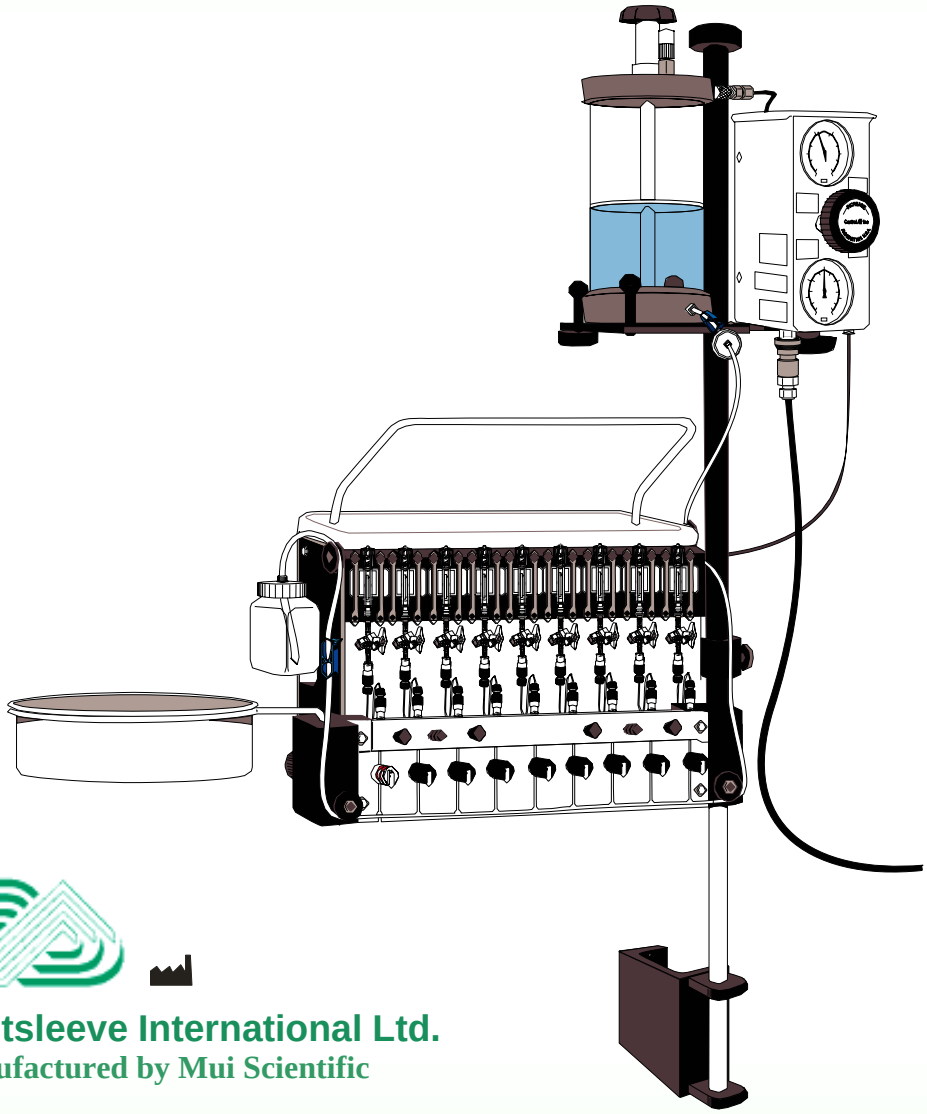
MARK III Manometric Perfusion Pump

Vertical Deck



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Handbook

September, 2006

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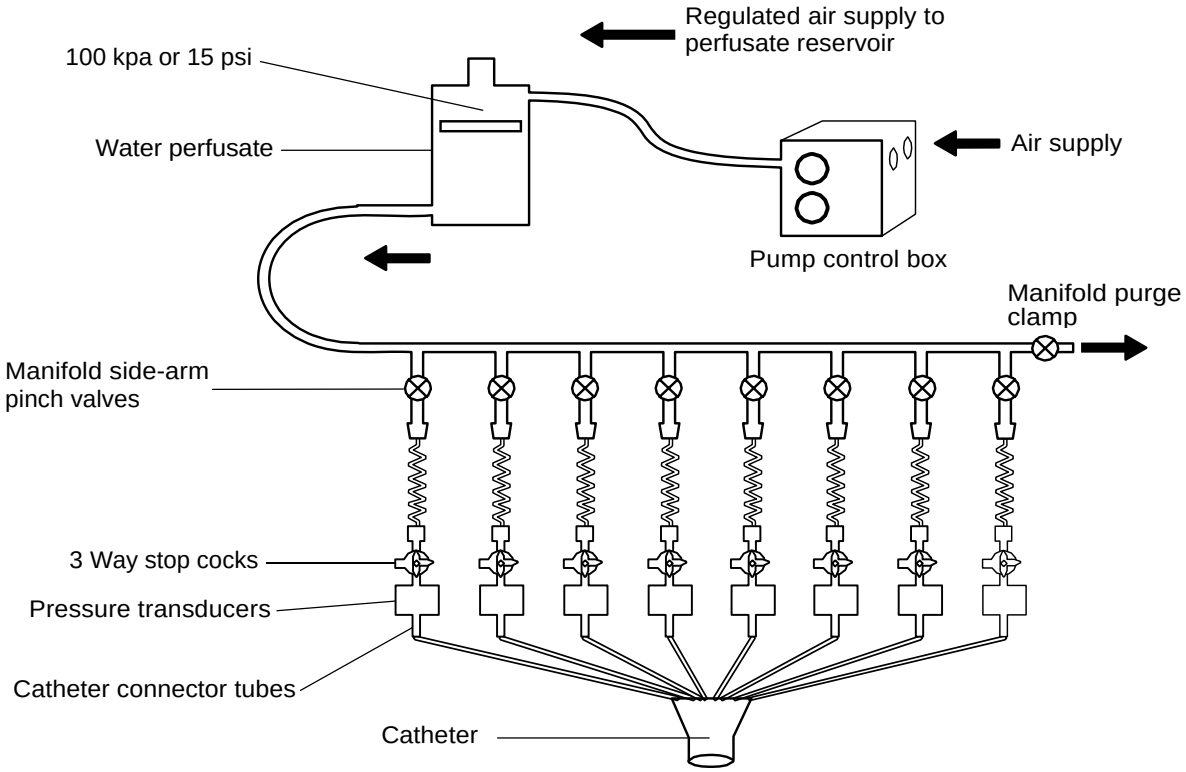
Notes on the use of this manual

- References within the manual are shown in brackets
  eg (C – 4.2) = section C, part 4, instruction 2

- Part numbers (#) given in the text are unique for Dentsleeve

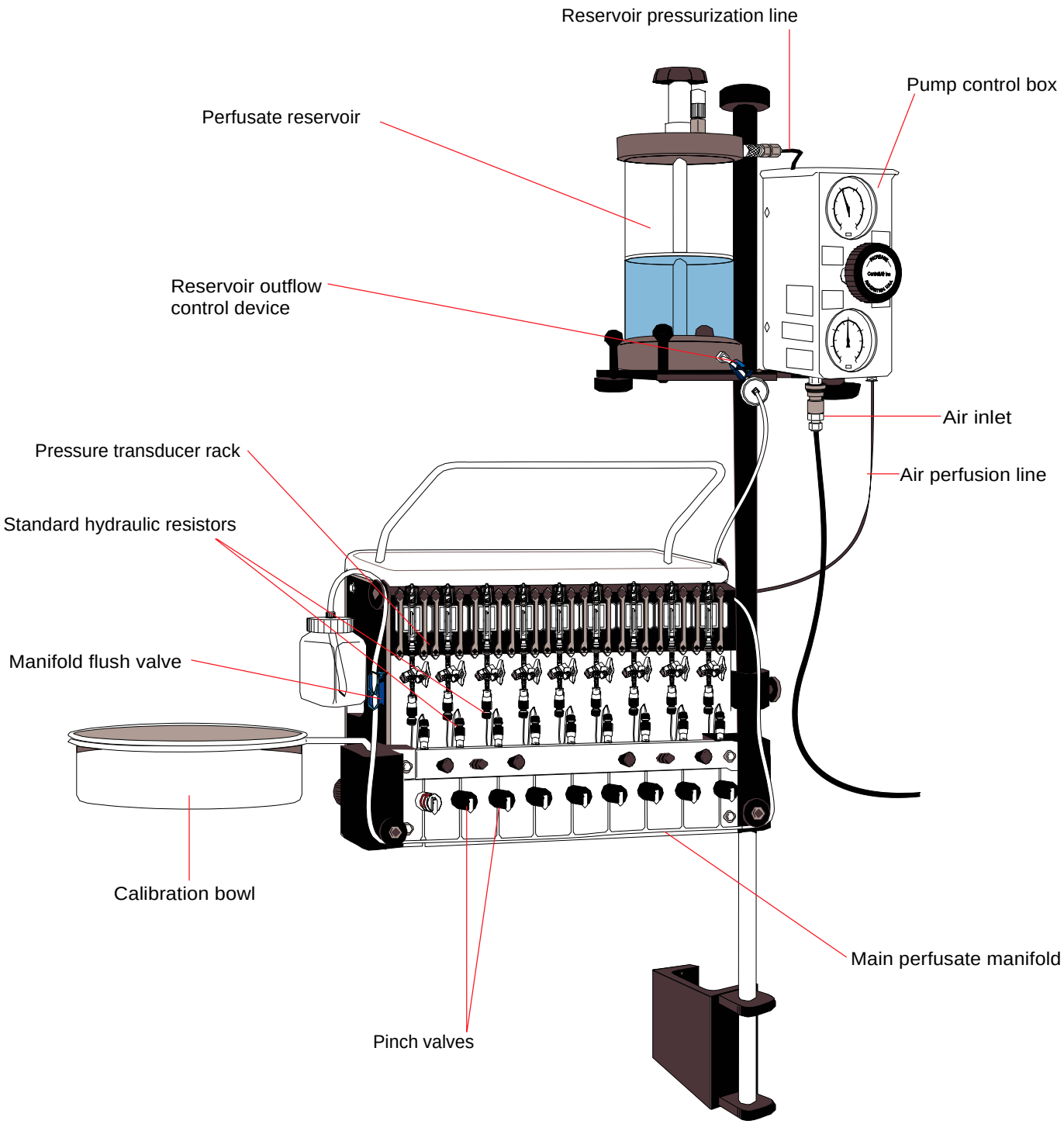
- The technical information and illustrations in this manual reflect specifications and operating procedures at the time of drafting. Some specifications and operating procedures differ from earlier manuals for Mark III perfusion pump models. Dentsleeve reserves the right to vary specifications and operating procedures as part of its continuous product improvement process.

Schematic of pump A – 1



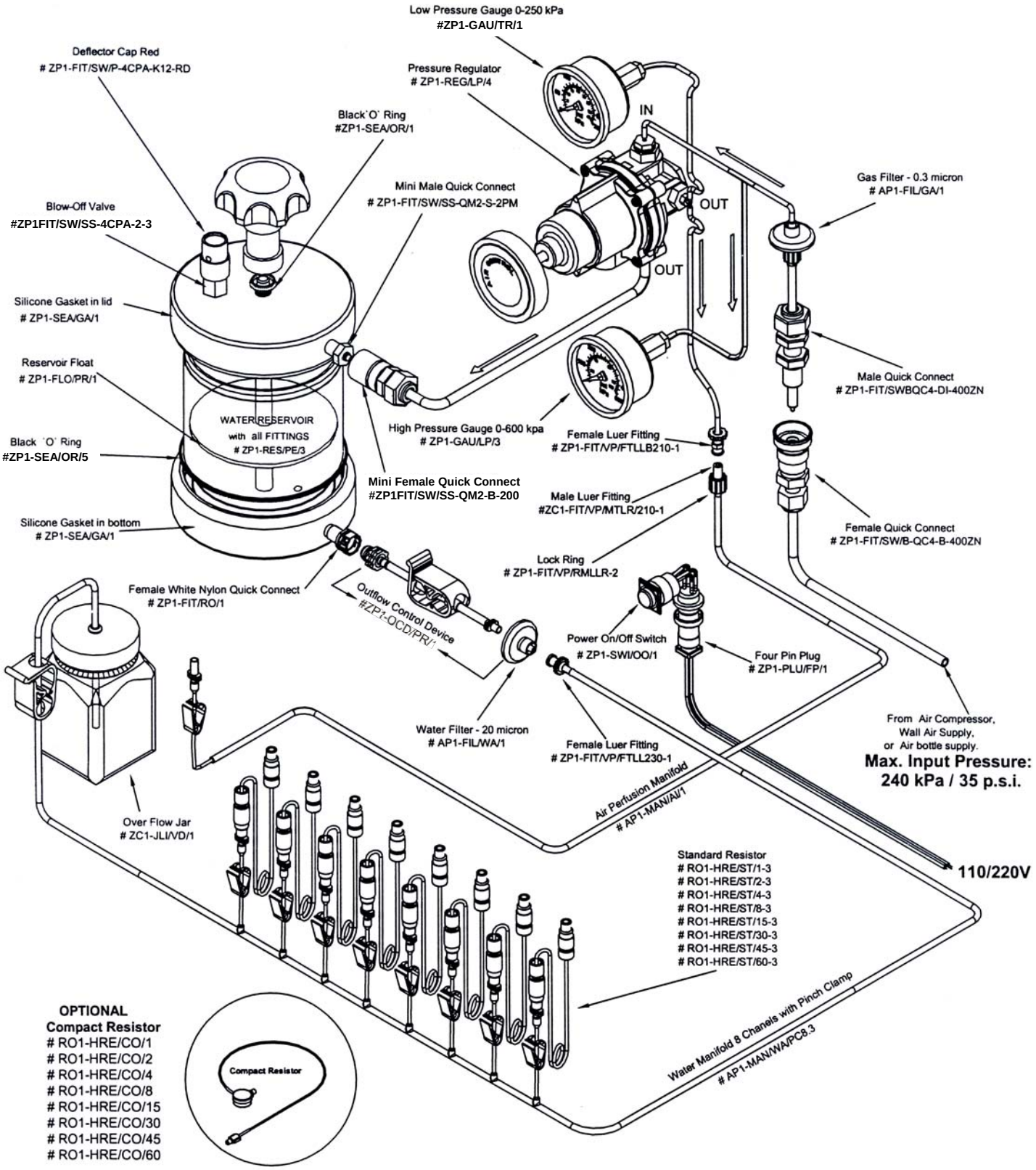
Note: Schematic diagram of water perfusion circuit. Only critical components are shown.

A – 2 Major pump components



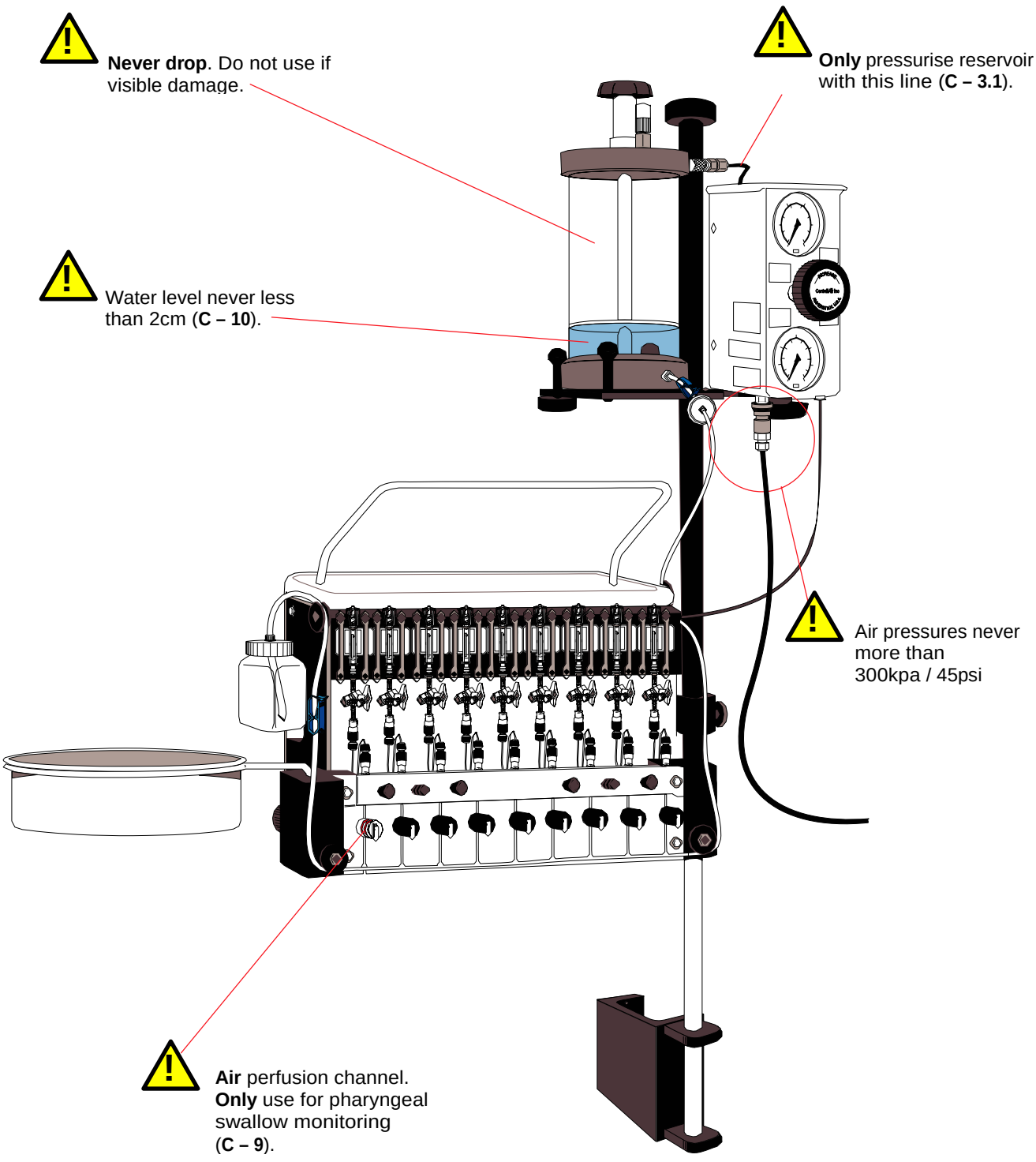
Note: Pump length, channel numbers and spacings vary according to individual specifications. Standard deck version shown. Transducer types vary: Abbott Transpac 42582-10 transducers shown.

A – 3 MKIII Pump Air – Water System



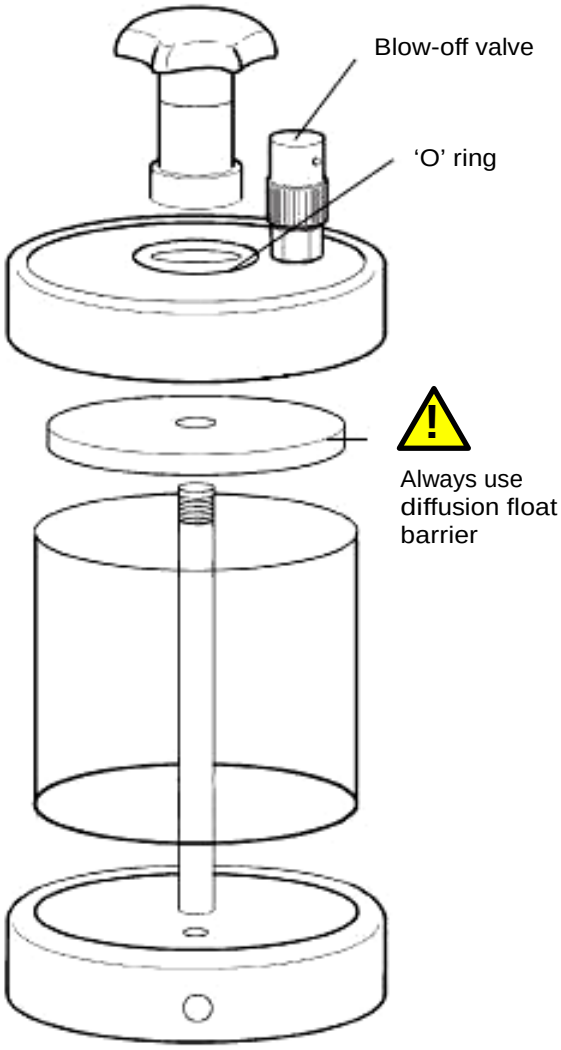
B Precautions & Warnings

B – 1



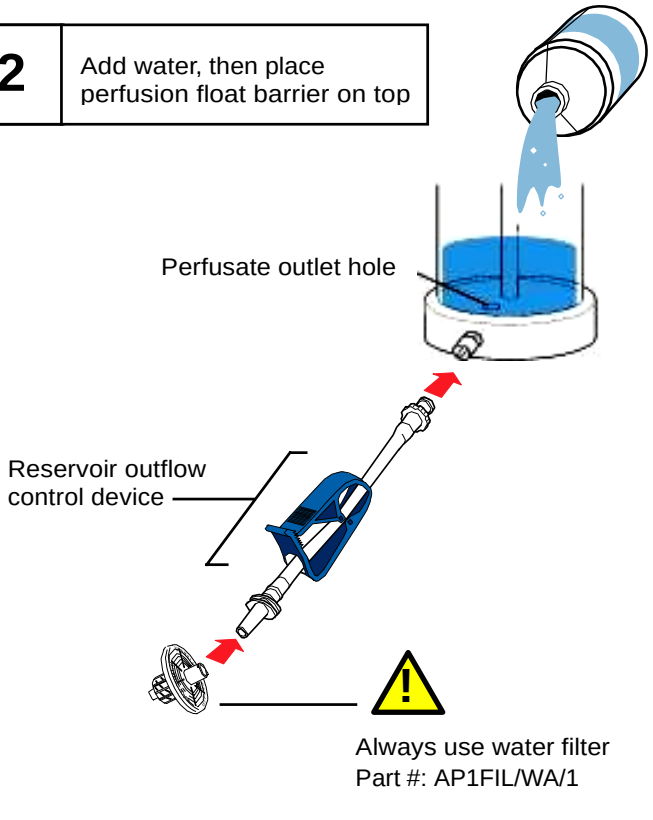
Assembly & filling of perfusate reservoir C – 1

Note: See E – 2 for Dentsleeve part #'s

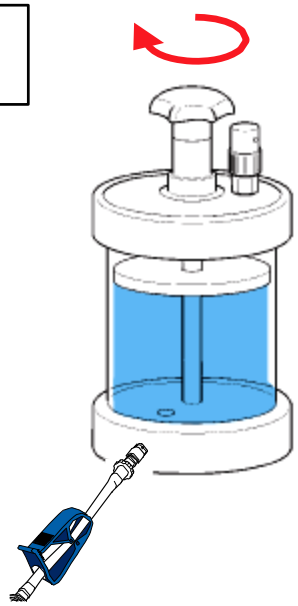


Fill with particle free, degassed, distilled H_20

1 — **2** Add water, then place perfusion float barrier on top



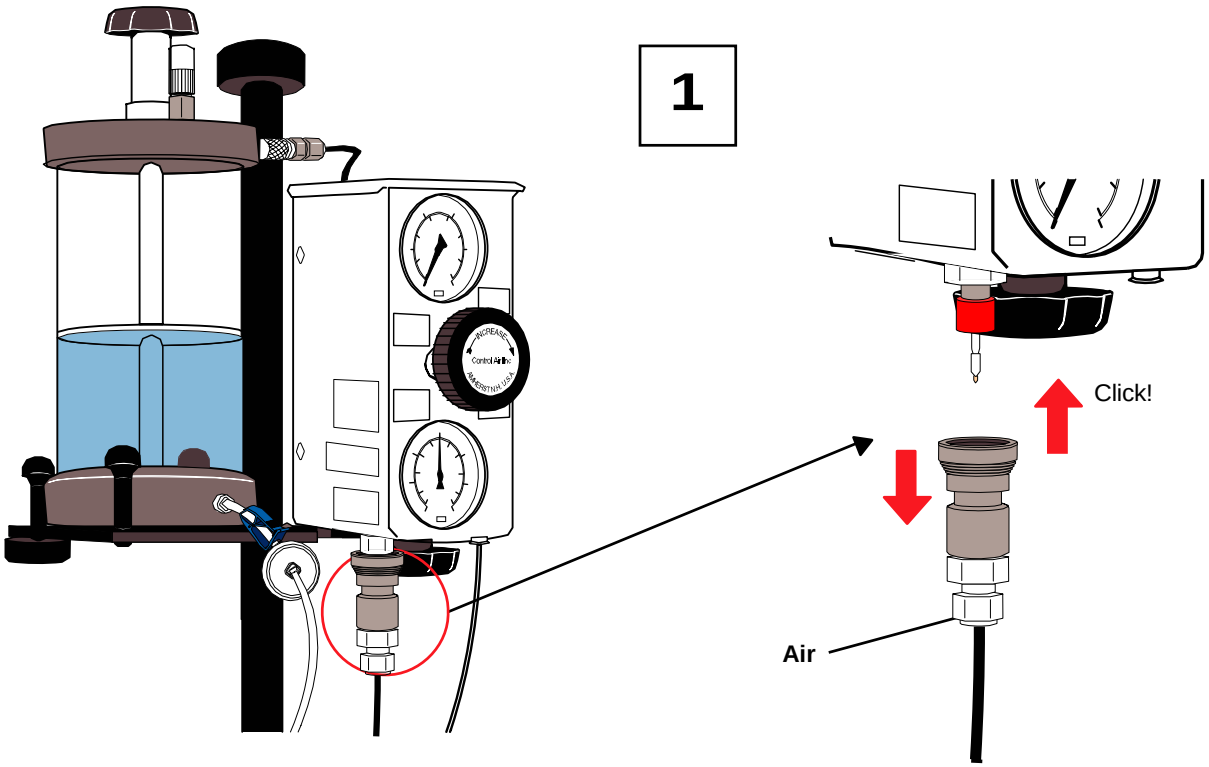
3 Tighten firmly to seal



Normal Use

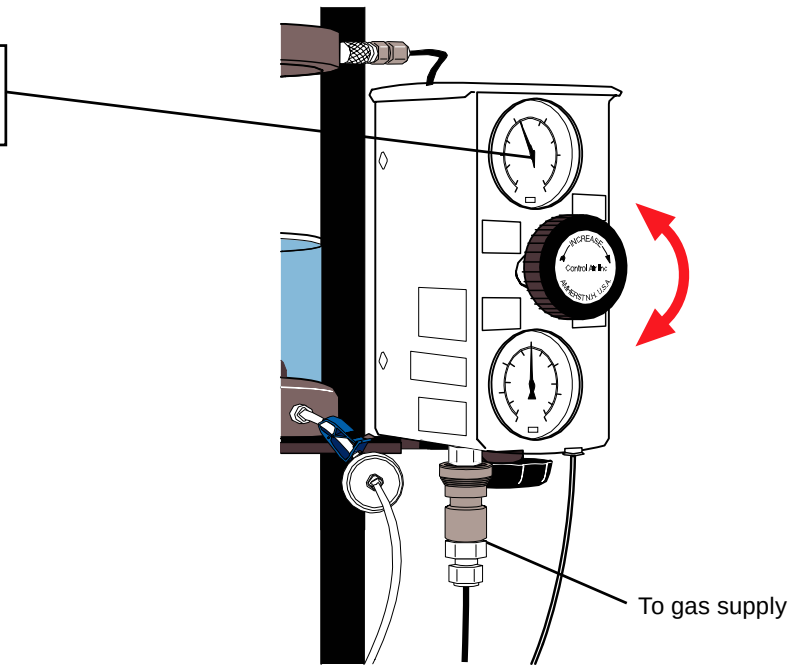
For set-up and first use see E – 1 to **E – 7**

C – 2 Check, connect & set air supply

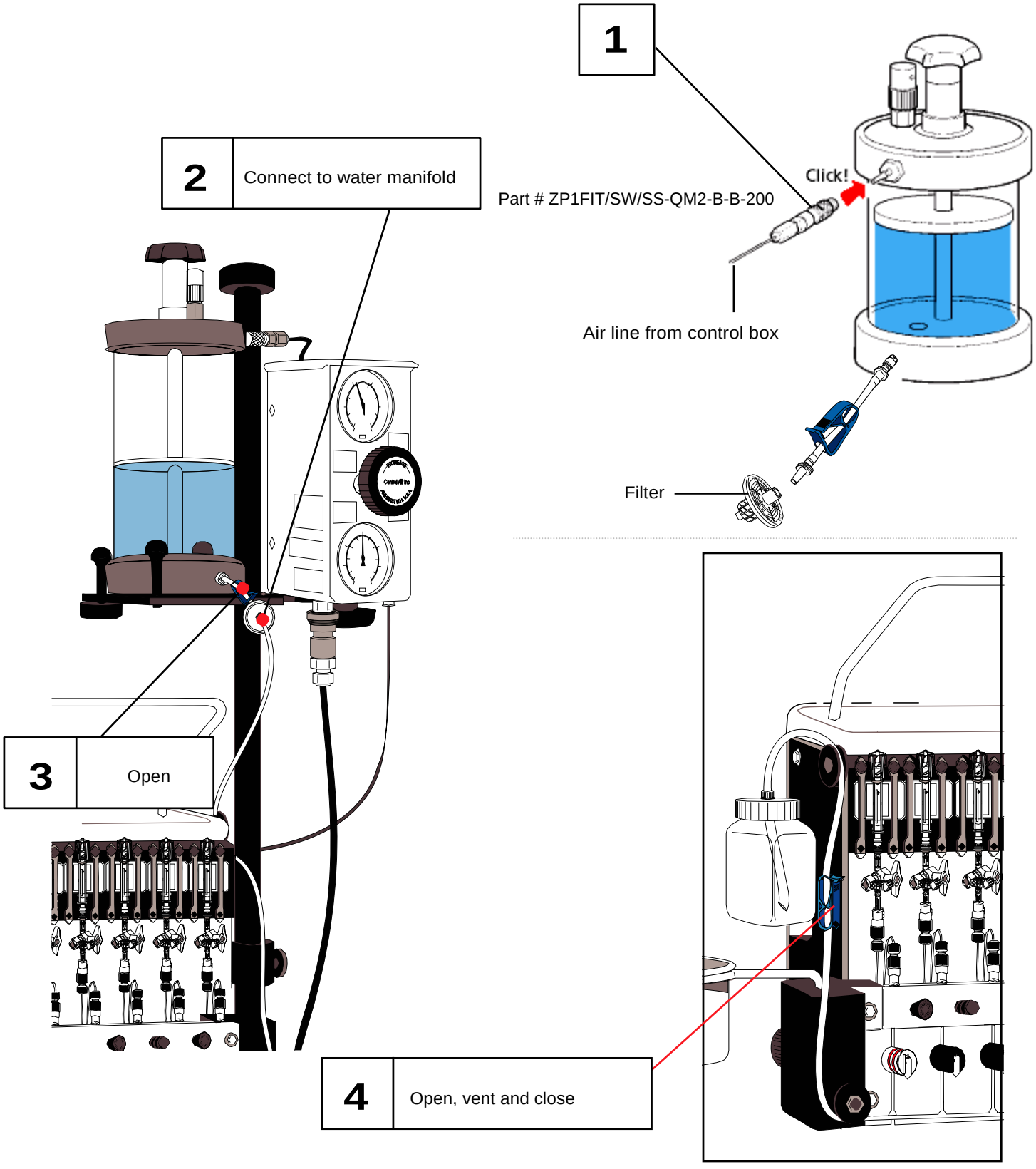


2

Air
Set to 100 kPa / 15 psi

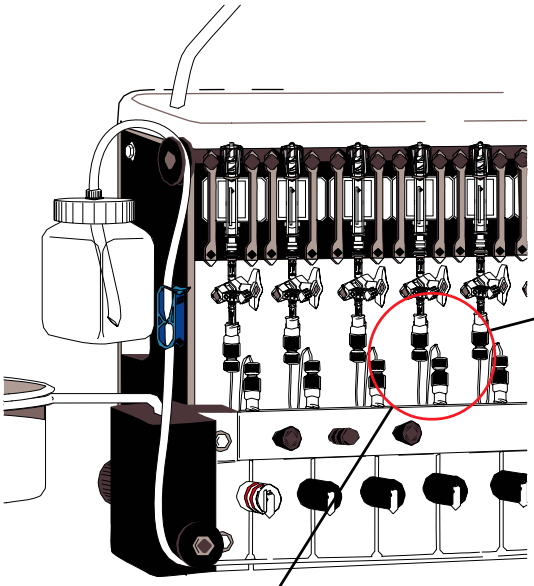


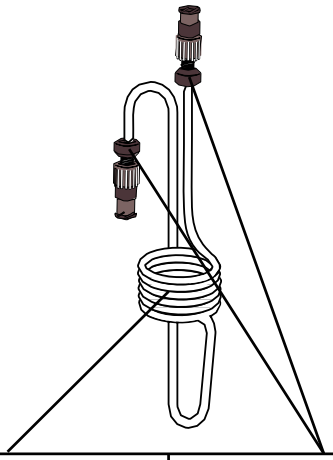
Connection & flushing of water manifold C – 3



C – 4 Check flow values of each hydraulic resistor

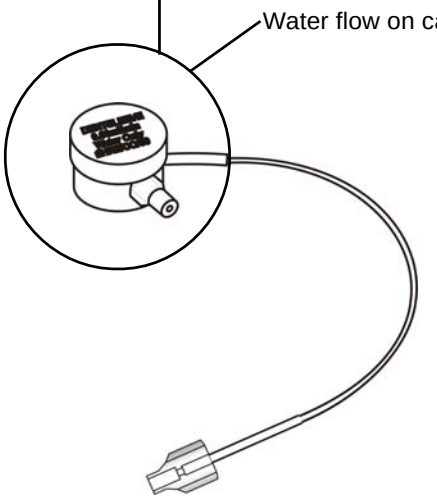
1 Standard resistor shown : flow is colour coded





Flow ml/min	Tube Colour	Screw Colour	Part #
0.01	Black	White	R01HRE/ST/1(3)
0.02	Black	Black	R01HRE/ST/2(3)
0.04	Black	Red	R01HRE/ST/4(3)
0.08	Red	White	R01HRE/ST/8(3)
0.15	Red	Black	R01HRE/ST/15(3)
0.3	Green	White	R01HRE/ST/30(3)
0.45	Green	Red	R01HRE/ST/45(3)
0.6	Green	Black	R01HRE/ST/60(3)

1 Alter**native:**
Compact hydraulic resistor

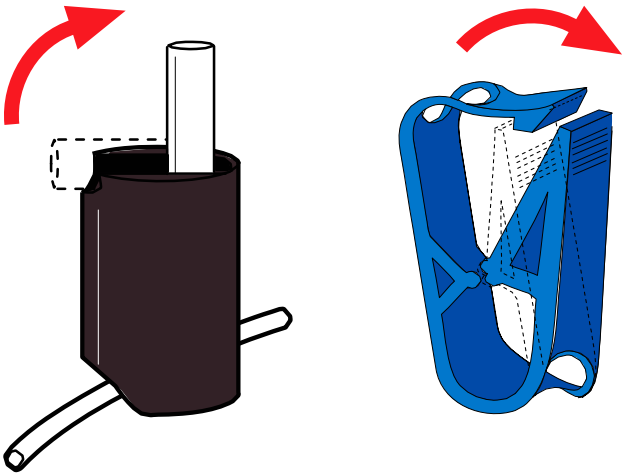


2 **The flow value is...**

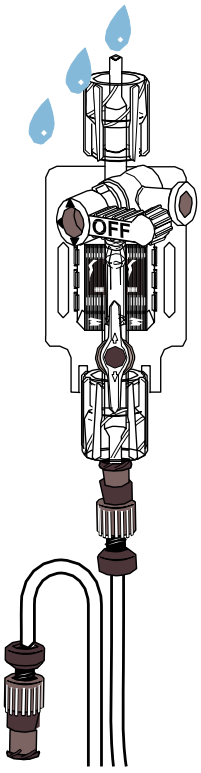
- **Correct**, go to ▶ **C – 5**
- **Changed**, go to ▶ **E – 5 or 6**

Turn on water perfusion to fill each transducer C – 5

1	Open pinch valve or clamp

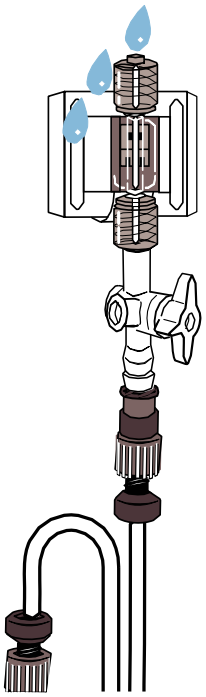


2	Fill transducers



Note: PVB DPT-6100 Transducer shown

2	Fill transducers

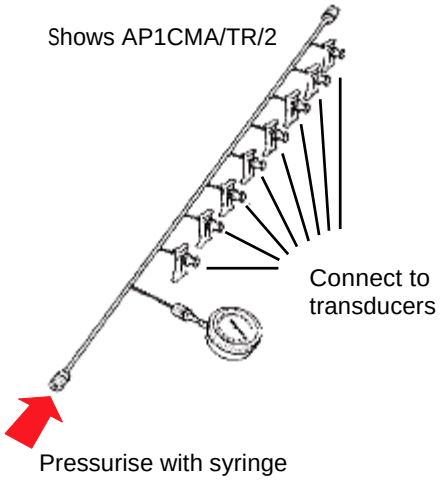


Prefered position for 3 way stopcock
- other than PVB DPT-6100

Note: Abbott Transpac 42582-10 Transducer Shown

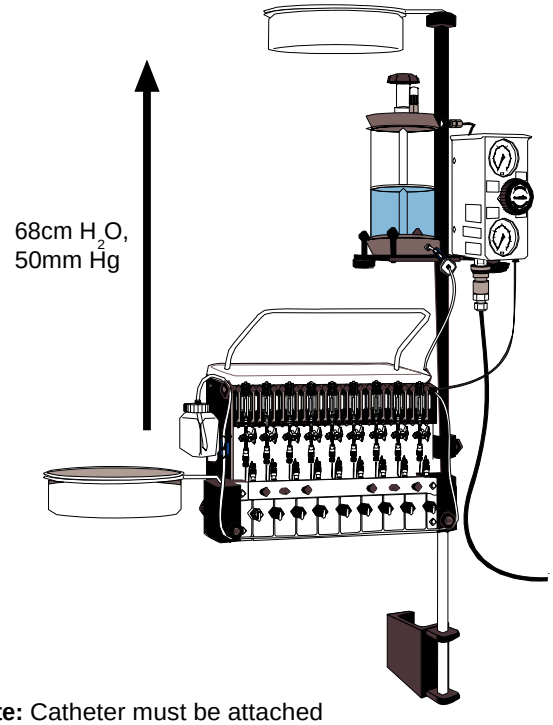
C – 6 Transducer calibration (if required)

1	Turn perfusion off - (**C – 5**)
2	Set tranducer gain by applying standard external pressure



Note: Shows Dentsleeve calibration manifold; made according to channel numbers and spacings Part #'s AP1CMA/TR/1to5

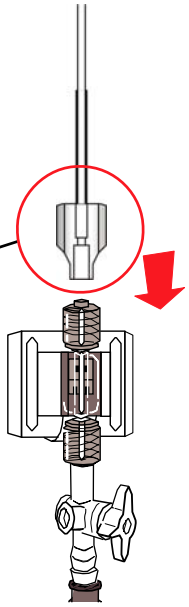
3	or use gravity calibration



Note: Catheter must be attached to transducers – (C – 7)

C – 7 Connect catheter to transducers

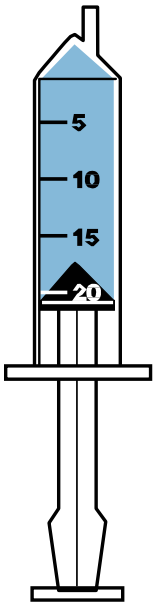
1	Select correct channel
2	Twist & push on firmly



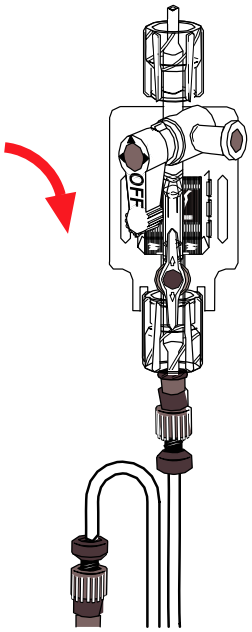
Note: Catheter detail is for Dentsleeve product

Water injection procedure - each channel C – 8

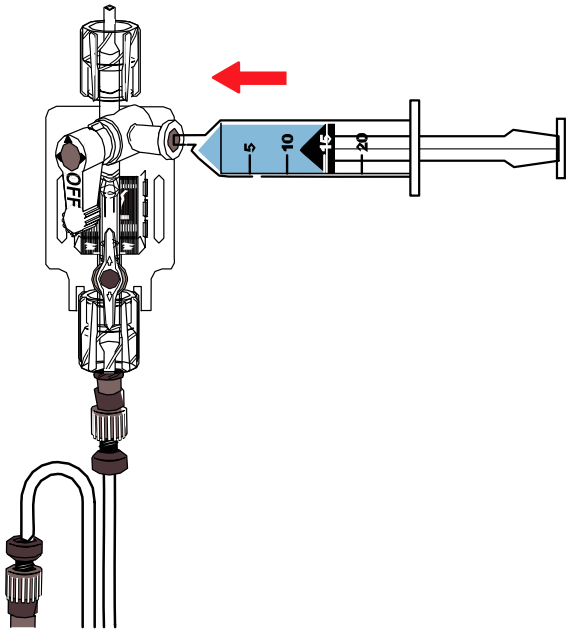
1	H_2O - no bubbles



2	Open side-port

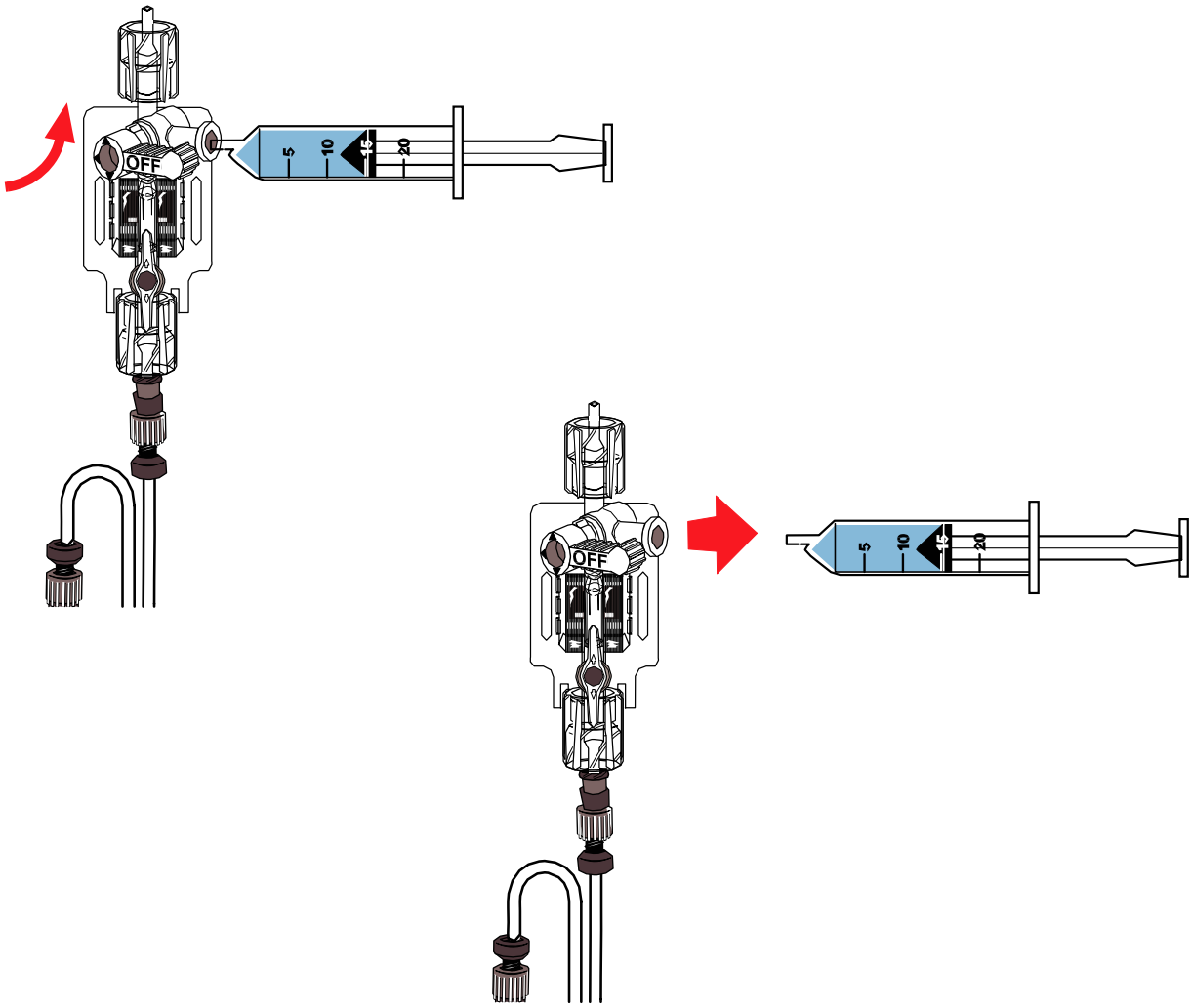


3	Inject **5ml** of H_2O



C – 8 Water injection procedure - each channel (continued)

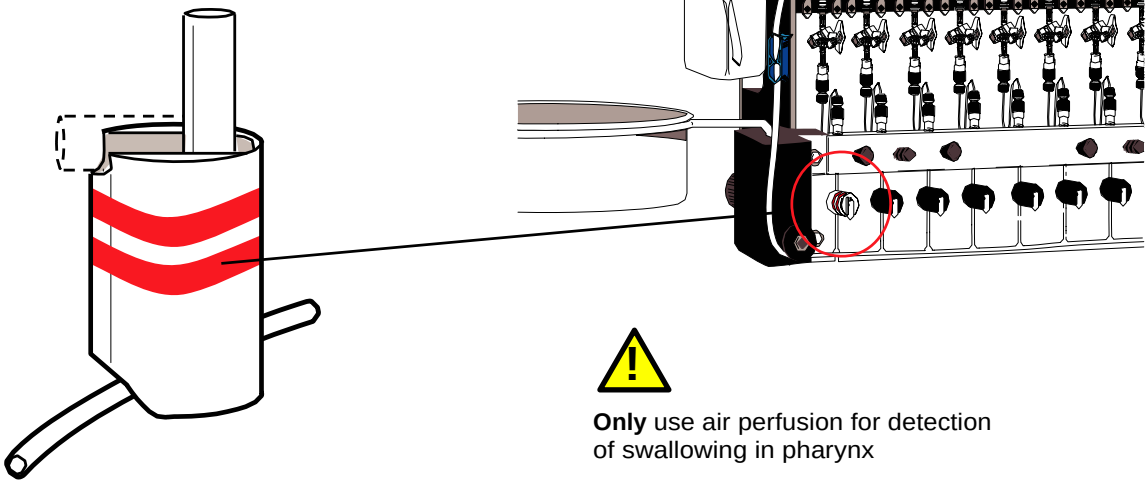
4	Close side-port then remove syringe



Note: Arrangement for PVB DPT-6100 transducer shown

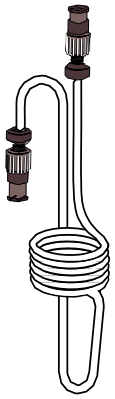
Check flow value for air perfusion manometry C – 9

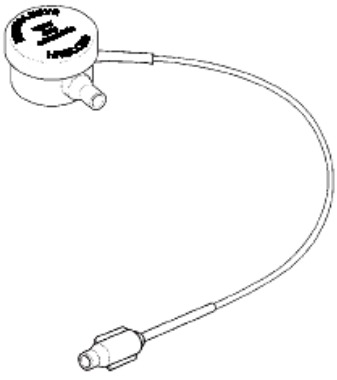
1	Identify air perfusion channel pinch valve



Only use air perfusion for detection of swallowing in pharynx

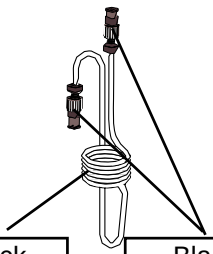
2	Ensure resistor for air perfusion channel is correct





Must be installed between manifold and transducer to limit air flow into manometric catheter to **less than 10ml/min**

Air flow rate through hydraulic resistor is **x100 water flow rate.**



Air flow ml/min			Part #
2	Black	Black	R01HRE/ST/2(3)
4	Black	Red	R01HRE/ST/4(3)
8	Red	White	R01HRE/ST/8(3)

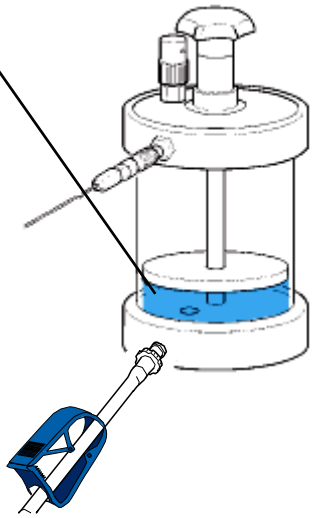
Suitable compact resistors give airflow on case

Air flow ml/min	Water Flow ml/min	Part #
2	0.02	R01HRE/CO/2
4	0.04	R01HRE/CO/4
8	0.08	R01HRE/CO/8

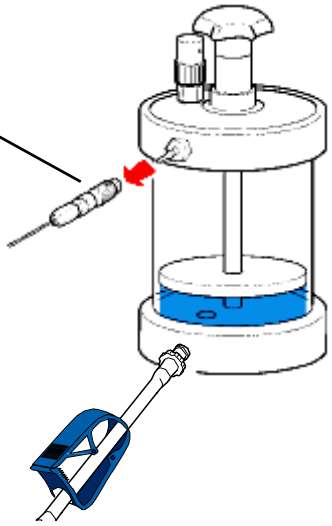
C – 10 Observation & refilling of perfusate reservoir

If perfusate exhausted, large volumes of gas may be perfused down catheter

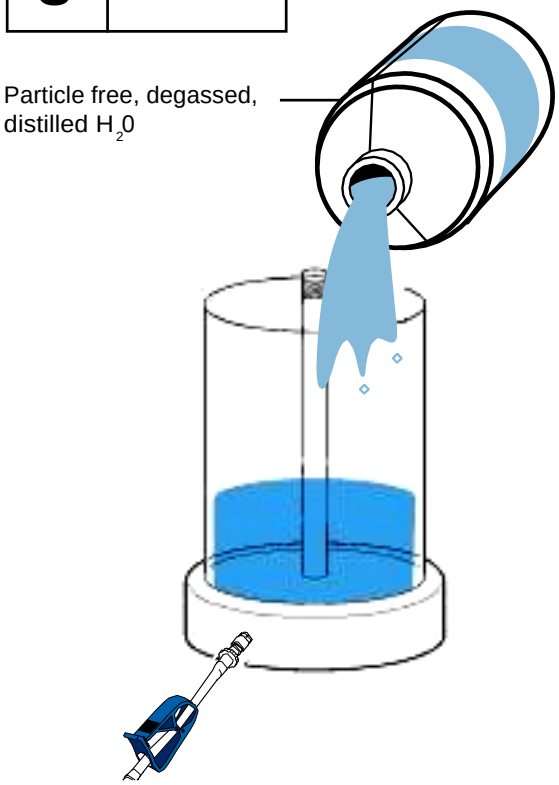
1 Refill when at 2cm



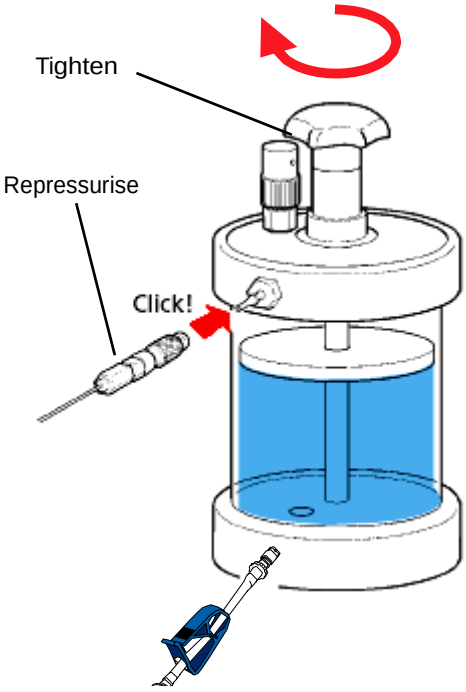
2 Release pressure



3 Refill

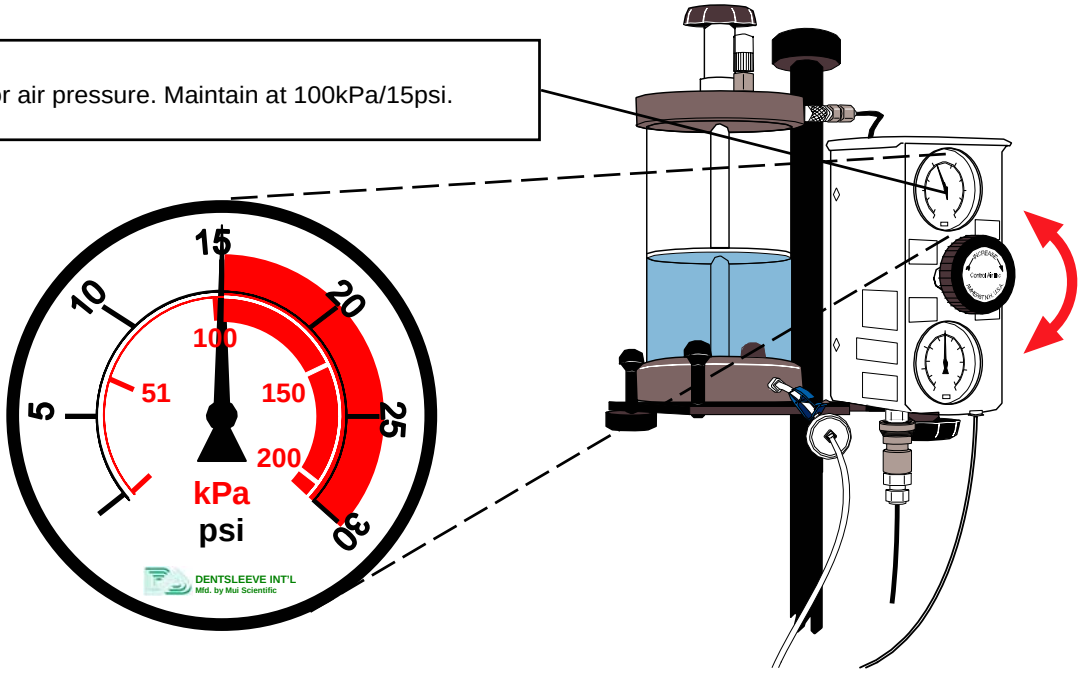


4 Restart perfusion

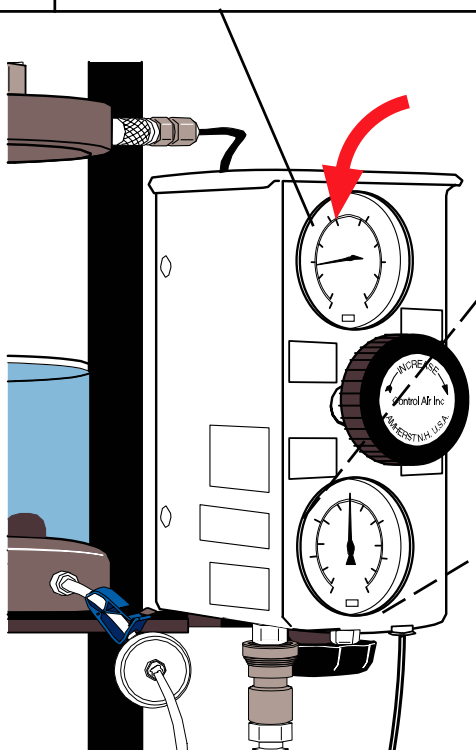


Maintain correct perfusate reservoir pressure C – 11

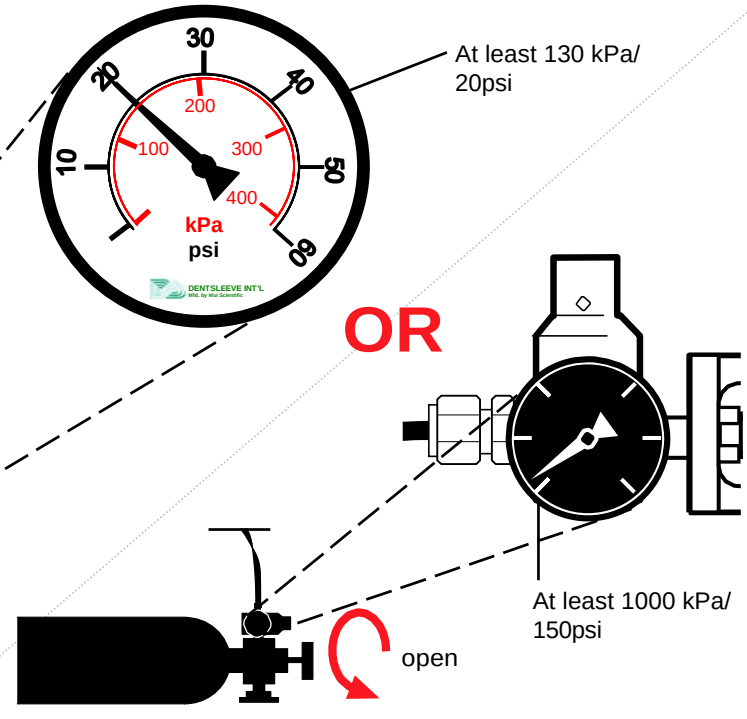
1	Monitor air pressure. Maintain at 100kPa/15psi.



2	Check if air pressure drops



3	Check that air supply is adequate

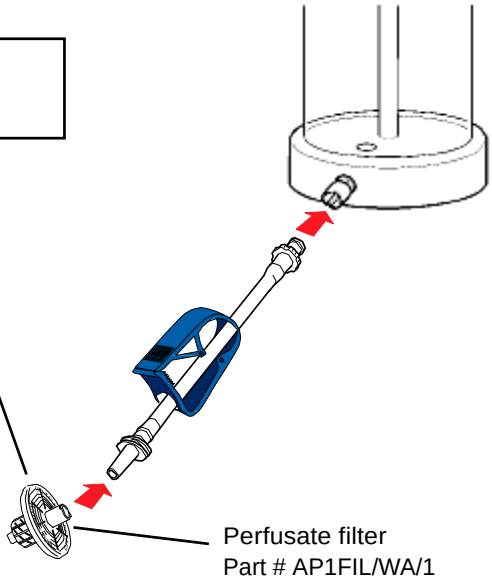


C – 12 Prevention, recognition and correction of hydraulic resistor blockage

1	Prevention of blockages - **Always** use perfusate filter
2	Minimise perfusate particle load

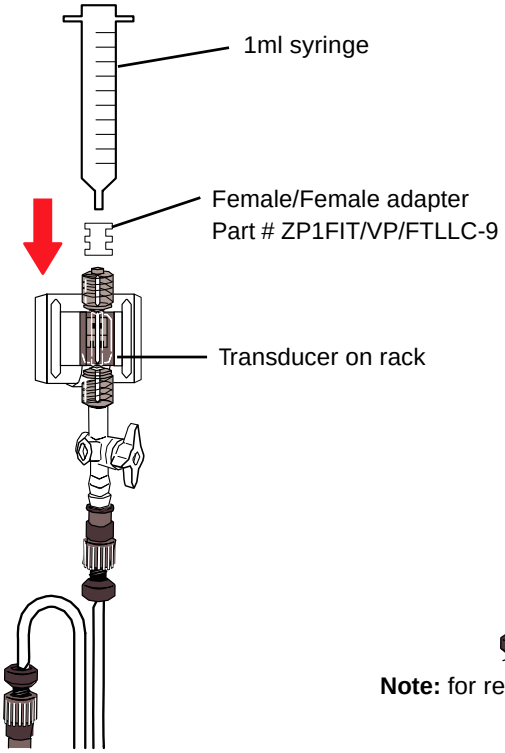
Double-distilled or de-ionised water

No particles in reservoir **(E-2)**



Perfusate filter
Part # AP1FIL/WA/1

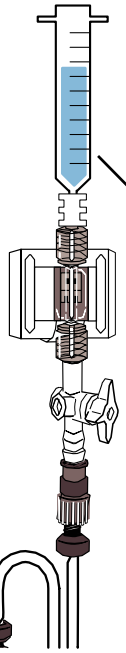
3	Replace water perfusate filter regularly - **(G-1)**
4	Check perfusate flow rates - assemble 1ml syringe barrel on transducer



1ml syringe

Female/Female adapter
Part # ZP1FIT/VP/FTLLC-9

Transducer on rack

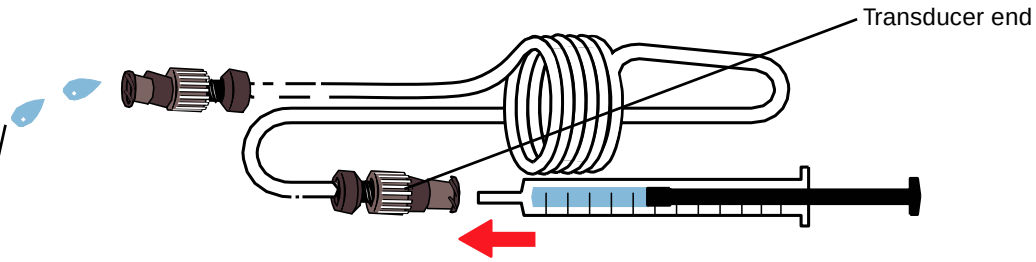


5	Start perfusion - **(C -2)**
6	Measure time to deliver water

Note: for resistor flow rates < 0.15ml/min use 0.25 - 0.50 ml syringe barrels

Prevention, recognition and correction of hydraulic resistor blockage **C – 12**

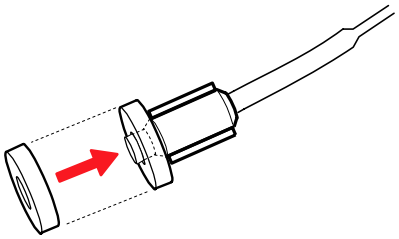
7	Flushing of blocked resistors - remove resistor from circuit

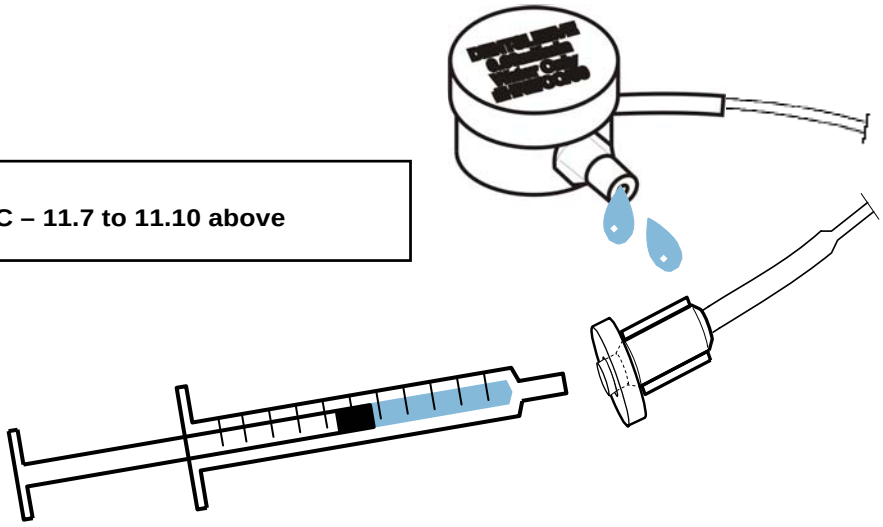


8	Backflush forcibly
9	Observe water flow
10	Re-install - **(E – 5)**

OR

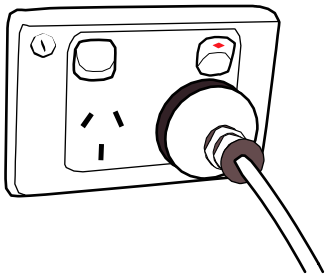
11	Remove resistor from circuit
12	Insert flush support tool - **(E – 6)**
13	Same steps as **C – 11.7 to 11.10 above**



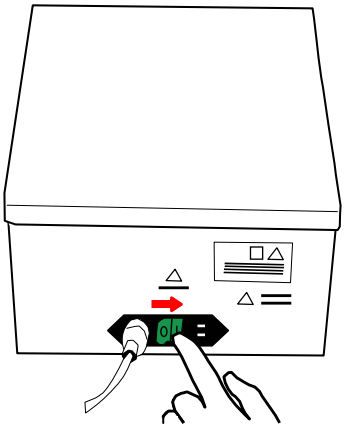


C – 13 Compressor

1	Always ground

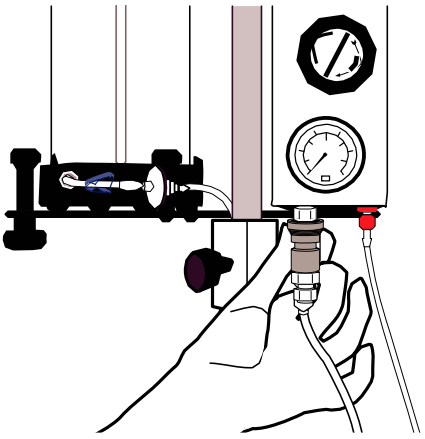


2	Turn on power switch. Power is on when switch is illuminated



3	Connect compressor air outlet to pump

4	Plug in compressor to pump control

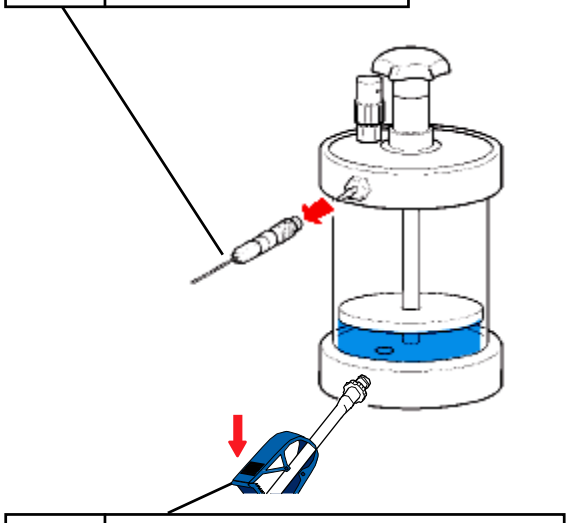


Steps On Completion of Measurements

D

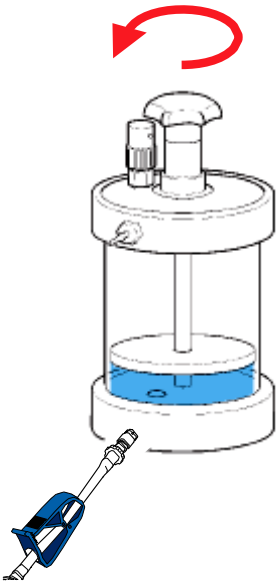
Perfusate reservoir D – 1

1	Depressurise



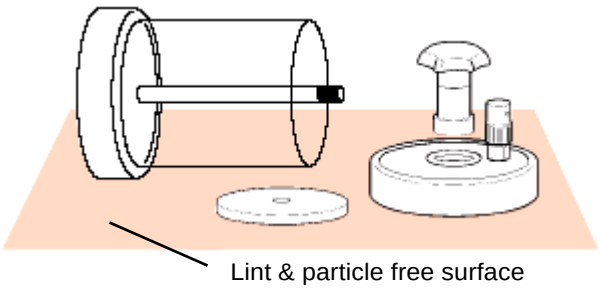
2	Close and disconnect from manifold

3	Remove lid



4	Drain Reservoir

5	Remove float & air dry

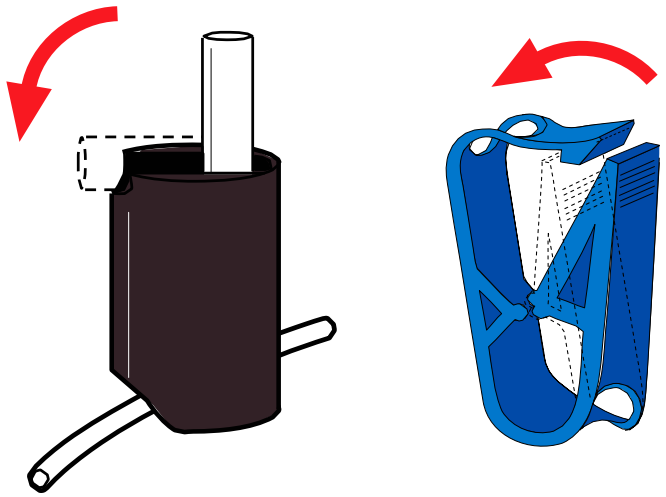


Do not transfer particles to internal surfaces of reservoir

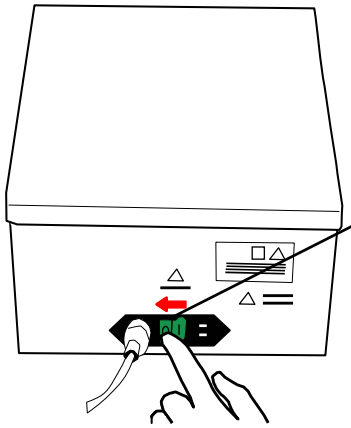
D Steps On Completion of Measurements

D – 2 Water manifold

1	Close



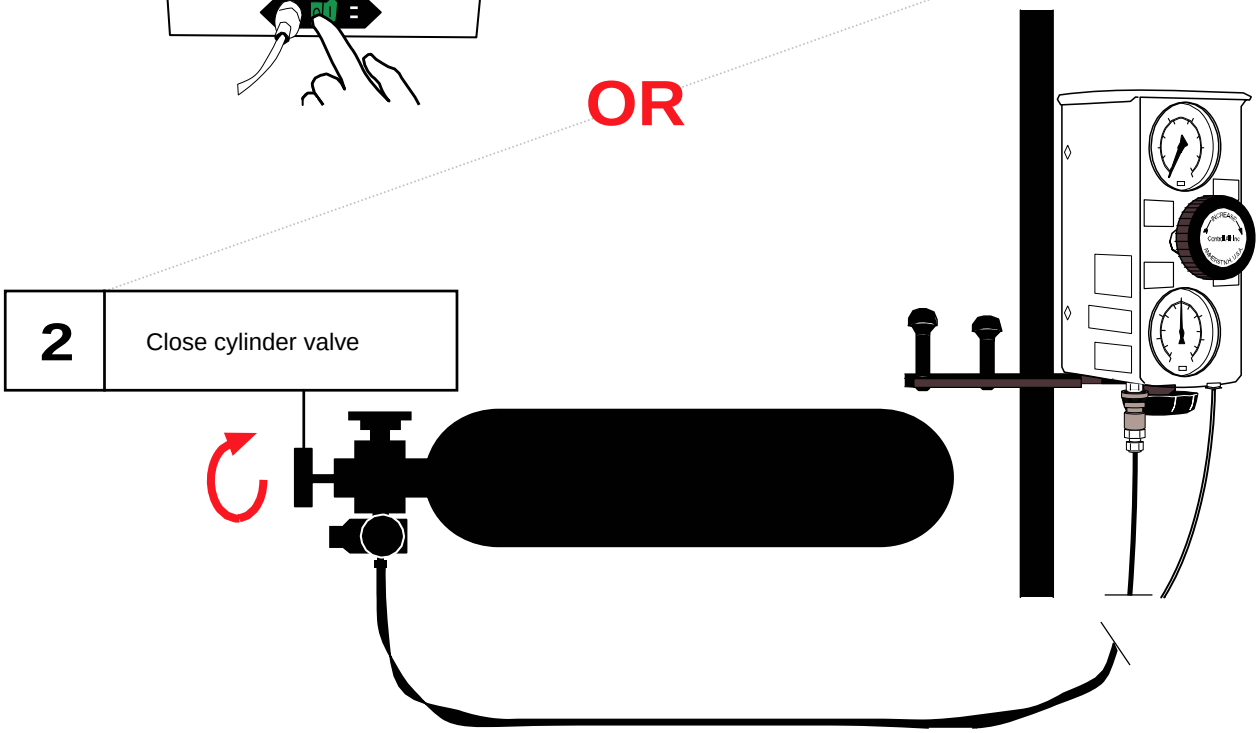
D – 3 Air supply



1	Turn off compressor

OR

2	Close cylinder valve



Air supply E – 1

Installation only by an approved, qualified biomedical engineer

1	Use air

Note: Air chosen as:

1. Air dissolution in perfusate prevented by perfusate float barrier.
2. More suitable for gas perfusion manometry than N_2 .
3. Usually more available and cheaper than N_2.
4. Available from wall supply and simple compressors.

2	Set up for compressor, wall or air bottle supply

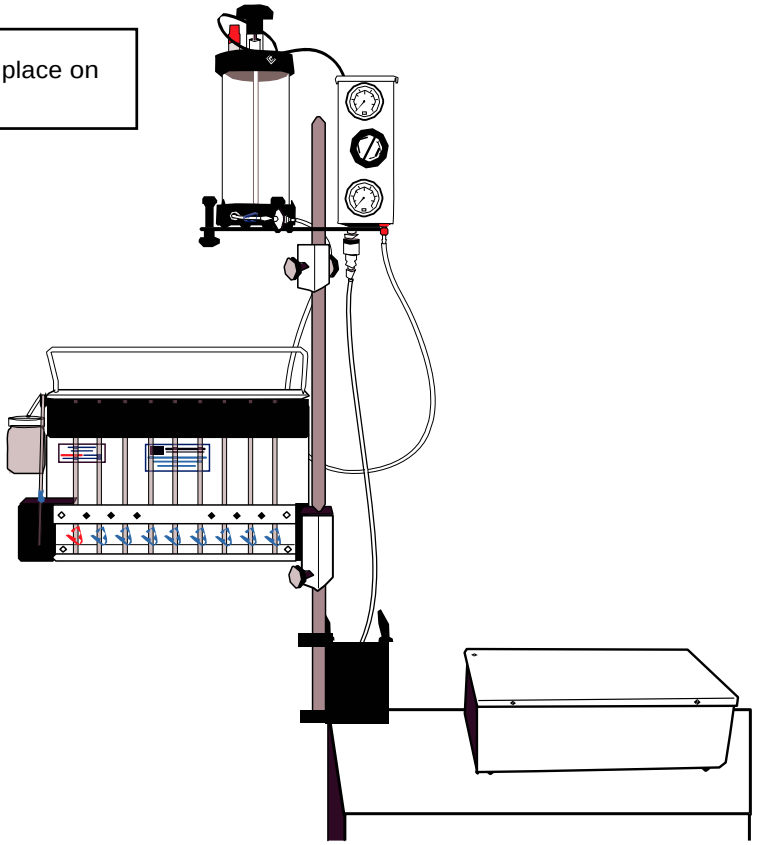
Compressor ▶ **E – 1.3**

Wall ▶ **E – 1.4**

Air bottle ▶ **E – 1.6 or 1.9**

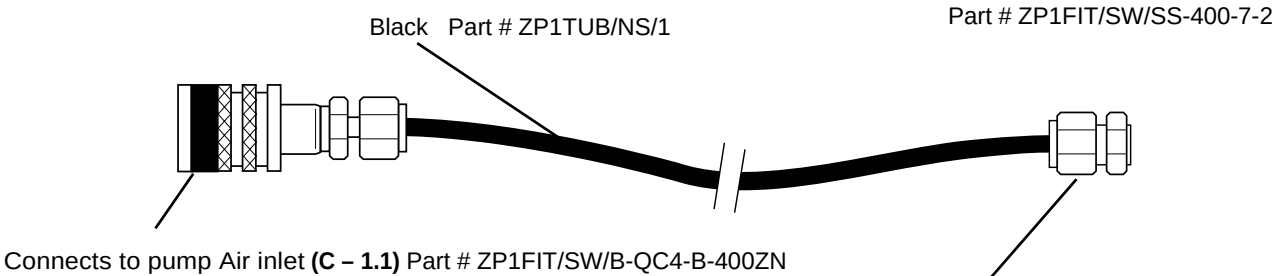
E – 1 Air supply (continued)

3	Install next to pump deck or place on bottom shelf of trolley



OR

4	Identify air line



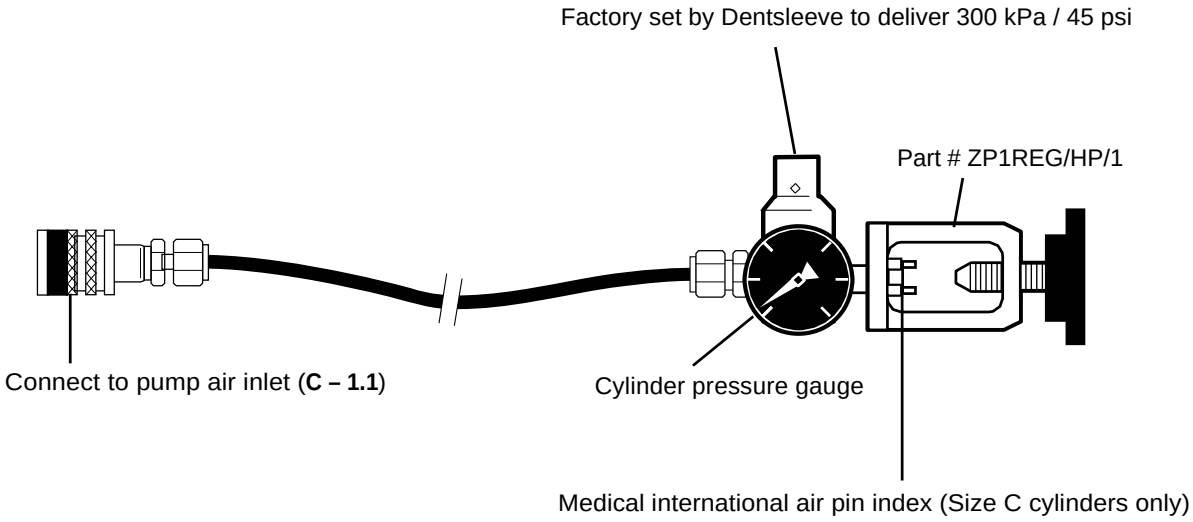
Connects to pump Air inlet **(C – 1.1)** Part # ZP1FIT/SW/B-QC4-B-400ZN

5	Ensure air source is suitable: • 130 - 240 kPa or 20 - 35 psi • no oil or moisture • filtered to 0.5 micron

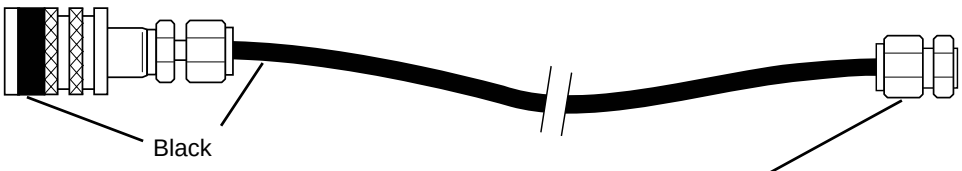
6	Make appropriate connection to supply

Air supply (continued) E – 1

7	Identify air line with Dentsleeve supplied regulator



8	Identify air line if no high pressure regulator supplied

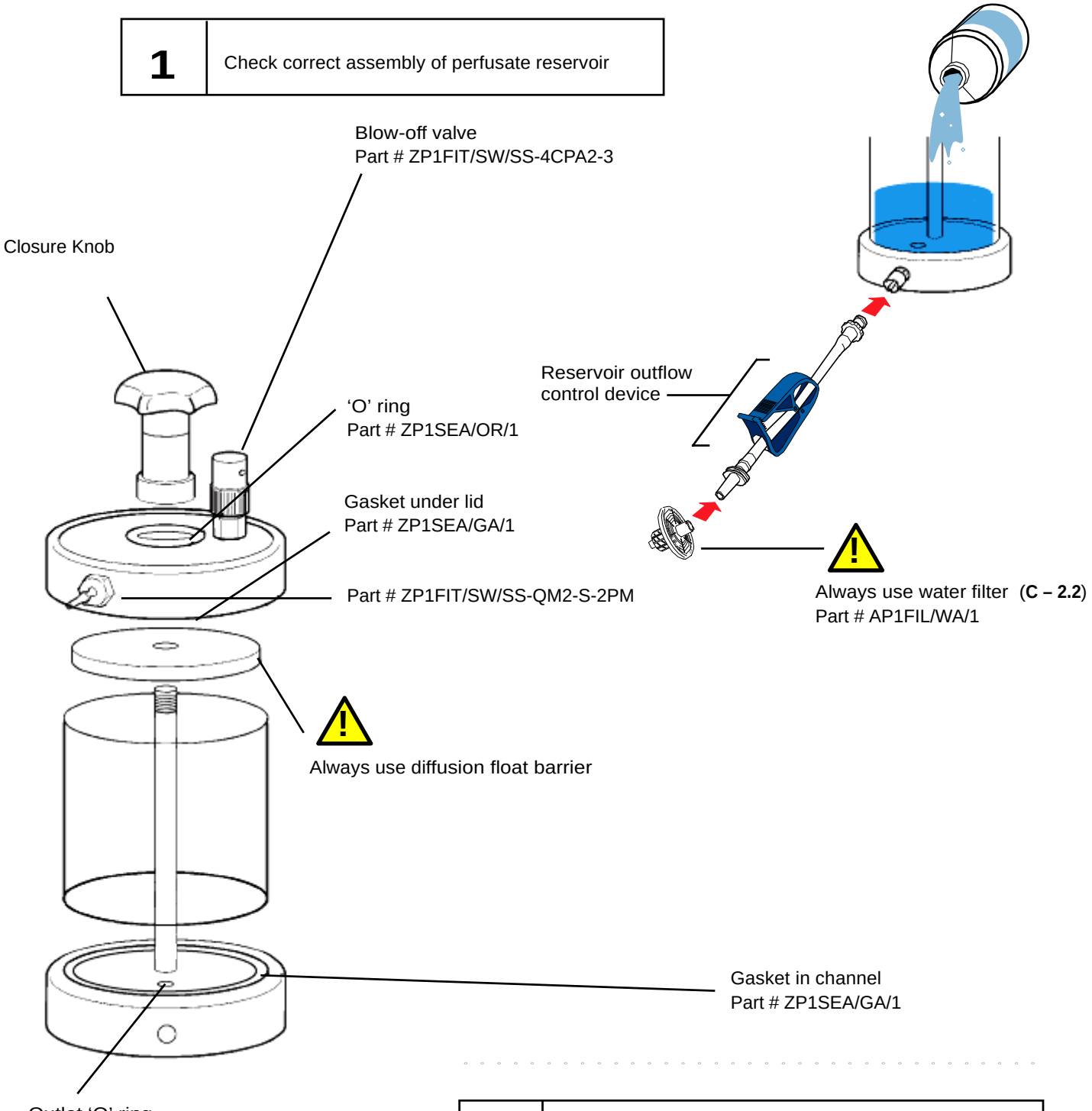


9	Connect to suitable locally sourced high pressure regulator with lockable outlet pressure control

10	Adjust regulator to deliver outlet pressure of 300 kPa / 45 psi

E – 2 Perfusate reservoir prior to first use

1	Check correct assembly of perfusate reservoir

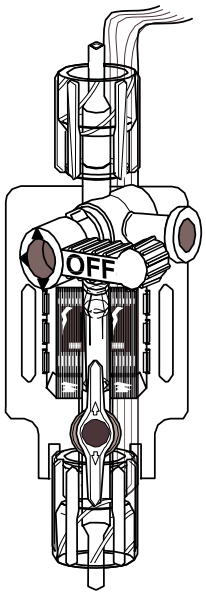


2	Flush reservoir with water to remove any particles

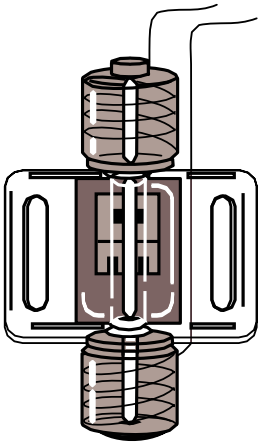
Installation of pressure transducers E – 3

1

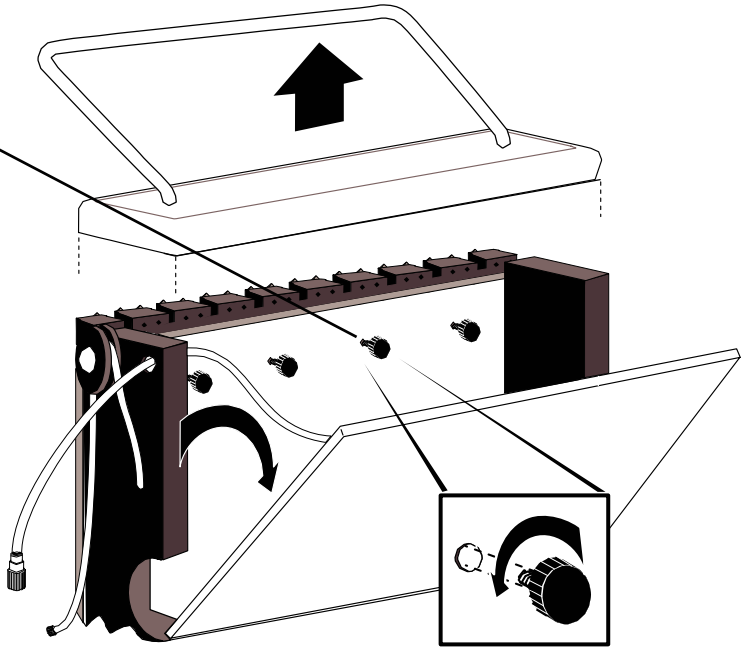
PVB DPT-6100



Abbott Transpac 42582-01

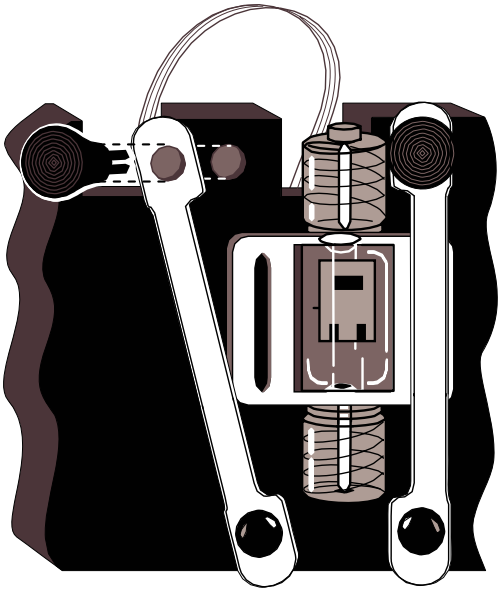


2 Mount bar removable

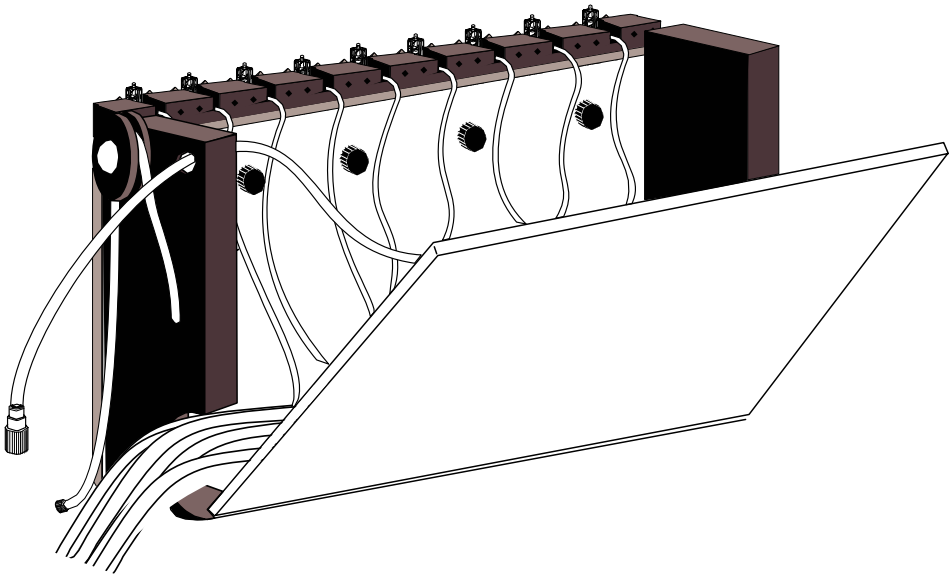


E – 3 Installation of pressure transducers (continued)

3

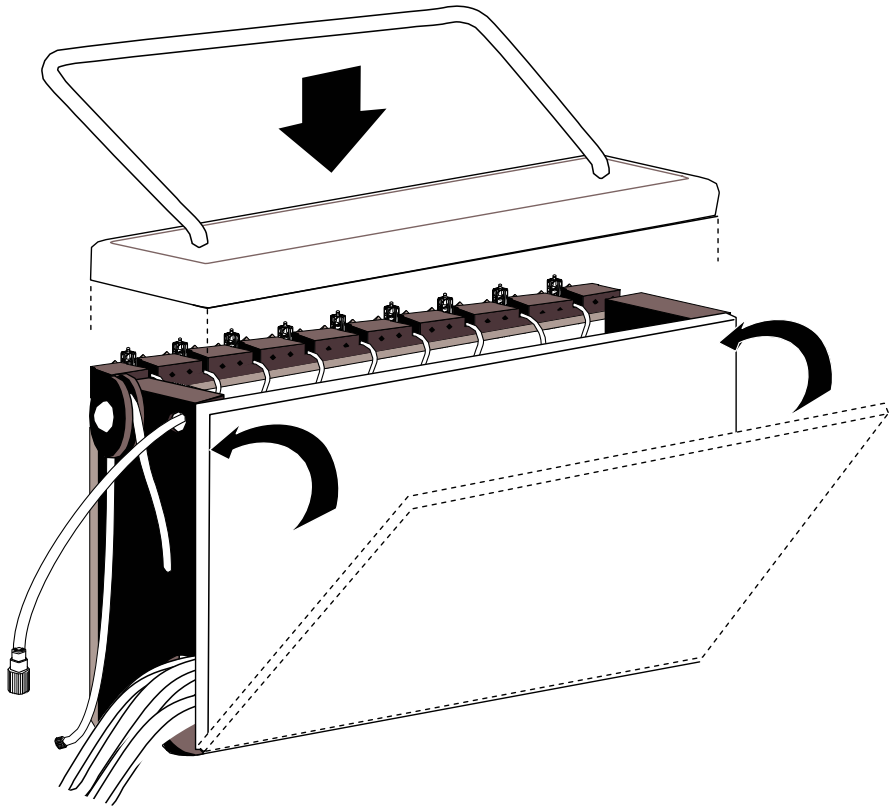


4



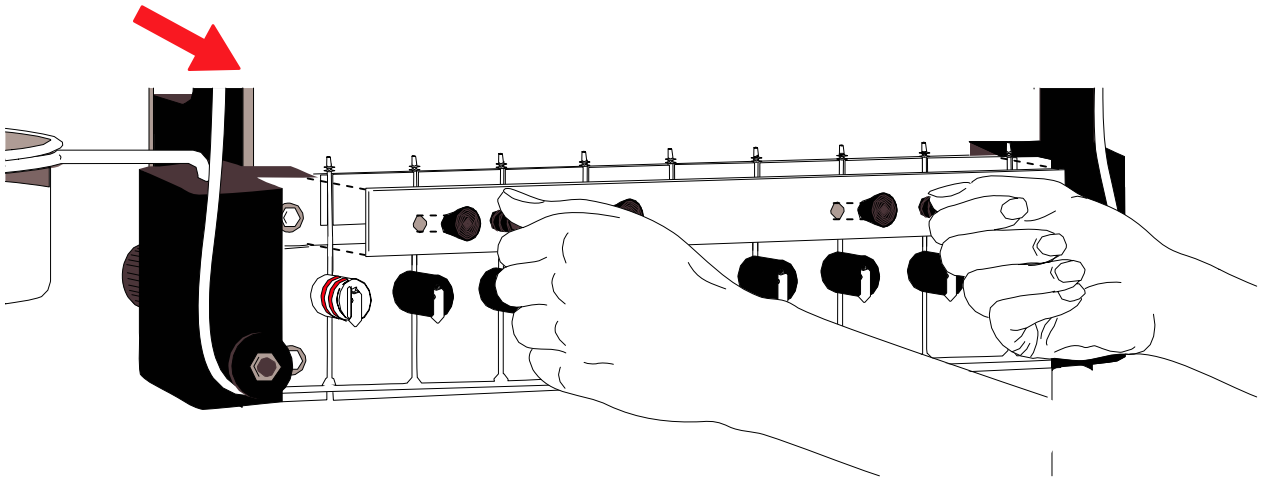
Installation of pressure transducers (continued) E – 3

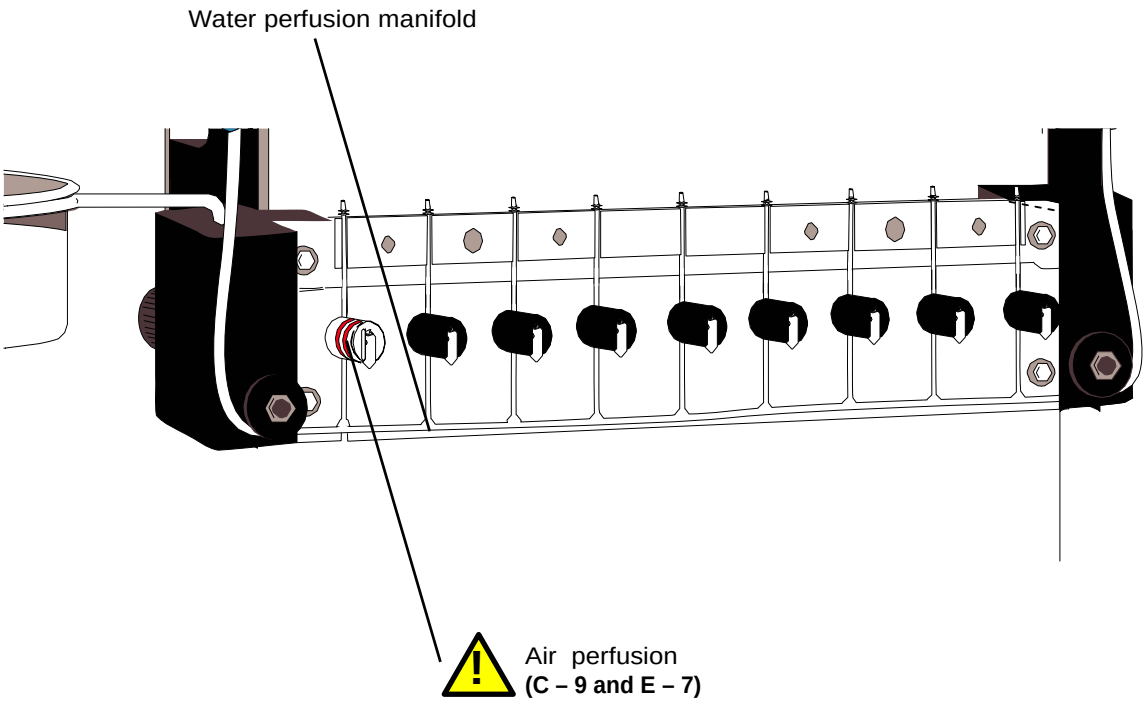
5



E – 4 Water perfusion manifold – removal

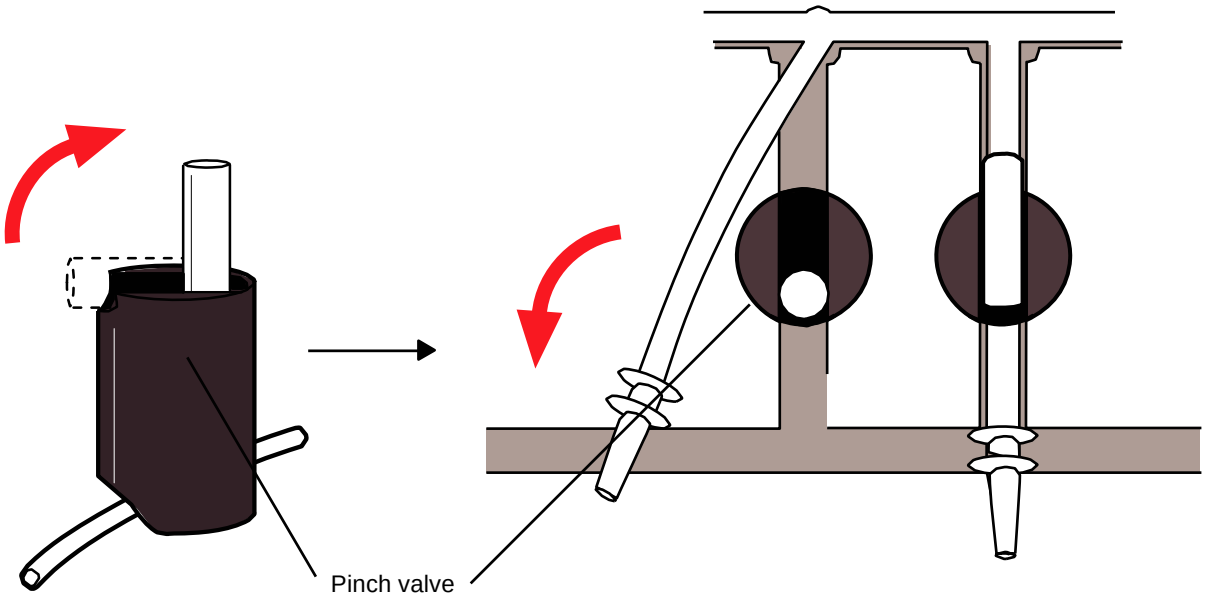
1



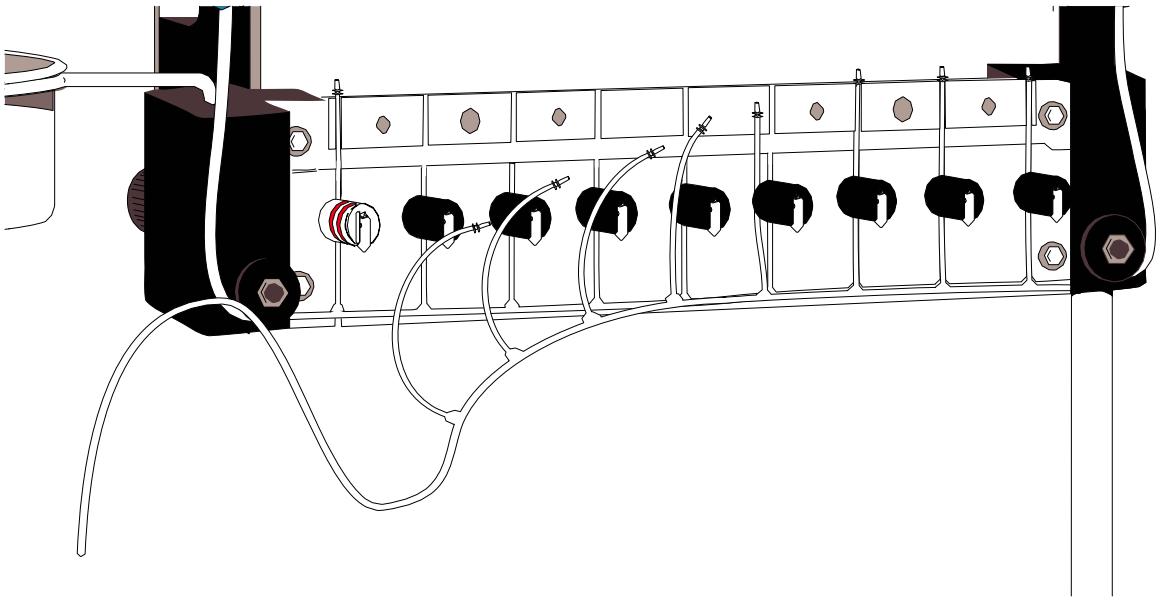


Water perfusion manifold – removal (continued) E – 4

2



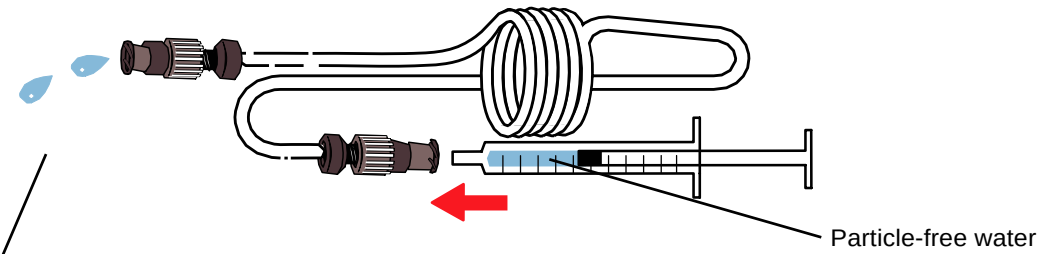
3



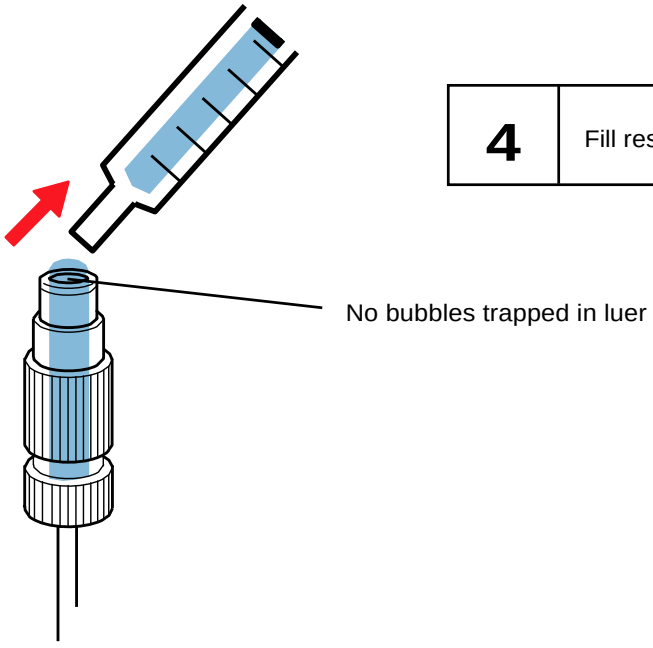
E – 5 Standard hydraulic resistors

1	Identify standard resistor with correct flow value. **(C – 4)**

2	Prime resistor with water. Use 1 ml syringe for 0.6 - 0.15ml/min resistors 0.5ml syringe for lower flow rates



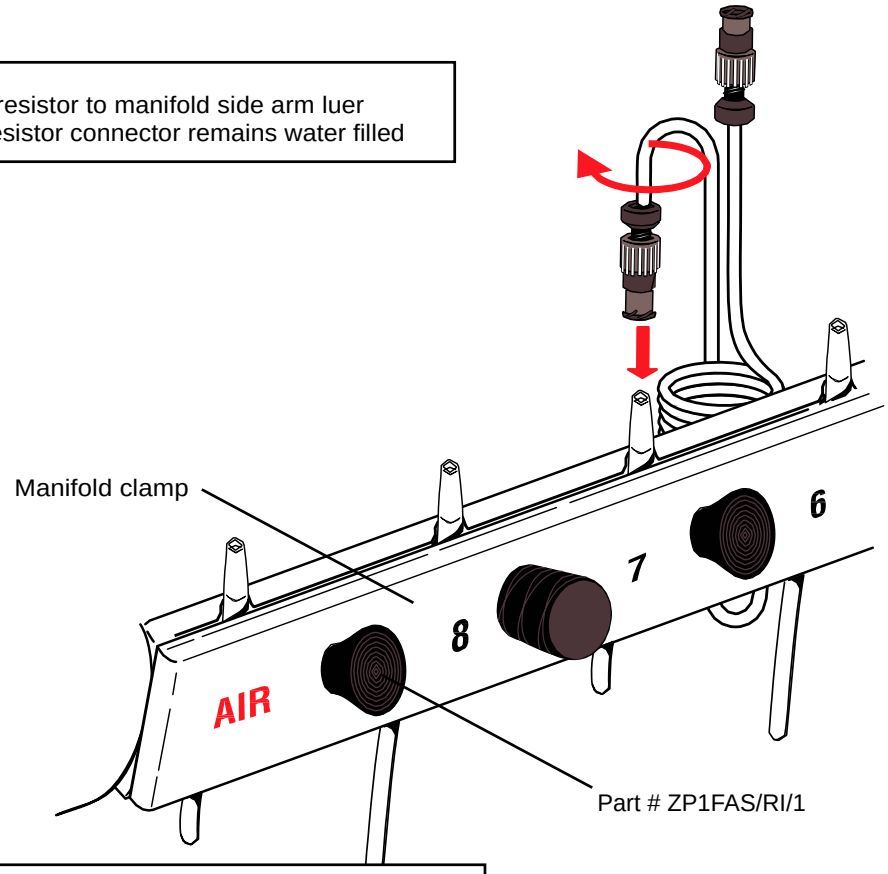
3	Inject till water flows from other end



4	Fill resistor connector as syringe withdrawn

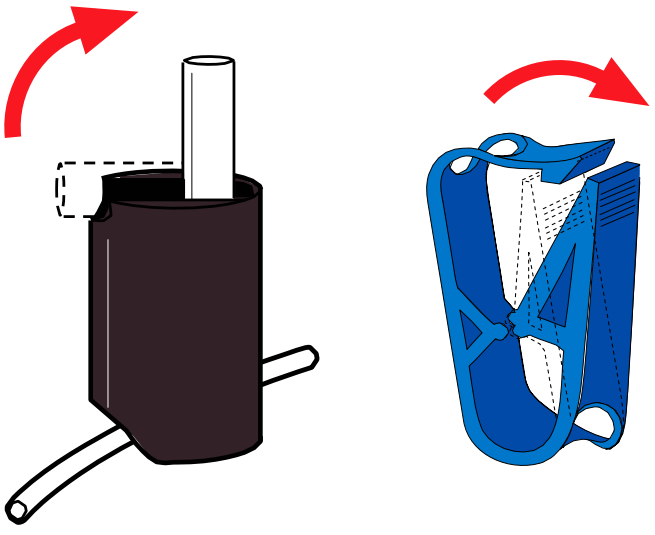
Standard hydraulic resistors (continued) E – 5

5	Connect resistor to manifold side arm luer Ensure resistor connector remains water filled



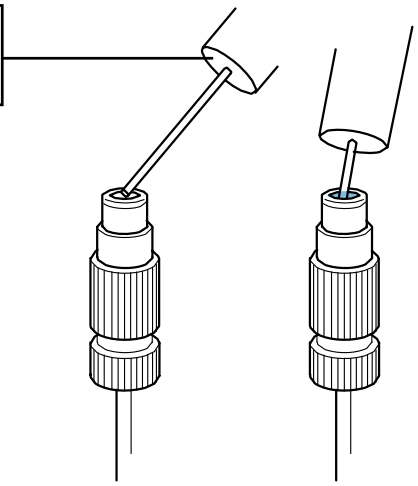
6	Push and rotate resistor firmly onto manifold luer

7	Open



E – 5 Standard hydraulic resistors (continued)

8	Debubble downstream resistor luer Inject particle-free water into bottom of luer

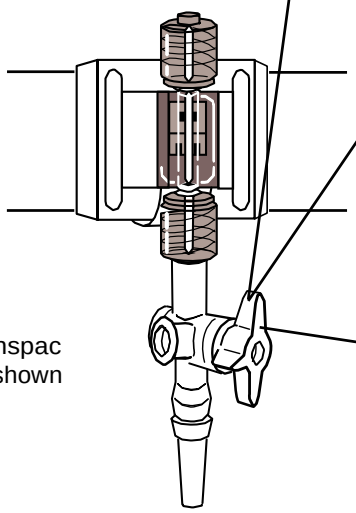


9	Ensure no bubbles are trapped

10	Connect to pressure transducer Preferred position for 3 way stopcock

11	Use special high pressure stopcock

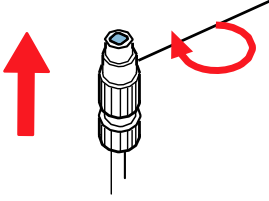
12	Push and rotate resistor firmly onto 3 way stopcock



Abbott transpac
42582-01 shown

Part # ZP1STO/HP/2

Water filled



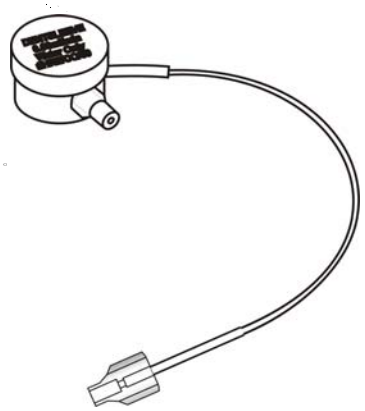
Note PVB DPT-6100 transducer has integral stop-cock at transducer outlet

13	Final setup: Follow instructions from **(C – 7.2)**

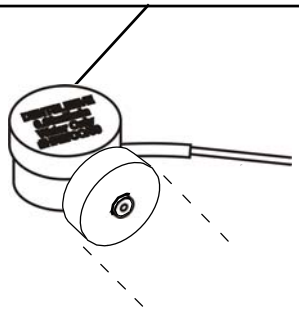
Set Up Procedures & Connection of Components

Compact resistors E – 6

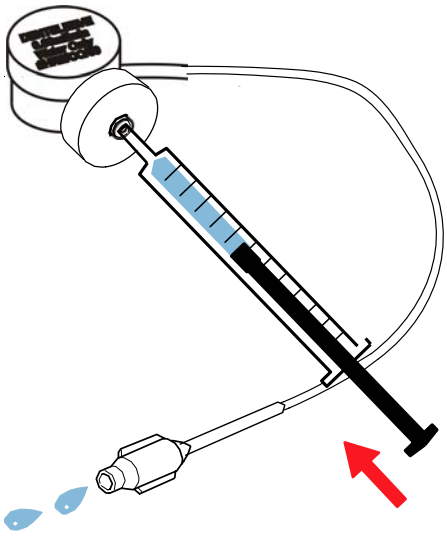
1	Check flow values for each hydraulic resistor
2	Prime resistor with water - Use flush tool



3	Place flush tool on silicone rubber connector



4	Use 1 ml syringe for 0.6 – 0.15 ml/min resistors 0.25 – 0.5 syringe for lower flow rates



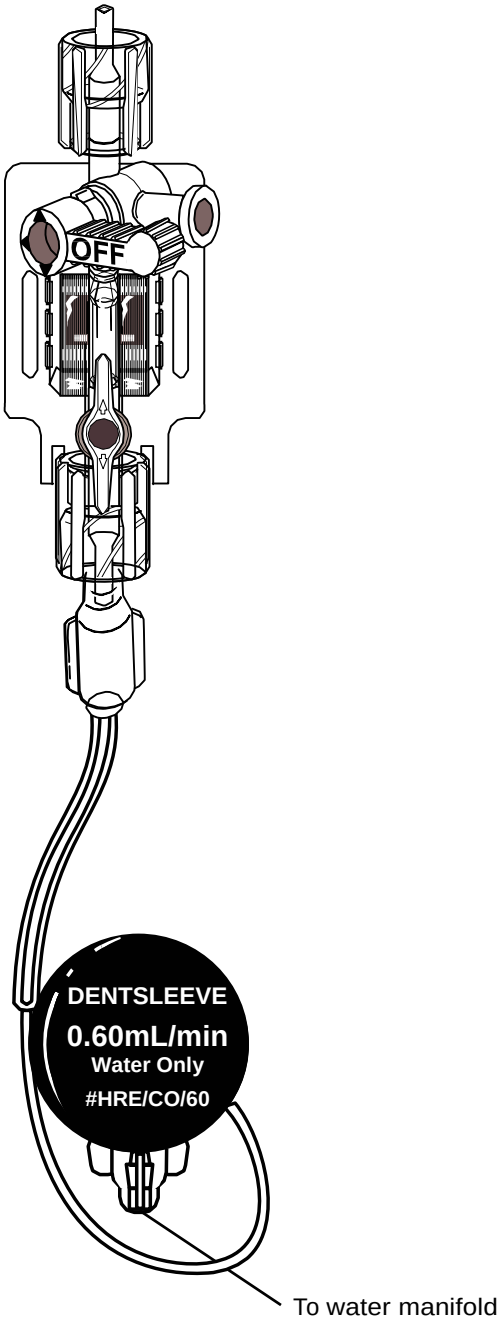
5	Inject until water flows from other end

6	Fill resistor connector as syringe withdrawn

7	Remove flush tool

E – 6 Compact resistors (continued)

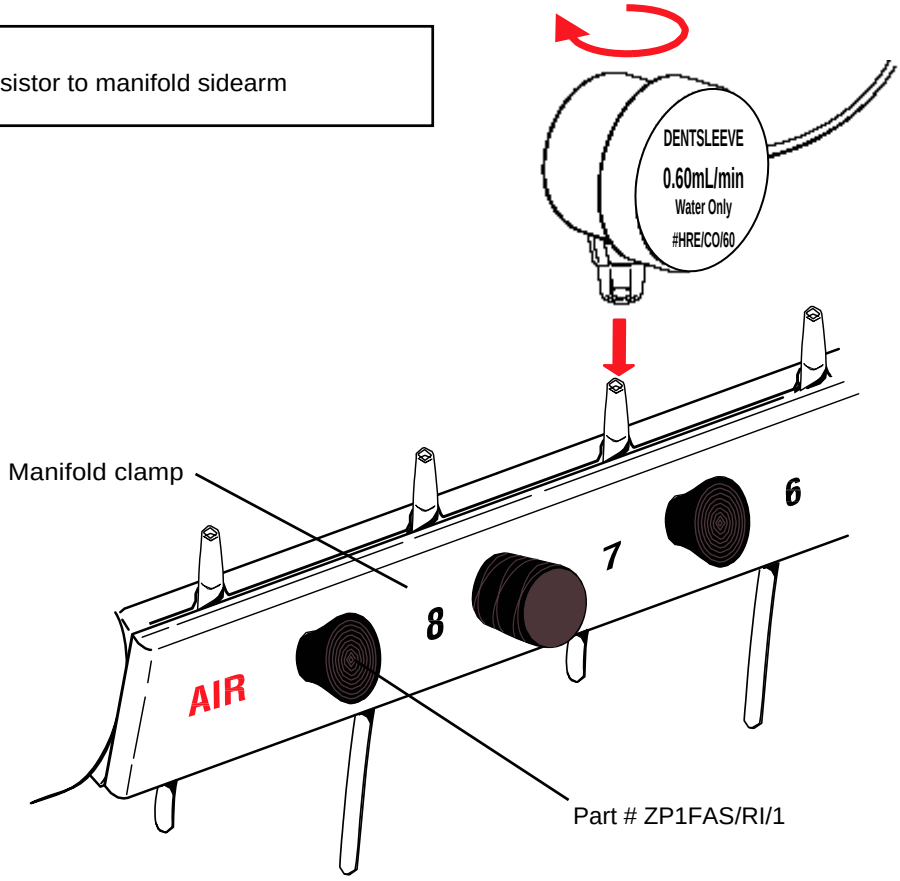
8	Connect as shown



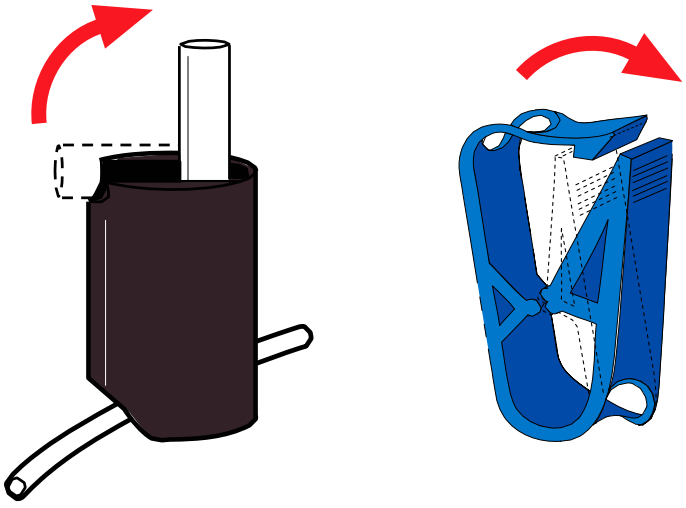
Note: Connectors are self-debubbling. PVB DPT-6100 transducer shown.

Compact resistors (continued) E – 6

9	Connect resistor to manifold sidearm



10	Open

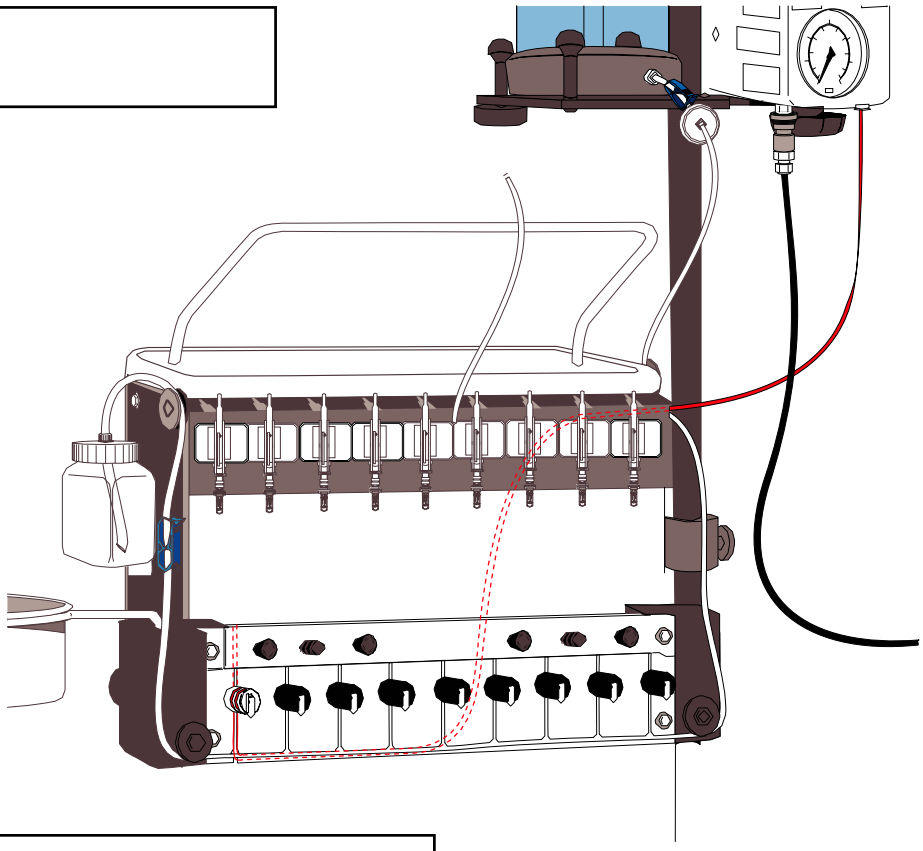


11	Final set-up - follow from **(C – 5.2)**.

E – 7 Air perfusion circuit

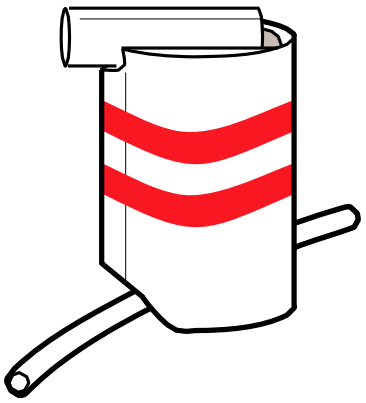
N_2 perfusion into pharynx may dilute inspired oxygen - use only air for perfusate reservoir pressurisation in small children, as this gas is also used for gas perfusion circuit

1	Identify circuit



2	Locate air manifold and check correctly connected

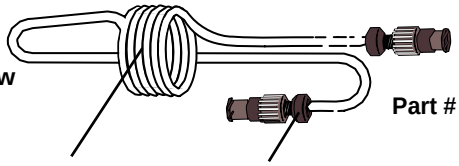
3	Resistor must **always** be installed



To transducer

Air perfusion circuit (continued) E – 7

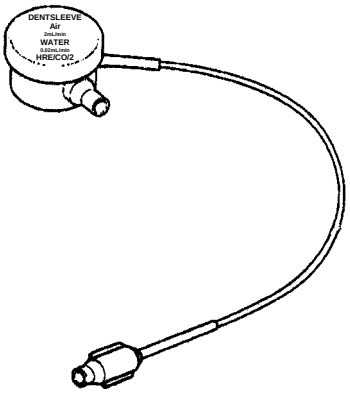
4	Select resistor that controls airflow to less than 10ml/min



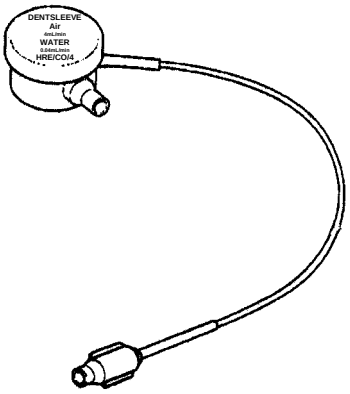
Air flow ml/min	Waterflow ml/min			Part #
2	0.02	Black	Black	R01HRE/ST/2(3)
4	0.04	Black	Red	R01HRE/ST/4(3)
8	0.08	Red	White	R01HRE/ST/8(3)

5	Airflow is x100 waterflow

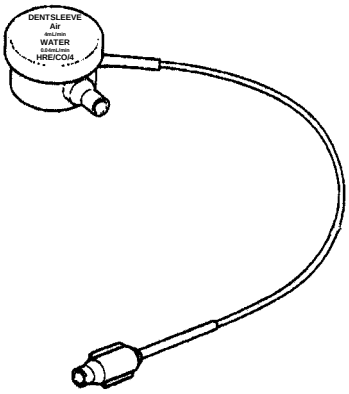
Appropriate compact resistors show airflow on case



Air = 2ml/min

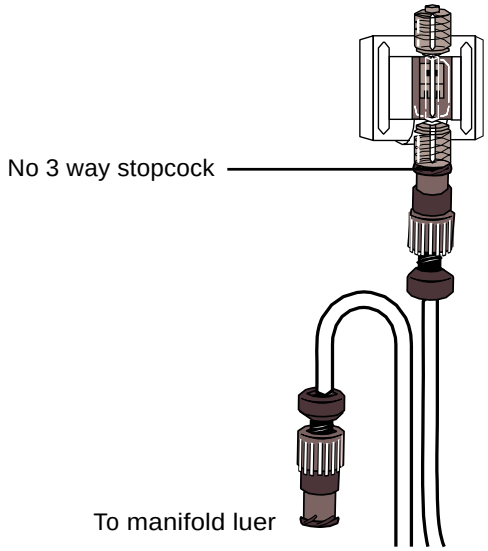


Air = 4ml/min



Air = 8ml/min

6	Install air flow resistor between air manifold luer and transducer



7	No water prime required

Air perfusion to be used only for pharyngeal manometry

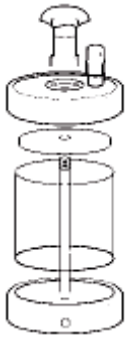
F

Cleaning & Disinfection

Cleaning of plastic parts F – 1

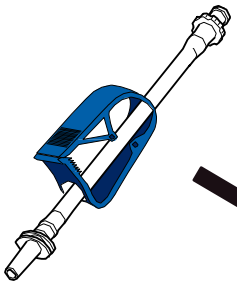
1	Clean with cloth and mild detergent

Sterilization of perfusate reservoir F – 2



1	**Gas sterilize only**

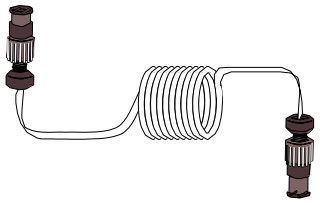
Sterilization of manifolds F – 3

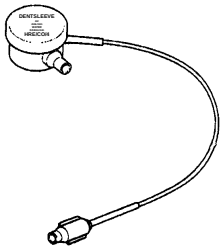


Water manifold
Air manifold

1	Autoclavable

Hydraulic resistors F – 4





1	**Not** autoclavable

2	Autoclavable

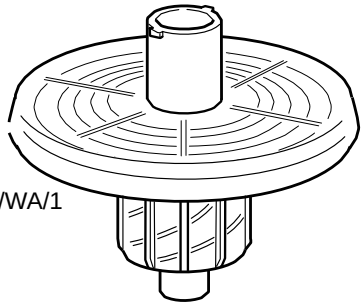
Cleaning of compressor F – 5

1	Wipe with a dry cloth

G – 1 Every 3 months (or as needed): perfusate water filter

1	Replace

Part # AP1FIL/WA/1

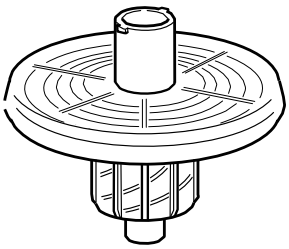


Regular Maintenance

Every year or as needed: gas filters G – 2

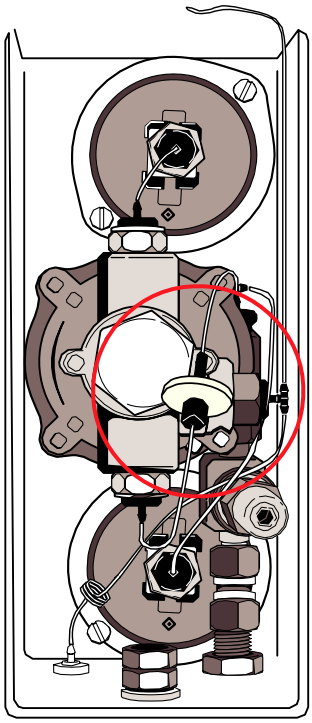
To be done only by an approved, qualified biomedical engineer

1	Disconnect gas supply then open control box (**G – 3.2**)
2	Use correct filter



Part # AP1FIL/GA/1

Gas (Black)

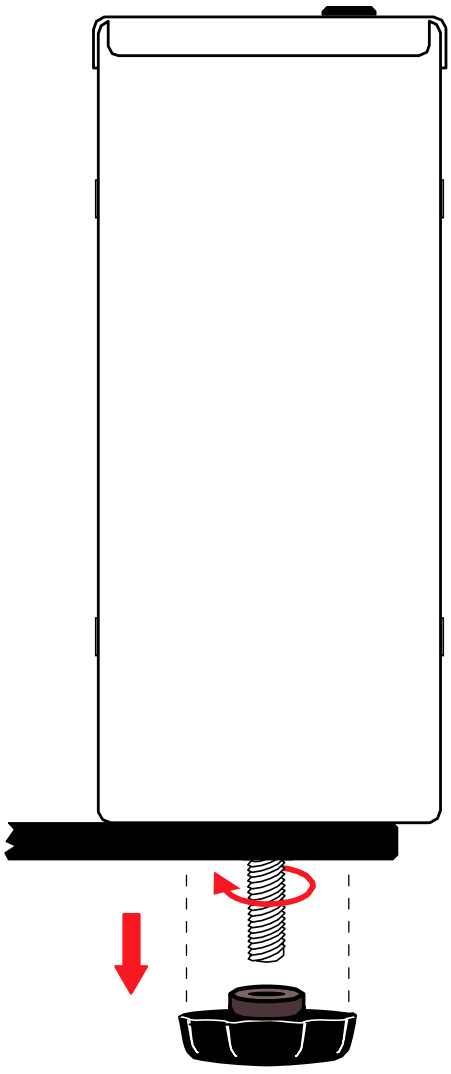


3	Replace filter
4	Check for air-tightness

Note: Gas filter life depends on quality of air – always use medical grade

G – 3 Service of control box by Dentsleeve

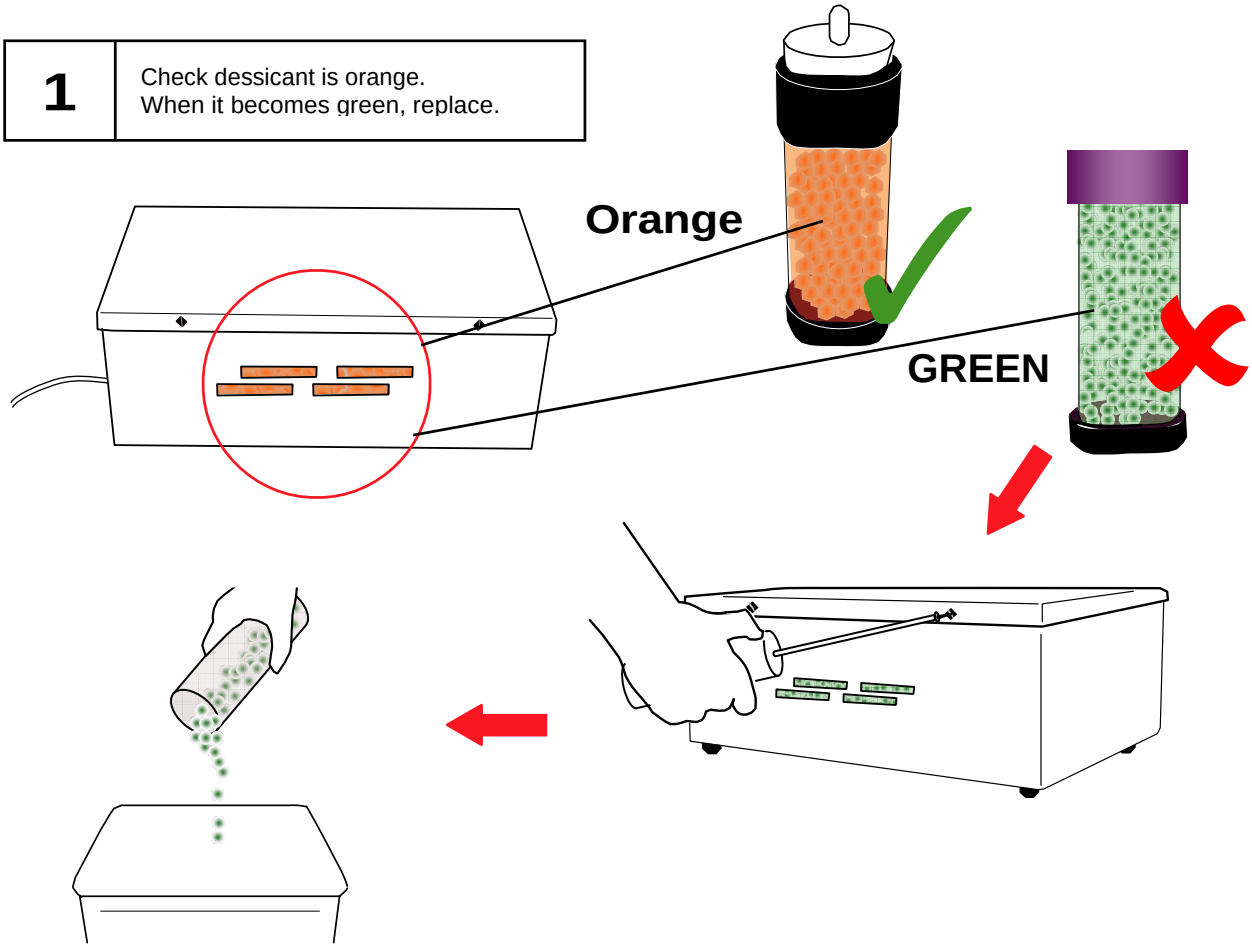
1	Undo screw that holds control box
2	Send control box to Dentsleeve



Regular Maintenance

Compressor Dessicant G – 4

1	Check dessicant is orange. When it becomes green, replace.

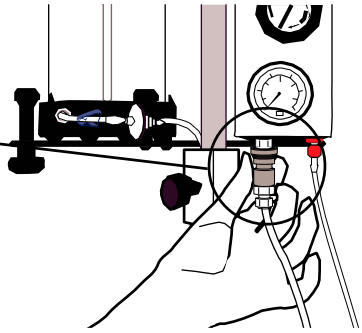


OR

- Spread granules evenly onto tray, one granule deep.
- Heat granules for approximately 5 hours. (or until it turns back to its original orange color) at 125°C (250°F) in a conventional oven.
- Cool dessicant before replacing back into canister.

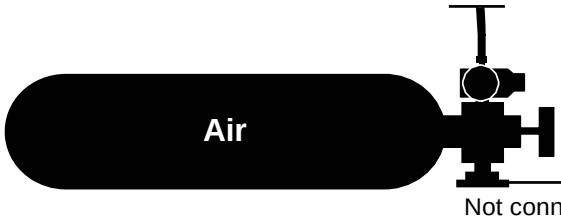
Diagnosis of abnormal air consumption H – 1

1 Check compressor connection



For compressor malfunction, please contact Dentsleeve

OR

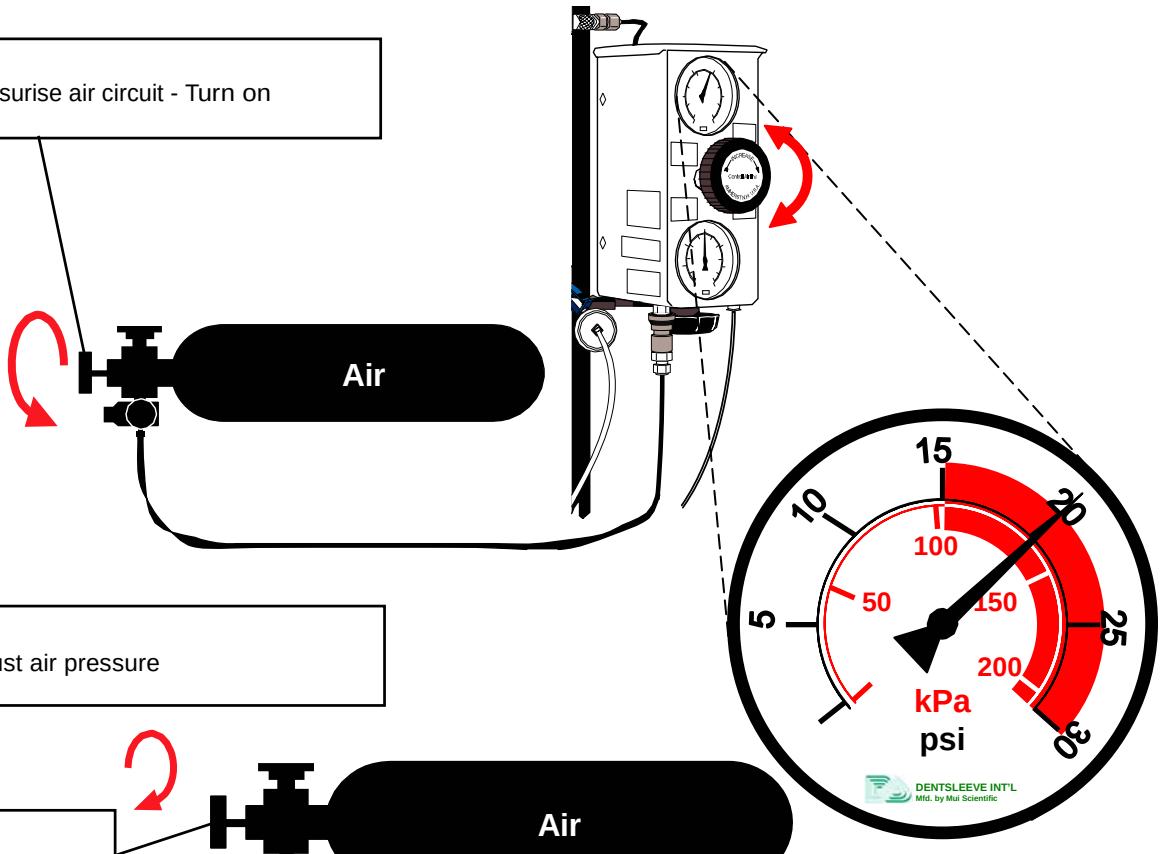


Check regulator/cylinder connection

Tighten

Not connected

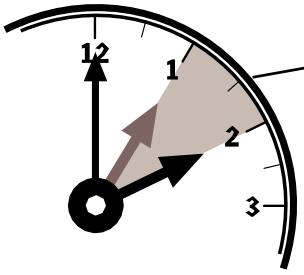
2 Pressurise air circuit - Turn on



3 Adjust air pressure

4 Turn off

H – 1 Diagnosis of abnormal air consumption (continued)



5 Recognise leakage - Wait 1 hour

either

or

6 Drop less than 33 kPa/5psi

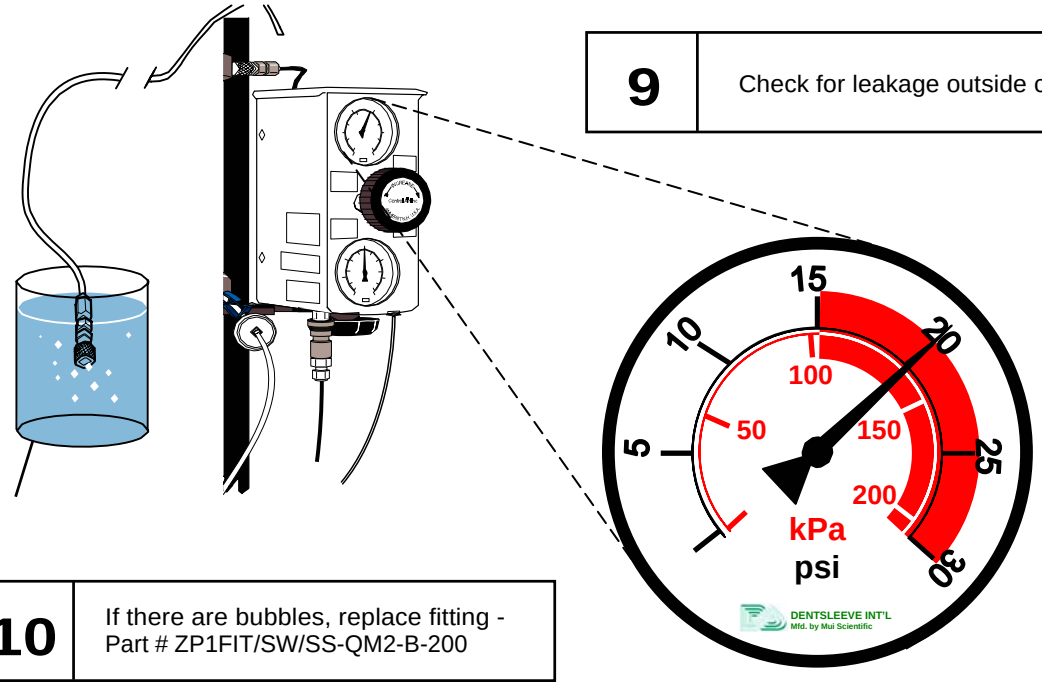
No significant leak

7 Drop more than 33 kPa/5psi

Significant leak

8 Follow **(H-1.9)** below

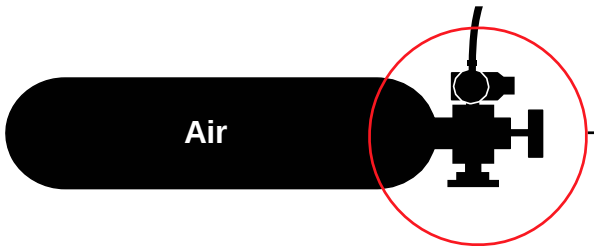
Diagnosis of abnormal air consumption (continued) H – 1



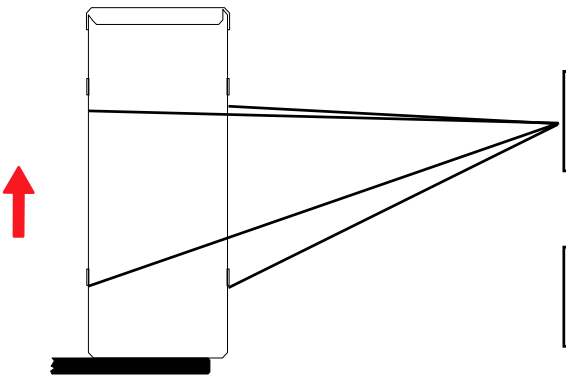
9	Check for leakage outside control box

10	If there are bubbles, replace fitting - Part # ZP1FIT/SW/SS-QM2-B-200

11	Consult approved, **qualified biomedical engineer** to do check **(H-1.12 to H-1.17)** below



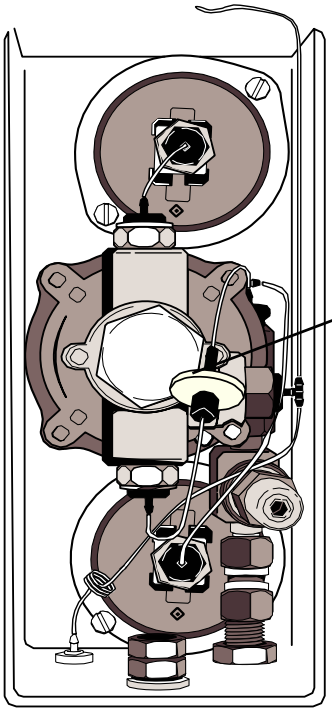
12	Leakage?



13	Open pump control box.

14	Remove control box lid/back

H – 1 Diagnosis of abnormal air consumption (continued)



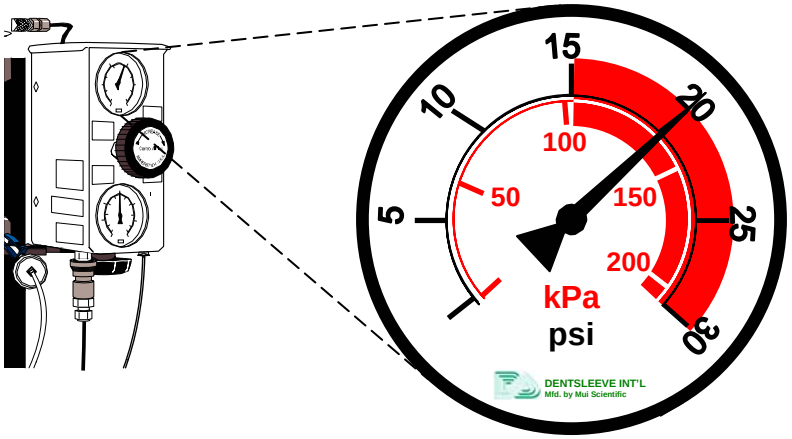
15	Filter leakage - tighten or replace

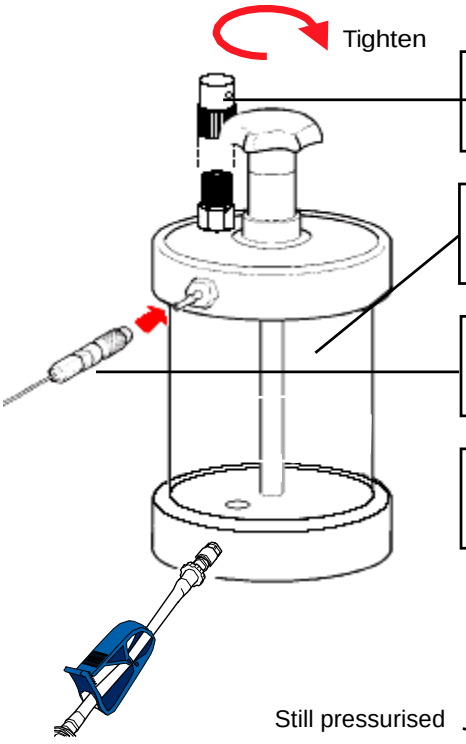
16	Check rest of air circuit

Abnormal air consumption - perfusate reservoir leakage H – 2

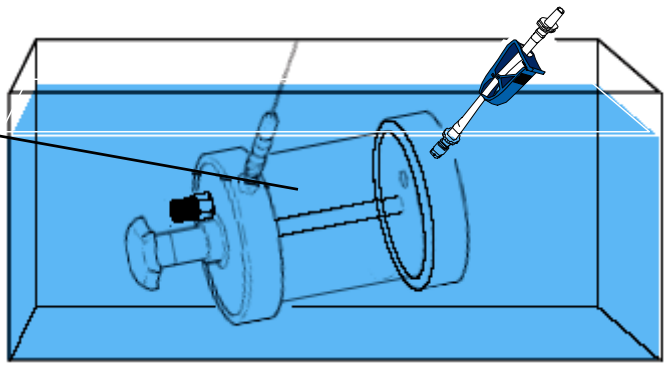
1	First exclude air circuit leakage - **(H – 1)**

2	Set pressure



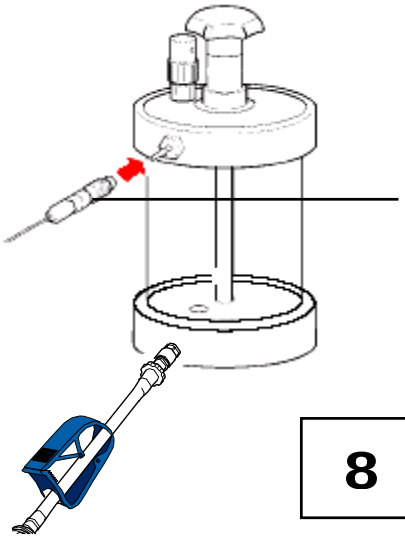


3	Set up reservoir. Remove blow-off valve cap
4	No water
5	Pressurise
6	Locate site of leakage - observe underwater

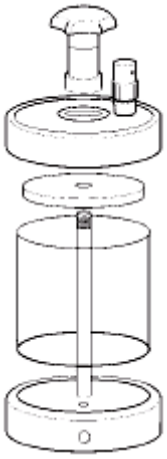


7	Locate site of bubbling

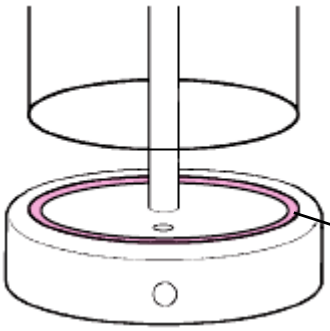
H – 2 Abnormal Air consumption - perfusate reservoir leakage (cont.)



ZP1FIT/SW/B-QM2-B-200ZN

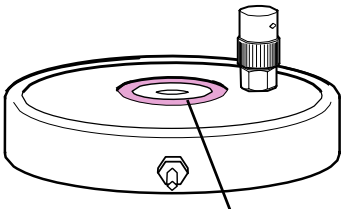


8	If leak elsewhere, dismantle reservoir



9	Identify cause of leakage at base
10	Gasket clean and intact?

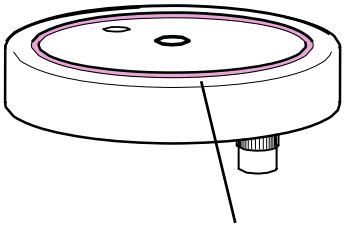
11	Identify cause of leakage at top



Check ‘O’ ring
Part # ZP1SEA/OR/1

Flip

Underside



Gasket underneath clean and intact?
Part # ZP1SEA/GA/1

Specifications I – 1

Air	Medical grade only
High pressure regulators Recommended first stage regulators (*if supplied)	CONCOA Medical Air (Air pin index)
Inlet pressure Pump inlet pressure (from gas supply first stage regulator)	Air 167 - 300kPa (25 - 45 psi) Compressor 130 - 240kpa (20 - 35 psi)
Supply lines (from gas bottles) Air (black) line	Air Male Inlet Air female connector to perfusate reservoir
Air supply on pump Driving air supply (pump) Air flow rate ± 20%	Adjustable 0 -250 kPa (0 - 36psi) Flow restricted to 30ml/min at 100kPa (15psi)
Pressure relief valves Perfusate reservoir relief valve Control box inlet overpressure relief valve	Preset to 200 kPa (29psi) Preset to 300 kPa (45psi)
Filtration Air	0.5 micron male/female luer connection disposable disc filter

Technical Support I – 2

1	Contact Dentsleeve for advice
2	See contact details on front cover

I Specifications, Support, Spare Parts & Accessories

Spare Parts I – 3

Spare Parts Kit

2x AP1FIL/GA/1 **Gas filters**, for installation within pump control box.

5x AP1FIL/WA/1 **Water filters**, for filtration of water perfusate

2x ZP1-OCD/PR/1 **Reservoir outflow control device**, for perfusate outflow.

Regulatory Information I – 4

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