ALP K2®

Service Manual

for Digital Blood Pressure Monitor

Model No.WS-910

INDEX

1. DESCRIPTION

The Model WS-910 is an Auto Inflation Wrist Digital Blood Pressure Monitor. The readings in each function are digital displayed on 13 digits LCD panel.

STATUS INDICATION shows Palpatory Wave and Battery Weak.

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

BATTERY POWER is monitored always the battery remnant is shown on the display.

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 3 minutes or more.

2. SPECIFICATIONS

2-1. Model	**WS-910-08**	
2-2. Classification	**CLASS Ⅱ a**	
2-3. Function	❶ Blood Pressure Measuring	
	❷ Pulse Rate Measuring	
	❸ Automatic Power Shut Off	
	❹ 3 Error Indication	
2-4. B.P.M. Specifications		
(1) Measuring Method	Cuff Oscillo-Metric	
(2) Measuring Position	Wrist	
(3) Coverage wrist circumference	125mm ~ 205mm	
(4) Pressure detection	Pressure to Frequency Converter	
(5) Pressure indicating (Cuff Pressure)	❶ Units	mmHg **EN1060-1 6**
	❷ Range	0 - 300 mmHg **EN1060-3 7.7.1**
	❸ Resolution	1mmHg **EN1060-3 7.7.2**
	❹ Zero setting	Automatic zero setting **EN1060-3 7.4.4**
(6) Measuring range	❶ Systolic	50- 250 mmHg Cuff Pressure
	❷ Diastolic	40- 180 mmHg Cuff Pressure SYS-DIA >10mmHg
	❸ Pulse Rate	40 - 160 Beat/Min.
(7) Accuracy	❶ Pressure	± 3 mmHg **EN1060-1 7.1.1**
	❷ Pulse rate	± 5 % of Reading
(8) Cuff inflation	Automatic Inflation System (Air Pump)	
(9) Preset pressure	180mmHg (Fixed)	
(10) Cuff deflation	Electromagnetic deflation Control Valve (ECV)	
(11) Deflation rate	5.5 ~ 7.5 mmHg/sec.	
(12) Rapid Exhaust	Automatic Exhaust (ECV) **EN1060-3 7.4.3**	
(13) Cuff system	❶ Cuff of Wrist	
	❷ Locking Mech-Velcro	
	❸ Bladder Size	52mm(W) × 128mm(D)
	❹ Cuff Size	66mm(W) × 280mm(D)

(14) Indicator	13Digits+ 2 Indicators LCD.Display **EN1060-1 5**	
	❶ 13 Digits Display	· Date/Time · Systolic · Diastolic · Pulse rate · Memory No.
	❷ Indicators	· Palpatory wave (Heart mark) · Weak battery
(15) Memory	❶ Systolic Diastolic and Palse rate	
	❷ 60 measurement results	
	❸ Memory Data Average (SYS. DIA. PUL.)	
(16) Microcomputer	8Bit Microcomputer	TMP86CH29AU- 3D63 A205119-01
(17) Power Source	LR03 Type (AAA Saize) 2 pcs. **EN1060-3 7.3.1**	
(18) Power consumption	2W (Max.)	
(19) Operating TEMP./Humidity	+10 ℃ to +40 ℃ /85% RH or below **EN1060-1 7.1.2.2**	
(20) Storage TEMP./Humidity	-5 ℃ to +50 ℃ /85% RH or below **EN1060-3 7.5.1**	
(21) Main unit size	64 mm (W) × 66.5 mm (D) × 30.5 mm (H)	
(22) Main unit weight	Approx. 100 gm (Not Including Batteries)	
2-5. Safety system	Cuff Pressure > 330 mmHg ➡ Rapid Exhaust	
2-6. Electrical safety	**EN1060-1 7.2.1**	
2-7. Resistants 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

3-1. Operation of Each Unit

These units operate as follows:

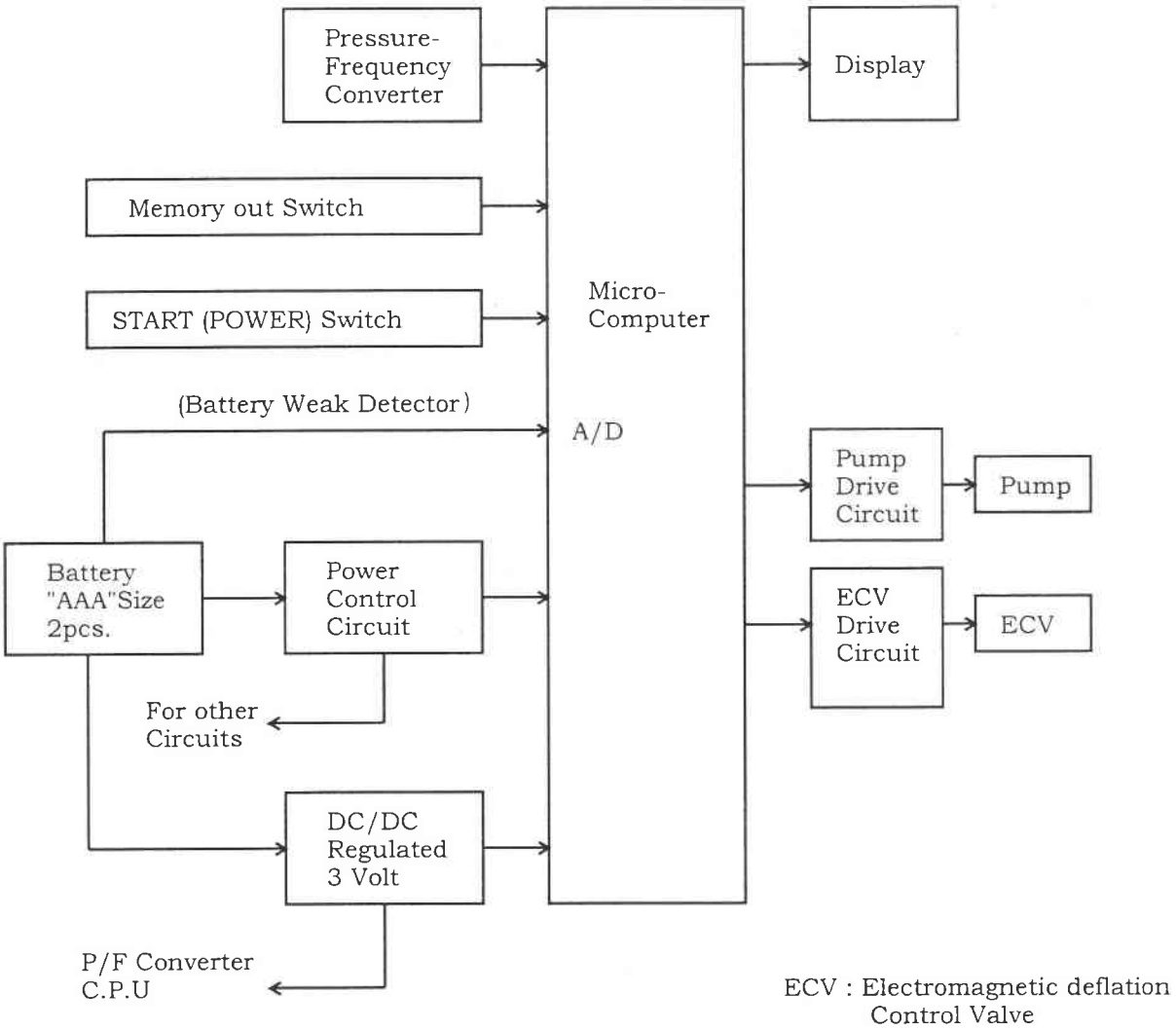


FIG. 3-1 Block Diagram

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.

Electromagnetic deflation control valve (ECV) drive circuit;

ECV drive circuit controls the air exhaust speed regularly during blood pressure measuring by the controlling signal from the microcomputer.
It exhausts the air rapidly after the measuring or when "Err" indicating.

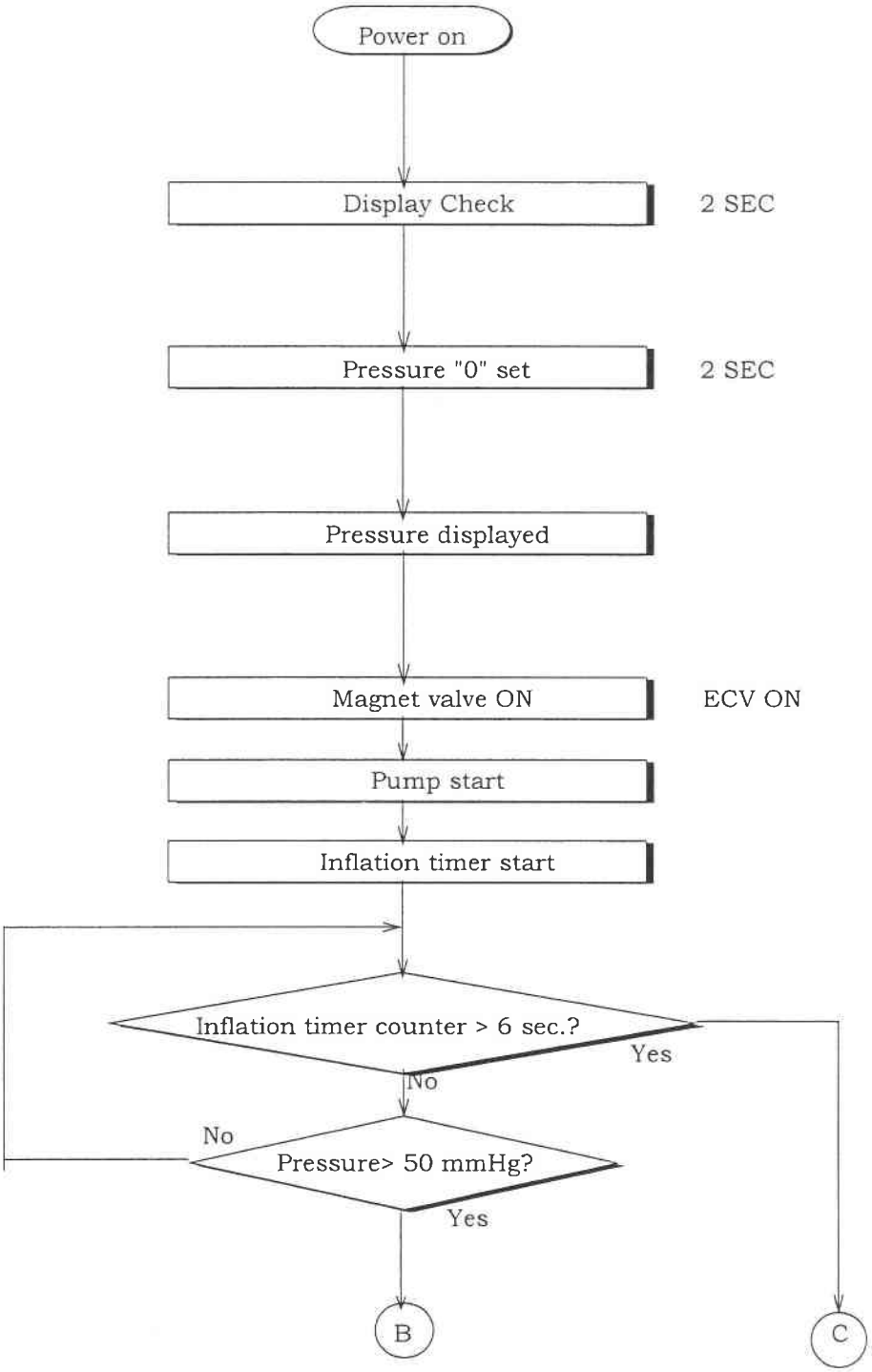
Pump drive circuit;

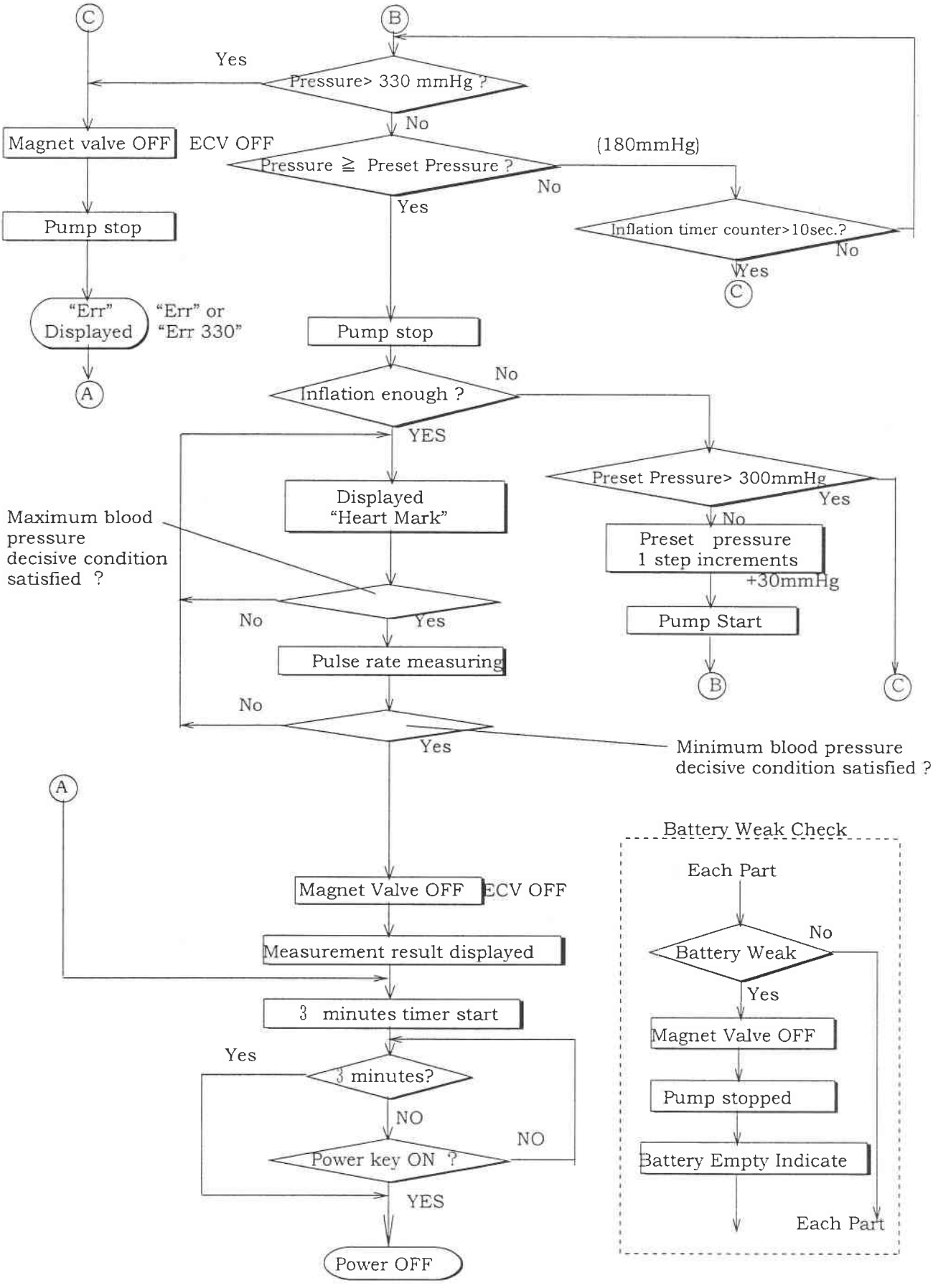
Controls starting and stopping of the pump.

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




C
B
Yes
Pressure> 330 mmHg ?
No
Magnet valve OFF
ECV OFF
Pressure ≧ Preset Pressure ?
(180mmHg)
No
Yes
Pump stop
Inflation timer counter>10sec.?
No
Yes
C
"Err" Displayed
"Err" or "Err 330"
A
Pump stop
Inflation enough ?
No
YES
Preset Pressure> 300mmHg
Yes
No
Displayed "Heart Mark"
Maximum blood pressure decisive condition satisfied ?
Preset pressure 1 step increments
+30mmHg
Pump Start
No
Yes
Pulse rate measuring
B
C
No
Yes
Minimum blood pressure decisive condition satisfied ?
A
Battery Weak Check
Each Part
Magnet Valve OFF
ECV OFF
Measurement result displayed
3 minutes timer start
Yes
3 minutes?
NO
Power key ON ?
NO
YES
Power OFF
No
Battery Weak
Yes
Magnet Valve OFF
Pump stopped
Battery Empty Indicate
Each Part

3-3 Air Circuit;

The air circuit is composed of the following;

Pump : Used during an increase of pressure.

Electromagnetic deflation control valve

: Used for constant air exhaustion at the time of measurement.

: Used after the measurement.

Cuff : To tighten the left or right wrist.

Pressure Sensor : Frequency are changed by pressure

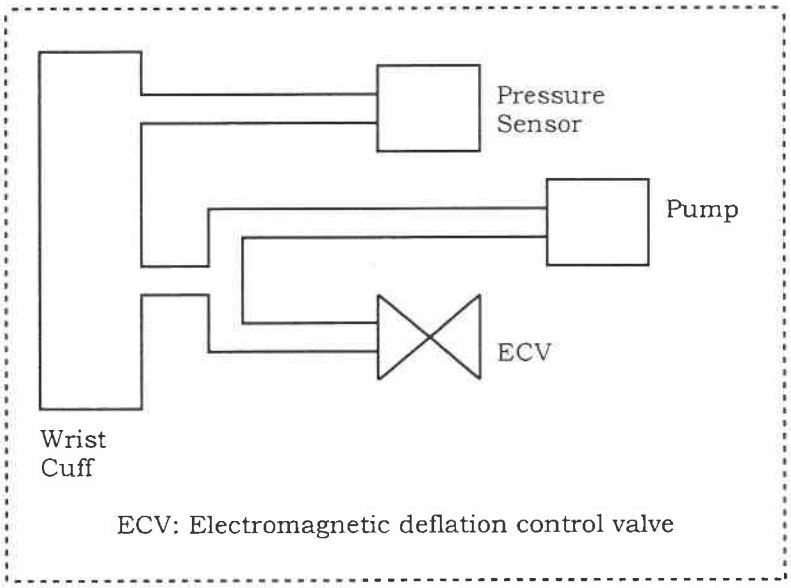


FIG. 3-3 Air Circuit

4. OPERATIONS INSTRUCTION

4-1 Power Supply

1) In case using battery
Take off battery cover left side of main body and insert 2 pieces of LR03 type batteries to fit polarity indication.

4-2 Time set up

1) Push the "POWER" switch for 2 seconds, the LCD shows all segments.

2) Then the LCD shows like FIG 4-2-2 after zero blink.

3) Push the "MEMORY" switch for 2 seconds, the LCD shows Time set up mode, we can change the numerical value of blink up position.

Push the "POWER" switch, value are up one at a time.

Push the "MEMORY" switch, value of blink up position change.
turn: A.D. → month → day → hour → minute (FIG 4-2-3)

Return the time display after minute set up.

FIG 4-2-2

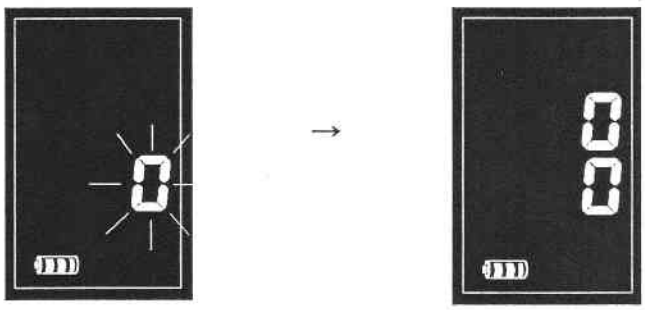
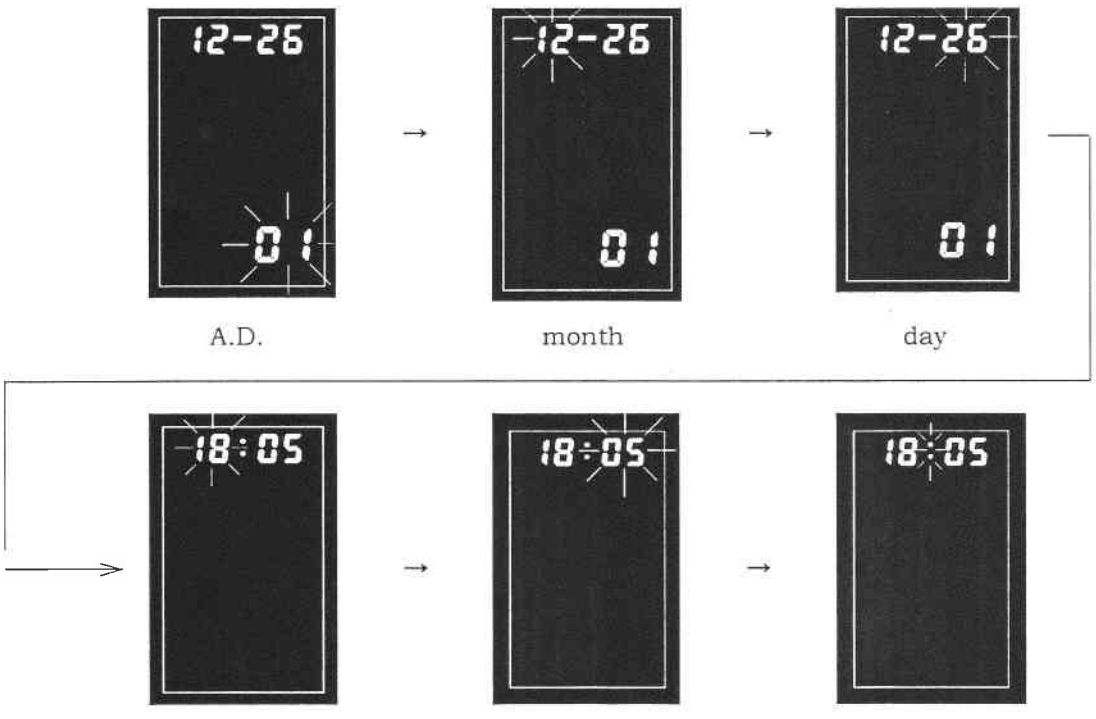


FIG 4-2-3 ex) Dec. 26 2001

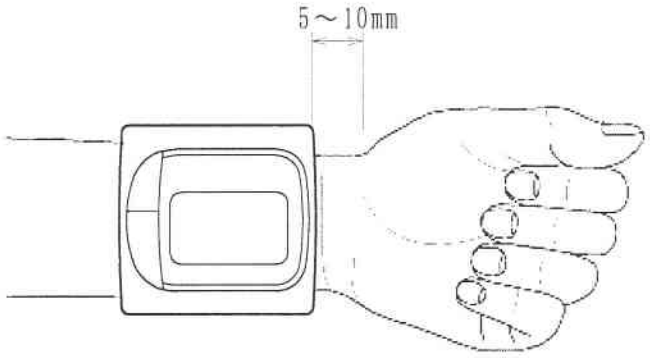


A.D. month day

hour minute the time display

4-3 Measurement Procedures

1) Wrap the Cuff around the upper left wrist.
Face upwards the palm of the hand, make the body position in the center of the palm, and wrap the cuff tightly to the wrist, leaving no space between the cuff cloth.



In case you wear a wrist watch on your left wrist, please wrap cuff after you put off it. 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 wrist 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 "POWER" switch to automatically inflate cuff to the Optimum pressure.

3) Pressure start to descend. Please do not move your body as possible as you can later.

4) Further descending cuff pressure, indication mark for "Heart mark" flashing to notice pulse wave when the pulse wave begin to generate.

5) Further descending cuff pressure and when come to minimum blood pressure, display for "Heart mark" flashing also disappear.

6) Minimum, maximum blood pressure and pulse rate is displayed.

7) Measurement is completed above all steps. Then the unit will automatically exhaust the air from the cuff.

8) If you forget to turn the power switch to off after completion of measurement, it will be automatically turned off after the 3 minutes.

9) In case you take measure again, you should repeat from item 2) to 7).

4-4 Memory information

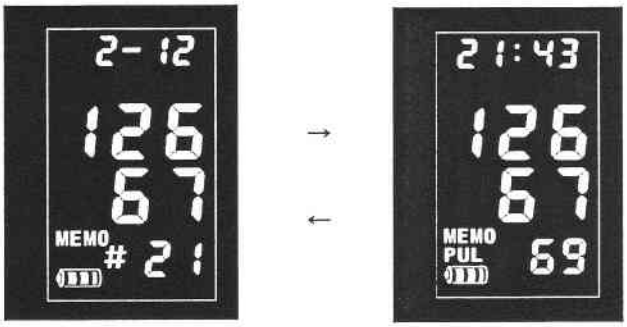
1) The unit can store the results of 60 measurements in the memory.

Measurement result is automatically stored in the memory when the first 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. Second, third ,4 ,5 ,6 · · · 60th pushes on the button will recall the results in Memories 2,3,4,5,6 · · · 60.
The memory number recalled will be shown in the Memory number Display Area in the lower right corner of the display panel.

3) You will see memory data when you press memory button. First display shows date, systolic, diastolic pressures and memory No.(MEMO #). (2 sec) Second display shows time, systolic, diastolic pressures and pulse (PUL). (3 sec) First, Second display is repeated 5 times.



repeated 5 times

2 sec 3 sec

4) 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. a letter [A] as a marking is indicated.

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.

5-1. Improper pressure

Err 330 *Inflation above 330 mmHg.

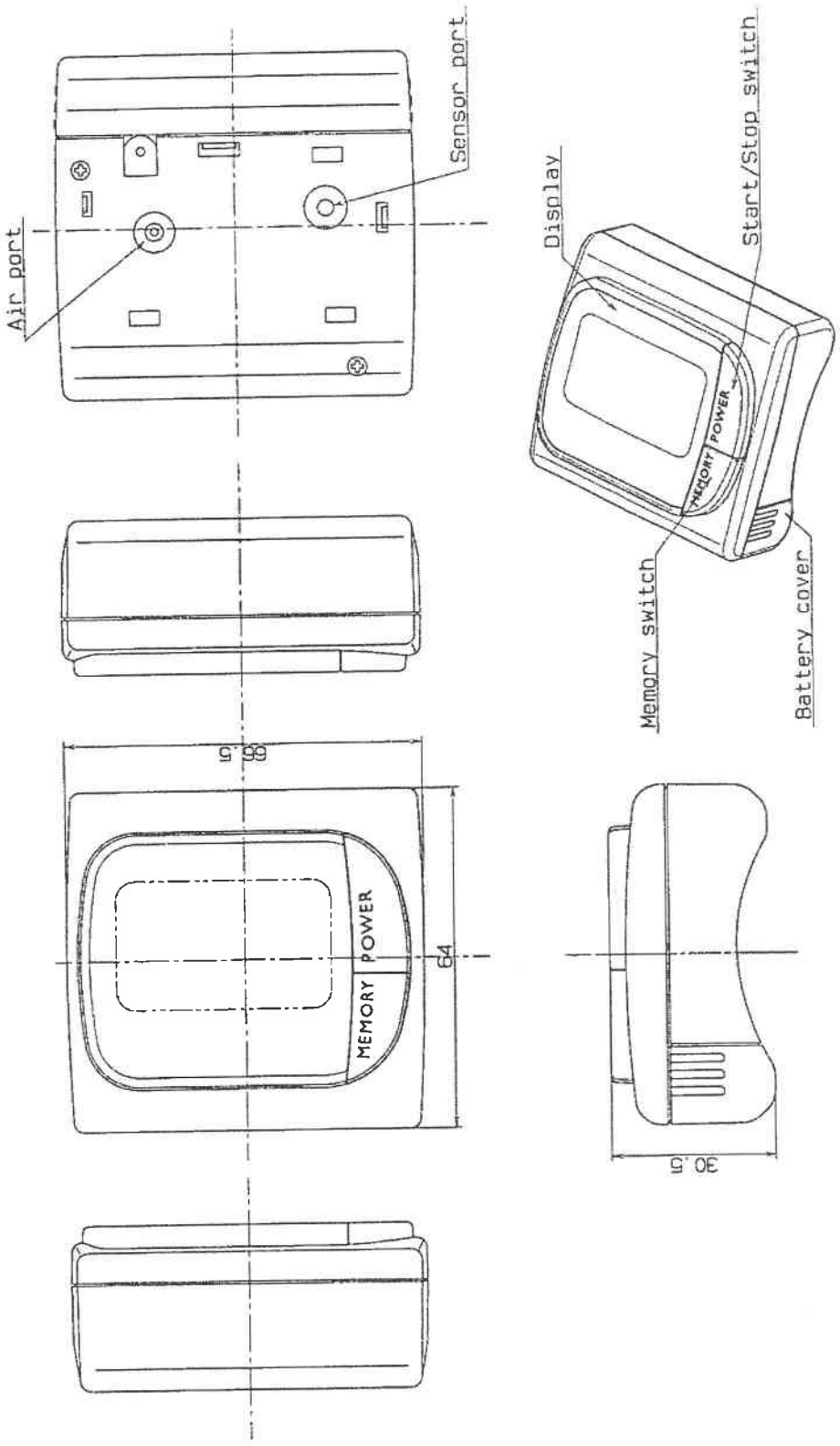
Err *Noise is detected by moving body during measurement.
*The exhaust speed is irregular.
The exhaust speed is higher than 9 mmHg/sec. or lesser than 2 mmHg/sec.

5-2. Weak battery

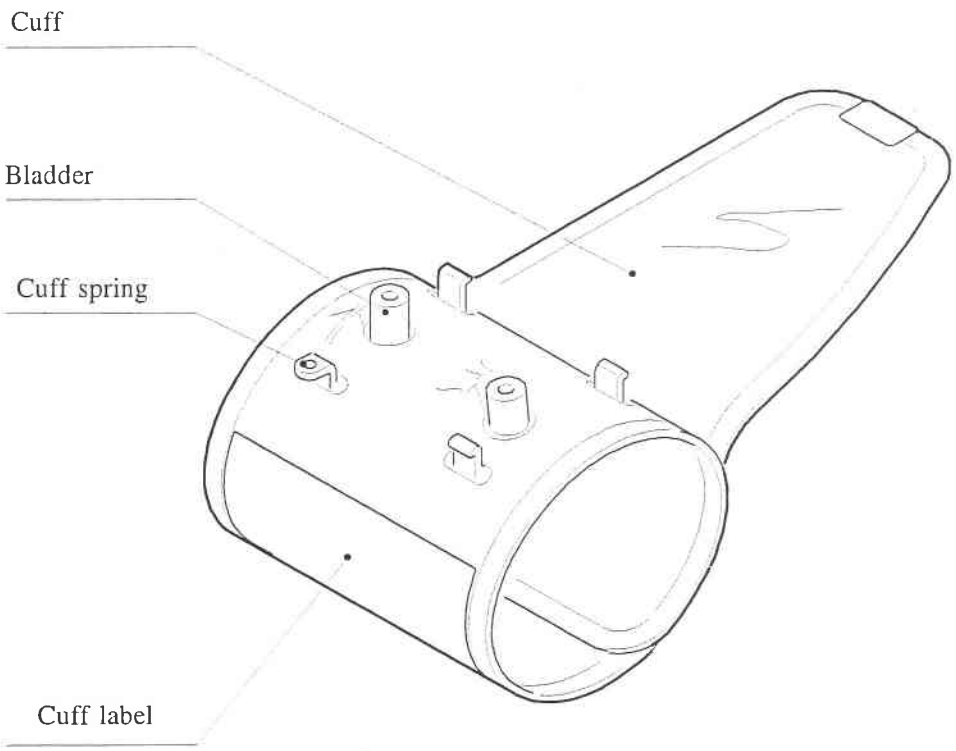
Weak battery provide inadequate voltage for operation of the unit.
Batteries need to be replaced.

6. OUTSIDE DRAWING

6-1. MAIN UNIT



6-2. CUFF UNIT

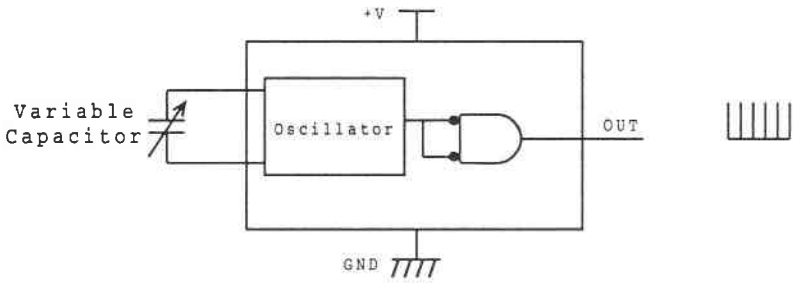


7. PRODUCTION PROCESS TABLE

8. PRESSURE SENSOR

8-1 Model : CS-100

8-2 Construction : Pressure / Frequency Converter



8-3 Usage Condition

(1) Pressure range	0 ~ 300 mmHg
(2) Safety over load	390 mmHg
(3) Compensation temperature range	0 ~ 50 ℃
(4) Storage temperature range	-34 ~ 65 ℃
(5)Humidity	85% Rh or below
(6)Power supply	3 V ±0.2V

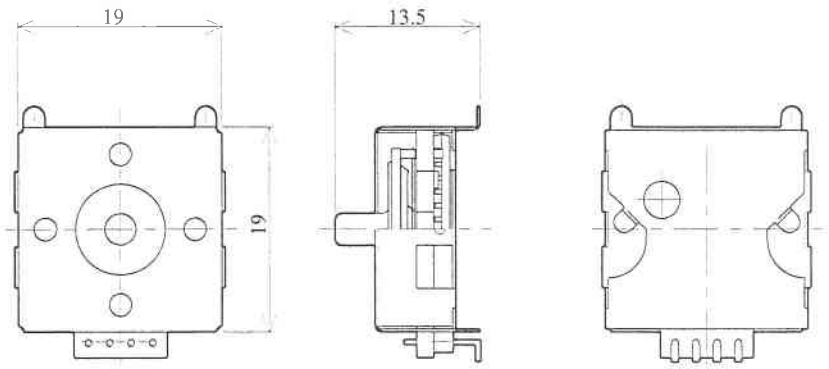
8-4 Outline

Outline dimension	19 × 19 × H13.5mm
Weight	Approx. 7g

8-5 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 ℃ ~ 45 ℃)

CS-100 Outline Drawing

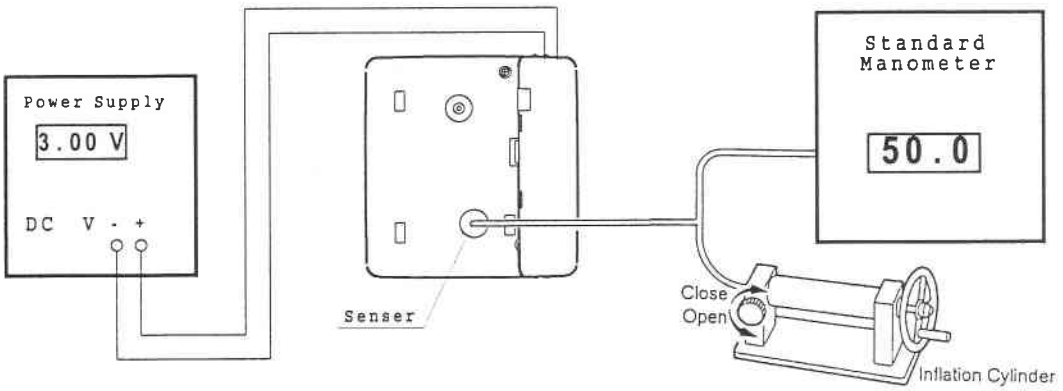


9. PRESSURE ACCURACY TEST

Connection with Test Device

1. Connect a 3V DC power supply in off mode.

2. Connect the standard manometer and the inflation cylinder, then make it diverge to join the connector used for the pressure accuracy test on the unit.



Test method

1. Open the inflation cylinder, then turn on the power supply.

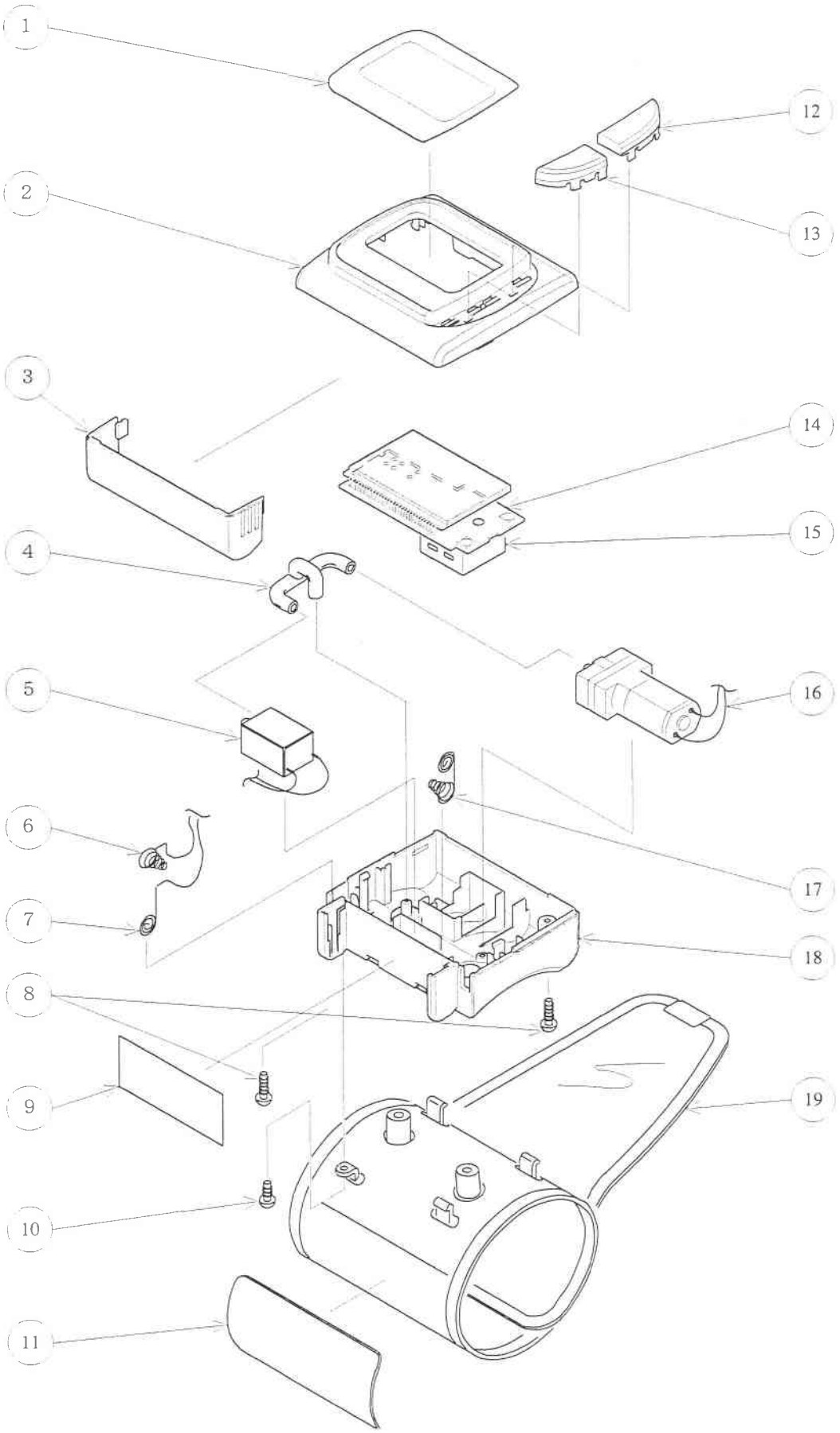
2. Press the start switch and hold it until "0" starts to flash on the display. The unit goes to TEST MODE as two "0"s appear on the display.

3. Close the inflation cylinder, then turn the cylinder handle to inflate air until a reading of 50 mmHg on the standard manometer is obtained. At that time, the display of the unit should show "50 50" instead of the " 0 0" mentioned Step 2 above. Both numbers "50 50" should not deviate too much 50 ±3 at the most.

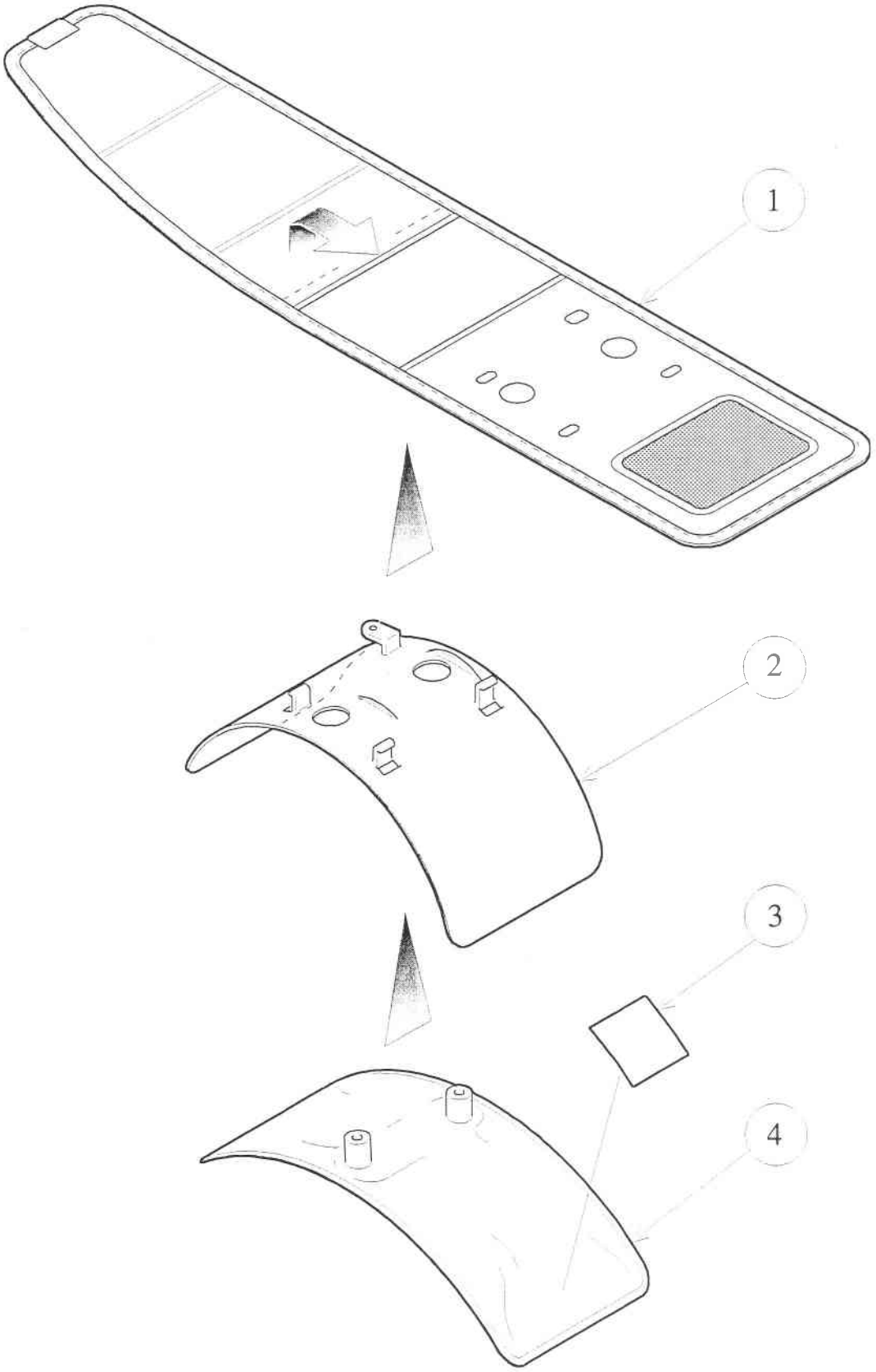
4. Do the check described in Step 3 above at 100,150,200,250, and 300 mmHg as well(±3 mmHg).

10. EXPLODED VIEWS

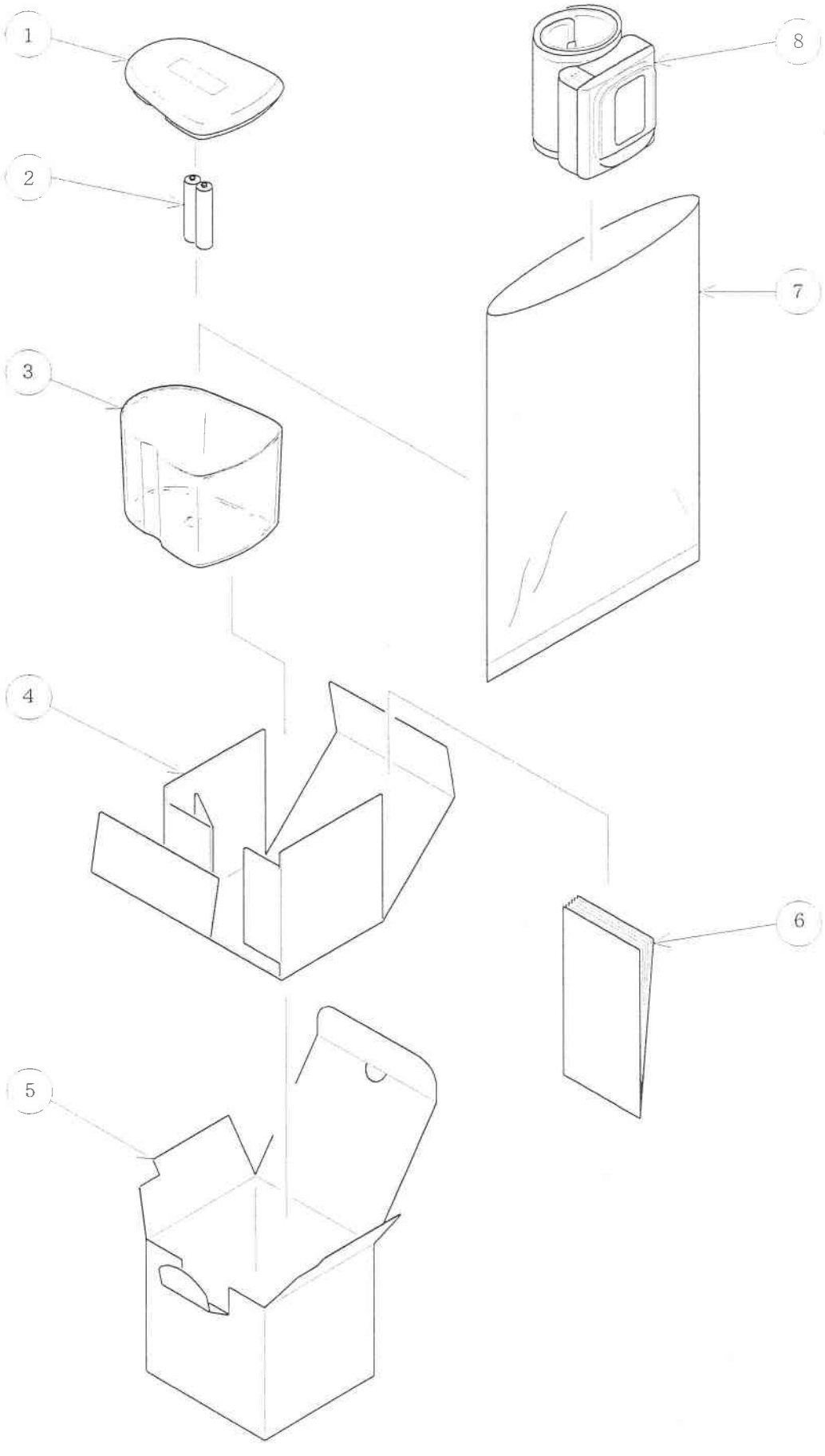
10-1. MAIN UNIT



10-2.CUFF UNIT



10-3. PACKING



11. PARTS LIST

MAIN UNIT

No.	Description	Part No.	Material technical date	Quantity /unit
1	Display Panel	A108612-1PT	P.C	1
2	Upper Case	D106076-2PT	ABS	1
3	Battery Cover	C105929-5PT	ABS	1
4	Preformed tube	A106499-1PT	Latex	1
5	ECV(ECV-03-01)	A104764-1	PBT	1
6	Battery Terminal −	A106382-1PT	Steel(Nickel Plating)	1
7	Battery Terminal +	A106381-1PT	Steel(Nickel Plating)	1
8	Case Holding Screw	A100034-2008	Steel(Chromate treatment)	2
9	Battery Label	A108694-1	Paper	1
10	Cuff Holding Screw	A100034-2006	Steel(Chromate treatment)	1
11	Cuff Label	A108653-1	PVC	1
12	Power/Start Switch Knob	B106078-2PT	ABS	1
13	Memory Switch Knob	B106079-2PT	ABS	1
14	PC Board Assembly	B250826-1PT	CEM3	1
15	Pressure transducer	A250319-1	Steel	1
16	Air Pump (DP-130-01)	A106337-1PT	ABS+Steel	1
17	Battery Terminal ±	A106383-1PT	Steel(Nickel Plating)	1
18	Bottom Case	D105928-5PT	ABS	1
19	Cuff Unit	A108695-1	-----	1

CUFF UNIT

1	Cuff	A108212-1PT	PVC+Nylon	1
2	Cuff Spring	B106357-1PT	PP	1
3	Adhesive Tape	A103313-2020PT	Non woven cloth	1
4	Bladder	A108108-1	PVC	1

PACKING

1	Carry Cap	B102918-2PT	PS	1
2	Battery	A210116-1	-----	2
3	Carry Box	B102920-1PT	PS	1
4	Spacer 620	A103261-1PT	Paper	1
5	Gift Box	A108693-1A	Paper	1
6	Instructions		Paper	1
	(English)	A108716-1A		
	(Spanish)	A108717-1A		
7	Polyethylene Bag	A101702-10PT	PE-LD	1
8	Main Unit	WS-910-08	-----	1