

Automated Distillation Tester  
Model: AD-6  
Instruction Manual

Ver 2.00 080729



Read this manual thoroughly before using the product,  
and store in a safe place for future reference.

**TANAKA SCIENTIFIC LTD, TOKYO, JAPAN**

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## FOREWORD

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Thank you for purchasing the Automated Distillation Tester Model AD-6 from Tanaka Scientific Limited.

This instruction manual provides necessary information for using the AD-6. Read this manual thoroughly before use and ensure that you have understood its contents.

This manual employs the following precautionary notation. For your safety, ensure that you understand these precautions and heed them at all times.

 **WARNING:**



Warnings indicate a significant risk of death or serious physical injury if the information is ignored.

 **CAUTION:**



Cautions indicate a significant risk of physical injury or property damage if the information is ignored.

## USES

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 **WARNING:** This product is only to be used for distillation measurements, as prescribed in ASTM D86 "Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure", ASTM D850 "Standard Test Method for Distillation of Industrial Aromatic Hydrocarbons and Related Materials" and ASTM D1078 "Standard Test Method for Distillation Range of Volatile Organic Liquids".

This product automates the testing procedures prescribed in ASTM D 86, D850 and D1078 for making distillation measurements and is not to be used for any other purpose.

## About This Manual

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- This manual is intended for all operators of the AD-6.  
The reader is assumed to have sufficient knowledge of ASTM procedures and standards as well as knowledge of the correct handling procedures for hazardous materials.
- The content this manual is subject to change without notice due to enhancements to the performance and functionality of the tester.
- If this manual is lost or damaged, contact Tanaka Scientific Limited or an authorized distributor for a replacement copy.
- The contents of this manual have been thoroughly reviewed. If any pages are missing, out of order, or the manual contains spelling, grammatical or descriptive errors, please contact Tanaka Scientific Limited or an authorized distributor.

## BEFORE USE

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- Before using the product, ensure that you have read this manual thoroughly and have understood all of the content.  
If you have any questions, be sure to contact Tanaka Scientific Limited or an authorized distributor.
- Keep this manual in a safe, easily accessible place.
- This product is to be used for its intended purpose only.
- Adhere strictly to all procedures given in this manual. Ensure that you understand and abide by all (  Warnings) and (  Cautions) given in this manual.

## WARNINGS AND CAUTIONS FOR SAFE USE

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Failure to follow all of the warnings and cautions listed below may result in damage to the tester and/or serious personal injury.

Tanaka Scientific Limited will not assume any responsibility for faults or accidents arising from failure to adhere to these instructions.

### Installation Environment

⚠ Warning: The tester must be installed in a well-ventilated environment.  
As samples release inflammable and/or toxic gases, inadequate ventilation may result in poisoning.

⚠ Warning: Install the tester on a strong level table.  
Keep inflammable substances away from the tester.  
Ensure that a fire extinguisher is kept near the tester.  
If the table is unstable, the tester may fall down causing a fire.

### Electric Connection

⚠ Warning: Observe the following instructions when handling power cables and electric connections:

- Do not connect or disconnect any cables or electrical connections when the mains power is ON.
- Do not handle any cables or electrical connections with wet hands.
- Never use the cord to pull a plug from an outlet.
- Do not place heavy items on cords or cable.
- Do not use force to bend any cords or cables.
- Ensure that all electric connections (plugs, sockets, connectors, etc.) are free of dust.
- Keep all cables and electrical connections free of water and other liquids.

Failure to adhere to the above precautions may result in electric shock, damage to the tester, cords and/or cables, and/or fire due to overheating.

⚠ Warning: Ensure that supply voltage meets the specifications of the product.  
Do not turn the power on until all electric connections are secured.  
Incorrect power supply specifications or loose electric connections may damage the tester and result in electric shock and/or other electrical accidents.

⚠ Warning: Ensure all ground wires are securely grounded.  
Loose or disconnected ground wires may result in electric shock.  
Never connect the ground wires to gas pipes.  
Doing so may result in a fire or explosion.  
Ground wires may be connected to one of the following:

- Ground terminal of a power outlet
- Copper bar buried 65cm or more underground
- Water pipes as authorized by your local water bureau as a grounding object

### Handling Precautions

⚠ Warning: Be sure to confirm test configuration prior to every test.  
Testing using incorrect parameters or with no boiling chips may cause a sample to bump and catch fire.

⚠ Warning: Never touch the flask with bare hands after testing.  
The danger of burns exists, even after cooling.

⚠ Warning: Never discard hot samples.  
If a hot sample is discarded into a container containing low flash point waste oil, a fire or explosion may result.

## Operational Precautions

- ⚠ Warning: Never touch the heater section with bare hands during operation.  
The cell is heated to high temperatures during operation and can cause serious burns.
- ⚠ Warning: The tester is not to be operated unattended.  
Great danger exists if the tester falls or is knocked over.  
For safety reasons, an operator should always be in the same room as the running tester.
- ⚠ Warning: If the tester makes any abnormal noises or exhibits any abnormal behavior, stop operation immediately, turn the power off at the mains, and contact Tanaka Scientific Limited or an authorized distributor.

## Consumables, Accessories and Replacement Parts

⚠ Caution: Use only Tanaka Scientific Limited genuine consumables, parts and accessories or such parts as recommended by Tanaka Scientific Limited.

## Repairs, Alterations and Maintenance

⚠ Warning: Do not make any modifications or alterations to the tester without the approval of Tanaka Scientific Limited.

⚠ Warning: Do not attempt to repair the tester yourself. In the event that the tester exhibits any abnormal behavior whatsoever, contact Tanaka Scientific Limited or an authorized distributor.

⚠ Warning: Only Tanaka Scientific Limited service personnel or authorized representatives are to repair or maintain the tester.

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# 1 Section Names and Functions

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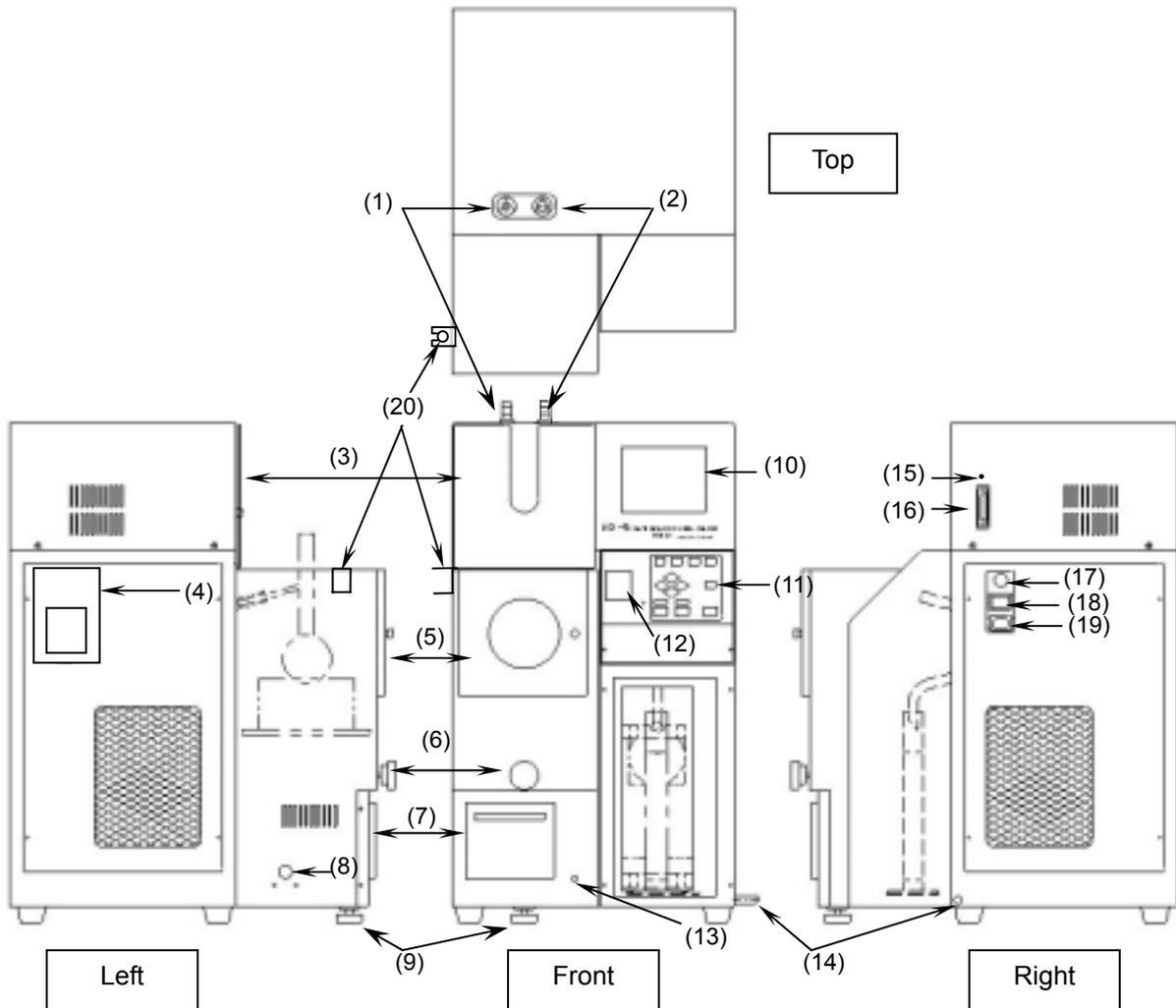


Fig. 1 Model AD-6

- (1) **Temperature Sensor Connector:** Connect the temperature sensor here.
- (2) **Dry Point Sensor Connector:** Connect the dry point sensor (option) here.
- (3) **Fire Containment Shutter:** Closes to prevent a fire if a flask breaks, a sample catches fire, or the thermofuse blows. **Do not close when starting a test, thermofuse blows.**
- (4) **Circulating Water Verification Window:** Allows the user to view the level and status of the internal circulating solution.
- (5) **Heater Door:** Open this door when inserting or removing a flask. Be sure to hold the knob because the door becomes very hot.
- (6) **Heater Height Adjustment Dial:** Raises or lowers the heater unit to set the flask in the correct location.
- (7) **Printer (Option):** Prints distillation data and plots a distillation curve.
- (8) **Fire Containment Nitrogen Inlet Port:** Used to discharge nitrogen gas into the heater section in case of fire. If the nitrogen line is connected, the solenoid valve opens automatically, similarly to the fire containment shutter, if the thermofuse is blown. The nitrogen gas in combination with the shutter helps to control fires and prevent the spread of flames. The size of the inlet port is PT1/4 female, and recommended Nitrogen gas pressure is 500 kPa.
- (9) **Heater unit level adjuster:** Can be adjusted to keep the unit level
- (10) **LCD display:** Displays various configuration menus, distillation data, distillation curves and error messages.
- (11) **Operating Panel:** Contains START, COOL, RESET and other keys for operating the tester. Tester settings for each mode can be changed using the keys on this panel.
- (12) **Temperature Sensor Holder:** Insert the temperature sensor here during pre-cooling.
- (13) **Heater Status Lamp:** Continuously lit during heating, flashing during temperature adjustment.
- (14) **Condensation Drain:** Drains condensation pooled in the receiver compartment.
- (15) **Manual Fire Containment Shutter Activator:** Press this button to test the fire depressant shutter. This switch can also be used to manually close the shutter if the shutter fails to close automatically during a fire.
- (16) **RS-232C Connector:** Connect a personal computer with LIMS communication software and Tanaka's ADManager (option) installed to this communications port.
- (17) **Circuit Breaker:** Pops out and cuts power to the tester to protect the circuits if excess current is detected. To reset, turn the main switch off once, rectify the cause of the current overload, and press the circuit breaker button.
- (18) **Mains Power Switch:** Turns the tester on and off.
- (19) **Power Cable Socket:** Connect one end of the power cable to this socket and the other end to an outlet meeting the specifications.
- (20) **Temperature Sensor Rest:** Place the temperature sensor when stand-by.

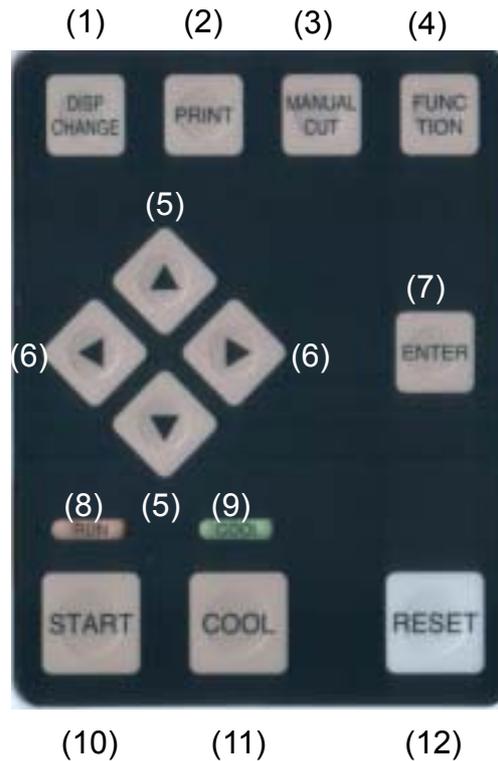


Fig. 2 Model AD-6 Operator Panel

- (1) **DISP CHANGE Key:** Press this key to toggle between the STANDBY and RUN screens.
- (2) **PRINT Key:** Press this key to reprint test results, plot distillation curves, and to print temperature correction values, test parameters, and other settings if optional printer is installed
- (3) **MANUAL CUT Key:** Press this key to stop testing manually.
- (4) **FUNCTION Key:** Press this key to change from the RUN screen to the Distillation Curve screen while a test is running. Also, the menu can be displayed by pressing this key and the RESET key at the same time.
- (5) **Up and Down Keys:** Use these keys to select a test mode (long cursor) or to change an item or increment or decrement a value at the cursor (short cursor).
- (6) **Left and Right Keys:** Use these keys to move the cursor (short cursor). This is mainly used when changing test parameters (on the STANDBY screen).
- (7) **Enter Key:** Use this key accept the mode name and move the cursor to the test parameters to allow them to be changed.
- (8) **RUN Lamp:** Lights at the start of a test. (Red)
- (9) **COOL Lamp:** Lights while the heater section is cooling after a test. (Green)
- (10) **START Key:** Press this key to start a test.
- (11) **COOL Key:** Press this key to cool the heating section as required. If this key is pressed during testing, the test is terminated and the heater section cooled for 10 minutes.
- (12) **RESET Key:** This key is mainly used to abort testing or cooling. Pressing this key returns the tester to the standby state and displays the STANDBY screen shown in Fig.5 on Page 18.

## 2 Installation

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### 2.1 Installation Site

- ⚠ **Warning:** The tester must be installed in a well-ventilated environment.
- ⚠ **Warning:** Install the tester on a strong level table. Keep inflammable substances away from the tester. Ensure that a fire extinguisher is kept near the tester. If the table is unstable, the tester may fall down causing a fire.

Install the tester on a strong, level bench in a well-ventilated location.

Do not expose the tester to any of the following:

- High temperatures (> 40 °C)/ low temperatures (< 0 °C) or high humidity (> 90%)
- Direct sunlight
- Dust
- Rapid temperature changes

### 2.2 Setting of Fire Containment Shutter

Lift and fix the Fire Containment Shutter to the hook.

### 2.3 Electrical Connections

- ⚠ **Warning:** Observe the following instructions when handling power cables and electric connections:
  - Do not connect or disconnect any cables or electrical connections when the mains power is ON.
  - Do not handle any cables or electrical connections with wet hands.
  - Never use the cord to pull a plug from an outlet.
  - Do not place heavy items on cords or cable.
  - Do not use force to bend any cords or cables.
  - Ensure that all electric connections (plugs, sockets, connectors, etc.) are free of dust.

- Keep all cables and electrical connections free of water and other liquids.

Failure to adhere to the above precautions may result in electric shock, damage to the tester, cords and/or cables, and/or fire due to overheating.

⚠ Warning: Ensure that supply voltage meets the specifications of the product.

⚠ Warning: Ensure all ground wires are securely grounded. Loose or disconnected ground wires may result in electric shock.

Never connect the ground wires to gas pipes.

Doing so may result in a fire or explosion.

Ground wires may be connected to one of the following:

- Ground terminal of a power outlet
- Copper bar buried 65cm or more underground
- Water pipes as authorized by your local water bureau as a grounding object

Connect the power cable to the right side of the tester when viewed from the front and the power plug to an outlet meeting the tester specifications. <sup>(1)</sup>

The maximum power consumption of this tester is 1.5 kW. When sharing an outlet with other electrical appliances, make sure that the total power consumption does not exceed the outlet capacity.

**Note <sup>(1)</sup>** The standard power cable comes with a three-prong plug. If the plug does not fit your outlet, you will need to change the plug.

If the outlet does not have a ground terminal (as in ordinary home outlets), connect the power cable through a ground adapter (triangular add-on). In this case, be sure to ground the tester with an extension ground cord.

#### 2.4 Nitrogen Gas Connection (for fire containment)

Connect nitrogen gas piping to inlet port (see Fig. 1 (8)).

The size of the nitrogen gas inlet port is PT1/4 female. Connect PT1/4 male joint.

The recommended nitrogen gas pressure is 500 kPa.

## 2.5 Supplying Circulating Solution

Check the circulating solution is already filled or not. Some of AD-6s are shipped without filling circulation solution to avoid freezing in transit. If the slotion is empty, pour in the solution to the AD-6 as follows. The solution capacity is about 1.6 liters.

Recommended solution is as follows

Lowest ambient temperature < 5°C: Distilled water + Antifreez\*

\*: Cooling capacity will be decrease if Antifreez propotion will be over 10%.

Lowest ambient temperature > 5 °C: Distilled water

- (1) Remove the circulating solution verification window from the left side of the tester (see Fig. 3).
- (2) Remove the cap of the circulating solution tank and pour the solution to MAX (see Fig. 4).
- (3) Replenish the solution to MAX again after lower the solution level. When the solution reaches a water pump, surface descent will stop.
- (4) Turn ON the MAIN switch of the AD-6, solution surface will descent again. Replenish the solution to MAX again.
- (5) Return the removed items to their original positions.

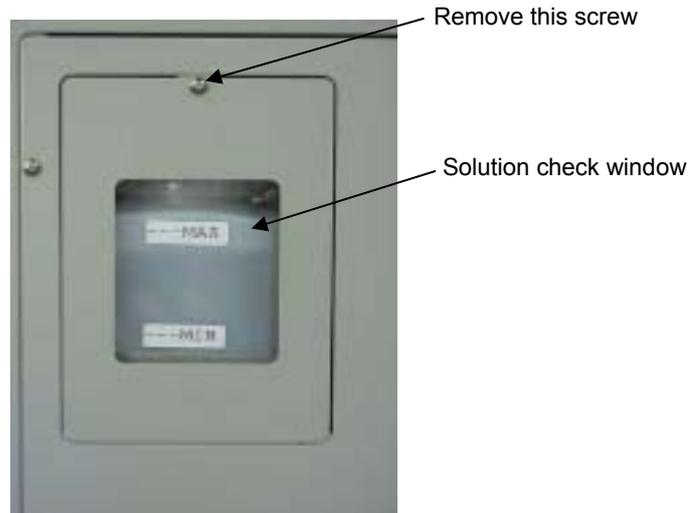


Fig.3 Check window



Fig.4 Solution tank

### 3 Routine Daily Inspection

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The following should be checked routinely before using the tester:

Table 1: Checklist

Item	Description
Appearance	<ul style="list-style-type: none"> <li>· The tester has no apparent damage.</li> </ul>
Electrical connections  (Before turning the main power on...)	<ul style="list-style-type: none"> <li>· The power cable is not damaged.</li> <li>· The power plug is fully inserted into the outlet.</li> <li>· The grounding cable is properly connected (only applicable if using the ground adapter)</li> <li>· The circulating solution is filled to the specified level.</li> </ul>
Operation of each component	< After turning the main power on...> <ul style="list-style-type: none"> <li>· The display appears to be functioning correctly</li> <li>· The circulating solution is circulating normally.</li> <li>· Each key functions normally when pressed.</li> <li>· The condenser bath and receiver compartment are at the set temperatures.</li> <li>· Fire containment shutter closes correctly by pressing Manual Fire Containment Shutter Activator. (See 10.3 on page 33)</li> </ul>

**⚠ Warning:** Do not attempt to repair the tester yourself. In the event that the tester exhibits any abnormal behavior whatsoever, contact Tanaka Scientific Limited or an authorized distributor.

## 4 Prior to Testing

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⚠ Warning: Do not use flasks having a deformed bottom, fine scratches or cracks, as these may break and cause a fire during testing.

⚠ Warning: To prevent a sample from accidentally catching alight, adhere to the following three precautions:

- Do not leave the laboratory unattended during testing.
- Ensure that a fire extinguisher is located nearby.
- Do not place any inflammable substances near the tester.

⚠ Caution: The standard graduated cylinder contains a Viton O-ring. Do not use acetone, methyl ethyl ketone, acetic ethyl, or any other solvent, as solvents may cause the ring to inflate and damage the graduated cylinder.

※Optional graduated cylinder with Perfluoroelastomer O-ring is available

⚠ Caution: Use boiling chips (Small stones or small porous ceramics) to avoid irregular boiling.

### 4.1 Starting the Tester

Turn on the main power switch. The test unit comes on and displays the screen shown in Fig. 5.

<	STANDBY 1	>	BAROMETER	1013 hPa
1	* GASOLIN(300)		INIT TEMP1	250.0°C
2	KEROSIN(300)		INIT TEMP2	450.0°C
3	NAPHTHA(300)		HEAT/FREEZ	95.0 %
4	KEROSIN(400)		FINAL H (AUTO)	+ 0.0 %
5	GAS-OIL(400)		TEMP RANGE	300
6			RESIDUE	1.0 %
7			DIST.RATE	4.5 %
8			SET BATH	0.5 °C
9			SET REC	15.0 °C
10				
11			START TEMP	25.0°C
12			BATH TEMP	12.3°C
13			REC TEMP	18.0°C

(Mode Selection)

(Mode Parameters)

Fig. 5 STANDBY Screen

(1) Use the ↑ and ↓ keys on the operating panel to move the cursor and select a mode (↑).

**Note** <sup>(2)</sup> For information on setting mode parameters, refer to "9.2 Setting Test Parameters" on Page 29.

(2) Wait until the condenser bath and receiver compartment reach the specified temperatures.

Note: Bath temperature is maintained at 4°C when STANDBY even if set bath temperature is 0 °C to avoid icing. Once start a test, bath temperature will be maintained at set temperature.

#### 4.2 Drying the Condenser Tube

Attach a piece of cloth, such as dry gauze, to one end of a steel wire of length 70 cm and insert it into the condenser tube from the bottom, wiping moisture and dirt off the inside wall of the tube. If the tester is used in a very humid environment, condensation may occur near the bottom of the exposed section of the condenser tube in the receiver compartment, and accumulate in the receiver cover. Be sure to wipe moisture from this section. If condensation drips into the graduated cylinder, test results may be incorrect.

#### 4.3 Setting a Sample

- (1) Prepare cooled test samples, flask and graduated cylinder according to ASTM D86/D850/D1078. Do not use flasks having a deformed bottom, fine scratches or cracks, as these may break and cause a fire during testing.
- (2) Measure the sample precisely up to the 100% graduation (top mark) of the graduated cylinder, then immediately transfer the entire sample to the distillation flask.
- (3) Add few boiling chips (small stones or small glass beads) to the sample to avoid an irregular boiling (bumping).
- (4) Attach the temperature sensor with centering device directly to the distillation flask to prevent vapor from escaping, then clamp the sensor into place so that it will not come off during testing.<sup>(3)</sup>

**Note** <sup>(3)</sup> For details on attaching the temperature sensor, refer to "8.1 Attaching the Temperature Sensor" on Page 26, and for attaching the dry point sensor, refer to "8.2 Attaching the Dry Point Sensor" on Page 27.

- (5) Place the assembled flask in the heater unit.

Attach silicon-rubber stopper No.0 to the vapor tube of the flask to secure the connection to the condenser tube. Turn the knob on the front of the heater until the flask support board comes into firm contact with the bottom of the flask and makes the flask straight. The diameter of the hole in the flask support board should be chosen by following the testing method of section 4.3 (1).

**Do not close the Fire Containment Shutter after setting the flask.**

- (6) Place the graduated cylinder used in 4.3 (1) into the receiver compartment. To do this, lift the receiver cover along the condenser tube. With the cut-out on the bottom plate of the graduated cylinder facing the tester, tilt the cylinder and put the top inside the compartment. Push the cylinder up and swing the base across into the receptacle of the monitor assembly. After checking that the graduated cylinder is seated straight, lower the receiver cover until it comes into firm contact with the top of the graduated cylinder.

<<This completes the test preparations>>

## 5 Starting a Test

### 5.1 Starting a Test

Press the START key. (4)

**Note** (4) The tester will not start if the starting conditions have not been satisfied, for example, if the condenser bath is not within  $\pm 6$  °C of the set temperature (see point (2) in Section 10.4: Error Status and Faults on Page 34).

**Do not start a test with shutter closed, thermofuse blows**

- (1) Adjust the photo levels of the initial boiling point sensor (IBP) and the fluid level follower sensor (MS).

During photo level adjustment, the following message is displayed:

<PHOTO ADJUSTMENT>				
IBP	OUT	80	IN	3800
MS	OUT	80	IN	3800

- (2) After photo level adjustment, the fluid level follower sensor begins to go down. During the descent, the following message is displayed.

LEVEL FOLLOWER DESCENDING
---------------------------

- (3) When the level follower sensor has detected the zero point of the graduated cylinder, the RUNNING screen shown in Fig. 6 appears on the display and the RUN lamp lights. If the graduated cylinder is not in the receiver compartment, a problem occurs and the test is interrupted (see (1) in Section 10.4: Error Status and Faults on Page 34).

		Temperatur	Dist time/rate	
< RUNNING >				
MODE(01) GASOLIN(300)		IBP	c	s
		5	c	s
		10	c	%
DIST VOL	0.0 (%)	20	c	%
DIST TEMP	25.0 (°C)	30	c	%
DIST TIME	0 sec	40	c	%
		50	c	%
HEATER OUT	50 (V)	60	c	%
BATH TEMP	1.0 (°C)	70	c	%
REC TEMP	15.0 (°C)	80	c	%
HEAT TEMP	25 (°C)	90	c	%
		95	c	
RE CORR	0.1(%)	97	c	
PREV.RESULT	OFF	E.P	c	s

Fig. 6 RUNNING Screen (Testing)

If the FUNCTION key is pressed during testing, the Distillation Curve screen shown in Fig. 7 on Page 21 is displayed. Press the key once to view the distillation curve during testing and once again to return to the RUNNING screen shown in Fig. 6.

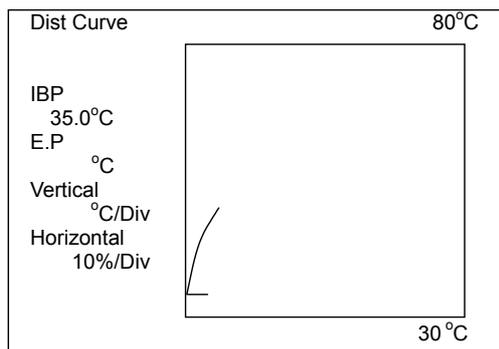


Fig. 7 Distillation Curve Screen

<<From this point, testing proceeds automatically.>>

## 5.2 Test Sequence

- The first 4 minutes
  - The heater block temperature is changed to the set temperature IT1.
  - TIME begins counting.
- After 4 minutes
  - The heater block temperature is changed to the set temperature IT2.
- IBP search begins
  - The initial boiling point and the time until the point is found are displayed at IBP.
  - TIME is reset and counting resumes.
- IBP search ends
  - Automatic distillation control begin at a distillation rate of 4 to 5%/min when +0.5% is reached.
- 5% distillation volume
  - The distillation temperature and the time from the initial boiling point until 5% are displayed at [5] on the display.
  - TIME is reset and counting resumes.
- 10%, 20% distillation volume
  - Distillation temperatures and rates are displayed at distillation volumes of 10 to 90%.
- 90% distillation volume
  - TIME is reset for each and counting resumes.
- 95%, 97% dist. vol.
  - Distillation temperatures are displayed at distillation volumes of 95 and 97%.
- Final heating starting pt.
  - Automatic control stops, and heater output is controlled at FH.
  - TIME is reset and counting resumes.
- End point (EP) detected
  - The heater is turned off.
  - The end point temperature and the time from the start to the end of final heating are displayed at EP.
- 5 minutes later
  - Distillation data is printed by the built-in printer if optional printer is installed (refer to Fig. 16 on Page 41 for printout content)
  - Distillation data is sent from the RS-232C port only when ADManager is OFF at Ext Out. For the data format, refer to the Maintenance Manual.
  - The RUN lamp goes off.
  - The COOL lamp lights and cooling starts (10-minute cooling).
- 10 min. after cooling begins
  - The COOL lamp goes off and cooling stops.
  - The STANDBY screen shown in Fig. 5 on Page 18 is displayed.

<< This completes testing. >>

### 5.3 Test without a 100% Sample in the Graduated Cylinder

- (1) If the sample volume in the graduated cylinder is not 100%<sup>(5)</sup>, place the graduated cylinder in the receiver compartment as is.

**Note** <sup>(5)</sup> Make sure that the sample volume is less than 100%.

If the sample volume is not 100%, the ratio of the remaining oil needs to be changed. If the sample is 50 ml, for example, 1 ml of sample remaining in the flask must be calculated as 2%. Since this tester has a conversion formula, simply set the volume of oil (ml) and volume remaining in the flask (ml).

- (2) Press the start button. After the performing operation of (1) from Section 5.1: Starting a Test on Page 20, the tester automatically detects the sample in the graduated cylinder. The level follower sensor stops with the following message displayed:

<SAMPLE MEASURING MODE>  
SAMPLE DETECT, REMOVE CYLINDER!!

- (3) Remove the graduated cylinder and transfer it to the flask (refer to "4.3 Setting a Sample" on Page 19).

When the graduated cylinder has been removed, the level follower sensor starts descending again with the following message displayed:

<SAMPLE MEASURING MODE>  
LEVEL FOLLOWER DESCENDING

- (4) After transferring the sample to the flask, put the graduated cylinder in place once again. When the level follower has reached the lowermost point, the following message appears. Make sure that the graduated cylinder is in place, then press the START key again. The tester proceeds automatically, following the test sequence as described in Section 5.2 on Page 21.

<SAMPLE MEASURING MODE>  
SET CYLINDER AND PRESS START SWITCH

## 6 Terminating a Test

---

Under ordinary test conditions, tests end when the end point is detected (E.P CUT). However, tests can also be terminated arbitrarily under the following conditions:

### 6.1 Termination and Dry Point (D.P CUT)

A test can be terminated at the dry point in one of the following two ways:

- (1) The dry point is detected by the dry point sensor (optional accessory) for automatic termination.
- (2) The operator keeps an eye on the tester near the end of the test and presses the MANUAL CUT key on the operator panel at the dry point.

### 6.2 Termination at a Set Distillation Percentage (% CUT)

Set the end point at %CUT in the test parameters to terminate the test.

For the setting procedure, refer to (18) in Section 9.1: Selecting Mode on Page 28.

This method is effective for distillation tests in a 10% distillation residue and carbon residue test.

For the 10% distillation residue and carbon residue test, a 250 ml flask and a 200 ml <sup>(6)</sup> graduated cylinder are needed.

**Note <sup>(6)</sup>** The net capacity of the 200 ml graduated cylinder is 186±1 ml.

### 6.3 Termination at Set Temperature (°C CUT)

As in Section 6.2: Termination at Set Distillation Percentage, set the end point at °C CUT to terminate the test.

For the setting procedure, refer to (17) in Section 9.1: Selecting Mode on Page 28.

If % CUT is also set, the test terminates the first time either condition is satisfied.

## 7 Reprinting and Resending Data after Residue or Barometric Correction

After the residue and barometric pressure are set again, corrected data can be reprinted (if optional printer is installed) and resent as follows:

### 7.1 Setting the Residue or Barometric Pressure Again

Set the barometric pressure on the STANDBY screen. For the setting procedure, refer to (3) in Section 9.2: How to Set Test Parameters on Page 29.

Set the residue on the RUN screen. If the STANDBY screen is displayed, press the DISPCHANGE key on the operator panel to change the display to the RUN screen (see Fig. 8). The residue can be set again by changing the value at RE CORR. To change the value, move the cursor with the ← or → key and increment or decrement the value with the ↑ or ↓ key.

### 7.2 Reprinting

Corrected data can be reprinted or resent only when the RUN screen is displayed.

Press the PRINT key to start printing.

Press the FUNCTION key to display the Distillation Curve screen shown in Fig.9 and the PRINT key to start plotting a distillation curve.

### 7.3 Resending

Press the MANUAL CUT key to start sending the data to the RS-232C port in the same format as at the end of a test (Note: This only applies when ADManager is OFF at Ext Out)

< TEST RESULT >		IBP		
MODE(01) GASOLIN(300)		5	50.0c	70s
		10	60.0c	4.5%
DIST VOL	97.5 (%)	20	75.0c	4.5%
DIST TEMP	25.0 (°C)	30	85.0c	4.5%
DIST TIME	300 sec	40	95.0c	4.5%
		50	110.0c	4.5%
HEATER OUT	50 (V)	60	120.0c	4.5%
BATH TEMP	1.0 (°C)	70	130.0c	4.5%
REC TEMP	15.0 (°C)	80	140.0c	4.5%
HEAT TEMP	25 (°C)	90	150.0c	4.5%
		95	170.0c	
RE CORR	0.1(%)	97	185.0c	
PREV.RESULT	OFF	E.P	205.0c	250s

Fig.8 RUN Screen (After Test)

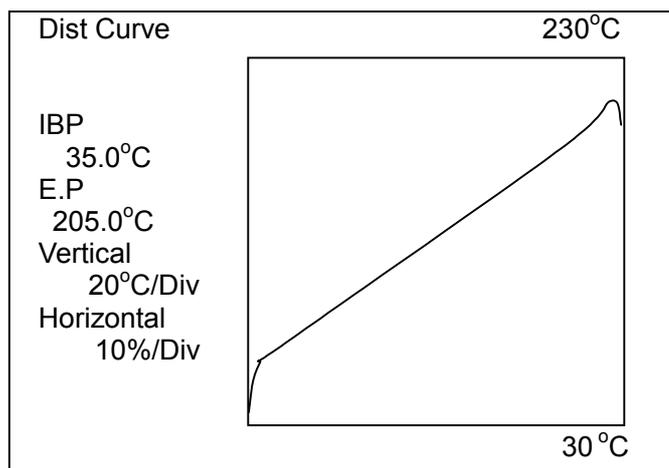


Fig. 9 Distillation Curve Screen (After Test)

#### 7.4 Displaying and Printing Previous Distillation Data

This tester stores previous distillation data.

When displaying previous distillation data, set PREV.RESULT on the RUN screen (after test), as shown in Fig.8 on Page 24, to ON and press the ENTER key.

TEST RESULT changes to PREVIOUS RESULT, and the previous distillation data is displayed. The data can be printed by pressing the PRINT key. The Distillation Curve screen (after test) allows the previous distillation curve to be displayed and printed.

When displaying the present test result, set PREV.RESULT on the RUN screen (after test), as shown in Fig.8 on Page 24, to OFF and press the ENTER key.

To change a setting to ON or OFF, move the cursor using the ← or → key and toggle the setting between ON and OFF using the ↑ or ↓ keys.

## 8 Attaching the Temperature Sensor and Dry Point Sensor

### 8.1 Attaching the Temperature Sensor

Attach the temperature sensor straight so that it will come to the center of the neck of the flask.

The attaching position differs between the temperature sensor for fuel oil and that for BTX. Figures 10 and 11 show the corresponding positions.

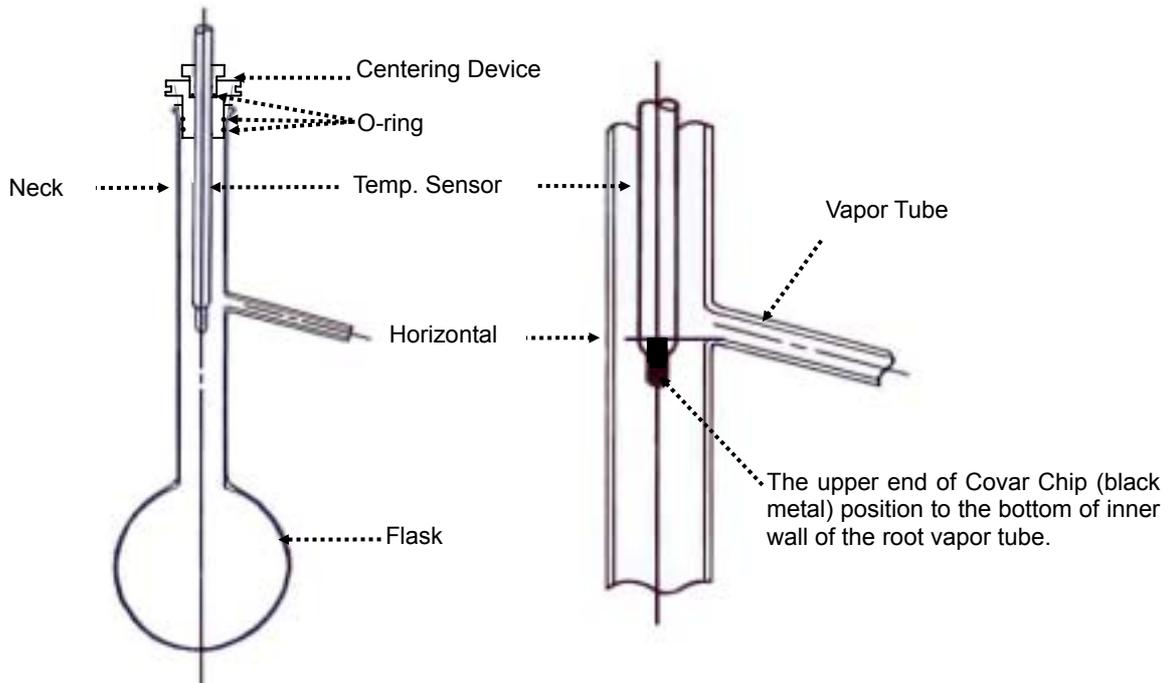


Fig. 10 Attachment Location of the Temperature Sensor for Fuel Oil

8.2 Attachment Location of the Dry Point Sensor and Temperature Sensor for BTX  
When attaching the dry point sensor, insert the temperature sensor into the Centering Device provided with the dry point sensor, and attach to the distillation flask as shown in Fig.11.

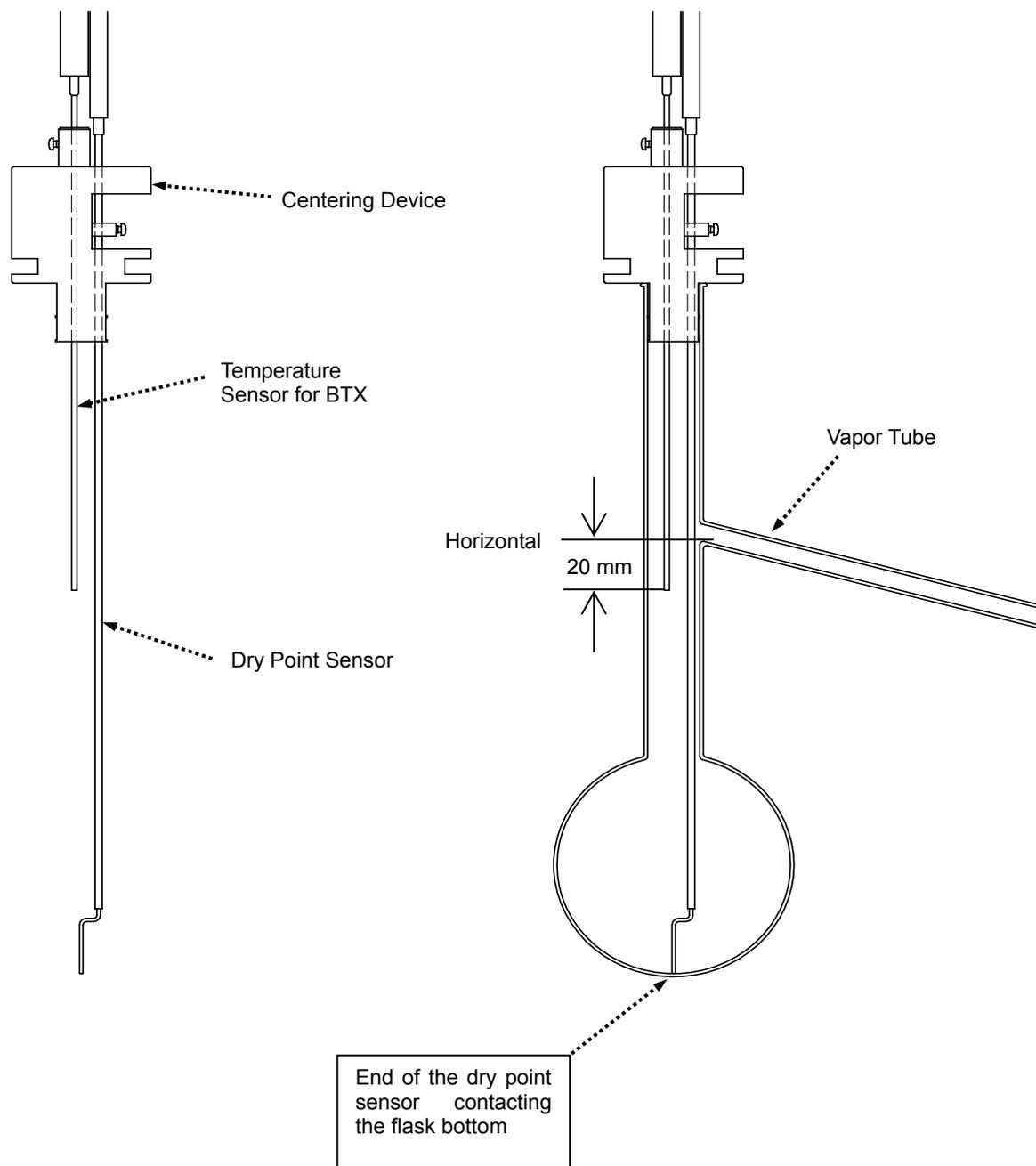


Fig. 11 Attachment Location of the Dry Point Sensor and Temp. Sensor for BTX

## 9 Setting Test Parameters

---

### 9.1 Select Mode

To simplify the test parameters modification procedure, test parameters can be preset. The user can select a set of base settings by selecting a single mode number. The tester provides modes 1 to 13 on STANDBY 1 screen and 14 to 26 on STANDBY 2 screen (refer to Section 9.2: How to Set Test Parameters on Page 29). Each mode allows the following parameters to be set:

- (1) Initial Heating 1 : Initial heating temperature setting 1 (0 to 999.9°C)
- (2) Initial Heating 2 : Initial heating temperature setting 2 (0 to 999.9°C)
- (3) Final Heating Starting Point : Percentage of distillate for final heating (80 to 95%)  
Set to 93% for group 1 and 2 samples and 95% for group 3 and 4 samples.
- (4) Final Heating : Final heating voltage [(AUTO) ± 98% or (MANU) 0 to 98 V] Usually set to (AUTO)+00%.
- (5) Temperature Range : 300 (0 to 300 °C to cover ASTM 7C thermometer)  
400 (0 to 400 °C to cover ASTM 8C thermometer)  
P200 (0 to 200 °C for BTX and solvents)  
P400 (0 to 400 °C for solvents)
- (6) Residue : Expected residue (0 to 9.9%)
- (7) Distillation Rate Setting: Control distillation rate (2.0 to 9.0 ml/min)  
Usually set 4.5 ml/min.
- (8) Condenser Bath Setting : Condenser bath control temperature (0 to 69.9 °C)
- (9) Receiver Compartment Temperature : Receiver compartment control temperature (0 to 69.9 °C)

The above test parameters are displayed on the STANDBY screen.

In addition, the following test parameters are provided as options (refer to Section 9.2: How to Set Test Parameters on Page 29):

- (10) **Loss Calculation Method** : Choice of a method for calculating a loss  
(graphical [GRAPH] or arithmetical [ARITH])
- (11) **Distillation Temperature Accuracy** : Distillation temperature rounding (0.1 or 0.5 °C)
- (12) **Distillation Volume Accuracy** : Distillation volume rounding (0.1% or 0.5%)
- (13) **Manual Heater Control** : Manual heater control (ON or OFF)
- (14) **Both EP and DP Measurement** : Measurement of end point and dry point (ON or OFF)
- (15) **Hesitation Point Correction** : Linear correction of hesitation points (ON or OFF)
- (16) **Data Printout** : Test result printing (ON or OFF)  
Set OFF not to print test results by the printer of this device.
- (17) **Distillation Temperature Cutoff** : Test end at a set distillation temperature (0.1 to 399.9°C)
- (18) **Distillation Volume Cutoff** : Test end at a set distillation volume (0.1 to 99.9%)
- (19) **Initial Automatic Heating Setting** : Automatic setting of the initial temperature for a sample of an unknown boiling point (ON or OFF)  
When testing a sample of an unknown boiling point, set to ON.  
This tester sets the initial temperature and enters the temperature automatically into IT1 and IT2 after the test. After the test, return the setting to OFF.
- (20) **Baro Method** : Choice of a method for barometric pressure correction. (ASTM D86, D850 or D1078) The default setting is D86.  
When D850 is selected, "Const A XXX" and "Const B XX" are displayed on the upper right of the screen. Enter 3 digit significant value to Const A, and 2 digit significant value to

Const B before a test. (e.g. The constants of Toluene are A:0.0463 and B:0.000027. So, enter 463 to Const A and 27 to Const B)

When D1078 is selected, "Const K XX" is displayed on the upper right of the screen. Enter 2 digit significant value to Const K before a test. (e.g. The constant of Toluene is 0.035. So, enter 35 to Const K)

- (21) **(°C) → (%) Printing** : Printing the distillation volume for a specific distillation temperature (8 points maximum)
- (22) **(%) → (°C) Printing** : Printing the distillation speed for a specific distillation volume (8 points maximum)

## 9.2 How to Set Test Parameters

On the STANDBY and Test Parameters screens, the cursor may be one character long (referred to as the short cursor) or longer (referred to as the long cursor).

The long cursor appears when the power is turned on, the RESET key is pressed, or the display changes.

The long cursor can be moved up or down to the parameter to change using the ↑ and ↓ keys.

Press either the ← or → key to change the long cursor to the short cursor.

With the short cursor displayed, the cursor can be moved to the right or left using the ← and → keys, and data or numeric values changed using the ↑ and ↓ keys<sup>(7)</sup>.

When the short cursor is being displayed, press the ENTER key to return to the long cursor.

**Note** <sup>(7)</sup> After changing or setting data or numeric values, press the PRINT key to obtain a hardcopy of the parameters changes or record parameters to some paper if . Save the hard copy for re-entering parameters when the memory backup battery is replaced.

### (1) Selecting a mode number

Press the ↑ or ↓ key on the control panel to move the long cursor<sup>(8)</sup> from (Mode selection) on the STANDBY screen shown in Fig. 5 on Page 18.

**Note** <sup>(8)</sup> If the ← or → key is pressed by mistake during mode number selection (short cursor displayed), press the ENTER key to revert to the long cursor.

(a) Switching from <Standby 1> to <Standby 2>

Press the ↑ key when the long cursor is displayed in Mode 1 or the ↓ key in Mode 14.

(b) Switching from <Standby 2> to <Standby 1>

Press the ↑ key when the long cursor is displayed in Mode 15 or the ↓ key in Mode 27.

### (2) Setting or changing the parameters for a mode

(a) Press the ENTER key on the STANDBY screen shown in Fig. 5 on Page 18 to move the cursor to (Mode contents).

(b) Set or change data using the ←, →, ↑ and ↓ keys.

(c) After setting or changing data, return to the long cursor and press the ENTER key once more. The cursor returns to (Mode selection).

### (3) Setting the barometric pressure

To correct for barometric pressure, set the barometer reading (hPa) at Barometric Pressure in the same way as in (2) before starting tests. If barometric pressure correction is not necessary, set to 1013 (hPa).

A barometric pressure sensor (option) can be attached to the tester. If the sensor is attached, the barometric pressure only needs to be set once, not for each test <sup>(9)</sup>

**Note** <sup>(9)</sup> Periodic corrections with a barometer are necessary.

(4) Setting Temp CUT and Volume CUT

Select a mode number on the STANDBY screen shown in Fig. 5 on Page 18 to set or change the mode parameters, and press the FUNCTION key <sup>(10)</sup>. The screen shown in Fig. 12 on Page 30 is displayed.

**Note <sup>(10)</sup>** The Test Parameters screen cannot be displayed during testing.

<Test Condition>		MODE(01) GASOLIN(300)	
Sample	OFF	G-000001	Const A 463 ←
Operator	OFF	TANAKA	Const B 27
Loss Corr		GRAPH	
Temp Unit	0.1 °C	(°C) -> (%) Print	
Vol Unit	0.1 %	1 100.0 5 200.0	
Manu.Heat	OFF	2 - - - - 6 - - - -	
Both EP&DP	OFF	3 - - - - 7 - - - -	
Hesi.Corr	OFF	4 - - - - 8 - - - -	
Prnt.Result	OFF	(%) -> (°C) Print	
Temp Cut	- - - - °C	1 50.0 5 100.0	
Vol Cut	- - - - %	2 - - - - 6 - - - -	
Auto Adj IT	OFF	3 - - - - 7 - - - -	
Baro Method	D850	4 - - - - 8 - - - -	

Const A does not appear and Const B will be changed to Const K when Baro Method is D1078. Both Const A and Const B don't appear when Baro Method is D86.

Fig.12 Test Parameters Screen

- (a) Temp Cut, Vol Cut, and (°C)→(%) Print and (%)→(°C) Print display . . . . . instead of 000.0 to indicate that no value is set. To set data, position the cursor on one of the . . . . . and press the ↑ or ↓ keys. If numeric data is displayed, change as necessary.
- (b) After setting data, press the FUNCTION key again to return to the STANDBY screen.

(5) Setting sample or operator names

- (a) When setting a sample or operator name, display the Test Parameters screen shown in Fig. 12 in the same way as (4).
- (b) To include the sample or operator name in the printout, change from OFF to ON (refer to the example of the test results printout shown in Fig. 15 on Page 42).
- (c) The following characters can be entered in the Sample or Operator fields:

Blank	!	"	#	\$	%	&	'	(	)	*	+	,
-	.	/	0	1	2	3	4	5	6	7	8	9
A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

- (d) If only the ↑ or ↓ keys are used to enter characters in the Sample or Operator fields, it takes a lot of time to enter. To save some time, the tester provides the following function: Each time the MANUALCUT key is pressed, a blank, 0, A or N are displayed, in this order. Select the one closest to the necessary character and then select the intended character using the ↑ or ↓ key.
- (e) After setting the name, press the FUNCTION key again to return the display to the STANDBY screen.

(6) Setting a mode name

- (a) A mode name can be set on the STANDBY screen shown in Fig. 5. Select a mode number using the operations explained in (1) and press either the ← or → key to display the short cursor.
- (b) Enter a mode name in the same way as (c) and (d) of (5) in Section 9.2: How to Set Test Parameters on Page 29.
- (c) After setting a mode name, press the ENTER key to change to the long the cursor.
- (d) When entering several mode names, repeat steps (a) to (c).

## 10 Maintenance

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### 10.1 Inspecting and Replenishing Circulating Solution

Before using this tester, check the circulating solution. If the solution level is low, replenish the solution as explained below.

The tester will be damaged if used without adequate circulating solution. In cold areas, use antifreeze. If the circulating solution freezes, the tester will be damaged.

- (1) Remove the circulating solution verification window from the left side of the tester (see Fig. 13).
- (2) Remove the cap of the circulating solution tank and replenish the solution to MAX (see Fig. 14).
- (3) Return the removed items to their original positions.

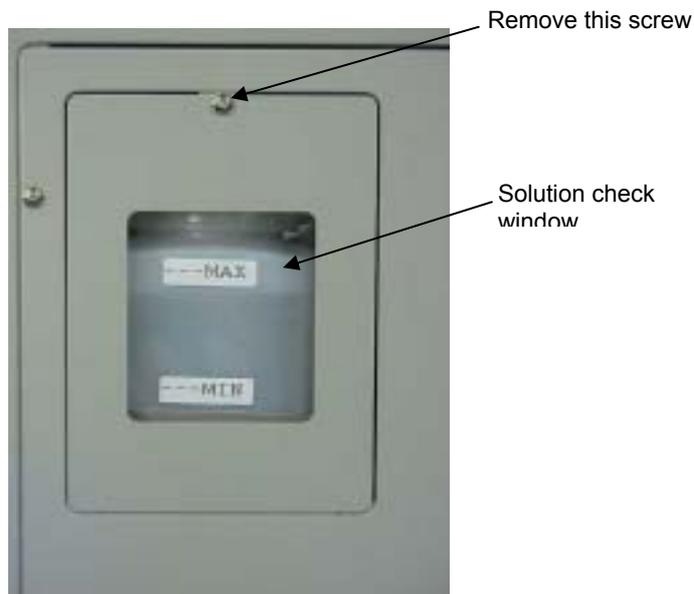


Fig.13 Check window



Fig.14 Solution tank

## 10.2 Replacing Circulating Solution

**⚠ Caution:** Before maintenance, be sure to turn the power off and remove the power plug from the outlet.

Before using the tester, be sure to check the circulating solution. If the solution is dirty, replace it as explained below. Even if the solution is not dirty, replace it at least once every two years. In cold areas, use antifreeze. If the circulating solution freezes, the tester will be damaged.

- (1) Remove the cover from the left side of the tester (see Fig. 15).
- (2) Remove the circulating solution tank stay and take out the circulating solution tank.
- (3) Remove the cap from the circulating solution tank and tilt the tank to drain the circulating solution (see Fig. 16).
- (4) After draining the solution, secure the circulating solution tank as it was and pour in the solution in the same manner to 2.3 Supplying Circulating Solution on page 15.

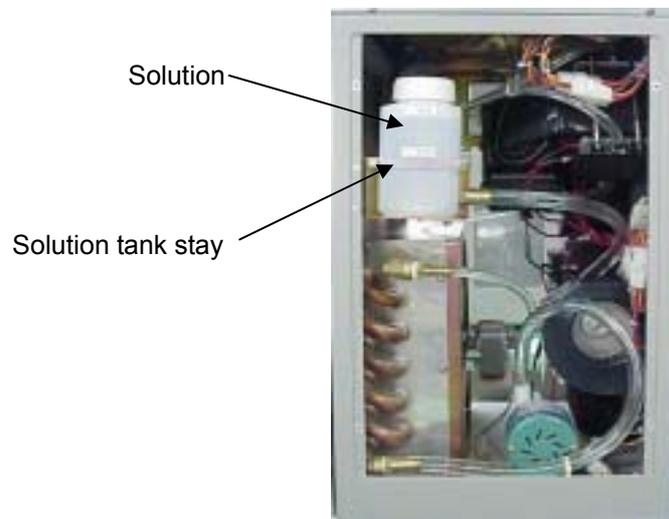


Fig.15 Without the left side cover



Fig.16 Draining

### 10.3 Fire Containment Shutter

Press the manual shutter switch once ((15) in Fig. 1 on Page 11) to confirm operation as if the thermofuse has been blown.

After confirming normal operation, press the switch again, lift the shutter and secure using the shutter hook.

### 10.4 Error Status and Fault

If an error occurs in the last test, or an operational error or equipment fault occurs, details are displayed and printed, the buzzer sounds for 10 seconds, and tests are interrupted and prevented from starting. Check the cause of the error and contact one of the authorized Tanaka distributors listed at the end of this manual.

If problems occur during testing, data indicating the cause of the problem is printed. Press the RESET key to return to the STANDBY screen.

Example of Error Display

TROUBLE			
NO RECEIVER !!		<- Trouble description	
REC	0.0 %	DIST	25.0 °C
ROOM	25.0 °C	BATH	1.0 °C
HEAT	25.0 °C	D.P	0.0

Example of Error Print

TROUBLE			
DATE			
2 / 8 / 20 11 : 30 : 00			
NO RECEIVER !!		<-Trouble contents	
VOL	0.0%	DIST	25.0 °C
REC	25.0 °C	BATH	1.0 °C
HEAT	25.0 °C	D.P	0.0

Error messages indicating bad test parameters or operational errors

- (1) [NO RECEIVER!!]  
No graduated cylinder is set before the start of the test.
- (2) [BATH TEMP?]  
The condenser block is not at the set temperature  $\pm 6$  °C at the start of a test.
- (3) [M.S FLWR POSITION]  
A test has started when the level follower sensor is not at the upper fixed position.
- (4) [HF POINT?]  
The final heating start point is not set correctly. The setting range is from 80% to 95%.  
If started with a point outside this range, an error is generated.
- (5) [THERMOFUSE]  
The sample caught fire and the thermofuse was blown.  
If the thermofuse is blown, the fire buzzer sounds and the shutter closes.  
If the nitrogen pipe is connected to the fire containment nitrogen port ((8) in Fig.1: Model AD-6 on Page 11), the solenoid valve opens automatically to discharge nitrogen into the heater block to help controllig the fire.  
If a test is excuted with shutter closed, stove section will be heated abnormally, and then thermofuse will be blown. The fire containment shutter must be lifted/fixed to the shutter hook during a test.

The above errors are attributable to bad settings or operation. Eliminate the causes of any errors and repeat the test.

## 11 Inspection and Post-sale Service

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### 11.1 Periodic Maintenance

This tester is fully inspected and calibrated prior to shipping, and should require no readjustment immediately upon delivery.

To ensure high performance and maximum safety, however, the tester needs to be maintained and adjusted periodically.

### 11.2 Consumables and Accessories

**⚠ Caution:** Use only Tanaka Scientific Limited genuine consumables, parts and accessories or such parts as recommended by Tanaka Scientific Limited.

For an order or inquiry about consumables, accessories, or other replacement parts for this tester, contact the authorized Tanaka distributor given in the warranty at the end of this manual.

When placing an order, be sure to quote the product model "AD-6".

The most commonly used consumables and accessories are listed in Table 2: and Accessories for Model AD-6 (Incomplete).

Table 2: Consumables and Accessories for Model AD-6 (Incomplete)

▪ Graduated cylinder assemblies: 100 ml • 200 ml (net: 186 ml)
▪ Distillation flasks: 100 ml ▪ 125 ml ▪ 200 ml
▪ Flask support boards: Ø25, Ø32, Ø38, Ø50, Ø70 hole
▪ Roll paper (thermal paper for built-in printer)
▪ Temperature sensors: For fuel oil ▪ for BTX
▪ Thermofuse: 5 pcs/Pack
▪ Temperature Sensor Centering Device for 125 ml flask
▪ Silicon Stopper : No.0A for vapor tube No.3 for fuel-oil temperature sensor No.S8 for BTX temperature sensor For condenser tube cap

### 11.3 Troubleshooting

- ⚠ Warning: Do not make any modifications or alterations to the tester without the approval of Tanaka Scientific Limited.
- ⚠ Warning: Do not attempt to repair the tester yourself. In the event that the tester exhibits any abnormal behavior whatsoever, contact Tanaka Scientific Limited or an authorized distributor.
- ⚠ Warning: Only Tanaka Scientific Limited service personnel or authorized representatives are to repair or maintain the tester.

Should the tester become faulty, contact Tanaka Scientific Limited or an authorized distributor. Contact details are provided with the product warranty at the end of this manual. Provide as much information as possible about the problem.

Equipment failures will be resolved in one of two ways:

- (1) Tanaka Scientific Limited will send a replacement part to the local distributor or directly to the customer. The local distributor or the customer repair the AD-6 with supplied parts.
- (2) The customer will need to send part or all of the faulty equipment to Tanaka Scientific Limited for repairs.  
However, the local dealer may pick it up.

### 11.4 Period of Warranty

This tester will be guaranteed for a period of one year from the date of delivery.

For details, see the Product Warranty at the end of this manual.

### 11.5 Period of Availability of Maintenance Tools

Replacement parts for this tester will be held for at least five years after the delivery of the tester.

These parts are needed to maintain the performance of the tester.

## 12 Post-delivery Notes

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### 12.1 Long Periods of Dormancy

When the tester is not used for a long period of time, unplug the power cable from the outlet. It is recommended that the tester is covered when in storage to reduce the impact of dust and moisture.

### 12.2 Lost Instruction Manuals

These manuals are part of this tester. Should you lose either manual, contact Tanaka Scientific Limited or an authorized distributor for a new copy.

For safety, keep a copy of the address and telephone number of Tanaka Scientific Limited or an authorized distributor.

### 12.3 Transfer

When transferring this tester to a third party, be sure to contact Tanaka Scientific Limited. The tester may not operate as it is at a different power-supply voltage or frequency.

### 12.4 Disposal

This tester does not use harmful substances.

Dispose of the tester as general industrial waste.

## 13 Specifications

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- (1) Conforming stds: ASTM D86, ISO 3405, (ASTM D850/1078 with Optional Accessories)
- (2) Temp ranges: The following four ranges can be selected
  - Fuel oil: Room temperature to 300 °C (for ASTM 7C thermometer)
  - Room temperature to 400 °C (for ASTM 8C thermometer)
  - Solvent (BTX): Room temperature to 200 °C
  - Room temperature to 400 °C
- (3) Program control: Microprocessor controlled sequencing
- (4) Display: LCD display with backlight
- (5) Barometric pressure correction: Manual setting on display screen

**Remarks:** Installing the optional barometric sensor allows auto barometric correction.
- (6) Temperature sensor: Sample vapor: Platinum resistance temperature sensor 100Ω/0 °C (Pt100)  
Heater: CA thermocouple  
Bath: Platinum resistance temperature sensor 100Ω/0°C (Pt100)  
Receiver compartment: Platinum resistance temperature sensor 100Ω/0 °C (Pt100)
- (7) Heater: Nichrome coil, 800W at AC100V or 1kW at AC220V
- (8) Heater cooling: Forced cooling with sirocco fan
- (9) Condenser tube: Brass

**Remarks:** Stainless steel available as a factory option
- (10) Condenser tube temp: Electronic cooling and heating by Peltier device (Setting range: 0 to 69.9°C)
- (11) Receiver compartment temp: Electronic cooling and heating by Peltier device (Setting range: 0 to 69.9°C)
- (12) IBP detection: Photoelectric detection by red LED and phototransistor
- (13) Dillute level detection: Photoelectric detection by red LED and phototransistor  
Level Follower Sensor: LEADER mode sensor  
Distillation rate: 4.5%/min at shipping (Changeable from 2 to 9m% in 0.5% steps)  
Control: PID control
- (14) Test mode: 26 modes for selection as required  
A sample name can be entered for each mode (partially set at factory)  
Mode No.1 – 5 → Standard test mode (set at factory, but may be changed)  
No.6 – 18 → Standard test mode (set by the user)  
No.19 – 20 → 10% distillation residue mode (Set at factory, but may be changed)  
No.21 – 24 → Known data compare mode (Set by the user)  
No.25 – 26 → JIS Standard sample data compare mode (Set at factory, but may be changed)
- (15) Test Parameters: Set the following test parameters for each mode.
  - (1) Essential parameters: Always set these parameters.
    - Heater temperature between test start and initial boiling point detection (°C)
    - Distillation rate between initial boiling point detection and final heating start point (%)
    - Final heating start point (distillation volume) (%)
    - Heater voltage between final heating start point and test end (V)
    - Test temperature range (selected from the four options in (2) on the previous page)
    - Expected residue (%)
    - Condenser tube temperature (°C)
    - Receiver compartment temperature (°C)

(2) Special parameters: Set these parameters as required (defaults are the underlined values in the parentheses)

- Loss correction method (graphical/arithmetical)
- Unit of rounding distillation temperature and volume (0.1/0.5)
- Heater temperature manual control (ON/OFF)
- Measurement both end point and dry point (ON/OFF)
- Hesitation point correction (ON/OFF)
- Data printing (ON/OFF)
- Test end at specified distillation temperature or volume (Not set at factory)
- Initial temperature automatic setting (ON/OFF)
- Distillation volume printing at specified distillation temperature (Not set at factory)
- Distillation temperature printing at specified distillation volume (Not set at factory)

(16) Test termination: Can be one of the following four conditions.

- End at end point
- End at dry point
- Abortion at specified distillation temperature (in units of 0.1 °C)
- Abortion at specified distillation volume (in units of 0.1%)

(17) Dry point: Manual detection by visual check

**Remarks:** Attaching the optional dry point sensor (CRC thermocouple) enables automatic detection.

(18) Safety: (1) Activating the overheating prevention function if the distillation temperature reaches the full scale (upper limit of the test temperature range)

→ Heating stops, the buzzer sounds intermittently, and a message is displayed.

(2) Activating the self-diagnosis function if a sensor wire cut, a test parameter, or an operational error is detected

→ Heating stops, the buzzer sounds intermittently, and a message is displayed.

(3) Activating the fire alarm function if a sample flowed into the heater block catches fire and the thermofuse is blown

→ Heating stops, the fire containment shutter operates, the N<sub>2</sub> gas inflow solenoid valve goes ON<sup>(11)</sup>, the fire buzzer sounds continuously, and a message is displayed.

**Note <sup>(11)</sup>** : If N<sub>2</sub> gas is connected, the gas flows into the heater block.

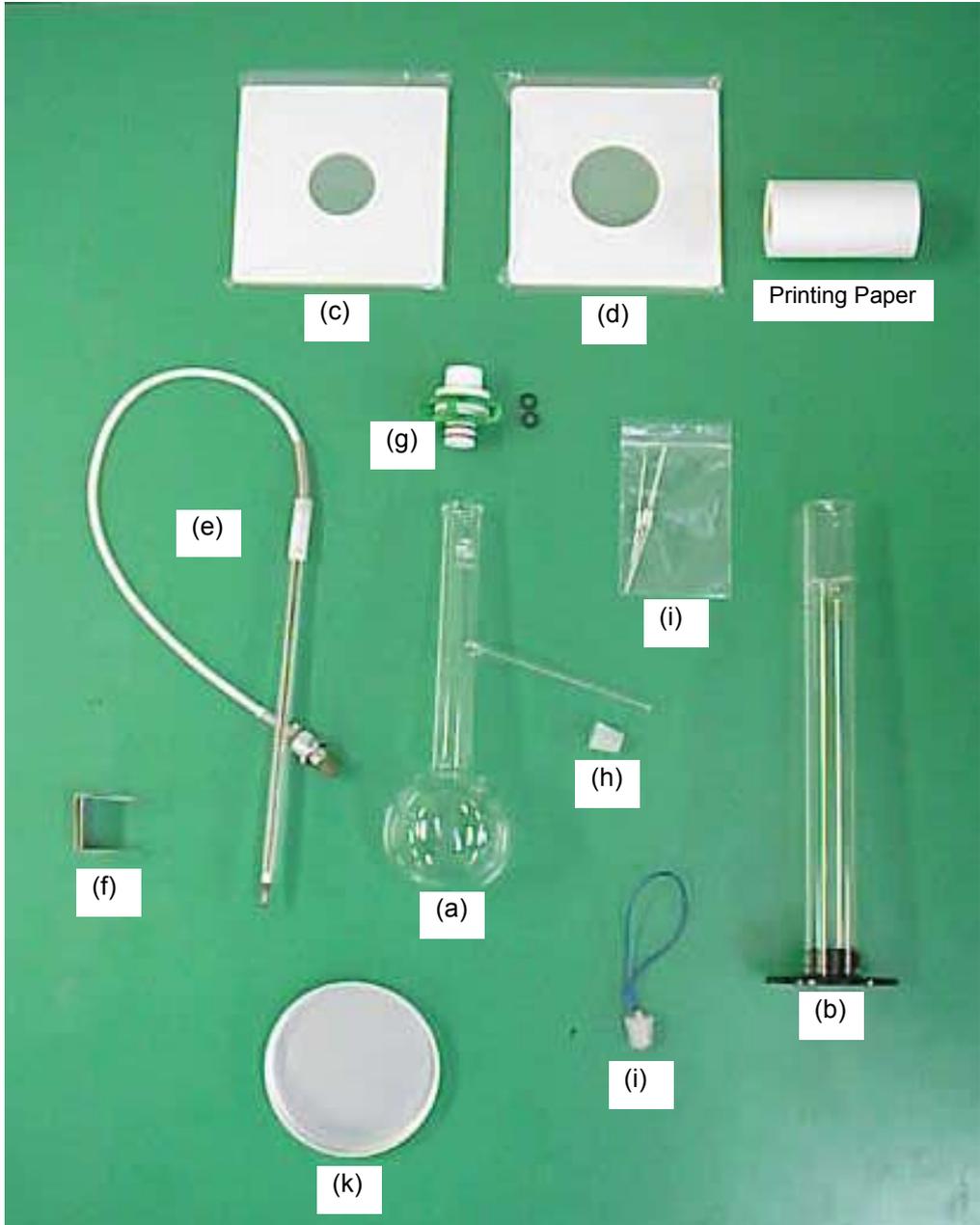
(19) External output: RS-232C × 1ch (standard)

(20) Power supply: AC120/220/240 V (set at factory) 50/60 Hz 1.5 kW

(21) Dimensions and weight: W400 × D520 × H710 mm About 55.0 kg (excluding projections)

(22) Minimum installation space: W600 × D620 mm

(23) Standard accessories: Distillation Flask (125 ml)	1 pc (a)
Graduated Syllinder Assembly (100 ml)	1 pc (b)
Flask Support Board (Ø38 mm hole)	1 pc (c)
Flask Support Board (Ø50 mm hole)	1 pc (d)
Temperature Sensor (for fuel oil)	1 pc (e)
Temperature Sensor Rest	1 pc (f)
Temperature Sensor Centering Device	1 pc (g)
Silicon Stopper No.0A (for flask vapor tube)	1 pc (h)
Silicon Stopper for Condenser Tube Cap	1 pc (i)
Spare Thermofuse	3 pcs(j)
Condensation Water Saucer	1 pc (k)
AC Power Cord	1 pc
Instruction Manual and Maintenance Manual	each 1 copy



(24) Additional accessories: (Optional)

- Barometric Pressure Sensor Set
  - ⇒ Necessary for automatic barometric pressure correction (requiring not manual input for each test but periodic correction with a barometer)
  
- Dry Point Sensor with Centering Device for 125ml Flask
  - ⇒ Necessary for automatic dry point detection for ASTM D86 distillation test
  
- BTX Temperature Sensor Distillation Flasks (200 ml) Silicon Stopper No.S8 Dry Point Sensor with Centering Device for 200ml Flask Flask Support Boards (Ø25, 32 mm holes)
  - ⇒ Necessary for ASTM D850/1078 distillation test
  
- Distillation Flask (250 ml) Flask Support Boards (Ø70 mm holes) Graduated Cylinder Assembly (200 ml)<sup>(12)</sup>
  - ⇒ Necessary for distillation test with 10% distillation residue

**Note** <sup>(12)</sup>: The actual capacity at the mark of the 200 ml graduated cylinder assembly is 186±1ml. Cutting of the heater for this sample at 88 to 89% produces 10% residue of about 18.6 ml.

- Data Management System ADMgr
  - ⇒ Necessary for printing distillation curves or printing data using a PC
  - Functionality: Printing distillation curves, accumulating and storing distillation results, displaying statuses on Model AD-6, transferring distillation results (RS-232C), and sending/receiving and storing set test parameters
  - Operating environment
    - PC: PC/AT-compatible machine
    - OS: Windows2000/XP/Vista
    - CPU: Pentium 300 MHz or faster
    - RAM: 128 MB or more
    - HDD: 20 MB or greater space
    - CDD: Built-in or external
    - I/O: RS-232C 9P port (Two ports necessary when using the distillation result transfer function)

If a CP has only USB port, a RS-232C/USB  
Cnverter is required.

For details, refer to the ADMgr catalog.

```

AD-6 ( NO 1 )
OPERATOR
SAMPLE
DATE
  4/ 4/13 12:45:51
MODE NO 4
  KEROSIN(400)

INIT TEMP1- 550.0(°C)
INIT TEMP2- 550.0(°C)
H. /FREEZE-- 95.0(%)
FINAL H(AUTO)+ 0(%)
TEMP RANGE- 400
RESIDUE----- 1.0(%)
DIST RATE--- 4.5(%/m)
SET BATH---- 30.0(°C)
SET REC----- 25.0(°C)
LOSS COR--- GRAPH

```

DISTILLATION DATA

```

BATH TEMP-- 29.8(°C)
REC TEMP--- 24.9(°C)
FINAL HEAT- 54(%)

RECOVERY---- 98.5(%)
RESIDUE----- 1.0(%)
LOSS----- 0.5(%)

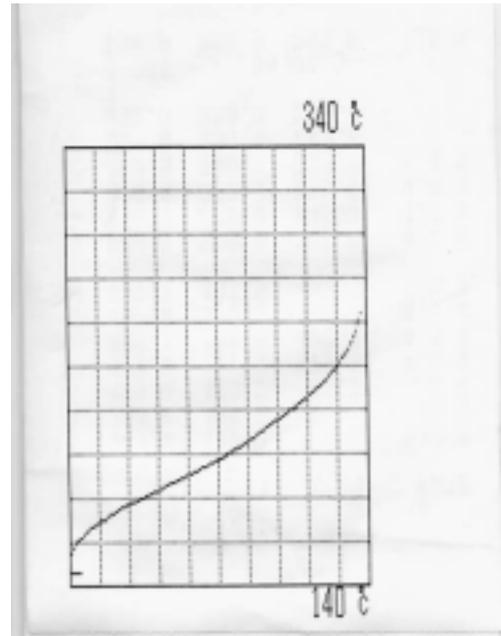
```

```

PRESSURE COR EXECUTE
BAROMETER--- 1018hPa

```

REC (%)	RAW TEMP (°C)	BARO CORR (°C)	LOSS CORR (°C)	TIME & RATE
IBP	147.4	147.3	147.3	591 S
5	164.6	164.5	163.2	76 S
10	169.6	169.5	169.3	4.3 %
20	177.8	177.6	177.3	4.4 %
30	184.1	183.9	183.5	4.4 %
40	190.8	190.6	190.4	4.5 %
50	197.7	197.5	197.1	4.4 %
60	206.2	206.0	205.6	4.4 %
70	216.1	215.9	215.3	4.4 %
80	226.3	226.1	225.5	4.4 %
90	240.5	240.3	239.5	4.4 %
95	251.6	251.4	249.8	
97	259.0	258.8	256.3	
E.P CUT	( 98.0% )			
	264.0	263.8	263.8	123 S



When ASTM D850 is selected in "Baro Method" line (refer 9.1 (20)), barometer is printed out in mmHg.

Fig. 17 Example of Test Result Print

## Product Warranty

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1. This product has passed a quality assurance inspection to the standards of Tanaka Scientific Limited.
2. This product will be warranted for a period of one year from the date of delivery.  
To avoid later confusion, be sure to enter the date of delivery in warranty ticket below.
3. If any faults occur due to normal use within the warranty, the product will be repaired free of charge.
4. Be sure to notify Tanaka Scientific Limited when repairs being requested are covered under the warranty.
5. The following faults or damage are not covered by the warranty:
  - Any fault or damage arising from failure to adhere to all warnings and precaution as described in the instruction manual
  - Any fault or damage arising from misuse or carelessness
  - Any fault or damage arising from repairs or alterations unauthorized by Tanaka Scientific Limited
  - Any fault or damage arising from falls or accidents during transportation after the initial delivery
  - Any fault or damage arising from external causes, such as fire, act of God (earthquake, storm, or flood), environmental contamination, or power supply variations
6. All other repairs, consumables and accessories are chargeable. (Glassware, Temperature Sensor, Heater Coil, etc.)

Product Name	Automated Distillation Tester		
Model Name	AD-6	Machine No.	No.
Warranty Period	One year from the date of delivery:		
<p>Manufactured and sold by:</p> <p>Contact: 7-10-3, Ayase, Adachi-ku, Tokyo 120-0005            Phone: +81-3-3620-1711(Representative)            Fax: +81-3-3620-1713            E-mail: <a href="mailto:sales@tanaka-sci.com">sales@tanaka-sci.com</a></p>			
Distributor:			