

C3 Advance

A presentation by
Richard Crisp



C3 Advance



16 & 22 litres
Available with choice of
printer or data logger

C3 Advance

	A30005000	A30002000
Height in mm	410	410
Length in mm	440	560
Width in mm	480	480
Weight in kg	35	39
Chamber diameter in mm	250	250
Chamber length in mm	330	430
Capacity in litres	16	22
Sterilizing temperature min °C	134	134
Sterilizing time in minutes min	3.5	3.5
Operating pressure in bar min	2.05	2.05
Voltage	230	230
Wattage	2200	2200
Frequency Hz	50	50

Key Features

- Full 2 year parts warranty (Dental Only)
- Data capture – thermal printer, data logger
- Faster vacuum cycle times
- Reduced weight
- Reduced surface temperature

Cycle Options

- All cycles are either B or N.
- 3 B cycles.
- 5 N cycles.
- 134°C and 121°C temperatures.
- Pre-programmed cycles.
- Challenge cycle for helix or Bowie Dick.
- Air leak test.

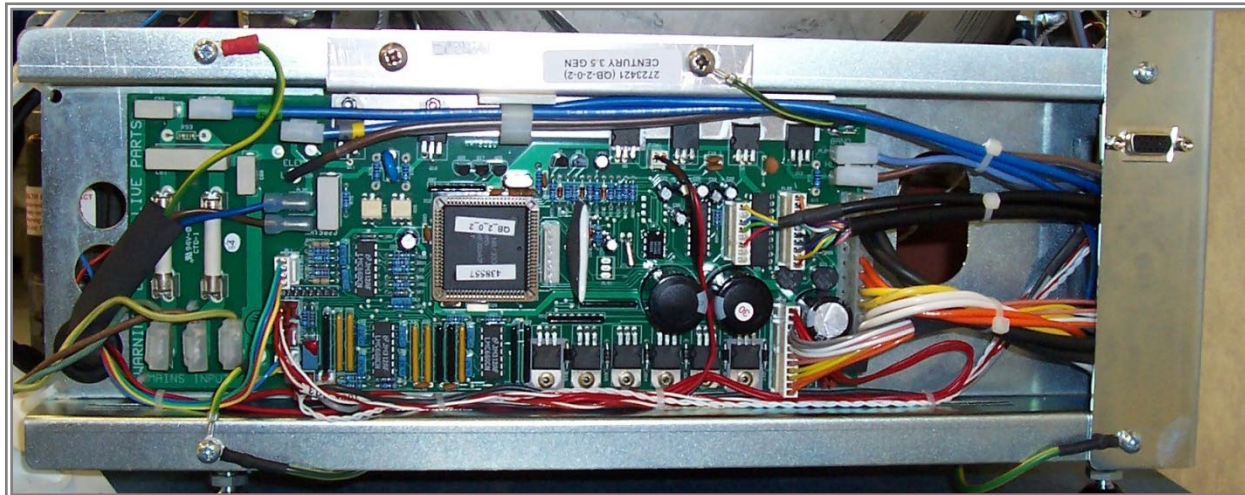
C3 Advance

Faster Cycle times

- Drying time 15 minutes maximum.
- Optional selectable additional drying – 5,10 or 15 minutes.
- B cycle in less than 50 minutes including 15 minutes of drying.
- Test pack B cycle (without drying) in 35 minutes.
- Delayed start facility
- Operator selectable leak test facility

C3 Advance *Generic Module*

- Common module for both 16 litre and 22 litre.
- Fitted at the rear on all units.



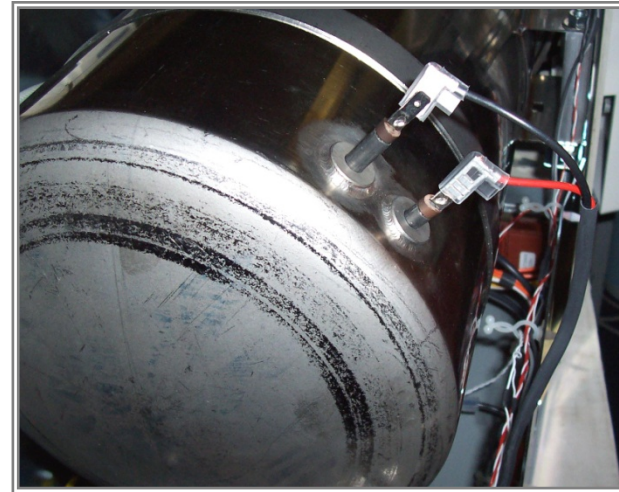
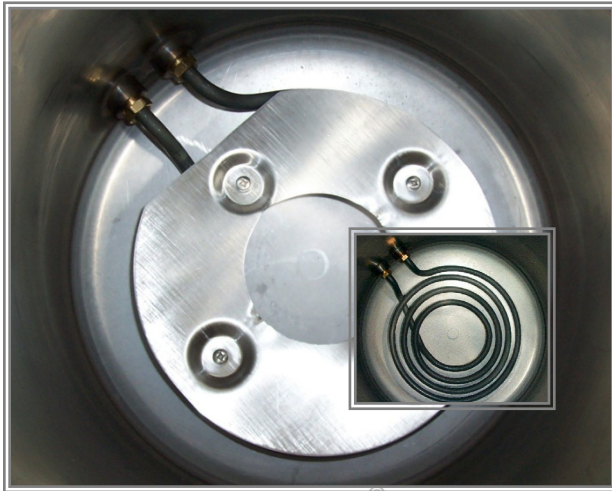
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Internal Element

Improved drying and reduced drying times are achieved with an internal heating element.

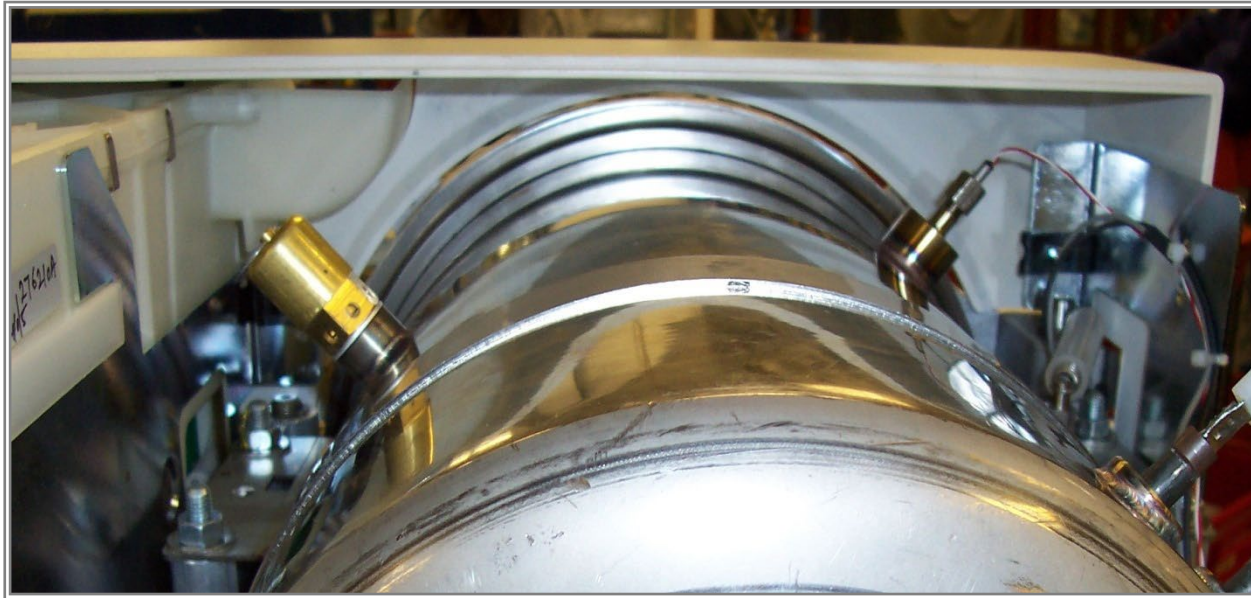
This replaces the band heater on earlier models.

The internal element is located at the back of the autoclave as shown.



C3 Advance *Chamber Connections*

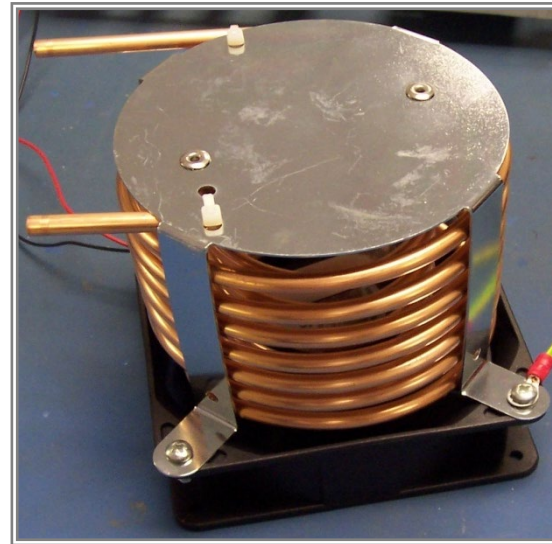
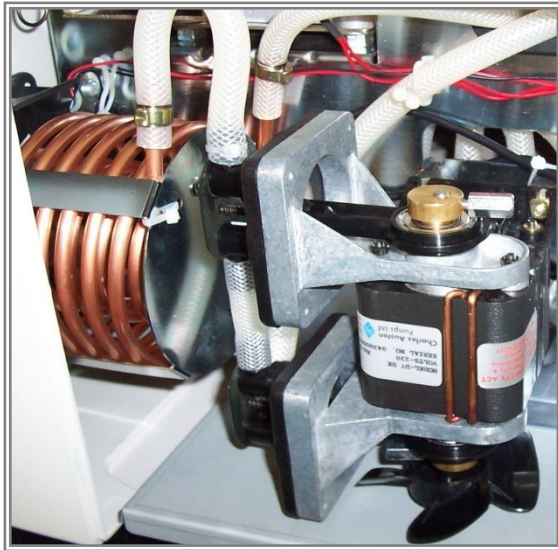
Welded chamber bosses give added protection against leaks



C3 Advance

Condensing coil

A condensing coil fitted in the vacuum line
Assists drying and improves vacuum pump
performance

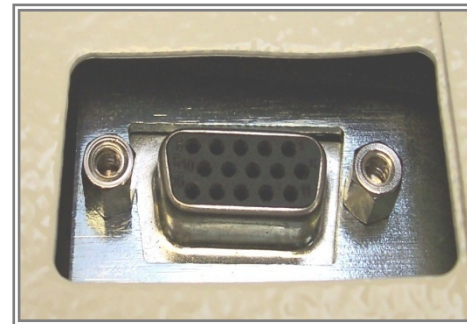


New Printer

- Optional quiet thermal printer.
- The printout will remain for a minimum of 8 years.
- The connection is at the rear of the unit.
- The printer can be retro-fitted to older models.



Printer



Printer/ Data logger
connection.

Data Capture

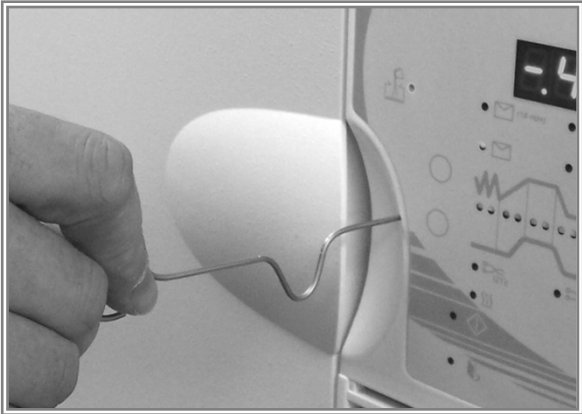
Serial No:	05052506
Date:	21/07/05
Time:	16:15
Cycle_type:	134 U
Hold time:	0180
Cycle No:	0114
Dry Time:	00 mins.
Operator:	
Location:	
Batch:	
Cycle Start	16:15.5
Sterilise Start	16:25.1
16:25	134.5C 2.07 Bar
16:25	136.0C 2.21 Bar
16:25	136.2C 2.23 Bar
16:26	136.2C 2.23 Bar
16:26	136.3C 2.24 Bar
16:27	136.4C 2.25 Bar
16:27	136.4C 2.25 Bar
16:27	136.5C 2.26 Bar
16:28	136.5C 2.26 Bar
Sterilize Finish	16:28.1
Temperatures -	
Min:	135.7
Max:	136.6 C

- Optional data logger capable of storing over 50,000 sets of cycle data.
- The data logger will retain data in exactly the same format as that provided by the printer.
- Standard PC software will enable data to be stored and viewed graphically.



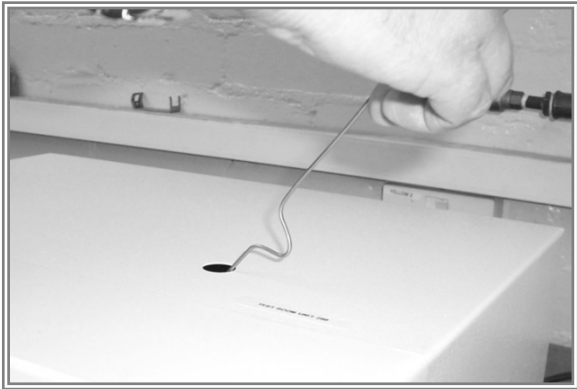
Data Logger

Simplified emergency **C3 Advance** *access*



In the event of power loss it is now much simpler to gain access to trapped instruments

Using the special tool provided pushing the locking mechanism back couldn't be easier providing there is no pressure in the chamber



If there is pressure or vacuum in the chamber the unit cannot be opened. But by using the special tool provided to lift the over pressure relief valve and returning to atmospheric pressure, opening the door couldn't be easier.

Base plate

To improve air flow through the product a steel base plate has been added this helps to ensure the outside temperature of the product remains low.

New adjustable feet have been added to the base plate avoiding stress on the mouldings



User Operations

Setting the date and time

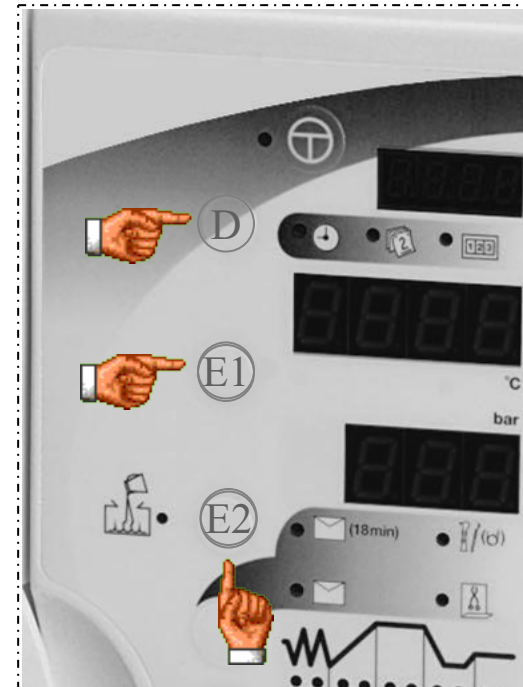
With the autoclave in the ready mode. Press button **D** for 5 seconds.

The time display will show **00

1. To set the year in tens (**00)
press button D to increase the value
press button E1 to decrease the value
press button E2 to accept the value

Repeat procedure 1

2. To set the year in hundreds (00**)
3. To set the month (**00)
4. To set the day (00**)
5. To set the minutes (**00)
6. To set the hours (00**)



User Operations

Auto – Cycle Start

With the autoclave in the Standby mode. Press button **D** for 5 seconds.

The time display will flash 06.30

1. To accept this time press button E2

To enter a different start time, change the minutes then hours by:

pressing button D to increase the value

pressing button E1 to decrease the value

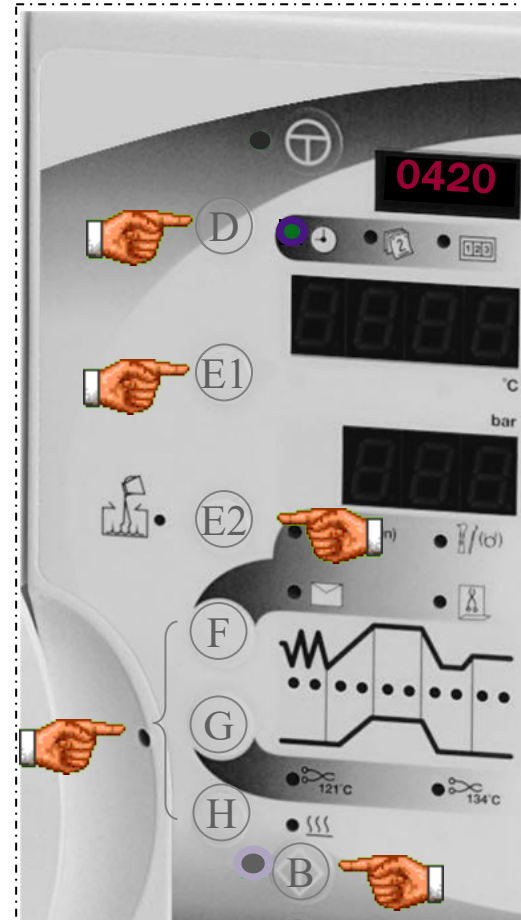
To accept press button E2

The unit returns to the ready mode and the LED next to the clock symbol will begin to flash

2. Select the required sterilization cycle by pressing buttons F, G, & H
3. Press the start button B the start LED will also begin to flash

The selected cycle will begin when the programmed time is reached The clock light will continue flashing until cycle complete

An auto-cycle start can be cancelled by pressing the standby button



User Operations

Vacuum system leak test

With the autoclave in the Standby mode. Press button **F** for 5 seconds.

Continue to press button F and the time display will begin to count down

Hold button F until the count down reaches zero

The test will now start

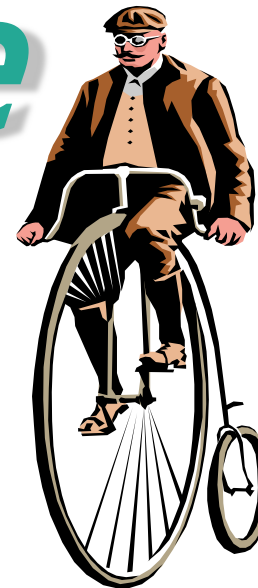
During the test the segments of the cycle status graphic will flash

The test will take between 15 and 30 minutes. On completion the print-out will advise if the unit has passed or failed the test.

If a fail occurs, clean the gasket and chamber rim before repeating the test.



The Cycle



Sterilizing Cycles

C3 Adv

- Vacuum cycle for porous loads, wrapped, pouched, solid or hollow instruments, with drying.
Sterilizing cycle - 134°C/3.5min
- Vacuum cycle for porous loads, wrapped, pouched, solid or hollow instruments, with drying.
Sterilizing cycle - 134°C /18min
- Rapid vacuum cycle for pouched or un-pouched solid instruments, with/without drying.
Sterilizing cycle - 134°C/3.5min
- Vacuum cycle for Bowie Dick or Helix Steam penetration test, without drying.
Sterilizing cycle - 134°C/3.5min
- Non-vacuum cycle for unwrapped solid instruments.
Sterilizing cycle - 121°C/16min Without drying
- Non-Vacuum cycle for unwrapped solid instruments.
Sterilizing cycle - 134°C/3.5min. Without drying
- Additional Drying. Add drying in 5 minute increments, up to 15 minutes.

C1i 

C1ii  (18min)

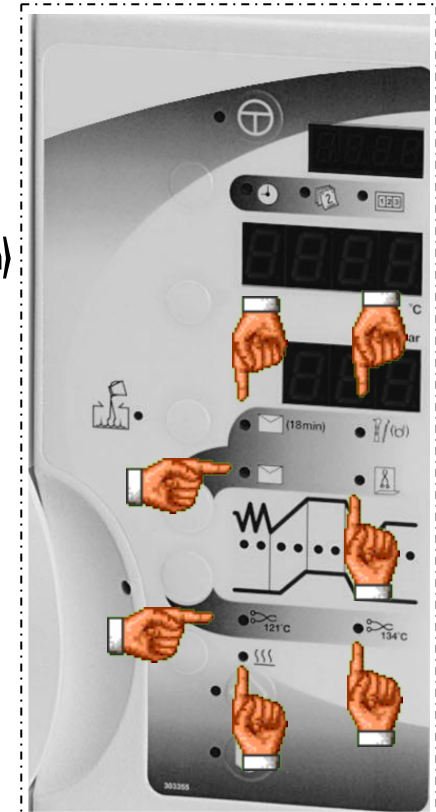
C2i 

C2ii  (BD)

C3  121°C

C4  134°C

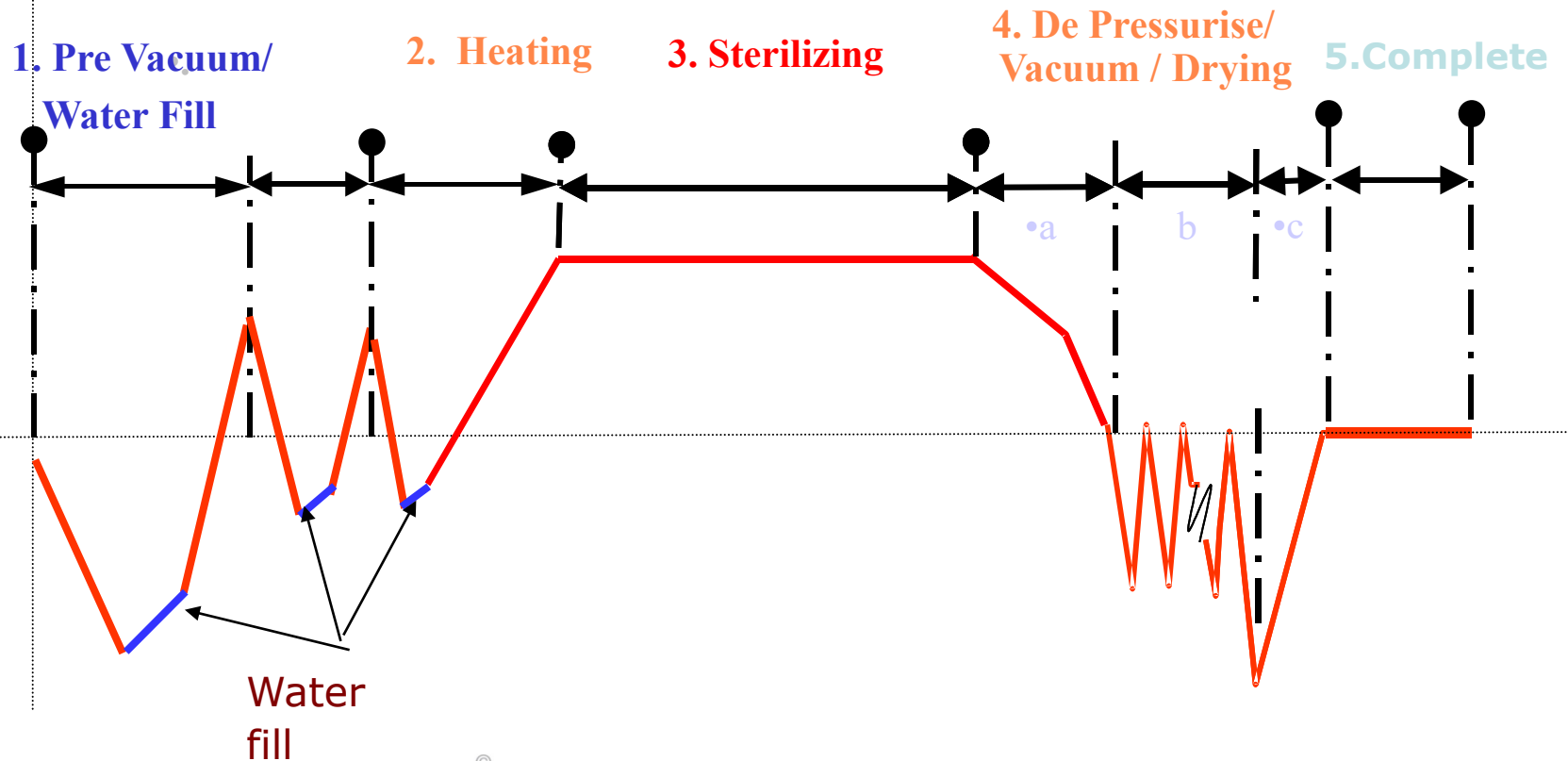
C5 



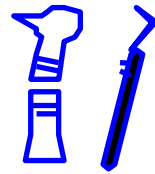
C3 Advance



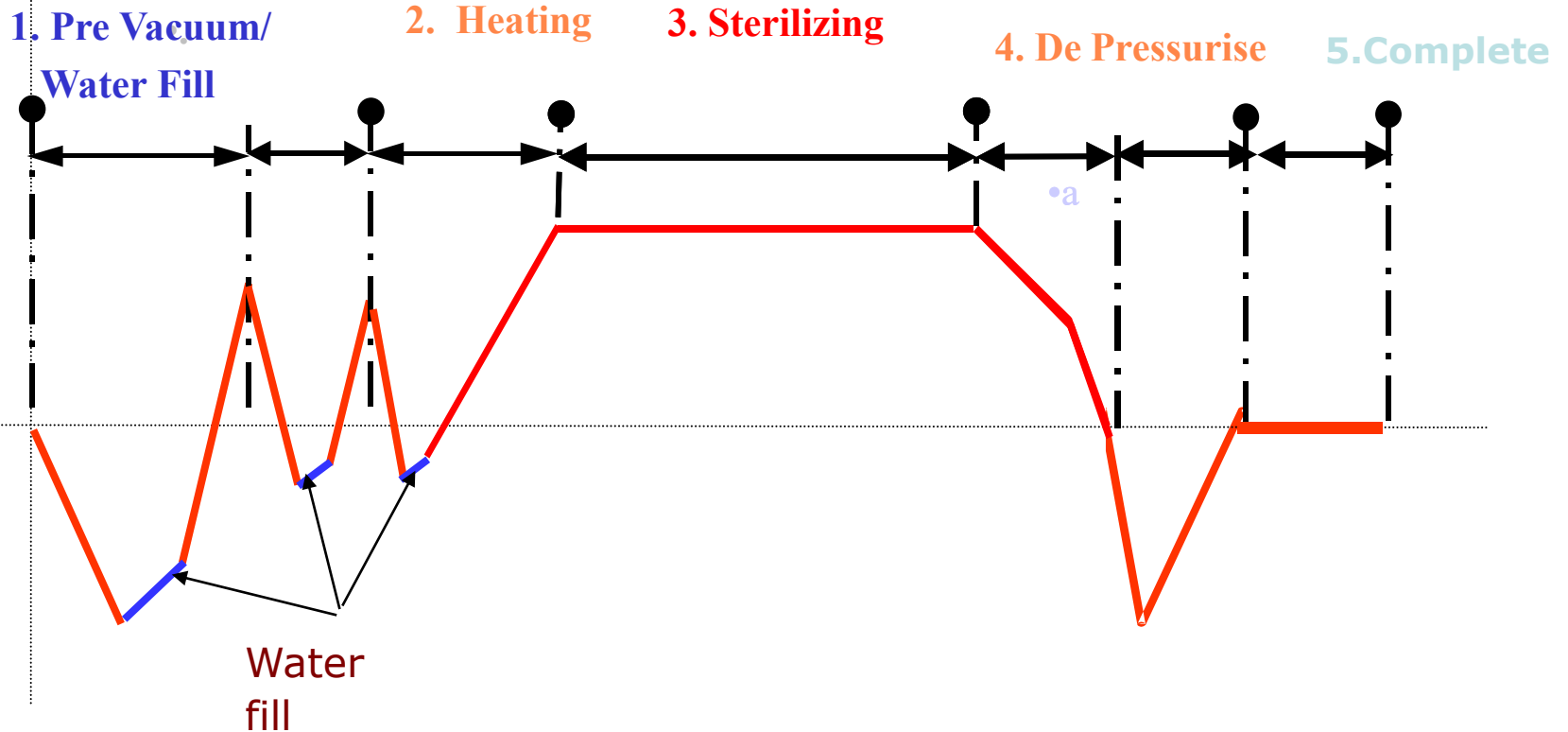
134B
134B (18 min)



C3 Advance

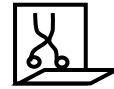


134 (BD)

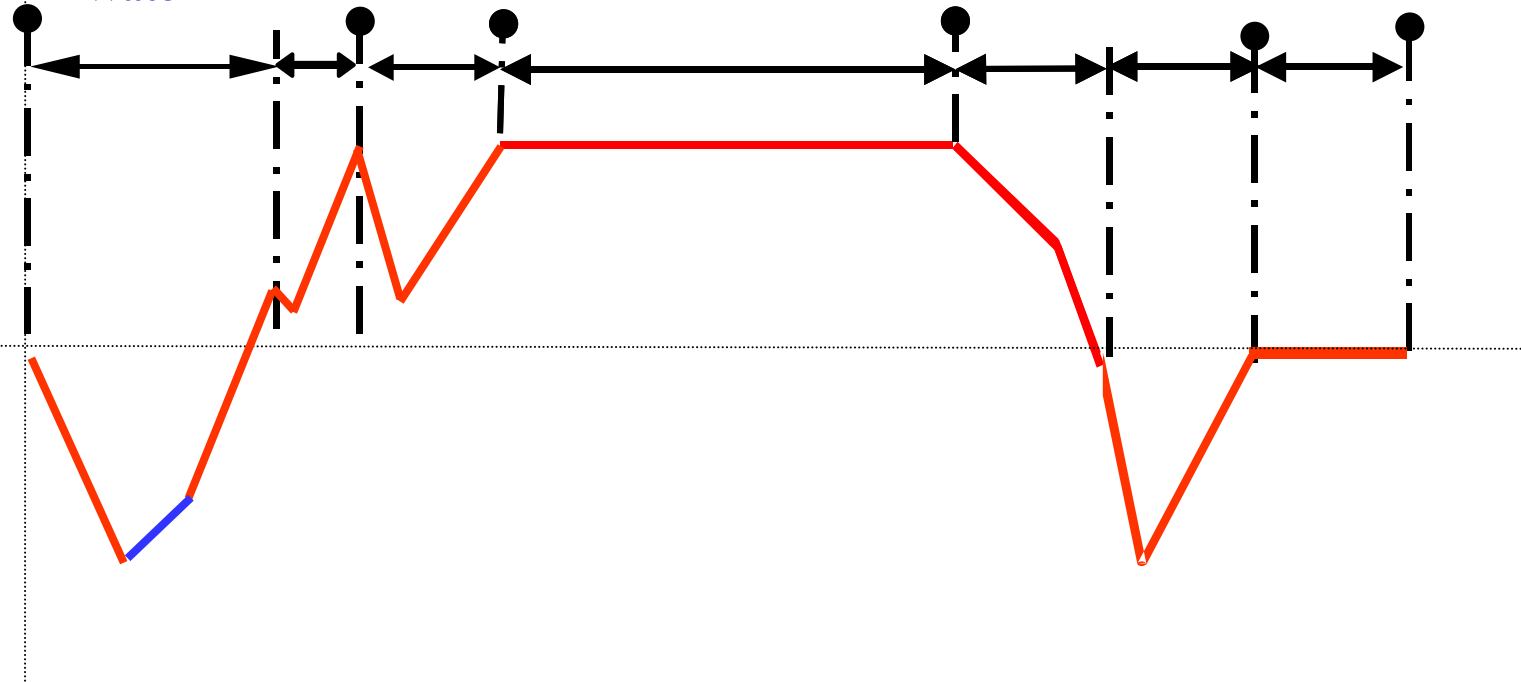


C3 Advance

134

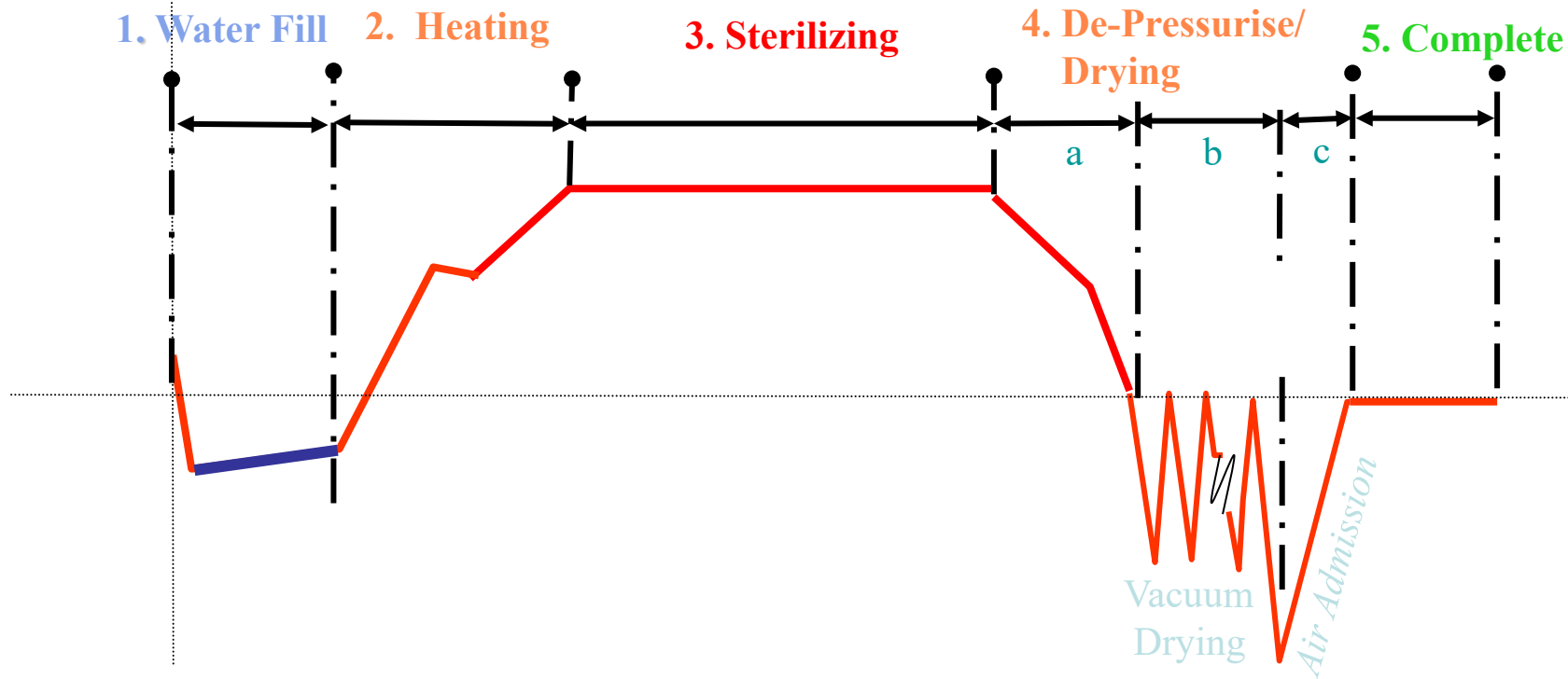


1. Pre Vacuum/
Water Fill 2. Heating 3. Sterilizing 4. De Pressurise 5. Complete

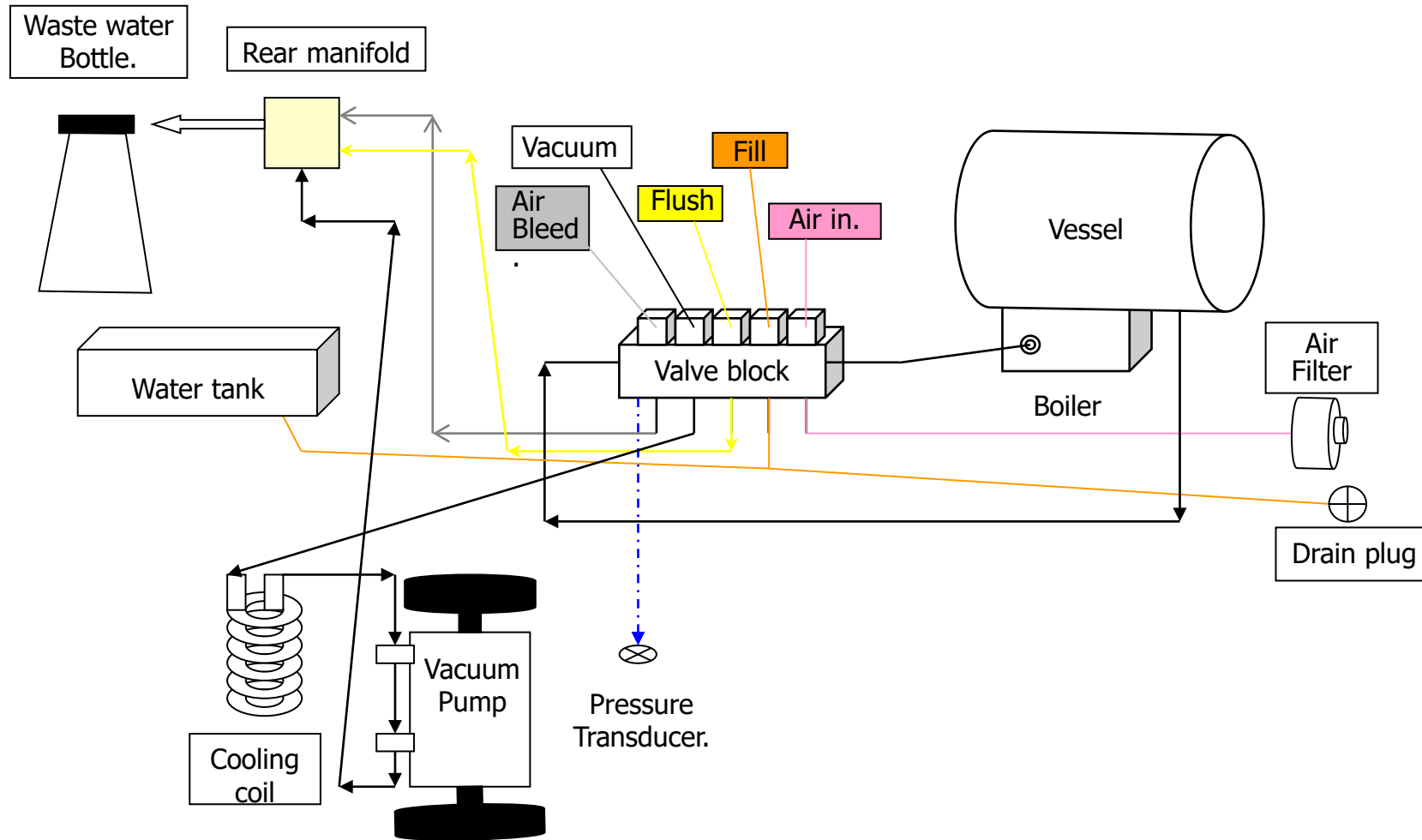




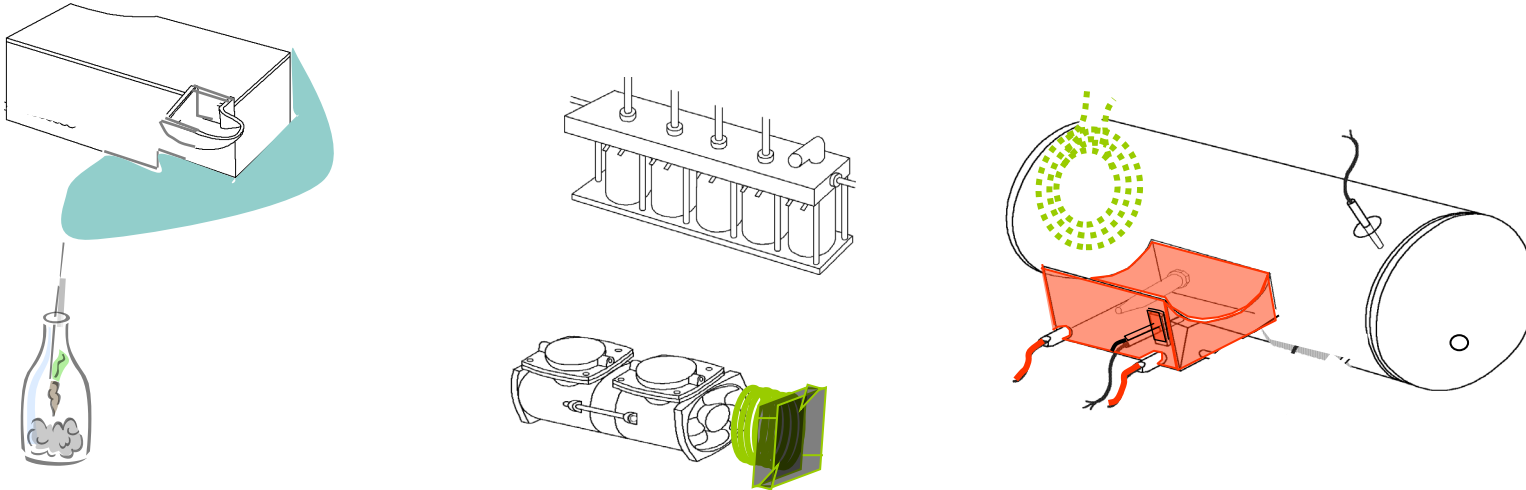
121/134°C with/without Drying



C3 Advance

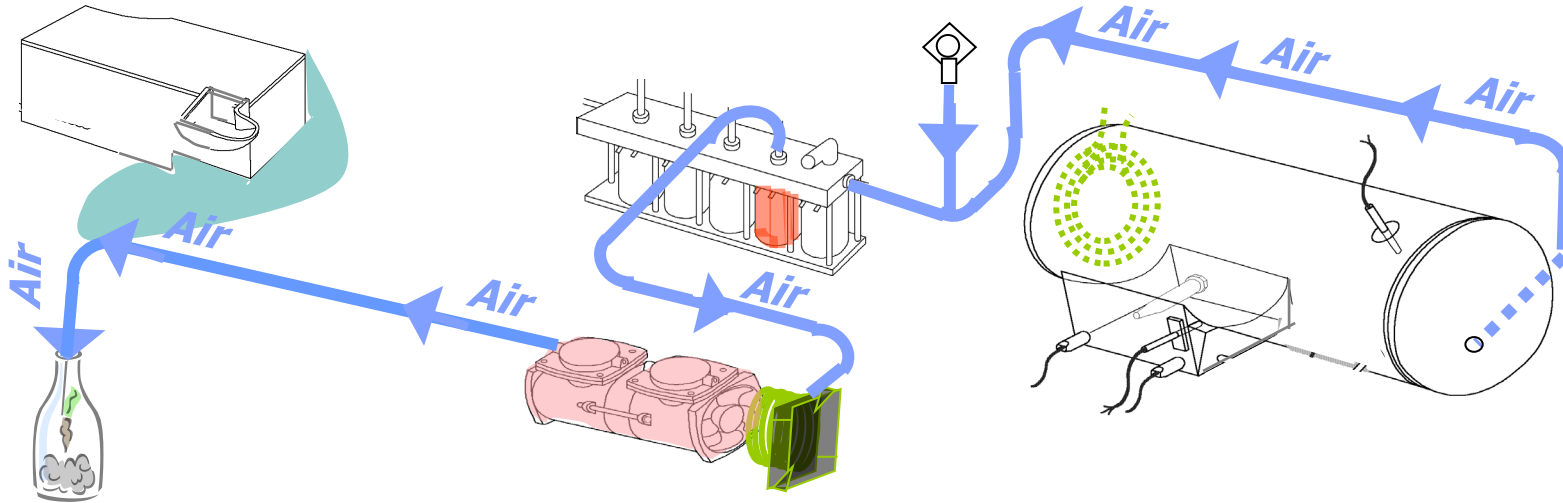


Stand-By



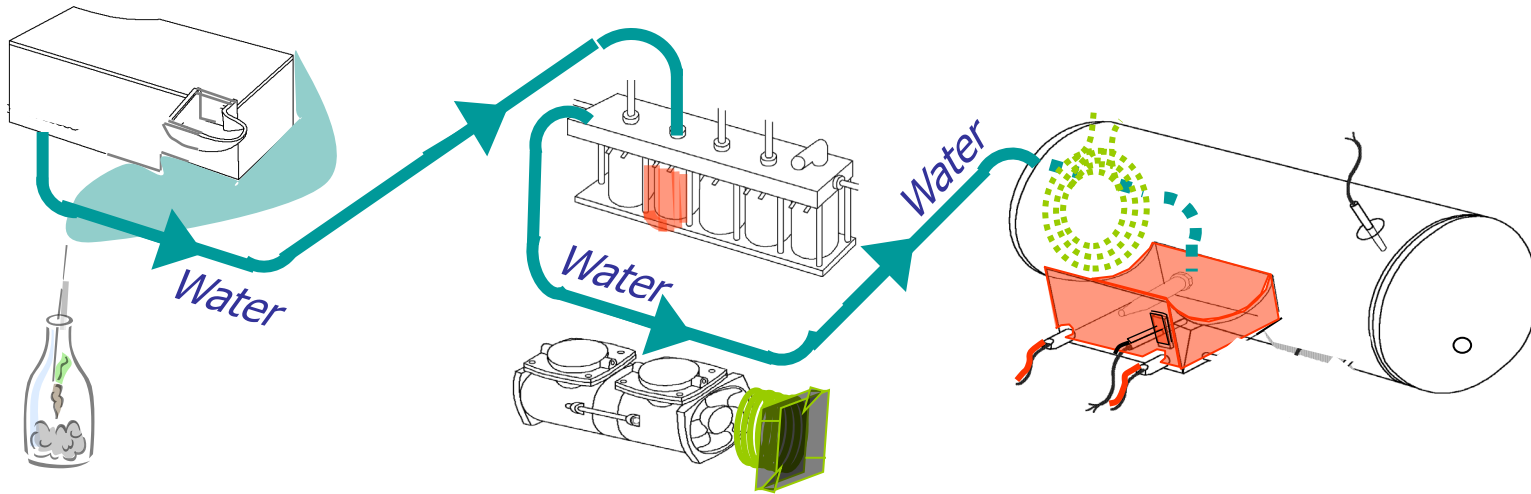
- When switched on, the unit will go into the 'standby mode'.
- The valves will be closed, and the heater will turn on, pre-heating to a temperature of 45°C *ready for use*.
- After one hour if no buttons are pressed, the heater will be turned off. The heater will turn on again once the unit is switched to the ready mode (from software level CA1_0_5)
- Pressing the ready/standby button:  puts the unit into the 'ready mode' and the air bleed solenoid valve opens

Pre Vacuum



- When the start button is pressed the air bleed closes, and the heater is turned off
 - The vacuum pump and vacuum solenoid valve are energised and a vacuum forms within the chamber.
 - The vacuum is drawn to to a value selected in CAL11
 - Once the vacuum level is achieved the cycle progresses to water fill.
- NB Failure to achieve the required vacuum will lead to user message 04*

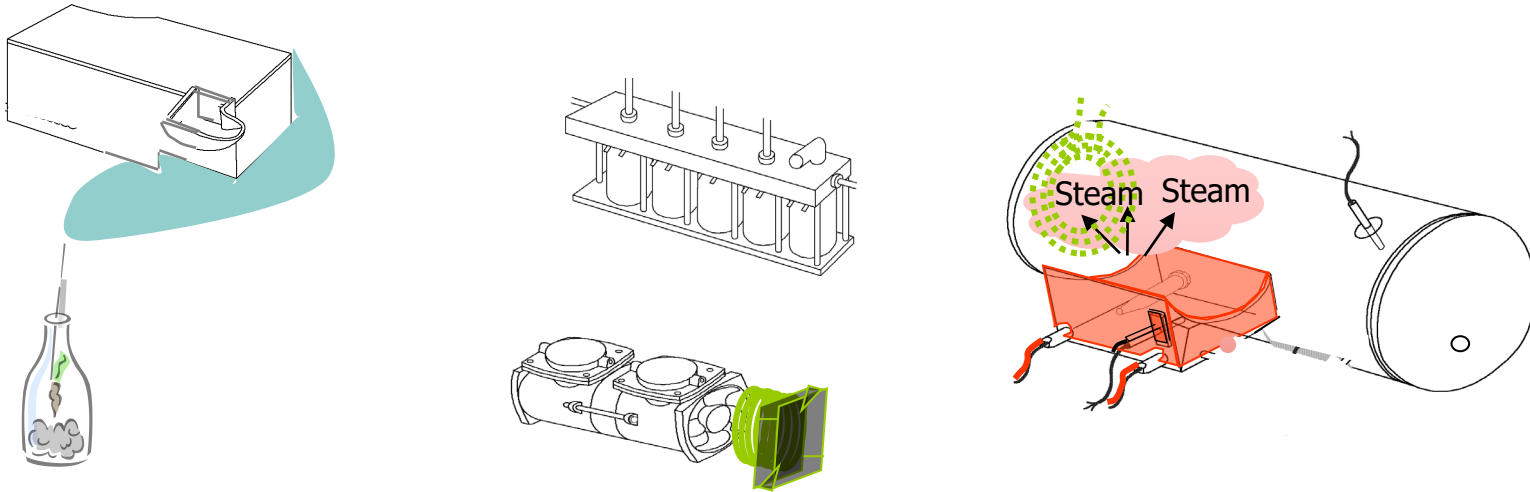
Water Fill



- Once the first vacuum level has been achieved, the water fill solenoid energises & water travels from the tank, through the water fill valve to the boiler.
- The boiler probe acts as a level sensor. When the water reaches the boiler probe a circuit is completed and the valve closes.

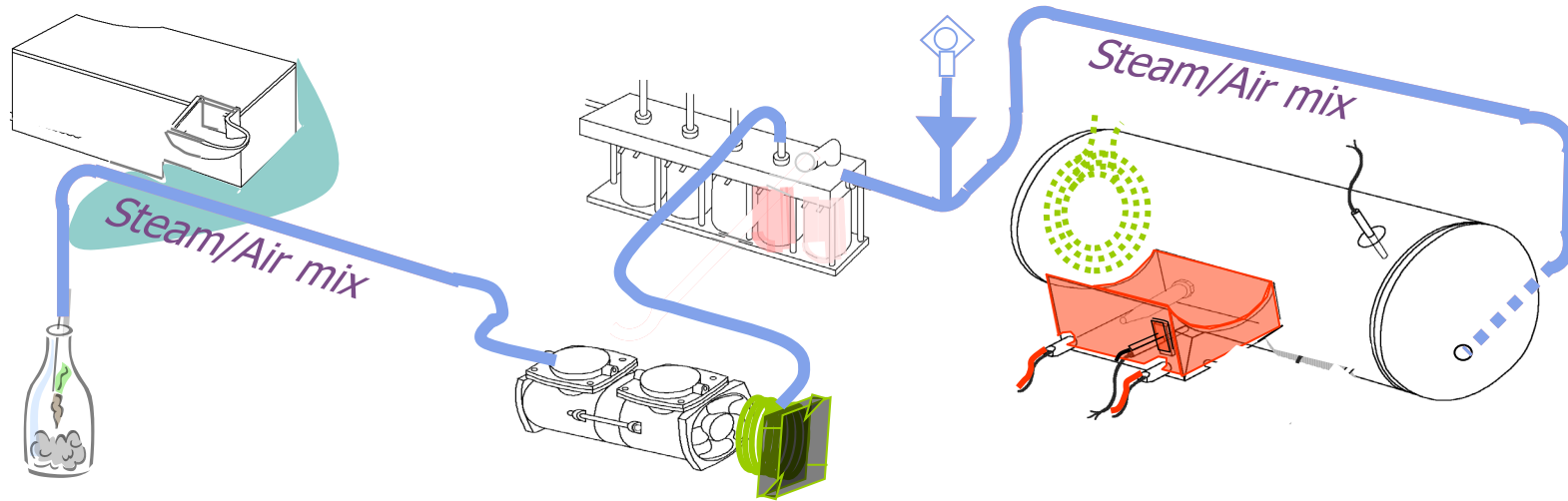
*NB Two attempts are made to fill the boiler with water.
If the sensor does not detect water in a given time frame
user message 13 will be indicated.*

Heating



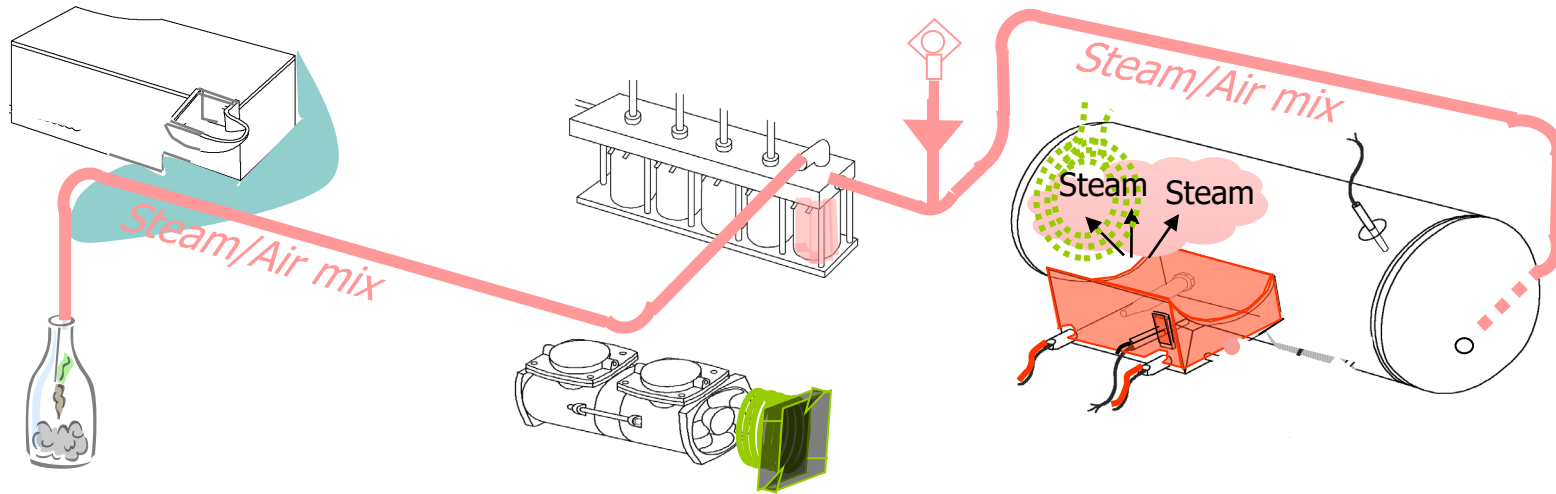
- Once the boiler is full the heater element is energised and the fan is turned off
- Pressure then increases up to the level set in the software

Pre Vacuum 2



- Once the required pressure is reached the fan is turned on and pressure is released via the air bleed valve.
- Once the temperature reaches 110 °C the air bleed solenoid will close and the vacuum solenoid valve is energised
- At 105 °C the vacuum pump is energised and a vacuum again forms within the chamber.
- The vacuum is drawn to the level set in the software
- Once the vacuum level has been achieved, the water level will be checked and topped up if required. The fan will be turned off and the heating stage will then be repeated, at the end of which the fan will be turned on and prevacuum 2 is repeated

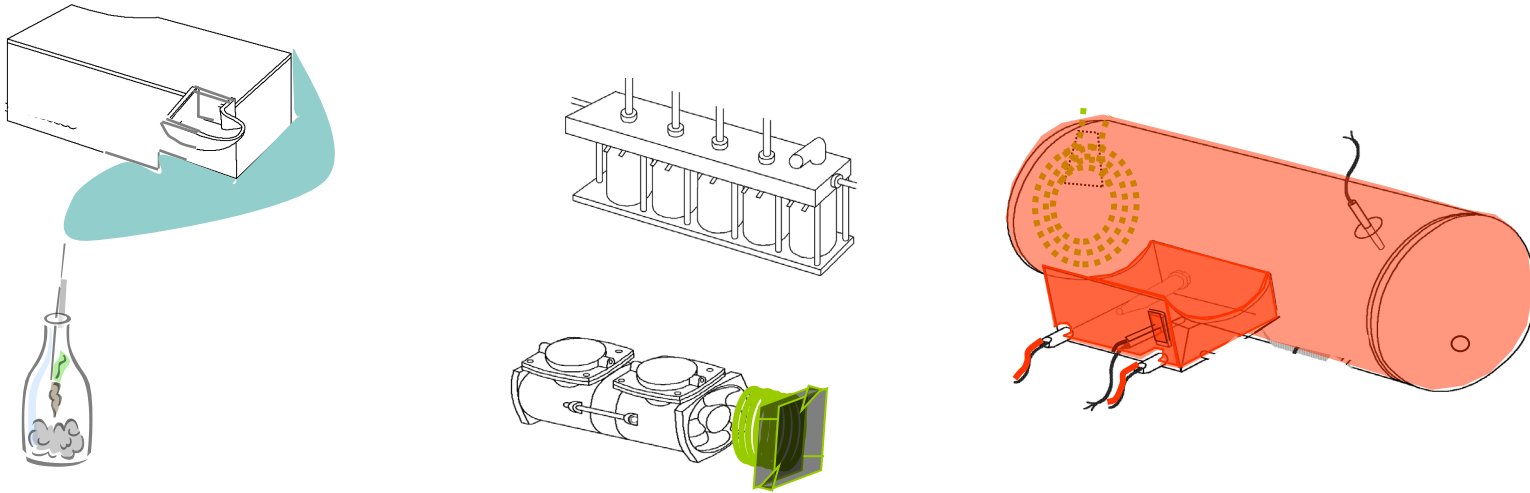
Heating



- Following the final pre vacuum the water level is checked once more and topped up if required.
- Pressure will again rise in the chamber and when the temperature reaches 105°C the air bleed solenoid will open allowing steam to be released.
- At around boiling we begin to monitor the differential between the boiler and chamber probes. When no differential is evident the air bleed valve closes this is around 106°C and the temperature continues to rise up to the sterilizing temperature.

NB Failure to achieve zero differential results in User message 03

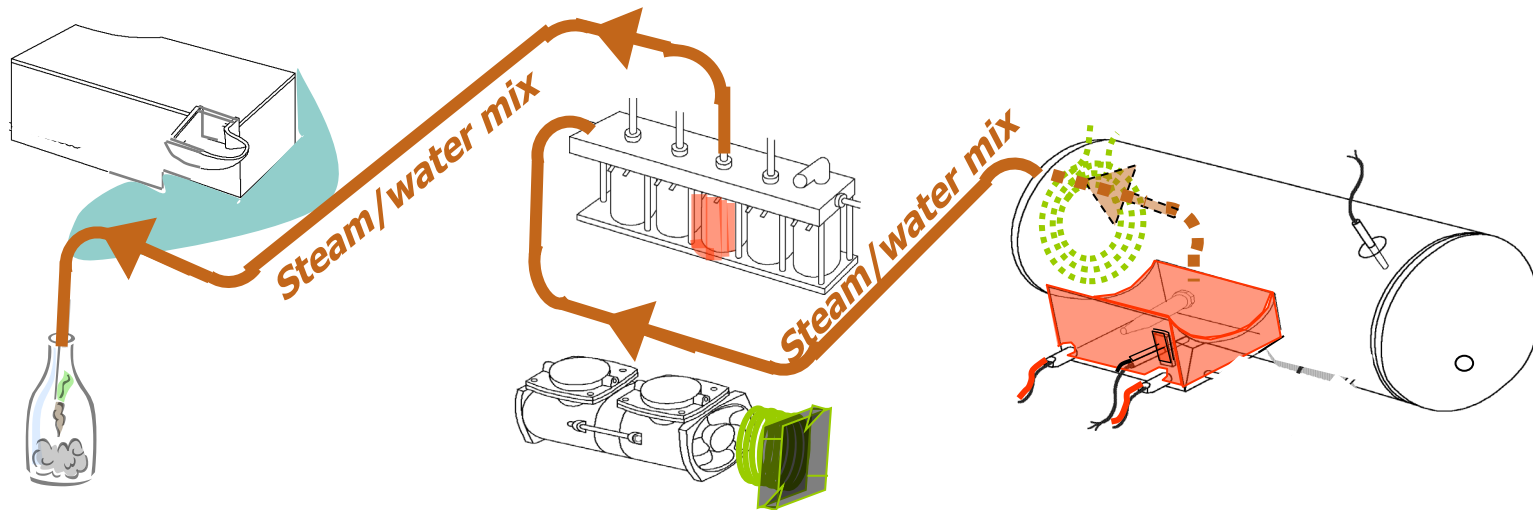
Sterilizing



- As the temperature approaches the Sterilizing start temperature, set in CAL01, the energy input is reduced avoiding the possibility of temperature overshoot.
- On reaching CAL 01, the sterilizing timer is started. This time is determined by CAL07 which is set in seconds.
- The temperature continues to rise to the target temperature. This is the temperature at which sterilization will be controlled and is set in CAL02
- During the sterilization period the temperature in the boiler is compared with the temperature in the chamber and this should be within the range $134^{\circ}\text{C} +4 / -0^{\circ}\text{C}$ for a 134°C cycle

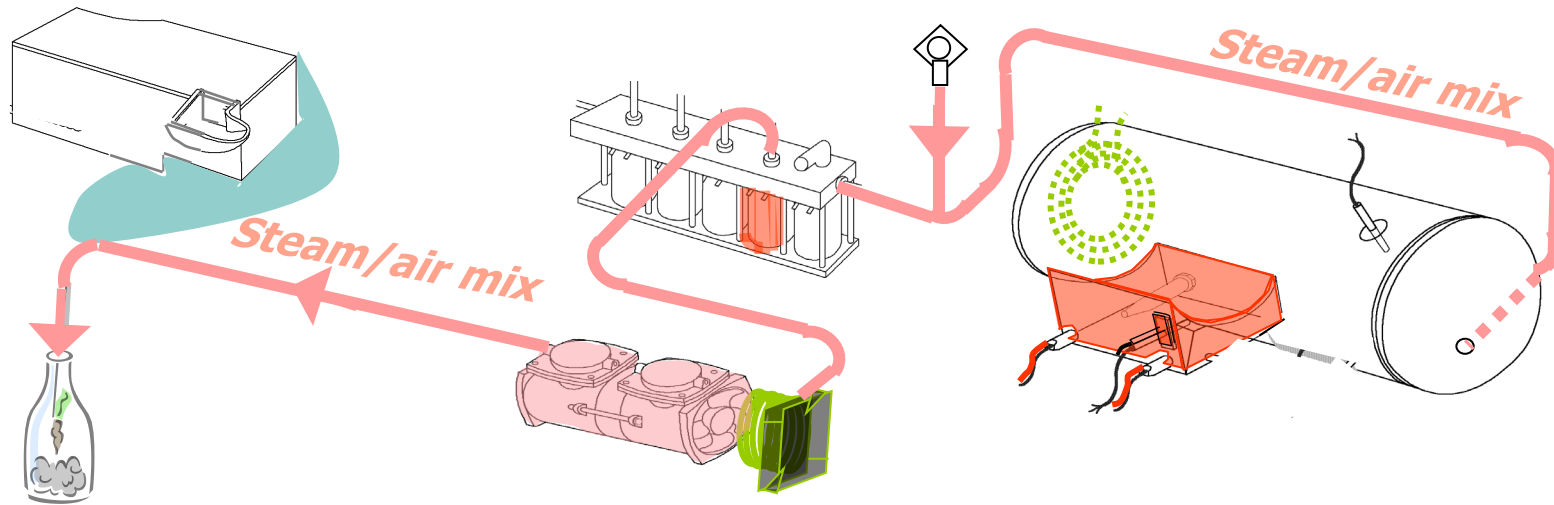
NB Possible errors in this stage: b02, d02, t02 (and p02 if option selected)

Depressurisation



- At the end of the sterilizing period the fan and the heater are turned off and the flush valve opens.
- With the flush valve open the pressure in the chamber forces the water out of the boiler and out to the waste water bottle.
- Once all the water has been discharged to the bottle, the pressure in the chamber falls rapidly.
- Once the pressure has returned to atmospheric, proceeds to vacuum drying, if selected.

Drying- Vacuum

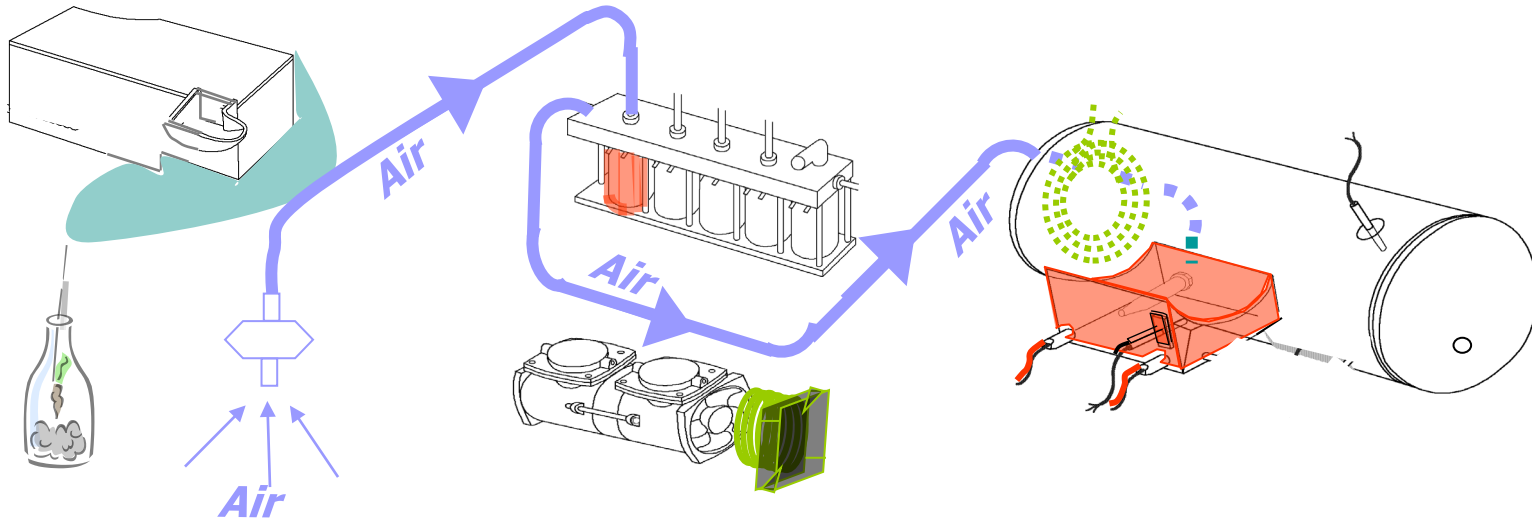


If vacuum drying has been selected, Power is applied alternately to the boiler and internal heater, the vacuum solenoid is energised the vacuum pump starts and the fan operates.

A vacuum is then pulled for a period of time. At the end of this time the vacuum pump and valve are turned off.

If the vacuum does not fall 50mb or more below atmospheric in the time allowed, User message Uod3 occurs

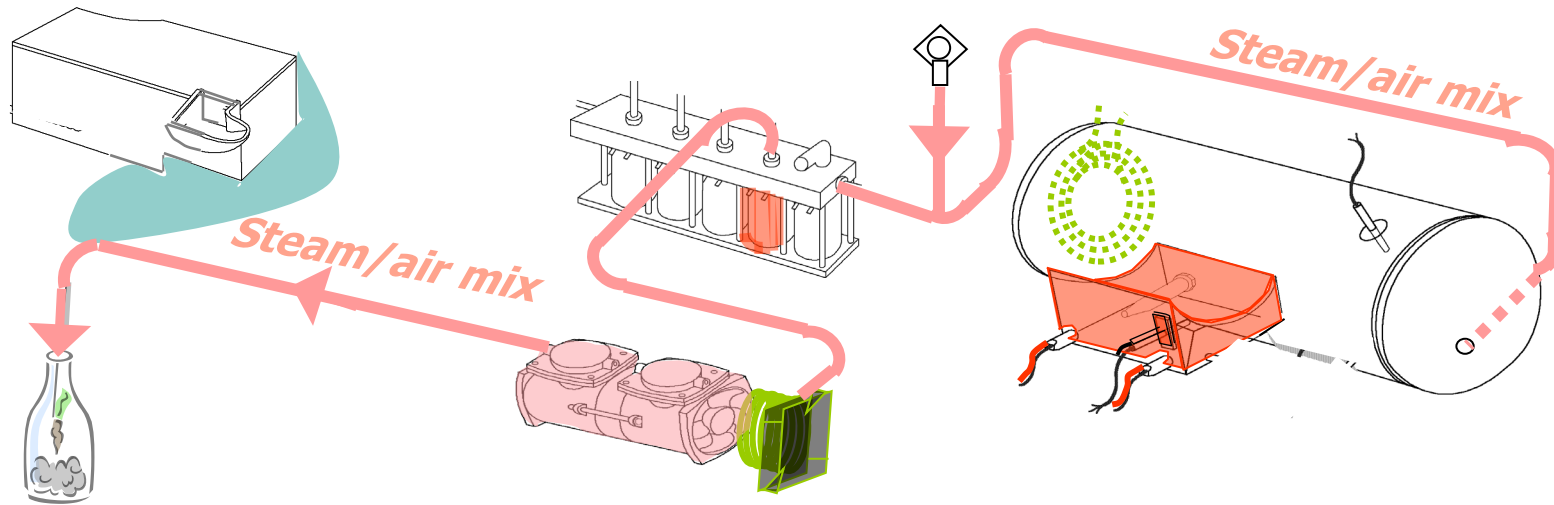
Vacuum Release



- Once the vacuum valve and pump have been turned off, power is applied to the air solenoid, the air valve opens, air is allowed to enter the chamber and the chamber returns to atmospheric pressure.

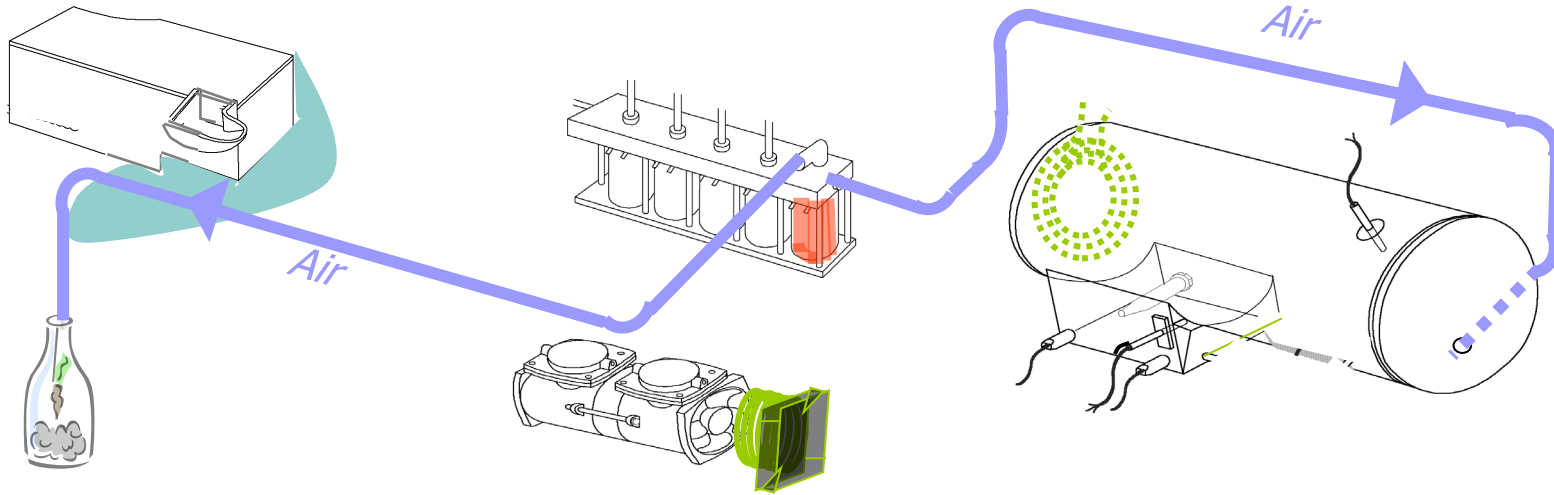
NB If a pressure within 50mb of atmospheric pressure is not achieved within 30 seconds a user message 11 will be indicated.

Drying – Vacuum (repeated)



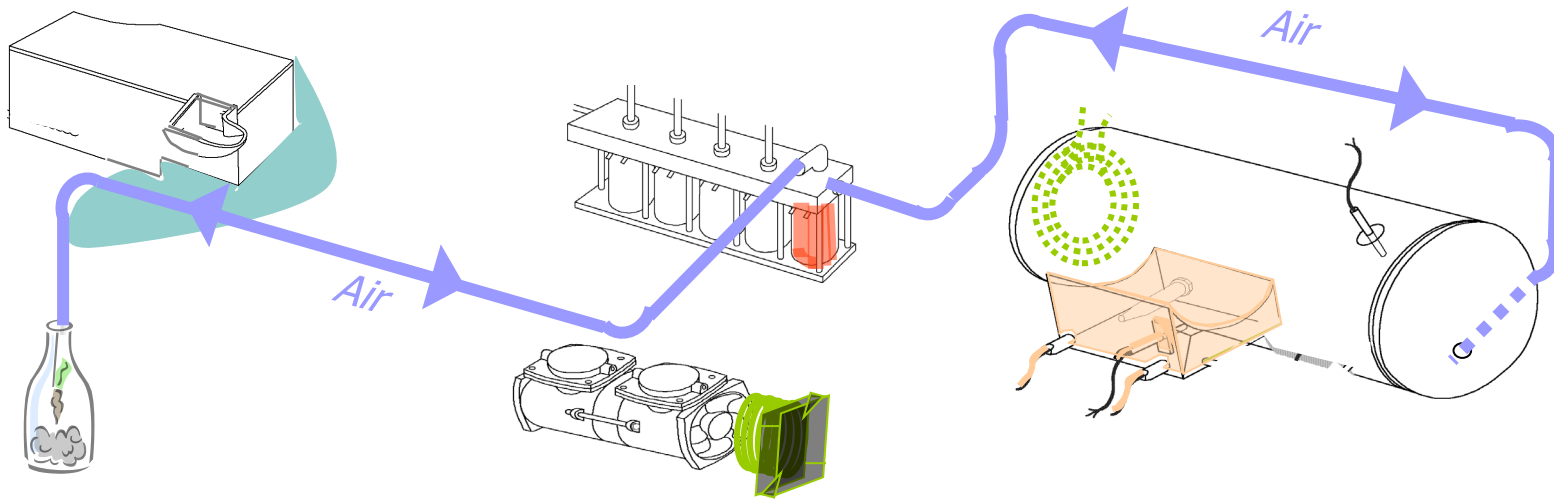
- The air valve remains energised for approximately 30 seconds, after which the air valve is de-energised the vacuum solenoid is energised, the vacuum valve opens and the vacuum pump is turned on.
- The whole process is then continuously repeated for a period of approximately 13 minutes with the final vacuum time extended to 2 minutes.

Air Equalisation



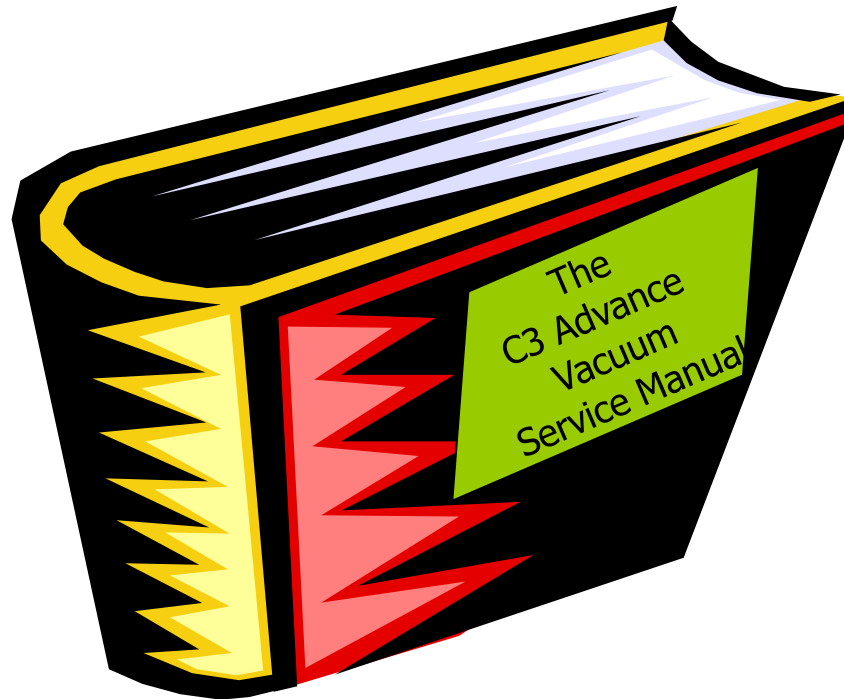
Once atmospheric pressure is achieved, the air valve, boiler and internal heater are de-energised, and power is applied to the air bleed solenoid. The air bleed valve opens and atmospheric pressure is maintained in the chamber through this route.

Cycle Complete

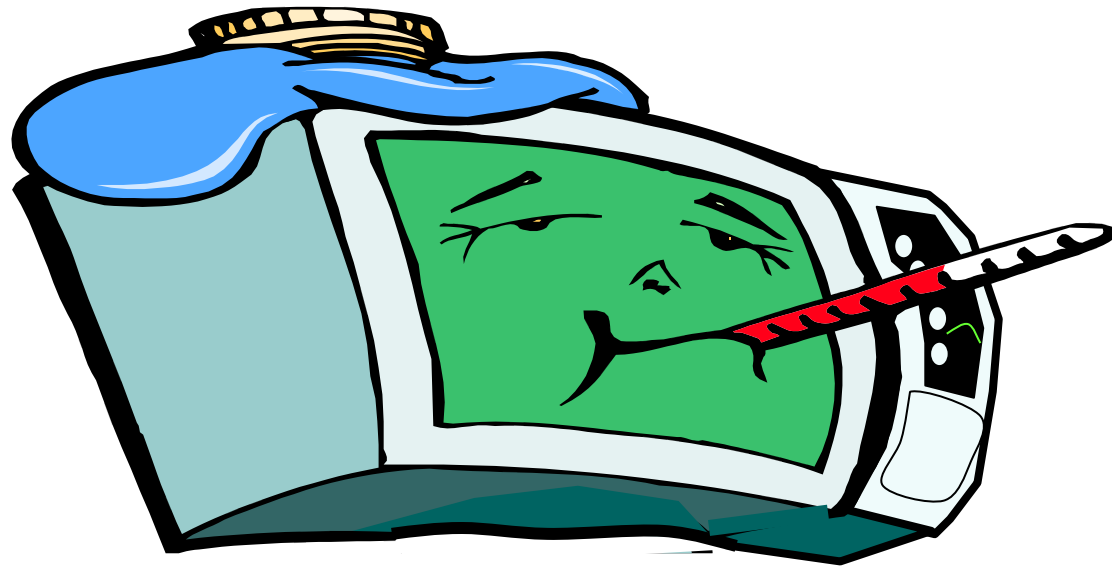


- After a few moments delay, the cycle will complete. Indicated by 3 bleeps from the buzzer.
 - The air bleed valve remains open to avoid a pressure increase or vacuum forming within the chamber, before the door is opened.
- NB. A positive or negative pressure in the chamber can stop the door from opening.*
- Once the door open button is pressed, a reduced power is applied to the boiler heater in order to ensure that the unit is 'warm' ready for the next cycle.
 - The fan will remain on for 5 minutes.

C3 Advance



Fault Diagnosis



Error Codes

- 01 Power Failure
- 02 Sterilizing Parameter Fault
 - » b02 Band error
 - » d02 Probe difference
 - » t02 Timing error
- 03 Air Bleed
- 04 Failed to Achieve Vacuum Level
- 07 Boiler Thermistor Failure
- 08 Pressure Sensor Fault
- 10 Water in Boiler

Error codes (cont/d... .)

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- 11 Air filter blocked
- 13 Boiler Failed to Fill
- 14 PT100 Failure
- U0d1 Boil Dry
- U0d2 Time to Sterilizing
- U0d3 Not Pulling Vacuum in Drying

'Unit Flashes Door Continuously'

The solenoid has been triggered but the door microswitch has not opened.

WHAT TO LOOK FOR

- a. Door is held closed due to some mechanical condition
- b. Door is held closed by a vacuum caused during cool down as a consequence of the air bleed valve not operating
- c. Door micro switch or harness is short circuited (S/C)
- d. Power/control module fault

Fault Diagnosis C3 Advance

01

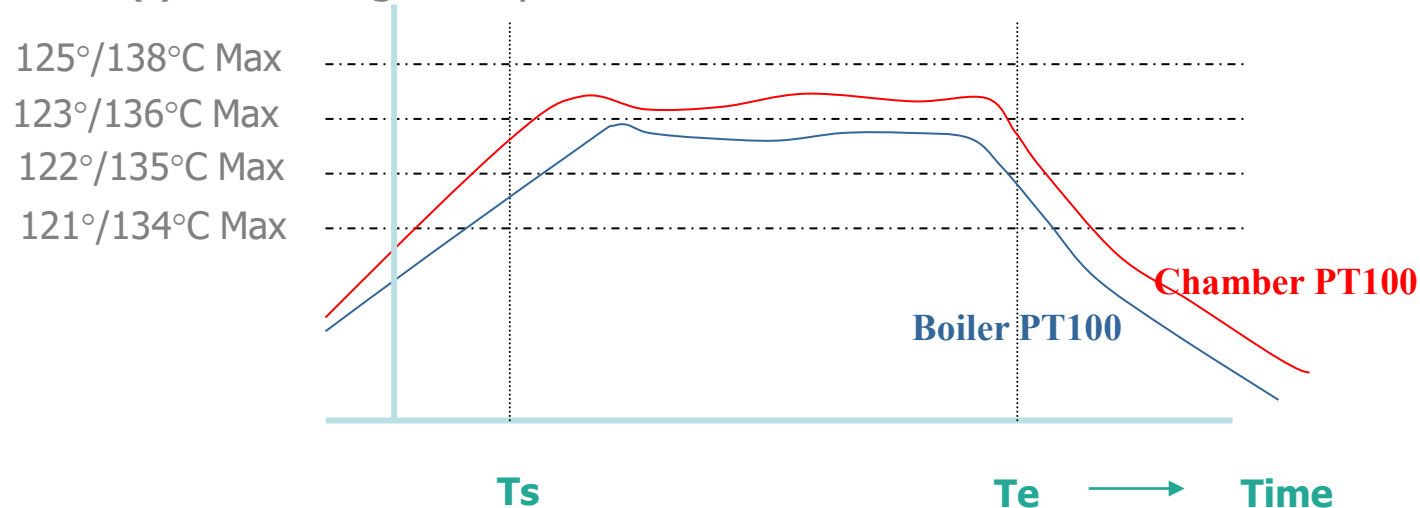
Power failure at any time during sterilizing cycle.

Fault Diagnosis 02

Error during Sterilizing

The autoclave is fitted with an electronic comparator that checks the following conditions during the sterilizing cycle:-

No. 1(t) Sterilizing hold period



When the start temperature is reached, the on board computer sets to zero the cycle timer, it also reads the time clock. When the cycle timer has timed out, the on board computer reads the time clock. The cycle time and timer clock values must agree to better than 10 seconds.

02 (cont/d....) C3 Advance

- No. 2.(d) Compare boiler and chamber PT100 probe values during the sterilizing period they must agree with an error of $>2^{\circ}\text{C}$.
- No. 3.(b) Both boiler and chamber PT100 must be within the min/max cycle limits.

WHAT TO LOOK FOR

- a. Check chamber probe is correctly inserted.
- c. Check that both PT100 probes have a similar resistance.
- d. Check all pipe work for leaks, water loss from boiler giving rise to a boil dry condition during sterilizing will trigger this error code.
- e. Power/control module fault

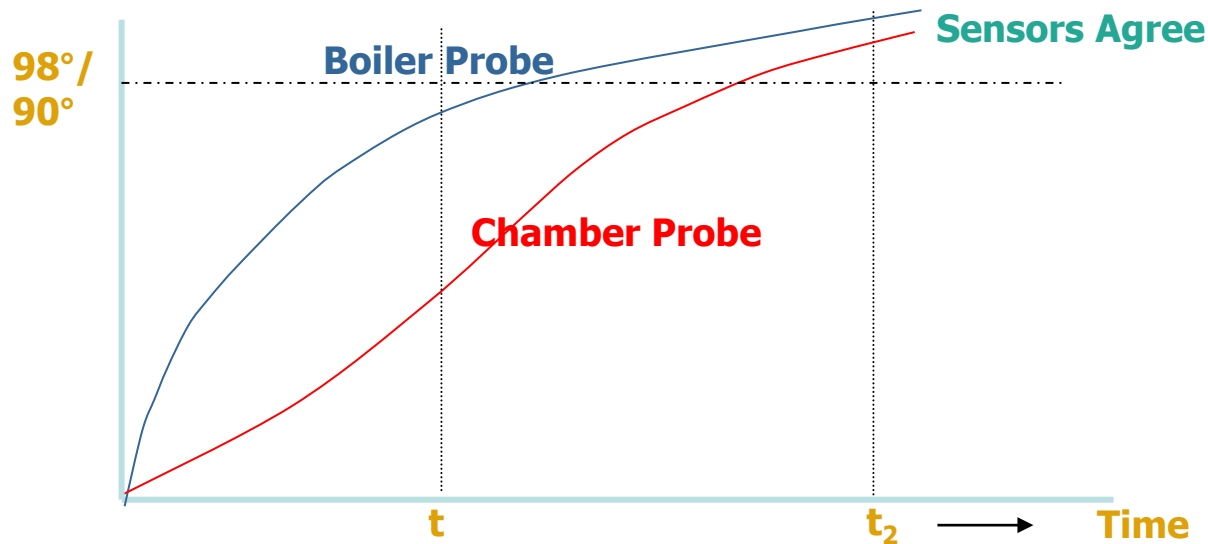
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Fault Diagnosis

03

Air bleed was not successful.

Autoclave has failed to obtain a balance between boiler and chamber PT100 probes within the time limit.



$t_2 - t_1$ must be < 10 mins¹ from Boiler probe reaching 90°C/ 98°C (16/22 litre.)

03 (cont/ d...)

C3 Advance

WHAT TO LOOK FOR

- a. Very low applied voltage (less than 188v for 230v (machines))
- b. Gross steam leak
- c. Check boiler filling with water
- d. Air bleed tubes blocked
- e. Air bleed solenoid valve failed to operate
- f. Air bleed solenoid blocked
- g. Check chamber probe is correctly inserted.
- h. Check that both PT100 probes have a similar resistance
- i. Balance Voltage incorrect
- j. Power/control module

Setting Balance Voltage

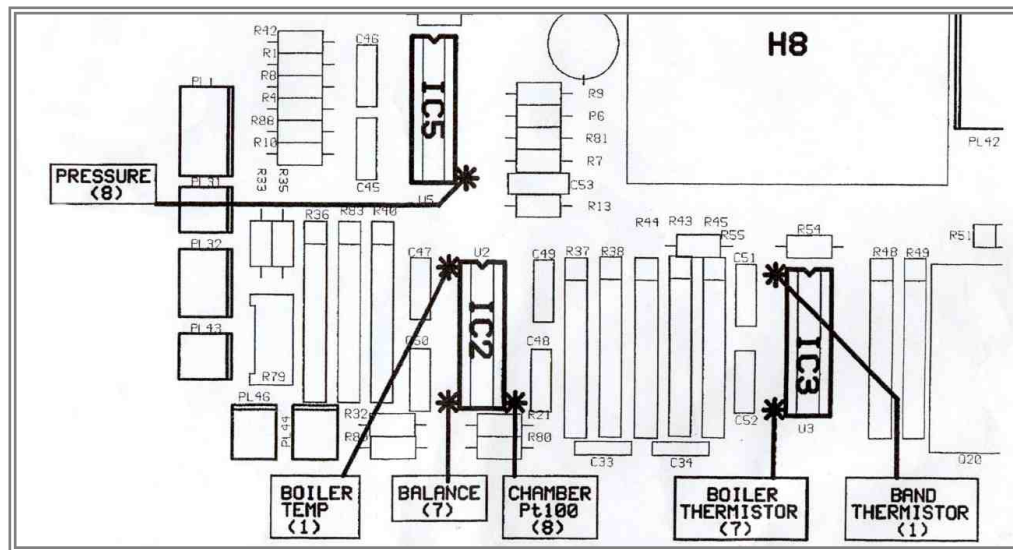
Balance Voltage Checks

The voltage is checked using a Multimeter and a matched pair of probes.

Clip one lead of the Multimeter on to the bottom left hand leg of integrated circuit (IC2) and the other lead to the chassis earth, the reading observed should be 2.7 vdc when both probes are at an equal temperature.

Best checked by placing both sensor into a cup of water

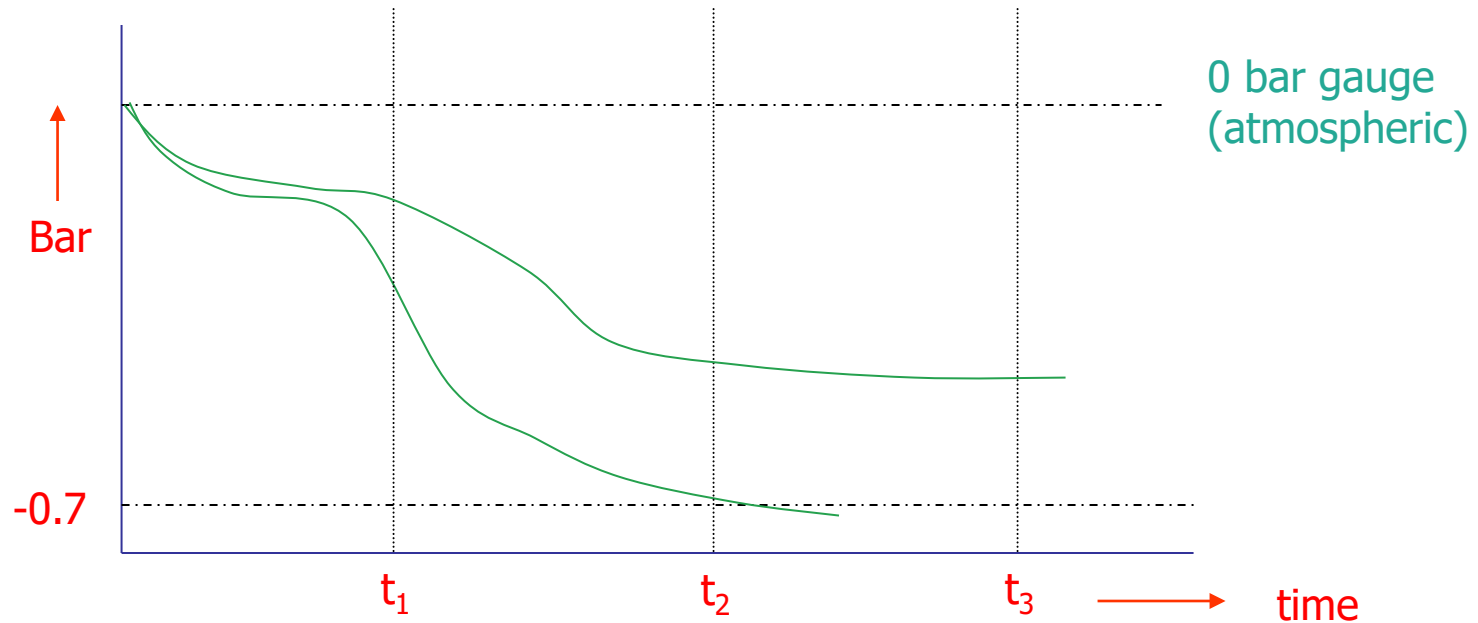
Rotating the small brass screw on the potentiometer adjacent to the micro switch connector will adjust the voltage.



Fault Diagnosis

04

Required vacuum level was not achieved
within time allowed



Autoclave detects a vacuum fault

t_1 = Vacuum pump on

t_2 = Vessel vacuum level achieved

t_3 = Time limit

04 (Cont/d...)

If vacuum level is not reached inside time limit ($t_3 - t_1 = 10$ mins) then a fault is reported.

WHAT TO LOOK FOR:-

- a. Water in boiler/vessel
- b. Vessel/tubing/connection leak (may be quite small)
- c. Vacuum pump did not operate
- d. Valve did not open/blocked
- e. Another valve stuck open
- f. Pump outlet/inlet blocked
- g. Pressure sensor not correctly calibrated
- h. Tubing restricted

Fault Diagnosis

07

Boiler thermistor fault

WHAT TO LOOK FOR

- a. Boiler thermistor S/C or S/C to ground
- b. Power/control module

Fault Diagnosis

08

Pressure sensor fault

WHAT TO LOOK FOR:-

- a. Pressure sensor O/C or S/C
- b. Power/control module fault

Fault Diagnosis 10

**Water in boiler at end of cycle
when door open is enabled**

WHAT TO LOOK FOR

- a. Was an error code previously displayed
- b. Fill solenoid fault (open or leaking)

Fault Diagnosis

11

Air filter fault

WHAT TO LOOK FOR:-

- a. Air filter blocked
- b. Tubes collapsed
- c. Air solenoid fault
- d. Air bleed tube blocked
- e. Power/control module fault

Fault Diagnosis

13

Boiler did not fill with water

WHAT TO LOOK FOR

- a. Fresh water tank empty due to level sensor fault, check wiring and polarity (copper coil is ground side)
- b. Fill tubes blocked
- c. Fill solenoid failed to operate
- d. Fill solenoid blocked
- e. Water filter blocked
- f. Boiler probe (water level sensor function) not connected
- g. Power/control module fault

Fault Diagnosis

14

PT100 sensor fault

WHAT TO LOOK FOR

Chamber PT100 probe either O/C or S/C or S/C to ground.
Power/control module fault

Fault Diagnosis

U0d1

Boil dry indication.

Autoclave detects that the boiler has run out of water.

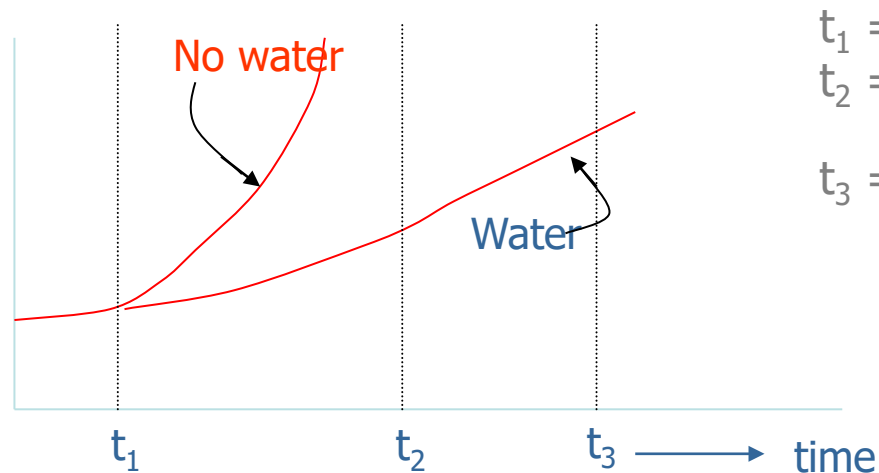
It should be noted that if a U0d1 error occurs before the air bleed valve has closed then the rate of rise of boiler wall temperature can cause the thermal cut-out to operate.

- There are two key detection phases.

U0d1(cont/d...)

Phase 1

During the heating phase from end of water fill to air bleed valve close the boiler thermistor is actively looking for a rapid rise in boiler temperature signifying that there is no water in the boiler.

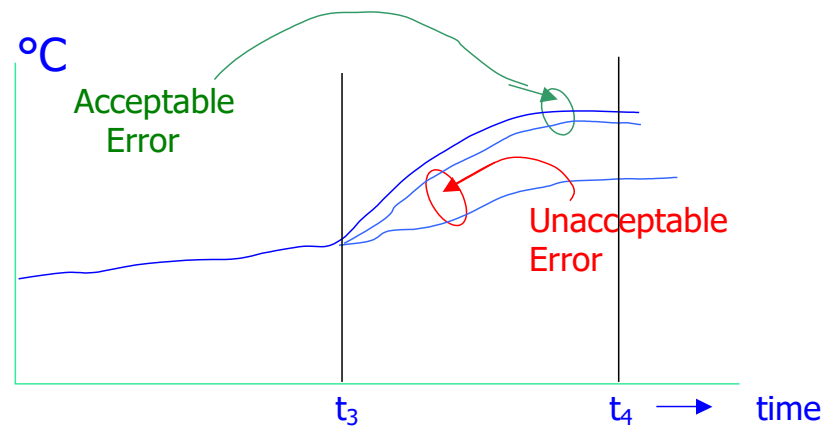


t_1 = Heater on
 t_2 = Water boiling
in boiler
 t_3 = Air bleed close

U0d1(cont/d...)

Phase 2

During the heating phase from air bleed to start of sterilizing the control system is checking to make sure that both boiler and chamber PT100s are tracking. Any significant deviation is reported as an error.



t_3 = Air bleed close

t_4 = Sterilizing start

U0d1(cont/d...)

Note

During phase 1, most likely causes of water loss is gross steam leak, or large linen load.

During phase 2, most likely causes are:-

- Small steam leak, increasing with pressure
- Linen load
- Chamber probe fault

U0d1(cont/d...)

WHAT TO LOOK FOR

- a. Boiler did not fill
- b. Gross water/steam leak in pipes/ASME valve etc.
- c. Load mass or surface area too great or receptacles open end up retaining working
- d. Load is too absorbent, eg. Linen materials
- e. PT100 probe fault boiler or chamber (tracking error, diagnose by substitution.)
- f. Power/control module fault
- g. Chamber probe insertion depth.

Note: Thermal cutout operation will often precede a "U0d1."

Fault Diagnosis U0d2

Time to Sterilization

Unit taken too long to achieve sterilization

What to Look for

- Check & Clean Gasket
- Check Pipework and connections for leaks
- Check that the boiler is heating up correctly

Fault Diagnosis

U0d3

Not Pulling a Vacuum

Pressure failed to drop more than 50mb
below atmospheric during Drying

What to Look for

- Ensure correct load size
- Check Operation of Vacuum Pump
- Check & Clean Gasket
- Check Pipework and Connections for Leaks
- Check Door Settings

Fault Diagnosis

Flashing red led

Insufficient water in fresh water tank to run a cycle but tank full.

WHAT TO LOOK FOR

- a. Check sensor wiring
- b. Check polarity of wiring
(copper coil is ground side)
- c. Power/control module fault

Fault Diagnosis

Thermal Cut-out Operates

What to look for

- a. See U0d1
- b. Boiler thermistor out of range
- c. Boiler thermistor not located correctly on boiler
- d. Power/control module fault.

Fault Diagnosis

No Display Loss of Power

What to look for

- a. No mains (at plug top),
- b. Fuses blown,
- c. Thermal cutout on boiler.
- d. Check mains connections on power/control module.
- e. Check transformer output. No output could be caused by a faulty transformer or an overloaded output.
(If unit recovers, most likely it is a S/C on one of the transformer loads.)
- f. Power/control module fault.
- g. Display module fault/not connected.

C3 Advance *Calibration Modes*



Calibration Modes

Entering the CAL Mode

Calibration modes are entered by using an access code complete with up/down and accept buttons, door must be open with unit in ready mode:-

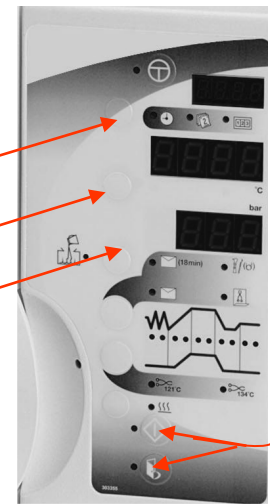
■ To enter CAL modes, press and hold door open and cycle start buttons for 10 secs. The letters "CAL" will appear in the date/time display, "01" will appear in the pressure display window.

■ Up button, was date/time/cycle count button.

■ Down button, was DegC button.

■ Accept button, was Bar button.

When using CAL modes 01 to 04 inclusive, ignore the small indicator led's and also ignore the door flashing on the display when entering Calibration mode.



Calibration Modes

CAL 01

Sterilizing Start Temperature

SEQUENCE

- Open door.
- Enter CAL mode.
- Press accept (001 now flashing on the pressure display.)
- Use up/down button to adjust to the required temperature value. display in_°C.
- Press accept to update with the new setting (001 stops flashing and the accepted value is shown on the temperature display.)

NB: 001 on pressure display does not flash.

- Press accept to update with the new setting (001 still on the pressure display and the accepted value on the temperature display.)
- Press Standby button to exit CAL 01.

Calibration Modes

CAL 02

Target Temperature

SEQUENCE

- Enter the mode as in CAL01
- Using the up button select CAL02
- Press accept (002 now flashing on the pressure display.)
- Adjust the value as in CAL01 and accept
- Press accept to update with the new setting (002 still on the pressure display and the accepted value on the temperature display.)
- Press Standby button to exit CAL 02.

Calibration Modes

CAL 03

Temperature Calibration

- This mode is used to calibrate the displayed temperature value (derived from the chamber probe.)
- Before starting a cycle ensure that your measuring equipment has a valid calibration certificate and you have correctly connected it to the vessel using the 1/4 BSP entry ports provided in the door.
- Place thermocouple adjacent to the chamber probe. Other thermocouples may be placed in the centre of the chamber or load if preferred and at the rear of the chamber near the drain (10mm above centre of large hole in rear of chamber floor.)

CAL 03 (cont/d...)

SEQUENCE

- Open door.
- Enter CAL mode, as described for CAL01
- Use Up/Down button to obtain a displayed mode "03."
- Press accept (003 flashing on the pressure display.)
- **Ensure a 134°C Non Vacuum Non Drying Cycle is selected**
- Close door and start the cycle.
- Wait 3 minutes after the sterilizing led comes on for the temperature to stabilise.
- Use up/down button to adjust temperature value displayed in Deg C.
- Press accept to update with the new setting (003 no longer flashing on the pressure display.)
- Press the standby button and wait for unit to complete the sterilizing cycle.
- After pressing the door release button the display returns to the ready mode.

Calibration Modes

CAL 04

Pressure display offset +ve pressure

- This mode is used to CALIBRATE the displayed pressure value (derived from the transducer.)
- Before starting a cycle ensure that your measuring equipment has a valid calibration certificate and you have correctly connected it to the vessel using the 1/4 BSP entry ports provided in the door.

CAL 04 (cont/d...)

SEQUENCE

- Open door.
- Enter CAL mode, as described for CAL01
- Use Up/Down button to obtain a displayed mode "04."
- Press accept (004 flashing on the pressure display.)
- **Ensure a 134°C Non Vacuum Non Drying Cycle is selected**
- Close door and start the cycle.
- Wait 3 minutes after the sterilizing led comes on for the temperature to stabilise.
- Use up/down button to adjust pressure value displayed in Deg C.
- Press accept to update with the new setting (004 no longer flashing on the pressure display.)
- Press the standby button and wait for unit to complete the sterilizing cycle.
- After pressing the door release button the display returns to the ready mode.

NB: Ignore pressure display reading during heating until after air bleed valve has closed.

Calibration Modes

CAL 05

Pressure display offset -ve pressure

- Pressure Display/Control calibration for negative pressure.
- This mode is used to CALIBRATE the displayed negative pressure value.
- Before starting a cycle ensure that your measuring equipment has a valid calibration certificate and you have correctly connected it to the vessel using the 1/4 BSP entry ports provided in the door.

CAL 05 (cont/d...)

SEQUENCE:-

- Open door.
- Enter CAL 05 mode as previously described and press accept.
- Vacuum Pump should start and the pressure display begin to drop.
- Wait for the Pressure to stabilise (very slow change.)
- Use up/down button to adjust pressure value displayed in bar.
- Press accept to update with the new setting (the temperature will still be flashing.)
- The Vacuum pump still running.
- At this point exit CAL 05 mode by pressing the standby button.
- Air bleed opens and unit returns to ready mode.

NB: Ignore the pressure display decimal point. A reading of -2.1 Bar is actually -0.21 Bar. The resolution has been increased in this mode from 0.1 to 0.01 increments.

Calibration Modes

CAL 06

Pressure Calibration (pressure transducer)

- Once **CAL06** is started it is important to complete the whole procedure
- For use when either a pressure sensor or power/control module change has occurred.
- Pressure Transducer CALIBRATION.
- This mode is used to CALIBRATE the Pressure Transducer.
- Before starting a cycle ensure that your measuring equipment has a valid calibration certificate and you have correctly connected it to the vessel using the 1/4 BSP entry ports provided in the door.

CAL 06 (cont/d...)

SEQUENCE:-

- Open door.
- Enter CAL 06 mode as previously described and press accept.
- The Pressure display should be 06 flashing and the temperature display should show 10 or previously set value.
- Vacuum pump will start.
- Close the door. When the pressure levels off, at about 130mbar absolute on the calibrated instrument, use the up & down buttons to get the display to show 13, press accept & open the air valve.

CAL 06 (cont/d...)

- The vacuum pump will switch off and air is allowed into the vessel. Control the air line to 3.5 bar absolute.
- The display will then rise and stabilise.
- Once stable use up & down buttons to obtain on the unit, the displayed pressure as seen on the calibrated instrument, 3.5bar will show as 350 on the unit.
Press accept (the display should return to ready mode). Switch off at the mains.
- Absolute pressure transducer should be used to stop any unnecessary error.

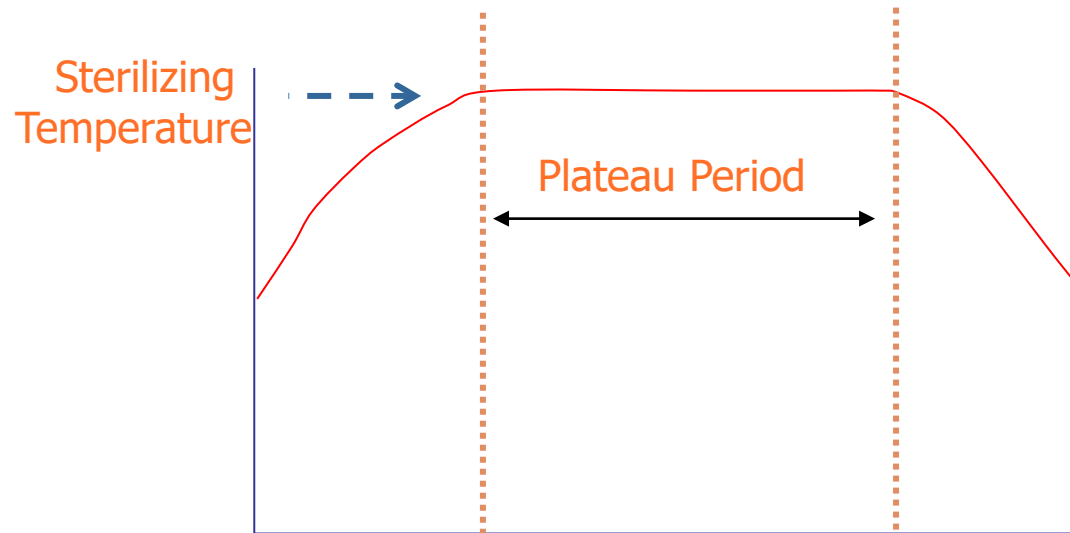
NB: An absolute pressure transducer should be used when carrying out CAL06

Calibration Modes

CAL 07

Sterilization hold time

- This mode is used to set sterilizing cycle timer (plateau period at temperature.)
- The temperature selection button can be used to select the range to be adjusted whilst in CAL 07 mode.



CAL 07 (cont/d...)

SEQUENCE

- Open door.
- Enter CAL 07 mode as previously described and press accept.
- Use Up/Down button to adjust to the required time value (displayed in seconds), for the selected temperature.
- Press accept to update with the new time setting (007 stops flashing and the accepted value is shown on the temperature display.)

CAL 07 (cont/d...)

To set the sterilizing timer for another cycle

- Press the cycle selection button (007 still on pressure display, previously entered time setting still shown on the temperature display.)
- Use Up/Down button to adjust to the required time value (displayed in seconds), for the selected temperature.
- NB: 007 on pressure display does not flash.
- Press accept to update with the new setting (007 still on the pressure display and the accepted value on the temperature display.)
- Press Standby button to exit CAL 07.

Calibration Modes

CAL 08

Factory Default Settings

This mode is used to return unit to the factory de-fault settings i.e. Temperature and Time.

SEQUENCE

- Open door.
- Enter CAL 08 mode as previously described and press accept.
- Use Up/Down button to obtain a displayed mode "08."
- Press Accept and the unit should return to ready mode.

If the original default settings are required it is recommended that these are rebooted into the software. This is done by switching off and back on at the mains switch.

Calibration Modes

CAL 10

Vacuum Time Limit for First Pulse

This enables you to set the time limit for achieving the required vacuum pressure. This is a time flag. If the required vacuum temperature has not been reached by the set time error code E 04 will occur.

SEQUENCE

- Open door.
- Enter CAL 10 mode as previously described and press accept
- Press accept (010 now flashing on the pressure display.)
- Use Up/Down button to adjust to the required value. Display in seconds.
- Press accept to update with the new setting (010 stops flashing and the accepted value is shown on the temperature display.)
- Exit by pressing the standby button.

Calibration Modes

CAL 11

Vacuum Pressure Limit for First Pulse

This enables you to set the pressure limit to achieve on the first pulse. If the required vacuum pressure has not been reached in the set time error code 04 will occur.

- SEQUENCE
- Open door.
- Enter CAL 11 mode as previously described and press accept
- Use Up/Down button to adjust to the required value. Displayed in kPa.
- Press accept to update with the new setting (011 stops flashing and the accepted value is shown on the temperature display.)
- Exit by pressing the standby button.
- Unit returns to ready mode.

Calibration Modes

CAL 14

Cycle Availability

This facility allows the Engineer to select which cycles can be used. For example only 134°C cycles could be selected. No 121°C cycles could then be used. The sequence of events is as follows:-

SEQUENCE

- Open door.
- Enter CAL 14 mode as previously described and press accept
- The Led's indicate a 134°C Vacuum cycle. The "On" on the temperature display is showing that the 134°C vacuum cycle has been selected.
- If this was not required we would have to press the down button which would change the display to "Off" i.e. not selected.
- If this is what is required we then proceed to the next cycle option i.e. 121°C Vacuum cycle by pressing the Up button.
- 3 and 4 above are then repeated for each cycle.
- Once all the settings have been accessed and they have been checked as correct, press accept (14 stops flashing on the pressure display.)

CAL 14 (cont/d...)

- If you then press the standby button.
- The unit should now automatically go to CAL 15 (Default setting) i.e. 015 flashing on the pressure display and “On” flashing on the temperature display.
- Scroll through all selected cycles by pressing the Up button.
- When the cycle required is reached press accept. 15 is still showing on the pressure display but has stopped flashing and On is still showing on the temperature display.
- Press the standby button and the unit returns to ready mode.

Calibration Modes

CAL 15

Default Cycle

This allows the Engineer to set the required cycle default i.e.
The cycle to which the unit returns to on completion of a cycle
Or on power up etc.

SEQUENCE

- Open door.
- Enter CAL 15 mode as previously described and press accept.
- Press accept (015 now flashing on the pressure display.)
- Proceed as described above in CAL 14.

Calibration Modes

CAL 16

Pre-vacuum trip point (+ve)

Allows you to set the pre-vacuum positive pressure limit.

SEQUENCE

- Open door.
- Enter CAL 16 mode as previously described and press accept
- Use Up/Down button to adjust to the required value.
Displayed is in KPa.
- Press accept to update with the new setting (016 stops flashing and the accepted value is shown on the temperature display.)
- Exit by pressing the standby button.
- Unit returns to ready mode.

Calibration Modes

CAL 17

Pre-vacuum trip point (-ve) on first pulse

Allows you to set the Vacuum pressure limit.

SEQUENCE

- Open door.
- Enter CAL 17 mode as previously described and press accept.
- Use Up/Down button to adjust to the required value. Displayed in KPa.
- Press accept to update with the new setting (017 stops flashing and the accepted value is shown on the temperature display.)
- Exit by pressing the standby button.
- Unit returns to ready mode.

Engineering Modes



C3 Advance *Engineering Modes* *Introduction*

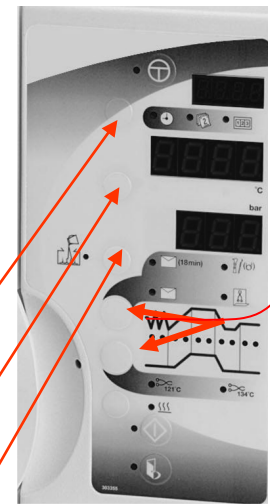
Engineering modes are provided to ensure that the diagnostic process can proceed smoothly. Each output device can be operated individually, this allows easy pin pointing of parts that are not operational.

Engineering Modes

Entering the Mode

Engineering modes are entered by using an access code complete with Up/Down and accept buttons:-

- To enter ENG modes, press and hold both drying cycle selection button and the Concealed button immediately above for 10 secs.
- The letters "ENG" will appear in the Temperature display, "01" will appear in the pressure display window.
- Up button, was date/ time/cycle count button.
- Down button, was Deg C / Deg F button
- Accept button, was Bar/PSI button



Engineering Modes

ENG 01

Over pressure valve test

SEQUENCE

- Open door.
- Enter ENG mode, as described.
- Use Up/Down button to obtain a displayed mode "01."
- Press accept (001 flashing on the pressure display.)
- **Ensure a 134°C Non Vacuum Non Drying Cycle is selected**
- Close door and start the cycle.
- Wait 3 minutes after the sterilizing led comes on for the temperature to stabilise.
- Use up/down button to adjust temperature value displayed in Deg C.
- Press accept to update with the new setting (001 no longer flashing on the pressure display.)
- Press the standby button and wait for unit to complete the sterilizing cycle.
- After pressing the door release button the display returns to the ready mode.

Engineering Modes ENG 02

Printer Test

This mode is used to test that the printer is working

SEQUENCE

- Enter Eng 2 mode as previously described and press accept
- (02 Flashing on pressure display & actual vessel temperature on the temperature display).
- Press accept again to make test
- Press standby button to exit

(Printer should then print out)

Prestige Medical

Printer Test

Serial No: 03010108 (For example)

Date : 08/01/98 (For example)

Time : 10:52 (For example)

Version: CA 1_0_2 (For example)

Valve Block: Asco

Door Switch: 3 Wire

Single Use Water

Engineering Modes

ENG 03

Valve Test

SEQUENCE

- Enter Eng 03 mode as previously described.
- Press accept - 03 Flashing on the pressure display and the first cycle status Led is illuminated.
- Press the accept button - 03 Still flashing but first cycle status Led goes out.
- Press accept - 03 Flashing on the pressure display and the second cycle status Led is illuminated.
- Press the accept button - 03 Still flashing but second cycle status Led goes out.
- Repeat the above procedure until all valves have been tested. Each cycle status Led represents a valve and when illuminated indicates that the valve is open.

(cont/d...)

The following is a key for identification purposes :-

Key for identifying valves

- 1st. Cycle Status Led "On" = Air Bleed Valve Open. (Grey)
- 2nd. Cycle Status Led "On" = Vacuum Valve Open. (White)
- 3rd. Cycle Status Led "On" = Flush Valve Open. (Yellow)
- 4th. Cycle Status Led "On" = Water Fill Valve Open. (Orange)
- 5th. Cycle Status Led "On" = Air Inlet Valve Open. (Pink)
- During this mode it is possible to check valve function by disconnecting pipes and checking for flow, it is possible to check the air bleed function by blowing into the air bleed fitting using a piece of tube (fitting located bottom front left of chamber with door open.)
- It is possible to use a multimeter to check the applied voltage at the power/control module connector block, also check coil resistance.

N.B. If there is any in the water tank then the boiler will tend to fill when either the water fill or flush valve are opened this may lead to an Error E10

Engineering Modes

ENG 04

Vacuum pump Test

This mode is used to determine if the vacuum pump is working.

Note: Vacuum pump will not start if a vacuum exists in the inlet pipe.

SEQUENCE:-

- Enter Eng 04 mode as previously described
- Press Accept button - 04 Flashing on the pressure display and Eng on the temperature display. The vacuum pump also starts running.
- Press Accept button - 04 Flashing on the pressure display again and Eng on the temperature display. The vacuum pump is no longer running.
- The pump can be switched on and off by pressing the accept button.
- When finished Exit by pressing the standby button - unit returns back to the ready mode.

Engineering Modes ENG 05

Fan Test

This mode is for testing the fan.

SEQUENCE:-

- Enter Eng 05 mode as previously described
- Press Accept button - 05 Flashing on the pressure display and Eng solid on the temperature display. The fan is now running at varying speeds.
- The fan can now be switched off and on by pressing the accept button.
- When finished Exit by pressing the standby button - unit returns back to the ready mode.

Engineering Modes ENG 06

Door Solenoid Test

This mode is used to test that the door solenoid is working.

Shut door, operate mode, check that door pops open but held in drying position, release mode and check door opens fully.

ENG 06 *(cont/d...)*

SEQUENCE

- Enter Eng 06 mode as previously described
- Press accept - 06 Flashing on Pressure Display, with Eng (Solid) on the temperature display. The solenoid also energises.
- Press accept again - 06 Flashing on Pressure Display, with Eng (Solid) on the temperature display. The solenoid is now de-energised.
- Press standby button to exit - Unit returns to ready mode.
- It is possible to use a multimeter to check the applied voltage at the power/control module connector block, also check coil resistance.

Engineering Modes ENG 07

Boiler Heater element check

This mode is used to test that the triac drive circuit and heating element are working.

If left 'on' in this mode it is possible to test thermal cutout.

ENG

07(*cont/d* SEQUENCE

- Enter Eng 07 mode as previously described
- Press accept - 07 Flashing on the pressure display. "OFF" on the temperature display. This indicates triac drive inactive.
- Press accept - 07 Flashing on the pressure display. "ON" on the temperature display. This indicates triac drive is active.
- Press standby button to exit - Unit returns to ready mode
- When using this mode, place 100ml of water in boiler and wait for steam to be generated, then de-energise to check that correct function is obtained.
- It is possible to use a multimeter to check the applied voltage to the heating element, also check element resistance.

Engineering Modes ENG 08

LED and Buzzer check

This mode is used to test that all the display led's and buzzers are working.

SEQUENCE

- Enter Eng 08 mode as previously described
- Press accept - All Led's begin to flash on and off accompanied by the buzzer.
- Press standby button to exit - Unit returns to ready mode.

Engineering Modes

ENG 09

Leak Check

Simplified leak check

SEQUENCE

- Enter Eng 09 mode as previously described
- Press accept - 09 Flashing on the pressure display. Eng on the temperature display. 1st. Cycle status led on.
- After 15 seconds if the pressure has dropped by 15 kPa then the second cycle status Led will come on and the vacuum will continue.
- Once the second status led is illuminated there is a time limit in which a certain negative pressure has to be achieved. This is set by Cal Modes 10 & 11. If the negative pressure value is reached in the set time "pass" is displayed in the temperature display. If the pressure is not reached due to leaks then "fail" will be displayed in the temperature display.
- Press standby button to exit. - Unit returns to the ready mode.

Engineering Modes

ENG 10

Internal Heater Check

To check that the drying cycle heater warms up.

SEQUENCE

- Enter Eng 10 mode as previously described
- Press accept - 010 Flashing on the pressure display. "OFF" on the temperature display. This indicates that the band heater is switched off.
- Press accept - 010 Flashing on the pressure display. "ON" on the temperature display. This indicates that the band heater is switched on.
- Check using thermocouple attached to vessel base.
- Exit by pressing standby - Unit returns to ready mode.

Engineering Modes ENG 13

Setting of Cycle Counter

To set the cycle counter when control module is replaced

SEQUENCE

- Enter Eng 13 mode as previously described
- Press accept - 013 Flashing on the pressure display. With current cycles showing on the temperature display.
- Use toggle up button to set the 2nd 2 digits and the toggle down button for the 1st 2 digits
- To save press and hold the additional drying button whilst pressing the accept button, then exit via the standby button.

Engineering Modes

ENG 14

Logging Option

With a special cable, this can be used to log a cycle.

SEQUENCE

- Enter Eng 14 mode as previously described
- Press accept - 014 Flashing on the pressure display and "Off" on the temperature display.
- If logging is required press the down button and "On" will now show on the temperature display.
- Press accept and then the standby button.

If a printer is connected the unit will print out every second.
Using hyper terminal and a special cable it is possible to log either to a computer or to the Prestige Medical Data Logger, this can then be downloaded to a txt file, which can be opened up in Excel.

Further information can be obtained from Prestige Medical.

Engineering Modes ENG 15

Pressure limits in sterilizing

If required, the pressure can be monitored during sterilizing, so that if the pressure drops out of the acceptable range, a PO2 error will be displayed.

SEQUENCE

- Enter Eng 15 mode as previously described
- Press accept – '0'15 flashing on the pressure display and 'Off' on the temperature display.
- If pressure limits during sterilizing are required i.e. PO2 enabled, then pressing the 'Down' button will change the temperature display to 'On'
- Press accept and then the standby button.

Engineering Modes

ENG 16

Module emulation

When fitting a generic module to an earlier Century model this ENG mode is used to emulate the functions of these models

SEQUENCE

- Enter Eng 16 mode as previously described
- Press accept – '0'15 flashing on the pressure display.
- The temperature display shows the current module setting Factory default 0000
- Using the up or down buttons select the required cycle emulation, where
 - 0000 = type '**B**'
 - 0001 = Non Vacuum
 - 0002 = Type '**S**'
- Press Accept

Engineering Modes ENG 17

Valve block selection

This allows the technician to select which type of valve block is used. Either Prestige Medical valve or Asco/Comex valve block types.

SEQUENCE

- Enter Eng 17 mode as previously described
- Press accept – '017' flashing on the pressure display and "On" or "Off" on the temperature display. "On" represents a Prestige valve block and "Off" represents an Asco valve block.
- Press the down button to change between "On" and "Off".
When set correctly press accept and then the standby button.

Engineering Modes ENG 18

Door Microswitch selection

This allows the technician to select which type of door micro-switch is used. Either two wire or three wire.

“On” represents two-wire and “Off” represents three-wire.

SEQUENCE

- Enter Eng 18 mode as previously described
- Press accept – ‘018’ flashing on the pressure display and “On” or “Off” on the temperature display.
- Press the down button to change between “On” and “Off”.
When set correctly press accept and then the standby button

Engineering Modes ENG 19

Single Use / Multiuse water selection

This allows the technician set the control module to work with whichever water feed system is installed on the autoclave.

SEQUENCE

- Enter Eng 19 mode as previously described
- Press accept – '019' flashing on the pressure display and "On" or "Off" on the temperature display.
- Press the down button to change between "On" and "Off". Select "Off" for single use systems.

Engineering Modes ENG 20

Provides control module compatibility
with earlier Century 3 models

This allows the technician set the control module to
function as the earlier type B software version SCVB*_*

SEQUENCE

- Ensure the previous ENG modes 16-19 have been correctly set as previously described
- Enter Eng 20 mode
- Press accept – '020' flashing on the pressure display and "On" or "Off" on the temperature display.
- Press the down button to change between "On" and "Off".
Select "On" for compatibility with earlier software version.

NB: When setting the control module to "ON" it is important to run a CAL08 to assert a set of control values compatible with the earlier program

Engineering Modes ENG 21

Enables or disables the condenser fan
When in standby mode.

This allows the technician to determine whether the fan operates for 5 minutes in the standby mode when first switched on

SEQUENCE

- Enter Eng 21 mode as previously described
- Press accept – '021' flashing on the pressure display and "On" or "Off" on the temperature display.
- Press the down button to change between "On" and "Off". Select "Off" to keep the fan off in standby.

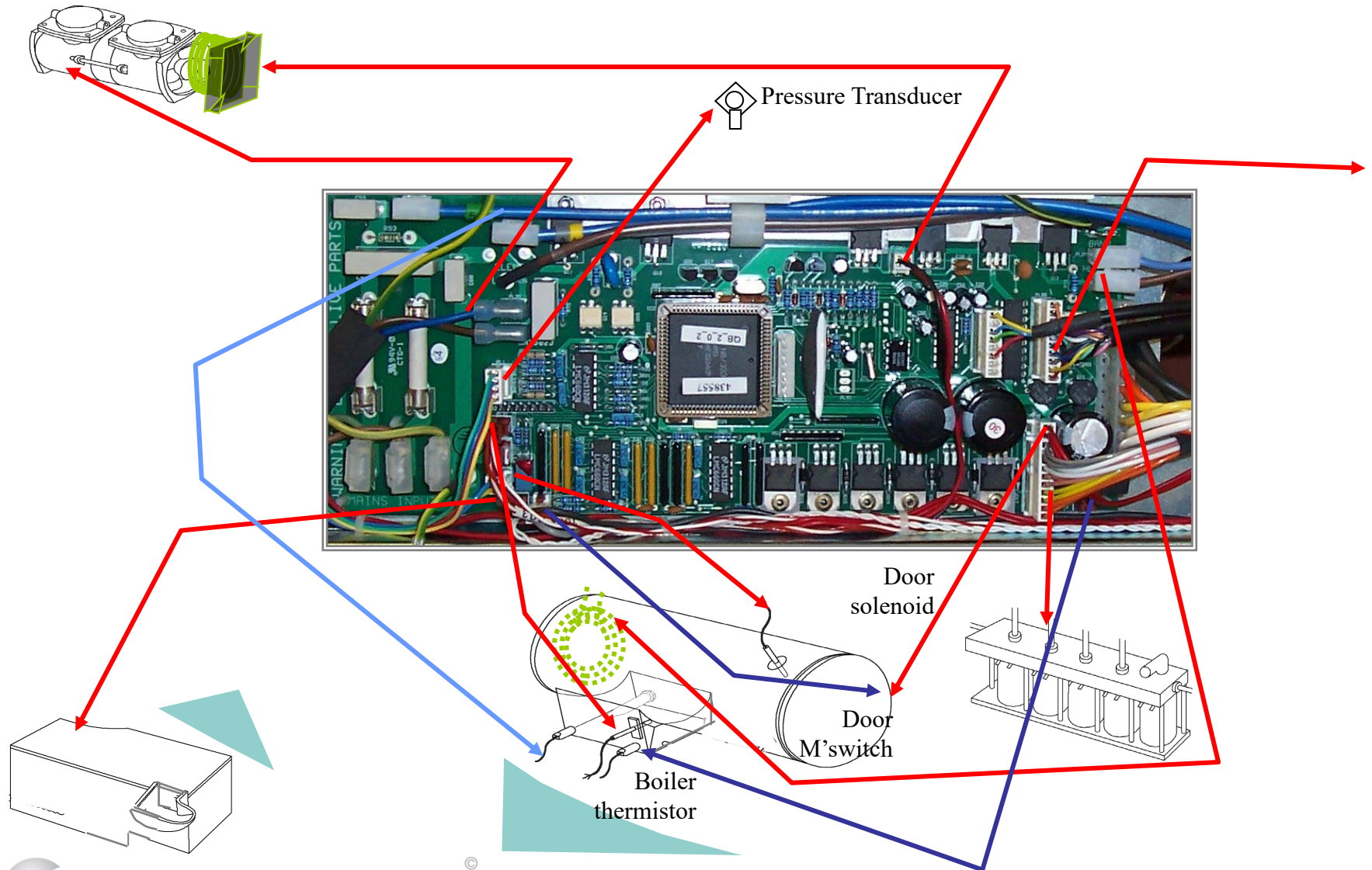
Engineering Modes ENG 22

Auto-Heat Selection

This allows the technician to select whether the background heating switches off after one hour when in the standby/ready mode

SEQUENCE

- Enter Eng 22 mode as previously described
- Press accept – '022' flashing on the pressure display and "On" or "Off" on the temperature display.
- Press the down button to change between "On" and "Off".
- "On" signifies that the background heating control is operational
- When set correctly press accept and then the standby button



Steam Tables

Pressure		Temp
bar	kPa	°C
1.2	120	123.46
1.3	130	124.9
1.4	140	126.28
1.5	150	127.62
1.6	160	128.89
1.7	170	130.13
1.8	180	131.37
1.9	190	132.54
2	200	133.69
2.2	220	135.88
2.4	240	138.01
2.6	260	140
2.8	280	141.92
3	300	143.75
3.2	320	145.46

Pt 100 Resistance Tables

Temp 0°C	Resistance Ω
0	100.00
10	103.90
20	107.79
30	111.67
40	115.54
50	119.40
60	123.24
70	127.07
80	130.89
90	134.70
100	138.50
110	142.29
120	146.06
130	149.82
140	153.58
150	157.31

Engineering Modes

Electrical Values

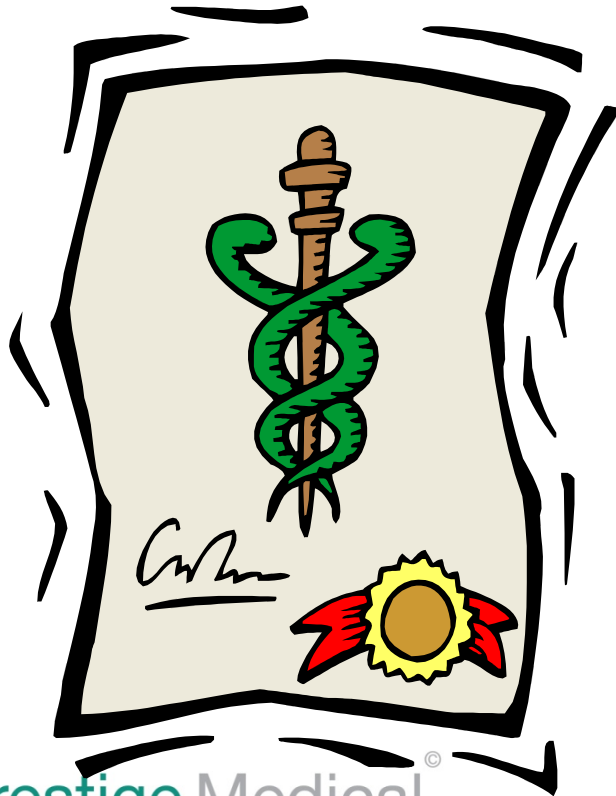
values		Typical
• Asco Solenoid valve coil		21.5Ω
• Door solenoid		11.5Ω
• Boiler heater (230v)		24.7Ω
• Internal heater		80.0Ω
• PT100 (Chamber and boiler sensors)		107.7Ω
• Thermistor (Boiler sensor) at ambient		100kΩ
• Vacuum Pump Coil		37.0Ω
• Solenoid drive voltages (Door and valve block)		5.1v
• Fan drive voltage (Using ENG 05)		23.0v
• Transformer output voltages	(Orange)	36.0v
	(White)	10.4v
	(Yellow)	12.6v
• Printer drive voltage		12-18v DC

Engineering Modes

Torque Settings

M8 Boiler strap.....	8 Nm
M8 Vessel to Chassis Plate.....	24 Nm
M8 Chassis Plate to Bezel.....	20 Nm
M6 Fixings.....	6 Nm
M5 Fixings.....	2.5 Nm
Port Door Entry.....	2 Nm
Screw Strike Plate.....	0.5 Nm
Plate door microswitch.....	1.7 Nm
Boiler sensor Fixing Nuts.....	1.0 Nm
Thermal Cut out Switch.....	0.7 Nm

THE



END