Product Manual

Carbo-Mite™ 220 PED

Bulk CO_2 Storage System

Designed and Built by:

Chart Inc.

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Contents

Revision Log

Revision Level	Date	Description
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Preface

General

The Carbo-Mite 220 PED Bulk CO_2 System is a new generation bulk liquid CO_2 storage container designed for the small 20/50 lb high-pressure cylinder user. The revolutionary design and construction of the Carbo-Mite 220 system provides all the benefits of bulk storage with no gas losses between refills up to six months apart (minimum account size CO_2 use: 1.0 lbs/day).

Product Advantages

- Safe, low operating pressure
- Enhanced drink quality
- Added back room security
- Eliminate changing high-pressure cylinders
- Eliminate running out of CO_2 during peak rush periods.
- Peak flow rate: 1.5 lb/hr
- Indoor or outdoor installation

Product Highlights

- Compact package reduces floor requirements
- Built-in stainless steel external vaporization coil
- Stainless steel handling ring protects plumbing from stacked goods
- Roto-Tel™ Liquid Level Gauge - new generation accurate liquid level gauge, telemetry ready
- Economizer Regulator
- Harris Final Line Regulator
- Standard Fill Valve
- Manifolded primary and secondary safety valves with single vent connection
- Optional six inch legs meet sanitation requirements

Product Manual

The Carbo-Mite 220 PED Product Manual is designed to be used in conjunction with Carbo-Mite 220 Bulk CO_2 System. If there are any questions regarding the operation of the tank, contact Chart's Technical Service division at 1-800-253-1769.

This manual contains information regarding the safe operation and handling of CO_2. It should be thoroughly read and understood by anyone that operates the equipment.

The safety requirements for operating the tank and handling or transporting extremely cold liquid products are shown in the Safety section. Use this safety section as a "Safety Checklist" each time the equipment is being used.

The Introduction section discusses the general features of the tank and gives a system overview.

In the Installation section information is available for performing a site survey to determine tank and fill box locations. A list of equipment needed for a successful installation is also provided along with detailed information on installing the tank, fill station (wall box), fill hose and line.

For information on how to operate the tank and to solve general troubleshooting problems refer to the Operations and Troubleshooting section.

The schematics, piping illustrations, and parts list located in the Specifications section show reference numbers for each component used on the tank. The reference numbers may be used throughout this manual to draw specific attention to a component while describing its function, operation, or repair.

Terms

Throughout this manual safety precautions will be designated as follows:

Warning! Description of a condition that can result in personal injury or death.

Caution! Description of a condition that can result in equipment or component damage.

Note: *A statement that contains information that is important enough to emphasize or repeat.*

Acronyms / Abbreviations

The following acronyms / abbreviations are used throughout this manual:

ASME	American Society of Mechanical Engineers
BAR	Pressure (Metric)
CO_2	Carbon Dioxide
DOT	Department of Transportation
FPT	Female Pipe Thread
Kg	Kilogram
MPT	Male Pipe Thread
N_2	Nitrogen
NPT	National Pipe Thread
OD	Outer Diameter
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch (Gauge)

Safety

General

The system described in this manual holds and dispenses carbon dioxide (CO_2) gas under pressure. All persons using this equipment must read and understand the operation and safety information contained in this manual and must be adequately trained to operate this equipment.

Warning! ***Asphyxiation hazard. Carbon dioxide gas can cause serious injury or death. Do not breathe CO_2 gas. Avoid entering tank area if a leak is suspected and thoroughly ventilate area.***

Warning! ***Frostbite hazard. Contents are extremely cold and can cause frostbite. Do not touch liquid, ice, or ice crystals on or near tank. Stay away from escaping gas.***

CO_2 gas is a colorless, odorless, tasteless gas that displaces oxygen and does not support life. The gas is difficult to detect without the assistance of special equipment. Avoid breathing or contacting CO_2 in gas, liquid or solid form.

Exposure to concentrations of less than 5% for less than 15 minutes can cause physical symptoms including unconsciousness, injuries or death. Even low concentrations of CO_2 can cause:

- Dizziness, headaches, nausea or disorientation
- Increased respiration or heart rate
- Shortness of breath or rapid suffocation

CO_2 is heavier than air and can collect in low areas such as basements, stairwells, and confined spaces. Avoid entry into areas where CO_2 leaks or high concentrations of CO_2 are suspected. Enter those areas with caution only after they have been thoroughly ventilated.

Whenever the vessel is inside a building it's safety relief circuit must be connected to an outdoor vent typically in the fill box. The fill box and/or vent must never be located in or above any below-ground spaces or stairwells. The vessel must not block emergency exits, aisles, fire suppression equipment or utility boxes or accesses. CO_2 lines or hoses must be located away from traffic areas and heat sources and must be protected from potential causes of damage. All connections, lines, and components must be leak-free.

This equipment should be installed and serviced only by professional agents who are qualified to work with CO_2 and the mini-bulk liquid CO_2 storage vessels. They should be familiar with all pertinent safety procedures.

Handle liquid so that it will not splash or spill. Protect your eyes and cover skin where the possibility of contact with liquid, cold pipes and equipment, or cold gas exists. Safety goggles or a face shield should be worn if liquid ejection or splashing may occur or cold gas may issue forcefully from equipment. Clean, insulated gloves that can be easily removed and long sleeves are recommended for arm protection. Cuffless trousers should be worn over the shoes to shed spilled liquid.

Oxygen Deficient Atmospheres

Warning! ***CO_2 vapors in air may dilute the concentration of oxygen necessary to support or sustain life. Exposure to such an oxygen deficient atmosphere can lead to unconsciousness and serious injury, including death.***

The normal oxygen content of air is approximately 21%. Depletion of the oxygen content in air, either by combustion or by displacement with inert gas, is a potential hazard and users should exercise suitable precautions.

One aspect of this possible hazard is the response of humans when exposed to an atmosphere containing only 8 to 12% oxygen. In this environment, unconsciousness can be immediate with virtually no warning.

When the oxygen content of air is reduced to about 15-16%, the flame of ordinary combustible materials, including those commonly used as fuel for heat or light, may be extinguished. Somewhat below this concentration, an individual breathing the air is mentally incapable of diagnosing the situation because the onset of symptoms such as sleepiness, fatigue, lassitude, loss of coordination, errors in judgment and confusion can be masked by a state of "euphoria," leaving the victim with a false sense of security and well being.

Human exposure to an atmosphere containing 12% or less oxygen leads to rapid unconsciousness. Unconsciousness can occur so rapidly that the user is rendered essentially helpless. This can occur if the condition is reached by an immediate change of environment, or through the gradual depletion of oxygen.

Most individuals working in or around oxygen deficient atmospheres rely on the "buddy system" for protection - obviously the "buddy" is equally susceptible to asphyxiation if he or she enters the area to assist the unconscious partner unless equipped with a portable air supply. Best protection is obtained by equipping all individuals with a portable supply of respirable air. Life lines are acceptable only if the area is essentially free of obstructions and individuals can assist one another without constraint.

If an oxygen deficient atmosphere is suspected or known to exist:

1. Use the "buddy system." Use more than one "buddy" if necessary to move a fellow worker in an emergency.
2. Both the worker and "buddy" should be equipped with self-contained or airline breathing equipment.

Equipment Safety and Handling

Note: *A bulk CO_2 storage vessel is ASME coded for permanent installation. It is not DOT regulated and must not be transported when it contains liquid CO_2. It must be shipped, stored and used in a vertical position to avoid structural damage. When loading a vessel onto or off of a truck, use a power lift gate, crane, or an inclined ramp. Never attempt to manually lift or slide a vessel on or off a truck bed.*

CO_2 Monitoring Systems

The Analox 50™ and Ax 50™ Carbon Dioxide Analyzers are precision instruments that provide continuous, accurate monitoring of CO_2 levels to ensure a safe working environment for your employees, suppliers and yourself.

A proven system with over 80,000 units installed worldwide. The Chart/Analox 50 Monitoring System is comprised of one detector (with visual and audible alarms) and one alarm repeater for remote mounting. The Chart/Ax 50 Monitoring System includes one detector, one alarm repeater and one relay for additional notifications.

For more information look for PN 13586611 on http://literature.chart-ind.com.

First Aid and Emergency Action

If inhaled:

- Move to fresh air immediately
- If not breathing, give artificial respiration
- If breathing is difficult, give oxygen
- Get immediate medical attention

In case of frostbite:

- End exposure immediately
- Do not rub or pour water on the affected area
- Get immediate medical attention

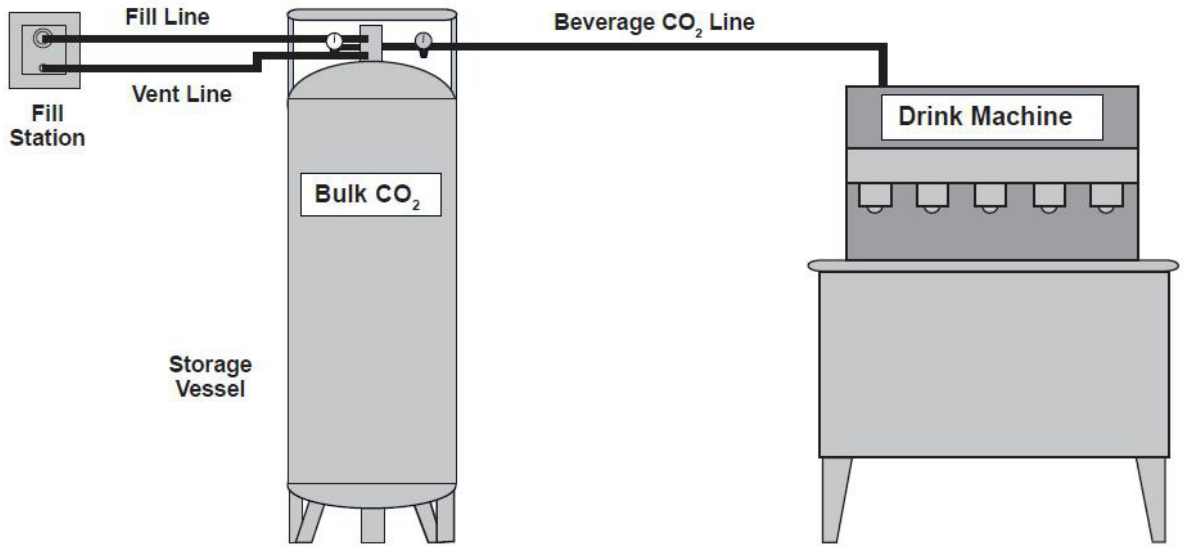
Rescue:

- Do not attempt a rescue in areas of high CO_2 concentrations without proper life-support or rescue equipment (avoid being the next victim).
- Thoroughly ventilate areas of possible high CO_2 concentration before entering them.

In case of spills or leaks:

- Evacuate all personnel immediately from affected areas
- Thoroughly ventilate the area of the spill or leak before entering

Introduction



System Overview

The Carbo-Mite Bulk CO_2 Storage System is designed to provide safe, convenient low pressure liquid storage and supply of carbon dioxide gas for beverage carbonation and dispensing purposes. The system consists of three primary elements: the CO_2 storage vessel, a CO_2 fill box (fill station), and connecting fill and vent hoses.

Storage Vessel

The storage vessel consists of an inner vessel and an outer vessel, much like a giant Thermos® bottle. The space between the two vessels contains a vacuum and additional insulating material. The vacuum and insulation minimize the entry of unwanted heat into the liquid CO_2 stored in the inner vessel.

The vessel construction includes an external vaporizer (coil) and plumbing configuration that combines to maintain adequate CO_2 gas supply rates. When CO_2 gas is needed, liquid CO_2 is drawn from the inner vessel and converted to gas. An adjustable line regulator supplies gas to the end use point at the desired pressure. The gas use or "final line" regulator is normally set between 90 and 115 psi.

In accordance with ASME standard, a vent relief valve protects the vessel in the event of excessive pressure. Excess pressure is vented safely to the outside.

Fill Station

The stainless steel fill station (box) is the second major element of the bulk CO_2 storage system. The lockable remote fill box is permanently mounted on an outside wall. It contains a fitting for filling the storage vessel at any time of the day without entering the store. The fill box is also equipped with a vent connection through which CO_2 gas from the storage vessel's safety can be released harmlessly outside. If a vessel is equipped with a direct fill fitting an alternate safety relief vent line is also required if the vessel is not used outdoors.

Fill Hose and Vent Line

The third major element of the stationary bulk CO_2 system is comprised of a fill hose and vent line. These two lines join the outdoor fill box with the CO_2 storage vessel.

The fill-hose, constructed with FDA approved food grade materials, is a pressure rated line that connects the brass fill fitting in the fill box with the fill circuit on the vessel. The hose is available in standard lengths equipped with connector fittings. Common standard fill hose lengths are 5, 10, 15, 25, and 30 feet.

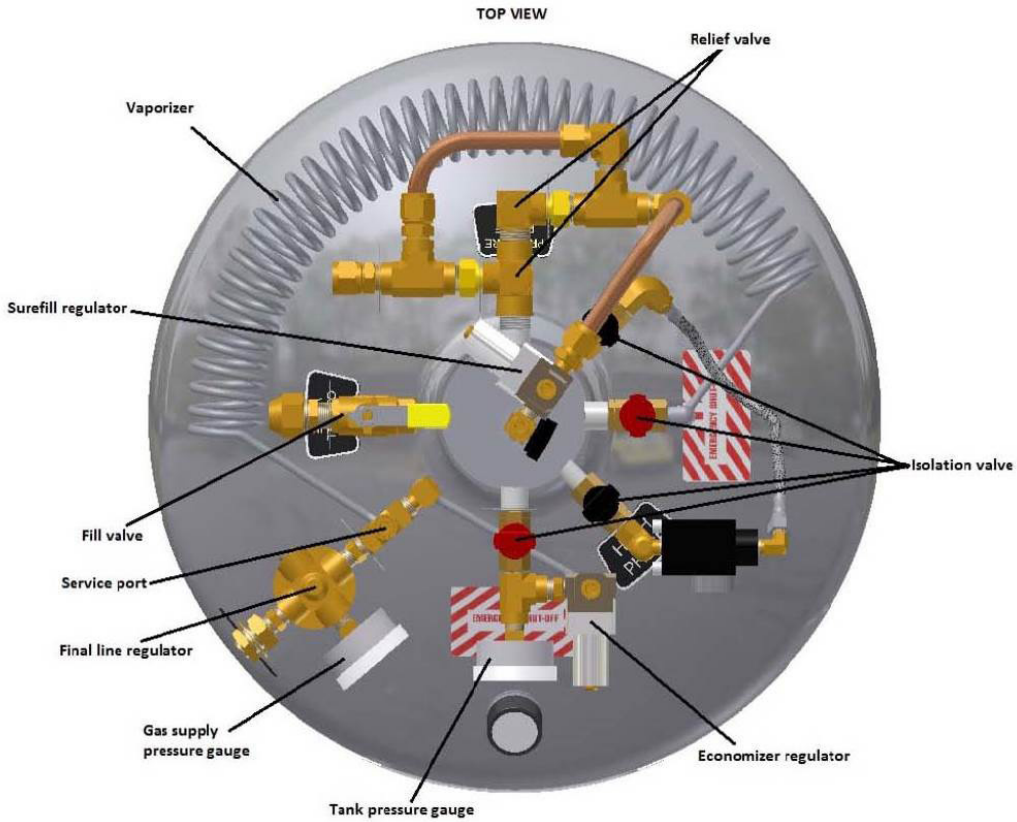
The vent line is as important as any component in the bulk CO_2 system. It connects the safety relief valves on the vessel to either the outdoor fill box vent fixture or to an alternative outdoor vent tube.

Note: *When used indoors a CO_2 storage vessel must always be connected with a vent line to the outdoors (see Safety section).*

Vessel Plumbing

Plumbing components on the liquid CO_2 storage vessel perform five functions (refer to illustrations on this page):

1. The fill tube allows liquid CO_2 to be transferred into the vessel during the delivery process.
2. The gas-use circuit dispenses CO_2 gas to the end use system.
3. The "Economizer" pressure control circuit on the Carbo-Mite 220 system maintains optimal operating pressure and conserves gas for efficient system performance.
4. The relief/vent circuit allows excess pressure to safely exit the vessel and the building.
5. Contents and pressure gauges monitor the status of the CO_2 inside the storage vessel.



Installation

Equipment Location

Site Survey

Prior to installation of the CO_2 system components a site survey should be performed to determine the best location for placing the bulk CO_2 vessel and the fill station. As a matter of safety, this would be a good time to determine the proper location for a CO_2 monitor (CO_2 is 1 ½ times heavier than air and in the event of a leak is likely to collect in low-lying and confined spaces).

A site survey form created by the installer should be used to plan, understand, and approve the best location for the equipment. The survey must be conducted with the store owner or their designated representative and the system installer. Any subsequent modifications to the installation should be noted on the form and signed by the store representative and the installer.

Fill Box Location

The fill box location must be determined before locating the CO_2 vessel. A fill box is typically mounted on a back wall at a height of 3 ½ to 4 feet. It should be located out of the way of store customer operations if possible. It must be located within a distance allowing easy delivery access and considering the length of the fill hose from the delivery truck. The fill box may be located in a drive-thru lane and the fill hose may be driven over when it is pressurized during the filling operation.

While determining the best location for the fill box always check the inside wall of the proposed location to be sure the box installation will not interfere with appliances in the store and will not damage anything inside the wall such as plumbing and electrical conduits. In some stores the fill line between the fill box and the storage vessel must be sleeved. In those cases be sure to locate the box where it will allow the inside sleeve to have adequate radius for the fill hose to easily pass thru for installation and for future maintenance. The sleeve must not interfere with store operations.

The fill box and/or vent must never be located in or above any below-ground spaces or stairwells. The vessel must not block emergency exits, aisles, fire suppression equipment or utility boxes or accesses. CO_2 lines or hoses must be located away from traffic areas and heat sources and must be protected from potential causes or damage. All connections, lines, and components must be leak-free. Refer to Safety section for more detail.

Storage Tank Location

Once the fill box location has been determined, the location of the CO_2 storage tank can be determined. The primary considerations for placing the storage tank are space and distance from the fill box. The storage tank must be placed as close to the fill box as possible to maximize filling efficiency; ideally within 25 feet. The distance from the storage tank to the beverage machine or other use point is not critical.

The storage tank should not be installed in hallways. It should be placed in locations out of the way of other fixtures such as electrical panels and sinks. Although the tank should be in the most out-of-the-way location available, it must be placed where it is accessible for service and in a manner that allows its gauges to be read.

Note: *To prevent damage to the tank's plumbing components the tank's handling ring must never be used as a hanging rack or platform for storage.*

Installation Equipment

Installation Tools and Supplies

Installation of the bulk CO_2 system requires certain tools and installation materials. A supply of the following materials and tools should be maintained for most simple and economic installations though not all installations will require them:

Note: *Chart authorized distributors or installation agents have the installation tools and supplies necessary for proper installation.*

Tools

Warning! When using the following tools, suitable eye and ear protection must be worn. Failure to do so could result in serious personal injury.

- Electric Hammer Drill - for drilling holes and chiseling brick. Accessories:
  - 3/4" x 21" Scaling Chisel
  - 3" Core Bit

  - 1” x 21” Masonry Bit
  - 1/4” x 13” Masonry Bit
  - 1/2” Masonry Bit
- 7 ¼” Builder’s Circular Saw - for scoring brick and cutting wood exteriors. Accessories:
  - Masonry Cut-Off Wheel
  - Combination Blade
- Reciprocating Saw - for cutting through wood walls. Accessories:
  - Metal Cutting Blades
  - Wood Cutting Blades
- Electric Hand Drill - for drilling anchor holes. Accessories:
  - Masonry Bits
  - Set of Twist Drills
  - 3” Hole Saw
- Oxyacetylene Torch - for cutting rebar in poured concrete walls and floors.

Supplies

- Hand Truck with Strapping Attachment
- Torpedo Level
- Carpenter Square
- Extension Cord
- Oetiker Clamp Pliers
- Step Ladder
- Caulk Gun
- Assorted Hand Tools
- Flashlight
- Silicone Sealant (clear and white)
- 2” PVC Pipe and Elbows
- 1/4” Plastic Screw Anchors
- 1/4” x 1” Self-Tapping Screws
- 9” Cable Ties
- PVC Cement
- Duct Tape
- Teflon Tape
- PVC Flanges
- Chalk or Other Marker
- Leak Check Solution

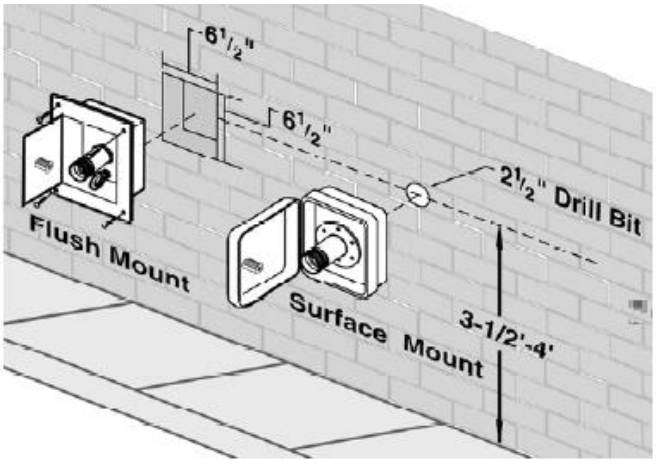
Hardware	Chart PN
Clamps for 1/4” ID Tubing	3411321
1/4” Hose Barb Nipple	1611481
1/4” Female Flare Nut	1611471
1/4” Hose Barb x 1/4” Female Elbow	1611461
Flare Nut Connector	1111222
1/4” ID Beverage Tubing	2811416

Note: *Stainless steel fittings should be used.*

Fill Station (Wall Box) Installation

Note: *For fill-box diagrams and components identification refer to the Specifications section of this manual*

If possible, select a fill station location that will not interfere with store / customer operations. A neat and clean installation is important since the fill station is visible to the general public.



Before marking the fill station location on the exterior wall, check to be sure the fill box will not interfere with any electrical, plumbing, or gas lines inside or outside the store.

Flush-Mount Fill Box (PN 9723139)

1. Using a pre-cut template or carpenter's square and a level, mark a 6 ½" square on the exterior wall making sure the marking is plumb. Match the fill box to the outline on the wall to make sure the outline is correct.

2. Using a circular saw, make a 1/2" to 1" perimeter cut along the inside of the outline. Use a masonry blade to cut brick, concrete or block wall.

Caution! ***Do not attempt to remove material from the wall without first making the perimeter cut.***

Warning! ***To help prevent serious injury, always wear goggles, gloves, and a dust mask when making perimeter cuts.***

3. Use a hammer drill and 3/4" scaling chisel to remove brick or concrete material within the perimeter of the cut. Begin chiseling near the bottom of the perimeter and work toward the top.

   For easier separation of wall material from a poured concrete wall, drill 3/4" holes about 3" deep around the inside of the perimeter to perforate the material before chiseling.

Warning! ***Be very careful when handling the chisel. The chisel may have a tendency to "jump" and could cause personal injury or damage to the surrounding wall.***

4. Remove debris from the hole.

Note: *Some concrete walls contain reinforcing rods. Cut rebar with an oxyacetylene torch if necessary.*

5. Slide the box into the opening and make sure its flange lies flat against the wall surface.

6. While holding the box in position mark the four corner mounting holes.

7. Drill the corner mounting holes about 1 ½" deep using a 1/4" drill bit or masonry bit as necessary. Insert plastic screw anchors.

8. Drill a 3" 'center hole' in the back of the fill box opening using a 3" core bit.

Caution! ***To prevent damage to the inside wall surface, the center hole may need to be drilled from inside to outside. To accomplish this, first drill a 1/4" pilot hole through from the outside; then drill the 3" hole from the inside using the pilot hole as a guide.***

9. Insert the box into position and fasten it using sheet metal screws.

Surface-Mount Fill Box (PN 9722279)

When the use of a surface mounted box is preferred, it will simply be mounted onto the outside surface of the store wall.

1. At the desired fill box location mark and drill the center hole using a 3" bit.

2. Place the box in position so its fill and vent fittings are within the 3" hole. Mark the four corner holes while using a carpenter's level to make sure the box is level.

3. Drill the four corner pilot holes. Use a 1/4" bit if necessary for screw anchors. Insert the anchors.

4. Fasten the box in place using sheet metal screws.

Fill Hose Line Installation

Fill and vent lines will likely be routed differently in each store. By following basic recommendations, the lines should be run properly and as easily and simply as possible.

Distance from the outside fill box to the CO_2 storage tank should be as short as possible and typically varies from 1 to 30 running feet. Fill line distances of longer than 30 feet are not recommended because longer fill hose length results in reduced CO_2 fill efficiency.

Note: *When installing the fill and vent lines please be aware that they need to be accessible for inspection and service. The lines should be inspected at least once a year for leaks, damage or signs of wear. They should be replaced every eight years.*

Fill and vent lines are generally secured together with cable ties about every 18 inches and attached to the wall using conduit straps about every 2 or 3 feet along the run. The lines should run either horizontally or vertically and as inconspicuously as possible. Excess line should be coiled and tied.

Running lines through a conduit sleeve is generally not necessary. However, if the lines were to be exposed in a high traffic area, it may be best to run them through a sleeve to ensure protection. Sleeve material generally used is 2" or 3" PVC piping.

Connect Lines to Fill Box

1. Gain access to the back of the fill box by temporarily removing the box from its mount.

Note: *The fill fitting is fastened to the fill box by four lock-nuts on threaded studs. The fitting can be easily removed for service or for attaching the fill line.*

2. Fasten the vent line simply by pushing the line onto the barbed fitting on the back of the fill box.

3. Fasten the flare connector on the end of the fill hose to the flare connection end of the fill fitting.

Note: *In the event that a fill hose needs to be attached at a right angle to the fill box, a flare fitting 90° elbow (Chart PN 11388573) may be used to connect the fill hose to the fill fitting.*

Run Lines to Tank Location

1. Feed the fill and vent lines through the wall (or PVC wall flange if used) to the inside of the store.

2. Re-attach the fill box if necessary.

3. If sleeve material is not being used, route lines to the tank location according to plan and attach them to the wall with conduit straps about every 2 or 3 feet. Proceed to CO_2 storage tank installation.

4. If a sleeve is being used, size and cut the sleeve material to the proper length and with a bend radius toward the wall flange. Bond sleeves to elbows with PVC glue only if necessary. If the connections are not bonded they will be easier to separate when future service is required. If the connections are bonded the bend radius should allow the fill hose to slide freely within the sleeve for future maintenance and replacement.

Note: *A fill hose should be replaced every eight years.*

5. Feed the fill and vent lines through the PVC sleeve conduit and run the sleeve conduit to the CO_2 storage tank.

6. Attach the PVC sleeve to the wall with conduit straps. Proceed to CO_2 storage tank installation.

CO_2 Storage Tank Installation

The Carbo-Mite 220 storage tank should be installed in compliance with local code requirements as applicable. It should be installed in an area having free flowing air space and out of the way of pedestrian traffic. It should be located away from chemical storage areas. The tank should be positioned so its plumbing components are accessible for service and so its gauges are facing "forward" and are readable.

Caution! The storage tank must be vented to the outside to prevent hazardous CO_2 concentrations from developing if a pressure relief valve should open.

Connect Lines to the CO_2 Storage Tank

Bulk CO_2 storage tanks contain positive CO_2 gas pressure when they are shipped. Before installing the lines onto the tank, any residual pressure should be vented off by simply opening the gas-use valve.

1. Connect the liquid fill hose to the inlet flare fitting on the tank; then open the tank valve.

2. Squarely cut the vent tubing to the proper length and attach the tubing to vent circuit fitting of the tank.

3. Connect the supply line tubing to the tank's supply regulator.

Note: *Do not use copper tubing for CO_2 gas supply.*

For best results, the tank should be filled at this time to ensure that the lines are properly purged before use with the beverage system. This is also the best time to check the system for leaks.

Connecting to the Beverage System

The gas-use line from the CO_2 storage tank to the beverage equipment or other end use point(s) will probably be run differently in each location. The distance from the CO_2 tank to the equipment is not critical and can be several hundred feet.

Beverage tubing lines with 1/4" ID are generally adequate for service up to 50 feet. For longer runs a larger ID tubing may be desired to compensate for pressure drop. See the chart below for recommended gas line sizes for various distances. For certain applications where several 'stations' are supplied by a single CO_2 source, a larger diameter 'header' or 'trunk' line may be used while teeing 1/4" 'drop' lines to supply individual stations. By following basic recommendations described in this section, CO_2 supply lines can be run as easily and as effectively as possible.

1. Run the gas use line in a manner that is as inconspicuous as possible.
2. The line should be attached along the run in horizontal or vertical orientation; level and plumb wherever possible to present a neat and careful installation. Never leave loose line hanging.
3. Cut the line to proper length.
4. Secure connections to the CO_2 storage tank's final line (supply) regulator and to the drink system equipment using appropriate fittings.
5. Open the gas-use isolation valve on the bulk CO_2 storage tank and check the supply regulator gauge for proper set pressure within the range of 90-115 psi while gas is flowing.
6. Perform a leak check with soap solution on all joints to the drink system and correct as necessary.

Note: *Beverage systems consist of a variety of equipment functions. Each function may require a different CO_2 pressure. The bulk CO_2 storage system supplies a pre-set CO_2 pressure of about 110 psi. Therefore, secondary or 'step-down' regulators should be used as necessary to meet the requirements of system functions. Since high pressure regulators normally used on high pressure cylinders are constructed to respond to very high inlet pressures, they may not perform properly in the low pressure bulk CO_2 system and their use is not recommended.*

Gas-Use Tubing Size / Distance Recommendations From a Single Supply Regulator			
Tubing ID	***To 1 Carbonator***	***To 2 Carbonators***	***To 3-5 Carbonators***
1/4"	0' - 50'	0' - 20'	--
3/8"	51' - 250'	21' - 100'	0' - 20'

Operation and Troubleshooting

Filling the CO_2 Storage Tank

First Fill

The first fill of the tank cools the inner vessel of the storage system. Since the inner vessel of a new CO_2 storage tank is relatively 'warm,' its first fill may take 20 to 30 minutes and a larger than normal amount of CO_2 gas will be vented during the fill. A higher-than-normal operating pressure can be expected for several days after the first fill.

1. Open the fill-box door and inspect the threaded fill-fitting for debris and damage. Wipe the fitting with a clean dry cloth if necessary.
2. Inspect the delivery hose quick-connect and wipe the fitting if necessary.
3. Connect the delivery hose to the fill box fill fitting.
4. Open the liquid delivery valve to allow liquid CO_2 to flow into the vessel. CO_2 will stop flowing when the tank's Sure-Fill™ Tank Filling System float ball seats. At this point the tank should be just over half full.

Note: *The initial fill will take considerably longer time than subsequent fills. If scheduling permits, it can be a good idea to initially fill the tank about halfway and then return in a day or two to complete the fill.*

5. Check all connections and fittings on the tank and fill box for leaks using a leak-check solution. Tighten connections if necessary.

General CO_2 Delivery

Delivery routes are typically planned to minimize travel times and "rush-hour" traffic situations. To minimize delivery expense, delivery frequency should be scheduled to allow a 150-175 pound delivery. For low-use restaurants the time between deliveries can be several months.

1. Delivery vehicle pressure must be maintained at 280-300 psi for proper operation. Low delivery pressure can cause longer fill times.
2. A delivery pressure of 50 psi higher than the restaurant storage vessel pressure should be maintained during filling. A low pressure differential will cause long fill times.
3. Maintain a delivery log for each account to help detect irregularities in CO_2 consumption.
4. Adjust delivery program to longer intervals between deliveries as consumption justifies.

Carbon Dioxide Consumption

The amount of CO_2 that will be consumed in the variety of restaurant applications is almost impossible to predict. While primarily used for beverage carbonation, CO_2 is also used for carbonating frozen drinks and for driving pumps and automatic dispense systems.

A typical 16 oz. soft drink contains about 2.4 oz. of syrup and water carbonated with 0.0112 lb. of CO_2 (approximately 1 lb. of CO_2 is required to carbonate one hundred 16 oz. drinks). The table below shows an estimate of CO_2 consumption just for beverage carbonation based on a use ratio of 0.6 lb. CO_2 per gallon of syrup.

Weekly Syrup Usage (gallons)	Bag-In-Box Containers	CO_2 Consumption for Carbonation (lb.)
10	2	6
20	4	12
30	6	18
40	8	24
50	10	36
60	12	42
70	14	48
80	16	54
90	18	60
100	20	66

CO_2 is also used to "push" beer from kegs. To push a "direct draw" beer dispense system, which dispenses directly from the keg, only the fresh-keg (rack) pressure of 12 to 15 psi needs to be maintained on the keg to pour the beer and prevent excessive foaming caused by over-carbonation.

Note: *To push beer greater distances in common "long draw" dispense systems higher gas pressures are required. However, to avoid over-carbonation and excessive foaming, that higher gas pressure must consist of a calculated blend of CO_2 and N_2. Blend gas equipment is available for this purpose.*

The following table shows the approximate amount of CO_2 consumed to dispense beer.

16 Gallon Kegs	CO_2 Consumption (lb.)
10	2.5
20	5.0
30	7.5
40	10.0
50	12.5
60	15.0

Operating the Bulk CO_2 System

The store operator should be familiar with basic elements of the system. The installer is responsible for explaining the CO_2 system to the store operator upon completion of the bulk CO_2 system installation. The following table describes functional elements of the system and is intended to assist with that explanation.

Component / Observation	Function / Indication
CO_2 Contents Gauge	Indicates the approximate amount of liquid CO_2 inside the tank.
CO_2 Tank Pressure Gauge	Indicates tank pressure. Normal operation pressure is between 110 and 175 psi. Vessel pressure may be as high as 300 psi after a CO_2 delivery
Final Line (Supply) Regulator Note: Actual regulator may not match style shown in diagrams in this manual.	Controls pressure in supply line from tank to beverage equipment.
Final Line (Supply) Regulator Gauge	Indicates supply pressure in the gas-use line. Final line (gas use) pressure is normally 90 - 115 psi.
Gas-Use Valve	On / Off valve for gas supply.
Relief Valve	Prevents tank pressure from exceeding 300 psi.
Vent Hose	Vents excess gas pressure to fill box outside.
Fill Hose	Transports liquid CO_2 from fill box to tank during fill.
Fill Box	Connection point for liquid CO_2 delivery and transfer line.
Filling Schedule	Should be established with supplier based on CO_2 use.
Periodic Frost	Frost on the external vaporizer coil indicates that liquid CO_2 is being converted to gas to meet a demand.
Continuous Frost	Continuous presence of frost during non-business hours or in mornings before business hours indicates a demand for CO_2 gas perhaps caused by a leak in the beverage system.

Facts to Know

1. A vessel's normal internal operating pressure is between 125 psi and 150 psi, which is sufficient pressure to supply the carbonator (typically 90 psi) and low enough pressure to be filled directly.
2. Vessel pressure can be as high as 300 psi after a delivery but returns to its normal operating pressure after a day or two of normal CO_2 use.

Note: *Topping off small amounts of liquid between normal delivery cycles will add excessive heat to the cylinder keeping the pressure high.*

3. The gas supply pressure is normally between 90 psi and 120 psi.
4. Frost or condensation on the vessel is normal during periods of CO_2 use.
5. Frost or condensation on the vessel before starting the daily use of CO_2 is a sign of a CO_2 leak. Have the leak fixed.
6. A Carbo-Mite 220 holds 221 lbs of CO_2 for a use rate of about 40 lbs per week (per monthly fill).
7. The contents gauge displays the approximate amount of liquid CO_2 in the vessel.
8. CO_2 becomes dry ice below a pressure of 61 psi. Stop using CO_2 from the vessel if its pressure reaches 70 psi or less.
9. An isolation (shut-off) valve is open when its handle is parallel to the valve body and the line. The valve is closed when its handle is perpendicular to the valve body and the line.

General Operation Notes

1. Always use caution when working with CO_2. Read and understand the Safety Section of this manual.
2. The Carbo system does not require adjustment under normal operating conditions.
3. In an emergency the flow of CO_2 from or through the storage tank can be stopped by closing the following valves:
   - Valve 16 to stop the flow of gas from the vessel to the beverage or other use-point system.
   - Valve 18 to stop CO_2 flow or leakage through the fill hose and/or the brass fill fitting in the outdoor fill box.
   - Valve 16 to stop CO_2 flow through the tank's pressure control circuit.
4. For CO_2 equipment issues, call your CO_2 supplier or service specialist. Before calling for service or troubleshooting assistance, please have the following information at hand:
   - Serial number of the vessel
   - Description of the problem
   - Readings from:

     the vessel contents gauge,

     the vessel pressure gauge and

     the final line pressure gauge
   - Observations such as unusual frosting and/or events related to the problem
5. Every day before starting operations and CO_2 use check for:
   - CO_2 leaks (see Safety)
   - Pressure readings
   - CO_2 contents
   - Abnormal frost or condensation
   - Anything unusual

Troubleshooting

The following table is arranged in a Trouble/Probable Cause//Remedy format. The probable causes for specific problems are listed in descending order of significance. That is, check out the first cause listed before proceeding to the next. Perform all procedures in order listed and exactly as stated (Refer to diagrams in the Specifications section as required to locate system components identified in the troubleshooting guide.) If you need further assistance please contact Chart's service team at 1-800-253-1769.

Trouble	Probable Cause	Remedy
No CO_2 to carbonator or use-point system. OR Carbonated drinks are flat.	CO_2 storage vessel is empty.	Switch to emergency CO_2 gas cylinder. Call CO_2 supplier for delivery
	Isolation valve (16) to final line regulator is closed.	Open valve as required.
	Vessel pressure is low (110 psi or less)	Switch to emergency CO_2 gas cylinder. Stop CO_2 withdrawal from bulk CO_2 vessel by closing isolation valve. If vessel pressure fails to rebuild see section on low vessel pressure.
	Pressure relief "Economizer" regulator not operating properly; set too low or stuck open.	Close supply pressure valve (16) and switch to emergency CO_2 gas cylinder. If tank pressure fails to rise within 24 hours see section below on low vessel pressure.
	Unknown	Call CO_2 service agent.
Frost on the bottom, sides, or top of the vessel.	A normal condition during or following CO_2 use.	None
	Leak in beverage system and/or gas supply lines or CO_2 fill box.	See Safety section. Evacuate and ventilate. Check for frost in the morning before CO_2 has been used. If possible, locate and correct leak. Call appropriate equipment service agent.
Frost on vessel after extended periods of no CO_2 use; such as in the morning before store operations begin.	Leak from the beverage system, CO_2 vessel's plumbing, or fill box. Bag-in-box pump running because B.I.B. is empty.	See Safety section. Evacuate and ventilate the room. Locate and correct leak if possible. Call appropriate service agent.
Constant low vessel pressure (below 125 psi).	Economizer regulator set too low or stuck open.	Call CO_2 service agent.
	CO_2 leak from vessel plumbing, CO_2 fill box and/or vessel safety system.	See Safety section. Evacuate and ventilate the room. Call CO_2 service agent.
Constant high vessel pressure (above 200 psi).	Normal condition for several hours following a CO_2 delivery	None
	Normal when little or no CO_2 is used.	None
	Economizer regulator (4) set too high or stuck closed.	Call CO_2 service agent.
	Tank has a weak vacuum insulation.	Call CO_2 service agent.
	Repetitive small deliveries	Refill cylinder when less than half full.

Trouble	*Probable Cause*	*Remedy*
High CO_2 consumption.	Increased beverage sales or CO_2 use.	None
	Vessel pressure constantly high.	See section on vessel pressure too high.
	CO_2 leak from vessel plumbing, CO_2 fill box, gas lines, and/or beverage or other use-point equipment.	See Safety section. Evacuate and ventilate the room. Locate and correct leak if possible. Call appropriate service agent.
	Error in CO_2 supplier invoice.	Check CO_2 usage history / pattern against supplier invoices. Consult CO_2 supplier.
CO_2 vessel will not fill.	CO_2 vessel is already full.	None
	Fill valve (18) is shut off or is faulty.	Consult CO_2 service agent.
	Brass fill fitting in CO_2 fill box and/or on truck's delivery hose is faulty.	Consult with CO_2 supplier or service agent. Have brass fill fitting(s) replaced if necessary.
	Pressure difference between store vessel pressure and delivery pressure is too small.	Verify delivery vessel pressure is at least 275 psi and store vessel pressure is between 110 and 150 psi. Vent store vessel to lower pressure if needed (never vent store vessel pressure to lower than 125 psi).
	Delivery vessel empty or truck delivery hose is obstructed, e.g. vehicle stopped on hose or hose is bent.	Ask driver to make another delivery or clear obstruction or wait until obstruction clears.
Hissing sounds or evidence of gas leak.	Normal for short periods of time from some regulators and relief valves.	Observe leak. If it is not large and does not last long and does not occur frequently, no action is needed.
	Large leaks from elsewhere in the system, sustained leaks, or frequent leaks, are not normal.	See Safety section. Evacuate all personnel from affected areas. Ventilate the area. Call CO_2 service agent.
Final line / gas-use pressure gauge indicates less than 90 psi.	Final line regulator (5) intentionally set lower by beverage service agent.	None
	Final line regulator (5) not operating in proper pressure range.	Call CO_2 service agent.
	Final line pressure gauge (3) damaged or faulty.	Call CO_2 service agent.
	One or more of the causes listed in "no CO_2" or "flat drinks" problem section.	See indication sections regarding "no CO_2" and "flat drinks" etc. Call CO_2 service agent.

Fill Box Operation and Troubleshooting

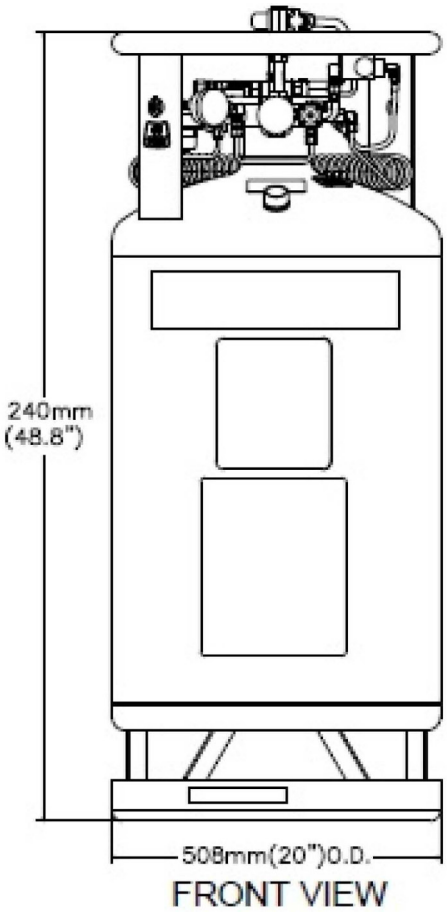
Trouble	Probable Cause	Remedy
Fill box door will not close, lock, or open.	Wrong key.	Verify correct key and retry. Contact CO_2 supplier for spare key. Order new key.
	Lock dirty or damaged	Clean and oil lock Replace lock if necessary
Brass fill fitting in fill box leaking or hissing.	Particle of ice or debris caught in fill fitting poppet.	If driver is still on-site, reconnect CO_2 delivery hose and then disconnect. If driver is not available, carefully press poppet with dull instrument to re-seat poppet. If leak continues after line warms, close the fill isolation valve and call service agent.
	Fitting is defective or sealing surface is worn due to normal wear.	Close the fill isolation valve on the vessel and call service agent to replace fitting.
Threads on brass fill fitting are worn or stripped.	Normal wear. Fill fitting must be replaced	Contact CO_2 service agent to replace fitting.
	Fill fitting cross threaded with the CO_2 delivery hose coupler.	Contact CO_2 service agent to replace fitting.
CO_2 is venting from fill box	Normal during CO_2 delivery.	None
	Normal for short periods of time if vessel is at or over 300 psi.	None if for short period(s) of time. If vessel pressure is consistently over 300 psi, see section on “vessel pressure too high.”
	Fill fitting is not sealing properly.	Call CO_2 service agent to replace fitting.

Specifications

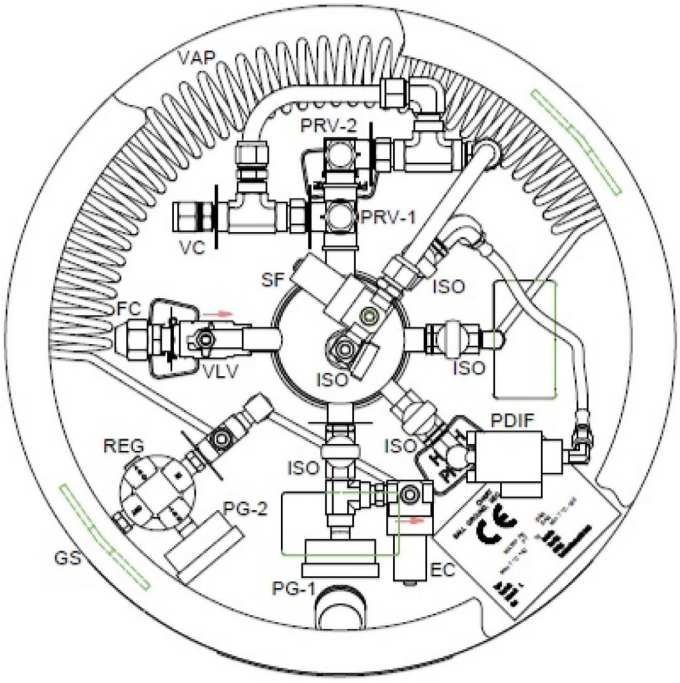
	Carbo-Mite 220 PED	
Dimensions / Weight		
Diameter	20 in	50.8 cm
Height (add 6” for legs)	40 in	101.6 cm
Empty Weight	150 lb	68 kg
Full Weight	400 lb	182 kg
Design Criteria		
Design Specification	PED	
MAWP	300 psig	20.7 barg
Hydraulic Test Pressure	450 psig (31.03 barg)	
Insulated Type	Super Insulation / High Vacuum	
Design Temperature	-320°F	-196°C
Capacity		
Service	Liquid Carbon Dioxide	
Service Temperature Range	-320°F to 100°F	-196°C to 38°C
Gross Volume	26 gal	99 ltr
Net Storage Volume	24.1 gal	91 ltr
Storage Capacity @ 200 psig	221 lb	100 kg
Performance		
Evaporation Rate*	1.0 lb/day	.45 kg/day
Gas Delivery**	0.2 lb/hr	0.1 kg/hr
	(18-16 oz drinks/hr)(Based on 11.25 lb of CO_2/1000 16 oz drinks)	
Peak Flow Rate***	0.8 lb/hr	0.4 kg/hr
	(71-16 oz drinks/hr)(Based on 11.25 lb of CO_2/1000 16 oz drinks)	
Components		
ASME Relief Valve Setting	300 psig	20.7 barg
Gas Use Connection	1/4 in x 45° Flare	
Fill Line Connection	5/8 in x 45° Flare	
Relief Valve Vent Connection	1/2 in OD Tubing	
Construction		
Inner Vessel Material	ASTM 201LN	
Outer Vessel Material	ASTM 304	
Liquid Level Gauge	Roto-Tel™ Liquid Level Gauge (telemetry ready)	

**At 125 psig at room temperature, no loss in accounts at 1.0 lb/day minimum.*
*** 12 consecutive hours at room temperature.*
**** 4 consecutive hours at room temperature.*

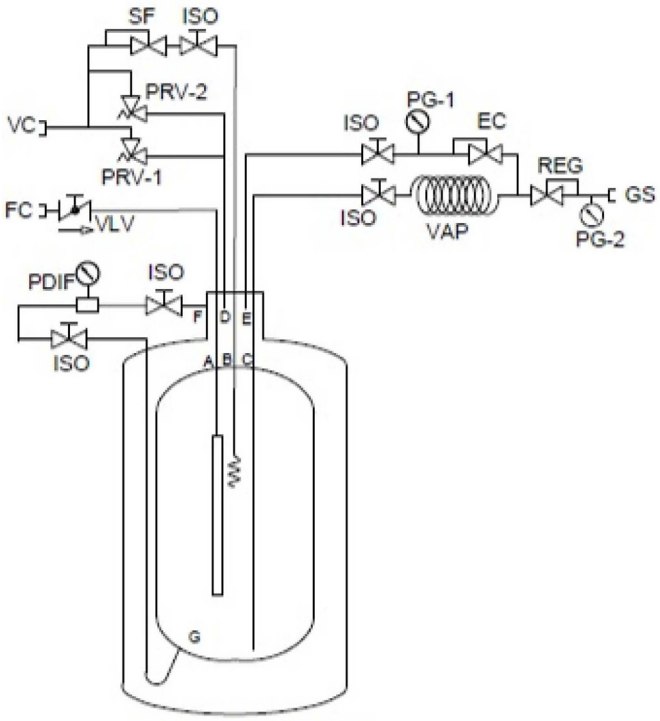
Carbo-Mite 220 PED Side View



Carbo-Mite 220 PED Top View



Carbo-Mite 220 PED Piping Diagram



Piping Accessories Legend

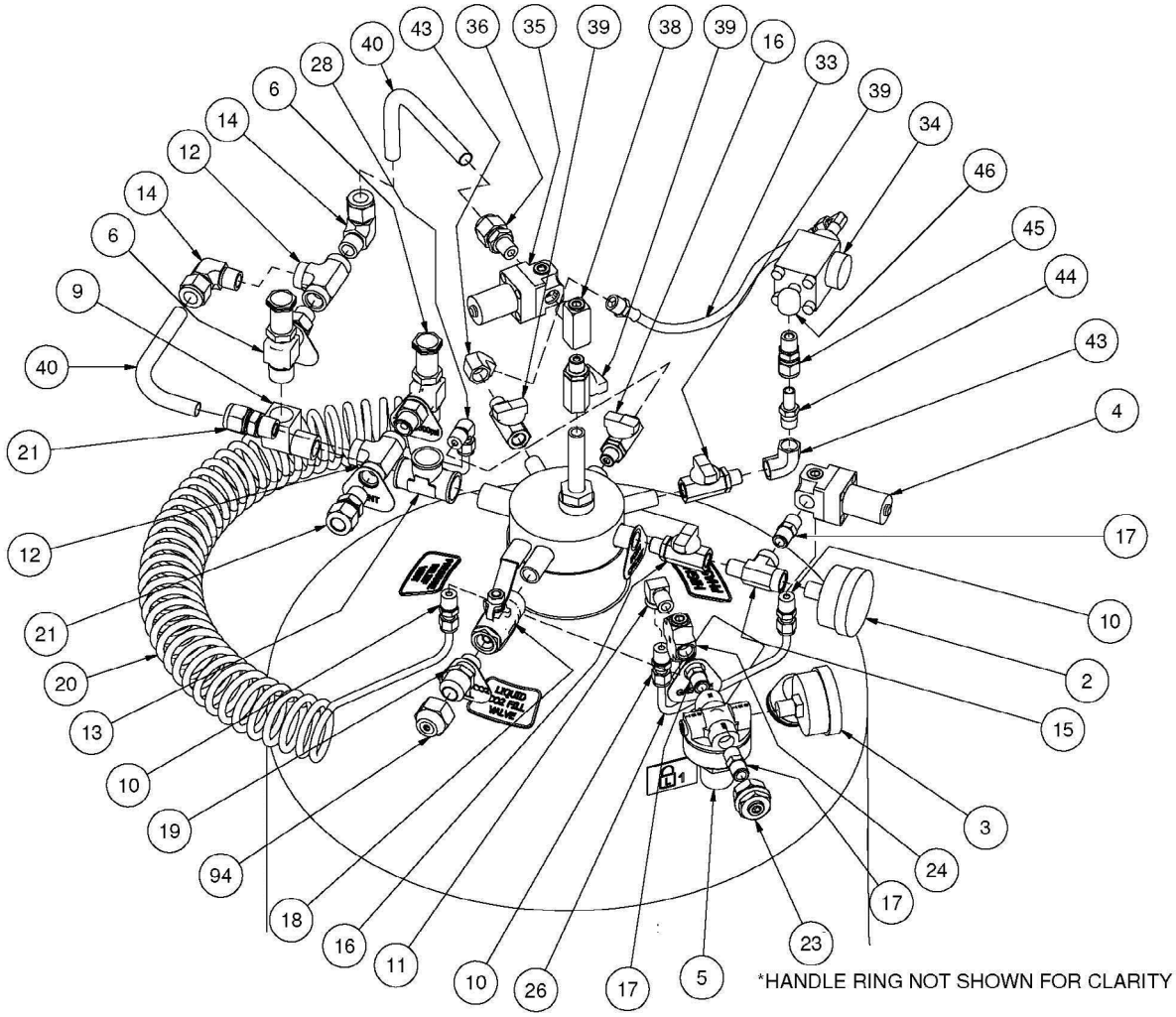
SF	SURE-FILL REGULATOR 1/4” NPT, 200 PSI (13.79 BAR)
EC	ECONOMIZER-REGULATOR 1/4” NPT, 150 PSI (10.34 BAR)
FC	FILLING CONNECTOR, BRASS, 1/2” ODT X 1/4” BRASS MPT
VC	VENT (SAFETY) CONNECTOR, BRASS, 1/2” ODT X 1/4” BRASS MPT
GS	GAS SUPPLY CONNECTOR, BRASS, 1/2” ODT X 1/4” BRASS MPT
REG	FINAL LINE, GAS SUPPLY REGULATOR, 1/4” NPT, 110 PSI (7.58 BAR)
VAP	VAPORIZER COIL
PG-1	TANK CONTENTS PRESSURE GAUGE, 2” DIAL, 0-400 PSI (0-27.58 BAR)
PG-2	SUPPLY PRESSURE GAUGE, 2” DIAL, 0-160 PSI (0-11.03 BAR)
PDIF	DIFFERENTIAL PRESSURE GAUGE, 1/8” NPT
PRV-1	PRESSURE RELIEF VALVE, 1/2” NPT, 20.68 BAR (~300 PSI), CE-MARKED
PRV-2	PRESSURE RELIEF VALVE, 1/2” NPT, 20.68 BAR (~300 PSI), CE-MARKED
VLV	BALL VALVE 3/8” NPT WITH CHECK VALVE
ISO	ISOLATION VALVE BRASS, 1/4” NPT

Piping Lines Legend

A	FILL LINE
B	SURE-FILL & VENT LINE
C	GAS WITHDRAWAL LINE
D	PRESSURE RELIEF LINE
E	ECONOMIZER-REGULATOR LINE
F	LOW PRESSURE PORT
G	HIGH PRESSURE PORT

Parts Identification

Carbo-Mite 220 PED PN 20794724



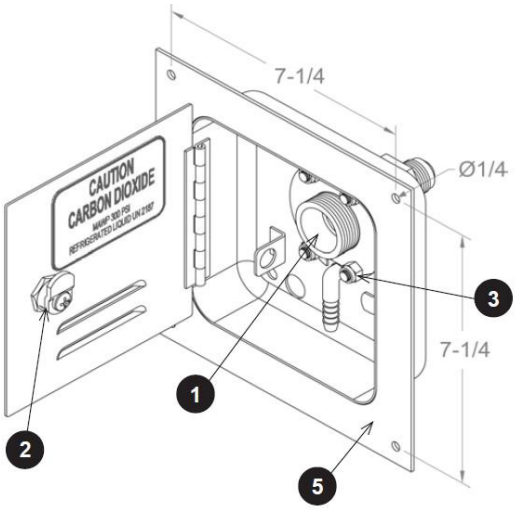
Note: *Regulator styles may vary from the style depicted in this diagram. Please refer to the descriptions in the parts lists included in the Specification section.*

Vessel Parts

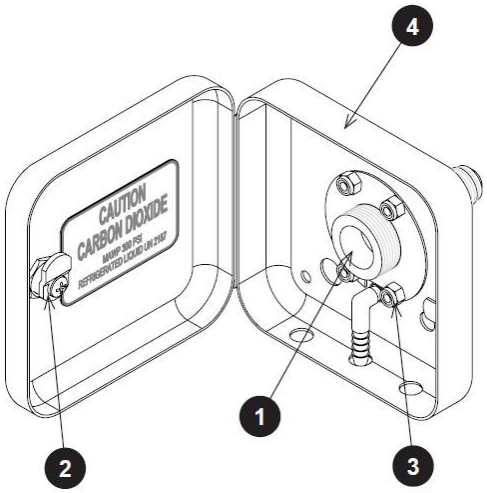
Item	Part Number	Description	Notes
2	13321014	PG 2"DIAL 0-400PSI 1/4"MPT CBM	Displays internal vessel pressure
3	13321006	PG 2"DIAL 0-160PSI 1/4"MPT CBM	Indicates CO_2 gas pressure to use-point
4	13154842	REGULATOR .250NPT@150PSI ECON	Controls vessel pressure (relieving)
5	14743163	REGULATOR .250NPT@110PSI	Controls CO_2 gas pressure to use-point
6	20882331	RV BRS 1/2MPT INLET 20BAR (~300PSI)	Primary inner vessel safety relief valve
9	1210502	ELBOW STREET BRS 90D 1/2NPT	Joins secondary relief valve to vent circuit
10	10MC003	CONN SS 1/4ODTX1/4MPT	Connects tubing to gas circuit fittings
11	1210462	ELBOW STREET BRS 90D 1/4MPT	Joins economizer circuit to gas use circuit
12	11499898	TEE BRS 3/8FPT	Joins Sure-Fill circuit to vent circuit
13	11044869	TEE BRS 1/2FPT FORGED	Joins knuckle to vent circuit
14	13832877	ELBOW BRS 90D 1/2ODTX3/8MPT	Connects vent tubing to vent circuit
15	14175021	TEE STREET BRS 1/4NPT FORGED	Joins economizer circuit components
16	20733158	VALVE ISO BRS RED-HANDLED ABCO	On / Off control for gas supply
17	1310092	NIPPLE HEX BRS 1/4NPT SCH 40	Joins gas use components
18	14422693	VALVE BALL 3/8NPT W/CHECK	Isolates CO_2 fill hose from vessel
19	1110112	CONN BRS 5/8ODTX3/8MPT 45D FL	Joins CO_2 fill components
20	14775641	VAPORIZER COIL CARBOMITE 220	Transforms CO_2 liquid to gas
21	13670943	CONN BRS 1/2ODTX3/8MPT	Connects tubing to vent circuit
23	1013362	CONN BRS ANCHOR 1/4NPTX	Secure gas line to tank supply
24	1210762	CROSS BRS 1/4FPT	Joins gas use lines with gas use regulator
26	14775632	TUBE SS .250"OD .020WX12.00	Pressure maintenance line (economizer)
28	11940065	ELBOW SS 90D 1/4ODTX1/4MPT SL	Connects tubing to liquid withdrawl isolation valve
33	20754903	HOSE FLEX 1/4MPTX12"LG SS/BRS	Connects DP gauge circuit components
34	14346977	DIFF PG 0-36" 1/8"FPT FULL	Displays internal CO_2 level
35	13154834	REGULATOR .250NPT @200PSI SF	Controls CO_2 gas pressure vent circuit
36	13832914	CONN BRS 1/2ODTX1/4MPT	Joins Sure-Fill Regulator to vent tubing
38	1213092	TEE BRS 1/4FPTX1/4FPTX1/4MPT	Connects Sure-Fill components
39	20733160	VALVE ISOLATION BRS ABCO	On / Off control for Sure-Fill and DP guage
40	6910623	TUBE CU .375" NO TYPE L SOFT	Joins vent circuit components
43	1210402	ELBOW BRS 90D 1/4FPT	Connects DP gauge circuit components
44	15057974	ADAPTER BRS 3/8ODTX1/4MPT	Connects DP gauge circuit components
45	13670994	CONN BRS 3/8ODTX1/4MPT	Connects DP gauge circuit components
46	14285481	ELBOW STREET RDCR BRS 90D	Connects DP gauge circuit components
94	1110422	CAP NUT 5/8ODT 45D FL W/HOLE	
-	20870356	LABEL CARBOMITE 220	
-	20894563	LABEL CARBOMITE 220 PED SCHEM	
-	14231117	LABEL VACUUM SEAL 1-1/4DIA	

Fill Box Parts

Flush-Mount Fill Box
PN 9723139



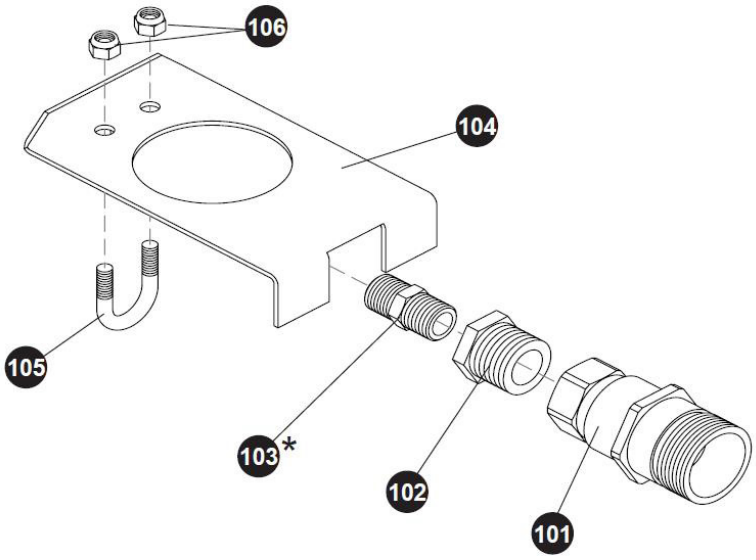
Surface-Mount Fill Box
PN 9722279



Item	PN	Description	Function
--	11784496	Caution Label	Advisory identification of CO_2 use.
1	11381021	CO_2 Fill Fitting, Brass	Connection for CO_2 delivery vessel hose.
2	13078190	Lock Assembly (includes key)	Locks fill box door.
--	13104087	Key for Lock Assembly (not pictured)	Replacement key for fill box.
3	2914071	Locknut SS w/nylon Insert	Attach fill fitting to fill box studs.
4	11386771	Surface-Mount CO_2 Fill Box Shell (w/out fittings)	Allows outdoor filling and venting of vessel.
5	11866871	Flush-Mount CO_2 Fill Box Shell (w/out fittings)	Allows outdoor filling and venting of vessel.
--	10802912	CO_2 Fill Hose only, 5 ft. (2000 psi & FDA)	Transfers liquid CO_2 from fill box into vessel.
--	10802921	CO_2 Fill Hose only, 10 ft. (2000 psi & FDA)	Transfers liquid CO_2 from fill box into vessel.
--	10802947	CO_2 Fill Hose only, 15 ft. (2000 psi & FDA)	Transfers liquid CO_2 from fill box into vessel.
--	10802939	CO_2 Fill Hose only, 25 ft. (2000 psi & FDA)	Transfers liquid CO_2 from fill box into vessel.
--	10370710	CO_2 Fill Hose only, 30 ft. (2000 psi & FDA)	Transfers liquid CO_2 from fill box into vessel.
--	10370728	CO_2 Fill Hose only, 50 ft. (2000 psi & FDA)	Transfers liquid CO_2 from fill box into vessel.
--	2811726	Vent Hose (lengths match fill hose)	Vents excess vessel pressure outdoors.
--	11388573	Elbow, Brass (5/8” ODT Fem x Male 45° Flare)	Attaches fill hose to fill box if needed for in-wall installation.

Direct Fill Components

"Direct Fill" Fitting Kit
PN 14905901
(for outdoor installations only)



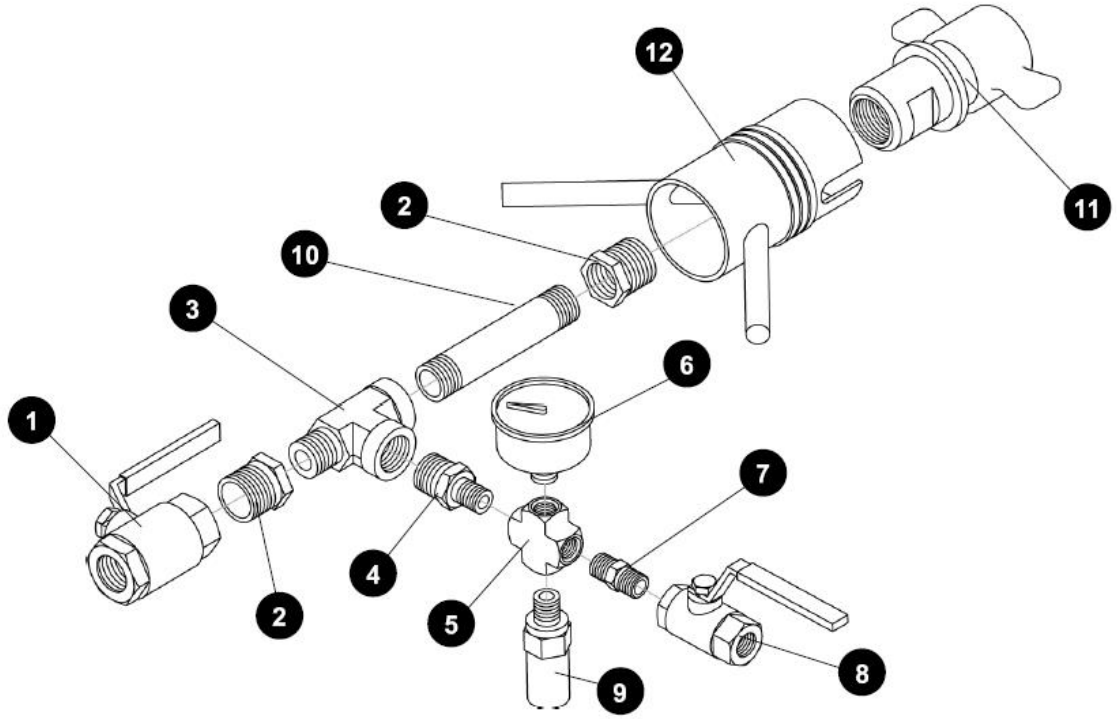
Item	PN	Description	Function
101	10582833	CO_2 Fill Fitting, Brass (3/4" thread)	Fill port connection for CO_2 delivery.
102	1212062	Hex Bushing (3/8" FPT x 3/4" MPT)	Joins fill fitting to hex nipple.
103	14902814 or 1310072	Pipe Nipple, Brass (3/8" NPT x 2") or Hex Nipple (3/8" NPT x 1 ¼" long)(pictured)	Used to join fill fitting to valve on vessel when bracket is used (recommended). Used to join fill fitting to valve on vessel when bracket is not used.
104	10724192	CO_2 Fill Fitting Support Bracket	Prevents fill fitting from turning with fill (gun) coupling.
105	10644601	U-bolt	Secures fill fitting bracket to fill tube.
106	2914071	Locking Nut	Secures u-bolt to fill fitting bracket and fill tube.

Fill and Vent Hose Kits

PN	Description	PN	Description
10973252	5 ft. Fill & Vent Hose	10973332	25 ft. Fill & Vent Hose
10973308	10 ft. Fill & Vent Hose	10973341	30 ft. Fill & Vent Hose
10973324	15 ft. Fill & Vent Hose	10973359	50 Ft. Fill & Vent Hose

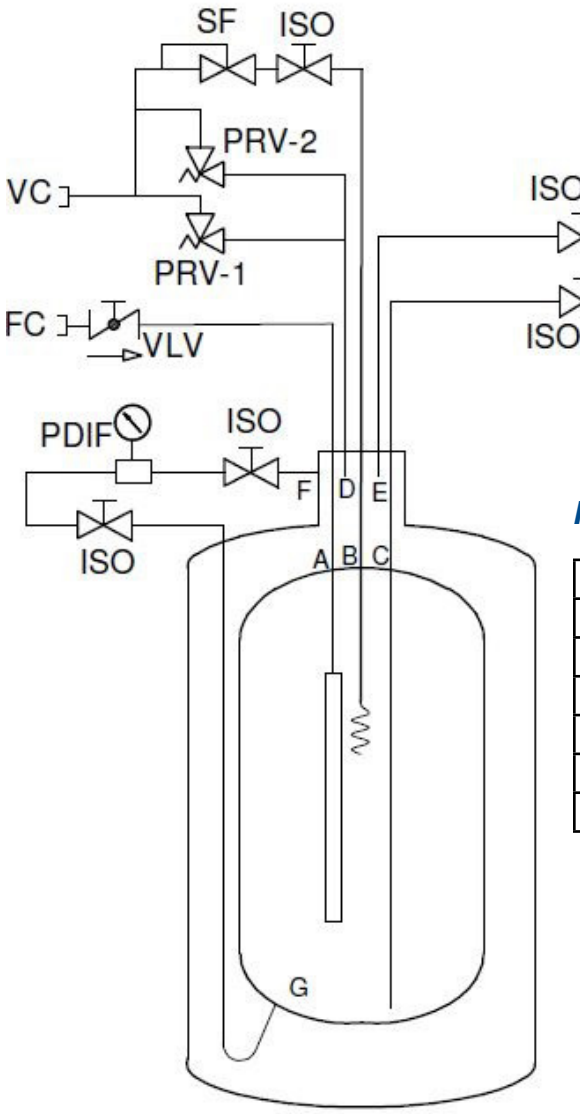
Fill "Gun" Components

Fill Gun PN 11039031



Item	Part No.	Description	Function
1	12930192	Ball Valve, SS (3/4 FPT)	CO_2 Supply Valve
2	1210062	Hex Bushing (3/4 MPT x 1/2 FPT)	Connects 3/4 FPT fitting to 1/2 MPT fitting
3	1212082	Street Tee (1/2 FPT x 1/2 MPT)	Joins supply & pressure vent components
4	10599563	Hex Nipple (1/2 NPT x 1/4 NPT)	Joins street tee to cross
5	1212922	Cross, BRS (1/4 FPT)	Joins supply, gauge and vent components
6	2015179	Pressure Gauge, 0-400 PSI (1/4" CBM)	Displays line / tank pressure
7	1310092	Hex Nipple (1/4 NPT)	Joins manual relief ball valve to cross
8	1716182	Ball Valve (1/4 NPT)	Manual pressure relief
9	1811472	Relief Valve, 450 PSI (1/4 MPT)	Safety relief
10	132032	Nipple, SS (1/2 NPT) 4"	Joins supply control components to quick-connect
11	1213169	Female Wing Nut Quick Connector	Connects fill gun to wall box fill fitting
12	9720959	Quick Connector Wrench	Turns quick connector onto wall box fill fitting

Carbo-Mite 220 Piping Diagram



PIPING DIAGRAM

Piping Lines Legend

A	FILL LINE
B	SUREFILL & VENT LINE
C	GAS WITHDRAWAL LINE
D	PRESSURE RELIEF LINE
E	ECONOMIZER-REGULATOR LINE
F	LOW PRESSURE PORT
G	HIGH PRESSURE PORT

Piping Accessories Legend

SF	SURE-FILL REGULATOR 1/4” NPT, 200 PSI (13.79 BAR)
EC	ECONOMIZER-REGULATOR 1/4” NPT, 150 PSI (10.34 BAR)
FC	FILLING CONNECTOR, BRASS, 1/2” ODT X 1/4” BRASS MPT
VC	VENT (SAFETY) CONNECTOR, BRASS, 1/2” ODT X 1/4” BRASS MPT
GS	GAS SUPPLY CONNECTOR, BRASS, 1/2” ODT X 1/4” BRASS MPT
REG	FINAL LINE, GAS SUPPLY REGULATOR, 1/4” NPT, 110 PSI (7.58 BAR)
VAP	VAPORIZER COIL
PG-1	TANK CONTENTS PRESSURE GAUGE, 2” DIAL, 0-400 PSI (0-27.58 BAR)
PG-2	SUPPLY PRESSURE GAUGE, 2” DIAL, 0-160 PSI (0-11.03 BAR)
PDIF	DIFFERENTIAL PRESSURE GAUGE, 1/8” NPT
PRV-1	PRESSURE RELIEF VALVE, 1/2” NPT, 20.68 BAR (~300 PSI), CE-MARKED
PRV-2	PRESSURE RELIEF VALVE, 1/2” NPT, 20.68 BAR (~300 PSI), CE-MARKED
VLV	BALL VALVE 3/8” NPT WITH CHECK VALVE
ISO	ISOLATION VALVE BRASS, 1/4” NPT

Service and Parts Ordering

Service or maintenance work on the bulk CO_2 storage system should be performed only by Chart trained and authorized professional service agents. These service agents are familiar with CO_2, bulk liquid CO_2 pressure vessels, and all pertinent safety and service procedures. Chart recommends the use of Chart approved replacement parts. Contact Chart for the name of the authorized service agent(s) in your area.

Before calling for service or troubleshooting assistance, please have the following information at hand:

- Serial number of the vessel
- Description of the problem
- Readings from:
  - the differential pressure gauge (item 34)
  - the vessel pressure gauge (item 2)
  - the final line pressure gauge (item 3)
- Any special observations (for example: unusual frosting or events related to the problem)

Chart recommends that a qualified professional service agent perform a thorough preventive maintenance check on the system at least once every two years. The check should be done to ensure safety and optimal system performance.

The bulk CO_2 storage system has no user serviceable parts. An authorized professional service agent should perform all service work.

Note: *Any attempt by an unauthorized person to service or perform unauthorized modifications on the equipment will void the warranty.*

For service contact your local authorized Chart CO_2 supplier or equipment service agent. For parts contact your local authorized Chart service agent or order on-line directly from Chart at www.chartparts.com.

Know the model and serial number of the vessel for which you are ordering parts. To assure that your order is processed promptly, list each item separately, being careful to specify the quantity, the part number, and the description of each item being ordered.

Chart “Beverage” Customer Service: 1-800-247-4446

Chart “Beverage” Technical Service 1-800-253-1769

Warranty

Warranty Policy

Chart Inc. ("Chart") warrants to the Purchaser that the Bulk CO_2 Storage Systems equipment (the "Equipment") shall be free from any defects in workmanship and materials; provided, however, that this warranty shall be limited to Equipment found to be defective within a period of one (1) year from initial use or eighteen (18) months from the date of shipment, whichever expires first, except that parts sold as a spare or for replacement are warranted for ninety (90) days from the date of shipment. Chart also warrants the vacuum in the Equipment for five (5) years from the date of the original Chart invoice. Chart warrants that its services will be performed in a professional and workmanlike manner. All Chart services are warranted for a period of ninety (90) days from the date of their completion.

Purchaser agrees that as a pre-condition to any Chart liability hereunder, Purchaser or its appointed agents shall fully inspect all Equipment immediately upon delivery and shall give Chart written notice of any claim or purported defect within ten (10) days after discovery of such defect.

As a further pre-condition to any Chart liability hereunder, an approved Chart service company must supply both parts replacement and labor and Purchaser must strictly adhere to the Warranty Claims Procedure set forth below. Chart's sole and exclusive liability under this limited warranty is to the original Purchaser only and is, at Chart's sole option: (1) repair or replacement of the defective Equipment or parts thereof; or (2) refund the net purchase price of the defective Equipment or parts thereof paid by the original Purchaser; or (3) in the case of nonconforming services, provide equivalent services or refund the net price paid by the original Purchaser for such services. Chart shall not be responsible for providing working access to the defect, including disassembly and reassembly of Equipment or for providing transportation to and from Chart's repair or factory facility, all of which shall be at Purchaser's risk and expense.

This limited warranty does not apply to Equipment that Chart determines to have been caused by the effects of normal wear and tear, erosion, corrosion, fire, flood, explosion or other excessive external forces, misuse, abuse, negligence or accident. Alterations or repairs by any party other than those designated and approved in writing by Chart, or installation, storage, maintenance or operation of such Equipment in a manner inconsistent with Chart accepted practices, normal operating instructions, specifications and drawings, or outside the specified design conditions, unless pre-authorized in writing by Chart, shall void this limited warranty. Modifications in any way to the Equipment without Chart's prior written approval shall render this warranty void. This limited warranty does not apply to Equipment comprised of materials provided or a design stipulated by Purchaser or to Equipment purchased used. Negligent handling of the vacuum by the Purchaser or others, or testing of the vacuum levels by any party other than Chart designated and approved party shall render the vacuum warranty void.

Repairs or replacements made pursuant to warranty shall not renew or extend the applicable original warranty period; provided however, that any such repairs or replacement of Equipment or parts thereof shall be warranted for the time remaining in the original warranty period or thirty days, whichever is longer.

Individual parts replacements under warranty and with a component list price less than $50.00 will be replaced at no charge. Individual components costs exceeding $50.00 that are replaced under warranty will be invoiced to the Purchaser and the Purchaser will be issued credit based on results of Chart's evaluation of the returned component(s). The Return Material Authorization (RMA) process must be initiated prior to shipment of any replacement parts.

Chart is not liable for component replacement labor exceeding two hours for actual replacement and two hours travel time (four hours @ 65.00/hour maximum).

Chart specifically makes no warranties or guarantees, expressed or implied, including the warranties of merchantability of fitness for a particular purpose or use, or warranties arising from course of dealing or usage of trade, which are all expressly disclaimed, other than limited warranties expressly specified herein.

In no event shall Chart be liable for any special, indirect, incidental or consequential damages, including but not limited to loss of profits, lost opportunity, loss of use of the equipment, CO_2 loss, cost of capital, cost of substitute equipment, downtime costs, costs of delays nor for any penalties, whether any such claim for the same is based on contract, warranty, tort, negligence, strict liability or otherwise, Chart's liability for any such claims whether in contract, warranty, negligence, tort, strict liability, or otherwise or for any loss or damage arising out of, connected with, or from any design, sale, installation, operation or use of the equipment or performance of any services rendered by Chart, shall in no event exceed the purchase price paid to Chart by purchaser for the specific equipment or part thereof or for the services giving rise to the claim. Purchaser agrees to defend, indemnify and hold Chart harmless from any third party claims arising out the use, sale, or lease of the equipment.

This warranty policy is not intended to replace or supersede the warranties, limitations, exclusive remedy and disclaimers set forth in Chart's Terms and Conditions of Sale. In the event of a conflict between Chart's Terms and Conditions

of Sale and this Warranty Policy, this Warranty Policy shall control.

Warranty Claims Procedure

1. All warranty claims must be previously authorized by Chart Inc. Telephone / electronic approval may be obtained by contacting Chart's Beverage Systems Technical / Customer Services at:

   1-800-247-4446

   1-800-253-1769

   Fax: 1-952-758-8275

   Or by writing to:

   Chart Inc.

   407 7th Street NW

   New Prague, MN 56071

2. Authorization must be obtained from Chart prior to shipping any Equipment to Chart facilities. In order to process the return of a vessel its model and serial number must be provided. If approved, a Return Material Authorization (RMA) number will be provided. The RMA number must be prominently indicated on the packing slip and any packaging that accompanies the goods being returned. The customer returning the goods is responsible for all freight, proper packing, and any damage incurred during shipment of the goods back to Chart.