

# INSTALLATION INSTRUCTIONS FOR PROTECTOSEAL

# Automatic Tank Gauges

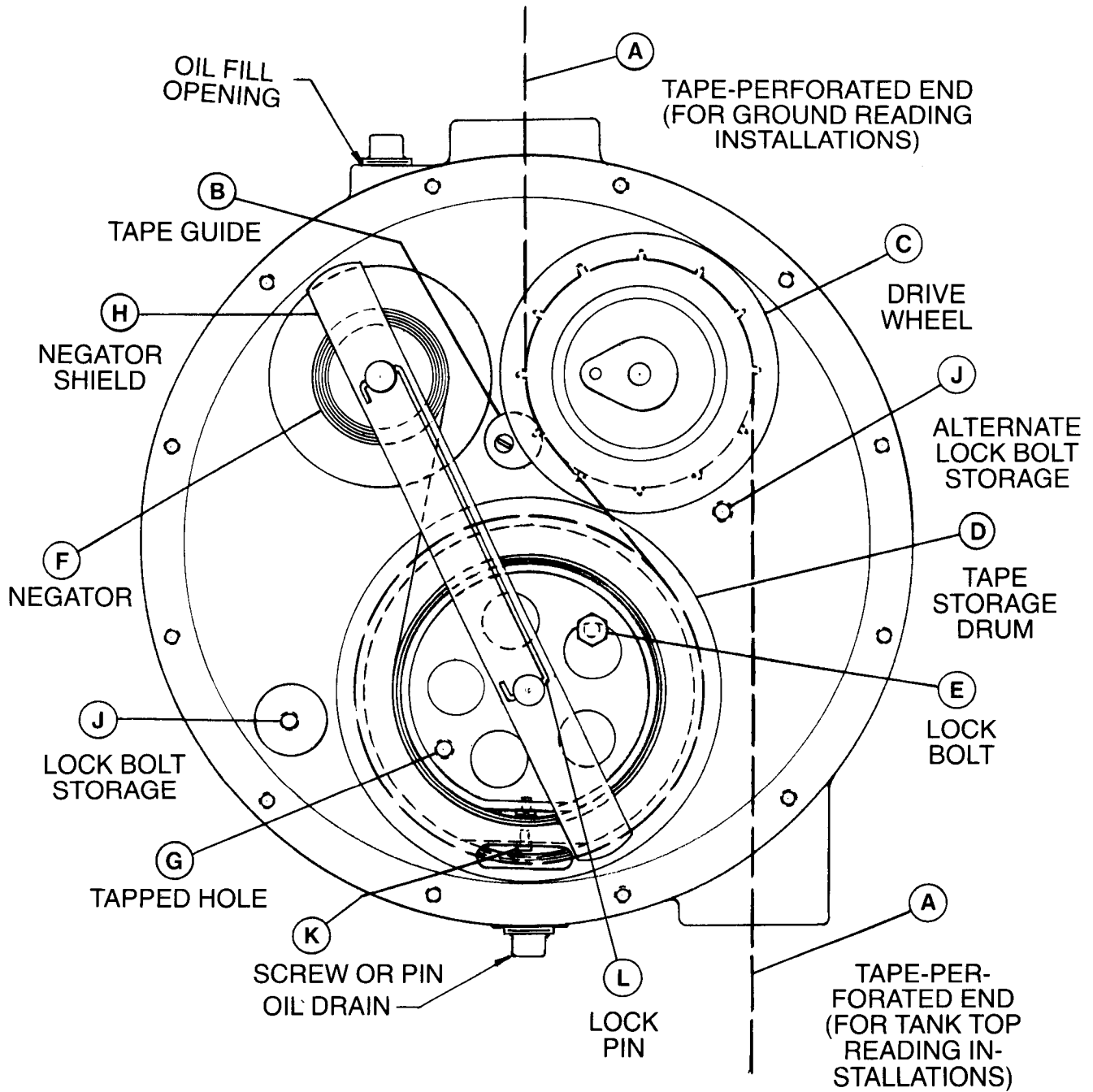


42000A SERIES  
42000B SERIES



**PROTECTOSEAL<sup>®</sup>**

***SAFETY WITHOUT COMPROMISE***



# Automatic type liquid level indicators

Read instructions carefully before proceeding with installation

## AUTOMATIC TANK GAUGE OPERATION

The liquid level sensing device of an automatic tank gauge is a float which remains buoyant on the surface of the liquid to a depth dependent on the specific gravity of the stored liquid. One end of a perforated tape is connected to the top of the float, while the other end is connected to a storage drum in the gauge head. The storage drum, in turn, is directly coupled to a constant-torque "negator" spring which keeps the tape taut between the float and the storage drum. The linear movement of the per-

forated tape imparts rotary motion to a sprocket or drive wheel over which it passes on its way to the storage drum. The rotating drive wheel is coupled to calibrated wheels that display the liquid level in feet, inches, and sixteenths of an inch, or, on a metric counter, in meters, decimeters, centimeters, and millimeters.

Friction of moving parts is reduced to a minimum through the use of Teflon bearings; Type 316 corrosion-resistant stainless steel is used for such

## Installation Instructions

Read instructions carefully before proceeding with installation, noting particularly cautionary notes shown in bold type.

### 42000 / 42000B SERIES — REFER TO DRAWINGS

1. Depending on the application of the liquid level gauge being installed or serviced, refer to the following basic drawings on pages 3 through 5:

APPLICATION	SEE
Ground Reading	Figure 1 (Page 4)
Tank Top Reading	Figure 2 (Page 5)
Ground Reading — With Liquid Seal	Figure 3 (Page 5)
Tank in Service	Figure 4D (Page 6)

2. Locate and mark the position of the holes for the two 1/4" half-nipples of the top anchor assemblies ② (Figures 1, 2 or 3) and the 1/2" half-coupling (supplied by customer) as shown on Figure 4A. The following points should be considered:

- a. If possible, position the top anchors within arms reach of a roof manhole or inspection hatch to facilitate subsequent servicing and inspection.
- b. If the fill pipe opening of the tank is located close to the proposed float position (and if the float cannot be relocated), it is recommended that a deflector plate be installed at the fill pipe opening in order to direct the impinging liquid stream away from the float.

3. Cut two 1/4" holes in the tank top and weld the two 1/4" half-nipples of the top anchors vertically in place as shown. Cut a hole for the customer-furnished 1/2" coupling and weld in place vertically, as shown.

4. Using plumb lines from each 1/4" half-nipple, locate and weld the bottom anchor ⑥ (Figures 1, 2, or 3) in its proper position on the tank bottom.

5. Refer to Figure 4B. Remove and lay aside the pipe caps and nipples of the top anchor assemblies. Also remove and lay aside the lock nut and washer of each top anchor bolt.

Insert the float guide wires ③ through the top anchor bolt down into the tank. Fasten the lower end of each wire to the bottom anchor as shown in Figure 4C. From the top of the tank, tighten the guide wires through the center hole of each top anchor bolt, making them as taut as possible. Make two right angle bends in the wire, feed the wire through the slotted top anchor bolt as shown in Figure 4B. Reinstall the washer and lock nut and tighten to lock the wire in place. Tighten the lower (adjustment) nut until the guide wire becomes spring-loaded. Reinstall the pipe caps and nipples, using a suitable thread lute if necessary. The float guide wires, when installed, must be straight, taut, and parallel. Do not kink or bend the wires during installation. For liquid seal installation, welded fittings as well as threaded connections must be tight. Run leakage

tests. For tanks already in service, see alternate method shown in Figure 4D.

6. Install the float assembly ⑤ on the guide wires by tilting the float on edge and engaging the guide wires by the wire loops on the float. The tape connection on the float must be on the top side. Set the float on the tank bottom.
7. Install desired height of 1/2" piping on the center 1/2" coupling. Next, install the two sheave assemblies ⑦ with their connecting piping (or one sheave assembly and one liquid seal assembly, if applicable). Locate and install the support brackets ⑧ (typically 10 feet apart) on the tank as shown. (Sheave assemblies and support brackets are not needed for tank top reading gauges.) All piping must be straight and plumb. Galvanized piping is recommended to reduce corrosion.
- 8A. Install the gauge head ① at a 90° angle to the tank side with the counter readout window at an average eye level and facing away from the tank.
- 8B. In the case of tank top reading installations, remove the 1/2" pipe plug from the bottom of the gauge head ① and install the plug in the top opening, using a suitable pipe lute to insure a tight seal. The gauge head can then be installed with the readout window in a convenient position.
9. Remove the main cover from the gauge head and the covers of each of the sheave assemblies (also liquid seal assembly cover, if used).
10. Refer to Figure 5.

**Caution: Do not remove Lock Bolt ⑥ holding the negator motor. The constant-tension spring of this motor is factory wound. If this bolt is removed without a full understanding of the following instructions, sudden release of the spring can cause personal injury or damage to the gauge head mechanism.**

11. NOTE: In the following discussion, reference will be made (parenthetically) to perforated or unperforated ends of the float tape. Tapes furnished currently are perforated throughout their length and references to the different ends can be ignored. (However, if you have an older system and are using these instructions for maintenance purposes, the material within parentheses will be helpful to you.) Keeping the float tape free of kinks, sharp bends or twists, thread the tape through the sheave assemblies and piping (keeping the unperforated end on the float side and the perforated end on the gauge side.) It should be threaded from the gauge head, through the piping, and into the tank. Any excess tape should be pulled into the tank so that the amount of tape extending beyond the tape storage drum in the gauge head does not exceed 6 feet.
12. Refer to Figure 5. Attach (the perforated end of) the tape ④ to tape storage drum ⑨ as shown. If the gauge head is equipped with a

**CAUTION:** Tank must be empty, free from flammable vapors and out of service before any welding, cutting and assembly

vital parts as the perforated tape, shafts, float, guide wires, drive pins, sheave wheels, negator and springs. The housing, covers and storage drum are made of aluminum. Wheels and pinions of the counter are made of a tough, resilient acetal resin and the inch and foot (or meter and centimeter) wheels are of phenolic resin.

double-ended leaf spring (on older models) it is not necessary to loosen the tape guide ⑧. Slip the tape between the tape guide ⑧ and the drive wheel ③, then mesh the tape perforations with the pins of the drive wheel by rotating the drive wheel. On later models the tape guide consists of a small wheel, mounted eccentrically. In this case loosen the screw that holds the tape guide and rotate the guide to permit meshing of the tape with the drive wheel. When meshed, the guide should be rotated so that the space between the tape guide and the tape is about  $\frac{1}{16}$ " inch (1.6 mm). The screw should then be tightened. Check to make sure there is no binding. Next, loop the tape clockwise around the storage drum ⑩ for about 300°, and attach the tape to the storage drum over the notch in pin ⑫.

13. Holding storage drum ⑩ firmly with one hand, remove lock bolt ⑪ and insert it in tapped hole ⑬ in the drum so that it can be used as a crank handle. Let the negator motor ⑭ slowly wind tape on the storage drum ⑩ three or four turns.

**Caution:** Do not let drum ⑩ slip away since the negator motor is under tension, and will rewind rapidly causing possible injury to personnel and damage to components. Having wound three to four turns of tape on the storage drum, replace lock bolt ⑪ so that the drum is again locked in place.

14. Next, assemble the tank end of the tape to float assembly ⑤ — with the float assembly resting on the tank bottom using the fastener provided (see Fig. 4E). Pull the tape taut, fasten securely, and cut off any excess tape.

15. Grasp storage drum ⑩ in the gauge head firmly and remove lock bolt ⑪ from its locked position. Release grasp on the storage drum slowly and let negator motor ⑭ exert tension on the tape pulling against the float. Remove lock pin ⑬ from storage drum shaft. Do not remove lock pin from negator shaft. Swing negator shield clear of tape storage drum.

16. Check for smooth operation of the tape over the sheave assembly pulleys and gauge head components by screwing lock bolt ⑪ into the tapped hole ⑬ on the storage drum, slowly cranking the float to the top of the tank and slowly letting it return to the tank bottom.

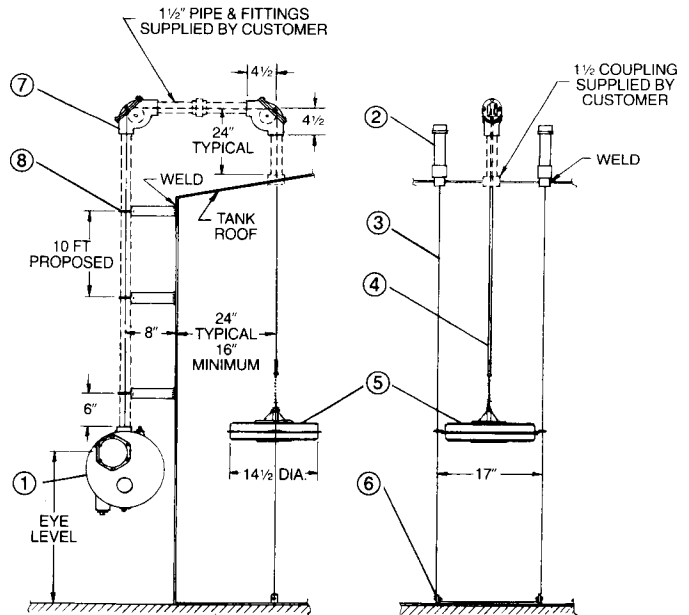
**Caution:** Do not let handle grip slip when cranking. The falling float will cause high speed rotation of the gauge head mechanism with subsequent potential damage to the counter mechanism, negator, float and tape as well as possible injury to personnel.

17. Unscrew lock bolt ⑪ from tapped hole ⑬ of the storage drum. Insert the bolt in its storage position in tapped hole ⑭ in the body of the gauge head. Do not replace the main cover at this point.

18. Proceed with setting the counter mechanism. Refer to pages 7 and 8 of these instructions.

## INSTALLATION DRAWINGS—FIGURE 1

### TYPICAL GROUND READING INSTALLATION

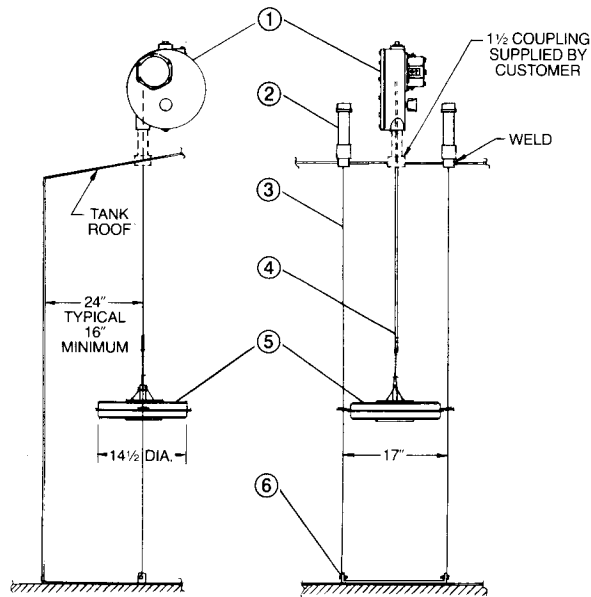


### PARTS LIST — 42000A/42000B SERIES

KEY NO.	PART NO.	QUANTITY	DESCRIPTION	DIMENSIONS	MATERIAL
①	4200B-50	1	Gauge Head Assembly	—	Alum. Housing with Anodized Alum. & Steel Parts and Teflon Bearings
	OR 42000BC-50	1	Gauge Head Assembly (with crank)		
②	41000-100-60	2	Top Anchor Assembly	1 1/4" NPT	Steel & St. Steel
③	41000-125-69	1	Guide Wire	2 X Tank Ht. + 5 ft.	#316 St. Steel
④	42000-90-69	1	Perforated Tape	Variable	#316 St. Steel
⑤	41000-225-69	1	Float Assembly	For 17" C/L	#316 St. Steel
⑥	41000-130-61	1	Bottom Anchor Assembly	—	Steel
⑦	42000-275-13	2	Sheave Assembly	1 1/2" x 1 1/2"	Alum. Housing, #18-8 St. Steel Wheel & Teflon Bearing
⑧	42000-110-61	*	Brace Assembly	—	Steel

\*One Brace Assembly for each 10 ft. of Tank Height

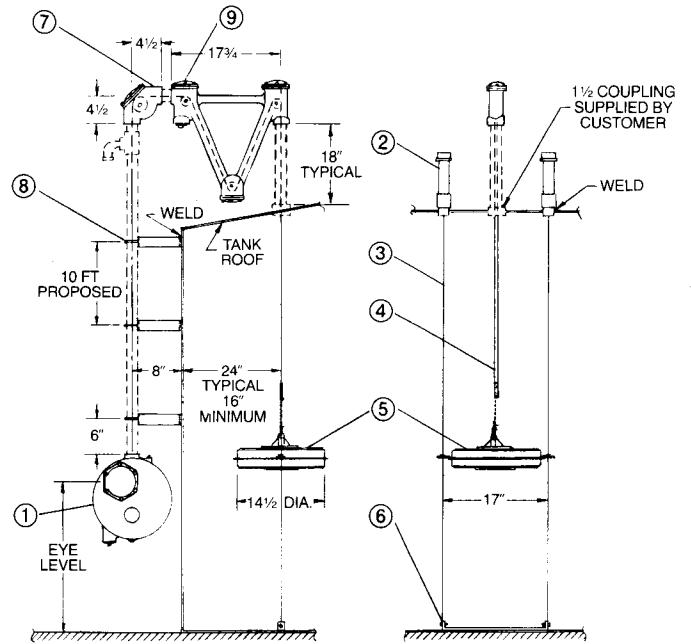
### TYPICAL TANK TOP READING INSTALLATION



### PARTS LIST — 42000A/42000B SERIES

KEY NO.	PART NO.	QUANTITY	DESCRIPTION	DIMENSIONS	MATERIAL
①	4200B-50	1	Gauge Head Assembly	—	Alum. Housing with Anodized Alum. & St. Steel Parts and Teflon Bearings
②	41000-100-60	2	Top Anchor Assembly	1 1/4" NPT	Steel
③	41000-125-69	1	Guide Wire	2 X Tank Ht. + 5 ft.	#316 St. Steel
④	42000-90-69	1	Perforated Tape	Variable	#316 St. Steel
⑤	41000-225-69	1	Float Assembly	For 17" C/L	#316 St. Steel
⑥	41000-130-60	1	Bottom Anchor Assembly	—	Steel

### TYPICAL LIQUID SEAL GROUND READING INSTALLATION

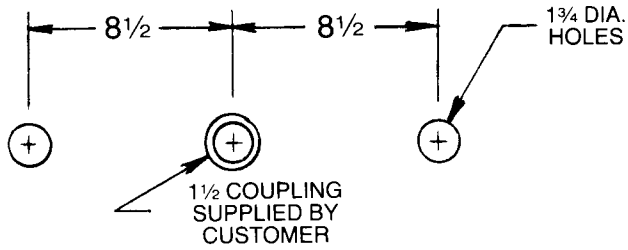


### PARTS LIST — 42000A/42000B SERIES

KEY NO.	PART NO.	QUANTITY	DESCRIPTION	DIMENSIONS	MATERIAL
①	4200B-50	1	Gauge Head Assembly	—	Alum. Housing with Anodized Alum. & St. Steel Parts and Teflon Bearings
②	41000-100-60	2	Top Anchor Assembly	1 1/4" NPT	Steel
③	41000-125-69	1	Guide Wire	2 X Tank Ht. + 5 ft.	#316 St. Steel
④	42000-90-69	1	Perforated Tape	Variable	#316 St. Steel
⑤	41000-225-69	1	Float Assembly	For 17" C/L	#316 St. Steel
⑥	41000-130-60	1	Bottom Anchor Assembly	—	Steel
⑦	42000-275-13	1	Sheave Assembly	1 1/2" x 1 1/2"	Alum. Housing, #18-8 St. Steel Wheel & Teflon Bearing
⑧	42000-110-61	*	Brace Assembly	—	Steel
⑨	41200-175-13	1	Liquid Seal Assembly	1 1/2" x 1 1/2"	Aluminum

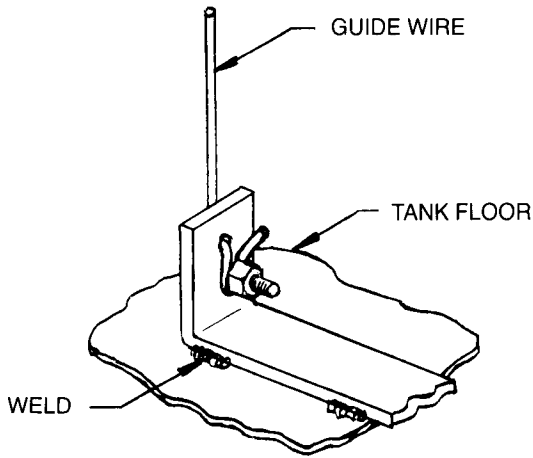
\*One Brace Assembly for each 10 Ft. of Tank

**FIG. 4A HOLE LAYOUT IN ROOF**

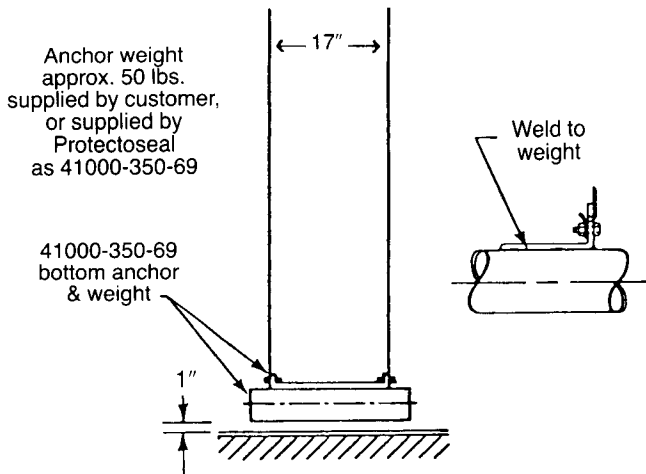


FLOAT DIAMETER	CABLE GUIDE DISTANCE	DIM. "A"
14 1/2" (Standard)	17"	8 1/2"
12" ("W" & "WC" Style)	13 1/4"	6-5/8"

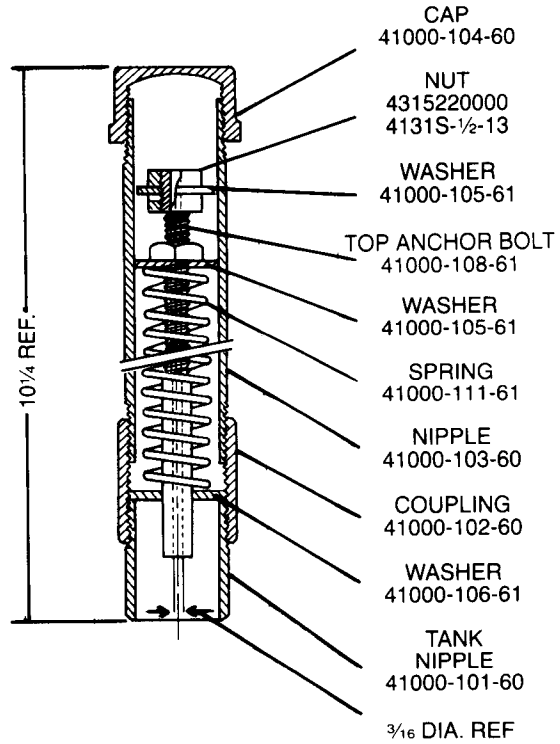
**FIG. 4C BOTTOM ANCHOR ASSEMBLY**



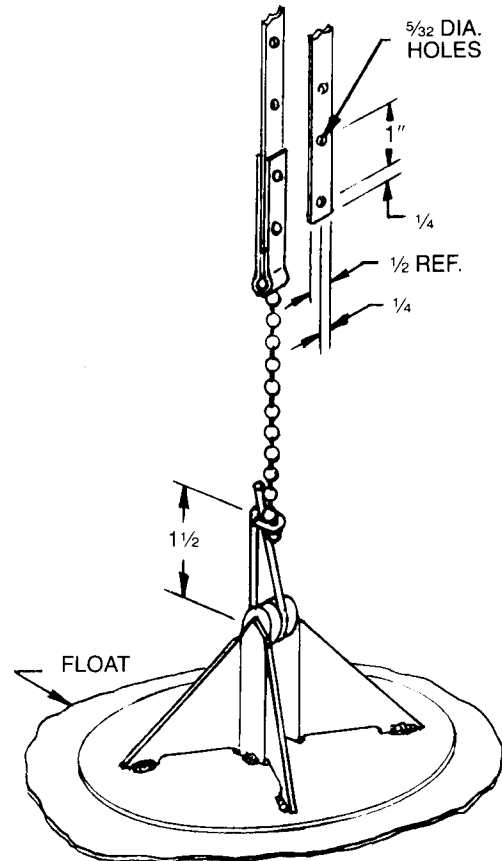
**FIG. 4D ALTERNATE METHOD OF ANCHORING FLOAT GUIDE WIRES TO TANK BOTTOM — FOR TANKS IN SERVICE**



**FIG. 4B TOP ANCHOR ASSEMBLY**

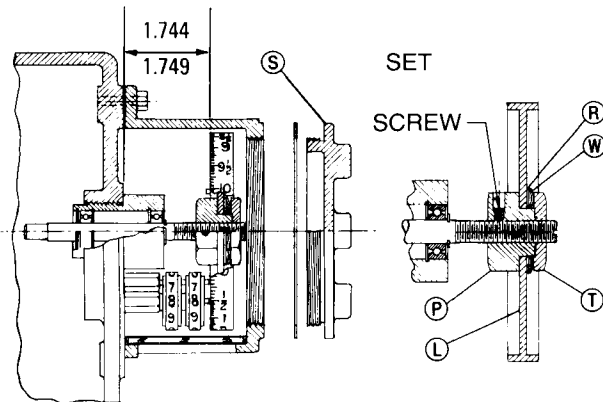


**FIG. 4E CABLE FLOAT ATTACHMENT**



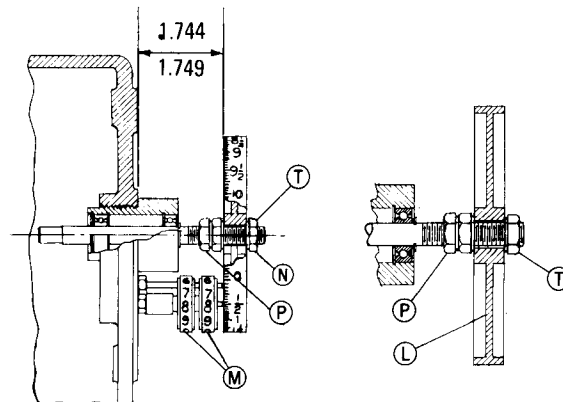
**FIG. 6A TOP VIEW  
(COVER PLATE REMOVED)**

CURRENT STYLE



**FIG. 6B TOP VIEW  
(COVER REMOVED)**

EARLIER STYLE



**COUNTER SETTING INSTRUCTIONS**

**Current Style**

Refer to Figure 6A (Page 7)

- 1a. Remove counter cover plate and gasket (S) from the gauge head.
- 2a. It is not necessary — in fact it is undesirable — to loosen or adjust threaded parts associated with the large inch (or centimeter) wheel (L). Wheel nut (P) has been positioned and locked in place with a set screw at the factory at a dimension that assures a proper mesh of the pinions and cogs of the various counter wheels. (Should wheel nut (P) be disturbed, it must be reset and locked in place at the 1.744 to 1.749 inch [44.3 to 44.4 mm.] dimension indicated in Fig. 6A). Drive nut (T) is pulled up against a shoulder of wheel nut (P), clamping wheel (L) by means of a wave washer (W) and friction washer (R). This permits adjustment rotation of wheel (L) on its shaft; once adjusted, however, it will stay in position.
- 3a. Use a suitable wrench to hold drive nut (T) in place. Rotate wheel (L) until the two small counter wheels (M) read 00. (Metric gauges have three counter wheels and are to be set at 000).
- 4a. Now rotate wheel (L) until it reads at the proper point with respect to the 00 or 000 setting of the counters. The reading on wheel (L) should be approximately 1-1/2 inches (38 mm.), the nominal liquid depth displaced by the float.

**Earlier Style**

Refer to Figure 6B (Page 7)

- 1b. Remove entire counter cover housing.
- 2b. Holding wheel nut (P) securely with an open-end wrench, loosen hexagon drive nut (T) on the outside of the large inch (or centimeter) wheel (L) just enough to permit the wheel to turn freely on its shaft.
- 3b. Rotate wheel (L) until the two small counter wheels (M) read 00. (Metric gauges have three counter wheels and are to be set at 000).
- 4b. Now rotate wheel (L) until its marking is at the proper point with respect to the 00 or 000 setting of the counters. The setting on wheel (L) should be approximately 1-1/2 inches (38 mm.), the nominal liquid depth displaced by the float.
- 5b. Lock wheel (L) firmly on shaft (N) by tightening the hexagon drive nut (T) slightly more than finger tight, holding wheel nut (P) with an open-end wrench. Do not apply excessive pressure, as this may distort the hub of the inch wheel or disturb the factory adjustment of the wheel nut (P). Should wheel nut (P) be disturbed, it must be reset and locked in place at the 1.744 to 1.749 inch (44.3 to 44.4 mm.) dimension indicated in Fig. 6B, to insure proper mesh of pinions and cogs of the counter wheels.

**Applies to Both Current and Earlier Styles**

Refer to Figure 5 (Page 6)

6. To check the proper operation of the counter mechanism, remove lock bolt (E) from its storage position (D), and screw the lock bolt into tapped hole (C) on the tape storage drum (D). Crank the float slowly through its entire travel and back again.
 

**Caution: Do not allow the float to fall free.**
7. Readjust the counter if necessary.
8. Store lock bolt (E) in its storage position in tapped hole (D).
9. Replace the counter cover or counter housing (S) and gasket.
10. Replace negator shield (H) with lock pin. Replace the gauge head cover and gasket. On gauges incorporating a hand crank (models with a suffix letter C in the gauge part number), the crank handle should be pulled out to its outermost position when replacing the cover. After the cover has been replaced, push the crank handle in and raise and lower the float by a few turns of the crank to make

- sure it engages the tape storage drum properly. Once the float is again on the tank bottom, pull the crank to its "out" position and make sure the crank retaining thumb screw is loose for normal operation. The thumb screw is used only to lock the float in its "up" position in those operations that require that it be raised out of the way when adding viscous or solid materials to the tank that might damage the float.
11. Replace covers and gaskets on sheave assemblies (and liquid seal, if used).
12. The gauge is now ready for service. Once product has been put into the tank, it may be desirable to make a final readjustment of the counter by comparing the counter reading to the earlier reading made by hand.

## REPLACEMENT OF NEGATOR

Refer to Figure 5 (Page 6)

1. Should it become necessary to replace negator ⑤, follow these instructions carefully.
2. Ideally, replacement should, if possible, be scheduled for a time when the storage tank is empty. Not only is exposure to vapors from the tank minimized, but also the smallest amount of perforated float tape and negator spring has to be dealt with during the replacement procedure. If it is necessary to replace the negator while the tank is in service, it would be well to take steps to prevent the inadvertent filling of the tank.
3. Remove the twelve main cover cap screws, the cover, and its gasket.
4. Unreel perforated tape ④ from tape storage drum ⑩ by pulling it out, starting at a point between drive wheel ③ and tape drum ⑩. The tape drum will rotate counter-clockwise as tape is pulled off. Negator ⑤ will rotate clockwise. Handle the tape being unreeled to avoid kinking or creasing it.
5. When the end of the perforated tape is visible on storage drum ⑩, insert lock bolt ⑥ to lock the drum in place. The tape end is held on the drum by either a screw or pin ⑧. Disengage the tape by removing the screw or unhooking from the pin. To prevent tape damage, lay the loose tape well out of the way.
6. While holding storage drum ⑩, remove and lay aside lock bolt ⑥. Allow the negator spring to wind itself up slowly on its core. When the end of the negator spring becomes visible, replace bolt ⑥ in its lock position to hold drum in position.
7. At this point it would be well to have available within easy reach a pair of pliers, a two-foot length of adhesive or electrical tape, and a few small pins or nails to serve as temporary shaft restraints after removal of the negator shield.
8. Carefully holding negator ⑤, loosen the screw connecting to drum ⑩ enough to permit removal of the plate from under the screw head. Holding the negator firmly, unhook the end of the negator spring from the screw head and allow it to wind onto its core.
9. Still holding the negator, use pliers to remove the lock wire or cotter pins and negator shield ⑨. Pull the negator off its shaft and wind several layers of an adhesive tape on the negator to keep it from telescoping.
10. Now slide the replacement negator onto the shaft, hub first. To insure that the negator and tape drum do not slide off their shafts during subsequent handling, insert pins or nails temporarily at the ends of both shafts.
11. Remove the negator shipping tape carefully. Hook the end of the negator spring over the screw on tape storage drum ⑩ in the direction shown in Figure 5. Slide the negator plate over the negator spring and under the screw head. Tighten the screw.
12. Lay perforated tape ④ out flat and reconnect it to storage drum ⑩, using screw or pin ⑧, so that there will be no twist in the tape when it is wound onto the drum. Remove lock bolt ⑥ and, using it as a handle in the tapped hole in the storage drum, reel in all loose tape. This will simultaneously wind the negator spring around the storage drum.
13. When all tape slack has been taken up, and while still holding lock bolt handle ⑥, check to see that the tape perforations are properly engaged on the pins of drive wheel ③. Then hold the tape drum while locking it by transfer of bolt ⑥. At this point, storage drum ⑩ will contain the same amounts of both perforated tape and negator spring as when the replacement procedure was started.
14. Remove the temporary pins from the shaft ends and replace negator shield ⑨. Insert and lock the retaining wire or cotter pins. Remove lock bolt ⑥ and store in storage position ④.
15. Rotate the operation checker (located below the counter window on the back of the gauge head) back and forth to see that the whole assembly responds freely and properly.
16. Replace the cover, evenly tightening the twelve cap screws in a diametrical sequence.

## OPERATION CHECKER

An operation checker is provided on the right-hand side of the gauge head. Turning the operation checker knob counterclockwise about a quarter turn and releasing it will lift and drop the float approximately 1-

1/4 inches (32 mm.). This action will free any sticking or binding of working parts. The counter reading will change during the checking procedure but should return to its original reading.

## LUBRICATION

1. Most of the bearings in this gauge require no lubrication, since they are made of Teflon. A few drops of light lubricating oil applied from time to time to the two ball bearings ⑧ (Figure 6) behind the inch wheel will keep them in good working order.
2. In some installations, it may be desirable to fill the main compartment and/or the counter compartment of the gauge head with oil either to protect the internal parts from corrosion by vapors of the stored product or to provide general lubrication of the operating parts. (It should be borne in mind that slight contamination of the stored product may occur from oil carryover into the tank by the perforated tape.)
3. Pipe plugs are provided at the top of both the main and counter compartments for filling and at the bottom of each for draining. Approximately 5 quarts are sufficient to totally fill the compartments.
4. The oil used should be selected for the lowest anticipated ambient temperature, according to the table below.

Lowest Temperature		Recommended Oil
°F	°C	
32	0	Low pour point mineral oil
-20	-29	Transformer oil
-60	-51	Synthetic base oil

# PROTECTOSEAL®



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