MC series

Mass comparator

INSTRUCTION MANUAL

MC-1000
MC-6100

A&D Company, Limited

1WMPD4002204

This Manual and Marks

All safety messages are identified by the following, “WARNING” or “CAUTION”, of ANSI Z535.4 (American National Standard Institute: Product Safety Signs and Labels). The meanings are as follows:

⚠WARNING	A potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	A potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

⚠ This is a hazard alert mark.

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1. INTRODUCTION

This manual describes how the MC Series Mass Comparator Balances, MC-1000 and MC-6100, work, and how to get the most out of them in terms of performance.

Read this manual thoroughly before using the balance and keep it at hand for future reference.

For other functions and operations that this manual does not describe, refer to the GX series instruction manual.

1-1 About This Manual

This manual consists of the following five parts:

Basic operation	Describes precautions on handling the balance, balance construction and basic balance operation.
Adapting to the environment	Describes response adjustment, calibration and calibration test.
Functions	Describes various functions of the balance.
RS-232C serial interface	Describes the interface which transmits data and controls the balance.
Maintenance	Describes maintenance, error codes, troubleshooting, specifications and options.

1-2 Features

- Display resolution, one digit greater than a standard balance. This allows management of OIML class F1 weights.
- Capable of weighing small amounts of powdery or liquid material, even with a massive tare.
- When used as a mass comparator, the balance can achieve even more precise weighing, by using the optional auto-centering pan (sold separately), which reduces eccentric loading errors.

1-3 Compliance

Compliance with FCC Rules

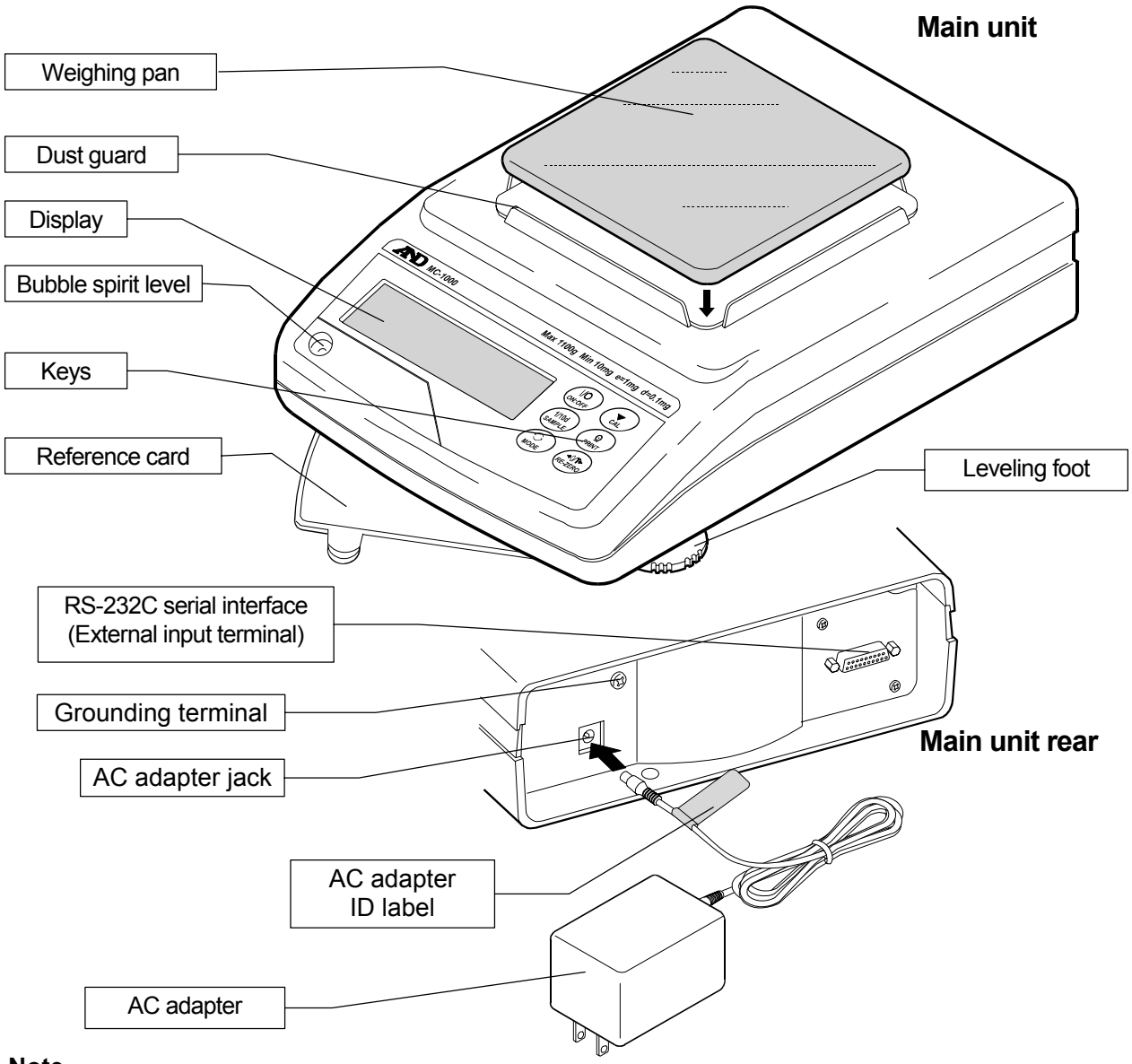
Please note that this device generates, uses and can radiate radio frequency energy. This device has been tested and has been found to comply with the limits of a Class A computing device pursuant to Subpart J of Part 15 of FCC rules. These rules are designed to provide reasonable protection against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

(FCC = Federal Communications Commission in the U.S.A.)

2. UNPACKING THE BALANCE

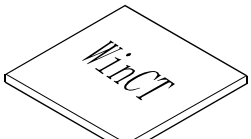
- The balance is a precision instrument. Unpack the balance carefully. Keep the packing material to be used for transporting the balance in the future.
- The packing contents depend on the balance model. See the illustrations to confirm that everything is contained..

2-1 MC-1000

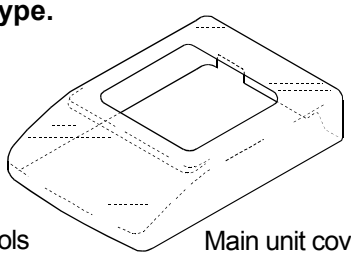


Note

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

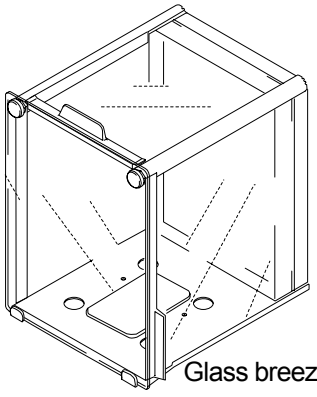


Windows Communication Tools
WinCT



Main unit cover

Breeze break
securing screw
(2 pieces)

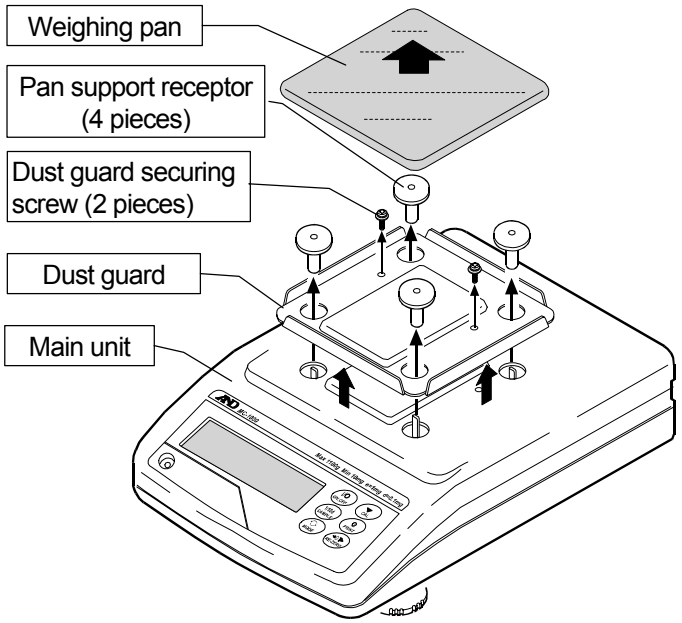


Glass breeze break

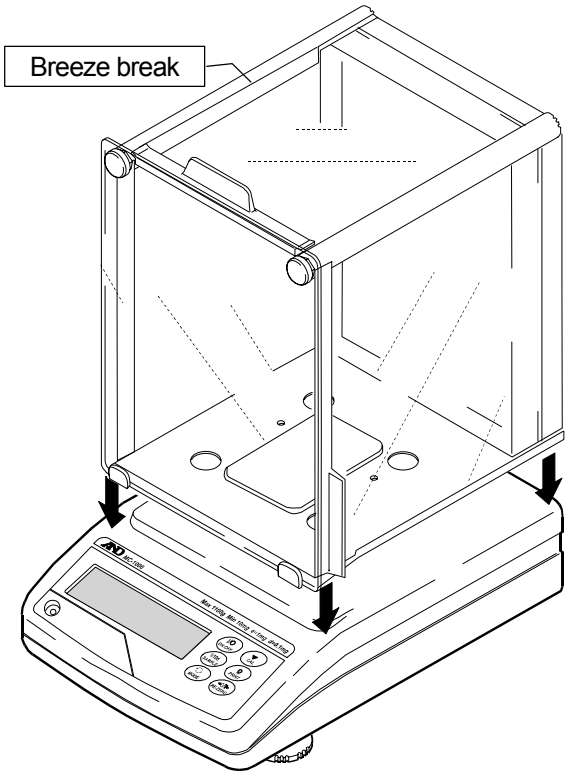
Glass breeze break installation procedure

Caution: During installation, do not apply excessive force to the balance.

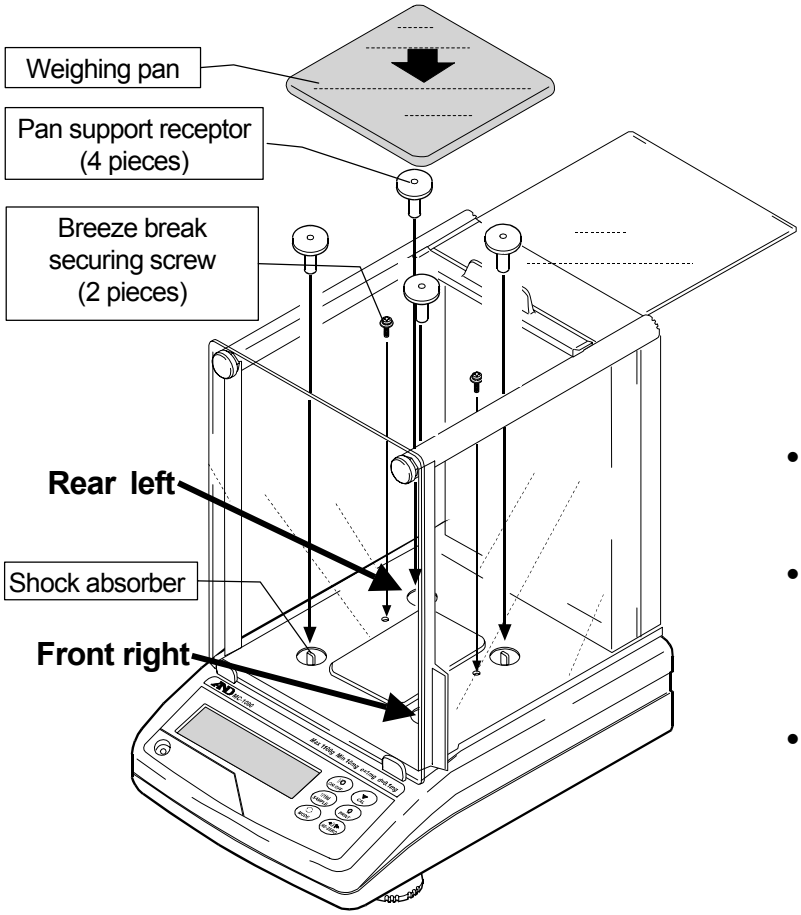
1. Remove the weighing pan, pan support receptors, and dust guard from your balance. To remove the dust guard, remove the two screws that secure it to the balance.



2. Place the breeze break on the main unit

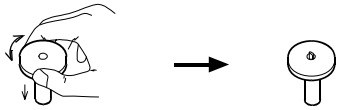


3. Secure the breeze break to the main unit using two screws provided with the breeze break. Replace the pan support receptors and weighing pan.



- When installing the pan support receptors at the front right and rear left, note the following:

  Push in the pan support receptors so that the shock absorber springs are above the receptor head surface. If the pan support receptors are hard to push in, hold the head of the receptor as shown below and push it in while rotating the head to the right and left.



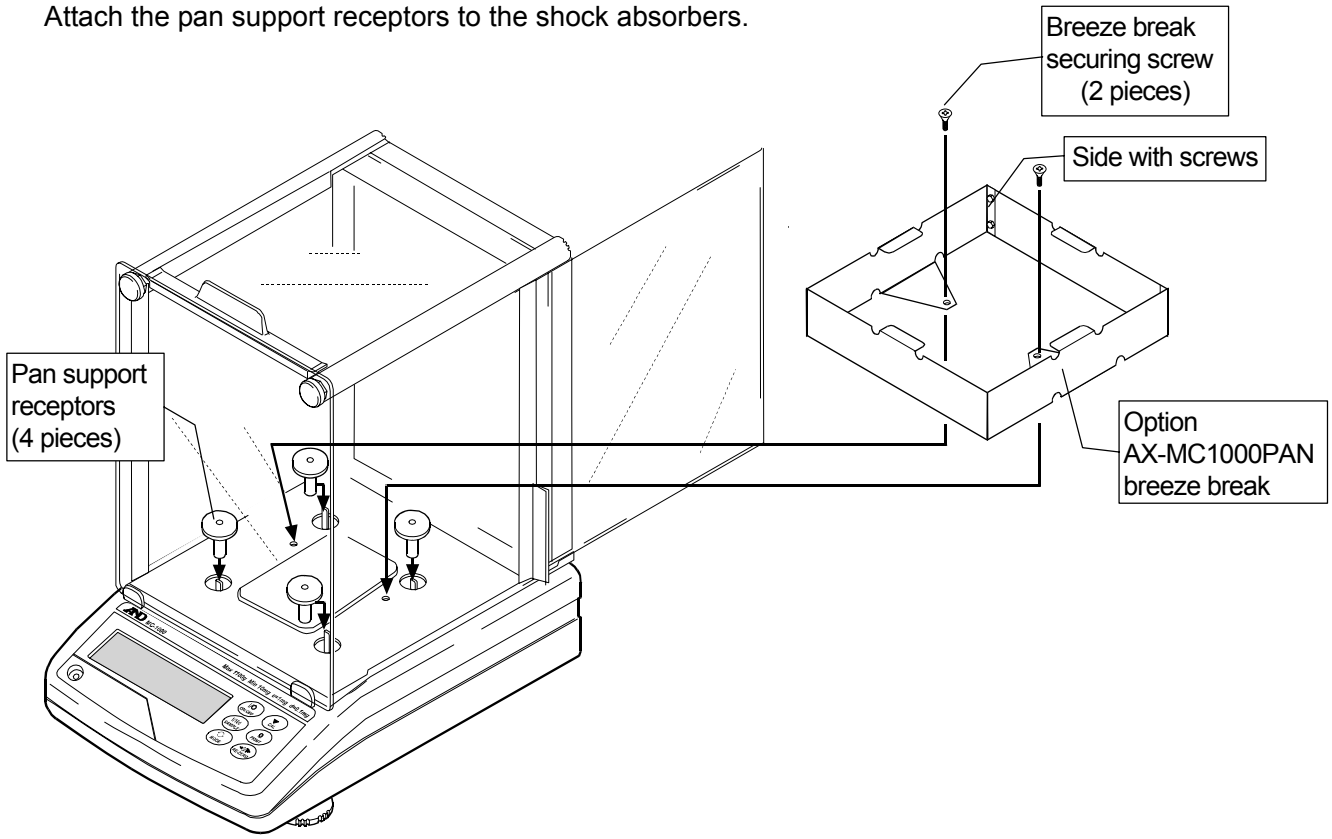
- Keep the removed dust guard and dust guard securing screws (2 pieces).
- To reinstall the dust guard after removing the breeze break, use the two screws to secure the dust guard.
- The dust guard securing screws and breeze break securing screws are different in length.

Auto-centering pan (AX-MC1000PAN) installation procedure

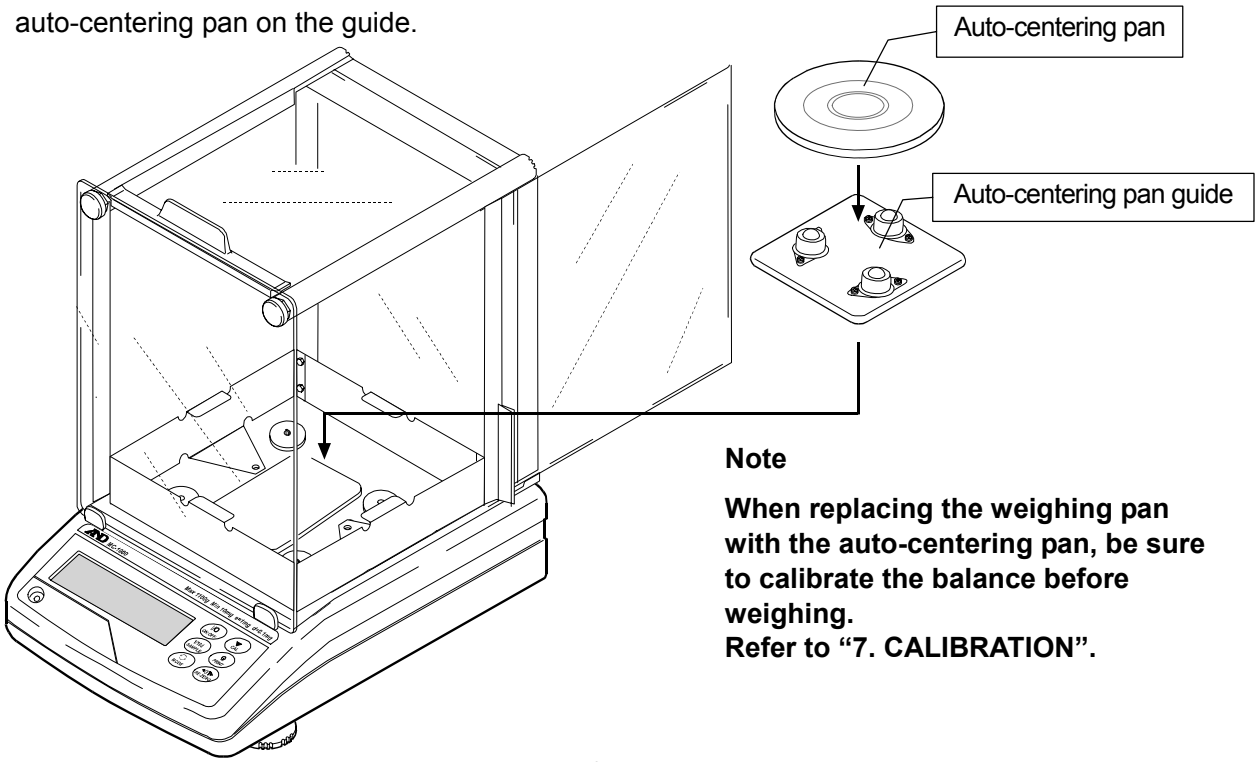
Caution: During installation, do not apply excessive force to the balance.

- **When used as a mass comparator, the balance can achieve even more precise weighing, by using the auto-centering pan (sold separately), which reduces eccentric loading errors.**

1. At step 2 of the glass breeze break installation procedure, secure the breeze break provided with the AX-MC1000PAN option using the breeze break securing screws provided with the option. At this time make sure that the side of the breeze break with the screws is placed at the back. Attach the pan support receptors to the shock absorbers.



2. Place the auto-centering pan guide on the pan support receptors, and then place the auto-centering pan on the guide.

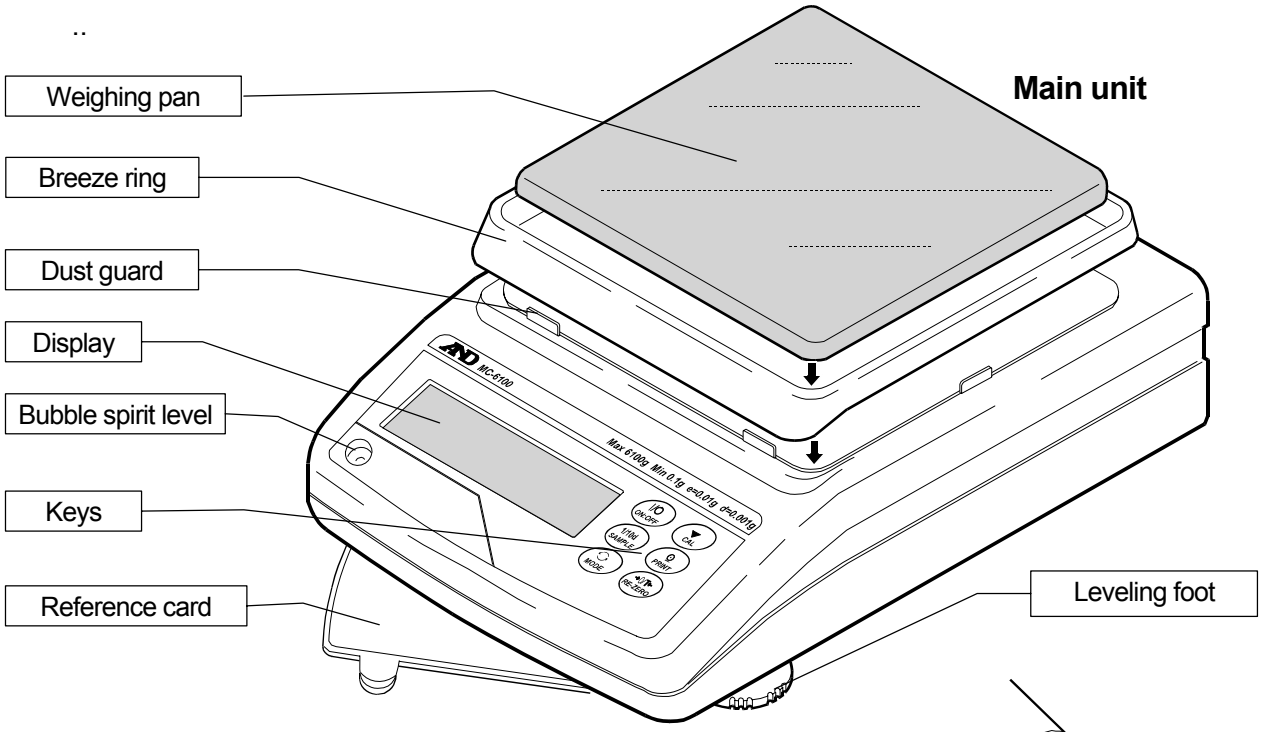


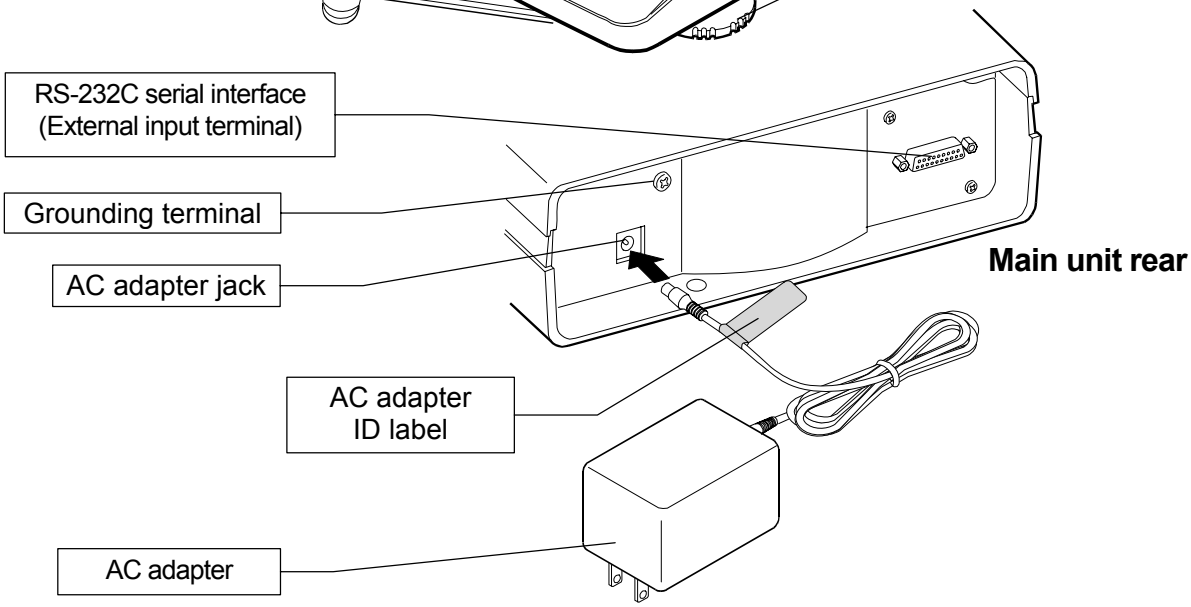
Note

When replacing the weighing pan with the auto-centering pan, be sure to calibrate the balance before weighing.
Refer to "7. CALIBRATION".

2-2 MC-6100

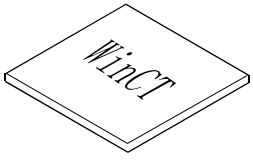
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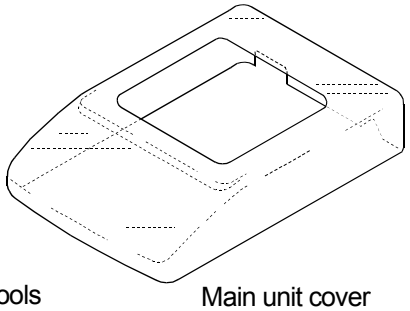


Note

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



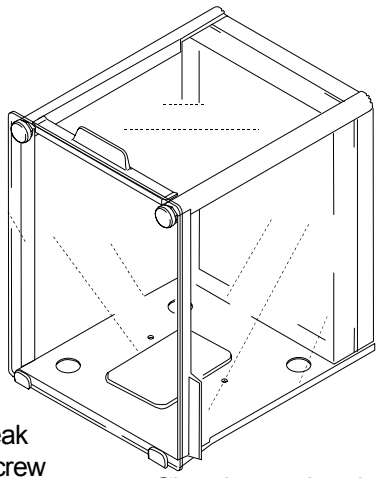
Windows Communication Tools
WinCT



Main unit cover



Breeze break
securing screw
(2 pieces)

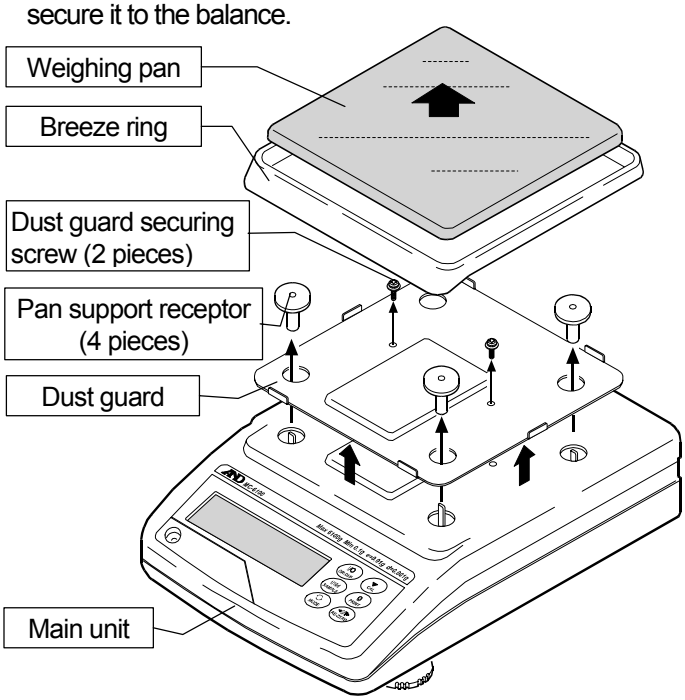


Glass breeze break

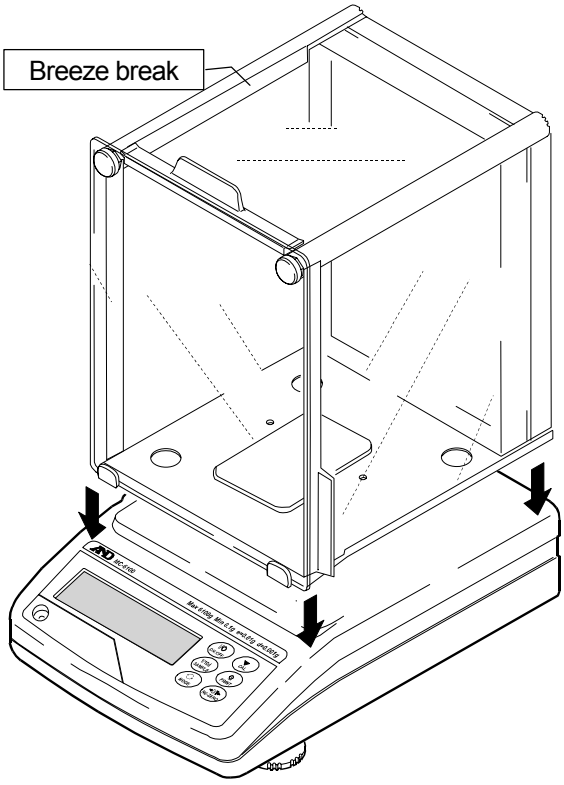
Glass breeze break installation procedure

Caution: During installation, do not apply excessive force to the balance.

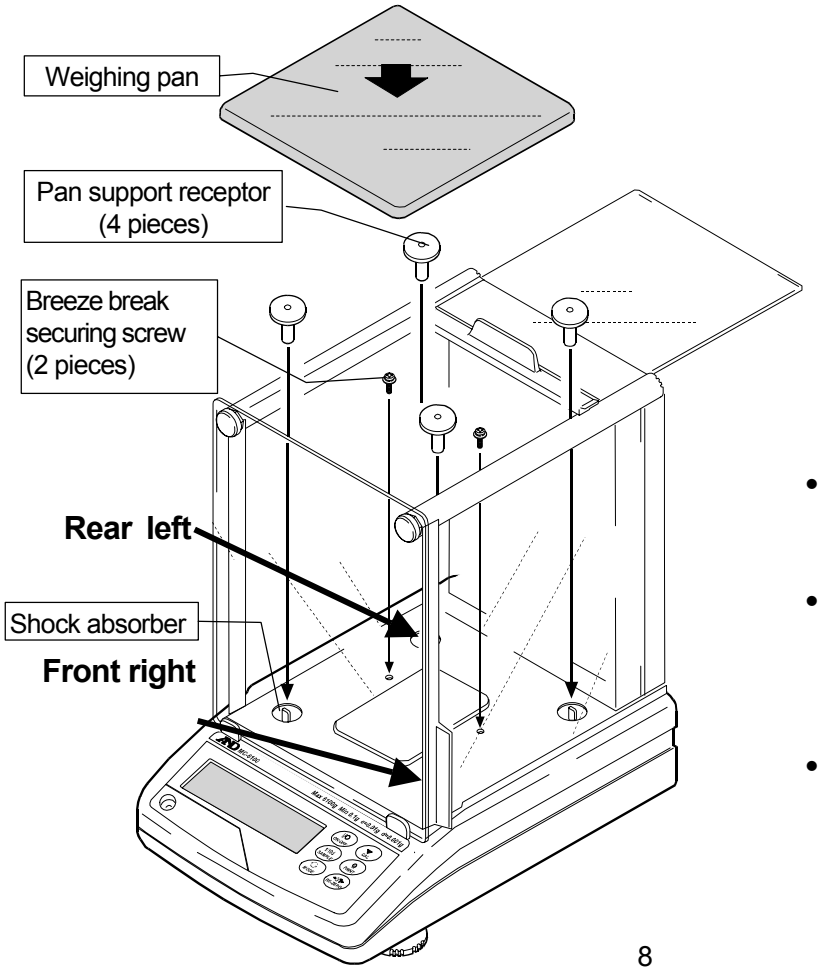
1. Remove the weighing pan, breeze ring, pan support receptors, and dust guard from your balance.
   To remove the dust guard, remove the two screws that secure it to the balance.



2. Place the breeze break on the main unit

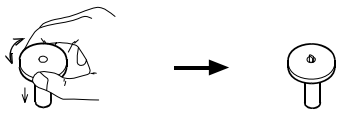


3. Secure the breeze break to the main unit using two screws provided with the breeze break.
   Replace the pan support receptors and weighing pan.



- When installing the pan support receptors at the front right and rear left, note the following:

  Push in the pan support receptors so that the shock absorber springs are above the receptor head surface. If the pan support receptors are hard to push in, hold the head of the receptor as shown below and push it in while rotating the head to the right and left.



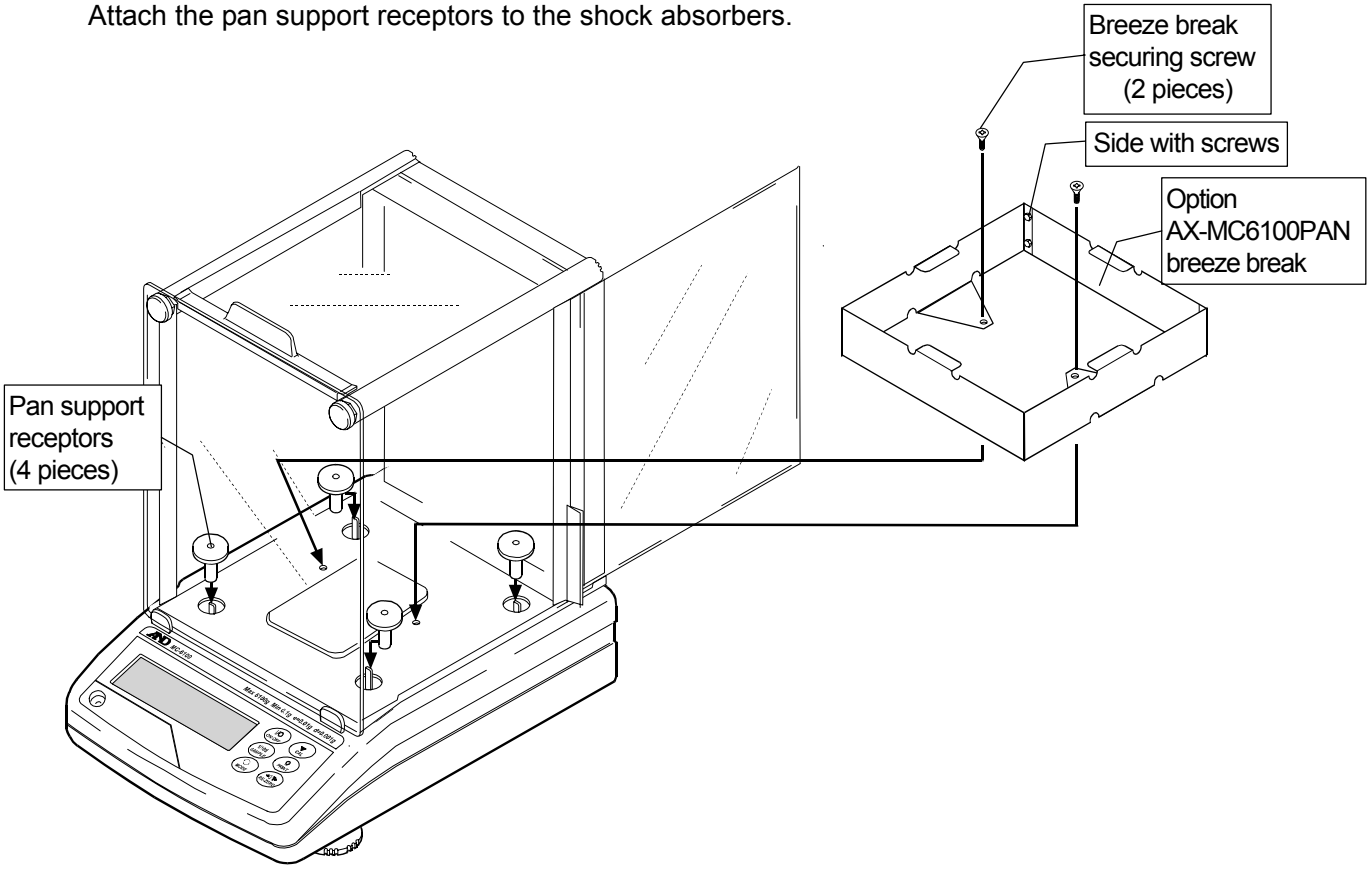
- Keep the removed dust guard, dust guard securing screws (2 pieces) and breeze ring.
- To reinstall the dust guard after removing the breeze break, use the two screws to secure the dust guard.
- The dust guard securing screws and breeze break securing screws are different in length.

Auto-centering pan (AX-MC6100PAN) installation procedure

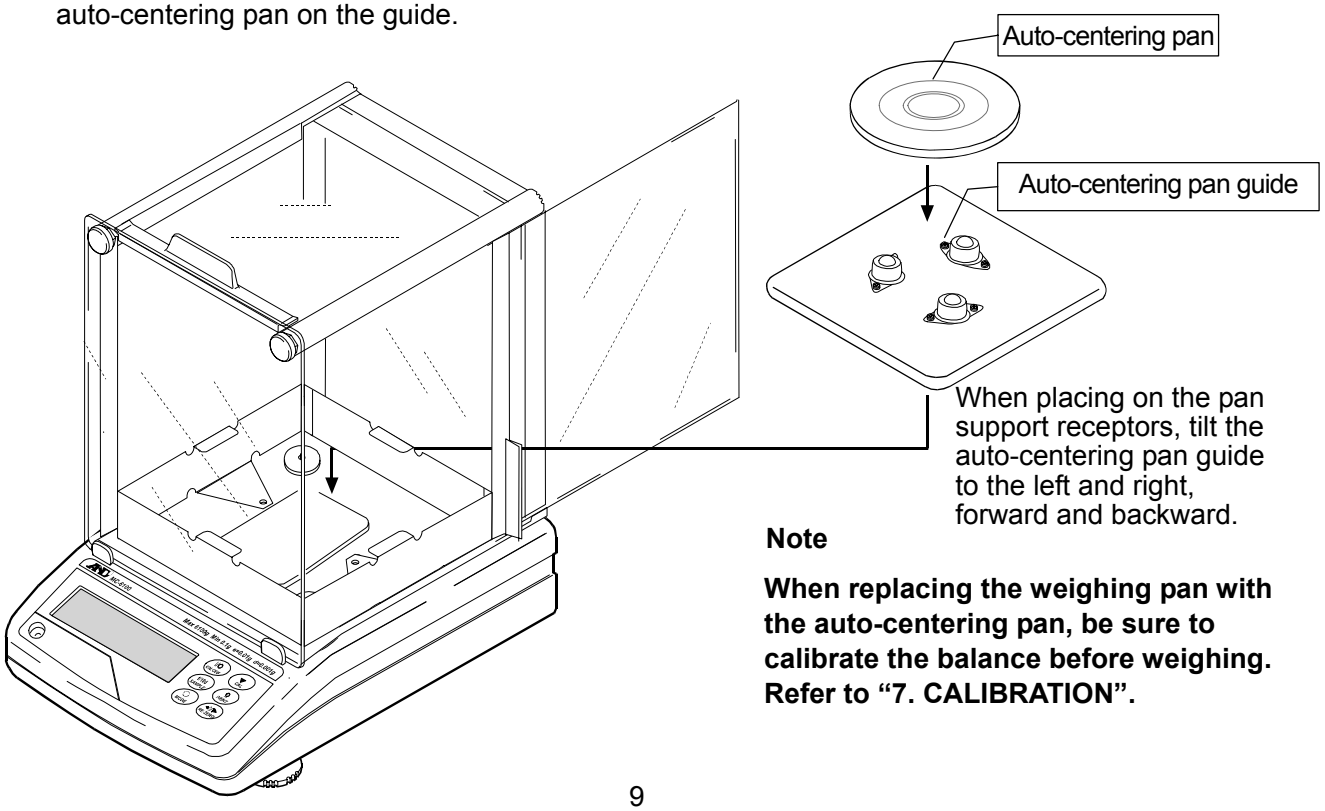
Caution: During installation, do not apply excessive force to the balance.

- **When used as a mass comparator, the balance can achieve even more precise weighing, by using the auto-centering pan (sold separately), which reduces eccentric loading errors.**

1. At step 2 of the glass breeze break installation procedure, secure the breeze break provided with the AX-MC6100PAN option using the breeze break securing screws provided with the option. At this time make sure that the side of the breeze break with the screws is placed at the back. Attach the pan support receptors to the shock absorbers.



2. Place the auto-centering pan guide on the pan support receptors, and then place the auto-centering pan on the guide.



Note

When replacing the weighing pan with the auto-centering pan, be sure to calibrate the balance before weighing. Refer to "7. CALIBRATION".

2-3 Installing the Balance

Install the balance as follows:

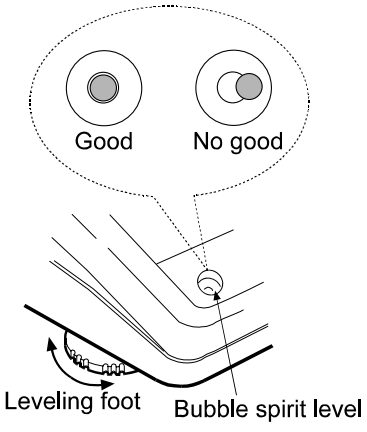
1. Refer to “3-1 Before Use” for installing the balance. Place the balance on a solid weighing table.
2. Assemble the balance as shown in “2. UNPACKING THE BALANCE”.
3. Adjust the leveling feet to level the balance. Confirm it using the bubble spirit level.
4. Confirm that the adapter type is correct for the local voltage and power receptacle type.
5. Connect the AC adapter to the balance. Warm up the balance for at least 30 minutes with nothing on the weighing pan.

3. PRECAUTIONS

To get the optimum performance from the balance and acquire accurate weighing data, note the following:

3-1 Before Use

- The MC series is a high-precision balance with a resolution of 1/10000000. It is prone to changes in temperature and pressure, static electricity, drafts and vibration of the installation site. During calibration using an internal mass, it resolves up to one digit lower than the minimum weighing value. Therefore, be sure to place the balance in a stable environment.
- The best operating temperature is about 20°C±2°C at 45-60% relative humidity.
- Install the balance where it is not exposed to direct sunlight and it is not affected by heaters or air conditioners.
- Install the balance where it is free of dust.
- Install the balance away from equipment which produces magnetic fields.
- Install the balance in a stable place avoiding vibration and shock. Corners of rooms on the first floor are best, as they are less prone to vibration.
- The weighing table should be solid and free from vibration, drafts and as level as possible.
- Level the balance by adjusting the leveling feet and confirm it using the bubble spirit level.
- If static electricity is a problem at the installation site, use the electrostatic field meter and the static eliminator.
- Ensure a stable power source when using the AC adapter.



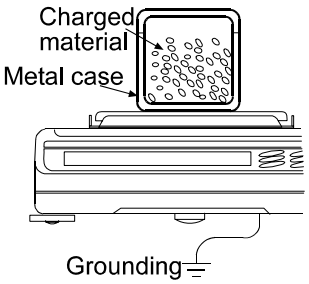
- Warm up the balance for at least 30 minutes. Plug in the AC adapter as usual.
- Calibrate the balance periodically for accurate weighing.
- Before using the balance for the first time or after having moved it to another location, warm up the balance for six hours or more to allow the balance to reach equilibrium with the room temperature, and then calibrate the balance.

Caution

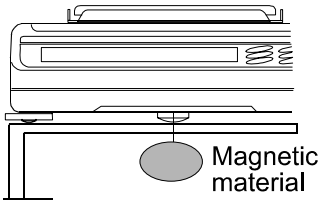
Do not install the balance where flammable or corrosive gas is present.

3-2 During Use

- Static charge may cause weighing errors. When the ambient humidity is less than 45% RH, insulators such as plastic or glass are prone to static electricity. Discharge static electricity from the material to be weighed (hereinafter referred to as sample). Ground the balance and try the following:
  - Eliminate the static electricity by using an optional static eliminator, AD-1683,
  - Or try to keep the ambient humidity above 45%RH.
  - Or use a metal shield case.
  - Or wipe a charged plastic sample with the wet cloth.



- This balance uses a strong magnet as part of the balance assembly, so please use caution when weighing magnetic materials such as iron. If there is a problem, use the underhook on the bottom of the balance to suspend the material away from the influence of the magnet.



- Cancel the temperature difference between a sample, tare and the environment. When a sample is warmer (cooler) than the ambient temperature, the sample will be lighter (heavier) than the true weight. This error is due to a rising (falling) draft around the sample.
- Make each weighing gently and quickly to avoid errors due to changes in the environmental conditions.
- Do not drop things upon the weighing pan, or place a sample on the pan that is beyond the balance weighing capacity. Place a sample in the center of the weighing pan.
- Do not use a sharp instrument such as a pencil to press the keys. Use your finger only.
- Press the RE-ZERO key before each weighing to prevent possible errors.
- Take into consideration the affect of air buoyancy on a sample when more accuracy is required.
- Keep the balance interior free of dust and foreign materials.

3-3 After Use

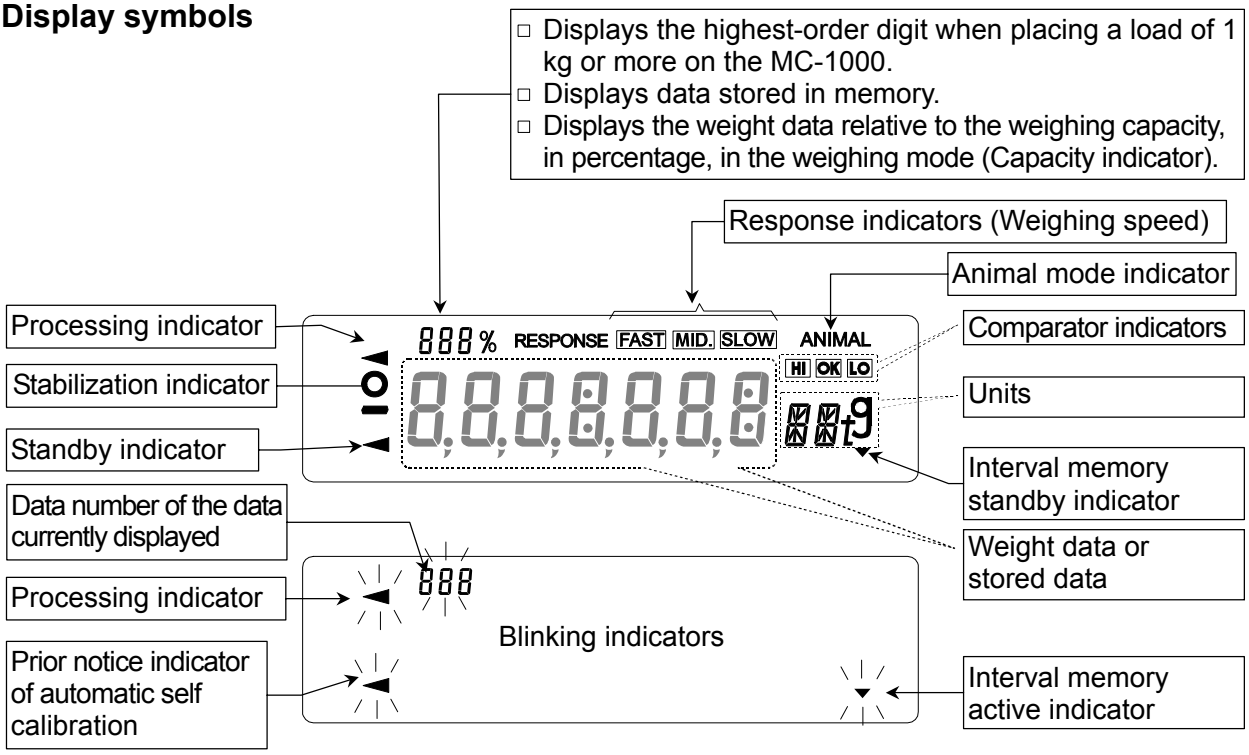
- Avoid mechanical shock to the balance.
- Do not disassemble the balance. Contact the local A&D dealer if the balance needs service or repair.
- Do not use organic solvents to clean the balance. Clean the balance with a lint free cloth that is moistened with warm water and a mild detergent.
- Protect the internal parts of the balance from liquid spills and excessive dust.

3-4 Power Supply

- Do not remove the AC adapter while the internal mass is in motion, for example, right after the AC adapter is connected, or during calibration using the internal mass.
  If the AC adapter is removed under the conditions described above, the internal mass will be left unsecured, that may cause mechanical damage when the balance is moved.
  Before removing the AC adapter, press the ON:OFF key and confirm that zero is displayed.
- When the AC adapter is connected, the balance is in the standby mode if the standby indicator is on (refer to “4. DISPLAY SYMBOLS AND KEY OPERATION”). This is a normal state and does not harm the balance. For accurate weighing, warm up the balance for at least 30 minutes before use.

4. DISPLAY SYMBOLS AND KEY OPERATION

Display symbols



Key operation

Key operation affects how the balance functions. The basic key operations are:

- "Press and release the key immediately" or "Press the key" = normal key operation during measurement



- "Press and hold the key"



Key	When pressed	When pressed and held
I/⏻ ON:OFF	Turns the display on and off. The standby indicator is displayed when the display is turned off. The weighing mode is enabled when the display is turned on. This key is available anytime. Pressing the key during operation will interrupt the operation and turn the display off.	
1/10d SAMPLE	In the weighing mode, turns the minimum weighing value on and off. In the counting or percent mode, enters the sample storing mode.	Enters the function table mode. Refer to "9. FUNCTION TABLE".
MODE	No function at the factory setting Switches the weighing units when units other than "g" are stored in the function setting.	Performs response adjustment and self check.
CAL	Performs calibration of the balance using the internal mass.	Displays calibration-related menu.
PRINT	Stores the weighing data in memory or outputs to a printer or personal computer using the RS-232C interface (Factory setting), depending on the function settings.	No function at the factory setting By changing the function setting: Outputs "Title block" and "End block" for GLP report. Displays the data memory menu.
→0/T← RE-ZERO	Sets the display to zero.	

5. WEIGHING

5-1 Selecting the Weighing Units (Modes)

The unit “g” (gram) was set at the factory.
To use other units, select and store units and displaying order in the function setting of “ Unit ”.

For details on weighing unit selection procedure, refer to the GX series instruction manual, “5. WEIGHING UNITS”.

5-2 Basic Weighing

When using as a mass comparator

- To reduce the influence of drafts and vibration, set the following function settings as below.
  “Condition (Cond)” of “Environment, Display (bASFnc)” to “Slow (2)”
  “Filter (F IL)” of ““Environment, Display (bASFnc)” to “Used (1)”

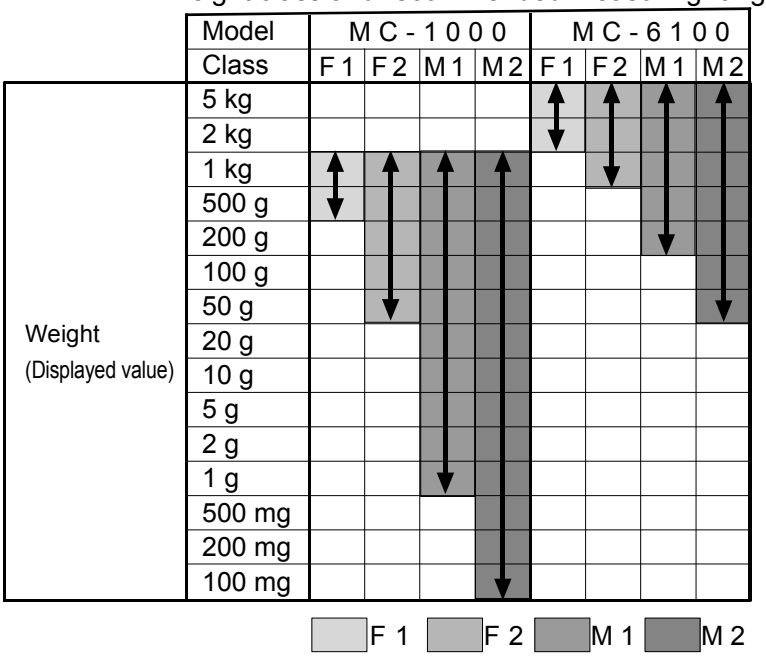
  For details, refer to “9. FUNCTION TABLE”.

- To avoid eccentric loading errors, place the sample in the center of the weighing pan.
  As an option, auto-centering pans are available: AX-MC1000PAN for the MC-1000 and AX-MC6100PAN for the MC-6100.
  Using an AD-8922A remote controller, which is sold separately, the balance can be controlled remotely by the AD-8922A key operations in the same way as when the CAL or RE-ZERO key of the balance is pressed. For the connection procedure between the balance and the AD-8922A, refer to the AD-8922A instruction manual.

- Take measures against causes of weighing error at the installation site, such as changes in temperature, atmospheric pressure, drafts, vibration and static electricity. Perform weighing operations in a stable environment.

- The table below lists the weight class and recommended measuring range for each model of the MC series. The measuring range is determined so that the balance repeatability is to be less than one third of the maximum permissible error for each weight class.

Weight class and recommended measuring range



When building into a system

- When a special weighing pan is to be designed, the weight of the pan and the material to be weighed should not exceed the weighing capacity of the balance.
  To reduce influences of static electricity and magnetism, use materials other than resin and magnetic material such as iron.
- There is a function available to maintain the previous weight value in non-volatile memory, even if the AC adapter is removed.
  When “Zero upon power-on (P-tr)” of “Environment, Display (bASFnc)” is set to “ 1 ”, the previous weight value is displayed upon power-on.
  For details, refer to “Zero upon power-on” on page 33.
- There is a function available to perform span calibration only, when performing calibration with a tare on the weighing pan.
  When “Span calibration (SPn)” of “Environment, Display (bASFnc)” is set to “ 1 ”, span calibration using the internal mass is performed, with a tare on the weighing pan.
  For details, refer to “Span calibration” on page 33.
- To set a higher response rate or to batch-weigh small amounts of material, such as a powdery material, refer to “14. EXTENDED FUNCTION”.

6. RESPONSE ADJUSTMENT / SELF CHECK FUNCTION

This function detects the influence on weighing that is caused by drafts and/or vibration at the place where the balance is installed and sets the response characteristic automatically. When this function is selected, the balance self-checks the performance at the same time.

Two modes of response adjustment are available: automatic and manual.

The function has three rates as follows:

Response indicators



Changing the response rate changes the display refresh rate.

Indicator	Parameter	Response characteristic	Display refresh rate
FAST	Cond 0	Fast response, Sensitive value ⬆ ⬇ Slow response, Stable value	If the response rate is changed as follows: MID. or SLOW→▶ FAST =10 times/second FAST→▶ MID. or SLOW = 5 times/second
MID.	Cond 1		
SLOW	Cond 2		

Note

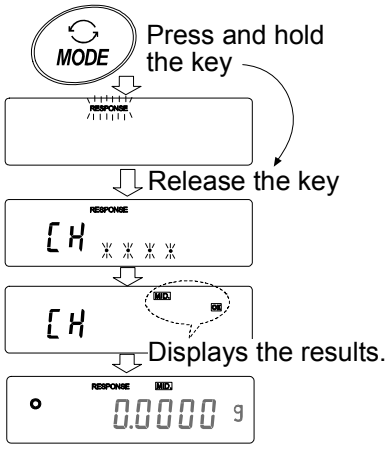
To set the refresh rate of 5 times/second when the response rate is FAST or 10 times/second when the response rate is MID. or SLOW, change the "Display refresh rate (SPd)" parameter of "Environment, Display (bASFnc)" in the function table. For details, refer to "9. FUNCTION TABLE".

6-1 Automatic Response Adjustment / Self Check Function

This function automatically updates the response adjustment by analyzing the influence of the environment on the weighing data and also self-checks the balance performance using the internal mass.

Operation

1 Press and hold the MODE key until RESPONSE is displayed, then release the key.



2 The balance automatically starts to check the balance performance and sets the response characteristic.

Caution

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

3 After automatic adjustment, the balance displays the updated response indicator and returns to the weighing mode. The response indicator remains displayed for about 30 seconds.

e.g. " MID. OK "

The example above indicates that the result of the self check is good and MID. is selected as the response rate.

Notes

- □ **If improper performance is found in the self check, the balance displays [CH no]. Contact the local A&D dealer for repair.**
- □ **If the automatic response adjustment fails, the balance displays [CH nG]. Check the ambient conditions such as breeze and vibration, also check the weighing pan. Then, perform the adjustment again. To return to the weighing mode, press the [CAL] key.**
- □ **If the automatic response adjustment is awkward, try to refine it using the manual response adjustment.**

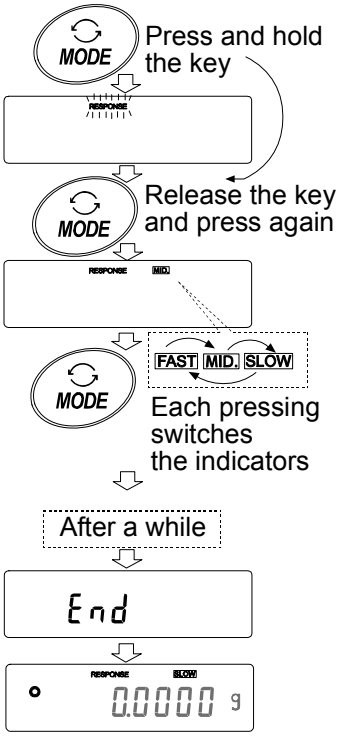
6-2 Manual Response Adjustment

This function manually updates the response adjustment.

Operation

1 Press and hold the [MODE] key until [RESPONSE] is displayed, then release the key.

Press the [MODE] key again quickly.



2 Press the [MODE] key to select a rate of the response adjustment. Either [FAST], [MID.] or [SLOW] can be selected.

3 After a few seconds of inactivity the balance displays [End]. Then, it returns to the weighing mode and displays the updated response indicator. The response indicator remains displayed for about 30 seconds.

Note

The response adjustment can be changed at "Condition (Cond)" of "Environment, Display (bASFnc)" in the function table. For details, refer to "9. FUNCTION TABLE".

7. CALIBRATION

7-1 Calibration Group

Calibration	● Automatic self calibration (calibration due to changes in temperature) ● Calibration using the internal mass (one-touch calibration) ● Calibration using an external weight
Calibration test	● Calibration test using an external weight (Calibration test does not perform calibration.)

Correction of the internal mass value

Terms

The following terms are defined as follows:

Internal mass	=	Built-in calibration weight
External weight	=	A weight that you have. Referred to as a calibration weight when used for calibration.
Calibration weight	=	A weight used for calibration
Target weight	=	An external weight used for calibration test

Caution

- Calibration adjusts the balance for accurate weighing.
  Besides periodic calibration and before each use, perform calibration when:
  • the balance is installed for the first time.
  • the balance has been moved.
  • the ambient environment has changed.
- Do not allow vibration or drafts to affect the balance during calibration.
- To output the data for GLP using the RS-232C interface, set "GLP output (inFo)" of "Data output (dout)". For details, refer to "9. FUNCTION TABLE". Time and date are added to the GLP report. If the time or date is not correct, adjust them. For details, refer to the GX series instruction manual, "10-9 Clock and Calendar Function".
- Calibration test is available only when "GLP output (inFo)" of "Data output (dout)" is set to " 1 " or " 2 ".
- The calibration and calibration test data can be stored in memory. To store them, set "Data memory (dAtA)" to " 3 ". For details, refer to the GX series instruction manual, "12. DATA MEMORY".

Caution on using an external weight

- The accuracy of an external weight can influence the accuracy of weighing. Select an appropriate weight as listed below:

Model	Usable calibration weight	Adjustable range
MC-1000	**1000g**, 900g, 800 g, 700 g, 600 g, 500 g**,** 400 g, 300 g, 200 g	-0.0150 g to +0.0159 g
MC-6100	6000 g, **5000 g**, 4000 g, 3000 g, 2000 g	-0.150 g to +0.159 g

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

Display



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

7-2 Automatic Self Calibration (Calibration due to changes in temperature)

This function automatically calibrates the balance when the balance detects an ambient temperature change. If GLP output is selected in the function table, the balance outputs the calibration report or stores the data in memory. Automatic self calibration functions even if the display is turned off (standby state). ,

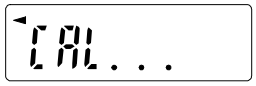
Caution

If something is on the weighing pan, the balance judges that it is in use and does not perform automatic self calibration. To maintain the calibrated state, keep the weighing pan clear while not in use.

The displays shown below are related to the automatic self calibration.



Indicates that the balance detects a change in ambient temperature and automatic self calibration will start. If the balance is not used for a few minutes with this indicator blinking, the balance performs automatic self calibration. The blinking duration depends on the environment.



Indicates that the balance is measuring calibration data. Do not allow vibration or drafts to affect the balance while this indicator is displayed. After calibration, the balance returns to indicate the previous display.

Note

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

7-3 Calibration Using the Internal mass (One-touch calibration)

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

Operation

1 Connect the AC adapter and warm up the balance for at least 30 minutes with nothing on the weighing pan.

2 Press the CAL key.

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

4 The balance displays End after calibration. If the “GLP output (inFo)” parameter of the function table is set to “ 1 ” or “ 2 ”, the balance displays GLP and outputs the “Calibration Report” using the RS-232C interface or stores the data in memory. For details on the calibration report format, refer to “10-2 GLP Report”.

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

About the internal mass

The value of the internal mass may change due to corrosion or other damage caused by the operating environment, or due to aging. Check the internal mass periodically. Correct the internal mass value as necessary. For details, refer to “7-6 Correcting the Internal Mass Value”.

To maintain the weighing accuracy, perform the calibration using an external weight periodically, as described below.

7-4 Calibration Using an External Weight

This function calibrates the balance using an external weight.

When the MC-1000 is used

1 Connect the AC adapter and warm up the balance for at least 30 minutes with nothing on the pan.

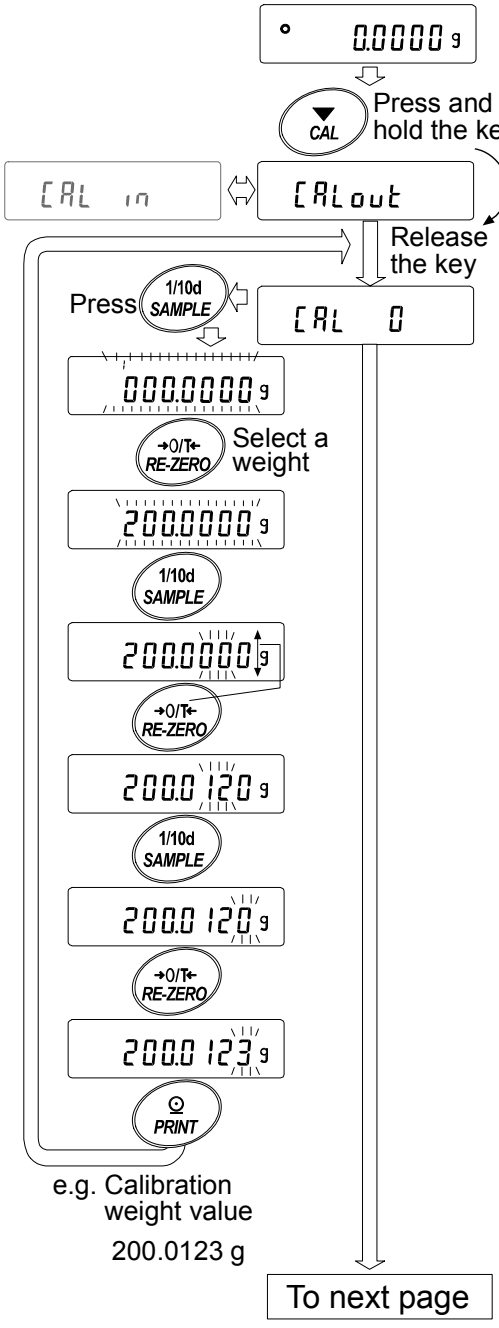
2 Press and hold the CAL key until [CALout] is displayed, then release the key.

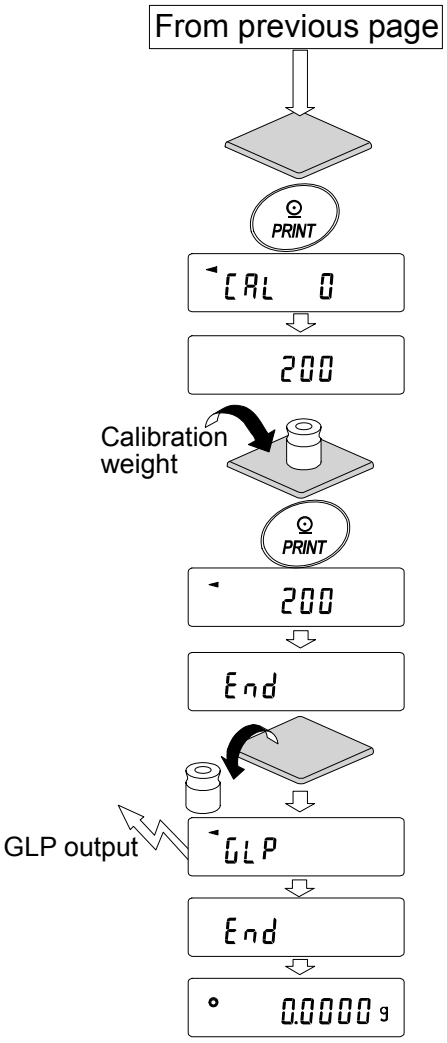
3 The balance displays [CAL 0].

- If you want to change the calibration weight (a list of usable weights is shown on page 18), press the SAMPLE key and proceed to step 4.
- If you use the calibration weight value stored in the balance, proceed to step 5.

4 Specify the calibration weight value as follows:

SAMPLE key	To switch between the calibration weight selection mode (All of the digits blinking) or the value adjustment mode (The selected digits blinking). With the MC-1000, the digits in the 2nd, 3rd, and 4th decimal places can be adjusted. With the MC-6100, the digits in the 2nd and 3rd decimal places can be adjusted.
RE-ZERO key	To select the calibration weight (All of the digits blinking) or adjust the value (The selected digits blinking). Refer to page 18
PRINT key	To store the new weight value. Even if the AC adapter is removed, the data is maintained in non-volatile memory.
CAL key	To cancel the operation and return to [CAL 0].





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

The balance displays the calibration weight value.

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

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

8 If the "GLP output (inFo)" parameter, of the function table, is set to " 1 " or " 2 ", the balance displays GLP and outputs the "Calibration Report" using the RS-232C interface or stores the data in memory. For details on the calibration report format, refer to "10-2 GLP Report".

9 The balance will automatically return to the weighing mode.

10 Place the calibration weight on the pan and confirm that the value displayed is within ±2 digits of the specified value. If it is not within the range, check the ambient conditions such as breeze and vibration, also check the weighing pan. Then, repeat steps 1 to 10.

Note

Digit indicates a unit of minimum weighing value.

7-5 Calibration Test Using an External Weight

This function tests the balance weighing accuracy using an external mass and outputs the result. This is available only when the "GLP output (inFo)" parameter is set to " 1 " or " 2 ". (Calibration test does not perform calibration.)

When the MC-1000 is used

1 Connect the AC adapter and warm up the balance for at least 30 minutes with nothing on the pan.

2 Press and hold the CAL key until [CCout] is displayed, then release the key.

3 The balance displays [CC 0].
- If you want to change the target weight (a list of usable weights is shown on page 18), press the SAMPLE key and proceed to step 4.
- If you use the target weight value stored in the balance, proceed to step 5.

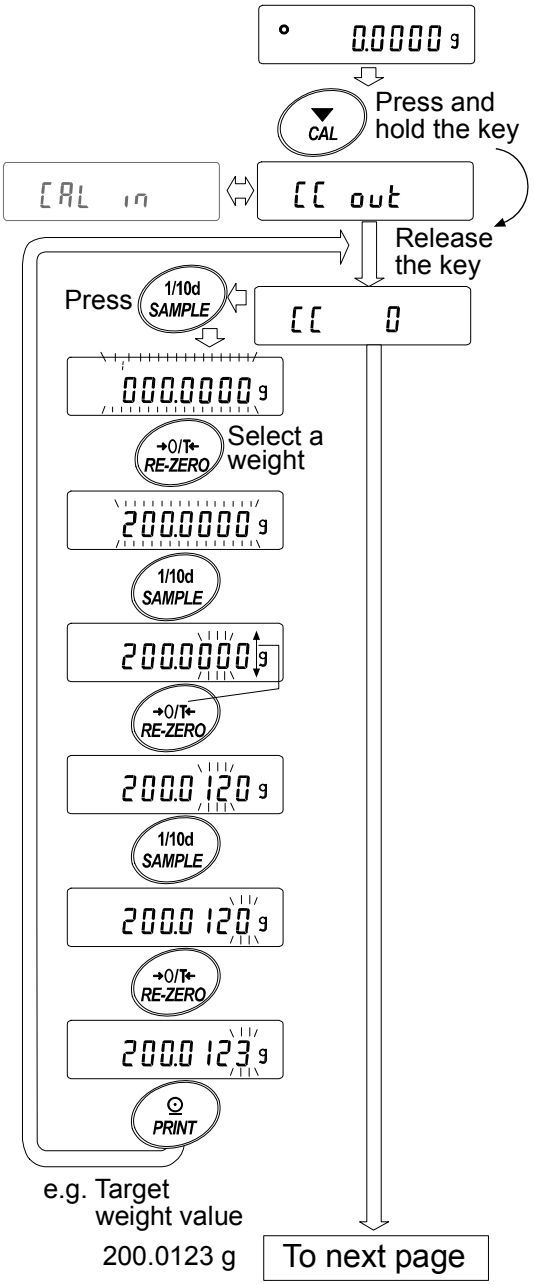
4 Specify the target weight value as follows:

SAMPLE key — To switch between the target weight selection mode (All of the digits blinking) or the value adjustment mode (The selected digits blinking).
With the MC-1000, the digits in the 2nd, 3rd, and 4th decimal places can be adjusted.
With the MC-6100, the digits in the 2nd and 3rd decimal places can be adjusted.

RE-ZERO key — To select the target weight (All of the digits blinking) or adjust the value (The selected digits blinking). Refer to page 18

PRINT key — To store the new weight value. Even if the AC adapter is removed, the data is maintained in non-volatile memory.

CAL key — To cancel the operation and return to [CC 0].



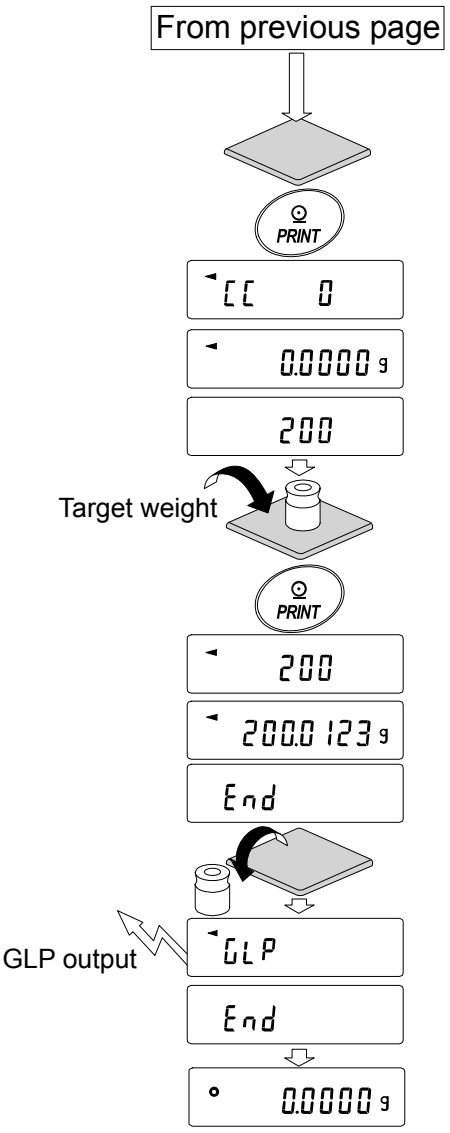
5 Confirm that there is nothing on the pan and press the PRINT key. The balance measures the zero point and displays the measured value. Do not allow vibration or drafts to affect the balance.
The balance displays the target weight value.

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

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

8 The balance displays GLP and outputs the “Calibration Test Report” using the RS-232C interface or stores the calibration test data in memory. For details on the calibration test report format, refer to “10-2 GLP Report”.

9 The balance will automatically return to the weighing mode.



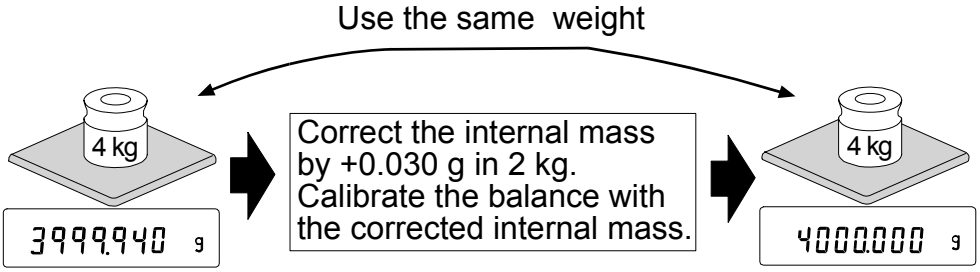
7-6 Correcting the Internal Mass Value

The MC series balance can correct the internal mass value within the range shown below. This function corrects the internal mass value to conform to an external weight. The corrected mass value is maintained in non-volatile memory even if the AC adapter is removed.

The internal mass value is corrected as follows:

Model	Correction reference value	Correction range
MC-1000	500.0000 g	±0.020 g
MC-6100	2000.000 g	±0.20 g

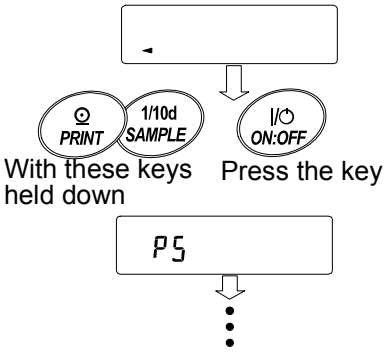
Example: Using the MC-6100



Operation

1 Calibrate the balance using the internal mass (one-touch calibration). Then, place an external weight and confirm the value to be corrected.

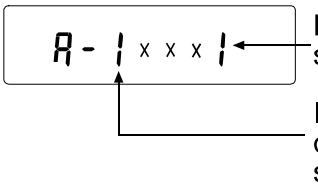
In the example, the value is off by -0.060 g and the correction reference value of the MC-6100 is 2 kg. So, the value is to be corrected by 0.030 g in 2 kg.



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

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

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



Set the function table switch and internal mass correction switch to " 1 " as shown above using the following keys.

SAMPLE key	To select the switch to change the value.
RE-ZERO key	To change the parameter of the switch selected.

5 Press the PRINT key to store the new setting. The balance returns to the weighing mode.

6 Press and hold the SAMPLE key to enter the function table and release the key when bASFnc is displayed.

7 Press the SAMPLE key several times until CS in is displayed.

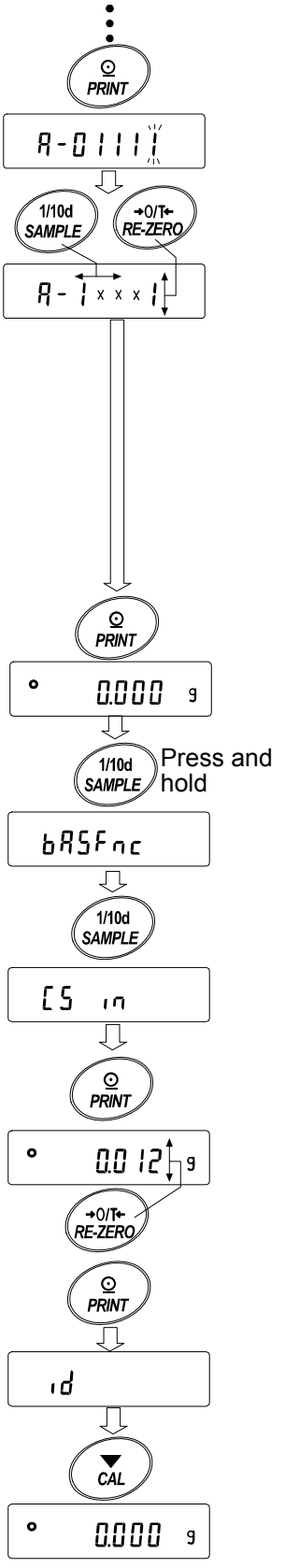
8 Press the PRINT key to enter the procedure for correcting the internal mass value.

9 Correct the internal mass value using the following keys.

RE-ZERO key	To select the value. (-20 digits appear after +20 digits.)
PRINT key	To store the new value and display the next menu of the function table.
CAL key	To cancel the correction and display the next menu of the function table.

10 Press the CAL key. The balance returns to the weighing mode.

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



12 Place the external weight on the pan and confirm that the correction has been performed properly (Confirm that the value displayed is within the range that is described at "Accuracy right after calibration using the internal mass" of "17. SPECIFICATIONS".)

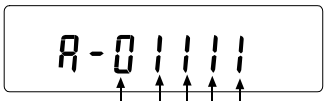
If the internal mass value has not been corrected properly, repeat the procedure, starting at step 6 and adjust the correction value.

8. FUNCTION SWITCH AND INITIALIZATION

8-1 Permit or Inhibit

The balance stores parameters that must not be changed carelessly (e.g. Calibration data for accurate weighing, Data for adapting to the operating environment, Control data for the RS-232C interface). There are five switches for the purpose of protecting these parameters. Each switch can select either “permit” or “inhibit”. “Inhibit” protects parameters against careless operations.

Switches



(The display shown left indicates the factory settings.)

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

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

Calibration using an external weight
- 0 To inhibit calibration using an external weight
- 1 To permit calibration using an external weight

Automatic self calibration (Calibration due to changes in temperature)
- 0 To inhibit automatic self calibration
- 1 To permit automatic self calibration

Internal mass correction
- 0 To inhibit correction
- 1 To permit correction

Operation

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

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

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

4 Set the switches using the following keys.

SAMPLE key	To select the switch to change the parameter.
RE-ZERO key	To change the parameter of the switch selected.
	0:To inhibit changes. 1:To permit changes
PRINT key	To store the new parameter and return to the weighing mode.
CAL key	To cancel the operation. (CLr is displayed.)
	To return to the weighing mode, press CAL key once again.

8-2 Initializing the Balance

This function returns the following parameters to factory settings.

- Calibration data
- Function table
- The sample unit mass value (counting mode), 100% reference mass value (percent mode)
- The data that is stored in the balance using the data memory function
- External calibration weight and target weight value
- Function switch settings

Note

Be sure to calibrate the balance after initialization.

Operation

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

2 While pressing and holding the PRINT key and the SAMPLE key, press the ON:OFF key. The balance displays [P5].

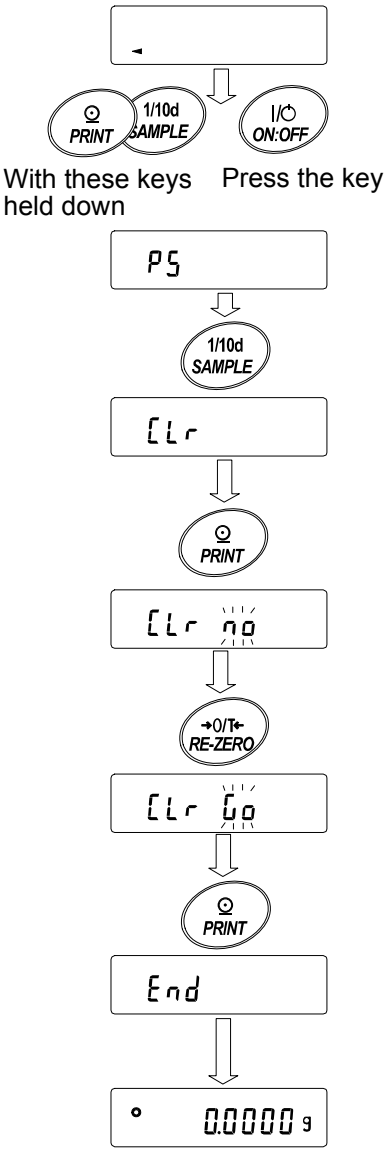
3 Press the SAMPLE key to display [CLr].

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

5 Press the RE-ZERO key.

6 Press the PRINT key to initialize the balance.

The balance will automatically return to the weighing mode.



9. FUNCTION TABLE

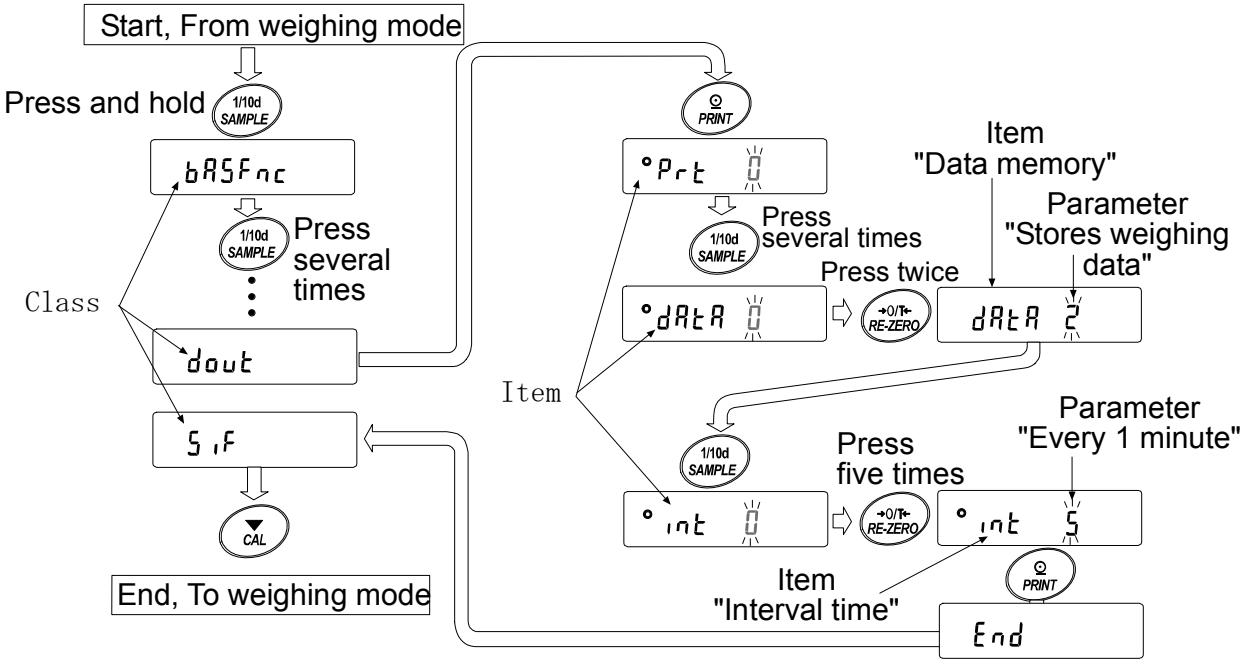
The function table reads or rewrites the parameters that are stored in the balance. These parameters are stored in non-volatile memory, and are maintained even if the AC adapter is removed.

9-1 Structure and Sequence of the Function Table

The function table menu consists of two layers. The first layer is the “Class” and the second layer is the “Item”. Each item stores a parameter.

Example

This example sets “Stores weighing data” for “Data memory” and “Every 1 minute” for “Interval time”.



9-2 Display and Keys

Display/Key	Description
°	The symbol “O” indicates that the parameter displayed is in effect.
1/10d SAMPLE	When pressed and held in the weighing mode, enters the function table mode. Selects the class or item in the function table mode.
→0/T← RE-ZERO	Changes the parameter.
PRINT	When a class is displayed, moves to an item in the class. When an item is displayed, stores the new parameter and displays the next class.
CAL	When an item is displayed, cancels the new parameter and displays the next class. When a class is displayed, exits the function table mode and returns to the weighing mode.

9-3 Details of the Function Table

Class	Item and Parameter		Description	
bASFnc Environment Display	Cond Condition	0	Fast response rate, sensitive value FAST	Can be changed by response adjustment. With "hold 1", sets the averaging time.
		▪ 1	MID.	
		2	Slow response rate, stable value SLOW	
	St-b Stability band width	0	Stable range is ±1 digit	The stabilization indicator illuminates when the display fluctuation is within the range. With "hold 1", sets the averaging time.
		▪ 1		
		2	Stable range is ±3 digits	
	Hold Hold function	▪ 0	OFF	Holds the display when stable in animal mode. With "Hold 1", ANIMAL turns on.
		1	ON	
	trc Zero tracking	0	OFF	Keeps zero display by tracking zero drift.
		▪ 1	Normal	
		2	Strong	
		3	Very strong	
	SPd Display refresh rate	▪ 0	5 times/second	Period to refresh the display
		1	10 times/second	
	Pnt Decimal point	▪ 0	Point (.)	Decimal point format
		1	Comma (,)	
	P-on Auto display-ON	▪ 0	OFF	Turns on the weighing mode display when the AC adapter is plugged in.
		1	ON	
	PoFF Auto display-OFF	▪ 0	OFF	Turns off the display after 10 minutes of inactivity.
		1	ON (10 minutes)	
	GS1 Capacity indicator	▪ 0	OFF	Capacity indicator Zero: 0%, Maximum capacity: 100%
		1	ON	
	FIL Filter	▪ 0	Not used	
		1	Used (when the balance is used as a mass comparator)	
	P-tr Zero upon power-on	▪ 0	Sets the display to zero.	
		1	Does not set the display to zero. Displays the previous value. With this setting, do not perform re-zero operations frequently. Refer to "Zero upon power-on" on page 33.	
	SPn Span calibration	▪ 0	Performs zero and span calibration	
		1	Performs span calibration only. Span calibration using the internal mass is possible with a tare on the weighing pan. Refer to "Span calibration" on page 33.	
CL AdJ Clock		Refer to the GX series instruction manual, "10-9 Clock and Calendar Function".		Confirms and sets the time and date. The time and date are added to the output data.
CP Fnc Comparator	CP Comparator mode	▪ 0	No comparison	
		1	Comparison, excluding "near zero" when stable or overloaded	
		2	Comparison, including "near zero" when stable or overloaded	
		3	Continuous comparison, excluding "near zero"	
		4	Continuous comparison, including "near zero"	
	CP in Input method	▪ 0	Digital input, upper/lower limits	CP Hi, CP Lo can be selected.
		1	Weighing input, upper/lower limits	
		2	Digital input, reference value	CP rEF, CP LAt can be selected..
		3	Weighing input, reference value	

▪ Factory setting

Note: "Digit" is a unit of minimum weighing value

Class	Item and Parameter		Description	
CP Hi Upper limit			Refer to the GX series instruction manual, "10-10 Comparator Function".	Displays when CP in 0 or CP in 1 is selected.
CP Lo Lower limit				
CP rEF Reference value				Displays when CP in 2 or CP in 3 is selected.
CP LnE Tolerance				
doUt Data output	PrT Data output mode	▪ 0	Key mode (when stable)	Accepts the PRINT key only when the display is stable.
		1	Auto print mode A (Reference = zero)	Outputs data when the display is stable and conditions of AP-P, AP-b and the reference value are met.
		2	Auto print mode B (Reference = last stable value)	
		3	Stream mode / Interval memory mode	With dAtA 0, outputs data continuously; with dAtA 2, uses interval memory.
	AP-P Auto print polarity	▪ 0	Plus only	Displayed value>Reference
		1	Minus only	Displayed value<Reference
		2	Both	Regardless of displayed value
	AP-b Auto print difference	▪ 0	10 digits	Difference between reference value and displayed value
		1	100 digits	
		2	1000 digits	
	dAtA Data memory	▪ 0	Not used	Related items: PrT, int, d-no, S-td, inFo
		1	Stores unit mass in counting mode	
		2	Stores weighing data	
		3	Stores calibration data	
	int Interval time	▪ 0	Every measurement	Interval time in the interval memory mode when using PrT 3, dAtA 2
		1	2 seconds	
		2	5 seconds	
		3	10 seconds	
		4	30 seconds	
		5	1 minute	
		6	2 minutes	
		7	5 minutes	
		8	10 minutes	
	d-no Data number output	▪ 0	No output	Refer to the GX series instruction manual, "12. DATA MEMORY".
		1	Output	
	S-td Time/Date output	▪ 0	No output	Selects whether or not the time or date is added to the weighting data. For details, Refer to the GX series instruction manual, "10-9 Clock and Calendar Function".
		1	Time only	
		2	Date only	
		3	Time and date	
	S- id ID number output	▪ 0	No output	Selects whether or not the ID number is output.
		1	Output	
	PUSE Data output pause	▪ 0	No pause	Selects the data output interval.
		1	Pause (1.6 seconds)	

▪ Factory setting

Note: "Digit" is a unit of minimum weighing value

Class	Item and Parameter		Description	
dout Data output	At-F Auto feed	▪ 0	Not used	Selects whether or not automatic feed is performed.
		1	Used	
	inFo GLP output	▪ 0	No output	Selects GLP output method. For how to set time and date to be added, refer to the GX series instruction manual, “10-9 Clock and Calendar Function”.
		1	AD-8121 format	
		2	General data format	
	Ar-d Zero after output	▪ 0	Not used	Adjusts zero automatically after data is output.
		1	Used	
SIF Serial interface	bPS Baud rate	0	600 bps	
		1	1200 bps	
		▪ 2	2400 bps	
		3	4800 bps	
		4	9600 bps	
	btPr Data bit, parity bit	▪ 0	7 bits, even	
		1	7 bits, odd	
		2	8 bits, none	
	CrLF Terminator	▪ 0	CR LF	CR: ASCII code 0Dh LF: ASCII code 0Ah
		1	CR	
	tYPE Data format	▪ 0	A&D standard format	Refer to the GX series instruction manual, "10-6 Description of Item "Data Format".
		1	DP format	
		2	KF format	
		3	MT format	
		4	NU format	
		5	CSV format	
	t-UP Timeout	0	No limit	Selects the wait time to receive a command.
		▪ 1	1 second	
	ErCd AK, Error code	▪ 0	No output	AK: ASCII code 06h
		1	Output	
	CtS CTS, RTS control	▪ 0	Not used	Controls CTS and RTS.
		1	Used	
Unit Unit		g	gram	Refer to the GX series instruction manual, "5. WEIGHING UNIT".
dS Fnc Density function	Ld in Liquid density input	▪ 0	Water temperature	Available only when density mode is selected. Refer to the GX series instruction manual, "15. DENSITY MEASUREMENT”.
		1	Liquid density	
CS in Internal mass value correction			Refer to “7. CALIBRATION”.	Displayed only when the internal mass value correction switch is set to 1.
id ID number setting			Refer to “10. ID NUMBER AND GLP REPORT”.	

▪ Factory setting

Class	Item and Parameter		Description
ErFnc Extended function	F 1-b Averaging range for the first moving average	0	Small
		1	
		2	
		3	
		▪ 4	
		5	
		6	
		7	Large
	F 1-t Averaging time for the first moving average	0	No averaging
		1	0.5 second
		▪ 2	1.0 second
		3	1.5 seconds
		4	2.0 seconds
		5	2.5 seconds
		6	3.2 seconds
		7	4.8 seconds
		8	6.4 seconds
Only when F iL is 0	F2-b Averaging range for the second moving average	0	Small
		▪ 1	
		2	
		3	
		4	
		5	
		6	Large
	F2-t Averaging time for the second moving average	0	No averaging
		1	0.5 second
		2	1.0 second
		3	1.5 seconds
		4	2.0 seconds
		▪ 5	2.5 seconds
		6	3.2 seconds

▪ Factory setting

Caution

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

9-4 Description of the Class “Environment, Display”

Condition (Cond)

Cond 0 ⇕ **Cond 2**

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

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

Notes

- □ **In automatic response adjustment, the response rate is selected automatically.**
- □ **With “Hold function (HoLd)” set to “ON (1)”, this item is used to set the averaging time.**

Stability band width (St-b)

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

St-b 0 ⇕ **St-b 2**

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

St-b 2 This parameter ignores slight fluctuation of a weight value. Used to prevent a weight value from drifting due to vibration or drafts.

Note

With “Hold function (HoLd)” set to “ON (1)”, this item is used to set the stabilization range.

Zero upon power-on (P-tr)

When a hopper is attached to the weighing pan and loss-in weighing is performed, the remaining amount of the material will become unknown if tare is performed each time a weighing starts.
When " P-tr " is set to “ 1 ”, tare is not performed at weighing start. So, the remaining amount of the material can be monitored, when the power is turned on again after it was turned off.

Span calibration (SPn)

When a hopper is attached to the weighing pan and calibration is to be performed with the hopper attached, set " SPn " to “ 1 ”. When the tare value (hopper and other devices attached) is within the value in the table below, calibration using the internal mass is possible.

Model	Tare value
MC-1000	500 g or less
MC-6100	5 kg or less

9-5 Description of the Item “Data output mode”

The parameter setting of the “Data output mode (PrE)” applies to the performance when the “Data memory (dAtA)” parameter is set to “ 2 ” (to store the weighing data)and when the data is transmitted using the RS-232C interface.

Key mode

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

Required setting	doutE	PrE 0	Key mode

Auto print modes A and B

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

Mode A: Required setting	doutE	PrE 1	Auto print mode A (reference = zero)
	doutE	AP-P	Auto print polarity
	doutE	AP-b	Auto print difference
Example	“For weighing each time a sample is placed and removed.”		

Mode B**:** Required setting	doutE	PrE 2	Auto print mode B (reference = last stable value)
	doutE	AP-P	Auto print polarity
	doutE	AP-b	Auto print difference
Example	“For weighing while a sample is added.”		

Stream mode

The balance outputs the weighing data continuously regardless of the display condition. The display does not blink in this mode. This mode is not available and the interval memory mode is used when the “Data memory (dAtA)” parameter is set to “ 2 ” (to store the weighing data).

Required setting	doutE	PrE 3	Stream mode
	doutE	dAtA 0	Data memory function is not used.
	bASFnc	SPd	Display refresh rate
	S iF	bPS	Baud rate
Example	“For monitoring data on a computer”		

Caution

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

Interval memory mode

The weighing data is periodically stored in memory.

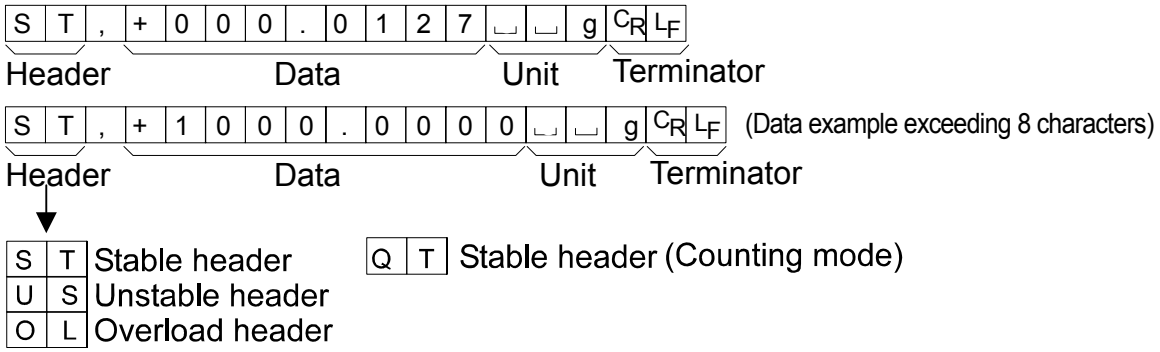
Required setting	dout	Prt 3	Interval memory mode
	dout	dAtA 2	Data memory function is used. Stores weighing data.
	dout	int	Interval time
Optional setting	dout	S-td 1, 2, or 3	Adds the time and date.
Example	"For periodical weighing without a computer command and outputting all of the data to a computer at one time"		

9-6 Description of the Item "Data format"

A&D standard format SiF tYPE 0

This format is used when the peripheral equipment can receive the A&D format. If an AD-8121B is used, set the printer to MODE 1 or 2.

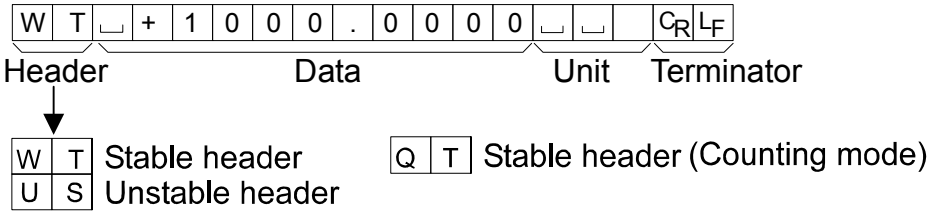
- This format consists of fifteen or sixteen characters excluding the terminator.
  With the MC-1000, when the numerical data excluding the decimal point exceeds eight characters, the data format will be sixteen characters long.
- A header of two characters indicates the balance condition.
- The polarity sign is placed before the data with the leading zeros. If the data is zero, the plus sign is used.
- The unit, consisting of three characters, follows the data.



DP (Dump print) format SiF tYPE 1

This format is used when the peripheral equipment can not receive the A&D format. If an AD-8121B is used, set the printer to MODE 3.

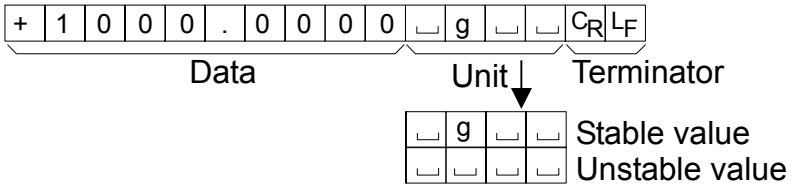
- This format consists of sixteen characters excluding the terminator.
- A header of two characters indicates the balance condition. No overload header is used.
- The polarity sign is placed before the data, with spaces in place of leading zeros, if the data is not zero or overloaded.
- The unit, consisting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



KF format SIF TYPE 2

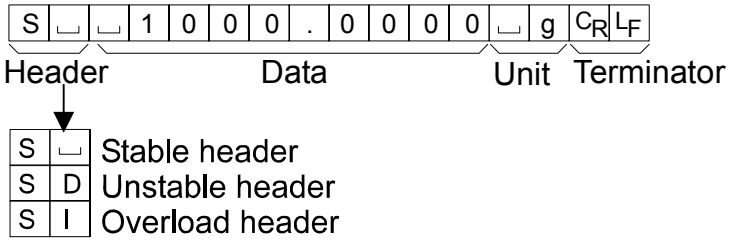
This is the Karl-Fischer moisture meter format and is used when the peripheral equipment can only communicate using this format.

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



MT format SIF TYPE 3

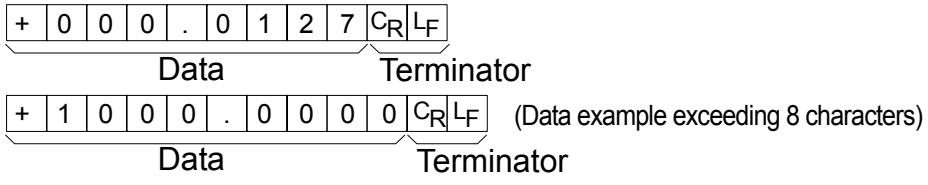
- A header of two characters indicates the balance condition.
- The polarity sign is used only for negative data.
- The weighing data uses spaces in place of the leading zeros.
- The character length of this format changes dependent upon the unit



NU (Numerical) format SIF TYPE 4

This format outputs only numerical data.

- This format consists of nine or ten characters excluding the terminator.
  With the MC-1000, when the numerical data excluding the decimal point exceeds eight characters, the data format will be ten characters long.
- The polarity sign is placed before the data with the leading zeros. If the data is zero, the plus sign is used.



CSV format　SIF TYPE 5

- Separates the data of A&D standard format and the unit by a comma (,).
- Outputs the unit even when the data is overloaded.
- When the ID number, data number, time and date are added, outputs the ID number, data number, date, time and weighing data in this order and separates each item by a comma and treats all the items as one group of data.

LAB-123, No,012, 2009/12/31, 12:34:56, ST,+1000.0000, ␣ ␣ g<CR><LF>
ID number Data number Date Time Weighing data

S	T	,	+	1	0	0	0	.	0	0	0	0	,	␣	␣	g	CR	LF
O	L	,	+	9	9	9	9	9	9	9	E	+	1	9	,	␣	␣	g	CR	LF

Note

To add the ID number, data number, time and date, the function settings must be changed.

9-7 Description of the Data Format Added to the Weighing Data

ID number　dout S-id 1

The number to identify a specific balance.

- This format consists of seven characters excluding the terminator.

L	A	B	-	1	2	3	CR	LF

Data number　dout d-no 1

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

- This format consists of six characters excluding the terminator.
- When CSV format (SIF TYPE 5) is selected, the period (.) is replaced with a comma (,).

N	o	.	0	0	1	CR	LF

Data number　Terminator

Note

The data number is added only to the weighing data that is stored in memory.

Date　dout S-td 2 or 3

- The date output order can be changed in “Clock (CL AdJ)”. Outputs the year in four-digit format.

2	0	0	9	/	1	2	/	3	1	CR	LF

Time　dout S-td 1 or 3

- Outputs time in 24-hour format.

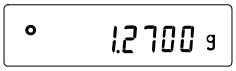
1	2	:	3	4	:	5	5	CR	LF

Note

When the data described above is added to the weighing data, the output is in the following order: ID number, Data number, Date, Time and Weighing data.

9-8 Data Format Examples

Stable



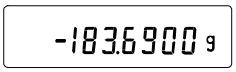
(Data example exceeding 8 characters)



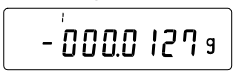
A&D	S	T	,	+	0	0	1	.	2	7	0	0	␣	␣	g	C_R L_F
DP	W	T	␣	␣	␣	␣	+	1	.	2	7	0	0	␣	␣	g	C_R L_F
KF	+	␣	␣	␣	1	.	2	7	0	0	␣	g	␣	␣	C_R	L_F
MT	S	␣	␣	␣	␣	␣	1	.	2	7	0	0	␣	g	C_R	L_F
NU	+	0	0	1	.	2	7	0	0	C_R	L_F					

A&D	S	T	,	+	1	0	0	0	.	0	0	0	0	␣	␣	g	C_R L_F
NU	+	1	0	0	0	.	0	0	0	0	C_R	L_F					

Unstable



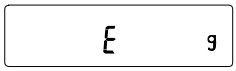
(Data example exceeding 8 characters)



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

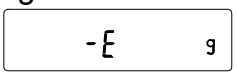
A&D	U	S	,	-	1	0	0	0	.	0	1	2	7	␣	␣	g	C_R L_F
NU	-	1	0	0	0	.	0	1	2	7	C_R	L_F					

Overload
Positive error



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

Overload
Negative error



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

Unit

g (gram) g

A&D	D.P.	KF	MT
␣ ␣ g	␣ ␣ g	␣ g ␣ ␣	␣ g

␣ Space, ASCII 20h
C_R Carriage Return, ASCII 0Dh
L_F Line Feed, ASCII 0Ah

10. ID NUMBER AND GLP REPORT

- The ID number is used to identify the balance when Good Laboratory Practice (GLP) is used.
- The ID number is maintained in non-volatile memory even if the AC adapter is removed.
- The GLP output format is selected at “GLP output (inFo)” of the function table and can be output to a personal computer or printer using the RS-232C serial interface.
- The GLP output format includes the balance manufacturer, model, serial number, ID number, date, time and space for signature for weighing data, and the weight used and results for calibration or calibration test data.
- The balance can output the following reports for GLP.

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

  “Calibration report” of the calibration, using an external weight.

  “Calibration test report” of the calibration test, using an external weight.

  “Title block” and “End block” for the weighing data.
- Calibration and calibration test data can be stored in memory to output several reports at the same time. Refer to the GX series instruction manual, “12. DATA MEMORY” for details.
- For details on confirming and setting the time and date, refer to the GX series instruction manual, “10-9 Clock and Calendar Function”.

10-1 Setting the ID Number

1 Press and hold the SAMPLE key until bASFnc of the function table is displayed.

2 Press the SAMPLE key several times to display id.

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

RE-ZERO key	To set the character of the digit selected. Refer to the display character set shown below.
SAMPLE key	To select the digit to change the value.
PRINT key	To store the new ID number and display bASFnc.
CAL key	To cancel the new ID number and display bASFnc.

4 With bASFnc displayed, press the CAL key to return to the weighing mode.

Display character set

0	1	2	3	4	5	6	7	8	9	-	␣	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
0	1	2	3	4	5	6	7	8		-		A	b	C	d	E	F	G	H	ı	J	K	L	M	n	o	P	q	r	S	t	U	v	W	X	y	Z

␣ Space

10-2 GLP Report

Set the following parameters to output the report.

- To print the report, set the “GLP output (inFo)” parameter to “ 1 ”, the “Data output pause (PUSE)” parameter to “ 1 ”, and use MODE 3 of the AD-8121B. For details on using the printer, refer to “12-1 Connection to the AD-8121B Printer”.
- To output the report to a personal computer using the RS-232C interface, set the “GLP output (inFo)” parameter to “ 2 ”.
- If the time and date are not correct, set the correct time and date in “Clock (CL AdJ)” of the function table.

Calibration report using the internal mass

When the setting is “ inFo 1 ”:

AD-8121 format

```
                A & D
MODEL       MC-1000
S/N       01234567
ID          ABCDEFG
DATE    2009/12/31
TIME      12:34:56
CALIBRATED(INT.)
SIGNATURE


_ _ _ _ _ _ _ _
```

When the setting is “ inFo 2 ”:

General data format

```
␣␣␣␣␣␣␣␣␣␣␣A␣&␣D<TERM>
MODEL␣␣␣␣MC-1000<TERM>
S/N␣␣␣␣␣␣01234567<TERM>
ID␣␣␣␣␣␣␣ABCDEFG<TERM>
DATE<TERM>
␣␣␣␣␣␣2009/12/31<TERM>
TIME<TERM>
␣␣␣␣␣␣␣␣12:34:56<TERM>
CALIBRATED(INT.)<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
----------------<TERM>
<TERM>
<TERM>
```

Manufacturer
Model
Serial number
ID number
Date
Time
Calibration type
Signature

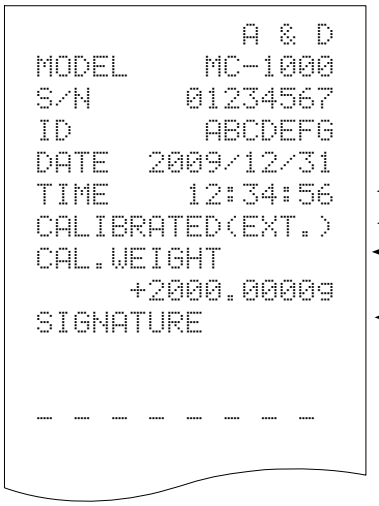
␣ Space, ASCII 20h
<TERM> Terminator, C_R , L_F or C_R
C_R Carriage return, ASCII 0Dh
L_F Line feed, ASCII 0Ah

Calibration report using an external weight

When the setting is "InFo 1":

When the setting is "InFo 2":

AD-8121 format



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

General data format

```
␣␣␣␣␣␣␣␣␣␣␣A␣&␣D<TERM>
MODEL␣␣␣␣MC-1000<TERM>
S/N␣␣␣␣␣01234567<TERM>
ID␣␣␣␣␣␣␣ABCDEFG<TERM>
DATE<TERM>
␣␣␣␣␣2009/12/31<TERM>
TIME<TERM>
␣␣␣␣␣␣␣␣12:34:56<TERM>
CALIBRATED(EXT.)<TERM>
CAL.WEIGHT<TERM>
␣␣␣␣␣+2000.0000g<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
----------------<TERM>
<TERM>
<TERM>
```

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

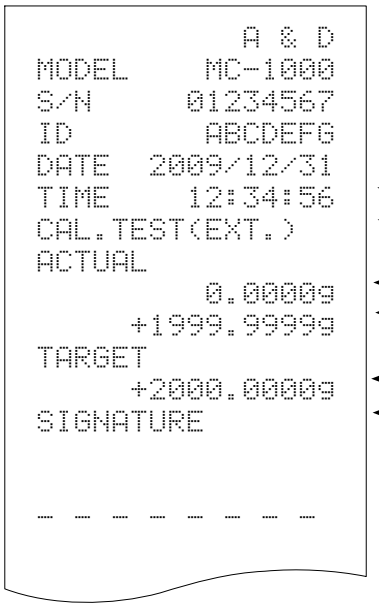
Calibration test report using an external weight

(Calibration test does not perform calibration.)

When the setting is "InFo 1":

When the setting is "InFo 2":

AD-8121 format



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

General data format

```
␣␣␣␣␣␣␣␣␣␣␣A␣&␣D<TERM>
MODEL␣␣␣␣MC-1000<TERM>
S/N␣␣␣␣␣01234567<TERM>
ID␣␣␣␣␣␣␣ABCDEFG<TERM>
DATE<TERM>
␣␣␣␣␣␣2009/12/31<TERM>
TIME<TERM>
␣␣␣␣␣␣␣␣12:34:56<TERM>
CAL.TEST(EXT.)<TERM>
ACTUAL<TERM>
␣␣␣␣␣␣␣␣␣0.0000g<TERM>
␣␣␣␣␣+1999.9999g<TERM>
TARGET<TERM>
␣␣␣␣␣+2000.0000g<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
----------------<TERM>
<TERM>
<TERM>
```

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

Title block and end block

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

Notes

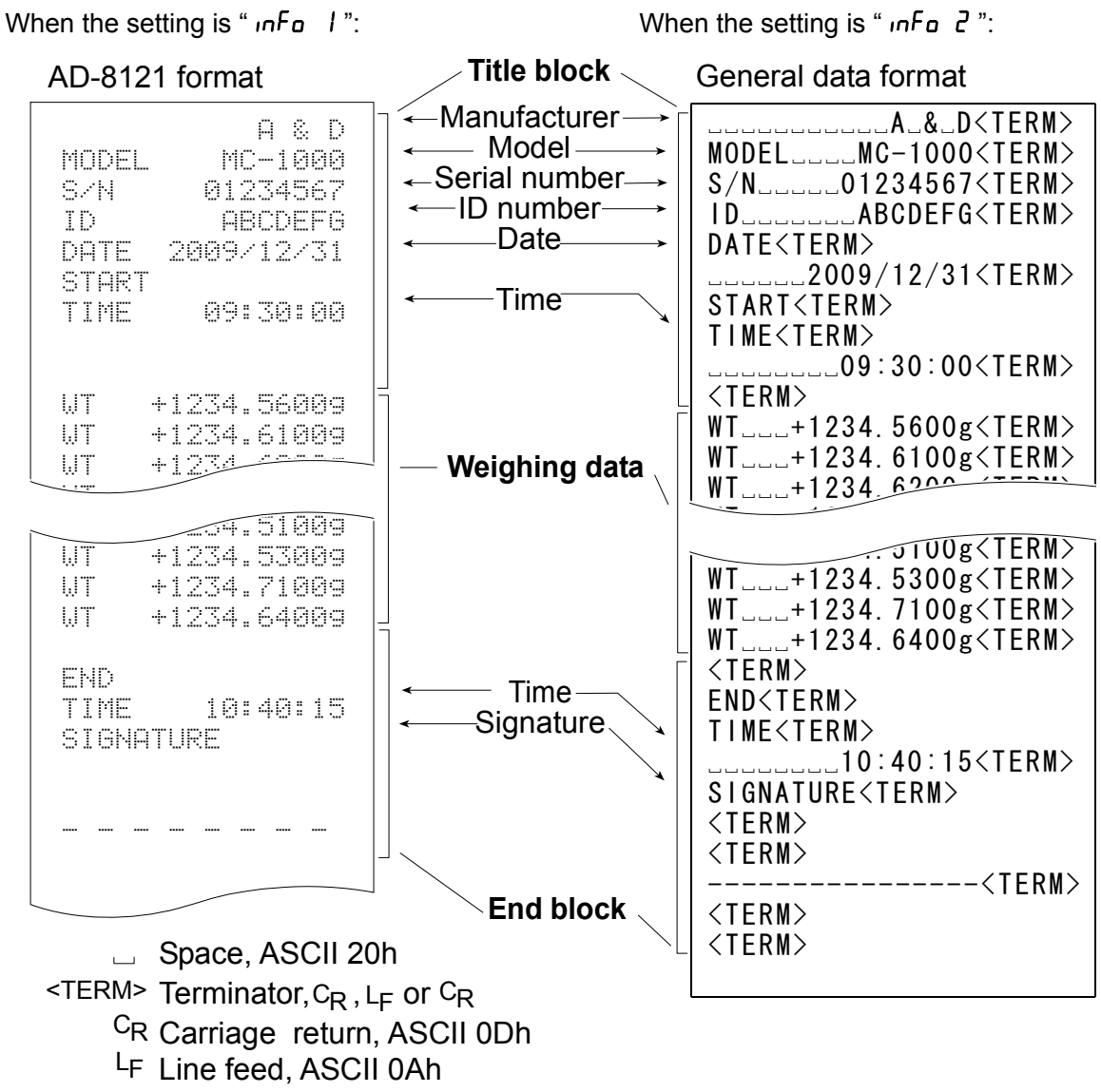
- **To output the report to an AD-8121B , use MODE 3 of the AD-8121B.**
- **If the data memory function is used, the “Title block” and “End block” can not be output.**

Operation

1 With the weighing data displayed, press and hold the PRINT key until StArt is displayed. The “Title block” is output.

2 The weighing data is output according to the parameter setting of the data output mode.

3 Press and hold the PRINT key until rEcEnd is displayed. The “End block” is output.

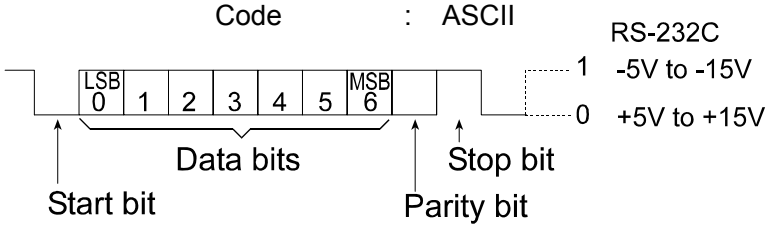


11. RS-232C SERIAL INTERFACE / EXTERNAL INPUT

RS-232C

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

Transmission system	:	EIA RS-232C		
Transmission form	:	Asynchronous, bi-directional, half duplex		
Data format	:	Baud rate	:	600, 1200, 2400, 4800, 9600 bps
		Data bits	:	7 or 8 bits
		Parity	:	Even, Odd (Data bits 7 bits)
				None (Data bits 8 bits)
		Stop bit	:	1 bit
		Code	:	ASCII



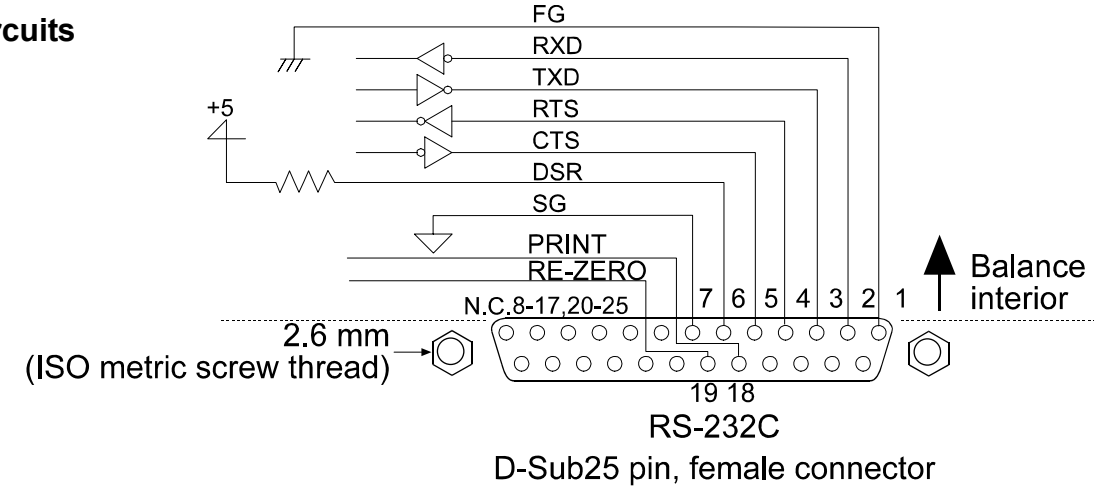
Pin connections

Pin No.	Signal name	Direction	Description
1	FG	-	Frame ground
2	RXD	Input	Receive data
3	TXD	Output	Transmit data
4	RTS	Input	Ready to send
5	CTS	Output	Clear to send
6	DSR	Output	Data set ready
7	SG	-	Signal ground
18	PRINT	Input	Same as the PRINT key
19	RE-ZERO	Input	Same as the RE-ZERO key
8 – 25 (Excluding 18 and 19)	-	-	Not connected

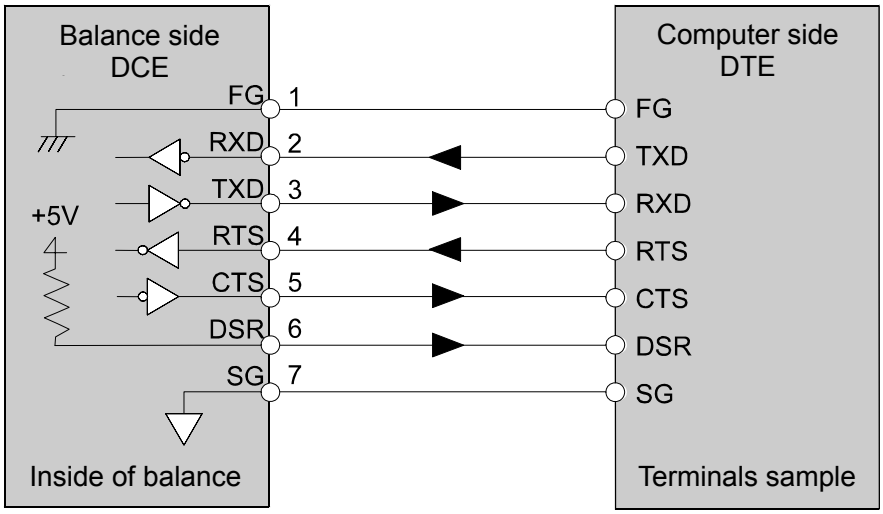
Note

The signal names for the RS-232C are the same as those for the DTE side except TXD and RXD.

Circuits

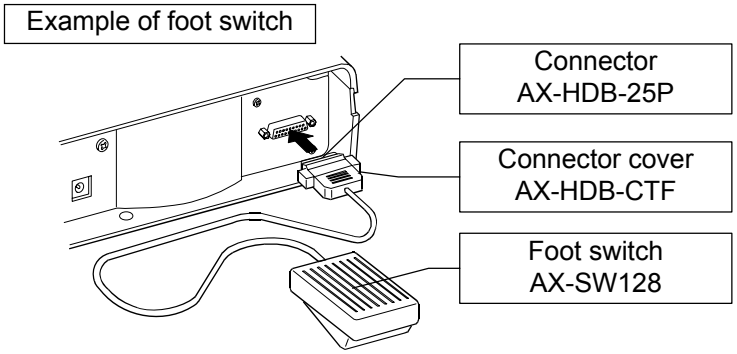


RS-232C Terminals



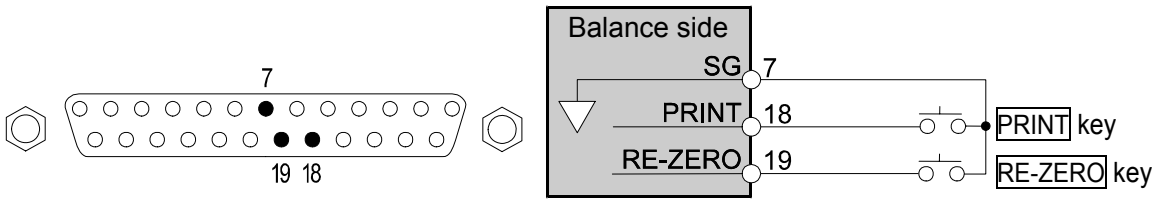
External contact input

By connecting pin 18 (PRINT command) to pin 7, or pin 19 (RE-ZERO command) to pin 7 for 100 ms or more, the same operation as performed by pressing the PRINT key or the RE-ZERO key, will be performed.



Option

Connector : AX-HDB-25P/CTF
Foot switch : AX-SW128



12. CONNECTION TO PERIPHERAL EQUIPMENT

12-1 Connection to the AD-8121B Printer

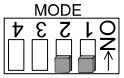
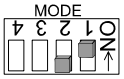
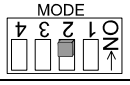
Set the following parameters to use the AD-8121B printer.

Class	Item	Factory setting	AD-8121B		
			Mode 1	Mode 2	Mode 3
dout Data output	PrT Data output mode	0	0, 1, 2, 4, 5	3	0, 1, 2, 4, 5
	AP-P Auto print polarity	0	*1	Not applicable	*1
	AP-b Auto print difference	1			
	d-no Data number output	0	0	0	0, 1
	S-td Time/date output	0	0	0	0, 1, 2, 3
	S- id ID number output	0	0	0	0, 1
	PUSE Data output pause	0	0	0	0, 1 *2
	At-F Auto feed	0	0	0	0, 1
S iF Serial interface	bPS Baud rate	2	2	2	2
	PtPr Data bit, parity bit	0	0	0	0
	CrLF Terminator	0	0	0	0
	tYPE Data format	0	0	0	1
	CtS CTS, RTS control	0	0	0	0

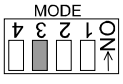
***1** Set the parameter when the data output mode is set to the auto print mode (PrT 1 or PrT 2).

***2** When multiple lines are to be printed, set the parameter to 1.

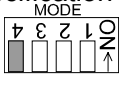
AD-8121B settings

Mode	AD-8121B DIP switches	Description
Mode 1		Prints upon data receipt Standard mode, statistical calculation mode
Mode 2		Prints using the AD-8121B DATA key or the AD-8121B built-in timer Standard mode, interval mode, chart mode
Mode 3		Prints upon data receipt Dump print mode

DIP switch 3: Handling unstable data
ON = To print unstable data
OFF = Not to print unstable data



DIP switch 4: Data input specification
ON = Use the current loop
OFF = Use the RS-232C



□ With dAtA 0, the weight data can be output to the printer.
□ With dAtA 2, the weight data stored in memory can be output to the printer.
□ With dAtA 3, the calibration report stored in memory can be output to the printer.
□ Refer to “10. ID NUMBER AND GLP REPORT” for print samples.



12-2 Connection to a Computer

The MC series balance is of the DCE type (Data Communication Equipment), which can be connected to a personal computer using the RS-232C interface.

Before connection, read the personal computer manual thoroughly.

Use a standard DCE cable for connection (cable type: straight-through).

12-3 Using Windows Communication Tools (WinCT)

When Windows is used as an operating system in a personal computer, the provided WinCT can be used to transmit the weighing data to the personal computer.
The WinCT has two communication methods: “RsCom” and “RsKey”. For details on WinCT, refer to the WinCT instruction manual.
The current version of the WinCT can be downloaded from the A&D website.

RsCom

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

RsKey

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

Note
Windows and Excel are the registered trademarks of the Microsoft Corporation.

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

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

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

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

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

5 Using the MC series balance memory function
The weighing data, instead of outputting it immediately to an external device, can be stored in the balance's memory. Later, all of the weighing data stored can be output to a personal computer at one time.

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

13. COMMANDS

13-1 Command List

Commands to query weighing data

C	Cancels the **S** or **SIR** command.
Q	Requests the weighing data immediately.
S	Requests the weighing data when stabilized.
SI	Requests the weighing data immediately.
SIR	Requests the weighing data continuously.
$^{E}_{SC}$P	Requests the weighing data when stabilized.

Note: The "Q" and "SI" commands, the "S" and "$^{E}_{SC}$P" commands behave the same.

Commands to control the balance

CAL ␣␣	Same as the CAL key.
OFF	Turns the display off.
ON	Turns the display on.
P	Same as the ON:OFF key
PRT	Same as the PRINT key
R	Same as the RE-ZERO key
SMP	Same as the SAMPLE key.
T	Same as the RE-ZERO key
Z	Same as the RE-ZERO key
$^{E}_{SC}$T	Same as the RE-ZERO key
U	Same as the MODE key
UN:mm	Changes the unit mass stored in memory with the number of mm (01-20).
?UN	Outputs the unit mass number of the selected unit mass.
UW:*. ** g**	Sets the unit mass value. e.g.,UW:+0.123␣␣g (to set the unit mass to 0.123 g: ␣represents a space.)
?UW	Outputs the unit mass value of the selected unit mass number.
?ID	Requests the ID number.
?SN	Requests the serial number.
?TN	Requests the model name.

Note: The "R", "T", "Z" and "$^{E}_{SC}$T" commands behave the same.

Commands to control the comparator function

HI:*. **␣␣g**	Sets the upper limit value. e.g.,HI:+2.34␣␣g (to set the upper limit value to 2.34 g: ␣ represents a space.)
LO:*. **␣␣g**	Sets the lower limit value. e.g.,LO:+1.23␣␣g (to set the lower limit value to 1.23 g: ␣ represents a space.)
?HI	Outputs the upper limit value.
?LO	Outputs the lower limit value.

Note: To use a command to control the comparator function, set the "Input method ([P in) " parameter to " 0 " or " 1 ".

Commands to control the memory function

MCL	Deletes all data in memory.
MD:nnn	Deletes weighing data with the data number nnn.
?MA	Outputs all data in memory.
?MQnnn	Outputs weighing data with the data number nnn.
?MX	Outputs the number of weighing data in memory.

Note: "nnn" indicates a three-digit numerical value.
$^{E}_{SC}$: 1Bh in ASCII code

13-2 Acknowledge Code and Error Codes

When the “Serial interface function (SIF)” parameter is set to “ ErCd 1 ”, the balance outputs <AK> code or error code to each command as follows:

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

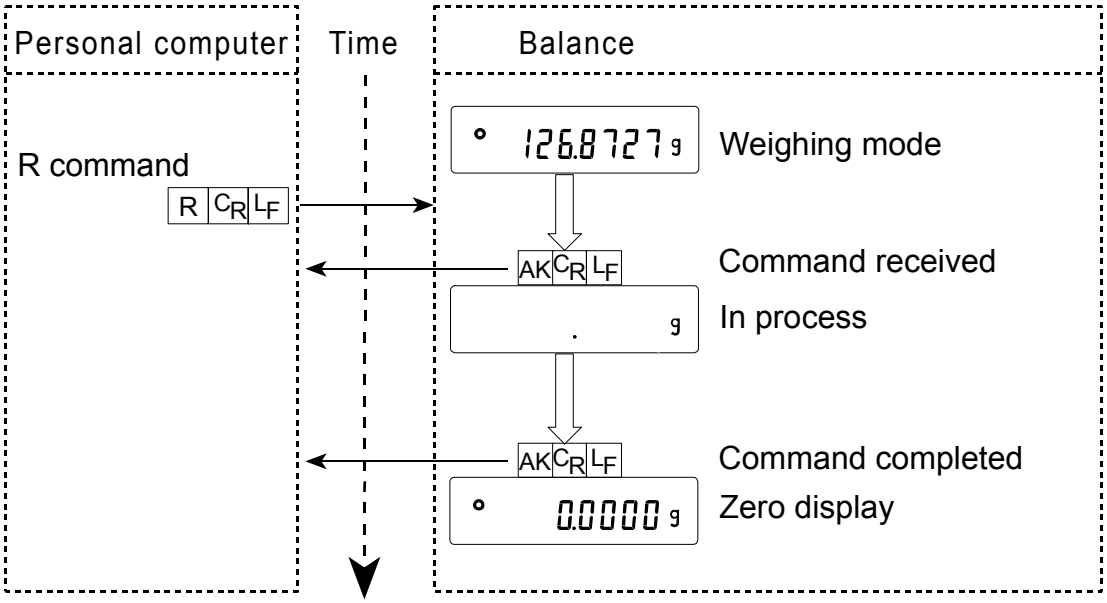
- When the balance receives a command to request data and can not process it, the balance transmits an error code (EC, Exx).
  When the balance receives a command to request data and can process it, the balance outputs the data.
- When the balance receives a command to control the balance and can not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

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

  CAL command (Calibration command) ON command (Display ON command)

  P command (Display ON/OFF command) R command (RE-ZERO command)

R command



- When a communication error has occurred due to external noise, or a parity error has occurred due to transmission error, the balance transmits an error code. In this case, send the command again.

13-3 Control Using CTS and RTS

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

CtS 0

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

CtS 1

The CTS line is kept Hi normally. When the balance can not receive the next command (e.g. while the balance is processing last command), the balance sets the CTS line to Lo. The balance confirms the level of the RTS line before outputting a set of data. If the RTS level is Hi, the balance outputs data. If the RTS level is Lo, data is not output (The data is canceled).

13-4 Settings Related to RS-232C

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

14. EXTENDED FUNCTION

The MC series balance has several extended functions equipped for special applications or to troubleshoot when using the standard functions.

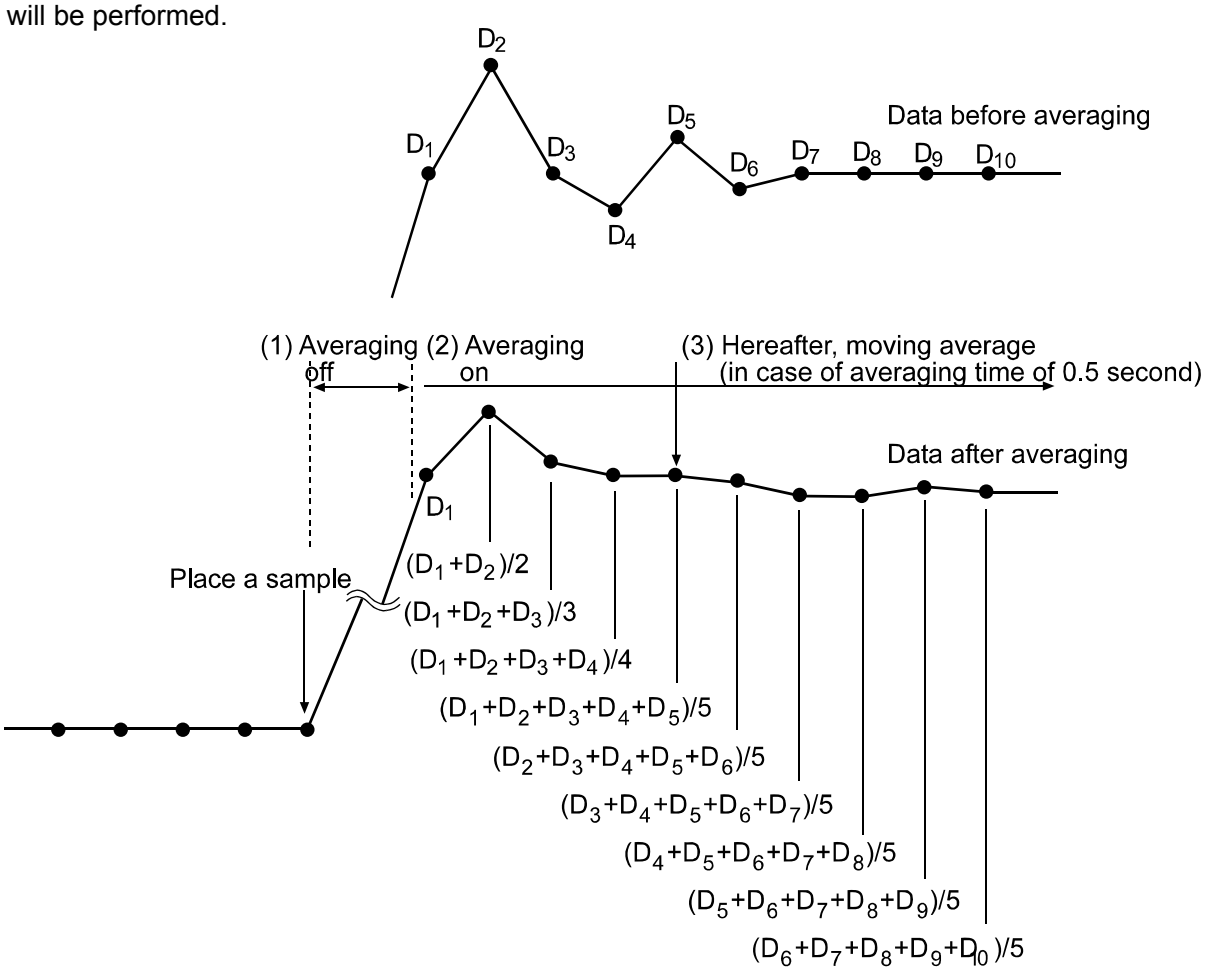
When the "Filter (F IL)" is set to " 0 ", extra items are available as shown below.

Class	Item and Parameter		Description	
ErFnc Extended function	F 1-b Averaging range for the first moving average	0	Small ▲	When the fluctuation of a weight value is within the averaging range, the averaging operation starts to stabilize the value. When the fluctuation is small, for example, when weighing or filling a small amount of sample, the averaging operation is always performed and the response rate may be slow. Under such a condition, change the parameter. Refer to "Averaging range (F 1-b) and averaging time (F 1-t)"
		1		
		2		
		3		
		■ 4		
		5		
		6		
		7	▼ Large	
	F 1-t Averaging time for the first moving average	0	No averaging	When the fluctuation of a weight value is within the averaging range, the averaging operation starts. Once the duration of averaging operations reaches the averaging time, moving averaging starts. This parameter sets the time to start moving averaging. Refer to "Averaging range (F 1-b) and averaging time (F 1-t)"
		1	0.5 second	
		■ 2	1 second	
		3	1.5 seconds	
		4	2.0 seconds	
		5	2.5 seconds	
		6	3.2 seconds	
		7	4.8 seconds	
		8	6.6 seconds	
	F2-b Averaging range for the second moving average	0	Small ▲	Refer to "Filter depending on differences in the amount to deliver powdery and liquid material".
		■ 1		
		2		
		3		
		4		
		5		
		6	▼ Large	
	F2-t Averaging time for the second moving average	0	No averaging	
		1	0.5 second	
		2	1 second	
		3	1.5 seconds	
		4	2.0 seconds	
		■ 5	2.5 seconds	
		6	3.2 seconds	

14-1 Description of "Averaging range" and "Averaging time"

Averaging range (F 1-b) and averaging time (F 1-t)

1. When the fluctuation of a weight value is beyond the range that is selected in " F 1-b ", the averaging operation is disabled and the display reflects the varying value.
2. Once the fluctuation becomes within the selected range, the averaging operation starts to stabilize the weight value.
3. The process of averaging increases. When the selected time is reached, moving averaging will be performed.



When a small amount of sample is weighed or is filled, the fluctuation of a weight value is too small to be beyond the selected range and the averaging operation is not disabled. Consequently moving averaging is always performed and it takes a longer time to reach the final weight value. Under such a situation, change the setting of " F 1-b " to a smaller range. But please note that the smaller the range is, the more prone to external disturbance the value will become.

Filter depending on differences in the amount to deliver powdery and liquid material

- When the weight value is not stable even without load fluctuations
  - □ Increase the averaging range for the first moving average parameter (F 1-b).
  - □ Increase the averaging time for the first moving average parameter (F 1-t).
  - □ Strengthen the digital filter. (Increase the function setting “Condition (Cond)” parameter.)

- When response is slow during full and medium flow
  - □ Decrease the averaging range for the first moving average parameter (F 1-b).
  - □ Weaken the digital filter. (Decrease the function setting “Condition (Cond)” parameter.)

- When response is slow during dribble flow
  - □ Decrease the averaging time for the first moving average parameter (F 1-t).
  - □ Weaken the digital filter. (Decrease the function setting “Condition (Cond)” parameter.

- To increase stability without load fluctuations
  - □ Increase the averaging range for the second moving average parameter (F2-b).
  - □ Increase the averaging time for the second moving average parameter (F2-t).

15. MAINTENANCE

- Do not use organic solvents to clean the balance. Clean the balance with a lint free cloth that is moistened with warm water and a mild detergent.
- Do not disassemble the balance. Contact the local A&D dealer if the balance needs service or repair.
- Use the original packing material for transportation.

16. TROUBLESHOOTING

16-1 Checking the Balance Performance and Environment

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

Checking that the balance performs properly

- Check the balance performance using the self-check function as described in “6-1 Automatic Response Adjustment / Self Check Function”.

  An error display appears when a malfunction is found.
- Check the balance repeatability using an external weight. Be sure to place the weight in the center of the weighing pan.
- Check the balance repeatability, linearity and calibrated value using external weights with a known value.

Checking that the operating environment or weighing method is proper

Operating environment

- Is the weighing table solid enough (especially for the balance with a minimum weighing value of 0.0001 g)?
- Is the balance level? Refer to “3-1 Before Use”.
- Is the operating environment free from vibration and drafts? Has the breeze break been installed?
- Is there a strong electrical or magnetic noise source such as a motor near the balance?

Weighing method

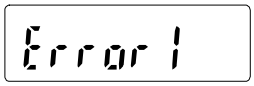
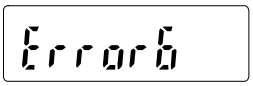
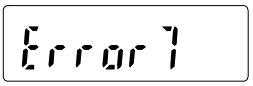
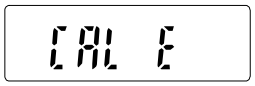
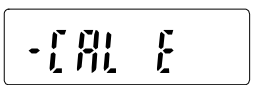
- Does the weighing pan touch the breeze ring or anything? Is the weighing pan installed correctly?
- Is the RE-ZERO key pressed before placing a sample on the weighing pan?
- Is the sample placed in the center of the weighing pan?
- Has the balance been calibrated using the internal mass (one-touch calibration)?
- Has the balance been warmed up for 30 minutes before weighing?

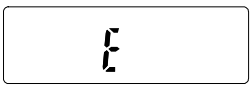
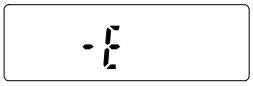
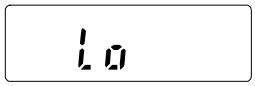
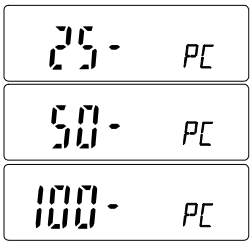
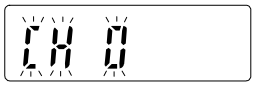
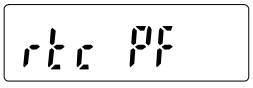
Sample and container

- Has the sample absorbed or lost moisture due to the ambient conditions such as temperature and humidity?
- Has the temperature of the container been allowed to equalize to the ambient temperature? Refer to “3-2 During Use”.
- Is the sample charged with static electricity? Refer to “3-2 During Use”.

  Static electricity is generated when the relative humidity is low.
- Is the sample of magnetic material such as iron? Caution is required for weighing magnetic materials. Refer to “3-2 During Use”.

16-2 Error Codes

Display	Error code	Description
	**EC, E11**	**Stability error** The balance can not stabilize due to an environmental problem. Prevent vibration, drafts, temperature changes, static electricity and magnetic fields. Refer to “3. PRECAUTIONS” for details on the operating environment and “6. RESPONSE ADJUSTMENT” about adapting the balance to the environment. To return to the weighing mode, press the CAL key.
	**EC, E16**	**Internal mass error** Applying the internal mass does not yield a change in the weighing value as specified. Confirm that there is nothing on the pan and perform the weighing operation from the beginning again.
	**EC, E17**	**Internal mass error** The internal mass application mechanism does not function properly. Perform the weighing operation from the beginning again.
	**EC, E20**	**Calibration weight error** The calibration weight is too heavy. Confirm the calibration weight value. Press the CAL key to return to the weighing mode.
	**EC, E21**	**Calibration weight error** The calibration weight is too light. Confirm the calibration weight value. Press the CAL key to return to the weighing mode.

Display Error code	Description
	**Overload error** A sample beyond the balance weighing capacity has been placed on the pan. Remove the sample from the pan.
	**Weighing pan Error** The weight value is too light. Confirm that the weighing pan is properly installed and calibrate the balance.
	**Sample mass error** The balance can not store the sample for the counting mode or for the percent mode because it is too light. Use a larger sample.
	**Unit mass error** The sample unit mass for the counting mode is too light. Storing and using it for counting will cause a counting error. Add samples to reach the specified number and press the PRINT key. Pressing the PRINT key without adding samples will shift the balance to the counting mode. But, for accurate counting, be sure to add samples.
	**Automatic response adjustment zero error** The automatic response adjustment can not be performed because there is something on the pan. Clear the pan. Press the CAL key to return to the weighing mode.
 (CHECK NG)	**Automatic response adjustment unstable error** The automatic response adjustment can not be performed because the weight value is unstable. Check the ambient conditions such as breeze, vibration and magnetic fields, also check the weighing pan. Press the CAL key to return to the weighing mode.
 (CHECK NO)	**Internal error** Indicates an internal error as the result of the self-check function. Repair is required. Contact the local A&D dealer.
	**Clock battery error** The clock backup battery has been depleted. Press any key and set the time and date. The clock and calendar function works normally as long as the AC adapter is connected to the balance. If this error appears frequently, contact the local A&D dealer.

Display	Error code	Description
FUL (Blinking)		**Memory full** The amount of weighing data in memory has reached the maximum capacity. Delete the data in memory to store new data. For details, refer to the GX series instruction manual, “12. DATA MEMORY”.
FUL (Illuminated)		**Memory full** The amount of calibration or calibration test data in memory has reached the maximum capacity (50 sets). The data in memory will be deleted automatically to store new data. For details, refer to the GX series instruction manual, “12. DATA MEMORY”.
CLr		**Memory type error** The type of memory set in the function table and the type of data stored are different. For details, refer to the GX series instruction manual, “12. DATA MEMORY”.
	EC, E00	**Communications error** A protocol error occurred in communications. Confirm the format, baud rate and parity.
	EC, E01	**Undefined command error** An undefined command was received. Confirm the command.
	EC, E02	**Not ready** A received command can not be processed. e.g. The balance received a Q command, but not in the weighing mode. e.g. The balance received a Q command while processing a RE-ZERO command. Adjust the delay time to transmit a command.
	EC, E03	**Timeout error** If the timeout parameter is set to “ t-UP1 ”, the balance did not receive the next character of a command within the time limit of one second. Confirm the communication.
	EC, E04	**Excess characters error** The balance received excessive characters in a command. Confirm the command.

Display	Error code	Description
	EC, E06	**Format error** A command includes incorrect data. e.g. The data is numerically incorrect. Confirm the command.
	EC, E07	**Parameter setting error** The received data exceeds the range that the balance can accept. Confirm the parameter range of the command.
Other errors		If the errors described above can not be released or other errors are displayed, contact the local A&D dealer.
Other symbol		
		When this indicator blinks, automatic self calibration is required. The indicator blinks when the balance detects changes in ambient temperature. If the balance is not used for several minutes with this indicator blinking, the balance performs automatic self calibration. The blinking duration depends on the operating environment.

16-3 Asking For Repair

If the balance needs service or repair, contact the local A&D dealer.

The balance is a precision instrument. Use much care when handling the balance and observe the following when transporting the balance.

- Use the original packing material.
- Remove the weighing pan from the main unit.

17. SPECIFICATIONS

	MC-1000	MC-6100
Weighing capacity	1100 g	6100 g
Maximum display	1100.0844 g	6100.844 g
Minimum weighing value	0.0001 g	0.001 g
Repeatability (Standard deviation) See Note 1 below.	0.0005 g / 1 kg 0.0004 g / 500 g	0.004 g / 5 kg 0.0015 g / 2 kg
Sensitivity drift (10°C-30°C/50°F-86°F with)	±2 ppm/°C (When automatic self calibration is not used)	
Accuracy right after calibration using the internal mass. See Note 2 below	±0.0100 g	±0.150 g
	The value above is to the weighing capacity.	
Operating environment	5°C to 40°C (41°F to 104°F) 85%RH or less (No condensation)	
Internal mass	Yes	
Data memory function, weight data	Maximum 200 (Maximum 100 when the time and date are added)	
Calendar function	Yes	
Display refresh rate	5 times/second or 10 times/second	
Display mode	g (gram)	
Interface (Provided as standard)	RS-232C with Windows Communication Tools WinCT	
External calibration weight	1000 g, 900 g 800 g, 700 g 600 g, 500 g 400 g, 300 g 200 g	6000 g 5000 g 4000 g 3000 g 2000 g
Weighing pan	128 x 128 mm	165 x 165 mm
Net weight	Approx. 4.6 kg	Approx. 5.1 kg
External dimensions	210 (W) x 317 (D) x 86 (H) mm	
AC adapter	Confirm that the adapter type is correct for the local voltage and power receptacle type	
Power consumption	Approx. 11VA (supplied to the AC adapter)	
Accuracy class F1	500 g, 1 kg	2 kg, 5 kg

Note 1: When the auto-centering pan or automatic system is used in good ambient conditions.

Note 2: Accuracy right after calibration using the internal mass in good ambient conditions (within the temperature range of 10°C to 30°C (50°F to 86°F) with no abrupt changes in temperature or humidity, no drafts, no effect by magnetic fields or static electricity).
The value of the internal mass may change due to corrosion or other damage caused by the operating environment, or due to aging. Check the internal mass using an external weight periodically.

18. OPTIONS

AX-MC1000PAN Auto-centering pan for the MC-1000

- Consists of an auto-centering pan, a breeze break, two breeze break securing screws and an auto-centering pan guide(128 x 128 mm).

AX-MC6100PAN Auto-centering pan for the MC-6100

- Consists of an auto-centering pan, a breeze break, two breeze break securing screws and an auto-centering pan guide (165 x 165 mm).

AD-1682 Rechargeable battery

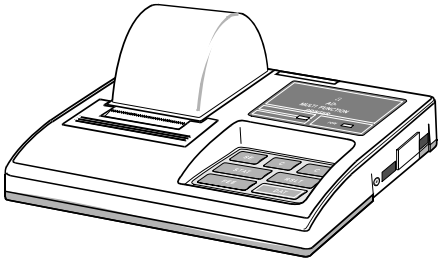
- Allows use of the balance in a place where AC power is not available.

AD-1683 DC static eliminator

- Used to minimize weighing errors due to static electricity on the material.

AD-8121B Printer

- Compact dot-matrix printer
- Statistical function, clock and calendar function, interval print function, graphic print function, dump print mode
- 5 x 7 dots, 16 characters per line
- Print paper (AX-PP143, 45 (W) x 50 (L) mm , ø65 mm)
- AC adapter or alkaline battery.



AD-8524A/B Keyboard adapter

- Used to connect the balance to a personal computer with appropriate OS and applications.

AD-8920A Remote display

- Connected to the MC series using the RS-232C interface to display the weighing data away from the balance.

AD-8922A Remote controller

- Connected to the MC series balance using the RS-232C interface to display the weighing data and to remotely control the balance.

AX-HDB-25P/CTF Connector

AX-SW128 Foot switch

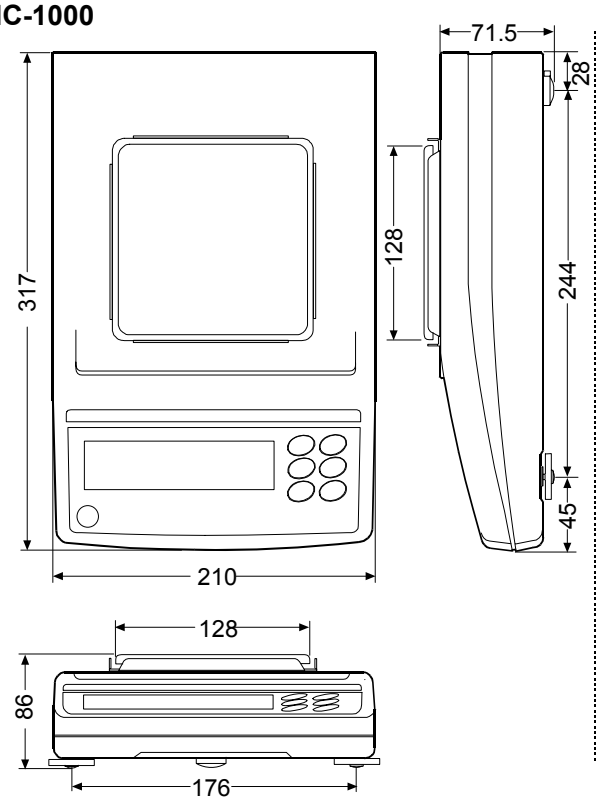
- Used to externally transmit a RE-ZERO or PRINT signal to the balance.

AX-USB-25P-EX USB converter

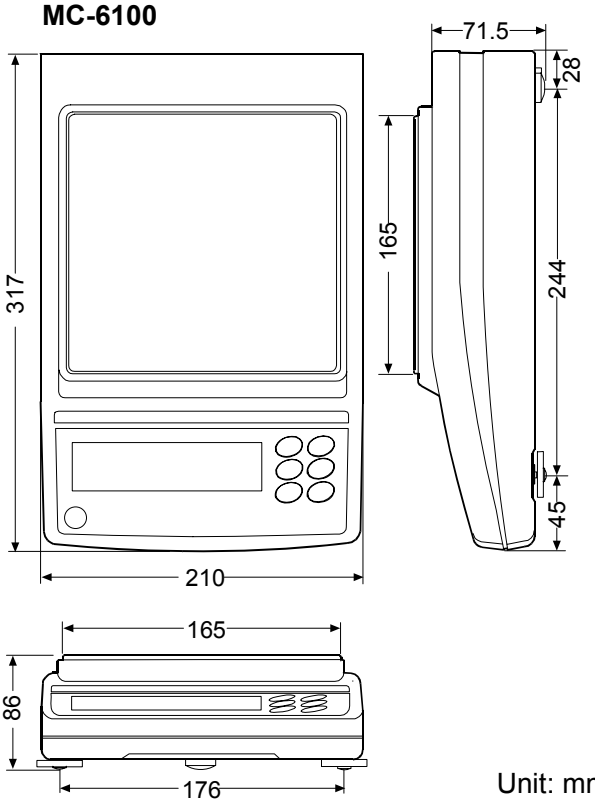
- An RS-232C cable is provided to connect the USB converter to the balance.

19. EXTERNAL DIMENSIONS

MC-1000



MC-6100



Unit: mm

20. TERMS/INDEX

Terms

Stable value The weight data when the stabilization indicator appears.

Environment Ambient conditions such as vibration, drafts, temperature, static electricity and magnetic fields which affect the weighing operation.

Store To save the weighing data, unit mass or calibration data using the data memory function.

Calibration Adjustment of the balance so that it can weigh accurately.

Output To output the weighing data using the RS-232C interface.

Zero point A weighing reference point or the zero display. Usually refers to the value displayed when nothing is on the weighing pan.

Data number Numbers assigned sequentially when weighing data or unit weight is stored.

Digit Unit of digital resolution. Used for the balance, a unit of minimum weighing value.

Tare To cancel the weight of a container which is not included in the weighing data.

Mode Balance operational function.

Re-zero To set the display to zero.

GLP Good Laboratory Practice.

Repeatability Variation in measured values obtained when the same weight is placed and removed repetitively. Usually expressed as a standard deviation.
e.g. Standard deviation=1 digit: This means that measured values fall within ±1 digit in the frequency of about 68%.

Stabilization time Time required after a sample being placed, until the stabilization indicator illuminates and the weighing data is displayed.

Sensitivity drift An affect that a change in temperature causes to the weighing data. Expressed as temperature coefficient.
e.g. Temperature coefficient = 2 ppm/°C : If a load is 500 g and the temperature changes by 10°C, the value displayed changes by the following value.
0.0002%/°C x 10°C x 500 g = 10 mg

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MC series

Mass comparator

INSTRUCTION MANUAL

MC-10K
MC-30K

A&D Company, Limited

1WMPD4002203

This Manual and Marks

All safety messages are identified by the following, “WARNING” or “CAUTION”, of ANSI Z535.4 (American National Standard Institute: Product Safety Signs and Labels). The meanings are as follows:

⚠WARNING	A potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	A potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

⚠ This is a hazard alert mark.

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1. Introduction

This manual describes how the MC Series Mass Comparator Balances, MC-10K and MC-30K, work and how to get the most out of them in terms of performance.
Read this manual thoroughly before using the balance and keep it at hand for future reference.
For other functions and operations that this manual does not describe, refer to the GX-K series instruction manual.

1-1. About This Manual

This manual consists of the following five parts:

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

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

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

Interface and communication ... Describes the RS-232C serial interface and external contact input. The RS-232C serial interface can communicate with a computer that requests weighing data and controls the balance. This RS-232C interface is for use with a computer or printer. The external contact input commands the balance re-zeroing and data output.

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

1-2. Features

- Display resolution, one digit greater than a standard balance. This allows management of OIML class F1 or lower weights.
- Capable of weighing small amounts of powdery or liquid material, even with a massive tare.
- When used as a mass comparator, the balance can achieve even more precise weighing, by using the optional auto-centering pan (sold separately), which reduces eccentric loading errors.

1-3. Compliance

1-3-1. Compliance With FCC Rules

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

1-3-2. Compliance With EMC Directives

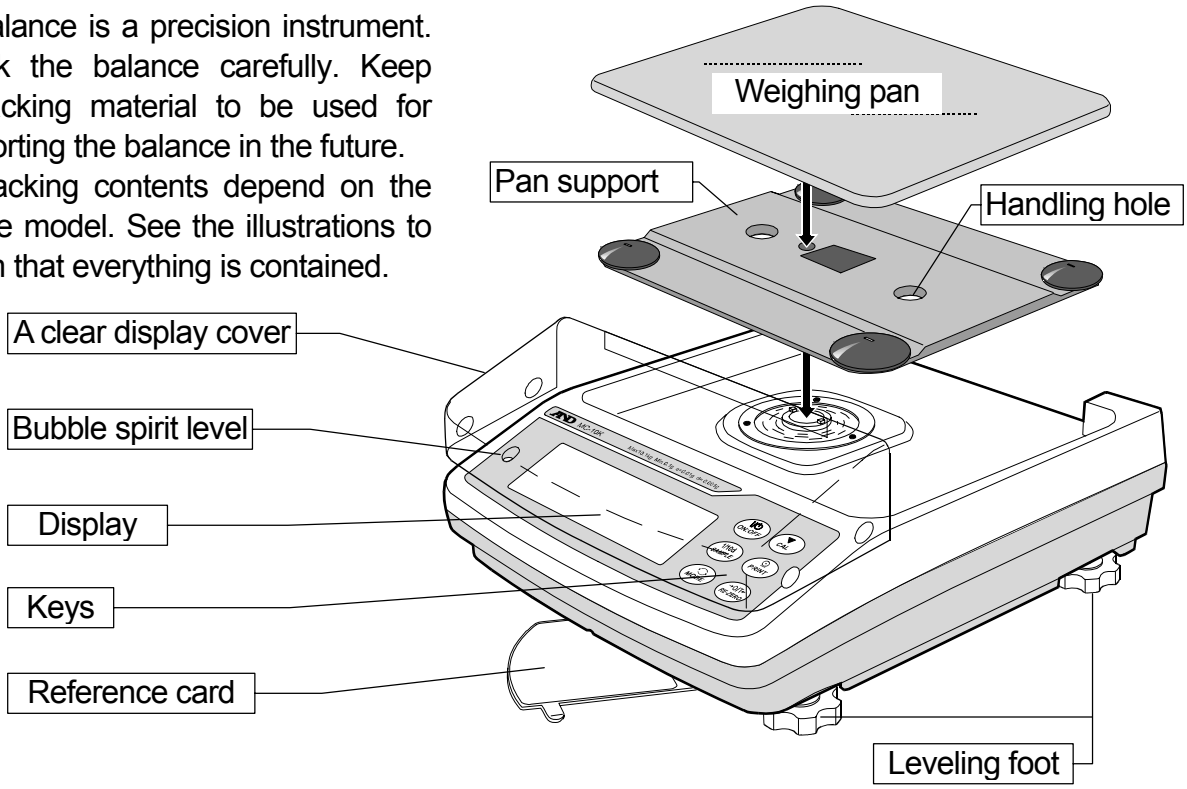
CE This device features radio interference suppression and safety regulation in compliance with the following Council Directives

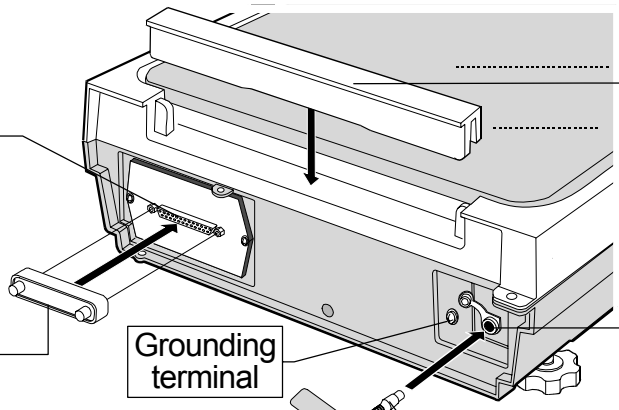
Council directive 89/336/EEC	EN61326	EMC directive
Council directive 73/23/EEC	EN60950	Safety of Information Technology Equipment

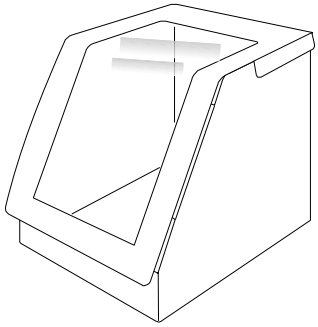
□ The CE mark is an official mandatory European marking.
Please note that any electronic product must comply with local laws and regulations when sold or used anywhere outside Europe.

2. Unpacking And Installing The Balance

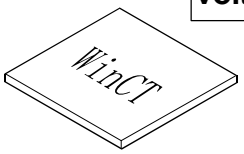
- The balance is a precision instrument. Unpack the balance carefully. Keep the packing material to be used for transporting the balance in the future.
- The packing contents depend on the balance model. See the illustrations to confirm that everything is contained.



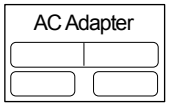




Breeze break



Windows communication tools software



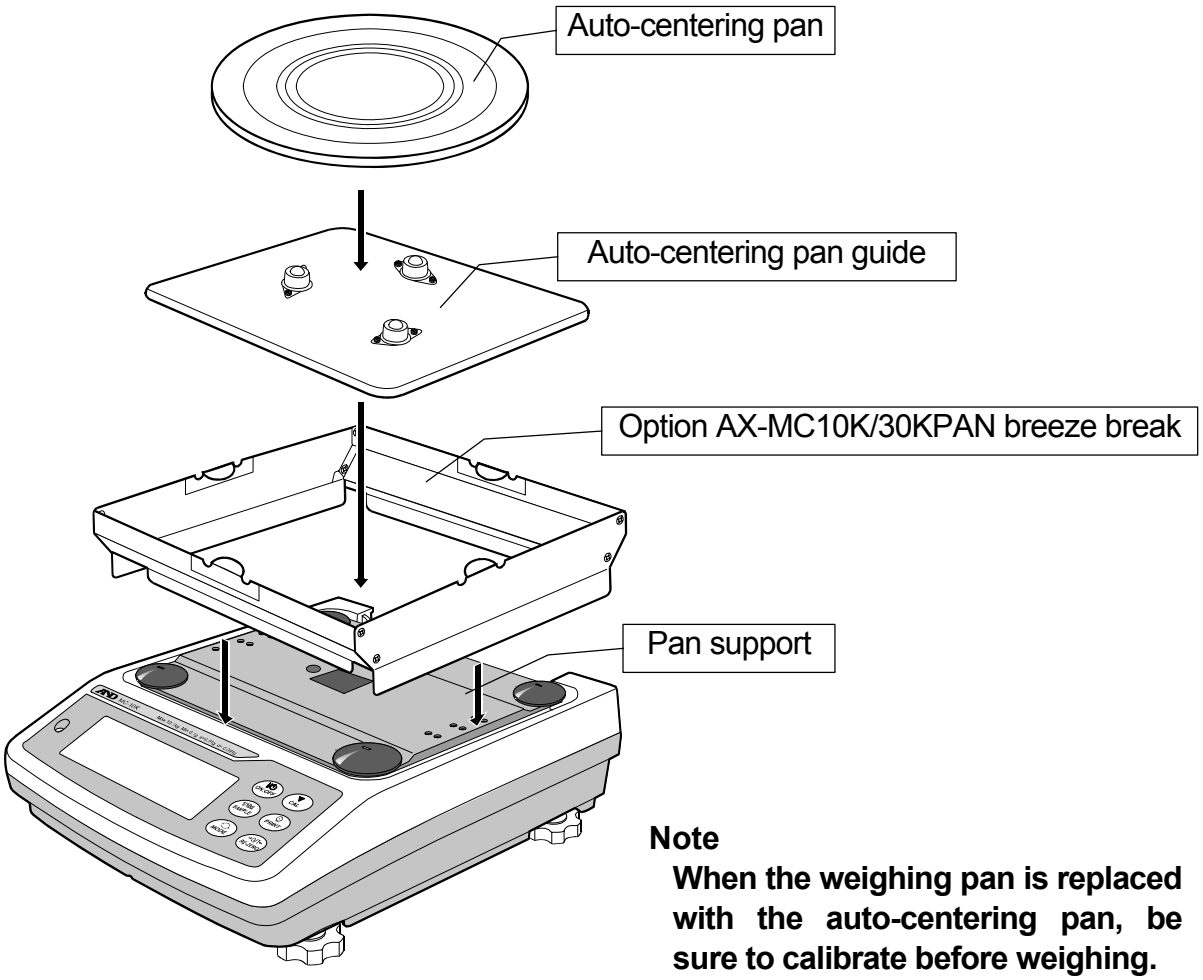
AC adapter labels

2-1. Auto-centering Pan (AX-MC10K/30KPAN) Installation Procedure

Caution: During installation, do not to apply excessive force to the balance.

□ **When used as a mass comparator, the balance can achieve even more precise weighing, by using the auto-centering pan (sold separately), which reduces eccentric loading errors.**

1. Place the pan support on the balance. Place the breeze break provided with the AX-MC10K/30KPAN option on the balance.
   Place the auto-centering pan guide on the pan support, and then place the auto-centering pan on the auto-centering pan guide.



Note

When the weighing pan is replaced with the auto-centering pan, be sure to calibrate before weighing. Refer to "7. CALIBRATION".

2-2. Installing the Balance

Install the balance as follows:

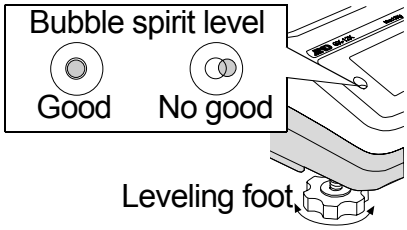
1 Refer to "3. Precautions" for installing the balance.

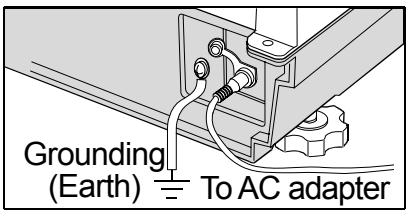
2 Install the pan support, weighing pan and draft gate. Refer to the previous page.

3 Adjust the leveling feet to level the balance. Confirm it using the bubble spirit level.

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

5 Connect the AC adapter to the balance firmly. Earth the balance. Warm up the balance for at least 30 minutes with nothing on the weighing pan.





3. Precautions

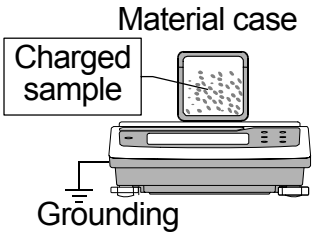
To get the optimum performance from the balance and acquire accurate weighing data, note the following:

3-1. Before Use

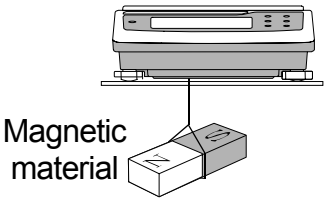
- The maximum resolution of the precision balance is ten million counts. Therefore, there are tendencies to be influenced by temperature change, air pressure change, static electrisity, vibration and drafts where the balance is placed.
- Install the balance in an environment where the temperature and humidity are not excessive. The best operating temperature is about 20°C / 68°F at about 50% relative humidity.
- Install the balance where it is not exposed to direct sunlight and it is not affected by heaters or air conditioners.
- Install the balance where it is free of dust.
- Install the balance away from equipment that produces magnetic fields.
- Install the balance in a stable place avoiding vibration and shock. Corners of rooms on the first floor are best, as they are less prone to vibration.
- The weighing table should be solid and free from vibration, drafts and as level as possible.
- Level the balance by adjusting the leveling feet and confirm it using the bubble spirit level.
- If static electricity is a problem at the installation site, use the electrostatic field meter and the static eliminator.
- Ensure a stable power source when using the AC adapter.
- Connect the AC adapter and warm up the balance for at least 30 minutes.
- Calibrate the balance periodically for accurate weighing.
- When the balance is installed for the first time or has been moved, warm up the balance for at least 6 hours to allow the balance to reach equilibrium with the ambient temperature, and then perform calibration before use.
- The meaning of IP-65 is "No ingress of dust. Projected against water jets".
  If a powerful water jet is used or the balance is immersed in water, it may cause a damage that is due to ingress of water.
- Confirm that "the plug is inserted firmly into the jack" and "the terminal is covered using the waterproof cover or the waterproof RS-232C cable (GX-07K)", when using the balance.
- Use the waterproof option cable GX-07K, when the RS-232C interface is used with IP-65. AX-KO1710-200, a standard RS-232C cable, is not waterproof or dustproof.
- Confirm that the weighing pan does not touch to rim.

⚠ **Do not install the balance where flammable or corrosive gas is present.**

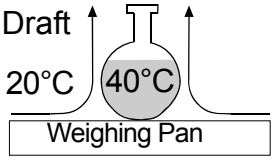
3-2. During Use



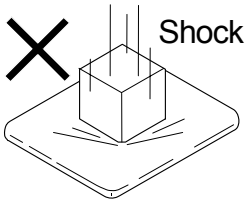
- Discharge static electricity from the weighing material. When weighing sample (plastics, insulator, etc.) could have a static charge, the weighing value is influenced. Ground the balance, and
  - Eliminate the static electricity by using an optinal static eliminator, AD-1683.
  - Or try to keep the ambient humidity above 45%RH at the room.
  - Or use the metal shield case.
  - Or wipe a charged material (plastic sample etc.) with the wet cloth.



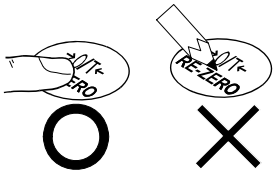
- This balance uses a strong magnet as part of the balance assembly, so please use caution when weighing magnetic materials such as iron. If there is a problem, use the underhook on the bottom of the balance to suspend the material away from the influence of the magnet.



- Eliminate any temperature difference between the sample and the environment. When a sample is warmer (cooler) than the ambient temperature, the sample will be lighter (heavier) than the true weight. This error is due to a rising (falling) draft around the sample.



- Make each weighing gently and quickly to avoid errors due to changes in the environmental conditions.
- Do not drop things upon the weighing pan, or place a sample on the pan that is beyond the balance weighing capacity. Place the sample in the center of the weighing pan.
- Do not use a sharp instrument such as a pencil to press the keys. Use your finger only.



- Press the [RE-ZERO] key before each weighing to prevent possible errors.
- Calibrate the balance periodically so as to eliminate possible errors.
- Take into consideration the affect of air buoyancy on a sample when more accuracy is required.
- It is possible to check the reference card for principle operation.
- Prevent foreign matter, such as powder, liquid and metal, from invading the area around the weighing pan.
- Use the "breeze break" for a precision weighing.

3-3. After Use

- Avoid mechanical shock to the balance.
- Do not disassemble the balance. Contact the local A&D dealer if the balance needs service or repair.
- Do not use organic solvents to clean the balance. Clean the balance with a lint free cloth that is moistened with warm water and a mild detergent.

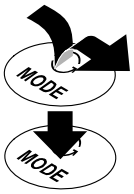
- Do not allow the balance to be immersed in water. Even though the balance complies with IP code, the balance will not withstand being completely immersed in water.
- The weighing pan, pan support and draft gate can be removed to clean the balance. Clean by splashing with water.
- Use the waterproof option RS-232C cable GX-07K, when RS-232C interface is used with IP-65. AX-KO1710-200, a standard RS-232C cable, is not waterproof or dustproof.

3-4. Power Supply

- Do not remove the AC adapter while the internal mass is in motion, for example, right after the AC adapter is connected, or during calibration using the internal mass.
  If the AC adapter is removed under the conditions described above, the internal mass will be left unsecured, that may cause mechanical damage when the balance is moved. Before removing the AC adapter, press the [ON:OFF] key and confirm that zero is displayed.
- When the AC adapter is connected, the balance is in the standby mode if the standby indicator is on. This is a normal state and does not harm the balance. For accurate weighing, keep the AC adapter connected to the balance and AC power unless the balance is not to be used for a long period of time.

4. Display Symbols And Key Operation

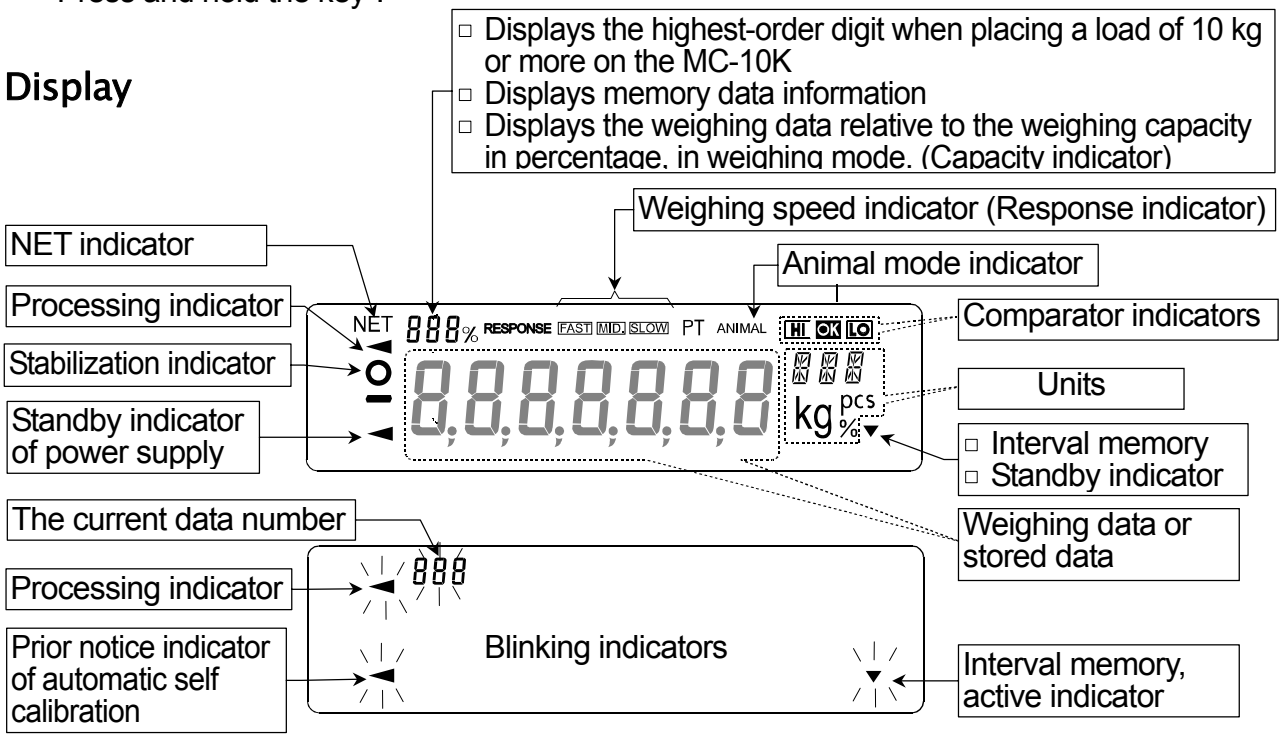
Key Operations



Key operation affects how the balance functions. The basic key operations are:

- "Press and release the key immediately" or "Press the key" are normal operation.
  = normal key operation during measurement
- "Press and hold the key".

Display



Each key, when pressed or when pressed and held, functions as follows:

Key	When pressed and released	When pressed and held
I/⏻ ON:OFF	Turns the display ON and OFF. The standby indicator is displayed when the display is turned off. The weighing mode is enabled when the display is turned on. This key is available anytime. Pressing the key during operation will interrupt the operation and turn the display OFF.	
1/10d SAMPLE	In the weighing mode, turns the minimum weighing value ON and OFF. In the counting or percent mode, enters the sampling mode.	Enters the function table mode. Refer to "9. Function Table".
⟳ MODE	No function at the factory setting. Switches the weighing units when units other than "g" are stored in the function setting.	Performs weighing speed adjustment (response adjustment) and self check.
▼ CAL	Performs calibration using the internal mass.	Displays other items of the calibration menu.
⊙ PRINT	Stores the weighing data in memory or outputs to a printer or personal computer depending on the function table settings. (Factory setting = output)	No function at the factory setting. By changing the function table: □ Outputs "Title block" and "End block" for GLP report. □ Displays the data memory menu.
→0/T← RE-ZERO	Sets the display to zero.	

5. Weighing

5-1. Selecting the Weighing Units (Modes)

The unit “g” (gram) was set at the factory.
To use other units, select and store units and displaying order in the function setting of “ Un it ”.

For details on weighing unit selection procedure, refer to the GX-K series instruction manual, “5. WEIGHING UNITS”.

Note

The density mode is not installed in the MC-10K/30K.

5-2. Basic Weighing

5-2-1. When using as a mass comparator

- To reduce the influence of drafts and vibration, set the following function settings as below.

  “Condition (Cond)” of “Environment, Display (bASFnc)” to “Slow (2)”
  “Filter (F IL)” of “Environment, Display (bASFnc)” to “Used (1)”

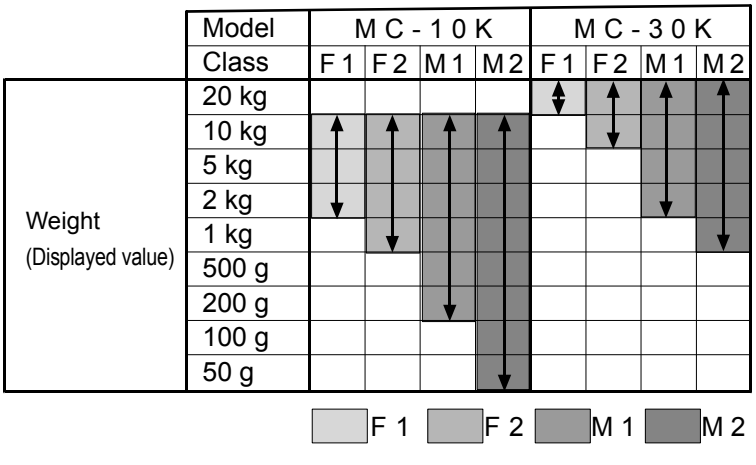
  For details, refer to “9. Function Table”.

- To avoid eccentric loading errors, place the sample in the center of the weighing pan. As an option, AX-MC10K/30KPAN auto-centering pan is available.
  Using an AD-8922A remote controller, which is sold separately, the balance can be controlled remotely by the AD-8922A key operations in the same way as when the CAL or RE-ZERO key of the balance is pressed. For the connection procedure between the balance and the AD-8922A, refer to the AD-8922A instruction manual.

- Take measures against causes of weighing error at the installation site, such as changes in temperature, atmospheric pressure, drafts, vibration and static electricity. Perform weighing operations in an stable environment.

- The table below lists the weight class and recommended measuring range for each model of the MC series. The measuring range is determined so that the balance repeatability is to be less than one third of the maximum permissible error for each weight class.

Weight class and recommended measuring range



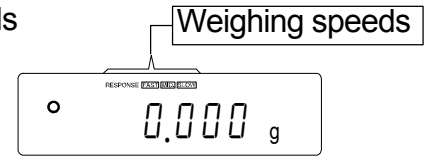
5-2-2. When building into a system

- When a special weighing pan is to be designed, the weight of the pan and the material to be weighed should not exceed the weighing capacity of the balance.
  To reduce influences of static electricity and magnetism, use materials other than resin and magnetic material such as iron.
- There is a function available to maintain the previous weight value in non-volatile memory, even if the AC adapter is removed.
  When "Zero upon power-on (P-tr)" of "Environment, Display (bASFnc)" is set to " 1 ", the previous weight value is displayed upon power-on.
  For details, refer to "Zero upon power-on" on page 30.
- There is a function available to perform span calibration only, when performing calibration with a tare on the weighing pan.
  When "Span calibration (SPn)" of "Environment, Display (bASFnc)" is set to " 1 ", span calibration using the internal mass is performed, with a tare on the weighing pan.
  For details, refer to "Span calibration" on page 30.
- To set a higher response rate (weighing speed) or to batch-weigh small amounts of material, such as a powdery material, refer to "13. Extended Function".

6. Weighing Speed Adjustment / Self Check Function

6-1. Weighing Speed Adjustment

This function detects the influence on weighing that is caused by drafts and/or vibration at the place where the balance is installed and sets the following three weighing speeds (response characteristics) automatically.



The function has three rates as follows:

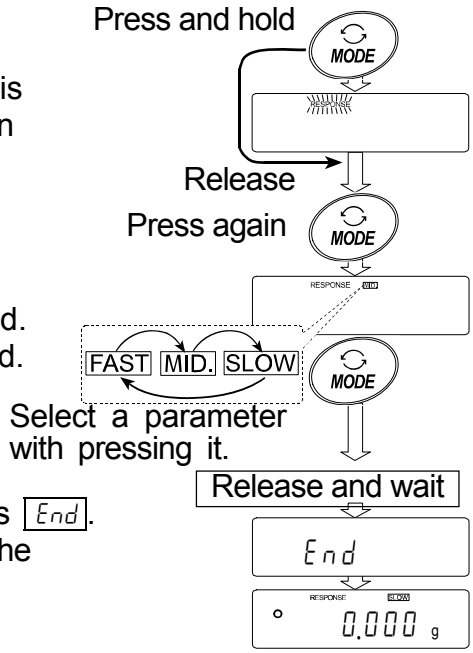
Changing the weighing speed changes the display refresh rate.

Indicator	Parameter	Weighing Speed Stability	Display refresh rate
FAST	Cond 0	Fast response, Sensitive value	If the weighing speed is changed as follows:
MID.	Cond 1	⬆ ⬇	MID. or SLOW FAST =10 times/second
SLOW	Cond 2	Slow response, Stable value	FAST MID. or SLOW = 5 times/second

Step 1 Press and hold the [MODE] key until [RESPONSE] is displayed. And then, press the [MODE] key again quickly.

Step 2 Press the [MODE] key to select a weighing speed. Either [FAST], [MID.] or [SLOW] can be selected.

Step 3 After a few seconds of inactivity the balance displays [End]. Then, it returns to the weighing mode and displays the updated response indicator. The response indicator remains displayed for a while.

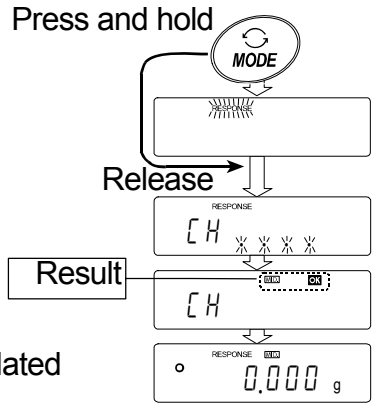


Note

- **The weighing speed adjustment can be changed at "Condition (Cond)" of "Environment, Display (bASFnc)" in the function table. Refer to "9. Function Table" for details.**
- **To set a refresh rate of 5 times/second when the response rate is [FAST] or 10 times/second when the response rate is [MID.] or [SLOW], change the "Display refresh rate (SPd)" parameter of "Environment, Display (bASFnc)" in the function table.**

6-2. Self Check Function With Response Adjustment

This function automatically updates the response adjustment by analyzing the influence of the environment on the weighing data and also self-checks the balance performance using the internal mass.



Step 1 Press and hold the MODE key until RESPONSE is displayed, and then release the key.

Step 2 The balance automatically starts to check the balance performance and sets the response characteristic.

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

Step 3 After automatic adjustment, the balance displays the updated response indicator and returns to the weighing mode. The response indicator remains displayed for a while.

Example of display

MID. and OK : The example above indicates that the result of the self check is good and MID. is selected as the response rate..

Note

- **If improper performance is found in the self check, the balance displays CH no. Contact the local A&D dealer for repair.**
- **If the automatic response adjustment fails, the balance displays CH nG. Check the ambient conditions such as breeze and vibration, also check the weighing pan. Then, perform the adjustment again. To return to the weighing mode, press the CAL key.**

7. Calibration

7-1. Calibration Group

The balance has the following modes as a calibration group.

Calibration

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

Calibration Test

Calibration test using an external weight (Calibration test does not perform calibration)

Correction of the internal mass value

Terms

The following terms are defined as follows:

Internal mass	=	Built-in calibration weight
External weight	=	A weight that you have. Referred to as a calibration weight when used for calibration.
Calibration weight	=	A weight used for calibration
Target weight	=	An external weight used for calibration test

Caution

- Calibration adjusts the balance for accurate weighing.
  Besides periodic calibration and before each use, perform calibration when:
  - The balance is installed for the first time.
  - The balance has been moved.
  - The ambient environment has changed.
- Do not allow vibration or drafts to affect the balance during calibration.
- To output the data for GLP using the RS-232C interface, set "GLP output (InFo)" of "Data output (dout)". Refer to "9. Function Table". Time and date can be added to the GLP report. If the time or date is not correct, adjust them. Refer to the GX-K manual "10-7. Clock and Calendar Function".
- Calibration test is available only when "GLP output (InFo)" of "Data output (dout)" is set to "1" or "2",
- The calibration and calibration test data can be stored in memory. To store them, set "Data memory (dAtA)" to "3". Refer to the GX-K manual "12. Data Memory" for details.
- The value of the internal mass may change due to aging, corrosion or other damage caused by the operating environment. Check the internal mass periodically. Correct the internal mass value as necessary.

Caution on using an external weight

- The accuracy of an external weight can influence the accuracy of weighing. Select an appropriate weight as listed below:
- Select a mass for calibration and calibration test from the following table.

Model	Usable calibration weight	Adjustable range
MC-10K	2kg, 3kg, 4kg, 5kg, 6kg, 7kg, 8kg, 9kg, **10kg**	-0.150g ~ +0.159g
MC-30K	**20kg**, 30kg	-1.50g ~ +1.59g

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

Display



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

7-2. Automatic Self Calibration

Automatic self calibration due to changes in temperature

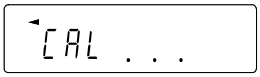
This function automatically calibrates the balance when the balance detects an ambient temperature change. If GLP output is selected in the function table, the balance outputs the calibration report or stores the data in memory. Automatic self calibration functions even if the display is turned off (standby state). Refer to "8-1. Permit Or Inhibit" for the operation.

Caution

- **If something is on the weighing pan, the balance judges that it is in use and does not perform automatic self calibration. To maintain the calibrated state, keep the weighing pan clear while not in use.**



Indicates that the balance detects a change in ambient temperature and automatic self calibration will start. If the balance is not used for a few minutes with this indicator blinking, the balance performs automatic self calibration. The blinking duration depends on the environment.



Indicates that the balance is measuring calibration data. Do not allow vibration or drafts to affect the balance while this indicator is displayed. After calibration, the balance returns to indicate the previous display.

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

7-3. One-Touch Calibration

Calibration using the internal mass

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

Step 1 Connect the AC adapter and warm up the balance for at least 30 minutes with nothing on the weighing pan.

Step 2 Press the [CAL] key.

Step 3 The balance displays [CAL in] and performs calibration using the internal mass. Do not allow vibration or drafts to affect the balance.

Step 4 The balance displays [End] after calibration. If the "GLP output (inFo)" parameter of the function table is set to " 1" or "2", the balance displays [GLP] and outputs the "calibration report" using the RS-232C interface or stores the data in memory. Refer to "10-2. GLP Report" and "Data memory (dAtA)" of the function table for details.

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

About the internal mass

The value of the internal mass may change due to aging, corrosion or other damage caused by the operating environment. Check the internal mass periodically. Correct the internal mass value as necessary. Refer to "7-6. Correcting the Internal Mass Value".

To maintain the weighing accuracy, perform the calibration using an external weight periodically, as described below.

7-4. Calibration Using an External Weight

This function calibrates the balance using an external weight.

When the MC-10K is used

Step 1 Connect the AC adapter and warm up the balance for at least 30 minutes with nothing on the weighing pan.

Step 2 Press and hold the [CAL] key until [CALout] is displayed, then release the key.

Step 3 The balance displays [CAL 0].

- □ If you want to change the calibration weight, press the [SAMPLE] key and go to step 4.
- □ If you use the calibration weight value stored in the balance, go to step 5.

Step 4 Specify the calibration weight value as follows:

[SAMPLE] key··· To switch between the calibration weight selection mode (All of the digits blinking) or the value adjustment mode (The selected digits blinking).
With the MC-10K, the digits in the 1st, 2nd, and 3rd decimal places can be adjusted.
With the MC-31K, the digits in the 1st and 2nd decimal places can be adjusted.

[RE-ZERO] key·· To select the calibration weight or adjust the value. In the value adjustment mode, -150 digits appear after +150 digits.

[PRINT] key····· To store the new weight value. Even if the AC adapter is removed, the data is maintained in non-volatile memory.

[CAL] key ····· To cancel the operation and return to [CAL 0].

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

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

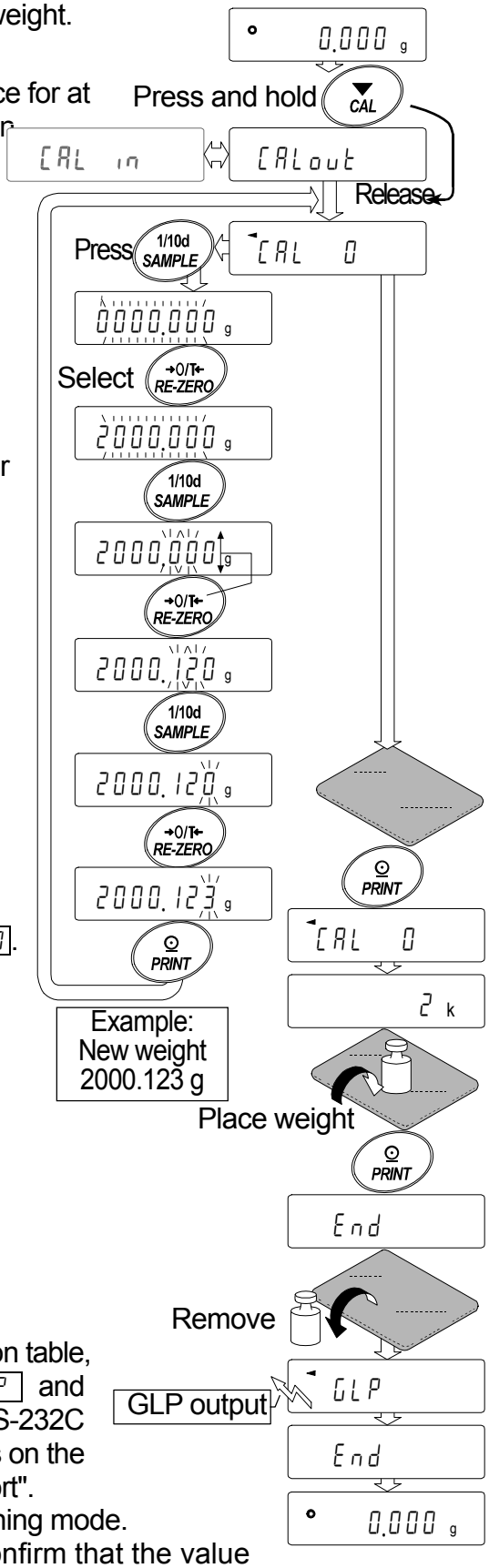
Step 7 The balance displays [End].
Remove the weight from the pan.

Step 8 If the "GLP output (InFo)" parameter, of the function table, is set to "1" or "2", the balance displays [GLP] and outputs the "Calibration Report" using the RS-232C interface or stores the data in memory. For details on the calibration report format, refer to "10-2. GLP Report".

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

Step 10 Place the calibration weight on the pan and confirm that the value displayed is within ±20 digits of the specified value. If it is not within the range, check the ambient conditions such as breeze and vibration also check the weighing pan. Then, repeat steps 1 to 10.

*



7-5. Calibration Test Using an External Weight

This function tests the weighing accuracy using an external weight and outputs the result. This is available only when the "GLP output (inFo)" parameter is set to "1" or "2". (Calibration test does not perform calibration)

When the MC-10K is used

Step 1 Connect the AC adapter and warm up the balance for at least 30 minutes with nothing on the weighing pan.

Step 2 Press and hold the [CAL] key until [CCout] is displayed, then release the key.

Step 3 The balance displays [CC 0].

- □ If you want to change the target weight, press the [SAMPLE] key and go to step 4.
  A list of usable weights is shown on page 17.
- □ If you use the target weight value stored in the balance, go to step 5.

Step 4 Specify the target weight value as follows:

[SAMPLE] key··· To To switch between the calibration weight selection mode (All of the digits blinking) or the value adjustment mode (The selected digits blinking).
With the MC-10K, the digits in the 1st, 2nd, and 3rd decimal places can be adjusted.
With the MC-31K, the digits in the 1st and 2nd decimal places can be adjusted.

[RE-ZERO] key · To select the target weight or adjust the *value. In the value adjustment mode, -15 digits appear after +15 digits.

[PRINT] key····· To store the new weight value. Even if the AC adapter is removed, the data is maintained in non-volatile memory.

[CAL] key ····· To cancel the operation and return to [CC 0].

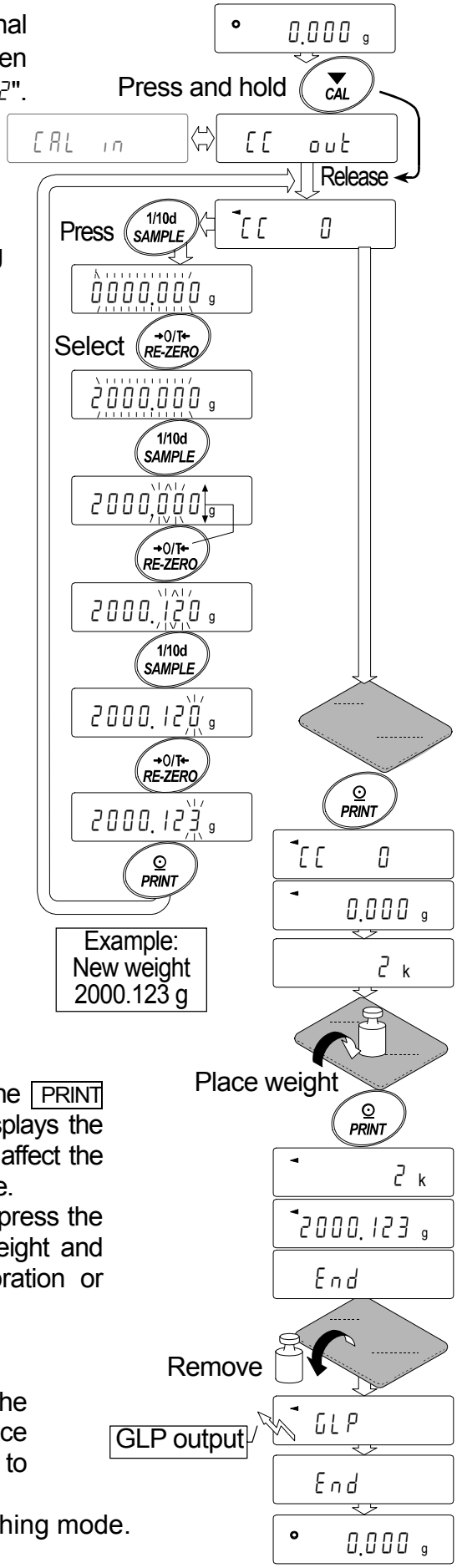
Step 5 Confirm that there is nothing on the pan and press the [PRINT] key. The balance measures the zero point and displays the measured value. Do not allow vibration or drafts to affect the balance. The balance displays the target weight value.

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

Step 7 The balance displays [End].
Remove the weight from the pan.

Step 8 The balance displays [GLP] and outputs the "calibration test report" using the RS-232C interface or stores the calibration test data in memory. Refer to "10-2. GLP Report" of the function table for details.

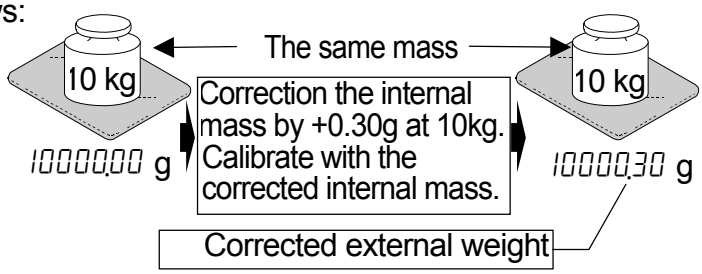
Step 9 The balance will automatically return to the weighing mode.



7-6. Correcting the Internal Mass Value

The balance can correct the internal mass value within the range shown below. This function corrects the internal mass value to conform to an external weight. The corrected mass value is maintained in non-volatile memory even if the AC adapter is removed. The internal mass value is corrected as follows:

Model	Target	Range
MC-10K	2 kg	±0.500 g
MC-30K	10 kg	±5.00 g

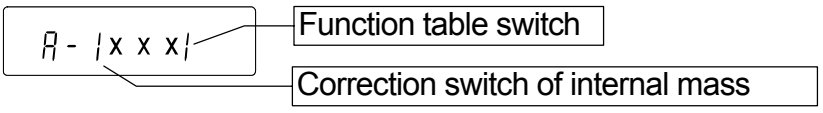


Step 1 Calibrate the balance using the internal mass. (one-touch calibration).
Place the external weight and find out the correction value.
Example for correcting the weight value by +0.30 g in 10 kg, when using MC-30K. If correcting the weight value by +0.30 g in 5 kg, the weight changed into 10 kg, the correction value is +0.60 g.

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

Step 3 While pressing and holding the [PRINT] key and the [SAMPLE] key, press the [ON:OFF] key. The balance displays [PS].

Step 4 Press the [PRINT] key. Then the balance displays the function switches. Set the function table switch and internal mass correction switch to "1" as shown above using the following keys.
[SAMPLE] key···To select the switch to change the value.
The selected digit blinks.
[RE-ZERO] key ··To change the parameter of the switch selected.



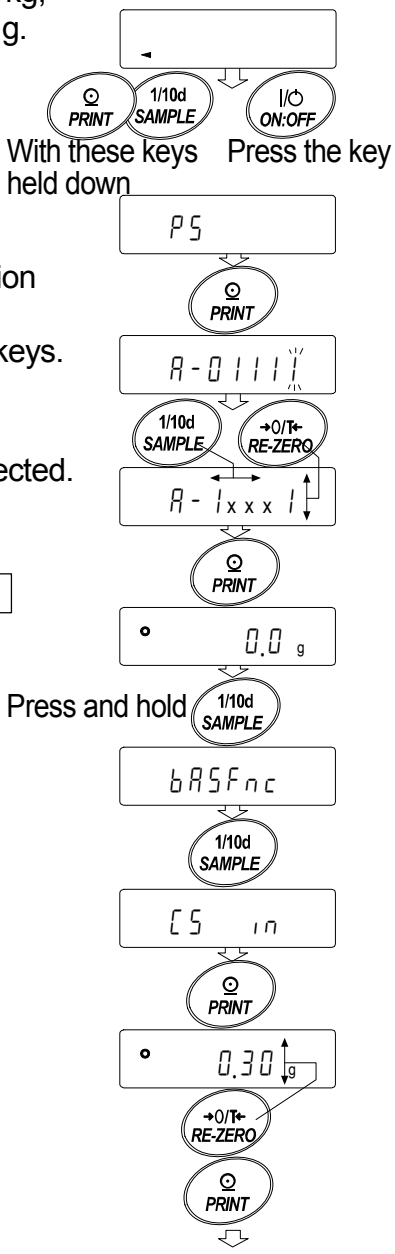
Step 5 Press the [PRINT] key to store the new setting.
The balance returns to the weighing mode.

Step 6 Press and hold the [SAMPLE] key to enter the function table and release the key when [bASFnc] is displayed.

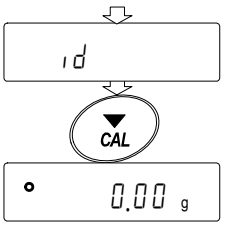
Step 7 Press the [SAMPLE] key several times until [CS in] is displayed, then release the key.

Step 8 Press the [PRINT] key to enter the procedure for correcting the internal mass value.

Step 9 Correct the internal mass value using the following keys.
[RE-ZERO] key··To select the value. (-500 digits appear after +500 digits)
[PRINT] key·····To store the new value and display the next menu item of the function table.



CAL key·····To cancel the correction and display the next menu item of the function table.



Step 10 Press the CAL key to return the weighing mode.

Step 11 Press the CAL key to calibrate the balance using the internal mass.

Step 12 Place the external weight on the pan and confirm that the correction has been performed properly. In this example, confirm that the value displayed is within the range that is described at "Accuracy after calibration using the internal mass" of "16. Specification ". If the value is incorrect, repeat the correction.

8. Function Switch And Initialization

8-1. Permit or Inhibit

The balance stores parameters that must not be changed unintentionally (Example: Calibration data for accurate weighing, Data for adapting to the operating environment, Control data for the RS-232C interface). There are five switches for the purpose of protecting parameters. Each switch can select either "permit" or "inhibit". The "inhibit" protects parameters against unintentional operations.

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

Step 2 While pressing and holding the [PRINT] key and the [SAMPLE] key, press the [ON:OFF] key to display [P5].

Step 3 Press the [PRINT] key. Then the balance displays the function switches.

Step 4 Set the switches using the following keys.

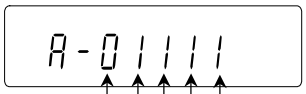
[SAMPLE] key — To select a switch to change the parameter. The selected switch blinks.

[RE-ZERO] key — To change the parameter of the switch selected.

- 0 To inhibit changes. (Can not be used.)
- 1 To permit changes. (Can be used.)

[PRINT] key — To store the new parameter and return to the weighing mode.

[CAL] key — To cancel the operation and return to the weighing mode.



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

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

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

Automatic self calibration (Calibration due to changes in temperature)
- 0 To inhibit automatic self calibration.
- 1 To permit automatic self calibration.

Internal mass correction
- 0 To inhibit correction
- 1 To permit correction

8-2. Initializing the Balance

This function returns the following parameters to factory settings.

- Calibration data
- Function table
- The sample unit mass value (counting mode),
  100% reference mass value (percent mode)
- The data that is stored in the balance using the data memory function
- External calibration weight and target weight value
- Function switch settings

Note Be sure to calibrate the balance after initialization.

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

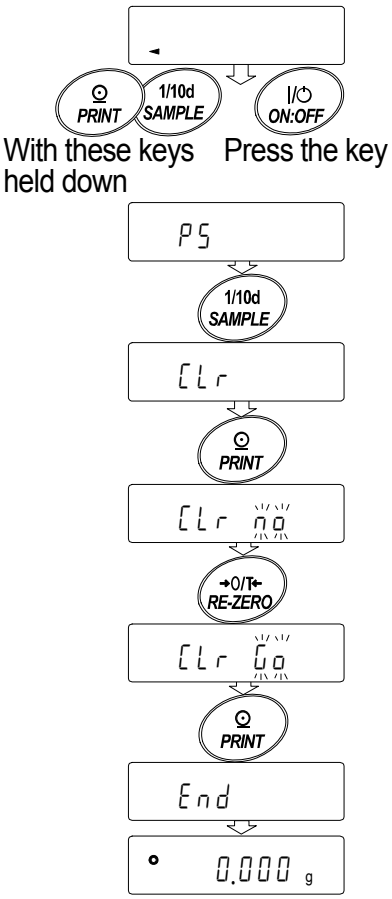
Step 2 While pressing and holding the [PRINT] key and the [SAMPLE] key, press the [ON:OFF] key to display [PS].

Step 3 Press the [SAMPLE] key to display [Clr].

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

Step 5 Press the [RE-ZERO] key to display [Clr Go].

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



9. Function Table

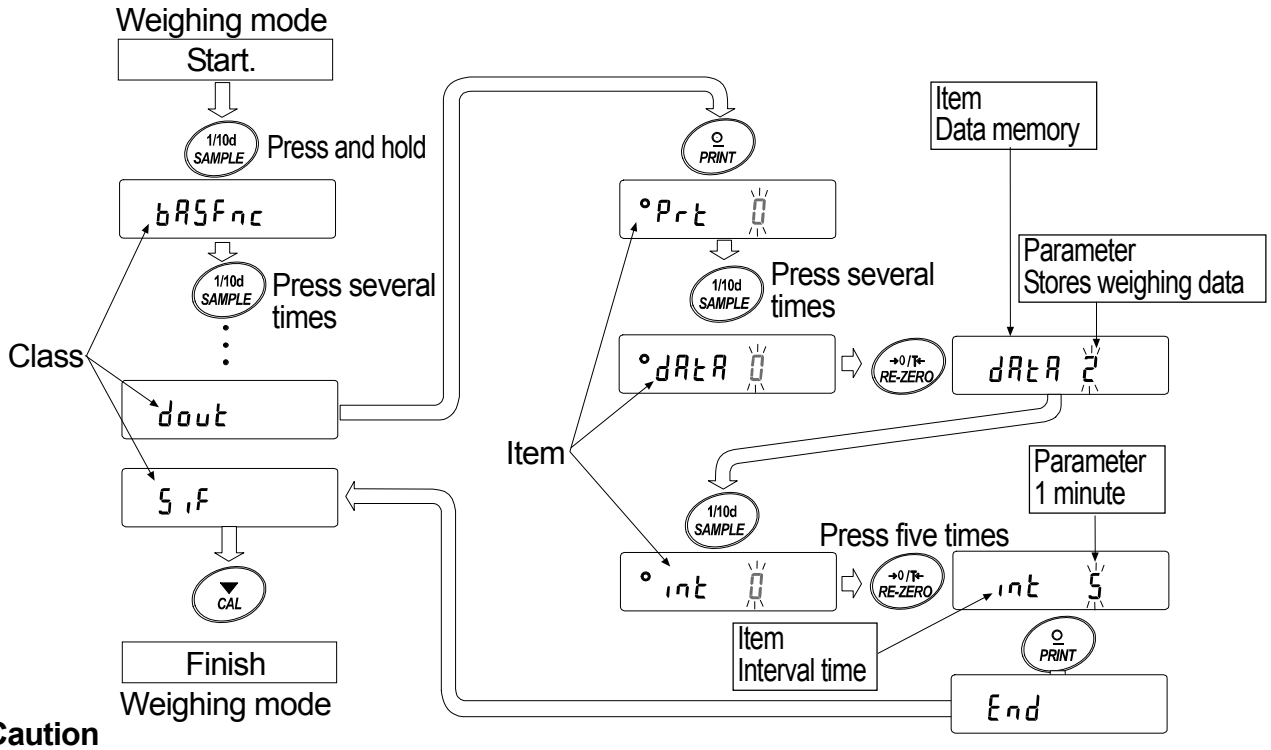
This function table reads or rewrites the parameters that are stored in the balance. These parameters are maintained in non-volatile memory, even if the AC adapter is removed.

9-1-1. Structure and Sequence of the Function Table

This function table menu consists of two layers. The first layer is the "Class" and the second layer is the "Item". It has effect that a parameter is stored in each item and is displayed latest. New parameters are applied to the balance after the [PRINT] key is pressed.

Example

This example sets "Stores weighing data" for "Data memory" and "1 minute" for "Interval time".



Caution

Check the settings and condition before changing parameters.

9-1-2. Display and Operation Keys

o	The symbol "O" shows effective parameter.
1/10d SAMPLE	When pressed and held in the weighing mode, enters the function table mode. Selects the class or item in the function table mode.
→0/T← RE-ZERO	Changes the parameter.
PRINT	When a class is displayed, moves to an item in the class. When an item is displayed, stores the new parameter and displays the next class.
CAL	When an item is displayed, cancels the new parameter and displays the next class. When a class is displayed, exits the function table mode and returns to the weighing mode.

9-2. Details of the Function Table

Class	Item and Parameter		Description	
bASFnc Environment Display	Cond Condition	0	Fast response, sensitive value FAST	Can be changed by response adjustment. With "HoLd 1", sets the averaging time.
		▪ 1	MID.	
		2	Slow response, stable value SLOW	
	St-b Stability band width	0	Stable when within ±1 digit	The stabilization indicator illuminates with the display fluctuation within the range. With "HoLd 1", sets the stable range.
		▪ 1		
		2	Stable when within ±3 digits	
	HoLd Hold function	▪ 0	OFF	Holds the display when stable in animal mode. With "HoLd 1", ANIMAL turns on.
		1	ON	
	trc Zero tracking	0	OFF	Keeps zero display by tracking zero drift.
		▪ 1	Normal	
		2	Strong	
		3	Very strong	
	SPd Display refresh rate	▪ 0	5 times/second	Period to refresh the display
		1	10 times/second	
	Pnt Decimal point	▪ 0	Point (.)	Decimal point format
		1	Comma (,)	
	P-on Auto display-ON	▪ 0	OFF	Turns on the weighing mode display when the AC adapter is connected.
		1	ON	
	PoFF Auto display-OFF	▪ 0	OFF	Turns off the display after 10 minutes of inactivity.
		1	ON (10 minutes)	
	GSi Capacity indicator	▪ 0	OFF	Capacity indicator. Zero: 0% Maximum capacity: 100%
		1	ON	
	Add Accumulation function	▪ 0	OFF	Displays and outputs the total value of the weighing data.
		1	ON	
	rnG Display at start	▪ 0	Does not display	Select whether or not to display the smallest displayable weighing value at weighing start.
		1	Displays	
	FIL Filter	▪ 0	Not used	
		1	Used (when the balance is used as a mass comparator)	
	P-tr Zero upon power-on	▪ 0	Sets the display to zero.	
		1	Does not set the display to zero. Displays the previous value. With this setting, do not perform re-zero operations frequently. Refer to"Zero upon power-on" on page 30.	
	SPn Span calibration	▪ 0	Performs zero and span calibration	
		1	Performs span calibration only. Span calibration using the internal mass is possible with a tare on the weighing pan. Refer to "Span calibration" on page 30.	
CL Add Clock	Refer to the GX-K manual "10-7. Clock and Calendar Function"			Confirms and sets the time and date. The time and date are added to the output data.
CP Fnc Comparator	CP Comparator mode	▪ 0	No comparison	
		1	Comparison, excluding "near zero" when stable value or overloaded	
		2	Comparison, including "near zero" when stable value or overloaded	
		3	Continuous comparison, excluding "near zero"	
		4	Continuous comparison, including "near zero"	
	CP in Data input method	▪ 0	Set the upper lower limit value	Select CP Hi or CP Lo.
		1	Set the reference value	Select CP rEF or CP Lnt.
	CP-r Comparison results	▪ 0	Not added	Select whether or not to add the comparison results to the output data.
		1	Added	

▪ : Factory settings. Digit is a unit of minimum weighing value.

Class	Item and Parameter		Description	
CP Fnc Comparator	CP-b Main display comparison	▪ 0	OFF	Displays the results on the main portion of the display in place of the weight value.
		1	ON	
Displayed only when Comparator output (GX-04K) is installed	bEP_ LO buzzer	▪ 0	OFF	Select whether or not to sound the LO buzzer.
		1	ON	
	bEP- OK buzzer	▪ 0	OFF	Select whether or not to sound the OK buzzer.
		1	ON	
	bEP- HI buzzer	▪ 0	OFF	Select whether or not to sound the HI buzzer.
		1	ON	
CP Hi Upper limit			Refer to the GX-K manual "10-8. Comparator Function"	Displayed when CP in 0 is selected.
CP Lo Lower limit				
CP rEF Reference value			Refer to the GX-K manual "10-8. Comparator Function"	Displayed when CP in 1 is selected.
CP LnE Tolerance				
dout Data output	Prt Data output mode	▪ 0	Key mode	Accepts the PRINT key only when the display is stable.
		1	Auto print mode A (Reference = zero)	Outputs data when the display is stable and conditions of AP-P, AP-b and the reference value are met.
		2	Auto print mode B (Reference = last stable value)	
		3	Stream mode / Interval memory mode	With dAtA 0, outputs data continuously; with dAtA 2, uses interval memory.
	AP-P Auto print polarity	▪ 0	Plus only	Displayed value>Reference
		1	Minus only	Displayed value<Reference
		2	Both	Regardless of displayed value
	AP-b Auto print difference	▪ 0	10 digits	Difference between reference value and displayed value
		1	100 digits	
		2	1000 digits	
	dAtA Data memory	▪ 0	Not used	Related items: Prt, int, d-no, S-td, inFo
		1	Stores unit mass in counting mode	
		2	Stores weighing data	
		3	Stores calibration data	
		4	Stores comparator settings	
		5	Stores tare value	
	int Interval time	▪ 0	Every measurement	Interval time in the interval memory mode when using Prt 3, dAtA 2
		1	2 seconds	
		2	5 seconds	
		3	10 seconds	
		4	30 seconds	
		5	1 minute	
		6	2 minute	
		7	5 minute	
		8	10 minute	

▪ : Factory settings. Digit is a unit of minimum weighing value.

Class	Item and Parameter		Description	
dout Data output	d-no Data number output	▪ 0	No output	Refer to the GX-K manual "12. Data Memory"
		1	Output	
	S-td Time/Date output	▪ 0	No output	Selects whether or not the time or date is added to the weighing data. Refer to the GX-K manual "10-7. Clock and Calendar Function" for details.
		1	Time only	
		2	Date only	
		3	Time and date	
	S- id ID number output	▪ 0	No output	Selects whether or not the ID number is output.
		1	Output	
	PUSE Data output pause	▪ 0	No pause	Selects the data output interval.
		1	Pause (1.6 seconds)	
	At-F Auto feed	▪ 0	Not used	Selects whether or not automatic feed is performed.
		1	Used	
	inFo GLP output	▪ 0	No output	Selects GLP output method. For how to set time and date to be added, refer to the GX-K manual "10-7. Clock and Calendar Function".
		1	AD-8121 format	
		2	General data format	
	Ar-d Zero after output	▪ 0	Not used	Adjusts zero automatically after data is output
		1	Used	
SIF Serial interface	bPS Baud rate	0	600 bps	
		1	1200 bps	
		▪ 2	2400 bps	
		3	4800 bps	
		4	9600 bps	
		5	19200 bps	
	btPr Data bit, parity bit	▪ 0	7 bits, even	
		1	7 bits, odd	
		2	8 bits, none	
	CrLF Terminator	▪ 0	CR LF	CR: ASCII code 0Dh LF: ASCII code 0Ah
		1	CR	
	tYPE Data format	▪ 0	A&D standard format	Refer to "9-5. Description of Item "Data Format".
		1	DP format	
		2	KF format	
		3	MT format	
		4	NU format	
		5	CSV format	
	t-UP Timeout	0	No limit	Selects the wait time to receive a command.
		▪ 1	1 second	
	ErCd AK, Error code	▪ 0	No output	AK: ASCII code 06h
		1	Output	
	CtS CTS, RTS control	▪ 0	Not used	Controls CTS and RTS.
		1	Used	
nLt Programmable-unit (Multi-unit)			Available only when programmable-unit mode is selected. Refer to the GX-K manual "14. Programmable Units" for details".	

▪ : Factory settings. Digit is a unit of minimum weighing value.

Class	Item and Parameter		Description
Unit Unit			Refer to GX-K manual "5. Weighing Units".
CS in Internal mass correction			Displayed only when the internal mass value correction switch is set to 1. Refer to "7. Calibration".
id ID number setting			Refer to "10. ID Number And GLP Report".
ErFnc Extended function	F1-b Averaging range for the first moving average	0 1 2 3 ▪ 4 5 6 7	Small ▲ ▼ Large
	F1-t Averaging time for the first moving average	0 1 ▪ 2 3 4 5 6 7 8	No averaging 0.5 second 1.0 second 1.5 seconds 2.0 seconds 2.5 seconds 3.2 seconds 4.8 seconds 6.4 seconds
	F2-b Averaging range for the second moving average	0 ▪ 1 2 3 4 5 6	Small ▲ ▼ Large
	F2-t Averaging time for the second moving average	0 1 2 3 4 ▪ 5 6	No averaging 0.5 second 1.0 second 1.5 seconds 2.0 seconds 2.5 seconds 3.2 seconds

▪ : Factory settings. Digit is a unit of minimum weighing value.

Caution

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

9-3. Description of the Class "Environment, Display"

Condition (Cond)

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



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

Notes **In automatic response adjustment, the weighing speed is selected automatically.**
With "Hold function (HoLd)" set to "ON (1)", this item is used to set the averaging time.

Stability band width (St-b)

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

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



St-b 2 This parameter ignores slight fluctuation of a weight value. Used to prevent a weight value from drifting due to vibration or drafts.

Note **With "Hold function (HoLd)" set to "ON (1)", this item is used to set the stabilization range.**

Zero upon power-on (P-tr)

When a hopper is attached to the weighing pan and loss-in weighing is performed, the remaining amount of the material will become unknown if tare is performed each time a weighing starts.
When " P-tr " is set to " 1 ", tare is not performed at weighing start. So, the remaining amount of the material can be monitored, when the power is turned on again after it was turned off.

Span calibration (SPn)

When a hopper is attached to the weighing pan and calibration is to be performed with the hopper attached, set " SPn " to " 1 ". When the tare value (hopper and other devices attached) is within the value in the table below, calibration using the internal mass is possible.

Model	Tare value
MC-10K	9 kg or less
MC-30K	29 kg or less

9-4. sDescription of the Item "Data Output Mode"

The parameter setting of "Data output mode (Prt)" applies to the performance when the "Data memory (dAtA)" parameter is set to "2" (to store the weighing data) and when the data is transmitted using the RS-232C interface.

Key mode

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

Required setting	dout	Prt 0	Key mode

Auto print modes A and B

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

Auto print modes A

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

Auto print modes B

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

Stream mode

The balance outputs the weighing data continuously regardless of the display condition. The display does not blink in this mode. The interval memory mode is used when the "Data memory (dAtA)" parameter is set to "2" (to store the weighing data).

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

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

Interval memory mode

The weighing data is periodically stored in memory.

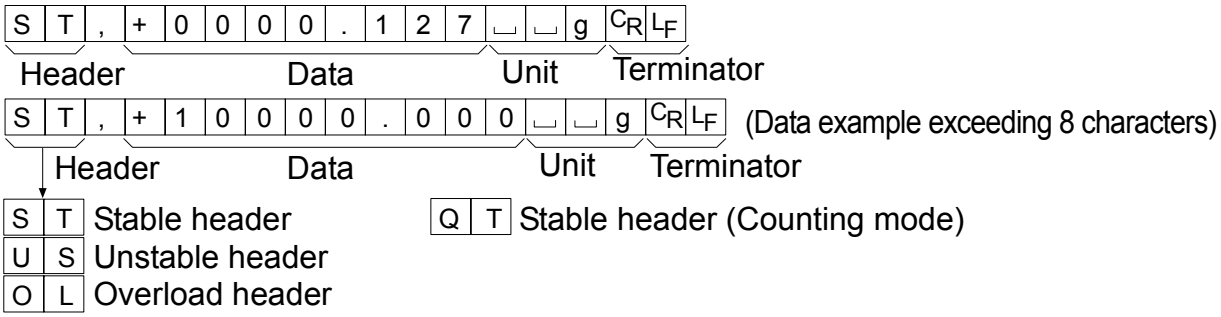
Example	For periodical weighing without a personal computer command and to output all of the data, to a computer, at one time. Time and date can be added with "Time/Date output (5-td)".		
Required setting	dout	Prt 3	Interval memory mode
	dout	dAtA 2	Data memory function is used
	dout	int	Interval time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

9-5. Description of Tte Item "Data Format"

A&D standard format 5 iF tYPE 0

This format is used when the peripheral equipment can receive the A&D format.
If an AD-8121B is used, set the printer to MODE 1 or 2.

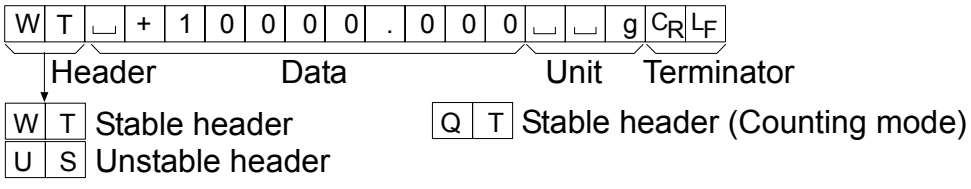
- This format consists of fifteen or sixteen characters excluding the terminator.
  With the MC-10K, when the numerical data excluding the decimal point exceeds eight characters, the data format will be sixteen characters long.
- A header of two characters indicates the balance condition.
- The polarity sign is placed before the data with the leading zeros. If the data is zero, the plus sign is applied.
- The unit, consisting of three characters, follows the data.



DP (Dump print) format 5 iF tYPE 1

This format is used when the peripheral equipment can not receive the A&D format.
If an AD-8121B is used, set the printer to MODE 3.

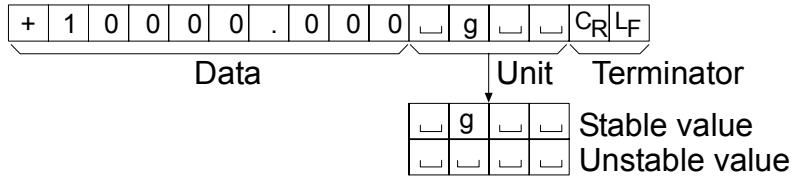
- This format consists of sixteen characters excluding the terminator.
- A header of two characters indicates the balance condition. No overload header is used.
- The polarity sign is placed before the data, with spaces in place of leading zeros, if the data is not zero or overloaded.
- The unit, consisting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



KF format　　SIF TYPE 2

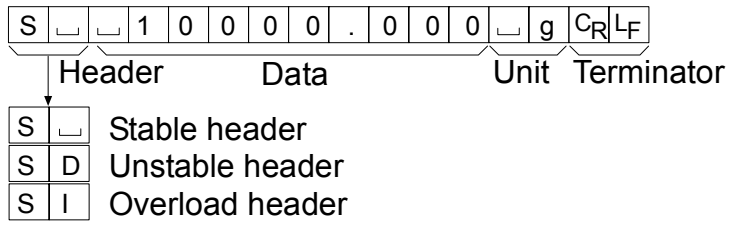
This is the Karl-Fischer moisture meter format and is used when the peripheral equipment can only communicate using this format.

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



MT format　　SIF TYPE 3

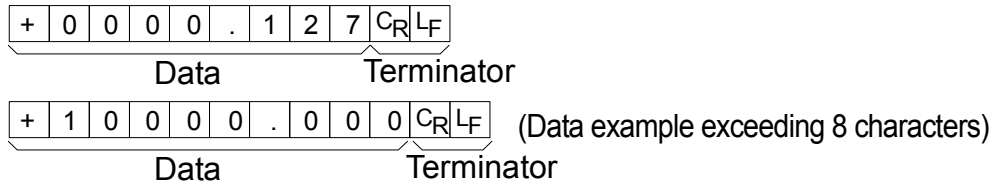
- A header of two characters indicates the balance condition.
- The polarity sign is used only for negative data.
- The weighing data uses spaces in place of the leading zeros.
- The character length of this format changes dependent upon the unit



NU (numerical) format　　SIF TYPE 4

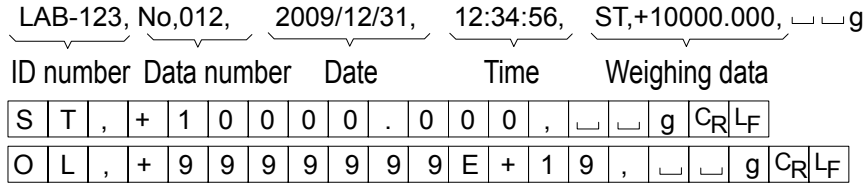
This format outputs only numerical data.

- This format consists of nine or ten characters excluding the terminator.
  With the MC-10K, when the numerical data excluding the decimal point exceeds eight characters, the data format will be ten characters long.
- The polarity sign is placed before the data with the leading zeros. If the data is zero, the plus sign is used.



CSV format　　SIF TYPE 5

- This format separates the data of A&D standard format and the unit by a comma (,).
- This format outputs the unit even when the data is overloaded.
- When the ID number, data number, time and date are added at "Data output (dout)" of the function table, outputs ID number, data number, date, time and weighing data in this order and separates each item by a comma and treats all the items as one group of data.



9-5-1. Description of the Data Format Added to the Weighing Data

ID number dout S-id 1

The number to identify a specific balance.

□ This format consists of seven characters excluding the terminator.

L	A	B	-	1	2	3	CR	LF

Data number dout d-no 1

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

□ This format consists of six characters excluding the terminator.

□ When CSV format (SIF TYPE 5) is selected, the period (.) is replaced with a comma (,).

N	o	.	0	0	1	CR	LF

Data number Terminator

Date dout S-td 2 or 3

□ The date output order can be changed in "Clock (CL Adj)".
The year is output in a four-digit format.

2	0	0	9	/	1	2	/	3	1	CR	LF

Time dout S-td 1 or 3

□ This format outputs time in 24-hour format.

1	2	:	3	4	:	5	6	CR	LF

Tare value

□ When the tare value in memory is recalled, the tare value is output before the weighing data.

P	T	,	+	0	0	0	1	2	3	.	4	␣	␣	g	CR	LF

Tare value recalled from memory

N	␣	,	+	0	0	0	5	6	7	.	8	␣	␣	g	CR	LF

Net value

Comparison results

□ By setting "Comparison results (CP-r)" of the function table to "1", the comparison results can be added to the data output using the RS-232C serial interface. Use A&D standard format (TYPE 0).
The comparison results are added after the header in A&D standard format as below.

S	T	,	O	K	,	+	0	1	2	3	4	5	.	6	␣	␣	g	CR	LF

Header Comparison result Data Unit Terminator

H	I
O	K
L	O
-	-

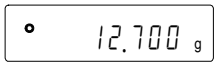
When the comparison result is HI
When the comparison result is OK
When the comparison result is LO
Not applicable

Note

When the data described above is added to the weighing data, the output is in the following order: ID number, Data number, Date, Time and Weighing data.

9-6. Data Format Examples

Stable



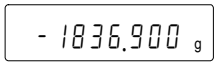
A&D	S	T	,	+	0	0	1	2	.	7	0	0	␣	␣	g	CR LF
DP	W	T	␣	␣	␣	␣	+	1	2	.	7	0	0	␣	␣	g	CR LF
KF	+	␣	␣	␣	1	2	.	7	0	0	␣	g	␣	␣	CR LF		
MT	S	␣	␣	␣	␣	␣	1	2	.	7	0	0	␣	g	CR LF		
NU	+	0	0	1	2	.	7	0	0	CR LF							

(Data example exceeding 8 characters)



A&D	S	T	,	+	1	0	0	0	0	.	0	0	0	␣	␣	g	CR LF
NU	+	1	0	0	0	0	.	0	0	0	CR LF						

Unstable



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

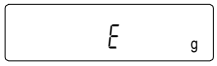
(Data example exceeding 8 characters)



A&D	U	S	,	-	1	0	0	0	0	.	1	2	7	␣	␣	g	CR LF
NU	-	1	0	0	0	0	.	1	2	7	CR LF						

Overload

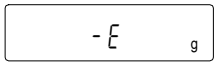
Positive error



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

Overload

Negative error



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

Unit

		A&D	D.P.	KF	MT
g	g	␣ ␣ g	␣ ␣ g	␣ g ␣ ␣	␣ g

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

10. ID Number And GLP Report

- The ID number is used to identify the balance when Good Laboratory Practice (GLP) is used.
- The ID number is maintained in non-volatile memory even if the AC adapter is removed.
- The GLP output format is selected at "GLP output (inFo)" of the function table and can be output to a personal computer or printer using the RS-232C serial interface.
- The GLP output format includes the balance manufacturer, model, serial number, ID number, date, time and space for signature for weighing data, the weight used and results for calibration or calibration test data.
- The balance can output the following reports for GLP.
  - "Calibration report" of the calibration, using the internal mass (Calibration due to changes in temperature and one-touch calibration.)
  - "Calibration report" of the calibration, using an external weight.
  - "Calibration test report" of the calibration test, using an external weight.
  - "Title block" and "End block" for the weighing data.
- Calibration and calibration test data can be stored in memory to output several reports at the same time. Refer to the GX-K manual "12. Data Memory" for details.
- For details on confirming and setting the time and date, refer to the GX-K manual "10-7. Clock and Calendar Function".

10-1. Setting the ID Number

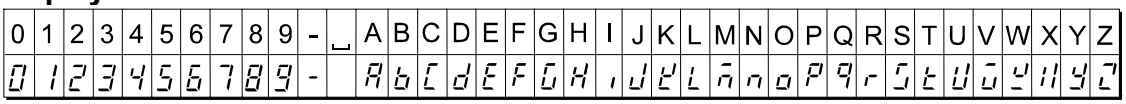
Step 1 Press and hold the [SAMPLE] key until [bASFnc] of the function table is displayed, then release the key.

Step 2 Press the [SAMPLE] key several times to display [id].

Step 3 Press the [PRINT] key. Set the ID number using the following keys.
[RE-ZERO] key····· To set the character of the digit selected.
Refer to the display character set shown below.
[SAMPLE] key····· To select the digit to change the value.
[PRINT] key····· To store the new ID number and display [bASFnc].
[CAL] key····· To cancel the new ID number and display [bASFnc].

Step 4 With [bASFnc] displayed, press the [CAL] key to return to the weighing mode.

Display character set



10-2. GLP Report

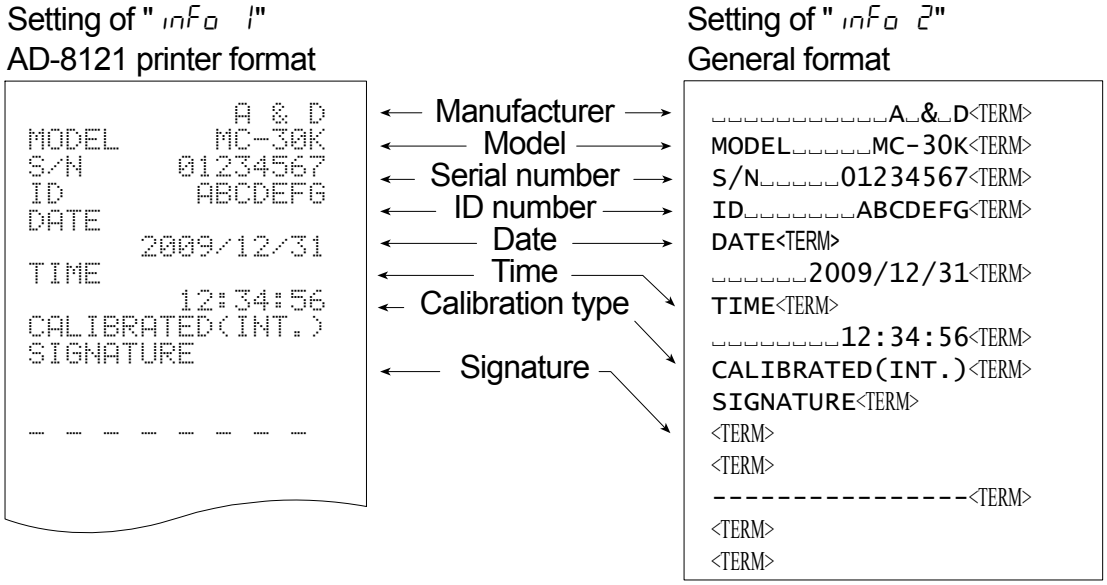
Set the following parameters to output the report.

- To print the report, set the "GLP output (inFo)" parameter to " 1" and use MODE 3 of the AD-8121B. Refer to "11-2-1. Connection to the AD-8121B Printer" for details on using the printer.
- To output the report to a personal computer using the RS-232C interface, set the "GLP output (inFo)" parameter to "2".
- If the time and date are not correct, set the correct time and date in "Clock (CL AdJ)" of the function table.

Notes

- For operational details about calibration and calibration test, refer to "7. Calibration".

Calibration report using the internal mass



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

Calibration report using an external weight

Setting of " InFo 1"
AD-8121 printer format

```
          A & D
MODEL      MC-30K
S/N      01234567
ID        ABCDEFG
DATE   2009/12/31
TIME     12:34:56
CALIBRATED(EXT.)
CAL.WEIGHT
     +20000.00  g
SIGNATURE
```

Setting of " InFo 2"
General format

```
␣␣␣␣␣␣␣␣␣␣␣A␣&␣D<TERM>
MODEL␣␣␣␣␣MC-30K<TERM>
S/N␣␣␣␣␣01234567<TERM>
ID␣␣␣␣␣␣␣ABCDEFG<TERM>
DATE<TERM>
␣␣␣␣␣␣2009/12/31<TERM>
TIME<TERM>
␣␣␣␣␣␣␣␣12:34:56<TERM>
CALIBRATED(EXT.)<TERM>
CAL.WEIGHT<TERM>
␣␣␣␣+20000.00␣␣g<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
----------------<TERM>
<TERM>
<TERM>
```

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

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

Calibration test report using an external weight

Note Calibration test does not perform calibration.

Setting of " InFo 1"
AD-8121 printer format

```
          A & D
MODEL      MC-30K
S/N      01234567
ID        ABCDEFG
DATE   2009/12/31
TIME     12:34:56
CAL.TEST(EXT.)
ACTUAL
          0.00  g
    +19999.99  g
TARGET
    +20000.09  g
SIGNATURE
```

Setting of " InFo 2"
General format

```
␣␣␣␣␣␣␣␣␣␣␣A␣&␣D<TERM>
MODEL␣␣␣␣␣MC-30K<TERM>
S/N␣␣␣␣␣01234567<TERM>
ID␣␣␣␣␣␣␣ABCDEFG<TERM>
DATE<TERM>
␣␣␣␣␣␣2009/12/31<TERM>
TIME<TERM>
␣␣␣␣␣␣␣␣12:34:56<TERM>
CAL.TEST(EXT.)<TERM>
ACTUAL<TERM>
␣␣␣␣␣␣␣␣␣0.00␣␣g<TERM>
␣␣␣␣+19999.99␣␣g<TERM>
TARGET<TERM>
␣␣␣␣+20000.00␣␣g<TERM>
SIGNATURE<TERM>
<TERM>
<TERM>
----------------<TERM>
<TERM>
<TERM>
```

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

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

Title block and end block

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

Notes

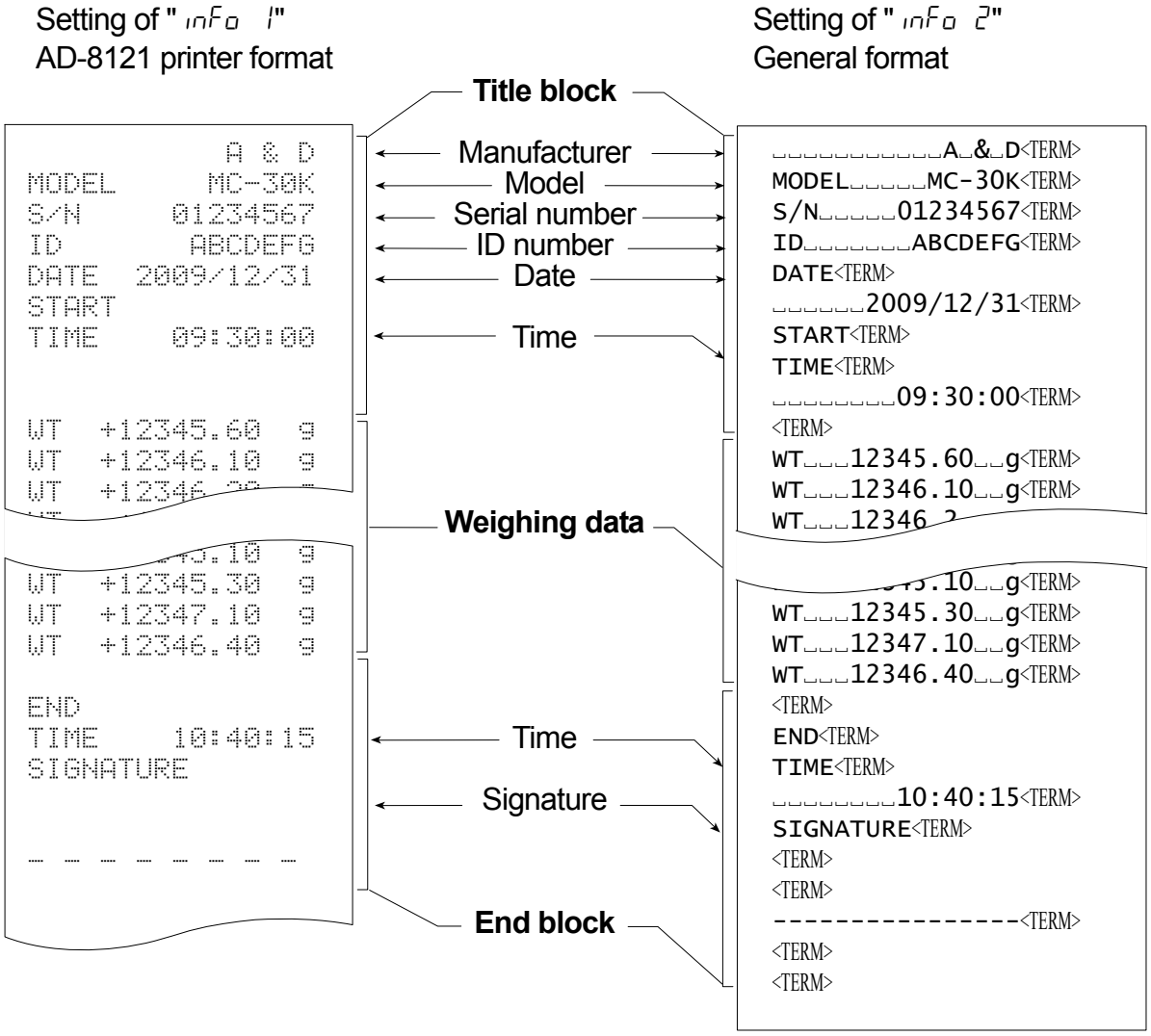
- To output the report to an AD-8121B , use MODE 3 of the AD-8121B.
- If the data memory function is used, the "Title block" and "End block" can not be output.

Operation

Step 1 With the weighing data displayed, press and hold the [PRINT] key, until [StArt] is displayed, then release the key. The "Title block" is output.

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

Step 3 Press and hold the [PRINT] key until [rEcEnd] is displayed, then release the key. The "End block" is output.

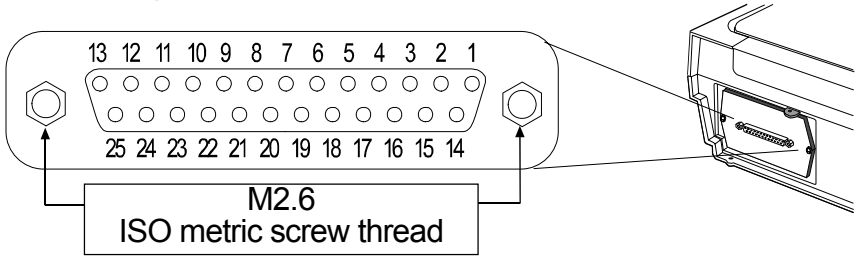


␣	Space, ASCII 20h
<TERM>	Terminator, CR , LF or CR
CR	Carriage return, ASCII 0Dh
LF	Line feed, ASCII 0Ah

11. Standard Input & Output Interface

11-1. RS-232C and External Contact Input

D-Sub 25 pin numbers



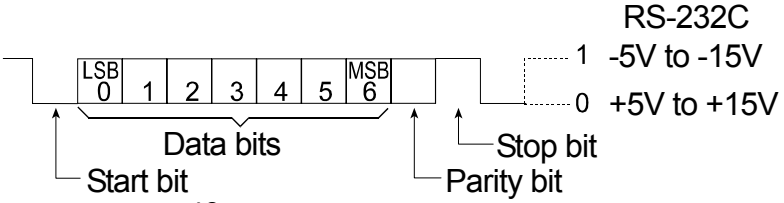
D-Sub 25 pin assignments

Pin No.	Signal name	Interface type	Direction	Description
1	FG		–	Frame ground
2	RXD	RS-232C	Input	Receive data
3	TXD	RS-232C	Output	Transmit data
4	RTS	RS-232C	Input	Ready to send
5	CTS	RS-232C	Output	Clear to send
6	DSR	RS-232C	Output	Data set ready
7	SG	RS-232C / external contact input	–	Signal ground
18	PRINT	External contact input	Input	Same as the PRINT key
19	RE-ZERO	External contact input	Input	Same as the RE-ZERO key
Others	–	–	–	No connection

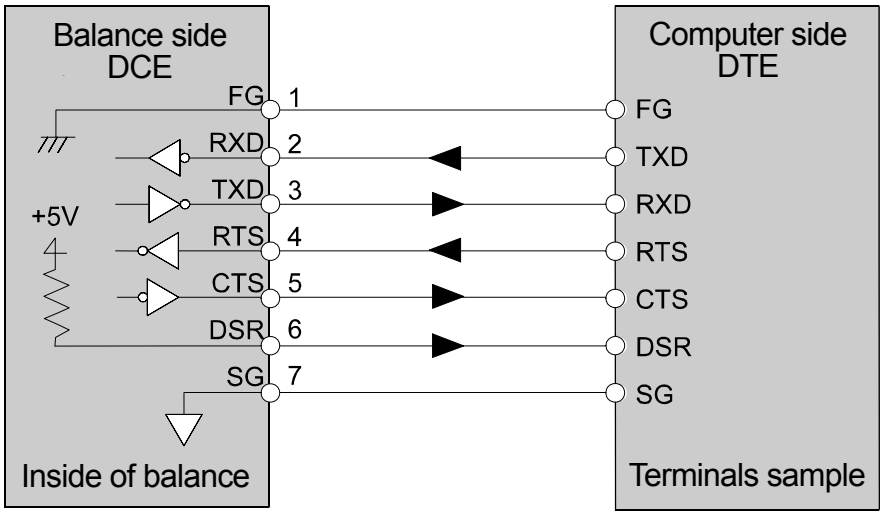
RS-232C

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

Transmission system : EIA RS-232C
Transmission form : Asynchronous, bi-directional, half duplex
Transmission rate : 10 times/second or 5 times/second (same as data refresh rate)
Data format : Baud rate : 600, 1200, 2400, 4800, 9600, 19200bps
Data bits : 7 or 8 bits
Parity : Even, Odd (Data bits 7 bits)
None (Data bits 8 bits)
Stop bit : 1 bit
(When sending, 2 bits; receiving, 1 bit.
A personal computer will function with either setting.)
Code : ASCII



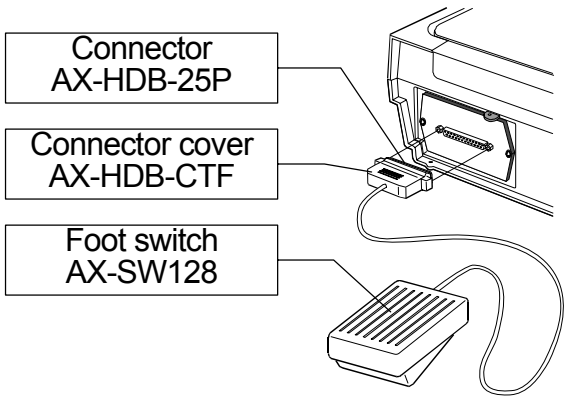
RS-232C Terminals



External contact input

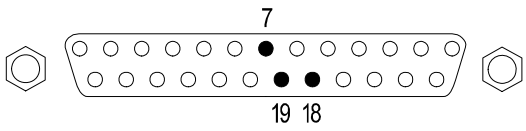
By connecting pin 18 (PRINT command) to pin 7, or pin 19 (RE-ZERO command) to pin 7 for 100 ms or more, the same operation as performed by pressing the [PRINT] key or the [RE-ZERO] key, will be performed.

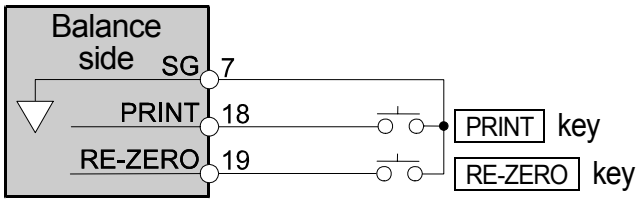
Example of foot switch



Option

Connector : AX-HDB-25P/CTF
Foot switch : AX-SW128





11-2. Connection to peripheral equipment

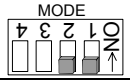
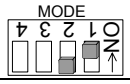
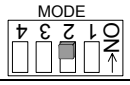
11-2-1. Connection to the AD-8121B Printer

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

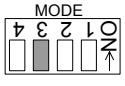
Class	Item and Parameter	Factory settings	AD-8121B MODE 1	AD-8121B MODE 2	AD-8121B MODE 3
dout Data output	PrE Data output mode	0	0, 1, 2	3	0, 1, 2
	AP-P Auto print polarity	0	#1	Not necessary	#1
	AP-b Auto print difference	1			
	d-no Data number output	0	0	0	0, 1
	S-td Time/Date output	0	0	0	0, 1, 2, 3
	S-id ID number output	0	0	0	0, 1
	PUSE Data output pause	0	0	0	0, 1 #2
	At-F Auto feed	0	0	0	0, 1
S.IF Serial interface	bPS Baud rate	2	2	2	2
	btPr Data bit, parity bit	0	0	0	0
	CrLF Terminator	0	0	0	0
	tYPE Data format	0	0	0	1
	CtS CTS, RTS control	0	0	0	0

#1 Set parameters when auto print mode A or B (PrE 1 or 2) is selected.
#2 Set 1 when multiple lines are printed. Example: When appending ID number, set 1.

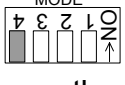
□ Settings of AD-8121B

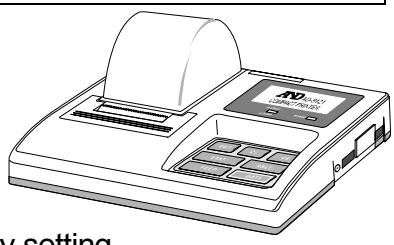
MODE	AD-8121B DIP switch	Description
MODE 1		Print at receiving data. Standard mode, statistic mode
MODE 2		Print by DATA key operation or built-in timer. Standard mode, interval mode, chart mode
MODE 3		Print at receiving data. Dump print mode

DIP switch No.3 : Handling unstable data
ON Print
OFF Not printed



DIP switch No.4 : Data input specifications (Interface selection)
ON Current loop
OFF RS-232C





□ The printer performs as follows, depending on the data memory setting.

Setting	Output data
dAtA 0	The weighing data
dAtA 2	The weighing data stored in memory
dAtA 3	The calibration report stored in memory

□ Refer to "10-2. GLP Report" for print samples.

11-2-2. Connection to a Computer and the Use of WinCT

The balance is of the DCE type (Data Communication Equipment), which can be connected to a personal computer using the RS-232C interface. Before connection, read the personal computer manual thoroughly. Use a standard DCE cable for connection (cable type: straight-through). When the personal computer type is a DOS/V with a 9-pin port, use a straight-through cable with a 25-pin male connector and a 9-pin female connector.

Using Windows Communication Tools Software (WinCT)

When Windows is used as an operating system in a personal computer, the provided WinCT software can be used to transmit the weighing data to the personal computer.
The WinCT software has two communication methods: "RsCom" and "RsKey". Refer to the WinCT instruction manual.

RsCom

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

RsKey

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

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

- **Analyzing the weighing data and the statistics with "RsKey"**
  The weighing data can be input directly into an Excel worksheet. Then, Excel can analyze the data to obtain total, average, standard deviation, maximum and minimum value, and display them in a graph.
- **Controlling the balance using commands from a personal computer**
  By using "RsCom", the personal computer sends commands such as "re-zero" or "send weighing data" to the balance and controls the balance.
- **Printing the balance GLP report using your printer**
  The balance GLP report can be printed using a printer connected to the personal computer.
- **Receiving weighing data at a certain interval**
  The weighing data can be received at a certain interval and data characteristic with elapsed time can be obtained.
- **Using the balance memory function**
  The data can be stored in the balance's memory. Of the data stored, the weighing data and calibration data can be transmitted to a personal computer at one time.
- **Using a personal computer as an external indicator**
  With the "RsKey" test mode function, a personal computer can be used as an external weight indicator for the balance. (To do this, set the balance data output mode to stream mode.)

12. Commands

12-1. Command List

Note A command has a terminator added, that is specified using "S,F CrLF" of the function table, and is sent to the balance.

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

Commands to control the balance	
?CN	Requests the upper/lower limit value code number of the selected value.
?HI	Requests the upper limit value.
?ID	Requests the identification number.
?LO	Requests the lower limit value.
?MA	Outputs all weighing data in memory.
?MQnnn	Outputs data with the data number nnn. nnn: Three digits
?MX	Outputs the number of data in memory (the last data number)
?PN	Request the tare number of the selected value.
?PT	Request the tare value.
?SN	Request the serial number of the balance.
?TN	Request the model name of the balance.
?UN	Requests the unit mass numbers in memory.
?UW	Requests the unit mass value.
CAL	Same as the CAL key.
CN:mm	Recalls the upper/lower limit value in memory. mm: 01 to 20.
HI:******.*␣␣g	Sets the upper limit values. ␣ is space mark. Example: the upper limit value is 2000.0 g. Command: HI:+002000.0␣␣g
ID:*******	Sets identification number.
LO:******.*␣␣g	Sets the lower limit values. ␣ is space mark. Example: the lower limit value is 1000.0 g. Command :LO:+001000.0␣␣g
MCL	Deletes all data in memory.
MD:nnn	Deletes data with the data number nnn. nnn: Three digits.
OFF	Turns the display off.
ON	Turns the display on.
P	Same as the ON:OFF key
PN:mm	Recalls the tare value in memory. mm: 01 to 20.
PRT	Same as the PRINT key
PT:*****.*␣␣g	Sets the tare value. ␣ is space mark. Example: the tare value is 1000.0 g. Command :PT:+001000.0␣␣g

Commands to control the balance	
R	Same as the RE-ZERO key
SMP	Same as the SAMPLE key.
U	Same as the MODE key
UN:mm	Recalls the unit mass values in memory. mm: 01 to 50.
UW:******.*␣␣g	Changes the unit mass value. Use "g" of unit. ␣ is space mark. Example: the unit mass value is 2000.0 g. Command: UW: +002000.0␣␣g

When a unit is required in commands such as a "PT:" command, use the 3-digit unit code of the A&D standard format.
nnn indicates a three-digit numerical value.

12-2. Acknowledge Code and Error Codes

When the "Serial interface function (SIF)" parameter is set to "ErCd 1", the balance outputs <AK> code or error code to each command as follows:

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

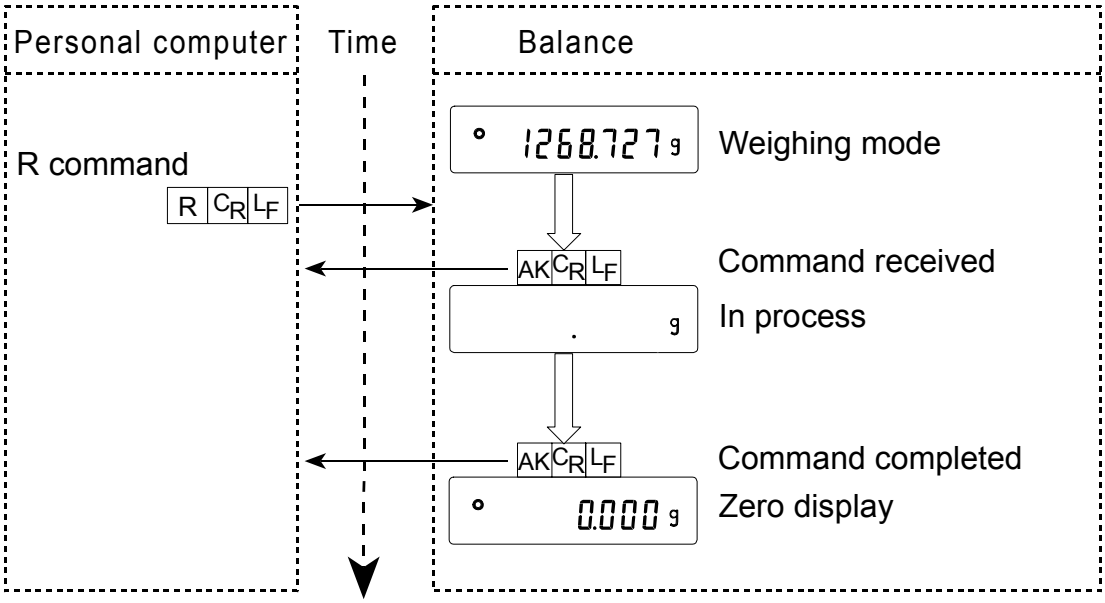
□ When the balance receives a command to request data and can not process it, the balance transmits an error code (EC, Exx).
When the balance receives a command to request data and can process it, the balance outputs the data.

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

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

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

R command



□ When a communication error has occurred due to external noise, or a parity error has occurred due to transmission error, the balance transmits an error code. In this case, send the command again.

xx is error code number.

12-3. Control Using CTS and RTS

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

CtS 0

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

CtS 1

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

12-4. Settings Related to RS-232C

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

13. Extended Function

The MC series balance has several extended functions equipped for special applications or to troubleshoot when using the standard functions.

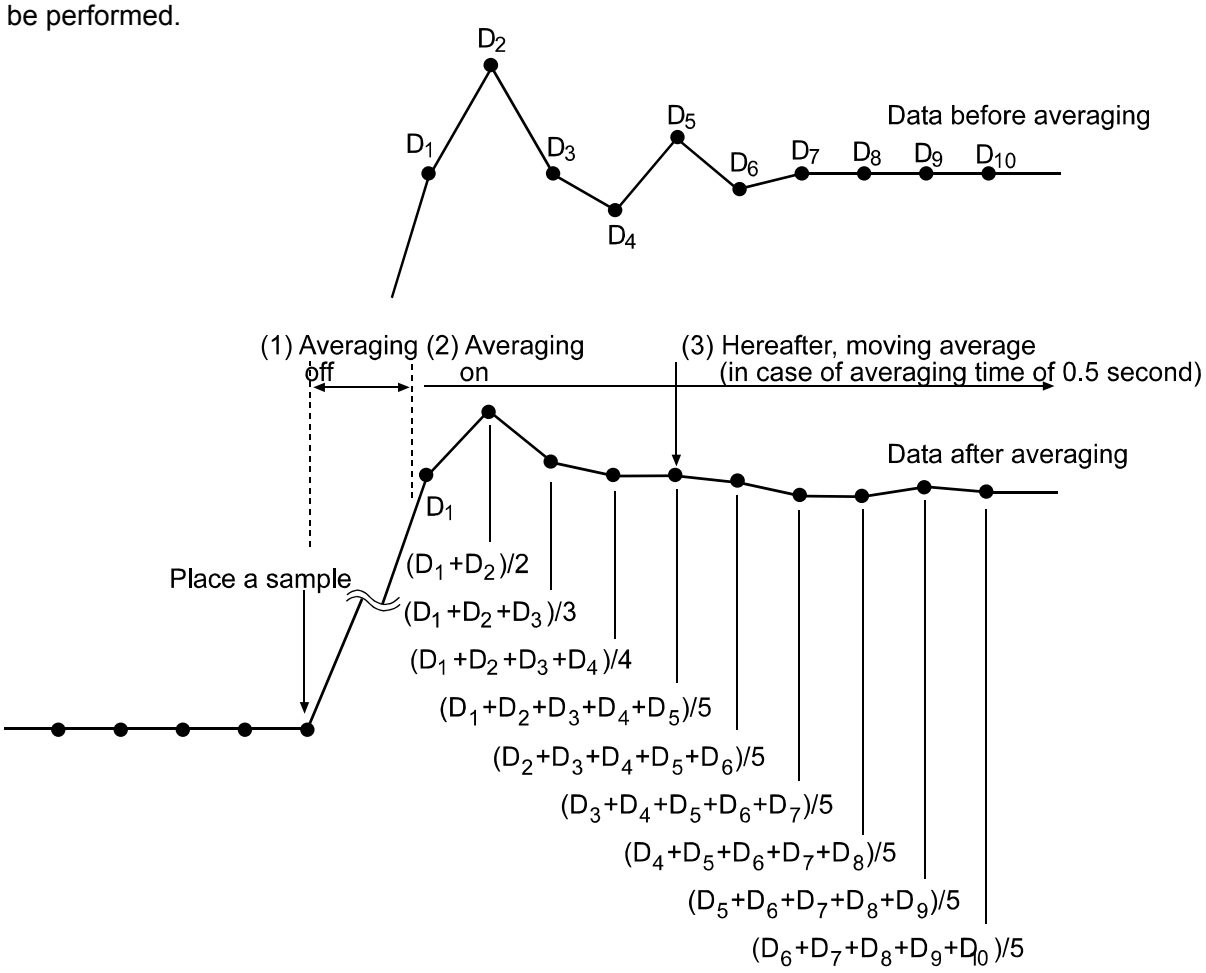
When the "Filter (F IL)" is set to " 0 ", extra items are available as shown below.

Class	Item and Parameter		Description	
ErFnc Extended function	F1-b Averaging range for the first moving average	0	Small ▲	When the fluctuation of a weight value is within the averaging range, the averaging operation starts to stabilize the displayed value. When the fluctuation of a weight value is small, for example, when weighing or filling a small amount of sample, the averaging is always performed and the response rate maybe slow. Under such a condition, change the parameter. Refer to "Averaging range (F1-b) and averaging time (F1-t)"
		1		
		2		
		3		
		▪ 4		
		5		
		6		
		7	▼ Large	
	F1-t Averaging time for the first moving average	0	No averaging	When the fluctuation of a weight value is within the averaging range, the averaging operation starts. Once the duration of averaging operations reach the averaging time, moving averaging starts. This parameter sets the time to start moving averaging. Refer to "Averaging range (F1-b) and averaging time (F1-t)"
		1	0.5 second	
		▪ 2	1.0 second	
		3	1.5 seconds	
		4	2.0 seconds	
		5	2.5 seconds	
		6	3.2 seconds	
		7	4.8 seconds	
		8	6.4 seconds	
	F2-b Averaging range for the second moving average	0	Small ▲	Refer to "Filter depending on differences in the amount to deliver powdery and liquid material".
		▪ 1		
		2		
		3		
		4		
		5		
		6	▼ Large	
	F2-t Averaging time for the second moving average	0	No averaging	
		1	0.5 second	
		2	1.0 second	
		3	1.5 seconds	
		4	2.0 seconds	
		▪ 5	2.5 seconds	
		6	3.2 seconds	

13-1. Description of "Averaging range" and "Averaging time"

13-1-1. Averaging range (F1-b) and averaging time (F1-t)

1. When the fluctuation of a weight value is beyond the range that is selected in " F1-b ", the averaging operation is disabled and the display reflects the varying value.
2. Once the fluctuation becomes within the selected range, the averaging operation starts to stabilize the weight value.
3. The process of averaging increases. When the selected time is reached, moving averaging will be performed.



When a small amount of sample is weighed or is filled, the fluctuation of a weight value is too small to be beyond the selected range and the averaging operation is not disabled. Consequently moving averaging is always performed and it takes a longer time to reach the final weight value. Under such a situation, change the setting of " F1-b " to a smaller range. But please note that the smaller the range is, the more prone to external disturbance the value will become.

13-1-2. Filter depending on differences in the amount to deliver powdery and liquid material

- When the weight value is not stable even without load fluctuations
  - □ Increase the averaging range for the first moving average parameter (F 1-b).
  - □ Increase the averaging time for the first moving average parameter (F 1-t).
  - □ Strengthen the digital filter. (Increase the function setting “Condition (Cond)” parameter.)

- When response is slow during full and medium flow
  - □ Decrease the averaging range for the first moving average parameter (F 1-b).
  - □ Weaken the digital filter. (Decrease the function setting “Condition (Cond)” parameter.)

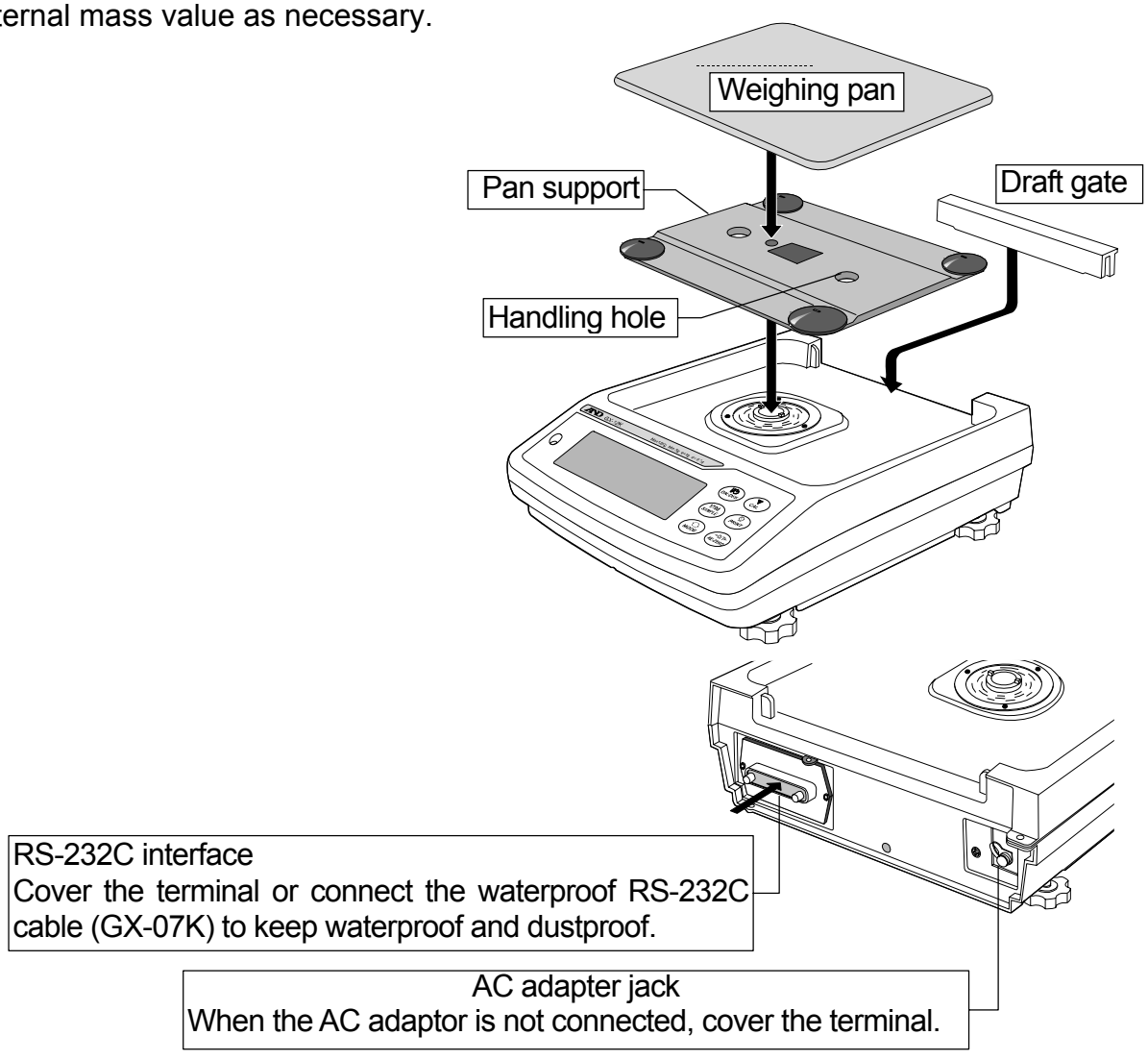
- When response is slow during dribble flow
  - □ Decrease the averaging time for the first moving average parameter (F 1-t).
  - □ Weaken the digital filter. (Decrease the function setting “Condition (Cond)” parameter.

- To increase stability without load fluctuations
  - □ Increase the averaging range for the second moving average parameter (F2-b).
  - □ Increase the averaging time for the second moving average parameter (F2-t).

14. Maintenance

14-1. Treatment of the Balance

- In normal use, the balance can be cleaned with water. But, keep the following precautions so that dust and water do not invade the balance.
  - Do not direct water pressure at the bottom of the balance.
  - Do not use powerful water jets.
  - Do not submerge the balance in water.
- Clean the balance with a lint free cloth that is moistened with warm water and a mild detergent.
- Do not use organic solvents to clean the balance.
- Do not disassemble the balance. Contact the local A&D dealer if the balance needs service or repair.
- Use the original packing material for transportation.
- While cleaning the balance and keeping it waterproof, connect a waterproof RS-232C cable (GX-07K) or cover terminals of the RS-232C interface and AC adapter jack. Insure that the underhook cover is in place.
- The value of the internal mass may change due to aging, corrosion or other damage caused by the operating environment. Check the internal mass periodically. Correct the internal mass value as necessary.



15. Troubleshooting

15-1. Checking the Balance Performance and Environment

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

Checking that the balance performs properly

- □ Check the balance performance using the self-check function as described in "6. Weighing Speed Adjustment / Self Check Function".
  An error display appears when a malfunction is found.
- □ Check the balance repeatability using an external weight. Be sure to place the weight in the center of the weighing pan.
- □ Check the balance repeatability, linearity and calibrated value using external weights with a known value.

Checking that the operating environment or weighing method is proper

Operating environment

- □ Is the weighing table solid enough?
- □ Is the balance level? Refer to "3-1. Before Use".
- □ Is the operating environment free from vibration and drafts?
- □ Is there a strong electrical or magnetic noise source such as a motor near the balance?

Weighing method

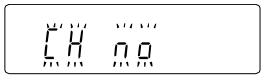
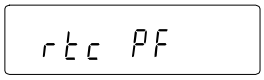
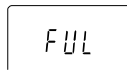
- □ Does the weighing pan touch the rim or anything? Is the weighing pan and pan support installed correctly?
- □ Is the [RE-ZERO] key pressed before placing a sample on the weighing pan?
- □ Is the sample placed in the center of the weighing pan?
- □ Has the balance been calibrated using the internal mass (one-touch calibration)?
- □ Has the balance been warmed up for 30 minutes before weighing?

Sample and container

- □ Has the sample absorbed or lost moisture due to the ambient conditions such as temperature and humidity?
- □ Has the temperature of the container been allowed to equalize to the ambient temperature? Refer to "3-2. During Use".
- □ Is the sample charged with static electricity? Refer to "3-2. During Use".
- □ Is the sample of magnetic material such as iron? Caution is required for weighing magnetic materials. Refer to "3-2. During Use".

15-2. Error Codes

Display	Error code	Description
Error 1	EC,E11	**Stability error** The balance can not stabilize due to an environmental problem. Check around the pan. Refer to "3. Precautions". Prevent vibration, drafts, temperature changes, static electricity and magnetic fields, from influencing the balance. To return to the weighing mode, press the CAL key.
Error 2		**Out of the setting range** The data to be stored is out of the setting range.
Error 6	EC,E16	**Internal mass error** Applying the internal mass does not yield a change in the weight value as specified. Confirm that there is nothing on the pan and perform the weighing operation from the beginning again.
Error 7	EC,E17	**Internal mass error** The internal mass application mechanism does not function properly. Perform the weighing operation from the beginning again.
CAL E	EC,E20	**Calibration weight error** The calibration weight is too heavy. Confirm the calibration weight value. Press the CAL key to return to the weighing mode.
-CAL E	EC,E21	**Calibration weight error** The calibration weight is too light. Confirm the calibration weight value. Press the CAL key to return to the weighing mode.
E		**Overload error** A sample beyond the balance weighing capacity has been placed on the pan. Remove the sample from the pan.
-E		**Weighing pan Error** The weight value is too light. Confirm that the weighing pan is properly installed and calibrate the balance.
Lo		**Sample mass error** The balance can not store the sample for the counting mode or for the percent mode because it is too light. Use a larger sample.
25- pcs 50- pcs 100- pcs		**Unit mass error** The sample unit mass for the counting mode is too light. Storing and using it for counting will cause a counting error. Add samples to reach the specified number and press the PRINT key. Pressing the PRINT key without adding samples will shift the balance to the counting mode. But, to acquire accurate weighing, be sure to add samples.

Display / Error code	Description
	**Automatic response adjustment zero error** The automatic response adjustment can not be performed because there is something on the pan. Clear the pan. Press the CAL key to return to the weighing mode.
 (Check NG)	**Automatic response adjustment unstable error** The automatic response adjustment can not be performed because the weight value is unstable. Check the ambient conditions such as breeze, vibration and magnetic fields, also check the weighing pan. Press the CAL key to return to the weighing mode.
 (Check no)	**Internal error** This error indicates an internal error as the result of the self-check function. Repair is required. Contact the local A&D dealer.
	**Clock battery error** The clock backup battery has been depleted. Press any key and set the time and date. The clock and calendar function works normally as long as the AC adapter is connected to the balance. If this error appears frequently, contact the local A&D dealer.
 (Blinking)	**Memory full** The amount of weighing data in memory has reached the maximum capacity. Delete the data in memory to store new data. For details, refer to the GX-K manual "12. Data Memory".
 (Illuminated)	**Memory full** The amount of calibration or calibration test data in memory has reached the maximum capacity (50 sets). The data in memory will be deleted automatically to store new data. For details, refer to the GX-K manual "12. Data Memory".
	**Memory type error** The type of memory set in the function table and the type of data stored are different. For details, refer to the GX-K manual "12. Data Memory".
EC,E00	**Communications error** A protocol error occurred in communications. Confirm the format, baud rate and parity.
EC,E01	**Undefined command error** An undefined command was received. Confirm the command.
EC,E02	**Not ready** A received command can not be processed. Example: □ The balance received a "Q" command, but not in the weighing mode. □ The balance received a "Q" command while processing a RE-ZERO command.

Display Error code	Description
	Adjust the delay time to transmit a command.
EC,E03	**Timeout error** If the timeout parameter is set to "t-UP 1", the balance did not receive the next character of a command within the time limit of one second. Confirm the communication.
EC,E04	**Excess characters error** The balance received excessive characters in a command. Confirm the command.
EC,E06	**Format error** A command includes incorrect data. Example: □ The data is numerically incorrect. Confirm the command.
EC,E07	**Parameter setting error** The received data exceeds the range that the balance can accept. Confirm the parameter range of the command.
Other error code	If an error described above can not be released or other errors are displayed, contact the local A&D dealer.

15-3. Other Display



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

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

15-4. Asking for Repair

If the balance needs service or repair, contact your local A&D dealer.

The balance is a precision instrument. Use much care when handling the balance and observe the following when transporting the balance.

- □ Use the original packing material for transportation.
- □ Remove the draft gate, weighing pan and pan support from the main unit before placing the balance in the shipping container.

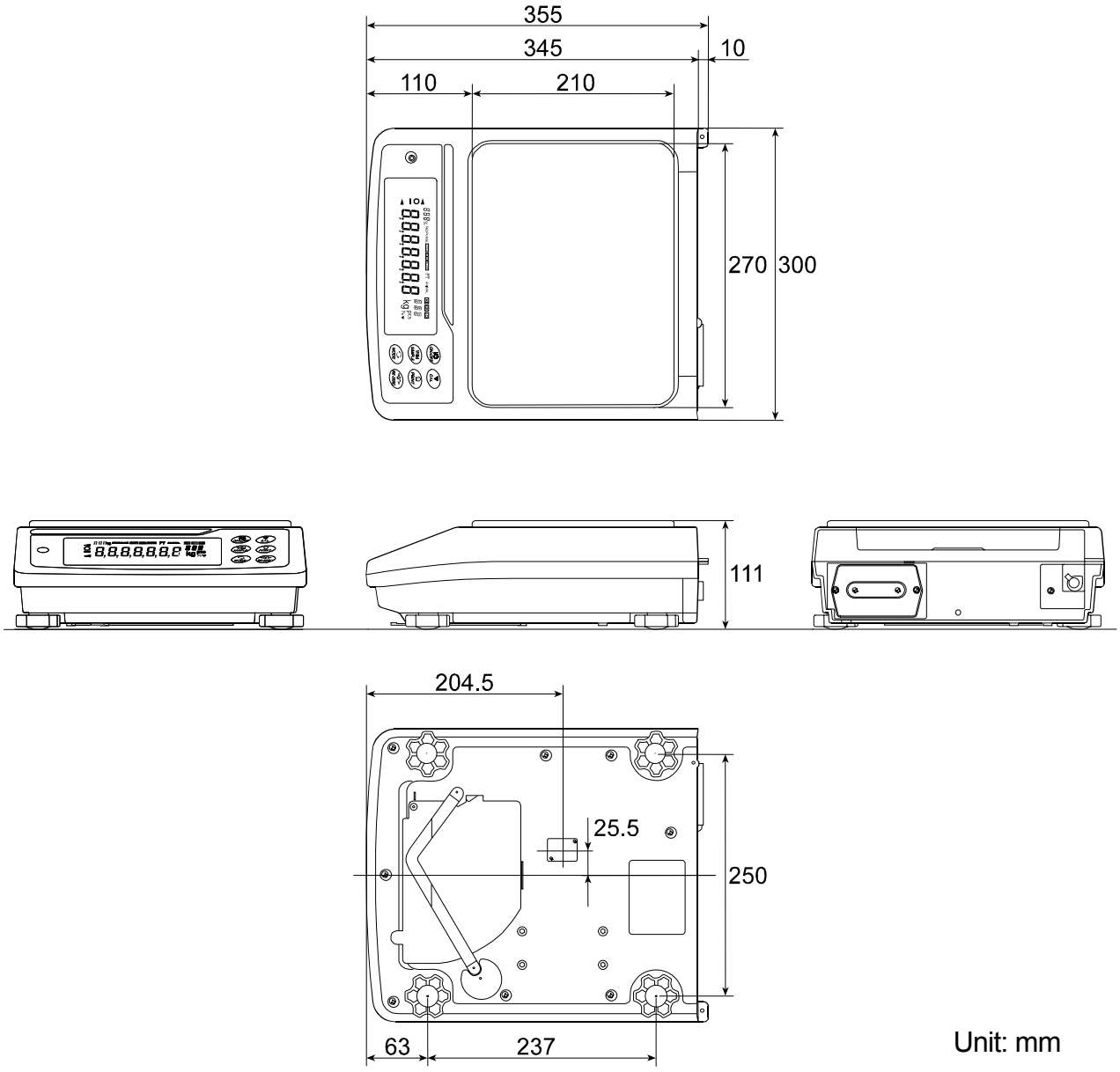
16. Specifications

	MC-10K	MC-30K
Weighing capacity	10.1 kg	31 kg
Maximum display	10.100844 kg	31.00844 kg
Minimum weighing value (1 digit)	0.001 g	0.01 g
Repeatability *1 (Standard deviation)	0.005 g (10 kg) 0.004 (5 kg) / 0.0015 (2 kg)	0.015 (20 kg)
Linearity	±0.030 g	±0.20 g
Stabilization time (Typical at FAST)	Approx. 1.5 seconds	
Sensitivity drift, (10°C ~ 30°C / 50°F ~ 86°F)	±3 ppm/°C	
Accuracy right after calibration using the internal mass *2 (Accuracy of full scale)	±0.150 g	±1.50 g
Operating environment	5°C to 40°C (41°F to 104°F), 85%RH or less (No condensation)	
Internal mass	Built-in function	
Weighing data of data memory	200 data, 100 data with calendar	
Time and clock function	Built-in function	
Display refresh rate	5 times/second or 10 times/second	
Display mode	g (gram)	
Interface (Provided as standard)	RS-232C with Windows Communication Tools Software WinCT	
External calibration weight	2 kg, 3 kg, 4 kg, 5 kg, 6 kg, 7 kg, 8 kg, 9 kg, 10 kg	20 kg, 30 kg
Weighing pan	270 x 210 mm	
External dimensions	300(W) x 355(D) x 111(H) mm	
Power supply & AC adapter type	Power consumption: Approx. 11VA (supplied to the AC adapter) Confirm that the adapter type is correct for the local voltage and power receptacle type.	
Weight	Approx. 9.3 kg	
Dust and water protection	Complying with IP65	

*1: When the auto-centering pan or automatic system is used in good ambient conditions..

*2: Accuracy right after calibration using the internal mass in good ambient conditions (within the temperature range of 10°C to 30°C (50°F to 86°F) with no abrupt changes in temperature or humidity, no drafts, no effect by magnetic fields or static electricity).
Check the internal mass periodically as described in "13. Maintenance".

16-1. External Dimensions



Unit: mm

16-2. Options and Peripheral Instruments

AX-MC10K/30KPAN Auto-centering Pan

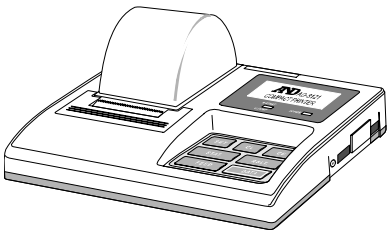
- This option consists of an auto-centering pan, a breeze break and an auto-centering pan guide.

AD-8922A Remote controller

- Connected to the MC series balance using the RS-232C interface to display the weighing data and to remotely control the balance.

AD-8121B Printer

- Compact dot-matrix printer
- Statistical function, clock and calendar function, interval print function, graphic print function, dump print mode
- 5 x 7 dots, 16 characters per line
- Print paper (AX-PP143, 45 (W) x 50 (L) mm , ø65 mm)
- AC adapter or alkaline battery



Order code	Name and description
GX-04K	**Comparator Output (Relay/ with a Buzzer) / RS-232C / Current Loop** - This option generates a relay output corresponding to HI , OK and LO in the display. - Current loop and RS-232C can be used at the same time. For example, a personal computer and an AD-8121B printer can be used simultaneously. - This option is installed in place of the standard RS-232C serial interface.
GX-06K	**Analog Voltage Output / Current Loop** - This option outputs a voltage of 0 to1V (or 0.2 to1V) depending on the displayed value. - With this option, current loop can be used. For example, an AD-8121B printer can be used simultaneously using this option. - This option is installed in place of the standard RS-232C serial interface. So, RS-232C is not available for use.
GX-07K	**Waterproof and Dustproof RS-232C Cable** - Length 5m, straight type, D-sub 9pin - D-sub 25pin. - Only the 25pin connector of the balance side is a waterproof type.
GXK-012	**Animal Weighing Bowl** - This bowl can be used to weigh a small animal. - When using this bowl, the weighing range that can be used is an approximately 1.5 kg less than the weighing capacity.

Note When option GX-04K or GX-06K is installed in the balance, the balance does not comply with IP-65 (waterproof and dustproof).

Order code	Name and description
AD-1682	**Rechargeable Battery** □ This option allows use of the balance in a place where AC power is not available.
AD-8524A/B	**Keyboard Adapter** □ This option can be used to connect the balance to a personal computer with appropriate OS and applications.
AD-8920	**Remote Display** □ This option can be connected to the balance using the RS-232C interface.
AX-GXK-31	**Breeze break**
AX-KO1710-200	**RS-232C Cable** □ Length 2m, straight type, D-sub 9pin - D-sub 25pin.
AX-SW128	**Foot Switch** □ This option is used to externally transmit a RE-ZERO or PRINT signal to the balance.

17. Terms/Index

17-1. Terms

Calibration	Adjustment of the balance so that it can weigh accurately.
Calibration weight	A weight used for calibration
Data number	Numbers assigned sequentially when weighing data or unit weight is stored.
Digit	The minimum weighing value available. Used for the balance, one digit is the smallest mass that can be displayed.
Environment	Ambient conditions such as vibration, drafts, temperature, static electricity and magnetic fields which affect the weighing operation.
External weight	The weight that you have.
GLP	Good Laboratory Practice.
Internal mass	Built-in calibration weight
IP-65	IP code: Degree of protection provided by enclosures. 6: Dust-tight. No ingress of dust. 5: Protect against water jets.
Mode	Balance operational function.
Output	To output the weighing data using the RS-232C interface.
Range	A combination of weighing range and resolution.
Repeatability	Variation in measured values obtained when the same mass is placed and removed repetitively. Usually expressed as a standard deviation. Example: Standard deviation = 1 digit: This means that measured values, obtained when the same sample is placed and removed repetitively, fall within ±1 digit in the frequency of about 68%.
Re-zero	To set the display to zero.
Sensitivity drift	An affect that a change in temperature causes to the weighing data. Expressed as a temperature coefficient. Example: Temperature coefficient = 2 ppm/°C : If a load is 8 kg and the temperature changes by 10°C, the value displayed changes by the following value. 0.0002%/°C x 10°C x 8 kg = 0.16 g In this example, if the value displayed is 8000.00 g before temperature changes, a temperature change of 10°C will make the value displayed 8000.16 g.
Smart range function	The function allows weighing in the precision range, even if a heavy tare is used.

Stable value	The stable weight data, indicated by the illuminated stabilization indicator.
Stabilization time	Time required after a sample being placed, until the stabilization indicator illuminates and the weighing data is displayed.
Store	To save the weighing data, unit mass or calibration data using the data memory function.
Tare	To cancel the weight of a container which is not to be included in the weighing data. Normally, refers to an operation of placing a container and setting the display to zero.
Target weight	An external weight used for calibration test
Zero point	A weighing reference point. Usually refers to the value displayed when nothing is on the weighing pan.

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MEMO

MEMO