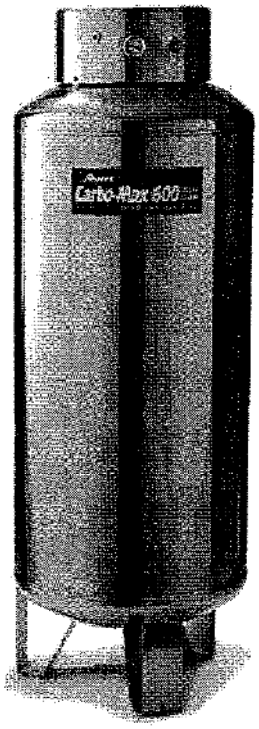
User's Manual



MVE Carbo-Max 600

with Sure-Fill™

CHART™

Table of Contents

IMPORTANT SAFETY PRECAUTIONS

All persons involved in the installation, use, filling, and care of this equipment must read and understand the safety and operating information contained in this manual.

WARNINGS

This tank holds and dispenses carbon dioxide (CO_2) gas under pressure. Avoid breathing CO_2 or direct contact with CO_2 in any form; gas, liquid or solid. CO_2 gas will not support life.
CO_2 is a colorless, tasteless gas with only a slight pungent odor, and is therefore very difficult to detect without special equipment.

Exposure to CO_2 concentrations higher than 5% can cause unpleasant physical effects, unconsciousness, or death in less than 15 minutes. 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 will collect in low areas, such as basements, stairwells, and confined spaces. If CO_2 leaks or if high concentrations of CO_2 are suspected in those areas, use caution and avoid entering them until they are thoroughly ventilated.

Whenever the tank is inside a building the tank's safety relief circuit must be connected to an outdoor vent. The fill box and/or vent must never be located in or above any below-ground spaces or stairwells that might be used by humans. The tank must not block emergency exits, aisles, fire suppression equipment or utility boxes or accesses. 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.

Installation and service of this equipment should be performed only by professional personnel who are qualified to work with CO_2 and the mini-bulk liquid CO_2 pressure vessels, and who are familiar with all pertinent safety procedures.

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 at once.
- Do not rub or pour water on 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. (Do not become the next victim.)
- Thoroughly ventilate areas of possible high CO_2 concentration before entering.

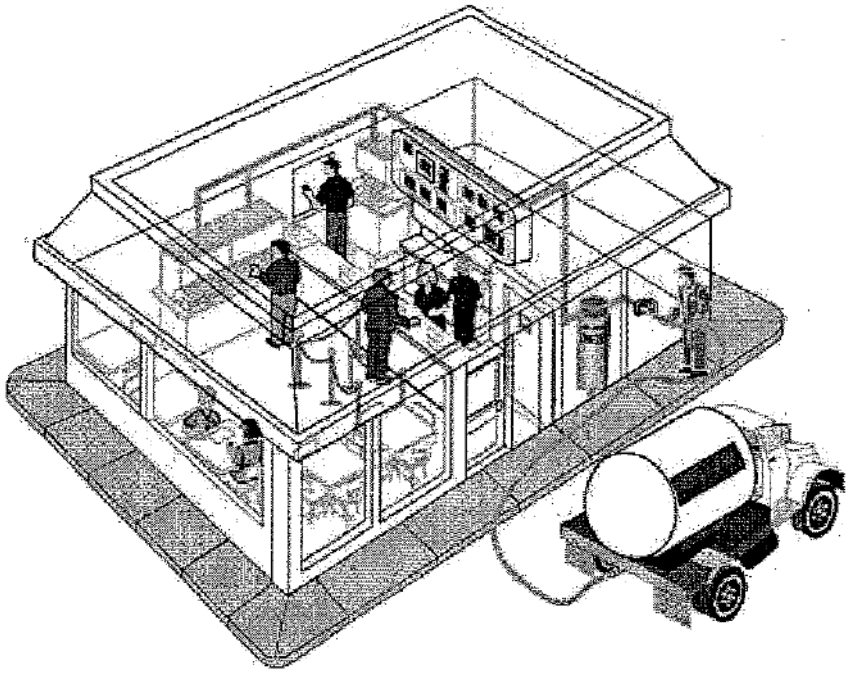
Spills or Leaks

- Immediately evacuate all personnel from affected areas.
- Thoroughly ventilate the area of the spill or leak before entering.

FOR MORE INFORMATION CONTACT:

Local CO_2 supplier or
Compressed Gas Association
725 Jefferson Davis Highway, Suite 1004
Arlington, VA 22202-4100; USA
Telephone: (703) 412-0900
FAX: (703) 412-0128

II General Description



System Overview

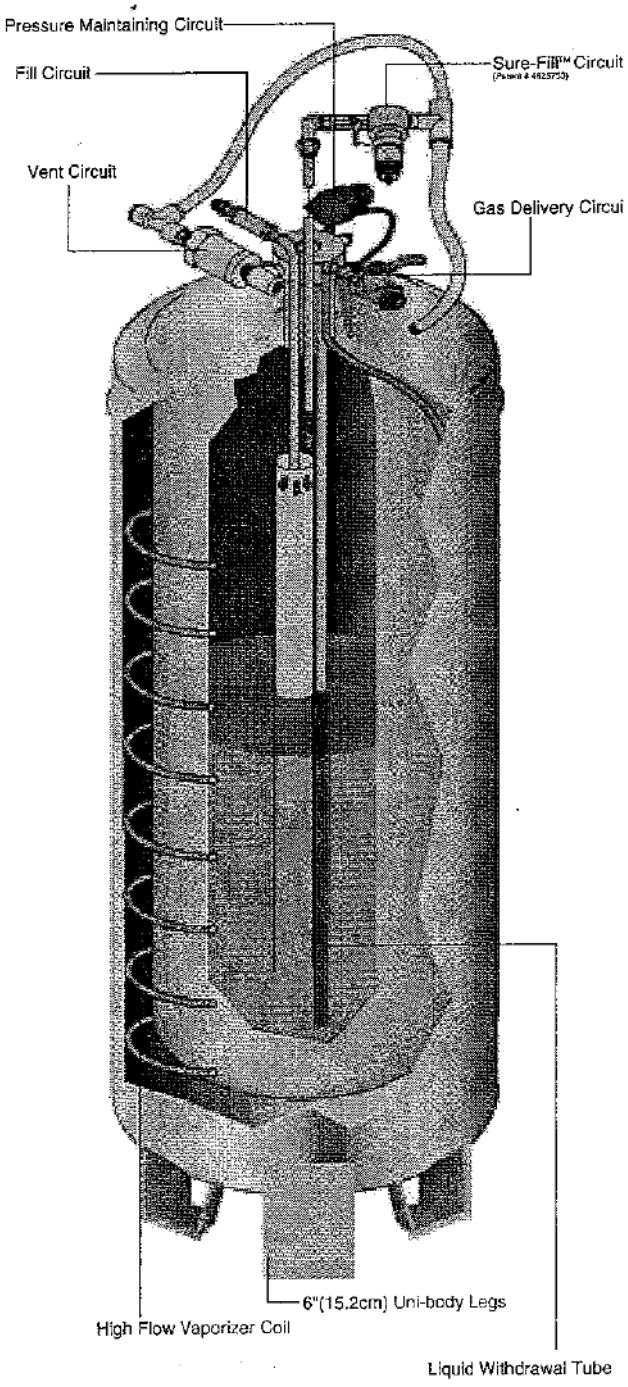
The MVE Carbo-Max 600 bulk carbon dioxide (CO_2) system is designed for low pressure storage and supply of carbon dioxide gas for beverage carbonation, brewing, pH control in swimming pools, and a variety of other purposes. The Carbo-Max system consists of three primary components; the CO_2 storage tank, the CO_2 fill box, and the fill and vent hoses.

Installation

The Carbo-Max 600 can only be operated as a stationary system. The system employs a permanently installed tank, an outdoor-mounted CO_2 fill box, and the connecting fill and vent hoses. The fill hose and the vent line join the tank to the outdoor fill box. The CO_2 fill box allows the CO_2 supplier to fill the tank from outside the building. The delivery process takes only about 5-10 minutes and does not interrupt the CO_2 user's operations.

Storage Tank

The Carbo-Max 600 tank is a stainless steel low-pressure tank that holds approximately 600 pounds (272 kg) of CO_2. The tank consists of an inner and an outer vessel, much like a Thermos™ bottle. The space between the two vessels contains a special insulation and has a near-perfect vacuum. The insulation and vacuum minimize the entry of unwanted heat into the liquid CO_2 stored in the inner tank. When carbon dioxide gas is needed, liquid CO_2 is withdrawn from the inner tank, converted to a gas, and dispensed to the beverage system or other use-point.



Tank Plumbing

The plumbing components on the tank perform five functions:

- Liquid CO_2 Fill
- CO_2 Gas Supply
- Pressure Control
- Safety Vent or Pressure Relief
- Pressure and Contents Measurement

The CO_2 fill circuit allows liquid CO_2 to be transferred into the tank during the delivery process. The Carbo-Max 600 is equipped with MVE's patented Sure-Fill™ assembly to increase CO_2 fill and delivery efficiency. The gas supply circuit dispenses CO_2 gas to the beverage or other use-point system. A pressure control circuit reduces the internal tank pressure from its post-fill high pressure to the internal tank pressure needed to supply CO_2. The vent/relief circuit allows excess pressure to safely exit the tank and the building. The contents and pressure gauges indicate the status of the CO_2 inside the Carbo-Max tank.

Fill Circuit

The fill circuit consists of a brass fill fitting in the CO_2 fill box, a fill hose, a check valve on the tank, and MVE's Sure-Fill assembly. Liquid CO_2 is transferred into the tank through the brass fill box fitting and the fill hose. The check valve on the tank stops the reverse flow of gas to the fill box.

The tank's Sure-Fill assembly provides fast, trouble-free filling without having to manually vent excess pressure that might develop during a CO_2 delivery. The Sure-Fill maintains optimal internal tank pressure during the fill process by releasing excess pressure through the safety vent line and fill box. It also automatically stops the liquid CO_2 fill process when the tank is full.

II General Description

Gas Supply or Gas Use Circuit

Carbon dioxide gas is supplied to the use-point through the gas supply/use circuit. In a Carbo-Max, CO_2 is first withdrawn from the inner tank as cold liquid CO_2 and then converted to a gas before leaving the tank's plumbing. The Carbo-Max and similar tanks are often called "liquid withdrawal" style tanks because the CO_2 is withdrawn as a liquid from the bottom of the inner tank through a vaporizer tube where it converts to a gas for final line use.

The conversion from liquid to gas occurs by allowing liquid CO_2 to flow through a stainless steel ambient vaporizer (heat exchange coil) located between the inner and outer tank walls. The vaporizer assures a non-toxic and inert conversion of the liquid to gas. As it is needed, carbon dioxide gas is produced by the vaporizer and passes through the isolation valve into the final line regulator and then to the use-point.

During CO_2 use cold liquid carbon dioxide flowing through the vaporizer cools the outside of the tank and produces a frost or condensation ring around the tank. When CO_2 is being used the frost ring is normal. However, when CO_2 has not been used, such as in the morning before the start of operations, frost on the bottom of the tank may indicate a CO_2 leak in a line, on the tank, or in the beverage system or other use point. If a leak is indicated, have it fixed.

A final line regulator (provided by the installer or CO_2 supplier) controls gas pressure to the beverage system or other use-point. The optional MVE high-flow final line regulator is factory set at 90 psi but the pressure may be adjusted. For regular soft drinks the regulator is commonly set between 90 psi and 115 psi.

Secondary pressure regulators may be added "downstream" for other applications such as bag-in-the-box, beer or diet systems. Consult with the use-point equipment manufacturer for the correct pressure regulator and pressure setting(s).

Pressure Control Circuit

The pressure control circuit (also called the economizer circuit) in the Carbo-Max 600 assists in regulating the internal operating pressure of the tank. Sufficient internal tank pressure is needed to supply CO_2 gas and to prevent the carbon dioxide from changing to dry ice which is the solid form of CO_2. However, internal pressure that is too high can cause venting and difficulties when refilling the tank. The economizer circuit maintains the correct pressure level while saving gas and improving system efficiency.

The "economizing" process is controlled by a regulator that monitors the tank's internal pressure. When the tank pressure exceeds the set point of the regulator (factory set at 140 psi), the regulator opens allowing CO_2 gas to flow directly into the gas use circuit whenever CO_2 gas is being used. By taking gas from the top of the tank instead of liquid CO_2 from the bottom, the internal pressure of the tank is reduced and controlled.

When the tank's internal pressure reaches the regulator's set point, the regulator closes and the pressure stops dropping and returns to its stable operation pressure.

Safety Vent Circuit

The inner pressure vessel of the Carbo-Max 600 tank is designed to meet or exceed the ASME Section VIII, Division 1 pressure vessel code. The ASME code dictates that the tank be protected against excess pressure by a safety relief valve. Chart uses two relief valves for added safety.

The tank's safety vent circuit is comprised of an ASME relief valve set at 300 psig and an additional relief valve set at 450 psig. The relief valves must always be vented outdoors by a vent tube, usually through the fill box, to prevent potential concentration of CO_2 within the building. The 300 psi relief valve may open during CO_2 deliveries or when CO_2 is not being used regularly.

Pressure and Contents Gauges

The tank pressure gauge measures pressure in the top space of the tank. That pressure will range between 125 and 300 psi, but the typical tank operating pressure is 125 to 150 psi.

The contents (liquid level) gauge is a differential-pressure type indicator. It displays the amount of CO_2 in the tank by simultaneously measuring the pressure in the top of the tank and at the bottom of the tank (under the liquid CO_2). The difference between these two pressures represents the weight (or level) of the liquid CO_2. As the weight of liquid CO_2 changes in the tank, the needle on the contents gauge indicates the approximate CO_2 contents.

CO_2 Fill Box

The stainless steel CO_2 fill box is the second major component in a Carbo-Max system. The purpose of the CO_2 fill box is to provide an accessible filling point for the tank and to vent excess pressure out of the tank and out of the building. The fill box has a brass fill fitting, a connection for the safety relief valve/vent circuit, a safety snap connection point, and a lockable door. Two standard types of fill boxes are available; a surface-mounted model or a flush-mounted model. Fill boxes must be mounted outside the building where they are easily accessible to the CO_2 supplier and where they can safely vent any excess CO_2 pressure outdoors. NOTE: All tanks must be vented outside so CO_2 can be dispersed safely outdoors.

Fill Hose and Vent Line

The last major components in a stationary system are the fill hose and vent line. These two lines join the Carbo-Max tank with the outdoor fill box. The fill hose, constructed with FDA compliant materials, is a pressure-rated line that connects the brass fill fitting in the fill box to the fill circuit on the tank. The vent line is as important as any component in the system. It connects the safety relief valves on the tank to either the outdoor fill box or to an alternative outdoor vent tube.

NOTE: The Carbo-Max must always be connected to an outdoor vent line when the tank is indoors and contains CO_2.

The Bulk CO_2 Supplier

The bulk CO_2 supplier is also an important part of the system. Most CO_2 suppliers not only provide the timely delivery of CO_2, but also install and service the Carbo-Max.
For service, parts, information, and emergency delivery of CO_2 or other CO_2 related assistance, contact the local MVE authorized CO_2 supplier. A place has been saved on page 18 of this manual to record the name and phone number of your CO_2 supplier, as well as other important service contacts.

III Specifications

MVE Carbo-Max 600

Dimensions

Diameter	24 in	(610 mm)
Height	68 in	(1727 mm)
Empty Weight	375 lb	(170 kg)
Full Weight	975 lb	(442 kg)
Gross Capacity	72.7 gal	(275 liters)
Storage Capacity	600 lb	(272 kg)
Gas Use Connection	¼" 45° Flare Fitting	
Fill Line Connection	5/8" Male 45° Flare Fitting	
Vent Line Connection	½" OD Tubing	

Rates and Pressures

Continuous CO_2 Delivery Rate	15.0 lb/hr*	(6.8 kg/hr)*
Evaporation Rate	3.5 lb/day**	(1.6 kg/day)**
Max. Allowable Working Pressure (MAWP)	300 psig	(20.7 bar g)
ASME Relief Valve Setting	300 psig	(20.7 bar g)
Additional Relief Valve Setting	450 psig	(31.0 bar g)
Sure-Fill™ Regulator Setting	200 psig	(13.8 bar g)

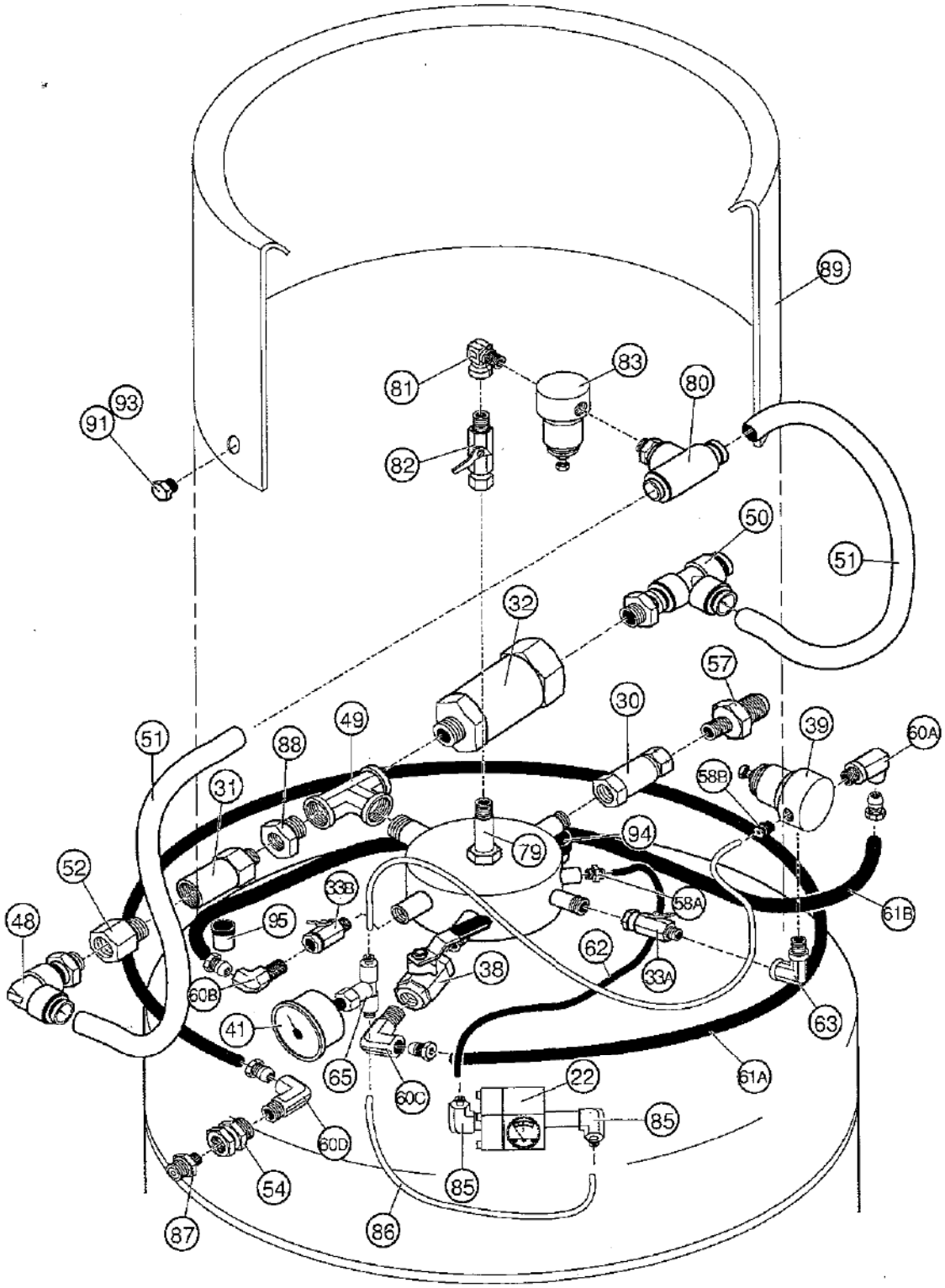
Design Criteria

Design Specifications	ASME Section VIII, Division 1
Fill System	"Lo-Loss" Single Line
Patented Sure-Fill™ System	Standard Feature
Insulation Type	Super Insulation with Vacuum
Pressure Control System	Economizer Circuit
Liquid Level Gauge	Differential Pressure
Outer Vessel Material	Stainless Steel
Inner Vessel Material	Stainless Steel
Fill Fitting	¾" OD Threaded Brass Coupling
Fill Box Design	Surface-Mount or Flush-Mount

* Equals approximately 840 - 16 oz. carbonated soft drinks per peak hour
** No loss in normal applications

IV Parts Identification

MVE Carbo-Max 600 Storage Tank **Part No. 9922839**



Carbo-Max 600 High Flow

Parts Identification IV

MVE Carbo-Max 600 Storage Tank — Part No. 9922839

ITEM	PART NO.	DESCRIPTION	QTY	FUNCTION
22	2013799	Gauge, Liquid Level / Contents, Dif. Press.	1	Indicates approximate CO_2 contents
22a	2913821	Mounting Bolt (8/32" dia. x 3/8" long) {not shown}	1	Secures liquid level gauge to shroud
30	1717872	Check Valve (3/8" FPT x 3/8" FPT)	1	Isolates CO_2 fill hose & fill fitting from tank
31	1812062	Relief Valve, 450 psig (¼" MPT)	1	Secondary inner vessel safety relief valve
32	1811252	Relief Valve, 300 psig (½" MPT x ½" FPT)	1	Primary inner vessel safety relief valve
33a	1716162	Isolation Valve (¼" MPT x ¼" FPT)	1	Isolates liquid-side of economizer regulator
33b	1716162	Isolation Valve (¼" MPT x ¼" FPT)	1	Isolates gas-side of economizer regulator
38	1717579	Isolation Valve (¼" FPT x ¼" FPT)	1	Opens / closes gas supply to use-point
39	1812289	Regulator, Pressure Control / Economizer, 140 psi (¼" FPT x 1/8" FPT x ¼" FPT)	1	Regulates internal tank pressure by controlling economizer circuit
41	2014329	Pressure Gauge, 0-400 psi (1/8" MPT CBM)	1	Displays internal tank pressure
48	10486454	Elbow, Plastic (½" Comp. x 3/8" MPT)	1	Joins 450 psig relief valve to vent circuit
49	11044869	Tee, Brass (½" FPT x ½" FPT x ½" FPT)	1	Manifolds primary & secondary relief valves
50	10486462	Tee, Nylon (½" ODT x ½" MPT x ½" ODT)	1	Joins 300 psig relief valve to vent circuit
51	2811726	Tube, White Nylon (½" OD)	1	Joins vent circuit components
52	1611592	Adapter, Pipe-Away (3/8" FPT)	1	Joins 450 psig relief valve to vent circuit
54	1013362	Anchor, Brass (¼" FPT x ¾"-16 NPT)	1	Secures gas use line to shroud
57	1110112	Connector (3/8" MPT x 5/8" - 45° Male Flare)	1	Connects CO_2 fill hose to tank
58a	1013672	Connector, Brass (1/8" comp. x 1/8" MPT w/ 0.008 orifice)	1	Connects high (liquid) phase liquid level gauge line to knuckle port
58b	1013672	Connector, Brass (1/8" comp. x 1/8" MPT w/ 0.008 orifice)	1	Connects low (gas) phase liquid level and pressure gauge line to economizer regulator
60a	10586666	Elbow, Brass (¼" Comp. x ¼" MPT)	1	Joins economizer valve to ¼" tubing
60b	10586666	Elbow, Brass (¼" Comp. x ¼" MPT)	1	Joins economizer regulator to ¼" tubing
60c	10586666	Elbow, Brass (¼" Comp. x ¼" MPT)	1	Joins gas use valve to ¼" tubing
60d	10586666	Elbow, Brass (¼" Comp. x ¼" MPT)	1	Joins ¼" tubing to gas use connection
61a	2811836	Tubing, Black Nylon (¼" OD)	1	Supplies gas to gas use connection
61b	2811836	Tubing, Black Nylon (¼" OD)	1	Supplies gas from economizer regulator into gas use circuit
62	2811346	Tubing, Black Plastic (1/8" OD)	1	Supplies high pressure / liquid side pressure to liquid level gauge
63	1210462	Elbow Street, 90°, Brass (¼" MPT x ¼" FPT)	1	Joins economizer regulator to isolation valve
65	1013996	Tee, Swivel, Tubing (1/8" Comp. x 1/8" FPT 1/8" Comp.)	1	Connects pressure line to pressure gauge
79	8511889	Sure-Fill™ Assembly (7/8"-14 Male)	1	Controls CO_2 filling and pressure venting
79a	2300059	O-Ring, Sure-Fill™, Viton {not shown}	1	Seals Sure-Fill™ assembly into tank
80	10486518	Tee Nylon (½" ODT x ¼" MPT x ½" ODT)	1	Joins Sure-Fill™ assembly to vent circuit
81	1210462	Elbow, Brass, 90° (¼" MPT x ¼" FPT)	1	Joins Sure-Fill™ regulator to isolation valve
82	1716162	Isolation Valve (¼" MPT x ¼" FPT)	1	Opens / closes Sure-Fill™ circuit
83	1812279	Regulator, Sure-Fill™, 200 psi (¼" FPT x ¼"FPT)	1	Vents excess pressure during CO_2 filling
85	1013422	Elbow, Brass, (1/8" Comp. x 1/8" MPT)	2	Joins pressure lines to liquid level gauge
86	2811826	Tubing, White Plastic (1/8" OD)	1	Supplies low pressure / gas side pressure to gauges

Table continued on next page.

IV Parts Identification

MVE Carbo-Max 600 Storage Tank (continued) Part No. 9922839

ITEM	PART NO.	DESCRIPTION	QTY	FUNCTION
87	4010582	Fitting, Brass (CGA 320 x ¼" MPT)	1	Joins final line regulator to gas use circuit
88	1210032	Hex Bushing (½" MPT x ¼" FPT)	1	Joins 450 psi relief valve and brass tee
89	8511841	Shroud, Stainless Steel	1	Protects tank plumbing components
91	2910501	Screw (¼"-20 x 5/8" long)	4	Secures shroud to tank
93	2910601	Washer, Split Lock (¼" OD) {not shown}	4	Secures shroud screw to tank
94	None	Vacuum Pump-Out Port	1	Accesses vacuum space (**Do NOT Open!**)
95	None	Vacuum Regeneration Port	1	Accesses vacuum regeneration system
	10575721	Label Set, Operations	1	Identifies operations and safety
	10860661	Label, Carbo-Max 600	1	Denotes tank model

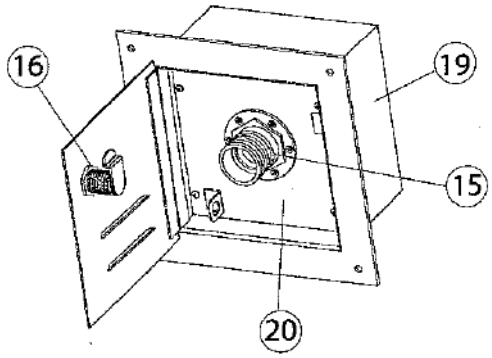
Optional MVE High Flow Final Line Regulator & Gauge Assembly Kit Part No. 8502229

PART NO.	DESCRIPTION	QTY	FUNCTION
2111312	Regulator, High-Flow Final Line, 90 psi (¼"FPT)	1	Controls pressure to the use point
2013262	Pressure Gauge, 0-160 psi (1/8" MPT CBM)	1	Indicates line pressure to use point
1310092	Hex Nipple (1/4 NPT)	1	Joins Regulator to Anchor Connector (54)
1811502	Relief Valve, 130 psi (1/4 MPT X MPT 45^0 Flare) **(not included in kit)**	1	Attaches between regulator and gas supply line to protect equipment from excess pressure

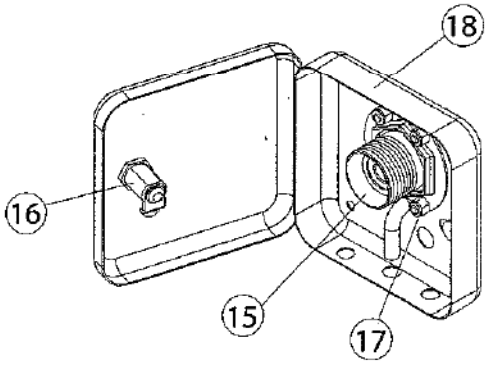
Parts Identification IV

Stationary Installation Components

Flush-Mount Fill Box
Part No. 9723139



Surface-Mount Fill Box
Part No. 9722279



ITEM	PART NO.	DESCRIPTION	QTY.	FUNCTION
15	11381021	CO_2 Fill Fitting, Brass	1	Connection for CO_2 delivery tank hose
16	4310689	Lock Assembly	1	Locks fill box
17	2914071	Locknut SS °-20 W/NYL Insert	4	Attach fill fitting to fill box studs
18	11386771	Surface-Mount CO_2 Fill Box (without fittings)	1	Allows outdoor filling and venting of tank
19	9111289	Flush-Mount CO_2 Fill Box	1	Allows outdoor filling and venting of tank
20	10503517	Flush-Mount Fill Box Plate	1	Holds brass fill fitting
	10802912	CO_2 Fill Hose Only, 5 ft. (2000 psi & FDA)		Transfers liquid CO_2 from fill box into tank
	10802921	CO_2 Fill Hose Only, 10 ft. (2000 psi & FDA)		Transfers liquid CO_2 from fill box into tank
	10802947	CO_2 Fill Hose Only, 15 ft. (2000 psi & FDA)		Transfers liquid CO_2 from fill box into tank
	10802939	CO_2 Fill Hose Only, 25 ft. (2000 psi & FDA)		Transfers liquid CO_2 from fill box into tank
	11370710	CO_2 Fill Hose Only, 30 ft. (2000 psi & FDA)		Transfers liquid CO_2 from fill box into tank
	11370728	CO_2 Fill Hose Only, 50 ft. (2000 psi & FDA)		Transfers liquid CO_2 from fill box into tank
	2811726	Vent Hose Only (lengths match fill hose)		Vents excess tank pressure outdoors

Fill and Vent Hose Kits

PART NO.	DESCRIPTION	PART NO.	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

Operation and Troubleshooting V

Ten Facts You Need To Know

1. The tank's normal internal operating pressure (Item 41) is between 110 psi and 150 psi.
2. The tank pressure can be as high as 300 psi after a delivery, but returns to its normal operating pressure after several days of normal CO_2 use.
3. The gas supply pressure for regular soft drinks is normally between 90 psi and 120 psi. Pressures for other applications may be different.
4. Frost or condensation on the tank is normal during periods of CO_2 use.
5. Frost or condensation on the tank before starting the daily use of CO_2 is a sign of a CO_2 leak. Have the leak fixed.
6. A full tank holds about 600 pounds of CO_2. Typical Carbo-Max users use 50 to 250 pounds of CO_2 per week.
7. The color-coded contents gauge (Item 22) displays the approximate amount of liquid CO_2 in the tank.
8. Never allow the internal tank pressure (Item 41) to drop below 62 psi. CO_2 turns to dry ice below 62 psi. If pressure in the tank reaches 70 psi or less stop using CO_2 from the Carbo-Max and switch to the back-up CO_2 system. Check the Carbo-Max system for leaks.
9. Isolation (shut-off) valves are open when the valve handle is parallel to the valve body and the line. Valves are closed when the handle is perpendicular to the valve body and the line.
10. Check the tank every day before starting operations and CO_2 use. Check for:
    - CO_2 leaks (See "**Safety**")
    - Pressure readings (tank and supply)
    - CO_2 contents (Item 22)
    - Abnormal frost or condensation
    - Anything unusual

General Operating Instructions

- Always use caution around CO_2. Read and understand the "**Safety**" section of this manual.
- The Carbo-Max system does not require adjustment by the user under normal operating conditions.
- Check the tank daily before using CO_2. See need-to-know fact number 10.
- In an emergency, CO_2 flow from or through the Carbo-Max can be stopped by closing the isolation (shut-off) valves. CO_2 flow can be stopped by closing the following valves:
    - Shut-off valve (38) stops the flow of gas from the tank to the beverage system or other use-point.
    - Shut-off valves (33A) and/or (33B) stops the flow of CO_2 through the pressure control / economizer circuit.
    - Shut-off valve (82) stops the flow through the Sure-Fill™ assembly to the CO_2 vent line and fill box.
- For CO_2 equipment problems, call your CO_2 supplier or a CO_2 service agent.
- Before calling for service or trouble-shooting assistance, please have the following information at hand:
    - Serial number of the tank
    - Description of the problem
    - Readings from the contents gauge, the tank pressure gauge, and the final line pressure gauge
    - Other observations such as unusual frosting, or events related to the problem

V Operation and Troubleshooting

TROUBLESHOOTING GUIDE - TANK

INDICATION	POSSIBLE CAUSE	CORRECTIVE ACTION
Insufficient CO_2 pressure to carbonator system or other use-point. OR Drinks are "flat"	Bulk CO_2 tank empty.	Switch to emergency CO_2 gas cylinder. Call CO_2 supplier for delivery.
	Isolation valve (#38) to final line regulator is closed.	Open valve or valves as needed.
	Tank pressure (#41) is low (110 psi or less).	Check for leak in gas supply lines, beverage system, tank plumbing, tank safety system and/or CO_2 fill box. (Frost should not be present on tank after extended periods with no CO_2 use.)
	Economizer regulator (#39) not operating properly; set too low or stuck open	Close isolation valve (38) and switch to emergency CO_2 gas cylinder. If tank pressure fails to rise, see section on low tank pressure. Close isolation valves (33A) & (33B) on economizer circuit. Call CO_2 service agent.
	Unknown	Call CO_2 service agent.
Frost on the bottom or sides of the tank or on top center of tank plumbing assembly.	A normal condition during or following CO_2 use.	1. NONE 2. Check tank for frost / leaks each morning before starting CO_2 use.
Frost on tank after extended periods with no **CO_2 use (such as in the morning before store operations begin).**	CO_2 discharge due to leak in gas supply lines, beverage system, tank plumbing, tank safety system or fill box.	1. See "**Safety**." Evacuate and ventilate room. 2. If leak point is known, call appropriate equipment service agent. 3. Call CO_2 service agent.
Routinely low tank pressure. (#41 below 140 psi)	Economizer regulator (#39) relieving at low pressure.	1. Close isolation valves (#33a & 33b) to economizer to stop further pressure drop. 2. Call CO_2 service agent.
	CO_2 leak from tank plumbing, CO_2 fill box and/or tank safety system.	1. See "**Safety**". Evacuate & ventilate the room. 2. Call CO_2 service agent.
	Sure-Fill™ assembly leaking or malfunctioning.	1. Close Sure-Fill™ isolation valve (#82) to stop flow. 2. Call CO_2 service agent.
	Unknown	1. Call CO_2 service agent.

TROUBLESHOOTING GUIDE - TANK

INDICATION	POSSIBLE CAUSE	CORRECTIVE ACTION
High tank pressure. (#41 over 200 psi)	1. Normal condition for several days following a CO_2 delivery. 2. Normal when little or no CO_2 has been used for several days.	NONE
	#39 Economizer regulator not opening	Call CO_2 service agent
	Tank has a weak vacuum.	Call CO_2 service agent.
High CO_2 usage.	Increase in beverage sales.	NONE
	Tank pressure (#41) routinely too high.	See section on High tank pressure.
	CO_2 leak from tank plumbing, CO_2 fill box, gas lines, Sure-Fill and/or beverage or other use-point equipment.	1. See "**Safety**". Evacuate & ventilate room. 2. Call appropriate CO_2 or beverage equipment service agent.
	Error in CO_2 delivery or supplier invoice.	1. Check CO_2 usage & beverage sales history / pattern against supplier invoices. 2. Call CO_2 supplier.
CO_2 tank will not fill.	CO_2 tank is already full.	NONE
	Fill check valve (#30) is inoperative.	Call CO_2 service supplier / service agent.
	Brass fill fitting in CO_2 fill box and/or on truck's delivery hose is faulty.	1. Consult with CO_2 supplier and/or service agent. 2. Have brass fill fitting replaced, if needed.
	Pressure differential between store tank and delivery tank is too small. (At start of fill, store tank pressure should be 110 psi - 150 psi and delivery tank should be 275 psi - 300 psi).	1. Ask driver to verify delivery tank pressure is at least 250 psi. 2. Check store tank pressure (#41) to verify it is between 110 psi - 150 psi. Caution: NEVER vent store tank pressure to lower than 110 psi.
	Sure-Fill assembly not operating (relieving) properly.	1. Ensure that Sure-Fill valve (#82) is open. 2. Call CO_2 service agent.
	Truck delivery hose is obstructed, e.g. vehicle stopped on hose or hose is kinked.	Clear obstruction or wait until obstruction clears.

V Operation and Troubleshooting

TROUBLESHOOTING GUIDE - TANK

INDICATION	POSSIBLE CAUSE	CORRECTIVE ACTION
Intermittent hissing sounds near tank's plumbing	Regulators and relief valves "self relieving" for short periods of time. (Normal during extended periods of no or low gas use.)	1. See "**Safety**". 2. Evacuate and ventilate room / area. 3. If possible, observe leak. If it is not large and does not last long or occur frequently, no actior may be needed. If in doubt, call appropriate equipment service agent.
Hissing sounds near tank, CO_2 lines or other equipment using CO_2 gas.	Large leaks in the system, sustained leaks, or frequent leaks.	1. See "**Safety**". 2. Evacuate and ventilate room / area. 3. Call CO_2 or equipment service agent.
Final line / gas use pressure gauge is too low (typically below 90 psi).	Final line regulator intentionally set lower by beverage service agent.	NONE
	Final line regulator not operating in proper pressure range.	Call CO_2 service agent.
	Final line pressure gauge damaged or faulty.	Call CO_2 service agent.
	One or more of the causes listed in "no CO_2" or "flat drinks" problem section.	1. See problem sections above regarding "no CO_2", "flat drinks", etc. 2. Call CO_2 service agent.

For CO_2 equipment problems, call your CO_2 supplier or an authorized CO_2 service specialist.

TROUBLESHOOTING GUIDE - FILL BOX

INDICATION	POSSIBLE CAUSE	CORRECTIVE ACTION
Fill box door will not close, lock, or open.	Lock dirty or damaged.	1. Check for obstruction. 2. Clean and/or lubricate lock. 3. Replace lock if necessary.
Brass fill fitting in fill box leaking or hissing.	Particle of ice or debris caught in fill fitting poppet.	4. If driver is still on site, reconnect CO_2 delivery hose and then disconnect. 5. If driver not available, carefully press poppet with dull instrument to reseat poppet. 6. If leak continues after line warms, call service agent to service or replace fill fitting.
	Brass fill fitting or fill hose is loose.	Call CO_2 service agent to tighten connections.
	Fitting is defective or sealing surface is worn due to normal wear.	1. Avoid any CO_2 deliveries until fitting is replaced. 2. Call CO_2 service agent to replace fill fitting.
	Brass fill fitting threads are worn or stripped	1. Avoid any CO_2 deliveries until fitting is replaced. 2. Call CO_2 service agent to replace fill fitting.
	Cross threading the coupler with the CO_2 delivery hose coupler	1. Avoid any CO_2 deliveries until fitting is replaced. 2. Call CO_2 service agent to replace fitting.
CO_2 is venting from fill box.	Normal during a CO_2 delivery.	NONE
	Normal for short periods of time if tank pressure is at or over 300 psi	1. NONE if for short period(s) of time. 2. If tank pressure consistently over 300 psi, see section on tank pressure too high.
	Sure-Fill assembly leaking or malfunctioning.	1. Close Sure-Fill isolation valve (#82) to stop flow. 2. Call CO2 service agent.
	Brass fill fitting is not sealing properly.	Call CO_2 service agent to replace fitting.

For CO_2 equipment problems, call your CO_2 supplier or an authorized CO_2 service specialist.

VI Ordering Service and Parts

Service and Maintenance

1. Service or maintenance on the MVE Carbo-Max 600 should be performed **only** by Chart trained and authorized professional service agents who are familiar with CO_2, mini-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.
2. Before calling your CO_2 supplier for service or troubleshooting assistance, please have the following information:
   - Serial number of the tank
   - Description of the problem
   - Readings from
     - the contents gauge (Item 22),
     - the tank pressure gauge (Item 41) and
     - the final line pressure gauge.
   - Any special observations (for example: unusual frosting, sequence of events related to the problem, etc.)

1. Chart recommends that a thorough preventive maintenance check be performed on the Carbo-Max system by a qualified professional service agent at least once every two years. The check should be done to insure safety and optimum performance of the system.
2. The MVE Carbo-Max has no user serviceable parts. All service work should be performed by an authorized professional service agent.
3. NOTE: Any attempt to service the equipment by unauthorized persons or to perform unauthorized modifications will void the warranty.

Ordering Parts or Service

For parts or service contact your local authorized Chart CO_2 supplier or equipment service agent. To assure prompt processing of your order, list each item separately, taking care to specify the quantity, the part number, and the description of each item ordered.

Important Telephone Numbers

Company	Contact Person	Phone Number
CO_2 Supplier	_____	_____
	After-Hours / Emergency Number	_____
CO_2 Service Agent	_____	_____
CO_2 Equipment Installer	_____	_____
Chart Customer Service	(952) 882-5000 or (800) 247-4446 {toll free in US}	
Chart Technical Service	(800) 253-1769 {toll free in US}	

WARRANTY VII

WARRANTY POLICY

Chart Ind. Inc. warrants to the Purchaser the MVE Carbo-Max 600 bulk CO_2 system equipment for 90 (ninety) days from the MVE invoice date, that said equipment shall be free from any defects in workmanship and materials. Chart also warrants the reliability of the vacuum in the Carbo-Max 600 tank for 5 (five) years from the date of the original MVE invoice.

Purchaser agrees that as a pre-condition to any Chart liability hereunder, Purchaser or its appointed agents shall fully inspect all goods 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, parts replacement and labor must be supplied by an approved Chart service company. Chart may elect to repair or replace such equipment or any defective component or part thereof which proves to be defective, or to refund the purchase price paid by the original Purchaser. Chart shall not be liable for defects caused by the effects of normal wear and tear, erosion, corrosion, fire, explosion, misuse, or unauthorized modification.

Alterations or repair by others than those designated and approved by Chart or operation of such equipment in a manner inconsistent with Chart accepted practices and all operating instructions, unless pre-authorized in writing by Chart, shall void this Warranty.

Chart's sole and exclusive liability under this Warranty is to the Purchaser and shall not exceed the lesser of the cost of repair, cost of replacement, or refund of the net purchase price paid by the original Purchaser.

Chart is not liable for any losses (including CO_2), damages, or costs of delays, including incidental or consequential damages. Chart specifically makes no warranties or guarantees, expressed or implied, including the warranties of merchantability or fitness for a particular purpose or use, other than those warranties expressed herein.

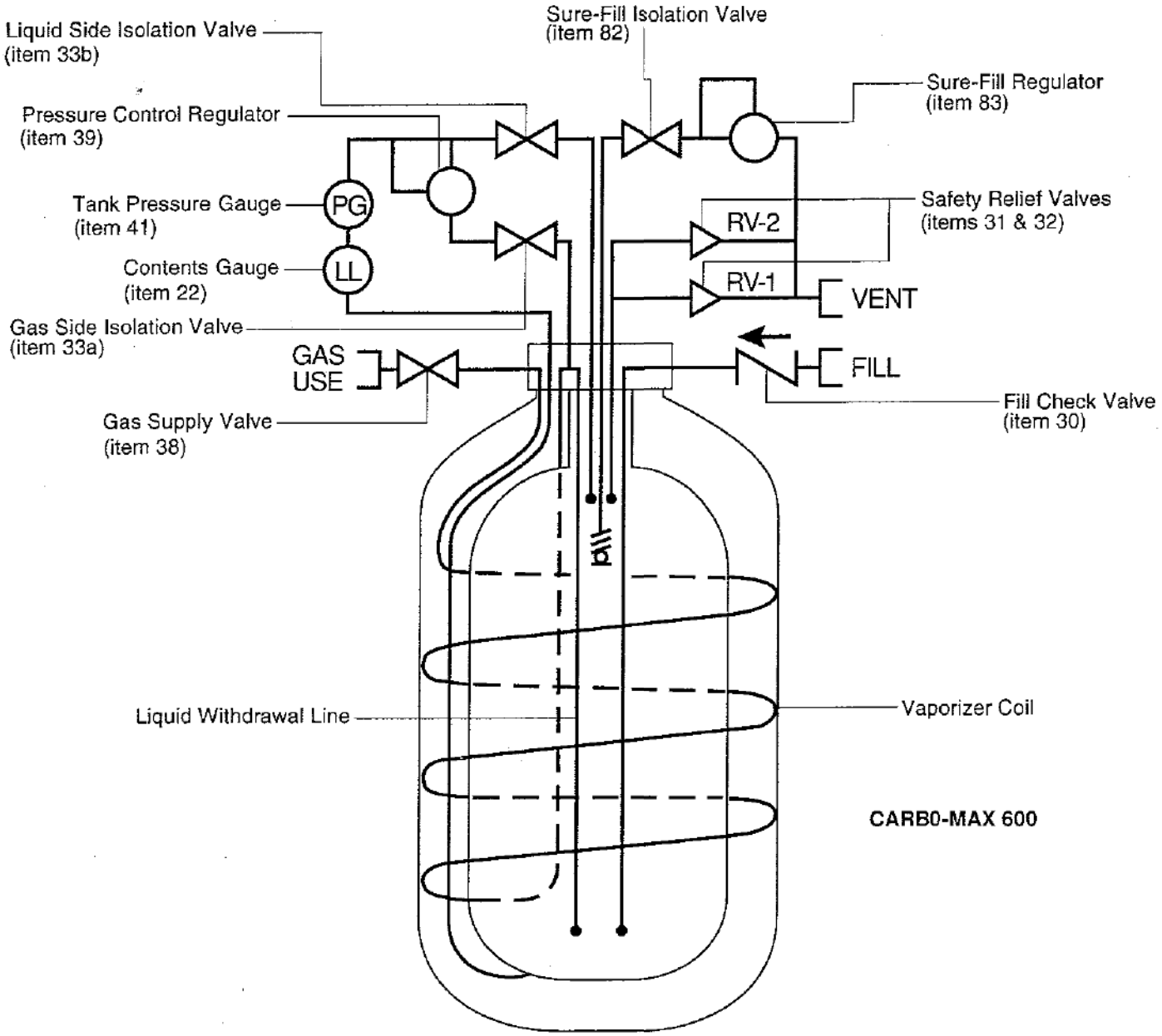
WARRANTY CLAIMS PROCEDURE

1. All warranty claims must be previously authorized by Chart Ind. Inc. Telephonic / electronic approval may be obtained by contacting MVE Beverage Systems Technical / Customer Services at:
   - Telephone: 952-882-5000
     800-253-1769
     (toll free in U.S.)
   - Facsimile: 952-882-5185

   or by writing to:
   Chart Ind., Inc.
   MVE Beverage System Technical Service
   3505 County Road 42 West
   Burnsville, MN 55306-3803
   USA

1. Authorization must be obtained from Chart prior to shipping any equipment to Chart facilities. The model and serial number of the tank must be provided in order to process the return. 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 which 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.

VIII System Flow Schematic



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