

ALP K2®

Service Manual

for Digital Blood Pressure Monitor

Model No.K2-1702

INDEX

1. Description	2
2. Specifications	3
3. Principles of Operation	5
4. Operating Instruction	10
5. Error Display	12
6. Outside Drawing (Main Unit)	13
7. Production Process Table	14
8. Pressure Sensor	15
9. Pressure Test	16
10. Exploded Views	
10-1.Main Unit	18
10-2.Cuff Unit	19
10-3.Packing	20
11. Parts List	21
12. Trouble Shooting	22

1. Description

THE MODEL DS-1904-03 is an Auto 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.

AUTOMATIC AIR INFLATION inflates the cuff pressure by an internal air pump.

AUTOMATIC AIR DUMP VALVE dumps the pressure in the cuff automatically when the measurement is over or error has been occurred.

AUTOMATIC POWER SHUT OFF;
The unit will automatically turn off if it is not operated for about 180 seconds or more.

2. Specifications

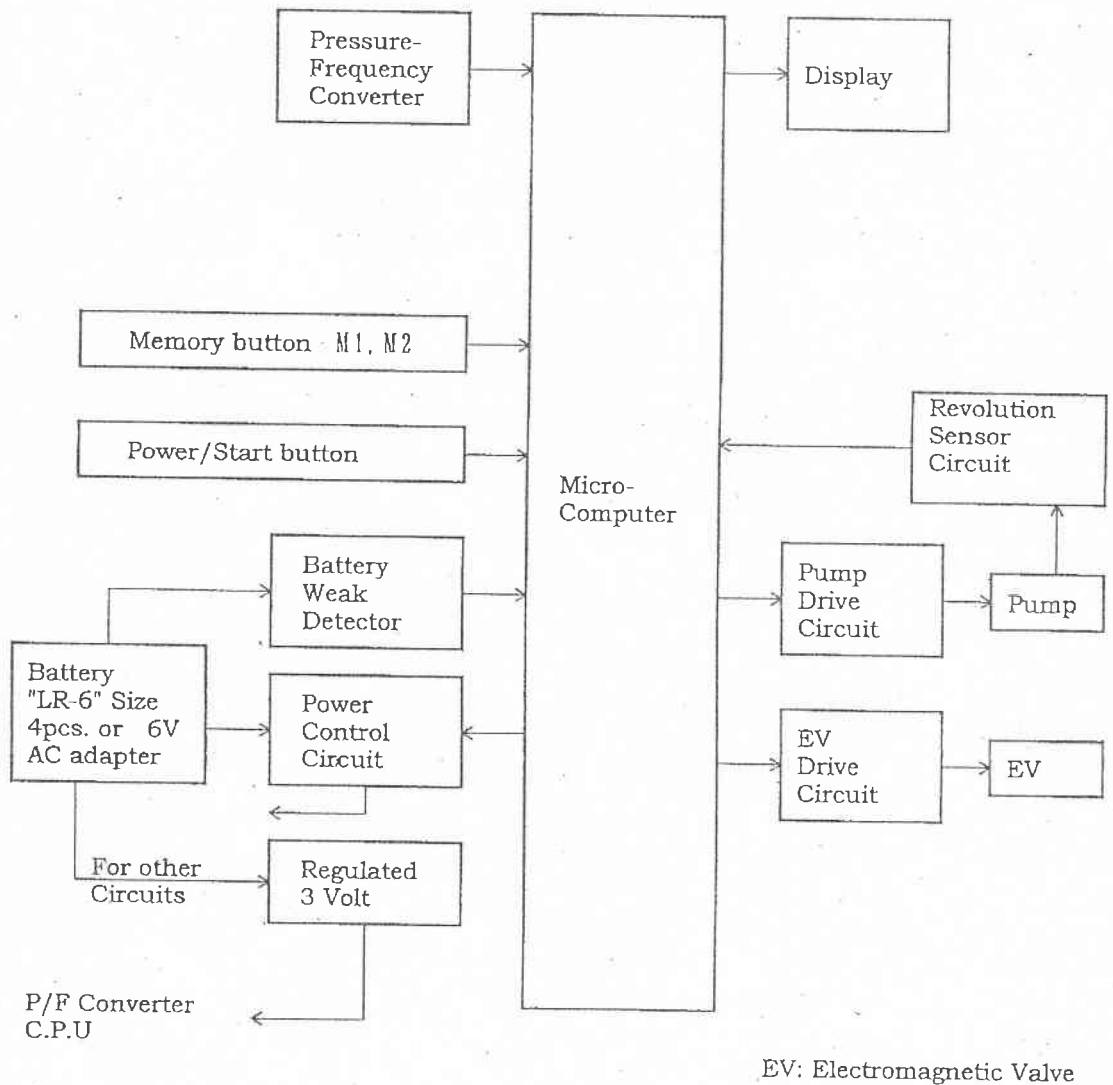
2-1. Model	DS-1904-03	
2-2. Classification	CLASS II a	
2-3. Function	① Blood Pressure Measuring	
	② Pulse Rate Measuring	
	③ Automatic Power Shut Off	
	④ 4 Error Indication	
2-4. B.P.M. Specifications		
(1) Measuring Method	Cuff Oscillo-Metric	
(2) Measuring Position	Upper Arm	
(3) Coverage arm circumference	230 mm ~ 430 mm	
(4) Pressure detection	Pressure to Frequency Converter	
(5) Pressure indicating (Cuff Pressure)	① Units	mmHg EN1060-1 6
	② Range	0 -- 300 mmHg EN1060-3 7.7.1
	③ Resolution	1mmHg EN1060-3 7.7.2
	④ Zero setting	Automatic zero setting EN1060-3 7.4.4
(6) Measuring range	① Systolic	50- 250 mmHg Cuff Pressure
	② Diastolic	40- 150 mmHg Cuff Pressure SYS-DIA > 15 mmHg
(7) Accuracy	① Pressure	± 3 mmHg EN1060-1 7.1.1
	② Pulse rate	± 5 % of Reading
(8) Cuff inflation	Automatic Inflation System (Air Pump)	
(9) pressure at start of gradual inflation	30 mmHg	
(10) Inflation rate	1.5 ~ 7.5 mmHg/sec.(Nominal 4.5 mmHg/sec.)	
(11) Rapid Exhaust	Automatic Exhaust (EV) EN1060-3 7.4.3	
(12) Cuff system	① Cuff of Upper Arm	
	② Locking Mech-Velcro	
	③ Bladder Size	125 mm(W) × 225 mm(D)
	④ Cuff Size	142 mm(W) × 580 mm(D)

(13) Indicator	11 Digits+ 4 State Indicators LCD.Display EN1060-1 5	
	① 13 Digits Display	<ul style="list-style-type: none"> • Date/Time • Systolic • Diastolic • Pulse rate • Memory No.
	② 4 State Indicators	<ul style="list-style-type: none"> • Inflation • Deflation • Pulse wave • Weak battery
(14) Memory	① Systolic and Diastolic	
	② 30 measurement results × 2 Way	
	③ Memory Data Average (SYS. DIA. Pulse)	
(15) Microcomputer	8Bit Microcomputer	TMP86CH29BF A205176-01
(16) Power Source	R6P,LR6 Type (AA Saize) 4 pcs. or AC adapter (6V) EN1060-3 7.3.1	
(17) Power Consumption	4W (Max.)	
(18) Operating TEMP./Humidity	+10 °C to +40 °C / 85% RH or below EN1060-1 7.1.2.2	
(19) Storage TEMP./Humidity	-5 °C to +50 °C / 85% RH or below EN1060-3 7.5.1	
(20) Main unit size	150 mm(W) × 115 mm(D) × 50.5mm(H)	
(21) Main unit weight	APPROX. 330 gm (Not Including Batteries)	
2-5. Safety system	Cuff Pressure > 300mmHg → Rapid Exhaust	
2-6. Electrical safety	EN1060-1 7.2.1	
2-7. Resistant to vibration & shock	EN1060-1 7.2.2	
2-8. Air Leakage	EN1060-3 7.4.1	
2-9. Electromagnetic compatibility	EN1060-3 7.5.3	
2-10. Stability of the cuff pressure indication	EN1060-3 7.6	
2-11. Overall system accuracy	EN1060-3 7.9	
2-12. Lay a pipe system	See "10.Exploded Views" P18	
2-13. Operating manual	English, Spanish	
2-14. Accessories	Non	
2-15. Life	5 Year	

3. Principles of Operation

Operation of Each Unit

These units operate as follows:



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.

Electromagnetic valve (EV) drive circuit;

EV drive circuit controls the EV during blood pressure measuring by the switching signal from the micro computer.
It exhausts the air rapidly after the measuring or when "Err" indicating.

Pump drive circuit;

Pump drive circuit controls the Pump during blood pressure measuring by the controlling signal from the micro computer.

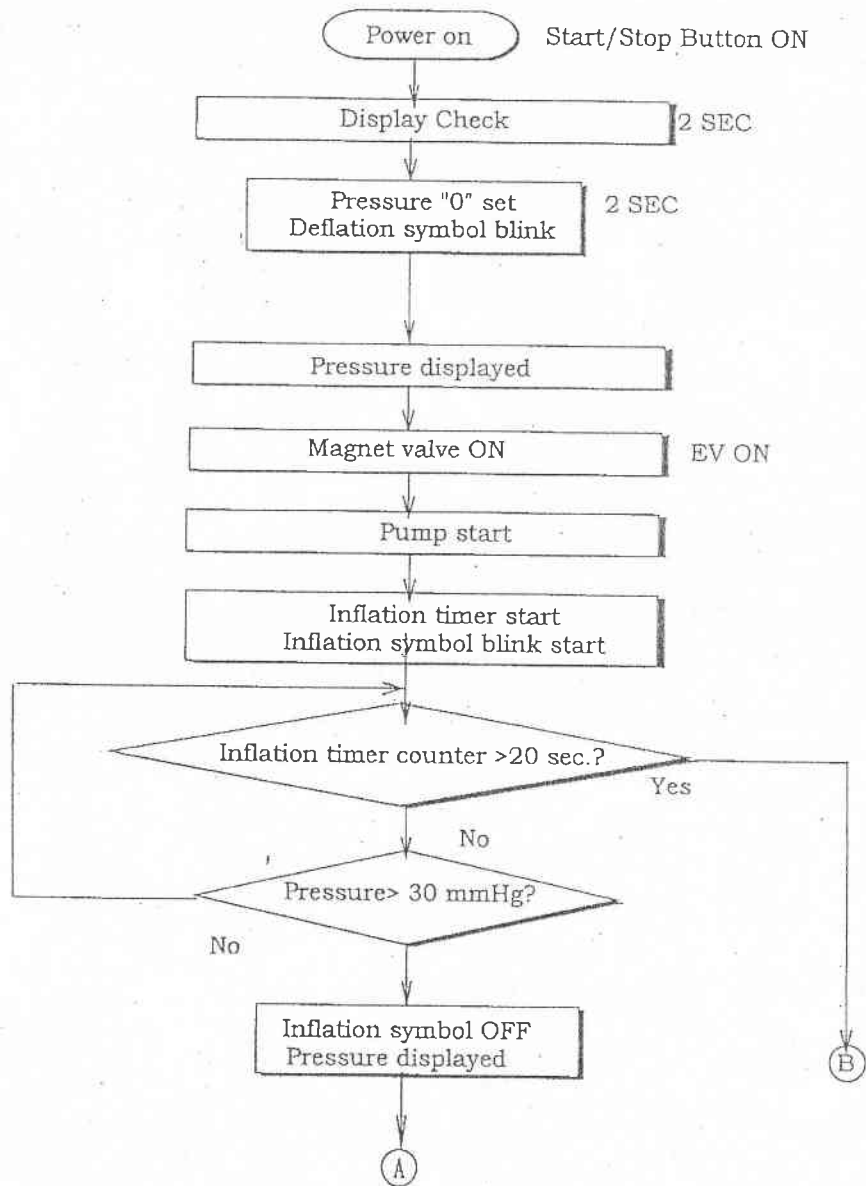
c) Revolution Sensor Circuit

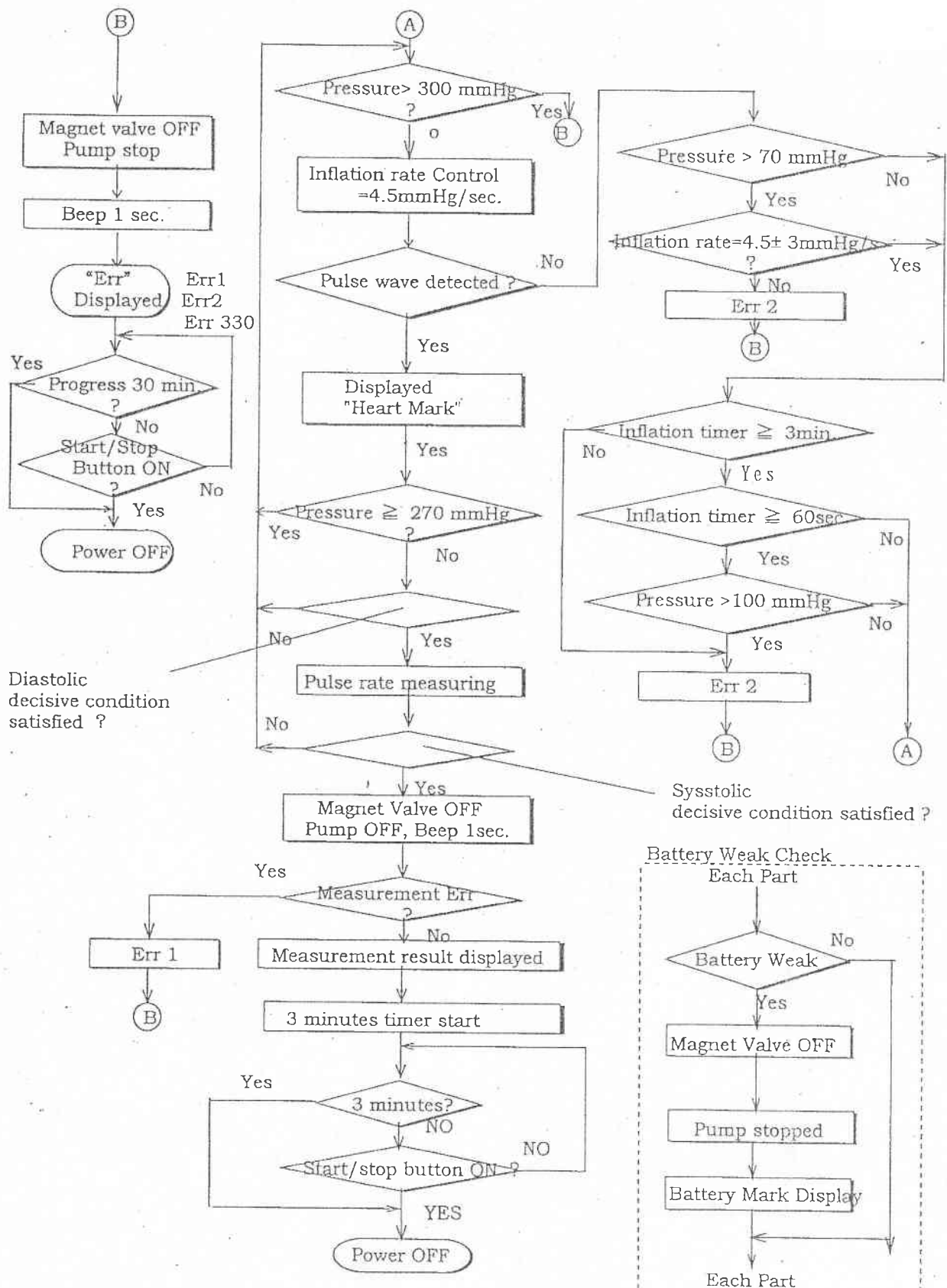
Receives the signal from the revolution Sensor of the Pump and this circuit send are signal to micro computer.

d) 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





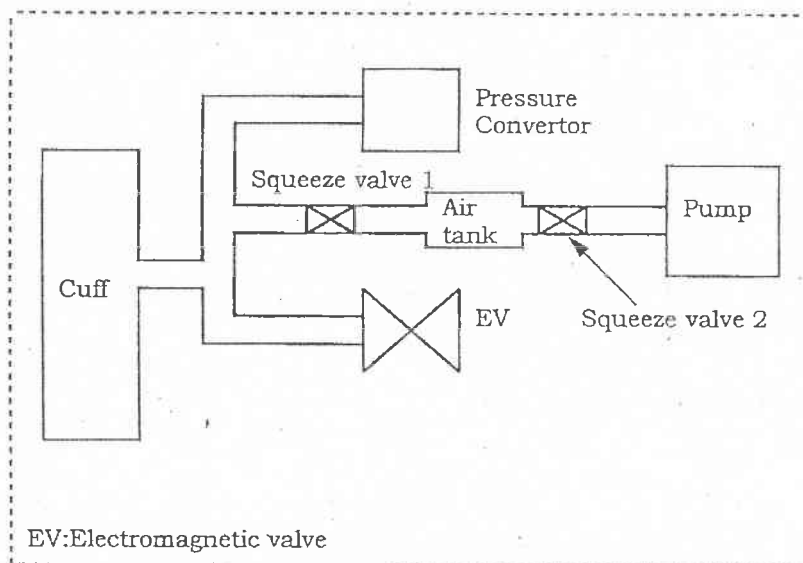
Air Circuit;

The air circuit is composed of the following;

Pump : Used during an increase of pressure.
Air tank : Used during the measurement.
Squeeze valve 1 , 2

Electromagnetic valve : Used during the measurement.
: Used after the measurement.

Cuff : To tighten the left arm.



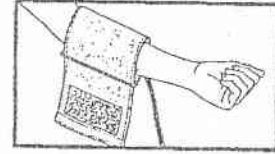
Air Circuit

4. Operating Instruction

4-1 Power Supply

1) Battery Installation

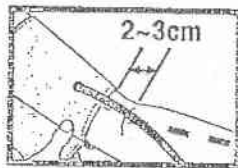
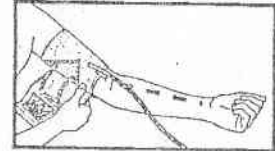
Take off battery cover rear side of main body and insert 4 pieces of R-6P or LR-6 type batteries to fit polarity indication.



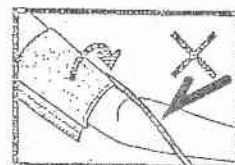
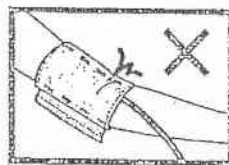
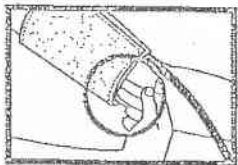
4-2 Measurement Procedures

1) Wrap the Cuff around the upper left arm.

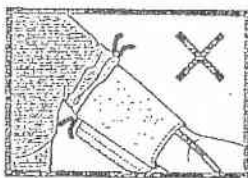
With the rubber tube of the cuff positioned in the direction of the fingertips, place it on the left arm. Wrap the cuff around the arm with the edge of cuff approximately 1 inch above the elbow.



* 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) Push the "Start/Stop" switch. All the panel displays will appear in the display. And then, Deflation Mark "↓" will start flashing on the display. If there is no pressure in the cuff, "0" will appear on the display.

- 3) Automatic Inflation start and inflation mark flashes.
Please do not move your body as possible as you can later.
- 4) The cuff is rapidly pressurized to approximately 30 mmHg at the beginning of a measurement, during which the inflation mark is displayed. After the pressure reaches this point, the inflation mark disappears and the cuff is pressurized more gradually.
- 5) Heart mark flashes with synchronizing beep as pulse wave is detected.
"Heart mark" flashing also disappear accompanied.
- 6) Long beep sounds as the measurement is completed above all steps.
Then the "Deflation" mark will appear and the unit will automatically exhaust the air from the cuff.
- 7) blood pressures and pulse rate are displayed for 30 second.
- 8) In case you take measure again, you should repeat from item 2) to 7).
- 9) If you forget to turn the power switch to off after completion of measurement, it will be automatically turned off after the 180 seconds.

4-3.MEMORY FUNCTIONS

1) Storing Measured Data

Measurement result is automatically stored in either M1 or M2. Make sure which memory bank number is displayed before turning off the unit.
Each of two memory banks can store up to 30 results and their average.

When the number of measurements exceeds 30, the oldest data will be deleted to store the new data. You May decide which bank to store your measurement results to avoid data mixture with someone else's or May use two banks to save data measured in the morning and evening separately.

The stored data will be hold after battery replacement.

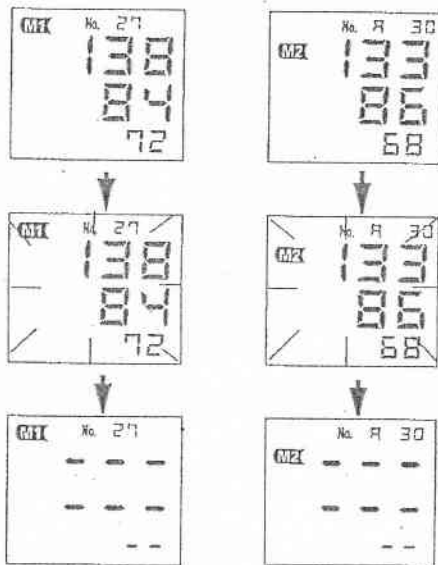
2) Recalling Measured Data

Press the MEMORY button.
(When no measurements are stored, nothing will be displayed.)

The memory data is displayed for approximately 30 seconds.
Approximately 30 seconds after the MEMORY button is released, the apparatus will turn off .

Every depression of the key switches among the memory data.

4-4. Deleting store DATA



Show the data to be erased or the average to erase all the data in the memory.

Press and hold down MEMORY BUTTON.

(4 sec.)

The displayed data start flashing.

(4 sec.)

Hold down the button until measurement result disappears.

5. Error Display

This blood pressure monitor displays an 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.

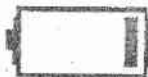
1) Improper pressure

Err 300 * Inflation above 300 mmHg.

Err 1 * Noise is detected by moving body during measurement.

Err 2 * Inflation speed is irregular.
Inflation speed is higher than 7.5 mmHg/sec. or less than 1.5 mmHg/sec.

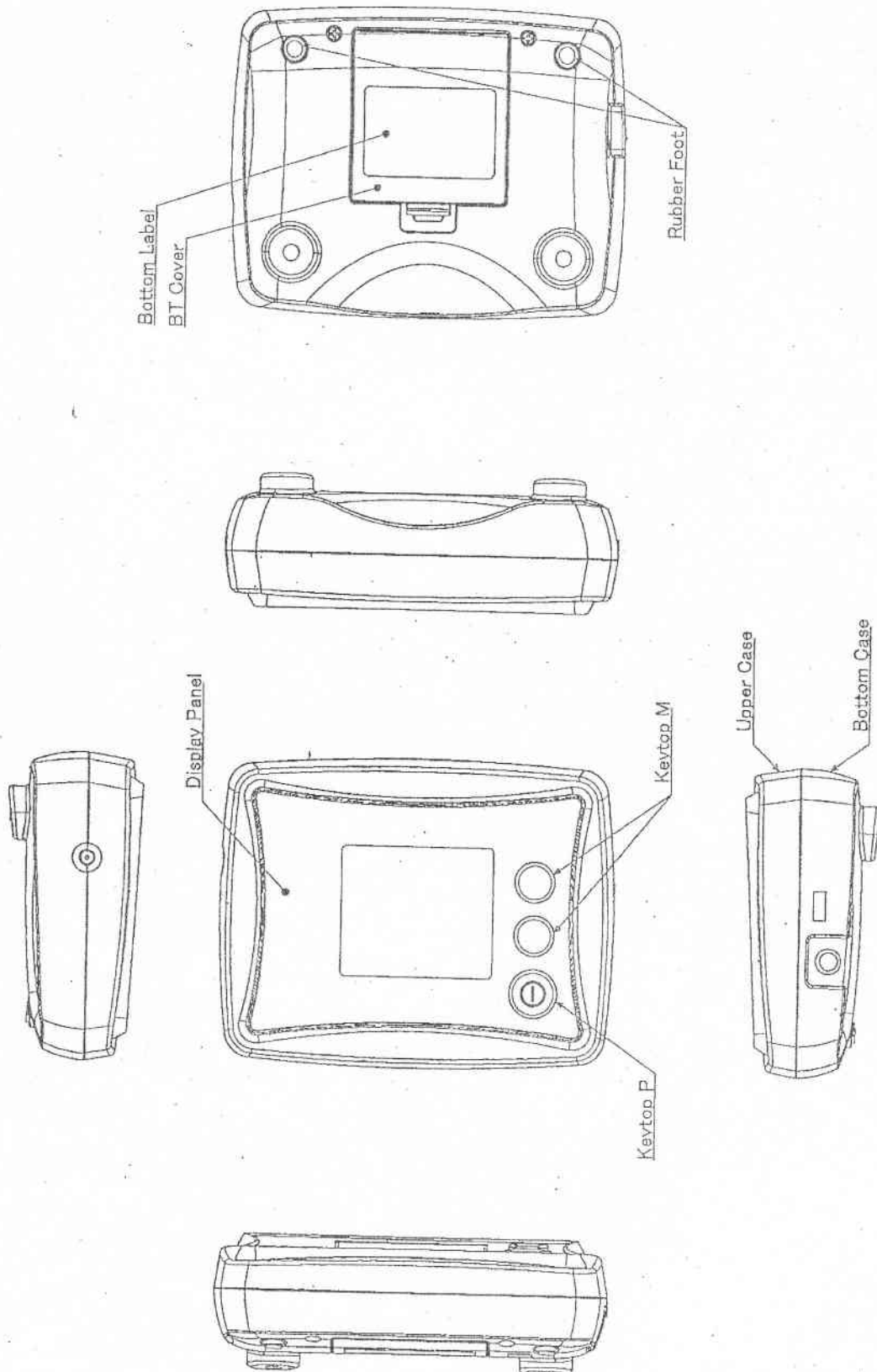
2) Weak battery



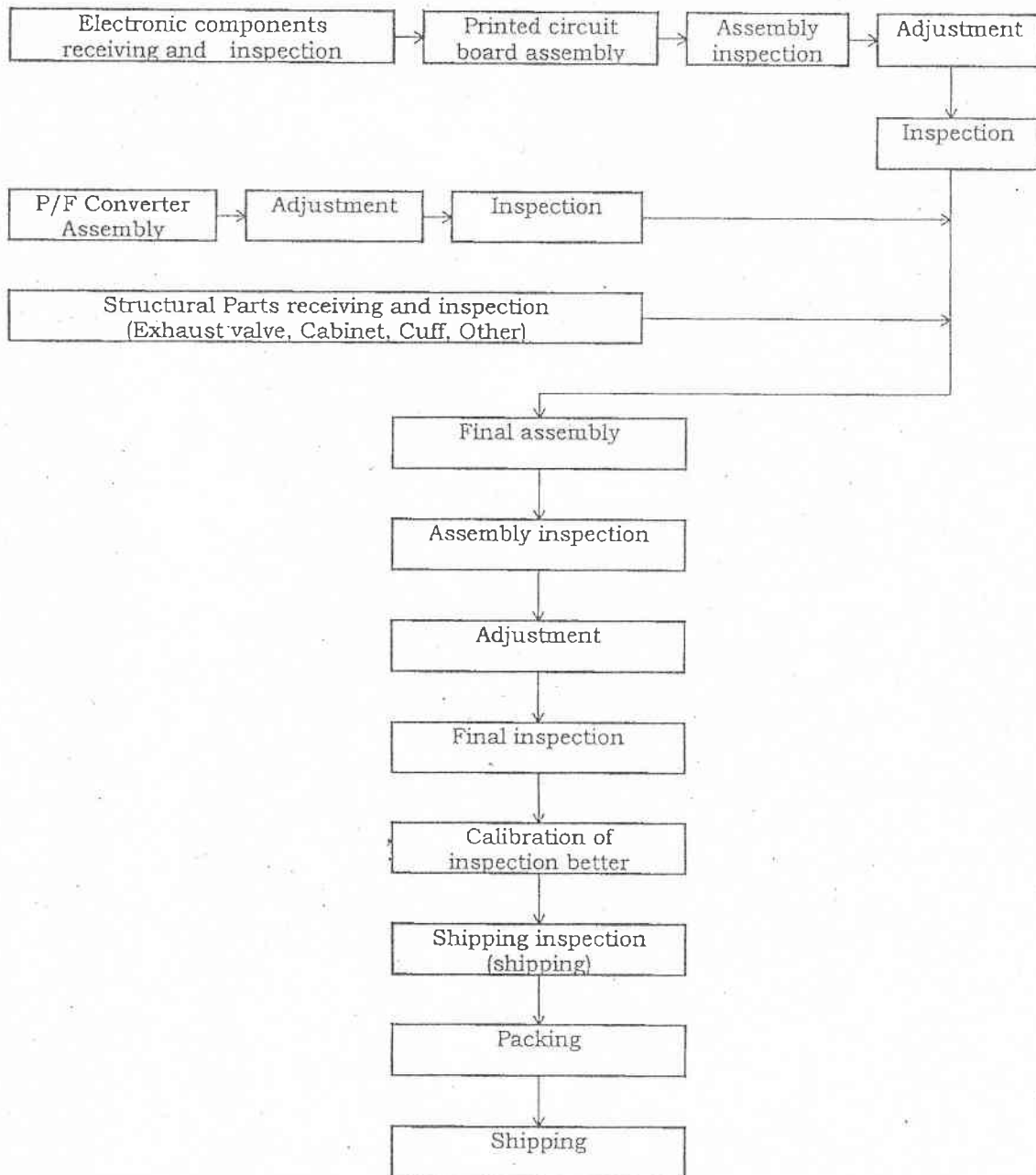
Weak battery provide inadequate voltage for operation of the unit.
Batteries need to be replaced.

6. Out Side Drawing

Main Unit



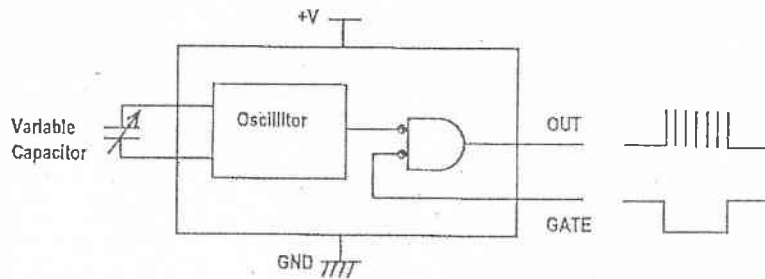
8. Production Process Table



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 ±0.2V

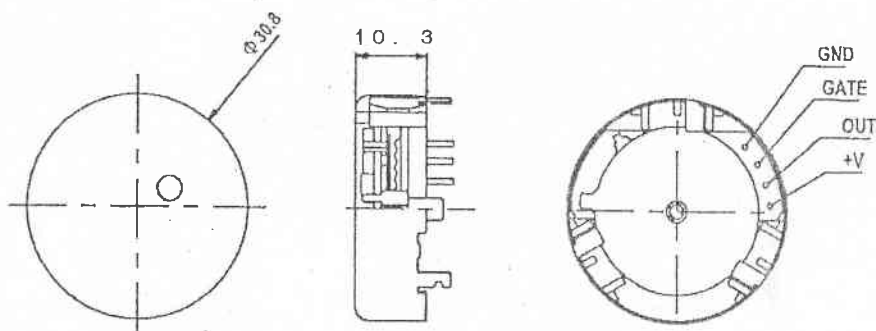
4. Outline

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

5. Performance

5-1 Output frequency	0 mmHg : 800 KHz ±300 KHz ··· f0 300 mmHg: f0-240 KHz
5-2 Linearity	Within ±0.3 % of FS
5-3 Hysteresis	Within ±0.3 % of FS
5-4 Span drift	±1% (10 °C ~ 45 °C)

CS-20A-01 Outline Drawing



9. Pressure Test

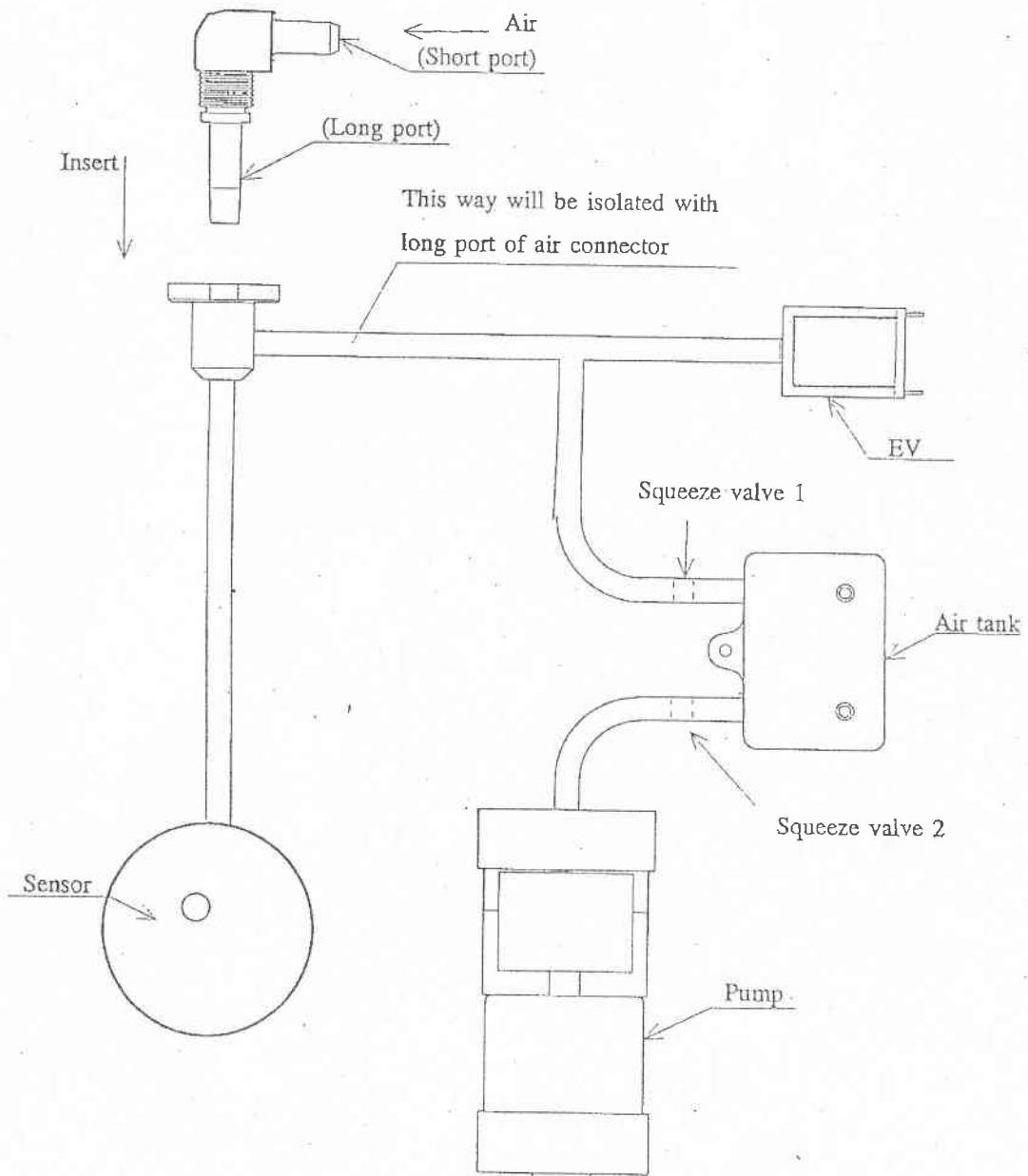
Method of Pressure Test

Insert Batteries while pressing and holding START/STOP button.
Two "0" s appear on the display. 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 lower, it means that the pressure precision of the SYS and DIA are the same.

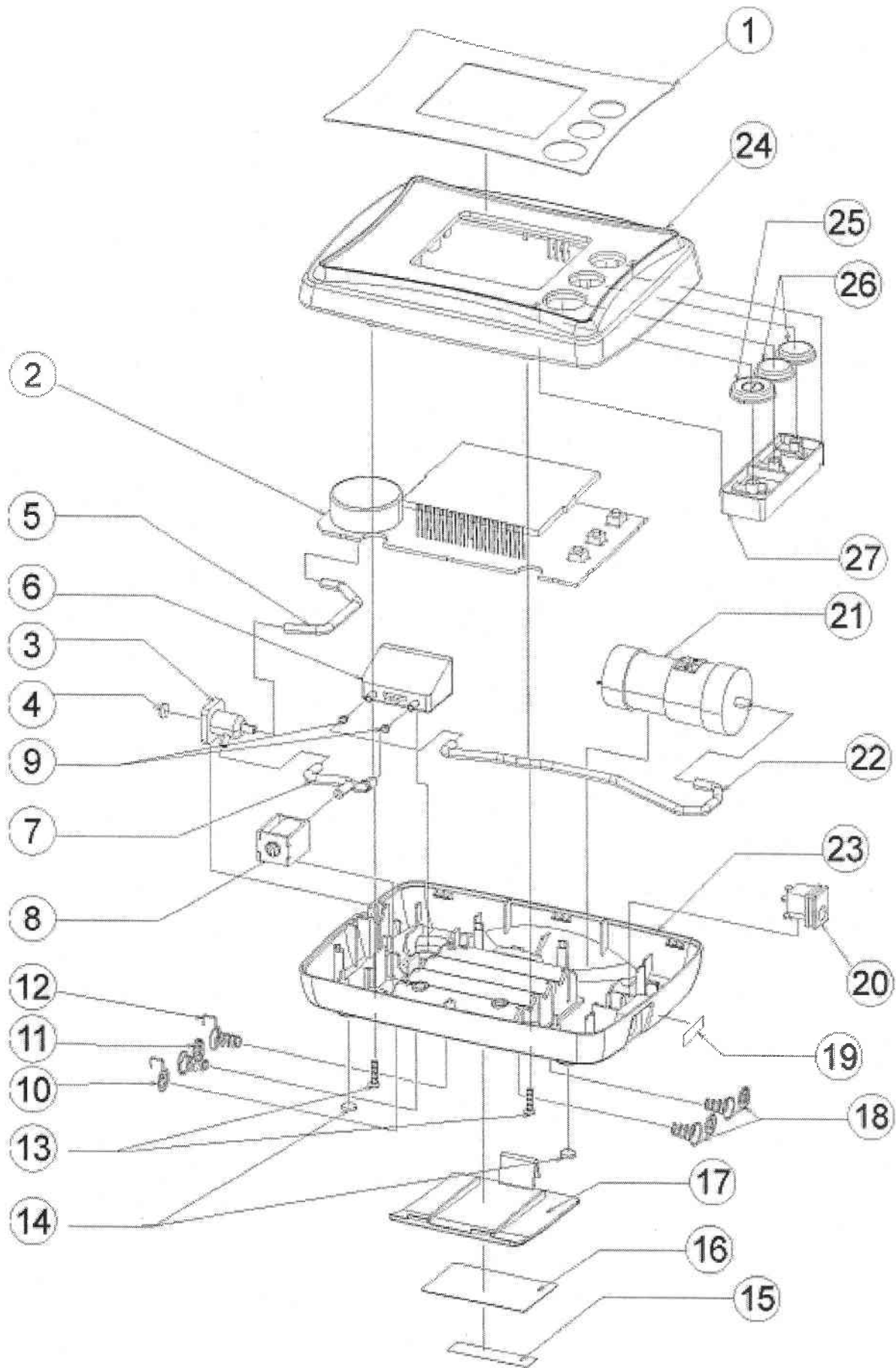
When pressure fluctuates up and down during a pressure test, it is judged as a pulse wave, which will decide the SYS or DIA, or cause errors.
Therefore, the mode which indicates pressure only is selected.

Pressure test circuit

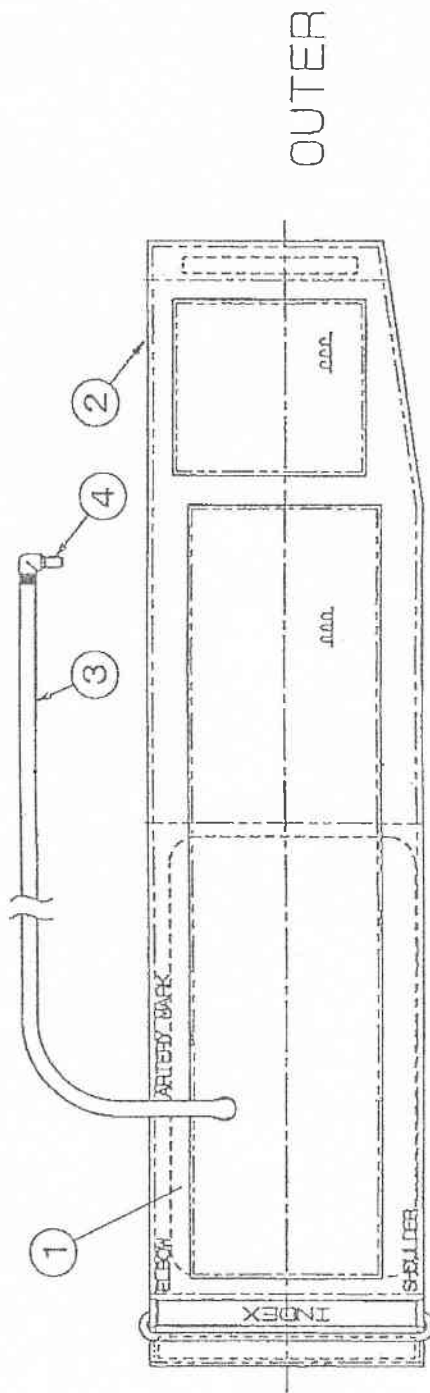


10. Exploded Views

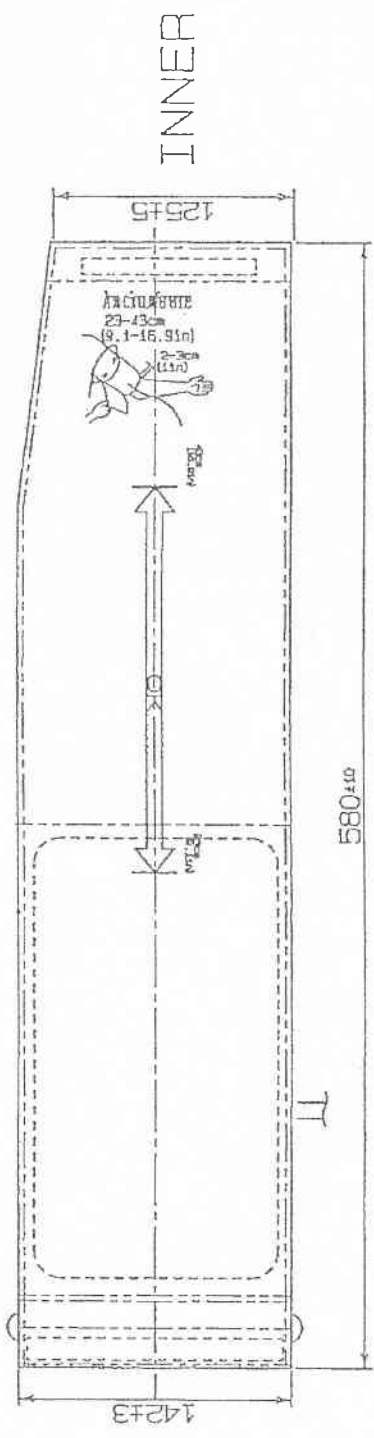
11-1. Main Unit



10-2. Cuff Unit

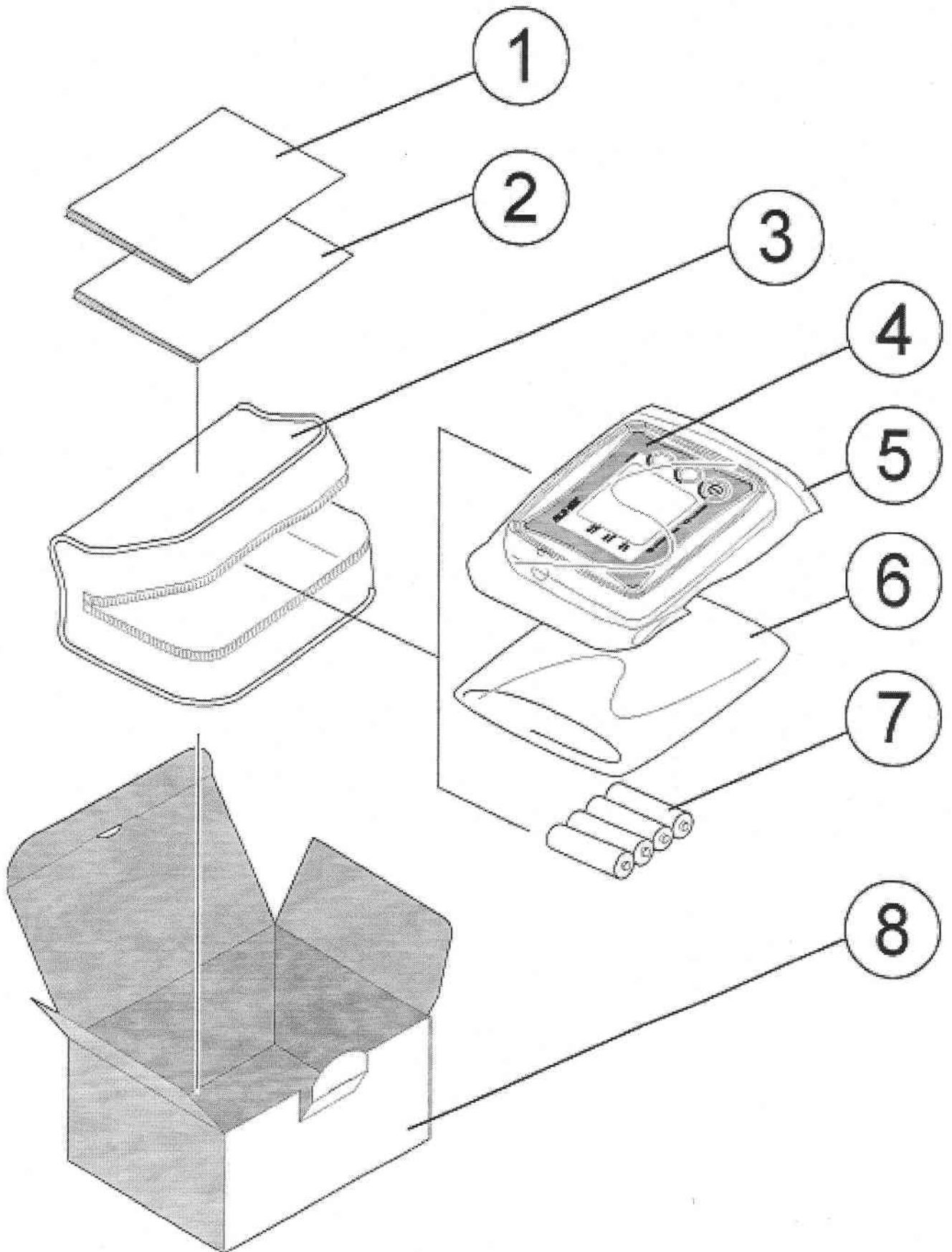


OUTER



INNER

10-3. Packing



11. Parts List

Main Unit

No.	Parts name		Material technical data	Quantity /unit
1	Display panel	A112426-1	P.C	1
2	PC board assembly	B251270-1	FR-2(PF-CP02)	1
3	Air connector	A100439-1	PE/HD	1
4	O ring	53831PN	Silicon	1
5	Air tube L=90	A100245-0090	Silicon	1
6	Air tank 1862	A108052-1	ABS	1
7	Pre-formed tube	A111597-1	Latex	1
8	EV (EV-08)	A210380-1	PBT	1
9	Squeeze valve	A108061-1	C3604 Ni plating	2
10	Battery terminal (+)	A101826-1	Steel(Nickel Plating)	1
11	Battery terminal (- +)	A106259-1	Steel(Nickel Plating)	1
12	Battery terminal (-)	A106260-1	Steel(Nickel Plating)	1
13	Case holding screw	A100034-2610	Steel(Chromate treatment)	2
14	Rubber stock	A101823-1	NBR	2
15	Serial NO. label	A102736-1	Void sheet	1
16	Bottom label	A112637-1-B	HSM	1
17	Battery cover	B111216-1	ABS	1
18	Battery terminal (+ -)	A106258-1	Steel(Nickel Plating)	2
19	DC jack label	A101711-1	HSM	1
20	DC jack	A210197-1	ABS	1
21	Air pump (DP-116-01)	A111503-1	ABS+Steel	1
22	Air tube L=190	A100245-0190	Silicon	1
23	Bottom case	D111214-1	ABS	1
24	Upper case	A112417-1	ABS	1
25	Start /Stop button knob	A112419-1	ABS	1
26	Memory button knob	B112421-1	ABS	2
27	Keytop Holder	B112423-1	ABS	1

Cuff Unit

No.	Parts name		Material technical data	Quantity /unit
1	Bladder	A110571-1	PVC	1
2	Cuff	A111688-1	PVC+Nylon	1
3	Air hose	A110680-0710	PVC	1
4	Air plug	A109137-2	ABS	1

Packing

No.	Parts name		Material technical data	Quantity /unit
1	Instructions(English)	A113163-1-A	Paper	1
2	Instructions(Spanish)	A113334-1-A	Paper	1
3	Carrying bag	A112152-1	PVC	1
4	Main Unit	A112443-1	----	1
5	Polyethylene Bag No.10	A100663-10	PE-LD	1
6	Cuff Packing	A111685-1	----	1
7	Battery LR6	A210246-1	----	1
8	Printing Box	A113162-1-A	Paper	4

12. 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 230 to 430 mm.
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 pump.	Replace the pump.
	Defective tube.	Replace the tube.
	Defective bladder.	Replace the bladder.
	Defective pressure sensor or circuit.	Replace the circuit board.
Inflation is too slow.	Defective circuit board, EV and PUMP.	Replace the circuit board, EV and PUMP.
	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.	Inflation is too slow.	Replace the circuit board, EV and PUMP.
	(Defective O ring.)	Replace the O ring.
	(Bursted bladder.)	Replace the bladder.
	Circuit failure.	Replace the circuit board.
Inaccurate reading	Circuit failure.	Replace the circuit board.