



# **Product Manual**

## **Bulk CO<sub>2</sub> Storage Systems**

### **Carbo-Max<sup>®</sup> 600, 750 and 1000**



**Designed and Built by:**

**Chart Inc.**

**1300 Airport Dr.**

**Ball Ground, GA 30107 USA**

**(800) 400-4683**



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## Revision Log

Revision Level	Date	Description
A	02/13/2015	Original
B	04/13/2017	Revise syrup table on page 14, change vacuum warranty to 7 years, add Carbo-Max 600
C	07/14/2017	Update Specifications section with PED information



## Preface

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### General

The Carbo-Max 600 High Flow, 750 High Flow and Carbo-Max 1000 systems are innovative bulk CO<sub>2</sub> systems that meet the demands of high volume customers. These systems offer the capacity and flow rates necessary for high volume users such as stadiums, brew pubs, cineplexes and microbreweries.

Each Chart Carbo-Series tank is equipped with a proprietary vacuum maintenance system to ensure optimized long-term performance. Unique to the market, this feature offers greater efficiency over longer periods of time.

### Product Advantages

- Stainless steel, double-walled, vacuum-insulated container
- Proprietary vacuum regeneration system for on-site maintenance
- Optional patented Sure-Fill™ System enables tank filling with no manual venting
- Stable 6" unibody legs meet health department sanitation requirements standard on Carbo-Max 600 & 750
- Lab Base available with the Carbo-Max 1000 model so it can be moved with a pallet jack
- Safe, low operating pressure
- Easy-to-read gauges for CO<sub>2</sub> contents and tank pressure
- Efficient CO<sub>2</sub> liquid withdrawal system
- Fully automated system requiring no electricity
- Maximizes limited space with one system replacing all of your high-pressure cylinders, using less than 3' of floor space
- Sized to match usage needs - available in a variety of sizes to meet the unique demands of your business

### Product Manual

The Carbo-Max Series Product Manual is designed to be used in conjunction with Carbo Max 600, 750 and 1000. If there are any questions regarding the operation of the tank, contact Chart's Technical Service division at 1-800-247-4446.

This manual contains information regarding the safe operation and handling of CO<sub>2</sub>. It should be thoroughly read and understood by anyone that operates the equipment.

The schematics, piping illustrations, and parts lists located in the Specifications section show a reference number for each component used on the tank. The reference numbers may refer to the same functional component between the various models. The reference numbers will be used throughout this manual to draw specific attention to a component while describing its function, operation, or repair.

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 the theory of operation.

Determining locations of the storage tank and the fill box are included in the Installation section. Part numbers are provided for easy identification of flush-mount and surface-mount fill boxes. This Installation section details the various connections required for the system and concludes with information on connecting to the beverage system.

The Operation and Troubleshooting section will help with instructions on filling the storage tank, operating the system, and general troubleshooting questions that may arise.

## 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 <sub>2</sub>	Carbon Dioxide
DOT	Department of Transportation
DP	Differential Pressure
FDA	Food and Drug Administration
FPT	Female Pipe Thread
ID	Inner Diameter
Kg	Kilogram
MAWP	Maximum Allowable Working Pressure
MPT	Male Pipe Thread
N <sub>2</sub>	Nitrogen
NPT	National Pipe Thread
OD	Outer Diameter
PB	Pressure Builder
PN	Part Number
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<sub>2</sub>) 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<sub>2</sub> 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.*



**Warning!** *CO<sub>2</sub> 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.*

CO<sub>2</sub> 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<sub>2</sub> in gas, liquid or solid form.

Exposure to concentrations of less than 5% can cause physical symptoms including unconsciousness, injuries or death. Even low concentrations of CO<sub>2</sub> can cause:

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

CO<sub>2</sub> is heavier than air and can collect in low areas such as basements, stairwells, and confined spaces. Avoid entry into areas where CO<sub>2</sub> leaks or high concentrations of CO<sub>2</sub> are suspected. Enter those areas with caution only after they have been thoroughly ventilated.

Whenever the tank is inside a building its 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 tank must not block emergency exits, aisles, fire suppression equipment or utility boxes or accesses. CO<sub>2</sub> 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<sub>2</sub> and the mini-bulk liquid CO<sub>2</sub> storage tanks. 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 CO<sub>2</sub>, cold pipes and equipment, or cold gas exists. Safety goggles or a face shield should be worn at all times when connecting to fill connections, while filling the tank and during disconnection from the fill connection. Clean, insulated gloves that can be easily removed and long sleeves are recommended for arm and hand protection. Cuffless trousers should be worn over the shoes to shed spilled liquid.

### Equipment Safety and Handling



**Note:** *A bulk CO<sub>2</sub> storage tank is an ASME coded tank designed for permanent installation. It is not designed to meet DOT regulations and must not be transported when containing liquid CO<sub>2</sub>. It must be shipped, stored and used in a vertical position to avoid structural damage. When loading a tank onto or off of a truck, use a power lift gate, crane, or an inclined ramp. Never attempt to manually lift or slide a tank on or off a truck bed.*

### CO<sub>2</sub> Monitoring Systems

The Analox 50™ and Ax 50™ Carbon Dioxide Analyzers are precision instruments that provide continuous, accurate monitoring of CO<sub>2</sub> 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<sub>2</sub> concentrations without proper self contained breathing apparatus.
- Thoroughly ventilate areas of possible high CO<sub>2</sub> concentration before entering.

In case of spills or leaks:

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

## Personal Protective Equipment (PPE)

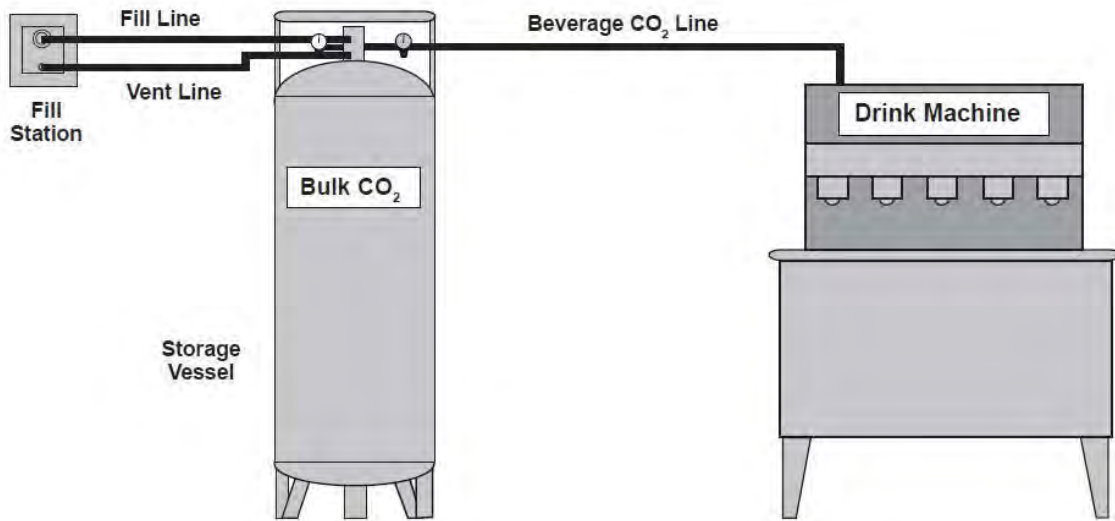
The following personal protective equipment is recommended when working around cryogenic liquid:

- Safety glasses with side shields to prevent cryogenic liquid from splashing into the eyes
- Chemical / Liquid resistant gloves to prevent cryogenic burns on exposed hands
- Long sleeve shirts to protect the arms
- Cuffless trousers worn over closed shoes





## Introduction



### System Overview

The Bulk CO<sub>2</sub> Storage System is designed to provide safe, convenient low pressure liquid storage and supply of carbon dioxide gas for purposes including beverage carbonation, beer dispensing, brewing, and pH control in swimming pools. The system consists of three primary elements: the CO<sub>2</sub> storage tank, a CO<sub>2</sub> fill box (fill station), and connecting fill hose and vent line.

### Bulk CO<sub>2</sub> Storage Tank

The storage tank consists of an inner tank and an outer tank, much like a giant Thermos® bottle. The space between the two tanks contains a vacuum and additional insulating material. The vacuum and insulation minimize the entry of unwanted heat into the liquid CO<sub>2</sub> stored in the inner tank.

The tank construction includes an internal vaporizer (coil) and external plumbing configuration that combines to maintain adequate CO<sub>2</sub> gas supply rates. When CO<sub>2</sub> gas is needed, liquid CO<sub>2</sub> is drawn from the inner tank 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, primary and secondary relief valves protect the tank 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<sub>2</sub> storage system. The lockable remote fill box is permanently mounted on an outside wall. It contains a fitting for filling the storage tank at any time of the day without entering the store. The fill box is also equipped with a vent connection through which CO<sub>2</sub> gas from the storage tank's pressure relief or Sure-Fill™ System circuits can be released to a safe area outside. If a tank is located indoors and is equipped with a direct fill fitting, not using a fill box located outside, the tank pressure relief circuit must still be vented to the outside.

### Fill Hose and Vent Line

The third major element of the stationary bulk CO<sub>2</sub> system is comprised of a fill hose and vent line. These two lines join the outdoor fill box with the CO<sub>2</sub> storage tank.

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 tank. 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<sub>2</sub> system. It connects the safety relief valves and the Sure-Fill system on the tank to either the outdoor fill box vent fixture or to an alternative outdoor vent tube.

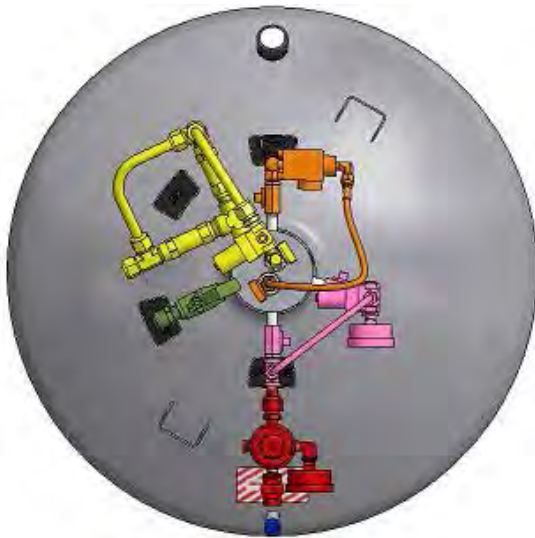


**Note:** When used indoors a CO<sub>2</sub> storage tank must always be connected with a vent line to the outdoors (see Safety section).

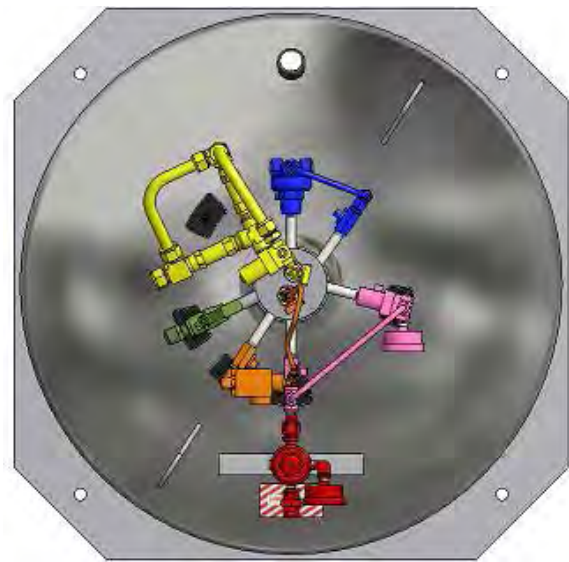
## Tank Plumbing

Plumbing components on the liquid CO<sub>2</sub> storage tank perform five functions (refer to illustrations on this page):

1. The fill tube allows liquid CO<sub>2</sub> to be transferred into the tank during the delivery process.
2. The gas-use circuit dispenses CO<sub>2</sub> gas to the end use system (shown in red).
3. The pressure control circuit (Economizer on Carbo-Max HF tanks - shown in pink) maintains optimal operating pressure and conserves gas for efficient system performance. The Carbo-Max 1000 also has the pressure building circuit from the Carbo-Mizer® Bulk CO<sub>2</sub> System Series (shown in blue).
4. The relief/vent circuit allows excess pressure to safely exit the tank and the building (shown in yellow). The Sure-Fill™ CO<sub>2</sub> Tank Filling System assembly is a standard feature on both the Carbo-Max 600, 750 and 1000.
5. Contents (shown in orange) and pressure gauges monitor the status of the CO<sub>2</sub> inside the storage tank (included in the economizer circuit shown in pink).



Carbo-Max 600 & 750



Carbo-Max 1000

## Installation

### Equipment Location

#### Site Survey

Prior to installation of the CO<sub>2</sub> system components, a site survey should be performed to determine the best location for placing the bulk CO<sub>2</sub> tank and the fill station. As a matter of safety, this would be a good time to determine the proper location for a CO<sub>2</sub> monitor (CO<sub>2</sub> is 1-1/2 times heavier than air and in the event of a leak is likely to collect in low-lying and confined spaces). Bulk CO<sub>2</sub> tanks should be installed outdoors in an unenclosed space whenever possible. Tanks should not be installed on roofs, in basements, or below grade. Tanks should have foundations or floors capable of supporting the full weight of the tank plus product. Tanks should not be installed near electrical panels, ventilation intakes, stairwells or elevators.

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<sub>2</sub> tank. A fill box is typically mounted on a back wall at a height of 3-1/2 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 tank 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 tank must not block emergency exits, aisles, fire suppression equipment or utility boxes or accesses. CO<sub>2</sub> 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.

#### Storage Tank Location

Once the fill box location has been defined, the location of the CO<sub>2</sub> 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. Tanks installed outside near traffic should have protective bollards or guards installed. Check local codes for specific requirements.



**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<sub>2</sub> 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:



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

## Tools

- 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
- 7-1/4" 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:
  - 1/4" and 3/8" Masonry Bits
  - Set of Twist Drills
  - 3" Hole Saw
- Oxyacetylene Torch - for cutting rebar in poured concrete walls and floors.

- 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
Concrete Wedge Anchor Hilti Kwik-Bolt® (3/8" x 3-3/8") or Red Head True Bolt®	10559713  11557752



**Note:** Stainless steel fittings should be used.

## Supplies

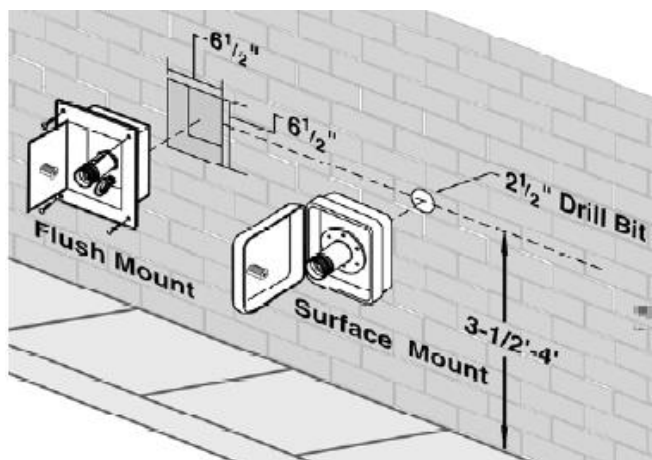
- Hand Truck with Strapping Attachment
- Torpedo Level
- Carpenter Square
- Extension Cord
- Oetiker Clamp Pliers
- Step Ladder
- Caulk Gun
- Assorted Hand Tools
- Flashlight

## 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)

- Using a pre-cut template or carpenter's square and a level, mark a 6-1/2" 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.
- 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.

- 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.

- Remove debris from the hole.



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

- Slide the box into the opening and make sure its flange lies flat against the wall surface.
- While holding the box in position mark the four corner mounting holes.
- Drill the corner mounting holes about 1-1/2" deep using a 1/4" drill bit or masonry bit as necessary. Insert plastic screw anchors.
- 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.

- 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.

- At the desired fill box location mark and drill the center hole using a 3" bit.
- 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.
- Drill the four corner pilot holes. Use a 1/4" bit if necessary for screw anchors. Insert the anchors.
- 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> storage tank.
6. Attach the PVC sleeve to the wall with conduit straps. Proceed to CO<sub>2</sub> storage tank installation.

## CO<sub>2</sub> Storage Tank Installation

The bulk CO<sub>2</sub> 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<sub>2</sub> concentrations from developing if a pressure relief valve should open.

## Bolting a Tank (with 6" legs) to the Floor

1. Place the tank in its best position and mark three floor-anchor holes through the holes in the bottom of the legs. Move the tank.

2. Drill holes with a masonry bit having the same diameter as the anchor. Make sure the hole depth exceeds the minimum embedment of the anchor.
3. Assemble each anchor with a nut and washer so the top of the nut is flush with the bolt. Drive each anchor into a floor hole until the nut is against the surface of the floor. Expand the anchor by tightening the nuts 3-5 turns until firmly tight. Remove and save the nuts and washers.
4. Move the tank back into position being careful that the hold in the bottom of each leg is over an anchor bolt. Place a washer and nut onto each bolt and tighten.
5. The Carbo-Max 1000 has a flat base with holes for securing the tank. A lab base is also offered with bolt holes included for ease while mounting.

### Connect Line to the CO<sub>2</sub> Storage Tank

Bulk CO<sub>2</sub> storage tanks contain positive CO<sub>2</sub> 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 the 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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 on the next page for recommended gas line sizes for various distances. For certain applications where several 'stations' are supplied by a single CO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> pressure. The bulk CO<sub>2</sub> storage system supplies a pre-set CO<sub>2</sub> 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<sub>2</sub> system and their use is not recommended.

<b>Gas-Use Tubing Size / Distance Recommendations From a Single Supply Regulator</b>				
<b>Tubing ID</b>	<b>To 1 Carbonator</b>	<b>To 2 Carbonators</b>	<b>To 3-5 Carbonators</b>	<b>To 6-8 Carbonators</b>
1/4"	0' - 50'	0' - 20'	--	--
3/8"	51' - 250'	21' - 100'	0' - 20'	--
1/2"	251' - 500'	101' - 500'	21' - 100'	0' - 50'
5/8" * or (2) 1/2"	--	--	101' - 250'	51' - 100'
3/4" * or (3) 1/2"	--	--	251' - 500'	101' - 250'

\*Non-standard tubing





## Operation and Troubleshooting

### Filling the CO<sub>2</sub> Storage Tank

#### First Fill

The first fill of the tank cools the inner tank of the storage system. Since the inner tank of a new CO<sub>2</sub> storage tank is relatively 'warm,' its first fill may take 20 to 30 minutes and a larger than normal amount of CO<sub>2</sub> 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. If filling a tank equipped with the Sure-Fill™ System option proceed to step 7.
4. Open the liquid delivery valve to allow liquid CO<sub>2</sub> to flow into the tank. CO<sub>2</sub> will stop flowing when the tank's pressure equals the pressure of the delivery source. At this point the tank should be just over half full.
5. Close the liquid delivery valve; then open the vent valve on the delivery hose assembly to reduce pressure in the tank. Drop the tank pressure to between 100 and 125 psi (frost should be seen at the bottom of the tank). Close the vent valve.
6. Repeat the liquid delivery and vent cycle as often as necessary to get the tank contents to about 350 pounds on the 450 pound model.
7. When filling a tank equipped with the Sure-Fill vent option, make sure the isolation valve in the Sure-Fill relief circuit is open.
8. Open the liquid delivery valve to allow liquid CO<sub>2</sub> to flow into the tank. The Sure-Fill vent valve will open when the tank pressure reaches approximately 200 psi. At that point a pressure relief venting noise will be heard from the vent fitting below the fill connection in the fill box. Continue filling.
9. When the venting stops the tank is full. Disconnect the fill hose from the fill station.
10. Using a leak check solution check all connections and fittings on the tank and fill box for leaks. Tighten connections if necessary.



**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.*

#### General CO<sub>2</sub> Delivery

To minimize delivery expense, delivery frequency should be scheduled to allow a 200-500 pound delivery; depending on tank size. For most restaurants, this will be every 20-30 days. Delivery routes are typically planned to minimize travel time and "rush-hour" traffic situations.

1. Delivery vehicle pressure must be maintained at 280-300 psi for proper operation. Low delivery pressure can cause 45-50 minute fill times.
2. A delivery pressure of 50 psi higher than the restaurant storage tank 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<sub>2</sub> consumption.
4. Adjust delivery program to longer intervals between deliveries as consumption justifies.

#### Carbon Dioxide Consumption

The amount of CO<sub>2</sub> that will be consumed in the variety of restaurant applications is almost impossible to predict. While primarily used for beverage carbonation, CO<sub>2</sub> 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<sub>2</sub> (approximately 1 lb. of CO<sub>2</sub> is required to carbonate one hundred 16 oz. drinks). The table below shows an estimate of CO<sub>2</sub> consumption just for beverage carbonation based on a use ratio of 0.6 lb. CO<sub>2</sub> per gallon of syrup.

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

CO<sub>2</sub> 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<sub>2</sub> and N<sub>2</sub>. Blend gas equipment is available for this purpose.

The following table shows the approximate amount of CO<sub>2</sub> consumed to dispense beer.

15.5 Gallon Kegs	CO <sub>2</sub> Consumption (lb.)
10	2.5
20	5.0
30	7.5
40	10.0
50	12.5
60	15.0

## Operating the Bulk CO<sub>2</sub> System

The store operator should be familiar with basic elements of the system. The installer is responsible for explaining the CO<sub>2</sub> system to the store operator upon completion of the bulk CO<sub>2</sub> system installation. The following table describes functional elements of the system and is intended to assist with that explanation.

Component	Function
CO <sub>2</sub> Contents Gauge	Indicates the approximate amount of liquid CO <sub>2</sub> inside the tank.
CO <sub>2</sub> Tank Pressure Gauge	Indicates tank pressure. Normal operation pressure is between 110 and 175 psi. Tank pressure may be as high as 300 psi after a CO <sub>2</sub> 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.
Primary Relief Valve	Prevents tank pressure from exceeding 300 psi.
Vent Hose	Vents excess gas pressure to fill box outside.
Fill Hose	Transports liquid CO <sub>2</sub> from fill box to tank during fill.
Fill Box	Connection point for liquid CO <sub>2</sub> delivery and transfer line.
Filling Schedule	Should be established with supplier based on CO <sub>2</sub> use (normally every 4-6 weeks).
Periodic Frost	Frost indicates that liquid CO <sub>2</sub> is being converted to gas to meet a demand. Frost near the bottom of the tank is normal during periods of high or continuous use.
Continuous Frost	Continuous presence of frost during non-business hours or in mornings before business hours indicates a demand for CO <sub>2</sub> gas perhaps caused by a leak in the beverage system.

## Facts to Know

1. A tank'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. Tank 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<sub>2</sub> 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 tank is normal during periods of CO<sub>2</sub> use.
5. Frost or condensation on the tank before starting the daily use of CO<sub>2</sub> is a sign of a CO<sub>2</sub> leak. Have the leak fixed.
6. A Carbo-Max 600 hold 612 lbs of CO<sub>2</sub> for a use rate of 50 to 300 lbs per week.  
A Carbo-Max 750 holds 771 lbs of CO<sub>2</sub> for a use rate of 50 to 300 lbs per week.  
A Carbo-Max 1000 holds 1000 lbs of CO<sub>2</sub> for a use rate of 70 to 400 lbs per week.
7. The contents gauge displays the approximate amount of liquid CO<sub>2</sub> in the tank.
8. CO<sub>2</sub> becomes dry ice below a pressure of 61 psi. Stop using CO<sub>2</sub> from the tank 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<sub>2</sub>. Read and understand the Safety Section of this manual.
2. The Carbo-Max system does not require adjustment under normal operating conditions.
3. In an emergency the flow of CO<sub>2</sub> from or through the storage tank can be stopped by closing the red-handles valves marked with the Emergency Shut-Off labels.
4. For CO<sub>2</sub> equipment issues, call your CO<sub>2</sub> supplier or service specialist. Before calling for service or troubleshooting assistance, please have the following information at hand:
  - Serial number of the tank
  - Description of the problem
  - Readings from:
    - the tank contents gauge,
    - the tank 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<sub>2</sub> use check for:
  - CO<sub>2</sub> leaks (see Safety)
  - Pressure readings
  - CO<sub>2</sub> 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 the 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.

<b>Trouble</b>	<b>Probable Cause</b>	<b>Remedy</b>
No CO <sub>2</sub> to carbonator or use-point system.  OR  Carbonated drinks are flat.	CO <sub>2</sub> storage tank is empty.	Switch to emergency CO <sub>2</sub> gas cylinder.  Call CO <sub>2</sub> supplier for delivery
	Isolation valve to final line regulator is closed.	Open valve or valves as required.
	Tank pressure is low (110 psi or less).	Switch to emergency CO <sub>2</sub> gas cylinder.  Stop CO <sub>2</sub> withdrawal from bulk CO <sub>2</sub> tank by closing isolation valve.  If tank pressure fails to rebuild see section on low tank pressure.
	On Carbo-Max 1000 tanks, pressure building regulator is not operating properly; is set too low, plugged, or faulty (closed).	Ensure that isolation valves are open (valve handles should be parallel with the line).  Call CO <sub>2</sub> service agent.
	Pressure relief "Economizer" regulator not operating properly; set too low or stuck open.	Close supply pressure valve and switch to emergency CO <sub>2</sub> gas cylinder. If tank pressure fails to rise within 24 hours see section below on low tank pressure.
	Unknown	Call CO <sub>2</sub> service agent.
Frost on the bottom, sides, or top of the tank.	A normal condition during or following CO <sub>2</sub> use.	None
	Leak in beverage system and/or gas supply lines or CO <sub>2</sub> fill box.	See Safety section. Evacuate and ventilate. Check for frost in the morning before CO <sub>2</sub> has been used. If possible, locate and correct leak.  Call appropriate equipment service agent.
Frost on tank after extended periods of no CO <sub>2</sub> use; such as in the morning before store operations begin.	Leak from the beverage system, CO <sub>2</sub> tank's plumbing, or fill box.	See Safety section. Evacuate and ventilate the room.  Locate and correct leak if possible.
	Bag-in-box pump running because B.I.B. is empty.	Call appropriate service agent.
Constant low tank pressure (gauge below 125 psi for PB on Max 1000 and 150 psi for Econ).	On Carbo-Max 1000 tanks PB regulator set low or plugged.	Call CO <sub>2</sub> service agent for service.
	PB shut-off valve closed.	Open valve by turning handle parallel to line.
	Economizer regulator set too low or stuck open.	Call CO <sub>2</sub> service agent.
	CO <sub>2</sub> leak from tank plumbing, CO <sub>2</sub> fill box and/or tank safety system.	See Safety section. Evacuate and ventilate the room.  Call CO <sub>2</sub> service agent.

<b>Trouble</b>	<b>Probable Cause</b>	<b>Remedy</b>
Constant high tank pressure (above 200 psi).	Normal condition for several hours following a CO <sub>2</sub> delivery	None
	Normal when little or no CO <sub>2</sub> is used.	None
	On Carbo-Max 1000, PB regulator set too high or stuck open.	Call CO <sub>2</sub> service agent.
	Economizer regulator set too high or stuck closed.	Call CO <sub>2</sub> service agent.
	Tank has a weak vacuum insulation.	Call CO <sub>2</sub> service agent.
	Repetitive small deliveries	Refill cylinder when less than half full.
High CO <sub>2</sub> consumption.	Increased beverage sales or CO <sub>2</sub> use.	None
	Tank pressure constantly high.	See section on tank pressure too high.
	CO <sub>2</sub> leak from tank plumbing, CO <sub>2</sub> 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 <sub>2</sub> supplier invoice.	Check CO <sub>2</sub> usage history / pattern against supplier invoices. Consult CO <sub>2</sub> supplier.
CO <sub>2</sub> tank will not fill.	CO <sub>2</sub> tank is already full.	None
	Fill valve is shut off or is faulty.	Consult CO <sub>2</sub> service agent.
	Brass fill fitting in CO <sub>2</sub> fill box and/or on truck's delivery hose is faulty.	Consult with CO <sub>2</sub> supplier or service agent. Have brass fill fitting(s) replaced if necessary.
	Pressure difference between store tank pressure and delivery pressure is too small.	Verify delivery tank pressure is at least 275 psi and store tank pressure is between 110 and 150 psi. Vent store tank to lower pressure if needed (never vent store tank pressure to lower than 125 psi).
	Sure-Fill™ System assembly does not vent gas because the Sure-Fill valve is closed or tank pressure did not return to normal operating pressure (after previous fill).	Tank pressure must drop below 200 psi between filling times to allow the 'check' ball to fall into the open position. Check that the Sure-Fill valve is open. Consult CO <sub>2</sub> service agent.
	Leak in Sure-Fill regulator (pressure above Sure-Fill check ball is lower than tank pressure).	Close valve at Sure-Fill regulator for several minutes to allow pressure above check ball to equalize and ball to fall into the open position. Contact CO <sub>2</sub> supplier.
	Delivery tank 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.	

<b>Trouble</b>	<b>Probable Cause</b>	<b>Remedy</b>
Hissing sounds or evidence of gas leak (continued).	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 <sub>2</sub> service agent.
Final line / gas-use pressure gauge indicates less than 90 psi.	Final line regulator intentionally set lower by beverage service agent.	None
	Final line regulator not operating in proper pressure range.	Call CO <sub>2</sub> service agent.
	Final line pressure gauge damaged or faulty.	Call CO <sub>2</sub> service agent.
	One or more of the causes listed in “no CO <sub>2</sub> ” or “flat drinks” problem section.	See indication sections regarding “no CO <sub>2</sub> ” and “flat drinks” etc. Call CO <sub>2</sub> service agent.

### Fill Box Troubleshooting

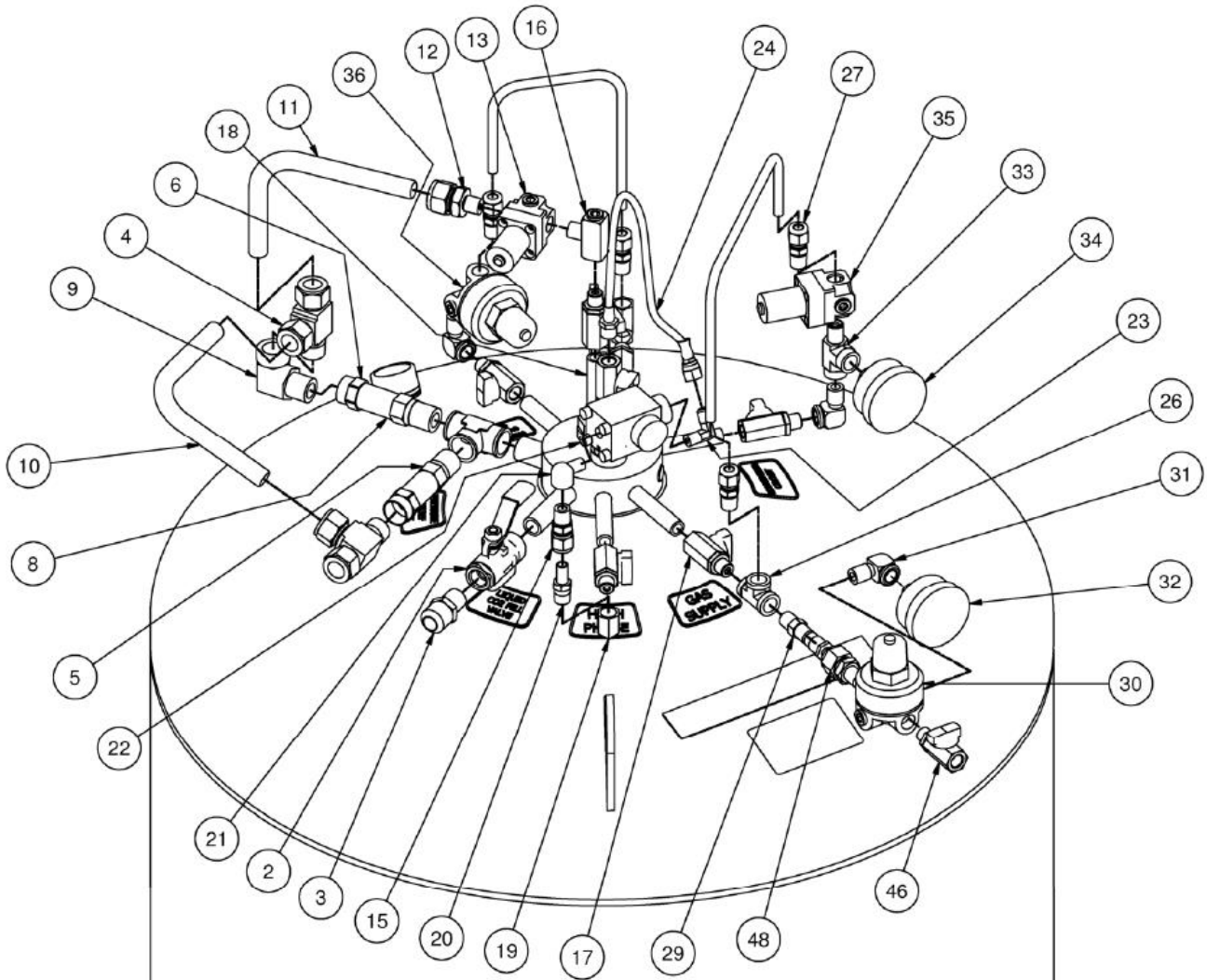
<b>Trouble</b>	<b>Probable Cause</b>	<b>Remedy</b>
Fill box door will not close, lock, or open.	Wrong key.	Verify correct key and retry. Contact CO <sub>2</sub> supplier for spare key. Order new key.
	Lock dirty or damaged	Clean and oil lock Replace lock if necessary
Brass fill fitting in fill box leaking or hissing.	Particle of ice or debris caught in fill fitting poppet.	If driver is still on-site, reconnect CO <sub>2</sub> 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 tank 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 <sub>2</sub> service agent to replace fitting.
	Fill fitting cross threaded with the CO <sub>2</sub> delivery hose coupler.	Contact CO <sub>2</sub> service agent to replace fitting.
CO <sub>2</sub> is venting from fill box	Normal during CO <sub>2</sub> delivery.	None
	Normal for short periods of time if tank is at or over 300 psi.	None if for short period(s) of time. If tank pressure is consistently over 300 psi, see section on “tank pressure too high.”
	Fill fitting is not sealing properly.	Call CO <sub>2</sub> service agent to replace fitting.

## Specifications

	<b>Carbo-Max 600</b>	<b>Carbo-Max 750</b>	<b>Carbo-Max 1000</b>
Diameter (in/cm)	22 / 55.8	26 / 66.0	30 / 76.2
Height (in/cm) (with legs)	75.938 / 192.9 (without legs subtract 6")	73.875 / 187.6 (without legs subtract 6")	72.5 / 184.2
Empty Weight (lb/kg)	323 / 146	430 / 195	788 / 357.4
Full Weight (lb/kg)	936 / 424.5	1219 / 552.9	1788 / 811.0
Gross Storage Volume (gal/ltr)	70.2 / 265.7	89.1 / 337.4	128.2 / 485.3
Net Storage Volume (gal/ltr)	65 / 246	82 / 311	118 / 446.6
CO <sub>2</sub> Storage Capacity at 125 psig	612 / 277.6	789 / 357.9	1000 / 453.6
Gas Use Connection	1/4" 45° Flare		
Fill Line Connection	5/8" Male 45° Flare		
Vent Line Connection	1/2" OD Tubing		
<b>Rates and Pressures</b>			
CO <sub>2</sub> Gas Delivery (continuous) (12 consecutive hrs @ room temp)	15 lb/hr (6.8 kg/hr)		30 lb/hr (13.6 kg/hr)
Peak CO <sub>2</sub> Gas Flow Rate (4 consecutive hrs & room temp)	40.0 lb/hr (18.1 kg/hr)		50 lb/hr (22.7 kg/hr)
Evaporation Rate (No loss in normal use)	3.0 lb/day (1.4 kg/day)		3.0 lb/day (1.4 kg/day)
MAWP	300 psig / 20.7 barg		
ASME Relief Setting	300 psig / 20.7 barg		
Additional Relief Setting	450 psig / 31.0 barg		
Sure-Fill™ CO <sub>2</sub> Tank Filling System Relief Setting	200 psig / 13.8 barg		
<b>Design Criteria</b>			
Design Specifications	ASME Section VIII, Division 1 / Meets with US and Canadian approvals / Approved for EU		
Fill System	Single line, pressure differential		
Sure-Fill System	Standard		
Insulation Type	Vacuum with Super Insulation		
Pressure Control	Pressure Relief (Economizer) circuit on Max 600 & 750 / Pressure Building Circuit on Max 1000		
Liquid Level Gauge	Differential Pressure Standard		
Outer Tank Material	Stainless Steel		
Inner Tank Material	Stainless Steel		
Floor Mount Design (Meets NSF Standards)	Permanent Legs Max 600 & 750 / Flat Base or Lab Base Max 1000		

## Parts Identification

### Carbo-Max 1000



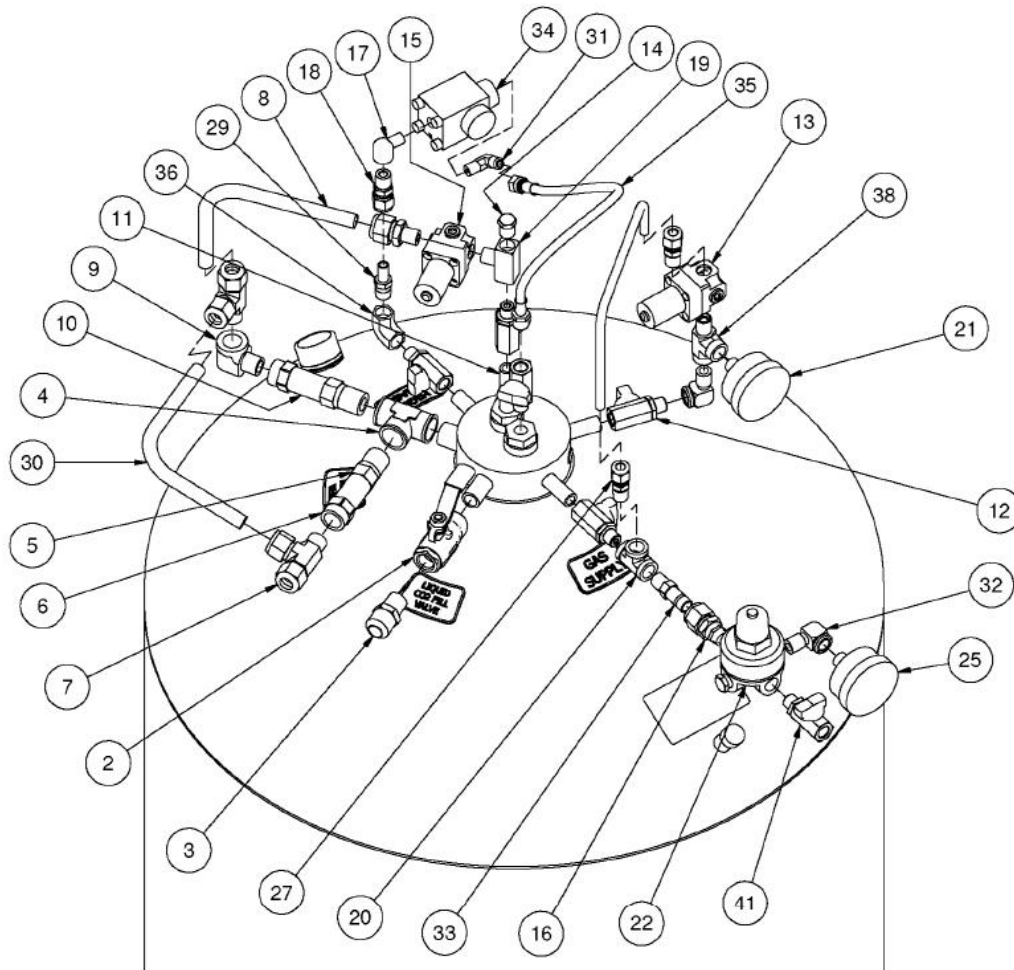


**Tank Parts: Carbo-Max 1000**

<b>Item</b>	<b>Part Number</b>	<b>Description</b>
2	14422693	Valve Ball 3/8" NPT w/Check
3	1110112	Connector Brass 5/8" ODT x 3/8" MPT 45° FL
4	20701607	Tee Brass M Run 5/8" ODT x 1/2" MPT
5	11708400	Relief Valve Brass 1/2" MPT 300 psi ASME
6	1810092	Relief Valve Brass In-line Adapter 1/2" NPT
8	11708451	Relief Valve Brass 1/2" MPT 450 psi
9	10791820	Elbow Brass 90° 1/2" FPT x 1/2" MPT
10	20701610	Tube Relief Valve / Vent 1000
11	20701611	Tube Sure-Fill™ Vent CO <sub>2</sub> 1000
12	20750775	Connector Brass 5/8" ODT x 1/4" MPT
13	13154834	Regulator .250 NPT @ 200 psi SF
15	13670994	Connector Brass 3/8" ODT x 1/4" MPT
16	1213092	Tee Brass 1/4" FPT x 1/4" FPT x 1/4" MPT
17	20733160	Valve Isolation Brass ABCO
18	15071274	Sure-Fill S/A Carbo-Max 1000
19	1210402	Elbow Brass 90° 1/4" FPT
20	15057974	Adapter Brass 3/8" ODT x 1/4" MPT
21	14285481	Elbow Street Reducer Brass 90°
22	15096551	Differential Pressure Gauge 0-50" 1/8" FPT Full
23	14339136	Elbow Brass 90° 1/8" ODT x 1/8" MPT
24	20754903	Hose Flex 1/4" MPT x 12" LG Stainless Steel / Brass
26	13450730	Tee Brass 1/4" FPT
27	13833757	Connector Stainless Steel 5/16" ODT x 1/4" MPT
29	11762875	Tube Stub Brass 1/4" MPT x 1/2" OD
30	14743163	Regulator .250 NPT @ 110 psi
31	1210462	Elbow Street Brass 90° 1/4" MPT
32	13321006	Pressure Gauge 2" Dial 0-160 psi 1/4" MPT CBM
33	14175021	Tee Street Brass 1/4" NPT Forged
34	13321014	Pressure Gauge 2" Dial 0-400 psi 1/4" MPT CBM
35	13154842	Regulator .250 NPT @ 150 psi Econ
36	14743180	Regulator .250 NPT @ 125 psi
46	20733158	Valve ISO Brass Red-Handled ABCO
48	13832914	Connector Brass 1/2" ODT x 1/4" MPT

## Carbo-Max 600 & 750

Equipped with Sure-Fill™ CO<sub>2</sub> Tank Filling System and DP style contents gauge.



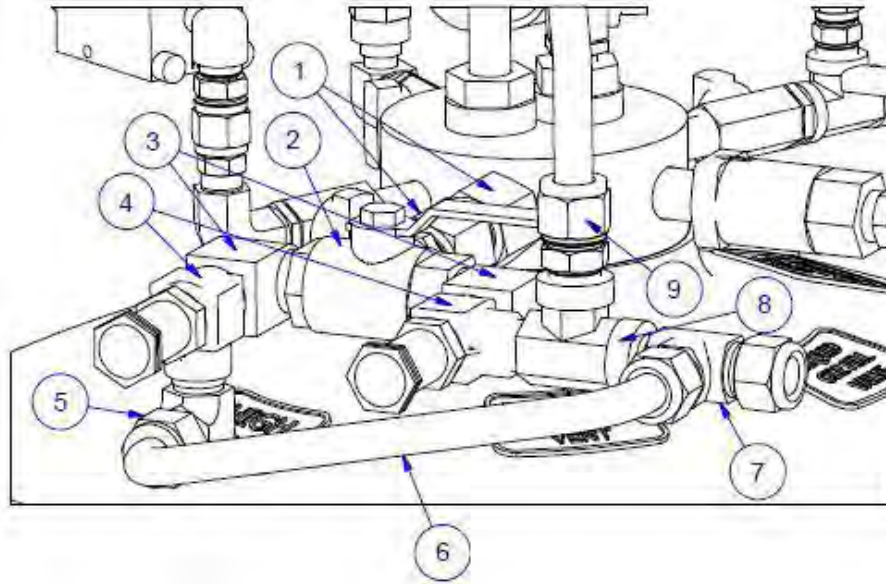
\*HANDLE RING NOT SHOWN FOR CLARITY

### Tank Parts: Carbo-Max 600 & 750

Item	PN	Description
2	14422693	Valve Ball 3/8" NPT w/Check
3	1110112	Connector Brass 5/8" ODT x 3/8" MPT 45° FL
4	11044869	Tee Brass 1/2" FPT Forged
5	11708400	Relief Valve Brass 1/2" MPT 300 psi ASME
6	13833731	Adapter Pipe-Away 3/8" FPT
7	13832906	Tee Brass M Run 1/2" ODT x 3/8" MPT
8	14275419	Tube Sure-Fill™ Vent CO <sub>2</sub> CTO Top
9	1210482	Elbow Street Brass 90° 3/8" NPT
10	11708451	Relief Valve Brass 1/2" MPT 450 psi
11	11764313	Sure-Fill S/A Tube, Ball and Spring
12	20733160	Valve Isolation Brass ABCO
13	13154842	Regulator .250 NPT @ 150 psi Econ
14	1211102	Plug Brass Hex HD .250 MPT
15	13154834	Regulator .250 NPT @ 200 psi SF
16	13832914	Connector Brass 1/2" ODT x 1/4" MPT
17	14285481	Elbow Street Reducer Brass 90°
18	13670994	Connector Brass 3/8" ODT x 1/4" MPT

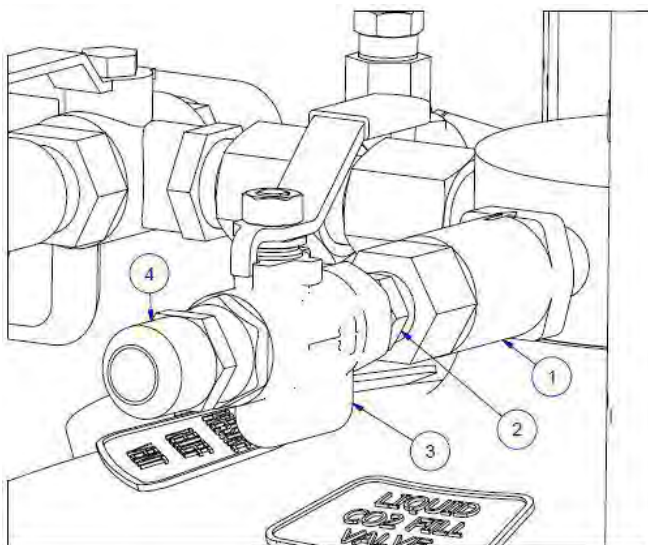
Item	PN	Description
19	1213092	Tee Brass 1/4" FPT x 1/4" FPT x 1/4" MPT
20	13450730	Tee Brass 1/4" FPT
21	13321014	Pressure Gauge 2" Dial 0-400 psi 1/4" MPT CBM
22	14743163	Regulator .250 NPT @ 110 psi
25	13321006	Pressure Gauge 2" Dial 0-160 psi 1/4" MPT CBM
27	13833757	Connector Stainless Steel 5/16" ODT x 1/4" MPT
29	15057974	Adapter Brass 3/8" ODT x 1/4" MPT
30	13799843	Tube Relief Valve / Vent CO <sub>2</sub>
31	14339136	Elbow Brass 90° 1/8" ODT x 1/8" MPT
32	1210462	Elbow Street Brass 90° 1/4" MPT
33	11762975	Tube Stub Brass 1/4" MPT x 1/2" OD
34	15076542	Differential Pressure Gauge 0-53" 1/8" FPT Full
35	20754903	Hose Flex 1/4" MPT x 12" LG Stainless Steel / Brass
36	1210402	Elbow Brass 90° 1/4" FPT
38	14175021	Tee Street Brass 1/4" NPT Forged
41	20733158	Valve ISO Brass Red-Handled ABCO

**PED Carbo-Max Relief Configuration**



<b>Item</b>	<b>PN</b>	<b>Description</b>
1	11883646	Adapter BRS 1/2 NPT
2	11773885	Valve Ball Div SS 1/2 NPT
3	1210502	Elbow Street BRS 90D 1/2 NPT
4	20986538	RV BRS 1/2 NPT Inlet 20.7 Bar
5	10501950	Elbow BRS 90D 1/2 ODT X 3/8 MPT
6	6910623	Tube CU .375" NOM Vent Tube
7	13166624	Tee BRS M Run 1/2 ODT X 3/8 MPT X
8	1211112	Tee Street BRS 3/8 NPT
9	13670943	Conn BRS 1/2 ODT X 3/8 MPT

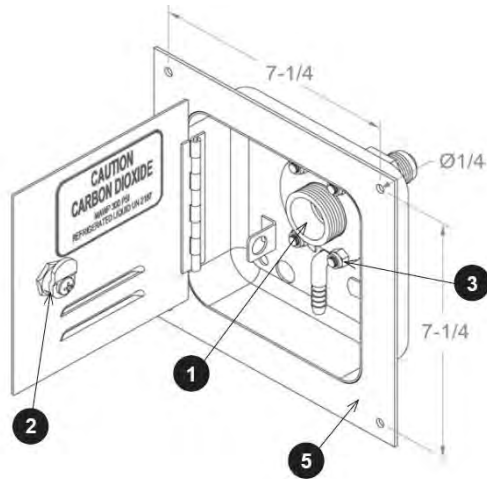
**PED Fill Circuit**



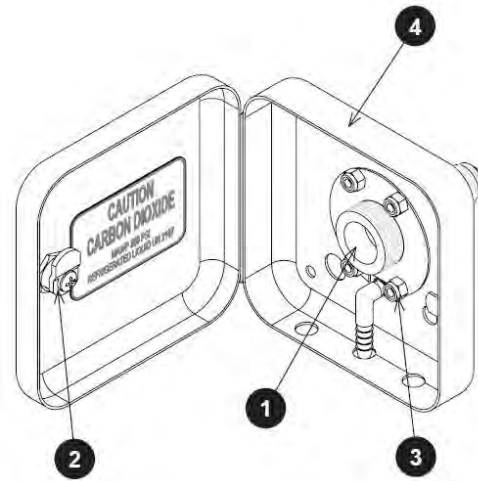
<b>Item</b>	<b>PN</b>	<b>Description</b>
1	1717872	Valve Check BRS 3/8 FPT Spring
2	1310072	Nipple Hex BRS 3/8 NPT SCH 40
3	20953805	Valve Ball 3/8 NPT
4	1110112	Conn BRS 5/8 ODT X 3/8 MPT 45D FL

## Fill Box Parts

**Flush-Mount Fill Box**  
PN 9723139



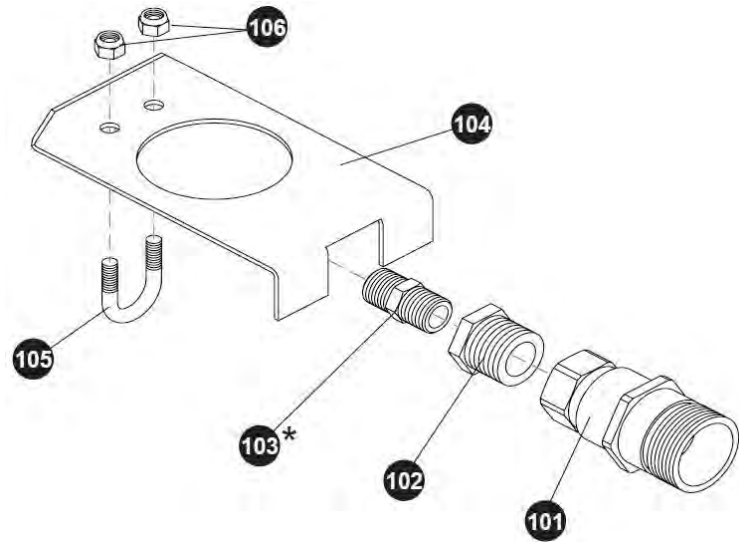
**Surface-Mount Fill Box**  
PN 9722279



Item	PN	Description	Function
--	11784496	Caution Label	Advisory identification of CO <sub>2</sub> use.
1	11381021	CO <sub>2</sub> Fill Fitting, Brass	Connection for CO <sub>2</sub> delivery tank 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 <sub>2</sub> Fill Box Shell (w/out fittings)	Allows outdoor filling and venting of tank.
5	11866871	Flush-Mount CO <sub>2</sub> Fill Box Shell (w/out fittings)	Allows outdoor filling and venting of tank.
--	10802912	CO <sub>2</sub> Fill Hose only, 5 ft. (2000 psi & FDA)	Transfers liquid CO <sub>2</sub> from fill box into tank.
--	10802921	CO <sub>2</sub> Fill Hose only, 10 ft. (2000 psi & FDA)	Transfers liquid CO <sub>2</sub> from fill box into tank.
--	10802947	CO <sub>2</sub> Fill Hose only, 15 ft. (2000 psi & FDA)	Transfers liquid CO <sub>2</sub> from fill box into tank.
--	10802939	CO <sub>2</sub> Fill Hose only, 25 ft. (2000 psi & FDA)	Transfers liquid CO <sub>2</sub> from fill box into tank.
--	10370710	CO <sub>2</sub> Fill Hose only, 30 ft. (2000 psi & FDA)	Transfers liquid CO <sub>2</sub> from fill box into tank.
--	10370728	CO <sub>2</sub> Fill Hose only, 50 ft. (2000 psi & FDA)	Transfers liquid CO <sub>2</sub> from fill box into tank.
--	2811726	Vent Hose (lengths match fill hose)	Vents excess tank 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 <sub>2</sub> Fill Fitting, Brass (3/4" thread)	Fill port connection for CO <sub>2</sub> delivery.
102	1212062	Hex Bushing (3/8" FPT x 3/4" MPT)	Joins fill fitting to hex nipple.
103	14902814	Pipe Nipple, Brass (3/8" NPT x 2")	Used to join fill fitting to valve on tank when bracket is used (recommended).
	or	or	
	1310072	Hex Nipple (3/8" NPT x 1-1/4" long)(pictured)	Used to join fill fitting to valve on tank when bracket is not used.
104	10724192	CO <sub>2</sub> 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.

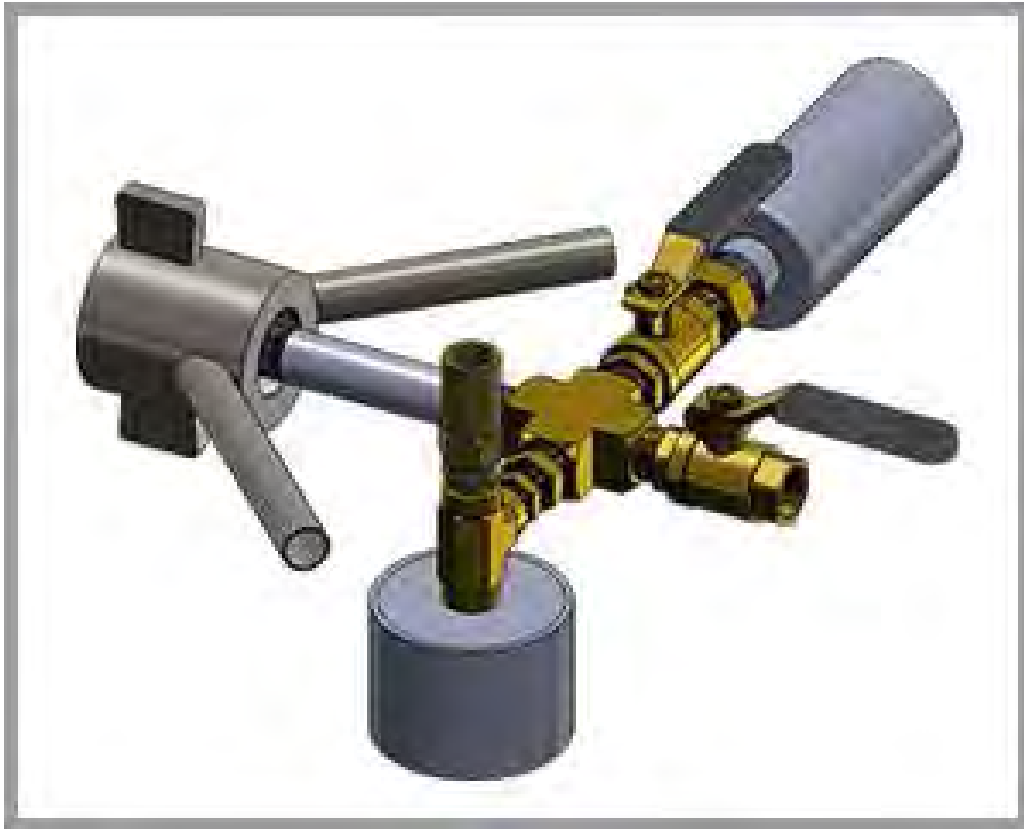
### Fill and Vent Hose Kits

PN	Description
10973252	5 ft. Fill & Vent Hose
10973308	10 ft. Fill & Vent Hose
10973324	15 ft. Fill & Vent Hose

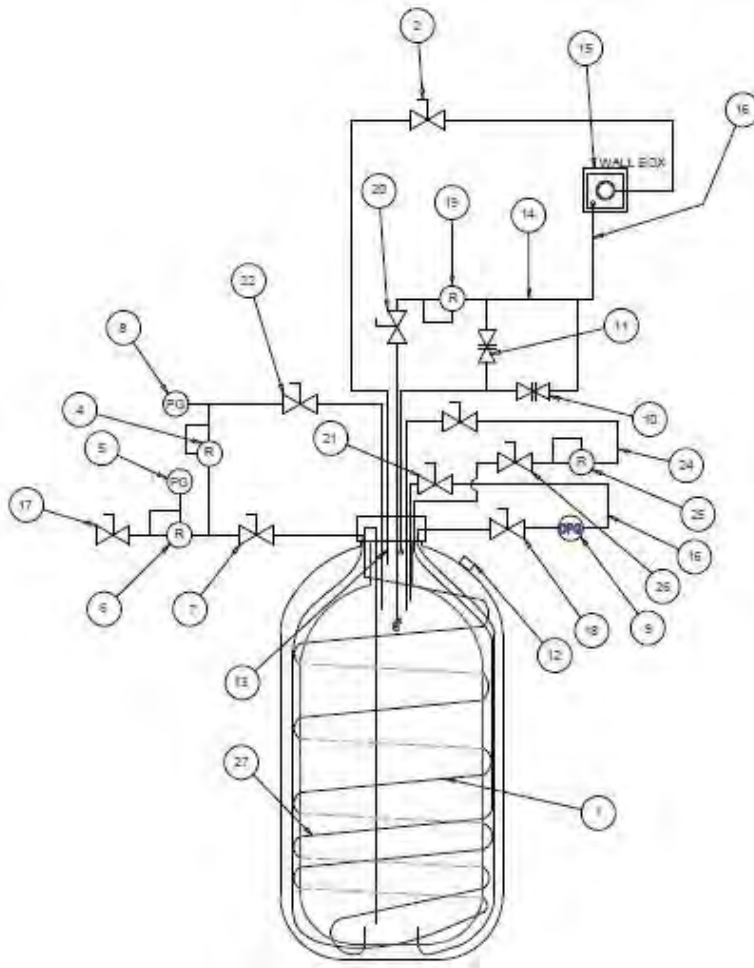
PN	Description
10973332	25 ft. Fill & Vent Hose
10973341	30 ft. Fill & Vent Hose
10973359	50 Ft. Fill & Vent Hose

### Fill "Gun" Assembly CO<sub>2</sub>

Fill Gun PN 20679772

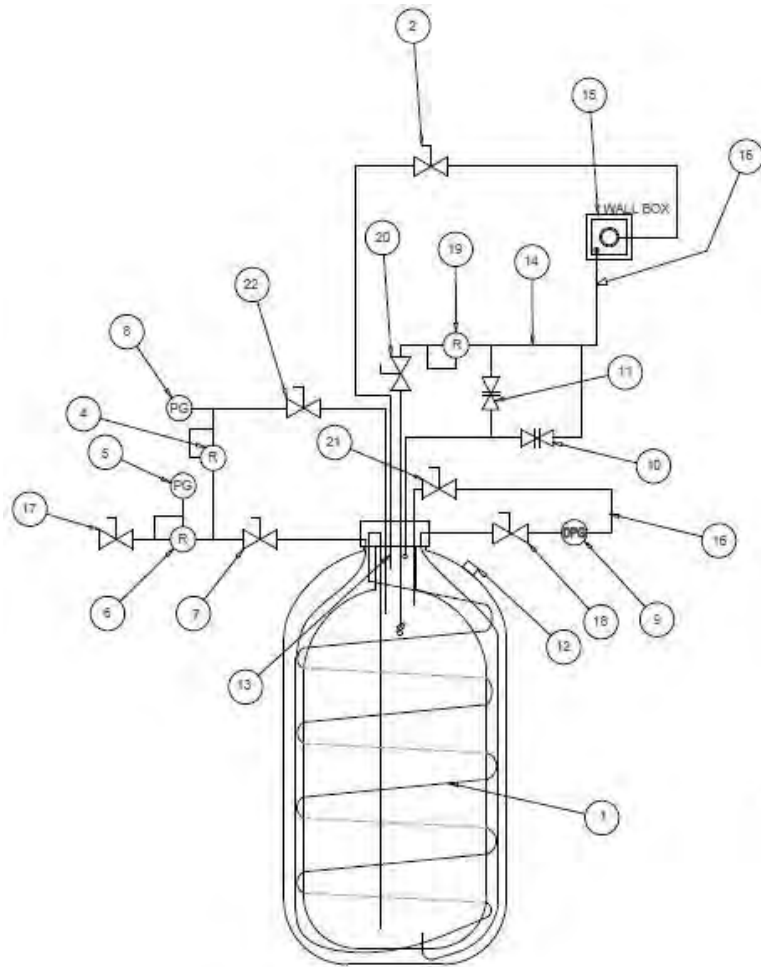


### Carbo-Max 1000 Flow Schematic



Item	Description	Item	Description
1	Vaporizer Coil - 3/8" OD SS Tubing	15	CO <sub>2</sub> Fill Connection
2	Liquid Fill Valve - 3/8" NPT	16	Vent Line to Fill Box
3	Tee Brass 1/2" FPT Forged	17	CO <sub>2</sub> Use Connection Isolation Valve 1/4" NPT (red-handled)
4	Economizer Regulator 1/4" NPT set @ 150 psig	18	High Side Differential Pressure Isolation Valve 1/4" NPT
5	Gas Use Pressure Gauge 0-160 psig	19	Sure-Fill™ CO <sub>2</sub> Tank Filling System Automatic Vent Regulator 1/4" NPT set @ 200 psig
6	Final Line Regulator 1/4" NPT set @ 110 psig	20	Sure-Fill Isolation Valve 1/4" NPT
7	Gas Supply Isolation Valve (on/off) 1/4" NPT	21	Low Side Differential Pressure Isolation Valve 1/4" NPT
8	Storage Tank Pressure Gauge 0-400 psig	22	Economizer Isolation Valve 1/4" NPT
9	Differential Pressure Gauge	23	Emergency Shut-Off Label
10	Primary Pressure Relief Valve set @ 300 psig (ASME rated)	24	Pressure Building Circuit
11	Secondary Pressure Relief Valve set @ 450 psig	25	Pressure Building Regulator 1/4" NPT set @ 125 psig
12	Outer Tank Pressure Protection set @ 23 psig	26	Pressure Building Isolation Valve (on/off) 1/4" NPT
13	Venturi Fill Device	27	Pressure Building Coil 3/8" OD SS Tubing
14	Vent Line 1/2" OD Copper Tubing		

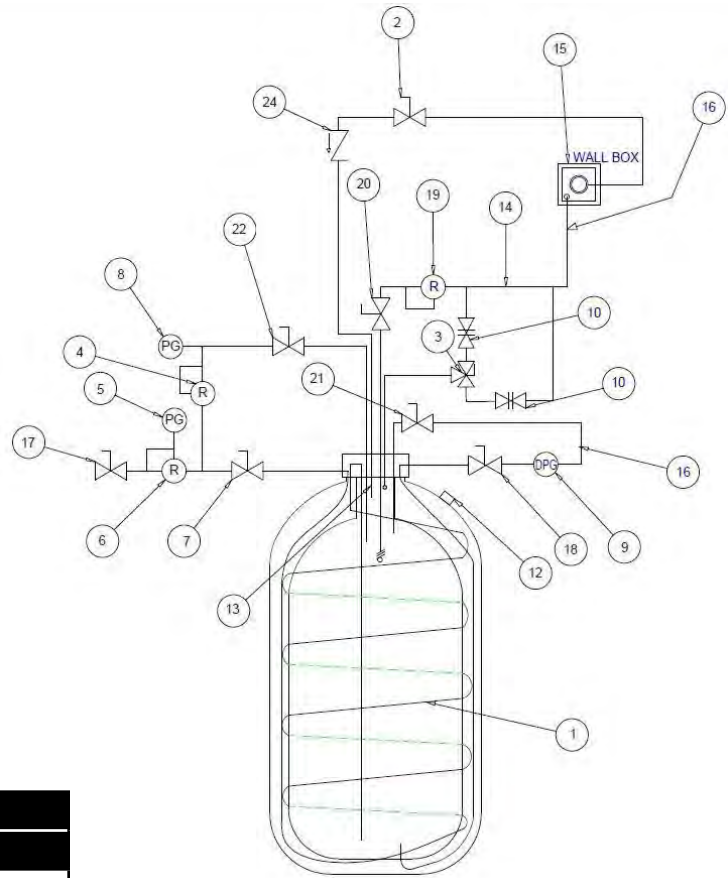
## Carbo-Max 600 & 750 Flow Schematic



Item	Description	Item	Description
1	Vaporizer Coil - 3/8" OD SS Tubing	13	Venturi Fill Device
2	Liquid Fill Valve - 3/8" NPT	14	Vent Line 1/2" OD Copper Tubing
3	Tee Brass 1/2" FPT Forged	15	CO <sub>2</sub> Fill Connection
4	Economizer Regulator 1/4" NPT set @ 150 psig	16	Vent Line to Fill Box
5	Gas Use Pressure Gauge 0-160 psig	17	CO <sub>2</sub> Use Connection Isolation Valve 1/4" NPT (red-handled)
6	Final Line Regulator 1/4" NPT set @ 110 psig	18	High Side Differential Pressure Isolation Valve 1/4" NPT
7	Gas Supply Isolation Valve (on/off) 1/4" NPT	19	Sure-Fill™ CO <sub>2</sub> Tank Filling System Automatic Vent Regulator 1/4" NPT set @ 200 psig
8	Storage Tank Pressure Gauge 0-400 psig	20	Sure-Fill Isolation Valve 1/4" NPT
9	Differential Pressure Gauge	21	Low Side Differential Pressure Isolation Valve 1/4" NPT
10	Primary Pressure Relief Valve set @ 300 psig (ASME rated)	22	Economizer Isolation Valve 1/4" NPT
11	Secondary Pressure Relief Valve set @ 450 psig	23	Emergency Shut-Off Label
12	Outer Tank Pressure Protection set @ 23 psig		



### Carbo-Max 600 PED Flow Schematic



Nomenclature	
Item	Description
1	Vaporizer Coil-3/8" OD SS Tubing
2	Liquid Fill Valve-3/8" NPT
3	Valve Diverter SS 1/2 NPT
4	Economizer Regulator-1/4" NPT, Set @ 150 PSIG
5	Gas Use Pressure Gauge 0-160 PSIG
6	Final Line Regulator-1/4" NPT, Set @ 110 PSIG
7	Gas Supply Isolation Valve (On/Off) 1/4" NPT
8	Storage Tank Pressure Gauge 0-400 PSIG
9	Differential Pressure Gauge
10	Safety Device, See Safety Device Table
11	Safety Device, See Safety Device Table
12	Outer Vessel Pressure Protection - Set @ 23 PSIG
13	Venturi Fill Device
14	Vent Line 1/2" OD Copper Tubing
15	CO <sub>2</sub> Fill Connection
16	Vent Line to Fill Box
17	CO <sub>2</sub> Use Connection Isolation Valve 1/4" NPT (red handle)
18	High Side Differential Pressure Isolation Valve 1/4" NPT
19	Sure-Fill (Auto Vent) Regulator 1/4" NPT, set @ 200 PSIG
20	Sure-Fill Isolation Valve 1/4" NPT
21	Low Side Differential Pressure Isolation Valve 1/4" NPT
22	Economizer Isolation Valve 1/4" NPT
23	Emergency Shut-Off Label
24	Liquid Fill Check Valve

Safety Device	Item	Qty
Relief Valve @ 300 PSI, 1/2" REGO PRV19434 (CE Marked)	10	2
Relief Valve @ 450 PSI, 1/2" REGO PRV19434 (CE Marked)	11	2
Relief Valve @ 300 PSI Maximum, 1/2" Herose 06001 (CE Marked)	10	2
Relief Valve @ 450 PSI Maximum, 1/2" Herose 06001 (CE Marked)	11	2
Relief Valve @ 300 PSI Maximum, 1/2" Herose 06002 (CE Marked)	10	2
Relief Valve @ 300 PSI Maximum, 1/2" Herose 06006 (CE Marked)	10	2
Relief Valve @ 300 PSI Maximum, 1/2" Generant CRV (CE Marked)	10	2
Relief Valve @ 300 PSI Maximum, 1/2" Herose 06478 (CE Marked)	10	2

## Service and Parts

Service or maintenance work on the bulk CO<sub>2</sub> storage system should be performed only by Chart trained and authorized professional service agents. These service agents are familiar with CO<sub>2</sub>, bulk liquid CO<sub>2</sub> pressure tanks, 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 tank
- Description of the problem
- Readings from:
  - the contents gauge (item 22 or 25)
  - the tank pressure gauge (item 41)
  - the final line pressure gauge (item 44)
- 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<sub>2</sub> 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 parts contact your local authorized Chart service agent or order on-line directly from chart at [www.chartparts.com](http://www.chartparts.com).

Know the model and serial number of the tank 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

[www.chartparts.com](http://www.chartparts.com)



# Warranty

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## Warranty Policy

Chart Inc. (“Chart”) warrants to the Purchaser that the Bulk CO<sub>2</sub> 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 seven (7) years from the date of the original Chart invoice (as of 1/1/2016)(“**Pool Coat**” vessels **for three (3) years**). 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<sub>2</sub> 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 tank 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.

