COLOR REFLECTION DENSITOMETER

OPERATION MANUAL

(Model R710, R720, R730)

IHARA

IHARA

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Dear Customer:

Congratulations! You have just purchased one of the finest color measurement instruments available. We appreciate the opportunity to serve you and we hope that you will be thoroughly satisfied with this product.

We at Ihara have a long history of engineering products to perform to exacting standards - standards based on our commitment to meeting and exceeding customer needs. A key component of this commitment is Ihara's strong and continuing research and development initiatives - initiatives designed to meet the changing needs of our customers well into the future.

Thank you again for selecting one of our quality products.

Sincerely,

Masayuki Itoh
President

OWNER'S RECORD

Model No. _____

Serial No. _____

Date of Purchase _____

Place of Purchase _____

Invoice No. _____

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- ☐ PACKING LIST
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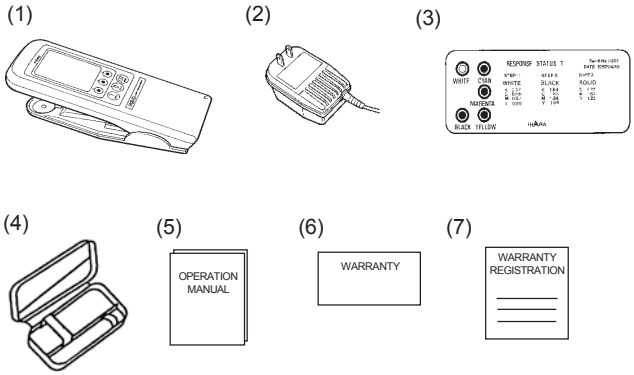
- ☐ LCD CONTRAST ADJUSTMENT

PACKING LIST

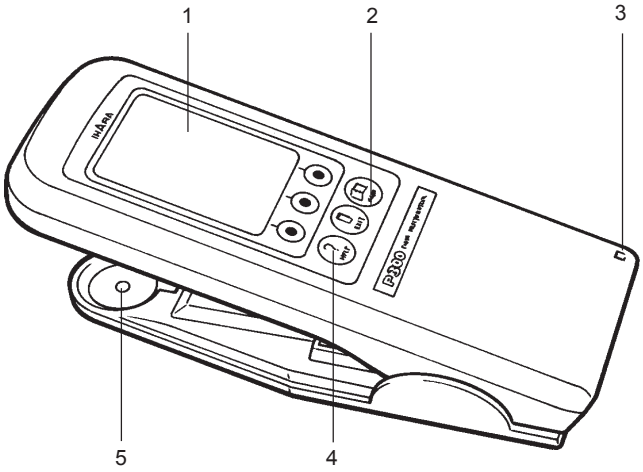
Before operating this instrument, please inspect for damage and check the packing list below to ensure that all parts are included in this package.

If there is a sign of damage due to shipping, please contact the shipper immediately.

Item #	Part No.	Description	Quantity
1	R7_0	Reflection Densitometer	1
2	406-002	AC Adapter - U.S.A. (120 VAC)	1
	406-003	AC Adapter - Europlug (220 VAC)	
	406-004	AC Adapter - Great Britain (230 VAC)	
3	403-004	Calibration Reference Card	1
4	405-001	Carrying Case	1
5	409-007	Operation Manual	1
6	803-111	Warranty Statement	1
7	563-101	Warranty Registration Card	1



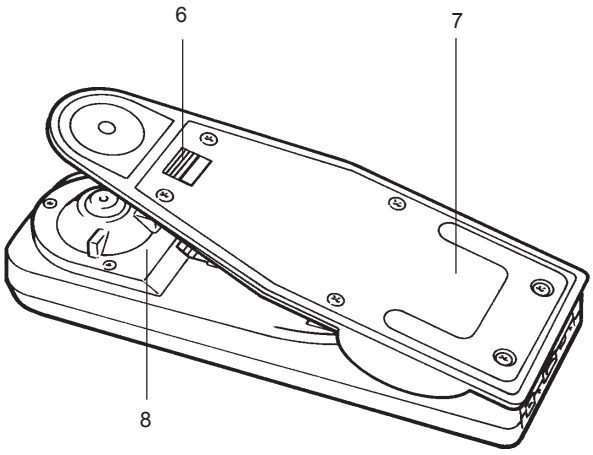
FEATURES



(Top View)

1. Large graphic LCD display with contrast adjustment.
2. Menu key: Main selection for all measurement functions.
3. Cable harness attachment (Ihara Part No. 413-001).
4. Help key: Help selection for all measurements.
5. Aperture target (3.0 mm or 1.7 mm).

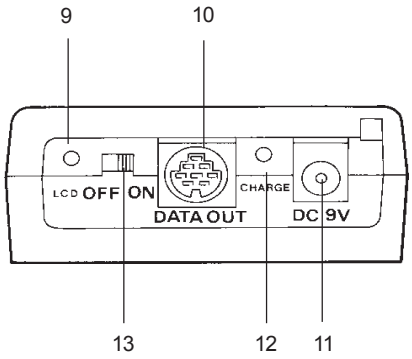
FEATURES



(Bottom View)

6. Shoe lock.
7. Battery compartment.
8. Interchangeable aperture attachment.

FEATURES



(Rear View)

9. LCD contrast adjustment.

10. Configurable RS-232C communication port.

11. AC adapter receptacle.

12. Charge status indicator:
    Green light indicates the battery is fully charged.
    Orange light indicates the battery is charging.

13. On/Off switch.

PRECAUTIONS

Every reflection densitometer is manufactured with the highest quality of workmanship. To assure long-lasting operation with this instrument, please read the following information carefully.

- Before operating this instrument for the first time, charge the instrument for approximately 1.5 hours. The unit is operable while it is charging.
- Avoid operating in an area where the instrument may be exposed to direct sunlight, high humidity or extreme temperatures.
- Examine periodically for dust or dirt in the optical area. If cleaning is necessary, please contact Ihara or a local dealer for further assistance.
- Calibrate the instrument periodically to ensure constant readings, especially after a long period of non-usage.
- **Use the AC adapter that came with the instrument**; all others may result in damage to the instrument.
- Dropping or misuse of this instrument may cause serious damage.

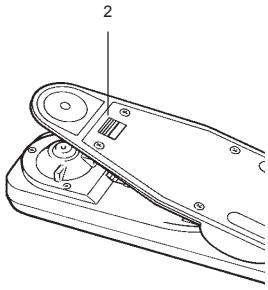
MEASUREMENT SHOE / POWER ON

Lock/unlock shoe

1. Locate the shoe lock on the underside of the measurement shoe.

2. To unlock: Gently slide the shoe lock forward to release the measurement shoe.

   To lock: Close the measurement shoe and gently slide the shoe lock backward.



Power On

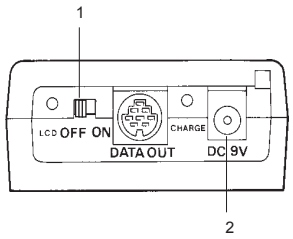
1. With the measurement shoe unlocked, gently slide the on/off switch to the "on" position.

2. Depress any one of the six function keys until the LCD screen is lit.

CHARGING BATTERY

Every densitometer is equipped with a built-in charging system. Please give special attention to the following details. Incorrect procedure may permanently damage this instrument.

Charging Sequence



1. Make sure the unit is turned off prior to connecting to the AC adapter.

2. Insert the AC adapter outlet plug into the receptacle in the back of the unit.

3. Plug the AC adapter into an electric outlet. Full charge should take approximately 1.5 hours.

4. When the unit is not to be used for a long period of time, be sure to slide the "on-off" switch to off.

CHARGING BATTERY

■ **Note:**

- **Use the AC adapter that came with the instrument**; all others may result in damage to the instrument. Make sure the AC adapter you use is center-negative.

- It takes approximately 1.5 hours to fully charge the unit.

- Ni-Cad batteries may be charged repeatedly. However, the time between required charges will reduce gradually. If the charging frequency increases dramatically, use the BATTERY REFRESH function in the SYSTEM SETUP menu to rejuvenate the battery (see page 28 for more details). If BATTERY REFRESH is not successful, replacement of the battery will be necessary.

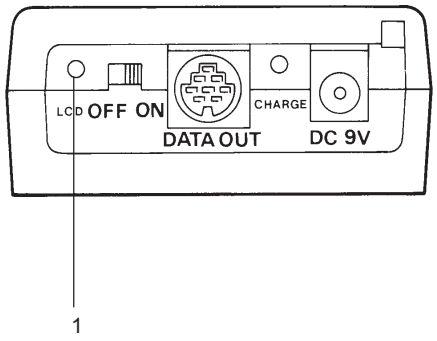
LCD CONTRAST ADJUSTMENT

It is possible to adjust the contrast of the liquid crystal display (LCD) by turning the adjustment screw in the left rear of the instrument (see diagram below).

The contrast of the LCD is adjusted at the factory. However, contrast may change, depending on the ambient temperature. You may adjust the LCD contrast to suit your preference.

We recommend that you use a flat jeweler's screwdriver to make the adjustment.

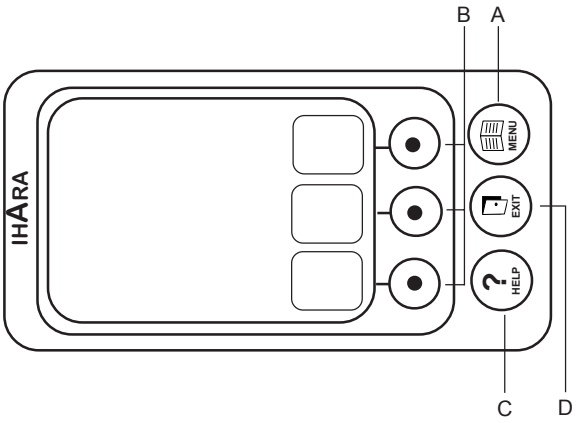
1. LCD Contrast Adjustment
   Turn clockwise: Increases contrast
   Turn counterclockwise: Decreases contrast



GENERAL OPERATION

- ☐ FUNCTION KEYS
- ☐ MEASUREMENT MODES
- ☐ SYSTEM SETUP
- ☐ HOW TO TAKE A MEASUREMENT
- ☐ GUIDE TO MEASUREMENT FUNCTIONS

FUNCTION KEYS



A MENU KEY

Opens the Function Menu. Each time you wish to select a new function, press the MENU key to open the Function Menu to begin selection.

B FUNCTION KEYS

The function of the three variable function keys is indicated to the left of each key on the LCD.

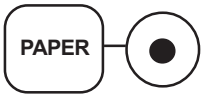
C HELP KEY

Opens the Help Menu which offers explanations and procedures for each measurement function and setup option.

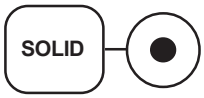
D EXIT KEY

Returns to the previous screen. Cancels the instruction message.

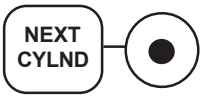
FUNCTION KEYS



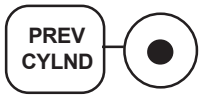
Prompts you to measure paper or enter paper values manually.



Prompts you to measure solid or enter solid values manually.



Proceed to the next cylinder.



Return to the previous cylinder.

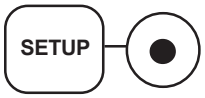
Proceed to the next page.

Return to the previous page.

Scroll up.

Scroll down.

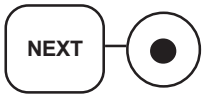
FUNCTION KEYS



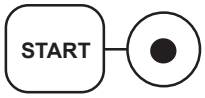
Opens up the setup options menu of the function displayed.

Select highlighted item.

Select item to revise value.



Proceed to next item.



Begins battery refresh process.

Prompts you to measure reference target or enter values manually.

MEASUREMENT MODES

- **DENSITY** (R710, R720, R730)

  Measures the change in ink film thickness.

- **DENSITY DIFFERENCE** (R710, R720, R730)

  Measures the change in ink film thickness with reference to a measurement standard.

- **DOT AREA** (R720, R730)

  Measures the dot area on a halftone patch.

- **DOT GAIN** (R720, R730)

  Measures the increase in size of the halftone. It allows the user to evaluate the quality of the print.

- **AUTO-FUNCTION** (R720, R730)

  This measurement function allows the user to measure density, dot gain and ink-trap (R730 only) interchangeably.

- **INK-TRAP** (R730)

  This measurement evaluates the overprints, i.e., the ability of a printed ink to accept a second ink.

MEASUREMENT MODES

- **CONTRAST** (R730)

  Evaluates the contrast of a specific print. It assists the operator in attaining the maximum contrast between ink laid down and dot gain at the 3/4 tone.

- **HUE ERROR** (R730)

  Measures the ink consistency of a color reproduction. Also, hue error measurements are needed by the color separator to adjust to the correct color.

- **GRAYNESS** (R730)

  Measures the contamination of one ink with another. If the measurement deviates from the usual reading, then contamination may have occurred.

- **SATURATION** (R730)

  Evaluates the color density as it deviates from a neutral gray.

- **CAST** (R730)

  Evaluates the highest and lowest of the red, green and blue reflectance. Cast is measured to evaluate the color of the paper.

MEASUREMENT MODES

- **BRIGHTNESS** (R730)

  Evaluates the brightness of the paper. This value is equal to the blue reflectance.

- **DOT ANALYSIS** (R730)

  This measurement allows the operator to measure and to plot the print characteristic curve (dot gain curve) for a press. You may record up to 8 cylinders.

- **SECURITY USER CODE** (Optional for R710, R720, R730)

  As an option to safeguard your investment, the R-series densitometers may be set to operate only with the correct user code.

  NOTE:

  Please note that Ihara's R-series color reflection densitometers are upgradeable. Should you be interested in upgrading your instrument, please contact your local dealer or Ihara for more information.

SYSTEM SETUP

The system setup menu allows the user to customize certain operation functions and the LCD display.

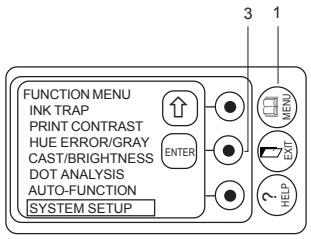
1. Press the MENU key to open the Function Menu.

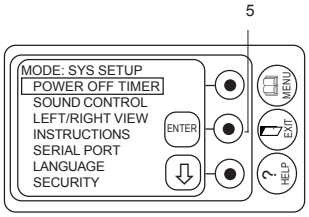
2. Press the DOWN ARROW key to scroll to SYSTEM SETUP.

3. Press the ENTER key to select System Setup.

4. Press the appropriate arrow key to scroll to the item you want to configure.

5. Press the ENTER key to make the selection.





SYSTEM SETUP

You may customize the following system setup parameters:

POWER OFF TIMER

The auto-off timer can be preset to turn the power off at 40 seconds, 90 seconds, or 210 seconds. You may also select DISABLE to inactivate this option. The unit will then shut off only with the ON/OFF switch located on the rear of the instrument.

SOUND CONTROL

The user may turn the "beep" sound on or off.

LEFT/RIGHT VIEW

The user may adjust the viewing direction of the LCD depending on whether the user is right-handed or left-handed.

INSTRUCTIONS

The user may turn on the instruction feature, which enables instruction messages to appear for the next measurement function. Press the EXIT key to close the instruction box.

SYSTEM SETUP

SERIAL PORT

The settings on the RS-232C serial communication port can be changed to support various protocols. The default settings are:
RATE: 19200 BPS
DATA: 8 BIT
STOP: 1 BIT
PARITY: NONE

LANGUAGE

The user has the option to set the language version of the instrument to English or Spanish.

BATTERY REFRESH

The built-in Ni-Cad battery has a life of about two years. If battery performance declines before this time, the user may perform battery refresh. To completely discharge the battery before recharging, perform the following steps:
1. Connect AC adapter to the instrument.
2. Push the start key to refresh and recharge the battery.

VERSION INFORMATION

Indicates the following information about the current unit:
Model
Optics
Language
Serial No.
ROM Ver.

SYSTEM SETUP

SECURITY

Ihara densitometers have an optional security function to safeguard your investment. The densitometer will operate only with the correct user code. Please contact Ihara for more information.

If you have purchased this optional security feature, please follow the following steps to set up:

1. Enter the 5 digit number provided by Ihara to access the security feature.

2. Select and enter your own 4 digit security code.

3. Confirm your 4 digit security code by entering it again.

4. Select the number of measurement readings to be allowed before the security confirmation screen appears.

5. After the above-assigned number of measurements have been made, a technical support information screen will appear before the instrument shuts off. When you then turn on the instrument to take a measurement, the prompt to enter the security code appears.

6. You have two attempts to enter the correct security code.

7. If the security code is entered incorrectly, the instrument will turn off automatically.

HOW TO TAKE A MEASUREMENT

Steps to take a measurement:

1. Locate the power switch in the rear of the instrument and slide it to the ON position.
2. Press the MENU key to open the Function Menu.
3. Scroll down to highlight a measurement function.
4. Press the ENTER key to select the function.
5. Place the aperture target window on the area you wish to measure.
6. Depress the top front of the instrument until the optical head is in contact with the target window.
7. Release the top front of the instrument.
8. Measurement reading is displayed on the LCD.

GUIDE TO MEASUREMENT FUNCTIONS

To introduce the user to the various features of the densitometer, each measurement function section contains the following subsections:

- **LCD Layout**

  Identifcation of all the indicators and variable function keys.

- **Measurement Mode**

  Steps to enter into a measurement mode.

- **Measurement Procedures**

  Steps to make a measurement.

- **Setup Parameters**

  Description of available setup parameters for each measurement function.

- **Customization of Setup Parameters**

  Example to demonstrate customizing of setup parameters.

CALIBRATION PROCEDURES

- ☐ STANDARD CALIBRATION
- ☐ QUICK CALIBRATION

CALIBRATION

Before operating the densitometer for the first time, you must calibrate the instrument. It is recommended that calibration be performed periodically to ensure accurate measurement.

Standard Calibration vs Quick Cal:

A Calibration Reference Card is provided with each instrument (see page 36). You may also use other calibration cards.

If you are calibrating this instrument for the first time, please select standard calibration.

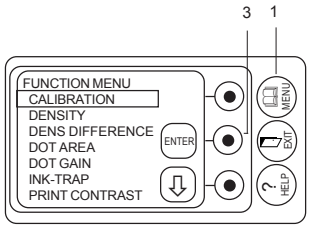
If the calibration reference card values had previously been entered into the instrument (Steps 1 through 3), select Quick Cal and measure each of the reference patches on the Calibration Reference Card (Steps 4 through 8, page 38).

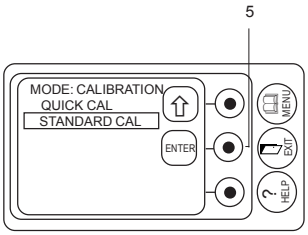
To achieve inter-instrument agreement, all densitometers should be calibrated using a single calibration card even though the densitometers may be from different manufacturers.

STANDARD CALIBRATION

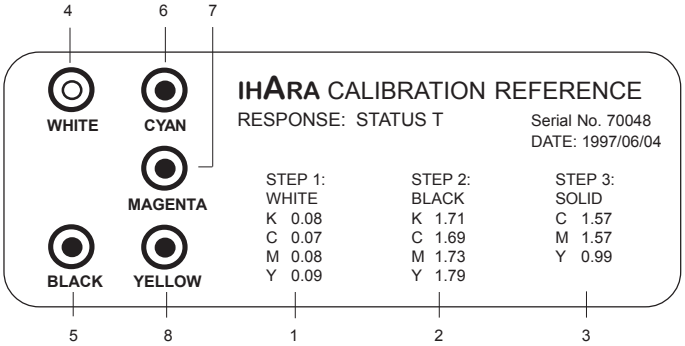
To enter calibration mode:

1. Press the MENU key to open the Function Menu.
2. Press the UP ARROW key to scroll to CALIBRATION.
3. Press the ENTER key to select Calibration function.
4. Press the DOWN ARROW key to scroll to STANDARD CAL.
5. Press the ENTER key to select Standard Calibration.





STANDARD CALIBRATION



Example: Ihara Calibration Reference Card with Calibration Steps.

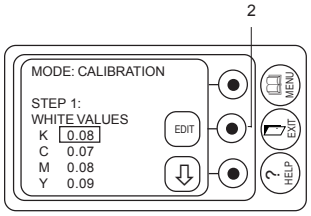
Entering Calibration Values

You must match the values displayed on the LCD with those on the Calibration Reference Card. If values displayed differ from those on the Calibration Reference Card, perform the following procedure:

1. Press the appropriate arrow key to scroll to the value you want to change.

2. Once that value is highlighted, press the EDIT key to select.

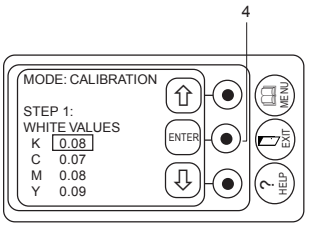
3. The value selected will begin flashing. You can use the UP ARROW or DOWN ARROW function keys to increase or decrease the value.



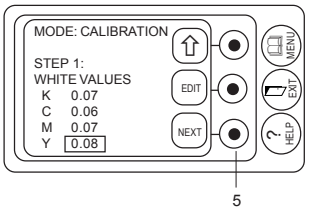
STANDARD CALIBRATION

4. Once you have finished matching the value. Press the ENTER key to record the value.

   Continue with the other white values.



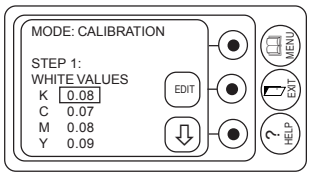
5. Press the NEXT function key to advance to the next step.



Calibration Steps:

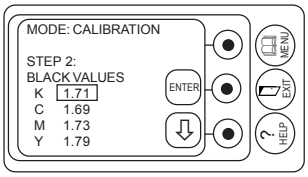
STEP 1:

Enter calibration values for the white patch (see page 36).



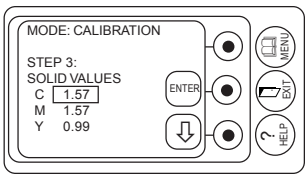
STEP 2:

Enter calibration values for the black patch (see Calibration Reference Card for black patch values).



STANDARD CALIBRATION

STEP 3:



Enter calibration values for the cyan, magenta, and yellow patches (see Calibration Reference Card for solid patch values).

STEP 4:

Measure the white patch on the Calibration Reference Card.

STEP 5:

Measure the black patch on the Calibration Reference Card.

STEP 6:

Measure the cyan patch on the Calibration Reference Card.

STEP 7:

Measure the magenta patch on the Calibration Reference Card.

STEP 8:

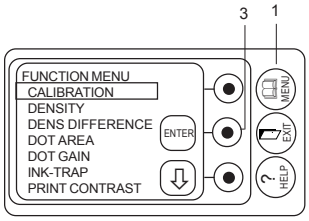
Measure the yellow patch on the Calibration Reference Card.

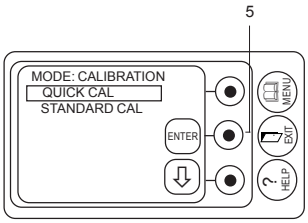
Calibration completed.

QUICK CAL

To enter calibration mode:

1. Press the MENU key to open the Function Menu.
2. Press the UP ARROW key to scroll to CALIBRATION.
3. Press the ENTER key to select Calibration function.
4. Press the UP ARROW key to scroll to QUICK CAL.
5. Press the ENTER key to select Quick Cal.





QUICK CAL

Quick Calibration may be selected if standard calibration has already been performed.

Calibration Steps:

STEPS 1, 2, and 3 are omitted.

STEP 4:

Measure the white patch on the Calibration Reference Card.

STEP 5:

Measure the black patch on the Calibration Reference Card.

STEP 6:

Measure the cyan patch on the Calibration Reference Card.

STEP 7:

Measure the magenta patch on the Calibration Reference Card.

STEP 8:

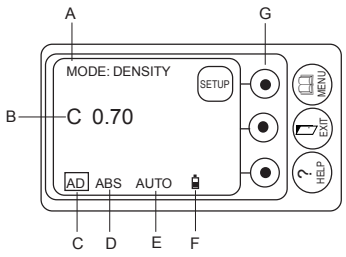
Measure the yellow patch on the Calibration Reference Card.

Calibration completed.

MEASUREMENT FUNCTIONS

- ☐ DENSITY
- ☐ DENSITY DIFFERENCE
- ☐ DOT AREA
- ☐ DOT GAIN
- ☐ INK-TRAP
- ☐ PRINT CONTRAST
- ☐ HUE ERROR/GRAYNESS/ SATURATION
- ☐ CAST/BRIGHTNESS
- ☐ DOT ANALYSIS
- ☐ AUTO-FUNCTION

DENSITY



A Function Indicator

Current mode: DENSITY

B Measurement Indicator

C Auto-Detection Indicator

On - allows the instrument to automatically detect paper or solid measurements.
Off - allows the user to specify exactly what is being measured.

D Measurement Format:

Absolute - Measurement includes paper values.
Relative - Measurement excludes paper values.

E Display Format:

AUTO - Displays only the dominant color.
ALL (CMYK) - Displays all four colors.
SINGLE - Displays only the color selected.

F Battery Indicator

G SETUP Function Key

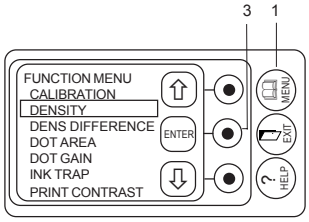
DENSITY

To enter density mode:

1. Press the MENU key to open the Function Menu.

2. Press the appropriate arrow key to scroll to DENSITY.

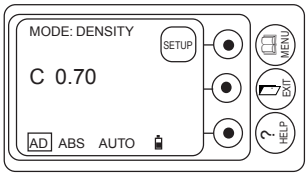
3. Press the ENTER key to select the density function.



Density measurement step:

1. Measure solid.

Measurement reading displayed.



DENSITY

Setup Parameters:

Display Format

Displays measurement reading as AUTO (dominant color only), ALL (CMYK), SINGLE (selected color).

Value Precision

Displays 2 or 3 decimal precision.

Measuring Mode

Displays measurement reading as absolute (including paper) or relative (excluding paper).

The default setting is in the absolute density mode. The absolute mode is recommended, since we are usually only concerned with the total visual response on a printed surface (paper included).

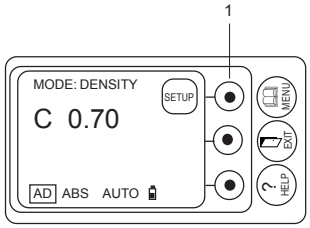
Auto-Detection

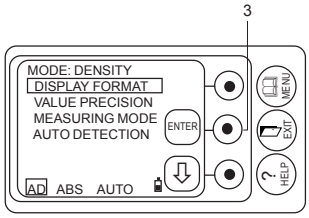
Automatically detects if a density or density difference measurement is that of a solid or paper.

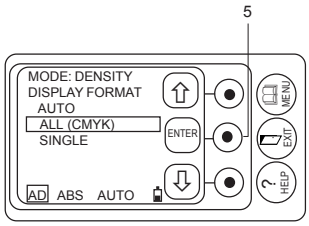
Auto-Detection may be turned off if the user needs to specify exactly what is being measured.

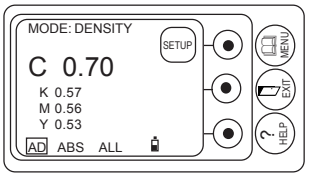
Example customization of setup parameters:

1. Press the SETUP key.
2. Press the appropriate arrow key to scroll to the setup parameter you wish to change.
3. Press the ENTER key to select the highlighted item.
4. Press the appropriate arrow key to scroll to the desired option.
5. Press the ENTER key to input selection.
6. Measurement screen displayed.
7. You may now take a measurement with your newly selected setup option.

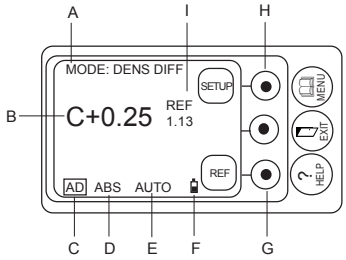








DENSITY DIFFERENCE



A Function Indicator

Current mode: DENSITY DIFFERENCE

B Measurement Indicator

C Auto-Detection Indicator (See page 42)

D Measurement Format (See page 42)

E Display Format (See page 42)

F Battery Indicator

G REF Function Key

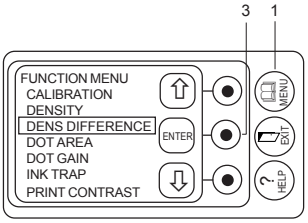
H SETUP Function Key

I Reference Value Indicator

DENSITY DIFFERENCE

To enter density difference mode:

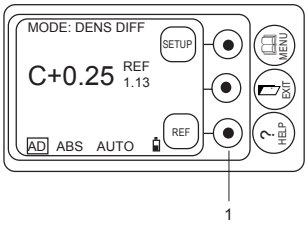
1. Press the MENU key to open the Function Menu.
2. Press the appropriate arrow key to scroll to DENS DIFFERENCE.
3. Press the ENTER key to select the density difference function.



Density difference measurement step:

1. Press the REF function key.
2. Measure reference target or input reference values manually.
3. Measure target.

Measurement reading displayed.



DENSITY DIFFERENCE

Setup Parameters:

Display Format (See page 44)

Measuring Mode (See page 44)

Reference

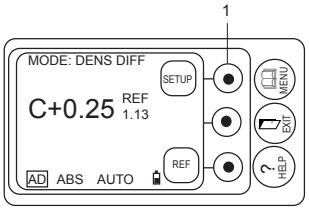
Density difference is a comparison between the reference and the target. Therefore, the user must first enter the reference value before measuring the target. Measure reference or enter value(s) manually.

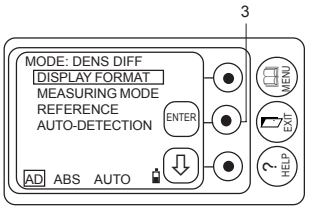
Auto-Detection (See page 44)

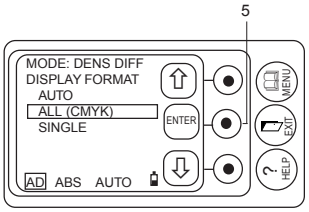
DENSITY DIFFERENCE

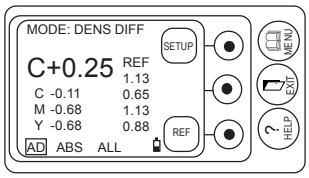
Example customization of setup parameters:

1. Press the SETUP key.
2. Press the appropriate arrow key to scroll to the setup parameter you wish to change.
3. Press the ENTER key to select the highlighted item.
4. Press the appropriate arrow key to scroll to the desired option.
5. Press the ENTER key to input selection.
6. Measurement screen displayed.
7. You may now take a measurement with your newly selected setup option.

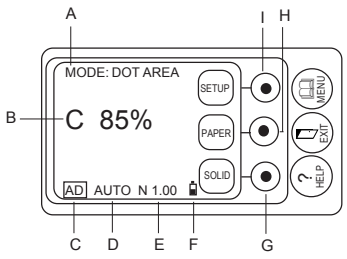








DOT AREA



A Function Indicator

Current mode: DOT AREA

B Measurement Indicator

C Auto-Detection Indicator

On - allows the instrument to automatically detect paper, solid, or halftone measurements.
Off - allows the user to specify exactly what is being measured.

D Display Format:

AUTO - Displays only the dominant color.
SINGLE - Displays only the color selected.

E N-Value Indicator

F Battery Indicator

G SOLID Function Key

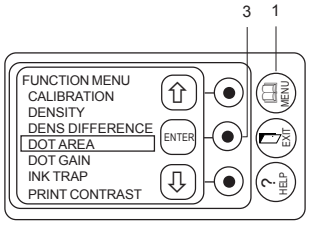
H PAPER Function Key

I SETUP Function Key

DOT AREA

To enter dot area mode:

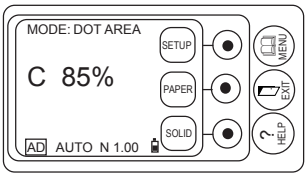
1. Press the MENU key to open the Function Menu.
2. Press the appropriate arrow key to scroll to DOT AREA.
3. Press the ENTER key to select the dot area function.



Dot area measurement steps:

1. Measure paper.
2. Select the halftone patch.
3. Measure the solid patch nearest the selected halftone patch.
4. Measure the selected halftone patch.

Measurement reading displayed.



DOT AREA

Setup Parameters:

N-Value

The default N-value is 1. The apparent dot area being evaluated is the physical dot plus the optical dot effects on a printed surface. When N is set other than 1 (Yule-Nielson Equation), the physical dot area is evaluated, which only considers the actual dot coverage and does not include optical dot.

Steps to enter N-Value:

1. Press the SETUP key.
2. Press the appropriate arrow key to highlight the N-value selection.
3. Press the ENTER key to select.
4. The current N-value will blink.
5. Press the appropriate arrow key to edit the value.
6. Press the ENTER key to input the updated value.

Display Format

Displays measurement reading as AUTO (dominant color only) or SINGLE (selected color).

Auto-Detection

Automatically detects if a dot area or dot gain measurement is that of a solid, paper, or halftone.

Auto-Detection may be turned off if the user needs to specify exactly what is being measured.

DOT AREA

Setup Parameters:

Paper
Measure paper or enter value(s) manually.

Solid
Measure solid or enter value(s) manually.

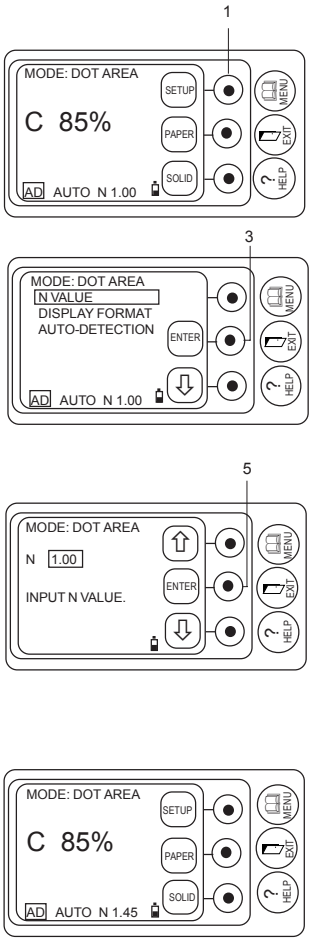
Steps to enter paper or solid values manually:

1. Press the EXIT key to clear the instruction message box.
2. Press the appropriate arrow key to scroll to the item you wish to change.
3. Press the EDIT key to select item.
4. The selected item will begin to blink.
5. Press the appropriate arrow key to change the value.
6. Press the ENTER key to input value.
7. Repeat steps 2 through 6 until all items have been updated.
8. Press the DOWN ARROW function key to scroll down to the color yellow.
9. Press the NEXT key to return to measurement mode.

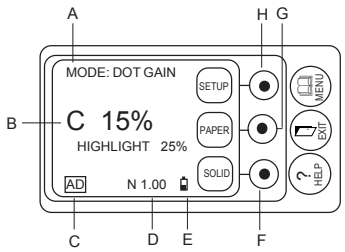
DOT AREA

Example customization of setup parameters:

1. Press SETUP key.
2. Press the appropriate arrow key to scroll to the setup parameter you wish to change.
3. Press the ENTER key to select the highlighted item.
4. Press the appropriate arrow key to scroll to the desired N-value.
5. Press the ENTER key to input selection.
6. Returns to Dot Area Measurement screen.
7. You may now take a measurement with your newly selected setup option.



DOT GAIN



A Function Indicator

Current mode: DOT GAIN

B Measurement Indicator

C Auto-Detection Indicator (See page 50)

D N-Value Indicator

E Battery Indicator

F SOLID Function Key

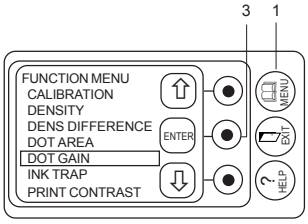
G PAPER Function Key

H SETUP Function Key

DOT GAIN

To enter dot gain mode:

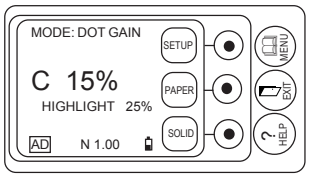
1. Press the MENU key to open the Function Menu.
2. Press the appropriate arrow key to scroll to DOT GAIN.
3. Press the ENTER key to select the dot gain function.



Dot gain measurement steps:

1. Measure paper.
2. Select the halftone patch.
3. Measure the solid patch nearest the selected halftone patch.
4. Measure the selected halftone patch.

Measurement reading displayed.



DOT GAIN

Setup Parameters:

N-Value (See page 52)

Color Bar Value

Assign the highlight, midtone, and shadow values corresponding to the color bar used.

The user must set the color bar values prior to the dot gain measurement. The color bar values of the highlight, midtone, and shadow should match the halftone percentages of the color bar being used.

Example: In a System Brunner color bar containing 25%, 50%, and 75% halftones, the user would set the highlight, midtone, and shadow to 25%, 50% and 75% respectively.

Auto-Detection (See page 52)

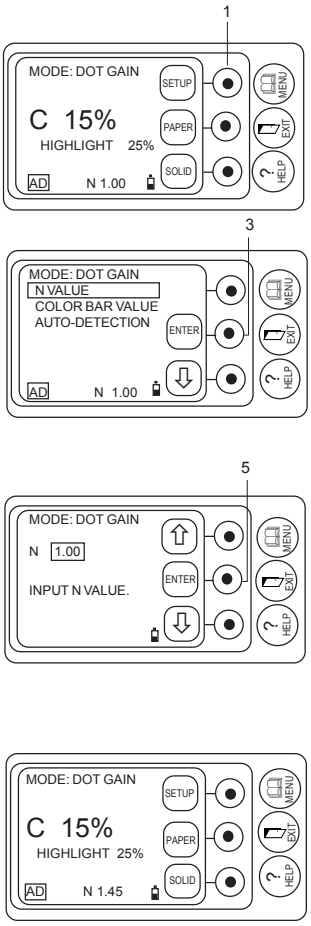
Paper (See page 53)

Solid (See page 53)

DOT GAIN

Example customization of setup parameters:

1. Press SETUP key.
2. Press the appropriate arrow key to scroll to the setup parameter you wish to change.
3. Press the ENTER key to select the highlighted item.
4. Press the appropriate arrow key to scroll to the desired N-value.
5. Press the ENTER key to input selection.
6. Returns to Dot Gain Measurement screen.
7. You may now take a measurement with your newly selected setup option.



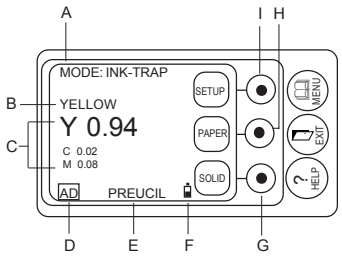
INK-TRAP

■ In the ink-trap function, there are two different measurement screens.

Screen 1: Indicates the ink color measurement.

Screen 2: Indicates the ink-trap measurement.

INK-TRAP



Screen 1: Ink Color Measurement

A Function Indicator

Current mode: INK-TRAP

B Ink Color Indicator

C Measurement Indicator

D Auto-Detection Indicator

On - allows the instrument to automatically detect paper, solid, or trap measurements.
Off - allows the user to specify exactly what is being measured.

E Trap Formula Indicator

Preucil (GATF)
Brunner
Newsprint

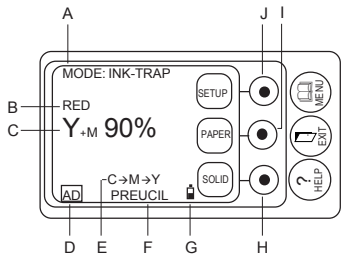
F Battery Indicator

G SOLID Function Key

H PAPER Function Key

I SETUP Function Key

INK-TRAP



Screen 2: Ink-Trap Measurement

A Function Indicator

Current mode: INK-TRAP

B Trap Indicator

C Measurement Indicator

D Auto-Detection Indicator (See page 60)

E Print Sequence Indicator

F Trap Formula Indicator (See page 60)

G Battery Indicator

H SOLID Function Key

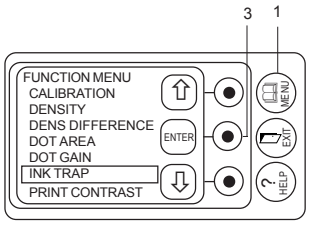
I PAPER Function Key

J SETUP Function Key

INK-TRAP

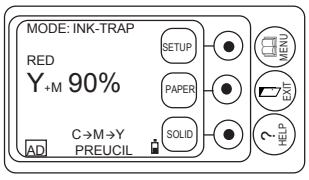
To enter ink-trap mode:

1. Press the MENU key to open the Function Menu.
2. Press the appropriate arrow key to scroll to INK-TRAP.
3. Press the ENTER key to select the ink-trap function.



Ink-Trap measurement steps:

1. Measure paper.
2. Measure the solid cyan patch closest to the trap patch.
3. Measure the solid magenta patch closest to the trap patch.
4. Measure the solid yellow patch closest to the trap patch.
5. Measure the trap patch.



Measurement reading displayed.

INK-TRAP

Setup Parameters:

Trap Formula

Select either Preucil (GATF), Brunner, or Newsprint trap formula.

Print Sequence

Select the correct ink application sequence.

Sequence options:
- CMY
- CYM
- MCY
- MYC
- YCM
- YMC

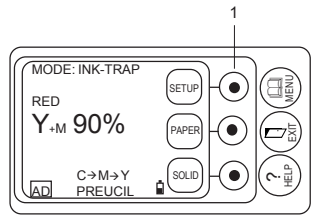
Paper (See page 53)

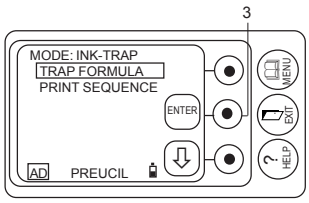
Solid (See page 53)

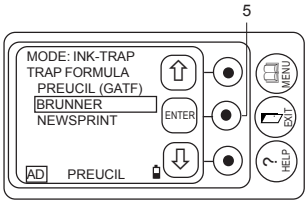
INK-TRAP

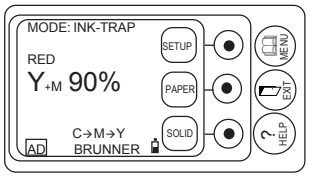
Example customization of setup parameters:

1. Press SETUP key.
2. Press the appropriate arrow key to scroll to the setup parameter you wish to change.
3. Press the ENTER key to select the highlighted item.
4. Press the appropriate arrow key to scroll to the desired option.
5. Press the ENTER key to input selection.
6. Measurement screen displayed.
7. You may now take a measurement with your newly selected setup option.

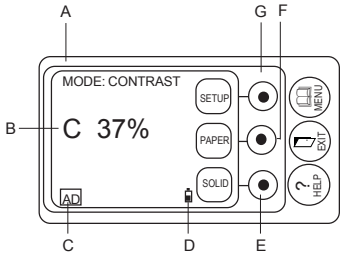








PRINT CONTRAST



A Function Indicator

Current mode: PRINT CONTRAST

B Measurement Indicator

C Auto-Detection Indicator (See page 50)

D Battery Indicator

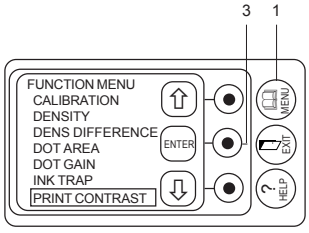
E SOLID function key

F PAPER function key

G SETUP function key

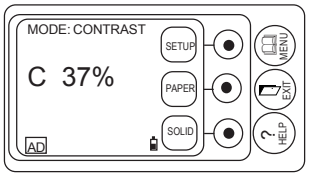
PRINT CONTRAST

To enter print contrast mode:



1. Press the MENU key to open the Function Menu.
2. Press the appropriate arrow key to scroll to PRINT CONTRAST.
3. Press the ENTER key to select the print contrast function.

Print contrast measurement steps:



1. Measure paper.
2. Measure solid.
3. Measure shadow (70%, 75%, or 80% on the color bar).

Measurement reading displayed.

PRINT CONTRAST

Setup Parameters:

Auto-Detection (See page 52)

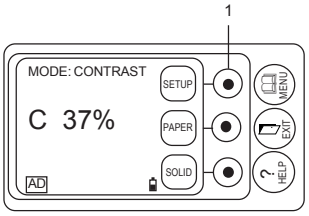
Paper (See page 53)

Solid (See page 53)

PRINT CONTRAST

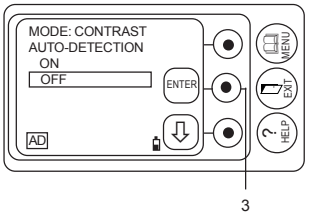
Example customization of setup parameters.

1. Press SETUP key.



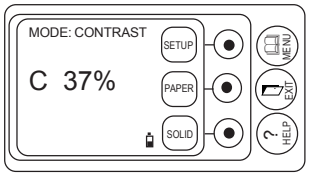
2. Press the appropriate arrow key to select ON or OFF for Auto-Detection.

3. Press the ENTER key to input selection.



4. Measurement screen displayed.

5. You may now take a measurement with your newly selected setup option.



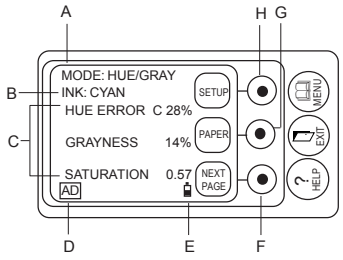
HUE ERROR/GRAYNESS/SATURATION

■ In the hue error/grayness/saturation function, there are two different measurement screens.

Screen 1: Indicates the measurement reading for hue error, grayness, and saturation.

Screen 2: Indicates the density measurement reading for the ink.

HUE ERROR/GRAYNESS/SATURATION



Screen 1: Hue Error, Grayness, and Saturation Measurements

A Function Indicator

Current mode: HUE ERROR/GRAYNESS/ SATURATION

B Ink Color Indicator

C Measurement Indicator for:

Hue Error
Grayness
Saturation

D Auto-Detection Indicator (See page 42)

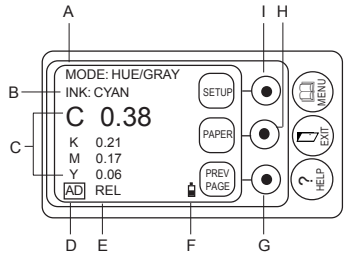
E Battery Indicator

F NEXT PAGE Function Key

G PAPER Function Key

H SETUP Function Key

HUE ERROR/GRAYNESS/SATURATION



Screen 2: Ink Density Measurement

A Function Indicator

Current mode: HUE ERROR/GRAYNESS/ SATURATION

B Ink Color Indicator

C Measurement Indicator for Density

D Auto-Detection Indicator (See page 42)

E Measurement Format:

Relative - Measurement excludes paper values.

F Battery Indicator

G NEXT PAGE Function Key

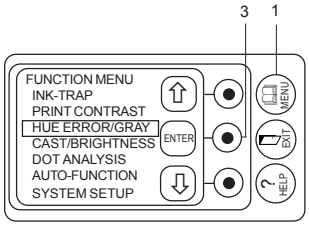
H PAPER Function Key

I SETUP Function Key

HUE ERROR/GRAYNESS/SATURATION

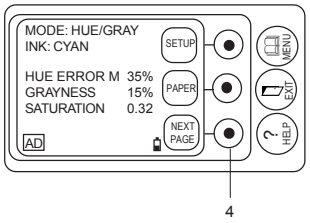
To enter hue error/ grayness/saturation mode:

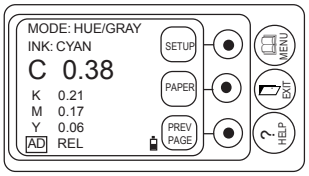
1. Press the MENU key to open the Function Menu.
2. Press the appropriate arrow key to scroll to HUE ERROR/GRAY.
3. Press the ENTER key to select the hue error/ grayness/saturation function.



Hue error/Grayness/ Saturation measurement steps:

1. Measure paper.
2. Measure solid.
3. Measurement reading displayed.
4. Press the NEXT PAGE key to view the ink density readings in relative mode (excluding paper values).





HUE ERROR/GRAYNESS/SATURATION

Setup Parameters:

Auto-Detection

Automatically detects if a measurement is that of a solid, paper, halftone, or overprint.

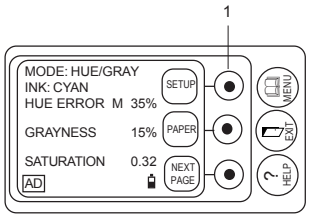
Auto-Detection may be turned off, if the user needs to specify exactly what is being measured.

Paper (See page 53)

HUE ERROR/GRAYNESS/SATURATION

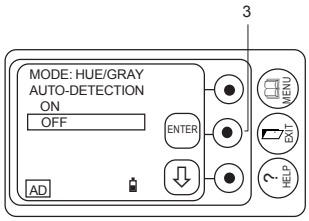
Example customization of setup parameters:

1. Press SETUP key.



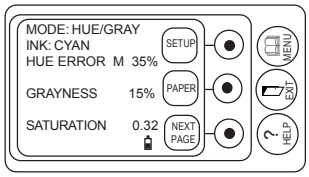
2. Press the appropriate arrow key to select ON or OFF for Auto-Detection.

3. Press the ENTER key to input selection.



4. Measurement screen displayed.

5. You may now take a measurement with your newly selected setup option.



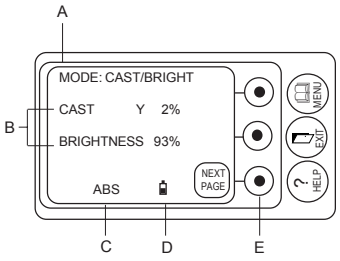
CAST/BRIGHTNESS

■ In the cast/brightness function, there are two different measurement screens.

Screen 1: Indicates the cast and brightness measurements.

Screen 2: Indicates the reflectance of the paper.

CAST/BRIGHTNESS



Screen 1: Cast and Brightness Measurement

A Function Indicator

Current mode: CAST/BRIGHTNESS

B Measurement Indicator for:

Cast
Brightness

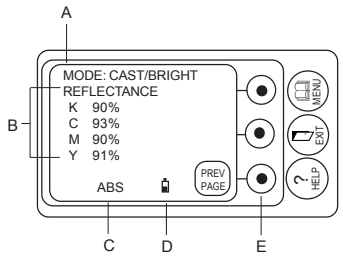
C Measurement Format:

Absolute - Measurement includes paper values.

D Battery Indicator

E NEXT PAGE Function Key

CAST/BRIGHTNESS



Screen 2: Reflectance Measurement

A Function Indicator

Current mode: CAST/BRIGHTNESS

B Measurement Indicator for Reflectance

C Measurement Format:

Absolute - Measurement includes paper values.

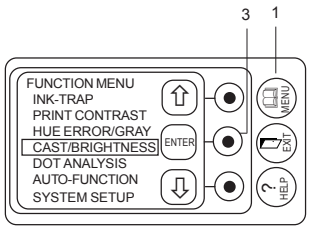
D Battery Indicator

E PREV PAGE Function Key

CAST/BRIGHTNESS

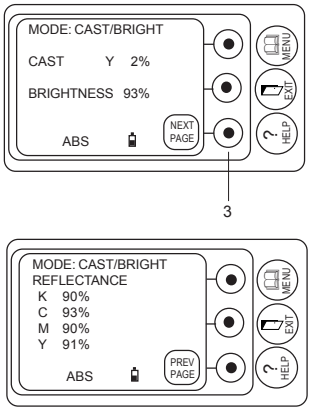
To enter cast/brightness mode:

1. Press the MENU key to open the Function Menu.
2. Press the appropriate arrow key to scroll to CAST/BRIGHTNESS.
3. Press the ENTER key to select the cast/brightness function.



Cast/Brightness measurement steps:

1. Measure paper.
2. Measurement reading displayed.
3. Press the NEXT PAGE key to view the reflectance values in the absolute mode (including paper values).



There are no setup parameters for this function.

DOT ANALYSIS

Dot Analysis allows the user to record the dot gain characteristics of a printing system. It is possible to record up to 8 cylinders or colors.

The dot gain measurements are recorded on a 10% graduated scale.

A corresponding graph is generated to give a visual representation.

The data can be saved for future reference.

Basic measurement steps for Dot Analysis:

1. Enter the number of cylinders or colors to be evaluated.

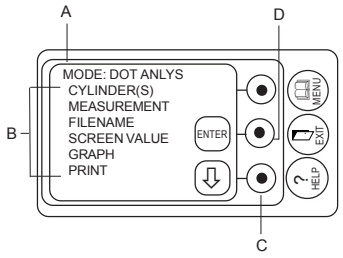
2. Measure the halftone values from 100% to 0% step screens for each cylinder.

3. Select "FILENAME" to save the measured data.

4. Select "SCREEN VALUE" to view the density or dot gain values.

5. Select "GRAPH" to view the dot gain curve.

DOT ANALYSIS



A Function Indicator

Current mode: DOT ANALYSIS

B Menu Options for Dot Analysis Mode

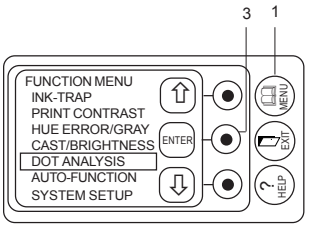
C DOWN ARROW Function Key

D ENTER Function Key

DOT ANALYSIS

To enter dot analysis mode:

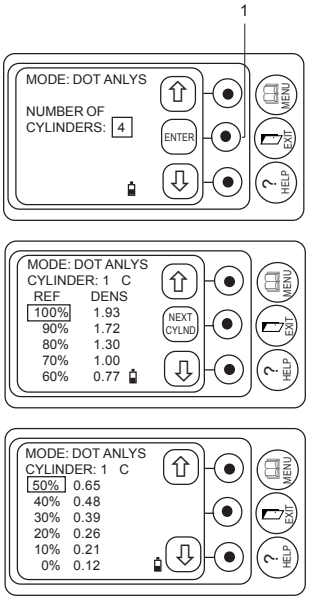
1. Press the MENU key to open the Function Menu.
2. Press the appropriate arrow key to scroll to DOT ANALYSIS.
3. Press the ENTER key to select the dot analysis function.



Dot analysis measurement steps:

1. Press the appropriate arrow key to scroll to the number of cylinders or colors to be evaluated.
2. Press the ENTER key to input selection.
3. Measure the halftone values for 100% through 0% step screens for each cylinder.

Measurement readings displayed.



DOT ANALYSIS

To return to Dot Analysis Menu:

1. Press the EXIT key to return to the Dot Analysis Menu.

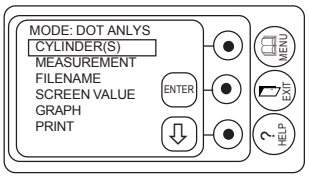
2. Press the DOWN ARROW key to scroll down to one of the following options:

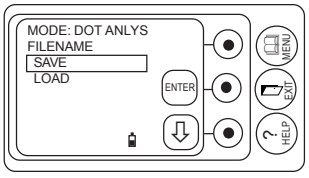
   A. Filename

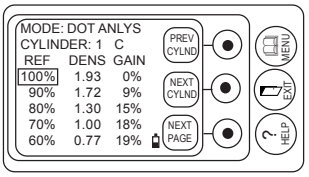
      To save or load a file.

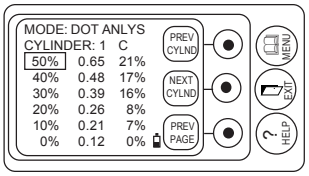
   B. Screen Value

      Displays the reference, density, and dot gain readings for each of the cylinders.



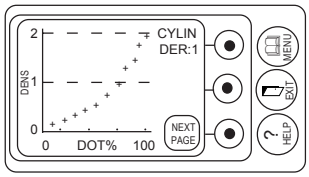




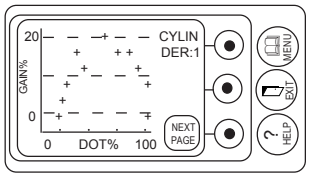


C. Graph

Displays the graph of density and dot area for each cylinder.



Displays the graph of dot gain and dot area for each cylinder.



D. Print

If the instrument is connected to a printer, the measurement readings will be printed out.

3. Press Enter key to input selection.

AUTO-FUNCTION

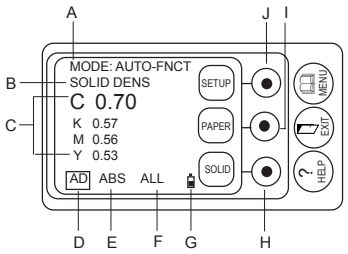
■ In auto-function, there are three different measurement screens.

Screen 1: Indicates the density measurement.

Screen 2: Indicates the dot gain measurement.

Screen 3: Indicates the ink-trap measurement.

AUTO-FUNCTION



Screen 1: Density Measurement

A Function Indicator

Current mode: AUTO-FNCT

B Measurement Function Indicator

C Measurement Indicator

D Auto-Detection Indicator

On - allows the instrument to automatically detect paper, solid, halftone, and ink-trap measurements.

Off - allows the user to specify exactly what is being measured.

E Measurement Format

F Display Format:

ALL (CMYK) - Displays all four colors.

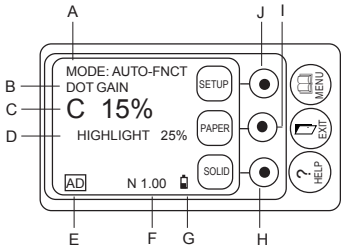
G Battery Indicator

H SOLID Function Key

I PAPER Function Key

J SETUP Function Key

AUTO-FUNCTION



Screen 2: Dot Gain Measurement

A Function Indicator

Current mode: AUTO-FNCT

B Measurement Function Indicator

C Measurement Indicator

D Halftone Indicator

E Auto-Detection Indicator (See page 50)

F N-Value Indicator

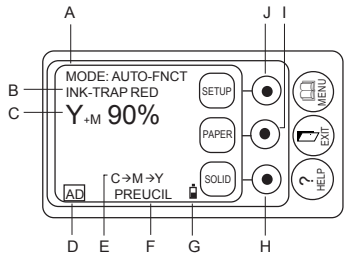
G Battery Indicator

H SOLID Function Key

I PAPER Function Key

J SETUP Function Key

AUTO-FUNCTION



Screen 3: Ink-Trap Measurement

A Function Indicator

Current mode: AUTO-FNCT

B Measurement Function Indicator

C Measurement Indicator

D Auto-Detection Indicator (See page 60)

E Print Sequence Indicator

F Trap Formula Indicator (See page 60)

G Battery Indicator

H SOLID Function Key

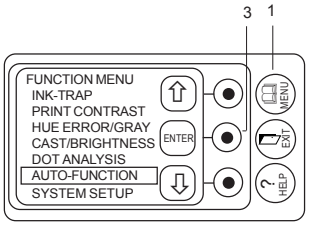
I PAPER Function Key

J SETUP Function Key

AUTO-FUNCTION

To enter auto-function mode:

1. Press the MENU key to open the Function Menu.
2. Press the appropriate arrow key to scroll to AUTO-FUNCTION.
3. Press the ENTER key to select Auto-Function.



Auto-Function measurement steps:

1. Measure paper.
2. Measure the black solid patch.
3. Measure the cyan solid patch.
4. Measure the magenta solid patch.
5. Measure the yellow solid patch.

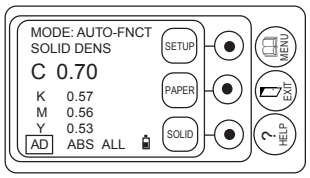
6. Measure one of the following:

   A. Density
   B. Dot gain
   C. Ink-trap

7. Measurement is displayed.

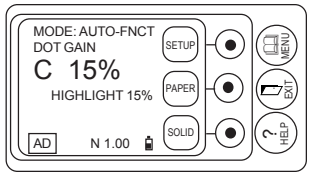
   A. Density

A



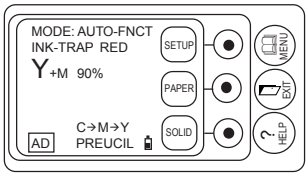
   B. Dot Gain

B



   C. Ink-Trap

C



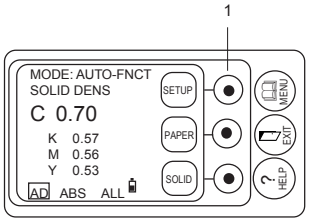
AUTO-FUNCTION

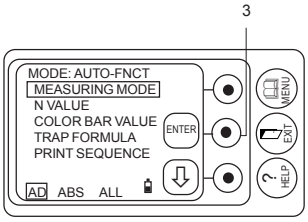
Setup Parameters:

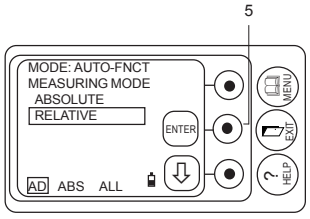
AUTO-FUNCTION

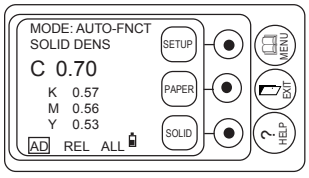
Example customization of setup parameters:

1. Press SETUP key.
2. Press the appropriate arrow key to scroll to the setup parameter you wish to change.
3. Press the ENTER key to select the highlighted item.
4. Press the appropriate arrow key to scroll to the desired option.
5. Press the ENTER key to input selection.
6. Measurement screen displayed.
7. You may now take a measurement with your newly selected setup option.









APPENDIX

- ☐ SPECIFICATIONS
- ☐ APPLICATION NOTES
- ☐ TECHNICAL SUPPORT INFORMATION
- ☐ WARRANTY INFORMATION
- ☐ LIST OF PRODUCTS

SPECIFICATIONS

Filter Response	Status T Status E Status A
Measuring Geometry	0°/45° (ANSI PH2.17, ISO 5/4, DIN 16536)
Measuring Range	Density, 0.00 D - 2.50 D Dot Area, 0%-100%
Repeatability	±0.01 D or ±1%
Accuracy	±0.02 D or ±2%
Light Source	Halogen Lamp, approximately 2856°K
Aperture Diameter	3.0 mm
Detector	GaAsP Photodiode
Display	128 x 64 Dot Graphic LCD
Power Supply	Ni-Cad (4.8V), 800mAh
Recharge Time	Approximately 1.5 hours
Measurements Per Charge	Approximately 4,000 (Internal Testing)
Security User Code	Optional
Computer Output	Configurable RS-232C Serial Interface
Accessories	Operation Manual Calibration Standard AC Adapter (9V, 500mA, center-negative) Carrying Case Serial Interface Cable (Optional) Ihara PR-95 Printer (Optional) Software (Optional) Cable Harness (Optional)

APPLICATION NOTES

This section provides an overview of basic densitometry. It is especially useful for the first-time user of densitometers. References are examples only since specific requirements will vary.

The following topics are discussed:

- **Density / Density Difference**
- **Dot Area / Dot Gain**
- **Ink-Trap**
- **Print Contrast**
- **Hue Error**
- **Grayness**
- **Typical Densitometer Values**

❖ DENSITY / DENSITY DIFFERENCE

The critical function of a densitometer is to determine density, a measure of the opacity (light absorption) of an object. It is a function of the chemical nature and concentration of the ink pigment particles and the ink film thickness.

By using a densitometer the user can interpret the work output systematically. It eliminates the guess-work of adjusting the ink displacement. Increase or decrease of the amount of ink applied during a run can now be done numerically.

Density Equation:

Density = $\log_{10} 1/R$ Where R = Reflectance

Density Difference Equation:

Density Difference = Sample Density - Reference Density

Measurement Location:

Density measurement is made on the solid patches of the color bar.

❖ DOT AREA / DOT GAIN

The function of dot area or dot gain measurement is to evaluate the halftone dot increase in size. It is inevitable that dot gain will occur during each press run. By measuring the dot gain, one can compensate for this increase during color separation. Also, dot gain is a good indicator of the quality of the print.

Dot Area Equation:

$$\text{Dot Area} = \frac{(1 - 10^{-D(t)-D(p)/n}) \times 100}{1 - 10^{-(D(s)-D(p))/n}}$$

Where: D(t) is the density of the tint
D(s) is the density of the solid
D(p) is the density of the paper
n is an empirically determined factor.

Dot Gain Equation:

Dot Gain = Sample Dot Gain - Reference Dot Gain

Measurement Location:

Dot area / dot gain measurement is made on the halftone patches of the color bar.

❖ INK-TRAP

Ink-trap measurement evaluates the ability of a printed ink film to accept another ink film. If poor trapping occurs, color shift will be apparent. Parameters that may influence the trap are ink tack, print sequence, ink film thickness, blank pressure, etc.

GATF (Preucil) Trap Equation:

$$\% \text{ Trap (2 color)} = \frac{(D_{op} - D_1) \times 100}{D_2}$$

Where:
- D_1 = 1st ink density minus paper density
- D_2 = 2nd ink density minus paper density
- D_{op} = 2 color overprint minus paper density

Brunner Trap Equation:

$$\% \text{ Trap (2 color)} = \frac{(1 - 10^{-(Dop)}) \times 100}{(1 - 10^{-(D1 + D2)})}$$

Where:
- D_1 = 1st ink density minus paper density
- D_2 = 2nd ink density minus paper density
- D_{op} = 2 color overprint minus paper density

❖ INK-TRAP

Newsprint (Hamilton) Trap Equation:

$$\% \text{ Trap (2 color)} = \frac{\log (1 + (D_{op} - D_1) / (D_m - D_{op})) \times 100}{\log (1 + (D_2 / (D_m - D_2)))}$$

Where:

- D_1 = 1st ink density minus paper density
- D_2 = 2nd ink density minus paper density
- D_{op} = 2 color overprint minus paper density
- D_m = is the maximum printable density for the given substrate minus substrate density.

Measurement Location:

Trap measurements are made at the solid and the overprint patches on the color bar.

❖ RELATIVE PRINT CONTRAST

Relative print contrast measurement evaluates the shadow tone to the solid. It is an indication of the print quality, whether it is "sharp" or "flat."

To achieve maximum contrast, high density and "sharp" images are desired. This measurement will give a quick indication of the optimal ink feed relating to the shadow tones.

Relative Print Contrast Equation:

$$\% \text{ Print Contrast} = \frac{(1 - (D_t - D_p)) \times 100}{D_s - D_p}$$

Where:
D_p = Density of paper
D_s = Density of the solid
D_t = Density of the 3/4 tone

Measurement Location:

Relative print contrast is normally made at the 3/4 tone (70%, 75% or 80% screen) and at the solid on the color bar.

❖ HUE ERROR

Hue error indicates the variation of a specific ink relative to the ideal ink. Theoretically, ideal ink has a hue error of zero. Since ideal ink does not exist, it is necessary to measure the ink sample and communicate this information to the color separator. The color separator can then make the adjustments to the film to achieve the best possible colors.

Hue Error Equation:

$$\% \text{ Hue Error} = \frac{(D_{mid} - D_{min}) \times 100}{D_{max} - D_{min}}$$

Where:
D_{max} = High density value
D_{mid} = Middle density value
D_{min} = Low density value

Measurement Location:

Hue error measurement is made at the solid tone patches on the color bar.

❖ GRAYNESS

Grayness evaluates the contamination of one color on another. The gray component is measured to check the consistency of the printed ink during a press run. If the reading is beyond the normal value, it is an indication that there may be a tack problem, trapping, or ink contamination, etc.

Grayness Equation:

$$\% \text{ Grayness} = \frac{D_{min} \times 100}{D_{max}}$$

Where: D_{max} = High density value
D_{min} = Low density value

Measurement Location:

Grayness measurement is made at the solid patches on the color bar.

❖ TYPICAL DENSITOMETER VALUES

DENSITY

	Black	Cyan	Magenta	Yellow	Tolerance
Gloss Coated Paper	1.75	1.45	1.40	1.05	±0.05
Coated Paper	1.65	1.35	1.30	0.95	±0.05
Uncoated Paper	1.55	1.25	1.20	0.90	±0.05
Newspaper	1.05	0.90	0.90	0.85	±0.05

DOT GAIN

	50% Midtone
Gloss Coated Paper	19%
Uncoated Paper	25%
Newspaper	31%

TRAP (2 color overprint, 75%)

Red	73
Green	80
Blue	77

PRINT CONTRAST (75% target)

	Black	Cyan	Magenta	Yellow
Gloss Coated Paper	42	37	35	30
Coated Paper	32	30	28	27
Uncoated Paper	31	28	25	25
Newspaper	17	16	13	14

HUE ERROR

	Cyan	Magenta	Yellow
Coated Paper	22	43	5
Newsaper	30	55	10

GRAYNESS

	Cyan	Magenta	Yellow
Coated Paper	10	9	1
Newspaper	42	34	25

TECHNICAL SUPPORT

To obtain prompt service, please have the following information ready prior to contacting our technical support center.

1. Model number
2. Serial number
3. Date of purchase
4. Place of purchase
5. Name, telephone and fax number
6. Clear description of the problem.

Ihara technical support center:

US & Canada: 800-457-8059

Japan: 0568-76-7878

All others: +1-661-257-5772

WARRANTY INFORMATION

A warranty statement and a warranty registration card are enclosed with each instrument. Please read the warranty information carefully and the limitations of coverage.

The warranty statement explains the terms of coverage. Please fill in the information requested on the warranty registration card and return to Ihara.

Ihara Instrument Loaner Program

If for any reason covered under the warranty the instrument becomes inoperable during the warranty period, Ihara will provide a unit (same model or later version) for the customer as a loaner while the inoperable unit is being serviced. The only cost to the owner would be the cost of shipping.

Service After The Warranty Period

Once the warranty expires, the coverage listed above will terminate. Ihara will then provide similar service for its customer but will impose a nominal charge.

WARRANTY INFORMATION

Returning Your Instrument For Service

To assure effective servicing of your instrument, please follow these instructions:

a. Obtain an **RMA (Return Material Authorization)** number from our technical service center (see page 104).

b. Provide description of the exact configuration at the time of the malfunction.

c. Provide brief description of the symptoms for service personnel.

d. If purchased through an IHARA dealer, provide a copy of the sales slip or other proof of purchase to establish the warranty coverage period.

e. Provide your name, address, and a phone number where you may be reached during the day.

LIST OF PRODUCTS

	Reflection Densitometer					Transmission Densitometer	
	B & W	Color			Plate	B & W	UV
FUNCTIONS:	R700	R710	R720	R730	P300	IHAC-T5	IHAC-T6
Density	•	•	•	•	•	•	•
Density Difference	•	•	•	•			
Dot Area	•		•	•	•	•	•
Dot Gain	•		•	•			
Ink Trap				•			
Print Contrast	•			•			
Hue Error				•			
Grayness				•			
Saturation				•			
Cast				•			
Brightness				•			
Dot Analysis	•			•			
Auto Function			•	•			
Auto N-Value Selection					•		
FEATURES:							
Right or Left Handed View	•	•	•	•	•		
RS-232C Serial Interface	•	•	•	•	•	•	•
Auto Color Display		•	•	•	•		
Single Color Display		•	•	•			
Four Color Display		•	•	•			
Quick Calibration	•	•	•	•	•		
Menu Driven Commands	•	•	•	•	•		
Self-Guiding Prompts	•	•	•	•	•		
Help Key Explanation	•	•	•	•	•		
OPTIONS:							
PR-95 Printer	•	•	•	•	•	•	•
Software	•	•	•	•	•		
Security User Code	•	•	•	•	•		
Polarization Filter	•	•	•	•			
1.7mm Aperture Kit	•	•	•	•			
Upgrade Functions		•	•				
Cable Harness	•	•	•	•	•		

NOTES

NOTES

MANUFACTURED BY
IHARA ELECTRONIC IND. CO., LTD.
KASUGAI CITY, JAPAN

CT041398