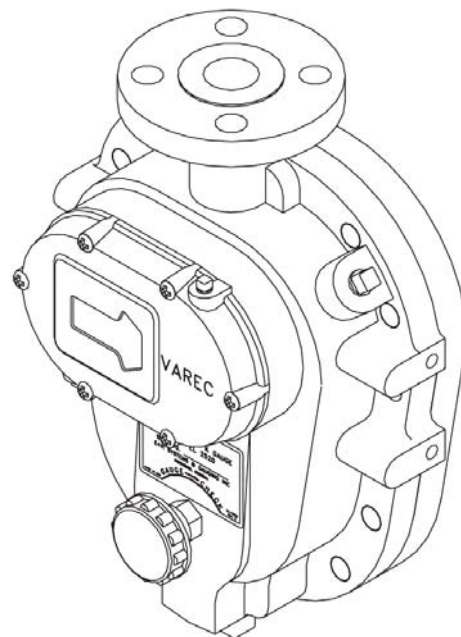


## 2520 High Pressure Automatic Tank Gauge

Mechanically operated, float and tape gauge for continuous liquid level measurement in bulk storage tanks



**Varec<sup>®</sup>**



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This manual is solely intended to describe product installation and functions and should not be used for any other purpose. It is subject to change without prior notice. This manual was prepared with the highest degree of care. However, should you find any errors or have any questions, contact one of our service offices or your local sales agent.

---

## Safety Precaution Definitions

**Caution!** Damage to equipment may result if this precaution is disregarded.

**Warning!** Direct injury to personnel or damage to equipment which can cause injury to personnel may result if this precaution is not followed.

## Safety Precautions

Read this manual carefully and make sure you understand its contents before using this product. Follow all instructions and safety guidelines presented in this manual when using this product. If the user does not follow these instructions properly, Varec cannot guarantee the safety of the system.

**Note** Comply with all applicable regulations, codes, and standards. For safety precautions, the user should refer to the appropriate industry or military standards.

**Caution!** Read and understand static and lightning electrical protection and grounding described in API 2003. Make certain that the 2520 High Pressure Automatic Tank Gauge (ATG) installation, operation, and maintenance conforms with the practice set forth therein.



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# 1 Introduction

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## 1.1 Using this Manual

This manual is designed to assist the user in the installation, operation, maintenance, and troubleshooting of high pressure Varec 2520 Series Automatic Tank Gauges. Former 2530 Series gauges for 300 psig service are included within the new feature/option series. These gauges are for use in 30 psig to 300 psig service. Low pressure Varec 2500 gauge installations are covered in the *2500 Automatic Tank Gauge (ATG) Installation and Operations Manual*.

Proper operation of the gauge requires the serious attention of the user to assure high quality control during the installation. Long-term, satisfactory performance of the gauge can thus be obtained. If the installation quality is compromised, gauge accuracy and life may be degraded.

This manual covers installation that is to be performed on tanks that are empty and are not in service. Varec service contracts provide the user substantial savings for maintaining and refurbishing the systems. Contact product service or marketing for further details.

---

## 1.2 Consider Redundant Installation

Varec urges that the user consider installing a redundant (duplicate) gauging system in high pressure installations, while a tank is empty. Even a high quality installation is subject to the possibility of failure in time. Operations of U. S. agencies, such as NASA, use back-up systems in high pressure gas and liquid handling. Situations may occur that make it impossible to repair a high pressure gauge system, while the tank is under pressure. For example, the optional plug valve will not permit the installation of a new perforated tape, if the installed tape is broken.

---

## 1.3 Getting Acquainted with the Tank Gauge Systems

System consists of the gaugehead (see Figure 1-1 on page 2), a cluster of three, type 304, stainless steel (S.S.) floats, perforated tape and the gauge piping, which carries the perforated tape. Changes in the liquid level in the tank raise or lower the float, which moves the tape, which drives a sprocket that is connected to the counter mechanism. The liquid level in feet and inches or meters and millimeters is displayed on dials, that are visible through a glass window on the gaugehead. The user may convert the liquid level to units of volume. This may be accomplished manually, or as is frequently the case, Varec's SCADA system performs the task.

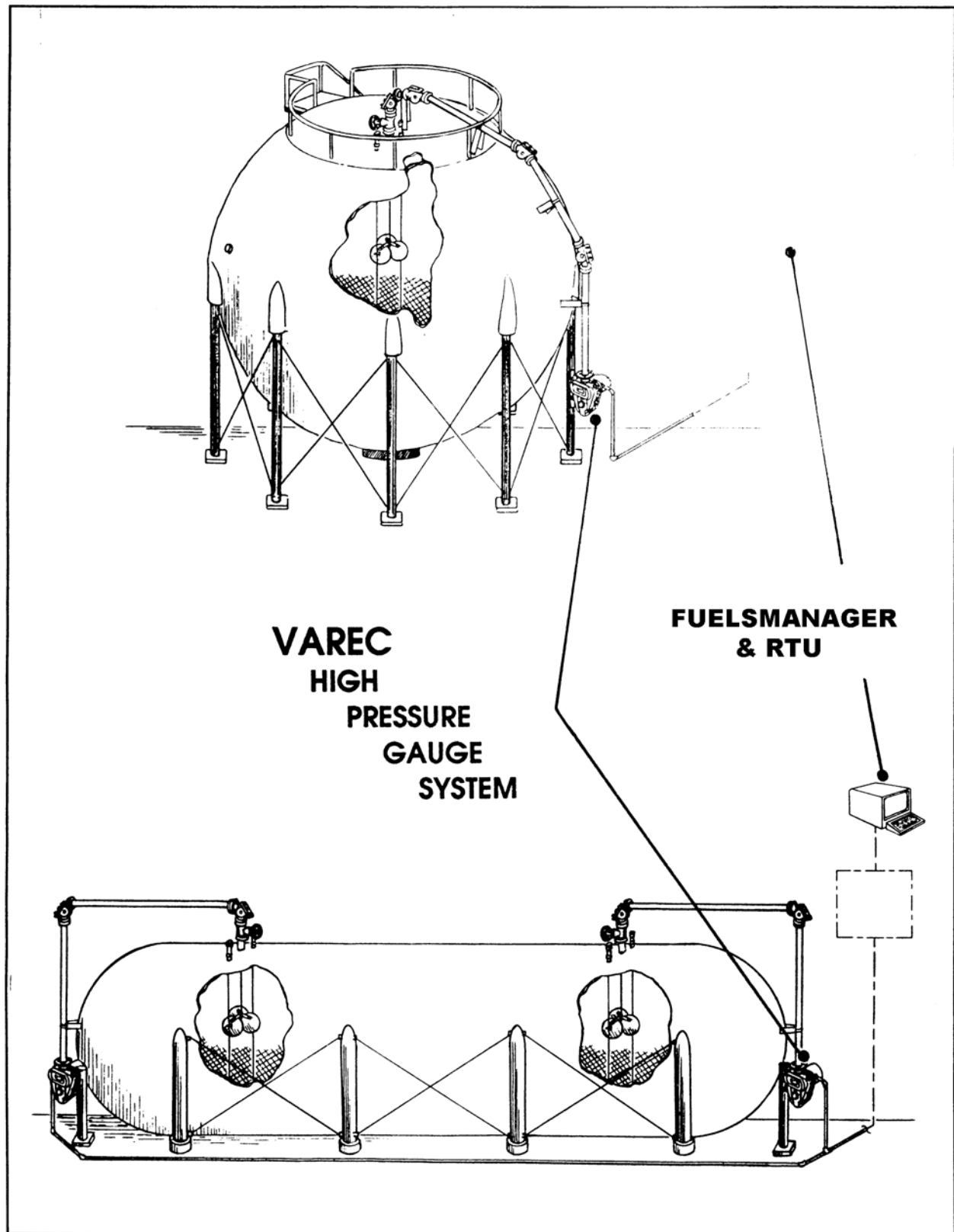


Figure 1-1: Typical Varec Model 2520 Installation

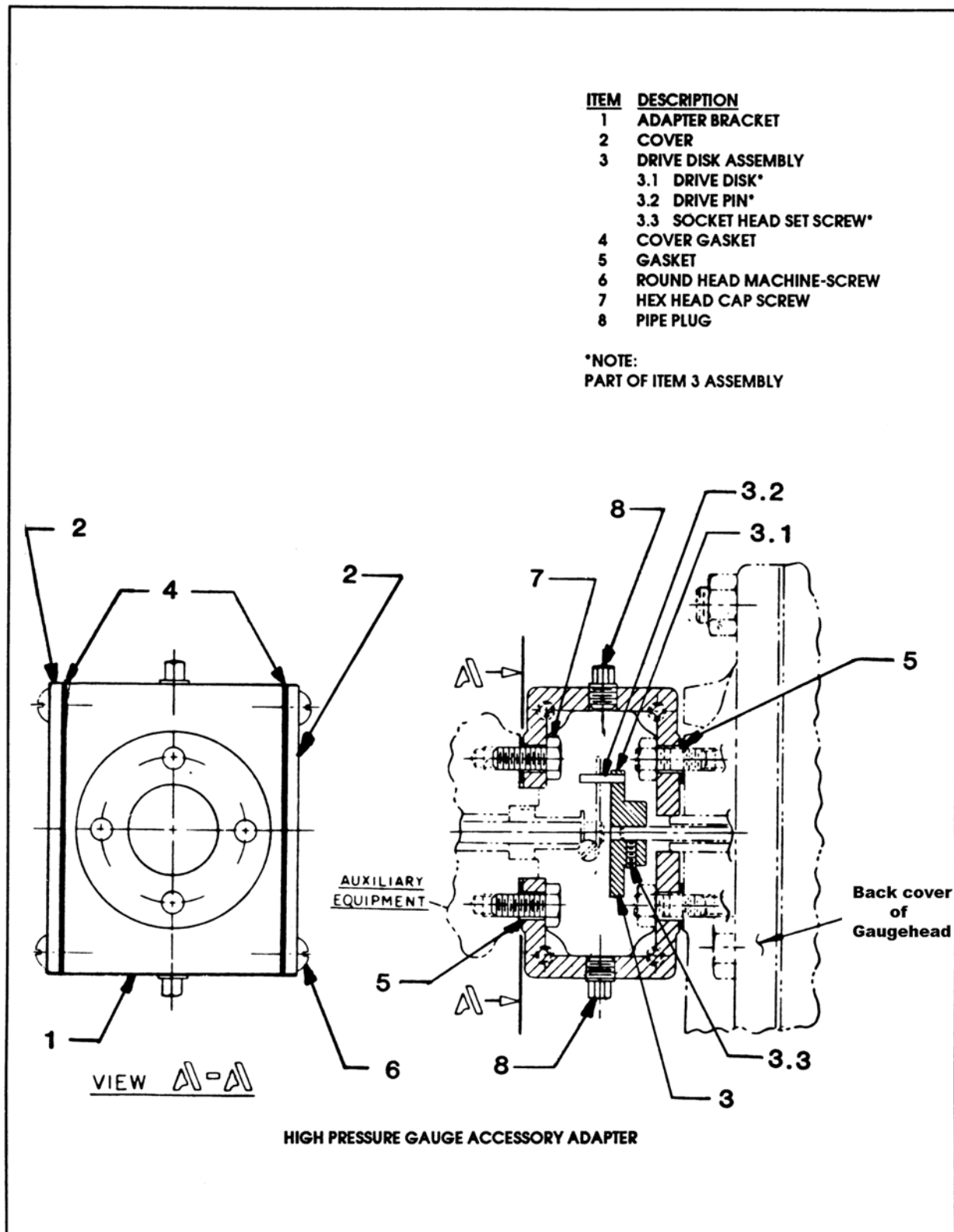


Figure 1-2: Varec Gauge Accessories

SCADA networks data from a tank farm. It can scan a large tank farm in less than five minutes and provide rapid status display and command, and control over tank farm activity.

Varec accessories may be attached to the gaugehead. These telemeter status and command information are used by Varec data acquisition systems. Figure 1-2 on page 3 illustrates the 2581 High Pressure Gauge to Transmitter Adapter that is needed to couple these accessories.

See Section 8.1, "Order Codes" on page 57 in Tables 8-1, 8-2, and 8-3 on pages 57 and 58 for details on standard configurations. Special order options are available, but this manual may not cover all of the details of a special order.

## 2 Identification

### 2.1 Device Designation

#### 2.1.1 Nameplate

The following technical data are give on the instrument nameplate of the 2520 High Pressure Automatic Tank Gauge:

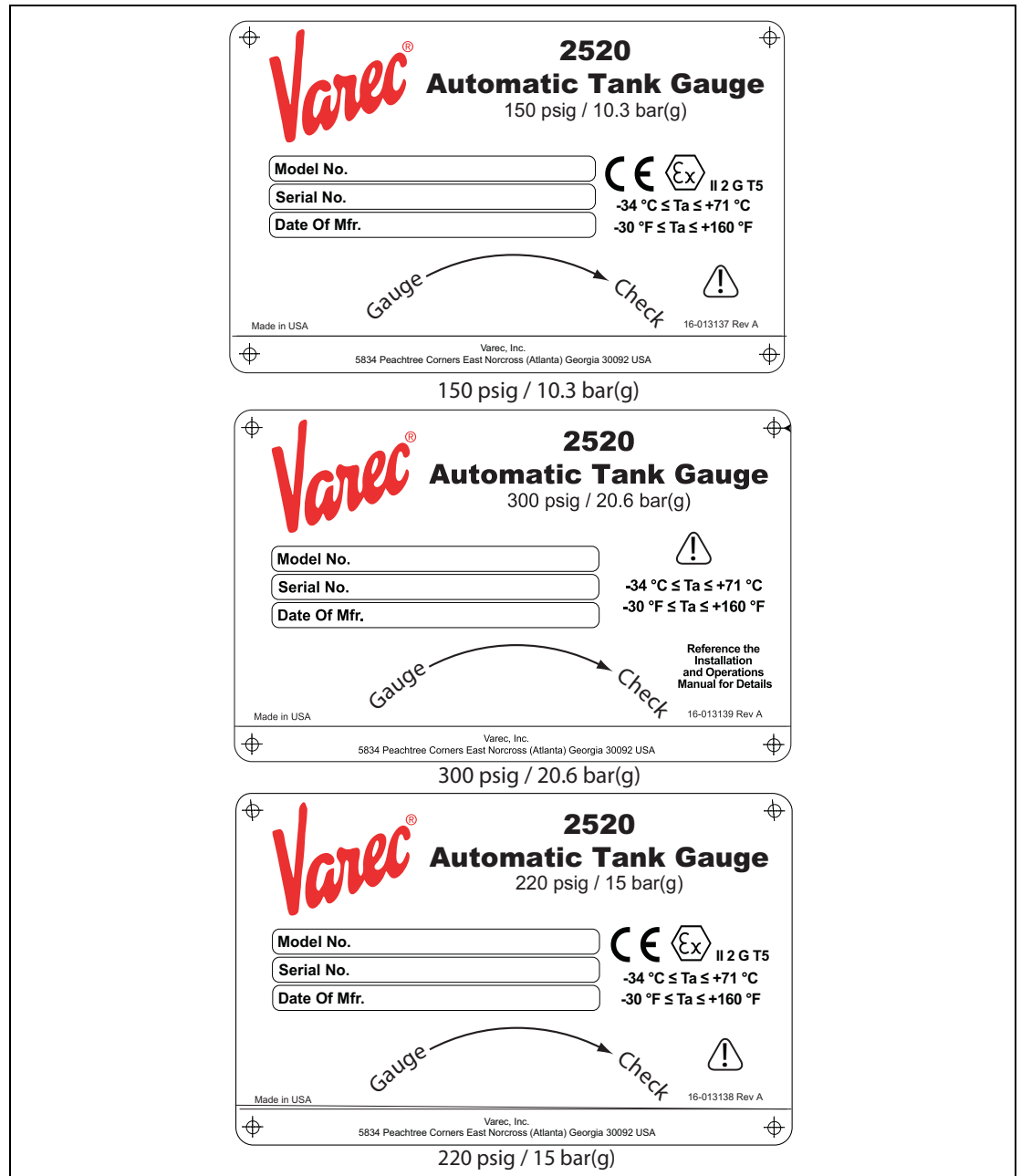


Figure 2-1: 2520 High Pressure Automatic Tank Gauge Labels



## 3 Installation

### 3.1 General Preparation

Read Chapter 1, "Introduction" on page 1. Determine the feature and option codes of the unit to be installed. Use Table 8-1, Table 8-2, and Table 8-3 on pages 57 and 58 to determine the appropriate installation figure in this user's manual. These are typical installations. All situations may not be covered. Contact Varec if additional information is needed. **It is paramount that the user monitors the quality of the installation to assure long-term, accurate performance.** If the quality is compromised, inferior operation may result.

Particularly important are:

- a. Accurate measurements referenced to the tank benchmark.
- b. Clean interior of the gauge piping.
- c. No kinks in the tape/cable.
- d. No noticeable binding friction in the mechanism.
- e. Installation cleanliness.
- f. True vertical gauge piping.

**! Warning** Make certain that the tank is empty and not in service. Ensure that the tank has been leak and pressure tested as appropriate for the liquid to be stored. Observe appropriate safety precautions in flammable or hazardous liquid storage areas. Do not enter a tank that has contained hydrocarbons, vapors, or toxic materials, until a gas-free environment is certified. Carry breathing equipment when entering a tank where oxygen may be depleted with carbon dioxide, nitrogen or other gases.

**! Warning** The mechanical connections between the guide cables, the float, the tape and the gaugehead provide an electrical resistance path to ground that is adequate for the safe electrical drain of electrostatic charges that may accumulate in the tank and the product. Worker activity and worker clothing may accumulate electrostatic charges on the body of a worker. Care should be used in flammable environments to avoid the hazard.

The user provides the 1 1/2-inch pipe that carries the perforated tape. The user must perform the welding tasks and install the necessary mounting. The user must drill holes in the tank as needed. Assemble the necessary tools and equipment at the work site. Table 3-1 on page 9 lists typical tools and equipment that may be needed. Use the drop cloth to maintain tool, equipment and installation kit cleanliness.

## 3.2 Planning the Installation

Installation of high pressure and medium pressure storage vessels for hydrocarbons requires planning that is not the same as that associated with atmospheric and low pressure tank storage. Butane and propane are the products most commonly stored. At atmospheric pressure and temperature they are gases. Butane liquefies at 37 psig at 100 degrees F and is usually stored in spherical vessels. Propane liquefies at 175 psig at 100 degrees F and is usually stored in cylinders (bullets).

Once filled, these vessels cannot be conveniently opened for repair and maintenance of the elements of the gauging system. For this reason, Varec suggests consideration of the installation of duplex tank gauges (see Figure 1-1 on page 2). Accurate level measurement must be assured at the time of the installation.

Place a pressure relief device near the gaugehead to bleed pressure, when maintenance is required.

Plan the pipe routing. Vertical pipe runs must be plumbed to be perpendicular to prevent the tape from binding inside the pipe.



Table 3–1 lists the typical required tools, equipment, and materials used when installing the 2520 ATG.

Tool/Equipment	Use
Wrenches	Selected for nuts/bolts/pipe
Screwdrivers	Selected for screws
Pliers	As needed
Level	Level pipe installation
Pipe taps/dies	Connect pipe segments
Vice	Hold pipe
Pipe cutter	Cut pipe
Cable cutter	As needed
Sheet metal shears	As needed
Electric drill	Drill holes
Drill bits	Selected for hole size
Hole cutters	Selected for hole size
Plumb bob	Check vertical plumb
Long measuring tape	Make required measurements
Chalk line	Mark lines
Chalk	Marking
String	Alignment
Compass	Centering/angle measurement
Protractor	Centering/angle measurement
Shovel	As needed
Pick	As needed
Welding equipment	Weld pipe supports
Breathing equipment	As needed
Tank hand gauge	Manual measurement
Clean drop cloth	Keep dirt off tape/tools
Loctite 567	Pipe thread compound
Dow Corning 4 compound	Mil-S-8660 white silicon grease
Dow Corning RTV 737	Multipurpose sealant
Loctite 262	Permanent thread locker
LPS 2	Lubricate screws, nuts, bolts, shafts, etc.

Table 3–1: Typical Required Tools, Equipment, and Materials

**Note** The user must attach the pipe carrying the tape to the tank by welding the supplied brackets. If the environment is such that welding cannot be performed, the user can construct a support structure with 3-inch (75 mm) pipe or conduit close to the outside of the tank. The brackets can be welded to the support structure at another location, if necessary, and the pipe structure assembled at the tank site. Refer to Document IOM001\_2500 for additional details.

The user should comply with all applicable regulations, codes, and standards. For safety precautions, the user should refer to the appropriate federal, state, local, industry or military standards.

### 3.3 Spheres and Cylinders to 16 Feet Diameter, Grade Level Installation

For spheres and cylinders to 16 feet diameter with the gaugehead located on the side, near grade level, see Figure 3-1 on page 13 for N2520 01 T01, N2520 02 T01, N2520 03 T05, N2520 04 T05, N2520 05 T05, and N2520 06 T05 feature/option installation kit codes. Refer to Table 8-1, Table 8-2, and Table 8-3 on pages 57 and 58 for details.

Make certain that after the installation is completed, it is checked and then doubled checked for proper installation. After the tank is pressurized, the user will have no easy method of correcting the errors that cause a float cluster to stick and the tape and cables to bind.

1. Determine the position on the tank roof, beneath which the center of the cluster of floats will rise and fall.
2. Provide the roof holes shown in Figure 3-1 on page 13, centered on this position. The guide cable holes are centered 8.50 inches (216 mm), each side of the center of the cluster of eight inch diameter floats. The tape pipe is centered on a 17.00-inch (432 mm) diameter. The plug valve is also centered on this dimension.
3. Weld a 1 1/2 inch ANSI 150 lb. or 300 lb. flanged nozzle into the top pipe center hole. Make certain that it is welded in true vertical position. Hold it plumb while welding. Failure to place the flanged nozzle in a true vertical position may affect the accuracy of the gauge. Make sure that the interior of all flanges and pipes are clean and corrosion free.
4. Weld the top, cable anchor 1 1/4 inch flanged nozzles into their respective holes. Make certain that they are welded in a true vertical position. Check with a plumb line prior to welding and maintain the plumb position during welding. Make sure that the interior of the flanges remains clean and corrosion free.
5. Install the plug valve, if it is to be installed, and install the top sheave elbow.

**Note** Varec recommends that a plug valve be installed to facilitate gauge maintenance. Use of parts that are not manufactured or supplied by Varec, voids any Varec warranty and relieves Varec of any obligation to service the product under warranty.

6. Weld the side support bracket in place.
7. Construct the gaugehead support stanchion and weld the gaugehead support bracket in place. Make certain that it is plumb and positioned as shown.
8. Install the tankside vertical pipe in the bracket. Make certain that it is plumb.
9. Install the tankside 90-degree sheave elbow and the horizontal pipe to the other elbow. Make certain that dimensioning remains as indicated.
10. Remove the housing nipple and cap from the top cable anchors and hang plumb lines from them at the center to mark the position where the bottom cable anchors will be welded.
11. Mark the plumb bob string at the height of the tank benchmark. This will assure that the plumb bob just touches the bottom, when the reference is made from the benchmark distance to the bottom.
12. Open the top sheave elbow and hang a plumb line through the center of the top tape pipe to the bottom to mark the float center. This should be 8.50 inches (216 mm) at the bottom from each of the bottom cable anchor positions.
13. When the positioning has been checked, weld the bottom cable anchors into place.
14. Thread the float cables into the tank through the top anchor fittings. Fasten them to the bottom cable anchors with the furnished hardware. Thread the upper end of each guide cable through the top anchor assembly. Hand tighten. Use the lock nut to lock the cable in place, then tighten the adjustment nut, until the guide cable is tensioned by the spring.
15. Replace the housing nipple and cap.

**! Warning** Whenever the back cover of the gaugehead is removed, make certain that internal pressure has been bled. Stand back as the last bolt is removed. If the negator motor spring is broken, the broken pieces may cause injury when the cover is removed.

16. Remove the back cover and gasket from the gaugehead (see Figures 3-2 and 3-3 on pages 15 and 16).
17. Remove the bolts, cover, and gasket from the other elbow.
18. Mount the gaugehead on the bracket and attach the pipe and flanged nipple to the top.
19. Tilt the float cluster on edge and slip the guide cables through the loops on the inside of the tank (see Figure 3-4 on page 17). Set it on the tank bottom with the tape connection up.
20. Check the part number on the roll of perforated tape to be sure that it is long enough for the tank. At the elbow on the tank entry pipe, unroll one or two turns of the perforated tape and start to feed it into the horizontal pipe. Leave the tape in the box and continue to unroll it several turns at a time until it enters the gaugehead.
21. Spread a clean ground cloth below the gaugehead and remove the lower hole plug.
22. Continue to unroll the tape several turns at a time feeding it through the gaugehead and lower tape hole and onto the ground, from the tank entry pipe elbow, until the tape is unrolled. Make sure that the tape on the ground does not become kinked or dirty.
23. At the elbow on the tank entry pipe, lower the end of the tape through the pipe to the tank bottom. Let several inches fall on the tank bottom.
24. Remove the product specific gravity reference tag from the float cluster and save it. Attach the tape to the float cluster with the furnished fastener. Feed the other end of the tape over the sheave in the elbow above and make sure that it is seated on the pulley.

Figure 3-1 shows a typical grade level installation for spheres and cylinders to 16 feet in diameter.

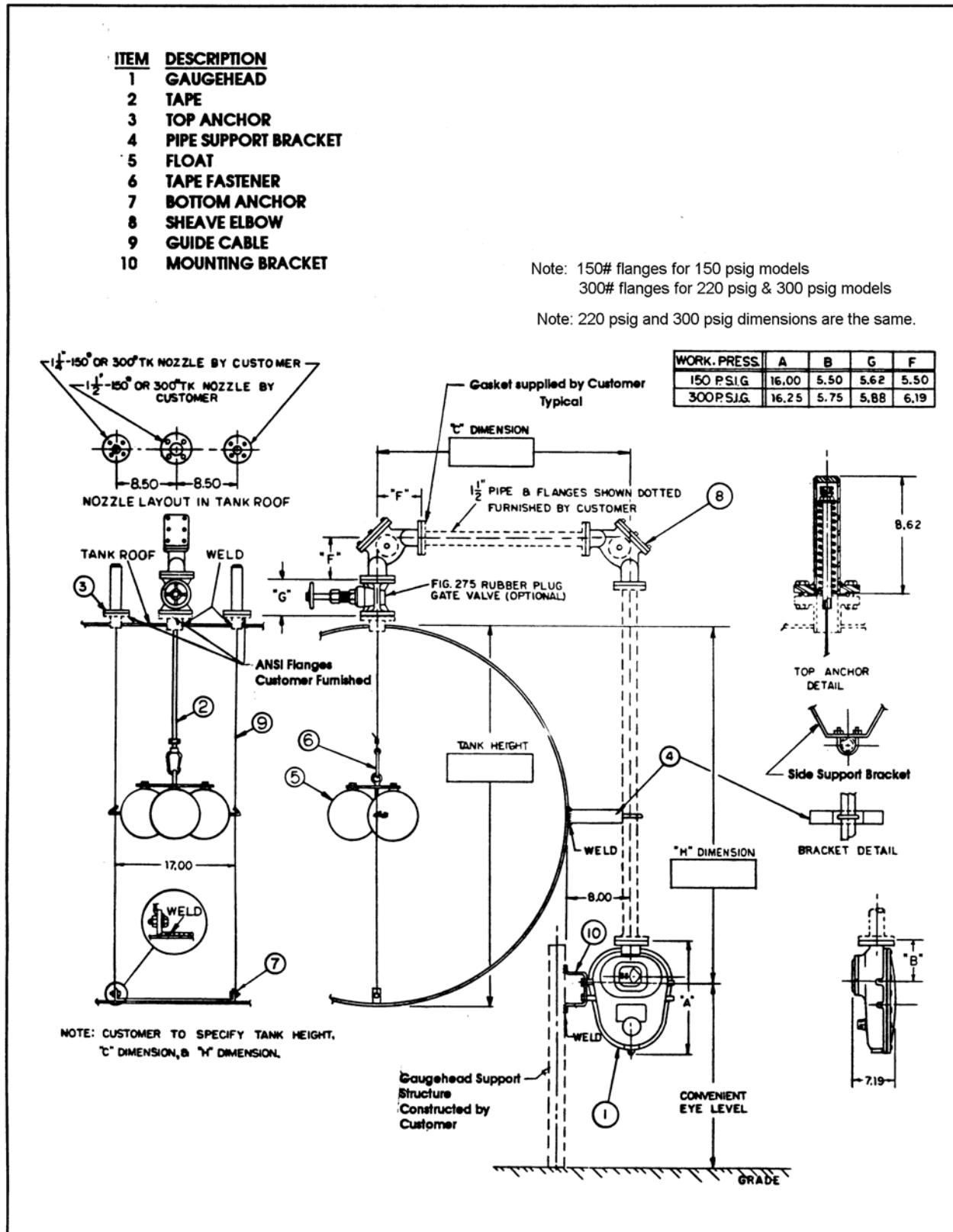


Figure 3-1: Typical Grade Level Installation for Spheres and Cylinders to 16 Feet Diameter

25. See Figure 3-5 on page 19 and attach the furnished installation crank to the tape storage gaugehead tape storage sheave.
26. The negator spring motor delivered with the gaugehead was selected by the user's specification of the tank depth of the installation. Use the installation crank. Wind the motor clockwise the number of turns shown in Table 3-2, then tighten the thumbscrew.

**! Warning** Use a firm grasp on crank while winding motor. Tighten thumbscrew before releasing grip. The rapid unwinding of the spring could result in the crank spinning and striking the operator.

Table 3-2 lists the number of turns to wind the negator motor.

Gaugehead Motor	Motor Sheave Assembly	Number of Turns
Extra Strong, PI-22	BA17725	47

*Table 3-2: Turns to Wind Negator Motor*

27. After the motor is wound and the thumbscrew securely tightened, reattach the tape to the storage sheave.
28. Pull the tape on the ground back through the gaugehead. Put the first hole in the tape on a pin of the sprocket close to the tape guide. Rotate the sprocket clockwise to pull the tape through the guide. Pull the tape around the storage sheave. Fasten the tape to the tape storage sheave with the sheave pin. Wind the excess tape counter-clockwise around the storage sheave until the slack is removed.
29. Check the tape path between the float cluster and the gaugehead to be sure that it is not kinked or twisted. Also check the float guide cables for kinks.
30. Make certain that the float cluster guide cables are parallel.
 

**Caution** Do not allow the float cluster to fall back to the floor of the tank. Damage may result.
31. Loosen the thumbscrew. The spring motor will pull the tape taut.
32. Slowly, smoothly crank the float cluster to the top of the tank and return it to the floor, while observing the tape travel through the elbows and gaugehead. There should be no noticeable binding. The counters will be zeroed in steps following, but they should register during the float travel.

Figures 3-2 and 3-3 on page 16 show exploded views of a typical gaugehead.

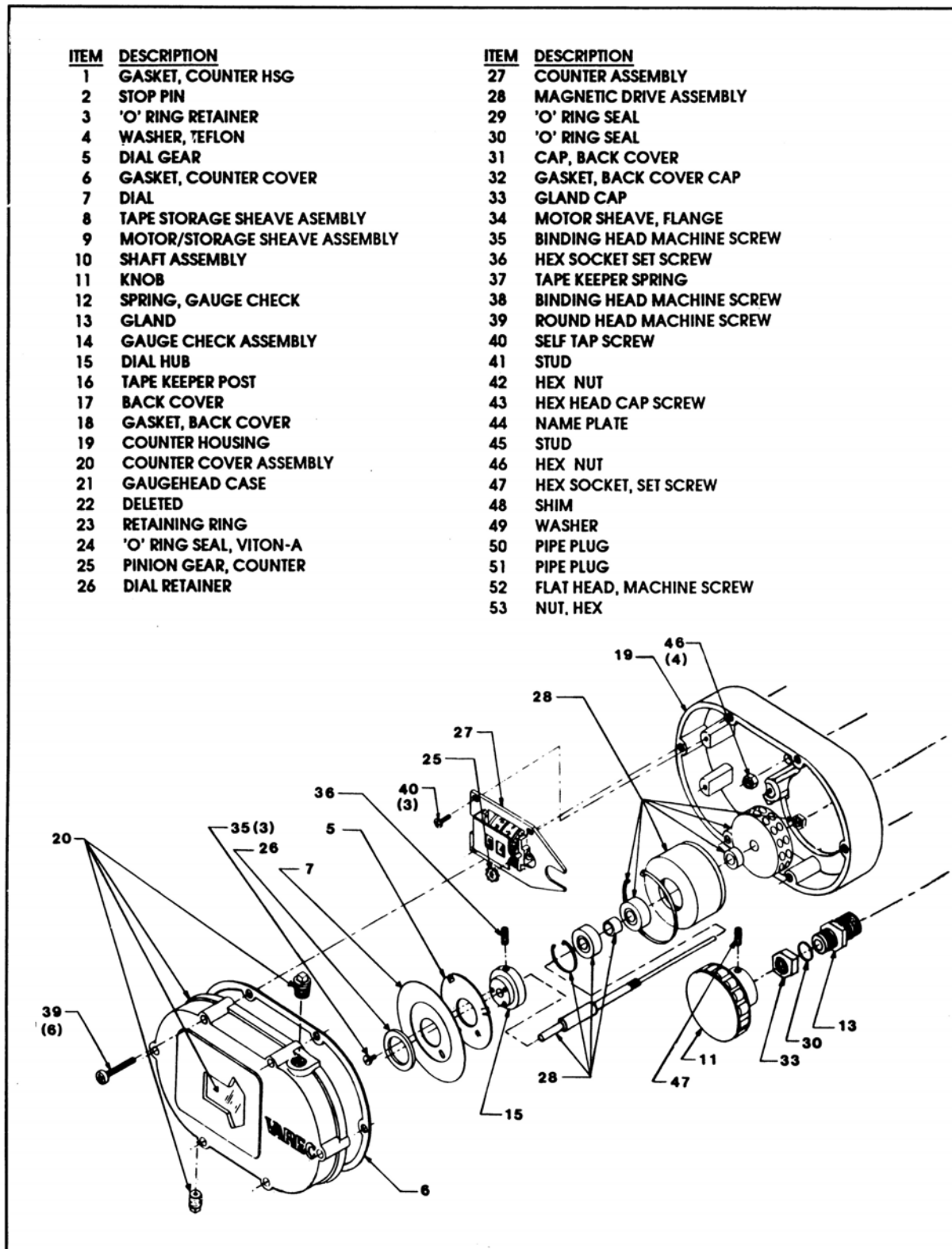


Figure 3-2: Exploded View of a Typical Gaugehead

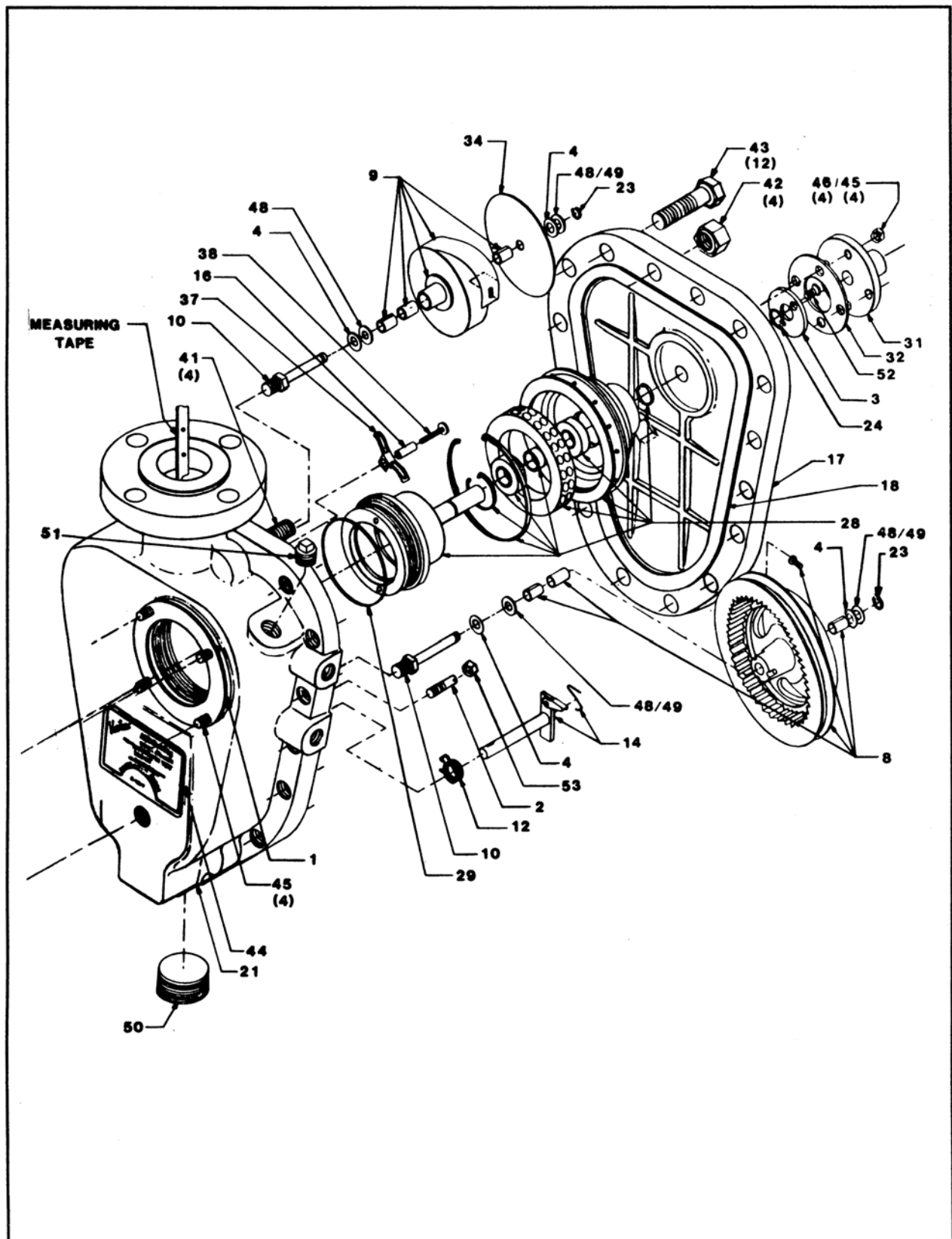


Figure 3-3: Exploded View of a Typical Gaugehead



Figure 3-4 shows a float cluster.

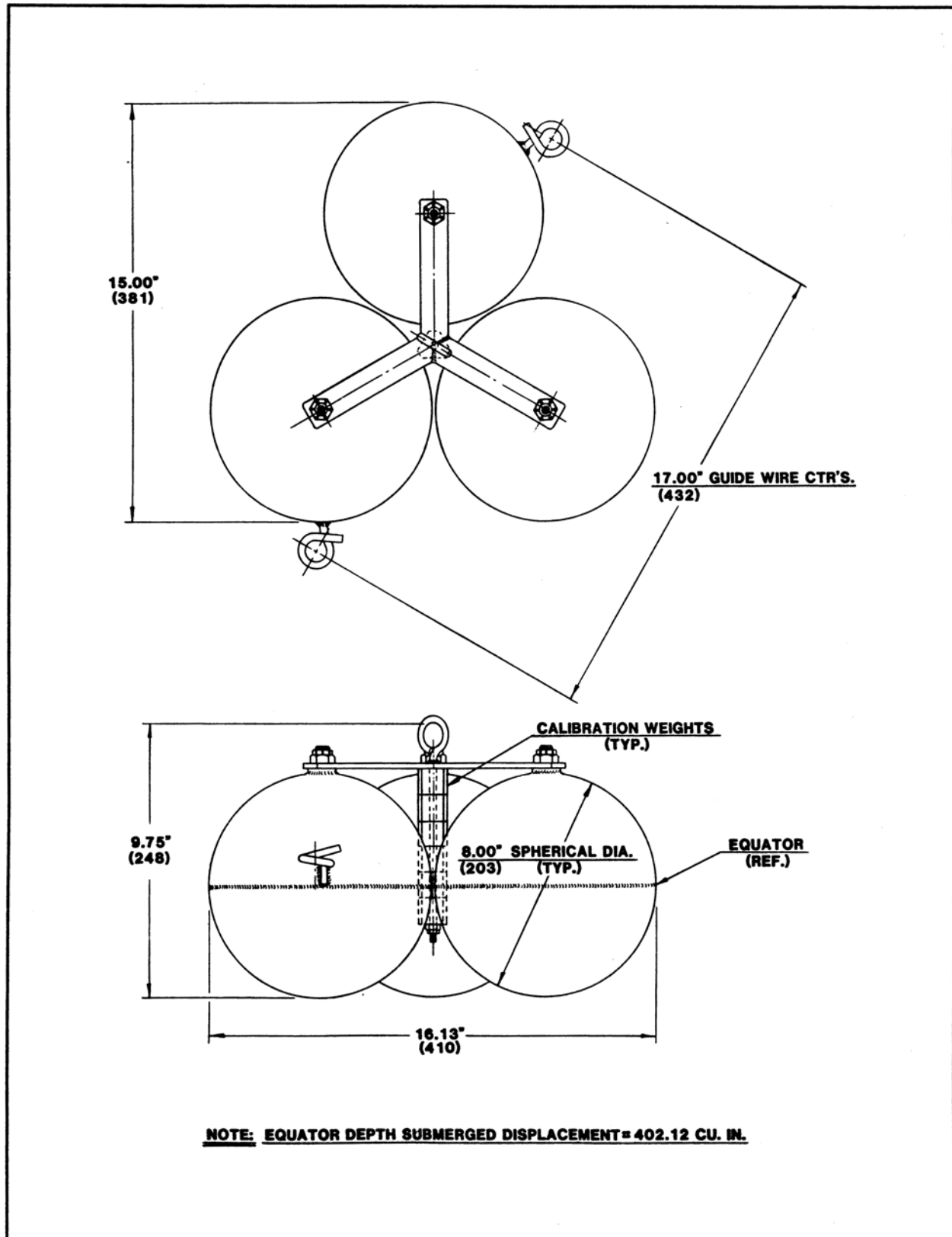


Figure 3-4: Float Cluster

### 3.3.1 Zeroing the display

1. See Figure 3-2 on page 15 and remove the cover from the counter mechanism of the gaugehead.
2. See Figure 2-5 and loosen screws, "A" until the dial plate, "C" and gear "H" rotate freely and independently of the hub.
3. Check that the float cluster is at the bottom of the tank with the tape taut. Rotate dial "C" and gear "H" until counter drums all display zero.

### 3.3.2 Initial calibration

These instructions apply to systems that use a float cluster. The float cluster is shipped with six weights attached (see Figure 3-4 on page 17). Table 3-3 on page 20 lists the submersion depth of the cluster for products having specific gravity ranging between .45 and .69 and the quantity of the weights that are required. Refer to the tag removed from the float cluster if this information should be needed in the future.

**Note** During manufacturing, lead shot may be added to the interior of each sphere to make the equator depth submerged displacement equal to 402.12 cu. in., when the specific gravity is beyond the standard range between .45 and .69.

1. Determine the specific gravity of the product to be stored.
2. Refer to Table 3-3 on page 20 and remove the required number of eights.
3. Pull up on the dial and gear "H" to disengage them from the counter pinion, then rotate the dial to indicate four inches (102 mm) for products with specific gravity between .51 and .69 (at 60 degrees F.) For product of specific gravity of .48, set the dial and drums to indicate four and 1/8 inches (104.8 mm). For product of specific gravity of .45, set the dial and drums to indicate four and 1/4 inches (107.9 mm).
4. Re-engage the gear and pinion. Tighten screws "A".

Figure 3-5 shows a tape installation on a low pressure gaugehead.

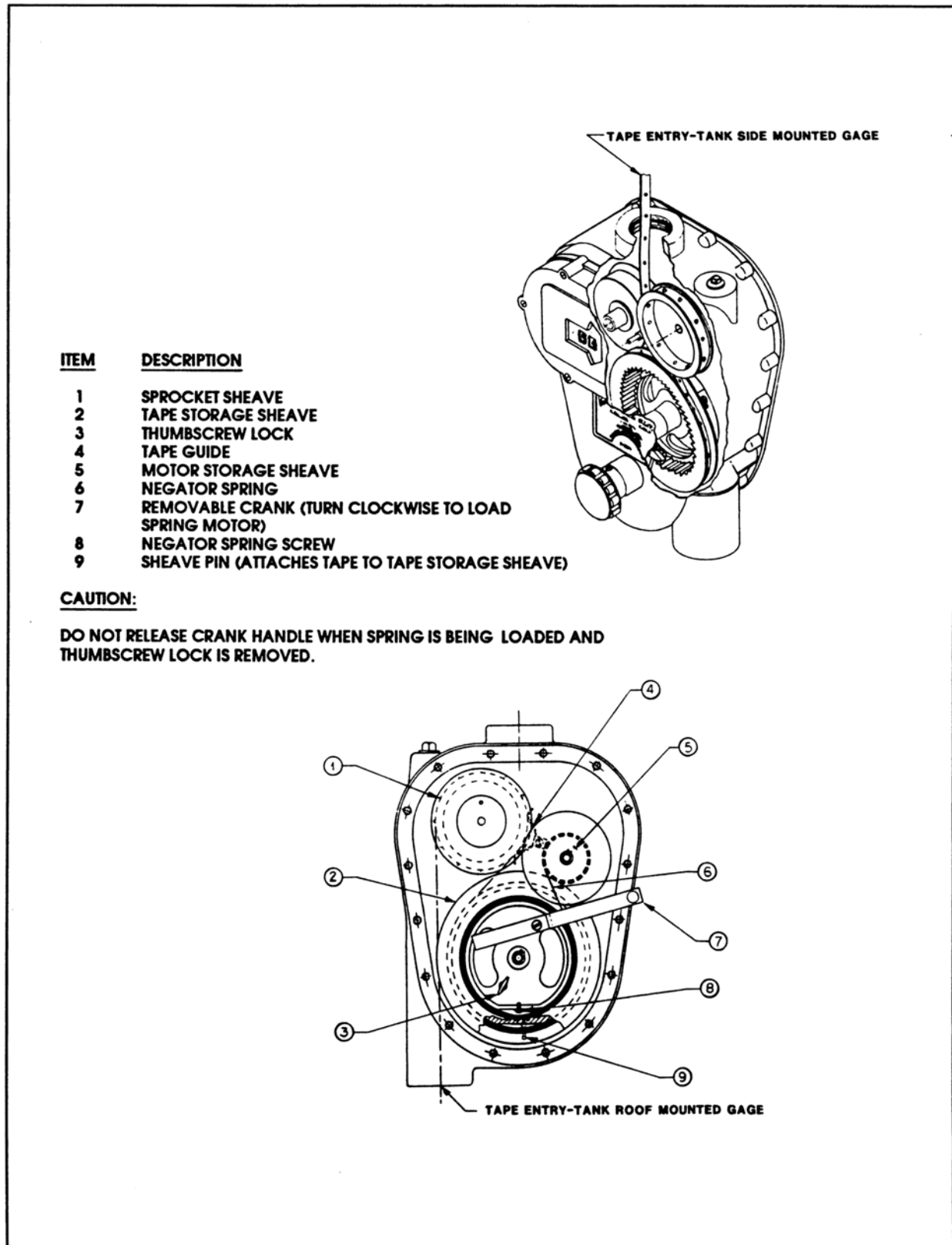


Figure 3-5: Tape Installation (Low Pressure Gaugehead Shown)

Table 3-3 shows a product specific gravity verses weight chart.

Special Gravity (@60°F)	Number of Weights	Submerged Depth
0.45	0	1/4 in. (6.35 mm) below equator
0.48	0	1/8 in. (3.175 mm) below equator
0.51	0	At equator
0.54	1	At equator
0.57	2	At equator
0.60	3	At equator
0.63	4	At equator
0.66	5	At equator
0.69	6	At equator

Table 3-3: Product Specific Gravity verses Weight Chart

**Note** English gaugeheads are shipped with dials indicating measurement in feet, inches, and 1/16 inch. Another dial that indicates measurement in 1/10 ft. x 1/100 foot is included in the kit. The user can install the other dial to suit. Refer to Chapter 5, "Maintenance" on page 43 for dial changing information. Dials providing outage readout are no longer available from Varec, except in a conversion kit that is ordered separately. Contact the company if further information is needed. The kit part number is 13-08774.

5. Loosen the thumbscrew lock.
6. Observe the operation of the drums and dial, while slowly cranking the float cluster to the top of the tank and then lowering it to the bottom. The drums and dial should rotate freely and return to the calibrated indication when the float cluster touches the tank bottom.
7. Use the chart furnished with the float cluster. Mark the float cluster for the submersion depth for the particular product to be stored in the tank.
8. With the float cluster on the bottom, measure the distance from the tank bottom to the submersion depth mark. Use this distance to reset the dial and counter drums for an empty tank.
9. Tighten the screws, after resetting the drums and dial.
10. Replace the counter cover and gasket.

Figure 3-6 shows display adjustments in English fractional and metric.

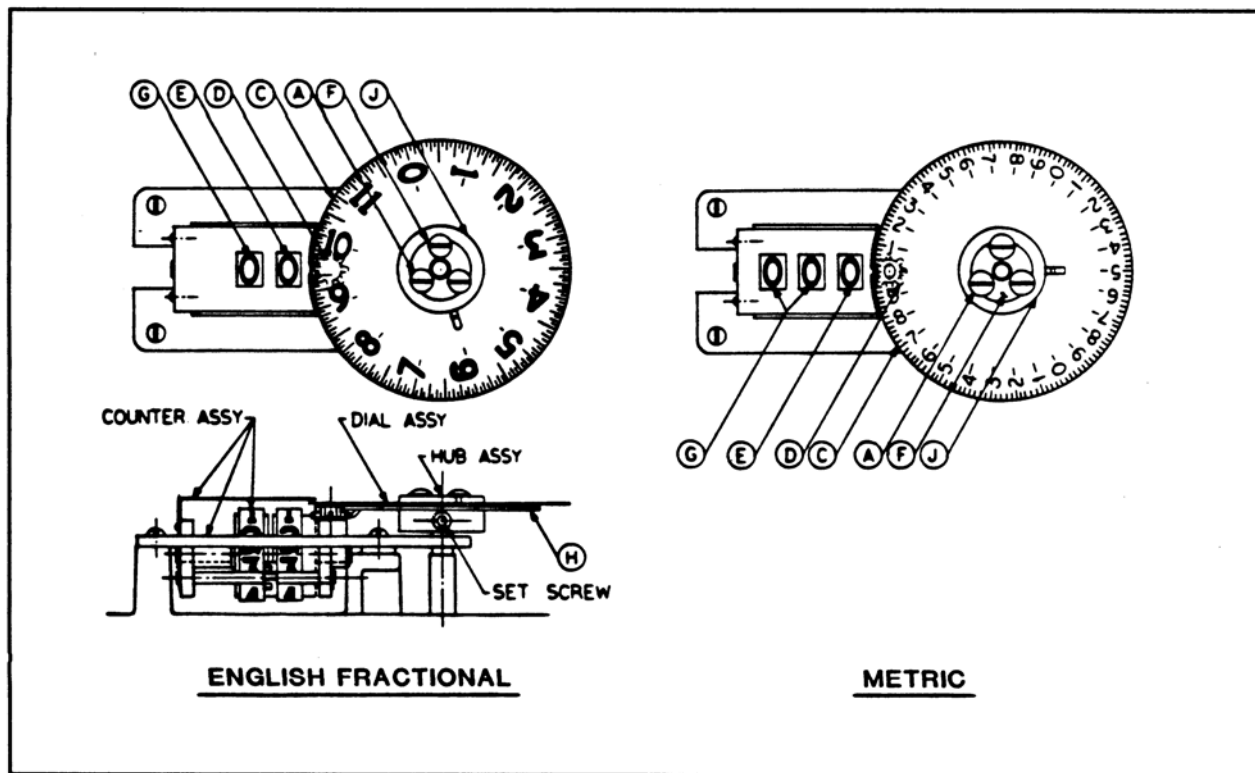


Figure 3-6: Display Adjustments

### 3.3.3 Auxiliary equipment

If auxiliary equipment is to be installed, remove the cap from the back cover. The hole size and bolt pattern mates with Varec auxiliary options. Each mating auxiliary unit has a coupling that engages the magnetic drive assembly. Use the cap screws to attach the auxiliary unit adapter to the back cover. Refer to the manual for the auxiliary unit for operational checkout after it is installed.

**Note** The use of auxiliary units not manufactured or supplied by Varec will void any Varec warranty and will relieve Varec of any obligation to service the product under warranty.

### 3.3.4 Initial lubrication

Apply LPS 2 to the elbow sheave. If the gaugehead is not going to be filled with oil, apply LPS 2 to the tape sprocket and storage sheave. If the gaugehead is to be filled with oil, perform the following reassembly, then fill with oil. Refer to Chapter 5, "Maintenance" on page 43, for the details. For most service, Varec recommends filling the gaugehead with oil to prolong the life.

**Note** Before the gaugehead is filled with oil, the NPT plug on the counter side, that has a hole to drain condensation, must be replaced with a solid NPT plug. Put the bottom plug on top and the top plug in the bottom.

### **3.3.5 Installation quality check**

It is essential that the user recheck the quality of the installation and then double check it, before pressurizing the tank. There is no easy method of correcting installation errors, after the tank is filled. If the float cluster travel is stuck, due to cables that are not parallel or plumb, or if the tape/cable travel is impaired, repair cannot be accomplished until the product pressure is removed from the tank.

### **3.3.6 Reassembly**

Remove the installation crank. If auxiliary equipment was not installed, replace the back cover and its gasket. Using the torque sequence shown in Figure 3–7 on page 23, torque the gaugehead bolts to 30 ft.-lbs. (41 Nm). If auxiliary equipment was installed, seat the magnetic coupling with the auxiliary adapter coupling and replace the back cover with the auxiliary unit adapter attached.

Check the operation of the auxiliary unit as appropriate.

1. Replace the gaskets, covers, and bolts on the elbows.
2. Torque the elbow bolts as shown in Figure 3–7 on page 23.
3. Close the tank manholes and inspection covers.

### **3.3.7 Pressure test the system**

Perform a pressure test of the vessel with the gauge and piping installed. Proof test to 1.50 x normal maximum pressure.

This completes the installation for feature/options kit codes N2520 01 T01, N2520 02 T01, N2520 03 T05, N2520 04 T05, N2520 05 T05, and N2520 06 T05. Proceed to place the system in operation.

Figure 3-7 shows the torque sequence.

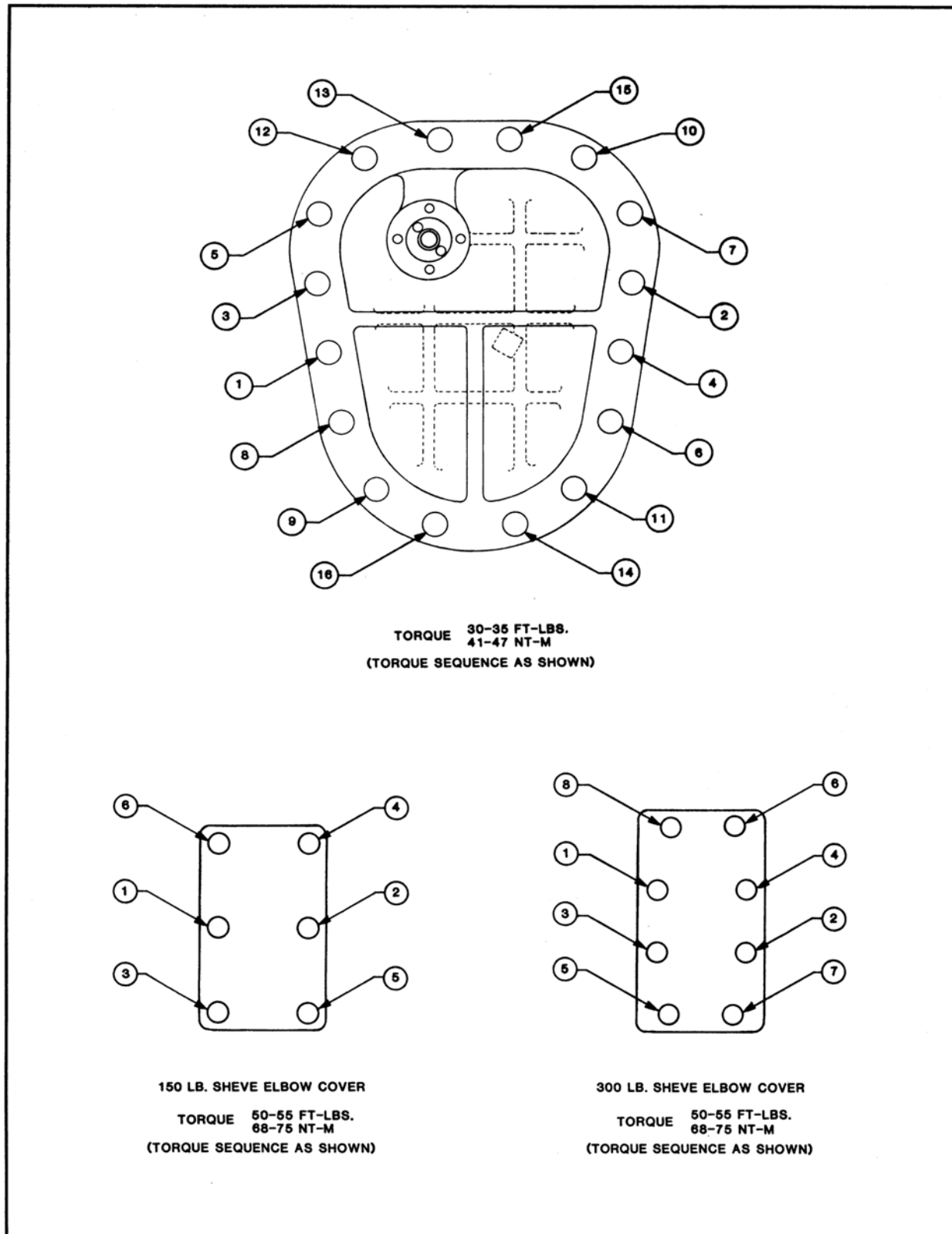


Figure 3-7: Torque Sequence

### 3.4 Spheres to 48 Feet Diameter, Grade Level Installation

For spheres to 48 feet diameter with the gaugehead located on the side, near grade level see Figure 3-8 on page 25 for feature/option installation kit codes N2520 01 T02, N2520 02 T02, N2520 03 T06, N2520 04 T06, N2520 05 T05, and N2520 06 T06. Refer to Table 8-1, Table 8-2, and Table 8-3 on pages 57 and 58 for details.

Make certain that after the installation is completed, it is checked and then doubled checked for proper installation. After the tank is pressurized, the user will have no easy method of correcting the errors that cause a float cluster to stick and the tape and cables to bind.

1. Determine the position on the tank roof, beneath which the center of the float cluster will rise and fall.

**Note** The position should be located where gauge piping will pass over the top of the tank shell close to a stairway platform to facilitate inspection and service of the gauge system.

2. Provide the roof holes shown in the Figure 3-8 on page 25, centered on this position. The guide cable holes are centered 8.50 inches (216 mm), each side of the center of the cluster of floats. The tape pipe is centered on a 17.00 inch (432 mm) diameter. The plug valve is also centered on this dimension.
3. Weld a 1 1/2 inch ANSI 150 lb. or 300 lb. flanged nozzle into the top pipe center hole. Make certain that it is welded in true vertical position. Hold it plumb while welding. Failure to place the flanged nozzle in a true vertical position may affect the accuracy of the gauge. Make sure that the interior of all flanges and pipes are clean and corrosion free.
4. Weld the top, cable anchor 1 1/4 inch flanged nozzles into their respective holes. Make certain that they are welded in a true vertical position. Check with a plumb line prior to welding and maintain the plumb position during welding. Make sure that the interior of the flanges remain clean and corrosion free.
5. Install the plug valve, if it is to be installed, and install the top sheave elbow.

**Note** Varec recommends that a plug valve be installed to facilitate gauge maintenance. Use of parts that are not manufactured or supplied by Varec, voids any Varec warranty and relieves Varec of any obligation to service the product under warranty.

6. Weld the side support brackets in place.
7. Construct the gaugehead support stanchion and weld the gaugehead support bracket in place. Make certain that it is plumb and positioned as shown.
8. Install the tankside vertical pipe in the bracket. Make certain that it is plumb.
9. Install the horizontal pipe in the 90 degree, tank top elbow. Apply thread compound (BestoLife 270 or equal) as appropriate.



Figure 3-8 shows a typical grade level installation for spheres to 48 feet in diameter.

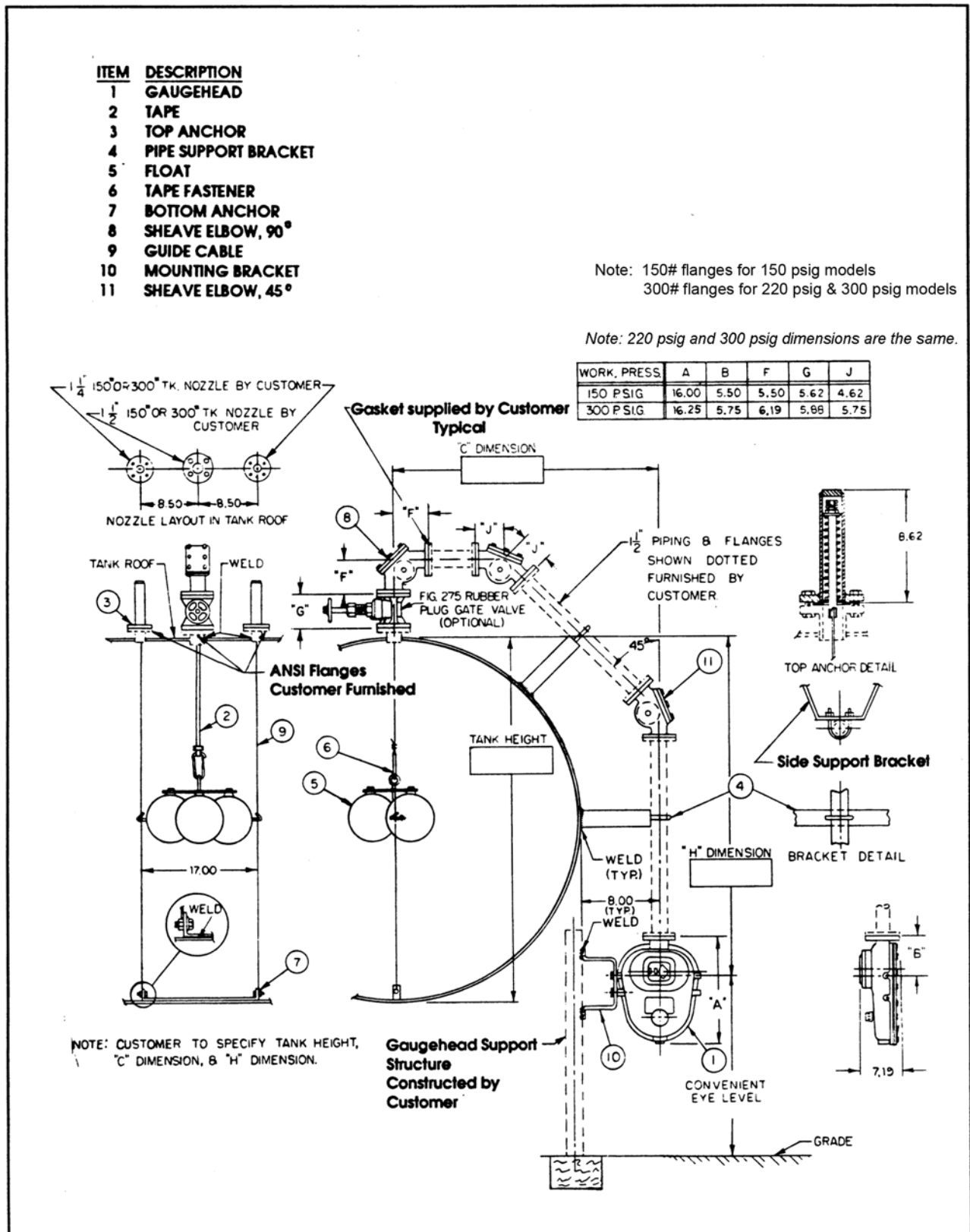


Figure 3-8: Typical Grade Level Installation for Spheres to 48 Feet Diameter

10. Install a 45 degree elbow on the horizontal pipe.
11. Install the 45 degree pipe in the bracket and attach it to the 45 degree elbow, then attach the second 45 degree elbow.
12. Attach the vertical pipe to the 45 degree elbow. Apply thread compound as appropriate. Make certain that dimensioning remains as indicated
13. Remove the housing nipple and cap from the top cable anchors and hang plumb lines from them at the center to mark the position where the bottom cable anchors will be welded.
14. Mark the plumb bob string at the height of the tank bench mark. This will assure that the plumb bob just touches the bottom, when the reference is made from the bench mark distance to the bottom
15. Open the top sheave elbow and hang a plumb line through the center of the top tape pipe to the bottom to mark the float center. This should be 8.50 inches (216 mm) at the bottom from each of the bottom cable anchor positions.
16. When the positioning has been checked, weld the bottom cable anchors into place.
17. Thread the float cables into the tank through the top anchor fittings. Fasten them to the bottom cable anchors with the furnished hardware. Thread the upper end of each guide cable through the top anchor assembly. Hand tighten. Use the lock nut to lock the cable in place, then tighten the adjustment nut, until the guide cable is tensioned by the spring.
18. Replace the housing nipple and cap.  
**! Warning** Make certain that pressure is removed from the gaugehead and piping, whenever the back cover of the gaugehead is removed. Also, stand back as the last bolt is removed. If the negator motor spring is broken, the broken pieces may cause injury when the cover is removed
19. Remove the back cover and gasket from the gaugehead (see Figures 3-2 and 3-3 on pages 15 and 16).
20. Remove the bolts, covers and gaskets from the other elbows.
21. Mount the gaugehead on the bracket and attach the pipe and flanged nipple to the top.
22. Tilt the float cluster on edge and slip the guide cables through the loops on the inside of the tank. Set it on the tank bottom with the tape connection up.
23. Check the part number on the roll of perforated tape to be sure that it is long enough for the tank. At the elbow on the tank entry pipe, unroll one or two turns of the perforated tape and start to feed it into the horizontal pipe. Leave the tape in the box and continue to unroll it several turns at a time until it enters the gaugehead.
24. Spread a clean ground cloth below the gaugehead and remove the lower hole plug.
25. Continue to unroll the tape several turns at a time feeding it through the gaugehead and lower tape hole and onto the ground, from the tank entry pipe elbow, until the tape is unrolled. Make sure that the tape on the ground does not become kinked or dirty.
26. At the elbow on the tank entry pipe, lower the end of the tape through the pipe to the tank bottom. Let several inches fall on the tank bottom
27. Remove the product specific gravity tag from the float cluster and save it. Attach the tape/cable to the float cluster with the furnished fastener (see Figure 3-4 on page 17). Feed the other end of the tape over the sheave in the elbow above and make sure that it is seated on the pulley.
28. See Figure 3-5 on page 19 and attach the furnished installation crank to the tape storage gaugehead tape storage sheave.
29. The negator spring motor delivered with the gaugehead was selected by the user's specification of the tank depth of the installation. Use the installation crank. Wind the motor clockwise the number of turns shown in Table 3-2 on page 14, then tighten the thumbscrew.

30. After the motor is wound and the thumbscrew securely tightened, reattach the tape to the storage sheave.
31. Pull the tape on the ground back through the gaugehead. Put the first hole in the tape on a pin of the sprocket close to the tape guide. Rotate the sprocket clockwise to pull the tape through the guide. Pull the tape around the storage sheave. Fasten the tape to the tape storage sheave with the sheave pin. Wind the excess tape counter-clockwise around the storage sheave until the slack is removed.
32. Check the tape path between the float cluster and the gaugehead to be sure that it is not kinked or twisted. Also check the float guide cables for kinks.
33. Make certain that the float cluster guide cables are parallel.  
**Caution** Do not allow the float cluster to fall back to the floor of the tank. Damage may result.
34. Loosen the thumbscrew. The spring motor will pull the tape taut.
35. Slowly, smoothly crank the float cluster to the top of the tank and return it to the floor, while observing the tape travel through the elbows and gaugehead. There should be no noticeable binding. The counters will be zeroed in steps following, but they should register during the float travel.

#### 3.4.1 Zeroing the display

1. See Figures 3-2 and 3-3 on pages 15 and 16 and remove the cover from the counter mechanism of the gaugehead.
2. See Figure 3-6 on page 21 and loosen screws, "A" until the dial plate, "C" and gear "H" rotate freely and independently of the hub.
3. Check that the float cluster is at the bottom of the tank with the tape taut. Rotate dial "C" and gear "H" until counter drums all display zero.

#### 3.4.2 Initial calibration

These instructions apply to systems that use a float cluster (see Figure 3-4 on page 17). The float cluster is shipped with six weights attached. Table 3-3 on page 20 lists the submersion depth of the cluster for products having specific gravity ranging between .45 and .69 and the quantity of the weights that are required. Refer to the product specific gravity tag removed from the float cluster, if this information is needed in the future.

**Note** During manufacturing, lead shot may be added to the interior of each sphere to make the equator depth submerged displacement equal to 402.12 cu. in., when the specific gravity is beyond the standard range between .45 and .69.

1. Determine the specific gravity of the product to be stored.
2. Refer to Table 3-3 on page 20 and remove the required number of weights.
3. Pull up on the dial and gear "H" to disengage them from the counter pinion, then rotate the dial to indicate four inches (102 mm) for products with specific gravity between .51 and .69 (at 60 degrees F.) For product of specific gravity of .48, set the dial and drums to indicate four and 1/8 inches (104.8 mm). For product of specific gravity of .45, set the dial and drums to indicate four and 1/4 inches (107.9 mm).
4. Re-engage the gear and pinion. Tighten screws "A".
5. Loosen the thumbscrew lock.
6. Observe the operation of the drums and dial, while slowly cranking the float cluster to the top of the tank and then lowering it to the bottom. The drums and dial should rotate freely and return to the calibrated indication when the float cluster touches the tank bottom.

7. Use the chart furnished with the float cluster. Mark the float cluster for the submersion depth for the particular product to be stored in the tank.
8. With the float cluster on the bottom, measure the distance from the tank bottom to the submersion depth mark. Use this distance to reset the dial and counter drums for an empty tank.
9. Tighten the screws, after resetting the drums and dial.
10. Replace the counter cover and gasket.

### 3.4.3 Auxiliary equipment

If auxiliary equipment is to be installed, remove the cap from the back cover. The hole size and bolt pattern mates with Varec auxiliary options. Each mating auxiliary unit has a coupling that engages the magnetic drive assembly. Use the cap screws to attach the auxiliary unit adapter to the back cover. Refer to the manual for the auxiliary unit for operational checkout after it is installed.

**Note** The use of auxiliary units not manufactured or supplied by Varec will void any Varec warranty and will relieve Varec of any obligation to service the product under warranty.

### 3.4.4 Initial lubrication

Apply LPS 2 to the elbow sheave. If the gaugehead is not going to be filled with oil, apply LPS 2 to the tape sprocket and storage sheave. If the gaugehead is to be filled with oil, perform the following reassembly, then fill with oil. Refer to Chapter 5, "Maintenance" on page 43, for the details. For most service Varec recommends filling the gaugehead with oil to prolong the life.

**Note** Before the gaugehead is filled with oil, the NPT plug on the counter side, that has a hole to drain condensation, must be replaced with a solid NPT plug. Switch the top plug to the bottom. Put the bottom plug on top.

### 3.4.5 Installation quality check

It is essential that the user recheck the quality of the installation and then double check it, before pressurizing the tank. There is no easy method of correcting installation errors, after the tank is filled. If the float cluster travel is stuck, due to cables that are not parallel or plumb, or if tape/cable travel is impaired, repair cannot be accomplished until the product pressure is removed from the tank.

### 3.4.6 Reassembly

Remove the installation crank. If auxiliary equipment was not installed, replace the back cover and its gasket. Using the torque sequence shown in Figure 3-7 on page 23 torque the bolts to 30 ft.-lbs. (41 Nm). If auxiliary equipment was installed, seat the magnetic coupling with the auxiliary adapter coupling and replace the back cover with the auxiliary unit adapter attached. Check the operation of the auxiliary unit as appropriate.

1. Replace the covers, gaskets, and bolts on the elbows.
2. Torque the bolts as shown in the Figure 3-7 on page 23.
3. Close the tank manholes and inspection covers.

### **3.4.7 Pressure test the system**

Perform a pressure test of the vessel with the gauge and piping installed. Test to 1.50 times the normal maximum pressure.

This completes the installation for feature/options kit codes N2520 01 T02, N2520 02 T02, N2520 03 T06, N2520 04 T06, N2520 05 T06, and N2520 06 T06. Proceed to place the system in operation.

### 3.5 Spheres to 60 Feet Diameter, Grade Level Installation

For spheres and cylinders to 60 feet diameter with the gaugehead located on the side, near grade level see Figure 3-9 on page 31 for feature/option installation kit codes N2520 01 T04, N2520 02 T04, N2520 03 T08, N2520 04 T08, N2520 05 T08, and N2520 06 T08. Refer to Table 8-1, Table 8-2, and Table 8-3 on pages 57 and 58 for details.

Make certain that after the installation is completed, it is checked and then doubled checked for proper installation. After the tank is pressurized, the user will have no easy method of correcting installation error.

1. Determine the position on the tank roof, beneath which the center of the float cluster will rise and fall.

**Note** The position should be located where gauge piping will pass over the top of the tank shell close to a stairway platform to facilitate inspection and service of the gauge system.

2. Provide the roof holes shown in the Figure 3-9 on page 31, centered on this position. The guide cable holes are centered 8.50 inches (216 mm), each side of the center of the cluster of floats. The tape pipe is centered on a 17.00 inch (432 mm) diameter. The plug valve is also centered on this dimension.
3. Weld a 1 1/2 inch ANSI 150 lb. or 300 lb. flanged nozzle into the top pipe center hole. Make certain that it is welded in true vertical position. Hold it plumb while welding. Failure to place the flanged nozzle in a true vertical position may affect the accuracy of the gauge. Make sure that the interior of all flanges and pipes are clean and corrosion free.
4. Weld the top, cable anchor 1 1/4 inch flanged nozzles into their respective holes. Make certain that they are welded in a true vertical position. Check with a plumb line prior to welding and maintain the plumb line during welding. Make sure that the interior of the flanges remain clean and corrosion free.
5. Install the plug valve, if it is to be installed, and install the top sheave elbow.

**Note** Varec recommends that a plug valve be installed to facilitate gauge maintenance. Use of parts that are not manufactured or supplied by Varec, voids any Varec warranty and relieves Varec of any obligation to service the product under warranty.

6. Weld the side support brackets in place.
7. Construct the gaugehead support stanchion and weld the gaugehead support bracket in place. Make certain that it is plumb and positioned as shown.
8. Install the tankside vertical pipe in the bracket. Make certain that it is plumb.
9. Install the horizontal pipe in the 90° degree, tank top elbow, and bracket.
10. Install a 30 degree elbow on the horizontal pipe.

Figure 3-9 shows a typical grade level installation for spheres to 60 feet in diameter.

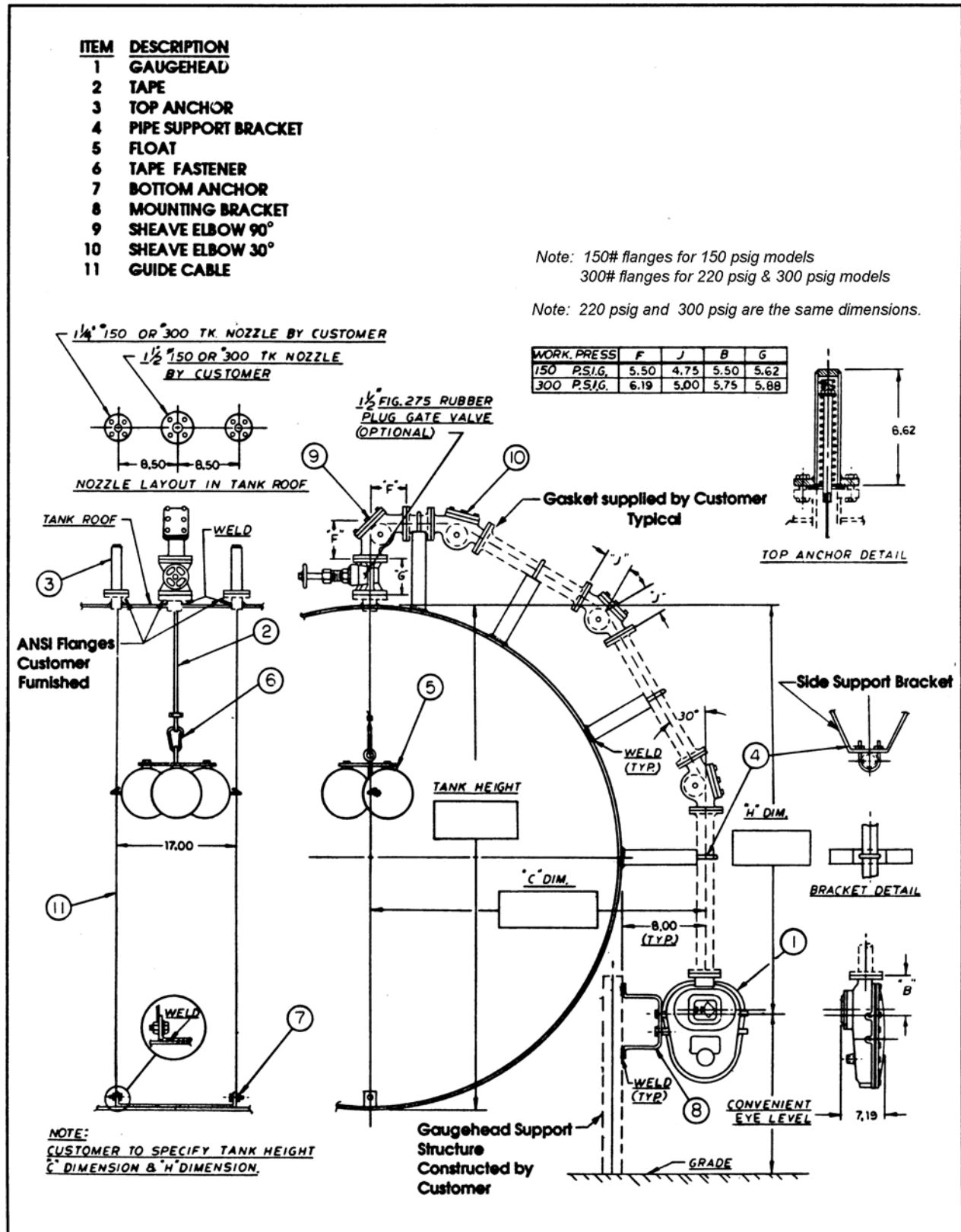


Figure 3-9: Typical Grade Level Installation for Spheres to 60 Feet Diameter

11. Install a 30 degree pipe in the bracket and attach it to the 30 degree elbow, then attach the second 30 degree elbow.
12. Attach the second 30 degree pipe to the bracket and elbow.
13. Attach the last 30 degree elbow to the pipe.
14. Attach the vertical pipe to the 30 degree elbow. Make certain that dimensioning remains as indicated.
15. Remove the housing nipple and cap from the top cable anchors and hang plumb lines from them at the center to mark the position where the bottom cable anchors will be welded.
16. Mark the plumb bob string at the height of the tank bench mark. This will assure that the plumb bob just touches the bottom, when the reference is made from the bench mark distance to the bottom.
17. Open the top sheave elbow and hang a plumb line through the center of the top tape pipe to the bottom to mark the float center. This should be 8.50 inches (216 mm) at the bottom from each of the bottom cable anchor positions.
18. When the positioning has been checked, weld the bottom cable anchors into place.
19. Thread the float cables into the tank through the top anchor fittings. Fasten them to the bottom cable anchors with the furnished hardware. Thread the upper end of each guide cable through the top anchor assembly. Hand tighten. Use the lock nut to lock the cable in place, then tighten the adjustment nut, until the guide cable is tensioned by the spring.
20. Replace the housing nipple and cap.

**! Warning** Whenever the back cover of the gaugehead is removed, make certain that the pressure has been bled from the gaugehead and piping, then stand back as the last bolt is removed. If the negator motor spring is broken, the broken pieces may cause injury when the cover is removed.
21. Remove the bolts, back cover, and gasket from the gaugehead (see Figures 3-2 and 3-3 on pages 15 and 16).
22. Remove the bolts, covers, and gaskets from the other elbows.
23. Mount the gaugehead on the bracket and attach the pipe and flanged nipple to the top.
24. Tilt the float cluster on edge and slip the guide cables through the loops on the inside of the tank (see Figure 3-4 on page 17). Set it on the tank bottom with the tape connection up.
25. Check the part number on the roll of perforated tape to be sure that it is long enough for the tank. At the elbow on the tank entry pipe, unroll one or two turns of the perforated tape and start to feed it into the horizontal pipe. Leave the tape in the box and continue to unroll it several turns at a time until it enters the gaugehead.
26. Spread a clean ground cloth below the gaugehead and remove the lower hole plug.
27. Continue to unroll the tape several turns at a time feeding it through the gaugehead and lower tape hole and onto the ground, from the tank entry pipe elbow, until the tape is unrolled. Make sure that the tape on the ground does not become kinked or dirty.
28. At the elbow on the tank entry pipe, lower the end of the tape through the pipe to the tank bottom. Let several inches fall on the tank bottom.
29. Remove the product specific gravity tag from the float cluster and save it for future reference. Attach the tape to the float with the furnished fastener. Feed the other end of the tape over the sheave in the elbow above and make sure that it is seated on the pulley.
30. See Figure 3-5 on page 19 and attach the furnished installation crank to the tape storage gaugehead tape storage sheave.
31. The negator spring motor delivered with the gaugehead was selected by the user's specification of the tank depth of the installation. Use the installation crank. Wind the motor clockwise the number of turns shown in Table 3-2 on page 14, then tighten the thumbscrew.



32. After the motor is wound and the thumbscrew securely tightened, attach the tape to the storage sheave.
33. Pull the tape on the ground back through the gaugehead. Put the first hole in the tape on a pin of the sprocket close to the tape guide. Rotate the sprocket clockwise to pull the tape through the guide. Pull the tape around the storage sheave. Fasten the tape to the tape storage sheave with the sheave pin. Wind the excess tape counter-clockwise around the storage sheave until the slack is removed.
34. Check the tape path between the float cluster and the gaugehead to be sure that it is not kinked or twisted. Also check the float guide cables for kinks.
35. Make certain that the float cluster guide cables are parallel.  
**Caution** Do not allow the float cluster to fall back to the floor of the tank. Damage may result.
36. Loosen the thumbscrew. The spring motor will pull the tape taut.
37. Slowly, smoothly crank the float cluster to the top of the tank and return it to the floor, while observing the tape travel through the elbows and gaugehead. There should be no binding. The counters will be zeroed in steps following, but they should register during the float travel.

### 3.5.1 Zeroing the display

1. See Figures 3-2 and 3-3 on pages 15 and 16 and remove the cover from the counter mechanism of the gaugehead.
2. See Figure 3-6 on page 21 and loosen screws, "A" until the dial plate, "C" and gear "H" rotate freely and independently of the hub.
3. Check that the float cluster is at the bottom of the tank with the tape taut. Rotate dial "C" and gear "H" until counter drums all display zero.

### 3.5.2 Initial calibration

These instructions apply to systems that use a float cluster. The float cluster is shipped with six weights attached. Table 3-3 on page 20 lists the submersion depth of the cluster for products having specific gravity ranging between .45 and .69 and the quantity of the weights that are required. The product specific gravity tag removed from the float cluster should be saved for future reference.

**Note** During manufacturing, lead shot may be added to the interior of each sphere to make the equator depth submerged displacement equal to 402.12 cu. in., when the specific gravity is beyond the standard range between .45 and .69.

1. Determine the specific gravity of the product to be stored.
2. Refer to Table 3-3 on page 20 and remove the required number of weights.
3. Pull up on the dial and gear "H" to disengage them from the counter pinion, then rotate the dial to indicate four inches (102 mm) for products with specific gravity between .51 and .69 (at 60 degrees F.) For product of specific gravity of .48, set the dial and drums to indicate four and 1/8 inches (104.8 mm). For product of specific gravity of .45, set the dial and drums to indicate four and 1/4 inches (107.9 mm).
4. Re-engage the gear and pinion. Tighten screws "A".
5. Loosen the thumbscrew lock.
6. Observe the operation of the drums and dial, while slowly cranking the float cluster to the top of the tank and then lowering it to the bottom. The drums and dial should rotate freely and return to the calibrated indication when the float cluster touches the tank bottom

7. Use the chart furnished with the float cluster. Mark the float cluster for the submersion depth for the particular product to be stored in the tank.
8. With the float cluster on the bottom, measure the distance from the tank bottom to the submersion depth mark. Use this distance to reset the dial and counter drums for an empty tank.
9. Tighten the screws, after resetting the drums and dial.
10. Replace the counter cover and gasket.

### 3.5.3 Auxiliary equipment

If auxiliary equipment is to be installed, remove the cap from the back cover. The hole size and bolt pattern mates with Varec auxiliary options. Each mating auxiliary unit has a coupling that engages the magnetic drive assembly. Use the cap screws to attach the auxiliary unit adapter to the back cover. Refer to the manual for the auxiliary unit for operational checkout after it is installed.

**Note** The use of auxiliary units not manufactured or supplied by Varec will void any Varec warranty and will relieve Varec of any obligation to service the product under warranty.

### 3.5.4 Initial lubrication

Apply LPS 2 to the elbow sheave. If the gaugehead is not going to be filled with oil, apply LPS 2 to the tape sprocket and storage sheave. If the gaugehead is to be filled with oil, perform the following re-assembly, then fill with oil. Refer to Chapter 5, "Maintenance" on page 43 for the details. For most service Varec recommends filling the gaugehead with oil to prolong the life.

**Note** Before the gaugehead is filled with oil, the NPT plug on the counter side, that has a hole to drain condensation, must be replaced with a solid NPT plug. Put the bottom plug on top and the top plug in the bottom.

### 3.5.5 Installation quality check

It is essential that the user recheck the quality of the installation and then double check it, before pressurizing the tank. There is no easy method of correcting installation errors, after the tank is filled. If the float cluster travel is stuck, due to cables that are not parallel or plumb, or if tape/cable travel is impaired, repair cannot be accomplished until the product pressure is removed from the tank.

### 3.5.6 Reassembly

Remove the installation crank. If auxiliary equipment was not installed, replace the back cover and its gasket. Using the torque sequence shown in Figure 3-7 on page 23, torque the bolts to 30 ft-lbs. (41 Nm). If auxiliary equipment was installed, seat the magnetic coupling with the auxiliary adapter coupling and replace the back cover with the auxiliary unit adapter attached. Check the operation of the auxiliary unit as appropriate.

1. Replace the gaskets, covers, and bolts on the elbows.
2. Torque the bolts as shown in the Figure 3-7 on page 23.
3. Close the tank manholes and inspection covers.

### **3.5.7 Pressure test the system**

Perform a pressure test of the vessel with the gauge and piping installed. Test to 1.50 times the normal maximum pressure.

This completes the installation for feature/options kit codes N2520 01 T04, N2520 02 T04, N2520 03 T08, N2520 04 T08, N2520 05 T08, and N2520 06 T08. Proceed to place the system in operation.

### 3.6 Top Tank Reading Installation for Spheres and Cylinders

For tank top reading gaugehead installations see Figure 3-10 on page 37 for codes N2520 01 T03, N2520 02 T03, N2520 03 T07, N2520 04 T07, N2520 05 T07, and N2520 06 T07. Refer to Table 8-1, Table 8-2, and Table 8-3 on pages 57 and 58 for details.

Make certain that after the installation is completed, it is checked and then doubled checked for proper installation. After the tank is pressurized, the user will have no easy method of correcting the errors that cause a float cluster to stick and the tape and cables to bind.

1. Determine the position on the tank roof, beneath which the center of the float will rise and fall.

**Note** The position should be located where gauge piping will pass over the top of the tank shell close to a stairway platform to facilitate inspection and service of the gauge system.

2. Provide the roof holes shown in Figure 3-10 on page 37, centered on this position. The guide cable holes are centered 8.50 inches (216 mm), each side of the center of the cluster of floats. The tape pipe is centered on a 17.00 inch (432 mm) diameter. The plug valve is also centered on this dimension.
3. Weld a 1 1/2 inch ANSI 150 lb. or 300 lb. flanged nozzle into the top pipe center hole. Make certain that it is welded in true vertical position. Hold it plumb while welding. Failure to place the flanged nozzle in a true vertical position may affect the accuracy of the gauge. Make sure that the interior of all flanges and pipes are clean and corrosion free.
4. Weld the top, cable anchor 1 1/4 inch flanged nozzles into their respective holes. Make certain that they are welded in a true vertical position. Check with a plumb line prior to welding and maintain the plumb position during welding. Make sure that the interior of the flanges remain clean and corrosion free.
5. Install the Varec plug valve, if it is to be installed, and install the top pipe.

**Note** Failure to place the pipe in a true vertical position may affect the accuracy of the gauge.

6. Center the base of a top cable anchor in its hole. Hold it plumb while welding it to the roof. Do the same for the other top cable anchor.
7. Remove the housing nipple and cap from the top cable anchors and hang plumb lines from them at the center to mark the position where the bottom cable anchors will be welded.
8. Hang a plumb line through the center of the top tape pipe to the bottom to mark the float center. This should be 8.50 inches (216 mm) at the bottom from each of the bottom cable anchor positions. When the positioning has been checked, weld the bottom cable anchors into place.
9. Thread the float cables into the tank through the top anchor fittings. Fasten them to the bottom cable anchors with the furnished hardware.

Figure 3-10 shows a typical installation for a top reading roof tank.

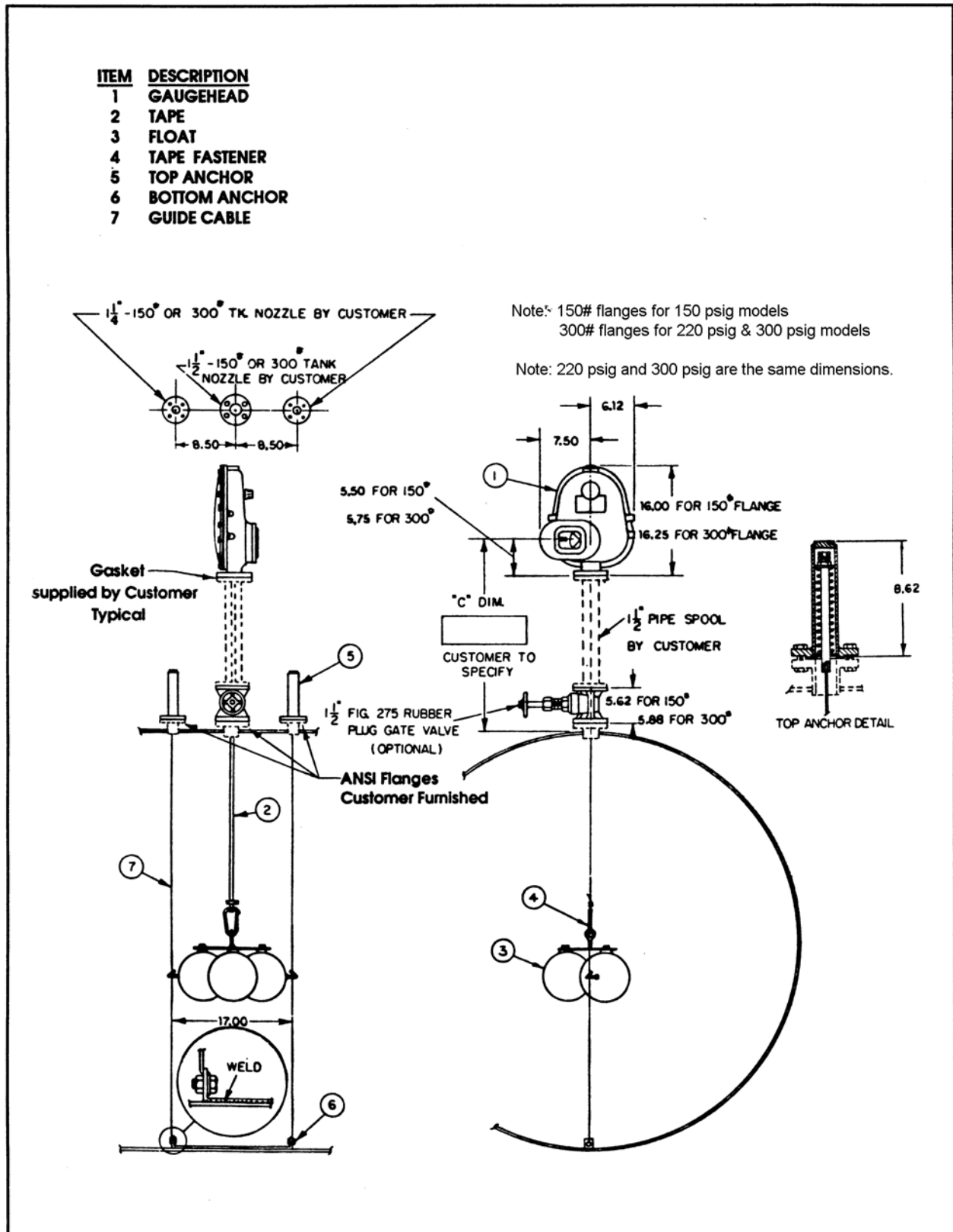


Figure 3-10: Top Reading Roof Tank, Typical Installation

10. Thread the upper end of each guide cable through the top anchor assembly. Hand tighten. Use the lock nut to lock the cable in place, then tighten the adjustment nut, until the guide cable is tensioned by the spring.
11. Replace the housing nipple and cap.  
**! Warning** Whenever the back cover of the gaugehead is removed, make certain that pressure has been bled from the gaugehead and piping, then stand back as the last bolt is removed. If the negator motor spring is broken, the broken pieces may cause injury when the cover is removed
12. Remove the back cover and gasket from the gaugehead (see Figures 3-2 and 3-3 on pages 15 and 16).
13. Attach the gaugehead to the vertical pipe. Position it for convenient reading. The pipe supports the weight of the gaugehead.
14. Tilt the float cluster on edge and slip the guide cables through the loops on the inside of the tank. Set it on the tank bottom with the tape connection up. Remove the product specific gravity tag and save it.
15. At the gaugehead entry pipe, lower one end of the tape through the pipe to the tank bottom. Attach the tape to the float cluster with the furnished fastener (see Figure 3-4 on page 17).
16. See Figure 3-5 on page 19 and attach the furnished installation crank to the tape storage gaugehead tape storage sheave with the thumbscrew.  
**! Warning** Use a firm grasp on crank while winding motor. Tighten thumbscrew before releasing grip. The rapid unwinding of the spring could result in the crank spinning and striking the operator.
17. The negator spring motor delivered with the gaugehead was selected by the user's specification of the tank depth of the installation. Use the installation crank. Wind the motor clockwise the number of turns shown in Table 3-2 on page 14, then securely tighten the thumbscrew.
18. Lower the remainder of tape on the roll into the tank, then thread the tape into the gaugehead. Put the first hole in the tape on a pin of the sprocket close to the tape guide. Rotate the sprocket clockwise to pull the tape through the guide. Pull the tape around the storage sheave. Fasten the tape to the tape storage sheave with the sheave pin. Wind the excess tape counter-clockwise around the storage sheave, until the slack is removed.
19. Securely tighten the thumbscrew lock.
20. Check the tape path between the float and the gaugehead to be sure that it is not kinked or twisted. Also check the float guide cables for kinks and that they are parallel.
21. At the bottom of the tank, pull the tape taut. Disconnect float cluster, while holding tape taut, and cut off the excess tape. Reconnect the float cluster.  
**Caution** Do not allow the float cluster to fall back to the floor of the tank. Damage may result.
22. Loosen the thumbscrew. The spring motor will pull the tape taut.
23. Slowly, smoothly crank the float to the top of the tank and return it to the floor, while observing tape travel through the gaugehead. There should be no binding. The counters will be zeroed in steps following, but they should register during the float travel.

### 3.6.1 Zeroing the display

1. See Figures 3-2 and 3-3 on pages 15 and 16 and remove the cover from the counter mechanism of the gaugehead.
2. See Figure 3-6 on page 21 and loosen screws, "A" until the dial plate, "C" and gear "H" rotate freely and independently of the hub.
3. Check that the float cluster is at the bottom of the tank with the tape taut. Rotate dial "C" and gear "H" until counter drums all display zero.

### 3.6.2 Initial calibration

These instructions apply to systems that use a float cluster. The float cluster is shipped with six weights attached. Table 3-3 on page 20 lists the submersion depth of the cluster for products having specific gravity ranging between .45 and .69 and the quantity of the weights that are required. Keep the product specific gravity tag removed from the float cluster for future reference.

**Note** During manufacturing, lead shot may be added to the interior of each sphere to make the equator depth submerged displacement equal to 402.12 cu. in., when the specific gravity is beyond the standard range between .45 and .69.

1. Determine the specific gravity of the product to be stored.
2. Refer to Table 3-3 on page 20 and remove the required number of weights.
3. Pull up on the dial and gear "H" to disengage them from the counter pinion, then rotate the dial to indicate four inches (102 mm) for products with specific gravity between .51 and .69 (at 60 degrees F.) For product of specific gravity of .48, set the dial and drums to indicate four and 1/8 inches (104.8 mm). For product of specific gravity of .45, set the dial and drums to indicate four and 1/4 inches (107.9 mm).
4. Re-engage the gear and pinion. Tighten screws "A".
5. Loosen the thumbscrew lock.
6. Observe the operation of the drums and dial, while slowly cranking the float cluster to the top of the tank and then lowering it to the bottom. The drums and dial should rotate freely and return to the calibrated indication when the float cluster touches the tank bottom.
7. Use the chart furnished with the float cluster. Mark the float cluster for the submersion depth for the particular product to be stored in the tank.
8. With the float cluster on the bottom, measure the distance from the tank bottom to the submersion depth mark. Use this distance to reset the dial and counter drums for an empty tank.
9. Tighten the screws, after resetting the drums and dial.
10. Replace the counter cover and gasket.

### 3.6.3 Auxiliary equipment

If auxiliary equipment is to be installed, remove the cap from the back cover. The hole size and bolt pattern mates with Varec auxiliary options. Each mating auxiliary unit has a coupling that engages the magnetic drive assembly. Use the cap screws to attach the auxiliary unit adapter to the back cover. Refer to the manual for the auxiliary unit for operational checkout after it is installed

**Note** The use of auxiliary units not manufactured or supplied by Varec will void any Varec warranty and will relieve Varec of any obligation to service the product under warranty.

#### **3.6.4 Initial lubrication**

The gaugehead that is mounted on top of a tank cannot be filled with oil. Apply LPS 2 to the tape sprocket and storage sheave.

#### **3.6.5 Installation quality check**

It is essential that the user recheck the quality of the installation and then double check it before pressurizing the tank. There is no easy method of correcting installation error after the tank is filled. If the float cluster travel is stuck, due to cables that are not parallel and plumb, or if the tape/cable travel is impaired, repair cannot be accomplished until the product pressure is removed from the tank.

#### **3.6.6 Reassembly**

Remove the installation crank. If auxiliary equipment was not installed, replace the back cover and its gasket. Using the torque sequence shown in Figure 3–7 on page 23, torque the bolts to 30 ft.–lbs. (41 Nm). If auxiliary equipment was installed, seat the magnetic coupling with the auxiliary adapter coupling and replace the back cover with the auxiliary unit adapter attached. Check the operation of the auxiliary unit as appropriate.

1. Replace the gaskets, covers, and bolts on the elbows.
2. Torque the bolts as shown in the Figure 3–7 on page 23.
3. Close the tank manholes and inspection covers.

#### **3.6.7 Pressure test the system**

Perform a pressure test of the vessel with the gauge and piping installed. Proof test to 1.50 times the normal maximum pressure.

This completes the installation for feature/options kit codes N2520 01 T03, N2520 02 T03, N2520 03 T07, N2520 04 T07, N2520 05 T07, and N2520 06 T07. Proceed to place the system in operation.



## 4 Operation

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### 4.1 Initial Operation

**Caution** Initial filling of the tank must be at a reduced rate of flow, until the float travel and dial operation are verified. This checks that the installation was correctly made and prevents possible damage to the gauge system. The system must have been previously pressure checked to a proof pressure 1.50 times the normal maximum operating.

The user should review the appropriate industry manual for petroleum products (API Chapter 3, and others) for details of the handling of the particular product. These are general instructions.

1. Station an observer at the gaugehead.
2. Commence tilling the tank to raise the float cluster several feet (about three feet or one meter) from the bottom.

**Caution** Do not release the checker knob and allow the springs to return the mechanism. Over time, the springs may break and jam the gauge.

3. Turn the operation checker knob on the front of the gaugehead a quarter-turn clockwise to lift the float cluster slightly. Check that the display registers the movement. Return the knob slowly to its original position. Verify that the float has returned to its original level.

**Note** If the tape is slackened, with the float cluster on the surface, it may slip off of the tape storage sheave retainer. If this occurs, refer to Chapter 6, "Troubleshooting" on page 51.

4. If the gauge operation is normal, continue filling the tank to the desired level. If it is not, remove the product pressure and correct the problem

## 4.2 Normal Operation

**Caution** Do not release the checker knob and allow the springs to return the mechanism. Over time, the springs may break and jam the gauge.

Use the operation checker knob to check gauge operation. Turn it clockwise one-quarter turn, while observing the display.

**Note** If the tape is slackened, with the float cluster on the surface, it may slip off of the tape storage sheave retainer. If this occurs, refer to Chapter 6, "Troubleshooting" on page 51.

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## 4.3 Calibration and Volume Measurement

Tank gauging measurements provide appropriate inventory checks and a valuable method of checking marine receipts and metered custody transfers.

Accuracy of measurements requires that a number of factors be considered:

1. The density and specific gravity of product.
2. The gross volume.
3. The temperature of the product.
4. Tank-bottom deformation.

It is the user's responsibility to appropriately consider these and other factors in his application. For example, petroleum product tank capacity tables are calculated for product at 60 degrees F. A higher temperature will cause the tank to expand and the actual volume will be greater than the volume at the standard temperature. Refer to appropriate industry standards for volume correction factors.

Careful reference to the benchmark of the tank will help assure accuracy of the automatic gauge.

## 5 Maintenance

**! Warning** The product stored in the tanks that are gauged is under pressure of 30 to 300 psig. It is most probably a flammable product, such as butane or propane. The gaugehead and piping are under pressure. Do not open them without first closing the Varec plug valve and then carefully bleeding the product pressure from the gaugehead and piping. If there is no Varec plug valve installed, no maintenance can be performed, unless the tank is empty and not under pressure.

**! Warning** Observe appropriate safety precautions in flammable or hazardous liquid storage areas. Do not enter a tank that has contained hydrocarbons, vapors, or toxic materials, until a gas-free environment is certified. Carry breathing equipment when entering a tank where oxygen may be displaced by carbon dioxide, nitrogen or other gases.

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### 5.1 Electrostatic Discharge Hazard

**! Warning** The mechanical connections between the guide cables, the float, the tape and the gaugehead provide a resistance to ground that is adequate for the safe electrical drain of electrostatic charges that may accumulate in the tank and the product. Worker activity and worker clothing may accumulate electrostatic charges on the body of a worker. Care should be used in flammable environments to avoid the hazard. Observe American Petroleum Institute (API) Recommended Practice 2003 or other appropriate industry or military standard.

Varec 2520 Series High Pressure Automatic Tank Gauges are designed for long service life. Like any other instrument, Varec 2520 gauges require regular, periodic service to maintain the original performance. Table 5-1 on page 44 provides some suggested periodic service.

Performance of routine maintenance will lengthen the service life. Gauge accuracy may be impaired if routine maintenance is not performed. Varec provides maintenance service contracts that provide regular periodic inspection and maintenance at substantial savings. Some repair tasks may require special tools.

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### 5.2 Lubrication

**! Warning** The product stored in the tanks that are gauged is under pressure of 30 to 300 psig. It is most probably a flammable product, such as butane or propane. The gaugehead and piping are under pressure. Do not open them without first closing the Varec plug valve and then carefully bleeding the product pressure from the gaugehead and piping. If there is no Varec plug valve installed, no maintenance can be performed, unless the tank is empty and not under pressure.

1. Close the Varec plug valve.
2. Vent the product pressure in the piping and gaugehead safely to the atmosphere, using appropriate industry or military safety procedures.
3. Lubricate moving parts of the tape elbow sheaves at regular intervals. Use LPS 2.
4. If the gaugehead is not oil-filled, lubricate the moving parts at regular intervals with LPS 2.

### 5.3 Oil-filled Gauges

**Note** Some oils may cause the numbers on the counters and dial to flake after long-term exposure. A maintenance kit is available from Varec to correct the problem

The counter side is sealed from the pressure at the back. It may be separately filled with oil. The NPT plug with the hole for draining condensed moisture must be replaced to fill the counter side with oil. Switch the positions of the top and bottom plugs.

Table 5-1 lists the suggested periodic maintenance routine.

Routine	90 Days	Remarks	10 Years
Operation check	X		
Guide cables			
Lubricate	X		
Leak check	X		
Change oil			
Calibration			
Corrosion check			
Sediment check	X		
Deformation check	X		
Refurbish			X

Table 5-1: Suggested Periodic Maintenance Routine

Fill the tape sheave compartment of the gaugehead with oil to protect it from corrosion by vapors from the product in the tank. Do not use a condensate reservoir. Use a 1 1/2 inch NPT plug in the lower tape entry port. Check that this drain plug is firmly in place. Fill through the top NPT plug (see Figures 3-2 and 3-3 on pages 15 and 16). Use Table 5-2 on page 44 to determine the appropriate oil. Fill the counter side separately. Before filling the counterside, substitute a solid NPT plug for the NPT plug with the condensation draining hole by reversing the top and bottom plugs.

Table 5-2 lists typical gaugehead oils.

Temperature Degrees		Typical Oil
C	(F)	
0	(32) and above	Light weight, uncompounded, low pour, mineral oil
-32	(-22) to 0 (32)	LPS 2
-52	(-62) to -30 (-22)	Low viscosity, synthetic base Mil-L-7808D-8B, or equivalent

Table 5-2: Typical Gaugehead Oils

## 5.4 Inspection

It is recommended that the first inspection after the unit has been placed in service be made at the end of the first thirty-day period. Subsequent inspections should be made every 90 days (see Table 5-1 on page 44). The user may adjust the schedule for his own convenience and safety, depending upon the product. Varec maintenance service contracts are available for 90 day periods at a substantial savings.

**Caution** Do not release the checker knob and allow the springs to return the mechanism. Over time the springs may break and jam the gauge.

1. Check the operation of the gauge and calibrate.
2. Check for pipe corrosion. Interior corrosion of the pipe carrying the tape may become deposited in the mechanism and affect the accuracy.
3. Check for leaking oil in oil-filled gaugeheads.
4. Check for leaking product.

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## 5.5 Changing Dial Plates

As indicated in earlier paragraphs, the English gaugehead is shipped with a counter wheel assembly for measurement in feet and a dial plate that indicates inches, and 1/16 inch that is factory installed. A spate dial that indicates measurement of 1/10 inch and 1/100 inch is included in the package. To change the dial, see Figures 3-2, 3-3, and 3-6 on pages 15, 16, and 21 respectively.

1. Remove the screws attaching the counter cover and remove the counter cover.
2. Remove the screws attaching the dial and lift off the dial and the dial retainer.
3. Substitute the other dial plate and reassemble in reverse order of disassembly.

## 5.6 Maintenance and Repair Kits

Varec provides two maintenance and repair kits for either English or Metric 2520 Series Gauges. The parts in each are listed in Table 5-3 and Table 5-4 on pages 48 and 50. Kit installation instructions are included in the kits, when delivered. The casting has been changed on newer gaugeheads. Users with the old style, 150 psig pressure gauge will use the gasket indicated Table 5-3 on page 48.

Table 5-3 lists the Basic Maintenance Kit #1.

Part Name (English)	Part Number 13-08784
2500 CRANK ASSY.	BM3784
TAPE ENG.PERF,316 SST X 180'	B10537-606
F H M S 10-24 X 3/8 304 SS	P031-03-1642
KIT INSTRUCTIONS(MAINT)2520	33-08848
GASKET COUNTER HOUSING 2500	B6287-071
2520 "O" RING RETAINER	B7411-005
DIAL GEAR, (ENGLISH)	B8235-040
DIAL, (ENGLISH)	B8218-001
SLOTTED SHIM, .010"	P031-29-1883
COUNTER COVER GASKET 2500	B7720-071
SHEAVE ASSY-MOTOR,70' (ALUM)	BA17725
SPRING GAUGE CHECK 2500	B7796-005
GAUGE CHECK ASSY (2520)	BA11566
HUB, DIAL PLATE	B9668-001
POST 2500	B6547-005
GASKET-BACK COVER,300# GA	B7293-046
RETAINING RING, 5/16 SS	P10-2
"O" RING 11/16X1/2 VITON-A	P14-148
DELRIN PINION GEAR	P25-16
RETAINER DIAL 2500	B8234-001
ENGLISH COUNTER ASSY 2500	BM18849-100
"O" RING,38IDX.50ODX.06,VITON	P14-146
GASKET,CAP,2500	B5059-071
PHMS,#8-32X1/4, SS	P031-01-1719
HSSS 10-24 X 1/2 CUP PT	P31-657
TAPE KEEPER SPRING 2500	B7300-005
BINDING HD.MACH.SCREW 10-24X1	P31-669
WASH-SHIM.562X.316/.313X.005SS	P31-13

Part Name (Metric)	Part Number 13-08785
2500 CRANK ASSY.	BM3784
TAPE MET PERF,316 SST X 180'	B10538-606
F H M S 10-24 X 3/8 304 SS	P031-03-1642
HSSS 10-24 X 1/2 CUP PT	P31-657
KIT INSTRUCTIONS(MAINT)2520	33-08848
GASKET COUNTER HOUSING 2500	B6287-071
2520 "O" RING RETAINER	B7411-005
DIAL GEAR, (METRIC)	B8327-040
COUNTER COVER GASKET 2500	B7720-071
DIAL PLATE METRIC (30 CM GRAD)	B8325-001
SHEAVE ASSY-MOTOR,70' (ALUM)	BA17725
SPRING GAUGE CHECK 2500	B7796-005
WASH-SHIM.562X.316/.313X.005SS	P31-13
GAUGE CHECK ASSY (2520)	BA11566
HUB, DIAL PLATE	B9668-001
POST 2500	B6547-005
GASKET-BACK COVER,300# GA	B7293-046
RETAINING RING, 5/16 SS	P10-2
"O" RING 11/16X1/2 VITON-A	P14-148
DELRIN PINION GEAR	P25-16
2500 COUNTER ASSY - METRIC	BM18850-100
"O" RING,38IDX.50ODX.06,VITON	P14-146
GASKET,CAP,2500	B5059-071
PHMS,#8-32X1/4, SS	P031-01-1719
SLOTTED SHIM, .010	P031-29-1883
RETAINER DIAL 2500	B8234-001
TAPE KEEPER SPRING 2500	B7300-005
BINDING HD.MACH.SCREW 10-24X1	P31-669

Table 5-3: Basic Maintenance Kit #1



Table 5-4 lists the Refurbishing/Overhaul Maintenance Kit #2.

Part Name (English)	Part Number 13-08786
2500 CRANK ASSY.	BM3784
TAPE ENG.PERF,316 SST X 180'	B10537-606
F H M S 10-24 X 3/8 304 SS	P031-03-1642
KIT INSTRUCTIONS(MAINT)2520	33-08848
GASKET COUNTER HOUSING 2500	B6287-071
2520 "O" RING RETAINER	B7411-005
DIAL GEAR, (ENGLISH)	B8235-040
DIAL, (ENGLISH)	B8218-001
SLOTTED SHIM, .010"	P031-29-1883
COUNTER COVER GASKET 2500	B7720-071
SHEAVE ASSY-TAPE STORAGE(ALUM)	BA7761
SHEAVE ASSY-MOTOR,70' (ALUM)	BA17725
SPRING GAUGE CHECK 2500	B7796-005
GAUGE CHECK ASSY (2520)	BA11566
HUB, DIAL PLATE	B9668-001
POST 2500	B6547-005
GASKET-BACK COVER,300# GA	B7293-046
COUNTER COVER ASSY	DA4044
RETAINING RING, 5/16 SS	P10-2
"O" RING 11/16X1/2 VITON-A	P14-148
DELRIN PINION GEAR	P25-16
RETAINER DIAL 2500	B8234-001
ENGLISH COUNTER ASSY 2500	BM18849-100
MAGNETIC DRIVE ASSY (ENGLISH), including O-Ring	BM6874-101
"O" RING,38IDX.50ODX.06,VITON	P14-146
GASKET,CAP,2500	B5059-071
PHMS, #8-32X1/4, SS	P031-01-1719
HSSS 10-24 X 1/2 CUP PT	P31-657
TAPE KEEPER SPRING 2500	B7300-005
BINDING HD.MACH.SCREW 10-24X1	P31-669
WASH-SHIM.562X.316/.313X.005SS	P31-13

Part Name (Metric)	Part Number 13-08787
SHEAVE ASSY-MOTOR,70' (ALUM)	BA17725
2500 CRANK ASSY.	BM3784
TAPE MET PERF,316 SST X 180'	B10538-606
F H M S 10-24 X 3/8 304 SS	P031-03-1642
WASHER 9/16X21/64X1/16 SS.	P31-1
KIT INSTRUCTIONS(MAINT)2520	33-08848
GASKET COUNTER HOUSING 2500	B6287-071
STOP PIN 2500	B5274-005
2520 "O" RING RETAINER	B7411-005
DIAL GEAR, (METRIC)	B8327-040
MAGNETIC DRIVE ASSY (METRIC), including O-Ring	BM8645-101
SLOTTED SHIM, .010"	P031-29-1883
COUNTER COVER GASKET 2500	B7720-071
DIAL PLATE METRIC (30 CM GRAD)	B8325-001
SHEAVE ASSY-TAPE STORAGE(ALUM)	BA7761
SPRING GAUGE CHECK 2500	B7796-005
GAUGE CHECK ASSY (2520)	BA11566
HUB, DIAL PLATE	B9668-001
POST 2500	B6547-005
GASKET-BACK COVER,300# GA	B7293-046
RETAINING RING, 5/16 SS	P10-2
"O" RING 11/16X1/2 VITON-A	P14-148
DELRIN PINION GEAR	P25-16
RETAINER DIAL 2500	B8234-001
2500 COUNTER ASSY - METRIC	BM18850-100
WASH-SHIM.562X.316/.313X.005SS	P31-13
"O" RING,38IDX.50ODX.06,VITON	P14-146
GASKET,CAP,2500	B5059-071
PHMS,#8-32X1/4, SS	P031-01-1719
HSSS 10-24 X 1/2 CUP PT	P31-657
TAPE KEEPER SPRING 2500	B7300-005
BINDING HD.MACH.SCREW 10-24X1	P31-669
WASH-SHIM.562X.316/.313X.005SS	P31-13

Table 5-4: Refurbishing/Overhaul Maintenance Kit #2

## 6 Troubleshooting

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### 6.1 Common Problems

Friction is a common problem that affects gauge accuracy. Some liquids produce corrosion in the mechanism. Periodic inspection and maintenance provided by an Varec service contract can prevent problems from occurring. Periodic cleaning, lubrication and replacement of worn parts stops trouble before it starts.

**! Warning** The product stored in the tanks that are gauged is under pressure of 30 to 300 psig. It is most probably a flammable product, such as butane or propane. The gaugehead and piping are under pressure. Do not open them without first closing the plug valve and then carefully bleeding the product pressure from the gaugehead and piping. If there is no Varec plug valve installed, no maintenance can be performed, unless the tank is empty and not under pressure.

### 6.1.1 Dials do not respond when check knob rotated

Possible Cause		Action
1	Tape broken?	<p><b>Caution</b> Broken negator spring may cause injury. Stand clear of gaugehead and remove back cover.</p> <p><b>Yes</b></p> <ul style="list-style-type: none"> <li>• Replace tape.</li> <li>• Check negator motor attachment to storage sheave.</li> <li>• Check for damaged gauge parts.</li> </ul> <p><b>No</b> Go to 2.</p>
2	Negator motor broken?	<p><b>Yes</b></p> <ul style="list-style-type: none"> <li>• Replace negator. <i>Do not redrill or repair.</i> Wear gloves. Check tape condition.</li> <li>• Check for damaged gauge parts.</li> </ul> <p><b>No</b> Go to 3.</p>
3	Tape rewound?	<p><b>Yes</b></p> <ul style="list-style-type: none"> <li>• Tape detached from float. Replace tape and reattach.</li> <li>• Check for damaged gauge parts.</li> </ul> <p><b>No</b> Go to 4.</p>
4	Dials stopped?	<p><b>Yes</b></p> <ul style="list-style-type: none"> <li>• Check for frozen tape sprocket sheave shaft. Repair/replace.</li> <li>• Check for frozen accessory shaft. Repair/replace.</li> <li>• Check dial gear engagement with pinion gear. Adjust/replace.</li> <li>• Check gauge checker for broken spring and damaged ratchet pawl. Replace.</li> </ul> <p><b>No</b> Go to 5.</p>
5	Counter dial wheels stopped; dial plate rotates?	<p><b>Yes</b></p> <ul style="list-style-type: none"> <li>• Check for worn/broken counter pinion gear and counter wheels. Replace.</li> </ul>

Table 6-1: Dials do not Respond when Check Knob Rotated

### 6.1.2 Calibration repeatability unstable

Possible Cause		Action
1	Dirty gauge housing?	<b>Caution</b> Broken negator spring may cause injury. Stand clear of the gaugehead and remove the back cover.
		<b>Yes</b> Clean with automotive type spray degreaser. <b>No</b> Go to 2.
2	Tape/cable off elbow pulley?	Remove elbow covers. <b>Yes</b> Reseat and lubricate the gauge. <b>No</b> Go to 3.
3	Elbow pulley shaft/bushing worn/corroded?	<b>Yes</b> Repair or replace. <b>No</b> Go to 4.
4	Tape pipe/conduit dirty?	<b>Yes</b> Remove and clean. <b>No</b> Go to 5.
5	Guide cables loose, kinked or broken?	<b>Yes</b> Tighten, repair or replace. <b>No</b> Go to 6.
6	Worn Teflon bushings or bearings?	<b>Yes</b> Refurbish gauge, replace Teflon bushings or bearings. Special tools may be required.



## 7 Specifications

### 7.1 General

Manufacturer	Varec, Inc. Atlanta, GA USA
Designation	2520 High Pressure Automatic Tank Gauge (ATG)
Function	Mechanically operated, float and tape gauge for continuous liquid level measurement in bulk storage tanks

### 7.2 Environmental

Operating Temperature	From $-34\text{ }^{\circ}\text{C} \leq T_a \leq +71\text{ }^{\circ}\text{C}$ Ambient (From $-30\text{ }^{\circ}\text{F} \leq T_a \leq +160\text{ }^{\circ}\text{F}$ Ambient)
Pressure Parameters	<ul style="list-style-type: none"><li>• 150 psig [10.3 bar(g)]</li><li>• 220 psig [15 bar(g)]</li><li>• 300 psig [20.6 bar(g)]</li></ul>

### 7.3 Mechanical Construction

Enclosure Type	IP66
Material	WCB Cast Steel
Dimensions	16.25" x 12.375" x 6.875"
Shipping Weight	70 lbs. (33 kg) (nominal; weight increases with various kits).

### 7.4 Certifications and Approvals

ATEX, Class I, Zone 1 (Ex II 2G T5) 150 and 220 psi(g) Rated Models
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## 8 Ordering Information

### 8.1 Order Codes

		Measurement Units		
	01	English — 150 psig [10.3 bar(g)]		
	02	Metric — 150 psig [10.3 bar(g)]		
		Tank Type		
	T01	Tank Spheres to 16 ft. Diameter or Horizontal Cylinder Tanks		
	T02	Tank Spheres to 48 ft. Diameter		
	T03	Top Mounting on Tank Sphere or Horizontal Cylinder Tanks		
	T04	Tank Spheres to 60 ft. Diameter or Horizontal Cylinder Tanks		
		Plug Valve		
	0	Plug Valve Not Used		
	1	1 1/2" (DN40) 150 psig [10.3 bar(g)] Gauge Plug Valve (Viton-A plug)		
		Transmitter Adapter		
	0	Transmitter Adapter Not Used		
	1	2581 Transmitter Adapter		
N2520				Example Order Code N2520-01-T01-0-0

Table 8-1: 2520 Automatic Tank Gauge (ATG) 150 psig [10.3 bar(g)] – ATEX, Class I, Zone 1 (Ex II 2G T5) 150 psig [10.3 bar(g)]

		Measurement Units		
	03	English — 300 psig [20.6 bar(g)]		
	04	Metric — 300 psig [20.6 bar(g)]		
		Tank Type		
	T05	Tank Spheres to 16 ft. Diameter or Horizontal Cylinder Tanks		
	T06	Tank Spheres to 48 ft. Diameter		
	T07	Top Mounting on Tank Sphere or Horizontal Cylinder Tanks		
	T08	Tank Spheres to 60 ft. Diameter or Horizontal Cylinder Tanks		
		Plug Valve		
	0	Plug Valve Not Used		
	1	1 1 / 2” (DN40) 300 psig [20.6 bar(g)] Gauge Plug Valve (Viton-A plug)		
		Transmitter Adapter		
	0	Transmitter Adapter Not Used		
	1	2581 Transmitter Adapter		
N2520				Example Order Code N2520-03-T05-1-1

Table 8-2: 2520 Automatic Tank Gauge (ATG) 300 psig [20.6 bar(g)]

	Measurement Units		
	05	English — 220 psig [15 bar(g)]	
	06	Metric — 220 psig [15 bar(g)]	
		Tank Type	
	T05	Tank Spheres to 16 ft. Diameter or Horizontal Cylinder Tanks	
	T06	Tank Spheres to 48 ft. Diameter	
	T07	Top Mounting on Tank Sphere or Horizontal Cylinder Tanks	
	T08	Tank Spheres to 60 ft. Diameter or Horizontal Cylinder Tanks	
		Plug Valve	
	0	Plug Valve Not Used	
	1	1 1/2" (DN40) 300 psig [15 bar(g)] Gauge Plug Valve (Viton-A plug)	
		Transmitter Adapter	
	0	Transmitter Adapter Not Used	
	1	2581 Transmitter Adapter	
N2520			Example Order Code N2520-06-T05-1-1

Table 8-3: 2520 Automatic Tank Gauge (ATG) 220 psig [15 bar(g)] – ATEX, Class I, Zone 1 (Ex II 2G T5) 220 psig [15 bar(g)]



