

# HP SERIES

## INSTRUCTION MANUAL

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### PRECISION INDUSTRIAL BALANCE

HP-12K

HP-20K

HP-22K

HP-30K

HP-40K

HP-60K

HP-100K

HP-102K



This is hazard alert mark.



This is information mark that inform to you about the operation of balance.



This is notice mark that inform to you on the operation of balance.



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# 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 HP balance complies with IP65 of the IEC 529 rules. (Dust-protected and Protected against spraying water)
- The HP series can be easily adapted to most operating environments through simple adjustments from the keyboard.
- The OP-03 serial interface is able to control the balance or transmit weighing data from the balance to 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 percentage (pct) and counting (cnt) functions.
- Counting mode, for inventorying lightweight components or pharmaceuticals.
- Percent mode, for matching weights against a standard.
- Animal Weighing Mode, for weighing live animals
- Digital Tare, allows the input of a tare value from the keyboard or via the RS-232C interface.
- Adjustable Swing-arm Display pad.



## Options and Accessories

- OP-03 Serial interface, Bi-directional RS-232C/ Current Loop.
- OP-04 Comparator output with buzzer/ Current Loop.
- OP-05 Printer interface(Current Loop).
- OP-06 Analog output(Voltage output)/ Current Loop.
- OP-10 Underhook for HP-12K, HP-20K, HP-22K.
- OP-11 Underhook for HP-30K, HP-40K.
- OP-12 Underhook for HP-60K.
- OP-13 Underhook for HP-100K, HP-102K.
- AD-8121 multi-function printer. This printer can print weighing data, total weighing counting and standard deviation, along with the time and date.



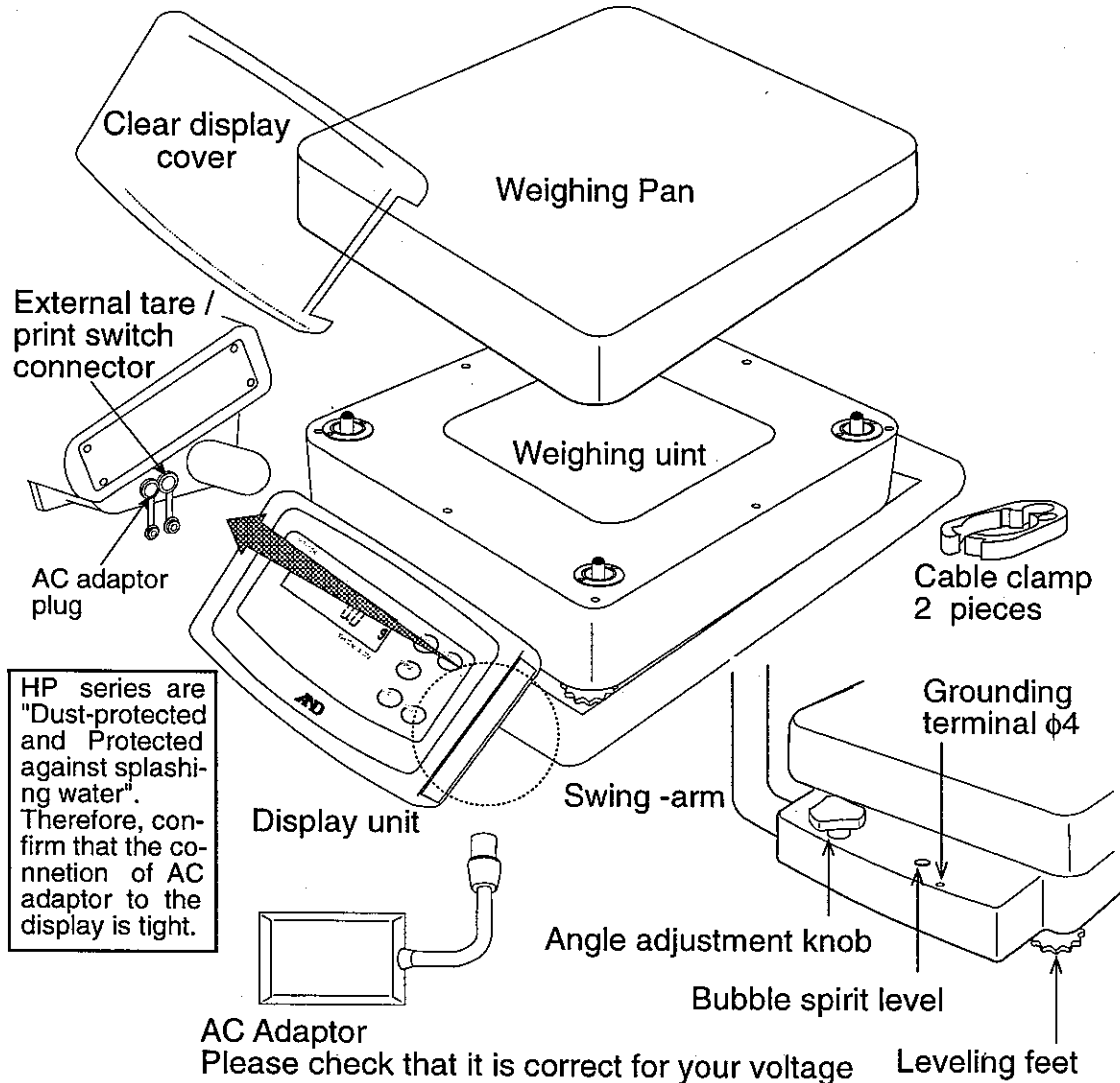
## Compliance with FCC Rules

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.)



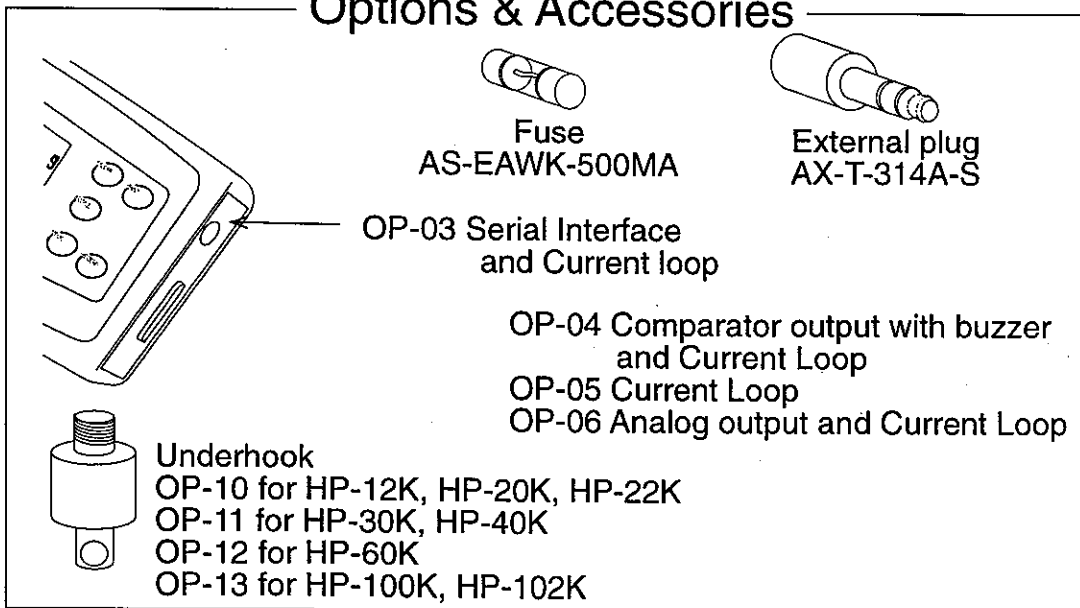
# Unpacking Your Balance

- ❑ 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:



HP series are "Dust-protected and Protected against splashing water". Therefore, confirm that the connection of AC adaptor to the display is tight.

## Options & Accessories





## Balance Location

- The surface that the HP is placed on 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 AC power source.
- Best operating temperature is about 20°C/68°F at about 50% Relative Humidity.



## Best conditions for weighing

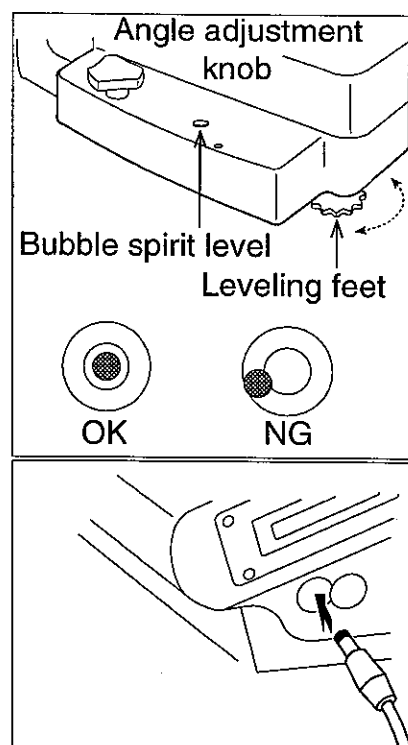


To ensure that you get the most from your balance, please try to follow these conditions as closely as possible:

- 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 as quick as possible to avoid errors due to environmental conditions.
- Use a breeze break 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 contain 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.
- This balance uses a strong magnet as part of the balance assembly, so please use caution when measuring magnetic material. If there is a problem, use the optional underhook assembly (mounts on the bottom of the balance) to suspend the material away from the influence of the magnet.
- 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.
- 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 your instruction 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 your Balance

- Place the balance on a firm surface and turn the adjustable feet until the balance is level (check the spirit level on the rear of balance).
- Install the weighing pan on the balance (see the "Unpacking Your Balance" section).
- Plug in the AC adaptor. The adaptor's input requirements could be 100, 120, 220 or 240 Volts (50/60Hz) depending on where you are in the world, so please check that the adaptor is correct. Ground the balance chassis for electrostatic discharge if static electricity could be a problem.
- Adjust the angle of the swing-arm and display using the angle adjustment knob.



## 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. Using a lint free cloth and warm water with a mild detergent is best for cleaning for display unit.
- Keep equipment containing magnets away from the balance.
- You can clean the weighing unit by splashing water on it, but don't spray water under pressure on it. Also, don't submerge the balance in water.
- Please use a very precise calibration mass.

## Power Supply

When the AC adaptor is connected, the balance is in the standby mode if the display shows only a decimal point. 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. HP series are "Dust-protected and Protected against splashing water". Therefore, confirm that the connection of AC adaptor to the display is tight.

## Display ON:OFF & Power Errors

- It is necessary to wait several seconds after pressing the **ON:OFF** key for the balance enter the weighing mode.
- 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 AC adaptor was removed or power cut with the display on. To clear this error, press the **ON:OFF** key.





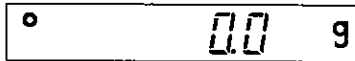
# Keys and Displays



This section explains the keys and displays for the weighing mode. Refer to the following separate sections for an explanation of Percent (Pct) Mode, Counting (cnt) Mode and Animal Weighing Mode.

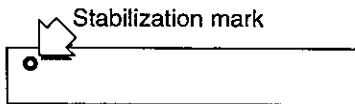


## Displays

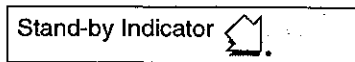


Normal weighing display of zero. Please read weighing data only after the stabilization mark is displayed.

Note: the number of decimal places depend on the model in use (HP-12K illustrated).



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" of the Functions.



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



## Keys



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.



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.



- The **SAMPLE** key can be used to register a sample count (eg: 10 units) in counting "cnt" mode or register 100% in percentage mode.
- The **SAMPLE** key can also be used to hide or show the minimum figure alternatively (except the gram mode of the HP-60K and HP-100K).



If you press the **MODE** key, the balance switches between weighing modes. However, only the 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".

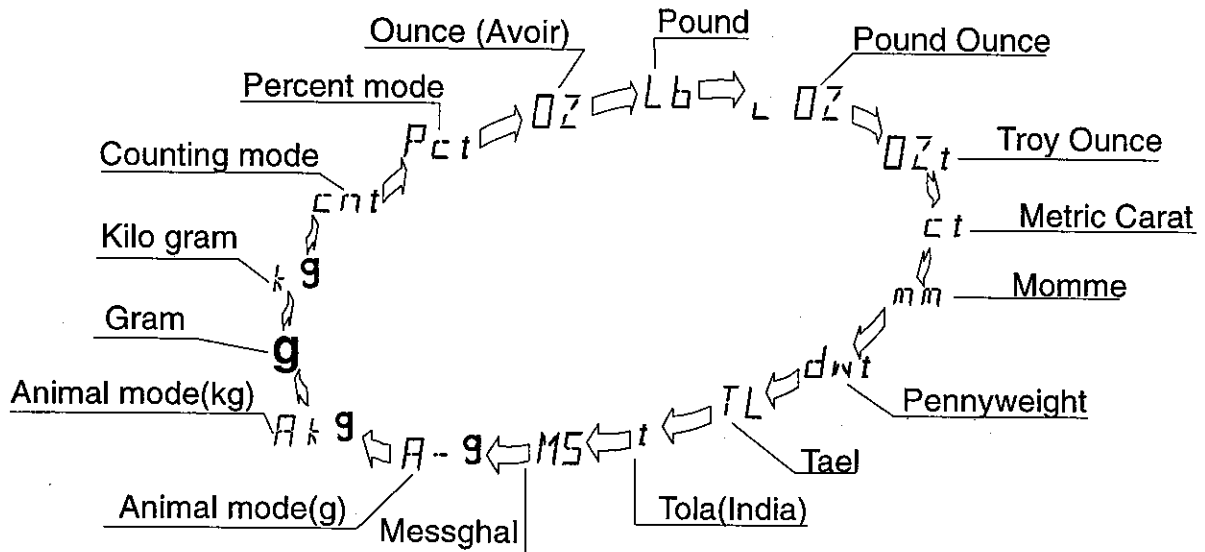


The **PRINT** key can be used to output data to a printer or personal computer if the RS-232C or current loop is installed. Please refer to section "Functions" for details of output format and setting up the balance.

# 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 the weighing modes, counting and percent as follows:



HP-102K can not select " **g**, **ct**, **dwt**, **A - g** ". Therefore, the units that can be selected are as follows: " **k g**, **cnt**, **Pct**, **OZ**, **Lb**, **L OZ**, **OZt**, **mm**, **TL**, **t**, **MS**, **A k g** "

Balances other than the HP-102K can select units from " **k g**, **A k g** " but can not select " **k g**, **A k g** ". Therefore, the units that can be selected are as follows:

" **g**, **k g**, **cnt**, **Pct**, **OZ**, **Lb**, **L OZ**, **OZt**, **ct**, **mm**, **dwt**, **TL**, **t**, **MS**, **A - g**, **A k g** "

**A - g** The animal weighing mode uses the unit of gram.

**A k g** The animal weighing mode uses the unit of kilogram.

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.



## Weighing Units and their Conversions

Abbrev.	Name	Conversion
oz	Ounce (Avoir)	28.3495231g
lb	Pound(UK)	453.59237g
ozt	Troy Ounce	31.1034768g
ct	Metric Carat	0.2g
mom	Momme	3.75g
dwt	Pennyweight	1.55517384g
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



# Selecting the Weighing Units



The HP series balances are multi-functional instruments where switching between the weighing units contained in the balance software is done by pressing the **MODE** key.

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 regularly used, but you may want to turn them back on. The complete weighing mode cycle is as follows (if some are missing please refer to your dealer):

**1** Turn off the display

**2** Press and hold the **MODE** and press the **ON:OFF** key. The balance will display "Unit".

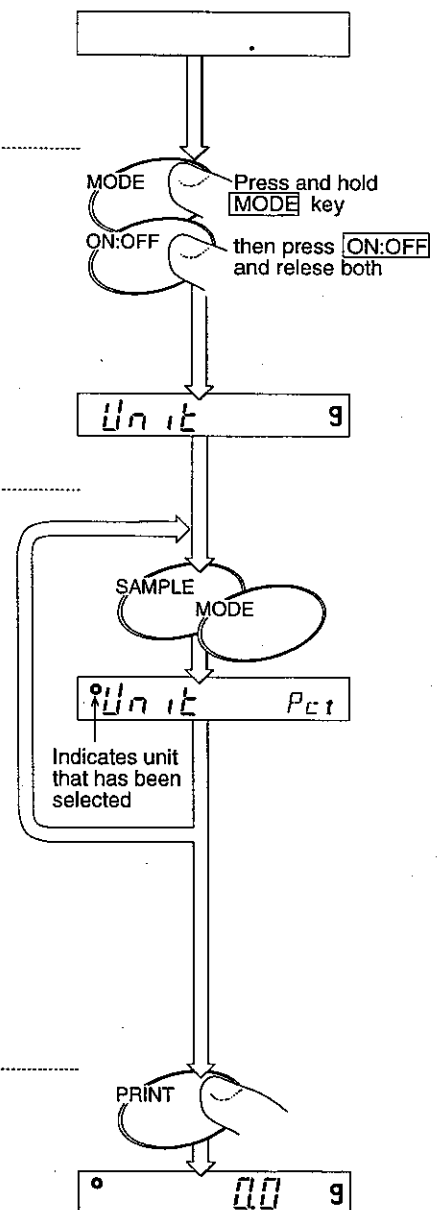
**3** Select the modes you want active using the following keys:

**MODE** key to step through the modes

**SAMPLE** key to select the mode


**ON:OFF** key to cancel the updating to a new set

**4** Press the **PRINT** key to store the modes selected and return to normal display.



Unit LO → "LO" means the unit of pound-ounce.

# Weighing

 For accurate weighing, please warm up the balance for an hour before use and try to meet "Best conditions for weighing". HP-102K uses only the unit of kg. The minimum figure of the HP-102K is blanked when the weighing value increases beyond the limit of the lower range. The minimum figure of the HP-102K is displayed when the weighing value becomes zero on the lower range.

## Simple Weighing

- 1** Turn the display on using the **ON:OFF** key. After a moment "zero" will be displayed.

(The number of decimal places on the display depends on the model in use.)

- 2** If you are using a tare container, place it on the weighing pan. The display will show the container weight.

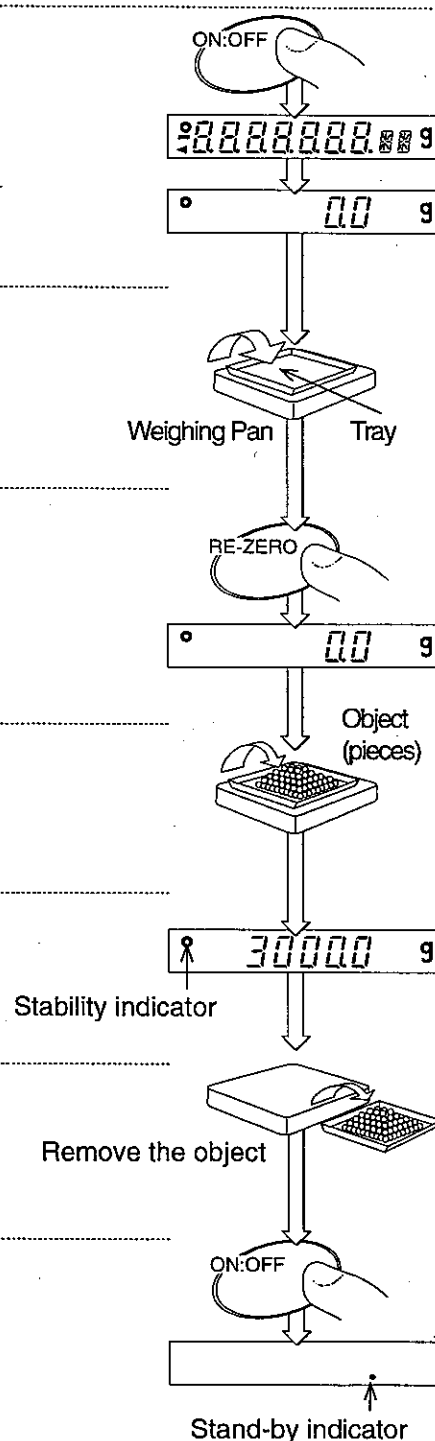
- 3** Press the **RE-ZERO** key to cancel the weight.

- 4** Place the object to be weighed in the container.

- 5** Wait for the stabilization mark to come on and read the weight.

- 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.



## Counting Mode (cnt)

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 HP 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 figure of unit-weight is the same as the minimum figure in grams. HP-22K and HP-102K can only store the unit weight in the upper range value.

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

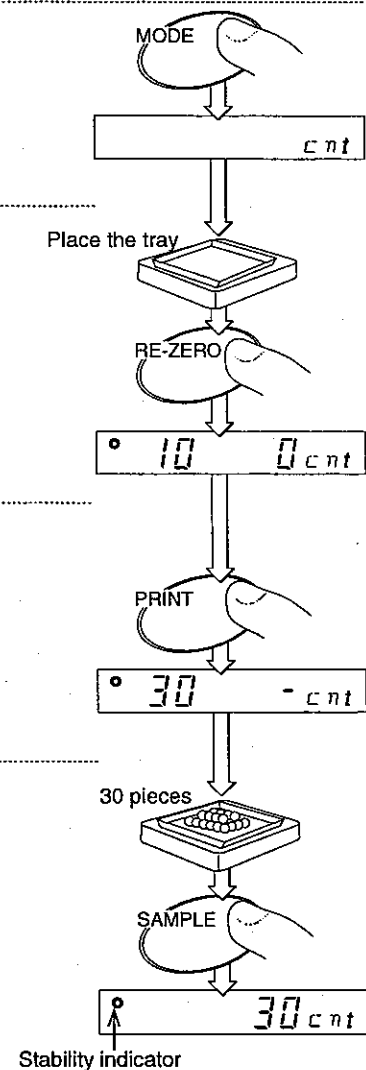
**1** Select "cnt" using the **MODE** key (if you want to clear the unit weight, press the **SAMPLE** key).

**2** Press the **RE-ZERO** key to clear any offset from zero, such as a container to hold the items to be counted.

**3** The sample is set to 10. If you want change number of items used for the sample, press the **PRINT** key to select the number of items to be used for the sample. This may be set to 10, 20, 30, 40, 50, 60, 70, 80, 90 or 100. (The higher the number, the better the accuracy).

**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 mark to come on. Press the **SAMPLE** key. The balance will calculate the unit weight and store it (this value is saved, even if the balance is turned off).



Error

If the sample is very light, the balance may not be able to perform the counting mode.

**6** Add the remainder of the items to be counted.



# 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

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

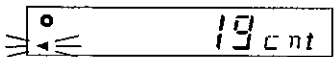
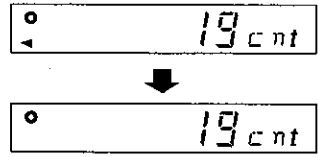
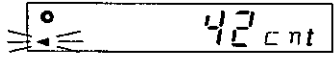
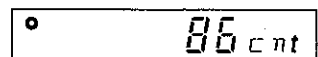
Example: If you use 10 very small parts as your sample, with a unit weight of 0.1000 grams calculated by the balance. Using the ACAI feature, after 200 parts were counted, the updated unit weight was .0995 grams. This does not seem like a significant difference, but the count could have been off by 1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

$$0.1000 - 0.0995 = 0.0005g$$

$$0.0005g \times 200 \text{ parts} = 0.1000g \text{ or } 1 \text{ part.}$$

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). 
- 2 Allow the ACAI indicator to blink several times then stay on. Then ACAI indicator turn off and the unit weight data is updated. (Wait the ACAI mark to turn off) This indicates that the balance has updated the unit weight. 
- 3 Repeat steps 1. and 2., each time approximately doubling the amount added. Continue this process until you reach the desired count. 
- 4 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 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.

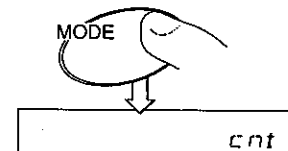


# Counting Mode using Digital Input of Unit Weight

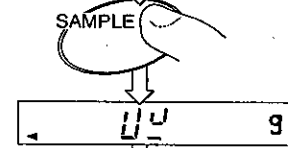
If you know the unit weight of the objects to be counted, it may be entered using the keyboard or from a computer using the optional RS-232C interface. This is especially useful when inventorying a warehouse or pharmacy where many different unit weights are already known.

The minimum figure of unit-weight is the same as the minimum figure in grams. HP-22K and HP-102K can only store the unit weight in the upper range value.

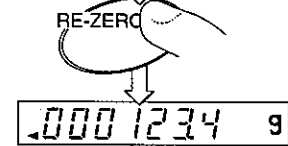
**1** Select "cnt" using the **MODE** key.



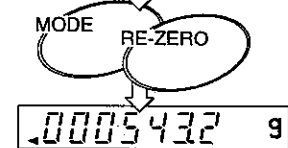
**2** Press and hold the **SAMPLE** key to select the unit for the unit of weight. The balance will display "U\_". Select the unit using the **MODE** key for unit weight. This unit can select without cnt, Pct, and unselected unit.



**3** 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.

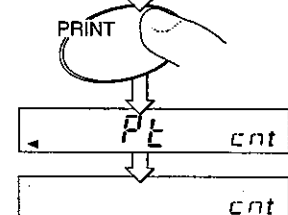


**4** Press the **MODE** key. Then you can enter a new unit weight. Select the digit to be changed using the **MODE** key. Press the **RE-ZERO** key to change the value of the digit selected. Continue this process until all of the digits are set correctly.



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

The balance will display "P\_L" for several seconds, then the count will again be displayed. Continue with your counting.



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

## Percent Mode (pct)



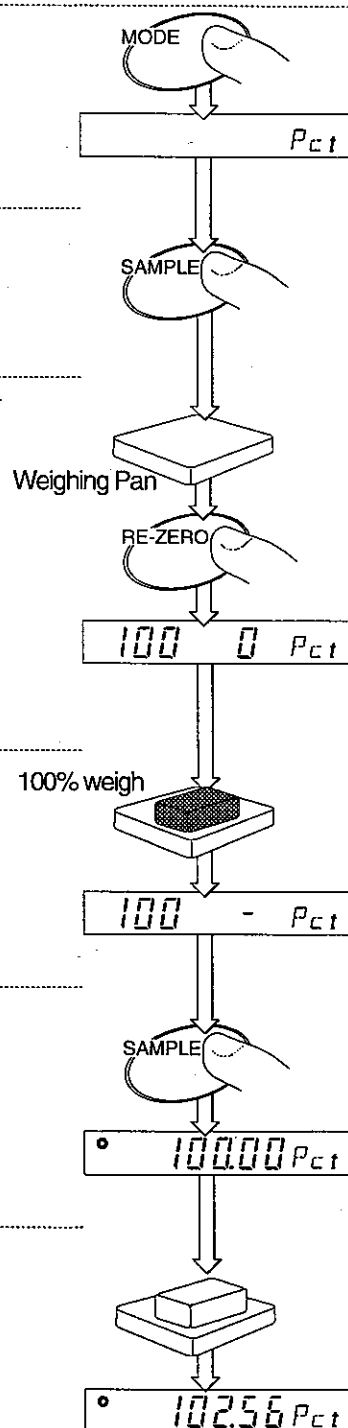
The HP balance has a Percentage mode that allows you to establish a 100% point, and then use this to determine a percentage based on that sample. Less or greater than 100% may be displayed at 1%, 0.1% or 0.01%, dependent on the range of digits used.

The minimum figure of 100% weight that is able to store a value is as follows:

The single range balances is minimum figure x 100.

The HP-22K and HP-102K dual range balances are minimum figure x 100 of the upper range.

- 1** Select "Pct" using the **MODE** key.
- 2** When the balance displays a value in the unit of percentage, press the **SAMPLE** key.
- 3** With nothing on the pan, 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 **SAMPLE** 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.



## Percent Mode (pct) with Digital Input of 100% Weight



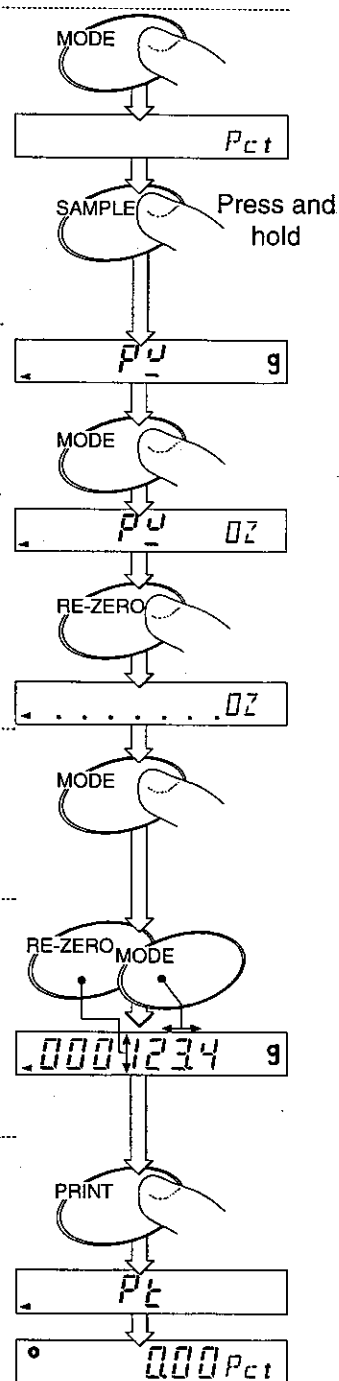
The HP balance has a Percentage mode that allows you to enter the 100% weight using the keyboard or a computer (using the optional RS-232C interface) for the percentage sample.

The minimum figure of 100% weight that is able to store a value is as follows:

The single range balances is minimum figure x 100.

The HP-22K and HP-102K dual range balances are minimum figure x 100 of the upper range.

- 1** Select "Pct" using the **[MODE]** key.
- 2** Press and hold the **[SAMPLE]** key to switch to the digital input mode. "p\_u" 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 the 100% weight in memory. 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\_t" will be display for a few seconds, then the percentage will again be displayed.

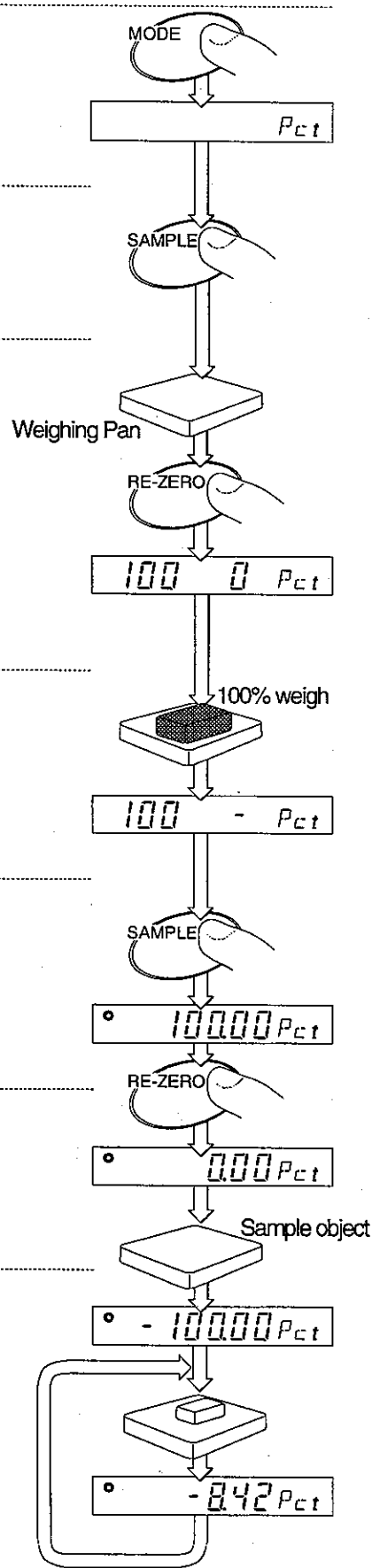


The sample weight for the 100% point is stored in memory and will be retained if the power is turned off.



# Measuring differences in Percent (pct) Mode

- 1** Select "Pct" using the **MODE** key.
- 2** When the balance displays a value in the unit of percentage, press the **SAMPLE** key.
- 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 **SAMPLE** key. The balance will store the weight of the sample as the 100% point.
- 6** Press the **RE-ZERO** key and remove 100% sample.
- 7** Load the next sample. The weighing difference is displayed in percentage (%).





# Animal Mode



Use animal mode to weigh living animals. The balance is allowed to stabilize for a fixed period of time and width, then the 'Animal mode' mark comes on showing the average sample weight of the moving object.



The balance displays a fixed value as a result of the calculation when the Stability indicator come on. (When weighing data is averaged, the animal weighing mode indicator will be blinking.)

This mode can only be used after setting the display to zero.

Press the **RE-ZERO** key to set the display to zero.

### Animal Mode Conditions:

After setting the display to zero, animal mode is only activated if the display changes by at least the amounts shown in the following table. If the weight is less than the amount given below, the balance is in the normal weighing mode.



Initial Range	Model
20g	HP-12K, HP-20K, HP-30K, HP-22K
50g	HP-40K, HP-60K, HP-100K, HP-102K

### Animal Mode Stabilization range:

This mode corresponds to internal setting **[ - 0 ]**, **5tb-b** in the following way:

		This indicator lights when weighing data is averaged within the range set below.	
<b>5tb-b</b> Stability band width	<b>0</b>	Stable when within $\pm 6.25\%$ of the weighing value.	To measure most precisely, but slow to stabilize
	<b>*1</b>	Stable when within $\pm 12.5\%$ of the weighing value.	
	<b>2</b>	Stable when within $\pm 25\%$ of the weighing value.	To eliminate vibration and to stabilize quickly

\* factory setting

### Animal Weighing Averaging Time:

This mode corresponds to function **[ - 0 ]**, **[and]** Condition in the following way:

	<b>Averaging Time</b>		Better weighing conditions faster weighing response  Worse weighing conditions slower weighing response
	<b>0</b>	1 sec	
	<b>1</b>	2 sec	
	<b>*2</b>	4 sec	
	<b>3</b>	6 sec	
<b>[and]</b> Response / Environment	<b>4</b>	8 sec	

\* factory setting

# Animal Weighing - Example of Use

The animal weighing mode uses the unit of  $\text{A-g}$  or  $\text{A-k g}$ .

$\text{A-g}$  The animal weighing mode uses the unit of gram.

$\text{A-k g}$  The animal weighing mode uses the unit of kilogram.

HP-102K uses only  $\text{A-k g}$ .

Balances other than the HP-102K can select a unit from  $\text{A-g}$  or  $\text{A-k g}$ . Some balances can not select  $\text{A-k g}$ .

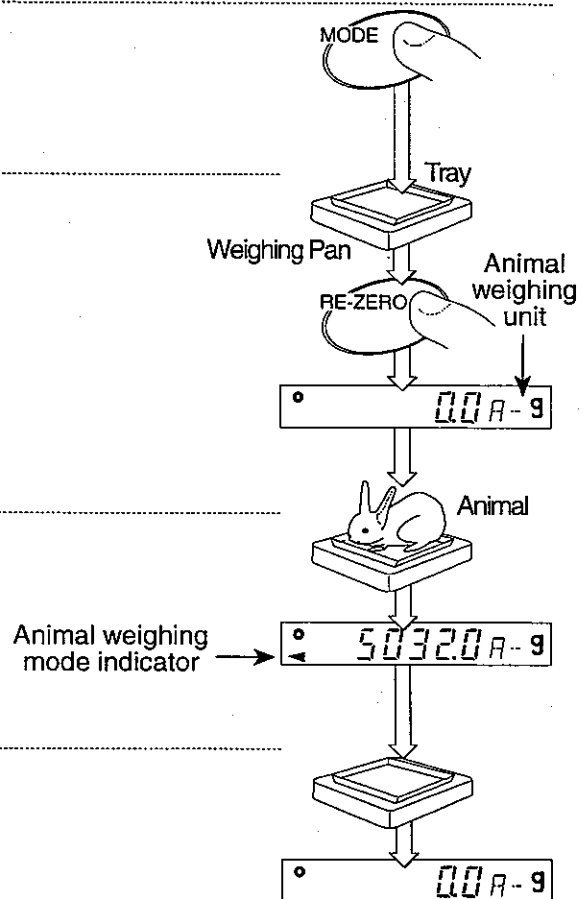
**1** Select animal weighing mode using the **MODE** key. (model HP-12K illustrated)

**2** Place a tare container on the pan and press **RE-ZERO**. The display will show zero.

**3** Place the animal in the tare container.

When the animal weighing mark is lit, read the displayed weight.

**4** Remove the animal. The display will return to zero.





# Environment Response Adjustment

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

## Conditions respond rate

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 periodical maintenance. Refer to "Calibration".

## Function

The HP 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 weighing mode without saving the new parameter.

Conditions Determining Response Rate

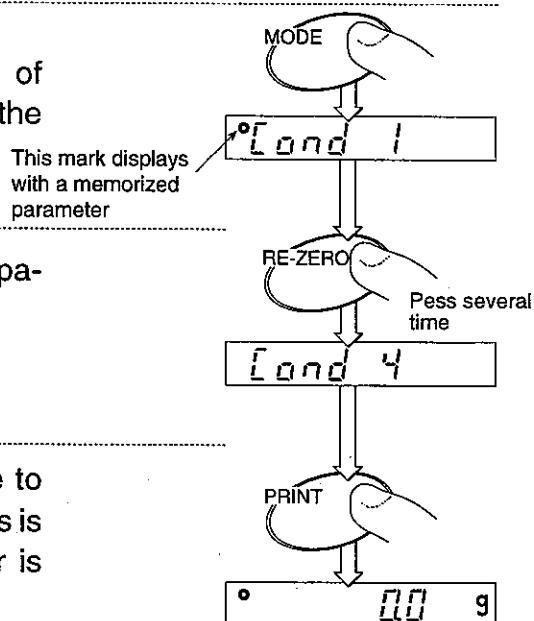
Parameter setting		
Cond	0	better weighing conditions faster weighing response
	1	
	*2	
	3	worse weighing conditions slower weighing response
	4	

\* 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".

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

- 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 power is removed from the balance.



# Calibration

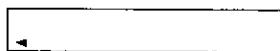


Prevent vibrations, drafts, and ambient temperature changes from affecting the balance during calibration.

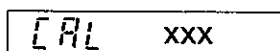
- To get the output for Good Laboratory Practice (GLP) set "output of Calibration" ([- 4, INF]) before you perform the calibration.
- Please use a very precise calibration mass. The accuracy of your balance is decided by this calibration mass.
- If you want only zero-point-calibration, a calibration mass is not needed.
- Please select your calibration mass from following table. The preferred calibration mass is the value in bold type and is selected when the balance enters the calibration mode.

Model	Calibration mass								
HP-12K	5kg	<b>10kg</b>	-	-	-	-	-	-	-
HP-20K	-	10kg	<b>20kg</b>	-	-	-	-	-	-
HP-30K	-	-	<b>20kg</b>	30kg	-	-	-	-	-
HP-40K	-	-	20kg	30kg	<b>40kg</b>	-	-	-	-
HP-60K	-	-	-	30kg	40kg	50kg	<b>60kg</b>	-	-
HP-22K	-	10kg	<b>20kg</b>	-	-	-	-	-	-
HP-100K/102K	-	-	-	-	-	-	60kg	80kg	<b>100kg</b>

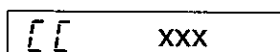
## Displays and canceling calibration



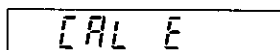
This mark means the balance is proofing calibration data. Do not allow vibrations or drafts to affect the balance while this mark is displayed.



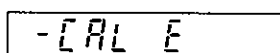
- XXX = [ ] balance is executing zero-point-calibration.
- XXX = (except zero) shows the required calibration mass weight and means to be executing full-scale-calibration.



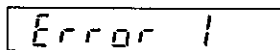
- XXX = [ ] means to be executing zero-point-check.
- XXX = (except zero) shows the required calibration mass weight and the balance is executing full-scale-check.



"CAL E" will be displayed if the calibration mass is too heavy.



"-CAL E" will be displayed if the calibration mass is too light.



Warning of instability due to vibration or draft. 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.



The **ON:OFF** key cancels the execution of calibration without saving new data and turns the display off.



# Calibration Procedure

The way to perform a zero point and full-scale calibration is shown below. This assumes that parameter 'C-4 - INFO 0' is set to 'no output'. Please refer the manual of option 03. This illustration is for model HP-12K

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

**2** Turn the display on.

**3** Press and hold the **RE-ZERO** key until **CAL** is displayed. Release the **RE-ZERO** key. **CAL** appears to indicate that the balance is in calibration mode. If the balance enters another mode, press the **ON:OFF** key and restart the procedure.

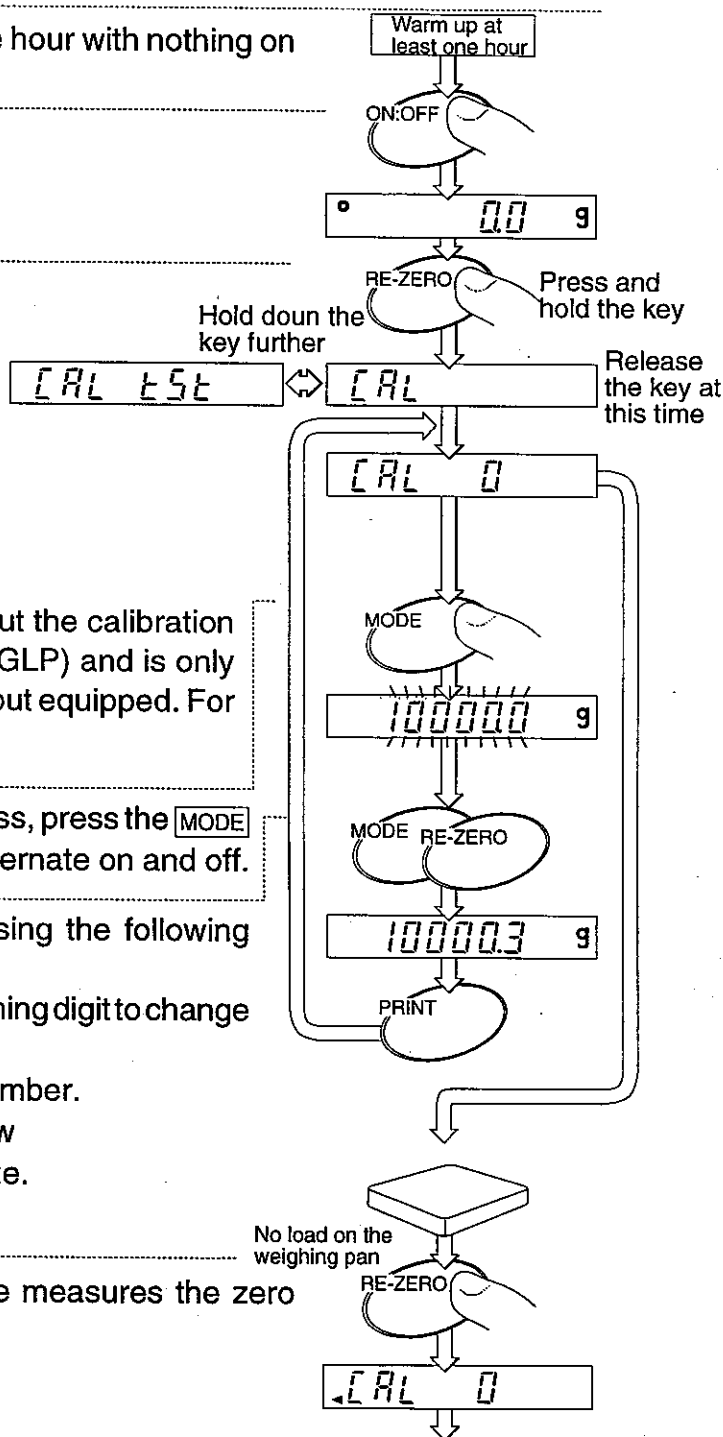
**CAL EST** is the function to output the calibration condition serially (conforming to GLP) and is only for the balance with the serial output equipped. For details, see the options manual.

**4** To set the value of the calibration mass, press the **MODE** key. A digit to enter a number will alternate on and off.

**5** Enter the calibration mass value using the following keys.

- MODE** key      Used to move the flashing digit to change a number.
- RE-ZERO** key    Used to change a number.
- PRINT** key      Used to store the new calibration mass value.

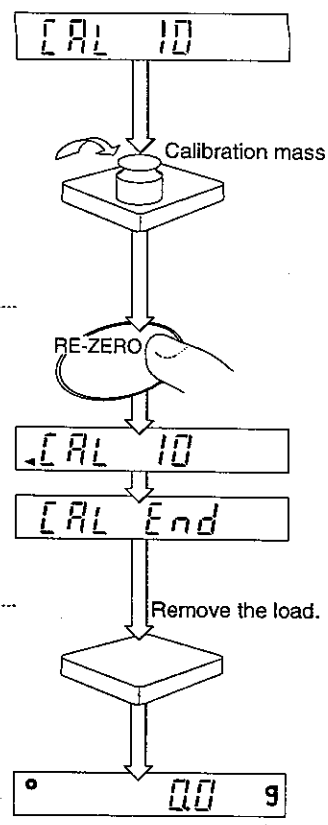
**6** Press the **RE-ZERO** key. The balance measures the zero point.



**7** `CAL 10` will be displayed. Place the calibration mass (10kg) on the pan.

**8** Press the `RE-ZERO` key. The balance measures the weight. `CAL End` is displayed. The calibration is finished.

**9** Remove the calibration mass from the pan. Please check weighing calibration by placing the calibration weight back on the weighing pan, verifying the value.



## Zero-point-calibration

If the display reads `-E` when the balance has been turned on, it means that the zero point has shifted, making it necessary to perform zero-calibration. Zero-calibration is discussed on the following page.

**Caution** The decimal point position and/or weight values are different depending on the balance model. The following procedure assumes that the internal settings are set at `[-3] CAL 2` and `[-4] INF 0` (manufactures setting). Please confirm that you have the proper settings before attempting zero-calibration.

**1** Connect the AC adaptor and then turn off the display.  
Confirm that there is nothing on the weighing pan.

**2** Press the **ON:OFF** key to turn on the balance.

When the balance displays **-E**, you must perform zero-point-calibration

**3** Press the **RE-ZERO** key.

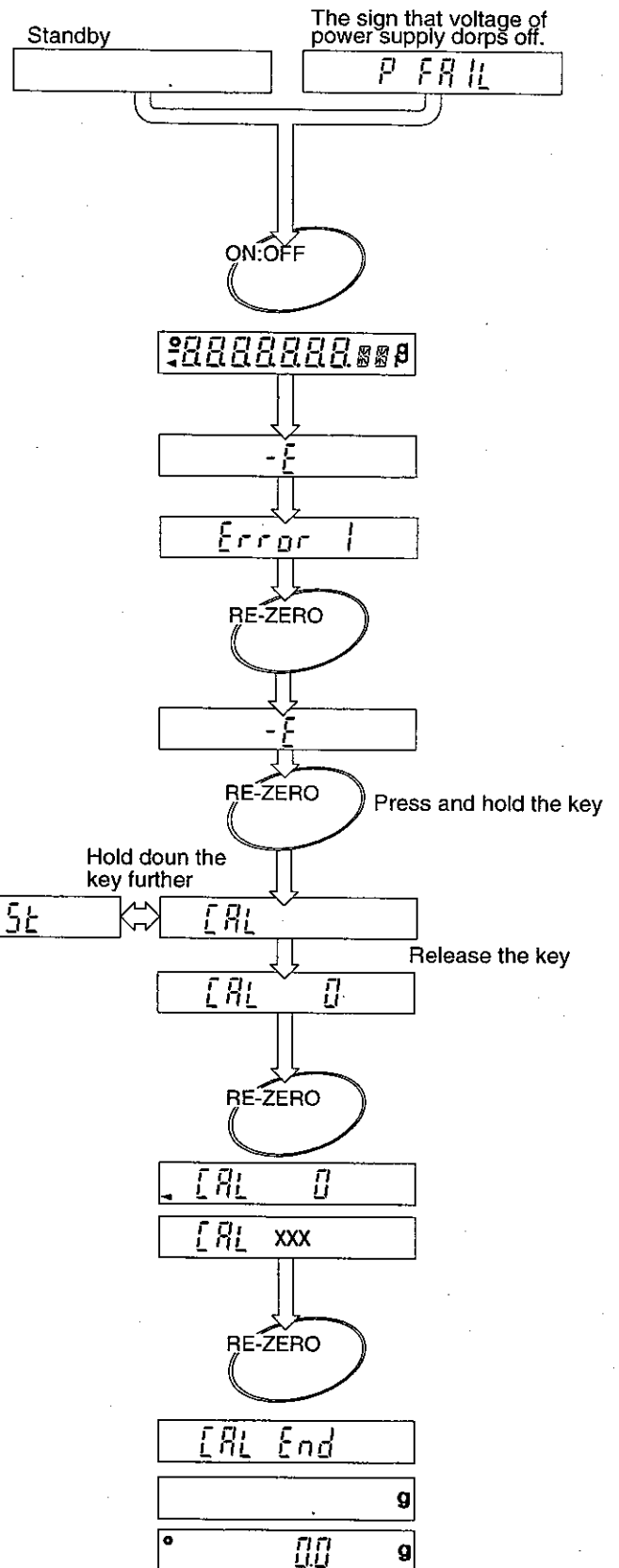
**4** Press and hold the **RE-ZERO** key until the balance displays **CAL**. Then release the **RE-ZERO** key. The balance enters calibration mode.

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

Make sure that the balance stability is not influenced by breeze or vibration.

**6** Press the **RE-ZERO** key.

The zero-point-calibration is finished and the balance returns to the normal weighing mode.





# Functions



Your HP 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.

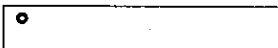
All of the parameters have initial settings from the factory, or possibly from your dealer. You may easily change these settings as you need them, or conditions vary.

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	<b>C-0</b> Environment	<b>Stb-b</b> Stability band	<b>Cond</b> Resp. / Environ.	<b>trc</b> Zero tracking				
1	<b>C-1</b> Display update	<b>SPEED</b> Refresh rate	<b>Point</b> Decimal point	<b>P-on</b> Auto start function	<b>rANGE</b> Minimum weighing			
2	<b>C-2</b> Auto re-zero	<b>Ar-0</b> Auto re-zero on/off	<b>Ar-b</b> Auto re-zero band	<b>Ar-t</b> Detection time	Some products can not select this function.			
3	<b>C-3</b> Calibration	<b>CAL</b> Calibration inhibit						
4	<b>C-4</b> Data out	<b>Pr int</b> Data out mode	<b>AP-P</b> Auto print polarity	<b>AP-b</b> Auto print band	<b>PAUSE</b> Data pause	<b>At-F</b> Auto feed	<b>Ar-d</b> Zero after data out	<b>info</b> Cal verification
5	<b>C-5</b> Serial interface	<b>bPS</b> Baud rate	<b>bt-Pr</b> Length, Parity bit	<b>Cr-LF</b> Terminator	<b>tYPE</b> Data format	<b>t-UP</b> Receive time	<b>E-Cod</b> Error code	<b>CtS</b> CTS control
6	<b>C-6</b>	<b>CP</b> Comparator Use	<b>CP-0</b> Compare near zero	<b>bEEP -</b> Buzzer for under	<b>bEEP -</b> Buzzer for target	<b>bEEP -</b> Buzzer for over		
7	<b>C-7</b>	<b>An</b> Range of output	<b>SEL</b> Target figure	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.				
8	<b>C-8</b>							
9	<b>C-9</b> Parameter control	<b>Pn</b> ID protect	<b>PF</b> Parameter protect					



## C-parameter keys and displays



This mark appears when the memorized parameter is displayed.



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



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

RE-ZERO

The **RE-ZERO** key is used to select a parameter for the item selected by the **MODE** and **SAMPLE** keys.

PRINT

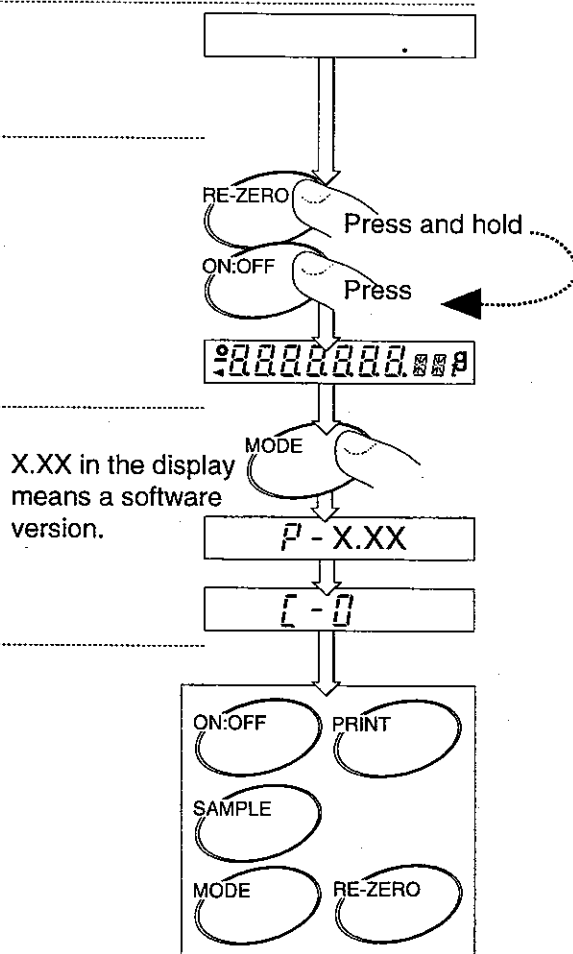
The **PRINT** key is used to save the new C-parameter settings and to exit to the weighing mode.

ON:OFF

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 enters the function setting mode and **[ - 0 ]** will be displayed.
- 4** Set the C-parameter using the keys described on the preceding page.



# C-Parameter Settings

**[ - 0 ] Environment:** The settings adjust the balance to your environment.

<b>Stb-b</b> Stability band width	<input type="checkbox"/>	The Stability indicator lights when the display fluctuation is within the range set below	
	0	Stable when within $\pm 1$ digit half second.	
	*1	Stable when within $\pm 2$ digits half second.	
<b>Cond</b> Response / Environment	2	Stable when within $\pm 3$ digits half second.	
	0	Better weighing conditions faster weighing response   Worse weighing conditions slower weighing response  	
	1		
	*2		
	3		
4			
<b>trc</b> 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.

**[ - 1 ] Display Update, Decimal Point and Auto Start**

<b>SPEED</b> Display update rate	parameter	The setting of the period to refresh the display	
		Software version ~1.00	Software version 1.10~
	*0	5 times/second type at stable weighing 10 time/second type at unstable weighing	5 time/second
	1	5 times/second	10 time/second
<b>Point</b> Decimal point display	*0	Point (.)	
	1	Comma (,)	
<b>P-on</b> 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	
<b>rANGE</b> Minimum figure	parameter	The setting to display the minimum figure when you start weighing. The minimum figure can be turned on or off by pressing the SAMPLE key alternately. Caution • This function can not be used in the counting or percent mode. • There are some products that can not select this function.	
	*0	The minimum figure is displayed at turn-on	
	1	The minimum figure is not displayed at turn-on	

\* factory setting

## [ - 2] Auto Re-ZERO Function

<b>Ar - 0</b> 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'
<b>Ar - b</b> Auto re-zero band	*0	Zero when within ±5 digits of the zero-point.	slow Re-ZERO
	1	Zero when within ±50 digits of the zero-point.	
	2	Zero when within ±500 digits of the zero-point.	fast Re-ZERO
<b>Ar - t</b> Time for auto zero determination	*0	Re-ZERO when near zero for more than a half second.	fast 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.	slow Re-ZERO

\* factory setting.

## [ - 3] Keys that can be used for calibration.

<b>[AL]</b> Calibration keys accepted	0	Keyboard and EXT. switch can not be used.
	1	Keyboard can be used, EXT. switch can not be used.
	*2	Keyboard and EXT. switch can be used.

\* factory setting

[ - 4, [ - 5, [ - 6, [ - 7: refer to the instructions for these separately available options.

## [ - 9

### C-parameter control

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

\* factory setting



# The ID number and GLP

- The ID number is used to identify the balance when using Good Laboratory Practice (GLP).
- 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.
- Verifying the calibration executes using the ID number and weighing data after the calibration. The AD-8121 printer will add the time and date.
- Refer to the option manual "Testing the calibration".



## Setting the ID number



The ID number is saved in the balance memory without the AC adaptor and is effective until the next change.

The ID number was set to `00000000` at the factory.



If you do not complete steps 1 and 2 within five seconds, the balance returns to the weighing mode without saving the new ID number.

**1**

Turn the display off.

Press and hold the **SAMPLE** key and press the **ON:OFF** key.

**2**

Press the **MODE** key. The ID number will blink.

**3**

Set your ID number using following keys.

**RE-ZERO**

The **RE-ZERO** key is used to change the character that is displayed. You can select following characters.

`0-9, A-Z, -, (space mark)`

Refer to the following section 'Display Character Set'

**SAMPLE**

Switches between numbers and letters

**MODE**

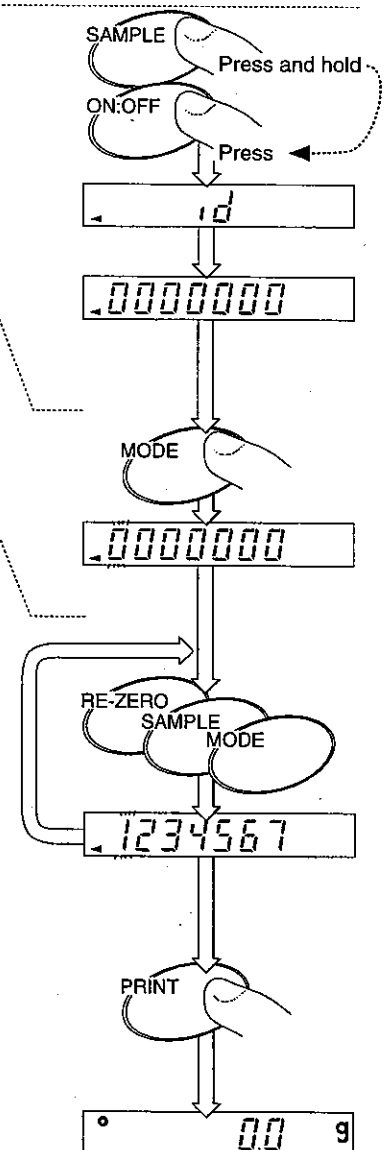
The **MODE** key is used to shift the character that is displayed.

**PRINT**

The **PRINT** key saves the new ID number and go to the weighing mode.

**ON:OFF**

The **ON:OFF** key turns the display off without saving the new ID number.





# Display Character Set:

Pressing the SAMPLE key will switch from one group to the other.

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				
À	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï	ð	ñ	ó	ô	õ	ö	÷	ø	ù	ú	û	ü	ý	ÿ
1	2	3	4	5	6	7	8	9	0	-	_ (Space)																		
1	2	3	4	5	6	7	8	9	0	-	Space : while flashing display " - "																		

# Miscellaneous

## 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, the balance will store the value of the weight on the weighing pan into **Pt**.

If you do not complete steps 2 and 3 in five seconds or less, the balance returns to the weighing mode.

- 1 Turn the display on.
- 2 Press and hold the **SAMPLE** key until the balance displays **Pt**. (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.



When you press the **RE-ZERO** key after setting the Digital Tare value, the value set into the Digital Tare is cleared.

0.0 g

SAMPLE Press and hold

Pt g

RE-ZERO

.0000000 g

MODE

.0000000 g

RE-ZERO SAMPLE MODE

.0000 10.0 g

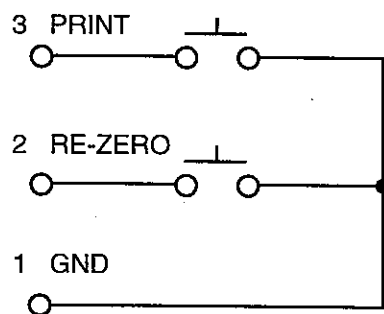
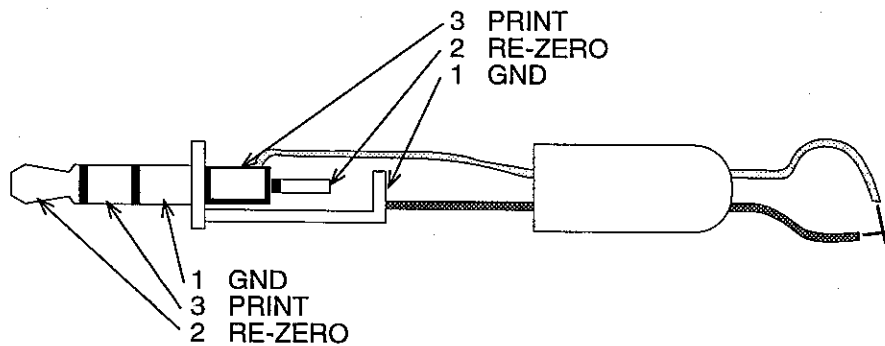
PRINT

0 - 10.0 g

## External key plug

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 short the GND line to the PRINT or RE-ZERO line for at least 100ms.

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



Part name: AX-T-314A-S

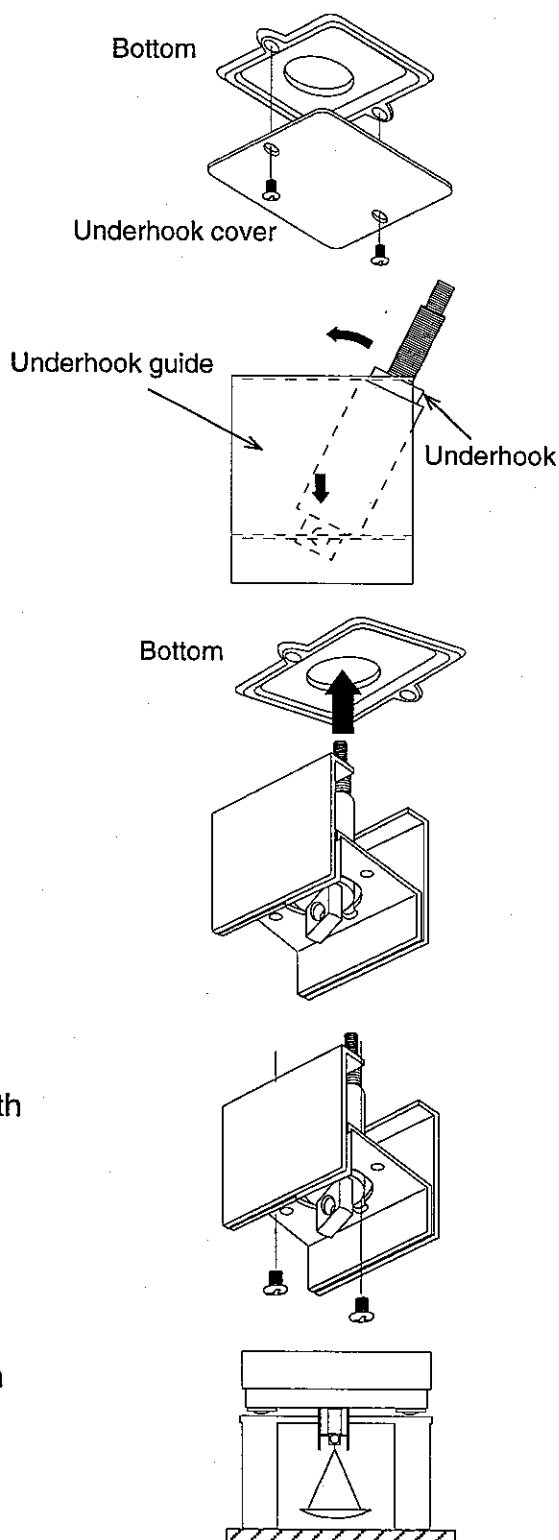
## Underhook Weighing

The underhook weighing is a method of finding out the specific gravity or weighing the magnetic substance.

OP-10~13 underhook that is specialized for each HP product is necessary to weigh it.

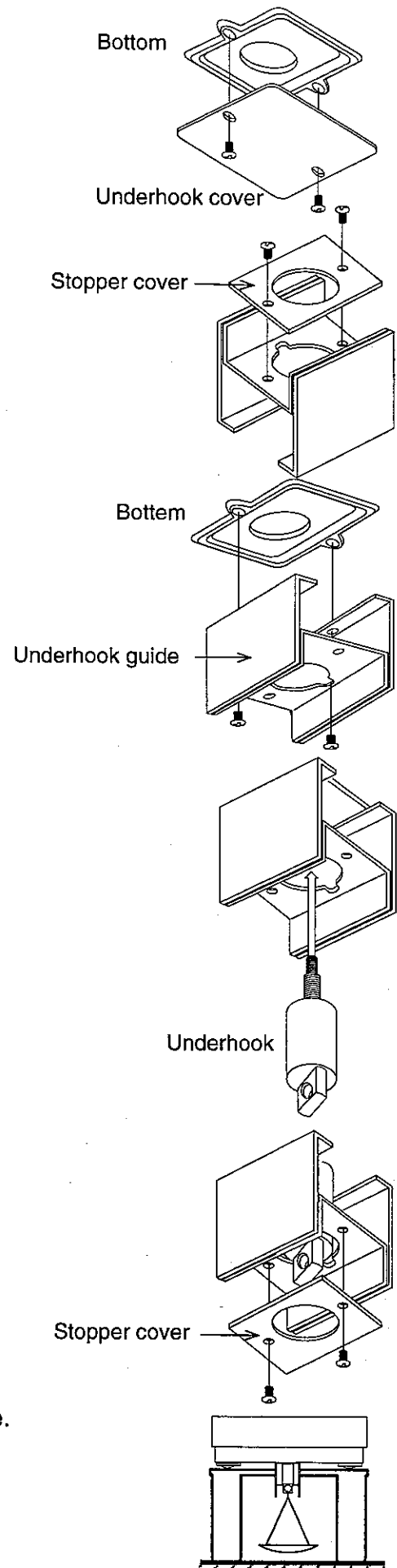
### In case of HP-10

- 1** Remove the weighing pan.  
Remove the underhook cover.
- 2** Insert the underhook to the hole of guide aslant.
- 3** Fasten the underhook to the HP sensor unit gently.
- 4** Screw up the guide to the HP bottom gently.
- 5** Place the HP balance on a weighing table with a hole cut in it.
- 6** Hang a light-weight weighing harness through this hole.



## In case of HP-11~13

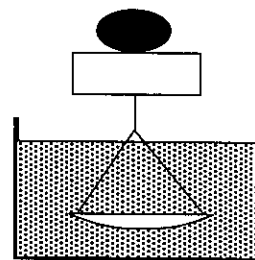
- 1** Remove the weighing pan.  
Remove the underhook cover.
- 2** Remove the stopper cover.
- 3** Screw up the guide to HP bottom gently.
- 4** Fasten the underhook to HP sensor unit gently.
- 5** Replace the stopper cover.
- 6** Place HP balance to a weighing table with a hole cut in it.
- 7** Hang a light-weight harness through this hole.





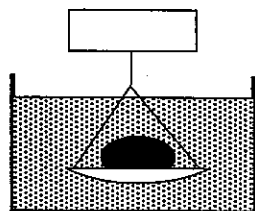
# An Example of Underhook Weighing

- 1 Press the **RE-ZERO** key to zero the display.
- 2 Place the material on the pan.  
Find the weight *A* of the material in air.  $A = 10000.0\text{g}$



$A = 10000.0\text{g}$

- 3 Press the **RE-ZERO** key.
- 4 Lower the material into water at 10 °C.  
Find the absolute weight *B* of the material in water.  $B = 466.1\text{g}$



$B = |-466.1\text{g}|$   
 $= 466.1\text{g}$

- 5 Find a water density *C* from following table.  $C = 466.2\text{cm}^3$

0°	0.99984 g/cm <sup>3</sup>	
4	0.99997	
10	0.99970	
15	0.99910	
20	0.99820	
25	0.99704	
30	0.99565	Reference

$$\frac{B=466.1\text{g}}{0.99970\text{g/cm}^3} = 466.2\text{cm}^3$$

$$C = 466.2\text{cm}^3$$

- 6 The density is 21.45 g/cm<sup>3</sup>. This material is most likely platinum.

$$\frac{10000.0\text{g}}{466.2\text{cm}^3} \approx 21.45\text{g/cm}^3$$



# Errors and Specifications



## Errors

### Low sample weight

Lo

The sample is very light, the balance may not be able to perform the counting or percent modes.

XX - cnt

If samples are lighter than the correct value, counting error becomes too large and the balance asks to place the required number of samples. Count and place the remaining samples on the pan. Press the **[SAMPLE]** key to store the correct value.

xx=20, 30, 40, 50, 60, 70, 80, 90, 100

### 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.

### Zero-point Error

-----

This display indicates that the zero-point of weighing has drifted from last calibrating zero-point (**[CAL 0]**), make certain that there is nothing on the weighing pan. Execute calibration to reset the zero-point (**[CAL 0]**).

### 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.

Error 0
Error 3
Error 4
Error 8
Error 9

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

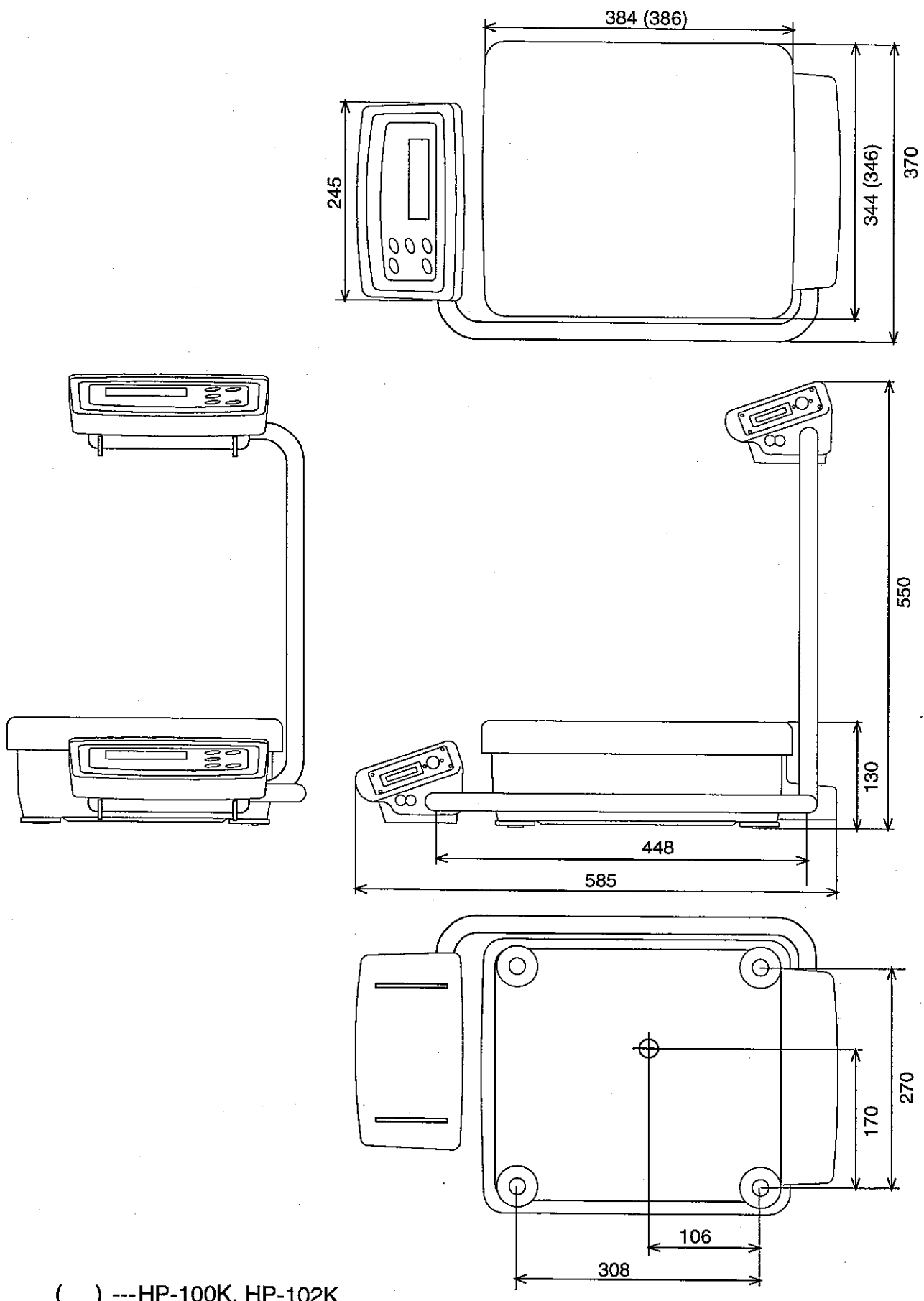
## Specifications

MODEL	HP-12K	HP-20K	HP-30K	HP-40K	HP-60K	HP-22K	HP-100K	HP-102K	
Weighing capacity kg	12	21	31	41	61	21 / 2	101	101 / 61	
Minimum weighing display g (kg)	0.1			0.5	1	1 / 0.1	1	(0.01 / 0.001kg)	
Minimum 100% weighing g (kg)	10.0			50.0	100			(1.00kg)	
Minimum unit weighing g (kg)	0.1			0.5	1			(0.01 kg)	
Repeatability (Standard deviation) g (kg)	0.1			0.5	0.7	0.5 / 0.1	1	(0.05 / 0.001kg)	
Linearity g (kg)	±0.2			±1		±1/ ±0.1	±2	(±0.01 / ±0.002kg)	
Sensitivity drift ppm/°C	±5*	±3*		±6*		±10*	±6*	±10*	
Stabilization time	2 second ( typical)								
Display Update Rate	5 times / second , 10 times / second								
Weighing Pan mm	384 x 344						386 x 346		
Calibration Mass kg	5								
	10	10					10		
		20	20	20		20			
			30	30	30				
				40	40				
					50				
					60		60	60	
							80	80	
						100	100		
Net weight kg	17						18		
Operating condition	0°C ~ 40°C, RH < 85%, Do not allow condensation to form								
Power consumption	AC adaptor, 11VA approximately								

\* Temperature range is 10°C~30°C.



# Dimensions



( ) ---HP-100K, HP-102K



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