T500/TR500

Instruction Manual

IHARA
IHARA ELECTRONIC INDUSTRIES CO., LTD.
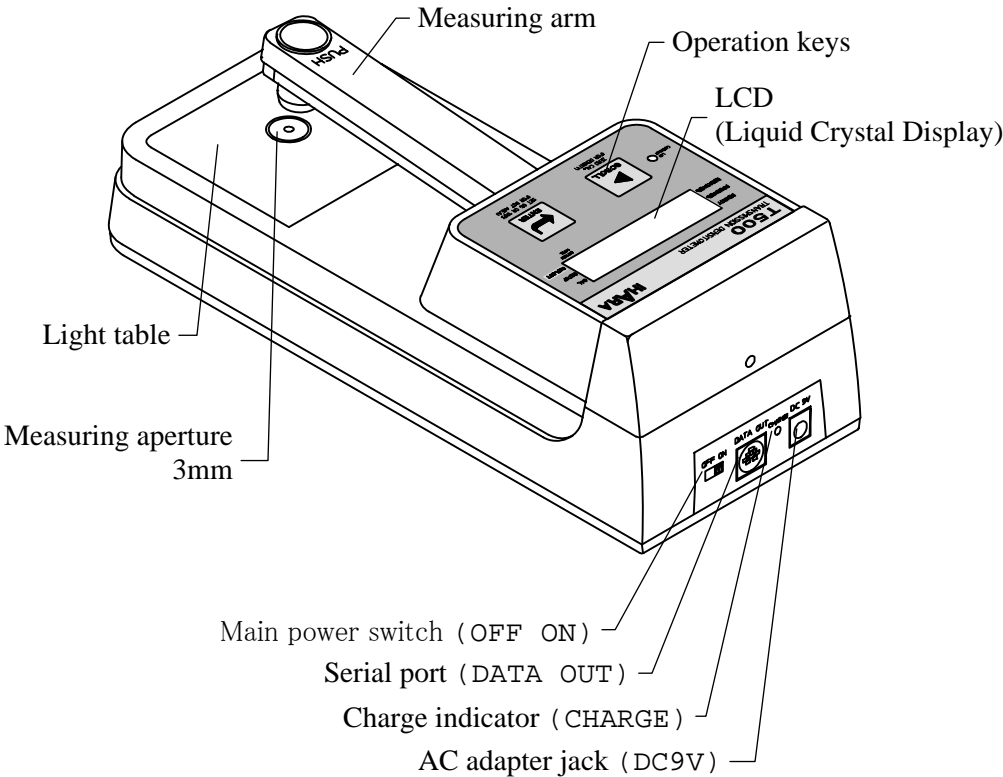
1. **NOMENCLATURE**

1.1. <u>Product Items and Components</u>

T500 Transmission densitometer body

Measuring arm

Operation keys

LCD
(Liquid Crystal Display)

Light table

Measuring aperture
3mm

Main power switch (OFF ON)

Serial port (DATA OUT)

Charge indicator (CHARGE)

AC adapter jack (DC9V)
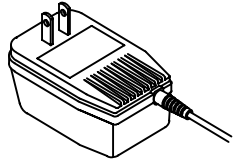
AC adapter

Additional apertures: 2mm, 1mm

Calibration Film

Instruction manual

Transmission Densiometer

T 5 0 0

INSTRUCTION MANUAL

IHARA
IHARA ELECTRONIC INDUSTRIES CO., LTD.

1.2. Operation Panel

Mode indicator   Battery indicator

T500
TRANSMISSION DENSITOMETER

IH**A**RA

DENSITY
POSITIVE%
NEGATIVE%

1.85

CAL
SETUP
REFLECT

BATTERY
LEVEL

LCD
CONTRAST

▶
SCROLL

ZERO CAL.
(FOR DENSITY)

↵
ENTER

SET 0% OR 100%
(FOR DOT AREA)

SCROLL key   ENTER key

LCD contrast volume (LCD CONTRAST)
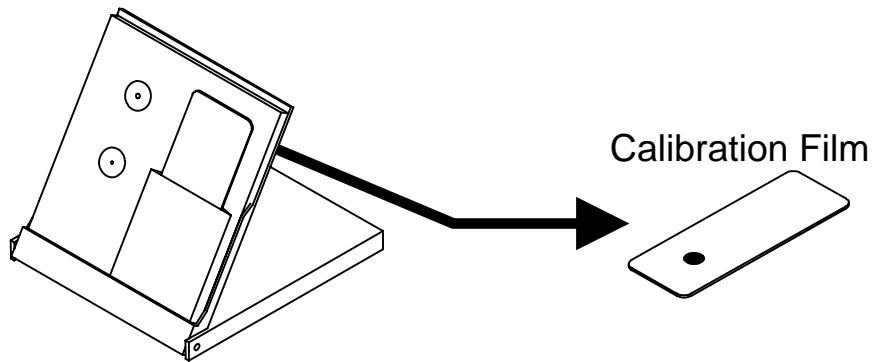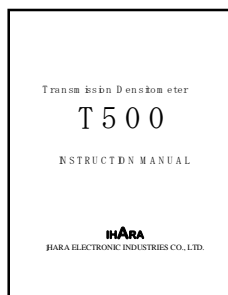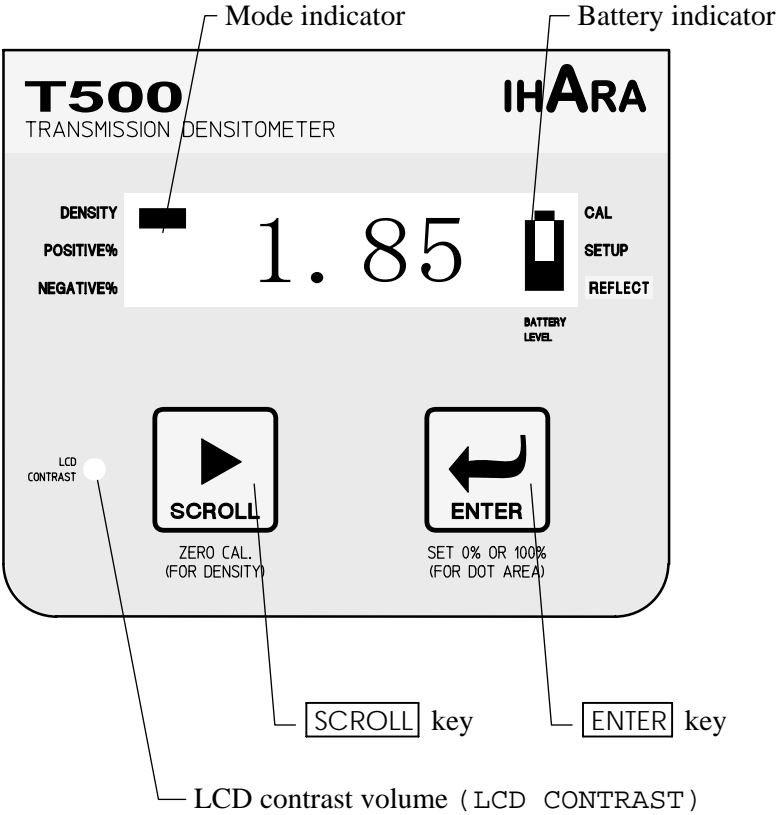
2. PREPARATION BEFORE MEASUREMENT

2.1. Connecting the AC adapter

Securely plug the supplied AC adapter into the AC adapter connection jack on the rear of the equipment.

STOP *Do not connect the AC adapter to any power line other than the designated AC voltages.*

Do not connect any AC adapter other than the one supplied with the equipment.

Do not leave the AC adapter plugged into an outlet if the equipment is not in use for a long time.

2.2. Charging the Battery

The equipment has a NiCd battery built in. If the AC adapter is connected, charging is automatically started. Measurements can be made while charging. After charging is completed, measurements can be made even if the AC adapter is disconnected. If the AC adapter is kept connected even after completion of charging, charging is automatically started when the battery is used up. You can check the remaining battery capacity with the charge lamp and the battery indicator.

How to charge the battery

1. Insert the AC adapter into an AC 100V outlet and the AC adapter connection jack on the rear side of the equipment.
2. The charging lamp is lit orange during charging.

   HINT *If the built-in battery is not charged at all, particularly just after purchase, the charge lamp may not be lit for the first tens of seconds even with the AC adapter connected. This is not a failure. Leave it as it is, and charging will be started.*

3. When charging is completed, the charge lamp changes from orange to green. Charging time is about 1.5 hours.

HINT

Measurements can be made during charging. During charging, the main body may become heated, but this is not unusual.

HINT

If continuing use of the equipment with the battery charger connected, it will not always be charging. Once the battery is fully charged, charging is temporarily ended. After that, as the battery charge decreases to a level that requires charging while using the Densitometer, charging will be started again. You can check the state and level of charge by the charge lamp and battery indicator. If you start re-charging immediately, disconnect the AC adapter temporarily and insert it once again.

HINT

When the optional R500 is connected, charging of R500 will be automatically started after the T500 is fully charged. .

CHECK Proper charging of the battery

The NiCd battery life is around two years or about 500 charge/discharge cycles. However, improper charging will degrade the performance of the battery. This results in a decreasing capacity of the battery even with charging. Such a phenomenon is generally called a memory effect.

By following these points, the memory effect can be minimized.

·Use the battery until the charge is almost completely depleted.

It is not a good practice to begin charging the battery when it is in a charged state.

·Do not interrupt charging of the battery.

Do not pull out the battery charger until the charge lamp changes to green. Measurements can still be made while charging.

HINT

If the memory effect occurs, the battery must be refreshed to recover the performance. For refreshing the battery, see page 25.

8

Battery indicator

The battery indicator is shown in the lower right area of the liquid crystal display.

DENSITY

POSITIVE%

NEGATIVE%

1.85

CAL

SETUP

REFLECT

BATTERY
LEVEL

The battery indicator changes at seven stages depending on the remaining charge of the battery. If the remaining charge becomes 0 %, the battery must be charged.

100%   0%

The battery indicator below will be displayed during charging.

2.3. <u>Power On-Off</u>

Turning on the power supply

    1. Slide the power switch at the rear side of the body to ON.

    2. If any one of the keys is pressed, the power supply will be turned on and the light table will illuminate.

Measurements can be made simultaneously when the power supply is turned on if the measuring arm is lowered with the main power switch being not at ON.

Turning off the power supply

If the equipment is left unused, the power supply will go off automatically (auto power-off). The auto power-off feature allows you to set up any of three stages and an invalid state. But, even when it is invalid, the power supply will go off if it is left unused for 60 minutes

For details of setting the auto power off timer, see page 21.

The power supply can be turned off by pressing the ENTER key until the display changes into PWR OFF and then releasing the ENTER key.

If you carry or store the equipment for extended time, turn the main power switch to OFF.

2.4. <u>Adjusting the Liquid Crystal Display Contrast.</u>

If the liquid crystal display is hard to see, adjust the contrast.

    1. Prepare a very small screwdriver.

    2. Turn on the power supply.

    3. Using the screwdriver, turn the LCD contrast adjustment at rear side of the equipment to an optimum position while checking the display.

3. BASIC MEASURING OPERATION

3.1. ITEMS TO BE CONFIRMED BEFORE MESUREMENT

◆Confirm the following items before any measurement

1. Select the desired measuring aperture and exchange.

For details on exchanging the aperture, see page 29

2. Perform the calibration.

For details on calibration, see page 11.

◆Measurement mode

The measurement mode changes sequentially by pressing the ‖SCROLL‖ key.

The current measurement mode is shown on the left or right side of the LCD display.

CHECK *Press the ENTER key after CALIBRATION or SETUP is displayed to perform the calibration or the setup.*

HINT *Since density, positive dot percentage, negative dot percentage will be calculated at the same time in one measurement, the correct measurement value will be displayed even if the mode is changed. Therefore, it is not necessary to measure again to see both density and dot percentage.*

DENSITY

DENSITY	▬	0. 72	🔋	CAL
POSITIVE%				SETUP
NEGATIVE%				REFLECT

↓ [SCROLL] key

POSITIVE DOT %

DENSITY				CAL
POSITIVE%	▬	80. 9%	🔋	SETUP
NEGATIVE%				REFLECT

↓ [SCROLL] key

NEGATIVE DOT %

DENSITY				CAL
POSITIVE%		19. 1%	🔋	SETUP
NEGATIVE%	▬			REFLECT

↓ [SCROLL] key

CALIBRATION

DENSITY				CAL ▬
POSITIVE%	CALIB.			SETUP
NEGATIVE%				REFLECT

↓ [SCROLL] key

SETUP

DENSITY				CAL
POSITIVE%	SETUP		▬	SETUP
NEGATIVE%				REFLECT

↓ [SCROLL] key

·

· （Return to the density screen）

·

◆Light table

The light table illuminates when the instrument is turned on or any key is pressed while in measurement mode. It also illuminates due to a measuring arm operation.
The light table turns off automatically after a specified time.

For details on setting the illuminating time, see page 22.

◆Sound Control

When any key is pushed or by any operation, the buzzer will beep. It is possible to turn the sound off.

For details on setting the sound control, see page 23.

The time when the buzzer will beep, and kinds of the sounds are shown in the following table:

Timing	Sound
When the power is turned on	Beep
When any key is operated	Beep
When the measurement is ended	Beep
When an error occurs	Beep Beep

◆Measuring operation

For measurement, place the film on the light table and push down the measuring arm. The value will be shown.

TT′
CHECK *Do not release the measuring arm until the measurement result is displayed.*

If the measuring arm is released too early, INVALID! will be displayed. In this case, repeat the measuring procedures.

4. **CALIBRATION**

To ensure accurate measurements, calibration must be performed. Perform the slope calibration using the calibration film supplied.

ТТ′ *Check the manufacturing date on the calibration film. Normally it is*
CHECK *valid for 2 years from the manufacturing date. Correct measurement results can only be obtained with a valid calibration film. Do not expose the calibration film to intense heat, direct sun light or any harsh chemical. Please give careful attention to handling of the calibration film --avoid contact with the surface and keep it in its case after use.*

1. Set the mode indicator on CAL with the SCROLL key, and press ENTER key.

DENSITY   CALIB.   CAL
POSITIVE%   SETUP
NEGATIVE%   REFLECT

2. The present value will be shown on the display.

DENSITY   C: 2.10   CAL
POSITIVE%   SETUP
NEGATIVE%   REFLECT

3. Using the SCROLL key, enter the value on the calibration film. Entry values circulate as follows,
   2.00 → 2.01 → ⋯ → 3.00 → 1.00 → 1.01 → ⋯ → 2.00 →
   Once the current value is reached, press the ENTER key

   If the SCROLL *key and the* ENTER *key are pressed at same*
   HINT *time, the display will return to [2.00].*

DENSITY   C: 2.10   CAL
POSITIVE%   SETUP
NEGATIVE%   REFLECT

4. After the [READ AIR] is displayed, lower the measuring arm without placing anything on the aperture and release the arm when [C 0.00] is displayed.

DENSITY	READ AIR	CAL
POSITIVE%		SETUP
NEGATIVE%		REFLECT

↓

DENSITY	READING ▬	CAL
POSITIVE%		SETUP
NEGATIVE%		REFLECT

↓

DENSITY	C 0.00 ▬	CAL
POSITIVE%		SETUP
NEGATIVE%		REFLECT
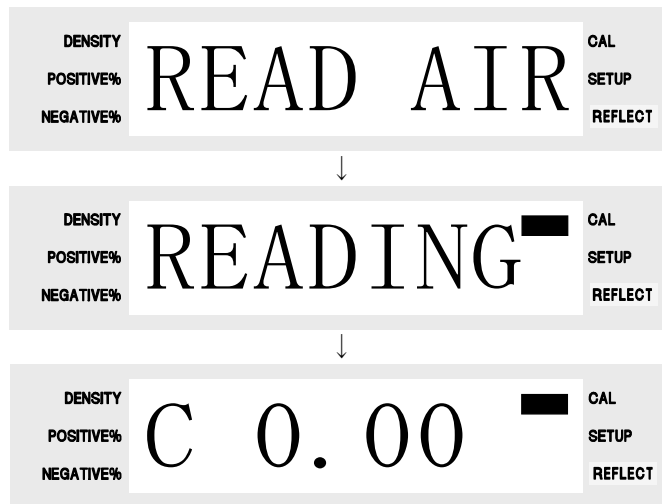
5. Next, the [READ STD] will be shown on the display. Measure the calibration   film.
   Release the measuring arm when the inputted value such as [2.10] is displayed.

DENSITY	READ STD	CAL
POSITIVE%		SETUP
NEGATIVE%		REFLECT

↓

DENSITY	READING ▬	CAL
POSITIVE%		SETUP
NEGATIVE%		REFLECT

↓

DENSITY	C 2.10 ▬	CAL
POSITIVE%		SETUP
NEGATIVE%		REFLECT
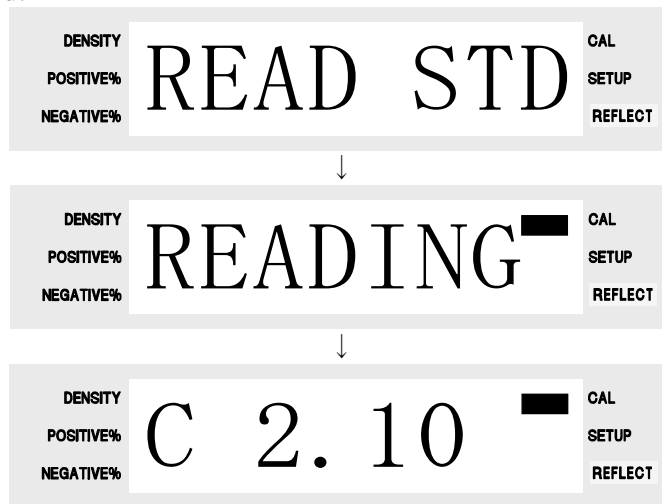
6. When the calibration is completed, [CAL END] will be displayed and the T500 will return to the measuring mode. If [CAL ERR] is displayed, a calibration error has occurred. Repeat the calibration procedures.

DENSITY	CAL END ▬	CAL
POSITIVE%		SETUP
NEGATIVE%		REFLECT

HINT

Since the inputted value will be stored in nonvolatile memory, it is not necessary to alter the value if the same calibration film is used. When the present value is displayed, press the ENTER key and follow from procedure 4.

CHECK

To abort the calibration mode, press the SCROLL key to cancel.

5. MEASURING PROCEDURE

5.1. Density measurement

◆Density measurement fundamentals

1. Set the mode indicator to「DENSITY」with the SCROLL key.
2. Position the area of the film to be measured onto the measuring aperture and lower the measuring arm.
3. After the displayed value has disappeared for an instant, the measured value will be displayed. If the density is under 5.0, 2 decimal places are indicated. For values over 5.0, 1 decimal place is indicated.

DENSITY		CAL
POSITIVE%	3.25	SETUP
NEGATIVE%		REFLECT

CHECK *If the measuring arm is released too early, [INVALID!] is displayed -- repeat the measurement.*

HINT *It is still possible to view the correct value even if the mode is changed to the density mode after measurement in the dot area mode. Therefore, it is not necessary to measure again when both density and dot percentage are to be viewed.*

◆Zeroing the film

Any measuring area on the film can be defined as a zero reference value by a single key operation.

Before the density measurement, perform zeroing on a clear substrate area (a transparent part) of the film to be measured.

⊤⊤′
CHECK
Zeroing the density can only be performed in the density mode.

1. Lower the measuring arm after positioning the clear substrate area of the film on the aperture.
2. With the measuring arm down, press the SCROLL key after the value is displayed.
3. Release the measuring arm after [ZERO CAL] is displayed. Zeroing is then completed.

⊤⊤′
CHECK
When a value has been defined as a zero reference in the density mode, it will be applied to all subsequent measurements including the dot area mode.

HINT
Perform the zeroing operation on a clear substrate area (transparent part) of the film to set the clear substrate density to zero.

5.2. Dot area measurement（POSITIVE%／NEGATIVE%）

◆Dot area measurement fundamentals

In reality, the density of a clear substrate is not zero and/or the density of a solid area is not sufficiently high enough.

In such case, this equipment will measure the clear substrate and the solid and store the value (0-100% setting). Then, by using the following formula, the dot area measurement can be altered:

$$POSITIVE\% = \frac{1-10^{-(Dt-D0)}}{1-10^{-(Ds-D0)}} \times 100$$

$$NEGATIVE\% = 100 - POSITIVE\%$$

Dt : Density of the half-tone
Ds : Density of the solid
D0 : Density of the clear substrate
POSITIVE% : Positive dot area
NEGATIVE% : Negative dot area

1. Set the mode indicator to「POSITIVE%」or「NEGATIVE%」with the SCROLL key.
2. Position a clear substrate area of the film onto the measuring aperture and lower the measuring arm.
3. Once the value has been displayed, with the measuring arm still lowered, press ENTER key. Release the measuring arm after [0.0%] is displayed in the POSITIVE% mode or [100%] is displayed in the NEGATIVE% mode. The density is memorized as the clear substrate reference.

DENSITY		CAL
POSITIVE%	▬ 0. 0%	SETUP
NEGATIVE%		REFLECT

(in the POSITIVE% mode）

4. Next, position the solid area of the film onto the measuring aperture and lower the measuring arm.

5. Once the value has been displayed, with the measuring arm still lowered, press the ENTER key. Release the arm after [100%] in POSITIVE% mode or [0%] in NEGA% mode is displayed. This density is then memorized as the solid reference.

DENSITY		CAL
POSITIVE%	▬ 100. 0% ▯	SETUP
NEGATIVE%		REFLECT

（in the POSITIVE% mode）

6. Position the area of the film to be measured onto the measuring aperture and lower the measuring arm. After the displayed value disappears for a moment, the measured value of the dot area will be displayed. If the fringe correction is being setup, the measured value will be displayed after the fringe correction percentage is displayed.

For details on setting the fringe correction, see page 17.
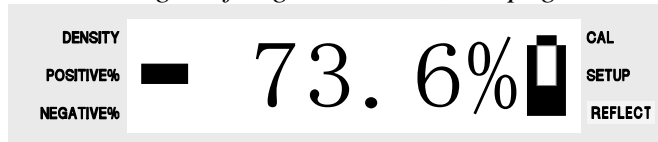
DENSITY		CAL
POSITIVE%	▬ 73. 6% ▯	SETUP
NEGATIVE%		REFLECT

┬┬′
CHECK   *If the measuring arm is released too early, [INVALID!] is displayed -- repeat the measurement.*

┬┬′
CHECK   *The value set with the ENTER key (100% setting value) will be stored until the switch is turned off. To cancel the value, turn off the switch once.*

HINT   *It is still possible to view the correct dot percentage even if the mode is changed to the dot area mode after a measurement in the density mode. Therefore, it is not necessary to measure again if both density and dot area are to be viewed.*

◆Fringe correction

The edge (a contour) of the dot area is a clearly divided boundary between a solid area and clear substrate in an ideal film. That is, there is no middle density area between an area of density infinity and an area of density zero. However, a middle density area occupies some areas at the edge of an actual   dot   image. Fringe correction is a feature that adjusts the percentage to compensate for the measured dot area, which has some middle density area on the dot edge, in calculating practical dot area from measured density.

A correction coefficient inputted as 50% dot area automatically applies to all ranges of dot area from 0 % to 100 % in proportion to the contour length of each dot area.

$$fPOSITIVE\% = POSITIVE\% + F\% \times \sqrt{1 - \frac{|POSITIVE\% - 50|}{50}}$$

fPOSI% : Positive dot area after fringe correction
POSI% : Positive dot area before fringe correction
F% : Fringe correction percentage on 50% dot area

Following table is an example for '-5%' fringe correction.

Before correction			After correction
100.0 %	→	100.0 %	
90.0 %	→	87.8 %	
70.0 %	→	66.1 %	
50.0 %	→	45.0 % (-5%)	
30.0 %	→	26.1 %	
10.0 %	→	7.8 %	
0.0 %	→	0.0 %	

⊤⊤′
CHECK

Normally, the fringe correction percentage is zero or is a negative value.

For the details on setting the fringe correction value, see page 24 "6.5.Setting the fringe correction percentage".

6. SET UP OPERATION

Setting of system options are performed in the setup mode. The following are the parameters in the set up mode.

　　　　(1) Output data　　　　　　　　　[OUTPUT]
　　　　(2) Auto power off timer　　　　　[TIMER]
　　　　(3) Illumination time of light table [LIGHT]
　　　　(4) Sound control　　　　　　　　[SOUND]
　　　　(5) Fringe correction　　　　　　[FRINGE]
　　　　(6) Refreshing battery　　　　　[REFRESH]

These parameters are set in memory until a new set of data are inputted.

Common operation of set up

1. Set the mode indicator to 「SETUP」 with the SCROLL key and press the ENTER key.

2. 　　　Set up items will be displayed. The first set up menu is displayed [OUTPUT].
3. Select the item to set up with the SCROLL key and press the ENTER key.
4. Perform the setting of the selected item.
5. The display will return to the measurement mode after the setup.

ＴＴ′
CHECK
If the measuring arm is depressed while in the set up mode, the setup menu will terminate and will return to the measurement mode.

22

Key operation in the setup mode

The common functions are assigned to each key in every set up mode.

SCROLL key: This key is used to scroll through the available selections.

When selecting numeric values, the displayed value scrolls sequentially.

ex: Present value $\rightarrow$ $\cdots$ $\rightarrow$ Maximum value $\rightarrow$ Minimum value $\rightarrow \cdots \rightarrow$ Present value $\rightarrow$

ENTER key :   This key is used to set the selected choice.

Measuring arm : The selection of an entry is abandoned and it returns to the previous measurement mode. Previous settings are not changed.

HINT

To scroll the display, keep pressing the SCROLL key. When the SCROLL key and the ENTER key are pressed at the same time on the selection screen, the displayed entry is shifted to the default settings.

6.1. Setting the data output

Configuring the following data output formats via the serial communication port can be performed by the following steps shown below:

AUTO : Current data to current measurement mode.

ALL   : Density, positive dot area and negative dot area in every measurement mode.

NONE : No data.

1. Set the mode indicator to「SETUP」with the SCROLL key and press the ENTER key.
2. Select [OUTPUT] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	OUTPUT ▬	SETUP
NEGATIVE%		REFLECT

3. Select one of [AUTO   ], [ALL   ], [NONE   ] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	AUTO ▬	SETUP
NEGATIVE%		REFLECT

4. Return to the measurement mode.

6.2. Setting the auto power off timer

The auto power off timer can be selected from 4 different intervals. It is also possible to turn off the auto power off timer.

40sec : Off in approximately 40 seconds.

90sec : Off in approximately 90 seconds.

210sec : Off in approximately 210 seconds.

DISABLE : Power does not turn off automatically. However, if it is left untouched for 60 minutes, power will be turned off automatically.

1. Set the mode indicator to 「SETUP」 with the SCROLL key and press the ENTER key.
2. Select [TIMER] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	TIMER ▬	SETUP
NEGATIVE%		REFLECT

3. Select one of [40sec]、[90sec]、[210sec]、[DISABLE] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	40sec ▬	SETUP
NEGATIVE%		REFLECT

4. Return to the measurement mode.

TT'
CHECK   *If [DISABLE] is selected, press the ENTER key for 2 seconds after use and be sure to turn off the power switch.*

6.3. <u>Setting the illumination time of light table</u>

You can change the illumination time of the light table.

  Setting range : 1sec～30sec

1. Set the mode indicator to「SETUP」with the SCROLL key and press the ENTER key.
2. Select [LIGHT] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	LIGHT ▬	SETUP
NEGATIVE%		REFLECT

3. Set the illumination time to between [1sec] and [30sec] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	9sec ▬	SETUP
NEGATIVE%		REFLECT

4. Return to the measurement mode.

Pressing the SCROLL key and the ENTER key simultaneously is a short cut operation to reset the value to [9sec].

HINT

6.4. <u>Setting the sound control</u>

It is possible to set the sound control to "ON" or "OFF".

ON : The buzzer will beep.

OFF : The buzzer will not beep.

1. Set the mode indicator to 「SETUP」 with the SCROLL key and press the ENTER key.
2. Select [SOUND] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	SOUND ▬	SETUP
NEGATIVE%		REFLECT

3. Select either [ON] or [OFF] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	ON ▬	SETUP
NEGATIVE%		REFLECT
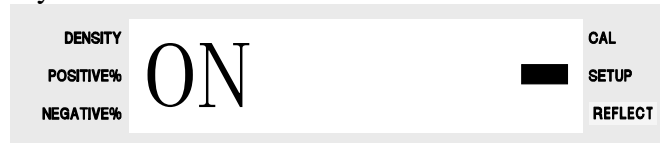
4. Return to the measurement mode.

6.5. <u>Setting the fringe correction percentage</u>

It is possible to change the setting of the fringe correction percentage of dot area. Fringe correction percentage is set as the dot area correction percentage on a 50% dot area.

The setting range : -9.9%～+9.9%

For details on the correction method, see page 17 in the "5.2 Dot area measurement - Fringe correction".

1. Set the mode indicator to「SETUP」with the SCROLL key and press the ENTER key.
2. Select [FRINGE] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	FRINGE ▬	SETUP
NEGATIVE%		REFLECT

3. The presently set percentage is displayed.
4. Input the new fringe correction percentage with the SCROLL key. The   entry   value
   $0.0 \rightarrow -0.1 \rightarrow \cdots \rightarrow -9.8 \rightarrow -9.9 \rightarrow 9.9 \rightarrow 9.8 \rightarrow \cdots \rightarrow 0.0 \rightarrow$
   will circulate as shown above. Choose the value to be inputted and press the ENTER key.

DENSITY		CAL
POSITIVE%	F： 0. 0%▬	SETUP
NEGATIVE%		REFLECT

5. Return to the measurement mode.

⊤⊤′
CHECK *Zero or the minus value is usually inputted as for fringe correction percentage.*

HINT *Pressing the SCROLL key and the ENTER key simultaneously is a short cut operation to reset the value to [0.0].*

6.6. <u>Refreshing the Battery</u>

The battery-refreshing feature discharges the battery completely before recharging the battery. This is to dissolve the memory effect of the NiCd battery built in the equipment. Proceed as follows:

For more on the memory effect of the NiCd battery, see page 5.

1. Connect an AC adapter between the appropriate AC wall receptacle and the DC 9V connection jack on the rear side of the equipment.
2. Set the mode indicator in「SETUP」with the SCROLL key and press the ENTER key.
3. Select [REFRESH] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	REFRESH■	SETUP
NEGATIVE%		REFLECT

4. The charge lamp will change to green and discharging will start. The battery indicator will blink the voltage value.

DENSITY		CAL
POSITIVE%	4.86V ■	SETUP
NEGATIVE%		REFLECT

5. When the discharge ends completely, the charge lamp will change to orange and charging will start. While charging, the equipment is powered off.
6. When the charge lamp changes to green, battery refreshing has been completed.

ㅜㅜ′
CHECK
To cancel discharging, press down the measuring arm until the display returns to the measurement mode.

⚠ *The NiCd battery has a finite lifetime. Its capacity decreases severely after service of around two years or 500 charge and discharge cycles even in normal use. The battery-refreshing feature will not extend this service life. If the battery capacity is consumed soon after refreshing, the battery should be replaced. For replacing the battery, see page 30.*

7. SERIAL OUTPUT

Measurement data can be transmitted via the serial communications port to a printer or computer.

When this equipment is connected via the serial communication port to a printer or computer and the output data format is set, the measurement results will be automatically outputted.

Protocol

Communication protocol: RS-232C

Baud rate   : 9,600 bps

Data bit   : 8 bits

Stop bit   : 1 bit

Parity bit   : None

Flow control   : Hardware（CTS/RTS）

7.1. Output data format

It is possible to change the output data format if necessary.

For details, see page 20 "6.1 Setting the data output".

```
DENS          2.76
         :
         :
POSI DOT    45.6%
NEGA DOT    54.4%
         :
         :
POSI DOTF   12.9%
NEGA DOTF   87.1%
         :
         :
SOLID        2.51
```

If the fringe correction is set, F will be displayed.

 Please use the Ihara serial communication cable (optional) to connect to output devices.

The type of the communication cable

・For connection with the optional printer "PR-95" or a PC with pins serial connector:

      Communication cable D-Sub 25 pin (Part number: H02388AS)

・Connection with a PC with 9 pin serial connector:

      Communication cable D-Sub 9 pins (Part number: H02607AS)

   or Communication cable D-Sub 25 pin and conversion connector

                (Part numbers: H02388AS and AT-925S)

8. ERROR AND WARNING MESSAGES

If one of the following messages is displayed on the screen during measurement, stop measuring and check this device.

Message	Meanings
INVALID!	The arm was returned too soon during the measurement. Or the head was lifted during measurement with R500. Try the measurement again.
NEED CAL	Calibration has not been performed. Therefore, calibration is required.
CAL ERR	Some calibration error has occurred. Try the calibration again.
LAMP OUT	The lamp is out. If the same message is displayed after trying the measurement again, contact the dealer to replace the lamp.
A/D ERR!	This indicates an A/D initialization error. If the same message appears after turning on the power again, repair is needed. Please contact the dealer.
A/D OVER	This indicates an A/D overflow. Try the calibration again.
PROM ERR	This indicates an EPROM writing error. If the same message appears after turning on the power again, repair is needed. Please contact the dealer.

9. MAINTENANCE

9.1. Replacing the aperture

In this device, a ϕ2mm or ϕ1mm small diameter aperture can be used in addition to the standard ϕ3mm aperture. These apertures are included as standard attachments. For measuring a small area, change the standard aperture to the small diameter aperture. After changing apertures, perform calibration. In the case where the small diameter aperture is used for measuring a large area, the measuring accuracy and repeatability may be slightly lower than those obtained from the ϕ3mm aperture. Therefore, when measuring a large area portion, use the ϕ3mm aperture.

How to replace apertures

1. Prepare a very small flatblade screwdriver.
2. Insert the screwdriver into the clearance between the aperture and the light table of this device and remove the aperture.
3. Fit the appropriate aperture.
4. Perform calibration.

 丅丅′ *The replaced aperture should be kept in its case in order to prevent it*
CHECK *from being lost.*

9.2. <u>Replacing the Battery</u>

The T500 densitometer has a NiCd battery built in. Its service life is around two years, but may be shortened if charged often. If the battery capacity cannot be recovered even after recharging or if battery capacity is used up soon after recharging, the service life has been reached. Replace the NiCd battery.

    Replacement part (option): NiCd battery, part No. H00366AS.

ⓉⓉ′
CHECK *When ordering the NiCd battery, inform the service representative of the serial number of the equipment.*

How to replace the NiCd battery

1. Prepare a large Phillips screwdriver.
2. Remove the AC adapter. Turn off the main power switch on the rear side of the equipment.
3. Put the equipment upside down. Remove the five screws on the bottom. Take off the metal cover.
4. Pull out the connector at the end of the cable extended from the NiCd battery. Take out the NiCd battery.
5. Put a new NiCd battery in position. Securely insert the connector.
6. Correctly place the cable in the groove. Place the metal cover in its original position. Tighten the five screws.
7. Connect the AC adapter for charging.

ⓉⓉ′
CHECK *If the charge lamp is not lit orange within one minute after the AC adapter is connected, check to insure proper connection of the battery connector.*

STOP *Never disassemble the battery. Its strong alkali electrolyte may injure skin and clothes. Should the electrolyte leak, thoroughly wash the battery with water before handling.*

Also, never place the battery into a fire. The battery may explode and is extremely dangerous.

Ni-Cd *The NiCd battery is a valuable recyclable resource. Please do not discard it, but bring it to a NiCd battery recycle shop for reuse.*

9.3. Replacing the lamp

The life of the lamp unit should last for some years under "normal" use. If the lamp unit ever fails, please contact your local dealer or manufacturer for replacement instructions.

We highly recommend the lamp unit be replaced by a factory technician. Non-trained personnel may seriously damage the instrument.

Please see the back of this manual for the Ihara customer support telephone numbers.

9.4. Options and Replacement Parts

Options include: Printer, Model [PR-95]
Communication cable D-Sub 9 pin (Part No. H02607AS)
Communication cable D-Sub 25 pin (Part No. H02388AS)
Conversion connector: 25 pin - 9 pin (Part No. AT-925S)
Data communication software 『IHARAComJ』

Replacement parts include: NiCd battery (Part No. H00366AS)
Calibration film (Part No. H02161AS)

10. TROUBLESHOOTING

Power does not seem to be connected, no display on the LCD.
- · Is the slide switch on the back panel set to the "On" position?
- · Is the AC adapter connected?
- · Is the LCD contrast correctly adjusted?
- · Is the built-in battery connected properly?

A measured value is not correct.
- · Has calibration been done recently?
- · Was the zeroing operation performed with the correct material?
- · Was the calibration or zeroing operation performed after the exchange of a new aperture?
- · Is the calibration film still valid?
- · Has the calibration film been handled carefully, with no dirt or contamination noticeable?
- · Was the calibration film exposed to direct sun light, high intensity heat or harsh chemical?
- · Does the lamp illuminate?
- · Is the measuring arm bent or mis-aligned?

Measured value (especially dot area) is not correct.
- · Was the fringe correction coefficient set properly?
- · Was the zeroing operation performed with the correct material?
- · Was the 0 -100% setting correctly performed?

Screen is hard to see.
- • Is the LCD contrast correctly adjusted?
- • Is the built-in battery used up?

Measured value is not transmitting to the printer or the computer.
- · Did you use the Ihara serial cable to connect the output device?
- · Is the output data format set to 'NON'?
- · Is the communication protocol for the input device set correctly?
  See "Setting the Serial Communication", page 26.

Battery becomes low soon after charging.

- Is the charging method correct?
- Has a battery refreshment been made?
- Has the battery service life ended?
  See "Smart Charging the Battery", page 5.
- Is auto power-off set properly?

11. SPECIFICATIONS

Classification / model	Portable black and white transmission densitometer / **T500**
Dimensions	251mm (D) x 103mm (W) x 87mm (H) (9.9" x 4.1" x 3.4")
Size of light table	80mm (W) x 70mm (D) (3.1" x 2.8")
Depth of film feed	185mm (7.3")
Weight	Approximately 1,200g (2.6lbs.)
Optical design	ANSI PH2.19 (Specular - Diffuse)
Filter	Visual
Light source	Halogen lens lamp
Detector	Filter, built-in photo diode
Apertures	ϕ 3mm, ϕ 2mm, ϕ 1mm
Measuring range	0.0 - 6.0D, 0 - 100%
Repeatability	+0.01D (at < 4.0D, ϕ 3mm aperture)
Accuracy	+0.02D (at < 4.0D, ϕ 3mm aperture)
Measurement function	Density
	Positive dot area
	Negative dot area
Fringe correction	Supported
Calibration	One touch zeroing operation Slope calibration using calibration film
Temperature range	5oC ~ 40oC (50oF ~ 104oF)
Display	8 characters LCD
Contrast adjustment	Supported
AC adapter	9V - 500mA
Built-in rechargeable battery	4.8V NiCd battery
Charging time	Approximately 1.5 hours
Battery status indicator	Shown on the display permanently
Battery refresh function	Supported
Operational keys	Interlocking arm measuring switch, 2 operational panel keys

Power on/off	Power on by any key operation Auto power off timer – equipped (Possible to select from 4 choices including disables)
Warm-up time	None
Sound Control	Supported (possible to turn off)
Interface	RS-232C （9,600bps、Data 8 bits、Non Parity、1 Stop bit）
Standard Accessories	Instruction Manual (warranty), Aperture ϕ 3mm (installed), ϕ 2mm, ϕ 1mm, AC Adapter, Calibration film
Options	Printer 『PR-95』, serial interface, etc.

12. **B&W REFLECTION DENSITOMETER R500**

The T500 is designed to accept the Black and White Reflection Densitometer R500 through a cable connection to measure the transmission, black and white reflection density and dot percentage of films and photographic printing paper.

ㅜㅜ′
CHECK   *When the R500 black and white reflection densitometer is connected, the measured values and settings for the R500 are indicated on the liquid-crystal display of the T500.*

ㅜㅜ′
CHECK   *The R500 can not be used separately. In order to use it, be sure it is connected to the T500.*

12.1. <u>Nomenclature</u>

◆Nomenclature

Reflection densitometer R500 body

・Top view

Cable harness attachment

Operation keys

・Bottom view

Target film

Shoe lock

Shoe

Optical head

・Rear View

Main power switch

LCD OFF ON
CHARGE
DC 9V
DATA OUT

AC adapter receptacle

Charge status indicator

RS-232C communication port

・Calibration reference

IH**A**RA *CALIBRATION REFERENCE*

WHITE   CYAN

MAGENTA

BLACK YELLOW

RESPONSE : VISUAL   Serial No. 50044
                                         DATE : 1998/08/21

STEP 1 :
    WHITE   **BLACK**
    0.09   1.76
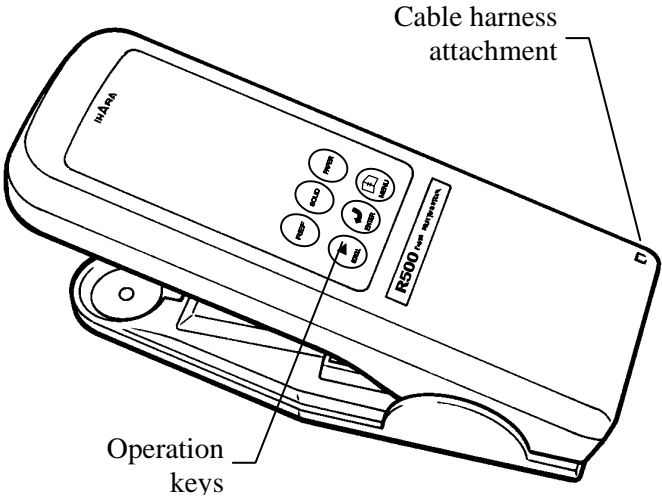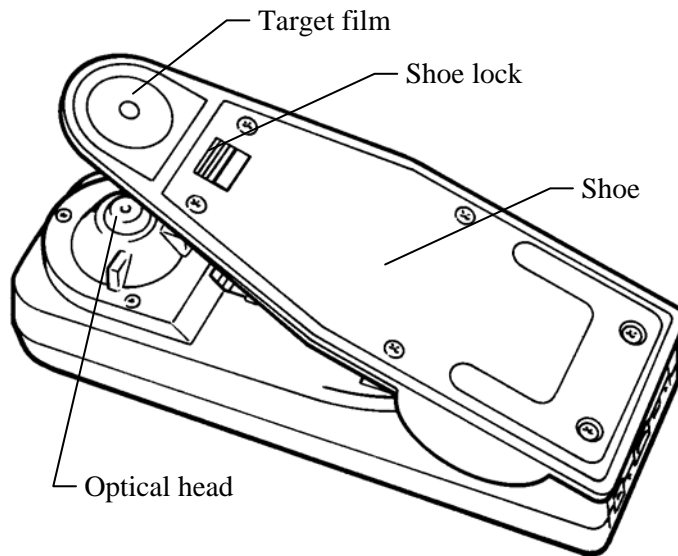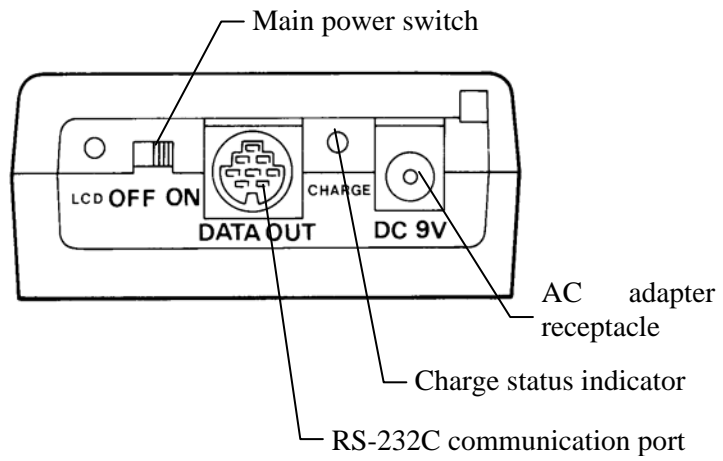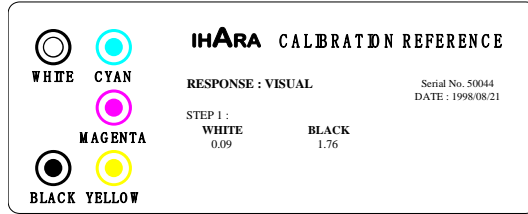
・Soft case

◆Operation panel

REF key

SOLID key

PAPER key

MENU key

ENTER key

SCROLL key
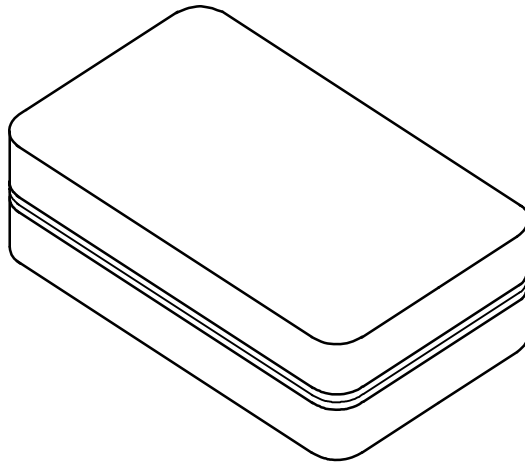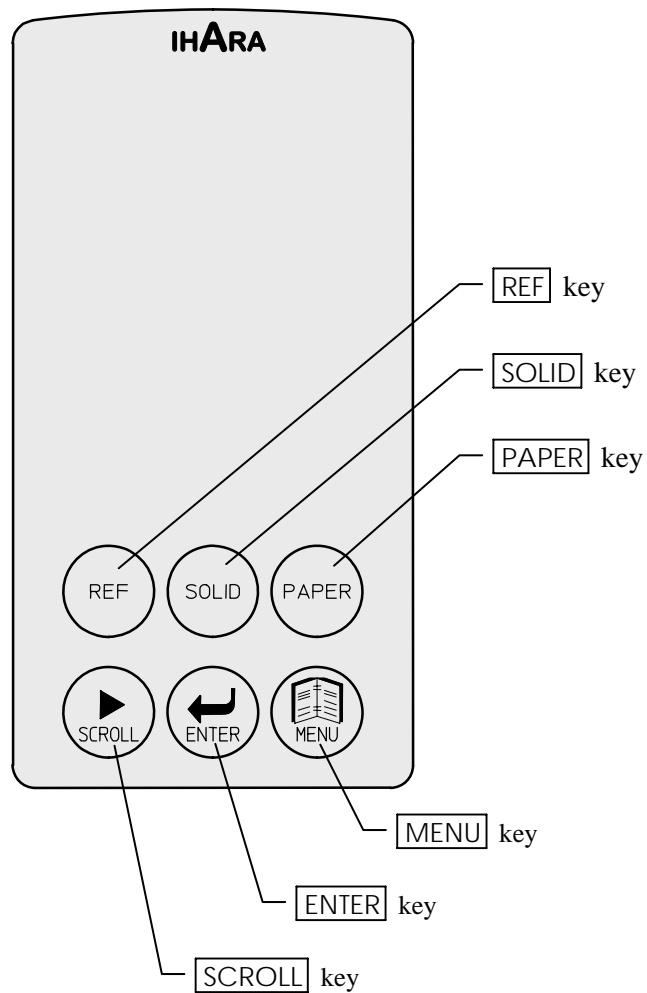
12.2. Preparation before Measurement

◆Power On-Off of the R500

Power-on

 1. Turn on the main power switch on the rear face of the R500 unit.

2. Connect the T500 to the R500 through the communication cable (No.8 pin to No.8 pin).

3. Turn on the power switch on the rear face of the T500.
   For turning on the power of the T500, refer to page 7.

4. Release the shoe slide lock. Then, the power will be turned on. When the shoe is open, press any key to turn on the power.

5. Then, the R500 measurement mode is available, and the R500 reflection density measurement mode will appear on the T500 liquid-crystal display.

   At the same time, the mode indicator points to REFLECT on the right side of the display, indicating that the current display is for the R500.

   $\top\top'$ *The display varies depending on the R500 setup measurement*
   CHECK *mode.*

   For details on setting the measurement value mode, see page 62.
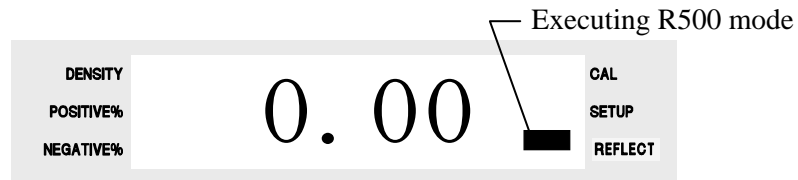
```
                                           ┌── Executing R500 mode
  ┌─────────────────────────────────────────────────────┐
  │ DENSITY                                        CAL   │
  │ POSITIVE%        0 . 00                         SETUP │
  │ NEGATIVE%                              ▇▇      REFLECT│
  └─────────────────────────────────────────────────────┘
```
（Where the measurement mode is set to absolute density measurement.）

☀ *If a measurement operation is performed when the shoe is open but*
HINT *the power is OFF, the measurement will be started automatically after power-on.*

$\top\top'$ *Unless the T500 power is switched to, the R500 power can not be*
CHECK *turned on*

Power-off

A few seconds after closing the shoe and locking the shoe slide lock, the power will go off and a buzzer will sound. If the T500 is powered down, the R500 power is also turned off at the same time.

Also, in the case where the communication cable is disconnected, the power will go off in a few seconds.

During transportation or long-term storage, be sure to turn off the main power switch.

◆**Charging the battery**

The R500 also incorporates a Ni-Cd battery. For charging the battery, connect the AC adapter to the AC adapter jack (DC9V) located on the rear face of R500.

Battery Indicator

When a measurement is performed with R500, the battery indicator (showing the charge status of the R500 battery) and the READING message are displayed. The battery charge status and remaining capacity for the R500 is displayed in the same manner as the T500.

For details on the display of the remaining battery capacity, see page 6 "Battery Indicator" for the T500.

12.3. Basic Operation

◆**Function keys of R500**

The function of each operation key for the R500 is as follows:

REF key : This is for setting the basic reflection density. (This is effective only in reflection density difference measurements.)

SOLID key : This is for setting the solid density. (This is effective only in dot percentage measurements.)

PAPER key : This is for setting the paper density. (This is effective only in relative density measurement and the dot percentage measurement.)

SCROLL key : This is for changing the selected items. For entering numeric values, the numbers on the display can be scrolled in turn.

ENTER key : This is for defining the selected item.

MENU key : This is for displaying the function menu. In the case where the T500 mode is displayed, the mode will return to the R500 mode and the function menu will be displayed with this operation.

◆Menu Selection

1. Press the MENU key.

2. Then, the function menu is displayed. The first menu item to be first displayed is CALIB.

DENSITY   CAL
POSITIVE%   **CALIB.** ▬   SETUP
NEGATIVE%   REFLECT

3. Select the required menu item by pressing the SCROLL key, and then press the ENTER key.

Calibration

DENSITY		CAL
POSITIVE%	CALIB. ▬	SETUP
NEGATIVE%		REFLECT

↓ [SCROLL] key

Density measurement

DENSITY		CAL
POSITIVE%	DENSITY▬	SETUP
NEGATIVE%		REFLECT

↓ [SCROLL] key

Density difference measurement

DENSITY		CAL
POSITIVE%	DEN DIF▬	SETUP
NEGATIVE%		REFLECT

↓ [SCROLL] key

Dot area measurement

DENSITY		CAL
POSITIVE%	DOT % ▬	SETUP
NEGATIVE%		REFLECT

↓ [SCROLL] key

Set up

DENSITY		CAL
POSITIVE%	SETUP ▬	SETUP
NEGATIVE%		REFLECT

↓ [SCROLL] key

・
・ （Return to the calibration menu）
・

◆Sound control

Same as the T500, when any key is pushed or by any operation, the buzzer will beep. It is possible to set it on or off in the setup menu.

For details on setting the sound control, see page 65.

The times when the buzzer will beep, and the kinds of sounds are shown in the following table:

Timing	Sound
When the power is turned on	Beep
When any key is operated	Beep
When the measurement is ended	Beep
When an error occurs	Beep Beep

◆Measuring operation

1. Place a measurement object on an even surface.
2. Fit the target film window to the measurement object.
3. Press down the head securely so that the position of the target film does not shift.
4. Do not release the head and continue to hold it until the display shows the measured value.
5. Once the measurement data is shown, the measurement is ended.

ⓣⓣ′ *If the head is released too early, an error message will be*
CHECK *displayed as [INVALID!]. Please measure again.*

◆Note

If the key operation or measurement of 『T500』 is performed in the 『R500』 mode, the mode will automatically change to the 『T500』 mode. On the contrary, if the key operation or measurement of 『R500』 is performed in the 『T500』 mode, the mode will automatically change to the 『R500』 mode.

12.4. Calibration

To ensure accurate measurements as a reflection densitometer, calibration must be performed. Perform the calibration using the calibration reference card supplied.

TT′
CHECK
Check the manufacturing date on the calibration reference card. Normally it is valid for 2 years from the manufacturing date. Correct measurement results can only be obtained with a valid calibration reference card. Do not expose the calibration card to intense heat, direct sun light or any harsh chemical. Please give careful attention to handing of the calibration reference card --- avoid contact with the surface and keep it in its case after use.

1. Press the MENU key.
2. Select [CALIB.] with the SCROLL key, and press the ENTER key.

DENSITY		CAL
POSITIVE%	CALIB. ▬	SETUP
NEGATIVE%		REFLECT

3. Enter the calibration value for the white patch.
Match the calibration value with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	W:0.09 ▬	SETUP
NEGATIVE%		REFLECT

4. In the same way, enter the calibration value for the black patch.
Match the calibration value with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	B:1.78 ▬	SETUP
NEGATIVE%		REFLECT

5. Next, measure the white patch.

DENSITY		CAL
POSITIVE%	WHITE ▬	SETUP
NEGATIVE%		REFLECT

↓
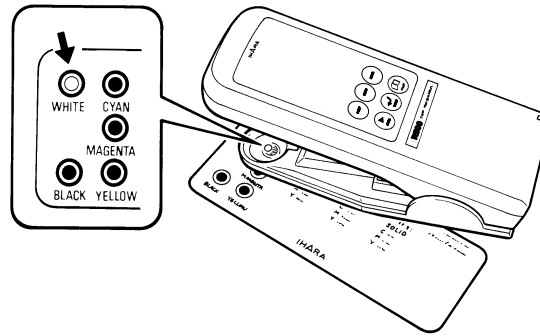
6. After [READING] and the battery indicator are displayed, the measured value of the white patch will be shown. Release the head after the value is displayed.

DENSITY		CAL
POSITIVE%	READING ▯	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	W:0.09 ▬	SETUP
NEGATIVE%		REFLECT
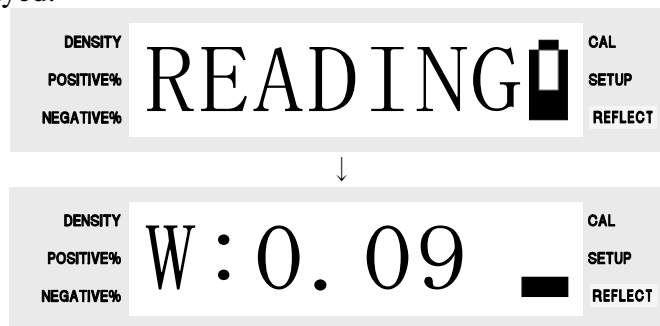
7. In the same way, measure the black patch.

DENSITY		CAL
POSITIVE%	BLACK ▬	SETUP
NEGATIVE%		REFLECT

↓
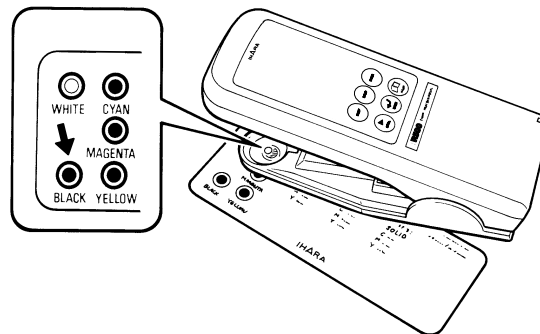
8. After [READING] and the battery indicator are displayed, the measured value of the black patch will be shown. Release the head after the value is displayed.

DENSITY		CAL
POSITIVE%	READING▉	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	B:1.78 ▬	SETUP
NEGATIVE%		REFLECT

9. When the calibration is completed, [CAL END] will be displayed and return to the measurement mode. If [CAL ERR!] is shown, perform the calibration again.

DENSITY		CAL
POSITIVE%	CAL END▬	SETUP
NEGATIVE%		REFLECT

12.5. Measuring Operations

◆Density measurement

The reflection density measurement shall be performed as follows:

1. Press the MENU key to display the function menu.
2. Select "DENSITY" by pressing the SCROLL key, and then press the ENTER key.

DENSITY		CAL
POSITIVE%	DENSITY▬	SETUP
NEGATIVE%		REFLECT

ТТ′
CHECK
The subsequent procedures vary depending on whether the measurement value mode is set to "absolute density" or "relative density.
For details on setting the measurement value mode, see page 62.

⊤⊤′
CHECK

When the calibration and setup are finished, the device returns to the reflection density measurement mode. Different displays appear depending on whether the measurement value mode is set to "absolute density" or "relative density". In each case, continue with the appropriate procedure number 3 on the following page.

For Absolute Density Measurement

3. After the measurement display appears, measure the sample.

DENSITY		CAL
POSITIVE%	**0. 00** ▬	SETUP
NEGATIVE%		REFLECT

4. After the [READING] message and the battery indicator appear, the measured value is displayed.

DENSITY		CAL
POSITIVE%	**READING**▮	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	**0. 70** ▬	SETUP
NEGATIVE%		REFLECT
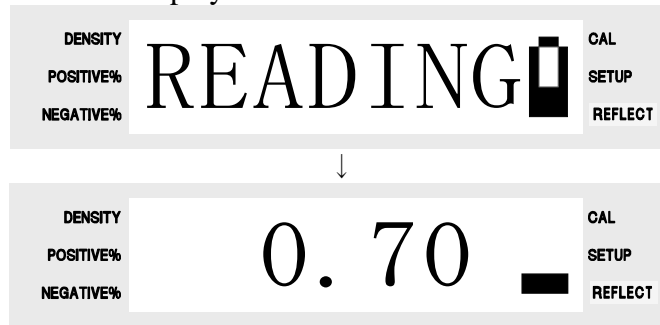
For Relative Density Measurement

3. After the [PAPER] message is displayed, measure the paper density.

DENSITY		CAL
POSITIVE%	**PAPER** ▬	SETUP
NEGATIVE%		REFLECT

ᛏᛏ′
CHECK *In the case where the measurement value mode is set to "relative density," the paper density can be altered by pressing the PAPER key on the measurement display. For details on setting the measurement value mode, see page 62. For details on setting the paper density in reflection density measurements, see page 50.*

4. After [READING] and the battery indicator are displayed, the value of the paper density will be shown.

DENSITY		CAL
POSITIVE%	**READING**▮	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	P： 0.08▬	SETUP
NEGATIVE%		REFLECT

5. After [TARGET] is displayed, measure the sample.

DENSITY		CAL
POSITIVE%	TARGET ▬	SETUP
NEGATIVE%		REFLECT

6. After [READING] and the battery indicator are displayed, the value will be shown.

DENSITY		CAL
POSITIVE%	READING▯	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	0.62 ▬	SETUP
NEGATIVE%		REFLECT
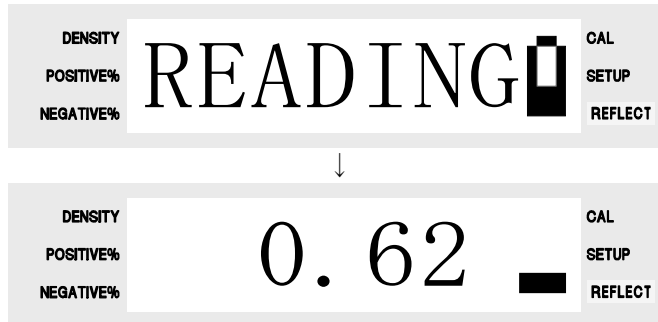
Setting the paper density

To measure the relative density, it is necessary to set the value of the paper to be used before measuring the sample. Then, the relative density of the target compared to the paper density set to zero will be shown.

ＴＴ′
CHECK
The paper density setting is in the relative density mode of the 『 R500 』 setup measurement mode. For details on changing the measurement mode, see page 62.

1. Press the PAPER key in the measurement mode.
2. When [PAPER] is displayed, measure the paper density.

DENSITY		CAL
POSITIVE%	PAPER ▬	SETUP
NEGATIVE%		REFLECT

3. After [READING] and the battery indicator are displayed, the value of the paper density will be shown.

DENSITY		CAL
POSITIVE%	READING🔋	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	P: 0.08 ▬	SETUP
NEGATIVE%		REFLECT

4. After [TARGET] is displayed, measure the sample.

DENSITY		CAL
POSITIVE%	TARGET ▬	SETUP
NEGATIVE%		REFLECT

5. After [READING] and the battery indicator are displayed, the value will be shown.

DENSITY		CAL
POSITIVE%	READING🔋	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	0.62 ▬	SETUP
NEGATIVE%		REFLECT
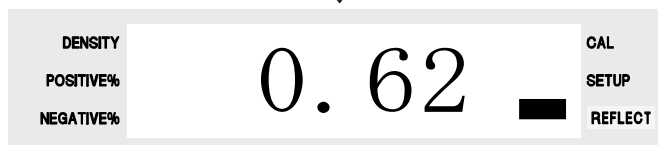
◆Density difference measurement

Density difference measurements is used to compare between a reference and the target

1. Press the MENU key to open the function menu.
2. Select [DEN DIF] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	DEN DIF▄	SETUP
NEGATIVE%		REFLECT

3. After [REF   ] is displayed, measure the reference.

DENSITY		CAL
POSITIVE%	REF ▄	SETUP
NEGATIVE%		REFLECT

⌉⌉′
CHECK *If the REF key is pressed in the measurement mode, it is possible   to   alter   the   reference   value. For details on setting the reference value, see page 53.*

4. After [READING] and the battery indicator are displayed, the value of the reference will be shown.

DENSITY		CAL
POSITIVE%	READING🔋	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	R: 1.13▄	SETUP
NEGATIVE%		REFLECT

5. After [TARGET] is displayed, measure the sample.

DENSITY		CAL
POSITIVE%	TARGET ▄	SETUP
NEGATIVE%		REFLECT

6. After [READING] and the battery indicator are displayed, the value
   will be shown.

DENSITY		CAL
POSITIVE%	READING▯	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	0.25 ▁	SETUP
NEGATIVE%		REFLECT
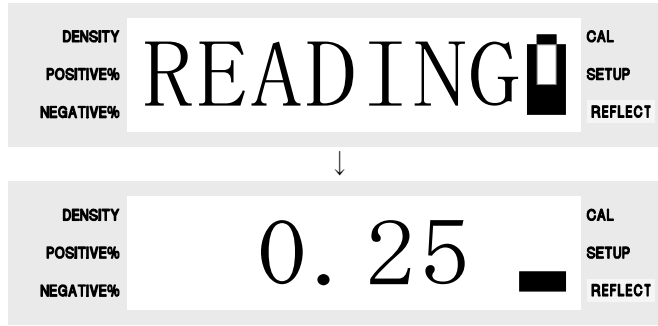
Setting the reference density

To perform the density difference measurement, it is necessary to set the
reference density.

1. Press the REF key in the measurement mode.
2. After [REF   ] is displayed, measure the reference sample.

DENSITY		CAL
POSITIVE%	REF ▬	SETUP
NEGATIVE%		REFLECT

3. After [READING] and the battery indicator are displayed, the value of
   the reference density will be shown.

DENSITY		CAL
POSITIVE%	READING▯	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	R: 1.13▬	SETUP
NEGATIVE%		REFLECT
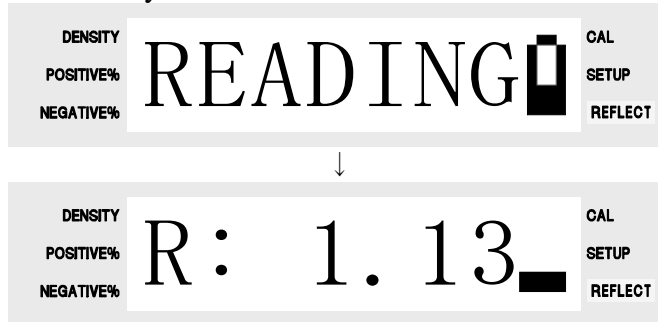
4. After [TARGET] is displayed, measure the target sample to compare.

DENSITY		CAL
POSITIVE%	TARGET ▬	SETUP
NEGATIVE%		REFLECT

5. After [READING] and the battery indicator are displayed, the value
   will be shown.

DENSITY		CAL
POSITIVE%	READING	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	0.25	SETUP
NEGATIVE%		REFLECT

◆Dot area measurement

Performs the dot area measurements of the target area.

The dot percent shows the ratio of the area where ink is put on the measured dot gradation area. For instance, a dot percent of 30% means that ink coverage is 30% of the measured patch.

   1. Press the MENU key and select the function menu.
   2. Select [DOT %] with the SCROLL key and press the ENTER. Key.

DENSITY		CAL
POSITIVE%	DOT %	SETUP
NEGATIVE%		REFLECT

   3. After [PAPER] is displayed, measure the paper density.

DENSITY		CAL
POSITIVE%	PAPER	SETUP
NEGATIVE%		REFLECT

     ㅜㅜ′   *If the PAPER key is pressed in the measurement screen, it is*
     CHECK   *possible to change the paper density value. For details on setting the paper density, see page 57.*

   4. After [READING] and the battery indicator are displayed, the paper density value will be shown.

DENSITY		CAL
POSITIVE%	READING▯	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	P: 0.08	SETUP
NEGATIVE%		REFLECT
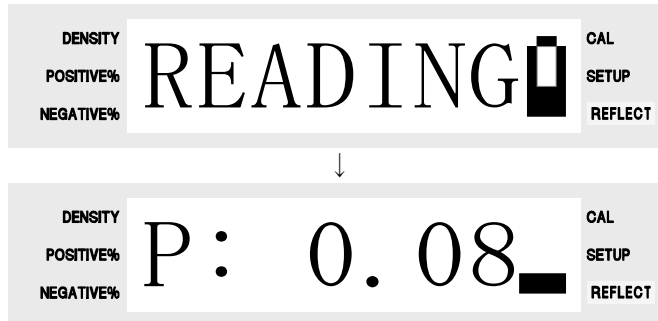
   5. After [SOLID] is displayed, measure the solid patch.

DENSITY		CAL
POSITIVE%	SOLID	SETUP
NEGATIVE%		REFLECT

     ㅜㅜ′   *If the SOLID key is pressed in the measurement mode, it is*
     CHECK   *possible to alter the solid density value. For details on setting the solid density value, see page 58.*

6. After [READING] and the battery indicator are displayed, the solid density value will be shown.
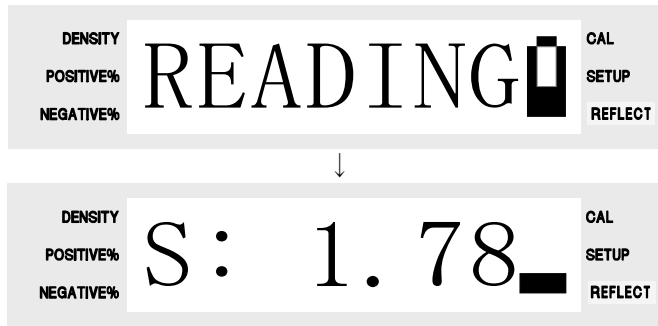
DENSITY		CAL
POSITIVE%	READING▯	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	S: 1.78▃	SETUP
NEGATIVE%		REFLECT

7. After [%SCREEN] is displayed, measure the halftone patch.

DENSITY		CAL
POSITIVE%	%SCREEN▃	SETUP
NEGATIVE%		REFLECT

8. After [READING] and the battery indicator are displayed, the value will be shown.

DENSITY		CAL
POSITIVE%	READING▯	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	85%▃	SETUP
NEGATIVE%		REFLECT
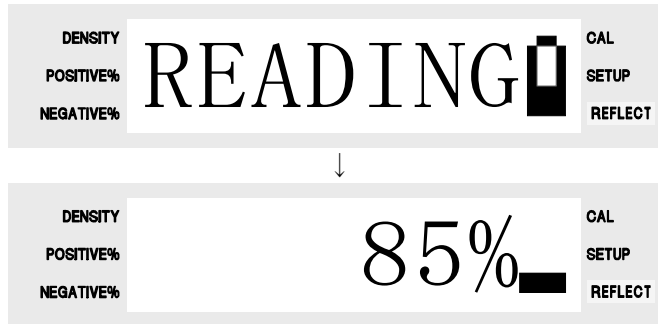
ＴＴ′
CHECK

To measure the dot area, it is necessary to set the density value of the   paper,   and   solid   density. For details on setting the paper density of dot area, see page 57. For details on setting the solid density, see page 58

.

Setting the paper density

It is necessary to set the paper density before performing a measurement of a halftone patch. Then, the dot percent compared with the paper density set to zero will be displayed.

1. Press the PAPER key in the measurement mode.
2. After [PAPER] is displayed, measure the paper density.

DENSITY		CAL
POSITIVE%	PAPER ▬	SETUP
NEGATIVE%		REFLECT

3. After [READING] and the battery indicator are displayed, the value of the paper density will be shown.

DENSITY		CAL
POSITIVE%	READING▯	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	P: 0.08▬	SETUP
NEGATIVE%		REFLECT

4. After [%SCREEN] is displayed, measure the halftone patch.

DENSITY		CAL
POSITIVE%	%SCREEN▬	SETUP
NEGATIVE%		REFLECT

5. After [READING] and the battery indicator are displayed, the value will be shown.

DENSITY		CAL
POSITIVE%	READING▯	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	85%▬	SETUP
NEGATIVE%		REFLECT

Setting the solid density

It is necessary to set the solid density before performing a measurement of a halftone patch. Then, the dot percent compared with the solid density set to 100% will be displayed.

1. Press the SOLID key in the measurement mode.
2. After [SOLID] is displayed, measure the solid density.

DENSITY		CAL
POSITIVE%	SOLID ▬	SETUP
NEGATIVE%		REFLECT

3. After [READING] and the battery indicator are displayed, the value of the solid value will be shown.

DENSITY		CAL
POSITIVE%	READING▯	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	S: 1.78▬	SETUP
NEGATIVE%		REFLECT

4. After [%SCREEN] is displayed, measure the halftone patch.

DENSITY		CAL
POSITIVE%	%SCREEN▬	SETUP
NEGATIVE%		REFLECT

5. After [READING] and the battery indicator are displayed, the value will be shown.

DENSITY		CAL
POSITIVE%	READING▯	SETUP
NEGATIVE%		REFLECT

↓

DENSITY		CAL
POSITIVE%	85%▬	SETUP
NEGATIVE%		REFLECT

12.6. <u>SYSTEM SETUP</u>

Various settings of R500 such as the operating environment can be adjusted in the setup mode. In the setup mode, the following settings can be made.

（1）Setting the value resolution　　　[VALUE]
（2）Setting the value mode　　　　　[READING]
（3）Setting the automatic renewal　[DETECT]
（4）Setting the N-value　　　　　　[N VALUE]
（5）Setting the sound control　　　[SOUND]

Settings made in the setup mode are written into nonvolatile memory and stored until the setting is changed again.

Common operations for every setup

1. Press the MENU key to display the function menu.
2. Select "SETUP" by using the SCROLL key, and then press the ENTER key.

DENSITY		CAL
POSITIVE%	SETUP	SETUP
NEGATIVE%	▬	REFLECT

3. Each setting item is displayed.

The first setting item to be displayed is [VALUE].

4. Select the item to set up with the SCROLL key, and press the ENTER key.
5. Set the selected item.
6. After the setup operation, the display returns to the measurement mode.

⌝⌝′ *If the setup needs to be cancelled, press the MENU key. Then, the*
CHECK *display returns to the function menu.*

Setup mode key operation

For each setup item, the functions of the following operation keys are common.

ARROW SCROLL key: This is for changing the selected items. For entering numeric values, the numbers on the display can be scrolled in turn.

Current value $\rightarrow$ $\cdots$ $\rightarrow$ Maximum value $\rightarrow$
Minimum value $\rightarrow \cdots \rightarrow$ Current value $\rightarrow$

ENTER key: This is for defining the selected item on the display and returning to the measurement mode.

MENU key: This is for stopping the setup and returning to the function menu.
In that case, the previous settings will not be changed.

HINT *When the SCROLL key is kept pressed, the numeric values are continuously scrolled. If the SCROLLand ENTER keys are pressed at the same time, the displayed setting value can be returned to the initial value, which was set by the manufacturer before delivery.*

◆Setting the value resolution

Choose one of the two decimal precisions to be displayed.

x.xx   : Displays 2 places beyond the decimal point
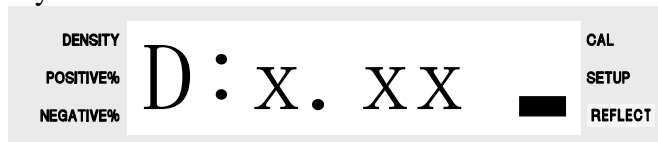
x.xxx   : Displays 3 places beyond the decimal point

1. Press the MENU key to display the function menu.
2. Select [SETUP] with the SCROLL key, and press the ENTER key.

DENSITY	SETUP	CAL
POSITIVE%		SETUP
NEGATIVE%	▬	REFLECT

3. Select [VALUE] with the SCROLL key and press the ENTER key.

DENSITY	VALUE	CAL
POSITIVE%		SETUP
NEGATIVE%	▬	REFLECT

4. Select one of [D:x.xx]、[D:x.xxx] with the SCROLL key and press the ENTER key.

DENSITY	D:x. xx	CAL
POSITIVE%		SETUP
NEGATIVE%	▬	REFLECT

5. Return to the measurement mode.

◆Setting the value mode

Select one of the two reflection densitometer measurement value modes.

ABS（absolute density）: In accordance with the calibration standard, the absolute density compared with the density of the complete diffuse reflection surface (calibration standard) as zero will be displayed.

REL（relative density） : This shows the relative density compared to the paper density as zero.
In this case, it is necessary to measure the paper density before the relative density measurement.

For details on setting the paper density of reflection density measurements, see page 50.

1. Press the MENU key to display the function menu.
2. Select [SETUP] with the SCROLL key and press the ENTER key.

DENSITY
POSITIVE%
NEGATIVE%
SETUP
CAL
SETUP
REFLECT

3. Select [READING] with the SCROLL key and press the ENTER key.

DENSITY
POSITIVE%
NEGATIVE%
READING
CAL
SETUP
REFLECT

4. Select one of .[ABS   ]、[REL   ] with the SCROLL key and press the ENTER key.

DENSITY
POSITIVE%
NEGATIVE%
ABS
CAL
SETUP
REFLECT

5. Return to the measurement mode.

◆Setting the automatic renewal

Auto renewal is used to set the measured paper or solid density value automatically to a new value, by only the measurement of paper density or dot area.

ON : The automatic renewal function is valid.

OFF : The automatic renewal function is invalid.

TT'
CHECK
It will be valid when the measurement mode is set to relative density in the reflection density measurement. For details on setting the measurement mode, see page 7.

For details on setting the paper density in reflection density measurements, see page 50.
For details on setting the paper density in dot area measurements, see page 57.
For details on setting the solid density in dot area measurements, see page 57.
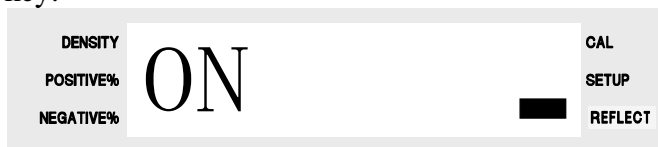
1. Press the MENU key and display the function menu.
2. Select [SETUP] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	SETUP	SETUP
NEGATIVE%	▬	REFLECT

3. Select [DETECT] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	DETECT	SETUP
NEGATIVE%	▬	REFLECT

4. Select one of [ON]、[OFF] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	ON	SETUP
NEGATIVE%	▬	REFLECT

5. Return to the measurement mode.

67

◆Setting the N-Value

The N-value is used to calculate the percent dot by using the Yule-Nielson equation, and it changes depending on the screen ruling and quality of paper. When the N-value is set to 「1」, Murray-Davies equation is performed instead of Yule-Nielson. Since this is generally a popular method, N-value is normally set to 「 1 」 Enter the N-value directly and set.

Setting range: 0.00～3.00

1. Press the MENU key to display the function menu.
2. Select [SETUP] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	SETUP ▬	SETUP
NEGATIVE%		REFLECT

3. Select [N VALUE] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	N VALUE▬	SETUP
NEGATIVE%		REFLECT

4. The current value will be displayed.
5. Enter the new value with the SCROLL key.
Display the desired value and press the ENTER key.

DENSITY		CAL
POSITIVE%	N:1. 00 ▬	SETUP
NEGATIVE%		REFLECT

6. Return to the measurement mode.

☼
HINT   *If the SCROLL key and the ENTER key are pressed simultaneously, the value will return to [1.00].*

◆**Setting the sound control**

It is possible to set the sound control to ON or OFF.

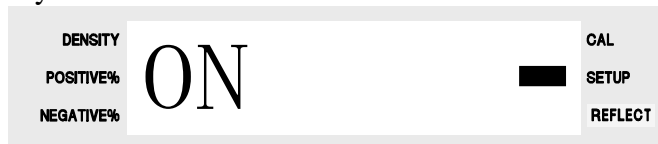   ON   : The buzzer will beep.

    OFF : The buzzer will not beep.

    1. Press the MENU key to display the function menu.
    2. Select「SETUP」with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	SETUP	SETUP
NEGATIVE%		REFLECT

    3. Select [SOUND] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	SOUND	SETUP
NEGATIVE%		REFLECT

    4. Select either [ON   ] or [OFF   ] with the SCROLL key and press the ENTER key.

DENSITY		CAL
POSITIVE%	ON	SETUP
NEGATIVE%		REFLECT

    5. Return to the measurement mode.

12.7. <u>MAINTENANCE</u>

◆**Replacing the battery**

The R500 reflection densitometer has a NiCd battery built in. Its service life is around two years, but may be shortened if charged often. If the battery capacity cannot be recovered even after recharging or the battery capacity is used up soon after recharging, the service life has been reached. Replace the NiCd battery.

    Replacement part (option): NiCd battery (Part No.: H02523AS)

      ⊤⊤′ *When ordering the NiCd battery, inform the service*
    CHECK *representative of the serial number of the equipment.*

How to replace the NiCd battery

1. Prepare a large Phillips screwdriver.
2. Remove the AC adapter. Turn off the main power switch on the rear side of the equipment.
3. Put the equipment upside down. Remove the six screws on the bottom. Take off the metal cover.
4. Pull out the connector at the end of the cable extended from the NiCd battery. Take out the NiCd battery.
5. Put a new NiCd battery in position. Securely insert the connector.
6. Correctly place the cable in the groove. Place the metal cover in its original position. Tighten the six screws.
7. Connect the AC adapter for charging.

CHECK *If the charge lamp is not lit orange within one minute after the AC adapter is connected, check to insure proper connection of the battery connector.*

STOP *Never disassemble the battery. Its strong alkali electrolyte may injure skin and clothes. Should the electrolyte leak, thoroughly wash the battery with water before handling.*

Also, never place the battery into a fire. The battery may explode and is extremely dangerous.

Ni-Cd *The NiCd battery is a valuable recyclable resource. Please do not discard it, but bring it to a NiCd battery recycle shop for reuse.*

◆Replacing the lamp

The life of the lamp unit should last for some years under "normal" use. If the lamp unit ever fails, please contact your local dealer or manufacturer for replacement instructions.

For the replacement method, refer to the instruction enclosed in the lamp unit.

Replacement parts: Lamp unit (Part No.: H02383PB)

CHECK *Please inform your representative of the serial number of the machine when ordering the replacement lamp unit.*

◆Options and Replacement Parts

Replacement parts include: For the R500
Lamp unit (Part No.: H02383PB)
NiCd battery (Part No.: H02461AS)
Calibration reference (Part No.: H01721AS)

12.8. <u>Specifications</u>

Model	Portable black and white reflection densitometer / **R500**
Dimensions	Console: 210mm(D)×72mm(W)×50mm(H) "8.3 x "2.8 x "2.0
Weight	Approximately 530g (including battery)
Optical design	0°/45° (ISO 5/4、ANSI PH2.17、DIN 16536)
Aperture	ϕ 3mm
Response	Visual (ISO 5/3)
Polarization filter	Optional
Measurement functions	Density, Dot Area %
Measuring range	Density: 0.00D - 2.50D, Dot Percentage: 0% to 100%
Repeatability	±0.01D (at<2.0D, ±1%)
Accuracy	±0.02D (at<2.0D, ±2%)
Calculation method	Yule-Nielson Equation
Light source	Halogen tungsten lamp
Detector	Filter, built-in photo diode
Operating temperature range	41 - 104 °F (5 - 40 °C)
Operational key	6 sheet keys
Battery	NiCd battery 4.8V-800mAh
Charging time	Approximately 1.5 hours
Battery status indicator	Displayed on the display of the **T500** when a measurement is performed
Sound control	Supported (It is possible to set on or off.)
Calibration	Calibration using calibration reference
Standard accessories	Operation manual (including warranty), Calibration reference, Soft case, Serial communication cable 8P-8P