

Instructions for XL-160 and XL-180



Do not attempt to use or maintain this unit until you read and understand these instructions. Do not permit untrained persons to use or maintain this unit. If you do not fully understand these instructions, contact your supplier for further information.



Taylor-Wharton

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Container Safety

Pressure Hazard – The containers covered by this literature contain liquefied gas under pressure. Sudden release of this pressure may cause personal injury by issuing cold gas or liquid, or by expelling parts during servicing. Do not attempt any repairs on these containers until all pressure is released, and the contents have been allowed to vaporize to ensure no pressure buildup can occur.

Extreme Cold – Cover Eyes and Exposed Skin – Accidental contact of the skin or eyes with any cryogenic liquid or cold issuing gas may cause a freezing injury similar to frostbite. Protect your eyes and cover your skin when handling the container or transferring liquid, or in any instance where the possibility of contact with liquid, cold pipes, and cold gas may exist. Safety goggles or a face shield should be worn when withdrawing liquid or gas. Long-sleeved clothing and gloves that can be easily removed are recommended for skin protection. Cryogenic liquid is extremely cold and will be at temperatures below -300° F (-184°C) under normal atmospheric pressure.

Keep Equipment Well Ventilated – Although the gases used in these containers are non-toxic and non-flammable, they can cause asphyxiation in a confined area without adequate ventilation. An atmosphere that does not contain enough oxygen for breathing can cause dizziness, unconsciousness, or even death. These gases cannot be detected by the human senses and will be inhaled normally as if they were air. Ensure there is adequate ventilation where these gases are used and store liquid containers outdoors or only in a well ventilated area.

Replacement Parts Must be Clean to Prevent Contamination – Use only Taylor-Wharton recommended spare parts, and be certain parts used are properly cleaned to prevent contamination of stored product. For information on cleaning, consult the Compressed Gas Association (CGA) pamphlet¹ G-4.1, “Cleaning for Oxygen Service” or equivalent industrial cleaning specifications.

Install Relief Valves in Cryogenic Liquid Lines – When installing or fill hose assemblies, make certain a suitable safety relief valves is installed in each section of plumbing between shut-off valves. Trapped liquefied gas will expand as it warms and may burst hoses or piping causing damage or personal injury.

NOTE:

For detailed information on the handling of cryogenic liquids, refer to the Compressed Gas Association publication(1): P-12 “Safe Handling of Cryogenic Liquids.”

¹ Available from the Compress Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.

General Information

The XL-160 and XL-180 are vacuum insulated, stainless steel containers designed to store, transport, and dispense cryogenic liquid nitrogen. Built to DOT 4L standards, these containers may be used for over-the-road transportation, as well as on-site storage and supply.

Specifications

	XL-160	XL-180
Dimensions (Nominal) Diameter Height	20 in. (508 mm) 57 5/8 (1464 mm)	20 in. (508 mm) 64 3/8 in. (1635 mm)
Weight Empty	197 lb. (89 kg)	205 lb. (93 kg)
Approximate Weight of Contents (Nitrogen) in 22 psig (1.5 bar/152 kPa) Service	259 lb. (117 kg)	296 lb. (134 kg)
Capacity, Gross	163 liters	186 liters
Capacity, Useable Liquid	160 liters	180 liters
Normal Evaporation Rate* (% Capacity per Day) Nitrogen	1.3%	1.25%
Relief Valve Setting	22 psig (1.5 bar/152 kPa)	22 psig (12 bar/1214 kPa)
Inner Container Bursting Disc	176 psig (12 bar/ 1214 kPa)	176 psig (12 bar/1214 kPa)
Design Specifications T/DOT Rated Service Pressure	4LM/4L 100 psig (6.9 bar/ 690 kPa)	4LM/4L 100 psig (6.9 bar/690 kPa)

Specifications are subject to change without notice.

*Vented N.E.R. based on Useable Liquid Capacity

Handling the Container

XL Series containers are very rugged liquid cylinders. All cryogenic liquid containers have an inner container and an outer container with an insulated vacuum space between them; any abuse (dents, dropping, tip-over, etc.) can affect the integrity of the container's insulation system.

When fully loaded, the XL-180 in nitrogen service will contain up to 296 lb. (134 kg) of product. While moving a full container, you may be handling up to 501 lb. (227 kg), and you should treat the load accordingly. The attachment points provided on the XL-160/XL-180 will allow you to use a hand truck, or a hoist, to handle these loads properly. Do not attempt to move these cylinders by any other means. When moving the cylinder, the following precautions should be observed:

- Never lay the container on its side. Always ship, operate, and store the unit in a vertical or upright position.
- When loading or unloading the container from a truck, use a lift gate, a crane, or a parallel loading dock. Never attempt to manually lift from the unit.
- To move the container over rough surfaces or to life the container, attach an appropriate sling to the lifting points cut into the welded support posts, and use a portable lifting device that will handle the weight of the container.

XL-160 and XL-180 Liquid Cylinders

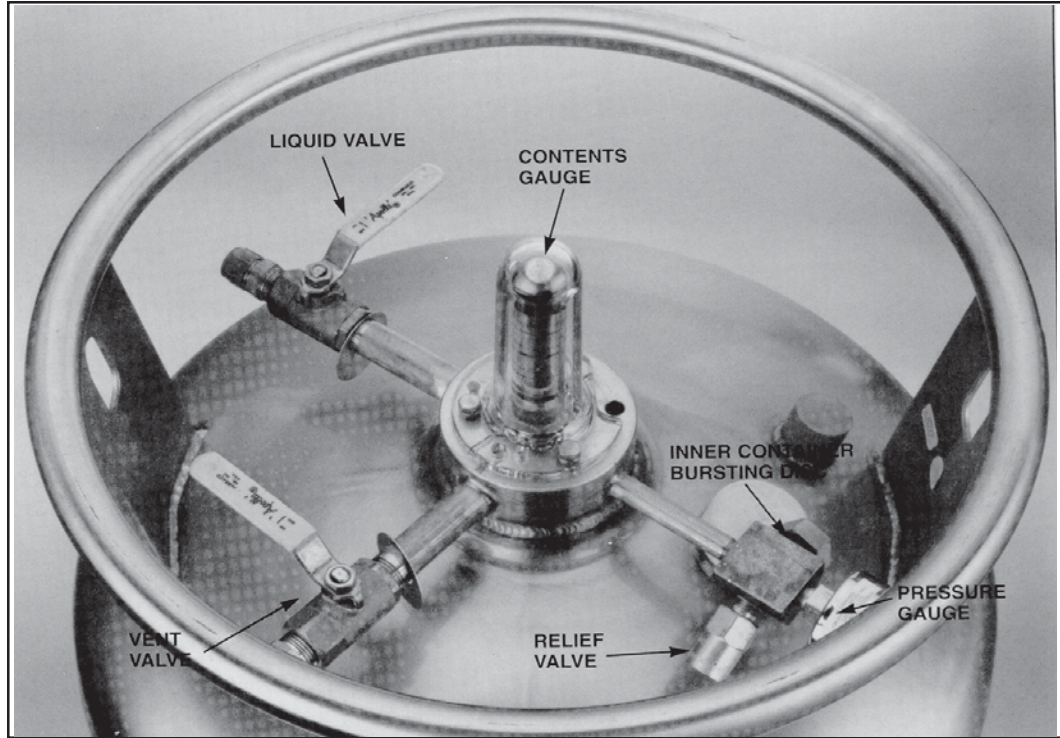


Freight Damage Precautions

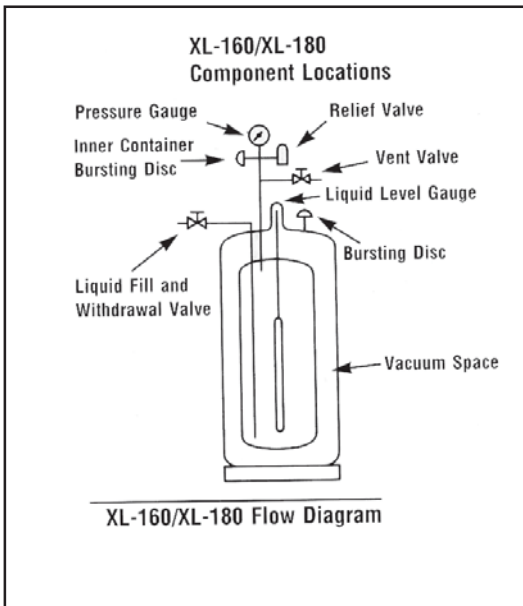
Any Freight Damage claims are your responsibility. Cryogenic liquid containers are delivered to your carrier from Taylor-Wharton's dock in new condition. When you receive our product you may expect it to be in that same condition. For your own protection, take time to visually inspect each shipment in the presence of the carrier's agent before you accept delivery. If any damage is observed, make an appropriate notation on the freight bill. Then ask the driver to sign the notation before you receive the equipment. You should decline to accept containers that show damage which may affect service ability.

Operation

The model numbers of XL-160/XL-180 indicate their respective liquid storage capacities in liters of product. Both cylinders are designed for liquid nitrogen service only. The following component and circuit descriptions are pertinent to either container and should be read before attempting operation. The components may be identified on the Component Location illustration.



XL-160/XL-180 Component Locations



The Liquid Valve - Liquid product is added or withdrawn from the container through the connection controlled by this valve. It has the CGA fitting that is required for liquid connections.. The valve is opened for fill or liquid withdrawal after connecting a transfer hose with compatible fittings to the LIQUID line connection.

The Pressure Gauge - The pressure gauge displays the internal container pressure in pounds per-square-inch, bar or in kiloPascals.

The VENT Valve - This valve controls a line into the head space of the container. It is used during the fill process. the VENT valve is opened to vent the head space area while liquid is entering the inner container during a pressure transfer fill through the LIQUID valve.

The Full View Contents Gauge - The container contents gauge is a float type liquid level sensor that indicates container liquid content through a magnetic coupling to a yellow indicator band. This gauge is an indication of approximate container contents only and should not be used for filling.

Relief Devices - These cylinders have inner container relief valves set at 22 psig (1.5 bar/152kPa) and inner container bursting disc that will rupture at 176 psig (12 bar/1213)

Withdrawing Liquid From The Container

To use the container in liquid delivery service, attach a transfer hose to the LIQUID connection and open the adjacent LIQUID valve. The pressure in the container will drive liquid product out through the valve as long as the container pressure exceeds that of the receiver.

The rate of liquid withdrawal from these containers is variable depending on the container pressure and the saturation temperature of the liquid. With liquid saturated at 22 psig (1.5 bar/152 kPa) withdrawal rate of up to 6 liters/min can be obtained.

WITHDRAWING LIQUID FROM THE CONTAINER

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Filling the Container

Cryogenic liquid containers that operate below 25 psig (1.7 bar/172 kPa) may be filled by weight or by volume. The latter method depends on the filler observing liquid product exiting the vent valve as an indication that the container is full. Both methods are listed here. Be certain to observe all safety precautions associated with the handling of cryogenic liquids.

Filling the Container by Weight of Contents

Using the procedures below, first determine the proper filled weight of each container. The weight derived is then used in the filling procedure that follows.

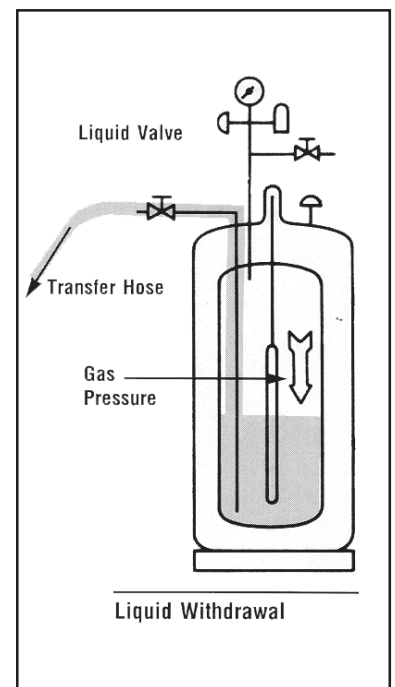
1. Visually inspect the container. Do not attempt to fill containers that have broken or missing components.
2. Move the container to a filling station scale and weigh it both with, and without, the fill hose attached to determine the weight of the fill line assembly. The difference is the fill line weight.
3. To determine the weight at which the fill should be stopped, *add* the desired filling weight, the transfer line weight, and the Tare Weight from the container's data plate.
4. Once you have determined the proper fill weight for the container, connect a transfer hose to the LIQUID fitting from a low pressure sources of liquid.
5. Open the supply valve. Then, on the XL-160/XL-180, open the LIQUID and VENT valves to begin the fill.
6. During the fill, monitor the container pressure and maintain a pressure of 10-15 psig (0.7 bar/69-103 kPa) by throttling the VENT valve.
7. When full weight is reached, close both the LIQUID and the VENT valves.
8. Close the liquid supply valve and open the dump valve on the fill line assembly.
9. Disconnect the fill line from the container and remove the container from the scale.

CAUTION:

To avoid contamination, close the LIQUID valve before disconnecting the transfer line.

WARNING:

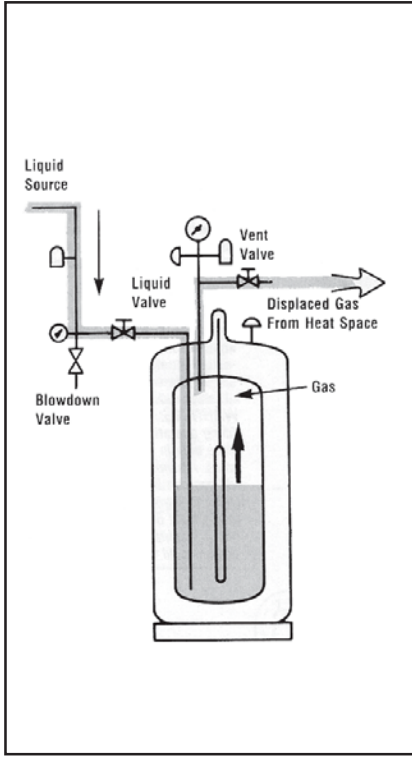
Filling operations should take place only in well ventilated areas. Accumulations of product gas can be very dangerous (refer to the safety precautions in the front of these instructions). Maintain adequate ventilation at all times.



Liquid Withdrawal

NOTE:

The fill weight calculation includes the weight of residual liquid. The weights shown in the Specifications are for liquid saturated at atmospheric pressure. The actual fill weight for your application depends on the saturation temperature of liquid in your storage tank, and may be determined by weighing cylinders that have been filled by volume.



Pressure Transfer Filling

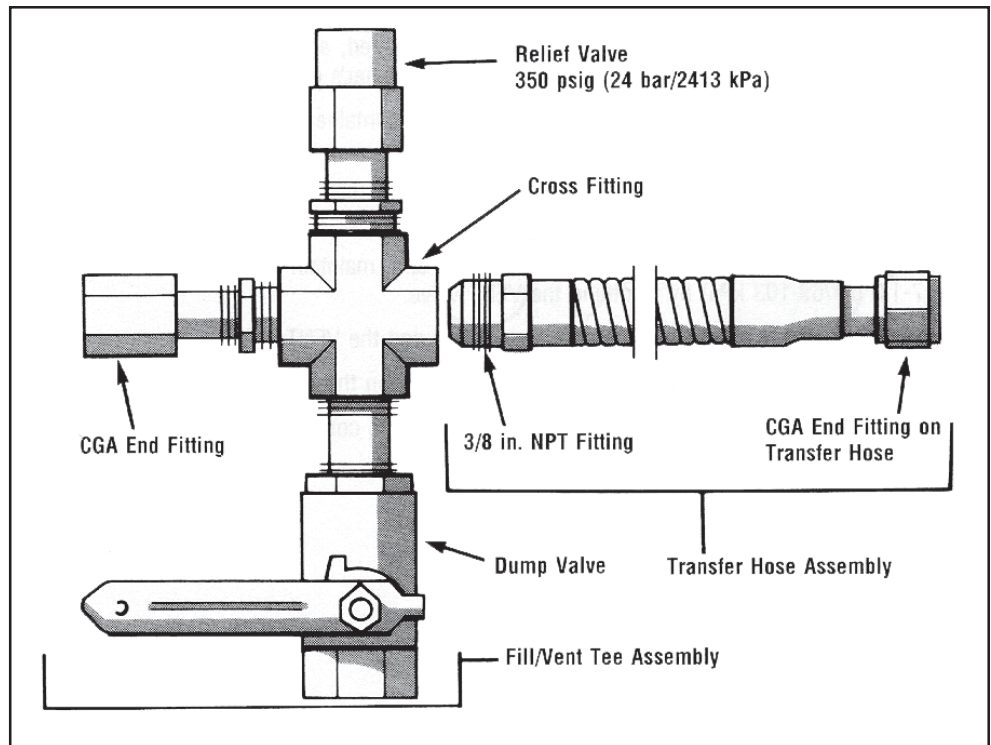
Filling the Container by Volume

1. Visually inspect the container. Do not attempt to fill containers that have broken or missing components.
2. Connect a transfer hose to the LIQUID fittings from a low-pressure source of liquid.
3. Open the supply valve. Then, on the XL-160/XL-180, open the LIQUID and VENT valves to begin the fill.
4. When liquid begins to spit from the VENT valve, quickly close the LIQUID valve and then the VENT valve. Both valves must be closed before the container relief valve opens.
5. Open the dump valve on fills line assembly to vent the fill line assembly.
6. Disconnect the fill line from the container.

Fill Hose Kits

Taylor-Wharton fill hose kits for the XL-160/XL-180 are designed to transfer liquefied gases to, or from the containers. These accessories are comprised of a Fill Tee Assembly and a Fill Hose. Cryogenic transfer hoses are constructed of stainless steel suitable for cryogenic liquids, and are available in 4 or 6-ft. (1.2 or 1.8 m) lengths with a 3/8 in. NPT fitting on one end and CGA service specific female fittings on the other. A Fill Tee Assembly consists of a cross fitting with a CGA end fitting, relief valve and manual dump valve.

Fill Hose Kits



In use, the CGA end fitting on the Fill/Vent Tee Assembly couples to the fill connection to be filled. The Relief Valve vents pressure over 350 psig (24-bar/2413 kPa) that builds up in the fill line due to trapped liquid. The Dump Valve is used to allow the operator to blow-down in the receiving container during a pump fill, or to relieve residual pressure from expanding liquid trapped before disconnecting the fill line.

Fill kits are available with different combinations of hose length. The following chart identifies the available transfer hoses and the Fill/Vent Tee assemblies that are appropriate for use with the XL-160/XL-180.

Transfer Hoses & FILL/VENT Tee Assemblies

The Fill/Vent Tee connects to a transfer hose to complete a fill line kit. Each assembly includes a 3/8-in. pipe connector to CGA fitting with a 350-psig (24-bar/2413-kPa) relief valve, and a ball-type dump valve.

Description	Cylinder Connections	End Fittings	Part Number
Hose, 4 ft. (1.2 m) SS	LIQUID or VENT valve	CGA 295 to 3/8 in NPT	1700-9C65
Hose, 6 ft. (1.8 m) SS	LIQUID or VENT valve	CGA 295 to 3/8 in NPT	1600-9C66
Fill/Vent Tee Assemb.	LIQUID or VENT valve	CGA 295	GL50-8C60

Maintenance

Read the Safety Precautions in the front of this manual before attempting any repairs on these containers. Also, follow these additional safety guidelines while performing container maintenance.

- ❑ **Never work on a pressurized container.** Open the vent valve as a standard practice during maintenance to guard against pressure build-up from residual liquid.
- ❑ **Use only repair parts for oxygen service.** Be certain your tools are free of oil and grease. This is a good maintenance practice and helps ensure you do not introduce any contaminants to the plumbing of the container.
- ❑ **Leak test connections after every repair.** Pressurize the container with an appropriate inert gas for leak testing. Use only approved leak test solutions and follow the manufacturers recommendations. “Snoop” Liquid Leak Detector is one approved solution. It is available from Nupro Co., 4800 E. 345th St., Willoughby, Ohio 44094 USA.

CHECKING CONTAINER PERFORMANCE

Cryogenic containers are two containers, one within the other. The space between the containers acts as a highly efficient thermal barrier including high technology insulation, and a vacuum maintenance system. Each serves a very important part in the useful life of the container. The high technology insulation is very effective in preventing radiated heat or solid conduction from entering the container; the vacuum prevents heat convection from reaching the stored product. Unfortunately, the perfect vacuum cannot be achieved since trace gas molecules begin to enter the vacuum space from the moment of manufacture. The vacuum maintenance system consists of materials which gather gas molecules from the vacuum space. The maintenance system can perform its function for years, but has a limited capacity. When the vacuum maintenance system is saturated, it can no longer maintain the vacuum integrity of the container. The change will be very gradual and may go unnoticed for several years. When the vacuum in the insulation space is no longer effective, the following symptoms may appear.

1. When the container is filled with liquid, the outer casing will be much colder than normal.
2. The container may appear to “sweat” if the air surrounding the container is hot and humid.
3. The relief valve will open continuously until the container is empty.
4. The container will hold pressure for several days, but will not hold liquid.

NER TESTING

If a loss of vacuum integrity is suspected, the container's Normal Evaporation Rate (NER) should be checked. The test measures the actual product lost over time so you can compare the results obtained to the NER value in the SPECIFICATIONS table. A test period of 48 hours is recommended, after the container is allowed to stabilize, but the formula given produces a Daily NER over any time period.

1. Fill the container with 150 pounds (68 kg) of liquid nitrogen.
2. Close the LIQUID valve, open the VENT valve and allow it to remain open during the test.

3. Allow the container to stabilize for 24 hours, then weigh it. Record the weight, time and date.
4. Reweigh after the recommended 48 hours. The test is most effective if the container is not moved during this period, and if conducted in an area where ambient temperatures are consistent.

NOTE:

Fill through the LIQUID valve with VENT valve open.

The following calculation will provide the actual Normal Evaporation Rate.

$$\text{Daily NER} = \frac{\text{Weight Loss (Step 3-Step 4)}}{\text{Elapsed Time (Hrs.)}} \times 24 \text{ hours}$$

Compare the results of your test to the "as manufactured" NER value in the SPECIFICATIONS section of this manual. A container in service should maintain an NER value of less than two times the new specification. Any test result greater than two times the listed value is indicative of a failed, or failing, vacuum. If NER is found to be high, contact Taylor-Wharton Customer Service at (334) 443-8680 for disposition.

HAND VALVE REPAIR

The ball valves used on the XL-160/XL-180 may be replaced by removing fittings and unscrewing the valve body from the container plumbing. When installing a new valve, it is important to close the valve, and observe the presence of a small hole in the ball that is visible through only one of the threaded openings in the valve body. This hole is a vent that allows the valve to prevent pressure buildup due to liquid trapped in the ball chamber when the valve is closed. When installing a replacement valve, always check to ensure the hole faces the container when the valve is closed.

NOTE:

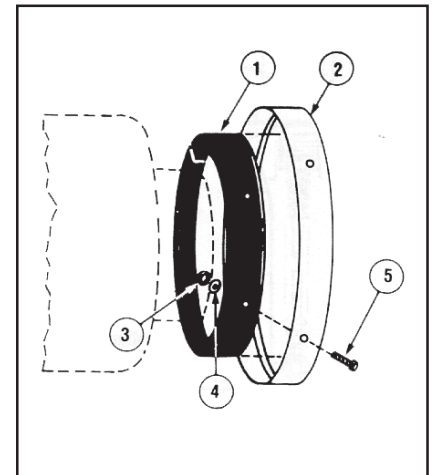
IF the original Shock Mount Ring is badly damaged we recommend that an NER test is performed to ensure that no internal damage has resulted from the impact of the shock mount ring.

SHOCK MOUNT FOOT RING

Item No.	Description	Part. No.	Qty.
1	Rubber Shock Ring	XL50-4C18	1
2	Foot Ring	XL50-4C19	1
3	Hex Nut	6310-0135	4
4	Washer	6430-0125	4
5	Carriage Bolt	6620-0401	4

Replacement of Shock Mount Foot Ring

1. Empty or transfer all contents of tank. Vent to atmospheric pressure.
2. Gently lay the tank on its side and unbolt the four (4) carriage bolts that attach the foot ring and rubber shock ring to the tank.
3. Slide off the damaged foot ring and rubber shock ring.
4. Assemble rubber shock ring into new foot ring and force over shock mount ring on vessel. Use a rubber hammer to drive the rubber shock ring into place.
5. Using a 1/2 in. drill bit, drill holes through the rubber so that the carriage bolt slides in smoothly.
6. The holes in foot ring must be positioned in alignment with hole in shock mount ring. Using the 4 bolts, washers and nuts, fasten the new parts of the cylinder.
7. After securing the shock mount ring to the tank, gently lift the tank to the upright position and inspect your work.



Shock Mount Foot Ring - Exploded View

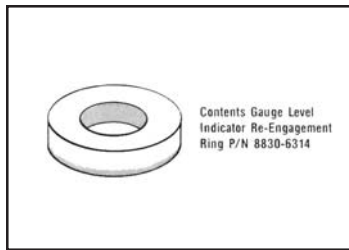
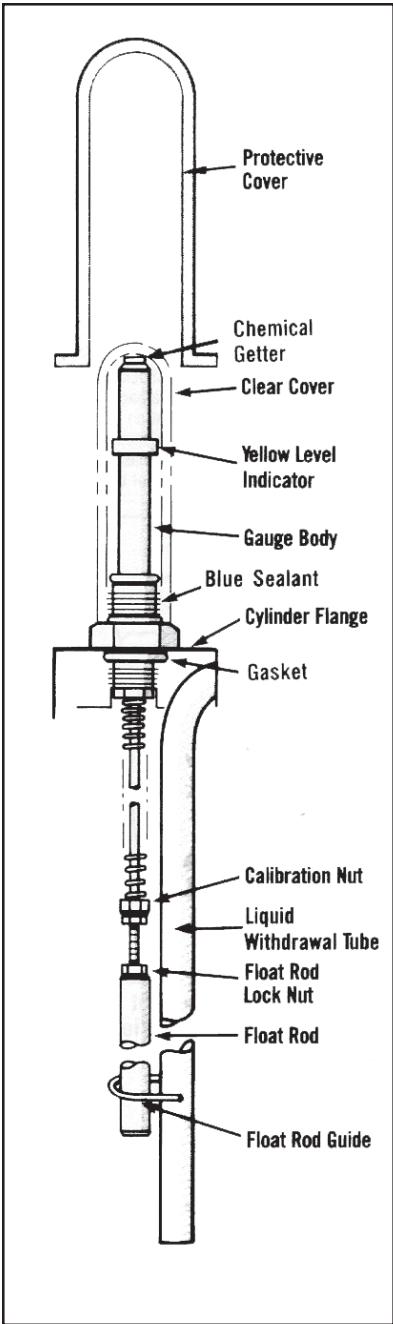
WARNING:

Cold surfaces should never be handled with bare skin. Use gloves and other protective clothing when performing this procedure.

FULL VIEW CONTENTS GAUGE MAINTENANCE

The contents of these containers is measured with the Full View Contents Gauge. The device consists of the gauge assembly beneath a clear plastic protective cover. When the gauge is assembled, a level indicator ring is magnetically coupled to the top of a float rod and moves up or down with the changing level of liquid in the container. The clear cover over the gauge body and level indicator is sealed at assembly to resist fogging of the gauge. This seal should never need to be broken.

If the level indicator does not move when container is filled, it may indicate that the magnetic field between the level indicator and the gauge has been uncoupled. The level indicator should recouple itself as the container is emptied. However, a re-engagement tool (ring) is available to correct the problem immediately. To reestablish the correct relationship, slip the re-engagement ring over the contents gauge and its protective cover. The magnetic field of this tool will allow you to lift the yellow level indicator until it recouples with the magnetic field on the gauge rod.



Removing the Full View Contents Gauge

1. Vent all pressure from the container.
2. Remove the protective cover by removing three bolts from the base cover.
3. Unscrew the gauge body using a wrench on hex fittings at base of the indicator.
4. Lift the entire gauge assembly free of the container. The gauge assembly is long and may be very cold. Gloves should be used to protect your skin.

Calibration Procedure for Liquid Level Contents Gauge

1. You will need a column of water approximately 4-ft. (1.2 m) tall. A clear plastic tube 2.0-in. (51 mm) with a cap glued to one end is perfect.
2. Support the gauge assembly by holding the base of the indicator tube. Care must be taken to prevent interference with the spring action. Partially immerse the aluminum float rod in the water. The water level should be 3.0 in. (76 mm) below the top of the rod as illustrated. The gauge assembly must be held vertically and the rod must not touch the side or bottom of the tube. The yellow level indicator of the gauge should indicate a full reading with the scale.

If the gauge fails to indicate a full liquid level, the assembly is to be removed from the water, calibrated and retested.

To change calibration, loosen locking nut away from brass calibration nut and turn the threaded rod with respect to the calibration nut.

Full View Contents Gauge

If the rod is turned clockwise (to the left) with respect to calibration nut, the exposed portion of rod becomes longer and the gauge yellow band will be lowered.

To raise the yellow band, turn rod counter clockwise. The exposed portion of rod becomes shorter. Once you had adjusted calibration, recheck for proper setting. (See illustration.) After proper setting has been obtained, lock down nut against calibration unit.

1. Once the gauge assembly has been calibrated to read in full water, it must be verified that it reads empty when the aluminum float rod is suspended in the air. The yellow indicator must be as close to the bottom as possible (inner rod will be firmly bottomed out.)

If calibration is required to make the gauge read empty in air, it must be rechecked in water.

2. After calibration, you will need to follow contents gauge installation to reinsert gauge. Be sure to dry the assembly before reinserting into the cylinder to prevent ice build up that could restrict movement or catch on the guide ring inside the cylinder.

NOTE:

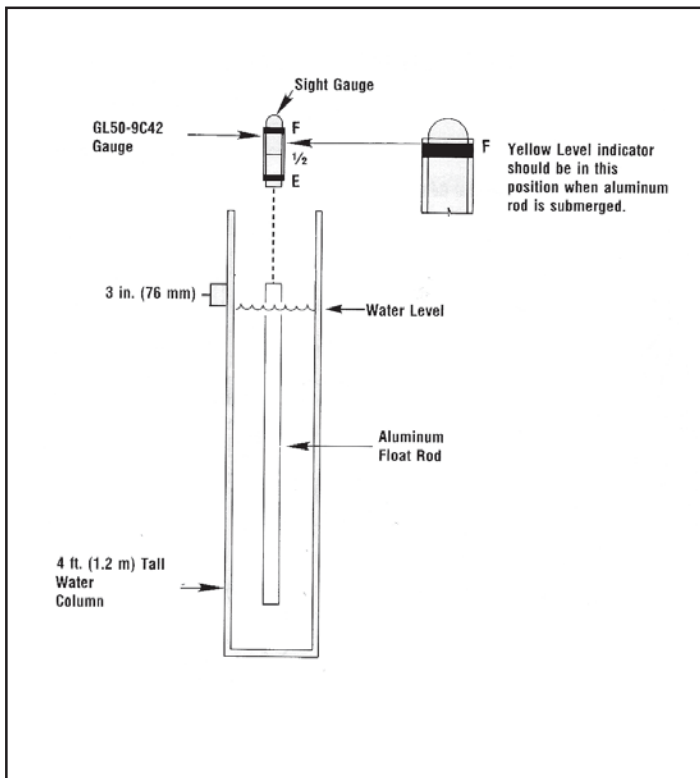
The yellow band will move approximately 1/4 in. (6.4 mm) to each 10 turns of the rod.

NOTE:

Remember this procedure is performed with gauge in an upright (vertical) position.

NOTE:

Make sure that the Gauge Assembly is not bent or out of line before reinserting the gauge into the container.



Contents Gauge Installation

Before installing a new or repaired gauge, inspect the gasket seals. If any damage is apparent, replace the gasket. (See following page for illustration.)

1. When inserting the gauge assembly, lower the float rod through the gauge opening until about 8 in. (203 mm) of the float rod remains above the container.
2. Grasp the clear cover portion of the gauge assembly with two fingers so that the assembly hangs free and "plumb."

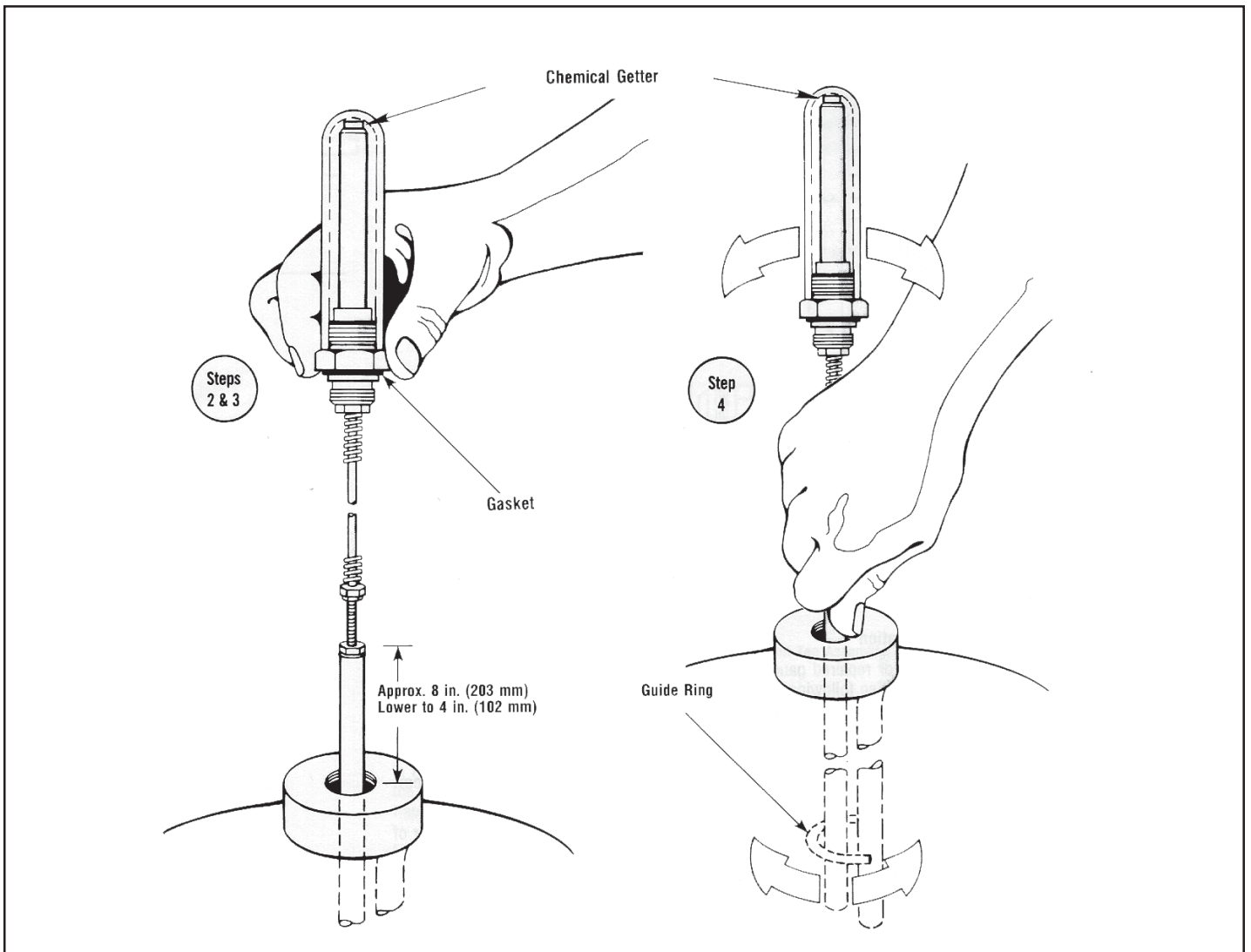
CAUTION:

When installing the gauge assembly, care must be taken to ensure that the float rod is inserted through "guide ring" located on the liquid withdrawal line inside container. IF gauge does not engage this ring, the contents indication will be inaccurate, or the gauge may be damaged in use.

Lower the assembly about 4 in. (102 mm) slowly and try to keep the rod in the center of the threaded entrance hole as you do. If you are careful during this portion of the insertion, you will drop the float rod straight through the guide ring inside the cylinder.

1. To confirm that the rod is correctly positioned in the cylinder, stop where you can still grasp the top of the rod (see illustration) and try to swing the lower end from side to side.
2. When the rod is engaged in the guide ring, the rod will be restricted to lower end movement of about ½ in. (12.7 mm); if you can feel greater movement, withdraw the rod to the point where its top is 8 in. (203 mm) above the gauge opening and try again.
3. When you are satisfied that the float rod is correctly installed, lower the rest of the way into the container until the top portion threads can be engaged.
4. Screw the gauge in place and hand torque to about 20 ft. lbf (2.8 kgf m). Leak check the connection of gauge body to the flange.

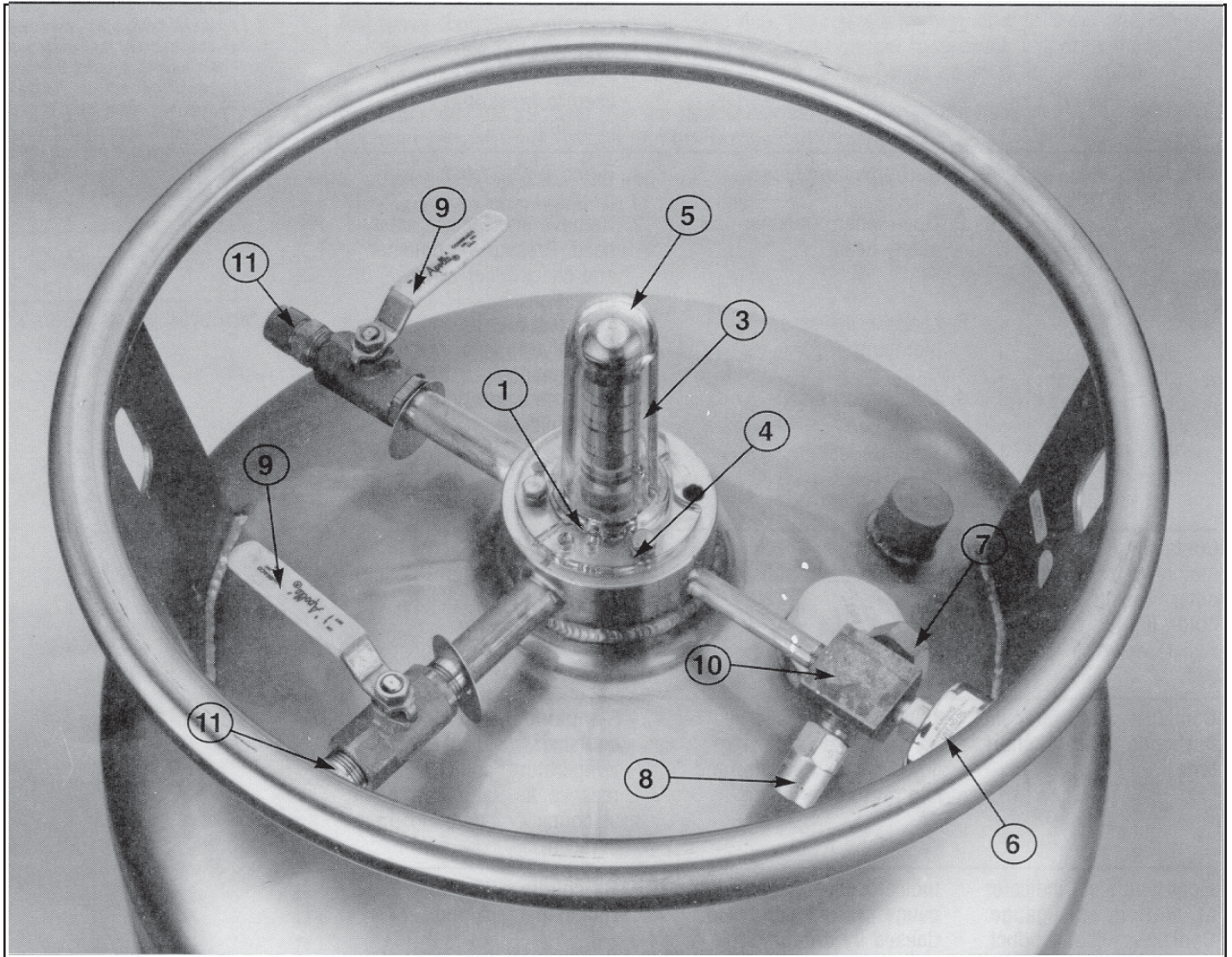
Contents Gauge Insertion



Troubleshooting

Symptom	Possible Cause	Corrective Action
Consistently low operating pressure.	<ol style="list-style-type: none"> 1. Relief valve open at low pressure. 2. Cold liquid. 	<ol style="list-style-type: none"> 1. Remove and replace relief valve. 2. Container pressure will build over time, or an external pressure source can be used to pressurize container.
Very low or no pressure show on gauge	<ol style="list-style-type: none"> 1. Bad pressure gauge. 2. Open inner container safety head. 3. Leaks in valves or plumbing. 4. Liquid too cold. 5. Possible leak in VENT valve. 6. Faulty relief valve. 	<ol style="list-style-type: none"> 1. Remove and replace bad gauge. 2. Remove and replace safety head. Pressurize container and check relief valve operation. 3. Leak test and repair leaks. 4. Allow container to stand and build pressure. 5. Replace valve. 6. Replace valve.
Container is cold and may have ice or frost on outer casing. Will not hold liquid overnight. Relief valve is venting gas.	Vacuum loss. Check vacuum bursting disc.	Consult with Taylor-Wharton for course of action. Do not attempt to put additional liquid into container.
Container vents after fill but quits after a short time.	This may be caused by residual heat vaporizing liquid inside container and is a normal condition.	Symptom should stop when container reaches operating temperature and the liquid reaches its saturation point at container operating pressure.
Float-type level indicator at bottom of gauge. Container full of product.	Indicator disengaged from gauge rod magnetic field. Caused by dropping the container.	Re-couple indicator using re-engagement ring.

Replacement Parts



XL-160/XL-180
Component Locations

Accessories

Accessories available for use with Taylor-Wharton XL Series containers include:

- Manifolds, Automatic and Manual
- Transfer Hoses
- Fill/Vent Tee Assemblies
- Container Hand Trucks
- Cryogenic Phase Separators

For additional information concerning the accessory of your choice, please consult the separate manual on accessories or call Taylor-Wharton at (334) 443-8680.

Index No.	Description	Part No.	Recommended for 10 Units
1.	Gasket, Glass Filled Teflon	7701-0083	5 each
2.	Float, Contents Gauge	1604-9C60	1 each
3.	Contents Gauge Assembly (Includes Gauge and Spring)	GL50-9C42	1 each
4.	Screw, Contents Gauge Cover	6114-1087	3 each
5.	Cover, Contents Gauge, Protective	GL50-9C04	4 each
6.	Gauge, Pressure 0-60 (4.1 bar/414 kPa)	7702-6192	2 each
7.	Safety Head, 176 psig (12 bar/1213 kPa)	L240-9C20	2 each
8.	Relief Valve, 22 psig (1.5 bar/152 kPa)	6913-6223	5 each
9.	Ball Valve ½ in.	6916-7114	3 each
10.	Cross, Brass ¼ in. NPT	GL55-9C30	2 each
11.	End Fitting, CGA 295, Vent/Liquid	7355-4698	5 each
*	Decal Nitrogen	GL55-9C51	A/R
*	Decal, XL-160	1604-9C50	A/R
*	Decal, XL-180	L180-9C50	A/R
*	Decal, UN Number, Nitrogen	GL55-9C63	A/R
*	Decal, Warning	1700-9C07	A/R

Warranty

TAYLOR-WHARTON XL Series Liquid Cylinders

Taylor-Wharton Gas Equipment Division, Harsco Corporation warrants that each of its Refrigerator and Dewars will be free from defects in material and workmanship, in the normal service for which the product was manufactured, for a period of ninety (90) days from date of shipment to the original purchaser. The product is further warranted to maintain a Normal Evaporation Rate (NER) within 10% of Taylor-Wharton's published specifications for the product, on date of shipment. This warranty is in effect for all XT, HC, LS, CX and LD Series products for a period of three (3) years from date of shipment to the original purchaser, and for all Series products for a period of two (2) years from date of shipment to original purchaser, if the product is used and maintained according to Taylor-Wharton's instructions.

To make a claim under this warranty, the purchaser must: 1) give Taylor-Wharton written notice with ten (10) days after discovery of claimed defect, 2) immediately discontinue use of the product, and 3) return such product freight paid to the location specified by Taylor-Wharton for evaluation to validate warranty claim. If the claimed defect is confirmed by Taylor-Wharton's inspection, Taylor-Wharton will, at its option and as the purchaser's sole remedy, repair or replace such product or any component part thereof, or refund the original purchase price.

This warranty is voided by alterations or by repairs by others. Taylor-Wharton shall not be liable under this warranty, or otherwise, for defects caused by negligence, abuses, or misuse of the product, corrosion, fire, heat, or the effects of normal wear. Any related components or other equipment manufactured by other which may be sold with Taylor-Wharton's product are not covered by this warranty.

THIS WARRANTY IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

THE REMEDIES SET FORTH HEREIN ARE EXCLUSIVE TAYLOR-WHARTON SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL OR INCIDENTAL DAMAGES RESULTING FROM THE DELIVERY, USE OR FAILURE OF THE PRODUCT (INCLUDING LOSS OF ANY MATERIAL STORED IN THE PRODUCT), OR FROM ANY OTHER CAUSE WHATSOEVER. BY ACCEPTING DELIVERY OF THE PRODUCT SOLD HEREUNDER, THE PURCHASER ACKNOWLEDGES THAT THIS LIMITATION REMEDIES IS REASONABLE AND ENFORCEABLE. IN NO EVENT SHALL TAYLOR-WHARTON'S LIABILITY EXCEED THE PURCHASE PRICE FOR THE PRODUCT.



Taylor-Wharton

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