HM SERIES

INSTRUCTION MANUAL

PRECISION ELECTRONIC BALANCE

HM-120
HM-200
HM-202
HM-300

A&D

This is hazard alert mark.

This informs to you about the operation of the balance.

This is a notice about the operation of the balance.

Contents

▉ Introduction

*Thank You For Your **AND** Purchase*

Electronic Balances are easy to use, yet they are rather complex in that they are high technology products. This manual will tell you in simple language how this balance works and how to get the most out of it in terms of performance.

▉ Features

❑ The HM-202 is dual range balance (42g x 0.01mg/ 210g x 0.1mg).
❑ The HM-120, HM-200 and HM-300 are single range balances.
❑ The HM series can be easily adapted to most operating environments through simple adjustments from the keyboard.
❑ The OP-03 serial interface allows control of the balance or transmission of the weighing data to a computer or printer.
❑ Good Laboratory Practices (GLP) calibration output using the OP-03 / 05 serial interface.
❑ A calibration mass correction function allows precise input of the calibration mass.
❑ Multiple weighing units, with most of the common units used around the world.
❑ Counting (pcs) mode, for inventorying lightweight components or pharmaceuticals.
❑ Percent (%) mode, for matching weights against a standard.
❑ Digital Tare, allows the input of a tare value from the keyboard or via the RS-232C interface.
❑ Security, the serial number of the balance is available using the RS-232C interface.

▉ Options and Accessories

❑ OP-03   Serial interface, bi-directional RS-232C/ Current Loop.
❑ OP-05   Current Loop printer interface.
❑ OP-11   Anti-theft device.
❑ AD-8121 multi-function printer. This printer can print weighing data, total weighing counting and standard deviation, along with the time and date. Includes statistical calculation.

▉ 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 might 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.)

❏ Unpack the balance carefully and keep the packing material if you want to transport the balance again in the future.

❏ In the carton you should find this manual plus:

Weighing pan

Weight plate

Pan support

Bubble spirit Level

Breeze break ring

Leveling feet

Dust plate

Display

Keys

AC adaptor
Please check that the adaptor type is correct for your line voltage.

Options & Accessory

OP-03
Current loop
RS-232C

OP-05
Printer Interface
(Current loop)

OP-11
Anti-theft Device

External key plug
Order name
AX–T–314A–S

AC adaptor jack
External key jack

Grounding terminal
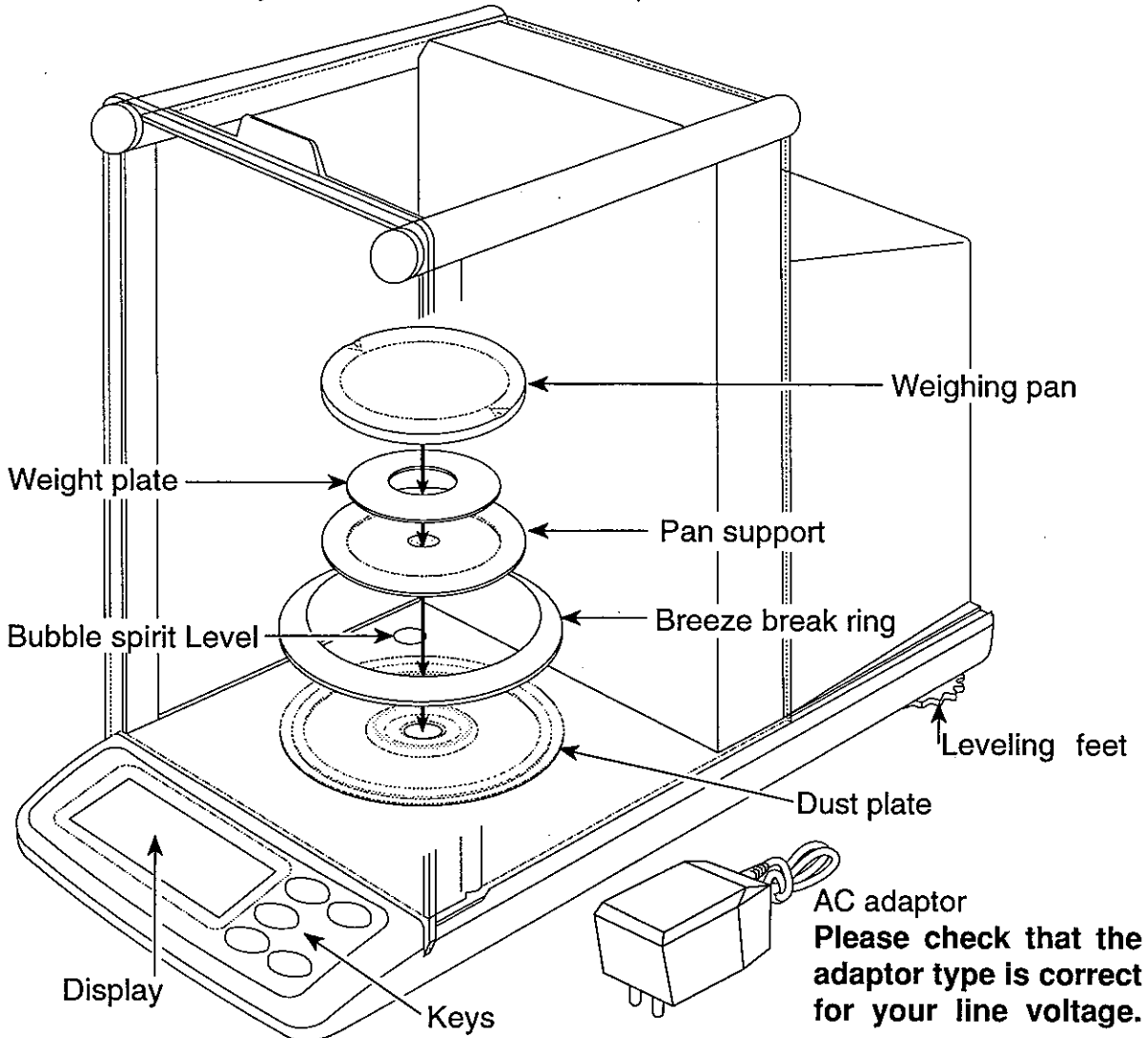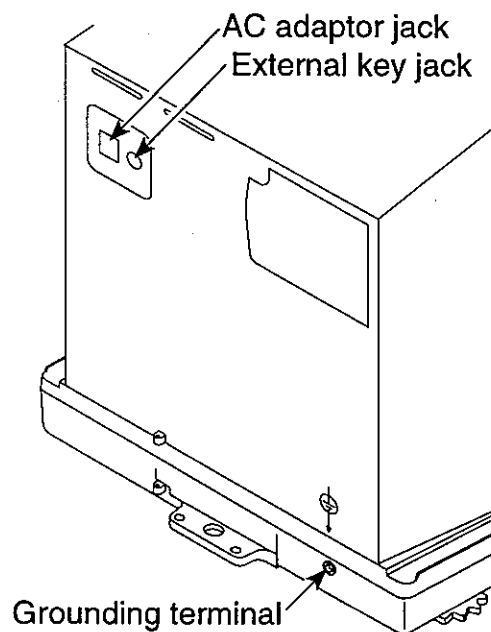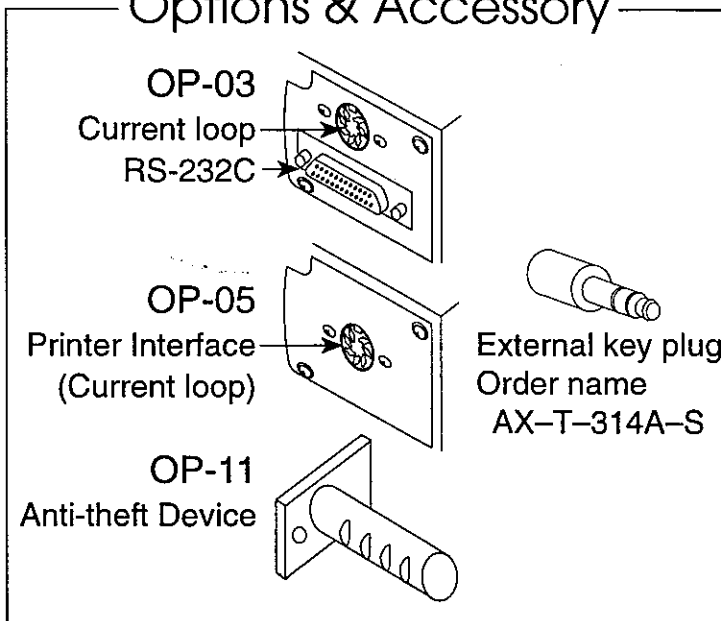
⚡ Balance Location

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

○ Corners of rooms are best as they are less prone to vibrations.

○ Don't install the balance near heaters or air conditioners.

○ Don't install the balance in direct sunlight.

○ Don't use the balance near other equipment which produces magnetic fields.

○ Try to ensure a stable power source when using the AC adaptor.

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

⚡ Best Conditions for Weighing

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

○ Please warm-up (plug-in) the balance for at least one hour.

○ The weighing room should be kept clean and dry.

○ Please RE-ZERO the balance before each use to prevent possible error.

○ Make each weighing quickly to avoid errors due to changes in environmental conditions.

○ Close the breeze break doors to keep out drafts.

○ Do not drop things upon the weighing pan, or place a weight beyond the range of the balance on the weighing pan.

○ Do not use a sharp instrument (such as a pencil or ball point pen) to press the keys, use only your finger.

○ Use caution when weighing items that could have a static charge (plastics, insulator, etc.), as the weight of a material that has a static charge is influenced by its surroundings. Try to keep the ambient humidity above 45%RH.

Charged material
Shield case
Grounding

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

Magnetic material ⟶

○ When weighing a sample that is either warmer or cooler than the ambient temperature, the sample can set up a draft due to the air rising or falling next to the sample. This draft can cause a shift in the weight of the sample.

20°C
40°C
Air buoyance and draft

○ Due to the affect of air buoyancy on a sample, please take this into account when absolute accuracy is required.

○ There are two methods of pressing a key. The first, is to press and release a key; and the second, is to press and hold a key. Each of these will perform a different function. Please refer to other sections of this manual to learn the functions of the keys. Take special care with the RE-ZERO key, because if it is pressed and held, the balance will enter the calibration mode which could cause you to reset calibration improperly.
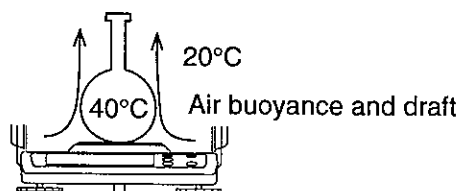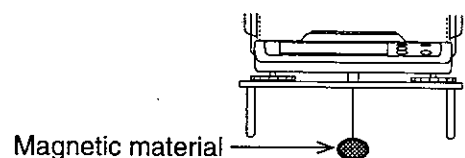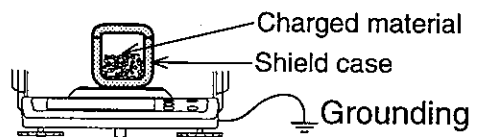
■ Setting Up the Balance

○ Place the balance on a firm weighing table and turn the adjustable feet until the balance is level (check the spirit level on the balance).

○ Install the weighing pan and breeze break ring on the balance (see the section on "Unpacking Your Balance").

○ Please check that the adaptor is the correct voltage. Plug in the AC adaptor. Ground the balance chassis for electro-static discharge if static electricity could be a problem.

Leveling feet

Bubble spirit level

OK   NG

AC adaptor

Grounding
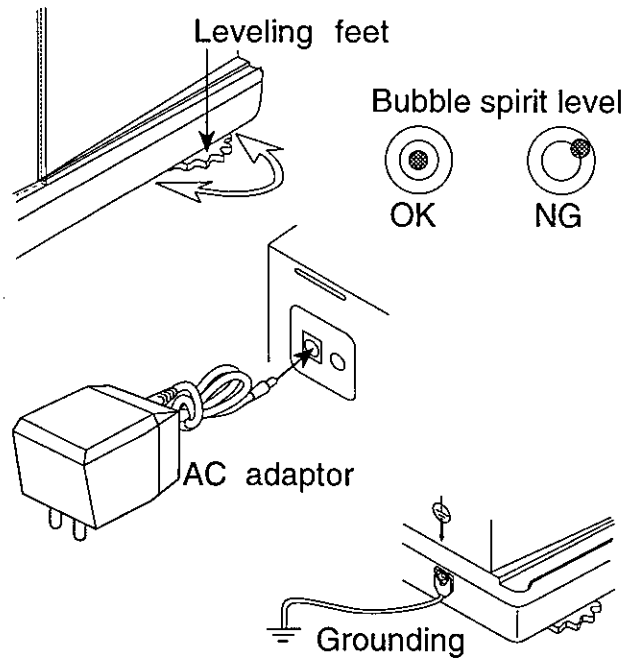
■ Taking Care of the Balance

○ Don't disassemble the balance. Contact your local A&D dealer if your balance needs service or repair.

○ Don't use solvents to clean the balance. A lint free cloth is best for cleaning, using warm water with a mild detergent.

○ Keep equipment containing magnets away from the balance.

○ Protect the internal parts from liquid spills and excessive dust.

○ Please use a very precise calibration mass.

■ Power Supply

When the AC adaptor is connected, the balance is in the standby mode if the standby indicator is on (see "Displays" on the next page). This is a normal state and does not harm the balance. We recommend that you plug in your balance for at least an hour before use so it can warm up.

■ Display ON:OFF & Power Errors

○ The balance does a self check when you connect the AC adaptor or press the ON:OFF key. If there is a problem, you will get an error display. Please refer to the error code table. $P \ FAIL$ will be displayed if the power was cut with the display on. To clear this error, press the ON:OFF key.
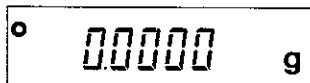

Keys and Displays

This section explains the keys and displays for the weighing mode. Refer to the following separate sections for an explanation of Percent (%) Mode, Counting (pcs) Mode.
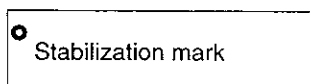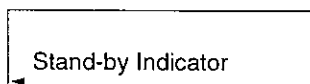
Displays

```
o  00000  g
```

Normal weighing display of zero. Please read weighing data only after the stabilization mark is displayed.
Note: the number of decimal places depend on the model in use (HM-200 illustrated).

```
o
Stabilization mark
```

This round symbol is the stabilization mark. It is displayed when the balance is stable and the weighing data can be read. Refer to "Stability Band Width" Function.
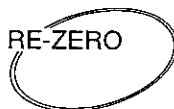
```
Stand-by Indicator
```

This is the Stand-by Indicator. This mark is displayed when you turn the display off, and the AC adaptor still connected.

Keys

ON:OFF

The ON:OFF key switches the display ON and OFF but does not cut the power to the balance. The balance will remain on standby (warm up) while the AC adaptor remains connected.

RE-ZERO

The RE-ZERO key is used to zero the display within the range of the balance. This key returns the balance to the center of zero when the weighing pan is empty, and can also tare total weight (container and sample). Please use this key before each weighing to cancel possible error.

RANGE

The RANGE key can also be used to turn ON/OFF the last significant digit alternately. This key switches the weighing range for the HM-202.
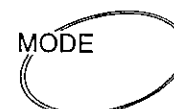
MODE

If you press the MODE key, the balance switches between weighing modes. However, only selected modes will be displayed.
If you press and hold the MODE key, the balance changes the adjustment mode to a new weighing environment. This mode sets the response of the balance. This parameter is common to the "Response / Environment" function and "Condition of response". Refer to this function and "Condition of response".

PRINT

The PRINT key can be used to output data to a printer or personal computer if the RS-232C or current loop is installed. Please refer to section "Functions" for details of output format and setting up the balance.

Units

The most common unit of weight used around the world is grams, but there is often a need to shift to an alternative unit specific to the country where the balance is used or to select modes such as counting or percent.
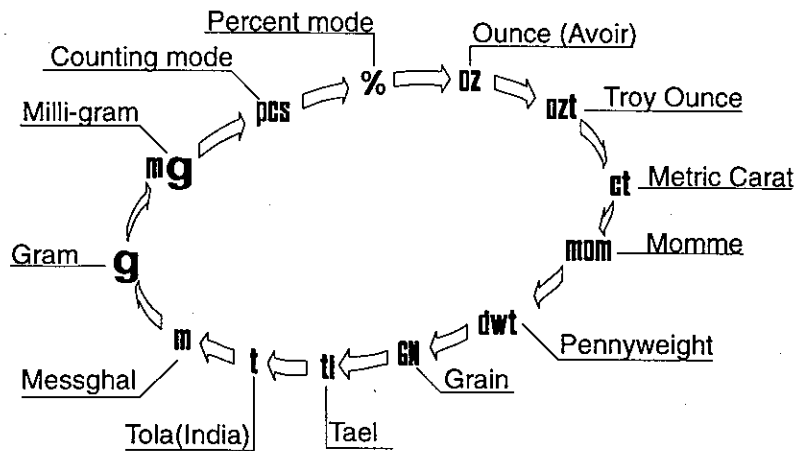
The MODE key is used to switch between these Units. The complete weighing mode cycle is as follows (if some are missing please refer to your dealer):

If a mode or unit of weight has been turned off, the sequence will be missing that mode or unit. There are also the various Tael and Tola that can be included if necessary.(Tael is selected a unit from four units by the factory)

Percent mode — Counting mode — Milli-gram mg — Gram g — Messghal m — Tola(India) t — Tael tl — Grain GN — Pennyweight dwt — Momme mom — Metric Carat ct — Troy Ounce ozt — Ounce (Avoir) oz — % — pcs

If the law in your area permits, you may use all of the units, or at this software level you can disable the weighing units you don't regularly use. Also, some dealers may initially turn OFF units which are not in regular use, but you may want to turn them back on.

Weighing Units and their Conversions

Abbrev.	Name	Conversion
mg	Milli-gram	0.001g
oz	Ounce (Avoir)	28.3495231g
ozt	Troy Ounce	31.1034768g
ct	Metric Carat	0.2g
mom	momme	3.75g
dwt	Pennyweight	1.55517384g
GN	Grain (UK)	0.06479891g
tl	Tael (HK general, Sing.)	37.7994g
tl	Tael (HK, jewelry)	37.429g
tl	Tael (Taiwan)	37.5g
tl	Tael (China)	31.25g
t	Tola (India)	11.6638038g
mes	Messghal	4.6875g

1 Turn off the display

2 Press and hold the MODE and press the ON:OFF key. The balance will display the test mode and then "*Un it*".

· Prees and hold MODE

→ And press ON:OFF

Un it   g

3 Select the modes you want active using the following keys:

MODE   key to step through the modes

RANGE   key to select the mode

ON:OFF   key to cancel the updating
            new set

RANGE   MODE

○ *Un it*   ᴾᶜˢ

This mark displays with a memorized units

4 Press the PRINT key to store a new mode set selected the modes and return to normal display.

PRINT

○   0.0000   g
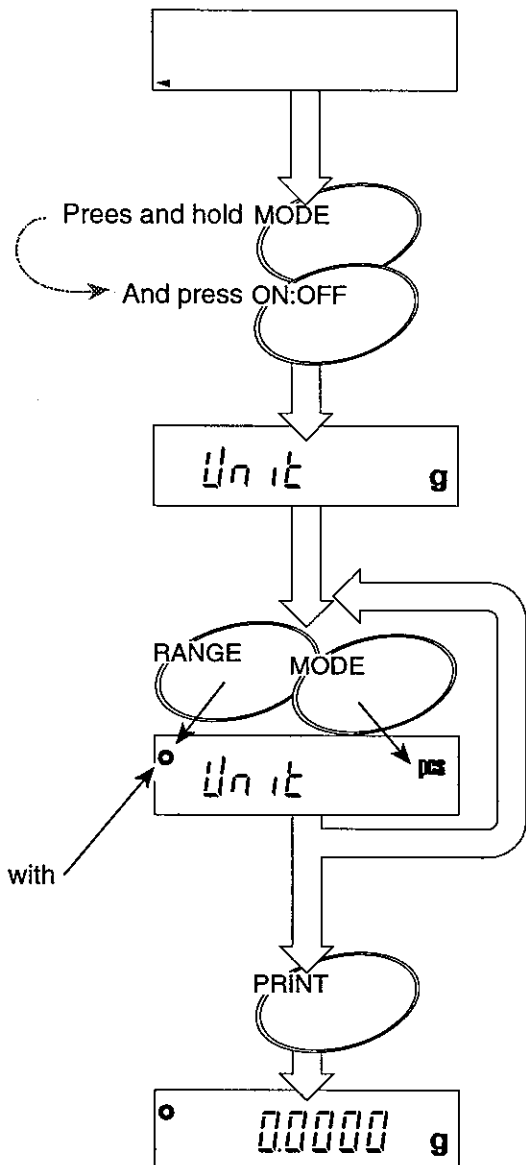
Weighing

For accurate weighing, please warm up the balance for an hour before use and try to meet "Best conditions for weighing".

Simple Weighing

1 Turn the display on using the ON:OFF key. After a moment " zero" will be displayed.
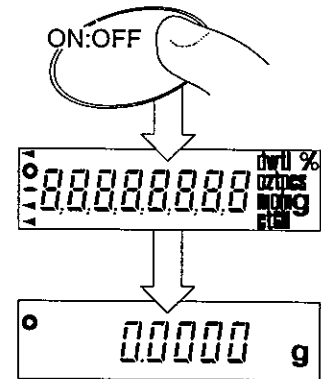
2 If you are using a tare container, place it on the weighing pan. The display will show the container weight.

Container

Weighing pan
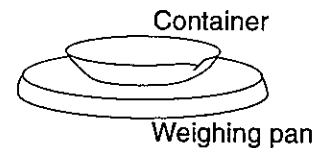
3 Press the RE-ZERO key to cancel the weight.

RE-ZERO
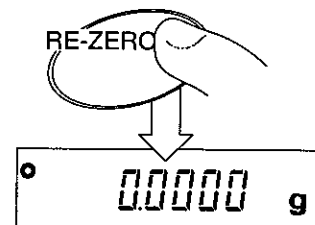
4 Place the object to be weighed in the container.
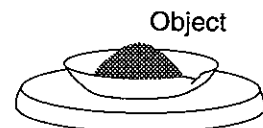
Object

5 Wait for the stabilization mark to be displayed on and read the weight.

Stabilization mark
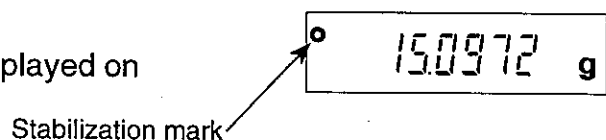
6 Remove the object from the pan.
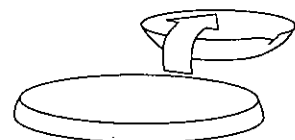
7 Turn the display off using the ON:OFF key. The display will show the stand-by indicator.

ON:OFF

Standby indicator
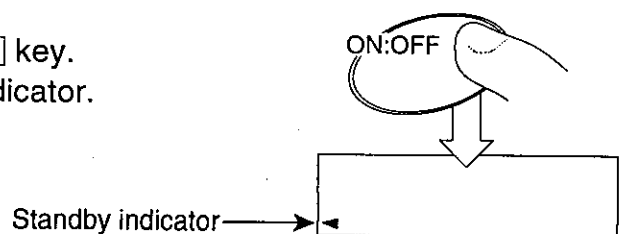
▪ Counting Mode (pcs)

Often there is a need to be able to count small parts or pharmaceuticals. This is usually an inventory function that can be a problem due to the light weight of the individual item.

The HM balance counts by calculating the average weight of one piece-weight called the unit weight, then applying it to the total weight of what you are trying to count. A&D has added exclusive software called ACAI™ (Automatic Counting Accuracy Improvement) that constantly updates the unit weight. It is explained on page 13.
The minimum unit to be able to store it is the same as minimum figure of display. (The HM-202 can store it as an upper range value only)

This is the step by step process for using the counting function:

1 Select "pcs" using the MODE key. If the balance displays " _IO_ ", proceed to the step 3. If the balance does not display " _IO_ ", press the RANGE key and proceed to step 3.

2 If you want to select the quantity to be used as a sample, see page 12.

3 For convenience a container may be placed on the pan. Press the RE-ZERO key to clear any offset from zero, such as the container to hold the items to be counted.

4 Place the sample to be counted on the pan (This will normally be the same quantity as the count displayed).

5 Wait for the stabilization to come on. Press the RANGE key. The balance will store the sample weight. Then the balance will display the counts. (First count will be ten items)

6 Remove the sample and container from the pan.
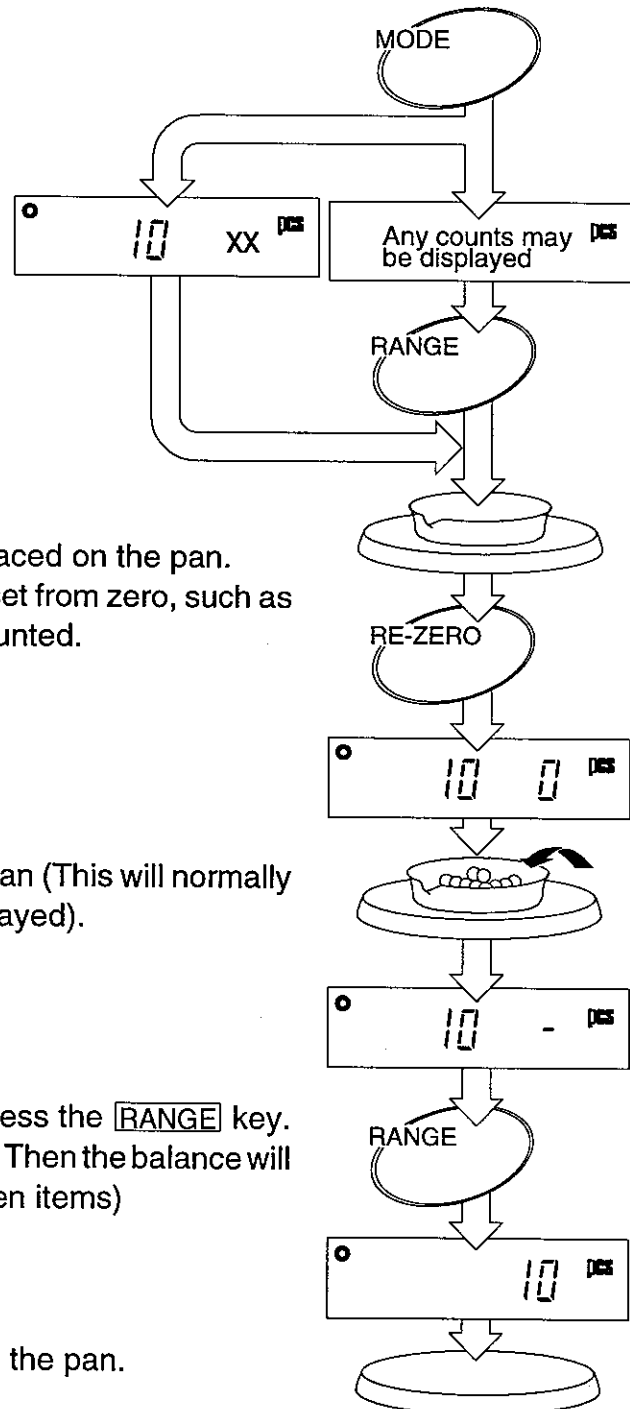
▣ Selecting the Quantity to be Used as a Sample

You can select the quantity to be used as a sample in step 2.

❶ Select "pcs" using the MODE key.
If the balance displays " *I□* ",
proceed to the step 2. If the balance
does not display " *I□* ", press the
RANGE key and proceed to step 2.

In case of no unit data

Other case

MODE

| ○ *I□* XX ㎰ |

| Any counts may ㎰ be displayed |

RANGE

❷ Select the number of items to be used for the sample
using the PRINT key. This may be set to 10, 20, 30, 40,
50, 60, 70, 80, 90 or 100. (The higher the number, the
better the accuracy) .

RE-ZERO

❸ Press the RANGE key.

| ○ *I□   □* ㎰ |

❹ For convenience a container may be placed on the pan.
Press the RE-ZERO key to clear any offset from zero,
such as the container to hold the items to be counted.

Several times
PRINT

❺ Place the sample to be counted on the pan (this will
normally be the same quantity as the count displayed).

| ○ *3□   □* ㎰ |

30 items

❻ Wait for the stabilization mark to come on. Press the
RANGE key. The balance will calculate the unit weight
and store it (This value is saved, even if the balance is
turned off.

RANGE

Error

| *L □* |

| ○ *3□* ㎰ |
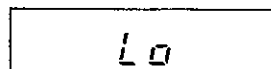
❼ If the sample is very light, the balance may not be able
to perform the counting mode.

Remove the sample and container from the pan.

Page 12
HM series v.2.a
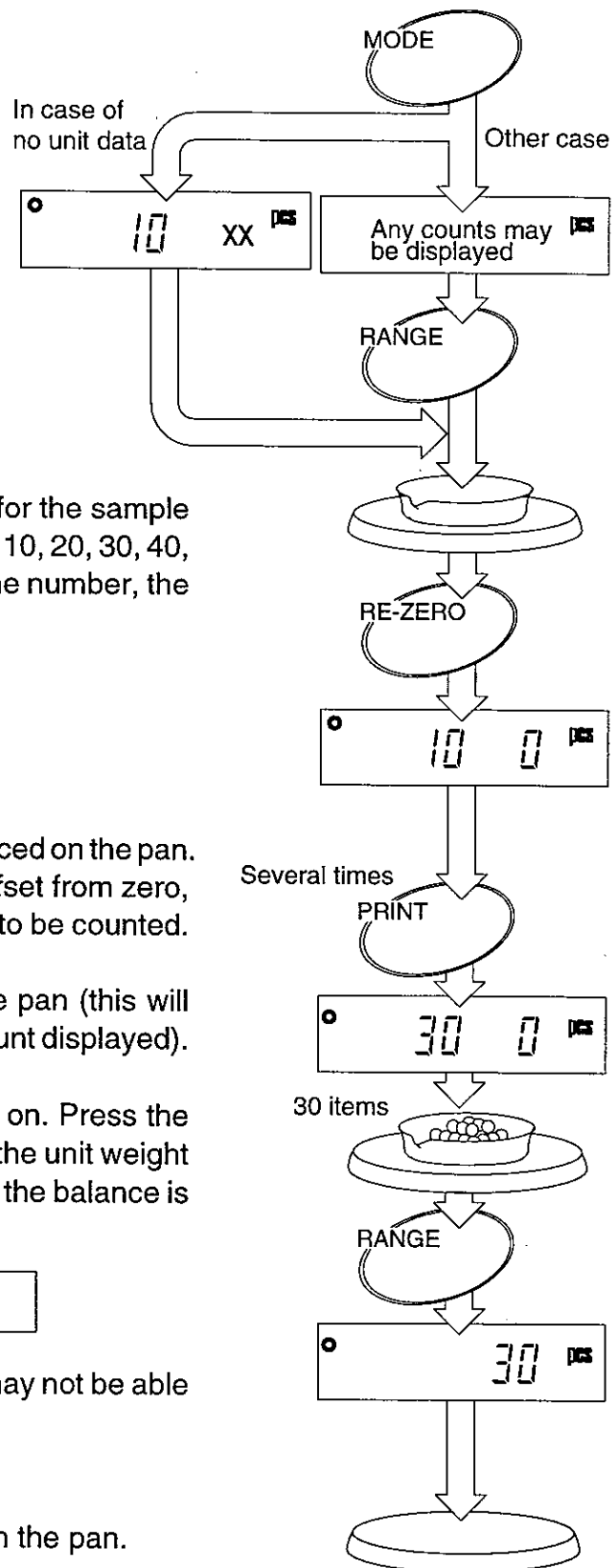
ACAI Automatic Counting Accuracy Improvement

The ACAI™ (Automatic Counting Accuracy Improvement) function re-calculates the unit weight as more items are added, to improve the accuracy.

The ACAI indicator

The ACAI indicator
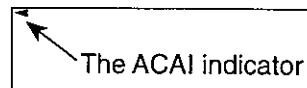
When the balance calculates the unit weight, the higher the number of items in the sample, the higher the accuracy.

Example: If you use 10 very small parts as your sample, with a unit weight of 0.1000 grams calculated by the balance. Using the ACAI feature, after 200 parts were counted, the updated unit weight was .0995 grams. This does not seem like a significant difference, but the count could have been off by 1 part at a count of 200, 2 parts at 400, etc..

0.1000 - 0.0995 = 0.0005g

0.0005g X 200 parts = 0.1000g or 1 part.

This would not be acceptable if the part is expensive. This would be totally unacceptable to a purchaser if he stopped to count the parts.

To use ACAI, Follow the steps outlined on the previous pages, then follow these steps:

1 Add a small number of additional parts (it is not necessary to count the added number).Then the ACAI indicator will blink several times.

**2** The balance has updated the unit weight after the display stops blinking. Wait until the ACAI indicator turn off, then continue.

3 ACAI stores the corrected unit weight in memory until a new sample is established, or the process is repeated.

Please add these samples according to the table to best use the ACAI function.

Count on the weighing pan	Next total count on the weighing pan	Count on the weighing pan	Next total count on the weighing pan
10	13~26	70	73~118
20	23~47	80	83~128
30	33~65	90	93~138
40	43~81	100	103~148
50	53~95	101~	As necessary, but no less that 3 items greater than the current count.
60	63~108		

ACAI Notes

- ❏ You must use the ACAI procedure immediately after establishing the unit weight. Do not remove any of the original samples, just continue to add.
- ❏ There is no need to actually count the additional items added.
- ❏ Do not remove the sample until the ACAI procedure is completed (if you remove the sample, the balance will accept this as the maximum amount that you want the ACAI to correct for).
- ❏ The balance will store the unit weight for the next count.
- ❏ If you use "Digital Unit of Weight" the balance can not use the "ACAI" mode for counting.

Counting Mode using Digital Input of Unit Weight

If you know the unit weight of the objects to be counted, it may be entered using the keyboard or from a computer using the optional RS-232C interface. This is especially useful when inventorying a warehouse or pharmacy where many different unit weights are already known.

If you use "Digital Unit of Weight" the balance can not use the "ACAI" mode for counting.

1 Select "pcs" using the MODE key.

2 Press and hold the RANGE key to select the unit for the unit of weight. The balance will display "U_".

3 Select the unit using the MODE key for unit weight.

4 Press the RE-ZERO key to input the digital unit weight. The balance will display the last unit weight or ". . . . . . ." if there was no unit weight in memory.
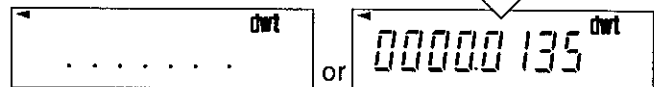
5 Press the MODE key. Then you can enter a new unit weight.

6 Select the digit to be changed using the MODE key. Press the RE-ZERO key to change the value of the digit selected. Continue this process until all of the digits are set correctly.

7 Press the PRINT key to store the new unit of weight in memory.

8 The balance will display " Pt " for several seconds, then the count will again be displayed. Continue with your counting.
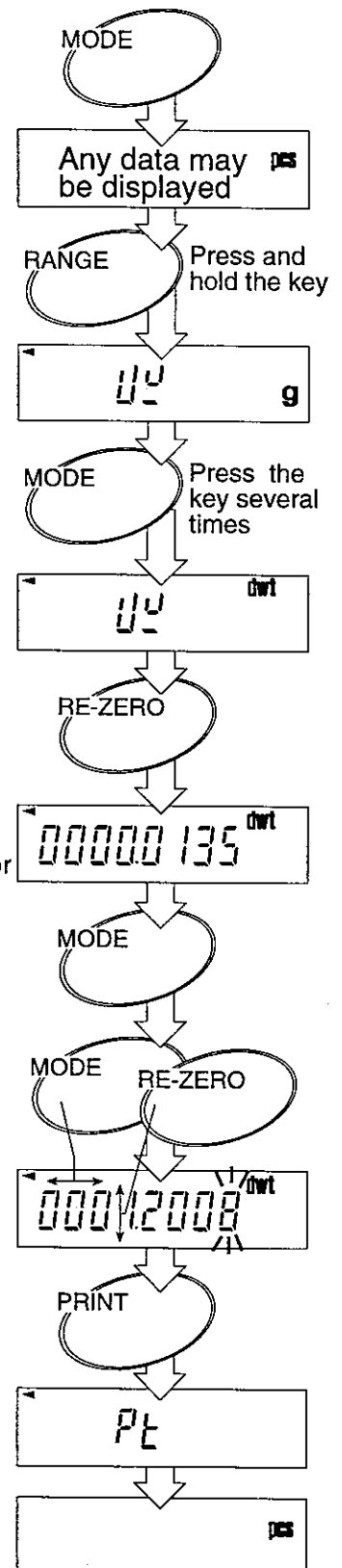
Percent Mode (%)

The HM balance has a Percentage mode that allows you to establish a 100% point, and then use this to determine a percentage based on that sample. Less or greater than 100% may be displayed at 1%, 0.1% or 0.01%, dependent on the range of digits used.

The minimum unit-weight that can be stored is 10.0mg.

1 Select "%" using the MODE key. If the balance displays " _IOO_ xx ", proceed to the step 3.

2 If you want to change the 100% weight, press the RANGE key to switch to the sample input mode.

3 Press the RE-ZERO key to set the zero point.

4 Place the item to be used as the sample on the pan.

5 Press the RANGE key. The balance will store the weight of the sample as the 100% point.

6 Remove the sample and place another item to be checked on the pan. Wait for the stability indicator to come on and read the percentage.
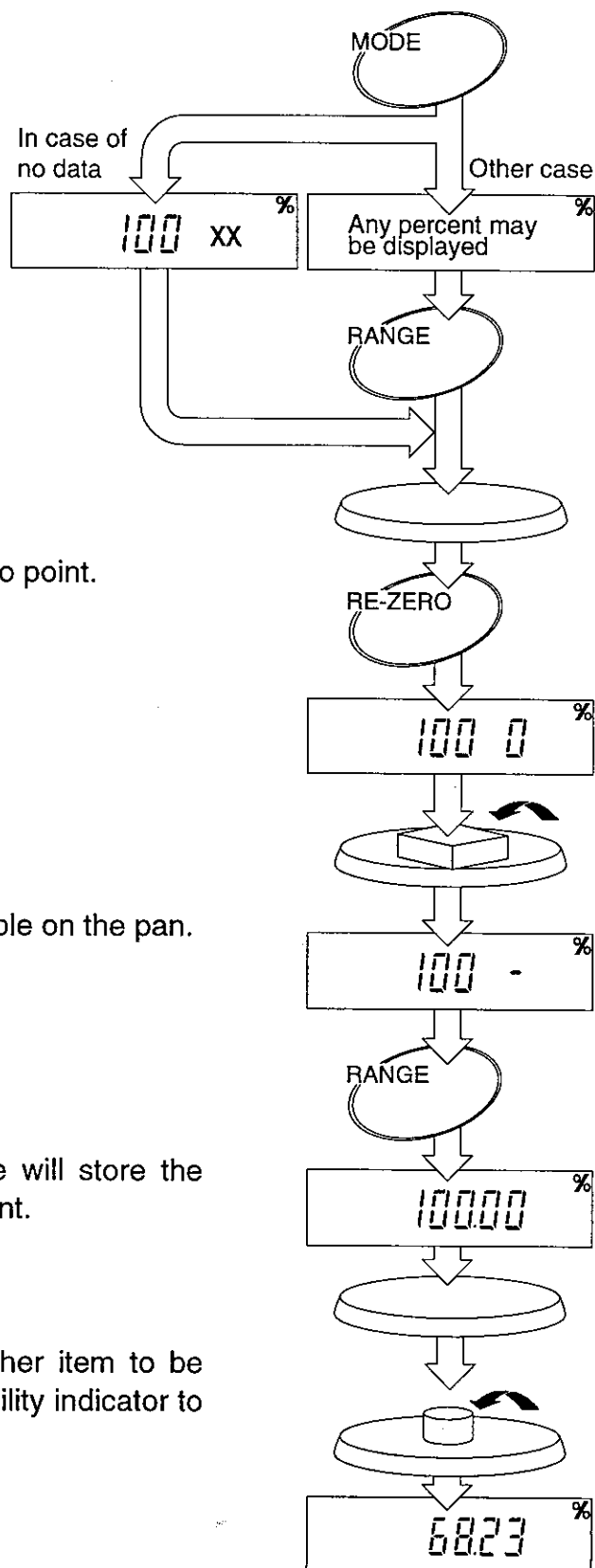
MODE

In case of no data | Other case

IOO xx % | Any percent may be displayed %

RANGE

RE-ZERO

IOO 0 %

IOO - %

RANGE

IOO.OO %

_68.23_ %

The HM balance has a Percentage mode that allows you to enter the 100% weight using the keyboard or a computer (using the optional RS-232C interface) for the percentage sample.

1 Select "%" using the [MODE] key.

2 Press and hold the [RANGE] key to switch to the sample input mode. " $P \cup$ " will be displayed.

3 If you would like to use a different weighing unit other than the one shown, Press the [MODE] key to select the unit of weight.

4 Press the [RE-ZERO] key to display 100% weight. If no 100% weight is stored in memory the display will be ". . . . . . .".

5 Press the [MODE] key to enter the value setting mode.

6 Press the [MODE] key to select the digit to change and the [RE-ZERO] key to set the value of the digit selected.

7 Press the [PRINT] key to store this value.

" $P \boldsymbol{E}$ " will be display for a few seconds, then the balance weights in percentage mode.

The sample weight for the 100% point is stored in memory and will be retained if the power is turned off.

MODE

| Any data may be displayed | % |

RANGE Press and hold

| $P \cup$ | g |

RE-ZERO

| . . . . | or | 00000 135 | g

MODE

| 00000 135 | g

MODE RE-ZERO

| 0.0 135 | g

| 3 12.000 | g

PRINT

| $P \boldsymbol{E}$ | % |

| 0.00 | % |
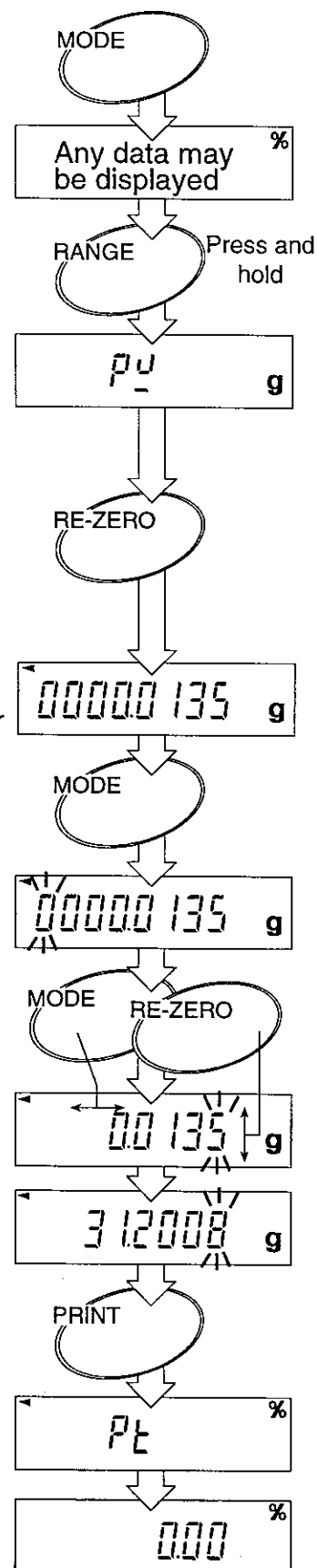
Environment Response Adjustment

The HM series has three functions to adapt the balance to environmental changes.

Condition responce
Use this setting when you want a reading as quickly as possible or a reading as stable as possible. This parameter is common data with the "Response / Environment" function. Refer to "Functions" and the Condition of Response procedure.

Calibration
This mode allows recalibration, canceling possible weighing error due to gravity, altitude, air pressure, ambient temperature and humidity using a calibration mass. Please use a calibration mass sufficiently precise to recalibrate the smallest digit of the display.

Please calibrate the balance when you move the balance or perform the periodical maintenance. Refer to "Calibration".

Function
The HM series has a number of internal software parameters so that you are able to select the best weighing features for your needs. Refer to "Function".

Conditions of Response

In this procedure, If you do not complete the next steps within five seconds, the balance will return to the weighing mode without saving the new parameter.

Conditions Determining Response Rate

Parameter setting		
Cond	*0*	better weighing conditions
	1	faster weighing response
	2	
	3	worse weighing conditions
	4	slower weighing response

* factory setting

1 Press and hold the MODE key.
The balance will change to the "Condition of response" mode and the display will show the "*Cond*".

This mark displays with a memorized parameter

MODE

Cond 2

2 Press the RE-ZERO key several times until the parameter you want is displayed.

RE-ZERO
Press several times

ex. most stable parameter

Cond 4

3 Press the PRINT key. The balance will change to weighing mode, saving the new parameter. This is stored in the balance memory, even if the AC adaptor or optional battery is removed from the balance.

PRINT

00000 g
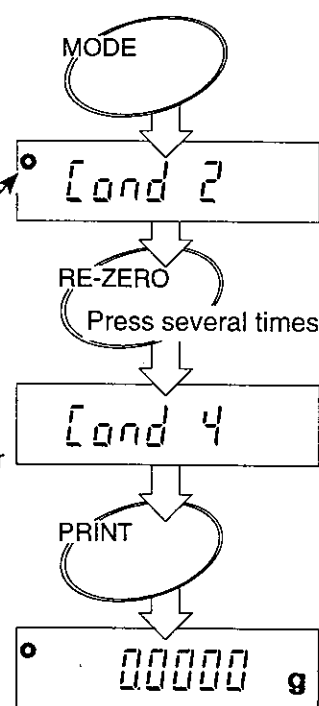
Calibration

Prevent vibration, drafts, and ambient temperature changes from affecting the balance during calibration.

○ Please set the parameter of Function C - 3 before you perform the calibration.

○ Please set the parameter of Function C - 4 info before you perform the calibration, If you use serial interface option OP-03 or OP-05.

○ To get the output for Good Laboratory Practice (GLP), set the parameter of Function C - 3 and C - 4 before you perform the calibration.

Refer to Functions and Option Manual.

○ Use a very precise calibration mass. The accuracy of your balance is decided by this calibration mass.

○ Please perform the calibration when you move the balance or before use.

And Please check the accuracy using "Calibration check" periodically.

○ Please select your calibration mass from following table. The calibration mass is set to the value in bold type when the balance enters the calibration mode.

Model - Calibration mass

HM-120	50g	**100g**	
HM-200		100g	**200g**
HM-300			**200g**	300g
HM-202		100g	**200g**

Displays and Canceling Calibration

	This mark means "the balance is measuring calibration data". Do not allow vibration or drafts to affect the balance while this mark is displayed.
$CAL. . . .$	This sign means status of performing the calibration.
$CC . . . .$	This sign means status of performing the verification calibration mode.
$CAL \quad E$	"CAL E" will be displayed if the calibration mass is too heavy.
$-CAL \quad E$	"-CAL E" will be displayed if the calibration mass is too light.
$Error \quad 1$	Warning of instability due to vibration or drafts. Please check ambient conditions. See also the conditions. If you choose eg. Cond 3 or 4 you are likely to have a more stable reading.
ON:OFF	The [ON:OFF] key cancels the execution of calibration without saving new data and the display turns off.
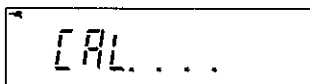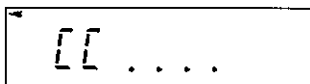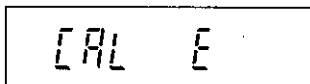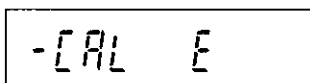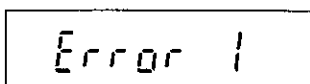
◻ One Touch Calibration

The simplest way to perform the calibration is shown below. This assumes that you do not want to enter a different value for the calibration mass, that parameter "$\mathcal{L} - \mathcal{J}, \mathcal{L} \mathcal{H} \mathcal{L}$ / or $\mathcal{2}$" is set to "Permission of key operation". This illustration is for model HM-200.

① Warm up the balance for at least one hour with nothing on the weighing pan.
Turn the display on.

```
o   0.0000  g
```

② Press and hold the [RE-ZERO] key to enter calibration mode.

RE-ZERO
Press and hold the key

Mode are displayed alternatively.

③ Release the [RE-ZERO] key at the time when the balance is flashing "$\mathcal{L} \mathcal{H} \mathcal{L}$".
(The balance displays some modes alternatively.)

```
CAL tSt  ←→  CAL
```

Release the key at this time

④ The balance informs you of entering the Calibration Mode.

```
CAL  in
```

⑤ Ready for zero-point-calibration.

```
CAL.
```

⑥ Measuring zero-point data for zero-point-calibration.

```
CAL .
```

⑦ Ready for full-scale-calibration.

```
CAL    .
```

⑧ Measuring full-scale data for full-scale-calibration.

```
CAL    .
```

⑨ The balance informs you of finishing with the calibration.
(It is able to output the calibration report, if you need.)

Data output

```
CAL End
```

⑩ The balance returns to the weighing mode automatically.

```
o   0.0000  g
```
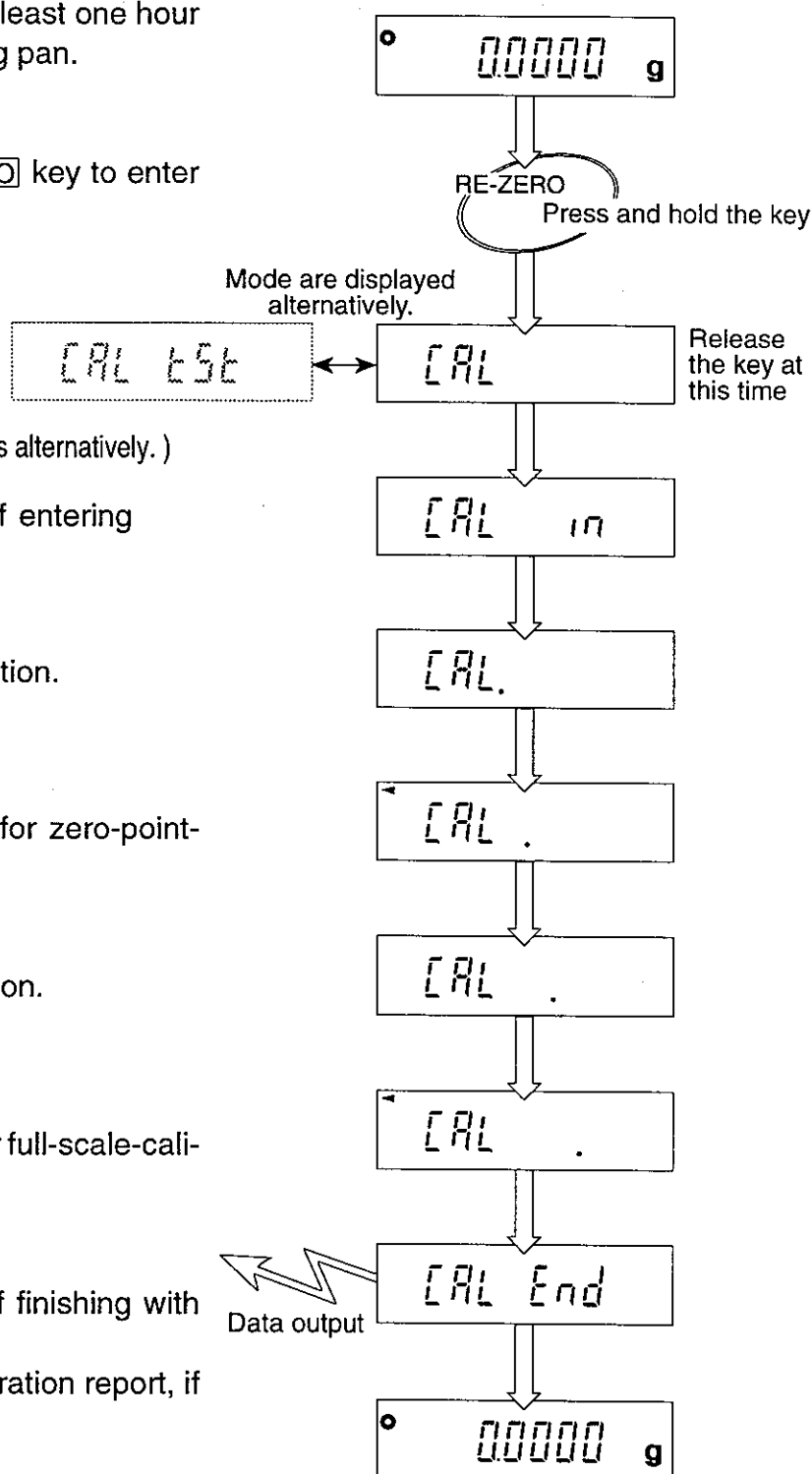
One Touch Calibration Test

This procedure performs verifying calibration using the internal calibration mass and the balance displays the data of measuring the zero-point and the calibration mass. The balance can output this data. This assumes that parameter "$C-3$, CAL 1 or 2" is set to "Permission of key operation". This illustration is for model HM-200.

1 Warm up the balance for at least one hour with nothing on the weighing pan. Turn the display on.

0.0000 g

RE-ZERO
Press and hold the key

2 Press and hold the RE-ZERO key to enter calibration verification mode.

Mode are displayed alternatively.

3 Release the RE-ZERO key when the balance flashes "CAL tSt".
(The balance displays some modes alternatively.)

CAL ⟷ CAL tSt

Release the key at this time

4 The balance informs you of entering Verifying Calibration Mode.

CC in

5 Ready for zero-point-calibration.

CC .

6 Measuring zero-point data.

CC .

7 The balance displays measured data .

0.0000 g

8 Ready for full-scale-calibration.

CC .

9 Measuring full-scale data.

CC .

10 The balance displays measured data (and outputs the data, if you use the serial interface).

200.0001 g

11 The balance informs you of finishing with the verifying calibration.
(It is able to output the calibration report, if you need.)

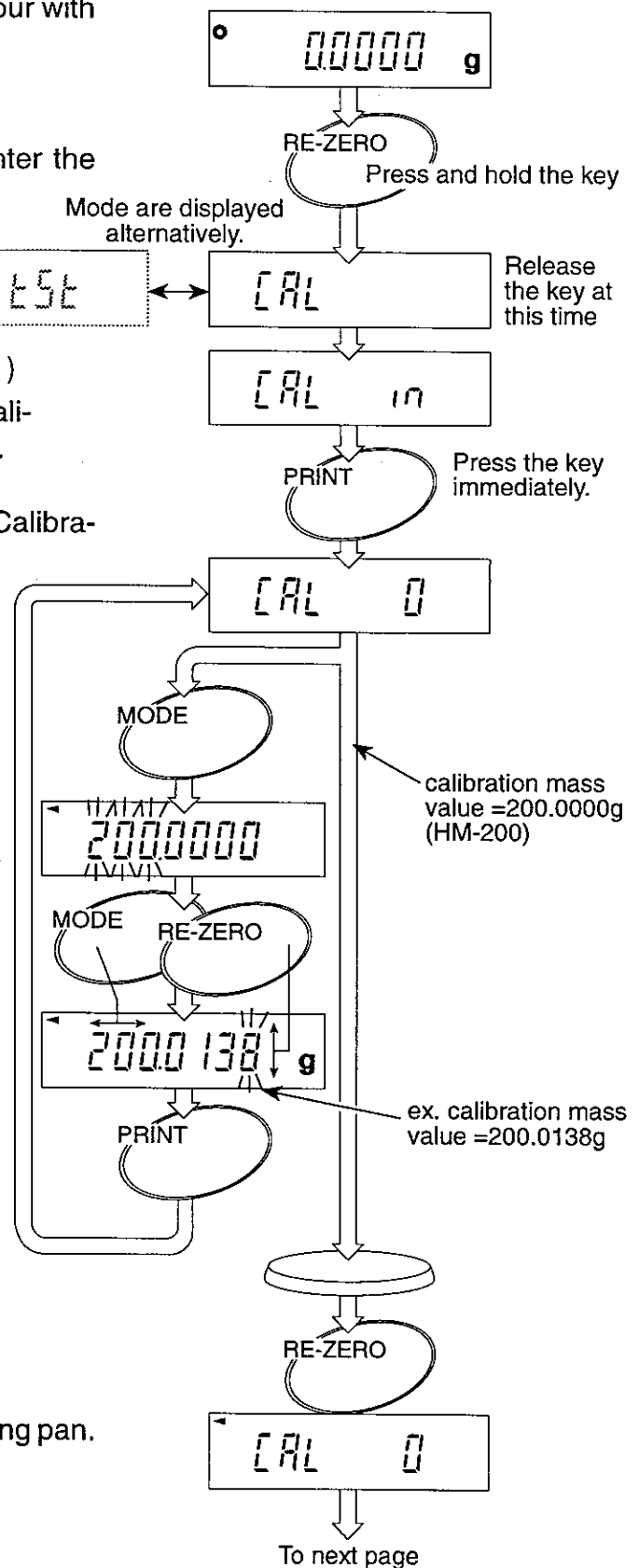Data output

tSt End

12 The balance returns to the weighing mode automatically.

0.0000 g
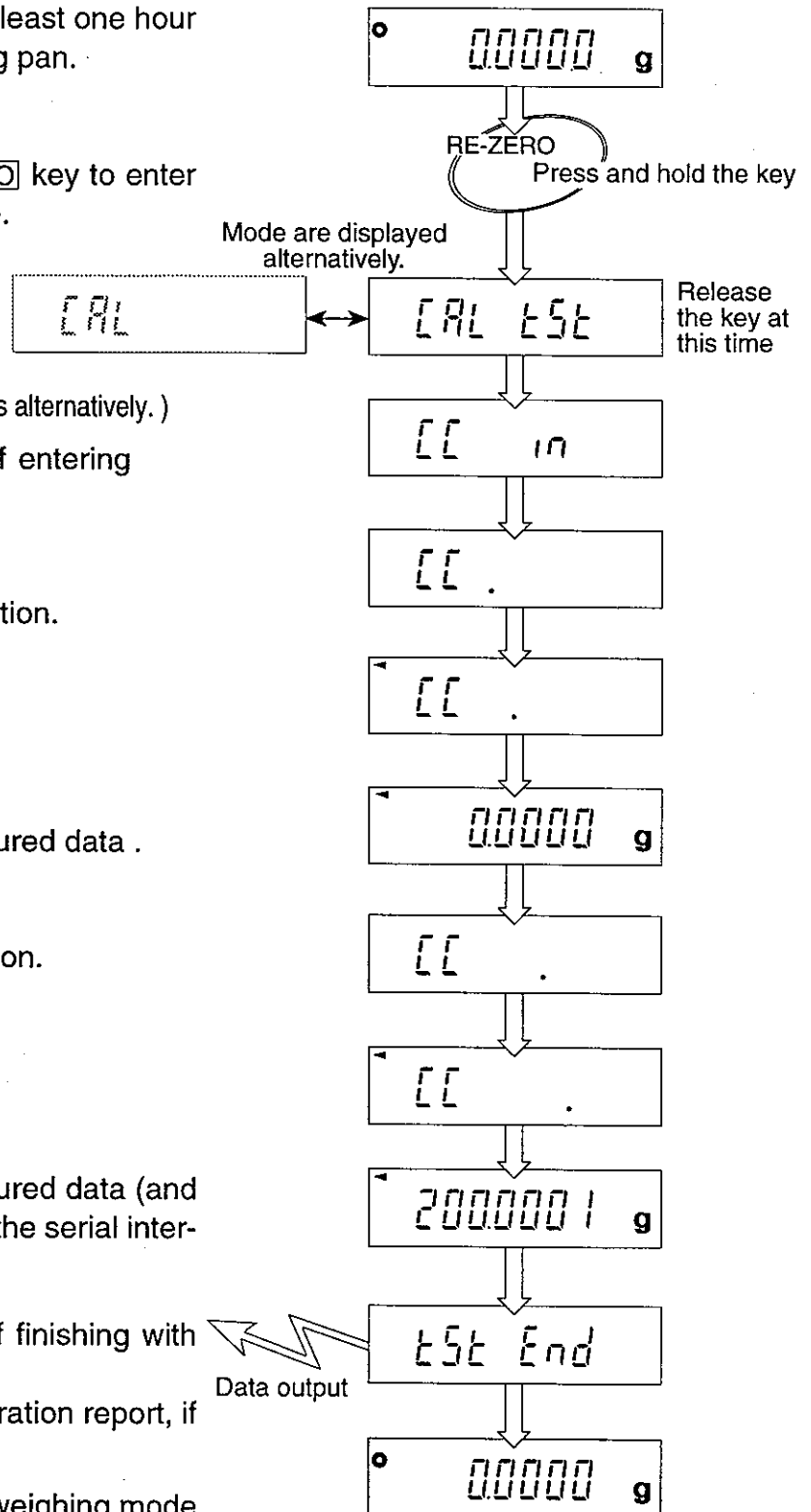
Manual Calibration

This procedure is used to perform manual calibration using your own calibration mass. This assumes that parameter "C - 3, CAL 1 or 2" is set to "Permission of key operation". This illustration is for model HM-200.

1 Warm up the balance for at least one hour with nothing on the weighing pan.
Turn the display on.

2 Press and hold the RE-ZERO key to enter the calibration mode.

3 Release the RE-ZERO key when the balance is flashing "CAL".
(The balance displays some modes alternatively.)

4 The balance informs you of entering Calibration Mode by displaying "CAL in".
Press the PRINT key immediately.
Then the balance will enter the Manual Calibration Mode.

5 ☐ If you do not want to change the calibration mass weight, proceed to step 8.
☐ If you want to change the calibration mass value, press the MODE key.

6 Enter the calibration mass value using the following keys.
MODE key   Used to move digit to enter a number.
RE-ZERO key Used to change a number.

7 Press the PRINT key. The balance stores the new calibration mass value.

8 In case of storing a new parameter again, proceed to step 5.
In other cases, proceed to step 9.

9 Verify that there is nothing on the weighing pan.

10 Press the RE-ZERO key.
The balance measures the zero-point.

Flowchart:

0.0000 g

RE-ZERO — Press and hold the key

Mode are displayed alternatively.

CAL tSt ↔ CAL — Release the key at this time

CAL in

PRINT — Press the key immediately.

CAL 0

MODE

200.0000 — calibration mass value =200.0000g (HM-200)

MODE   RE-ZERO

200.0138 g — ex. calibration mass value =200.0138g

PRINT

RE-ZERO

CAL 0

To next page

11 *CAL 200* will be displayed.
Place the calibration mass on the pan.
(If you want to perform zero-point-calibration only, press the RE-ZERO key without a calibration mass and proceed step 13.)

CAL 200

Calibration mass

RE-ZERO   RE-ZERO

12 The balance measures the calibration mass value.

CAL 200

13 The manual calibration is finished.
(The calibration report will be output, if you have selected that function and have OP-03 or OP-05 installed.)

Data output

CAL End

14 Remove the calibration mass from the pan.
The balance will return to the normal weighing mode automatically.

0.0000 g
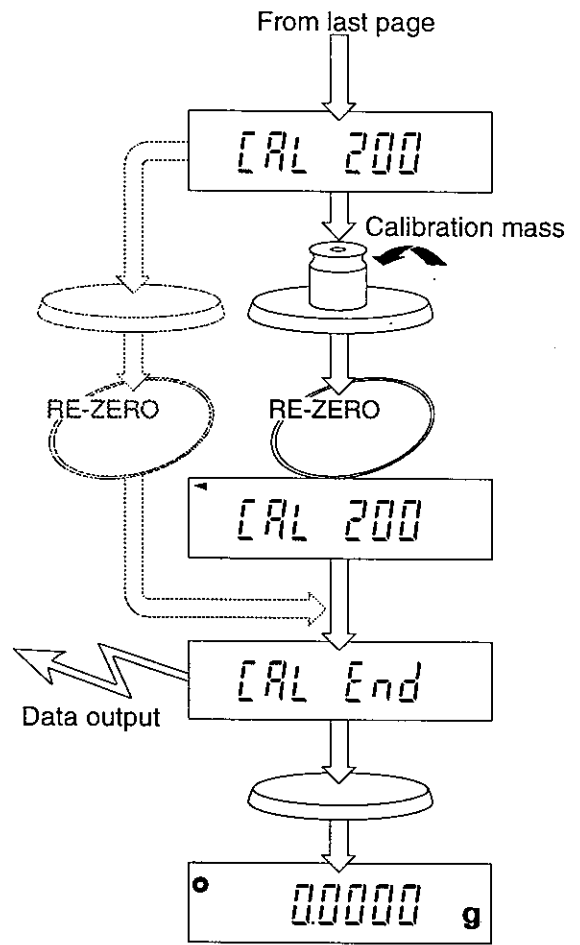
Manual Calibration Test

This procedure performs calibration verification using your own target mass. The balance can output this data. This assumes that parameter "C-3,CAL l or 2" is set to "Permission of key operation". This illustration is for model HM-200.

1 Warm up the balance for at least one hour with nothing on the weighing pan. Turn the display on.

`0.0000 g`

2 Press and hold the ⬚RE-ZERO⬚ key to enter the calibration mode.

RE-ZERO — Press and hold the key

Mode are displayed alternatively.

3 Release the ⬚RE-ZERO⬚ key when the balance flashes "CAL tSt".
(The balance displays some modes alternatively.)

`CAL` ⟷ `CAL tSt`

Release the key at this time

4 The balance informs you of entering the Calibration Check Mode by displaying "CC in".
Press the ⬚PRINT⬚ key immediately.
The balance enters the Manual Calibration Check Mode.

`CC in`

PRINT — Press the key immediately.

`CC 0`

5 ❑ If you do not want to change the target mass weight, proceed to step 8.
❑ If you want to change the target mass value, press the ⬚MODE⬚ key.

MODE

`200.0000`

target mass value =200.0000g (HM-200)

6 Enter the target mass value using the following keys.
⬚MODE⬚ key   Used to move digit to enter a number.
⬚RE-ZERO⬚ key Used to change a number.

MODE   RE-ZERO

`200.0138 g`

ex. target mass value =200.0138g

7 Press the ⬚PRINT⬚ key. The balance re-sisters the new target mass value.

PRINT

8 In case of storing a new parameter again, proceed to step 5.
In other case, proceed to step 9.

RE-ZERO

9 Verify that there is nothing on the weighing pan.

`CC 0`

To next page

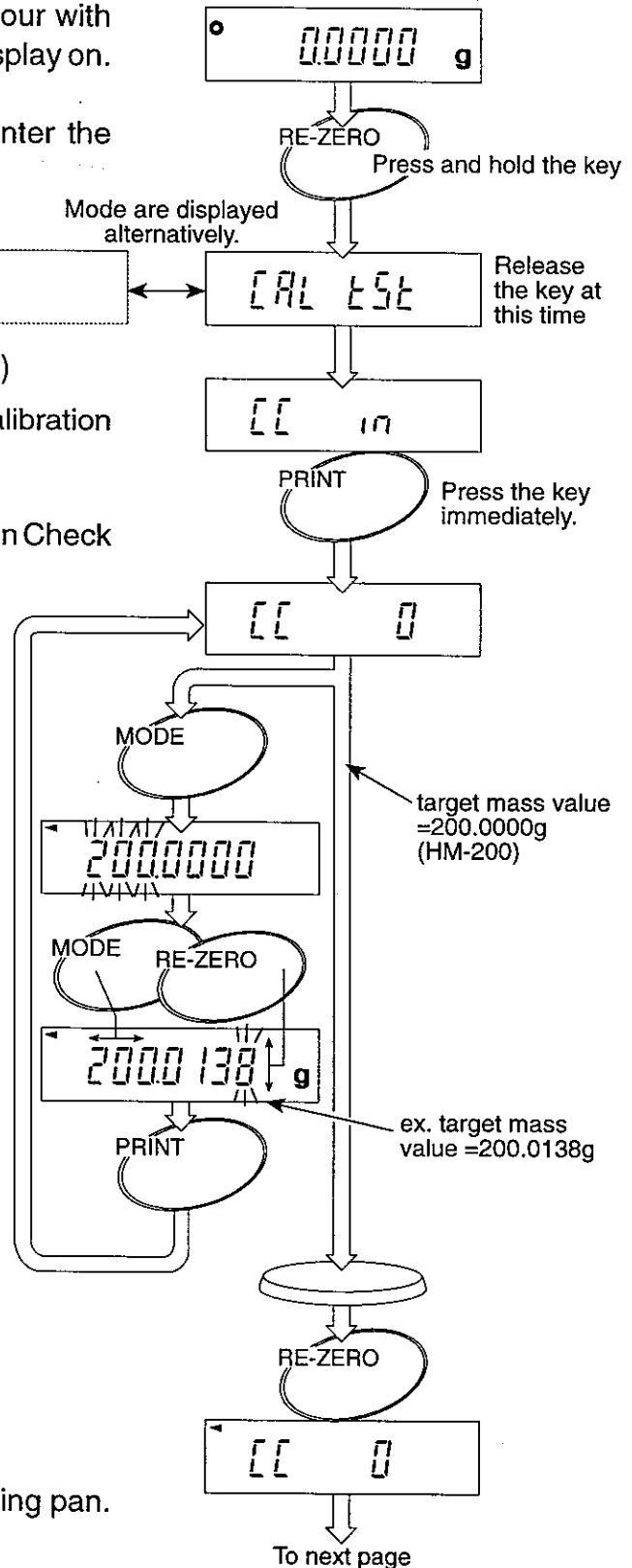**10** Press the ⬚RE-ZERO⬚ key.
The balance measures the zero-point.

11 The balance displays the measured zero-point data.

12 *CC 200* will be displayed.
Place the target mass on the pan.

13 Press the [RE-ZERO] key.
The balance measures the target mass value.

14 The balance displays the measured target mass value.

15 The manual calibration check is finished.
(If you use the serial interface, the balance transmits the calibration report)

Data output

16 Remove the target mass from the pan.
The balance will return to the normal weighing mode automatically.

0.0000 g

CC 200

Target mass

RE-ZERO

CC 200

200.0001 g

tSt End

0.0000 g
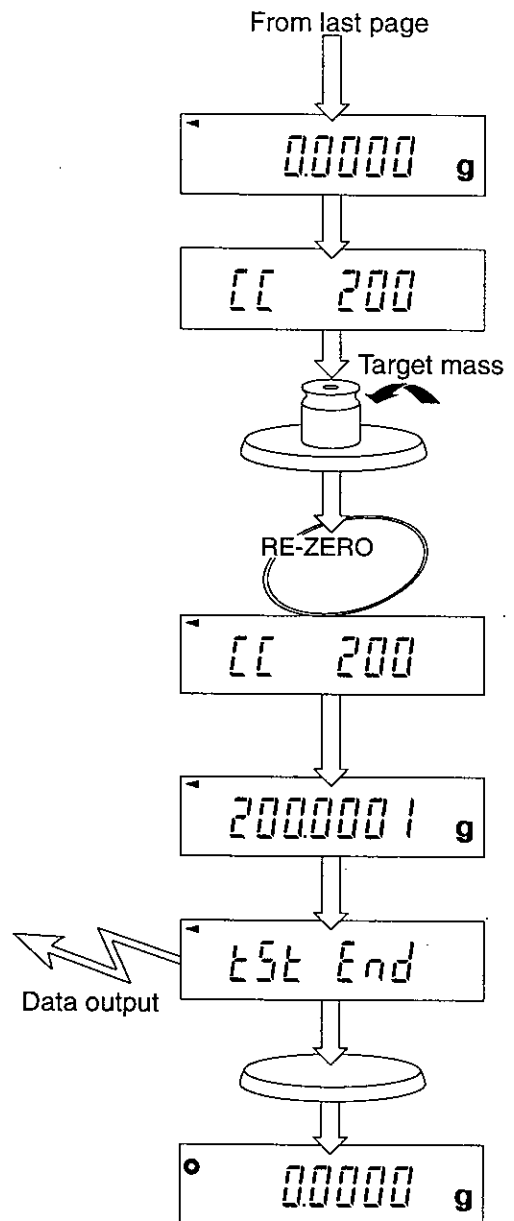
⬛ Correcting the Internal Calibration Mass Value
(For software versions after 1.10)

The balance can correct the value of the internal calibration mass within ±1.5mg range.
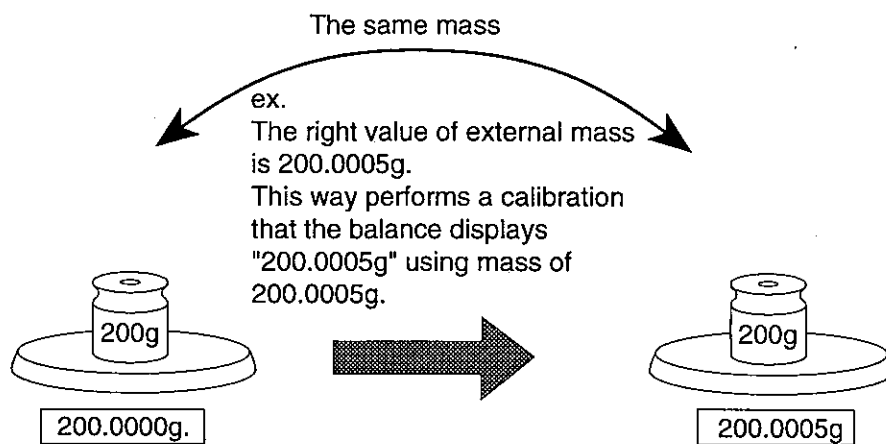This mass value is set at the factory, but may be reset if necessary.
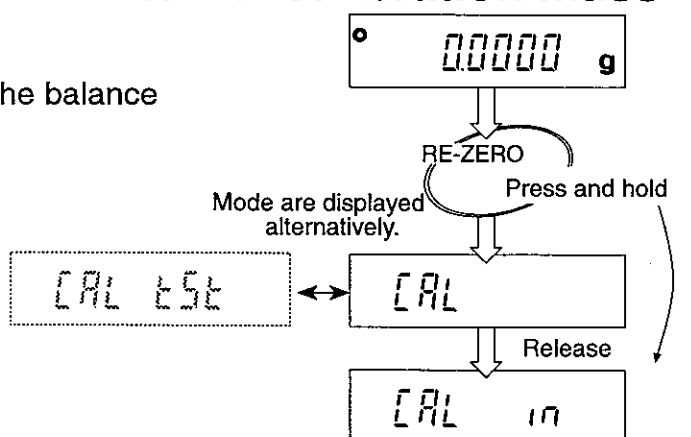
    HM-120 ——— 100.0000g
    HM-200,300 and 202 ——— 200.0000g

The same mass

ex.
The right value of external mass
is 200.0005g.
This way performs a calibration
that the balance displays
"200.0005g" using mass of
200.0005g.

| 200g | ⟹ | 200g |

| 200.0000g. | | 200.0005g |

In case of HM-200M

Procedure for correcting the internal calibration mass

1 Press and hold the [RE-ZERO] key.
Release the [RE-ZERO] key when the balance
displays CAL.

```
 ○    0.0000  g
```

RE-ZERO Press and hold

Mode are displayed
alternatively.

```
CAL tSt  ↔  CAL
```

Release

```
CAL   in
```

2 Press the [MODE] key immediately when the
balance displays $\mathit{CAL}\ in$.

MODE Press the key
immediately.

Flashing

```
 ○    0.0  mg
```
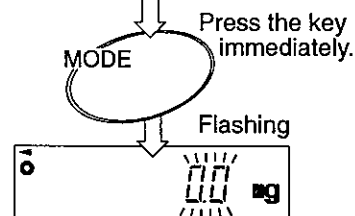
3 Use keys as follows:

[RE-ZERO] key to select the value of mass.

(-1.5mg~1.5mg)
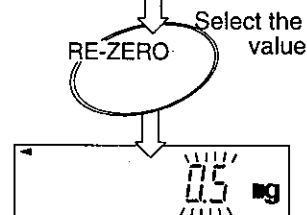
[PRINT] key to enter the value of mass.

(The "O" mark is displayed when the balance
has stored the value)

RE-ZERO Select the
value

```
      0.5  mg
```

PRINT Dicide the
value

To next page
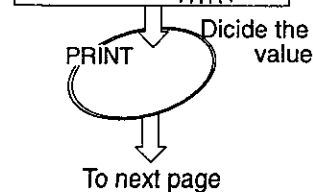
4 This procedure is to calibrate the balance using internal calibration mass.

```
  CAL.

◄ CAL .

  CAL    .

◄ CAL      .

  CAL End

○ 0.0000  g
```
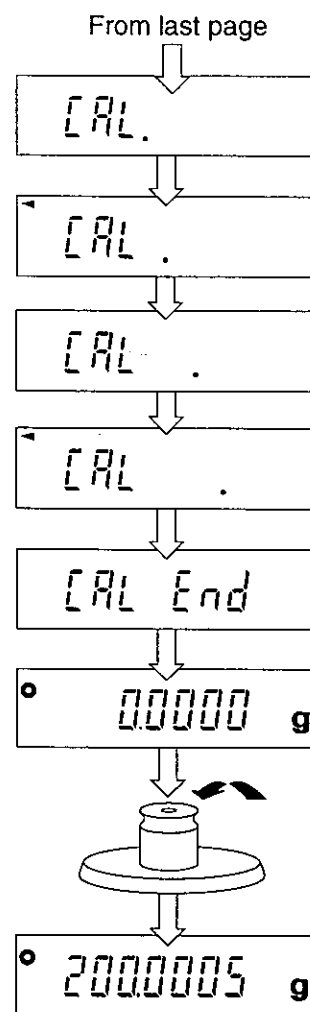
5 Confirm the weighing value using an external mass.

```
○ 200.000  g
```

▉ Calibration errors

The balance informs of a zero-point error, if ☐ -E ☐ or ☐ - - - - - - - - ☐ is displayed when pressing the ON:OFF key. The way of correcting the condition is to perform one touch calibration (Pg20) or zero-point calibration (Pg22).

Functions

Your HM series balance has a number of internal software parameters that enable you to select the best weighing features for your needs. These settings control how you want the balance to respond to its environment, various commands, operations and options. An overall parameters table is shown below.

All of the parameters have initial settings from the factory, or possibly from your dealer. You may easily change these settings as you need them, or conditions vary.

These settings are stored in the balance until the next change even without power applied. The section, C-parameters keys and displays, explains how to change the parameter. The individual settings for each group are detailed in C-parameters settings.

Group Number		Item and Item Number						
	Group	0	1	2	3	4	5	6
0	*C-0* Environment	*Stb-b* Stability band	*Cond* Resp. / Environ.	*trc* Zero tracking				
1	*C-1* Display	*SPEEd* Refresh rate	*Po int* Decimal point	*P-on* Auto start function	You can select group C-4 and C-5 if your balance has option 03 or 05 installed			
2	*C-2* Auto re-zero	*Ar-0* Auto re-zero on/off	*Ar-b* Auto re-zero band	*Ar-t* Detection time				
3	*C-3* Calibration	*CAL* Calibration inhibit						
4	*C-4* Data out	*Pr int* Data out mode	*AP-P* Auto print polarity	*AP-b* Auto print band	*PAUSE* Data pause	*At-F* Auto feed	*Ar-d* Zero after data out	*info* Cal verification
5	*C-5* Serial interface	*bPS* Baud rate	*bt-Pr* Length, Parity bit	*Cr-LF* Terminator	*tYPE* Data format	*t-UP* Receive time	*E-Cod* Error code	*CtS* CTS control
6	*C-6*		Response/environment is common data with the condition of response accessible using the keyboard. If a value is set in the C parameters, it will be changed if new conditions of response are set.					
7	*C-7*							
8	*C-8*							
9	*C-9* Parameter control	*Pn* ID protect	*PF* Parameter protect					

❏ If you install serial interface OP-03, OP-05 or OP-06 in the balance, you can select and change the parameter *C-4* and *C-5*.

❏ you can not select the parameter *C-6* and *C-7*.

C-parameter Keys and Displays
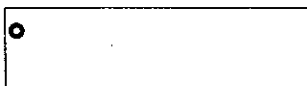
|o | This mark appears when a selected parameter is displayed.

MODE   The MODE key is used to select the group of C-parameters.

RANGE   The RANGE key is used to select the item from the group selected by the MODE key.

The [RE-ZERO] key is used to select a parameter for the item selected by the [MODE] and [RANGE] keys.
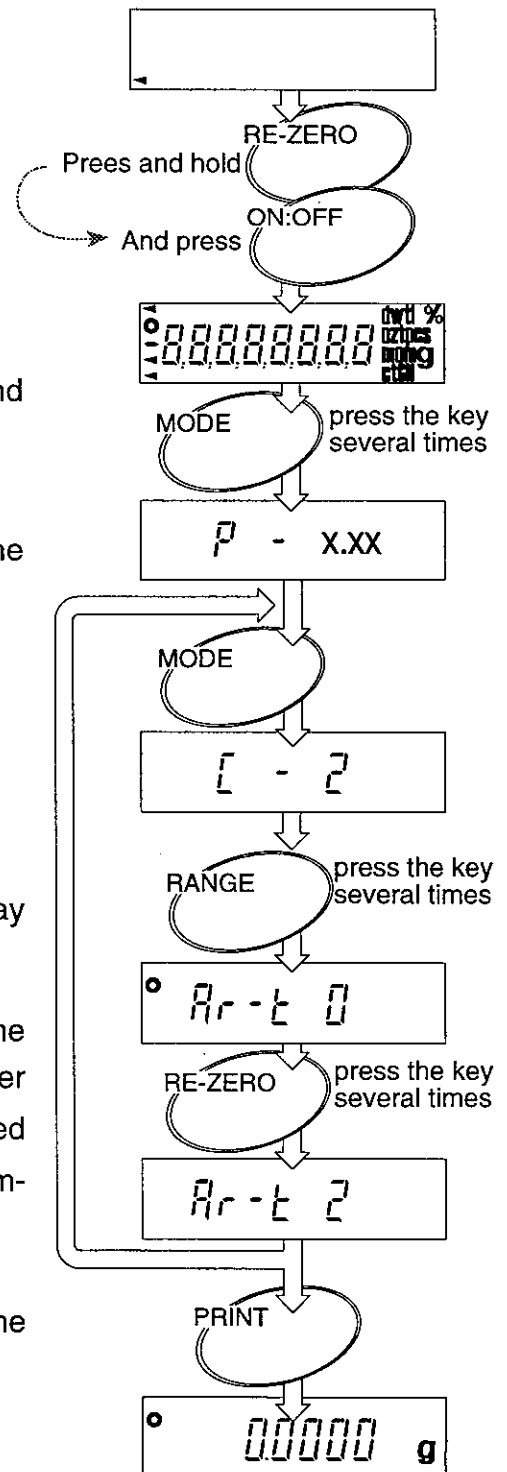
The [PRINT] key is used to save the new C-parameter settings and to exit to the weighing mode.

The [ON:OFF] key cancels the new C-parameter settings and turns the display off.

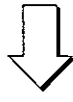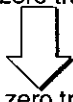# Internal Parameter Setting

1 Turn the display off.

2 Press and hold the [RE-ZERO] key and press the [ON:OFF] key. Release both keys.

3 Press the [MODE] key.
The balance displays the software version (x.xx) and enters to C-parameters settings.

4 Press the [MODE] key (several times), To display the parameter "$C - 2$".

5 Press the [RANGE] key (several times), To display the parameter "$Ar - t$ ".

6 Press the [RE-ZERO] key (several times), To display the parameter "2".

7 If you want to enter parameters in other item, use the following keys. [MODE] key to select the parameter group. [RANGE] key to select the item of the selected parameter group. [RE-ZERO] key to select the parameter of the selected items.

8 Store the C-parameter set using the [PRINT] key. The balance will return to the normal weighing mode.

RE-ZERO
Prees and hold

And press
ON:OFF

MODE — press the key several times

P - X.XX

MODE

C - 2

RANGE — press the key several times

$Ar - t$ 0

RE-ZERO — press the key several times

$Ar - t$ 2

PRINT

00000 g

⬛ C-Parameter Settings

$C - 0$ Environment: The settings adjust the balance to your environment.

		⊙ The Stability indicator lights when the display fluctuation is within the range set below	
$Stb-b$ Stability band width	0	Stable when within ±1 digit per second.	
	*1	Stable when within ±2 digits per second.	
	2	Stable when within ±3 digits per second.	
$Cond$ Response / Environment	0	Better weighing conditions faster weighing response ⬆	Worse weighing conditions slower weighing response ⬇
	1		
	*2		
	3		
	4		
trc Zero tracking	0	Zero tracking off	The balance tracks zero-drift caused by change of temperature, humidity, air pressure, etc., and stabilizes the ZERO point. Display continues to ZERO if the drift is less than 1 digit per average. If weighing very light samples, select a lower number (weak tracking).
	1	Weak zero tracking ⬇	
	*2		
	3		
	4	Strong zero tracking	

* factory setting.

$C - 1$ Display Update, Decimal Point and Auto Start

$SPEEd$ Display update rate	*0	Display is refreshed at normal speed.	
	1	Display is refreshed at high speed.	
$Point$ Decimal point display	*0	Point (.)	
	1	Comma (,)	
$P-on$ Auto start function	*0	No auto start	Chose whether the display is to come on automatically without using the ON:OFF key when power is supplied.
	1	Auto start	

* factory setting

$C - 2$ Auto Re-ZERO Function

$Ar-0$ Auto Re-Zero function when near Zero	*0	Auto Re-ZERO off	
	1	Auto Re-ZERO on	•Auto Re-ZERO occurs when display is ±'Ar-b' digits for the time 'Ar-t'
$Ar-b$ Auto re-zero band	*0	Zero when within ±5 digits of the zero-point.	slow Re-ZERO ⬍ fast Re-ZERO
	1	Zero when within ±50 digits of the zero-point.	
	2	Zero when within ±500 digits of the zero-point.	
$Ar-t$ Time for auto zero determination	*0	Re-ZERO when near zero for more than a half second.	fast Re-ZERO ⬍ slow Re-ZERO
	1	Re-ZERO when near zero for more than 1 second.	
	2	Re-ZERO when near zero for more than 2 seconds.	
	3	Re-ZERO when near zero for more than 4 seconds.	

* factory setting

$C - 3$ Keys that can be used for calibration.

CAL	0	Keyboard and EXT. switch can not be used.
Calibration keys	1	Keyboard can be used, EXT. switch can not be used.
accepted	*2	Keyboard and EXT. switch can be used.

* factory setting

$C - 4$, $C - 5$: refer to the instructions for these separately available options.

$C - 6$, $C - 7$ and $C - 8$: Not used

$C - 9$
C-parameter control

Pn	parameter	Parameter definition and use. Determines whether a change is permitted to the ID number
ID protect	*0	Permits a change to the ID number
	1	Inhibits a change to the ID number
PF	parameter	Parameter definition and use.
	*0	Permits a change to the C-parameters
Parameter	1	Inhibits a change to the C-parameters.
protect	2	C-parameters are changed to the original factory settings.

* factory setting

Setting Digital Tare

Instead of placing a container on the balance and pressing the RE-ZERO key, you can enter the weight of the container via this Digital Tare.
The Digital Tare range is from zero to maximum capacity.

If you press the RE-ZERO key after completion of this procedure, the balance will store the value of the weight on the pan into P_t.
Digital tare can not store a value in the counting mode or percent mode.

1 Turn the display on.

2 Press and hold the RANGE key until the balance displays P_t. (Preset Tare)

3 Press the RE-ZERO key. The value of digital tare will be displayed. If you want to change the value, press the MODE key.

4 Set the digital tare that you want using following keys.

MODE
The MODE key is used to select the figure to be changed.
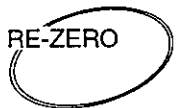
RE-ZERO
The RE-ZERO key is used to change the number that is displayed.

PRINT
The PRINT key saves the new Digital Tare value and returns to the weighing mode.

ON:OFF
The ON:OFF key turns the display off without saving the new Digital Tare.

Prees and hold RANGE

P_t

RE-ZERO

MODE

ex. Factory setting

0 0 0 0 0 0 0 0 g

press the key several times

MODE   RE-ZERO

0 0 1 0 0 0 0 0 g

PRINT

P_t

- 1 0 0 0 0 0 g
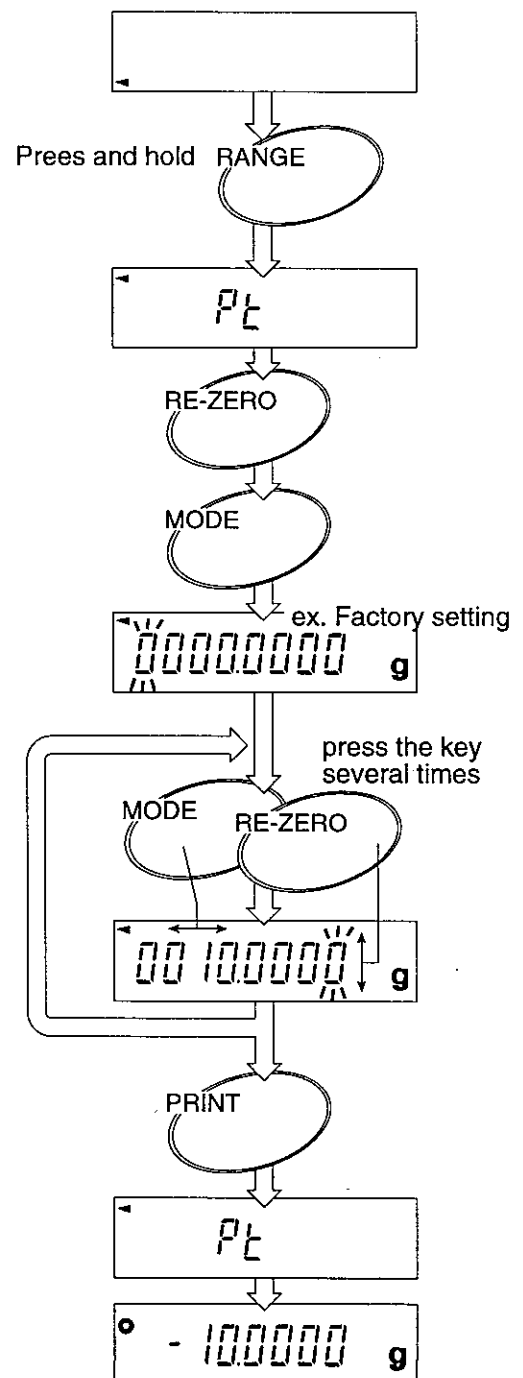
○ Option 03 or 05 is necessary to output the balance data using the ID number.
○ The data can be transmitted to an AD-8121 printer or a computer using option 03 or 05.
○ The ID number is used to identify the balance when using Good Laboratory Practice (GLP).
○ Verifying the calibration executes using the ID number and weighing data after the calibration. The AD-8121 printer will add the date and time.

Setting the ID number

The ID number is saved in the balance memory without the AC adaptor or optional battery connected and is effective until the next change. The ID number is eight characters.

⚠ If you do not complete steps 2 and 3 within five seconds, the balance returns to the weighing mode without saving the new ID number.

1 Set the parameter $\varGamma$ -ς, $\varPi_\Pi$ $\varOmega$ to permit a change of ID number. Turn the display off.

2 Press and hold the [RANGE] key and press the [ON:OFF] key.

3 The ID number is displayed. Press the [MODE] key.

4 Set your ID number using following keys.

RANGE — The [RANGE] key switches between numbers and letters.

RE-ZERO — The [RE-ZERO] key is used to change the character that is displayed. You can select following characters.
0 - 9, - , (space mark), and A-Z.
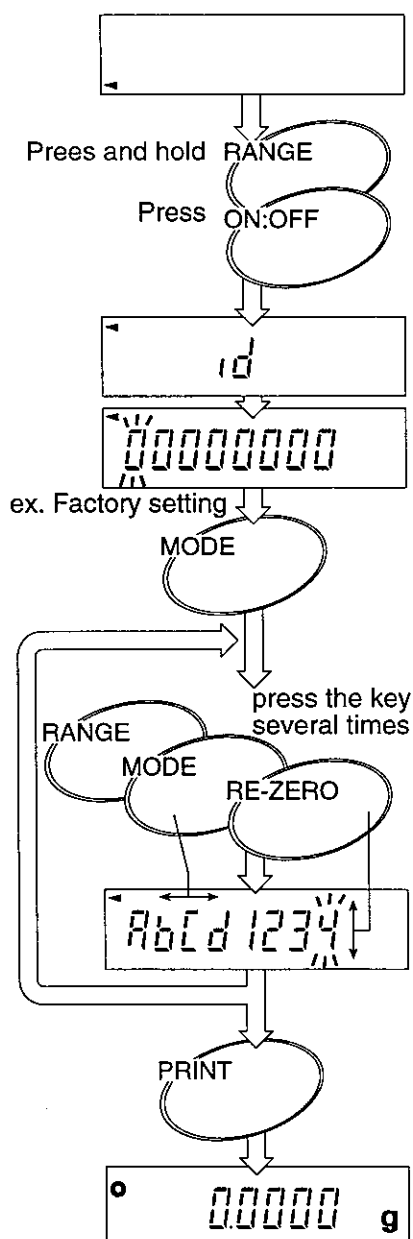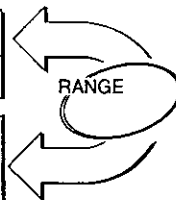Refer to the 'Display Character Set' at the bottom of this page.

MODE — The [MODE] key is used to shift the character that is displayed.

5 Press the [PRINT] key to store the new ID number and return to the weighing mode.

If you do not want to enter a new ID number, press the [ON:OFF] key. This turns the display off without saving the new ID number.

Prees and hold RANGE
Press ON:OFF

ıd

ex. Factory setting
MODE

press the key several times
RANGE
MODE
RE-ZERO

PRINT

Display Character Set:

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

RANGE

1	2	3	4	5	6	7	8	9	0	-	(Space)

▣ External Key Connector

An external connector plug is supplied, to enable remote control of the balance. When this plug is connected, RE-ZERO and PRINT instructions can be sent to the balance. Refer to the diagram below. You must connect the GND line to the PRINT or RE-ZERO line for at least 100ms.

In the following example, the Print switch is turned on.


```
3  PRINT
2  RE-ZERO
1  GND
```

```
1  GND
3  PRINT
2  RE-ZERO
```



```
3  PRINT
2  RE-ZERO
1  GND
```
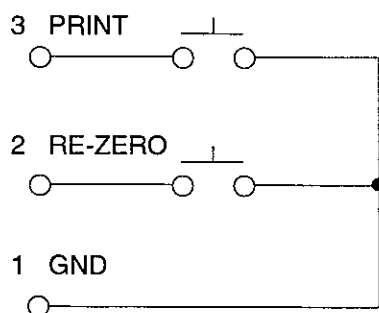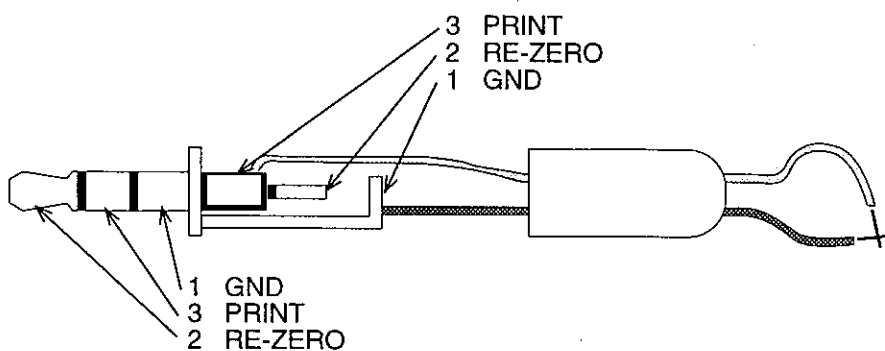
Part name: AX-T-314A-S

Underhook Weighing

The HM series balances are equipped with a standard built-in underhook. This makes density determination a relatively simple matter. Also use the underhook to weigh magnetic material.

1 You can find the underhook behind the plastic plug on the under-side of your balance.

2 Place the balance on a weighing table with a hole cut in it or place it on a firm metal stand designed for underhook weighing.

3 Hang a light-weight weighing harness from the underhook or thread a strand of thin string /wire through it.

4 For best results recalibrate the balance with the harness in place.
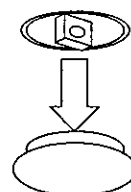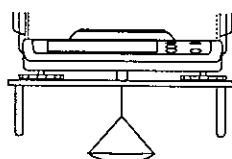
An Example of Underhook Weighing

1 Press the RE-ZERO key to zero the display.

A = 10.0000 g

2 Place the material on the pan.
Find the weight A of the material in air. A = 10.0000g

3 Press the RE-ZERO key.

4 Lower the material into water at 10 °C.
Find the weight B of the material in water. B = 0.4666g

5 Find a water density C from following table. C= 0.99970g/cm³
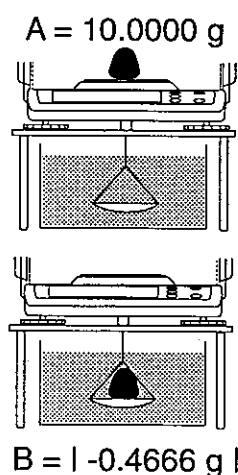
B = | -0.4666 g |

0°	0.99984 g/cm³	
4	0.99997	
10	0.99970	
15	0.99910	
20	0.99820	
25	0.99704	
30	0.99565	Reference

$$\text{Volume} \; \frac{0.4666 \text{ g}}{0.99970 \text{ g/cm}^3} = 0.4667 \text{ cm}^3$$

$$\text{Density} \; \frac{10.0000 \text{ g}}{0.4667 \text{ cm}^3} \approx 21.4 \text{ g/cm}^3$$

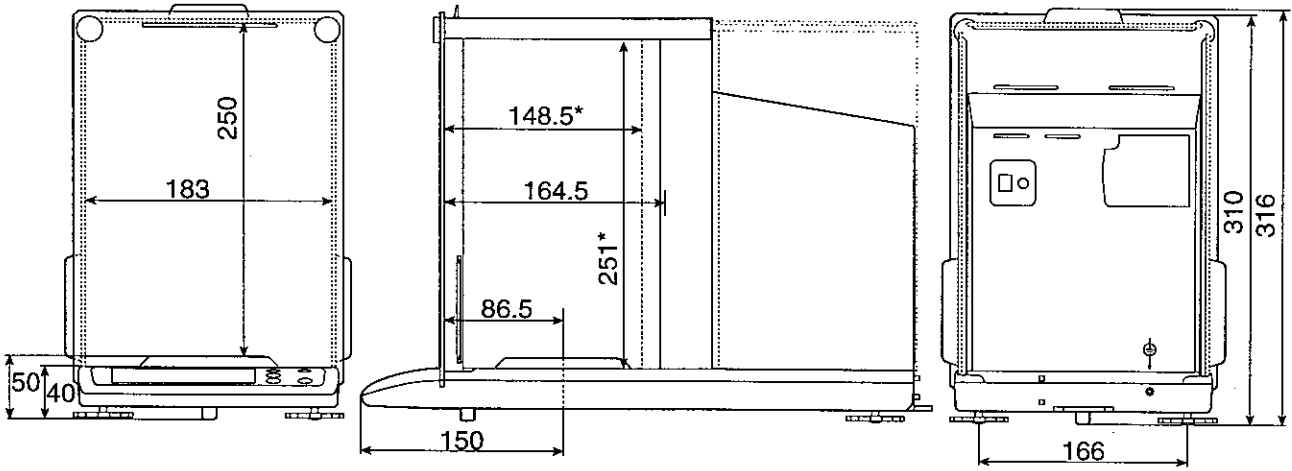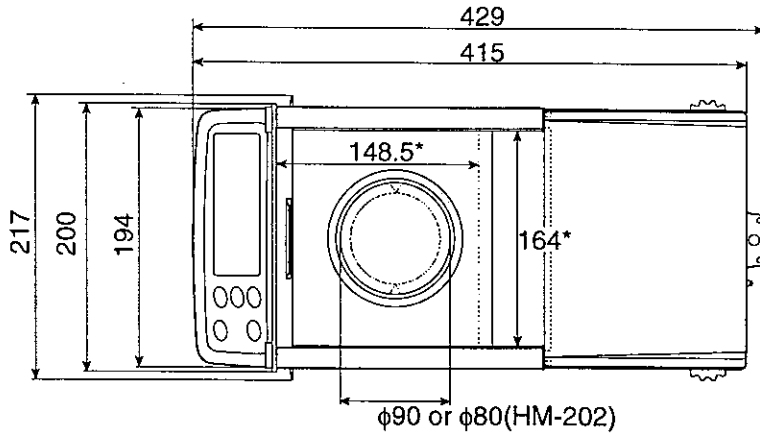**6** The density is 21.4 g/cm³. This material is most likely platinum.

⬛ Specifications

Model		HM-120	HM-200	HM-300	HM202
Weighing Capacity	g	120	210	310	210/ 42
Min. weighing display	mg	0.1			0.1/ 0.01
Min. unit weighing	mg	0.1			
Min. 100% weighing	mg	10.0			
Repeatability (Standard deviation)	mg	0.1		0.2	0.1/ 0.02
Linearity	mg	±0.2			±0.2/ 0.03
Sensitivity drift	ppm/°C	±2 (Temperature range of Sensitivity drift is 10°C ~ 30°C)			
Stabilization Time	sec.	3.0		3.5	3.5/8.0
Pan size	mm	90			80
Calibration mass (External mass)	g	50			
		100	100		100
			200	200	200
				300	
Net weight (approx.)	kg	8.5		8.2	
Operating temperature		5°C ~ 40°C (32°F ~ 104°F), RH < 85%, do not allow condensation			
Power supply		AC adaptor Please check that the adaptor type is correct for your line voltage. [factory preset]), 11VA approximately			
External dimensions		429(D) × 217(W) × 316(H)			

429
415
148.5*
164*
217
200
194
φ90 or φ80(HM-202)

250
183
148.5*
164.5
251*
86.5
150
310
316
50 40
166

* : Width of doorway

265
80
305
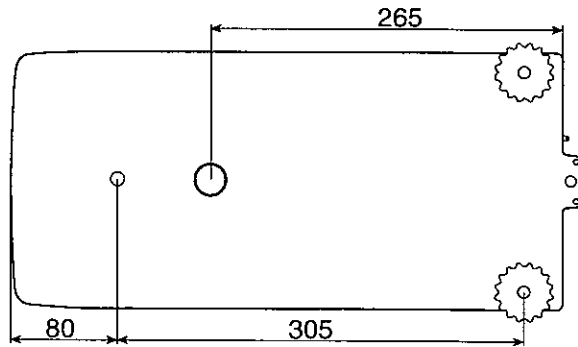
Errors

Over load Error

E

This display indicates that the weight placed on the pan is beyond the balance capacity.

Weighing pan Error

$-E$

This display indicates that the weighing pan or the pan support are not properly installed.

Power failure Error

$P \ FAIL$

This display indicates that power was interrupted during weighing the last time the balance was used. Press the ON:OFF key to clear.

Stability Error

$Error \ 1$

This display indicates that the balance can not become stable while zeroing or weighing.
Check for excessive vibration or drafts. Press the RE-ZERO key to clear.

Digital Input Error

$Error \ 2$

This display indicates that an unacceptable Digital value was input. Press the RE-ZERO key to clear.

Position error for internal mass

$Error \ 6$

This is a position error for the internal mass.
Confirm that there is nothing touching the pan. Turn on the balance once more.

Zero-point Error

$- - - - - - - -$

This display indicates that the zero-point of weighing has drifted from last calibrating zero-point , make certain that there is nothing on the weighing pan.
Execute calibration to reset the zero-point.

CAL Errors

$CAL \ E$

This display indicates that the calibration mass is too heavy.

$-CAL \ E$

This display indicates that the calibration mass is too light.

Unit weight Error

Lo

The samples are too light to calculate the unit weight in the percent mode. Increase the weight of the sample.

❑ Sample quantity Notice

```
┌─────────────────┐
│                 │
│     XX  -       │
│                 │
└─────────────────┘
```

If samples are lighter than the minimum value, the counting error becomes too large and the balance requests that you add the required number of samples. Count and place the requested samples on the pan. Press the [RANGE] key to store the correct value.

xx - is the quantity to add

```
┌─────────────────┐
│   Error  0      │
└─────────────────┘
┌─────────────────┐
│   Error  3      │
└─────────────────┘
┌─────────────────┐
│   Error  4      │
└─────────────────┘
┌─────────────────┐
│   Error  7      │
└─────────────────┘
┌─────────────────┐
│   Error  8      │
└─────────────────┘
┌─────────────────┐
│   Error  9      │
└─────────────────┘
```

The balance needs repair. Request service from the store where you purchased the balance, or from the A&D service group.

MEMORANDA