SERVICE PROCEDURES

Control Unit

Yes, you can.®

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Control Unit

Control Unit

The following section outlines the steps and procedures to follow if there is a suspected fault in the Control Unit.

Any fault or damage to the product that is not discussed in these Service Procedures is deemed a non serviceable issue. The faulty product must be returned to the Manufacturer for repair or replacement.

If a repair seems unmanageable or the issue falls outside the scope of serviceable repairs, please return the Control Unit to the Manufacturer.

Malfunction of the Control Unit may be due to the failure of one of the replaceable electrical components of the Control Unit, including the compressor, print circuit board and timing motor rotary valve.

Alternatively, a lack or loss of system pressure can be attributed to a variety of causes, including an incorrectly attached CPR Tag; a loosely connected or leaking Air Cell; leaking Air Pipe; or faulty fuse. Insufficient system pressure is identified when the Alarm LED flashes, and the corresponding Pressure Setting alarm signals display.

Should the Control Unit fail to operate, or system pressure fail to reach normal operating status, please follow the steps below to isolate the cause of the problem and make the relevant repair.

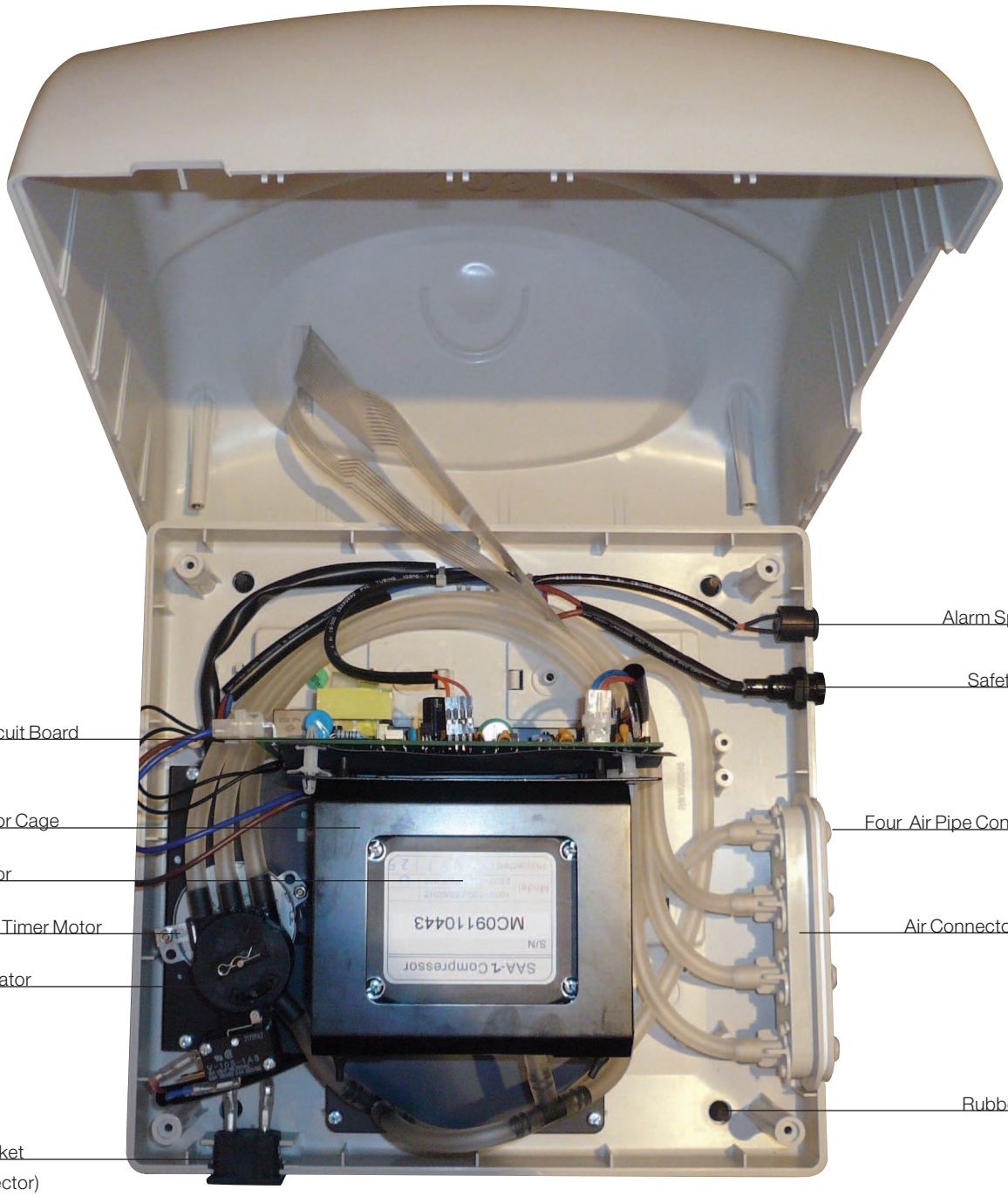
Internal Descriptions — Control Unit

The electronically controlled Control Unit provides the air supply to the Mattress. The unit is operated by a digital touch membrane on the front display panel which controls eight comfort pressure settings; Alternating or Static Mode for treatment or transfers respectively; Max Firm mode for rapid inflation to maximum pressure to create a firm surface; and Control Unit Lockout to prevent accidental changes to the settings. The Alarm LED indicator and Alarm Mute completes the operator controls. The visible and audible alarm function has a number of LED indication sequences depending on the cause of the failure.

On the side of the unit are four air connectors for quick connection to the four hole handle. The mains supply to the unit can be easily disconnected and is designed to detach if pulled too firmly – protecting the internal wiring from damage.

The quality of the Control Unit underpins the reliability and pressure reduction capabilities of the System. At the centre of the Control Unit lies the compressor, which runs at a rapid and intermittent rate whenever the unit is operational. Non-continuous rapid movement places compressor materials under high stress and heat conditions, which can make the unit susceptible to wear and tear over a long period of time.

To minimise noise and vibration, the compressor is housed within a strong metal cage, secured on all sides by rubber mounts. These mounts serve to insulate the rest of the unit from the vibration of the compressor.



Basic System Checks

Control Unit

Before commencing any service procedure, the following basic checks should be completed to ensure that system fault or failure is not due to an oversight on behalf of the user. Set up the system and check the following:

1 Ensure all power cords and leads are firmly attached and that the system is connected to a working power source (with correct voltage).

2 Check the Handle is securely attached to the Control Unit - all four connectors should be firmly inserted.

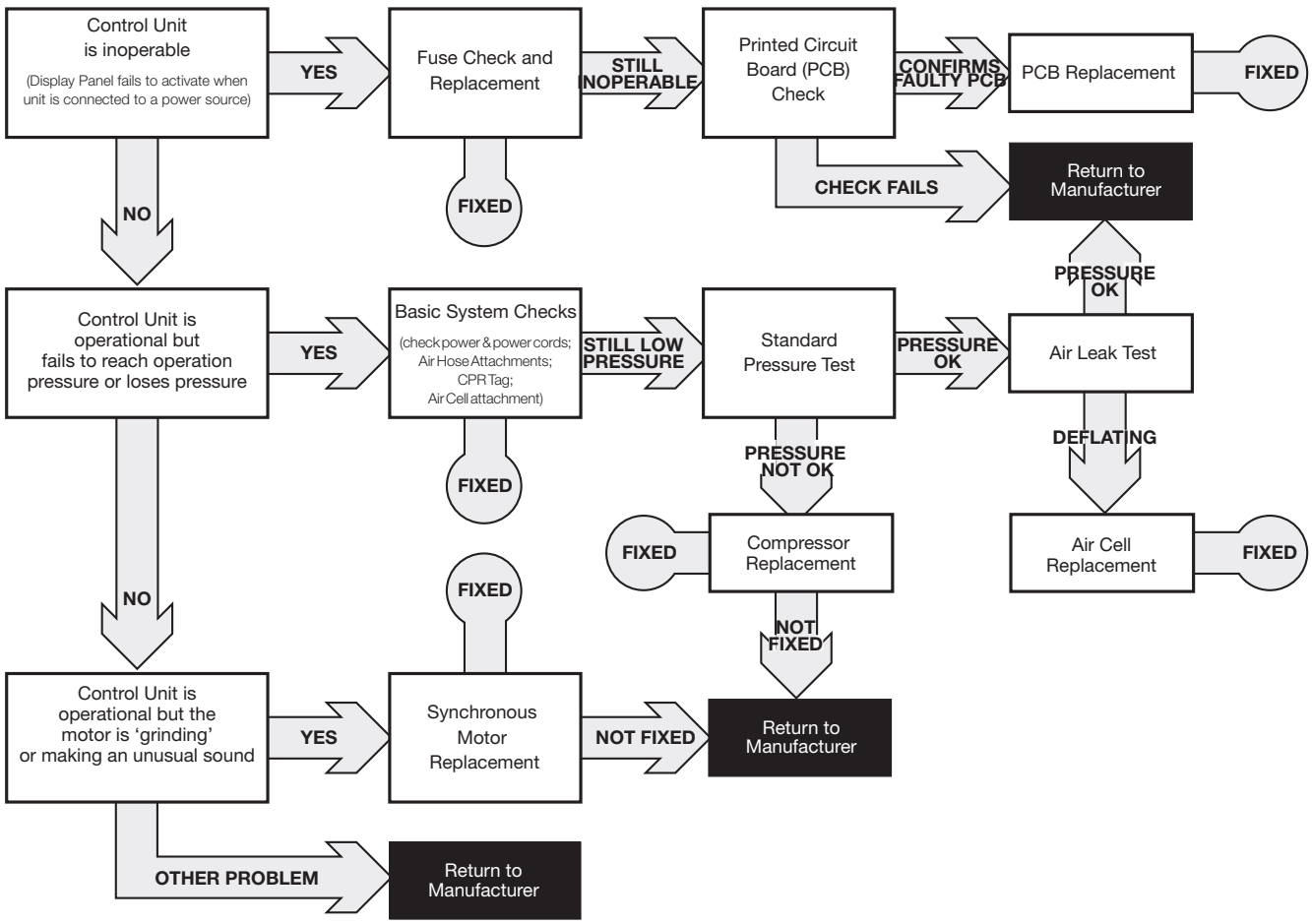
3 Remove the Mattress Top Cover and check the CPR Tag is firmly connected.

4 Check each Air Cell and/or Side Bolster is firmly connected to the internal air pipe/s.

Once these simple checks are complete, proceed with the service and repair as outlined in the following procedures.

Service Procedure Flowchart

Follow the flowchart to establish the recommended steps for system check and repair.

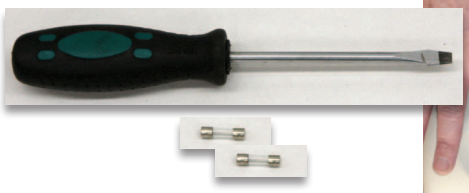


Fuse Check and Replacement — Control Unit

Testing fuse for damage and replacing a blown fuse

Control Unit failure may be the result of a blown fuse. Always check the fuse before opening the unit and performing any other internal component test procedures.

Note: When changing the replaceable fuse, use same rating fuse only (T1AL/250V).



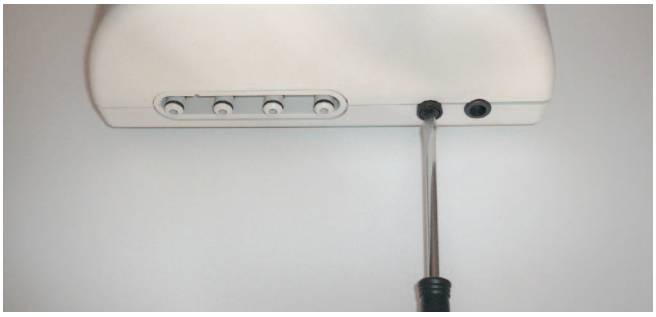
The following tools are required:

- Flat Head Screwdriver

The following replacement parts are required:

- T1AL/250V fuse

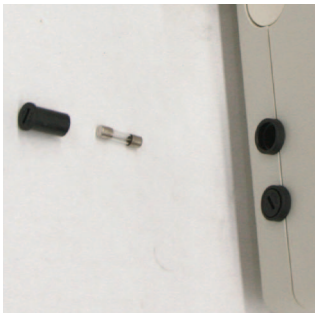
1 Switch off power supply to the Control Unit and remove the power cord from the electrical socket in the base of the unit.



2 Using a level surface, place the Control Unit on its base, with easy access to the black round fuse cap located on the side of the unit (closest to the connectors).

3 Insert a small screwdriver into the groove on the fuse cap and turn counter-clockwise in the direction of the arrow (quarter turn) to remove the fuse plug and single fuse.

4 Visually inspect the fuse – check if the metal filament inside the fuse cylinder is disconnected or snapped – and discard if damaged (or re-insert if undamaged).



5 Insert a new fuse (or the undamaged fuse) into the plug. Push against the force of the spring and turn clockwise with the screwdriver (quarter turn).

6 Reconnect the power cord to the Control Unit and switch on power supply. If Control Unit still fails to operate, the problem may be due to a faulty circuit board. Proceed to **Printed Circuit Board Check** procedure.

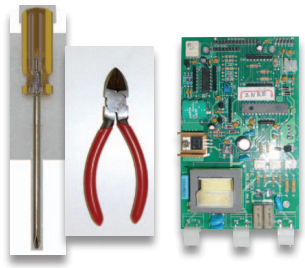
Printed Circuit Board (PCB) Check — Control Unit

Testing for a faulty circuit board by 'piggybacking' a working spare

If the Control Unit still fails to operate after checking and replacing a damaged fuse, the next step is to test the Printed Circuit Board (PCB) for failure.

To determine if the PCB has failed, always test the Control Unit using a working spare.

When handling the PCB, anti-static gloves (or other anti-static precautions) should be used to protect the PCB from static.



The following tools are required:

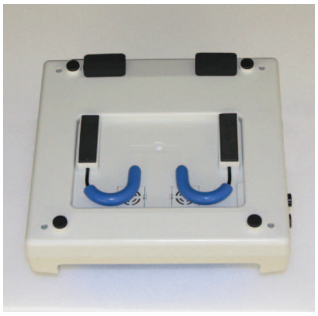
- Phillips Head Screwdriver*
- Wire Clippers*

The following spare parts are required:

- 1 x PCB (in known working condition)
- Cable Ties*
- 4 x Plastic Isolators

* not supplied by Invacare

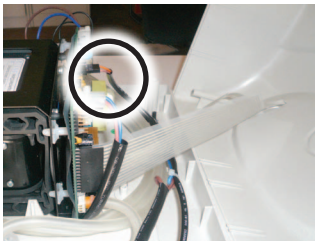
1 Switch off power supply to the Control Unit, disconnect the Air Pipes and remove the power cord from the electrical socket in the base of the unit.



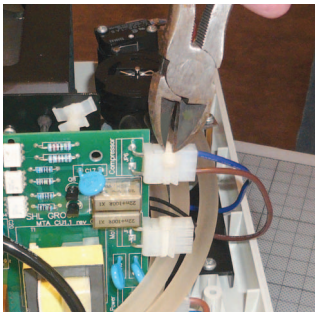
2 Using a soft cloth to protect the unit from damage, place the Control Unit on a level work surface with base facing upwards.

3 Use a Phillips Head Screwdriver to remove the four screws that secure the housing. Place the screws and washers in a safe place (such as small container or jar) to prevent loss. Hold the unit firmly and turn it over, face upwards on its base.

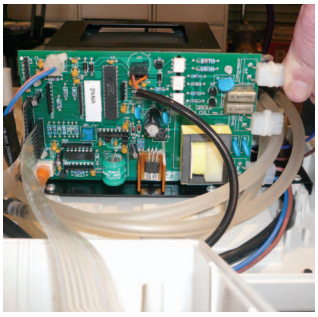
4 Gently loosen the top and bottom housing. Once loose, hold the power socket (IEC connector) to prevent from catching while lifting the top cover and leaning it back on your work surface.



Be careful not to drag the internal wires and tubing during this process. Before continuing, ensure no electrical leads are stretched and that all electrical connectors on the Printed Circuit Board (PCB) are firmly connected. You may need to prop the top housing case to prevent strain on the electrical cords.

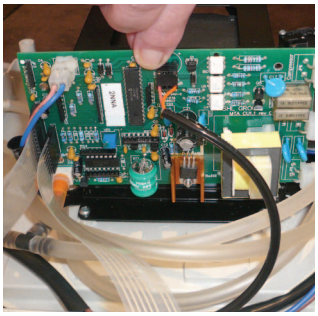


5 Disconnect the four electronic power leads by cutting the cable ties that secure the leads to the PCB. Carefully pull the plastic casing (not the wiring) to disconnect.



6 Disconnect the remaining three connections from the PCB (two flat digital leads and one air tube). Be sure to note the location of all eight connections on the circuit board for easy replacement.

Leave the disconnected PCB in the Control Unit during testing.



7 Take the working spare PCB and reconnect all eight leads into the corresponding connectors (eight electronic leads; two digital; one air pipe).

8 Reconnect mains power, switch on the Control Unit and check the Display Panel. If the unit now operates, the internal PCB has failed and needs replacing. Proceed to the **Printed Circuit Board Replacement** procedure for next steps.

If the Control Unit still does not operate, the unit needs to be returned to the Manufacturer for further repair or replacement.

a Switch off power supply to the Control Unit, remove the spare PCB and reconnect the internal PCB (reconnect the eight power leads to the circuit board) before closing the housing.

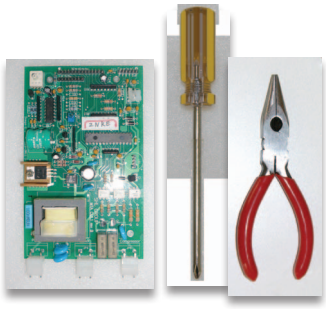
b Return the Control Unit to the Manufacturer in accordance with standard procedures.

Printed Circuit Board (PCB) Replacement — Control Unit

Replacing a faulty circuit board

Having established a fault with the PCB by following the Printed Circuit Board Check procedure detailed previously (steps 1 through 7), replace the faulty PCB with a new PCB.

When handling the PCB, anti-static gloves (or other anti-static precautions) should be used to protect the PCB from static.



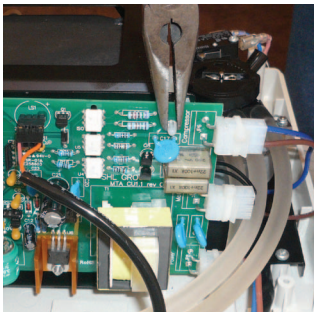
The following tools are required:

- Needle Nosed Pliers
- Phillips Head Screwdriver

The following replacement parts are required:

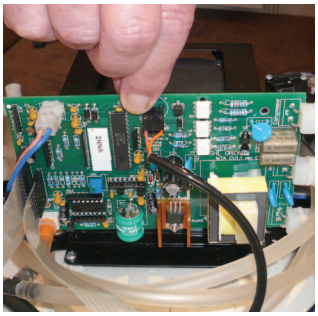
- 1 x PCB
- Cable Ties
- 4 x Plastic Isolators

8 Switch off power supply to the Control Unit before disconnecting the spare 'test' PCB. Disconnect all eight leads while noting the location of each lead on the circuit board.

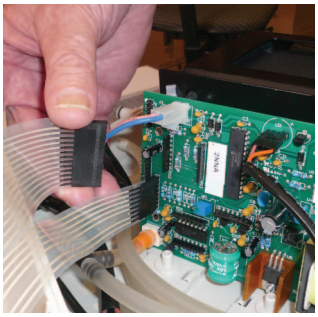


9 Using Needle Nosed Pliers, unclip the PCB from the top housing. Note the orientation of the PCB before removing it from the unit.

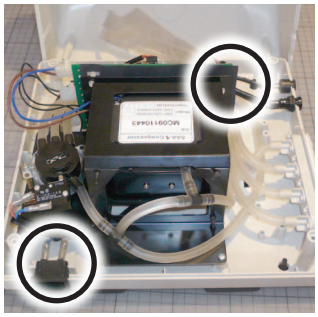
Dispose of the faulty PCB in an environmentally safe manner. If under warranty, return the PCB to the supplier.



10 Unpack the replacement PCB. Align the circuit board against the four holes and carefully reconnect the clips by pressing firmly into place.



11 Reconnect all eight leads into the corresponding connectors on the circuit board.



12 Before closing the housing, make sure all power leads and pipes are free from the side edges. Ensure the regulator tubing will not kink when the top cover is closed.

13 Align the top and bottom housing before slowly pushing closed. Ensure the seal is properly aligned around the housing, including the air pipe connectors, fuses and power connector.

14 Holding the top and bottom housing firmly together, turn the Control Unit upside down, with base facing upwards.

15 Use a Phillips Head Screwdriver to replace the four screws plus washers and tighten to secure the housing together.

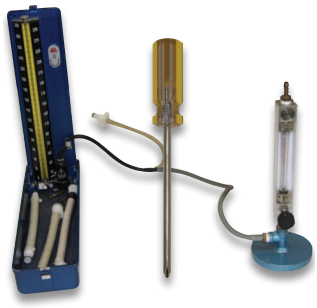
16 Connect the Control Unit to mains power and switch on the Control Unit to confirm operation.

Testing airflow and checking for a faulty compressor

The Control Unit compressor is designed for long life, and backed by a two-year warranty from the Manufacturer, however compressor failure can occur and will require replacement.

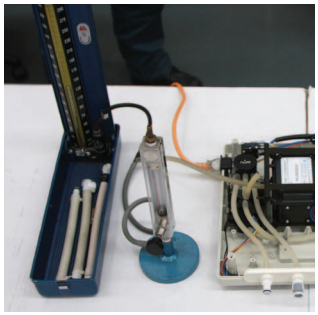
The Standard Pressure Test should be carried out to check the compressor is working at full operational capacity and that sufficient airflow is being generated to maintain maximum Mattress specifications. By directly connecting the compressor to the Pressure Test Equipment (Sphygmomanometer and Air Flow Meter), this test will confirm system pressure readings at maximum and minimum airflow (in free flow mode or with different degrees of back pressure applied). If the Pressure Test fails and pressure readings do not match required settings, the compressor should be replaced and the test repeated.

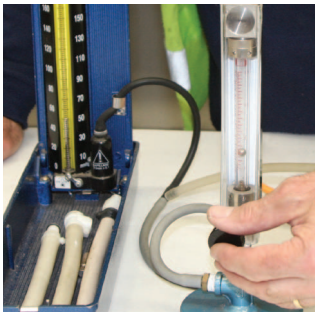
The Control Unit must be allowed to "warm up" before undertaking the Standard Pressure Test, to ensure the diaphragm inside the compressor has loosened and is operating at maximum capacity. After opening the unit, reconnect power and allow the system to run for a minimum of thirty minutes before commencing this test.



The following tools are required:

- Phillips Head Screwdriver
- Pressure Test Equipment
  - > Sphygmomanometer (mmHg reading)
  - > Air Flow Meter (Lpm reading)

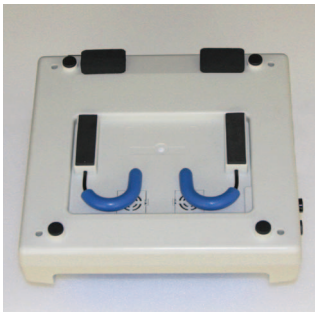




Pressure Test Equipment Set Up

One air pipe is connected to the rear of the Sphygmomanometer and another to the base of the Air Flow Meter. These two air pipes are then connected by a 'Y' piece to form a single air pipe outlet. Check all pipe attachments are secure before commencing the test. Initially set the equipment to free flow mode – ensure the airflow valve at the front of the Air Flow Meter is fully open (turn the valve clockwise to open).

1 Switch off power supply to the Control Unit, disconnect the Air Pipes and remove the power cord from the electrical socket in the base of the unit.



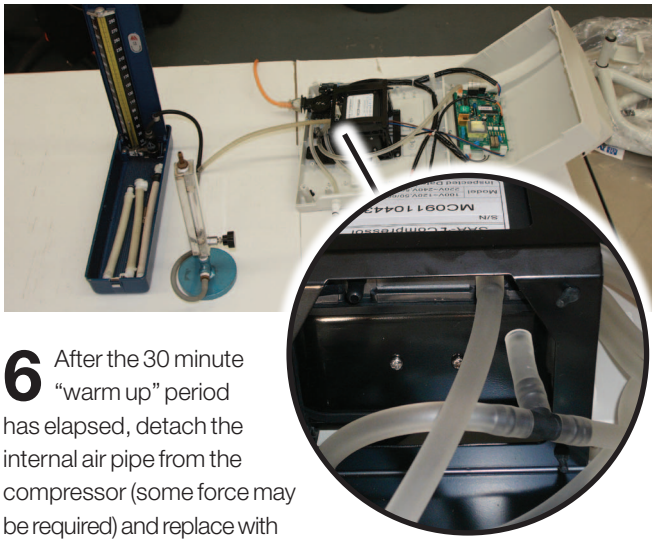
2 Using a soft cloth to protect the unit from damage, place the Control Unit on a level work surface with base facing upwards.

3 Use a Phillips Head Screwdriver to remove the four screws that secure the housing. Place the screws and washers in a safe place (such as small container or jar) to prevent loss. Hold the unit firmly and turn it over, face upwards on its base.

4 Gently loosen the top and bottom housing. Once loose, hold the power socket (IEC connector) to prevent from catching while lifting the top cover and leaning it back on your work surface.

Be careful not to drag the internal wires and tubing during this process. Before continuing, ensure no electrical leads are stretched and that all electrical connectors on the Printed Circuit Board (PCB) are firmly connected. You may need to prop the top housing case to prevent strain on the electrical cords.

5 Reconnect the Control Unit to mains power and switch on. The unit must run for a minimum of 30 minutes to "warm up" before pressure testing commences. Leave the unit in a safe place during the warm up period.



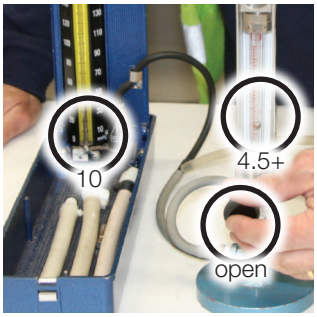
6 After the 30 minute "warm up" period has elapsed, detach the internal air pipe from the compressor (some force may be required) and replace with the air pipe from the Pressure Test Equipment (for directly connection to the compressor). Push the air pipe firmly until it fully covers the connector.

To check operational capacity of the compressor, test each pressure setting as outlined in the following steps.

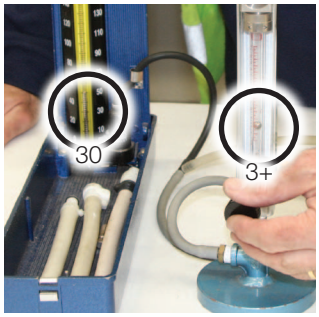
Base Pressure mmHg	Air Flow Lpm
>10	4.5+
30	3+
60	2+
120>	0

The table above summarises the expected pressure and air flow measurements. If air flow measurements fail to meet the specified minimum levels during any stage of the pressure test, the compressor is not operating at full capacity and needs to be replaced.

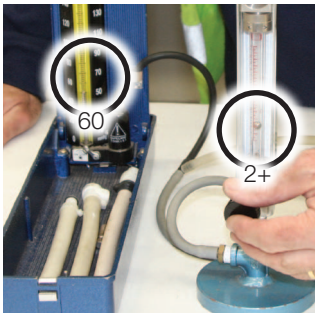
Remember that a 30 minute "warm up" period is required.



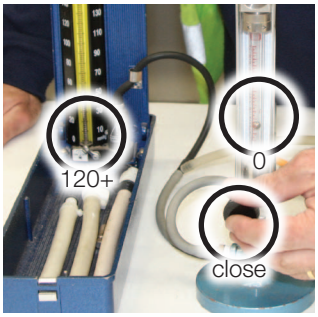
a Ensure the equipment is set to 'free flow mode' (i.e. no resistance or back pressure against the full flow of air from the compressor). The valve at the front of the Air Flow Meter should be fully open. If not, turn clockwise to open the valve to maximum. With the system in free flow mode, the ball bearing inside the Air Flow Meter should rise to a minimum of 4.5+ litres per minute. The Sphygmomanometer pressure reading should be low (approximately 10 mmHg).



b Slowly close the valve on the Air Flow Meter to reduce airflow air and simulate 'back pressure' (i.e. to emulate the weight of a patient lying on the mattress, which forces pressure back against the flow of air from the unit). Slowly close the valve until the Sphygmomanometer pressure reading reaches 30 mmHg. At 30 mmHg, the ball bearing inside the Air Flow Meter should drop to a minimum of 3+ litres per minute.

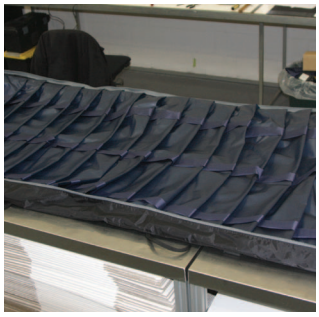


c Continue to increase back pressure resistance. Slowly close the valve on the Air Flow Meter until the Sphygmomanometer pressure reading reaches 60 mmHg. At 60 mmHg, the ball bearing inside the Air Flow Meter should drop to a minimum of 2+ litres per minute.

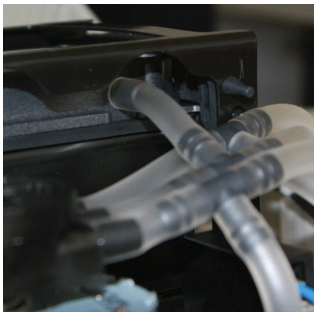


d Finish testing by fully closing the Air Flow Meter valve (maximum resistance). The ball bearing inside the Air Flow Meter should drop to 0 and the Sphygmomanometer pressure reading should rise to 120+ mmHg.

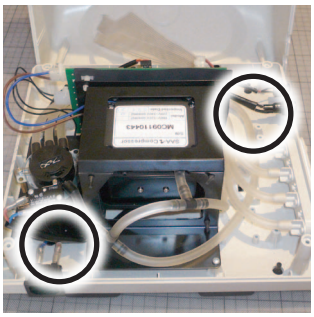
e If air flow measurements fail to meet the specified minimum levels during any stage of the pressure test, the compressor is not operating at full capacity and needs to be replaced. Proceed to **Compressor Replacement** procedure.



If all pressure and air flow measurements met the expected levels, the problem may be due to a leaking Air Cell or other defect with the Mattress. Close the Control Unit and proceed to **Mattress** procedures.

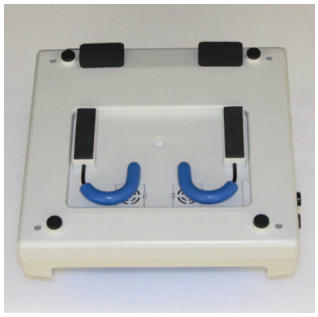


7 To close the Control Unit, first disconnect the Pressure Test Equipment air pipe from the compressor and reattach the internal air pipe, using gentle pressure to ensure a firm fit.



8 Before closing the housing, make sure all power leads and pipes are free from the side edges. Ensure the regulator tubing will not kink when the top cover is closed.

9 Align the top and bottom housing before slowly pushing closed. Ensure the seal is properly aligned around the housing, including the air pipe connectors, fuses and power socket.



10 Holding the top and bottom housing firmly together, turn the Control Unit upside down, with base facing upwards.

11 Use a Phillips Head Screwdriver to replace the four screws plus washers and tighten to secure the housing together.

12 Connect the Control Unit to mains power and switch on the unit to confirm operation.

Replacing a faulty compressor

Having established a fault with the compressor by following the completing the Standard Pressure Test procedure detailed previously (steps 1 through 6), replace the faulty compressor with a new compressor.

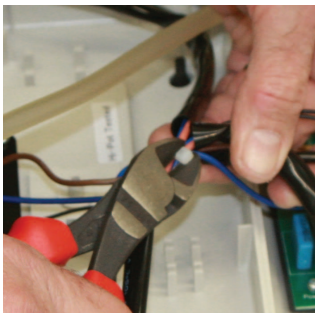
The following tools are required:

- Wire Clippers (or sharp knife)
- Needle Nosed Pliers
- Phillips Head Screwdriver

The following replacement parts are required:

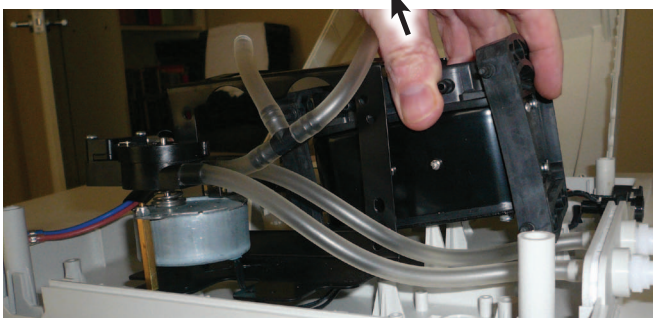
- 1 x Compressor
- 1 x Cable Tie

7 Switch off power supply to the Control Unit and remove the power cord from the electrical socket in the base of the unit before disconnecting the Pressure Test Equipment air pipe.

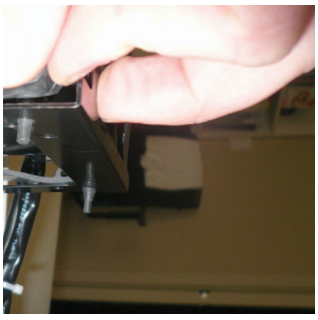


8 Using Wire Clippers (or a sharp knife) carefully cut and remove the cable tie securing the power leads between the two halves of the unit.

9 Check the internal compressor power lead and air pipe is disconnected before removing the eight rubber mounts that secure the compressor within the metal cage. It is easier to extract each mount using a pair of needle nosed pliers to gently twist free rather than pulling directly with force. If rubber mounts break, make sure all pieces are removed from inside the unit. Undamaged mounts can be reused.



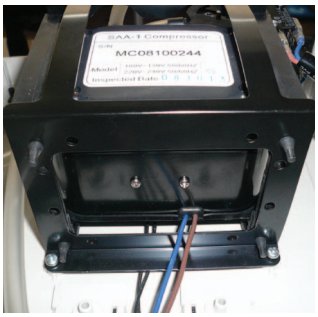
10 Using a Phillips Head Screwdriver loosen the two screws at the end of the cage furthest from the air pipe inlets. Then remove the screws closest to the air pipe inlets, placing carefully aside. Tilt the cage upwards to slide the compressor over the housing struts. Ensure the compressor power lead does not get caught in the process. Dispose of the faulty compressor in an environmentally safe manner. If under warranty, return the compressor to the supplier.



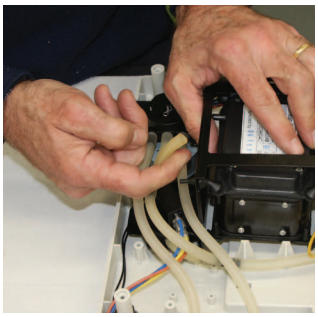
11 Unpack the replacement compressor. Carefully thread the power lead through the base of the cage before sliding the new compressor into position (with power lead closest to the PCB, and air pipe connector positioned towards base). Replace the two screws before tightening the loosened screws

12 Secure the compressor to the metal cage by connecting the eight new rubber mounts, starting with four mounts on one side of the cage (bottom followed by top), then four mounts on opposite side.

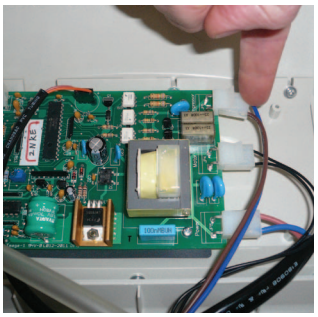
When connecting mounts, it helps to prop or hold the compressor within the cage to better align the mount holes. Insert the tapered end of the rubber mount through the corresponding hole in the cage, gently pushing through until the mount can be twisted around the nose of the pliers and pulled firmly into place.



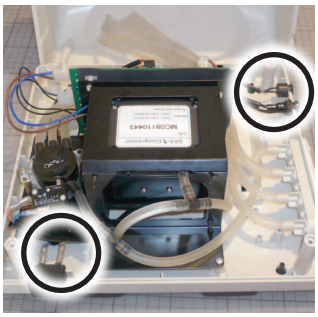
13 Visually check that each mount is secure – gently move the compressor within the cage to ensure all mounts are connected and the compressor is correctly suspended with the metal cage.



14 Reattach the air pipe to the compressor, using gentle pressure to ensure a firm fit.

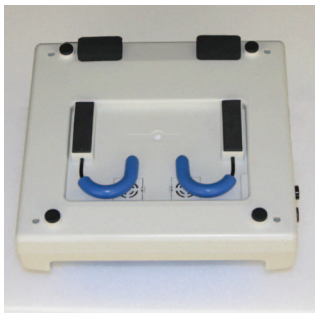


15 Reconnect the compressor power lead to the circuit board and attach a new cable tie to secure all power leads as before. Retest the compressor to make sure the replacement is working.



16 Before closing the housing, make sure all power leads and pipes are free from the side edges. Ensure the regulator tubing will not kink when the top cover is closed.

17 Align the top and bottom housing before slowly pushing closed. Ensure the seal is properly aligned around the housing, including the air pipe connectors, fuses and power connector.



18 Holding the top and bottom housing firmly together, turn the Control Unit upside down, with base facing upwards.

19 Use a Phillips Head Screwdriver to replace the four screws plus washers and tighten to secure the housing together.

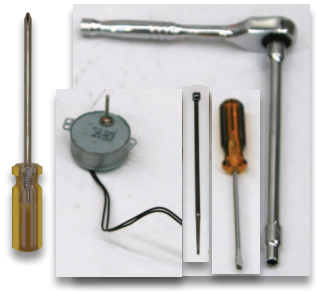
20 Connect the Control Unit to mains power and switch on the Control Unit to confirm operation.

Synchronous Motor Replacement — Control Unit

Replacing a faulty synchronous motor

The synchronous motor runs the rotovalve that operates the timing mechanism for the alternation cycle. If the rotovalve becomes worn or damaged it no longer spins smoothly and the unit will emit a distinct 'grinding' noise.

If you hear an uncharacteristic noise from the motor when the Control Unit is switched on, the synchronous motor needs to be replaced.



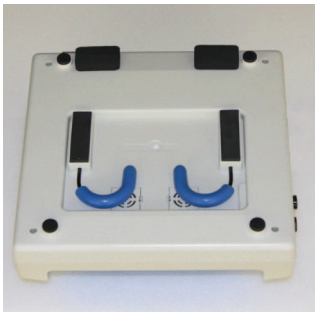
The following tools are required:

- Phillips Head Screwdriver
- Wire Clippers (or sharp knife)
- Flat Head Screwdriver (small)
- 7/32 Inch Socket Wrench

The following replacement parts are required:

- 1 x Synchronous Motor
- 1 x Cable Tie

1 Switch off power supply to the Control Unit, disconnect the Air Pipes and remove the power cord from the electrical socket in the base of the unit.

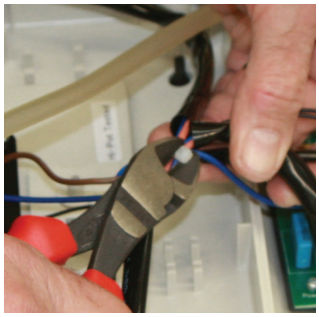


2 Using a soft cloth to protect the unit from damage, place the Control Unit on a level work surface with base facing upwards.

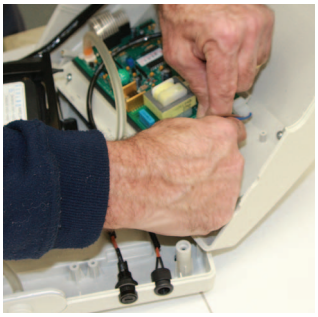
3 Use a Phillips Head Screwdriver to remove the four screws that secure the housing. Place the screws and washers in a safe place (such as small container or jar) to prevent loss. Hold the unit firmly and turn it over, face upwards on its base.

4 Gently loosen the top and bottom housing. Once loose, hold the power socket (IEC connector) to prevent from catching while lifting the top cover and leaning it back on your work surface.

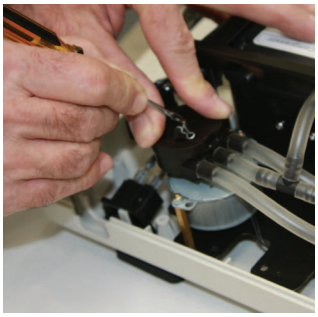
Be careful not to drag the internal wires and tubing during this process. Before continuing, ensure no electrical leads are stretched and that all electrical connectors on the Printed Circuit Board (PCB) are firmly connected. You may need to prop the top housing case to prevent strain on the electrical cords.



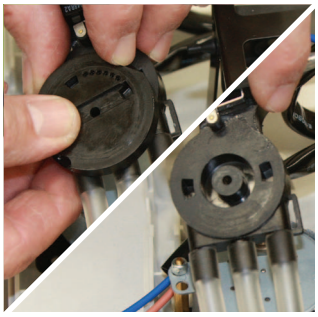
5 Using Wire Clippers (or a sharp knife) carefully cut and remove the cable tie securing the power leads between the two halves of the unit.



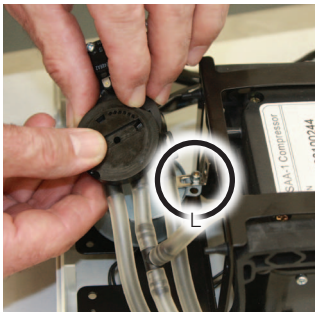
6 Trace the power lead running from underneath the synchronous motor to its connection on the circuit board. Disconnect this lead from the circuit board by carefully pulling the plastic casing (not the wiring) and gently remove the lead from under the compressor cage and leave it free.



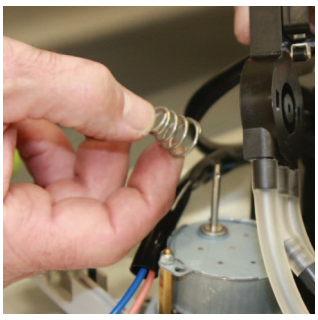
7 Using thumb and forefinger, push down firmly on the plastic rotovalve casing to release tension while removing the split pin – a deal of downward pressure is required. While maintaining downward pressure, take a small screwdriver or other implement to gently lift the split pin from the top of the motor shaft. Place the pin in a safe place for future replacement.



The rotovalve is made of two plastic circular casings held together by lubricant material, and should remain attached during removal. If the top casing comes free during this process, place in a safe place until time to replace the rotovalve, when it can be reattached.



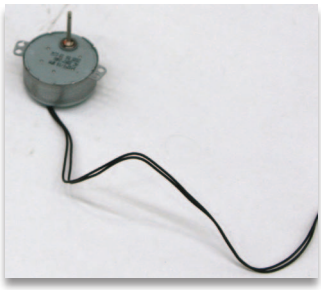
8 Gently lift the plastic rotovalve up and over the shaft, sliding the 'L' shaped metal bracket through the black plastic handle at the side of the rotovalve, to reveal the spring and synchronous motor beneath.



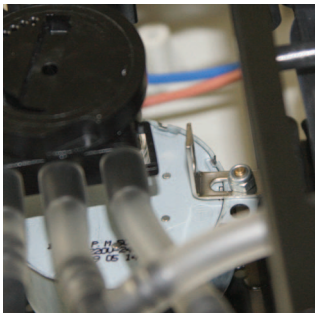
9 Remove the spring and place it in a safe place for future replacement.

10 Using the socket wrench, unscrew the two bolts that hold the motor in place, noting the position of both the bolts and the 'L' shaped metal bracket (closest to the compressor). This bracket helps secure the plastic rotovalve casing to the motor and should also be removed and placed in a safe place with bolts for future replacement.

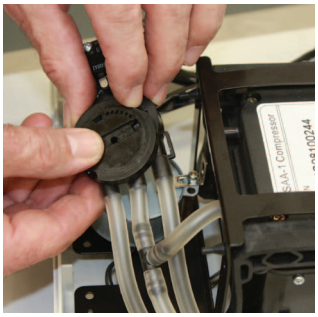
11 Lift the motor off its mounts and remove, ensuring the power lead does not get caught in the process. Dispose of the faulty motor in an environmentally safe manner. If under warranty, return the motor to the supplier.



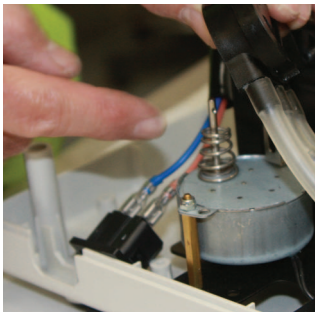
12 Unpack the replacement motor. Carefully thread the power lead under the base of the compressor cage before repositioning the new motor over the shaft and on its mounts, ensuring bolt holes are correctly aligned.



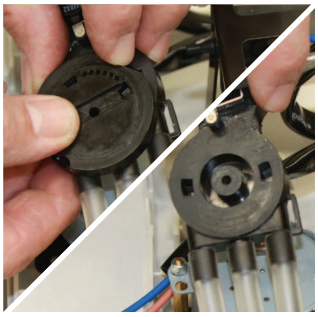
13 Replace the 'L' shaped metal bracket over the bolt hole closest to the compressor – it must be positioned to accommodate the plastic handle on the rotovalve. If not correctly positioned, the rotovalve will move during operation.



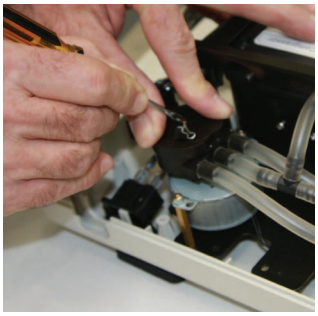
14 To test correct alignment of the motor and bracket, insert both bolts to secure the motor but finger tighten only. Gently place the rotovalve over the shaft to check the 'L' shaped bracket is correctly positioned to slide through the plastic handle at the side of the rotovalve. Once alignment is verified, remove the rotovalve and using the 7/32 inch socket wrench, tighten both bolts to firmly secure the motor in place. Be careful not to overtighten.



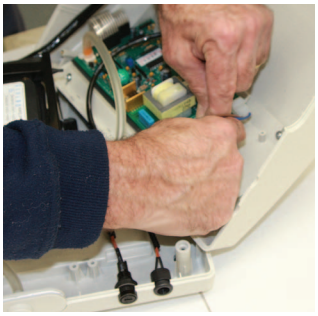
15 Reposition the spring over the shaft, wider coils at the base (finer coils on top).



16 If the top plastic casing of the rotovalve has come lose, reposition it and hold firmly in place before replacing the rotovalve over the shaft, while sliding the 'L' shaped bracket through the plastic handle at the side of the rotovalve.



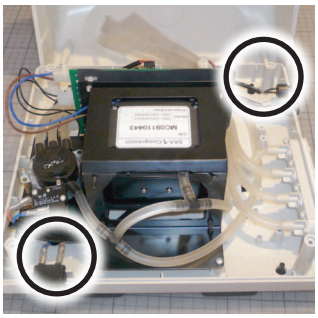
17 Firmly push down on the rotovalve while replacing the split pin through the top of the shaft. A significant amount of pressure is required to counteract the force of the spring.



18 Reconnect the motor power lead to the circuit board and attach a new cable tie to secure all power leads as before.

19 Test the motor before closing the housing. Connect the Control Unit to mains power and switch on to ensure the motor works and rotovalve is turning (with no adverse noise).

It the Control Unit fails to operate, the unit needs to be returned to the Manufacturer for further repair or replacement. Switch off power supply to the Control Unit before closing the housing. Return the Control Unit to the manufacturer in line with standard procedures.



20 Before closing the housing, make sure all power leads and pipes are free from the side edges. Ensure the regulator tubing will not kink when the top cover is closed.

21 Align the top and bottom housing before slowly pushing closed. Ensure the seal is properly aligned around the housing, including the air pipe connectors, fuses and power connector.

22 Holding the top and bottom housing firmly together, turn the Control Unit upside down, with base facing upwards.

23 Use a Phillips Head Screwdriver to replace the four screws plus washers and tighten to secure the housing together.

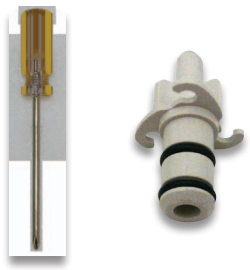
24 Connect the Control Unit to mains power and switch on the Control Unit to check function.

Connector Replacement — Control Unit

Replacing the air pipe connectors

Each of the four connectors on the side of the Control Unit can be removed and replaced in the event of damage or breakage.

In the event of more significant damage to the external plate that houses the four connectors, proceed to the **Connector Plate Replacement** procedure.



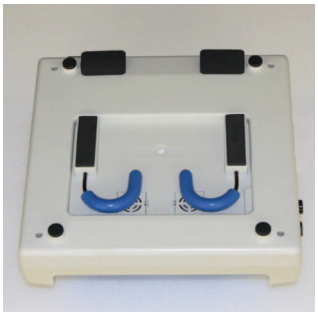
The following tools may be required:

- Phillips Head Screwdriver

The following replacement parts are required:

- Connector

1 Switch off power supply to the Control Unit, disconnect the Air Pipes and remove the power cord from the electrical socket in the base of the unit.

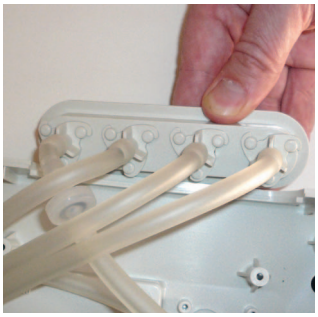


2 Using a soft cloth to protect the unit from damage, place the Control Unit on a level work surface with base facing upwards.

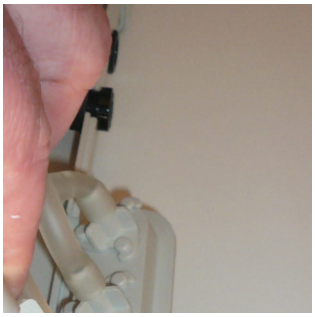
3 Use a Phillips Head Screwdriver to remove the four screws that secure the housing. Place the screws and washers in a safe place (such as small container or jar) to prevent loss. Hold the unit firmly and turn it over, face upwards on its base.

4 Gently loosen the top and bottom housing. Once loose, hold the power socket (IEC connector) to prevent from catching while lifting the top cover and leaning it back on your work surface.

5 Be careful not to drag the internal wires and tubing during this process. Before continuing, ensure no electrical leads are stretched and that all electrical connectors on the Printed Circuit Board (PCB) are firmly connected. You may need to prop the top housing case to prevent strain on the electrical cords.



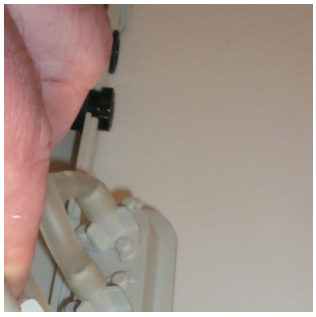
6 Gently loosen the Connector Plate from the side of the unit and hold firmly in one hand.



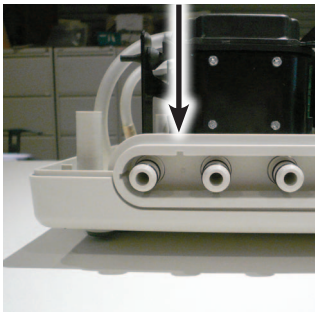
7 Remove the damaged connector from the Connector Plate by holding the base of the connector (at top of air pipe) and twisting counter clockwise to release the locking mechanism.

8 Detach the air pipe from the damaged connector by pulling firmly. Unpack the replacement connector and press firmly to reattach the internal air pipe as before. Ensure the pipe is secure and fully buttressed against the base of the connector.

You may want to carefully secure pipe using a gentle adhesive tape or cable tie to bind.

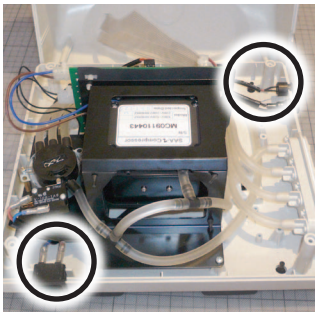


9 Refit the connector to the Connector Plate, twisting clockwise to lock into place. Repeat this process for other damaged connectors.



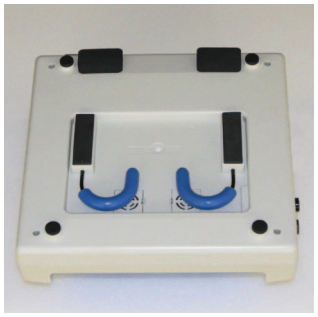
10 Reposition the Connector Plate into the side of the control unit.

Ensure the Connector Plate retains the correct orientation, with the groove (that aligns with the tongue on the Handle) positioned towards the top housing. This ensures the correct orientation of the Handle is maintained.



11 Before closing the housing, make sure all power leads and pipes are free from the side edges. Ensure the regulator tubing will not kink when the top cover is closed.

12 Align the top and bottom housing before slowly pushing closed. Ensure the seal is properly aligned around the housing, including the air pipe connectors, fuses and power connector.

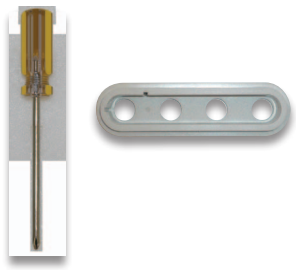


13 Holding the top and bottom housing firmly together, turn the Control Unit upside down, with base facing upwards.

14 Using the Phillips Head Screwdriver to replace the four screws plus washers and tighten to secure the housing together.

Replacing the Connector Plate

If the sunken Connector Plate is cracked or damaged it must be replaced.



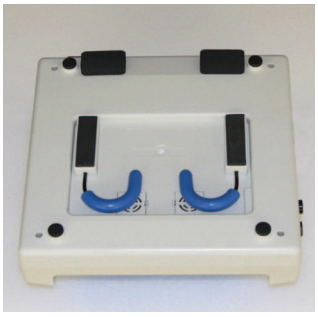
The following tools may be required:

- Phillips Head Screwdriver

The following replacement parts are required:

- Connector Plate

1 Switch off power supply to the Control Unit, disconnect the Air Pipes and remove the power cord from the electrical socket in the base of the unit.

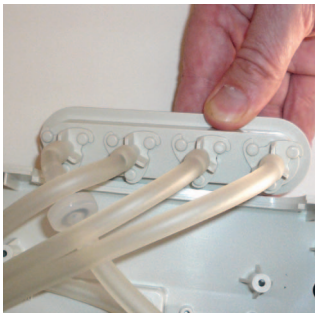


2 Using a soft cloth to protect the unit from damage, place the Control Unit on a level work surface with base facing upwards.

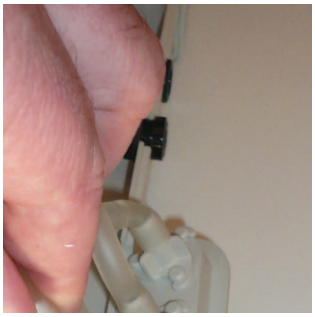
3 Use a Phillips Head Screwdriver to remove the four screws that secure the housing. Place the screws and washers in a safe place (such as small container or jar) to prevent loss. Hold the unit firmly and turn it over, face upwards on its base.

4 Gently loosen the top and bottom housing. Once loose, hold the power socket (IEC connector) to prevent from catching while lifting the top cover and leaning it back on your work surface.

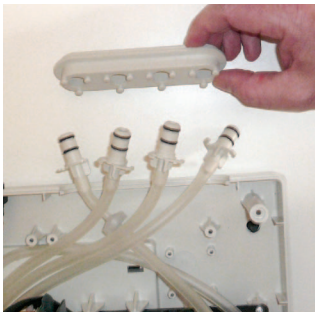
5 Be careful not to drag the internal wires and tubing during this process. Before continuing, ensure no electrical leads are stretched and that all electrical connectors on the Printed Circuit Board (PCB) are firmly connected. You may need to prop the top housing case to prevent strain on the electrical cords.



6 Gently loosen the Connector Plate from the side of the unit and hold firmly in one hand.

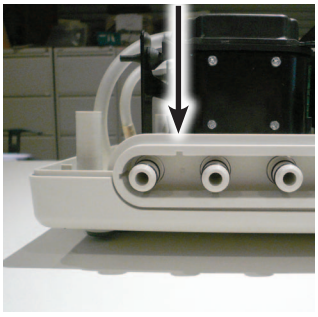


7 Detach all four connectors from the Connector Plate by holding the base of each connector (at top of air pipe) and twisting counter clockwise to release the locking mechanism. Be careful to maintain the correct order of the pipes or alternation sequence will be incorrect.



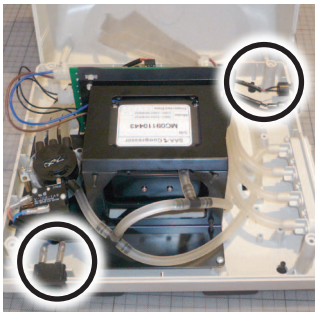
8 Unpack the replacement Connector Plate and refit all four connectors in the correct sequence, twisting clockwise to lock into place.

You may want to carefully secure pipes using a gentle adhesive tape or cable tie to bind.



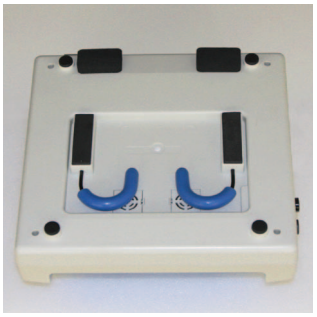
9 Reposition the Connector Plate into the side of the control unit.

Ensure the Connector Plate retains the correct orientation, with the groove (that aligns with the tongue on the Handle) positioned towards the top housing. This ensures the correct orientation of the Handle is maintained.



10 Before closing the housing, make sure all power leads and pipes are free from the side edges. Ensure the regulator tubing will not kink when the top cover is closed.

11 Align the top and bottom housing before slowly pushing closed. Ensure the seal is properly aligned around the housing, including the air pipe connectors, fuses and power connector.



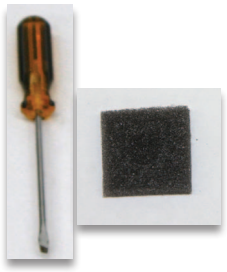
12 Holding the top and bottom housing firmly together, turn the Control Unit upside down, with base facing upwards.

13 Using the Phillips Head Screwdriver to replace the four screws plus washers and tighten to secure the housing together.

Cleaning and replacing the air filters

Good filter maintenance is critical to maintain the Control Unit in optimal operating condition. Failure to maintain clean filters may result in system downtime and increased repair costs. It is recommended that the air filter be replaced each year as a minimum.

Always check and replace air filters as part of any standard maintenance or service procedure.



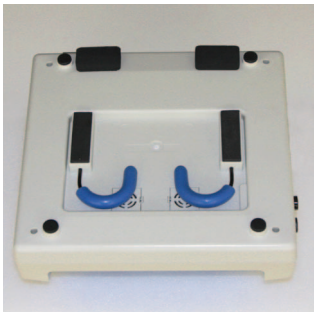
The following tools are required:

- Fine Flat Head Screwdriver

The following replacement parts are required:

- 2 x Filters

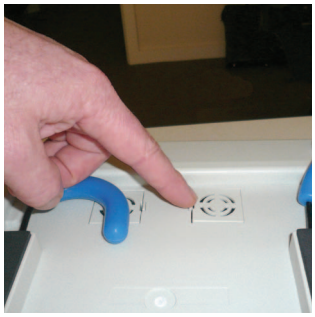
1 Switch off power supply to the Control Unit, disconnect Air Pipes and remove the power cord from the electrical socket in the base of the unit.



2 Using a soft cloth to protect the unit from damage, place the Control Unit on a level work surface with base facing upwards.

3 Using a suitable tool (such as 2mm flat head screwdriver), gently press the clip on each air filter cover to remove.

4 Remove each foam air filter for cleaning or replacement. The foam air filters and filter casings may be washed with soap and water. Rinse with plain water and dry thoroughly before returning to the Control Unit. Alternatively refit with a new filter (recommended annually).



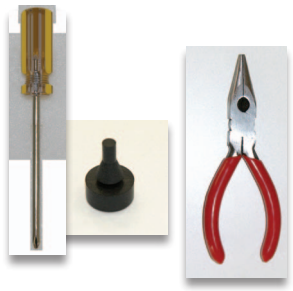
5 Replace both air filters and refit the filter covers, ensuring the clip snaps into place.

Rubber Feet Replacement — Control Unit

Replacing the rubber feet on the base of the unit

The Control Unit has four rubber feet at each corner of the base of the unit, to cushion the unit when hanging against the foot of the bed or standing on the floor or other stable surface. On occasion, these rubber feet will fall out or become damaged.

Missing or damaged rubber feet should be replaced to maintain the stability of the Control Unit.



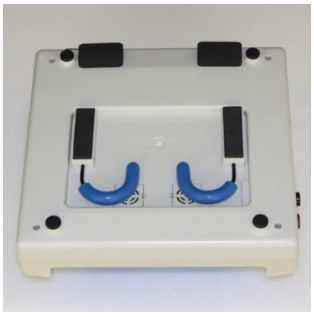
The following tools are required:

- Phillips Head Screwdriver
- Needle Nose Pliers

The following replacement parts are required:

- Rubber Feet

1 Switch off power supply to the Control Unit, disconnect Air Pipes and remove the power cord from the electrical socket in the base of the unit.



2 Using a soft cloth to protect the unit from damage, place the Control Unit on a level work surface with base facing upwards.

3 Use a Phillips Head Screwdriver to remove the four screws that secure the housing. Place the screws and washers in a safe place (such as small container or jar) to prevent loss. Hold the unit firmly and turn it over, face upwards on its base.

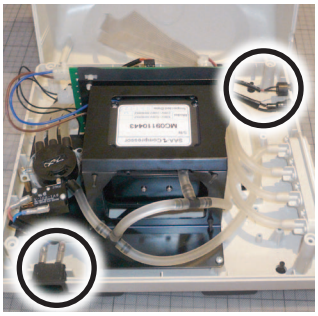
4 Gently loosen the top and bottom housing. Once loose, hold the power socket (IEC connector) to prevent from catching while lifting the top cover and leaning it back on your work surface.

5 Be careful not to drag the internal wires and tubing during this process. Before continuing, ensure no electrical leads are stretched and that all electrical connectors on the Printed Circuit Board (PCB) are firmly connected. You may need to prop the top housing case to prevent strain on the electrical cords.

6 Lift the bottom housing up to access the base of the unit. For damaged feet, use the Needle Nose Pliers to hold the rubber base and remove from the casing.

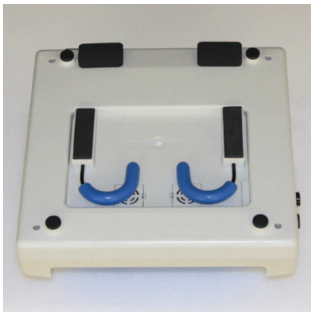
7 Unpack the replacement rubber feet. Insert the long nose of the rubber foot into the empty socket on the base of the unit (pushing from outside in).

8 Once through the hole, lay the bottom housing flat and use the Needle Nose Pliers to gently pull through until the rim of the foot locks into place. Move gently from side to side while pulling, rather than applying direct upward force, to avoid snapping the nose of the replacement foot.



9 Before closing the housing, make sure all power leads and pipes are free from the side edges. Ensure the regulator tubing will not kink when the top cover is closed.

10 Align the top and bottom housing before slowly pushing closed. Ensure the seal is properly aligned around the housing, including the air pipe connectors, fuses and power connector.



11 Holding the top and bottom housing firmly together, turn the Control Unit upside down, with base facing upwards.

12 Use a Phillips Head Screwdriver to replace the four screws plus washers and tighten to secure the housing together.

Hanging Hook Replacement

Replacing the hanging hooks on the base of the unit

Very rarely, the metal hanging hooks located on the base of the Control Unit will become damaged or worn. Either one or both hooks can be replaced.

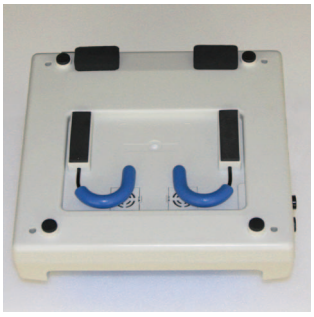
The following tools are required:

- Phillips Head Screwdriver

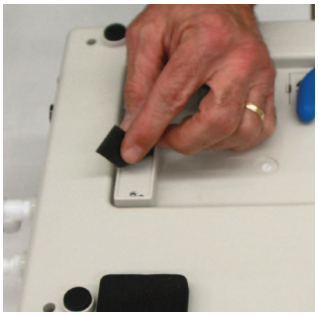
The following replacement parts are required:

- Hanging Hooks

1 Switch off power supply to the Control Unit, disconnect Air Pipes and remove the power cord from the electrical socket in the base of the unit.

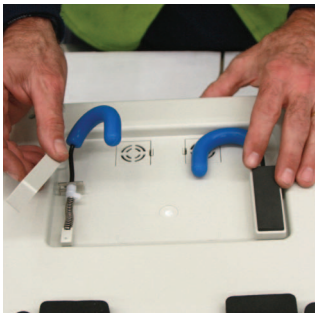


2 Using a soft cloth to protect the unit from damage, place the Control Unit on a level work surface with base facing upwards.



3 Gently peel back the two foam mounting strips to reveal the plastic housing beneath.

If careful enough, the foam mounts can be reused.



4 Use a Phillips Head screwdriver to unscrew the three screws that secure the plastic housing. Place the screws in a safe place (such as small container or jar) to prevent loss. Lift the plastic housing to reveal the spring connection.

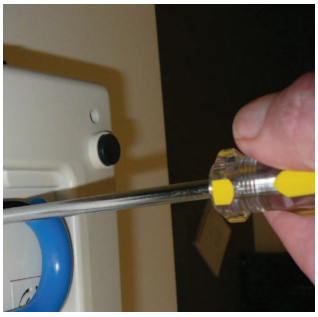
5 While holding the small silver bracket at the top of the spring with one hand, use the head of the hook to push against the spring and release the damaged hook. The hook will slide free from the spring and base mount.

6 Unpack the replacement hook and lay in position over the plastic bracket

Ensure the flat side of the teeth sit against the unit.

7 Slide the hook into the spring and push the hook into the base mount.

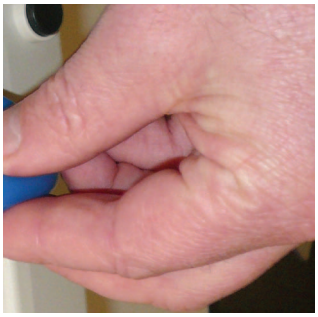
8 Insert the 'U' shaped silver bracket over the shaft, between the teeth and the plastic bracket.



9 Replace the plastic housing and use the Phillips Head Screwdriver to replace the three screws to secure.

10 Replace the foam mounting strip by aligning sticky side over housing and firmly pressing to adhere.

If the original foam mounting is destroyed, peel protective back off new foam mounting and adhere.



11 Check the smooth movement of the hooks.

Troubleshooting

The following section outlines a list of common troubleshooting issues, together with recommended initial checks and subsequent Technical Service steps and procedures to follow if there is a suspected fault in the System.

⚠ **If a repair seems unmanageable, the issue falls outside the scope of serviceable repairs or the problem persists following the recommended service checks and repair procedures, please return the faulty System (Control Unit; Mattress; or both) to the Manufacturer.**

Problem	Cause	Initial Checks	Technical Service Procedure
Control Unit does not operate; no display lights illuminate.	The Control Unit may not be attached to a power source. The power cord may be damaged. A fuse may need replacing.	1. Check the Control Unit is connected to mains power outlet with the correct voltage. 2. Check the Control Unit is switched on. Switch off and disconnect the unit before restarting. 3. Check the Control Unit with a spare power cord (in known working condition).	Control Unit Fuse Check and Replacement Control Unit Printed Circuit Board Check and Replacement
Control Unit operational but red Alarm LED illuminates (Mattress fails to reach or drops below accepted minimum level). Mattress fails to inflate.	The system may have an air leak. The Air Filters may need cleaning or replacing.	1. Check the Handle is securely attached to the Control Unit. 2. Check the CPR Tag is intact, ensuring all sealing connectors are fully fitted to the Mattress air pipes. 3. Check all pipes along the inside of the Mattress – each should be firmly connected. 4. Check each Air Cell and/or Side Bolster is securely attached to the connecting air pipe. 5. Check all cells, pipes and pipes for any air leakage. 6. Check air filter covers are secure and air filters are clean.	Control Unit Air Filter Maintenance Control Unit Compressor Check and Replacement
The Control Unit is 'grinding' or making an unusual noise.	The Synchronous Motor (timing motor) may be damaged.		Control Unit Synchronous Motor Replacement
The Mattress is inflated but static head cells are still deflated.	System may need more time to inflate – air pressure must build in alternating section before static head cells inflate. CPR Tag is not fully connected. Valves to static head cells may be damaged or cracked.	1. Check system has had sufficient time for initial inflation (40 to 50 minutes). 2. Check the CPR Tag is intact, ensuring all sealing connectors are fully fitted to the Mattress air pipes. 3. Visually check the internal Mattress air pipes that run from the CPR Tag to the static head cells for splits, cracks or other damage.	Return System to Manufacturer for further repairs or replacement.

Troubleshooting

Problem	Cause	Initial Checks	Technical Service Procedure
The Mattress is not alternating.	Static or Max Firm modes may be activated.	1. Switch the Control Unit off and disconnect the power before restarting. Ensure Alternating Mode is selected.	Synchronous Motor Replacement
Patient is sinking or "bottoming out" while lying flat on Mattress.	The pressure may be set too low for the patient's weight. The system may be losing pressure.	1. Increase Pressure Setting – an incremental increase is usually sufficient but wait 12 minutes (one full cycle) before checking. 2. Perform "bottoming out" test: a. With patient lying supine, fold back one side of the Mattress Top Cover just past sacral region (lower spine). b. Slide hand underneath the patient and feel for a deflated cell under the patient's lower spine. Any inner static cell will remain inflated however your hand should easily slide between patient and base. c. If patient is adequately suspended, pressure setting can be lowered however this test should be repeated after approximately 20 minutes.	Mattress Service Procedures

Control Unit alarm indicators			
Problem	Cause	Initial Checks	Technical Service Procedure
Alarm LED + audible alarm	Initial failure	1. Reset the alarm – turn off Power and press the Alarm Mute button. 2. Check the CPR Tag is intact, ensuring all sealing connectors are fully fitted to the Mattress air pipes. 3. Check all air pipes along inside of the Mattress and/or Side Bolsters – each should be firmly connected. Check each Air Cell and/or Side Bolster is securely attached to its connecting air pipe. 4. Check all cells, pipes and pipes for any air leakage. 5. Switch on Power.	Control Unit Fuse Check and Replacement Control Unit Printed Circuit Board Check and Replacement
Alarm LED + audible alarm	Pressure too low	1. Reset the alarm – turn off Power and press the Alarm Mute button. 2. Check the CPR Tag is intact, ensuring all sealing connectors are firmly fitted to Mattress air pipes. 3. Check all air pipes along inside of the Mattress – and/or Side Bolster each should be firmly connected. Check each Air Cell and/or Side Bolster is securely attached to its connecting air pipe. 4. Check all cells, pipes and pipes for any air leakage. 5. Check air filter covers are correctly secured and air filers are clean. 6. Switch on Power.	Control Unit Air Filter Maintenance Control Unit Compressor Check and Replacement
Alarm LED + audible alarm	Pressure too high	1. Reset the alarm – turn off Power and press the Alarm Mute button. 2. Disconnect the Handle to reduce pressure – reconnect when pressure has decreased. 3. Check for twists in the air pipes between Control Unit and Mattress. 4. Switch on Power.	Control Unit Standard Pressure Test
Alarm LED + audible alarm	Alternating Mode Failure (no alternation)	1. Reset the alarm – turn off Power and press the Alarm Mute button. 2. Disconnect the Handle to reduce pressure – reconnect when pressure has decreased.	Control Unit Standard Pressure Test
Alarm LED + audible alarm	Power down	1. Press the Alarm Mute button to silence the audible alarm. 2. Check the power cord is firmly plugged into the Control Unit; check the Control Unit is connected to mains power outlet with the correct voltage. 3. Check the Control Unit is switched on. Switch off and disconnect the unit before restarting. 4. Check the Control Unit with a spare power cord (in known working condition).	Control Unit Fuse Check and Replacement Control Unit Printed Circuit Board Check and Replacement

General Safety Precautions

Do not use this equipment in the presence of flammable anesthetics. Explosions could result.

The air intakes for the Control Units are at the sides of the unit. To avoid the risk of blocking these intakes, it is recommended that the unit be mounted on the footboard of a bed frame. Should the bed not have a suitable footboard, it is recommended that the unit be placed on a solid surface such as a table, or on the floor.

Protection Against Hazards

Fluids

Avoid spilling fluids on any part of the Control Unit.
If spills do occur:

- Disconnect the unit from the mains wall socket.
- Clean fluids from the case.

Ensure that there is no moisture in or near the power inlet, power switch and power plug before reconnecting the power supply.

- Check the operation of controls and other components in the area of the spill.
- Perform applicable checkout procedures.

Liquids remaining on the electronic controls can cause corrosion that may cause the electronic components to fail. Component failures may cause the unit to operate erratically, possibly producing hazards to patient and staff.

Disposal

Dispose of the Air Filter, Air Cells and Mattress Top Cover according to local procedures and regulations. At the end of useful life, dispose of waste according to the European Union Waste Electrical and Electronic Equipment (WEEE) Directive and in compliance with relevant local regulations.

Power Cord

The system should never be operated with a worn or damaged power cord. Should the power cord be found to be worn or damaged, replace immediately and dispose of the damaged cord.

Interference

Although this equipment conforms to the intent of the Directive IEC 60601-1-2 in relation to Electromagnetic Compatibility, all electrical equipment may produce interference. If interference is suspected, move equipment from sensitive devices or contact the Manufacturer. (IEC 60601-1-2. Medical Electrical Equipment – Part 1: General Requirements for Safety, Amendment No. 2. Collateral Standard: Electromagnetic Compatibility Requirements and Tests).

General Recommendations

Follow the Manufacturer's instructions as detailed below and in the applicable User Manual. Failure to do so may result in cross contamination or equipment damage.

To prevent cross contamination, the Manufacturer recommends that the system be cleaned and laundered between patients according to the instructions below.

Always disconnect the Control Unit from mains power before cleaning. Do not spray disinfectant directly on to the unit, or immerse the unit in any type of liquid. Failure do so could result in equipment damage and / or electric shock.

Do not use high temperature autoclave steam cleaning devices or phenolic based cleaning products. Use of either of these items could result in damage to equipment and/or loss of waterproof qualities of the Top Cover.

The System may be cleaned according to local protocols and regulations/procedures for blood borne pathogens provided the Manufacturer's instructions are followed.

Refer to the Top Cover wash tag for detailed cleaning instructions.

Cleaning While System in Use

The System should be cleaned every two weeks if in constant use.

Allow all parts to dry thoroughly before returning to use.

1. Remove patient from the System.
2. Unplug the Control Unit from mains power.
3. Remove the Top Cover.
4. Using a well wrung out cloth dipped in warm soapy water, wipe the surface of the Top Cover. Rinse with plain water and allow to dry.
5. Pull the CPR Tag and disconnect the Handle from the Control Unit to allow the Mattress to deflate completely.
6. Inspect the interior of the Mattress for any signs of fluid contamination.

If the interior of the Mattress shows signs of fluid contamination, inspect the Top Cover for punctures or damage.

If the Top Cover is damaged it should be replaced before returning the system to use.

If necessary for inspection or cleaning, the Air Cells may be removed by carefully disconnecting the air pipes and unsnapping the cell. It is not recommended that Side Bolsters be removed for cleaning.

7. Using a well wrung out cloth dipped in warm soapy water, wipe the Mattress base, Air Cells and Side Bolsters (where applicable). Rinse with plain water and allow to dry.
8. Using a well wrung out cloth dipped in warm soapy water, wipe the Control Unit, Handle and Air Pipes.

Do not allow fluid to penetrate the Control Unit.

9. If the Top Cover or Air Cells have become excessively soiled they may be laundered in a washing machine at up to 95°C using normal domestic washing powder.

Do not add bleach to the wash cycle. Rinse well using plain water and dry thoroughly before use.

Do not dry the Top Cover using the heat cycle or a dryer. Air dry or select a low of non-heat dry cycle.

Cleaning and Maintenance Between Patients

⚠ **Inspect all parts for damage and replace as necessary before returning to service.**

⚠ **Do not return the Control Unit to service without replacing air filters.**

⚠ **Do not allow fluid to penetrate the Control Unit.**

1. The Mattress should be dismantled according to the instructions on the previous page.
2. Launder the Top Cover and Air Cells as described on the previous page.
3. Using warm soapy water (or sodium hypochlorite solution at 10,000ppm) and a well wrung cloth, clean the Mattress, Control Unit, Handle, Air Pipes and Side Bolsters (where applicable). Rinse with plain water and allow to dry thoroughly.
4. Replace air filters (see the relevant Air Filter Maintenance procedure for details).

Definition of Symbols Used

The following symbols may appear in this manual, on the Control Unit, or on its accessories. Some of the symbols represent standards and compliances associated with the Control Unit and its use.

Caution: Warning of possible hazard to system, patient or staff.

Warning of possible electrical hazard.

Important operational information.

Authorized Representative in the European Community

Class II equipment

Manufacturer

SN **Specifies serial number**

Type B applied part

DISPOSAL: Do not dispose this product as unsorted municipal waste. Collection of such waste separately for special treatment is necessary.

Technical Specifications

Power input	AC 220-240VAC 50Hz, 0.2A or AC 100-120VAC 60Hz, 0.3A	
Fuse rating	T1AL250V	
Compressor	SAA-1	
Air distributor	Timing motor working as rotary valve	
Control system	Digital control system	
Power consumption	14 Watt (typical) / 20 Watt (maximum)	
Operation mode	Non-continuous	
Cycle control	Distributor valve supplying air to the inflatable cells	
Cycle time	10 minutes	
Pressure setting	18-60 ± 2 mmHg in 8 steps (6mmHg per step)	
Piping output	4	
Max. Load on mattress	180Kg	
Operating Environment	Air humidity	30% to 70%
	Ambient temperature	10ºC to 40ºC
Storage/Transportation Environment	Air humidity	10% to 70%
	Ambient temperature	-10°C to 60°C
Classification IEC60601-1	Class II equipment	
	Type B applied part	
	IPX0	
	Not category AP / APG equipment.	

Declaration – electromagnetic emissions- for all ME EQUIPMENT and ME SYSTEMS

Guidance and manufacture's declaration – electromagnetic emission This Control Unit is intended for use in the electromagnetic environment specified below.		
Emission test	Compliance	Electromagnetic environment – guidance
RF emissions CISPR 11	Group 1	This Control Unit only uses RF energy for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emission CISPR 11	Class B	This Control Unit is suitable suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Declaration – electromagnetic immunity

Guidance and manufacture's declaration – electromagnetic immunity This Control Unit is intended for use in the electromagnetic environment specified below.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floor are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/ burst IEC 61000-4-4	±2 kV for power supply lines	±2kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV line(s) to line(s)	±1 kV differential mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines EC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in UT) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the control requires continued operation during power mains interruptions, it is recommended that the Control Unit be powered from an uninterruptible power supply or a battery.
Power frequency (50Hz) magnetic field IEC 61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE	**U_T is the a.c. mains voltage prior to application of the test level.**		

Declaration – electromagnetic immunity – for ME EQUIPMENT and ME SYSTEMS that are not LIFE-SUPPORTING

Guidance and manufacture's declaration – electromagnetic immunity This Control Unit is intended for use in the electromagnetic environment specified below.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Conducted RF IEC 61000-4-6	3 V_{rms} 150 kHz to 80 MHz	3 V_{rms}	Portable and mobile RF communications equipment should be used no closer to any part of the CT515, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	**Recommended separation distance** $d = 1.167\sqrt{P}$ $d = 1.167\sqrt{P}$ 80 MHz to 800 MHz $d = 2.333\sqrt{P}$ 800 MHz to 2.5 GHz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1 **At 80 MHz and 800 MHz, the higher frequency range applies.**

NOTE 2 **These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.**

a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which this Control Unit is used exceeds the applicable RF compliance level above, the Control Unit should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Control Unit.

b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended separation distances between portable and mobile RF communications equipment and the EQUIPMENT or SYSTEM – for ME EQUIPMENT or ME SYSTEM that are not LIFE-SUPPORTING

Recommended separation distances between portable and mobile RF communications equipment and this alternating Control Unit.			
This Control Unit is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of this Control Unit can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the control as recommended below, according to the maximum output power of the communications equipment.			
Rated maximum output power of transmitter (W)	Separation distance according to frequency of transmitter (m)		
	150 KHz to 80 MHz $d = 1.167\sqrt{P}$	80 MHz to 800 MHz $d = 1.167\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.333\sqrt{P}$
0.01	0.117	0.117	0.233
0.1	0.369	0.369	0.738
1	1.167	1.167	2.333
10	3.689	3.689	7.379
100	11.667	11.667	23.333
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.			
NOTE 1 **At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.** **NOTE 2** **These guidelines may not apply in all situations.** **Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.**			

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