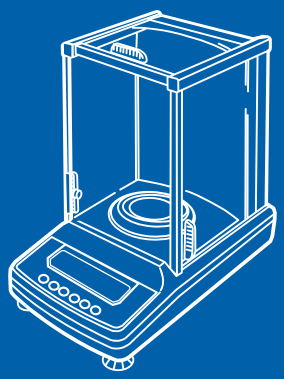
INDUSTRIAL WEIGHING SOLUTION™

CAU SERIES

Electronic Balance



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OWNER'S MANUAL

CAS

Notation Conventions

Note

This instruction manual uses the following notation conventions to indicate Safety Precautions and additional information.

Caution	Indicates a potentially hazardous situation that may result in injury to personnel or equipment damage.
Note	Provides additional information needed to properly use the balance.

Other conventions used in this manual include:

Item	Description
1,2,3....	Indicates the step number in a procedure or a sequence of changes in the balance display.
[ ] key	Indicates the operation key on the balance. See 2.2.
“ ”	Indicates the message appearing in the balance display.
mass display	Indicates that the balance is in the weighing mode and mass is displayed in one of the weighing units.

Safety Precautions

Caution

To ensure safe and proper operation of the balance, observe the following precautions.

- **Do not use the balance in hazardous areas.**
  This includes areas where the balance is expose to dust or flammable gases and liquids.

- **Use the AC adapter specified by CAS.**
  To prevent electric shock, never disassemble the AC adapter.
  The AC adapter is designed for indoor use. Do not use the AC adapter in exterior environments or where it may be splashed by water.
  Ensure that the power supply voltage meets the indicated range of the AC adapter.

- **Handle the balance carefully.**
  The balance is a precision instrument of solid design.

- **Do not connect peripheral devices other than those recommended by CAS.**
  The balance may not operate properly if peripheral devices other than those specified in this manual are used. The specifications of the RS-232C/CAUX connector are described in Appendix 4. Connect the peripheral devices according to the methods described in this instruction manual.

- **Do not disassemble the balance, accessories, or peripheral unit.**

Declaration Of Conformity

CAS Corporation declares that the following products:

CAUW-D Series, CAUW Sreies, CAUX Series and CAUY Series Analytical Balances

conform to the following directives.

Directives
EMC directive 89/336/EEC amended by 92/31/EEC, 93/68/EEC
EN55022: 1994 / A1: 1995 / A2: 1997 (Class A)
EN55024: 1998
EN61000-3-2: 1995 /A1: 1998 /A2: 1998, EN61000-3-3: 1995
Low Voltage directive 73/23/EEC amended by 93/68/EEC
EN60950: 1992 /A1: 1993 /A2: 1993

Weighing Instruments Department
Analytical & Measuring Instruments Division
CAS CORPORATION
CAS BLDG., #440-1, SUNGNAE-DONG,
GANGDONG-GU, SEOUL, KOREA

Nederlands Meetinstituut

EC type-approval certificate

Number **T7236** revision 0
Project number 704813

Issued by
NMi Certin B.V.
Hugo de Grootplein 1
3314 EG Dordrecht
The Netherlands

Notified Body Number 0122

In accordance with
The Council Directive 90/384/EEC on non-automatic weighing instruments.

Applicant
CAS Corporation
#19, Ganap-Ri, Gwangjuk-Myoun,
Yangju-Gun, Gyeonggi-Do
South Korea

In respect of
A class (I), electronic **non-automatic weighing instrument**.
Manufacturer : CAS
Type : CAU

Characteristics

Class	(I)			
Max	120 g ~ 220 g	600 ct ~ 1100 ct	120 g ~ 320 g	600 ct ~ 1600 ct
e	≥ 0.001 g	≥ 0.01 ct	≥ 0.001 g	≥ 0.01 ct
d	e = 100 d		e = 10 d	
n	≤ 220000	≤ 110000	≤ 320000	≤ 160000
Min	≥ 0.001 g	≥ 0.1 ct	≥ 0.01 g	≥ 0.1 ct

Temperature range +10 °C / +30 °C

In the description number T7236 revision 0 further characteristics are described.

Valid until
18 June 2017

Description and documentation
The instrument is described in the description number T7236 revision 0 and documented in the documentation folder T7236-1, appertaining to this EC type-approval certificate.

Dordrecht, 18 June 2007
NMi Certin B.V.

Ing. C. Oosterman
Manager Product Certification

Nederlands Meetinstituut
Hugo de Grootplein 1
3314 EG Dordrecht
Telephone +31 78 6332332
Telefax +31 78 6332309

NMi B.V.
(Chamber of Commerce no.27.228.701)

Subsidiary companies:
NMi Van Swinden Laboratorium B.V. (27228703)
NMi Certin B.V. (27.233.418)
Verispect B.V. (27.228.700)

CAS Balances and 21 CFR Part 11

21 CFR Part 11

21 CFR Part 11, Electronic Records, Electronic Signatures, Final Rule (often referred to as Part 11) is the United States Food and Drug Administration (FDA) regulation affecting computer resources and electronic records that are used for any document that is required to be kept and maintained by FDA regulations.
Requirements concerning computer resources security are key elements in Part 11. The controls implemented as a result of security related requirements are intended to result in trusted records.

CAS CLASS-Balance Agent

CAS provides a means for compliance with 21 CFR Part 11 with CAS CLASS-Balance Agent software, part of a comprehensive laboratory data management system, CAS CLASS Agent.
Ask your CAS representative about it.

CAS WindowsDirect

When CAS balances are integrated with laboratory software by means of our WindowsDirect function, no communication software is required or used.
The CAS balance functions as a primary device in the system, just as a keyboard, mouse or other data entry hardware does.
For this reason, system validation and compliance may be greatly simplified with the use of CAS balances.

Two-way Communication

CAS balances have always been computer friendly and they can be set up for bi-directional communication as part of a fully automated production system or LIMS.
This manual includes the command codes and information needed by programmers to integrate CAS balances with their software.

Contents

1. Introduction

Thank you for choosing the CAS CAUW-D/CAUW/CAUX/CAUY Series analytical balance. CAS confidently offers this high-performance analytical balance, the result of over 80 years of experience in manufacturing precision balances. While providing rapid and accurate mass measurement, reliability has been improved even more by employing the UniBloc cell, introduced for use in electronic balances by CAS in 1989. These CAS analytical balances provide WindowsDirect functions for transfer of measurement results to personal computer without installing software. This and other various functions can be used to meet the operator's objectives. Also, the CAUW- D/CAUW/CAUX series offers consistently accurate
measurement without calibration work, with temperature detection and time setting, and the built-in motor-driven calibration weight that performs fully-automatic span calibration.

In order to make full use of the functions and performance provided in the CAUW-D/CAUW/CAUX/CAUY series balance, please read this instruction manual before using the balance and keep the manual for future reference.

This manual has notation for CAUW-D series, CAUW series, CAUX series, CAUY series, combined as CAUWD/CAUW/CAUX/CAUY series (or notations two to three series).
Note that the menu settings and the calibration display examples shown in this manual are mainly for the CAUW220 model. On different models, the numerical values and other items may differ.
The model name can be found in the label placed in front of the weighing chamber.
The alphabets in model name indicate its series name. CAUW220D and CAUW120D are called CAUW-D series.

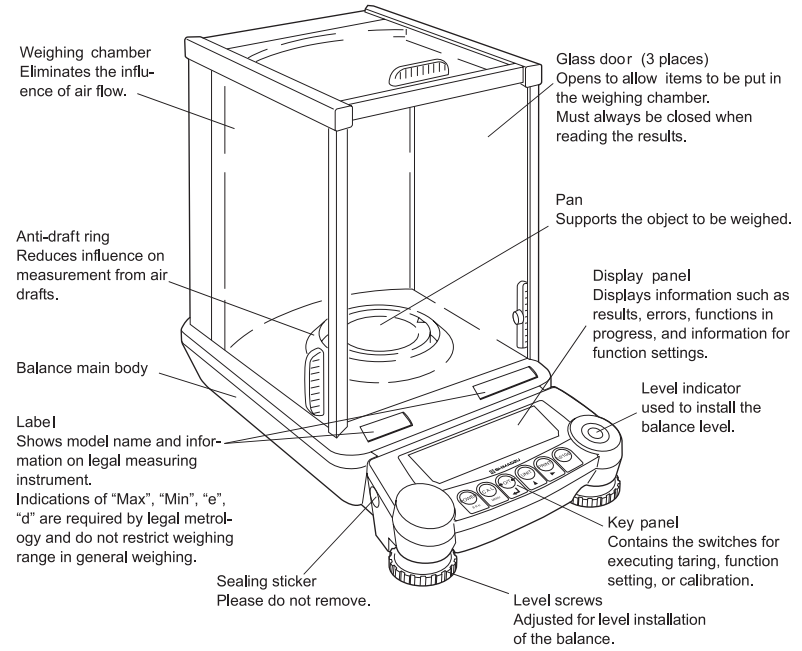
Symbols Used in the Manual

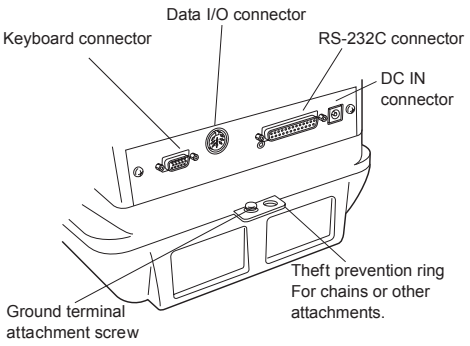
1,2,3....	Shows operation procedure.
[POWER] key, etc.	**[ ]** shows operation keys.
"E-CAL" etc.	Shows items displayed on the balance, including displays appearing during menu selection.
g display	The balance display is in gram unit so the value changes depending on the load on the pan.
Mass display	The balance display is in one of mass units so the value changes depending on the load on the pan.

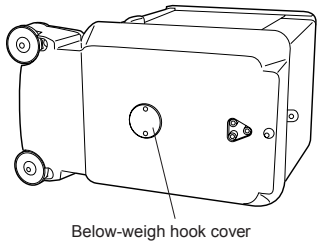
2. Component Names and Functions

2.1 Main Components

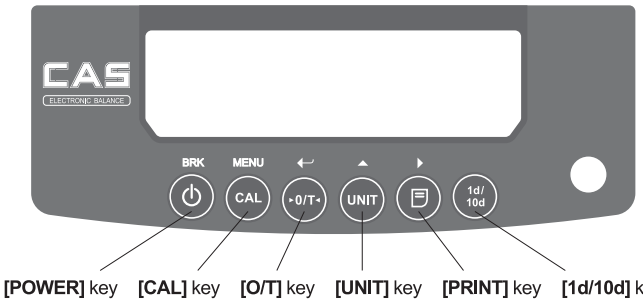
Read these pages before installation







2.2 Key Panel and Operation

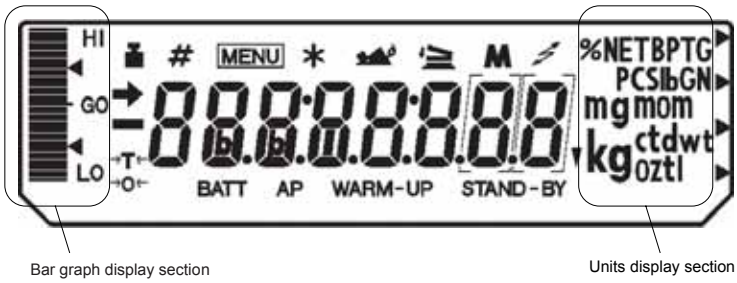


The following is a list of the functions for each key.

Key	During Measurement		
	Pressed once and released		Pressed and held for about 3 seconds
[POWER]	Switches between the operation and standby modes.		Switches the key notification buzzer on/off.
[CAL]	Enter calibration or menu item selection.		Enter calibration or menu item selection.
[O/T]	Tares the balance. (Displays zero.)		
[UNIT]	Switches the units of measurement.		
[PRINT]	Outputs the displayed values to an electronic printer, computer, or other external devices.		Outputs the date and time to external devices. (Not with CAUY)
[1d/10d]	CAUW/CAUX/CAUY	Switches display between 1d/10d. (Minimum display is rounded by one digit.)	
	CAUW-D	Switches the weighing range.	

Key	During Menu Item Selection	
	Pressed once and released	Pressed and held for about 3 seconds
[POWER]	Return to the menu above the current menu level	Returns to mass display.
[CAL]	Moves to the next menu item.	
[O/T]	Select or set the displayed item, or enter into the displayed menu.	
[UNIT	Numerical value input, increases the numeric value of the blinking digit by 1.	
[PRINT]	Numerical value input, moves the blinking digit.	
[1d/10d]	No effect.	

2.3 Balance Display and Functions



(Some of the symbols and characters on the balance display are not used by this balance.)

Display	Name	Description
➡	Stability mark	Indicates that the weighed value is stable. In menu selection, indicates the currently selected item.
	Weight symbol	Appears during span calibration. Blinks before automatic calibration starts. Blinks to advise necessity of span calibration.
#	Number symbol	Indicates numeric value entry.
MENU	Menu symbol	Appears during menu selection. Always shown when the menu is locked.
	Add-on symbol	Indicates set-up of Add-on mode or Formulation mode.
M	Memory symbol	Indicates set-up of Formulation mode.
	Communication symbol	Indicates communication with external devices via RS-232C cable or Data I/O connector. Shown when communication functions are ON.
BATT	Battery symbol	Indicates a low battery voltage when using the balance with the optional battery pack.
AP	Auto Print symbol	Indicates set-up of the Auto Print function.
STAND-BY	Standby mark	Appears during standby status. Indicates standby of the interval timer output function.
▼	Inverse triangle	Illuminates as part of the solid specific gravity measurement display.

3. Specifications

Series name		CAUW-D series (Dual range type)		CAUW series			CAUX Series			CAUY series	
Model name		CAUW220D	CAUW120D	CAUW320	CAUW220	CAUW120	CAUX 320	CAUX220	CAUX120	CAUY220	CAUY120
Capacity		220g/82g	120g/42g	320g	220g	120g	320g	220g	120g	220g	120g
Minimum display		0.1mg/0.01mg	0.1mg/0.01mg	0.1mg	0.1mg	0.1mg	0.1mg	0.1mg	0.1mg	0.1mg	0.1mg
Repeatability (standard deviationσ)		≤0.1mg (220g range) ≤0.05mg (82g range)	≤0.1mg (120g range) ≤0.02mg (42g range)	≤0.15mg	≤0.1mg	≤0.1mg	≤0.15mg	≤0.1mg	≤0.1mg	≤0.1mg	≤0.1mg
Linearity		±0.2mg (220g range) ±0.1mg (82g range)	±0.2mg (120g range) ±0.03mg (42g range)	±0.3mg	±0.2mg	±0.2mg	±0.3mg	±0.2mg	±0.2mg	±0.2mg	±0.2mg
Response time (stabilization time, typical)		3s (220g range), 15s (82g range)	3s (120g range), 12s (42g range)	3 s							
Calibration weight		Built-in								None	
Operation temperature range		5 to 40 deg.C									
Temperature coefficient of sensitivity (10 to 30 deg.c)		±2ppm/deg.C (when PSC function is Off)								±2ppm/deg.C	
Sensitivity stability (10 to 30 deg.c)		±2ppm (when PSC function is On)									
Pan size		80mm dia Approx.									
Main body dimensions		220mm W X 330mm D X 310mm H									
Main body Weight		7kg Approx.									
Power requirements		DC, 10 to 15.5V, 600mA (Plug polarity: center negative)									
Data I/O		RS-232C									
Function	Display backlight			●	●	●					
	PSC automatic span calibration	●	●	●	●	●	●	●	●		
	Clock-CAL	●	●	●	●	●					
	Built-in clock	●	●	●	●	●	●	●	●		
	GLP/GMP/ISO calibration report	●	●	●	●	●	●	●	●		
	WindowsDirect	●	●	●	●	●	●	●	●	●	●
	Interval timer output	●	●	●	●	●	●	●	●		
	RS-232 C I/F	●	●	●	●	●	●	●	●	●	●
	Specific gravity measurement software, piece counting, % display, unit conversion	●	●	●	●	●	●	●	●	●	●
	Analog display	●	●	●	●	●	●	●	●	●	●
	Battery (option)	●	●	●	●	●	●	●	●	●	●

4. Installation

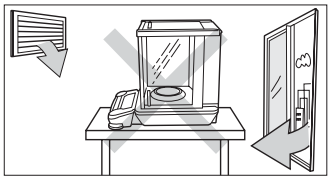
4.1 Installation Site

(1) Power Requirements

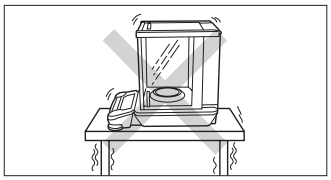
・Select an installation site that is near a power source to allow the use of the attached AC adapter or a site where the special accessory battery pack can be properly used.
Verify that the power voltage conforms to that indicated on the AC adapter.

(2) Installation site

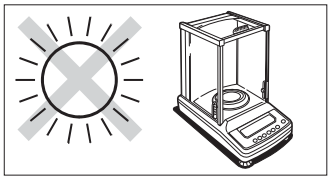
> ⚠ Caution
>
> The balance must be installed in a proper place to ensure safe and accurate measurement. Avoid the following types of sites.



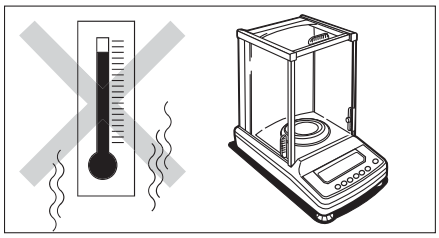
• Sites with air current from air conditioners, ventilators, open doors, or windows.



• Sites with vibration.



• Sites in direct sunlight.



• Sites with extreme temperature changes,
or high/ low temperature,
or high/low humidity.

• Sites near flammable of corrosive gases

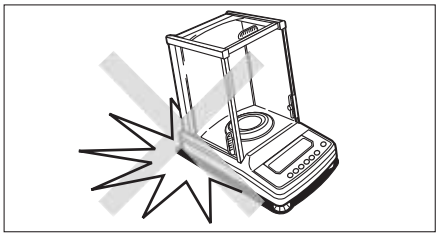
• Sites with dust, electromagnetic waves, or magnetic fields

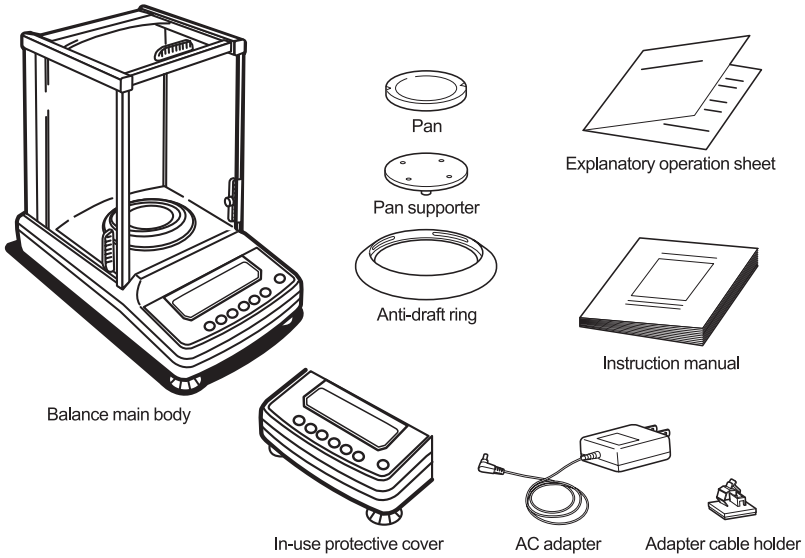
Install on a sturdy and level tabletop. Stone is recommended. Rather than the middle of the room, the edges and corners are generally appropriate for vibration-free measurement.

> ⚠ Caution
>
> The glass doors open backwards beyond the rear end of the main body.
> Make certain enough space is saved to allow the doors fully open.

4.2 Unpacking and Delivery Inspection

> ⚠ Caution
>
> Analytical balance is a precision instrument. Make certain not to allow any impact when placing it on the table.



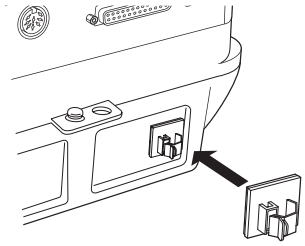


Verify that there has been no damage and that the following standard packing items are present. Contact your local distributor in case of damaged or missing items.

Standard packed items and quantity

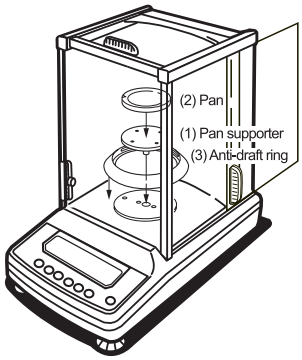
Standard packed items	quantity
Balance main body	1
Pan	1
Pan supporter	1
Anti-draft ring	1
AC adapter	1
Adapter cable holder	1
Instruction manual	1
Explanatory operation sheet	1
Inspection certificate	1
In-use protective cover	1

4.3 Installation

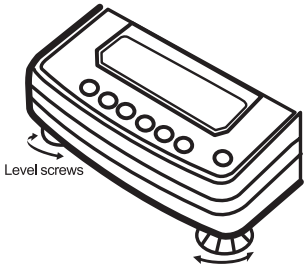


1 Attach the adapter cable holder.
Peel the protective sheet of adhesive off the adapter cable holder, and stick it on the back of the balance as shown in the figure.

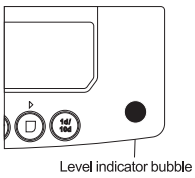
2 Place the balance main body on the installation site.

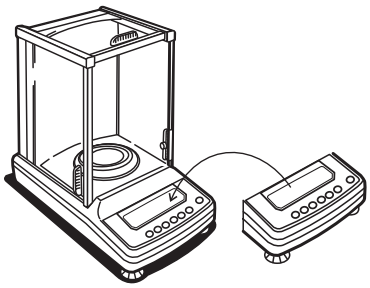


3 Attach the pan supporter, the pan, and the antidraft ring.
(1) Gently attach the pan supporter on the center axis of the weighing chamber.
(2) Gently place the pan on the pan supporter.
(3) Place the anti-draft ring.



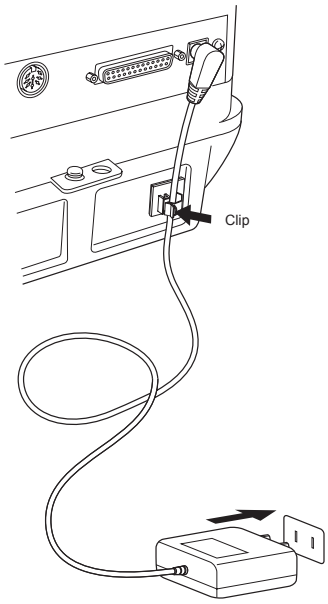
4 Adjust the horizontal level.
(level adjustment)
There are two level screws on the front of this balance.
The screws grow longer when turned in clockwise direction from above and they grow shorter when turned counter-clockwise. Adjust the level screws until the bubble in the level indicator is in the middle of the red circle.





5 Attach the In-use protective cover.
When the key panel and the display must be protected from dirt and wear, place the cover over the key panel.

4.4 Turning On the Power

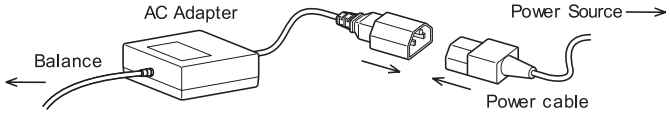


1 Insert the AC adapter plug in to the DC IN connector
on the back of the balance. Place the AC adapter cable as shown in figure and hold it with the adapter cable holder.

2 Plug the AC adapter to the power outlet. After the balance performs a self check, calibration will be automatically executed. During this process, the display will change as follows. “CHE 5”, “CHE 4” ..... “CHE 0”, “CAL 2”, “CAL 1”, “CAL 0”, “CALEnd”, “oFF”
(This span calibration immediately after power up can be aborted by pressing the **[POWER]** key, however at least one span calibration is necessary before use. The CAUY series does not perform calibration and the display showing “CAL...” will not appear.)

Note

A power cable may be necessary to connect the AC adapter to the power source, depending on the type of the AC adapter



3 Press the **[POWER]** key. After all displays appear, the gram (g) display appears. Also, the display backlight illuminates (CAUW series only).

4 Pressing the **[POWER]** key again turns on the standby symbol and puts the balance in standby (warm up) status. (For CAUW-D/CAUW/CAUX series, the current time is displayed according to the built-in clock settings in 8. For the CAUW series, the backlight will turn off.)

4.5 Span Calibration

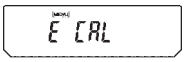
After installation, be certain to complete warm up and span calibration. During span calibration, the balance must be left in a very stable condition. To do this, leave the power on at standby (warm up) for an hour or more before performing calibration. When using the CAUW-D series in the small range (minimum display 0.01mg), leave the power on for at least four hours.
Also, perform calibration in conditions without people entering and leaving the room and without air flow or vibration. The CAUW series is equipped with display backlight. Use of the backlight requires warm up in mass display such as "g", not in standby state. The default setting of backlight is ON.

For CAUW-D/CAUW/CAUX Series (No operation is required)
Fully-automatic span calibration by PSC
The default setting is ON for PSC, which performs fully-automatic span calibrations. When PSC is ON, span calibration is automatically performed, if necessary, when the gram display first appears after the balance is turned ON (See 4.4). When PSC operates, the weight symbol starts blinking about two minutes beforehand for notification. During operation, the display will automatically change and the motor sound of the weight loading system is heard.
In order to ensure proper PSC operation, prevent vibrations and air flow. When gram display returns after completion of span calibration by PSC, measurement can begin according to 5.
Basic Operation. (Fully-automatic span calibration by PSC is set to ON by default. Also, span calibration with built-in calibration weight is set as preset calibration method by default.
For other methods, please refer to 10. Calibration. The CAUW-D/CAUW series also allow Clock-CAL function to perform span calibrations regularly by time settings.


Note

For accurate measurement, perform span calibration again when the balance is moved or when the temperature of the installation site has changed. It is recommended that either PSC or Clock-CAL be set to ON so that the necessary calibrations will operate automatically.

For CAUY Series
Span calibration with external weights



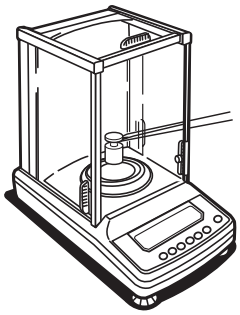
(Example)

1. Leave the pan with nothing on, in g display mode.

2 Press the **[CAL]** key once. "E-CAL" will be displayed.

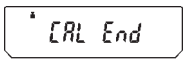
3 Press the **[O/T]** key. The zero display will blink. Stability is confirmed after about 30 seconds and the value of the weight that should be loaded will blink.

- For accurate span calibration, input the exact mass value of your calibration weight according to instructions in 10.3.5



4 Open the glass door, load the weights of the amount shown, and close the glass door of the weighing chamber.

5 After a short time, the zero display will blink. Remove the weight from the pan and close the glass door. After "CAL End" appears, the display returns to g display mode and the calibration is complete.



Span calibration by external weights is set for routine calibration by default in CAUY series. For other methods, see 10. Calibration.

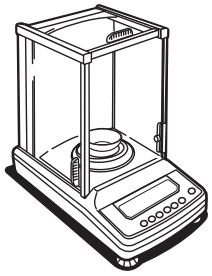
> **Note**
>
> For accurate measurement, perform calibration again when the balance is moved or when the temperature of the installation site has changed.
> Daily calibration before use is recommended.

5. Basic Operation

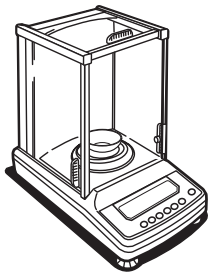
(Read Chapters 1 to 5 for basic but proper operation of the balance.)

> Note
>
> Before using the balance, warm up thoroughly (at least one hour) and calibrate. When intending to use the CAUW-D series in the small range (minimum display 0.01mg), warm it up for at least four hours.

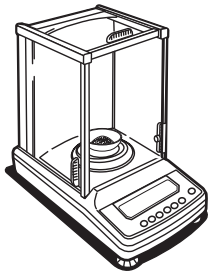
5.1 Weighing



1 Open one of the glass doors of the weighing chamber, place the weighing vessel (container) on the pan, and close the glass door again. (When using a container)



2 Wait for the display to stabilize and press the **[O/T]** key (taring). The appearance of the stability mark (➡) indicates a stable state. The display will read zero.



3 Open the glass door, place the items to be weighed in the weighing vessel and close the glass door.

4 After the display stabilizes, read the display.

Note

- Except when placing or removing items or calibration weights to and from the weighing chamber, keep the glass doors closed unless otherwise described in this manual.
- Air convection causes measurement error if the temperatures of the weighed item and the chamber are different. In order to avoid this, equalize the temperatures by leaving the item in the extra space within the chamber before weighing.

5.2 Changing the Unit Display

Pressing the **[UNIT]** key switches display between the registered units, piece counting and specific gravity measurement modes. The units other than 'g', 'pcs', '%' and 'ct' are not registered in the default settings.

> **Notes**
>
> The units to be used must be registered as described in 12.Units.
> If the power is turned off and turned on again, the weighing unit will be 'g'.
> (The registered units remain.)

5.3 Switching the Weighing Range (CAUW-D series only)

In the dual-range balance CAUW-D series, when the power is connected and turned on, the balance is set to the "small range" with a minimum display of 0.01mg.
To switch to the "large range" with a minimum display of 0.1mg, press the **[1d/10d]** key (except for CAUW-D series, this key has a different function. →9.2).
When measurement exceeds the small range capacity
(82g for CAUW220D, 42g for CAUW120D)
during use of the small range, display automatically switches to the large range.
In this case, taring with **[O/T]** key in the large range will fix the range, and reducing the load on the pan within the small range capacity will not return it to the small range.
[O/T] key has to be pressed again, within the small range, to resume the small range display.

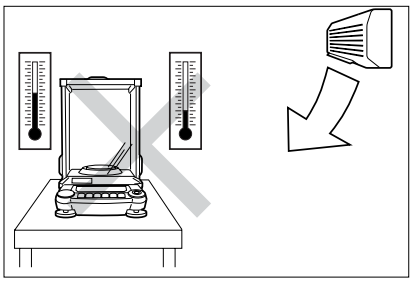
Small range

Large range

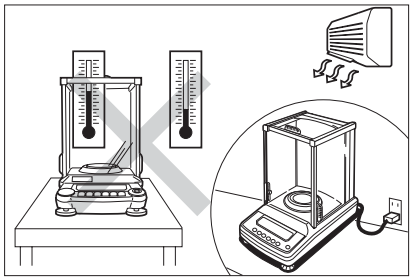
5.4 For Stable Measurement in Semi-micro Range

(CAUW-D series only)

The small range (semi-micro range, minimum display 0.01mg) of CAUW-D series dual range
balances produces excellent response and stability. However, weighing in the 0.01mg range is generally more subject to the environment and how measurements are performed compared to the 0.1mg range.
When using the small range of CAUW-D series, observe the following instructions in order to obtain the best result.

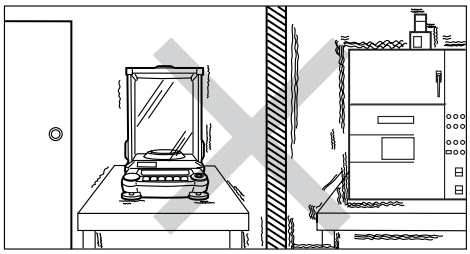


Avoid air current from the air conditioner. When the air conditioner is in operation, the temperature of the air current from it has a large difference from the room temperature. Air current and presence of different temperatures both make the measurement unstable.

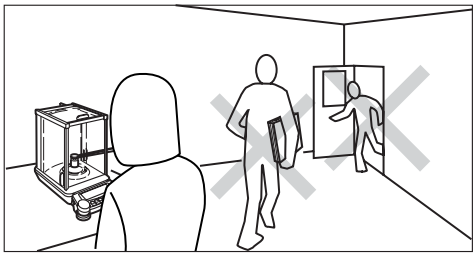


The temperature of the balance does not change as fast as the room temperature. Changing room temperature prior to measurement causes temperature difference remaining for a long period. Even without direct blow of air current, contact of air of different temperatures generate air convection in the weighing chamber and result in unstable display.

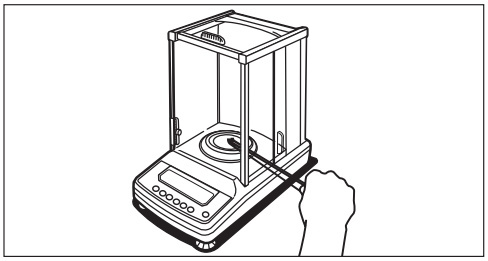
- Leave the glass doors open while not in use. This prevents temperature gap between weighing chamber and ambience.



Avoid the location where vibration from any machinery is transmitted.
Corners of a room are less subject to influence of vibration.



Do not use the door of the room. Do not allow other people enter, exit or move in the room.



Open glass door minimum. Use long tweezers etc. Equalize the temperature of the samples to the chamber's.
Remove influence of the heat emitted from human body and the heat from the sample to be weighed. Equalize the temperature of the object to be weighed to that of balance weighing chamber (If possible keep the object in the extra space of the chamber prior to measurement.)
Use a long pair of tweezers, spatula or other instruments to keep hands away from the weighing chamber.
Open the glass door as little as possible when loading / unloading.

6. Windows Direct Function

6.1 What is WindowsDirect?

The CAUW-D/CAUW/CAUX/CAUY series can transfer data directly to a computer running MS-Excel mass input window of analytical instrument software or other applications on Windows®* OS, as if the numeric value in the balance display were typed from the keyboard. This function is called WindowsDirect. It uses components that are already part of the Windows OS, and does not need communication software to be installed. Combination with Auto Print function (13.4) is also possible to further enhance productivity. Windows Direct does not allow the computer to send commands to the balance. In order to control the balances, programming with command codes (14.2.3) is required.

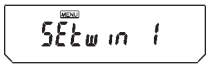
• Only numerical values can be transferred through WindowsDirect.

6.2 WindowsDirect Settings

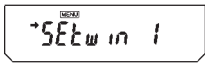
Simple settings are made for the balance and the computer. Connection is by RS-232C cable specified by CAS

If bi-directional communication software is used: WindowsDirect function should be turned off. Set up the optimal communication parameters for the software according to "14.3 Communication setting".

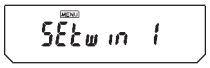
6.2.1 Setting the Balance



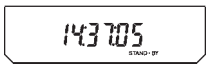
1 From the mass display, press the **[MENU]** key twice. "SEtwin |" appears.



2 Press the **[O/T]** key. Now all the communication settings for WindowsDirect are made.
After setting, the stability mark appears.
At this time, pressing the **[O/T]** key again unsets the WindowsDirect and returns the communication settings to the default settings.



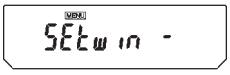
(Example)



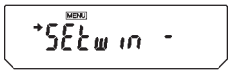
3 Press the **[POWER]** key to go to STAND-BY, then unplug the AC adapter cable from the balance.
This is necessary after the above setting.

Notes

- When data is outputted to the computer by WindowsDirect function, the effect is the same as “typing the numerical value displayed on the balance and pressing Enter key on the computer’s keyboard”.
  If you wish the effect of **“pressing → key”** instead of **“pressing Enter key”**on the computer’s keyboard”, select “SEtwin -” in the above step **1**, instead of “SEtwin |”.
  The “SEtwin -” setting menu display appears when the **[MENU]** key is pressed one more time from “SEtwin |”.



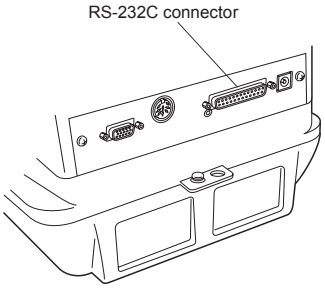
(When not set)



(When set)

- The communication parameters selected by “SEtwin -” or “SEtwin |” settings here are listed in the table in 14.3.2.
- After WindowsDirect setting has been made using the “SEtwin -” or “SEtwin |” setting, individual communication parameters can be changed using the Communications Settings menu (14.3). In this case, the ➡ (stability mark) may still appear if you go to the “SEtwin -” or “SEtwin |” display but WindowsDirect may not operate. To restore WindowsDirect optimal settings then, first remove the stability mark by pressing the **[O/T]** key at the “SEtwin -” or “SEtwin |” display. This restores the default Communications settings. Then, reset “SEtwin -” or “SEtwin |” following the procedure described in 6.2.1.

6.2.2 Connecting the RS-232C Cable



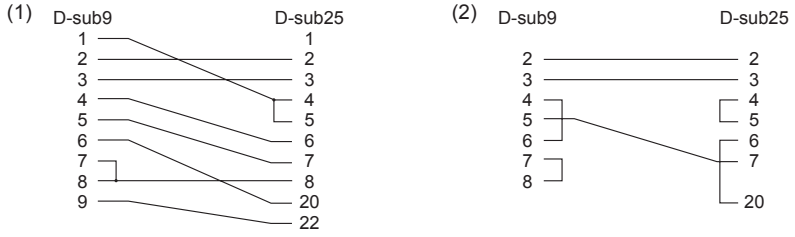
1 Check that the balance is in “oFF” or “STANDBY” status.

2 Remove power from the balance and turn off the computer.

3 Connect the RS-232C cable to the RS-232C connector on the back of the balance.

4 Connect the RS-232C cable to the computer.

When using WindowsDirect, use a Null modem cable of one of the below wirings.



A cable of hte (1) wiring is available as an optional accessory.

RS-232C Cable 25P-9P (1.5m) P/N 321-60754-01

6.2.3 Setting Up the Computer

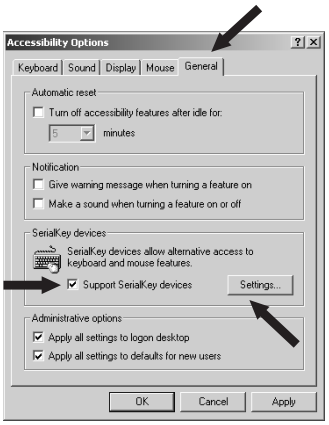
(leave the balance unplugged)

1 Turn ON the power to the computer and start Windows®*.

2 Click “Start”, choose “Settings”, and “Control Panel”.

3 Select “Accessibility Options.”

4 Verify that there are no check marks for any items on all five tabs including “General.”



5 Put a check mark at "Support Serialkey device" in the "General" tab. This should be the only check mark on all the tabs of Accessibility Options unless "Administrative options" appears in the "General" tab.
Put check marks at both the items of "Administrative options" to maintain the settings even after restarting Windows®.

6 Open "Settings".

7 Select the serial port corresponding to the RS-232C port of your personal computer.
(Serial port: any one of COM1 to 4.
Usually, COM1)

8 Select a "Baud rate" of 300..

9 Click "OK".

10 Click "Apply" and wait.

11 Click "OK".

6.2.4 Start and Checking Operation

1 Start Windows®.

2 After Windows® has completely started, connect power cable from the AC adapter to the balance, when "oFF" is displayed, press the **[POWER]** key. The mass display appears.

> **Note**
>
> Turning ON the balance before Windows®* is completely activated may cause incorrect operation.

3 Open the "Note pad" accessory in Windows®* (or start the application you wish to use).

4 Press the **[PRINT]** key o f the balance. Verify that the numeric value displayed on the balance appears at the cursor position on the screen of computer. The effect is the same as typing the value from the computer keyboard and pressing the ENTER key. Characteristics indicating the unit of measure are not sent to the computer.

5 Test combination with Auto Print function, if you wish to use it.

6 End the operation using the standard close or exit procedure.

Windows®* = Windows® 95, Windows® 98, Windows® Me, Windows® 2000, Windows® XP, and higher.

6.3 Troubleshooting WindowsDirect Function

Notes

- This function may not operate on a computer on which a normal U.S. version of Microsoft Windows®* does not operate. Some types of personal computers may not be able to use this function or some features may be limited. CAS does not guarantee that this function can be used on all computers without any problems currently or in the future.

(CAS is not liable for any direct or indirect problems caused by this function. It is recommended that important data or programs on your computer be backed - up before using this function. For the operation of Windows®* or the computer, refer to commercial tutorials or the appropriate instruction manual.

(It is necessary to have the "Accessibility Options" function of Windows®* installed on the PC. To install "Accessibility Options", select "Start" → "Setting" → "Control panel" → "Add /Remove Programs" and open the "Windows® Setup" tab. Place a check mark on "Accessibility Options." For more information, see the Windows®* instruction manual.

(When "Support Serialkey device" is selected in Accessability Options, software which uses the same RS - 232C port on that computer does not operate correctly, until Serialkey support is discontinued. If another device (an external modem, plotter or etc.) is to be connected, remove the check mark placed on "Support Serialkey device" and re - activate Windows® after the balance is disconnected.

When the WindowsDirect Function Does Not Operate At All:

(For some notebook computers, it is possible to shut off the RS - 232C port for energy saving purposes. Set the computer so that the RS - 232C port can be used.

- Try different COM port settings from 1 to 4. Re-start Windows®* after each setting change.
- Verify that the correct RS-232C cable is being used.

For Windows® 98 and higher, try setting the computer again without restarting.

Communication through LAN by other applications may interfere with Serialkey device set-up. Try without LAN connection.

Windows®* = Windows® 95, Windows® 98, Windows® Me, Windows® 2000, Windows® XP, and higher.

When the WindowsDirect Function Intermittently Malfunctions:

- Use a communication speed of 300bps. Depending on the processing ability of the computer, this function may operate incorrectly if communication speed is too high.
- Send the next data only after the current one is displayed on the screen. Depending on the processing ability of the PC, this function may operate incorrectly if the interval of data transmission is too short.
- Do not touch the keyboard or the mouse while the balance is transmitting data.
- Stop the data transmission and confirm that no data is entering the computer before touching the keyboard or the mouse.

Notes

- This function may generate incorrect data when the displayed value is not a weight value (i.e. error code or time).
- The unit designation is not transmitted. The balance display unit selected and the unit required by the application should be set the same.
- This function may operate incorrectly depending on the settings of various lock keys of the keyboard such as the NUMLOCK or cursor key lock. Change the state of the lock and function keys on the computer keyboard.
- When this function is used, a command cannot be sent from the peripheral device or computer to the balance.
- Set the data formats, such as decimal places and units, according to each application.

7. Menu Item Selection

7.1 What is a menu?

The CAUW-D/CAUW/CAUX/CAUY series is equipped with many useful functions.
The menu is provided to allow the operator to efficiently select the functions that meet the operator's objectives.
Understand the menu procedures to gain full command of the functions provided in the CAUW-D/CAUW/CAUX/CAUY series.
Procedures of each menu item selection are explained with the display examples in chapters 8 to 14.
However, when selecting menu items, refer to the menu map for more efficient setting.

7.2 What is a menu map?

The CAUW-D/CAUW/CAUX/CAUY series menu consists of four levels. The menu map displays this hierarchy in an easy-to-understand format. The map allows quick access to the menu item desired.
Also, it gives the default settings information. The menu map is in Appendices A-1.

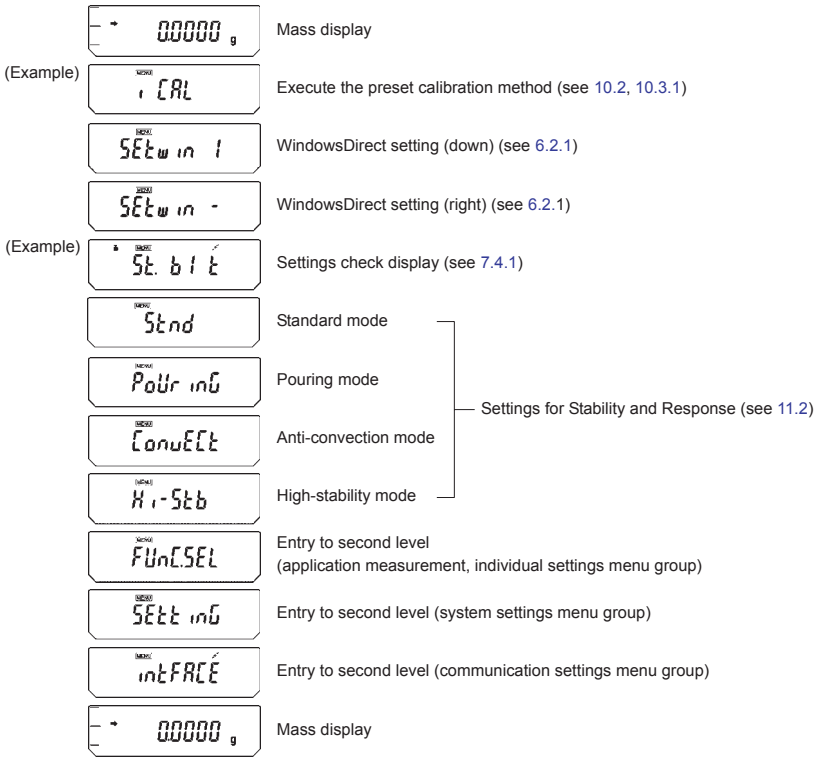
7.3 Menu Item Selection Procedures

See the menu map (Appendix A-1).
The CAUW-D/CAUW/CAUX/CAUY series menu consists of four levels with the most often used menus in the first level for an easy-to-use structure. The menu can be entered by pressing the **[CAL]** key from the mass display. The menu operation keys for movement in the menu tree are shown in the following table. From any menu level, pressing repeatedly or holding down the **[POWER]** key returns to the mass display.

Operated key	During Menu selection		
	Pressed once and released	Pressed and held for about 3 seconds	Moving direction on Menu Map
[POWER]	Return to the menu above the current menu level.	Returns to mass display.	←
[CAL]	Moves to the next menu item.		↓
[O/T]	Select the displayed menu item, or move to the next menu below the current menu level.		→
[UNIT	In numerical value input, increases the numeric value of the blinking digit by 1.		
[PRINT]	In numerical value input, moves the blinking digit to the right.		
[1d/10d]	No effect.		

1 Press the **[CAL]** key from the mass display.
"i-CAL" appears.
(The type of regular-use calibration appears. "i-CAL" is default of CAUW-D/CAUW/ CAUX series. In the CAUY series this is "E-CAL" or "E-tESt".)

2 After that, pressing the **[CAL]** key changes the display in the order shown below.



Application measurement, individual settings menu group (Select FUnCSEL)
This second level menu group includes settings for selection and execution of alternative calibration method (see 10.2, 10.3.1), zero tracking on/off (see 11.4), stability detection band setting (see 11.3), unit selection/removal (see 12.1), Auto Print on/off, analog display on/off, auto-memory & zeroing mode on/off, and net total measurement mode on/off.

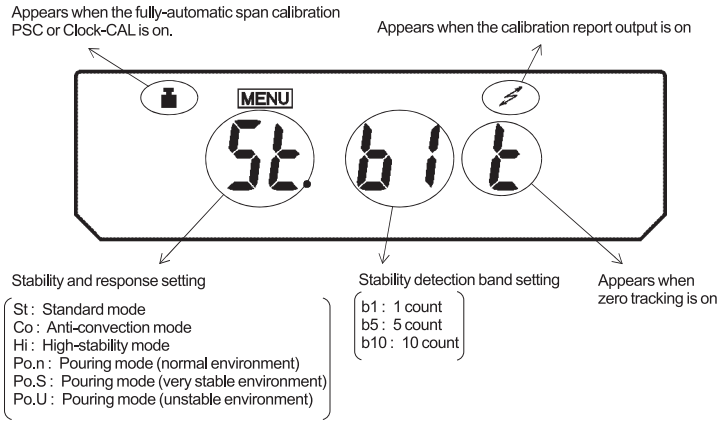
System settings menu group (Select SEtt inG)
This second level menu group includes various settings related to calibration such as settings for the type of regular-use calibration (see 10.3, 10.4), as well as information entries for mediums required for specific gravity measurement (see 13.2, 13.3) and settings related to the clock.

Communication settings menu group (Select intFACE)
This second level menu group includes settings for communication formats for connecting the balance to external devices (see 14.3). There are standard formats prepared beforehand and user-defined formats that allow itemized selection.

7.4 Useful Functions Related to Menu

7.4.1 Settings Check Display

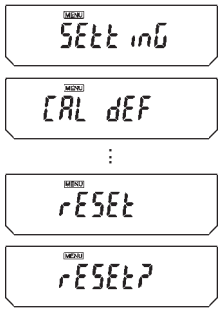
From mass display, press the **[CAL]** key four times to display the confirmation of the current settings. Displayed as abbreviations are the three kinds of environmental settings (see 11.), ON/OFF for the fully-automatic span calibration(see 10.3.2,10.3.3), and ON/OFF for the GLP/GMP/ISO compliant calibration report output.(see 10.4.1)



The weight symbol appears when either or both of the fully-automatic span calibration PSC or Clock-CAL are on.

7.4.2 Returning to Default Settings (Menu reset)

This will return all the settings to default. The reference value stored in previous use of piece counting or percentage conversion and the set time of Interval Timer function will also be cleared. The default settings are indicated with " # " on the Menu Map.



1 Press the **[CAL]** key repeatedly until "SEttinG" appears. Press the **[O/T]** key. The display shows "CAL dEF".

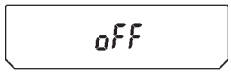
2 Press the **[CAL]** key repeatedly until the display shows "rESEt". Press the **[O/T]** key. The display shows "rESEt?" for confirmation.

3 Press the **[O/T]** key one more time.

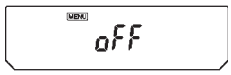
7.4.3 Menu Lock

The menu setting operations can be locked so that the settings cannot be inadvertently changed. This is called Menu Lock. Windows Direct settings also lock.
The menu lock is set with the following procedure.

How to lock the menu



1 Connect the balance to the power and wait.



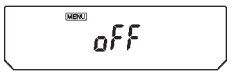
2 When “oFF” appears, press and hold the **[CAL]** key for about three seconds. “LoCKEd” appears and the menu lock function is activated, returning to the “oFF” display. When the lock function is activated, the MENU mark appears.

(Time is not displayed with AUY.)

When menu is locked, MENU symbol is illuminated at STAND-BY display, too.

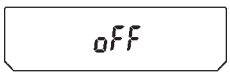
If a menu item selection is attempted in locked status, the message “LoCKEd” appears and the menu selection is not allowed. To allow menu selections again, follow this procedure.

How to remove menu lock



1 Disconnect the balance from power. Wait, then connect power again.

2 When “oFF” appears, press and hold the [CAL] key for about three seconds.



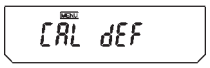
3 “rELEASE” appears and the menu lock is released.

8. Setting the Built-in Clock

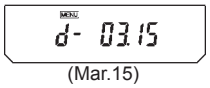
(CAUW-D/CAUW/CAUX series only)

CAUW-D/CAUW/CAUX series are installed with a built-in clock. set the clock before use of Clock-CAL (10.3.3) or Calibration report (10.4.1) functions. Note that the current time is displayed during STANDBY mode (4.4).

8.1 Date

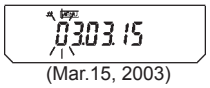


(Example)



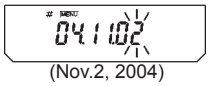
(Mar.15)

(Example)



(Mar.15, 2003)

(Example)



(Nov.2, 2004)

1 From the mass display, press the **[CAL]** key repeatedly until "SEttinG" appears, press the [O/T] key. "CAL dEF" will appear.

2 Press the **[CAL]** key repeatedly until "d-MM.DD" appears (MM and DD are each two digits representing month and date, respectively), and press the **[O/T]** key. In the upper part of the display, the MENU Symbol and the # symbol appear indicating number entry mode. Also, the current date setting appears as [YY.MM.DD] (YY is the year) with the leftmost digit blinking.

3 Pressing the **[UNIT]** key increases the blinking digit by one. Pressing the **[PRINT]** key moves the blinking digit one place to the right.

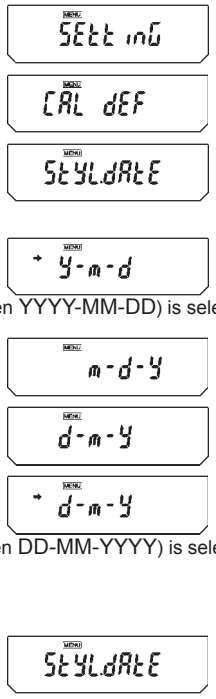
4 Press the **[O/T]** key when the desired date is shown in the display. The built-in clock will be set.

5 Press the **[POWER]** key repeatedly to return to the mass display.

> Note
>
> The actually outputted date format is not the same as the display during this setting. Select your desirable style of expressing year, month and date in **8.2.**

8.2 Date Output Style

The order of the year, the month and the date in the external output can be selected from three styles.



1 From the mass display, press the **[CAL]** key repeatedly until "SEttinG" appears, press the **[O/T]** key. "CAL dEF" will appear.

2 Press the **[CAL]** key repeatedly until "StyL. dAtE" appears.

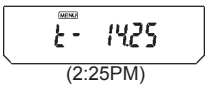
3 Press the **[O/T]** key.
The display shows "y-m-d".
After this, pressing the **[CAL]** key cycles the displays in the order of "y-m-d" → "m-d-y" → "d-m-y" → "y-m-d".
"y-m-d" is for setting YYYY-MM-DD, "m-d-y" is for MM-DD-YYYY and "d-m-y" is for DD-MM-YYYY.
When the current setting is displayed, the stability mark (➡) appears. To change the setting, press the **[O/T]** key when the desired setting is on the display, or

4 Press the **[POWER]** key to return to "StyL. dAtE" without changing the setting.

5 Pressing the **[POWER]** key again returns to the mass display.

8.3 Time

(Example)

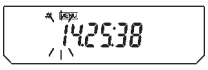


(2:25PM)

1 From the mass display, press the **[CAL]** key repeatedly until "SEttinG" appears.
Press the **[O/T]** key.
"CAL dEF" will appear.

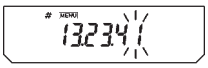
2 Press the **[CAL]** key repeatedly until "t-HH.MM" appears (HH and MM are each two digits representing hour and minute, respectively), and press the **[O/T]** key.

(Example)



3 In the upper part of the display, the MEMU symbol and the # symbol appear indicating number entry status. Also, the current time setting appears as [HH.MM.SS] (HH is hours, MM is minutes, and SS is seconds) with the leftmost digit blinking.

(Example)



4 Pressing the **[UNIT]** key increases the blinking digit by one. Pressing the **[PRINT]** key moves the blinking digit one place to the right.

5 Press the **[O/T]** key when the desired time is shown in the display. The built-in clock will be set.

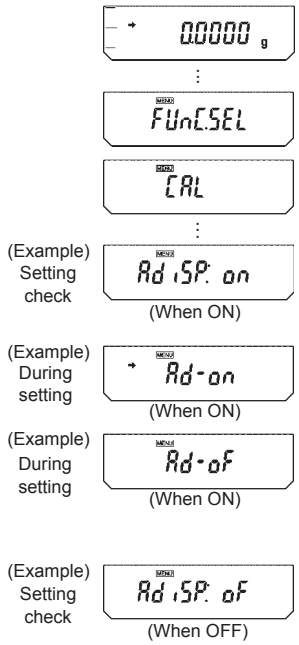
6 Press the **[POWER]** key repeatedly to return to the mass display.

9. Display Settings

9.1 Bar Graph Display

This function displays a bar graph representation of the load on the pan. This may be used to prevent sudden appearance of "oL" (overload) during measurement. This bar graph display can be turned on or off.

Setting ON/OFF



1 Press the **[CAL]** key repeatedly from the mass display and when "Func.SEL" appears, press the **[O/T]** key. "CAL" is displayed.

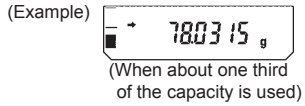
2 Press the **[CAL]** key repeatedly unit "AdiSP:**" appears. The ** position displays the current setting "on" or "oF".

3 Press the **[O/T]** key. "Ad-on" is displayed. At this point, pressing the **[CAL]** key switches the display between "Ad-on" and "Ad-oF".
When the current setting is displayed, the stability mark (➡) appears. To change the setting, press the **[O/T]** key when the desired setting appears, and the display will return to "AdiSP:**", indicating the new setting.

4 If no change is required, press the **[POWER]** key. The display returns to "AdiSP:**".

5 Press the [POWER] key repeatedly to return to the mass display.

Bar graph in weighing



9.2 Changing the Minimum Display

(CAUW/CAUX/CAUY series only)

The CAUW/CAUX/CAUY series allow the minimum display to be changed by one digit if desired. The last decimal place will be rounded and removed from the display.

(Standard)

1 (To change the minimum display by one digit)
Press the **[1d/10d]** key from the mass display. The minimum display digit will be displayed with only three decimal places.

2 (To return the minimum display to the standard setting)
Press the **[1d/10d]** key from the mass display. The minimum display digit will return to the previous setting.

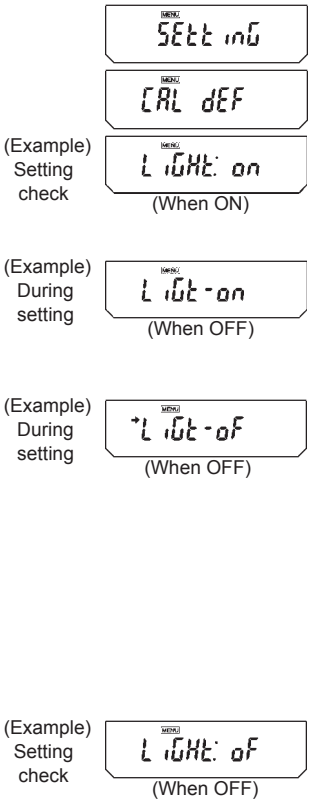
Note

- The decimal point does not move. When the minimum display is changed by one decimal place, the final decimal place remains empty.
- In the CAUW-D series the [1d/10d] key switches the weighing ranges and the position of the decimal point also changes. (See 5.3)

9.3 Turning the Backlight On and Off

(CAUW series only) (Not for CAUW-D)

The CAUW series is equipped with a backlight for the display to allow easy viewing Regardless of the surrounding lighting conditions. The backlight can be switched on and off.



(Example) Setting check

(Example) During setting

(Example) During setting

(Example) Setting check

1 Press the **[CAL]** key repeatedly from the mass display until "SEttinG" appears.
Press the **[O/T]** key. "CAL dEF" appears.

2 Press the **[CAL]** key and the display shows "LiGHt:**". The ** position shows "on" for on, and "oF" for off.

3 To change the settings, press the **[O/T]** key when the "LiGHt:**" appears. The display shows "LiGt-on".

4 From that point, every time the **[CAL]** key is pressed, the display switches between "LiGt-on" (on), and "LiGt-oF" (off). Here, when the current setting is displayed, the stability mark (➡) appears.

5 Press the **[O/T]** key when the desired setting appears, and the display will return to "LiGHt:**", indicating the new setting.

6 If no change is required, press the **[POWER]** key to return to "LiGHt:**".

7 Press the **[POWER]** key repeatedly to return to the mass display.

> **Note**
>
> When backlight is used for normal operations, any required "warm-up" should also by performed with backlight on. Leave the balance in mass display, rather than "STAND-BY" for the required warm-up period. (See 4.4)

10. Calibration

10.1 What is calibration?

10.1.1 The Necessity of Calibration

Calibration is required to accurately weigh items with an electric balance. Calibration must be performed in these conditions:

- When the location of the installation site is changed (even when moved within the same room).
- When the room temperature changes.
- Also, daily calibration before use is recommended.

The CAUW-D/CAUW/CAUX series are set to operate fully-automatic span calibration PSC by default. The CAUY series requires span calibration using external weights.

The Essential Role of Span Calibration for the Use of Electronic Balances

The measurement desired when using an electronic balance is the measurement of mass. However, an electronic balance cannot detect mass directly.
Instead, it detects the weight (the weight is the Earth's attraction on the item, gravity) and displays the mass as computed from the weight. The proportion of mass to weight depends on the gravitational acceleration at the location. By placing calibration weights of accurately known mass on the electronic balance, the corresponding weight for that mass can be recorded. This allows the mass of any item that is subsequently weighed to be computed from its weight and accurately displayed. The recording and setting of weight-mass relation is known as span calibration. The necessity can be recognized this way for example, the gravitational acceleration in the Japanese cities of Kyoto and Tokyo are 979.70775 cm/s2 and 979.76319 cm/s2 respectively, with a difference of about 0.0057%. This means that if a balance is calibrated in Kyoto and the balance is moved to Tokyo, an object of 100.0000g mass will exhibit 100.0057g on the balance, generating an error of two digits. Always perform span calibration at the installation site before using the balance to correct for this effect. In addition, electronic balances use a permanent magnet and a coil in their weight detecting system. Even with compensation, a permanent magnet generates a sensitivity difference of up to ± 2ppm (two millionths) with every 1 C fluctuation in temperature. When measuring for example, a 100g object, this difference amounts to ±2mg, which means a possible error on the final two digits displayed on the electronic balance. If the temperature changes by 5°C after calibration, an object of 100.0000g may appear to increase to a maximum of 100.0010g. When there is a change in temperature, always calibrate again for accurate measurement.

10.1.2 Types of Calibration

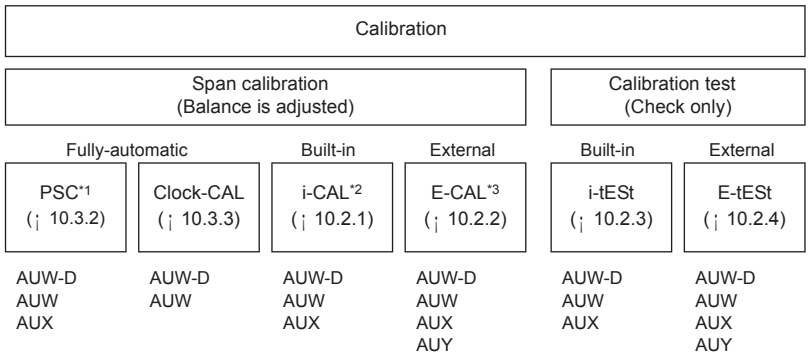
Terms used in this manual:

Span calibration ..... Adjustment of the balance sensitivity using two weight values, zero and near-capacity

Calibration test ..... Comparing the current calibration mass reading to the calibration mass reading after the last span calibration.

Calibration ..... Specifies both span calibration and calibration test.

The CAUW-D/CAUW/CAUX series have a built-in, motor-driven calibration weight. This weight allows easy key calibration operations (i-CAL, i-tESt) without having to maintain external weights and manually load and unload weights. These models are also equipped with functions for performing fully-automatic span calibration whenever necessary. The two functions are PSC, for executing automatic span calibration made necessary by temperature changes, and Clock-CAL, for performing automatic span calibration at set times. Calibration can also be done with external calibration weights (E-CAL, E-tESt). Calibration of the built-in calibration weight with external calibration weights (PCAL) is also possible.
Calibration of the CAUY series must be done with external calibration weights as this series does not have a built-in calibration weight.



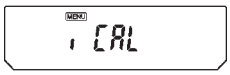
Each calibration type is available for the listed series only.
*1 Default setting is ON for CAUW-D/CAUW/CAUX
*2 Default preset calibration method for CAUW-D/CAUW/CAUX
*3 Default preset calibration method for CAUY

10.2 Executing Calibration

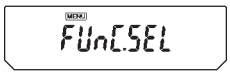
Perform calibration only after correct installation and thorough warm up. Also, make sure that nothing is on the pan and ensure conditions free from the influence of vibrations or wind.

10.2.1 Span Calibration With Built-in Weight
(CAUW-D/CAUW/CAUX series only)

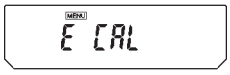
"i-CAL" (The balance will be adjusted with the built-in calibration weight.)



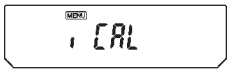
1 From the mass display, press the **[CAL]** key once. If the display shows "i-CAL" (Preset calibration method is "i-CAL"), jump to Step **5**.
If the display shows another item (Preset calibration method is not "i-CAL"), go on to Step **2**.
(Refer to 10.3.1 for preset calibration method)



2 Press the **[CAL]** key repeatedly until "FUnC.SEL" appears, then, press the **[O/T]** key to display "CAL".

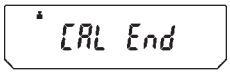


3 Press the **[O/T]** key again. The display shows "E CAL".



4 Press the **[CAL]** key twice. The display shows "i-CAL".

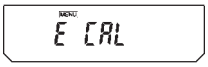
⋮



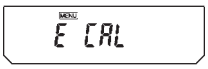
5 Press the **[O/T]** key. The motor sound of weight loading system is heard and the display changes automatically in this order: "CAL 2", "CAL 1", "CAL 0", and "CAL End".
When the display returns to the mass display, span calibration is complete.

10.2.2 Span Calibration With External Weights

"E-CAL" (The balance will be adjusted with external calibration weights)



1 From the mass display, press the **[CAL]** key once. If the display shows "E CAL" (Preset calibration method is "E-CAL"), jump to Step **4**.
If the display shows another item (Preset calibration method is not "E-CAL"), go on to Step **2**.
(Refer to 10.3.1 for preset calibration method)



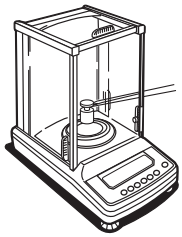
2 Press the [CAL] key repeatedly until "FUnC.SEL" appears, then press the **[O/T]** key to display "CAL".

3 Press the [O/T] key. The display shows "E CAL".

4 While "E-CAL" is shown, press the **[O/T]** key. Span calibration begins and the zero display blinks.

(Example)

5 Recheck that there is nothing on the pan and wait.



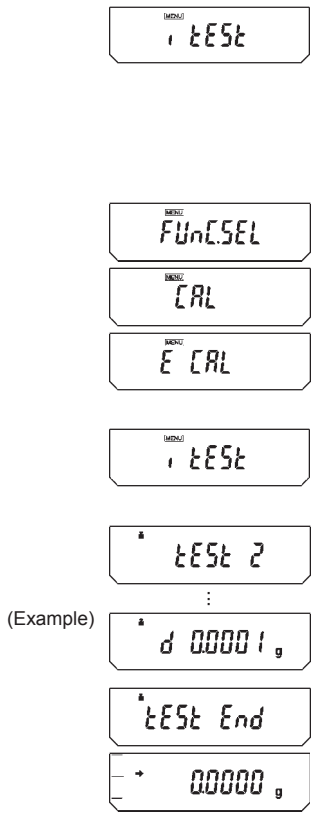
6 The set weight value (Refer to 10.3.5) appears, blinking.

7 Place the weight indicated on the pan. Wait until the blinking zero display reappears.
(It may take about 30 seconds.)

8 Remove the calibration weight.
After "CAL End" appears for several seconds, the display returns to the mass display and the span calibration is complete.

10.2.3 Calibration Check With Built-in Weight
(CAUW-D/CAUW/CAUX series only)

"i-tESt" (The balance is checked with the built-in weight but not adjusted.)



1 From the mass display, press the **[CAL]** key once. If the display shows "i tESt" (Preset calibration method is "i-tESt"), jump to Step **5**.
If the display shows another item (Preset calibration method is not "i-tESt"), go on to Step **2**.
(Refer to 10.3.1 for preset calibration method)

2 Press the **[CAL]** key repeatedly until "FUnC.SEL" appears, then, press the **[O/T]** key to display"CAL".

3 Press the **[O/T]** key again. The display shows "E CAL".

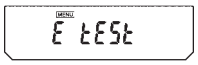
4 Press the **[CAL]** key repeatedly until the display shows "i tESt".

5 Press the **[O/T]** key. The display changes automatically in this order: "tESt 2", "tESt 1", and "tESt 0". After that, the display shows the drift from the previous span calibration for several seconds.

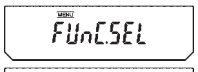
6 After "tEStEnd" appears for several seconds, the display returns to the mass display, and the calibration test is complete.
Note that the Calibration Test procedure DOES NOT adjust the balance, it only reports the drift from the previous span calibration.

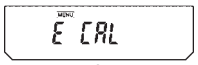
10.2.4 Calibration Check With External Weights

"E-tESt" (The balance is checked with external calibration weights but not adjusted.)

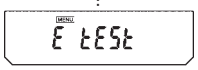


1 From the mass display, press the [CAL] key once. If the display shows "E tESt" (Preset calibration method is "E-tESt"), jump to Step 5.
If the display shows another item (Preset calibration method is not "E-tESt"), go on to Step 2.
(Refer to 10.3.1 for preset calibration method)





2 Press the [CAL] key repeatedly until "FUnC.SEL" appears, then, press the [O/T] key to display "CAL".



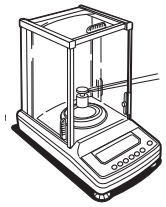
3 Press the [O/T] key. The display shows "ECAL".

4 Press the [CAL] key repeatedly until the display shows "E tESt".

5 Press the [O/T] key. The calibration test begins and the zero display blinks.

(Example)

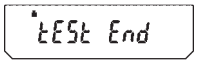
6 Recheck that there is nothing on the pan and wait.



7 The set weight value (Refer to 10.3.5) appears, blinking.

8 Place the weight indicated on the pan. Wait until the blinking zero display reappears.
(It may take about 30 seconds.)

(Example)



9 Remove the weight. The display shows the drift from the previous span calibration for several seconds. Then, after "tESt End" appears for several seconds, the display returns to the mass display, and the calibration test is complete.
Note that the Calibration Test procedure DOES NOT adjust the balance, it only reports the drift from the previous span calibration.

10.3 Calibration Settings

One of the following four calibration methods listed in the below step 3 is selected as "preset calibration method". Preset calibration method will be called with only one key touch from the mass display for convenience of frequent use. Select your most frequently used method here. The default setting is "i-CAL" ("E-CAL" for CAUY). The rest of the methods are alternative calibration methods, which can also be performed at any time by entering the function selection menu. Procedures for performing each calibration method as the preset or as an alternative calibration method are described in 10.2.

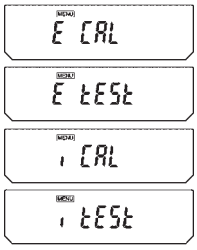
10.3.1 Selecting Preset Calibration Method

1 From the mass display, press the [CAL] key repeatedly until the "SEttinG" menu appears. Press the [O/T] key. "CAL dEF" appears.

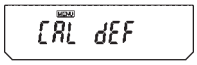
2 When "CAL dEF" appears, press the [O/T] key. The "E CAL" display appear.

3 Press the [CAL] key repeatedly until the desired setting appears. Select from the following four types (or two types for CAUY series). The stability mark appears when the currently preset method is shown.

(Displays of four menu items)



"E CAL": Span Calibration with external weights (E-CAL)
"E tESt": Calibration test with external weights (E-tESt)
"i CAL": Span Calibration with built-in calibration weight (i-CAL) (CAUW-D/CAUW/CAUX series only)
"i tESt": Calibration test with built-in calibration weight (i-tESt) (CAUW-D/CAUW/CAUX series only)



4 Press the [O/T] key when the desired calibration setting appears. "CAL dEF" appears when the setting is made.

5 Press the [POWER] key to return. The calibration type set here can be executed by simply pressing the [CAL] key followed by the [O/T] key from mass display.

10.3.2 PSC Fully-automatic span calibration
(CAUW-D/CAUW/CAUX series only)

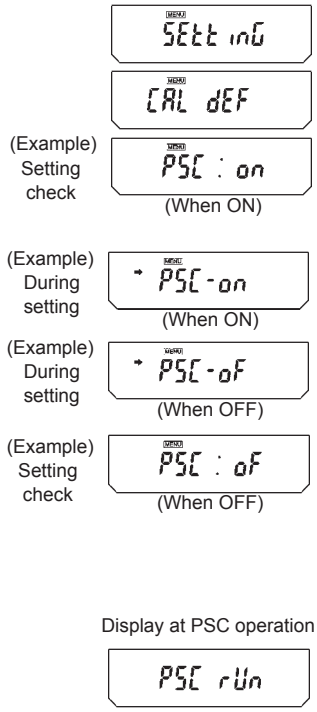
Using a temperature sensor, this function performs fully-automatic span calibration with the built-in weight when a significant temperature change is detected.
If PSC turned ON, when there is a temperature change that would influence sensitivity, span calibration executes automatically to maintain the sensitivity of the balance.
Span Calibration executes automatically in mass display mode under any of the following circumstances.

(1) When there is a change in the surrounding temperature.
(2) When about four hours has passed since the previous calibration.
(3) After either condition (1) or (2) above has been met during warm up at stand-by status, when the balance is switched to mass display mode.

In mass display mode, when any of the conditions above has been met, the weight symbol will blink for about two minutes as notification of span calibration before calibration begins. The sensitivity before and after span calibration is slightly different. Also, no measurements can be made during span calibration. When you wish to avoid entering span calibration in the middle of one round of measurements, pressing the **[POWER]** key when the weight symbol is blinking will abort the automatic span calibration.

> ⚠ Caution
>
> Make certain that no object is on the pan and all the doors are closed during span calibration. Never cause vibration of the balance during calibration.

Setting PSC ON/OFF



1 From mass display, press the **[CAL]** key repeatedly until "SEttinG" appears. Press the **[O/T]** key to display "CAL dEF".

2 Press the **[CAL]** key repeatedly until "PSC:**" appears. The ** positions show the current setting, either "on" when on or "oF" when off.

3 To change the setting, press the **[O/T]** key when "PSC:**" appears.

4 "PSC-on" appears and from this point, every time the **[CAL]** key is pressed, the display switches between "PSC-oF" and "PSC-on". Here, when the current setting is displayed, the stability mark (➡) appears. When the desired setting appears, pressing the **[O/T]** key changes the current setting. Pressing the **[POWER]** key returns the setting to "PSC:**" without changing the setting.

Display at PSC operation

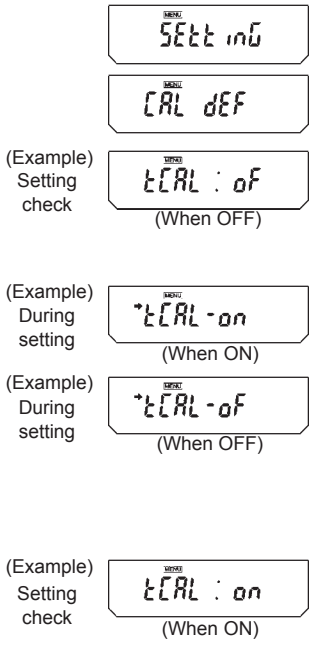
5 Press the **[POWER]** key repeatedly to return to the mass display.

PSC and Clock-CAL can each be turned on and off independently.
Weight symbol appears in the Settings Check Display (see 7.4.1) when either or both of PSC and Clock-CAL are on.

10.3.3 Clock-CAL Fully-automatic span calibration
(CAUW-D/CAUW series only)

The balance can be set to execute fully-automatic span calibration at set times (up to three times a day) with the built-in weight and the built-in clock.
Clock-CAL is a very convenient function, when calibration reports are desired for regular calibrations, or to schedule span calibrations during break times to avoid interruption of measurement work. The weight symbol blinks for about two minutes as notification of span calibration before it begins. Pressing the **[POWER]** key during the notification blinking halts the automatic span calibration.

> **Caution**
>
> Make certain that no object is on the pan and all the doors are closed during span calibration. Never cause vibration of the balance during calibration.



Setting PSC ON/OFF

1 From mass display, press the **[CAL]** key repeatedly until "SEttinG" appears. Press the **[O/T]** key to display "CAL dEF".

2 Press the **[CAL]** key repeatedly until "tCAL:**" appears. The ** positions show the current setting, either "on" when on or "oF" when off.

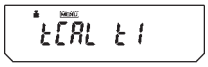
3 To change the setting, press the **[O/T]** key when "tCAL:**" appears.

4 "tCAL-on" appears and from this point, every time the **[CAL]** key is pressed, the display switches between "tCAL-oF" and "tCAL-on". Here, when the current setting is displayed, the stability mark (➡) appears. When the desired setting appears, pressing the **[O/T]** key changes the current setting. Pressing the **[POWER]** key returns the setting to "tCAL:**" without changing the setting.

5 Press the **[POWER]** key repeatedly to return to the mass display.

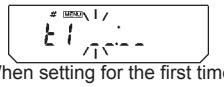
Setting the time for Clock-CAL

(Example)



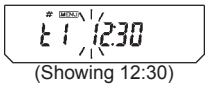
(For the t1 setting)

(Example)



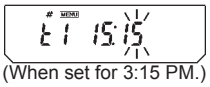
(When setting for the first time)

(Example)

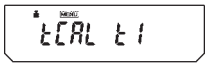


(Showing 12:30)

(Example)



(When set for 3:15 PM.)



1 From mass display, press the **[CAL]** key repeatedly until "SEttinG" appears. Press the **[O/T]** key to display "CAL dEF"

2 Press the **[CAL]** key repeatedly until "tCAL t*" appears. Press the **[O/T]** key to display "t* HH:MM". The * position shows the reference number of the time setting, a numeral from 1 to 3. The currently set time is displayed as "HH:MM" (HH is the hours and MM is the minutes), with the leftmost digit blinking. The time appears as _ _:_ _ when no time is set. The MENU symbol, and the # symbol appear to indicate the display is in the numerical input mode.

3 The numeral of the blinking digit may be changed. Pressing the **[PRINT]** key moves the blinking digit one place to the right. Press the **[UNIT]** key to change the value of the blinking digit. When the **[UNIT]** key is pressed, the value of the blinking digit increases by 1 at a time. The numerals progress in this order: 0→1→2→...→9→_→0... Set the hours in the range from 00 to 23 and the minutes from 00 to 59. Press the **[POWER]** key to complete the setting. The display returns to "t CAL t *".

4 To set another time, press the **[CAL]** key to move to the next "t CAL t*" setting and set the time in the same way.

5 After completing the setting, press the [POWER] key to return to the mass display.

Clearing the Settings

The Clock-CAL settings "tCAL t1" to "tCAL t3" may each be reset by using procedure 3 to set the time to _ _:_ _.

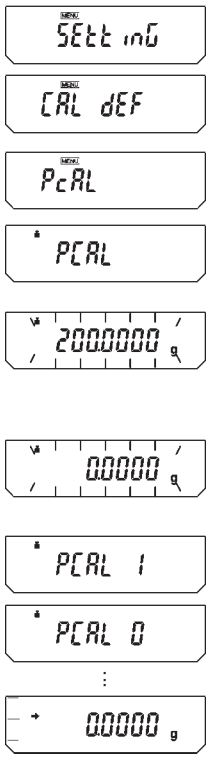
PSC and Clock-CAL can each be set on and off independently. Weight mark appears in the settings Check Display (see 7.4.1) when either or both of PSC and Clock-CAL are on.

10.3.4 PCAL: Calibration of the Built-in Weight

(CAUW-D/CAUW/CAUX series only)

The built-in calibration weight is already calibrated before shipping but the operator can also calibrate the built-in calibration weight using their own external calibration weights.
The calibration of the built-in calibration weight is called PCAL. Inputting the conventional mass value (s) of the operator's calibration weight (s) can provide the most accurate span calibration (refer to 10.3.6). Perform span calibration only after correct installation and thorough warm up. Also, make sure that nothing is on the pan and ensure conditions free from the influence of vibration or air flow.

Setting PSC ON/OFF



(Example)

1 From mass display, press the **[CAL]** key repeatedly until "SEttinG" appears.
Press the **[O/T]** key.
"CAL dEF" appears.

2 Press the **[CAL]** key repeatedly until "PcAL" appears and press the **[O/T]** key.
Calibration of the built-in calibration weight begins and the display shows "PCAL" (the C becomes capital).

3 When the display shows a value, "XXX.XXXX", place the weight of the value displayed on the pan. (Refer to 10.3.6)

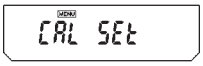
4 After that, "0.0000" is displayed.
Remove the calibration weights from the pan.

5 The display changes automatically from "PCAL 1" to "PCAL 0". (The built-in weight is being loaded and unloaded.)

6 When the display returns automatically to the mass display, the calibration is complete.

10.3.5 Inputting External Calibration Weight Value for E-CAL

The exact value (conventional mass value) of the operator's calibration weight to be used for E-CAL and E-tESt procedures can be entered.



(Example)

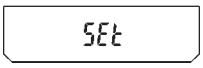
1 From mass display, press the **[CAL]** key repeatedly until "SEttinG" appears. Press the **[O/T]** key. "CAL dEF" appears.

2 Press the **[CAL]** key repeatedly until "CAL SEt" appears and press the **[O/T]** key. One of these numbers will appear, depending on the model: 50.0000g, 100.0000g, 200.0000g, or 300.0000g. In the upper part of the display panel, the MENU symbol and the # symbol appear in order to indicate numerical input mode. The leftmost numeral blinks. The blinking digit may be changed.

(Example)

3 When the **[UNIT]** key is pressed, the value of the blinking digit increases by 1 at a time. Press the [PRINT] key to move the blinking digit one place to the right. Enter the desired value.

4 Press the **[O/T]** key to set the external calibration weight value. The display proceeds to "SEt" and then to "CAL SEt".



5 Press the **[POWER]** key again to return to the mass display.

Calibration Weight Value Range

CAUW-D series	220D	75g to capacity
	120D	35g to capacity
Other series	320	145g to capacity
	220	95g to capacity
	120	45g to capacity

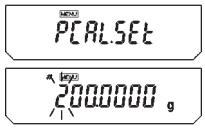
Note

In the CAUW-D series the conventional mass value may be input for up to five decimal places.

10.3.6 Inputting External Calibration Weight Value for PCAL

The exact value (conventional mass value) of the operator's calibration weight to be used for PCAL procedure can be entered.

1 From mass display, press the **[CAL]** key repeatedly until "SEttinG" appears. Press the **[O/T]** key. "CAL dEF" appears.



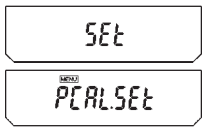
2 Press the **[CAL]** key repeatedly until "PCAL Set" appears and press the **[O/T]** key. One of these numbers will appear, depending on the machine model: 50.0000g, 100.0000g, 200.0000g, or 300.0000g. In the upper part of the display panel, the MENU symbol and the # symbol appear in order to show number entry mode. The leftmost numeral blinks. The blinking digit may be changed.

(Example)

3 When the **[UNIT]** key is pressed, the value of the blinking digit increases by 1 at a time. Press the **[PRINT]** key to move the blinking digit one place to the right. Enter the desired value.

(Example)

4 Press the **[O/T]** key to set the external calibration weight value for built-in weight calibration. The display proceeds to "SEt", then to "PCAL SEt".



5 Press the **[POWER]** key again to return to the mass display.

Calibration Weight Value Range

CAUW-D series	220D	75g to capacity
	120D	35g to capacity
Othes series	320	145g to capacity
	220	95g to capacity
	120	45g to capacity

Note

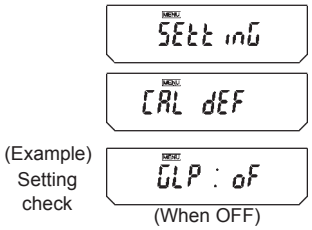
In the CAUW-D series the conventional mass value may be input for up to five decimal places.

10.4 For GLP/GMP/ISO Compliance

10.4.1 Calibration Report Setting

Setting the calibration report provides an automatic calibration record output every time span calibration or calibration test is performed. An optional electronic printer (see 14.1) can save reports by printing them. Combination with Clock-CAL function (see 10.3.3) provides fully-automatic and periodical calibration and reports.

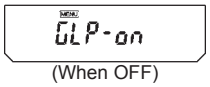
• As WindowsDirect function can transfer numerical values only, the descriptions appearing in this calibration report can not be received properly through WindowsDirect.



(Example) Setting check

(When OFF)

(Example) During setting



(When OFF)

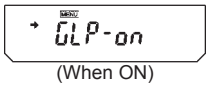
1 From mass display, press the **[CAL]** key repeatedly until "SEttinG" appears. Press the **[O/T]** key. "CAL dEF" appears.

2 Press the **[CAL]** key repeatedly until "GLP: **" appears. The ** positions show the current setting, "on" when set and "oF" when unset.

3 To change the setting press the **[O/T]** key when "GLP: **" is showing. The display will show "GLPon". (The ":" becomes "-")

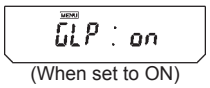
4 From this point, every time the **[CAL]** key is pressed, the display will switch between "GLP- oF" and "GLP-on". Here, when the current setting is displayed, the stability mark (➡) appears.

(Example) During setting



(When ON)

(Example) Setting check



(When set to ON)

5 To change the setting, press the **[O/T]** key when the desired setting appears, or

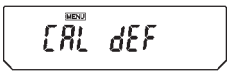
6 Press the **[POWER]** key to return to "GLP: **" without changing the setting.

7 Press the **[POWER]** key again to return to the mass display.

> **Note**
>
> Date output, ID number etc. of electronic printer EP-50 or EP-90 should be Turned off when calibration report is produced.

10.4.2 Balance ID Setting

This setting is for the balance ID number that is output along with the calibration report.

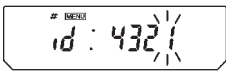


(Example)

1 From mass display, press the **[CAL]** key repeatedly until "SEttinG" appears. Press the **[O/T]** key. "CAL dEF" appears.

2 Press the **[CAL]** key repeatedly until "id: ****" appears. (The **** is a number.) Press the **[O/T]** key. In the upper part of the display panel, the MENU symbol and the **#** symbol appear in order to indicate numerical input mode. The leftmost digit of **** blinks. The numeral of the blinking digit can be changed.

(Example)



3 Press the **[UNIT]** key to increase the value of the blinking digit by 1. Press the [PRINT] key to set that digit and move the blinking digit one place to the right. When the desired setting is entered, press the **[O/T]** key to confirm the balance ID number.

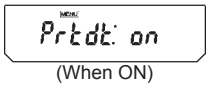
4 Press the **[POWER]** key to return to "id: ****". (No blinking)

5 Press the **[POWER]** key again to return to the mass display.

10.4.3 Date Printout Setting

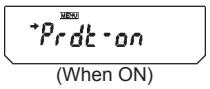
This setting determines whether or not the date and time on the balance's built-in clock is printed out along with the calibration report.

(Example) Setting check



(When ON)

(Example) During setting



(When ON)

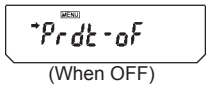
1 From mass display, press the **[CAL]** key repeatedly until "SEttinG" appears. Press the **[O/T]** key. "CAL dEF" appears.

2 Press the **[CAL]** key repeatedly until "Prtdt:**" appears. The ** positions show the current setting, "on" when set (print) and "oF" when unset (do not print).

3 To change the setting, press the **[O/T]** key when "Prtdt:**" is showing. The display will show"Prdt-on". (The ":" becomes "-")

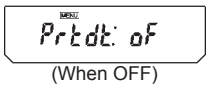
4 From this point, every time the **[CAL]** key is pressed, the display will switch between "Prdt-oF" and "Prdt-on". Here, when the current setting is displayed, the stability mark (➡) appears.

(Example) During setting



(When OFF)

(Example) Setting check



(When OFF)

5 To change the setting, press the **[O/T]** key when the desired setting appears, or

6 Press the **[POWER]** key to return to "Prtdt: **" without changing the setting.

7 Press the **[POWER]** key again to return to the mass display.

11. Environment Settings

11.1 What are environmental settings?

The response and other settings can be changed to adapt to the installation environment (for example, unavoidable vibrations or air currents) or measurement uses (for example, depending on whether solid objects, liquids, or powders are to be measured).

11.2 Settings for Stability and Response

Generally, signal processing for greater stability slows the response and processing for higher response reduces stability. The CAUW-D/CAUW/CAUX/CAUY series are designed to have capability to provide both good response and high stability.
Most measurements can be done with the default settings, which is Standard mode. Depending on the environment and the objectives of using the balance, Anti-convection mode, High-stability mode and Pouring mode are also available. The currently set mode is easily checked by pressing the [CAL] key four times from mass display to produce the settings check display (see 7.4.1).

11.2.1 Standard mode

Settings Check Display

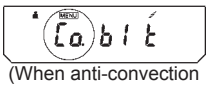
(When standard mode is selected)

This is the default setting. Use this mode unless stability or response is affected by environmental factors. From the mass display, pressing the **[CAL]** key repeatedly until "Stnd" is displayed. Pressing the **[O/T]** key here sets the mode to Standard mode. Setting of this mode can be confirmed only in settings check display (see 7.4.1).

11.2.2 Anti-convection mode

When ambient temperature changes (such as those due to air-conditioner cycling) are unavoidable during measurements, convection may occur in the weighing chamber and cause display fluctuation after the stability mark appears. The small range (minimum display of 0.01mg) of the CAUW-D series is more likely to demonstrate this effect.

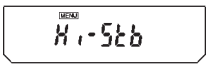
Settings Check Display



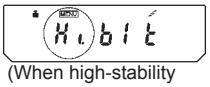
(When anti-convection mode is selected)

Anti-convection mode adjusts the timing of appearance of the stability mark. Note that when Anti-convection mode is selected, the stability mark will take longer to appear. From the mass display, press the **[CAL]** key repeatedly until "ConvECt" is displayed. Pressing the **[O/T]** key here sets it to Anti-convection mode. Setting of this mode can be confirmed only in settings check display (see 7.4.1).

11.2.3 High-stability Mode



Settings Check Display

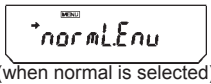


(When high-stability mode is selected)

The CAUW-D/CAUW/CAUX/CAUY series is designed to minimize the effects of vibrations or air currents. However, if it must be set up in a location with poor conditions, use this function to reduce the effects of vibration or air current even further. The response will slow slightly but the display will be stabilized. From the mass display, press the **[CAL]** key repeatedly until "Hi-Stb" is displayed. Press the **[O/T]** key here to enter High-stability mode. Setting of this mode can be confirmed only in settings check display (see 7.4.1).

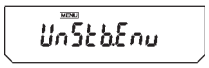
11.2.4 Pouring Mode (fast response)

When using the balance for dosing or filling a specified quantity, Pouring mode will give sufficiently fast response. Note that the display will become very sensitive and unstable. Pouring mode allows adjustments to the surrounding environment, too. You can specify the environment of the installation site choosing from "normal environment", "stable environment", and "unstable environment".



(when normal is selected)

Press the **[CAL]** key repeatedly from the mass display until "Pouring" appears.
Pressing the **[O/T]** key here sets it to Pouring mode and proceeds to "normL.Env" display.
the arrow mark indicates that the displayed environmental setting is currently selected.
Press **[POWER]** key to return to the mass display.

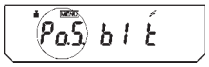


(when normal is selected)

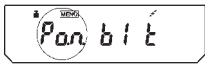
Environmental setting menu

Or, press [CAL] key once or twice to display "StAbL.Env" (for very stable environmental condition) or "UnStb.Env" (for unstable environmental condition). Pressing [O/T] key at each display will select that environmental setting.

It is recommended to set "StAbL.Env" or "UnStb.Env" when you find the measurements are too slow or too unstable with the default "normL.Env".



(Pouring mode for stable environmental condition)



(Pouring mode for normal environmental condition)

(Pouring mode for unstable environmental condition)

Settings check display

Setting of Pouring mode can be confirmed only in the settings check display (see 7.4.1). Settings check display also shows the environmental setting for Pouring mode when this mode is selected.

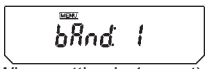
11.3 Stability Detection Band

The appearance of the Stability Mark (➡) indicates that the mass display has been stabilized. The condition for judging stability is user-selectable. When the stability detection band is set to 1, the stability mark appears when the mass display stays within 1 count for a set period of time. The stability detection band setting may be selected from three levels: 1 count, 5 counts and 10 counts. The default setting is 1 count. One count is equal to 0.1mg when the minimum display is 0.1mg. The setting of the stability detection band can be checked in the settings check display (see 7.4.1) by pressing the **[CAL]** key four times from mass display.

Setting the Stability Detection Band

1 Press the **[CAL]** key repeatedly from the mass display. When "FUnC.SEL" appears, press the **[O/T]** key. "CAL" is displayed.

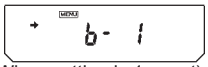
(Example)



(When setting is 1 count)

2 Press the **[CAL]** key twice. "bAnd:* *" is shown.
The ** part (single or double digits) shows the current stability detection band setting.

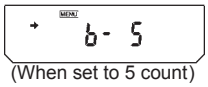
(Example)



(When setting is 1 count)

3 Press the **[O/T]** key. "b-1" appears.
At this point, pressing the **[CAL]** key changes the display in this order: "b-1", "b-5", "b-10" representing stability detection bands of 1 count, 5 counts, and 10 counts, respectively.
When the current setting is displayed, the stability mark (➡) appears.

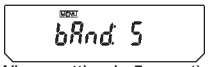
(Example)



(When set to 5 count)

4 Press the **[O/T]** key to select the stability detection band currently displayed, or

(Example)



(When setting is 5 count)

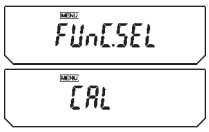
5 Press the **[POWER]** key to return to the "bAnd: **" display without changing the setting.

6 Press the **[POWER]** key to return to the mass display.

11.4 Zero Tracking

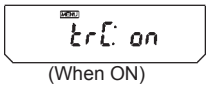
Using the zero tracking function allows the display to be kept at the current zero point by automatically canceling slight drifts from the zero point caused by environmental conditions. When measuring very slow change in mass such as liquid droplets and evaporation processes, it is recommended to turn zero tracking OFF.

Setting zero tracking ON/OFF



1 Press the **[CAL]** key repeatedly from the mass display and when "FUnC.SEL" appears, press the **[O/T]** key to display "CAL".

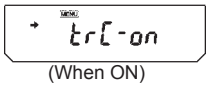
(Example) Setting check



(When ON)

2 Press the **[CAL]** key once. "trC:**" is shown. The ** part shows the current setting as "on" for on and "oF" for off.

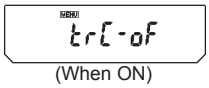
(Example) During setting



(When ON)

3 Press the **[O/T]** key. "trC-on" appears (The ":" changes to "-".). At this point, pressing the **[CAL]** key changes the display between "trC-oF" (zero tracking off) and "trC-on" (zero tracking on).
When the current setting is displayed, the stability mark (➡) appears.

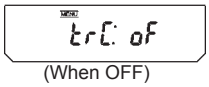
(Example) During setting



(When ON)

4 Press the **[O/T]** key to select the zero tracking setting currently diplayed, or

(Example) Setting check



(When OFF)

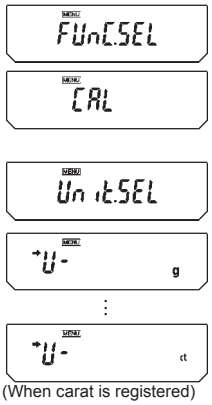
5 Press the **[POWER]** key to return to the "trC: **"display without changing the setting.

6 Press the **[POWER]** key to return to the mass display.

12. Units

The CAUW-D/CAUW/CAUX/CAUY series allow display of various mass units. Units that are registered beforehand can be called by simply pressing the **[UNIT]** key when in mass display.
The default units are gram, percentage, PCS, and carat. In order to use the other units included in the CAUW-D/CAUW/CAUX/CAUY series, register the units beforehand according to section 12.1. Units that are not needed can also be removed from registration.
Registration of units for piece counting and specific gravity measurements are also covered in section 12.1. For information about piece counting, refer to 13.1. Refer to 13.2 for solid specific gravity measurement and 13.3 for liquid density measurement.

12.1 Setting Units of Measurement



(Example)

(When carat is registered)

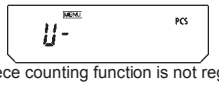
1 Press the [CAL] key repeatedly from the mass display until "FUnC.SEL" is showing.
Press the [O/T] key to display "CAL".

2 Press the [CAL] key repeatedly until "Unit.SEL" appears and press the [O/T] key.
The display shows "U- g".
At this point pressing the [CAL] key cycles the display in the order of the table below.
The stability mark (➡) appears with the units and functions that are currently registered.

Menu display	Units or function	Reference
“U-g”.	g (gram)	
“U-mg”	mg (milligram)	
“U-%”	percentage conversion	See 12.2
“U-PCS”	piece counting	See 13.1
“U-ct”	ct (carat)	
“U-,d”	solid specific gravity measurement	See 13.2
“U-d”	liquid density measurement	See 13.3
“U-mom”	monme*	
“U-Lb”.	pound*	
“U-Oz”	ounce*	
“U-Ozt”	Troy ounce*	
“U-HK”	Hong Kong tael*	
“U-SporE”	Singapore tael*	
“U-tiwAn”	Taiwan tael*	
“U-,mAL”	Malaysia tael*	
“U-ChinA”	Chinese tael*	
“U-dwt”	Pennyweight*	
“U-GN”	Grain*	
“U-m”	Mesghal*	
“U-b”	Baht*	
“U-t”	Tola*	
“U-o”	Parts Pound*	

* Depending on the legal restriction, these units are not always available.

(Example)



(When piece counting function is not registered)

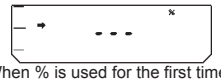
3 Select the units to register by pressing the **[O/T]** key when the desired unit appears. To remove a registered unit, press the **[O/T]** key when the unit to be removed appears with stability mark.

A table of Unit Conversion Constants appears in Appendix A-5.

12.2 Percentage (%) Conversion

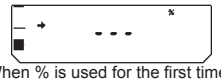
Setting a standard sample to 100% allows percentage conversions.

(Example)



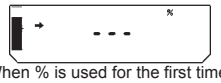
(When % is used for the first time)

(Example)

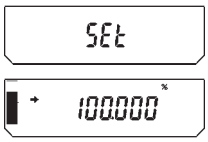


(When % is used for the first time)

(Example)



(When % is used for the first time)



1 Register percentage unit beforehand. (See 12.1.) Percentage unit is registered by default. Therefore, registrantion is not required if the default setting has not been changed.

2 From the mass display, press the **[UNIT]** key repeatedly to switch to the % display.

3 When a weighing vessel (container) is used, place the vessel on the pan and press the **[O/T]** key. (The display does not change.)

4 Load the item to serve as a standard (the item mass serves as 100% and must be at least 100 counts in gram display), and wait for the stability mark to appear.

5 Press the **[CAL]** key. After "SEt" is displayed, the mass of the standard item is set as 100%.

6 Remove the standard item and begin measurement by loading samples.

7 To return to the mass display, press the **[UNIT]** key several times.

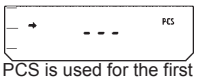
Notes

- When the **[UNIT]** key is pressed, the display returns to the mass display, with units such as g. The actual mass of the current sample can easily be displayed at any time this way.
- When changing the item to serve as a 100% standard, the process must be repeated from step 3.
- In steps 2 through 4, the display is output in percentage based on the last setting of percentage conversion.

13. Application Functions

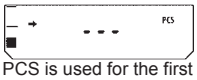
13.1 Piece Counting (PCS)

(Example)



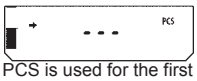
(When PCS is used for the first time)

(Example)

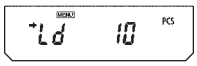


(When PCS is used for the first time)

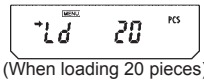
(Example)



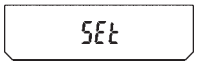
(When PCS is used for the first time)



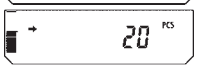
(Example)



(When loading 20 pieces)



(Example)



1 Register PCS as one of the units beforehand. (See 12.1.) PCS is registered by default. Therefore, registration is not required if the default setting has not been changed.

2 From the mass display, press the **[UNIT]** key repeatedly to switch to the PCS display.

3 When a weighing vessel (container) is used, place the vessel on the pan and press the **[O/T]** key. (The display does not change.)

4 Count the 10 pieces (or 20, 50, 100 pieces) of the sample to be measured accurately and load them on the balance.

5 Press the **[CAL]** key. "Ld 10" is displayed.

6 Every time the **[CAL]** key is pressed, the display will change in this order: "Ld 10", "Ld 20", "Ld 50", and "Ld 100".

7 When the correct number of pieces on the balance is displayed and the stability mark has appeared, press the **[O/T]** key.

8 "SEt" appears for several seconds and the number of pieces is displayed.

9 Load the items to be measured and read the number of pieces.

Notes

- When the [UNIT] key is pressed, the display returns to the mass display, with units such as g. The actual mass of the current sample can easily be displayed at any time this way.
- When changing the item to be counted, the process must be repeated from step 3.
- In steps 2 through 4, the display is output in pieces based on the unit mass of the item measured in the previous use of PCS.

13.2 Solid Specific Gravity Measurement

Solid specific gravity measurement computes the density (or specific gravity) of a solid sample by measuring its weight in air and in a liquid of known density (or specific gravity). The following is the procedure when using a hanging pan, a tank and a table allowing below balance weighing, prepared by the operator. Measurement of density or specific gravity can be done even more easily with an optional specific gravity measurement kit.
When using the kit, follow the instruction manual provided with the lkit.

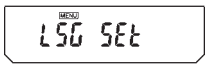
1 Remove the below-weigh hook cover on the base of the balance, after removing the two fixing screws.

2 Hang the user-prepared hanging pan from the below-weigh hook and sink that hanging pan into the liquid of the tank.

3 Register ",d" (the solid specific gravity) as a unit, referring to 12.1.

4 Input the density of the liquid to be used for solid specific gravity measurement.

(a) Press the **[CAL]** key repeatedly from the mass display until the "SEttinG" appears. Press the [O/T] key. The display shows "CAL dEF".

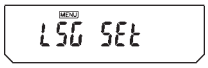


(b) Press the **[CAL]** key repeatedly until "LSG SEt" appears and press the **[O/T]** key. MENU The symbol and the # symbol appearing in the upper part of the display panel indicates it is numerical entry mode. Also "SG*.****" appears (where the *.**** is a number). The leftmost digit of *. **** blinks. The blinking digit can be changed.

(Example)

(Example)

(c) Press the **[UNIT]** key to increase the value of the blinking digit by 1. Press the **[PRINT]** key to set that digit and move the blinking digit one place to the right. When the desired setting is entered, press the **[O/T]** key to confirm the density of the liquid to be used, or



(d) Press the **[POWER]** key to abort the setting and return to the "LSG SEt" display.

(e) Press the **[POWER]** key repeatedly to return to the mass display.

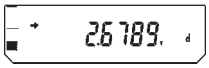
5 Pressing the [UNIT] key repeatedly from the mass display switches the display to ",d". Note that "g" also appears during weight measurement in air.

(Example)

6 Press the [O/T] key.

7 Place the items to be measured on the pan.

(Example)



8 When the stability mark appears, press the [CAL] key.

9 Place the items to be measured on the immersed hanging pan. The display shows the density of the measured item. "dSP oL" may appear when nothing is on the pan, which is normal.

10 To make the next measurement, unload the pans, press [CAL], and begin again at Step 5.

Notes

- Although the density display shows 4 decimal places, not all of these digits will stabilize depending on the conditions.
- When the items to be measured are placed in the liquid, they must be completely immersed and must not have bubbles adhering to the surface of the sample or the immersed hanging pan.

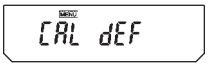
13.3 Liquid Density Measurement

Liquid density measurement computes the density of a liquid by measuring the weight of a sinker (solid) with a known volume in air and in the liquid.
The following is the procedure when using a hanging pan, a tank and a table allowing below balance weighing, prepared by the operator. Measurement of density can be done even more easily with an optional specific gravity measurement kit. When using the kit, follow the instruction manual provided with the kit.

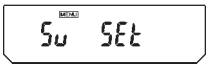
1 Remove the below-weigh hook cover on the base of the balance, after removing the two fixing screws.

2 Hang the user-prepared hanging pan from the below-weigh hook and sink that hanging pan into the sample liquid in the tank.

3 Register "d" (liquid density) as a unit, referring to 12.1.

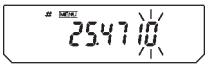


4 Input the sinker volume (in cm3) for liquid density measurement.

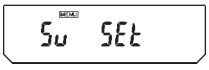


(Example)

(a) Press the **[CAL]** key repeatedly from the mass display until the "SEttinG" display appears. Press the **[O/T]** key. The display shows "CAL dEF".
(b) Press the **[CAL]** key repeatedly until "Sv SEt" appears and press the **[O/T]** key. *.****" appears (where the *.*** is a number). The MENU symbol and the # symbol appearing in the upper part of the display panel indicates it is numerical entry mode. The leftmost digit of *. **** blinks. The blinking digit can be changed.



(c) Press the **[UNIT]** key to increase the value of the blinking digit by 1. Press the **[PRINT]** key to set that place and move the blinking digit one place to the right. When the desired setting is entered, press the **[O/T]** key to confirm sinker volume (in cm3) of the sinker to be used, or
(d) Press the **[POWER]** key to abort the setting and return to the "Sv SEt" display.

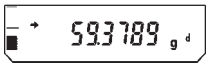


(e) Press the **[POWER]** key again to return to the mass display.

5 Pressing the **[UNIT]** key repeatedly from the mass display switches the display to "d". Note that"g" also appears during weight measurement in air.

6 Press the **[O/T]** key.

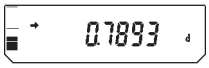
(Example)



7 Place the sinker on the balance pan.

8 When the stability mark appears, press the **[CAL]** key.

(Example)



9 Place the sinker on the immersed hanging pan. The display shows the density of the sample. "dSP oL" may appear when nothing is on the pan, which is normal.

10 To make the next measurement, unload the pans, press **[CAL]**, and begin again at Step 5.

Notes

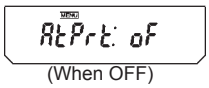
- Although the density display shows 4 decimal places, not all of these digits will stabilize depending on the conditions.
- When the sinker is placed in the sample liquid, it must be completely immersed and must not have bubbles adhering to its surface or the immersed hanging pan.

13.4 Auto Print

Using Auto Print allows measurement results to be automatically output via the RS-232C connector or DATA I/O connector without pressing the **[PRINT]** key with every measurement. This function can be combined with WindowsDirect (see 6.). When Auto Print is activated, if a sample weighing 10 counts or more is placed on the pan while the mass displayed is within ±5 counts of zero, the result is output via the RS-232C cable or DATA I/O connector automatically upon display stabilization. Subsequent sample measurement results will output automatically, if the previous sample is first removed from the pan and the display returns to within ±3 counts of zero.

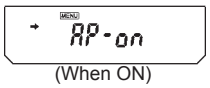
(Example)

(Example) Setting check



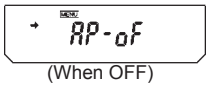
(When OFF)

(Example) During setting



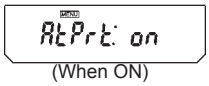
(When ON)

(Example) During setting



(When OFF)

(Example) Setting check



(When ON)

1 Press the **[CAL]** key repeatedly from the mass display until "FUnC.SEL" appears. Press the **[O/T]** key. The display will show "CAL".

2 Press the **[CAL]** key repeatedly until "AtPrt:* *" appears. the "**" shows the current setting, "on" for on and "oF" for off.

3 Press the **[O/T]** key. The display shows "AP-on"and after this, pressing the **[CAL]** key switches the displays between "AP-on" and "AP-oF". When the current setting is displayed, the stability mark (➡) appears. To change the setting, press the **[O/T]** key when the desired setting appears, or

4 Press the **[POWER]** key to return to "AtPrt: **" without changing the setting.

5 Pressing the **[POWER]** key again returns to the mass display.

6 When the Auto Print mode is set up, the Auto Print symbol appears in the mass display.

7 To turn the Auto Print function off, follow steps 1through 3, above.

Notes

No more than one of the four application modes, Auto Print (13.4), Interval Timer(13.5), Add-on Mode (13.6), Formulation Mode (13.7), can be set ON at the sametime.

13.5 Interval Timer (CAUW-D/CAUW/CAUX series only)

This function automatically outputs the measurement values of the balance at set time intervals.

(Example)

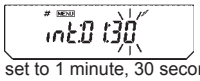
1 Press the **[CAL]** key repeatedly from the mass display until "FUnC.SEL" appears. Press the **[O/T]** key to display "CAL".

2 Press the **[CAL]** key repeatedly until "int" appears.

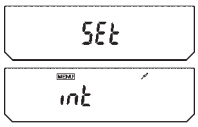
(Example)

3 Press the **[O/T]** key. "int: **:**" appears. (**** are numbers)
The MENU symbol and the # symbol appear in order to show number entry mode. **:** shows the current interval setting as [MM:SS] (where MM is minutes and SS is seconds). The leftmost digit blinks.

(Example)



(When set to 1 minute, 30 seconds)



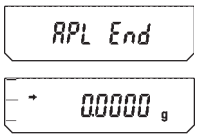
4 Pressing the **[UNIT]** key increases the blinking digit by 1. Pressing the **[PRINT]** key moves the blinking digit one place to the right. Set minutes up to 99 and seconds up to 59.

5 Press **[O/T]** key to set.

(Example)

6 Press the **[POWER]** key repeatedly to return to the mass display. The letter "T" and STAND-BY symbol appear indicating interval output standby.

7 Press the **[PRINT]** key. Automatic output commences and continues at the set interval.



8 To pause, press the **[POWER]** key.

9 To discontinue the Interval Timer printing function, hold down the **[POWER]** key during mass display for about three seconds until "APL End" appears. The letter "T" and STAND-BY symbol will disappear.

Note

No more than one of the four application modes, Auto Print (13.4), Interval Timer (13.5), Add-on Mode (13.6), Formulation Mode (13.7), can be set ON at the same time.

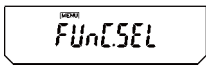
Notes

- The [O/T] key can always be used for taring.
- In interval timer standby status, pressing the [POWER] key puts the balance in power standby status.
- Using the interval timer function for long periods of time may generate measurement errors due to drift of the balance.
- Short interval settings may not operate properly, depending on the capability of the device receiving the data. In this case, increase the length of the interval.
- During use of the interval timer function, keep PSC (10.3.2) and Clock-CAL (10.3.3) functions off.
- Do not perform any type of calibration while using interval timer function.

13.6 Add-on Mode

This function is convenient for making many measurements of minute samples. In this mode with any unit, when the displayed value is within ±5 counts of zero, and an item of mass of 10 counts or more is placed on the pan, that value is output via the RS-232C cable or DATA I/O connector upon display stability and automatic taring is done each time afterwards.
This is repeated newly every subsequent time a new sample is placed on the balance.
(In the CAUW/CAUX/CAUY series, when the minimum display digit has been eliminated by pressing the **[1d/10d]** key, the evaluation is based on the count number displayed before.)
Pressing the **[POWER]** key stops the Add-on function. When stopped, the measurements up to that point are summed up and displayed. When the optional printer or computer are connected, the startup is printed out as "--------- ADDON MODE ---------" and upon stop, the total is printed out as "TOTAL=".

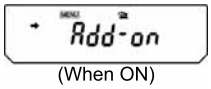
(Example)



(Example)
Setting check

(When OFF)

(Example)
During setting

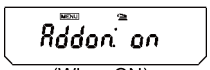


(When ON)

(Example)
During setting

(When OFF)

(Example)
Setting check



(When ON)

1 Press the **[CAL]** key repeatedly from the mass display until "FUnC.SEL" appears. Press the **[O/T]** key. The display will show "CAL".

2 Press the **[CAL]** key repeatedly until "Addon: **" appears. The "**" shows the current setting, "on" for on, "oF" for off.

3 Press the **[O/T]** key. The display shows "Adon-on" and after this, pressing the **[CAL]** key switches the displays between "Adon-on" and "Adon-oF". When the current setting is displayed, the stability mark (➡) appears. Press the **[O/T]** key when the desired setting is shown, to change the setting.

4 Press the **[POWER]** key to return to"Addon:**"

5 Pressing the **[POWER]** key again returns to the mass display.

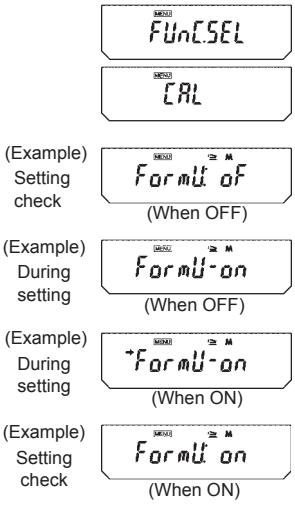
6 When the Add-on Mode is set up, the add-on mode symbol appears in the mass display.

Notes

- No more than one of the four application modes, Auto Print (13.4), Interval Timer (13.5), Addon Mode (13.6), Formulation Mode (13.7), can be set ON at the same time.
- When Add-on mode is in use, fully-automatic span calibration by PSC (10.3.2) or Clock-CAL (10.3.3) is not performed. Instead, Weight symbol ( ) keeps blinking when span calibration is necessary. Span calibration can be performed between sets of measurements.

13.7 Formulation Mode

This function is convenient for making many measurements of minute samples and seeking the total mass. In this mode with any unit, when a sample is placed on the pan and [PRINT] key is pressed, that value is output via the RS-232C cable or DATA I/O connect and automatic taring is performed each time afterwards. This is repeated every subsequent time a new sample is placed and [PRINT] key is pressed. Pressing the [POWER] key stops the Formulation mode. When stopped, the measurements up to that point are summed up and displayed. When the optional printer or computer is connected, the start up is printed out as "--------- FORMULATION MODE ---------" and upon stop, the total is printed out as "TOTAL=".



(Setting Formulation Mode)

1 Press the **[CAL]** key repeatedly from the mass display until "FUnC.SEL" appears. Press the **[O/T]** key. The display will show "CAL".

2 Press the **[CAL]** key repeatedly until "Formu:**" appears. The "**" shows the current setting, "on" for on, "oF" for off.

3 Press the **[O/T]** key. The display shows "Formu-on" and after this, pressing the **[CAL]** key switches the displays between "Formu-on" and "Formu-oF". When the current setting is displayed, the stability mark (➡) appears. Press the **[O/T]** key when the desired setting is shown, to change the setting, or

4 Press the **[POWER]** key to return to "Formu: **".

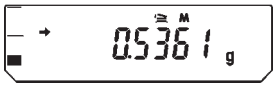
5 Pressing the **[POWER]** key again returns to the mass display.

Note

No more than one of the four application modes, Auto Print (13.4), Interval Timer (13.5), Add-on Mode (13.6), Formulation Mode (13.7) can be set ON at the same time.

(Operating Formulation Mode)

When the Formulation Mode is set on, the add-on symbol and the Memory symbol are illuminated in the mass display.



1 In the Formulation Mode, place the container (if used) on the pan and press **[O/T]** key to tare. (Taring is accepted only before weighing the first sample.)

2 Place the sample (first component) in the container and press **[PRINT]** key.
Upon stability, the mass value is outputted to the external Device with the numbering "CMP001". After output, the display is automatically tared.

3 Repeat the above step 2 until all the component samples have been weighed.

4 Press the **[POWER]** key.
The measurements up to this point are summed up and displayed on the balance and outputted to the external device.

5 Clear the pan.
The balance is ready for the next set of measurements.


```
---Formulation Mode---
CMP001 =
          0,5361g
CMP002 =
          0,5422g
CMP003 =
          0,4488g
TOTAL =
          1,5271g
```

The items above are outputted for the measurement examples shown here. Decimal points can be either comma or period in the output.(Refer to 14.4)

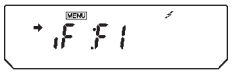
Note

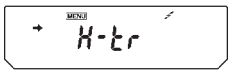
When Formulation mode is in use, fully-automatic span calibration by PSC (10.3.2) or Clock-CAL (10.3.3) is not performed.
Instead, Weight symbol ( ) keeps blinking when span calibration is necessary. Span calibration can be performed between sets of measurements.

14. Communication with Peripheral Devices

14.1 Electronic Printer

The CAU-C series allows connection to the following CAS electronic printers.
EP-80 Electronic Printer
EP-50 / EP-50WIN Electronic Printer
EP-60A Electronic Printer
When using an electronic printer, follow the below procedure for connecting it to the balance.





1 Set the communication status of the balance to F1 (standard settings 1). (See 14.3.2)

2 When using a computer as well, set to timer handshake (see 14.3.3.1) in the user settings.

3 Turn off the power when the balance is either "oFF" or "STAND-BY". Then connect the printer cable to the DATA I/O on the back of the balance.
Connect the printer cable to the printer, too.

4 Turn on the balance power.

5 Turn on the printer power.

Notes

- Refer to the instruction manual of the electronic printer.
- When using EP-80 or EP-50WIN simultaneously with WindowsDirect function, communication settings are different. Follow 6.2.1 for setting the balance.
- **Date and time output:** Press and hold the balance's **[PRINT]** key for about 3 seconds (Not with CAUY).
- Before printing the data other than normal measured value (date, report of calibration etc.), turn off the number printing function (automatic count-up) of EP-50.
- Continuous output cannot be made to an electronic printer.

14.2 Personal Computer - RS-232C

Programming with the command codes makes it possible to control the balance from a computer. When the balance does not have to be controled by the computer, WindowsDirect (see 6.) offers very handy data transmission.

14.2.1 Connecting the Cable

> **Notes**
>
> - The cable must have the correct connections as shown in the diagram below.
> - Cables with the connections shown below and the optional accessory RS-232 cable are not guaranteed to operate properly for all types of computers and devices.
> - Refer to 6.2.2 when using WindowsDirect function.

For DOS/V computers (D-sub9 pin) (Null-modem)

Computer side			Balance side	
RXD	2	----------	2	TXD
TXD	3	----------	3	RXD
DTR	4	----------	6	DSR
SG	5	----------	7	SG
DSR	6	----------	20	DTR
RTS	7	----------	5	CTS
CTS	8	----------	4	RTS
	9	----------	22	.....This connection is not necessarily required.

14.2.2 Data Format

Data format 1 (“F-dF1” in menu item selection) is the CAS’s standard data format. (See 14.3.3.5) The following is the details of this data format.

(1) Basic format

An example of data format for a negative weight value (-21.6865g) with delimiter of C/R is shown.

Data length of this example: 13 bytes													
Position	1	2	3	4	5	6	7	8	9	10	11	12	13
ASCII code	2DH	20DH	20DH	32DH	31DH	2EH	36H	38H	36H	35H	67H	20H	0DH
Data	**-**			**2**	**1**	**.**	**6**	**8**	**6**	**5**	**g**		**C/R**

The data length varies depending on attached information, unit expression and the delimiter selection as explained in (2).

Remarks

Position 1: For a positive value, " " (space) (20H), and for a negative value, "-" (2DH) is in this position.

Positions 2 to 10: The absolute value. When the numerical value does not use all the 9 positions, the code for space (20H) is entered to each excessive position as shown in this example. With CAUW-D, space may appear after the value; at the position No.10.

Positions 11,12: One or two letters indicating the weighing unit. As shown in this example, the code for space is entered at position No.12 if only one letter is used for the unit.

Position 13: Code for delimiter.

(2) Information of additional bytes

(i) Output with stability information

When outputting data with stability information (Refer to 14.2.3 D7), the code for “S” or “U” is added before Position No.1 in the above example. Consequently, the data becomes 1 byte longer.

When stable: S

When unstable: U

(ii) Verified balance as a legal measuring instrument

The brackets “[ ]” bordering auxiliary indicating device of legal measuring instrument are also outputted. In this case, “[” and “]” are inserted to border the part of auxiliary indicating device in the format. Consequently, the data becomes 2 bytes longer.

(iii) When the delimiter "C/R+L/F" is selected (Refer to 14.3.3.2)
The delimiter information requires one more character. Therefore one more byte is added after Position No.13 in the above example. Consequently, the data becomes 1 byte longer.

(3) Data format in case of "oL" or "-oL" (Overload)
The below is the data format for "oL".

Data length of this example: 13 bytes													
Position	1	2	3	4	5	6	7	8	9	10	11	12	13
ASCII code	20H	20H	20H	20H	20H	4FH	4CH	20H	20H	20H	20H	20H	0DH
Data						**O**	**L**						**C/R**

For "-oL" (negative overload), Position 1 is replaced with "-" (minus, ASCII code: 2DH).
The following parts appearing in "(2) Information of additional bytes" also apply to (3).

(i) Output with stability information

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

14.2.3 Command Codes

> **Caution**
>
> Inputting characters and command codes not shown here into the balance may not only alter the previous settings but may also impair proper measurement. If by mistake characters or commands not shown here are entered into the balance, immediately unplug the power supply cable and wait about ten seconds before plugging it in again.

Command Code	Function	Description
D01	Continuous output	The balance continuously outputs every 110ms.
D05	1 time output	Corresponds to **[PRINT]** key
D06	Auto Print	See 13.4
D07	1 time output with stability information	The status of the stability mark is appended to the head of the data with output. S: when the stability mark is showing U: when the mark is not showing
D08	1 time output at stability	After command input, the data is output at the first appearance of the stability mark.
D09	Halt output	Auto Print and continuous output halted
Q	ON/OFF switching	Switches between standby status and measurement status.
T	Taring	Corresponds to the **[O/T]** key
TS	Taring after stability wait	After command input, taring is done at the first appearance of the stability mark.
C18	Span calibration	
M	Formulation mode measurement	See 13.7
+	Add-on mode measurement	See 13.6
R	Total reset	All application measurements terminated and reset
mg	mg unit registry	See 12.
PERCENT	% unit registry	
PCS	Piece counting registry	

CT	ct unit registry	
MOM	Monme unit registry	
SDENCE	Solid specific gravity registry	
LDENCE	Liquid specific gravity registry	
%	100% setting	
G	g, % switching	
- g	g unit removal	
- mg	mg unit removal	
- PERCENT	% unit removal	
- PCS	Piece counting removal	
- CT	ct unit removal	
- MOM	Monme unit removal	
- SDENCE	Solid specific gravity removal	
- LDENCE	Liquid specific gravity removal	
C02	High-stability mode setting	
C13	Anti-convection mode setting	
C14	Standard mode setting	
C05	Stability detection band, 1count setting	
C06	Stability detection band, 5count setting	
C15	Stability detection band, 10count setting	
C07	Zero tracking	
C08	Unset zero tracking	
C10	Automatic span calibration	
C11	Unset automatic span calibration	
C17	Display setting status	Measurement conditions set by menu selection in abbreviated form is output.

14.3 Communication Settings

14.3.1 What are communication settings?

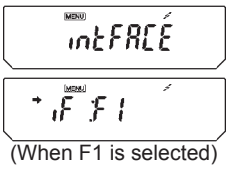
These settings are menu item selections for determining communication specifications when connecting to devices such as an electronic printer or a computer.
The settings here are effective for both RS-232C and DATA I/O communication specifications. When a printer or another device is connected to the DATA I/O connector, set the balance communication settings to "Standard Setting 1".
Five standard settings are stored in the balance, that are composed for frequently used types of communication. Selecting a standard setting allows all of these items to be set at once: communication speed (baud rate), delimiters, parity (and bit length), stop bit, data format, and handshake. Setting combinations that are not included in the standard settings may be selected by individual items in the User Settings.

14.3.2 Standard Setting

The combinations shown in the table below are available as standard setting 1 to standard setting 6. In the communication settings menu, the standard settings 5 and 6 cannot be selected. The standard settings 5 and 6 (WindowsDirect) can be set easily without entering the menu (see 6.2.1).

	Display at menu item selection	Compatible manufacturer	Baud rate	Delimiter	Parity (and bit length)	Stop bit	Data format	Hand shake
Standard setting 1	iF:F1	CAS (standard)	1200	C/R	None (8)	1	dF1	Hard ware
Standard setting 2	iF:F2	(extended)	1200	C/R	None (8)	1	dF2	Hard ware
Standard setting 3	iF:F3	Mettler	2400	C/R+L/F	Even (7)	1	dF3	Hard ware
Standard setting 4	iF:F4	Sartorius	1200	C/R+L/F	Odd (7)	1	dF4	Hard ware
Standard setting5	SEtwin |	CAS Windows Direct	300	Win |	None (8)	1	dF1	Hard ware
Standard setting6	SEtwin -	CAS Windows Direct	300	Win -	None (8)	1	dF1	Hard ware
User settings (see 14.3.3)	iF:USEr		User set	User set	User set	User set	User set	User set

* Refer to 6.2.1 for selection of these standard settings.



(When F1 is selected)

(Selecting one of standard Settings)

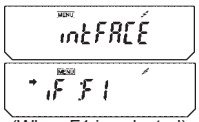
1 From the mass display, press the **[CAL]** key repeatedly until the **[intFACE]** display appears. Press the **[O/T]** key. The display shows "iF;F1"

2 If necessary, press the **[CAL]** key repeatedly until the desired standard setting display appears. Then, press the **[O/T]** key.

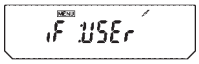
3 Press the **[POWER]** key repeatedly to return to the mass display.

14.3.3 User Setting

The user setting allows individual setting for each item in communication settings.

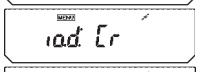


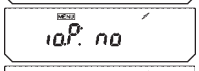
(When F1 is selected)

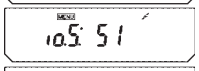


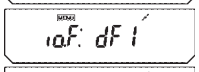
Displays of all the items

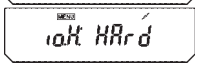
(Example) 

(Example) 

(Example) 

(Example) 

(Example) 

(Example) 

(Making user settings)

1 In mass display, press the **[CAL]** key repeatedly until "intFACE" appears and press the **[O/T]** key. "iF:F1" appears.

2 Press the **[CAL]** key repeatedly until "iF: USEr" appears and press the **[O/T]** key. "io.b:* ***" appears (communication speed settings). (**** shows the current setting; 2 to 4 characters, the same applies hereafter.) After this, pressing the **[CAL]** key alternates the display in this order: "io.d: ****" (delimiter setting), "io.P; *:**" (parity setting), "io.S: ****" (stop bit setting), "io.F: ****" (data format setting), and "io.H: ****" (handshake setting).

3 When the item to be set appears, press the **[O/T]** key. (Refer to the following selections thereafter.)

14.3.3.1 Communication speed settings

(1) The display changes from "io.b:****" to "b-300".
Pressing the **[CAL]** key cycles through the available settings.
The stability mark (➡) appears, when the current setting is displayed.

Display during setting	b-300	b-600	b-1200	b-2400	b-4800
Setting specifics	300bps baud rate	600bps baud rate	1200bps baud rate	2400bps baud rate	4800bps baud rate

Display during setting	b-9600	b-19.2K	b-38.4K
Setting specifics	9600bps baud rate	19.2Kbps baud rate	38.4Kbps baud rate

(2) When the desired setting appears, press the **[O/T]** key.

(3) Press the **[POWER]** key to return to "io.b: ****".

14.3.3.2 Delimiter settings

(1) The display changes from "io.d: ****" to "d-Cr".
Pressing the **[CAL]** key cycles through the available settings.
The stability mark (➡) appears, when the current setting is displayed.

Display during setting	d-Cr	d-LF	d-CrLF	d-Cn	d-win
Setting specifics	delimiter C/R	delimiter L/F	delimiter C/R + L/F	delimiter Comma	delimiter WindowsDirect

(2) When the desired setting appears, press the **[O/T]** key.

(3) Press the **[POWER]** key to return to "io.d: ****".

14.3.3.3 Parity settings

The display changes from "io.P: ****" to "P-no".
Pressing the **[CAL]** key cycles through the available settings.
The stability mark (➡) appears, when the current setting is displayed.

Display during setting	P-no	P-odd	P-EvEn
Setting specifics	No parity (eight bits)	Odd parity (seven bits)	Even parity (seven bits)

(1) When the desired setting appears, press the **[O/T]** key.

(2) Press the **[POWER]** key to return to "io.P:****".

14.3.3.4 Stop bit settings

(1) The display changes from "io.S: ****" to "S-S1".
Pressing the **[CAL]** key cycles through the available settings.
The stability mark (➡) appears, when the current setting is displayed.

Display during setting	S-S1	S-S2
Setting specifics	Stop bit, 1 bit	Stop bit, 2bit

(2) When the desired setting appears, press the **[O/T]** key.

(3) Press the **[POWER]** key to return to "io.S: ****".

14.3.3.5 Input-output data format settings

(1) The display changes from "io.F: ****" to "F-dF1".
Pressing the **[CAL]** key cycles through the available settings.
The stability mark (➡) appears, when the current setting is displayed.

Display during setting	F-dF1	F-dF2	F-dF3	F-dF4
Setting specifics	Data format 1. Standard CAS format.	Data format 2. Extended format from data format 1.	Data format 3. Same format as Mettler balances.	Data format 4. Same format as Sartorius balances.

(2) When the desired setting appears, press the **[O/T]** key.

(3) Press the **[POWER]** key to return to "io.F: ****".

> **Caution**
>
> When using EP-80, EP-50, EP-50WIN or EP-60A electronic printer, always use data format 1.

> **Note**
>
> When set to data format 2, the balance will always send a process result in response to commands from the computer.

14.3.3.6 Handshake settings

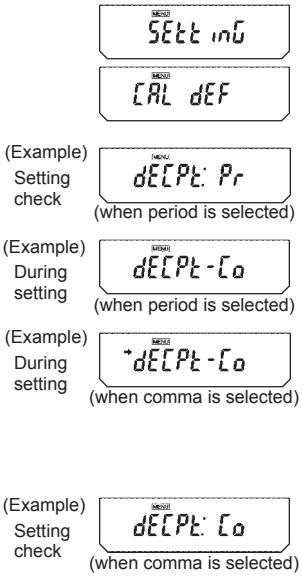
(1) The display changes from "io.H: ****" to "F-dF1".
to "H-oFF". Pressing the **[CAL]** key cycles through the available settings.
The stability mark (➡) appears, when the current setting is displayed.

Display during setting	H-oFF	H-Soft	H-HArd	H-tr
Setting specifics	No handshake	Software handshake	Hardware andshake	Timer handshake

When the desired setting appears, press the **[O/T]** key.
Press the **[POWER]** key to return to "io.H: ****".

14.4 Decimal Point Symbol in Output Data

The CAUW-D/CAUW/CAUX/CAUY series offers choice of decimal point symbols in the outputted data to a computer or an electronic printer. The decimal point can be expressed with either "." (period) or "," (comma) depending on your preference.
Note that the decimal point expression on the balance display is always with "." (period).



1 From the mass display, press the [CAL] key repeatedly until "SEttinG" appears, press the [O/T] key. "CAL dEF" will appear.

2 Press the [CAL] key repeatedly until "dECPt: **" appears (** indicates the current setting. "Pr" for period, "Co" for comma.

3 Press the [O/T] key. The display shows "dECPt-Co" and after this, pressing the [CAL] key switches the displays between "dECPt-Co" and "dECPt-Pr". When the current setting is displayed, the stability mark (➡) appears. To change the setting, press the [O/T] key when the desired setting appears, or

4 Press the [POWER] key to return to "dECPt:**" without changing the setting.

5 Pressing the [POWER] key again returns to the mass display.

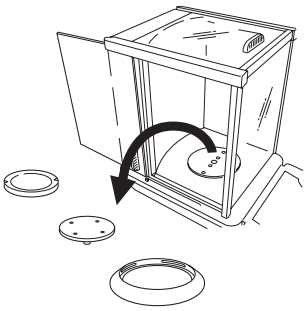
15. Maintenance and Transport

15.1 Maintenance

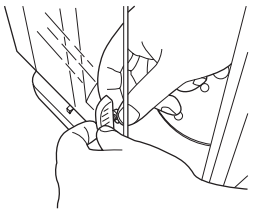
Cleaning
Clean by wiping with a soft cloth soaked in neutral detergent and wrung tightly.
The pan can be washed in water. Dry it thoroughly before attaching it to the balance.
The side glass doors can be removed to allow cleaning and replacement of the door rail.
Never use organic detergents and chemicals or chemical wiping cloths, as they may damage the coating and the display panel.

> ⚠ Caution
>
> Handle the glass doors with great care to keep them from breaking.
> When removing the knob on the inside of the door, be very careful not to allow the hand to touch the pan supporter shaft in the weighing chamber.
> When removing the door rails, take care not to let the rail edge injure the hands.

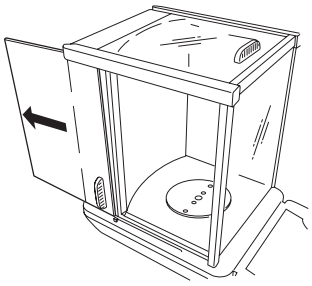
When the glass door does not slide smoothly
- In the CAUW-D/CAUW/CAUX/CAUY series, the side glass doors can be removed to allow replacement and cleaning of the door rails.



1 Remove the anti-draft ring, the pan, and the pan supporter from the weighing chamber



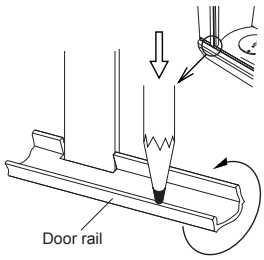
2 Unscrew and remove the inside knob on the glass door.



3 Slide the glass door out backwards.

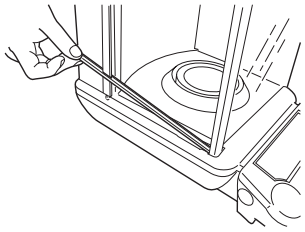
- In the CAUW-D/CAUW/CAUX/CAUY series, when the door rails of the side glass doors become dirty or worn, the rails can be replaced.

Removing the door rail



1 Remove the glass door.

2 Press down the outer edge of the door rail with a pointed thing for lifting the door rail.

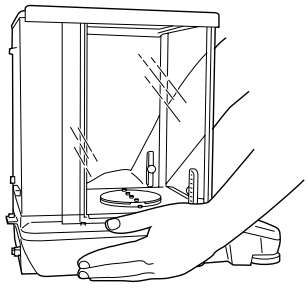


3 Lift and remove the rail. Door rail

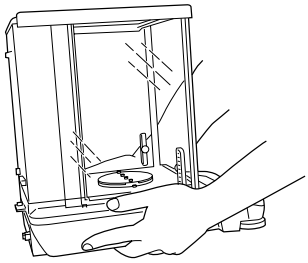
15.2 Transport

When moving by hand … Remove the anti-draft ring, the pan, and the pan supporter from the weighing chamber. Lift the main body as shown in the figures and carry it securely in both hands.

When using other methods of transport … Use the packing box in which the balance was delivered.



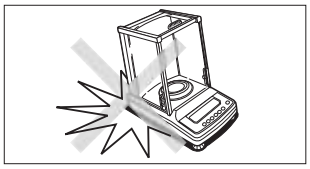
1 Place hands on the main body as shown in the figure.



2 Lift the main body slowly with the fingers inserted beneath the bottom of it.

Caution

This is a precision instrument.
Handle with care and never give any impact.



16. Troubleshooting

16.1 Error Code Displays

Error code display	Description	Countermeasures
CAL E2	The zero point shift is large during calibration.	Remove items from the pan. In order to postpone calibration, press **[POWER]** key.
CAL E3	Large span error in PCAL	Use the correct calibration weight.
CAL E4	Large span error in span calibration	Use the correct calibration weight.
CHE X (X is a numeral) (when the display stops here)	Internal malfunction	Please contact a service representative.
Err 0X (X is a numeral)	Internal malfunction	Please contact a service representative.
Err 20	An improper value setting was attempted.	Enter the correct numbers or decimal points.
Err 24	Power voltage error	Check the power voltage.

16.2 Troubleshooting

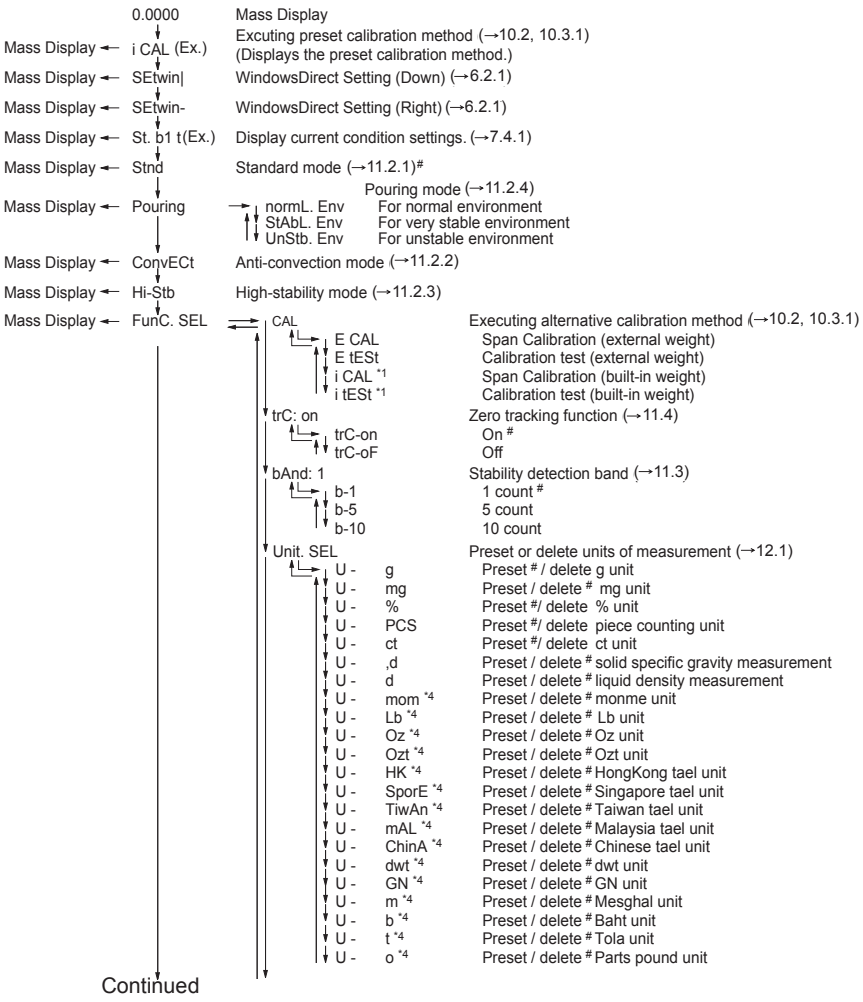
When	Symptom	Possible Causes	Countermeasures
Before measurement	Nothing appears in the display.	The AC adapter is not securely connected. The power switchboard of the room is turned off. The power voltage is incorrect.	Check power supply and connect correctly.
During measurement	The display fluctuates.	Vibration or wind effects	Change the installation site. Change the stability and response settings or change the stability detection band.
		Attempting to measure volatile substances	Measure with a lid on it.
	The stability mark does not readily appear.	The weighed item is electrically charged.	Measure in a metal container. Measure with a metal object larger than the items.
	The measured results have poor repeatability.	The sample temperature and the temperature inside the weighing chamber differ.	Measure at the same temperature. Leave the item in the chamber before measurement. Change to high-stability mode.
	The display diverges in the same direction.	There are air currents entering the weighing chamber.	Leave the glass doors of the weighing chamber open 1 to 2 cm wide when not in use.
	“CAL d” appears frequently.	Effects of electronic noise or strong electromagnetic waves	Move away from the noise source.
		Internal trouble with the balance	Contact a service representative.
	“oL” or “-oL” is displayed.	The load on the pan is too large. The pan is detached.	Use within the weighing capacity. Place the pan on correctly.

	Automatic span calibration executes frequently.	Severe temperature variations in the room or the instrument	Move to a location with less temperature fluctuation.
	The mass display is incorrect.	Span calibration has not been done.	Perform correct span calibration.
		No taring to zero before weighing.	Press the [O/T] key to return mass to zero before weighing.
	The desired weighing unit cannot be called by [UNIT] key.	The unit has not been registered beforehand.	Set unit beforehand. (See 12.1)
	Cannot transmit or receive data to or from computer or device.	Communication settings are wrong.	Make the proper communication settings.
	Error message appears.		Refer to the error code table.
During calibration	Error message appears.		Refer to the error code table.
Attempt of menu settings	The menu cannot be entered. "LoCKEd" is displayed briefly.	The menu is locked	Remove the menu lock. (See 7.4.3)

Appendices

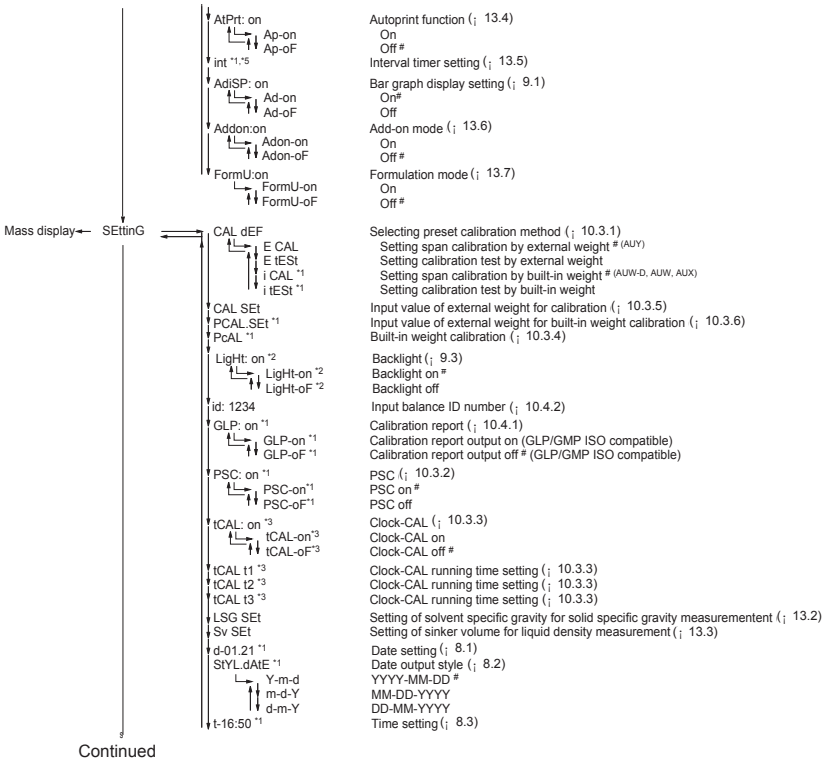
A-1. Menu map (→ in brackets after the menu item shows reference section number)

- **[CAL]** key: Pressing the **[CAL]** key moves to the next menu in the current hierarchy. (↓ in the diagram below)
- **[O/T]** key: Pressing the **[O/T]** key moves the current hierarchy to the menu of one hierarchy down. (→ in the diagram below) When no menu exists in the hierarchy below, this command is fixed.
- **[POWER]** key: Pressing the **[POWER]** key returns the current hierarchy to the menu of one hierarchy up. (← in the diagram below) (Pressing the **[POWER]** key and holding it down returns the interface directly to the mass display.)



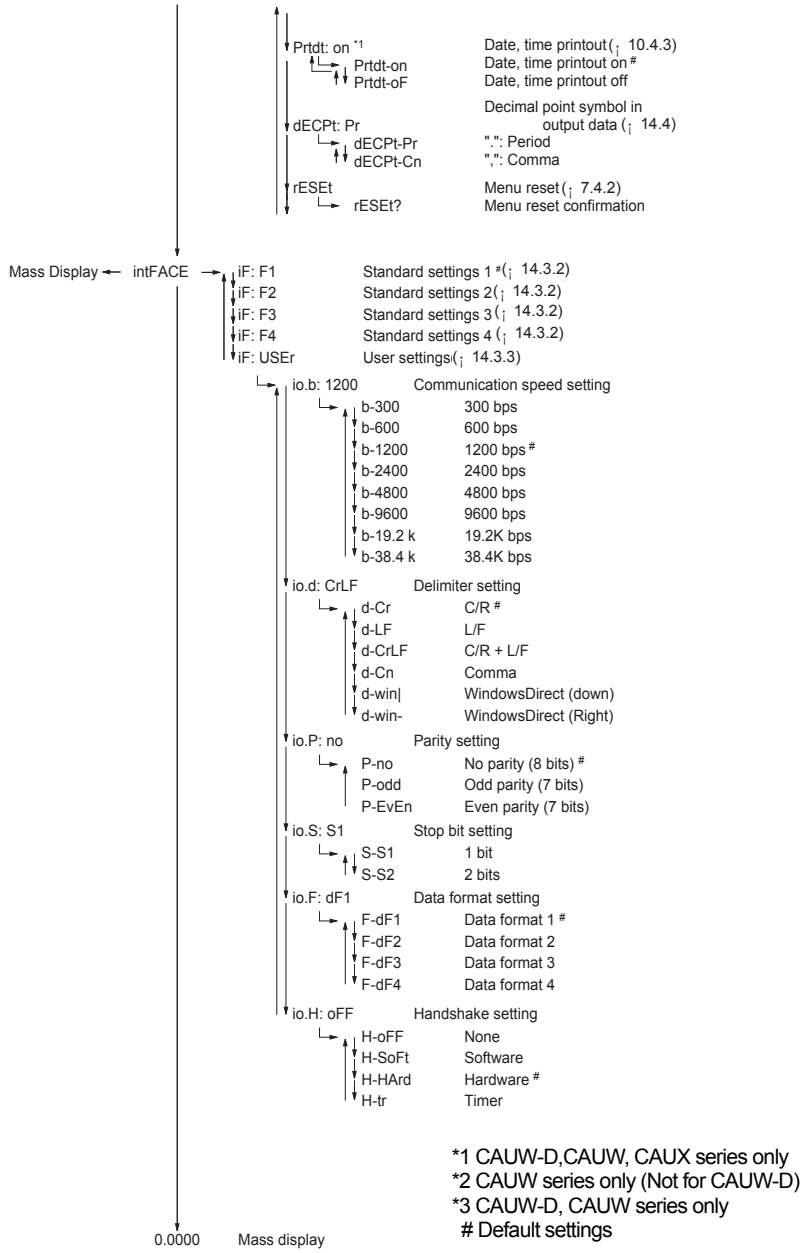
Continued

*1 CAUW-D, CAUW, CAUX series only
*2 CAUW series only
*3 CAUW-D, CAUW series only
Default settings
*4 These units cannot be selected in some countries for legal reason.



Continued

*1 CAUW-D,CAUW, CAUX series only
*2 CAUW series only(Not for CAUW-D)
*3 CAUW-D,CAUW series only
Default settings



*1 CAUW-D,CAUW, CAUX series only
*2 CAUW series only (Not for CAUW-D)
*3 CAUW-D, CAUW series only
Default settings

A-2. Standard Accessories and Maintenance Parts List

Part name	Part number	Remarks
Pan	321-41225	
Pan supporter assembly	321-62933	With rubber cushions
Anti-draft ring	321-62903	
AC adapter		Contact your distributor
Level screw	321-62884	
Glass door assembly (right)	321-62932-02	Includes handle
Glass door assembly (left)	321-62932-01	Includes handle
Glass door assembly (top)	321-62935	Includes handle
Front glass assembly	321-62931	
Door rail (right)	321-62901-01	
Door rail (left)	321-62901-02	
In-use protective cover	321-62936	
In-use protective cover (5pieces)	321-62982	
Rubber cushions (4pieces)	321-62984	For pan supporter
Knob for glass door (3pieces)	321-62985	
Adapter cable holder	072-60330-02	

A-3. Special Accessories (Options) List

Part name	Part number	Remarks
Electronic Printer EP-80	321-62675-01 (w/o AC adapter)	Impact-dot print, Can be used with WindowsDirect, Statistical calculation.
Electronic Printer EP-90	321-62675-11 (w/o AC adapter)	Impact-dot print, Can be used with WindowsDirect, Statistical calculation, Sample No. can be attached, Date/time can be attached (except for CAUY)
Ionizer(Static Remover) "STABLO-EX"	321-73000-21 (w/o AC adapter)	Holder stand included, AC corona discharge method
RS-232C cable 25P-9P(1.5m)	321-60754-01	For IBM-PC/AT, DOS/V (Null modem)
Footswitch FSB-102TK	321-60110-12	For taring (corresponds to [O/T] key)
Footswitch FSB-102PK	321-60110-11	For output (corresponds to [PRINT] key)
Specific gravity measurement kit SMK-401	321-60550-01	
Application keyboard AKB-301	321-53382-01	UPPER, LOWER and TARGET keys for checkweighing cannot be used with CAUW-D/CAUW/CAUX/CAUY series.

Note

The number and specifications noted here are subject to change without notice.
The RS-232C cables are not guaranteed to match every computer or device.
Also, their lock screws may not match the connector threads on the balance.

A-4. Specifications for RS-232C Connector

RS-232 Specifications

Pin number	Name	Function	Comment
1	FG	Frame ground	
2	TXD	Data output	
3	RXD	Data input	
4	RTS	Internal connection with CTS	
5	CTS	Internal connection with RTS	
6	DSR	Handshake reception	
7	SG	Signal ground	
8	NC	Open	
9	NC	Open	
10	NC	Open	
11	NC	Open	
12	NC	Open	
13	NC	Open	
14	NC	Open	
15	NC	Open	
16	NC	Open	
17	NC	Open	
18	NC	Open	
19	NC	Open	
20	DTR	Handshake (transmission)	
21	NC	Open	
22	NC	Open	
23	NC	Open	
24	NC	Open	
25	NC	Open	

A-5. Table of Unit Conversion Constants

The following conversions are used to display in various mass units.

1g = 1000 mg
= 5 ct
= 0.266667 mom
= 0.00220462 Lb
= 0.0352740 Oz
= 0.0321507 Ozt
= 0.0267173 TL-HK
= 0.0264555 TL-Singapore
= 0.0266667 TL-Taiwan
= 0.0264600 TL-Malaysia
= 0.0266071 TL-China
= 0.643015 dwt
= 15.4324 GN
= 0.216999 m
= 0.0657895 b
= 0.0857339 t
= 1.12877 o

Note

The unit of parts pounds (o) is not outputted to external devices.

A-6. Performance Check Guide

Notes

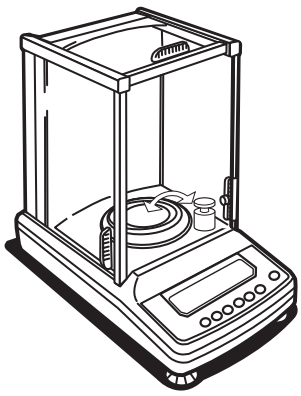
- The following is a standard guideline used to determine whether the balance is working properly. The specific criterion can be set according to each user's requirements.
- Conduct the performance check in a location without changes in room temperature. Install the balance following the instruction of this manual.
- Leave the calibration weight in the weighing chamber before start performance check so that the temperatures will be equalized.
- For placing and removing the weight, use a long pair of tweezers. Do not put hand into the weighing chamber.

Repeatability
For CAUW-D series, perform steps 3 to 5 in both large and small ranges.

1 Leave the power on in mass display (backlight of CAUW series illuminates if it is set to on) and let stand for one hour (two hours for CAUW-D series).

2 Following chapter 11, set the stability and response to the standard mode, set the stability detection band to 1 count, and set zero tracking to OFF.

3 With a pair of tweezers, place a weight close to the weighing capacity on the pan and take it off six times. For each time record
Xi: the value displayed each time the weight is loaded
Yi: the value shown when the weight is removed.



Load and unload a weight close to the capacity 6 times

Loaded: X1, X2...Xi...X6

Removed: Y1, Y2...Yi...Y6

Rx = Xmax-Xmin

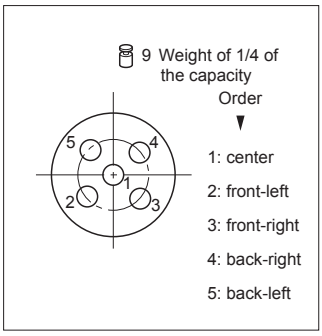
Ry = Ymax-Ymin

(Max is the maximum value. Min is the minimum value.)

4 Compute Rx and Ry according to the expressions given above.

5 Rx and Ry values within 1.0mg are normal. (In the small range of CAUW-D series, within 0.30mg.)

Cornerload Performance (four-corner error)
For CAUW-D series, conduct this check in the large range.



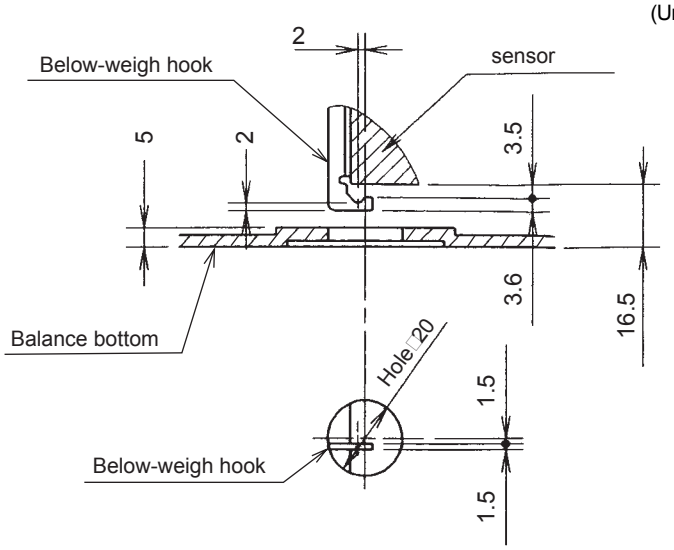
1 Warm up the balance thoroughly. Warm up for at least one hour.

2 Place a weight of about one-quarter of the capacity on the pan at the locations and in the order of the numbers given in the figure. Record the results X1 through X5, for the locations 1 through 5, respectively. If all the differences between the value measured in the center location and each of the other locations are within ±1mg, the balance cornerload performance is considered normal.

(In CAUW-D series, this check is not necessary in the small range.)

A-7. Below-weigh Hook Dimensions

(Unit: mm)



A-8. Index

U

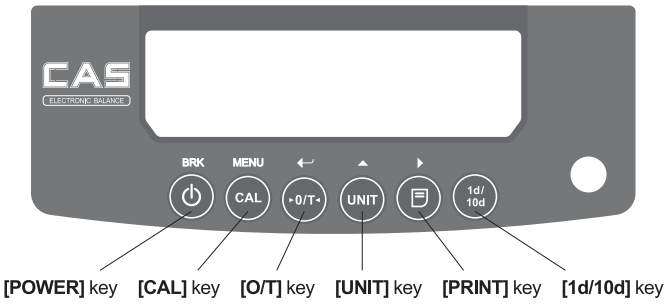
V

W

Z

[Explanatory Operation Sheet]

Key Switch Basic Functions



Key functions during basic weighing (Refer to main manual 2.2 for details)

[POWER]	Switches between operation and stand-by (On/Off).	
[CAL]	Enters calibration or menu item selection.	
[O/T]	Tares the balance (Displays zero with a container on the pan)	
[UNIT]	Switches weighing units.	
[PRINT]	Output the displayed data to an electronic printer or a computer.	
	To output date and time → Press and hold for about 3 seconds (Not with CAUY)	
[1d/10d]	CAUW/CAUX/CAUY	Switches minimum display
	CAUW-D	Switches weighing range

Stabilizing Display

• If it is unavoidable to install the balance at a location subject to air flow or vibration, try changing the environmental settings to high stability mode.

How to set high stability mode

(From mass display) **Press [CAL] key** repeatedly till "Hi-Stb" is displayed →
Press [O/T] key → High stability mode is set and the display returns to mass display.
(See 11.2.3 for details)

Faster Response for Filling

• If faster response is required for filling or dosing purpose, select Pouring mode.
The response will be very fast, but display will be unstable.

How to set pouring mode

(From mass display) Press [CAL] key repeatedly till “Pouring” is displayed →
Press [O/T] key → Pouring mode is set and “normL.Env” is displayed →
Press [POWER] key repeatedly to return to mass display.
(See 11.2.4 for details including environmental setting for pouring mode.)

For Weighing Minute Samples

• The default setting of Zero Tracking function is ON.
When measuring minute sample or very slow change in mass, switch Zero Tracking OFF.

How to switch off Zero Tracking

(From mass display) Press [CAL] key repeatedly till “FunC.SEL” is displayed →
Press [O/T] key (“CAL” is displayed) → Press [CAL] key once (“trC: on” is displayed)
→ Press [O/T] key (“trC-on” is displayed) → Press [CAL] key (“trC-oF” is displayed) →
Press [O/T] key (➡) is added.) → Press [POWER] key (“trC: oF” is displayed) →
Press [POWER] key repeatedly to return to the mass display. (See 11.4 for detail.)

Hints on Data Output

When outputting the data to external devices,

Decimal point symbol can be selected from “period” and “comma”.
→ See main manual 14.4.
Date output style can be selected from “yyyy-mm-dd”, “mm-dd-yyyy” and “dd-mm-yyyy”.
→ See main manual 8.2.
Date and time can be output to external device from the balance (except for CAUY).
→ Press **[PRINT]** key for about 3 seconds.

Hints on Fully-automatic Span Calibration

• Fully-automatic span calibration **PSC (Not** with CAUY series) (Refer to 10.3.2 for detail.)
Default setting of PSC is ON. Upon detection of temperature change, span calibration is automatically performed to maintain accuracy. Weight symbol ( ) blinks prior to fully-automatic calibration.

How to skip a PSC

Press [POWER] key while Weight symbol ( ) is blinking.

How to switch off PSC

From mass display, **press [CAL] key** repeatedly until "SEttinG" appears.
→ **Press [O/T] key** to display "CAL dEF". → **Press [CAL] key** repeatedly until "PSC:on" appears. → **Press [O/T] key.**
"PSC-on" appears. → **Press [CAL] key**. "PSC-oF" appears. → **Press [O/T] key**.
Stability mark (➡) is added. → **Press [POWER] key** returns "PSC:oF".
→ **Press [POWER] key** repeatedly to return to the mass display.

When PSC is off, perform span calibration according to **Span Calibration Procedure** when it is necessary.

Clock-CAL
Clock-CAL is a practical alternative that performs regular automatic span calibration according to time setting (CAUW-D/CAUW series only, up to 3 times a day, refer to 10.3.3).

Span Calibration Procedure

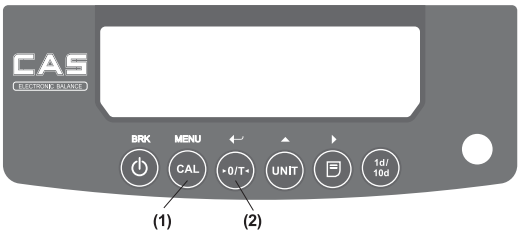
Span calibration is required to accurately weigh items with an electronic balance.
Span calibration should be performed:

- When the location of the balance is changed, even within the same room.
- When the room temperature changes considerably.
- Periodically, according to the quality control plan of the user.

Before span calibration, verify that the balance is in the mass-display and that the pan is empty.

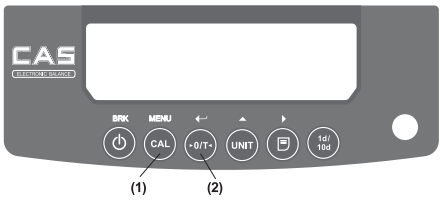
CAUW-D/CAUW/CAUX Series (Span Calibration Using Built-in Weight)

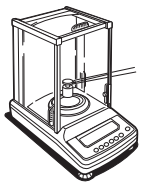
(1) Press the **[CAL]** key once. The display shows "i-CAL" (default settings).
(2) Press the **[O/T]** key. After the display shows "CAL 2", "CAL 1", "CAL 0" and "CAL End", it returns to the mass display and span calibration is complete.

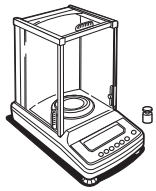


* When fully-automatic span calibration PSC is on, span calibration is automatically performed according to temperature changes. PSC is set to ON by default. (See 10.3.2)

CAUY Series (Span Calibration Using External Weights)







(1) PressFrom the mass display, press the **[CAL]** key. The display shows "E-CAL" (default settings).
(2) Press the **[O/T]** key. Span calibration begins and the zero display blinks and about 30 seconds later the weight value to be loaded appears.
(3) Open the weighing chamber's glass door, set the indicated weight on the pan, and shut the glass door.
(4) After the zero display blinks, remove the weight from the pan and shut the glass door. "SEt", "CAL End" appears and, after returning to mass display the span calibration is complete.

MEMO

CAU SERIES

Electronic Balance

CAS BLDG., # 440-1, SUNGNAE-DONG,
GANGDONG-GU, SEOUL, KOREA
TEL_ 82 2 2225 3500
FAX_ 82 2 475 4668
www.globalcas.com

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