

# TM-2650

AUTOMATIC DIGITAL BLOOD PRESSURE METER

## INSTRUCTION MANUAL

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Owners-TM-2650-v.2.a 91.03.25

AUTOMATIC DIGITAL BLOOD PRESSURE METER



# CONTENTS

Warranty, FCC rules.....	Page 2
1. INTRODUCTION.....	Page 3
2. FEATURES.....	Page 3
3. NAMES AND FUNCTIONS OF PARTS .....	Page 4
4. RATED SPECIFICATIONS.....	Page 6
5. CONFIGURATION.....	Page 7
6. PREPARATION FOR MEASUREMENT.....	Page 8
7. MEASUREMENTS.....	Page 16
8. NOTES ON USE .....	Page 19



## Warranty

Warranty rights vary from country to country but it is the general intention of A&D Co., Ltd., to offer customers a one year warranty on this product from the day it is purchased. In some countries consumer protection legislation states that your dealer is responsible for offering a warranty and under these circumstances please refer to your local dealer.

In the U.S.A. the product (if defective) should be returned, freight prepaid by the customer, to A&D Engineering Inc. in California and in Europe the product can be returned freight prepaid to A&D Instruments GmbH in Frankfurt, West Germany. Elsewhere the product can be returned to A&D Co., Ltd. in Japan. In any event please contact your nearest A&D office, before shipping, to confirm that the product is covered by this warranty. Simple repairs can be carried out by your local dealer under warranty and this may be the fastest method of solving your problem.

This warranty only applies to product failures due to defective materials and/or workmanship. This warranty will be rendered invalid if, upon inspection, it is found that the product was: Abused; used for a purpose for which it was not designed; mishandled; placed in a hostile environment; repaired by unauthorized personnel; improperly installed or not adjusted in accordance with instructions given in this manual.

If repair under warranty is confirmed by A&D, then the product will be repaired (or replaced, at the discretion of A&D) and then returned to the customer at no extra cost.



## Compliance with FCC Rules

Please note that this equipment generates, uses and can radiate radio frequency energy. This equipment has been tested and has been found to comply with the limits of a Class A computing device pursuant to Subpart J of Part 15 of FCC rules. These rules are designed to provide reasonable protection against interference when equipment is operated in a commercial environment. If this unit is operated in a residential area it might cause some interference and under these circumstances the user would be required to take, at his own expense, whatever measures are necessary to eliminate the interference.

(FCC = Federal Communications Commission in the U.S.A.)



## 1. INTRODUCTION

Blood pressure has been and still is the most basic vital indicator of the human circulatory system, and remains an effective means of checking a person's health. Preventing high blood pressure is very important in protecting people against such geriatric diseases as cerebral apoplexy and heart disease. Under these circumstances, people have been seeking a high-precision a blood pressure meter that anyone, young or old, can use. Of course, the arm cuff cannot be fitted or the exhaust speed cannot be adjusted properly without considering the shape of one's arm. This had made measurements difficult. The Blood Pressure Meter TM-2650 has solved this problem by automating the procedure so that anyone can easily and quickly measure blood pressure. The automatic cuff-type digital blood pressure meter can be used for a variety of purposes, such as diagnosing out-patients at hospitals, medical checks at sports facilities, periodic checks at offices, and for customer services at drugstores.



## 2. FEATURES

The blood pressure meter consists of the main unit, (arm cuff) and display unit. The display unit can be freely mounted. The main unit is turned on and off by using the respective start and stop switches on the display unit.

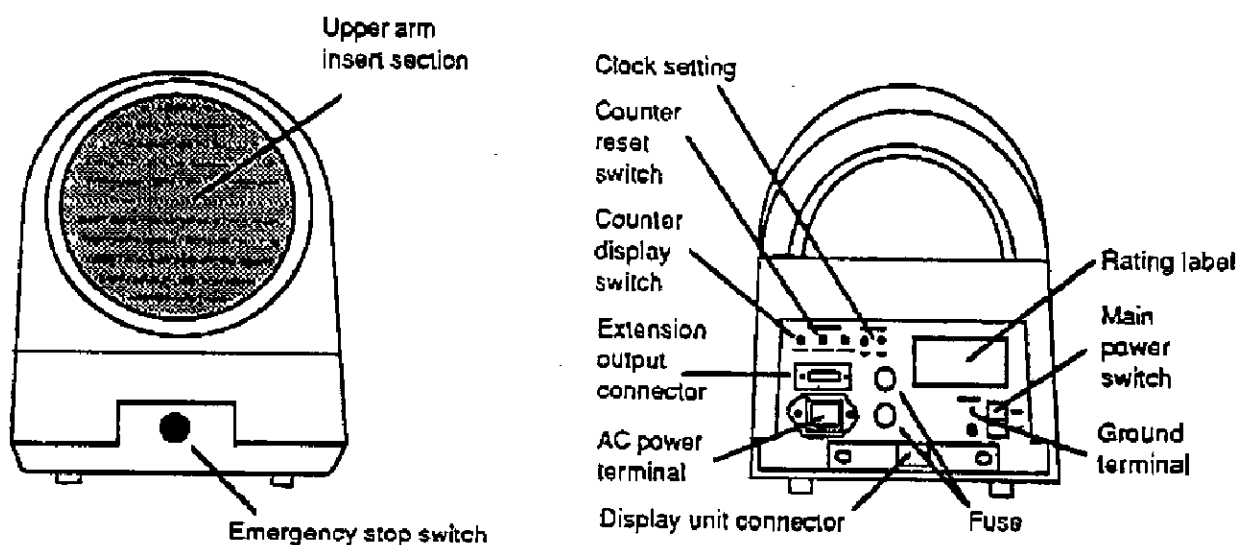
The measured blood pressures are sent to the display unit and displayed on the LED display.

- ☐ Measurement is fully automatic. Just insert the person's arm into the arm cuff and press the START switch.
- ☐ The arm cuff fits the arm naturally and prevents measurement error.
- ☐ The print mode can be selected from the result only and results and pulselevel modes.
- ☐ The correction mechanism adjusts the pressure to the arm cuff and deflation speed to prevent measurement error.
- ☐ Because the arm cuff and display unit are separate, they can be set anywhere. The instruction panel is easy to see.
- ☐ The counter function can count up to 50,000 measurements.
- ☐ The RS-232C I/O connector is standard.

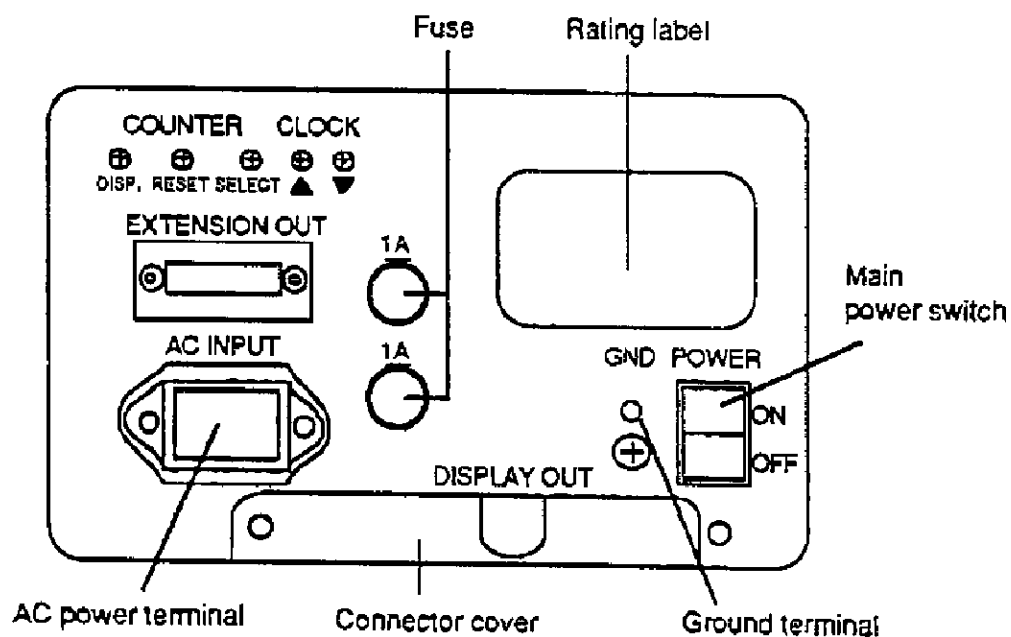


### 3. NAMES AND FUNCTIONS OF PARTS

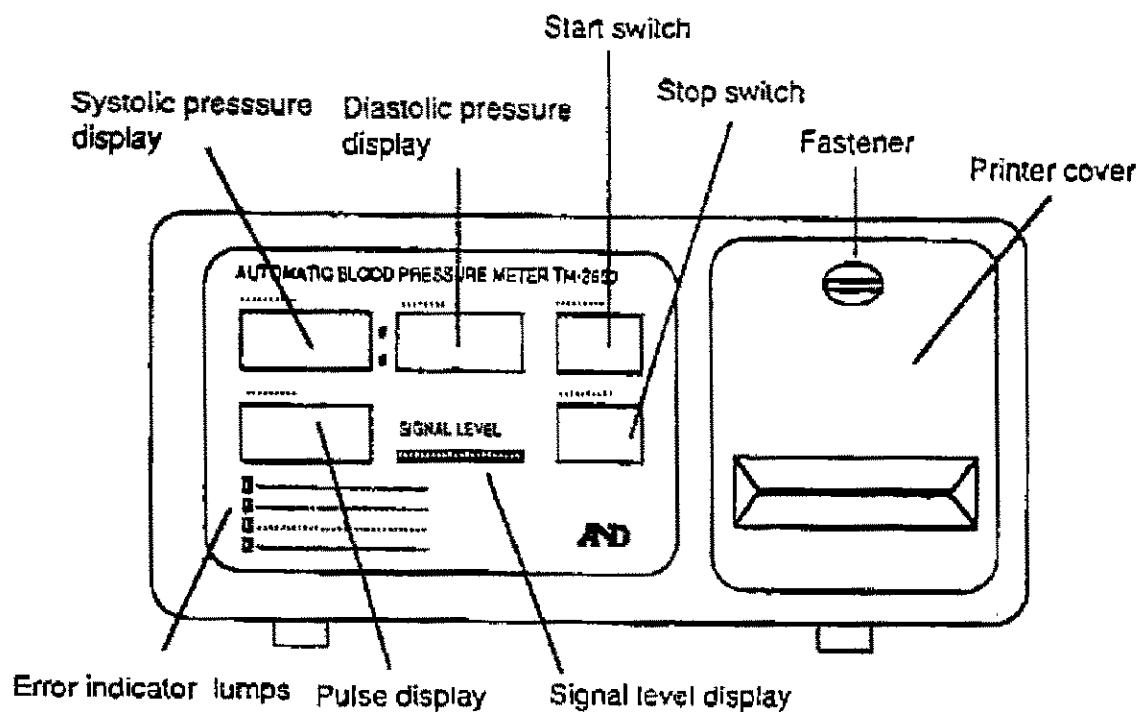
#### Main unit (arm cuff)



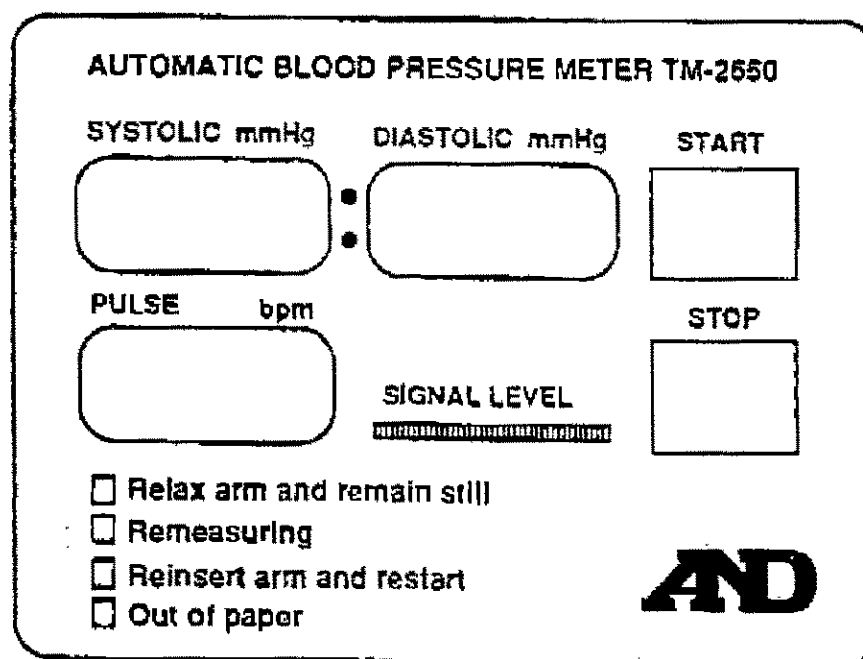
#### Rear panel



## Display unit



## Front Nameplate





## 4. RATED SPECIFICATIONS

1) Measurement method	Oscillometric method
2) Measurement range	Pressure: 0 - 300 mmHg Pulse: 20 to 200 beats/min.
3) Accuracy	Pressure: $\pm 3$ mmHg or 2% of readings if greater/Pulse $\pm 5\%$
4) Display	Measurement value: Red LED 3 digits Signal level: Bar-graph LED Other: LED lamp
5) Clock function	Time indication: Hour/min and automatic calendar
6) Counter function	Measurement count display (50000 max.)
7) Printer	Thermal type (58 mm width)
8) External output	RS-232C compatible
9) Arm cuff	Winding mechanism with geared motor
10) Pressurization method	Automatic pressurization using micro-pump
11) Deflation method	Speed-controlled deflation using automatic mechanical valve
12) High-speed deflation method	Automatic high-speed deflation using electro-magnetic valve
13) Protection system	Stop switch Emergency stop switch High-speed deflation using electromagnetic valve at 320 mmHg or higher pressure High-speed deflation using mechanical safety valve at 350 mmHg or higher pressure
14) Power source	100, 115, 220, 240 VAC selective, 50/60 Hz
15) Power consumption	24 VA
16) Operating temperature/humidity	+10° - +40°C, 30% - 85% RH
17) Storage temperature/humidity	-20° - +60°C, 10% - 95% RH
18) External dimensions	Main unit: 200 (W) x 265 (H) x 402 (D) mm Display unit: 260 (W) x 122 (H) x 122 (D) mm
19) Weight	Main unit: 6.5 kg Display unit: 1.6 kg



## 5. CONFIGURATION

The TM-2650 consists of the following components:

1. Main unit (arm cuff)
2. Display unit (with connection cord)
3. Operation panel and instruction manual
4. Thermal type printer paper (two rolls)
5. Cuff cover x 2 (One is attached to the main unit.)
6. AC power cord

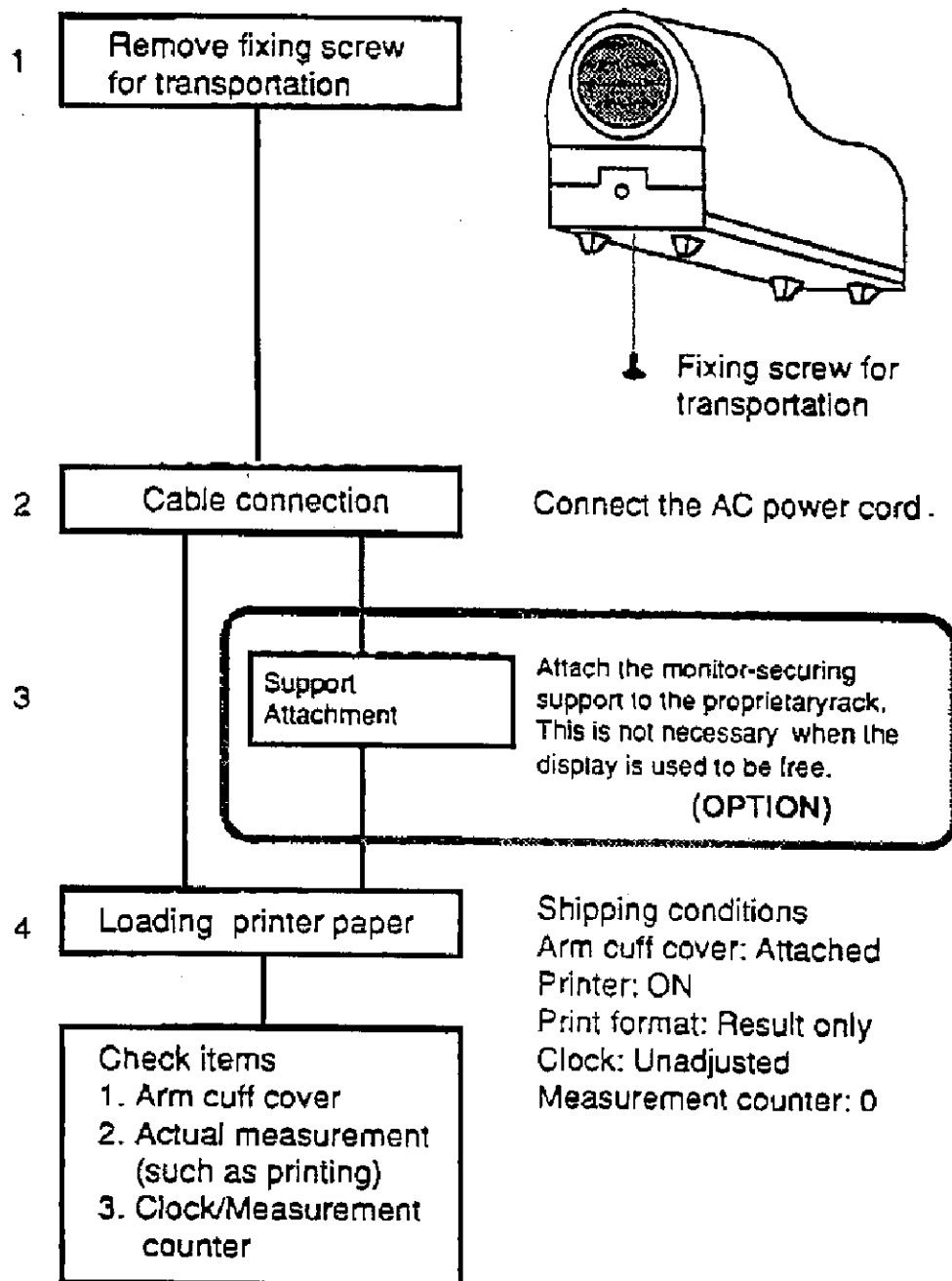
### <Accessory>

- |                                                                   |                                                      |
|-------------------------------------------------------------------|------------------------------------------------------|
| <input type="checkbox"/> proprietary desk (TM9311)                | <input type="checkbox"/> chair (TM9315)              |
| <input type="checkbox"/> thermal type printer paper (AX-PP-136-S) | <input type="checkbox"/> carrying case (TM9313)      |
| <input type="checkbox"/> cuff cover (AX-U46148-S)                 | <input type="checkbox"/> horizontal stay (TM2650-02) |
| <input type="checkbox"/> vertical stay (TM2650-01)                | <input type="checkbox"/> vertical stand (TM9314)     |





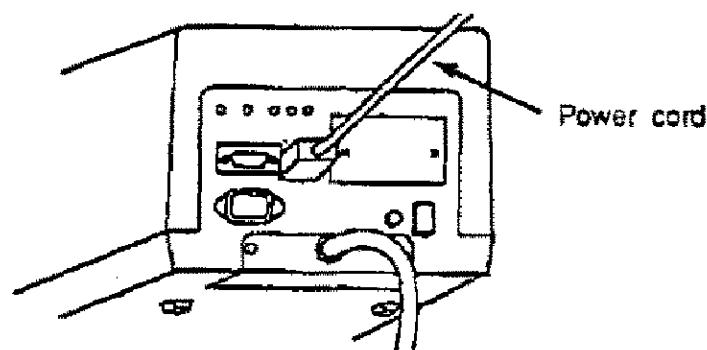
## 6. PREPARATION FOR MEASUREMENTS



## 6.1 Connecting the cords

Connect the accessory AC power cord.

[Do not turn on the power until cord connection is completed.]



## 6.2 Attaching the support

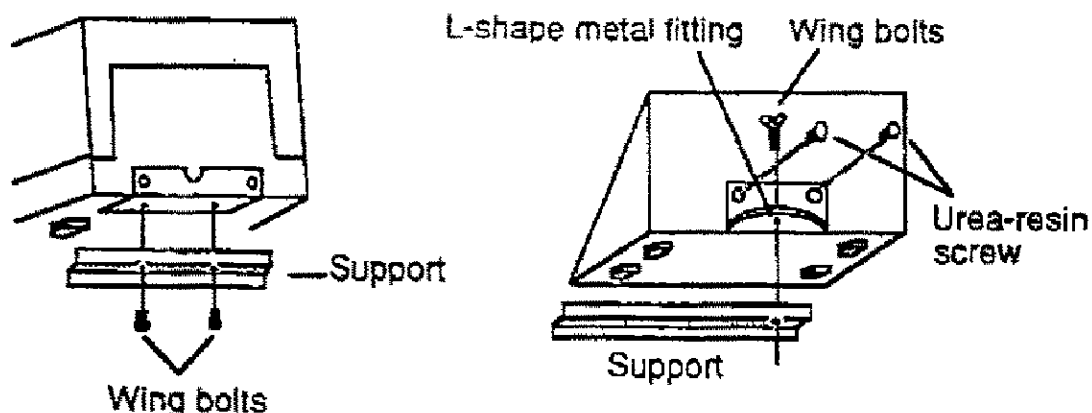
(unnecessary when not fixing the display unit): Option

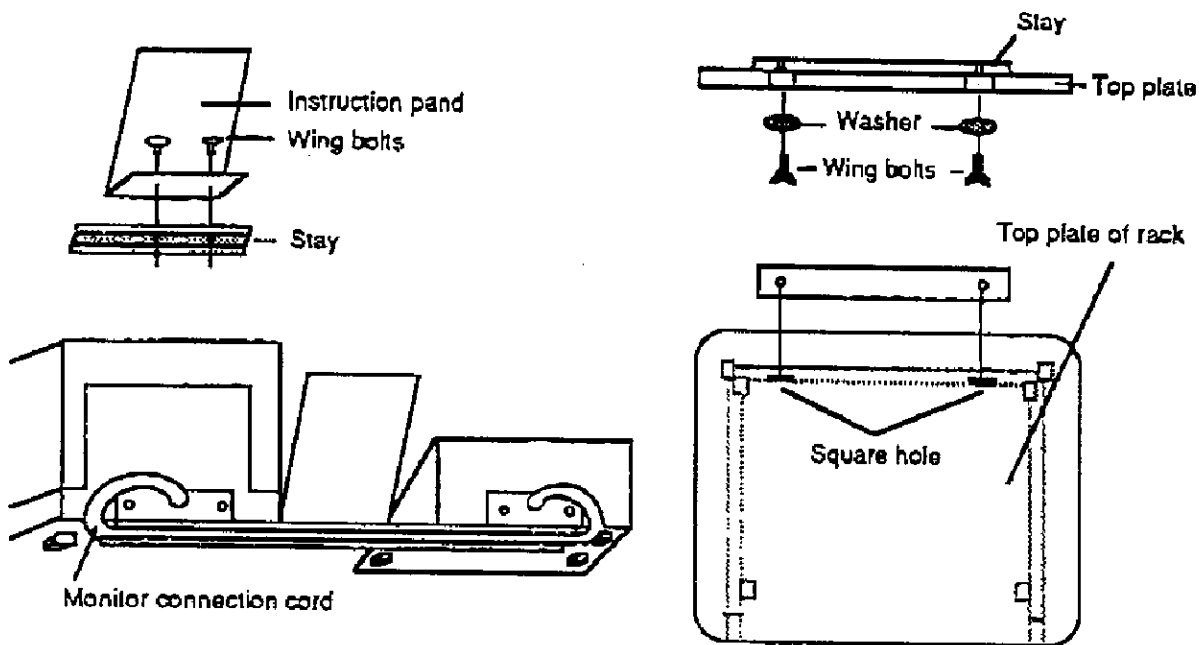
### 6.2.1 Attaching the horizontal stay (TM2650-02): Option

- (1) Attach the support to the display unit terminal cover at the bottom of the arm cuff by using the two screws.
- (2) Attach the L-shaped metal fitting to the back of the display unit by using the two urea-resin screws. Then secure the L-shaped metal fitting and support with the wing bolts, urea-resin screws had been fixed back of the monitor.
- (3) Attach the operation panel to the support by using the two wing bolts.
- (4) Put the display unit connection cord in the support. [The display unit connection cord exit is located on the rear or bottom.]
- (5) Attach the support to the proprietary rack.

[The proprietary rack is assembled and the support is attached to the TM-2650.]

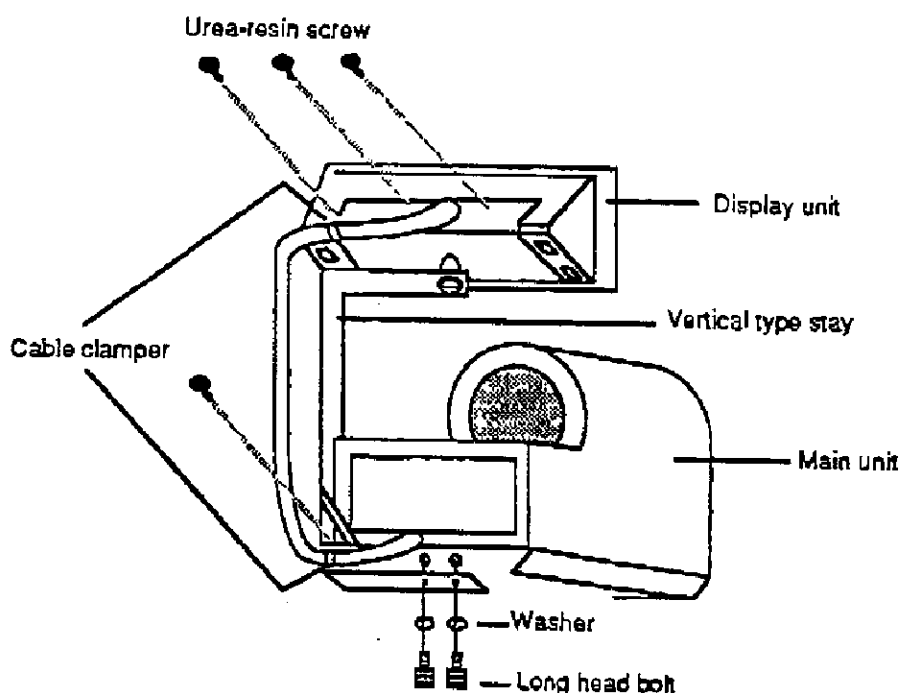
Align the holes of the TM-2650 support with the square holes of the top plate of the rack. Secure the support by using the accessory wing bolts of the rack from the bottom of the top plate.



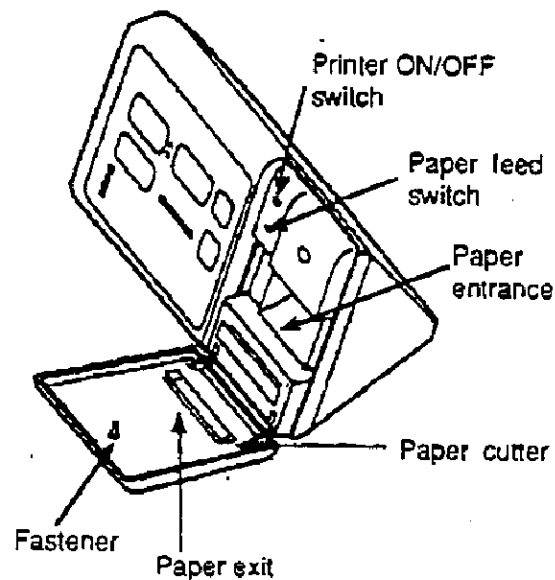


### 6.2.2 Attaching the vertical set up kit (TM2650-01): Option

- (1) Fasten two long head screws on the bottom, using the spanner (one of the accessories) as shown below.
- (2) Fasten two urea-resin screws (found at the rear panel of the display unit) to attach the display pad with the stay as shown below.
- (3) Fix the signal cable between the unit and the display pad using a clammer and urea-resin screws.
- (4) The display pad can be turned to 180 degrees right and left for a better angle for viewing.



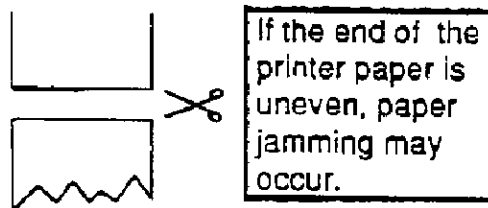
### 6.3 Loading the printer paper



- (1) Turn the fastener by 90° to remove the printer cover.  
(The fastener can be turned by using a coin.)

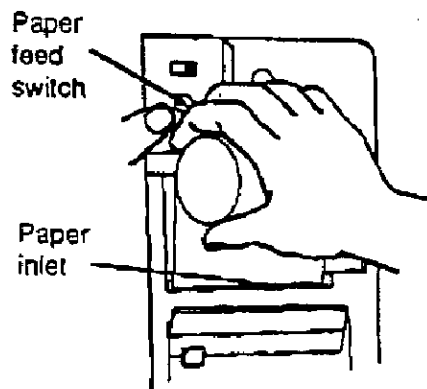


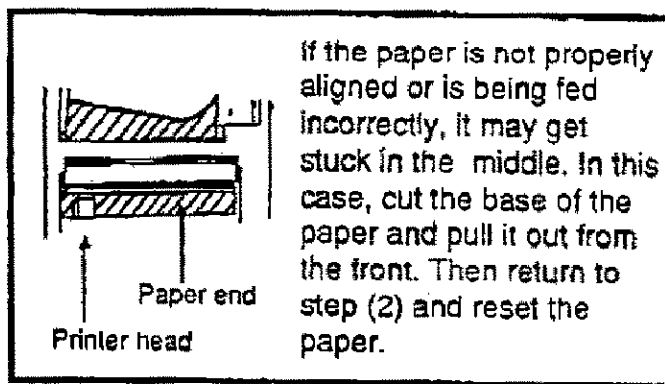
- (2) Cut the end of the printer paper with a pair of scissors.



If the end of the printer paper is uneven, paper jamming may occur.

- (3) Load the printer paper and feed it about 10 cm.





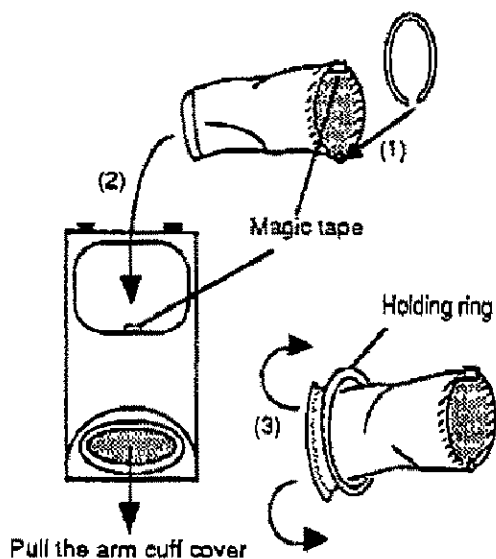
- (4) Insert the paper through the paper exit of the printer cover, then turn the fastener by 90° to secure the printer cover.



Note: Set the printer ON/OFF switch to ON to print the results of a blood pressure measurement. The paper-out LED on the display goes on when there is no more paper.

#### 6.4 Attaching the arm cuff cover

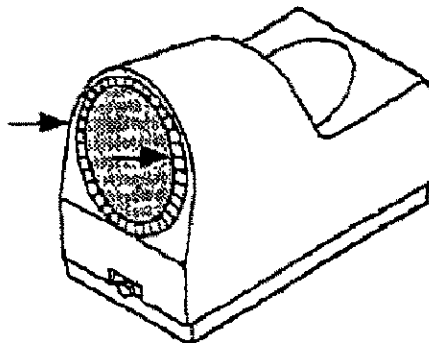
[The TM-2650 has two arm cuff covers. If the preset cover gets dirty, replace it with the other one. Always use a clean one to maintain normal meter operation.]



- (1) Put the ring from the cloth of the arm cuff cover.

- (2) Insert the cloth of the arm cuff cover through the circular holes, then fix it by the magic tape.

- (3) Put the arm cuff cover through the holding ring and fold it so that its seam comes to the edge of the ring.



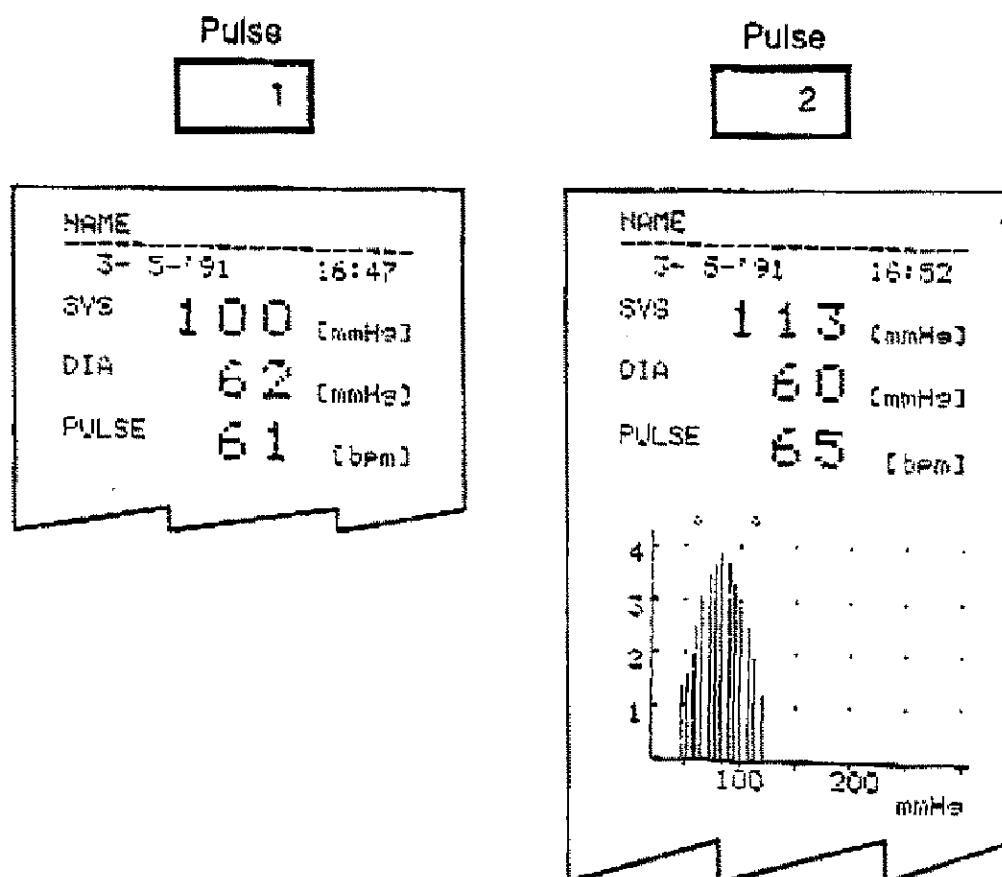
- (4) Push in the holding ring from the front of the arm cuff.

## 6.5 Setting the print format

The meter is set in a mode in which only results are printed. If the pulse level is necessary, results and pulse can be printed. To do so, remove the printer cover from the monitor and press the start switch while holding the paper feed switch down. "1" and "2" are cyclically indicated on the pulse display.

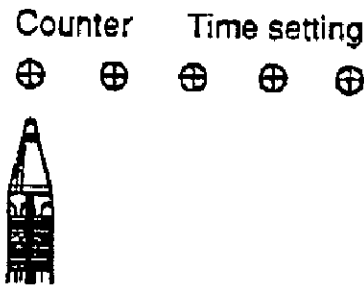
1: Results only

2: Results and pulse level



## 6.6 Setting the clock

The clock adjustment/counter switch is on the rear of the main unit (inside the main unit to prevent it from being pressed by mistake). Press it with the tip of a ball-point pen.



1. Turn on the power switch to display the clock. Now the time can be set.

This switch is used to select the Year, Month, Day, Hour, Minute, or Second setting mode.

<Clock setting switches>

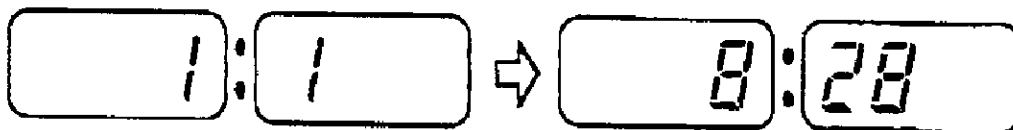
These switches are used to increment or decrement the year, month, day, hour, or minute now being displayed.

2. Year, month, day, hour, and minute setting

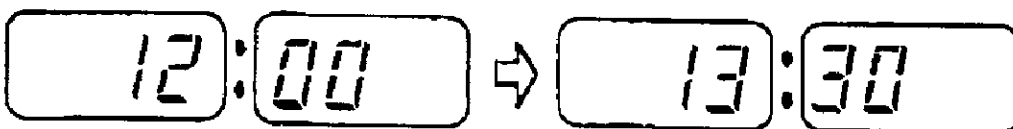
- (1) Press the clock selector switch once to activate the year setting mode. The year value starts flashing. Set the value by pressing the appropriate clock setting switches. Example: Set 90 for 1990. (The calendar range is from 1990 to 1999.)



- (2) Press the clock selector switch again to activate the month and day setting mode. The month value starts flashing. Set the value by pressing the clock setting switches. Press the selector switch again to cause the day value to flash. Set the value by pressing the appropriate time setting switches.



- (3) Press the clock selector switch again to activate the hour and minute setting mode. ":" is lit and the hour value starts flashing. Set the value by pressing the appropriate clock setting switch. Press the selector switch again to cause the minute value to flash. Set the value by pressing the clock setting switches.



- (4) Press the clock selector switch again to terminate the setting.  
The second value is reset to 0 and the clock is displayed.

#### 6.7 Checking the counter

- (1) Press the counter display blind switch on the rear of the main unit to display the measurement count on the SYS/DIA LED for five seconds.
- (2) Press the reset switch on the counter display to clear the value to 0.





## 7. MEASUREMENTS

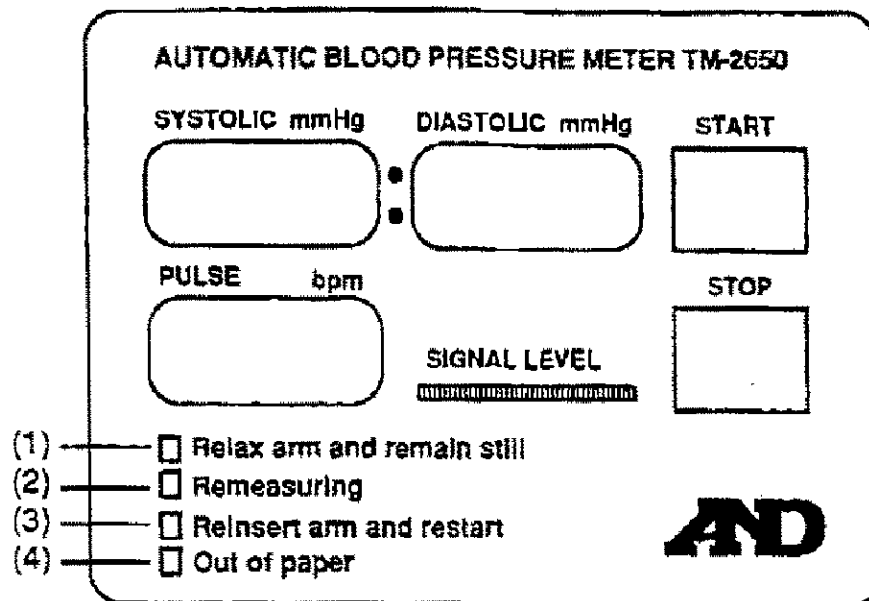
Item	TM-2650 Display
<b>Setup:</b> Connect the AC power cord, and turn on the power switch ON.	(1) Clock display
Item	TM-2650 Display
<b>Measurement:</b> (1) Insert the left arm (or right arm) from the arm insertion section to the shoulder section.  (2) Press the start switch of the monitor	(1) All LEDs light for about one second, then change to pressure display (2) The arm cuff is automatically wound around the arm. (3) The arm cuff is pressurized to 200 mmHg. (4) The pressure is reduced at a constant speed by the automatic deflation unit. (5) When the pulse is detected, the bar graph at the signal level display lights according to the signal level. (6) The arm cuff is deflated quickly to the original state. (7) The measurement results are displayed on the LEDs. If the printer switch is on, the results are printed. (8) The LED display returns the clock mode.
(3) Tear off the print data.	

Item	TM-2650 Display
<b>Notes:</b> (1) To stop a measurement halfway, press the stop switch on the monitor.	(1) The arm cuff is quickly deflated to the original state. (2) The LED display changes to the clock mode.
(2) If a measurement error occurs, the error message LED lights. Press the start switch to make another measurement.	(3) The error message LED lights.

#### □ Safety operation

Symptom	Action
1 You feel a pain due to the winding of the cuff or some other reason during a measurement	Press the stop switch on the monitor. (The arm cuff will be quickly deflated to the original state.) Check the insertion method according to the instruction panel, then restart the measurement.
2 The TM-2650 malfunctioned (at the monitor, for example) for some reason.	Press the emergency stop switch in front of the arm cuff. (Power is turned off immediately to reset the system.)
3 Power was interrupted due to a power outage during a measurement.	Pull out the arm from the arm cuff by rolling the arm sideways. (The arm cuff is quickly deflated and the arm cuff mechanism is unlocked.)

□ Error indications



LEDs (1) and (2) are on during measurement.

LED (3) lights if an error occurs twice. Withdraw the arm once and restart from the beginning.

LED (4) lights when there is no more paper in the printer. Load printer paper. Refer to the printer instruction manual for how to load the paper.

**Remeasurement**

If the blood and pulse cannot be measured, "Err" is indicated on the pulse display and the arm cuff is quickly deflated for remeasurement. The air pressure for the remeasurement is automatically set by the computer according to the error contents.

If the error occurs twice, error LED 3 lights and the arm cuff returns to its original status.

Press the start switch while error LED 3 is on (for about 10 seconds). The computer automatically determines the pressure from the contents of the error, then restarts the measurement. The maximum pressure is 300 mmHg.

If the start switch is not pressed during the ten-seconds period when error LED 3 is on, the measurement state is reset and the error LED goes off.

- \* If the start switch is pressed before inserting the arm, the arm cuff winding error is detected. Error LED 3 lights and the meter returns to the initial state.



## 8. NOTES ON USE

1. Read the instruction manual carefully before using the unit.
2. Precautions during installation
  - (1) Install the unit where it is not exposed to moisture.
  - (2) Install the unit where not exposed to extreme pressure, excessive temperature, humidity, wind, sunlight, dust, salt, sulphur, and other atmospheric conditions that may cause malfunction.
  - (3) Install, store, and transport the unit on a flat surface where not subject to excessive vibration, or shock.
  - (4) Install the unit away from chemicals and gas.
  - (5) Use the correct voltage and frequency.
  - (6) Be sure to ground the unit.
3. Precautions before use
  - (1) Make sure that the unit operates normally.
  - (2) Make sure that the arm cuff cover is mounted, the printer paper is loaded, and the cords are connected properly.
  - (3) Consult a specialist when using another unit together with this meter.
4. Precautions during use
  - (1) Make sure that there are no abnormalities with the unit or the patient. If an abnormality occurs, stop operation and take the necessary action to protect the patient.
  - (2) If a power failure occurs due to a lightning or some other cause during a measurement, instruct the patient to gently roll his/her arm to withdraw it from the arm cuff.
5. Precautions after use
  - (1) Turn off the power according to the specified procedure.
  - (2) Gently disconnect the cords correctly.
  - (3) Clean the unit for subsequent use.
  - (4) Do not disconnect the cord between the monitor and main unit before turning the power off.
6. If the unit malfunctions, tell the patient what to do, then contact your sales agent or service center.
7. Periodically inspect the unit and its components.
8. Do not tamper with the unit.

**MEMORANDA**

[illegible]

*We hope that you have found this Instruction Manual useful and informative. If you have any suggestions for product improvement, found an error in this manual, or if you would like more information concerning this product, please don't hesitate to contact your nearest A&D office, or:*

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