

ALP K2®

Service Manual
for Digital Blood Pressure Monitor

Model No.K2-1701

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1. Description

THE MODEL DS-135-03 is a Manual Inflation Digital Blood Pressure Monitor. The readings in each function are digital displayed on LCD panel.

STATUS INDICATION shows Deflation, Inflation, Pulse Wave and Battery Weak.

ERROR MESSAGE CODE includes Battery Weak, it is impossible to measure the blood pressure accurately.

BATTERY POWER is monitored when the unit is turned on and a warning will be displayed if it is too weak.

MEASURING SEQUENCE is displayed to invite necessary operation by the user.

They are;

Deflation: Wait until inflation or dump the cuff pressure.

Inflation: Pressurize the cuff.

BEEPER tells the positive pick up of the pulse wave, together with the flashing "HEART" Mark on the display.

AUTOMATIC POWER SHUT OFF;

The unit will automatically turn off if it is not operated for about 180 seconds or more.

2. Specifications

| | | |
|--|--|---|
| 2-1. Model | DS-135-03 | |
| 2-2. Classification | CLASS II a | |
| 2-3. Function | ① Blood Pressure Measuring | |
| | ② Pulse Rate Measuring | |
| | ③ Automatic Power Shut Off | |
| | ④ 3 Error Indication | |
| 2-4. B.P.M. Specifications | | |
| (1) Measuring Method | Cuff Oscillo-Metric | |
| (2) Measuring Position | Upper Arm | |
| (3) Coverage arm circumference | 220mm ~ 320mm | |
| (4) Pressure detection | Pressure to Frequency Converter | |
| (5) Pressure indicating (Cuff Pressure) | ① Units | mmHg |
| | ② Range | 0 - 300 mmHg |
| | ③ Resolution | 1mmHg |
| | ④ Zero setting | Automatic zero setting |
| (6) Measuring range | ① Systolic | 50- 250 mmHg Cuff Pressure |
| | ② Diastolic | 40- 180 mmHg Cuff Pressure SYS-DIA >10mmHg |
| (7) Accuracy | ① Pressure | ± 3 mmHg |
| | ② Pulse rate | ± 5 % of Reading |
| (8) Cuff inflation | Squeeze Bulb | |
| (9) Preset pressure | 180mmHg | |
| (10) Cuff deflation | Constant Air Release Manual Valve | |
| (10) Deflation rate | 2.0 ~ 5.0 mmHg/sec.(Nominal 3.5 mmHg/sec.) | |
| (11) Rapid Exhaust | Automatic Exhaust (EV) | |
| (12) Cuff system | ① Cuff of Upper Arm | |
| | ② Locking Mech-Velcro | |
| | ③ Bladder Size | 130 mm (W) × 230 mm (D) |
| | ④ Cuff Size | 147 mm (W) × 500 mm (D) |

| | | |
|---|--|--|
| (13) Indicator | 9 Digits+ 4 State Indicators LCD.Display | |
| | ① 9Digits Display | <ul style="list-style-type: none"> • Systolic • Diastolic • Pulse rate • Memory No. |
| | ② 4 State Indicators | <ul style="list-style-type: none"> • Inflation • Deflation • Palpatory wave • Weak battery |
| (14) Memory | ① Systolic and Diastolic | |
| | ② 30 measurement results ×1 Way | |
| | ③ Memory Data Average (SYS. DIA.) | |
| (15) Microcomputer | 8Bit Microcomputer | TMP86CH29BF |
| (16) Power Source | R6P,LR6 Type (AA Saize) 4 pcs. | |
| (17) Power consumption | 40mW (Max.) | |
| (18) Operating TEMP./Humidity | +10 ℃ to +40 ℃ /15% ~ 90% RH SP10 4.4.2.3.A | |
| (19) Storage TEMP./Humidity | -34 ℃ (24H) to +65 ℃ /85% RH (24H) SP10 4.2.1 | |
| (20) Main unit size | 150 mm(W) × 115 mm(D) × 50.5 mm(H) | |
| (21) Main unit weight | APPROX. 180 gm (Not Including Batteries) | |
| 2-5. Safety system | Cuff Pressure > 330mmHg → Rapid Exhaust | |
| 2-6. Electrical safety | SP10 5.3.2 | |
| 2-7. Resistans to vibration & shock | SP10 5.2.3.1 | |
| 2-8. Air Leakage | SP10 4.5.2.1 | |
| 2-9. Electromagnetic compatibility | IEC60601-1-2 | |
| 2-10. Stability of the cuff pressure indication | SP10 4.4.3.4.A, 4.4.1.4.A | |
| 2-11. Overall system accuracy | SP10 5.4.5.B | |
| 2-12. Lay a pipe system | See "11. Exploded Views" P19 | |
| 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:

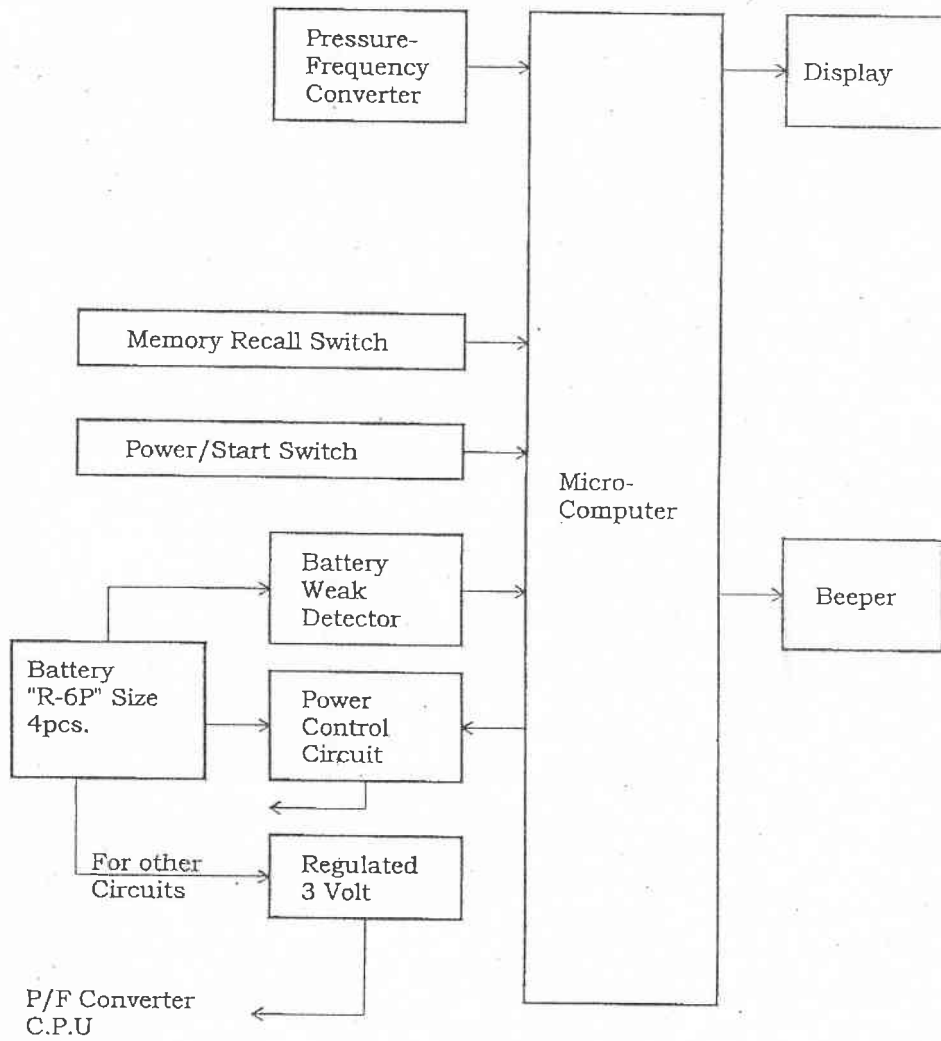


FIG. 3-1 Block Diagram

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.

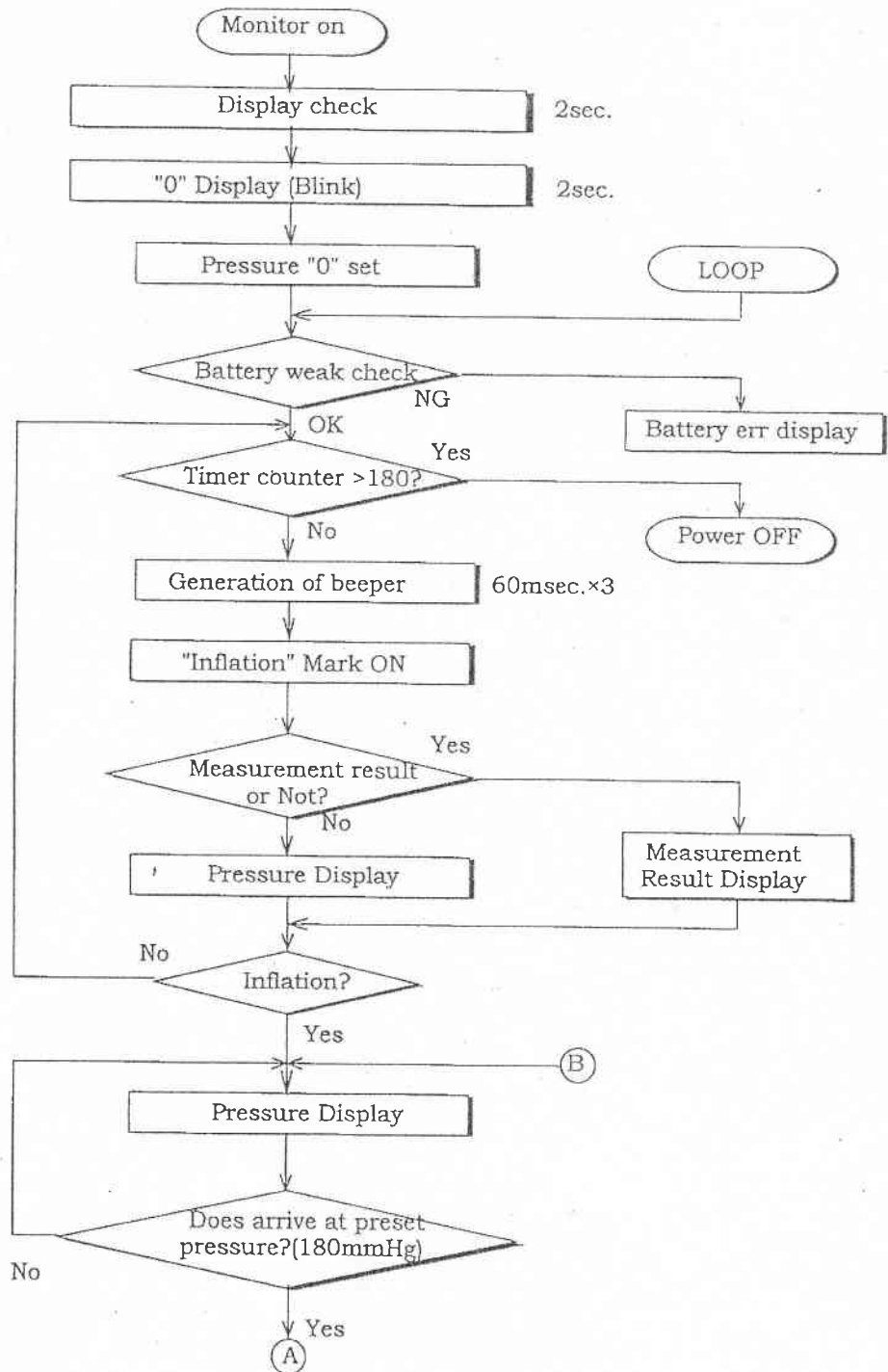
Display Unit;

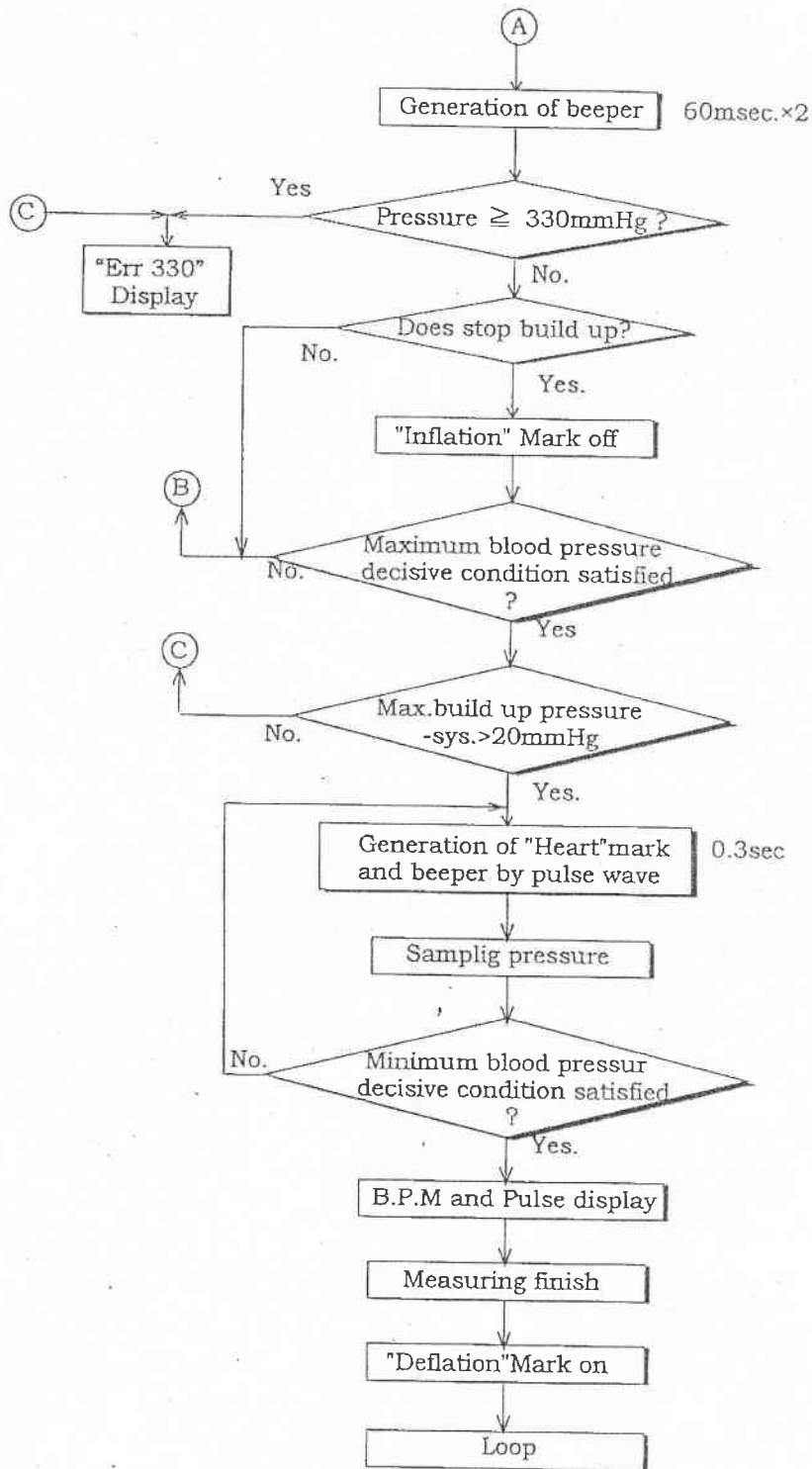
Displays cuff pressure, maximum blood pressure, minimum blood pressure, pulse rate and information messages.

c) 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;

Squeeze bulb : Used during an increase of pressure.

Constant exhaust valve : Rate to be 2-3 mmHg per second.

Rapid exhaust valve : Used after the measurement.

Cuff : To tighten the left arm.

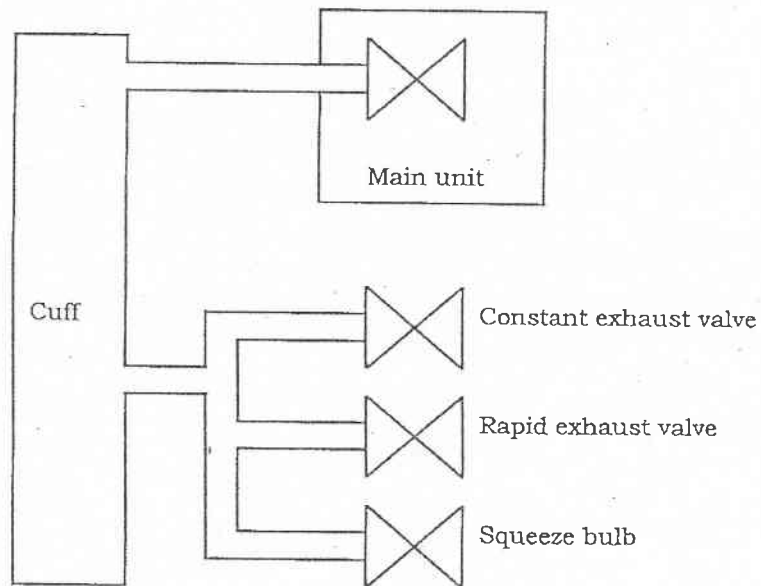


FIG. 3-3 Air Circuit

4. Operating Instruction

4-1 Power Supply

1) Battery Installation

Take off battery cover rear side of main body and insert 4 pieces of R-6P or LR-6 type batteries to fit polarity indication.

4-2 Measurement Procedures

1) Power switch on

Please confirm to appear "Deflation" mark on the LCD panel.

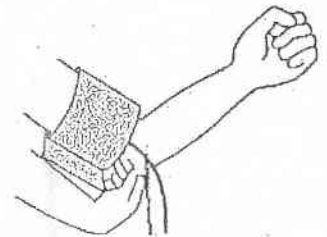
2) Wrap the Cuff around the upper left arm.

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.

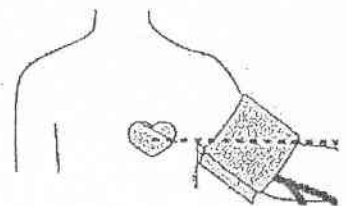
* When wrapping the cuff, wrap it loosely enough around the arm so that two fingers can be placed between the cuff and the arm. If the cuff is wrapped more tightly or loosely than this, inaccurate blood pressure readings may result.

* 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.



- 3) Confirming display "Inflation", set rapid exhaust valve to close side.
- 4) Squeeze the inflation bulb until the display indicates a measure greater than your expected systolic pressure by 30-40 mmHg
- 5) "Inflation" indication will disappear when pressure start to descend. Please do not move your body as possible as you can later.
- 6) Further descending cuff pressure, indication mark for "Heart mark" flashing and "beeper sound" sounds to notice pulse wave when the pulse wave begin to generate.
- 7) Further descending cuff pressure and when come to minimum blood pressure, display for "Heart mark" flashing also disappear accompanied with longer beeper sound.
- 8) Measurement is completed above all steps.
- 9) Minimum and maximum blood pressure is displayed for 3 second and pulse rate is displayed for 2 second and on the LCD panel
- 10) Push the rapid exhaust button. Until a beeper will sound.

4.3 Memory information

1) The unit can store the results 1 way of 30+A measurements in the memory.

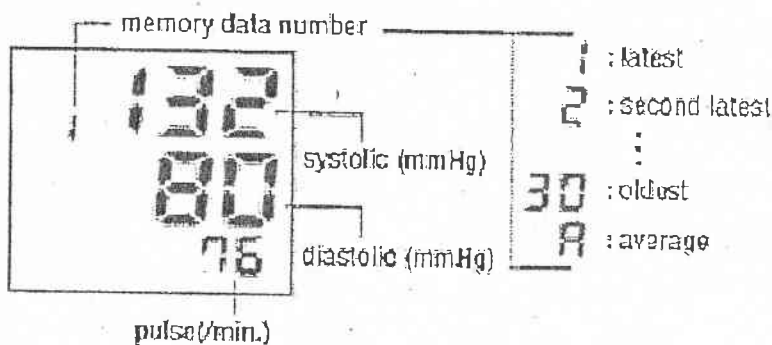
Measurement result is automatically stored in the memory when the measurement is completed. (Memory No. 1 indicates the measurement result obtained in the right previous measurement).

2) To recall the memory, press Memory Button, a single push will recall the results stored in Memory 1,2,3,4,5, ,30 and A pushes on the button will recall the results in Memories 1,2,3,4,5, , and 30. The memory number recalled will be shown in the Memory number Display Area in the right corner of the display panel.

3) If you press the memory recall button in succession by the number of times of memory, and press it again after all the memory data are recalled, you can see in the LCD display the average value of all stored data of Systolic blood pressure and the average value of all stored data of diastolic blood pressure. At the same time, in the area of memory No. as a marking is indicated.

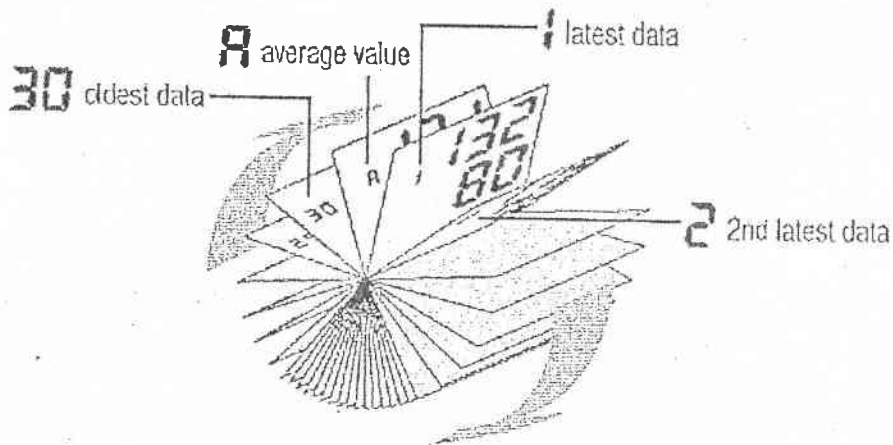
Press the MEMORY button.

(When no measurements are stored, nothing will be displayed.)



The memory data is displayed for approximately 5 seconds. Approximately 5 seconds after the MEMORY button is released, the apparatus will turn off or return to the current measurement display. Every depression of the key switches among the memory data.

While the MEMORY button is held down for approximately 2 seconds, the memory data numbers will be fast-forwarded to the average of total stored data unless the button is released; the number stops as the button is released.



5. Error Display

This blood pressure monitor displays as error message for mistake measurement method and weak battery.

In case displaying error message during measurement, please exhaust and please re-measure after confirming how to use.

1) Improper pressure

Err 330 * Inflation above 330 mmHg.

Err

* Noise is detected by moving body during measurement.

* The exhaust speed is irregular.

The exhaust speed is higher than 6 mmHg/sec. or less than 2 mmHg/sec.

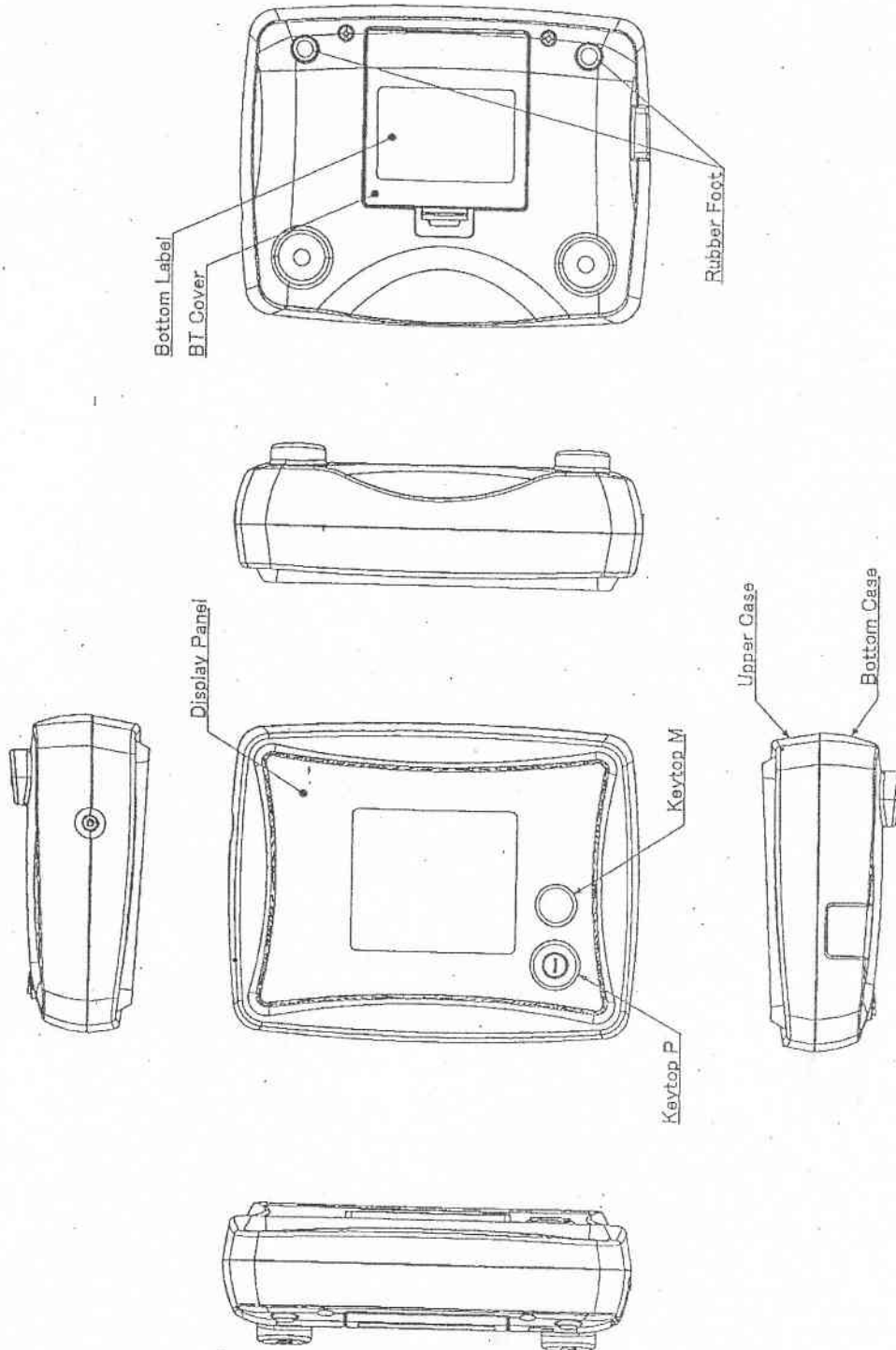
2) Weak battery



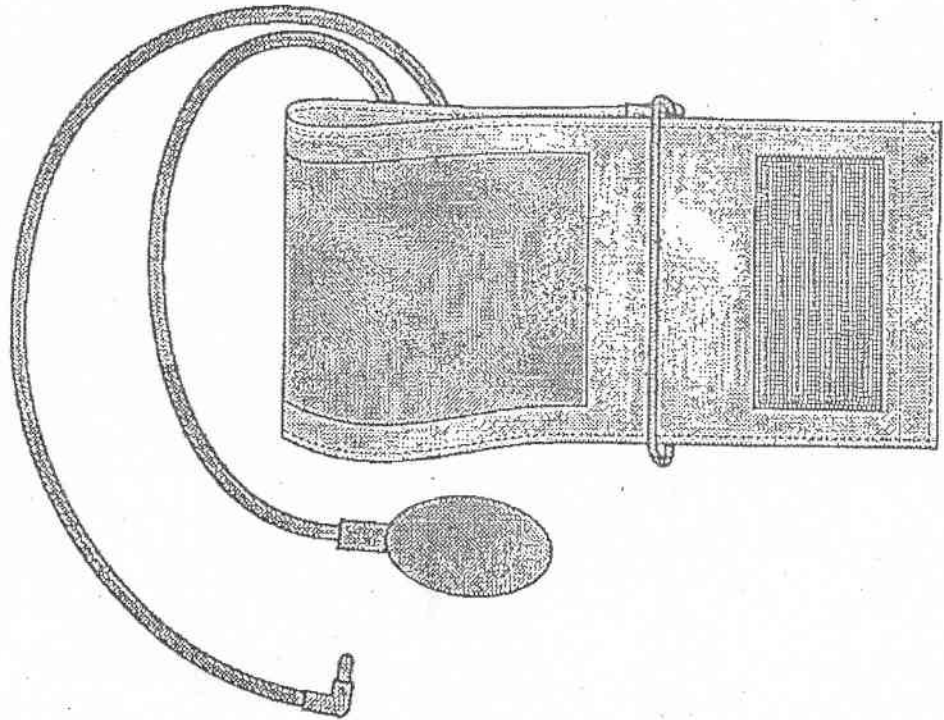
Weak battery provide inadequate voltage for operation of the unit. Batteries need to be replaced.

6. Out Side Drawing

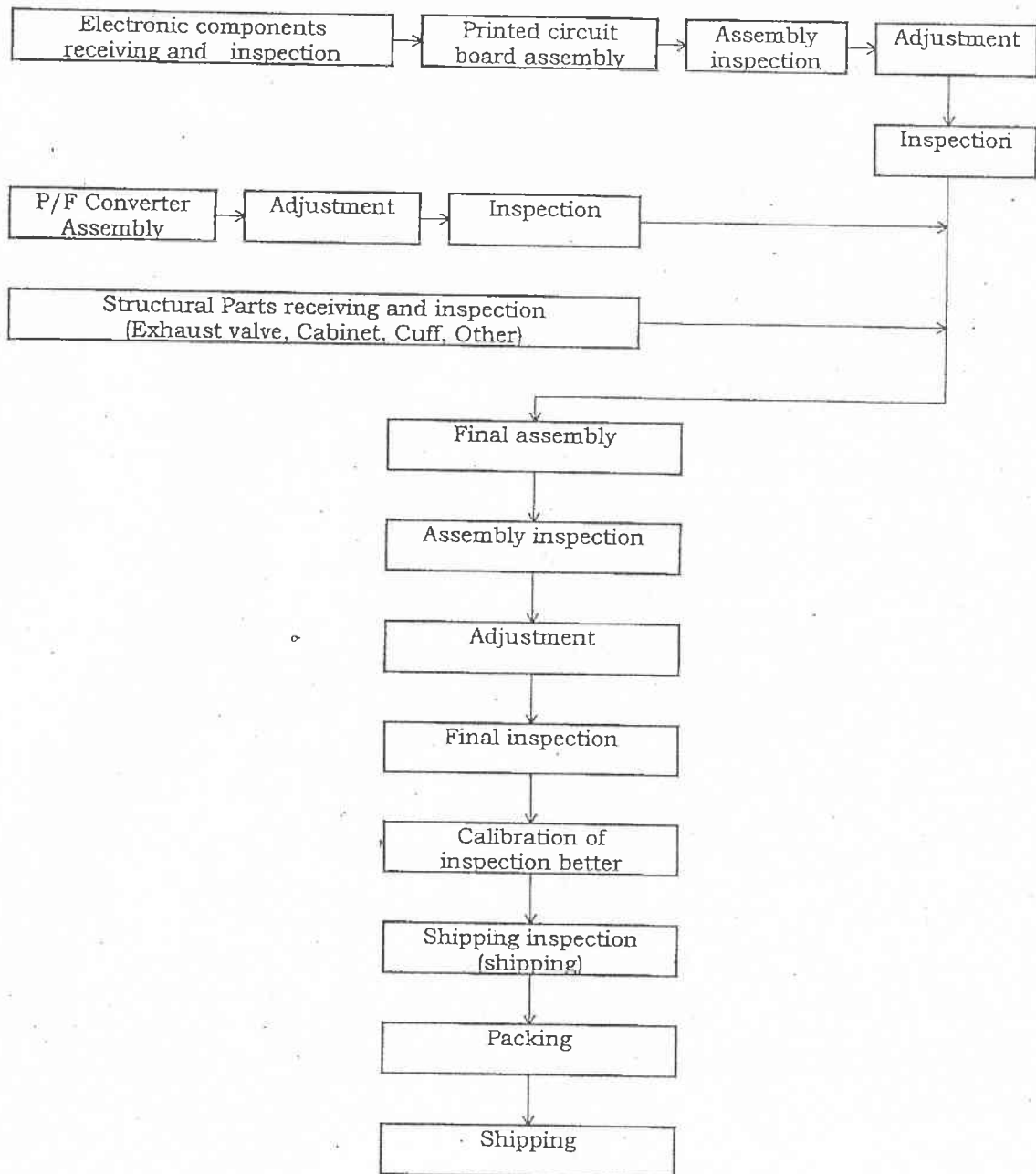
6-1. Main Unit



6-2. Cuff Unit



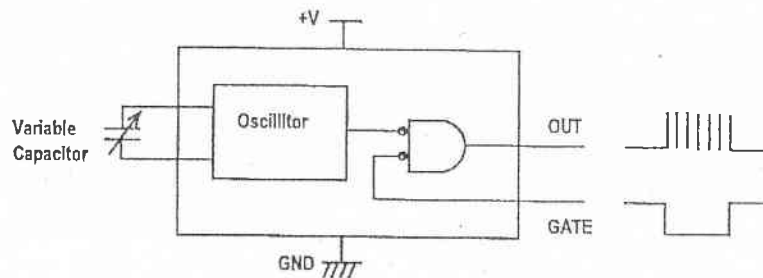
7. Production Process Table



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 |

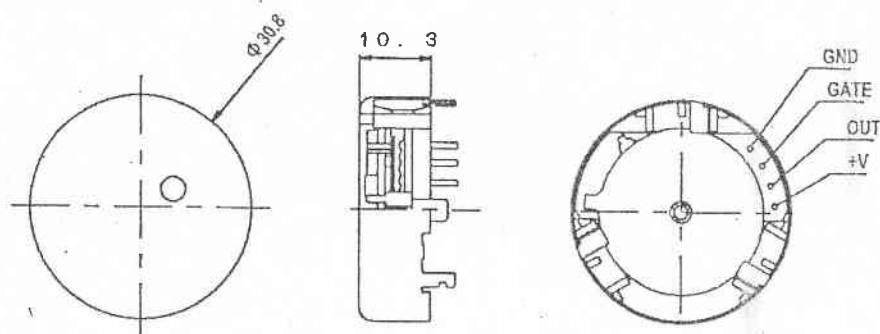
4. Outline

| | |
|-------------------|-----------------------|
| Outline dimension | ϕ 30.8 × H10.3mm |
| Weight | Approx. 15g |

5. Performance

| | |
|----------------------|--|
| 5-1 Output frequency | 0 mmHg : 800 KHz \pm 300 KHz \cdots f0 300 mmHg: f0-240 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 start button.

Both upper and under 3 columns show "0" indication, Now the unit is in pressure test mode.

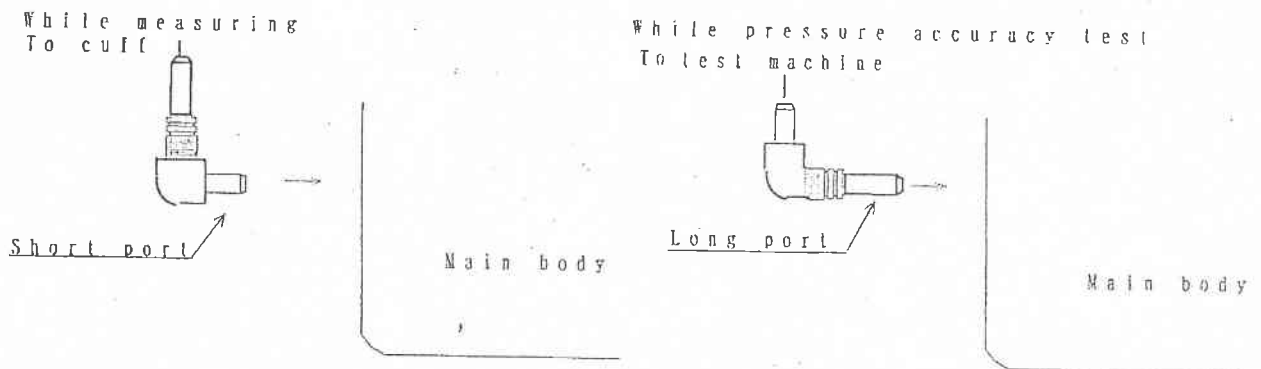
When this mode is set in, the same pressure is indicated in 3 digits both on the upper and the under, it means that the pressure precision of the SYS and DIA are the same.

When pressure fluctuate up and down during a pressure test, it is judged as pulse wave, which will decide the SYS or DIA, or cause errors.

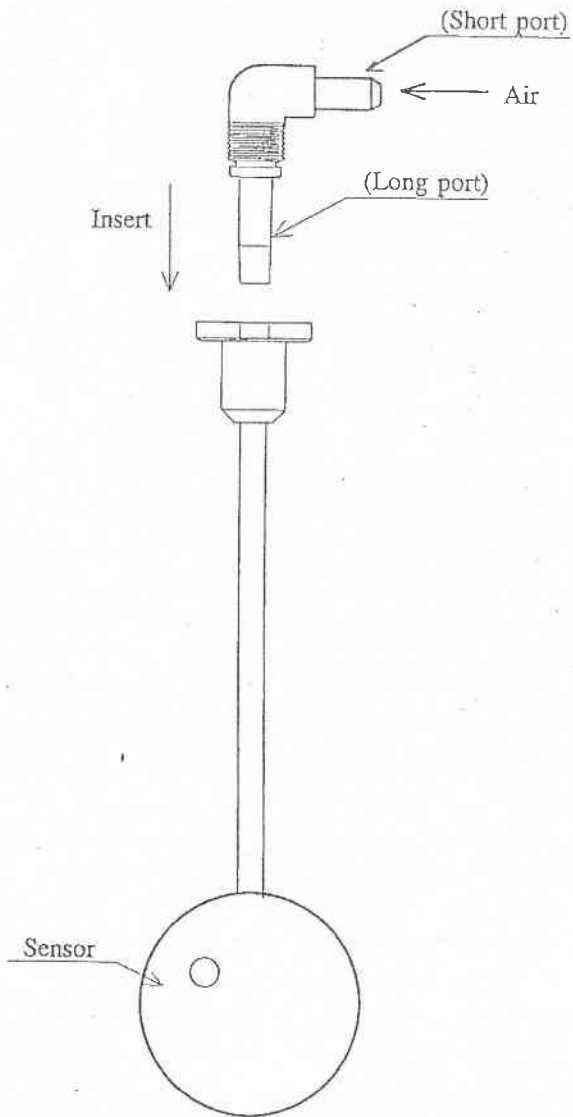
Therefore, the mode which indicates pressure only is selected.

Notice at pressure accuracy test

When making pressure accuracy test, As mentioned below, Please insert an air connector to main body conversely of blood pressure measuring in order to intercept air-circuit which is connected to constant exhaust valve.

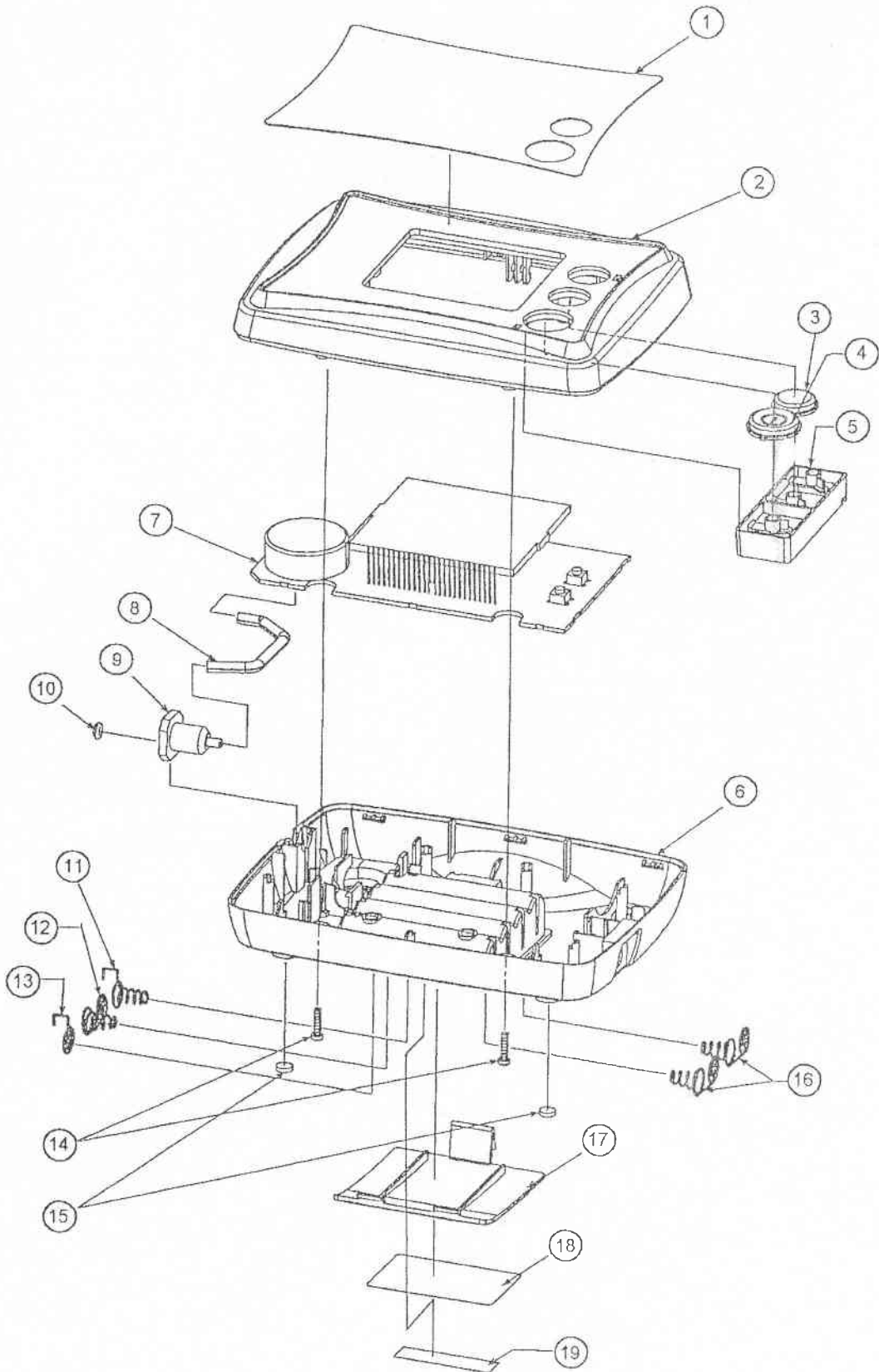


Pressure test circuit

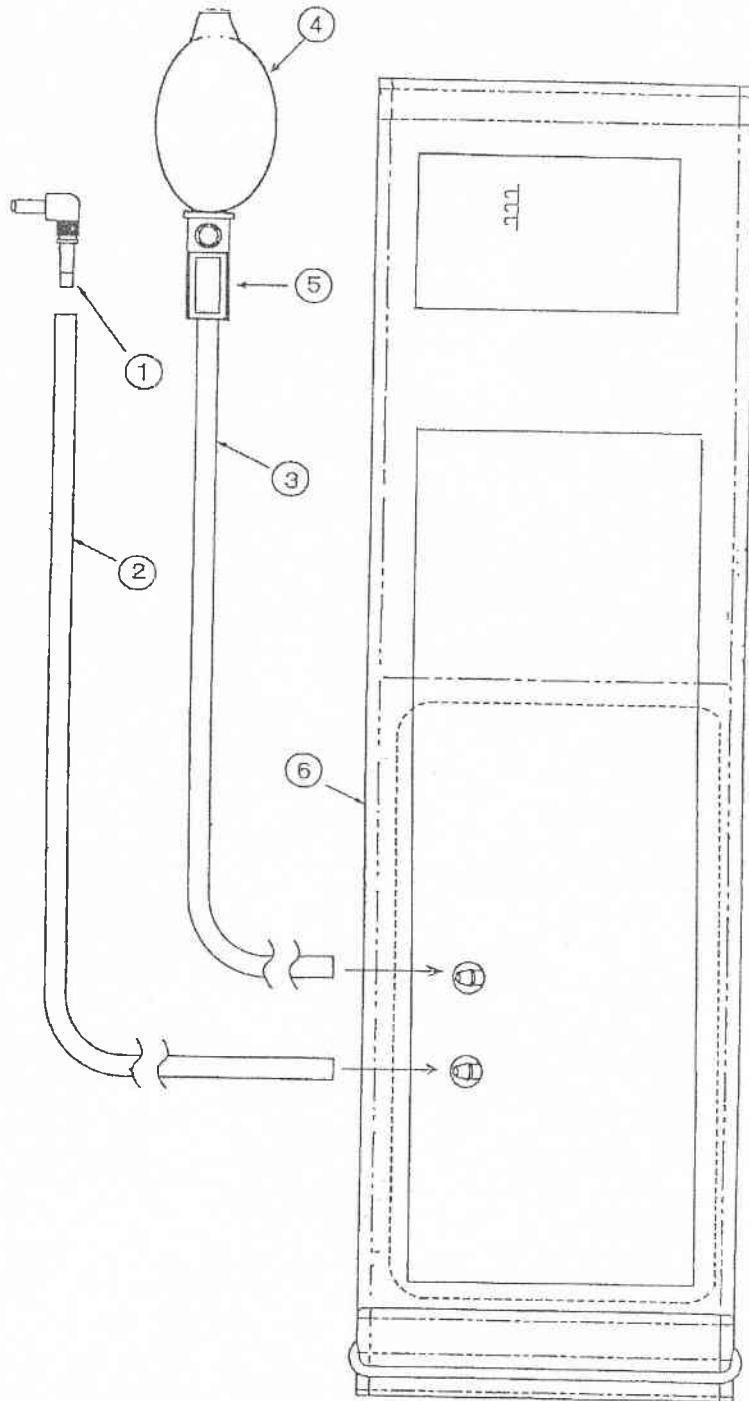


10. Exploded Views

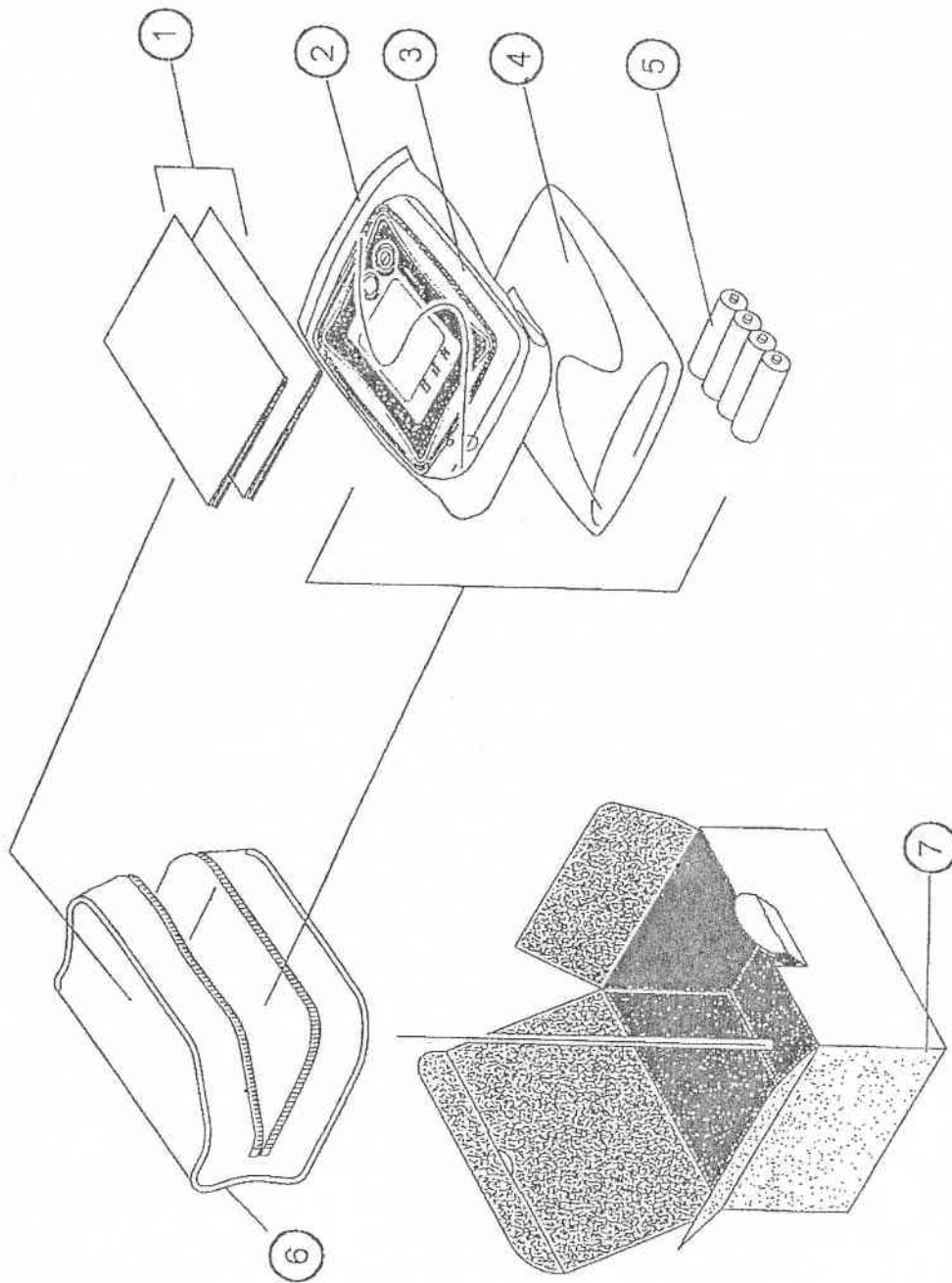
10-1. Main Unit



10-2. Cuff Unit



10-3. Packing



12. Parts List

Main Unit

| No. | Parts name | | Material technical data | Quantity /unit |
|-----|--------------------------|--------------|---------------------------|----------------|
| 1 | Display panel A | A112595-1 | P.C | 1 |
| 2 | Upper case | D112417-1 | ABS | 1 |
| 3 | Memory switch knob | A112421-1 | ABS | 1 |
| 4 | Power/Start switch knob | A112419-1 | ABS | 1 |
| 5 | Switch knob holder | A112423-1 | | - |
| 6 | Bottom case | A112974-1 | ABS | 1 |
| 7 | PC board assembly | B251273-1 | FR-2(PF-CP02) | 1 |
| 8 | Air tube L=90 | A100245-0090 | Silicon | 1 |
| 9 | Air connector | A102543-1 | PE/HD | 1 |
| 10 | O ring | 53831PN | Silicon | 1 |
| 11 | Battery terminal (-) | A106260-1 | Steel(Nickel Plating) | 1 |
| 12 | Battery terminal (- +) | A106258-1 | | 1 |
| 13 | Battery terminal (+) | A101826-1 | Steel(Nickel Plating) | 1 |
| 14 | Battery cover | A111216-1 | Steel(Chromate treatment) | 2 |
| 15 | Case holding screw | A100034-2610 | NBR | 2 |
| 16 | Battery terminal (+ -) | A106258-1 | ABS | 1 |
| 17 | Battery cover | C111216-1 | Steel(Chromate treatment) | 2 |
| 18 | Bottom label | A112637-1 | HSM | 1 |
| 19 | Serial Number label | A103587-1 | | |

Cuff Unit

| No. | Parts name | | Material technical data | Quantity /unit |
|-----|-------------------|--------------|-------------------------|----------------|
| 1 | Air plug | A109137-1 | ABS | 1 |
| 2 | Air tube | A110680-0610 | PVC | 1 |
| 3 | Air tube | A110680-0610 | PVC | 1 |
| 4 | Inflation bulb | A105033-1 | PVC | 1 |
| 5 | Air control valve | A111824-1 | PVC | 1 |
| 6 | Cuff | A110558-1 | PVC+Nylon | 1 |

Packing

| No. | Parts name | | Material technical data | Quantity /unit |
|-----|------------------------|-------------|-------------------------|----------------|
| 1 | Instructions (English) | A113160-1-A | Paper | 1 |
| 1 | Instructions (Spanish) | A113338-1-A | Paper | 1 |
| 2 | Polyethylene Bag No.10 | A100663-10 | PE-LD | 1 |
| 3 | Main Unit | A112967-1 | ---- | 1 |
| 4 | Cuff Packing | A110556-1-B | ---- | 1 |
| 5 | Battery (R6) | A210238-2 | ---- | 4 |
| 6 | Carring Bag | A112152-1 | PVC | 1 |
| 7 | Gift Box | A113159-1-A | Paper | 1 |

13. Trouble shooting

GENERAL PERFORMANCE

Each unit claimed to be defective should be rechecked to determine whether the problem is really due to a failure of the device. There are many cases where a customer returns the unit thinking it is defective when, in fact, it was simply handled improperly. Check the unit to determine if it is actually defective.

Note : that the accuracy of a blood pressure reading is affected by the following conditions.

1. Operating sequencePower switch must be turned on first of all.
2. Cuff wrapping adjustmentIf the cuff is too tight or too loose, inaccurate blood pressure readings may result.
3. Arm sizeApplicable circumference range is from;
220 to 320 mm. (Normal cuff)
320 to 420 mm. (Large cuff)
4. Arm movementMoving may give inaccurate readings, or no readings.
5. Arm (Cuff) levelThe arm must be at same level as the heart.
6. Low battery

CUSTOMER EDUCATIONS IF UNIT IS NOT OUT OF ORDER

If general performance of the unit is within the specifications, the reason for the return should be one of the following.

1. The readings did not agree with those from his or her doctor.
2. proper reading could not be obtained due to the special heart body characteristics peculiar to the particular user.

The following causes can be considered for item 1 above.

- Blood pressure varies according to changes in physical rhythm at different times of the day-morning, afternoon, evening, right after a meal, and / or any routine movement.
- State of mind (There are many people whose blood pressure increases in front of a doctor due to tension.)
- Ambient temperature (Blood pressure varies according to the season-summer, winter, etc.)
- Exercise and / or work

Detailed explanations to the customer should be provided for their better understanding of the variations in blood pressure readings and the theory of measurement.

The following causes can be considered for item 2 above.

- Abnormality in his or her circulation system (A skipped heartbeat or an irregular pulse will make a proper reading difficult.)
- Exceptionally low pulse level (A condition unique to that individual could cause a low pulse level.)

If a customer has something peculiar about his or her circulation system, it should be explained to him or her by their doctor. Most people with an irregular pulse will be able to read his or her blood pressure correctly after some training. However, the customer having such an abnormality should consult his or her doctor, if they have not already done so.

If a customer's pulse level is low, make another attempt to check their blood pressure. If a correct reading still cannot be obtained, he or she cannot use an electronic blood pressure monitor.

TROUBLE SHOOTING CHART

| Symptom | Cause | Remedy |
|---|---------------------------------------|---|
| Cuff setting trouble | Broken cuff. | Replace the cuff. |
| Unit is inoperative | Batteries are too weak. | Replace batteries. |
| | Broken battery terminal or soldering. | Replace the bottom case assembly or resolder. |
| | Defective circuit. | Replace the circuit board. |
| No display | Poor parts soldering. | Resolder. |
| | Defective LCD or CPU. | Replace the circuit board. |
| Cannot inflate (pressure display does not increase.) | Defective Rubber balb. | Replace the Rubber balb. |
| | Defective tube. | Replace the tube. |
| | Defective bladder. | Replace the bladder. |
| | Defective pressure sensor or circuit. | Replase the circuit board. |
| Exhaust is too fast | Defective CV. | Replace the circuit board and CV. |
| | Defective O ring. | Replace the O ring.. |
| | Bursted bladder. | Replace the bladder. |
| No beeping | Poor buzzer soldering. | Resolder. |
| | Broken buzzer. | Replace the buzzer. |
| | Circuit failure. | Replace the circuit board. |
| ♥ does not flash | Circuit failure. | Replace the circuit board. |
| Systolic and diastolic is not measured | Circuit failure. | Replace the circuit board. |
| "Err" appears very often | Exhaust is too fast. | Replace the circuit board and CV . |
| | (Defective O ring.) | Replace the O ring. |
| | (Burstled bladder.) | Replace the bladder. |
| | Circuit failure. | Replace the circuit board. |
| Inaccurate reading | Circuit failure. | Replace the circuit board. |