321-78327A
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Uni Bloc

Shimadzu Analytical Balance

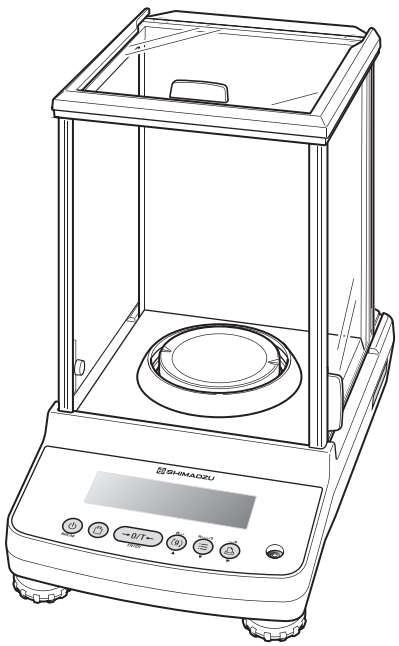
Instruction Manual

ATX-R series

ATX324R
ATX224R
ATX124R
ATX84R

ATY-R series

ATY324R
ATY224R
ATY124R
ATY64R



Read the instruction manual throughly before you use the product.
Keep this instruction manual for future reference.

SHIMADZU

BEFORE WEIGHING
Name and Function of Components
Installation

USING THE BALANCE
Weighing
Outputing Weight Readings
Selecting the Display
Ending Weighing

USING MORE CONVENIENTLY
Menu Setting
Calibration
Functions Relating to Taring
Adjusting Response and Stability
Setting Units
Application Function Mode
Comparator Function
Connection and Communication with Peripheral Devices

MAINTENANCE
Maintaining the Balance
Inspection
About Weights

TROUBLESHOOTING
What to Do If...
Responding to Messages...

FOR YOUR INFORMATION
Turning the Power ON and OFF
Changing the Password
GLP Output Function
Specifications
Maintenance Parts
List of Functions That Can Be used in Combination
Menu Map

Foreword

Read the instruction manual thoroughly before using the product.

Thank you for purchasing the Shimadzu Analytical Balance AT-R Series.

This instruction manual provides details on how to use the balance and on the accessories and options, etc., that are related to it. Read the manual thoroughly and make sure it is used in accordance with the details listed herein. The following instruction manual is also supplied with this product.

Simple Sheet: Operation Guide 321-78340 Operation descriptions in a simple diagram format.

Store the instruction manuals together with the product in an easily-accessible location.

The instruction manuals (PDF format) can also be downloaded from the Shimadzu website (https://www.shimadzu.com/an/balance/index.html). Balances SEARCH Click

Notices

- If the balance is to be operated by a different user or transferred to a different location, make sure the instruction manuals are also provided to the subsequent users.
- Contact the Shimadzu sales office or agency in the event of the instruction manuals were lost or mislaid.
- Safety precautions are listed in the instruction manual to ensure safe usage. Read the section on [Safety Precautions] thoroughly prior to using the balance.
- You are requested to complete the user registration procedure to ensure that your balance can be used without anxiety. This is required when making claims against the product warranty, and you are requested to complete either of the following two user registration procedures.
  (1) Fill in the details on the rear of the [Product Warranty] card provided, and send it to us by facsimile.
  (2) Access our website and will in the details accordingly. (https://www.shimadzu.com/an/contact/index.html)

Once you have completed the user registration procedures, you will be given precedence with regard to receiving information on product warranty and Shimadzu products and services. (You are also requested to fill in the questionnaire.)

Notices

- The content of this manual is subject, without notice, to modifications for the sake of improvement.
- Every effort has been made to ensure that the content of this manual was correct at the time of creation. However, in the event that any mistakes or omissions are discovered, it may not be possible to correct them immediately.
- The copyright of this manual is owned by Shimadzu Corporation. Reproduction and duplication of whole or part of the content without permission of the company are strictly prohibited.
- Windows is the registered trademark of Microsoft Corporation of the U.S.A. in the United States and other countries. All other company names and product names that appear in this manual are trademarks or registered trademarks of the companies concerned. Note that ™ and ® indications are not used.
- UniBloc and Smart+ are the registered trademarks of Shimadzu Corporation in Japan.
- Shimadzu does not guarantee that the serial communication functions will operate without problem on all PCs. Shimadzu will not accept responsibility for any trouble that arises as a result of using this function. It is recommended that all important data and programs are backed up in advance.
- Shimadzu does not guarantee the operations all USB memories, USB hubs or USB keyboards that can be connected to the USB port.

How to Find the Information You Need

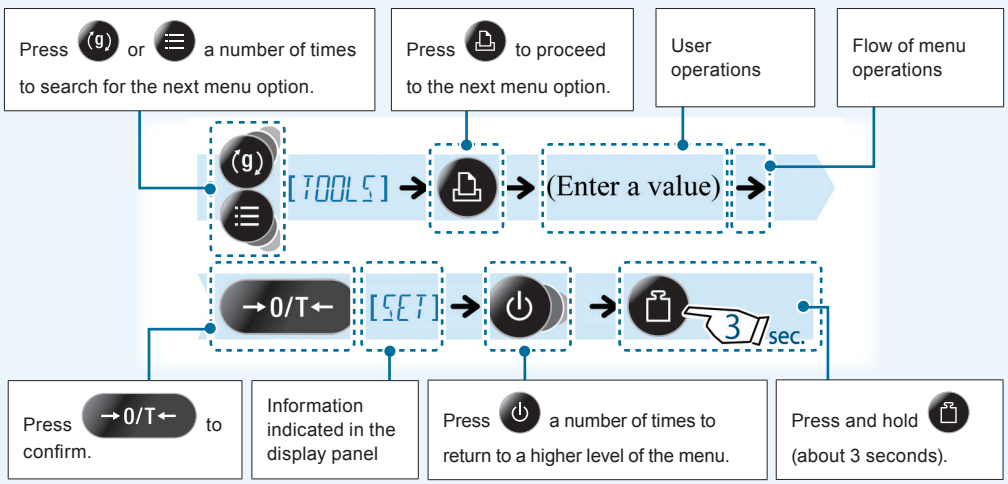
This manual allows you to search for a function or operating procedure in a number of ways.

"Cover index"	Search for the information by thumbing through the manual.
"What You Can Do", page 6	Search for what you want to do.
"Menu Map", page 150	Search quickly for the menu option you want to use.
"Table of Contents", page 15	Search for information based on its order of appearance in the manual.
"Index", page 155	Search for information based on a key word.

◆ Conventions used in menu operations

The instruction manual describes menu operations in a simplified form.

Example:



◆ Conventions used for the display panel

This instruction manual depicts the display panel in relation to particular operating procedures. The actions of the display panel (flashing, lighting up, confirmation) are shown in the following way.

- Flashing

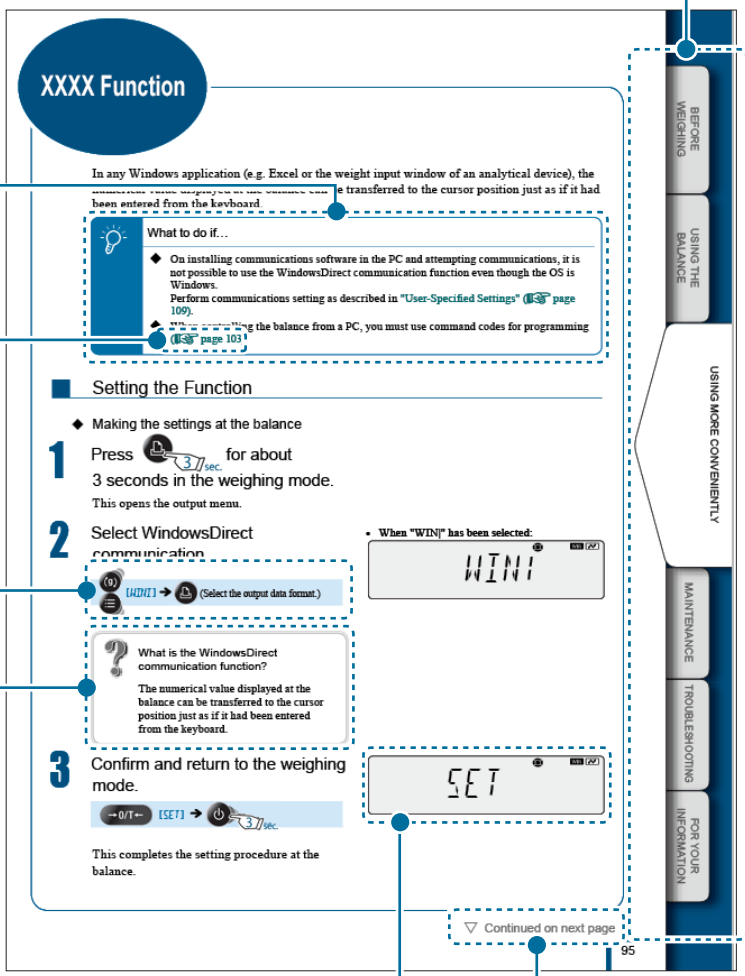
- Lit

- Confirmation

◆ Example page

Linked to the cover index (right-hand pages only)

Index



Notes

Information to help use the balance correctly

Reference

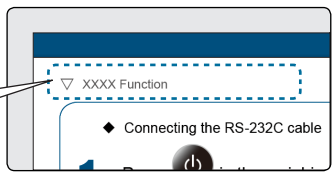
Menu operation

Explanation of terms

Depiction of the display

Continued on next page

The symbol shown in the figure below appears at the head of the next page.



The title of the previous page appears here.

What You Can Do

This section lets you search for a method you would like to try or a function you want to know about.

Various weighing methods

- I want to weigh up to a fixed quantity by adding increments of the same sample (item to be weighed: powder, liquid, etc.) a little at a time.

Pouring Mode ➡ page 71

- I want to make fine adjustments during weighing, like increasing the reaction speed of the display or stabilizing the display.

Easy Setting ➡ page 72

- I want to use the balance to count items.
- I want to set unit weights (the weight of a single piece of the item being weighed) for multiple samples in advance.

Piece Counting ➡ page 82

- I want to weigh in percentages.

Percentage Weighing ➡ page 87

- I want to weigh a fixed amount of each of a number of different samples (items to be weighed: powder, liquid, etc.) and to mix these samples according to a formula.

Formulation ➡ page 102

- I want to check excess or deficiency with respect to a target value and make "pass or fail" judgments accordingly.

Comparator Function ➡ page 107

- I want to adjust the conditions under which the stability mark lights up.

Adjusting the Stability Mark ➡ page 74

Zero point, and taring

- I want to stabilize the display at zero when an empty sample container is placed on the pan.

Zero Tracking Function ➡ page 65

- I want to automatically return the display to zero after weighing.

Auto Zero Function ➡ page 66

- I want to automatically tare the balance (set the display to zero) after outputting a weight reading.

Auto Tare Function ➡ page 68

- I want to tare the balance without waiting for the stability mark to light up.

Zero / Tare Timing Change Function ➡ page 69

Calibration

- I want to adjust the balance so that it is very accurate after stabilization.
  Span Calibration and Adjustment ➡ page 52
- I want to carry out calibration and output a record.
  Leaving a Record of Calibration ➡ page 61

Printing / output

- I want to send data to a PC (e.g. to Excel).
  Balance keys ➡ page 118
- After weighing, I want to output automatically upon stabilization.
  Auto Print Function ➡ page 111
- I want to output data continuously.
  Continuous Output Function ➡ page 113
- I want to output data either immediately or after stabilization.
  Output Timing Change Function ➡ page 131
- I want to change the format of the decimal point (comma or period) in the output data.
  Selecting the Decimal Point Display Symbol ➡ page 39
- I want to add the balance model name, ID and other information to weight readings.
  GLP Output Function ➡ page 143

Miscellaneous

- I want to display weights in units other than g (grams).
  Switching Units ➡ page 37
  Setting the Units ➡ page 77
- I want the power to turn off automatically when I am not using the balance.
  Auto Power-Off Function ➡ page 140
- I want to go directly into weighing mode when the power is switched ON.
  Setting the Startup Display ➡ page 141

Notation Conventions Used within the Instruction Manual

The instruction manual uses the following notation conventions in accordance with the degree of risk and damage to equipment.

Notation	Description
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.
Precautions	Provides additional information needed to properly use the balance.

Descriptions of the other pictograms used within the instruction manual are listed below.

Pictogram	Description
Prohibitions	Indicates an action that must NOT be performed
Instructions	Indicates an action that must be performed.
Hints	Provides information on useful techniques for using the balance.
References	Indicates the location of information that can be used as reference material.

Safety Precautions

Precautions on Use

To be strictly observed

To ensure that you use the balance safely and correctly, read the following precautions carefully. The details listed below provide important information on safety, and must be observed at all times.

■ Precautions Related to Usage

⚠ CAUTION

Prohibitions

Cannot be used as proof of transactions.

The balance is not permitted by law to be used as proof of transaction for drug formulation, etc.

■ Precautions Related to Place of Installation

⚠ CAUTION

Prohibitions

Do not use the balance outdoors or anywhere where it will be exposed to water.

You could sustain an electric shock or the product could operate abnormally.

Prohibitions

Avoid locations where the balance will be exposed to volatile gas, flammable gas or corrosive gas.

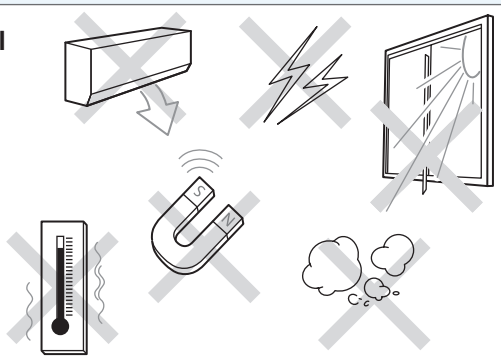
Failure to observe this may result in the outbreak of fire and accidents.

Prohibitions

Avoid locations where the balance will be exposed to any of the following.

You may not be able to obtain correct weight readings.

- Air flow from an air conditioner, ventilator, door or window
- Extreme temperature changes
- Vibration
- Direct sunlight
- Dust, fine particles, electromagnetic waves or a magnetic field
- Condensation



Instructions

Install the balance on a strong and stable flat table or floor.

Placing the balance in an unstable site could lead to injury or trouble with the balance.
When selecting the installation site, take into account the combined weight of the balance and the item to be weighed.

■ Precautions Related to Installation Work

⚠ CAUTION

Prohibitions

Do not connect anything other than peripheral devices specified by Shimadzu to the balance's connector.

If you do, the balance may stop working normally.
In order to avoid trouble, always connect peripheral devices in accordance with the directions in this manual.

Instructions

Use the correct power supply and voltage with the AC adapter supplied.

Using the balance with an incorrect power supply or voltage may result in the outbreak of fire or malfunctions. Note also that if the power supply or voltage is unstable or if the power supply capacity is insufficient, it will not be possible to obtain satisfactory performance from the balance.

Instructions

Install measures to prevent the balance from toppling over in the event of earthquakes, etc.

If the balance topples over as a direct result of vibrations, it may result in injury.

Instructions

Plug the AC adapter into an easily accessible power outlet.

During emergencies, it is necessary to unplug the AC adaptor from the power outlet.

Instructions

Beware of the gaps between equipment during installation.

Failure to observe this may result in fingers getting caught, leading to injury.
Place fingers on the indentations on the sides of the unit and grip it firmly with both hands during installation.

■ Precautions Related to Work/Operations

⚠ CAUTION

Prohibitions

Do not operate the ionizer when measuring items that are explosive or inflammable.

Failure to observe this may result in ignition and the outbreak of fire.

Instructions

Use the correct weighing units.

Using incorrect weighing units can lead to accidents as a result of weighing errors. Check that the weighing units are correct before starting weighing.

Instructions

Treat the balance with care and respect.

The balance is a precision instrument. Subjecting it to impact may result in malfunctions. When moving the balance, remove the pan, the pan supporter and the pan ring, in place, and grasp it firmly with both hands when carrying it. If the balance is to be stored for long periods of time, place it in the packaging box which was used for delivery and store it in a safe location with few temperature fluctuations.

■ Risks Involved in Repairs/Dismantling/Modifications

⚠ CAUTION

Prohibitions

Never disassemble, modify or attempt to repair this product or any accessory.

You could sustain an electric shock or the product could operate abnormally. If you believe that the balance has failed, contact your Shimadzu representative.

■ Precautions Related to Inspections/Maintenance

⚠ CAUTION

Prohibitions

The design standard period of usage for this product is ten years. Using the product for more than the design standard period may result in it being impossible to maintain performance or malfunctions, etc.

- A fee is charged for safety inspections. Direct all requests to our sales offices, dealers or the service agencies specified by the company.
- The design standard period is the standard period during which the product can be used safely without malfunctions, and it does not represent the valid period of product warranty.
- See [Chapter 11. Maintenance] for details on daily maintenance inspections and replacement parts.

Instructions

Unplug the power cord from the AC adapter during inspections, maintenance and when replacing parts.

Failure to observe this may result in accidents caused by electric shocks or short-circuits.

Instructions

Always use the parts specified in the instruction manual when replacing parts.

The use of non-specified parts may result in them becoming damaged and unusable.

■ Measures to be Observed during Emergencies

⚠ CAUTION

Instructions

If you detect anything abnormal (e.g. a burning smell), immediately disconnect the AC adapter from the power outlet.

Continuing to use the balance with an abnormality could lead to fire or an electric shock.

■ Measures to be Observed during Power Outages

⚠ CAUTION

Instructions

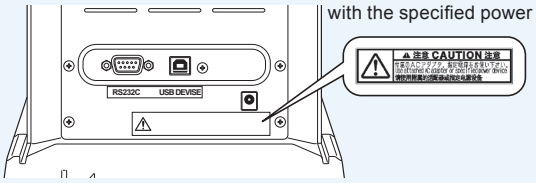
After a power outage, turn the power back ON.

When a power outage occurs, the power is shut off automatically. Therefore, begin operation from “Turning on the Power” (☞ P.29) again.

■ Caution Labels

Cautions labels are placed in necessary locations on the balance to ensure that it is used correctly. In the event of these labels being mislaid or damaged, contact a Shimadzu sales office or service agency to request new labels, and then make sure they are situated in the correct locations.

[ATX324R example]



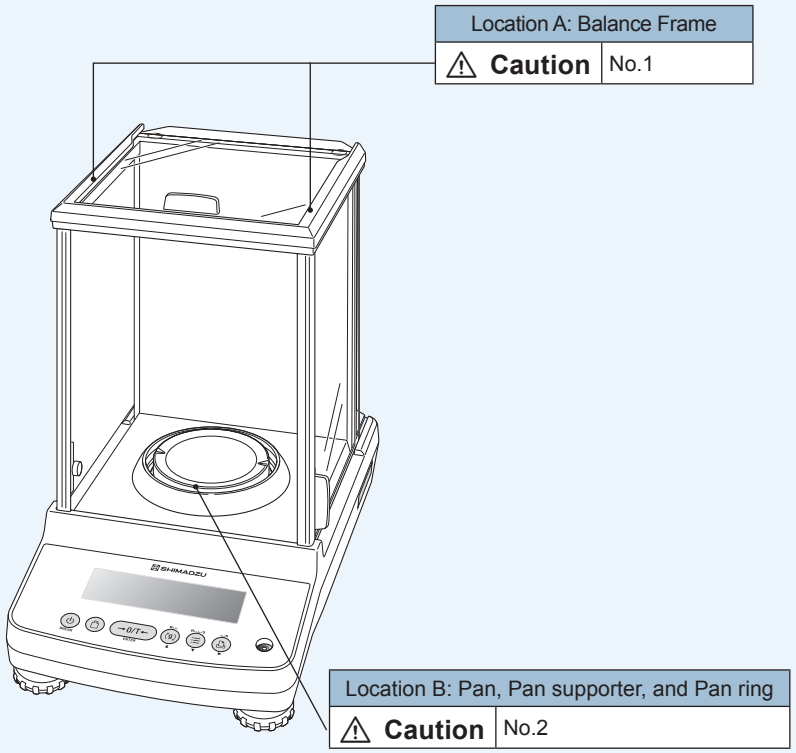
Use the AC adapter supplied with the specified power supply

■ Residual Risk Information

Residual risk refers to the risks that could not be removed or reduced during the design and manufacturing stages. Check the [Residual Risk Maps] for each area with inherent risks and implement protective measures while referring to the [List of Residual Risks].

■Residual Risk Maps

The [Equipment Location] and [No.] shown below match up with the [List of Residual Risks].
Refer to the [List of Residual Risks] for further details.



■ **List of Residual Risks**

The [No.] and [Equipment Location] shown below match up with the [Residual Risk Maps].
Check the [Residual List Maps] for further retains on the relevant [Equipment Location].
Read and fully comprehend the details listed in [Refer To] and implement protective measures without fail.

Measurement Preparations

No.	Equipment Location	Risk	Protective Measures Implemented by Users	—	—
1	A	⚠ **Caution** The frame and front glass may become detached when the top frame is picked up and moved.	When moving the balance, do not hold it by the top frame, but grip the bottom of the main unit firmly with both hands to pick it up.	Refer To	P.27
				Task	Moving the Balance
				Qualifications & Training	Recipients of Work Training

Maintenance

No.	Equipment Location	Risk	Protective Measures Implemented by Users	—	—
2	B	⚠ **Caution** Transporting the unit with the pan, pan supporter and pan ring installed may result in damage to the draft shield glass.	Remove the pan, pan supporter and pan ring without fail when transporting the balance during repairs.	Refer To	P.132
				Task	Transporting during repairs
				Qualifications & Training	Recipients of Work Training

Product Warranty

Shimadzu provides warranty with regard to the following as a basic principle. See the [Product Warranty] supplied for further details.

1. Period of Warranty

Valid for one year from the date of purchase (Restricted to Japan).

2. Items Covered by the Warranty

Malfunctions attributable to Shimadzu occurring within the period of warranty will be repaired or parts replaced free of charge (The warranty is only valid within Japan).

3. Limitation of Liability

1) Shimadzu cannot be held responsible for the users' loss of profit, indirect damages or secondary damages under any circumstances. The company can also not be held responsible for damages relating to damage compensation caused to users by third parties.
2) The liability for compensatory damages attributable to Shimadzu is limited to a sum equivalent to the cost of the product in all cases.

4. Warranty Exemption

The warranty is not valid for malfunctions attributable to the following, even during the period of warranty.

1) Malfunctions occurring as a result of misuse.
2) When the product is repaired or modified, etc., by any company or person other than Shimadzu Corporation.
3) Malfunctions attributable to causes other than the product itself.
4) When used in harsh environments, such as high-temperature and high-humidity environments, environments subject to corrosive gases, and environments subject to vibrations, etc.
5) Malfunctions caused by fire, earthquakes or other natural disasters, by contamination caused by radioactivity or toxic substances, or by unavoidable situations, such as war, civil unrest and crime.
6) When moved or transported elsewhere after having been installed.
7) Consumable parts and parts conforming to this designation.

Aftercare Services and Part Supply Period

1. Aftercare Service

In the event of the product not operating normally, carry out inspections and resolve the problem in accordance with the instructions providing in [10.TROUBLESHOOTING] (☞ P.138). If the problem persists or other problems that are thought to be malfunctions not covered by the instructions provided arise, contact the numbers provided on the back cover.

2. Part Supply Period

The period during which replacement parts will be supply for the product is up until seven years after the termination of manufacture.
Note that there are cases in which it will not be possible to supply replacement parts once this supply period has elapsed.
However, the supply periods stipulated separately by the manufacturers will be applied for parts not manufactured by Shimadzu.

Inspections and Maintenance

Daily inspections, Periodic inspections and regular calibrations are required to ensure that the performance of the balance is maintained for long periods of time so that correct measurement data can be acquired.

- See [Chapter 11: Maintenance/Inspections] for details on daily inspections and part replacement.
- Contact a Shimadzu sales office or service agency, or one of Shimadzu's service companies to request Periodic inspections and regular calibrations.

Product Disposal

When disposing of the product, dismantle and dispose of the parts separately in accordance with their composition in order in consideration of environmental conservation.
Direct all inquiries to the contact numbers provided on the back cover.

Table of Contents

1 BEFORE WEIGHING 20

Name and Function of Components 20

- Main body 20
- Operation Keys 22
- Display Panel 23
- Unpacking and Delivery Inspection 25

Installation 26

- Choosing the Installation Site 26
- Installing the Components 27
- Adjusting the Level of the Balance 27
- Turning the Power ON 29
- Warming Up 29
- Performing Span Calibration 30

2 USING THE BALANCE 34

Weighing 34

Outputting Weight Readings 36

Selecting the Display 37

- Switching Units 37
- Selecting the Minimum Number of Displayed Digit (1d/10d display) 37
- Selecting the Decimal Point Display Symbol 39

Ending Weighing 41

- Turning the Power OFF 41

3 MENU SETTINGS 42

What Is the Menu? 42

- The Structure of the Menu 42
- Menu Map 43
- Instruction Manual 43
- Menu Operation Key Symbol 43

Basic Menu Operations 44

Entering Numerical Values 45
■ Changing the Numerical Value 45
■ Changing the Position of the Decimal Point 46
Convenient Functions for Menu Setting 47
■ Returning to the Default Settings (Menu Reset) 47
■ Prohibiting Changes to the Menu Settings (Menu Lock) 48
■ Outputting the Menu Setting Information 49

4 CALIBRATION 50

Before Starting Calibration 50
Span Calibration and Adjustment 52
Perfect Self Calibration (PSC) (ATX-R only) 56
Calibration of the Internal Weight (ATX-R Only) 58
Leaving a Record of Calibration 61
■ Example Printout of a Calibration Record 61
■ Setting Output of a Calibration Record 62
■ Setting a Balance ID 63

5 FUNCTIONS RELATING TO TARING 64

Zero Tracking Function 65
Auto Zero Function 66
Auto Tare Function 68
Zero / Tare Timing Change Function 69

6 ADJUSTING RESPONSE AND STABILITY 70

Selecting the Weighing Mode 71
■ Selecting the General Weighing Mode 71
■ Selecting the Pouring Mode 71
Easy Setting of Response and Stability 72

Adjusting the Stability Mark 74
■ Setting the Stability Detection Range 74
■ Setting the Stability Mark Lighting Timing 75

7 SETTING UNITS 77
■ Units That Can Be Displayed and Conversion Factors 77
Selecting Units to Display 78
Setting User-Specified Units 79
■ Conversion Factors 79
■ Minimum Indication 80

8 APPLICATION FUNCTION MODE 81
Counting Pieces by Weight (Piece Counting) 82
■ Preparation for Piece Counting (Including Setting the Unit Weight) 82
■ Counting Numbers of Pieces 85
■ Changing a Unit Weight, or Adding a New Unit Weight 86
Percentage Weighing 87
■ Preparation for Percentage Weighing 87
■ Weighing Percentages 90
Measuring Specific Gravity of Solids
(Solid Specific Gravity Measurement) 91
■ Preparation for Solid Specific Gravity Measurement 91
■ Data Hold Function 93
■ Density/Specific Gravity Calculation Formula Selection 94
■ Solid Specific Gravity Measurement 96
■ Solid Specific Gravity Measurement for Lighter than Water Solids (1 g/cm^3 or less) . . . 97
Measuring Specific Gravity of Liquids
(Liquid Specific Gravity Measurement) 98
■ Glass Sinker Volume Measurement 98
■ Preparation for Liquid Density Measurement 99
■ Liquid Density Measurement 101

Formulation 102
■ Performing Formulation 102
■ Outputting Component Numbers 105
■ Outputting the Gross Weight 106

9 COMPARATOR FUNCTION 107

Target Mode 107
Checkweighing Mode 109

10 CONNECTION AND COMMUNICATION WITH PERIPHERAL DEVICES 111

Convenient Functions Relating to Output 111
■ Printing / Outputting Automatically (Auto Print Function) 111
■ Printing / Outputting Continuously (Continuous Output Function) 113
Connecting External Equipment 116
■ Connecting Printers 116
■ Connecting Personal Computers 117
■ Connecting PLCs and Other Serial Communications Equipment 119
■ Cable Connections (RS232C) 120
■ Data Format 121
■ Command Codes 123
Communication Settings 127
■ Standard Settings (MODE) 128
■ User-Specified Settings 128
Output Timing Change Function 131

11 MAINTENANCE 132

Maintaining the Balance 132
■ Removing the Glass Door 133
Inspection 134
■ Daily Inspections 134
■ Periodic Inspections 135

About Weights 136
■ Types of Weight and Their Selection 136

12 TROUBLESHOOTING 138

What to Do If.... 138
Responding to Messages 139

13 FOR YOUR INFORMATION 140

Turning the Power ON and OFF 140
■ Auto Power-Off Function 140
■ Setting the Startup Display 141
Changing the Password 142
GLP Output Function. 143
■ Setting the GLP Output Function. 143
■ Setting a Balance ID 145
Specifications 146
■ ATX-R/ATY-R Series 146
Maintenance Parts 147
■ ATX-R/ATY-R Series 147
List of Functions That Can Be Used in Combination 149
Menu Map 150
■ Reading the Menu Map 150
■ Main Menu 151
■ Data Output Menu 153
■ Unit Setting Menu. 154
■ Calibration Menu 154
■ Zero / Tare Menu 154

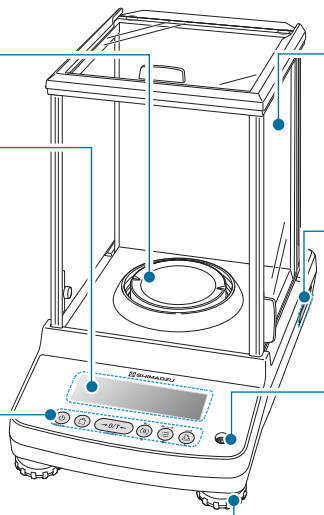
Name and Function of Components

This section lists the names of the various parts of the ATX-R/ATY-R Series and explains their major functions.

Main body

The ATX-R/ATY-R Series comprises toploading electromagnetic balances with UniBloc weighing mechanism.

◆ Main body



Pan

Place the object to be weighed here.

Display panel

Shows the weighing results, information for making function settings, the current function setting, errors, codes and other information.
(☞ page 22)

Windbreak

Even a slight breeze may affect measurement, so the windbreak is provided to avoid air movements in the surroundings influencing the weight reading.

Product label

The model name and serial number are stated here.

Level

Indicates the level of the balance.
(☞ page 27)

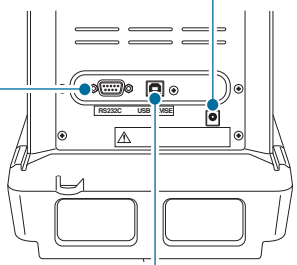
Operation keys

Used to tare the balance, perform calibration and print.
(☞ page 22)

Level screws

Adjust to level the balance.
(☞ page 27)

◆ Back of the unit



DC IN connector

Used to connect an AC adapter for power supply.

RS232C connector

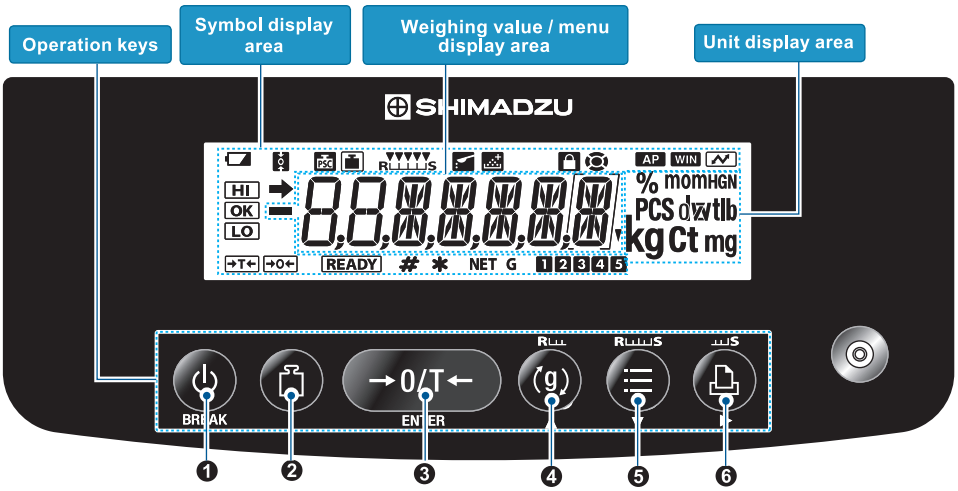
Used to connect to a printer (e.g. EP-100 or EP-110).
(☞ page 116)

USB Device

Used to connect to a PC.
(☞ P.117)

▽ Continued on next page

▽ Name and Function of Components



Operation Keys

No.	Key	During Weighing		During Menu Operation
		Press Once and Release ...	Press and Hold for About 3 Seconds ...	
❶	[BREAK]	Switch between the operation and standby modes	-	• Takes you to a higher level in the menu hierarchy. • Long pressing the key quits menu mode and return directly to the weighing mode. • Suspends calibration / numerical value entry. • Quits the smart setting mode.
❷	[CAL]	Performs calibration	Enters the calibration menu	-
❸	→0/T← [O/T]	Tares the balance (setting it to zero)	Opens the zero / tare menu	Confirm and set
❹	[UNIT] ▲	• In the weighing mode: Used to select the unit • When piece counting: Displays the unit weight • When performing percentage weighing: Displays the reference weight	• In the weighing mode: Opens the unit setting menu • When piece counting: Used to select the item number • When performing percentage weighing: Used to select the percentage reference	• Scrolls backward through menu options • When entering numerical values: Increases the value • In the smart setting mode: Adjusts to response (R) direction.
❺	[MENU] ▼	Turns the smart setting mode on	Switches between the weighing mode and the application function mode	• Scrolls forward through menu options • When entering num
❻	[PRINT] ▶	Outputs the weight reading to a peripheral device (printer or PC)	Opens the data output menu	• Takes you to a lower level in the menu hierarchy • When entering numerical values: Moves the focus one digit on the right • In the smart setting mode: Adjusts to Stable (S) direction.

* Refer to P.102 for operations of each key during formulation/operation.

Display Panel

Display	Name	Description	See:
	Battery symbol	Lights up when the battery voltage is low.	-
	Zero tracking symbol	Lit when the zero tracking function is set ON.	Page 65
PSC	Perfect Self Calibration symbol	Blinks before Perfect Self Calibration starts.	Page 56
	Weight symbol	This symbol is lit during calibration. Blinks when calibration is necessary for a verified balance as a legal measuring instrument.	Page 50
RUGGED	Easy setting indicator	Indicates what level the response and stability are currently set to.	Page 72
	Pouring symbol	Lit when the pouring mode is set.	Page 71
	Formulation symbol	Lit during mixing measurement (formulation) operations.	Page 102
	Menu lock symbol	Lit while the menu is locked.	Page 48
	Menu operation key symbol	Indicates that the menu option currently displayed requires confirm and set operations when is displayed in the middle. Indicates that a higher or lower level exists in the menu hierarchy when arcs are displayed on the right and left side. Indicates that other menu options can be selected when arcs on the upper and lower side is displayed.	Page 43
AP	Auto print symbol	Lit when the auto print function is set.	Page 111
	Communication symbol	Indicates that data is being exchanged with an external device.	-
HI OK LO	Comparator symbol	When the comparator function (Checkweighing) has been set, indicates the comparison judgment.	Page 107
	Stability mark	Lit when the weight reading is stable. Lit when the option currently set in menu setting is displayed.	Page 44 Page 70
	Minus symbol	Lit when the weight reading is negative.	-
READY	Ready symbol	Lit during the standby mode. During weighing, lit to indicate the ready to weigh status, for example when using the mixing measurement.	Page 41 Page 102
#	Number symbol	Lit when it is possible to enter numerical values.	Page 45
*	Hold symbol	Lit when a value that is not the real-time weight reading (for example the indication of the unit weight in piece counting) is displayed.	Page 85 Page 90
NET	Net weight symbol	Indicates that the weight reading displayed in mixing measurement (formulation) is the net weight of the current component with the weight of the container and prior components. Also indicates that a measuring operation is in progress.	Page 103
G	Gross weight symbol	Indicates that the weight reading displayed in mixing measurement (formulation) is the total weight of all of the components of the mixture with the weight of the container subtracted.	Page 103

▽ Continued on next page

▽ Name and Function of Components

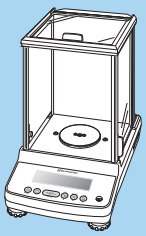
Display	Name	Description	See:
1 2 3 4 5	Item number indication	Shows the item number in the piece counting mode.	Page 83
▼	Inverse triangle symbol	Will be displayed during specific gravity measurement. Or if displayed when the decimal place of the conversion coefficient is changed to an arbitrary setting for each user, a value with no decimal point can be input.	Page 46
PCS	Piece counting symbol	Lit while the piece counting mode is in effect.	Page 82
% 0	Specific percentage weighing symbol	Lit when the specific percentage reference has been set for percentage weighing.	Page 89
%	Percentage weighing symbol	Lit during percentage weighing.	Page 90

Unpacking and Delivery Inspection

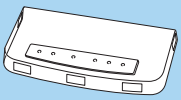
The items packed will differ depending on the model of balance ordered.
Check that all of the items indicated below are included in the package, and that nothing has been damaged.
The numbers in the boxes [ ] indicate the quantity of each item.

◆ ATX-R/ATY-R Series

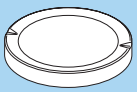
☐ Balance main body (with windbreak) [1]



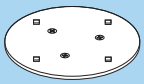
☐ Protective cover [1]



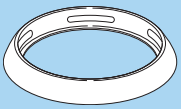
☐ Pan [1]



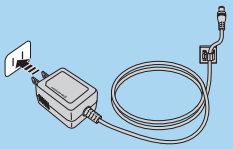
☐ Pan supporter [1]



☐ Pan ring [1]

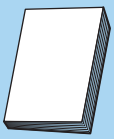


☐ AC adaptor [1]



* The shape of the adapter supplied with the balance may differ from this figure.

☑ Instruction manual [1]



☐ Simple Sheet: Operation Guide [1]

Installation

This section will explain processes from balance installation to the beginning of measurement.

Choosing the Installation Site

The measuring performance of the balance is greatly influenced by the environment where it is installed.
Observe the following points to ensure safe and accurate weighing.

⚠ Caution

Prohibitions

Do not use the balance anywhere exposed to explosive, combustible or corrosive gases.

This could cause fire or trouble.

Instructions

Use the correct power supply and voltage with the balance.
Use the balance with the attached AC adapter.

Using an incorrect power supply or voltage with the balance will lead to fire or trouble with the balance.
Note also that if the power supply or voltage is unstable or if the power supply capacity is insufficient, it will not be possible to obtain satisfactory performance from the balance.

Precautions on Use

Prohibitions

Avoid locations where the balance will be exposed to any of the following.

You may not be able to obtain correct weight readings.

- Air flow from an air conditioner, ventilator, door or window
- Extreme temperature changes
- Vibration from surroundings or nearby equipment
- Direct sunlight
- Dust, fine particles, electromagnetic waves or a magnetic field

Instructions

Install the balance on a strong and stable flat table or floor in the room.

Placing the balance in an unstable site could lead to injury or trouble with the balance.
When selecting the installation site, take into account the combined weight of the balance and the item to be weighed.

Installing the Components

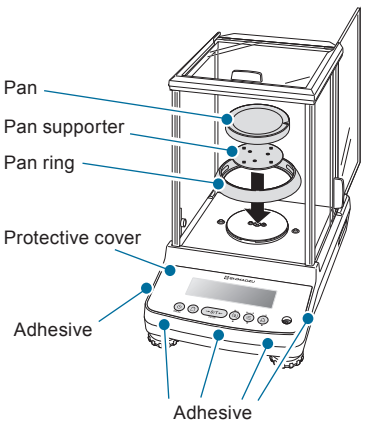
The procedure for fitting the components differs depending on the model of the balance.

◆ ATX-R/ATY-R Series

1 Place the pan supporter.

2 Place the pan on the pan supporters.

Align the two pan notches with the left and right on the balance main body.



3 Fit the pan ring.

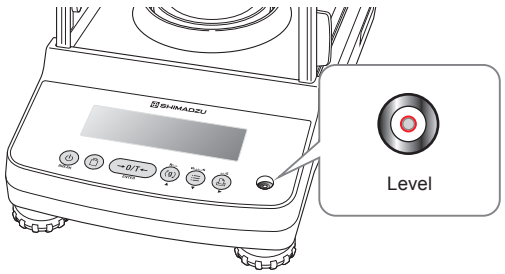
4 Set the protective cover.

If the balance is used in an environment where it gets dirty easily, use the protective cover available.
(1) Peel off the paper to expose the adhesive on it.
(2) Fit it on the display.
(3) Press the adhesive parts firmly to keep fitting it on the display.

Adjusting the Level of the Balance

Operation of the level screws

Turning the level screws clockwise, as viewed from above, extends them and raises the balance, while turning them counterclockwise retracts them and lowers the balance.



Level the balance by following the procedure below.

1 Turn all the level screws (total two at front) counterclockwise as viewed from above until they come to a gentle stop.

The balance will now be tilting toward the front.

▽ Continued on next page

▽ Installation

2 Adjust the two level screws at the front so that the air bubble in the level becomes centered in the left/right direction.

At this stage it doesn't matter if the air bubble isn't centered in the front/rear direction.

If the air bubble is left of center 	Turn the front right level screw clockwise. 
If the air bubble is right of center 	Turn the front left level screw clockwise. 

3 Turn both the level screws at the front in the same direction at the same time to center the air bubble in the level in the front/back direction.

Adjust so as to bring the air bubble into the center of the circle.

On turning the two level screws at the front in the clockwise direction… 	The bubble moves toward the front. 
On turning the two level screws at the front in the counterclockwise direction… 	The bubble moves toward the back. 

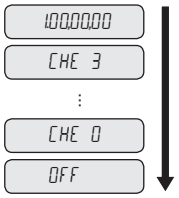
Turning the Power ON

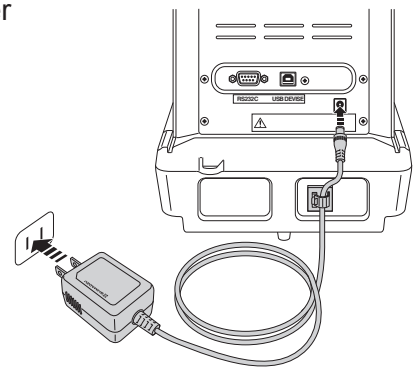
1 Insert the plug of the AC adapter into the DC IN connector on the back of the balance.

2 Connect the AC adapter to the power outlet.

The display will automatically go through the changes indicated below, ending with the OFF display.
The first information displayed is the software version number. Depending on the product, this may differ from the example shown below.

(This is the balance's self check display.)





The actual AC adapter shape may be different.

For the ATX-R series…

An operation check on the internal weight mechanism is performed automatically. During this check, a small motor noise will be heard.

If "ERR H" is displayed…

See "Responding to Messages" (☞ page 139).

Clamps are attached to the AC adaptor.

Attach the clamps at an appropriate position as shown in the illustration above.
Fix the cable of the AC adaptor with clamps on an appropriate position on the back of the balance so they do not interfere with the glass door when it is opened or closed.

Warming Up

Before performing span calibration on the balance or measuring its accuracy, you must ensure that it is in a stable state.
When stabilizing the balance, it is important that its temperature is stable.
Put the balance in weighing mode (for example showing the gram display) and leave it with **the power ON for at least an hour** in advance of calibration.
This is called "warming up".

Warming up is also accomplished in the standby mode.
For details on the standby mode, see "Turning the Power OFF" (☞ page 41).

▽ Continued on next page

Performing Span Calibration

Always perform span calibration for a balance after moving it.

Weights are required for span calibration of the ATX-R series. For details on weights, see "About Weights" (☞ page 136).

Before performing span calibration, warm up the balance in advance.

Also, carry out the adjustment at a location where there are few people moving around and there is no air flow or vibration.

◆ ATX-R Series

1 Press  while the windbreak glass door is closed.

Calibration using the internal weight starts automatically.

If "WAIT" is displayed…

The calibration record is being output. When output has finished, span calibration will start automatically.

If "BUSY" is displayed…

There is something placed on the pan. When this item is taken off the pan, span calibration will start automatically. To cancel scan calibration, press

If "ERR H" is displayed…

See "Responding to Messages" (☞ page 139).

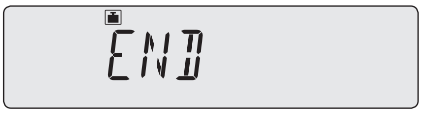
If "ERR C" is displayed…

Span calibration was not completed for one of the following reasons.

- ◆ There is too large a discrepancy between the zero point of the balance and the sensitivity.
- ◆ A container has been placed on the pan.
- ◆ The pan is not on the balance.
- ◆ There is too large a discrepancy in the value of the internal weight.

Press  and redo the operation from the beginning. If even on doing this the same display reappears, calibrate the internal weight (☞ page 58).

* This may not be displayed.



"END" will be displayed and the balance will return to the weighing mode.

Caution

Instructions

If calibration doesn't end normally and the balance stops, do not move it nor leave it as it is.

Moving the balance in such a condition may cause failure because the internal weight is not held correctly.

Before moving the balance, be sure to turn the power on and start it up correctly (so that the internal weight is correctly held).

◆ ATY-R Series

1 Press 

The weight value will flash.

If "WAIT" is displayed…

The calibration record is being output. When output has finished, span calibration will start automatically.

If "BUSY" is displayed…

There is something placed on the pan. Take the item off the pan and follow the procedure below.

To cancel scan calibration, press  .

If no operation is performed within 60 seconds…

"ERR C" (calibration error) is displayed.

Press  and repeat the operation from the beginning.

▽ Continued on next page

▽ Installation

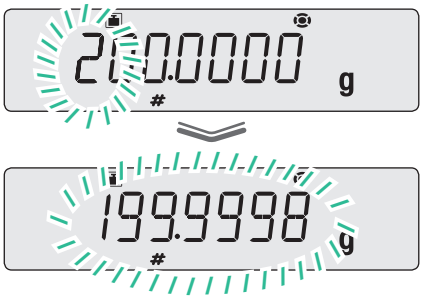
2 Enter the weight value.

If necessary, change the weight value to match the weight that will be used for calibration. If there is no need to change it, proceed to step 3.

(If necessary enter the weight value.) →0/T←

"Entering Numerical Values", page 45

For details on the weight values that can be entered, see "Specifications" (page 146).

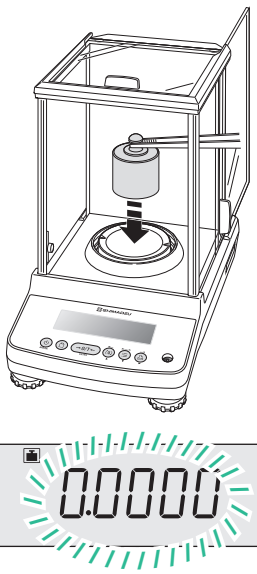


3 Place the calibration weight on the pan.

Open the glass door in the windbreak, place the weight on the pan, and shut the glass door again. Wait until the flashing weight value display changes to a flashing zero.

Shut the glass door fully.

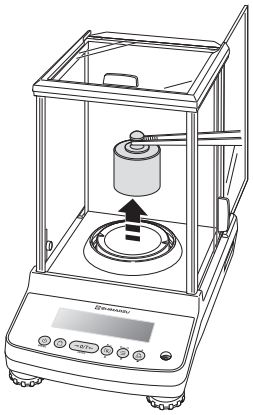
After placing a weight on the pan or removing a weight from the pan, check that the glass door is fully shut.



4 Take the calibration weight off the pan.

Open the glass door in the windbreak, remove the weight from the pan and shut the glass door again.

After a while, "END" will be displayed and the balance will return to the weighing mode.



The procedure described above is the default standard span calibration procedure.

For details, see "4. CALIBRATION" (☞ page 50).

2 USING THE BALANCE

Weighing

1 Enter the weighing mode.

What is the weighing mode?

The balance is in the state where it indicates the units (for example grams) of the weight on the pan.

To establish the weighing mode, follow the steps below depending on the current status of the balance.

Status of the Balance	To Establish the Weighing Mode….
The display is off.	Press ⏻ . When the "OFF" indication appears or all segments are lit, press any key.
"OFF" indication, all segments lit, or READY (ready symbol) lit	Press any key.
The application function mode is established.	3 sec. Press ☰ for about 3 seconds.
A menu indication is displayed.	⏻ Press ⏻ a number of times. Or press 3 sec. for about 3 seconds.
The balance is accepting numerical value entry.	⏻ Press ⏻ a number of times.

If an indication like "OL" or "-OL" appears during measurement…

See "Responding to Messages" (☞ page 139).

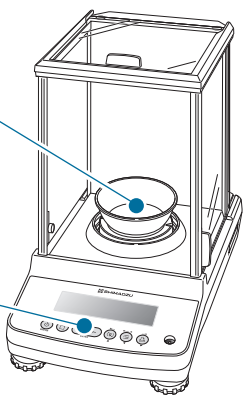
With models that feature the windbreak

2 Place a container on the pan.

Open the glass door in the windbreak, place the container on the pan and shut the glass door again.

3 Once the display has stabilized (➡ has lit), press →0/T←

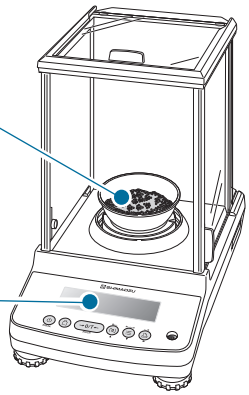
The indication changes to zero.



4 Insert the sample (item to be measured) into the container.

Open the glass door of the windbreak, place the sample (item to be weighed) on the pan and shut the glass door again.

5 When the display has stabilized, ➡ (the stability mark) lights up, read the display.



Shut the glass door fully.

Check that the glass door is fully shut before reading the balance display.

Avoid doing the following:

- Putting your hand inside the glass door of the windbreak
- Touching the container or sample with bare hands
- Weighing samples (items to be weighed) of different temperatures

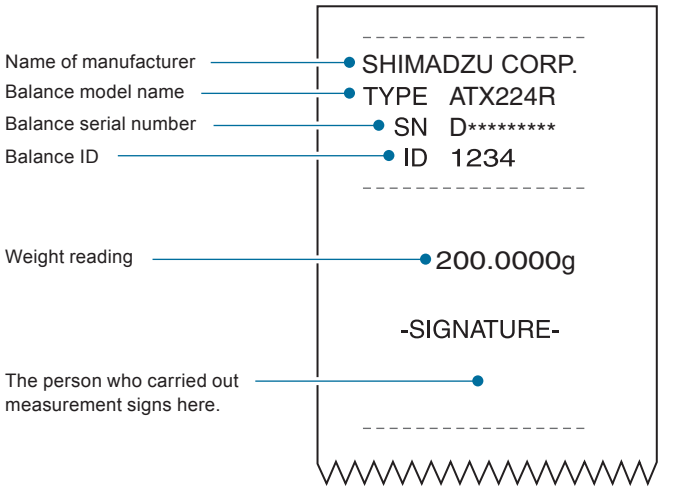
The heat will lead to convection, and this may make the balance display unstable.
Use forceps or gloves to carry containers and samples.
When dealing with samples (items to be weighed) at different temperatures, eliminate the temperature difference by leaving the samples around the pan inside the glass door before weighing.

Outputting Weight Readings

When the balance is connected to a PC and a printer (option), you can output a weight reading, settings, and so on for each measurement. The Balance Keys, Balance Data Collection Software (page 118) is convenient for output to a PC.

- When the GLP output function (page 143) is set to OFF, only the weight reading is output.
- When the GLP output function (page 143) is set to ON, the following information is output.

Example printout from printer
(When the GLP output function is set to ON)



Selecting the Display

Switching Units

You can display different units from among those set to be available.

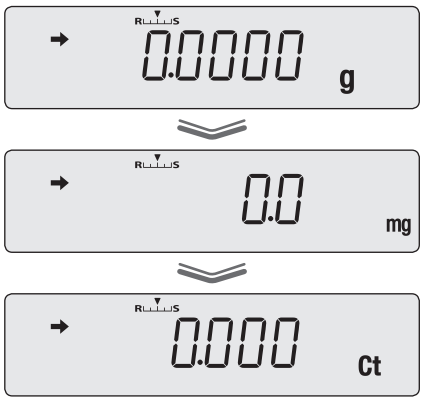
1 Press (g) in the weighing mode.

Repeatedly pressing this key will cycle you through the registered units.

When the balance is shipped from the factory, the only unit registered is grams.
To be able to switch to other units, you must first register the units you wish to use.

"Selecting Units to Display", page 78

When user-specified units have been selected, the characters and symbols that indicate the units don't light up.



Unit display after restarting

When the power is turned off and back on, the balance starts up displaying the units that were in use before the power was turned off.

Selecting the Minimum Number of Displayed Digit (1d/10d display)

If necessary, the minimum number of displayed digit can be reduced by one digit (Set to the 10d display).

Not applicable to a verified balance as a legal measuring instrument.

1 Press ☰ twice shortly in the weighing mode.

This opens the main menu.

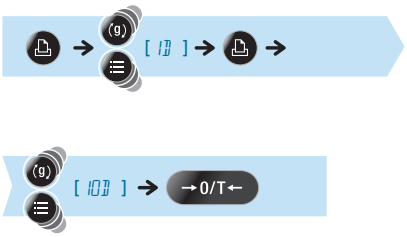
* This may not be displayed.

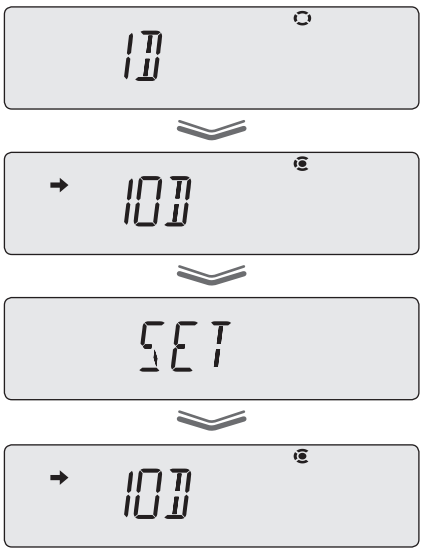
▽ Continued on next page

▽ Selecting the Display

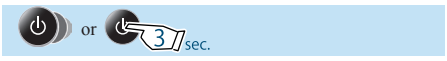
2 Select the measurement parameters in other functions.

3 Select switching between 1D and 10D, and confirm at 10D.





4 Return to the weighing mode.



Display after selection

The decimal place doesn't change. Note also that when one digit is removed the display area for the final digit appears as a blank.

To return to the 1d display...

Follow the above steps, and confirm on the 10D display in step 4.

Selecting the Decimal Point Display Symbol

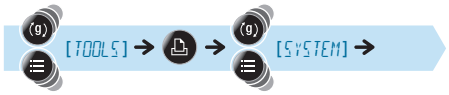
The decimal point can be displayed as either "." (a period) or "," (a comma).

1 Press ☰ twice shortly in the weighing mode.

This opens the main menu.

* This may not be displayed.

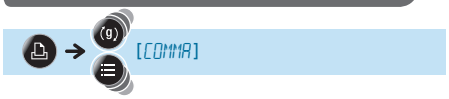
2 Select decimal point display setting.



3 Select the decimal point display symbol.

To select "." (period):

To select "," (comma):



▽ Continued on next page

▽ Selecting the Display

4 Confirm and return to the weighing mode.

The way the decimal is displayed has now changed.

Selecting the decimal point display symbol

When the decimal point display is changed, the decimal point changes accordingly in data output to external devices such as printers.

- To select the period

- To select the comma

Ending Weighing

Turning the Power OFF

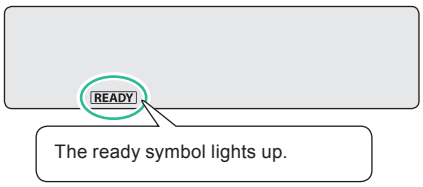
1 Establish the weighing mode.

"Weighing", page 34

2 Press 

If the status described below is not established, press  again.

READY (the ready symbol) will light and the standby mode will be established.
Normally, leave the balance on standby in this state until the next weighing.
To shut the power off completely, disconnect the AC adapter.



What is the standby mode?

This is the status in which the balance stands by, saving electricity although it can still be used right away.
On pressing  in the weighing mode the display is turned off, **READY** (the ready symbol) is lit and the power saving status (standby mode) is established.
During the standby mode, the interior of the balance is powered and in the warming-up status, ready for immediate use.

⚠ Caution

Prohibitions

While [WAIT] or [SET] is displayed, on no account disconnect the AC adaptor.

There is a risk that data in the scale will be corrupted.

3 MENU SETTINGS

What Is the Menu?

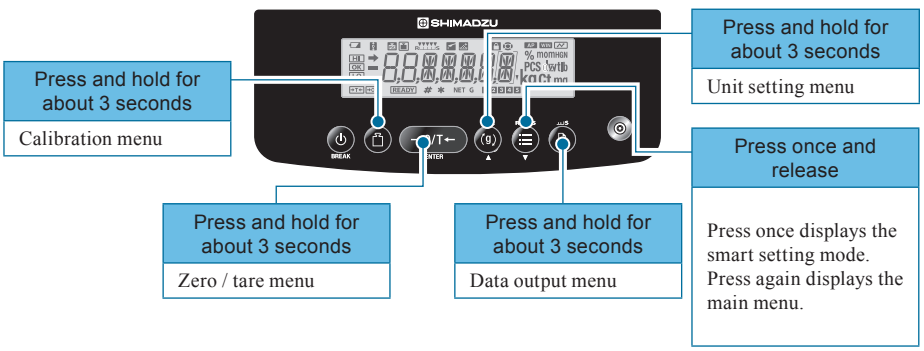
With the ATX-R/ATY-R series, the menu is used to efficiently select the right functions for the user's application.

The Structure of the Menu

The menu is divided into five groups according to the setting made.

Menu Group	Description
Main menu	Used to set the application function mode, comparator, stability/response adjustment and system configuration
Calibration menu	Used to set the details for calibration
Zero / tare menu	Used to set the details for taring and zero point
Data output menu	Used to set the functions for transmitting data to a PC or outputting them to a printer
Unit setting menu	Used to set which units may be displayed in weighing mode

You can open each menu group by pressing the various operation keys.

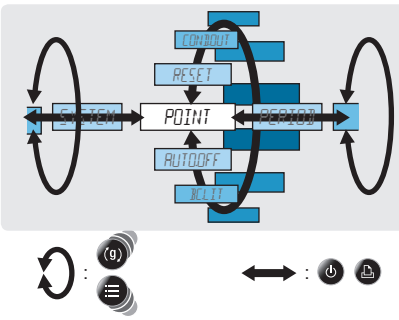


Within each menu group are a number of hierarchical menu levels.

You can move between levels in the menu hierarchy by pressing ⏻ and 🖹

You can scroll through the options within each level of the hierarchy by pressing (g) or ☰

Arrangement of the Menu

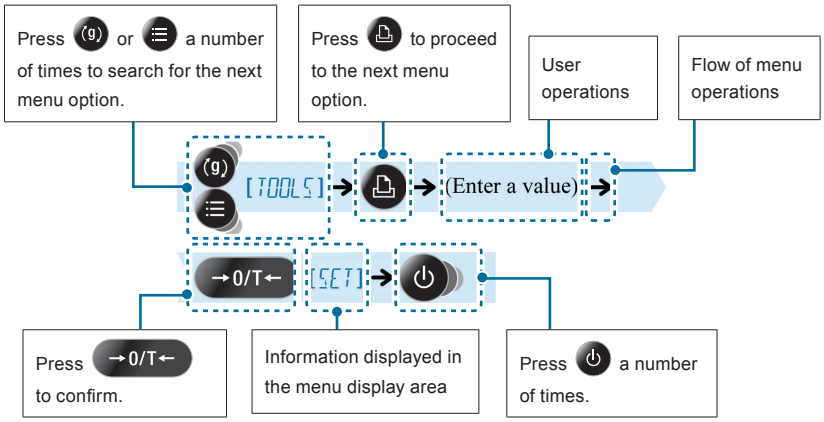


Menu Map

The menu map represents the organization of the menu options graphically to make it easy to understand.
It is useful for quickly accessing the menu option you want to use.
For more on the menu map, see "Menu Map" (☞ page 150) and "Menu Map Sheet".

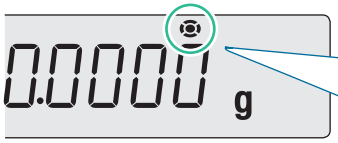
Instruction Manual

The instruction manual describes specific parts of the menu operations in a simplified form.



Menu Operation Key Symbol

On entering menu operation, (the menu operation key mark) lights up.
The keys represented by lid segments can be used.



Example of numeric value entry

Displayed symbol	Meaning
in the middle	The menu option currently displayed requires confirm and set operations
Arcs on the right and left side	A higher or lower level exists in the menu hierarchy
Arcs on the upper and lower side	Other menu options can be selected

Basic Menu Operations

1 Open the target menu from the weighing mode.

The method used to open a menu option differs depending on the group.

For details on the methods used for menu opening from each group, see "The Structure of the Menu" (☞ page 42).

For a menu option that is already set…

➡ (the stability mark) appears in the menu display.

2 Confirm and return to the weighing mode.

The operation after confirming the menu selection differs depending on the menu, and you will either be returned to the weighing mode automatically or will need to do it manually.

To return to the weighing mode manually, press  a number of times or press  for about 3 seconds.

If you open the menu again…

The recently set menu option will be displayed first.
Note also that, when the set menu option is displayed, ➡ (the stability mark) also appears.

Entering Numerical Values

Numerical values sometimes have to be entered for menu settings, for example the weight value of a calibration weight, condition values for operating functions, the balance ID, passwords, etc.

◆ Operations of the operation keys

Operation Key	Operation During Numerical Value Entry
→0/T←	Confirms the entered numerical value
(g)	Increases the value of the digit to be entered (the flashing digit) Pressing this key while the decimal point is flashing shifts the decimal point to the left.
☰	Decreases the value of the digit to be entered (the flashing digit) Pressing this key while the decimal point is flashing shifts the decimal point to the right.
⎙	Shifts the digit to be entered (the flashing digit) one digit to the right
⏻	Cancels entry

Changing the Numerical Value

As an example, here is the procedure for changing "120.0000 g" to "200.0000 g".

1 Enter the numeric value entry mode.

(the number symbol) lights and the leftmost digit (highest digit) in the range where the value can be changed flashes.

2 Press (g) once.

The numerical value of the flashing digit increases by one, so that it changes from "1" to "2".

3 Press ⎙

The flashing shifts to the second digit from the left.

▽ Continued on next page

▽ Entering Numerical Values

4 Press ☰ twice.

The numerical value of the second digit from the left decreases two times, so that it changes from "2" to "1" to "0".

5 Press →0/T←

This confirms the entered numerical value.
The indication shown to the right remains displayed for several seconds, then the display automatically moves on to the next step.

Changing the Position of the Decimal Point

The position of the decimal point can only be changed when entering a conversion factor with the user-specified units.

☞ "Conversion Factors", page 77

As an example, here is the procedure for shifting the position of the decimal point one digit to the left, to change the displayed value from "100.000" to "10.0000".

1 Establish the numeric value entry mode.

(the number symbol) lights and the leftmost digit (highest digit) in the range where entry (change) is possible flashes.

2 Press ⎙ several times until the decimal point flashes.

3 Press (g) or ☰ several times.

This will move the decimal point to the left or right.

> To set a numerical value with no decimal point…
>
> Press ⎙ several times until ▼ (the inverse triangle symbol) flashes.

4 Press →0/T←

This confirms the entered numerical value.
The indication shown to the right remains displayed for several seconds, then the display automatically moves on to the next step.

Convenient Functions for Menu Setting

Returning to the Default Settings (Menu Reset)

If you want to return the menu settings to the default settings, reset the menu.
The default settings are indicated by asterisks in the menu map (page 150) and on the menu map sheet.

1 Press ☰ twice shortly in the weighing mode.

This opens the main menu.

2 Select menu reset.

(g) [TOOLS] → 🖶 → (g) [SYSTEM] →

🖶 → (g) [RESET] → →0/T← [OK?]

→ →0/T←

3 Enter the password.

The password is set to "9999" before shipment. If the default setting is not changed, enter "9999".

"Entering Numerical Values", page 45

"Changing the Password", page 142

4 Confirm.

→0/T← [WAIT] [SET]

The default menu settings are reinstated and the balance automatically returns to weighing mode.

▽ Continued on next page

▽ Convenient Functions for Menu Setting

Prohibiting Changes to the Menu Settings (Menu Lock)

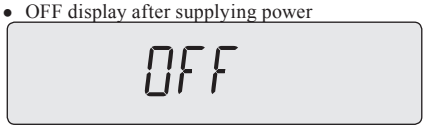
In order to ensure that the menu settings are not changed by mistake, the person managing the balance controls the password and can prohibit menu operation.
The default password is "9999". To change the password, see "Changing the Password" (☞ page 142).

Operation in the menu lock status

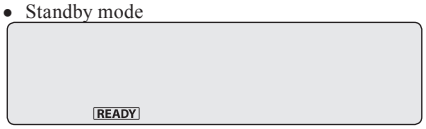
Even when the menu is locked it is possible to perform calibration ( ) and change the weight value.

1 Press 3 sec. until the display changes (about three seconds) while "OFF" is displayed after supplying power or while in the standby mode.

- OFF display after supplying power



- Standby mode



2 Enter the password.

☞ "Entering Numerical Values", page 45

3 Press →0/T←

The password will be accepted.
The menu will be locked and the display will return to the indication in step **1**.

If the password is wrong…

The error message shown to the right will be displayed and the display will return to the indication in step **1**.

4 Confirm.

On entering the weighing mode…

(the menu lock symbol) is shown in the display.

On performing prohibited operations...

"LOCKED" is displayed and menu operation is not possible.

Releasing the menu lock

To release the menu lock, perform steps **1** through **3** again.

Outputting the Menu Setting Information

You can output the menu settings to make a record of the balance settings.

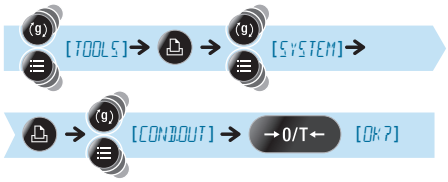
1 Connect the balance to a PC or printer (option).

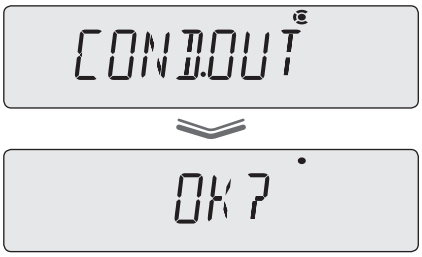
"10. CONNECTION AND COMMUNICATION WITH PERIPHERAL DEVICES", page 111

2 Press (g) twice shortly in the weighing mode.

This opens the main menu.

3 Select output of menu setting information.

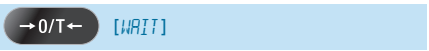




To output the settings, proceed to step **4**.

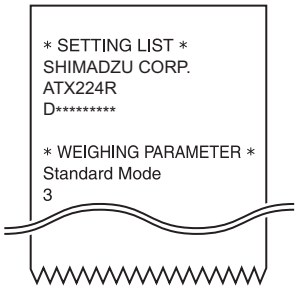
To cancel, press (power) and return to the weighing mode.

4 Confirm.



On confirmation, the menu setting information is output to the PC or printer.

The balance automatically returns to weighing mode.



4 CALIBRATION

In order to weigh accurately with an analytical balance, the balance must be calibrated after it has been moved or if the room temperature has changed substantially.
You are also advised to carry out calibration routinely (before use every day).

Before Starting Calibration...

Following calibration operations are possible with the ATX-R/ATY-R series.

Span calibration	Adjust to achieve correct balance sensitivity using either the internal weight (ATX-R only) or the external weight. Drift in the sensitivity is corrected.

Registering the internal weight (ATX-R only) or the external weight on , you can start operations only by pressing .

The operation to calibrate the internal weight itself cannot be registered in

To calibrate the internal weight itself, refer to "Calibration of the Internal Weight (ATX-R Only)" (page 58).

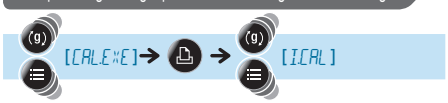
Use the following procedure to set the preferred operation for

1 Press 3 sec. for about 3 seconds.

This opens the calibration menu.

2 Select either "internal weight" or "external weight".

Example of registering "span calibration using the internal weight"



Example of registering "span calibration using the external weight"

3 Confirm and return to the weighing mode.

→0/T← [SET]→ or 3 sec.

Whichever was selected in step **2** is set for and the balance returns to the weighing mode.

- When "span calibration using the external weight" has been selected

When executing "span calibration", see "Span Calibration and Adjustment" (page 52).

Span Calibration and Adjustment

Adjust to achieve correct balance sensitivity using either the internal weight (ATX-R only) or the external weight.

Set the relevant "span calibration" in  in advance by following the procedure in "Before Starting Calibration …" (☞ page 50). (As the default setting, "span calibration using the internal weight" is set for ATX-R, and "span calibration using the external weight" is set for ATY-R.)

◆ Span calibration using the internal weight (ATX-R series only) **I.CAL**

1 Press  in mass measurement mode.

When the GLP output function (☞ page 143) has been set to ON, initially the indication "WAIT" is displayed, then the balance model name and other information is output.
After a little while ▣ (the weight symbol) lights up and span calibration using the internal weight will start automatically.

If "WAIT" is displayed…

The calibration record is being output. When output has finished, span calibration will start automatically.

If "BUSY" is displayed…

There is something placed on the pan. When this item is taken off the pan, the span calibration will start automatically.
To cancel the span calibration, press 

If "ERR H" is displayed…

See "Responding to Messages" (☞ page 139).

* This may not be displayed.

If "ERR C" is displayed…

Span calibration was not completed for one of the following reasons.

- There is too large a discrepancy between the zero point of the balance and the sensitivity.
- A container has been placed on the pan.
- The pan is not on the balance.
- There is too large a discrepancy in the value of the internal weight.

Press ⏻ and redo the operation from the beginning. If even on doing this the same display reappears, calibrate the internal weight (page 58).

"END" will be displayed and the balance will return to the weighing mode.

Caution

Instructions

If calibration doesn't end normally and the balance stops, do not move it nor leave it as it is.

Moving the balance in such a condition may cause failure because the internal weight is not held correctly.

Before moving the balance, be sure to turn the power on and start it up correctly (so that the internal weight is correctly held).

▽ Continued on next page

▽ Span Calibration and Adjustment

◆ Span calibration using the external weight **E.CAL**

1 Press [⏻] in the weighing mode.

When the GLP output function (☞ page 143) has been set to ON, initially the indication "WAIT" is displayed, then the balance model name and other information is output.
After a little while [⚖] (the weight symbol) lights up and the weight value of the weight to be placed on the pan flashes.

If "WAIT" is displayed…

The calibration record is being output. When output has finished, span calibration will start automatically.

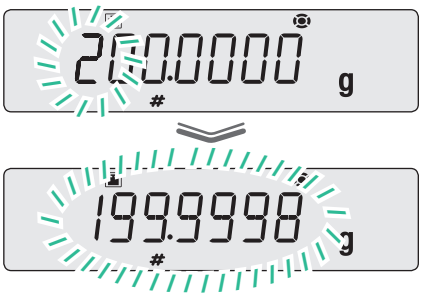
If "BUSY" is displayed…

There is something placed on the pan. Take the item off the pan and follow the procedure below.
To cancel scan calibration, press [⏻].

If no operation is performed within 60 seconds…

"ERR C" (calibration error) is displayed. Press [⏻] and repeat the operation from the beginning.

2 Enter the calibration weight value.



If necessary change the weight value displayed to match the weight that will be used for calibration. If there is no need to change it, proceed to step **3**.

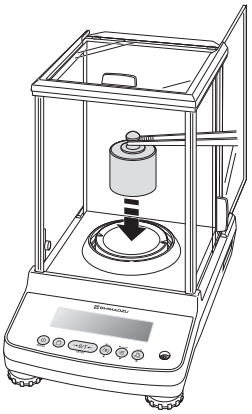
[☰] (Enter a weight value if necessary.) [→0/T←]

☞ "Entering Numerical Values", page 45

For details on the range of weight values that can be used, see "Specifications" (☞ page 146).

3 Place the weight on the pan.

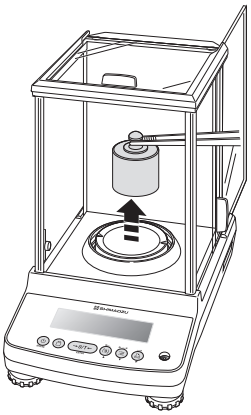
Open the glass door in the windbreak, place the weight on the pan, and shut the glass door again.
Wait until the flashing weight value display changes to a flashing zero.

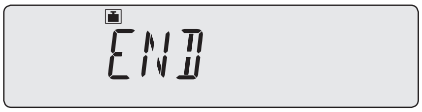


> Shut the glass door fully.
>
> After placing a weight on the pan or removing a weight from the pan, check that the glass door is fully shut.

4 Take the calibration weight off the pan.

Open the glass door in the windbreak, remove the weight from the pan and shut the glass door again.
"END" will be displayed and the balance will return to the weighing mode.





> Avoid doing the following:
>
> - Putting your hand inside the glass door of the windbreak
> - Touching the container or sample with bare hands
> - Weighing samples (items to be weighed) of different temperatures

The heat will lead to convection, and this may make the balance display unstable.
You are recommended to use forceps or gloves to carry containers and samples.
When dealing with samples (items to be weighed) at different temperatures, eliminate the temperature difference by leaving the samples around the pan inside the glass door before weighing.

Perfect Self Calibration (PSC) (ATX-R only)

The ATX-R Series is equipped with a perfect self calibration (PSC) function which carries out fully automated span calibration when temperature changes are detected in order to allow for accurate measurements.

PSC is carried out automatically in mass measurement mode under any of the following conditions. The calibration weight symbol will blink approximately 2 minutes before PSC begins as a notification.

(1) When there is a change in the surrounding temperature.

(2) When about four hours has passed since the previous calibration.

(3) If the balance switches to mass measurement mode after conditions (1) or (2) above are fulfilled in the standby or menu display states.

⇨ The PSC symbol will blink when any of conditions (1) through (3) above are fulfilled. Once 2 minutes elapses after the PSC symbol begins blinking, different operations will be carried out as detailed below depending on if there is any load on the pan or not.

◆ Case1) There is no load on the pan.

"PSC.RUN" is displayed and automatic span adjustment is executed.

It returns to the weighing mode when automatic span adjustment ends.

To continue weighing when "PSC.RUN" is displayed, press ⏻ to stop span calibration.

The balance will return to mass display without completing span calibration and the PSC symbol will blink.

◆ Case 2) There is some load on the pan.

(a) In the case of a verified balance

The PSC symbol will continue to blink until there is nothing on the pan. Span calibration will begin when the sample is removed from the pan.

(b) Except for a verified balance

The PSC symbol and mass display will both blink. After 2 minutes have passed since the mass display begins blinking, "PLS.CAL" will be displayed, so remove the sample from the pan so that there is nothing on the pan. Span calibration will then begin.

The PSC symbol will continue to blink even if there is nothing on the pan when using the application function mode. Span calibration will begin after switching to mass measurement mode.

When two minutes pass since mass display blinking start, "PLS.CAL" is displayed.
If "PLS.CAL" is displayed, please unload the thing on the pan and execute span adjustment.

Push key when you must keep measuring after “PLS.CAL” is displayed. Return to blinking mass display.

If the span adjustment is not executed, the mass display blinking for two minutes and "PLS.CAL" display are repeated.

◆ PSC configuration procedures

1 Press and hold the for approximately 3 seconds.

The calibration menu will open.

2 Press the or several times to display "PSC".

3 The stability mark ➡ will be displayed or turn off each time the →0/T← is pressed.

Stability mark ➡	"PSC" setting
Off	OFF (Default setting)
Displayed	ON

4 Press the several times or press and hold the for 3 seconds to return to mass measurement mode.

In the case of a verified balance as a legal measuring instrument, PSC is not displayed in the menu.

In the case of a verified balance as a legal measuring instrument, if one of the PSC start conditions in (1) to (3) above is satisfied in the “ATY-R” series, the PSC symbol begins to blink. Once 2 minutes elapses after the PSC symbol begins blinking, different operations will be carried out as detailed below depending on if there is any load on the pan or not.

◆ Case1) There is no load on the pan.

"PLS.CAL" is displayed. If "PLS.CAL" is displayed, press and execute span adjustment.

◆ Case 2) There is some load on the pan.

The PSC symbol and mass display will both blink. After 2 minutes have passed after the mass display begins blinking, "PLS.CAL" will be displayed, so remove the sample from the pan and press [CAL] to start span calibration.

Calibration of the Internal Weight (ATX-R Only)

In the ATX-R series, the weight for calibration is built in. The internal weight itself is calibrated on shipment from the factory, but it is possible to recalibrate it using external weights. This is called **P.CAL**

For the range of values for the external weights that can be used, refer to "Specifications" (☞ page 146).

Not applicable to a verified balance as a legal measuring instrument.

1 Press (g) 3 sec. for about 3 seconds.

This opens the calibration menu.

2 Select calibration of the internal weight.

(g) → [PCAL] → →0/T←

3 Enter the administrator's password.

☞ "Entering Numerical Values", page 45
☞ "Changing the Password", page 142

If the password is wrong…

The error message shown to the right will be displayed and the display will return to the indication in step **1**.

4 Press →0/T←

The password will be recognized and the display will blink zero. The zero point will be read, so place no loads on the pan and wait.

If "WAIT" is displayed…

The calibration record is being output. When output has finished, span calibration will start automatically.

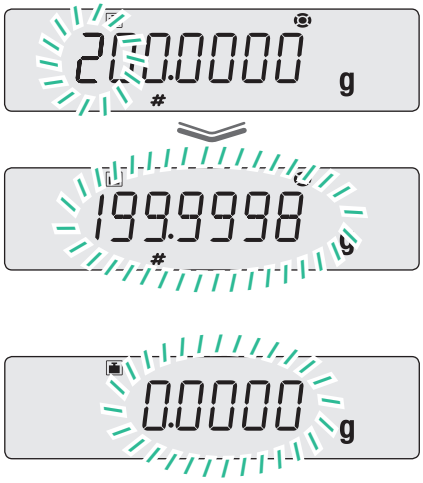
After a short time the external sensitivity calibration weight value will blink.

5 If necessary, enter a weight value.

Use the , , and to enter the calibration weight value, then confirm by pressing the →0/T←. If no change is to be made, proceed to step 6 without doing anything.

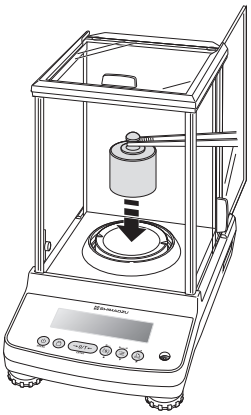
"Entering Numerical Values", page 45

For the range of weight values that can be used, refer to "Specifications" (page 146).



6 Place the weight on the pan.

Open the windbreak glass door, place the calibration weight on the pan, and close the glass door again. Wait until the flashing weight value indication changes to a flashing zero indication.



If "ERR C" is displayed…

The internal weight has not been calibrated for one of the following reasons.

- The wrong weight has been placed on the pan.
- No operation has been performed within 60 seconds of the flashing weight value or zero display.

Press and repeat the operation from the beginning.

▽ Continued on next page

▽ Calibration of the Internal Weight (ATX-R Only)

7 Take the calibration weight off the pan.

Open the glass door of the windbreak, take the weight off the pan, and close the glass door.

If "BUSY" is displayed…

There is something placed on the pan. When this item is taken off the pan, internal weight calibration will start automatically.
To cancel internal weight calibration, press ⏻

If "ERR H" is displayed…

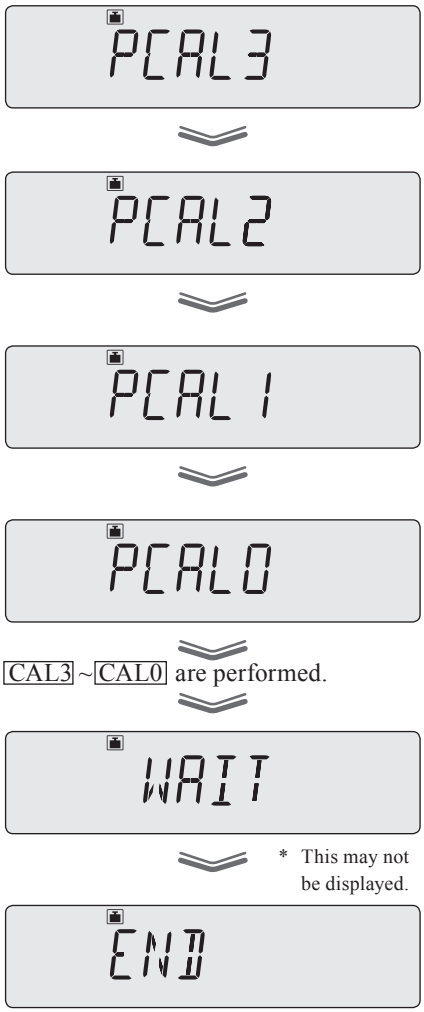
See "Responding to Messages" (☞ page 139).

If "ERR C" is displayed…

The internal weight has not been calibrated for one of the following reasons.

- There is too large a discrepancy between the zero point of the balance and the sensitivity.
- A container has been placed on the pan.
- The pan is not on the balance.
- There is too large a discrepancy in the value of the internal weight.

Press ⏻ and repeat the operation from the beginning.



CAL3 ~ CAL0 are performed.

* This may not be displayed.

"END" is displayed, then span calibration using the internal weight starts.
When span calibration using the internal weight ends, the balance returns to the weighing mode.

☞ "Span Calibration and Adjustment" page 52

⚠Caution

Instructions

If calibration doesn't end normally and the balance stops, do not move it nor leave it as it is.

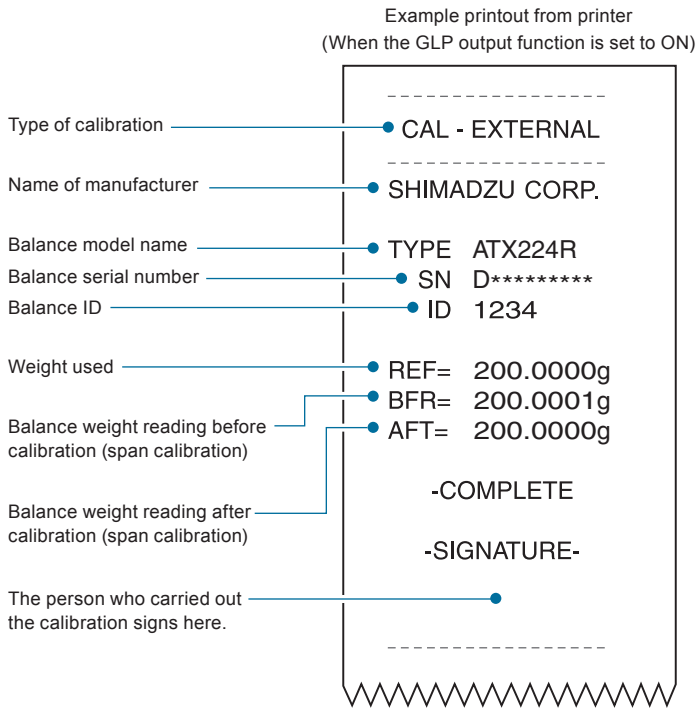
Moving the balance in such a condition may cause failure because the internal weight is not held correctly.
Before moving the balance, be sure to turn the power on and start it up correctly (so that the internal weight is correctly held).

Leaving a Record of Calibration

You can leave a record of execution of calibration and set an ID for a balance to facilitate management of multiple balances.

Example Printout of a Calibration Record

You can output a record of execution of calibration to a PC or printer (option).
Balance keys (page 118) is useful for output to a PC.
The output calibration record includes the following items.



Outputting the date and time

Since the ATX-R/ATY-R series doesn't incorporate a clock function, it is not possible to output the date and time from the balance.

▽ Continued on next page

▽ Leaving a Record of Calibration

Setting Output of a Calibration Record

Output of the calibration record can be set by turning the GLP output function (page 143) ON and OFF.

When the GLP output function is set to on, the statistic calculation function of the printer cannot be used.

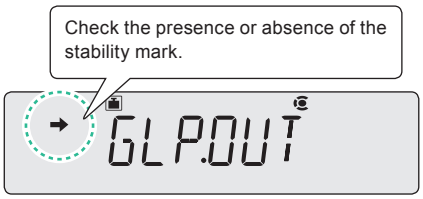
1 Press 3 sec. for about 3 seconds.

This opens the calibration menu.

2 Select the GLP output function.

(g) [GLP.OUT]

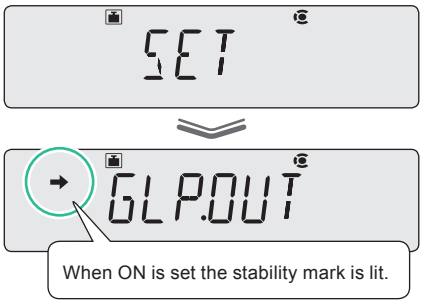
Stability Mark	GLP Output Function
Lit	ON
Unlit	OFF



3 Change the setting.

Pressing alternately sets the ON and OFF settings.

→0/T← [SET]



4 Return to the weighing mode.

or 3 sec.

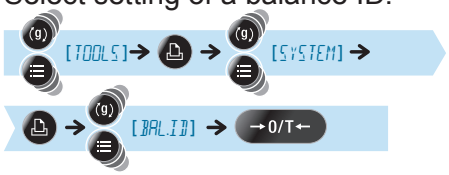
Setting a Balance ID

When managing multiple balances, you can set a four-digit management number (ID) for each balance which will be indicated as part of calibration records output.

1 Press ☰ twice in the weighing mode.

This opens the main menu.

2 Select setting of a balance ID.

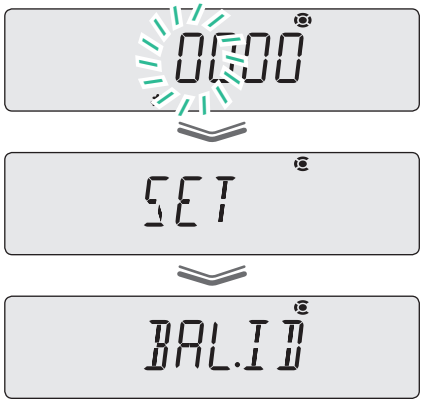


3 Enter the required numerals (max. 4 digits).

(Enter the ID.) → →0/T← [SET]

☞ "Entering Numerical Values", page 45

The default ID is "0000".



4 Return to the weighing mode.

⏻ or ⏻ 3 sec.

5 FUNCTIONS RELATING TO TARING

The ATX-R/ATY-R series has the following functions relating to the zero point and taring.
Make use of these functions in accordance with the weighing environment and the application.

Zero / Taring Functions

Zero tracking function

Fluctuations in the zero point that occur immediately after turning the power ON and as a result of temperature changes are compensated for, so the zero indication is maintained.

(☞ page 65)

Auto zero function

Drift of the zero point that occurs as a result of material left on the pan after measurement is automatically compensated for.

See Hint as blow.

(☞ page 66)

Auto tare function

After outputting a weight reading, taring is executed automatically.

(☞ page 68)

Zero / tare timing change function

After waiting for ➡ (the stability mark) to light up, zero point setting / taring is executed.

See Hint as blow.

(☞ page 69)

What is taring?

This is a function whereby the weight of the container placed on the pan is subtracted to set the display to zero, so that only the weight of the sample placed inside the container is indicated.

What is the zero point?

This means the state where nothing is placed on the pan, zero is indicated, and weighing can be started.

Not applicable to a verified balance as a legal measuring instrument.

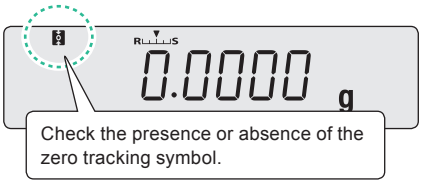
Zero Tracking Function

When the zero tracking function is set, when the indication is zero (including when taring is performed) the fluctuations in the zero point that occur immediately after turning the power ON and due to temperature changes and other factors are compensated for and the zero indication is maintained.
(In the default setting the zero tracking function is ON.)

1 Check (the zero tracking symbol) in the weighing mode.

Zero Tracking Symbol	Zero Tracking Function
Lit	ON
Unlit	OFF

If you proceed to the next step while zero tracking is ON, it goes OFF.



2 Press twice.

This opens the main menu.

> Setting from the zero / taring menu
>
> You can also press →0/T← 3 sec. for about 3 seconds and make the setting from the zero / taring menu.

3 Select the zero tracking function.

(g) → [ZTRC]

4 Confirm the ON or OFF selection.

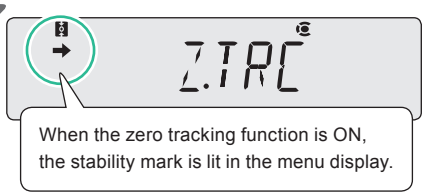
→0/T← [SET]

The ON or OFF status will be selected and the balance will automatically return to the weighing mode.

After setting "ON", (the zero tracking symbol) lights up.

When the setting has been made from the zero / taring menu

or 3 sec.



Auto Zero Function

When the auto zero function is set, any drift of the zero point that occurs as a result of material left on the pan after weighing is automatically compensated for so that zero is displayed.

Note that the auto zero function cannot be used in combination with formulation.

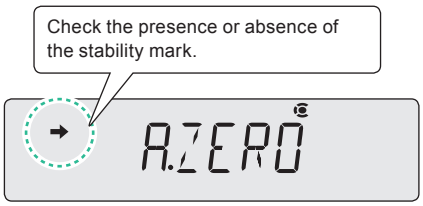
Not applicable to a verified balance as a legal measuring instrument.

1 Press →0/T← for about 3 seconds in the weighing mode.

This opens the zero / taring menu.

2 Select the auto zero function.

(g) [AZERO]



What is the current situation?

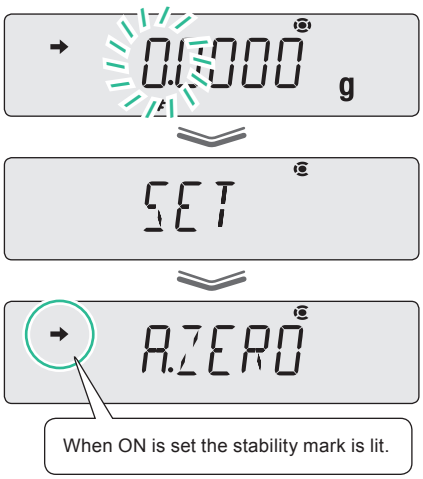
Stability Mark	Auto Zero Function	What do you want to do? To set or Update…	To Cancel…
Lit	ID is ON	Press and go to step 3.	Press →0/T← and go to step 4.
Unlit	ID is OFF	Press →0/T← and go to step 3.	Go to step 4.

3 Enter the value for the range for automatic compensation to the zero point (auto zero range).

(Enter the zero range value.) → →0/T← [SET]

"Entering Numerical Values", page 45

If there is anything with a weight lower than or equal to the auto zero range value left on the pan after weighing the sample, it will automatically be compensated for and the zero point will be established when ➡ (the stability mark) lights up.



Auto zero range value

The auto zero range value is only effective in the units that are displayed when the value is entered.

If other units are later selected, change (update) the setting for the zero range value by following the procedure from step **1** while these new units are displayed.

The upper limit value for the zero range is 99 d. 1 d is the minimum indication in the displayed units.

For example, for a balance with a minimum indication of 0.0001 g, the situation is as follows.

Units	Minimum Indication	Upper Limit Value for the Zero Range
g	0.0001 g	0.0099 g
ct	0.001 ct	0.099 ct

4 Return to the weighing mode.

Auto Tare Function

When the auto tare function is set, the balance is automatically tared after the weight reading has been output, and the indication at that point is set to zero.

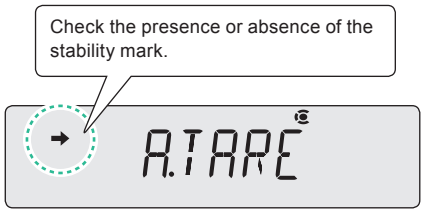
1 Press →0/T← for about 3 seconds in the weighing mode.

This opens the zero / taring menu.

2 Select the auto tare function.

(g) [A.TARE]

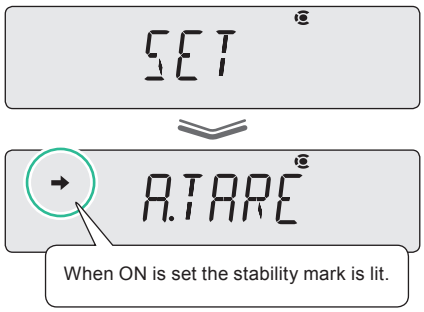
Stability Mark	Auto Tare Function
Lit	ON
Unlit	OFF



3 Change the setting.

Pressing →0/T← alternately sets the ON and OFF settings.

→0/T← [SET]



4 Return to the weighing mode.

or 3 sec.

Zero / Tare Timing Change Function

The zero / tare timing change function allows you to select whether setting of the zero point / taring is executed without waiting for ➡ (the stability mark) to light up, or after waiting for ➡ (the stability mark) to light up after pressing →0/T←.

This function can also be applied to operations under the auto zero function and the auto tare function. (The default setting is for execution without waiting for ➡ (the stability mark) to light up.)

Not applicable to a verified balance as a legal measuring instrument.

1 Press →0/T← for about 3 seconds in the weighing mode.

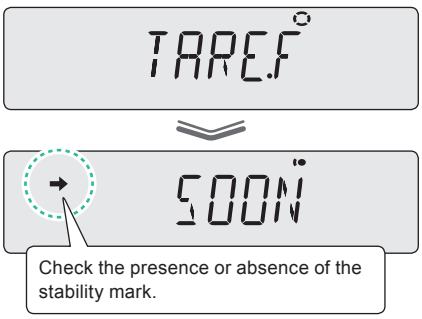
3 sec.

This opens the zero / taring menu.

2 Select the zero / tare timing change function.

(g) → [TAREF] → [SOON]

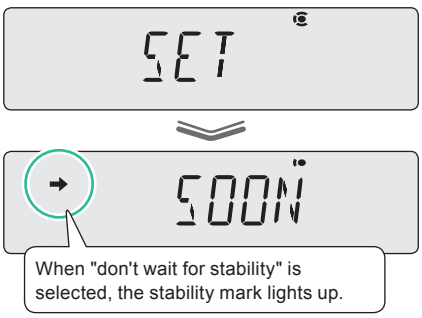
Stability Mark	Zero / Tare Timing Change Function
Lit	The balance doesn't wait for stability
Unlit	The balance waits for stability.



3 Change the setting.

Pressing →0/T← alternately selects the "wait for stability" and "don't wait for stability" settings.

→0/T← [SET]



4 Return to the weighing mode.

or 3 sec.

6 ADJUSTING RESPONSE AND STABILITY

The response and stability of the balance can be adjusted in several ways in accordance with the installation environment (degree of vibration and so on) and the weighing application (whether solid objects / clumps or poured liquids / powders are being weighed).

- Stability: The degree to which the weight reading is stable, with little fluctuation
- Response: The speed of the reaction to changes in the weight on the pan

Set the optimum conditions for your application by following the procedure below.

Selecting the weighing mode

The ATX-R/ATY-R series offers two basic weighing modes.
Select the right one in advance in accordance with the environment of use and the application.

General weighing mode

This is the fundamental mode in which response and stability are given equal emphasis.

(☞ page 71)

Pouring mode

This is a weighing mode where response is given priority over stability, which is suited to operations where substances like liquids or powders are poured out until a target weight is reached.

(☞ page 71)

Adjusting the stability and response in real time during weighing

Pressing  once in the weighing mode turns smart setting function on. By pressing  and  , you can adjust stability and response.

"Easy Setting of Response and Stability" (☞ page 72)

Adjusting ➡ (the stability mark)

The conditions for making ➡ (the stability mark) light up (the stability detection range and the stability mark lighting timing) can be adjusted.

"Adjusting the Stability Mark" (☞ page 74)

Selecting the Weighing Mode

ATX-R/ATY-R series balances have the following two types of weighing mode.
Set the right mode in advance depending on the environment of use and the weighing application.

Selecting the General Weighing Mode

This is the fundamental mode in which response and stability are given equal emphasis.

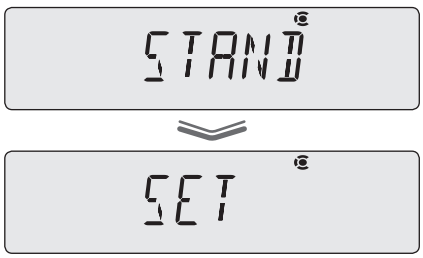
1 Press ☰ twice in the weighing mode.

This opens the main menu.

2 Select the general weighing mode.

(g) ☰ [STAND] → →0/T← [SET]

The balance has been set in the general weighing mode.



Selecting the Pouring Mode

This is the weighing mode suited to pouring out a sample (substance being weighed such as a powder or liquid) until a target weight is reached.
The update of the display is fast and the final value can be stabilized for reading.

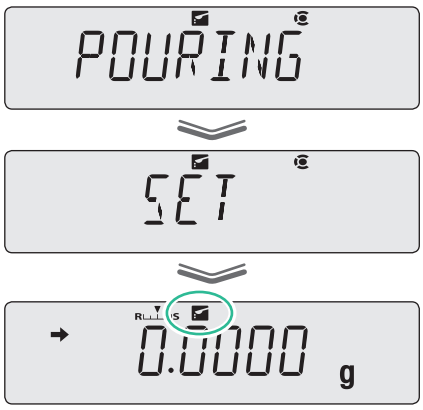
1 Press ☰ twice in the weighing mode.

This opens the main menu.

2 Select the pouring mode.

(g) ☰ [POURING] → →0/T← [SET]

The pouring mode is established and (the pouring symbol) lights up.

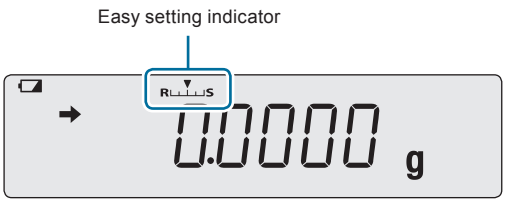


Easy Setting of Response and Stability

During weighing, the response and stability of the weighing mode can be adjusted in stages in accordance with the installation environment and the weighing application.

The ATX-R/ATY-R series balances feature excellent response and stability, but since response and stability are generally antagonistic, if one is prioritized it will to some extent weaken the characteristics of the other.

Easy Setting allows quick adjustment to match your preference, requirements or particular application.



Pressing in the weighing mode flashes the smart setting indicator and turns the smart setting on. Then, you can perform operations as in the table below.

Pressing again (pressing twice in the weighing mode) enters the main menu. In this case, press and return to the weighing mode.

Smart setting function automatically turns off if there is no key operation after a certain period of time.

This functions can also be turned off by pressing .

Priority Given to Response	⟷	Priority Given to Stability
← 	Easy setting indicator	→ 
Press (g) The more times you press this key, the further ▼ (the level indicator) moves to the R side, increasing the response of the display in stages.	Operation	Press The more times you press this key, the further ▼ (the level indicator) moves to the S side, increasing the stability of the display in stages.
• When you want to weigh things quickly • When you want to improve working efficiency • When weighing out target quantities of a liquid or powder or when making a formulation	For these circumstances…	• When you want to weigh things with confirmed accuracy • When the display is unstable • When the balance is used in a location where there is a constant and relatively large vibration • When the balance is subject to constant air movements and the indication wavers

Adjusting the Stability Mark

The stability mark is a symbol (➡) that is displayed when it is determined that the weight reading has stabilized.
The following settings adjust conditions for lighting up of ➡ (the stability mark).

- Stability detection range
- Stability mark lighting timing

Normally there is no need to change these settings. (Change the settings if, for example, you want to relax the conditions and make ➡ (the stability mark) light more easily because the environment is unstable, or to speed up operation if stability is used to automatically print or output data.

Lighting up of ➡ (the stability mark)

The lighting up of ➡ (the stability mark) indicates the fact that the weight reading is stable.

If the load is being changed slowly, or due to the settings relating to stability detection, the weight reading may change while ➡ (the stability mark) remains lit, or ➡ (the stability mark) may light temporarily and then the weight reading may change.

Setting the Stability Detection Range

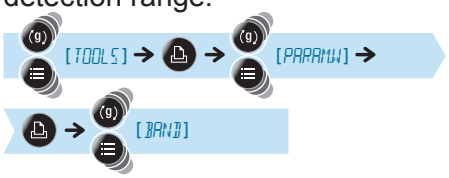
The stability detection range is a value set as a count of the smallest digit that is displayed, and the display is judged to be stable if fluctuation in the weight reading is within this count during a fixed time.
(The default setting for the stability detection range is 1 count (1d).)

Effect of reducing the stability detection range	It takes some time for ➡ (the stability mark) to light up, but after it has lit the weight reading is stable (improvement in reliability).
Effect of increasing the stability detection range	➡ (the stability mark) can be made to light more quickly but the weight reading is liable to fluctuate after it has lit (improvement of weighing and data output speeds).

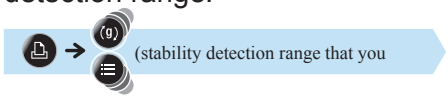
1 Press ☰ twice in the weighing mode.

This opens the main menu.

2 Select setting of the stability detection range.



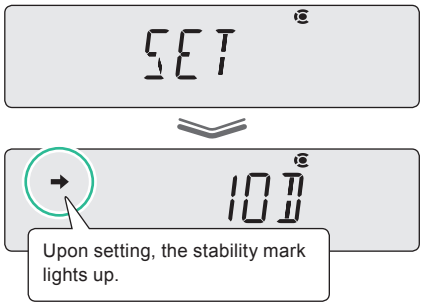
3 Select the value for the stability detection range.



Select the stability detection range from among the following options depending on the weighing application and purpose: 0.5d, 1d, 10d, 50d, 100d, 1000d.

4 Confirm and return to the weighing mode.

The stability detection range has now been set.



If data output is slow…

There are factors in the installation environment and the sample that make the display unstable. If data output triggered by stability detection is very slow, increase the stability detection range.

Setting the Stability Mark Lighting Timing

The timing according to which ➡ (the stability mark) lights can be set in accordance with the application and required accuracy.

Not applicable to a verified balance as a legal measuring instrument.

Effect of speeding up the timing for lighting up of the stability mark	At the same time as stability is detected, ➡ (the stability mark) lights up. The weight reading after ➡ (the stability mark) lights up becomes more susceptible to fluctuation since many samples can be weighed in succession and the working time can be used more efficiently (improvement of weighing speed).
Effect of setting the stability mark lighting timing to the standard setting	When stability is detected and remains detected for a fixed time, ➡ (the stability mark) lights up. ➡ (the stability mark) lighting judgments become stricter and the weight reading is stable after it has lit, so highly accurate weighing is possible (improvement of reliability of data).

▽ Continued on next page

▽ Adjusting the Stability Mark

1 Press ☰ twice in the weighing mode.

This opens the main menu.

2 Select setting of ➡ (the stability mark) lighting timing.

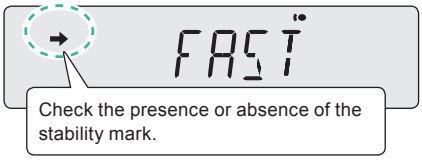
[TOOLS] → 🖶 → [PARAMW] →

🖶 → [STBMK]

3 Check the lighting timing setting.

🖶 [FAST]

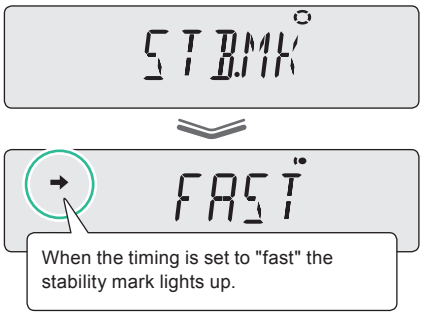
Stability Mark	Stability Mark Lighting Timing
Lit	Fast
Unlit	Standard



4 Change ➡ (the stability mark) lighting timing.

Pressing →0/T← alternately sets the "fast" and "standard" settings.

→0/T← [SET]



5 Return to the weighing mode.

⏻ or ⏻ 3 sec.

7 SETTING UNITS

ATX-R/ATY-R series balances can be made to indicate weights in units other than the basic units of grams by switching units with the (g) key in the weighing mode.

You must register the units you will require in advance.

On shipment from the factory, the only unit registered is g (grams).

☞ "Switching Units", page 37

Units That Can Be Displayed and Conversion Factors

Some of the units below cannot be selected in some countries due to legal restrictions.

Weight Unit (Weight Name)	Gram Conversion (*1)	Conversion Factor (*2)
g (gram)	1	1
mg (miligram)	0.001	1000
ct (carat) *3	0.2	5
mom (momme) *6	3.75	0.2666667
User *4, *5		Can be set as required by the user (*4)

*1 If we take the value in the Gram conversion column to be "a", the formula is as follows.
"a" × balance weight reading (each unit) = value in gram units

*2 If we take the conversion factor to be "k", the formula is as follows.
"k" × value in gram units = balance weight value (selected units)

*3 The minimum indication for ct (carat) may vary depending on the production lot even if they are the same model.
Not applicable to verified balance as a legal measuring instrument of ATX84R and ATY64R.

*4 With user-specified units, the conversion factor (*2) and minimum indication can be set as required.
For details on the method for setting user-specified units, see "Setting User-Specified Units" (☞ page 79).

*5 Not applicable to a verified balance as a legal measuring instrument.

Selecting Units to Display

Select and set the units you require to display so that they can be called up by pressing (g) during weighing operation.

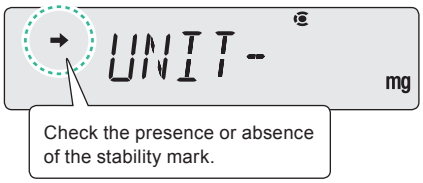
For details on user-specified units, see "Setting User-Specified Units" (☞ page 79).

1 Press (g) 3 sec. for about 3 seconds in the weighing mode.

This opens the unit setting menu.

2 Select the units to be called up and check if ➡ (the stability mark) is displayed or not.

(g) (☰) (Select the units.)



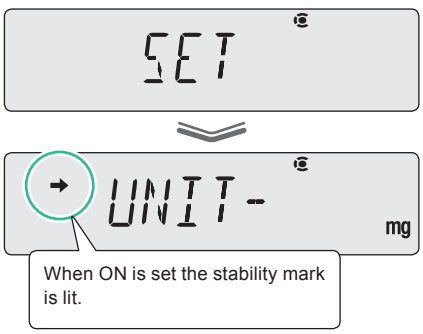
Stability Mark	Registering Units
Lit	ON
Unlit	OFF

3 Change the setting for units.

Pressing →0/T← alternately sets the ON and OFF settings.

→0/T← [SET]

To set or cancel other units, go to step **2**.
To quit, go to step **4**.



4 Return to the weighing mode.

(⏻) or (⏻) 3 sec.

5 Press (g) to call up selected units.

☞ "Switching Units", page 37

Setting User-Specified Units

Conversion Factors

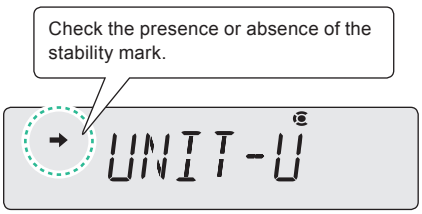
Numerical values (multipliers) by which the weight reading (in grams) is multiplied can be set without restriction.

1 Press (g) 3 sec. for about 3 seconds in the weighing mode.

This opens the unit setting menu.

2 Select the user-specified units.

(g) [UNIT-U]



What is the current situation?

Stability Mark	User-Specified Units
Lit	Set
Unlit	Cancelled

What do you want to do?

To Set / Update	To Cancel
Press and go to step **3**.	Press →0/T← and go to step **5**.
→0/T← and go to step **3**.	Go to step **5**.

3 Select setting of the conversion factor.

(g) [CONV.K] → →0/T←

4 Enter the conversion factor.

(Enter the conversion factor.) → →0/T← [SET]

"Entering Numerical Values", page 45

Changing the position of the decimal point

When entering a conversion factor, the position of the decimal point can be changed (page 46).

▽ Continued on next page

▽ Setting User-Specified Units

Calculation formula for the conversion factor

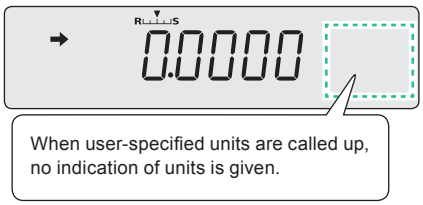
If we take the conversion factor to be "k" the formula is as follows.
"k" × value in gram units = balance weight reading (user-specified units)

5 Return to the weighing mode.

or 3 sec.

6 Press (g) to call up the user-specified units.

"Switching Units", page 37



Minimum Indication

You can set the minimum weight reading display for the user-specified units.

Make the setting by replacing steps **3** and **4** of the conversion factor procedure (page 79) with the following procedure.

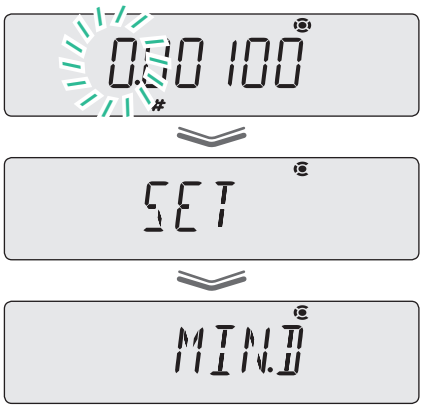
3 Select setting of the minimum indication.

(g) or ☰ [MIN.D] → →0/T←

4 Enter the minimum indication.

(Enter the smallest indication.) → →0/T← [SET]

"Entering Numerical Values", page 45



5 Return to the weighing mode.

or 3 sec.

The minimum weight reading display for the user-specified units is ...

This can be set to any required value but in some cases it will not be possible to guarantee the stability of the weight reading display.

8 APPLICATION FUNCTION MODE

Application Function Mode

You can choose one of the three modes indicated below to suit the application.

Piece counting

You can set the unit weight of the sample (item to be weighed) and then "count" the number of pieces present.

(☞ page 82)

Percentage weighing

You can measure weights as a percentage of a reference weight.

(☞ page 87)

Specific gravity measurement

You can measure solid density and liquid density in this mode.

(☞ page 91)

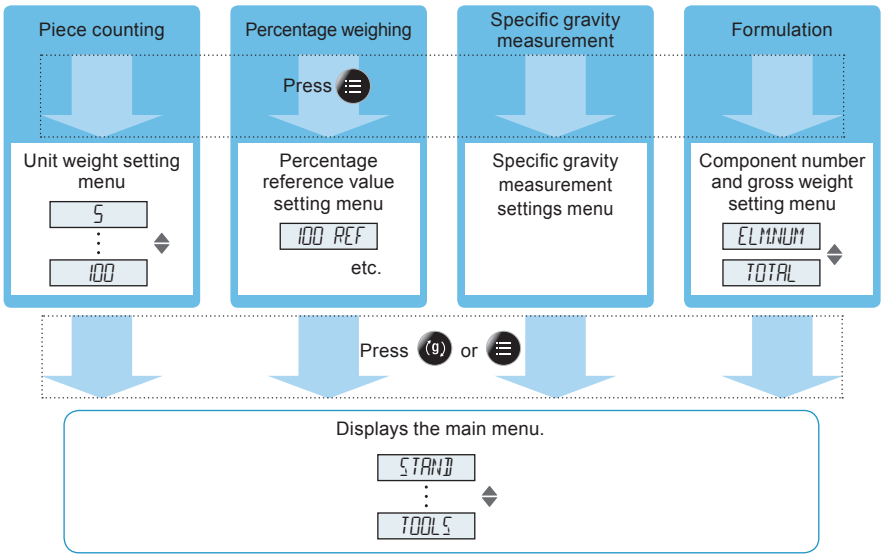
Formulation

This mode is convenient when mixing a number of different samples together according to a formula.

(☞ page 102)

When the application function mode is set…

- Pressing 3 sec. for 3 seconds alternately selects the weighing mode (gram or other unit indication) and the application function mode in use.
- It can be used in combination with the comparator function (☞ page 107).
- If the power is turned OFF and back ON the balance will start up in the weighing mode but the application function mode settings will be retained.
- Pressing ☰ twice in the weighing mode displays the setting menu for each application function mode.
  If you then press (g) or ☰, the top hierarchical level of the main menu appears.
  The flow of the operation for displaying the menu is shown below.



Counting Pieces by Weight (Piece Counting)

You can set the unit weight (weight of a single piece) of the item in advance and then display the number of pieces in the sample.

The unit weight is recorded by placing a sample on the pan that comprises the "number of pieces used for setting".

Unit weights for up to five different types of items can be set at the same time.

Points where care is necessary

- If the sample is spread out too much or unevenly in the container on the pan, accurate piece counting will not be possible.
- If a large quantity sample is to be weighed, and the quantity in the sample greatly exceeds the quantity used to set the unit weight, there may be a large counting error.

To minimize the counting error…

- In step **5** of "Preparation for Piece Counting", make the number of pieces used for setting the unit weight as large as possible.
- When actually measuring numbers of pieces, don't place a large quantity of the sample on the pan at one time but rather add a small portion at a time and, when the display has stabilized, press ☰ for at least 3 seconds to update the unit weight. Keep repeating this operation.

Preparation for Piece Counting (Including Setting the Unit Weight)

The preparations for piece counting are explained here. Only make the setting in the following circumstances.

- You are performing piece counting for the first time.
- You are switching from another application function mode to piece counting.

1 Enter the weighing mode and press ☰ twice.

This opens the main menu.

2 Select piece counting.

(g) (☰) [APLFUNC] → ☐ → (g) (☰) [PCS] →

→0/T← [SET]

3 Select the item number.

[SAMPLE] → (g) / ☰ (Item number: select from 1 2 3 4 5) → →0/T← [SET]

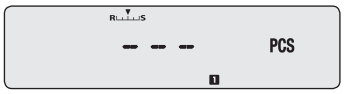
Five different unit weight settings (1 2 3 4 5) can be recorded.

4 Check the number of pieces indication.

The display will indicate whether a unit weight has already been set.

When no unit weight has been set for the item number:

[---]



When a unit weight has already been set for the item number:

(The number of pieces is indicated.)

- To update the unit weight, proceed to step **5**.
- If you are not intending to update the unit weight, the procedure from step 5 on is unnecessary. You can start piece counting right away.

☞ "Counting Numbers of Pieces", page 85

5 Place the container on the pan and press →0/T←

6 Select the number of pieces used for setting.

☰ → (g) / ☰ (Select the number of pieces used for setting.)

Number of pieces used for setting

The number of pieces used for setting can be selected from among 5 pieces, 10 pieces …. 100 pieces.
In order to minimize counting error, make the number of pieces used for setting the unit weight as large as possible.

▽ Continued on next page

▽ Counting Pieces by Weight (Piece Counting)

On pressing (g) or ☰ …

A menu option other than the number of pieces for setting may be displayed but this is not abnormal.
Press (g) or ☰ several times to return to the number of pieces for setting display.

7 Put a quantity of the item to be counted corresponding to the selected "number of pieces used for setting" into the container.

8 Check that ➡ (the stability mark) lights up, then confirm.

→0/T← [SET]

The unit weight will be set and the number of pieces of the sample will be indicated.
You can now start piece counting.

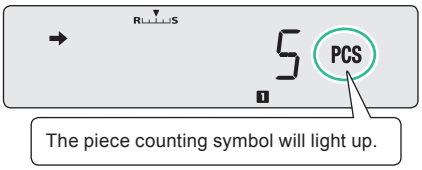
☞ "Counting Numbers of Pieces", page 85

If you wish to add the unit weight for another item to be counted, see "Changing a Unit Weight, or Adding a New Unit Weight" (☞ page 86).

Counting Numbers of Pieces

1 Enter the piece counting mode

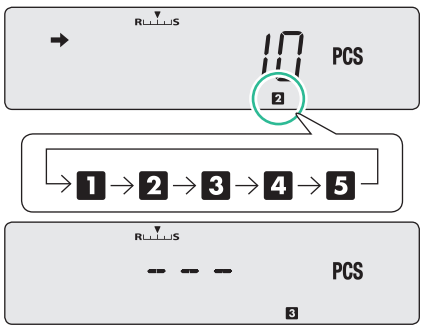
If you have returned to the weighing mode (mode where grams or other units are displayed) from the piece counting mode, then long press (g) 3 sec. for about 3 seconds to enter the piece counting mode.



> **If the piece counting mode is not established…**
>
> The preparations for piece counting have not been completed. Make settings according to "Preparation for Piece Counting (Including Setting the Unit Weight)" (☞ page 82).

2 Select the item number.

Each time (g) 3 sec. is pressed for about three seconds, the selection moves to the next item number and the corresponding item number indication (from 1 to 5) is displayed.



> **If the display appears as shown to the right…**
>
> This means that the unit weight has not been set for the selected item number. To make this setting, follow the procedure in "Changing a Unit Weight, or Adding a New Unit Weight" (☞ page 86).

3 Place a container on the pan and press →0/T←

The balance will be tared.

4 Add the sample to be counted into the container.

The number of pieces in the sample is indicated.
The operations of each of the keys after setting are summarized below.

On pressing ☰ twice.	Establishes the unit weight setting menu. (☞ step 3 onward on page 86.)
On pressing (g) ...	Pressing this key alternately displays the set unit weight (in grams) and the number of pieces. Press ⎙ while the unit weight is displayed to output the unit weight. While the unit weight is displayed, ✱ (the hold display symbol) is displayed.
OOn long pressing ☰ 3 sec. ...	The weighing mode is established. Pressing the key once more returns you to the piece counting mode.

▽ Continued on next page

▽ Counting Pieces by Weight (Piece Counting)

Changing a Unit Weight, or Adding a New Unit Weight

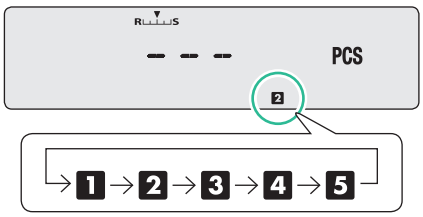
1 Establish the piece counting mode.

In the weighing mode (mode where grams or other units are displayed), long press 3 sec. to switch to the application function mode.

2 Select the item number whose unit weight you want to change, or for which you want to add a unit weight.

Each time you press (g) for about 3 seconds, the next item number is displayed.

"Counting Numbers of Pieces", page 85



3 Place the container on the pan and press →0/T←

The balance will be tared.

4 Press ☰ twice.

The number of pieces used for setting will be displayed.

5 Select the number of pieces used for setting.

(g) ☰ (Select the number of pieces used for setting.)

6 Put a quantity of the item to be counted corresponding to the selected "number of pieces used for setting" into the container.

7 Check that ➡ (the stability mark) lights up, then confirm.

→0/T← [SET]

The unit weight will be added, and piece counting will become possible.

Percentage Weighing

In this mode the weight of the sample is converted to a percentage of the reference weight.
The following two setting methods are available for percentage weighing.

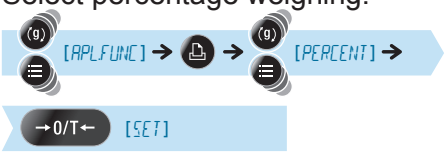
100% Reference	The reference weight is set as 100%.
Specific Percentage Reference	The reference weight is set as a percentage value of your choice.

Preparation for Percentage Weighing

1 Press ☰ twice in the weighing mode.

This opens the main menu.

2 Select percentage weighing.



The setting beyond this point differs depending on the percentage value you are assigning to the reference weight.

If the reference weight is being set as 100%, see "When setting the reference as 100%…" (☞ page 88).
If the reference weight is being set as a specific percentage, see "When setting the reference as a percentage of your choice…" (☞ page 89).

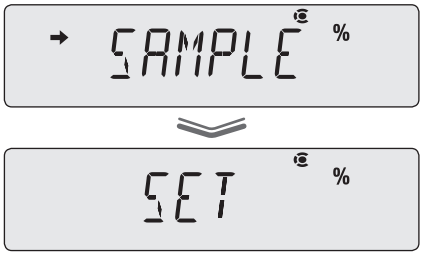
▽ Continued on next page

▽ Percentage Weighing

When setting the reference as 100%…

3 Select the 100% reference.

(g) (menu) [SAMPLE] → →0/T← [SET] →



(Check the indication.)

The indication differs depending on whether a reference value has already been set or not.

When no percentage reference value has been set

[---]

When a percentage reference value has already been set

(The percentage reference value is displayed.)

- To update the percentage reference value, proceed to step **4**.
- If you are not updating the percentage reference value, the following steps are not necessary.
  ☞ "Weighing Percentages", page 90

4 Place the container on the pan and press →0/T←

The balance will be tared.

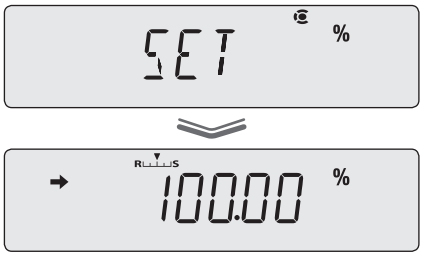
5 Select 100% reference setting.

Press (menu) twice [100 REF]

6 Place the sample that is to provide the reference weight in the container.

7 Check that ➡ (the stability mark) lights up, then confirm.

→0/T← [SET]



A percentage value with the reference weight taken to be 100% is displayed.

Percentage Weighing is now possible.

☞ "Weighing Percentages", page 90

What to do if….

It is not possible to use a reference weight that weighs less than 100 times the minimum indication of the balance as the reference weight.

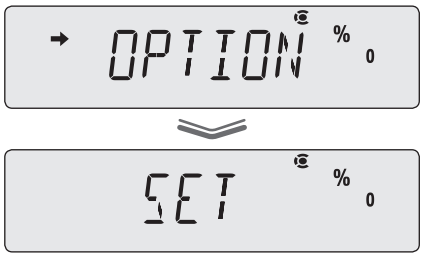
When setting the reference as a percentage of your choice...

3 Select the specific percentage reference.

(g) / ☰ [OPTION] → →0/T← [SET] →

(Check the indication.)

The indication differs depending on whether a reference value has already been set or not.



When no percentage reference value has been set

[---]

When a percentage reference value has already been set

(The percentage reference value is displayed.)

- To update the percentage reference value, proceed to step **4**.
- If you are not updating the percentage reference value, the following steps are not necessary.
  "Weighing Percentages", page 90

4 Place the container on the pan and press →0/T←

The balance will be tared.

5 Enter a percentage value of your choice.

☰ [OPT REF] →

(Enter the percentage value.) → →0/T←

"Entering Numerical Values", page 45

6 Place the sample that is to provide the reference weight in the container.

7 Check that ➡ (the stability mark) lights up, then confirm.

→0/T← [SET]

The specific percentage weighing symbol lights up.

A percentage value calculated by conversion on the basis that the reference weight is equal to the set percentage is displayed.

Percentage weighing is now possible.

"Weighing Percentages", page 90

▽ Continued on next page

▽ Percentage Weighing

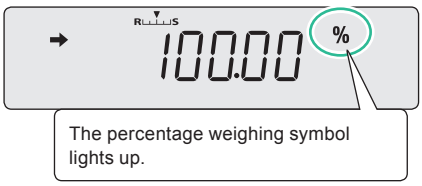
What to do if….

It is not possible to use a reference weight such that the weight corresponding to 100% is less than 100 times the minimum indication of the balance.

Weighing Percentages

1 Establish the percentage weighing mode.

If you have returned to the weighing mode (mode where grams or other units are displayed) from the percentage weighing mode, then long press 3 sec. for about 3 seconds to enter the percentage weighing mode.



If the percentage weighing mode is not established…

The preparations for percentage weighing have not been completed. Make setting in accordance with "Preparation for Percentage Weighing" (☞ page 87).

2 Place the container on the pan and press →0/T←

The balance will be tared.

3 Insert the sample (item to be measured) into the container.

A percentage value obtained by conversion based on the set reference percentage value and reference weight is displayed.

The operations of each of the keys after setting are summarized below.

On pressing ☰ twice.	The percentage reference value setting menu is displayed. (☞ step 4 onward on pages 87 and 88.)
On pressing (g) ...	The set reference weight (in grams) and the percentage indication are displayed alternately. Press ⎙ while the reference weight is displayed to output the reference weight. While the reference weight is displayed, ✱ (the hold display symbol) is displayed.
On long pressing (g) 3 sec....	The 100% reference and specific percentage value are displayed alternately.
On long pressing ☰ 3 sec....	The mode is switched to the weighing mode. Pressing the key again will return you to the percentage weighing mode.

Measuring Specific Gravity of Solids (Solid Specific Gravity Measurement)

This measures the sample (solid) weight in air and in liquids of known density (or specific gravity) and then calculates the sample's density (or specific gravity). The following procedures are when using hanging plates and water tanks to be prepared by the customer. Use of the optional SMK-501 specific gravity measurement kit allows for even easier measurement of specific gravity. Refer to the kit instruction manual for usage methods when using the kit.

Preparation for Solid Specific Gravity Measurement

1 Press ☰ 2 times in mass measurement mode.

The main menu will open.

2 Select specific gravity measurement.

[APLFUNC] → ☐ → [SG] →

→0/T← [SET]

3 Select solid specific gravity measurement.

[SSG] → →0/T← [SET]

4 Configure the medium

[WATER] → →0/T← [SET]

Display	Medium
WATER.	Water
ETHL.	Ethyl alcohol
METHL	Methyl alcohol
OTHER	Other

5 Enter the medium temperature.

[L.TEMP] → →0/T← → [25.0] [SET]

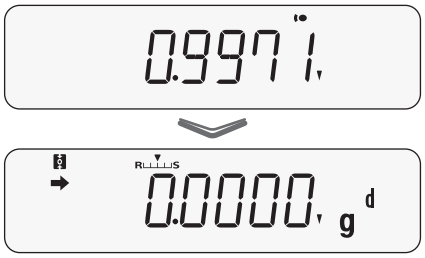
For OTHER, the medium temperature input screen will not be displayed, and you will instead input the medium density directly.

Value input The balance display will switch to value input mode, and the 1st digit will blink and be able to be changed as described below.	
↑	Increase value
↓	Decrease value
→	Move right
↵	Confirm value

▽ Continued on next page

▽ Measuring Specific Gravity of Solids (Solid Specific Gravity Measurement)

6 After entering the medium temperature, the density of the medium for the input temperature will be automatically displayed for 3 seconds, and then the device will switch to specific gravity measurement mode.



When the medium is set to OTHER, the device will switch to specific gravity measurement mode after entering the medium density.

To exit specific gravity measurement mode

Press and hold for 3 seconds to switch to weighing mode.

Data Hold Function

This data hold function is used when using solid specific gravity measurement the same as when using liquid specific gravity measurement. When measuring specific gravity, the displayed value will often change slightly, making it difficult to read. This data hold function can be set to maintain the currently displayed specific gravity value while (g) is pressed, making it easier to read the value.

Configuration method

1 Press ☰ 2 times in mass measurement mode.

The main menu will open.

2 Select specific gravity measurement.

(g) ☰ [APL.FUNC] → 🖶 → (g) ☰ [SG] →

→0/T← [SET]

3 Press the (g) or ☰ several times to display "SG.HOLD".

4 The stability mark ➡ will be displayed or turn off each time the →0/T← is pressed. The stability mark ➡ indicates the data hold function is set.

5 Press the ⏻ several times or press and hold the ⏻ for 3 seconds to return to specific gravity measurement.

Density/Specific Gravity Calculation Formula Selection

This function allows for switching of calculation formulas by switching "AIR.COR. ON and OFF.

Solid density and liquid density can be measured by selecting from the 2 formulas as shown in the table below. Select the formula before carrying out measurement.

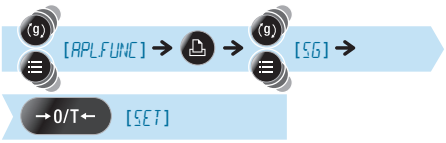
	"AIR.COR" settings	
	OFF (calculation with no correction for air buoyancy) *Default setting	**ON (calculation with correction for air buoyancy)**
Solid density	Formula which does not include air buoyancy correction $\rho = \frac{W_a}{W_a - W_l}\rho_l$ W_a : Mass of sample measured in air W_l : Mass of sample measured in liquid ρ_l : Density of liquid used (normally water)	Formula which does include air buoyancy correction $\rho = \frac{Wa}{W_a - W_l}(\rho_l - \rho_a) + \rho_a$ W_a : Mass of sample measured in air W_l : Mass of sample measured in liquid ρ_l : Density of liquid used (normally water) ρ_a : Density of air 0.0012 g/cm³
Liquid density	Formula which does not include air buoyancy correction $\rho = \frac{W_a - W_l}{V}$ W_a : Mass of sinker measured in air W_l : Mass (apparent) of sinker measured in liquid V : Volume density of sinker used	Formula which does include air buoyancy correction $\rho = \frac{W_a - W_l}{V} + \rho_a$ W_a : Mass of sinker measured in air W_l : Mass (apparent) of sinker measured in liquid V : Volume density of sinker used ρ_a : Density of air 0.0012 g/cm³

Operation procedure

1 Press (☰) 2 times in mass measurement mode.

The main menu will open.

2 Select specific gravity measurement.



3 Press the (g) or (☰) several times to display "AIR.COR".

4 The stability mark ➡ will be displayed or turned off each time the →0/T← is pressed.

Stability mark "➡"	"AIR.COR" settings
Off	OFF (Default setting)
Displayed	ON

5 Press the (⏻) several times or press and hold the (⏻) for 3 seconds to return to specific gravity measurement.

▽ Continued on next page

▽ Density/Specific Gravity Calculation Formula Selection

Solid Specific Gravity Measurement

1 Verify that the device is in solid specific gravity measurement mode.

2 If the balance display does not display zero, press →0/T←.

3 Place the sample to be measured in the hanging pan and the weight of the sample in air will be displayed.

4 Wait until the stability mark ➡ is displayed then press (g) and "SINK" will be displayed as shown in the image to the right.

5 Next place the sample on the underwater weighing pan then press (g) and when the underwater sample weight is confirmed, the solid density will be displayed.

6 Connect the printer and press to output the results.

7 Remove the sample. Press (g) and repeat the above procedure from step 2 to measure another sample.

If the calculated solid density value is less than or equal to zero, "---" will be displayed.

Solid Specific Gravity Measurement for Lighter than Water Solids (1 g/cm³ or less)

Two different methods are available for solid specific gravity measurement for lighter than water solid (1 g/cm³ or less) samples.

Method 1: Measurement using a medium with a specific gravity lower than the solid specific gravity
(Ex.: Ethanol 0.8 g/cm³)

This method is used when the solid density is only slightly different than the density of distilled water.

Do not use ethanol if the solid sample will be affected by or react with ethanol.

It is necessary to strictly abide by all safety related regulations when handling ethanol.

Method 2: Measurement using a submersion basket for a solid sample which floats on water rather than placing the sample on the underwater weighing pan.

⇨ Carry out "solid specific gravity measurement" and enter the medium parameters.
(☞ Refer to P.91 to 92 steps **5** and **6**)

⇨ (☞ P91) Refer to the procedures for solid specific gravity measurement, and set the sample with the underwater weighing pan already submerged. If the sample buoyancy pushes the underwater weighing basket upward, place a dummy weight on the pan and tare the weight of the dummy when weighing in air beforehand.

Measuring Specific Gravity of Liquids (Liquid Specific Gravity Measurement)

A glass sinker for which the volume is already known is used for liquid specific gravity measurement. The sinker weight is first measured in air, then the weight is measured in liquid, and the density of the liquid is determined. The density is calculated by the balance software from the difference in mass found from buoyancy.

For the following procedures, use of the optional SMK-501 specific gravity measurement kit allows for easier measurement of specific gravity. Refer to the kit instruction manual for usage methods.

Glass Sinker Volume Measurement

If the volume of the glass sinker is not known, the volume can be calculated using the following procedure.

1. Fill the water tank with water which has reached a stable temperature and measure the temperature using a temperature gauge.
2. Enter weighing mode and press →0/T← if zero is not displayed.
3. Lower the sinker and the sinker's weight in air will be displayed.
4. Wait until the stability mark ➡ is displayed, then press →0/T←.

5 Install the water tank on a base, submerge the sinker in the water tank and wait for the stability mark ➡ to be displayed.

The balance will display the difference between the weight in air and the weight in liquid, so read the value and use the formula to the right to calculate the volume of the glass sinker.

$V=W/\rho$

V: Glass sinker volume

W: Difference between weight in air and weight in liquid

ρ: Water density at the given temperature (Refer to Table 1 below)

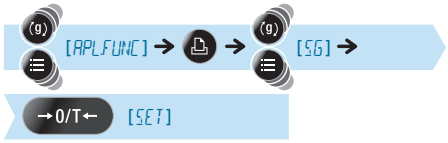
Table 1: Water density at given temperatures

Temperature [°C]	Density ρ[g/cm³]	Temperature [°C]	Density ρ[g/cm³]	Temperature [°C]	Density ρ[g/cm³]
10	0.9997	19	0.9984	28	0.9963
11	0.9996	20	0.9982	29	0.9960
12	0.9995	21	0.9980	30	0.9957
13	0.9994	22	0.9978	31	0.9954
14	0.9993	23	0.9976	32	0.9951
15	0.9991	24	0.9973	33	0.9947
16	0.9990	25	0.9971	34	0.9944
17	0.9988	26	0.9968	35	0.9941
18	0.9986	27	0.9965		

Preparation for Liquid Density Measurement

1 Press ☰ 2 times in mass measurement mode.

2 Select specific gravity measurement.



3 Select liquid density measurement.

▽ Continued on next page

▽ Measuring Specific Gravity of Liquids (Liquid Specific Gravity Measurement)

4 Input the sinker volume.

Next the singer volume will be displayed as shown in the figure to the right, so press the →0/T← key, and the values can then be re-input according to the below table.

Value input The balance display will switch to value input mode, and the 1st digit will blink and be able to be changed as described below.	
↑	Increase value
↓	Decrease value
→	Move right
↵	Confirm value

The "#" symbol indicates the balance is in value input mode.

The first digit from the right will blink and can be changed.

Use the cursor keys to enter the sinker volume.
(☞ P.100)

5 After entering the sinker volume, "SET" will be displayed for 3 seconds, and then the device will switch to liquid density measurement mode.

To exit liquid density measurement mode

Press and hold ☰ for 3 seconds to switch to weighing mode.

Refer to p.93 to p.97 for data hold function and density/specific gravity calculation method selection settings.

Liquid Density Measurement

1 Fill the water tank with the sample liquid, and make sure the device is in liquid density measurement mode.

2 If the balance display does not display zero, press →0/T←.

3 Lower the sinker and the sinker's weight in air will be displayed.

4 Wait until the stability mark ➡ is displayed then press (g) and "SINK" will be displayed as shown in the image to the right.

5 Install the water tank on a base, completely submerge the sinker in the water tank so that there are no air bubbles on the sinker, and press (g).

6 The liquid density will be displayed.

7 Connect the printer and press to output the results.

If the liquid solid density value is less than or equal to zero, "---" will be displayed.

Formulation

This function is useful when mixing multiple components together by weight, according to a formula. Use this function while the printer is connected to a printer or PC.

The weight of each component is measured and output or added, and on completion of the formulation the gross weight is output.

During formulation the auto zero function (☞ page 64) will not work.

Performing Formulation

1 Press ☰ twice in the weighing mode.

This opens the main menu.

2 Set the balance to the formulation mode.

(g) ☰ [APLFUNC] → 🖷 → 🖷 ☰ [FORMULA] →

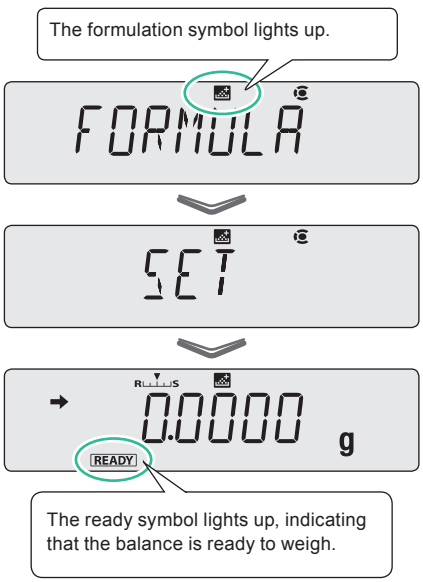
→0/T← [SET]

The balance is now ready to weigh.

If necessary, set output of the component numbers and output of the gross weight.

☞ "Outputting Component Numbers", page 105

☞ "Outputting the Gross Weight", page 106

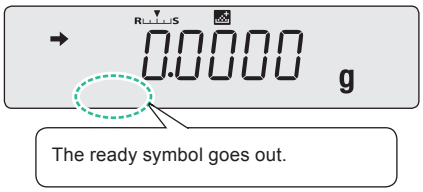


3 Place the container on the pan and press →0/T←

The balance will be tared.

4 Press 🖷

Formulation starts.



When the GLP output function (☞ page 143) is set to ON…

The balance ID (☞ page 145) and other information is printed.

5 Insert the component into the container.

6 Press

The weight value of the current sample (item to be weighed: element) is output / recorded and the balance is automatically tared.

The net weight symbol lights up.

Now repeat the operations in steps **5** and **6** to add the other components to the formulation.

7 On completion of formulation, press .

The total of the individual weight values up to this point (gross weight) is displayed and the balance returns to the ready to weigh status.

The gross weight symbol flashes.

The ready symbol lights up, indicating that the balance is ready to weigh.

To output the gross weight…

Make the setting in "Outputting the Gross Weight" (☞ page 106) in advance.

When the GLP output function (☞ page 143) is set to ON…

The signature panel is printed after the total weight.

▽ Continued on next page

▽ Formulation

The operation after setting is as follows.

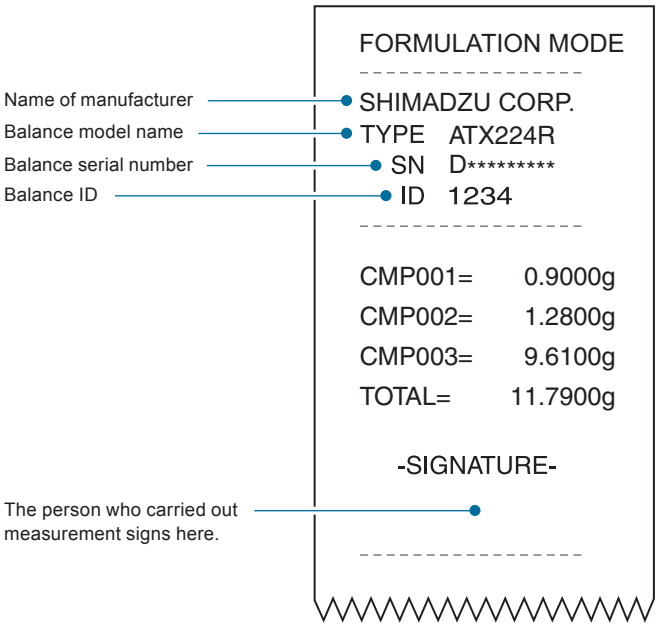
When in the ready to weigh status:

On long pressing 	The weighing mode is established. Long pressing the key once more returns you to the ready to weigh status.

When weighing is in progress:

On long pressing 	The gross weight of the components weighed up to that point is displayed for about 2 seconds.

Example printout from printer
(When the GLP output function is set to ON)



Outputting Component Numbers

The numbers for each component are automatically assigned to the output results.

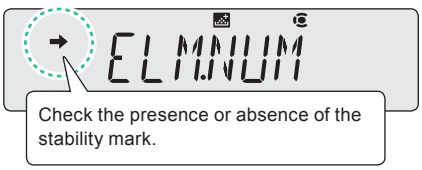
1 Press ☰ twice in ready to weigh status while in the formulation mode.

This opens the main menu.

> If the ready to weigh status is not established…
>
> Perform steps **1** and **2** of formulation (☞ page 102).

2 Select component number output setting.

(g) → [ELMNUM]

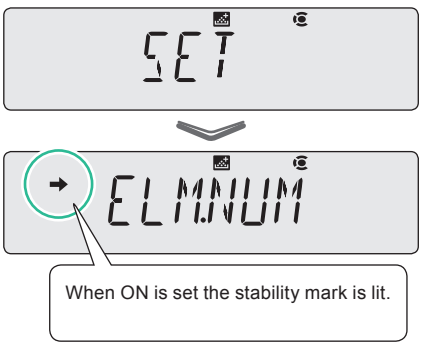


Stability Mark	Outputting Component Numbers
Lit	ON
Unlit	OFF

3 Change the output setting.

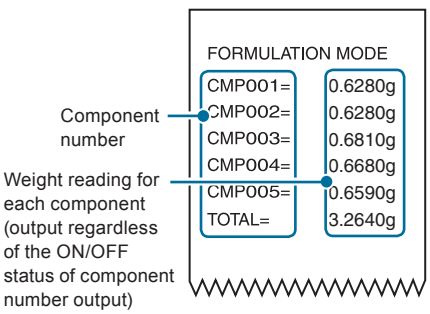
Pressing →0/T← alternately sets ON and OFF for the output setting.

→0/T← [SET]



4 Return to ready to weigh status.

⏻ or ⏻ 3 sec.



▽ Continued on next page

▽ Formulation

Outputting the Gross Weight

The gross weight for a formulation weighing operation is output at the same time it is displayed. The gross weight is output together with the printed indication: "TOTAL =".

1 Press ☰ twice in ready to weigh status while in the formulation mode.

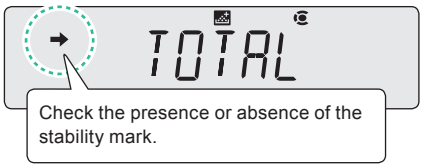
This opens the main menu.

> If the ready to weigh status is not established…
>
> Perform steps **1** and **2** of formulation (☞ page 102).

2 Select gross weight output setting.

(g) [TOTAL]

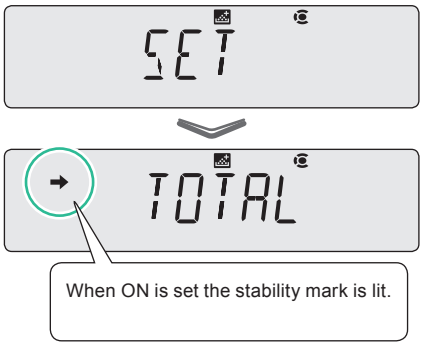
Stability Mark	Outputting the Gross Weight
Lit	ON
Unlit	OFF



3 Change the output setting.

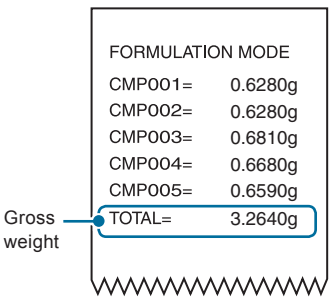
Pressing →0/T← alternately sets ON and OFF for the output setting.

→0/T← [SET]



4 Return to ready to weigh status.

⏻ or ⏻ 3 sec.



9 COMPARATOR FUNCTION

The comparator function performs a comparison between the weight reading and a reference value or target value and displays the status of this comparison.

Comparator Function

You can select and use either of these modes according to the environment of use and application.

Target mode

After setting a target value and a tolerance range with respect to that target value, excesses and deficits in relation to the target value are indicated by HI, OK and LO (the comparator symbols).

(☞ page 107)

Checkweighing mode

After setting the threshold values at the upper and lower limits of the pass range, when a sample is weighed a pass or fail determination is indicated by HI, OK and LO (the comparator symbols). An out of range determination is indicated by all comparator symbols OFF.

(☞ page 109)

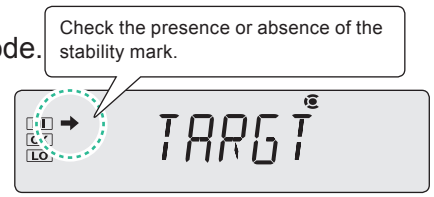
Before setting the comparator function

- It can be used in combination with the application function mode (☞ page 81).
- If you are already using the application function mode, read "When the application function mode is set…" (☞ page 81).
- The comparator function settings are retained even if the power is switched off.

Target Mode

1 Press ☰ twice in the weighing mode.

This opens the main menu.



2 Select the target mode.

(g) ☰ [TOOLS] → 🖨 → (g) ☰ [TARGT] → →0/T← [SET]

What is the current situation? / What do you want to do?

Stability Mark	Target Mode	To Set / Update	To Cancel
Lit	ON	Press 🖨 and go to step **3**.	Press →0/T← and go to step **4**.
Unlit	OFF	Press →0/T← and go to step **3**.	Go to step **4**.

▽ Continued on next page

▽ Target Mode

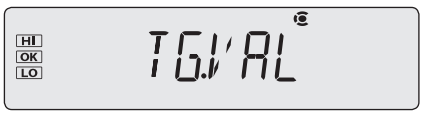
3 Enter the target value and the tolerance range with respect to the target value.

"Entering Numerical Values", page 45

When entering the target value:

(g) [TGT'AL] →

→0/T← (Enter the target value.) → →0/T← [SET]



When entering the tolerance range with respect to the target value:

(g) [LMT'AL] →

→0/T← (Enter the tolerance range value.) →

→0/T← [SET]

4 Return to the weighing mode.

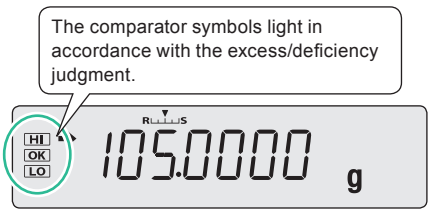
⏻ or 3 sec.

5 Place the container on the pan and press →0/T←

The balance will be tared.

6 Insert a sample into the container.

Excess or deficiency is determined according to the the following conditions.



Condition	Judgment	Comparator Symbol
Over the target value range	Large difference with respect to the target value	HI (flashes slowly)
	Small difference with respect to the target value	HI (flashes quickly)
Within the target value range (target value ± permissible range)	Acceptable	OK
Under the target value range	Small difference with respect to the target value	LO (flashes quickly)
	Large difference with respect to the target value	LO (flashes slowly)

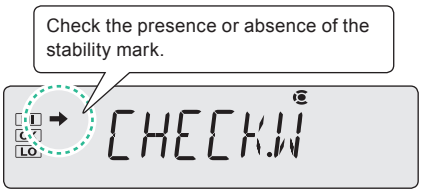
Checkweighing Mode

1 Press ☰ twice in the weighing mode.

This opens the main menu.

2 Select the checkweighing mode.

(g) ☰ [TOOLS] → 🖨 → (g) ☰ [CHECKW] → →0/T← [SET]



What is the current situation?

Stability Mark	Checkweighing Mode	What do you want to do? To Set / Update	To Cancel
Lit	ON	Press 🖨 and go to step **3**.	Press →0/T← and go to step **4**.
Unlit	OFF	Press →0/T← and go to step **3**.	Go to step **4**.

3 Enter the pass range upper limit value and lower limit value, and the checkweighing range lower limit value and checkweighing range upper limit value.

☞ "Entering Numerical Values", page 45

To enter the pass range upper limit value:

(g) ☰ [HILIM] → →0/T← (Enter the pass range upper limit value.) → →0/T← [SET]

To enter the pass range lower limit value:

(g) ☰ [LOLIM] → →0/T← (Enter the pass range lower limit value.) → →0/T← [SET]

▽ Continued on next page

▽ Checkweighing Mode

To enter the checkweighing range lower limit value:

[UNDRNG] → →0/T← (Enter the checkweighing range lower limit value.) → →0/T← [SET]

To enter the checkweighing range upper limit value:

[OVRRNG] → →0/T← (Enter the checkweighing range upper limit value.) → →0/T← [SET]

Be sure to double check all values.

If the entered values don't go together logically, for example if a value lower than the lower limit value is entered as the upper limit value, the values will be automatically corrected and other values will be set.

Particular care is required when entering new values where settings have been made before (updating).

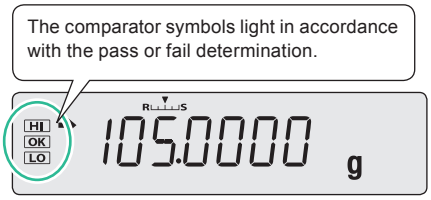
4 Return to the weighing mode.

or 3 sec.

5 Place the container on the pan and press →0/T←

The balance will be tared

6 Insert the sample (item to be measured) into the container.



Pass or fail determination is based on the following conditions.

Condition	Result	Comparator Symbol
Upper limit value of the checkweighing range < indication	Out of Range	All off
Upper limit value of the pass range < indication ≤ upper limit value of the checkweighing range	HI	HI
Lower limit value of the pass range ≤ indication ≤ upper limit value of the pass range	PASS	OK
Lower limit value of the checkweighing range ≤ indication < lower limit value of the pass range	LO	LO
indication < lower limit value of the checkweighing range	Out of Range	All off

10 CONNECTION AND COMMUNICATION WITH PERIPHERAL DEVICES

With ATX-R/ATY-R series balances, weight readings, settings and other data can be output to a personal computer or a printer. This section describes some convenient functions relating to output, and how to connect the balance to a PC or printer.
Use an optional dedicated printer.
The "Balance Keys" communication tool (freeware) is provided for use as a PC input tool.
Balance Data Collection Software, Balance Keys :
https://www.shimadzu.com/an/balance/balance_keys/index.html

Convenient Functions Relating to Output

Printing / Outputting Automatically (Auto Print Function)

This function allows you to automatically output the displayed weight reading at each weighing without pressing 

Select the output timing from among the following five modes.

	Stable Positive Value	Stable Negative Value	Stable Zero Indication	Pass in Checkweighing Mode	Explanation
Mode 1 L.P. .	○				When stability is detected with a positive value, the value is output.
Mode 2 L.PUL.	○	○			When stability is detected with a positive or negative value, the value is output.
Mode 3 L.P. .Z	○		○		When stability is detected with a positive value, or when the reading has returned to zero, the value is output.
Mode 4 L.PUL.Z	○	○	○		When stability is detected with a positive or negative value or when the reading has returned to zero, the value is output.
Mode 5 L.POK.				○	When the auto print function is used in combination with the checkweighing mode (page 109) and stability is detected with an "OK" determination, the value is output.

○: Output, Blank: Not output

1 Press 

for about 3 seconds in the weighing mode.

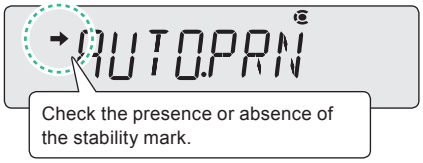
This opens the output menu.

▽ Continued on next page

▽ Convenient Functions Relating to Output

2 Select the auto print function.

[APL.PRN] → [AUTO.PRN]



What is the current situation?

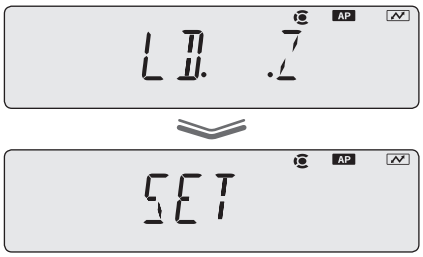
What do you want to do?

Stability Mark	Auto Print Function	To Set / Update	To Cancel
Lit	ON	Press [print] and go to step 3.	Press →0/T← and go to step 5.
Unlit	OFF	Press →0/T← and go to step 3.	Go to step 5.

3 Select the mode for output timing.

Select the output timing from among mode 1 to mode 5 (see the table on the previous page).

(Select the mode.) → →0/T← [SET]

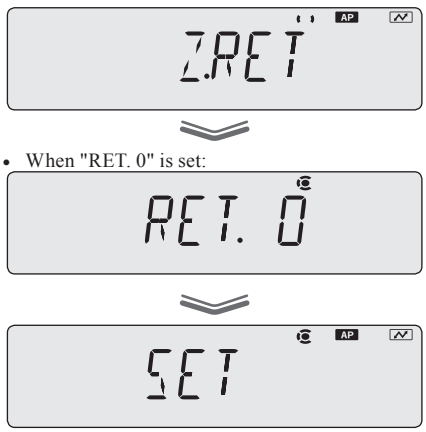


As an example, assume here that mode 3 is selected (output with a stable positive value or a stable zero indication).

4 If necessary, set zero return requirement.

[print] [Z.RET] → [print] → [RET. 0] or

[RET. 50] → →0/T← [SET]



- When "RET. 0" is set:

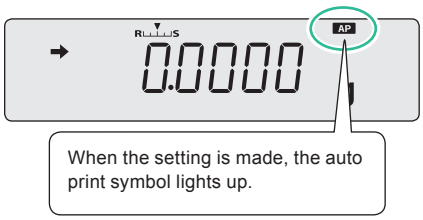
What is zero return requirement?

After the previous sample (item to be weighed) has been removed from the pan, the weight reading must fall below the zero value and stability must be achieved before the next sample is placed on the pan, otherwise there will be no automatic output for this next sample. This function is intended to prevent two or more outputs being made for the same sample. For the zero return value, select either zero or 50% of the weight of the immediately preceding sample. Setting 50% saves time because even if the display doesn't return to zero, as long as stability is achieved, output will be possible if the next sample is placed on the pan.

If you are not setting zero return requirement, proceed to step 5.

5 Return to the weighing mode.

or 3 sec.



6 Place the container on the pan and press →0/T←

The balance will be tared.

7 Place the sample into the container.

After ➡ (the stability mark) lights up, the displayed weight reading is automatically output.

8 Remove the sample from the pan.

If ➡ (the stability mark) lights up at a value close to zero, the displayed weight reading is automatically output.

Printing / Outputting Continuously (Continuous Output Function)

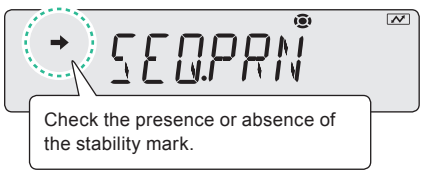
This function allows displayed weight readings to be automatically output continuously in the same timing as the display refresh cycle (approximately 100 msec intervals) while weighing, without having to press

Not applicable to a verified balance as a legal measuring instrument.

1 Press 3 sec. for about 3 seconds in the weighing mode.

2 Select the continuous output function.

[APLPRN] → → [SEQPRN]



Stability Mark	Continuous Output Function
Lit	ON
Unlit	OFF

▽ Continued on next page

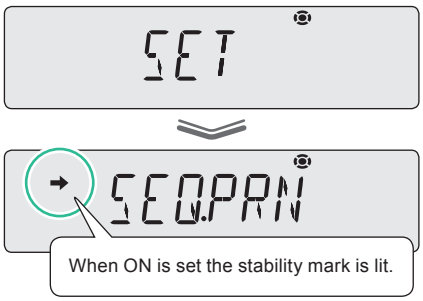
▽ Convenient Functions Relating to Output

3 Change the setting.

Pressing →0/T← alternately sets the ON and OFF settings.

→0/T← [SET]

If OFF is selected, perform step **6**. Steps **7** onward are not necessary in this case.

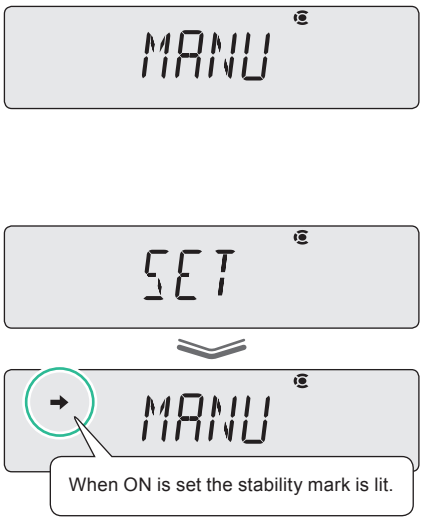


4 Set whether starting of the continuous output is performed manually by key operation.

→ (g) [MANU]

Pressing →0/T← alternately sets the ON and OFF settings.

→0/T← [SET]

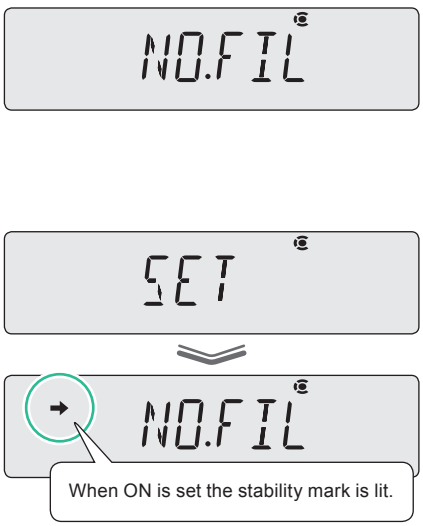


5 Set whether the non-averaged value is output as a continuous output value.

[MANU] → (g) [NOFIL]

Pressing →0/T← alternately sets the ON and OFF settings.

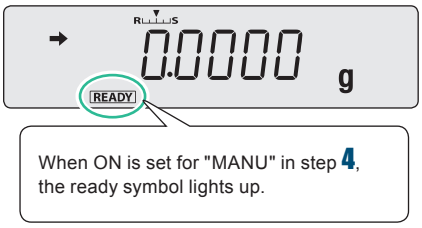
→0/T← [SET]



6 Return to the weighing mode.

or 3 sec.

When OFF is set for "MANU" in step **4**, continuous output starts.
Step **8** is not necessary in this case.



When ON is set for "MANU" in step **4**, the ready symbol lights up.

7 Place the container on the pan and press →0/T←

The balance will be tared.

8 Press (when ON is set for "MANU" in step **4**).

After **READY** (the ready symbol) has gone off, displayed weight readings are continuously output.

9 Place the sample in the container.

Displayed weight readings will be automatically output in the same timing as the display refresh cycle (approximately 100 msec intervals).

Pausing and restarting the continuous output function

To pause the function, press .
To restart it, press

When OFF is set for "MANU" in step **4**…

"MANU" is set to ON when is pressed and the continuous output function is temporarily stopped.

Operation of (the communication symbol)

During continuous output, it may appear as though (the communication symbol) is continuously lit.
Note also that if the transmission speed for data output is slow the display will be unstable and the response time of the balance will also be slow.

When connected to a printer…

For reasons linked to the performance of the printer, the data output interval will increase to longer than 100 msec.

Connecting External Equipment

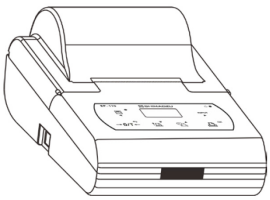
It is possible to output weight values, setting details and other data from printers, PLCs and other serial communication equipment, and to personal computers. This section explains useful functions for connecting and outputting data to these types of external equipment. The rear of the balance is equipped with various types of connectors that are compatible with the external equipment that is to be connected.

Connecting Printers

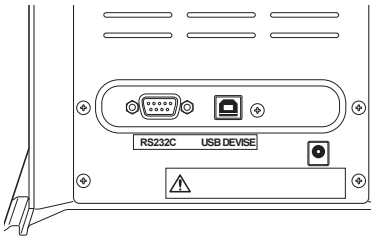
It is possible to connect the special EP-100/EP-110 printers for printing weight values, setting statuses and other data. Connect the printer to the balance in accordance with the following procedures.

1. Switch off the power to the balance and the printer
2. Firmly connect the cable (supplied with the printer) from the RS232C serial connector on the balance to the connector on the printer
3. Switch on the power to the balance
4. Switch on the power to the printer
5. Press  on the balance, and then check operations to make sure the measurement values are printed normally.

EP-100/EP-110 Printer



Special cable is provided



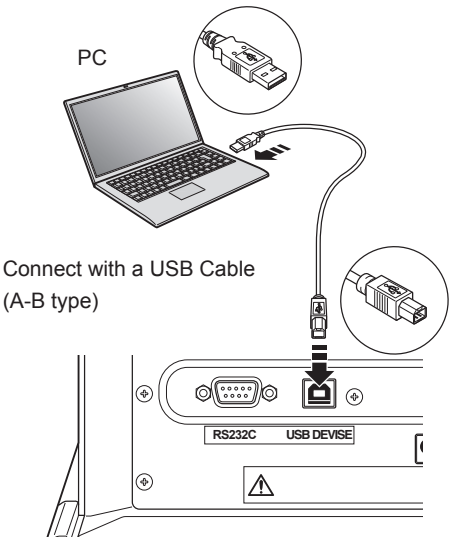
Rear of the balance

Points to Note

Switch off the power to the printer before switching off the balance. Refer to the printer's instruction manual for details on the printer.

Connecting Personal Computers

It is possible to output weight values, setting statuses and other data to personal computers in the same way as with printers with the use of USB cables(A-B type). USB cables are available as options (S321-71730-41 USB cable set). Connect personal computers to the balance in accordance with the following procedures.



Rear of the balance

1 Switch off the power to the balance.

2 Connect the USB cable between the USB connector on the PC and the [USB DEVICE] connector on the rear of the balance.

3 Switch on the power to the balance.

4 The USB driver will be automatically installed on the PC.

If the USB driver does not install correctly

There are cases in which the USB driver will not be installed correctly if the personal computer concerned is not connected to the Internet (not connected to a LAN).
In this event, download the following instruction manual and USB driver from the Internet, and perform the installation procedure once again.
USB Interface Installation Manual Download Page
https://www.an.shimadzu.co.jp/balance/products/moc63umanual.pdf
USB Driver Download Page
https://www.an.shimadzu.co.jp/balance/products/driver.htm

▽ Continued on next page

▽ Connecting External Equipment

5 Download the [Balance Keys] software for collecting data

(1) Log into a personal computer equipped with Internet access with administrator authority.
(2) Start up the browser, and access the following site.
https://www.an.shimadzu.co.jp/balance/products/balance_keys/index.htm
(3) Click on [Download] on the [Balance Keys Data Collection Software] page, and then download the file in accordance with the on-screen instructions.

[Balance Keys] data collection software

It is the [Balance Keys] software that enables numerals entered from keyboards with the use of the balance's serial communication function to be easily transferred to the position where the PC cursor lies. Data can be directly loaded as long as key input is possible, regardless of the application.

Points to Note

If communications are to be performed with communication software installed onto the personal computer, make sure the settings are made in accordance with the instructions for that software.

6 Decompress the downloaded [Balance Keys] file

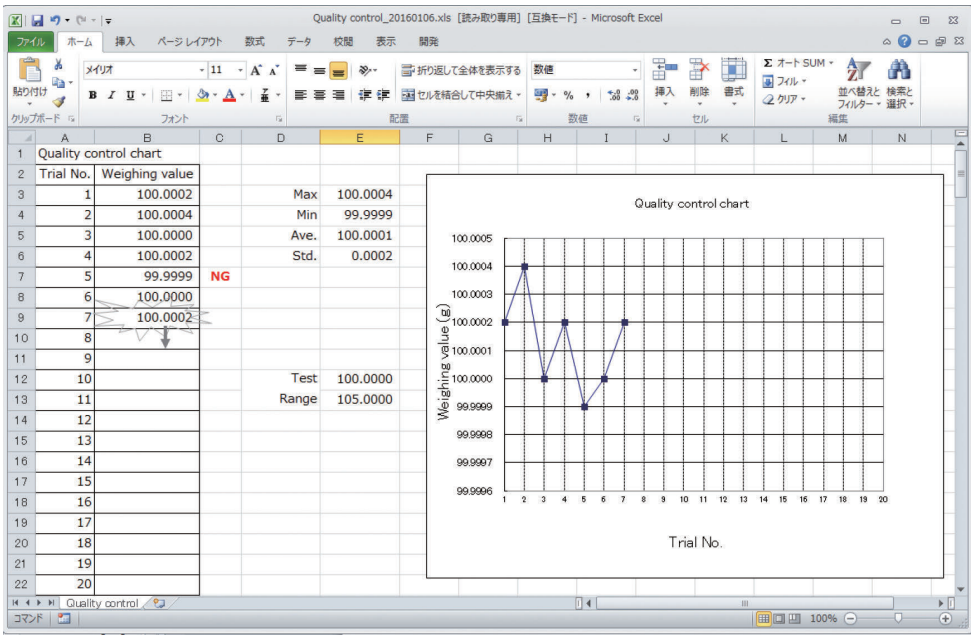
Right-click on the file downloaded in Step 5, and then click on [Open All] or [Decompress].

7 Set up [Balance Keys]

See the instruction manual for the [Balance Keys Data Collection Software] decompressed in Step 6 for details on set-up, start up the setup file (Setup.exe), follow the instructions displayed to set it up, and then set the [Balance Keys] parameters.

8 Confirming operations

Run an operation test while setting the parameters by pressing  on the balance and checking that the measurement values displayed are correct. If everything is normal, press the [TEST OK] button.
Next, start up [Excel] (or [Notepad] or a similar application) on the personal computer Key input will be enabled, and the cursor will be displayed at a location where input is possible. Press  on Balance, The values displayed on the balance will be transferred to the cursor position.



	A	B	C	D	E
1	Quality control chart				
2	Trial No.	Weighing value			
3	1	100.0002		Max	100.0004
4	2	100.0004		Min	99.9999
5	3	100.0000		Ave.	100.0001
6	4	100.0002		Std.	0.0002
7	5	99.9999	NG		
8	6	100.0000			
9	7	100.0002			
10	8				
11	9				
12	10			Test	100.0000
13	11			Range	105.0000
14	12				
15	13				
16	14				
17	15				
18	16				
19	17				
20	18				
21	19				
22	20				

Example of balance data loaded onto an Excel worksheet

Connecting PLCs and Other Serial Communications Equipment

It is possible to connect PLCs and other serial communication equipment to output weight values, perform taring and calibration with special commands, and read and write setting values. Connect the equipment to the balance in accordance with the following procedures in this event.

1 Switch off the power to the balance and other equipment.

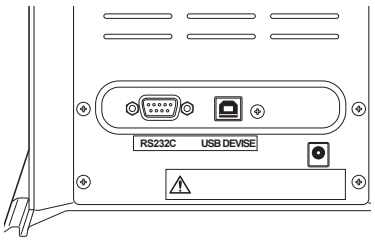
2 Firmly connect the [RS232C] connector on the rear of the balance to the communication connector on the equipment with the use of a special cable prepared by the user.

* See [Cable Connections (RS232C)] (P.120).

3 Switch on the power to the balance.

PLCs and other serial communication equipment

Cables to be prepared by the user



Rear of the balance

▽ Continued on next page

▽ Connecting External Equipment

4 Switch on the power to the equipment.

5 Align the Communication settings on the balance to the settings on the equipment.

Procedures for confirming operations for the serial communications equipment connected

There are many different types of communications specifications for serial communications equipment depending on the manufacturer and the equipment concerned. Read the instruction manual for the relevant equipment first of all, and then check operations in accordance with the following procedures.
(1) Check the cable connection, (2) Check that the communication conditions are in alignment,
(3) Establish communications procedures, (4) Check operations.

6 Either press  on the balance or send and receive a command from the equipment to check whether the weight value has been correctly input and output.

Cable Connections (RS232C)

Advanced equipment (D-sub9 pin) (Cross connection)

Advanced Equipment Specifications differ in accordance with the equipment			Balance D-sub9P plug (female) Connect to the RS232C connector	
RXD	2	———	3	TXD
TXD	3	———	2	RXD
DTR	4	———	6	DSR
SG	5	———	5	SG
DSR	6	———	4	DTR
RTS	7	⌋ ⌊	7	RTS
CTS	8		8	CTS

Data Format

The details of the data format when standard setting 1 (MODE.1) or data format 2 (DF.2) in the user settings has been selected in the communication settings (page 127) are given below.

◆ Standard format

The data format when outputting negative values (for example: –123.4567 g) is as shown below. The delimiter is a carriage return.

The data length varies depending on the accompanying information, the number of characters used to indicate units, the delimiter and so on.

Data length for this example: 12 bytes

	❶	❷								❸		❹
Position	1	2	3	4	5	6	7	8	9	10	11	12
ASCII code	2DH	31H	32H	33H	2EH	34H	35H	36H	37H	67H	20H	0DH
Data	-	1	2	3	.	4	5	6	7	g		C/R

No.	Position	Explanation
❶	Position 1 (sign)	If the value is positive " " (a space) is entered and if the value is negative "–" (a minus symbol) is entered.
❷	Positions 2 to 9 (absolute values)	If not all of the eight locations are used for a numerical value, a code representing a space is entered at the blank positions, as shown in the example.
❸	Positions 10 and 11 (units)	If the unit designation comprises one character, a code representing a space is entered at position 12. If the unit designation comprises three characters, a total of 14 characters is sent.
❹	Position 12 (delimiter)	This is a code that represents the delimiter.

▽ Continued on next page

▽ Connecting External Equipment

◆ When the data length is longer than the standard

When outputting data with stability information included

A code representing S or U is appended at the head of the data.
Accordingly, the data length is increased by one byte.

Position	1	2	3	4
ASCII code	53H	2DH	20H	31H
Data	S	-		1

When stable: S (53H)
When unstable: U (55H)

When the delimiter "C/R+L/F" is selected

Two bytes are required for the delimiter information.
One byte is added after position 12 in the standard format. Accordingly, the data length is increased by one byte.

Position	1	11	12	13
ASCII code	2DH	20H	0DH	0AH
Data	-		C/R	L/F

◆ When there is "OL" or "-OL" (overload) output

The data format when "OL" is included is shown below.

Data length for this example: 12 bytes

Position	1	2	3	4	5	6	7	8	9	10	11	12
ASCII code	20H	20H	20H	20H	20H	4FH	4CH	20H	20H	20H	20H	0DH
Data						O	L					C/R

When the information is "-OL" (minus overload), the entry at position 1 is changed from a space to "-" (a minus symbol, ASCII code 2DH).

Command Codes

◆ Commands whose final character is a numeral, a letter of the alphabet, or a symbol other than "="

Each command code is sent to the balance with a delimiter appended at the end

Example 1:

P R I N T (C / R)	This is the same as pressing 

◆ Commands whose final character is "="

Each command code is sent to the balance followed by numerals (sometimes including a decimal point) and with a delimiter appended at the end.

Example 2:

ID = 1 2 3 4 (C / R)	This sets "1234" as the balance ID.

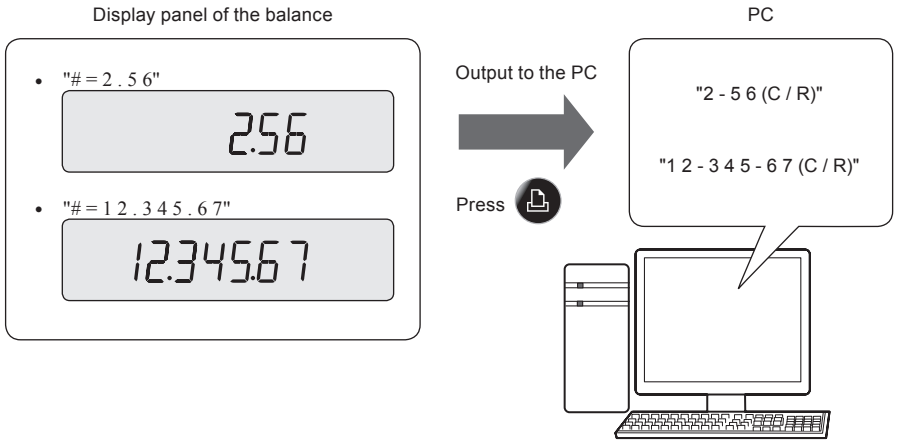
Example 3:

UW1 = 1 . 2 3 (C / R) (Example for models with two places after the decimal point)	This sets 1.23 g as the unit weight for piece counting 1.

Example 4:

UW1 = 0 . 0 0 (C / R) (Example for models with two places after the decimal point)	This clears the unit weight for piece counting 1.

Working from the PC connected to the balance, it is possible to instruct a weighing operation or to display a numerical value of your choice at the balance.



Output to the PC

In order to distinguish between instruction information from the PC and the balance's weight display data, "." is converted to "-" before output.

▽ Continued on next page

▽ Connecting External Equipment

◆ Echo-back commands

A character string comprising N characters following an echo-back command "{" or "}" and terminated by a delimiter is resent unchanged from the balance (provided unprocessed commands do not remain in the balance's receive buffer, and N ≤ 30).

Example 5:

A B C D E F G 1 2 3 4 5 (C / R)	After receiving this command, the balance outputs A B C D E F G 1 2 3 4 5 (C/R). When a printer is used in combination with the balance, this character string can be printed by the printer (printing of any required character string).

To print with the printer

Only use upper case letters of the alphabet, numerals and some symbols (including the decimal point and signs), and limit the string to within 15 characters.

◆ Command list

Data output

Command	Function
D01	Continuous output *1
D02	Continuous output at stability
D03	Continuous output with stability information
D05	Single output
D06	Auto print setting
D07	Single output with stability information
D08	Single output at stability
D09	Cancel output

*1 When handshake is OFF, output at a cycle around 100 msec.

Key operation

Command	Function
BREAK	Break key
Q	
CAL	Calibration key
TARE	Zero setting / taring key
T	
PRINT	Output key

Acceptance of commands

Depending on the status of the balance, even though a command is output it may not be accepted, with the display of "COM ERR".
If "COM ERR" is displayed, try lowering the communication setting baud rate.

Application weighing

Command	Function	
R	Cancels application weighing mode setting	
Piece counting		
PCS☐	Sets the piece counting (PCS) mode	☐: 1 to 5 mode numbers
UW☐ = XX.XXXX	Sets the unit weight	XX.XXXX : Setting value
UW☐	Reads the unit weight	
UB☐ = XXX	Sets the reference number of pieces	XXX : Reference number of pieces value
UB☐	Reads the reference number of pieces	
RECAL	Recalculates the unit weight	
Percentage weighing		
G	Switches between percentage (%) and gram units	
%	Sets the percentage weighing mode	
Formulation		
M	Sets the formulation mode	

Other functions

Command	Function	
Comparator		
TRGT	Establishes the target mode	
TARGET = XX.XXXX	Sets the target in the target mode	XX.XXXX: Setting value
LIMIT = XX.XXXX	Sets the target range in the target mode	
CHKW	Establishes the checkweighing mode	
OVR.RNG = XX.XXXX	Sets the checkweighing range upper limit value in the checkweighing mode	XX.XXXX: Setting value
UND.RNG = XX.XXXX	Sets the checkweighing range lower limit value in the checkweighing mode	
HI.LIM = XX.XXXX	Sets the pass range upper limit value in the checkweighing mode	
LO.LIM = XX.XXXX	Sets the pass range lower limit value in the checkweighing mode	
GO	Reads the results [Response command] HL (above "too heavy" range) HI (too heavy) OK (appropriate weight, pass) LO (too light) LL (below "too light" range)	

System-related commands

Command	Function	
ID = XXXX	Sets the balance ID	XXXX: Setting value
ID	Reads the balance ID	
STATE	Outputs the setting details	

▽ Continued on next page

▽ Connecting External Equipment

Commands relating to calibration

Command	Function	
ECAL	Starts external calibration	
ECAL.W = XXX.XXXX	Sets the reference weight value (W ref) for calibration	XXX.XXXX: Setting value
ICAL	Executes calibration with the internal weight	

Commands relating to zero / taring

Command	Function	
ZRNG = X.XXXX *1	Sets the zero range	X.XXXX: Setting value

Commands relating to unit registration

Command	Function
g	Sets gram units
mg	Sets milligram units (only accepted by models capable of displaying 0.001 g)
ct	Sets carat units
mom*1	Sets momme units

Other companies' commands

Command	Function
TI	Immediate taring (Mettler)
S	Single output at stability (Mettler)
SI*1	Immediate single output (Mettler)
SIR*1	Continuous output (Mettler)
SR*1	Continuous output at stability (Mettler)
(ESC) P	Immediate single output (Sartorius) ESC = &H1B
(ESC) T	Immediate taring (Sartorius) ESC = &H1B

Others

Command	Function	
"_" (space)	Buffer clear command	
# = XXXXXXX	Enters and displays a numerical value	XXXXXXX : Numerical value
{□□ ...	Echo-back mode	□□ ...: Character string

*1 Not applicable to a verified balance as a legal measuring instrument.

Communication Settings

This section explains the menu settings that determine the communication specifications when the balance is connected to a PC, printer, or other device.

For information on the WindowsDirect communication function, see "WindowsDirect Communication Function" (☞ page 116).

The settings made here are effective simultaneously for RS-232C ports. If you are connecting the printer to the connector, set the communication specifications of the balance to "MODE1".

The default setting is "MODE1".

Apart from this default setting, another five modes comprising frequently used combinations of communication settings are provided.

Selecting one of the settings from "MODE1" to "MODE5" allows you to set all of the following items at once: baud rate (communication speed), parity (bit length), stop bit, handshake, data format, delimiter.

☞ "Standard Settings (MODE)", page 128

The user can set each item according to requirements.

☞ "User-Specified Settings", page 128

	Standard Settings 1	Standard Settings 2	Standard Settings 3	Standard Settings 4	Standard Settings 5	User-Specified Settings
Display with user-specified settings	MODE.1	MODE.2	MODE.3	MODE.4	MODE.5	MODE.U
Relevant manufacturer	Shimadzu (standard)	Shimadzu (responses given*)	Mettler	Sartorius	A&D	–
Baud rate (communication speed)	1200	1200	2400	1200	2400	Any required setting
Parity (bit length)	None (8)	None (8)	Even (7)	Odd (7)	Even (7)	Any required setting
Stop bit	1	1	2	2	2	Any required setting
Handshake	OFF	Hardware	OFF	Hardware	OFF	Any required setting
Data format	Shimadzu standard	Shimadzu standard	Mettler standard	Sartorius standard	A&D standard	Any required setting
Delimiter	C/R	C/R	C/R+L/F	C/R+L/F	C/R+L/F	Any required setting

* The balance can return responses to commands from a PC.
When a command is received normally, OK (C/R) is returned and when a command is received abnormally, NG (C/R) is returned.

▽ Continued on next page

▽ Communication Settings

Standard Settings (MODE)

Make a selection from the setting combinations "MODE1" to "MODE5".

1 Press 

for about 3 seconds in the weighing mode.

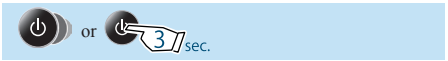
This opens the output menu.

2 Select communication setting.

(Select the mode.) → →0/T← [SET]

- When "MODE2" is selected

3 Return to the weighing mode.



User-Specified Settings

In this setting each of the communication settings can be set according to the user's requirements.

1 Press 

for about 3 seconds in the weighing mode.

This opens the output menu.

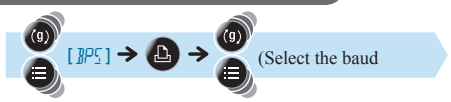
2 Select user-specified setting.

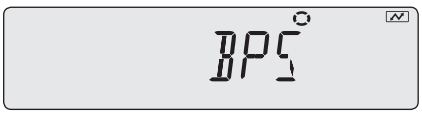
→0/T← [SET]

3 Make the communication settings according to your own requirements.

Set the following items as necessary.

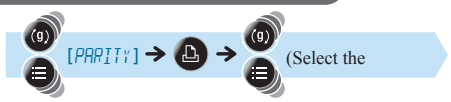
Setting the baud rate (communication speed)





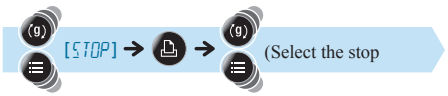
Indication	B.300	B.600	B.1200	B.2400	B.4800	B.9600	B.19.2K	B.38.4K
Baud rate	300 bps	600 bps	1200 bps	2400 bps	4800 bps	9600 bps	19.2k bps	38.4k bps

Setting the parity (bit length)



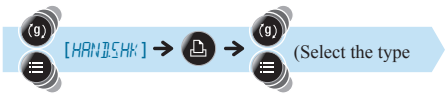
Indication	P.NONE	P.ODD	P.EVEN
Parity (bit length)	No parity, 8-bit length	Odd parity, 7-bit length	Even parity, 7-bit length

Setting the stop bit



Indication	S. 1	S. 2
Stop bit	Stop bit = 1 bit	Stop bit = 2 bits

Setting the handshake

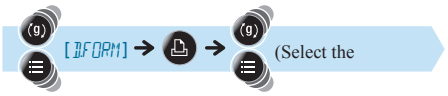


Indication	HS.OFF	HS.HW	HS.SW	HS.TIM
Handshake	No handshake	Hardware handshake	Software handshake	Timer handshake

▽ Continued on next page

▽ Communication Settings

Setting the data format



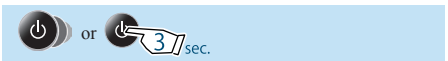
Indication	FORM1	FORM 2	FORM 3	FORM 4	FREE
Data format	Data format 1	Data format 2	Data format 3	Data format 4	Free format
	This is Shimadzu's standard format. Normally, make this setting.	This is an expansion of the data format 1 function.	This is the same format as used by Mettler balances.S	This is the same format as used by Sartorius balances.	This is a format that allows the leading bytes and number of send data to be set freely. The leading bytes can be set in the range 1 to 17 and the number of send data can be set in the range 8 to 23.

Setting a delimiter

Delimiter: A symbol used to partition individual data items and individual commands

Indication	CR	LF	CR+LF	COMMA
Delimiter	CR	LF	CR+LF	Comma

4 Return to the weighing mode.



Output Timing Change Function

Data can be set to output without waiting for detection of stability (immediate output), or to output only after detecting stability (output after stability), when is pressed.

Not applicable to a verified balance as a legal measuring instrument.

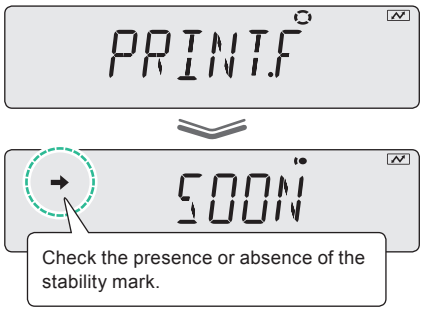
1 Press for about 3 seconds in the weighing mode.

This opens the output menu.

2 Select the output timing change function.

[APLPRN] → → [PRINTF]

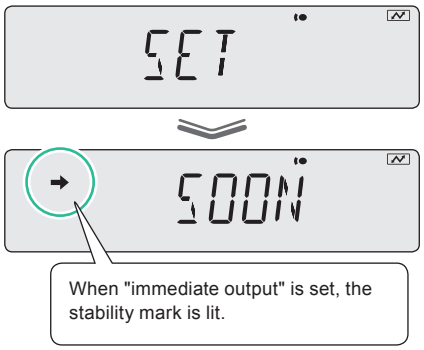
Stability Mark	Output Timing Change Function
Lit	When "immediate output" is set
Unlit	When "output after stability" is set



3 Change the setting.

Pressing →0/T← alternately selects "immediate output" and "output after stability".

→0/T← [SET]



4 Return to the weighing mode.

or

11 MAINTENANCE

Maintaining the Balance

⚠Caution

Instructions

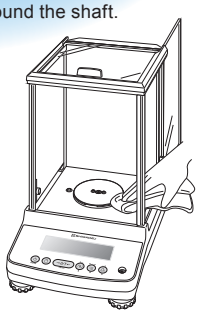
Before starting maintenance on the balance, disconnect the AC adapter from the power outlet.

If you carry out maintenance with the AC adapter left plugged into the power outlet, you may sustain an electric shock.

Main body

Wipe over with a soft cloth moistened with a little neutral detergent and well wrung out.

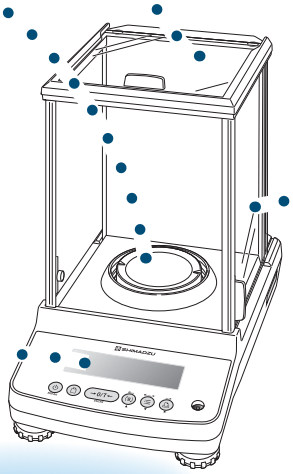
When cleaning the inside of the balance, be sure to remove the pan, pan supporter and pan rings. Take care not to touch the shaft and not to allow dusts come inside from holes around the shaft.



Pan

When cleaning the pan, be sure remove it from the body.

The pan can be washed with water. In that case, dry it thoroughly before fitting it back on the balance.



Glass door

The door can be removed and the door rails can be wiped over or replaced.

For details on how to remove the door, see "Removing the Glass Door" (☞ page 133).

Display

Avoid using organic solvents, chemical agents or cloths impregnated with chemicals since they will damage the coating of the balance and the display panel.

If the balance is used in an environment where it gets dirty easily, use the protective in-use cover available.

Removing the Glass Door

The glass door of the ATX-R/ATY-R series of balances can be removed to clean the door rails.

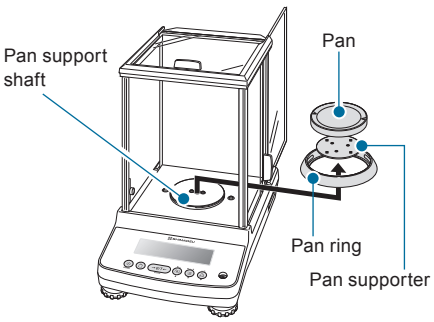
⚠Caution

Instructions

Handle the glass door with due care.

- Take care when handling the glass door so as not to crack it.
- Take care not to injure your hands on the door rail.
- Exercise due care when handling broken glass.

1 Remove the pan ring, the pan and pan supporter.



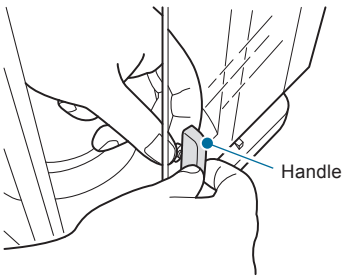
2 Turn the knob on the inner side of the handle to remove the handle.

⚠Caution

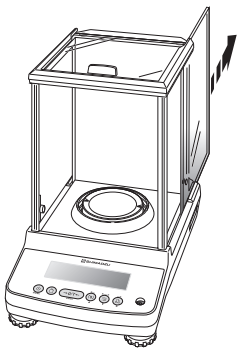
Prohibitions

Do not touch the pan support shaft.

This could damage the balance.



3 Pull the glass door out from the rear.



4 Install the glass door with steps in the reverse order when it is removed.

⚠Caution

Instructions

When fitting the glass door, be sure to fit the knob.

If you forget to fit the knob the glass door could fall off.

Inspection

Since the balance may develop error due to its application and environment of use, it must undergo both daily and periodic inspections in order to properly maintain its required performance and functions.

However, since the management standards governing the content of these inspections (methods, judgment criteria, etc.) will differ depending on the purpose of use, management goals, they must be determined by the customer.

If the content of the inspections is made too lax, the risk that you will continue to use the balance without discovering an abnormality increases, but if it is excessively strict it may reduce working efficiency, so you should take the care to devise balanced inspection content, considering the risks, the performance that is required in the work to be done.

This section indicates the guidelines for daily inspections and periodic inspections.

Please use these guidelines for reference when deciding the practical details of your own inspections.

Daily Inspections

Daily inspections are inspections performed on a daily basis (for example before starting work) by the person who actually uses (or manages) the balance.
The points inspected in daily inspections can, if you like, be reduced to the minimum necessary.

Here are some examples for your reference.

	Daily Inspection [Reference Example 1]	Daily Inspection [Reference Example 2]
Frequency of inspection	Once per day	Once to several times per day (as required)
Inspection timing	Before the start of work	Before the start of work and when performing important weighing operations
Method of inspection	Observe the instrumental error at a single point. Set the "observation point" as a point a little above the upper limit value of the range in which the balance is actually used to weigh.	Observe the instrumental error at a single point. As the point to be observed before the start of work, set a point a little above the upper limit value of the range in which it is possible that actual measurements will be made.
Criterion of judgment	To be accurate to within ±5 at one decimal place to the right of the digit where accuracy is required when actually weighing with the balance.	To be accurate to within ±5 at one decimal place to the right of the digit where accuracy is required when actually weighing with the balance.

What is instrumental error?

This is the amount of the discrepancy between the value indicated by the balance and the correct value.

It is assessed as the difference between the weight reading when a weight that corresponds to the observation point is weighed on the balance and the actual weight value of that weight.

For details on weights, see "About Weights" (☞ page 136).

Periodic Inspections

Periodic inspections are inspections that are performed periodically (for example once a year). The content of periodic inspections must cover all aspects including performance and functions.

An overview is given below.

	Overview of Periodic Inspection [Reference Example]
Frequency of inspection	Once a year
Inspection timing	Any day during the established month
Method of inspection	Check for abnormalities in the following functions and external appearance. • Display panel • Menu operation keys / operation keys • Pan • Level Check the following aspects of performance. • Repeatability: Weigh a weight that corresponds to approximately half of the weighing capacity of the balance five to ten times and assess the dispersion in the weight readings obtained. • Eccentric error: Assess the difference in the weight readings obtained when a weight corresponding to one fourth to one third of the weighing capacity of the balance is placed in the center of the pan and at a position shifted from the center by a specified distance. • Instrumental error: Decide on three to five observation points and assess the difference between the values obtained when weights corresponding to these points are weighed on the balance and the actual weight values of the weights.
Criterion of judgment	To be accurate to within ±5 at one decimal place to the right of the digit where accuracy is required when actually weighing with the balance.

For details on weights, see "About Weights" (☞ page 136).

About Weights

In order to establish and maintain the performance of the balance, weights must be used to accurately adjust the balance's scale, and to check its adjustment.

With the ATX-R/ATY-R series balances, weights are used when performing a part of calibration (☞ page 50) and inspections (☞ page 134) in the environment in which the balance is actually used. The weights should be prepared in advance and managed properly.

Types of Weight and Their Selection

There are many types of weights.

Select the appropriate weights for the specifications of your balance by referring to the following table.

◆ Selecting the class of weight

As the main form of classification, weights are normally divided into classes according to their degree of accuracy.

Select the most appropriate class of weights to be used for calibration and inspection of the balance, based on the type of the balance.

The table below shows the classes of weight and the applicable balances.

Select weights whose Class of Weight is E2.

Class of Weight	Applicable Type of Balance		
	Minimum Indication	Resolution*	Common Name
E2	Less than 1 mg	Around 1/1,000,000 or better	Analytical balances
F1	1 mg or greater	Around 1/100,000 or better	Toploading balances
F2	1 mg or greater	Around 1/100,000 or lower	Toploading balances
M1	10 mg or greater	Around 1/10,000 or better	Scales, etc.

* "Resolution" means: minimum indication / weighing capacity

◆ Selecting the calibration weights to be used

Now you must select the "indicated weight" of the weight to be used (how many grams it should be).
The weights of weights are set with the smallest at 1 mg and progressing in the sequence 1 mg, 2 mg, 5 mg, ... as shown below.

1 mg, 2 mg, 5 mg, 10 mg ... 1 g, 2 g, 5 g, 10 g, 20 g, 50 g, 100 g ...

When selecting a weight to be used for calibrating a balance, you are recommended to select one that is close to the weighing capacity of the balance.
The table below shows the recommended calibration weights to be used for balances with different weighing capacities.

Weighing Capacity of Balance	Recommended Weight of Weight for Calibration
62 g	60 g (50g +10g)
82 g	80 g (50g + 20g +10g)
120 g	100 g
220 g	200 g
320 g	300 g (200 g + 100 g)

For information on the range of weights that can be used to calibrate balances (i.e. values that can be entered as the weight value) see "Calibration range with external weights" (☞ page 146) in "Specifications".
It is also possible to calibrate a balance with a weight that is not close to the weighing capacity of the balance.
However, if you do this, when weighing in the range that exceeds the weight value that was used for calibration, the performance may deteriorate proportionately (the instrumental error may become larger).

12 TROUBLESHOOTING

What to Do If....

Symptom	Probable Cause(s)	Countermeasure	See:
Nothing is displayed on the display panel.	● The power cable is disconnected. ● The main switch on the distribution panel is off. ● The power supply voltage is wrong.	● Check the power supply and voltage and make the connections correctly.	Page 146
The display doesn't change when a sample (item to be weighed) is placed on the pan.	● The pan has been displaced.	● Set the pan correctly on the balance.	Page 27
The display fluctuates and ➡ (the stability mark) does not appear readily.	● The balance has been installed in an unstable environment.	● Eliminate the effects of vibration and air movement. ● Install the balance on a robust platform.	Page 26
	● Check if the object for weighing sticks out of the pan.	● Place the object so it does not sticks out too much of the pan.	—
	● Check if anything other than the object for weighing touches the pan.	● Avoid anything other than the object for weighing touches the pan.	—
	● The glass door of the windbreak is open.	● Close all the glass doors before reading the display.	—
The weighing result is not accurate.	● Span calibration has not been performed.	● Perform span calibration.	Page 52
	● Is the display at zero before weighing?	● Press →0/T← to set the display at zero before weighing.	Page 34
The units that you want to use are not displayed.	● The units that you want to use have not been set.	● Ser the units that you want to use for (g)	Page 78
Menu operations are not possible.	● Menu operation is locked.	● Release the menu lock.	Page 48
Calibration (I.GAL) by using internal weight takes longer than usual.	● If END is displayed after waiting for a while, it does not mean any abnormalities; use as usual.		Page 52

Responding to Messages

Message Display	Probable Cause(s)	Countermeasure	See:
ERR H (Hardware error)	● There is a fault in the hardware, such as the temperature sensor or internal weight mechanism (TW series only). ● There is an error in the internal system data.	● Disconnect the AC adaptor and turn the power back ON. If the same message is still displayed, contact your Shimadzu representative.	Page 29
ERR C (Span calibration error)	● The balance has a large drift of the zero point or sensitivity. ● A container is placed on the pan. ● The pan is displaced. ● The wrong weight has been placed on the pan.	● Press ⏻ to return to the weighing mode. Execute span calibration again in an appropriate condition.	Page 53
CAL D	● Display is very instable.	● Press ⏻ to return to the weighing mode and execute calibration again when there is no wind or vibration. If CAL D is still displayed, contact your Shimadzu representative.	Page 50
ERR N (Numerical value entry error)	● Either a mistake has been made when entering the value or the value is not appropriate.	● After the error is displayed, the balance returns to the status immediately before the error occurred. Enter the correct numerical value.	Page 45
ERR W (Operation error)	● The operation used is wrong.	● After the error is displayed, the balance returns to the status immediately before the error occurred. At this point, follow the correct operation.	—
COM ERR (External input error)	● An unrecognizable command code has been received.	● After the error is displayed, the balance returns to the status immediately before the error occurred. At this point, set the correct command code.	Page 124
- OL	● Either the pan or the pan supporter is displaced.	● Set the pan or pan supporter correctly on the balance.	Page 27
OL (overload)	● The weighing capacity has been exceeded.	● Use the balance within its weighing capacity.	Page 146
ABORT (Operation aborted)	● The calibration or standard value setting operation has been aborted.	● After this is displayed, the balance returns to the operable state.	—
WAIT (Waiting for permission for the operation)	● This message is displayed in order to avoid unnecessary key operations.	● After this is displayed, the balance returns to the operable state.	—
BUSY (Load detected)	● There was something placed on the pan when calibration was started.	● Take the item off the pan. The message will be cleared automatically and you will be able to continue calibration.	Page 52
PLS.CAL (Load detected)	● There was something placed on the pan when PSC was started.	● Execute span calibration with nothing on the pan.	Page 56

Turning the Power ON and OFF

Auto Power-Off Function

When the auto power-off function is turned on, the liquid crystal display will go fully off automatically (to the standby mode) when the stability mark is continually displayed during the set time.

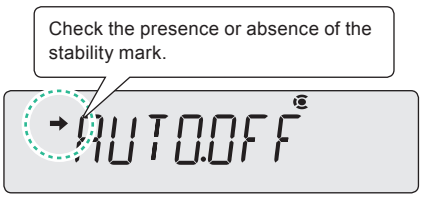
1 Press ☰ twice in the weighing mode.

This opens the main menu.

2 Select the auto power-OFF function.

(g) [TOOLS] → 🖶 → (g) [SYSTEM] →

🖶 → (g) [AUTOOFF]



What is the current situation? / What do you want to do?

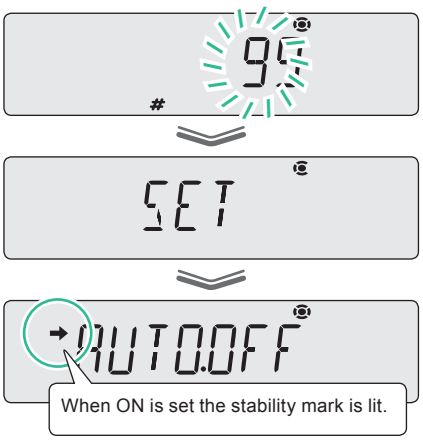
Stability Mark	Auto Power-Off Function	To Set / Update	To Cancel
Lit	ON	Press 🖶 and go to step **3**.	Press →0/T← and go to step **4**.
Unlit	OFF	Press →0/T← and go to step **3**.	Go to step **4**.

3 Enter the time (in minutes).

(Enter the time (in minutes).) → →0/T← [SET]

"Entering Numerical Values", page 45

> Setting time for auto power-off function
>
> The upper limit time which can be set for the auto power-off function is 99 minutes.



4 Return to the weighing mode.

⏻ or ⏻ 3 sec.

Setting the Startup Display

Select the startup display from one of the three following types.

Weighing mode	After the power is turned on, the balance proceeds automatically to the weighing mode.
OFF display	After the power is turned on, the balance stops with the "OFF display". When any of the keys is pressed during the OFF display the balance automatically proceeds to the all segments lit display and then to he weighing mode.
All segments lit	After the power is turned on, the balance stops with the "OFF display". When any of the keys is pressed during the OFF display, the balance stops with all display segments lit. Pressing →0/T← while all segments are lit takes you to the weighing mode.

1 Press ☰ twice in the weighing mode.

This opens the main menu.

2 Select setting of the startup display.

[TOOLS] → 🖒 → [SYSTEM] →

🖒 → [START]

3 Select the type of startup display.

🖒 → (Select the type of start display.) →

→0/T← [SET]

➡ (the stability mark) lights up for the set start display.

- Weighing mode

- OFF display

- All segments lit

4 Return to the weighing mode.

⏻ or ⏻ 3 sec.

The startup display is now set.

Changing the Password

To execute menu reset (page 47), to set or cancel menu lock (page 48), or to execute calibration of the internal weight (page 58), you have to input a password.

"9999" is set as the default password, but this can be changed by following the procedure below.

1 Press ☰ twice in the weighing mode.

This opens the main menu.

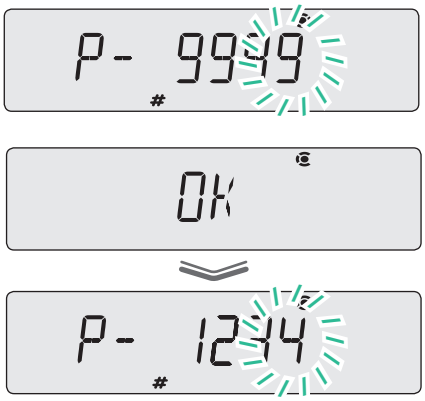
2 Select the password.

(g) ☰ [TOOLS] → 🖶 → (g) ☰ [SYSTEM] →

🖶 → (g) ☰ [PASSWRD]

3 Enter the current password.

→0/T← (Enter the current password.)



4 Enter the new password.

→0/T← [OK] (Enter the current password.)

"Entering Numerical Values", page 45

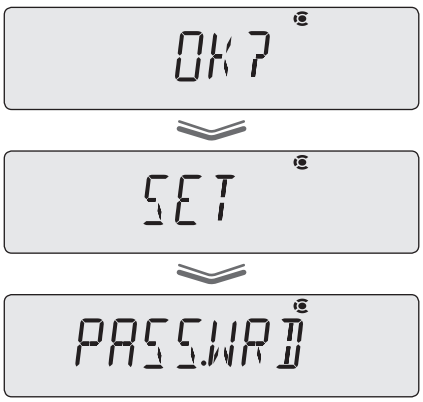
5 Confirm.

→0/T← [OK?]

To cancel at this point, press ⏻. The balance will return to the status after step **2**, without setting the value entered in step **3**.

To confirm the password, proceed as follows.

→0/T← [SET] → [PASSWRD]



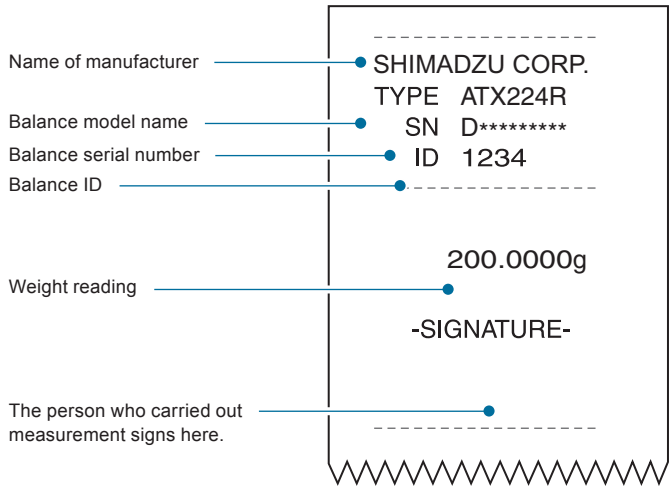
6 Return to the weighing mode.

⏻ or ⏻ 3 sec.

GLP Output Function

On turning the GLP output function ON, you can add the balance ID and other information to the calibration record (page 61) and weight reading outputs. However, the statistic calculation function of the printer cannot be used.

Example printout from printer
(When the GLP output function is set to ON)

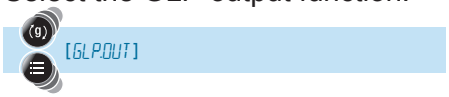


Setting the GLP Output Function

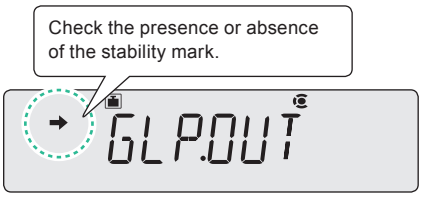
1 Press  for about 3 seconds.

This opens the calibration menu.

2 Select the GLP output function.



Check the presence or absence of the stability mark.



Stability Mark	GLP Output Function
Lit	ON
Unlit	OFF

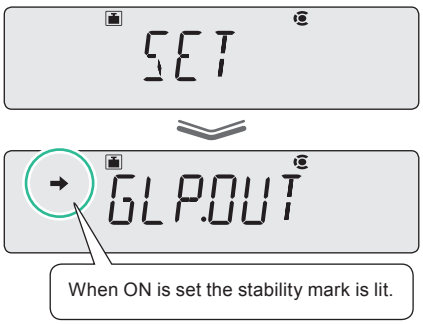
▽ Continued on next page

▽ GLP Output Function

3 Change the setting.

Pressing →0/T← alternately sets the ON and OFF settings.

→0/T← [SET]



4 Return to the weighing mode.

or 3 sec.

On setting the GLP output function to ON and outputting weight readings…

A long time is required to output one weight reading.
In addition, depending on conditions, data may not be printed correctly at the printer. See the setting conditions below.

Handshake Settings in the Communication Settings (☞ page 129)	Rough Time Required for Output of One Weight Reading		
	Printer Only	PC Only	Both Printer and PC used
OFF	Approx. 10 sec.	Approx. 3 sec.	Approx. 10 sec.
SW (software)	Approx. 10 sec.	Approx. 3 sec.	Approx. 10 sec.
HW (hardware)	Approx. 10 sec.	Correct printing is not possible	Approx. 10 sec.
TIM (timer)	Approx. 35 sec.	Approx. 35 sec.	Approx. 60 sec.

On setting the GLP output function to ON and using the command code "D01 (continuous output)"…

No items other than weight readings are output.

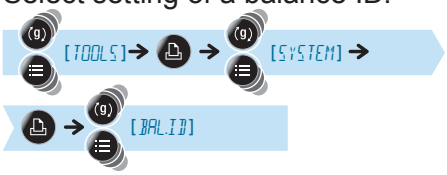
Setting a Balance ID

When managing multiple balances, by setting a four-digit management number (ID) and turning the GLP output function ON, you can add the balance ID to calibration records (page 61) and weight reading outputs.

1 Press ☰ twice in the weighing mode.

This opens the main menu.

2 Select setting of a balance ID.

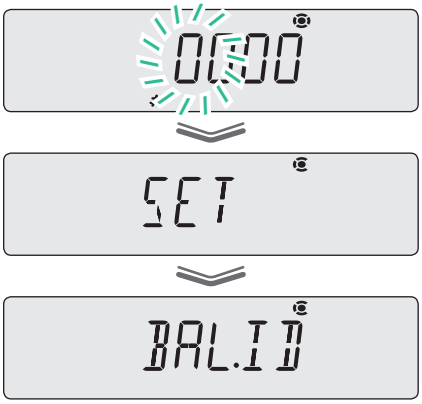


3 Enter the required numerals (max. 4 digits).

→0/T← (Enter the ID.) → →0/T← [SET]

"Entering Numerical Values", page 45

The default ID is "0000".



4 Return to the weighing mode.

⏻ or ⏻ 3 sec.

Specifications

ATX-R/ATY-R Series

Model Name	ATX324R	ATX224R	ATX124R	ATX84R	ATY324R	ATY224R	ATY124R	ATY64R
Weighing capacity	320 g	220 g	120 g	82 g	320 g	220 g	120 g	62 g
Minimum indication	0.1 mg	0.1 mg	0.1 mg	0.1 mg	0.1 mg	0.1 mg	0.1 mg	0.1 mg
Range of external weights for calibration	95 - 320 g	95 - 220 g	45 - 120 g	45 - 82 g	95 - 320 g	95 - 220 g	45 - 120 g	45 - 62 g
Repeatability (standard deviation)	≤ 0.15 mg	≤ 0.1 mg			≤ 0.15 mg	≤ 0.1 mg		
Linearity	± 0.3 mg	± 0.2 mg			± 0.3 mg	± 0.2 mg		
Response time *1	Approx. 3.0 seconds							
Operating temperature and humidity limits	5 - 40 °C 20~85% *2							
Temperature coefficient for sensitivity (10 - 30 °C)	± 2 ppm/°C							
Pan size (mm)	Approx. ϕ 91 *3							
Main body dimensions (mm)	Approx. 213 (W) × 356 (D) × 338 (H)							
Main body weight	ATX-R: approx. 6.2 kg ATY-R: approx. 6.0 kg							
Display	LCD							
Rated electric power supply	DC 12 V, 1 A							
Pollution Degree	2							
Overvoltage Category	Category II							
Installation Site	device may only used indoors							
AC adapter (primary)	AC 100- 240 V, 320 mA 50/60 Hz *4							
I/O terminal	RS232C(D-Sub 9P plug), USB device (Type B)							

*1 The response time is a representative value.

*2 No condensation

*3 The size of the pan is the dimension of outer diameter.

*4 May differ depending on the AC adapter.

* The part numbers, specifications, etc. indicated here are subject to change without notice. Refer to our company website (https://www.shimadzu.com/an/balance/index.html) for the latest information.

Maintenance Parts

ATX-R/ATY-R Series

◆ Maintenance parts list

Item name	Part Number (P/N)	Remarks
Pan	S321-71052	
Pan supporter	S321-71284	With 4 rubber parts
Pan ring	S321-71053-01	
AC adaptor		Contact your distributor
Horizontal adjustment stands	S321-71069-01	
Glass door left ASSY	S321-71043-01	
Glass door right ASSY	S321-71043-02	
Glass door upper ASSY	S321-71041	
Front glass	S321-62931-01	
Knobs for glass doors	S321-62787-01	
Set of 4 rubber parts for pan supporters	S321-62984-02	
Instruction Manual	S321-78327	This Book

▽ Continued on next page

▽ Maintenance Parts

◆ OptionalList of special accessories (option)

Item name	Part Number (P/N)	Remarks
Printer EP-100	S321-73900-11	
Printer EP-110	S321-73900-12	
Printer EP-100 for Europe	S321-80019-11	
Printer EP-110 for Europe	S321-80019-12	
Printer EP-110 for Europe	S321-80019-21	Please use this model for legal measuring in Europe.
Protective Cover (5 pcs.)	S321-71026	
STABLO-AP	S321-73700-02	Ionizer
USB Cable set	S321-71730-41	USB Cable (A-B type)
Specific Gravity measurement Kit SMK-501	S321-60550-02	

List of Functions That Can Be Used in Combination

A correspondence table for application functions, comparator functions and output functions is shown below. It shows whether functions can be used in combination with each other or not.

		Application Function Mode				Comparator		Output Functions			
		Piece Counting	Percentage Weighing	Specific gravity measurement	Formulation	Target Mode	Checkweighing Mode	Continuous Output	Auto Print	Output Timing Change Function	GLP output function
Application Function Mode	Piece Counting		×	×	×	○	○	△	○	○	○
	Percentage Weighing	×		×	×	○	○	△	○	○	○
	Specific gravity measurement	×	×		×	○	○	×	×	○	○
	Formulation	×	×	×		○	○	×	×	×	○
Comparator	Target Mode	○	○	○	○		×	○	○	○	○
	Checkweighing Mode	○	○	○	○	×		○	○	○	○
Output Functions	Continuous Output	△	△	×	×	○	○		×	×	*
	Auto Print	○	○	×	×	○	○	×		×	○
	Output Timing Change Function	○	○	○	×	○	○	×	×		○
	GLP output function	○	○	○	○	○	○	*	○	○	
See:		Page 82	Page 87	Page 91	Page 102	Page 107	Page 109	Page 113	Page 111	Page 131	Page 143

○ : Can be used in combination

△ : Can be used in combination while the weight value is displayed

× : Cannot be used in combination

* : Weight readings are output, but no other information is output.

Menu Map

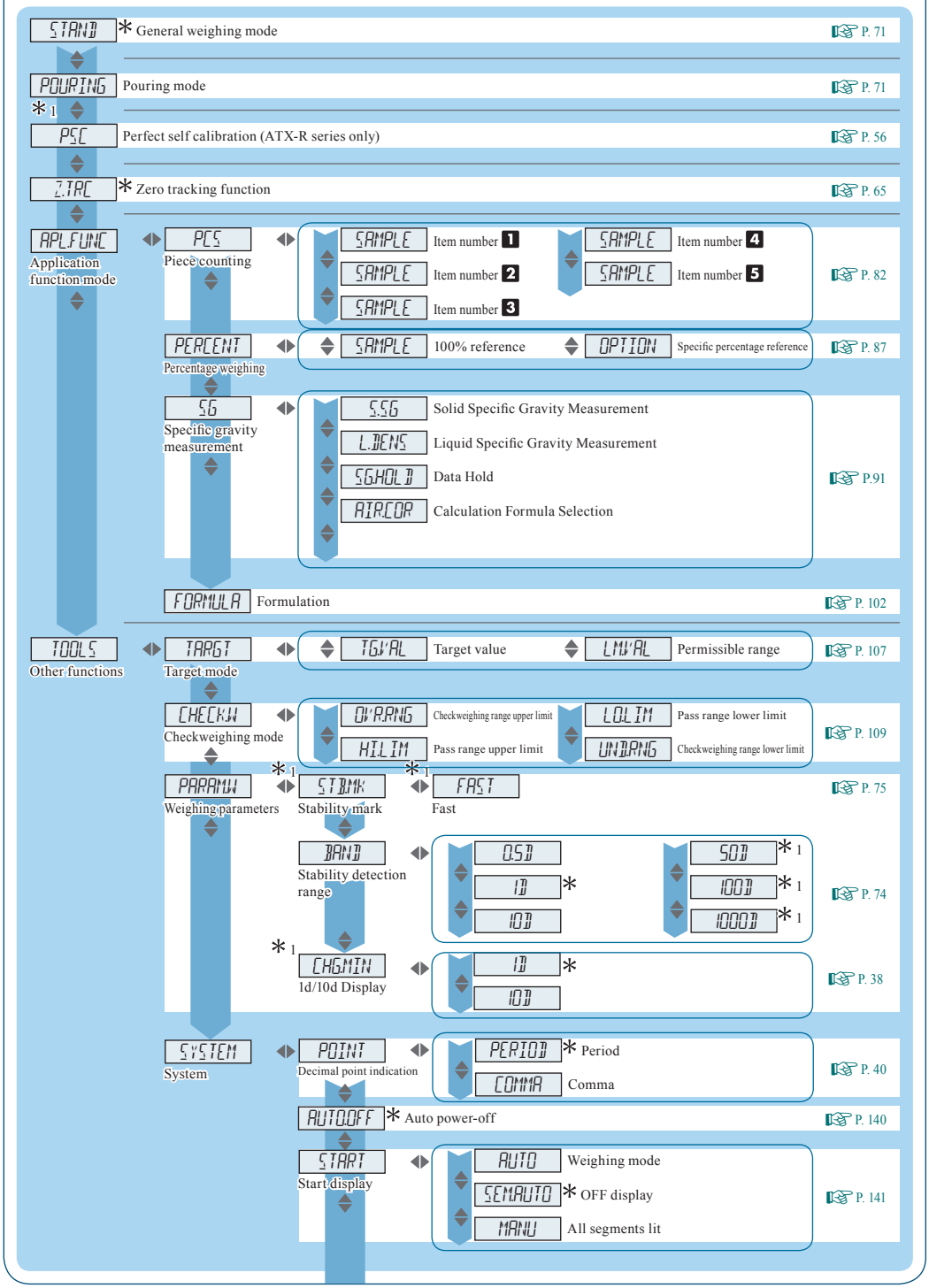
The menu map represents the organization of the menu options graphically to make it easy to understand.
It is useful for quickly accessing the menu option you want to use.
For details on the organization of the menu settings and the method of operation of the menu, see "3. MENU SETTINGS" (☞ page 42).

Reading the Menu Map

Conventions Used in the Menu Map	Explanation of Operation
▲▼	Press (g) or ☰ to search for the menu option.
▶	Press 🖨 to proceed to the next menu option.
	Press →0/T← to confirm.
◀	Press ⏻ to return to the previous menu option.
☞	Refers to a page in the instruction manual.
*	The default settings (settings when the menu is reset)

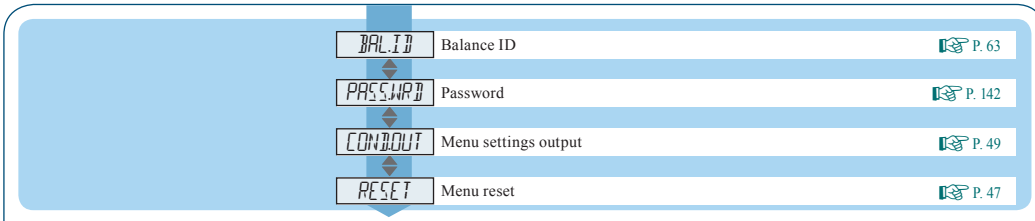
Main Menu

Press ☰ twice in the weighing mode.



▽ Continued on next page

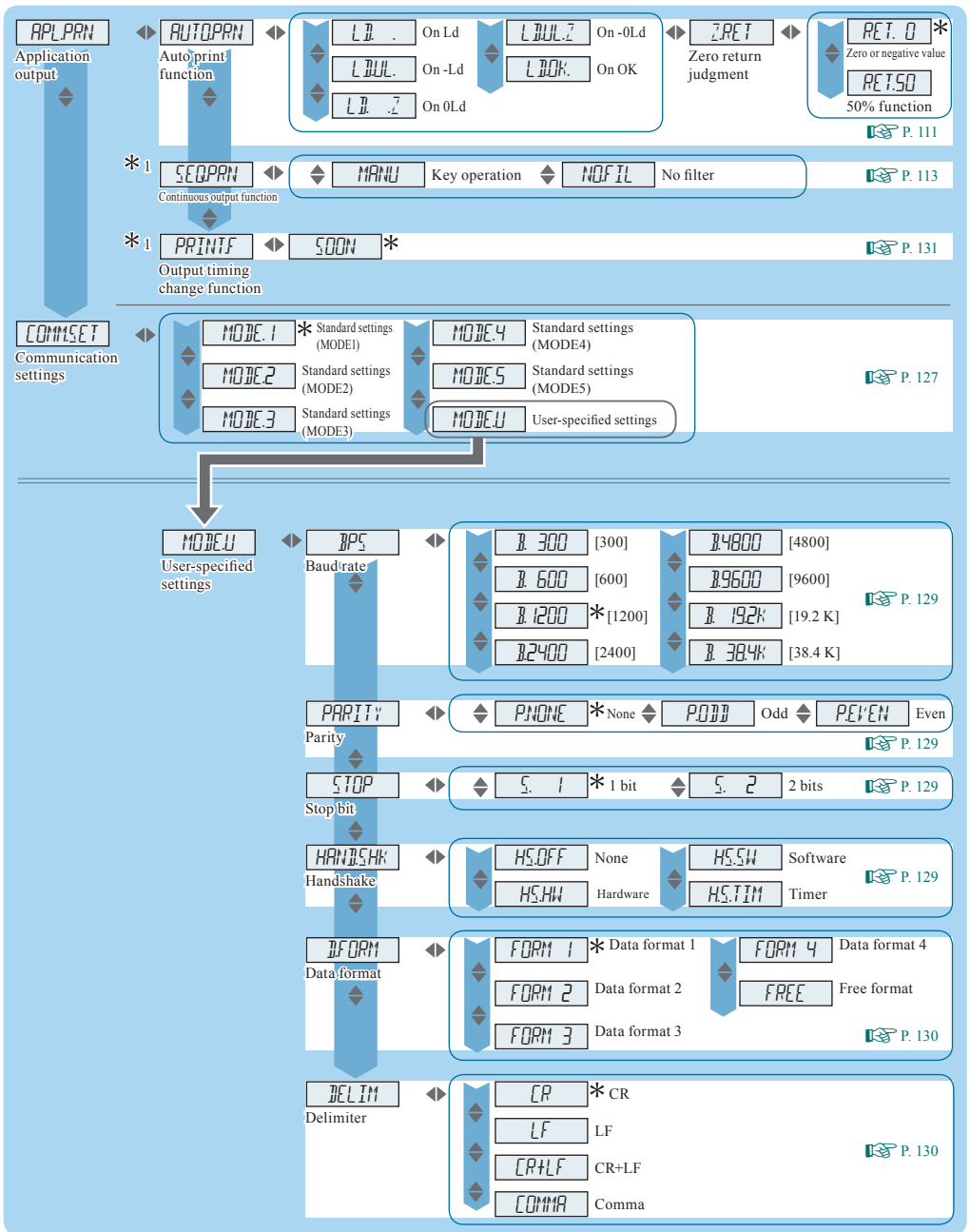
▽ Menu Map



✻1 Not applicable to a verified balance as a legal measuring instrument.

Data Output Menu

Press 3 sec. for about 3 seconds in the weighing mode.

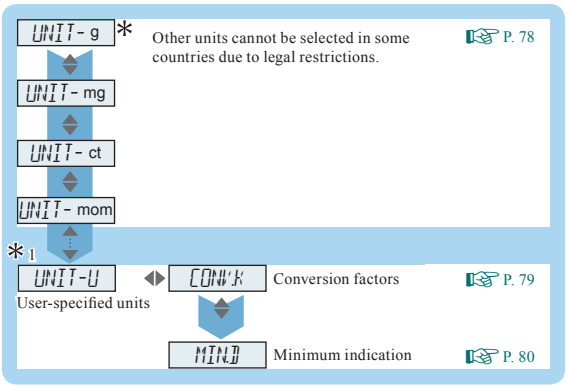


*1 Not applicable to a verified balance as a legal measuring instrument.

▽ Menu Map

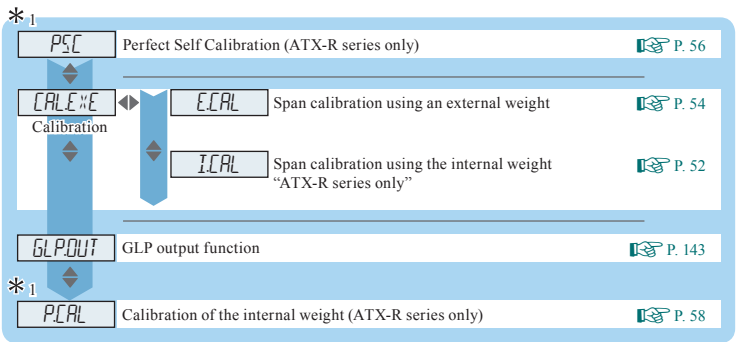
Unit Setting Menu

Press (g) 3 sec. for about 3 seconds in the weighing mode.



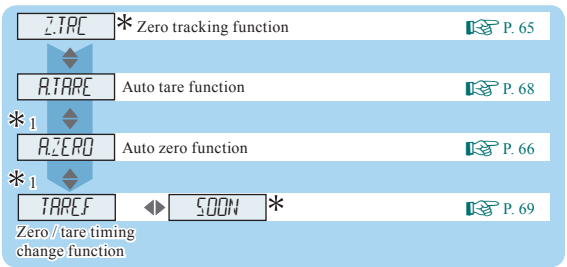
Calibration Menu

Press 3 sec. for about 3 seconds in the weighing mode.



Zero / Tare Menu

Press →0/T← 3 sec. for about 3 seconds in the weighing mode.



* 1 Not applicable to a verified balance as a legal measuring instrument.

Index

Symbol

- OL 139

Number

100% reference 87

Alphabets

A

Adjusting the level. 27
All segments lit 141
Application function mode 81
Auto power-off function 140
Auto print symbol 23, 113
Auto tare function 68
Auto zero function. 66

B

Balance ID 63
Battery symbol 23
Baud rate 129

C

Calibration menu 42, 43, 154
Calibration of the internal weight 58
Calibration record 61
Carat. 77
Checkweighing mode 109
Checkweighing range lower limit value . .109
Checkweighing range upper limit value . .109
Command 123
Communication settings 127
Communication symbol 23
Comparator function 107
Comparator symbol 23, 107
Component number 105
Container 34
Continuous output function. 113
Conversion factor. 77

D

Daily inspections 134
Data format 121
Data output menu 42, 153
DC IN connector 21
Decimal point display symbol. 39
Default settings 47
Delimiter 130
Display panel 20, 23

E

Easy setting indicator 23, 73
Echo-back 124
Entering numerical values. 45
ERR 139
Error. 139

F

Formulation 102
Formulation symbol. 23, 102

G

General weighing mode. 71
Glass door 132
GLP output function 62, 143
Gram 77
Gross weight 23

Gross weight symbol 23, 103

H

Handshake 129
Hierarchical menu levels 42
Hold symbol. 23

I

Installation site 26
Inverse triangle symbol 24, 46
Item number. 85
Item number indication 24, 85

L

Level 28
LOCKED. 48

M

Main menu. 42, 43
Maintenance parts 147
MENU 22
Menu group 42, 43
Menu lock 48
Menu lock symbol 23, 48
Menu map 150
Menu operation key symbol 23, 43
Menu reset 47
Miligram 77
Minimum number of displayed digit. 37
Minus symbol 23
Momme 77

N

Net weight 23
Net weight symbol. 23, 103
Number of pieces used for setting. 83
Number symbol 23, 45
Numeric value / menu display area 22

O

OFF display 141
OL 139
Operation keys. 22
Optional 148
Output of menu setting information 49
Output timing 112
Output timing change function 131
Outputting the gross weight 106

P

Parity 129
Pass range lower limit value 109
Pass range upper limit value 109
Password 142
P.CAL. 58
Percentage of the reference weight 87
Percentage weighing 90
Percentage weighing symbol. 24, 90
Perfect Self Calibration 56
Perfect Self Calibration symbol 23
Periodic inspections. 135
Piece counting mode 85
Piece counting symbol. 24, 85
Position of the decimal point. 46
Pouring mode. 71
Pouring symbol 23, 71
Product label 20

R

Ready symbol 23, 41
Ready to weigh 102
Response 70
RS232C connector 21

S

Selecting units to display 78
Span calibration 52
Specific percentage reference 87
Specific percentage weighing symbol . 24, 89
Stability 70
Stability detection range 74
Stability mark 23, 74
Stability mark lighting timing 75
Standby mode 41
Startup display 141
Stop bit 129
Switching units 37

T

Target mode 107
Target value 108
Taring 64
Tolerance range 108

U

UNIT 22
Unit display area 22
Unit setting menu 42
Unit weight 82
USB device 21
User-specified units 79

W

Warming up 29
Weighing capacity 146
Weighing mode 34
Weight 136
Weight symbol 23

Z

Zero point 64
Zero range 66
Zero return judgment 112
Zero / tare menu 42, 43
Zero / tare timing change function 69
Zero tracking function 65
Zero tracking symbol 23, 65

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