BM series

INSTRUCTION MANUAL

Analytical Balance

BM-5
BM-5D
BM-20
BM-22
BM-252
BM-200
BM-300
BM-500

A&D

A&D Company, Ltd.

The contents of this manual and the specifications of the instrument covered by this manual are subject to change for improvement without notice.

Contents

Interface and Communication

Maintenance

1. Introduction

This manual describes how the **BM** series balances work and how to get the most out of them in terms of performance. Read this manual thoroughly before using the balance and keep it at hand for future reference.

About this manual

This manual consists of the following five parts:

Basic operation ····························· Describes precautions, the balance's construction and basic operation.

Adapting to the environment ··········· Describes response (and stability) adjustment to adapt to the environment where there is vibration or drafts, the way to maintain weighing precision in a variation of ambient temperature, calibration and calibration test.

Selecting functions ·························· Describes functions of the balance.

Interface and communication··········· Describes the serial interface used for communicating with a computer that requests weighing data and controls the balance, and for use with a printer

Maintenance ································· Describes maintenance, error codes, troubleshooting, specifications and options.

Balance software version

Some balance operations vary depending on the balance software version. For details on checking the software version, refer to "**18. Checking the Balance Software Version**".

1.1. Features

□ A built-in ionizer can eliminate static electricity from the weighing sample before weighing, reducing weighing errors.

□ Each electrode unit of the ionizer is designed to be removed, cleaned and replaced.

□ Automatic self calibration, using the internal mass, adapting to changes in temperature.

□ Response adjustment adapting to drafts and/or vibration in the environment automatically.

□ Memory function to store weighing data and calibration data.
When only weighing data is stored, a maximum of 200 data can be stored.
Interval mode to store the weighing data periodically.

□ Good laboratory practice (GLP) / Good manufacturing practice (GMP) data can be output using the RS-232C serial interface.

□ A built-in clock and calendar that can add the time and date to the output data. (Changing the clock setting can be limited to the administrator. Refer to "**15. Password Function**".)

□ The password function can be used to restrict balance users or changes to the function settings.

□ The key lock function disables the balance key operation and enables the balance to be operated only by commands from external devices.

□ Underhook, for measuring density and weighing magnetic materials.

□ Multiple weighing units with most of the common units used around the world.
Gram, Milligram, Counting mode, Percent mode, Ounce (Avoir), Troy Ounce, Metric carat, Momme, Pennyweight, Grain (UK), Tael (preset at the factory), Tola (India), Messghal and Density mode

□ The **BM-5D** and **BM-22** are equipped with a smart range function to weigh in the precision range (readability: 1 µg) after zeroing a tare weight, if within the weighing capacity.

□ The micro tube holder is included in the accessories of the **BM-5**, **BM-5D**, **BM-20** and **BM-22**.

□ Density mode for calculating the density of a solid.

□ The **BM** series balances are equipped with an RS-232C serial interface and a USB interface to communicate with a computer. While outputting data to a printer using the RS-232C interface, data can be transmitted to a computer at the same time using the USB interface.
Using the RS-232C interface and the Windows communication tools software (WinCT) enables bi-directional communication between a Windows computer and the balance.
The current version of the WinCT can be downloaded from the A&D website.

□ Connecting the USB interface of the balance by a cable to a Windows computer allows transmission of the weighing data to Excel or Word.

□ When multiple balances have the BM-08 Ethernet interface installed in place of the USB interface and connected to a LAN, data can be acquired from each of them using the WinCT-Plus software.

□ When the accessory data logger (**AD-1688**) is connected, weighing data can be stored without using a computer.

1.2. Compliance

1.2.1. Compliance with FCC Rules

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

1.2.2. Compliance with Directives of CE mark

CE This device features radio interference suppression, safety regulation and restriction of Hazardous Substances in compliance with the following Council Directives

Council directive 2014/30/EU	EN61326	EMC directive
Council directive 2014/35/EU	EN60950	Safety of Information Technology Equipment
Council directive 2011/65/EU	EN50581	Restriction of the use of certain Hazardous Substances

□ The CE mark is an official mandatory European marking.
Please note that any electronic product must comply with local laws and regulations when sold or used anywhere outside Europe.

EU Declaration of Conformity

$C \in$

A&D Instruments Ltd. hereby declare that the following Weighing product conforms to the requirements of the council directives on …

Electromagnetic Compatibility (EMC) 2014/30/EU,

Low Voltage Equipment (LVD) 2014/35/EU and

Restriction of the use of certain Hazardous Substances (RoHS) 2011/65/EU

provided that they bear the CE mark of conformity.

Model/Series….BM Series

Standards applicable:

EN 61326-1:2013

Electrical equipment for measurement, control and laboratory use -EMC requirements Part 1: General requirements

EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013

Safety of Information Technology Equipment

EN 50581:2012

Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

This Declaration of Conformity is issued under the sole responsibility of the manufacturer

A&D Instruments, 24-26 Blacklands Way, Abingdon, Oxfordshire OX14 1DY, England

CE Mark first applied 28 January 2011

Signed for A&D Instruments on 02 July 2016

J. Ghuman
Managing Director
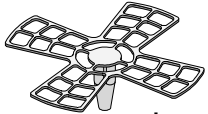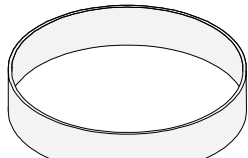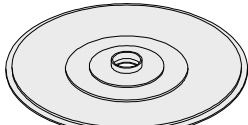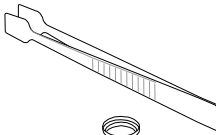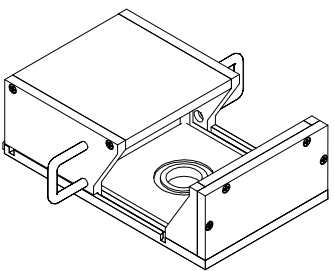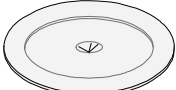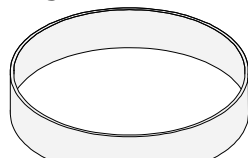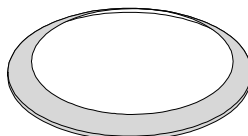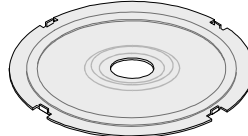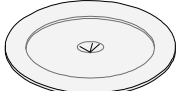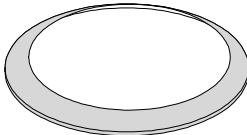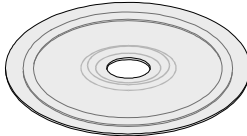
A&D Company, Limited

2. Unpacking the Balance

Unpack the balance carefully. Keep the packing material to be used for transporting the balance in the future. See the illustrations to confirm that everything is included.

Accessories for each model

BM-5, BM-5D, BM-20, BM-22	BM-252	BM-200, BM-300 BM-500
Small weighing pan for filter / Large weighing pan for filter Weighing pan / Pan support / Micro tube holder Small fine range ring Dust plate / Fine range ring Tweezers AX-MX-36 φ15, 0.8 mL Large / φ12, 0.3 mL Medium / φ8, 0.05 mL Small Round aluminum analytical pans (10 pieces each) Slide breeze break AX-BM-035 * Provided only for the BM-20 and BM-22, excluding the BM-5 and BM-5D	Weighing pan / Pan support Fine range ring Breeze break ring Dust plate	Weighing pan Pan support Breeze break ring Dust plate

Common accessories

Positions to place the AC adapter labels

Attach the AC adapter labels to the AC adapter as shown in the illustration.

識別シール
ACアダプタ、コード等に貼って下さい
Identification Sticker
Attach Label to the AC Adapter and its Cable

BM	BM
BM	BM
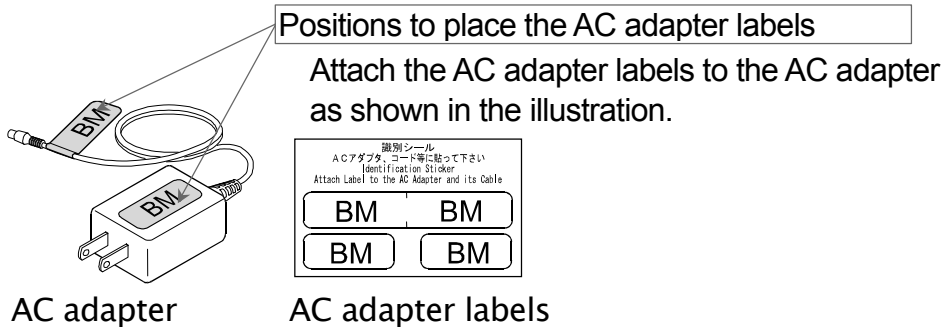
AC adapter   AC adapter labels
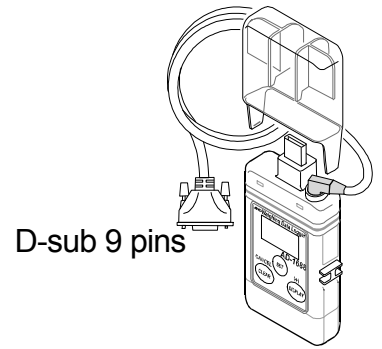
D-sub 9 pins

Data logger
AD-1688
The weighing data can be stored when connected to the RS-232C interface of the balance.

Notes
- **Please confirm that the AC adapter type is correct for your local voltage and receptacle type.**
- **Please use the dedicated AC adapter specified for the balance.**
- **Do not use the AC adapter provided with the balance for other models or equipment with which the AC adapter may not be compatible.**
- **If you use the wrong AC adapter, the balance and other equipment may not operate properly.**
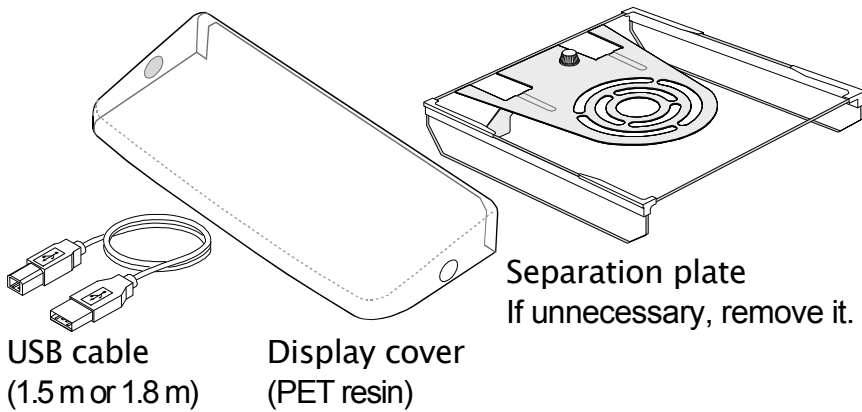
USB cable
(1.5 m or 1.8 m)

Display cover
(PET resin)

Separation plate
If unnecessary, remove it.
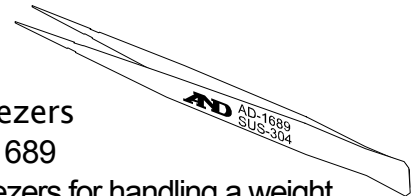
Tweezers
AD-1689
Tweezers for handling a weight.
Use it to avoid temperature changes due to having your hand in the weighing chamber, thus to perform accurate calibration.
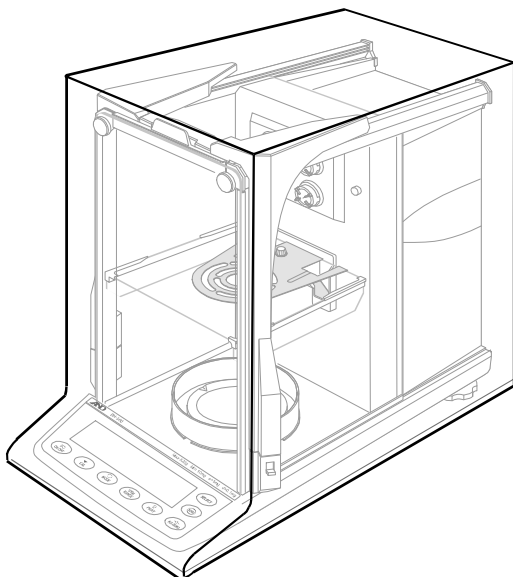
Body cover
Cover during storage to prevent dust and dirt contamination.
The cover can be used for the balance with the AC adapter and other cables connected.

LED of the ionizer

Glass door handle

Ionizer

Electrode unit of the ionizer

Neutralization area

Separation plate
If unnecessary, remove it.

Example of BM-20

Weighing chamber

Leveling foot

Joint handle
When jointed to the right (left) glass door handle, the right (left) glass door can be opened or closed with the left (right) joint handle.

Display

Keys

Display cover

Bubble spirit level

Glass door handle
The handle for the glass door.
The handle can be jointed to the joint handle

USB interface

AC adapter jack

External key jack
Cap the terminal with the accessory rubber cap when it is not used.

BM

Outlet example

BM

Serial number

RS-232C serial interface
D-sub 9 pins

Anti-theft device

Grounding terminal

3. Installing the Balance and Precautions

3.1. Installing the Balance

1 Place the balance on a solid weighing table. Refer to "**3.2. Precautions Before Use**" for details on a place to install the balance.

2 Assemble the weighing pan and other parts in accordance with the model and use as shown below.

BM-200, BM-300, BM-500

Weighing pan
Pan support
Breeze break ring
Dust plate
Sectional view

BM-252

Fine range ring
Fine range ring

Note
The mounting direction (head / tail) of the dust plate.
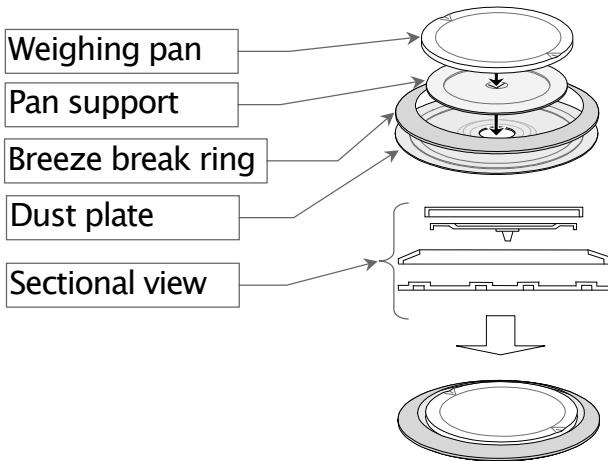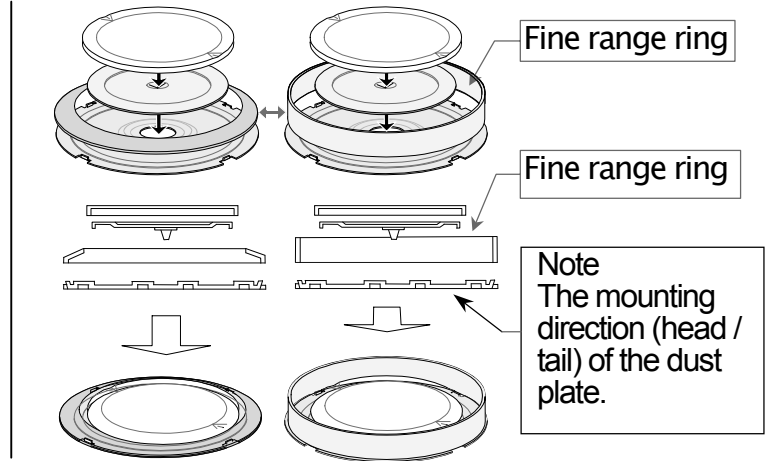
Use the fine range ring in place of the breeze break ring to avoid errors caused by drafts when weighing with a readability of 0.01 mg.

BM-5, BM-5D, BM-20, BM-22

Note   **When using the micro tube holder for the BM-5 and BM-5D:**
The micro tube holder is approximately 2 g heavier than the standard pan (weighing pan and pan support). When a micro tube holder is used for the BM-5 and BM-5D, the available weighing range will be up to approximately 3 g including the tare such as a micro tube and test tube.

Micro tube holder
Large weighing pan for filter
Small weighing pan for filter
Weighing pan
Pan support
Small fine range ring
Fine range ring
Dust plate
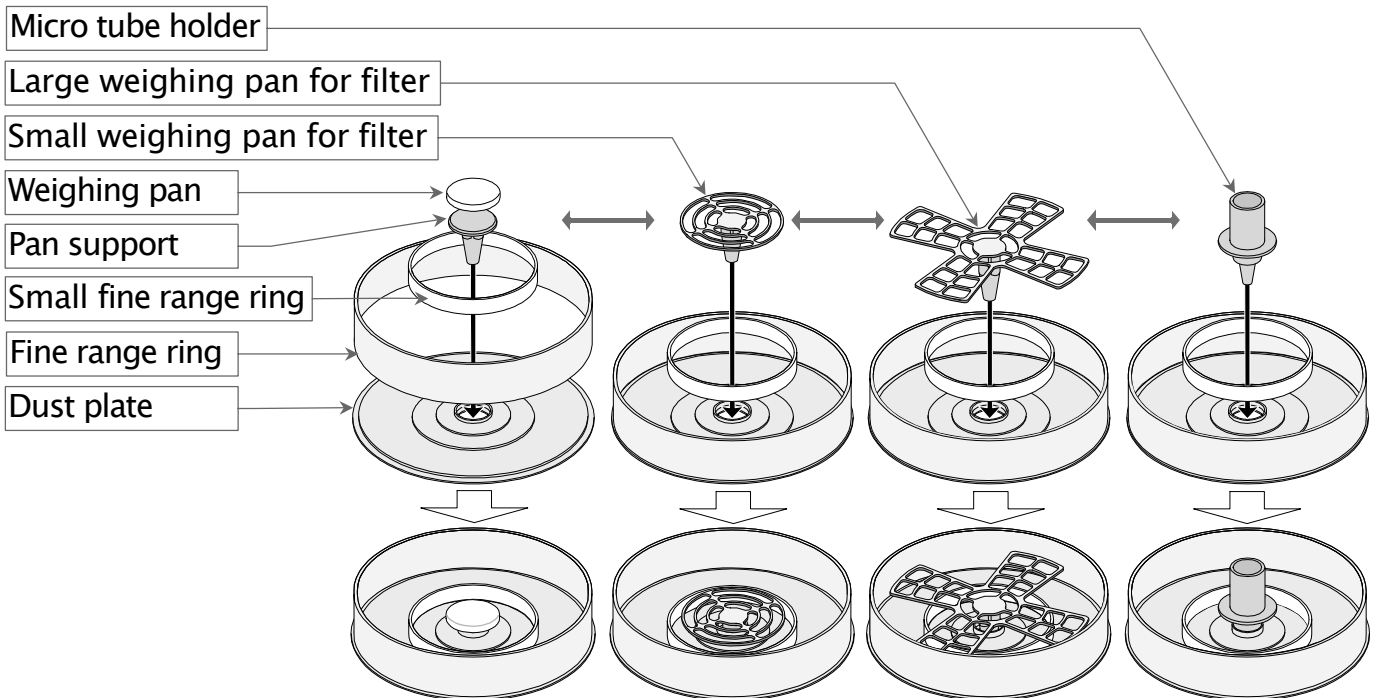
Choose the weighing pan appropriate to the filter size.

Use the holder for micro tube or test tube of φ12 mm or less.

Assembling the parts in the weighing chamber

BM-252, BM-200
BM-300, BM-500

BM-252

BM-5, BM-5D, BM-20, BM-22

BM-20, BM-22

Leveling foot

Bubble spirit level

OK   NG
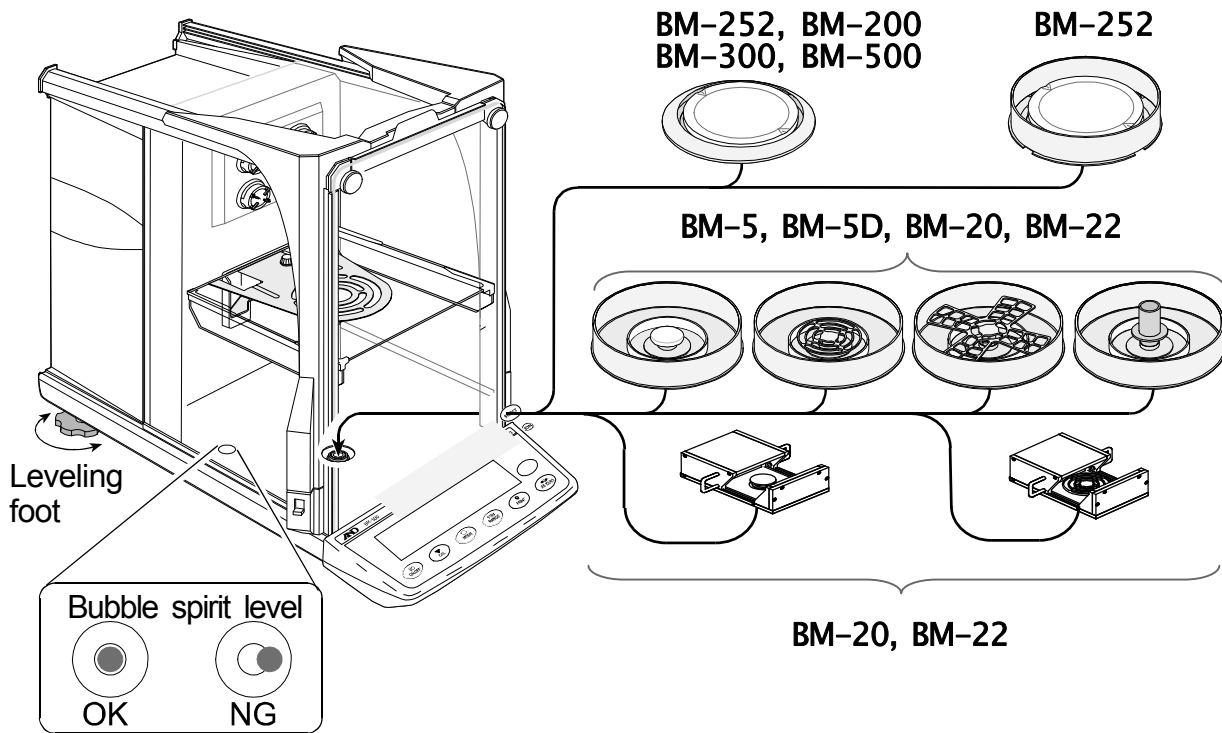
3   If the separation plate is not necessary, remove the screw and take the plate off. Refer to "**3.1.2**. **Removing and attaching the separation plate**".

4   Adjust the level of the balance using the leveling feet. (Refer to "**Adjusting the Level**" on page 14.)

5   Confirm that the AC adapter type is correct for your local voltage and power receptacle type.

6   Connect the specified AC adapter to the balance. Warm up the balance for at least one hour with nothing on the weighing pan.

Screw

Separation plate

Hook
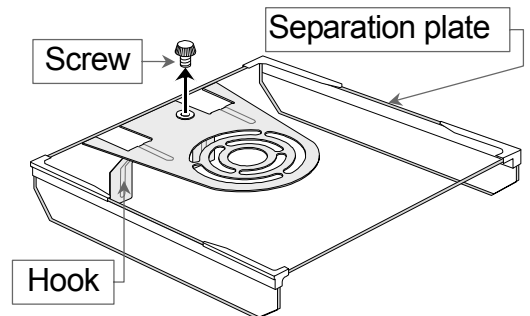
3.1.1. Installing the slide breeze break   BM-20 / BM-22

The slide breeze break improves weighing precision by reducing the negative effects from the surrounding environment. It is installed inside the weighing chamber of the **BM-20** / **BM-22.**

1 Determine positioning of the slide breeze break to align the slide breeze break (base) hole with the weighing pan/pan support mounted section while pressing the sponge, located at the rear of the slide breeze break (base), at an angle to the **BM-20** or **BM-22** wall surface.

2 Attach the weighing pan/pan support and he slide breeze break (door).

Slide breeze break
（door）

Weighing pan/
Pan support
(Note 2)

Slide breeze break
（base）

Attach the slide breeze break (base) while pressing the sponge part located at the rear of the slide breeze break (base) at an angle to the wall surface.

Weighing pan /
pan support
(Note.2)

Small weighing pan
for filter
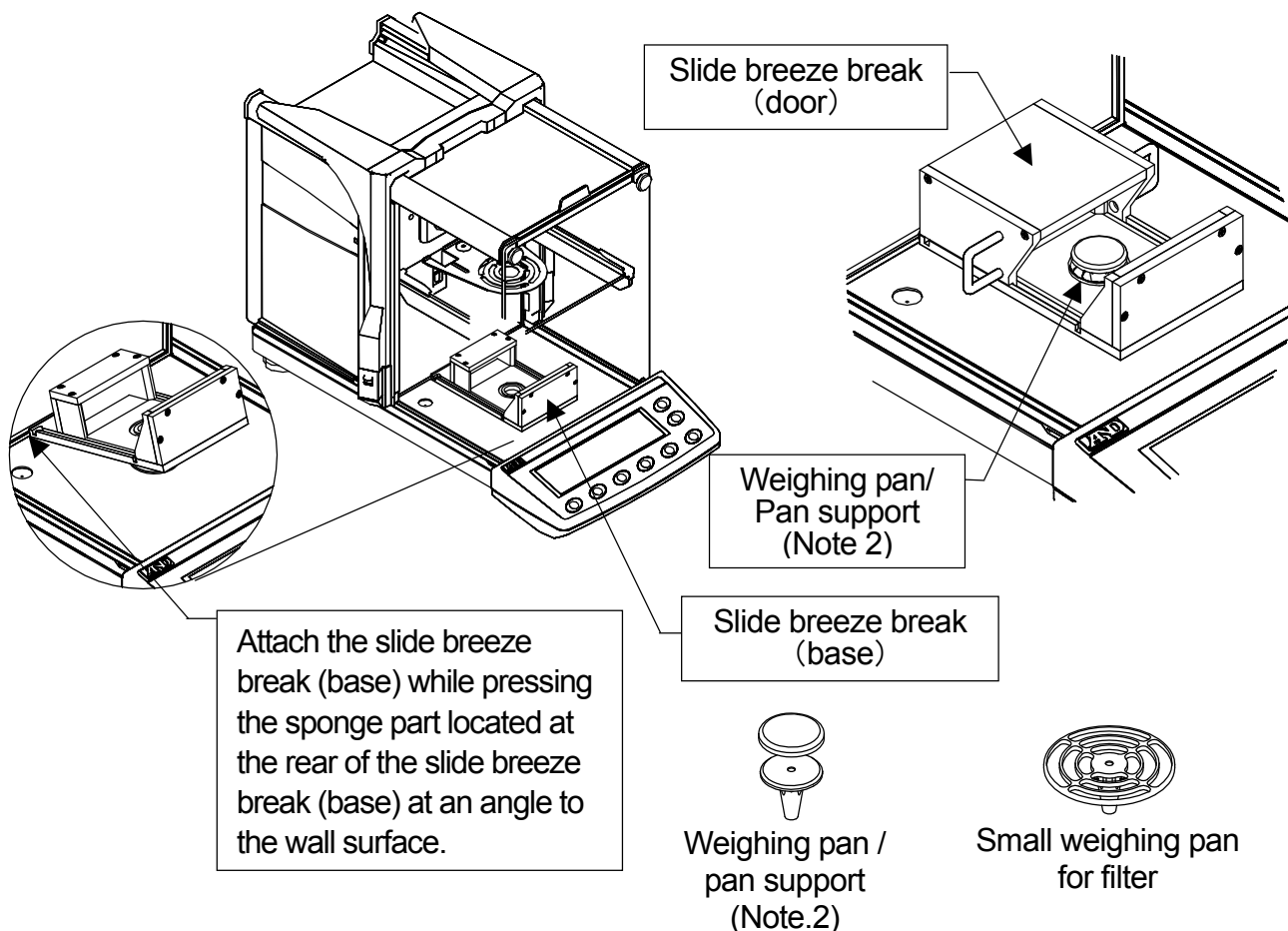
Note 1 There may be variations in weighing results after attaching the slide breeze break as it has not adjusted to the surrounding temperature. Wait a while before making any measurements.

Note 2 The weighing pan / pan support or small weighing pan for filter provided with the BM-20 / BM-22 can be used.

3.1.2. Removing and attaching the separation plate

Note Take care not to damage the separation plate when handling it.

Removing the separation plate

1 Support the separation plate and remove the screw from the plate.

2 Lift the plate and unhook the hooks.

3 Rotate the plate on the axis of the front edge.
   Rotate the plate on the axis of the back edge.

4 Remove the plate from the chamber.

Attaching the separation plate

Use the arrows in reverse to attach the plate.

5 Insert the plate into the chamber.

6 Rotate the plate on the axis of the back edge.
   Rotate the plate on the axis of the front edge.
   Level the plate.

7 Insert the hooks and hook the plate.

8 Support the plate and secure the screw.
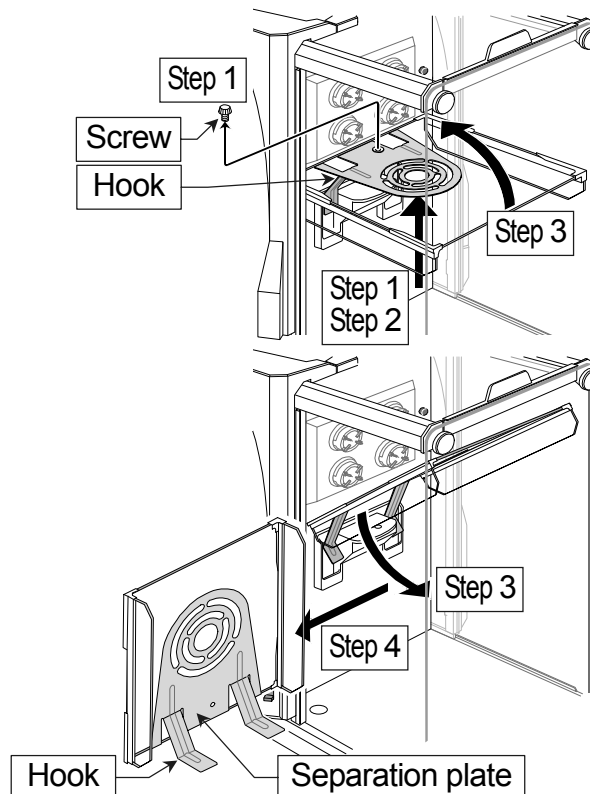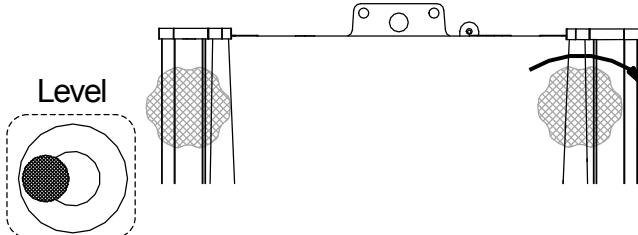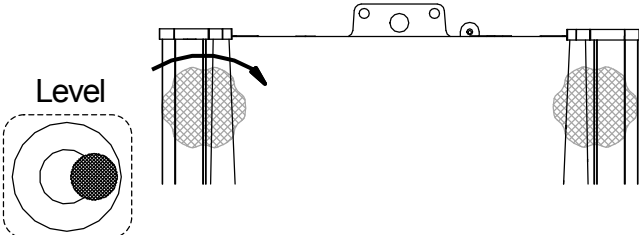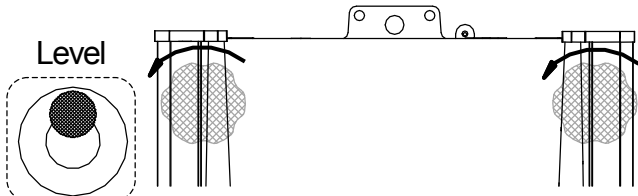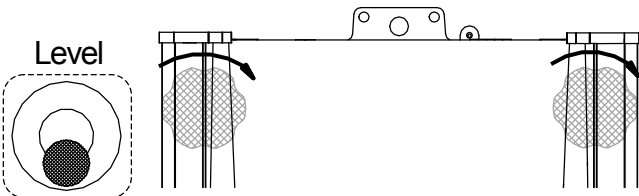
3.2. Precautions Before Use

To ensure that you get the most from your balance, please try to follow these conditions as closely as possible, especially for the **BM–5**, **BM–5D**, **BM–20** and **BM–22** that are sensitive.

□ The best operating temperature is about 20°C / 68°F at about 50% Relative Humidity.

□ The weighing room should be free of dust.

□ Clean the weighing chamber and its surroundings to prevent foreign matter from invading, especially when weighing a very small amount of sample.

□ The weighing table should be solid and free from vibration, drafts (such as frequently opening doors or windows) and as level as possible. We recommend that you use the anti-vibration table (**AD–1671**) and the remote controller (**AD–8922A**) for the **BM–5**, **BM–5D**, **BM–20** and **BM–22**.

□ Do not install the balance where it will be subject to vibration. Corners of rooms on the first floor are best.

□ Do not install the balance near a heater, air conditioner, or in a breeze. The influence of breezes can be reduced by using the tabletop breeze break (L) (**AD–1672/AD–1672A**) or the tabletop breeze break (M) (**AD–1676**).

□ Do not install the balance in direct sunlight. Avoid excessive temperature changes.

□ Do not use the balance near other equipment which produces magnetic fields.

□ Adjust the level of the balance using the leveling feet.

□ Please warm up the balance for at least one hour. Plug in the AC adapter as usual.

□ Calibrate the balance if it is installed for the first time or relocated, or when a weighing pan is replaced.

□ Ensure a stable power source when using the AC adapter.

⚠ **Do not place or use the balance where there is flammable or corrosive gas present.**

Adjusting the level

When the bubble is off to the left :	**When the bubble is off to the right :**
Turn the leveling foot on the rear right in the clockwise direction.	Turn the leveling foot on the rear left in the clockwise direction.
Level	Level
When the bubble is off to the backward position :	**When the bubble is off to the forward position :**
Turn both leveling feet on the rear in the counterclockwise direction at the same time.	Turn both leveling feet on the rear in the clockwise direction at the same time.
Level	Level

Up
Leveling foot
Down

Down
Leveling foot
Up

○ Red circle

● Bubble

Bubble spirit level

OK

NO

Red circle
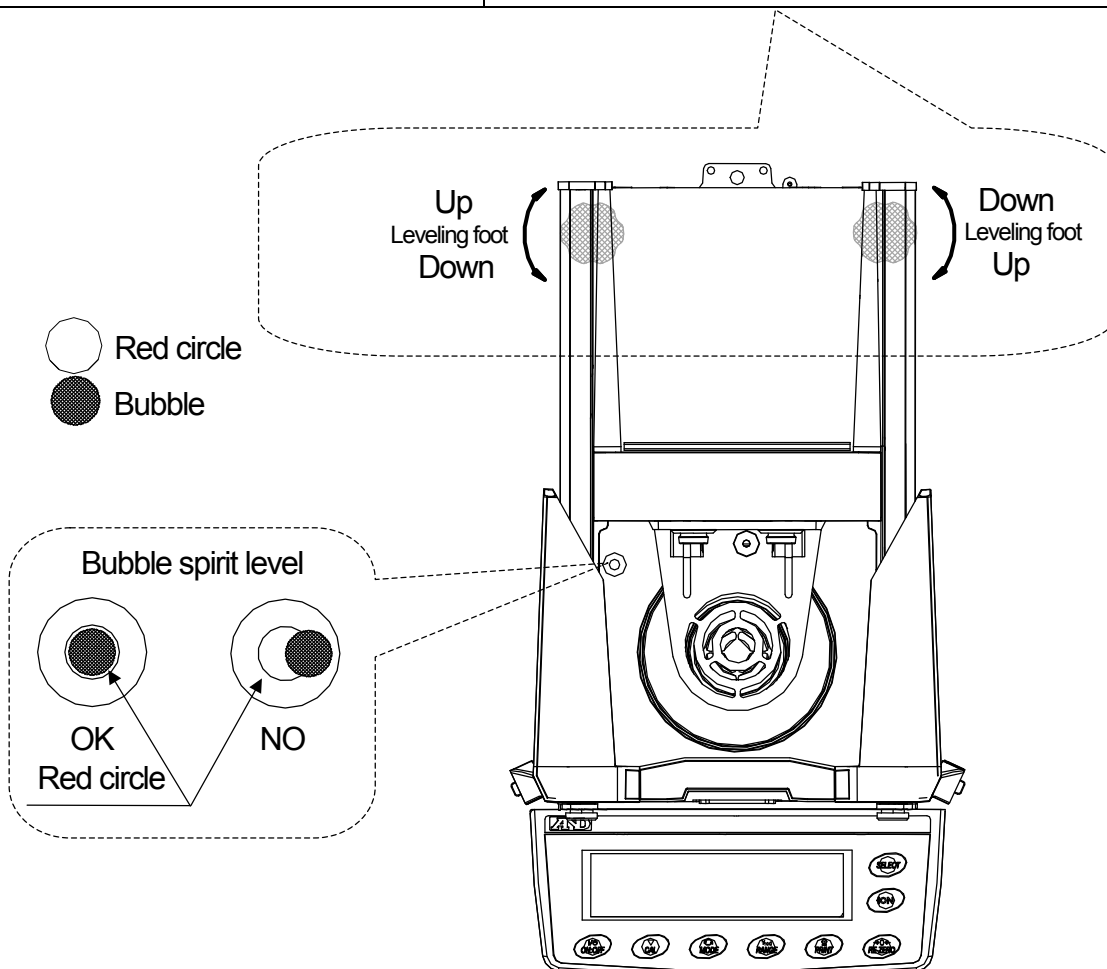
3.3. Precautions During Use

Note the following items to get accurate weighing data.

☐ Discharge static electricity from the weighing sample. When a weighing sample (plastics, insulator, etc.) could have a static charge, the weight value is influenced. Ground the balance, and
  - Eliminate the static electricity using the built-in ionizer.
  - Try to keep the ambient humidity at or above 45% RH in the room.
  - Use a metal shield case.
  - Wipe a charged material (plastic sample, etc.) with a damp cloth.

Charged material
Metal case
Grounding

☐ This balance uses a strong magnet as part of the balance assembly, so please use caution when weighing magnetic materials. If there is a problem, use the underhook (refer to "**13. Underhook**") to suspend the material away from the influence of the magnet.

Magnetic material

☐ Eliminate temperature differences between the weighing sample and the environment. When a sample is warmer (cooler) than the ambient temperature, the sample will appear lighter (heavier) than the true mass. This error is due to the rising (falling) draft around the sample. If you touch the sample, the same type of error will occur. Do not touch the sample directly with your hand. Use tweezers or other tools.

Draft
20°C 40°C
Weighing pan

☐ Do not drop things upon the weighing pan, or place a weight beyond the range of the balance on the weighing pan.

☐ Make each weighing gently and quickly to avoid errors due to changes in the environmental conditions.

Shock

☐ We recommend that the **fine range ring** and **separation plate** are used to avoid weighing errors caused by drafts when weighing using the **BM-252** (readability: 0.01 mg).

Fine range ring
BM-252

☐ We recommend that the **small fine range ring**, **fine range ring** and **separation plate** are used to avoid weighing errors caused by drafts when weighing using the **BM-20** or **BM-22** (readability: 0.01 mg and 0.001 mg). To reduce the influence of breezes, minimize operation of doors of the weighing chamber. In addition, in order to weigh more accurately while reducing the effects of the surrounding environment, attach the slide breeze break to the weighing chamber.

Small fine range ring
Fine range ring
BM-5
BM-5D
BM-20
BM-22

☐ The weighing value of the **BM-5**, **BM-5D**, **BM-20** and **BM-22** may change after the stabilization indicator is displayed. We recommend that you set a certain amount of wait time (approx. 10 seconds) before reading the value after the stabilization indicator is displayed.

Slide breeze break
BM-20
BM-22

☐ If contamination may be a problem, perform sampling operations outside the weighing chamber in order to prevent the sample from scattering in the weighing chamber.

☐ Take into consideration the affect of air buoyancy on a sample when more accuracy is required.

☐ Do not use a sharp instrument (such as a pencil or ball point pen) to press the keys, use your finger only.
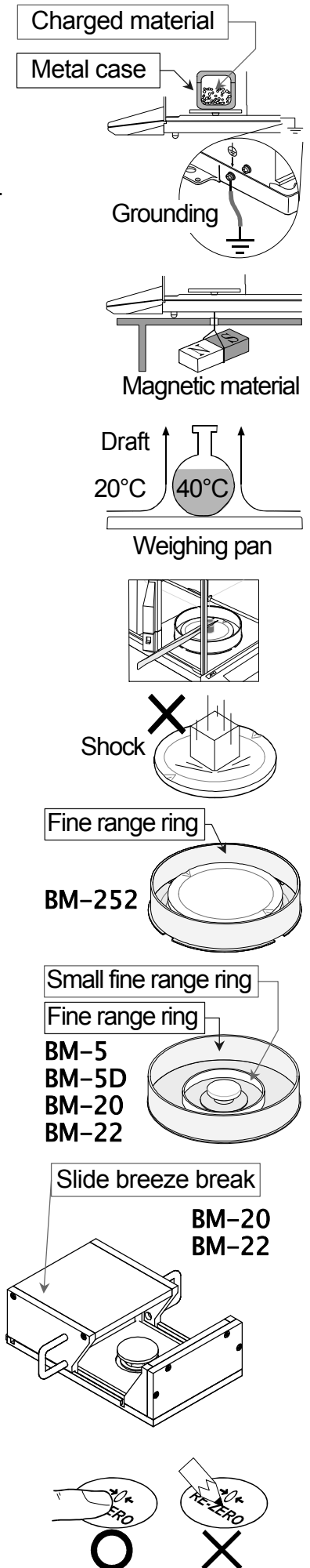
□ Press the RE-ZERO key before each weighing to prevent possible errors.

□ Keep the balance interior free of foreign matter (dust, liquid or metal fragments).

3.4.   Precautions After Use

□ Avoid mechanical shock to your balance.

□ Do not disassemble the balance. Contact your local A&D dealer if your balance needs service or repair.

□ Do not use solvents to clean the balance. For best cleaning, wipe with a dry lint free cloth or a lint free cloth that is moistened with warm water and a mild detergent.

□ Keep the balance interior free of foreign matter (dust, liquid or metal fragments).

3.5.   Precautions for Power Supply

□ Do not remove the AC adapter while the internal mass is in motion, for example, right after the AC adapter is connected, or during calibration using the internal mass.
If the AC adapter is removed under the conditions described above, the internal mass will be left unsecured, that may cause mechanical damage when the balance is moved.
Before removing the AC adapter, press the ON:OFF key and confirm that zero is displayed in the weighing mode.

□ After connecting the AC adapter to the balance, warm up the balance for at least one hour before weighing.

□ When the AC adapter is connected, the balance is in the standby mode if the standby indicator is on. This is a normal state and does not harm the balance. For accurate weighing, we recommend that the AC adapter be kept connected, especially for the **BM-5**, **BM-5D**, **BM-20** and **BM-22**.

4. Display Symbols and Key Operation

Display

Processing indicator

Stabilization indicator

Standby indicator of power supply

Weighing data or stored data

The current data number

Active processing indicator
Density mode, Display lock

Prior notice indicator of automatic self calibration

The amount of stored data with data memory function
Humidity (%)

Response indicator for approx. 30 seconds when weighing starts.

Right and left glass door indicator
Barometric pressure (hPa)

Standby indicator of interval memory function

Ionizer operation indicator

Units.
Refer to "**5. Weighing Units**".

Active indicator of interval memory function

Blinking indicators

The interval memory function is used to store the weighing data periodically. Refer to "**12. Data Memory**".

Key operation

☐ Press and release the key immediately or "Click the key" ·· MODE

☐ Press and hold the key (for approx. 2 seconds) ··· MODE

Key	When pressed and released	When pressed and held (approx. 2 seconds)
I/☉ ON:OFF	Turns the display on and off. The standby indicator is displayed when the display is turned off. When the display is turned on, the weighing mode is enabled. If the password function is used, ⌐PASS ᵘᵈ⌐ is displayed to prompt you to enter a password. Refer to "**15.4. Entering the Password Before Weighing**". This key is available anytime. Pressing the key during operation will interrupt the operation and turn the display off.	
▼ CAL	Cancels the operation when performing function settings. Enters the calibration mode using the internal mass.	Displays other items of the calibration menu.
⟲ MODE	Switches the preset weighing units stored in the function table. Refer to "**5. Weighing Units**".	Performs automatic response adjustment.
1/10d RANGE	☐ In the weighing mode, turns the minimum weighing value on and off. ☐ In the counting or percent mode, enters the unit mass storing mode or reference mass storing mode.	☐ Displays the function table menu. Refer to "**10. Function Table**". ☐ Performs a repeatability test when pressed and held for another 2 seconds after the function table menu is displayed. Refer to "**6.7. Repeatability Test**".
☉ PRINT	The key to output the weighing data to a printer or personal computer (or store it in memory) depending on the function table settings. (Factory setting = output)	☐ No function at the factory setting. ☐ By changing the function table: ■ "Title block" and "End block" for GLP / GMP report are output. ■ The data memory menu is displayed.
→0← RE-ZERO	The key to set the display to zero.	
(ION)	The key to turn the ionizer on and off.	
SELECT	The key to monitor the time and date, and the environmental sensors (temperature, humidity, barometric pressure), for several seconds. Refer to "**6.6. Monitoring the Clock and Environmental Sensors**".	

5. Weighing Units

5.1. Units

□ The units and weighing modes can be selected and stored in the function table as described in "**5.2. Storing Active Units**".
The sequence of displaying them can be arranged to fit the frequency of use.
They are stored and are maintained in non-volatile memory, even if the AC adapter is removed.

□ If the law in your area permits, you may use all of the units. You can disable the units that you don't regularly use. And you are able to turn them back on.

□ If a weighing mode (or unit of mass) has been turned off, that mode or unit will be missing in the sequence. Tael has four varieties, one of which can be selected and installed at the factory.

□ Press the ⌷MODE⌷ key to select a unit or mode for weighing.

□ For details about the units and modes, see the table below:

Name (unit, mode)	Abbreviation	Display unit	Conversion factor
Gram	g	g	1 g
Milligram	mg	mg	0.001 g
Counting mode	PC	PC	–
Percent mode	%	%	–
Ounce (Avoir)	oz	oz	28.349523125 g
Troy Ounce	ozt	ozt	31.1034768 g
Metric Carat	ct	ct	0.2 g
Momme	mom	mom	3.75 g
Pennyweight	dwt	dwt	1.55517384 g
Grain (UK)	GN	GN	0.06479891 g
Tael (HK general, Singapore)			37.7994 g
Tael (HK jewelry)	tl	tL	37.429 g
Tael (Taiwan)			37.5 g
Tael (China)			31.25 g
Tola (India)	t	t	11.6638038 g
Messghal	m	m	4.6875 g
Density mode	DS	Refer to "**14. Density Measurement**"	

□ Density mode
  ■ To use the density mode, it must be stored in the function table as described on page 22. For details about this mode, refer to "**14. Density Measurement**".

  ■ To select the density mode, press the ⌷MODE⌷ key until the processing indictor ☀ blinks with the unit "g" displayed.

Capacity and readability for the BM-252, BM-200, BM-300, BM-500

□ The tables below indicate the weighing capacity and the readability for each balance.

Unit	BM-200	BM-300	BM-500	
	Capacity			Readability
Gram	220	320	520	0.0001
Milligram	220000	320000	520000	0.1
Ounce (Avoir)	7.76	11.2	18.3	0.00001
Troy Ounce	7.07	10.2	16.7	0.00001
Metric Carat	1100	1600	2600	0.001
Momme	58.6	85.3	138	0.0001
Pennyweight	141	205	334	0.0001
Grain (UK)	3395	4938	8024	0.002
Tael (HK general, Singapore)	5.82	8.46	13.7	0.00001
Tael (HK jewelry)	5.87	8.54	13.8	0.00001
Tael (Taiwan)	5.86	8.53	13.8	0.00001
Tael (China)	7.04	10.2	16.6	0.00001
Tola (India)	18.8	27.4	44.5	0.00001
Messghal	46.9	68.2	110	0.0001

Unit	BM-252	
	Capacity	Readability
Gram	250	0.00001
Milligram	250000	0.01
Ounce (Avoir)	8.81	0.000001
Troy Ounce	8.03	0.000001
Metric Carat	1250	0.0001
Momme	66.6	0.00001
Pennyweight	160	0.00001
Grain (UK)	3858	0.0002
Tael (HK general, Singapore)	6.61	0.000001
Tael (HK jewelry)	6.67	0.000001
Tael (Taiwan)	6.66	0.000001
Tael (China)	8.00	0.000001
Tola (India)	21.4	0.000001
Messghal	53.3	0.00001

Capacity and readability for the BM-5 and BM-5D

☐ The **BM-5D** is equipped with the precision range and standard range of the smart range function.

Unit	BM-5	
	Precision range	
	Capacity	Readability
Gram	5.20	0.000001
Milligram	5200	0.001
Ounce (Avoir)	0.183	0.0000001
Troy Ounce	0.167	0.0000001
Metric Carat	26.0	0.00001
Momme	1.38	0.000001
Pennyweight	3.33	0.000001
Grain (UK)	80.1	0.00002
Tael (HK general, Singapore)	0.137	0.0000001
Tael (HK jewelry)	0.138	0.0000001
Tael (Taiwan)	0.138	0.0000001
Tael (China)	0.166	0.0000001
Tola (India)	0.444	0.0000001
Messghal	1.10	0.000001

Unit	BM-5D			
	Precision range		**Standard range**	
	Capacity	Readability	Capacity	Readability
Gram	2.10	0.000001	5.20	0.00001
Milligram	2100	0.001	5200	0.01
Ounce (Avoir)	0.0737	0.0000001	0.183	0.000001
Troy Ounce	0.0671	0.0000001	0.167	0.000001
Metric Carat	10.5	0.00001	26.0	0.0001
Momme	0.560	0.000001	1.38	0.00001
Pennyweight	1.34	0.000001	3.33	0.00001
Grain (UK)	32.4	0.00002	80.1	0.0001
Tael (HK general, Singapore)	0.0551	0.0000001	0.137	0.000001
Tael (HK jewelry)	0.0560	0.0000001	0.138	0.000001
Tael (Taiwan)	0.0560	0.0000001	0.138	0.000001
Tael (China)	0.0671	0.0000001	0.166	0.000001
Tola (India)	0.179	0.0000001	0.444	0.000001
Messghal	0.444	0.000001	1.10	0.00001

Capacity and readability for the BM-20 and BM-22

☐ The **BM-22** is equipped with the precision range and standard range of the smart range function.

| Unit | BM-20 | |
| | Precision range | |
	Capacity	Readability
Gram	22.0	0.000001
Milligram	22000	0.001
Ounce (Avoir)	0.776	0.0000001
Troy Ounce	0.707	0.0000001
Metric Carat	110	0.00001
Momme	5.86	0.000001
Pennyweight	14.1	0.000001
Grain (UK)	339	0.00002
Tael (HK general, Singapore)	0.582	0.0000001
Tael (HK jewelry)	0.587	0.0000001
Tael (Taiwan)	0.586	0.0000001
Tael (China)	0.704	0.0000001
Tola (India)	1.88	0.0000001
Messghal	4.69	0.000001

| Unit | BM-22 | | | |
| | Precision range | | Standard range | |
	Capacity	Readability	Capacity	Readability
Gram	5.10	0.000001	22.0	0.00001
Milligram	5100	0.001	22000	0.01
Ounce (Avoir)	0.179	0.0000001	0.776	0.000001
Troy Ounce	0.163	0.0000001	0.707	0.000001
Metric Carat	25.5	0.00001	110	0.0001
Momme	1.36	0.000001	5.86	0.00001
Pennyweight	3.27	0.000001	14.1	0.00001
Grain (UK)	78.7	0.00002	339	0.0001
Tael (HK general, Singapore)	0.134	0.0000001	0.582	0.000001
Tael (HK jewelry)	0.136	0.0000001	0.587	0.000001
Tael (Taiwan)	0.136	0.0000001	0.586	0.000001
Tael (China)	0.163	0.0000001	0.704	0.000001
Tola (India)	0.437	0.0000001	1.88	0.000001
Messghal	1.08	0.000001	4.69	0.00001

5.2. Storing Active Units

□ The units and modes can be selected and stored in the function table.
The sequence of displaying them can be arranged to fit the frequency of use.
The units stored are maintained in non-volatile memory, even if the AC adapter is removed.

1 In the weighing mode, press and hold the RANGE
key (for approx. 2 seconds) until bASFnc is displayed,
and then release the key.

2 Press the RANGE key several times to display Unit.

3 Press the PRINT key to enter the unit selection mode.

4 Specify a unit or mode in the order to be displayed
using the following keys.
RANGE key ········· To display the units sequentially.
RE-ZERO key ······ To specify a unit or mode.
The indicator ◯ appears when
the displayed unit or mode is specified.

Examples

Unit		Display
Gram	g	° Unit g
Milligram	mg	° Unit mg
Counting mode	PC	° Unit PC
Percent mode	%	° Unit %
Density mode	DS	° Unit DS

5 Press the PRINT key to store the units or modes.
The balance displays End and then displays the next
menu item of the function table.

6 Press the CAL key to exit the function table.
Then the balance returns to the weighing mode with the
selected unit.

Press and hold
(approx. 2 seconds) 1/10d RANGE

° 00000 g

bASFnc

Press several times 1/10d RANGE

Unit

○ PRINT

Selection key 1/10d RANGE

Examples g mg PC % ct mom DS

Specify the unit →0← RE-ZERO

The indicator ○ is
displayed at the
units specified.

° Unit   mom g

Store ○ PRINT

End

▼ CAL

° 00000 g
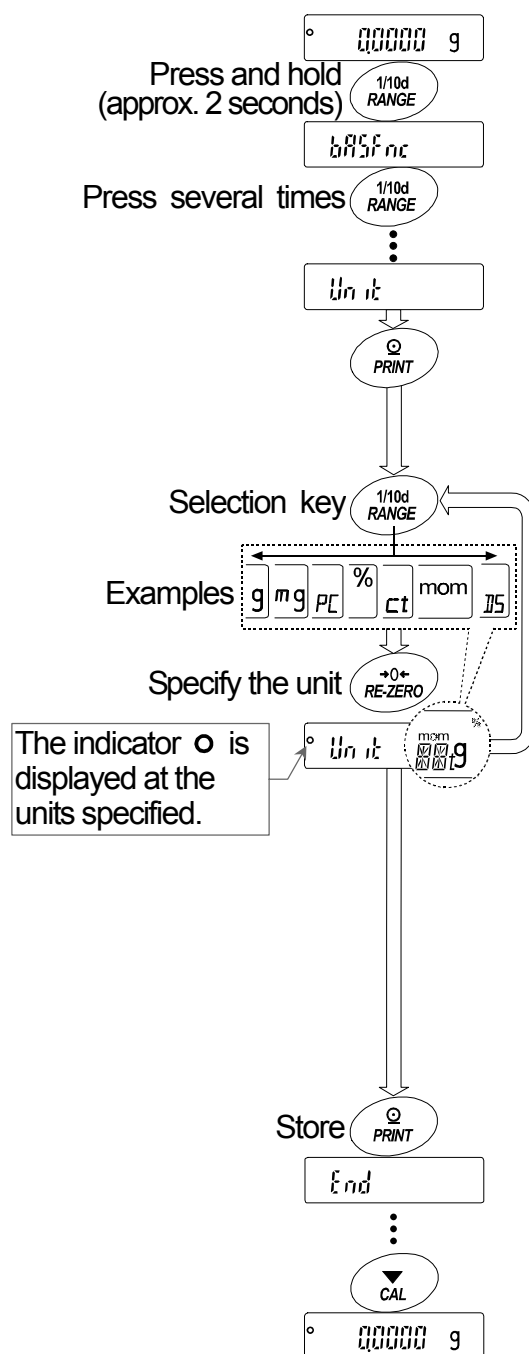
5.3. Selecting Units and Weighing Modes

▫ Preset the sequence of displaying units and weighing modes to fit the frequency of use. Refer to "**5.2. Storing Active Units**".

▫ Press the [MODE] key in the weighing mode to display the units and weighing modes in order.

▫ For the **BM-5**, **BM-5D**, **BM-20** and **BM-22,** the units preset at the factory, ^{m}g (Milligram) and g (Gram), are displayed in this order.

▫ For the **BM-252**, **BM-200**, **BM-300** and **BM-500**, the units preset at the factory, g (Gram) and ^{m}g (Milligram), are displayed in this order.

▫ Density mode
- To use the density mode, it must be stored in the function table as described on page 22. Refer to "**14. Density Measurement**" for details about the mode.

- To select the density mode, press the [MODE] key until the processing indictor ⊰ blinks with the unit "g" displayed.

The unit sequence of the factory settings.
Turning the display on.
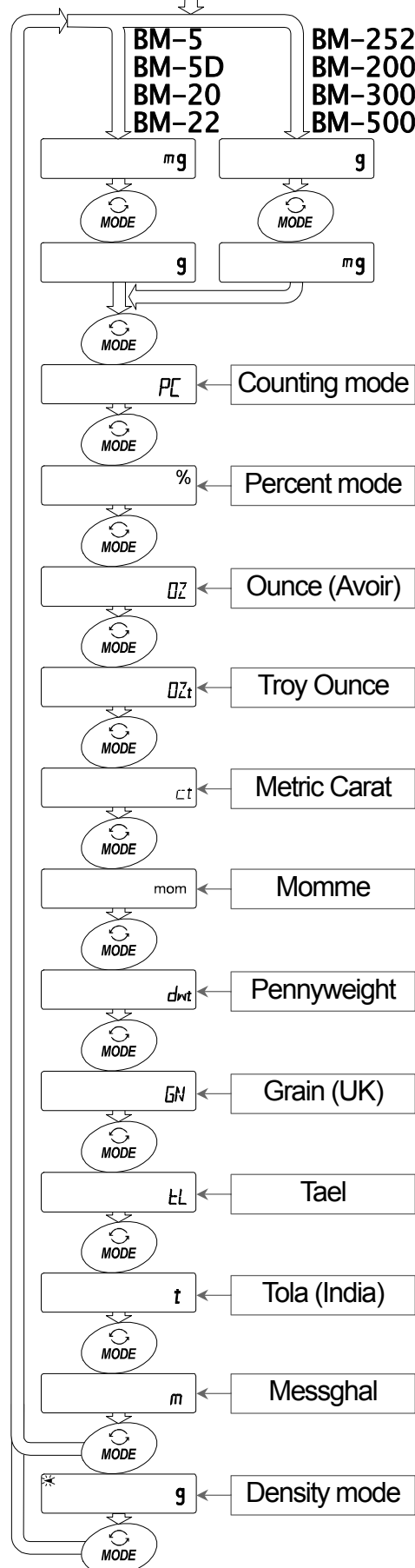
5.3.1. Unit Setting Example

The example below sets the units in the order with g (gram) as the first unit followed by PC (counting mode).

1 In the weighing mode, press and hold the RANGE key (for approx. 2 seconds) until bASFnc is displayed, and then release the key.

2 Press the RANGE key several times to display Unit .

3 Press the PRINT key to enter the unit selection mode.

4 Press the RE-ZERO key to specify the unit of g.
   The stabilization indicator O appears when the unit is specified.

5 Press the RANGE key several times to display Unit PC .

6 Press the RE-ZERO key to specify the unit of PC.
   The stabilization indicator O appears when the unit is specified.

7 Press the PRINT key to store the units.
   The balance displays End and then displays the next menu item of the function table.

8 Press the CAL key to exit the function table. Then the balance returns to the weighing mode with g, the unit selected first.

9 Press the MODE key to switch between g and PC.
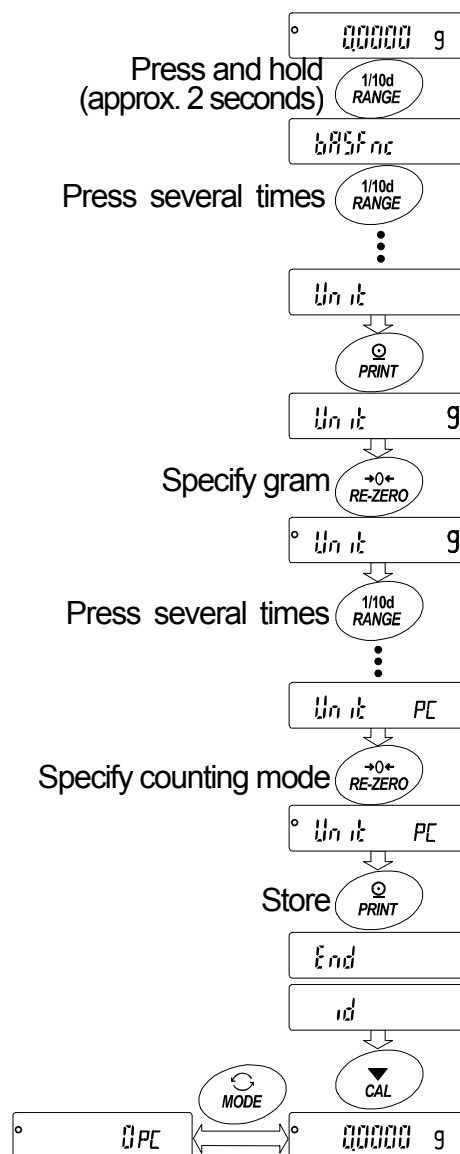
6. Weighing

Precautions for the weighing operation

□ Press the RE-ZERO key each time, before placing a sample on the weighing pan, to prevent possible errors.

□ Place a sample in the center of the weighing pan gently.

□ Temperature changes during measurement may cause weighing errors.

□ Shorten the operation time as much as possible. (Opening and closing door, placing and removing sample) Material with an electrostatic charge or that is magnetic may cause weighing errors.

□ Use a pair of tweezers to avoid a temperature change due to having your hand in the weighing chamber.

□ Do not drop things on the pan, or place a weight on the pan that is beyond the weighing range.

□ Keep the area clean and dry.

□ Do not press keys with a sharp instrument (such as a pencil or ball point pen).

□ For precision weighing, keep the AC adapter connected to the balance.

□ Calibrate periodically to maintain weighing accuracy. Refer to "**8. Calibration**".

□ For the **BM-5**, **BM-5D**, **BM-20** and **BM-22**, perform pre-weighing of the container (tare) so that precision weighing can be performed.

□ Consider section "**3. Installing the Balance and Precautions**" for the weighing operation.

6.1. Basic Operation (Gram Mode)

Refer to "**4. Display Symbols and Key Operation**" before operation.

Note When turning the balance on with a tare weight placed on the pan, the balance automatically displays the zero display.

1 Press the ON:OFF key to turn the display on.

2 Press the MODE key to select a unit, if necessary.

3 Place a container (tare) on the weighing pan, if necessary.
   Press the RE-ZERO key to cancel the tare weight.
   Then zero is displayed.
   Tare : A vessel placed on the pan, but not
           to be included in the weighing data.
           Example: Container.

4 Place a sample on the pan or in the container.
   Close the door.

5 Wait for the stabilization indicator ⟨O⟩ to be displayed, and then read the value.

6 Remove the sample and container from the pan.

Press the key to select a unit, if necessary.

Container (tare)

Weighing pan

Stabilization indicator

Zero display

Sample

The glass door is not closed

Close the door

Warning

Stabilization indicator

Remove
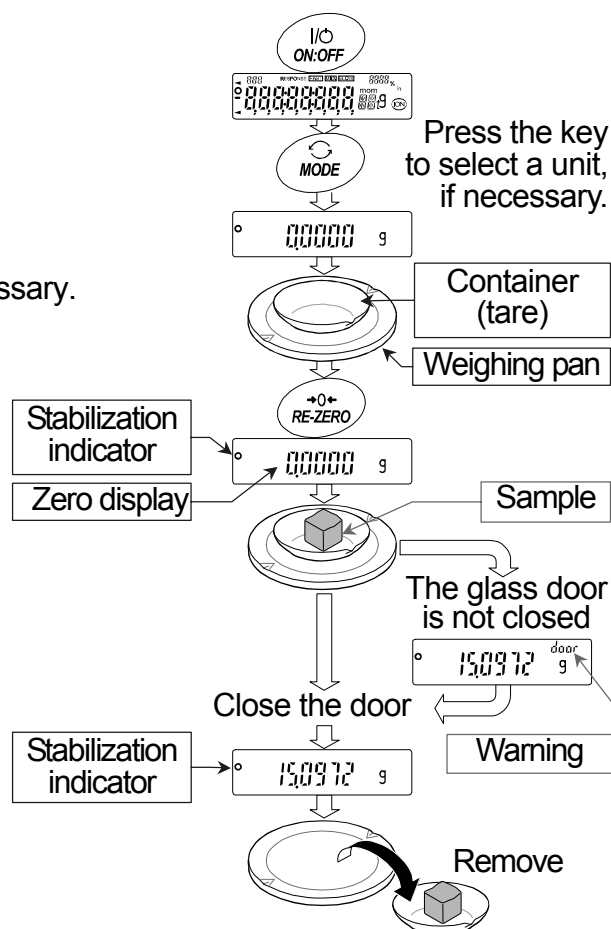
Zero operation, tare operation and weighing range

▫ When weighing is started
The balance will determine the reference zero point when the ON:OFF key is pressed to enter the weighing mode.
Depending on the load condition at that time, the balance will automatically judge whether to perform zero or tare operation. The condition for determining which is used is "power on zero range", and when power on zero range is exceeded, the tare operation is performed.

▫ Re-zero operation
By pressing the RE-ZERO key, the display can be set to zero.
The re-zero operation with the RE-ZERO key will automatically judge whether to perform zero or tare operation.
The condition for determining which is used is "zero range", and when zero range is exceeded, the tare operation is performed.

▫ Weighing range
The range that the balance can weigh varies depending on the model.
When the total amount (net weight + tare weight) displayed for each model exceeds the maximum display, E is displayed to indicate that the weighing range is exceeded.
When exceeded in the negative direction, -E is displayed.

Model	Power on zero range	Zero range	-E display range
BM−5	Approx. ±0.1 g	Approx. -3.0 g to +0.1 g	Less than approx. -3 g
BM−5D			
BM−20	Approx. ±2.2 g	Approx. -3.0 g to +0.4 g	Less than approx. -3 g
BM−22			
BM−252	Approx. ±25 g	Approx. -37 g to +5.0 g	Less than approx. -37 g
BM−200	Approx. ±22 g	Approx. -37 g to +4.4 g	
BM−300	Approx. ±32 g	Approx. -37 g to +6.4 g	
BM−500	Approx. ±52 g	Approx. -37 g to +10.4 g	

6.2. Smart Range

□ The smart range for the **BM-5D** and **BM-22** consists of the standard range and precision range (high resolution).

□ Smart range function
- The range switches automatically, depending on the value displayed.
- Pressing the ⌗RE-ZERO⌗ key allows weighing in the precision range, regardless of the tare value.
- The range can be fixed to the standard range by pressing the ⌗RANGE⌗ key.

Example

1 Press the ⌗RE-ZERO⌗ key to use the precision range.
   The balance displays zero.

   Precision range

   Container (tare)

2 Place a container (tare) on the weighing pan.
   When the value of the container (tare) exceeds the precision range, the balance automatically switches to the standard range.

   Standard range

3 Press the ⌗RE-ZERO⌗ key to use the precision range.
   The balance displays zero.

   Precision range

   Weighing sample

4 Place the weighing sample in the container (tare).
   When the sample is within the precision range,
   the weighing value can be read in high resolution.
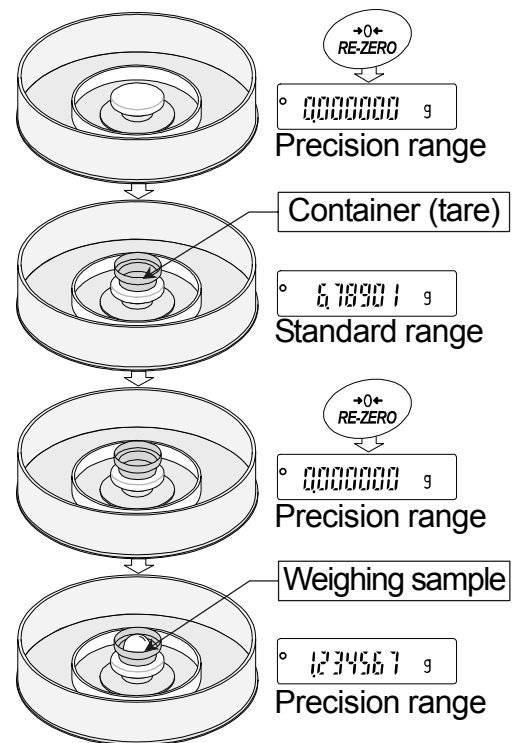
   Precision range

Precision range and standard range

Model	Unit	Precision range	Standard range
BM-5D	Milligram	0.000 ^{m}g to 2100.009 ^{m}g	2100.01 ^{m}g to 5200.08 ^{m}g
	Gram	0.000000 g to 2.100009 g	2.10001 g to 5.20008 g
BM-22	Milligram	0.000 ^{m}g to 5100.009 ^{m}g	5100.01 ^{m}g to 22000.08 ^{m}g
	Gram	0.000000 g to 5.100009 g	5.10001 g to 22.00008 g

Refer to pages 20 and 21 for other units.

6.3. Counting Mode (PC)

▫ This is the mode to determine the number of objects in a sample based on the standard sample unit mass. The unit mass means an average mass of the samples. The smaller the variation in the samples is, the more accurate the count will be. The balance is equipped with the Automatic Counting Accuracy Improvement (ACAI) function to improve the counting accuracy.

Notes

▫ **Use samples with a unit mass of 1 mg or more for counting.**

▫ **If the sample unit mass variable is too large, it may cause a counting error.**

▫ **To improve the counting performance, use the ACAI function frequently or divide the samples into several groups and count each group.**

Selecting the counting mode

1 Press the ⎡MODE⎤ key to select the unit ⎡PC⎤ (counting mode).

Storing a sample unit mass (Weighing input mode)

2 Press the ⎡RANGE⎤ key to enter the sample unit mass storing mode.

3 Select the number of samples using the ⎡RANGE⎤ key.
It may be set to 10, 25, 50 or 100.
Note   A greater number of samples will yield more accurate counting result.

4 Place a container (tare) on the weighing pan, if necessary.
Press the ⎡RE-ZERO⎤ key to cancel the weight (tare).
The number specified in Step 3 appears.
Example: ⎡25 0 PC⎤ is displayed if 25 is selected in Step 3.

5 Place the number of samples specified on the pan.
In this example, 25 pieces.

6 Wait for the stabilization indicator to be displayed.
Press the ⎡PRINT⎤ key to calculate and store the unit mass. Then the balance displays ⎡25 PC⎤ and is set to count samples with this unit mass. To improve the accuracy of the unit mass, proceed to Step 8.

Notes

▫ **If the balance judges that the mass of the samples is too light to acquire accurate weighing, it displays an error requiring the addition of more samples to the specified number.**
Example: ⎡50 - PC⎤ appears, requiring 25 more samples. Add 25 samples and press the ⎡PRINT⎤ key. When the unit mass is stored correctly, the balance proceeds to the counting mode.

▫ **If the balance judges that the mass of the samples is too light (under 0.0001g) and cannot be stored as the unit mass, it displays ⎡Lo⎤.**

▫ **The sample unit mass is stored in non-volatile memory, and is maintained even if the AC adapter is removed.**

Counting operation

7 Place the samples to be counted on the pan.
Read the result and remove the samples from the pan.

MODE

⎡ 0 PC⎤

1/10d RANGE

⎡ 10 - PC⎤

1/10d RANGE

⎡ 25 - PC⎤

Weighing pan
Container (tare)

→0← RE-ZERO

⎡ 25 0 PC⎤

25 samples

PRINT

⎡ 25 PC⎤

To Step 8 when using the ACAI function.

Place samples

Counting result ⎡ 55 PC⎤

BM series
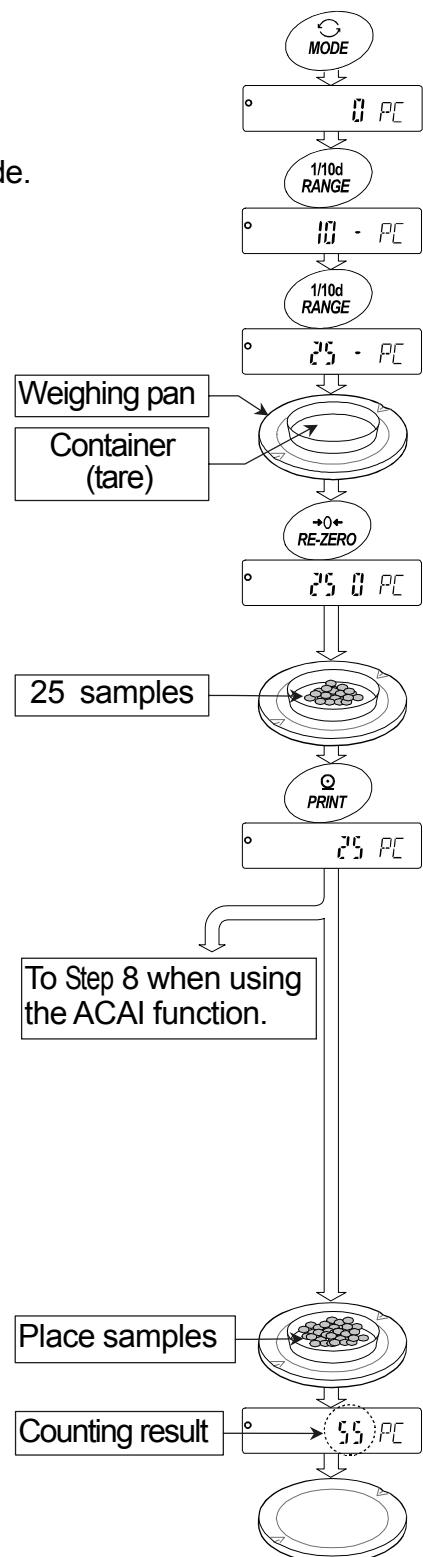
Counting mode using the ACAI function

The ACAI is a function that improves the accuracy of the unit mass automatically by increasing the number of samples as the counting process.

ACAI: Automatic Counting Accuracy Improvement

Proceed to Step 8 after storing a unit mass on the previous page.

8 If a few more samples are added, the processing indicator turns on. To prevent an error, add three or more. The processing indicator does not turn on if overloaded. Try to add the same number of samples as displayed.

9 The balance re-calculates the unit mass while the processing indicator is blinking. Do not touch the balance or samples on the pan until the processing indicator turns off.

10 Counting accuracy is improved when the processing indicator turns off.
Each time the above operation is performed, a more accurate unit mass will be obtained. There is no definite upper limit to the ACAI range for the number of samples exceeding 100. Try to add the same number of samples as displayed.

11 Remove all the samples used in ACAI and proceed with the counting operation using the improved unit mass.

From Step 6 on the previous page

Add a few more samples.

The indicator turns on at proper range.

65 PC

The indicator blinks during calculation.

65 PC

The indicator turns off after the unit mass is improved.

65 PC

Repeat
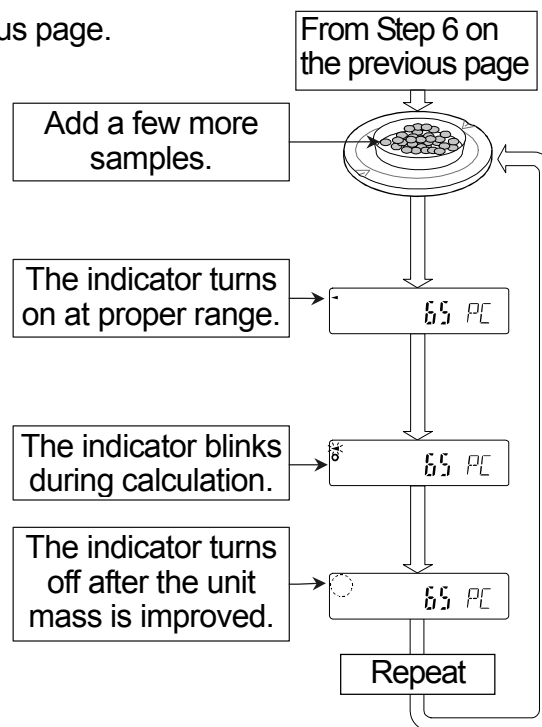
6.4.   Percent Mode (%)

The percent mode displays the weight value in percentage compared to a 100% reference mass and is used for target weighing or checking the sample variance.

Selecting the percent mode
1   Press the MODE key to select the unit % (Percent mode).
    If the percent mode cannot be selected, refer to "**5. Weighing Units**".

Storing the 100% reference mass

2   Press the RANGE key to enter the 100% reference mass storing mode.

3   Place a container (tare) on the weighing pan, if necessary. Press the RE-ZERO key to cancel the weight (tare). The balance displays ┌ *100 0 %* ┐.

4   Place the sample to be set as the 100% reference mass on the pan or in the container.

5   Press the PRINT key to store the reference mass. The balance displays ┌ *100.00 %* ┐.

Notes

□   **The readability depends on the 100% mass.**

BM–252, BM–200 BM–300, BM–500		BM–5, BM–5D BM–20, BM–22	
100% mass	Readability	100% mass	Readability
0.0100 g to 0.0999 g	1 %	0.00100 g to 0.0099 g	1 %
0.1000 g to 0.9999 g	0.1 %	0.01000 g to 0.0999 g	0.1 %
1.0000 g to	0.01 %	0.10000 g to	0.01 %

□   **If the balance judges that the mass of the sample is too light (under 0.01g) to be used as a reference, it displays** ┌ *Lo* ┐.

□   **The 100% reference mass can be stored in the non-volatile memory and is maintained even if the AC adapter is removed.**

6   Remove the sample.

Reading the percentage
7   Place a sample to be compared to the reference mass on the pan. The displayed percentage is based on the 100% reference mass.

Weighing pan

Container (tare)

100% mass

Place sample

Percentage
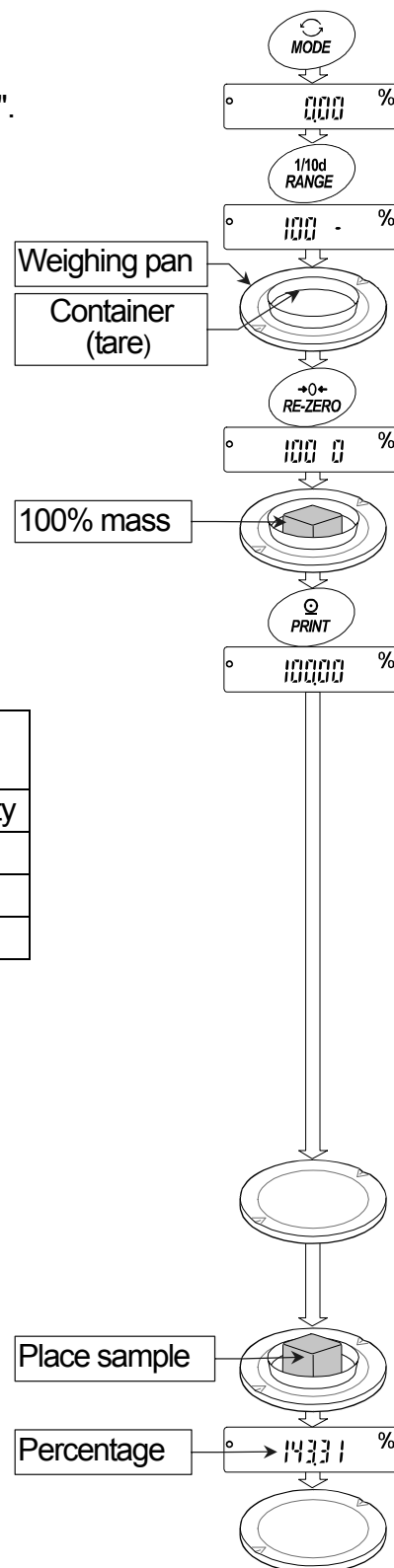
6.5. Ionizer (Neutralization Device)

The **BM** series is equipped with four ionizer electrode units to neutralize static electricity from a charged weighing sample.
Neutralizing static electricity before weighing will improve stability, reducing errors.

Neutralizing ion : The discharge electrodes of the ionizer continuously generate bipolar ions by corona discharge. Applying these ions to the weighing sample neutralizes the static charge.

Static electricity : In general, when the ambient humidity is less than 45% RH, nonconductors such as powders, paper and plastics easily become charged with static electricity. The influence of the static electricity may cause a weighing error of several milligrams. The ionizer effectively neutralizes the electrical charge.

Operation

1 Place the sample to be weighed on the center (of the metallic circle) of the separation plate to neutralize the static charge.

2 Press the ⃞ION key to start the neutralization. The ⓘON mark and the LED blink.
The neutralization will stop after the preset time of "Neutralization time (ιοη)" in the function table (the factory setting is 3 seconds).

□ The readability of the **BM-5**, **BM-5D**, **BM-20**, **BM-22** and **BM-252** is switched to 0.1 mg while performing the neutralization.

□ Pressing the ⃞ION key during neutralization stops the neutralization.
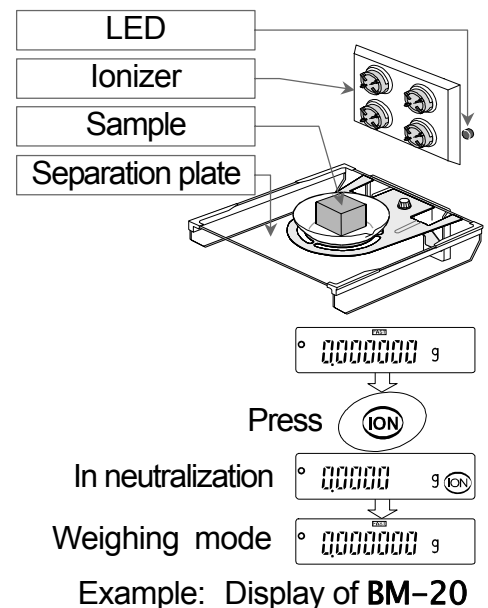
Notes

□ **Keep the weighing sample away from the electrodes while neutralizing. Placing the sample too close to the electrodes may cause the sample to become charged.**

□ **Remove any obstacle between electrodes and the weighing sample.**

LED
Ionizer
Sample
Separation plate

Press ⓘON
In neutralization
Weighing mode

Example: Display of **BM-20**

6.5.1. Maintenance of the Electrode Units

□ When using the ionizer for a long time, dust and stains may stick to the electrodes. Clean them periodically to maintain performance.

□ When needles of the electrodes are worn down and neutralization ability is not restored after cleaning them, replace all four electrodes with new ones. The standard life of an electrode unit is approximately 10000 hours.

Step 1
Step 2
Cleaning
Electrode needle
Electrode unit

Replacing the electrode units

1 Turn the electrode units 45 degrees counterclockwise and remove them from the ionizer.

2 Replace all four units with new ones.

Note Do not replace, remove and clean the electrodes while the ionizer is in operation as there is a danger of electrical shock.

3 Turn the electrode units 45 degrees clockwise and insert them into the ionizer.
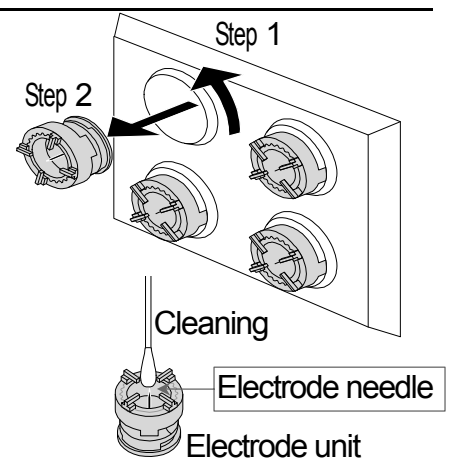
6.5.2. Controlling the Ionizer Externally

It is possible to control the BM ionizer function by connecting the remote controller (AD-8922A) or the foot switch (AX-SW137-PRINT, AX-SW137-REZERO).

□ When specifying "*on*" to "AD-8922A control (*8922*)" in the function table (*ionFnc 8922 on*), the balance assigns the function of the ION key to the MODE key on the AD-8922A.
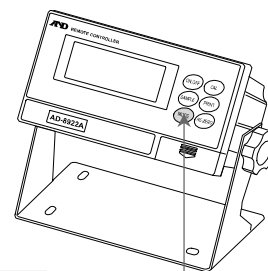
Assign the ION key to the MODE key on the AD-8922A.

□ When specifying "External control input (*E-5*)" in "Ionizer function (*ionFnc*)", the following functions can be assigned to AX-SW137-PRINT (option) or AX-SW137-REZERO (option) terminals.

Ionizer function	External control input	AX-SW137-PRINT	AX-SW137-REZERO
■ *ionFnc*	*E-5 0*	PRINT key	RE-ZERO key
ionFnc	*E-5 1*	PRINT key	ION key
ionFnc	*E-5 2*	ION key	RE-ZERO key

■ Factory settings

6.6. Monitoring the Clock and Environmental Sensors

In the weighing mode, the built-in clock and environmental sensors (temperature, humidity, barometric pressure) can be monitored and temperature data can be output in the function settings.

Specifications of the environmental sensors

Sensor	Resolution	Measurement range	Applicable range
Temperature	±1.5 °C	5 °C to 40 °C	5 °C to 40 °C
Humidity	±10 %	0 % to 100 %	
Barometric pressure	±10 hPa	300 hPa to 1100 hPa	

Notes
- **The environmental sensors are built into the balance casing. Therefore, these values are not in accordance with the environmental condition.**
- **Refer to "20. Specifications" for the balance operating conditions.**

Operation

- Press the SELECT key in the weighing mode. The current time, date and sensor values (temperature, humidity, barometric pressure) are displayed for several seconds in order. The balance returns to the weighing mode automatically.

- When pressing the SELECT key while the current data is displayed, the display proceeds to the next data.

- When pressing the CAL key while the current data is displayed, the balance returns to the weighing mode.
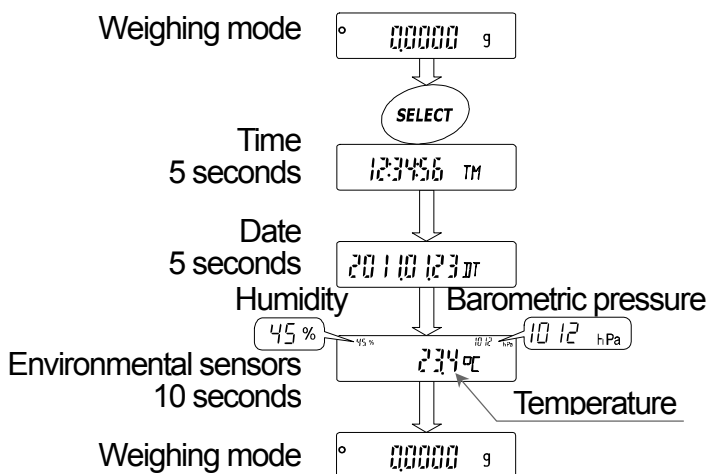
Notes
- **When adjusting the built-in clock, refer to "10.7. Clock and Calendar Function".**
- **When adding the time and date to the output data, refer to "Time/Date output (5-ld)" of "10.2. Details of the Function Table".**
- **When adding temperature data to the output data, refer to "Temperature output (5-lP)" of "10.2. Details of the Function Table".**

6.7. Repeatability Test

Repeatability is an index of variation in weighing values when the same mass is repeatedly loaded and unloaded. Standard deviation is generally used for the indicator of repeatability.
The repeatability test measures the internal mass 10 times and displays the standard deviation.
Use the repeatability test function to inspect the performance of the balance when changing the environment or when moving the balance to a new location.

Example: "Standard deviation = 0.2 mg" means that the results of repeated measurements of the same mass fall within the range of ±0.2 mg at a frequency of about 68%.

Notes

□ **When the password function is used, the repeatability test function is available only when logged in as an administrator ($Ad\bar{m}_{IN}$).**

□ **The repeatability test uses the internal mass. Therefore, the obtained standard deviation may disagree with that of the repeatability of "20. Specifications". Regard the standard deviation as a reference.**

Model	Internal mass
BM-5, **BM-5D**	Approx. 5 g
BM-20, **BM-22**	Approx. 20 g
BM-252, **BM-200**, **BM-300**, **BM-500**	Approx. 190 g

1 Press and hold the RANGE key (for approx. 4 seconds) until $\ulcorner EP\ \ulcorner ESE$ is displayed, and then release the key.

2 When $\ulcorner EP\ \ulcorner ESE$ is displayed, the measurement is automatically started, $\ulcorner EP$ blinks and the measurement count (0 to 10) is displayed.
To cancel the current measurement, press the CAL key.

Note   Avoid vibration and breezes for precise measurement during this test.

3 At the end of the measurement, the standard deviation of the repeatability is displayed.

4 Press the CAL key or PRINT key to return to the weighing mode.

Example of **BM-20**

Weighing mode

Press and hold (approx. 4 seconds)

Release

Counter

In measurement

Cancel

Result
Standard deviation

or

End

Weighing mode
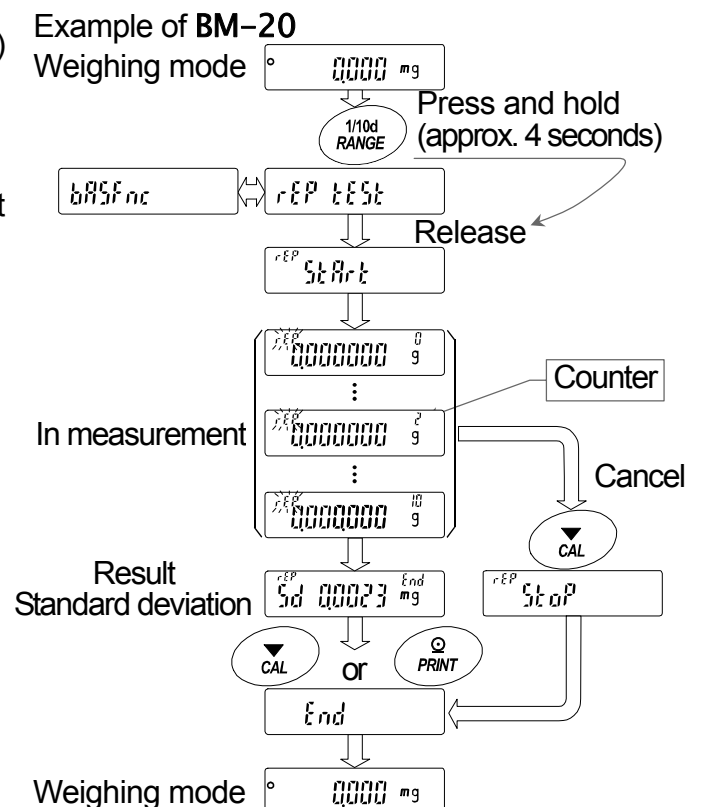
7.   Response Adjustment

This function stabilizes the weight value by reducing the influence on weighing that is caused by drafts and/or vibration at the place where the balance is installed. The adjustment of the function can be performed by analyzing the environment automatically or hand-operation. The state of the function has three stages as follows :

Indicator	Parameter	Response	Stability
FAST	Cond 0	Fast response,	Sensitive value
MID.	Cond 1	⬆	⬇
SLOW	Cond 2	Slow response,	Stable value

Response indicator
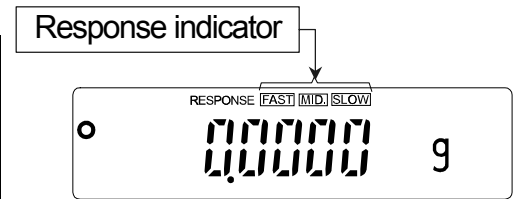
7.1.   Automatic Response Adjustment

This function automatically updates the response adjustment by analyzing the influence of the environment using the internal mass.

1 Press and hold the MODE key (for approx. 2 seconds) until RESPONSE is displayed, and then release the key.

2 The balance automatically sets the response characteristic.

   Caution   Do not allow vibration or drafts to affect the balance during adjustment.

3 After automatic adjustment, the balance displays End , returns to the weighing mode and displays the updated response indicator for about thirty seconds.

Press and hold (approx. 2 seconds)

Release

Result

Notes

□ **If the automatic response adjustment fails, the balance displays CH nG . Check the ambient conditions such as breeze and vibration, also check the weighing pan. Then, perform adjustment again. Press the CAL key to return to the weighing mode.**

□ **If there is anything on the weighing pan, the balance displays CH E . Remove the substance from the pan. Press the CAL key to return to the weighing mode.**

□ **If the automatic response adjustment is not helpful, try "7.2. Manual Response Adjustment".**
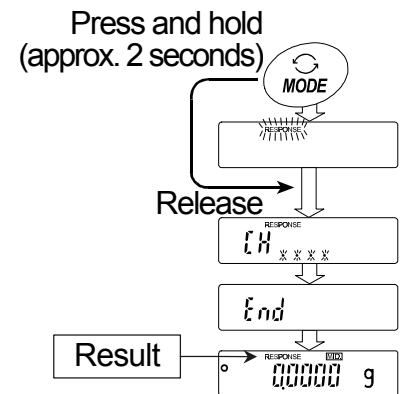
7.2. Manual Response Adjustment

1 Press and hold the ⌈MODE⌋ key (for approx. 2 seconds) until ⌈RESPONSE⌋ is displayed, and then release the key. Press the ⌈MODE⌋ key again immediately.

2 Select a setting for the response adjustment using the ⌈MODE⌋ key. Either ⌈FAST⌋, ⌈MID.⌋ or ⌈SLOW⌋ can be selected.

3 The balance displays ⌈End⌋, returns to the weighing mode and displays the updated response indicator for about thirty seconds.

Press and hold
(approx. 2 seconds)

Release and press again immediately

Select a parameter

Release and wait

Result

Notes

□ **When the response adjustment is selected, the "Condition (Cond)" parameter of "Environment, Display (bASFnc)" in the function table will be changed accordingly as shown below.**

Display	Cond (Condition)
FAST	0
MID.	1
SLOW	2

□ **The response adjustment setting can be changed by the "Condition (Cond)" parameter of "Environment, Display (bASFnc)" in the function table. For details, refer to "10. Function Table".**

BM series
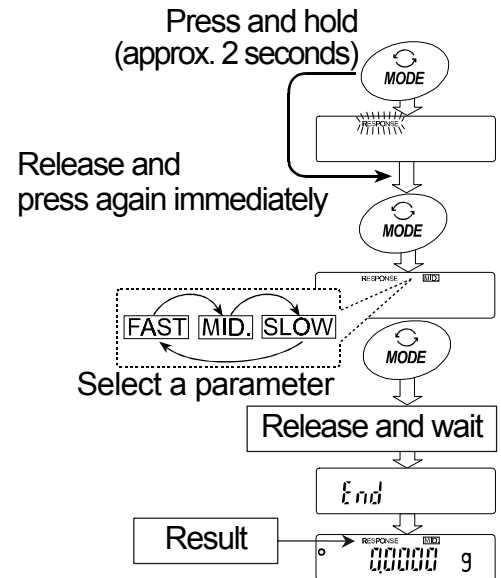
8. Calibration

8.1. Calibration Group

Since the balance's resolution is high, weighing values may change due to gravity and daily environmental changes. It is necessary to perform calibration (sensitivity adjustment) with the weight in order to keep the weighing values from changing even if gravity or the environment changes.
Calibrate the balance if it is installed for the first time or relocated, or when the weighing values change significantly in daily inspection.
Calibration means to adjust the weighing value of the balance using the reference weight or internal mass. Calibration test means to weigh with the reference weight and compare how much the result deviates from the reference value. (Calibration test does not perform adjustment.)

Calibration (Sensitivity adjustment)

Automatic self calibration----------------------- Automatically adjusts the balance using the internal mass depending on the temperature change of the operating environment.

Calibration using the internal mass---------- Using the internal mass, adjusts the balance with a single touch.

Calibration using an external weight -------- Using an external weight, adjusts the balance.

Calibration test（Sensitivity check）

Calibration test using the internal mass ---- Checks the accuracy of weighing using the internal mass and outputs the result.
*No adjustment is made.

Calibration test using an external weight--- Checks the accuracy of weighing using an external weight (target weight) and outputs the result.
*No adjustment is made.

Notes
□ **Do not allow vibration or drafts to affect the balance during calibration.**
□ **When using the data output for GLP / GMP using the RS-232C interface, set "GLP output (_ınFo_)" of the function table. Refer to "10. Function Table". The time and date can be added to the GLP report. If the time and date are incorrect, refer to "10.7. Clock and Calendar Function" and adjust them.**
□ **Calibration test is available only when "GLP output (_ınFo_)" is set to " _1_ " , " _2_ " or " _3_ ".**
□ **The calibration and calibration test data can be stored in memory. When using memory, set "Data memory (_dAtA_)" of the function table. Refer to "12. Data Memory" for details.**

Note on using an external weight
□ The accuracy of an external weight can influence the accuracy of weighing.
□ Select a weight for calibration and calibration test from the following table.

Model	Usable weight					Adjustable range
BM-5	1 g	2 g	**5 g***			
BM-5D	1 g	2 g	**5 g***			-3.000 mg to +3.099 mg
BM-20	1 g	2 g	5 g	10 g	**20 g***	
BM-22	1 g	2 g	5 g	10 g	**20 g***	
BM-252	10 g	20 g	50 g	100 g	**200 g***	-15.00 mg to +15.99 mg
BM-200	50 g	100 g	**200 g***			
BM-300	50 g	100 g	**200 g***	300 g		-30.0 mg to +30.9 mg
BM-500	50 g	100 g	**200 g***	300 g	500 g	

Bold type*:   Factory settings.   The weight value can be adjusted within the range above.

About the internal mass

□ The internal mass may change due to corrosion or other damage caused by the operating environment, or due to aging. Check the internal mass periodically and correct the internal mass value if necessary. Refer to "**8.7. Correcting the Internal Mass Value**".

Display

This indicator means that the balance is measuring calibration data.
Do not allow vibration or drafts to affect the balance while the indicator is displayed.

8.2. Automatic Self Calibration

Automatic self calibration due to changes in temperature

This function automatically calibrates the balance when the balance detects an ambient temperature change. If GLP output is selected in the function table, the balance outputs the calibration report or stores the data in memory. Automatic self calibration functions even if the display is turned off (standby mode). Refer to "**9.1. Permit or Inhibit**" for the operation.

Caution

□ **To maintain the calibrated state, keep the weighing pan clear while not in use.**

□ **If something is on the weighing pan, the balance decides that it is in use and does not perform automatic self calibration.**

□ **When performing a long term weighing with something placed on the pan, installing the balance in a system or considering the importance of continuous data, turn off automatic self calibration.**

Notes

□ **When turning on the balance with nothing on the pan, if a sample heavier than 0.5 g is placed on the pan, the balance detects the state that a sample is placed on the pan and does not perform automatic self calibration.**

Indicates that the balance detects changes in ambient temperature and automatic self calibration will start. If the balance is not used for several minutes with this indicator (◄) blinking, the balance performs automatic self calibration. The blinking duration depends on the operating environment.
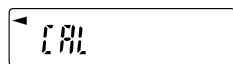
Indicates that the balance is measuring calibration data. Do not allow vibration or drafts to affect the balance while this indicator is displayed. After calibration, the balance returns to indicate the previous display.

□ **The balance can be used while the indicator blinks. But, to maintain the accuracy, stop using the balance and confirm that there is nothing on the pan and allow the balance to perform self calibration.**

8.3. Calibration Using the Internal Mass

▫ This function calibrates the balance using the internal mass.
▫ The only operation required is to press the ⌑CAL⌑ key.

1 Connect the AC adapter and warm up the balance for at least one hour with nothing on the weighing pan.

2 Press the ⌑CAL⌑ key to display ⌑*CAL* *in*⌑ .

3 The balance performs calibration using the internal mass.
  Do not allow vibration or drafts to affect the balance.

4 If GLP output is set, ⌑*GLP*⌑ is displayed, the calibration report is output to the RS-232C interface and is stored in memory. Refer to "GLP output (*info*)" and "Data memory (*dAtA*)" of the function table in "**11.2. GLP Report**" and "**12. Data Memory**".
  ⌑*End*⌑ is displayed after calibration.

5 The balance will automatically return to the weighing mode after calibration.

6 Confirm weighing accuracy using calibration test (*CC in*).

GLP output
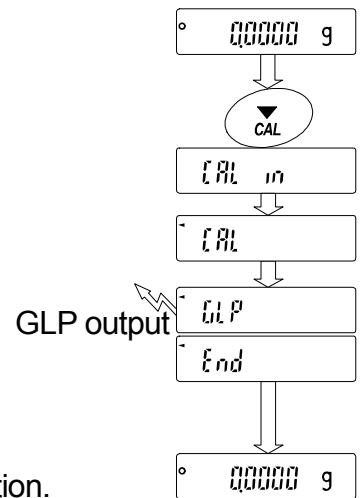
8.4. Calibration Test Using the Internal Mass

□ This function checks the accuracy of weighing using the internal mass.
□ Calibration test does not perform adjustment.

1 Connect the AC adapter and warm up the balance for at least one hour with nothing on the weighing pan.

2 Press and hold the ⌈CAL⌉ key until ⌈ ⌈⌈ ᵢₙ ⌉ is displayed, and then release the key.

3 The balance measures the zero point.
Prevent vibration and drafts to affect the balance.

4 The measured zero point data is displayed.

5 The balance measures the internal mass.
Prevent vibration and drafts to affect the balance.

6 The value of the internal mass is displayed.
The normal range of the value is as follows:

Model	Internal mass	Normal range
BM-5, BM-5D	5.00000 g	±0.02 mg
BM-20, BM-22	20.00000 g	±0.02 mg
BM-252, BM-200 BM-300, BM-500	200.0000 g	±0.2 mg

7 ⌈ GLP ⌉ is displayed and the calibration test report is output to the RS-232C interface and is stored in memory. Refer to "GLP output (ᵢₙFₒ)" and "Data memory (dAtA)" of the function table.
⌈ End ⌉ is displayed after the calibration test.

8 The balance automatically returns to the weighing mode.

BM series

8.5. Calibration Using an External Weight

□ This function calibrates the balance using an external weight.

Note **Automatic self calibration (due to changes in temperature) is enabled in the factory setting. Therefore, even after calibration using an external weight, the balance may perform automatic self calibration whenever it detects changes in temperature.**
When considering the importance of continuous data or managing the balance using the external weight only, refer to "9.1. Permit or Inhibit" to set the function switch to "inhibit"

1 Connect the AC adapter and warm up the balance for at least one hour with nothing on the weighing pan.

2 Press and hold the ⬛CAL⬛ key until ⬛CALout⬛ is displayed, and then release the key.

3 When ⬛CAL 0⬛ is displayed, proceed as follows:
   □ If you want to change the calibration weight, press the ⬛RANGE⬛ key and proceed to Step 4.
   □ If you use the calibration weight value stored in the balance, proceed to Step 5.

4 Specify the calibration weight value as follows:
   ⬛RANGE⬛ key ·········· To switch blinking digits.
   ⬛RE-ZERO⬛(+)key ····· To select the calibration weight or adjust the
   ⬛MODE⬛(−)key   calibration weight value. Refer to page 37.
   ⬛PRINT⬛ key ·········· To store the new calibration weight value.
                         Even if the AC adapter is removed, the
                         data is maintained in non-volatile memory.
   ⬛CAL⬛ key ············· To cancel the operation and return to
                         ⬛CAL 0⬛.

5 Confirm that there is nothing on the pan and press the ⬛PRINT⬛ key. The balance measures the zero point. Do not allow vibration or drafts to affect the balance. The balance displays the calibration weight value.

6 Place the displayed calibration weight on the pan and press the ⬛PRINT⬛ key. The balance measures the calibration weight. Do not allow vibration or drafts to affect the balance.

7 ⬛End⬛ is displayed. Remove the weight from the pan.

8 If GLP output is set, ⬛GLP⬛ is displayed and the calibration report is output and stored. Refer to "GLP output (info)" and "Data memory (dAtA)" of the function table in "**11.2. GLP Report**" and "**12. Data Memory**".

9 The balance will automatically return to the weighing mode.

10 Place the calibration weight on the pan and confirm that the value displayed is correct. If it is not within the range, check the ambient conditions such as breeze and vibration, and also check the weighing pan. Then, repeat Steps 2 to 10.

Press and hold
CAL in ⇄ CAL out
Release
New value
CAL 0
1/10d RANGE
2000000 g
Select a weight — →0/T← RE-ZERO
1000000 g
1/10d RANGE
Adjust the value
1/10d RANGE — →0← RE-ZERO — MODE
100.0012 g
PRINT

Example:
New value
100.0012 g

PRINT
CAL 0
100
Place the weight
PRINT
End
Remove the weight
GLP output — GLP
End
00000 g
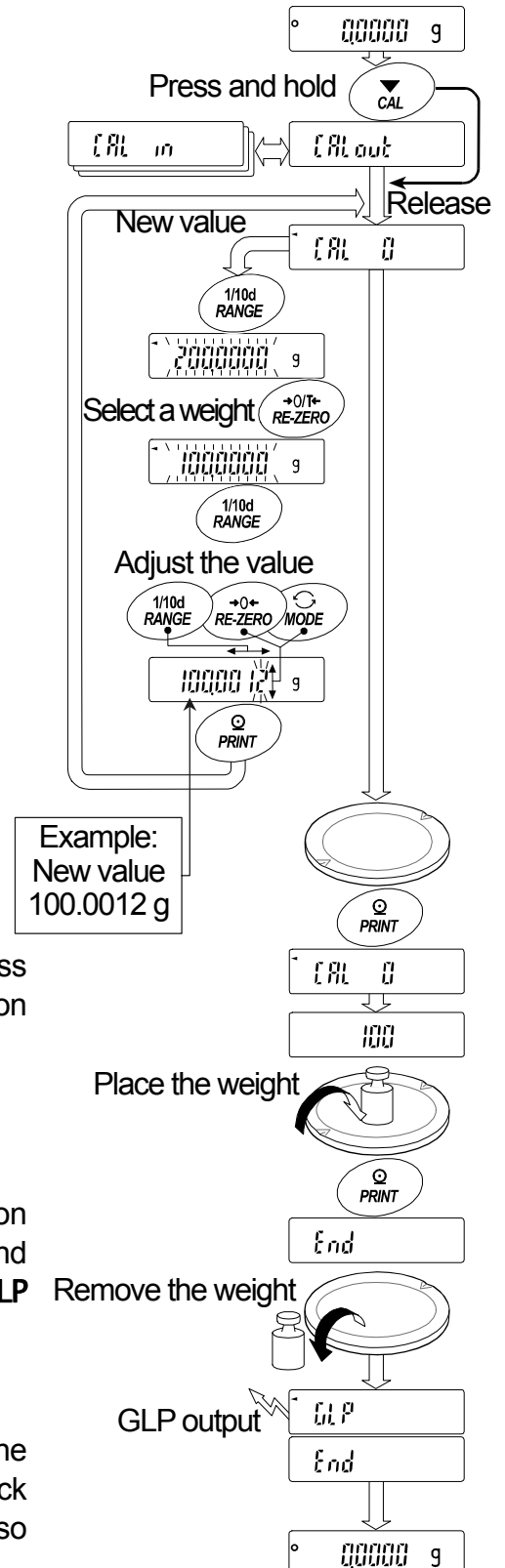
8.6. Calibration Test Using an External Weight

□ This function checks the accuracy of weighing using an external weight.
□ This is available only when the "GLP output ($inFo$)" parameter is set to " l ", " 2 " or " 3 ".
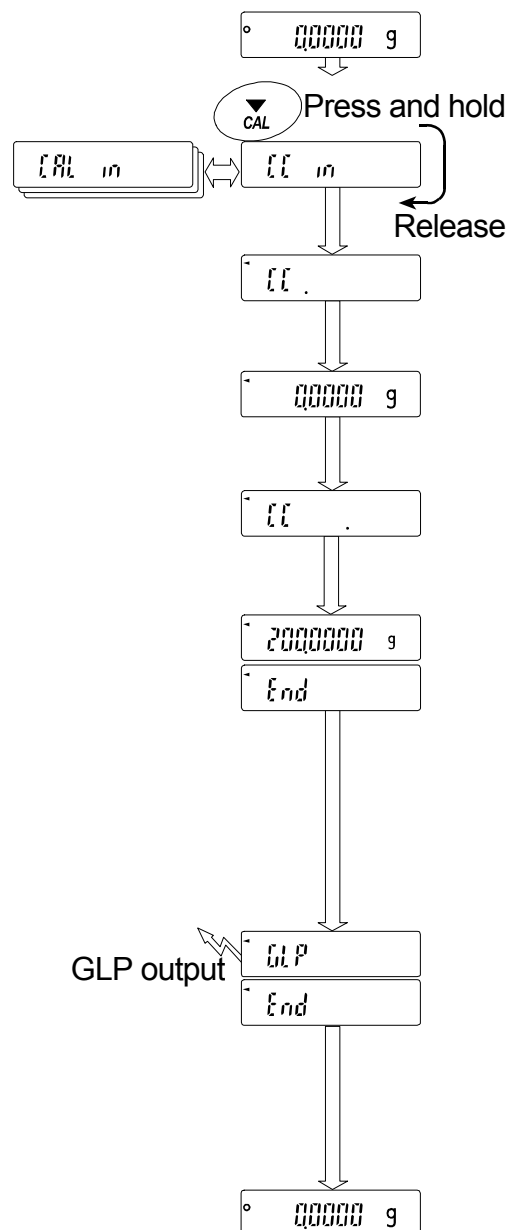□ Calibration test does not perform adjustment.

1 Connect the AC adapter and warm up the balance for at least one hour with nothing on the weighing pan.

2 Press and hold the CAL key until $[[\ out$ is displayed, and then release the key.

3 When $[[\ 0$ is displayed, proceed as follows:
  □ If you want to change the target weight, press the RANGE key and proceed to Step 4. A list of usable weights is on page 37.
  □ If the current target weight value is used, proceed to Step 5.

4 Specify the target weight value as follows:
  RANGE key ········· To switch blinking digits.
  RE-ZERO (+)key ··· To select the target weight or adjust the
  MODE (−)key   weight value. Refer to page 37.
  PRINT key ·········· To store the new target weight value.
                      Even if the AC adapter is removed, the
                      data is maintained in non-volatile memory.
  CAL key ············· To cancel the operation and return to
                      $[[\ 0$.

5 Confirm that there is nothing on the pan and press the PRINT key. The balance measures the zero point.
  Do not allow vibration or drafts to affect the balance.
  The balance displays the target weight value.

6 Place the displayed target weight on the pan and press the PRINT key. The balance measures the target weight.
  Do not allow vibration or drafts to affect the balance.

7 End is displayed.
  Remove the weight from the pan.

8 GLP is displayed and the calibration test report is output and stored. Refer to "GLP output ($inFo$)" and "Data memory ($dAtA$)" of the function table in "**11.2. GLP Report**" and "**12. Data Memory**".

9 The balance will automatically return to the weighing mode.
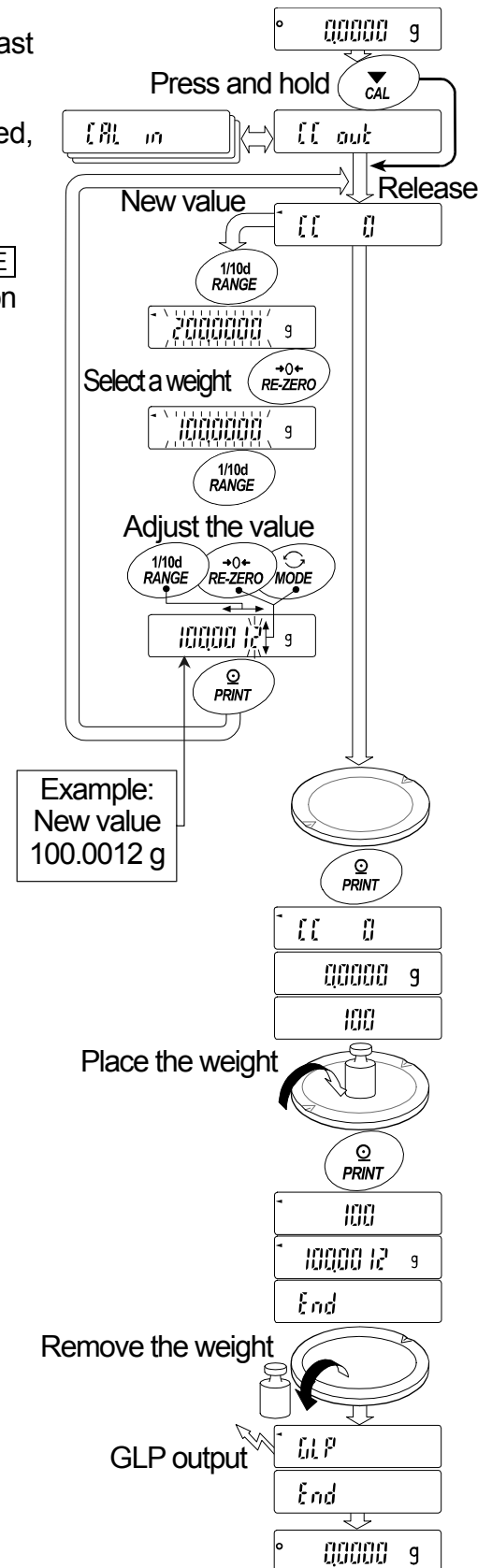
8.7. Correcting the Internal Mass Value

□ The balance can correct the internal mass value within the range shown below. This function corrects the internal mass value to conform to an external weight. The corrected mass value is maintained in non-volatile memory even if the AC adapter is removed. The internal mass value is corrected as follows:
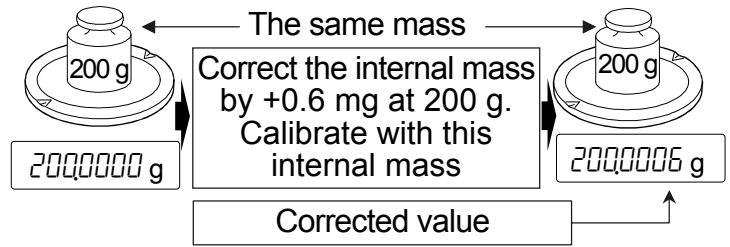
Model	Correction reference value	Correction range
BM-5, BM-5D	5.00000 g	±1.5 mg
BM-20, BM-22	20.00000 g	±1.5 mg
BM-252, BM-200, BM-300, BM-500	200.0000 g	±1.5 mg

Example: With the **BM-300**, 200.0000 g is corrected by +0.6 mg (200.0006 g). When performing a +0.6 mg correction with a 100 g external weight, the correction value will be +1.2 mg in accordance with the reference value of 200 g.

1 Perform calibration using the internal mass. Weigh an external weight and get the correction value.

2 Press the ON:OFF key to turn the display off.

3 While pressing and holding the PRINT key and the RANGE key, press the ON:OFF key. PS is displayed.

4 Press the PRINT key to display the function switches. Set the function table switch and internal mass correction switch to "1" as shown to the right using the following keys.

   RANGE key·········To select the blinking digit.
   RE-ZERO key·······To change the value of the blinking digit.
   PRINT key··········To store the new value and return to the weighing mode.
   CAL key············To cancel the current operation.

   Internal mass correction switch
   Function table switch

5 Press and hold the RANGE key (for approx. 2 seconds) to enter the function table and release the key when $bASFnc$ is displayed.

6 Press the RANGE key several times to display $CS\ in$.

7 Press the PRINT key.
   Correct the internal mass value using the following keys.
   RE-ZERO (+)key····To increase the value.
   MODE (−)key·······To decrease the value.
   PRINT key··········To store the new value and display the next menu item of the function table.
   CAL key···········To cancel the current operation and display the next menu item of the function table.

8 Press the CAL key to return to the weighing mode.

9 Press the CAL key to calibrate the balance using the internal mass.

10 Check that the correction has been performed properly with the external weight. If the value is incorrect, repeat the correction.
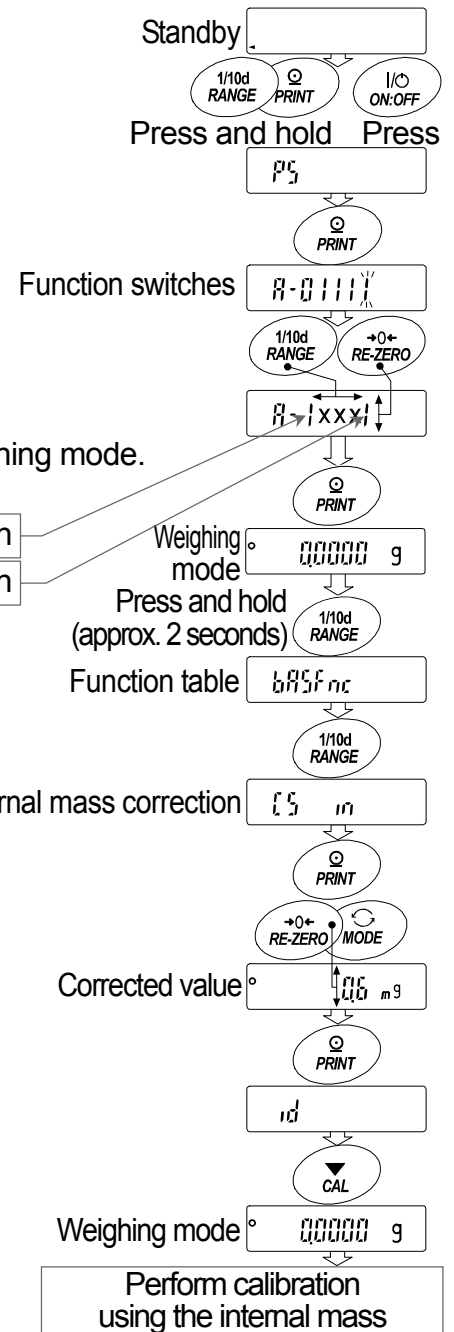
9. Function Switch and Initialization

9.1. Permit or Inhibit

□ The balance stores parameters that must not be changed unintentionally.
 Example: Calibration data for accurate weighing, Data for adapting to the operating environment,
  Control data for the RS-232C interface.

□ The balance is equipped with five switches for the purpose of protecting parameters as shown above. Each switch can select either "permit" or "inhibit". "Inhibit" protects parameters against unintentional operations.
 In addition to the above, when using balances with software version 1.660 or later, the password function can be used to restrict calibration functions.

1 Press the ON:OFF key to turn the display off.

2 While pressing and holding the PRINT key and the RANGE key,
 press the ON:OFF key to display PS .

3 Press the PRINT key. Then the balance displays the function switches.

4 Specify the switches using the following keys.
  RANGE key ·········· To select the blinking digit.
  RE-ZERO key ········ To change the parameter of the selected switch.
       0   To inhibit changes. (Cannot be used.)
       1   To permit changes. (Can be used.)
  PRINT key ·········· To store the new parameter and return to the weighing mode.
  CAL key ·············· To cancel the operation (CLr is displayed). To return to the weighing
       mode, press the CAL key once again.

  ┌──────────┐
  │ A·01111 │   (The display shown left indicates the factory settings)
  └──────────┘

Function table
  0   To inhibit changes to the function table.
  1   To permit changes to the function table.

Calibration using the internal mass
  0   Software ver. 1.00 to 1.64   To inhibit calibration using the internal mass.
     Software ver. 1.660 or later PASS 0   To inhibit calibration using the internal mass.
           PASS 1,2 To inhibit calibration using the internal mass when
           See Note 1. logged in as a user (USER) or a guest (GUEST).
  1   To permit calibration using the internal mass.

Calibration using an external weight
  0   Software ver. 1.00 to 1.64   To inhibit calibration using an external weight.
     Software ver. 1.660 or later PASS 0   To inhibit calibration using an external weight.
           PASS 1,2 To inhibit calibration using an external weight when
           See Note 1. logged in as a user (USER) or a guest (GUEST).
  1   To permit calibration using an external weight.

Automatic self calibration (for variation of ambient temperature)
  0   To inhibit automatic self calibration.
  1   To permit automatic self calibration.

Internal mass correction
  0   To inhibit correction.
  1   To permit correction.
       Note 1: The operation is permitted when logged in as an administrator (AdmIN).

9.2.   Initializing the Balance

- □ This function restores the following parameters to the factory settings.
  - Calibration data
  - Function table (excluding the time and date)
  - Sample unit mass value (counting mode),
    100% reference mass value (percent mode)
  - The data that is stored in the balance using the data memory function
  - External weight value
  - Function switch settings ("**9.1. Permit or Inhibit**")
  - Liquid density and temperature in the density mode

Note   Be sure to calibrate the balance after initialization.

1   Press the ON:OFF key to turn the display off.

2   While pressing and holding the PRINT key and the
    RANGE key, press the ON:OFF key to display $P5$.

3   Press the RANGE key to display $[Lr$.

4   Press the PRINT key to display $[Lr\ no$.
    To cancel the operation, press the CAL key.

5   Press the RE-ZERO key to display $[Lr\ Go$.

6   Press the PRINT key to initialize the balance.
    The balance will automatically return to the weighing mode.

Press and hold   Press

PS

$[Lr$

$[Lr\ no$

$[Lr\ Go$

End

$0.0000\ g$
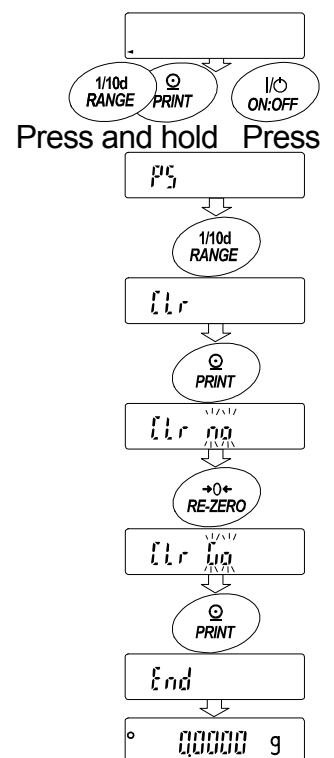
10. Function Table

The function table reads or rewrites the parameters that are stored in the balance.
These parameters are maintained in non-volatile memory, even if the AC adapter is removed.
The function table menu consists of two layers. The first layer is the "Class" and the second layer is the "Item".

10.1. Setting the Function Table

Display symbol and keys

○ ▭	The symbol "○" indicates that the parameter displayed is in effect.
1/10d RANGE	When pressed and held (for approx. 2 seconds) in the weighing mode, enters the function table mode. Selects the class or item in the function table mode.
→0← RE-ZERO	Changes the parameter.
○ PRINT	When a class is displayed, enters an item in the class. When an item is displayed, stores the new parameter and displays the next class.
▼ CAL	When an item is displayed, cancels the new parameter and displays the next class. When a class is displayed, exits the function table mode and returns to the weighing mode.

Setting procedure

1 In the weighing mode, press and hold the ⎡RANGE⎤ key (for approx. 2 seconds) until ⎡bASFnc⎤ is displayed, and then release the key.

2 Press the ⎡RANGE⎤ key to select a class.

3 Press the ⎡PRINT⎤ key to enter the class.

4 Press the ⎡RANGE⎤ key to select an item.

5 Press the ⎡RE-ZERO⎤ key to select a parameter for the selected item.

6 Repeat Steps 4 and 5 to select other items of the class.

7 To store the parameters of the selected class, press the ⎡PRINT⎤ key.
   Then the next class is displayed.
   To cancel the current operation, press the ⎡CAL⎤ key. Then the next class is displayed.

8 To specify parameters for another class, proceed to Step 2.
   To finish the setting, press the ⎡CAL⎤ key to return to the weighing mode.

Setting example

This example sets the "Data memory (*dAtA*)" parameter to "*1*" (To store the weighing data) and the "Interval time (*int*)" parameter to "*5*" (1 minute).

Weighing mode

| Start |

Step 1
1/10d RANGE — Press and hold (for approx. 2 seconds)

| *bASFnc* |

Step 2
1/10d RANGE — Press several times

⋮

Class

| *dout* |

Step 3
PRINT

| *Prt* *0* |

Step 4
1/10d RANGE — Press several times

Item

| *dAtA* *0* |

Step 5
Press 2 times
RE-ZERO →0←

Item "Data memory"

Parameter "Stores the weighing data"

| *dAtA* *1* |

Step 4
1/10d RANGE

| *int* *0* |

Step 5
Press 5 times
RE-ZERO →0←

Parameter "1 minute"

| *int* *5* |

Item "Interval time"

Step 7
PRINT

| *End* |

| *S iF* |

Step 8
CAL ▼

| Finish |

Weighing mode

10.2. Details of the Function Table

Class	Item and Parameter			Description	
bASFnc Environment Display	Cond Condition	▪	0 1 2	Fast response, sensitive value ⬆⬇ Slow response, stable value	FAST MID. SLOW Can be changed by response adjustment.
	St-b Stability band width	▪	0 1 2	Stable range is ±1 digit ⬆⬇ ±2 digit #1 Stable range is ±3 digits	The stabilization indicator illuminates when the display fluctuation is within the range.
	PLoc Display lock function	▪ oFF on			OFF ON	Display lock function to measure the volume dispensed from the pipette.
	trc Zero tracking	▪	0 1 2 3	OFF Normal Strong Very strong	Keeps zero display by tracking zero drift.
	SPd Display refresh rate	▪	0 1	5 times/second 10 times/second	Period to refresh the display
	Pnt Decimal point	▪	0 1	Point (.) Comma (,)	Decimal point format
	P-on Auto display-ON	▪ oFF on			OFF ON	Turns on the weighing mode display when the AC adapter is connected.
	bEEP Beep	oFF ▪ on			OFF ON	Sounds a beep when a key is touched.
CL Adj Clock	Refer to "**10.7. Clock and Calendar Function**"				The time and date are added to the output data.
dout Data output	Prt Data output mode	▪	0	Key mode	Accepts the PRINT key only when the display is stable.
			1	Auto print mode A Reference = zero	Outputs data when the display is stable and conditions of *AP-P*, *AP-b* and the reference value are met.
			2	Auto print mode B Reference = last stable value	
			3	Stream mode / Interval mode	With *dAtA 0*, outputs data continuously; with *dAtA 1*, uses interval memory.
	AP-P Auto print polarity	▪	0	Plus only	Displayed value > Reference
			1	Minus only	Displayed value < Reference
			2	Both	Regardless of displayed value
	AP-b Auto print difference	▪	0 1 2	10 digits 100 digits 1000 digits	Difference between reference value and displayed value #2
	dAtA Data memory	▪	0 1 2	Not used Stores the weighing data Stores the calibration data	Related items: *Prt, int, d-no, S-td, info*

▪ : Factory settings.

#1 The unit of readability is digit.
    Example: If 1 mg display is selected using the RANGE key for the **BM-300**, 1 mg is one digit.
#2 Usable readability of the balance is one digit.
    Example: In gram display, one digit is 0.01 mg for the **BM-252** and 0.1 mg for the **BM-300**.

Class	Item and Parameter			Description
dout Data output	int Interval time	■	0	Every measurement	Interval time in the interval memory mode when using Prt 3, dAtA 1
			1	2 seconds	
			2	5 seconds	
			3	10 seconds	
			4	30 seconds	
			5	1 minute	
			6	2 minutes	
			7	5 minutes	
			8	10 minutes	
	d-no Data number output	■	oFF	No output	Refer to "12. Data Memory"
			on	Output	
	5-td Time/Date output	■	0	No output	Selects whether or not the time or date is added to the weighting data. Refer to "10.7. Clock and Calendar Function" for details.
			1	Time only	
			2	Date only	
			3	Time and date	
	5-id ID number output	■	oFF	No output	Selects whether or not the ID number is output.
			on	Output	
	PU5E Data output pause	■	oFF	No pause	Selects the data output interval.
			on	Pause (1.6 seconds)	
	At-F Auto feed	■	oFF	Not used	Selects whether or not automatic feed is performed.
			on	Used	
	inFo GLP output	■	0	No output	Refer to "11. ID Number and GLP Report" for details. #3 Available for balances with software version 1.660 or later.
			1	AD-8121 format	
			2	General (balance clock data)	
			3	General (external device clock data) #3	
	Ar-d Zero after output	■	oFF	Not used	Adjusts zero automatically after data is output
			on	Used	
	5-tP Temperature output	■	oFF	Not output	Adds temperature to data output
			on	Output	
5 iF Serial interface	bP5 Baud rate		0	600 bps	
			1	1200 bps	
		■	2	2400 bps	
			3	4800 bps	
			4	9600 bps	
			5	19200 bps	
	btPr Data bit, parity bit	■	0	7 bits, even	
			1	7 bits, odd	
			2	8 bits, none	
	CrLF Terminator	■	0	CR LF	CR: ASCII code 0Dh LF: ASCII code 0Ah
			1	CR	
	tYPE Data format	■	0	A&D standard format	Refer to "10.5. Description of the Item "Data Format" ".
			1	DP format	
			2	KF format	
			3	MT format	
			4	NU format	
			5	CSV format	

■ : Factory settings.

Caution **The balance may not transmit the data completely at the specified refresh rate, depending on the baud rate or data added to the weighing data such as time, date and ID number.**

Class	Item and Parameter		Description	
5 iF Serial interface	*t-UP* Timeout	*oFF*	No limit	Selects the wait time to receive a command.
		▪ *on*	1 second	
	ErCd AK, Error code	▪*oFF*	No output	AK: ASCII code 06h
		on	Output	
d5 Fnc Density function	*Ld in* Liquid density input	▪ *0*	Water temperature	Available only when density mode is selected
		1	Liquid density	
Un it Unit			Refer to "**5. Weighing Units**".	
C5 in Internal mass correction			Displayed only when the internal mass value correction switch is set to *1*. Refer to "**8. Calibration** ".	
id ID number setting			Refer to "**11. ID Number and GLP Report**".	
ionFnc Ionizer function	*ion* Neutralization time	▪ *0*	3 seconds	Refer to "**6.5. Ionizer**".
		1	10 seconds	
		2	Manual operation (max. 10 min.)	
	8922 AD8922A control	▪*oFF*	The ⎡ION⎤ key is not used.	
		on	Assigns the ⎡ION⎤ key to the ⎡MODE⎤ key on AD-8922A.	
	E-5 External control input	▪ *0*	Assigns the ⎡PRINT⎤ key and ⎡RE-ZERO⎤ key.	
		1	Assigns the ⎡PRINT⎤ key and ⎡ION⎤ key.	
		2	Assigns the ⎡ION⎤ key and ⎡RE-ZERO⎤ key.	
door Door sensor function	*d-dt* Door sensor	*oFF*	Not used	Refer to "**6.1. Basic Operation**"
		▪ *on*	Used	
LocFnc Password function	*PA55* #4 Password function	▪ *0*	Not used	Refer to "**15. Password Function**".
		1	Used (Limits weighing operations)	
		2	Used (Allows basic weighing)	
Loc no. Password		*AdmIN*	Password input by the administrator	
		USER 01	Password input by user 1	
		|	|	
		USER 10	Password input by user 10 #5	

▪ : Factory settings.

#4 Only "Not used (*0*)" and "Used (*1*)" are available for balances with software version 1.50 to 1.64.
   All the parameters are available for balances with software version 1.660 or later.

#5 Available for balances with software version 1.660 or later.
   For balances with software version 1.50 to 1.64, only the password input by the administrator is available.

10.3. Description of the Class "Environment, Display"

Condition (*Cond*)

Cond 0   This parameter is for sensitive response to the fluctuation of a mass value. Used for powder target weighing, weighing a very light sample or when quick response weighing is required. After setting, the balance displays ⎡FAST⎤.

Cond 2   This parameter is for stable weighing with slow response. Used to prevent a weight value from drifting due to vibration or drafts. After setting, the balance displays ⎡SLOW⎤.

Note   **In automatic response adjustment, this parameter is selected automatically.**

Stability band width (5ᵗ-ᵇ)

This item controls the width to regard a mass value as a stable value. When the fluctuation per second is less than the parameter, the balance displays the stabilization indicator and outputs or stores the data. The parameter influences the "Auto print mode".

5ᵗ-ᵇ 0   This parameter is used for sensitive response of the stabilization indicator. Used for exact weighing.

5ᵗ-ᵇ 2   This parameter ignores slight fluctuations of a mass value. Used to prevent a mass value from drifting due to vibration or drafts.
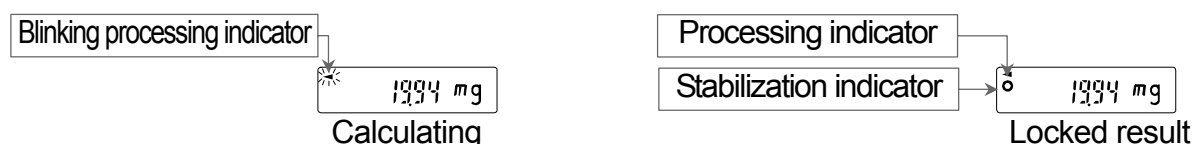
Display lock function (PLᵒᶜ)

□ This function is used to lock the display when measuring the volume dispensed from the pipette. With "Display lock function is used (PLᵒᶜ ᵒⁿ)" selected in the function table, when the liquid is dispensed into the weighing bottle from the pipette and a stable weighing value is obtained, the balance calculates an average value and displays the result (locked).

□ When using this function for the measurement of a small volume, the influence of liquid evaporation can be reduced.

Caution   **Even if the weighing bottle (evaporator trap) to reduce the water evaporation is used, at least 0.05 mg (0.05 $\mu\ell$) evaporation will occur.**

□ When canceling this function, press the RE-ZERO key.

Blinking processing indicator		Processing indicator	
	☼ 1994 mg	Stabilization indicator	○ 1994 mg
	Calculating		Locked result

Zero tracking (ᵗʳᶜ)

This function tracks zero point drift caused by changes in the environment and stabilizes the zero point. When the weighing data is only a few digits, turn the function off for accurate weighing.

ᵗʳᶜ 0   The tracking function is not used. Used for weighing a very light sample.
ᵗʳᶜ 1   The normal tracking function is used.
ᵗʳᶜ 2   The strong tracking function is used.
ᵗʳᶜ 3   The very strong tracking function is used. Used for stable zero display.

Display refresh rate (5Pᵈ)

The periodic time to refresh the display. This parameter influences "Baud rate", "Data output pause" and the data output rate of "Stream mode".

Decimal point (Pⁿᵗ)

The decimal point format can be selected.

Auto display–ON (P-ᵒⁿ)

When the AC adapter is plugged in, the display is automatically turned on without pressing the ON:OFF key, to display the weighing mode. Used when the balance is built into an automated system. One hour warm up is necessary for accurate weighing.

10.4. Description of the Item "Data Output Mode"

The parameter setting of "Data output mode (Prt)" applies to the performance when the "Data memory ($dAtA$)" parameter is set to "l" (to store the weighing data) and when the data is transmitted using the RS-232C interface.

Key mode

When the PRINT key is pressed with the stabilization indictor turned on, the balance outputs or stores the weighing data and the display blinks one time.

  Required setting $dout$ $Prt\ 0$ Key mode

Auto print modes A and B

When the displayed value is stable and the conditions of "Auto print polarity", "Auto print difference" and the reference value are met, the balance outputs or stores the weighing data.
When the PRINT key is pressed with the stabilization indictor turned on, the balance outputs or stores the data and the display blinks one time.

Auto print mode A

Example	For weighing each time a sample is placed and removed, with "$Ar\text{-}d$" set to "l" (to adjust zero after the data is output).
Required setting	$dout$ $Prt\ 1$ Auto print mode A (reference = zero)
	$dout$ $AP\text{-}P$ Auto print polarity
	$dout$ $AP\text{-}b$ Auto print difference
	$dout$ $Ar\text{-}d\ on$ Zero after output

Auto print mode B

Example	For weighing while a sample is added.
Required setting	$dout$ $Prt\ 2$ Auto print mode B (reference = last stable value)
	$dout$ $AP\text{-}P$ Auto print polarity
	$dout$ $AP\text{-}b$ Auto print difference

Stream mode

The balance outputs the weighing data continuously regardless of the display condition. When the display refresh rate is set to 5 times / second ($SPd\ 0$), the data output rate is also set to the same 5 times / second. The display does not blink in this mode. The interval memory mode is used when the "Data memory ($dAtA$)" parameter is set to "l" (to store the weighing data).

Example	For monitoring data on a computer.
Required setting	$dout$ $Prt\ 3$ Stream mode
	$dout$ $dAtA\ 0$ Data memory function is not used
	$bASFnc$ SPd Display refresh rate
	SiF bPS Baud rate

Caution **The balance may not transmit the data completely at the specified refresh rate, depending on the baud rate or data added to the weighing data such as time, date and ID number.**

Interval mode

The balance outputs the weighing data periodically regardless of the display condition and the display blinks one time. When the "Data memory ($dAtA$)" parameter of "Data output ($dout$)" is set to "l" (to store the weighing data), the weighing data is periodically stored in memory.
Pressing the PRINT key starts output and pressing the PRINT key again during output stops the output.

Example	For periodical weighing without a personal computer command and to output all of the data, to a computer, at one time.
Required setting	$dout$ $Prt\ 3$ Interval mode
	$dout$ $dAtA\ 1$ Data memory function is used
	$dout$ int Interval time

10.5. Description of the Item "Data Format"

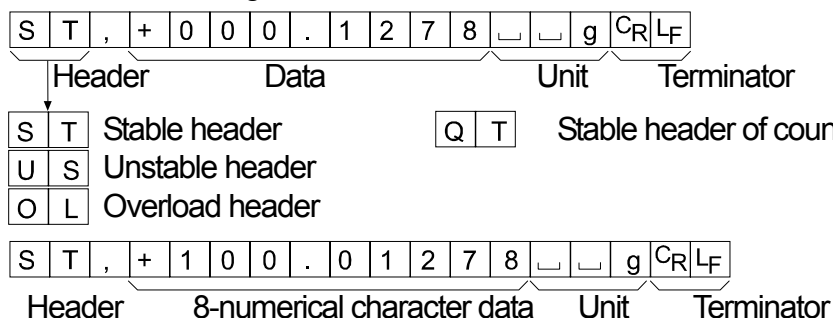## A&D standard format $5\ iF\ type\ 0$

This format is used when the peripheral equipment can receive the A&D format.
With an AD-8121B printer, use MODE 1 or 2. With an AD-8127 printer, use the external key printing mode, manual printing mode, auto printing mode or interval printing mode.

□ This format consists of fifteen or sixteen characters excluding the terminator.
□ A header of two characters indicates the balance condition.
□ The polarity sign is placed before the data with the leading zeros. If the data is zero, the plus sign is applied.
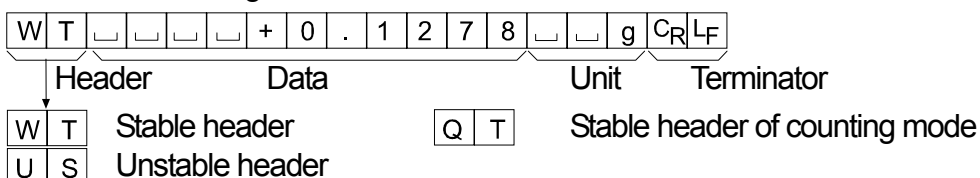□ The unit, consisting of three characters, follows the data.

| S | T | , | + | 0 | 0 | 0 | . | 1 | 2 | 7 | 8 | ␣ | ␣ | g | CR | LF |

Header   Data   Unit   Terminator

S	T	Stable header		Q	T	Stable header of counting mode
U	S	Unstable header
O	L	Overload header

| S | T | , | + | 1 | 0 | 0 | . | 0 | 1 | 2 | 7 | 8 | ␣ | ␣ | g | CR | LF |

Header   8-numerical character data   Unit   Terminator

DP (Dump print) format $5\ iF\ type\ 1$

This format is used when the peripheral equipment cannot receive the A&D format.
With an AD-8121B printer, use MODE 3. With an AD-8127 printer, use the dump printing mode.

□ This format consists of sixteen characters excluding the terminator.
□ A header of two characters indicates the balance condition. No overload header is used.
□ The polarity sign is placed before the data, with spaces in place of leading zeros, if the data is not zero or overloaded.
□ The unit, consisting of three characters, follows the data.

| W | T | ␣ | ␣ | ␣ | ␣ | + | 0 | . | 1 | 2 | 7 | 8 | ␣ | ␣ | g | CR | LF |

Header   Data   Unit   Terminator

| W | T | Stable header | | Q | T | Stable header of counting mode |
| U | S | Unstable header |

KF format $5\ iF\ type\ 2$

This is the Karl-Fischer moisture meter format and is used when the peripheral equipment can only communicate using this format.

□ This format consists of fourteen characters excluding the terminator.
□ This format has no header characters.
□ The polarity sign is placed before the data, with spaces in place of leading zeros, if the data is not zero or overloaded.
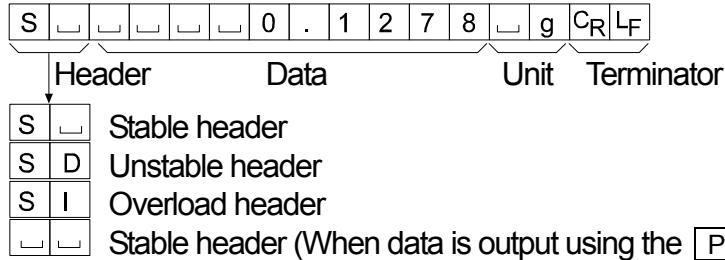□ This format outputs the unit only for a stable value.

| + | ␣ | ␣ | ␣ | 0 | . | 1 | 2 | 7 | 8 | ␣ | g | ␣ | ␣ | CR | LF |

Data   Unit   Terminator

| ␣ | g | ␣ | ␣ | Stable value |
| ␣ | ␣ | ␣ | ␣ | Unstable value |
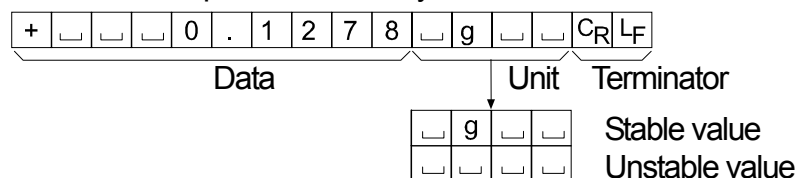
MT format `5 iF EYPE 3`

This format is used when the peripheral equipment of other manufacturer is connected. Please note that the connection is not guaranteed.

□ A header of two characters indicates the balance condition.
□ The polarity sign is used only for negative data.
□ The weighing data uses spaces in place of the leading zeros.
□ The character length of this format changes dependent upon the unit

| S | ␣ | ␣ | ␣ | ␣ | 0 | . | 1 | 2 | 7 | 8 | ␣ | g | C$_R$ | L$_F$ |

Header　　　Data　　　　　Unit　Terminator

S	␣	Stable header
S	D	Unstable header
S	I	Overload header
␣	␣	Stable header (When data is output using the [PRINT] key)

NU (numerical) format　　　　　　　　　　`5 iF EYPE 4`

This format outputs only numerical data.

□ This format consists of ten characters excluding the terminator.
□ The polarity sign is placed before the data with the leading zeros. If the data is zero, the plus sign is used.
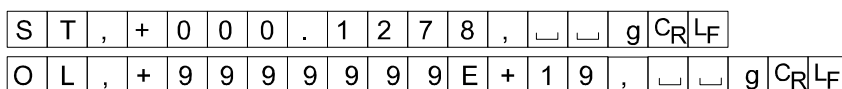
| + | 0 | 0 | 0 | 0 | . | 1 | 2 | 7 | 8 | C$_R$ | L$_F$ |

Data　　　　　　　Terminator
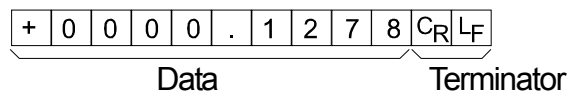
CSV format　　　　　　　　　　　　　`5 iF EYPE 5`

□ This format separates the data of A&D standard format and the unit by a comma (,).
□ This format outputs the unit even when the data is overloaded.
□ When a comma (,) is selected for the decimal point, the separators are set to semicolon (;).
□ When the ID number, data number, time and date are added in "Data output ($dout$)" of the function table, outputs ID number, data number, date, time and weighing data in this order and separates each item by a comma and treats all the items as one group of data.

LAB-0123, No,012, 2010/11/01, 12:34:56, ST,+0000.1278,␣␣g<CR><LF>

ID number　Data number　　Date　　　Time　　　Weighing data

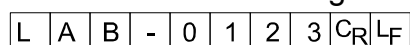| S | T | , | + | 0 | 0 | 0 | . | 1 | 2 | 7 | 8 | , | ␣ | ␣ | g | C$_R$ | L$_F$ |
| O | L | , | + | 9 | 9 | 9 | 9 | 9 | 9 | 9 | E | + | 1 | 9 | , | ␣ | ␣ | g | C$_R$ | L$_F$ |

Note　When the balance is connected to a personal computer via the USB interface, the ID number, data number, time and date cannot be added to the weighing data.

ID number　　　　　　　　　　　　　`dout 5- id on`

The number to identify a specific balance.

□ This format consists of eight characters excluding the terminator.

| L | A | B | - | 0 | 1 | 2 | 3 | C$_R$ | L$_F$ |

Data number   *dout d-no on*

   This format outputs the data number just before the data is transmitted using the RS-232C interface.

   ▫ This format consists of six characters excluding the terminator.
   ▫ When CSV format (*5 iF tYPE 5*) is selected, the period (.) is replaced with a comma (,).

| N | O | . | 0 | 0 | 1 | C_R | L_F |

<u>Data number</u>   Terminator

Date   *dout 5-td 2 or 3*

   ▫ The date output order can be changed in " Time/Date output (*5-td*)" and "Clock (*CL Adu*)".
   This format outputs the year in a four-digit format.

| 2 | 0 | 1 | 0 | / | 1 | 1 | / | 0 | 1 | C_R | L_F |

Time   *dout 5-td 1 or 3*

   ▫ This format outputs the time in a 24-hour format.

| 1 | 2 | : | 3 | 4 | : | 5 | 6 | C_R | L_F |

Temperature   *dout 5-tP on*

   ▫ This format outputs the temperature. The unit is "C".
   Note   Humidity and barometric pressure are not output.

| + | 0 | 2 | 3 | . | 4 | ␣ | ␣ | C | C_R | L_F |

10.6. Data Format Examples

Stable

Display: `° 0.1278 g`

```
S  T  ,  +  0  0  0  .  1  2  7  8  ␣  ␣  g  CR LF
S  T  ,  +  1  0  0  .  0  1  2  7  8  ␣  ␣  g  CR LF
W  T  ␣  ␣  ␣  ␣  +  0  .  1  2  7  8  ␣  ␣  g  CR LF
+  ␣  ␣  ␣  0  .  1  2  7  8  ␣  g  ␣  ␣  ␣  CR LF
S  ␣  ␣  ␣  ␣  ␣  0  .  1  2  7  8  ␣  g  CR LF
+  0  0  0  0  .  1  2  7  8  CR LF
```

Unstable

Display: `-18.3690 g`

```
U  S  ,  -  0  1  8  .  3  6  9  0  ␣  ␣  g  CR LF
U  S  ,  -  1  0  1  .  8  3  6  9  0  ␣  ␣  g  CR LF
U  S  ␣  ␣  ␣  -  1  8  .  3  6  9  0  ␣  ␣  g  CR LF
-  ␣  ␣  1  8  .  3  6  9  0  ␣  ␣  ␣  ␣  CR LF
S  D  ␣  ␣  -  1  8  .  3  6  9  0  ␣  g  CR LF
-  0  0  1  8  .  3  6  9  0  CR LF
```

Overload
Positive error

Display: `E g`

```
O  L  ,  +  9  9  9  9  9  9  9  E  +  1  9  CR LF
␣  ␣  ␣  ␣  ␣  ␣  ␣  ␣  E  ␣  ␣  ␣  ␣  ␣  ␣  ␣  CR LF
␣  ␣  ␣  ␣  ␣  ␣  H  ␣  ␣  ␣  ␣  ␣  ␣  ␣  ␣  CR LF
S  I  +  CR LF
+  9  9  9  9  9  9  9  9  9  CR LF
```

Overload
Negative error

Display: `-E g`

```
O  L  ,  -  9  9  9  9  9  9  9  E  +  1  9  CR LF
␣  ␣  ␣  ␣  ␣  ␣  ␣  -  E  ␣  ␣  ␣  ␣  ␣  ␣  CR LF
␣  ␣  ␣  ␣  ␣  ␣  L  ␣  ␣  ␣  ␣  ␣  ␣  ␣  CR LF
S  I  -  CR LF
-  9  9  9  9  9  9  9  9  9  CR LF
```

Symbol	Meaning	ASCII
␣	Space,	20h
CR	Carriage Return,	0Dh
LF	Line Feed,	0Ah

Units

		A&D	D.P.	KF	MT
g	g	⎵⎵g	⎵⎵g	⎵g⎵⎵	⎵g
mg	mg	⎵mg	⎵mg	⎵mg⎵	⎵mg
Counting mode	PC	⎵PC	⎵PC	⎵pcs	⎵PCS
Percent mode	%	⎵⎵%	⎵⎵%	⎵%⎵⎵	⎵%
Ounce (Avoir)	OZ	⎵oz	⎵oz	⎵oz⎵	⎵oz
Troy Ounce	OZt	ozt	ozt	⎵ozt	⎵ozt
Metric Carat	ct	⎵ct	⎵ct	⎵ct⎵	⎵ct
Momme	mom	mom	mom	⎵mom	⎵mo
Pennyweight	dwt	dwt	dwt	⎵dwt	⎵dwt
Grain	GN	⎵GN	⎵GN	⎵gr⎵	⎵GN
Tael (HK general, Singapore)	tL	⎵tl	⎵tl	⎵tls	⎵tl
Tael (HK, jewelry)	tL	⎵tl	⎵tl	⎵tlh	⎵tl
Tael (Taiwan)	tL	⎵tl	⎵tl	⎵tlt	⎵tl
Tael (China)	tL	⎵tl	⎵tl	⎵tlc	⎵tl
Tola (India)	t	⎵⎵t	⎵⎵t	⎵tol	⎵t
Messghal	m	mes	mes	⎵MS⎵	⎵m
Density	DS	⎵DS	⎵DS	⎵DS⎵	⎵DS

⎵   Space, ASCII 20h

10.7. Clock and Calendar Function

The balance is equipped with a clock and calendar function. When "GLP output (info)" and "Time/Date output (5-td)" are used, the time and date can be added to the output data. The operation is as follows:

Operation

1 In the weighing mode, press and hold the [RANGE] key (for approx. 2 seconds) until [bASFnc] is displayed, and then release the key.
2 Press the [RANGE] key several times to display [CL AdJ].
3 Press the [PRINT] key to enter the time and date setting mode.

Checking the current time

4 The current time is displayed with all the digits blinking.
  □ To change the time, press the [RE-ZERO] key and proceed to Step 5.
  □ When the time is correct, press the [RANGE] key and proceed to Step 6.
  □ To exit the mode, press the [CAL] key and proceed to Step 8.

Storing a new time

5 Set the time in a 24-hour format using the following keys.
  [RE-ZERO](+)key··· To increase the value by one.
  [MODE](−)key······· To decrease the value by one.
  [RANGE] key········ To select the digit to change the value.
  [PRINT] key········· To store the new time and proceed to Step 6.
  [CAL] key············ To cancel the operation and proceed to Step 6.

Checking the current date

6 The current date is displayed with all the digits blinking.
  □ To change the display order of year (Y), month (n) and day (d), press the [MODE] key. The date is output in the order as specified.
  □ To change the date, press the [RE-ZERO] key and proceed to Step 7.
  □ When the date is correct, press the [CAL] key and proceed to Step 8.
  □ To change the time again, press the [RANGE] key and proceed back to Step 4.
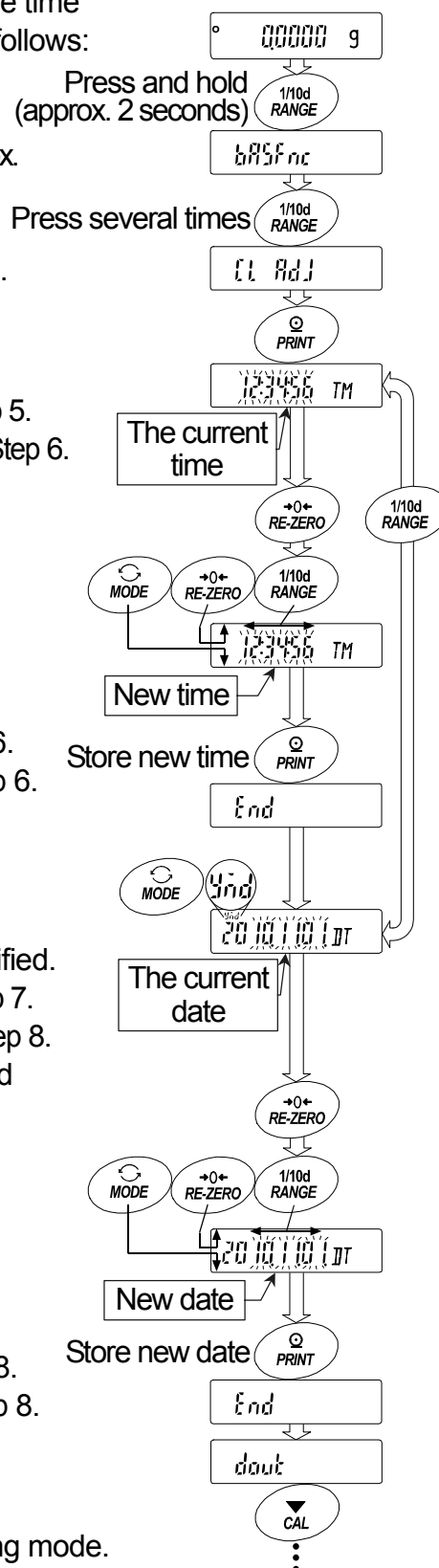
Storing a new date

7 Set the date using the following keys.
  [RE-ZERO](+)key ·· To increase the value by one.
  [MODE](−)key······· To decrease the value by one.
  [RANGE] key······· To select the digits to change the value.
  [PRINT] key········· To store the new date and proceed to Step 8.
  [CAL] key············ To cancel the operation and proceed to Step 8.

Quitting the operation

8 The balance displays the next menu item of the function table. Press the [CAL] key to exit the mode and return to the weighing mode.

Note Do not enter invalid values such as non-existing time and date in this function. When the clock backup battery has been depleted, the balance displays [rtc PF]. Under this condition, press any key and set the time and date. The dead battery only affects the clock and calendar function. Even so, the function works normally as long as the AC adapter is connected to the balance.

Flowchart (right column):

00000 g
→ Press and hold (approx. 2 seconds) [1/10d RANGE]
bASFnc
→ Press several times [1/10d RANGE]
CL AdJ
→ [PRINT]
12:34:56 TM — The current time
  → [RE-ZERO] / [1/10d RANGE]
  → [MODE] [RE-ZERO] [1/10d RANGE]
12:34:56 TM — New time
  → Store new time [PRINT]
End
  → [MODE] (Ynd)
2010/10/01 DT — The current date
  → [RE-ZERO]
  → [MODE] [RE-ZERO] [1/10d RANGE]
2010/10/01 DT — New date
  → Store new date [PRINT]
End
dout
  → [CAL]

11. ID Number and GLP Report

- The ID number is used to identify the balance when Good Laboratory Practice (GLP) or Good Manufacturing Practice (GMP) is used.
- The output format for GLP/GMP compliant report is selected in "GLP output (info)" of the function table and can be output to a personal computer or printer using the RS-232C serial interface.
- The GLP/GMP compliant report includes the balance manufacturer, model, serial number, ID number, date, time and space for signature. The calibration report and the calibration test report include the weight used and the result.
- The balance can output the following reports for GLP / GMP using the RS-232C serial interface.
  - "Calibration report" of the automatic self calibration and the calibration using the internal mass.
  - "Calibration report" of the calibration using an external weight.
  - "Calibration test report" of the calibration test using the internal mass.
  - "Calibration test report" of the calibration test using an external weight.
  - "Title block" and "End block" for the weighing data.
- Calibration report and calibration test report can be stored in memory and several reports can be output at the same time. Refer to "**12. Data Memory**" for details.
- The ID number is maintained in non-volatile memory even if the AC adapter is removed.
- Refer to "**10.7. Clock and Calendar Function**" for checking and storing the time and date.
- When an AD-8127 printer is connected to the balance and outputs the GLP report, the time and date can be added to the report using the clock function of the printer. (Available for balances with software version 1.660 or later) This is very useful for managing the time and date using the AD-8127 password lock function to prevent them from being falsified.
  To output the GLP/GMP compliant report, set the AD-8127 printer to the dump printing mode.

11.1. Setting the ID Number

1 Press and hold the RANGE key (for approx. 2 seconds) until $\boxed{\mathit{bASFnc}}$ is displayed, and then release the key.

2 Press the RANGE key several times to display $\boxed{\mathit{id}}$.

3 Press the PRINT key. Set the ID number using the following keys.
   RE-ZERO key ·····To set the character of the digit selected.
                     Refer to the display character table shown below.
   RANGE key ········To select the digit to change the character.
   PRINT key··········To store the new ID number and display $\boxed{\mathit{bASFnc}}$.
   CAL key ·············To cancel the new ID number and display $\boxed{\mathit{bASFnc}}$.

4 When $\boxed{\mathit{bASFnc}}$ is displayed, press the CAL key to return to the weighing mode.

Display character table

0	1	2	3	4	5	6	7	8	9	-	␣	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

␣ Space

11.2. GLP Report

To output the GLP/GMP compliant report to an AD-8121B printer, AD-8127 printer or to a personal computer, set the "GLP output (info)" parameter of the function table to " $\mathit{1}$ " (AD-8121 format), " $\mathit{2}$ " (General format using the balance built-in clock data) or " $\mathit{3}$ " (General format using the external device clock data).

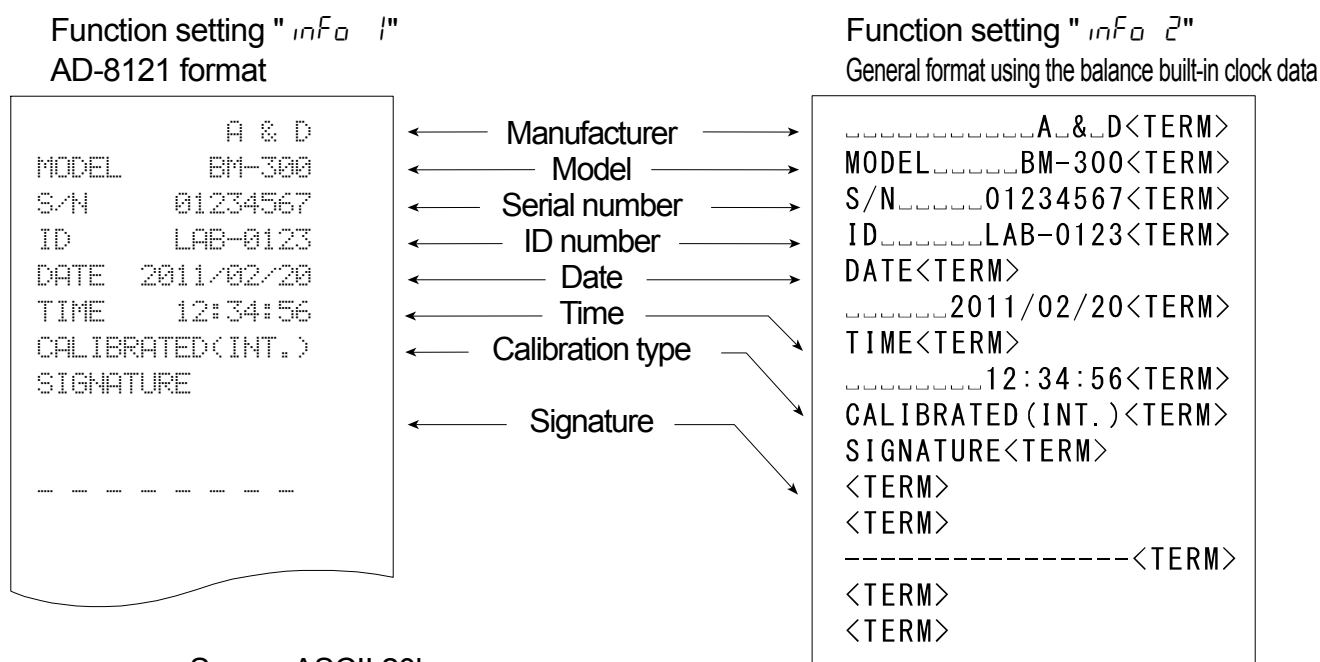## Notes on outputting the GLP/GMP compliant report to a printer

□ Refer to "**16.2. Connecting to Peripheral Equipment**" for connection to a printer.
□ With an AD-8121B printer, use MODE 3. If MODE1 is used, select temporarily the dump print mode by pressing the ⌐STAT.⌐ key of the AD-8121B printer.
  With an AD-8127 printer, use the dump printing mode.
  If the external key printing mode is used, press and hold the ⌐ENT⌐ key of the AD-8127 printer (for approx. 2 seconds) to switch between the external key printing mode and the dump printing mode.
  If the data memory function is used (except data $\mathit{0}$), the GLP output cannot be output automatically.
□ If the time and date are not correct when the balance built-in clock data is output (info $\mathit{1}$, $\mathit{2}$), set the correct time and date in "Clock (CL Adj)" of the function table.
□ " info $\mathit{3}$" is available for balances with software version 1.660 or later.

Calibration report using the internal mass

Note **If the data memory function is used (except data $\mathit{0}$), the "Title block" and "End block" cannot be output.**

Key operation
1 Press the ⌐CAL⌐ key to display ⌐CAL in⌐. The balance performs calibration using the internal mass.
2 If GLP output is used, ⌐GLP⌐ is displayed and the calibration report is output.
3 The balance returns to the weighing mode.

Function setting " info $\mathit{1}$"
AD-8121 format

Function setting " info $\mathit{2}$"
General format using the balance built-in clock data

```
            A & D
MODEL    BM-300
S/N      01234567
ID       LAB-0123
DATE   2011/02/20
TIME      12:34:56
CALIBRATED(INT.)
SIGNATURE


— — — — — — —
```

```
⌐⌐⌐⌐⌐⌐⌐⌐⌐⌐⌐⌐A⌐&⌐D<TERM>
MODEL⌐⌐⌐⌐⌐BM-300<TERM>
S/N⌐⌐⌐⌐⌐01234567<TERM>
ID⌐⌐⌐⌐⌐⌐LAB-0123<TERM>
DATE<TERM>
⌐⌐⌐⌐⌐⌐2011/02/20<TERM>
TIME<TERM>
⌐⌐⌐⌐⌐⌐⌐⌐⌐12:34:56<TERM>
CALIBRATED(INT.)<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
--------------<TERM>
<TERM>
<TERM>
```

← Manufacturer →
← Model →
← Serial number →
← ID number →
← Date →
← Time →
← Calibration type →
← Signature →

⌐   Space, ASCII 20h
<TERM>   Terminator, CR , LF or CR
CR   Carriage return, ASCII 0Dh
LF   Line feed, ASCII 0Ah

Outputting the clock data of the external device " *inFo* *3***"**

When the "GLP output (*inFo*)" parameter of the function table is set to "*3*", the clock data of external devices such as a printer or a personal computer can be used instead of the balance built-in clock data for the GLP/GMP compliant report. This is useful for standardizing the clock data using the clock function of an external device.

Notes

- □ **To output the clock data of an external device, the external device such as an AD-8127 printer or Windows communication tools software WinCT RsCom must have a function to output the time and date when <ESC>D or <ESC>T is received.**
- □ **Even with** *inFo* *3* **set, the data memory function saves the balance built-in clock data for the calibration report.**

Function setting "*inFo* *3*"
General format using the external device clock data

Manufacturer →	A & D
Model →	MODEL BM-300
Serial number →	S/N 12345678
ID number →	ID LAB-0123
Date →	DATE 2018/06/18
Time →	TIME 12:34:56
Calibration type →	CALIBRATED(INT.)
Signature →	SIGNATURE

AD-8127 data
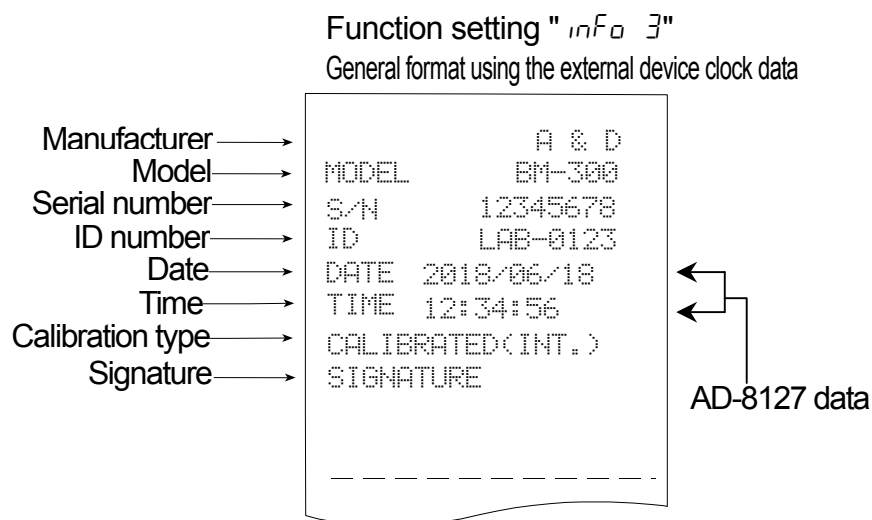
Calibration test report using the internal mass

Note □ **Calibration test does not perform adjustment.**

□ **If the data memory function is used (except** *dAtA 0*)**, the "Title block" and "End block" cannot be output.**

Key operation

1 Press and hold the $\boxed{\text{CAL}}$ key to display $\boxed{\text{CC in}}$ and release the key.
2 $\boxed{\text{CC}}$ is displayed and the balance is checked automatically.
3 The zero point is measured and the weight value is displayed for a few seconds.
4 The internal mass is weighed and the weight value is displayed for a few seconds.
5 If GLP output is used, $\boxed{\text{GLP}}$ is displayed and the calibration test report is output.
6 The balance returns to the weighing mode.

Command

This calibration test can be performed with the TST command.

Function setting " *info 1*"
AD-8121 format

Function setting " *info 2*"
General format using the balance built-in clock data

	A & D	
MODEL	BM-300	
S/N	01234567	
ID	LAB-0123	
DATE	2011/02/20	
TIME	12:34:56	
CAL.TEST(INT.)		
ACTUAL		
	0.0000 g	
	+200.0002 g	
TARGET		
	+200.0000 g	
SIGNATURE		

Manufacturer
Model
Serial number
ID number
Date
Time
Calibration test type
Zero point value
Target weight value
Target weight
Signature

```
⎵⎵⎵⎵⎵⎵⎵⎵⎵⎵A⎵&⎵D<TERM>
MODEL⎵⎵⎵⎵⎵⎵BM-300<TERM>
S/N⎵⎵⎵⎵⎵⎵01234567<TERM>
ID⎵⎵⎵⎵⎵⎵⎵LAB-0123<TERM>
DATE<TERM>
⎵⎵⎵⎵⎵⎵⎵2011/02/20<TERM>
TIME<TERM>
⎵⎵⎵⎵⎵⎵⎵⎵12:34:56<TERM>
CAL.TEST(INT.)<TERM>
ACTUAL<TERM>
⎵⎵⎵⎵⎵⎵⎵⎵0.0000⎵⎵g<TERM>
⎵⎵⎵⎵⎵+200.0002⎵⎵g<TERM>
TARGET<TERM>
⎵⎵⎵⎵⎵+200.0000⎵⎵g<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
---------------<TERM>
<TERM>
<TERM>
```

⎵	Space, ASCII 20h	
<TERM>	Terminator, CR , LF or CR	
CR	Carriage return, ASCII 0Dh	
LF	Line feed, ASCII 0Ah	

Calibration report using an external weight

Note If the data memory function is used (except *dAtA 0*), the "Title block" and "End block" cannot be output.

Key operation

1 Press and hold the [CAL] key to display [CAL out] and release the key.
2 [CAL 0] is displayed.
3 To update the calibration weight value, press the [RANGE] key and proceed to Step 4.
  To use the preset calibration weight value, proceed to Step 5.
4 Specify the calibration weight value using the following keys.
  [RANGE] key········To select the blinking digit.
  [RE-ZERO](+)key···To increase the value of the blinking digit.
  [MODE](−)key ·······To decrease the value of the blinking digit.
  [PRINT] key ·········To store the new value.
5 Press the [PRINT] key. The zero point is measured and the weight value is displayed for a few seconds.
6 Place the displayed weight on the pan. Press the [PRINT] key to measure the weight and the weight value is displayed for a few seconds.
7 [End] is displayed. Remove the weight from the pan.
8 If GLP output is used, [GLP] is displayed and the calibration report is output.
9 The balance returns to the weighing mode.

Function setting " *info 1* "
AD-8121 format

Function setting " *info 2* "
General format using the balance built-in clock data

```
            A & D
MODEL     BM-300
S/N       01234567
ID        LAB-0123
DATE   2011/02/20
TIME      12:34:56
CALIBRATED(EXT.)
CAL.WEIGHT
    +200.0000   g
SIGNATURE


⎯ ⎯ ⎯ ⎯ ⎯ ⎯
```

Manufacturer
Model
Serial number
ID number
Date
Time
Calibration type
Calibration weight
Signature

```
␣␣␣␣␣␣␣␣␣␣␣␣A␣&␣D<TERM>
MODEL␣␣␣␣␣␣BM-300<TERM>
S/N␣␣␣␣␣␣01234567<TERM>
ID␣␣␣␣␣␣␣LAB-0123<TERM>
DATE<TERM>
        2011/02/20<TERM>
TIME<TERM>
␣␣␣␣␣␣␣␣␣12:34:56<TERM>
CALIBRATED(EXT.)<TERM>
CAL.WEIGHT<TERM>
␣␣␣␣+200.0000␣␣g<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
--------------<TERM>
<TERM>
<TERM>
```

    ␣   Space, ASCII 20h
  <TERM>   Terminator, CR , LF or CR
   CR   Carriage return, ASCII 0Dh
   LF   Line feed, ASCII 0Ah

Calibration test report using an external weight

Note □ **Calibration test does not perform adjustment.**

□ **If the data memory function is used (except _dAtA 0_), the "Title block" and "End block" cannot be output.**

Key operation

1 Press and hold the ⎡CAL⎤ key to display ⎡_CC out_⎤ and release the key.
2 ⎡_CAL 0_⎤ is displayed.
3 To update the target weight value, press the ⎡RANGE⎤ key and proceed to Step 4.
   To use the preset target weight value, proceed to Step 5.
4 Specify the target weight value using the following keys.
   ⎡RANGE⎤ key ·········· To select the blinking digit.
   ⎡RE-ZERO⎤(+)key ···· To increase the value of the blinking digit.
   ⎡MODE⎤(−)key ········ To decrease the value of the blinking digit.
   ⎡PRINT⎤ key··········· To store the new value.
5 Press the ⎡PRINT⎤ key. The zero point is measured and the weight value is displayed for a few seconds.
6 Place the displayed target weight on the pan. Press the ⎡PRINT⎤ key to measure the weight. The weight value is displayed for a few seconds.
7 ⎡_End_⎤ is displayed. Remove the weight from the pan.
8 If GLP output is used, ⎡_GLP_⎤ is displayed and the calibration test report is output.
9 The balance returns to the weighing mode.

Function setting "_info 1_"
AD-8121 format

```
            A & D
MODEL     BM-300
S/N       01234567
ID        LAB-0123
DATE    2011/02/20
TIME     12:34:56
CAL.TEST(EXT.)
ACTUAL
         0.0000    g
     +200.0002    g
TARGET
     +200.0000    g
SIGNATURE


─ ─ ─ ─ ─ ─ ─
```

Manufacturer ──►
Model ──►
Serial number ──►
ID number ──►
Date ──►
Time ──►
◄── Calibration test type
◄── Zero point value
◄── Target weight value
Target weight ──►
Signature ──►

Function setting "_info 2_"
General format using the balance built-in clock data

```
␣␣␣␣␣␣␣␣␣␣␣␣A␣&␣D<TERM>
MODEL␣␣␣␣␣␣BM-300<TERM>
S/N␣␣␣␣␣␣01234567<TERM>
ID␣␣␣␣␣␣␣LAB-0123<TERM>
DATE<TERM>
␣␣␣␣␣␣2011/02/20<TERM>
TIME<TERM>
␣␣␣␣␣␣␣12:34:56<TERM>
CAL.TEST(EXT.)<TERM>
ACTUAL<TERM>
␣␣␣␣␣␣␣0.0000␣␣g<TERM>
␣␣␣␣+200.0002␣␣g<TERM>
TARGET<TERM>
␣␣␣␣+200.0000␣␣g<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
---------------<TERM>
<TERM>
<TERM>
```

␣   Space, ASCII 20h
<TERM>   Terminator, CR , LF or CR
CR   Carriage return, ASCII 0Dh
LF   Line feed, ASCII 0Ah

Title block and end block

When the weight values are recorded as GLP data, a "Title block" is inserted at the beginning and an "End block" is inserted at the end of a group of weight values in the GLP report.

Note   If the data memory function is used (except *dAtA 0*), the "Title block" and "End block" cannot be output.

Key operation

1   With the weighing data displayed, press and hold the PRINT key (for approx. 2 seconds) until *StArt* is displayed, and then release the key. The "Title block" is output.

2   The weighing data is output according to the parameter setting of the data output mode (*Prt*) of the function table.

3   Press and hold the PRINT key (for approx. 2 seconds) until *rEcEnd* is displayed, and then release the key. The "End block" is output.

Function setting " *info 1*"
AD-8121 printer format

```
          A & D
MODEL     BM-300
S/N       01234567
ID        LAB-0123
DATE   2011/02/20
START
TIME      12:34:56


WT   +123.4567   g
WT   +123.4612   g
WT   +123.4637
```

```
      4511   g
WT   +123.4534   g
WT   +123.4712   g
WT   +123.4645   g

END
       TIME    12:40
15
SIGNATURE


— — — — — — —
```

Title block

Manufacturer
Model
Serial number
ID number
Date

Time

Weighing data

Time

Signature

End block

Function setting " *info 2*"
General format using the balance built-in clock data

```
␣␣␣␣␣␣␣␣␣␣␣␣A␣&␣D<TERM>
MODEL␣␣␣␣␣BM-300<TERM>
S/N␣␣␣␣␣01234567<TERM>
ID␣␣␣␣␣␣LAB-0123<TERM>
DATE<TERM>
␣␣␣␣␣␣2011/02/20<TERM>
START<TERM>
TIME<TERM>
␣␣␣␣␣␣␣␣␣12:34:56<TERM>
<TERM>
WT␣␣+123.4567␣␣g<TERM>
WT␣␣+123.4612␣␣g<TERM>
WT␣␣+123.4622
```

```
    4512␣␣g<TERM>
WT␣␣+123.4534␣␣g<TERM>
WT␣␣+123.4712␣␣g<TERM>
WT␣␣+123.4645␣␣g<TERM>
<TERM>
END<TERM>
TIME<TERM>
␣␣␣␣␣␣␣␣␣12:40:15<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
----------------<TERM>
<TERM>
<TERM>
```

␣	Space, ASCII 20h
<TERM>	Terminator, CR , LF or CR
CR	Carriage return, ASCII 0Dh
LF	Line feed, ASCII 0Ah

12. Data Memory

Data memory is a function to store weighing data and calibration data in memory. The data stored in memory are available for outputting at one time to a printer or personal computer.

Weighing data	Excluding the time and date	Up to 200 sets
	Including the time and date	Up to 100 sets
Calibration report: Using the internal mass and an external weight Automatic self calibration Calibration test report: Using the internal mass and an external weight		Last 50 sets

12.1. Notes on Using Data Memory

□ To use the memory function, set the "Data memory (*dAtA*)" parameter and the "Time/Date output (*5-td*)" parameter of the function table. Refer to "**10. Function Table**" for details on setting the data memory.

□ For weighing data, the data contents to be stored and the storage capacity depend on the "Time/Date output (*5-td*)" parameter setting.

□ If a different type of data exists in memory, "*CLr*" blinks in the upper left of the display to prompt you to delete the data.
For example: You want to store weighing data but calibration data or unit mass data remains in memory. "*CLr*" blinks.

Upper left of the display

CLr

□ If the stored data is corrupted, "*Err*" blinks in the upper left of the display.
Under such a condition, before storing data, delete the data in memory as follows:

Releasing "*CLr*" or "*Err*"

1 Press and hold the PRINT key (for approx. 2 seconds) until *CLr no* with "*no*" blinking is displayed, and then release the key.

2 Press the RE-ZERO key to display *CLr Go* with "*Go*" blinking.

3 Press the PRINT key to delete all the data in memory.

4 The balance displays *End* and returns to the weighing mode.

12.2. Data Memory for Weighing Data

Features
□ The balance can store 200 sets of weighing data in memory (if the time and date are added, the balance can store 100 sets). Even if the AC adapter is removed, the data is maintained in the memory.
□ It is not necessary to connect a printer or personal computer to the balance continually, because the balance stores the weighing data in memory.
□ The data memory function does not occupy a printer or personal computer while weighing.
□ The data in memory can be displayed on the balance for confirmation.
□ The data in memory can be output at one time to a printer or personal computer.
Comment: Select items for addition to the output data, such as the ID number, data number, time and date, in the function settings.

Storing the weighing data

Note   If "*Clr*" blinks in the upper left of the display, delete the data in memory.

1   Set the "Data memory (*dАtА*)" parameter to " *1*" (To store the weighing data).

2   Specify whether or not to add the time and date using the "Time/Date output (*S-td*)" parameter.

3   The storing mode depends on the "Data output mode (*Prt*)" parameter setting.
    Four modes are available to store data.

Key mode ·······················	When the PRINT key is pressed and the displayed value is stable, the balance stores the weighing data.
Auto print mode A ···········	When the displayed value is stable and the conditions of "Auto print polarity", "Auto print difference" and zero point (reference value) are met, the balance stores the weighing data.
Auto print mode B ···········	When the displayed value is stable and the conditions of "Auto print polarity", "Auto print difference" and last stable data (reference value) are met, the balance stores the weighing data.
Interval mode ·················	Weighing data is stored at an interval specified in "Interval time (*int*)". Press the PRINT key to start and stop this mode.

Enabling the data memory function

1   Press and hold the RANGE key (for approx. 2 seconds) until *bASFnc* is displayed, and then release the key.

2   Press the RANGE key several times to display *dout* .

3   Press the PRINT key.

4   Press the RANGE key several times to display *dАtА* .

5   Press the RE-ZERO key to display *dАtА 1* .

6   Press the PRINT key to store the setting.

7   Press the CAL key to return to the weighing mode.
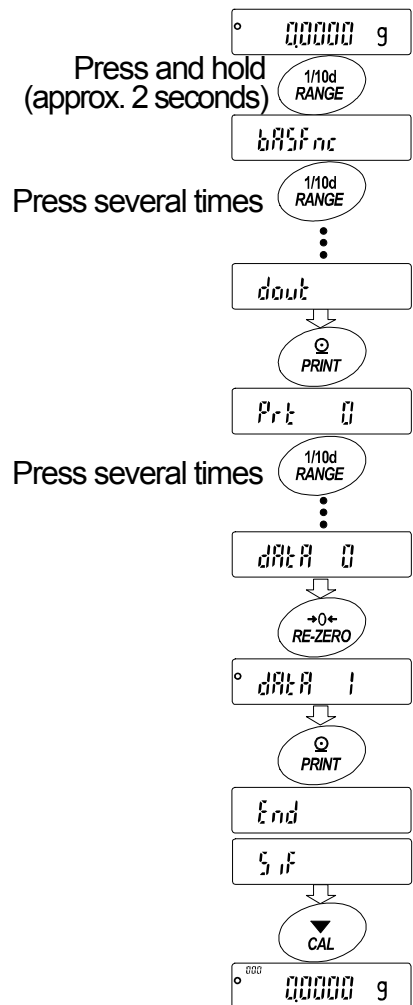
Display symbols for data memory

Number of data in memory	→ 008			

Number of data in memory → 008

Memory full → FUL

Weighing data being displayed

in ← Interval memory standby indicator

in (flashing) ← Interval memory active indicator

Data number of the data currently displayed → ◄ 008

Memory data being displayed
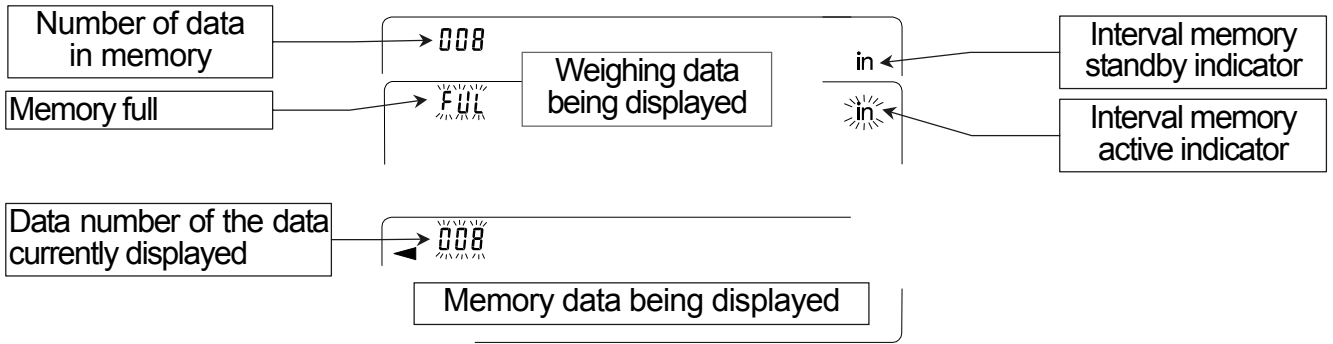
Notes

□ **When weighing data is being stored in memory, the data can be output to a personal computer using the RS-232C interface at the same time.**

□ **"FUL" indicates that memory is full or the memory capacity has been reached. More data cannot be stored unless the memory data is deleted.**

□ **Automatic self calibration cannot be used while the interval memory mode is active.**

□ **The following commands cannot be used during data storage.**

Setting the function table

Parameter settings for each output mode are as follows:

Mode \ Item	Data output mode	Auto print polarity, difference	Data memory function	Interval time
Key mode	Prt 0	Not used	dAtA 1	Not used
Auto print mode A	Prt 1	AP-A 0 to 2	dAtA 1	Not used
Auto print mode B	Prt 2	AP-b 0 to 2	dAtA 1	Not used
Interval mode	Prt 3	Not used	dAtA 1	int 0 to 8

Additional parameter settings, as follows:

Data number	No	d-no oFF	Time and date	No	S-td 0	200 sets
	Yes	d-no on		Time only	S-td 1	100 sets
ID number	No	S-id oFF		Date only	S-td 2	100 sets
	Yes	S-id on		Both	S-td 3	100 sets

Recalling the memory data

Confirm that the "Data memory (𝑑𝐴𝑡𝐴)" parameter is set to " 1 ".

1 Press and hold the PRINT key (for approx. 2 seconds) until 𝑟𝐸𝐶𝐴𝐿𝐿 is displayed, and then release the key. The type of data appears in the upper left of the display as shown to the right.

2 Press the PRINT key to enter the memory recall mode.
Recall the data in memory using the following keys.
RE-ZERO key ·····To proceed to the next data set.
MODE key ········To go back to the previous data set.
PRINT key·········To transmit the current data using the RS-232C interface.
With RANGE held down, press the CAL key
To delete the current data.
CAL key·············To exit the memory recall mode.

3 Press the CAL key to return to the weighing mode.

Indicators

-𝑑-

Weighing data
without time and date

𝑑-𝑡

Weighing data with
time and date
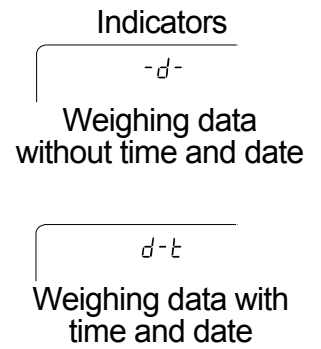
Transmitting all memory data at one time

Confirm that the "Serial interface (𝑆 𝑖𝐹)" parameters are set properly.
Refer to "**10. Function Table**" and "**16.2. Connecting to Peripheral Equipment**".

1 Press and hold the PRINT key (for approx. 2 seconds) until 𝑟𝐸𝐶𝐴𝐿𝐿 is displayed, and then release the key.

2 Press the RANGE key to display 𝑜𝑢𝑡 .

3 Press the PRINT key to display 𝑜𝑢𝑡 𝑛𝑜 with "𝑛𝑜" blinking.

4 Press the RE-ZERO key to display 𝑜𝑢𝑡 𝐺𝑜 with "𝐺𝑜" blinking.

5 Press the PRINT key to transmit all data using the RS-232C interface.

6 The balance displays 𝐶𝐿𝐸𝐴𝑟 when all data is transmitted.
Press the CAL key to return to the weighing mode.

Press and hold
(approx. 2 seconds)

Transmit all data
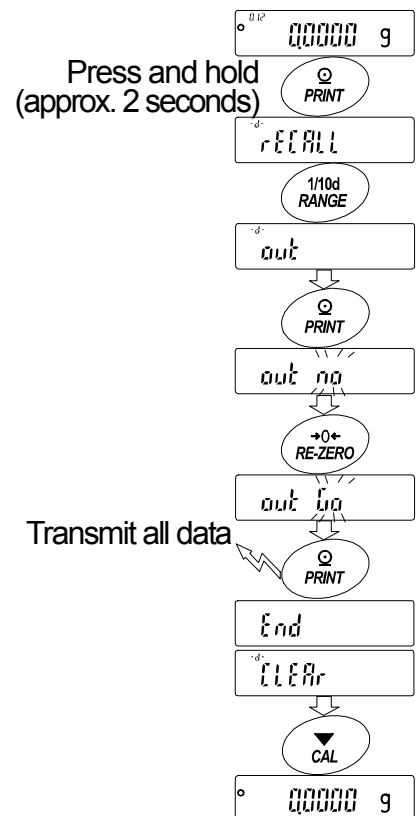
Deleting all memory data at one time

1   Press and hold the [PRINT] key (for approx. 2 seconds) until [rECALL] is displayed, and then release the key.

2   Press the [RANGE] key several times to display [CLEAr].

3   Press the [PRINT] key to display [Clr no] with "no" blinking.

4   Press the [RE-ZERO] key to display [Clr Go] with "Go" blinking.

5   Press the [PRINT] key to delete all data.

6   The balance displays [End] and returns to the weighing mode.

Press and hold (approx. 2 seconds) [PRINT]

[rECALL]

Press several times [1/10d RANGE]

[CLEAr]

[PRINT]

[Clr no]

[→0← RE-ZERO]

[Clr Go]

[PRINT]

[End]
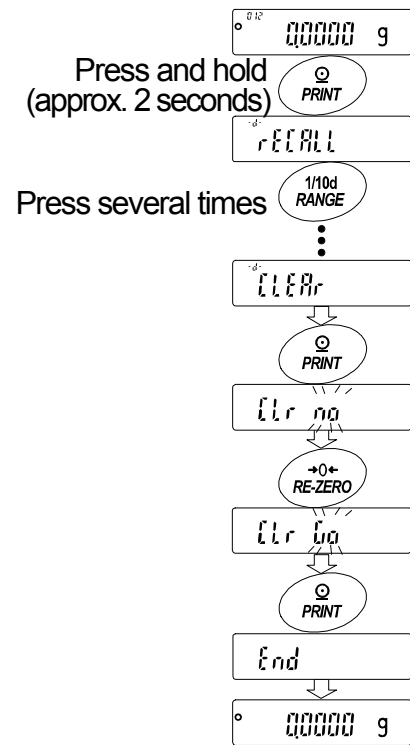
12.3. Data Memory for Calibration and Calibration Test Data

Features

☐ Calibration data (when and how it is performed) and calibration test data can be stored in memory.

☐ All the data in memory is available to be output at one time to a printer or personal computer.

☐ Up to 50 data sets of the latest calibration or calibration test can be stored. When the memory capacity has been reached, "FUL" is displayed in the upper left of the display.

Indicator

FUL

Storing the calibration and calibration test data

Note   If "Clr" appears blinking in the upper left of the display, delete the data in memory.

Store the calibration and calibration test data as follows:

1   Set the "Data memory (dAtA)" parameter to "2" (to store the calibration data).

2   Set the "GLP output (inFo)" parameter to " 1", "2" or "3".

3   With the settings above, each time calibration or calibration test is performed, the data is stored automatically.

Transmitting the memory data

Notes

☐ **Confirm that the "Serial interface (5 ıF)" parameters are set properly.**
Refer to "10. Function Table" and "16.2. Connecting to Peripheral Equipment".

☐ **Confirm that the "Data memory (dAtA)" parameter is set to "2".**

1 Press and hold the PRINT key (for approx. 2 seconds) until `out` is displayed, and then release the key.

2 Press the PRINT key to display `out no` with "no" blinking.

3 Press the RE-ZERO key to display `out Go` with "Go" blinking.

4 Press the PRINT key to transmit all memory data using the RS-232C interface.

5 The balance displays `CLEAr` when all memory data is output.
Press the CAL key to return to the weighing mode.

Press and hold
(approx. 2 seconds)

```
      0.0000  g
         PRINT
      out
         PRINT
   out no
       RE-ZERO
   out Go
         PRINT
   CLEAr
          CAL
      0.0000  g
```
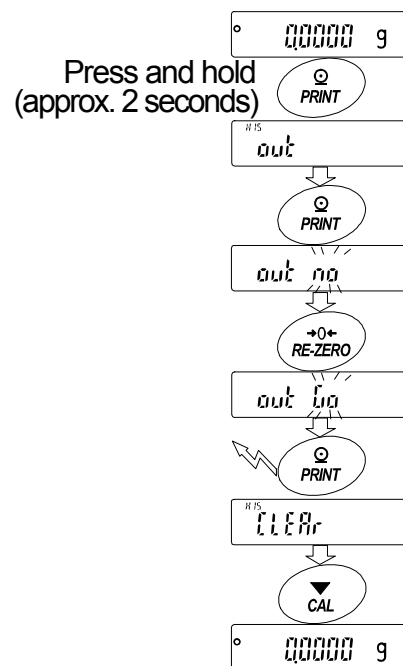
Deleting data stored in memory

1 Press and hold the PRINT key (for approx. 2 seconds) until `out` is displayed, and then release the key.

2 Press the RANGE key to display `CLEAr`.

3 Press the PRINT key to display `Clr no` with "no" blinking.

4 Press the RE-ZERO key to display `Clr Go` with "Go" blinking.

5 Press the PRINT key to delete all data.

6 The balance displays `End` and returns to the weighing mode when all the data has been deleted.

Press and hold
(approx. 2 seconds)

```
      0.0000  g
         PRINT
      out
    1/10d
    RANGE
   CLEAr
         PRINT
   Clr no
       RE-ZERO
   Clr Go
         PRINT
   End
      0.0000  g
```
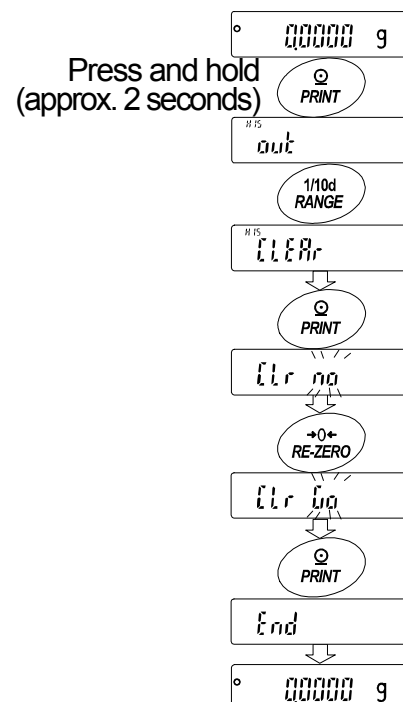
13. Underhook

The underhook can be used for magnetic materials or density measurement. The built-in underhook is revealed by removing the cap on the bottom of the balance. Use the underhook as shown below.

Caution
□ **Do not apply excessive force to the underhook.**
□ **When not in use, attach the cap to prevent dust from getting into the balance.**
□ **Do not push the underhook upward**
□ **When turning the balance over, parts and weighing sample in the weighing chamber will fall off. (Parts: the weighing pan, pan support, breeze break ring, fine range ring and dust plate)**
  Remove them first.
□ **When the cap is removed, a weighing error may occur, because of drafts entering into the internal portion of the balance. Arrange the room condition.**

Bottom

Underhook

Cap

1   Remove the cap on the bottom of the balance.

2   Hang your weighing pan on the underhook.
    Place the balance on the solid table.

Solid table
equipped with a hole.

Weighing pan
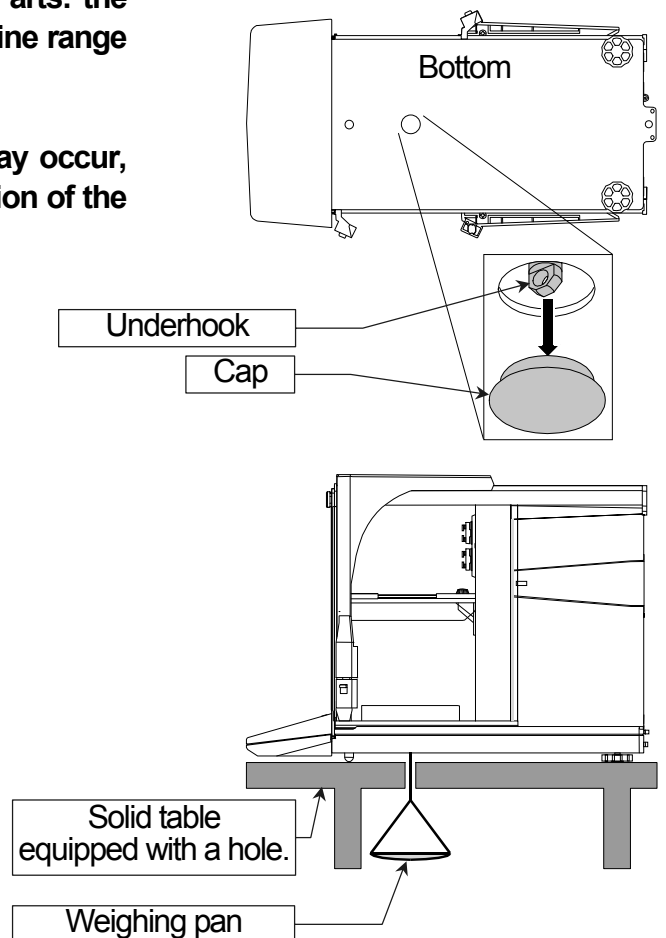
14. Density Measurement (Specific gravity)

The balance is equipped with a density mode. It calculates the density of a solid using the weight of a sample in air and the weight in liquid. We recommend the use of the AD-1653 Density Determination Kit.

Notes

□ **The density mode was not selected for use when the balance was shipped from the factory. To use this mode, change the function table settings to activate the density mode. Refer to "5.2. Storing Active Units".**

□ **When the density mode is selected, the response adjustment function cannot be used.**

□ **The readability is 0.0001 g while using the density mode.**

Formula to obtain the density

The density can be obtained by the following formula.

$$\rho = \frac{A}{A - B} \times \rho_0$$

Where
- ρ : Density of a sample
- A : Weight value of a sample in air
- B : Weight value of a sample in liquid
- ρ_0 : Density of a liquid

Prior to measurement: Changing the function table

Prior to measurement, change the function table as follows:

1 Selecting the density mode.
  The density mode is not available in the factory setting. To use the mode, select it (unit of $\boxed{Un\,it\ \mathit{I5}}$.) in the function table. Refer to **"5.2. Storing Active Units"**. Then, the density mode can be selected as one of the weighing units by pressing the $\boxed{\text{MODE}}$ key.

2 Selecting a way to set the density of a liquid.
  Select the liquid density input method from the function table below.

Note   The following function table is displayed only when the unit of $\boxed{Un\,it\ \mathit{I5}}$ is active. The table of the density function ($dS\ Fnc$) is displayed after $S\,iF$.

Class	Item and Parameter		Description
$dS\ Fnc$	$Ld\ in$	▪ 0	Water temperature
Density function	Liquid density input	1	Liquid density

▪ Factory setting.

Entering the density of a liquid

Two ways to set the density of a liquid are available in the function table, "Liquid density input ($Ld\ in$): by entering the water temperature or by entering the density directly.

1 Press the MODE key as necessary to select the density mode.
   Press and hold the MODE key (for approx. 2 seconds) to select to "water temperature" or "liquid density". In the density mode : The unit is "g (gram)". The processing indicator (◄) blinks. Response adjustment is off.
   If you cancel the density mode, press the MODE key.

Entering the water temperature ($Ld\ in\ 0$)

2 Press and hold the MODE key (for approx. 2 seconds). The water temperature currently set (unit: °C, factory setting : 25°C) is displayed. Use the following keys to change the value.
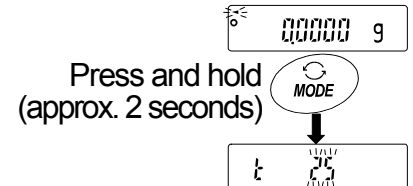
   RE-ZERO (+)key ···· To increase the temperature by one degree.
   (0°C is displayed after 99°C)

   MODE (-)key .... To decrease the temperature by one degree.
   (99°C is displayed after 0°C)

   PRINT key............ To store the new water temperature, display
   End and return to the density mode. Proceed
   to Step 1.

   CAL key............... To cancel the change and return to the density mode.
   Proceed to Step 1.

The relation between the water temperature and density

°C	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
0	0.99984	0.99990	0.99994	0.99996	0.99997	0.99996	0.99994	0.99990	0.99985	0.99978
10	0.99970	0.99961	0.99949	0.99938	0.99924	0.99910	0.99894	0.99877	0.99860	0.99841
20	0.99820	0.99799	0.99777	0.99754	0.99730	0.99704	0.99678	0.99651	0.99623	0.99594
30	0.99565	0.99534	0.99503	0.99470	0.99437	0.99403	0.99368	0.99333	0.99297	0.99259
40	0.99222	0.99183	0.99144	0.99104	0.99063	0.99021	0.98979	0.98936	0.98893	0.98849

g/cm^3

Entering the density directly ($Ld\ in\ 1$)

Press and hold the MODE key (for approx. 2 seconds). The density currently set (unit : g / cm^3, factory setting : 1.0000g / cm^3) is displayed.
Use the following keys to change the value.
The range to set the density is 0.0000g / cm^3 to 1.9999g / cm^3.
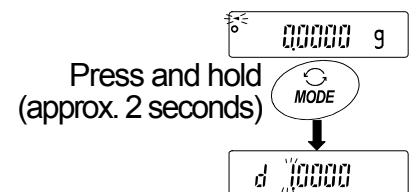
   RE-ZERO (+)key ····· To increase the value of the digit selected.

   MODE (-)key ········· To decrease the value of the digit selected.

   RANGE key ········· To select the digit to change the value.

   PRINT key·········· To store the change, display End and return to the density mode. (Step 1).

   CAL key ············ To cancel the change and return to the density mode. (Step 1)

BM series

Measuring the density（specific gravity）

Note **If the liquid temperature or the type of liquid is changed during measurement, input the value of the liquid density again as necessary. The density display is four decimal places. The readability cannot be changed with the $\boxed{\text{RANGE}}$ key.**

The density (or specific gravity) is displayed after "Weighing in air" and " Weighing in liquid". The procedure of each measurement is as follows:

g : gram. ◄ : the processing indicator

1 Enter the density mode. (g lights. ◄ blinks.)
   Place nothing on both pans and press the $\boxed{\text{RE-ZERO}}$ key to display zero.

2 Place the sample on the pan in air (g lights. ◄ blinks.)
   and wait for the weight value to be stable.
   To store or output the weight value, press the $\boxed{\text{PRINT}}$ key.
   Press the $\boxed{\text{RANGE}}$ key to confirm the weight value in air and proceed to the next step.
Note   **If negative value or $\boxed{E}$ (out of range) is displayed, the $\boxed{\text{RANGE}}$ key is inactive.**

3 Move the sample to the pan in liquid (g lights.◄ lights.)
   and wait for the weight value to be stable.
   To store or output the weight value, press the $\boxed{\text{PRINT}}$ key.
   Press the $\boxed{\text{RANGE}}$ key to confirm the weight value in liquid and proceed to the next step.
Note   **If $\boxed{E}$ (out of range) is displayed, the $\boxed{\text{RANGE}}$ key is inactive.**

4 To store or output the density value, press the $\boxed{\text{PRINT}}$ key. (Unit : ⅅ5. g turns off. ◄ lights.)
   Press the $\boxed{\text{RANGE}}$ key to measure another sample and proceed to Step 2.

5 If the liquid temperature or the type of liquid is changed during measurement, input the value of the liquid density again as necessary.

6 Press the $\boxed{\text{MODE}}$ key to proceed to other modes.

From "Entering the density of a liquid"

→0← RE-ZERO

Weighing in air.
g lights. ◄ blinks.
→ 0.0000 g

Place sample on the pan in air

Weighing in air.
g lights. ◄ blinks.
→ 123.450 g
Output or store
⊙ PRINT
1/10d RANGE

Move sample from the pan in air to the pan in liquid

Weighing in liquid.
g lights. ◄ lights.
→ 98.760 g
Output or store
⊙ PRINT
1/10d RANGE

Density display.
g turns off. ◄ lights.
→ 5.000 ⅅ5
Output or store
⊙ PRINT

Remove sample

1/10d RANGE

MODE

0.0000 g
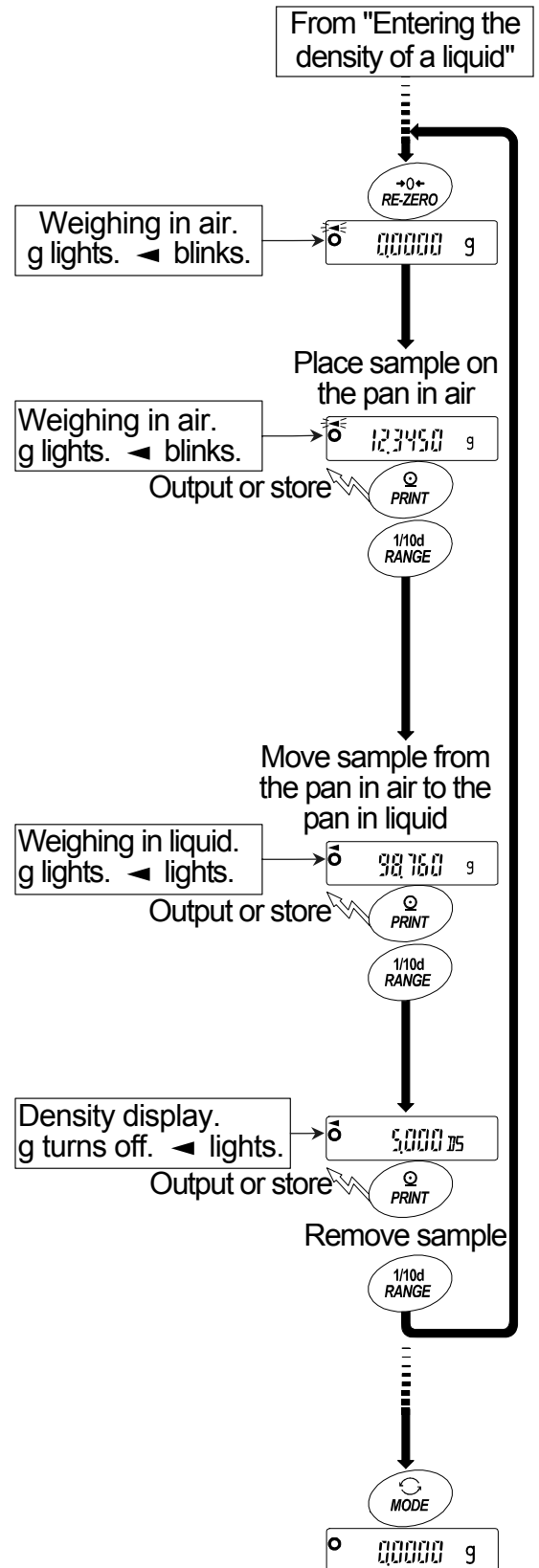
15. Password Function

The password function can be used to restrict balance use or functions. It is useful for preventing the time and date setting from being falsified and preventing users from changing other function settings.

Password: Four digits (4 x 4 x 4 x 4 = 256 outcomes) using the $\boxed{\text{MODE}}$, $\boxed{\text{RANGE}}$, $\boxed{\text{PRINT}}$ and $\boxed{\text{RE-ZERO}}$ keys.

At the factory setting, the password function has been disabled.
Settings related to the password function are performed in the function table.

Note The password function varies depending on the balance software version.

15.1. Balance Software Version 1.50 to 1.64

Two settings are available in "Password function (*LocFnc*)" of the function table.

PASS 0	No password function.
PASS 1	Entering a password is required before starting weighing.

PASS 0 (No password function)

No password is required. Anybody can perform weighing, use all the balance functions and make changes to them.

PASS 1 (Entering a password is required before starting weighing.)

The administrator (*AdmIN*) sets a unique password to restrict balance users. Only one password by the administrator can be set.
The correct password must be entered for the balance to enter the weighing mode.

15.2. Balance Software Version 1.660 or later

Three settings are available in "Password function (*LocFnc*)" of the function table.

PASS 0	No password function.
PASS 1	Entering a password is required before starting weighing.
PASS 2	Logging in by the administrator password is required before making changes.

PASS 0 (No password function)

No password is required. Anybody can perform weighing, use all the balance functions and make changes to them.

PASS 1 (Entering a password is required before starting weighing.)

The administrator (*AdmIN*) sets unique passwords to restrict balance users. Pressing the ON:OFF key before weighing will prompt you to enter a password.
The correct password must be entered for the balance to enter the weighing mode.

Two login levels are available: administrator (*AdmIN*) and user (*USER 01* to *10*).

Administrator (*AdmIN*)	All the functions and settings can be used.
	A password can be set for each of 10 users.
User (*USER 01* to *10*)	Initialization and changes to the settings are restricted, including the clock setting.
No password	The balance cannot be used.

PASS 2 (Logging in by the administrator password is required before making changes.)

Anybody can perform weighing, but initialization and changes to the settings are restricted, including the clock setting. Even if the ON:OFF key is pressed to start weighing, a password will not be required.

Two login levels are available: administrator (*AdmIN*) and guest (*GUEST*).

Administrator (*AdmIN*)	All the functions and settings can be used.
Guest (*GUEST*) *No password	Initialization and changes to the settings are restricted, including the clock setting.

When weighing is started by pressing the ON:OFF key while holding down the CAL key in the standby mode, the balance will prompt you to enter the administrator password.

Items restricted depending on the login level

Login level	Weighing		
	Entering password before weighing	Calibration	Changes to the settings ***1**
Administrator (*AdmIN*)	Required	Available	Available
User (*USER 01* to *10*)		Available or not available ***2**	Not available
Guest (*GUEST*)	Not required		

*1: Response adjustment, repeatability test, function switch and initialization, function settings (clock setting)

*2: Available under ordinary circumstances, but not available to users and guests when the administrator sets the function switch to "inhibit".

15.3. Using the Password Function

The password function can be switched among "Not used($\mathit{0}$)", "Used($\mathit{1}$)" and "Used($\mathit{2}$)" in "Password function ($LocFnc$)" of the function table.

1 In the weighing mode, press and hold the ⌊RANGE⌋ key (for approx. 2 seconds) until ⌊$bASFnc$⌋ is displayed, and then release the key.

2 Press the ⌊RANGE⌋ key several times to display ⌊$LocFnc$⌋.

3 Press the ⌊PRINT⌋ key to display ⌊$PASS\ \ \mathit{0}$⌋.
   To cancel the operation, press the ⌊CAL⌋ key.

4 Press the ⌊RE-ZERO⌋ key to switch the numbers. Display "$\mathit{1}$" or "$\mathit{2}$".

5 Press the ⌊PRINT⌋ key to display ⌊$SurE:YES_{No}$⌋ with "No" blinking (selected).

6 Press the ⌊RE-ZERO⌋ key to switch between "YES" and "No".

7 Display ⌊$SurE:YES_{No}$⌋ with "YES" blinking (selected).

8 Press the ⌊PRINT⌋ key to store the new setting. The password function can now be used.

9 ⌊$Loc\ \ no$⌋ is displayed. To store or change the password, proceed to Step 3 in **"15.6. Storing or Changing the Password"**. Not to store or change the password, press the ⌊CAL⌋ key to return to the weighing mode.
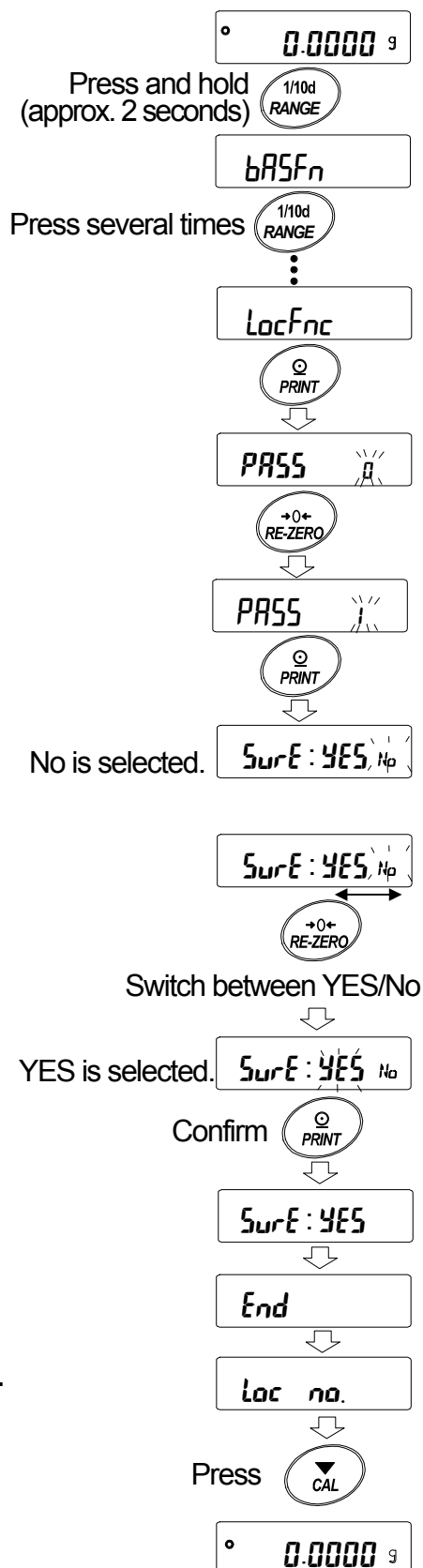
Note   When the balance software version is 1.50 to 1.64, only "Not used($\mathit{0}$)" or "Used($\mathit{1}$)" is available.

Press and hold
(approx. 2 seconds) ⌈1/10d RANGE⌋

⌊$bASFn$⌋

Press several times ⌈1/10d RANGE⌋
⋮

⌊$LocFnc$⌋
⌈PRINT⌋

⌊$PASS\ \ \mathit{0}$⌋
⌈RE-ZERO⌋

⌊$PASS\ \ \mathit{1}$⌋
⌈PRINT⌋

No is selected. ⌊$SurE:YES_{No}$⌋

⌊$SurE:YES_{No}$⌋
⌈RE-ZERO⌋
Switch between YES/No

YES is selected. ⌊$SurE:YES\ No$⌋
Confirm ⌈PRINT⌋

⌊$SurE:YES$⌋

⌊End⌋

⌊$Loc\ no.$⌋

Press ⌈CAL⌋

15.4.1. *PASS 1* (Entering a password is required before starting weighing)

1 In the standby mode, press the `ON:OFF` key.

2 After `USER` `PASS WD`, `---- PASS` is displayed to prompt you to enter a password.

3 Enter a four-digit password using the following keys. The display will turn off automatically after ten minutes of non-operation.
   `MODE` key.............To enter *m*
   `RANGE` key...........To enter *r*
   `PRINT` key.............To enter *P*
   `RE-ZERO` key........To enter *z*
   `CAL` key ....To go back one character

4 When the password is correct, the balance displays the login level, turns all the display segments on, and then enters the weighing mode.

   When the administrator password is entered, you are logged in as an administrator.
   The default password set at the factory is `2222` (press the `RE-ZERO` key four times), for administrator level.

   When the password is incorrect, the balance displays `FAiL`, sounds the buzzer three times and turns the display off.
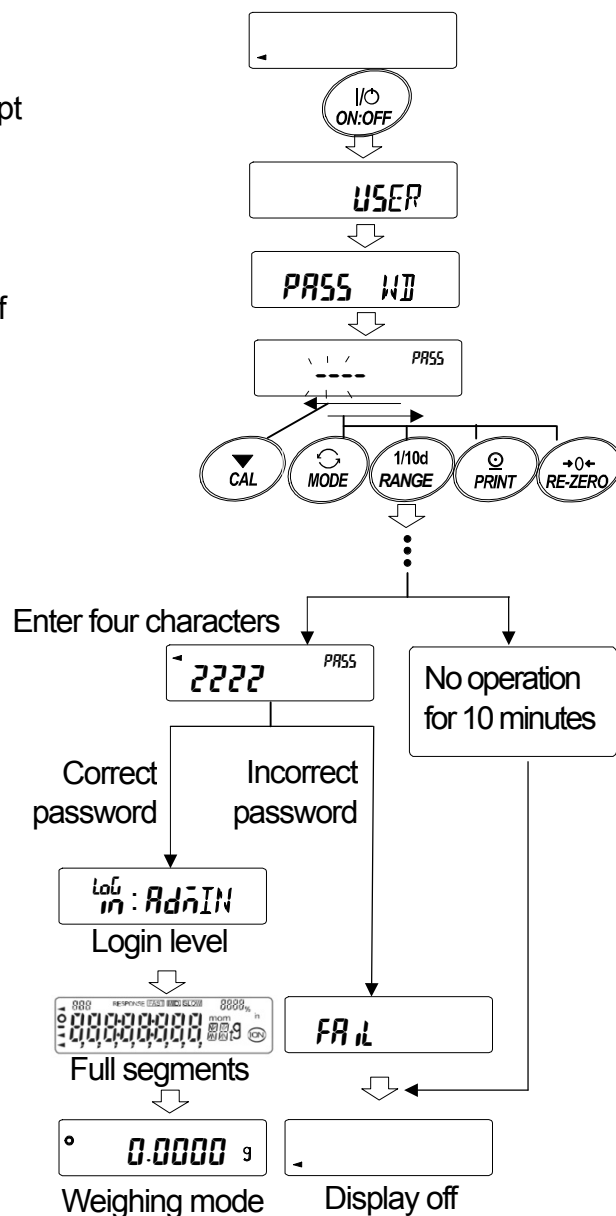
Note   When the balance software version is 1.50 to 1.64, the login level is not displayed when logged in. When the balance software version is 1.660 or later, enter the administrator password to log in as an administrator.

15.4.2. _PASS 2_ (Logging in by the administrator password is required before making changes)

Logging in as an administrator (_AdmIN_)

1 In the standby mode, while holding down the ⃞ CAL ⃞ key, press the ⃞ ON:OFF ⃞ key.

While holding down

↓

AdmIN

↓

PASS WD

↓

_----_ _PASS_

2 Enter a four-digit password using the following keys.
   The display will turn off automatically after ten minutes of non-operation.

   ⃞ MODE ⃞ key............To enter $\bar{m}$
   ⃞ RANGE ⃞ key...........To enter r
   ⃞ PRINT ⃞ key............To enter P
   ⃞ RE-ZERO ⃞ key........To enter $\bar{c}$
   ⃞ CAL ⃞ key ....To go back one character

▼ CAL — ↻ MODE — 1/10d RANGE — ⊙ PRINT — →0← RE-ZERO

↓

Enter four characters

3 When the password is correct, the balance displays the login level, turns all the display segments on, and then enters the weighing mode.

   The default password set at the factory is _2222_ (press the ⃞ RE-ZERO ⃞ key four times), for administrator level.

   When the password is incorrect, the balance displays _FAiL_, sounds the buzzer three times and turns the display off.

_2222_ _PASS_

Correct password | Incorrect password | No operation for 10 minutes

Log in: AdmIN
Login level

↓

Full segments

↓

° _0.0000_ g
Weighing mode

FAiL

↓

◂
Display off

Logging in as a guest (_GUEST_)

1 In the standby mode, press the ⃞ ON:OFF ⃞ key.

2 After _Log in: GUEST_, the balance enters the weighing mode.

I/Ö ON:OFF

↓

Log in: GUEST

↓

° _0.0000_ g
Weighing mode

BM series
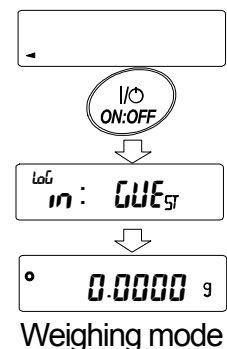
15.5. Logging Out

1   To log out, press the [ON:OFF] key to turn the display off.
    With the function $PASS$ 1 set, the password will need to be
    entered again to enter the weighing mode from the standby
    mode.

° 0.0000 g

Weighing mode

I/Ö
ON:OFF

Display off
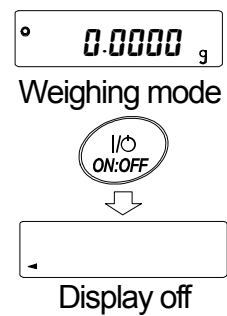
15.6. Storing or Changing the Password

The password can be changed in "Password ($Loc\ no.$)" of the function table.

1   In the weighing mode, press and hold the $\boxed{\text{RANGE}}$ key (for approx. 2 seconds) until $\boxed{bASFnc}$ is displayed, and then release the key.

2   Press the $\boxed{\text{RANGE}}$ key several times to display $\boxed{Loc\ no.}$.

3   Press the $\boxed{\text{PRINT}}$ key to display the login level ($AdnIN$).

4   Press the $\boxed{\text{RANGE}}$ key to display the login level to be changed ($AdnIN$/$USER\ 01$ to 10).
    The stabilization indicator appears at a login level where a password has been stored. (The password can be changed.)

5   To change the password, press the $\boxed{\text{PRINT}}$ key. For details, refer to **"15.7. Changing the Password"**.

0.0000 g

Press and hold
(approx. 2 seconds)

1/10d
RANGE

bASFn

Press several times

1/10d
RANGE

Loc no.

PRINT

AdnIN.

1/10d
RANGE

Login level

USER 01

Press several times

1/10d
RANGE

USER 10

PRINT

Refer to "15.7. Changing the Password".
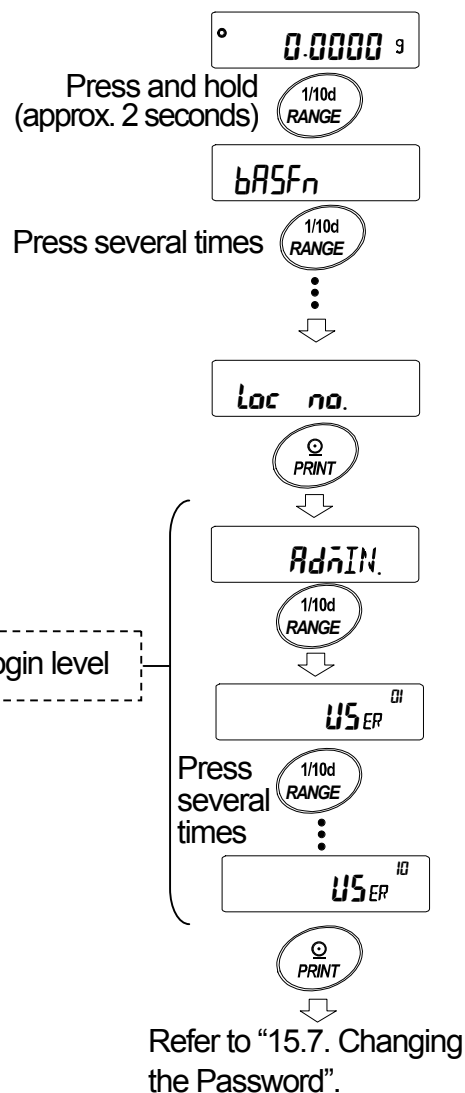
Notes
□   **To log out, press the $\boxed{\text{ON:OFF}}$ key to turn the display off.**
□   **With the function $PASS\ \ 2$ set, the administrator password is required to log in as an administrator. No password needs to be stored for $USER\ 01$ to 10.**
□   **When the balance software version is 1.50 to 1.64, only one password can be stored. While the balance displays $\boxed{Loc\ no.}$, press the $\boxed{\text{PRINT}}$ key to display the current password.**

15.7. Changing the Password

1 Refer to **"15.6. Storing or Changing the Password"** to display the login level to be changed.

2 Press the PRINT key to display the current password. The default password set at the factory is `2222` (press the RE-ZERO key four times), for administrator level.

3 Enter a new four-digit password using the following keys. The display will turn off automatically after ten minutes of non-operation.
MODE key............To enter $\bar{n}$
RANGE key..........To enter r
PRINT key............To enter P
RE-ZERO key.......To enter ∂
CAL key ....To go back one character
CAL key (press and hold for approx. 2 seconds)
...............To delete the password
Refer to **"15.8. Deleting the password"**.

4 The new password is displayed.

5 `SurE :YES No` is displayed with "No" blinking (selected).
Press the CAL key to return to the fourth character entry position.

6 Press the RE-ZERO key to display `SurE :YES No` with "YES" blinking (selected).

7 While "YES" is blinking, press the PRINT key to store the new password.

8 When setting is complete, `End` and then the next login level is displayed.
To set a password for the next level, follow the procedure starting from Step 2.
To finish the operation, press the CAL key twice to return to the weighing mode.

Refer to "15.6. Storing or Changing the Password".

`Admin`

PRINT

Current password

`2222 PASS`

CAL (Back key) MODE 1/10d RANGE PRINT +0+ RE-ZERO

Enter the 4ᵗʰ character

`nrP2 PASS`

`nrP2 PASS`

`SurE : YES No`

CAL +0+ RE-ZERO

No operation for 10 minutes

`SurE : YES No`

Confirm PRINT

`SurE : YES`

`End`

Display off

`USER 01`

PRINT CAL (Press twice)

`0.00 g`
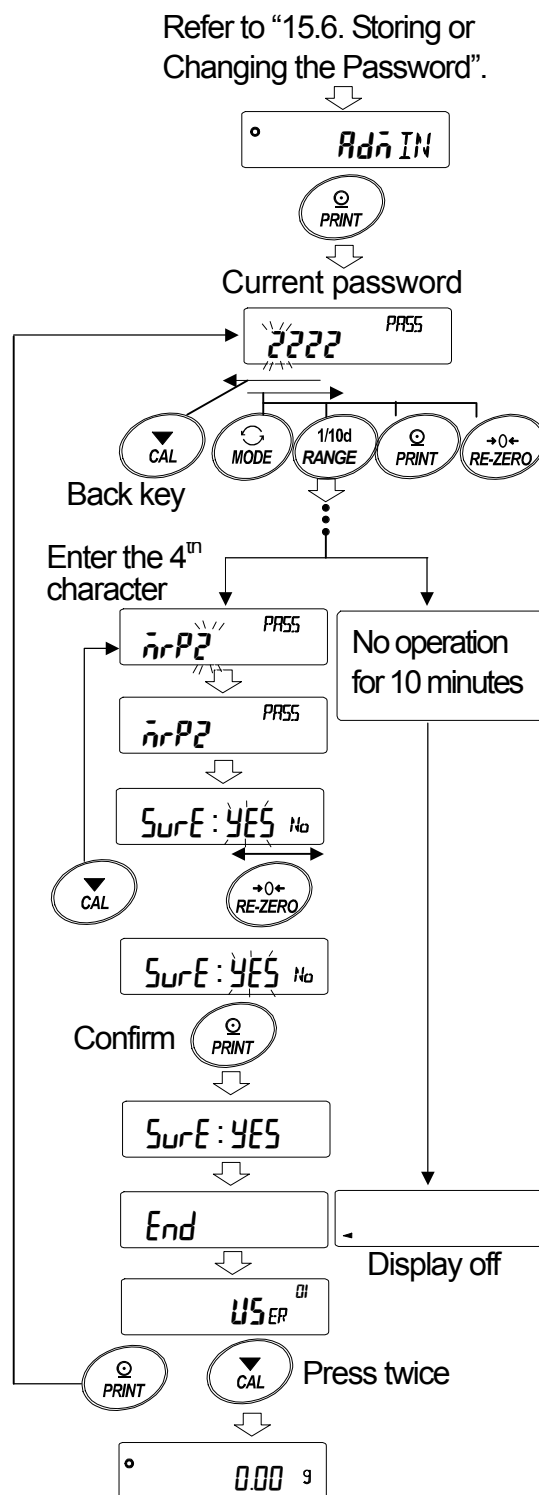
Notes
□ **If you have forgotten the password, the balance cannot be used. Make a record of the password and keep it where you can refer to it if needed.**
□ **The same password as the administrator password cannot be used for** `USER 01` **to** `10`**.**

15.8. Deleting the Password （USER 01～10）

1   Refer to **"15.7. Changing the Password"** to select the user whose password to be deleted and display the password.

2   Press and hold the [CAL] key (for approx. 2 seconds) to display | CLEAr | (blinking).

3   Press the [PRINT] key to display | CLEAr No |.

4   Press the [RE-ZERO] key to switch between "Go" and "No".

5   While | CLEAr Go | is displayed, press the [PRINT] key to delete the password.
    The balance displays | End | and then displays the login level.

Refer to "15.7. Changing the Password".

⇩

| nSP2   PASS |

Press and hold
(approx. 2 seconds) [▼ CAL]

⇩

| CLEAr |

[○ PRINT]

⇩

| CLEAR   No |

⇩

[→0← RE-ZERO]

⇩

| CLEAR   Go |

⇩

[○ PRINT]

⇩

| End |

⇩

| USER   01 |
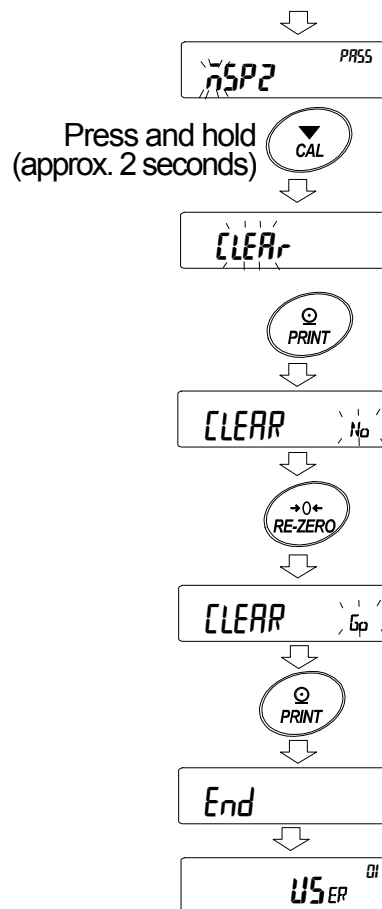
Note   **The administrator password cannot be deleted, but it can be changed.**
Refer to "15.6. Storing or Changing the Password" and "15.7. Changing the Password" to change it.

15.9. Forgotten Password

If you have forgotten the password, the balance cannot be used.
Contact your local A&D dealer to undo the password.

16. Standard Input and Output Interface

16.1. RS−232C Interface

The balance is a DCE device. Connect the balance to a personal computer (DTE) using a straight through cable.

Transmission system : EIA RS-232C
Transmission form : Asynchronous, bi-directional, half duplex
Transmission rate : 10 times/second or 5 times/second (same as data refresh rate)
Data format : Baud rate : 600, 1200, 2400, 4800, 9600, 19200 bps
Data bits : 7 or 8 bits
Parity : Even, Odd (Data bits 7 bits)
None (Data bits 8 bits)
Stop bit : 1 bit
Code : ASCII
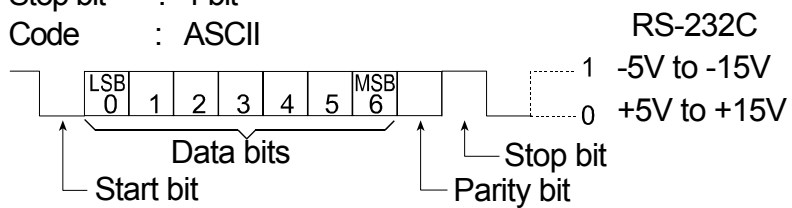
D−Sub 9 pin assignments

Pin No.	Signal name	Direction	Description
1	–	–	No connection
2	RXD	Output	Transmit data
3	TXD	Input	Receive data
4	–	–	No connection
5	SG	–	Signal ground
6	DSR	Output	Data set ready
7	RTS	Input	Request to send
8	CTS	Output	Clear to send
9	–	–	No connection

#4-40UNC
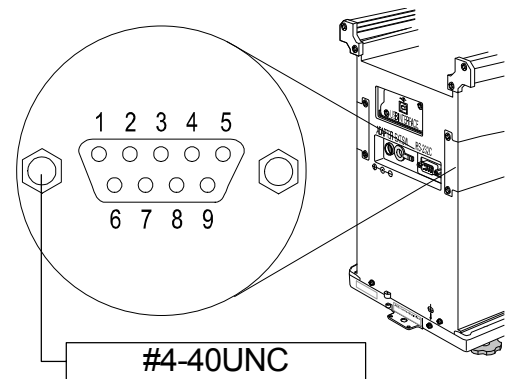
All signal names mean name for the DTE side.
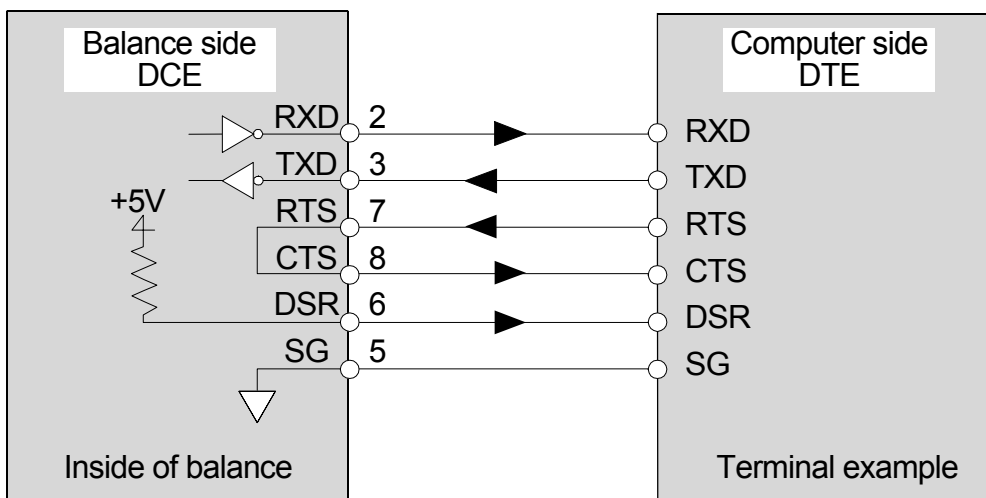
16.2.1. Connecting to the AD–8121B Printer

When connecting the AD-8121B printer to the balance for printing weighing data, configure the printer and the balance as follows
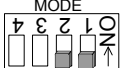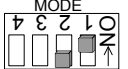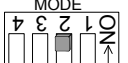
Class	Item and Parameter	Factory settings	AD-8121B MODE 1	AD-8121B MODE 2	AD-8121B MODE 3
dout Data output	*Prt* Data output mode	0	0,1,2	3	0,1,2
	AP-P Auto print polarity	0	#1	No setting	#1
	AP-b Auto print difference	1			
	5-id ID number output	off	off	off	off,on
	d-no Data number output	off	off	off	off,on
	5-td Time/Date output	0	0	0	0,1,2,3
	PU5E Data output pause	off	off	off	off,on #2
	At-F Auto feed	off	off	off	off,on
5 iF Serial interface	*bP5* Baud rate	2	2	2	2
	btPr Data bit, parity bit	0	0	0	0
	CrLF Terminator	0	0	0	0
	tYPE Data format	0	0	0	1

#1   Set the parameters when auto print mode A or B (*Prt* 1 or 2) is selected.

#2   Set *on* when multiple lines are printed. Example: When adding ID number, set *on*.

Notes

□ **Refer to "11.2. GLP Report" for print samples.**

□ **Settings of AD-8121B**

MODE	AD-8121B DIP switch	Description
MODE 1		Print at receiving data. Standard mode, statistical calculation mode
MODE 2		Print by [DATA] key operation or built-in timer. Standard mode, interval mode, chart mode
MODE 3		Print at receiving data. Dump print mode

DIP switch No.3 : Handling unstable data

　　ON　　To print
　　OFF　　Not to print
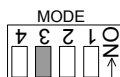
DIP switch No.4 : Data input specifications (Interface selection)

　　ON　　Current loop
　　OFF　　RS-232C
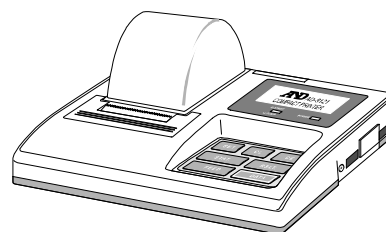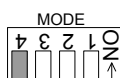
16.2.2. Connecting to the AD-8127 Printer

When connecting the AD-8127 printer to the balance for printing weighing data, configure the printer and the balance as follows according to the usage examples.

Function settings of the printer

Usage example	AD-8127 Multi printer Printing mode settings
When printing the balance weighing data with the balance's PRINT key or its "Auto print" mode.	EXT.KEY
When printing the balance weighing data with the printer's "Printing" key or its "Interval printing" mode. When printing charts with the printer.	MANUAL AUTO TIMER CHART
When printing the balance's statistical calculation results. When printing the balance's GLP report.	DUMP

□ Refer to the instruction manual of the AD-8127 printer for how to change the function settings of the AD-8127 printer.

Function settings of the balance

Usage example	Balance Prt Data output mode	Balance $type$ Data format
When printing the balance weighing data with the balance's PRINT key or its "Auto print" mode.	$0, 1, 2$	0
When printing the balance weighing data with the printer's "Printing" key or its "Interval printing" mode. When printing charts with the printer.	3	0
When printing the balance's statistical calculation results. When printing the balance's GLP report.	$0, 1, 2$	1

□ Refer to **"10. Function Table"** for how to change the function settings of the balance.

16.2.3. Connecting to a Computer Using the RS-232C Interface

Features

The balance is of the DCE type (Data Communication Equipment), which can be connected to a personal computer using the RS-232C interface. Before connection, read the personal computer manual thoroughly. Use a standard DCE cable for connection (cable type: straight-through).

Using Windows Communication Tools Software (WinCT)

When Windows is used as an operating system in a personal computer, the WinCT software can be used to transmit the weighing data to the personal computer. The current version of the WinCT can be downloaded from the A&D website. Confirm the windows version supported by this software when downloading. Refer to the WinCT instruction manual in the A&D website. The WinCT software has three communication methods: "RsCom" , "RsKey" and "RsWeight".

RsCom

□ RsCom can transmit commands to control the balance.
□ RsCom can make bi-directional communication between the balance and a personal computer using the RS-232C interface.
□ RsCom can display or store the data using a text file format. RsCom can also print the data using a printer connected to the personal computer.
□ When several ports of a personal computer have balances connected, the personal computer can communicate with each balance simultaneously.
□ RsCom can share a personal computer with other application software.
□ RsCom can receive the balance GLP report.

RsKey

□ RsKey can transmit the weighing data output from the balance directly to other application software such as Microsoft Excel.
□ RsKey can be used with most application software.
□ RsKey can receive the balance GLP report.

RsWeight

□ Can retrieve the weight data from the balance and display the data as a graph in real time.
□ Can calculate and display the maximum, minimum, average, standard deviation and coefficient of variation.

Using the WinCT software, the balance can do the following:

□ **Analyzing the weighing data and the statistics input by "RsKey"**
The weighing data can be input directly into an Excel worksheet. Then, Excel can analyze the data to obtain total, average, standard deviation, maximum and minimum values, and display them in a graph.

□ **Controlling the balance using commands from a personal computer**
By using "RsCom", the personal computer sends commands such as "re-zero" or "send weighing data" to the balance and controls the balance.

□ **Printing the balance GLP report using your printer**
The balance GLP report can be printed using a printer connected to the personal computer.

□ **Receiving weighing data at a certain interval**
The weighing data can be received at a certain interval and data characteristic with elapsed time can be obtained.

□ **Using the balance memory function**
The data can be stored in the balance's memory. Of the data stored, the weighing data and calibration data can be transmitted to a personal computer at one time.

□ **Using a personal computer as an external indicator**
With the "RsKey" test mode function, a personal computer can be used as an external weight indicator for the balance. (To do this, set the balance data output mode to stream mode.)

16.2.4. Connecting to a Computer Using the USB Interface

Features
□ The weighing data can be transmitted to a personal computer when connecting the balance and personal computer via the USB interface. The applicable operating system is Windows 7 or later, as of December 2018.
□ The USB interface uses standard device driver software and does not require installation of special driver software. By simply connecting, weighing data can be transmitted.
□ The data can be transmitted to most application software (ex.: EXCEL, WORD, Notepad).

Notes
□ **The balance can transmit the weighing data only without the header and unit.**
□ **The USB interface of the balance cannot receive the command that controls the balance. When using the command, connect to the RS-232C interface of the balance. When connecting the USB interface of a personal computer to the RS-232C interface of the balance, use the USB converter (AX-USB-9P).**
□ **Do not use the screensaver or suspend mode of a personal computer.**
□ **Even if stream mode is used, output will be performed approximately 2 times/second due to key input operation.**
□ **To add the ID number, data number, time and date to the weighing data or to output the GLP report, set the "Data output pause ($P \cup 5E$)" parameter of "Data output ($d \circ u E$)" to "$\circ n$" (Pause 1.6 seconds). The time and the date are separated by a dot when output.**
□ **When the "Data format ($E \cup PE$)" parameter is set to "5" (CSV format), the ID number, data number, time and date cannot be added to the weighing data.**

Using the USB interface
1   Start the Windows of the personal computer.
    Connect the AC adapter to the balance and press the ON:OFF key to turn the display on.
2   Connect the personal computer to the balance using the USB cable.
    Note   Do not use stream mode of data output mode ($d \circ u E: P \circ E \quad 3$).
3   At the first connection only, the USB driver software is automatically installed.
4   Open the application (ex.: EXCEL) that is to receive the weighing data.
    Move the cursor onto the position to input the weighing data.
5   Press the PRINT key to input the weighing data at the position of the cursor.
6   To finish the operation, remove the USB cable.

Examples
□ **Case 1: Transmitting the weighing data with key operation**
    Data output mode of the balance: Key mode (factory setting), $d \circ u E: P \circ E \quad 0$
    Press the PRINT key to transmit the weighing data. (basic use)

□ **Case 2: Transmitting the stable weighing data**
    Data output mode of the balance: Auto print mode A and B, $d \circ u E: P \circ E \quad 1$ or 2
    When a sample is placed and the stabilization indicator O is
    displayed, the weighing data is transmitted. This mode is useful
    when repeating the weighing.

□ **Case 3: Transmitting the weighing data periodically**
    Data output mode of the balance: Interval mode, $d \circ u E: P \circ E \quad 3, d R E R \quad 1$ and $\ln E$
    The weighing data is transmitted periodically.
    The interval time: 2, 5, 10, 30 seconds, 1, 2, 5, 10 minute(s).

16.3. Commands

16.3.1. Command List

Note **Before transmitting a command, add the terminator that is specified in the "Terminator ($CrLF$)" parameter of "Serial interface (SiF)" in the function table.**

Commands to query weighing data	
C	Cancels the S or SIR command.
Q	Requests the weighing data immediately.
S	Requests the weighing data when stabilized.
SI	Requests the weighing data immediately.
SIR	Requests the weighing data continuously.

Commands to control the balance			
CAL	Same as the CAL key.	Calibration using the internal mass.	
OFF	Turns the display off.		
ON	Turns the display on.		
P	Same as the ON:OFF key.	Turning the display on or off.	
PRT	Same as the PRINT key.		
R	Same as the RE-ZERO key.	Zero display.	#1
RNG	Same as the RANGE key.	Changing the readability.	
TR	Tares the balance.	Canceling the container's weight.	#1
TST	Performs calibration test.	Calibration test using the internal mass.	
U	Same as the MODE key.	Changing the unit.	

Commands to request data		
?ID	Requests the identification number.	
?PT	Outputs the tare value.	#1
?SN	Requests the serial number of the balance.	
?TN	Requests the model name of the balance.	

Command to set data		
PT:***.**** ␣␣ g	Sets the tare value.	#1

#1 □ Command R assumes the point as zero and sets the display to zero.

  □ Command TR cancels the tare weight when the displayed value is greater than zero.
    The canceled tare value can be read using the command ?PT.

  □ Command PT:***.**** ␣␣ g sets the tare value digitally.
    An example of this command sets a negative target value and fills with the sample until the display becomes zero. For details, refer to page 94.
    Step 1   Place a container.
    Step 2   Set the display to zero using the R command.
    Step 3   Set a target value using the PT: command.

16.3.2. Acknowledge Code and Error Codes

When the " AK, Error code (*ErCd*)" parameter of "Serial interface function (*SiF*)" is set to "*on*", the balance outputs <AK> code or error code to each command as follows:

<AK> (06h)   Acknowledge in ASCII code.

□ When the balance receives a command to request data and cannot process it, the balance transmits an error code (EC, Exx).
When the balance receives a command to request data and can process it, the balance outputs the data.

□ When the balance receives a command to control the balance and cannot process it, the balance transmits an error code (EC, Exx).
When the balance receives a command to control the balance and can process it, the balance transmits the acknowledge code.

<AK> (06h)   Acknowledge in ASCII code.

Among commands to control the balance, the following transmit the acknowledge code both when the balance receives the command and when the balance has accomplished the command. If the command cannot be processed properly, the balance transmits an error code (EC, Exx). This error can be resolved using the CAL command. xx is error code number.

CAL command   (Calibration command using internal mass)
ON command   (Display ON command)
P command   (Display ON/OFF command)
R command   (RE-ZERO command)
TR command   (Tare command)
TST command   (Calibration test command)

□ When a communication error has occurred due to external noise, or a parity error has occurred due to transmission error, the balance transmits an error code (EC, Exx). In this case, send the command again. xx is error code number.

16.3.3. Settings Related to RS-232C

Concerning the RS-232C, the balance has two functions: "Data output (*dout*)" and "Serial interface (*SiF*)". Set each function as necessary.

16.3.4. Command Examples

This example uses "$Er\mathcal{C}d$ on" of "$5\,iF$" so that the <AK> (06h) code is output.

ON command (turning the display on)

Computer	Time	Balance
ON command $\boxed{O}\,\boxed{N}\,\boxed{C_R}\,\boxed{L_F}$ →	⋮	Standby mode
←	⋮	$\boxed{A_K}\boxed{C_R}\boxed{L_F}$ — Command received
	⋮	$\boxed{\text{All segments}}$ — All segments are displayed
←	⋮	$\boxed{A_K}\boxed{C_R}\boxed{L_F}$ — Command completed
	↓	00000 g — Zero display
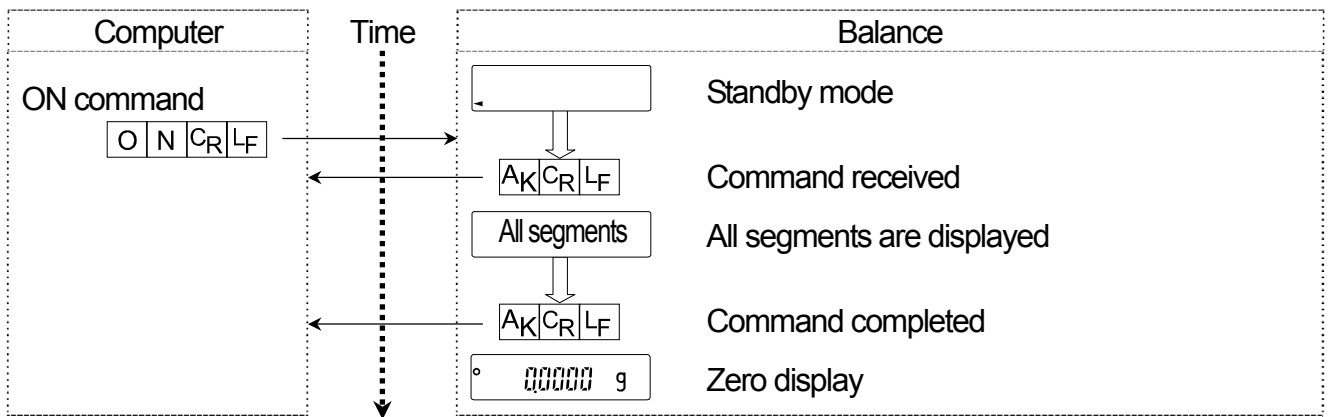
R command (Re-zeroing the display)

Computer	Time	Balance
R command $\boxed{R}\,\boxed{C_R}\,\boxed{L_F}$ →	⋮	12689 g — Weighing mode
←	⋮	$\boxed{A_K}\boxed{C_R}\boxed{L_F}$ — Command received
	⋮	. g — In process
←	⋮	$\boxed{A_K}\boxed{C_R}\boxed{L_F}$ — Command completed
	↓	00000 g — Zero display
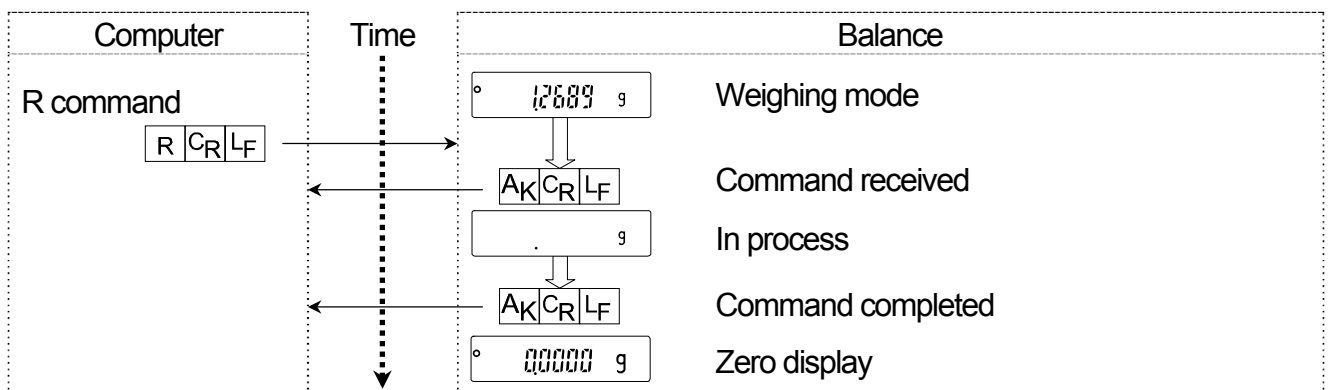
CAL command (Calibration with internal mass)

Computer	Time	Balance
CAL command $\boxed{C}\,\boxed{A}\,\boxed{L}\,\boxed{C_R}\,\boxed{L_F}$ →	⋮	00000 g — Zero display
←	⋮	$\boxed{A_K}\boxed{C_R}\boxed{L_F}$ — Command received
←	⋮	$\boxed{A_K}\boxed{C_R}\boxed{L_F}$ — Command completed
	↓	00000 g — Zero display
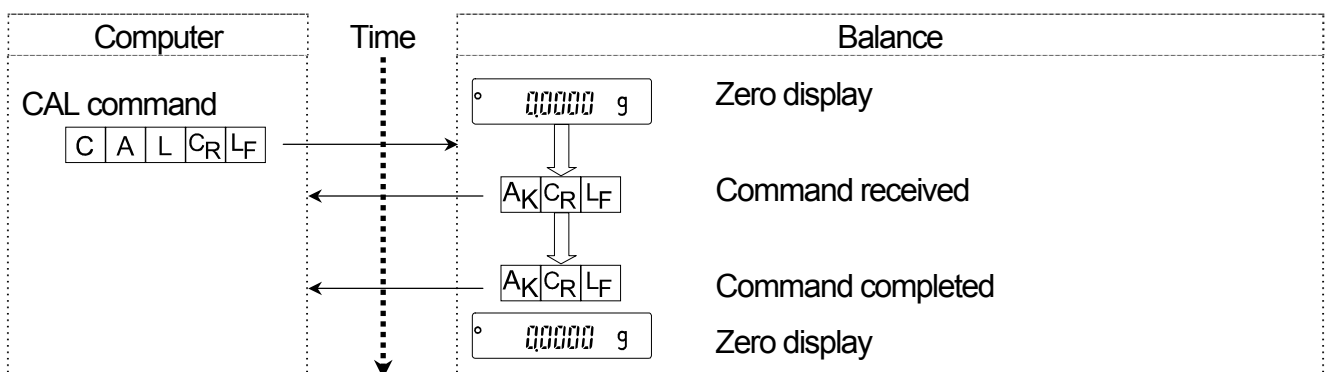
Error code

This example is of an error using the R command. "*ErCd on*" is used. The balance transmits an error code when the received command cannot be achieved.

Computer	Time	Balance	
R command `R` `C_R` `L_F`		`126970 g`	Weighing mode (unstable)
		`A_K` `C_R` `L_F`	Command received In process
		`. g`	When the R command cannot be achieved due to unstable weighing:
		`E C , E 1 1 C_R L_F`	
CAL command `C` `A` `L` `C_R` `L_F`		`Error 1`	Error code When the CAL command is received, the balance returns to the weighing mode.
		`A_K C_R L_F`	
		`126510 g`	Command completed. Weighing mode
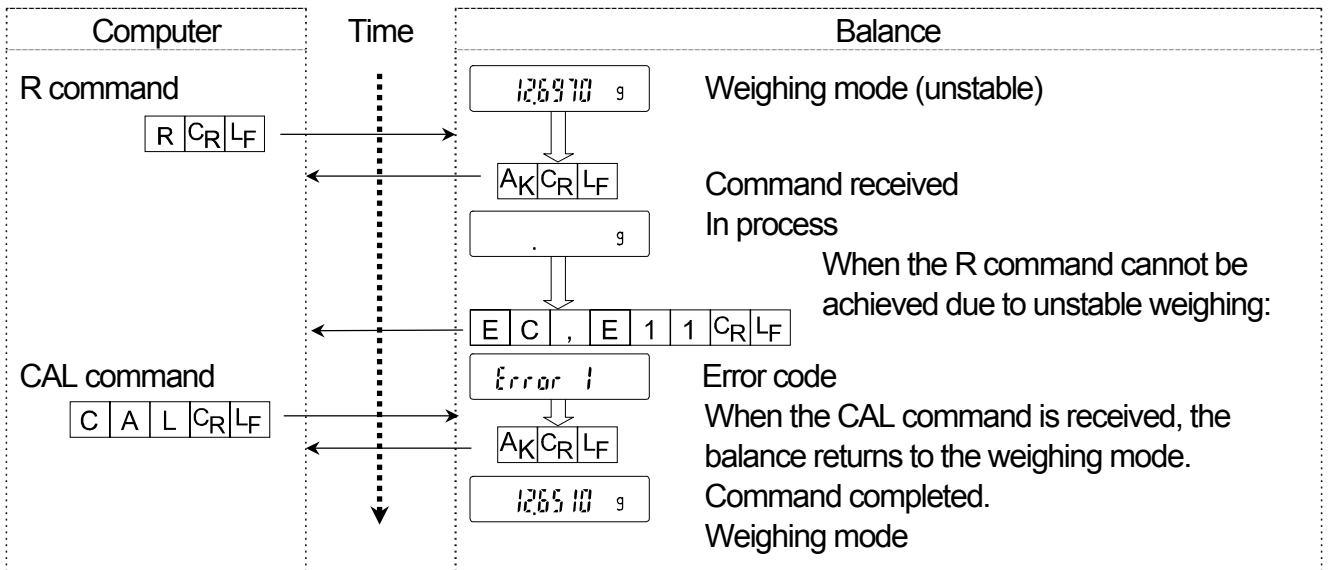
Weighing with a tare

This example uses "*ErCd on*" of "*SiF*" so that the <AK> (06h) code is output.

Computer	Time	Balance	
		(pan)	
R command `R` `C_R` `L_F`		`° 00003 g`	
		`A_K` `C_R` `L_F`	Sets the display to zero Command received
		`. g`	In process
		`A_K` `C_R` `L_F`	
		`° 00000 g`	Command completed Zero display
		(container)	Place a container
TR command `T` `R` `C_R` `L_F`		`° 123456 g`	
		`A_K` `C_R` `L_F`	Tares Command received
		`. g`	In process
		`A_K` `C_R` `L_F`	
		`° 00000 g`	Command completed Zero display
		(container with object)	
S command `S` `C_R` `L_F`		`° 100000 g`	
		`S T : + 0 1 0 . 0 0 0 0 ⊔ ⊔ g C_R L_F` (Net value)	
?PT command `?` `P` `T` `C_R` `L_F`		`P T , + 0 1 2 . 3 4 5 6 ⊔ ⊔ g C_R L_F` (Tare value)	

Setting a negative target value and filling with a sample until the display becomes zero

This example uses "ErCd on" of "SiF" so that the \<AK\> (06h) code is output.

Computer	Time	Balance
		Place a container
R command `R` `C_R` `L_F` →		`123456 g` Before command execution
← `A_K` `C_R` `L_F`		Command received
		`. g` In process
← `A_K` `C_R` `L_F`		Command completed
PT: command to set a target weight of 10 g `P` `T` `:` `0` `1` `0` `.` `0` `0` `0` `0` `␣` `␣` `g` `C_R` `L_F` →		`00000 g` Zero display
← `A_K` `C_R` `L_F`		Command received
		`-100000 g` Target weight display
		Fill with sample until the display becomes zero
		`-100000 g`
		`00000 g`
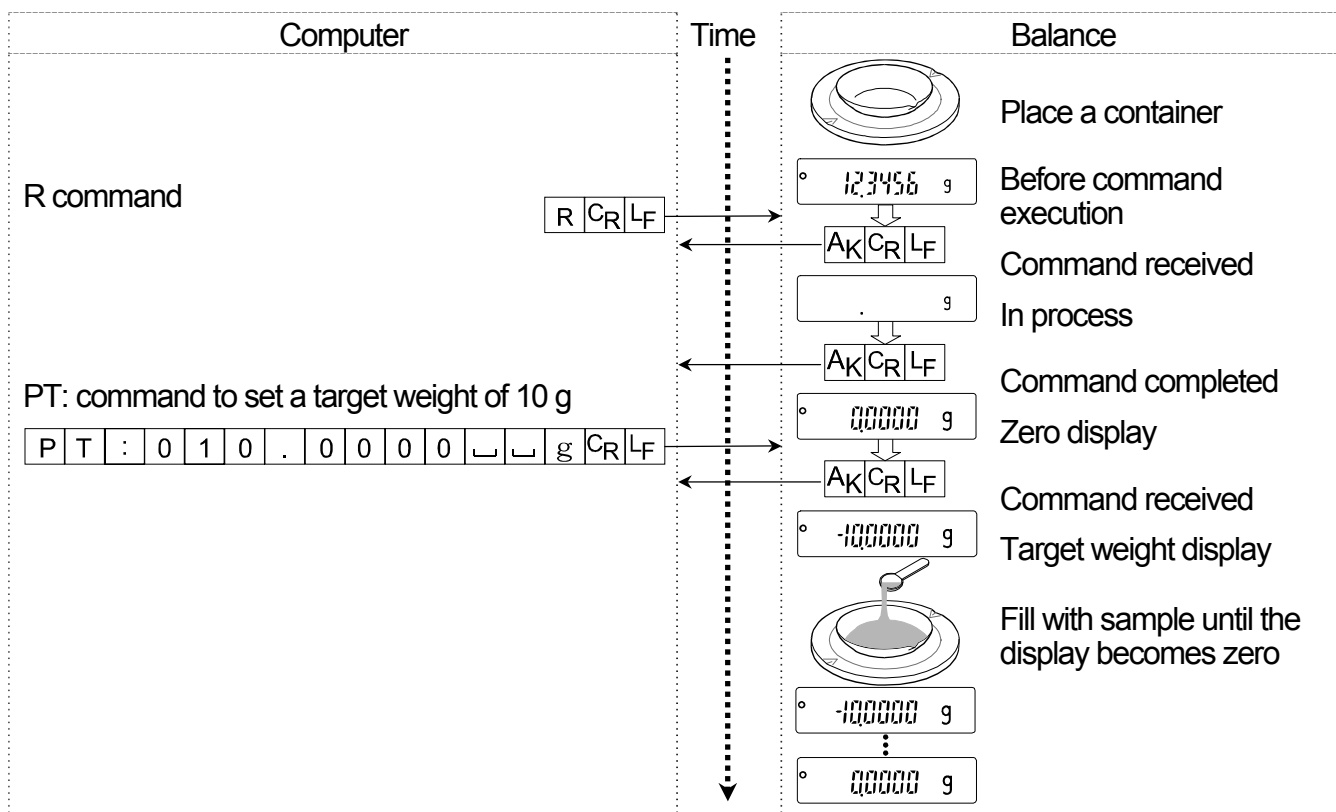
17. Key Lock Function

Sending specified commands to the balance will lock the keys on the balance to disable the key functions. This is useful for controlling the balance only by an external device such as a personal computer.

- □ Even if the keys are locked, key operations using commands are available. For details on commands to operate the keys, refer to **"16.3. Commands"**.
- □ The key lock state can be checked using the command to request the state of the balance keys.
- □ The key lock state is maintained until the balance receives the key unlocking command or the balance is turned off by removing the AC adapter.
- □ The key lock function (KL command and LK command) is available for balances with software version 1.660 or later.

17.1. Locking All the Keys

Using the KL command, all the keys on the balance can be disabled.

Command string	Description
`KL:***` (Enter `000` or `001` in place of `***`.)	`KL:000` Unlocks all the keys. `KL:001` Locks all the keys
`?KL`	Requests the state of the all key lock function. `KL,000` All keys unlocked. `KL,001` All keys locked.

17.2. Locking the Specified Keys

Entering numerical values ***** to the LK command will lock specified keys on the balance to disable their key functions. Set the numerical values ***** by adding the decimal numbers converted from bits assigned to each key as shown below.

Bits	Decimal	Keys
0	1	ON:OFF
1	2	CAL
2	4	MODE
3	8	RANGE
4	16	PRINT
5	32	RE-ZERO
6	64	SELECT
7	128	ION

Example 1: Locking all the keys excluding the PRINT key

1. Add the decimal numbers corresponding to the keys to be locked.
   1 (ON:OFF) + 2 (CAL) + 4 (MODE)+ 8 (RANGE) + 32 (RE-ZERO) + 64 (SELECT) +128 (ION) = 239

2. Send the LK command to the balance with the sum that is obtained in Step 1. LK:00239

Example 2: Unlocking all the keys

1. Send the LK command to the balance with 0, which indicates no keys to be locked. LK:00000

Command string	Description
LK:***** (Enter the numerical values 00000 to 00255 in place of *****.)	Locks the specified keys. e.g.: LK:00239　　Locks all the keys excluding the PRINT key.
?LK	Requests the state of the specified key lock function. e.g.1: LK,00239　　Specified keys locked. e.g. 2: LK,00000　　All keys unlocked.

18. Checking the Balance Software Version

The balance specifications vary depending on the balance software version. Follow the steps below to check the balance software version.

1. Unplug the AC adapter from the balance and plug it back in.

2. $P-$ *.*** is displayed with the software version in place of *.***.

$P-$ 1.663

BM series
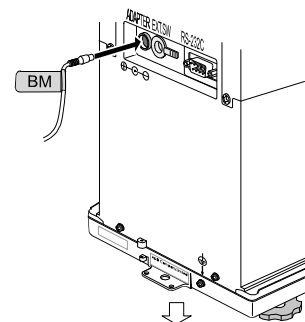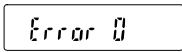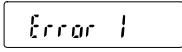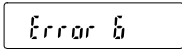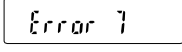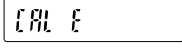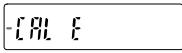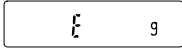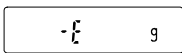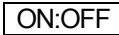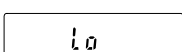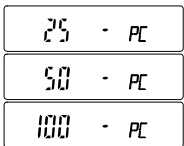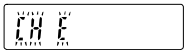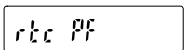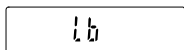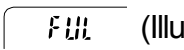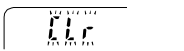
19. Maintenance

19.1. Cleaning and Handling the Balance

□ Clean the balance with a lint free cloth that is moistened with warm water and a mild detergent.
□ Do not use organic solvents to clean the balance.
□ Do not disassemble the balance. Contact the local A&D dealer if the balance needs service or repair.
□ Use the original packing material for transportation.
□ Consider "**3. Installing the Balance and Precautions**" when handling the balance.

19.2. Error Codes

Display	Error code	Description
Error 0	EC,E00	**Internal error** If this error is displayed continuously, contact your local A&D dealer to repair the balance.
Error 1	EC,E11	**Stability error** The balance cannot stabilize due to an environmental problem. Check around the pan. Prevent vibration, drafts, temperature changes, static electricity and magnetic fields, from influencing the balance. Press the ⌐CAL⌐ key to return to the weighing mode.
Error 6	EC,E16	**Internal mass error** Applying the internal mass does not yield a change in the mass value as specified. Confirm that there is nothing on the pan and perform the weighing operation from the beginning again.
Error 7	EC,E17	**Internal mass error** The internal mass application mechanism does not function properly. Perform the weighing operation from the beginning again.
CAL E	EC,E20	**Calibration weight error** The calibration weight is too heavy. Confirm the calibration weight value. Press the ⌐CAL⌐ key to return to the weighing mode.
-CAL E	EC,E21	**Calibration weight error** The calibration weight is too light. Confirm the calibration weight value. Press the ⌐CAL⌐ key to return to the weighing mode.
E g		**Overload error** A sample beyond the balance weighing capacity has been placed on the pan. Remove the sample from the pan.
-E g		**Weighing pan error** The mass value is too light. Confirm that the weighing pan and pan support are properly installed. Press the ⌐ON:OFF⌐ key two times to return to the weighing mode. If the error still persists, calibrate the balance.
Lo		**Sample mass error** The balance cannot store the sample for the counting mode or for the percent mode because it is too light. Use a larger sample.

Display	Error code	Description

`25 · PC`
`50 · PC`
`100 · PC`
		Unit mass error
		The sample unit mass for the counting mode is too light. Storing and using it for counting will cause a counting error.
		Add samples to reach the specified number and press the PRINT key. Pressing the PRINT key without adding samples will shift the balance to the counting mode. But, for accurate counting, be sure to add samples.

`CH E`		**Automatic response adjustment zero error** The automatic response adjustment cannot be performed because there is something on the pan. Clear the pan. Press the CAL key to return to the weighing mode.
`CH nG` (Check NG)		**Automatic response adjustment unstable error** The automatic response adjustment cannot be performed because the mass value is unstable. Check the ambient conditions such as breeze, vibration and magnetic fields, also check the weighing pan. Press the CAL key to return to the weighing mode.
`rtc PF`		**Clock battery error** The clock backup battery has been depleted. Press any key and set the time and date. The clock and calendar function works normally as long as the AC adapter is connected to the balance. If this error appears frequently, contact the local A&D dealer.
`Lb`		**Low battery error** Voltage of the power supply drops. Confirm whether the correct AC adapter is used.
`FUL` (Blinking)		**Memory full** The amount of weighing data in memory has reached the maximum capacity. Delete data in memory to store new data. For details, refer to "**12. Data Memory**".
`FUL` (Illuminated)		**Memory full** The amount of calibration or calibration test data in memory has reached the maximum capacity (50 sets). The data in memory will be deleted automatically to store new data. For details, refer to "**12. Data Memory**".
`CLr`		**Memory type error** Type of memory set in the function table and type of data stored are different. For details, refer to "**12. Data Memory**".
`Err`		**Memory data error** A fatal error occurs in the stored data. To use the memory function, delete all the old data and resolve the error. For details, refer to "**12.1. Notes on Using Data Memory**".
	EC,E00	**Communications error** A protocol error occurred in communications. Confirm the format, baud rate and parity.
	EC,E01	**Undefined command error** An undefined command was received. Confirm the command.

Display	Error code	Description
	EC,E02	**Not ready** A received command cannot be processed. Examples: □ The balance received a "Q" command, but not in the weighing mode. □ The balance received a "Q" command while processing a RE-ZERO command. Adjust the delay time to transmit a command.
	EC,E03	**Timeout error** When the timeout parameter is set to "*t-UP on*", the balance did not receive the next character of a command within the time limit of one second. Confirm the communication.
	EC,E04	**Excess characters error** The balance received excessive characters in a command. Confirm the command.
	EC,E06	**Format error** A command includes incorrect data. Example: □ The data is numerically incorrect. Confirm the command.
	EC,E07	**Parameter setting error** The received data exceeds the range that the balance can accept. Confirm the parameter range of the command.
Other error code		If an error described above cannot be resolved or other errors are displayed, contact the local A&D dealer.

19.3. Other Display
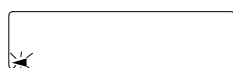
When this indicator blinks, automatic self calibration is required. The indicator blinks when the balance detects changes in ambient temperature. If the balance is not used for several minutes with this indicator blinking, the balance performs automatic self calibration. The blinking duration depends on the operating environment.

Note   The balance can be used while this indicator is blinking. We recommend that you perform automatic self calibration for precision weighing.
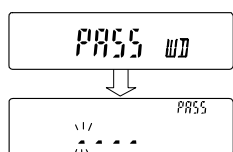
This is the display to prompt you to enter a password. When the password function is used, the correct password must be entered for the balance to enter the weighing mode.

For details, refer to "**15. Password Function**".

19.4. Checking the Balance Performance and Environment

The balance is a precision instrument. When the operating environment or the operating method is inadequate, correct weighing cannot be performed. Place a sample on the pan and remove it, and repeat this several times. If the balance seems to have a problem with repeatability or to perform improperly, check as described below. If improper performance persists after checking, contact the local A&D dealer for repair.

Checking that the operating environment or weighing method is proper
Operating environment
□ Is the weighing table solid enough?
□ Is the balance level?
□ Is the operating environment free from vibration and drafts?
□ Is there a strong electrical or magnetic noise source such as a motor near the balance?

Weighing method
□ Does the weighing pan edge touch anything? Is the weighing pan assembly installed correctly?
□ Is the ⬚RE-ZERO key pressed before placing a sample on the weighing pan?
□ Is the sample placed in the center of the weighing pan?
□ Is the fine range ring installed for weighing with a readability of 0.01 mg for the **BM-252**?
□ Is the fine range ring and small fine range ring installed for weighing with a readability of 0.001 mg for the **BM-5**, **BM-5D**, **BM-20** and **BM-22**?
  Is the slide breeze break installed for weighing with a readability of 0.001 mg for the **BM-20** and **BM-22**?
□ Has the balance been calibrated using the internal mass?
□ Has the balance been warmed up for one hour before weighing?

Sample and container
□ Has the sample absorbed or lost moisture due to the ambient conditions such as temperature and humidity?
□ Has the temperature of the container been allowed to equalize to the ambient temperature?
□ Is the sample charged with static electricity? Is the built-in ionizer (page 31) used to discharge the sample charged with static electricity.
□ Is the sample a magnetic material such as iron? Cautions are required when weighing magnetic materials.

Checking that the balance performs properly
□ Check the balance repeatability using an external weight. Be sure to place the weight in the center of the weighing pan.
□ Check the balance repeatability, linearity and calibrated value using an external weight with a known value.
□ Check whether the calibration is performed correctly. If an error occurs and the calibration cannot be performed quickly, the balance may not measure correctly.

19.5. Asking for Repair

If the balance needs service or repair, contact your local A&D dealer.
The balance is a precision instrument. Use much care when handling the balance and observe the following when transporting the balance.
□ Use the original packing material for transportation.
□ Remove the weighing pan, pan support, rings and dust plate from the balance.

20. Specifications

	BM-5	BM-5D	BM-20	BM-22
Weighing capacity	5.2 g	5.2 g	22 g	22 g
		2.1 g		5.1 g
Maximum display	5.200084 g	5.20008 g	22.000084 g	22.00008 g
		*1 2.100009 g		*1 5.100009 g
Readability	0.001 mg	0.01 mg	0.001 mg	0.01 mg
		0.001 mg		0.001 mg
Repeatability (Standard deviation)	*2 0.0012 mg	0.01 mg	*2 0.0025 mg	0.01 mg
		*2 0.004 mg		*2 0.004 mg
Linearity	±0.010 mg	±0.02 mg	±0.010 mg	±0.02 mg
		±0.010 mg		±0.010 mg
Stabilization time (Typical at FAST)	Approx. 10 seconds	Approx. 8 seconds	Approx. 10 seconds	Approx. 8 seconds
		Approx. 10 seconds		Approx. 10 seconds
Sensitivity drift	±2 ppm/°C (10 °C to 30 °C, Automatic self calibration: OFF)			
Operating environment	5 °C to 40 °C, 85 % RH or less (No condensation)			
Display refresh rate	5 times/second or 10 times/second			
Environmental sensors	Resolution: Temperature ±1.5 °C, Humidity ±10 %, Barometric pressure ±10 hPa Applicable range: 5 °C to 40 °C			
Counting mode — Minimum unit mass	0.1 mg			
Counting mode — Number of samples	10, 25, 50 or 100 pieces			
Percent mode — Minimum 100% reference mass	10 mg			
Percent mode — Readability	0.01 %, 0.1 %, 1 % (Depends on the reference mass stored.)			
Interface	USB and RS-232C			
External calibration weight	5 g 2 g 1 g	5 g 2 g 1 g	20 g 10 g 5 g 2 g 1 g	20 g 10 g 5 g 2 g 1 g
Size of loading area for weighing mm	Weighing pan: φ25 Filter weighing: φ50, φ95 Micro tube holder: φ12			
External dimensions	259(W) x 466(D) x 326(H) mm			
Power supply & AC adapter type	Power consumption: Approx. 30 VA (supplied to the AC adapter) Confirm that the adapter type is correct for the local voltage and power receptacle type.			
Mass	Approx. 10 kg			

□   The operating environment with no excessive changes in ambient temperature and humidity, no vibration and drafts, no influence by magnetic fields and static electricity.

□   The internal mass may change due to corrosion or other damage caused by the operating environment, or due to aging. Check the internal mass periodically and correct the internal mass value if necessary.

*1: Even when a tare weight beyond the precision range is placed, the weighing sample can be weighed in the precision range if using the smart range.

*2: Repeatability using a 1 gram weight within the weighing capacity.

	BM-252	BM-200	BM-300	BM-500
Weighing capacity	250 g	220 g	320 g	520 g
Maximum display	250.00084 g	220.0084 g	320.0084 g	520.0084 g
Readability	0.01 mg	0.0 mg		
Repeatability (Standard deviation)	*3 0.03 mg	0.1 mg	0.2 mg	
Linearity	±0.10 mg	±0.2 mg	±0.3 mg	±0.5 mg
Stabilization time (Typical at FAST)	Approx. 8 seconds	Approx. 3.5 seconds		
Sensitivity drift	±2 ppm/°C (10 °C to 30 °C, Automatic self calibration: OFF)			
Operating environment	5 °C to 40 °C, 85 % RH or less (No condensation)			
Display refresh rate	5 times/second or 10 times/second			
Environmental sensors	Resolution: Temperature ±1.5 °C, Humidity ±10 %, Barometric pressure ±10 hPa Applicable range: 5 °C to 40 °C			
Counting mode — Minimum unit mass	0.1 mg			
Counting mode — Number of samples	10, 25, 50 or 100 pieces			
Percent mode — Minimum 100% reference mass	10 mg			
Percent mode — Readability	0.01 %, 0.1 %, 1 % (Depends on the reference mass stored.)			
Interface	USB and RS-232C			
External calibration weight	200 g 100 g 50 g 20 g 10 g	200 g 100 g 50 g	300 g 200 g 100 g 50 g	500 g 300 g 200 g 100 g 50 g
Size of loading area for weighing mm	Weighing pan: φ90 Micro tube holder: φ12 (Option)			
External dimensions	259(W) x 466(D) x 326(H) mm			
Power supply & AC adapter type	Power consumption: Approx. 30 VA (supplied to the AC adapter) Confirm that the adapter type is correct for the local voltage and power receptacle type.			
Mass	Approx. 10 kg			

□   The operating environment with no excessive changes in ambient temperature and humidity, no vibration and drafts, no influence by magnetic fields and static electricity.

□   The internal mass may change due to corrosion or other damage caused by the operating environment, or due to aging. Check the internal mass periodically and correct the internal mass value if necessary.

3: Repeatability using a 100 gram weight within the weighing capacity.

20.1. External Dimensions
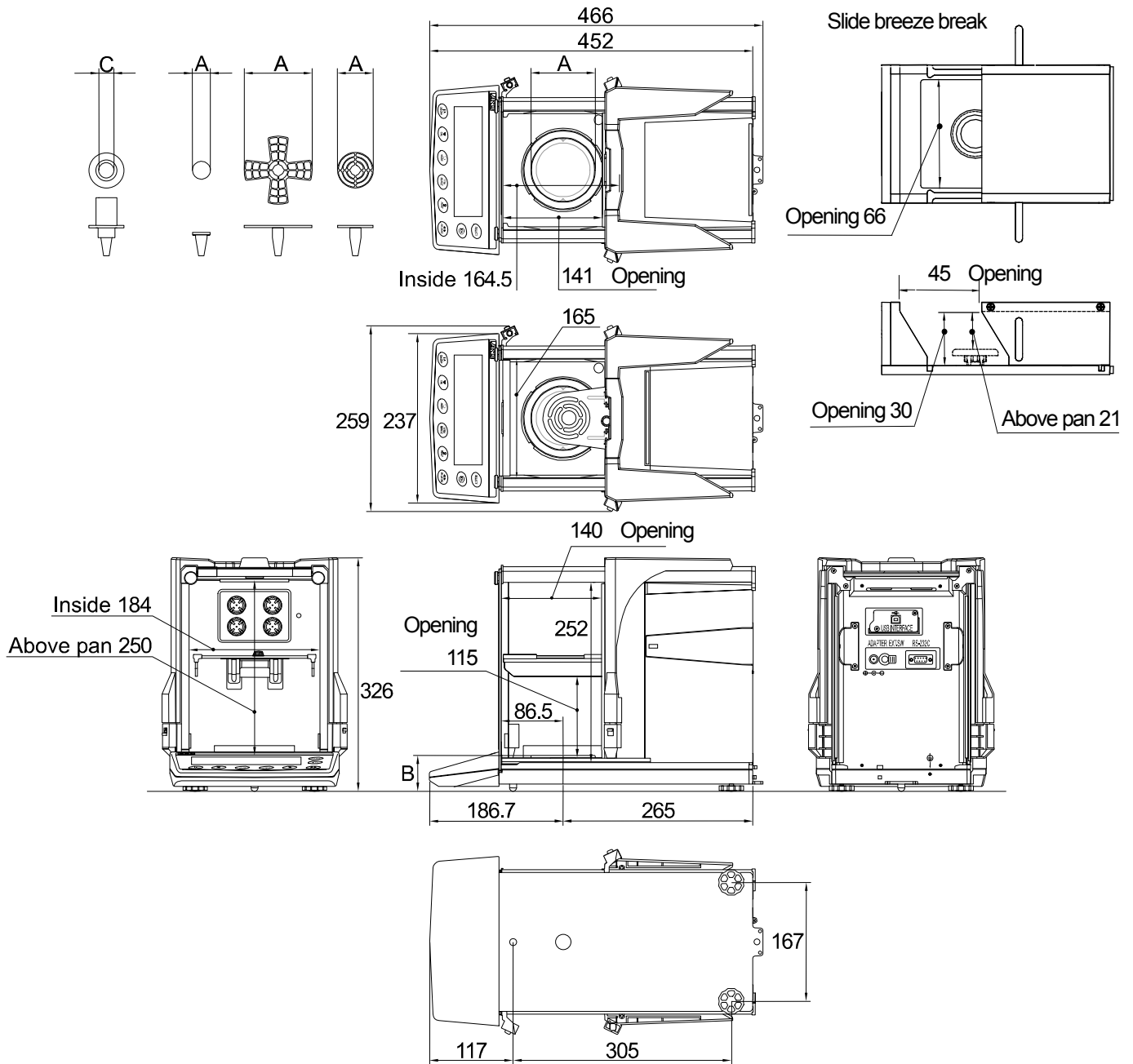
Unit: mm

	BM-5, BM-5D BM-20, BM-22	BM-252, BM-200 BM-300, BM-500
A: Diameter of the weighing pan	Weighing pan: φ25 Weighing pan for filter: φ50, φ95	Weighing pan: φ90
B: Height of the weighing pan	54	50
C: The inside diameter of the test tube holder	φ12	φ12 (Option)

20.2. Options and Peripheral Equipment

Ethernet Interface   BM-08
□ The interface to connect the balance to a LAN.
□ Accessory: "WinCT-Plus" data communication software.
  ■ The software can acquire data from multiple balances connected to a LAN.
  ■ The software can control these balances with commands.
  ■ The software can acquire data transmitted from balances. Example: When pressing the PRINT key of the balance, data is output and is acquired by the computer.
  ■ The stored data can be used with Microsoft EXCEL (if installed).

Pipette Accuracy Tester   BM-014
Note   This option cannot be used for the BM-5 and BM-5D.
□ This option can be used to inspect the volume dispensed from the pipette.
□ The accessory evaporation trap is used to prevent the evaporation of the test liquid inside it.
□ The WinCT-Pipette software converts the test liquid mass into a volumetric value.

5 mL, 30 mL
Sample cup
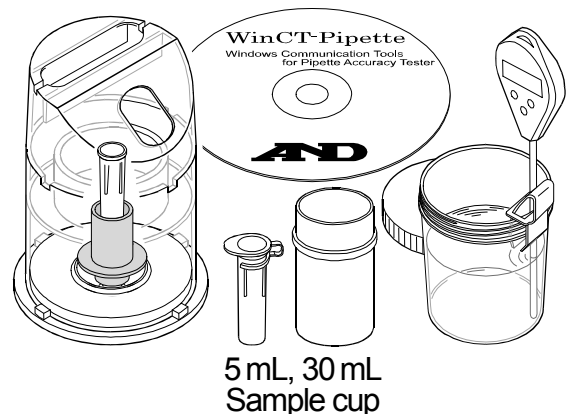
Electrode Unit of the Ionizer   AX-BM-NEEDLESET   (4 pieces)
□ Use these electrode units for replacement parts of the ionizer built into the balance.
□ Replace all four units with new ones at the same time.
□ Refer to "**6.5. Ionizer**" for the replacement.
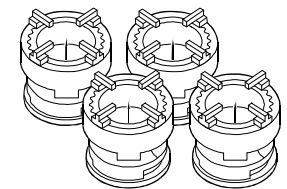
Display Cover   AX-BM-031   (5 pieces)
□ This option is the same as the accessory display cover.
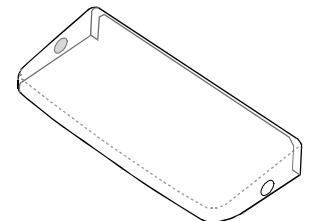
Micro Tube Holder   AX-BM-032 (for the BM-5/5D/20/22, standard accessory)
                        AX-BM-034 (for the BM-252/200/300/500)
□ This option is used when weighing with the general micro tube or test tube under Φ 12 mm.

**Note   When using the micro tube holder for the BM-5 and BM-5D:
The micro tube holder is approximately 2 g heavier than the standard pan (weighing pan and pan support). When a micro tube holder is used for the BM-5 and BM-5D, the available weighing range will be up to approximately 3 g including the tare such as a micro tube and test tube.**

Micro tube holder   Micro tube   Test tube
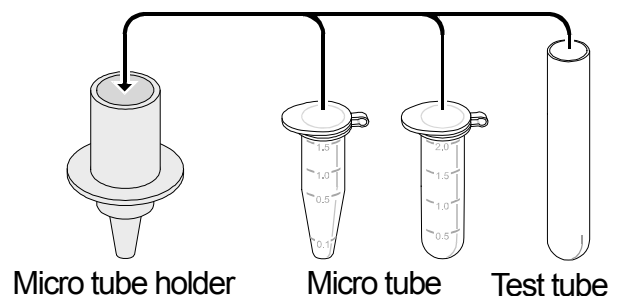
Body Cover   AX-BM-033

□ Cover during storage to prevent dust and dirt contamination.
□ The cover can be used for the balance with the AC adapter and other cables connected.
□ When removing the cover, take care so as not to get its edge caught on the balance.
□ Specification
  ∎ Material: Nylon
  ∎ Color   : Light gray

Body cover
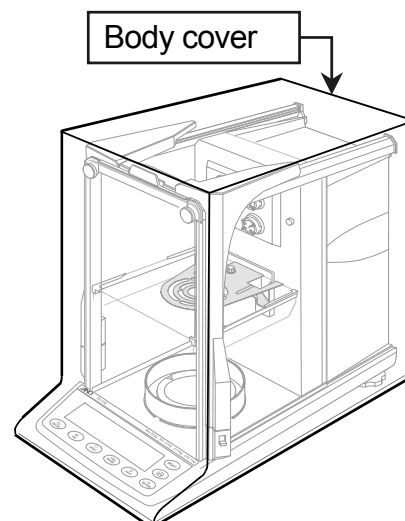
Slide Breeze Break   AX-BM-035 (for the BM-5/5D/20/22, standard accessory)

□ This option is attached to the weighing chamber to reduce the effects of the surrounding environment so as to improve weighing accuracy.
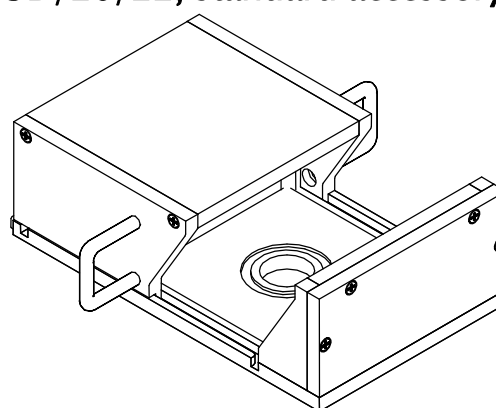
Aluminum Pans

□ This option is the same as the accessory aluminum pans used for weighing a very small amount of sample.

Name and description				Order code	View
Round aluminum analytical pan (L)	φ15	0.8 mL	100 pieces	AX-ROUND-PAN-L	
Round aluminum analytical pan (M)	φ12	0.3 mL	100 pieces	AX-ROUND-PAN-M	
Round aluminum analytical pan (S)	φ8	0.05 mL	100 pieces	AX-ROUND-PAN-S	

AD-1653 Density Determination Kit

Note   This option cannot be used for the BM-5, BM-5D, BM-20 and BM-22.

$$\frac{\text{Weight in air}}{\text{Weight in air - Weight in liquid}} \times \text{liquid density} = \text{sample density}$$

Example $\dfrac{10.0000 \text{ g}}{10.0000 \text{ g} - 9.5334 \text{ g}} \times 0.9970 \text{ g/cm}^3 = 21.4 \text{ g/cm}^3$

Temperature	Liquid density
0 ℃	0.99984 g/cm³
10 ℃	0.99970 g/cm³
20 ℃	0.99820 g/cm³
30 ℃	0.99565 g/cm³
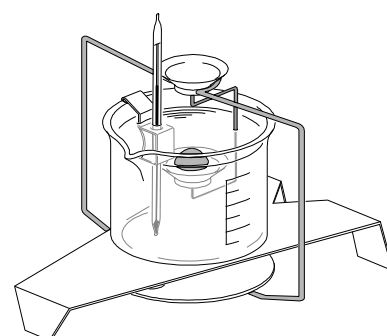
Option

AD-8127: Multi printer
- Small dot impact printer that connects to the balance via the RS-232C interface.
- Statistical calculation mode, calendar/clock function, interval printing mode, chart printing mode, dump printing mode

AD-1691: Balance environment analyzer
- During the routine inspection, repeatability and the minimum weighing value can be easily checked.
- Also, this calculates measurement uncertainty and supports environmental evaluation of the balance.
- This analyzer can be easily carried to the balance site, so more than one balance can be controlled using this analyzer.

AD-1687: Weighing environment logger
- A data logger equipped with 4 sensors for temperature, humidity, barometric pressure and vibration that can measure and store environmental data. When connected to the RS-232C interface of the balance, the AD-1687 can store environmental data along with weighing data. Therefore, it is possible to store data in an environment where a computer cannot be used.
- The stored data can be read to a personal computer using USB. As the AD-1687 is recognized as USB memory, special software is not required to read the data.

AD-1688: Data logger
- When connected to the RS-232C interface of the balance, the AD-1688 can store the data in an environment where a personal computer cannot be used.

AD-8526: Ethernet converter
- This option can be used to connect the RS-232C interface of the balance to the Ethernet (LAN) port of a computer. This allows management of the balance weighing data with a computer connected to a network.

AD-8527: Quick USB adapter
- This option transmits the weighing data directly to software applications such as Excel and Word.

AD-8920A: Remote display
- Connected to the balance using the RS-232C interface.

AD-8922A: Remote controller
- This option can be connected to the balance using the RS-232C interface and can control the balance remotely. Various options such as comparator output or analog output are available.

AX-USB-9: USB converter
- Adds a COM port to a personal computer.
- Enables bi-directional communication between the personal computer and the balance when a USB driver is installed.
- Can use serial communication software such as WinCT on a personal computer without COM ports.
- An RS-232C cable is provided to connect the USB converter to the balance.

AD-1671: Anti-vibration table
- Approximately 27 kg, Artificial stone (Terrazzo).
- Use this table when unstable weighing is caused by vibration coming from the floor.
- Use the AD-8922A remote controller to avoid a weighing error by a slight table tilt that key operation may make.

AD-1672/AD-1672A Tabletop breeze break (Large)
- Large sized table breeze break
- Protects the balance from wind from sources such as air conditioning or people passing by, thereby reducing balance weighing errors.
- The transparent panel assembly consists of antistatic plastic material that protects the balance from static electricity.
- Samples can be inserted or removed through the opening on the front.
- AD-1672: 680（W）x 600（D）x 720（H）mm, AD-1672A: 680（W）x 584（D）x 720（H）mm

AD-1676: Tabletop breeze break (Medium)

- A tabletop breeze break of a size best suited for the BM series balances.
- Protects the balance from wind from sources such as air conditioning or people passing by, thereby reducing balance weighing errors.
- The transparent panel assembly consists of antistatic plastic material that protects the balance from static electricity.
- Sliding panels on the right and left side enable samples to be inserted or removed from each side.
- 368(W) x 514(D) x 350(H) mm (Including the handle)

AD-1682: Rechargeable Battery

- This option allows use of the balance in a place where AC power is not available.

AD-1683: DC static eliminator

- This static eliminator eliminates static electricity to prevent weighing errors caused by static electricity during measurement.
- This direct current and windless type of eliminator is the most suitable for precisely weighing powder, etc.
- Small size, light weight

AD-1684A: Electrostatic field meter

- This option measures the amount of the static charge on the sample, tare or peripheral equipment and displays the result.
- If those are found to be charged, discharge them using the AD-1683 DC static eliminator.

AD-1689: Tweezers for calibration weight

- A pair of tweezers ideally suited for holding calibration weights of 1 g to 500 g.

AD-8529PC-W: Bluetooth converter (for connecting a personal computer)*

- This option connects a personal computer to the balance wirelessly (via Bluetooth$^{®}$) up to 10 m.
- Driver installation is required.

AD-8529PR-W: Bluetooth converter (for connecting a printer)*

- This option connects a printer to the balance wirelessly (via Bluetooth$^{®}$) up to 10 m.
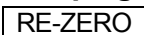
*Note on the AD-8529PC-W and AD-8529PR-W

The two products may require certification for compliance with local laws pertaining to radio broadcast and equipment for wireless communication. Please refer to the A&D website for countries where the products are already certified for use.

AX-SW137-PRINT: Foot switch print function with a plug

- The foot switch has the same function as the PRINT key.

AX-SW137-REZERO: Foot switch rezero function with a plug

- The foot switch has the same function as the RE-ZERO key.

AX-HOLDER-SET: Sample cup holder
Note This option cannot be used for the BM-5, BM-5D, BM-20 and BM-22.

- A set of holders to secure a sample cup such as a test tube, centrifuge tube or micro tube.
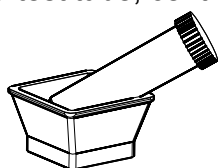
Large   Medium Small

Centrifuge tube secured slantingly
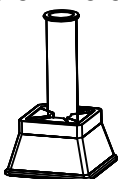
Sample cup holder used as test tube stand
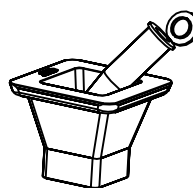
Sample cup holder used as holder for micro tube

21. Terms/Index

21.1. Terms

Calibration	Adjustment of the balance so that it can weigh accurately.
Calibration weight	A weight used for calibration.
Data number	Numbers assigned sequentially when weighing data or unit weight is stored.
Digit	The minimum weighing value available. Used for the balance, one digit is the smallest mass that can be displayed.
Environment	Ambient conditions such as vibration, drafts, temperature, static electricity and magnetic fields which affect the weighing operation.
External weight	A weight that you have.
GLP	Good Laboratory Practice.
GMP	Good Manufacturing Practice.
Internal mass	Built-in calibration weight.
ISO	International Organization for Standardization.
Micro tube	2 mL and 1.5 mL micro tubes in the market can be weighed with the micro tube holder.

1.5 mL   2 mL
Micro tube

Micro tube holder

Repeatability	Variation in measured values obtained when the same mass is placed and removed repetitively. Usually expressed as a standard deviation.
Example:	"Standard deviation = 1 digit " means that a weighing error may occur within ±1 digit in the frequency of approx. 68% when weighing the same mass repeatedly.
Re-zero	To set the display to zero.
Sensitivity drift	An affect that a change in temperature causes to the weighing data. Expressed as a temperature coefficient.
Example:	Temperature coefficient = 2 ppm/°C, If a load is 10 g and the temperature changes by 10°C, the value displayed changes by the following value. $0.000\,002$ ppm/°C x 10 °C x 10 g = 0.0002 g
Stabilization time	Time required after a sample being placed, until the stabilization indicator illuminates and the weighing data is displayed.
Tare	To cancel the mass value of a container which is not to be included in the weighing data. Normally, refers to an operation of placing a container and setting the display to zero.
Target weight	An external weight used for calibration test.
Zero point	A weighing reference point. Usually refers to the value displayed when nothing is on the weighing pan.

21.2. Index

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