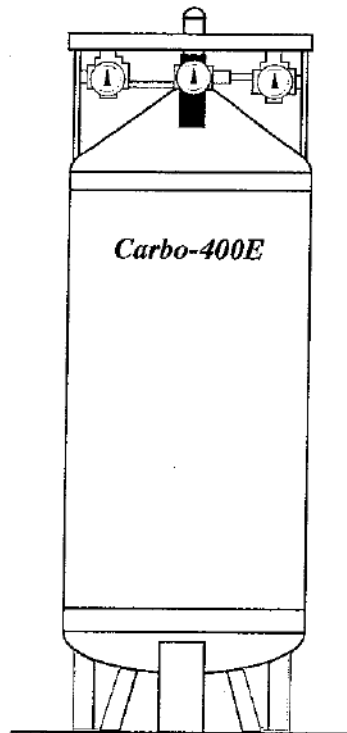


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# Installation Manual



## Carbo-400E Bulk CO<sub>2</sub> System

**M V E**

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## Safety Information

MVE Bulk CO<sub>2</sub> restaurant equipment is designed for safe and simple installation and operation. The installation procedures contained in this manual are intended to be used as guidelines for different types of installations. Each installation needs to be handled on an individual basis in order to provide customer satisfaction and to avoid any possible installation hazard.

While this manual is intended to provide safe installation guidelines, it is imperative that you read and understand all WARNINGS, CAUTIONS AND NOTES contained in this manual and enumerated below:

**WARNING: Excess carbon dioxide accumulation creates an oxygen deficient atmosphere. Exposure to such an atmosphere could result in unconsciousness and lead to serious and/or fatal injury.**

**WARNING: If at any time during the installation it becomes apparent that a leak exists in or on a component part of the system, the leak must be repaired before proceeding. Failure to comply could result in serious and/or fatal injury.**

*CAUTION: Use only replacement parts approved by MVE for any repairs during the installation. Failure to comply could result in substandard vessel performance and will void the factory warranty.*

# II Introduction

## General

The Minnesota Valley Engineering, Inc. (MVE) Carbo-400E CO<sub>2</sub> Supply System is a compact, self-contained, low pressure system designed for economical and safe operation in a beverage outlet.

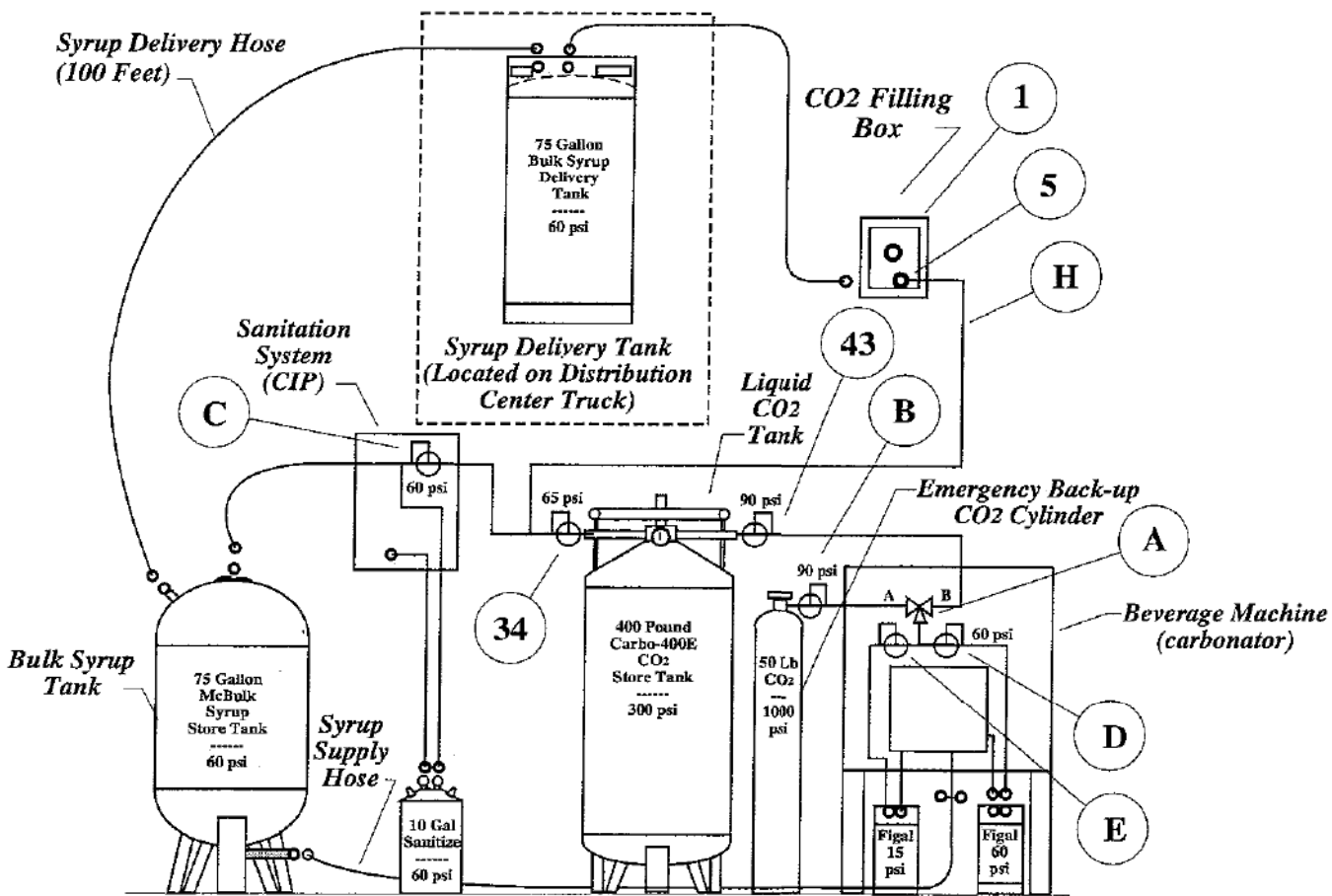
The model designation Carbo-400E indicates a "McDonald's Carbon Dioxide Supply Tank". The Carbo-400E system is only available as a 400 pound capacity system. The Carbo-400E system can be installed in basement stores in approximately 3 hours and in slab stores in approximately 2 hours. Installers of the MVE system must make sure that the installation complies with applicable building codes.

## Physical Description

MVE Bulk Restaurant Equipment is comprised of three (3) assemblies for the Carbo-400E system.

The Carbo-400E system consists of a 400 pound CO<sub>2</sub> capacity storage/supply tank, CO<sub>2</sub> fill box and installation kit. The necessary hoses to connect the tank to the CO<sub>2</sub> fill box are contained in the installation kit.

## McDonald's Beverage System Components



# Introduction II

## Operating Concept

The Carbo-400E Bulk CO<sub>2</sub> System is designed to store and dispense gaseous CO<sub>2</sub> for carbonated beverages. The system can simultaneously supply CO<sub>2</sub> to both a beverage machine (carbonator) and a bulk syrup system. The tank stores up to 400 pounds of liquid CO<sub>2</sub> and is available in both stationary and portable tank designs.

The stationary tank is filled remotely through the CO<sub>2</sub> fill box located in an outside wall. In addition to the CO<sub>2</sub> fill fitting, the fill box also contains two vents for the CO<sub>2</sub> and the syrup systems and a CO<sub>2</sub> gas connection used for bulk syrup deliveries. Portable tanks are used at sites, such as malls, hospitals and other special venues, where the CO<sub>2</sub> tank must be moved in order to be filled.

The Carbo-400E tank is constructed like a large thermos bottle. It has an inner and an outer vessel. The inner vessel contains the liquid CO<sub>2</sub> and is separated from the outer vessel by a vacuum space. The vacuum space with its special insulation materials keeps the CO<sub>2</sub> in a liquid state and at a low pressure.

The Carbo-400E tank is a "liquid withdrawal" tank. Liquid withdrawal tanks supply their gas by first drawing liquid CO<sub>2</sub> (or LCO<sub>2</sub>) from the tank and then passing it through a vaporizer or heat exchanger to convert it into a gas. In the Carbo-400E the vaporizer is fixed to the inside of the tank's outer vessel. As the cold LCO<sub>2</sub> enters the vaporizer it is heated or vaporized by the ambient heat surrounding the tank. It is the cold liquid moving through the tank's vaporizer and plumbing that causes the frost or condensation to develop on the outside of the tank when CO<sub>2</sub> gas is being used.

The plumbing on the top of the tank performs four functions: LCO<sub>2</sub> filling, CO<sub>2</sub> gas supply, tank pressure control, and tank safety. The fill line and fill valve (Item 30) connect the tank to the fill box for LCO<sub>2</sub> filling and make up the tank's LCO<sub>2</sub> fill plumbing.

The gas supply or use plumbing consists of the main gas valve (Item 38), the shut-down regulator/filter (Item 40), and the two branches which supply gas to the carbonator and the bulk syrup system. Each of the two gas supply branches has its own pressure regulator (Items 43 and 34) and pressure gauge (Items 44 and 35) to control and monitor the correct pressure to the carbonator or bulk syrup system.

The shut-down regulator (Item 40) in the gas supply plumbing plays an important role in both gas supply and pressure control. The shut-down regulator is set to shut-off or close at pressure of less than 70 psi (pounds per square inch) or 100 psi, depending upon the tank's generation. When the tank pressure is low and the regulator closes all gas flow to both the carbonator and the bulk syrup system stops. The regulator closes to prevent the tank pressure from dropping further. This protective feature is important because if the tank pressure drops below 70 psi the liquid CO<sub>2</sub> will start turning to a block of dry ice, solid CO<sub>2</sub>.

If the shut-off regulator closes, the cause of the low pressure must be corrected and the tank pressure, as shown on the tank pressure gauge (Item 41), must be raised before the gas supply is restarted. The flow of CO<sub>2</sub> gas is restarted by pressing the push-button reset valve (Item 42) for 10-15 seconds.

The other pressure control component is the pressure control (or economizer) regulator (Item 39) and its related plumbing. The pressure control regulator opens when the tank's pressure is above the desired operating pressure, such as after a LCO<sub>2</sub> delivery. When the regulator is open it brings the tank pressure down to the desired operating pressure (normally set at about 140 psi). It usually takes one to four days of gas use to bring the tank pressure down following a CO<sub>2</sub> delivery.

Safety is the last tank function. The safety system consists of the two relief valves (Items 31 and 32) and the vent line to the fill box. This system protects the tank from excess pressures due to extended periods with no CO<sub>2</sub> use, building fires, over-fills, etc.

# III Installation Tools and Supplies

## General

Installation of the Bulk Restaurant Equipment can be done with basic power tools and hardware. Because of the different brands of beverage machines, some types of fittings may not work on all machines.

## Installation Tools

Some of the tools contained in this section may not be needed on all installations. The equipment mentioned should be used as a guide in determining your equipment requirements.

Electric Hammer Drill: Used for drilling holes and chiseling brick.

Accessories included:

- 3" x 23" Core Bit
- 3/4" x 13" Drill Bit
- 3/4" x 21" Drill Bit
- 1-1/2" x 13" Drill Bit
- 2-1/4" x 13" Drill Bit

Electric Hand Drill: Used for drilling anchor holes.

Accessories include:

- 1/4" Masonry Bit
- 3/8" Masonry Bit

Hand Tools: Hammer, screwdriver, wrenches, tape measure, 50' extension cord, oetiker clamp pinchers, torpedo level, carpenter square, etc.

Hand Truck with Strapping Attachment: Used for placing the tank.

## Installation Supplied and Hardware

The installation supplies and hardware listed below and on the next page may not be used on all installations, but should be kept in small quantities on the installation truck. The items listed in this section are not supplied by the manufacturer and are the responsibility of the installer. The supplies listed are available at plumbing supply and beverage equipment companies or in some cases from MVE.

## Installation Supplies:

- 2 1/2" PVC Pipe and Elbows
- Quick Setting Cement
- PVC Cement
- Glazing Compound
- 1/4" x 1/4" Self-Tapping Screws
- Teflon Tape
- 9" Cable Ties
- 2" Conduit Straps, 2 hole
- 12" Cable Ties
- Squirt Bottle w/Soap Solution
- Silicon Sealant (Clear and White)
- 1/4" Plastic Screw Anchors
- PVC Flanges for Floor and Wall attachment of PVC Pipe
- Floor anchors (3/8" dia x 3-3/4" long, e.g. Hilti Kwik-Bolts or Red Head Trubolt wedge anchors).
- Hose Fittings (stainless steel)
  - 1/4" Barbed Flared Nipple with Swivel Nut
  - 3/8" Barbed Flared Nipple with Swivel Nut
  - 3/8" x 1/4" Barbed Splicer
  - 3/8" x 3/8" Barbed Splicer
  - 1/4" x 1/4" Barbed Splicer
- Hose Clamps (Oetiker)
  - # 133 for 1/4" ID Tubing
  - # 170 for 3/8" ID Tubing
  - # 140 for 1/4" ID Red Line Tubing
- Beverage Tubing
  - 1/4" Tubing
  - 3/8" Tubing

# Installation Tools and Supplies III

The following parts are included with the Carbo-400E System. They are used to connect the Carbo-400E tank to the fill box, bulk syrup system, and beverage machine (carbonator).

Qty	Description	Function	Part No.
1	Connector - 5/8" ODT 45° M flare x 3/4" MPT (brass)	Joins CO <sub>2</sub> fill hose to CO <sub>2</sub> fill fitting in fill box	1111182
1	Cap Nut - 1/8" ODT x 45° F flare	Caps extra port on syrup gas-use circuit when not used	1111292
1	Union - 1/4" MPT x 1/4" M flare (brass)	Joins tee to barbed elbow on carbonator gas-use circuit	1111502
1	Tee, - 1/4" M flare x 1/4" MPT x 1/4" M flare (brass)	Splits syrup gas-use circuit to CIP & CO <sub>2</sub> fill box	1111512
2	Tee - 1/4" F flare x 1/4" MPT x 1/4" flare (brass)	Connects to tank to start syrup gas-use circuit	1213092
1	Elbow - SS 90° 1/4" hose barb x 1/4" flare	Connects CO <sub>2</sub> pressure line from tank to CIP	1611461
1	Elbow - SS 90° 3/8" hose barb x 1/4" F flare	Connects CO <sub>2</sub> gas-use line from tank to carbonator	1611821
1	Relief Valve - 75 psi toggle type	Safety valve for syrup gas-use line	1812342
1	Relief Valve - 130 psi toggle type	Safety valve for carbonator gas-use line	1812352
20'	Beverage Tubing - 1/4" ID red line	CO <sub>2</sub> gas supply line from tank to fill box 2-pin beverage connector	2811606
100'	Beverage Tubing - 3/8" ID red-line	CO <sub>2</sub> gas supply line from tank to carbonator	2811586
15'	Tubing - white nylon 1/2"	CO <sub>2</sub> vent line from tank to outside fill box	2811726
4	Truss Anchor - nylon 1/4" x 1-1/2"	CO <sub>2</sub> fill box to outside wall	2914326
6	Hose Clamp - 3/8" ID tubing #170	Secures 3/8" beverage tubing	3411331
4	Hose Clamp - 1/4" ID red-line tubing # 140	Secures 1/4" red-line beverage tubing	3411511
1	CO <sub>2</sub> Fill Hose, 1/2" ID x 15' with 5/8" ODT 45° F flare	Connects fill box to tank for CO <sub>2</sub> filling	3711097
1	Female 2-Pin Connector - QC with 1/4" barb	Connects into & seals open end of syrup vent line coming from fill box	6511706
1	Pass-Thru Conduit - PVC 2.5" x 12"	Conduit for lines & fill hose through outside wall to fill box	8503796
5'	Beverage Tubing - 1" green line	Starter piece of bulk syrup vent line from outside fill box	2811616
4	Hose Clamp - 1/4" ID tubing #133	Secures 1/4" beverage tubing	3411321

# IV General Guidelines

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## Installation Responsibilities

1. The installer is responsible for:
  - a. Proper installation of the Bulk CO<sub>2</sub> System in accordance with these instructions and the requirements of the store management.
  - b. Communications with the store to coordinate the install schedule.
  - c. Inspection of the Bulk CO<sub>2</sub> System components for damaged or missing parts.
  - d. Supplying the tools and supplies listed in Section Three.
  - e. Communicating with the store during installation.
  - f. Complying with all relevant local codes, McDonald's, and store guidelines.
  - g. Testing the Bulk CO<sub>2</sub> System for proper operation.
  - h. Explaining and demonstrating the Bulk CO<sub>2</sub> System to the store management.
  - i. Completing any required documentation, billings, or checklists.
  - j. Cleaning the installation site before leaving.
2. The Store is responsible for:
  - a. Ordering the Bulk CO<sub>2</sub> System.
  - b. Working with the installer to identify sites for the CO<sub>2</sub> tank and fill box.
  - c. Removing any installation site obstructions prior to the installation.
  - d. Participating in Bulk CO<sub>2</sub> System training and mastering system operations.
  - e. Ordering bulk CO<sub>2</sub> deliveries.
  - f. Maintaining ASME Form U-1A, and any other required documentation.
  - g. Paying for the installation of the Bulk CO<sub>2</sub> System.



# General Guidelines V

## Site Survey

Prior to the installation of the bulk system, a site survey must be performed to determine the tank and fill box location. The survey must be conducted with either the store owner, corporate supervisor, or their designated representative. At this time, a survey plan should be prepared. The survey form should then be signed by both the store representative and the installer. Any modifications to the installation, after the survey form has been completed, must be noted on the original survey form and signed off by the person who approved the original survey.

## Fill Box Location

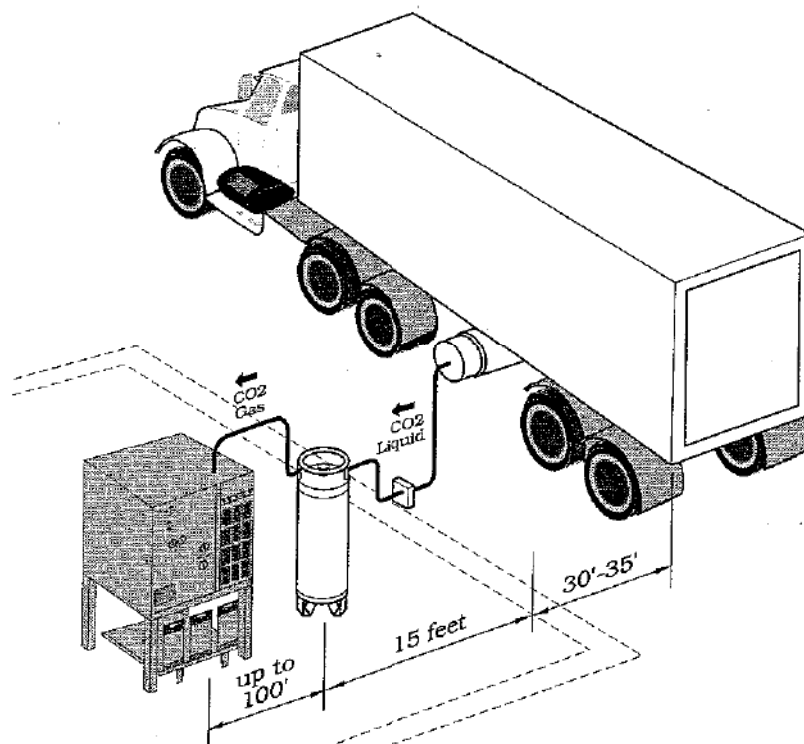
The fill box location must be determined before locating the CO<sub>2</sub> tank. It must be situated to allow easy access by CO<sub>2</sub> delivery personnel. The preferred fill box location is about 3 feet up on the back outside wall of the store. When placing the fill box, keep in mind the length of the fill hose from CO<sub>2</sub> delivery truck. The truck fill hose is 35 feet long which is more than adequate for most locations. The distance from the truck to the fill box should not exceed 30 feet to allow some slack at each end.

The fill box may be located in the drive-thru lane as long as the fill hose is across the drive-thru for as little time as possible. It will not hurt the hose to be driven over as long as it is under pressure. Do not allow the hose to be driven over when it is depressurized.

When determining the fill box location, always check the inside wall of the store to be sure that the box will not interfere with objects such as electrical lines or panels, freezers, sewer or water lines, sinks, etc. Care must also be taken to insure that installation of the fill box will not damage anything inside the wall such as conduits. In stores where the CO<sub>2</sub> fill line from the fill box to the tank must be sleeved, be sure to locate the box so the inside sleeving will not be damaged and will not interfere with the store's operation.

## CO<sub>2</sub> Tank Location

Once the fill box location is determined, you can decide on the location of the CO<sub>2</sub> tank. The primary factors for placing the CO<sub>2</sub> tank are space requirements and hose length from the fill box. The fill hose from the fill box is 15 feet long. (Special order hoses up to 25 feet long can be purchased.) The hose is a fixed length hose with fittings crimped on each end. The CO<sub>2</sub> tank must be placed within 15 feet of the fill box in any direction. The distance from the CO<sub>2</sub> tank to the beverage machine is not critical. Typical distances from the tank to the beverage machine are from 5 to 100 feet. The CO<sub>2</sub> tank must be placed so that it does not interfere with items such as electrical panels, sinks, hallways, etc. It is desirable to place the tank in the most out-of-the-way location available. However, the tank should not be placed such that it is inaccessible if service is ever required.



# V Fill Box Installation

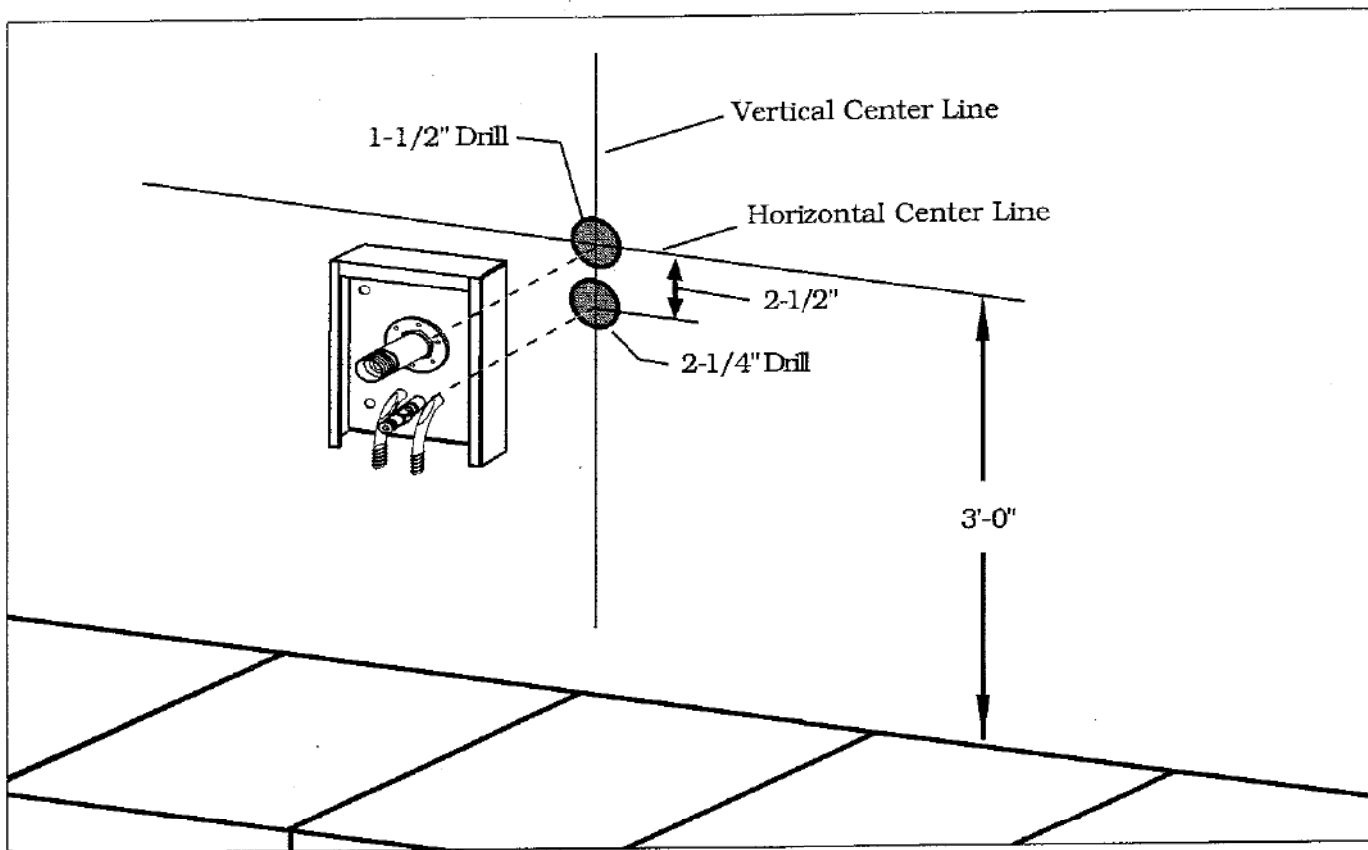
## General

The tools mentioned in Section 2 of this manual will be used during the fill box installation. Since this is the only part of the system which is directly visible, care must be taken to insure a professional looking job.

## Marking Fill Box Outline

Before marking the fill box outline on the exterior wall, check to be sure that the fill box will not interfere with or obstruct any electrical lines and/or conduit, plumbing, gas lines, etc. Locate where the fill box lines will penetrate the wall on the inside of the store and transfer its location to the outside wall. Draw a vertical center line on the outside wall. The fill box should be located approximately 3 feet above the ground.

Mark the horizontal position where the fill box will be located on the vertical centerline. The fill box measures 6" wide and 7" high with the fill and vent hoses located on the center line. If the inside wall is tiled, care must be taken to avoid damage. Large holes must be drilled from inside to outside. To do this, drill a 1/4" pilot hole through from the outside. Then go inside and drill through using the pilot hole as a guide. Using the 1-1/2" masonry bit, drill a hole through the wall where the vertical and horizontal line cross. Measure 2-1/2" down from the center of the hole on the vertical center line and mark the wall. Drill a 2-1/4" diameter hole at this location for the two vent lines and the CO<sub>2</sub> pressure line. Use the fill box as a template; hold the box in the opening and mark center of the four corner mounting holes. Drill corner mounting holes using 1/4" masonry bit. (Holes should be approximately 1-1/2" deep.) Insert plastic screw anchors.



# Installation of Lines and CO<sub>2</sub> Fill Hose VI

## General

Running the liquid fill hose, vent lines, and CO<sub>2</sub> pressure line from the box to the tank will most likely be done differently at each location. Follow the basic rules and guidelines listed below for the easiest and simplest installation possible.

1. Run all lines such that they are as inconspicuous as possible.
2. Lines should be secured together with cable ties at 12 to 18 inch intervals.
3. Lines should be anchored using conduit straps at least every two to three feet.
4. Lines should be run either horizontally or vertically whenever possible.
5. Never leave a loose line hanging; sags in the lines indicate an unprofessional job.
6. Excess CO<sub>2</sub> fill hose should be coiled and cable tied.
7. Lines should not be secured to electrical conduit or other lines or fixtures prohibited by codes.
2. If the lines are being run without sleeving material, continue at step 8.
3. If sleeving material is being used, size and cut the sleeve material to the proper length with a 90° elbow.
4. Feed the lines through PVC sleeve and elbow.
5. Bond the sleeve and elbow together, only if necessary, with PVC glue. Bond as little as possible for future service.
6. Run sleeving conduit to tank.
7. Attach the PVC sleeve to wall with conduit straps.
8. Run lines to tank. Attach lines to wall with conduit straps every two to three feet.
9. Excess line should be coiled and cable-tied and attached to wall with conduit straps.

## Line Connections to Fill Box

There are four lines that run between the fill box and the Carbo-400E system. The following list describes these lines:

1. Liquid CO<sub>2</sub> Fill Hose: This 1 inch rubber hose connects between the fill fitting on the back of the fill box and the CO<sub>2</sub> fill valve on the CO<sub>2</sub> tank.
2. CO<sub>2</sub> Tank Vent Line: A 3/8" ID white nylon tubing is used to connect the relief valves on the CO<sub>2</sub> tank with the barb fitting on the back of the fill box.
3. Syrup Tank Vent Line: Use 1/4" ID green line beverage tubing to connect the Clean-in-Place Panel (CIP) with the barb fitting on the back of the fill box.
4. CO<sub>2</sub> Pressure Line: Use 1/4" ID red line beverage tubing to connect the CO<sub>2</sub> pressure from the syrup regulator on the CO<sub>2</sub> tank to the two-pin connector in the fill box.

## Slab Stores

The tank distance from the outside fill box will vary from 12 inches to 15 running feet. The lines are generally attached to the wall with conduit straps every 18 inches. It is not necessary to run lines through a conduit sleeve, but if lines are exposed to a high traffic area and it is apparent the hose may be damaged, it would be best to run lines through a conduit sleeve for protection. The sleeve material generally used is 2 1/2" PVC piping.

1. Feed the liquid CO<sub>2</sub> fill hose, pressure lines, and vent line through PVC wall flange.

## Basement Stores

In some basement stores, the tank is located in the first floor. If the tank is located on the first floor, see the section on Slab Stores for proper installation procedure. Listed below are several different ways to run the lines on a basement store:

### Sleeving Lines into Basement

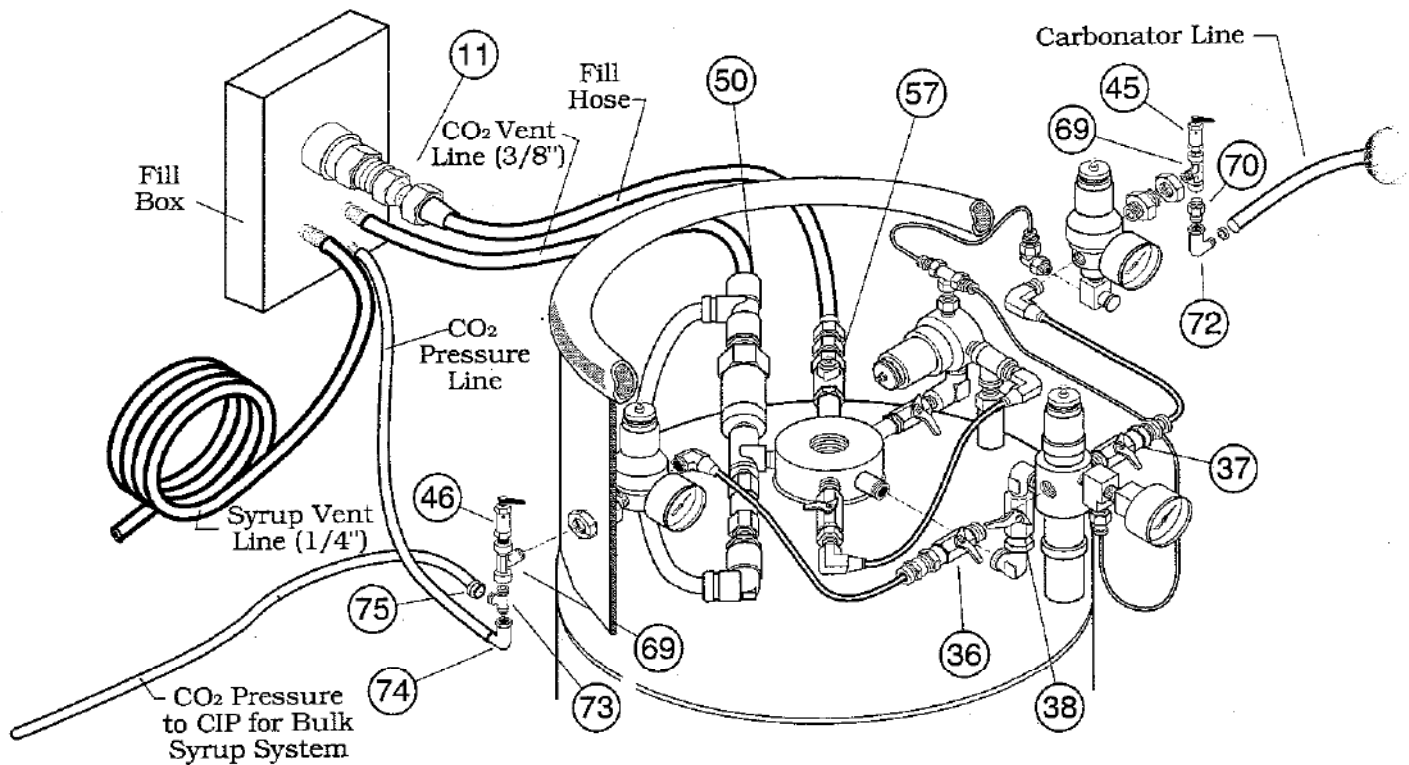
In some stores, the liquid fill and vent hose lines must be sleeved on the inside of the store for protection and cosmetic reasons. Sleeve material is generally 2-1/2 inch PVC pipe using two 90° elbows with floor and wall flanges. A hole must be drilled in the floor to allow the lines to pass to the basement. The sleeve must be secure and parallel to the wall. The following procedure should be used to run sleeved lines from fill box to tank:

1. Drill through the floor approximately 3 to 4 inches from the wall using the hammer drill and 3 inch core bit.
2. Size and cut the sleeve material to the proper length with a 90° elbow. The finished assembly should be square to the wall and floor.
3. Feed the liquid fill hose, vent hose and CO<sub>2</sub> pressure line through the PVC sleeve, wall, and floor flanges.
4. Bond the sleeve and elbow together, only if necessary, with PVC glue. Bond as little as possible for future service.
5. Feed the lines through the floor.
6. Attach the sleeve flanges to the floor and wall using two 1/4" x 1" screws with anchor plugs.
7. Run lines to the tank.
8. Excess CO<sub>2</sub> fill hose should be coiled and cable tied and attached to the wall. Attach the other lines to the wall with conduit straps at least every two to three feet.

# VII Connections To Fill Box

## Line Connections

1. Connect the 15' liquid CO<sub>2</sub> fill hose to liquid flare fitting (Item 11) on the back of the fill box.
2. Using the 1/4" ID green line beverage tubing run a syrup tank vent line from the back of the fill box. Slide an Oetiker clamp over the tubing. The line should then be inserted onto the left barb fitting on the back of the fill box and secure the clamp. Coil and cable tie the syrup vent line at the fill box. Insert and secure the end of the line with the female 2-pin connector. This will later be attached to the Bulk Syrup System.
3. Using the 1/4" ID beverage tubing run a line into the middle barb fitting of the fill box. Slide the two small Oetiker clamps over the tubing. Push the hose down on the barb fitting that is welded to the two pin connector. Crimp the two Oetiker clamps.
4. Using the 3/8" ID white nylon tubing run the tank vent line to the right barb fitting on the back of the fill box. Slide an Oetiker clamp over the tubing. The line should be inserted onto the barb and clamped.
5. Feed all lines back into store, at the same time pushing the fill box into place on the wall.
6. Leave 12 to 15" of slack in all the lines for easy removal of the fill box.
7. Loosely fasten fill box to the wall. (It will be removed for pressure checking later.)



# Installation of Bulk CO<sub>2</sub> Tank VIII

## Placing of Tank:

1. Place the tank in proper position on floor. (Tank pressure gauge and labels are located the front of the tank.)
2. Mark the bolt hole location on floor.
3. Drill 3 holes in floor for type of anchors being used.
4. Blow the dust out and insert the anchors.
5. Move the tank into position and bolt it down to the floor.

## Plumbing the CO<sub>2</sub> Tank for Syrup & Carbonator Connections:

The installation kit includes all the fittings needed to prepare the tank for hose connections.

1. Thread the 1/4" NPT street tees (Item 69) into the female fittings on each handling ring post. These are located on the outlet side of the syrup and carbonator regulators. Position the tees vertically so the relief valves will be at the top of the tees.
2. Thread the 70 psi relief valve (Item 46) into the top of the tee on the syrup side.
3. Thread the 130 psi relief valve (Item 45) into the top of the tee on the carbonator side.
4. Thread the 1/4" NPT x flare branch tee (Item 73) into the bottom of the tee on the syrup side.
5. Thread the 1/4" NPT x flare (Item 70) into the bottom of the tee on the carbonator side.

## Connecting Lines to CO<sub>2</sub> Tank:

1. Connect the liquid CO<sub>2</sub> fill hose to the CO<sub>2</sub> tank (Item 57).
2. Connect vent line tubing to the relief valve vent fitting (Item 50) on tank.
3. Connect 1/4" ID red line beverage tubing (from two pin wall box connector) to 1/4" flare connection (Item 73) on the syrup regulator outlet of the CO<sub>2</sub> tank. Use 1/4" female flare x 1/4" hose barb connector (Item 74) and Oetiker clamps.
4. Cap the 1/4" flare outlet with the brass cap (Item 75). This will later supply pressure to the CIP of the Bulk Syrup System.
5. Coil additional syrup tank vent line behind tank. Tie strap the line to the wall or fill box.
6. Connect 3/8" ID redline tubing to the outlet of the carbonator regulator (Item 70). Use a 1/4" flare x 3/8" barb connector (Item 72) and Oetiker clamps.
7. Close the syrup regulator isolation valve (Item 36) and the gas supply valve (Item 38).

NOTE: For best results the CO<sub>2</sub> tank should be filled with 50 to 300 pounds of liquid CO<sub>2</sub> at this time. This will assure all lines may be properly purged before connecting to the drink system. If this is not possible go to Section 10.

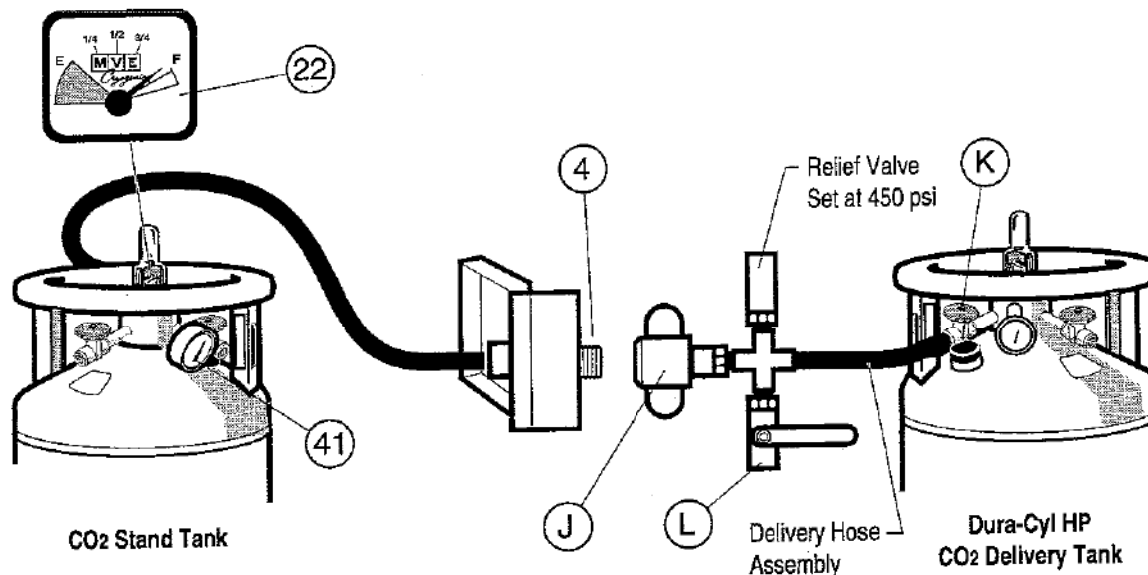
# IX Filling Procedures

## Filling of New CO<sub>2</sub> Tank

The first fill of the Carbo-400E tank will take from 20-30 minutes and requires that some CO<sub>2</sub> gas be vented. The first fill cools the inner vessel of the unit. Because of the insulating efficiency of the Carbo-400E, higher than normal operating pressure can be expected for two to three weeks after first fill. This is a normal condition during the cool down period.

The Delivery of CO<sub>2</sub> to the Carbo-400E can be done with an Industrial Liquid Cylinder (Dura-Cyl HP or Cryo-Cyl HP) or other liquid CO<sub>2</sub> vessel by using the following steps:

1. Open the pressure building valve on the Dura-Cyl to maintain 300 psi.
2. Connect the delivery hose assembly to the liquid valve of the Dura-Cyl HP.
3. Open the fill box door and inspect the quick connect for damage, foreign objects, debris or moisture on the CO<sub>2</sub> fill fitting. Wipe the fitting clean if necessary.
4. Inspect the delivery hose quick connect (Item J). Wipe the fitting clean if necessary.
5. Connect the delivery hose to the fill box (Item 4) and open the liquid fill valve on the Dura-Cyl HP (Item K).
6. CO<sub>2</sub> will begin to flow immediately upon connection. The flow of CO<sub>2</sub> will cease when pressure of the store tank equals the pressure of the delivery vessel. At this point the cylinder is slightly more than half full.
7. Using snoop or soap solution check *all* connections for leaks, including the fittings on the back of the instrument panel. Repair if necessary.
8. Close the liquid valve (Item K) on the Dura-Cyl HP and open the hose drain valve (Item L) on the hose assembly to vent down the Carbo-400E tank.
9. Observe the vessel pressure gauge (Item 41) and drop tank pressure to between 140 and 150 psi.
10. Close the hose drain valve (Item L).
11. Open the liquid valve on the Dura-Cyl HP (Item K) to restart liquid CO<sub>2</sub> flow.
12. Again, the flow of CO<sub>2</sub> will cease when the two unit pressures equalize. Repeat procedures 7 through 10 as often as necessary to get the tank contents to approximately 300 lbs of CO<sub>2</sub> (3/4 full) as shown on the level gauge (Item 22). Do not completely fill the tank during the first fill.
13. The first fill using a MCDU-500 is similar.



# Connecting To The Beverage System X

## General

Running the 3/8" ID red line beverage tubing from the tank to the beverage machine will most likely be done differently at each location. The distance from the CO<sub>2</sub> tank to the beverage machine (Carbonator) is not critical. Typical distances from tank to beverage machine are 5 to 100 feet. By following the basic rules and guidelines outlined in this section, the lines can be run easily and as simply as possible.

1. Run all of the lines such that they are as out-of-the-way as possible.
2. All lines should be secured with cable ties or conduit straps at two to three foot intervals.
3. The lines should be run either horizontally or vertically whenever possible.
4. Never leave loose lines hanging.
5. Cut the lines to the proper length.

## Slab Stores

1. Run the lines up into the false ceiling, over to the beverage machine.

## Basement Stores

1. Run the beverage line overhead alongside of conduit or plumbing, secure with cable ties or conduit straps.

## Beverage Line Hook-up

1. Open the gas use isolation valves (Item 38 and Item 37) on the Bulk CO<sub>2</sub> tank.
2. Press the small push button (Item 42) located below the carbonator pressure gauge until gas flows through the line. Hold it long enough to purge the entire beverage tube.
3. Connect the 3/8" red line beverage tubing to the drink system using the appropriate fitting. (Connect to the "B" side of the A & B switchover valve.) Different systems use different connections, the table below explains the typical options.
4. Press the small push button (Item 42) to pressurize the line. The carbonator gauge should read 90 psi.
5. Adjust final line regulator to 90 psi.
6. Check for leaks on the beverage hook-up.
7. Check for leaks on the CO<sub>2</sub> tank hook-up.
8. Switch the "A-B" switchover to the (B) side.
9. The beverage system is now operating on the Bulk CO<sub>2</sub> System.
10. After five minutes, readjust the gas usage regulator to 90 psi.

Beverage Machine	Connection	Fitting Required
Alco Model 210, 105 or 105R	1/4" M. Flare	1/4" F. Flare x 3/8 Barb
Alco Model 105TCP*	1/4" M. Flare	1/4" F. Flare x 3/8 Barb
Multiplex Model 1200**	1/4" M. Flare	1/4" F. Flare x 3/8 Barb
Multiplex Model 2000**	1/4" M. Flare	1/4" F. Flare x 3/8 Barb
Multiplex Model 72-	3/8" M. Flare	3/8" F. Flare x 3/8 Barb
Multiplex Model 37F	1/4" M. Flare	1/4" F. Flare x 3/8 Barb
Multiplex Model 37***	3/8" M. Flare	3/8" F. Flare x 3/8 Barb

\* Alco model 105 TCP has a bulk CO<sub>2</sub> manifold connection, so early models had an automatic changeover valve which must be removed for the bulk CO<sub>2</sub> systems to operate.

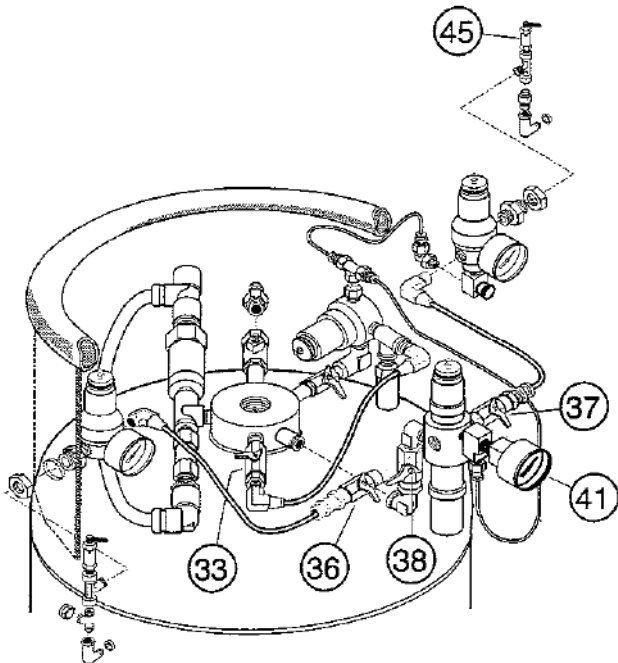
\*\* Do not remove the inverted flare fitting from the A & B switchover valve.

\*\*\* On Multiplex models 37T S/N prefix 8D8 and above the bulk CO<sub>2</sub> tank should be connected to the 3/8" flare connection between the "B" regulator and the switchover valve.

# XI System

## System Inspection

1. Clean up all excess material, tubing, brick, etc.
2. Soap test all joints and connections.
3. Make sure that all the isolation valves (Items 33, 36, 37 and 38) are open. Close the syrup isolation valve (Item 36) if the CIP for Bulk Syrup System is *not* hooked up.
4. Verify that the tank pressure (Item 41) is above 140 psi.
5. Verify gas flow by opening 130 psi relief valve (Item 45) for 10 to 15 seconds.



## Explaining the System

### General

Upon installation completion of the Bulk CO<sub>2</sub> System, it is the installers responsibility to explain the system to the store management. The table of descriptions and functions on pages 18 and 19 as well as the general description and operating concepts on pages 4 and 5 should be explained in detail:

### Guidelines for Bulk CO<sub>2</sub> Start-up

Listed below are suggested guidelines for using up existing CO<sub>2</sub> in high pressure bottles.

1. Do not terminate CO<sub>2</sub> supplier until Bulk CO<sub>2</sub> System has been installed.
2. The Bulk CO<sub>2</sub> System will be hooked into the "B" side of beverage system. The "A" side of beverage system should be hooked up to high pressure CO<sub>2</sub> bottles. This allows left-over high pressure CO<sub>2</sub> cylinders to be used up or kept as an emergency back-up CO<sub>2</sub> source.
3. To use up left-over CO<sub>2</sub> bottles, alternate between using CO<sub>2</sub> bottles and bulk tank every other day by switching "A-B" switchover valve on the beverage machine.

**EXAMPLE:** Monday, move switch to "A" side of drink system, ("A" side is hooked to high pressure CO<sub>2</sub> bottle). Tuesday, move switch to "B" side of drink system, ("B" side is hooked to Bulk CO<sub>2</sub> System).

Follow this switching pattern every day until high pressure CO<sub>2</sub> bottles are used up.



# Warranties XII

## Registration

A Warranty Registration Card must be filled out by the installer at the time of installation and signed by the store representative who is authorized to accept installation. The person signing the warranty cards accepts the installation in its entirety. Any changes, additions and /or modifications to the installation or related components after the warranty card has been signed, will not be the responsibility of MVE. Any changes, additions or modifications to the Bulk CO<sub>2</sub> System components supplied by MVE will not be the responsibility of MVE.

The Warranty Card must be filled out as detailed below:

1. **SERIAL NUMBER:** This is the serial number of the tank which is read from the name plate.
2. **STORE NATIONAL NUMBER:** Each McDonald's store has a distinct and unique national number.
3. **STORE:** The name of the store.
4. **ADDRESS:** The store address must include the street address, city, state and zip code.
5. **TELEPHONE:** The store phone number. (Not the office, regional office, or the distribution center number.)
6. **INSTALLER:** The name of the company who installed the equipment. Do not use the first or last name of person who did the installation unless it is the name of the company.
7. **DATE INSTALLED:** The actual installation date. This date determines the warranty period and must be accurate.
8. **COMMENTS:** Any additional information should be noted here.
9. **INSTALLATION INSPECTED:** The person signing here must be authorized to inspect and accept the installation.

MVE reserves the right to inspect any installation. Any repairs, additions and/or modifications to an installation deemed by MVE to be inconsistent with current standards are to be made at the installer's expense. The installer is responsible for the first fill of 50-100 pounds of CO<sub>2</sub> for the Bulk CO<sub>2</sub> unit.

## Warranty

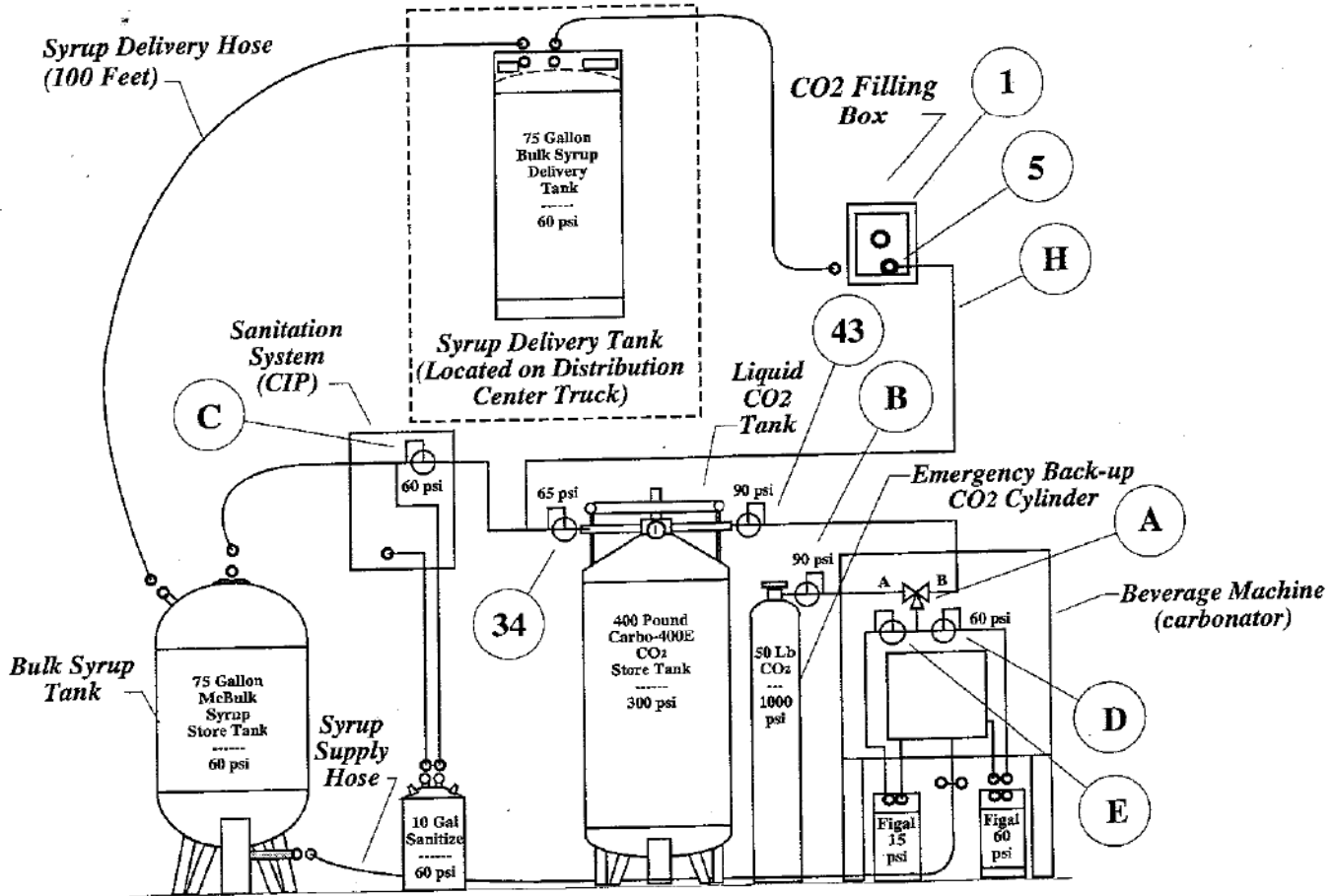
Minnesota Valley Engineering, Inc. (MVE) warrants the McDonald's Carbon Dioxide Storage Tank System (Carbo-400E) to be free from defects in workmanship and materials for one (1) year from date of purchase. MVE also warrants the vacuum for the Carbo-400E system for five (5) years from date of shipment, as established by MVE at time of purchase.

MVE shall, at its option, repair or replace any defective equipment or component within the warranty period, or refund the net purchase price. MVE shall not be liable for damages, secondary cost or expenses, or delays caused by any defective materials or workmanship, or by the failure of any parts due to normal wear and tear, misuse, modification, erosion, corrosion, fire or explosion.

MVE specifically makes no warranties or guarantees, expressed or implied, on equipment used for purposes other than that for which it was intended.

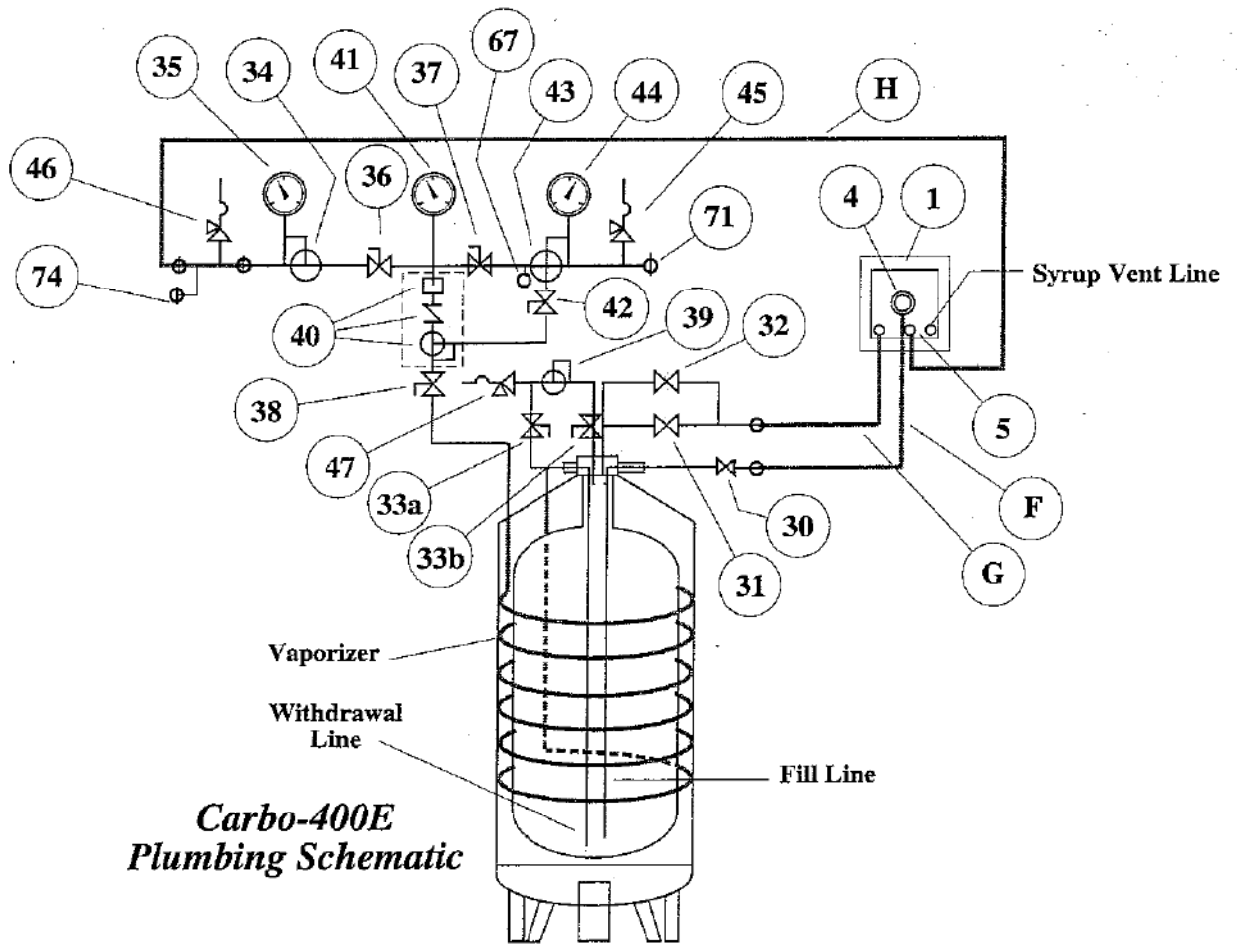
# XIII Schematics

## McDonald's Beverage System Components



Item No.	Description	Function
A	CO <sub>2</sub> "A-B" Switchover Valve	Selects CO <sub>2</sub> from cylinder (A) or bulk (B).
B	High Pressure Regulator (set at 90 psi)	Controls CO <sub>2</sub> pressure from cylinder.
C	Regulator (set at 60 psi)	Controls CO <sub>2</sub> pressure to syrup tank.
D	Regulator (set at 60 psi)	Controls CO <sub>2</sub> pressure to 5 gals.
E	Regulator (set at 15 psi)	Controls CO <sub>2</sub> pressure to Diet Coke
F	CO <sub>2</sub> Fill Line	Connects tank to CO <sub>2</sub> filling box.
G	CO <sub>2</sub> Vent Line	Vents CO <sub>2</sub> gas outside.
H	CO <sub>2</sub> Pressure Line	Pressurizes 2-pin connector.
1	CO <sub>2</sub> Filling Box	Houses the fill connection and vents
4	CO <sub>2</sub> Fill Connector	Liquid CO <sub>2</sub> filling connection.
5	2-Pin Connector	Pressure source for syrup delivery.
30	CO <sub>2</sub> Fill Isolation Valve	Isolates tank pressure to fill box.
31	Relief Valve (450 psi)	Secondary safety relief device.
32	Relief Valve (300 psi)	Prevents tank over-pressurization.

# Schematics XIII

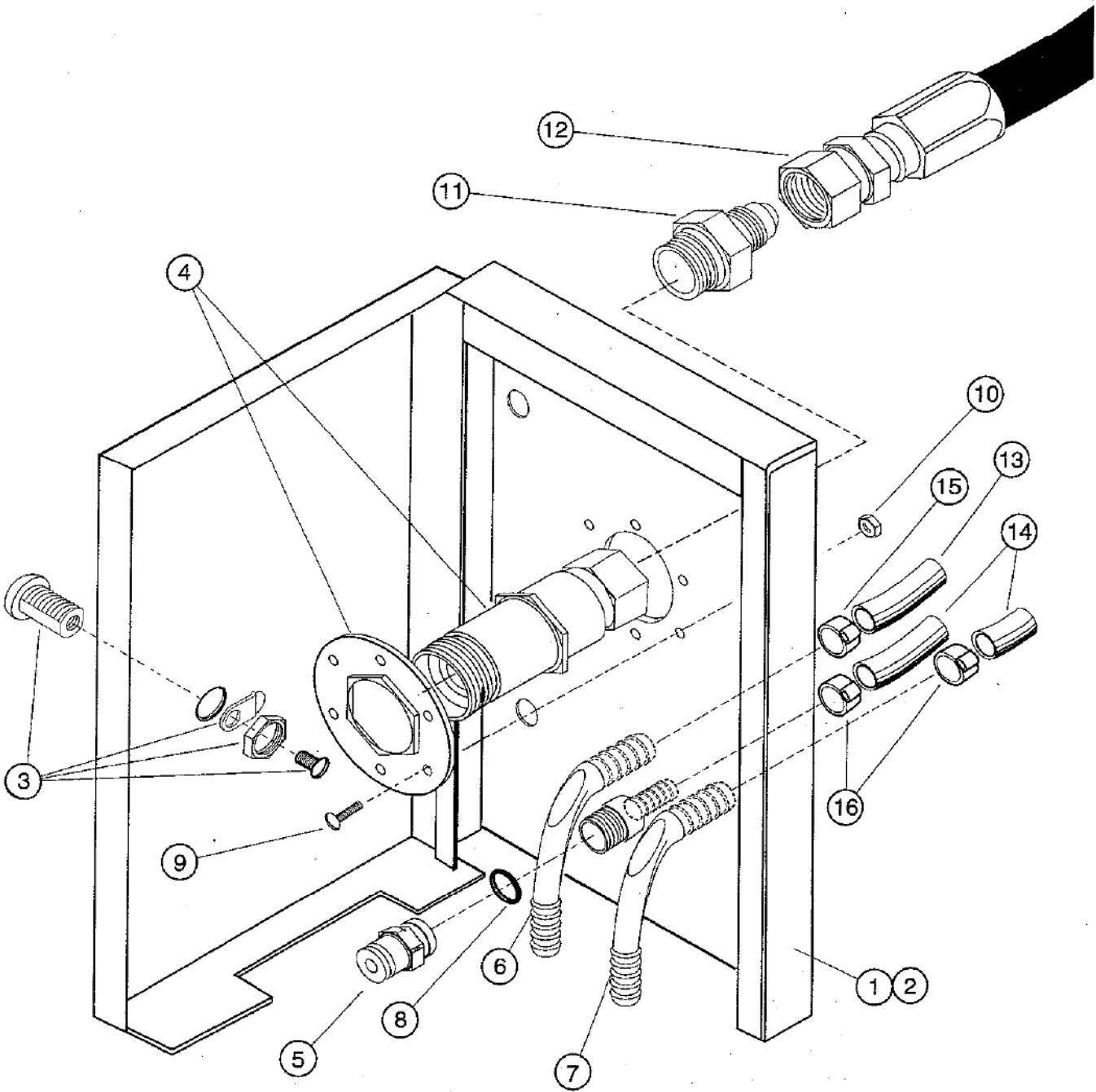


Item No.	Description	Function
33a	Isolation Valve (Pressure Control)	Isolates pressure control regulator (vaporizer side).
33b	Isolation Valve (Pressure Control)	Isolates pressure control regulator (tank side).
34	Regulator (set at 65 psi)	Controls pressure to syrup system.
35	Syrup Pressure Gauge	Displays pressure to syrup system.
36	Isolation Valve (Syrup)	Shuts off CO <sub>2</sub> gas to syrup system.
37	Isolation Valve (Carbonator)	Shuts off CO <sub>2</sub> gas to carbonator.
38	On/Off Valve	Turns all CO <sub>2</sub> gas on/off.
39	Regulator (set at 140 psi)	Controls CO <sub>2</sub> pressure in tank.
40	Combination Filter/Regulator	Shuts off CO <sub>2</sub> in emergencies.
41	Tank Pressure Gauge	Displays pressure in tank.
42	System reset button	Repressurizes CO <sub>2</sub> gas supply lines after shut-down.
43	Regulator (Set at 90 psi)	Controls pressure to carbonator.
44	Carbonator Pressure Gauge	Displays pressure to carbonator.
45	Relief Valve (set at 130 psi)	Protects the carbonator.
46	Relief Valve (set at 75 psi)	Protects the syrup tanks.
47	Relief Valve (set at 350 psi)	Protects isolated components.
67	Reserve Pressure Gauge Connection	Displays pressure in tank.
71	Connector (Carbonator)	Connects CO <sub>2</sub> gas to carbonator.
74	Connector (Syrup)	Connects CO <sub>2</sub> gas to syrup system.

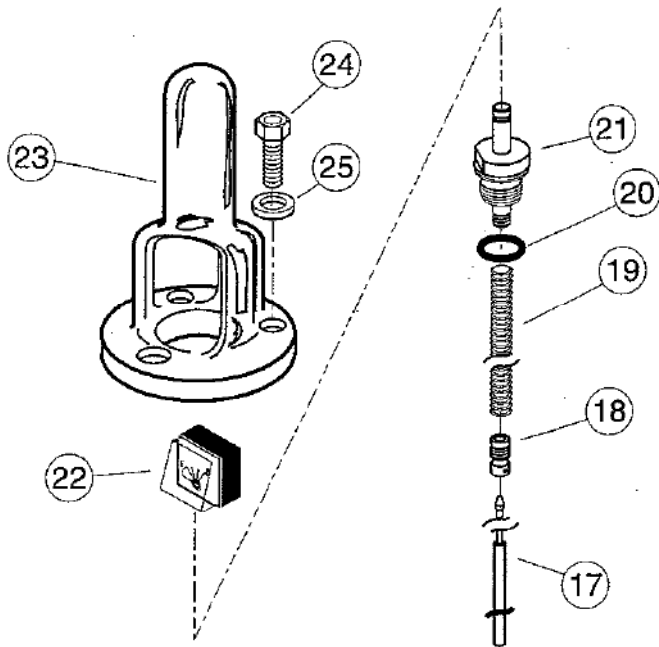
# XIV Parts List

**Carbo-400E**

**Filling Box  
Assembly**



# Parts List XIV



**Carbo-400E**

**Liquid Level  
Gauge**

Item No.	Part No.	Qty.	Description
1	97-2232-9	1	CO <sub>2</sub> Fill Box Assembly
2	85-0671-1	1	Fill Box
3	43-1112-9	1	Lock & Key
4	13-1248-2	1	Fill Connector
5	65-1163-1	1	2-Pin Connector
6	*	1	Vent (CO <sub>2</sub> Tank)
7	*	1	Vent (Syrup Tanks)
8	47-1061-9	1	O-Ring (2-Pin)
9	29-1097-1	7	Machine Screw
10	29-1377-1	7	Nut
11	11-1118-2	1	Connector – 5/8" flare x 3/4" MPT (Brass)
12	37-1109-7	1	CO <sub>2</sub> Fill Hose Assembly
13	**	1	Hose – 3/8" ID
14	**	2	Hose – 1/4" ID
15	**	1	Clamp – 3/8" ID
16	**	2	Clamp – 1/4" ID
17	90-9411-9	1	Level Gauge Float
18	54-1101-2	1	Adjusting Collar
19	54-1102-9	1	Spring
20	23-0002-9	1	O-Ring (Sight gauge)
21	54-1099-2	1	Level Gauge Plug
22	20-1348-9	1	Level Gauge
23	54-1148-6	1	Level Gauge Protector
24	29-1050-1	3	Hex-Head Machine Screw – 1/4"- 20 x 5/8" Lg.
25	37-1109-7	3	Flat Washer – 1/4"

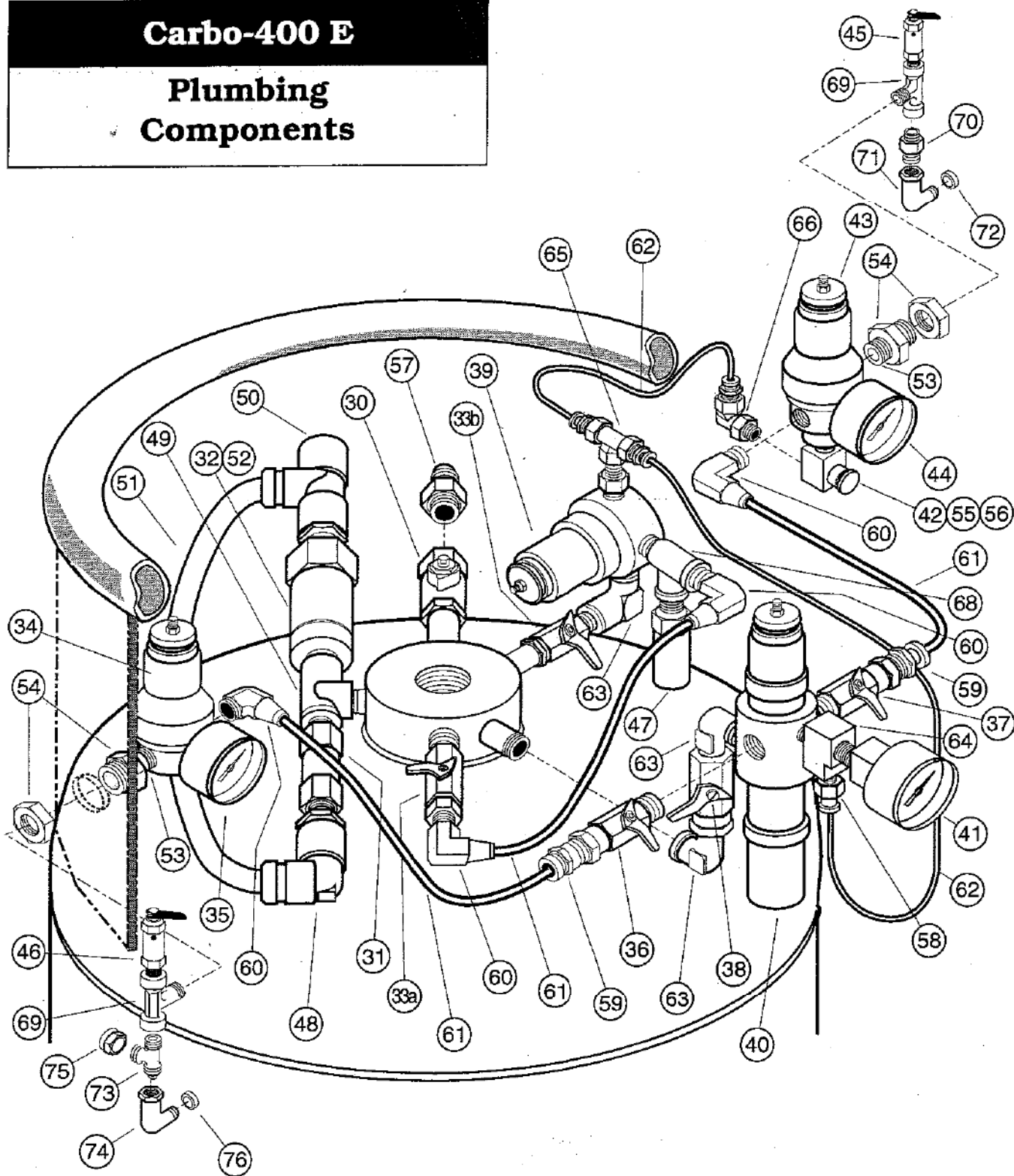
\* Part of Item 2

\*\* Installer Supplied

# XIV Parts List

## Carbo-400 E

### Plumbing Components



# Parts List XIV

Item No.	Part No.	Qty.	Description
30	17-1461-1	1	CO <sub>2</sub> Fill Valve
31	18-1206-2	1	Relief Valve - 450 psi
32	18-1125-2	1	Relief Valve - 300 psi
33a	17-1616-2	1	Isolation Valve Pressure Control 1/4" MPT x 1/4" FPT
33b	17-1616-2	1	Isolation Valve Pressure Control 1/4" MPT x 1/4" FPT
34	21-1161-5	1	Regulator (Syrup) - 1/4" FPT (set @ 65 psi)
35	20-1246-9	1	Pressure Gauge - 1/8" MPT, 1-1/2" Dial (0-160 psi)
36	17-1616-2	1	Isolation Valve (Syrup) - 1/4" MPT x 1/4" FPT
37	17-1616-2	1	Isolation Valve - Carbonator
38	17-1616-2	1	ON/OFF Valve (Gas) - 1/4" MPT x 1/4" FPT
39	18-1228-9	1	Pressure Control Economizer Regulator - 1/4" FPT (set @ 140 psi)
40	18-1231-9	1	Shut Down Regulator w/Check Valve & Filter
41	20-1394-9	1	Pressure Gauge - 1/8" MPT, 2" Dial (0-400 psi)
42	17-1788-9	1	Reset Valve - Push Button
43	21-1162-5	1	Regulator (Carbonator) - 1/4" FPT (set @ 65 psi)
44	20-1246-9	1	Pressure Gauge - 1/8" MPT, 2" Dial (0-160 psi)
45	18-1235-2	1	Relief Valve - 130 psi
46	18-1234-2	1	Relief Valve - 75 psi
47	18-1087-2	1	Relief Valve - 350 psi
48	10486454	1	Elbow - Plastic 90°, 3/8" MPT x 1/2" Tube
49	12-135-92	1	Tee - 1/2" X 1/2" X 1/4"
50	10486462	1	Tee - Plastic 1/2" OD x 1/2" MPT x 1/2" OD
51	28-1172-6	1	White Nylon Tubing - 1/2"
52	16-1159-2	1	Pipe Away Adapter - 3/8" FPT
53	13-1184-2	2	Nipple - 1/4" Close x 7/8" LG. (Brass)
54	10-1336-2	2	Anchor Connector - 1/4" FPT x 3/4" - 16 NPT (Brass)
55	17-1789-9	1	Brass Button - 3/16" Dia. Stem
56	13-1199-2	1	Nipple - Brass 1/8" Close
57	11-1011-2	1	Fill Connector - Male
58	10-1367-2	1	Connector - 1/8" OD x 1/8" MPT with Orifice (Brass)
59	10-1332-2	2	Connector - 1/4" OD x 1/4" MPT (Brass)
60	10586666	4	Elbow - 90° 1/4" OD X 1/4" MPT (Brass)
61	28-1183-6	3	Black Nylon Tubing - 1/4" OD
62	28-1134-6	2	Black Nylon Tubing - 1/8"
63	12-1046-2	3	Street Elbow - 90°, 250 MPT
64	12-1345-2	1	Street Tee - 1/8" Brass
65	12-1334-2	1	Tee - 1/8" Male Run Swivel for Poly Tube (Brass)
66	10-1342-2	1	Elbow - 1/8" MPT x 1/8" OD (Brass)
68	12-1307-2	1	Street Tee - 1/4" NPT
69	12-1309-2	2	Tee - 1/4" Branch
70	11-1150-2	1	Connector 1/4" MPT x 1/4" Flare
71	16-1182-1	1	Elbow - 90°, 3/8" Hose x 1/4" Flare
72	34-1133-1	5	Clamp - 3/8" ID Tube
73	11-1151-2	1	Tee - 1/4" Flare x 1/4" Flare x 1/4" MPT
74	16-1146-1	1	Elbow - 90°, 1/4" Hose x 1/4" Flare
75	11-1129-2	1	Cap Nut - 1/4", 45° Flare
76	34-1151-1	1	Clamp - 1/4" ID Tube



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