

YARWAY COLOR-PORT® WATER LEVEL GAUGES & WELBLOC GAUGE VALVES

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

Before installation, these instructions must be carefully read and understood.



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1 DESCRIPTION

The Yarway Color-Port® Water Level Gauges assembly is used to determine water level in pressure containing vessels. It consists of the following major components:

- 1.1 Gauge assembly** – The basic Color-Port® gauge assembly (Figure 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 Tie-bar** – includes upper and lower Welbloc gauge valves which provide isolation of the gauge for servicing, and a connection for draining of the gauge.
- 1.3 Illuminator** – A device that provides a light source via LEDs and color discernible viewing. Red and green light (via the LED illuminator) enter the gauge. Because of the difference in index of refraction of water and steam, only the color corresponding to the contents of the gauge can pass through and be seen. Green indicates water and red indicates steam.



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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

2 PRINCIPLE OF OPERATION

2.1 Operation – Water level gauges use the principle of a liquid seeking a common level between two connected vessels. The top of the gauge glass is connected to the steam space of the vessel. The bottom of the gauge is connected below the normal water level of the drum. This arrangement will allow the liquid in the gauge glass to seek a level indicative of the level in the vessel.

2.2 Accuracy – The water in the gauge glass is cooler than the water in the vessel and is therefore denser. The results in a gauge 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 gauge 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 gauge and will cause the water level in the gauge to rise. Steam leaks should be properly corrected to prevent damage to the gauge 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 gauge glass. Yarway protects the gauge 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.

Yarway 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 gauges that have glass which appears whit 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 gauge glass, the procedure given under the section on preparation for washdown, auxiliary service or gauge 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.

3 INSTALLATION OF GAUGE SYSTEM

CAUTION

Gauge should not be subjected to acid wash cleaning. Gauge must be isolated from this process or replaced with a boil out gauge during startup cleaning.

3.1 If the gauge is furnished with an alarm water column, water column, or gauge 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 Gauges furnished with Welbloc® isolating valves (see Figure 3C) are installed as follows:

3.2.1 Insert gaskets into groove of large groove face flanges and mount gauge (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 Gauges furnished with stuffing box (S/B) isolating gaugecocks (refer to gauge cock manual for the type of S/B gauge cocks provided) are installed as follows:

3.3.1 Remove upper & lower nipple stuffing box packing glands from the gaugecocks.

3.3.2 Install packing gland and bottom ring on top gauge nipple. Install packing gland on lower gauge nipple.

3.3.3 Install the packing on the upper and lower gauge nipples in the sequence specified in the packing instructions supplied with the packing.

3.3.4 Insert the gauge into the upper S/B gaugecock first, and the lower S/B gaugecock.

3.3.5 Rotate the gauge to the desired viewing angle, install and tighten the upper and lower packing glands to the gaugecocks.



Figure 1
Typical Gauge Assembly

3.3.6 Mount the chain wheels on gaugecock stems using nuts and washers furnished. The lower chain wheel should be mounted with the hub to the outside, so the upper chain hangs to the outside and clear of the lower chain wheel.

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4 OPERATING INSTRUCTIONS – PLACING GAUGE IN SERVICE

4.1 Start up Procedure

- 4.1.1 Open the gauge drain valve fully.
- 4.1.2 Open upper and lower isolation valves if provided.
- 4.1.3 Crack the upper Welbloc/stuffing box gauge valve.
- 4.1.4 Allow the gauge 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 gauge for about 15 to 20 minutes.
- 4.1.6 Close the gauge drain valve tightly.
- 4.1.7 Fully open the upper and lower Welbloc/stuffing box gauge valves.
- 4.1.8 Gauge is now in service

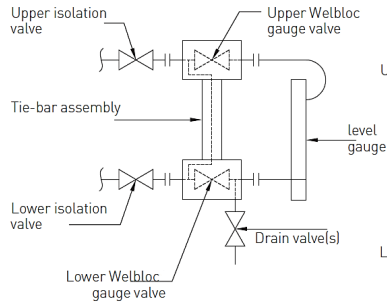


FIGURE 2A

Gauges with Tie-Bar, Welbloc Gauge Valves and Isolation Valves

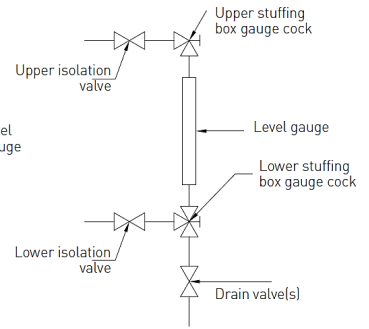


FIGURE 2B

Gauges with Stuffing Box (S/B) Gauge Valves and Isolation Valves

5 MAINTENANCE

5.1 Preparation for washdown, servicing gauge auxiliaries or gauge inspection

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

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

- 5.1.1 Close upper and lower isolation valves.
- 5.1.2 Close upper and lower Welbloc / stuffing box gauge valves.
- 5.1.3 Crack open drain valve(s) to slowly depressurize gauge. When gauge is depressurized, open drain valve(s) fully.
- 5.1.4 After cooking, 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 gauge. 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 gauge back in operation.

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.

5.2 Washdown Procedure

The level gauge connecting pipes, valves and internal passageways must be kept free from obstructions caused by sediment and rust deposits in order for the gauge 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, gauge washdown is recommended. Yarway recommends the following washdown procedures:

5.2.1 Gauges with Tie-Bar, Welbloc Gauge Valves and Isolation Valves (Figure 2A)

- 5.2.1.1 Open the upper and lower isolation valves.
- 5.2.1.2 Close upper and lower Welbloc gauge valves
- 5.2.1.3 Slowly open drain valve(s) – water in gauge will drain.
- 5.2.1.4 Close drain valve and slowly open lower Welbloc gauge valve. Water level in gauge will rise to the top. Open lower Welbloc gauge valve completely.
- 5.2.1.5 Slowly open drain valve(s). Water level in gauge will lower as flow rate through lower Welbloc gauge valve connecting pipe increases. This will clear sediment from lower Welbloc gauge valve and connecting lines.
- 5.2.1.6 Close the drain valve. Water level in gauge will again rise to the top of the gauge.

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- 5.2.1.7 Close upper isolation valve and open upper Welbloc gauge valve completely. Close lower Welbloc gauge valve; then, slowly open the drain valve. This will clear the tie-bar and the gauge with boiler water 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 gauge. This will purge the upper gauge connecting lines and the gauge with a mixture of steam and feedwater. Slowly close the drain valves.
- 5.2.1.9 Open the upper and lower Welbloc gauge valves and upper and lower isolation valves. Check the gauge 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 gauge is clean.

Blowdown Procedure:



- 5.2.2 Gauges with Stuffing Box (B/S) Gauge Valves and Isolation Valves (Figure 2B)
- 5.2.2.1 Open upper and lower isolation valves if provided.
- 5.2.2.2 Close upper Stuffing Box (B/S) Gauge Valve.
- 5.2.2.3 Open lower Stuffing Box (B/S) Gauge Valve.
- 5.2.2.4 Slowly open drain valve(s). Water level in gauge will lower as flow rate through lower Stuffing Box (B/S) Gauge Valve and connecting pipes increases. This will clear sediment from lower Stuffing Box (B/S) Gauge Valve and connecting lines.
- 5.2.2.5 Close the drain valve. Water level in gauge will again rise to top of gauge.
- 5.2.2.6 Close the lower Stuffing Box (B/S) Gauge Valve and open the upper Stuffing Box (B/S) Gauge Valve completely. Re-open drain valve slowly until a substantial flow rate is established through the gauge.
- 5.2.2.7 Close the drain valve completely.
- 5.2.2.8 Open the lower Stuffing Box (B/S) Gauge Valve. Check the gauge for clearness. Repeat procedure if necessary. Objects which cannot be cleared by the above procedure will require removal of the gauge from the boiler connections.

5.3 How to Service Color-Port® Water Gauge – Servicing the Ports

Yarway recommends servicing the gauge disconnected from the boiler piping and resting in a horizontal position on a workbench. Gauges 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 gauges serviced while connected to the boiler piping.

If a gauge 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 parenthesis refer to items in Figure 3B)

1. Isolate the gauge and remove pressure before starting to disassemble the gauge. Follow the procedure in section "Preparation for washdown, servicing gauge auxiliaries or gauge inspection."
2. Turn off the electrical power to the LED illuminator. Carefully remove and set aside the LED illuminator and viewing assembly. Remove the gauge assembly from the boiler connection lines.
3. Loosen and remove the cap screws (10). Use a 3/8" 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-clip ring assembly (7, 11, 9 and 3).

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5.4 Cleaning and Inspection of Parts

The semi-circular sealing surfaces in the gauge 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 for the parts:

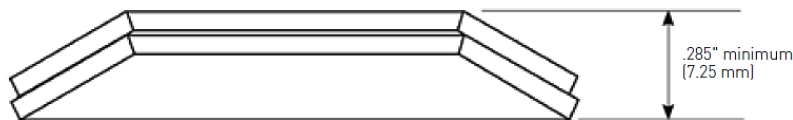


FIGURE 3A
4-bolt design (2 spring cones)

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

1. Clean and dry the gasket sealing surface of the gauge body. Use a solid-type stainless steel wire-end brush, Yarway 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 gauge body. Clean the surfaces of the gauge 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 gauge body for evidence of previous over-tightening of bolts. Check the gasket seal surface for cleanliness and polished finish. Contact Yarway if damage is found on the gauge body.
5. Inspect the spring cones. Replace them if they are damaged or corroded or if the spring cones stack height is below .285 inch (7.25mm). See Figure 3A.
6. Inspect 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 parenthesis 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, and 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 gauge body.
10. Tighten the cap screws (10) uniformly with 3/8" socket wrench until metal-to-metal contact is just made, then tighten to 22 – 25 ft•lb (29.8-33.9 N•m). Do not use a power wrench. Further tightening may damage the cap screws, body or cover.

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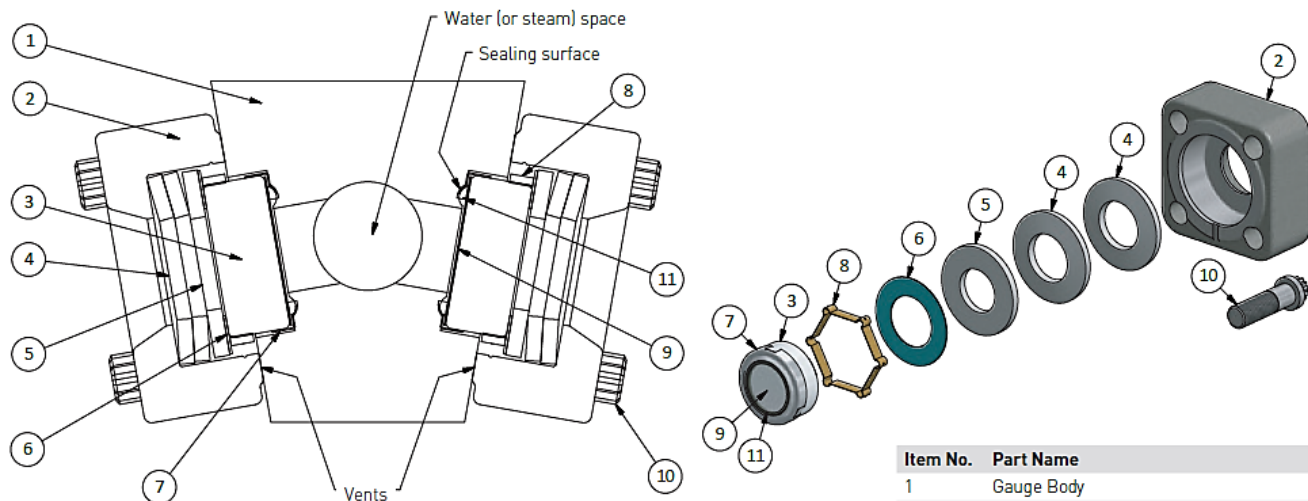


FIGURE 3B
Port Design

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

*Furnished in kit - P/N 7Y584-000

Groove clean up tool - (stainless wire brush) P/N 301160

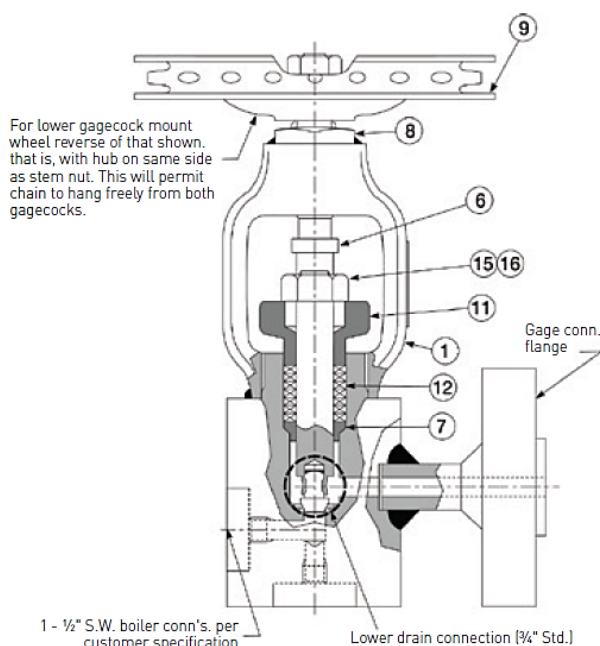


FIGURE 3C
Welbloc Gauge Valve

Item	Description	Remarks
1	Upper Valve Body	Specify Model No., L.H. or R.H. Pressure & Handling
2	Lower Valve Body	Specify Model No., L.H. or R.H. 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 Chain	Right Hand
20A		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.

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5.6 Parts/Materials

Use only genuine Yarway replacement parts for Yarway 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 Gauge In Service."

6 COLOR-PORT® WATER LEVEL GAUGE & WELBLOC GAUGE VALVE SPECIFICATIONS*

6.1 Color-Port® Gauge

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)

6.2 Welbloc Gauge Valves

Pressure / Temperature ratings:

3000 psig @ 696°F
(20.68 Mpag @ 369°C)

(With 2500# class flanges, a lower rated flange will de-rate the gauge cock).

7 DISPOSAL AT END OF USEFUL LIFE

The Color-Port® Water Level Gauges 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 Gauges must incur before its disposal. A Material Safety Data Sheet (MSDS) may be required before disposal services accept certain components.

Right to know laws and OSHA standard 29CFR (1910.1200)

Material Safety Data Sheets on the following Yarway product:
Color-port Water Level Gagues

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 Yarway products are considered in 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.

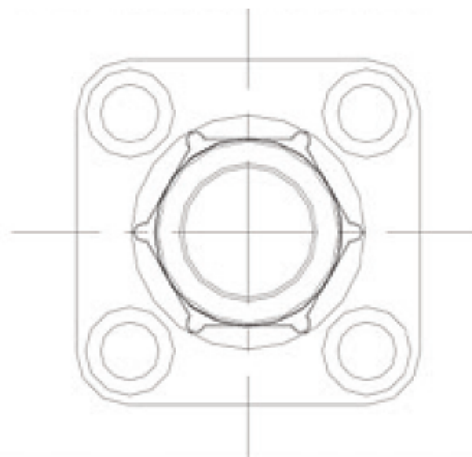


FIGURE 4
Port Hole Alignment

IMPORTANT

Whenever viewport gage cover components are replaced, make sure all components align with center hole of cover. Misalignment could lead to leakage or premature failure of the port when restored to service.

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8 WARRANTY

See sales order acknowledgments for Terms and Conditions of Sale.

9 TELEPHONE ASSISTANCE/FACTORY REPAIR

If you are having difficulty with your Color-Port® Water Level Gauges, contact your local Yarway distributor. You may also contact the factory direct at +1 (440) 572-1500 and ask for a Penberthy 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 Gauges
- 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 Gauges to the factory for intensive testing. You must obtain a Return Authorization (R.A.) 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 \$150.00 for evaluation for 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.

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