ASG-2000
SiloGauge Remote Unit

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INSTALLATION and OPERATING INSTRUCTIONS
PLEASE READ CAREFULLY

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SILOGAUGE REMOTE UNIT

SILOGAUGE SPECIFICATIONS

Power Requirements: ---------- 115 VAC 60 Hz
(230 VAC Models available)

Power Consumption: ---------- 25 VA Continuous 69 VA Intermittent

Current Draw (RMS): ----------@115 VAC 0.22A Continuous 0.6 Intermittent
@230 VAC 0.26A Continuous 0.6 Intermittent

Temperature: ---------- -40°F to 185°F (-40°C to 85°C)

Measurement Range: ---------- 90 ft Standard 150 ft Maximum

Accuracy: ---------- 0.25%

Repeatability: ----------0.1 ft (0.03m)

Resolution: ---------- 0.15 inch (0.4cm)

Communication: ---------- RS 485 Half Duplex

Wiring Distance: ----------4000 ft (1220 m)

Enclosure: ASG-2000 ---------- Type 4X, 5, 12

Mounting: ---------- 3inch NPT Floor Flange

Conduit Entry: ----------¾ inch NPT

Weight: ---------- 25 lbs (11.4)

Width: ---------- 15 ¾ inch (40 cm)

Height: ---------- 14 ¾ inch (37.5 cm)

Depth: ---------- 7.5 inch (19.05 cm)

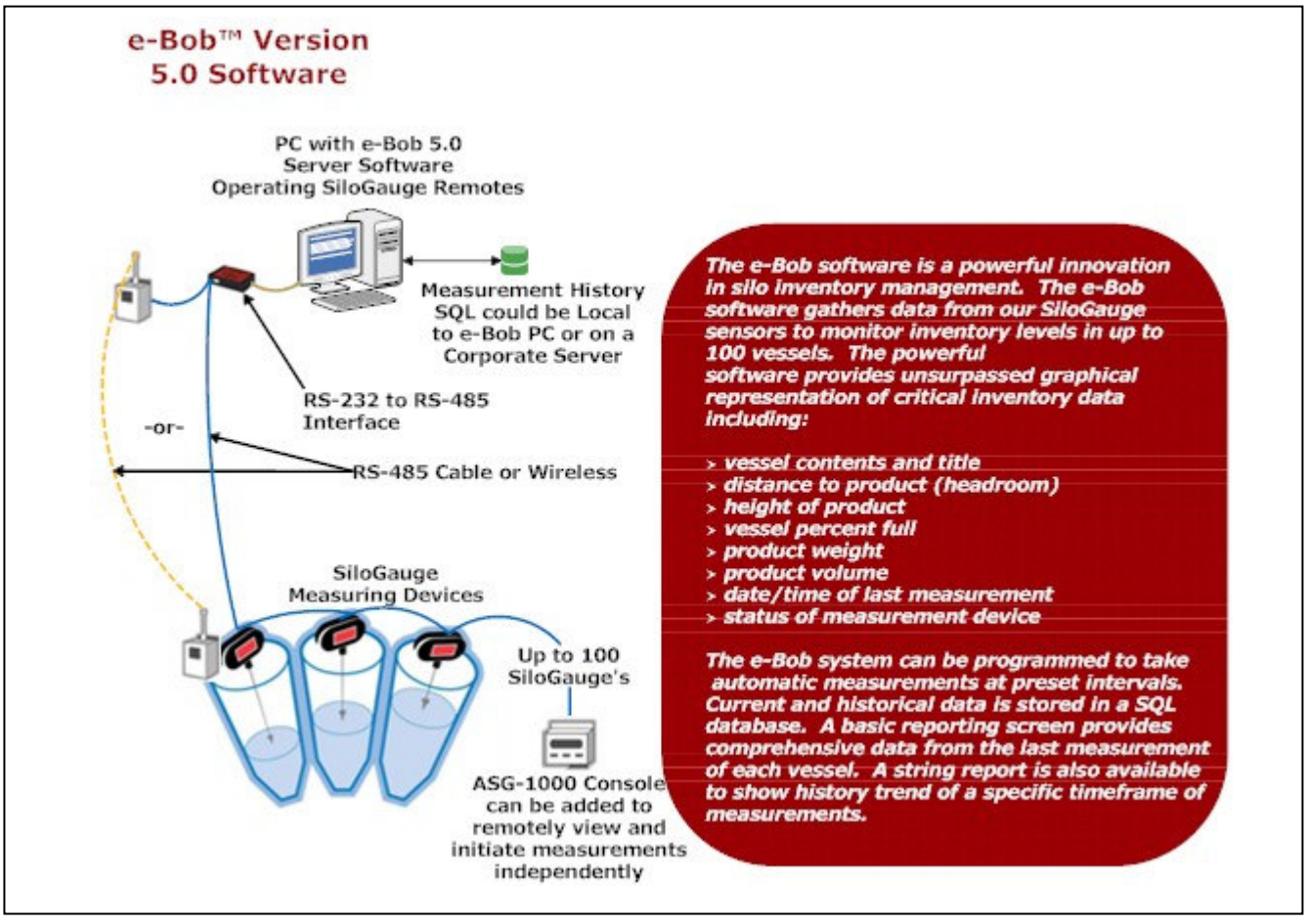
Air Purge Entry: ----------¼ inch NPT

Cable: ---------- 316 Stainless Steel 0.063 inch Diameter
Nylon Coated

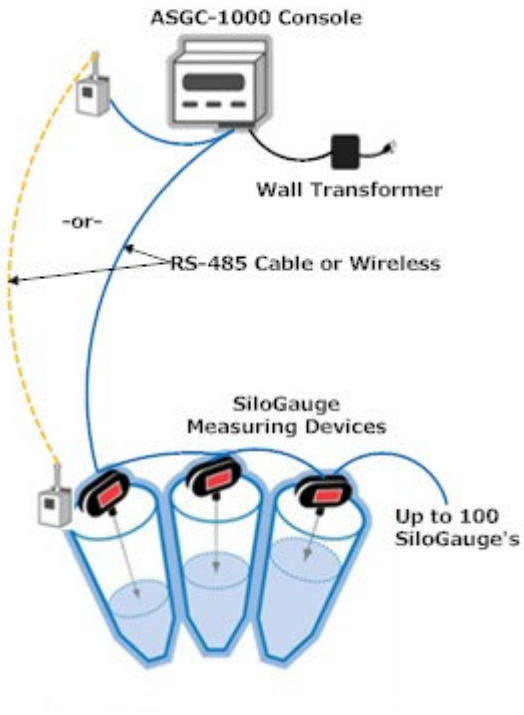
1.0 INTRODUCTION

The ABM Sensors SiloGauge ASG-2000 is a remote on demand level measurement sensing unit. It is designed to work in conjunction with a Personal Computer running windows 95/98, NT, or 2000, an ABM Sensors ASGC-1000 console, or an ABM Sensors ASU (Remote Start Unit). In operation, the ASG-2000 lowers a weighted Bob to the surface of the product, measuring the distance. A microcontroller counts the pulses from an encoder. Slack in the cable is detected when the Bob reaches the surface, causing the motor to reverse and retract the Bob. The retract distance is also measured for diagnostic purposes to assure that the Bob fully retracts.

General system diagrams showing use with a personal computer, ASGC-1000 console, and an ASU controller are illustrated in Figures 1a through 1c. eBob Software that runs on Windows XP Pro or Vista controls up to 100 SiloGauge units from one location with the standard RS485 interface box. The eBob software also provides current inventory, extended inventory, measuring scheduling, and vendor managed inventory and site status through faxing an E-mail. The ASGC-1000 is a stand alone console which can control and display measurements of up to 30 vessels. The ASU is a single vessel controller and provides 4 to 20 mA output for interfacing with other control systems.

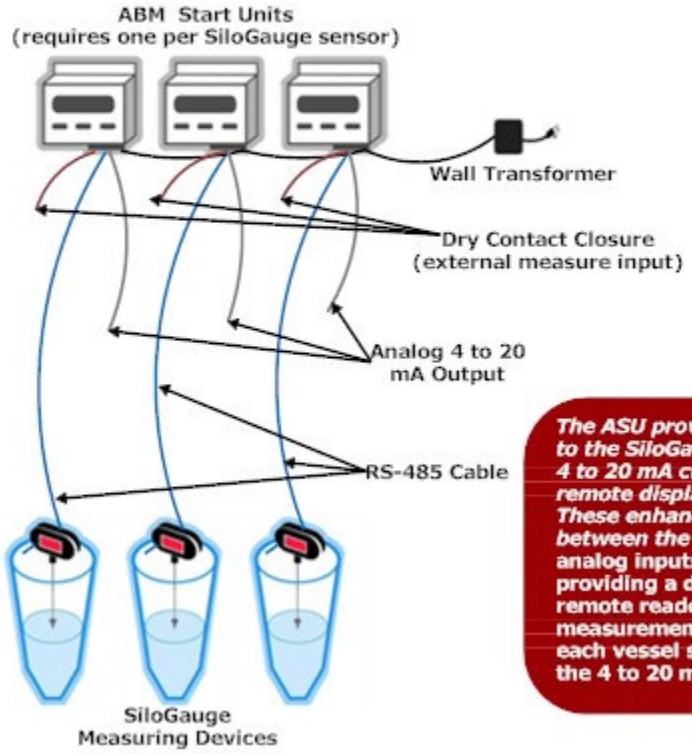


ASGC-1000 Manual Push Button Console with LCD Readout



The ASGC-1000 Console is the simplest way to remotely initiate and view measurements. The compact, manually operated console can control from 1 to 100 SiloGauge sensors with a push of a button. Individual bin heights are programmed into the console and measurements are displayed as distance to product, height of product, and percent full. The display also indicates the status of the Bob during the measurement cycle. Bin heights and percent full data of the most recent measurements are retained in the ASGC memory, even in instances of power loss.

ABM Start Unit (ASU)

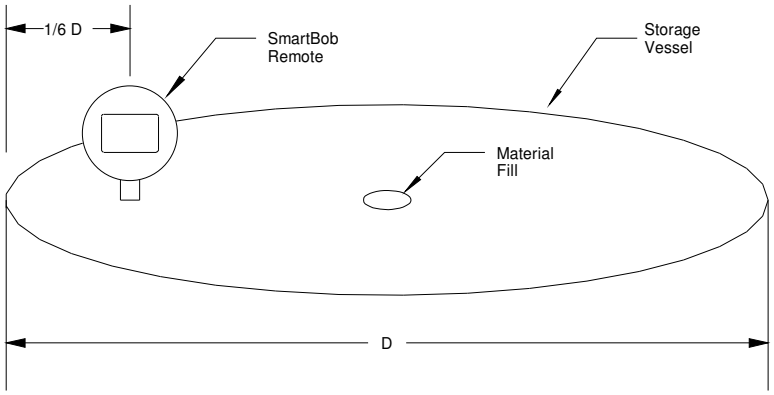


The ASU provides a variety of enhancements to the SiloGauge: an external measure input, a 4 to 20 mA current loop (analog)output, and a remote display or remote readout of measurement. These enhancements allow for a simple interface between the SiloGauge sensor and devices using analog inputs. Measurements can be initiated by providing a dry contact closure to the ASU. The remote readout feature allows you to view measurement data and diagnostic information from each vessel separately from the device reading the 4 to 20 mA signal.

2.0 INSTALLATION

2.1 LOCATION AND MOUNTING

The SiloGauge remote unit is mounted on the top of the storage vessel using a 3 inch NPT coupling. If a 3 inch NPT floor flange is used, it must be on a flat level surface to provide a vertical mount for the unit. For measuring dry solids which involve an angle of repose, it is recommended that the unit be mounted 1/6th of the vessel diameter in from the side, see Figure 2. A mounting flange template is provided on last page of this manual for a standard 3 inch NPT floor flange with a 5-1/8 inch bolt circle.



2.2 RS485 NETWORK WIRING

The ASG-2000 remotes are connected by a shielded twisted pair cable referred to as an RS485 network. This cable must run from one remote to the next connecting each remote in a daisy-chained fashion with no stub branch runs. All connections should be made at the terminals on the circuit board, see Figures 3&4. Be careful to maintain the proper wiring polarity at each terminal connection. The shield on the RS485 cable must be connected to the shield terminal on the circuit board, not to the enclosure ground.

2.3 NETWORK TERMINATION

On each ASG-2000 remote unit, ASGC-1000, ASU, and RS485 interface module, there is a network termination switch, labeled NTR. The two units on each end of the RS485 daisy chained network must have their NTR switch placed in the “ON” position. All other units on the network must have this switch set to the “OFF” position. See Figures 3.

NOTE: ***When installing the ASG-2000 in locations where moisture or moist air could enter the electrical compartment through the electrical conduit, the conduit openings should be adequately sealed with a duct seal compound.***

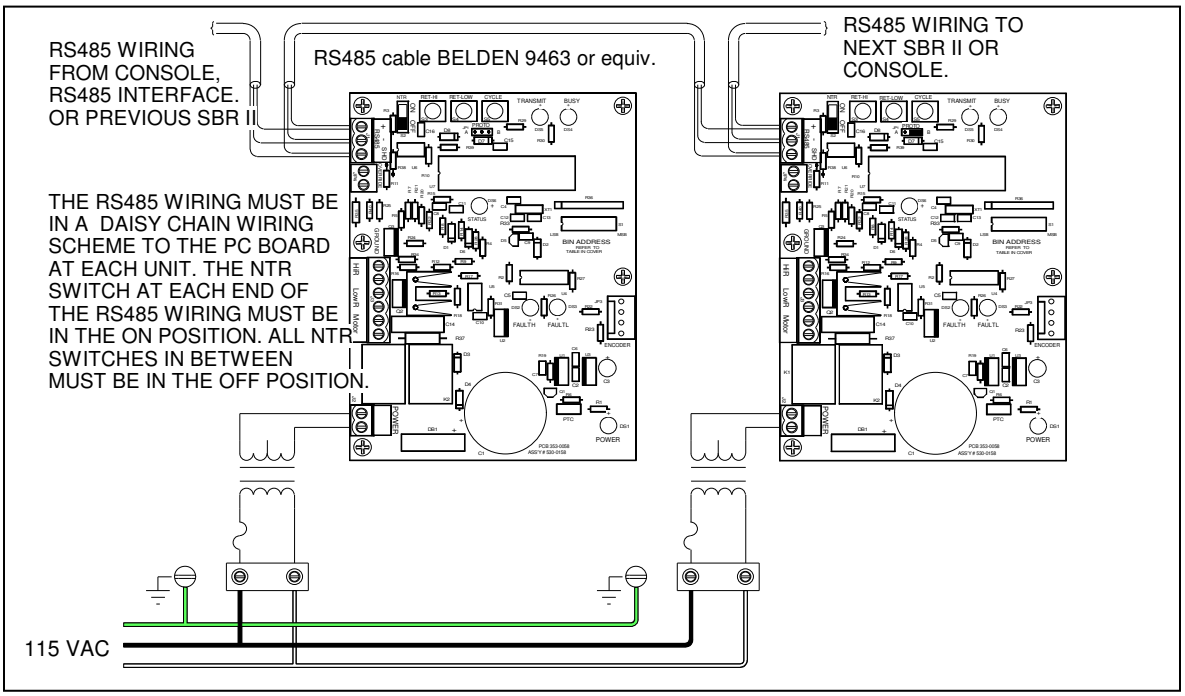


FIGURE 4

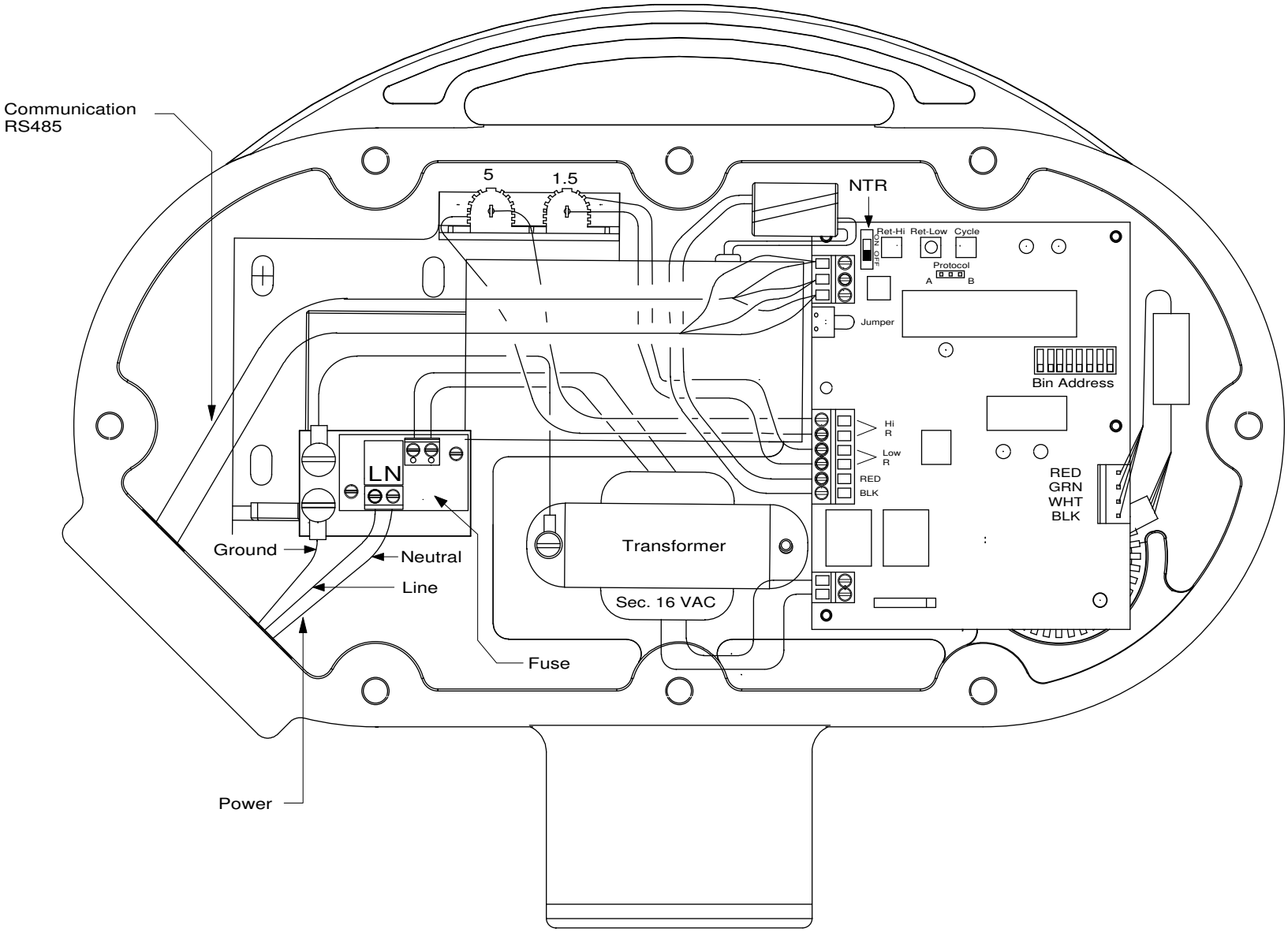
2.4 POWER WIRING

All wiring should be installed according to local and/or national codes. Refer to Figures 4 5 for the connection of the power wiring. The AC input power connects to the 2 pole terminal block located on the motor mount bracket. The neutral wire should be connected to the terminal on the right and the “LINE” conductor connected to the terminal on the left. The terminal on the left wires thru the fuse to the transformer.

A green ground screw is provided in the SiloGauge enclosure for electrically grounding the unit. A good electrical ground must to connected to the ASG-2000 for safety and to bleed off any static electrical charges that might build up in the ASG-2000. It is recommended that both the power and the RS485 communication cable be ran in metal conduit.

2.5 SETTING THE ADDRESS

The ABM Sensors eBob version 5.0 software can accommodate up to 100 ASG-2000 remote units with the standard RS485 interface. The ASGC-1000 console can accommodate up to 100 ASG-2000 remote units. Therefore a unique address must be set for each remote. Refer to Figure 4 and Table 1 regarding setting the address each for remote. This figure and table are also located on the inside cover of the ASG-2000 enclosure. The ASU console only operates with one SiloGauge remote. The address of a remote unit operating with an ASU must be set to #1.



ASG-2000 WIRING DIAGRAM

BIN ADDRESS DIP SWITCHES

BIN ADDRESS	DIP SWITCH SETTINGS								BIN ADDRESS	DIP SWITCH SETTINGS							
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	65	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	66	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	67	ON	ON	OFF	OFF	OFF	OFF	ON	OFF
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	68	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	69	ON	OFF	ON	OFF	OFF	OFF	ON	OFF
6	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	70	OFF	ON	ON	OFF	OFF	OFF	ON	OFF
7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	71	ON	ON	ON	OFF	OFF	OFF	ON	OFF
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	72	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF
9	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	73	ON	OFF	OFF	ON	OFF	OFF	ON	OFF
10	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	74	OFF	ON	OFF	ON	OFF	OFF	ON	OFF
11	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	75	ON	ON	OFF	ON	OFF	OFF	ON	OFF
12	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	76	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
13	ON	OFF	ON	ON	OFF	OFF	OFF	OFF	77	ON	OFF	ON	ON	OFF	OFF	ON	OFF
14	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	78	OFF	ON	ON	ON	OFF	OFF	ON	OFF
15	ON	ON	ON	ON	OFF	OFF	OFF	OFF	79	ON	ON	ON	ON	OFF	OFF	ON	OFF
16	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	80	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF
17	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	81	ON	OFF	OFF	OFF	ON	OFF	ON	OFF
18	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	82	OFF	ON	OFF	OFF	ON	OFF	ON	OFF
19	ON	ON	OFF	OFF	ON	OFF	OFF	OFF	83	ON	ON	OFF	OFF	ON	OFF	ON	OFF
20	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	84	OFF	OFF	ON	OFF	ON	OFF	ON	OFF
21	ON	OFF	ON	OFF	ON	OFF	OFF	OFF	85	ON	OFF	ON	OFF	ON	OFF	ON	OFF
22	OFF	ON	ON	OFF	ON	OFF	OFF	OFF	86	OFF	ON	ON	OFF	ON	OFF	ON	OFF
23	ON	ON	ON	OFF	ON	OFF	OFF	OFF	87	ON	ON	ON	OFF	ON	OFF	ON	OFF
24	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	88	OFF	OFF	OFF	ON	ON	OFF	ON	OFF
25	ON	OFF	OFF	ON	ON	OFF	OFF	OFF	89	ON	OFF	OFF	ON	ON	OFF	ON	OFF
26	OFF	ON	OFF	ON	ON	OFF	OFF	OFF	90	OFF	ON	OFF	ON	ON	OFF	ON	OFF
27	ON	ON	OFF	ON	ON	OFF	OFF	OFF	91	ON	ON	OFF	ON	ON	OFF	ON	OFF
28	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	92	OFF	OFF	ON	ON	ON	OFF	ON	OFF
29	ON	OFF	ON	ON	ON	OFF	OFF	OFF	93	ON	OFF	ON	ON	ON	OFF	ON	OFF
30	OFF	ON	ON	ON	ON	OFF	OFF	OFF	94	OFF	ON	ON	ON	ON	OFF	ON	OFF
31	ON	ON	ON	ON	ON	OFF	OFF	OFF	95	ON	ON	ON	ON	ON	OFF	ON	OFF
32	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	96	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF
33	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	97	ON	OFF	OFF	OFF	OFF	ON	ON	OFF
34	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	98	OFF	ON	OFF	OFF	OFF	ON	ON	OFF
35	ON	0N	OFF	OFF	OFF	ON	OFF	OFF	99	ON	ON	OFF	OFF	OFF	ON	ON	OFF
36	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	100	OFF	OFF	ON	OFF	OFF	ON	ON	OFF
37	ON	OFF	ON	OFF	OFF	ON	OFF	OFF	101	ON	OFF	ON	OFF	OFF	ON	ON	OFF
38	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	102	OFF	ON	ON	OFF	OFF	ON	ON	OFF
39	ON	ON	ON	OFF	OFF	ON	OFF	OFF	103	ON	ON	ON	OFF	OFF	ON	ON	OFF
40	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	104	OFF	OFF	OFF	ON	OFF	ON	ON	OFF
41	ON	OFF	OFF	ON	OFF	ON	OFF	OFF	105	ON	OFF	OFF	ON	OFF	ON	ON	OFF
42	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	106	OFF	ON	OFF	ON	OFF	ON	ON	OFF
43	ON	ON	OFF	ON	OFF	ON	OFF	OFF	107	ON	ON	OFF	ON	OFF	ON	ON	OFF
44	OFF	OFF	ON	ON	OFF	ON	OFF	OFF	108	OFF	OFF	ON	ON	OFF	ON	ON	OFF
45	ON	OFF	ON	ON	OFF	ON	OFF	OFF	109	ON	OFF	ON	ON	OFF	ON	ON	OFF
46	OFF	ON	ON	ON	OFF	ON	OFF	OFF	110	OFF	ON	ON	ON	OFF	ON	ON	OFF
47	ON	ON	ON	ON	OFF	ON	OFF	OFF	111	ON	ON	ON	ON	OFF	ON	ON	OFF
48	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	112	OFF	OFF	OFF	OFF	ON	ON	ON	OFF
49	ON	OFF	OFF	OFF	ON	ON	OFF	OFF	113	ON	OFF	OFF	OFF	ON	ON	ON	OFF
50	OFF	ON	OFF	OFF	ON	ON	OFF	OFF	114	OFF	ON	OFF	OFF	ON	ON	ON	OFF
51	ON	ON	OFF	OFF	ON	ON	OFF	OFF	115	ON	ON	OFF	OFF	ON	ON	ON	OFF
52	OFF	OFF	ON	OFF	ON	ON	OFF	OFF	116	OFF	OFF	ON	OFF	ON	ON	ON	OFF
53	ON	OFF	ON	OFF	ON	ON	OFF	OFF	117	ON	OFF	ON	OFF	ON	ON	ON	OFF
54	OFF	ON	ON	OFF	ON	ON	OFF	OFF	118	OFF	ON	ON	OFF	ON	ON	ON	OFF
55	ON	ON	ON	OFF	ON	ON	OFF	OFF	119	ON	ON	ON	OFF	ON	ON	ON	OFF
56	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	120	OFF	OFF	OFF	ON	ON	ON	ON	OFF
57	ON	OFF	OFF	ON	ON	ON	OFF	OFF	121	ON	OFF	OFF	ON	ON	ON	ON	OFF
58	OFF	ON	OFF	ON	ON	ON	OFF	OFF	122	OFF	ON	OFF	ON	ON	ON	ON	OFF
59	ON	ON	OFF	ON	ON	ON	OFF	OFF	123	ON	ON	OFF	ON	ON	ON	ON	OFF
60	OFF	OFF	ON	ON	ON	ON	OFF	OFF	124	OFF	OFF	ON	ON	ON	ON	ON	OFF
61	ON	OFF	ON	ON	ON	ON	OFF	OFF	125	ON	OFF	ON	ON	ON	ON	ON	OFF
62	OFF	ON	ON	ON	ON	ON	OFF	OFF	126	OFF	ON	ON	ON	ON	ON	ON	OFF
63	ON	ON	ON	ON	ON	ON	OFF	OFF	127	ON	ON	ON	ON	ON	ON	ON	OFF
64	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	128	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON

2.6 EXTERNAL OVERRIDE

This feature can be used to prohibit measurements during a vessel filling cycle. The IMS software will notify the user that measurement cannot be taken while a filling operation is in progress. Located on the SiloGauge circuit board in the upper left corner (just below the RS485 terminals), is the terminal block labeled OVERRIDE. A connection must exist across these terminals for normal operation of the remote unit, see Figure 6. A contact on an external relay can be used to disable the remote unit during a fill cycle to prevent burying the Bob. The use of this feature is optional, if not used, leave the factory installed jumper in the terminal block.

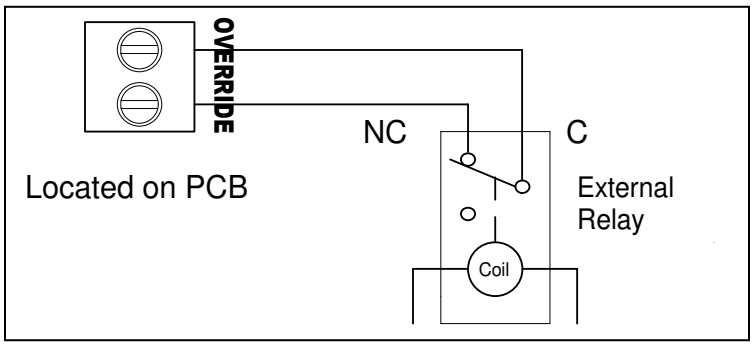


FIGURE 6

3.0 TESTING THE REMOTE OPERATION

IMPORTANT: Complete the SiloGauge INSTALLATION CHECKLIST, included with this manual, before attempting to operate the units.

3.1 MANUAL OPERATION FROM REMOTE UNIT

Once the SiloGauge Remote is installed and wired properly it can be manually cycled to verify proper operation. To perform the manual test:

- Open the electrical side of the remote unit.
- Press the CYCLE button located at the top of the printed circuit board. The unit will immediately lower the probe Bob to the surface and return.
- Replace the electrical side cover.

3.2 TROUBLESHOOTING

If the remote fails to cycle, verify that the Input Power is present at the terminal block and that the POWER LED located on the circuit board (in lower right corner), is lit. The LED should be lit whenever the power is present at the terminal block and that the POWER LED located on the circuit board (in lower right corner), is lit. This LED should be lit whenever the power is present at the board terminals. If the unit still does not operate, consult the factory at 705-740-2010.

4.0 AIR PURGE SYSTEM

Located on the lower right side of each SiloGauge remote unit is a ¼" NPT air fitting. This fitting can be used to connect an external source of dry, clean air or non-combustible gas to the remote housing. By adding pressure to the remote housing that is slightly greater than that in the vessel, material and dust from the vessel is prevented from entering into the unit. The external pressure should be one (1) psi greater than the ambient pressure in the storage vessel and should be free from moisture and other contaminates.

5.0 WARRANTY AND CUSTOMER SERVICE

5.1 LIMITED WARRANTY

The manufacturer warrants this equipment for two (2) years according to the following terms:

1.) This warranty extends to the original purchaser only and commences on the date of original purchase. The original purchaser must mail to the manufacturer the "Warranty Registration" card to confirm the equipment purchase. Failure to do so may void the warranty.
2.) The manufacturer will repair or replace any part of this equipment found to be defective, provided such part is delivered prepaid to the factory. Manufacturer's obligation is limited to the cost of material and labor to repair or replace and does not include transportation expenses.
3.) This warranty shall not apply to any product that has, in our judgment, been tampered with, altered, subject to misuse, neglect or accident. In addition, the warranty does not extend to repairs made necessary by normal wear.
4.) This warranty is in lieu of all other warranties, expressed or implied.

5.2 CUSTOMER SERVICE

ABM Sensors offers a toll-free Customer Service phone number, 705-740-2010. You may call the Customer Service Department for technical and application assistance Monday through Friday from 8:00 AM to 5:00 PM Central Time. International customers call us at 705-740-2010 or reach us via Fax at 705-740-2563. Email questions to info@ABM Sensors.com.

Note: This equipment has been tested and found to comply with the limits for Class A digital device, puASUant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference in which case the user will be required to correct the interference at their own expense.

CABLE REPLACEMENT INSTRUCTIONS

Before Starting

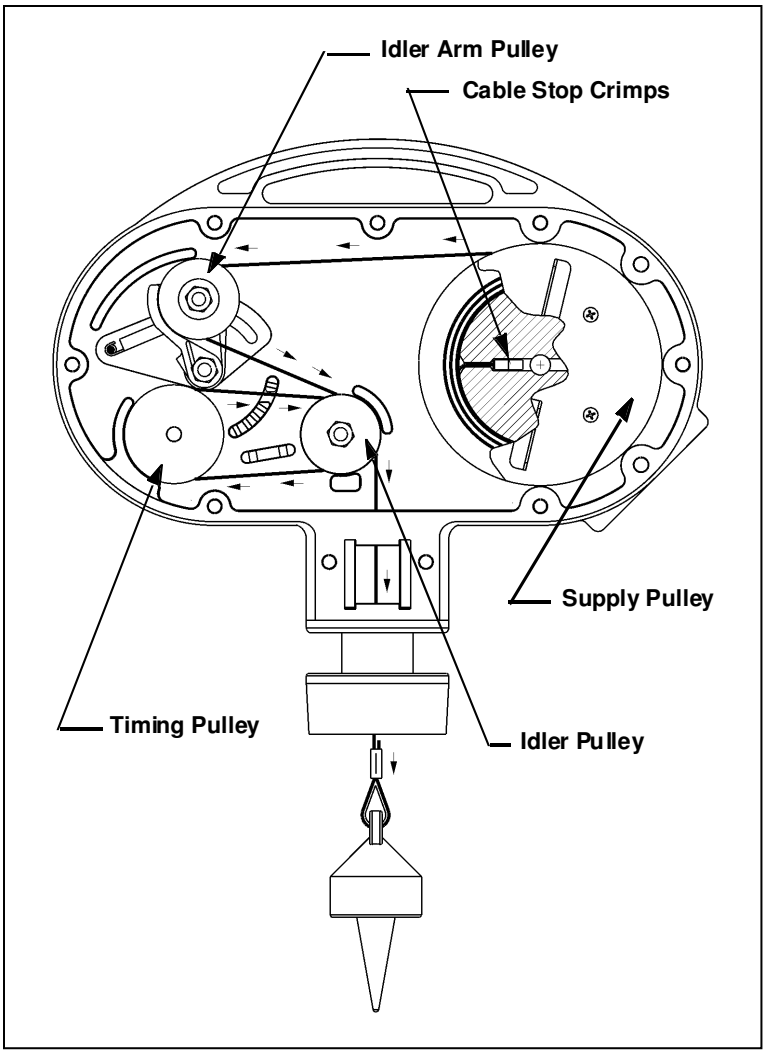
Disconnect the power source. Remove the flat cover plate on the front of the remote housing.

Cable Replacement

1. Loosen the ¼ set screw located on the hub of the supply pulley then remove the supply pulley assembly.
2. Remove and discard the old cable from the supply pulley.
3. Thread the bare end of the cable through the hub until the Cable Stop Crimps are positioned as shown in the illustration.
4. Tighten the #6 set screw located on the outside of the supply pulley hub. This will secure and ground the cable crimps.
5. Reassemble the supply pulley and tighten the ¼ set screw.
6. Skip to the Threading The Cable.

Kit Replacement

1. Loosen the ¼ set screw located on the hub of the supply pulley then remove the supply pulley assembly.
2. Remove and discard the old supply pulley and cable.
3. Assemble the new supply pulley replacement kit.
4. Skip to Threading the Cable.



Threading the Cable

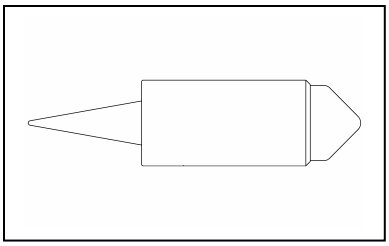
Thread the cable over the top of the idler arm pulley, over the top of the front groove of the idler pulley, under the timing pulley, then over the top of the back groove of the idler pulley as shown in the illustration. Then thread the cable down through the brushes and threaded mount assembly.

NOTE: At this point you should refer to the attached manual instruction sheet "Limiting Stainless Steel Cable". Follow steps 2 through 6.

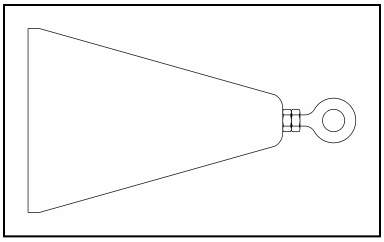
Loading the Supply Pulley

1. Reconnect the power source.
2. If loading the supply pulley is necessary, pull the cable taunt. Load supply pulley by pressing the "RET-HI" button located on the circuit board. Pressing this button will start the supply pulley turning in a clockwise direction, with the cable winding over the top. Keep the cable taunt until the pulley is full. When the supply pulley is full, release the "RET-HI" button.
3. Replace the cable wiper brushes and reattach the cover.

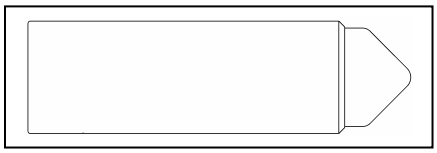
Probe Options



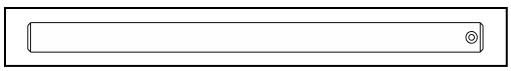
BBP-1
This Polypropylene Bob is designed for granular materials from 20 lbs. per cubic foot and greater.



BBP-2
This bob is a hollow inverted 6” cone made of stainless steel and is designed for bulk products with a density from 1.5 lbs. to 20 lbs. per cubic foot. This Bob may also be used in liquid applications.

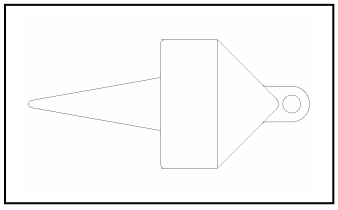


BBP-3
This Bob is designed for granular material with a density from 20 lbs. per cubic foot and greater. The BBP-3 bob should be filled with a material that is compatible with the material that is stored in the storage bin. Total weight of the Bob when full should be 16 to 20 oz. The BBP-3 Bob is made from an engineering plastic which will not damage the material handling auger in the unlikely event that the Bob should become separated from the unit.

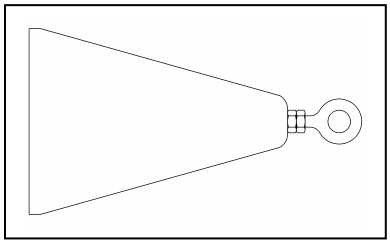


BBP-4
This submersible Bob is made of 316 stainless steel and was designed to penetrate a liquid to measure the solid substance which lies at the bottom of that liquid.

Probe Options



BBP-7
This stainless steel Bob is designed for granular materials from 20 lbs. per cubic foot and Greater. This Bob is Shipped standard with every SiloGauge remote.

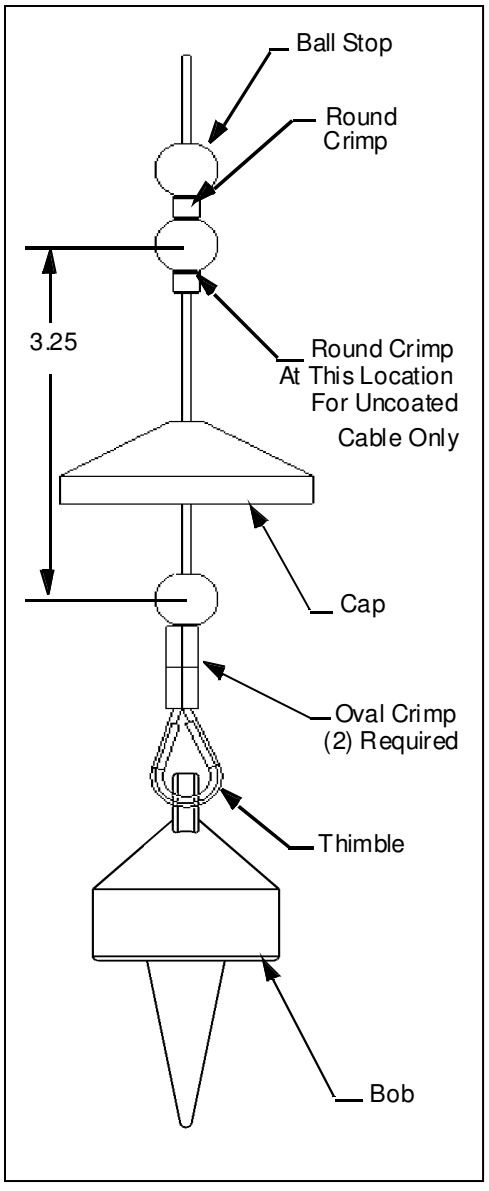


BBP-8
This Bob is a hollow inverted 4” cone made of stainless steel and is designed for bulk products with a density from 5 lbs. to 20 lbs. per cubic foot. This Bob should not be used in liquids.

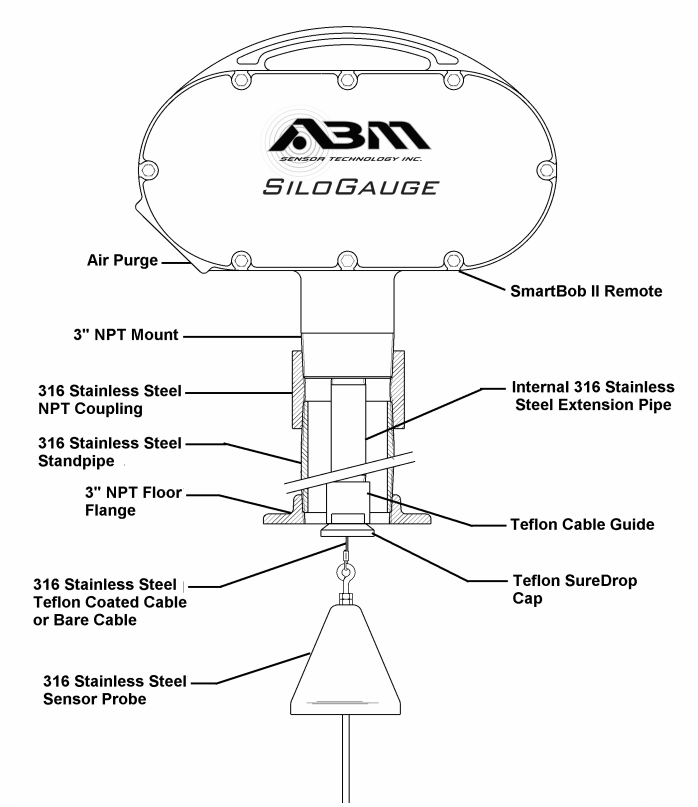
LIMITING STAINLESS STEEL CABLE
ASG-2000

It is important to limit the length of cable on the ASG-2000 remote, so that the bob is not lowered into an airlock, screw conveyor, or any other area that the bob might become trapped in. The ASG-2000 remote is shipped with 90' of cable unless otherwise specified. Disregard these instructions if the unit was ordered with the exact amount of cable necessary for your vessel. This procedure for limiting the cable should be done before the unit is installed:

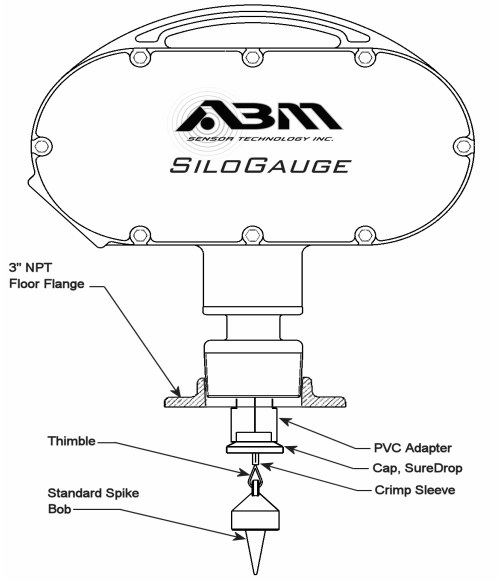
1. Remove the cable from the supply pulley by pressing the "CYCLE" button on the top of the PC board. Keeping the cable taunt, pull on the cable as the cable spools off the pulley. When the line is all paid out, the motor will reverse and try to rewind the cable. Hold the cable tight so it cannot rewind. The motor should now be shut off.
2. From the throat of the ASG-2000, measure the height of your vessel or the maximum distance you want the bob to travel into your vessel.
3. Cut the stainless steel cable through the suredrop, thimble and bob as shown.
4. Thread the stainless steel cable through the suredrop, thimble and bob as shown.
5. Tighten and crimp the noose around the thimble. Locate and crimp the round crimp as shown.
6. Test crimp by pulling on the cable and bob.
7. Rewind the cable onto the supply pulley or lower the cable and bob into the vessel. Tow rewind onto the supply pulley: Pull the cable taunt. Load the supply by pressing (and hold) the "RET-HI" button located on the circuit board. Pressing this button will start the supply pulley turning in a clockwise direction, with the cable winding over the top.
8. Continue installation of the unit on your vessel.



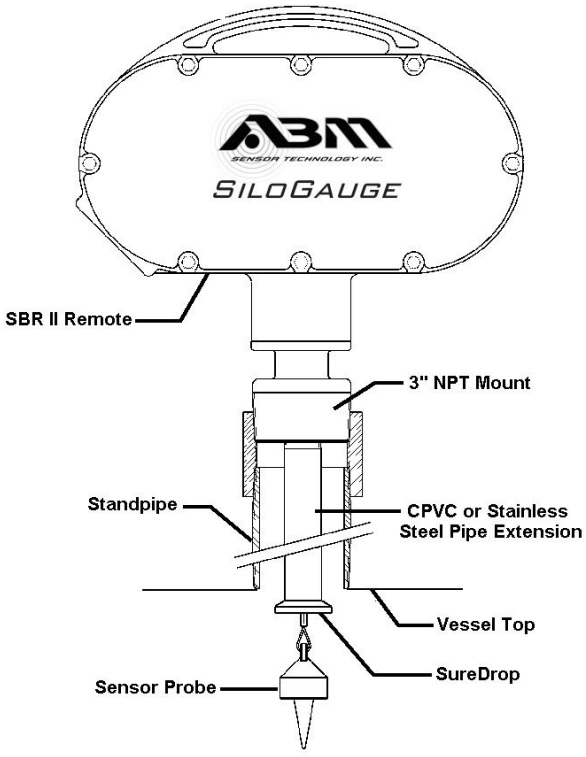
Mounting Options



High Temperature Mount

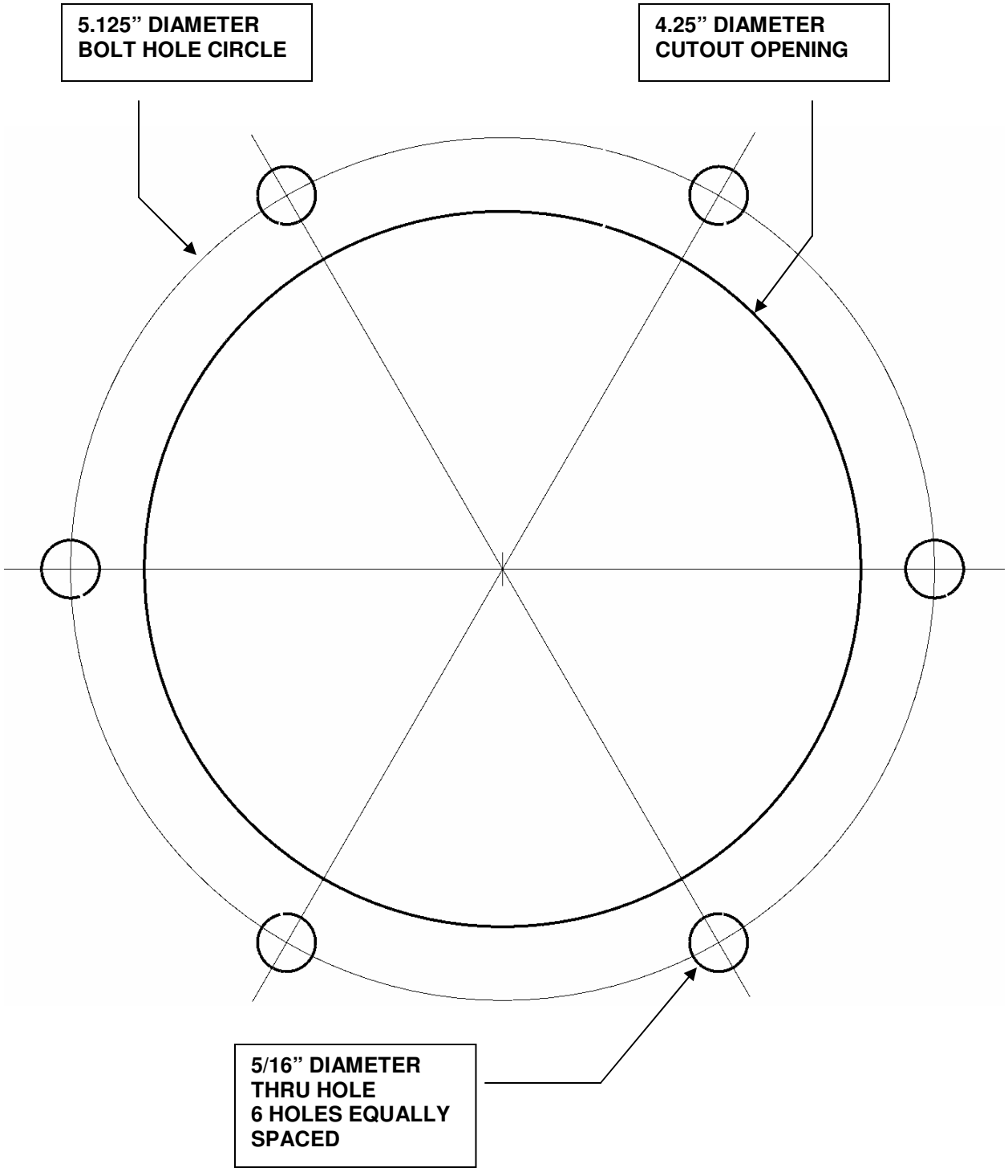


Standard Flange Mount



Pipe Extension Mount

SILOGAUGE REMOTE MOUNTING TEMPLATE

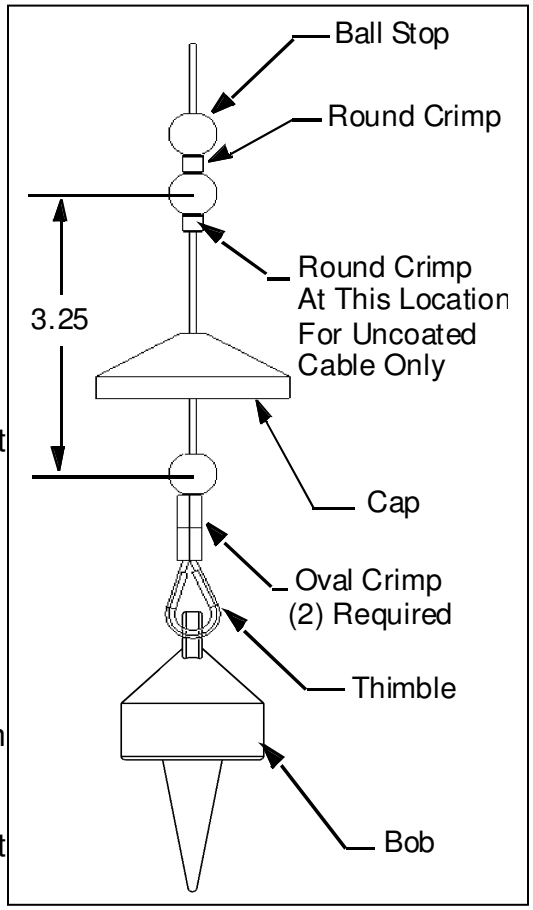


Suredrop Cable Release System

Assembly Instructions

Assemble the suredrop cable release system in the order as shown in the figure below.

1) Ball Stop
2) Round Crimp
3) Ball Stop
4) Cap
5) Ball Stop
6) Oval Crimp
7) Thimble
8) Cable



The Teflon balls are designed to be a tight fit on the cable. This is so the balls will not slip on the cable. Therefore the Teflon balls may be somewhat difficult to assemble onto the cable. The exception to this is with the balls used on an uncoated stainless steel cable. These balls are over size and will assemble with ease.

Using pliers, hold the cable about 1/8 inch from the end of the cable. This will keep the cable taut and straight while you press the cable through the Teflon ball. After all items are located as show, crimp the crimps in place. When compressing the crimps, be careful not to over tighten. Over tightening could cut and damage the cable.