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FOR EXTERNAL USE

# carilex®

## SERVICE MANUAL

### Dual

Power Unit	Mattress
S2101-3011 Dual P.U. Cari US	S2101-2010 Dual M-Set 90cm Cari Dtx
S2101-3033 Dual P.U. Cari UK	S2101-2020 Dual M-Set 82cm Cari Dtx
S2101-3045 Dual P.U. Cari EU	S2101-2030 Dual M-Set 120cm Cari Dtx
S2101-3058 Dual P.U. Cari AU	S2101-2050 Dual M-Set 107cm Cari Dtx
	S2101-2070 Dual M-Set 36x80 Cari Qlt
	S2101-2080 Dual M-Set 36x84 Cari Qlt
	S2101-2110 Dual M-Set 90x220cm Cari Dtx
	S2101-2120 Dual M-Set 82cm Cari Qlt

Please read and understand Dual Mattress Replacement/Overlay System's "Operating and Service Manual" prior to using this service manual. This service manual is for qualified technicians only! If you have any questions, please contact your local distributor or email us at [info@carilex.de](mailto:info@carilex.de) for assistant.

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## 1.0 WARNINGS

- 1.1 Attention! Explosion risks if used in the presence of flammable anesthetics.
- 1.2 Do not insert items into any opening of the power unit. This could cause fire or electrical shock due to possible internal components' short circuit.
- 1.3 Attention! This product incorporates fuse only in the ungrounded phase conductor.
- 1.4 Do not immerse power unit in any liquids or spray any liquids directly on power unit. (IPX0)
- 1.5 The Carilex Products are Class II products. Do not cut or remove the grounding prong for shock prevention from the plug used on any Carilex products if it present. In the event that a non-compatible wall receptacle is found, it is customer's personal liability and obligation to contact a qualified electrician to replace it with a compatible wall receptacle in accordance with the National Electrical Code.
- 1.6 If you must use an extension cord, ONLY use an appropriate extension cord that has the same or higher electrical rating as the device being connected.

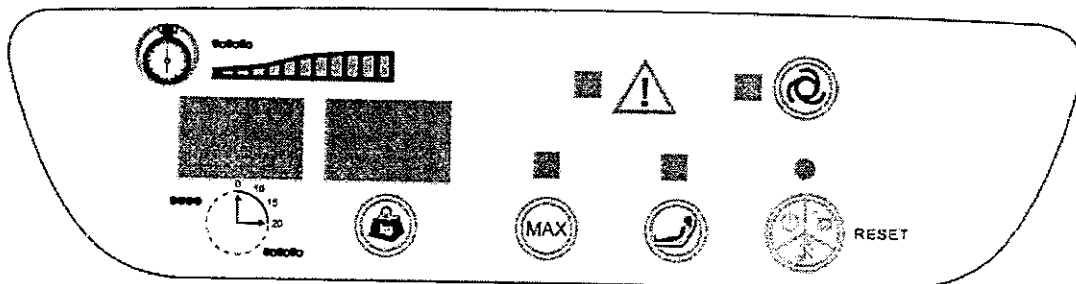
**\*\*Note:** Grounding reliability can only be achieved when plug is connected to an equivalent receptacle marked "Hospital Grade" or "Hospital Only".

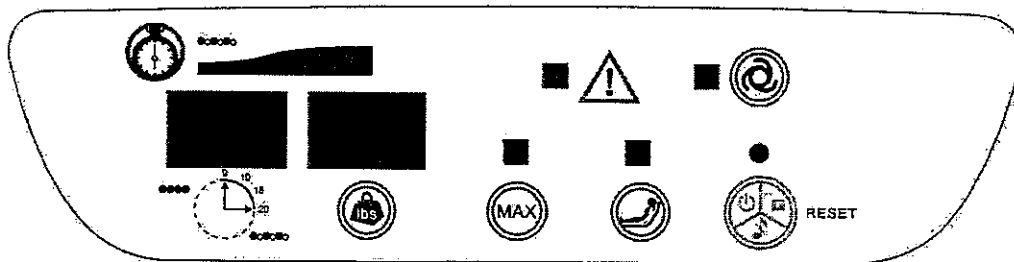
## 2.0 POWER UNIT CONTROL PANELS

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### 2.1 Dual Power Unit Control Panel Diagram

#### 2.1.1 S2101-3033/S2101-3045/S2101-3058





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## 3.0 PREVENTIVE MAINTENANCE

3.1 The Carilex products require very little preventative maintenance. The air filter should be checked once a year, if used in a difficult environment (smoke, dust) more often.. There are no tools necessary to change the filter.

### 3.2 To Clean The Air Filter:

- i) Remove filter from the rear of power unit by turning the cap.
- ii) If filter needs to be clean, gently wash with soap and water.
- iii) Thoroughly air dry before replacing.
- iv) Spare filters may be purchased from Carilex.

### 3.3 Replace Compressor:

- i) The life time of compressor varies upon environmental factors such as air condition, temperature, humidity, and so on...It is recommended to replace compressor once min. air flow reaches 8 liter/min., or min. air pressure reaches 90 mmHg (measure from air output of the compressor inside the power unit)
- ii) Unscrew the screws from the rear of power unit and open up the case.
- iii) Disconnect the wire connecting to power PCB.
- iv) Pull out the old compressor and replace with the new compressor.
- v) Connect the wire back to power PCB and screw back the case.
- vi) **\*\*Note:** Cigarette smoke can damage valve assembly and diaphragms of compressor. It is highly recommended not to smoke around the Carilex air products.

### 3.4 Replace Rotor Valve:

- i) Replace rotor valve every 2 years is recommended.
- ii) Unscrew the screws from the rear of power unit and open up the case.

- iii) Pull out the metal pin while holding the rotor valve down.
- iv) After the metal pin is pull out, simply remove the whole rotor valve.
- v) Re-insert the metal pin back after replacing the old rotor valve.
- vi) Please reassure everything is secured (especially the tube between pressure sensor and rotor valve) before screwing back the case.

## 4.0 ROUTINE MAINTENANCE

- 4.1 The Carilex products should be on a schedule of maintenance for function testing to ensure the system is working properly. Testing should be conducted annually and results should be recorded and filed.
- 4.2 Field maintenance function testing can be completed with the field testing kit from Carilex (Model S2507) with the following equipment:

Manometers (20-300 mmHg)

Flow meter (0-20 liters/min)

It is recommended to measure from air output of compressor inside the power unit, if air flow is lower than 8 liter/min, or pressure is lower than 90mmHg, please replace the compressor.

**\*\*Note:** Field maintenance function testing should only be performed by qualified technical personnel.

## 5.0 COMPONENTS' FUNCTIONS

### 5.1 Power PCB

- i) Transform ACV to DCV to be the power source of control PCB
- ii) Receive commands from control PCB to control motor and compressor's motions

### 5.2 Control PCB

- i) Control all functions of power unit
- ii) Power source for battery's recharging

### 5.3 Pressure Sensor (located on control PCB)

- i) Take the response of pressure from mattress and give IC software a signal to master compressor's motion continually

### 5.4 Chargeable Battery

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- i) Provide power to control PCB once power failure happens, which start the warning signal and buzzer
- 5.5 Compressor
  - i) Provide air inflation to Carilex's air mattress
- 5.6 Rotor Valve
  - i) Use its upper plate to differentiate the air for inflating the mattress depends on either Alternating or Static Mode be chosen
- 5.7 Motor Gear Box
  - i) Control by control PCB to drive rotor valve's motion
- 5.8 Photo Sensor
  - i) Detect the gap on the upper plate of rotor valve in order to provide power PCB signals for motor's motion



## 6.0 SYSTEM OPERATING CONCEPTS

- 6.1 When power on, motor gear box initially spinning two cycles in order for microprocessor to measure the distance between each gaps on the rotor valve. This action allows microprocessor to determine correct spinning time between each gap for different cycle time setting. After the initial two cycles, motor gear box will stop spinning at the position where the biggest gap located on the rotor valve, and then compressor start to pump air into both chambers of air mattress until its internal pressure reaches pre-programmed initial set up level.
- 6.2 Once air mattress's internal pressure reaches the initial set up level, microprocessor will drive motor gear box to spin and stop at the next gap where air start inflating and deflating regularly into each chambers -- alternating mode starts.
- 6.3 Air mattress' internal pressure is detecting by a pressure sensor on control PCB. Microprocessor will turn on/off compressor according to the feedback of pressure sensor in order to keep optimum internal pressure to meet different comfort need (patients' weight).
- 6.4 During alternating mode, "cycle timer" LED indicates the remaining time for each air alternating cycle .
- 6.5 Low pressure alert
  - i) In alternating mode – pressure sensor detects air mattress's internal pressure 5 seconds ahead of time before the rotor valve spins to change inflating set of air cells. If internal pressure is lower than 5mmHg,

- “alert” LED will lit with buzzer for alarming.
- ii) In static mode – pressure sensor detects air mattress’s internal pressure every 20 minutes.
  - iii) Low pressure alert function in the initial 35 minutes mattress internal pressure can’t be inflated to setting pressure after power turn on.
  - iv) To mute low pressure alarm, press mute. The buzzer will switch off, but LED stays lit. Once low pressure alarm is muted, alarm stays mute. If reason for low pressure is gone, alarm will vanish.
- 6.6 When “firm” mode selected, microprocessor will drive motor gear box to spin and stop at the position where command compressor to pump air into both chambers of air mattress, the internal pressure will go up to the highest pre-programmed level which harden air cells to provide convenience for nursing and therapy purpose. “firm” mode stays only 20 minutes and then back to original setting automatically.
- 6.7 The “upright” mode is designed for the purpose of increasing air mattress’s internal pressure by 10% before nurse set the patient to head-up position to avoid patient from bottoming out.
- 6.8 If power supply break off abnormally, chargeable battery will turn power LED to orange color with buzzer to advise the failure. You may press Power/Mute button to mute the buzzer.
- 6.9 “Pressure monitoring” LED lights when compressor is pumping.

## 7.0 TROUBLESHOOTINGS

**Caution:** Do not work, nor attempt to work on the power unit unless you are properly qualified to do so; unqualified personnel attempting to work on this power unit may risk serious injury to themselves and others, and possibly death by electrocution.

**Attention:** Always make sure power cord is well connected to both power unit's socket and wall receptacle before troubleshooting.

- 7.1 Rocker switch on, machine doesn't function after “power/ mute” button pressed
- a) Check if power cord is well connected to power unit's socket
  - b) Check if power cord is well connected to an appropriate wall receptacle

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- c) Check if fuse is burned out
    - \* If the power cord equipped with your power unit has fuse within, please check it as well
  - d) If all above checked, and no function, please replace both control and power PCBs
- 7.2 Power on, but machine function with LED display off
- a) Check if power PCB's electric wire is well connected to control PCB
  - b) Check power PCB's connectors on control PCB with multi-meter to see if correct voltage supplied
  - c) If all above checked, and no function, please replace power PCB
- 7.3 Power on, but control panel doesn't function properly
- a) Check if power PCB's electric wire is well connected to control PCB
  - b) Check power PCB's connectors on control PCB with multi-meter to see if correct voltage supplied
  - c) If above checked, and no function please replace power PCB
  - d) If all above checked, and no function please replace control PCB
- 7.4 "Power/mute" LED lights, machine function with "pressure monitoring" LED off
- a) Check if power PCB's electric wire is well connected to control PCB
  - b) Check if compressor is functioning
  - c) If all above checked, and no function, please replace power PCB
- 7.5 "Power/mute" LED lights, but compressor doesn't function properly
- a) Check if power PCB's electric wire is well connected to control PCB
  - b) Check if compressor is receiving the correct voltage from power PCB.
  - c) Disconnect the tube connecting from rotor valve to pressure sensor to see if it is pressure sensor failure
  - d) If compressor doesn't function properly, please replace compressor
  - e) If all above checked, and compressor still doesn't function properly, please replace power PCB
- 7.6 Low pressure alert on with failure
- a) Check if the tube connecting from rotor valve to pressure sensor is intact and well connected
  - b) Check if rotor valve has a leakage by taking off the tube connecting to pressure sensor in order to measure both air input and output from rotor valve

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- c) Check if all tubes connecting through rotor valve are intact and well connected. Please check if rotor valve is working correctly. After the system is turned on, the integrated photo sensor will detect one of the gaps on the turning disc while it is rotating. If the photo sensor is working properly, the turning disc will stop at a position where a gap on the turning disc is exactly below the photo sensor. The gap cannot be identified if the photo sensor is blocked by dust, or it is showing a constant voltage when multi-meter is used. If this occurs, the turning disc will stop after 30 seconds and low pressure alert will light. If this occurs, please replace the rotor valve. If the rotor valve is working correctly, please replace the control PCB.
  - d) Check if any of mattress' air cell has a leakage (please refer to 8.0 Mattress Failure Checking Procedure)
  - e) Check if air connecting tubes from power unit to air mattress are well connected and well connected
  - f) Check if all air connecting tubes within air mattress are well connected without any bending
  - g) If all above checked, and no function, please replace control PCB
- 7.7 Mattress can't be fully inflated
- a) Check power unit's air output (min. 8 liters/min.), if under the minimum output, please refer to 3.2 To Clean The Air Filter
  - b) If air still under the minimum output, please replace compressor
  - c) Check if rotor valve has a leakage by taking off the tube connecting to pressure sensor in order to measure both air input and output from rotor valve
  - d) Check if all tubes connecting through rotor valve are intact and well connected
  - e) Check if any of mattress's air cell has a leakage, please refer to 8.0 Mattress Failure Inspection Procedure
  - f) Check if air connecting tubes from power unit to air mattress are well connected.
  - g) Check if all air connecting tubes within air mattress are well connected without any bending
  - h) If mattress still can't be fully inflated, it could be "Alternating function failure", please refer to 7.8 Alternating Function Failure

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- i) If all above checked and the mattress still can't be fully inflated, may be the reason of pressure sensor malfunction, please replace power PCB
- 7.8 Alternating Function Failure (Motor gear box is not functioning)
- a) Check if motor gear box's electric wire is well connected to control PCB
  - b) Check motor gear box's connectors on control PCB with multi-meter to see if correct voltage supplied
  - c) If all above checked and no function, please replace motor gear box

## 8.0 MATTRESS FAILURE INSPECTION PROCEDURE

Mattress failure may cause low pressure alert failure and also the mattress can't be fully inflated. Please use inspection procedures in this section for mattress failure inspection

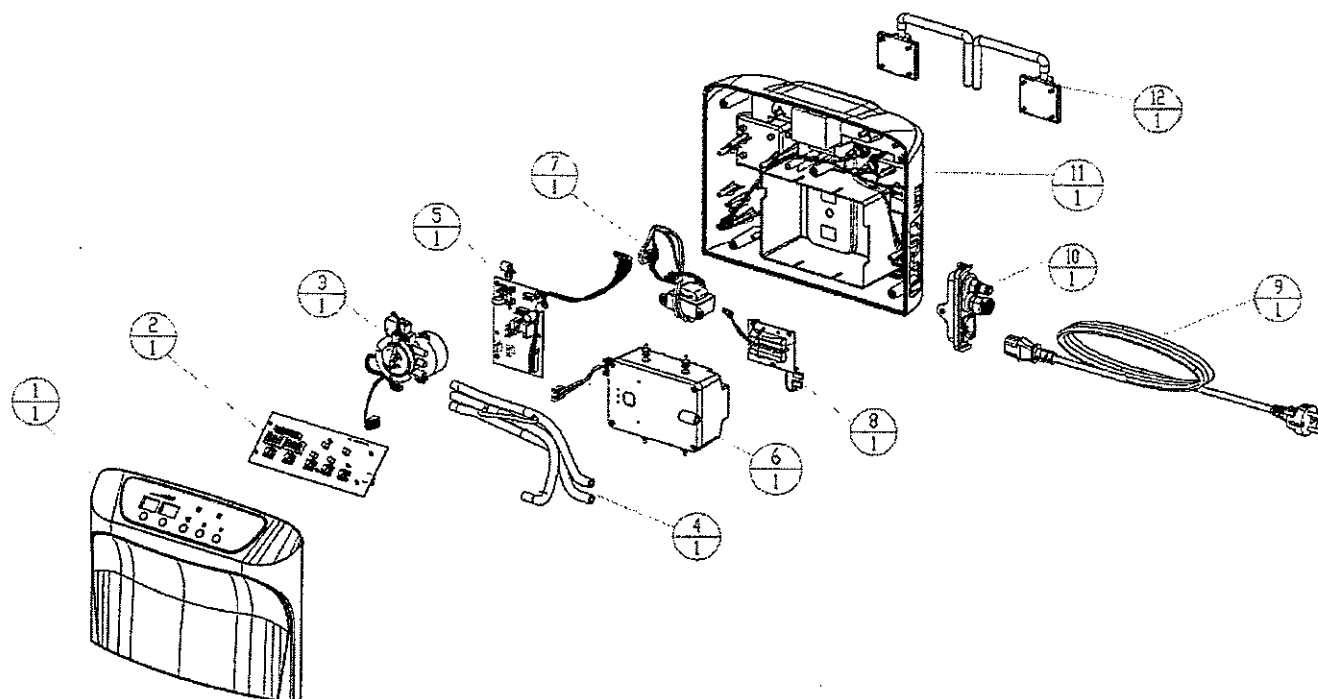
- 8.1 Check if connecting tubes are bended or leaked?
- a) Check if there's any bended tube by sight
  - b) Check if there's any leaked tubes (most leakage happens on the joint) by:
    - i) Using your hand to move through all tubes to feel if there's an air leakage
    - ii) Using soapsuds spray on the surface of the tubes to see if there's any bubble appears showing the leakage location
- 8.2 Check if air cells have leakage?
- a) Check if there's a leakage by putting the squeeze on each individual air cells.
  - b) **\*\*Note:** Ventilated air cells do have small air vents on them which do not cause low pressure alert failure. Please replace air cells if any visible holes or crevices are observed.

## 9.0 ENGINEERING DRAWINGS/PARTS LIST

Please use the following chart for each model part numbers, the most updated versions will be provided once change occurs. Please always refer to the most updated version.

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## 9.1 Dual Power Unit drawing



ART.#S2101-3011 Dual P.U. Cari US

Item	Part number	Part name	Q'ty
1	SC-P01-210117	Dual Top Case	1
2	S-LTC-P04-36001	Control PCBA -8	1
3	S-LTC-P06-36001	Rotor Valve -11	1
4	S-LTC-P07-36001	Silicon Tube -15	1
5	S-LTC-P11-3X001	Power PCBA -1	1
6	S-LTC-P05-36001	Compressor Set -1	1
7	S-LTC-P08-00001	Transformer Set -3	1
8	S-LTC-P10-00001	Battery Set -1	1
9	714-328B-S50	Power Cord	1
10	S-LTC-P03-36001	Side Panel Set -4	1
11	S-LTC-P02-36001	Bottom Case -9	1
12	S-LTC-P09-36001	Hanging Hook Set-1	1

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## ART.#S2101-3033 Dual P.U. Cari UK

Item	Part number	Part name	Q'ty
1	S-LTC-P01-36004	Dual Top Case	1
2	S-LTC-P04-36002	Control PCBA -8	1
3	S-LTC-P06-36002	Rotor Valve -11	1
4	S-LTC-P07-36001	Silicon Tube -15	1
5	S-LTC-P11-3X001	Power PCBA -1	1
6	S-LTC-P05-36002	Compressor Set -1	1
7	S-LTC-P08-00003	Transformer Set -3	1
8	S-LTC-P10-00001	Battery Set -1	1
9	712-0203-020	Power Cord	1
10	S-LTC-P03-36001	Side Panel Set -4	1
11	S-LTC-P02-36001	Bottom Case -9	1
12	S-LTC-P09-36001	Hanging Hook Set-1	1

## ART.#S2101-3045 Dual P.U. Cari EU

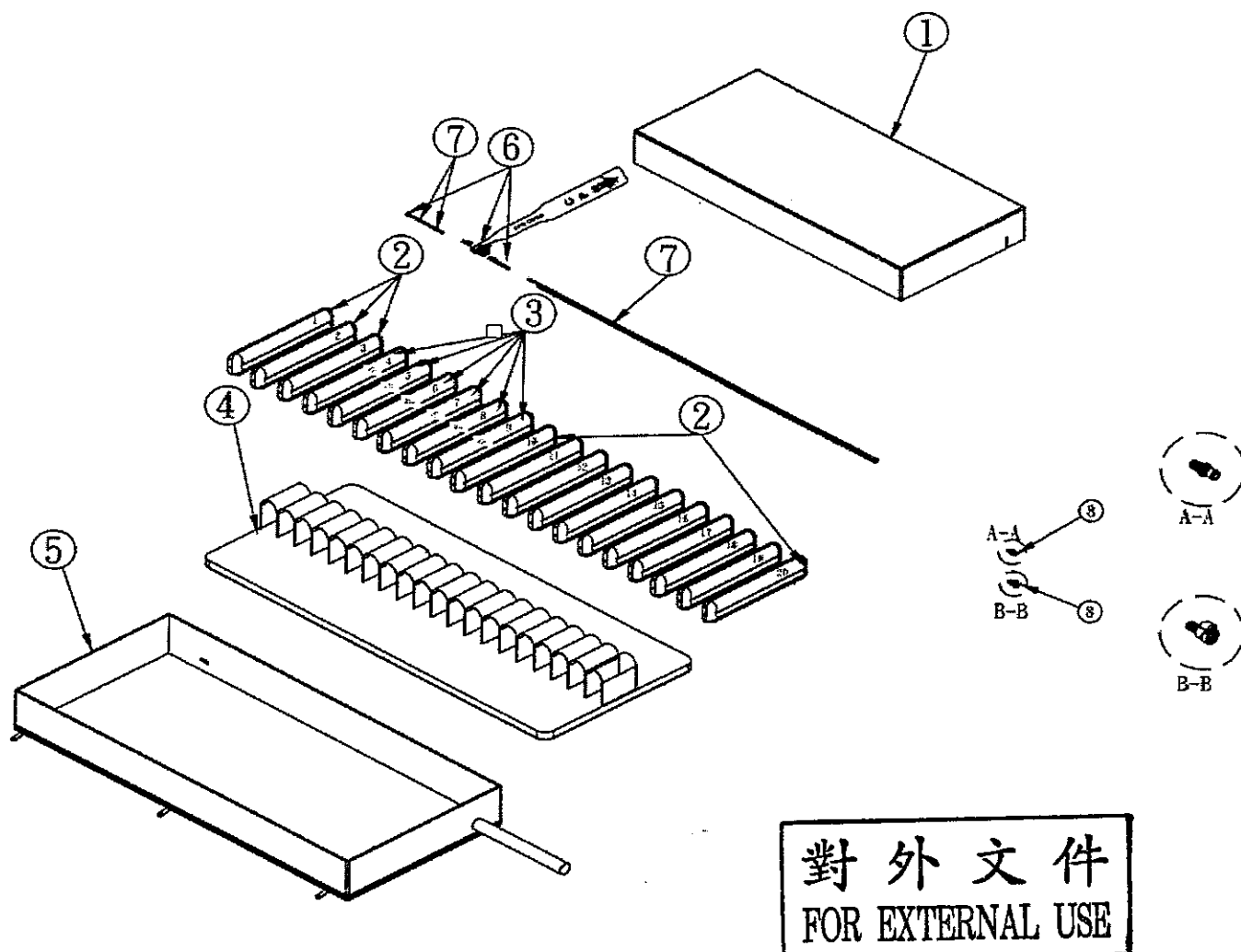
Item	Part number	Part name	Q'ty
1	S-LTC-P01-36004	Dual Top Case	1
2	S-LTC-P04-36002	Control PCBA -8	1
3	S-LTC-P06-36002	Rotor Valve -11	1
4	S-LTC-P07-36001	Silicon Tube -15	1
5	S-LTC-P11-3X001	Power PCBA -1	1
6	S-LTC-P05-36002	Compressor Set -1	1
7	S-LTC-P08-00003	Transformer Set -3	1
8	S-LTC-P10-00001	Battery Set -1	1
9	716-02C5-020	Power Cord	1
10	S-LTC-P03-36001	Side Panel Set -4	1
11	S-LTC-P02-36001	Bottom Case -9	1
12	S-LTC-P09-36001	Hanging Hook Set-1	1

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## ART.#S2101-3058 Dual P.U. Cari AU

Item	Part number	Part name	Q'ty
1	S-LTC-P01-36004	Dual Top Case	1
2	S-LTC-P04-36002	Control PCBA -8	1
3	S-LTC-P06-36002	Rotor Valve -11	1
4	S-LTC-P07-36001	Silicon Tube -15	1
5	S-LTC-P11-3X001	Power PCBA -1	1
6	S-LTC-P05-36002	Compressor Set -1	1
7	S-LTC-P08-00003	Transformer Set -3	1
8	S-LTC-P10-00001	Battery Set -1	1
9	717-328E-020	Power Cord	1
10	S-LTC-P03-36001	Side Panel Set -4	1
11	S-LTC-P02-36001	Bottom Case -9	1
12	S-LTC-P09-36001	Hanging Hook Set-1	1

## 9.2 Dual Mattress drawing



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ART.#S2101-2010 Dual M-Set 90cm Cari Dtx

Item	Part Number	Part Name	Q'ty
1	S2101-A010	Dual Coverlet 90cm	1
2	162-00H0-00510	Air Cells -8"	14
3	162-10H0-15510	Air Cells-8"	6
4	161-0020-05211	Foam Bag-205*90cm	1
5	163-0500-06511	Mattress Base-205*90cm	1
6	S-LTC-M01-00004	5"&8" CPR set	1
7	S-LTC-M02-00012	Connecting Hose	1
8	S-LTC-M05-00001	CPC set-1	1

## ART.#S2101-2020 Dual M-Set 82cm Cari Dtx

Item	Part Number	Part Name	Q'ty
1	S2101-A020	Dual Coverlet 82cm	1
2	162-00G0-00510	Air Cells-8"	14
3	162-10G0-15510	Air Cells-8"	6
4	161-0530-05211	Foam Bag-205*82cm	1
5	163-0530-06511	Mattress Base-205*82cm	1
6	S-LTC-M01-00004	5"&8" CPR set	1
7	S-LTC-M02-00012	Connecting Hose	1
8	S-LTC-M05-00001	CPC set-1	1

## ART.#S2101-2030 Dual M-Set 120cm Cari Dtx

Item	Part Number	Part Name	Q'ty
1	S2101-A030	Dual Coverlet 120cm	1
2	162-00G0-00510	Air Cells-8"	14
3	162-10H2-15510	Air Cells-8"	6
4	161-0260-05211	Foam Bag-205*120cm	1
5	163-0260-06511	Mattress Base-205*120cm	1
6	S-LTC-M01-00004	5"&8" CPR set	1
7	S-LTC-M02-00012	Connecting Hose	1
8	S-LTC-M05-00001	CPC set-1	1

## ART.#S2101-2050 Dual M-Set 107cm Cari Dtx

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Item	Part Number	Part Name	Q'ty
1	S2101-A050	Dual Coverlet 107cm	1
2	162-00H4-00510	Air Cells-8"	14
3	162-10H4-15510	Air Cells-8"	6
4	161-1130-02223	Foam Bag-205*107cm	1
5	163-1130-06500	Mattress Base-205*107cm	1
6	S-LTC-M01-00004	5"&8" CPR set	1
7	S-LTC-M02-00012	Connecting Hose	1
8	S-LTC-M05-00001	CPC set-1	1

## ART.#S2101-2070 Dual M-Set 36x80 Cari Qlt

Item	Part Number	Part Name	Q'ty
1	S2101-A070	Dual Coverlet 36*80" Qlt	1
2	162-00H0-00510	Air Cells-8"	14
3	162-10H0-15510	Air Cells-8"	6
4	161-0020-05211	Foam Bag-205*90cm	1
5	163-0500-06511	Mattress Base-205*90cm	1
6	S-LTC-M01-00004	5"&8" CPR set	1
7	S-LTC-M02-00012	Connecting Hose	1
8	S-LTC-M05-00001	CPC set-1	1

## ART.#S2101-2080 Dual M-Set 36x84 Cari Qlt

Item	Part Number	Part Name	Q'ty
1	S2101-A080	Dual Coverlet 36*84" Qlt	1
2	162-00H0-00510	Air Cells-8"	15
3	162-10H0-15510	Air Cells-8"	6
4	161-1330-00221	Foam Bag-213*90cm	1
5	163-1330-06511	Mattress Base-213*90cm	1
6	S-LTC-M01-00004	5"&8" CPR set	1
7	S-LTC-M02-00046	Connecting Hose	1
8	S-LTC-M05-00001	CPC set-1	1

## ART.#S2101-2110 Dual M-Set 90x220cm Cari Dtx

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Item	Part Number	Part Name	Q'ty
1	S2101-A110	Dual Coverlet 90*220cm	1
2	162-00H0-00510	Air Cells-8"	16
3	162-10H0-15510	Air Cells-8"	6
4	161-1430-02223-	Foam Bag-220*90cm	1
5	163-1430-06511	Mattress Base-220*90cm	1
6	S-LTC-M01-00004	5"&8" CPR set	1
7	S-LTC-M02-00053	Connecting Hose	1
8	S-LTC-M05-00001	CPC set-1	1

ART.#S2101-2120 Dual M-Set 82cm Cari Qlt

Item	Part Number	Part Name	Q'ty
1	S2101-A120	Dual Coverlet 82cm Qlt	1
2	162-00G0-00510	Air Cells-8"	14
3	162-10G0-15510	Air Cells-8"	6
4	161-0530-05211	Foam Bag-205*82cm	1
5	163-0530-06511	Mattress Base-205*82cm	1
6	S-LTC-M01-00004	5"&8" CPR set	1
7	S-LTC-M02-00012	Connecting Hose	1
8	S-LTC-M05-00001	CPC set-1	1

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## 10.0 Product Service Record

Please fill up the product service record (F101.03) when perform product service every time.



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## Product Service Record

F101.03

General Information		
Date:		
Service Technician:		
Company:		
Location:		
Product Serviced:		
Serial Number:		
Device Article Number:		
Invoice Number:		
In Warranty	Yes / No	
General Problems Description:		

Parts Replaced or Repaired	Problems Identified	Serial Number (Record if applicable)
		Old:
		New:
		Old:
		New:
		Old:
		New:
		Old:
		New:
		Old:
		New:

For Carilex QA Division use only: 類別: A: 硬體設計類 B: 軟體設計類 C: 機構設計類 D: 製造品質  
E: 檢驗品質 F: 供應商品質 G: 其他

是否建議開立 ECR ☐ No. ☐ Yes, ECR/ECN# \_\_\_\_\_

For Carilex Sales Div. use only: (已經超過保固期之維修費用請打 D/N 收款, 請在此記錄 D/N#)

Device sent back to customer on \_\_\_\_\_ via \_\_\_\_\_

(表格與 D.C.C 發行之最新版本相符)