

**Service Manual**  
for Digital Blood Pressure Monitor

**Model No.DM-500**

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# 1. Description

DIGITAL SPHYGMOMANOMETER DM-500 is intended for non-invasive measurement of blood pressure using auscultatory method. The device consists of pressure gauge with bar LCD, inflatable cuff and inflation bulb.

Battery power is monitored by the microprocessor and the low battery symbol is displayed when the battery power is weak.

"HOLD" function

The device records the last two pressure values at which "HOLD" button is pressed during deflation of the cuff. The user review the blood pressure after measurement on the bar LCD.

## 2. Specifications

2-1. Model	<b>DM-500-15</b>	
2-2. Classification	<b>CLASS II a</b>	
2-3. Function	① Pressure force indication	
	② A result indication function	
	③ Automatic Power Shut Off	
	④ Error Indication (Over-pressurization, Weak battery)	
	⑤ Manual inflation	
2-4. B.P.M. Specifications		
(1) Measuring Method	auscultatory method	
(2) Measuring Position	Upper Arm	
(3) Coverage arm circumference	230 mm ~ 320 mm	
(4) Pressure detection	Pressure to Frequency Converter	
(5) Pressure indicating (Cuff Pressure)	① Units	mmHg <b>EN1060-1 6</b>
	② Range	20 ~ 300 mmHg <b>EN1060-3 7.7.1</b>
	③ Resolution	2 mmHg <b>EN1060-3 7.7.2</b>
	④ Zero setting	Automatic zero setting
(6) Accuracy of pressure display	± 3 mmHg <b>EN1060-1 7.1.1</b>	
(7) Cuff inflation	Squeeze bulb	
(8) Cuff deflation	Manual deflation valve	
(9) Deflation rate	Manual control	
(10) Rapid Exhaust	Automatic Exhaust (EV) <b>EN1060-3 7.4.3</b>	
(11) Cuff system	① Cuff of Upper Arm	
	② Locking Mech.-Velcro	
	③ Bladder Size	230 mm (W) × 130 mm (D)
	④ Cuff Size	492 mm (W) × 145 mm (D)

(12) Indicator	Bar LCD <b>EN1060-1 5</b>	① Pressure value
		② Weak battery
(13) Microcomputer	8 Bit Microcomputer	MN101C73A-NK
(14) Power Source	R6,LR6 Type (AA Size) 2 piece <b>EN1060-3 7.3.1</b>	
(15) Power Consumption	0.5W (Max.)	
(16) Operating TEMP./Humidity	+10 °C to +40 °C /85% RH or below <b>EN1060-1 7.1.2.2</b>	
(17) Storage TEMP./Humidity	-5 °C to +50 °C /85% RH or below <b>EN1060-3 7.5.1</b>	
(18) Main unit size	122.7 mm (W) × 310.5 mm (D) × 86.3 mm (H),closed	
(19) Main unit weight	APPROX. 780 gm (Not Including Batteries)	
2-5. Safety system	Cuff Pressure > 330 mmHg → Rapid Exhaust	
2-6. Electrical safety	<b>EN1060-1 7.2.1</b>	
2-7. Resistance to vibration & shock	<b>EN1060-1 7.2.2</b>	
2-8. Air Leakage	<b>EN1060-3 7.4.1</b>	
2-9. Electromagnetic compatibility	<b>EN1060-3 7.5.3</b>	
2-10. Stability of the cuff pressure indication	<b>EN1060-3 7.6</b>	
2-11. Overall system accuracy	<b>EN1060-3 7.9</b>	
2-12. Lay a pipe system	See "11. Exploded Views" P18	
2-13. Operating manual	English Spanish	
2-14. Accessories	Non	
2-15. Life	5 Year	

### 3. Principles of Operation

#### 3-1. Operation of Each Unit

These units operate as follows:

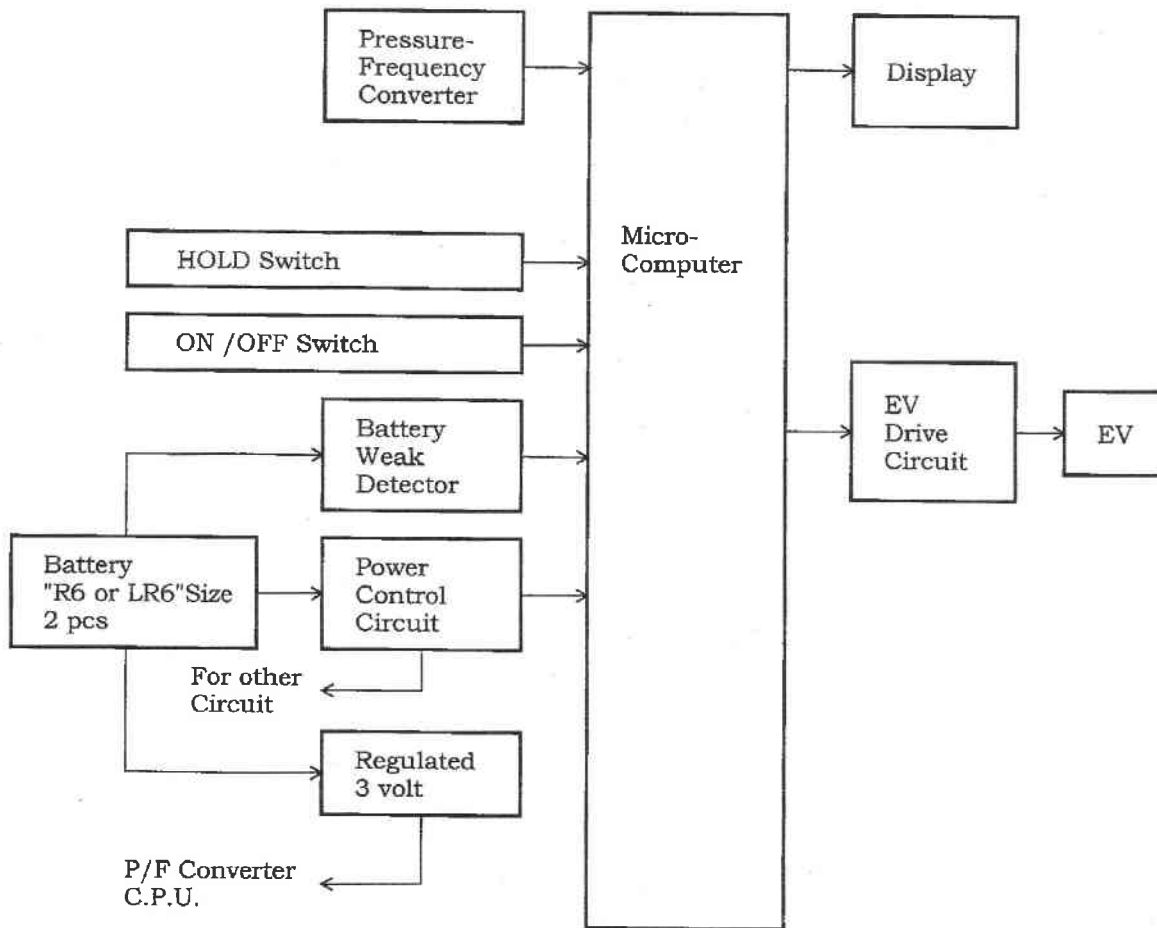


FIG. 3-1 Block Diagram

a) Pressure Sensor;  
Elastic capsule. Capsule is inflated by pressure.

Parallel Plate variable capacitor;  
Gap of parallel plate are changed by inflation.

CR oscillator;  
Oscillation frequency are changed by capacitance change.

Frequency Counter;  
Frequency are counted by counter and digital output is took in to the computer.  
(The counter is included in to the computer IC chip)

b) Others

Power supply control circuit;  
Receives the control signal from the microcomputer to turn the power on and off to units other than the microcomputer.

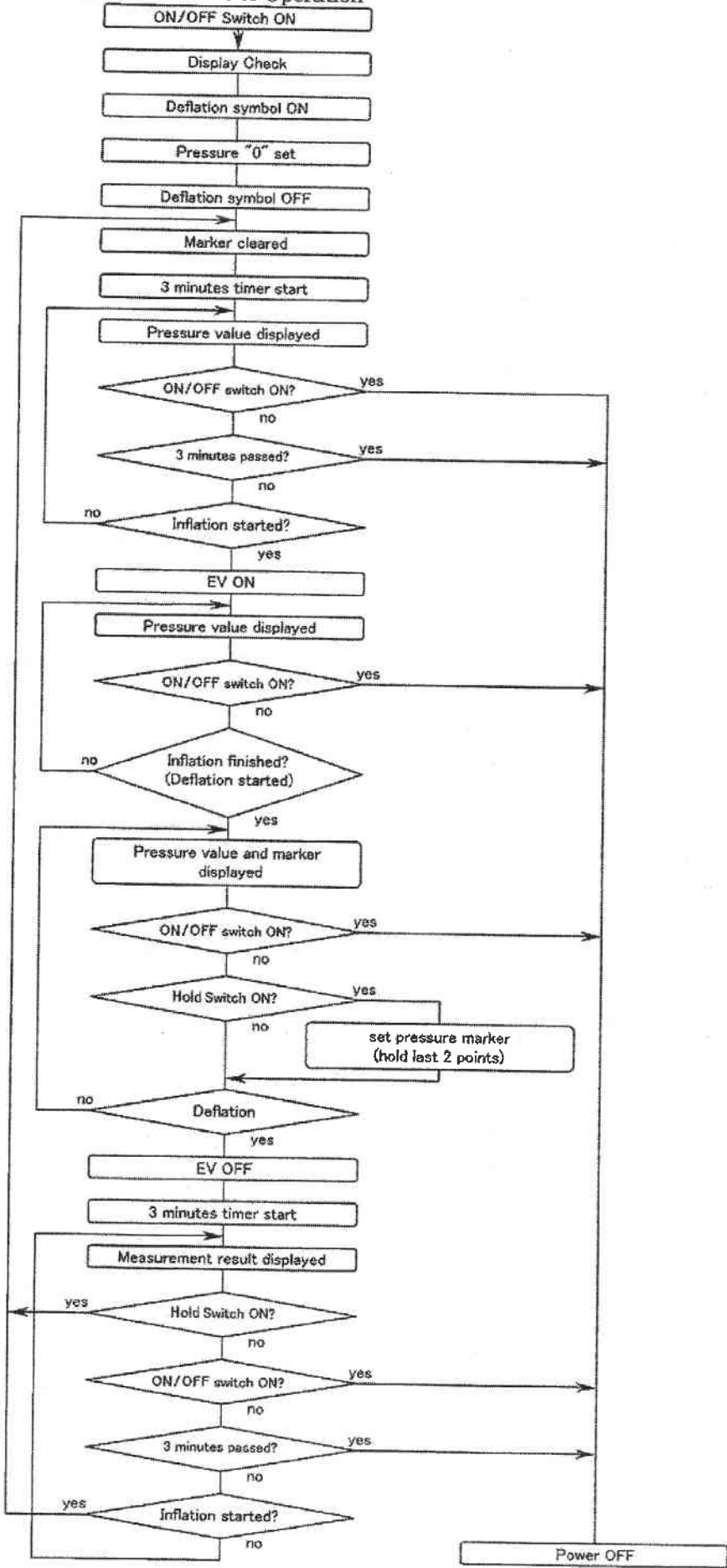
Bar Display  
Displays cuff pressure and Weak battery

Electromagnetic deflation valve (EV) drive circuit;  
Monitors cuff pressure and exhausts the air when the pressure exceeds the maximum value.

c) Microcomputer

Microcomputer  
According to the information received, the microcomputer controls the P/F converter, blood pressure measuring sequence and LCD display drive.

3-2 Flow Chart of Operation





## 3-3 Air Circuit;

The air circuit is composed of the following:

- Electromagnetic deflation valve [EV] : Used during the measurement.
- Cuff : Used after the measurement.  
: To tighten the left arm.
- Squeeze bulb : Used during an increase of pressure.
- Manual deflation valve : Used for manual control.

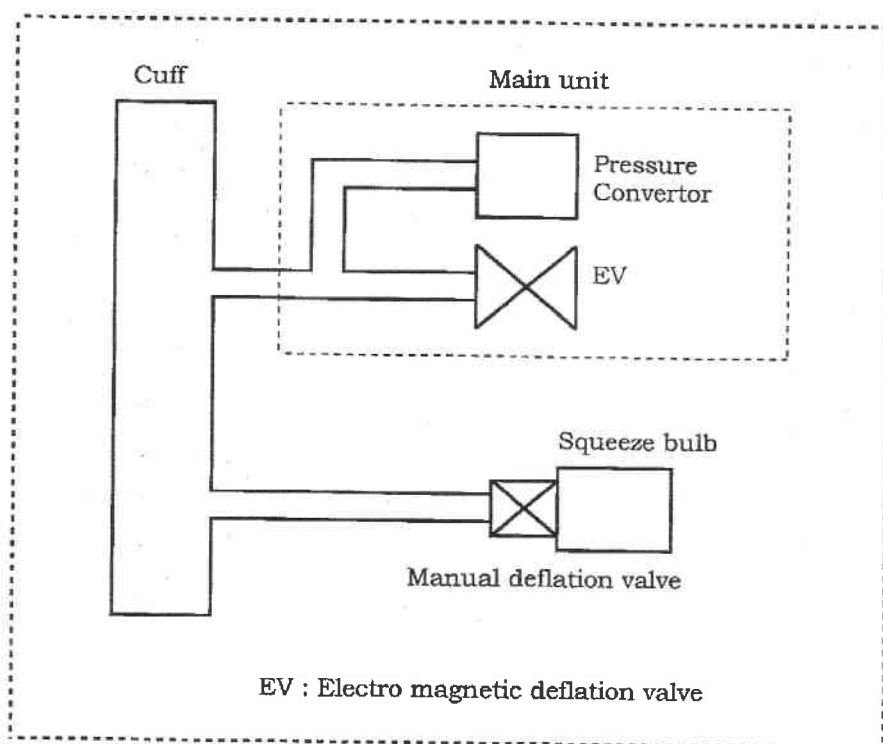


FIG. 3-3 Air Circuit

## 4. Operating Instruction

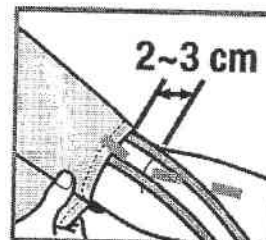
### 4-1 Power Supply

#### 1) Battery Installation

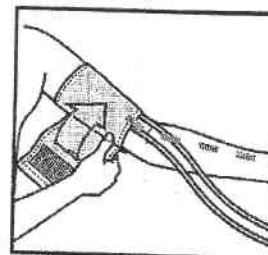
Take off battery cover rear side of main body and connect AA batteries.

### 4-2 Measurement Procedures

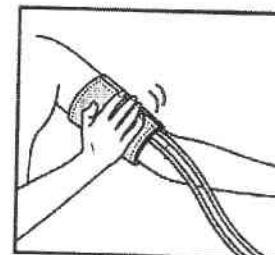
- 1) Wrap the Cuff around the upper left arm.  
With the rubber tube of the cuff positioned in the direction of the fingertips, place it on the left arm.  
Wrap the cuff around the arm with the edge of cuff approximately 1 inch above the elbow.



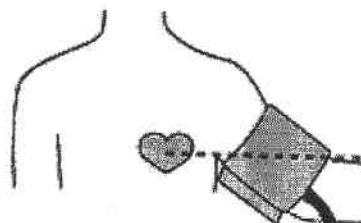
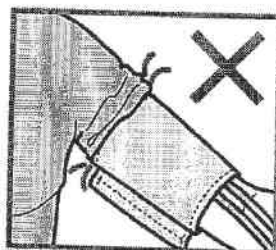
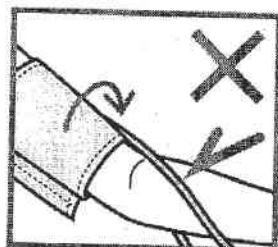
- \* When wrapping the cuff, wrap it loosely enough around the arm so that two fingers can be placed between the cuff and the arm.  
If the cuff is wrapped more tightly or loosely than this, inaccurate blood pressure readings may result.



- \* If you roll up your sleeve over the upper arm, you constrict the blood flow and prevent accurate measurements.



The position of the individual when being measured may be either lying down or sitting. In the sitting position however make sure that the location on the left arm to be measured is about at the same height as the heart and that the forearm is extended naturally on the table and does not move.



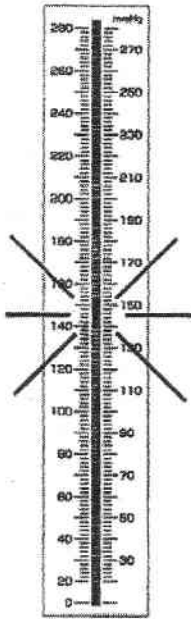
- 2) Press ON/OFF BUTTON to turn on the device.  
As the device is turned on, it starts the zero setting after the LCD test. The flashing dot at "0" in BAR LCD indicates that the zero setting is being conducted. Wait until the dot stops flashing to begin inflation of the cuff.
- 3) Make measurement after the zero setting.
- 4) Turn off the device by pressing ON/OFF BUTTON.  
The device will be turned off when the cuff pressure remains zero for approximately 3 minutes.

- \* Press ON/OFF BUTTON in case of any malfunction of the device or whenever to interrupt measurement. The device will exhaust the air from CUFF.
- \* Blood pressure can be confirmed on BAR LCD after measurement using HOLD BUTTON. Press HOLD BUTTON as you determine systolic blood pressure and a dot stays in BAR LCD. Press again as you determine diastolic blood pressure and the second dot stays in BAR LCD. If you press HOLD BUTTON more than twice, the first dot disappears. Only two dots remains on LCD.  
The display of measured blood pressure disappears as the device is turned off. The change in the cuff pressure, caused by removal of cuff or such, will erase the blood pressure display.

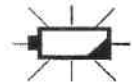
## 5. Error Display

This blood pressure monitor displays as error message for over-pressurization and low battery. In case displaying error message during measurement, please exhaust and please re-measure after confirming how to use.

- 1) over-pressurization (Inflation above 330 mmHg)



- 2) Weak battery



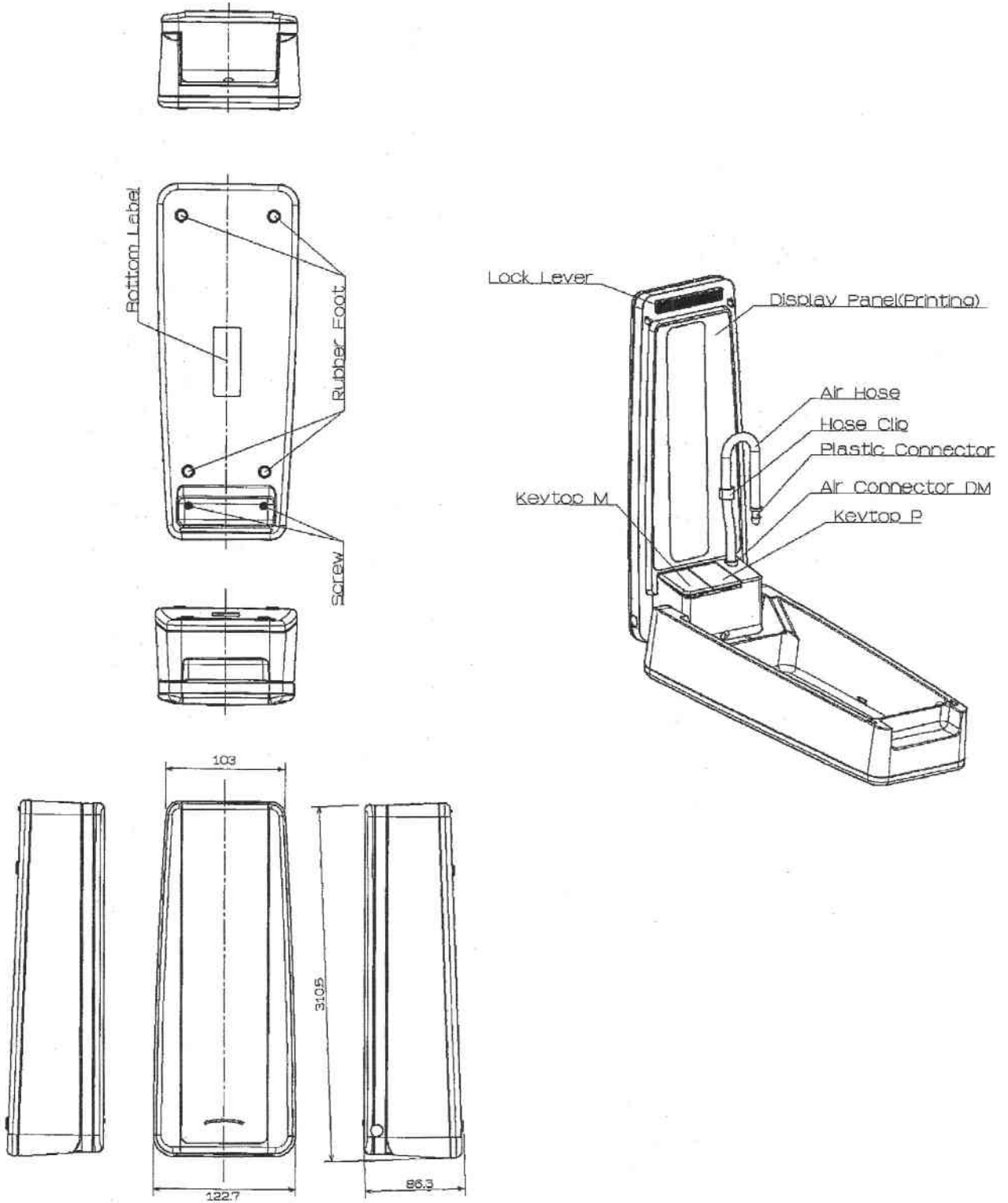
Low battery provide inadequate voltage for operation of the unit.



Batteries need to be replaced.

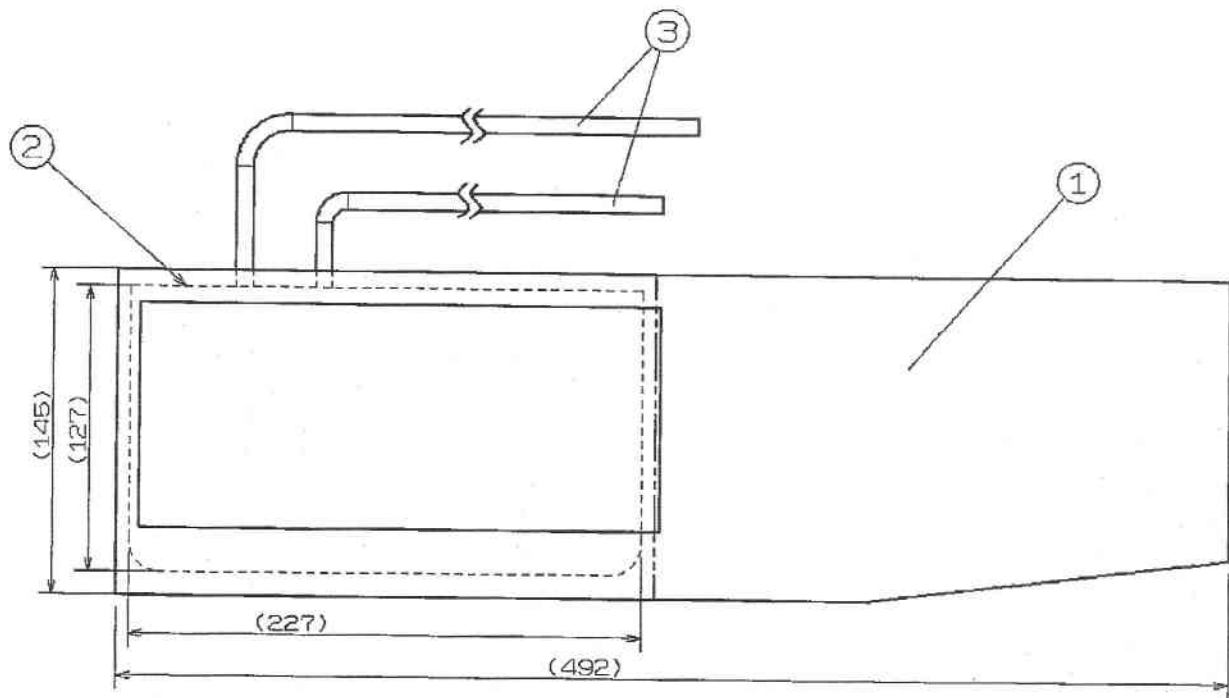
## 6. Outside Drawing

### 6-1. Main Unit



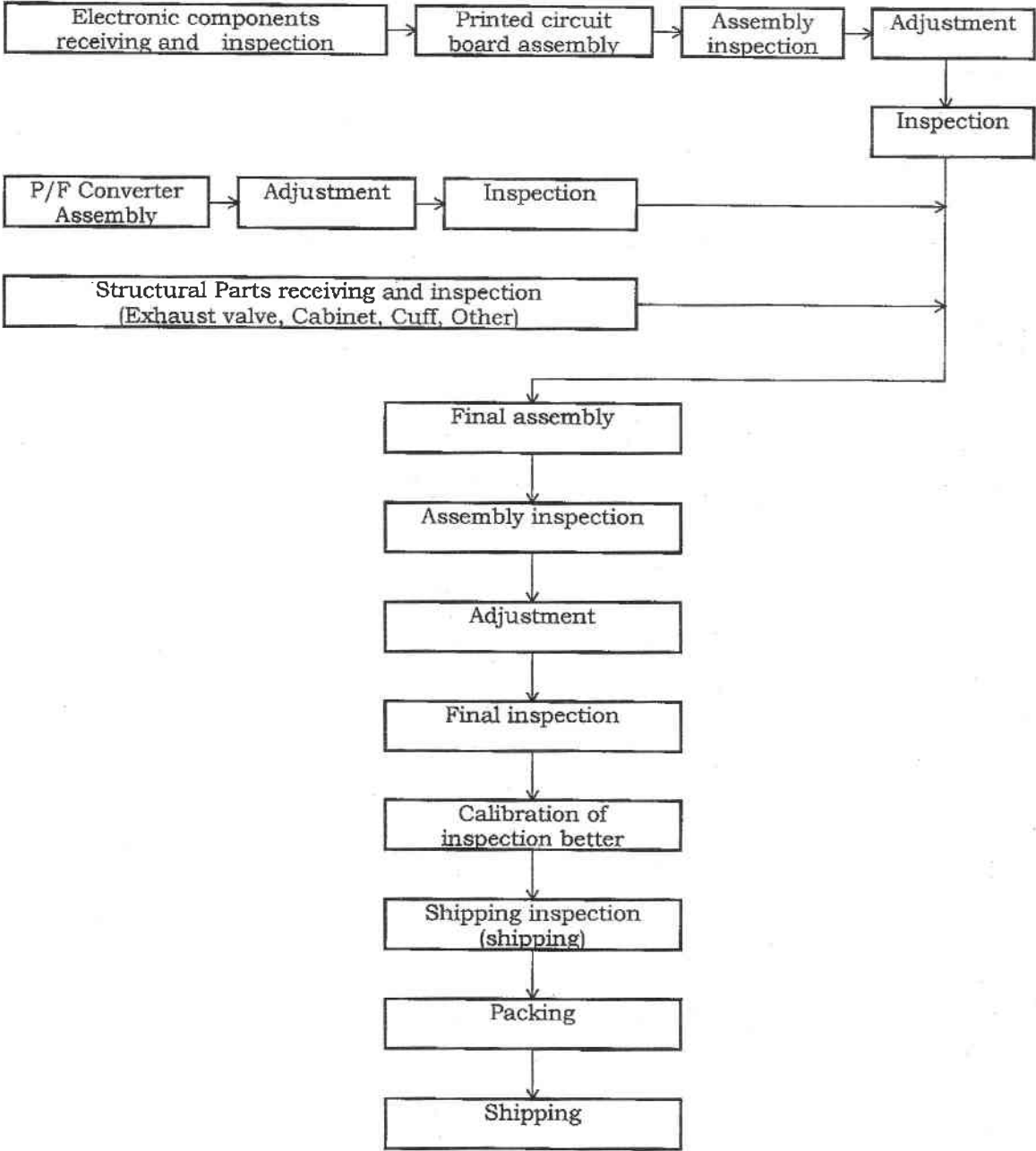
## 6-2. Cuff Unit

infoDM-500-15.jtd



No.	Parts Name	Parts code	Material technical data	Quantity /unit
1	Cuff Assembly	A117029-2	Polyester + rayon	1
2	Bladder	A117033-1	PVC	1
3	Air Hose	A110680-0500	PVC	2

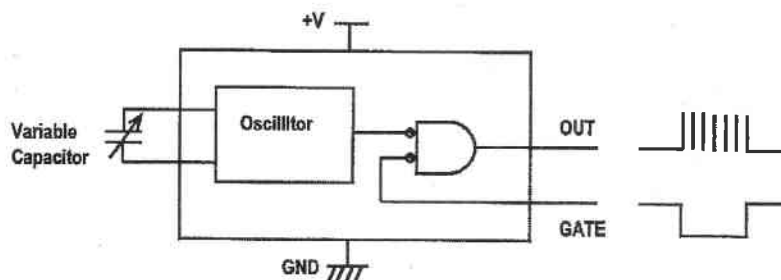
### 7. Production Process Table



## 8. Pressure Sensor

### SPECIFICATION

1. Model CS-20A
2. Construction  
Pressure / Frequency Converter



### 3. Usage Condition

3-1 Pressure range	0 ~ 300 mmHg
3-2 Safety over load	390 mmHg
3-3 Compensation temperature range	0 ~ 50 °C
3-4 Storage temperature range	-34 ~ 65 °C
3-5 Humidity	85% Rh or below
3-6 Power supply	3 V ~ 4 V

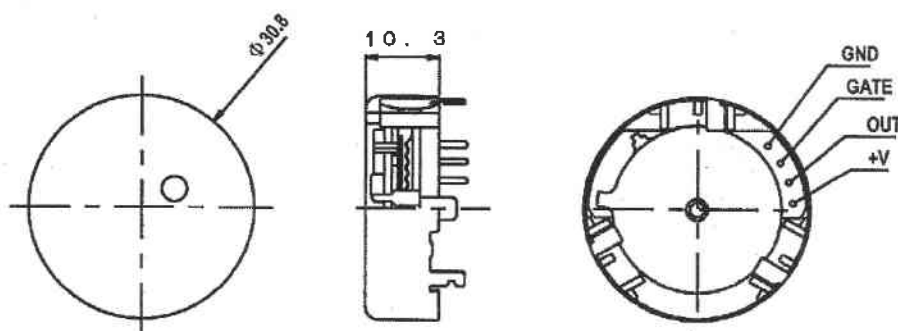
### 4. Outline

Outline dimension	$\phi$ 30.8 × H10.3mm
Weight	Approx. 15g

### 5. Performance

5-1 Output frequency	0 mmHg : 800 kHz $\pm$ 300 kHz $\cdots$ f <sub>0</sub> 300 mmHg: f <sub>0</sub> -240 kHz
5-2 Linearity	Within $\pm$ 0.3 % of FS
5-3 Hysteresis	Within $\pm$ 0.3 % of FS
5-4 Span drift	$\pm$ 1% (10 °C ~ 45 °C)

CS-20A-01 Outline Drawing





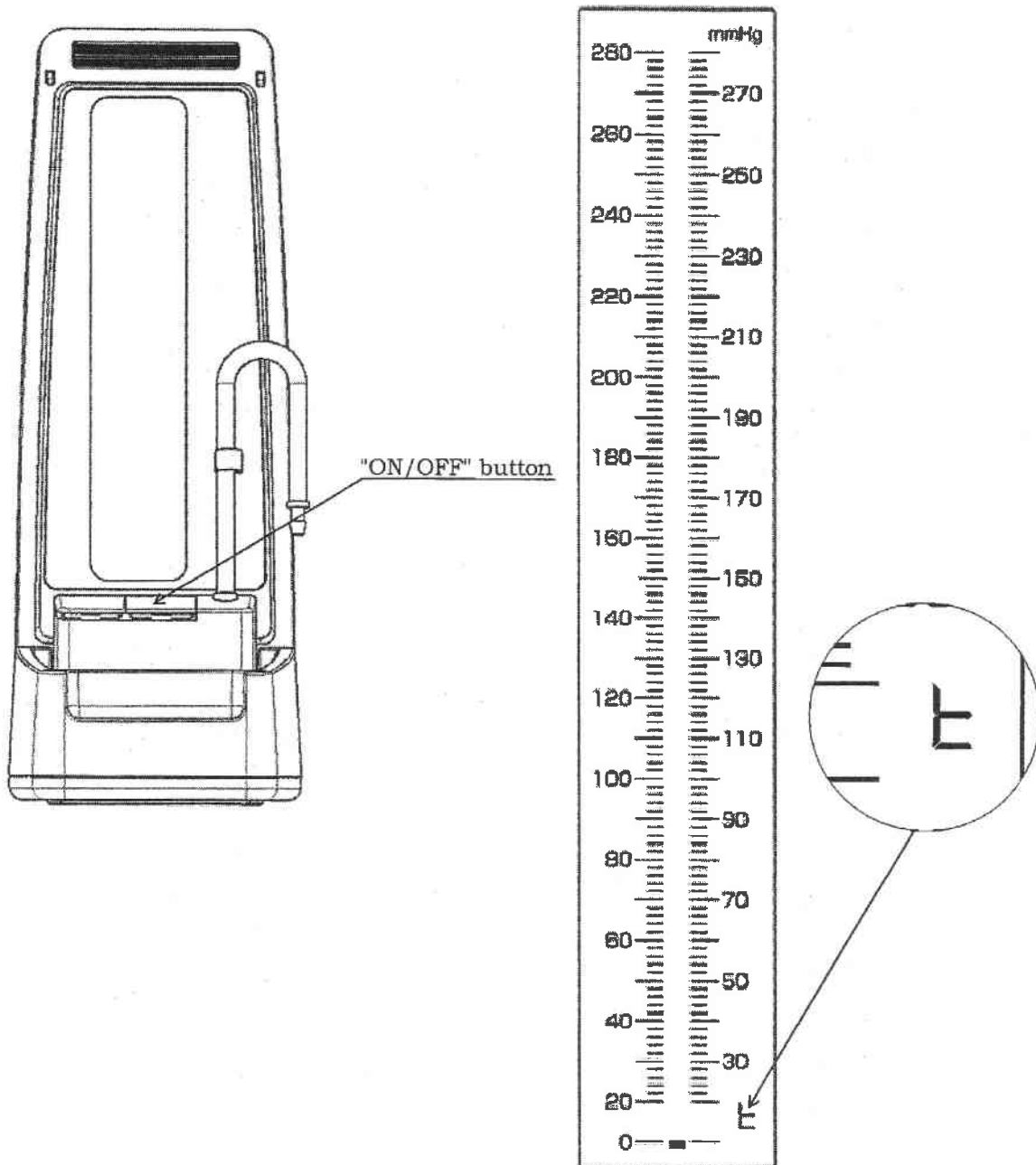
## 9. Pressure Test

### Method of Pressure Test

Insert batteries while holding the "ON/OFF" button.

"t" is displayed, indicating that the unit is in pressure test mode.

Apply pressure using pressure manometer and confirm the pressure value displayed on Bar LCD.

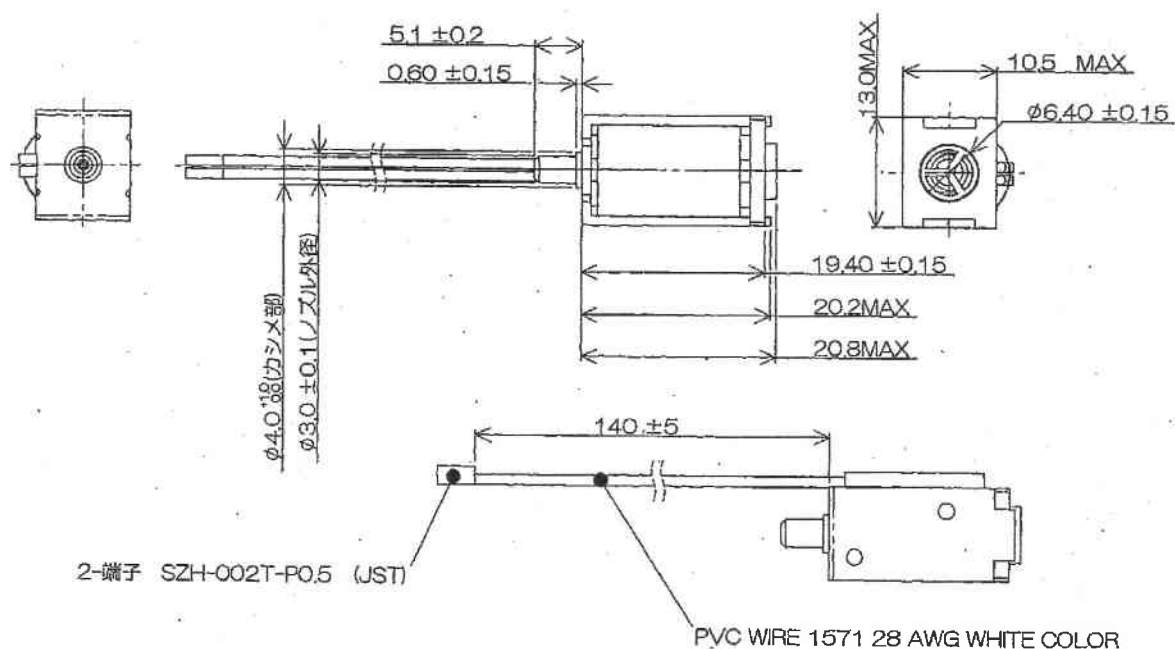


## 10. Electro Magnetic Valve (EV)

### 10-1 SPECIFICATIONS

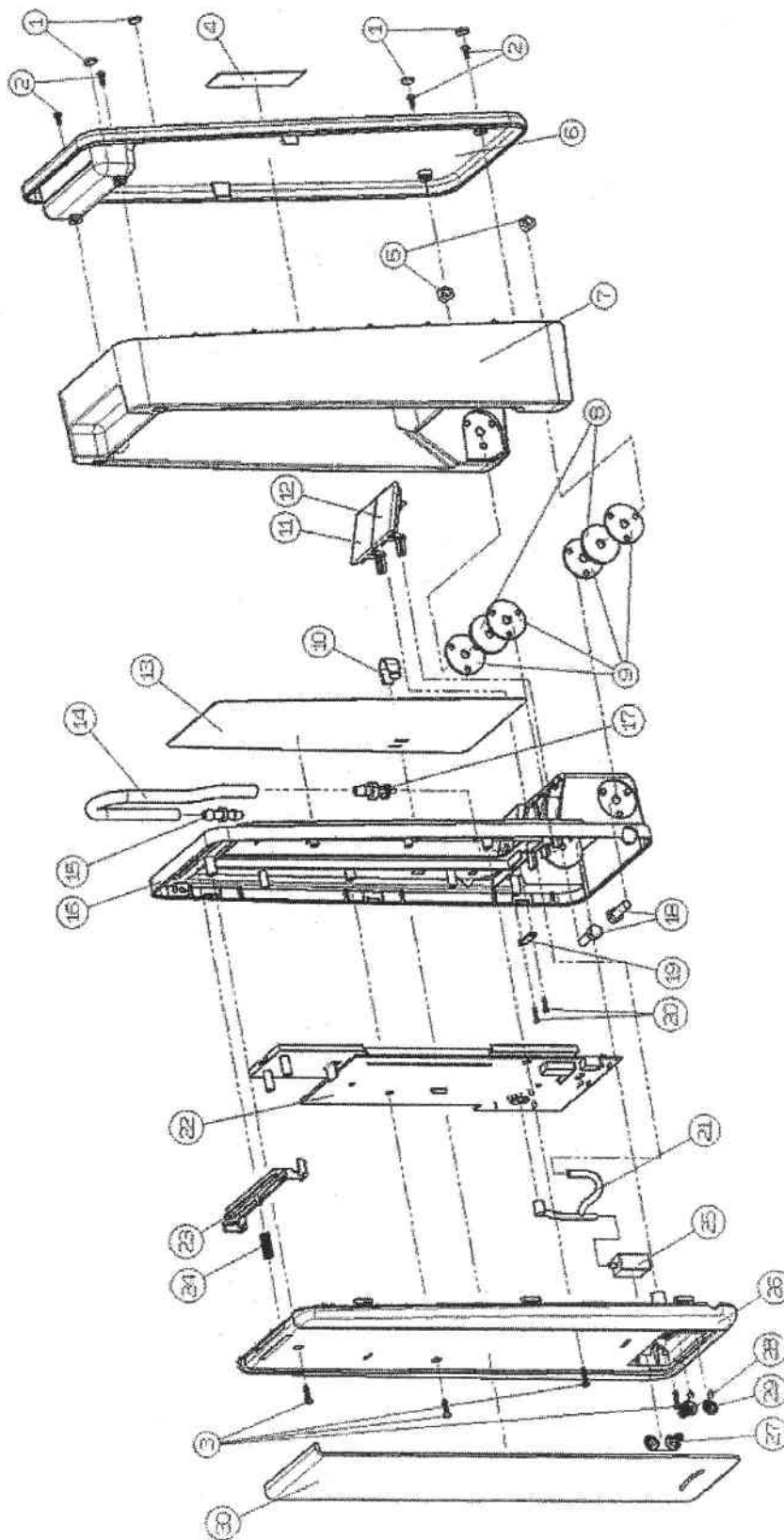
1) Rated voltage	: 3.0V
2) Range of operating voltage	: DC 2.2V ~ 3.0V
3) consumption electric power (Max)	: 0.285W
4) Use fluid	: Air
5) Range of operating pressure	: 330 mmHg Max
6) Range of operating temperature	: 0 °C to +45 °C 85% RH
7) Range of preservation temperature	: -25 °C to +70 °C 85% RH
8) Humidity	: 45 ~ 85% RH
9) life	: More than 30,000 times.

### 10-2 Outside drawing

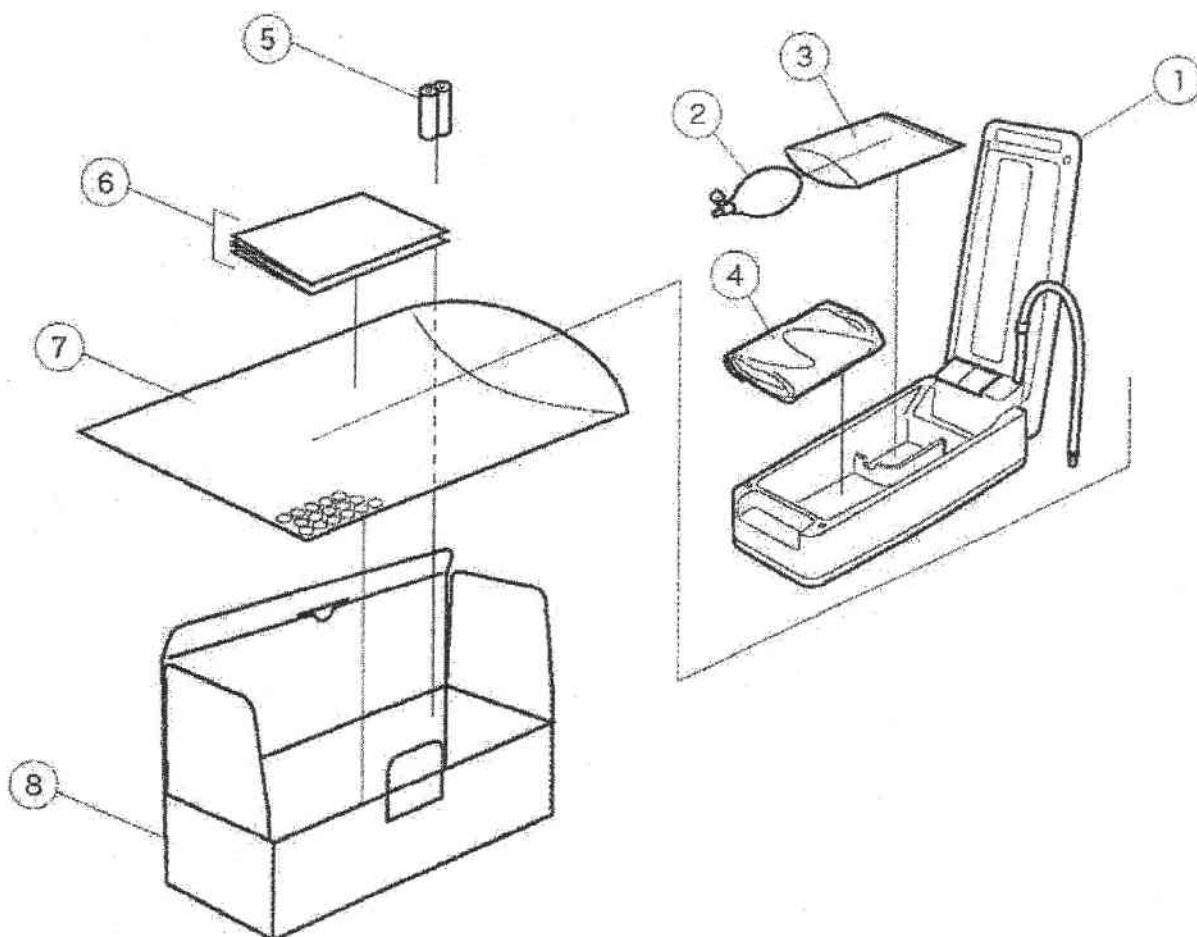


# 11. Exploded Views

## 11-1. Main Unit



## 11-2. Packing



## 12. Parts List

### Main Unit

No.	Parts name	Parts code	Material technical data	Quantity /unit
1	Rubber Foot	A114549-1	NBR	4
2	Screw 2.6 × 6	F111695-2606	NiC	4
3	Screw 2.6 × 10	F111695-2610	NiC	4
4	Bottom Label	A119443-1	Paper	1
5	Nut M5	F116966-50	NiC	2
6	Case C	D116854-1	ABS	1
7	Case D	D116856-1	ABS	1
8	Rubber Plate DM	A116764-1	NBR	2
9	Metal Plate DM	A116763-1	SPCC	4
10	Hose Clip	A116990-1	ABS	1
11	Key top P	B116860-1	ABS	1
12	Key top M	B116862-1	ABS	1
13	Display panel (Printing)	A119442-1	PC	1
14	Air Hose	A110680-0300	PVC	1
15	Plastic Connector	33616PM	ABS	1
16	Case A	D116850-1	ABS	1
17	Air Connector DM	A116904-1	ABS	1
18	Bolt M5 × 16	F116965-5016	NiC	2
19	Belt DM	A116906-1	SPCC	1
20	Screw 2 × 8	F111695-2008	NiC	2
21	Preform tube DM500	A116924-1	PVC	1
22	PCB Assy	B251556-1	---	1
23	Lock Lever	B116827-1	PC	1
24	Spring	A116835-1	SWIC-F	1
25	EV	A210467-1	---	1
26	Case B	D116852-1	ABS	1
27	Terminal +	A101824-1	Steel	1
28	Terminal -	A101825-1	Steel	1
29	Terminal +	A101826-1	Steel	1
30	Cover	C116858-1	ABS	1

### Packing

No.	Parts name	Parts code	Material technical data	Quantity /unit
1	Main Unit	DM-500-15	----	1
2	Inflation Bulb Assy	A117660-1	----	1
3	PE Bag	A106131-09	PE-LD	1
4	Cuff Assy	A110846-1	Adult	1
5	Battery	A210438-1	LR6	2
6	Instructions	A119447-1	English	1
		A119448-1	Spanish	1
7	Air Pack	A118105-1	----	1
8	Printing Box	A119446-1	Paper	1
				1
				1
				1