

Bravo



Troubleshooting Guide

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Bravo Alarm Code by Alarm Indication

Alarm Indication	Code	Alarm Description
ATM1 Timeout	A251	1 st rise to ambient pressure not reached within timeout
ATM2 Timeout	A254	2nd rise to ambient pressure not reached within timeout
ATM3 Timeout	A257	3rd rise to ambient pressure not reached within timeout
Black-Out	E000	Blackout (loss of power)
Door Locked	E021	Exceeded timeout for activating door locking system (opening)
Door Open	E010	Door open
Door Unlocked	E020	Exceeded timeout for activating door locking system (closing)
Exhaust Max	E031	Water in the drain tank at maximum (Max) level
Filling Problem	A040	Failure to fill the clear water tank (automatic filling)
Filling Problem	E041	Filling the tank to frequently or external water source out of water (automatic filling)
Heating Problem	A200	Pre-heating not performed within the timeout (sterilization chamber heating problem)
Level Problem	A032	Sensor-level problem
Locking Problem	A022	System door lock microswitches failed (Off-Off)
Locking Problem	A023	System door lock microswitches failed (On-On)
Locking Problem	A024	System door lock microswitches failed (On-Off)
Manual Stop	E999	Manual cycle interruption
MPX Broken	H150	MPX pressure sensor broken
MPX Shout Circuit	H160	MPX pressure sensor short-circuited/not connected
Overheating PT1	H991	Overheating (sterilization chamber PT1)
Overheating PT2	H992	Overheating (steam generator PT2)
Overheating PT3	H993	Overheating (band heating element PT3)
Overpressure	H990	Excessive pressure (sterilization chamber, MPX)
P Over Limit	H405	Pressure above Max limit (Phase Process)
P Under Limit	H406	Pressure below Min limit (Phase Process)
PPD Timeout	A260	Chamber depressurization not completed within timeout
PPP Timeout	A258	3 rd pressure pulse not reached within timeout
Process Timeout	A259	Phase of Process not started within timeout
P/T Problem	H400	Ratio Pconv/T not balanced (Pconv>T) (Phase Process)
PT1 Broken	A101	PT1 broken (sterilization chamber)
PT1 Fluctuating	H404	Temperature fluctuating over the limit (Phase Process)
PT2 Broken	A102	PT2 broken (steam generator)
PT3 Broken	A103	PT3 broken (sterilization chamber heating element)
PT4 Broken	A104	PT4 broken (sterilization chamber wall)
PT1 Short Circuit	A111	PT1 short-circuited (sterilization chamber)
PT2 Short Circuit	A112	PT2 short-circuited (steam generator)
PT3 Short Circuit	A113	PT3 short-circuited (sterilization chamber heating element)
PT4 Short Circuit	A114	PT4 short-circuited (sterilization chamber wall)
PV1 Timeout	A250	1 st vacuum pulse not reached within timeout
PP1 Timeout	A252	1 st pressure pulse not reached within timeout
PV2 Timeout	A253	2 nd vacuum pulse not reached within timeout
PP2 Timeout	A255	2 nd pressure pulse not reached within timeout
PV3 Timeout	A256	3 rd vacuum pulse not reached within timeout
Test Failed	E900	Vacuum Test failed (during the leakage phase)
Test Failed	E901	Vacuum Test failed (during the waiting phase)
Test Failed	E902	Vacuum Test failed (vacuum pulse timeout exceeded)
Timer Problem	H410	Wrong maintenance time (Phase Process)
T Over Limit	H402	Temperature above Max limit (Phase Process)
T/P Problem	H401	Ratio T/Pconv not balanced (T>Pconv) (Phase Process)
T Under Limit	H403	Temperature below Min limit (Phase Process)
Water Min	E030	Water in the fill tank at minimum (Min) level

Door Locking Error Codes A022, A023, A024, E020 & E021

When the door motor is in the open position the lower micro switch is activated and should read open and the roller micro switch is deactivated and should read closed.

Bravo Error A022 Locking Problem (Both door motor switches activated)

Failure of the micro switches (OFF-OFF), during the initial self test the two micro switches are ON.
Reset door motor and test door motor.
Check fuse F4 (1.25A 250V) on Gam PCB.
Check door micro switches and wiring.
Reset red button on Troll PCB

Bravo Error A023 Locking Problem (Door motor between switches, neither switch is activated)

Failure of the micro switches (ON-ON), during the initial self test the two micro switches are OFF.
Blackout during opening
Reset door motor and test door motor.
Check fuse F4 (1.25A 250V) on Gam PCB.
Check door micro switches and wiring.
Reset red button on Troll PCB

Bravo Error A024 Locking Problem (Door in closed position)

Failure of micro switches (ON-OFF), during the initial self test the closing micro switch is ON and the opening micro switch is OFF. Sterilizer turned OFF before completing the safety procedure.
Reset door motor and test door motor.
Check fuse F4 (1.25A 20V) on Gam PCB.
Check door micro switches and wiring.
Reset red button on Troll PCB

Bravo Error E020 Door Unlocked

When a cycle was started the door exceeded the timeout for the operation of the door locking mechanism (closing) 2.5 seconds.

Go to the Service menu (service code ++ -- ++ --), device test, manual, locking device. Select the locking device then activate the door motor and check if the door hook is closing and opening. If the door motor does not operate check fuse F4 on the Bravo Gam PCB and check the red reset button on the Troll PCB. Check the Pressure Switch you should have continuity between the two white wires.

Bravo Error E021 Door Locked

At the end of the cycle the door exceeded the timeout for the operation of the door locking mechanism (opening) 2.5 seconds.

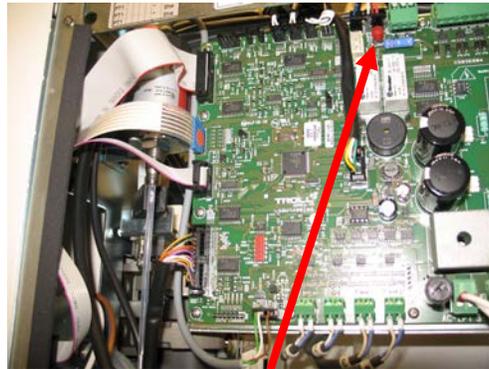
Go to the Service menu (service code ++ -- ++ --), device test, manual, locking device. Select the locking device then activate the door motor and check if the door hook is closing and opening. If the door motor does not operate check fuse F4 on the Bravo Gam PCB and check the red reset button on the Troll PCB. Check the Pressure Switch you should have continuity between the two white wires.

GAM PCB

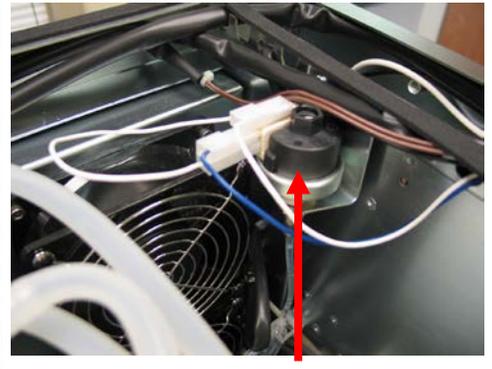
Troll PCB



Fuse F4



Red Reset Button



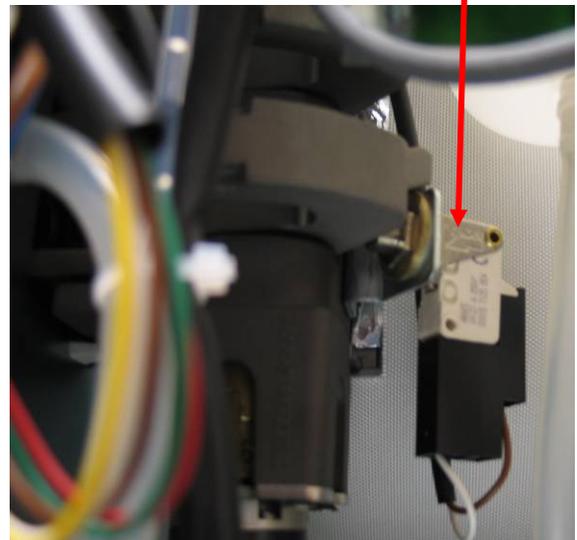
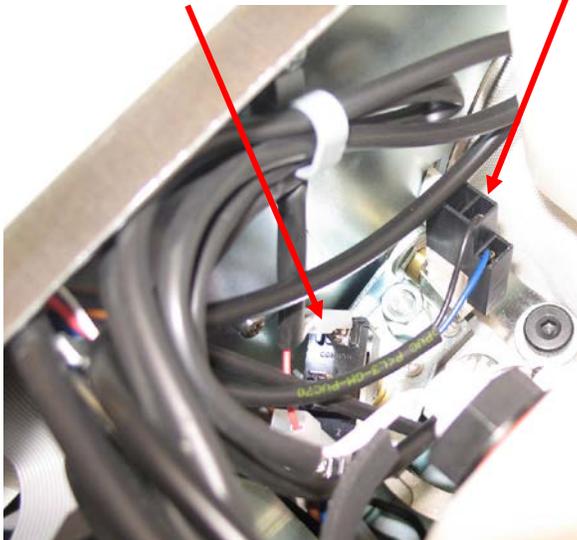
Pressure Switch

Bravo Door Switches

**Hook Micro switch
#43300080000**

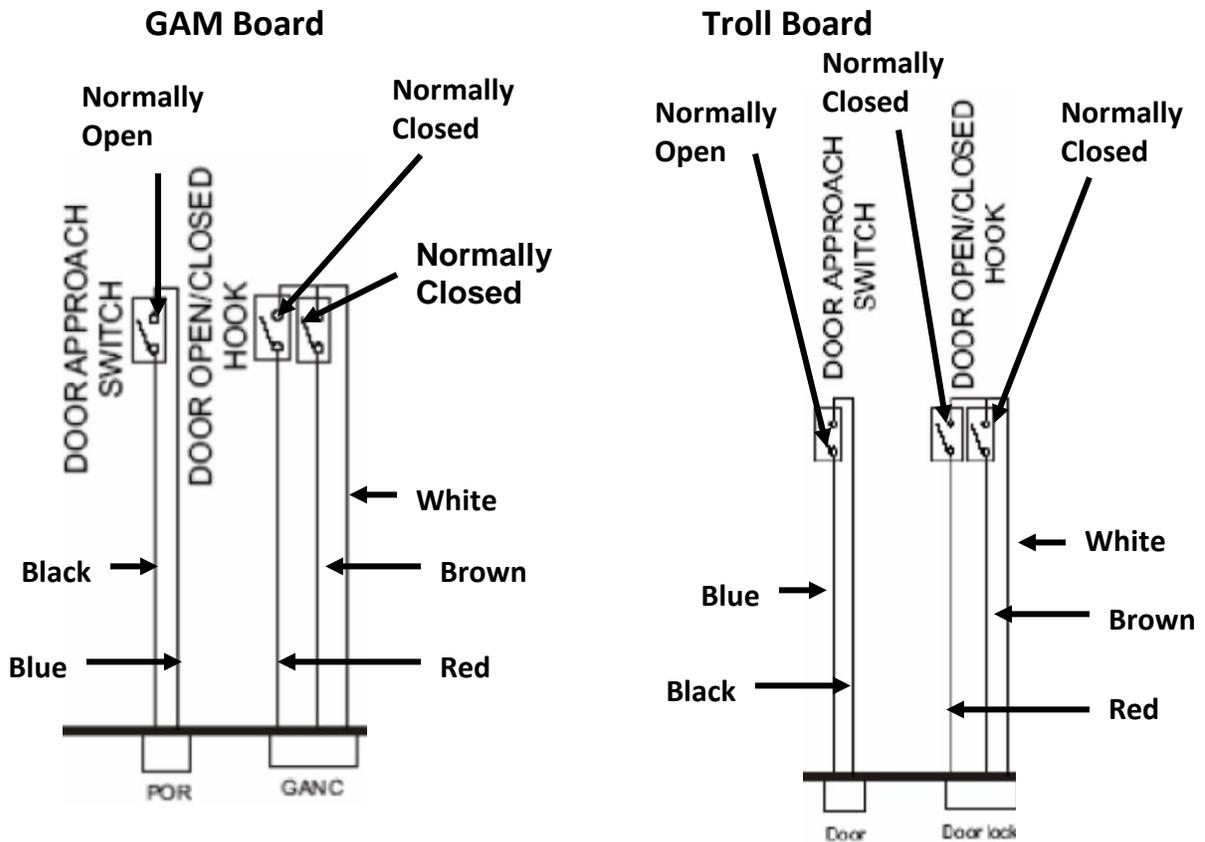
**Door Micro switch
#43300010000**

**Hook Micro switch
#43300010000**



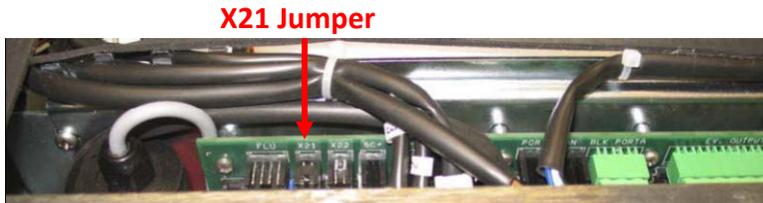
Door Approach Micro switch is a normally open switch.
Hook Micro switches are normally closed switches.

Bravo Door Switches Electrical Connections

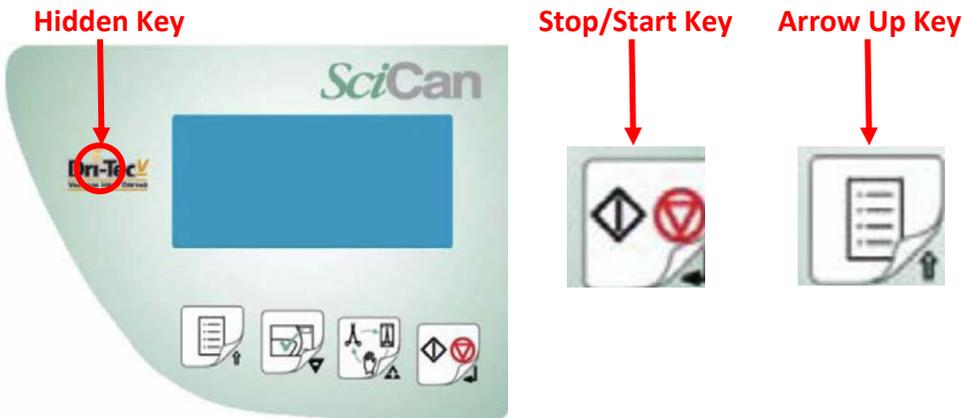


Bravo Door Motor Reset for Gam PCB

Remove the cover, and then remove jumper X21 located above the battery.



Push and hold the hidden key while turning the power ON. The message "Locking Device will appear on the LCD. Release the hidden key and press the stop/start key to reset the door locking mechanism. Open the door and press the arrow up key to exit. Turn the Bravo OFF and reinstall X21.



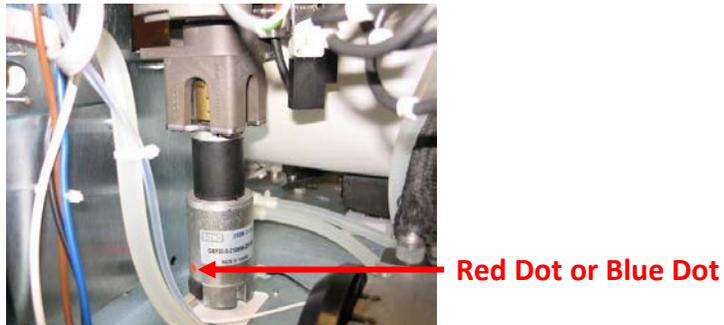
Bravo Door Motor Reset for Troll PCB

The cover does not need to be removed. Push and hold the hidden key while turning the power ON. The message “Locking Device will appear on the LCD. Release the hidden key and press the stop/start key to reset the door locking mechanism. Open the door and press the arrow up key to exit. If the door overload function has been triggered, there is no more beeping sound when pressing the keypad remove the cover and reset the red button on the PCB.



Bravo Door Motor Troubleshooting

The Bravo Door Motor is a DC motor. The voltage to the motor should read 24 -29 VDC. If replacing the door motor the white wire must be connected to the terminal with the red or blue dot to the left of the label.



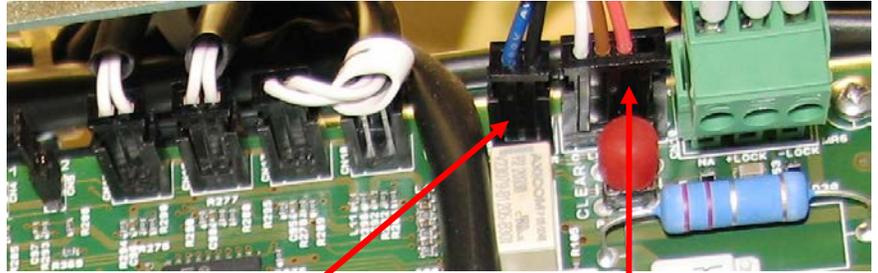
If there is no voltage to the door motor bypass the pressure switch. Remove the two white wires and connect them together. If you now have voltage to the door motor the pressure switch is defective.



Bravo Door Micro switch Wiring Troll PCB

Door Closed
Hook Micro switch

Door Open Micro switch



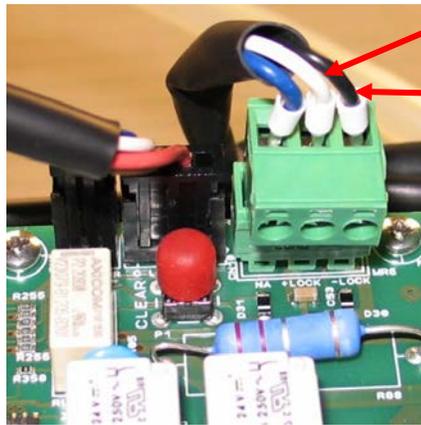
Blue & Black wires to Door
Closed Micro switch

Door Open
Hook Micro switch

White wire common to open & closed Door Hook
Micro switches.
Brown wire goes to door open Hook Micro switch
Red wire goes to door closed Hook Micro switch

Bravo Door Motor Wiring Troll PCB

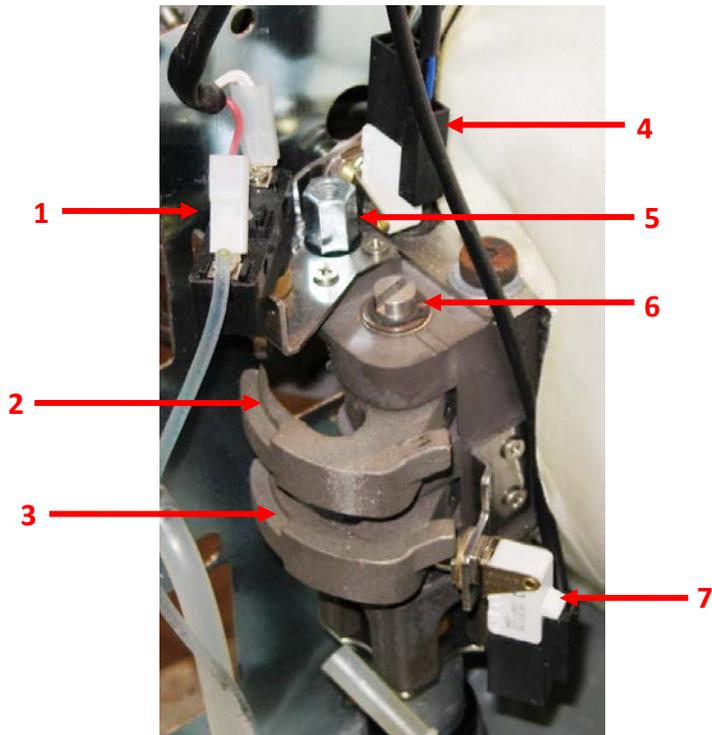
Door Motor reads approx. 120 Ω



White wire to pressure switch

Black wire to door motor

Bravo Door Motor Hook & Switch Assembly

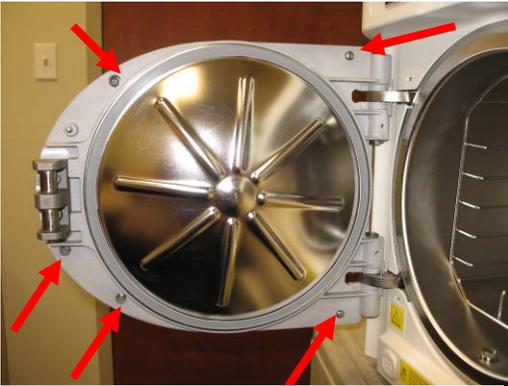


Item #	Description	Part #	Comments
1	Door Roller Switch	43300080000	The roller switch has normally closed contacts that will open when the switch is activated.
2	Door Closing Hook (upper hook)	COBP0590000	This hook (upper) locks the door closed and activates the door roller switch when the door motor is in the closed position.
3	Door Closing Hook (lower hook)	COBP0590000	This hook (lower) locks the door closed and activates the door open hook switch when the door motor is in the open position.
4	Door Switch	43300010000	The door switch has normally open contacts and will close when the door is manually pushed closed.
5	Door Position Pin	251000003K0	When manually closing door if door does not stay closed or is too hard to close check door position adjustment.
6	Door Motor Shaft		Top of door motor shaft. If door motor will not function (no power) and door must be opened try turning the shaft counterclockwise using a large screwdriver.
7	Door Hook Switch Open	43300010000	The door hook switch open has normally closed contacts that will open when the switch is activated.

Bravo Error E010 Door Open

When a cycle is started the door must be closed and the flashing key icon should appear on the display. If no flashing key icon appears check the Door Microswitch, it is normally open and should be closed when the door is closed. Manually activate the switch and see if it closes. If door switch closes when manually activated but not when door is closed check that the switch is firmly attached to the mounting plate and has not come loose. Adjust door switch actuator.

To access the door switch actuator adjustment, remove the 5 screws securing the door facia to the door and remove the door facia. Loosen the door switch actuator locking nut and adjust actuator using a 3mm Allen wrench. If the door switch actuates when the door is closed but the door is pushed back open when the door motor closes adjust the actuator out so the door must close further for the door switch to close.



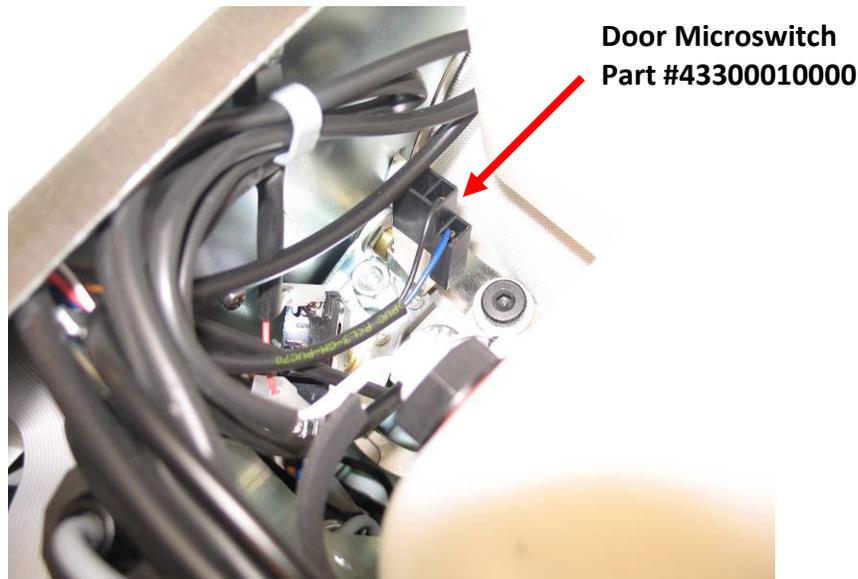
5 Door Facia Screws



**Door Switch
Actuator
Adjustment**



Door Switch Actuator



**Door Microswitch
Part #43300010000**

Bravo Error E020 Door Unlocked

When a cycle was started the door exceeded the timeout for the operation of the door locking mechanism (closing) 2.5 seconds.

Go to the Service menu (service code ++ -- ++ --), device test, manual, locking device. Select the locking device then activate the door motor and check if the door hook is closing and opening. If the door motor does not operate check fuse F4 on the Bravo Gam PCB and check the red reset button on the Troll PCB. Check the Pressure Switch you should have continuity between the two white wires.

Bravo Error E021 Door Locked

At the end of the cycle the door exceeded the timeout for the operation of the door locking mechanism (opening) 2.5 seconds.

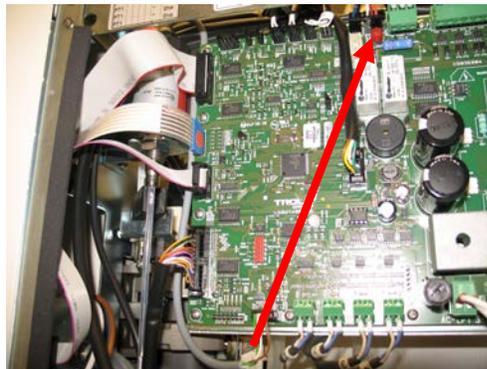
Go to the Service menu (service code ++ -- ++ --), device test, manual, locking device. Select the locking device then activate the door motor and check if the door hook is closing and opening. If the door motor does not operate check fuse F4 on the Bravo Gam PCB and check the red reset button on the Troll PCB. Check the Pressure Switch you should have continuity between the two white wires.

GAM PCB

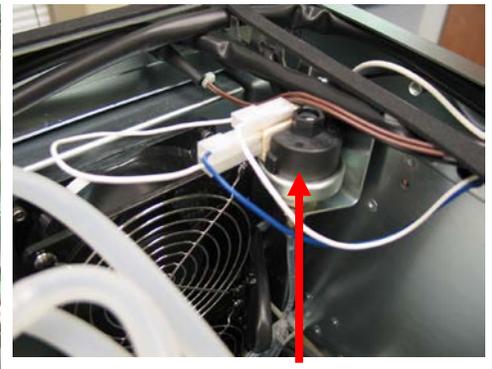


Fuse F4

Troll PCB



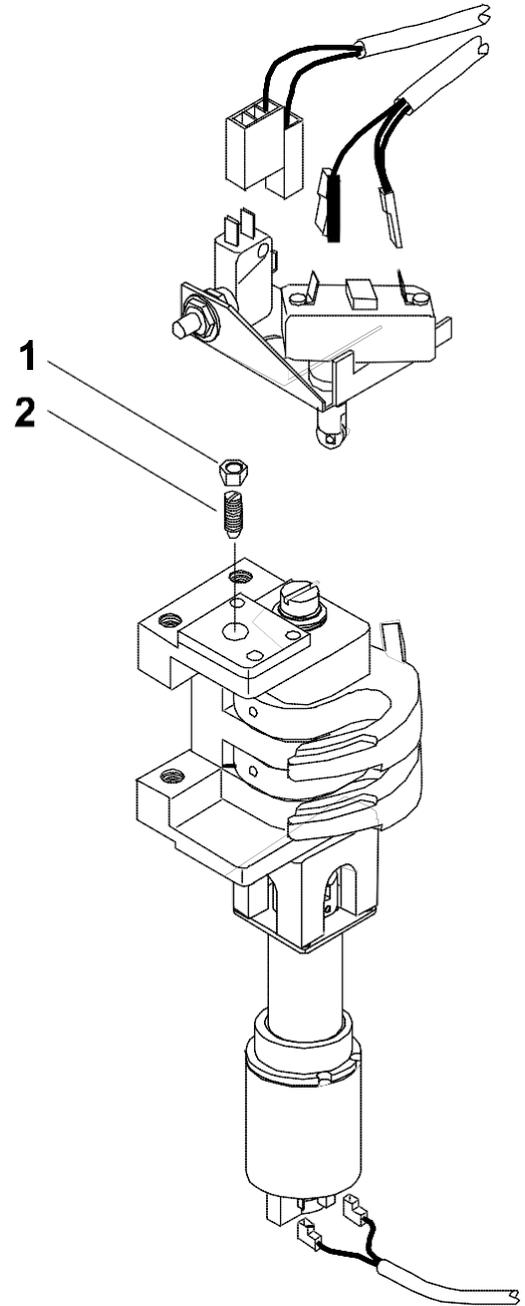
Red Reset Button



Pressure Switch

Bravo Door Positioner Adjustment

1. Remove the covers (left, upper & right).
2. Open and close the door to check its operation.
3. In case the door does not remain closed (no click at the stroke end), loosen the nut (1) and turn the positioner (2) clockwise.
4. In case of resistance on closing/opening the door, loosen the nut and turn the positioner counterclockwise.
5. Tighten the nut.
6. Perform a sterilization cycle.



Bravo Error A032 Level Problem

Error A032 – Level Problem

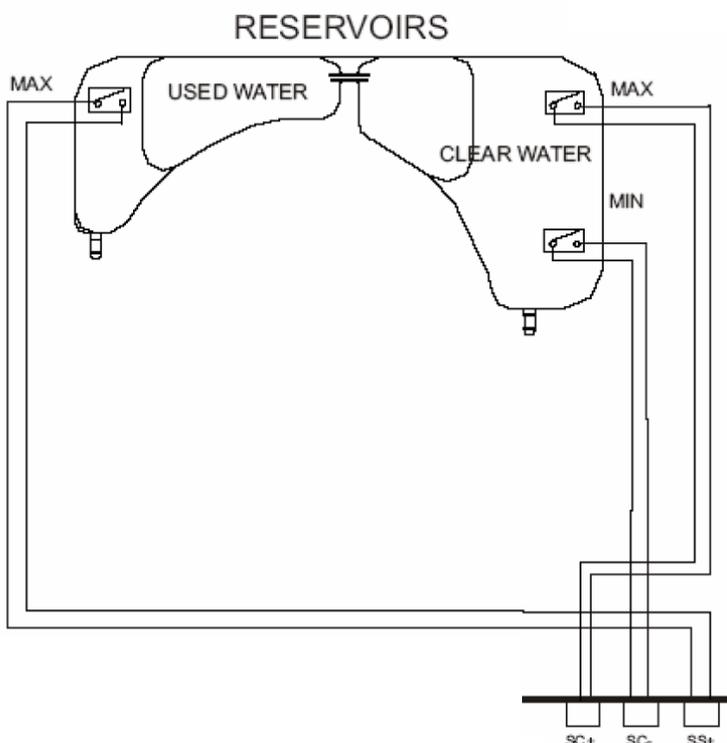
Problem with the water level floats. Lighting of both Min & Max level LED's.

1. Check the float switch wiring and plugs.
2. Check the floats.
3. Check that Bravo is not plugged into a plug strip.
4. Check receptacle with a ground tester plug.

The Bravo sterilizers have three float switches. Two of them are located in the clean water reservoir and one is located in the used water reservoir. The switches in the clean water reservoir are visible from the front of the Bravo and the used water reservoir switch from the rear of the Bravo.



**Clean Water Level Sensor Max
Part #43200050000**



The used water reservoir float is wire number 1 and connects to terminal SS+ on the PCB. It is a normally closed switch.

The clean water reservoir MIN float is wire number 2 and connects to terminal SC- on the PCB. It is a normally open switch.

The clean water reservoir MAX float is wire number 3 and connects to terminal SC+ on the PCB. It is a normally closed switch.

PCB terminals SS+, SC- & SC+ are located on the top left side of the PCB.

Bravo Error A040 & E041

Filling Problem Alarm

Error A040 – Filling Problem Alarm

Failure to automatically fill the Bravo sterilizer from the external water tank, the MIN level signaling is not turned OFF within 2 minutes from the start command of the automatic filling.

Note: If Bravo is a new installation or was completely drained you may need to turn the Bravo OFF and back ON to allow the unit to automatically fill twice to get sufficient water to activate the MIN level switch.

1. Check for water in the external filling tank.
2. Check for a kinked tubing from the external filling tank to the Bravo sterilizer.
3. Check that the valve on the external filling tank is open.
4. Check water filter is not clogged or cracked. If the water filter is cracked the pump may be louder than normal when running.
5. Check the auxiliary pump is providing water to the reservoir. Pump is located in rear of Bravo mounted vertically.
6. Prime Auxiliary Water Pump
7. Disassemble and clean Auxiliary Pump

Error E041 – Filling Problem

In automatic fill mode unit is filling too frequently. Two automatic fills every two cycles.

1. Check automatic fill bottle for water.
2. Check tubing from automatic fill bottle to back of unit for kinks.
3. Check water filter on input of Auxiliary Pump.
4. Check Auxiliary Pump.

Auxiliary Pump Priming Procedure

Special tools:

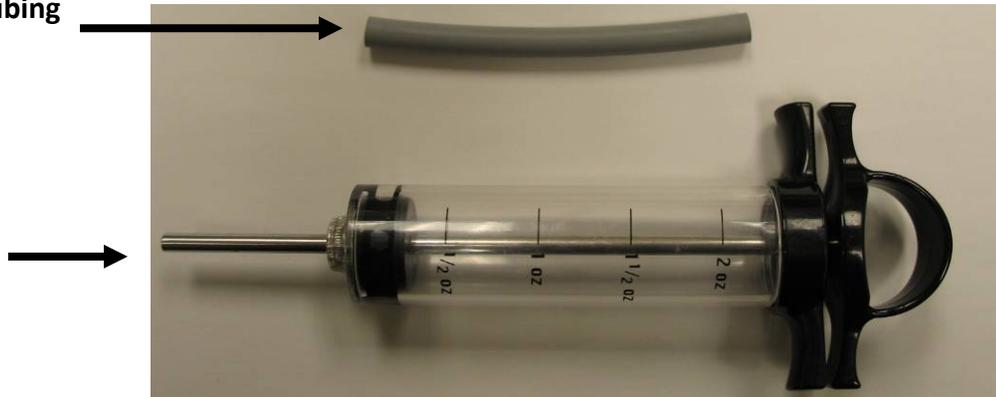
- Luer Slip Syringe – 30 ml recommended to prevent multiple refills during procedure.



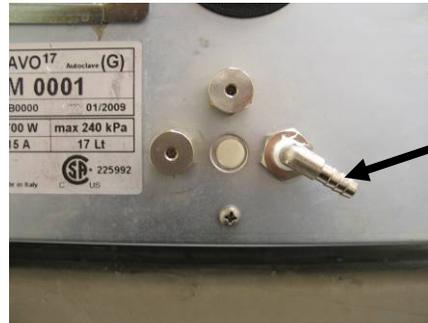
1/4" Tubing



Basting Syringe



When **error code A040** appears the auxiliary pump is not pulling water into the clean water reservoir. To prime the auxiliary pump turn the unit OFF. Go to the rear of the Bravo and remove the tube coming from the external clean water reservoir. Connect a short piece of 1/4" tubing to the auxiliary pump inlet elbow.

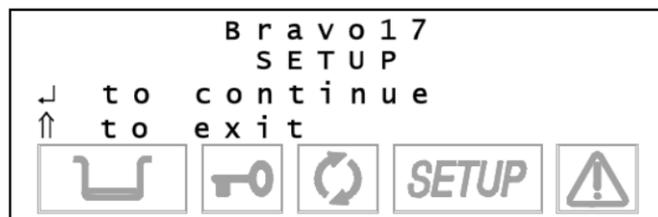


Auxiliary Pump Inlet Elbow

Fill a syringe with water and connect the syringe to the 1/4" tubing. Turn the Bravo on and when the check-up is complete enter the Setup Mode.

Entering Setup Mode

To enter the setup mode press and hold the first key on the left  for several seconds until the display shows Bravo Setup. If the display asks for a password, see instructions to disable password.



Press the first key on the right  to continue.



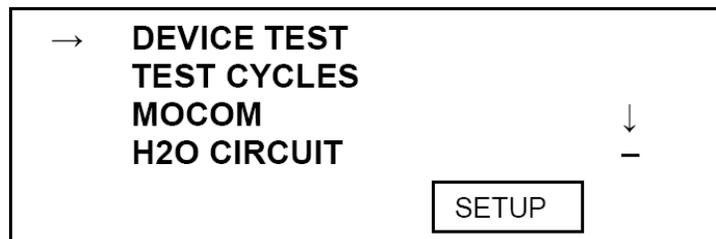
DATA REVIEW
EXIT SETUP

Press the second key on the left  to select Service. Press the first key on the right  to continue. A service code is required to enter the Service Menu. Press ++ -- ++ -- press the first key on the right  to continue.

- Key  + Key 
 ++ -- ++ --

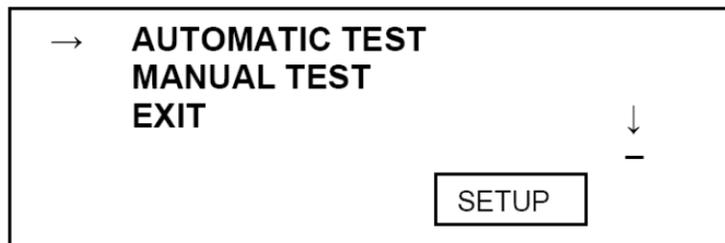


Device Test will appear on the top line of the display. Press the first key on the right  to continue.



COUNTER RESET
 TECHNICAL REPORT
 DEFAULT VALUES
 PT1 CORRECTION
 EXIT

Automatic Test will appear on the top line of the display. Press the second key on the left  to select Manual Test. Press the first key on the right  to continue.



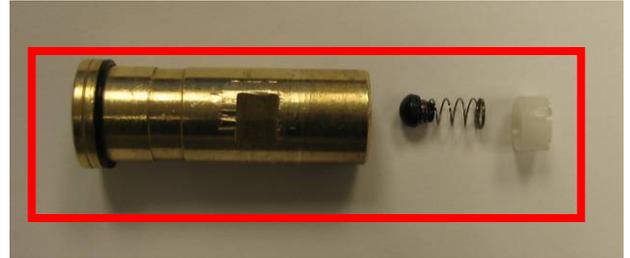
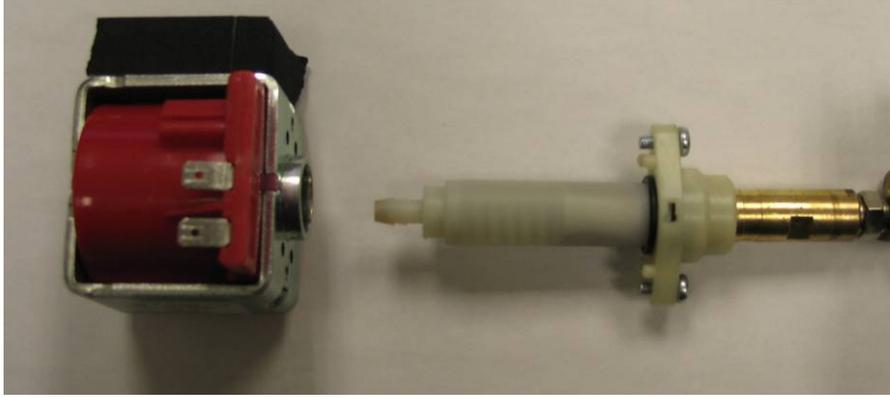
Locking Device will appear on the top line of the display. Press the second key on the left  to select the Auxiliary Pump. Press the first key on the right  to continue. Press and hold the first key on the right  while pressing the plunger on the syringe connected to the rear of the Bravo. If the syringe runs out of water release the first key on the right and  refill the syringe. When the pump is operating properly the syringe plunger will move into the syringe on its own or with very little pressure. Reconnect the automatic fill bottle and hold in the first key on the right  and verify that water is entering the Bravo from the bottle. To exit setup press and release the first key on the left  repeatedly until the display shows Exit Setup or Setup Completely. Press the first key on the right  to return to the Standby screen.

Bravo Water Pump disassembly for cleaning and inspection

Remove wires from pump and solenoid coils.

Remove pump inlet and outlet tubing.

Remove two screws that hold shaft to pump coil. Hold white shaft with one hand and white mounting piece with screws with the other hand. Push pump white shaft in slightly and turn counterclockwise. Carefully disassemble pump. Reverse procedure to reassemble.



Bravo Error A101, A102, A103 & A104 PTX Broken

Error A101 – PT1 Broken (Chamber Thermocouple)

The temperature detected by PT1 is higher than 250°C.

1. PT1 is broken should read approximately 1056Ω connected and 1086Ω disconnected.
2. Check the temperature value on the display.

Error A102 – PT2 Broken (Steam Generator Thermocouple)

The temperature detected by PT2 is higher than 250°C.

1. PT2 is broken should read approximately 1056Ω connected and 1086Ω disconnected.
2. Check water pump not feeding water to steam generator.
3. Steam Generator clogged.
4. Check PT2 temperature by holding in hidden key after unit is turned ON.

Error A103 – PT3 Broken (Chamber Heating Thermocouple)

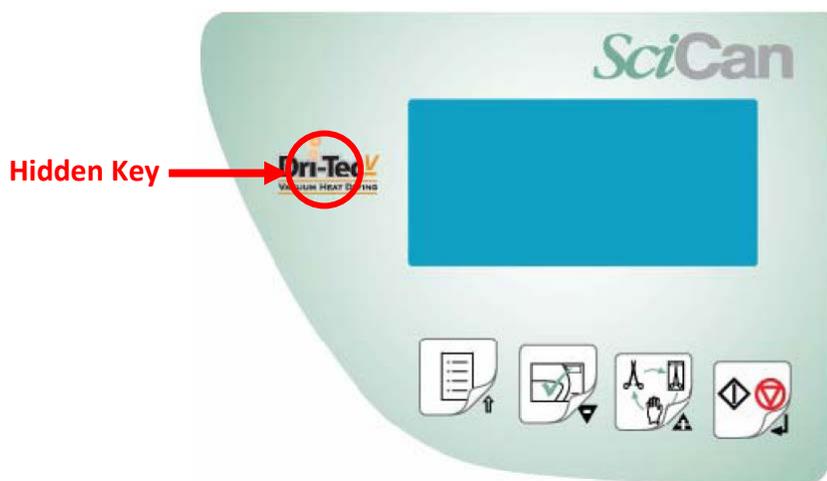
The temperature detected by PT3 is higher than 250°C.

1. PT3 is broken should read approximately 1056Ω connected and 1086Ω disconnected.
2. Check the PT3 temperature by holding in hidden key after unit is turned ON.

Error A104 – PT4 Broken (Chamber Wall Thermocouple)

The temperature detected by PT4 is higher than 250°C.

1. PT4 is broken should read approximately 1056Ω connected and 1086Ω disconnected.
2. Check the PT4 temperature by holding in hidden key after unit is turned ON.



Bravo Error A111, A112, A113 & A114 PTX Short-circuit

Error A111 – PT1 Short-circuit (Chamber Thermocouple)

Short-circuit in the PT1 probe. PT1 is reading a temperature value lower than 1°C.

1. Check the temperature value on the display.
2. If just being installed make sure unit was not in a cold truck overnight.
3. PT1 is short-circuited should read approximately 1056Ω connected and 1086Ω disconnected.

Error A112 – PT2 Short-circuit (Steam Generator Thermocouple)

Short-circuit in the PT2 probe. PT2 is reading a temperature value lower than 1°C.

1. Check PT2 temperature by holding in hidden key after unit is turned ON.
2. If just being installed make sure unit was not in a cold truck overnight.
3. PT2 is short-circuited should read approximately 1056Ω connected and 1086Ω disconnected.

Error A113 – PT3 Short-circuit (Chamber Heating Thermocouple)

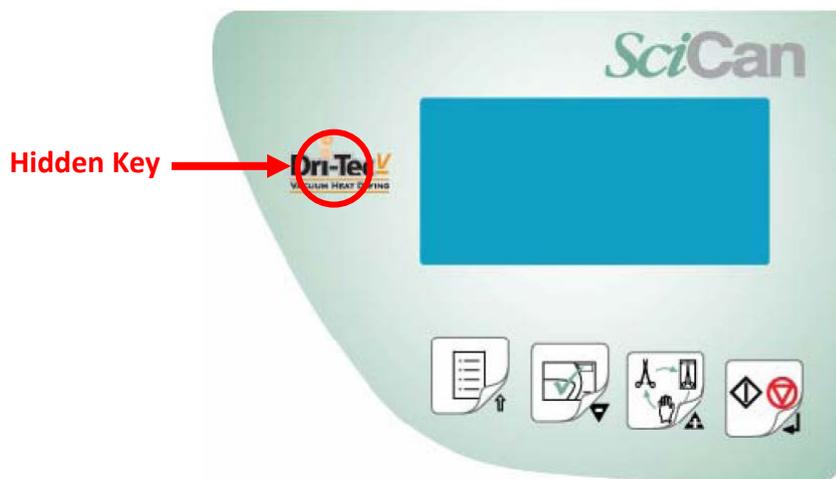
Short-circuit in the PT3 probe. PT3 is reading a temperature value lower than 1°C.

1. Check PT3 temperature by holding in hidden key after unit is turned ON.
2. If just being installed make sure unit was not in a cold truck overnight.
3. PT3 is short-circuited should read approximately 1056Ω connected and 1086Ω disconnected.

Error A114 – PT4 Broken (Chamber Wall Thermocouple)

Short-circuit in the PT4 probe. PT4 is reading a temperature value lower than 1°C.

1. Check PT4 temperature by holding in hidden key after unit is turned ON.
2. If just being installed make sure unit was not in a cold truck overnight.
3. PT4 is short-circuited should read approximately 1056Ω connected and 1086Ω disconnected.



Troubleshooting Bravo Error A200

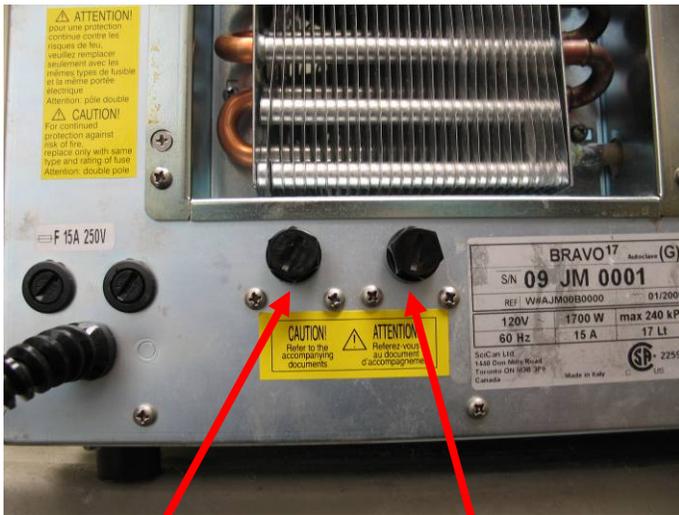
Error A200 – Heating Problem

Preheating phase not performed within the preset time. Pre-vacuum phase PV1 not start within 30 minutes from the cycle start.

1. Check the steam generator safety thermostat.
2. Check the band heating element safety thermostat.

Bravo Safety Thermostats

Remove cap and depress button. If you hear a click the thermostat was tripped. If there is no click, the thermostat was not tripped.



**Steam Generator
Thermostat**

**Band Heater
Thermostat**



Press to Reset

Bravo Error A250

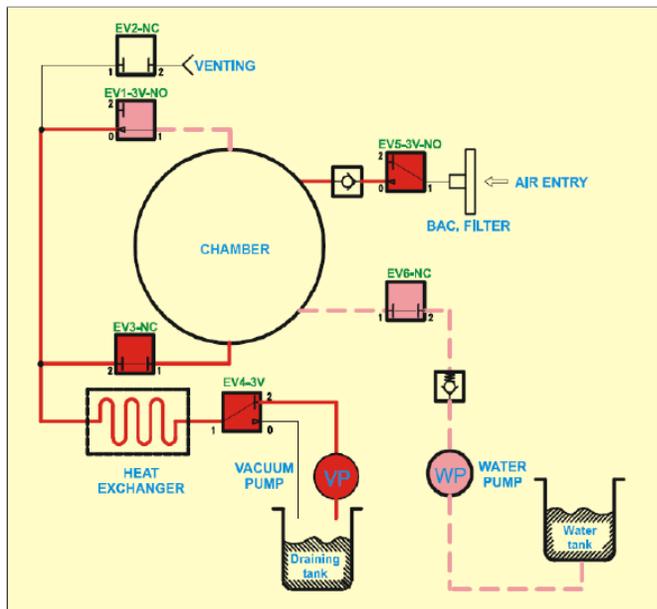
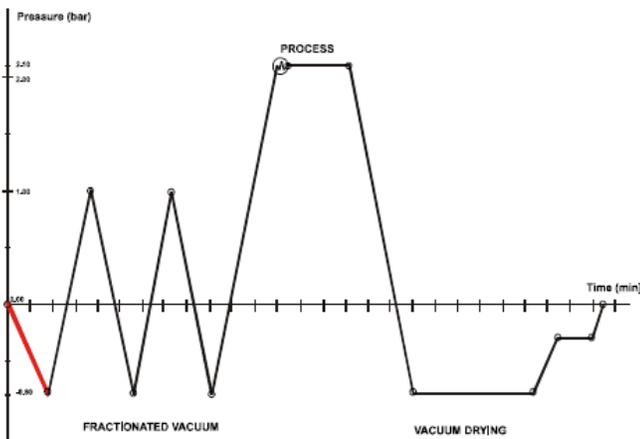
First Vacuum Pulse Failure

Error A250 – PV1 Timeout

1st vacuum pulse (from 0.00 to -0.80) not performed within the preset time (6 minutes).

1. Check for clogged filter in front of chamber. Remove nut and remove metal filter screen from the nut.
Note: Filter screen must be removed from the nut as debris collects on the inside of the filter.
2. Check for excess moisture in the chamber. Make sure Bravo has 2 inches of clearance on the left side, right side and the top and 4 inches of clearance in the rear. Dry chamber and try another cycle.
3. Check the Heat Exchanger is not clogged with dust. Clean if needed.
4. Go to the Service Menu and select Test Cycles No-Vacuum Cycle. Run the No-Vacuum Cycle and check for steam leaks from the door gasket and the tubing between the Steam Generator and the Chamber. Door gasket should be replaced every 1000 cycles or yearly whichever comes first.
5. Performed a Vacuum Test to verify that the Vacuum Pump is operating correctly.
Note: The chamber & steam generator temperature must be below 50°C to run a vacuum test.
6. Check the water pump and valve EV6. When the chamber reaches -0.7 bars the water pump turns ON, valve EV6 opens and EV1 closes. The vacuum pump continues to run as steam enters the chamber. After 3, .5 second pulses the water pump turns OFF and EV6 closes and EV1 opens. When the chamber reaches -0.8 bars the 1st pressure pulse PP1 starts. The fans will remain ON during the entire 1st vacuum pulse.

DESCRIPTION	STATUSES (P, t)	VP	WP	EV1 (no)	EV2 (nc)	EV3 (nc)	EV4	EV5 (no)	EV6 (nc)	Fan
1st vacuum pulse	from 0,00 to -0,70 bar	ON	OFF	OFF	OFF	ON	ON	ON	OFF	ON
	Water entry at -0,70 bar (0,5" x3)	ON	ON	ON	OFF	ON	ON	ON	ON	ON
	from -0,70 to -0,80 bar	ON	OFF	OFF	OFF	ON	ON	ON	OFF	ON
	Water entry at -0,80 bar (0,3" x1) for P < -0,80 bar	ON	OFF	OFF	OFF	ON	ON	ON	OFF	ON



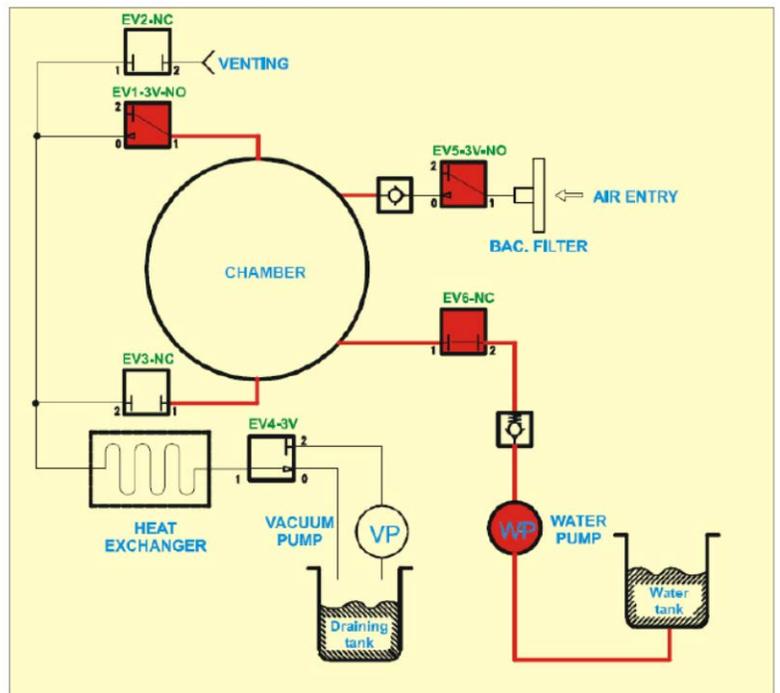
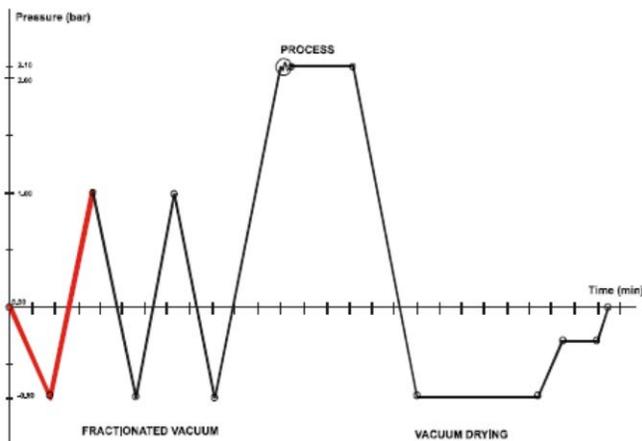
Bravo Error A251 ATM1 Timeout

Error A251 – ATM1 Timeout

1st pressure pulse (from -0.80 to 0.00 bars) not reached within timeout (3 minutes).

1. Check that chamber is not overloaded.
2. Check door gasket for steam leakage.
3. Check steam generator and band heater safety thermostats in rear of Bravo.
4. Check steam generator heating elements 120V units should read 7Ω and 220V units should read 26Ω.
5. Check water filter steam generator water pump.
6. Check steam generator water pump.
7. Check for clogged steam generator.
8. Check EV6 on output side of water pump.

DESCRIPTION	STATUSES (P, t)	VP	WP	EV1 (no)	EV2 (nc)	EV3 (nc)	EV4	EV5 (no)	EV6 (nc)	Fan
1 st pressure pulse from -0,88 to +0,50 bar	from -0,80 to 0,00 bar (water entry5" at -0,80 bar) from 0,00 to +0,50 bar	OFF	ON	ON	OFF	OFF	OFF	ON	ON	ON
1 st pressure pulse from +0,50 to +1,00 bar	from +0,50 to +0,90 bar from +0,90 to +1,00 bar	OFF	ON	ON	OFF	OFF	OFF	ON	ON	ON



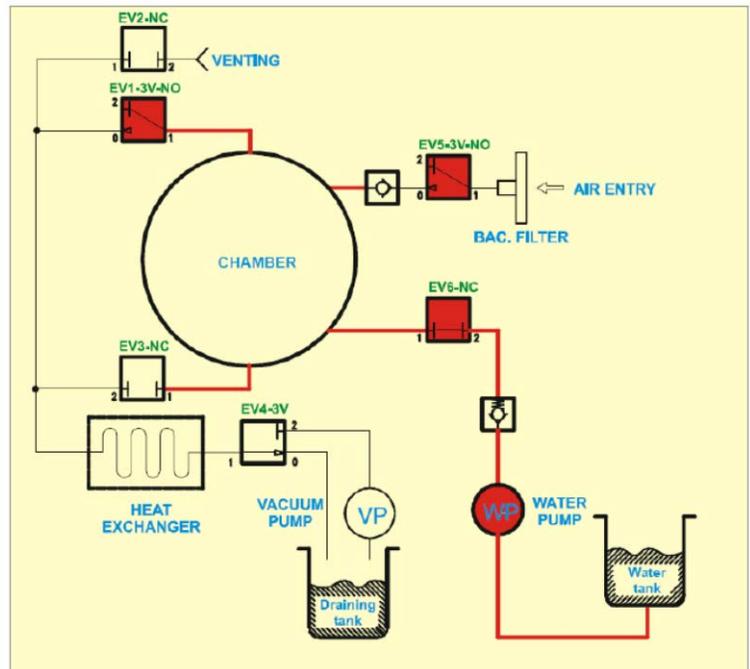
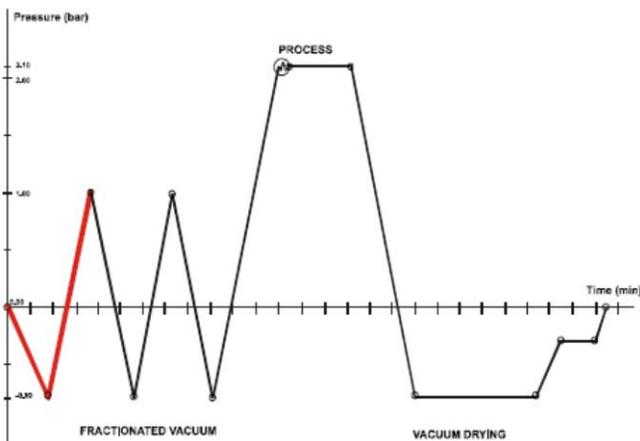
Bravo Error A252 PP1 Timeout

Error A252 – PP1 Timeout

1st pressure pulse (from 0.00 to +1.00 bars) not performed within preset time (3 minutes).

1. Check that chamber is not overloaded.
2. Check door gasket for steam leakage.
3. Check steam generator and band heater safety thermostats in rear of Bravo.
4. Check steam generator heating elements 120V units should read 7Ω and 220V units should read 26Ω.
5. Check water filter steam generator water pump.
6. Check steam generator water pump.
7. Check for clogged steam generator.
8. Check EV6 on output side of water pump.

DESCRIPTION	STATUSES (P, t)	VP	WP	EV1 (no)	EV2 (nc)	EV3 (nc)	EV4	EV5 (no)	EV6 (nc)	Fan
1 st pressure pulse from -0,88 to +0,50 bar	from -0,80 to 0,00 bar (water entry5" at -0,80 bar) from 0,00 to +0,50 bar	OFF	ON	ON	OFF	OFF	OFF	ON	ON	ON
1 st pressure pulse from +0,50 to +1,00 bar	from +0,50 to +0,90 bar from +0,90 to +1,00 bar	OFF	ON	ON	OFF	OFF	OFF	ON	ON	ON



Bravo Error A253

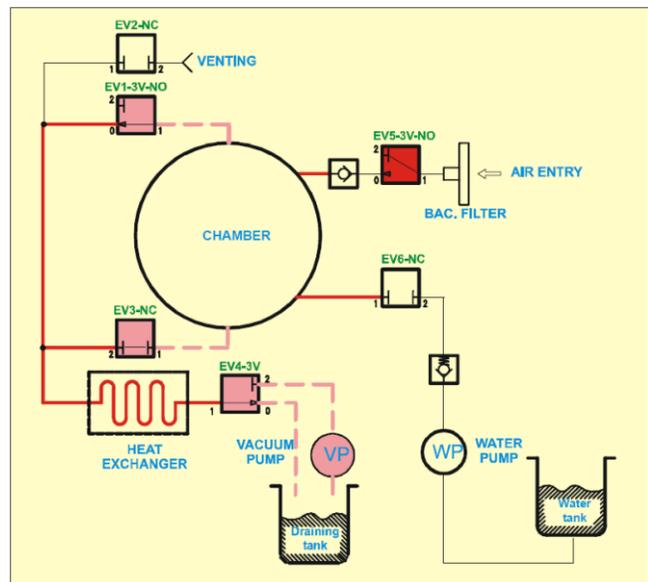
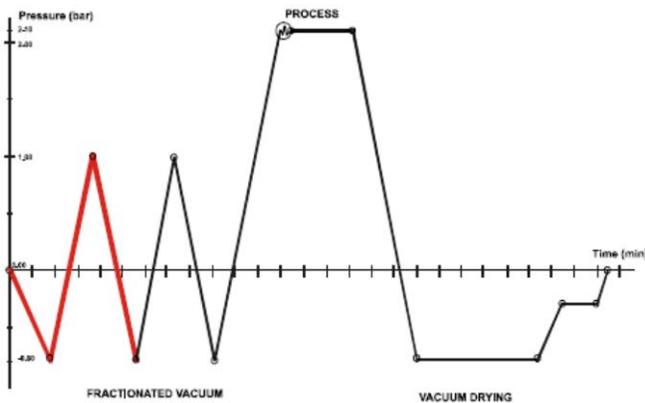
Second Vacuum Pulse Failure

Error A253 – PV2 Timeout

2nd vacuum pulse (from +1.00 to -0.80) not performed within the preset time (7 minutes).

1. Check for clogged filter in front of chamber. Remove nut and remove metal filter screen from the nut. **Note: Filter screen must be removed from the nut as debris collects on the inside of the filter.**
2. Check for excess moisture in the chamber. Make sure Bravo has 2 inches of clearance on the left side, right side and the top and 4 inches of clearance in the rear. Dry chamber and try another cycle.
3. Check the Heat Exchanger is not clogged with dust. Clean if needed.
4. Go to the Service Menu and select Test Cycles No-Vacuum Cycle. Run the No-Vacuum Cycle and check for steam leaks from the door gasket and the tubing between the Steam Generator and the Chamber. Door gasket should be replaced every 1000 cycles or after 1 year which ever comes first.
5. Performed a Vacuum Test to verify that the Vacuum Pump is operating correctly. **Note: The chamber temperature must be below 50°C to run a vacuum test.**

DESCRIPTION	STATUSES (P, t)	VP	WP	EV1 (no)	EV2 (nc)	EV3 (nc)	EV4	EV5 (no)	EV6 (nc)	Fan
2 nd vacuum pulse	Steam discharge from +1,00 to +0,22 bar	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	ON
	Transition phase of the charging circuit (1")	ON	OFF	ON	OFF	OFF	OFF	ON	OFF	ON
	Vacuum of the discharge circuit	ON	OFF	ON	OFF	OFF	ON	ON	OFF	ON
	Chamber discharge	ON	OFF	ON	OFF	ON	ON	ON	OFF	ON
	Chamber vacuum (up to -0,80 bar)	ON	OFF	OFF	OFF	ON	ON	ON	OFF	ON
	Chamber vacuum (up to PT2 =165°)									



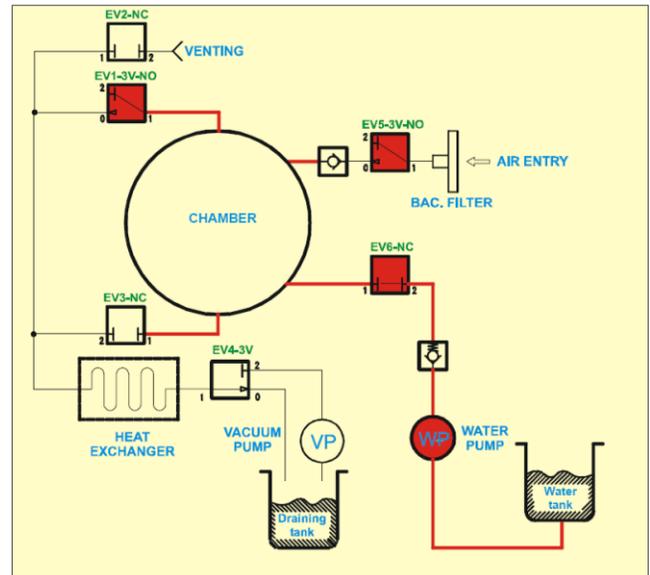
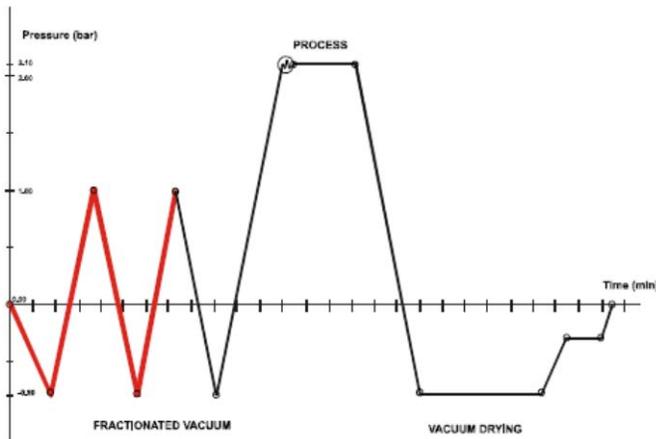
Bravo Error A254 ATM2 Timeout

Error A254 – ATM2 Timeout

2nd pressure pulse (from -0.80 to 0.00 bars) not performed within preset timeout (3 minutes).

1. Check that chamber is not overloaded.
2. Check door gasket for steam leakage.
3. Check steam generator and band heater safety thermostats in rear of Bravo.
4. Check steam generator heating elements 120V units should read 7Ω and 220V units should read 26Ω.
5. Check water filter steam generator water pump.
6. Check steam generator water pump.
7. Check for clogged steam generator.
8. Check EV6 on output side of water pump.

DESCRIPTION	STATUSES (P, t)	VP	WP	EV1 (no)	EV2 (nc)	EV3 (nc)	EV4	EV5 (no)	EV6 (nc)	Fan
2 nd pressure pulse	from -0,80 to 0,00 bar (water entry 5" at -0,80 bar)	OFF	ON	ON	OFF	OFF	OFF	ON	ON	ON
	from +0,00 to +0,90 bar									
	from +0,90 to +1,00 bar									



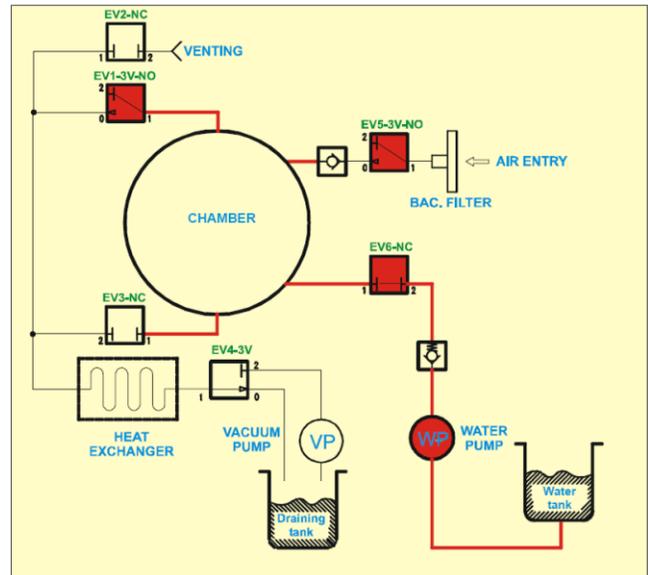
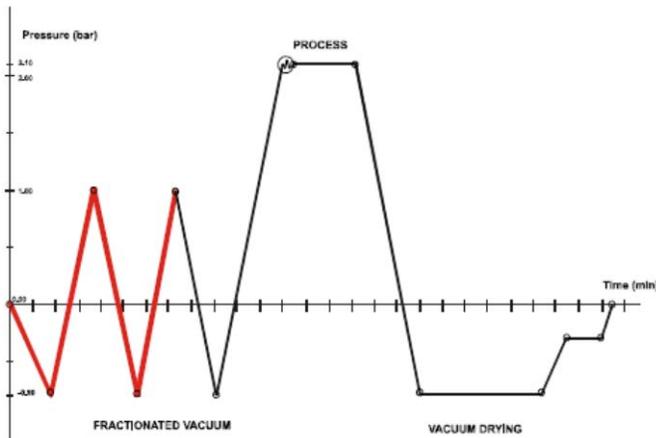
Bravo Error A255 PP2 Timeout

Error A255 – PP2 Timeout

2nd pressure pulse (from 0.00 to +1.00 bars) not performed within preset time (3 minutes).

1. Check that chamber is not overloaded.
2. Check door gasket for steam leakage.
3. Check steam generator and band heater safety thermostats in rear of Bravo.
4. Check steam generator heating elements 120V units should read 7Ω and 220V units should read 26Ω.
5. Check water filter steam generator water pump.
6. Check steam generator water pump.
7. Check for clogged steam generator.
8. Check EV6 on output side of water pump.

DESCRIPTION	STATUSES (P, t)	VP	WP	EV1 (no)	EV2 (nc)	EV3 (nc)	EV4	EV5 (no)	EV6 (nc)	Fan
2 nd pressure pulse	from -0,80 to 0,00 bar (water entry 5" at -0,80 bar)	OFF	ON	ON	OFF	OFF	OFF	ON	ON	ON
	from +0,00 to +0,90 bar									
	from +0,90 to +1,00 bar									



Bravo Error A256

Third Vacuum Pulse Failure

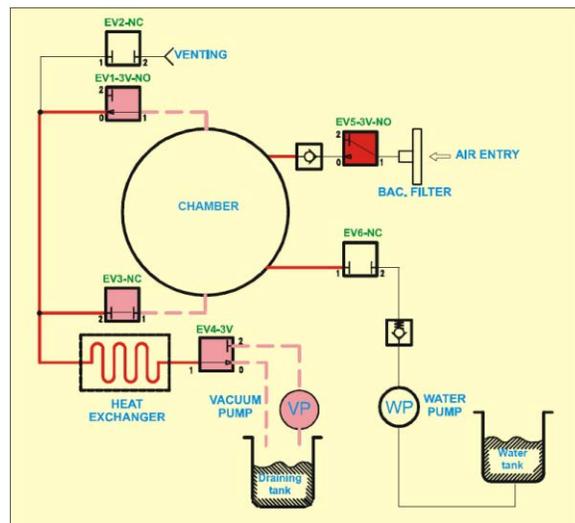
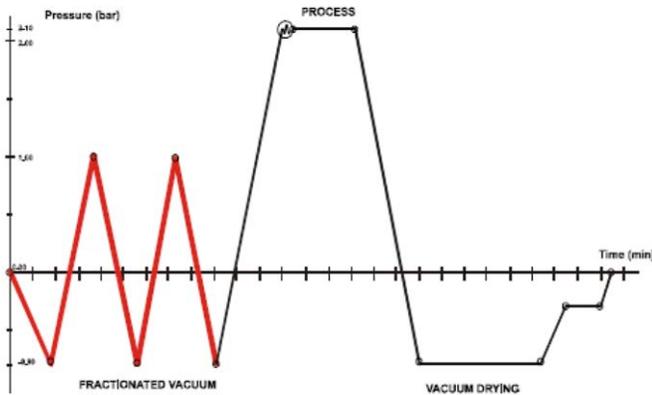
Error A256 – PV3 Timeout

3rd vacuum pulse (from +1.00 to -.80) not performed within the preset time (7 minutes).

At the end of the 2nd pressure pulse, the steam, mixed with residual air, is discharged, then a 3rd vacuum pulse starts. EV1 closes and EV3 opens allowing steam to vent through the chamber drain filter into the drain tank through the heat exchanger and EV4. Chamber pressure drops from 1 bar to .22 bars. The vacuum pump turns ON and the chamber discharges through the chamber drain filter and EV3 and EV4. This continues until the chamber reaches -.8 bars or PT2 = 165°C.

1. Check for clogged filter in front of chamber. Remove nut and remove metal filter screen from the nut.
Note: Filter screen must be removed from the nut as debris collects on the inside of the filter.
2. Check the Heat Exchanger is not clogged with dust. Clean if needed.
3. Go to the Service Menu and select Test Cycles No-Vacuum Cycle. Run the No-Vacuum Cycle and check for steam leaks from the door gasket and the tubing between the Steam Generator and the Chamber. Door gasket should be replaced every 1000 cycles or after 1 year whichever comes first.
4. Check for excess moisture in the chamber. Make sure Bravo has 2 inches of clearance on the left side, right side and the top and 4 inches of clearance in the rear. Dry chamber and try another cycle.
5. Performed a Vacuum Test to verify that the Vacuum Pump is operating correctly. **Note: The chamber temperature must be below 50°C to run a vacuum test.**

DESCRIPTION	STATUSES (P, t)	VP	WP	EV1 (no)	EV2 (nc)	EV3 (nc)	EV4	EV5 (no)	EV6 (nc)	Fan
3 rd vacuum pulse	Steam discharge from +1,00 to +0,22 bar	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	ON
	Transition phase of the charging circuit (1")	ON	OFF	ON	OFF	OFF	OFF	ON	OFF	ON
	Vacuum of the discharge circuit	ON	OFF	ON	OFF	OFF	ON	ON	OFF	ON
	Chamber discharge	ON	OFF	ON	OFF	ON	ON	ON	OFF	ON
	Vacuum of the chamber (up to -0,80 bar)	ON	OFF	OFF	OFF	ON	ON	ON	OFF	ON
	Chamber vacuum (up to PT2 =165°)									



Bravo Error A257

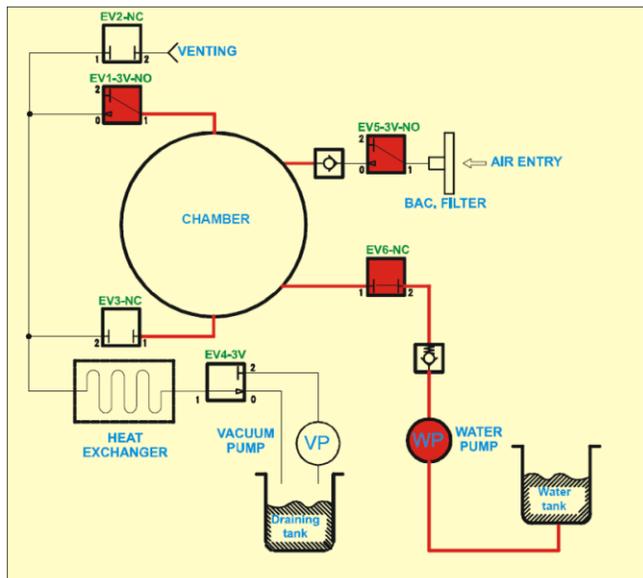
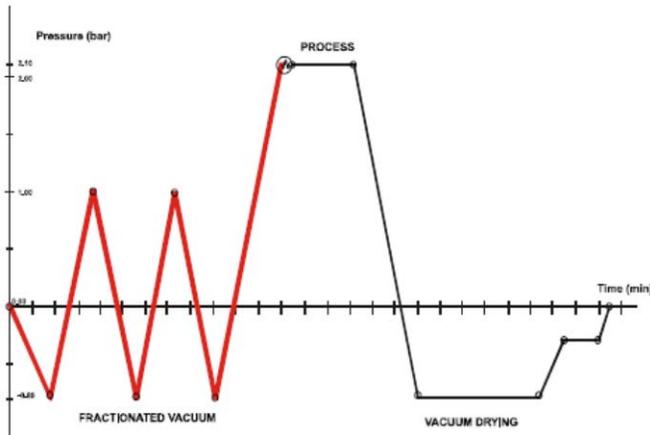
ATM3 Timeout

Error A257 – ATM3 Timeout

3rd pressure pulse (from -0.80 to 0.00 bars) not performed within preset timeout (3 minutes).

1. Check that chamber is not overloaded.
2. Check door gasket for steam leakage.
3. Check steam generator and band heater safety thermostats in rear of Bravo.
4. Check steam generator heating elements 120V units should read 7Ω and 220V units should read 26Ω.
5. Check water filter steam generator water pump.
6. Check steam generator water pump.
7. Check for clogged steam generator.
8. Check EV6 on output side of water pump.

DESCRIPTION	STATUSES (P, t)	VP	WP	EV1 (no)	EV2 (nc)	EV3 (nc)	EV4	EV5 (no)	EV6 (nc)	Fan
3 rd pressure pulse	from -0,80 to 0,00 bar (water entry 5" at -0,80 bar)	OFF	ON	ON	OFF	OFF	OFF	ON	ON	ON
	from +0,00 to +0,90 bar									
	from +0,90 to +1,00 bar									



Bravo Error A258

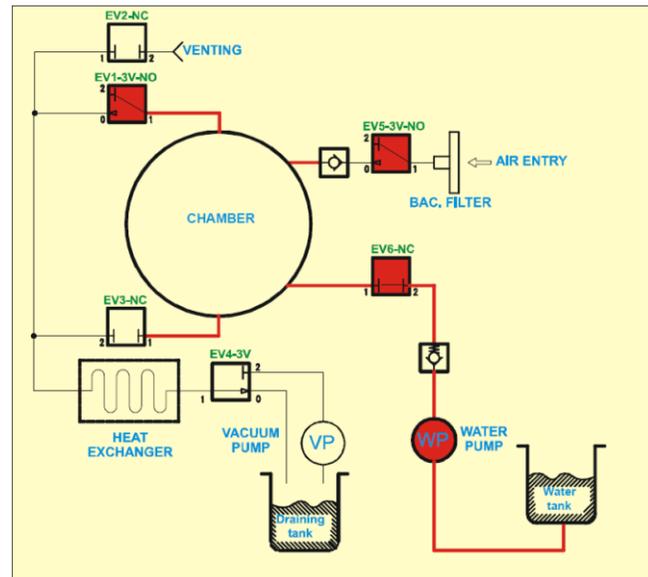
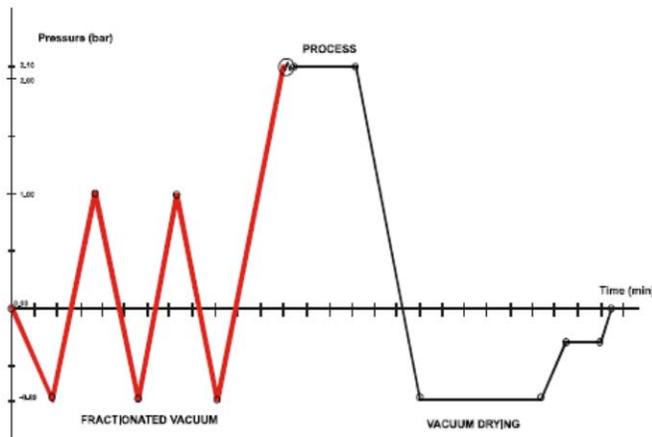
PPP Timeout

Error A258 – PPP Timeout

3rd pressure pulse (from 0.00 to +1.12/2.15 bars) not performed within preset time (7 minutes).

1. Check that chamber is not overloaded.
2. Check door gasket for steam leakage.
3. Check steam generator and band heater safety thermostats in rear of Bravo.
4. Check steam generator heating elements 120V units should read 7Ω and 220V units should read 26Ω.
5. Check water filter steam generator water pump.
6. Check steam generator water pump.
7. Check for clogged steam generator.
8. Check EV6 on output side of water pump.

DESCRIPTION	STATUSES (P, t)	VP	WP	EV1 (no)	EV2 (nc)	EV3 (nc)	EV4	EV5 (no)	EV6 (nc)	Fan
3 rd pressure pulse	from -0,80 to 0,00 bar (water entry5" at -0,80 bar)	OFF	ON	ON	OFF	OFF	OFF	ON	ON	ON
	from +0,00 to +0,90 bar									
	from +0,90 to +1,00 bar									



Bravo Error A259 Process Timeout

Error A259 – Process Timeout

Process phase (from PV1 to Process) not reached within preset time (35 minutes).

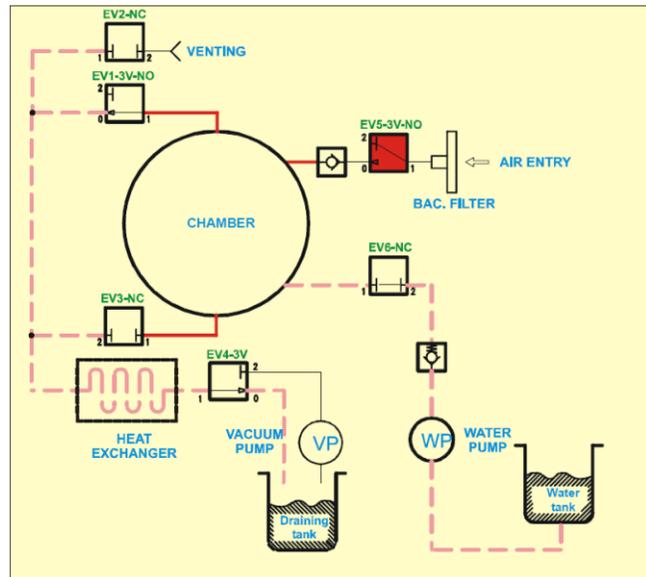
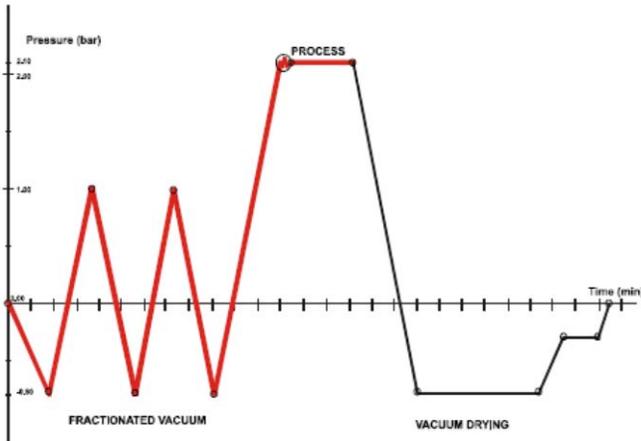
1. Check that chamber is not overloaded.
2. Check door gasket for steam leakage.
3. Check steam generator and band heater safety thermostats in rear of Bravo.
4. Check steam generator heating elements, 120V unit should read 7Ω and 220V should read 26Ω.
5. Check water filter steam generator water pump.
6. Check steam generator water pump.
7. Check for clogged steam generator.
8. Check EV6 on output side of water pump.

The icon  flashes to indicate the progress of the load sterilization process.

At the end of the process phase, the icon  remains lit steady to indicate the sterilization status of the load in the chamber.

If, for some reason, the sterilization cycle is interrupted before completion, the icon remains flashing in this case, the material cannot be considered sterile and must not be used.

DESCRIPTION	STATUSES (P, t)	VP	WP	EV1 (no)	EV2 (nc)	EV3 (nc)	EV4	EV5 (no)	EV6 (nc)	Fan
Holding time	For the time set by the program	OFF	ON	ON	OFF	OFF	OFF	ON	ON	ON



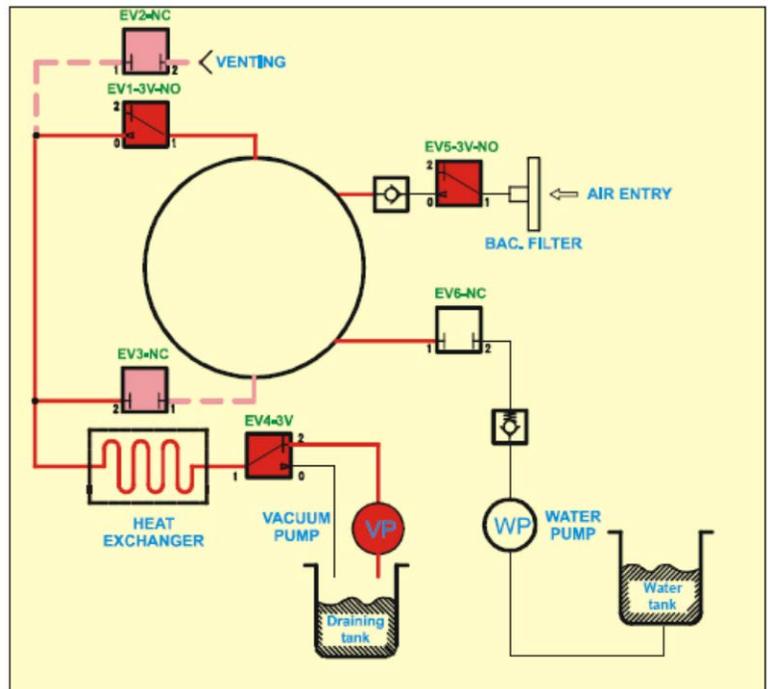
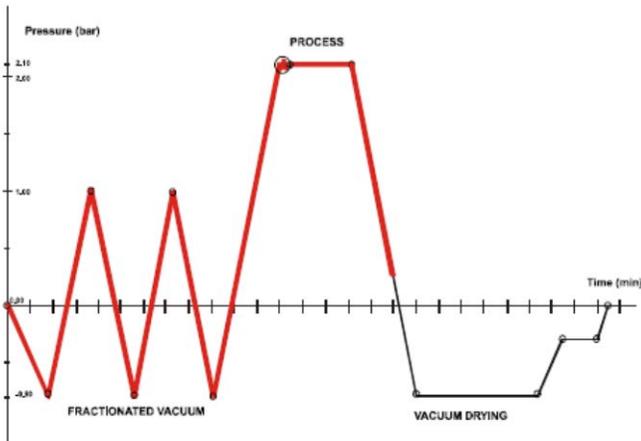
Bravo Error A260 PPD Timeout

Error A260 – PPD Timeout

Depressurization not performed within the preset time.

1. Check for clogged filter in front of chamber. Remove nut and remove metal filter screen from the nut.
Note: Filter screen must be removed from the nut as debris collects on the inside of the filter.
2. Check EV3

DESCRIPTION	STATUSES (P, t)	VP	WP	EV1 (no)	EV2 (nc)	EV3 (nc)	EV4	EV5 (no)	EV6 (nc)	Fan
Steam discharge	from +2,15/1,12 to +0,10 bar	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	ON
	from +0,10 to +0,10 bar	ON	OFF	ON	OFF	OFF	ON	ON	OFF	ON
	from +0,20 to -0,00 bar	ON	OFF	OFF	OFF	ON	ON	ON	OFF	ON



Bravo Error Code E000 Black-Out

Error Code E000 – Black-Out

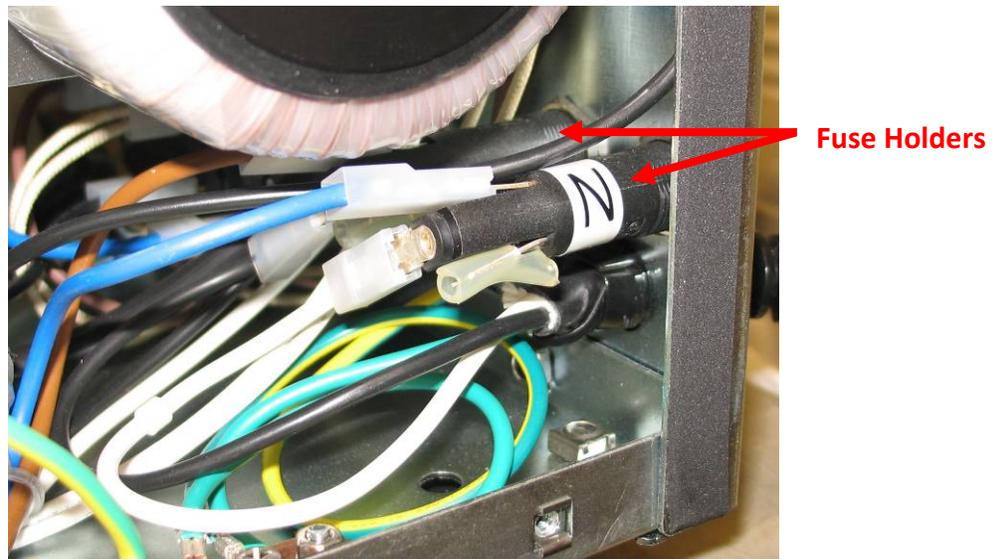
Loss of power to the Bravo sterilizer

If power switch does not light up when unit is turned ON:

1. Check wall outlet for power
2. Check two 15A 250V fuses in rear of unit by the power cord.

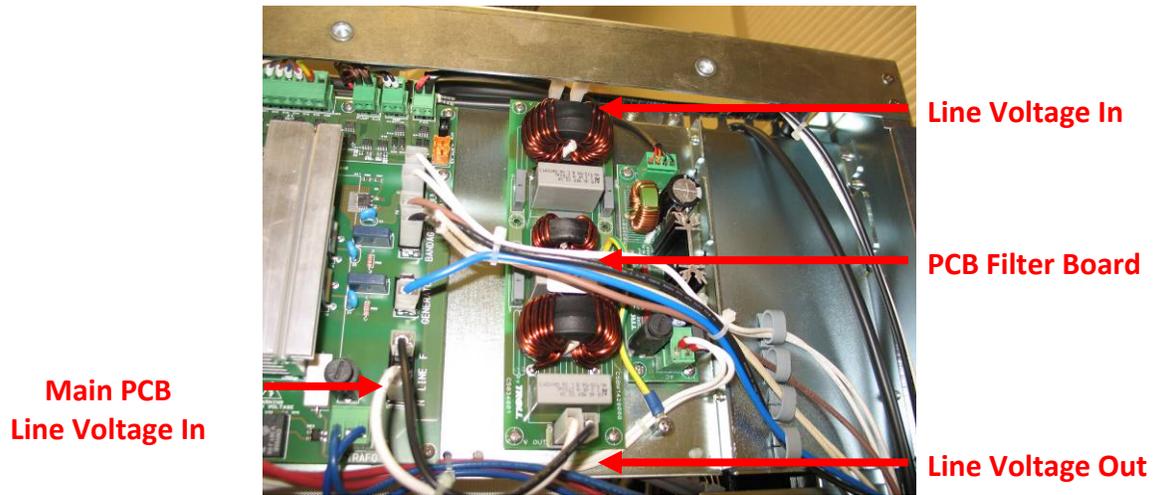


1. Check fuse holders

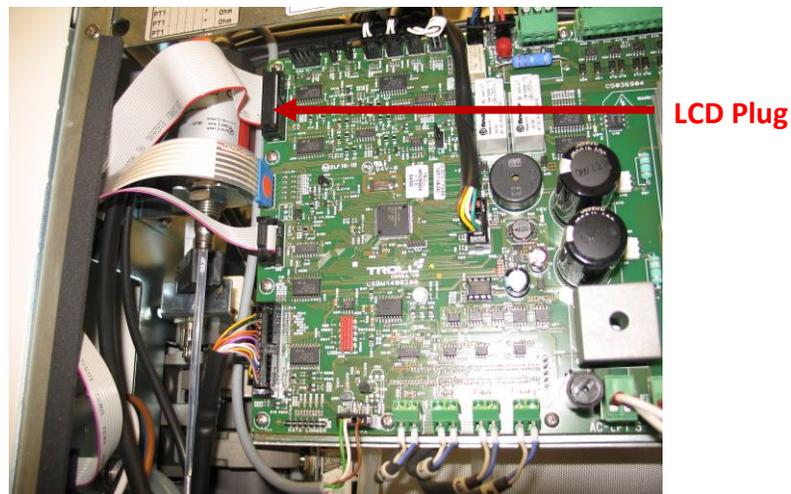


1. Check power switch
2. Check power cord and internal wiring from fuse holders to power switch

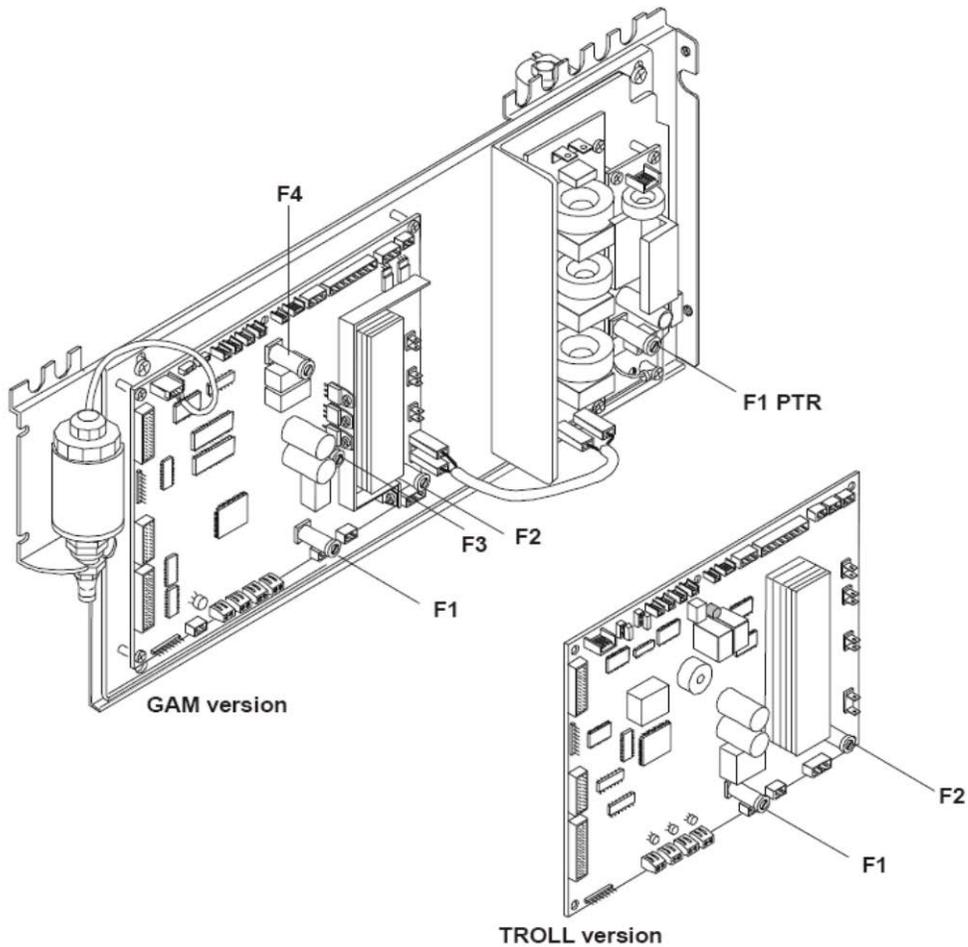
1. Check fuses on main PCB
2. Check for line voltage to PCB filter board
3. Check for line voltage from filter board to main PCB. If no voltage from filter board replace PCB filter board.



1. Check connection from LCD to left side of main PCB.
2. Replace main PCB or LCD as needed.



Bravo Fuses



Basic board: GAM version

F1: T 5A 250V (secondary transformer winding)

F2: T 4A 250V (120V Bravo) (Primary transformer winding)

F2: T 2A 250V (220V Bravo) (Primary transformer winding)

F3: T 200mA 250V (door-lock accidental activation)

F4: F 1.25A 250V (door-lock overload)

part # Fuse-T-5A

part # Fuse-T-4A

part # Fuse-TT-2A

part # Fuse-F-200MA

part # Fuse-F-1.25A

Basic board: TROLL version

F1: T 6.3A 250V (secondary transformer winding)

F2: T 3.15A 250V (primary transformer winding)

part # Fuse-T-6.3A

part # Fuse-T-3.15A

Printer PS board

F1 PTR: T 5A 250V (printer protection)

part # Fuse-T-5A

Line Fuses 15A 250V ABC (Fast Acting) (not shown)

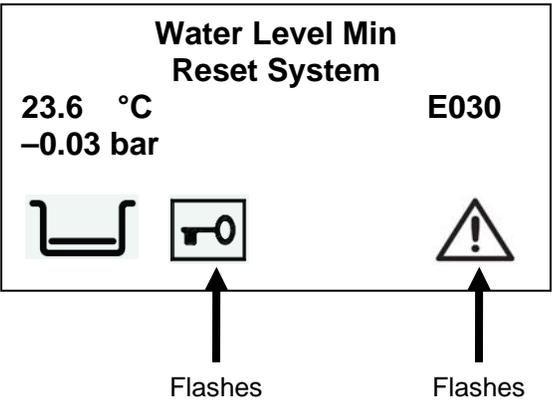
part # 41700330000

Line Fuses, F1, F2 & F3 on GAM board and F1 & F2 on Troll board will cause no display if blown.

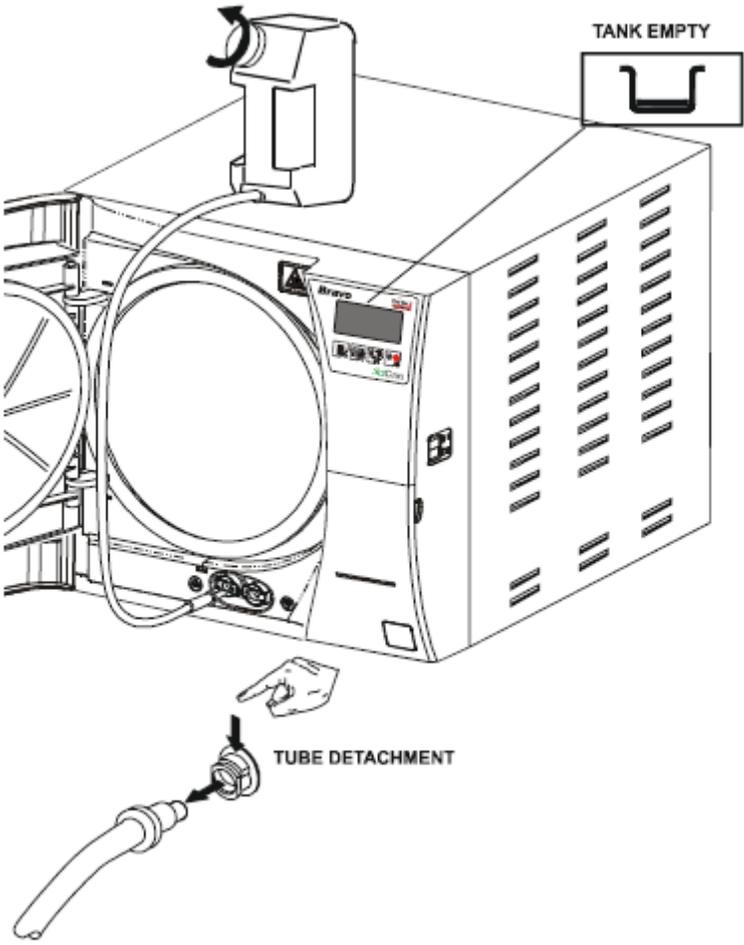
If F4 on GAM board is blown or red reset button is tripped on the Troll board, there will be no beeping sound and door motor, auxiliary pump, water pump, fans and valves will not operate.

Bravo Error E030 Water Level Min Manual Filling Mode

When a cycle is started in the Manual Filling Mode and the water level is below the minimum level the display will show Water Level Min Reset System and E030 will appear on the right side of the display. The empty water level icon will show in the bottom left corner of the display. The door status and alarm icons will flash. To reset system hold in the cycle select button for 3 seconds.

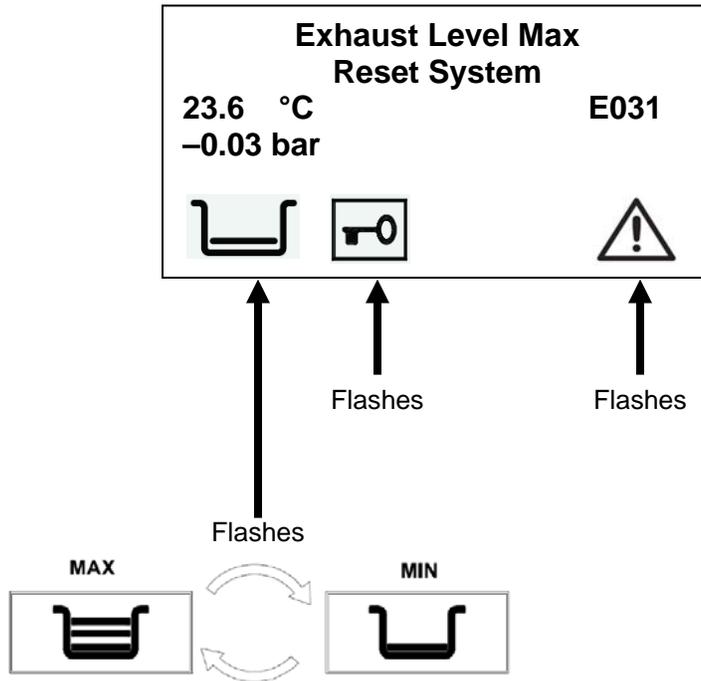


Manual Filling

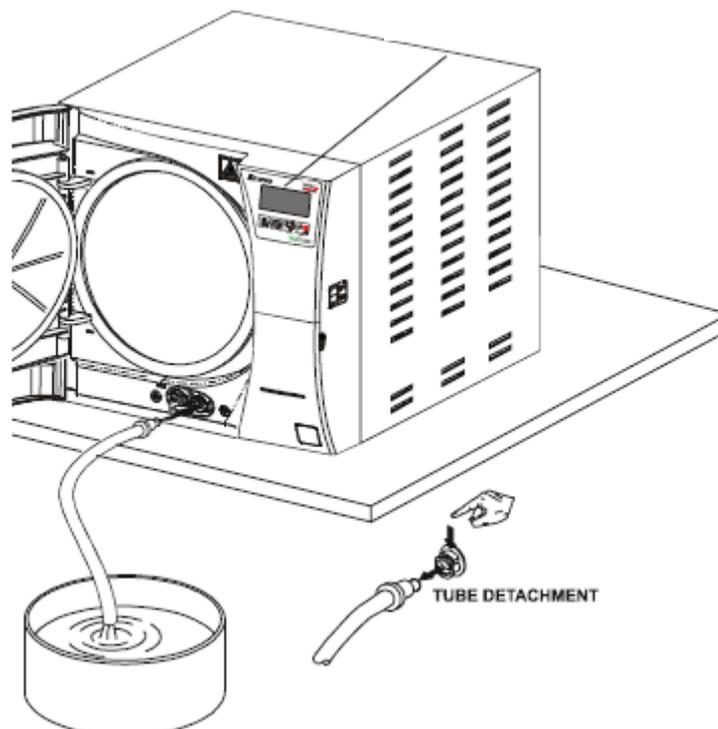


Bravo Error E031 Exhaust Level Max

When a cycle is started and the internal drain tank is full the display will show Exhaust Level Max Reset System and E031 will appear on the right side of the display. The water level icon will flash between empty and full in the bottom left corner of the display. The door status and alarm icons will flash. Empty the internal drain tank completely and reset the system. To reset system hold in the cycle select button for 3 seconds. **Drain Options in the Advanced Menu should always be set at Internal Drain even if connection to a central drain. If External Drain is selected Exhaust Level Max will continuously appear on the display when starting a cycle.**



Manual Draining



Bravo Error Codes E900, E901 & E902 Vacuum Test Failed

Error Code E900 – Vacuum Test Failed

Pressure changed over the limit of .02 bars.

1. Check that the Vacuum Test was not started with the chamber too hot (over 50°C).
2. Check for leaks.

Error Code E901 – Vacuum Test Failed

Vacuum test failed during the waiting time, pressure rising to high in chamber.

1. Check for too much humidity in the chamber.

Error Code E902 – Vacuum Test Failed

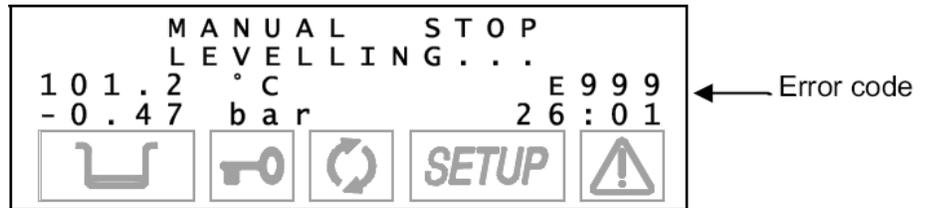
Vacuum test failed as the maximum vacuum -.80 bars is not reached within the set time 13 minutes.

1. Check for leaks.
2. Check Vacuum pump for defective seals or o-rings.
3. Check the Pressure transducer.

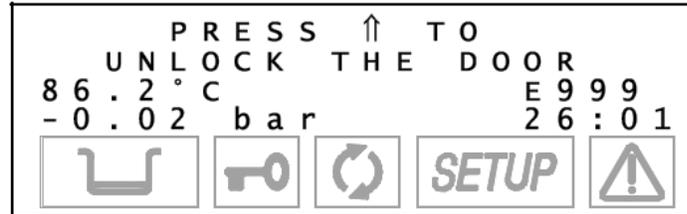
Bravo Error Code E999 Manual Cycle Interruption



The operator can manually interrupt the cycle at any time by pressing the Start/Stop key for three seconds. This command generates an error code **E999** because the cycle did not finish correctly. Until it is safe to open the door, the unit will beep and the display will show:



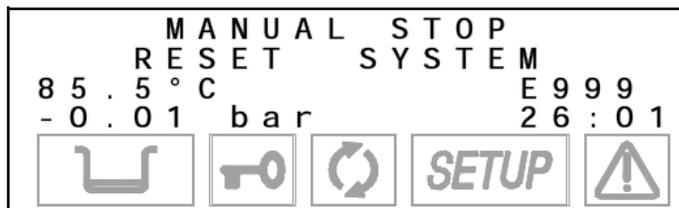
When safe conditions are reached, the machine activates a special procedure, asking the operator to manually unlock the door by displaying the following instructions:



Press the \uparrow key to unlock the door. The following message is then displayed:



Finally when the door is opened you will be asked to **Reset** the device by the following message:



To **Reset** the system, press and hold the **Program Selection** key for at least three seconds unit you hear the confirmation beep.

After the **Reset**, the device goes into the **Stand-by** mode, ready to execute a new program.

Bravo Error Code H150 MPX Broken

Bravo Error Code H150 – PMX Broken

Pressure transducer broken. Pressure reading by the transducer is over 2.35 bars.

1. Check plug from pressure transducer to the PCB.
2. Pressure transducer should read approximately 9.9K Ω (green wire to white wire).
3. Replace pressure transducer.

Bravo Error Code H160 MPX Short-circuit

Bravo Error Code H160 – MPX Short-circuit

Short-circuit in the pressure transducer. Pressure reading is under -1.01 bars.

1. Pressure transducer should read approximately 9.9K Ω (green wire to white wire).
2. Replace pressure transducer.

Bravo Error Code H400 P/T Problem

Error Code H400 – P/T Problem

Ratio P conversion/T not correctly balanced (P conversion greater than T) during the process phase. The difference between the P conversion and T is greater than 2°C.

1. Check that chamber is not overloaded.
2. Check door gasket for steam leakage.
3. Check water filter steam generator water pump.
4. Check for leakage from tubing connected from steam generator to chamber.
5. Check for leakage from steam generator.
6. Check water pump.

Bravo Error Code H401 T/P Problem

Error Code H401 – T/P Problem

Ratio T/P conversion not correctly balance (T greater than P conversion) during the process phase. The difference between the P conversion and T is greater than 2°C.

1. Check the chamber is not overloaded.
2. Check the door gasket for steam leakage.
3. Check water filter steam generator water pump.
4. Check for leakage from tubing connected from steam generator to chamber.
5. Check for leakage from steam generator.
6. Check water pump.
7. Check pressure transducer.
8. Check PT 1.

Bravo Error Code H402 Temperature Over Limit

Error Code H402 – Temperature Over Limit

Temperature is over the MAX threshold during the process phase. The temperature detected by PT1 probe is +3°C greater than the normal temperature value (124/137).

1. Check load for cassettes touching chamber thermocouple PT1.
2. Check PT1.
3. Check water filter steam generator water pump.
4. Check water pump.

Bravo Error Code H403 Temperature Under Limit

Error Code H403 – Temperature Under Limit

The PT1 temperature is under the MIN threshold during the process phase of the cycle. The temperature detected by PT1 normal value 121/134°C.

1. Check that chamber is not overloaded.
2. Check steam generator safety thermostat in rear of Bravo.
3. Check door gasket for steam leakage.
4. Check water filter steam generator water pump.
5. Check steam generator heating elements 120V units should read 7Ω and 220V units should read 26Ω.
6. Check for leakage from tubing connected from steam generator to chamber.
7. Check for leakage from steam generator.
8. Replace water pump.

Bravo Error Code H404 PT1 Fluctuating

Error Code H404 – PT1 Fluctuating

Temperature is fluctuating around the threshold during the process phase. The difference between PT1 max & PT1 min values is over 2°C.

1. Check that the chamber is not overloaded.
2. Check door gasket for steam leakage.
3. Check water filter steam generator water pump.
4. Check for leakage from tubing connected from steam generator to chamber.
5. Check for leakage from steam generator.

Bravo Error Code H405 P Over Limit

Error Code H405 – P Over Limit

Pressure value is over the MAX threshold during the process phase of the cycle. The pressure value is higher than 1.24 or 2.31 bars (depending on the cycle type 121 or 134°C).

1. Check pressure transducer.

Bravo Error Code H406 P Under Limit

Bravo Error Code H406 – P Under Limit

Pressure value is under the MIN threshold during the process phase. Pressure is below 1.03 or 2.02 bars (depending on the cycle type 121 or 134°C).

1. Check that chamber is not overloaded.
2. Check steam generator safety thermostat in rear of Bravo.
3. Check door gasket for steam leakage.
4. Check water filter steam generator water pump.
5. Check steam generator heating elements 120V units should read 7Ω and 220V units should read 26Ω.
6. Check for leakage from tubing connected from steam generator to chamber.
7. Check for leakage from steam generator.
8. Replace water pump.

Bravo Error Code H410 Timer Problem

Bravo Error Code H410 – Timer Problem

Hold time is wrong during the process phase. Countdown time mismatches the set point value.

1. PCB defective.

Bravo Error Code H990 Over Pressure

Error Code H990 – Over Pressure

Sterilization chamber is reading over pressure. Pressure value is over 2.32 bars.

1. Check the pressure transducer.

Bravo Error Code H991 Overheating PT1

Error Code H991 – Overheating PT1

PT1 is overheating. PT1 detects a temperature value over 138°C.

1. Check that the chamber is not overloaded.
2. Check PT1 thermocouple.
3. Check pressure transducer.
4. Defective PCB

Bravo Error Code H992 Overheating PT2

Error Code H992 – Overheating PT2

PT2 is overheating. PT2 is detecting a temperature value over 230°C.

1. Check water filter steam generator water pump.
2. Check water pump.
3. Check pressure transducer.
4. Defective PCB

Bravo Error Code H993 Overheating PT3

Error Code H993 – Overheating PT3

PT3 is overheating. PT3 is detecting a temperature value over 160°C.

1. Defective pressure transducer
2. Defective PCB

Bravo Forced Ventilation

When the sterilization cycle is complete as long as the door is not opened, the vacuum pump is periodically enabled in order to remove any traces of condensate from the sterilization chamber. During these periods the display will show:



Push the ↑ key to interrupt the ventilation and open the door.

Forced Ventilation

Heat Exchanger & Fans active 8 times: 1min ON & 5min OFF Vacuum Pump & Valves OFF.

Vacuum Pump, Valves & Fans active 5 times: 6min ON 1min OFF

Troubleshooting Vacuum Timeouts or Will Not Vent

A250, A253, A256 & A260

All vacuum error codes indicate that the Bravo was unable to draw a vacuum down to -0.8 bars before a set timeout. Depending on the cycle selected this can happen during the first vacuum pulse (A250), the second vacuum pulse (A253) or the third vacuum pulse (A256) or the chamber will not vent (A260). To determine the cause of these error codes follow the procedure below:

1. Check the chamber drain screen inserted into the fitting in the front of the chamber. Unscrew the fitting and remove the drain screen from the fitting. To remove the drain screen grab the end of the screen twist the fitting and pull on the drain screen. **(If you hold the drain screen in the center it will be crushed)**. Clean the inside of the drain screen using an instrument or a small flat head screwdriver. The drain screen can also be clean in an ultra-sonic cleaner. The chamber not venting (A260) is almost always a clogged drain screen.

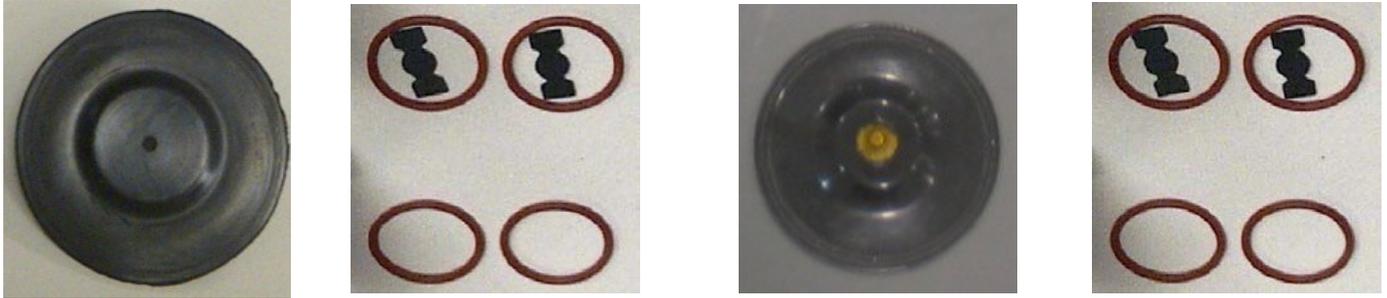


2. Check for excess moisture in the chamber. Make sure Bravo has 2 inches of clearance on the left side, right side and the top and 4 inches of clearance in the rear. Dry chamber and try another cycle.
3. Check the Heat Exchanger is not clogged with dust. Clean if needed.
4. Go to the Service Menu and select Test Cycles No-Vacuum Cycle. Run the No-Vacuum Cycle and check for steam leaks from the door gasket and all tubing connected to the Steam Generator and the Chamber. If No-Vacuum Cycle is successful check for steam leaks from the condensing coil in the rear of the Bravo during venting. Remove condensing coil cover and check for cracked solder joints. Door gasket should be replaced every 1000 cycles or after 1 year whichever comes first.
5. If Bravo is enclosed on all sides even with the clearances listed in number 2, remove Bravo from enclosure and set in open area (on an open counter). Try running a cycle, if the cycle is successful an exhaust fan may be required behind the Bravo when enclosed.
6. Performed a Vacuum Test to verify that the Vacuum Pump is operating correctly. Vacuum should reach -0.8 bars in 6 minutes or less. If vacuum test fails rebuild vacuum pump.

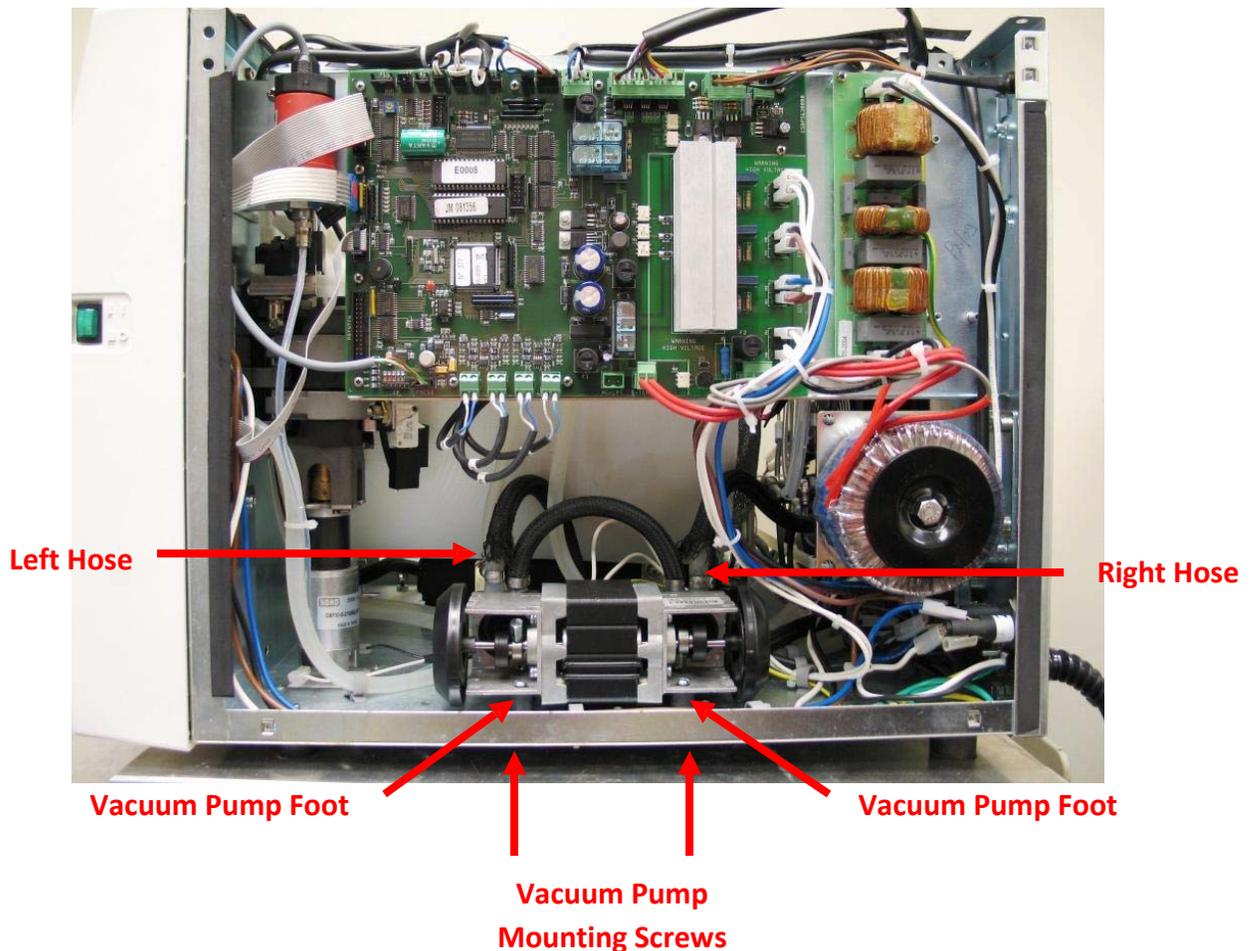
Note: The chamber temperature must be below 50°C to run a vacuum test.

Bravo 17 Vacuum Pump H5P3 Rebuild Instructions Repair Kit #SCI-901-03

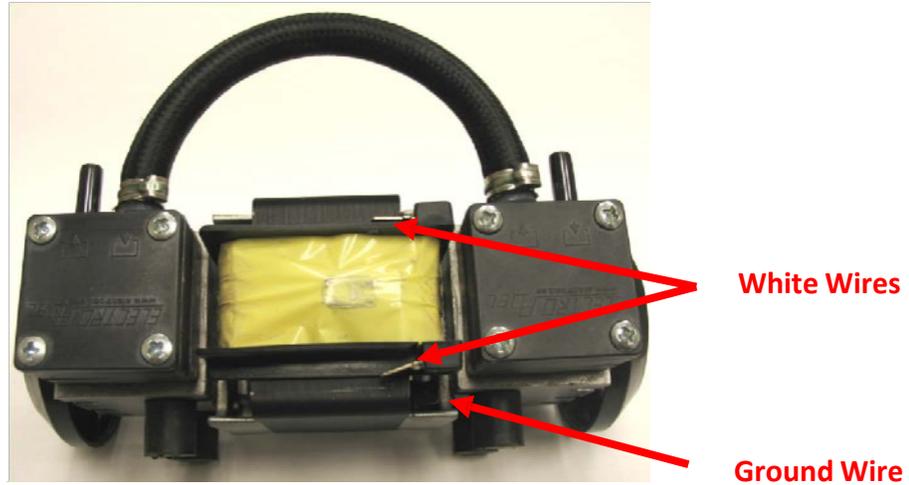
The kit contains 2 diaphragms, 8 orange o-rings and 4 black shutters



Remove the vacuum Pump from the Bravo. Slide the Bravo off the edge of a counter or drain the clean & waste water tanks and turn the Bravo on its side. Remove four screws from underneath the Bravo that screw into the vacuum pump legs. Remove the black hose on the far left side and the far right side of the vacuum pump. Roll the vacuum pump towards you and slide off the electrical connections.



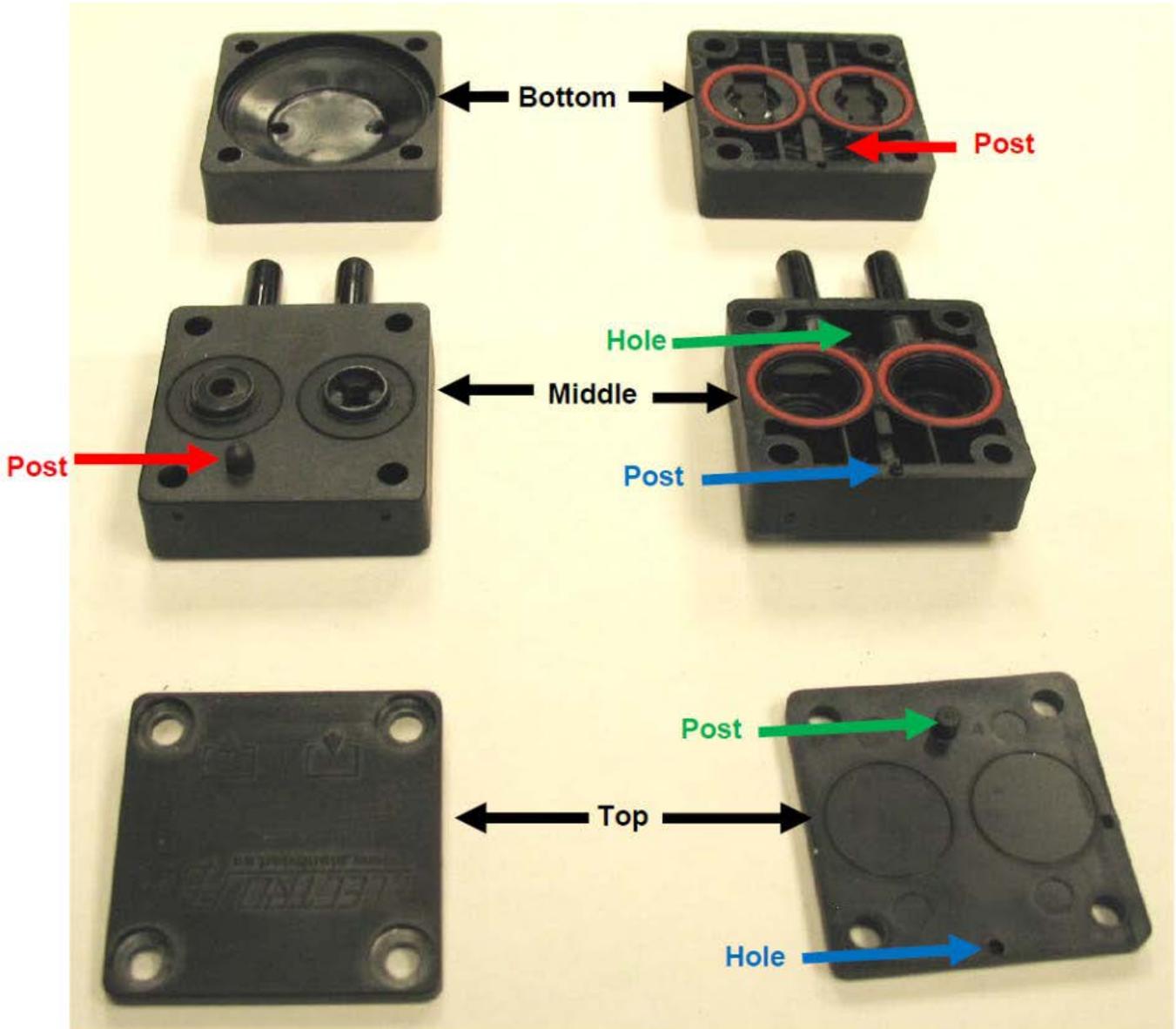
White wires can go on either terminal



Draw a line with a marker along the black plastic heads so they can easily be aligned when reinstalling. With heads removed turn diaphragms counterclockwise to unscrew them from pump arms. When installing new diaphragms be sure to screw them completely onto the pump arms using your hand only. Disassemble black plastic heads and replaced all o-rings and shutters.



O-ring & Shutter Replacement



After replacing the o-rings and shutters place the top piece onto the middle piece and then place the middle piece onto the bottom piece. When placing the rebuilt head assembly onto the vacuum pump motor assembly be sure the new diaphragm is seated into the bottom of the head assembly.

Note: When reinstalling the Vacuum Pump mounting screws, be careful if you are using an electric screwdriver that you do not damage the rubber feet on the pump.

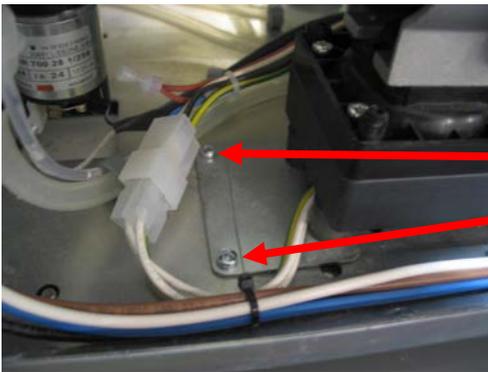
Bravo 17V & 21V Vacuum Pump EVO10

Rebuild Instructions

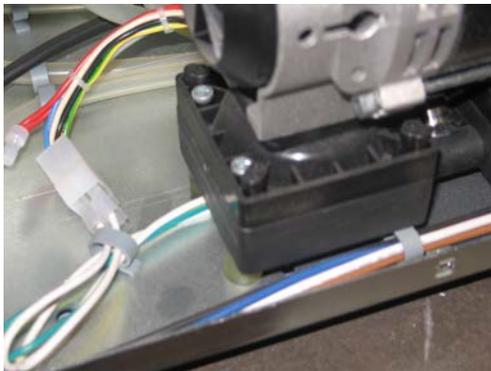
Repair Kit #SCI-900-40



1. Remove the EVO10 vacuum pump from the Bravo chassis; it is located on the right side of the unit (when looking at the Bravo from the front). The pump will be mounted to the frame in one of two ways, with or without small mounting plates (see pictures below).



Pump with mounting plates shown here. Remove these two screws on both sides respectively.

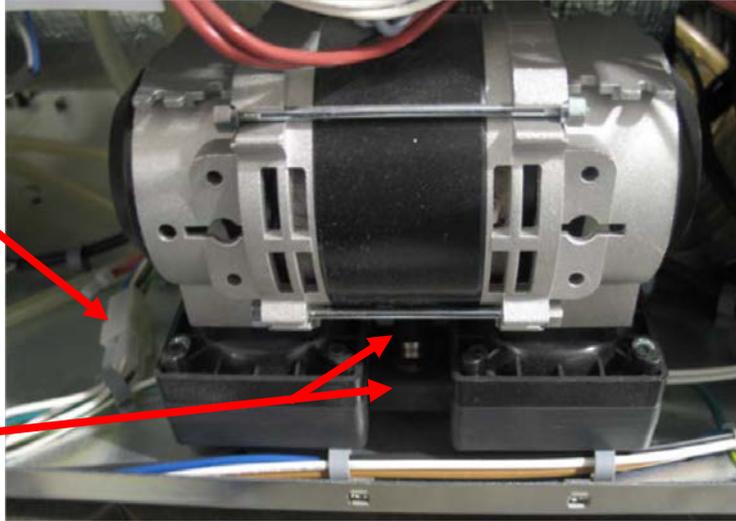


Pump without mounting plates shown here. Remove the four screws by accessing from beneath the Bravo's frame (sliding unit slightly off the edge of the work surface will allow access).

2. Disconnected wire connections on the left of the pump and slide off the two black, insulated tubes from between the two pump heads. The hose clamps do not have to be removed: the tubes will slide off with a firm pull.

Wire connections

Black, insulated tubes



3. The vacuum pump should now be free of the Bravo frame. If your unit employed the small mounting plates (shown below), remove the four screws attaching the plates.

Screws

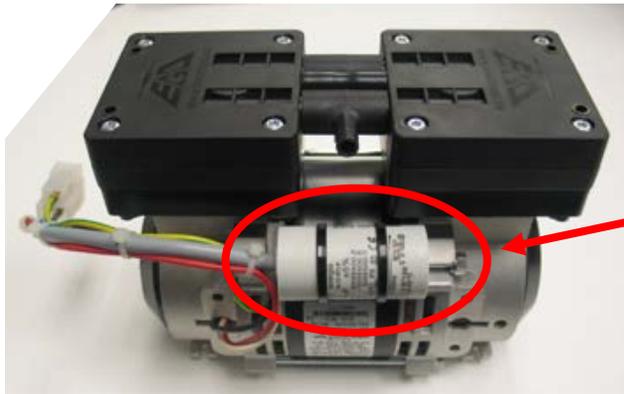
Screws



4. Next, remove the four rubber mounting posts from the base of the pump (two on each side).



5. Now flip the vacuum pump fully upside down as shown below. Take note of the large white capacitor facing you in the photo. The capacitor will be away from view (facing the inside of the Bravo) when the pump is mounted back into place, but will be used as a visual reference for these instructions (so we know which way is front and back).

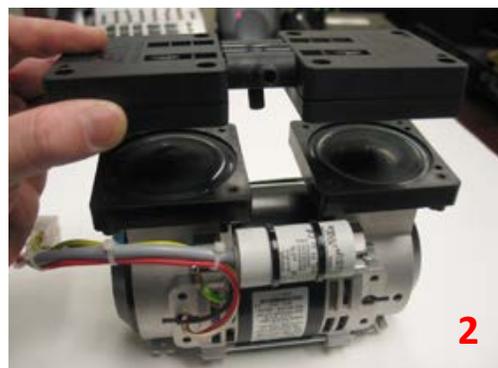


Large white capacitor for reference

6. Now we can disassemble the head units of the vacuum pump. First, remove the four screws on each head as shown below (8 screws total).



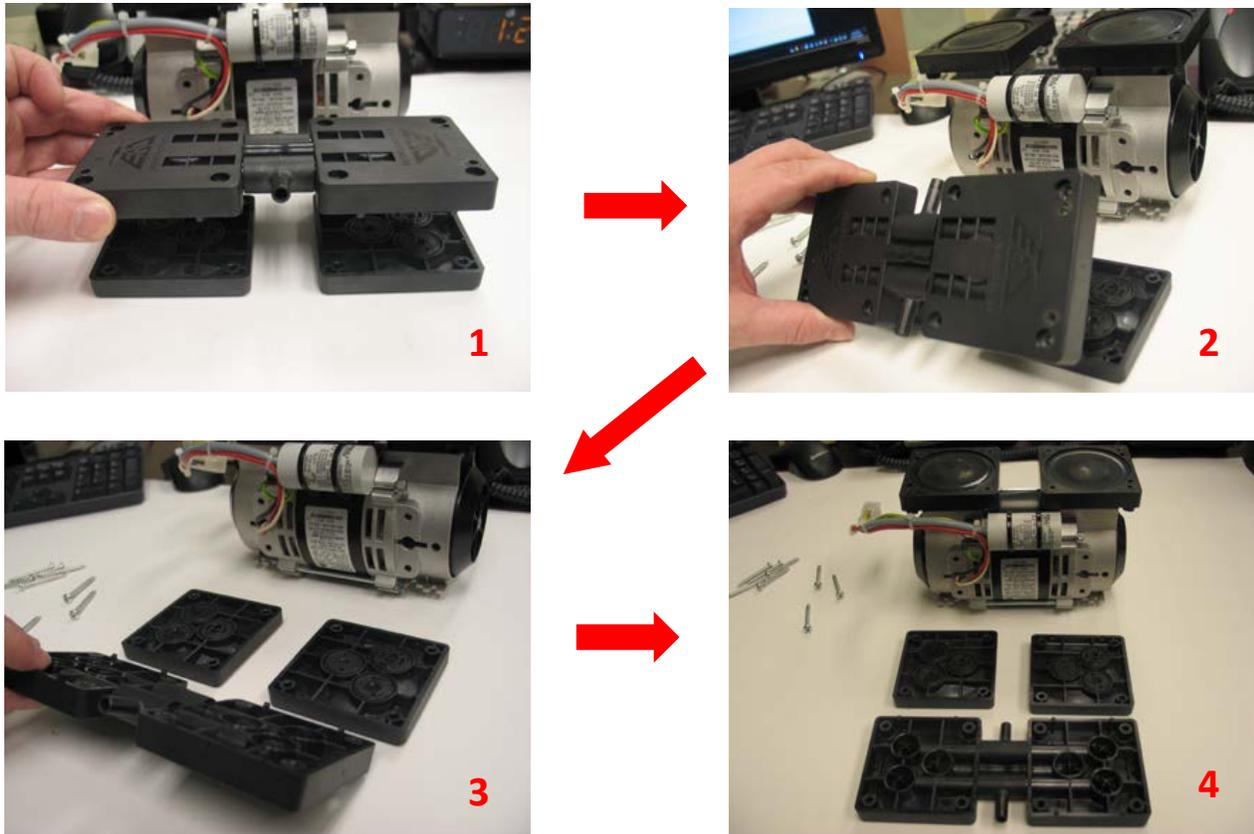
7. Now we can lift the head assembly off of the pump proper, maintaining orientation as shown below. Use both hands to prevent head sections from falling off while moving.



8. Looking downward at the head assembly you just removed, note the two input/output posts in between the two square heads. The output post will likely be out of view as shown below. For ease of recognition, rotate the post into view as shown below. Both direction arrows will now point in the same direction (away from you).



9. Now lift up and flip over the top section, maintaining orientation as shown.



10. Now we can replace the primary o-rings and shutter-disks of the two heads. Note the asymmetrical layout of these disks as shown below. (If the disks appear different, see next step)



11. In some older style vacuum pumps, the shutter-disks used small c-clips to hold the shutters in place. If your pump has these older shutter-disks with c-clips, no need to worry, simply replace them with the new shutter-disks provided with your rebuild kit.

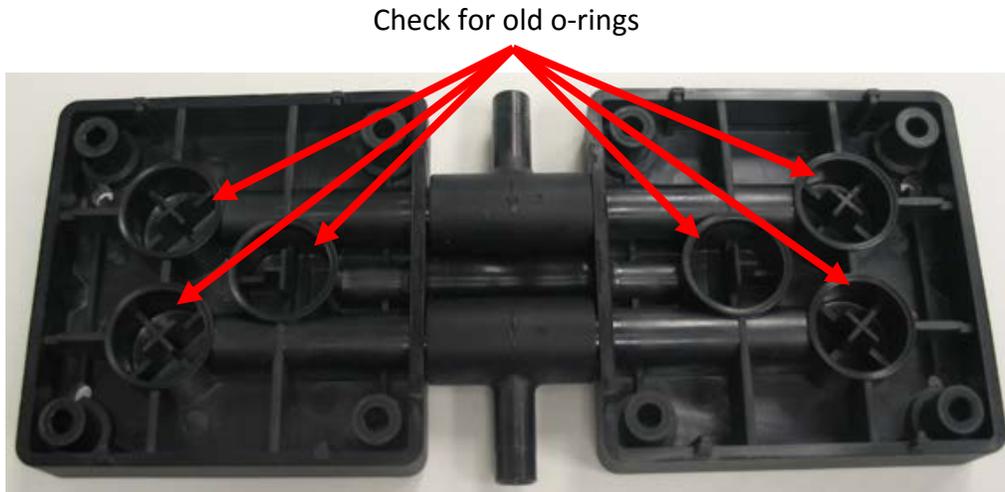
C-Clip style shutter-disks



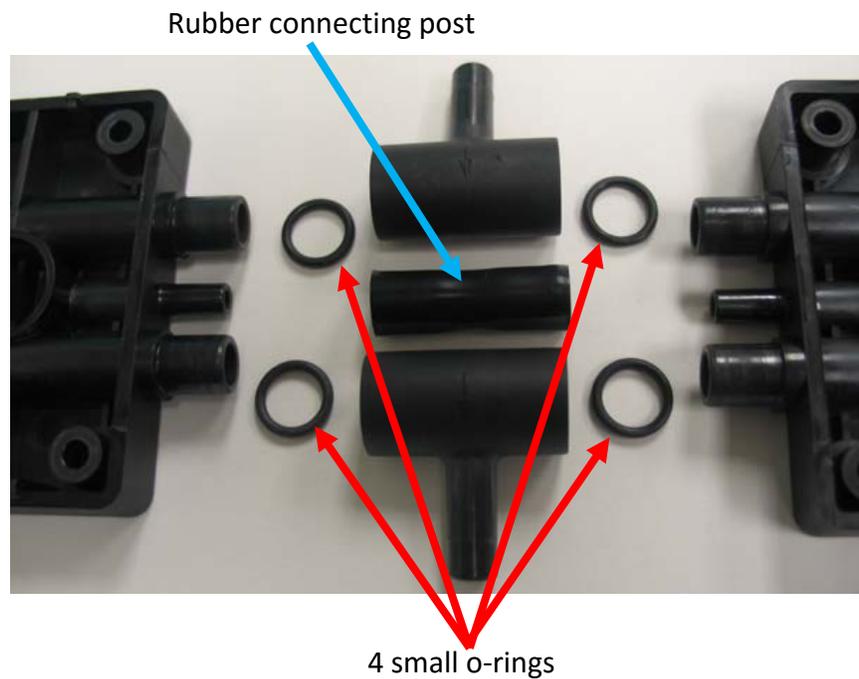
12. Remove all shutter-disks and o-rings (6 disks, 12 o-rings total). Each disk has two o-rings around its outer edge (one on each side), be sure to remove them all. Place two new o-rings on each new shutter-disk and set them in place, oriented the same as they were (as shown below).



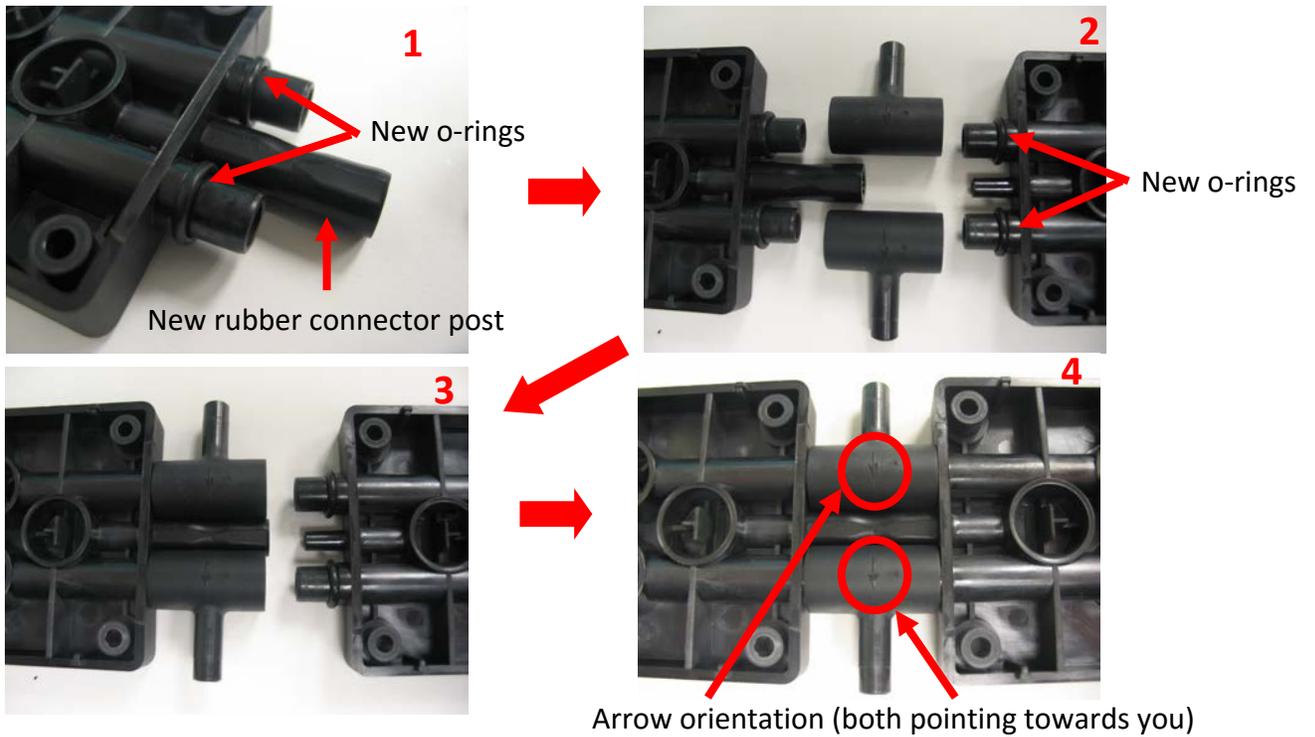
13. Now we can address the other section of the head units that we removed in step 9. Make sure there are no o-rings left behind from the old shutter-disks in any of the six round fittings



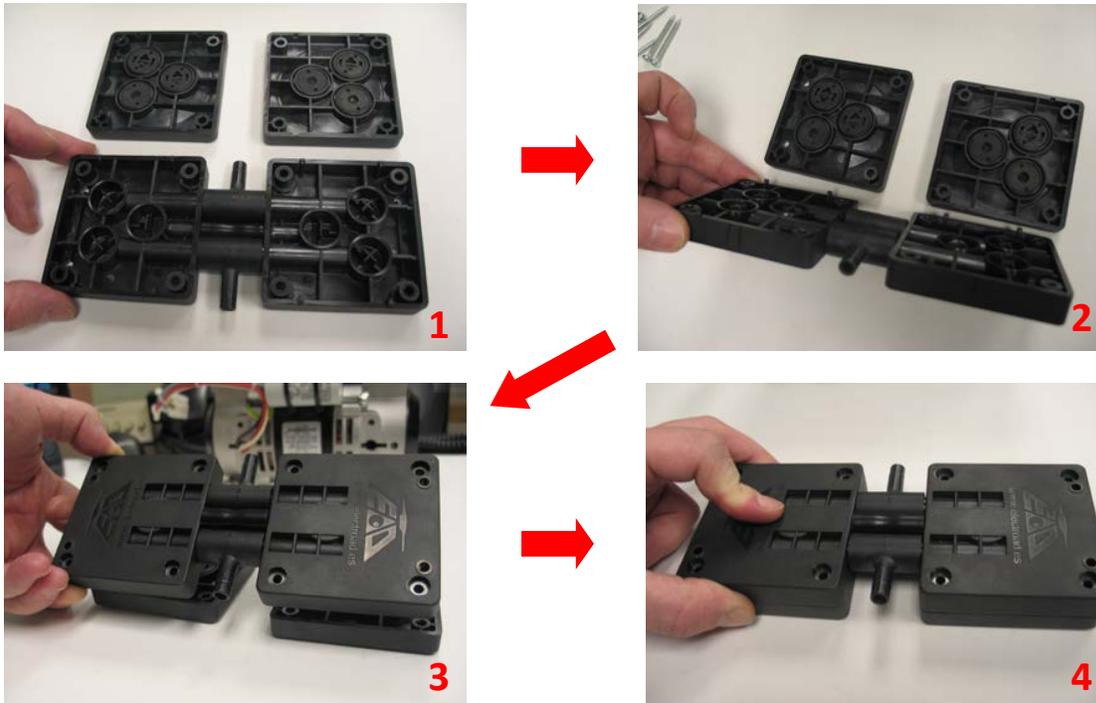
14. To separate the two head housings, simply pull them firmly apart from one another to expose the last four (smaller) o-rings and rubber central connecting post shown below.



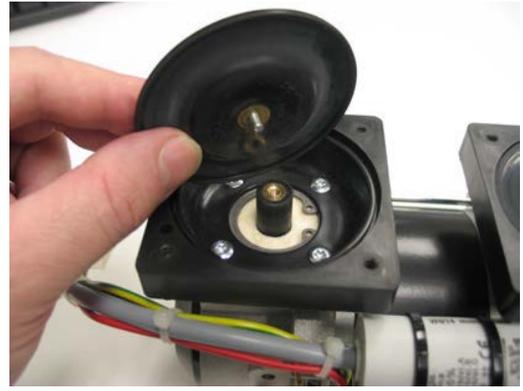
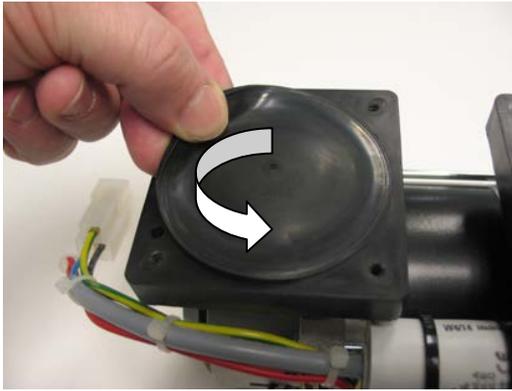
15. Replace the four small o-rings by sliding them onto the posts of the heads. Slide the new rubber central connector onto one of the heads, then press the two heads together as shown, maintaining the same orientation. At this point, the two black arrows on the barb connection pieces will be pointing towards you.



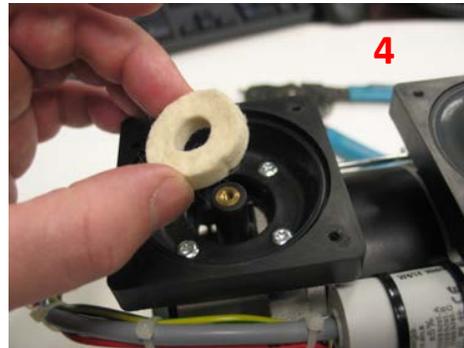
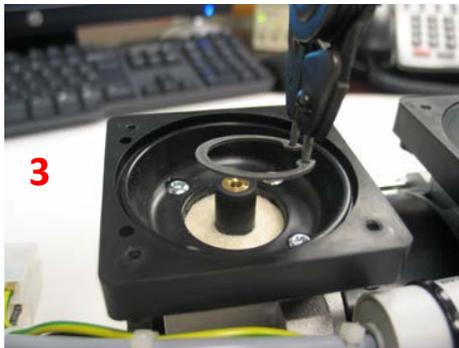
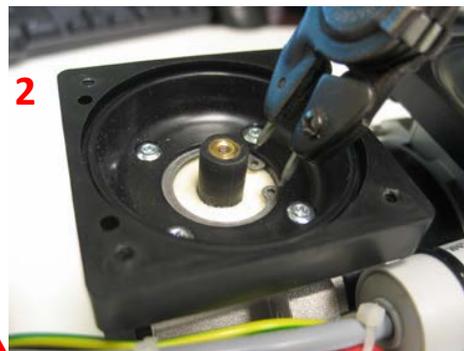
16. Now we can mate the head sections back together with one another as shown below.



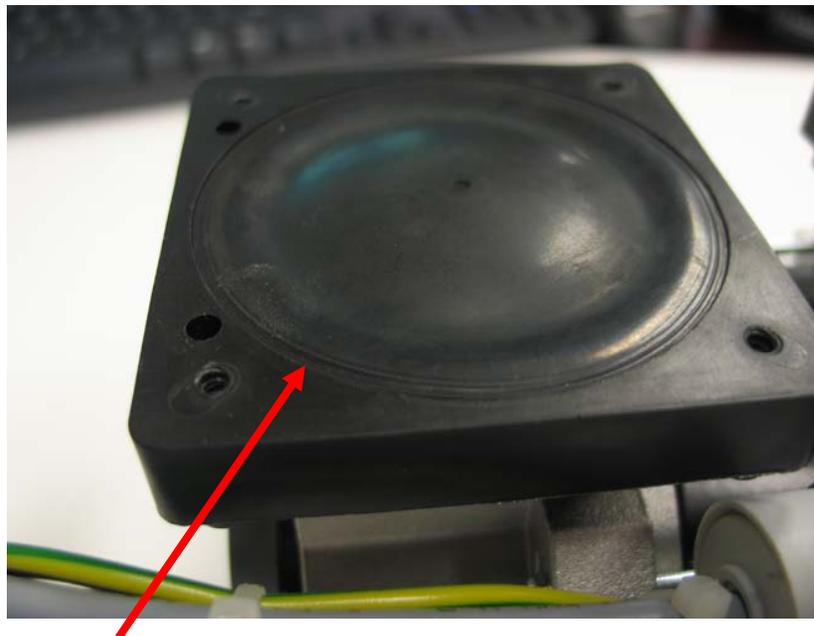
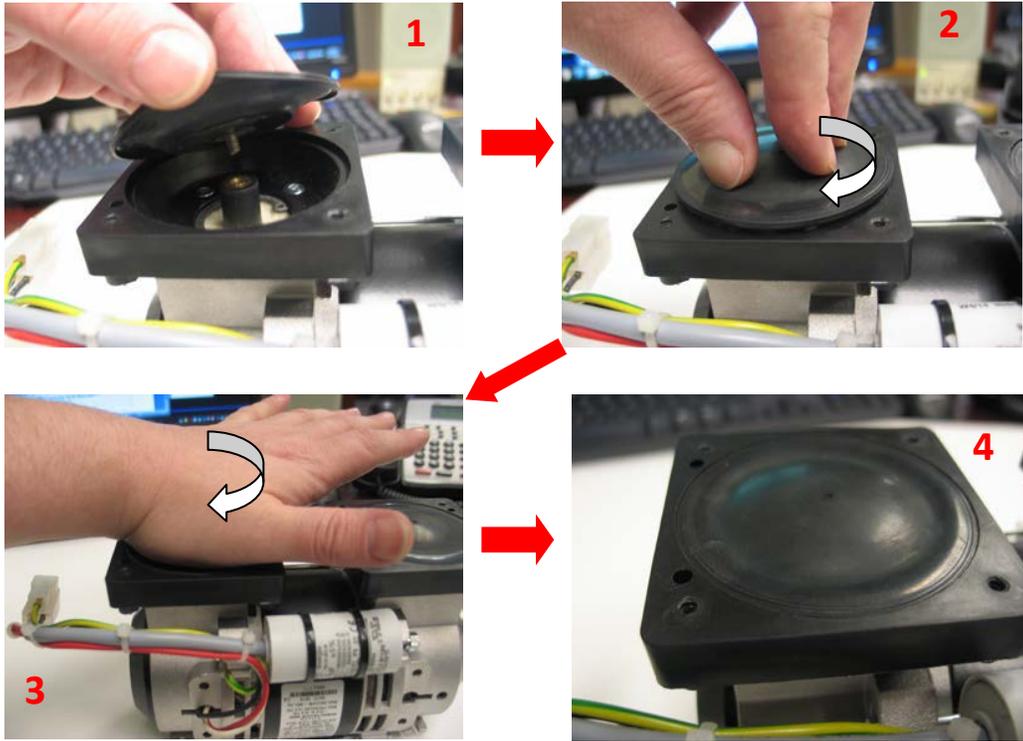
17. Now to replace the two main large membranes on the vacuum pump proper. To remove the membranes, lift up one edge and unscrew the membrane from the vacuum's piston (counter-clockwise to loosen). If the membrane is difficult to remove, gripping with a pair of pliers to help unscrew is fine (the old membranes will be discarded).



18. We can now see the firm cotton bushing surrounding the piston. Remove the c-clip using a pair of snap-ring pliers (aka clip-ring pliers) and remove the old bushing. Replace with the new bushing included in your rebuild kit.

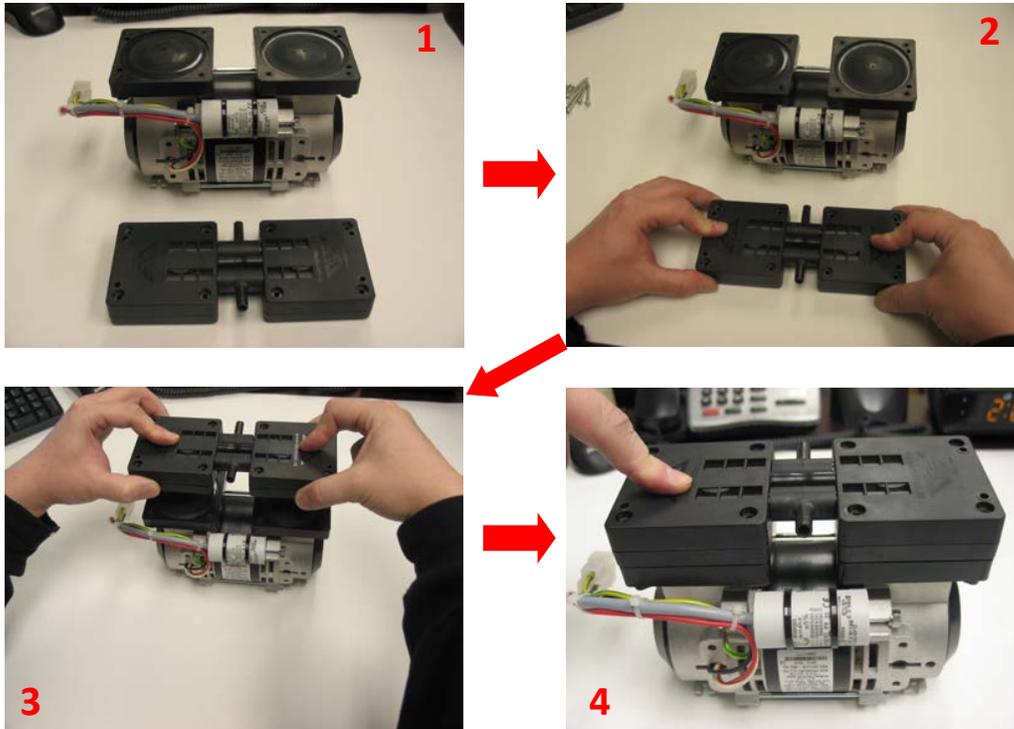


19. After installing the new bushings, we may now install the main diaphragm membrane to the pump's piston. Simply screw the central threaded post of the membrane into the end of the piston. The black flywheels on either side of the vacuum pump can be manually rotated to position the piston so it is protruding upward as far as it will go; this will assist us in getting the new membrane's post threaded properly, and help to ensure the membrane is fully screwed into place. Be sure to screw the membrane down completely flush to the end of the piston. Pressing down firmly with the palm of your hand while turning clockwise should work, as we do not want to use any tools that could tear/damage the new membrane. If the membrane is not screwed down entirely the vacuum pump will not rotate properly and will be very noisy when operating, or may not rotate at all.



New membrane nice and flush

20. Finally we may now replace the head units back onto the vacuum proper. With two hands (to prevent the heads from falling apart) place the head unit back onto the pump and replace the eight screws to secure them in place.



21. After the eight fastening screws that were removed in step 6 are replaced to secure the head units to the vacuum pump proper, replace the rubber feet and mounting plates (if applicable). Your vacuum pump is now rebuilt and ready for reinstallation into the Bravo.

Troubleshooting Error Codes A251, A252, A254, A255, A257, A258 & A259 Chamber will not pressurize

Step 1

First check is whether the water pump is running

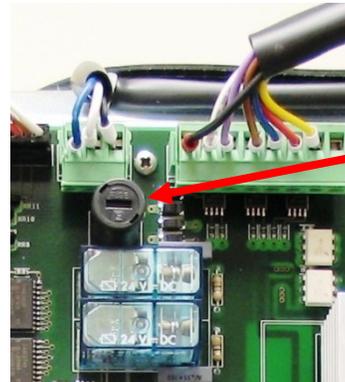
Go to the devices test menu and run the water pump. If the pump is running proceed to step 2. If the pump does not run, check the door motor to verify that the 24VDC power supply is operating. If both the water pump and the door motor do not run check the red reset button on the top/center of the Troll PCB or check fuse F4 (1.25A/250V fast acting part #Fuse-F-1.25A) located on the top/center of the GAM PCB.

Troll PCB



Red Reset Button

GAM PCB



F4

Step 2

Check the heating elements in the Steam Generator

Remove the black caps on the safety thermostats for the steam generator and band heating element below the condenser coil (heat exchanger) on the rear of the Bravo. Push to reset both thermostats.

Original Style Thermostat



New Style Thermostat

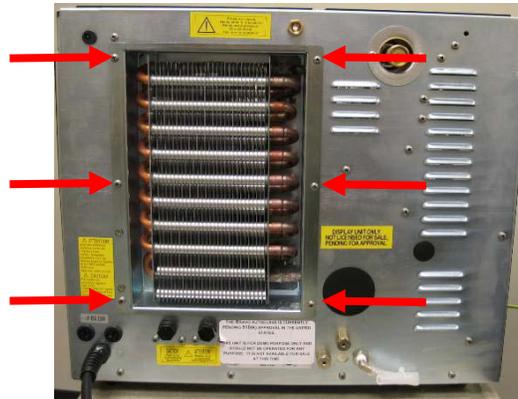


Note: The Steam Generator Safety Thermostat (part #97730011) is located on the left and the Band Heating Element Safety Thermostat (part #97730010) is located on the right when facing the rear of the Bravo. A small screwdriver or instrument will be required to reset the original style thermostat.

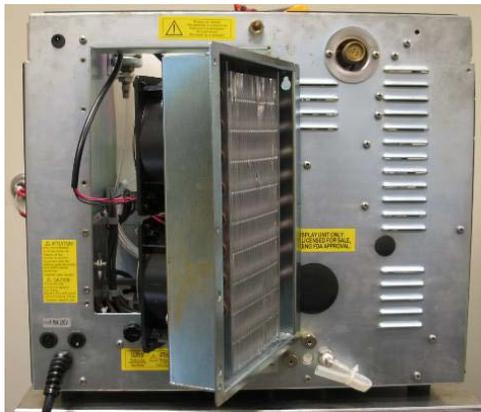
Using an Ohm Meter check the resistance reading of the Steam Generator heating elements. Reading should be approximately 8Ω for 120V & 27Ω for 220V Bravo. If resistance reads 15Ω for 120V or 54Ω for 220V Bravo one of the heating elements is open. We suggest replacing both elements if one is bad. If the reading is showing an open circuit, check the Steam Generator safety thermostat.



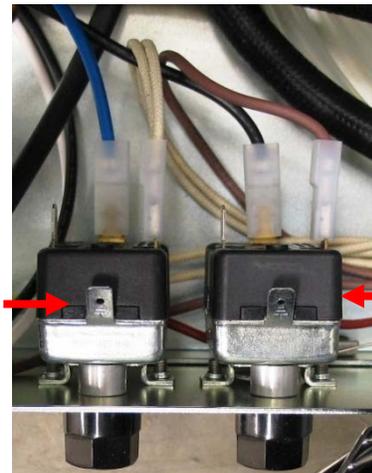
To access the Steam Generator safety thermostat, remove the six screws holding the condenser coil cover.



Open the condensing coil assembly to the right to access the safety thermostats.



Steam Generator Safety Thermostat



Band Heater Safety Thermostat

If Heating Elements or Thermostats test bad replace as needed.

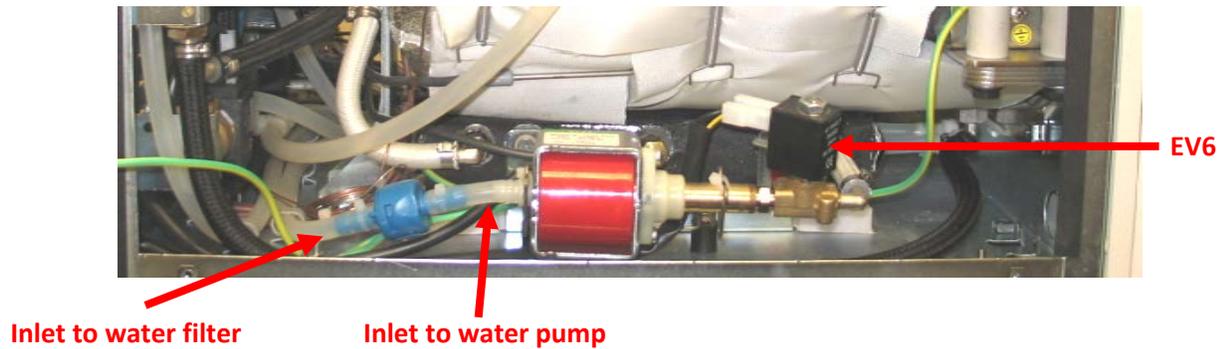
Steam Generator Heating Element Bravo 115V 850W
 Steam Generator Heating Element Bravo 220V 1000W
 Steam Generator Safety Thermostat TG400
 Band Heater Safety Thermostat TG400

Part #41000170000
 Part #41000260000
 Part #97730011
 Part #97730010

Step 3

Check the water flow from the reservoir to the water pump and water pump operation.

Disconnect the water inlet hose at the water pump. Check for good water flow. If the water is not flowing remove hose from inlet to water filter and check for good water flow. If water flows good, at input to filter and not at output of filter replace filter (part #97290166). If water does not flow good at input to the filter remove the water line from the reservoir to the filter and flush the hose. Then clean the water reservoir. (This is a monthly maintenance procedure, see distilled water reservoir cleaning in this manual). Disconnect the hose at the output of the water pump. Go to devices test menu and run the water pump. If water flow is good from the hose proceed to step 4. If there is no water from the solenoid go to devices test and check to see if EV6 is working properly. (You should hear a clicking noise as you activate and deactivate EV6).



If EV6 is clicking and you have good water flow to the pump, disassemble & inspect the water pump and clean all parts.



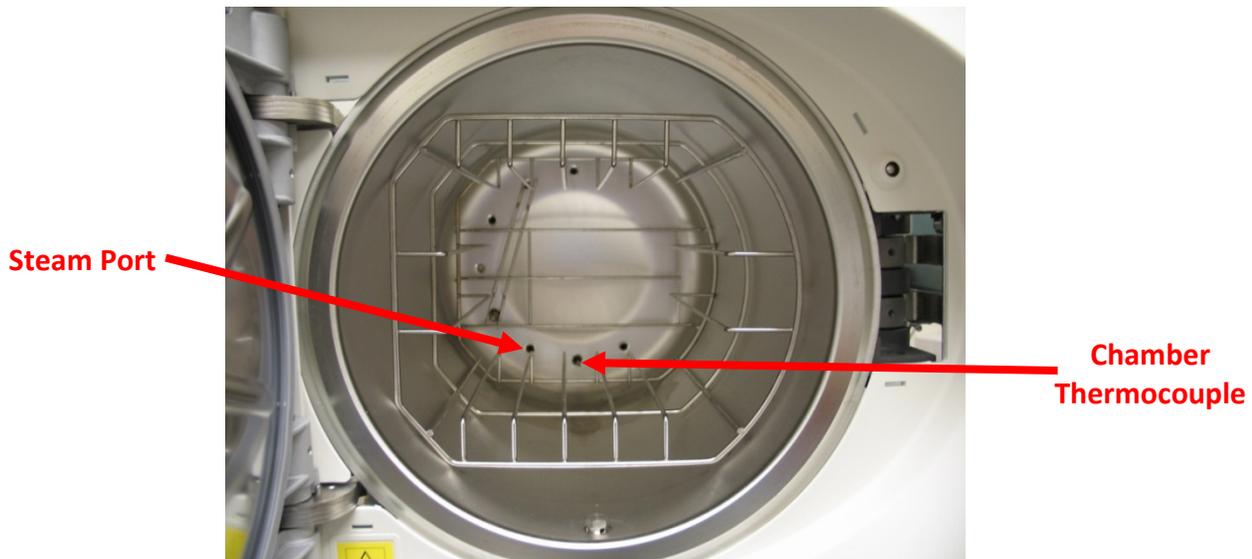
Reassemble pump and check for water flow through water pump (part #40000220000) & EV6 (part #40100370000)(water pump complete w/solenoid part #95509145). If water flow is good go to step 4.

Step 4

Check for water flow from steam port.

Go to devices test and run the water pump and check for water coming from steam port in chamber.

Note: Have a towel or paper towels available. Water will run to the front of the chamber.



If no water is coming out of the steam port proceed to step 5. If water flows freely from steam port run a cycle with the cover off and check for steam leaks.

Step 5 Check for clogged plates in steam generator.

Remove steam generator from under chamber.

STEAM GENERATOR GROUP

UPPER PART

C0BP547000P

LOWER PART

C0BP548000P

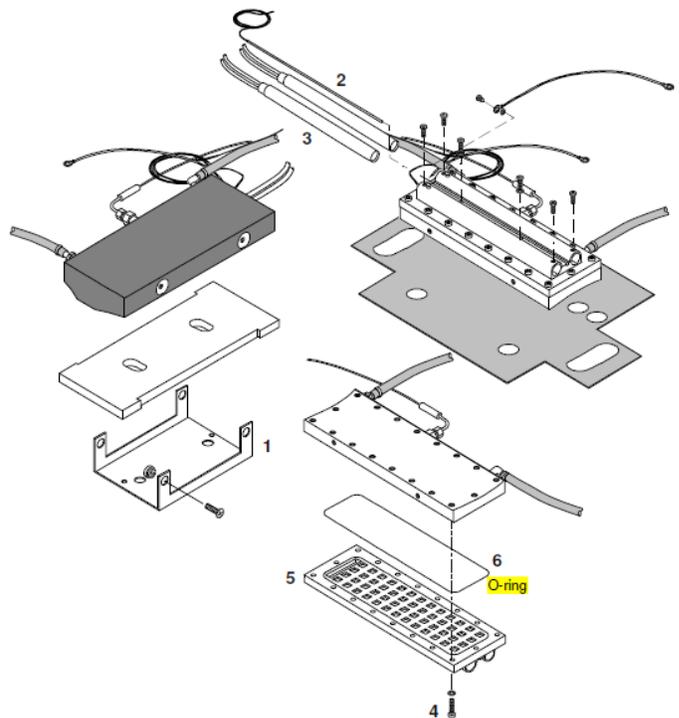
O-RING

48100080000

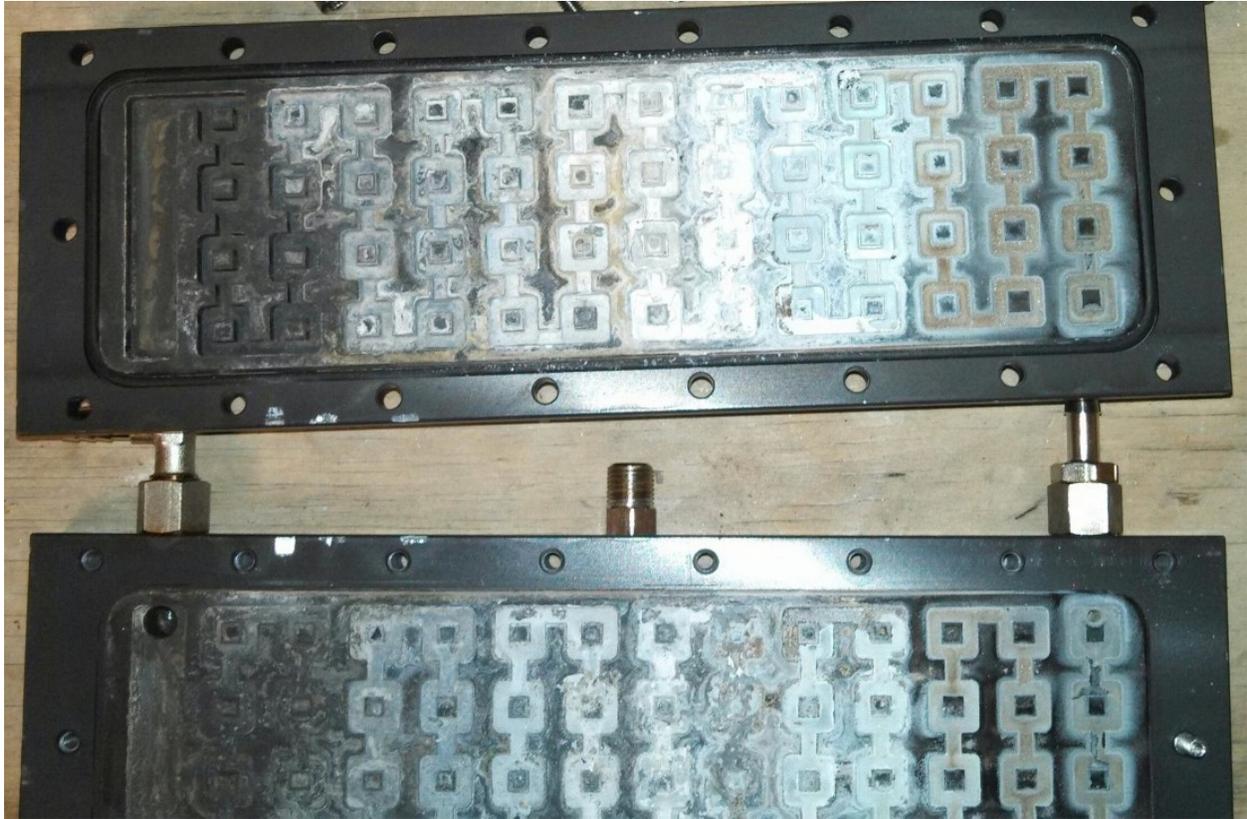


Before servicing, switch off the equipment and unplug the power supply cable from the mains socket.

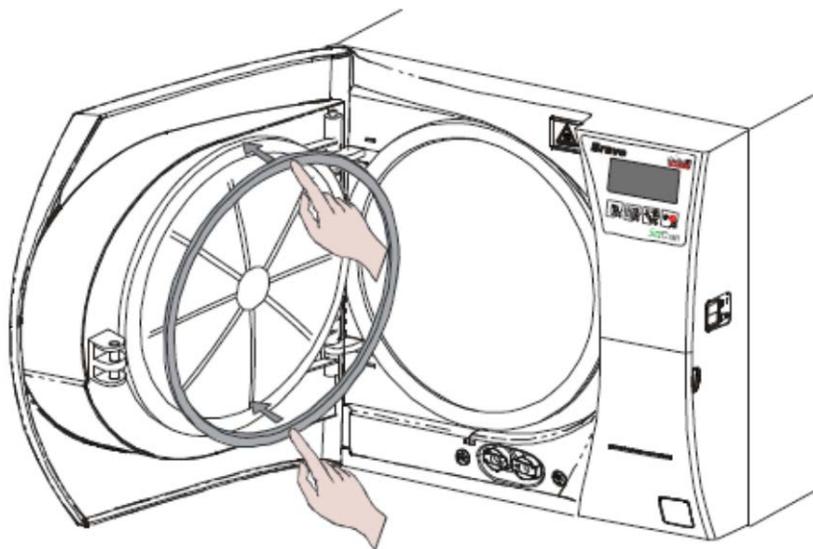
1. Remove the frame cover (see card [Gr7-1](#)).
2. Empty both reservoirs.
3. Remove the water pump group (see card [Gr3-1](#)).
4. Remove the screws from the bottom frame, and move the steam generator as much as possible out the frame.
5. Remove the steam generator from the support (1), and remove the thermo-insulating panel.
6. Remove the bulb of the safety thermostat (2).
7. Loosen the screws and remove the heater cartridges (3).
8. Remove the screws (4) and separate the lower parts (5) from the upper part.
9. Clean the upper part of the steam generator.
10. Replace the lower part, mount a new O-ring (6), reassemble and restore the connections proceeding in reverse order.
11. Run a sterilization cycle.



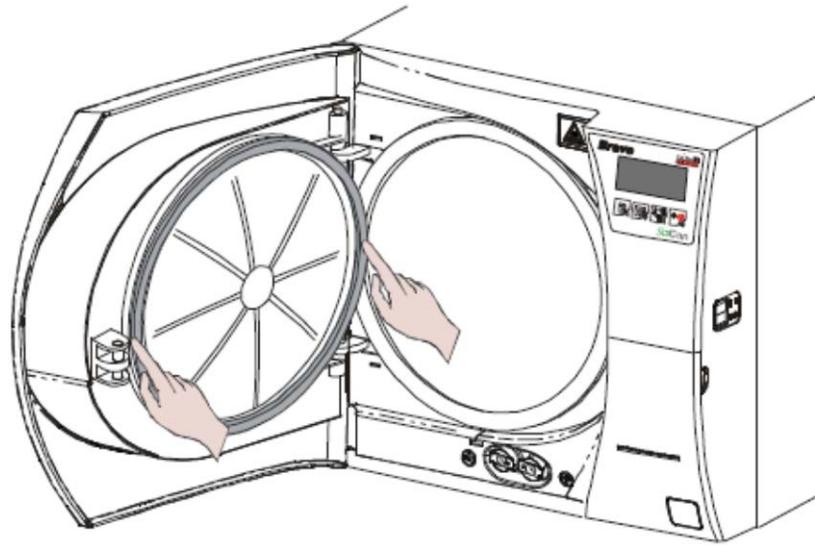
If steam generator is clogged plates will look similar to picture below. White calcium build up is caused by using bad water in the Bravo. Clean plates using distiller cleaner or white vinegar. It is advised to replace the O-ring (part #48100080000) that seals the plates together.



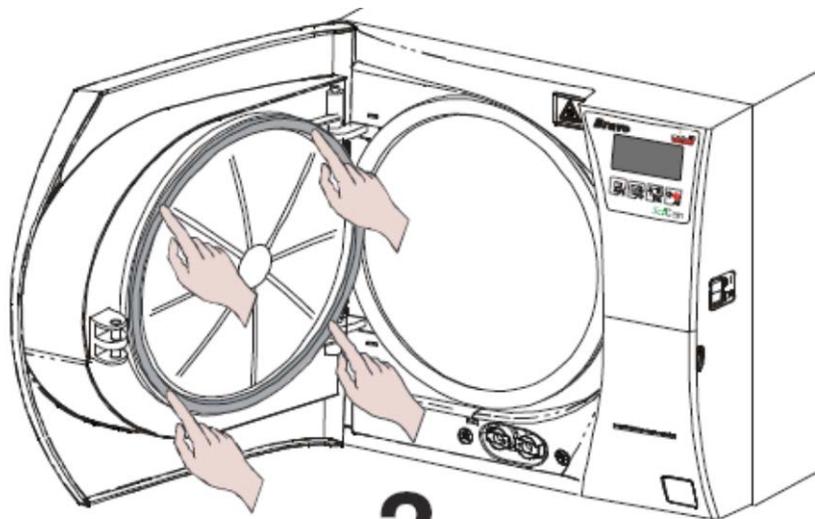
Bravo Door Gasket Replacement



1



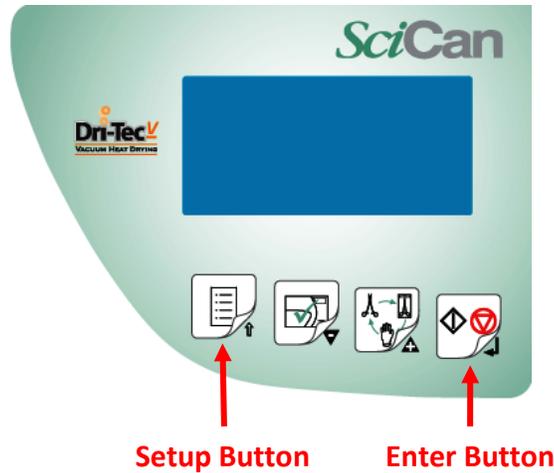
2



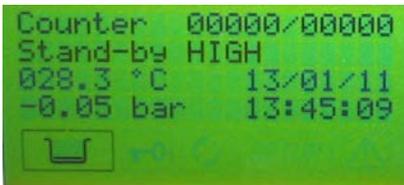
3

1. Open the door.
2. Remove the old gasket by hand.
3. Clean the door gasket seat to ensure it is debris-free.
4. Install the new door gasket by pressing it into its seat, starting at the top/bottom and on the sides. Then press the remaining gasket completely into its seat.
5. Perform a sterilization cycle.

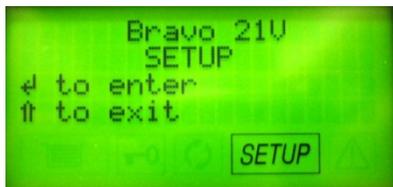
Bravo Entering Setup Mode Disabling Password



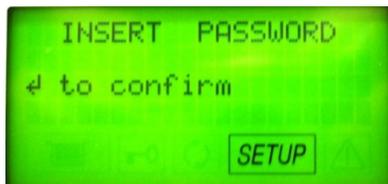
Turn the main power switch on and wait until one of the stand-by screens appears.



Press and hold the Setup button until Bravo Setup or Insert Password appears. If Bravo Setup appears press the Enter button and proceed to your menu selection.



If Insert Password appears turn the main power switch OFF. To turn the password OFF press and hold the Setup button while turning the main power switch ON. The Insert password screen will appear. Press the Minus button 8 times, and then press the Enter button to confirm.



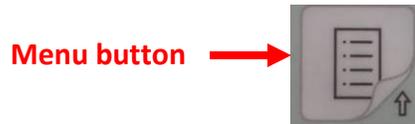
PW Setup ON will appear. Press the down arrow to select PW Setup OFF. Press the Enter button to return to one of the stand-by screens.



Once you have returned to the stand-by screen press the Setup button, and then the Enter button.

Adjusting Drying Options on the SciCan Bravo Autoclave

To change the drying options for the Bravo's Wrapped cycles, we must first enter the Setup mode. To enter this mode from the regular standby screen, press and hold the MENU button shown here for 4-5 seconds:



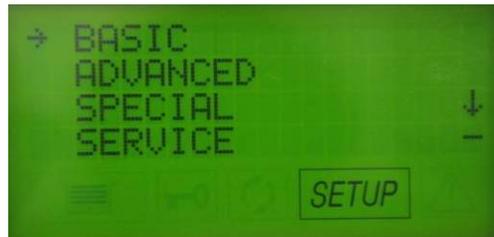
After holding the MENU button down for 4-5 seconds, the Bravo will beep and display this screen:



At this time, press the START/STOP button to proceed to the Bravo's setup menus.



Your screen should now look like this:



From here, we want to access the "Advanced Menu" option. As you can see, the "Basic" option is currently highlighted (has the small arrow pointing to it). To select the Advanced menu, press the MINUS button on the Bravo's keypad one time. (The MINUS button, indicated by the small "minus" symbol in the lower right corner of the button)

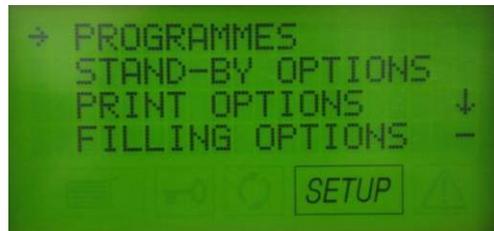


Your screen should now look like this:

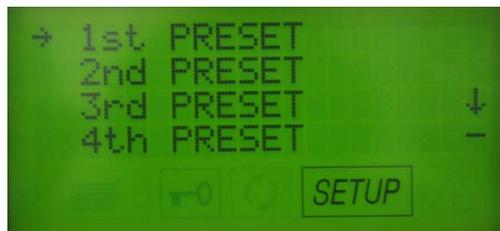


At this time, press the START/STOP button to proceed to the Advanced Menu.

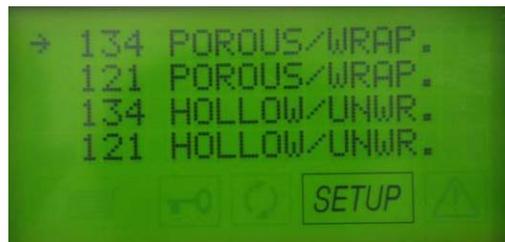
From the Advanced Menu (shown below), we want to select the first option listed entitled “Programmes”. The arrow should already be pointing to that option, so simply press the START/STOP button to proceed.



This will advance us to the listing of the available cycle presets. To adjust the drying options for a particular cycle, we must first select its preset slot. Because we are adjusting the drying options for your Wrapped cycles at this time, we will need to adjust presets #1 and #3. Let’s begin with #1. This will be highlighted already by the small arrow as shown below:



From the above screen, press the START/STOP button to select the 1st Preset. This will advance us to a listing of all of the available cycles that can be selected. We want to select the same cycle for this preset so we can simply adjust the drying options. Preset #1 should be the “134 POROUS/WRAPPED” cycle. If that is highlighted as shown below, press the START/STOP button.



After selecting the 134 POROUS/WRAPPED Cycle, we will now be given a list of drying options to choose from. The small arrow should be pointing to “INTELL. DRY” at this time. To change to a longer drying stage, press the MINUS button to move the arrow down to highlight “EXTRA DRYING” as shown below:



Once "EXTRA DRYING" is highlighted, press the START/STOP button to select that option. This will take us to the "EXTRA TIME" screen, from which we can add additional minutes to the end of the Bravo's standard 14 minute drying stage. To set the unit to maximum drying time, simply press the PLUS button until the top line of your display reads "EXTRA TIME: 15 MIN" as shown below:



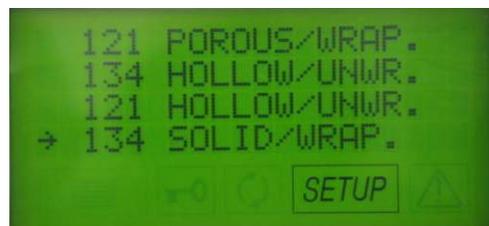
Once your display looks like the one above, press the START/STOP button. This will take us back to the listing of the 4 available Preset slots, with "1st Preset" highlighted as shown below.



Now we want to move down the list and select "3rd Preset". Simply press the MINUS button twice to highlight "3rd Preset" as shown below, and then press the START/STOP button.



This will take us to the listing of the available cycle choices, just like earlier when we were adjusting the 1st Preset. This time, we want to select 134 SOLID WRAPPED, which should be highlighted already as shown below:



If the arrow is pointing to 134 SOLID/WRAPPED, press the START/STOP button to advance to the drying options screen. Now the arrow should once again be pointing to "INTELL. DRY". We want to highlight "EXTRA DRYING" by pressing the MINUS button, then once the arrow is pointing to EXTRA DRYING, press the START/STOP button. This will advance us to the following screen:



From here, keep pressing the PLUS button to increase the additional drying time up to a maximum of 15 minutes as before. When finished, press the START/STOP button. This will take us back to the list of cycle presets again:



Now we are almost finished, both of your Bravo's Wrapped cycles have been set to maximum drying time. To exit the Menus, simply press the MENU button 3 times, until your screen looks like this:



To leave the Menus, press the START/STOP button. This will take you back to the Bravo's regular standby screen, which will look similar to the following. You are finished!



Bravo Continuous Cycles

To set the Bravo to run continuous cycles, we must first enter the Setup mode. To enter this mode from the regular standby screen, press and hold the Menu button shown here for 4-5 seconds:

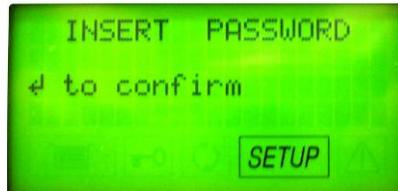


After holding the Menu button down for 4-5 seconds, the Bravo will beep and display a screen similar to this. Press the Start/Stop button.



← Start/Stop button

NOTE: If the Bravo requests a password when you hold the Menu button down press the Minus/Down button 8 times then press the Start/Stop button.

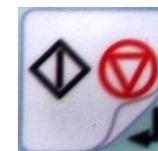


← Start/Stop button

Your screen should now look like this. Press the Minus/Down button 3 times.



Your screen should now look like this. Press the Start/Stop button.

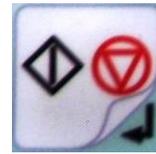


← Start/Stop button

Your screen should now look like this. Enter code + + - - + + - -



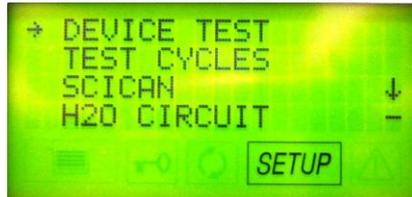
Your screen should now look like this. Press the Stop/Start button.



Start/Stop button

Your screen should now look like this. Press the Minus/Down button 1 time.

Minus/Down
Arrow button



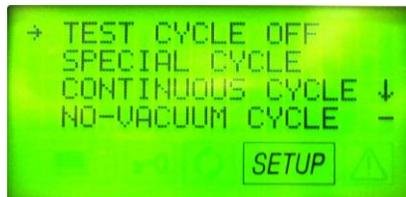
Your screen should now look like this. Press the Start/Stop button.



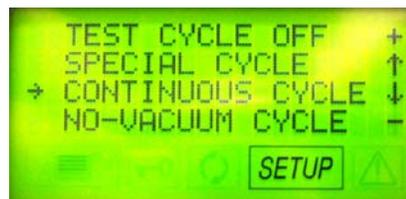
Start/Stop button

Your screen should now look like this. Press the Minus/Down button 2 times

Minus/Down
Arrow button



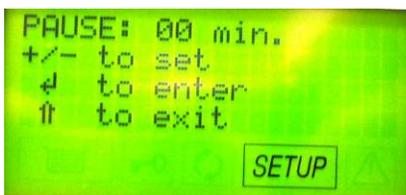
Your screen should now look like this. Press the Start/Stop button.



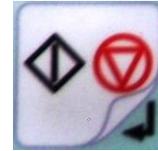
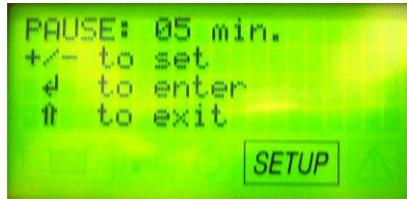
Start/Stop button

Your screen should now look like this. Press the Plus/Up button to increase the number of minutes you would like to pause between cycles.

Plus/Up
Arrow button



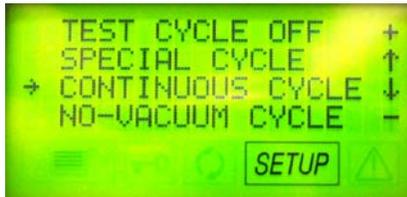
Your screen should look like this if you press the Plus/Up button 5 times. Press the Start/Stop button when your selected pause time is set.



← Start/Stop button

Your screen should look like this. Press the Menu button 3 times.

Menu button →



Your screen should look like this. Press the Start/Stop button.



← Start/Stop button

Your screen should look like this. CC & SETUP on the display indicate you have selected continuous cycles. You can now select the cycle of your choice and it will run continuously until you run out of water.



Note: If you wish to return the Bravo to its normal operating mode you will need to return to the Test Cycles screen and turn the Test Cycles OFF.

Bravo Maintenance Display Warning Messages

The sterilizer periodically reminds the user about recommended “routine” maintenance operations that must be carried out in order to ensure the proper operation of the device. The reminder notices are displayed on the screen when a sterilization cycle is started.

Warning Message	Frequency
Chamber Filter Cleaning	Every 200 cycles
Bacteriological Filter Replacement	Every 400 cycles
Door Gasket Replacement	Every 1000 cycles
General Service	Every 3000 cycles

The reminder notices are displayed on the screen when a sterilization cycle is started:



Push the ← key to confirm the recommended “routine” maintenance operation has been performed.

Press the ↑ key to postpone the message. The user is reminded with another message the next time the sterilizer is used.



The frequencies indicated have been calculated for “standard use” of the device, used correctly and positioned in a suitable environment. Should you notice a significant lose in performance, repeated occurrence of alarms or visible degradation of the parts subject to wear, it is advisable to carry out the maintenance operations earlier than the due dates programmed in the system.

Bravo Maintenance

Daily	Clean the door gasket and plate with a clean cotton cloth soaked in a weak solution of water and vinegar. Dry the surfaces and remove any residue before using the device. Clean external surfaces using a clean cotton cloth dampened with water and, if needed a neutral detergent.
Weekly	Clean the sterilization chamber and relative accessories. Disinfect external surfaces.
Monthly	Clean the internal distilled water tank. Safety valve maintenance. Clean (or replace) the drain filter.
Annual or every 1000 cycles	Replace the door gasket.
Every 3 Years or 3000 cycles	Recommended complete maintenance of the sterilizer by an authorized dealer.

Door Gasket Part #4800050000

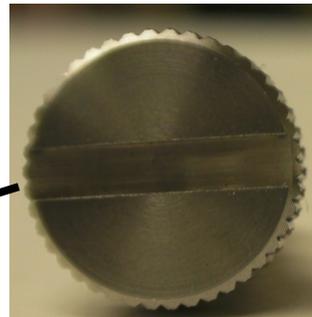


Clean the door gasket and front of chamber with a clean cotton cloth soaked in a weak solution of water and vinegar. Dry the surfaces and remove any residue before using the device.

Install the new door gasket by pressing the gasket into its seat, first on top, then bottom, then both sides. Once seated on 4 sides, continue to press the remaining gasket completely into its seat.

For the occasional disinfection of the external surfaces, you can use either denatured alcohol or detergents with a small percentage of sodium hypochlorite (or equivalent).

Chamber Drain Filter Part #47200030000 Cleaning & Replacing



Unscrew the fitting from the lower front of the chamber. Remove the screen from the fitting.

Note: Grab the screen on the solid end do not grab in the middle of the screen. You will damage the screen.

Clean the inside of the screen. The screen may look clean on the outside but the inside will be dirty and clogged with debris. Gently insert clean screen into chamber fitting and screw fitting in finger tight.

Bacteriological Filter Part #47200010000

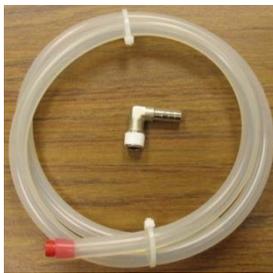
To replace the bacteriological filter unscrew the filter counterclockwise and replace with new filter.



Bacteriological Filter

Cleaning the Internal Distilled Water Tank

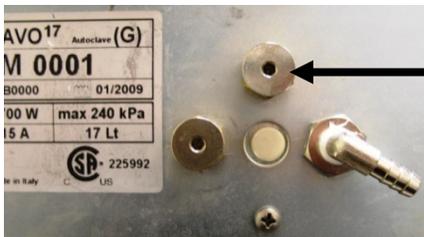
1. Turn the main power switch OFF and unplug the unit.
2. If a Bravo Water Reservoir Drain Kit is installed on the Bravo insert the end of the tube into an empty container and remove the plug from the tube.



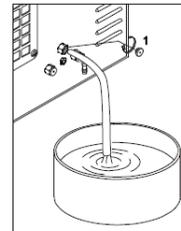
Water Reservoir Drain Kit
#01-112320S

3. If there is no internal drain tank tubing, go to the rear of the Bravo with an empty container and remove the plug to the Distilled Water Drain Port.

Note: As soon as the plug is removed water will come out of the port.



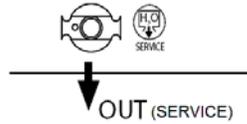
Distilled Water
Drain Port



4. Wait until the internal tank is completely drained and reinstall the plug.
5. Prepare 1 gallon of distilled water mixed with 10% of pure alcohol and fill using the manual filling container. If you have a Bravo 2, remove the reservoir cap and pour the cleaning solution into the top of the Bravo.
6. Fill the internal tank completely with this solution and allow the solution to sit for 30 minutes.
WARNING: DO NOT RUN ANY CYCLE DURING THIS PERIOD.
7. Now drain the internal tank and discard the solution. Close the drain port with a plug.
8. Fill the reservoir with distilled water and run one empty cycle of your choice.

Cleaning the internal tank Bravo 2

1. Arrange an empty container on the floor near the sterilizer and insert the free end of the tube.
2. Insert the other end of tube in the quick-coupling marked "Service" positioned on the front as shown in the figure below.

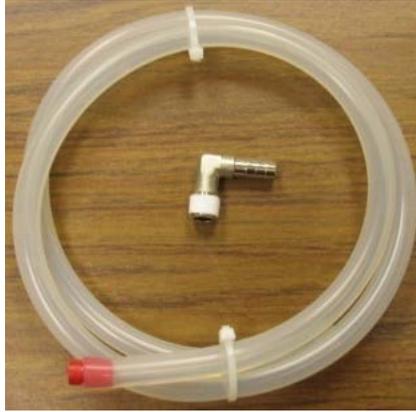


3. Allow the tank to empty completely, and then disconnect the tube.
4. Prepare 4 liters/1.06 US Gal of distilled water and 10 % of pure alcohol, such as isopropyl and then pour it into the distilled water tank following the procedure indicated in the chapter "Loading Distilled Water" until the maximum level has been reached.
5. Let the solution sit for 30 minutes.

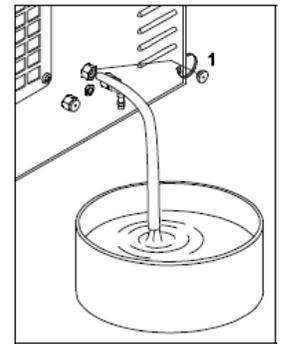
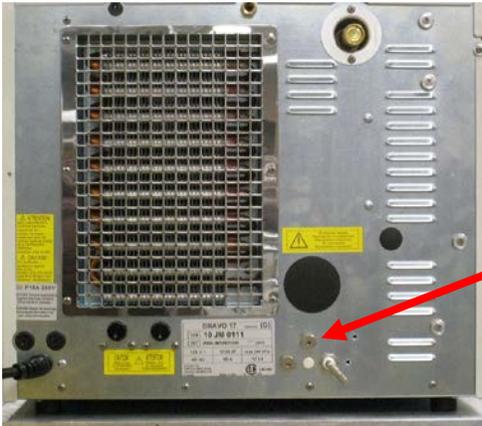
WARNING: DO NOT RUN ANY CYCLE DURING THIS PERIOD.

6. Repeat step 2 and **completely** empty the internal tank again (as in point 2).
7. Fill the reservoir with distilled water and run one empty cycle of your choice.

Bravo Distilled Water Reservoir Drain Kit Installation Instructions Part #01-112320S

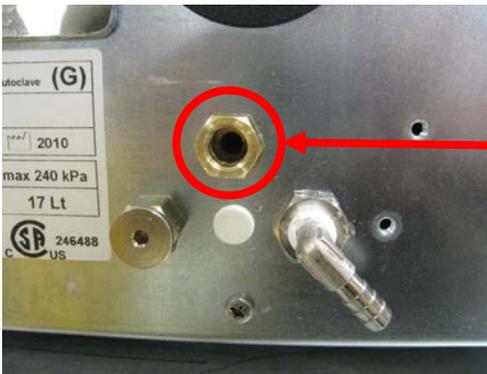


Turn the main power switch OFF and unplug the unit. Go to the rear of the Bravo with an empty container and remove the plug to the clean water drain port. **Note: As soon as the plug is removed water will come out of the port.**

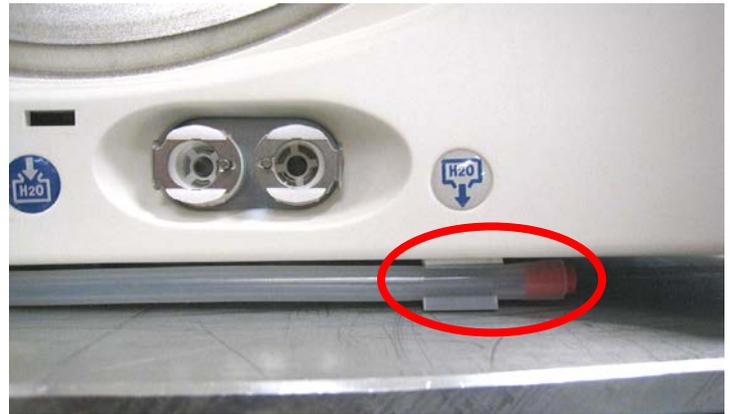
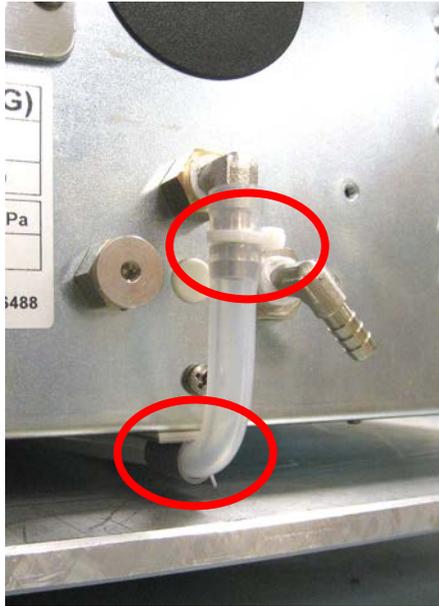


**Distilled Water
Drain Port**

Once the distilled water tank is drained install the elbow fitting into the distilled water drain port.



Connect the drain tubing to the elbow fitting using a tie wrap and install the plastic drain tube holder underneath the rear of the Bravo, below the elbow fitting. Feed the drain tubing through the holder. Mount the second drain tube holder underneath the front of the Bravo below the H2O drain sticker. Make sure the orange plug is installed into the end of the drain tubing.



Bravo Upgrade Kit Installation Instructions Kit Part #95509114

Bravo Door Motor Replacement Instructions



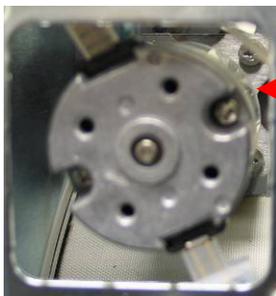
Remove covers

Drain clean water & waste water reservoirs and turn Bravo on to its side or slide Bravo over the edge of a counter. Remove the plate on the bottom of the Bravo below the door motor.



Disconnect the white and black wires to the motor. This is a DC motor so the white wire must be connected to the terminal with the red dot.

Insert a Phillips screwdriver with a shaft length of at least 5.5 inches through the opening where the cover plate was removed and remove 4 screws holding the motor assembly. Retain top coupling to reinstall with new motor.



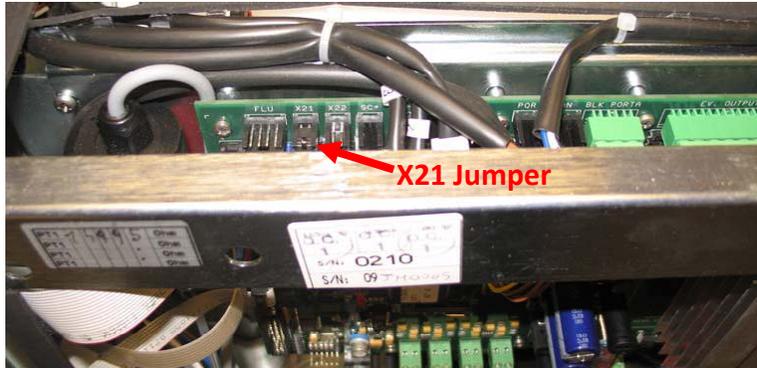
Remove the old motor through the opening in the bottom of the Bravo and install the new motor and coupling retained when old motor was removed. Reconnect the white and black wires making sure the white wire is connected to the terminal with the red dot.

When the Bravo is powered ON you will usually get a locking problem error code. Reset the new door motor using the following instructions.

Bravo Door Motor Reset for Gam PCB

Remove the cover

Remove the X21 jumper located above the battery



Push on the hidden key while turning the power switch ON

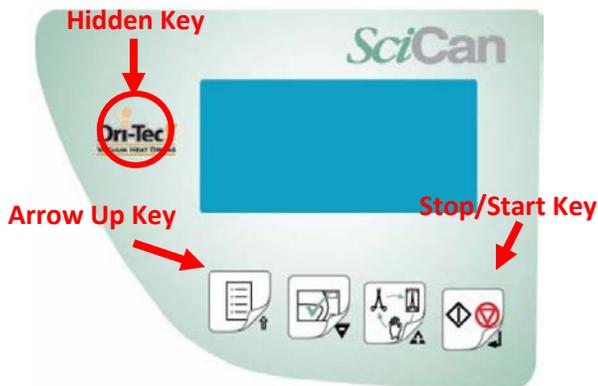
The message “Locking Device” will be displayed on the LCD

Release the hidden key and press the stop/start key to release the door locking mechanism

Open the door and press the arrow up key to exit this condition and start the self test

Switch off the Bravo at the end of the self test and reinstall jumper X21

Switch the Bravo ON and run a sterilization cycle



Door Motor Reset for Troll PCB

Push on the hidden key while turning the power switch ON

The message “Locking Device” will be displayed on the LCD

Release the hidden key and press the stop/start key to release the door locking mechanism

Open the door and press the arrow up key to exit this condition and start the self test

If the door overload function has been triggered, there is no more beeping sound when pressing the keypad
remove the cover and reset the red button on the PCB.

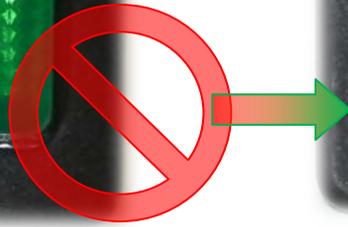


Bravo Power Switch Replacement Instructions

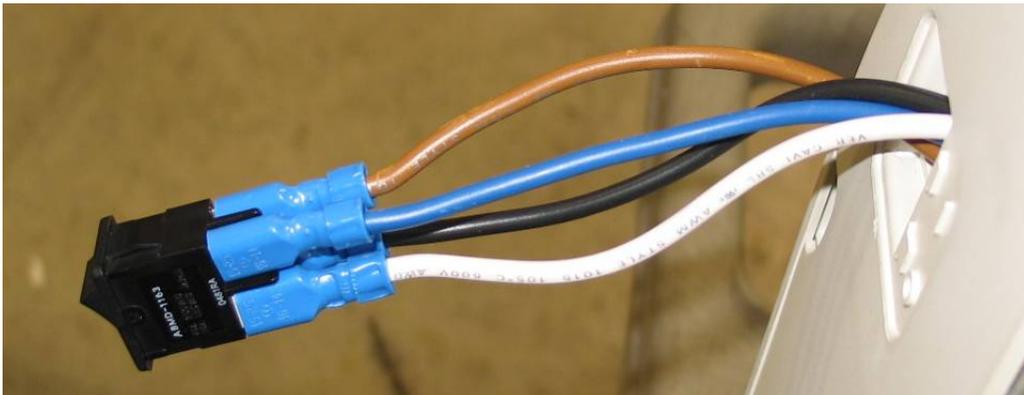
Old Power Switch



New Power Switch



When replacing the power switch connect the wires from the fuse holders to the top terminals of the switch and connect the wires to the filter board to the bottom terminals of the switch. White or blue wires (neutral wires) should be on one side of the switch and black or brown wires (positive wires) on the other side of the switch. The wires can be brought through the mounting hole for the switch and connected to the switch. Then push the switch into the mounting hole and lock into place.



Bravo Fuse Holder Replacement

Old Fuse Holder



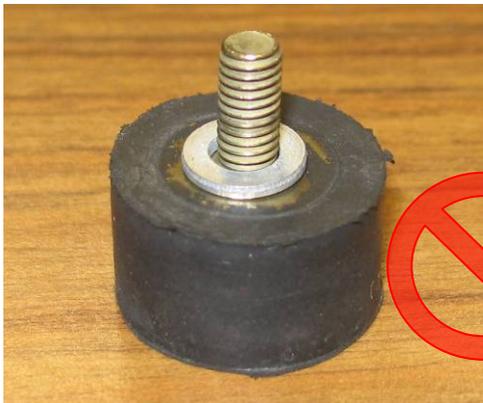
New Fuse Holder



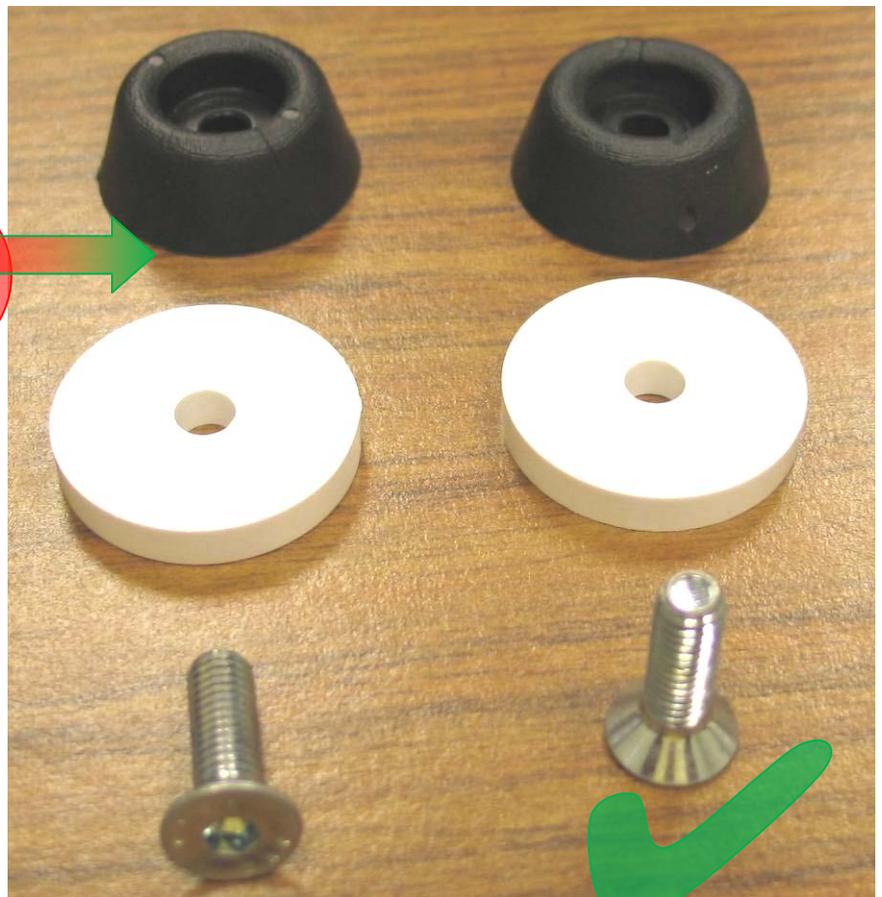
When replacing fuse holders connect white & blue wires to one fuse holder and black and brown wires to the other fuse holder.

Bravo Rear Leg Replacement

Old Leg



New Leg



Note: Requires 9/16 Allen Wrench

Bravo Float Switch Replacement Instructions

Old Float Switch (orange gasket)



New Float Switch (black gasket)



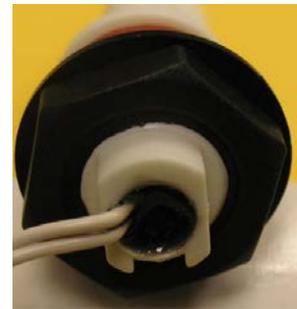
Remove cover

Drain clean water & waste water reservoirs

When replacing more than one float switch always complete installation of the first switch before removing the second switch so the wiring plugs do not get connected to the wrong terminals.

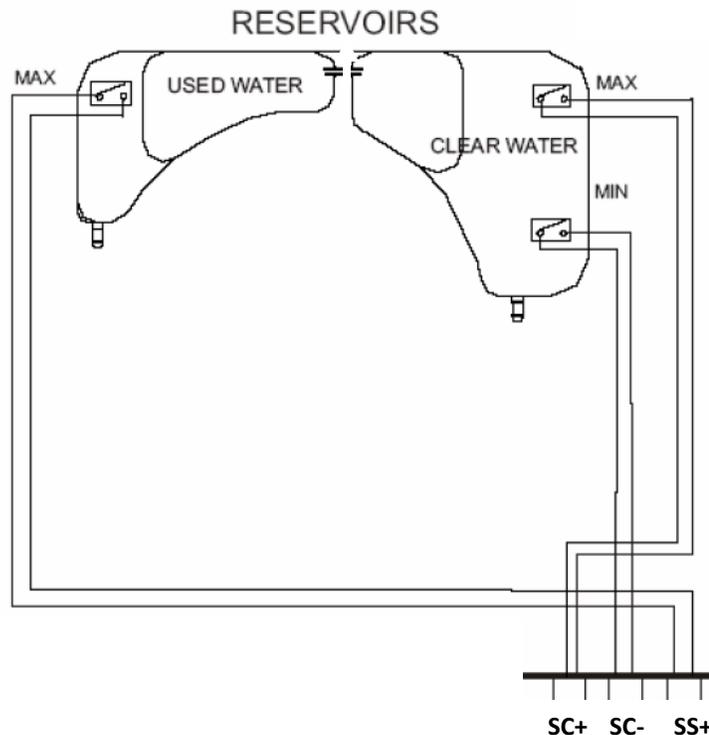
The float switch for the waste water tank (part # 97668046) will have a longer wire than the clean water reservoir float switches (part #97668045).

When install the float switch always observe the direction of the notch on the rear of the switch. The waste water tank switch the notch goes down, the clean water reservoir lower switch (water level minimum) the notch goes down and the clean water reservoir upper switch (water level maximum) the notch goes up.



Notch

The float switch wires connect to the top of the PCB on the left. The waste water tank switch connects to terminal SS+, The clean water reservoir lower switch (minimum level) connects to terminal SC- and the clean water reservoir upper switch (maximum level) connects to terminal SC+.

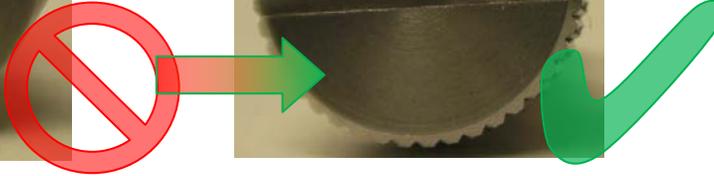
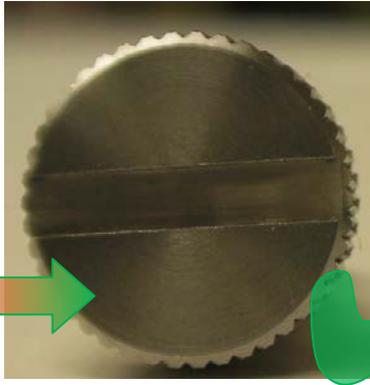


Chamber Filter Fitting Replacement

Old Chamber Filter Fitting



New Chamber Filter Fitting



Tubing Replacement

Old Tubing



New Tubing



Replace tubing from water pump to steam generator and tubing from steam generator to chamber.



Bravo Valves

OFF = no voltage to coil & ON = voltage to coil

EV1 – Normally Open

Valve is mechanically open when OFF.

EV2 – Normally Closed

Valve is mechanically closed when OFF.

EV3 – Normally Closed

Valve is mechanically closed when OFF.

EV4 – Connects Between Vacuum Pump & Drain Tank

Valve mechanically connected to Drain Tank when OFF.

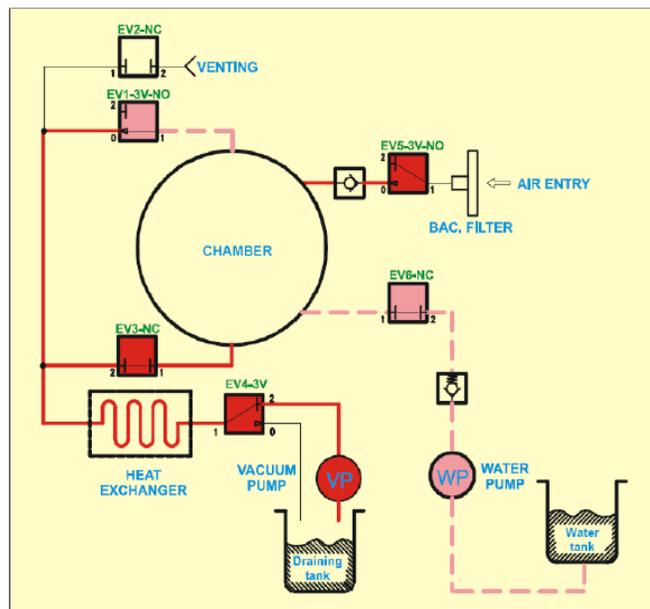
Valve mechanically connected to Vacuum Pump when ON.

EV5 – Normally Open

Valve is mechanically open when OFF.

EV6 – Normally Closed

Valve is mechanically closed when OFF.



Bravo Components Resistance Readings

Component Description	Reading
EV1	86.5 Ω
EV2	86.2 Ω
EV3	47.7 Ω
EV4	44.9 Ω
EV5	44.1 Ω
EV6	86.5 Ω
Water & Auxiliary Pumps	1.5 Ω
Door Motor	120 Ω
Small Vacuum Motor	5.3 Ω
Large Vacuum Motor	60 Ω
Steam Generator	8 Ω 120V*** / 27Ω 220V***
PT1 – PT4	1056Ω connected and 1086Ω disconnected
Pressure Sensor	9.94 KΩ

***Note: Steam Generator resistance readings will be 2X the normally reading if one element is open