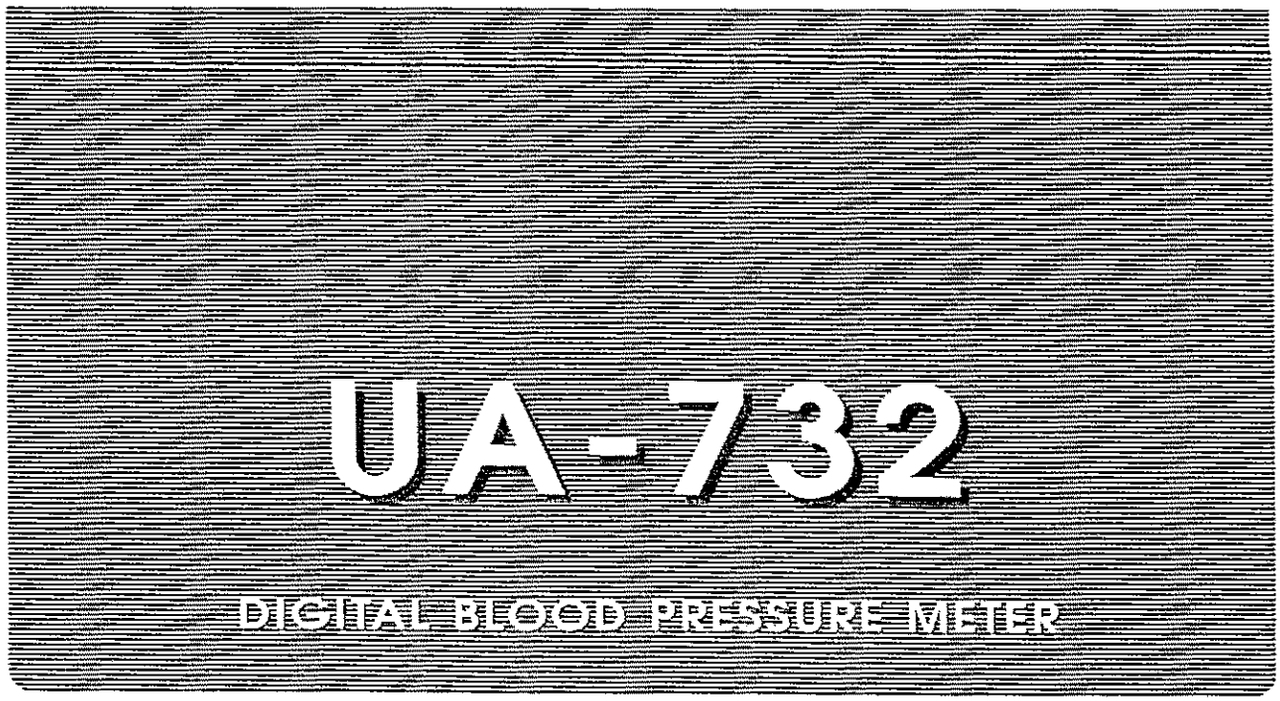


MAINTENANCE MANUAL

maintenance-UA 732-v.1.a 92/06/08

DIGITAL BLOOD PRESSURE METER

A&D Company, Limited

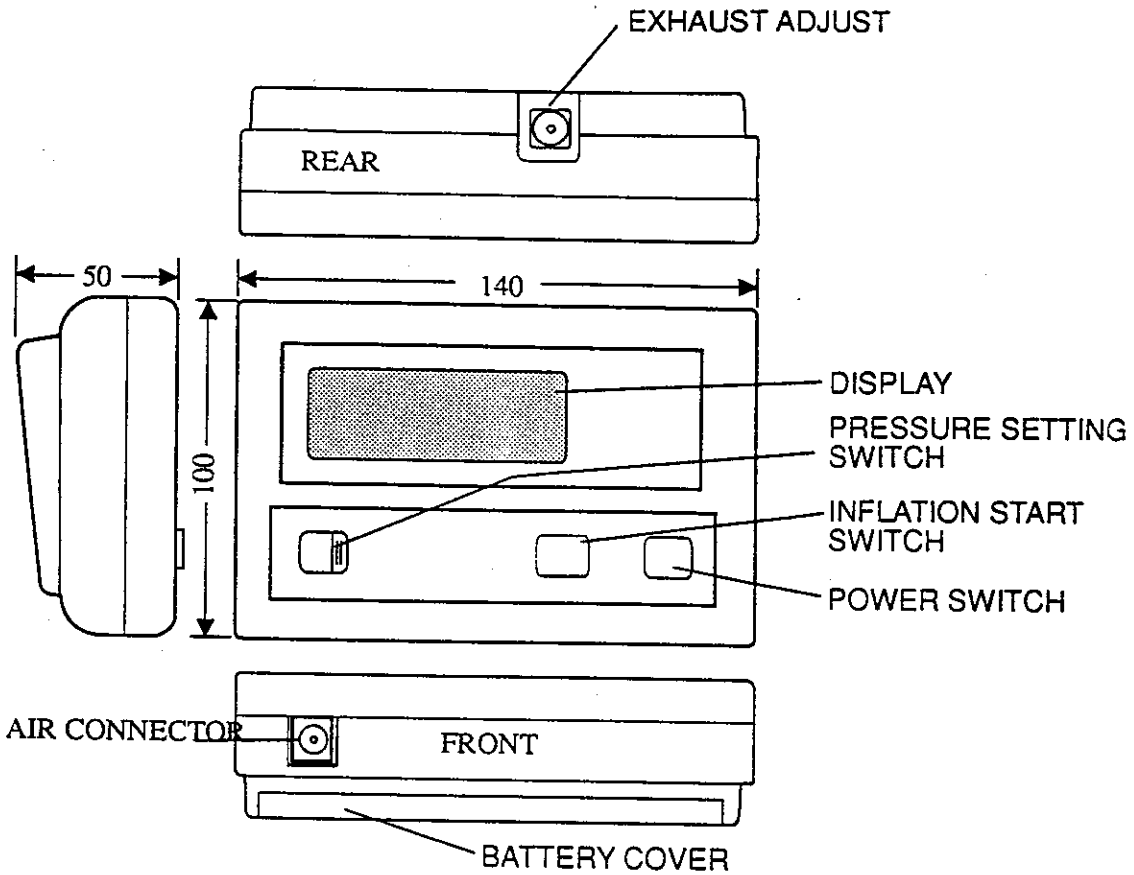
Table of Contents

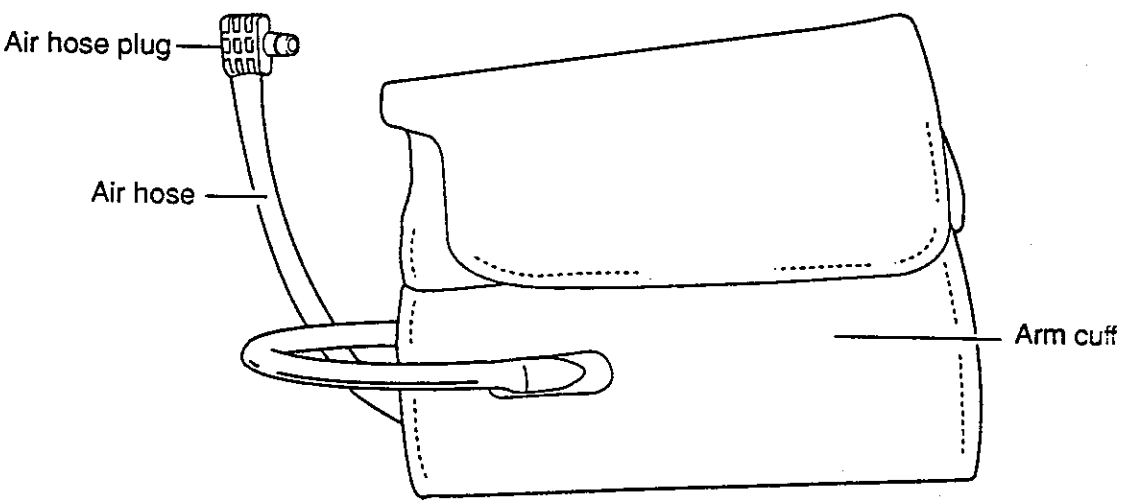
UA-732 Digital Blood Pressure Meter
Maintenance Manual 92/04/07

Specifications

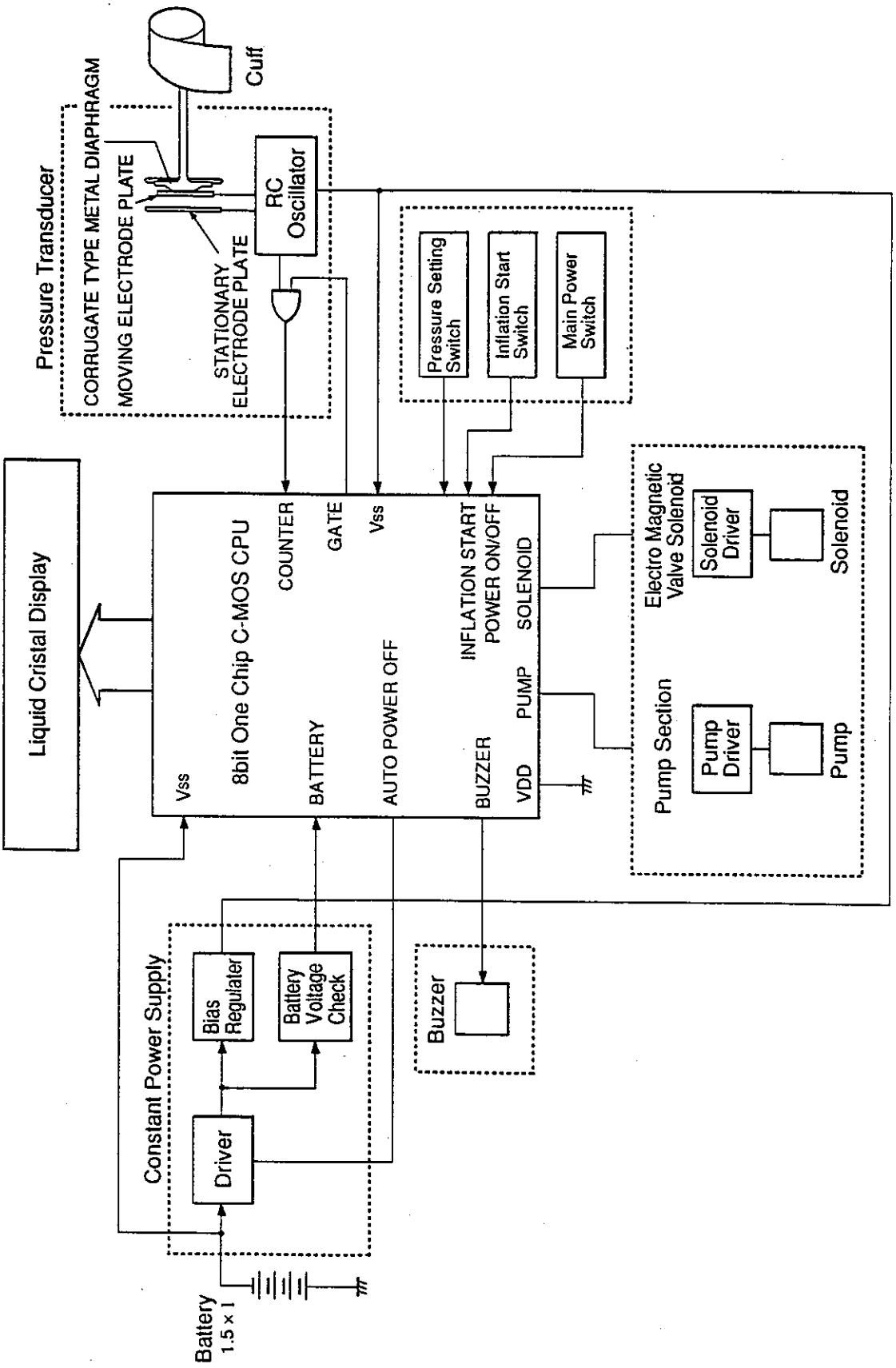
1)	Measurement Method	Oscillometric
1)	Display	Digital, 14mm height character LCD
3)	Measurement Range	20~280 mmHg (Blood Pressure) 40~200 pulses/minuet (Pulse)
4)	Accuracy	Pressure Transducer/Indicator accuracy within ±3 mmHg or 2% whichever greater Pulse Rate within ±5% of reading
5)	Inflation source	Diaphragm type micropump
6)	Cuff deflation	Adjustable constant exhaust speed valve
7)	Rapid Exhaust	Electro-magnetic type valve controlled by C.P.U.
8)	Pulse wave detection	Manschettor/Pressure Transducer in the air system
9)	Power source	6VDC, 4 x 1.5V"R6" type batteries
10)	Battery life	6 months (used for 3 minutes a day)
11)	Weight	Approx. 370g
12)	Dimension	140 (W) x 100 (D) x 50 (H) mm
13)	Operating environment	+10~40°C/less than 85%R.H.
14)	Storage environment	–20~55°C/less than 95%R.H.

Outline Drawing





Block Diagram



Operational Description

1) CPU

The CPU is a single chip C-MOS microprocessor, containing 4K × 8 bits of ROM, and 256 words RAM.

It was constructed from a standard logic circuit and a 16 bit counter for the pressure transducer. It also includes an LCD driver which drives the display using 1/3 dynamic drive.

2) Pressure Transducer

The pressure transducer is a pressure/capacitance conversion type. The transducer consists of variable electrode plate, which is connectec to a diaphragm, and a stationary electrode plate.

Mechanical displacement of the diaphragm is proportional to the pressure in the cuff. The capacitance of the transducer is proportional to (– 1/P).

3) Oscillator

The frequency of the oscillator corresponds to the pressure applied to the transducer. Changes in the oscillator frequency are measured by the microprocessor to detect pulse rate and blood pressure.

4) Power Supply

This section consists of a custom IC. The custom IC provides regulated voltages from the 6V supplied by the battery.

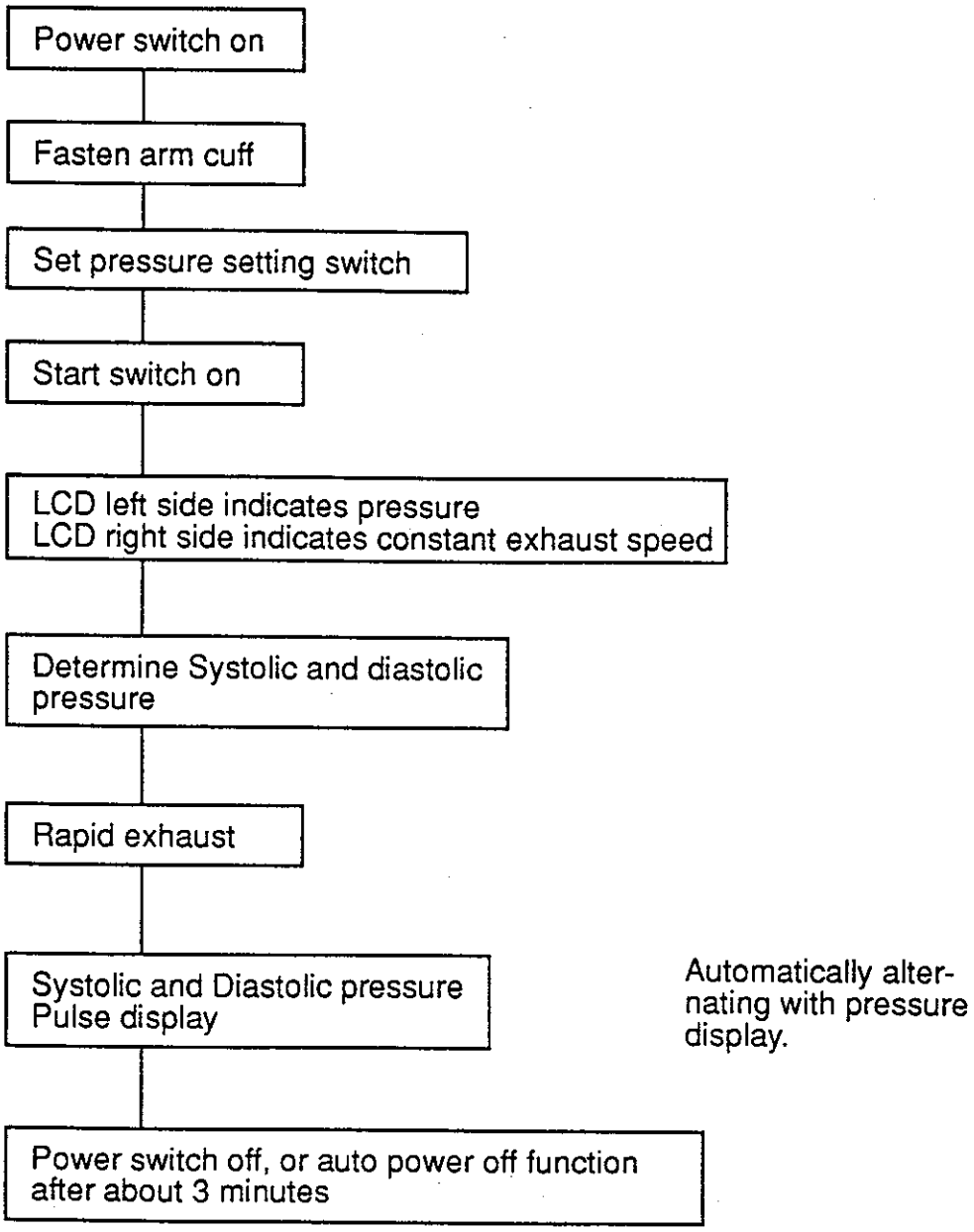
VDD =	0V	Common (positive battery terminal)
VSS1 =	-4V	Measure at pin 3 of IC2
VSS =	-6V	Measure at pin 8 of IC2
Boost =	-9V	Measure at pin 2 of IC2

5) Beeper Oscillator

When the set pressure (160/200/240/280 mmHg) is reached during the inflation process, and the initial pulse pressure waves have been detected, this condition is indicated by a "beep" from a piezo-electric beeper, driven by an oscillator which operates at a frequency of approximately 4 KHz.

Measurement Sequence

1) Measurement sequence (simplified)



2) Measurement Sequence

a) Press the "POWER" key

All LCD segments will appear and the beeper will sound for one second. After this, all LCD segments will be blanked and the exhaust mark (V) will appear.

The unit will perform internal zero calibration. When completed, "0" will be displayed and the instrument is ready for measurement.

b) Arm cuff

Wrap the cuff around the upper arm and fasten it. Position the elbow so that it is about the same height as the heart.

c) Set "PRESSURE" setting switch

Move the slide switch on the blood pressure meter to set the pressurization value. This value should be 30 to 40mmHG higher than your normal systolic blood pressure.

d) "START" key

When the "START" key is pressed, the pump will begin pressurizing the cuff. The pump will stop when the set pressure value is reached At this point, the constant-speed exhaust begins.

e) Pressure display

After the constant-speed exhaust begin, the measurement mark (♥) will appear in the display and the exhaust speed will be displayed until the pulse (pulse pressure wave) is detected.

f) Blood pressure display

When the pulse pressure wave is first detected, the instrument begins to determine the blood pressure and the internal cuff pressure display switches to the right side of the LCD.

When the systolic and diastolic determination is complete, the measurement completed beeper sounds.

g) Rapid exhaust

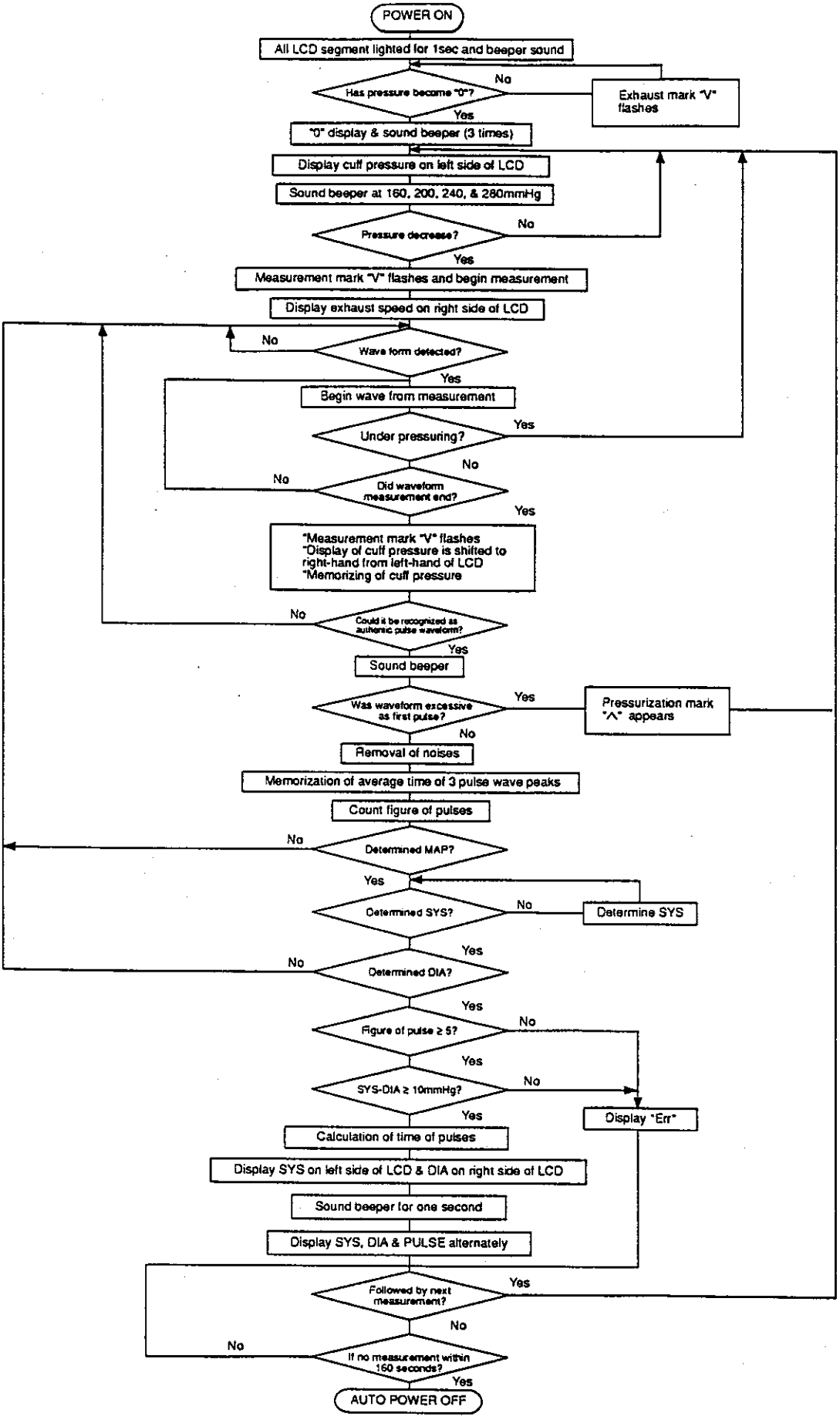
When the measurement sequence has completed, a solenoid valve opens and the air in the cuff is rapidly exhausted.

h) Pulse display

After the determination of the blood pressure values, the blood pressure and pulse are displayed alternately on the LCD.

i) Power off

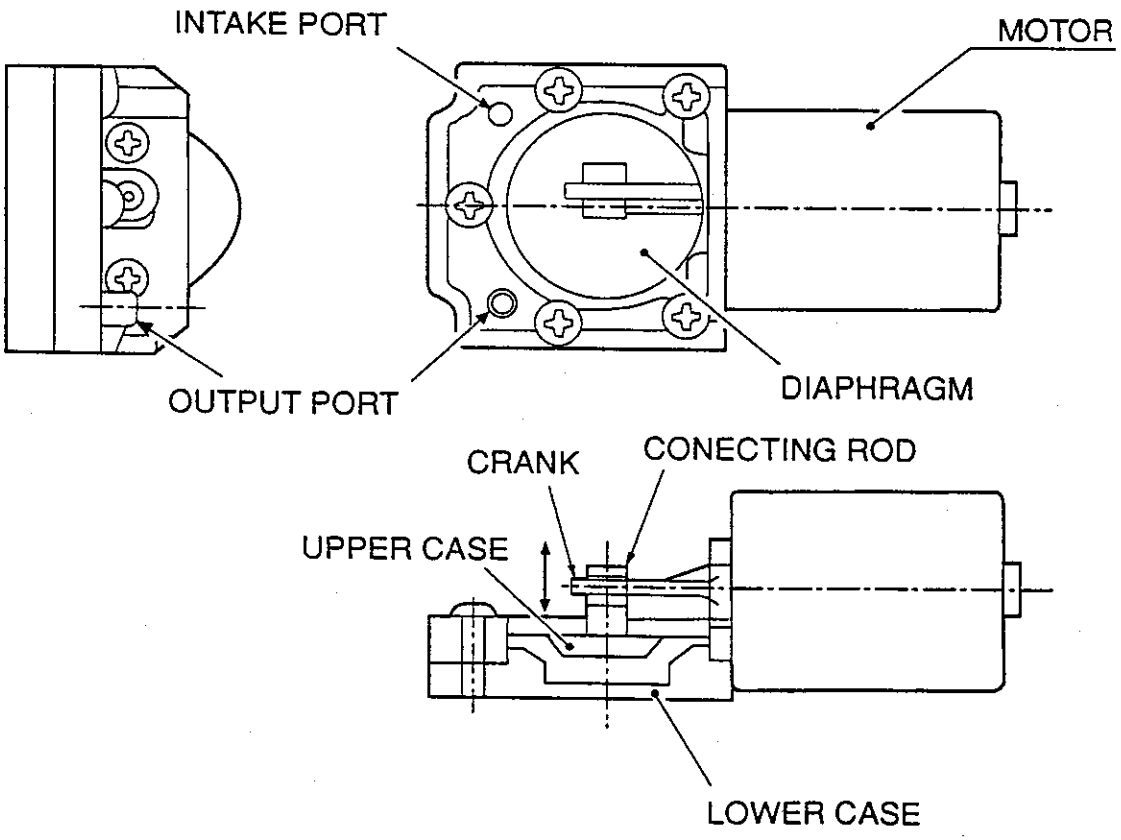
After completion of the measurement, press the "POWER" key to turn the instrument off, or simply allow the unit to remain unused for three minutes, and the power will automatically be switched off.


POWER ON
All LCD segment lighted for 1sec and beeper sound
Has pressure become "0"?
No
Yes
Exhaust mark "V" flashes
"0" display & sound beeper (3 times)
Display cuff pressure on left side of LCD
Sound beeper at 160, 200, 240, & 280mmHg
Pressure decrease?
No
Yes
Measurement mark "V" flashes and begin measurement
Display exhaust speed on right side of LCD
No
Wave form detected?
Yes
Begin wave from measurement
Under pressuring?
Yes
No
No
Did waveform measurement end?
Yes
"Measurement mark "V" flashes
"Display of cuff pressure is shifted to right-hand from left-hand of LCD
"Memorizing of cuff pressure
No
Could it be recognized as authentic pulse waveform?
Yes
Sound beeper
Was waveform excessive as first pulse?
Yes
Pressurization mark "^" appears
No
Removal of noises
Memorization of average time of 3 pulse wave peaks
Count figure of pulses
No
Determined MAP?
Yes
Determined SYS?
No
Determine SYS
Yes
No
Determined DIA?
Yes
Yes
Figure of pulse ≥ 5?
No
Yes
SYS-DIA ≥ 10mmHg?
No
Yes
Display "Err"
Calculation of time of pulses
Display SYS on left side of LCD & DIA on right side of LCD
Sound beeper for one second
Display SYS, DIA & PULSE alternately
Followed by next measurement?
Yes
No
No
If no measurement within 160 seconds?
Yes
AUTO POWER OFF

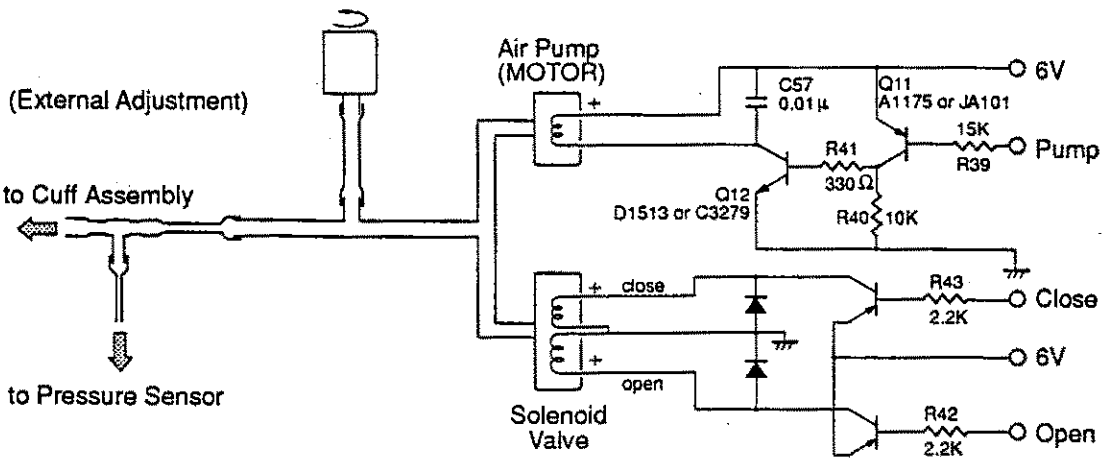
Inflation Pump & Exhaust Valve

Inflation Pump

Inflation method	Diaphragm type micropump, capable of repressurizing in the event of insufficient pressure for measurement
Pressurization ability	12 sec to 300 mmHg (with 300 cc tank)
Rapid exhaust	By solenoid valve 4 sec. from 300 mmHg to 20 mmHg (with 300 cc tank)
Leakage tolerance	15 mmHg per minute, at 300 mmHg
Operating temperature	10~40C/85%RH
Dimensions	67.5mm × 35mm × 26mm
Weight	Approx. 70 grams.

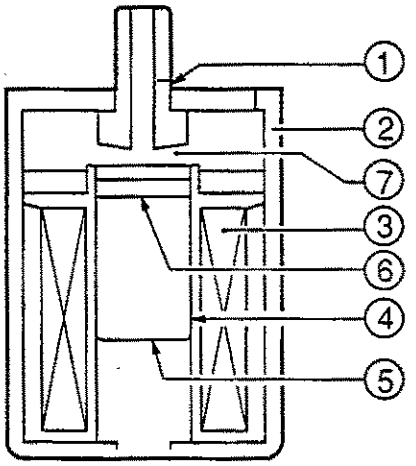


Construction Drawing of Pump Assembly



Block Diagram of Pump and Valve Assembly

Exhaust Valve



Solenoid Valve

Constructions

A. When performing measurements of blood pressure, the core is in the raised, or closed position. At the completion of a measurement, an electrical signal operates the drive coil, causing the core to drop, opening the valve for rapid exhaust.

B. When the pressure exceeds 320mmHg, an electrical signal causes the same operation as described in step A above.

C. When the power supply is OFF, the core returns to the lower position, opening the valve.

Check Sequence

1) Required Instruments

The instruments required for this procedure are as follows:

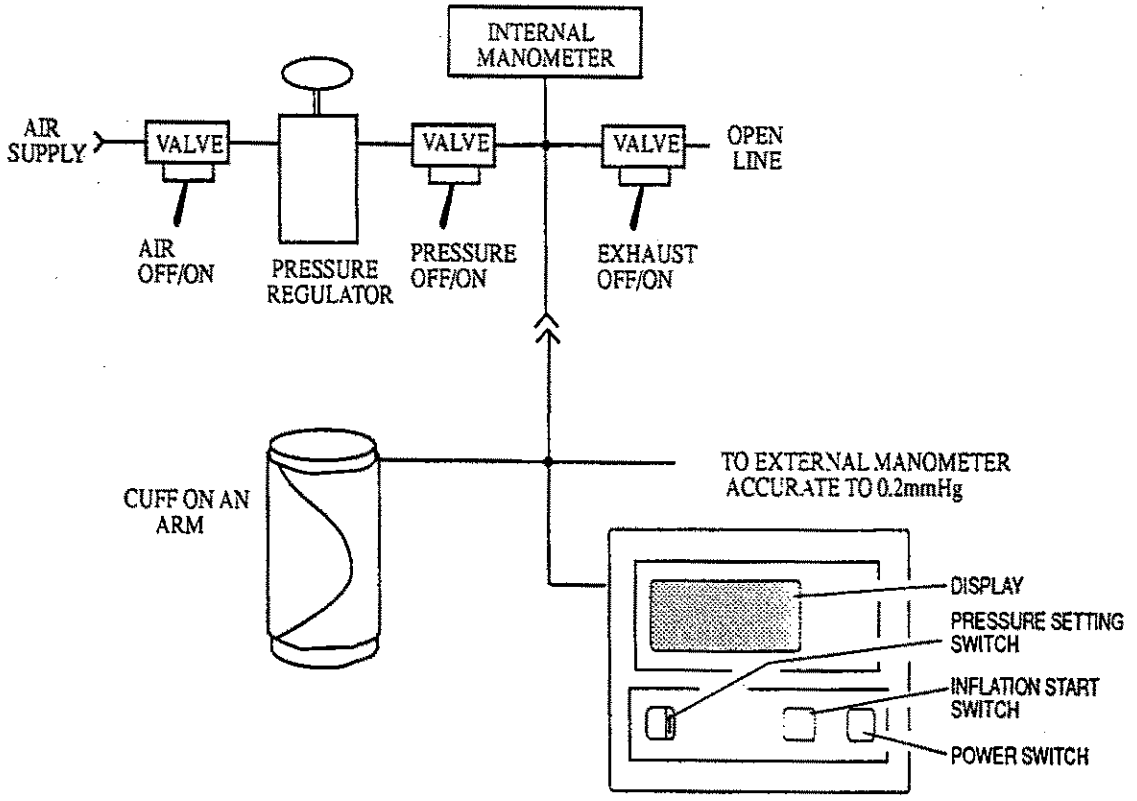
Digital Voltmeter (DVM)

Manometer (accurate to within ±0.2 mmHg)

Test system (accurate to within ±0.2 mmHg)

2) Power Supply Check

VDD (battery voltage) 6V	Battery positive terminal
Boost -9V	Measure at pin 2 of IC2
VSS -6V	Measure at pin 8 of IC2
VSS1 -4V ±0.2V	Measure at pin 3 of IC2
VS	Battery negative terminal



TEST SYSTEM

1) Open the unit

2) Supply power to the unit without feeding pressure (after a few seconds "0" will appear on the LCD). Set the pressure switch to 160mmHg.

3) Press START, the rapid exhaust valve will close and the pump will run until the set pressure is reached, feed pressure (280 mmHg) to the unit

4) Compare the reading of the unit and that of the test system (or a standard manometer).

5) When the unit reads higher (or lower) than the standard gauge, turn the span trimmer on the PCB of the unit to the left (to the right) so that the reading of the unit increases (decreases).

   Example: When the reading of the unit is 285 and that of the standard reads 280.0, turn the span trimmer to the left so that the unit reads 289 – 291. And when the reading of the unit is 275, and that of standard reads 280.0, turn the span trimmer to the right so that the unit reads 269 – 271. Remove the adjustment tool prior to checking the accuracy of the unit as the tool will cause an error in the reading.

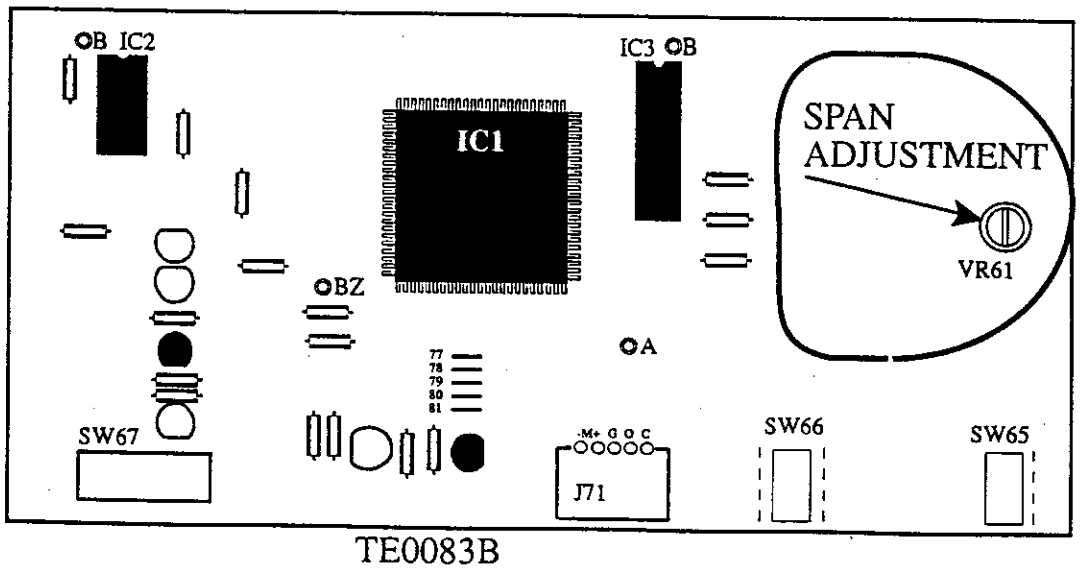
6) Then de-pressurize air from the test system and unit. Turn the power off (Press the power switch on the unit), then turn the power on again (the auto-zero system of the unit only works when you turn the power on).

7) Press START, the rapid exhaust valve will close and the pump will run until the set pressure is reached, feed pressure (280 mmHg) to the unit

8) Please repeat steps 4 through 7 to make an accurate calibration of the unit.

9) After adjusting the pressure span of the sensor, please check the pressure accuracy at 50 mmHg and 160 mmHg (linearity of the sensor). If the accuracy is not within the stated specifications, try adjusting the unit again.

10) Close the unit and check again please.



TE0083B

Constant Exhaust Speed

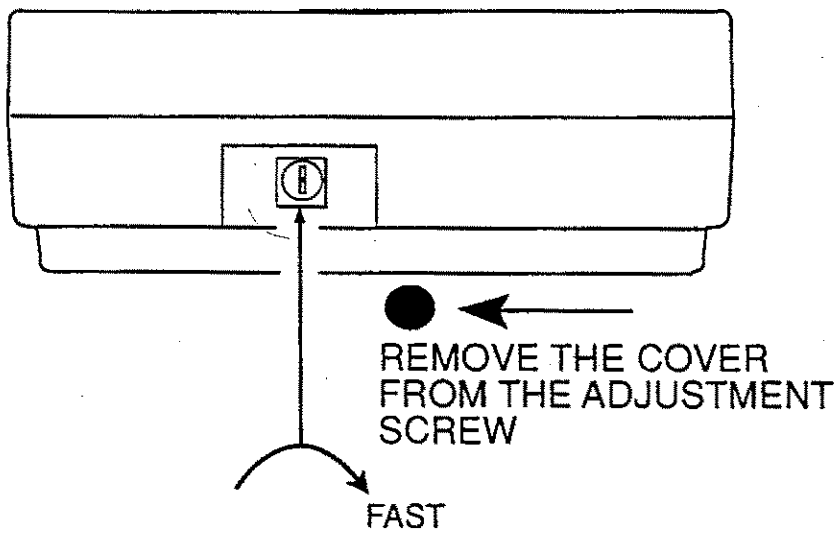
Connect the cuff hose (Shown in Check Sequence "Test System") to a 300CC air tank and pressurize to 200mmHg.

Approximately 1 second after stop of pressurization the deflation speed per second will appear on the diastolic display.

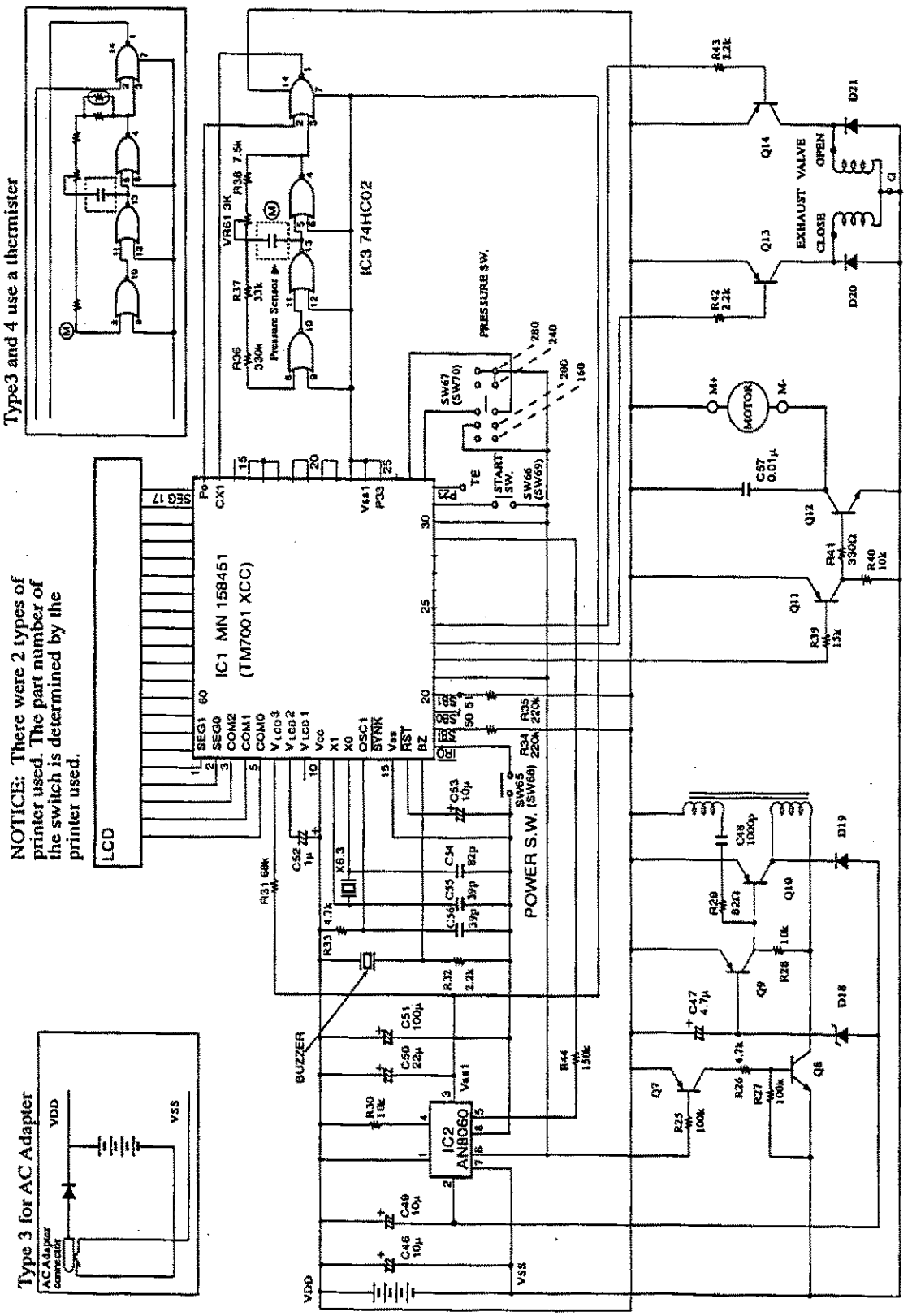
Adjust the deflation speed to 3-4mmHg/second at the cuff pressure range of 170-140mmHg by turning the adjustment screw. Turn it clockwise to increase the speed and counterclockwise to decrease. (1mmHg/sec/20)

If the adjustment screw has been turned to far, adjustment may be difficult. Try turning the adjustment screw clockwise several turns (you may not feel when the adjustment screw bottoms out as it is set in soft rubber), then counterclockwise three full turns. This should place the adjustment screw within range for proper adjustment.

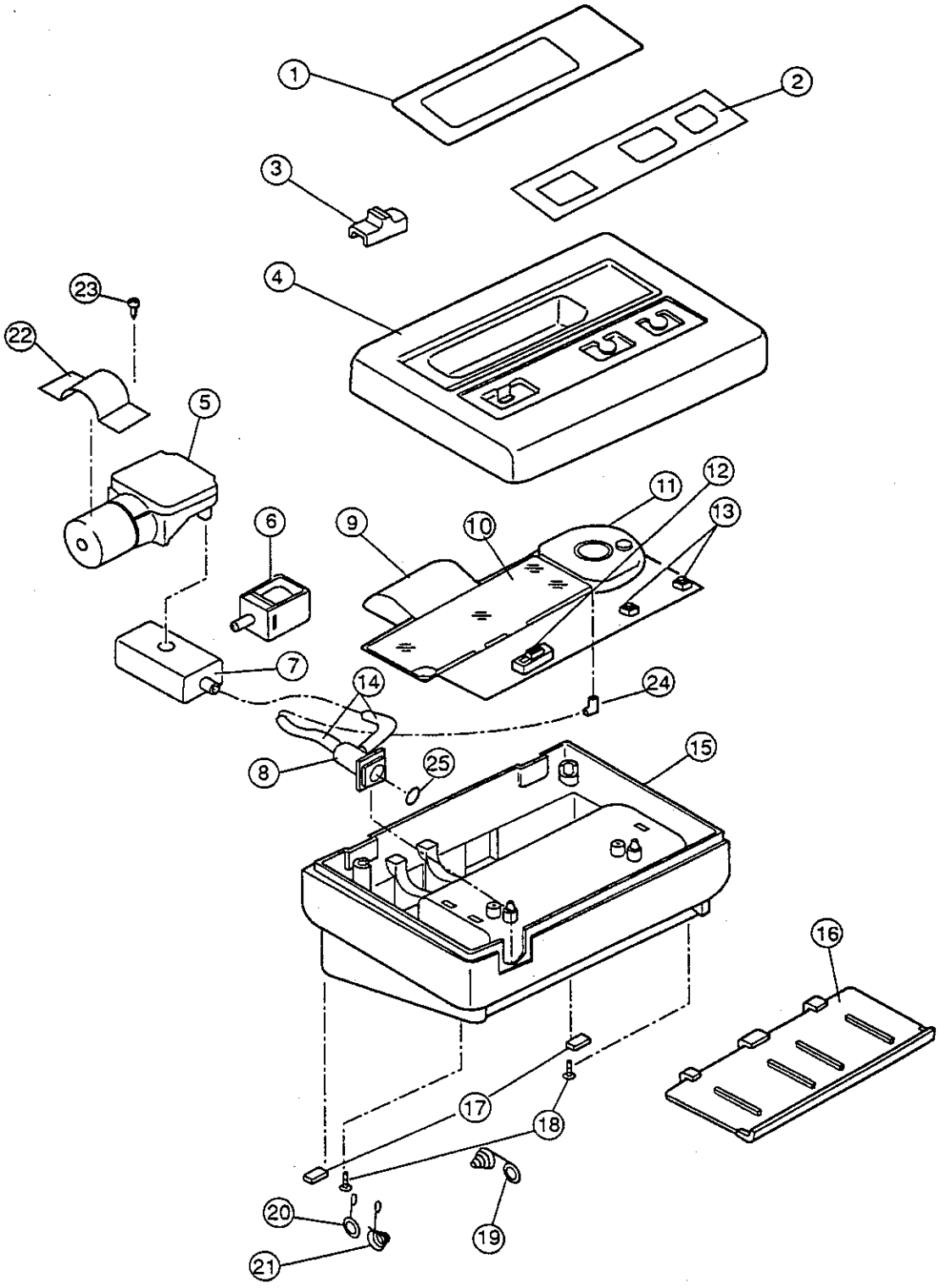
If the valve has been taken apart , it may be missing the valve block (a very small pointed plastic part), Adjustment of the screw will have no effect on the exhaust speed.



Circuit Diagram



Illustration



Exploded View

Parts List

Parts for UA-732

No.	Part name	Part No.
1	LCD sheet	U4-4837
2	Name sheet	U4-4835
3	Slide switch knob	U4-4407
4	Upper case	U2-416
5	Pump	UA3-572
6	Solenoid valve	LS-SS-068K-006C
7	Exhaust valve	**UA4-4391**
8	Air socket	U4-4513
9	Heat sheet	KH-21P150L030
10	LCD	**VL-LS397-C**
11	Printed circuit board	PA-00831M
12	Slide switch	SS-MSS224-001
13	Push switch	SK-SKHHAK
14	Silicon tube	TS-23400110 TP & TS-30500100 TP
15	Lower case	U4-4405
16	Battery cover	U4-4406
17	Rubber foot	U4-3256
18	Binding head wood screw M2.3 × 8	
19	Batter terminal B	U4-1512-A
20	Batter terminal D	U4-4600
21	Batter terminal C	U4-3521
22	Pump holder	U3-965
23	Panhead M2.6 × 6	
24	L air connector	U4-3242-A
25	Exhaust cap	U4-2736-A
26	Cuff	UA-4929
27	Hose plug	U4-4491
28	Soft case	U4-4379

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