GH SERIES

Analytical Balance

INSTRUCTION MANUAL

GH-120

GH-200

GH-300

GH-202

GH-252

A&D Company, Limited

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

Windows, Word and Excel are registered trademarks of the Microsoft Corporation.

Contents

1. Introduction

This manual describes how the balances of GH series 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.

1-1. Features

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

- ☐ Response adjustment adapting to drafts and/or vibration automatically.

- ☐ Memory function to store weighing data and calibration data.
  When weighing data is stored only, 200 data can be stored in maximum.
  Interval memory 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.

- ☐ Underhook, for measuring density and weighing magnetic materials.

- ☐ Multiple weighing units with most of the common units used around the world.

- ☐ Density mode for calculating the density of a solid.

- ☐ Standard RS-232C serial interface to communicate with a computer.
  Windows communication tools software (WinCT) to allow easy communication with a computer using Windows. The current version of the WinCT can be downloaded from the A&D website.

- ☐ When multiple balances have the GH-08 Ethernet interface installed and are connected to a LAN, data can be acquired from them using the WinCT-Plus software.

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.)

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.

Weighing chamber

Weighing pan

Pan support

Breeze break ring

Dust plate

Floor plate

Leveling foot

Bubble spirit level

Tweezers (AD-1689)

This tweezer is for handling a weight.
Use it to avoid temperature changes due to
having your hand in the weighing chamber,
thus to perform accurate calibration.

Fine range breeze break ring

This ring is an accessory for the
GH-252 and GH-202. Before
weighing with a readability of 0.01
mg, install this ring in place of the
"breeze break ring" to avoid errors
caused by drafts.

Dust plate for
GH-252 and GH-202

Keys

Display

Display cover

AC adapter jack

External Key Jack

Serial interface
(RS-232C, D-sub 9 pins)

Serial number
(side)

Position of placing
AC adapter labels

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

GH   GH
GH   GH

AC adapter labels

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

Terminal cover

AC adapter
**Note:Please confirm that the AC adapter
type is correct for your local
voltage and receptacle type.**

Grounding terminal

Leveling foot

2-1.   Installing the Balance

Install the balance as follows:

1. Consider the section "3. Precautions" for installing your balance. Place the balance on a firm weighing table.

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

GH-300, GH-200, GH-120   GH-202, GH-252

Weighing pan

Pan support

Breeze break ring

Dust plate

Sectional view

Fine range ring

Dust plate for GH-252/202

Fine range ring

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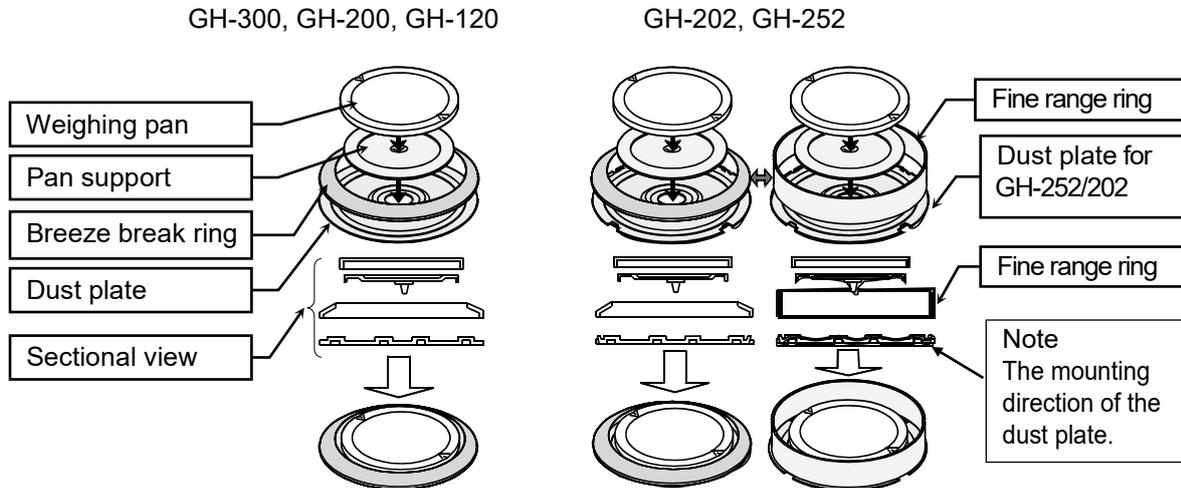
Use the fine range ring in place of the breeze break ring to avoid errors caused by drafts when weighing with a readability of 0.01 mg.

3. Refer to "2. Unpacking the Balance" on the previous page to assemble the dust plate and breeze break ring, or fine range ring, pan support and weighing pan in the weighing chamber.

4. Adjust the level of the balance using the leveling feet. Ground the balance chassis for discharging static electricity if you have a static problem.

5. Please confirm that the adapter type is correct for your local voltage and power receptacle type.

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

7. Calibrate the balance before use. Refer to "8. Calibration".

Leveling feet

OK   NG

Connect the AC adapter
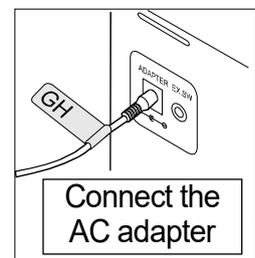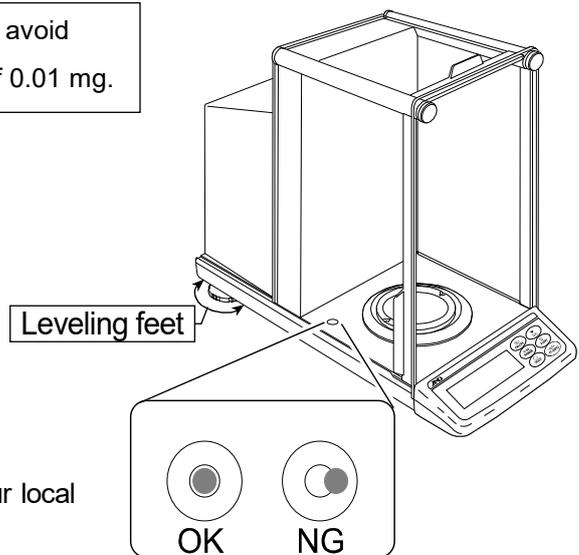
Note

□ 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.

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
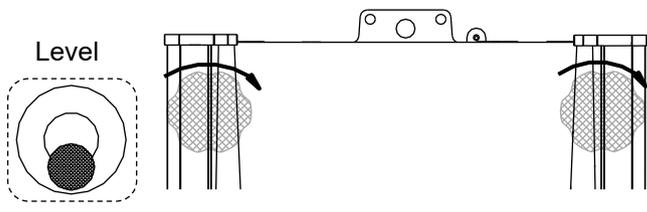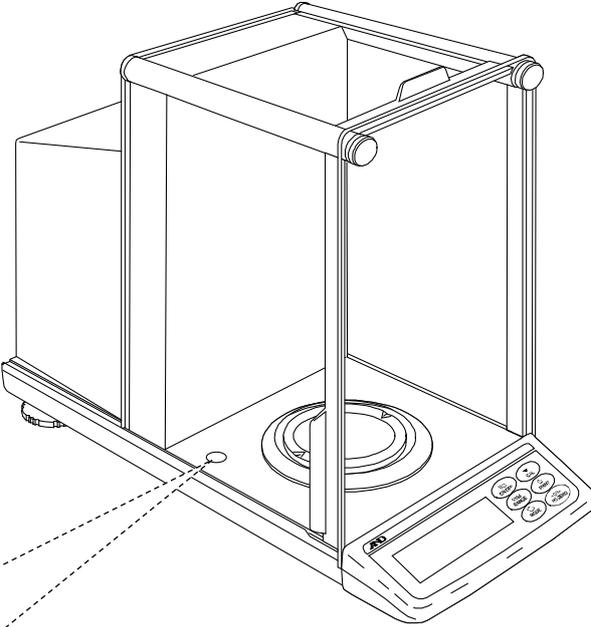
Red circle

Bubble

Bubble spirit level
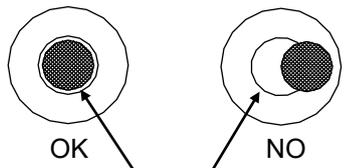
OK   NO

Red circle

3.   Precautions

3-1.   Before Use

To ensure that you get the most from your balance, please try to follow these conditions as closely as possible.

- □   Please confirm that the AC adapter type is correct for your local voltage and receptacle type.

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

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

- □   The weighing room should be free of dust.

- □   The weighing table should be solid and free from vibration, drafts (such as frequently opening doors or windows) and as level as possible.

- □   Corners of rooms are best as they are less prone to vibration.

- □   Do not install the balance near a heater or air conditioner.

- □   Do not install the balance in direct sunlight.

- □   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 before using and after moving it to another location.

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

3-2.   During Use

Note the following items to get accurate weighing data.

- □   Weighing errors may occur due to the influence of static electricity. Note that if the ambient humidity drops below 45%RH, insulators such as plastics are liable to have static electricity. Ground the balance and perform the following as needed.

   ■ Eliminate the static electricity using the optional AD-1683A.

   ■ Try to keep the ambient humidity above 45%RH at the room.

   ■ Use a metal shield case.

   ■ Wipe a charged material (plastic sample etc.) with a damp cloth.

Metal case
Charged material
Grounding

- □   Influence of magnetism may cause weighing errors. When measuring magnetic materials (irons, etc.), keep the sample away from the balance main body by means such as underhook weighing.

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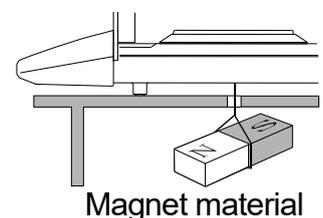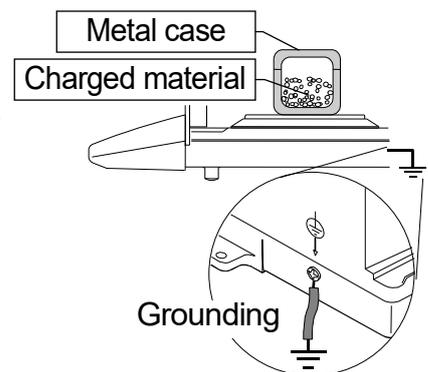
□ Eliminate temperature differences between the weighed sample and the environment. When a sample is warmer (cooler) than the ambient temperature, the sample will appear lighter (heavier) than the true mass. This error is due to the rising (falling) draft next the sample. If you touch the sample, the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

Draft
20°C 40°C
Weighing pan
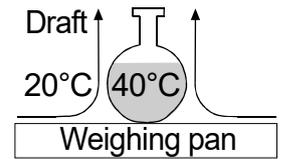
□ Make each weighing gently and quickly to avoid errors due to changes in the environmental conditions.

□ Before weighing with a readability of 0.01 mg for the GH-252 and GH-202, the "fine range breeze break ring" can be installed in place of the "breeze break ring" to avoid errors caused by drafts.

Fine range breeze break ring
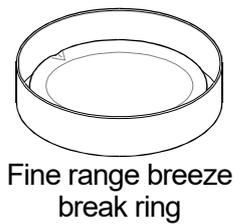
□ Do not drop things upon the weighing pan, or place a weight beyond the range of the balance on the weighing pan.

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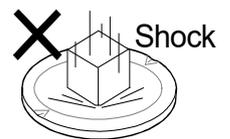
□ Do not use a sharp instrument (such as a pencil or ball point pen) to press the keys, use your finger only.
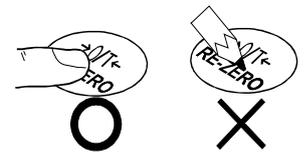
□ Press the RE-ZERO key before each weighing to prevent possible errors.

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

□ Avoid foreign matter (dust, liquid or metal fragments) that could get inside the balance.

3-3. 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.

□   Avoid foreign matter (dust, liquid or metal fragments) that could get inside the balance.
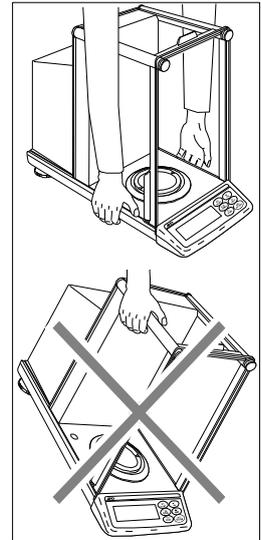
3-4. Power Supply

□   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 weighing mode.

□   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 you always plug in your balance so it can warm up.

4.   Display Symbols and Key Operation

Display

The amount of stored data with memory data function

Response indicator
(Displayed for about 30 seconds when weighing starts.)

Processing indicator

Stabilization indicator

Standby indicator of power supply

Units

Standby indicator of Interval memory function

Weighing data or stored data

The current data number

Blinking indicators

Prior notice indicator of automatic self calibration

Interval memory, active indicator

Key operation

□   Press and release the key immediately" or "Click the key"

□   Press and hold the key (for approx. 2 seconds)
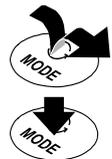
Key	When pressed and released	When pressed and held (for approx. 2 seconds)
I/ON:OFF	The key to turn the display ON and OFF. The standby indicator is displayed when the display is turned off. The weighing mode is enabled when the display is turned on. This key is available anytime. Pressing the key during operation will interrupt the operation and turn the display OFF.	
1/10d RANGE	□ In the weighing mode, the key to turn the readability ON and OFF. □ In the counting or percent mode, the key to enter the sampling mode.	The key to enter the function table mode. Refer to "10. Function Table".
MODE	The key to switch the preset weighing units stored in the function table. Refer to "5. Weighing Units".	The key to perform automatic response adjustment.
CAL	The key to perform calibration using the internal mass.	The key to display other items of the calibration menu.
PRINT	The key to outputs 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. (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/T← RE-ZERO	The key to set the display to zero.	

5. Weighing Units

5-1. Units

□ All weighing units and weighing modes are as follows:

Counting mode | Percent mode

g | mg | pcs | % | oz | ozt | ct
d | m | t | tl | GN | dwt | mom
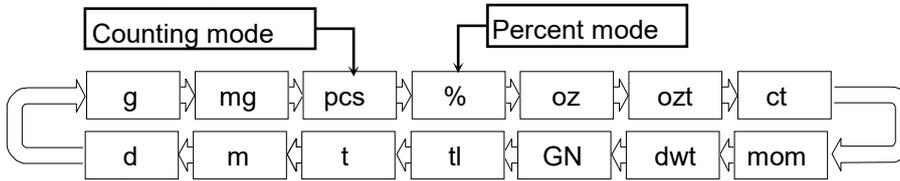
Density mode
□ To use this mode, it must be stored in the function table as described on page 14. For details about this mode, refer to "14. Density Measurement".
□ To select this mode, press the [MODE] key until the processing indictor ◄ blinks with the unit "g" displayed.

□ A unit or mode can be selected and stored in the function table as described in "5-2. Changing the Units".

□ 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.

□ To select a unit or mode for weighing, press the [MODE] key.

□ 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	pcs	pcs	-
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)			37.429 g
Tael (Taiwan)	tl	tl	37.5 g
Tael (China)			31.25 g
Tola (India)	t	t	11.6638038 g
Messghal	m	m	4.6875 g
Density mode	d	Refer to "14. Density Measurement"	

□ The tables below indicate the weighing capacity and the readability for each unit, depending on the balance model.

Unit	GH-252			
	Standard range		Precision range	
	Capacity	Readability	Capacity	Readability
Gram	250	0.0001	101	0.00001
Milligram	250000	0.1	101000	0.01
Ounce (Avoir)	8.82	0.00001	3.56	0.000001
Troy Ounce	8.04	0.00001	3.25	0.000001
Metric Carat	1250	0.001	505	0.0001
Momme	66.7	0.0001	26.9	0.00001
Pennyweight	160.8	0.0001	64.9	0.00001
Grain (UK)	3858	0.002	1559	0.0002
Tael (HK general, Singapore)	6.61	0.00001	2.67	0.000001
Tael (HK jewelry)	6.68	0.00001	2.70	0.000001
Tael (Taiwan)	6.67	0.00001	2.69	0.000001
Tael (China)	8.00	0.00001	3.23	0.000001
Tola (India)	21.43	0.00001	8.66	0.000001
Messghal	53.3	0.0001	21.5	0.00001

Unit	GH-202			
	Standard range		Precision range	
	Capacity	Readability	Capacity	Readability
Gram	220	0.0001	51	0.00001
Milligram	220000	0.1	51000	0.01
Ounce (Avoir)	7.76	0.00001	1.80	0.000001
Troy Ounce	7.07	0.00001	1.64	0.000001
Metric Carat	1100	0.001	255	0.0001
Momme	58.7	0.0001	13.6	0.00001
Pennyweight	141.5	0.0001	32.8	0.00001
Grain (UK)	3395	0.002	787	0.0002
Tael (HK general, Singapore)	5.82	0.00001	1.35	0.000001
Tael (HK jewelry)	5.88	0.00001	1.36	0.000001
Tael (Taiwan)	5.87	0.00001	1.36	0.000001
Tael (China)	7.04	0.00001	1.63	0.000001
Tola (India)	18.86	0.00001	4.37	0.000001
Messghal	46.9	0.0001	10.9	0.00001

Unit	GH-300	GH-200	GH-120	Readability
	Capacity			
Gram	320	220	120	0.0001
Milligram	320000	220000	120000	0.1
Ounce (Avoir)	11.29	7.76	4.23	0.00001
Troy Ounce	10.29	7.07	3.86	0.00001
Metric Carat	1600	1100	600	0.001
Momme	85.3	58.7	32.0	0.0001
Pennyweight	205.8	141.5	77.2	0.0001
Grain (UK)	4938	3395	1852	0.002
Tael (HK general, Singapore)	8.47	5.82	3.17	0.00001
Tael (HK jewelry)	8.55	5.88	3.21	0.00001
Tael (Taiwan)	8.53	5.87	3.20	0.00001
Tael (China)	10.24	7.04	3.84	0.00001
Tola (India)	27.44	18.86	10.29	0.00001
Messghal	68.3	46.9	25.6	0.0001

5-2. Changing the Units

▫ The units or modes can be selected and stored in the function table. The sequence of displaying these 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. Press and hold the $\boxed{\text{RANGE}}$ key (for approx. 2 seconds) until $\boxed{bASFnc}$ of the function table is displayed in the weighing mode, then release the key.

2. Press the $\boxed{\text{RANGE}}$ key several times to display $\boxed{Unit}$.

3. Press the $\boxed{\text{PRINT}}$ key to enter the unit selection mode.

4. Specify a unit or mode in the order to be displayed using the following keys.

   $\boxed{\text{RANGE}}$ key ·········· To display the units sequentially.

   $\boxed{\text{RE-ZERO}}$ key ······ To specify a unit or mode.

   The stabilization indicator $\boxed{\text{O}}$ appears when the displayed unit or mode is specified.

   Examples

Unit		Display
Gram	g	°Unit **g**
Milligram	mg	°Unit m**g**
Counting mode	pcs	°Unit pcs
Percent mode	%	°Unit %
Densitymode	d	°Unit d

5. Press the $\boxed{\text{PRINT}}$ key to store the units or modes. The balance displays $\boxed{End}$ and then displays the next menu item of the function table.

6. Press the $\boxed{\text{CAL}}$ key to exit the function table. Then the balance returns to the weighing mode with the selected unit.

Press and hold

To unit

Examples

g mg pcs % ct mom d

Displays the units sequentially

End
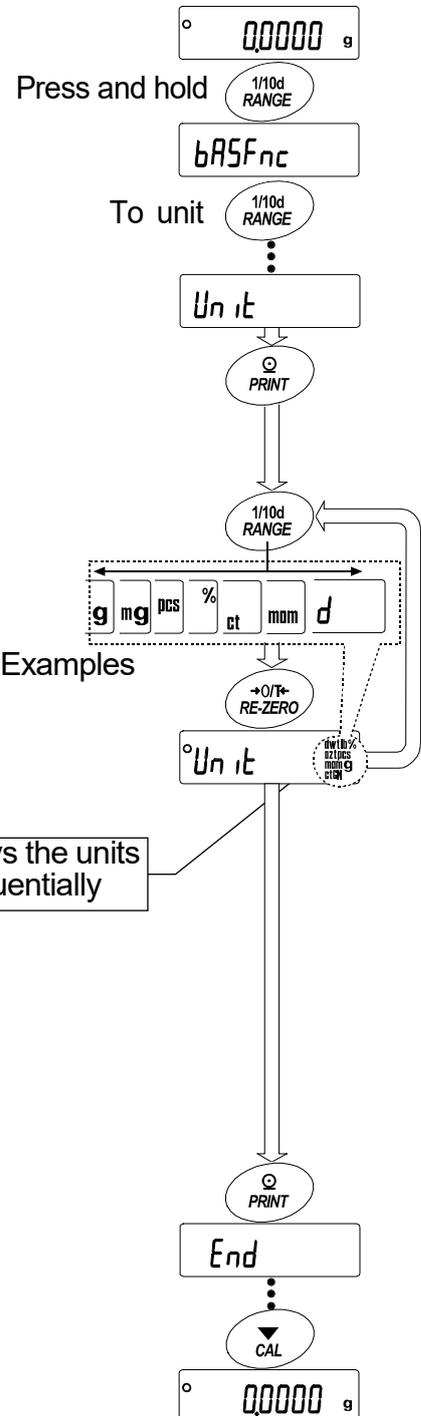
5-2-1 Unit setting example

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

1. Press and hold the RANGE key (for approx. 2 seconds) until bASFnc of the function table is displayed in the weighing mode, 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 pcs.

6. Press the RE-ZERO key to specify the unit of pcs.
   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 pcs (g→pcs).
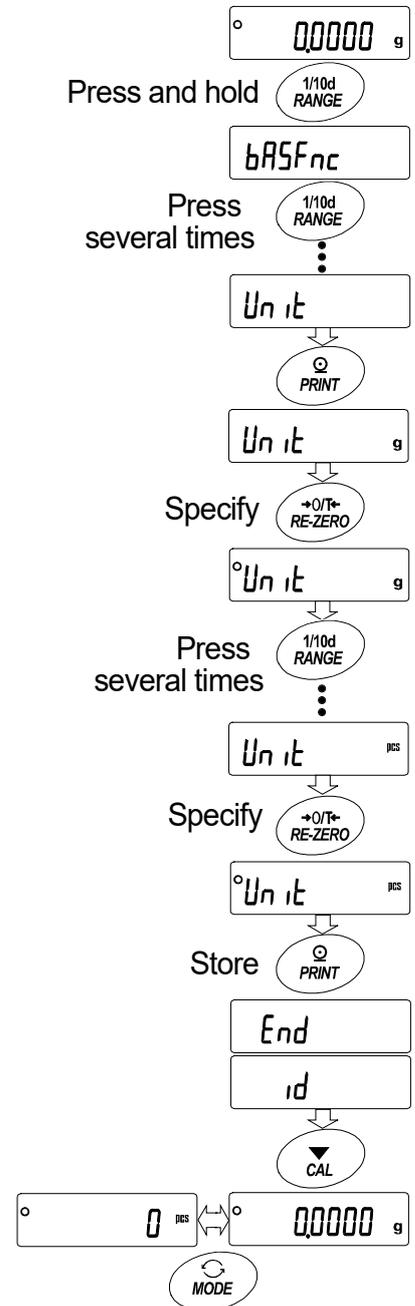
6.   Weighing

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 error.

▫ Shorten the operation time as much as possible. (Opening and closing door, putting and removing sample)

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

▫ Material with an electrostatic charge or that is magnetic may cause a weighing error.

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

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

▫ Calibrate your balance periodically to maintain weighing accuracy. Refer to section "8. Calibration".

▫ Keep the area clean and dry.

▫ Consider section "3. Precautions" for the weighing operation.

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

6-1.   Basic Operation (Gram Mode)

Read section "4. Display symbols and Key operation" before operation.

Note   When turning on the balance with a container placed on the pan, the tare function sets the display to zero automatically.

1.   Turn on the balance using the ⌷ON:OFF⌷ key.

2.   Select a preset unit (g or mg) using the ⌷MODE⌷ key.

3.   Place the container on the weighing pan, if necessary. Press the ⌷RE-ZERO⌷ key to cancel the weight (tare). Then zero is displayed.

    Container : A vessel placed on the pan, but not to be included in the weighing data.

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

5.   Wait for the stabilization indicator ⌷ O ⌷ to be displayed, then read the value.

6.   Remove the sample and container from the pan.
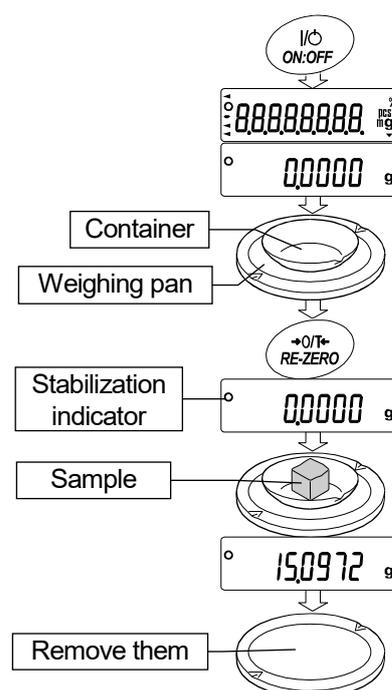
6-2. Dual Range

	Weighing range		Available readability		
	GH-252	GH-202			
Precision range	0 g to 101 g	0 g to 51 g	0.01 mg	0.1 mg	1 mg
Standard range	101 g to 250 g	51 g to 220 g		0.1 mg	1 mg

The GH-252 and GH-202 are equipped with two ranges "precision range" and "standard range".

□ When weighing is started by pressing the ON:OFF key, the readability will be 0.1 mg.

□ Pressing the RANGE key will switch these ranges alternately.

Precision Range — Turn on the balance
0.00000 g — Readability 0.1mg
0.00000 g — Readability 0.01mg
0.000 g — Readability 1mg

Standard Range — Turn on the balance
120.0000 g — Readability 0.1mg
120.000 g — Readability 1mg
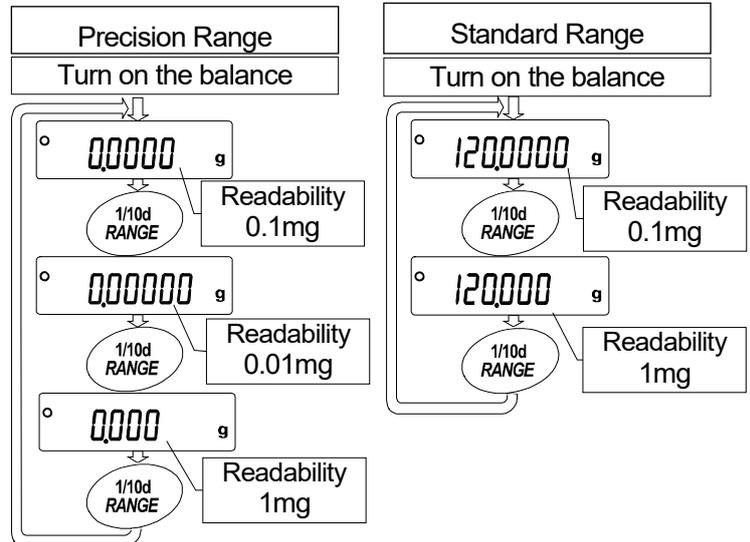
□ When a sample is weighed using the precision range with a readability of 0.01 mg and the weight value exceeds the precision range value, the readability changes to 0.1 mg of the standard range. When removing the sample, the readability changes to 0.01 mg of the precision range automatically.

0.00000 g — Readability 0.01mg
120.0000 g — Readability 0.1mg
0.00000 g — Readability 0.01mg

□ When a tare weight (container mass value) exceeds the precision range value, even if the sample is within the precision range value, 0.01 mg of the precision range can not be selected for the readability. In order to select 0.01 mg of the precision range, remove the tare weight and press the RE-ZERO key to cancel it.

0.00000 g — Readability 0.01mg
120.0000 g — Readability 0.1mg
0.0000 g — Zero display after placing a container Readability 0.1mg
-120.0000 g —
0.00000 g — Zero display after removing the container Readability 0.01mg

□ When a readability of 0.1 mg or 1 mg is selected by the RANGE key, the readability is maintained even if the range is changed during weighing.

19
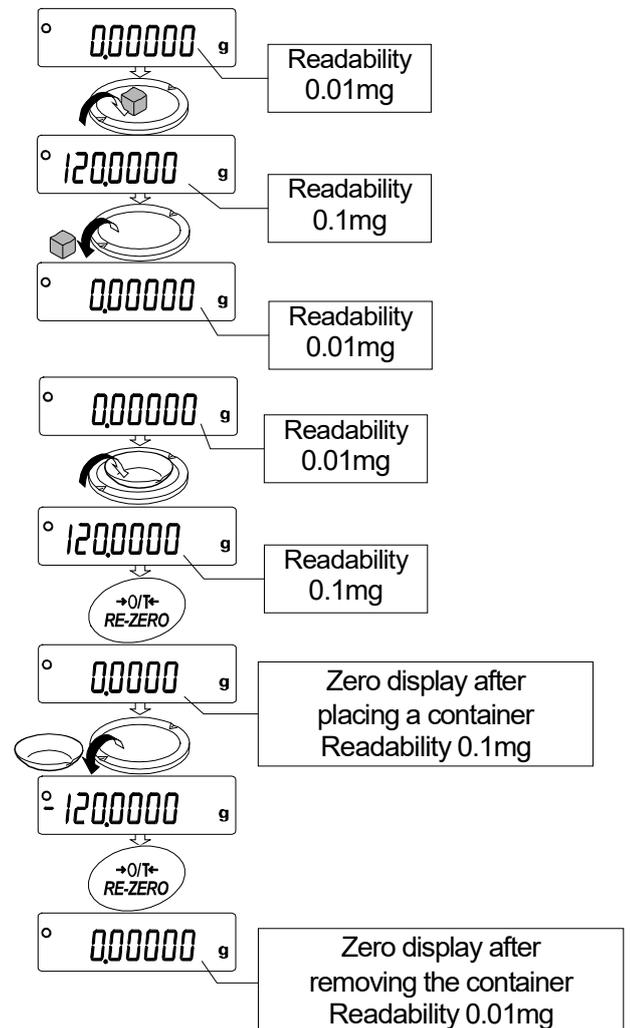
6-3. Counting Mode (PCS)

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, the more accurate the count will be. The balance is equipped with the Automatic Counting Accuracy Improvement (ACAI) function to improve the counting accuracy.

Note

☐　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 ⎡pcs⎤ (counting mode).

Storing a sample unit mass (Weighing input mode)

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

3. To select the number of samples using the ⎡RANGE⎤ key.
    It may be set to 10, 25, 50 or 100.

Advise

A greater number of samples will yield more accurate counting result.

4. Place a container on the weighing pan, if nec essary. Press the ⎡RE-ZERO⎤ key to cancel the weight (tare). The number specified in step 3 appears.

    Example: ⎡25 0⎤ pcs 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 pcs⎤ and is set to count samples with this unit mass. (The sample unit mass is stored in non-volatile memory, and is maintained even if the AC adapter is removed.) To improve the accuracy of the unit mass, proceed to step 8.

Note

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

☐　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 - pcs⎤ appears, requiring 25 more samples. Add 25 samples and press the ⎡PRINT⎤ key. When the unit mass is stored correctly, the balance proceedes to the counting mode.

Counting operation

7. Place the samples to be counted on the pan.

MODE

0 pcs

1/10d RANGE

10 - pcs

1/10d RANGE

25 - pcs

Weighing pan

Container

→0/T← RE-ZERO

25 Samples

25 0 pcs

PRINT

25 pcs

Place samples

Counting result — 55 pcs
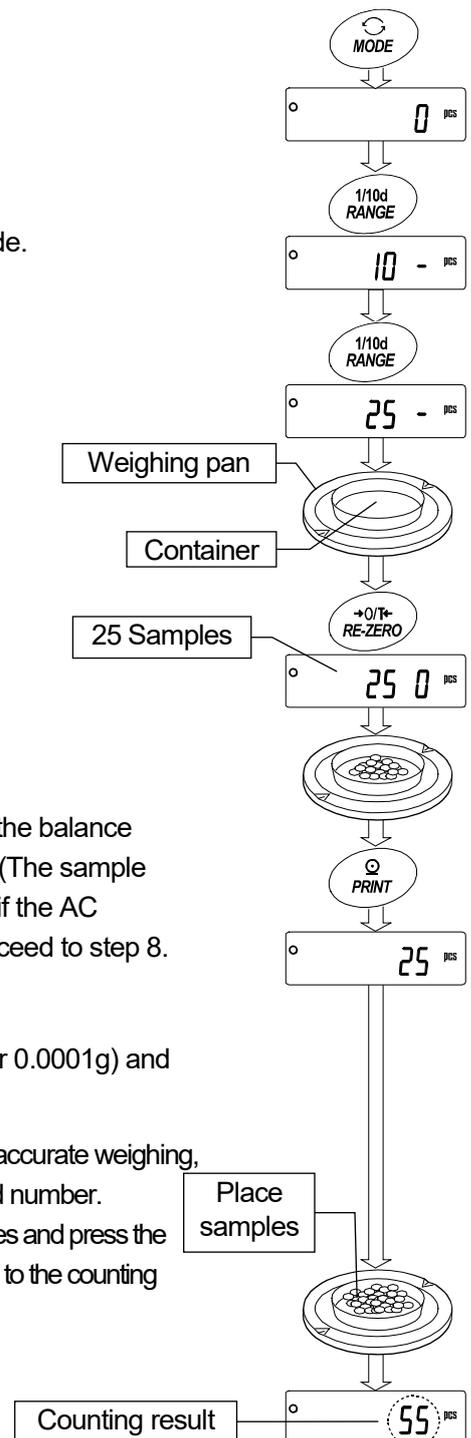
Counting mode using the ACAI function

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

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 7

Add a few more samples.

The mark turns on at proper range.   `6 5` PCS

The mark turns on and off during calculation.   `6 5` PCS

The mark turns off after the unit mass is improved.   `6 5` PCS

Repeat
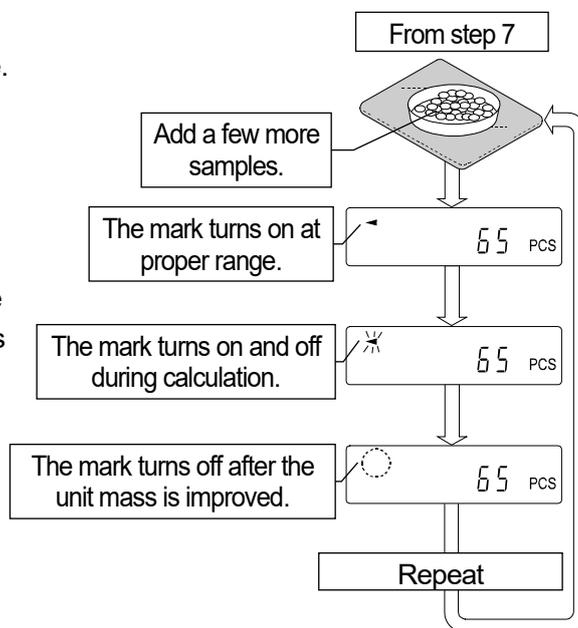
Note

ACAI will not function on the unit mass entered using the keys, or digital input mode.

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 can not 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. Even in the storing mode, pressing the MODE key will switch to the next mode.

3. Place a container 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_ %. (The decimal point position depends on the reference value. The reference mass is stored in non-volatile memory, and is maintained even if the AC adapter is removed.)

Note

Position of decimal point can be changed by 100% mass.

100% mass		Readability
0.0100g to 0.0999g		1%
0.1000g to 0.9999g		0.1%
1.0000g to weighing capacity		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_.

□ A 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 sthe pan. The displayed percentage is based on the 100% reference mass.
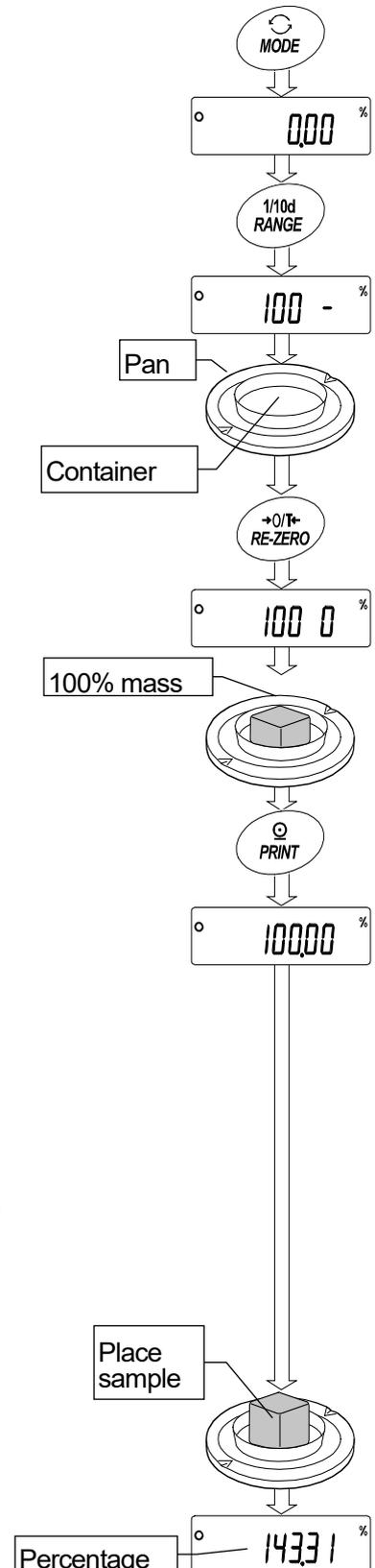
7.　Response Adjustment

This function stabilizes the weight value, reducing the influence on weighing that is caused by drafts and/or vibration at the place where the balance is installed. This function adjusts by automatically analyzing the environment or by hand-operation. 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
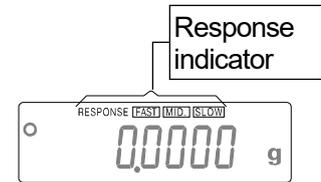
7-1.　Automatic Response Adjustment

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, 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

Release

$CH \times\times\times$

End

Result
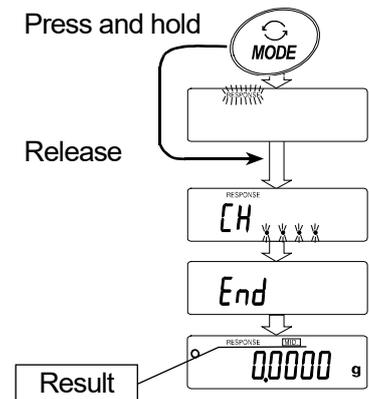
Note

□ 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 the adjustment again. To return to the weighing mode, press the ⌷CAL⌷ key.

□ If there is matter on the weighing pan, the balance displays $CH\ 0$. Remove them from the pan. To return to the weighing mode, press the ⌷CAL⌷ key.

Advise

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, then release the key.
    Press the MODE key again quickly.

2. Select a stage of 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

Release

Press again
immediately

Select a parameter

FAST MID. SLOW

Release and wait

End

0.0000 g
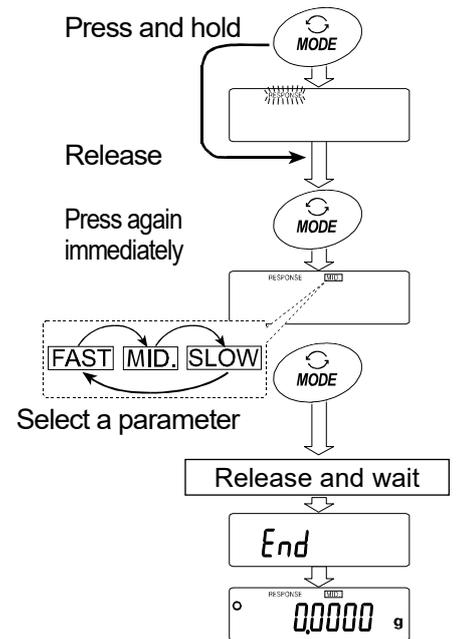
Advise

If the automatic response adjustment is not helpful, specify a parameter for "Condition ($Cond$) " of
"Environment, Display ($bASFnc$)" with key operation.

8. Calibration

8-1. Calibration Group

Calibration

Automatic self calibration (Calibration due to changes in temperature)
Calibration using the internal mass (One-touch calibration)
Calibration using an external weight that you have

Calibration test

Calibration test using the internal mass
Calibration test using target mass that you have

Correction of the internal mass value

Correction of the internal mass value

Caution

□ Do not allow vibration or drafts to affect the balance during calibration.

□ Calibration test does not perform calibration.

□ To output the data for GLP/GMP using the RS-232C interface, set "GLP output (ınƒo)" of "Data output (dout)". Refer to "10. Function Table". Time and date can be added to GLP/GMP report. If the time or date is not correct, adjust them. Refer to "10-7 Clock and Calendar Function".

□ Calibration test is available only when "GLP output (ınƒo)" of "Data output (dout)" is set .

□ The calibration and calibration test data can be stored in memory. To store them, set "Data memory (dAtA)". Refer to "12. Data Memory" for details.

Caution on using an external weight

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

Model	Usable calibration mass				Adjustable range
GH-120		50g,	**100g***		
GH-200			100g,	**200g***	-15.0 mg to +15.9 mg
GH-300			100g,	**200g***, 300g	
GH-202, GH-252	20g,	50g,	100g,	**200g***	-15.00 mg to +15.99 mg

The calibration mass in **bold type**: factory setting
The calibration mass value can be adjusted within the range above.

Display

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

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.

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 state). Refer to "9-1. Permit Or Inhibit" for the operation.

Caution

- ☐   When using automatic self calibration, do not place something on the weighing pan.

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

- ☐   When weighing a light sample or installing the balance in a system, turn off automatic self calibration.

Note

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 the automatic self calibration.

The mark ◄ is " prior notice indicator of automatic self calibration".
When the balance detects a change in ambient temperature, this indicator blinks and automatic self calibration is required. If the balance is not used for several minutes with this indicator blinking, the balance performs automatic self calibration. The environment will affect the time that the indicator blinks.

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.

Advise

The balance can be used while the indicator blinks. But, it is recommended that 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. One-Touch Calibration

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. The balance displays ⌈End⌉ after calibration. If the GLP output is set, the balance displays ⌈GLP⌉ and outputs the calibration report using the RS-232C interface or stores the data in memory. Refer to "GLP output (info)" and "Data memory (dAtA)" of the function table.

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

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

27
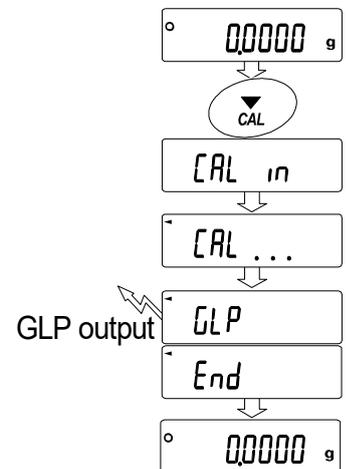
8-4.   Calibration Test Using the Internal Mass

This function tests the balance accuracy using the internal mass. (Balance is not calibrated) When the GLP output is set, the calibration test report is output or stored.

1. Connect the AC adapter and warm up the balance at least one hour.

2. Press and hold the $\boxed{\text{CAL}}$ key (for approx. 2 seconds) until $\boxed{CC \;\; in}$ is displayed, 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 full scale data. Prevent vibration and drafts to affect the balance.

6. The full scale data is displayed. The tolerance of the full scale data is ±0.2mg.

Model	Full scale data
GH-120	100.000 g
GH-200, GH-300, GH-202, GH-252	200.000 g

7. When the GLP output is set, the calibration test report is output or stored.

    □   Refer to "GLP output (*info*)" and "Data memory (*dAtA*)" of the function table.

    □   The zero point data and full scale data is displayed (or output) in unit of 0.0001g.

8. The balance automatically returns to the weighing mode.
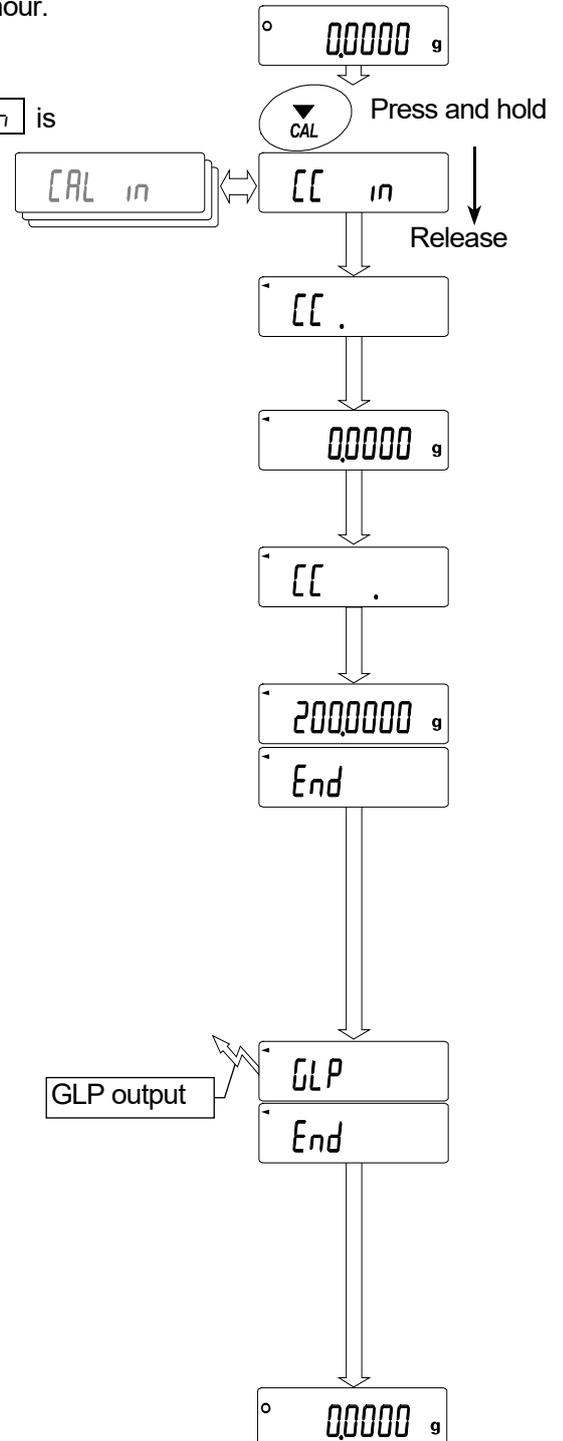
8-5. Calibration Using an External Weight

This function calibrates the balance using an external weight.

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 (for approx. 2 seconds) until ⌈*CALout*⌉ is displayed, then release the key.

3. The balance displays *CAL 0* .

    □ If you want to change the calibration mass, press the RANGE key and proceed to step 4.

    □ If you use the calibration mass value stored in the balance, proceed to step 5.

4. Specify the calibration mass value as follows:

RANGE key	The key to switch blinking figures.
RE-ZERO (+)key MODE (-)key	The keys to select the calibration mass or adjust the mass value. Refer to page 23.
PRINT key	The key to store the new mass value. Even if the AC adapter is removed, the data is maintained in non-volatile memory.
CAL key	The 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 mass value.

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

7. The balance displays *End* . Remove the weight from the pan.

8. If the "GLP output (*info*)" the function table is set, the balance displays *GLP* and outputs or stores "Calibration Report". Refer to "11-2. GLP Report" for details.

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 also check the weighing pan. Then, repeat steps 1 to 10.

Example:
New weight
100.0012 g

Place weight

Remove
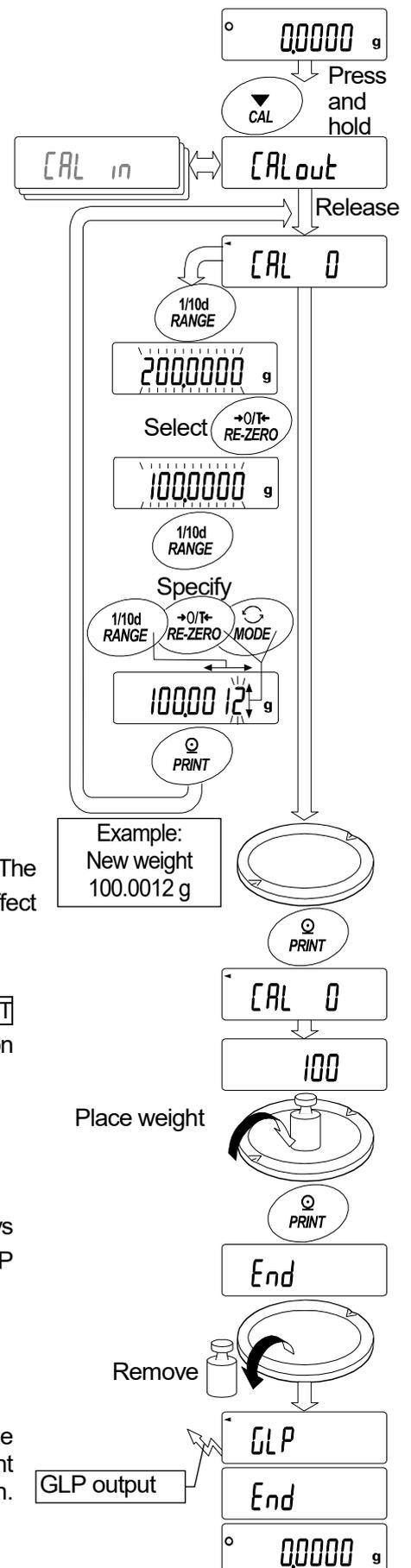
GLP output

8-6. Calibration Test Using an External Weight

This function tests the weighing accuracy using an external weight. Calibration test report can be output or stored with "GLP output ($inFo$)" (Calibration test does not perform calibration).

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 (for approx. 2 seconds) until $CC\ out$ is displayed, then release the key.

3. The balance displays $CC\ 0$.

    □ If the target mass is changed, press the RANGE key and proceed to step 4. A list of usable weights is on page 23.

    □ If current target mass value is used, proceed to step 5.

4. Specify the target mass value as follows:

    RANGE key ⋯⋯⋯⋯The key to switch blinking figures.

    RE-ZERO (+)key ⋯⋯⋯The keys to select the target mass or adjust
    MODE (-)key ⋯⋯⋯⋯the mass value. Refer to page 23.

    PRINT key ⋯⋯⋯⋯⋯The key to store the new mass value. Even if the AC adapter is removed, the data is maintained in non-volatile memory.

    CAL key ⋯⋯⋯⋯⋯⋯The key to cancel the operation and return to $CC\ 0$.

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

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

7. The balance displays End . Remove the weight from the pan.

8. The balance displays GLP and outputs or stores "calibration test report. Refer to "11.2. GLP Report" of the function table for details.

9. The balance will automatically return to the weighing mode.

Example:
New weight
100.0012 g

Place weight

Remove

GLP output
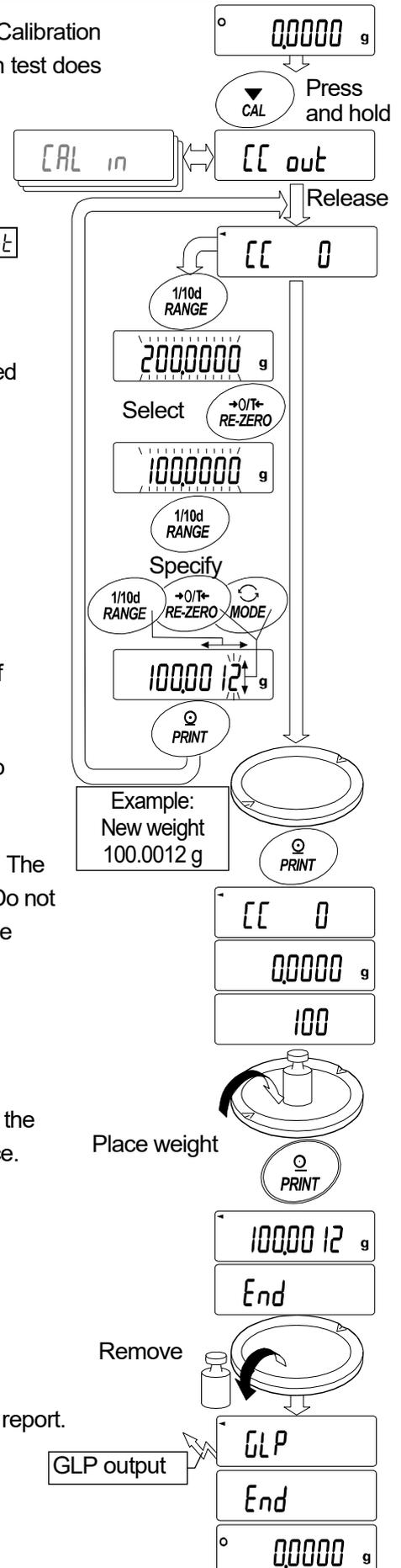
8-7.Correcting the Internal Mass Value

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	Target	Range
GH-120	100.000 g	
GH-200 GH-300 GH-202 GH-252	200.000 g	±1.5 mg

The same mass →

200g 200g

Correct the internal mass by +0.6mg. Calibrate with this internal mass.

200.0000 g → 200.0006 g

Corrected external weight
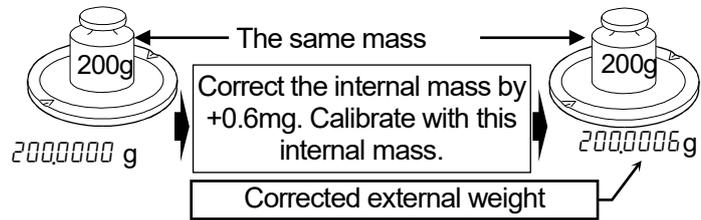
1. Calibrate the balance using the internal mass. (one-touch calibration)

   Example: 200.0000 g is corrected to +0.6 mg (200.0006 g). When correcting a 100 g external weight by +0.6 mg, the weight changed into 200 g, the correction value is +1.2 mg.

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

3. While pressing and holding the PRINT key and the RANGE key, press the ON:OFF key. The balance displays PS.

4. Press the PRINT key. Then the balance displays the function switches. Set the function table switch and internal mass correction switch to " / " as shown above using the following keys.

   RANGE key   The key to select blinking figure.
   RE-ZERO key   The key to change the value of the blinking figure..
   PRINT key   The key to store it and return to weighing mode.
   CAL key   The key to cancel current operation.

   A - |x x x| — Function table switch

   — Correction switch of internal mass
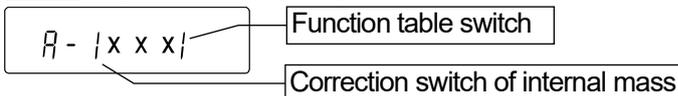
5. Press and hold the RANGE key (for approx. 2 seconds) to enter the function table and release the key when bASFnc is displayed.

6. Press the RANGE key several times until CS in is displayed, then release the key.

7. Press PRINT key. Correct the internal mass value using the following keys.
   RE-ZERO (+)key   The key to select the value.
   MODE (-)key   The key to select the value.
   PRINT key   The key to store the new value and display the next menu item of the function table.
   CAL key   The key to cancel this correction and display the next menu item of the function table.

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

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

10. Check the correction that has been performed properly with the external weight. If the value is incorrect, repeat the correction.

Press and hold   Press
1/10d RANGE   ⊙/PRINT   I/⦾ ON:OFF

PS
⊙ PRINT
A-01111
1/10d RANGE   →0/T← RE-ZERO
A- |xxx|
⊙ PRINT

Weighing mode — 00000 g

Press and hold
1/10d RANGE
bASFnc
1/10d RANGE
CS   in
⊙ PRINT
→0/T← RE-ZERO   ↻ MODE
0.6 mg
⊙ PRINT
id
▼ CAL
0.0000 g
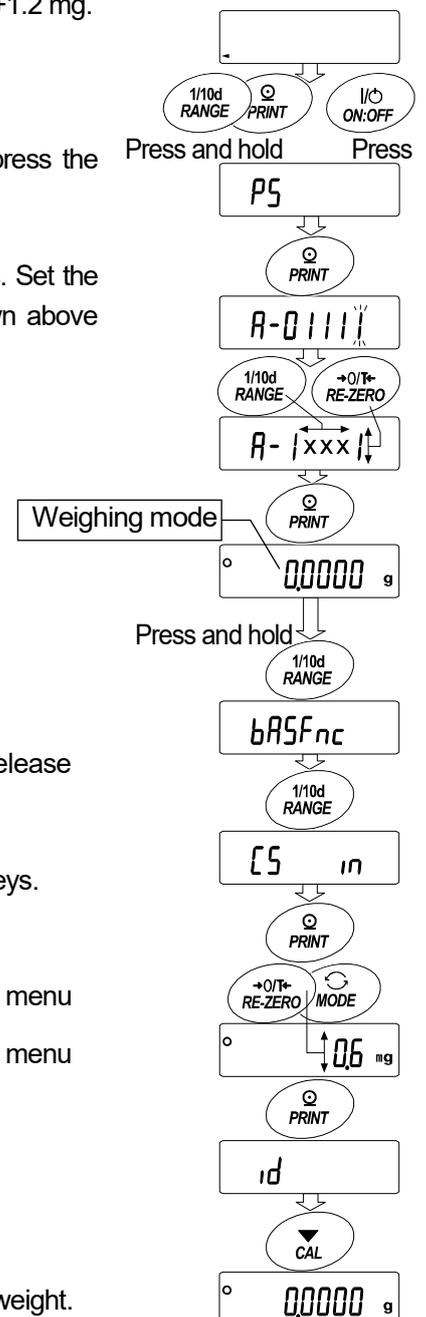
9. Function Switch and Initialization

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). There are five switches for the purpose of protecting parameters. Each switch can select either "permit" or "inhibit". "Inhibit" protects parameters against unintentional operations.

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

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

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

4. Specify the switches using the following keys.
   ⌈RANGE⌉ key·············The key to select blinking digit.
   ⌈RE-ZERO⌉ key··········The key to change the parameter for the selected switch.
   - 0   To inhibit changes. (Can not be used.)
   - 1   To permit changes. (Can be used.)
   ⌈PRINT⌉ key·············The key to store the new parameter and return to the weighing mode.
   ⌈CAL⌉ key·················The key to cancel current operation and return to the weighing mode.

A-01111
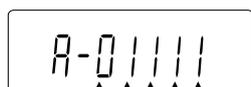
Function table
- 0   To inhibit changes to the function table.
- 1   To permit changes to the function table.

Calibration using the internal mass (One-touch calibration)
- 0   To inhibit calibration using the internal mass.
- 1   To permit calibration using the internal mass.

Calibration using the external weight
- 0   To inhibit calibration using the external weight.
- 1   To permit calibration using the external weight.

Automatic self calibration (due to changes 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.

9-2. Initializing the Balance

This function returns the following parameters to factory settings.

- □ Calibration data

- □ Function table

- □ The 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 calibration weight and target mass 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 off the display.

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

3. Press the RANGE key to display CLr.

4. Press the PRINT key.
   To cancel this operation, press the CAL key.

5. Press the RE-ZERO key to display CLr Go.

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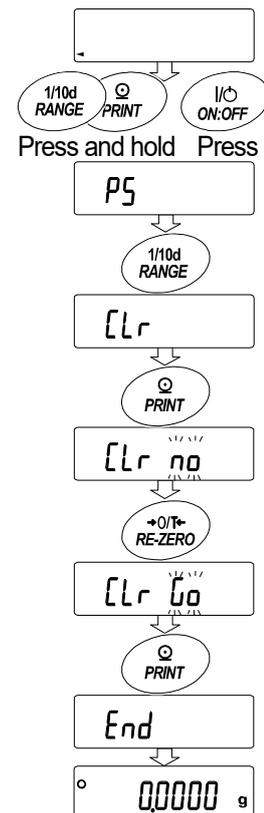
10. Function Table

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 "○" shows effective parameter.
1/10d RANGE	When pressing and holding the key in the weighing mode, the mode enters the function table mode. The key to select the class or item in the function table mode.
→0/T← RE-ZERO	The key to change the parameter.
◎ PRINT	When displaying a class, the key enters an item in the class. When displaying an item, the key stores the new parameter and displays the next class.
▼ CAL	When displaying an item, the key cancels the new parameter and displays the next class. When displaying a class, the key exits the function table mode and returns to the weighing mode.

Setting procedure

1. Press and hold the RANGE key (for approx. 2 seconds) until $bASFnc$ of the function table is displayed in the weighing mode, 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 a item.

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

6. If storing parameters of the selected class, press the PRINT key. Then the next class is displayed. If canceling the current operation, press the CAL key. Then the next class is displayed.

7. When specifying parameters for another class, proceed to step 2.
   When finishing the setting, press the CAL key to return to weighing mode.

Setting example

This example sets "Stores weighing data" for "Data memory" and "1 minute" for "Interval time".
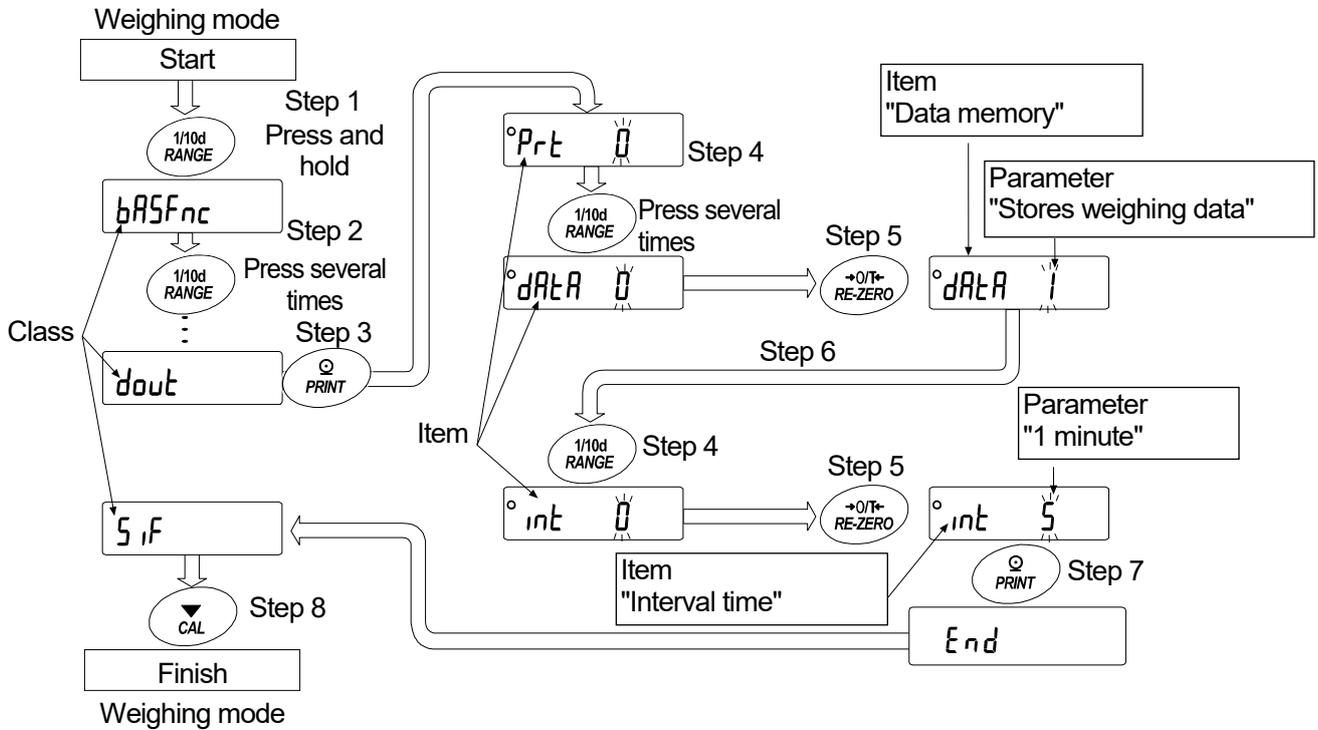
10-2. Details of the Function Table

Class	Item and Parameter			Description	
bASFnc Environment Display	Cond Condition		0	Fast response, sensitive value FAST	Can be changed by response adjustment.
		▪	1	⬍ MID.	
			2	Slow response, stable value SLOW	
	St-b Stability band width		0	Stable range is ±1 digit	The stabilization indicator illuminates when the display fluctuation is within the range.
		▪	1	⬍ #1	
			2	Stable range is ±3 digits	
	trc Zero tracking		0	OFF	Keeps zero display by tracking zero drift.
		▪	1	Normal	
			2	Strong	
			3	Very strong	
	SPd Display refresh rate	▪	0	5 times/second	Period to refresh the display
			1	10 times/second	
	Pnt Decimal point	▪	0	Point (.)	Decimal point format
			1	Comma (,)	
	P-on Auto display-ON	▪	0	OFF	Turns on the weighing mode display when the AC adapter is connected.
			1	ON	
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 memory mode	With dAtA 0, outputs data continuously; with dAtA 2, 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	10 digits	Difference between reference value and displayed value #2
		▪	1	100 digits	
			2	1000 digits	
	dAtA Data memory	▪	0	Not used	Related items: Prt, int, d-no, S-td, info
			1	Stores weighing data	
			2	Stores calibration data	

▪ : Factory settings.

#1   The unit of readability is digit.

Example: If 1 mg display is selected using the RANGE key for the GH-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 GH-252 and 0.1 mg for the GH-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 minute	
			7	5 minute	
			8	10 minute	
	d-no Data number output	▪	0	No output	Refer to "12. Data Memory"
			1	Output	
	S-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	
	S-id ID number output	▪	0	No output	Selects whether or not the ID number is output.
			1	Output	
	PUSE Data output pause	▪	0	No pause	Selects the data output interval.
			1	Pause (1.6 seconds)	
	At-F Auto feed	▪	0	Not used	Selects whether or not automatic feed is performed.
			1	Used	
	inFo GLP output	▪	0	No output	Selects GLP output method. Refer to "11. ID Number And GLP Report" for details.
			1	AD-8121 format	
			2	General data format	
	Ar-d Zero after output	▪	0	Not used	Adjusts zero automatically after data is output
			1	Used	
S iF Serial interface	bPS 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
			1	CR	LF: ASCII code 0Ah
	tYPE Data format	▪	0	A&D standard format	
			1	DP format	
			2	KF format	Refer to "10.5. Description of Item Data Format".
			3	MT format	
			4	NU format	
			5	CSV format	

Caution   ▪ : Factory settings.

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	
_S iF_ Serial interface	_t -UP_ Timeout		_0_	No limit	Selects the wait time to receive a command.
		▪	_1_	1 second	
	ErCd AK, Error code	▪	_0_	No output	AK: ASCII code 06h
			_1_	Output	
	CtS CTS, RTS control	▪	_0_	Not used	Controls CTS and RTS.
			_1_	Used	
dS 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".	
_CS 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".	

▪ : Factory settings. Digit is a unit of readability.

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.

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 mass, 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 mass 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 ($St-b$)

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"

$St-b\ 0$ This parameter is used for sensitive response of the stabilization indicator. Used for exact weighing.

$St-b\ 2$ This parameter ignores slight fluctuations of a mass value. Used to prevent a mass value from drifting due to vibration or drafts.

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 (SPd)

The period 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 the ON:OFF key operation, 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 "2" (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 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 modes A

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

Auto print modes B

Example	For weighing while a sample is added.
Required setting	$dout$ $Prt \ 2$ Auto print mode B (reference = last stable value)
	$dout$ AP-P Auto print polarity
	$dout$ AP-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 "1" (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
	$S \ iF$ 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 memory mode

The weighing data is periodically stored in memory.

Example		For periodical weighing without a personal computer command and to output all of the data, to a computer, at one time. The GH series can use time and date with "Time/Date output ($5-td$)".	
Required setting	$dout$	$Prt\ 3$	Interval memory mode
	$dout$	$dAtA\ 2$	Data memory function is used
	$dout$	int	Interval time
Optional setting	$dout$	$5-td\ 1, 2,$ or 3	Adds the time and date.

10-5.　Description of the Item "Data Format"

A&D standard format　　$5 \cdot F \; EYPE \; D$

This format is used when the peripheral equipment can receive the A&D format. If an AD-8121B is used, set the printer to 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. When numerical characters without decimal point are exceeded eight characters for the GH-252, the format becomes sixteen characters.

- □　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	$^C{}_R$	$^L{}_F$

Header　　　　　Data　　　　　　　　　Unit　　Terminator

S	T	Stable header
U	S	Unstable header
O	L	Overload header

Q	T	Stable header of counting mode

S	T	,	+	1	0	0	.	0	1	2	7	8	␣	␣	g	$^C{}_R$	$^L{}_F$

Header　　　　　　　Data　　　　　　　　Unit　　Terminator
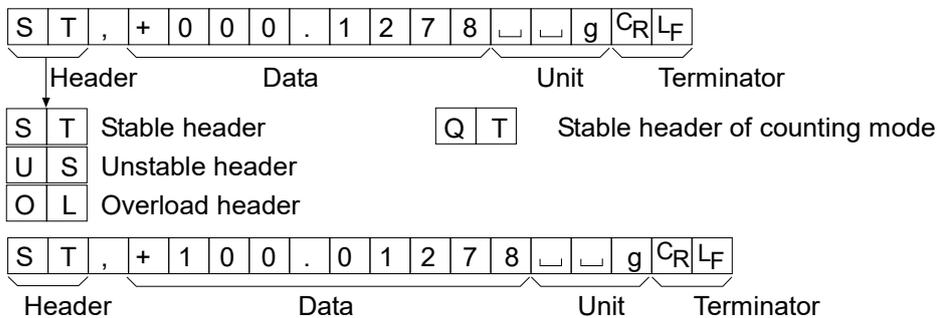
DP (Dump print) format　　$5 \cdot F \; EYPE \; I$

This format is used when the peripheral equipment can not receive the A&D format. If an AD-8121B is used, set the printer to MODE 3. With an AD-8126 printer, use this format. 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	$^C{}_R$	$^L{}_F$

Header　　　　Data　　　　　　　Unit　　Terminator

W	T	Stable header
U	S	Unstable header

Q	T	Stable header of counting mode
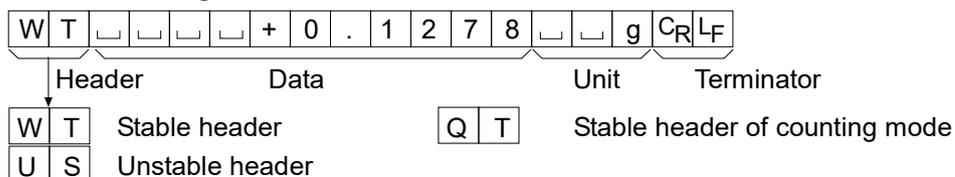
KF format $S \, iF \ t Y P E \ 2$

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	␣	␣	C$_R$	L$_F$

        Data   Unit   Terminator

| ␣ | g | ␣ | ␣ | Stable value |
| ␣ | ␣ | ␣ | ␣ | Unstable value |
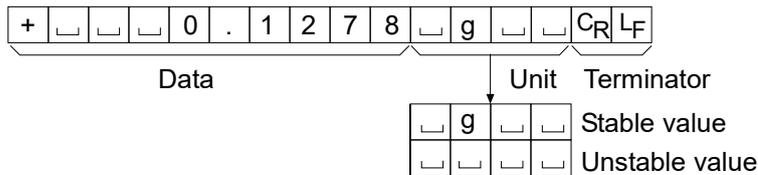
MT format $S \, iF \ t Y P E \ 3$

- ▫ 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
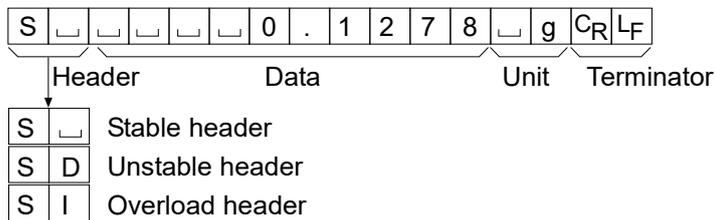
NU (numerical) format $S \, iF \ t Y P E \ 4$

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

43
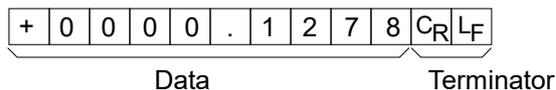
CSV format   5 iF EYPE 5

- □ 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 at "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, 2004/07/01, 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

ID number   dout 5- id 1

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 1

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 EYPE 5) is selected, the period (.) is replaced with a comma (,).

N	o	.	0	0	1	C_R	L_F

Data number   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)". The year is output in a four-digit format.

2	0	0	4	/	0	7	/	0	1	C_R	L_F

Time   dout 5-td 1 or 3

- □ This format outputs time in 24-hour format.

1	2	:	3	4	:	5	6	C_R	L_F

10-6. Data Format Examples

Stable

Display: `0.1278 g`

A&D	S	T	,	+	0	0	0	.	1	2	7	8	␣	␣	g	CR	LF
DP	W	T	␣	␣	␣	␣	+	0	.	1	2	7	8	␣	␣	g	CR	LF
KF	+	␣	␣	␣	0	.	1	2	7	8	␣	g	␣	␣	CR	LF
MT	S	␣	␣	␣	␣	␣	0	.	1	2	7	8	␣	g	CR	LF
NU	+	0	0	0	.	1	2	7	8	CR	LF

Unstable

Display: `-18.3690 g`

A&D	U	S	,	-	0	1	8	.	3	6	9	0	␣	␣	g	CR	LF
DP	U	S	␣	␣	␣	-	1	8	.	3	6	9	0	␣	␣	g	CR	LF
KF	-	␣	␣	1	8	.	3	6	9	0	␣	␣	␣	␣	CR	LF
MT	S	D	␣	␣	-	1	8	.	3	6	9	0	␣	g	CR	LF
NU	-	0	0	1	8	.	3	6	9	0	CR	LF

Overload

Positive error

Display: `E g`

A&D	O	L	,	+	9	9	9	9	9	9	9	E	+	1	9	CR	LF
DP	␣	␣	␣	␣	␣	␣	␣	␣	E	␣	␣	␣	␣	␣	␣	CR	LF
KF	␣	␣	␣	␣	␣	␣	H	␣	␣	␣	␣	␣	␣	␣	CR	LF
MT	S	I	+	CR	LF
NU	+	9	9	9	9	9	9	9	9	9	CR	LF

Overload

Negative error

Display: `-E g`

A&D	O	L	,	-	9	9	9	9	9	9	9	E	+	1	9	CR	LF
DP	␣	␣	␣	␣	␣	␣	␣	-	E	␣	␣	␣	␣	␣	␣	CR	LF
KF	␣	␣	␣	␣	␣	␣	L	␣	␣	␣	␣	␣	␣	␣	CR	LF
MT	S	I	-	CR	LF
NU	-	9	9	9	9	9	9	9	9	9	CR	LF

␣ Space, ASCII 20h

CR Carriage Return, ASCII 0Dh

LF Line Feed, ASCII 0Ah

Units

		A&D	D.P.	KF	MT
g	g	␣␣g	␣␣g	␣g␣␣	␣g
mg	mg	␣mg	␣mg	␣mg␣	␣mg
Counting mode	pcs	␣PC	␣PC	␣pcs	␣PCS
Precent 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

␣   Space, ASCII 20h

10-7. Clock and Calendar Function

The balance is equipped with a clock and calendar function. When the "GLP output ($inFo$)" parameter is set to " l " or " 2 " and the "Time/Date output ($5-\varepsilon d$)" parameter is set to " l ", " 2 " or " 3 ", the time and date are added to the output data. Set or confirm the time and date as follows:

Operation

1. Press and hold the ⬛RANGE⬛ key (for approx. 2 seconds) until $b\bar{A}5Fnc$ of the function table is displayed in the weighing mode, then release the key.

2. Press the ⬛RANGE⬛ key several times to display $\varepsilon L\ \ \bar{A}dJ$.

3. Press the ⬛PRINT⬛ key.
   The balance enters the mode to confirm or set the time and date.

Confirming the time

4. The current time is displayed with all the digits blinking.

   ▫ When the time is correct and the date does not need to be confirmed, press the ⬛CAL⬛ key and proceed to step 8.

   ▫ When the time is correct and the date is to be confirmed, press the ⬛RANGE⬛ key and proceed to step 6.

   ▫ When the time is not correct and is to be changed, press the ⬛RE-ZERO⬛ key and proceed to step 5.

Setting the time

5. Set the time in 24-hour format using the following keys.

   ⬛RANGE⬛ key ······ The key to select the digits to change the value. The selected digits blink.

   ⬛RE-ZERO⬛(-)key··· The key to increase the value by one.

   ⬛MODE⬛(+)key ······ The key to decrease the value by one.

   ⬛PRINT⬛ key········· The key to store the new setting, display εnd and proceed to step 6.

   ⬛CAL⬛ key············· The key to cancel the new setting and proceed to step 6.

Confirming the date

6. The current date is displayed with all the digits blinking.

   ▫ To change the display order of year (y), month ($\bar{n}$) and day (d), press the ⬛MODE⬛ key. The date is output in the order as specified.

   ▫ When the date is correct and the operation is to be finished, press the ⬛CAL⬛ key and proceed to step 8.

   ▫ When the time is to be confirmed again, press the ⬛RANGE⬛ key and proceed back to step 4.

   ▫ When the date is not correct and is to be changed, press the ⬛RE-ZERO⬛ key and proceed to step 7.

Note

The year is expressed using a two-digit format. For example: The year 2004 is expressed as "04".

Setting the date

7. Set the date using the following keys.

    RANGE key·········The key to select the digits to change the value.
                         The selected digits blink.
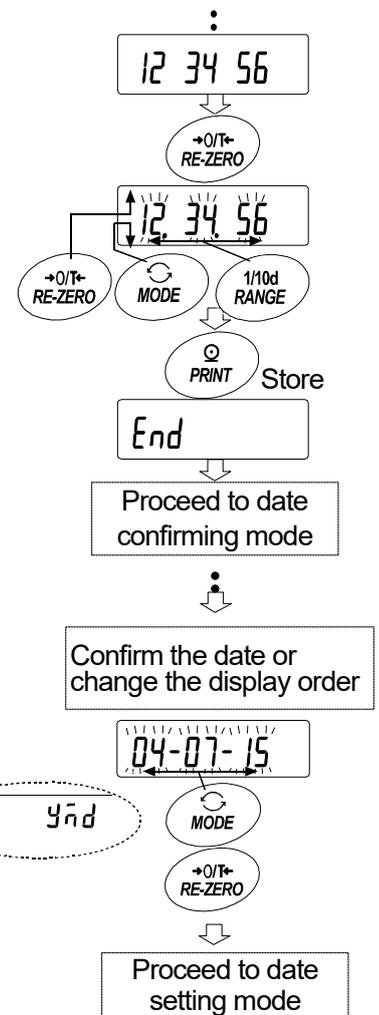
    RE-ZERO key······The key to increase the value by one.

    MODE key············The key to decrease the value by one.

    PRINT key············The key to store the new setting, display
                          End and proceed to step 8.

    CAL key··············The key to cancel the new setting and proceed to step 8.
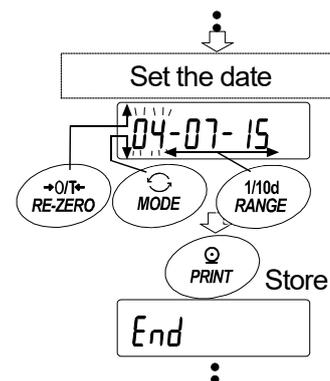
Quitting the operation

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

Note

Do not enter invalid values such as a non-existing date when setting the time and date. 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.

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 calibration, using the internal mass (Calibration due to changes in temperature and one-touch calibration.)

- "Calibration report" of the calibration, using an external weight.

- "Calibration test report" of the calibration test, using an external weight.

- "Title block" and "End block" for the weighing data.

▫ Calibration and calibration test data can be stored in memory to output several reports at the same time. Refer to "12. Data Memory" for details.

▫ For details on confirming and setting the time and date for the GH series. Refer to "10-7. Clock and Calendar Function". 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 | $bASFnc$ | of the function table is displayed, then release the key.

2. Press the ⎡RANGE⎤ key several times to display | id |.

3. Press the ⎡PRINT⎤ key. Set the ID number using the following keys.

   ⎡RE-ZERO⎤ key···· The key to set the character of the digit selected.
   Refer to the display character set shown below.

   ⎡RANGE⎤ key ······ The key to select the digit to change the value.

   ⎡PRINT⎤ key········· The key to store the new ID number and display | $bASFnc$ |.

   ⎡CAL⎤ key············· The key to cancel the new ID number and display | $bASFnc$ |.

4. With | $bASFnc$ | displayed, press the ⎡CAL⎤ key to return to the weighing mode.

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 (ɪnℲο)" parameter of the function table to " ɪ" (AD-8121 format) or "2" (General format using the balance built-in clock data).

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

- □ Refer to "15-2. Connection 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 time and date are not correct when the balance built-in clock data is output (ɪnℲο ɪ, 2), set the correct time and date in "Clock (ℂL Ⴈꓒꓒ)" of the function table.

Calibration report using the internal mass

Key operation

1. Press the [CAL] key to display [ℂꓮL ɪn] and calibrate the balance automatically.

2. If GLP output is used, [ꓖLℙ] is displayed and the calibration report is output.

3. The balance returns to weighing mode after this calibration.

Setting of " ɪnℲο ɪ"   Setting of " ɪnℲο 2"

AD-8121 printer format   General format

```
          A & D
MODEL      GH-300
S/N      01234567
ID       LAB-0123
DATE   2004/07/01
TIME     12:34:56
CALIBRATED(INT.)
SIGNATURE


⎯ ⎯ ⎯ ⎯ ⎯ ⎯ ⎯
```

Manufacturer
Model
Serial number
ID number
Date
Time
Calibration type

Signature

```
_____A_&_D<TERM>
MODEL_____GH-300<TERM>
S/N_____01234567<TERM>
ID_____LAB-0123<TERM>
DATE<TERM>
_____2004/07/01<TERM>
TIME<TERM>
_____12:34:56<TERM>
CALIBRATED(INT.)<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
---------------<TERM>
<TERM>
<TERM>
```
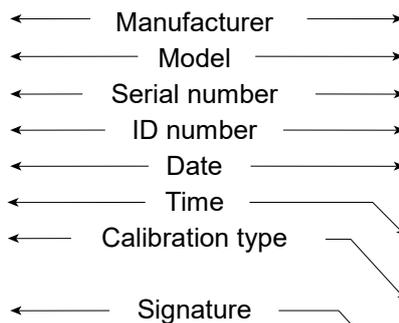
    ⎵   Space, ASCII 20h

   <TERM>   Terminator, CR , LF or CR

   CR   Carriage return, ASCII 0Dh

   LF   Line feed, ASCII 0Ah

Calibration test report using an internal mass

Note

Calibration test does not perform calibration.

Key operation

1. Press and hold the CAL key (for approx. 2 seconds) to display CC in and release the key.

2. CC is displayed and the balance is tested automatically.

3. The zero point is measured and the weight value is displayed for a few seconds.

4. Internal mass is weighed and the weight value is displayed for a few seconds.

5. If GLP output is used, GLP is displayed and the calibration test report is output.

6. The balance returns to weighing mode after this test.

Command

This calibration test report can be performed with command TST.

Setting of " info I "   Setting of " info 2 "

AD-8121 printer format   General format

```
          A & D                                         ⌴⌴⌴⌴⌴⌴⌴⌴⌴⌴A⌴&⌴D<TERM>
MODEL     GH-300         ← Manufacturer →                MODEL⌴⌴⌴⌴⌴GH-300<TERM>
S/N       01234567       ← Model →                       S/N⌴⌴⌴⌴⌴⌴01234567<TERM>
ID        LAB-0123       ← Serial number →                ID⌴⌴⌴⌴⌴⌴⌴LAB-0123<TERM>
DATE   2004/07/01        ← ID number →                    DATE<TERM>
TIME      12:34:56       ← Date →                         ⌴⌴⌴⌴⌴⌴⌴2004/07/01<TERM>
CAL.TEST(INT.)           ← Time →                         TIME<TERM>
ACTUAL                   ← Calibration test type          ⌴⌴⌴⌴⌴⌴⌴⌴⌴12:34:56<TERM>
                                                          CAL.TEST(INT.)<TERM>
       0.0000   g        ← Zero point value               ACTUAL<TERM>
    +200.0002   g        ← Target weight value            ⌴⌴⌴⌴⌴⌴⌴⌴0.0000⌴⌴g<TERM>
TARGET                                                    ⌴⌴⌴⌴+200.0002⌴⌴g<TERM>
    +200.0000   g        ← Target weight                  TARGET<TERM>
SIGNATURE                                                 ⌴⌴⌴⌴+200.0000⌴⌴g<TERM>
                         ← Signature                      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

Key operation

1. Press and hold the ⎡CAL⎤ key (for approx. 2 seconds) to display ⎡CAL out⎤ and release the key.

2. ⎡CAL 0⎤ is displayed.

3. When updating the calibration mass value, press the ⎡RANGE⎤ key and proceed to step 4. When using preset calibration mass value, proceed to step 5.

4. Specify calibration mass value using the following keys.

   ⎡RANGE⎤ key ·········· The key to select the blinking figure

   ⎡RE-ZERO⎤(+)key ····· The key to increase the value of the blinking figure.

   ⎡MODE⎤(-)key·········· The key to decrease the value of the blinking figure.

   ⎡PRINT⎤ key ··········· The key to store the new value.

5. When pressing the ⎡RE-ZERO⎤ key, the zero point is measured and the weight value is displayed for a few seconds.

6. Place the displayed mass on the pan. Press the ⎡PRINT⎤ key to measure the mass and the weight value is displayed for a few seconds.

7. If GLP output is used, ⎡GLP⎤ is displayed and the calibration report is output.

8. The balance returns to weighing mode after this calibration.

Setting of " info 1"

AD-8121 printer format

```
            A & D
MODEL      GH-300
S/N        01234567
ID         LAB-0123
DATE    2004/07/01
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		

Setting of " info 2"

General format

```
_____A_&_D<TERM>
MODEL_____GH-300<TERM>
S/N_____01234567<TERM>
ID_____LAB-0123<TERM>
DATE<TERM>
        2004/07/01<TERM>
TIME<TERM>
_____12:34:56<TERM>
CALIBRATED(EXT.)<TERM>
CAL.WEIGHT<TERM>
____+200.0000__g<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
---------------<TERM>
<TERM>
<TERM>
```
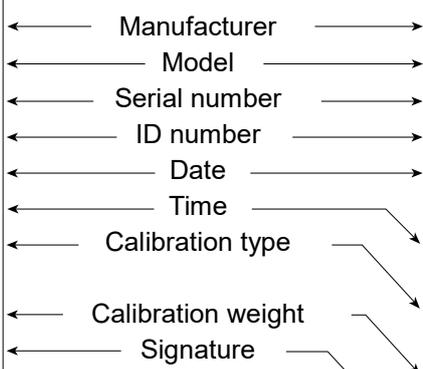
⎵	Space, ASCII 20h
\<TERM>	Terminator, CR , LF or CR
CR	Carriage return, ASCII 0Dh
LF	Line feed, ASCII 0Ah

Calibration test report using an external weight

Note

Calibration test does not perform calibration.

Key operation

1. Press and hold the ⎡CAL⎤ key (for approx. 2 seconds) to display ⎡CC out⎤ and release the key.

2. ⎡CAL 0⎤ is displayed.

3. When updating the target value, press the ⎡RANGE⎤ key and proceed to step 4.
   When using preset target value, proceed to step 5.

4. Specify calibration mass value using the following keys.

   ⎡RANGE⎤ key ··········The key to select the blinking figure

   ⎡RE-ZERO⎤(+)key·····The key to increase the value of the blinking figure.

   ⎡MODE⎤(-)key···········The key to decrease the value of the blinking figure.

   ⎡PRINT⎤ key ···········The key to store the new value.

5. When pressing the ⎡RE-ZERO⎤ key, the zero point is measured and the weight value is displayed for a few seconds.

6. Place the displayed mass on the pan. Press the ⎡PRINT⎤ key to measure the mass and the weight value is displayed for a few seconds.

7. If GLP output is used, ⎡GLP⎤ is displayed and the calibration test report is output.

8. The balance returns to weighing mode after this test.

Setting of " info 1"

AD-8121 printer format

```
         A & D
MODEL    GH-300
S/N      01234567
ID       LAB-0123
DATE  2004/07/01
TIME     12:34:56
CAL.TEST(EXT.)
ACTUAL
       0.0000   g
   +200.0002   g
TARGET
   +200.0000   g
SIGNATURE



    _ _ _ _ _
```

Setting of " info 2"

General format

```
_____A_&_D<TERM>
MODEL_____GH-300<TERM>
S/N_____01234567<TERM>
ID_____LAB-0123<TERM>
DATE<TERM>
_____2004/07/01<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>
```

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

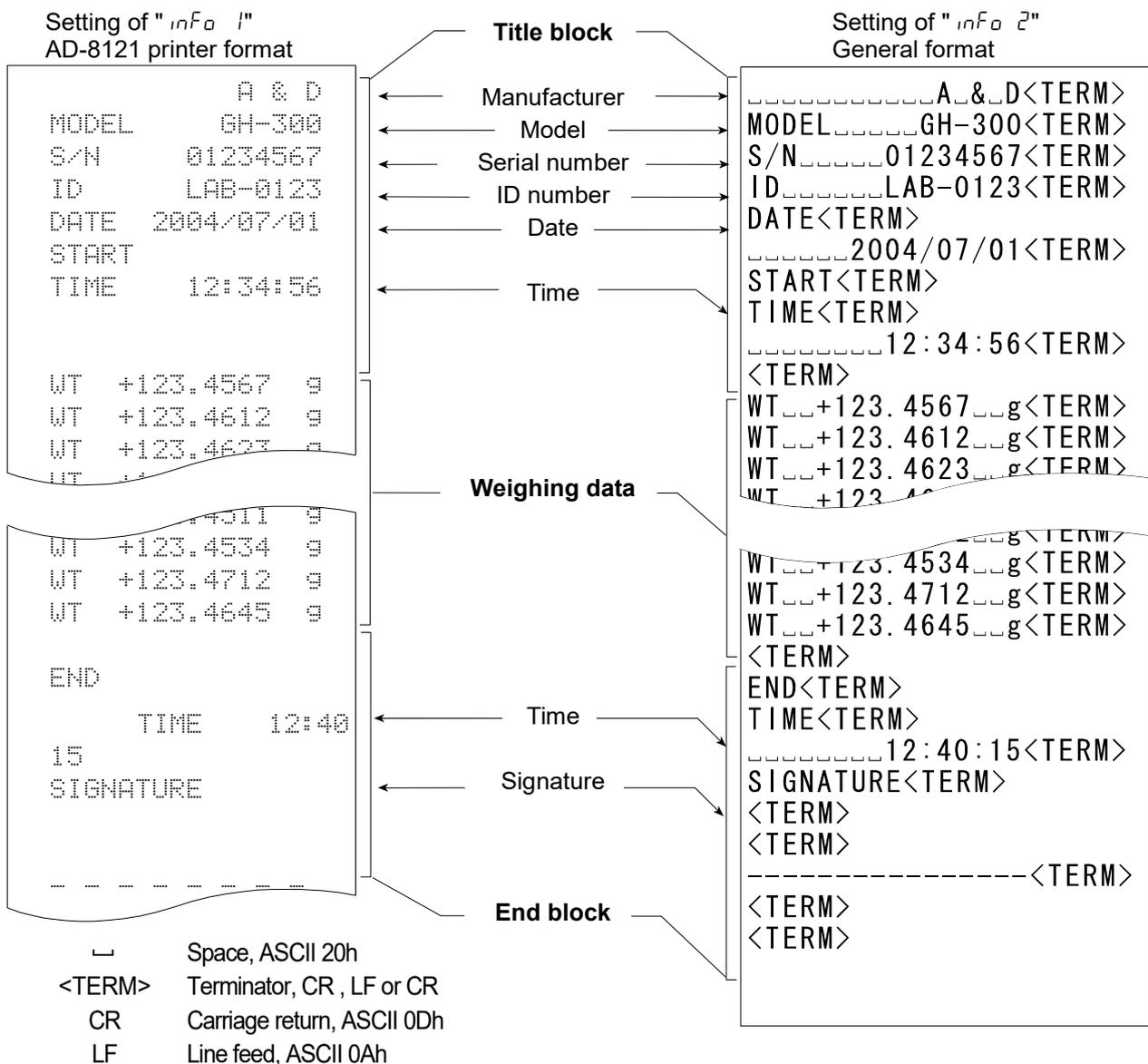| ␣ | Space, ASCII 20h |
`<TERM>`	Terminator, CR , LF or CR
CR	Carriage return, ASCII 0Dh
LF	Line feed, ASCII 0Ah

Title block and end block

When mass 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 mass values in the GLP report.

Note

□ To output the report to an AD-8121B , use MODE 3 of the AD-8121B. If MODE1 is used, select temporary dump print mode by pressing the ⎡STAT.⎤ key of the AD-8121B.

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

Key operation

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

Setting of " *info 1* "
AD-8121 printer format

```
              A & D
MODEL      GH-300
S/N        01234567
ID         LAB-0123
DATE   2004/07/01
START
TIME       12:34:56


WT   +123.4567   g
WT   +123.4612   g
WT   +123.4623   g
```

```
      +123.4511   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

Setting of " *info 2* "
General format

```
_____A_&_D<TERM>
MODEL_____GH-300<TERM>
S/N_____01234567<TERM>
ID_____LAB-0123<TERM>
DATE<TERM>
_____2004/07/01<TERM>
START<TERM>
TIME<TERM>
_____12:34:56<TERM>
<TERM>
WT__+123.4567__g<TERM>
WT__+123.4612__g<TERM>
WT__+123.4623__g<TERM>
WT__+123.4
```

```
_____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 date and time	Up to 200 sets
	Including date and time	Up to 100 sets
Calibration report 　Internal calibration 　External calibration Calibration test report 　Internal test calibration 　External test calibration		Last 50 sets

12-1.　Notes on Using Data Memory

□　To use the memory function, set the "Data memory (*dAtA*)" parameter and "Time/Date output (*S-td*)" parameter of the function table. Refer to "10. The 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 (*S-td*)" parameter setting.

□　If a different type of data exists in memory, "*Clr*" blinks the upper left of the display. For example, you want to store weighing data but calibration data or unit mass data remains in memory. Under such a condition, before storing data, delete the data in memory as follows:

Upper left of the display

Clr
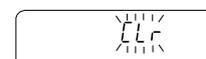
Releasing "*Clr*" or "*Err*"

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

2.　Press the ⎡RE-ZERO⎤ key to display ⎡*Clr　Go*⎤ with "*Go*" blinking. The type of data stored in memory appears in the upper left of the display as shown below:

Weighing data without time and date	*-d-*
Weighing data with time and date	*d-t*
Calibration report	*H iS*

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

▫ The balance can store 200 sets of weighing data in memory (if time and date are added, the balance can store 100 sets). Even if the AC adapter is removed, the data is maintained in non-volatile memory.

▫ It is not necessary to connect the printer or personal computer to the balance continually, because the balance stores the weighing data in memory.

▫ The data in memory can be output at one time to a printer or personal computer.

▫ The data in memory can be displayed on the balance for confirmation.

▫ Data (ID number, data number, time and date) to be added to the output data can be selected in the function setting.

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 ($dAtA$)" parameter to "1".

2. Specify the "Time/Date output ($S-td$)" parameter whether time and date is to added or not.

3. The storing mode depends on the "Data output mode (Prt)" parameter setting.
   Four types of storing 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 modes 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 modes 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 memory mode·····Weighing data is stored at an interval specified in "Interval time (int)". Press the PRINT key to start and stop this mode.

56
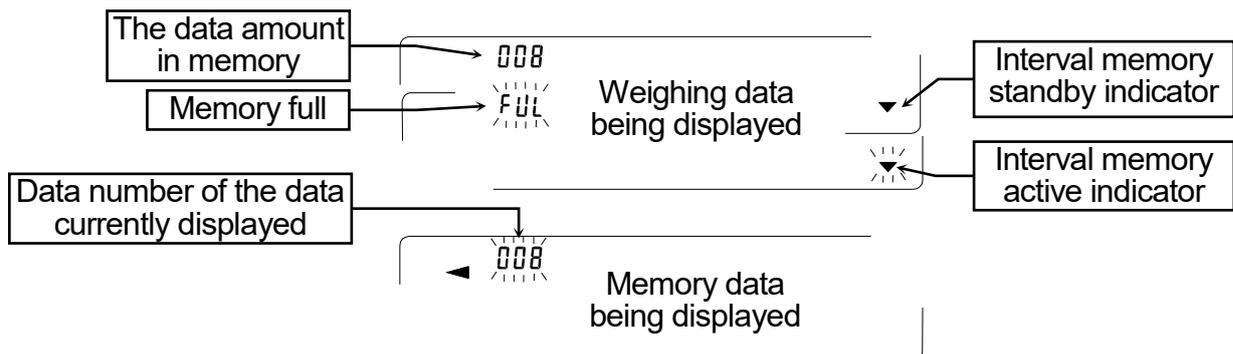
Caution

- When weighing data is being stored in memory, the data can not be output to a personal computer using the RS-232C interface.

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

- Automatic self calibration can not be used while the interval memory mode is active.

- The following commands can not be used during data storage.

Q	Query command for weighing data.
S	Query command for stable weighing data.
SI	Query command for weighing data.
SIR	Query command for continuous weighing data.

Setting the function table

Parameter settings for each output mode are as follows:

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

Additional parameter settings, as follows:

Data number	No	*d-no 0*		Time and date	No	*S-td 0*
	Yes	*d-no 1*			Time only	*S-td 1*
ID number	No	*S-id 0*			Date only	*S-td 2*
	Yes	*S-id 1*			Both	*S-td 3*

Enabling the data memory function

1. Press and hold the [RANGE] key (for approx. 2 seconds) until [*bASFnc*] is displayed, then release the key.
2. Press the [RANGE] key several times to display [*dout*].
3. Press the [PRINT] key.
4. Press the [RANGE] key three times to display [*dAtA 0*].
5. Press the [RE-ZERO] key to display [*dAtA 1*].
6. Press the [PRINT] key to store the setting.
7. Press the [CAL] key to return to the weighing mode.

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, then release the key.

2. Press the ‎ PRINT ‎ key to enter the memory recall mode. The type of data appears in the upper left of the display as shown to the right. 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 (5 iF)" parameters are set properly. Refer to "10. Function Table" and "15-2. Connection To Peripheral Equipment".

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

Indicators

-d-

Weighing data
without time and date

d-t

Weighing data with
time and date

Deleting all memory data at one time

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

12-3. Data Memory for Calibration and Calibration Test

- 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" illuminates in the upper left of the display as shown below.

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".
2. Set the "GLP output ($info$)" parameter to "1" or "2".
3. With the settings above, each time calibration or calibration test is performed, the data is stored automatically.

Transmitting the memory data

Note

- Confirm that the "Serial interface (SiF)" parameters are set properly. Refer to "10. Function Table" and "15-2. Connection 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, then release the key.

In the upper left of the display

HiS

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.

Deleting data stored in memory

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

2. Press the SAMPLE 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 out and returns to the weighing mode when all the data has been deleted.

In the upper left of the display

H_iS

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, the weighing pan, pan support, breeze break ring and dust plate will fall off. 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.

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.
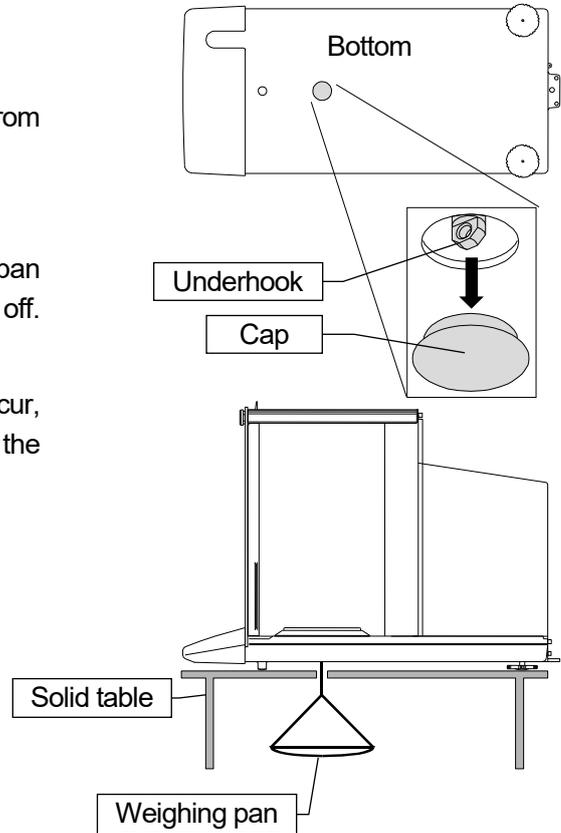
14. Density Measurement

The balance is equipped with a density mode. It calculates the density of a solid using the mass value of a sample in air and the mass value in liquid.

Note

▫ The density mode was not selected for use when the balance was shipped from the factory. To use the mode, change the function table and activate the density mode.

▫ When the density mode is selected, the response adjustment function can not be used.

▫ Readability is 0.0001 g while 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 : Mass value of a sample in air
- B : Mass 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 available as one of the weighing units. Select it by pressing the ⎡MODE⎤ key. To use the mode, select it (unit of ⎡ Un it d ⎤.) in the function table. Refer to "5-2. Changing Units".

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

Note

The function table is available only when the density mode (d5Fnc) is selected. d5Fnc is displayed next 5 iF when density mode is active at Un it.

Class	Item and Parameter		Description
d5 Fnc	Ld in	▪ 0	Water temperature
Density function	Liquid density input	1	Liquid density

▪ is 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. When the density mode begins, "g (gram)" is displayed and the processing indicator (◄) blinks.

$$\boxed{\quad 0.0000\ {}_g}$$

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

2. The water temperature currently set (unit:°C, factory setting : 25°C) is displayed. Use the following keys to change the value.

$$\boxed{t \qquad 25}$$

      RE-ZERO (+)key ······ The key to increase the temperature by one degree.
                            (0°C is displayed after 99°C)

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

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

      CAL key .... The 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
50	0.98804	0.98758	0.98712	0.98665	0.98618	0.98570	0.98521	0.98471	0.98422	0.98371
60	0.98320	0.98268	0.98216	0.98163	0.98110	0.98055	0.98001	0.97946	0.97890	0.97834
70	0.97777	0.97720	0.97662	0.97603	0.97544	0.97485	0.97425	0.97364	0.97303	0.97242
80	0.97180	0.97117	0.97054	0.96991	0.96927	0.96862	0.96797	0.96731	0.96665	0.96600
90	0.96532	0.96465	0.96397	0.96328	0.96259	0.96190	0.96120	0.96050	0.95979	0.95906

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

3. 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.

$$\boxed{d \qquad 1.0000}$$

      RE-ZERO (+)key ·····The key to set the value of the digit selected.

      RANGE (-)key ········The key to select the digit to change the value.

      PRINT key ·············The key to store the change, display End and return to the density mode. Proceed to Step 1.

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

Measuring the density

Note

If the liquid temperature or the type of liquid is changed during measurement, input again the value of the liquid density as necessary. Density display is four decimal places. Readability can not change with the RANGE key.

Denisty is displayed after "Mass measurement in air" and "Mass measurement in liquid". The procedure of each measurements is as follows:

1. Enter the density mode that "g (gram)" is displayed and the processing indicator (◄) blinks. Place nothing on both pan and press the RE-ZERO key to display zero.

2. Place the sample on the pan in air.
   If the weight value is stored or output, press the PRINT key to store it after a stable weight value is displayed.
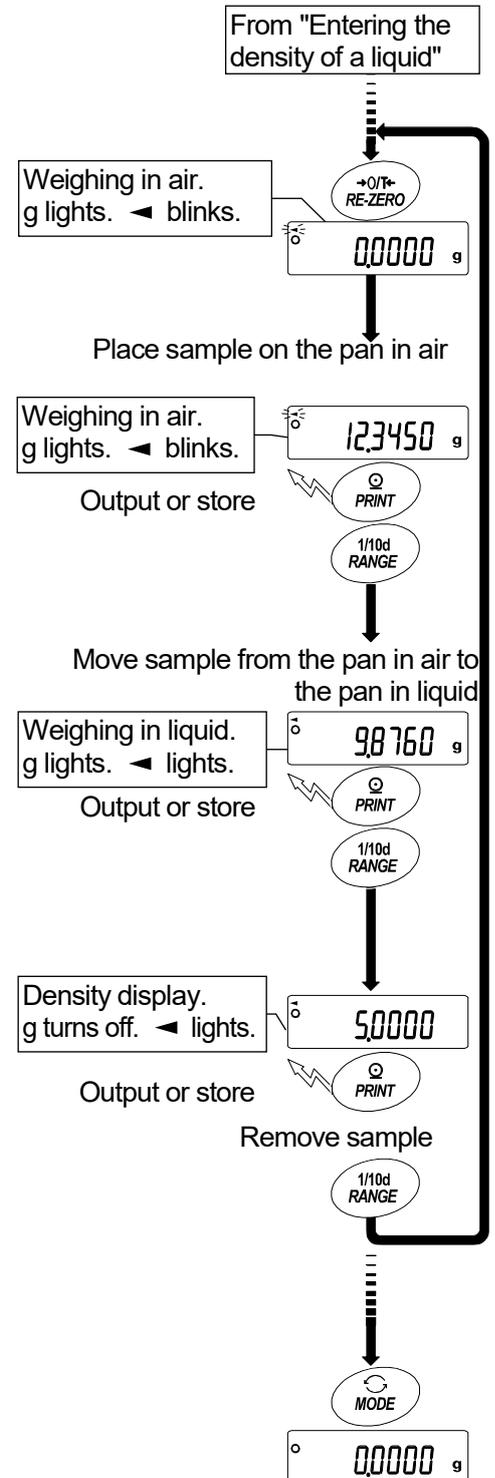   Press the RANGE key to decide the weight value in air and proceed to next step.

   Note
   If negative value or E (out of range) is displayed, the RANGE key is inactive.

3. Move the sample to the pan in liquid.
   If the weight value is stored or output, press the PRINT key to store it after a stable weight value is displayed. Press the RANGE key to decide the weight value in liquid and proceed to next step.

   Note
   If E (out of range) is displayed, the RANGE key is inactive.

4. If the density value is stored or output, press the PRINT key to store it. Press the RANGE key to measure other sample and proceed to step 2.

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

6. Press the MODE key to proceed to other modes.

From "Entering the density of a liquid"

→0/T←
RE-ZERO

Weighing in air.
g lights. ◄ blinks.

0.0000 g

Place sample on the pan in air

Weighing in air.
g lights. ◄ blinks.

12.3450 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.

9.8760 g

Output or store

PRINT

1/10d
RANGE

Density display.
g turns off. ◄ lights.

5.0000

Output or store

PRINT

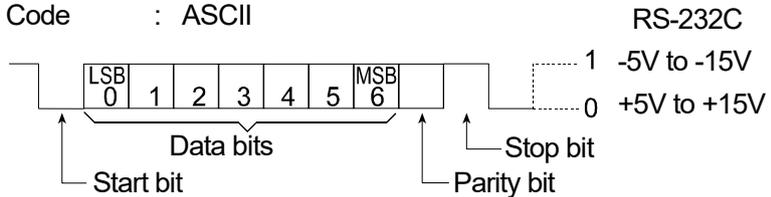Remove sample

1/10d
RANGE

MODE

0.0000 g

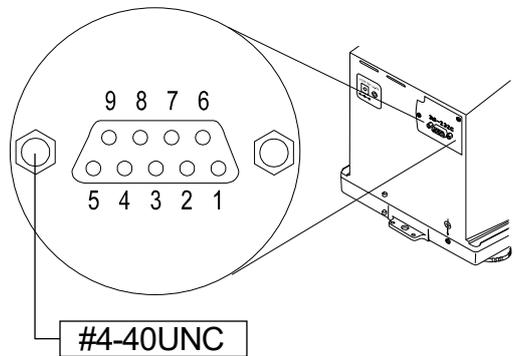# 15. Standard Input and Output Interface

15-1. 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, 19200bps
		Data bits : 7 or 8 bits
		Parity : Even, Odd (Data bits 7 bits)
		None (Data bits 8 bits)
		Stop bit : 1 bit
		Code : ASCII

RS-232C

1   -5V to -15V

0   +5V to +15V

LSB 0 1 2 3 4 5 MSB 6

Data bits — Stop bit — Start bit — Parity bit

D-Sub 25 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

9 8 7 6
5 4 3 2 1

#4-40UNC

All signal names mean name for the DTE side.

Balance side DCE		Computer side DTE
RXD 2	▶	RXD
TXD 3	◀	TXD
+5V RTS 7	◀	RTS
3.3kΩ CTS 8	▶	CTS
DSR 6	▶	DSR
SG 5		SG
Inside of balance		Terminal example
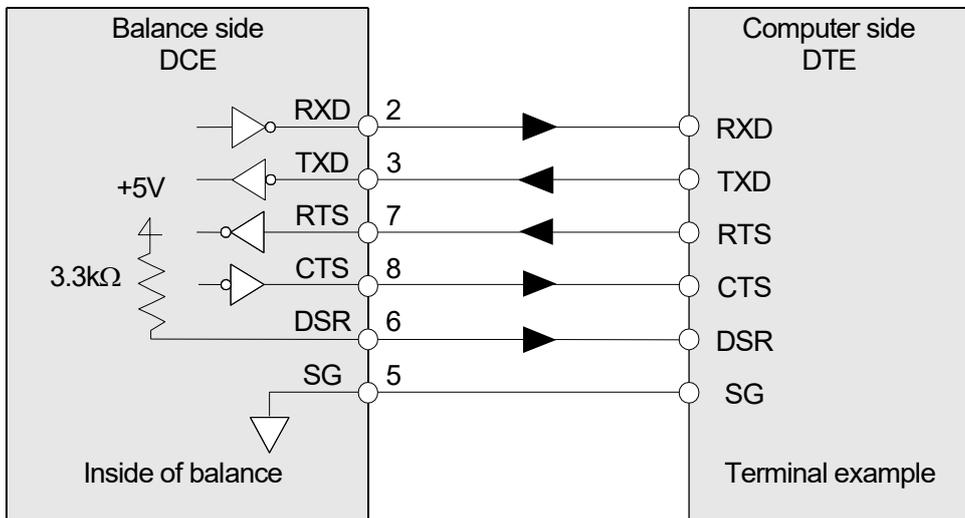
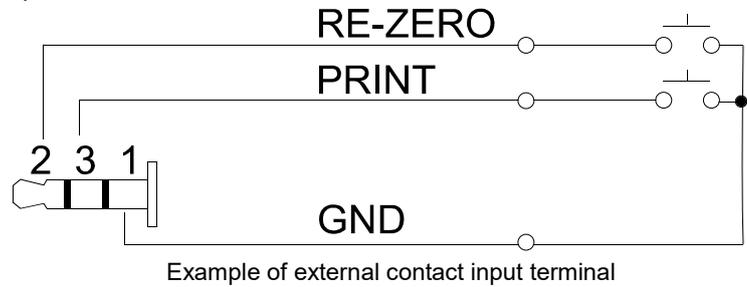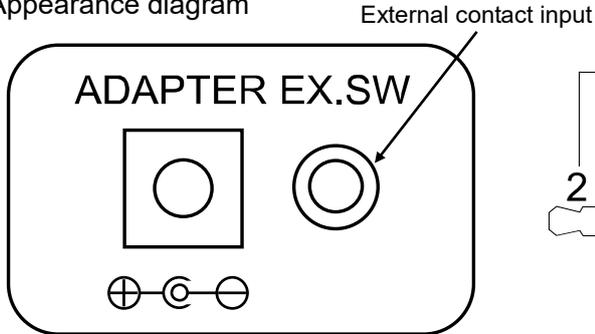## 15-2. External Contact Input

External contact input terminal   Compatible plug: φ3.5 mm 3-pole stereo plug

MP-013LC or the equivalent

Appearance diagram

Example of external contact input terminal

External contact input circuit   Pin assignments
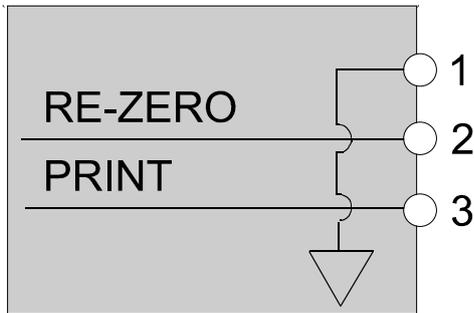
Pin No.	Description
1	GND
2	RE-ZERO External contact input
3	PRINT External contact input

When pin1 and pin 3 or pin1 and pin2 are shorted 100 ms or longer, the switch can operate the balance in the same way as the balance PRINT key or the RE-ZERO key, respectively.

□ AX-SW137-PRINT or AX-SW137-REZERO (optional foot switches sold separately) can be used.

Connection to an AD-8121B printer

Preset the following parameters to use the AD-8121B printer.

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	Not necessary	#1
	AP-b Auto print difference		*1*			
	d-no Data number output		*0*	*0*	*0*	*0,1*
	S-td Time/Date output		*0*	*0*	*0*	*0,1,2,3*
	S-id ID number output		*0*	*0*	*0*	*0,1*
	PUSE Data output pause		*0*	*0*	*0*	*0,1* #2
	At-F Auto feed		*0*	*0*	*0*	*0,1*
S iF Serial interface	*bPS* 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*
	CtS CTS, RTS control		*0*	*0*	*0*	*0*

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

#2   Set *1* when multiple lines are printed. Example: When appending ID number, set *1*.

Notes

□   Refer to "11-2. GLP Report" concerning print samples.

□   Settings of AD-8121B

MODE	AD-8121B DIP switch	Description
MODE 1		Print at receiving data. Standard mode, statistic 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   Print

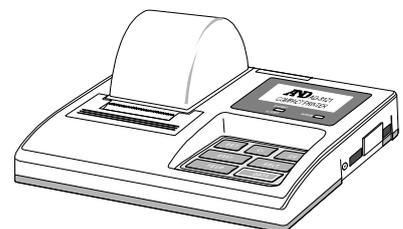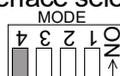   OFF Not printed
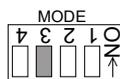
DIP switch No.4 : Data input specifications (Interface selection)

    ON   Current loop

    OFF RS-232C

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.	MANUAL AUTO TIMER
When printing charts with the printer.	CHART
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.

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.)

15-4. Commands

15-4-1 Command List

Note

A command has a terminator added, that is specified using "5 ιF ΕrLF" of the function table, and is sent to the balance.

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.
OFF	Turns the display off.
ON	Turns the display on.
P	Same as the ⸤ON:OFF⸥ key
PRT	Same as the ⸤PRINT⸥ key
R	Same as the ⸤RE-ZERO⸥ key [Note 1]
RNG	Same as the ⸤RANGE⸥ key.
TR	Tares the balance (Cancels the container's weight.) [Note 1]
TST	Perform calibration test.
U	Same as the ⸤MODE⸥ key

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

Command to set data	
PT:***.**** ⸤⸥	Sets the tare value. [Note 1]

Note

- □ R command assumes the point as zero and sets the display to zero.
- □ TR command cancels the tare weight when the displayed value is greater than zero.
  The canceled tare value can be read using the ?PT command.
- □ PT: command 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.
  - 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.

15-4-2 Acknowledge Code and Error Codes

When the "Serial interface function (5ᵢF)" parameter is set to "ErCd 1", 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 can not 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 can not 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.

    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 can not be processed properly, the balance transmits an error code (EC, Exx). This error can be released using the CAL command.
    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. In this case, send the command again.

    xx is error code number.

15-4-3 Control Using CTS and RTS

Depending on the "CtS" parameter of "Serial interface (5ᵢF)", the balance performs as follows:

CtS 0
Regardless of whether the balance can receive a command or not, the balance keeps the CTS line HI. The balance outputs data regardless of the condition of the RTS line.

CtS 1
The CTS line is kept Hi normally. When the balance can not receive the next command (Example: while the balance is processing the last command), the balance sets the CTS line to Lo. The balance confirms the level of the RTS line before outputting a set of data. If the RTS level is Hi, the balance outputs data. If the RTS level is Lo, data is not output (The data is canceled).
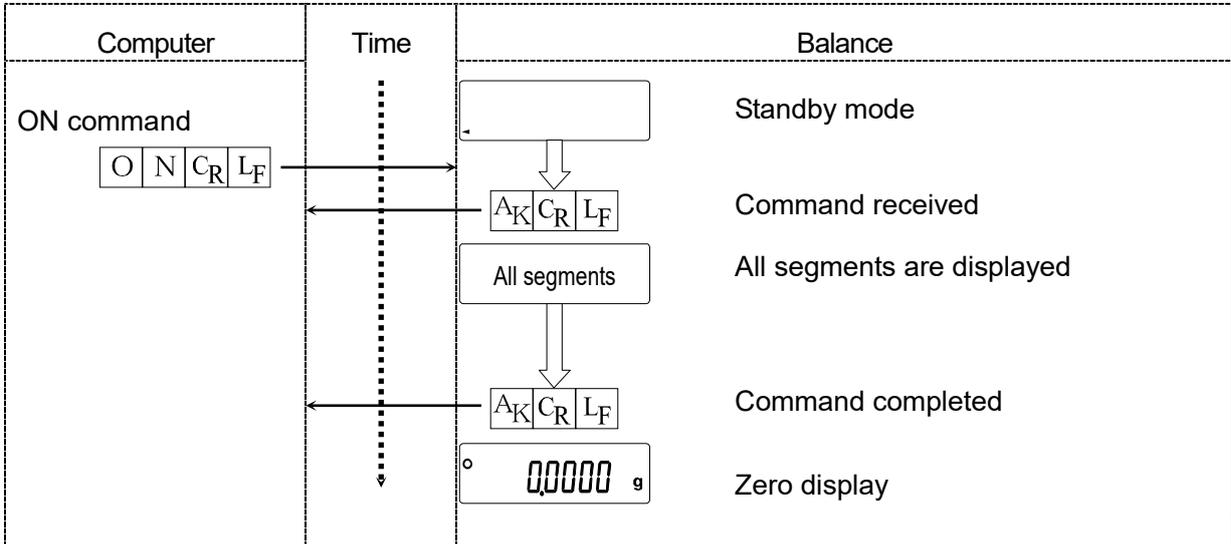
15-4-4 Settings Related to RS-232C

Concerning the RS-232C, the balance has two functions: "Data output (dout)" and "Serial interface (5ᵢF)". Set each function as necessary.
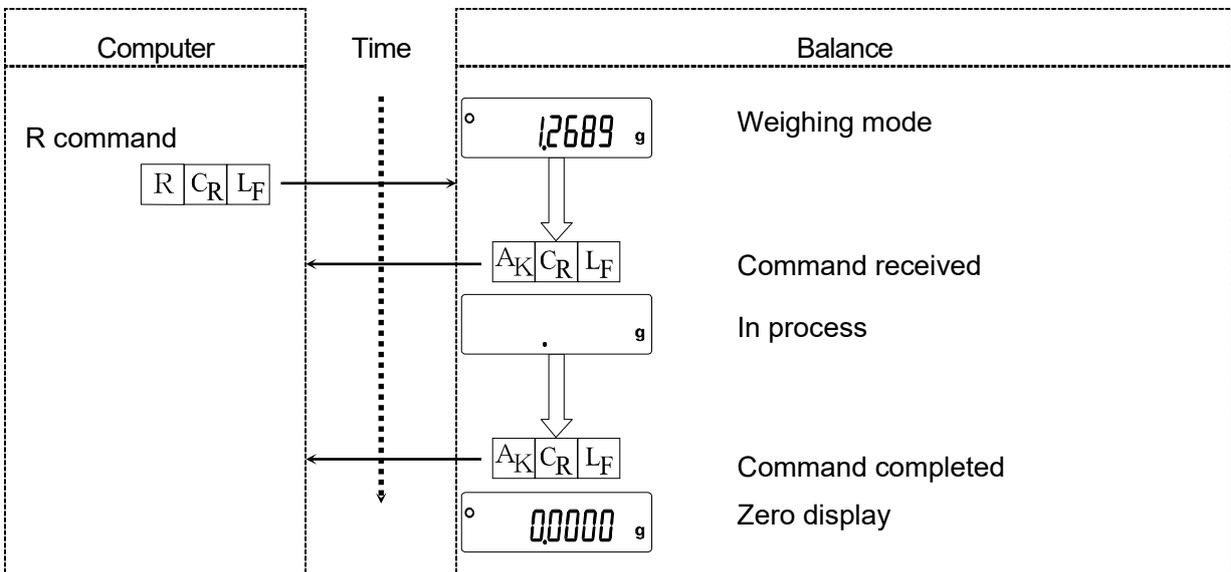
15-4-5 Command Examples

This example uses the "$ErCd\ 1$" of "SiF" so that the <AK> (06h) code is output.
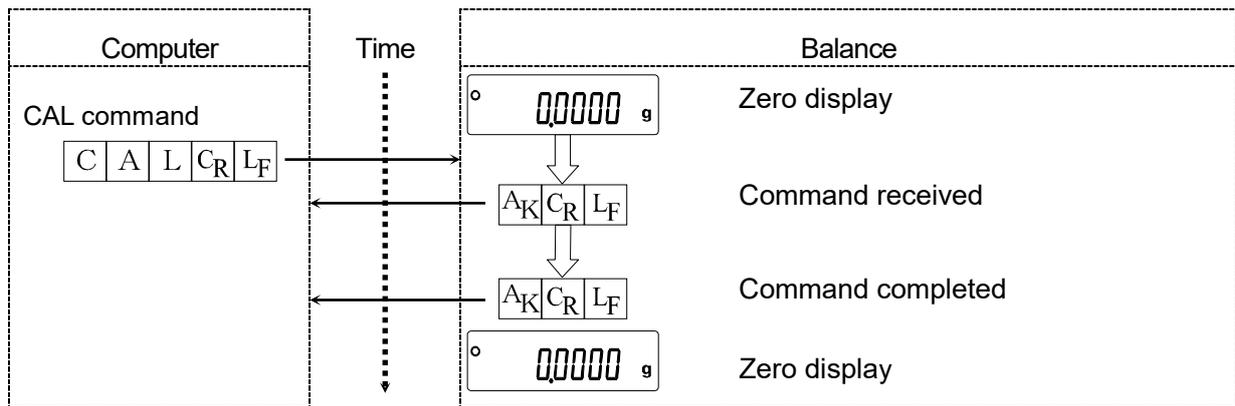
ON command (turning on the balance)

Computer	Time	Balance	
ON command [O][N][C_R][L_F]			Standby mode
		[A_K][C_R][L_F]	Command received
		All segments	All segments are displayed
		[A_K][C_R][L_F]	Command completed
		° 0.0000 g	Zero display

R command (Re-zeroing the display)

Computer	Time	Balance	
R command [R][C_R][L_F]		° 1.2689 g	Weighing mode
		[A_K][C_R][L_F]	Command received
		. g	In process
		[A_K][C_R][L_F]	Command completed
		° 0.0000 g	Zero display

CAL command (Calibration with internal mass)

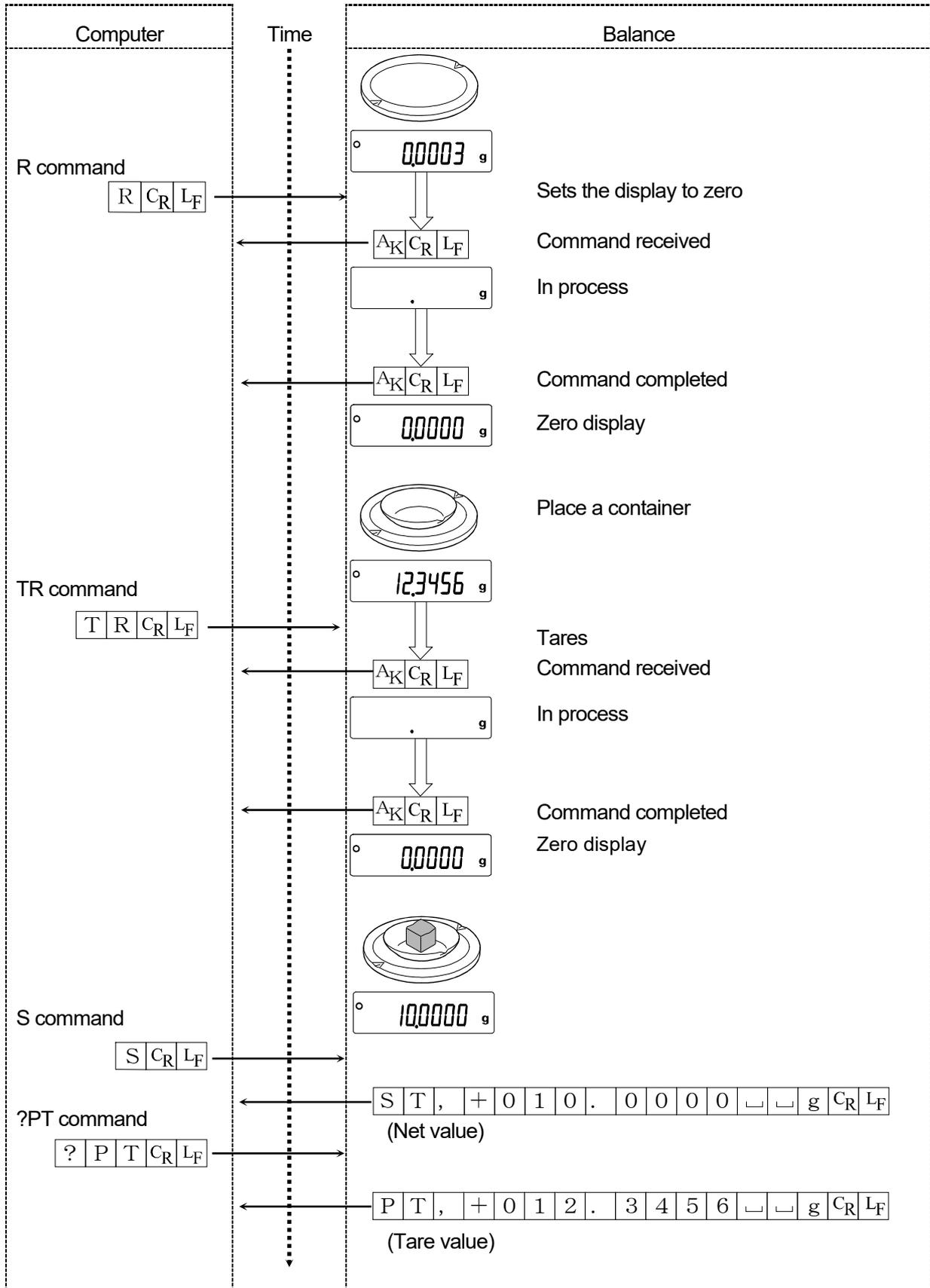| Computer	Time	Balance	
CAL command		° 0.0000 g	Zero display
C A L C_R L_F	→	A_K C_R L_F	Command received
	←	A_K C_R L_F	Command completed
	←	° 0.0000 g	Zero display

Error code

This example is of an error using the R command. "$ErCd\ 1$" is used. The balance transmits an error code when the received command can not be achieved.
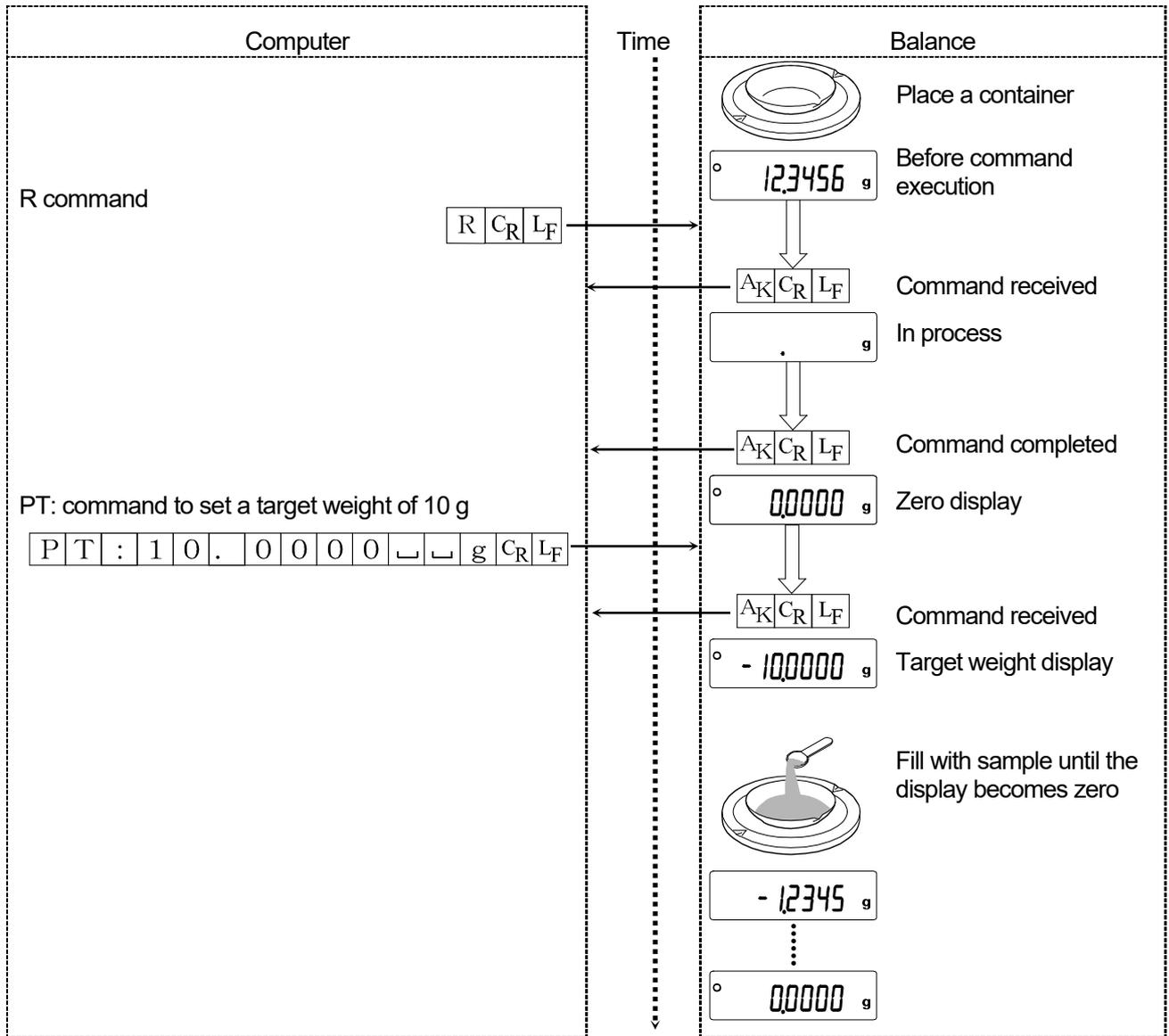
Computer	Time	Balance	
R command		12.6970 g	Weighing mode (unstable)
R C_R L_F	→	A_K C_R L_F	Command received
	←	. g	In process
			When the R command can not be achieved due to unstable weighing:
		E C , E 1 1 C_R L_F	Error code
		Error 1	
CAL command			When the CAL command is received, the balance returns to the weighing mode
C A L C_R L_F	→	A_K C_R L_F	Command completed
	←	12.6510 g	Weighing mode
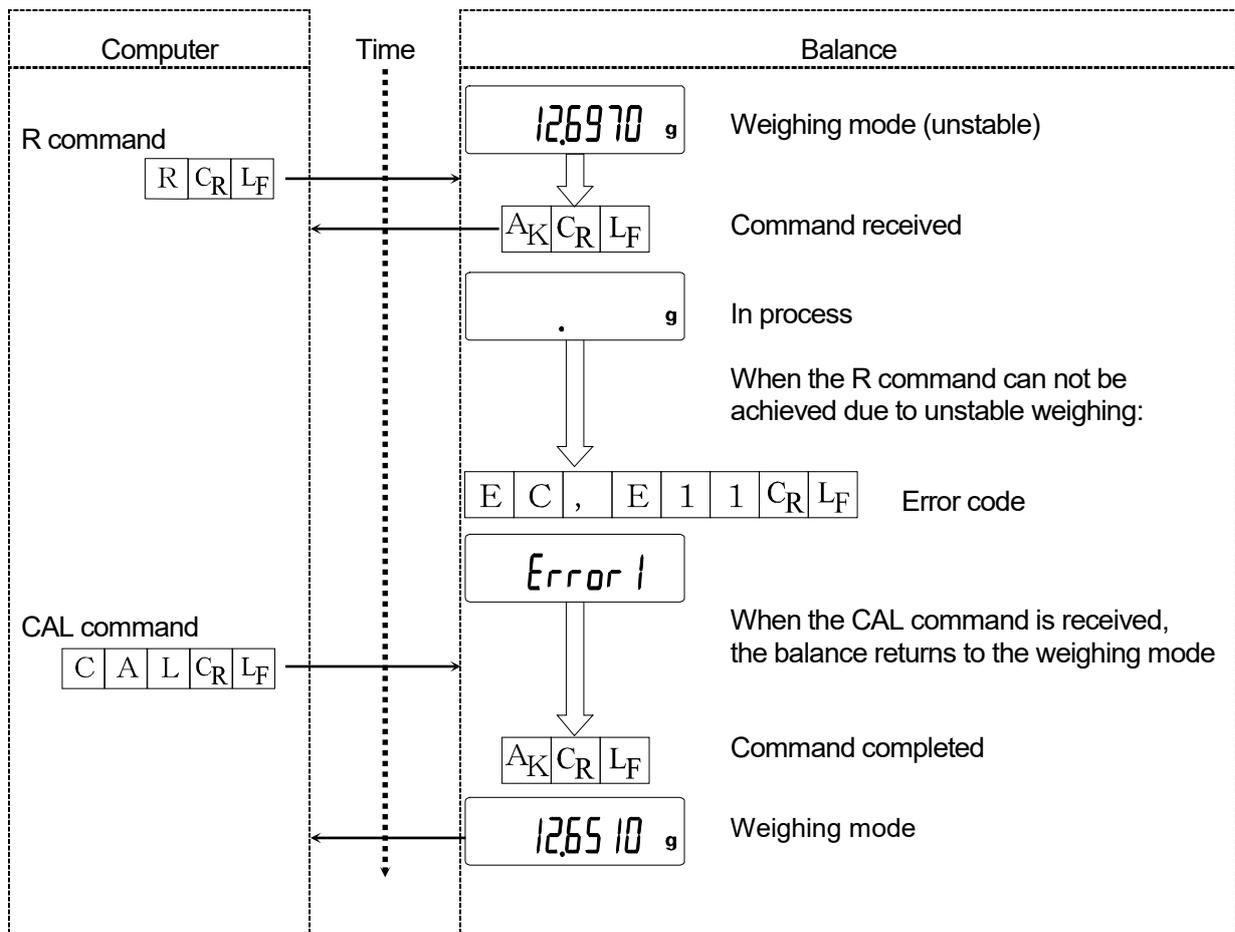
15-4-6 The Example of Weighing with a Tare

This example uses "ErCd 1" of "SiF" so that the <AK> (06h) code is output.

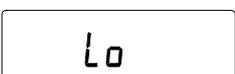| Computer	Time	Balance

R command

| R | C_R | L_F |

Sets the display to zero

| A_K | C_R | L_F |

Command received

In process

| A_K | C_R | L_F |

Command completed

Zero display

Place a container

TR command

| T | R | C_R | L_F |

Tares
Command received

In process

| A_K | C_R | L_F |

Command completed
Zero display

S command

| S | C_R | L_F |

| 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)

15-4-7 The Example of Setting a Negative Target Value and Filling with a Sample until the Display Becomes Zero

This example uses "*ErCd 1*" of "*SiF*" so that the <AK> (06h) code is output.

Computer	Time	Balance
		Place a container
		123456 g — Before command execution
R command		
R CR LF →		
	← AK CR LF	Command received
		. g — In process
	← AK CR LF	Command completed
PT: command to set a target weight of 10 g		0.0000 g — Zero display
P T : 1 0 . 0 0 0 0 ⎵ ⎵ g CR LF →		
	← AK CR LF	Command received
		- 10.0000 g — Target weight display
		Fill with sample until the display becomes zero
		- 1.2345 g
		⋮
		0.0000 g

16. Maintenance

16-1. Treatment of 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. Precautions" when operation the balance.

16-2. Error Codes

Display	Error code	Description
Error 1	EC, E11	**Stability error** The balance can not stabilize due to an environmental problem. Check around the pan. Prevent vibration, drafts, temperature changes, static electricity and magnetic fields, from influencing the balance. To return to the weighing mode, press the CAL key.
Error6	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.
Error7	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 mass 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 mass value. Press the CAL key to return to the weighing mode.
E		**Overload error** A sample beyond the balance weighing capacity has been placed on the pan. Remove the sample from the pan.
-E		**Weighing pan Error** The mass value is too light. Confirm that the weighing pan is properly installed and calibrate the balance.
Lo		**Sample mass error** The balance can not store the sample for the counting mode or for the percent mode because it is too light. Use a larger sample.
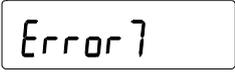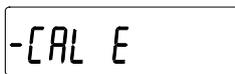
Display	Error code	Description
`25 - pcs` `50 - pcs` `100 - pcs`		**Unit mass error** The sample unit mass for the counting mode is too light. Storing and using it for counting will cause a counting error. Add samples to reach the specified number and press the PRINT key. Pressing the PRINT key without adding samples will shift the balance to the counting mode. But, for accurate counting, be sure to add samples.
`CH 0`		**Automatic response adjustment zero error** The automatic response adjustment can not 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 can not 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** The stored data were destroyed. To use the memory function, erase all the old data and release the error. For details, refer to "12.1. Notes on Using Data Memory".
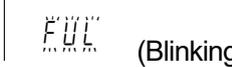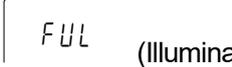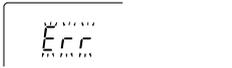
Display	Error code	Description
	EC, E00	**Communications error** A protocol error occurred in communications. Confirm the format, baud rate and parity.
	EC, E01	**Undefined command error** An undefined command was received. Confirm the command.
	EC, E02	**Not ready** A received command can not be processed. Example: ☐ 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** If the timeout parameter is set to "t-UP 1", 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 can not be released or other errors are displayed, contact the local A&D dealer.

16-3.Other Display
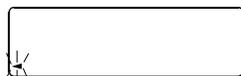
When this indicator blinks, automatic self calibration is required. The indicator blinks when the balance detects changes in ambient temperature. If the balance is not used for several minutes with this indicator blinking, the balance performs automatic self calibration. The blinking period depends on the operating environment.

Advise

The balance can be used while this indicator is blinking. We recommend that you perform automatic self calibration for precision weighing.

16-4. Checking the Balance Performance and Environment

The balance is a precision instrument. When the operating environment or the operating method is inadequate, correct weighing can not 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 rim 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 breeze break ring installed for weighing with a readability of 0.01 mg for the GH-252 and GH-202?

- □ Has the balance been calibrated using the internal mass (one-touch calibration)?

- □ 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 sample of magnetic material such as iron? There are cautions about weighing magnetic materials.

Checking that the balance performs properly

- □ Check the balance performance 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 external weights with a known value.

16-5. Asking for Repair

If the balance needs service or repair, please consult with 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.
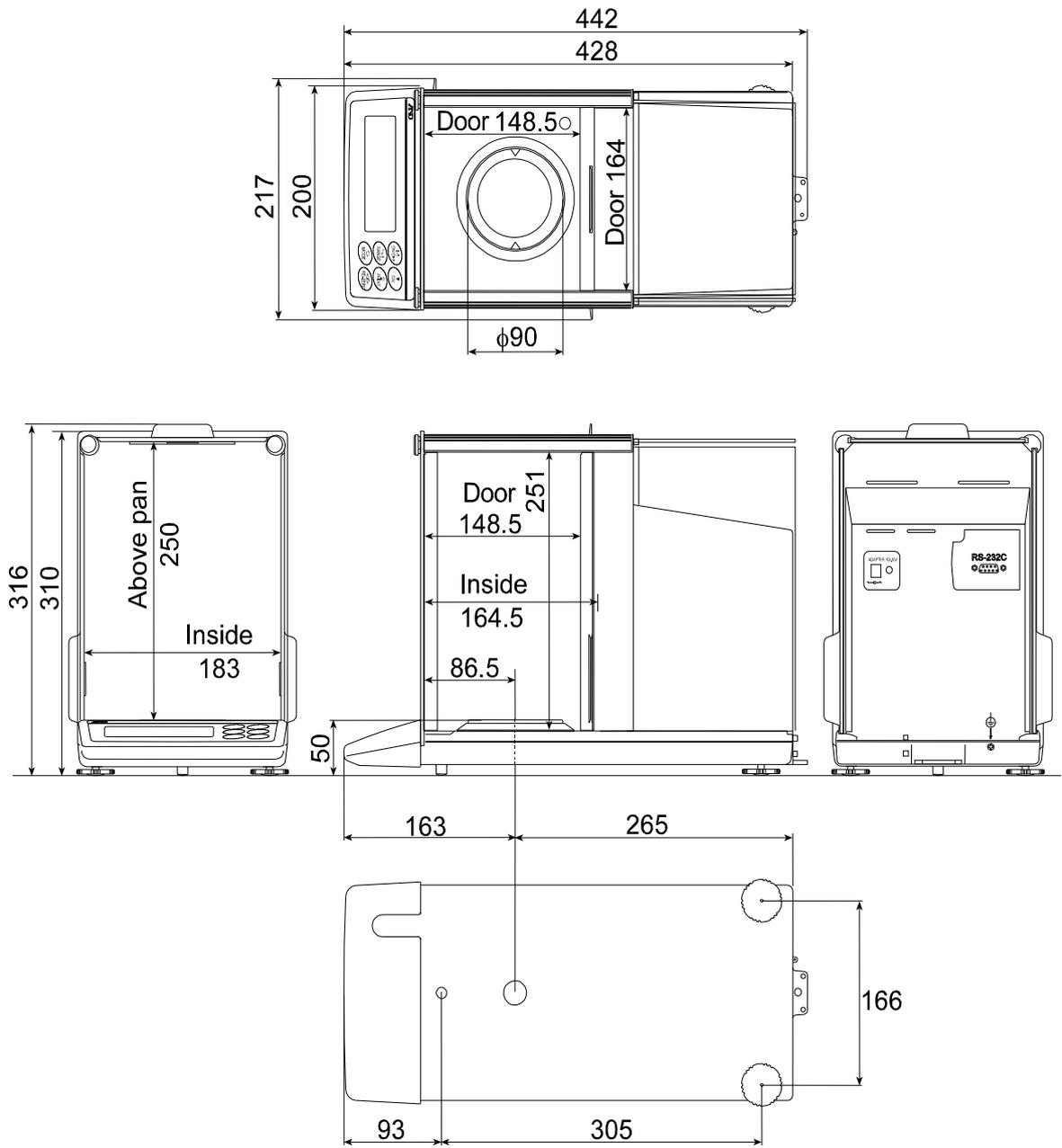
☐ Use the original packing material for transportation.

☐ Remove the weighing pan, pan support, breeze break ring and dust plate from the main unit.

17. Specifications

	GH-120	GH-200	GH-300	GH-202	GH-252
Weighing capacity	120 g	220 g	320 g	220 g	250 g
				51 g	101 g
Maximum display	120.0084 g	220.0084 g	320.0084 g	220.0084 g	250.0084 g
				51.00009 g	101.00009 g
Readability	0.1 mg			0.1 mg	
				0.01 mg	
Repeatability (Standard deviation)	0.1 mg		0.2mg	0.1 mg	
				0.02 mg	0.03 mg
Linearity	±0.2 mg		±0.3 mg	±0.2 mg	
				±0.03 mg	±0.10 mg
Stabilization time (Typical at FAST)	Approx. 3.5 seconds			Approx. 3.5 seconds	
				Approx. 8 seconds	
Sensitivity drift, 10°C to 30°C / 50°F to 86°F	±2 ppm/°C				
Operating environment	5°C to 40°C, 85%RH or less (No condensation)				
Display refresh rate	5 times/second or 10 times/second				
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	10.0 mg				
Percent mode — % readability	0.01 %, 0.1 %, 1 % (Depends on the reference mass stored.)				
Interface	RS-232C				
Applicable weights for calibration	100g 50g	200g 100g	300g 200g 100g	200g 100g 50g 20g	
Weighing pan	φ90 mm				
External dimensions	217(W) x 442(D) x 316(H) mm				
Mass	Approx. 8.2 kg				
Power supply & AC adapter type	Power consumption: Approx. 30VA (supplied to the AC adapter) Confirm that the adapter type is correct for the local voltage and power receptacle type.				
Current consumption	DC12V, approx. 0.3A (excluding the AC adapter and options)				

□ The operating environment does not include excessive change of ambient temperature, humidity, vibration, drafts, 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.

17-1. External Dimensions

442
428

Door 148.5○
Door 164

217
200

φ90

Above pan 250
Inside 183

316
310

Door 251
148.5
Inside 164.5
86.5

50

RS-232C

163
265

166

93
305

Unit: mm

17-2. Options and Peripheral Equipment
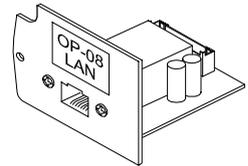
GH-02 USB interface

▫ The interface to connect a balance to a personal computer, and is used to transmit the balance weight data to the personal computer via USB. Applicable OS is Windows 98 or later.

▫ As the Windows standard driver is used to transmit the weighing data, complicated installation of a dedicated driver is not necessary.

▫ The balance weighing data can be transmitted to applications such as Excel, Word and memo pad for Windows automatically.

▫ To perform bi-directional communications using WinCT or to output GLP data to a personal computer by using the personal computer USB interface, use the AX-USB-9P USB converter.
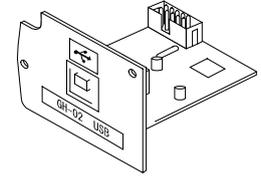
GH-08 Ethernet Interface

▫ The interface to connect the balance to a LAN.

▫ Accessory: The "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.

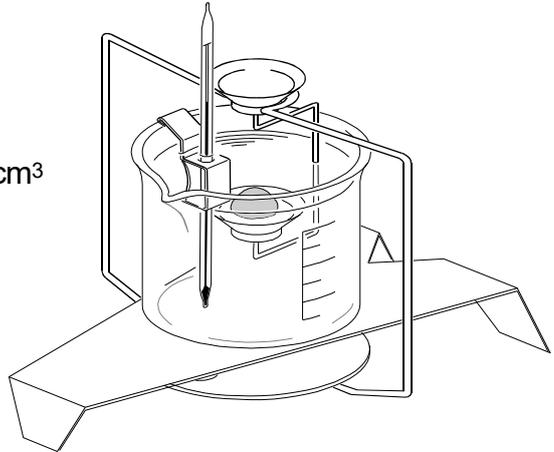■ The stored data can be used with Microsoft EXCEL (if installed).

AD-1653 Density Determination Kit

$$\frac{\text{Weigh in air}}{\text{Weigh in water - Weigh in the air}} \times \text{water density} = \text{sample density}$$

Example:

$$\frac{10.0000 \text{ g}}{10.0000 \text{ g} - 9.5334 \text{ g}} \times 0.9970 \text{ g/cm}^3 = 21.4 \text{ g/cm}^3$$

Temperature	Water density
0°C	0.99984 g/cm^3
10°C	0.99970 g/cm^3
20°C	0.99820 g/cm^3
30°C	0.99565 g/cm^3

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 readability 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-9P: 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 / GH / HR-*i* 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/AD-1683A: Ionizer

- Static eliminator that prevents error which can be caused when weighing samples are electrically charged.
- Its direct-current system and plentiful ion content enable weighing without breeze, which is ideally suited for precisely measuring powder and such.
- The built-in IR Sensor enables removal of static electricity in a touchless way. (AD-1683A only)

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 an ionizer such as AD-1683A.

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-KO5363-30: Connection cable for a weighing device with D-sub25 pin
- The AD-8529PC-W or AD-8529PR-W (Bluetooth converter) can be connected to the GH series balances using this optional cable.

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.

18. 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 readability 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	The weight that you have.
GLP	Good Laboratory Practice.
GMP	Good Manufacturing Practice
Internal mass	Built-in calibration weight
ISO	International Organization for Standardization
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: This means that measured values, obtained when the same sample is placed and removed repetitively, fall within ±1 digit in the frequency of about 68%.
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. 0.0002%/°C x 10°C x 10g = 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 mass	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.

AND

A&D Company, Limited
3-23-14 Higashi-Ikebukuro, Toshima-ku, Tokyo   170-0013,   JAPAN
Telephone: [81] (3) 5391-6132   Fax: [81] (3) 5391-1566

A&D ENGINEERING, INC.
1756 Automation Parkway, San Jose, California   95131,   U.S.A.
Telephone: [1] (408) 263-5333   Fax: [1] (408)263-0119

A&D INSTRUMENTS LIMITED
Unit 24/26 Blacklands Way, Abingdon Business Park, Abingdon, Oxfordshire   OX14 1DY   United Kingdom
Telephone: [44] (1235) 550420   Fax: [44] (1235) 550485

A&D AUSTRALASIA PTY LTD
32 Dew Street, Thebarton, South Australia   5031,   AUSTRALIA
Telephone: [61] (8) 8301-8100   Fax: [61] (8) 8352-7409

A&D KOREA Limited   한국에이.엔.디(주)
서울특별시 영등포구 국제금융로6길33 (여의도동) 맨하탄빌딩 817   우편 번호 07331
(817, Manhattan Bldg., 33. Gukjegeumyung-ro 6-gil, Yeongdeungpo-gu, Seoul,   07331   Korea)
전화: [82] (2) 780-4101   팩스: [82] (2) 782-4264

OOO A&D RUS   OOO "ЭЙ энд ДИ РУС"
Почтовый адрес:121357, Российская Федерация, г.Москва, ул. Верейская, дом 17
Юридический адрес: 117545, Российская Федерация, г. Москва, ул. Дорожная, д.3, корп.6, комн. 8б
(121357, Russian Federation, Moscow, Vereyskaya Street 17)
тел.: [7] (495) 937-33-44   факс: [7] (495) 937-55-66

A&D Instruments India Private Limited   ऐ&डी इन्स्ट्रूमेन्ट्स इण्डिया प्रा0 लिमिटेड
509, उद्योग विहार , फेस –5, गुड़गांव – 122016, हरियाणा , भारत
(509, Udyog Vihar, Phase-Ⅴ, Gurgaon – 122016, Haryana, India)
फोन : [91] (124) 4715555   फैक्स : [91] (124) 4715599

A&D SCIENTECH TAIWAN LIMITED.   **A&D**台灣分公司 艾安得股份有限公司
台湾台北市中正區青島東路 5 號 4 樓
(4F No.5 Ching Tao East Road, Taipei Taiwan R.O.C.)
Tel : [886](02) 2322-4722   Fax : [886](02) 2392-1794

A&D INSTRUMENTS (THAILAND) LIMITED   บริษัท เอ แอนด์ ดี อินสทรูเม้นท์ (ไทยแลนด์) จำกัด
168/16 หมู่ที่ 1 ตำบลรังสิต อำเภอธัญบุรี จังหวัดปทุมธานี 12110 ประเทศไทย
(168/16 Moo 1, Rangsit, Thanyaburi, Pathumthani 12110 Thailand)
Tel : [66] 20038911