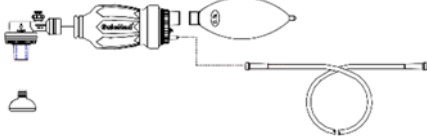


*MR-100™ Plus Autoclavable  
Manual Resuscitator*

INSTRUCTION MANUAL



| REF                                                                                 | SAP REF | Description                      |
|-------------------------------------------------------------------------------------|---------|----------------------------------|
|  |         |                                  |
| 2152                                                                                | AR0058  | MR-100 Plus Resuscitator, infant |

## Introduction

The MR-100™ Plus Manual Resuscitator Is designed for use as an adjunct to artificial respiration and cardiopulmonary resuscitation. The Resuscitator can be used to ventilate the apnoeic patient and to augment ventilation and/or oxygen delivery to the spontaneously breathing patient.

When connected to an oxygen source, the MR-100™ Plus Manual Resuscitator can also deliver supplemental oxygen with the aid of an oxygen reservoir. The oxygen concentration delivered by the MR-100™ Plus Manual Resuscitator depends on the oxygen supply flow rate, tidal volume, ventilation frequency and operator technique.

The Infant and Child models of the MR-100™ Plus Manual Resuscitator are fitted with pressure relief valves which vent the delivered breath to the atmosphere if the pressure exceeds 40±5cmH<sub>2</sub>O. The pressure relief valve can be overridden by the operator should a higher delivery pressure be required.

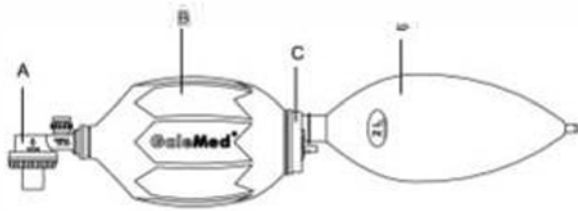
The MR-100™ Plus Manual Resuscitator is intended for use by qualified medical and emergency personnel trained in pulmonary ventilation and advanced cardiac life support techniques. Users should read and understand the contents of this manual and demonstrate proficiency in the assembly, disassembly and use of this device prior to use.

## Warning And Cautions

- **WARNING:** Do not use the MR-100™ Plus Manual Resuscitator in toxic atmospheres.
- **WARNING:** Remove the oxygen reservoir and reservoir valve if supplemental oxygen is not being administered. Failure to do so will affect the refill rate and maximum frequency capabilities.
- **WARNING:** Do not administer supplemental oxygen in the presence of open flames.
- **WARNING:** Do not use oil, grease or other hydrocarbon based substances on any part of the MR-100™ Plus Manual Resuscitator. Supplemental oxygen, supplied under pressure, can combine with hydrocarbons and cause explosions.
- **WARNING:** This device is intended for use by qualified medical and emergency personnel trained in pulmonary ventilation and advanced cardiac life support techniques.
- **WARNING:** Always test the device in accordance with this manual after cleaning and disinfection or replacement of parts.
- **WARNING:** Do not use the pressure relief valve override mechanism for the child and infant resuscitator.
- **CAUTION:** Use only replacement parts intended for use on MR-100™ Plus Manual Resuscitators.
- **CAUTION:** Do not attempt to disassemble the pressure relief valve assembly. Disassembly will damage the component.

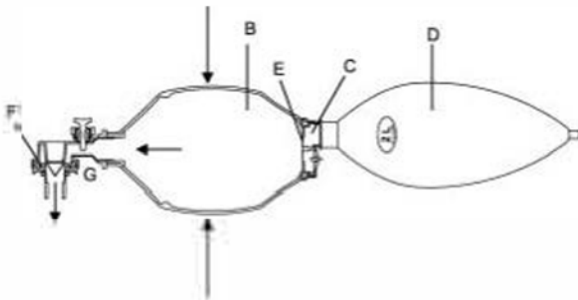
## Principles Of Operation 1

The MR-100™ Plus Manual Resuscitator consists of four major components (figure 1): non rebreathing valve assembly (A), silicone bag (B), intake valve (C), and reservoir (D), Part D should be removed if supplemental oxygen is not to be supplied from an external gas source.



**Figure 1. The MR100™ Plus Manual Resuscitator**

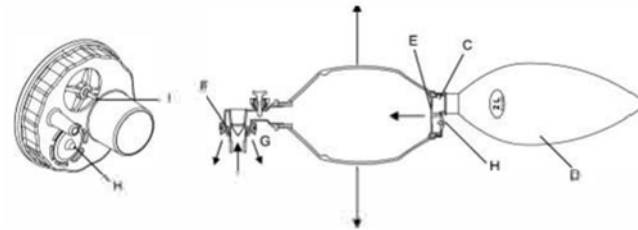
Gas is delivered to the patient by squeezing the bag (see figure 2). Positive pressure within the bag caused by its compression closes the intake valve (E) located at the base of the bag. This causes the duckbill valve (F) to close off the expiration ports (G) of the non-rebreathing assembly. Further compression of the bag forces gas through duckbill valve to the patient. If supplemental gas is used, oxygen is delivered to the reservoir (D) during compression of the silicone bag.



**Figure 2. Exhalation**

## Principles Of Operation 2

Exhalation begins when the patient exerts positive pressure (during passive exhalation) on the patient side of the duckbill valve (F) or when the operator releases pressure from the silicone bag (8). The valve lifts directing the patient's expiratory gases through the expiration ports (G) of the non-rebreathing valve (see figure 3).



**Figure 3. Inspiration**

The silicone bag refills for the next breath during patient exhalation. Negative pressure within the bag (caused by the expansion of the compressed bag) opens the intake valve (E), allowing gas to enter the bag either from the atmosphere or from the reservoir (D).

The reservoir should be used whenever supplemental oxygen is delivered. (Supplemental oxygen may be administered without using the reservoir but maximum available oxygen concentration will be reduced.) Excess oxygen vents to the atmosphere through the safety valve (H) should the reservoir fill before the next delivered breath. If the volume of gas in the reservoir is inadequate to fill the silicone bag, room air may be drawn in through the reservoir valve safety inlet (I). The concentration of the oxygen-enriched gas entering from the reservoir will depend on factors such as oxygen flow rate, tidal volume, ventilation rate and operator technique.

## Principles Of Operation 3

The Infant and Child models of the MR-100™ Plus Manual Resuscitator are fitted with pressure relief valves (see figure 4). These valves open when the pressure is in excess of  $40 \pm 5 \text{ cmH}_2\text{O}$ .

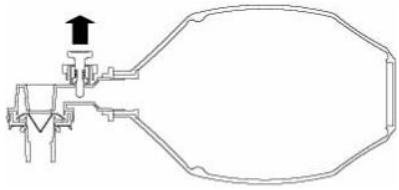


Figure 4. Pressure Relief Valve.

Should higher inspiratory pressure be required, the pressure relief valve may be overridden by placing thumb over the valve as shown in figure 5. It is also possible to lock the pressure relief valve in this position with Lock type Non rebreathing Valve. Just twist the valve half a turn and it will stay in the overridden position. (Lock Arrow forward to the NRV direction as Figure 5.1).

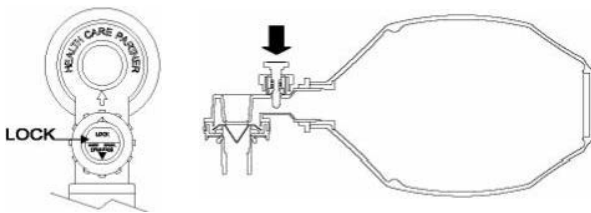


Figure 5.1

Figure 5. Overriding the Pressure Relief Valve

## Operating Instruction



1. Position victim face up.

2. Clear foreign objects out of patient's mouth and throat.

3. Insert oropharyngeal airway (if available), in accordance with the manufacturer's directions, to open the patient's mouth and prevent the tongue from obstructing the airway.



4. Position yourself behind the patient's head, extend the head back and pull the chin

**Note:** If the patient is intubated or has a tracheostomy, the resuscitator can be connected by removing the mask and attaching the non-rebreathing valve outlet directly to the connector of the endotracheal or tracheostomy tube.

## Operating Instruction



5. Hold mask firmly in place over the mouth and nose with thumb and index finger, using other fingers to grip the chin.

6. Inflate the lung by compressing resuscitation bag with the other hand. Develop rhythmic pattern for adequate inspiratory/ expiratory time.

7. Check to ensure that you are performing ventilation properly



- Observe rise and fall of the patient's chest.
- Check the patient's lip and face color through the transparent face mask.
- Check that the patient valve is working properly through the transparent housing.
- Check that the interior of the mask is being "fogged"

## General Instructions for Operation

Select the appropriate size of MR-100™ Plus Manual Resuscitator (Infant, Child or Adult). Select the appropriate size of face mask If ventilation by mask is to be performed. Connect mask to the outlet on non-rebreathing valve.

If supplemental oxygen is to be used, connect supply tubing (not supplied) between the regulated gas source and the oxygen reservoir inlet. Adjust gas flow so that the reservoir expands completely during the delivery of the breath and nearly collapses as the bag refills.

If supplemental oxygen is not to be used, remove the reservoir. Failure to do so will affect the refill rate and maximum frequency capabilities.

Should the non-rebreathing valve become contaminated with vomit, blood or secretions during ventilation, disconnect the Resuscitator from the patient and clear the non-rebreathing valve as follows:

Squeeze the silicone bag to deliver several sharp breaths through the non-rebreathing valve to expel the contamination. If the contamination does not clear, continue ventilation with another resuscitator or use mouth to mouth/mask techniques. Disassemble the non-rebreathing valve and rinse it with water. Reassemble and disinfect.

Once the procedure is completed, clean, disinfect and test the Resuscitator as described under Cleaning & Disinfection (P.14) & Testing the Resuscitator (P.15).

## Performance Characteristics

Range of delivery pressure

Adult: Unrestricted or  $60 \pm 10$  cmH<sub>2</sub>O

Child and Infant:  $40 \pm 5$  cmH<sub>2</sub>O maximum (can be overridden by operator)

Stroke volume range (typical values)

|        |                 |        |
|--------|-----------------|--------|
| Adult  | Using one hand  | 800ml  |
|        | Using two hands | 1350ml |
| Child  |                 | 350ml  |
| Infant |                 | 160ml  |

Oxygen concentration

**Adult** (Values In parentheses are without an oxygen reservoir O<sub>2</sub> flow In Tidal vol. (ml) x ventilation rate)

| L/min | 600X12 | 800X20 | 750X12 | 750X20 | 1000X20 | 1000X20 |
|-------|--------|--------|--------|--------|---------|---------|
| 05    | 82(33) | 56(33) | 65(33) | 50(30) | 55(30)  | 45(30)  |
| 10    | 99(37) | 60(37) | 99(37) | 99(37) | 66(37)  | 62(37)  |
| 15    | 99(45) | 99(45) | 99(45) | 99(45) | 99(45)  | 66(45)  |

Conditions: compliance - 0.02L/cmH<sub>2</sub>O, Resistance-20 cmH<sub>2</sub>O/L/s. I:E ratio: 1 :2

**Child** (Values In parentheses are without an oxygen reservoir O<sub>2</sub> flow In Tidal vol. (ml) x ventilation rate)

| L/min | 70x20  | 70X30  | 200X20 | 200X30 | 300X20 | 300X30 |
|-------|--------|--------|--------|--------|--------|--------|
| 02    | 99(65) | 95(65) | 56(37) | 50(37) | 45(34) | 40(32) |
| 05    | 99(86) | 99(83) | 99(44) | 96(43) | 84(37) | 88(36) |
| 10    | 99(93) | 99(90) | 99(46) | 99(45) | 99(45) | 99(43) |

Conditions: compliance - 0.01L/cmH<sub>2</sub>O, Resistance - 200 cmH<sub>2</sub>O/L/s. I:E ratio: 1 :2

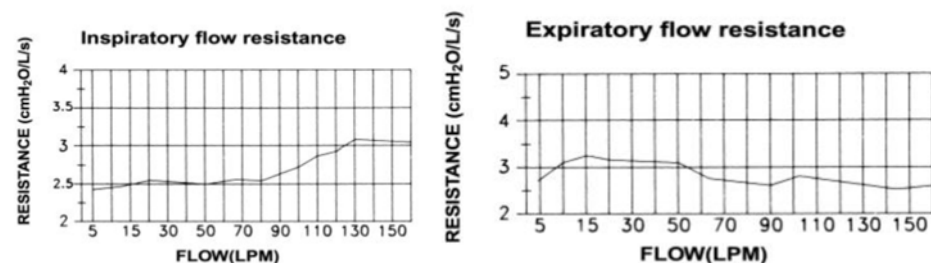
**Infant** (Values In parentheses are without an oxygen reservoir O<sub>2</sub> flow In Tidal vol. (ml) x ventilation rate)

| L/min | 20X30  | 20X60  | 40X30  | 40X60  | 70X30  | 70X60  |
|-------|--------|--------|--------|--------|--------|--------|
| 02    | 99(72) | 99(70) | 99(70) | 99(58) | 97(55) | 85(50) |
| 05    | 99(77) | 99(75) | 99(74) | 99(72) | 99(65) | 85(62) |
| 10    | 99(94) | 99(90) | 99(90) | 99(80) | 99(79) | 99(71) |

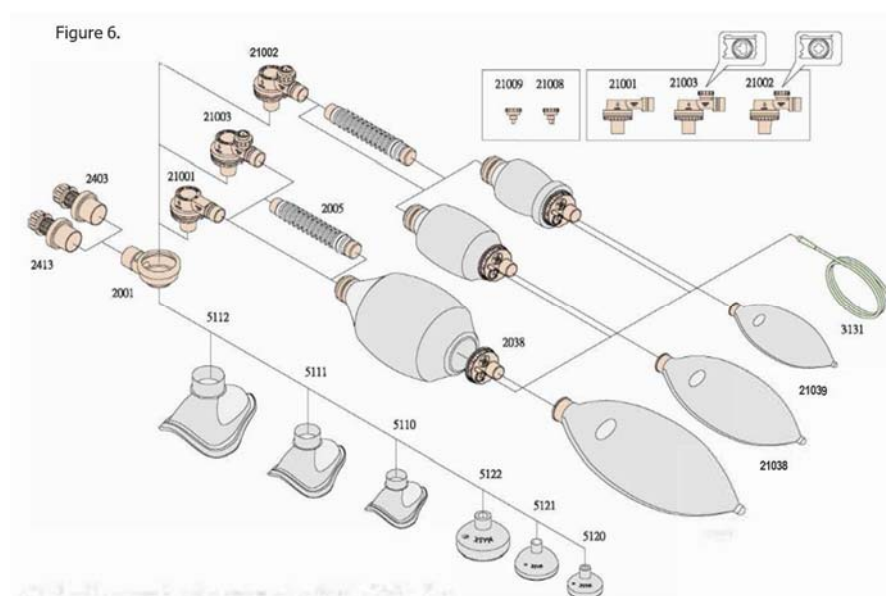
Conditions:

VT=20ml, Compliance - 0.001L/cmH<sub>2</sub>O, Resistance - 400 cmH<sub>2</sub>O/L/s. I:E ratio: 1 :1

VT=40 & 70ml, Compliance - 0.01L/cmH<sub>2</sub>O, Resistance - 20 cmH<sub>2</sub>O/L/s. I:E ratio: 1 :2



## Assembly View



Note: Should you need to order replacement parts for MR-100™ Plus, please use the re-order number along with the drawing.

## Performance Characteristics

The performance characteristics for MR-100™ Plus Manual Resuscitators will vary from user to user depending on a variety of factors: ambient temperature, patient lung compliance, ventilator frequency & size of operator's hands. The following data has been derived from MR-100™ Plus Manual Resuscitators in accordance with ISO standards.

### Frequency range

|          | -18°C/ 0°F<br>Cycle rate | 22°C/72°F<br>Cycle rate | 50°C/ 122°F<br>Cycle rate |
|----------|--------------------------|-------------------------|---------------------------|
| Adult    | 38                       | 45                      | 45                        |
| Child A  | 92                       | 105                     | 105                       |
| Child B  | 72                       | 78                      | 76                        |
| Infant A | 95                       | 95                      | 95                        |
| Infant B | 60                       | 60                      | 60                        |

These results were obtained under the following conditions:

Adult: VT- 600ml, Compliance -0.02L/cmH<sub>2</sub>O, Resistance - 20cmH<sub>2</sub>O/L/s

Child A: VT- 70ml, Compliance -0.01L/cmH<sub>2</sub>O, Resistance- 20cmH<sub>2</sub>O/L/s

Child B: VT- 300ml, Compliance -0.02 L/cmH<sub>2</sub>O, Resistance- 20cmH<sub>2</sub>O/L/s

Infant A: VT- 20ml, Compliance -0.001 L/cmH<sub>2</sub>O, Resistance- 400cmH<sub>2</sub>O/L/s

Infant B: VT-70ml, Compliance -0.01 L/cmH<sub>2</sub>O, Resistance- 20cmH<sub>2</sub>O/L/s

## Specifications

Storage temp: - 40°C/-10°F to 60°C/ 140°F

Operating temp: - 18°C/ 0°F to 50°C/ 122°F

Materials: Mask, Duckbill valve, Mushroom valve, Relief valve seal, Bag body, Silicon rubber: Oxygen reservoir bag, Oxygen reservoir bag band & plug.

Polysulfone: Non-rebreathing valve housing, Pressure relief valve housing, All-in one intake valve housing, Pressure relief valve stem & cap.

Poly-vinyl-chloride: Oxygen tubing

Stainless steel: Pressure relief valve

spring. Aluminum: Pressure relief name plate.

EPDM: O-ring

Connections:  
Patient port 15mmID/22mmOD

Silicon bag neck 24mmID

Oxygen gas inlet 6mmOD

Intake valve port 25mmOD

Reservoir bag port 25mmID

## Specifications

### ***Dead space:***

|                       |       |
|-----------------------|-------|
| Non-rebreathing valve | 7ml   |
| Adult mask            | 150ml |
| Child mask            | 95ml  |
| Infant mask           | 28ml  |

### **Pressure Relief**

40±5 cmH<sub>2</sub>O (infant & child)  
60±10 cmH<sub>2</sub>O (adult)

### **Reservoir volume**

2000ml (adult model)  
1000ml (child model)  
500ml (Infant model)

### **Bag volume/Stroke volume**

1500/1350ml (adult model)  
600/ 350ml (child model)  
280/ 160ml (infant model)

### **Maximum BPM**

45 breaths/min (adult model)  
105 breaths/min (child model)  
98 breaths/min (Infant model)

### **Oxygen Concentration**

|                   |                                                   |
|-------------------|---------------------------------------------------|
| With reservoir    | 99%                                               |
| Without reservoir | 45% (adult and child model)<br>90% (infant model) |

## Testing The Resuscitator

The MR-100™ Plus Manual Resuscitator should be tested as follows:

- **when first using the new Resuscitator**
- **after cleaning and disinfection**
- **after any new parts having been fitted**
- **monthly, if the Resuscitator is not frequently used.**

Equipment required: Test lung, 0-100cmH<sub>2</sub>O manometer (for Infant and Child resuscitators only) , flow meter, regulated gas supply & gas supply tubing.

### ***Testing the silicone bag assembly***

1. Remove the non-rebreathing valve and the oxygen reservoir (if fitted).
2. Compress the silicone bag and occlude (block) the non-rebreathing valve outlet.
3. Release the bag. The bag should expand immediately and refill. If not, check the intake valve at the base of the silicone bag is correctly assembled or not.
4. While keeping the non-rebreathing valve outlet blocked, compress the bag again. The bag should not be compressed easily. If this occurs, check that you are blocking the valve sufficiently, and that the intake valve at the base of the silicone bag is correctly assembled.

### ***Non-rebreathing valve assembly***

1. Connect the non-rebreathing valve to the silicone bag. Connect the test lung to the outlet on the non-rebreathing valve and is correctly assembled.

2. Compress and hold the bag. The housing duckbill valve inside the non-rebreathing valve should open and test lung should be filled. If not, check the connection between the Resuscitator and the test lung, and check that the non-rebreathing valve is correctly assembled.
3. Release the bag. The duckbill valve should close and as the test lung deflates, gas should flow through the expiratory ports of the non-rebreathing valve. If not, check if the non-rebreathing valve is correctly assembled.
4. Ventilate the test lung for a minimum of ten cycles to ensure that the Resuscitator is functioning correctly. Inspiration must occur when the silicone bag is compressed and exhalation should be in place, when the bag is released. If not, check on the non-rebreathing valve is correctly assembled.

***To check the function of the pressure relief valve (infant and Child Resuscitators)***

Connect a 0-100 cmH<sub>2</sub>O manometer to the patient outlet of the non-rebreathing valve. Compress the bag. When the pressure relief valve activates, the manometer should read 35-45cmH<sub>2</sub>O. If not, check that the non-rebreathing valve is correctly assembled and does not leak. If the pressure relief valve fails a further test, it must be replaced. Do not attempt to repair the pressure relief valve.

***Oxygen Reservoir/Intake Valve assemblies***

1. Attach the reservoir to the intake valve inlet.
2. Inflate the reservoir and block the reservoir port.
3. Compress the reservoir bag. Gas should escape through the safety outlet valve on the reservoir valve. If not, check if the reservoir valve is correctly assembled.

4. Cycle the Resuscitator through several ventilations. The safety inlet valve on the reservoir valve should open during each refill to allow room air to enter the silicone bag. If not, check if the safety inlet valve is correctly assembled.

***Overall Resuscitator function***

1. Fully assemble the Resuscitator (non-rebreathing valve, silicone bag and oxygen reservoir). Connect the Resuscitator to a supplemental gas source and connect a test lung to the patient outlet on the non-rebreathing valve.
2. Set the supplemental gas flow to 15LPM for the adult and the child models; and 10 LPM for the infant model.
3. Cycle the Resuscitator through several ventilations. The test lung should inflate during inspiration and deflate during exhalation. Check for leakage at all joints and connections. Ensure that the Resuscitator refills promptly and properly and that all valves are operating correctly. If not, repeat the tests above to find where the problem lies.

## **Accessories**

- 1. Masks**  
masks from infant to adult (6 sizes).
- 2. Peep valve**  
Durable 2-10 adjustable peep valve.  
Durable 5-20 adjustable peep valve.  
Diverter for PEEP valve

### 3. Filter

Toxic gas filter. (For military, chemistry etc.)

### 4. Tools

Silicone extension tube for non-rebreathing valve.

Teeth opener

Tongue depressor

Airway

### 5. Carry and Storage

Wall mount holder for resuscitators.

Silicone hanger for resuscitators.

Storage case.

## Order information

| REF  | SAP REF | Description                               |
|------|---------|-------------------------------------------|
| 2038 | AR0051  | MR-100 Plus Intake Valve Kit              |
| 2150 | AR0056  | MR-100 Plus Resuscitator set, adult w/Pop |
| 2151 | AR0057  | MR-100 Plus Resuscitator, child           |
| 2152 | AR0058  | MR-100 Plus Resuscitator, infant          |
| 2163 | AR0063  | MR-100 Plus Resuscitator, adult           |