

High-Precision Tuning Fork Electronic Balance

A B(R) Series

Operation Manual

IMPORTANT

- To ensure safe and proper use of the balance, please read this manual carefully.
- After reading this manual, store it in a safe place near the balance, so you can review it as needed.

SHINKO DENSHI CO., LTD.

Preface

Thank you for purchasing our AB(R) series.

The AB(R) series has the following features:

- The tuning-fork high-accuracy mechanism allows precise weighting.
- This product works well in various applications including part inventory management using a counting balance, comparison measurement using a percent balance, and fixed-quantity filling using the limit function.

Instructions

- This manual is copyrighted by SHINKO DENSHI CO., LTD. and may not be reproduced in part or in whole without permission.
- Please understand that part of this manual may not agree with the product due to modifications or other such changes to it.
- Descriptions in this manual are subject to change without notice.
- This manual is created with all possible care. However, in the unlikely event of an incorrect description or any other errors, please tell us.
- If any pages are bound in incorrect order or are missing, we will replace the manual. Please contact the retailer from whom the balance was purchased.
- Trouble with the equipment and the system's main unit will be serviced in accordance with their maintenance contracts. However, please be aware that we will not be held responsible for any indirectly related trouble that may occur such as operations being stopped due to the trouble of the main unit.
- **VIBRA** is the registered trademark of SHINKO DENSHI CO., LTD. The company names and product names described in this manual are either their trademarks or registered trademarks.

Important Notice



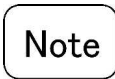





- You must be aware that the balance can potentially be dangerous. Be sure to follow this manual when you install and operate the balance, and perform maintenance and inspections.
 - SHINKO DENSHI CO., LTD. takes no responsibility for any injury or damage caused because you did not follow this manual or the balance was incorrectly used or modified without permission.
- In today's industrial equipment industry, potential risks are increasing due to new materials, process methods, and faster machines. It is impossible to predict all situations that pose such threats. In addition, there are too many "do's" and "do not's," to be able to cover them all in this manual. If the operation manual does not explicitly say that something is OK to do, please interpret it as a "do not." When installing or operating the balance, or performing maintenance or inspections on it, give due consideration to safety measures in addition to the instructions written in this manual and those written on the balance's main unit.
 - This manual is copyrighted by SHINKO DENSHI CO., LTD. All rights reserved. Do not reproduce or disclose drawings and technical documents without prior written consent from SHINKO DENSHI CO., LTD.
 - If you have any questions about this manual or you need more detailed information, please have the model name (type) and the manufacture number ready and contact the retailer from whom the balance was purchased.

How to Use This Manual

■ Symbols in this manual

Understand the meanings of the following symbols to follow the instructions in this manual:

Symbol	Meaning
	This symbol indicates a dangerous situation that may cause death or serious injury if not avoided.
	This symbol indicates a situation that may cause damage to the system or equipment, or data corruption, deletion, or overwriting if not avoided.
	This symbol is used for information to which particular attention is required, or to highlight information.
	This symbol is used for information such as operational tips.
	This symbol indicates a prohibited action that must not be done.
	This symbol indicates a mandatory action that must be executed without fail.

■ How to Read This Manual

This manual comprises the following chapters:

Chapter 1 How to Begin	This chapter gives introductory information such as how to assemble and install the balance, and how to turn the power on and off. Be sure to read this chapter the first time you use the balance.
Chapter 2 Basic Operation	This chapter gives basic instructions on how to weigh objects. The procedures for setting the functions used to set various functions are also described.
Chapter 3 Various Measuring Methods	This chapter describes how to use various measuring methods of the balance, such as counting and percentage weighing.
Chapter 4 Adjusting the Balance	The balance needs to be adjusted depending on where and when it is used. This chapter describes how to calibrate and test the balance.
Chapter 5 Setting the Functions	This chapter describes how to set the functions of the balance, such as setting units and readability.
Chapter 6 Input/Output to/from External Devices	This chapter describes printing to printers and how to input and output to and from RS-232C devices in detail.
Chapter 7 Troubleshooting	This chapter describes how to troubleshoot problems occurring with the balance, including actions required for errors, and remedies to problems.
Appendixes	The appendixes contain required data including the specifications of the balance.

■ Notational Conventions

In this manual, the following notation is used.

The balance	Refers to an AB(R) series product.
[On/Off] key	The names of the operation keys provided on the front of the main unit are enclosed in brackets [].
“Func”	Messages shown on the display are enclosed in quotation marks “ ”.
Press the key.	Refers to pressing a key once.
Press and hold the key.	Refers to pressing and holding down the operation key until the desired display is obtained.

Contents

Preface	i
Important Notice	iii
How to Use This Manual.....	iv
Contents	1
1 How to Begin	5
1-1 Warnings regarding Use.....	5
1-2 For More Precise Measurements.....	7
1-2-1 Precautions on the Measuring Room	7
1-2-2 Precautions on the Measuring Bench.....	8
1-2-3 Precautions on the Samples.....	8
1-2-4 Precautions on the Main Unit of the Balance	9
1-3 Checking Supplied Items	10
1-4 Names and Functions of Component Parts	11
1-5 How to Assemble the Windshield.....	12
1-5-1 Parts of the Windshield.....	12
1-5-2 Procedures for Assembling the Windshield	13
1-6 Assembling and Installing the Balance.....	18
1-7 Functions of Operation Keys.....	21
1-7-1 Operation keys.....	21
1-7-2 Operation key explanations	21
1-8 How to Read Displayed Signs.....	23
2 Basic Operation	25
2-1 Powering On/Off and Operation Check.....	25
2-2 Zero-point Adjustment	26
2-3 Weighing a Sample in a Container (Tare)	27
2-4 Weighing an Added Sample	28
2-5 Basics of Function Settings.....	29
3-1 Switching Display Units.....	31
3-1-1 Switching the Display Units	31
3-1-2 Setting Display Units.....	31
3-2 Counting the Number of Parts.....	33
3-3 Measuring Percentage	35

3-4 Judging between Too Heavy and Too Light (Limit Function)	36
3-4-1 Limit function settings	37
3-4-2 Judgment using definite values by setting actual sample weights	38
3-4-3 Judgment using definite values by entering values	39
4 Adjusting the Balance	41
4-1 Adjusting the Balance	41
4-1-1 Span adjustment with external weight	41
4-1-2 Span adjustment with internal weight	43
5 Setting the Functions	45
5-1 Zero-tracking	45
5-2 Improving the Stability of the Balance	46
5-3 Auto Backlight OFF	47
5-4 Date and Time setup	48
5-4-1 Time setup	48
5-4-2 Date setup	49
5-5 Various Function	50
5-5-1 Date Display	50
6 Input/Output to/from External Devices	51
6-1 Outputting to a Printer	51
6-1-1 Connecting a printer	51
6-1-2 Printing span adjustment result	51
6-1-3 Time and date Stamp Output	52
6-2 Connecting the Interface and External Devices	53
6-2-1 Connector pin numbers and functions	53
6-2-2 Sample connection with a PC	54
6-2-3 Interface specifications	54
6-3 Communication Data and Commands	55
6-4 Output data	56
6-4-1 Data format	56
6-4-2 Meanings of data	57
6-5 Input commands	59
6-5-1 Procedure for transmission	59
6-5-2 Sample input commands	59
6-5-3 Command form	59


6-5-4 Command format	60
7 Troubleshooting & Maintenance	63
7-1 Error Messages	63
7-2 Troubleshooting.....	65
7-3 Maintenance.....	67
7-3-1 Simple Method for Maintenance	67
7-3-2 How to Maintain the Windshield	68
Appendix	71
Appendix 1 Function Setting List.....	71
Appendix 2 Specifications	74
Appendix 2-1 Basic Spec	74
Appendix 2-2 Functional Specifications	75
Appendix 2-3 Weighing Capacity and Readability by Unit.....	76
Appendix 2-4 Unit Conversion Table.....	77
Appendix 2-5 Outline Drawings.....	78
Index of Terms	79

(Memo)


1 How to Begin

1-1 Warnings regarding Use



 **WARNING**

	<p>■ Do not disassemble or modify the balance. Doing so could result in injury, electric shock, fire and other accidents or failures. For inspection and adjustment, contact the retailer from whom the balance was purchased.</p>
	<p>■ Do not move the balance with a sample placed on the weighing pan. The sample could fall from the weighing pan and break or injure someone.</p>
	<p>■ Do not plug the AC adapter cord or the communication cable into the balance when the connector or jack is wet. Doing so could result in electric shock, short circuit or failure.</p>
	<p>■ Do not touch the AC adapter with wet hands. Doing so could result in electric shock, causing disability or death.</p>
	<p>■ Do not route the AC cord across passages. The cord could be tripped on by a passerby and the balance could fall down and break or injure someone.</p>
	<p>■ Do not use the balance on an unstable platform or in a place subject to vibration. The sample could fall from the weighing pan and break or injure someone. In addition, the balance could fail to accurately weigh samples.</p>
	<p>■ Only use the AC adapter specifically designed for the balance. Using any AC adapter other than the specified adapter could cause overheating, fire or failure.</p>
	<p>■ Only use the specified power supply. Using any power supply other than that specified could cause overheating, fire or failure.</p>
	<p>■ Do not bring the scale by holding the windshield. The main body could drop and break down or injure someone. Make sure to hold the main body to bring the scale.</p>


CAUTION

	<p>■ Do not apply excessive force to or impact the balance. Doing so could damage or result in failure of the balance. Carefully place samples on the balance.</p>
	<p>■ Do not allow the balance to remain in an overloaded state (o-Err indication). Doing so could damage or result in failure of the balance. Remove the sample immediately.</p>
	<p>■ Do not use volatile solvents. The main unit could deform. Wipe the main unit using dry cloth or a cloth moistened with a small amount of neutral detergent.</p>

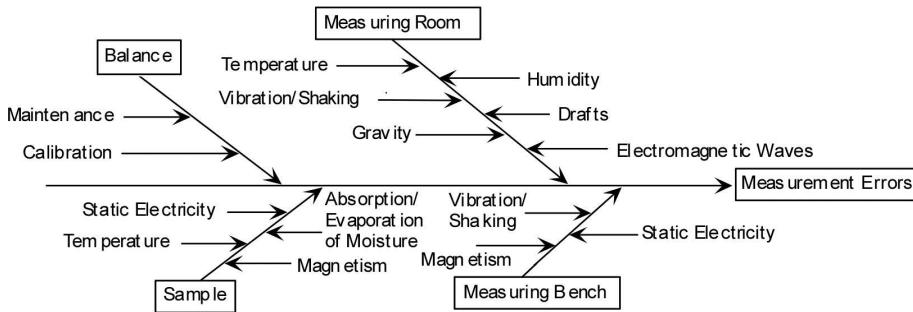
Note

	<p>■ Do not install the balance in a place where it is directly exposed to airflow from air-conditioning or heating equipment. Due to changes in the ambient temperature, the balance could fail to accurately weigh samples.</p>
	<p>■ Do not install the balance in a place exposed to direct sunlight. The internal temperature of the balance could rise and the balance could fail to accurately weigh samples.</p>
	<p>■ Do not install the balance where the floor is soft. When a sample is placed on the balance, the balance could slant and fail to accurately weigh samples.</p>
	<p>■ Do not install the balance in a place where the ambient temperature or humidity change significantly. The balance could fail to accurately weigh samples. Use the balance at an ambient temperature of 5 to 35°C and a relative humidity of 80% or lower.</p>
	<p>■ Do not install the balance on an unstable platform or in a place subject to vibration. The balance could fail to accurately weigh samples. In addition, a sample could fall off the weighing pan and injure someone.</p>
	<p>■ Always adjust (calibrate) the balance when it was reinstalled or relocated. Failure to do so might result in measurement errors. To ensure accurate measurements be sure to adjust (calibrate) the balance.</p>
	<p>■ Adjust (calibrate) the balance when it is installed or relocated. Failure to do so could result in measurement errors. To ensure accurate measurements, be sure to adjust (calibrate) the balance.</p>
	<p>■ Unplug the AC adapter from the receptacle when the balance is not going to be used for a long period of time. Unplug the balance from the receptacle to save energy and prevent degradation.</p>
	<p>■ Always adjust the level of the balance before use. A tilted balance generates errors which might cause inaccurate weighting. Install the balance in a sturdy and stable location (Refer to Section 1-6 “Assembling and Installing the Balance” (P. 18).)</p>

1-2 For More Precise Measurements

To be able to conduct more precise measurements, it is necessary to minimize the factors that contribute to measurement errors. There are a great variety of such error-inducing factors, which can be linked to machine error and performance of the balance itself, as well as the properties and condition of samples being measured, and the measuring environment (e.g., vibration, temperature/humidity). These factors can readily affect the results of measurement on a balance that has high resolution readability.

This material includes some precautionary notes that the user should bear in mind to eliminate error factors and ensure accurate measurement results.



Factor Analysis Chart for Measurement Errors

1-2-1 Precautions on the Measuring Room

Temperature / Humidity	→	Try to maintain constant room temperature as much as possible to prevent dew condensation and unstable indications due to fluctuations in temperature.
	→	Low relative humidity tends to induce static electricity, causing measurement error. (Relative humidity of about 60% is considered ideal.)
Vibration/ Shaking	→	The measuring room should preferably be located on the ground floor or in the basement. Higher floors are more susceptible to heavy vibration and shaking, which make such locations less suitable for measurement. A room facing a railway or road with heavy traffic should also be avoided as much as practicable.
Drafts	→	Avoid choosing a location subject to a direct draft of airflow from an air-conditioning unit or exposed to direct sunlight, which may cause unstable reading due to abrupt fluctuations in temperature. Also avoid a room subject to a heavy flow of people, since fluctuations in drafts and temperature are likely to occur in such a location.
Gravity	→	The gravity acting on a sample varies depending on the latitude or height of the location where measurement is being conducted. For this reason, the same sample may show different weight indications from one place to another. Therefore, make it a rule to calibrate the balance every time it is relocated.
Electromagnetic Waves	→	When the balance is located near an object that generates intense electromagnetic waves, it may be hindered from showing accurate weight due to the effects of such waves. Therefore, avoid placing the balance in such a location.

1-2-2 Precautions on the Measuring Bench

Vibration/ Shaking	<p>→ If the balance is subjected to vibration during measurement, its indications will become unstable, thus preventing accurate measurement from being conducted. To avoid this situation, select a solid measuring bench that is less susceptible to vibration. (A bench in a vibration-proof structure or one made of concrete or stonework will be suitable.) Moreover, do not conduct measurement with a soft cloth or paper placed under the balance, since the balance may be rocked out of its precise level positioning.</p> <p>→ Place the measuring bench in a location free from vibration as much as possible. It is a good idea to install the measuring bench in a corner of the measuring room, where less vibration is likely to occur than in the center of the room.</p>
Magnetism/ Static Electricity	<p>→ Avoid operating the balance on a bench that is susceptible to the effects of magnetism or static electricity.</p>

1-2-3 Precautions on the Samples

Static Electricity	<p>→ Generally speaking, objects made of synthetic resin and glass has high electric insulating properties and, therefore, are apt to be electrically charged. Measuring a charged sample as is may cause unstable indications, with resultant poor reproducibility of the results. With this in mind, be sure to discharge charged samples before measurement.</p>
Magnetism	<p>→ A sample affected by magnetism indicates different weight values depending on where it is located on the measuring pan, along with resultant poor reproducibility of the results.</p> <p>When a magnetized sample must be measured, first demagnetize it or place an appropriate pedestal on the measuring pan to adequately separate the mechanism part of the balance from the magnetized sample for avoiding the effects of magnetism.</p>
Absorption/ Evaporation of Moisture	<p>→ Measuring a sample with moisture absorbed or evaporated (volatized) continuously increases or decreases the values indicated. In such case, measure the sample in a container with a small opening and sealed airtight with a cap.</p>
Sample Temperature	<p>→ A difference in temperature between a sample and the interior of a windshield may cause convection to occur inside the windshield, resulting in erroneous measurement. Therefore, measure a very hot or cold sample only after allowing time for its temperature to acclimatize to room temperature. Moreover, to prevent convection inside the windshield, allow time for the interior of the windshield to acclimatize to room temperature.</p> <p>→ The body heat of a person conducting measurement can also affect measurement results. Avoid holding the sample with bare hands, and use long tweezers or a similar tool instead. Also refrain from putting your hands inside the windshield while measurement is in progress.</p>

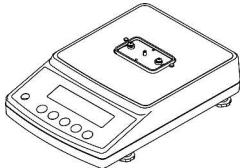
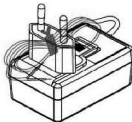
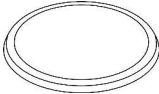
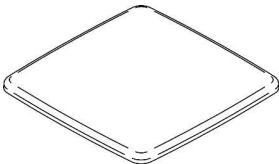
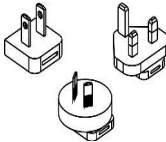
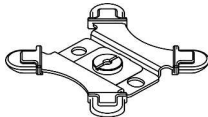
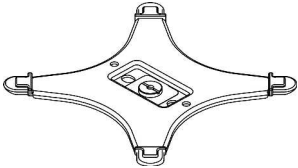

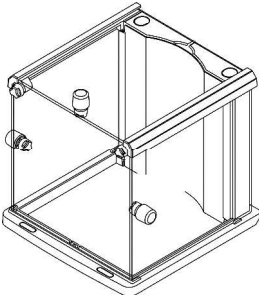
1-2-4 Precautions on the Main Unit of the Balance

Precautions on Use	<p>→ A transparent dust cover, supplied for some models, may be statically charged under low humidity conditions, which may cause unstable reading. In such case, wipe the dust cover with a damp cloth or use a commercial antistatic agent. Otherwise, simply operate the balance with the dust cover removed.</p> <p>→ For more stable measurement, it is recommended to have 30 minutes warm up time after power-up, and apply a load equivalent to the weighing capacity several times before conducting actual measurement operation.</p>
Calibration	<p>→ Periodically calibrate the balance with an internal or external calibration weight to ensure accurate measurement at all times.</p> <p>→ For more precise calibration, use an external calibration weight that approximates the weighing capacity. Moreover, calibrate the balance only after enough warm up time and loading near capacity weight.</p> <p>→ Calibration is also required in the following cases: When operating the balance for the first time, When not using the balance for a long time, When relocating the balance, or When there is wide fluctuation in temperature, humidity or atmospheric pressure.</p>
Maintenance	<p>→ When the measuring pan or pan base is contaminated with powder or liquid, erroneous weight values may result or indications may remain unstable. Therefore, be sure to frequently clean the balance. When cleaning the balance, be very careful not to allow dirt or liquid to penetrate inside (the mechanism part).</p>

1-3 Checking Supplied Items

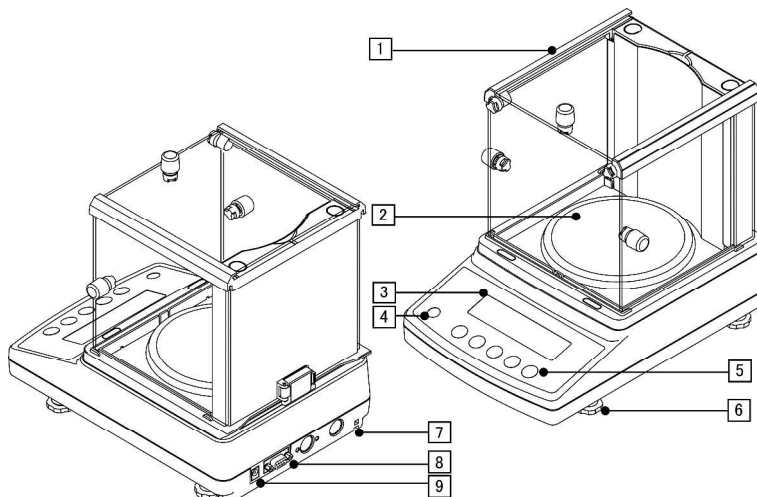
■ The following items are in the box.

In the unlikely event of problems such as missing or broken items, please contact the retailer from whom the balance was purchased.

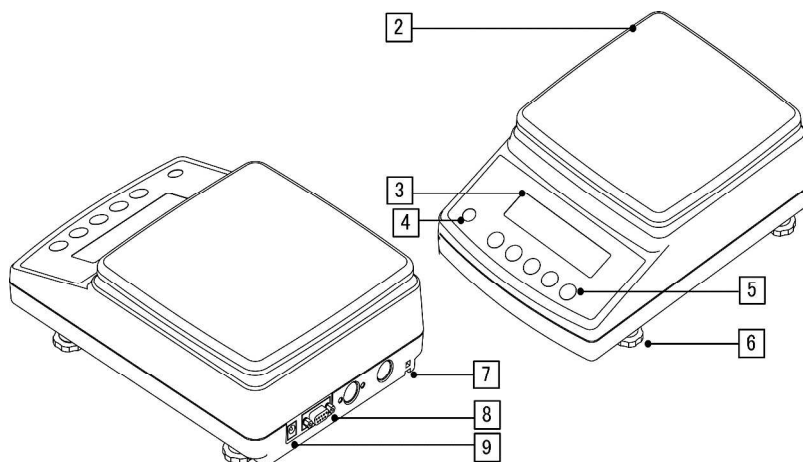
Part name	Quantity	Part name	Quantity
① Main unit of balance 	1	④ AC adapter 	1
② Circle Pan (140mm) AB323(R) - 623(R)  Square Pan (190×190mm) AB1202(R) - 12001(R) 	1	⑤ Adapter plug 	3
③ Pan base (Circle)  Pan base (Square) 	1	⑥ Operation manual 	1
		⑦ Wind shield (Only as for AB323(R)-623(R)) These parts are included since this product is to be assembled at your site. (Refer to "How to Assemble the Windshield" (P.12).) 	1

1-4 Names and Functions of Component Parts

■ AB323(R) – 623(R)



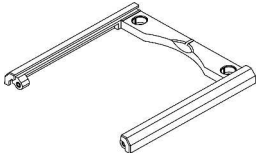
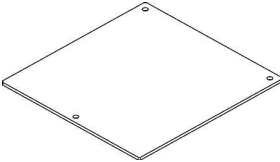
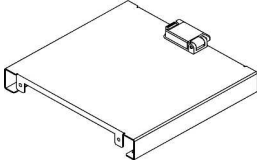
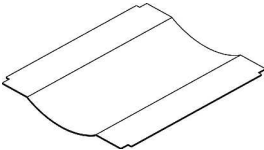
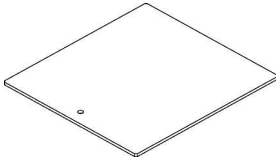


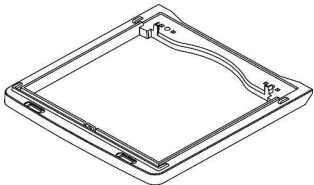




■ AB1202(R) – 12001(R)



Name of constitution parts	
1	Wind shield
2	Circle pan
3	Display
4	Level
5	Operation keys
6	Adjuster
7	Anti-theft hole
8	D-SUB9P RS232C output connector
9	AC adapter jack

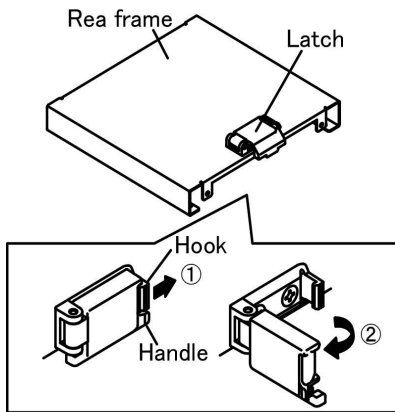
1-5 How to Assemble the Windshield

1-5-1 Parts of the Windshield

Part name	Quantity	Part name	Quantity
① Guide frame 	1	⑥ Front panel  (With three holes)	1
② Rear frame 	1	⑦ Inner panel 	1
③ Slide panel  (With one hole)	3	⑧ Knob 	3
		⑨ Knob bolt 	5
④ Base frame 	1	⑩ Rear cap 	2
		⑪ Front cap 	2
⑤ Inner panel holder 	2	⑫ M4 Screw 	4

1-5-2 Procedures for Assembling the Windshield

1 Release the latch on the rear frame.

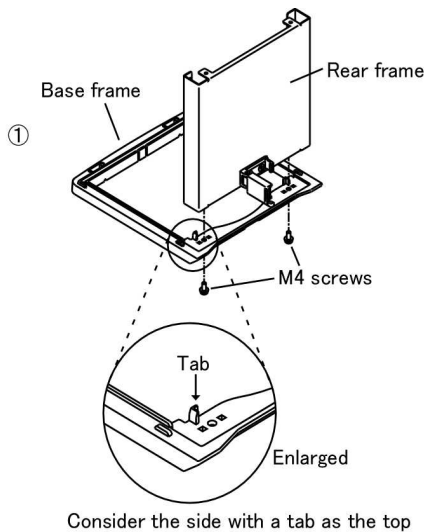


① Pull the latch hook slightly in the direction of the arrow.

CAUTION
Pulling the hook too much might damage the latch.

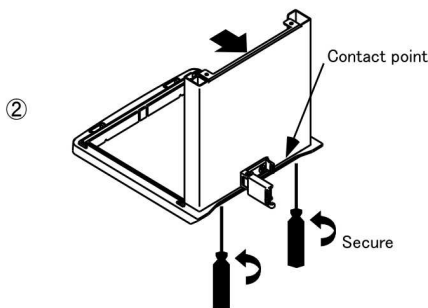
② Grip the handle to turn and release the latch.

2 Secure the base frame and rear frame.



① Secure the base frame and rear frame temporarily by using two M4 screws.

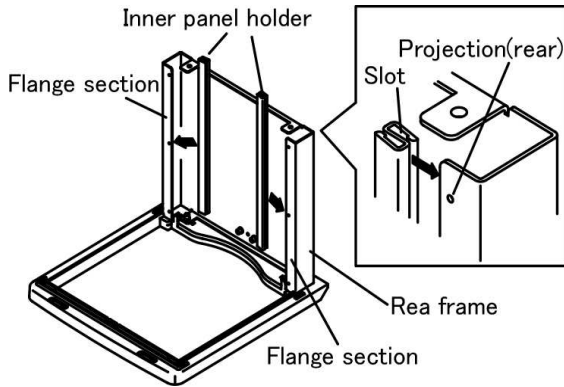
Reference
Temporarily means that the rear frame is secured to the base frame at a level where the rear frame still moves a little.



② Push the rear frame in the direction of arrow so that there are no gaps at the contact point between the base frame and rear frame, and then secure them with two M4 screws.

CAUTION
To secure the screws, use a Phillips-head (+) screwdriver (not supplied with product).

3 Secure the inner panel holder.

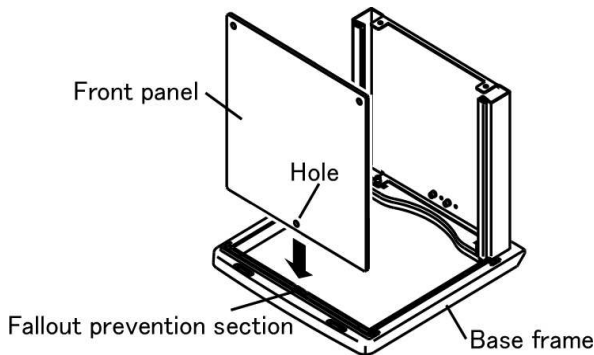


- ① Put the inner panel holder in the two flange sections on the rear frame.

CAUTION

Firmly push the inner panel holder towards the arrow so it hooks on the projections at the rear of the flange sections.

4 Secure the front panel and the base frame.

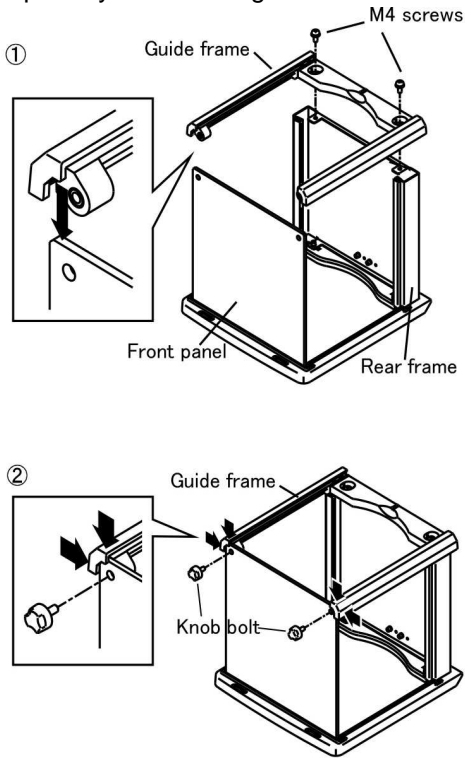


- ① Insert the front panel into the base frame.

CAUTION

- Insert the front panel firmly in the direction of arrow so that the hole on the front panel fits into the fallout prevention section of the base frame.
- Handle the front panel carefully since it is made of glass.

5 Temporarily secure the guide frame.



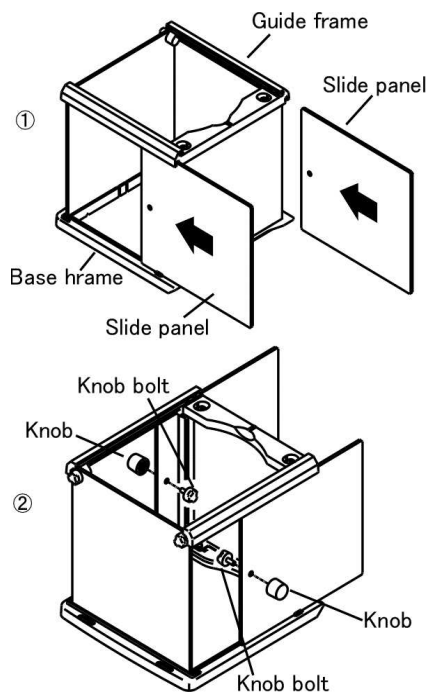
- ① Insert the guide frame into the front panel and temporarily secure it to the rear frame with two M4 screws.

Reference

Temporarily securing means that the guide frame is secured to the rear frame at a level where the guide frame can still move slightly.

- ② While pushing the guide frame in the direction of arrow, secure the front panel and guide frame by using the two knob bolts.

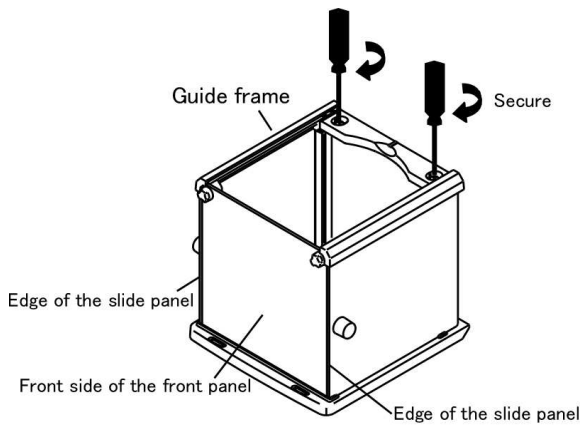
6 Install the panels at the sides.



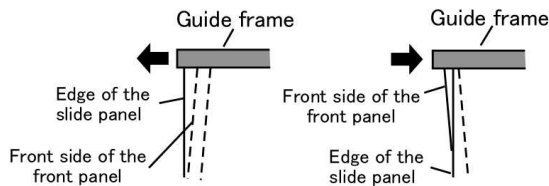
- ① Insert two slide panels into the guide frame and the base frame (in directions of arrows).

- ② Place the knob bolts through the holes in the respective slide panels to attach the knobs.

7 Secure the guide frame.



- A. The front side of the front panel is positioned after the edge of the slide panel
- B. The front side of the front panel is positioned before the edge of the slide panel



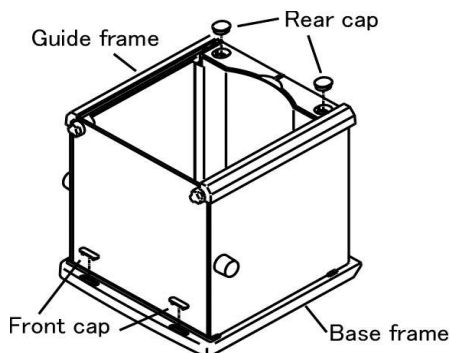
- Adjust the guide frame in the directions of the arrows so that the front side of the front panel and the edge of the slide panel are almost in parallel (refer to A and B in the left figure), and then secure the guide frame with two M4 screws.

CAUTION

Check that the front side of the front panel and the edge of the slide panel are in parallel at the position where the slide panel has been slid to the front (toward front panel) until it stops.

- To secure the screws, use a Phillips-head (+) screwdriver (not supplied with product).

8 Insert the caps.

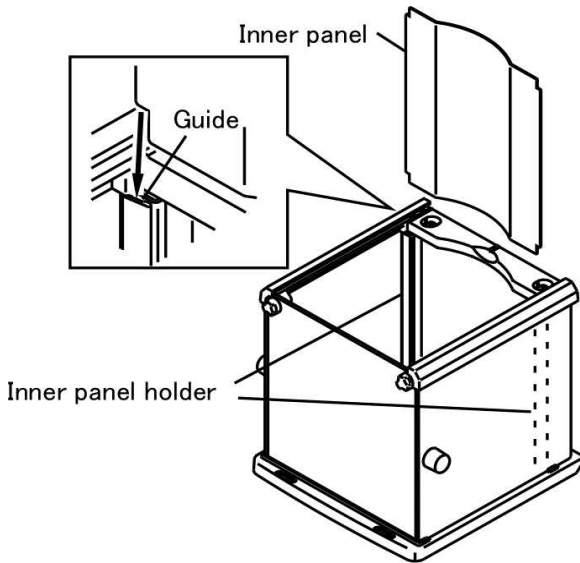


- Push the front cap and rear cap into the base frame.

CAUTION

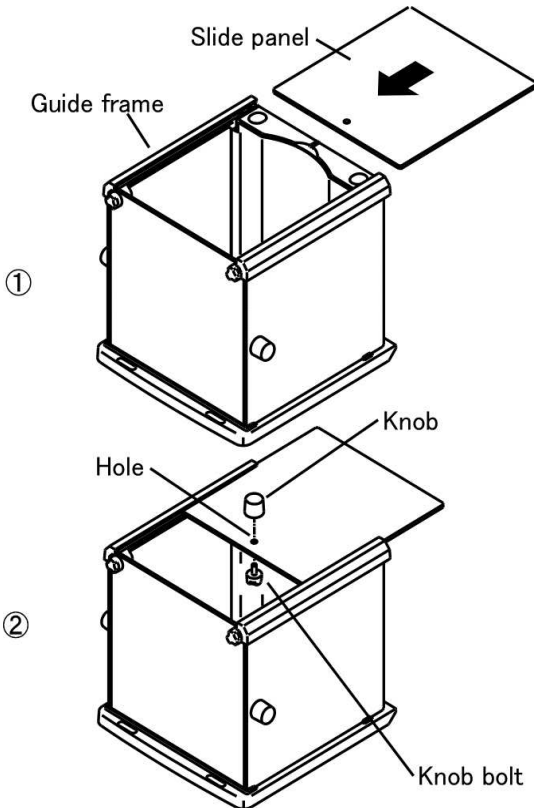
Push the caps firmly so that they do not rise above the frame surfaces.

9 Install the inner panel holder.



- ① Insert the inner panel into the guides on the two inner panel holders.

10 Install the panel on the top surface.



- ① Insert the slide panel into the guide frame (in direction of arrow).
- ② Insert the knob bolt through the hole of the slide panel and attach the knob.

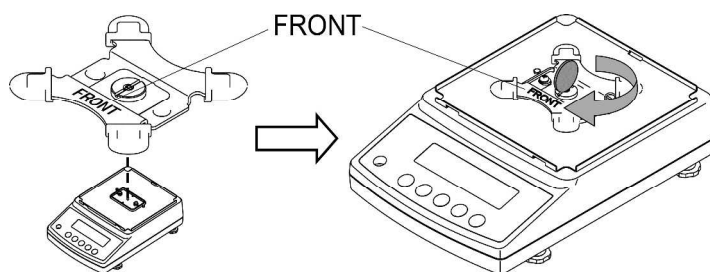
1-6 Assembling and Installing the Balance

■ Assemble the balance using the following steps:

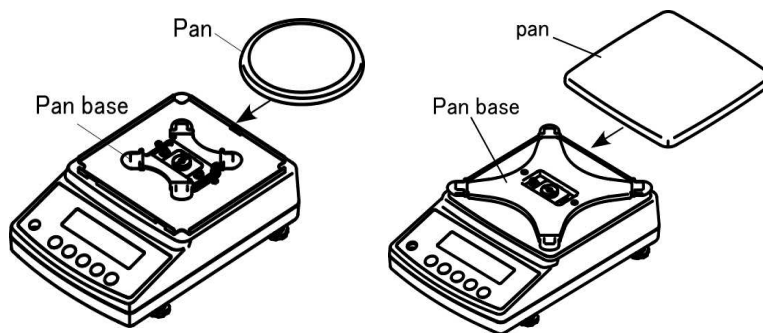
1 Assemble the pan base and weighing pan.

- ① Put the pan base on the balance. ("FRONT" mark shall be on the display side)
Fix the pan base screw by using a coin securely.

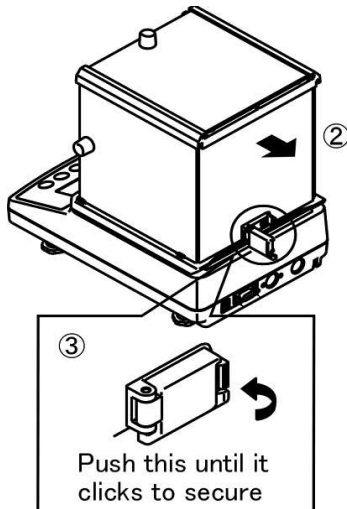
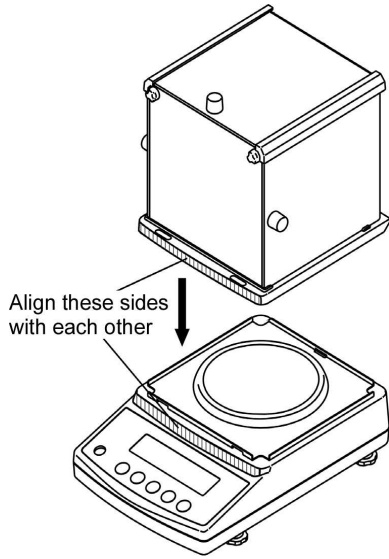
CAUTION Check the pan base screw is fixed securely on a regular basis.



- ② Put the pan on the pan base correctly.



2 Install the windshield (only for the circle pan).

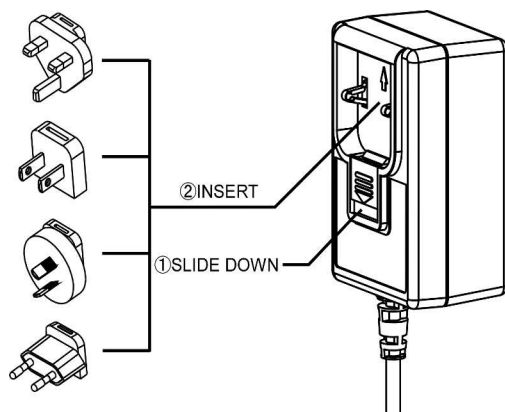


① Check that the latch is released, and then mount the windshield on the balance. At this time, place the windshield slightly towards the front side (indicator side) so that the rising section of the protector fits into the base frame.

② Pull the windshield in the direction of the arrow.

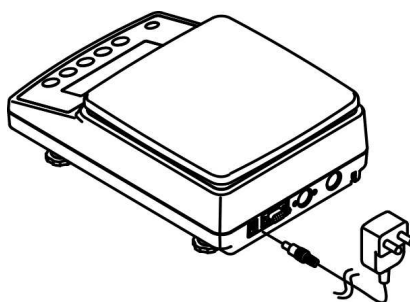
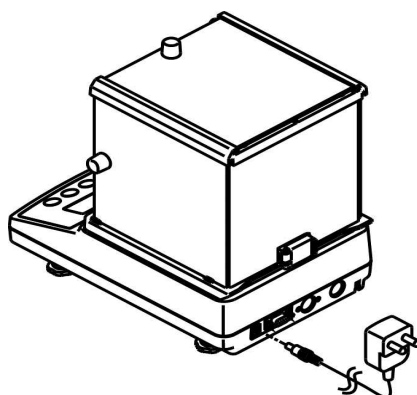
③ Turn the latch to secure the windshield to the balance.

3 Put the AC adapter plug to the AC adapter.

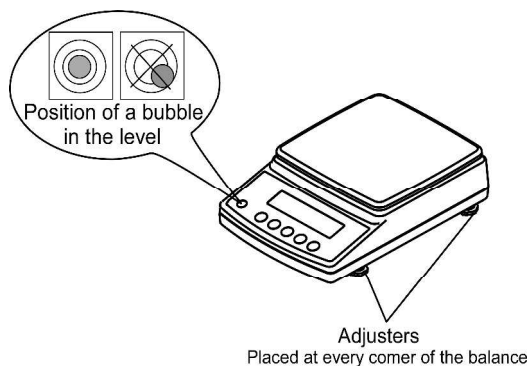


4 Connect the power cord.

Connect the jack on the rear of the balance to the receptacle (socket) by using the AC adapter.



5 Level the balance.

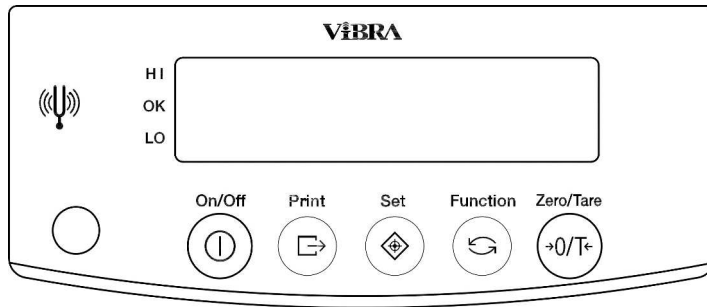


- ① Set the adjusters at the corners of the balance to their shortest and turn them to adjust the level of the unit little by little.
- ② It is easier to adjust the balance level while looking at the level.
- ③ When the bubble in the level enters the circle, press on all corners of the balance to check that the bubble does not move.

1-7 Functions of Operation Keys

■ The operation keys are located on the front of the main unit. Use these keys to operate and set the balance.

1-7-1 Operation keys



1-7-2 Operation key explanations

Operation key		Function	
[On/Off] key	On/Off 	Used to power on/off the balance.	
[Print] key	Print 	[Brief press]	initiates print or output.
		[Brief press]	saves the settings of the number of pieces or percentages (%), or the limit value when using the limit function.
[Set] key	Set 	[Brief press]	starts setting the number of pieces or percentages (%).
		[Continuous press]	starts setting the limit value when using the limit function.
[Function] key	Function 	[Brief press]	toggle-switches the units to be displayed in succession (g, Pcs, %, etc.).
		[Brief press]	moves the flashing digit in the setup of a limit value when using the value input method.
		[Brief press]	selects an item when setting the function.
		[Continuous press] [Longer continuous press]	invokes various functions. invokes span adjustment.
[Zero/Tare] key	Zero/Tare 	[Brief press]	resets the indication to zero when using zero-point setup or tare subtraction.
		[Brief press]	selects a value with the value input method when using the limit function.
		[Brief press]	selects a function when operating the balance in the function mode.

Reference**How to press keys**

The functions of some operation keys depend on how they are pressed.

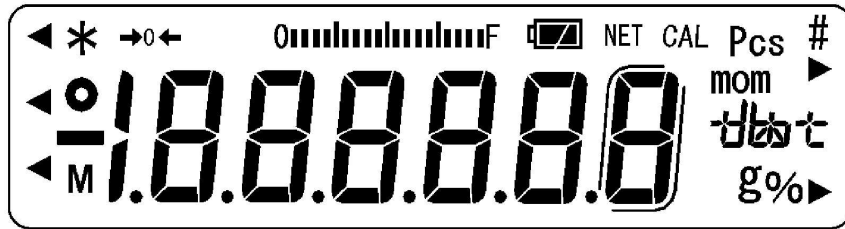
For example, the [Set] key saves a setting when it is pressed quickly. (This is the normal way of pressing keys.)

The [Set] key starts making a setting when it is pressed and held.

Pressing and holding a key is to hold the key down and then release it once the desired display has been obtained.

1-8 How to Read Displayed Signs

■ Each of the symbols displayed on the front of the main unit has the following meanings:



Display	Description
g	Grams
→0←	Zero point
NET	Tare being subtracted
○	Indication of stable balance (If the light is off, the balance is unstable.)
*	Balance powered up (Lights up when the power is turned off) or data transmitted
Pcs	Counting mode
%	Percentage mode
◀	Indication of judgement result (HI/OK/LO) when the limit function is active.
mom	Momme
M	Display of set values from memory (If a value is flashing, it is being saved.)
CAL	Stays on and flashes while span adjustment is in progress.
	Bar graph
	[ct] (ct) carat
	[oz] (oz) ounce
	[lb] (lb) pound
	[oz t] (ozt) troy ounce
	[dwt] (dwt) penny weight
	[t] (t) tael (Hong Kong)
	[t] ▶ Upper right] (t) ▶ Upper right) tael (Singapore, Malaysia)
	[t] ▶ Lower right] (t) ▶ Lower right) tael (Taiwan)
[to] (to) tola	

7-segment character display


Numeric characters

1	2	3	4	5	6	7	8	9	0
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>0</i>

Alphabet

A	B	C	D	E	F	G	H	I	J	K	L	M
<i>A</i>	<i>b</i>	<i>C</i>	<i>d</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>I</i>	<i>J</i>	<i>K</i>	<i>L</i>	<i>M</i>

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
<i>n</i>	<i>o</i>	<i>P</i>	<i>q</i>	<i>r</i>	<i>S</i>	<i>t</i>	<i>u</i>	<i>v</i>	<i>W</i>	<i>X</i>	<i>Y</i>	<i>Z</i>

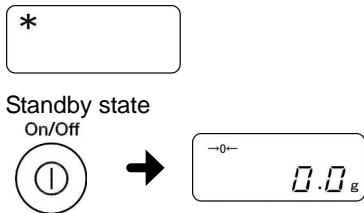
 CAUTION	Some characters look the same, for example, “5” and “S,” and “H,” “K,” and “X.”
--	---

2 Basic Operation

2-1 Powering On/Off and Operation Check

■Turning the balance ON/OFF

1 Turn the balance ON.



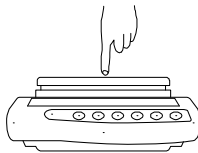
Check that the AC adapter is connected to the balance.

When the AC adapter is plugged in, the balance enters the standby state and an asterisk “*” appears.

Press the [On/Off] key.

The display shows all symbols and then changes to the zero display.

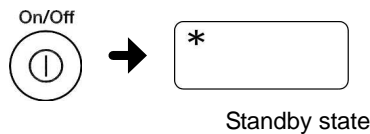
2 Check that it is operating.



Push the weighing pan with your finger to check that the readout changes.

Also check that the readout changes to zero when you stop pushing.

3 Turn the balance OFF.



Press the [On/Off] key again.

The balance enters the standby state.

Reference

- When the balance is turned ON, it is in the same measurement mode as when it was turned OFF. For example, if the balance was turned OFF in counting mode, when it is turned ON it is still in counting mode.
- When the balance is stabilized, the display shows a circle “O.”



When the balance is unstable, the circle “O” disappears. The balance may be affected by wind or vibration.

- The bar graph also appears on the display. It shows the current weight level compared to the weighing capacity.



As the weight approaches the weighing capacity of the balance the bar graph moves toward the right end.

2-2 Zero-point Adjustment

■Zeroing a deviated readout is called “zero-point adjustment.”

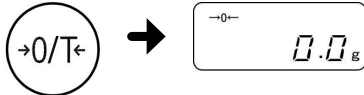
1 Examine the surface of the weighing section.

Check that nothing is on the weighing section.

2 Execute zero-point adjustment.

Press the [Zero/Tare] key.

Zero/Tare



The readout becomes zero and the “→0←” mark appears.

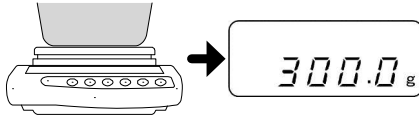
Reference

- When any object is placed on the balance, the “zero-point adjustment” is not carried out but “tare” is carried out instead. Refer to Section 2-3 “Weighing a Sample in a Container (Tare)” for details.
- The “**M**” mark blinks while waiting for the zero-point adjustment to stabilize. While the “**M**” mark is blinking, protect the balance from the effects of winds and vibration.

2-3 Weighing a Sample in a Container (Tare)

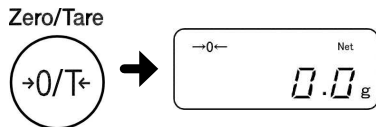
■ When weighing a sample in a container (tare), only the sample is weighed by subtracting the mass of the container. This is called “tare.”

- 1** Place the container on the weighing pan



The mass of the container is displayed.

- 2** Set the tare.



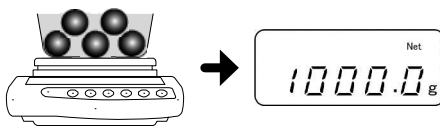
Press the [Zero/Tare] key.

The readout becomes zero and “→0←” and “Net” are displayed (tare range setting).

CAUTION

If “Net” does not appear when the [Zero/Tare] key is pressed, the balance is executing zero-point adjustment, not tare range setting.

- 3** Place a sample in the container.



Only the mass of the sample is displayed.

Reference

When setting the tare range, the weighable range is reduced by the mass of the tare (set tare).

Weighable range = original weighing capacity – set tare

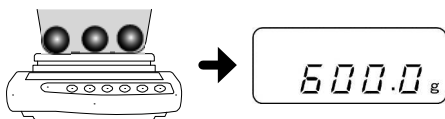
2-4 Weighing an Added Sample

■ Place an additional sample on the balance. Only the addition is measured.

1

Put a sample in place.

The mass of the sample is displayed.

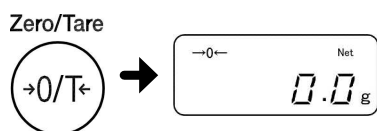


2

Set the tare.

Press the [Zero/Tare] key.

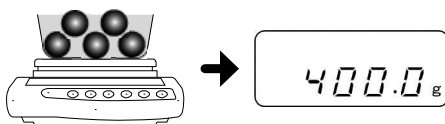
The readout becomes zero (tare range set).



3

Place the next sample on the balance

Only the mass of the added sample is displayed.



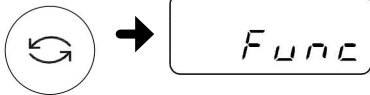
2-5 Basics of Function Settings

■ Use the Function key to change the balance's settings.

This section describes the basic operations for setting functions.

1 Go to the function setting mode.

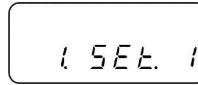
Function



Release the key when the display changes.

Press and hold the [Function] key. After "Func" is displayed, release the key.

The first function item is then displayed.



CAUTION

If you continuously hold the [Function] key, the function setting mode will change to another mode. If this happens, press the [Print] key to cancel the setting and do this step over again.

2 Select an item to set

Function



Press the [Function] key to select the item to be set.

Example: Press the [Function] key once and select "2.SEL" (additional functions). The first setting "2.SEL 0" is displayed.

3 Select a setting.

Zero/Tare



Press the [Zero/Tare] key to select the setting.

The next setting is displayed every time the [Zero/Tare] key is pressed. The first setting is displayed again if the [Zero/Tare] key is pressed when the last setting is displayed.

Example: Press the [Zero/Tare] key once to select "2.SEL 1."

4 Save the setting.

Set



Press the [Set] key to finish making settings.

The balance returns to the weight display.

To cancel making settings, press the [Print] key.

Reference

Refer to Appendix 1 "Function Setting List" for available function items and settings.

When you are in the middle of making a function setting, you can press the [Print] key to cancel the setting and return to measurement mode.

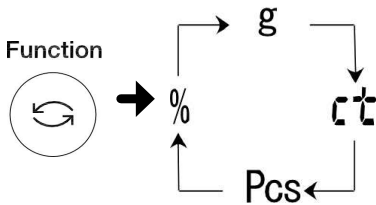
(Memo)

3-1 Switching Display Units

- Press the [Function] key to switch between the units, including “g,” “Pcs,” and “%.” Up to five types of units can be registered by using the function settings.

3-1-1 Switching the Display Units

- 1 Switch the display units.



Press the [Function] key. Each time the key is pressed, the display unit is switched.

*The balance is shipped from the factory with the following default set up [g] → [ct] → [Pcs] → [%] → [g] → . . .

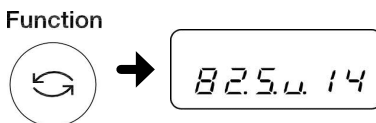
3-1-2 Setting Display Units

- Once setting values have been entered for the function items “81.S.u.” to “85.S.u.,” the display units can be switched by simply pressing the [Function] key. Refer to Appendix 1 “Function Setting List” for available units.

Example)

To change the default factory settings to lb(pound) units, use “82.S.u.” in the factory settings.

- 1 Go to the function setting mode. (Refer to Section 2-5 “Basics of Function Settings.”)
- 2 Select the display unit setting.



Press and hold the [Function] key until “Func” is displayed.

Press the [Zero/Tare] key several times to select “82.S.u.14.”

3 Set the unit of lb.

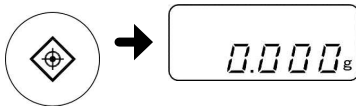
Zero/Tare



Press the [Zero/Tare] key several times to change to "82.S.u.16."

4 Record the unit of lb.

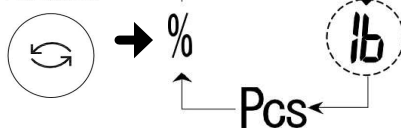
Set



Press the [Set] key to return to the measurement mode.

5 Switch between the display units.

Function



Press the [Function] key.

Each press of the key changes the units of measurement to be displayed, as follows :[g] → [lb] → [Pcs] → [%] → [g] → . . .

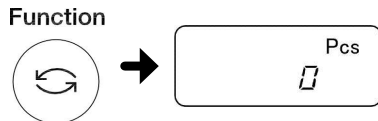
Reference

- Enter the setting values of respective display units in the functions "81.S.u." to "85.S.u."
- Press the [Print] key while setting the functions to abort the settings and return to the measurement mode.
- The units are displayed in the order of the settings in "81.S.u." to "85.S.u."
- When "00" is set, even if units are set in the subsequent items, those units are not displayed.
- "00" cannot be set in "81.S.u."
- When the same unit is set in multiple items, the duplicate unit set in the second item onwards is skipped during switching.

3-2 Counting the Number of Parts

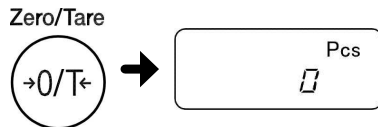
■ Place the specified number of samples on the balance to record the average unit weight (hereinafter, called unit weight) internally. The task to record this unit weight is called sampling. A counting balance counts the number of items by placing the items for which sampling has been completed on the balance and dividing the total weight of those items by the recorded unit weight.

1 Enter the counting mode.



Press the [Function] key to display "Pcs."

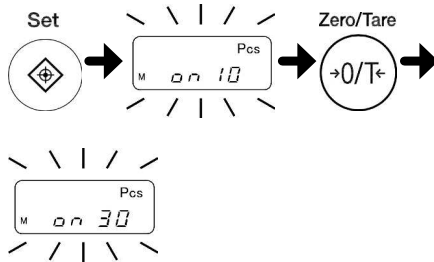
2 Set the display to 0.



Place a tare on the balance and press the [Zero/Tare] key.

The tare is carried out and the display shows the value 0.

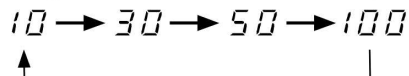
3 Select the number of samples.



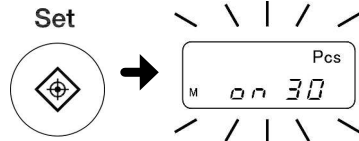
Press the [Set] key.

The display changes to "on 10" and starts blinking. Press the [Zero/Tare] key to select the number of samples.

Change of the number of the samples



4 Start sampling.



Press the [Set] key.

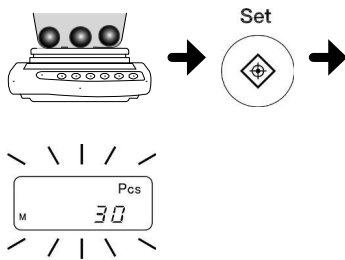
The display changes to "on 10" and starts blinking.

(This indicates that 10 samples are used.)

Reference

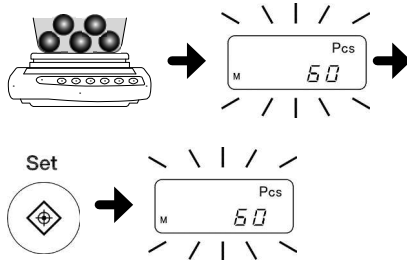
- When the number of samples was changed at the previous sampling, then that value is displayed.
- Press the [Print] key during sampling operation to abort the sampling.

5 Weigh the samples and record the unit weight.



Place the specified number of samples on the center of the weighing pan, and then press the [Set] key.

6 Add samples and update the newly recorded unit weight.



Add about the same number of samples as the displayed count and press the [Set] key.

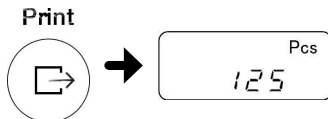
The unit weight is recorded and the display starts blinking again, which allows continuous record update.

7 Repeat addition of samples and record of the unit weight.

Repeat step 5.

The final number to be recorded should be between 1/2 and 1/5 of the number of items to be measured.

8 Finish the sampling.



Press the [Print] key.

Record the unit weight and return to the measurement mode.

Reference

- When the unit weight of sampled items is being recorded, the number display disappears and only the indication “M” is blinking. The recording time may take longer at this time if the balance is affected by wind or vibration.
- When “L-Err” is displayed, the following state has occurred.
(When “L-Err” has occurred, the sampling is aborted and the unit weight value is not recorded.)
→ The unit weight of a single sample is too light compared to the minimum unit weight.



Minimum unit weight	
AB323(R) – 623(R)	0.001 g
AB1202(R) – 3202(R)	0.01 g
AB12001(R)	0.1 g


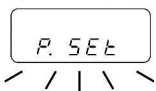
→ During sampling in step 4, the [Set] key was pressed while the samples are placed on the balance.




- The indication “Add” means that the number of added samples is too small. Add more samples to continue the record update.

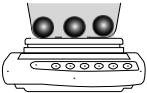
3-3 Measuring Percentage

■ The weight of the samples to be judged is displayed in percent based on a reference weight. The reference weight is set by performing the procedures for weighting the samples.

- 1** Select "percent balance."
 Function  → 

Press the [Function] key to display "%."
- 2** Start measurement of the reference weight.
 Set  → 

Press the [Set] key.
 When "P.SET" is displayed, release the key.
 This allows the reference weight setting.
- 3** Record the reference weight.
 →  → 

Place the samples to be judged and press the [Print] key.
 Set the reference sample weight value to 100 percent, and return to the measurement mode.
- 4** Weigh the samples.


The weight of the items to be judged is displayed as a percent of the reference weight.

Reference

- The minimum percent to be displayed is automatically set according to the recorded reference weight.

Minimum display	Reference weight range
1%	Weight limit ≤ Reference weight < Weight limit × 10
0.1%	Weight limit × 10 ≤ Reference weight < Weight limit × 100
0.01%	Weight limit × 100 ≤ Reference weight

- When "L-Err" is displayed, weighting is impossible because the reference weight is lighter than the limit weight.

Percent balance limit weight	
AB323(R) – 623(R)	0.1g
AB1202(R) – 3202(R)	1g
AB12001(R)	10 g

3-4 Judging between Too Heavy and Too Light (Limit Function).

■ You can set several limit values to be used to judge whether measurements are within the specified limits.

Reference

The limit function can be used in simple weight measurement mode, counting mode, percentage weighing mode.

■ Judgment method

According to the lower and upper limits you set, a measurement is judged to be too light (lower than the lower limit), within the appropriate range, or too heavy (higher than the upper limit), and the judgment result is displayed using the “◀” symbol.

		When one point (lower limit) is set	When two points (lower and upper limits) are set
HI	◀----- Above the upper limit	N/A	Upper limit < Weight
OK	◀----- Appropriate range	Lower limit ≤ Weight	Lower limit ≤ Weight
LO	◀----- Below the lower limit	Weight < Lower limit	Weight < Lower limit

Reference

In 1-point setting, only the lower limit is set and is used for judging whether samples are “OK (appropriate range)” or “LO (too light).”

The following two methods are available to enter limit values.

- Setting a weight by weighing an actual sample: Weigh an actual sample on the balance and save the weight.
- Setting a weight by entering a value: Enter a value using the keys.

■ Detailed function settings

The limit function can be set to a specific value with the function settings.

When the function setting “2.SEL” is “1” the following items can be set by pressing the [Function] key. Set these items as required.

Condition	21.Co.	1: Always judge. 2: Judge only when the balance is stable.
Range to Cover	22.Li.	0: Detect when the limit is exceeded by more than five divisions. 1: Detect both when the limit is exceeded and when it is not reached.
Point Scale	23.Pi.	1: 1-point scale (OK and LO are judged.) 2: Upper and lower limits are set (HI, OK and LO are judged).

CAUTION

-Separate limit values can be saved for each weighing mode.
-Before setting limit values, as required, adjust the zero-point or set a tare range.
-If the limit value entries are not lined up in the order of magnitude, three “◀” will be lit. Enter the values again.

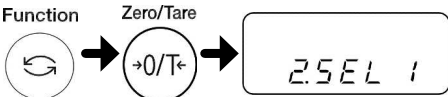
3-4-1 Limit function settings

■ First, set the limit function. Then, set limit values.

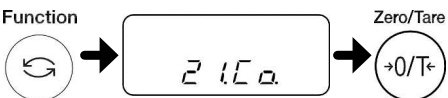
- 1** Go to the function setting mode. (Refer to Section 2-5 “Basics of Function Settings.”)

Press and hold the [Function] key until “Func” is displayed.
- 2** Select the limit function.

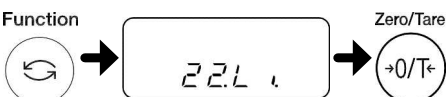
Press the [Function] key several times to select “2.SEL.”
Press the [Zero/Tare] key to select “2.SEL 1.”


- 3** Set the judgment condition.

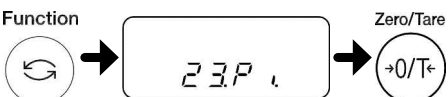
Press the [Function] key several times to select “21.Co.”
Press the [Zero/Tare] key to select a judgment condition.
1: Always judge (even when the balance is unstable)
2: Judge only when the balance is stable.


- 4** Set the range to cover.


Press the [Function] key several times to select “22.Li.”
Press the [Zero/Tare] key to select the range to cover.
0: Detect when the limit is exceeded by more than five divisions.
1: Detect both when the limit is exceeded and when it is not reached.


- 5** Set the point scale.

Press the [Function] key several times to select “23.Pi.”
Press the [Zero/Tare] key to select a point scale.
1: 1-point scale (OK and LO are judged.)
2: Upper and lower limits are set (HI, OK and LO are judged).


- 6** Save the settings.

Press the [Set] key.



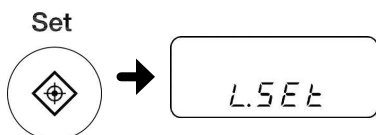
■ Then, set the values for judgment (limit values) to perform measurement.

3-4-2 Judgment using definite values by setting actual sample weights

■ Weigh a sample and set the upper-limit and lower-limit.

Check that the limit function for judgment using definite values is selected. (Refer to the previous section “Limit function settings.”)

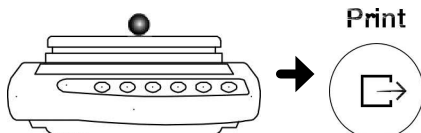
1 Set to actual sample weight setting mode.



<Press and hold>

Press and hold the [Set] key until “L.SET” is displayed.

2 Weigh the sample serving as the lower limit.

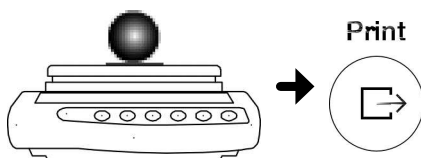


Put the sample serving as the lower-limit in place and press the [Print] key.

For 1-point setting, this operation completes the setting save process. Proceed to step 4.

For 2-point setting, “H.SET” is displayed.

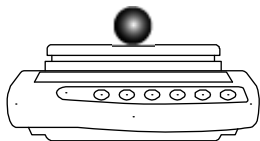
3 Weigh the sample serving as the upper limit.



Place the sample serving as the upper limit on the weighing pan and press the [Print] key.

The values for judgment are saved and the balance returns to the weight display.

4 Weigh a sample.



Place the sample to be judged on the weighing pan.

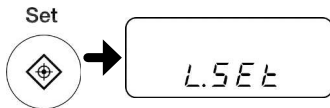
The OK/LO/HI result judged according to the upper-limit and lower-limit is indicated by “◀”.

3-4-3 Judgment using definite values by entering values

■Set the upper limit and the lower limit by using the keys.

Check that the limit function for judgment using definite values is selected. (Refer to the previous section “Limit function settings.”)

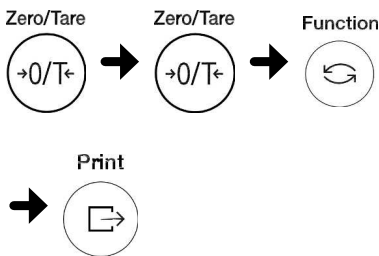
1 Set to actual sample weight setting mode.



Press and hold the [Set] key until “L.SET” is displayed.

<Press and hold>

2 Enter the lower-limit value.



Enter the lower-limit value with the following steps:

(1) Press the [Zero/Tare] key.

The rightmost digit will blink.

(2) Select a number by pressing the [Zero/Tare] key.

Pressing the key toggles the number between 0 and 9, and the decimal point.

(3) Press the [Function] key to move to the next digit, which will then start blinking.

(4) Press the [Set] key to save the number.

For 1-point setting, this operation completes the setting save process. Proceed to step 4.

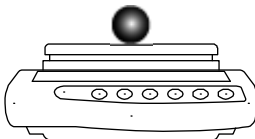
For 2-point setting, “H.SET” is displayed.

3 Enter the upper-limit value.

Enter the upper-limit value by doing the same operation as in step 2.

The values for judgment are saved and the balance returns to the weight display.

4 Weigh a sample.




Place the sample to be judged on the weighing pan.

The OK/LO/HI result judged according to the upper-limit and lower-limit is indicated by “◀”.

(Memo)

4 Adjusting the Balance

 CAUTION	Use an adjustment weight whose mass is heavier than 50% of the capacity. For more accurate adjustment, use a weight whose mass is the same as the capacity.
---	---


4-1 Adjusting the Balance

■ The span adjustment decreases the difference between the displayed value and the real value (mass).

Always perform this adjustment before high-accuracy weighting.

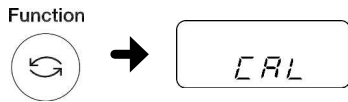
Since electronic scales are affected by gravity acceleration, this should be adjusted at each location where used.

Adjustment is also required when the balance is used for a long period of time or the display becomes inaccurate.

 CAUTION	- Use an external weigh that complies with the OILM F1 class for the span adjustment.
---	---

4-1-1 Span adjustment with external weight

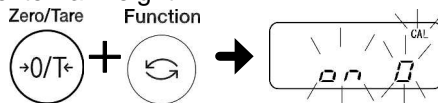
1 Call the span adjustment function.



<Press and hold>

Press and hold the [Function] key until "CAL" is displayed.

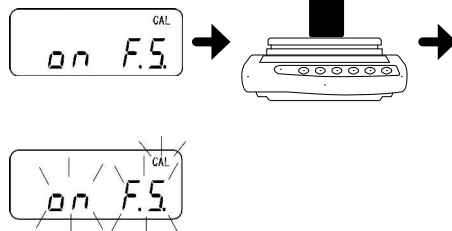
2 Start the span adjustment using the external weight.



Press the [Function] key while pressing the [Zero/Tare] key, and then release them at the same time.

When the display changes to "on 0" and starts blinking, the zero-point adjustment starts.

3



When the zero-point adjustment is complete and the display changes to "on F.S.," place the weight on the center of the weighing pan. The adjustment starts.

Once the capacity adjustment is complete, the balance returns to the original measurement mode.

Reference

-
1. Internal calibration weight model can not span adjustment with external weight.
 2. When the [Print] key is pressed during the span adjustment, "StOP" is displayed, the span adjustment is aborted, and the screen returns to the weight display.
 3. Use a weight whose mass is 80% or higher than the weighing capacity for the span adjustment using the external weight.

For a more accurate adjustment, use a weight whose mass is the same as the weighing capacity.

* We are always ready to take orders of and answer customer inquiries about the weights.

4. If the result of the span adjustment has a problem, one of the following error messages is displayed:
 - ① "1-Err": The reference weight is less than 50% of the weighing capacity during the span adjustment using the external weight.
 - ② "2-Err": During a span adjustment using the external weight, the display error between before and after the adjustment exceeds 1.0%. The balance might also be defective..
(When the [Function] key is pressed when the error message is displayed, the balance returns to the weighing mode.)
5. Displays the error message "Err 710" when unstable condition without span adjustment continues for 2 minutes.

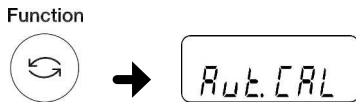
* When those error messages are displayed, the adjustment is not carried out.

Check the weight and retry again. When the same error message appears even after the adjustment is carried out by using a correct weight, then please contact our local dealer.

4-1-2 Span adjustment with internal weight

1 Call the span adjustment function.

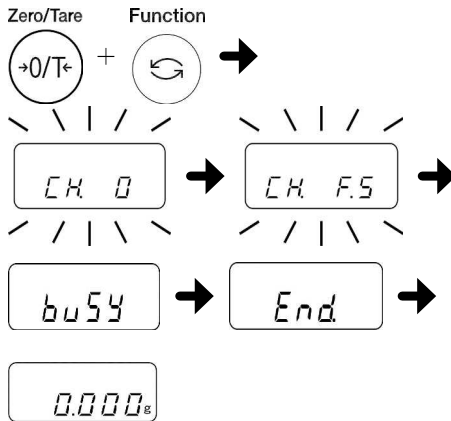
Press and hold the [Function] key until "Aut.CAL" is displayed.



<Press and hold>

2 Start the span adjustment using the internal weight.

Press the [Function] key while pressing the [Zero/Tare] key, and then release them at the same time.



Display changes to the order of "CH. 0 → CH.FS → busy → End".

Return to weight display automatically.

Reference

Error message

[3-Err]

Adjustment was performed with something loaded on the measurement pan.

[4-Err]

The weight error exceeded 1.0% during span adjustment, or the balance failed.

[A-Err]

The built-in weight or drive unit has failed.

(Memo)

5 Setting the Functions

5-1 Zero-tracking

- When the zero-tracking function is set, a zero point variation that occurs due to the temperature change when the display is zero, is automatically corrected to maintain the zero display.

- 1** Go to the function setting mode.
(Refer to Section 2-5 “Basics of Function Settings.”)

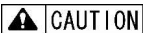
Press and hold the [Function] key until “Func” is displayed.
- 2** Set the zero-tracking function.

Press the [Function] key several times to select “3. A.O.”

Press the [Zero/Tare] key and select one of the following numbers:

0: Disable
1: Enable
- 3** Record the setting.

Press the [Set] key.
The screen returns to the weight display.



When the items to be judged are tiny, disable the zero-tracking function because it cannot weigh them accurately.

5-2 Improving the Stability of the Balance

■ When the balance is stable, “O” is lit in the upper left of the display.

When displayed values flicker and stabilized display blinks, it indicates that the balance is influenced by wind or vibration. In these situations, making a setting change can improve stability.

As greater values are set in the function setting of “stability judgment “6.S.d.””, “response speed “5.rE.””, stability will be improved more.


Relationship between each function setting and wind/vibration influences

Wind/vibration influences	Stability judgment 5.rE	Response speed 6.S.d.
Small	1	1
	2	2
	3	3
	4	4
Big	5	


(“0” in 5.rE. is for weighing with the balance included.)

- 1** Go to the function setting mode.
(Refer to Section 2-5 “Basics of Function Settings.”)


Press and hold the [Function] key until “Func” is displayed.
- 2** Select each function.
Function



Press the [Function] key several times to select the functions (See the above table).
“5.rE.” = Response speed
“6.S.d.” = Stability judgment
- 3** Select a setting.
Zero/Tare



Press the [Zero/Tare] key to select the setting values of each function (see the above table).
- 4** Save the setting.
Set



Press the [Set] key.
The balance goes back to normal display.

5-3 Auto Backlight OFF

■ This function is to set the ON / OFF of the backlight.

- 1** Go to the function setting mode. (Refer to Section 2-5 “Basics of Function Settings.”) Press and hold the [Function] key until “Func” is displayed.

- 2** Select each function.



Press the [Function] key several times to select “d. b.L.”

Press the [Zero/Tare] key and select one of the following numbers:

0: OFF

1: ON

- 3** Save the setting.

Press the [Set] key.

The screen returns to the weight display.

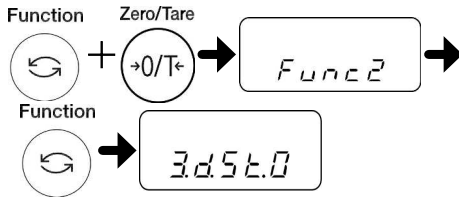


5-4 Date and Time setup

■ This function is to set the date and time.

5-4-1 Time setup

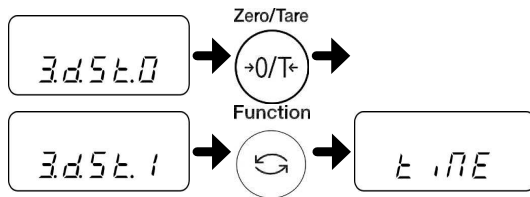
1 Set to the function2 setting mode.



Press the [Function] key while pressing the [Zero/Tare] key. Release the fingers when “Func2” is displayed.

The function2 setting mode is set, displaying “3.d.St. 0”

2 Display the time



Select “3.d.St.0” by pressing the [Function] key.

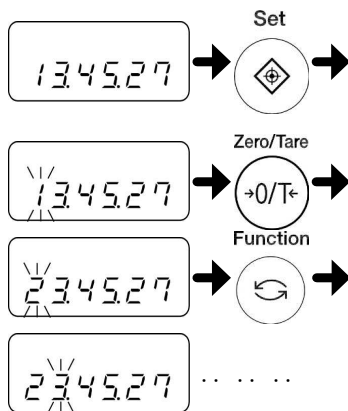
Select “1” by pressing the [Zero/Tare] key.

Press the [Function] key.

“tiME” is displayed.

Press the [Set] key.

3 Setting the Time



Digit to be changed blinks.

Press the [Zero/Tare] key.

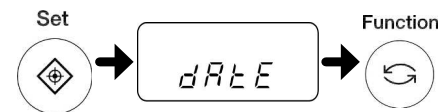
Change the numbers to be changed.

Press the [Function] key.

Digit to be changed is shifted to the right.

Set by operating the [Zero/Tare] key and [Function] key

4 Save the time



Press the [Set] key.

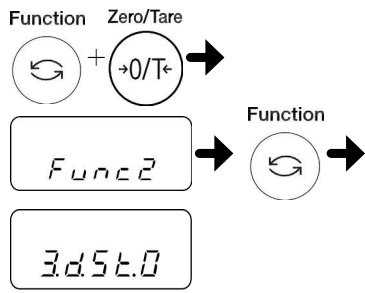
The “dAtE” is displayed.

Press the [Function] key.

The screen returns to the weight display.

5-4-2 Date setup

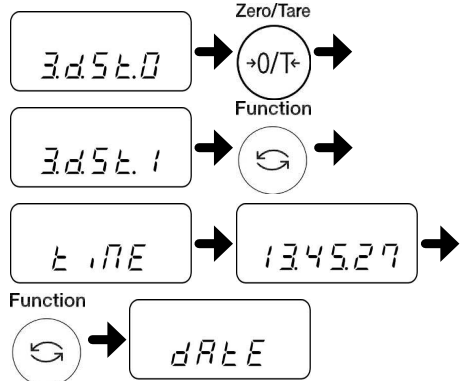
1 Set to the function2 setting mode.



Press the [Function] key while pressing the [Zero/Tare] key. Release the fingers when "Func2" is displayed.

The function2 setting mode is set, displaying "3.d.St. 0"

2 Display the Date



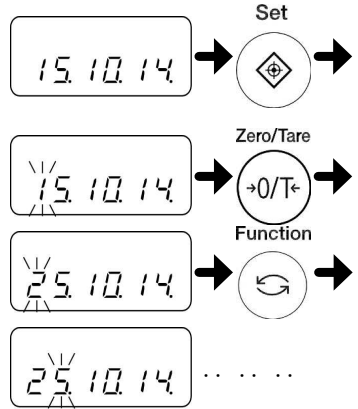
Select "3.d.St.0" by pressing the [Function] key.

Select "1" by pressing the [Zero/Tare] key.

Press the [Function] key. "tIME" is displayed.

Press the [Function] key. "dAtE" is displayed.

3 Setting the Date



Press the [Set] key.

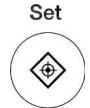
Digit to be changed blinks.

Press the [Zero/Tare] key. Change the numbers to be changed.

Press the [Function] key. Digit to be changed is shifted to the right.

Set by operating the [Zero/Tare] key and [Function] key

4 Save the Date



Press the [Set] key. The screen returns to the weight display.

5-5 Various Function

5-5-1 Date Display

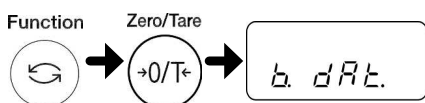
- This is a function to set the date format to be displayed in the balance or output to a printer.

1 Go to the function setting mode.
(Refer to Section 2-5 “Basics of Function Settings.”)

Press and hold the [Function] key until “Func” is displayed.

2 Set the date format function.

Press the [Function] key several times to select “b. dAt.”



Press the [Zero/Tare] key and select one of the following numbers:

- 1: Output in Year-Month-Day format.
- 2: Output in Month-Day-Year format.
- 3: Output in Day-Month-Year format.

3 Record the setting.

Press the [Set] key.

The screen returns to the weight display.



6 Input/Output to/from External Devices

6-1 Outputting to a Printer

By connecting the printer to the balance, span adjustment results can be printed on an ISO/GLP/GMP compliant format. The printers that can be connected to the balance are CSP-160II (SHINKO DENSHI).

6-1-1 Connecting a printer

By using the D-SUB9P cable, connect the RS-232C connector of the balance to a printer. For the printer, the following setting is required. Set the following by referring to the operation manual of the printer.

- Set the printing function (printing control) to “balance control.”
- Make the baud rate and other communication settings compatible with the settings made in the balance.

6-1-2 Printing span adjustment result

Reference

(1) This function is applied only for AB(R) Series.

(2) The output after the span adjustment is finished properly.

- 1** Go to the function setting mode.
(Refer to Section 2-5 “Basics of Function Settings.”)

Press and hold the [Function] key until “Func” is displayed.
- 2** Setting of ISO/GLP/GMP compliant output.

Press the [Function] key several times to select “0. GLP.”

Press the [Zero/Tare] key and select one of the following numbers:

0: Disable
1: Enable
- 3** Record the setting.

Press the [Set] key.
The screen returns to the weight display.

Reference

Printing example
The models with Clock function

* * C A L I B R A T I O N * *											
S H I N K O D E N S H I											
M O D E L :											
A B 3 2 0 0 R C E											
S / N : 1 2 3 4 5 6 7 8 9 0											
I D :											
D A T E : 2 8 . 1 1 . 2 0 1 4											
T I M E : 1 1 : 0 3											
* C A L . E N D											
N A M E											
* * * * * * * * * * * * * *											

6-1-3 Time and date Stamp Output

■ This is a function to output measurement date with the current time or date and time.

Reference

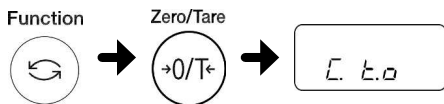
There is a need to pre-set the time and date.

1 Go to the function setting mode.
(Refer to Section 2-5 “Basics of Function Settings.”)

Press and hold the [Function] key until “Func” is displayed.

2 Stamp output setting of the time and date.

Press the [Function] key several times to select “C. t.o”



Press the [Zero/Tare] key and select one of the following numbers:

- 0: Disable
- 1: Outputs time together with measurement data.
- 2: Outputs date and time together with measurement data.

3 Record the setting.

Press the [Set] key.
The screen returns to the weight display.



6-2 Connecting the Interface and External Devices

**CAUTION**

Disconnect the AC adapter of the balance before connecting external devices.

6-2-1 Connector pin numbers and functions

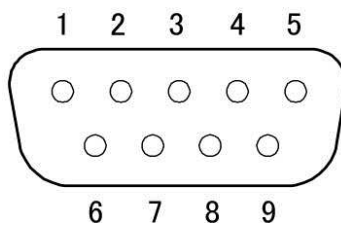
- The balance inputs and outputs from and to external devices such as a PC via the RS-232C interface.

The RS-232C interface equipped on the balance is a D-SUB9P type.

The connection with external devices is established with the following specifications:

The RS-232C connector equipped on the balance has the following pin alignment:

D-SUB9P male connector



Pin number	Signal name	Input/Output	Function & Remarks
1	-	-	-
2	RXD	Input	Receiving data
3	TXD	Output	Transmitting data
4	DTR	Output	HIGH (When the balance is powered ON)
5	GND	-	Signal ground
6	-	-	-
7	-	-	-
8	-	-	-
9	EXT.TARE	Input	External tare range setting

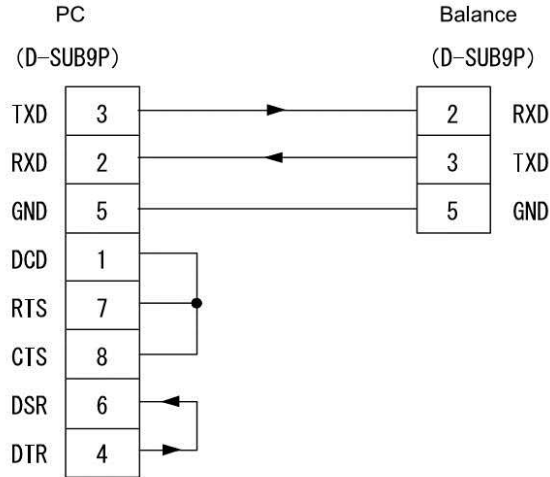
Reference

You can set a tare range or adjust the zero-point from an external device by connecting a contact or a transistor switch between the pin for externally setting a tare range (Pin 9) to the pin for signal ground (Pin 5). In this case, allow at least 400 ms for connection (ON) time (Maximum voltage when the balance is turned OFF: 15 V, sink current when it is turned ON: 20 mA.)

6-2-2 Sample connection with a PC

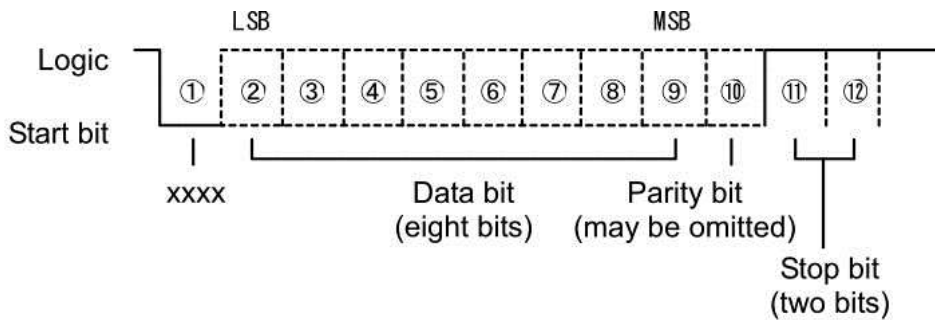
■ Use the following examples as a guide to connect the balance to external devices using the cable.

- Sample connection with a PC/AT compatible machine



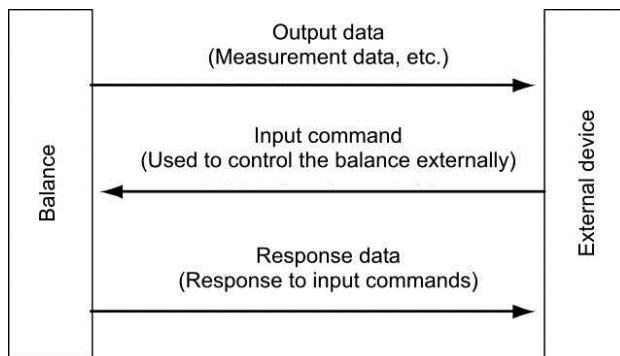
6-2-3 Interface specifications

Transmission system	Serial transmission, Start-stop synchronization
Transmission rate	1200/2400/4800/9600 bps
Transmission codes	ASCII codes (8 bits)
Signal level	Compliant with EIA RS-232C HIGH level (data logic 0): +5 to +15 V LOW level (data logic 1): -5 to -15 V
Bit configuration	Start bit: 1 bit Data bits: 8 bits Parity bit: 0/1 bit Stop bits: 2/1 bit
Parity bit	None/Odd/Even



6-3 Communication Data and Commands

- The RS-232C interface exchanges data with external devices as follows:




6-4 Output data


■ The two formats of “6-digit numeric”, “7-digit numeric” formats are available. Select a format with the following operation:

- 1** Go to the function setting mode. (Refer to Section 2-5 “Basics of Function Settings.”) Press and hold the [Function] key until “Func” is displayed.
- 2** Set the output date format function. Press the [Function] key several times to select “7.I.F.”.

Function




Zero/Tare



7 I.F.

Press the [Zero/Tare] key to select a format.
 1 = 6-digit numeric format
 2 = 7-digit numeric format
- 3** Save the setting. Press the [Set] key.
The balance goes back to normal display.

Set



6-4-1 Data format

- 6-digit numeric format

Consists of 14 characters, including terminators (CR = 0DH/LF = 0AH).

1	2	3	4	5	6	7	8	9	10	11	12	13	14
P1	D1	D2	D3	D4	D5	D6	D7	U1	U2	S1	S2	CR	LF

- 7-digit numeric format

Consists of 15 characters, including terminators (CR = 0DH/LF = 0AH). A parity bit can be appended.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
P1	D1	D2	D3	D4	D5	D6	D7	D8	U1	U2	S1	S2	CR	LF

- 6-digit numeric format for model provided with an auxiliary scale interval

Consists of 15 characters, including terminators (CR = 0DH/LF = 0AH), with “/” added to the left of the auxiliary scale interval place.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
P1	D1	D2	D3	D4	D5	D6	D7	D8	U1	U2	S1	S2	CR	LF

- 7-digit numeric format for model provided with an auxiliary scale interval

Consists of 16 characters, including terminators (CR = 0DH/LF = 0AH), with “/” added to the left of the auxiliary scale interval place.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
P1	D1	D2	D3	D4	D5	D6	D7	D8	D9	U1	U2	S1	S2	CR	LF

6-4-2 Meanings of data

[P1] (one character)

Indicates the polarity of data.

P1	Code	Description
+	2BH	Zero or positive data
-	2DH	Negative data

[D1 to D7 (or D8)] (seven or eight characters)

Numeric data is stored.

D1~D7(D8)	Code	Description
0~9	30H~39H	0 to 9 (numeric)
.	2EH	- Decimal point - Omitted when numeric data does not contain decimal places. In this case, a space is output to the least significant digit.
SP (Space)	20H	- A space heading a numeric value - When numeric data does not contain decimal places, a space rather than a decimal point is output to the least significant digit.

- * - If headed with no data, the numeric value is headed by 0 (30H) by factory default setting. Using the function setting, it can be headed by "SP" (20H).
 - When expression units are changed or switched to display of parts counting, percentage weighing the decimal place is changed (Refer to "■ Sample communication formats").

[U1, U2] (two characters)

Indicates the unit used to show numeric data.

U1	U2	Code		Meaning	Balance indicators
(SP)	G	20H	47H	Gram	g
C	T	43H	54H	Carat	ct
O	Z	4FH	5AH	Ounce	oz
L	B	4CH	42H	Pound	lb
O	T	4FH	54H	troy ounce	oz t
D	W	44H	57H	Pennyweight	dwt
G	R	47H	52H	Grain	▶ (lower right)
T	L	54H	4CH	tael (Hong Kong)	ti
T	L	54H	4CH	tael (Singapore, Malaysia)	ti▶ (upper right)
T	L	54H	4CH	tael (Taiwan)	ti▶ (lower right)
M	O	4DH	4FH	Momme	mom
t	o	74H	6FH	Tola	to
(SP)	%	20H	25H	Percentage	%
P	C	50H	43H	Pieces	Pcs

[S1] (one character)

Indicates the judgment result when the limit function is used.

S1	Code	Description	Remarks
L	4CH	Below (LO)	1- or 2-point scale
G	47H	Appropriate (OK)	
H	48H	Above (HI)	
(SP)	20H	No judgment result or no data type specified	

[S2] (one character)

Indicates the status.

S2	Code	Description
S	53H	Data stable
U	55H	Data unstable
E	45H	Data error (data other than S2 is invalid.) "o-Err", "u-Err"

6-5 Input commands

■ An input command is to control the balance from an external device.

The following two input commands are supported:

- (1) Tare range command (2) Set output control command

6-5-1 Procedure for transmission

- (1) An input command is sent from an external device to the balance.
The full-duplex transmission system allows you to send an input command at any time independently of the data transmit timing of the balance.
- (2) Upon successful completion of an input command, the balance will send out either a normal completion response or the result data requested by the command, to the external device.
 - If the operation has not resulted in successful completion, or if the command is invalid (in error), the balance will transmit an error response.
 - When the balance is in normal display mode, it usually sends a response to a command within one second after it is received. For a tare range command a response is sent after the command is completely processed.
 - If the balance receives a command when you are setting a function, when the balance is under span adjustment, or the balance is busy for other reasons, the command is executed after that operation is completed.



After you have sent an input command, do not send another command to the balance until the external device receives a response from the balance.

6-5-2 Sample input commands

Sent command	Description
T(SP)(CR)(LF)	Set tare range (adjust to zero-point).
01(CR)(LF)	Set to continuous output.
08(CR)(LF)	Output data (once immediately).
TT(CR)(LF)	Set tare range
Z(SP)(CR)(LF)	Adjust to zero-point

6-5-3 Command form

An input command consists of 4 characters including terminators (CR/LF).

C1	C2	CR	LF
----	----	----	----

6-5-4 Command format

(1) Tare range (zero-point adjustment) command

C1	C2	Code (C1)	Code (C2)	Description	Value	Response
T	(SP)	54H	20H	- Tare range setting - Zero-point adjustment	None	A00: Successful completion E01: Command error
T	T	54H	54H	- Tare range setting	None	A00: Successful completion E01: Command error E04: Can not tare
Z	(SP)	5AH	20H	- Zero-point adjustment	None	A00: Successful completion E01: Command error E04: Can not be zero adjustment

Reference

(1) For command T(SP)

Conducted zero adjustment when less than $\pm 1.5\%$ of the Max.

Conducted tare when more than $+1.5\%$ of the Max.


(2) For command TT

Conducted tare in the range of 1d - Max.

(3) For command Z(SP)

Conducted zero adjustment when less than $\pm 1.5\%$ of the Max.

(2) Set output control command

 CAUTION	Pay attention to the difference between O (the letter "o") and 0 (zero).
---	--

C1	C2	Code (C1)	Code (C2)	Description	Response
O	0	4FH	30H	Stop output.	A00: Successful completion E01: Command error
O	1	4FH	31H	Output continuously at all times.	
O	2	4FH	32H	Output continuously if stable (Stop output if unstable).	
O	3	4FH	33H	Output once when the [Print] key is pressed (whether the balance is stable or unstable).	
O	4	4FH	34H	Output once when the balance is stable. Output when a sample is lifted to cause the display to indicate a value below zero, and then another sample is placed to make the balance stable.	
O	5	4FH	35H	Output once when the balance is stable. Stop output when unstable. Output once when the balance is stabilized again (the output includes zero) even if it is not reloaded.	
O	6	4FH	36H	Output once when the balance is stable. Output continuously when unstable. Output is stopped after a single output when the balance is stable even if it is not reloaded.	
O	7	4FH	37H	Output once when the [Print] key is pressed if the balance is stable.	
O	8	4FH	38H	Output once immediately.	
O	9	4FH	39H	Output once after stabilized.	

- Commands O0 to O7 have the same workings as the output control set by the function setting.
- Commands O8 and O9 are used to request data from the balance.
- Once executed, O0 to O7 commands are held. However, the status is reset to the function setting when the balance is turned on again.
- When either an O8 or O9 command is executed, it returns to the state of "O0".

(3) Span adjustment/test command

Command Main Body				Description	Response
C1	C2	code(C1)	code(C2)		
C	1	43H	31H	Span adjustment with built-in weights	A00: Successful completion E01: Command error E02: Operation is disabled.

This command takes time because the balance sends back a response after an appropriate operation is completed.

(4) Request date or time output command

Command Main Body				Description	Response
C1	C2	code(C1)	code(C2)		
D	D	44H	44H	Date output request	Date data
D	T	44H	54H	Time output request	Time data

Response

Date data:

(DC2) D A T E : y y y y . m m . d d (CR)(LF) (DC4)

(Date format depends on the setting of Date Display in Function 1 [b. dat. *].)

Time data:

(DC2) T I M E : (SP)(SP)(SP)(SP)(SP) h h : m m (CR)(LF) (DC4)

The above data is accompanied by a control command (DC2,DC4) of our printer when output.

7 Troubleshooting & Maintenance

7-1 Error Messages

Message	Cause	Remedy
o-Err	The weight of the sample is more than the weighing capacity.	Unload the sample and weigh it in parts. Replace the tare with a lighter one. If the error message does not disappear even when nothing is placed on the weighing pan, mechanical parts may have failed. Please contact the retailer from whom the balance was purchased.
u-Err	The negative load exceeded the lower limit.	The weighing pan or the pan base may not be set properly. Check whether they are in contact with an object or if there is some other problem with them. If the error message does not disappear even if the weighing pan and pan base are properly set, mechanical parts may have failed. Please contact the retailer from whom the balance was purchased.
1-Err	The reference weight used during span adjustment with an external weight is far less than 80% of the weighing capacity.	Use a weight that is as close to the weighing capacity as possible.
2-Err	During the span adjustment using the external weight, the difference in display error between before and after the adjustment exceeds 1.0%. Or, the balance is out of order.	Check that the correct weight was put in place and that no objects other than the weight are on the pan. Then, execute span adjustment or span test again.
3-Err	Adjustment was performed with something loaded on the measurement pan.	Check correct span-adjustment procedure.
4-Err	The weight error exceeded 1.0% during span adjustment, or the balance failed.	Check correct span-adjustment procedure. Please contact the retailer from whom the balance was purchased.

Message	Cause	Remedy
A-Err	The built-in weight or drive unit has failed.	Please contact the retailer from whom the balance was purchased.
b-Err	The balance is influenced by static electricity or noise.	Unplug the AC adapter from the receptacle and then turn the power on again. If this error occurs again, electric components may have failed. Please contact the retailer from whom the balance was purchased.
C-Err	The internal clock has failed.	Please contact the retailer from whom the balance was purchased.
d-Err	The balance is influenced by static electricity or noise.	Unplug the AC adapter from the receptacle and then turn the power on again. If this error occurs again, electric components may have failed. Please contact the retailer from whom the balance was purchased.
L-Err	The weight of a sample is too light to take samples for counting, or for reference weight saving during percentage weighing.	Use a heavier sample by referring to the Specifications to check the minimum unit weight and the percentage weighing weight limit.
Err016	CRC-16 checksum of the software is not matched.	Please contact the retailer from whom the balance was purchased.
Err710	Unstable condition continued for 2 minutes during span adjustment.	There is a possible effect from vibration or wind. Refer to "Note" in Section 1-1 "Warnings regarding Use" to take appropriate measures, or change the installation location of the balance and perform the adjustment again.


7-2 Troubleshooting

Symptom	Cause	Action to take
Nothing is displayed even when the balance is powered on.	The AC adapter is not connected.	<ul style="list-style-type: none"> - Check that the AC adapter is connected. - If nothing is displayed even if the AC adapter plug is properly connected, the electric components of the balance or the AC adapter may have failed. Replace the AC adapter to test whether the adapter was the problem if you have an AC adapter of the same model that you know operates properly. - Please contact the retailer from whom the balance was purchased.
The display flickers.	The balance may be affected by an external influence such as wind and vibration.	Increase the setting values of relevant functions by referring to Section 5-2 "Improving the Stability of the Balance."
The displayed weight is incorrect.	This error is caused by the balance not being used for a long period of time or being relocated.	Perform span adjustment.
	The adjusters are not resting flat on the surface and the balance is not horizontal.	Make sure that the balance is horizontal.
	The tare range is set or is not set.	Unload the sample from the weighing pan and then zero the readout by pressing the [Zero/Tare] key to continue measurement.
An error still exists after adjustment.	The balance was affected by wind or vibration during the adjustment.	There is a possible effect from vibration or wind. Refer to "Note" in Section 1-1 "Warnings regarding Use" to take appropriate measures, or change the installation location of the balance and perform the adjustment again.
	The mass of the weight used for the adjustment is slightly different from that of the weight used for checking.	Use the same weight for the adjustment and checking.

Symptom	Cause	Action to take
The M continuously flashes. (When the [Zero/Tare] key is pressed when taking samples in counting mode, etc.)	The balance may be affected by an external influence such as wind and vibration.	The balance may be affected by an external influence such as wind and vibration. Take remedial actions or relocate the balance by referring to instructions about the place of installation described in Section 1-1 "Warnings regarding Use."
Unable to output anything	The output function settings may not have been set as you intended.	Refer to the instruction manual for each device to match the communication conditions of the balance with those of the external device. Check the output with the following procedures: Refer to the instruction manual for the external device to set the communication conditions to 1200 bps, 8-bit data, 2-bit stop, and no parity. In this state, after the [Print] key is pressed, output is performed only once after the balance stabilizes. Press the [Print] key to check the output.
	Communication conditions do not match those of the external device.	
	Wrong cable connection	To connect the balance to a common PC, a crossover cable is required (Refer to Section 6-2 "Connecting the Interface and External Devices"). Obtain one yourself or contact the retailer from whom the balance was purchased.
	The cable is disconnected or not properly connected.	Make sure that the cable is connected properly.
	Tare device is not in operation and weight indication is below zero.	Output data when tare device is in operation or weight indication is zero and above.

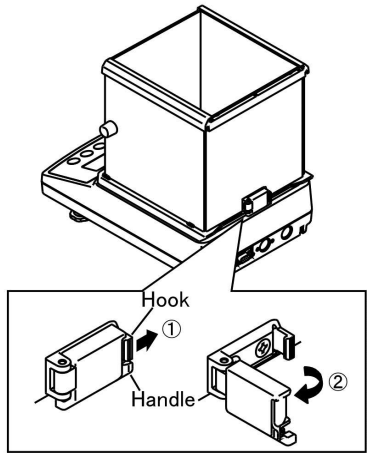
7-3 Maintenance

- When maintaining this product, pay attention to the following:
 - When the product is excessively dirty, disassemble it before cleaning. At this time, only the “windshield,” “weighing pan,” and “pan base” can be removed.
 - Wipe off any dirt on the main unit with a soft cloth that has been soaked in water and squeezing it firmly.


 CAUTION	<ul style="list-style-type: none"> • Be sure to unplug the AC adapter before cleaning the balance. • Do not use any strong solvents or abrasive cleansers. • Take care not to allow liquid or dirt to enter the main unit (mechanical parts).
--	--

7-3-1 Simple Method for Maintenance

1 Remove the windshield.
Release the latch.

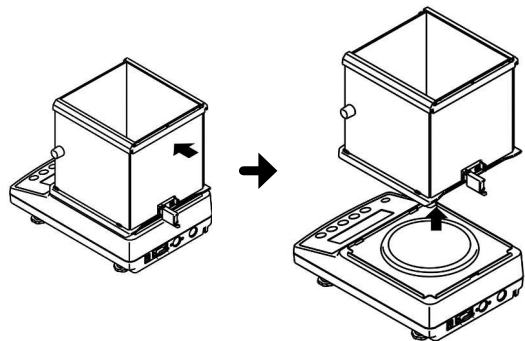


- ① Pull the latch hook slightly in the arrow direction.


 CAUTION	<p>Pulling the hook too much may damage the latch.</p>
--	--

- ② Grasp the handle to turn and release the latch.

2



- ① Move the windshield in the direction of arrow until it stops.
- ② Hold and lift the windshield with your hands to remove it.

 CAUTION	<p>When lifting or moving the windshield, be sure to do so with both hands.</p>
--	---

■ When the windshield has been removed, remove the weighing pan and pan base depending on the extent of dirt before maintenance.

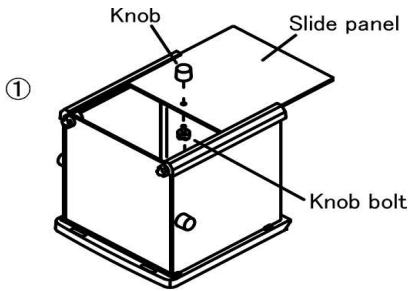
7-3-2 How to Maintain the Windshield

■ When it is excessively dirty, disassemble it before cleaning.

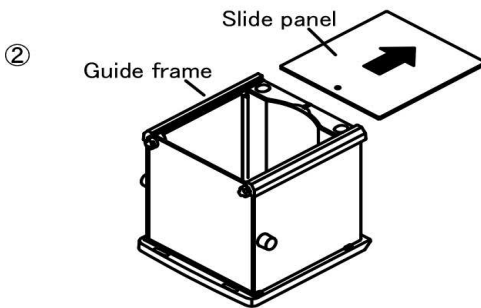
Reference

The windshield can also be maintained while still attached to the weighing section.

1 Remove the top panel.

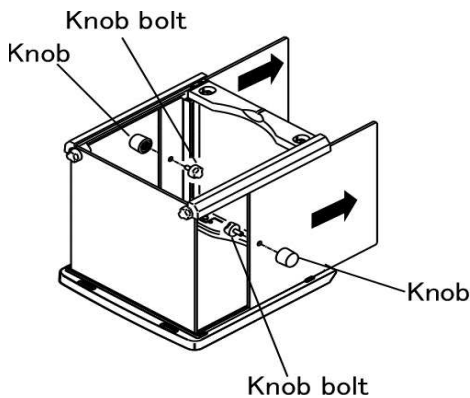


① Turn the knob bolt attached to the slide panel on the top and remove the knob.

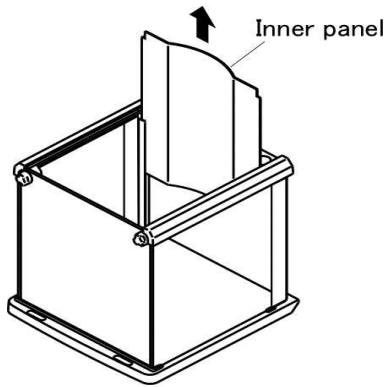


② Pull the slide panel out of the guide frame.

2 Remove the slide panel.



Turn the knob bolts attached to the right and left slide panels to remove the knobs, and then pull out the slide panels.

3 Remove the inner panel holder.

Pinch the top of the inner panel sides and pull it out.

CAUTION

When pulling out or inserting the inner panel, slowly remove or insert it so as to avoid forceful impacts.

* If you release the panel in mid-course, it applies an impact from dropping that may lead to damage or malfunction.

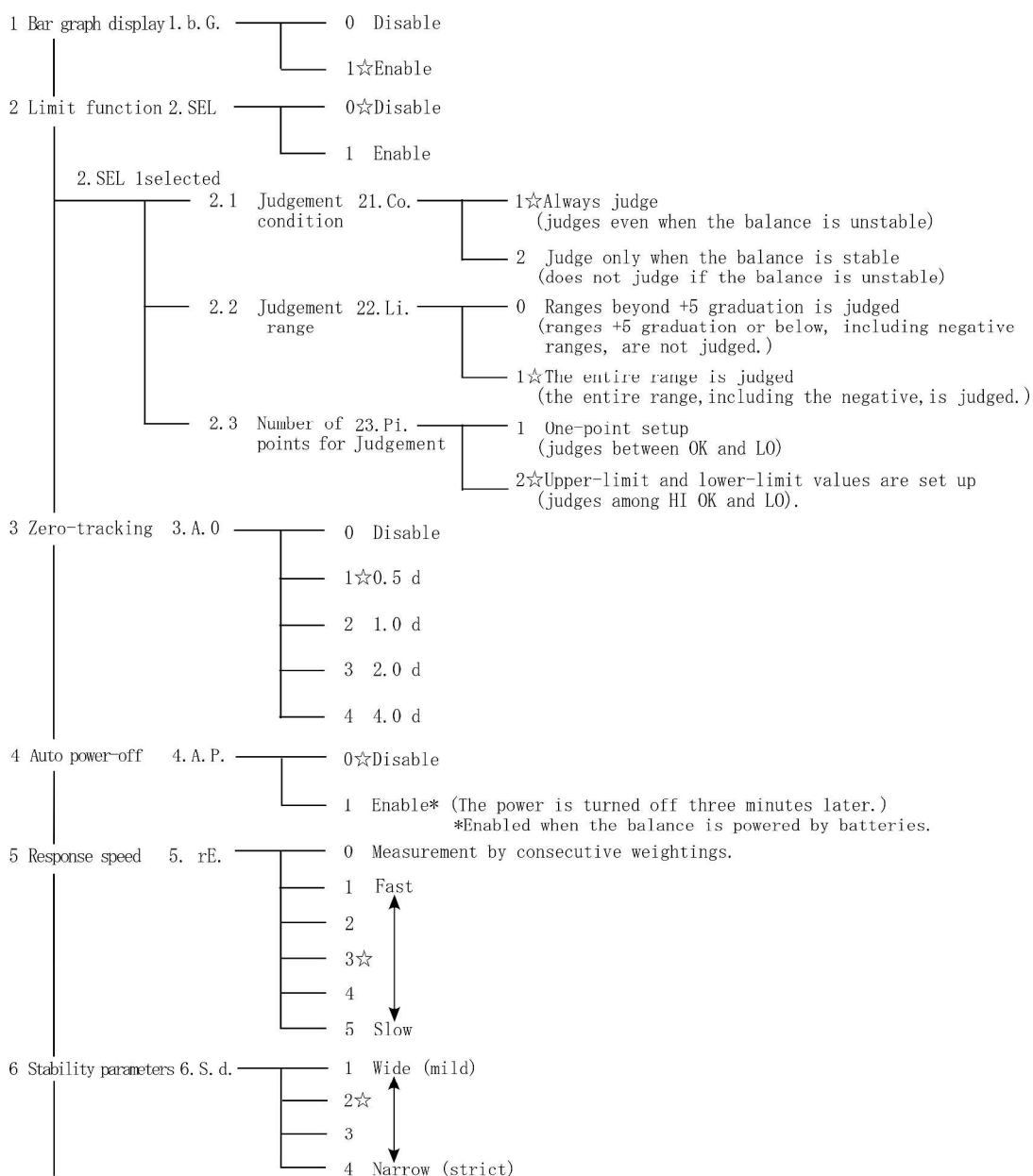
(Memo)

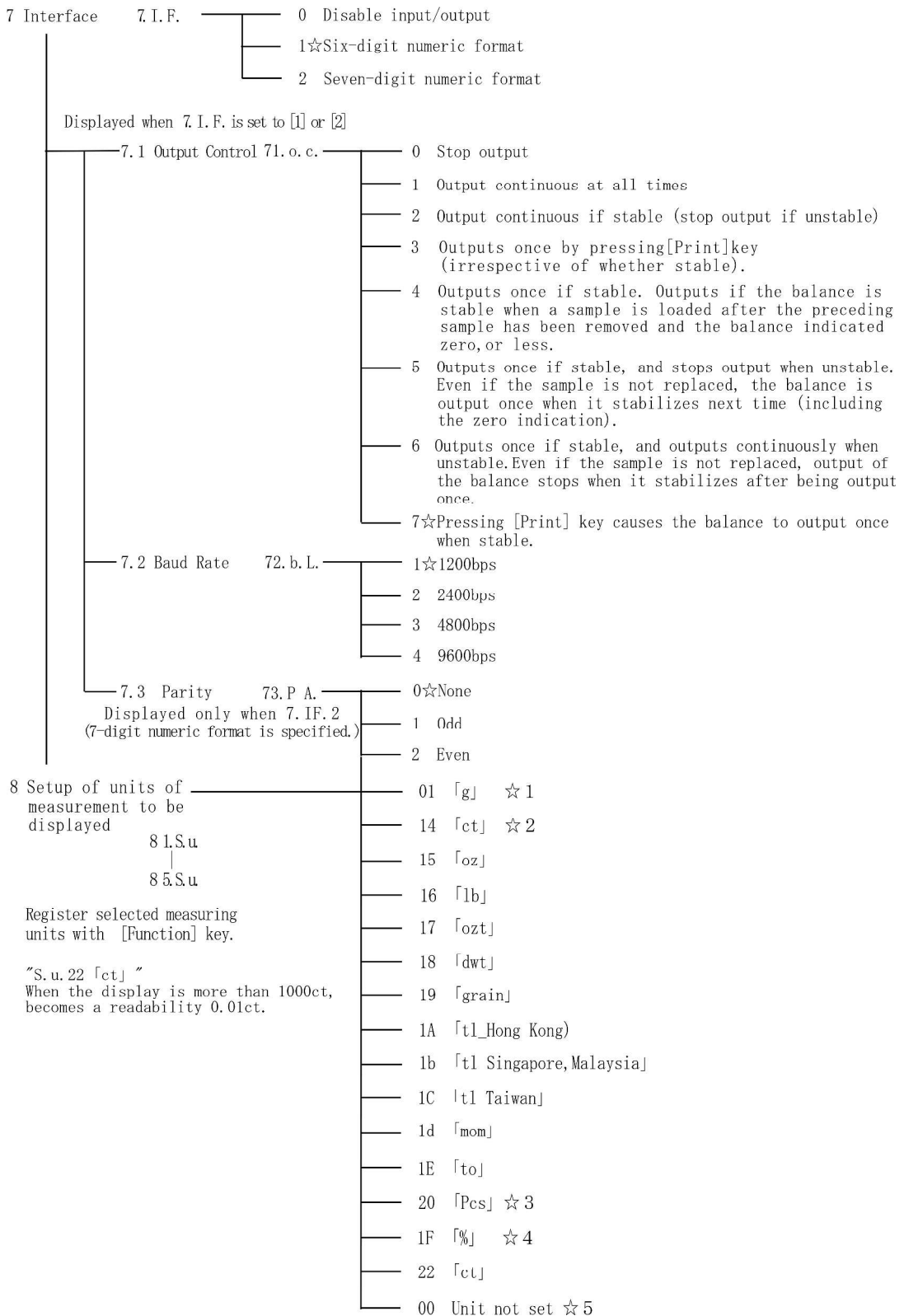
Appendixes

Appendix 1 Function Setting List

[Function]

☆Default





- 10 GLP-compliant print (AB-R series only)
 - 0. GLP
 - 0 ☆Disable
 - 1 Enable
- 11 Date Display
 - b. dat.
 - 1 Output in Year-Month-Day format
 - 2 Output in Month-Day-Year format
 - 3 ☆Output in Day-Month-Year format
- 12 Time stamp output
 - C. t. o
 - 0 ☆Disable
 - 1 Outputs time together with measurement data
 - 2 Outputs date and time together with measurement data
- 13 Backlight
 - d. b. L
 - 0 off
 - 1 ☆on
- 14 Auto Backlight OFF
 - E. A. b
 - 0 Disable
 - 1 ☆Enable (The backlight goes off if the balance is not used for about one minutes.)

[Function2]

☆Default

- 1 Date and time setup
 - 3. d. SEt
 - 0 ☆Disable
 - 1 Enable

Appendix 2 Specifications

Appendix 2-1 Basic Spec

Model	Gram(g)		Parts counting	Percentage	Span adjustment
	Max	d	Minimum unit weight (g)	Weight limit (g)	
AB323	320	0.001	0.01	1	External
AB623	620	0.001			
AB1202	1200	0.01	0.1	10	
AB3202	3200	0.01			
AB12001	12000	0.1	1	100	
AB323R	320	0.001	0.01	1	Internal
AB623R	620	0.001			
AB1202R	1200	0.01	0.1	10	
AB3202R	3200	0.01			
AB12001R	12000	0.1	1	100	

Appendix 2-2 Functional Specifications

Weight measurement method	Tuning-fork vibration method		
Balance types	Weight balance/Counting balance/Percent balance		
Functions	Limit (three-step judgment by upper and lower limit settings), unit switching		
Display	Liquid-crystal (with backlight) 7 segments (2 segments at the beginning) Up to 7-digit display Maximum segment height: 16.5 mm Bar graph display (20 steps) / Messages and signs display		
Tare	One-touch actual-weight tare by using the [Zero/Tare] key		
Zero tracking	Can be stopped by the setting		
Limits of indication	Upper limit : Max + 9e		
Output	Equipped with the RS-232C-compatible output by standard. SHINKO DENSHI standard format D-SUB9P male (RS-232C output, with an external tare port, bi-directional) Supported printer: CSP-160II		
Span adjustment	AB Series	Span adjustment using the external weight (the weight used should exceed 80% of the capacity).	
	ABR Series	Span adjustment using the internal weight.	
	* Span adjustment is only available in the g units.		
Power supply	AC Adapter	Input: 100 to 230 VAC, Output: 6 VDC	
External dimensions (WDH)	202 × 293 × 266 mm (AB323(R)–623(R), including the windshield) 196 × 293 × 89 mm (AB1202(R)–12001(R))		
Dimensions of the weighing pan	140 mm diameter (AB323(R)–623(R)) 190 × 190 mm (AB1202(R)–12001(R))		
Weight of the balance (Approximately)	AB323-623	3.5 kg	AB323R-623R 4.2 kg
	AB1202-12001	2.6 kg	AB1202R-12001R 3.5 kg
Operating temperature and humidity	Temperature: +5°C to +35°C, Humidity: 80%RH or lower (with no condensation)		

Appendix 2-3 Weighing Capacity and Readability by Unit

Unit	Model				
	AB323(R)	AB623(R)	AB1202(R)	AB3202(R)	AB12001(R)
(g) gram	320 0.001	620 0.001	1200 0.01	3200 0.01	12000 0.1
(ct) carat	1600 0.01	3100 0.01	6000 0.05	16000 0.1	60000 0.5
(mom) momme	85 0.0005	160 0.001	320 0.005	850 0.005	3200 0.05
(oz) ounce	11 0.0001	21 0.0001	42 0.0005	110 0.001	420 0.005
(lb) pound	0.7 0.00001	1.3 0.00001	2.6 0.00005	7 0.0001	26 0.0005
(ozt) troy ounce	10 0.0001	19 0.0001	38 0.0005	100 0.001	380 0.005
(dwt) penny weight	200 0.001	390 0.001	770 0.01	2000 0.01	7700 0.1
(GN) grain	4900 0.02	9500 0.02	18000 0.2	49000 0.2	180000 2
(tl) tael(Hong Kong)	8.5 0.00005	16 0.0001	32 0.0005	85 0.0005	320 0.005
(tl) tael(Singapore, Malaysia)	8.4 0.00005	16 0.0001	31 0.0005	84 0.0005	310 0.005
(tl) tael(Taiwan)	8.5 0.00005	16 0.0001	32 0.0005	85 0.0005	320 0.005
(to) tola	27 0.0001	53 0.0001	100 0.001	270 0.001	1000 0.01
*(ct) *carat	1600 0.005	3100 0.005	- -	- -	- -

* When the display is more than 1000ct, becomes a readability 0.01ct.

Appendix 2-4 Unit Conversion Table

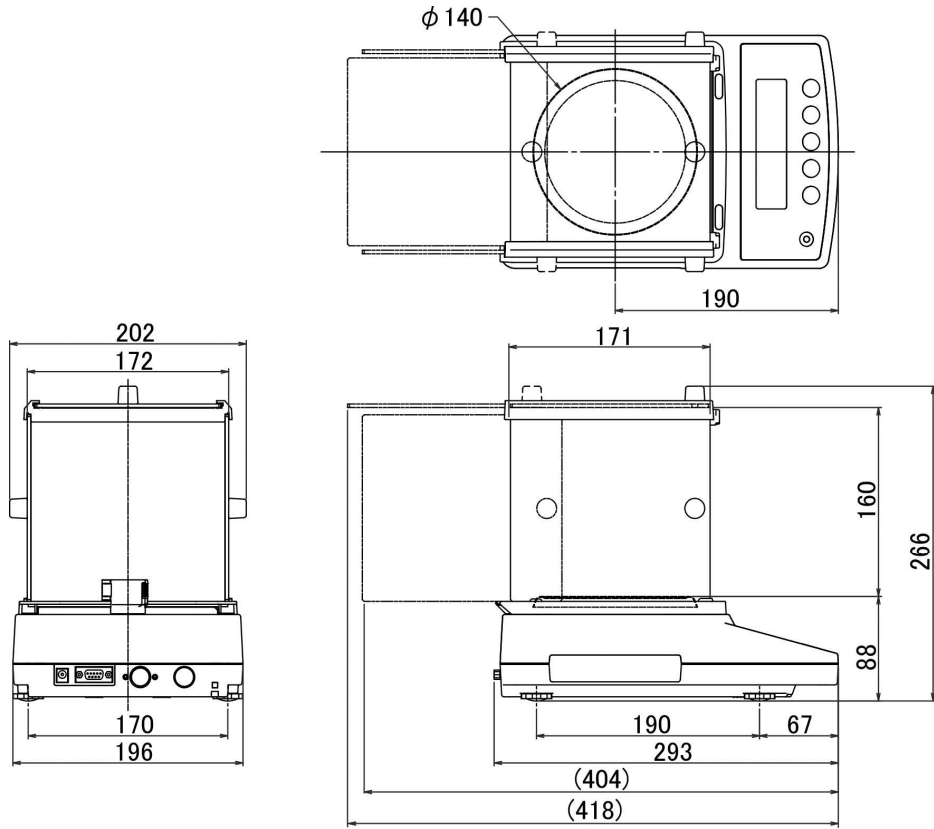
Unit	gram	carat	ounce	pound	troy ounce	penny weight
1g	1	5	0.03527	0.00220	0.03215	0.64301
1ct	0.2	1	0.00705	0.00044	0.00643	0.12860
1oz	28.34952	141.74762	1	0.06250	0.91146	18.22917
1lb	453.59237	2267.96185	16	1	14.58333	291.66667
1ozt	31.10348	155.51738	1.09714	0.06857	1	20
1dwt	1.55517	7.77587	0.05486	0.00343	0.05	1
1GN	0.06480	0.32399	0.00229	0.00014	0.00208	0.04167
1tl (Hong Kong)	37.429	187.145	1.32027	0.08252	1.20337	24.06741
1tl (SGP, Mal)	37.79936	188.99682	1.33333	0.08333	1.21528	24.30556
1tl (Taiwan)	37.5	187.5	1.32277	0.08267	1.20565	24.11306
1mom	3.75	18.75	0.13228	0.00827	0.12057	2.41131
1to	11.66380	58.31902	0.41143	0.02571	0.37500	7.5

Unit	grain	tael (Hong Kong)	tael (Singapore, Malaysia)	tael (Taiwan)	momme	tola
1g	15.43236	0.02672	0.02646	0.02667	0.26667	0.08574
1ct	3.08647	0.00534	0.00529	0.00533	0.05333	0.01715
1oz	437.5	0.75742	0.75	0.75599	7.55987	2.43056
1lb	7000	12.11874	12	12.09580	120.95797	38.88889
1ozt	480	0.83100	0.82286	0.82943	8.29426	2.66667
1dwt	24	0.04155	0.04114	0.04147	0.41471	0.13333
1GN	1	0.00173	0.00171	0.00173	0.01728	0.00556
1tl (Hong Kong)	577.61774	1	0.99020	0.99811	9.98107	3.20899
1tl (SGP, Mal)	583.33333	1.00990	1	1.00798	10.07983	3.24074
1tl (Taiwan)	578.71344	1.00190	0.99208	1	10	3.21507
1mom	57.87134	0.10019	0.09921	0.1	1	0.32151
1to	180	0.31162	0.30857	0.31103	3.11035	1

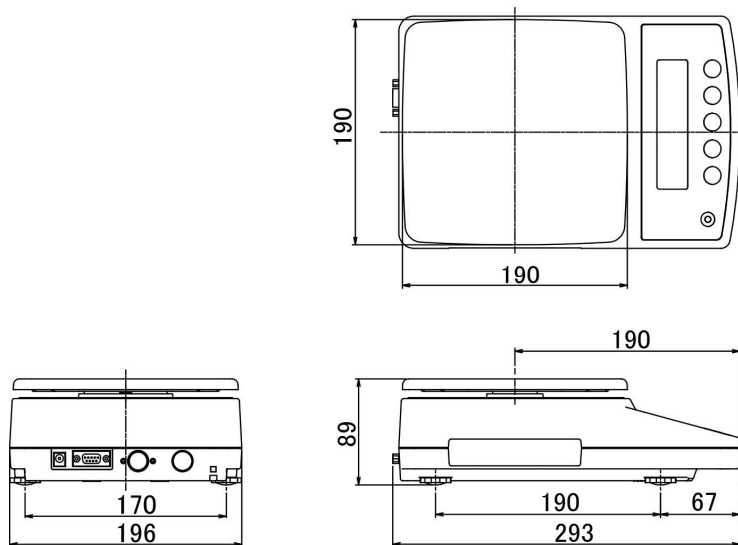
Appendix 2-5 Outline Drawings

■AB323(R)-623(R)

Unit : mm



■AB1202(R)-12001(R)



Index of Terms

[A]		Limit weight	34
AC adapter	20	[M]	
Adjuster	20	Maintenance.....	64
Auto Backlight	44	[O]	
[B]		Operation keys	11, 21
Bar graph	23	[P]	
[C]		Percentage.....	34
Calibration	40	Percentage weighing.....	35
Capacity and Readability.....	72	Procedure for transmission	56
Command.....	56	[R]	
Counting.....	32, 35	Reference weight	34
[D]		RS-232C	48, 50
date	46, 47, 49	[S]	
Date and Time	45	Span adjustment	39, 40, 41
D-SUB9P cable	48	Specifications	70
[E]		Stability.....	43
Error	60	[T]	
External tare.....	50	Tare range setting	27
[F]		Terminators	56
Function settings	29, 30	time	45, 49
Functional Specifications.....	71	[U]	
[I]		Unit Conversion.....	73
Input/Output	48	[W]	
Interface	50, 51, 63	Weighing capacity	27
[L]		[Z]	
Level.....	20	Zero-point adjustment	26, 57
Limit function	21, 35	Zero-tracking.....	42
Limit value	35		

