



BATCH CARBONATOR BC-1

Operator's Manual



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This document contains the original instructions for the unit described.

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Correct Disposal of this Product



RECYCLE

This marking indicates that this product should not be disposed with other household wastes throughout the EU. To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmental safe recycling.

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SAFETY INSTRUCTIONS

READ AND FOLLOW ALL SAFETY INSTRUCTIONS

Safety Overview

- Read and follow **ALL SAFETY INSTRUCTIONS** in this manual and any warning/caution labels on the unit (decals, labels or laminated cards).
- Read and understand ALL applicable OSHA (Occupational Safety and Health Administration) safety regulations and/or national and local codes before operating this unit.

Recognition

Recognize Safety Alerts



This is the safety alert symbol. When you see it in this manual or on the unit, be alert to the potential of personal injury or damage to the unit.

Different Types of Alerts



DANGER:

Indicates an immediate hazardous situation which, if not avoided, **WILL** result in serious injury, death or equipment damage.



WARNING:

Indicates a potentially hazardous situation which, if not avoided, **COULD** result in serious injury, death, or equipment damage.



CAUTION:

Indicates a potentially hazardous situation which, if not avoided, **MAY** result in minor or moderate injury or equipment damage.

SAFETY TIPS

- Carefully read and follow all safety messages in this manual and safety signs on the unit.
- Keep safety signs in good condition and replace missing or damaged items.
- Learn how to operate the unit and how to use the controls properly.

- **Do not** let anyone operate the unit without proper training. This appliance is **not** intended for use by very young children or infirm persons without supervision. Young children should be supervised to ensure that they do not play with the appliance.
- Keep your unit in proper working condition and do not allow unauthorized modifications to the unit.

QUALIFIED SERVICE PERSONNEL



WARNING:

Only trained and certified electrical, plumbing and refrigeration technicians should service this unit. **ALL WIRING AND PLUMBING MUST CONFORM TO NATIONAL AND LOCAL CODES. FAILURE TO COMPLY COULD RESULT IN SERIOUS INJURY, DEATH OR EQUIPMENT DAMAGE.**

SAFETY PRECAUTIONS

This unit has been specifically designed to provide protection against personal injury. To ensure continued protection, observe the following:



WARNING:

Disconnect power to the unit before servicing following all lock out/tag out procedures established by the user. Verify all of the power is off to the unit before any work is performed.

Failure to disconnect the power could result in serious injury, death or equipment damage.



CAUTION:

Always be sure to keep area around the unit clean and free of clutter. Failure to keep this area clean may result in injury or equipment damage.

SHIPPING AND STORAGE



CAUTION:

Before shipping, storing, or relocating the unit, the unit must be sanitized and all sanitizing solution must be drained from the system. A freezing ambient

environment will cause residual sanitizing solution or water remaining inside the unit to freeze resulting in damage to internal components.

CO₂ (CARBON DIOXIDE) WARNING



DANGER:

CO₂ displaces oxygen. Strict attention **MUST** be observed in the prevention of CO₂ gas leaks in the entire CO₂ and soft drink system. If a CO₂ gas leak is suspected, particularly in a small area, **IMMEDIATELY** ventilate the contaminated area before attempting to repair the leak. Personnel exposed to high concentrations of CO₂ gas experience tremors which are followed rapidly by loss of consciousness and **DEATH**.

UNIT LOCATION



CAUTION:

Appliance is not suitable for installation in an area where a water jet could be used.



CAUTION:

The appliance must be placed in a horizontal position.



CAUTION:

This unit is not designed for use in outdoor locations.

POWER CORD



CAUTION:

If the power cord is damaged, it must be replaced by a special cord available from the manufacturer or its service agent.

SOUND LEVELS



CAUTION:

The A-weighted sound pressure level has been determined to be below 70 dBA.

MACHINE USAGE

**CAUTION:**

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

**CAUTION:**

Children should be supervised to ensure that they do not play with the appliance.

**CAUTION:**

This appliance is intended to be used in commercial applications.

UNIT CLEANING

**CAUTION:**

This unit must not be cleaned by using a water jet.

GROUNDING INSTRUCTIONS

**CAUTION:**

This appliance must be grounded. In the event of malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This appliance is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

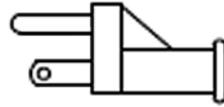
**DANGER:**

Improper connection of the equipment-grounding conductor can result in a risk of electric shock. The conductor with green insulation with or without yellow stripes is the equipment grounding conductor. If repair or replacement of the cord or plug is necessary, do not connect the equipment grounding conductor to a live terminal. If in doubt whether the appliance is properly grounded, check with a qualified electrician or serviceman. Do not modify the plug provided with the appliance - if it will not fit the outlet, have a proper outlet installed by a qualified electrician.

**CAUTION:**

This appliance is for use on electrical circuits, as shown in Table 1, and has a grounding plug that looks like the plug illustrated in Figure 1.

A qualified electrician should be consulted if there is any doubt about the outlet box being properly grounded.



3-Prong Plug *

* Example of grounded North American plug.

Figure 1.

SYSTEM OVERVIEW

The Batch Carbonation Unit is a state-of-the-art beverage carbonating machine. It provides on-demand carbonation (single drink) for a wide range of products in a reliable and compact design. The unit is designed to be used with a remote bulk CO₂ supply.

The unit provides the highest quality drink appearance and consistency, while keeping operation and maintenance simple and straightforward. It is designed to sit on a table or countertop and does not require any mounting to the table.

The unit consists of a sealed vessel that is pressurized with CO₂, coupled through a self-lubricating set of bearings and driven by a dc electric motor. Intelligent controls allow the user to set multiple carbonation levels.

FEATURES

- Adjustable carbonation levels
- Durable, robust design
- Easy to use
- Door interlock and rapid stop button
- Programmable via USB port

SPECIFICATIONS

Table 1.

Capacity	17.75 fl. oz. (0.52 liters)
CO ₂ Input Connection	1/4 in. quick connect
CO ₂ Vent Connection	1/4 in. quick connect
CO ₂ Pressure at Unit	Max: 100 psi (0.69 MPa)
Operational Voltage	100 V, 115 V, 220-240 V 50/60 Hz
Height	19.1 in. (485 mm)
Depth	14.1 in. (358 mm)
Width	11.5 in. (292 mm)
Weight (unit)	39 lbs. (17.7 kg)
Ambient Operating Temperature	40° F to 100° F (4.4° C to 37.8° C)

CONTROL PANEL OVERVIEW

The following section describes the components on the control panel and their functions:

The Batch Carbonation Unit user interface is a very simple design. It consists of a 2 x 16 character LCD display, an analog CO₂ pressure gauge and the Stop/Start selector knob. This interface allows the operator to control and program the unit. Troubleshooting information for the unit is available on the LCD display. The knob gives a clear, visual color indication of unit status.

The selector knob is located on the top-right side of the unit as shown in Figure 2.

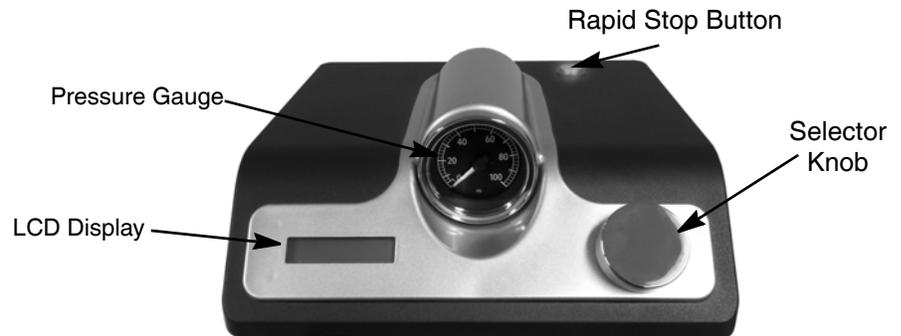


Figure 2.

Selector Knob

The rotary knob located around the Stop/Start push button is turned to select different menu options and is momentarily depressed to make user selections. The knob has a halo that displays different colors, depending on the status of the unit.

Power On/Off Switch

This switch is located on the back of the unit and turns power off to the entire unit. See Figure 4 for the location of the switch.

Rapid Stop Button

This button is located on the top right of the unit (see Figure 2). Press this switch to immediately stop a cycle. All unit activity stops and the system returns to its normal state. This includes venting the internal pressure in the vessel and unit. The switch latches in the down position, press the button again to return it to the up position and restore power to the unit.

NORMAL OPERATION

When the unit is powered up, the user interface display shows “STARBUCKS” on the first line and “CARBONATION” on the second line. After two seconds, line one reads “READY” and line two reads “GRANDE”.

Grande is the default drink setting for the unit when it is powered up. Rotate the selector knob to the desired setting. The “halo” around the selector knob is white when the unit is in the ready and drink complete states. Refer to Table 4 for the detailed procedure for making a drink.

When the cycle starts, the selector knob halo turns green and remains green until the cycle is complete. The asterisks on the second line of the display count down the remaining cycle time. The shake time of the unit varies by setting, followed by a vent cycle of 10 to 14 seconds.

When the pressure in the vessel drops below 6 PSI (0.041 MPa), line one of the display reads “DRINK COMPLETE”.

If there are no selection knob actions (press or rotate) for one hour, the unit goes into standby mode. The display and the selection knob halo both shut off to conserve energy. Pressing the selection knob or rotating it wakes up the unit.

Warning, Error or Alarm

If there is a warning, error or alarm, the selector knob halo turns red and the issue code is displayed on the second line of the display. Refer to the “Error Codes” section on page 21 for information.

Table 2 shows the possible warnings, errors and alarms.

Table 2.

Priority	Description	LCD Display
1	SELF CHECK ERROR	01: CPU ERROR
2	STUCK PUSH BUTTON ERROR	02: STUCK KEY
3	PRESSURE SENSOR ERROR	03: PRESS SENSOR
4	LOW VOLTAGE WARNING	04: 24 VDC LOW
5	PRESSURE VENTING ERROR	05: VENT ERROR
6	MOTOR ERROR	06: MOTOR ERROR
7	CO2 PRESSURE OUT ALARM	07: CO2 OUT
8	CO2 PRESSURE LOW ALARM	08: CO2 LOW
9	MOTOR STALL ALARM	09: MOTOR STALL
10	NO MOTOR ALARM	10: NO MOTOR
11	PRESSURE LEAK ALARM	11: PRESS LEAK
12	DOOR OPEN ERROR	11: DOOR OPEN

Stopping the Cycle

Pressing the selector knob during a drink cycle ends the cycle immediately. Line one displays "PLEASE WAIT" while the unit vents the CO₂ pressure. The second line displays the countdown asterisks. The unit returns to ready mode and the door unlocks after the system pressure falls below 6 PSI (0.041 MPa). Press the selector knob again to restart the cycle.

PROGRAM SETTINGS

The Batch Carbonation unit may be placed in Menu Selection Mode using the interface on the front panel of the unit.

The menu selection mode is used to access data on the unit, program CO₂ levels, provide service tests and retrieve cycle counts.

If the Start/Stop switch is not pressed or rotated for 30 seconds, the unit returns to operating mode and any changes made will not be saved. On menu selection mode exit, any changes made and not saved by the operator are discarded.

Using the User Interface

Press and hold the selector knob for 5 seconds. This places the unit into Menu Selection Mode. When the screen shown in Figure 3 appears, release the selection knob. Menu Selection Mode allows the operator to select from a list of menus. The list is shown in Table 3.

Rotating the selector knob clockwise cycles through the list from top to bottom, while rotating it counterclockwise cycles through the list from bottom to top.

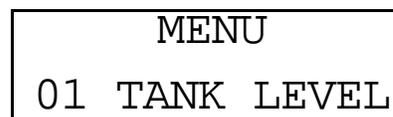


Figure 3.

Table 3.

Menu Screen Selections
01 TANK LEVEL
02 VERSION
03 DRINK COUNTS
04 ERROR LOG
05 SERVICE MODE
06 EXIT



LINE PRESSURE TESTING

01 Tank Level

Pressing the push button while "01 TANK CHECK" is displayed enters the tank level check. The top line of the LCD displays "MENU-CO2" and the second line displays either "TANK CHECK GO" or "TANK CHECK EXIT?". Default "GO" is flashing. Push the button again and the second line of the display shows the actual line pressure. Rotating the knob cycles between "TANK CHECK GO" and "TANK CHECK EXIT?". Pressing the push button while "TANK CHECK EXIT?" is displayed returns the user to the Menu Mode screen.

02 Version

Pressing the push button while "02 VERSION" is displayed enters the software revision check. The first line of the LCD displays "FW VERSION" and the second line displays the software revision. Pressing the push button again returns the user to the Menu Mode screen.

03 Drink Counts

Pressing the push button while "03 DRINK COUNTS" is displayed enters the drink counts check. The top line of the LCD displays "MENU-DRINK CNTS". The second line displays the number of drinks run by level setting and total drink counts. Turning the knob cycles through the different level settings, total drinks and exit. Pressing the Selector Knob while "DRINK COUNTS EXIT" is displayed returns to the Menu Mode screen.

04 Error Log

Pressing the push button while "04 ERROR LOG" is displayed enters the error log. The top line of the LCD displays "ERROR LOG". The second line displays a number 1 and an error/alarm/warning code. Rotate the Selector Knob to cycle through the five most recent error/alarm/warning codes and exit. (One is the most recent and five is the oldest error.) The second line of each error code flashes between the error/alarm/warning code and the drink count at the time the error occurred. If an error/alarm/warning occurs multiple times in a row, it is only recorded in the log once.

05 Service Mode

The Service Mode is only available to service technicians.



06 Exit

Returns the unit to normal operating mode.

OPERATION

INITIAL STARTUP

Connecting Power

Plug in the power cord to the appropriate outlet and the back of the unit. Make certain that the Rapid Stop button is in the up position, then turn on the power switch at the rear of the unit, shown in Figure 4. ("0" is off and "1" is on.)

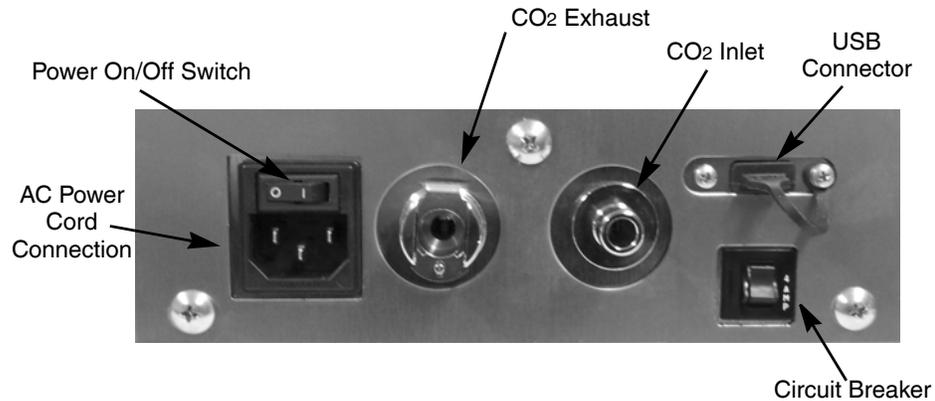


Figure 4.

Connecting CO₂

Make sure the CO₂ input and output connectors are properly connected to the connections on the rear of the unit, as shown in Figure 4.

Pre-Cleaning and Sanitation

Before using the unit for drink preparation, the mixing vessel and anti-foaming gasket must be washed and sanitized. The vessel and gasket are dishwasher safe. If hand washing, use a dish washing detergent and thoroughly wash the gasket and the inside/outside of the vessel. Rinse and dry the vessel and gasket.

The vessel and gasket must be sanitized. Mix a solution of approved chlorine sanitizer (Kay-5 sanitizer or equivalent) according to manufacturers instructions. Sanitize the gasket and mixing vessel thoroughly (inside and out) and let them air dry before use.

⚠ CAUTION:
DO NOT spray the unit.

Preparing a Drink

To prepare a drink, perform the procedure in Table 4.

Table 4.

Step	Action
1	Pour the drink contents into the mixing vessel and place the anti-foaming gasket over the vessel. Make sure the seal flange is securely down on the vessel.
2	Open the door and unlock the clamp latch. (See Figure 5.)
3	Open the clamp, slide the mixing vessel under the lid and push it toward the unit.
4	Close the clamp and latch it completely.
5	Close the door.
6	Rotate the Selector Knob, to the setting for the drink being carbonated. Verify the selection by observing the LCD display. (See Figure 2 on page 7.)
7	Press the Selector Knob to start the cycle. The color of the halo changes from white to green and the door locks. The LCD display shows the status of the drink preparation, as shown in Figure 6.
8	The cycle is complete after the mixing vessel is depressurized. The halo changes color from green to white and the door unlocks. The LCD display shows the drink complete, as shown in Figure 7.
9	Remove the mixing vessel by opening the door, the clamp handle and opening the clamp.
10	Wipe down the bottom of the pressure lid after removing the mixing vessel.
11	Pour the finished drink into the appropriate container.
12	Clean the mixing vessel and anti-foaming gasket before reuse.

NOTE: To stop the unit during the carbonation cycle, press the selector knob on the control panel. This stops the unit. To restart the unit, press the selector knob again to restart the cycle.



Figure 5.



Figure 6.



Figure 7.

DAILY MAINTENANCE

NOTE: Only use products approved by Starbucks and Cornelius in the batch carbonator. Failure to do so can result in degradation of unit performance or render the unit inoperable.

Cleaning Procedures

The following procedures should be followed only when using approved products. If other products are used, alternate cleaning procedures may be required.

Vessel, Lid, and Clamping Mechanism Cleaning Procedure

Follow steaming pitcher cleaning guidelines found in the “Sanitizing Food Contact Surfaces” section in the SCEMM for the vessel and vessel lid.

Perform these cleaning procedures at the following frequencies:

- Clean and rinse the vessel and vessel lid after each use.
- Wipe down the clamping mechanism as needed just like the espresso steaming wand
- Wash, rinse, and sanitize the vessel and lid every 2 hours

Materials required:

- ClickSan™ Disinfectant/Sanitizer solution or KAY-5® Sanitizer
- Wiping cloth
- SUPRA™ machine warewash detergent for dishmachine washing or QSR heavy duty multi-purpose sink detergent for manual warewashing using the three compartment sink.

Perform the procedure in Table 5 to clean and sanitize the clamping unit as needed.

Table 5.

Step	Action
1	Thoroughly wipe down the inside of the clamping mechanism and the bottom of the lid as needed using a wiping cloth saturated in sanitizer. See Figure 8.



Figure 8.

Batch Carbonator Cleaning Procedure

During normal operation of the unit, some spillage may occur in and around the unit. Perform the procedure in Table 6 to clean and sanitize the unit on a daily basis.

Materials Required:

- ClickSan™ Disinfectant/Sanitizer solution or KAY-5® Sanitizer
- Wiping Cloth
- Pump Cleaning Brushes
- SUPRA™ machine warewash detergent for dishmachine washing or QSR heavy duty multi-purpose sink detergent for manual warewashing using the three compartment sink.

Table 6.

Step	Action
1	Open the door and thoroughly wipe down the entire inside cavity with a wiping cloth saturated in sanitizer.
2	Use a wiping cloth and the pump cleaning brushes to clean the clamping mechanism, paying special attention to the back area. Slide the flexible pump cleaning brush up into the back area. (See Figure 9.)
3	Remove the drip tray and clean the exposed area underneath. Clean the tray in a dishmachine or a 3 compartment sink. (See Figure 10.)
4	Wipe down all visible surfaces on the machine. If necessary, use heavy duty multi-purpose sink detergent for cleaning tough stains. (See Figure 11.) NOTE: Wring out the wiping cloth so it is barely damp when cleaning the button, the back of the machine, and any other area that could be damaged by water entry.

Table 6.

Step	Action
5	Wipe the underside of the machine. Slide the machine over to clean the counter and wall underneath and behind it. (See Figure 12.) NOTE: You may have to turn the unit off, unplug the power cord, and remove the CO2 connections to be able to slide the machine. When complete, make sure to re-attach the power cord and CO2 connections to the machine.

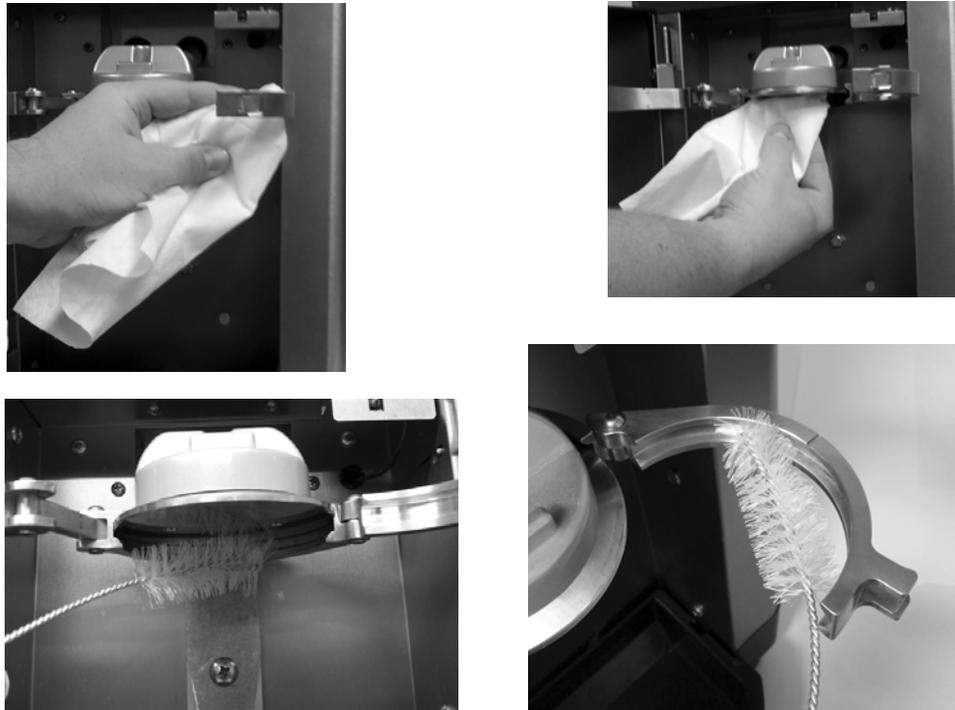


Figure 9.



Figure 10.



Figure 11.



Figure 12.

WEEKLY MAINTENANCE

Materials required:

- ClickSan™ Disinfectant/Sanitizer solution or KAY-5® Sanitizer
- Warm water
- Water Squeeze Bottle
- Sanitizer Squeeze Bottle
- Pump Cleaning Brush

Flush and sanitize the exhaust line, as shown in Table 7. This procedure should take from two to five minutes:

Table 7.

Step	Action
1	Turn off the unit and unplug the power cord and CO ₂ connections from the machine.
2	Fill the supplied "Sanitizer" squeeze bottle with sanitizer solution.
3	Fill the supplied "Water" squeeze bottle with a warm water.

Table 7.

Step	Action
4	Insert the tip of the squeeze bottle part way into the CO ₂ exhaust fitting and squeeze firmly as shown in Figure 13. Use caution, as a majority of the water will come back out of the CO ₂ exhaust fitting. Some liquid should reach the drip tray.
5	Slowly insert the wider end of the pump cleaning brush into the exhaust port in the lid as shown in Figure 14. Feed brush as far into the exhaust line as it will go and then pull it back out, as shown in Figure 15.
6	Repeat Step 4.
7	Insert the tip of the sanitizer squeeze bottle part way into the CO ₂ exhaust fitting and squeeze firmly as shown in Figure 13. Use caution as a majority of the sanitizer will come back out of the CO ₂ exhaust fitting. Some liquid should reach the drip tray.
8	Leave the door open and allow the unit to air dry.



Figure 13.

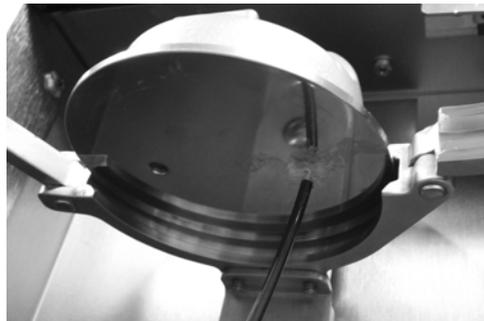


Figure 14.

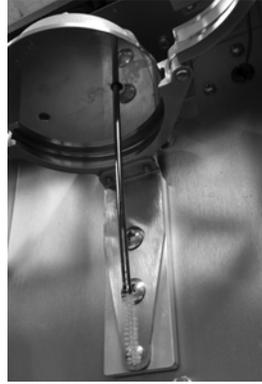


Figure 15.

TROUBLESHOOTING

TROUBLESHOOTING

Table 8 describes some of the possible symptoms and solutions for troubleshooting the unit.

Table 8.

Symptom	Probable Cause	Solution
No activity at all	<ul style="list-style-type: none"> A. Rapid Stop button off position (depressed). B. Power switch in off position. C. Power cord not plugged into unit. D. Power cord not plugged into outlet. E. Unit circuit breaker tripped. F. GFI outlet tripped. G. Circuit breaker tripped. 	<ul style="list-style-type: none"> A. Press Rapid Stop button. B. Turn power switch to on position. C. Plug into unit. D. Plug into outlet. E. If white paint is exposed push button back in to reset circuit breaker F. Press reset on outlet. G. Check that the fuse is good and the breaker is in the "ON" position.
If none of the above solutions fix the unit, call service.		
Carbonation level too low	<ul style="list-style-type: none"> A. Vessel filled above capacity. B. Beverage ingredient temperature too high. 	<ul style="list-style-type: none"> A. Fill vessel below maximum capacity, 17.75 fl. oz. B. Refrigerate ingredients.
If none of the above solutions fix the unit, call service.		
Can't open door	<ul style="list-style-type: none"> A. Carbonation cycle is running. B. Door latch in locked position. 	<ul style="list-style-type: none"> A. Normal operation, wait for cycle to complete. B. Cycle power via power switch on rear of unit.
If none of the above solutions fix the unit, call service.		
Shaker mechanism won't run	<ul style="list-style-type: none"> A. Door open. 	<ul style="list-style-type: none"> A. Close door.
If the above solution doesn't fix the unit, call service.		
Nothing displayed on LCD	<ul style="list-style-type: none"> A. Unit in standby mode. 	<ul style="list-style-type: none"> A. Rotate dial to "wake" the unit up.
Dial not changing settings on LCD display	Call service.	
Drink cycle not completed	Call service.	

ERROR CODES

Table 9.

LCD Displays	Condition Description	Action
"01: CPU ERROR"	Self check error occurs when microprocessor fails its self check.	Cycle power via the power switch. If problem persists, call service.
"02: STUCK KEY"	Stuck Selector knob error occurs when the Selector knob senses being pressed continuously for more than 10 seconds.	Cycle power via the power switch. If problem persists, call service.
"03: PRESS SENSOR"	Pressure sensor failure error occurs when PCBA is not receiving a signal back from the pressure sensor.	Call service.
"04: 24VDC LOW"	Low voltage warning occurs when the power supply voltage is less than 18V for more than 5 seconds.	Call service.
"05: VENT ERROR"	Pressure venting error occurs if the pressure transducer reads 6 PSI (0.041 MPa) or more 30 seconds after a venting cycle should have been completed.	Cycle power via the power switch. Attempt to rerun drink cycle. If problem persists, call service.
"06: MOTOR ERROR"	Motor error occurs when the PCB receives a signal that the motor is running when the unit is in a state where the motor shows that it is not running.	A. Cycle power via the power switch. Attempt to re-run drink cycle. If problem persists, call service.
"07: CO2 OUT"	CO2 sold out warning occurs when CO2 line pressure not high enough to make the lowest programmed carbonation level.	A. CO2 supply tank pressure is too low, replace CO2 supply tank. B. CO2 tank regulator set incorrectly. Change to 100±1 PSIG if primary tank gage reads above 100 PSI. C. If none of the above turns off alarm, call service.
"08: CO2 LOW"	CO2 low alarm occurs when CO2 supply line pressure was not high enough to make selected carbonation level.	A. CO2 supply tank is getting low. Press push button to continue making drink. (May result in drink out of spec). Replace CO2 supply tank. B. CO2 tank regulator set incorrectly. Change to 100±1 PSIG if primary tank gage reads above 100 PSI. C. If none of the above turns off alarm, call service.
"09: MOTOR STALL"	Motor stall error occurs if the motor draws an over-current for more than 5 seconds.	A. Cycle power via the power switch. Attempt to re-run drink cycle. If problem persists, call service.
"10: NO MOTOR"	No motor error occurs when no motor current is sensed when the motor is turned on.	B. Cycle power via the power switch. Attempt to re-run drink cycle. If problem persists, call service.

Table 9.

LCD Displays	Condition Description	Action
"11: PRESS LEAK"	Pressure leak alarm occurs when internal pressure doesn't increase at the expected rate when the inlet valve is open.	<ul style="list-style-type: none"> A. Vessel/Seal not installed properly, reinstall vessel and seal and attempt drink again. B. Cut/Tear in seal. Inspect seal for cuts or tears. Replace seal if ripped or torn. C. Dent or scratch in vessel flange. Inspect top of vessel flange for dents or scratches. Replace vessel if scratched or dented. D. If none of the above turns off alarm, call service
"12: DOOR OPEN"	Door open error occurs when door micro-switch does not sense door is closed.	<ul style="list-style-type: none"> A. Door is open, close door. B. If alarm remains on, call service.

CO₂ FLOW DIAGRAM

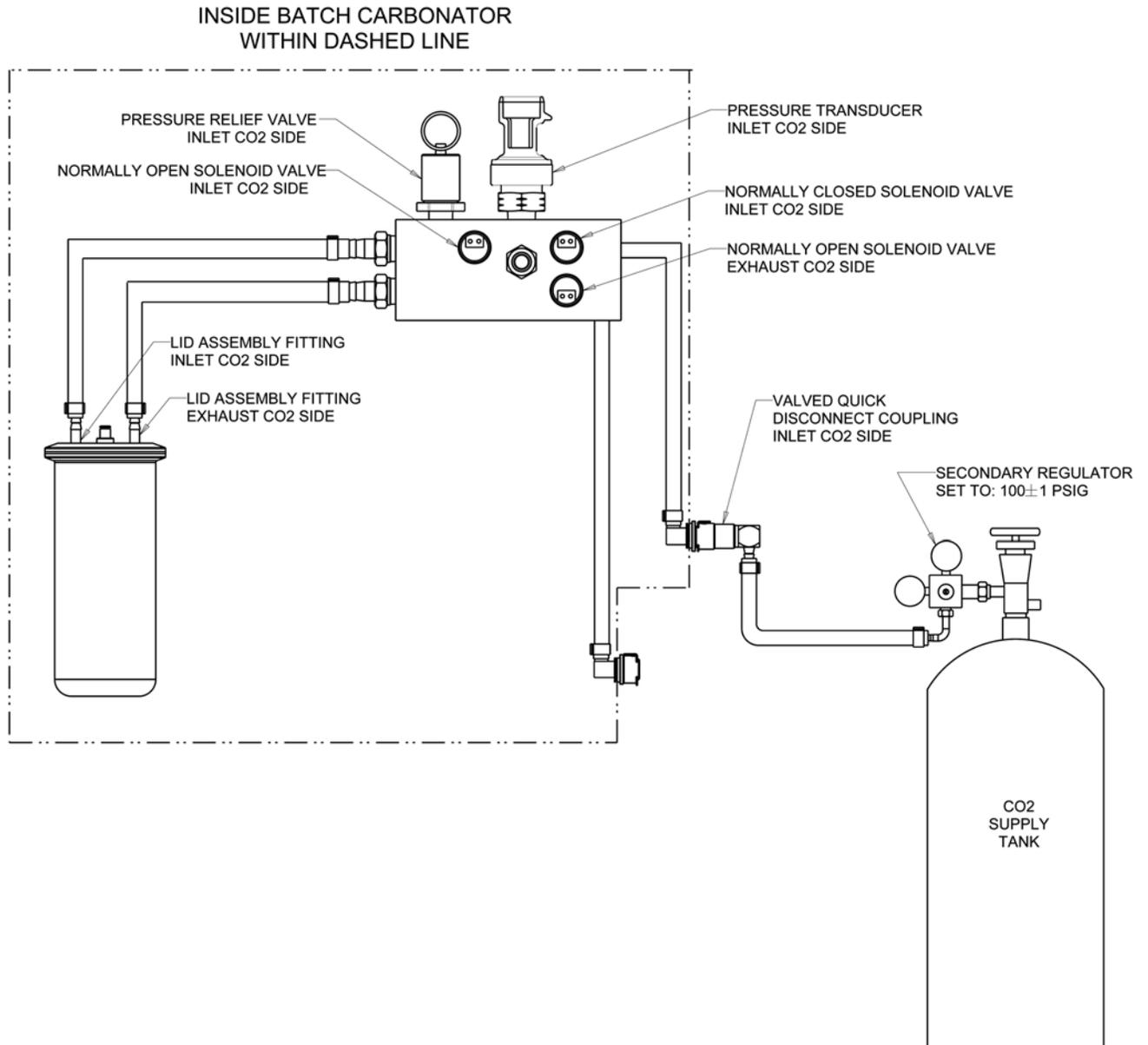


Figure 16.



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