

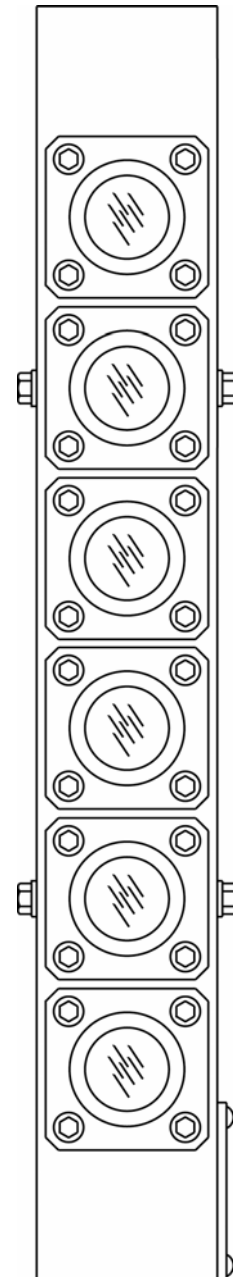


Flow Control

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PENBERTHY

Installation, Operation and Maintenance
for Penberthy Color-port
Water Level Gages &
GC3000 Gage Cocks



Installation, Operation and
Maintenance Instructions

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PENBERTHY PRODUCT WARRANTY

Tyco Valves & Controls-Prophetstown warrants its Penberthy products as designed and manufactured by TV&C-Prophetstown to be free of defects in the material and workmanship for a period of one year after the date of installation or eighteen months after the date of manufacture whichever is earliest. TV&C-Prophetstown will, at its option, replace or repair any products which fail during the warranty period due to defective material or workmanship.

Prior to submitting any claim for warranty service, the owner must submit proof of purchase to TV&C-Prophetstown and obtain written authorization to return the product. Thereafter, the product shall be returned to TV&C in Prophetstown, Illinois, with freight paid.

This warranty shall not apply if the product has been disassembled, tampered with, repaired or otherwise altered outside of TV&C-Prophetstown factory, or if it has been subject to misuse, neglect or accident.

The responsibility of TV&C-Prophetstown hereunder is limited to repairing or replacing the product at its expense. TV&C-Prophetstown shall not be liable for loss, damage or expenses related directly or indirectly to the installation or use of its products, or from any other cause or for consequential damages. It is expressly understood that TV&C-Prophetstown is not responsible for damage or injury caused to other products, buildings, personnel or property, by reason of the installation or use of its products.

THIS IS TV&C-PROPHETSTOWN'S SOLE WARRANTY AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED WHICH ARE HEREBY EXCLUDED, INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

This document and the warranty contained herein may not be modified and no other warranty, expressed or implied, shall be made by or on behalf of TV&C-Prophetstown unless made in writing and signed by the General Manager or Director of Engineering of TV&C-Prophetstown.

INSTALLATION, OPERATION and MAINTENANCE MANUAL FOR PENBERTHY COLOR-PORT WATER LEVEL GAGES

1.0 Description

The Penberthy Color-port Water Level Gages assembly is used to determine water level in pressure containing vessels. It consists of the following major components:

- 1.1 Gage assembly - The basic Color-port gage assembly (Fig. 1) consists of a trapezoidal stainless steel body with non-parallel front and back faces to which are attached individual covers holding the port assemblies.
- 1.2 Illuminator - A device that provides an electric lamp source and color discernible viewing. Red and green light (via the illuminator) enter the gage. Because of the difference in index of refraction of water and steam, only the color corresponding to the contents of the gage can pass through and be seen. Green indicates water and red indicates steam.

2.0 Principle of Operation

- 2.1 Operation - Water level gages use the principle of a liquid seeking a common level between two connected vessels. The top of the gage glass is connected to the steam space of the vessel. The bottom of the gage is connected below the normal water level of the drum. This arrangement will allow the liquid in the gage glass to seek a level indicative of the level in the vessel.
- 2.2 Accuracy - The water in the gage glass is cooler than the water in the vessel and is therefore more dense. This results in a gage water level which is lower than the true water level in the vessel. The operator must be cautioned to look for other conditions which may also lead to variations in gage glass levels. Plugged connection lines will cause abnormal level readings which can be corrected by proper washdown. Steam leaks will reduce the pressure in the steam space of the gage and will cause the water level in the gage to rise. Steam leaks should be properly corrected to prevent damage to the gage gasket seating surface as well as to prevent false readings.
- 2.3 Glass and Mica - At boiler pressures above 300 psig, high temperature water will corrode unprotected gage glass. Penberthy protects the gage glass from corrosive attack by installing a thin sheet of ruby mica on the inner face of each port; however, this protection is not permanent. Continual exposure to high temperature, high pressure water will also corrode the mica shield. The rate at which this corrosion occurs is significantly less than that of glass, and is dependent upon a number of factors. Generally, the higher the operating temperature, the higher the rate of attack.

Penberthy recommends each customer establish a preventative maintenance schedule which insures the mica-gasket-glass assembly is replaced prior to the dissolution of the mica shield.

In service gages that have glass which appears white or is opaque should be isolated immediately and the mica-gasket-glass assembly should be replaced before returning to service. Should any question develop on the condition of the gage glass, the procedure given under the section on preparation for washdown, auxiliary service or gage inspection should be used to evaluate port glass condition.



WARNING



Failure to promptly replace the mica-gasket-glass assembly that appears white or opaque can result in catastrophic failure of the glass with violent discharge of hazardous high velocity steam. The discharge of high velocity steam can result in severe personal injury and property damage.



Figure 1 - Typical Gage Assembly

3.0 Installation of Gage System

CAUTION: Gage should not be subjected to acid wash cleaning. Gage must be isolated from this process or replaced with a boil out gage during startup or cleaning.

- 3.1 If the gage is furnished with an alarm water column, water column, or gage isolation valves, they should be installed on the proper connections prescribed for the vessel. Any unused connections on some models of valves furnished with multi-connections should be sealed using the plugs furnished.
- 3.2 Gages furnished with gage cocks as shown in Fig. 3C are installed as follows:
 - 3.2.1 Insert gaskets into groove of large groove face flanges and mount gage (large tongue face flange) with studs and nuts provided.
 - 3.2.2 Mount the chain wheels (9) on valve stems using nuts (16) and washers (19) furnished. The lower chain wheel should be mounted with the hub to the outside, so that the upper chain hangs to the outside and clear of the lower chain wheel.

3.3 Gages furnished with stuffing box (S/B) isolating gage cocks (refer to gage cock manual for the type of S/B gage cocks provided) are installed as follows:

- 3.3.1 Remove upper & lower nipple stuffing box packing glands from the gage cocks.
- 3.3.2 Install packing gland and bottom ring on top gage nipple. Install packing glad on lower gage nipple.
- 3.3.3 Install the packing on the upper and lower gage nipples in the sequence specified in the packing instructions supplied with the packing.
- 3.3.4 Insert the gage into the upper S/B gage cocks first, and then the lower S/B gage cocks.
- 3.3.5 Rotate the gage to the desired viewing angle, install and tighten the upper and lower packing glands to the gage cocks.

4.0 Operating Instructions - Placing Gage in Service

4.1 Start up Procedure

- 4.1.1 Open the gage drain valve fully.
- 4.1.2 Open upper and lower isolation valves if provided.
- 4.1.3 Crack the upper gage gage cock.
- 4.1.4 Allow the gage to heat without pressure build up for 10 minutes.
- 4.1.5 Gradually close the drain valve and allow the pressure to build up slowly in the gage for about 15 to 20 minutes.
- 4.1.6 Close the gage drain valve tightly.
- 4.1.7 Fully open the upper and lower gage cocks.
- 4.1.8 Gage is now in service.

5.0 Maintenance

5.1 Preparation for washdown, servicing gage auxiliaries or gage inspection

Before performing any service or inspection on gages under pressure, the procedure given below is recommended to evaluate port condition. This includes gage washdown procedures, inspection and adjustment of Auxiliaries (Illuminator, etc.).

The following procedure is recommended to prevent exposure of personnel to pressurized gages with ports that require replacement.

- 5.1.1 Close upper and lower isolation valves.
- 5.1.2 Close upper and lower gage cocks.
- 5.1.3 Crack open drain valve(s) to slowly depressurize gage. When gage is depressurized, open drain valve(s) fully.
- 5.1.4 After cooling, remove Color-port viewing device (Hood, Direct View Hood, Fiber-Port, etc.) and Illuminator.
- 5.1.5 Visually check mica-gasket-glass assembly for a white or opaque appearance. Check each port from both sides of the gage. Use a flashlight for illumination. A white or opaque appearance is an indication that the protective mica shield has been penetrated. The mica-gasket-glass assemblies must be replaced before placing the gage back in operation.

5.2 Washdown Procedure



WARNING



Failure to promptly replace the mica-gasket-glass assembly that appears white or opaque can result in catastrophic failure of the glass with violent discharge of hazardous high velocity steam. The discharge of high velocity steam can result in severe personal injury and property damage.

The level gage connecting pipes, valves and internal passageways must be kept free from obstructions caused by sediment and rust deposits in order for the gage to provide the proper level indication. Additionally, sediment buildup on the mica can mask the true water level. To minimize the influence of sediment buildup, gage washdown is recommended. Penberthy recommends the following washdown procedures:

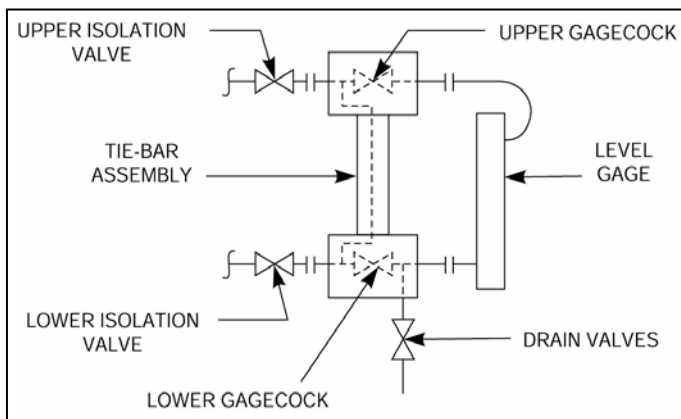


Figure 2A: Gages w/ Tie-Bar, Gage cocks & Isolation Valves

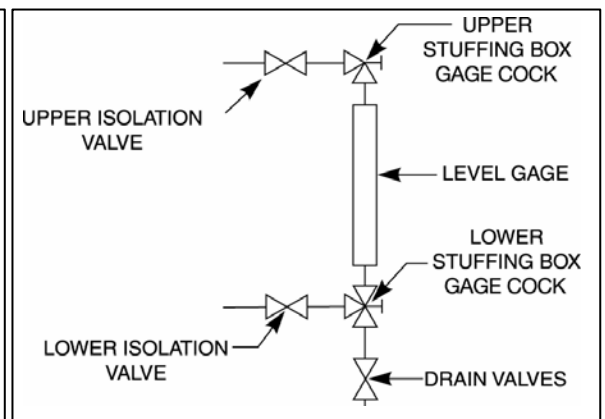


Figure 2B: Gages w/ Stuffing Box (S/B) & Isolation Valves.

5.2.1 Gages with Tie-Bar, Gage cocks and Isolation Valves (Figure 2A)

- 5.2.1.1 Open the upper and lower isolation valves.
- 5.2.1.2 Close upper and lower gage cocks.
- 5.2.1.3 Slowly open drain valve(s) - water in gage will drain.
- 5.2.1.4 Close drain valve and slowly open lower gage cock. Water level in gage will rise to the top. Open lower gage cock completely.
- 5.2.1.5 Slowly open drain valve(s). Water level in gage will lower as flow rate through lower gage cock connecting pipe increases. This will clear sediment from lower gage cock and connecting lines.
- 5.2.1.6 Close the drain valve. Water level in gage will again rise to the top of the gage.
- 5.2.1.7 Close the upper isolation valve and open upper gage cock completely. Close lower gage cock; then, slowly open the drain valve. This will clear the tie-bar and the gage with boiler feed-water. Slowly close the drain valve.
- 5.2.1.8 Open the upper isolation valve completely. Re-open the drain valve slowly until a substantial flow rate is established through the gage. This will purge the upper gage connecting lines and the gage with a mixture of steam and feedwater. Slowly close drain valves.
- 5.2.1.9 Open the upper and lower gage cocks and upper and lower isolation valves. Check the gage for cleanliness. Repeat procedure if necessary.

Completion of steps 6, 7, and 8, in order, give progressively increased cleaning action. The procedure may be stopped after step 6 or 7 by skipping to step 9 once the gage is clean.

5.2.2 Gages with Stuffing Box (B/S) Gage cocks and Isolation Valves (Fig. 2B)

- 5.2.2.1 Open upper and lower isolation valves if provided.
- 5.2.2.2 Close upper gage cock.
- 5.2.2.3 Open lower gage cock.
- 5.2.2.4 Slowly open drain valve(s). Water level in gage will lower as flow rate through lower gage cock and connecting pipes increases. This will clear sediment from lower gage valve and connecting lines.
- 5.2.2.5 Close the drain valve. Water level in gage will again rise to top of

gage.

5.2.2.6 Close the lower gage cock and open the upper gage cock completely. Re-open drain valve slowly until a substantial flow rate is established through the gage.

5.2.2.7 Close the drain valve completely.

5.2.2.8 Open the lower gage cock. Check the gage for clearness. Repeat procedure if necessary. Objects which cannot be cleared by the above procedure will require removal of the gage from the boiler connections.

5.3 How to Service Color-port Water Gage Servicing the Ports

Penberthy recommends servicing the gage disconnected from the boiler piping and resting in a horizontal position on a workbench. Gages serviced in this manner, where particular attention is given to body groove and port cleanliness, as well as sealing gasket positioning, have performed better than those gages serviced while connected to the boiler piping.

If a gage must be serviced while still installed on the boiler, particular attention must be given to:

- 1). The cleanliness and integrity of the body grooves
- 2). The cleanliness and position of the replacement port assemblies
- 3). The proper positioning of the sealing gaskets in the body grooves during tightening of the cover cap screws.

The following steps must be followed:

(Numbers in parentheses refer to items in Figure 3B)

1. Isolate the gage and remove pressure before starting to disassemble the gage. Follow the procedure in section "Preparation for washdown, servicing gage auxiliaries or gage inspection".
2. Turn off the electrical power to the illuminator. Carefully remove and set aside the illuminator and viewing assembly. Remove the gage assembly from the boiler connection lines.
3. Loosen and remove the cap screws (10). Use a 3/8" size socket wrench.
4. Remove the viewing port assembly completely. Figure 3B shows a cross section. Retain the cover (2), spring cones (4), washer (5), and retaining spring (8). Discard the used cushion gasket (6) and the used glass-mica-gasket-clip ring assembly (7, 11, 9, and 3).

5.4 Cleaning and Inspection of Parts

The semi-circular sealing surfaces in the gage body must be restored to as-new condition. Care must be used to retain or restore the controlled dimensions of

the parts to maintain the correct sealing forces as created by the spring cones. Use the following steps for cleaning and inspection of the parts:

(Number in parentheses refer to items in Figure 3B)

1. Clean and dry the gasket sealing surface of the gage body. Use a solid-type stainless steel wire-end brush, Penberthy P/N 301160, attached to an electrical drill. No damage is permitted to the sealing surface. Inspect carefully for marks or residual material, above or below the surface, that could cause leakage.
2. Carefully clean and dry the contact surfaces of the cover (2) inside and where it contacts the gage body. Clean the surface of the gage body contacted by the cover, and clean the surface of the washer (5) to remove all traces of the cushion gasket (6).
3. Inspect the condition of the cover (2) for distortion due to previous over-tightening of bolts or indentation from spring cone contact. Place the cover over its contact surface on the body. The cover and body must make firm, flat contact. Manually check for rocking of the cover on the body surface. Replace cover if damaged.
4. Inspect the condition of the gage body for evidence of previous over-tightening of bolts. Check the gasket seal surface for cleanliness and polished finish. Contact Penberthy if damage is found on the gage body.
5. Inspect the spring cones. Replace them if they are damaged or corroded or if the spring cone stack height is below .285 inch (7.25mm). See Fig 3A.

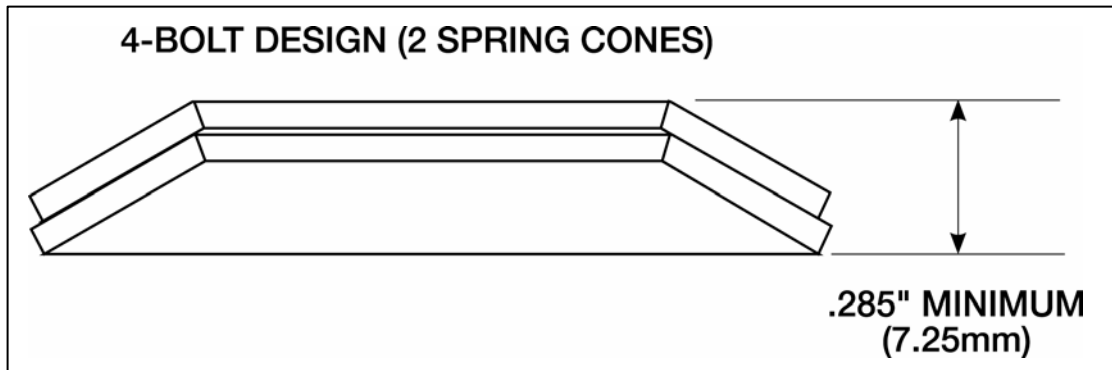


Figure 3A

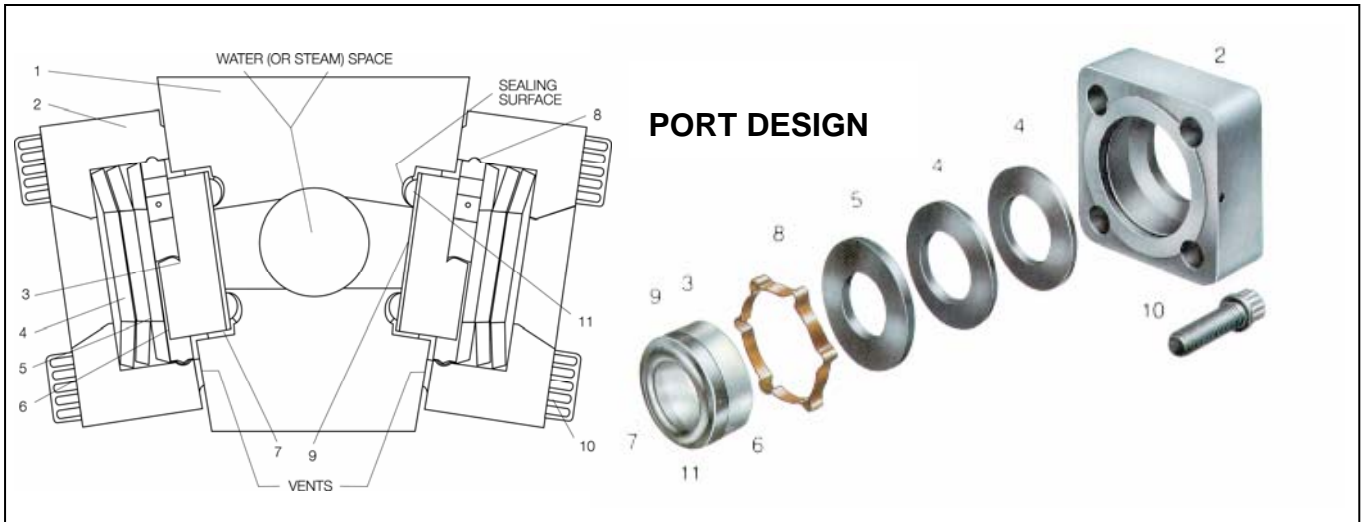
6. Inspect the replacement parts. A repair port kit, Penberthy P/N 7Y584-000, is furnished as a package consisting of a glass (3), mica (9), sealing gasket (11), held together in a clip ring (7), plus a cushion gasket (6).
7. The replacement parts are clean and dry as supplied. Handle the kit by holding it on the outer diameter; avoid touching the face of the mica or permitting moisture, dirt, chips, or other foreign matter to adhere to the parts. Cleanliness and dryness of the parts are most important.

5.5 Reassembling the Port

CAUTION: Grease, dirt, finger-prints and moisture will affect port life visibility.

(Numbers in parentheses refer to items in Figure 3B)

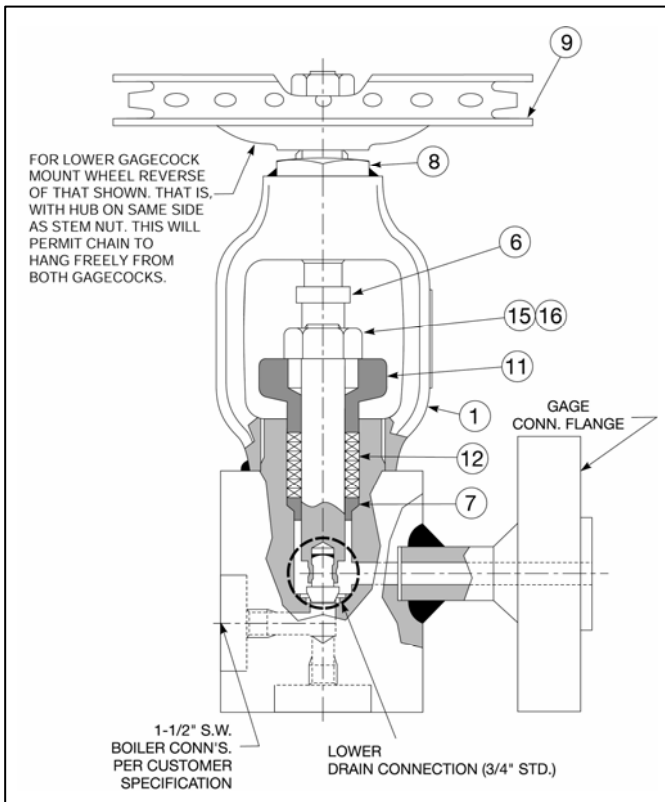
1. Lightly lubricate the cap screw (10) threads with high temperature anti-seize compound.
2. Properly orient spring cone(s) (4) into the cover (2). See Figure 3B. Note that the conical shape touches the cover on the large diameter and makes contact with the flat washer (5) on the smaller inside diameter.
3. Place the flat washer (5) on top of, and in contact with spring cone(s) (4).
4. Place the cushion gasket (6) in contact with the flat washer (5).
5. Install the retaining spring (8) into the cover. See Figure 3B.
6. Taking the repair kit as an assembly (glass, mica, sealing gasket, clip ring) insert it directly into the retaining spring and into contact with the cushion gasket (6). See Figure 3B and Figure 4.
7. Inspect for assurance of proper assembly and clean parts. The sealing gasket (11) should be firmly centered in the clip ring (7).
CAUTION: Handle the glass, mica, gasket and clip ring assembly by the edges only. When installing, do not touch or apply pressure directly on the gasket or mica.
8. Keep moisture from entering between the mica and the glass to prevent premature failure.
9. Reassemble the viewing port assembly, centering the sealing gasket in the body groove. Locate the vent in the horizontal direction, toward the narrow side of the gage body.
10. Tighten the cap screws (10) uniformly with 3/8" socket wrench until metal-to-metal contact is just made, then tighten to 30 to 35 ft•lb (40.7 - 47.5 N•m). Do not use a power wrench. further tightening may damage the cap screws, body or cover.



Item No.	Part Name	Item No.	Part Name
1	Gage Body	7	Clip Ring*
2	Cover	8	Retaining Spring
3	Glass*	9	Mica*
4	Spring Cones(s)	10	Cap Screws
5	Washer	11	Sealing Gasket*
6	Cushion Gasket*		

Figure 3B - Port Design

*Furnished in kit - P/N 7Y584-000 Groove clean up tool - (stainless wire brush) P/N 301160



Item	Description	Remarks
1	Upper Valve Body L.H. or R.H.	Specify Model No., Pressure & Handling
2	Lower Valve Body L.H. or R.H.	Specify Model No., Pressure & Handling
6	Stem & Disc Assembly	Order as complete Assembly only
7	Bushing-Stuffing Box	
8	Bushing-Yoke	
9	Chain Wheel	
11	Gland	
12	Packing for Stem	
14	Chain for Wheels	Specify Length
15	Studs	
16	Nuts	
19	Washers	
20	Pulls for	Right Hand
20A	Chain	Left Hand
WB-1	Seat Tool	P/N 959591-01
	Cutter No. 10	P/N 018564-01

To Order - Flange Gaskets, Bolts and Nuts - Specify Valve Figure No. and Pressure Class.

Figure 3C - Gage cock GC3000

5.6 Parts/Materials

Use only genuine Penberthy replacement parts for Penberthy products. The use of substitutes will result in risk to personal safety or poor product performance.

5.7 Heating up and Restoring to Service

Follow the instructions in "Operating Instructions, Placing Gage In Service".

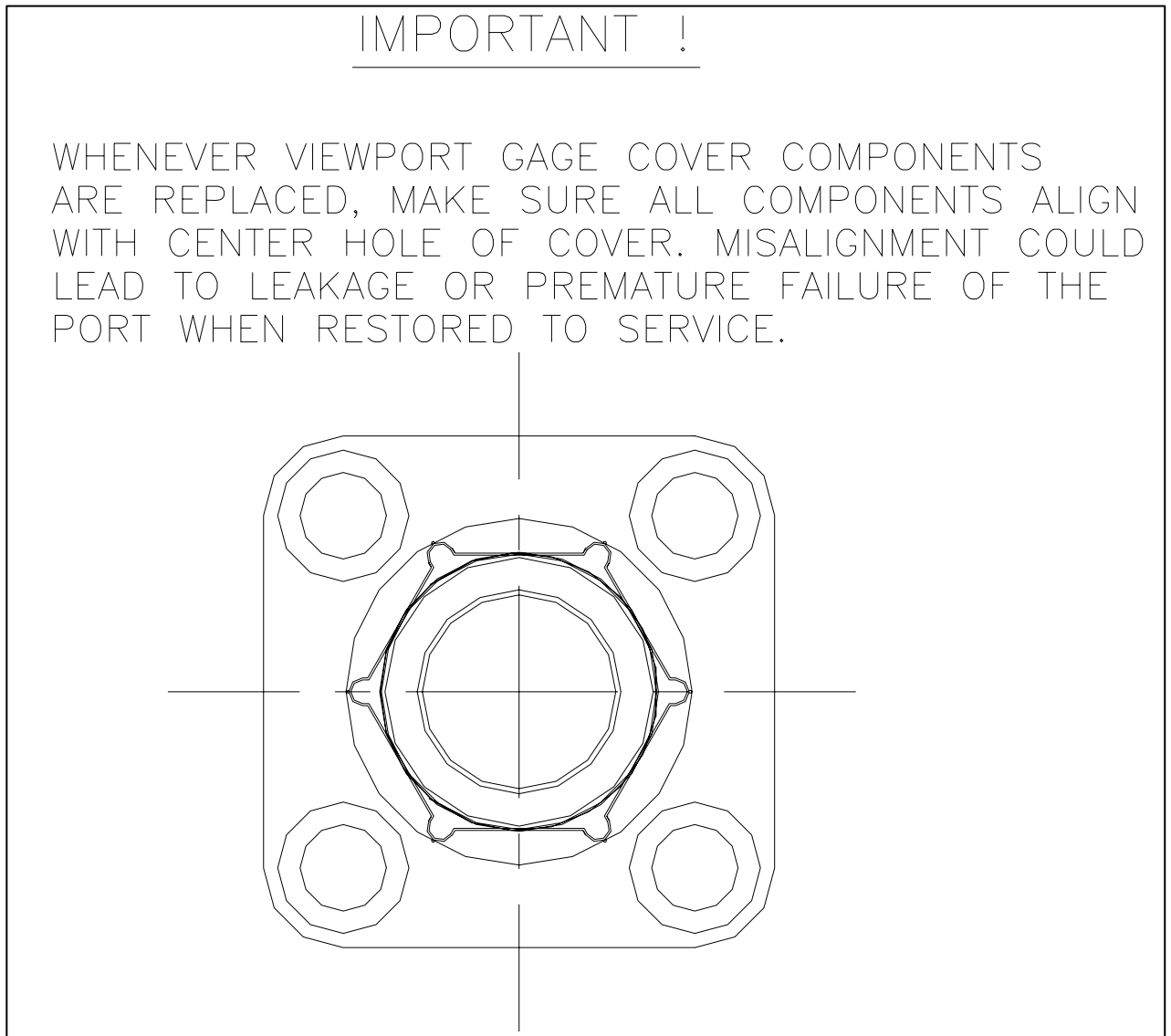




Figure 4 - Port Hole Alignment

6.0 Installation and Adjustment of Color-port Gage Illuminator

All instructions should be read and thoroughly understood before starting any installation. Only qualified experienced personnel who are familiar with the equipment and have read these instructions should install this equipment.

IMPORTANT: Failure to follow the instructions could result in a malfunction of the illuminator and the loss of the ability to read the liquid level in the Color-port Gage.

	WARNING	
<p>Any failure of the Color-port Gage resulting in leakage can cause severe personal injury or electrical shock to personnel. Property damage may occur as a result of a failure.</p>		
SAFETY INSTRUCTION		
<p>Always wear safety glasses and other required appropriate safety equipment when installing, servicing and operating the illuminator.</p>		

6.1 Design Ratings

Penberthy standard illuminators are designed to mount easily on Color-port Gages and are available for indoor and outdoor use. The standard illuminator rating is 120/230 VAC.

	WARNING	
<p>Check the line voltage going to the illuminator before starting the installation. The line voltage must match the voltage of the lamps that will be installed. Exceeding the rated limits can cause serious personal injury.</p>		

6.2 Installation

Only qualified, experienced personnel who are familiar with the equipment and have read and understood these instructions should install this equipment. Refer to the illuminator manual (P/N 18KY6-009) for detailed instructions.

	CAUTION	
<p>Do not install the illuminator to a Color-port Gage until the gage has been permanently mounted and tested in accordance with the gage instructions. The gage must be at ambient temperature and relieved of all internal pressure. Failure to do so may cause personal injury.</p>		

7.0 Color-port Water Level Gage & GC3000 Gage Cock Specifications *

7.1 Color-port Gage

Pressure / Temperature ratings:

Model 4511N: 1800 psig @ 622°F
[12.41 Mpag @ 328°C]

Model 4595F: 3000 psig @ 696°F
[20.68 Mpag @ 369°C]

7.2 GC3000 Gage cocks

Pressure / Temperature ratings: 3000 psig @ 696°F
[20.68 Mpag @ 369°C]

(With 2500# class flanges. A lower rated flange will de-rate the gage cock.)

8.0 Disposal at End of Useful Life

The Color-port Water Level Gages may be used in a variety of fluid applications. By following the appropriate national and industry regulations, the user must determine the extent of preparation and treatment the Color-port Water Level Gages must incur before its disposal. A Material Safety Data Sheet (MSDS) may be required before disposal services accept certain components.

Metal, glass and polymers should be recycled whenever possible. Refer to order and TV&C - Prophetstown Material Specification sheets for materials of construction.

RIGHT TO KNOW LAWS AND OSHA STANDARD 29CFR (1910.1200)
Material Safety Data Sheets on the following Penberthy product:
Color-port Water Level Gages

The OSHA Hazard Communication Standard 29CFR 1910.1200, states that the standard does not apply to "articles". The standard defines an article as:

*A manufactured item formed to a specific shape or design for a particular use which does not release or otherwise expose an employee to a hazardous chemical under normal conditions of use".

The above named products fall within the definition of an "article", no Material Safety Data Sheets are available or are required. Our product is manufactured as an "end product".

If the product is a weld end the following applies.

WARNING: Materials used in manufacture of Penberthy products are considered in a stable condition when shipped. However, under certain conditions purchasers could create potential hazardous conditions by their future operations.

Caution: Welding, cutting, burning, machining or grinding of this product can generate toxic dust and fumes of potentially hazardous ingredients.

The dust or fumes can cause irritation of the respiratory tract, nose, throat, skin and eyes. It may cause temporary or permanent respiratory disease in a small percentage of exposed individuals. Use moderate ventilation when grinding or welding. Avoid breathing dust, fumes or mist.

Avoid prolonged skin contact with dust or mist. Maintain dust levels below OSHA and ACGIH levels. Use protective devices. Wash hands thoroughly after contact with dust before eating or smoking.

For emergency information contact:

Tyco Valves & Controls, L.P. Prophetstown

320 Locust St., Prophetstown, Illinois 61277

Phone: 815-537-2311

Fax: 815-537-5365

E-mail: boilertrimteam@tycovalves.com

9.0 Telephone Assistance / Factory Repair

If you are having difficulty with your Color-port Water Level Gages, contact your local Tyco / Penberthy distributor. You may also contact the factory direct at (815) 537-2311 and ask for an applications engineer. So that we may assist you more effectively, please have as much of the following information available when you call:

- Model #
- Name of the company from whom you purchased the Color-port Water Level Gages
- Invoice # and date
- Process conditions (pressure, temperature, cycle rate, etc.)
- A brief description of the problem
- Troubleshooting procedures that failed

If attempts to solve your problem fail, you may request to return your Color-port Water Level Gages to the factory for intensive testing. You must obtain a Return Authorization (R.A.) number from TV&C - Prophetstown before returning anything. Failure to do so will result in the unit being returned to you without being tested, freight collect. To obtain an R.A. number, the following information (in addition to that above) is needed:

- Reason for return
- Person to contact at your company
- "Ship To" address

There is a minimum charge of \$75.00 for evaluation of non-warranty units. You will be contacted before any repairs are initiated should the cost exceed the minimum charge. If you return a unit under warranty, but is not defective, the minimum charge will apply.

tyco

Flow Control

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