 200 to 4000)

FIGURE 2 AD 682SH-1 ADDRESS JUMPER LOCATIONS

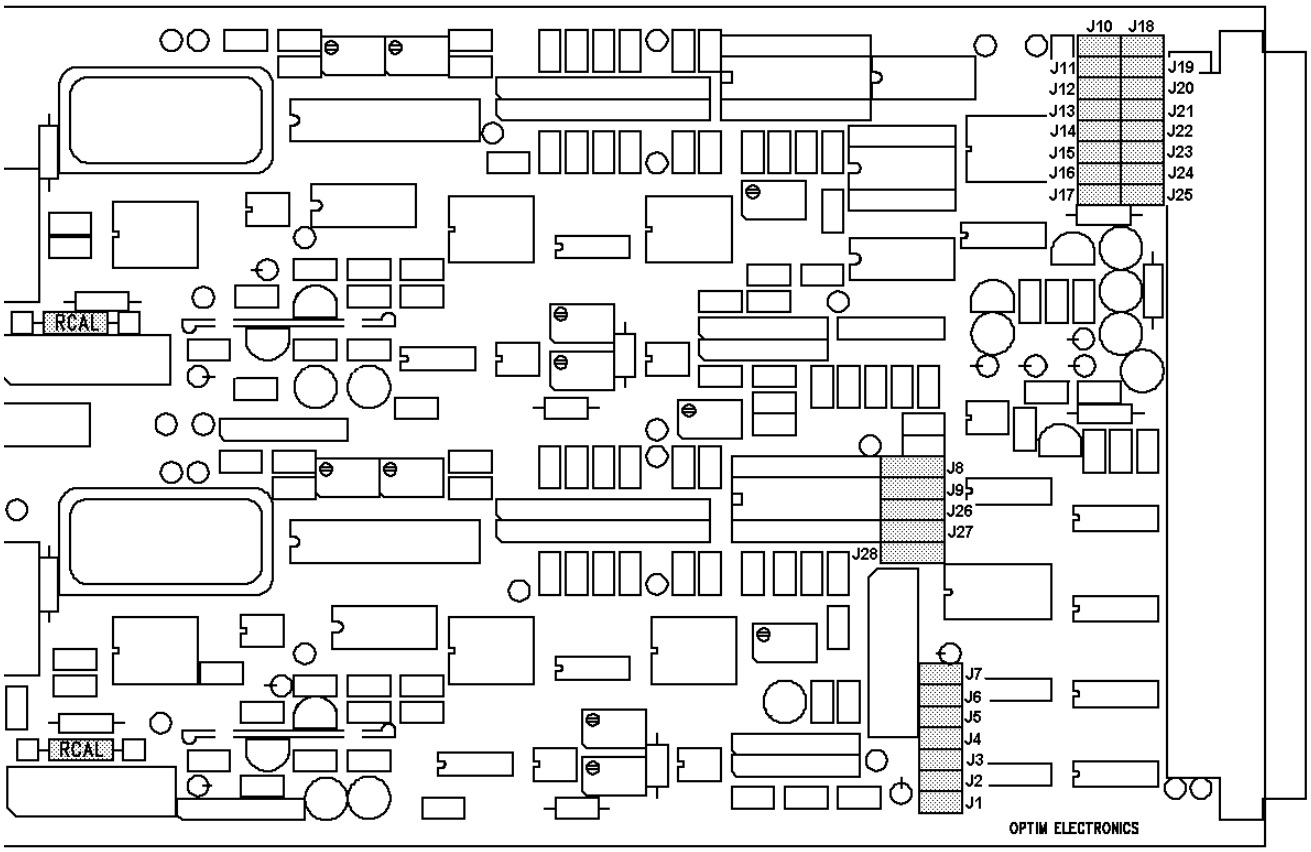


TABLE 2 AD 682SH-1 ADDRESS SELECTIONS

ADDRESS RANGE	J7	J6	J5	J4	J3	J2	J1	On **J10** thru **J25** Install two and only two jumpers
0-1	1	1	1	1	1	1	1	J10 and J18
2-3	1	1	1	1	1	1	0	J10 and J18
4-5	1	1	1	1	1	0	1	J10 and J18
6-7	1	1	1	1	1	0	0	J10 and J18
8-9	1	1	1	1	0	1	1	J10 and J18
10-11	1	1	1	1	0	1	0	J10 and J18
12-13	1	1	1	1	0	0	1	J10 and J18
14-15	1	1	1	1	0	0	0	J10 and J18
16-17	1	1	1	0	1	1	1	J11 and J19
18-19	1	1	1	0	1	1	0	J11 and J19
20-21	1	1	1	0	1	0	1	J11 and J19
22-23	1	1	1	0	1	0	0	J11 and J19
24-25	1	1	1	0	0	1	1	J11 and J19
26-27	1	1	1	0	0	1	0	J11 and J19
28-29	1	1	1	0	0	0	1	J11 and J19
30-31	1	1	1	0	0	0	0	J11 and J19
32-33	1	1	0	1	1	1	1	J12 and J20
34-35	1	1	0	1	1	1	0	J12 and J20
36-37	1	1	0	1	1	0	1	J12 and J20
38-39	1	1	0	1	1	0	0	J12 and J20
40-41	1	1	0	1	0	1	1	J12 and J20
42-43	1	1	0	1	0	1	0	J12 and J20
44-45	1	1	0	1	0	0	1	J12 and J20
46-47	1	1	0	1	0	0	0	J12 and J20
48-49	1	1	0	0	1	1	1	J13 and J21
50-51	1	1	0	0	1	1	0	J13 and J21
52-53	1	1	0	0	1	0	1	J13 and J21
54-55	1	1	0	0	1	0	0	J13 and J21
56-57	1	1	0	0	0	1	1	J13 and J21
58-59	1	1	0	0	0	1	0	J13 and J21
60-61	1	1	0	0	0	0	1	J13 and J21
62-63	1	1	0	0	0	0	0	J13 and J21

Where 0 = no jumper
1 = jumper installed

TABLE 2 CONTINUED AD 682SH-1 ADDRESS SELECTIONS

ADDRESS RANGE	J7	J6	J5	J4	J3	J2	J1	On **J10** thru **J25** Install two and only two jumpers
64-65	1	0	1	1	1	1	1	J14 and J22
66-67	1	0	1	1	1	1	0	J14 and J22
68-69	1	0	1	1	1	0	1	J14 and J22
70-71	1	0	1	1	1	0	0	J14 and J22
72-73	1	0	1	1	0	1	1	J14 and J22
74-75	1	0	1	1	0	1	0	J14 and J22
76-77	1	0	1	1	0	0	1	J14 and J22
78-79	1	0	1	1	0	0	0	J14 and J22
80-81	1	0	1	0	1	1	1	J15 and J23
82-83	1	0	1	0	1	1	0	J15 and J23
84-85	1	0	1	0	1	0	1	J15 and J23
86-87	1	0	1	0	1	0	0	J15 and J23
88-89	1	0	1	0	0	1	1	J15 and J23
90-91	1	0	1	0	0	1	0	J15 and J23
92-93	1	0	1	0	0	0	1	J15 and J23
94-95	1	0	1	0	0	0	0	J15 and J23
96-97	1	0	0	1	1	1	1	J16 and J24
98-99	1	0	0	1	1	1	0	J16 and J24
100-101	1	0	0	1	1	0	1	J16 and J24
102-103	1	0	0	1	1	0	0	J16 and J24
104-105	1	0	0	1	0	1	1	J16 and J24
106-107	1	0	0	1	0	1	0	J16 and J24
108-109	1	0	0	1	0	0	1	J16 and J24
110-111	1	0	0	1	0	0	0	J16 and J24
112-113	1	0	0	0	1	1	1	J17 and J25
114-115	1	0	0	0	1	1	0	J17 and J25
116-117	1	0	0	0	1	0	1	J17 and J25
118-119	1	0	0	0	1	0	0	J17 and J25
120-121	1	0	0	0	0	1	1	J17 and J25
122-123	1	0	0	0	0	1	0	J17 and J25
124-125	1	0	0	0	0	0	1	J17 and J25
126-127	1	0	0	0	0	0	0	J17 and J25

Where 0 = no jumper
1 = jumper installed

TABLE 2 CONTINUED AD 682SH-1 ADDRESS SELECTIONS

ADDRESS RANGE	J7	J6	J5	J4	J3	J2	J1	On **J10** thru **J25** Install two and only two jumpers
128-129	0	1	1	1	1	1	1	J10 and J18
130-131	0	1	1	1	1	1	0	J10 and J18
132-133	0	1	1	1	1	0	1	J10 and J18
134-135	0	1	1	1	1	0	0	J10 and J18
136-137	0	1	1	1	0	1	1	J10 and J18
138-139	0	1	1	1	0	1	0	J10 and J18
140-141	0	1	1	1	0	0	1	J10 and J18
142-143	0	1	1	1	0	0	0	J10 and J18
144-145	0	1	1	0	1	1	1	J11 and J19
146-147	0	1	1	0	1	1	0	J11 and J19
148-149	0	1	1	0	1	0	1	J11 and J19
150-151	0	1	1	0	1	0	0	J11 and J19
152-153	0	1	1	0	0	1	1	J11 and J19
154-155	0	1	1	0	0	1	0	J11 and J19
156-157	0	1	1	0	0	0	1	J11 and J19
158-159	0	1	1	0	0	0	0	J11 and J19
160-161	0	1	0	1	1	1	1	J12 and J20
162-163	0	1	0	1	1	1	0	J12 and J20
164-165	0	1	0	1	1	0	1	J12 and J20
166-167	0	1	0	1	1	0	0	J12 and J20
168-169	0	1	0	1	0	1	1	J12 and J20
170-171	0	1	0	1	0	1	0	J12 and J20
172-173	0	1	0	1	0	0	1	J12 and J20
174-175	0	1	0	1	0	0	0	J12 and J20
176-177	0	1	0	0	1	1	1	J13 and J21
178-179	0	1	0	0	1	1	0	J13 and J21
180-181	0	1	0	0	1	0	1	J13 and J21
182-183	0	1	0	0	1	0	0	J13 and J21
184-185	0	1	0	0	0	1	1	J13 and J21
186-187	0	1	0	0	0	1	0	J13 and J21
188-189	0	1	0	0	0	0	1	J13 and J21
190-191	0	1	0	0	0	0	0	J13 and J21

Where 0 = no jumper
1 = jumper installed

TABLE 2 CONTINUED AD 682SH-1 ADDRESS SELECTIONS

ADDRESS RANGE	J7	J6	J5	J4	J3	J2	J1	On **J10** thru **J25** Install two and only two jumpers
192-193	0	0	1	1	1	1	1	J14 and J22
194-195	0	0	1	1	1	1	0	J14 and J22
196-197	0	0	1	1	1	0	1	J14 and J22
198-199	0	0	1	1	1	0	0	J14 and J22
200-201	0	0	1	1	0	1	1	J14 and J22
202-203	0	0	1	1	0	1	0	J14 and J22
204-205	0	0	1	1	0	0	1	J14 and J22
206-207	0	0	1	1	0	0	0	J14 and J22
208-209	0	0	1	0	1	1	1	J15 and J23
210-211	0	0	1	0	1	1	0	J15 and J23
212-213	0	0	1	0	1	0	1	J15 and J23
214-215	0	0	1	0	1	0	0	J15 and J23
216-217	0	0	1	0	0	1	1	J15 and J23
218-219	0	0	1	0	0	1	0	J15 and J23
220-221	0	0	1	0	0	0	1	J15 and J23
222-223	0	0	1	0	0	0	0	J15 and J23
224-225	0	0	0	1	1	1	1	J16 and J24
226-227	0	0	0	1	1	1	0	J16 and J24
228-229	0	0	0	1	1	0	1	J16 and J24
230-231	0	0	0	1	1	0	0	J16 and J24
232-233	0	0	0	1	0	1	1	J16 and J24
234-235	0	0	0	1	0	1	0	J16 and J24
236-237	0	0	0	1	0	0	1	J16 and J24
238-239	0	0	0	1	0	0	0	J16 and J24
240-241	0	0	0	0	1	1	1	J17 and J25
242-243	0	0	0	0	1	1	0	J17 and J25
244-245	0	0	0	0	1	0	1	J17 and J25
246-247	0	0	0	0	1	0	0	J17 and J25
248-249	0	0	0	0	0	1	1	J17 and J25
250-251	0	0	0	0	0	1	0	J17 and J25
252-253	0	0	0	0	0	0	1	J17 and J25
254-255	0	0	0	0	0	0	0	J17 and J25

Where 0 = no jumper
1 = jumper installed

TABLE 3 AD 682SH-1 GAIN AND RANGE

CHANNEL GAIN	16 BIT ADC RANGE	RESOLUTION
1	10.0 **V**	312.5 **uV**
2	5.00	156.25
4	2.50	78.125
8	1.25	39.0625
10	1.00	31.250
20	500 **mV**	15.625
40	250	7.8125
80	125	3.90625
100	100	3.1250
200	50.0	1.5625
400	25.0	781.25 **nV**
800	12.5	390.62
1000	10.0	312.50
2000	5.00	156.25
4000	2.50	78.125

Due to the wide dynamic range of the ADC, Optim recommends using a range twice as large as your expected maximum. This provides 100% overrange capability and leaves adequate resolution.

DIRECT CONNECTIONS

Using a STB 682 in conjunction with the AD 682SH-1 greatly simplifies sensor connections, since the STB 682 contains all the completion resistors necessary for half and quarter bridge sensors (see page 12). The STB 682 is not required, however, since completion resistors can be connected directly to the AD 682SH-1. All AD 682SH-1 input/output pin numbers are shown on the connection list on page 22. Make copies of this list and use them to plan, wire, and document your test.

FULL BRIDGE Figure 3 is a four-wire full bridge using local sensing. The type of excitation, unipolar or bipolar, is determined by connecting the **-S** return line to **-V** for bipolar or **GND** for unipolar.

FIGURE 3 AD 682SH-1 FOUR-WIRE FULL BRIDGE

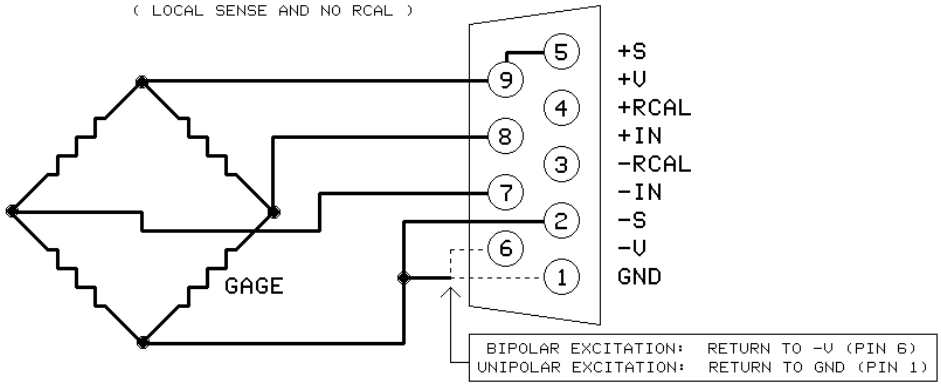
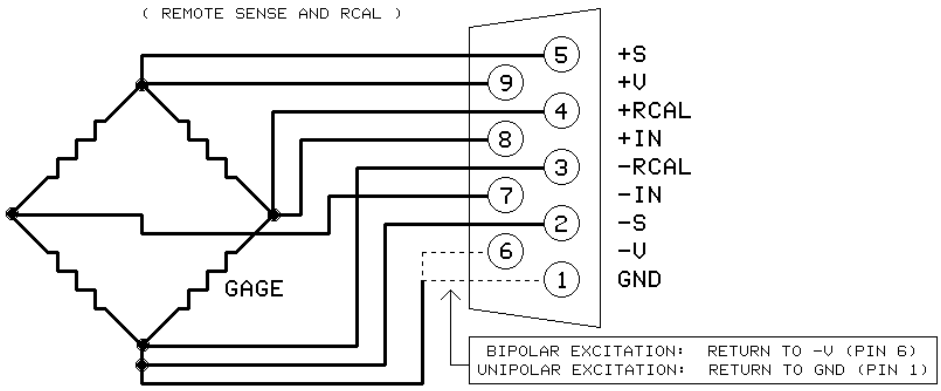


Figure 4 is an eight-wire full bridge using remote sensing and RCAL. The remote sensing compensates for the voltage drop from wire resistance, and the RCAL connections enable RCAL calibration. Running the RCAL lines to the sensor, on dedicated wires, reduces wire resistance errors.

FIGURE 4 AD 682SH-1 EIGHT-WIRE FULL BRIDGE



VOLTAGE MEASUREMENT Figures 5 and 6 show two- and three-wire measurements of a voltage source. Figure 5 is a two-wire single ended measurement.

FIGURE 5 AD 682SH-1 TWO-WIRE SINGLE ENDED MEASUREMENT

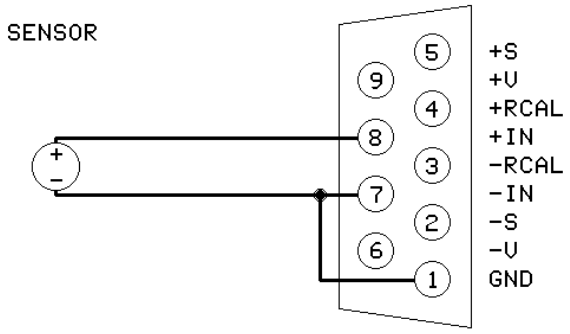
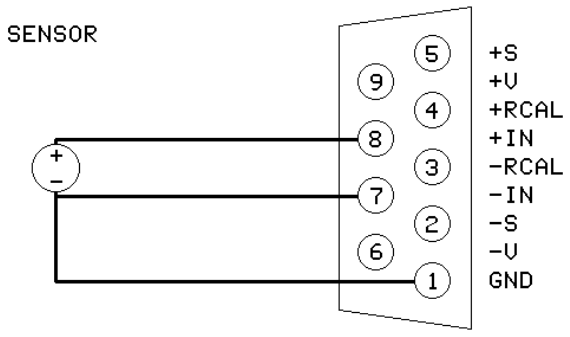


Figure 6 is a three-wire single ended measurement, which provides superior common-mode rejection.

FIGURE 6 AD 682SH-1 THREE-WIRE SINGLE ENDED MEASUREMENT



STB CONNECTIONS

The STB 682 Screw-Terminal-Blocks simplify the wiring to your AD 682SH-1. The STB 682 module may be used free-standing or mounted on a standard DIN rail next to the structure under test. Two 10 foot 9-conductor flat cables accompany the STB 682. The cabling between the STB and the AD 682SH-1 minimizes crosstalk, noise pick-up and signal loss. Therefore, it is preferred to mount the STB near the sensor so that the sensor wiring lengths are short; i.e., use a 50 foot STB cable and 10 foot sensor wiring instead of a 10 foot STB cable and 50 foot sensor wiring.

To minimize noise pick-up in the sensor wiring, equal length wire of the same insulation and wire gauge should be used. The wiring should be closely bundled and in extreme cases could be twisted and shielded.

To reduce the errors caused by wire resistance, use remote operation (remote voltage sensing and remote RCAL) whenever possible.

All input/output terminals are shown on the connection list on page 23. Make copies of this list and use them to plan and document your test.

The STB 682 jumpers are defined as follows:

J+H, J-H	Installed for half and quarter bridge operation
JQBC	Installed for quarter bridge 2-wire operation
J+S	Installed for local sensing on **+V** voltage
J-S	Installed for local sensing on **-V** voltage; for unipolar excitation, install the jumper in the **U** position. For bipolar excitation, install the jumper in the **B** position
J+RCAL, J-RCAL	Installed for local RCAL
INT/EXT	Installed for normal RCAL resistance, removed for adding an external resistor in series with the normal RCAL resistor (install the resistor in the screw terminals marked **RC**).

EXCITATION TYPE In remotely sensed configurations, the return wiring from the bottom of the bridge determines bipolar or unipolar excitation, and the bottom of the bridge must connect with either **-V** (for bipolar excitation) or **GND** (for unipolar excitation); the J-S jumper must not be installed. In locally sensed configurations, the J-S jumper determines bipolar or unipolar excitation, and must be installed in either the **B** position (for bipolar excitation) or the **U** position (for unipolar excitation); bridge return wiring goes into **-S** in either case.

Note that the sensor wiring that supplies the excitation power should be heavy enough to reduce line loss. The wires that carry significant current are **+V** and **-V** or **GND** for remotely sensed bridges, and **+IN** and **-IN** for half bridges and quarter bridges. The wires that carry significant current are **+V** and **-S** for locally sensed bridges, and **+IN** and **-IN** for half bridges and quarter bridges.

FULL BRIDGE Figures 7 and 8 show full bridge connections. Figure 7 is a six-wire full bridge using remote sensing; the J+S and J-S jumpers are removed. Figure 8 is a four-wire full bridge using local sensing, so the J+S and J-S jumpers are installed.

FIGURE 7 STB 682 SIX-WIRE FULL BRIDGE

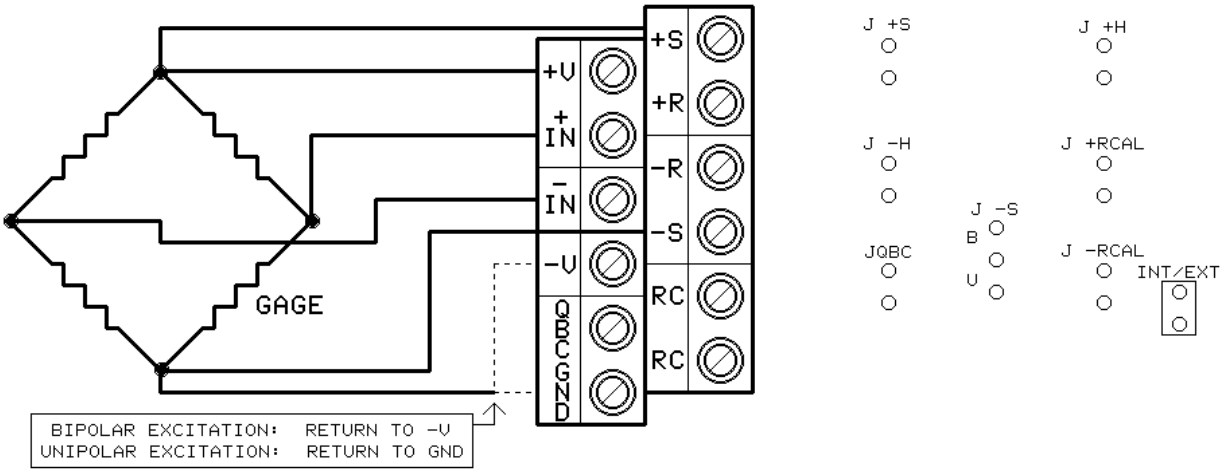
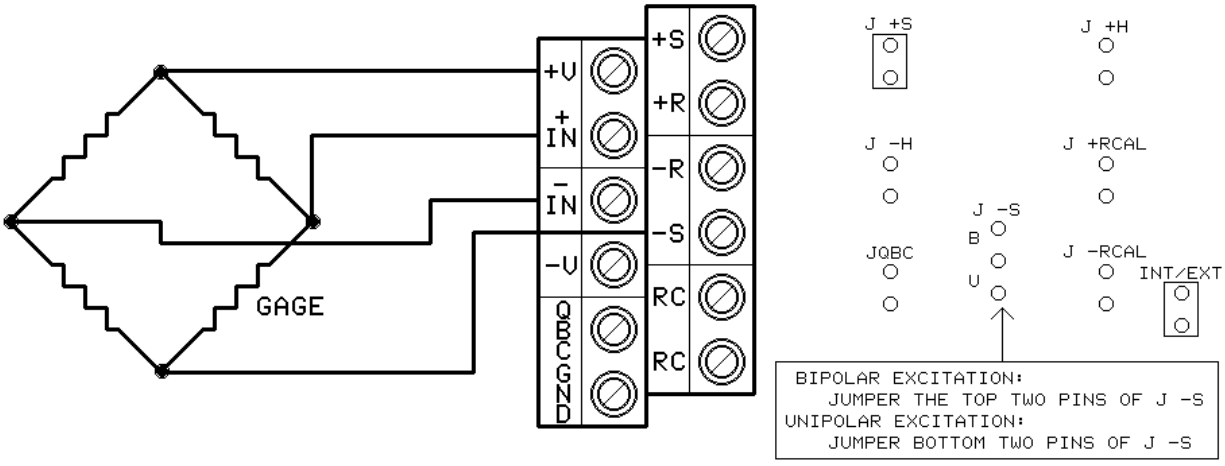


FIGURE 8 STB 682 FOUR-WIRE FULL BRIDGE



HALF BRIDGE Figures 9 and 10 show half bridge connections. Figure 9 is a four-wire half bridge using remote sensing, and Figure 10 is a three-wire half bridge using local sensing. The jumper settings shown engage the bridge resistors on the STB 682, and select correct sensing for the top of the bridge.

FIGURE 9 STB 682 FOUR-WIRE HALF BRIDGE

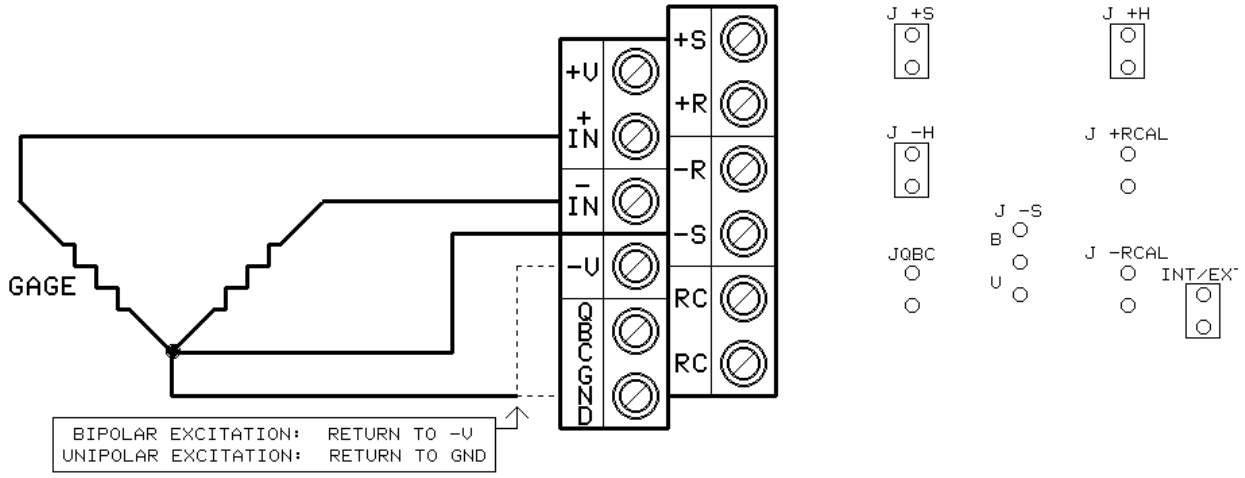
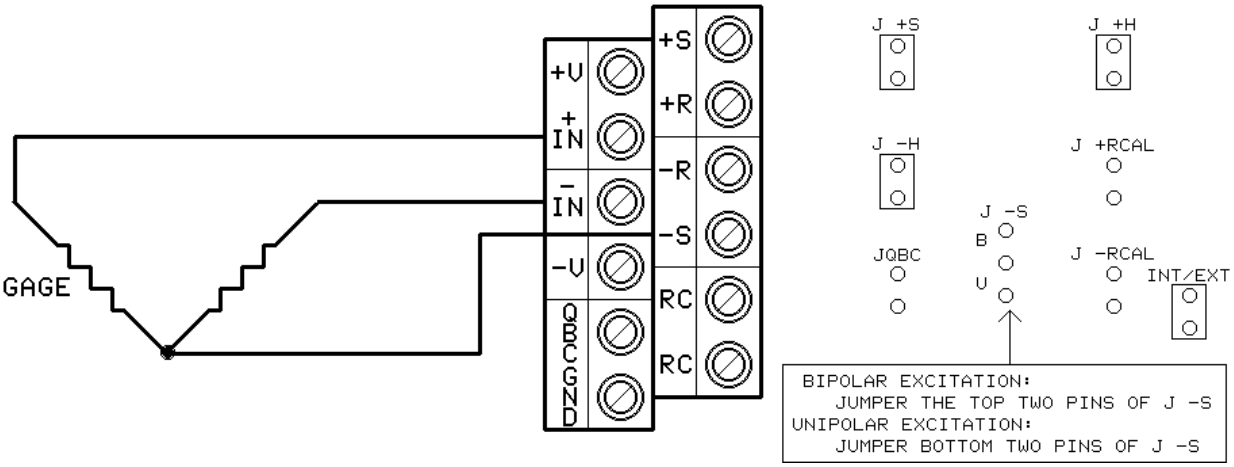


FIGURE 10 STB 682 THREE-WIRE HALF BRIDGE



QUARTER BRIDGE Figures 11 and 12 show quarter bridge connections. Figure 11 is a three-wire quarter bridge using remote sensing, and Figure 12 is a two-wire quarter bridge using local sensing, but it is not a recommended configuration because of thermal errors and line-loss errors which will accumulate. The jumper settings shown engage the bridge resistors and select local sensing, and the JQBC jumper in Figure 12 completes the bridge across the return line.

FIGURE 11 STB 682 THREE-WIRE QUARTER BRIDGE

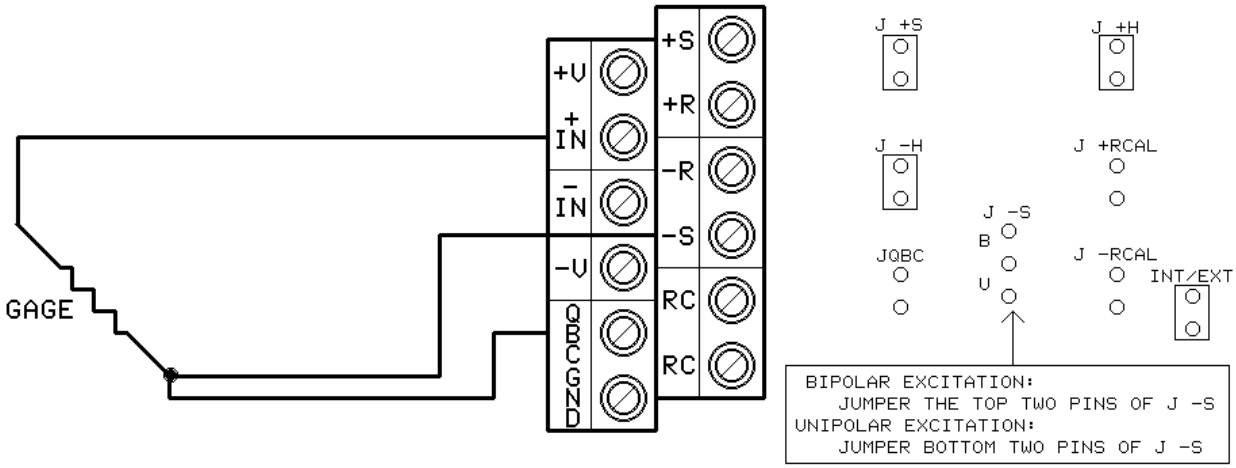
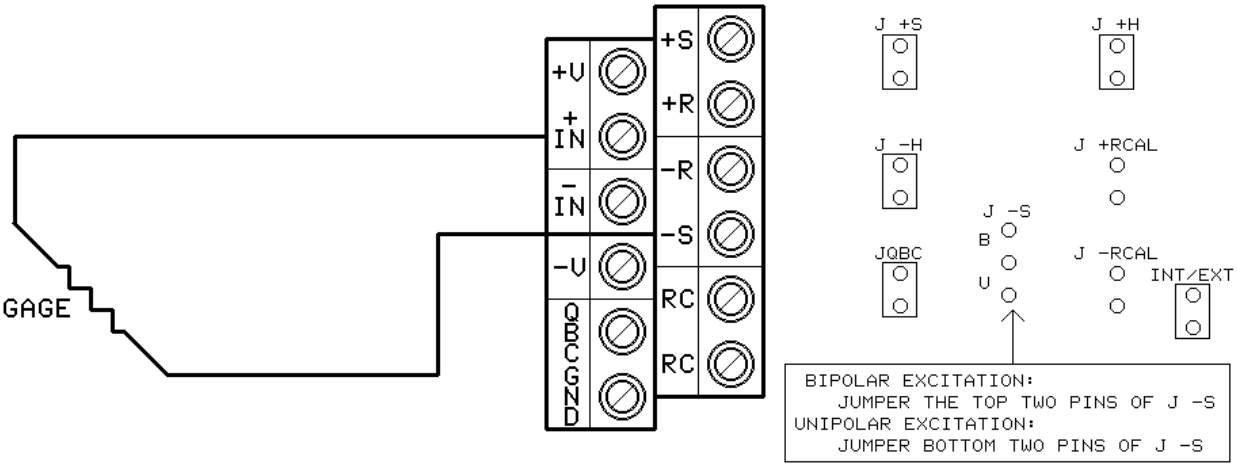


FIGURE 12 STB 682 TWO-WIRE QUARTER BRIDGE



VOLTAGE MEASUREMENT Figures 13 and 14 show single-ended measurements. Figure 13 is a two-wire single-ended measurement, and Figure 14 is a three-wire measurement with two wires and a shield attached to **GND**.

FIGURE 13 STB 682 TWO-WIRE SINGLE ENDED MEASUREMENT

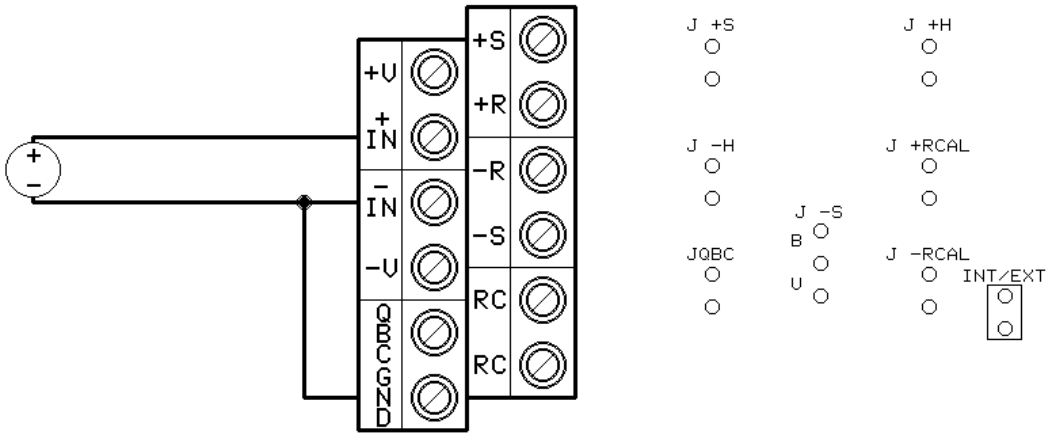
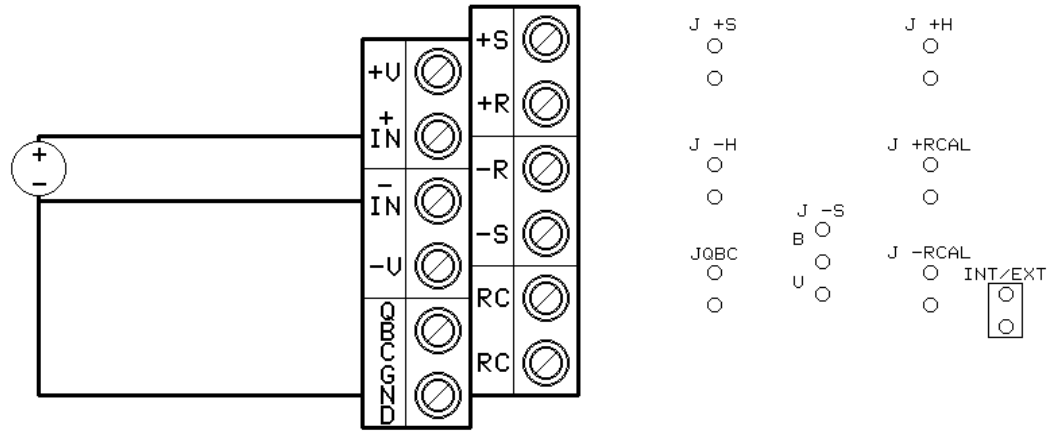


FIGURE 14 STB 682 THREE-WIRE SINGLE ENDED MEASUREMENT



RCAL CONNECTIONS Figures 15, 16, and 17 show full bridge connections with RCAL. Figure 15 is a four-wire full bridge using local RCAL--note that the J+RCAL and J-RCAL jumpers are installed. The RCAL resistance used is on the AD 682SH-1; therefore the INT/EXT jumper is installed.

FIGURE 15 STB 682 FOUR-WIRE FULL BRIDGE WITH RCAL

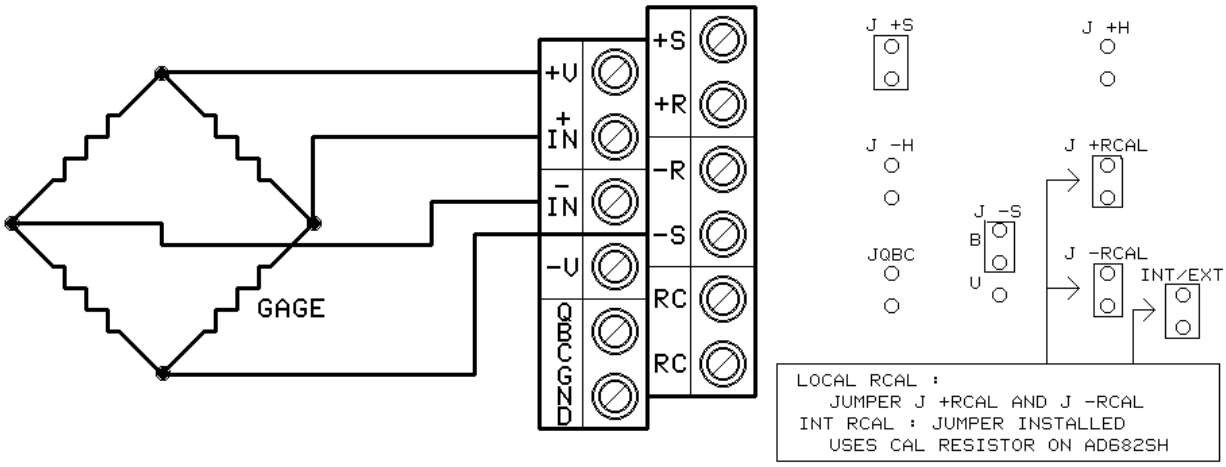


Figure 16 is a six-wire full bridge using remote RCAL, so the J+RCAL and J-RCAL jumpers are removed. Since the INT/EXT jumper is removed, the total RCAL resistance is the sum of the AD 682SH-1 RCAL resistor plus an external resistor installed in the **RC** screw terminals. If frequent changes of RCAL are required it may be easiest to install a wire jumper in the AD 682SH-1 RCAL resistor location (see appendix A3) so that the RCAL resistance is determined only by the external RCAL resistor.

FIGURE 16 STB 682 SIX-WIRE FULL BRIDGE WITH RCAL

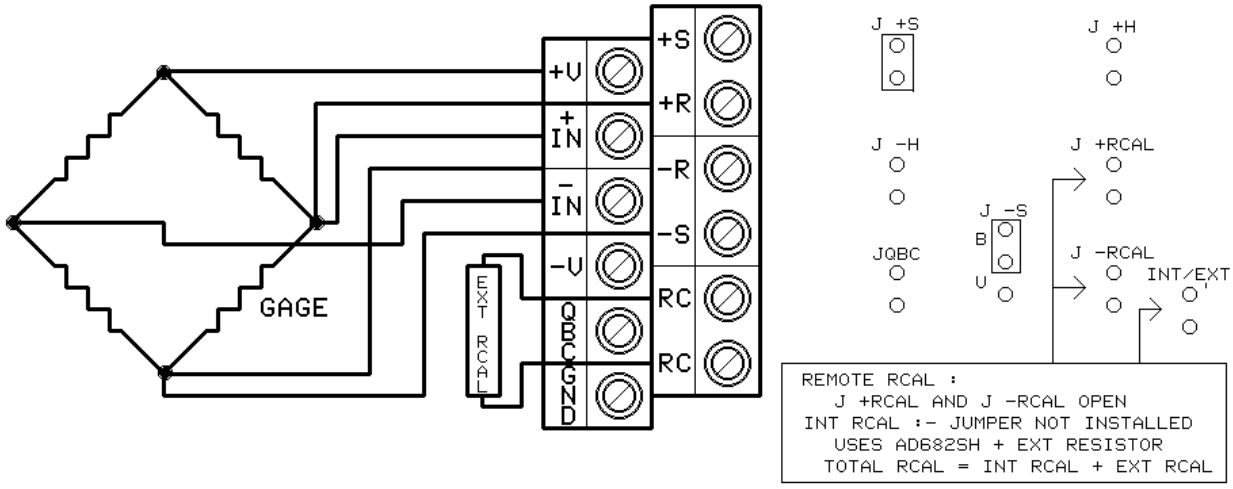
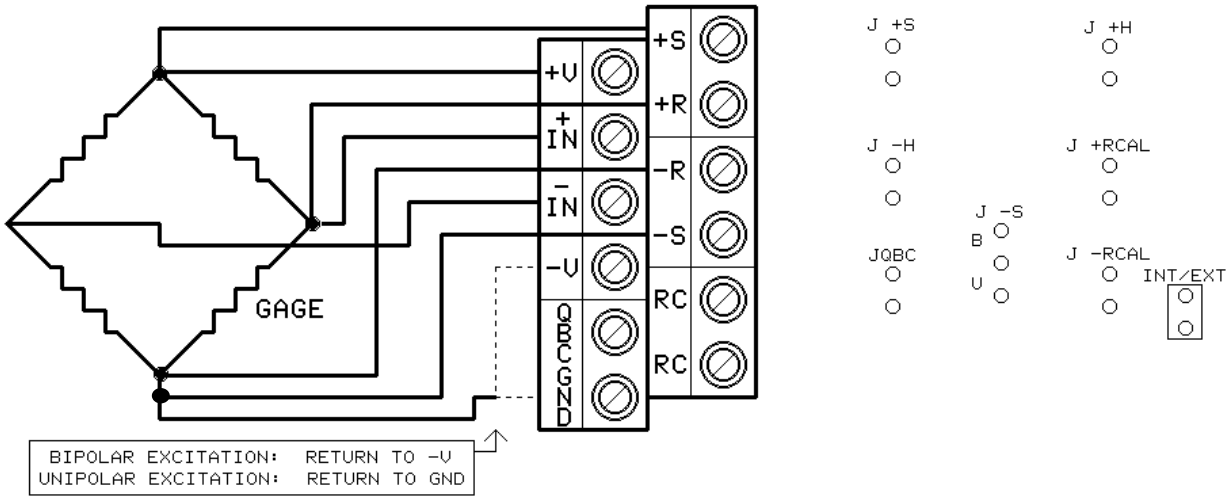


Figure 17 is an eight-wire full bridge connection which has remote sensing and RCAL using the AD 682SH-1 internal RCAL resistor (see below).

FIGURE 17 STB 682 EIGHT-WIRE FULL BRIDGE WITH RCAL



OPERATION

NOISE If you have unreasonable noise, follow this trouble-shooting procedure:

WIRING CHECK Check your wiring for good solder joints, clean connector pins and accurate wiring. You should use gold-to-gold for all low-level connections.

AMPLIFIER NOISE Short **+IN** and **-IN** to ground. Use a connector that has pin 7 and pin 8 shorted to pin 1. Amplifier noise should be approximately the following:

0.2 uV rms RTI at a card gain of 200

1 mV rms RTO at a card gain of 1

CABLING NOISE Compare the noise from a channel with an input short to the noise from a channel with a sensor short (or remove the excitation from the sensor). The noise increase is due to the electrical pick-up in your cables. This can be reduced by

1 Running **+IN** and **-IN** in a twisted pair, directly to the sensor. Noise picked up by the **+IN** wire will be the same as that of the **-IN** wire, and the common mode signal will be rejected.

2 Verifying a low impedance ground connection between the signal source and the MEGADAC. This reduces the size of the common mode signals. A single ground braid between the structure under test and the ground tab on the rear of the MEGADAC is excellent.

3 Shielding the **+IN** and **-IN** twisted pair, thus reducing common-mode noise pick-up.

SENSOR NOISE Compare the noise from a channel with a sensor short to the noise when fully operating. A significant increase indicates a noisy sensor, or sources of noise in the input force. For example, a 7 Hz ground conduction vibration would not be felt but could show up as a 0.5% full-scale reading. This would drop to zero when the excitation is removed and, therefore, indicate that it is in the signal.

FILTER The AD 682SH-1 is shipped with a 8-pole Butterworth filter. Figure 18 shows the filter response. Note that at 1000 Hz the signal is attenuated 30% (-3 db) and at 2000 Hz it is attenuated 99%. The step response shows settling to 1% in 3 mS. When you change filter frequencies the shapes in Figure 5 remain the same but the horizontal scale changes.

As the filter frequency goes up, filter frequency increments become coarser.

FREQUENCY RANGE	INCREMENTS
1-10 Hz	0.00125 Hz
10-100	0.125
100-1000	12.5
1-2 kHz	51 Hz
2-4	210
4-8	728
8.888 kHz	
10.0	
11.428	
13.333	
16.0	
20.0	

RCAL The AD 682SH-1 is shipped with an 81.6 kilOhm resistor for RCAL shunt calibration across a sensor. To avoid wire-resistance errors, make the RCAL connection at the sensor. The MEGADAC controls the RCAL relay. Under normal operation the relay is open and -RCAL to +RCAL (+R and -R on the STB) is an open circuit; when the relay closes, the RCAL resistance appears from the -RCAL to +RCAL terminals. For a strain gage, the RCAL resistance shifts the output as follows:

$$\text{Delta STRAIN} = \frac{RG - \frac{RG * RCAL}{RG + RCAL}}{RG * GF}$$

Where:

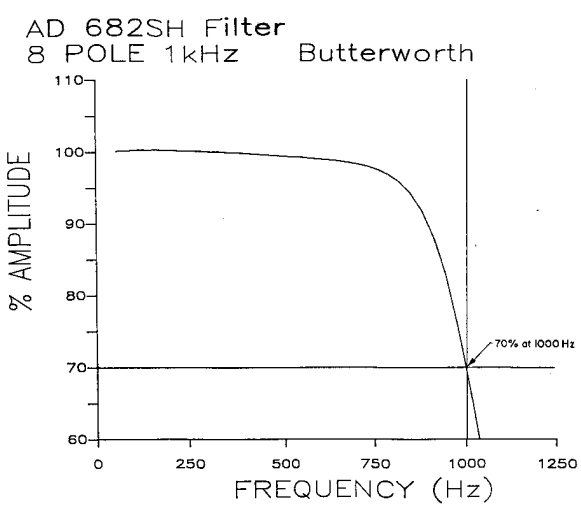
RG = Gage resistance

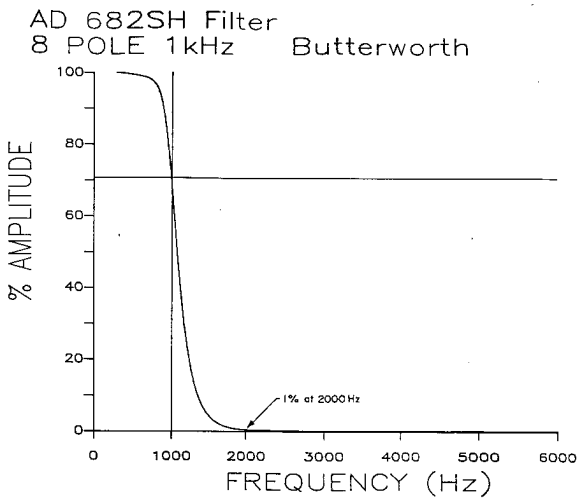
RCAL = Shunt resistance (81.6 kilOhms)

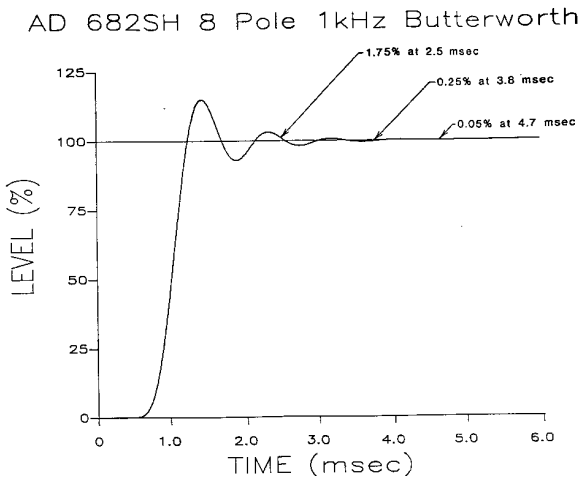
GF = Gage factor, typically 2

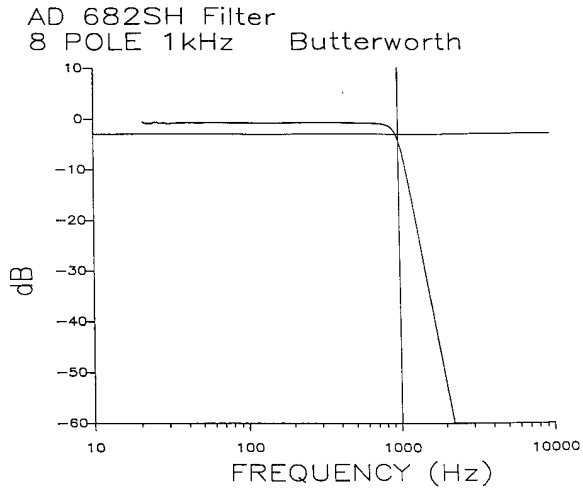
Example: For a 350 ohm strain gage with a gage factor of 2 and the factory-set shunt resistance of 81.6 kilOhms, the RCAL shift is a 0.002135 strain or 2135 microstrain shift.

FIGURE 18 AD 682SH-1 FILTER RESPONSE









VCAL AND BAL The AD 682SH-1 has three internal VCAL calibration voltages and a BAL shorting relay which can be substituted for the sensor to test the card for proper offset and gain as follows:

Card offset = BAL value(card output with the BAL relay closed)

$$\text{Card gain} = \frac{\text{Card output - Card offset}}{\text{VCAL voltage}}$$

The MEGADAC controls both VCAL and BAL. The VCAL voltage substitution values are as follows:

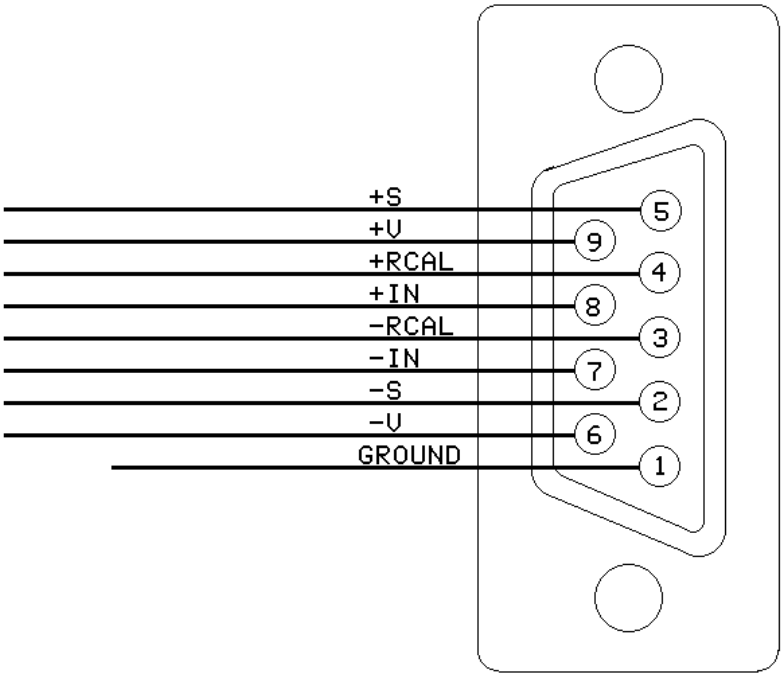
Gains 1 to 8	VCAL = 1 V
Gains 10 to 80	VCAL = 100 mV
Gains 100 to 1000	VCAL = 10 mV

Gains 2000 and 4000 have no calibration voltage.

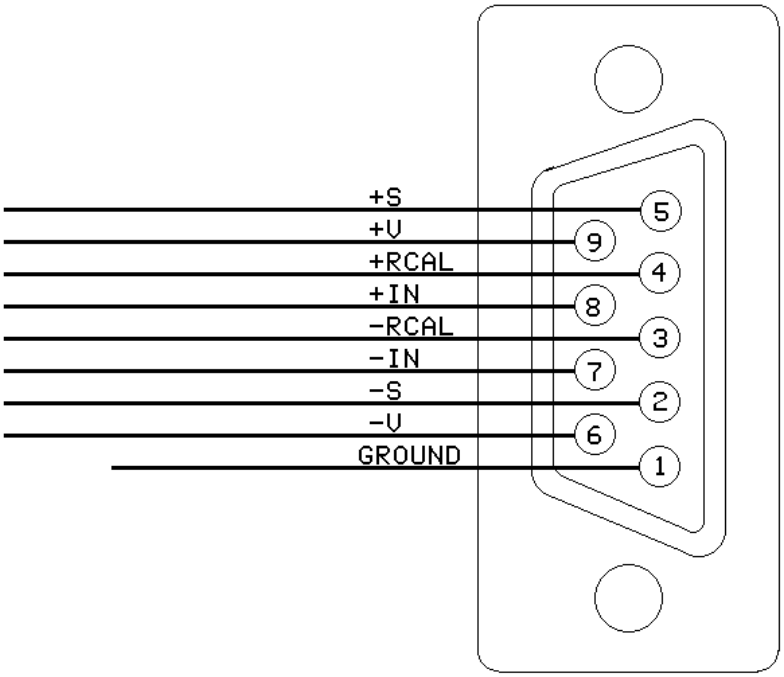
TEST NAME / DATE _____ PAGE ____ OF _____

CHANNEL RANGE _____ CONNECTS TO _____

CABLE _____



CABLE CONNECTOR DE9P
SOLDER CUP VIEW

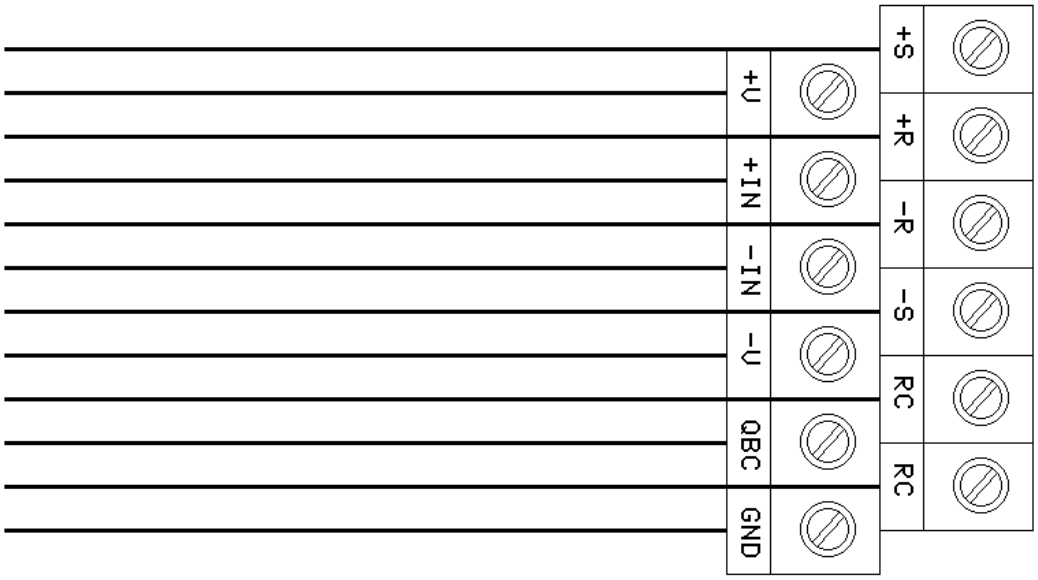


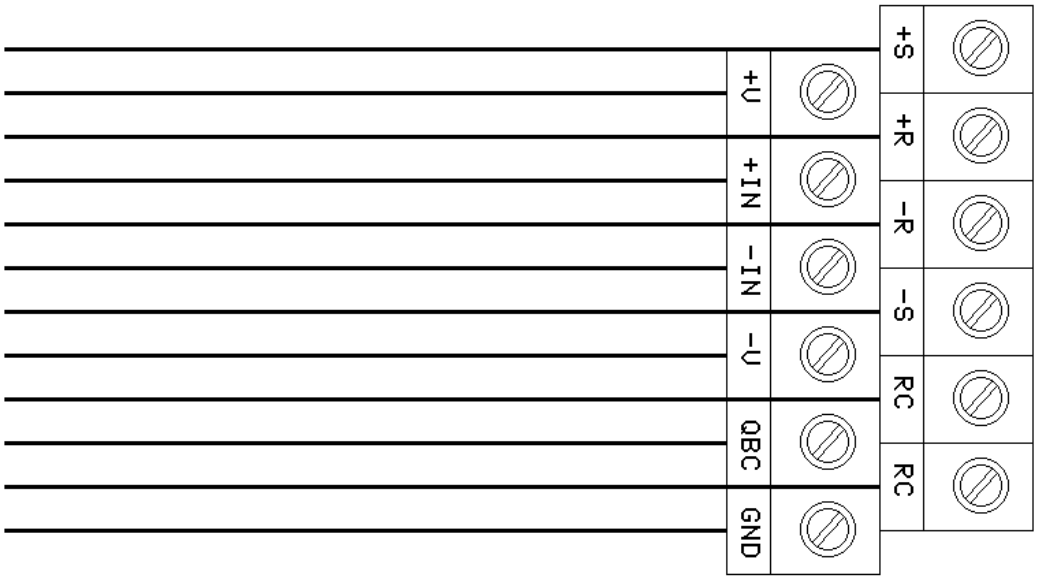
CABLE CONNECTOR DE9P
SOLDER CUP VIEW

TEST NAME / DATE _____ PAGE ____ OF _____

CHANNEL RANGE _____ CONNECTS TO _____

CABLE _____





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