HX SERIES

ELECTRONIC BALANCES

INSTRUCTION MANUAL

Instruction-HX-v.2.a 92.12.07.OGA

ELECTRONIC BALANCES

MODELS: HX-100
HX-400
HX-3000
HX-6000

A&D Company, Limited

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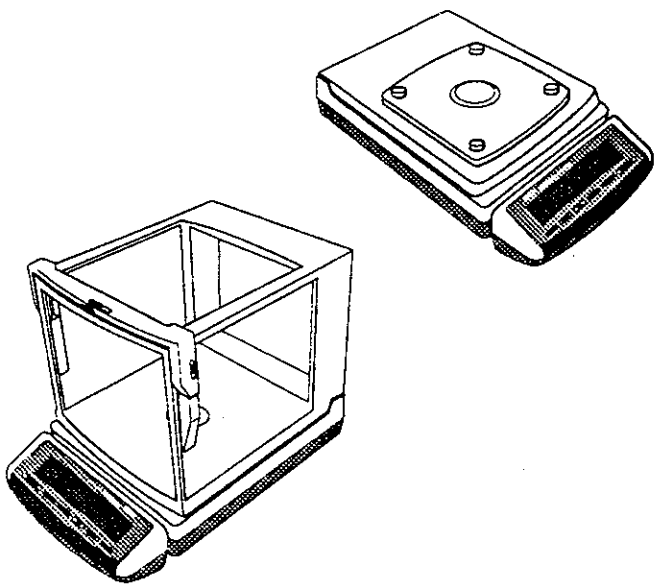
FCC Rules

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.)

HX Series • Section A

Set-Up

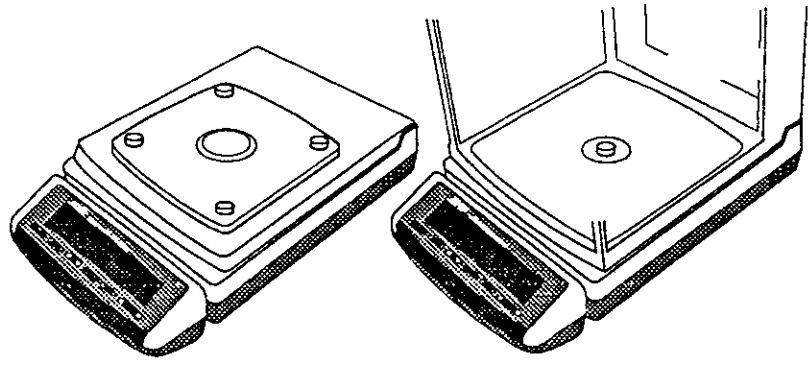


Unpacking Your HX

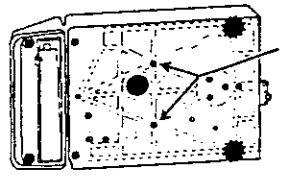
Unpack the scale carefully and keep the packing material if you are likely to transport the scale again in the future.

In the carton you should find this manual plus:

- The Balance.
- The Weighing Pan and Pan Support.
- An AC adaptor (check that the AC input rating is correct).
- A spare fuse (500mA, Time Lag).
- 8P DIN plug for connecting an external switch.
- Plastic Breeze Break fon HX-400



(HX-400 / 3000 / 6000) (HX-100)



Internal Weight Setscrews (Transportation Screws)

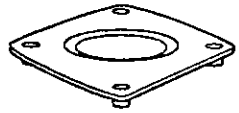
There are two transportation screws (internal weight setscrews) under the bottom of the main body. Be sure to remove them before use and keep them together with the packing materials. When you transport the instrument, be sure to tighten the setscrews.

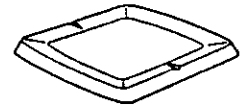
The HX series allows its display unit to be separated. If the display unit is to be removed, remove the internal weight set screws removing the display.

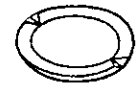
AC Adaptor

Spare Fuse
(500mA, Time Lag)

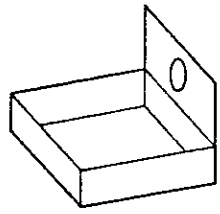
8P DIN Plug
(For Connecting
an External Switch)


Pan Support
(For HX-400 / 3000 / 6000)


Weighing Pan
(For HX-400 / 3000 / 6000)


Weighing Pan
(For HX-100)

Draft Ring
(For HX-100)


Plastic Breeze Break
(For HX-400)

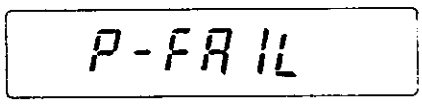
Best Conditions For Weighing

To ensure that you get the most from your balance, please try to meet the following 'Best Conditions' as closely as possible:

- ❑ The Balance must be level (check the spirit level on the rear of the Balance).
- ❑ The best operating temperature is about 20°C/68°F at about 50% Relative Humidity.
- ❑ The weighing room should be kept clean and dry.
- ❑ The weighing table must be of a solid construction.
- ❑ 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.
- ❑ Try to ensure a stable AC power supply when using an adaptor.
- ❑ Keep equipment containing magnets away from the balance.
- ❑ Warm-up the balance before use or leave it on standby (display OFF State) overnight.
- ❑ Ground the balance chassis for electrostatic discharge if the weighing conditions warrant (see next page).

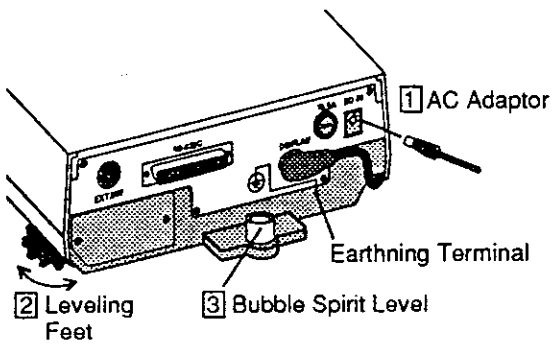
Setting Up Your HX Balance

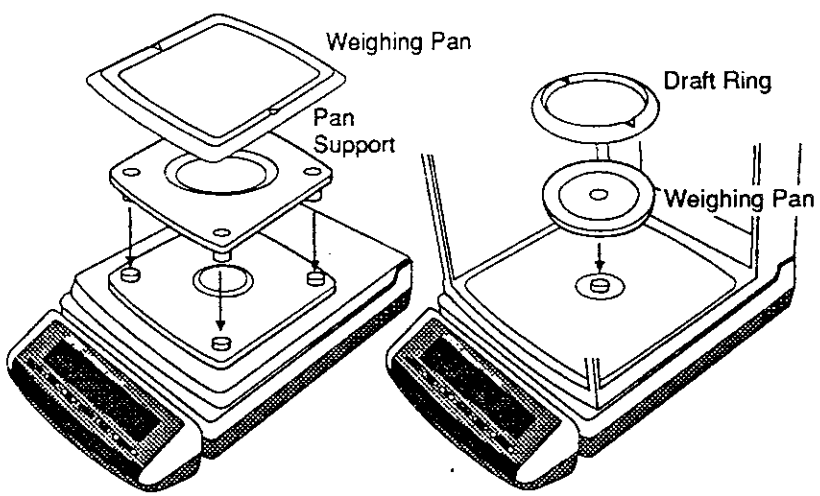
1 Place the balance on a suitable weighing surface (see BEST CONDITIONS FOR WEIGHING, previous page) and connect the AC adaptor [1] Please ground the chassis if you think static electricity may be a problem (there is a GND ground connection at the back of the balance).



Power Failure may be displayed when you plug in the AC Adaptor: see next page.

2 Turn the leveling feet [2] until the spirit level [3] indicates the balance is level. Install the Pan Support and Weighing Pan .

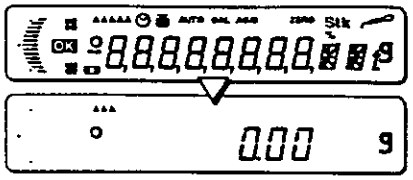




(HX-400 / 3000 / 6000) (HX-100)

3

- ▶ Press the ON:OFF key.
- ○ All the display segments will come ON and you will hear the ZEROing mechanism.
- ○ Moments later, zero will be displayed. Also, the internal setting monitors (▲) will be diplayed.



4

At this stage any weight reading will not be very accurate because the balance has not been "calibrated". You should "warm-up" your balance for at least one hour before calibration. You may turn OFF the display by pressing the ON:OFF key if you like.

Please also take the time to read SECTION B Introduction, it explains several important features of the HX, before proceeding to calibration SECTION C.

Power Supply Notes

Please use the AC adaptor that was supplied with the balance, an alternative 12V DC power supply might not be stable enough for this balance.

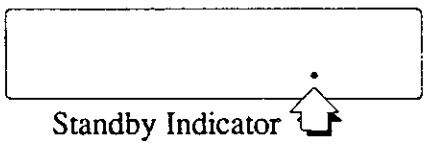
The balance is always warmed-up and ready-to-use as long as the AC adaptor is connected. This is the normal state and does no harm to the balance. Please warm-up (plug-in) the balance for one hour before use.

WARM-UP YOUR BALANCE BEFORE USE!

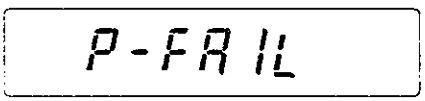
Display OFF State

○ When the balance is plugged-in, but the display is OFF, it is in the "Display OFF State". There are three possible displays while in Display OFF State:

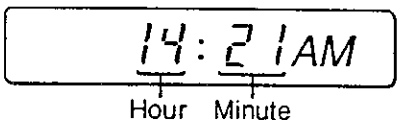
❑ **Power Indicator**
One decimal point at the right of the display.



❑ **Power Failure**
"P-FAIL" power failure is displayed if power was interrupted during weighing the last time the balance was used (see below).



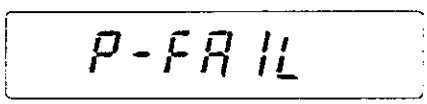
❑ **Time Display**
If you want the current time to be displayed during the "Display OFF State", set the internal setting "**oFF x c1**" to "**oFF 1c1**" . (see C1•Display in the section C-Parameter Settings.)



Display ON & 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:

Power Failure:



"P-FAIL" power failure is displayed if power was interrupted during weighing the last time the balance was used.

▶ Press the [ON:OFF] key to clear.

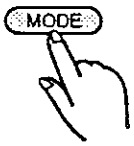
Stability Error:

'Error 1' will be displayed if the balance takes more than thirty seconds while attempting to ZERO.

- Make sure that nothing is touching the weighing pan. If there is: press the ON:OFF key to clear.
- If there is nothing touching the weighing pan or interfering with the balance, then it is an 'environment' error.

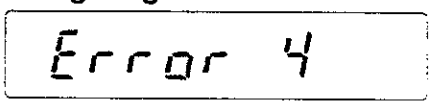
A

Press the RE-ZERO key and the display will show near ZERO. See that all of the BEST CONDITIONS FOR WEIGHING have been met, especially avoiding drafts and vibrations.

B 

If **'Error 1'** is still displayed, press the MODE key repeatedly until five setting monitor marks (▲) have been illuminated. This means that internal setting "Cond XC0" has been altered to "Cond 4C0". If the error still persists, call your dealer for service.

Weighing Pan Error:

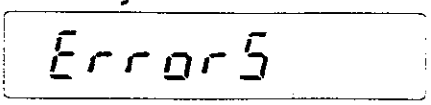


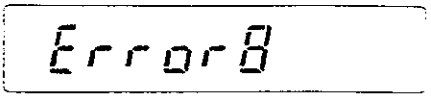
'Error 4' will be displayed if the weighing pan or pan support is not correctly installed, touching something or if there is a sample on the weighing pan when the ON:OFF key is pressed.

'Error 4' will be also displayed if you operate the balance with the internal weight set screws installed.

- Check the weighing pan and pan support, remove any sample from the weighing pan and wait for a minute. If it doesn't correct itself, press the ON:OFF key and try again after a few seconds. If the error persists, call your dealer for service.

Memory Error:





'Error 5' or **'Error 8'** will be displayed if the balance has a memory problem.

- Disconnect and connect AC power and try again. If error persists, call your dealer for service.

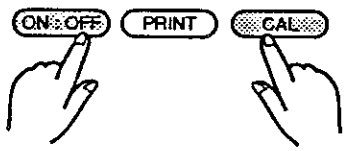
Setting and Confirming the Built-in Clock

You can select 12- hour or 24-hour display mode for the built-in clock.

Confirming and Altering the time

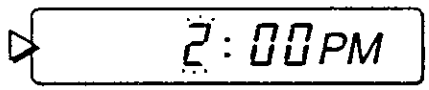
1

▶ Press the [ON:OFF] key to turn the display to the OFF state.

2 

▶ With the [CAL] key held down, press the [ON:OFF] key.

○ The current time is displayed.



[Or, it is displayed in the 24-hour mode. Pressing the [SAMPLE] key allows you to change the 12-hour/24-hour mode.]

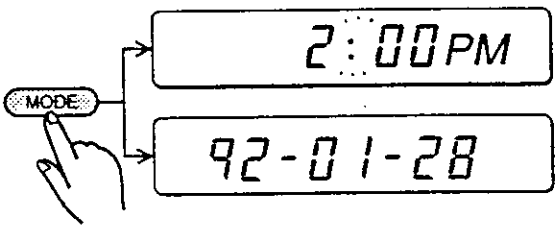
▶ If the time display is appropriate, press the [ON:OFF] key.

○ You are returned to the display OFF state.

▶ Confirm the current time displayed. When you want to display the date (**year, month, day**), press the [MODE] key.

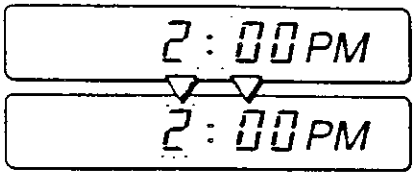
○ The date(year, month, day) will be displayed.

▶ Pressing the [MODE] key again returns you to the time display.



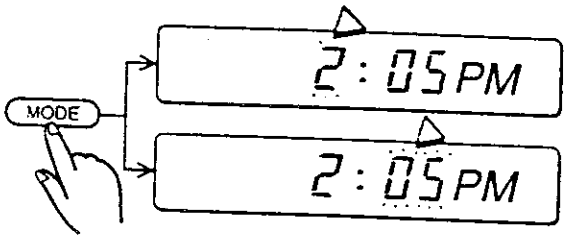
3

▶ When altering the time, press the RE-ZERO key first.
○ First, the **'Hour'** digits blinks.



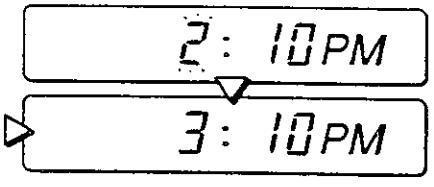
4

▶ Each time the MODE key is pressed, the **'Hour'** and **'Minute'** digits blink alternately.



5

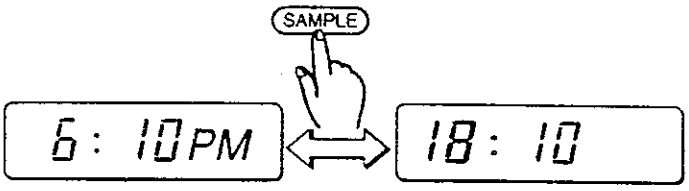
▶ Each time the RE-ZERO key is pressed, the blinking number in the **'Hour'** digits rotates 1 through 12 and back to 1 again. (in the 12-hour mode)



In the 24-hour mode, the blinking number in the **'Hour'** digits rotates 0 through 23 and back to 0 again, each time the RE-ZERO key is pressed.

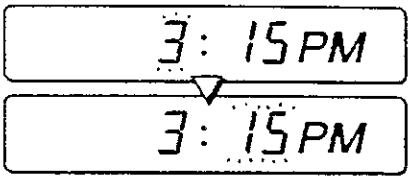
To quickly step through time, hold the RE-ZERO key down until proper digit is set.

▶ Each time the SAMPLE key is pressed, the 12-hour mode and 24-hour mode are selected alternately. The 12-hour mode was selected upon shipment from the factory.



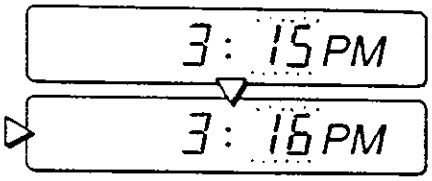
6

▶ After altering the number in the **'hour'** digits, press the MODE key.
○ The **'minute'** digits blink.



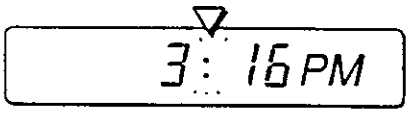
7

▶ Each time the RE-ZERO key is pressed, the blinking number in the **'minute'** digits rotates 01 through 59, and then, to 00, 01 onward.



8

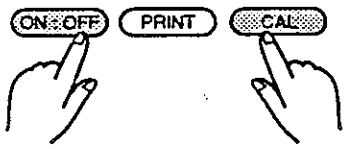
▶ After altering the **'hour'** and **'minute'** digits, press the PRINT key.
○ You are returned to the time display in Step 2.



Confirming and Altering the Date

1

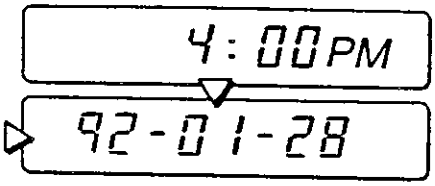
▶ Press the ON:OFF key to turn the display OFF state.

2 

▶ With the CAL key held down, press the ON:OFF key.
○ The current time is displayed.

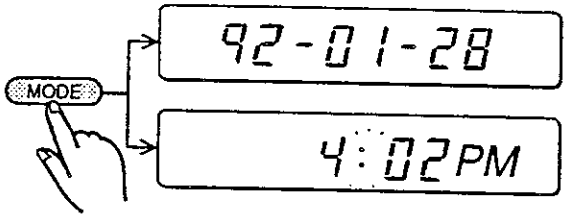
3

▶ Press the MODE key.
○ The current date is displayed.



(Jan. 28, 1992)

▶ If the date display is appropriate, press the ON:OFF key.
○ You are returned to the display OFF state.
▶ Confirm the current date displayed. When you want to return to the time display, press the MODE key.
○ The current time will be displayed.
▶ Pressing the MODE key again returns you to the time display.

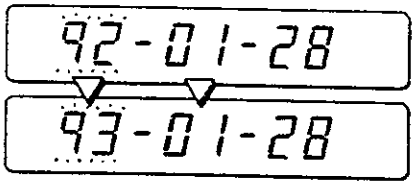


4

▶ Press the RE-ZERO key.
○ First, the **'Year'** digit blink.

5

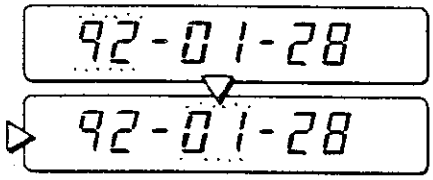
▶ If you press the RE-ZERO key with the **'year'** digits blinking, the lowest one of the blinking **'year'** digits will be incremented by 1.
▶ The number in the 'year' digits rotates 00 through 99 and back to 00 again.



To quickly step through digits, hold the RE-ZERO key down.

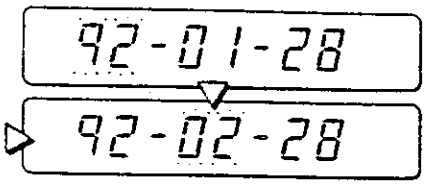
6

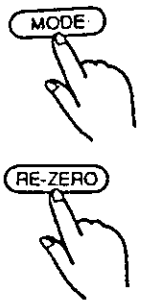
▶ To proceed to the **'month'** digits, press the MODE key.
○ The **'Month'** digits blink.



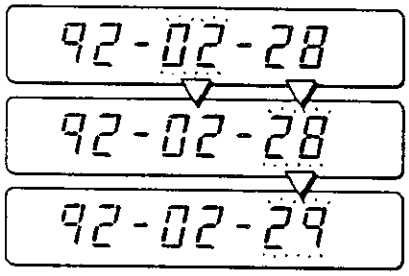
7

▶ If you press the [RE-ZERO] key with the '**month**' digits blinking, the lowest one of the '**month**' digits will be incremented by 1 each time the key is pressed.



8 

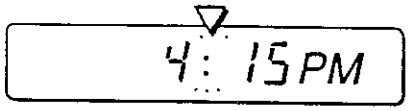
▶ When you proceed to the '**day**' digits, press the [MODE] key first to blink the '**day**' digits. The number in the '**day**' digits is incremented by 1 each time the [MODE] key is pressed.



9

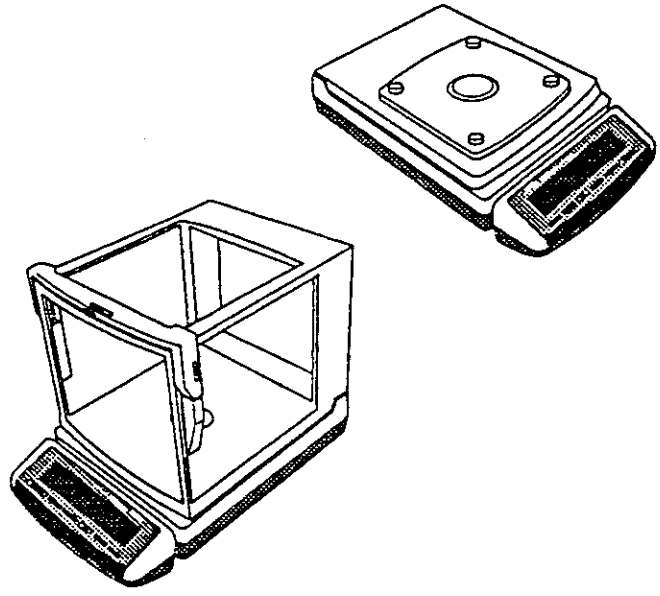
▶ After altering the '**year**', '**month**', and '**day**' digits, press the [PRINT] key.

○ You are returned to the time display in Step 2.



HX Series • Section B

Introduction



Welcome!

Thank You for Your A&D Purchase!

This is an owner's INSTRUCTION MANUAL for the A&D Electronic Balances,

❑ **HX-100** 101g x 0.0001g Range ❑ **HX-400** 410g x 0.001g Range

❑ **HX-3000** 3100g x 0.01g Range ❑ **HX-6000** 6100g x 0.1g Range

Electronic Balances are in one sense extremely simple products: they are very easy to use. In another sense they are rather complex in that they are high technology products, with many features available. This manual will try to explain how your balance works and how to get the most out of it in terms of performance.

The HX Series , multi-function, electronic balance is the product of years of research, design, development and in-field testing. It incorporates the latest advances in electronic and mechanical engineering and offers increased features, increased functions, high resolution and portability; all in a low profile balance base. Every care has been taken during the manufacturing process of this balance to ensure that it will perform accurately and reliably for many years.

Specifications

- Weighing units are **g** gram; **Lb** pound; **OZ** ounce (avoir); **Lb/OZ**; **OZt**; troy ounce; **dwt** pennyweight; **ct** carat; **mm** momme; **GN** grain; **t** tola; and **TL** tael. Counting and percentage modes are also standard.

Capacity x Resolution	HX-100	HX-400
GRAM	101 x 0.0001	410 x 0.001
OUNCE (OZ)	3.5 x 0.00001	14 x 0.0001
POUND (LB)	—	0.9 x 0.00001
Troy OUNCE (OZt)	3.2 x 0.00001	13 x 0.0001
Penny Weight (dwt)	64 x 0.0001	263 x 0.001
Carat (ct)	505 x 0.001	2050 x 0.01
Momme (mm)	18 x 0.0001	109 x 0.001
GRAIN (GN)	1558 x 0.002	6327 x 0.02
TOLA (t)	8.6 x 0.00001	35 x 0.0001
Tael (TL)	3.2 x 0.00001	10 x 0.0001
POUND/OZ	—	o.9Lb x 0.01 OZ
Weighing capacity	101g	410g
Minimum display	0.0001g	0.001g
Repeatability (Standard deviation)	0.00015g	0.001g
Linearity	± 0.0002g	± 0.002g
Sensitivity drift	± 3ppm/°C	
Stabilization time (Typical value)	Approx. 3.5 seconds	Approx. 1.5 seconds
Pan size	Φ3.4" (Φ85)	5.1" (□127)
Net weight	2.3lb (5.8kg)	9.5lb (4.3kg)
Display unit	g, Lb, OZ, Lb/OZ, OZt, dwt, ct, mm, GN, t, TL, cnt, % (percent display to the set weight)	
% minimum registered weight	0.01g	0.1g
% minimum display	0.01%, 0.1%, 1% (automatic switching)	
Operating temperature and humidity ranges	32°F to 104°F RH<85%	
Power supply	100, 200, 220, 240VAC as required (factory preset) 50/60Hz	
Display update rate	4 times/second (8 times/second at high-speed display)	
External dimensions	HX-100 201 (W) x 352 (D) x 249 (H) HX-400 201 (W) x 350 (D) x 62 (H)	

Capacity x Resolution	HX-3000	HX-6000
GRAM	3100 x 0.01	6100 x 0.1
OUNCE (OZ)	109 x 0.001	215 x 0.01
POUND (LB)	6.8 x 0.0001	13.4 x 0.001
Troy OUNCE (OZt)	99 x 0.001	196 x 0.01
Penny Weight (dwt)	1993 x 0.01	3922 x 0.1
Carat (ct)	15500 x 0.1	30500 x 1
Momme (mm)	826 x 0.01	1626 x 0.1
GRAIN (GN)	47839 x 0.2	92592 x 2
TOLA (t)	264 x 0.001	519 x 0.01
Tael (TL)	82 x 0.001	162 x 0.01
POUND/OZ	6Lb 13OZ x 0.01OZ	13Lb 7OZ x 0.01OZ
Weighing capacity	3100g	6100g
Minimum display	0.01g	0.1g
Repeatability (Standard deviation)	0.01g	0.1g
Linearity	± 0.02g	± 0.2g
Sensitivity drift	± 3ppm/°C	± 6ppm/°C
Stabilization time (Typical value)	Approx. 1.5 seconds	
Pan size	5.8" x 6.1 (145 x 153)	6.8" x 7.7" (169 x 193)
Net weight	11.7lb (5.3kg)	11.9lb (5.4kg)
Display unit	g, Lb, OZ, Lb/OZ, OZt, dwt, ct, mm, GN, t, TL, cnt, % (percent display to the set weight)	
% minimum registered weight	1g	10g
% minimum display	0.01%, 0.1%, 1% (automatic switching)	
Operating temperature and humidity ranges	32°F to 104°F RH<85%	
Power supply	100, 200, 220, 240VAC as required (factory preset) 50/60Hz	
Display update rate	4 times/second (8 times/second at high-speed display)	
External dimensions	201 (W) x 350 (D) x 62 (H)	

The following sections introduce you to some of the major features of your HX. Please take a moment to familiarize yourself with these items as they will be helpful for proper balance operation.

Features

- Memorizes the working condition of your HX series and extracts the operation pattern of the balance, obtains an optimum calibration timing and performs calibration automatically at that time.
- One Touch Automatic Calibration with motor driven internal calibration weight. Calibration can also be done using an external calibration mass (within weight limits).
- Comparator HI & LO limits, can be set using the optional AD-1652 Wireless Remote Keyboard, or a computer via the RS-232C Serial Interface .
- Using the comparator function, a built-in buzzer can sound when weight exceeds set limits (internal comparator displays "+", "–", and "OK").
- Interval data output settings, with clock function.
- The display unit and weighing unit can be separated. Depending on the purposes of use, the instrument can be set up in 3 way; united, stand-up, and separated.
- An orange bar graph shows a current weight condition with respect to weighing capacity. It represents visually how much can be loaded further.
- The balance is equipped with a built-in underhook for relative density experiments.

Accessories & Options

- **AD-1652 WIRELESS REMOTE KEYBOARD Accessory**
  Optional infrared Remote Keyboard expands HX functions with a 3m, 60° operating range for remote or isolated spaces. It has the same keys as the HX series balance, plus many more, and a 10 key input.
- **VIBRATORY SPOON AD-1651 Accessory**
  Handy vibratory spoon for medical compounds or powders. Vibration frequency variable from 110Hz to 230Hz. Automatic weighing adjustment with feed control output from the HX series balance.
- **MULTI-FUNCTION PRINTER AD-8121 Accessory**
  A quiet, sharp, clear printout serial impact dot-matrix printer with a full range of statistical functions: Weight Data, Total Weight Data, Counting Data, Total Counting Data, Numbers of Operations, Standard Deviation, Range, Average and Statistical calculation on up to 999 data blocks.
- **Option OP-04**
  Comparator/current loop output board
- **Option OP-05**
  Vibratory spoon AD-1651 connection board
- **Option OP-06**
  Analog Output Board
- **Option OP-10**
  Breeze Break for the HX-400
- **Option OP-11**
  Breeze Break for the HX-3000

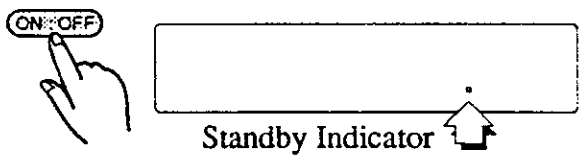
Standby and Operating Modes

The balance is always warmed-up and ready-to-use as long as the AC adaptor is connected. This is the normal state and does no harm to the balance. Please warm-up (plug-in) the balance for one hour before use.

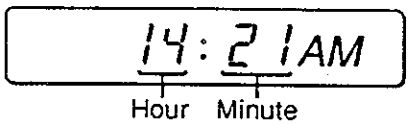
WARM-UP YOUR BALANCE BEFORE USE!

- The [ON:OFF] key switches the display ON & OFF. The display can also be turned ON & OFF via the AD-1652 Remote Keyboard, or using a computer via the RS-232C Serial Interface .
- **Standby Mode** is: when the balance display is OFF, but power is supplied via the AC Adaptor. The last decimal stays lit as an indicator.

▣ Use the [ON:OFF] key to turn the display ON or OFF. When the balance is in Standby mode, a period appears in the Display as an indicator that power is connected.



❑ **Time Display**
If you want the current time to be displayed during the "Display OFF State", set the internal setting **"oFF x c1"** to **"oFF 1c1"** . (see C1•Display in the section C-Parameter Settings.)



The HX balance has two main modes: *Standby Mode* and *Operating Mode*. In day-to-day operation, Standby Mode is normal when the balance is not in use. This keeps the weighing mechanism warmed-up for accurate readings, and also keeps the balance's temporary memory active. If the balance is not going to be used for a long period of time, then it may be appropriate to disconnect the main power.

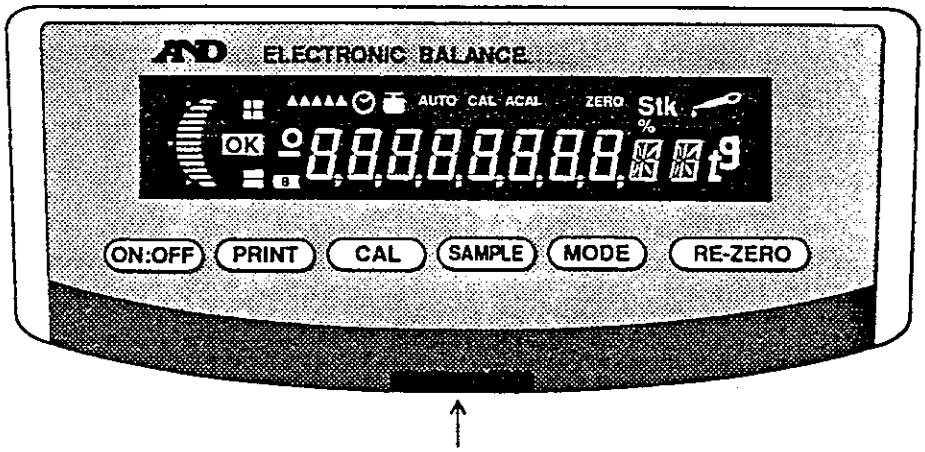
C-Parameters

Your HX balance has a number of software parameters that enable you to select the best weighing features for your needs. These settings control how the balance responds to various commands, operations and options. C-Parameters are listed on page G•2 and can be set using the method as shown in the section CHANGING C-PARAMETERS SETTINGS. The individual settings for each group are detailed in the section following THE C-PARAMETERS SETTINGS.

ACAI Automatic Counting Accuracy Improvement

The ACAI™ (Automatic Counting Accuracy Improvement) function is an exclusive A&D software advancement that re-calculates the unit weight as more pieces are added, to improve count accuracy. This is a very useful function when counting light items, especially when there is a large number to be counted.

The Display and Keyboard



Extended Controller AD-1652 (Option),
Wireless Remote Keyboard Sensor

	Bar graph ❑ This bar graph is available as a yardstick to avoid exceeding the weighing capacity.	OK	Comparator indication ❑ Indicates the too heavy, too light, and accepted conditions of the weighed substance with "+", "-", and "OK", respectively.
▲▲▲▲▲	Setting monitor mark ❑ The number of illuminated setting monitor marks " " represents the ambient environment of the balance and its corresponding internal setting related to the response characteristic of the balance.	○	Stability mark ❑ Indicates that a variable is stable.
B	Battery mark ❑ Informs you if the supply input voltage is too low.		Clock mark ❑ Illuminated during interval output. Indicating wether the data is output or not.
	Weight mark ❑ Blinks when you are prompted for a set value entry from the balance side in the comparator mode or during manual calibration.	AUTO	One touch calibration ❑ Illuminated during one touch calibration.
	Syringe mark ❑ Illuminated during feeding mode.	%	percent mark ❑ A weighed result is displayed in terms of percentage against the set 100% weight value.
cnt	The balance counts by calculating the weight of one piece -weight called the unit weight, then applying it to the total weight of what you are trying to count.	ACAI	Automatic Counting Accuracy Im provement function re-caluculates the unit weight as more pieces are added, to improve count accuracy.

- ❑ Care should be taken not to scratch or break the display and Remote Keyboard Sensor windows.
- ❑ Press on the middle of the keys to activate them, firmly but not forcefully. You will hear a faint '*beep*' when the key has been activated.

The ON:OFF Key

(ON : OFF)

The [ON:OFF] key switches the display ON and OFF but does not cut the power to the balance - so the balance will remain on standby (warmed-up) while the AC adaptor remains connected (See POWER SUPPLY NOTES section). The HX series uses a cobalt blue fluorescent display. You can make sure that all the display segments are working properly by:

1

▶ With the display OFF, press and hold the [RE-ZERO] key.

2

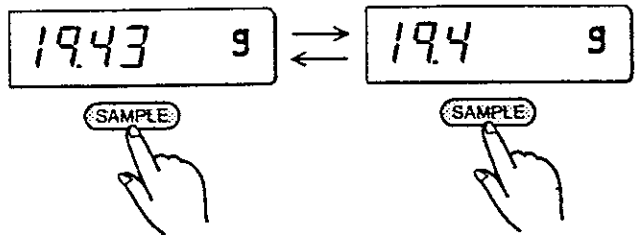
▶ While holding the [RE-ZERO] key, press the [ON:OFF] key. All the display segments will come ON (Press the [ON:OFF] key again when finished).

The SAMPLE Key

(SAMPLE)

The [SAMPLE] key can be used to register a sample count (eg: 10 units) in counting "cnt" mode or register 100% in percentage mode.

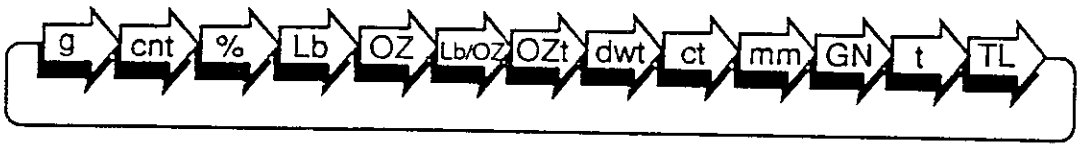
- ❑ Pressing the SAMPLE key in the "g" (gram) mode rounds the lowest digit to the nearest whole number. Pressing the SAMPLE key again returns you to the original number of digits.



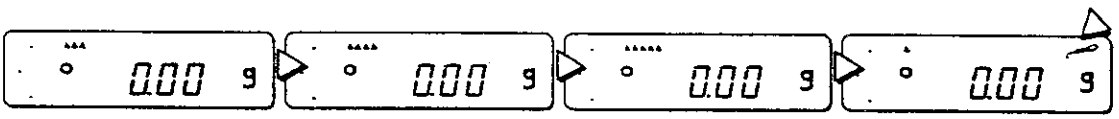
The MODE Key

MODE

- Press the MODE key quickly to rotate through the balance weighing modes.
- The weighing units are **g** gram; **Lb** pound; **OZ** ounce (avoir); **Lb/OZ**; **OZt** troy ounce; **dwt** pennyweight; **ct** carat; **mm** momme; **GN** grain; **t** tola; and **TL** tael (see the WEIGHING UNITS AND THEIR CONVERSIONS section (page B•14) for more information concerning the different weighing unit). There is also a percentage mode **%**, and counting mode **cnt.**
- The MODE key changes the units in the following sequence:



- When the first setting monitor mark (▲) appears, press and hold the MODE key for about two seconds. Then, the next setting monitor mark (▲) will appear. When pressing and holding the MODE key, the setting monitor appears sequentially, one per second.
  You can get a quick setting of response characteristic / environment.
  Pressing the MODE key again enters the "feeding mode".
  Press the MODE key repeatedly until five setting monitor marks (▲) have been displayed. Then, pressing the MODE key once again enters the "feeding mode".



- In the above "feeding mode", pressing the MODE key twice returns you to the normal mode.

The CAL Key

CAL

The [CAL] key starts the calibration process. From the normal weighing mode, with nothing on the weighing pan and the balance level, press the [CAL] key and the balance will calibrate itself!

The PRINT Key

PRINT

The [PRINT] key can be used to transmit data to the AD-8121 printer, or to a computer, via the RS-232C.

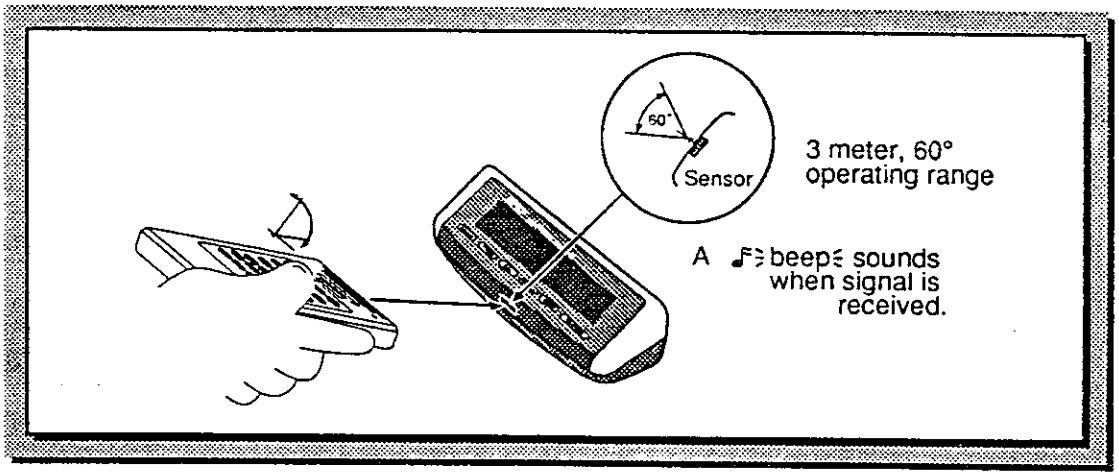
The RE-ZERO Key

RE-ZERO

- The [RE-ZERO] key returns the balance to the center of ZERO when the weighing pan is empty, and can also TARE total weight (sample and container), RE-ZEROing the display up to the maximum capacity of the balance.
- When the display shows a small deviation from ZERO and the weighing pan is empty (and TARE is not being used), then press the [RE-ZERO] key to return the display to ZERO.

If you are using an AD-1652 Wireless Remote Keyboard, remember that the balance sensor has a 3-meter, 60° operating range.

⚠ You will hear a faint '♪beep♪' if the key has been successfully received.

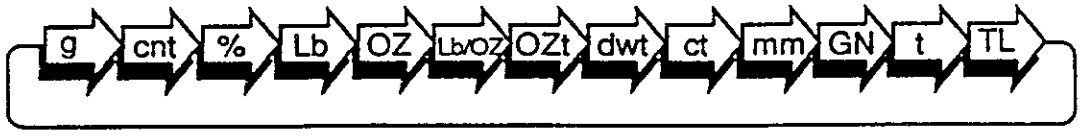


Selecting Weighing Units

MODE

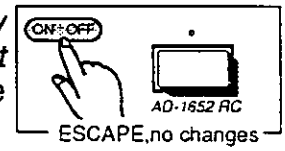
The HX series balances are multi-functional instruments where switching between the weighing units contained in the balance software is done by pressing the [MODE] key.

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 regular 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):



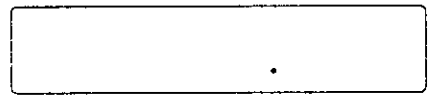
To Turn Weighing Units OFF or ON

In this procedure, *all available weighing units are initially turned OFF – you will have to select all the units you want to use!* You can escape at any time by pressing the [ON:OFF] key.



1

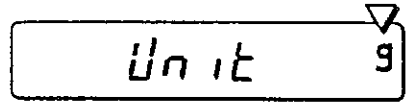
▶ With the display **OFF:** Press and hold the [MODE] key



2

▶ While holding [MODE] key, press the [ON:OFF] key.

○ "Unit **g**" will be displayed.



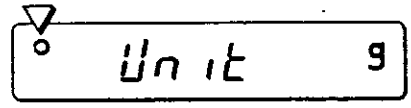
3

TIP

If you want only grams for your weighing mode, press the [PRINT] *key - only "g" will be enabled and you will exit to the weighing mode.*

▶ If you wish to keep "g", press the [SAMPLE] key.

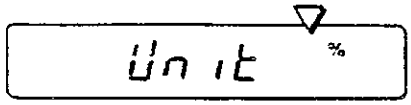
○ The "**O**" stability indicator will come ON, indicating that the unit is enabled.



4

▶ Press the MODE key to move to the next unit.

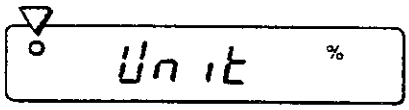
○ "Unit %" will be displayed.



5

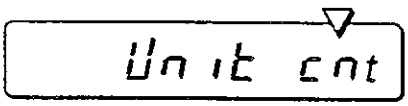
▶ If you wish to keep "%" as a mode, then press the SAMPLE key.

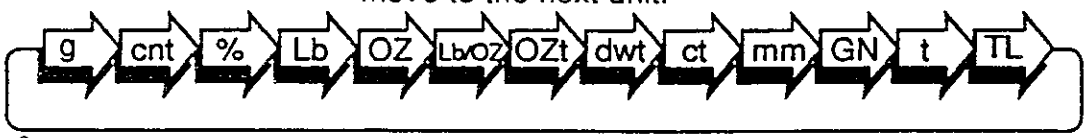
○ The "**O**" will come ON, the unit is enabled.



– or –

▶ If you want to skip "%" as a mode, then press the MODE key instead, to move to the next unit.





⚠ The weighing units/modes are **g** gram; **Lb** pound; **%** percentage mode; **cnt** counting mode; **OZ** ounce (avoir); **Lb/OZ**; **OZt** troy ounce; **dwt** pennyweight; **ct** carat; **mm** momme; **GN** grain; **t** tola; and **TL** tael.

6

Continue enabling the modes using the the MODE and SAMPLE keys until you have all weighing units desired.

⚠ Remember: *all available weighing units are turned OFF at this point – you will have to select all the units you want to use!*

7

▶ When you have the units you want, press the PRINT (PRINT A/K on the AD-1652 Remote) key to save any changes and exit to the weighing mode.

– or –

▶ Or, if you want to exit without saving any changes: press the ON:OFF key to exit without saving and go to display OFF state.

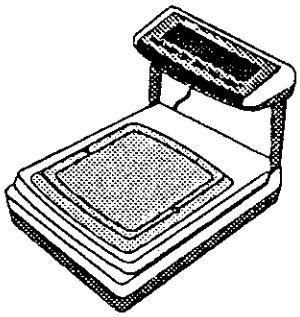
Weighing Units and Their Conversions

Abbrev.	Name In Full	Conversion
Lb	Pound	453.592 37 g
OZ	Ounce (Avoir)	28.349 523 125g
OZt	Troy Ounce	31.103 476 8g
dwt	Pennyweight	1.555 173 84g
ct	Metric Carat	0.2g (5=1 gram)
mm	Momme (Japan)	3.75g (10=1 Tael)
GN	Gtain (UK)	0.064 798 91g
t	Tola (India)	11.663 803 8g
TL	Tael (Taiwan)	37.5g
TL	Tael (Sing.)	37.793g
TL	Tael (HK)	37.7994g

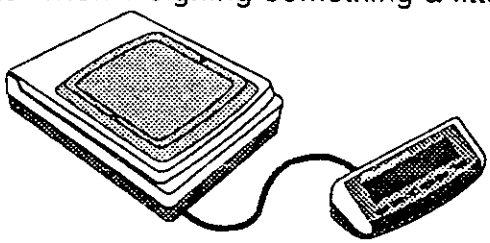
Separating the Display Units

The display unit of the HX series can be separated from the main body depending on the working environments.

- ❑ Unit for normal use.
- ❑ Stand up when a working space is narrow.



- ❑ Separate when weighing something a little large.

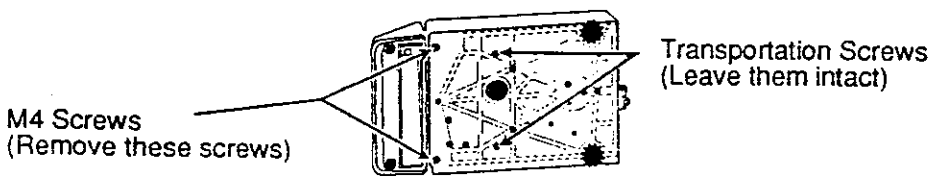


Detaching the Display Unit

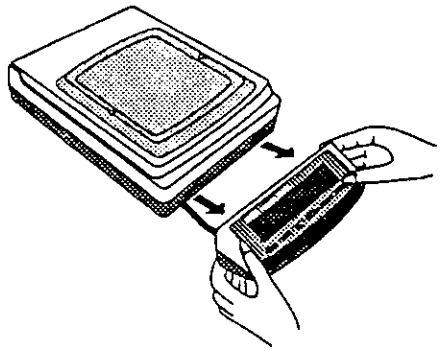
⚠ When the plastic transportation screws (internal weight setscrews) have been already removed, replace them prior to turning the balance over or on it's side.

1

- ▣ Remove the screws (M4 screws) from, the bottom of the HX series.
- ❍ You can see that the cable connecting the display unit and main body is placed in the bottom groove of the balance.

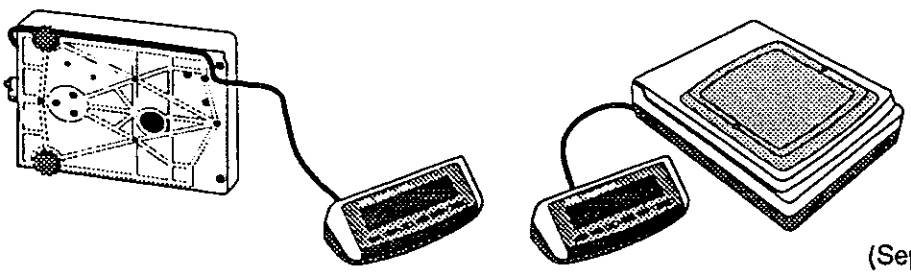


2 ▶ Remove the display assembly by pulling it straight out to the front, as there are retainer locks that grip the support tabs on the display. Some resistance to movement should be expected.



---

3 ▶ Remove the cable from the groove, which connects the display unit to the main body.

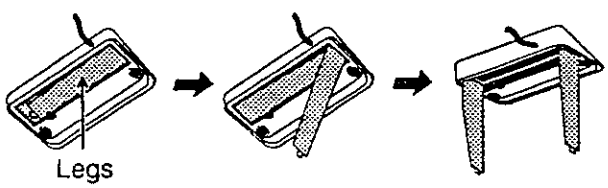


(Separated Type)

▶ Before using, remove the internal weight set screws (transportation screws). This must be done with the balance right side up, not on it's side or inverted.

---

4 ▶ When standing up the display unit, use the legs folded under it.



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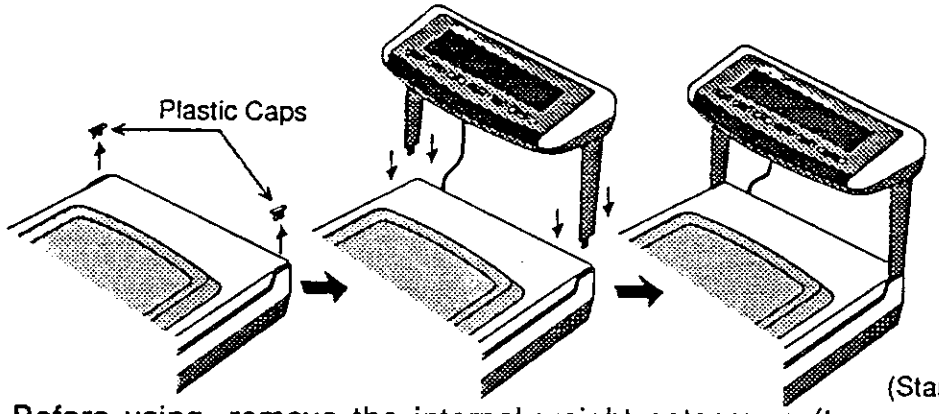
5 ▶ Remove the plastic caps located in the rear of the HX main body and insert the legs of the display unit into the holes.

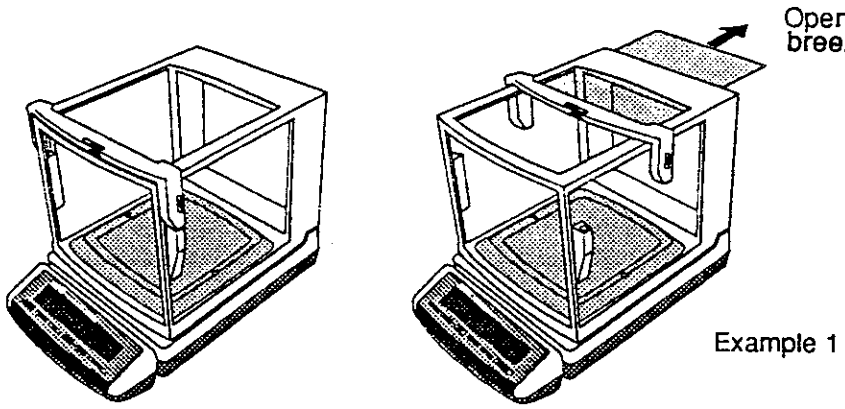


(Stand-up Type)

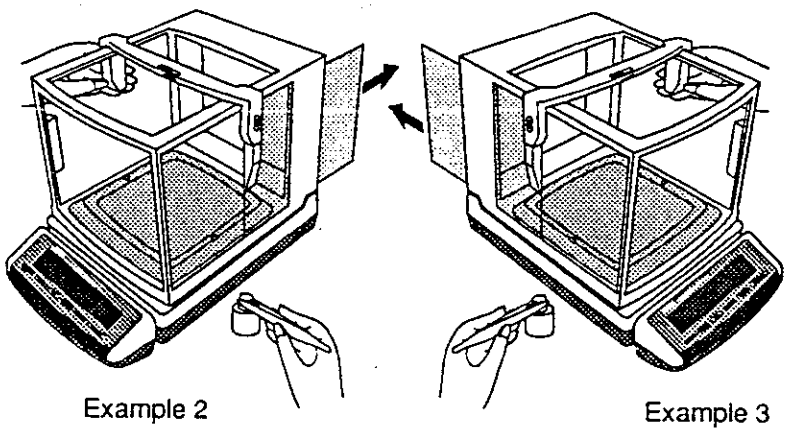
▶ Before using, remove the internal weight setscrews (transportation screws) this must be done with the balance right side up, not on it's side or inverted.

Using the Glass Breeze Break Conveniently

The glass breeze break can be opened/closed in various ways in order to improve operability of the HX series. Examples 2 and 3 below show convenient ways of use.



Example 1

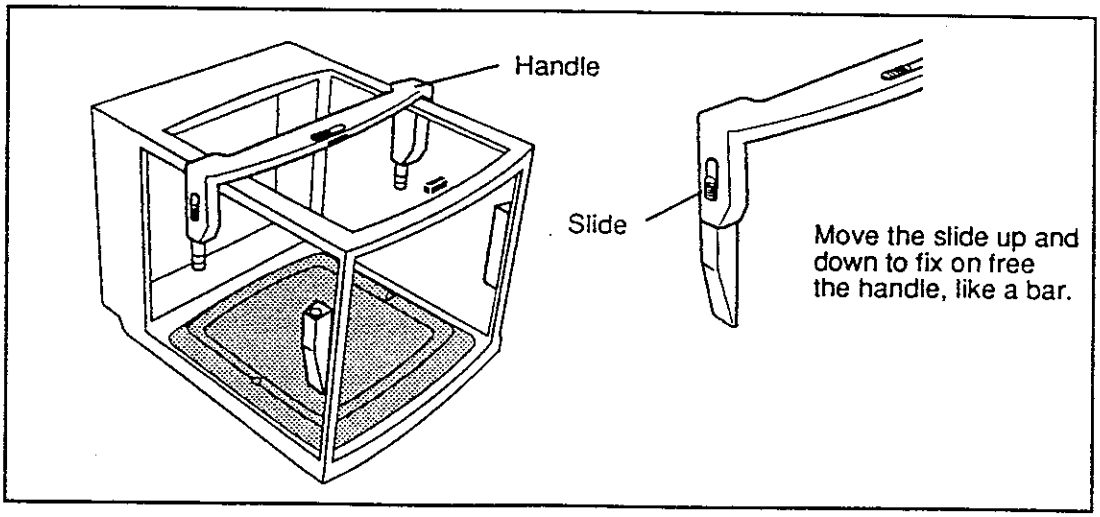


Example 2

Move only the handle with your left hand and open the right-side glass. At the same time, you can place a sample on the weighing pan with your right hand.

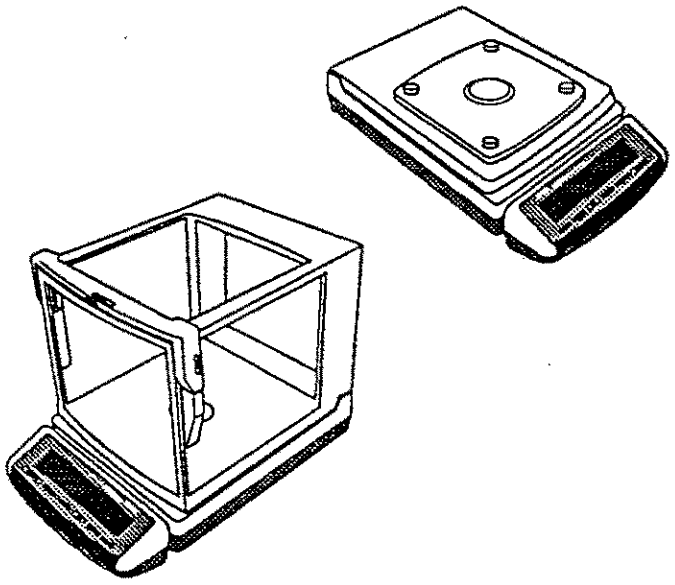
Example 3

Move only the handle with your right hand and open the left-side glass. At the same time, you can place a sample on the weighing pan with your left hand.



HX Series • Section C

Calibration



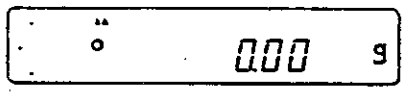
Intelligent Calibration

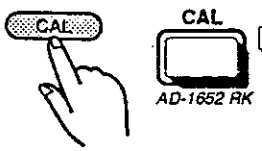
This mode memorizes the working condition of the balance and extracts its operation pattern, it helps you obtain an optimum calibration timing and enables automatic calibration at that time. The balance is automatically calibrated periodically without interrupting its weighing work, and you will be freed from troublesome calibration work.

- In internal setting, select the CAL setting "CAL 0 c4" "ENABLE ALL CAL." (Upon shipment, "ENABLE ALL CAL." has been selected.)
- In order to operate intelligent calibration, it is recommended to leave the balance turned on even when it is not used. In this case, the display may be left turned off.
- When you want to disable intelligent calibration, select the CAL setting "CAL I c4" "DISABLE INTELLIGENT CAL." (Even if intelligent calibration is disabled, internal calibration is performed by using the [CAL] key.)

One Touch Calibration

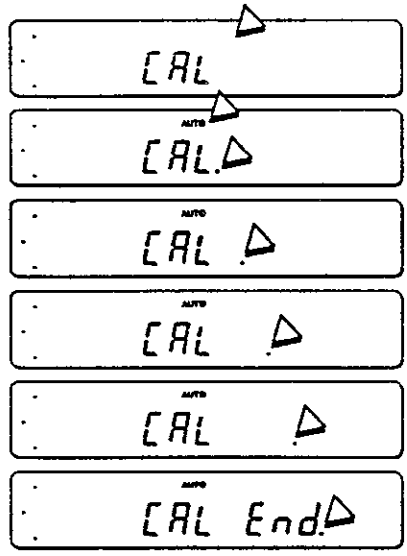
1 ▶ Have the display ON, in normal weighing mode and stable. Check that there is nothing on the weighing pan and the balance is level.



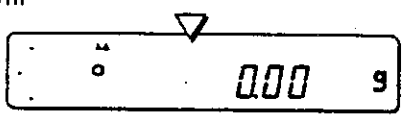
2 

▶ Press the [CAL] key.

○ You will hear the calibration mechanism working as the display goes to CAL. A decimal point will move to show that calibration is in progress.



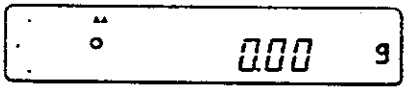
3 ▶ When the balance is finished calibrating it will return to normal weighing mode.



Manual Calibration

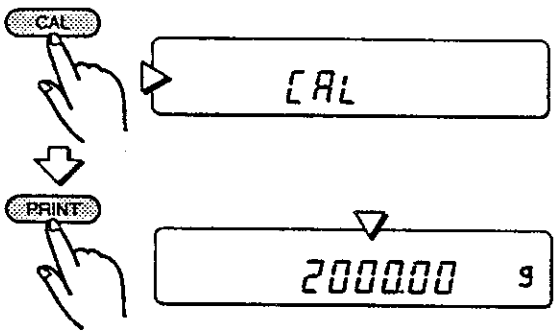
You can easily calibrate your HX balance by using your own calibration mass. If you want to enter the precise weight of the calibration mass, or what to use a different size mass, see the following page for instructions (ENTERING A DIFFERENT CAL MASS VALUE).

1 ▣ Have the display ON, in normal weighing mode and stable. Verify that there is nothing on the weighing pan and the balance is level.



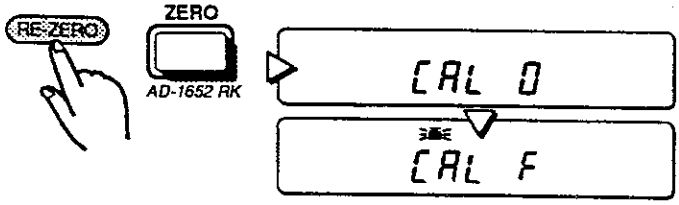
2 ▣ Press the [CAL] key, and then immediately press the [PRINT] key.

○ The last set CAL weight will be displayed ("100g for HX-100, 200g for HX-400, 2000g for HX-3000, 5kg for HX-6000" are the factory setting). If you wish to change this setting see page C-4.



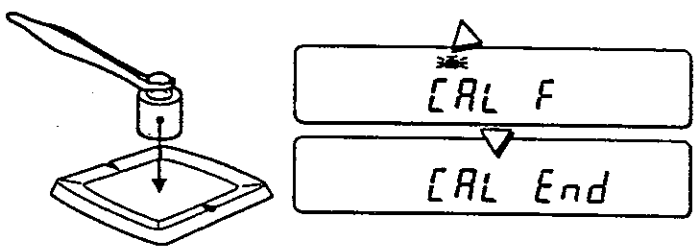
3 ▣ Press the [RE-ZERO] key.

○ "CAL 0", then the "▀" mark, and "CAL F" will be displayed.

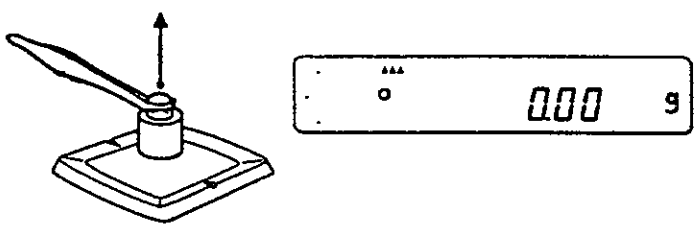


4 ▣ When "CAL F" and "▀" are displayed, place the calibration mass on the pan.

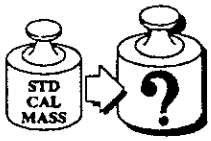
○ The "▀" mark, and then "CAL End" will be displayed.



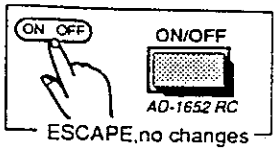
5 ▣ Remove the calibration mass and the display will return to normal weighing.



Entering a Different CAL Mass Value

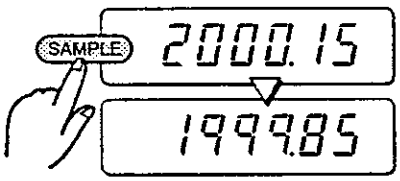


If you want to enter the precise weight of the calibration mass, or want to use a different size mass, then between Step 2 and 3 above, use the keys as shown below to enter the new mass value.



HX-100 : 100g ±15digit
HX-400 : 200g, 300g, 400g ±15digit
HX-3000 : 2000g, 3000g ±15digit
HX-6000 : 3kg, 4kg, 5kg, 6kg ±15digit

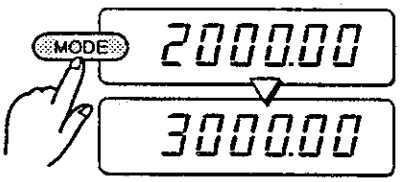
▶ Press the SAMPLE key to increase value by +1 digit.



(For HX-3000)

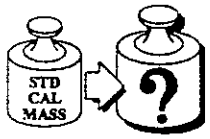
▶ Press the MODE key.

Pressing the MODE key alternates the display between "2000" and "3000".



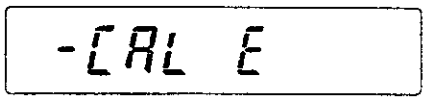
(For HX-3000)

Calibration Notes and Errors

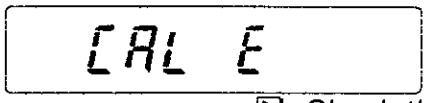


⚠ If you are using two calibration masses (say a 100g and a 200g to make 300g) a "-CAL E" will be given after you load the first mass – but "CAL F" will be displayed when you place the second on the weighing pan.

❑ **CAL Errors:**

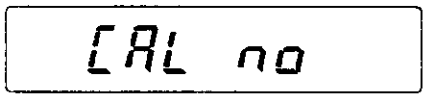


'-CAL E' will be displayed if the calibration mass is too light.



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

▶ Check the mass weight, look for something touching the weighing pan. Press the [RE-ZERO] key, then the [CAL] key (to use the balances' internal CAL mass) before trying again with an external CAL mass.

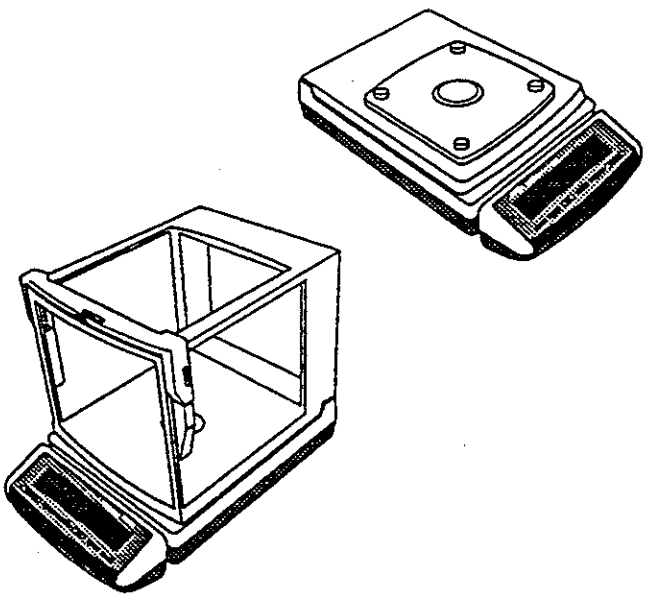


'CAL no' will be displayed if the balance is not stable while weighing the calibration mass.

▶ Check for excessive vibrations or drafts. Press the [RE-ZERO] key or see BEST CONDITIONS FOR WEIGHING.

HX Series • Section D

Weighing Mode



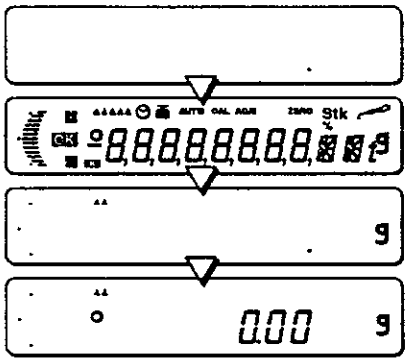
Simple Weighing

For accurate weighing, please warm-up the balance for an hour before using and try to meet the BEST CONDITIONS FOR WEIGHING.

1

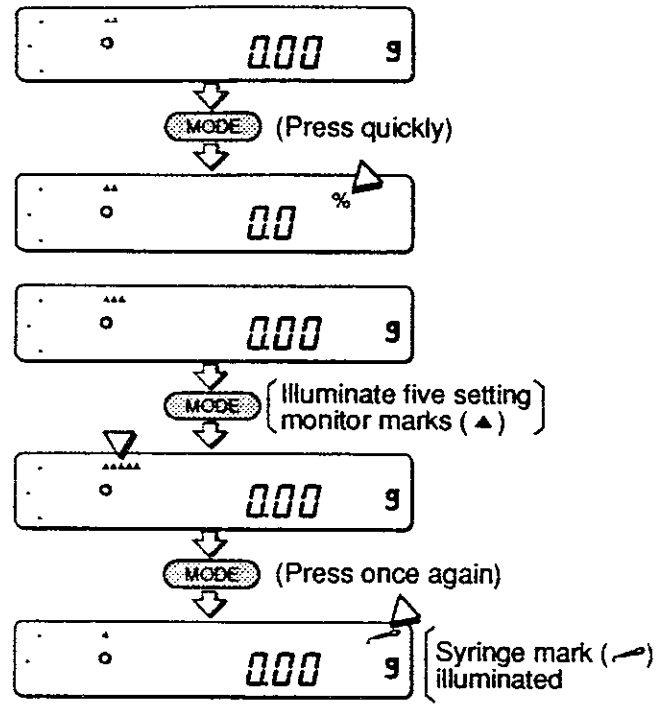
▶ Press the ON:OFF key.

- The display will come ON with all segments lit;
- The display will blank for a moment while the balance zero's;
- Moments later, '0' is displayed, the 'o' stability indicator and the '▲' internal setting monitor (Cond x co) will come ON.

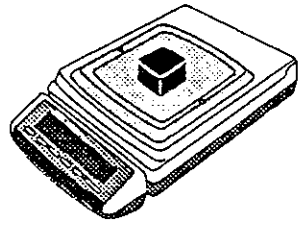


2

- Press the MODE key quickly as required to select a unit and the weighing mode.
- Press the MODE key quickly to rotate through the balance weighing modes.
- When the first setting monitor mark (▲) appears, press and hold the MODE key for about two seconds. Then, the next setting monitor mark (▲) will appear. When pressing and holding the MODE key, the setting monitor appears sequentially, one per second.
- Illuminate five setting monitor marks (▲) and press the MODE key once again. You will be placed in the feeding mode, and at the same time, the syringe mark ( ) will be illuminated.

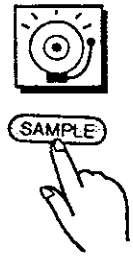


Weighing mode

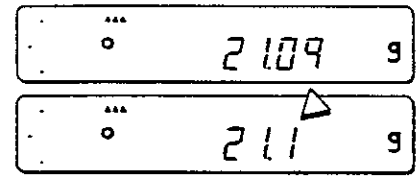


▶ Place item(s) to be weighed on the pan, *wait for the round stability indicator to come ON* and read the weight.

Wait for Stability!

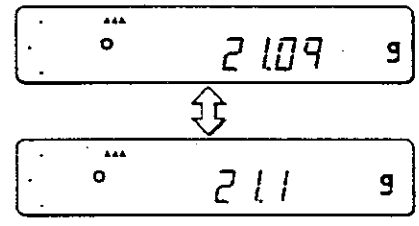


▶ When the unit is gram (g), pressing the SAMPLE key can display a variable, rounding the lowest digit .



❍ The lowest digit is rounded to the next number.

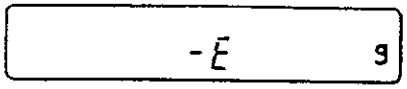
❍ Every time the SAMPLE key is pressed, the pre-rounded and post-rounded variables can be displayed alternately.



Weighing Errors

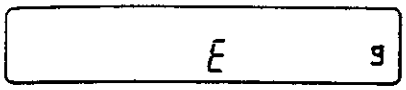
If there are stability problems, the environmental parameters can be adjusted to meet different conditions, please see the C0•Environment parameter group.

❑ **Weighing Pan Error:**



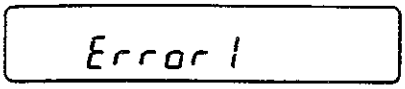
○ '**-E**' will be displayed if the the weighing pan or pan support are not installed.

❑ **Overload Error:**



○ '**E**' will be displayed if the weight is beyond the balance capacity.

❑ **Stability Error:**



'**Error 1**' will be displayed if the balance can not become stable while weighing.

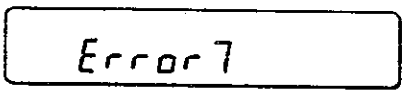
▣ Check for excessive vibrations or drafts. Press the [RE-ZERO] key and see BEST CONDITIONS FOR WEIGHING.

❑ **Memory Error:**

'**Error 6**' will be displayed if the balance has a memory problem.

▣ Disconnect and connect AC power and try again. If error persists, call for service.

❑ **Memory Error:**



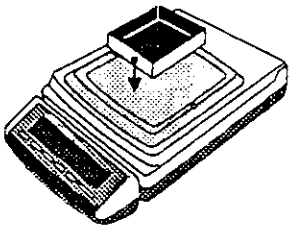
'**Error 7**' will be displayed if the balance has a memory problem.

▣ Disconnect and connect AC power and try again. If error persists, call for service.

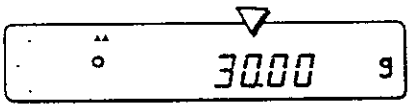
Using RE-ZERO to Tare (or TARE key on RK)

Weighing into a Container

1



▶ Place a container on the weighing pan.



○ The display will show the container weight.

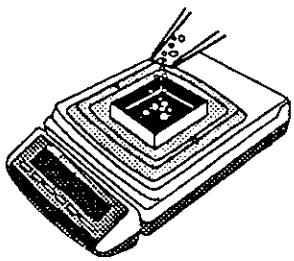
2

AD-1652 RK

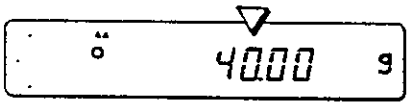
▶ Press the RE-ZERO to cancel the weight.

○ The display goes to zero.

3



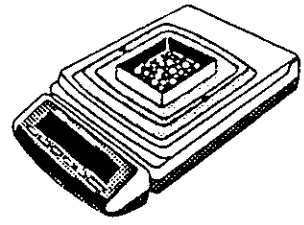
▶ Fill the container until the target weight is reached. *•When adding more than one ingredient to the container, press the* RE-ZERO *key after each.*



○ The display will show the sample weight.

Weighing Out of a Container

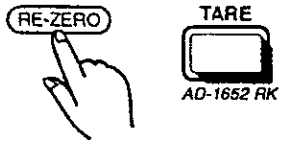
1



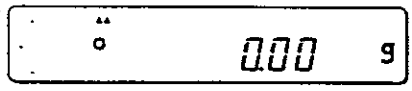
▶ Place a full container on the weighing pan.

○ The display will show the weight of the container and its contents.

2

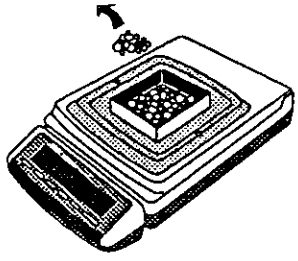


▶ Press the RE-ZERO (TAPE$^{R}_{K}$ *on AD-1652 Remote*) to cancel the weight.

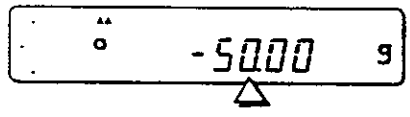


○ The display goes to zero.

3



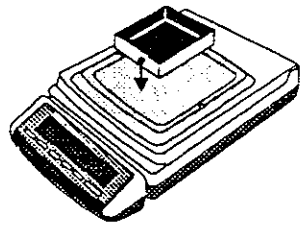
▶ Remove until target weight is reached, as shown by the negative display.



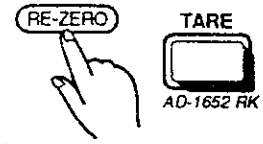
○ *When subtracting more than one ingredient from the container, press the RE-ZERO key after each.*

Weighing Out, Goal Remains in Container

1

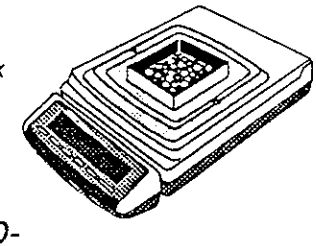


▶ Place a container on the weighing pan.



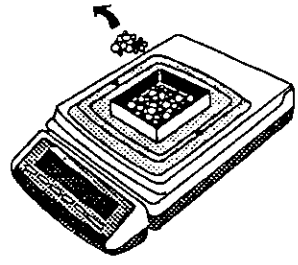
▶ Press the RE-ZERO (TAPE RK *on AD-1652 Remote)* to cancel the weight.

○ The display goes to zero.

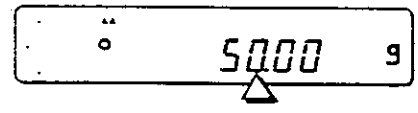


▶ Fill the container (the container may be removed and filled outside the weighing chamber).

2

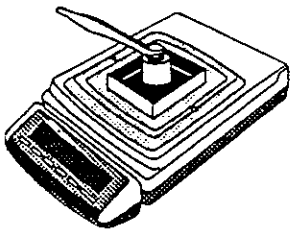


▶ Remove until the target weight is reached.

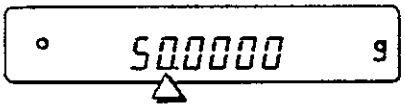


Deviational Weighing (Difference from an Ideal)

1

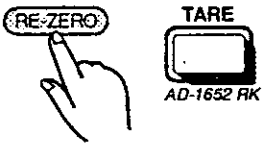


▶ Place a reference object (an ideal) on the weighing pan.

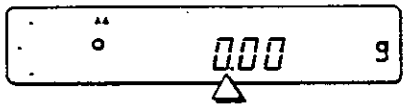


○ In this case, an object that will be weighed next should ideally weigh 50g.

2

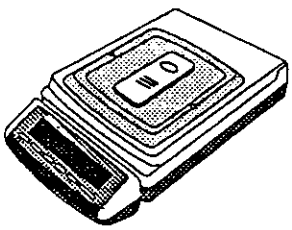


▶ Press the RE-ZERO (TAPE R/K *on the AD-1652 Remote*) to cancel the weight.



○ The display goes to zero.

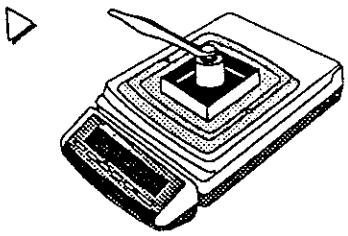
3



▶ Comparative objects will now show their deviation from the reference weight (zero) by a plus or minus weight.

○ The bar is -0.0003g under the ideal weight of 50g.

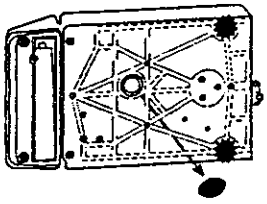
⚠ If you want to use a container, you would also put it on the weighing pan in Step 1.

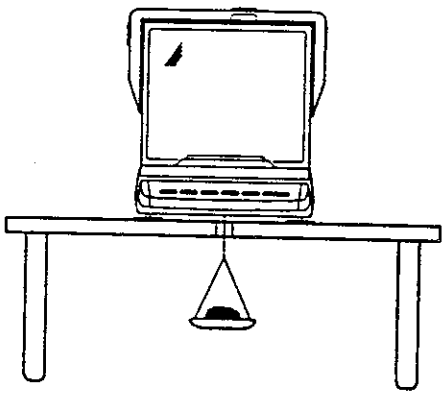


Underhook Weighing Density Determination

The HX Series comes equipped with a standard built-in underhook. This makes density determination a relatively simple matter. You may hang a light-weight weighing harness from this hole or thread a strand of fishing line through it. For best results re-calibrate the balance with the harness fitted. 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. In either event take care to exclude drafts with a breeze break around the apparatus.

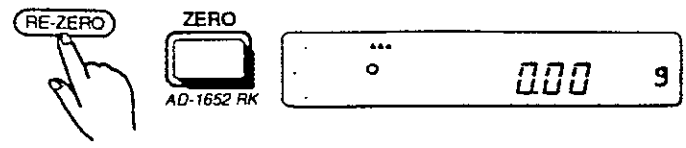
You can find the relative density (specific gravity) of a metal or some other material from its loss in weight when weighed in water. Because one gram of water is almost exactly one cubic centimeter in volume, the loss in weight (floating weight through displacement) associated with weighing an object in water is in proportion to the object's volume. By dividing the object's weight in air by the loss in weight in water (volume), you can find the relative density of the object (expressed as g/cm^3).





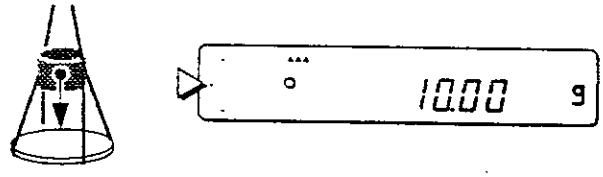
Underhook Weighing Example

1 After you have prepared the weighing mechanism: Press the RE-ZERO key to cancel the mechanisms' weight.

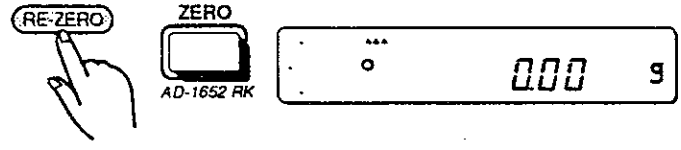


2 Place an object on the weighing mechanism and record the weight.

- In this example, the mass weighs 10g in the air.

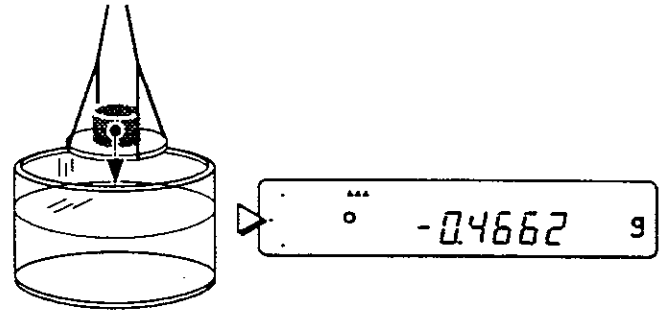


3 After recording the weight: Press the RE-ZERO key to cancel the weight of the mass.



4 Lower the object into water at 4°C (maximum density).

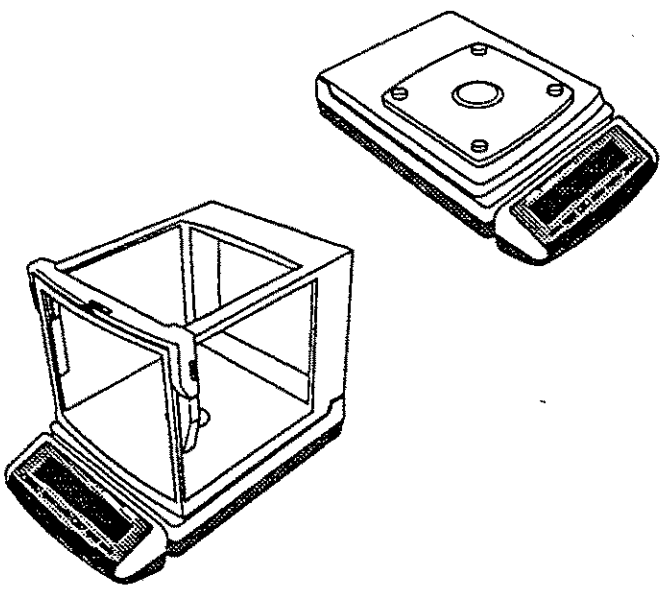
- In this example, the mass weighs -0.4662g in water, which is almost the same as 0.4662 cm^3.



5 Compute: 10.0000g÷0.4662cm^3≈21.45g/cm^3. The mass is most likely platinum.

HX Series • Section E

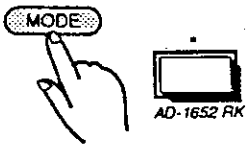
Counting Mode



'cnt' Counting Mode

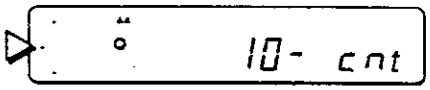
The HX balance counts by calculating the average weight of one piece-weight called the ***unit weight***, then applying it to the total weight of what you are trying to count. A&D has added exclusive software called **ACAI™** *Automatic Counting Accuracy Improvement* that constantly updates the unit weight.

1 ▶ Select "cnt" with the MODE key.

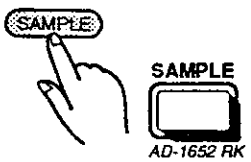


a) If you see this display, then a previous count weight has been entered, continue to Step 2.

b) If you see this display: continue from Step 3.

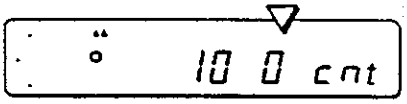


2

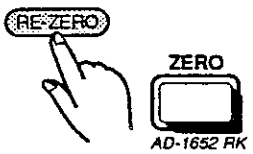


▶ Press the SAMPLE key (also see step 1b).

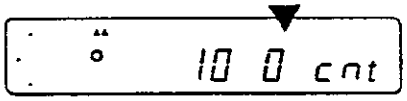
○ "10 0 cnt" will be displayed.



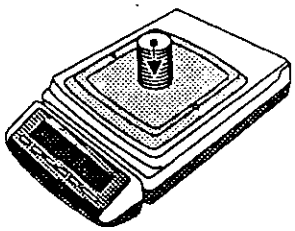
3



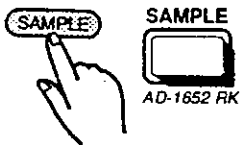
▶ Press the RE-ZERO key to ZERO the display.

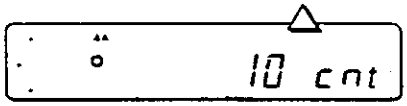


4



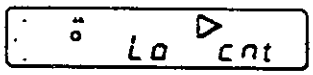
▶ Place 10 units on the pan: and press the SAMPLE key.



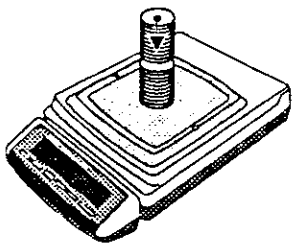


○ "10 cnt" will be displayed indicating the sample you have on the pan.

○ **'Lo cnt'** will be displayed if the unit weight is too small: less than 0.01g. The display will return to the "10 - cnt" display.

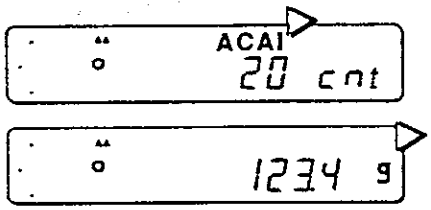


5



- ❑ Now, to activate the **ACAI**, you will need to *approximately* double the sample. The number you add can be an estimate, but must be between 3 and 16 additional units (see following ***ACAI Table*** just below).
- ▣ For this example we will add 10 more units (double the sample).

- ❍ "20 cnt" will be displayed and **ACAI** should appear meaning count was within the **ACAI** range.



6

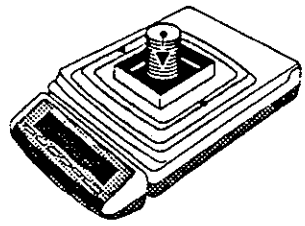
At this point please refer to the ***ACAI Table***, or the following section: **ACAI** OPERATION, concerning the number of units that need to be added to satisfy **ACAI**. A rule of thumb is to approximately double the previous count until you reach your target. Make sure that the **ACAI** indicator appear as you build. When you have reached your target: count!

ACAI Table

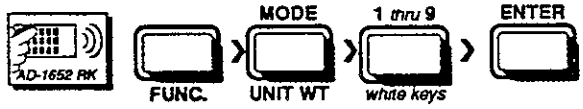
The table below shows that with an approximate number of sample unit "Pcs" on the weighing pan - to keep **ACAI** working, you add more units within the **ACAI** Addition Range shown, you don't have to be exact.

Pcs On the Weighing Pan	ACAI Addition Range
10	13 → 26
20	23 → 47
30	33 → 65
40	43 → 81
50	53 → 95
60	63 → 108
70	73 → 118
80	83 → 128
90	93 → 128
100	103 → 148
over 100	104 → ...

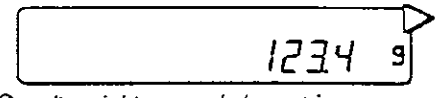
Counting Mode Notes



If you want to use a tared container: Load the container before pressing the RE-ZERO key in Step 3 (you may also use the ZERO or TARE key on the AD-1652 Remote Key-board).



Example:
123.4g
as unit weight



⚠ *unit weight can only be set in grams, and **ACAI** does not operate.*

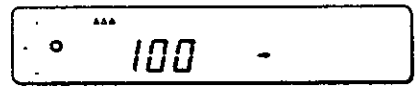
- The Unit weight can also be set digitally using the RS-232C Serial Interface. *Unit weight can only be set in grams and the **ACAI** will not operate.*

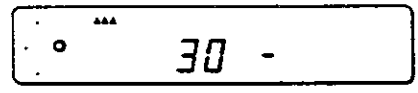
- The unit weight memory is non-volatile, even though the AC adaptor is disconnected, so unit weight is remembered (except: if you turn weighing units OFF or ON).

To Increase The Counting Accuracy

To increase the counting accuracy, refer to the following procedures instead of the **Step 3** to **Step 4** on page **E•2**.

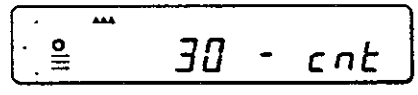
3 ▶ Press the PRINT key to rotate the piece count from 10 to 100 to set the actual piece count.





Example: 30 units were selected.

4 ▶ Place the 30 units on the pan.
○ "30-cnt" will be displayed.



▶ Press the SAMPLE key to register the Unit Weight.
○ "30cnt" will be displayed.

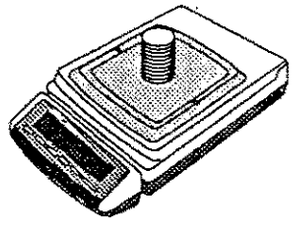
(Units on the pan will be displayed.)

Using ACAI

⚠ *Do not take any pieces off until the end of the **ACAI** procedure.* If you do, **ACAI** will stop operating and you will have to start again to use the **ACAI**. If you are unfamiliar with **ACAI**, please read the next section before you start.

⚠ You don't have to count out the pieces when you add, just stay within the **ACAI** range.

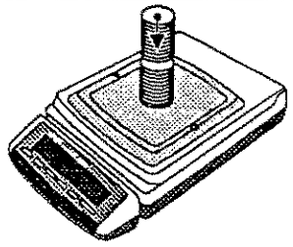
1



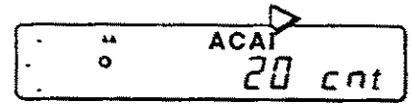
⚠ *We are at the same place as Step 5 on page E•2.*

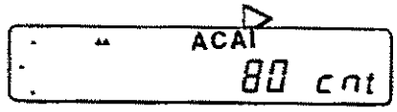
To start **ACAI** operation, unit weight must be registered *and the sample still on the weighing pan.*

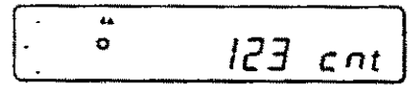
2



Add pieces within the nearest **ACAI** range, following the table below.





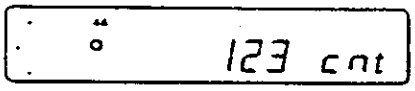


As you add, the **ACAI** indicator will be ON as long as you are in range.

When you stop adding, the stable indicator comes ON, the **ACAI** indicator will disappear.

Pcs On the Weighing Pan	ACAI Addition Range
10	13 → 26
20	23 → 47
30	33 → 65
40	43 → 81
50	53 → 95
60	63 → 108
70	73 → 118
80	83 → 128
90	93 → 128
100	103 → 148
over 100	104 → ...

As you add, the **ACAI** indicator will be ON as long as you are in range.



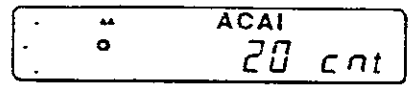
When you stop adding, the stable indicator comes ON, the **ACAI** indicator will disappear.

3

- Continue adding pieces within the **ACAI** range until you have reached a sample size as large as the largest number of pieces that you will be counting. For example, if you are going to be counting up to 300 bolts, follow the **ACAI** procedure until you have over 300 pieces on the weighing pan.
- When you have added the maximum number of pieces required, remove the sample pieces and start your counting job.

ACAI Automatic Counting Accuracy Improvement

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



When the balance calculates unit weight from sample pieces, the more sample pieces that are used, the higher the accuracy. For example: let's say that you use 10 pieces as your sample and the unit weight calculated by the balance from your sample is 1g. Using the **ACAI** feature, after loading on 200 pieces, the balance determines that the average unit weight is really 0.98g instead of 1g. This is improved accuracy and could make a big difference when you are counting thousands of pieces.

You need to stay within the **ACAI** counting range as you add more pieces. But this is easy to do and only needs to be done once, up to 500 pieces. After that, the **ACAI** remembers the most accurate unit weight.

If you set the unit weight digitally, by using the optional AD-1652 Remote Keyboard or by computer via the serial interface, the **ACAI** function will not operate.

ACAI Notes

- You must do the **ACAI** procedure just after you set the unit weight. *Samples must be still on the weighing pan.*
- Do not take the samples off until the end of the **ACAI** procedure.
- You don't have to count out the pieces when you add, just stay within the **ACAI** range.
- Continue the **ACAI** procedure to reach the largest amount that you will be counting (or 500 pieces).
- If you want the most precise counting results every time you count different batches of the same item, use **ACAI** every time you start counting the next batch (in other words, if you are counting to 100, start with approximately 10 pieces and then when you add, approximately double the amount until you get to 100).

⚠ *The **ACAI** function DOES NOT work when the unit weight is set digitally by the optional AD-1652 Remote Keyboard, or using a computer via the RS-232C Serial Interface .*

Counting Errors

❑ **Count Sample too light:**

'**Lo cnt**' will be displayed if the unit weight is too small. The display will show 'Lo' and returns to the "10 - cnt" display.

▶ Unit weight is less than 1digit.

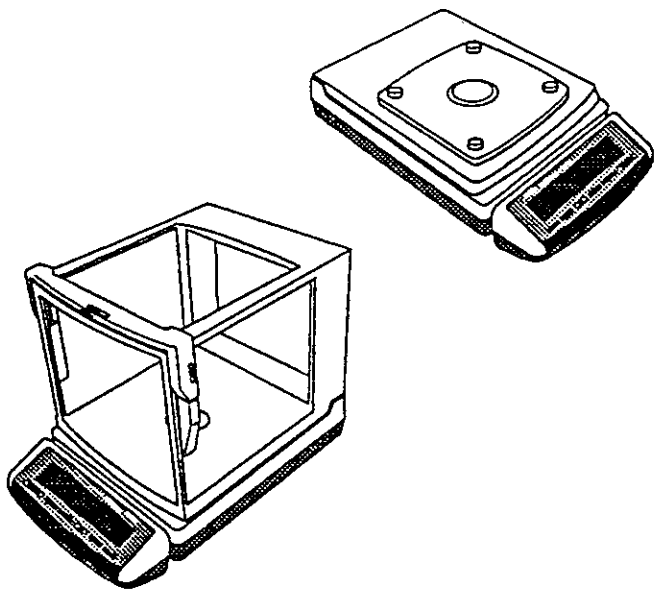
❑ **Stability Error:**

'**Error 2**' will be displayed if the balance can not become stable while registering the unit weight.

▶ Check for excessive vibrations or drafts. Press the RE-ZERO key and see BEST CONDITIONS FOR WEIGHING.

HX Series • Section F

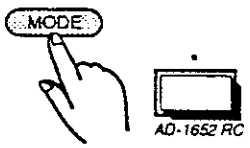
Percent Mode



'%' Percentage Mode

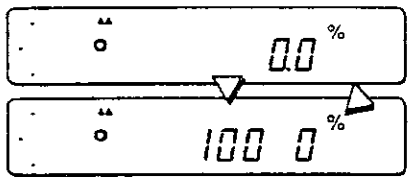
The HX balance contains a percentage mode which will tell you what percentage an item being weighed differs from an ideal weight. This ideal weight is called a '100%' weight. For example: if you have a metal bar that should weigh 50g, you simply register 50g as 100% weight - then when you weigh subsequent bars, the balance will display what percentage of the 100% weight they are (100% = 50g).

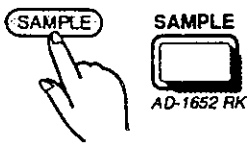
1 ▶ Select "%" with the MODE key.



a) If you see this display, then a previous percentage weight has been entered, continue to Step 2.

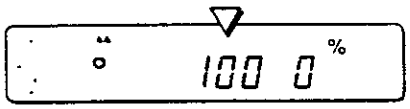
b) If you see this display: continue from Step 3.

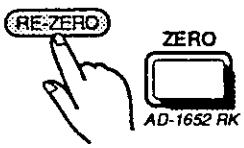


2 

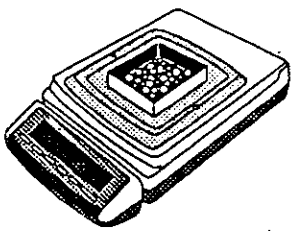
▶ Press the SAMPLE key (also see step 1b).

○ "100 0 %" will be displayed.



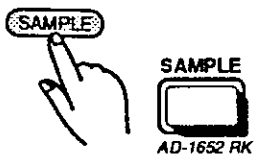
3 

▶ Press the RE-ZERO key to ZERO the display.

4 

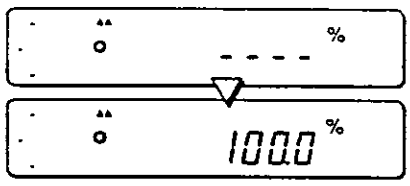
▶ Load the ideal 100% sample.

○ The '0' will go to a '–' to indicate that a sample has been loaded.

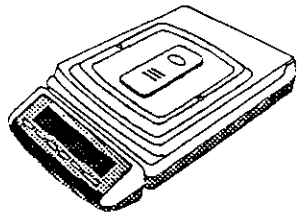
5 

▶ Press the SAMPLE key.

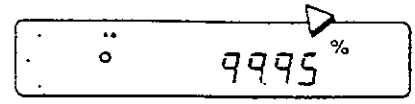
○ "100 %" will be displayed when the ideal weight has been registered.



6

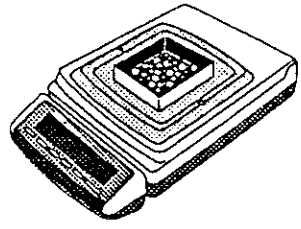


▣ Items will now show their deviation from the ideal weight.



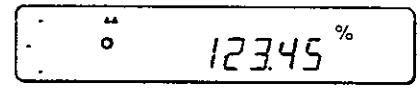
❍ In this example the bar is 99.95% of the ideal, or 0.05% under weight.

Percentage Mode Notes

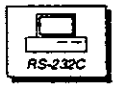


⚠ If you want to use a tared container: Load the container before pressing the RE-ZERO key in Step 3 (you may also use the ZERO RK or TARE RK key on the AD-1652 Remote Keyboard).

Example:
123.45g
as 100% weight



⚠ *100% weight can only be entered in grams.*

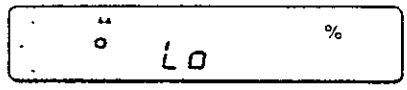


❑ The 100% weight can also be set digitally using the RS-232C Serial Interface. *100% weight can only be set in grams.*

❑ The 100% weight memory is non-volatile, even though the AC adaptor is disconnected, so unit weight is remembered (except: if you turn weighing units OFF or ON).

Percentage Mode Errors

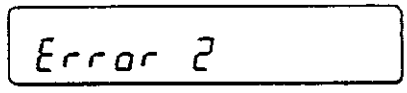
❑ **100% Sample too light:**



'**Lo Pct**' will be displayed if the 100% weight is too small. The display will show 'Lo' and returns to the "100 - %" display.

▶ 100% weight is less than 100digits.

❑ **Stability Error:**

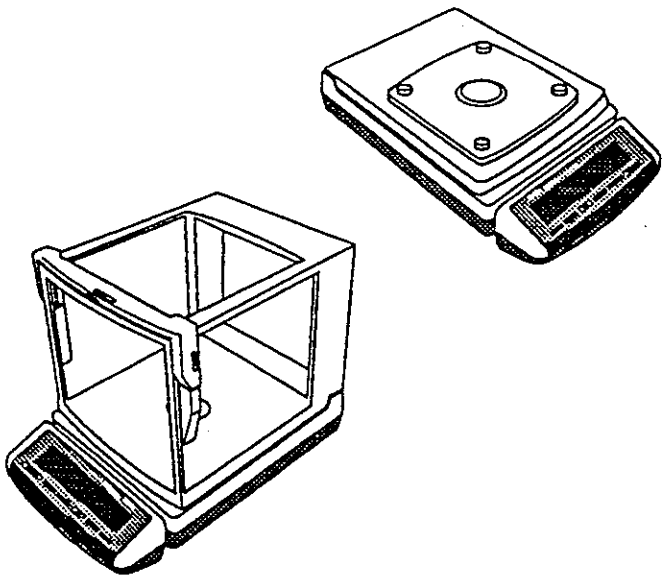


'**Error 2**' will be displayed if the balance can not become stable while registering the 100% weight.

▶ Check for excessive vibrations or drafts. Press the RE-ZERO key and see BEST CONDITIONS FOR WEIGHING.

HX Series • Section G

Internal C-Parameter Settings

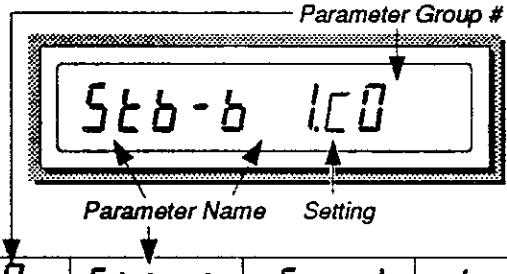


Internal Parameter C-Functions

Your HX 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 C-Parameters table is shown below.

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

CHANGING C-PARAMETERS explains how to change the settings. The individual settings for each group are detailed in the following section THE C-PARAMETERS.



When you are in the CHANGING C-PARAMETERS mode, the parameter name, its present setting, and the group number are displayed.

C0 Environment	Stb-b Stability Band Width	Cond Response/Environ.	trc Zero Tracking			
C1 Display	SPEEd Refresh Rate	diSP Readability	Point Decimal Display	P-on Auto Start Func	oFF Display OFF State	
C2 Data Output	Print Data Out Mode	AP-P Auto Print Polarity	AP-b Auto Print Band	d-out Send Date Data	t-out Send Time Data	CodE Send Code No.
	PAUSE Data Pause	dAtE Date Order	At-F Auto Feed	Ar-d Auto Data Transmit		
C3 Serial Interface	bPS Baud Rate	PAr Parity Bit	bit Data Bit Length	StoP Stop Bit	Cr-LF Terminator	tYPE Data Format
	t-UP Receive Time	dP ASCII decml. code	E-Cod Error Code	CtS CTS Control		
C4 Calibration	CAL CAL Inhibition	CAL-C Self Check	inFo CAL Date & Time			
C5 Auto Re-Zero	Ar-0 Auto Function	Ar-b Auto Re-zero Band	Ar-t Detecting Time			
C6 Comparator Out	CP Comparison Mode	CP-d Comp. Out	CP-0 Comp. Near Zero	bEEP_ Buzzer LO	bEEP- Buzzer GO	bEEP" Buzzer HI
C7 Analog Output	An Mode Selection					
C8 Misc.	id Remote Keybd. ID	PF Parameters Protect/ Initialization				FR-04

Expanding the Applications of the HX Series by Internal Setting

❑ As we want to incorporate the balance into the system, it is troublesome to press the [ON:OFF] key every time it is used.

Answer: Make use of "auto start." Select the internal setting "P-on / C1" (Refer to the page G•7 which has "C1: Display")

❑ We want to take in as many data as possible through the RS-232C.

Answer: Set the display refreshment to "high speed" at any time. Selecting the internal Setting "SPEEd 2 C1" outputs the data 8 times per second. (Refer to the page G•7 which has "C1: Display")

❑ We want the printout to be started automatically when substance is placed on the pan.

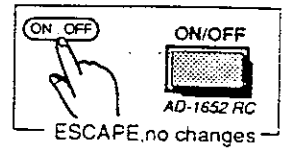
Answer: Make use of "auto print A/B." Selecting the internal setting "Pr int 2 C2" and "Pr int 3 C2" outputs the data once after stabilization. (Refer to the page G•8 which has "C2: Data Output")

❑ When we unload the substance weighed from the balance, we want zero to be displayed automatically.

Answer: Make use of "auto rezero." Select the internal setting "Ar-0 / C5" (Refer to the page G•13 which has "C5: Auto RE-ZERO Function")

Changing C-Parameter Settings

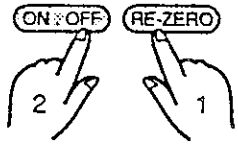
- The C-Parameters can't be changed when the memory is protected by **"PF"** C8 group. If this parameter is set to 'protect', PF IC8, change to PF 0C8
- You can escape without saving any changes, at any time, by pressing the ON:OFF key.



1

▶ With the display **OFF**: Press and hold the RE-ZERO key.

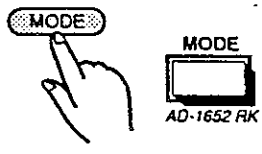
2



▶ While holding RE-ZERO, press the ON:OFF key.

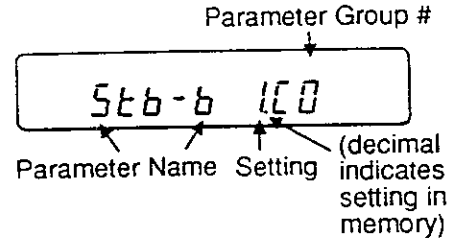
○ All display segments will come ON.

3



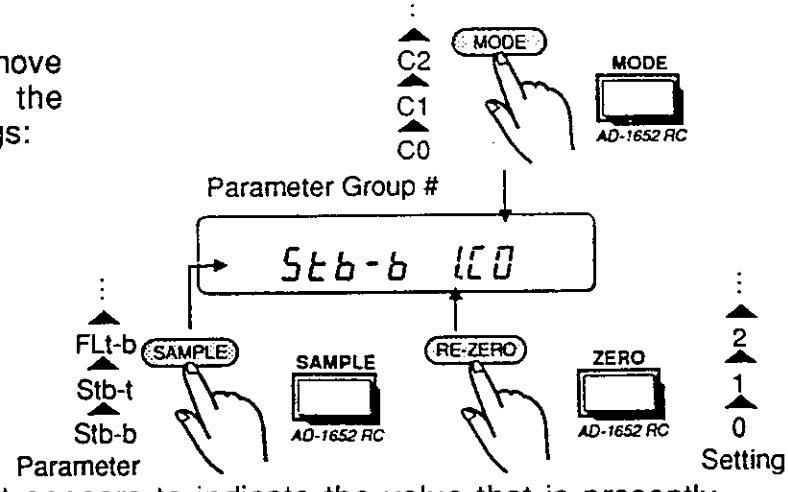
▶ Press the MODE key to move to C-Parameter Settings mode.

○ The software version number will be displayed briefly, then the first **Parameter Name**, **Setting** and **Group Number** will be displayed.



4

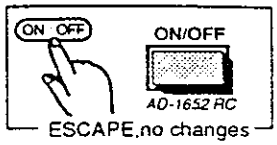
▶ Use these keys to move through, or change the C-Parameter settings:



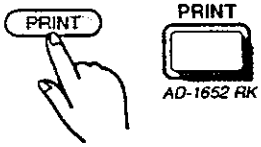
⚠ The decimal point appears to indicate the value that is presently stored in memory.

⚠ **Parameter Names**, **Settings** and **Group Numbers** will loop. So if you miss a setting, keep going until it comes around again.

❑ Remember that you can escape at any time *without saving any changes*, by pressing the ON:OFF key.

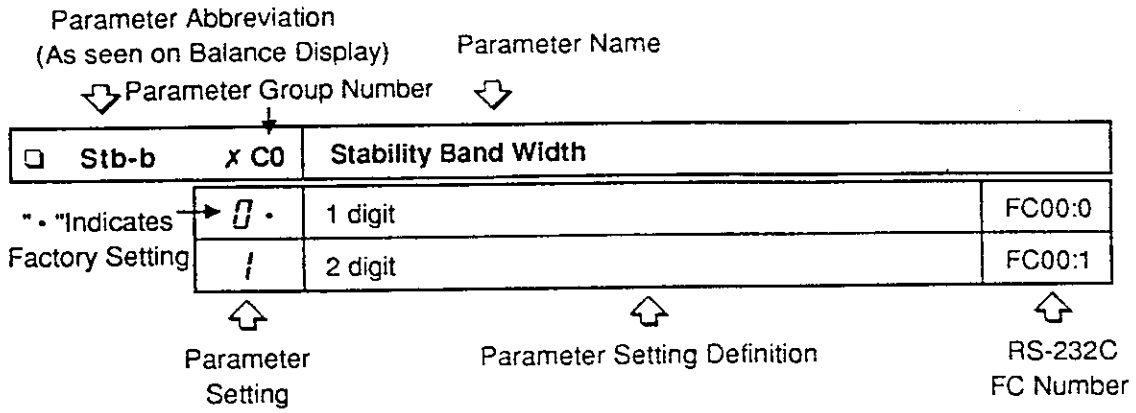


5



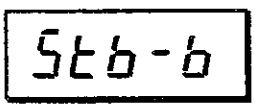
▶ When you have finished: Press the PRINT key to save the changes and exit to the weighing mode.

The C-Parameter Settings



C0 • Environment

❑ Stb-b xco	Stability Band Width NOTE: The Stability Indicator turns ON when display deviation is within the range set by **"Stb-b"**.	
0 •	Stable when 1 digit	FC00:0
1	Stable when 2 digits	FC00:1
2	Stable when 3 digits	FC00:2



❑ Cond xco	Response / Environment	
0	Fast Response / Good Environment	FC01:0
1	Mid-Fast Response	FC01:1
2 •	Normal	FC01:2
3	A bit Slow Response	FC01:3
4	Slow Response / Bad Environment	FC01:4

❑ trc xC0	Zero Tracking Detection Time NOTE: The balance traces a zero-drift caused by the change of temperature, humidity, air pressure, etc., and stabilizes the ZERO point. Display continues ZERO if the drift is less than 1 digit per time decided by 'trc' parameter. If weighing very light samples, select a smaller number.	
trc	0	ZERO tracking OFF	FC02:0
	1	Long (Weak Tracking)	FC02:1
	2 •	Normal	FC02:2
	3	Short (Strong Tracking)	FC02:3

C1 • Display

❑ SPEEd xC1	Display Refreshing Rate	
SPEEd	0 •	Normal if Stable, Hi speed if Unstable	FC10:0
	1	Normal (4 times/second)	FC10:1
	2	Hi Speed (8 times/second)	FC10:2

❑ diSP xC1	Repeatability	
diSP	0 •	1 digit	FC11:0
	1	2 digits	FC11:1
	2	5 digits	FC11:2

❑ Point xC1	Decimal Point Display	
Point	0 •	Point (.)	FC12:0
	1	Comma (,)	FC12:1

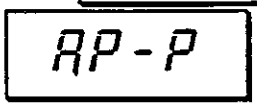
❑ P-on xC1	Auto Start Function	
P-on	0 •	No Auto start	FC13:0
	1	Auto Start (You don't have to press the **ON/OFF** key to start weighing, the display will come ON when power is supplied)	FC13:1

❑ oFF xC1	Display at 'Display OFF State' see p. A•4	
oFF	0 •	Power Indicator (right decimal ".")	FC14:0
	1	Time Displayed	FC14:1

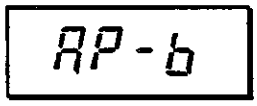
C2 • Data Output

These parameters are used with the RS-232C Serial Interface and Current Loop. Please see Section K.

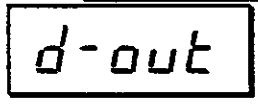
❑ Print xC2	Data Out Mode	
0 •	**PRINT** Key Mode **A**: **PRINT** key command accepted only if the display is stable. The display will blink when data is transmitted.	FC20:0
1	**PRINT** Key Mode **B**: **PRINT** key command accepted and output if display stable. The display will blink when data is transmitted.	FC20:1
2	Auto Print Mode **A**: Data output if display is over the 'Auto Print Band' **"AP-b C2"** setting and stable. Polarity by **"AP-P C2"**	FC20:2
3	Auto Print Mode **B**: Data output when the difference between the display and the last transmitted data is over the 'Auto Print Band' **"AP-b C2"** setting and stable. Polarity by **"AP-P C2"**	FC20:3
4	Stream Mode: Data output continuously.	FC20:4



❑ AP-P xC2	Polarity at Auto Print Mode	
0 •	Send only positive data.	FC21:0
1	• At Auto Print Mode A: both positive and negative data sent. •At Auto Print Mode B: Negative data only	FC21:1



❑ AP-b xC2	Auto Print Band	
0 •	10 digits	FC22:0
1	100 digits	FC22:1
2	1,000 digits	FC22:2



❑ d-out xC2	Send Date Data	
0 •	No Date Data.	FC23:0
1	Sent Date Data before the weighing result.	FC23:1

❑ t-out	XC2	Send Time Data	
t-out	0 •	No Time Data.	FC24:0
	1	Sent Time Data before the weighing result.	FC24:1

❑ COde	XC2	Send Code Number	
CodE	0 •	No Code Number.	FC25:0
	1	Send Code Number before the weighing result and the code number is increased by 1.	FC25:1

❑ PAUSE	XC2	Pause Between Data	
PAUSE	0 •	No Pause.	FC26:0
	1	Pause 1 second (NOTE: When AD-8121 compact printer is connected with HX, set 'PAUSE' to 1 so that the printer has time to print a compete line of data).	FC26:1

❑ dAtE	XC2	Date Order	
dAtE	0 •	yy-mm-dd	FC27:0
	1	mm-dd-yy	FC27:1
	2	dd-mm-yy	FC27:2

❑ At	XC2	Auto Paper Feed Function	
At-F	0 •	No Paper Feed.	FC28:0
	1	Paper Feed (NOTE: When AD-8121 compact printer is connected with HX, <CR> and <LF> are sent after weighing result is printed.	FC28:1

❑ Ar-d	XC4	Auto Re-ZERO after Weighting Data Transmission NOTE: This Auto Re-ZERO is executed only at Key A/B mode, or at Auto Print A/B mode.	
Ar-d	0 •	No Auto Re-ZERO	FC29:0
	1	Auto Re-ZERO	FC29:1

C3 • Serial Interface

These parameters are used with the RS-232C Serial Interface and Current Loop. Please see Section K

❑ bPS xC3	Baud Rate	
bPS	0	600 bps	FC30:0
	1	1200 bps	FC30:1
	2 •	2400 bps (for AD-8121)	FC30:2
	3	4800 bps	FC30:3
	4	9600 bps	FC30:4

❑ PAr xC3	Parity bit	
PAr	0 •	Even	FC31:0
	1	Odd (NOTE: When data bit length is selected as 8, "bit 1C3", it is regarded as No Parity)	FC31:1

❑ bit xC3	Data Bit Length	
bit	0 •	7 bits	FC32:0
	1	8 bits	FC32:1

❑ Stop xC3	Stop Bit	
StoP	0 •	1 bit	FC33:0
	1	2 bits	FC33:1

❑ Cr-LF xC3	Terminator NOTE: This parameter is applied to both transmitted or received data.	
Cr-LF	0 •	<cr> <lf>	FC34:0
	1	<cr>	FC34:1

❑ tYPE xC3	Data Format NOTE: Weighing result format can be changed by this parameter. For further information, see DATA FORMAT section.	
tYPE	0 •	A&D Standard	FC35:0
	1	Dump Print format	FC35:1
	2	KF format	FC35:2

❑ t-Up	✗C3	Time for Command Receiving	
t-UP	0 •	Timer ON	FC36:0
	1	Timer OFF	FC36:1

❑ dP	✗C3	ASCII Code of the Decimal Point	
dP	0 •	2EH(.)	FC37:0
	1	2CH(,)	FC37:1

❑ E-Cod	✗C3	Error Code at Command Mode	
E-Cod	0 •	No Error Code	FC38:0
	1	Transmit Error Code (NOTE: The balance transmits Error Code when command is received.)	FC38:1

❑ CtS	✗C3	CTS Control(Selects CTScontrol or RTS check)	
CtS	0 •	The balance controls neither CTS or RTS.	FC39:0
	1	The balance controls both CTS and RTS.	FC39:1

C4 • Calibration

❑ CAL xC4	Calibration Inhibition	
CAL	0 • All Calibration permitted (see p. C•2)	FC40:0
	1 Intelligent Calibration inhibited	FC40:1
	2 All Calibration inhibited	FC40:2

❑ CAL-C xC4	Self Check after Calibration (not with Automatic Self Calibration)	
CAL-C	0 • No Self Check	FC41:0
	1 Self Check (NOTE: Self Check is executed only when Calibration is done by the inner automatic balance calibration mass)	FC41:1

❑ inFo xC4	Send Calibration Date & Time	
inFo	0 • No calibration date and time	FC42:0
	1 Send the calibration date and time	FC42:1

C5 • Auto Re-ZERO Function

❑ Ar-0	✗C5	Auto Re-ZERO function near ZERO	
Ar-0	0 •	No Auto Re-ZERO	FC50:0
	1	Auto Re-ZERO (NOTE: If display is ZERO ±5 digits for the time set by **"Ar-t ✗C3"** parameter, re-ZERO will be executed automatically)	FC50:1

❑ Ar-b	✗C5	Auto Re-ZERO Band Width.	
Ar-b	0 •	ZERO when within 5 digits	FC51:0
	1	ZERO when within 50 digits	FC51:1
	2	ZERO when within 500 digits	FC51:2

❑ Ar-t	✗C5	Detecting Time for near ZERO	
Ar-t	0 •	1 second	FC51:0
	1	3 seconds	FC51:1

C6 • Comparator Output

❑ CP xC6	Comparison Mode	
CP	0 •	Compare all Data	FC60:0
	1	Compare Stable or Overload Data	FC60:1

❑ CP-d xC6	Comparison Result Display	
CP-d	0 •	No Display	FC61:0
	1	Display Comparison Result	FC61:1

❑ CP-0 xC6	Comparison Near ZERO	
CP-0	0 •	No Compare near ZERO	FC62:0
	1	Compare	FC62:1

❑ bEEP_ xC6	Buzzer for LO Limit	
bEEP_	0 •	No beep at LO limit	FC63:0
	1	Beep at LO limit	FC63:1

❑ bEEP– xC6	Buzzer for GO Range	
bEEP-	0 •	No beep for GO range	FC64:0
	1	Beep for GO range	FC64:1

❑ bEEP‾ xC6	Buzzer for HI Limit	
bEEP‾	0 •	No beep at HI limit	FC65:0
	1	Beep at HI limit	FC65:1

C7 • Analog Output

❑ An xC7	Mode Selection	
0 •	Output voltage corresponding to any of two digits	FC70:0
1	Output voltage corresponding to any of three digits.	FC70:1
2	Full Scale are output (Net)	FC70:2
3	Full Scale are output (Gross)	FC70:3

An

❑ SEL xC7	Digit position of Analog Output	
0 •	Least Digit	FC71:0
1	First Digit	FC71:1
2	Second Digit	FC71:2
3	Third Digit	FC71:3
4	Fourth Digit	FC71:4
5	Fifth Digit	FC71:5
6	Sixth Digit	FC71:6

SEL

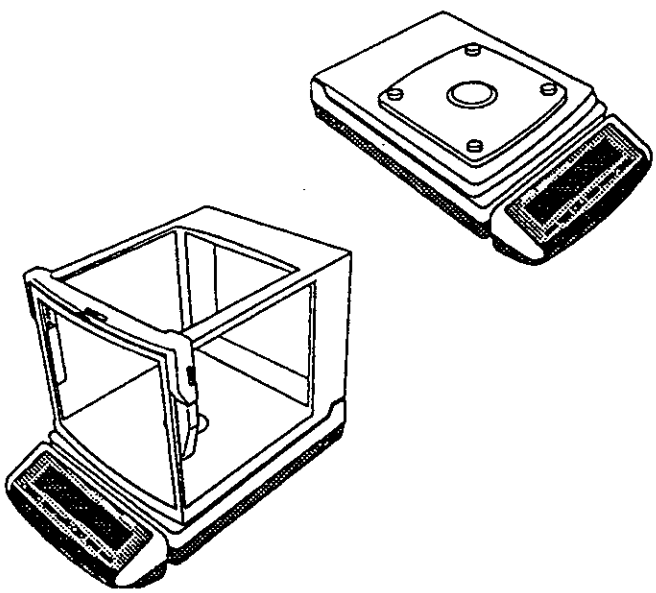
C8 • Others

❑ Id	xC8	ID Code for Remote Keyboard AD-1652	
id	0	No action to Remote Keyboard	FC80:0
	1 •	ID Code Number "1"	FC80:1
	2	ID Code Number "2"	FC80:2
	3	ID Code Number "3"	FC80:3
	4	ID Code Number "4"	FC80:4
	5	ID Code Number "5"	FC80:5
	6	ID Code Number "6"	FC80:6
	7	ID Code Number "7"	FC80:7

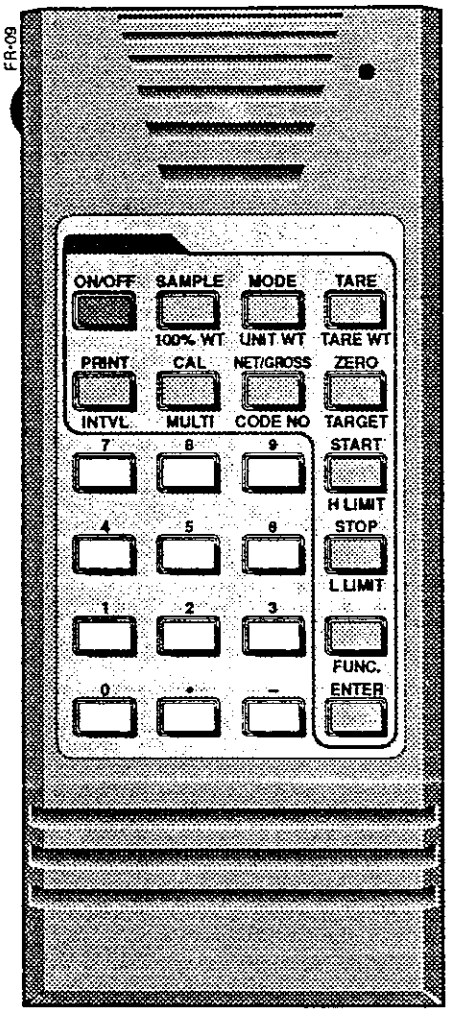
❑ PF	xC8	**Protect the set Parameters** NOTE: Even when 'PF' is set at "1", you can enter the Parameter Change mode and change the display, but the memories will keep the same value.	
PF	0 •	Parameters can be changed	FC82:0
	1	Parameters cannot be changed	FC82:1
	2	Initialization	FC82:2

HX Series • Section H

AD-1652 Wireless Remote Keyboard



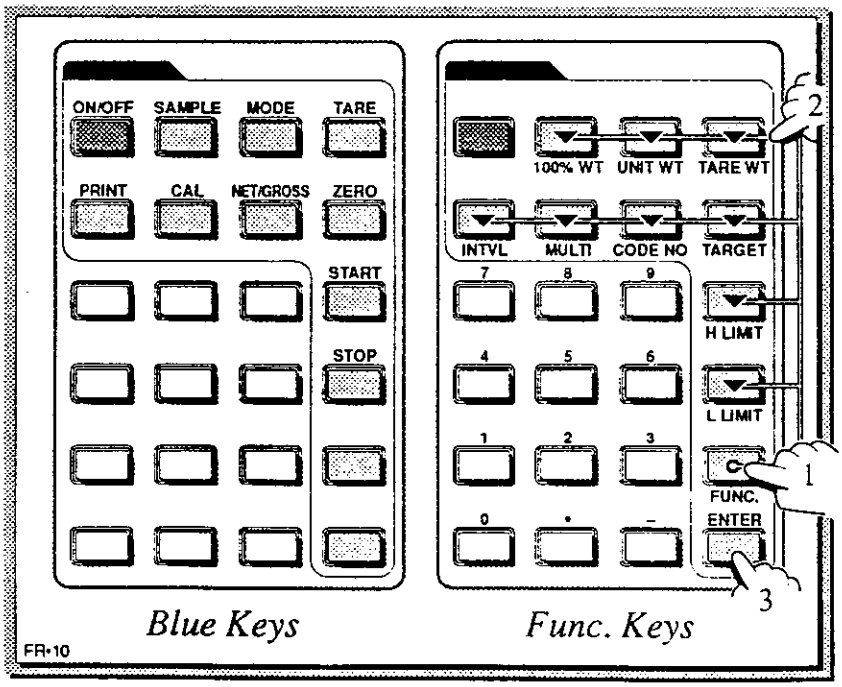
AD-1652 Remote Keyboard



AD-1652 WIRELESS REMOTE KEYBOARD Accessory

By using the Wireless Remote Keyboard AD-1652 Accessory, the HX Series Balance can be controlled with a 3m, 60° operating range. You never have to touch the balance itself, avoiding unnecessary vibrations.

Since every balance feature can be controlled by the AD-1652 Remote Keyboard, and digital data can also be entered through the 10-key keys, you greatly simplify the more complicated balance functions.



- The ***Blue Keys*** have two modes:

1. When pressed by themselves, the balance does what is printed in black above the key.
2. When the *FUNC.* key is pressed first, you may then enter a value for what is printed in blue below the key. In this section, these keys will be described as "F-keys". See the next page.

- The white 10-key pad keys are used to enter number values. In this section, these keys will be shown as: [1][2][.][3][4][5] keys, or 123.45.

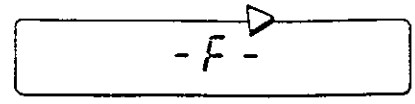
Entering Values with FUNC. Keys

1

▶ Press the FUNC R/K key.

○ "–F–" will be displayed.

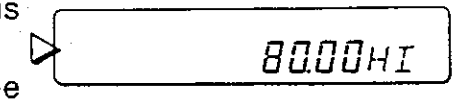
⚠ *Press the FUNC R/K key again anytime to exit, without saving any changes.*



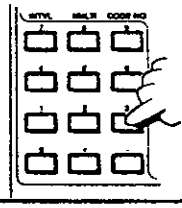
2

▶ Press the F-key desired, in this example: High Limit.

○ Any previously set value will be displayed, in this example: 80g.

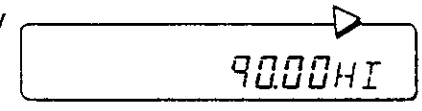


3



▶ Use the 10-key pad to display value to enter.

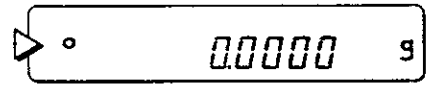
○ In this example: 90 keys, or 90g.



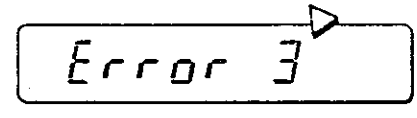
4

▶ Press the ENTER R/K key to enter the value.

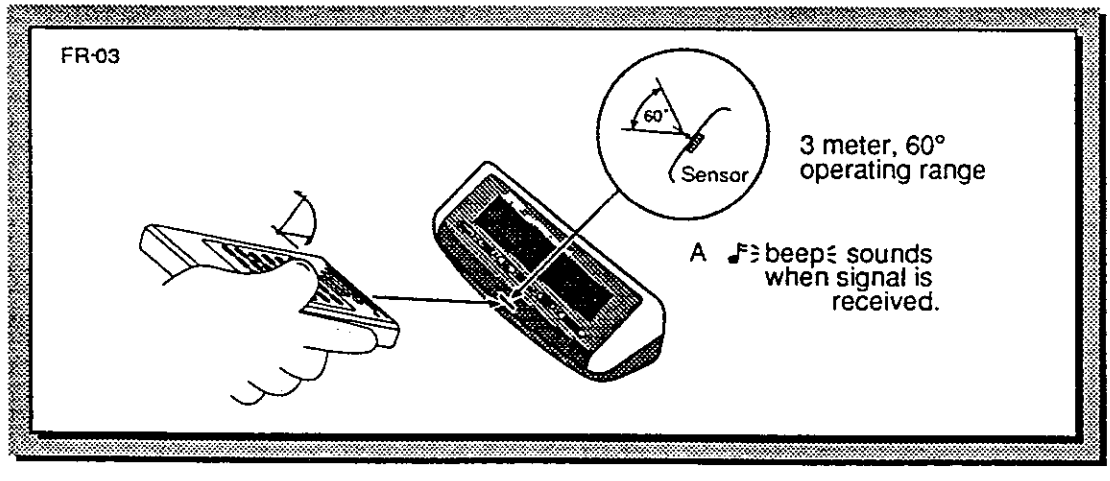
○ The display will return to where you left it.



"Error 3" will be displayed if the value entered is out of the range permitted for the function. To return to weighing mode, press any key.



⚠ When using the AD-1652 Wireless Remote Keyboard, remember that the balance sensor has a 3-meter, 60° operating range. You will hear a faint '*beep*' if the key signal has been successfully received.

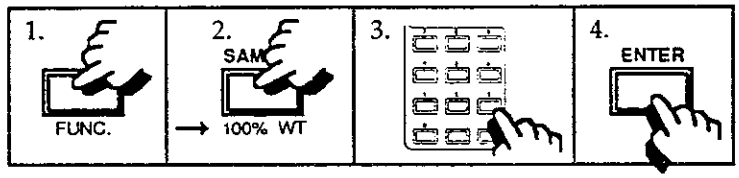


AD-1652 Keyboard Operation

- ❖ The "❑" sections are descriptions of the blue keys performing the operations printed in black above the keys.
- ❖ The "○" sections are descriptions of the F- key operations printed in blue below the keys. The "›" represents 'next', and <N> represents any number entered onto the display using the 10-key pad. For example:

(1) (2) (3) (4)

FUNC[R K] › 100% WT. key › <N> › ENTER[R K]



- ❖ If there is another key combination operation, it will be listed after the two above.

SAMPLE / 100% WT. Key

→ SAMPLE / 100% WT

❑ The SAMPLE key can be used to register a sample count (eg: 10 units) in counting "cnt" mode or register 100% in percentage "%" mode (when the 100 % sample is on the weighing pan).

❑ When the unit other than % and cnt is used, the lowest digit is rounded to the nearest whole number.

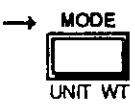
SAMPLE / → 100% WT

○ The FUNC[R K] › 100% WT. key › <N > › ENTER[R K] key combination digitally sets the 100 Pct. There will be an error if the entered value is negative or the number is less than 0.01g.

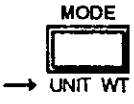
Example: FUNC[R K] › 100% WT. key › 2 0 . 0 2 › ENTER[R K]

the balance will enter 20.02g as the 100% weight (if "g" unit weight is being used).

MODE / UNIT WT. Key

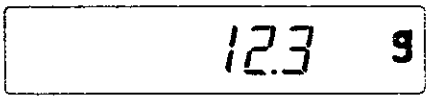


❑ The [MODE] key switches between the balance weighing modes: g, OZ, OZt, dwt, ct, mm, GN, t, and TL. There is also a percentage mode "%", and counting mode "cnt".



○ The [FUNC]R/K › [UNIT WT.] key › <N > › [ENTER]R key combination digitally sets the unit weight in milligrams (mg). There will be an error if the entered value is negative or the number is less than 1digit .

Example: [FUNC]R/K › [UNIT WT.] key



› [1][2][.][3] › [ENTER]R/K

the balance will enter 12.3g as the unit weight. The counting mode and percentage mode assume the unit of gram.

TARE Key

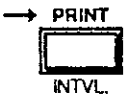
❑ The [TARE]R/K key re–ZERO's the display up to the maximum capacity of the scale and should not be confused with the [ZERO]R/K key which returns the scale to the center of ZERO when the weighing pan is empty. The TARE weight (container weight) is a portion of the total weight, and is a portion of the total range of the scale.

PERIOD key

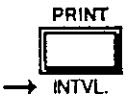
❑ The number of illuminated setting monitor marks "▲" represents the environment in which the balance is placed, and its corresponding internal setting related to the response characteristic of the balance.

The setting monitor marks appear sequentially each time this key is pressed.

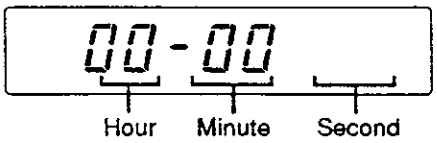
PRINT / INTVL. Key



❑ The [PRINT] key can be used to transmit data to the AD-8121 printer, or to a computer, via the RS-232C.

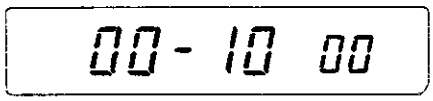


○ The [FUNC]R/K › [INTVL.] key › <N> › [ENTER]R/K combination digitally sets the data transmission time interval. As the time is being entered, the digit being set will flash, and move right when a 10-key is pressed.



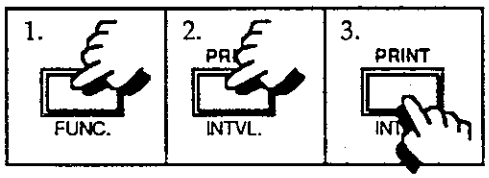
Interval OFF is "00:00:00".

Example: [FUNC]R/K › [INTVL.] key › [0][0][1][0][0][0] › [ENTER]R/K



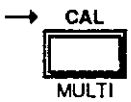
the balance will enter 10 minutes as the data transmission time interval.

Interval Start:



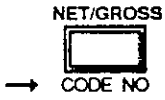
To start interval data output, press the [FUNC]R/K key then the [INTVL.] key and then again, as the [PRINT] key.

CAL Key



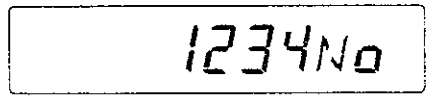
❑ The [CAL] key starts one-touch automatic calibration. From the normal weighing mode, with nothing on the weighing pan and the balance level, press the [CAL] key and calibration will be performed automatically.

CODE NO. Key



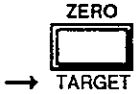
○ The [FUNC] ❯ [CODE NO.] key ❯ <N> ❯ [ENTER] key combination digitally sets the code number that will be transmitted (via RS-232C) at the next data-out operation. 10-key numbers are entered to the left up to 6 digits. The maximum number allowed is 999,999. Please see Parameter setting **"Code c2"** page G•8.

Example: [FUNC] ❯ [CODE NO.] key ❯ [1][2][3][4] ❯ [FUNC]



the balance will enter code number '001234'.

ZERO / TARGET Key

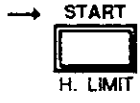


○ The [FUNC] ❯ [TARGET] key ❯ <N> ❯ [ENTER] key combination digitally sets the target weight to stop the optional AD-1651 Spoon Feeder. There will be an error if the entered value is over the balance capacity.

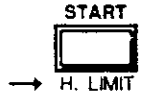
Example: [FUNC] ❯ [TARGET] key ❯ [2] ❯ [ENTER]

the balance will enter 2g as the target weight (if "g" unit weight is being used).

START / H. LIMIT Key

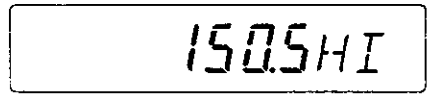


❑ The [START] key starts the optional AD-1651 Vibrating Spoon.



○ The [FUNC] ❯ [H. LIMIT] key ❯ <N> ❯ [ENTER] key combination digitally sets the comparator higher limit. A negative number is permitted and the acceptable range is from –9999999 to +9999999.

Example: [FUNC] ❯ [H. LIMIT] key ❯ [1][5][0][.][5] ❯ [ENTER]



the balance will enter 150.5g as the comparator's high limit (if "g" unit weight is being used).

STOP / L. LIMIT Key

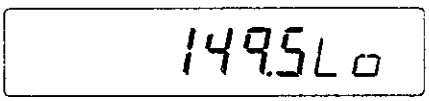
→ STOP / L. LIMIT

❑ The [STOP] key stops the optional AD-1651 Vibrating Spoon.

STOP / → L. LIMIT

○ The [FUNC] › [L. LIMIT] key › <N> › [ENTER] key combination digitally sets the comparator lower limit. A negative number is permitted and the acceptable range is from –9999999 to +9999999.

Example: [FUNC] › [L. LIMIT] key › [1][4][9][.][5] › [ENTER]



the balance will enter 149.5g as the comparator's lower limit (if "g" unit weight is being used).

FUNC. Key

FUNC.

❑ When the [FUNC] key is pressed before another blue key, the balance will set what is printed in blue below the key - after waiting for you to enter a number via the 10-key, and then press the [ENTER] key.

ENTER Key

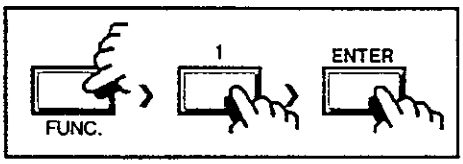
ENTER

❑ The [ENTER] key tells the balance to accept the number that has been entered via the 10-key, or to start an action.

FUNC. key, Plus a 10-key

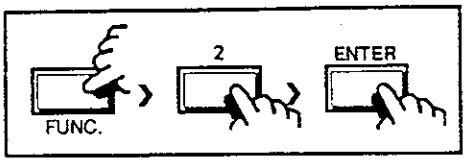
Entering a number subsequent to the FUNC key allows you to easily set the "internal C-Parameter settings", "weighing units", "code strings", "date" and "time".

Func. + 1 key • Set the "C-Parameter"



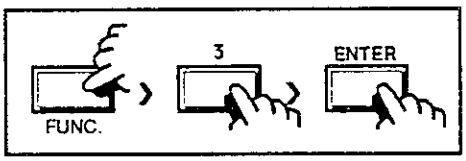
MODE	❑ Press the MODE key to select the "Parameter Group Number".
SAMPLE	❑ Press the SAMPLE key to select the "Parameter".
ZERO	❑ Press the ZERO key to select the "Setting Values".
PRINT	❑ Press the PRINT key to save "C-Parameter" and return to weighing mode.
ENTER	❑ Press the ENTER key to save "C-Parameter" and return to weighing mode.
ON/OFF	❑ Press the ON:OFF key to exit and go to "display OFF state".

Func. + 2 key • Set the "Weighing Unit"



MODE	❑ Press the [MODE] key to select the desired "Unit".
SAMPLE	❑ Press the [SAMPLE] key to keep the selected unit.
PRINT	❑ Press the [PRINT] key to save the selected unit.
ON/OFF	❑ Press the [ON:OFF] key to exit and go to "display OFF state".

Func. + 3 key • Set the "Code String"



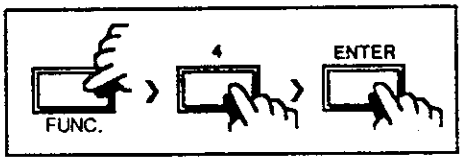
❍ Connect the serial interface to the balance and you can enter the code string form the 10-key pad.

❑ The code string itself must consist of six digits, including spaces or hyphens.

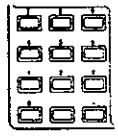
Example: [0][1][ ][3][-][5]

	❑ The keys [0] → [9] will display the numbers 0→9. The period key [.] will be the "space" and the minus key [-] will be the "hyphen".
ENTER	❑ Press the [ENTER] key to save the code string and return to weighing mode.
ON/OFF	❑ Press the [ON:OFF] key to exit and go to "display OFF state."

Func. + 4 key • Set the Date

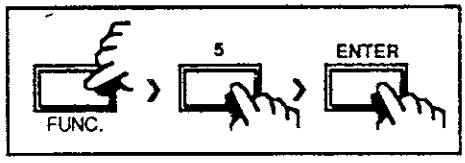


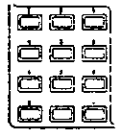
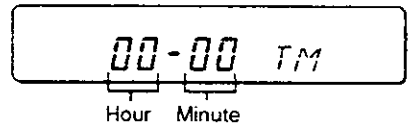
❍ The date is set in YY-mm-dd (or other depending on the setting 'Date Order' **"dAtE 5c2"** using the 10-key pad. Enter flashing digit as it moves to the right.

MODE	❑ Pressing the [MODE] key moves a blinking digit to the right.
	❑ The keys [0] → [9] will display the numbers 0→9.
ENTER	❑ Save the date and return to weighing mode.
PRINT	❑ Save the date and return to weighing mode.
ON/OFF	❑ Press the [ON:OFF] key to exit and go to display OFF state.

Func. + 5 key • Time

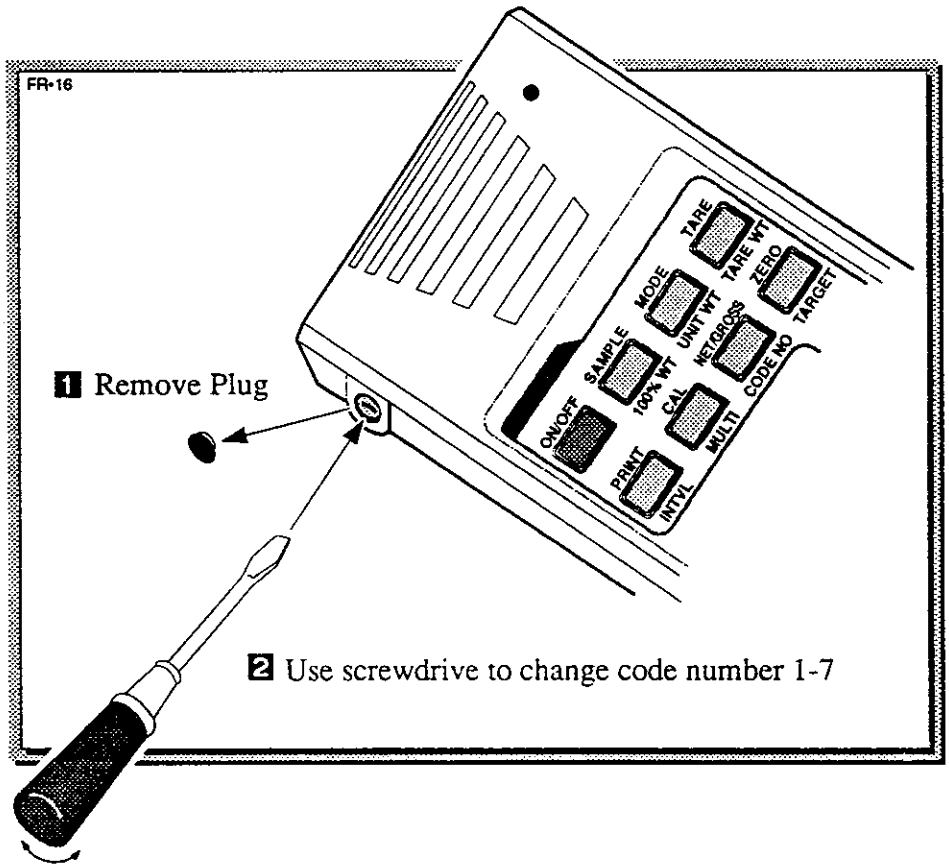
Using the setting "Display at 'Display OFF State" **"oFF 1c1"** the time can be shown while the display is OFF. It can also transmitted before the weighing result via the RS-232C



MODE	❑ Pressing the [MODE] key moves a blinking digit to the right.
SAMPLE	❑ Pressing the [SAMPLE] key selects the 12-hour mode and 24-hour mode alternately.
	❑ The keys [0] → [9] will display the numbers 0→9. Enter flashing digit as it moves to the right.  Hour Minute ❑ Although the displayed time is fixed, the clock is still working.
ENTER	❑ Save the time and return to weighing mode.
PRINT	❑ Save the time and transmit it (exit: [FUNC] or [-] key).
ON/OFF	❑ Press the [ON:OFF] key to exit and go to display OFF state.

AD-1652 Remote Code Number

The AD-1652 Remote Keyboard can be reset to a different code number if more than one balance is being used, or for what ever reason. If the number is changed on the AD-1652 Remote Keyboard, the C-Function "**id 1c8**" must also be changed.



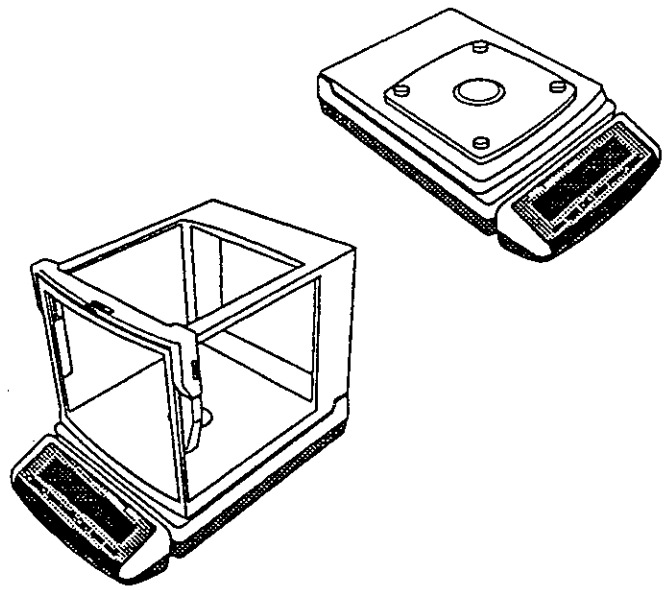
C8 • Others (from page G•16)

❑ id xc8		ID Code for Remote Keyboard AD-1652	
id	0	No action to Remote Keyboard	FC80:0
	1 •	ID Code Number "1"	FC80:1
	2	ID Code Number "2"	FC80:2
	3	ID Code Number "3"	FC80:3
	4	ID Code Number "4"	FC80:4
	5	ID Code Number "5"	FC80:5
	6	ID Code Number "6"	FC80:6
	7	ID Code Number "7"	FC80:7

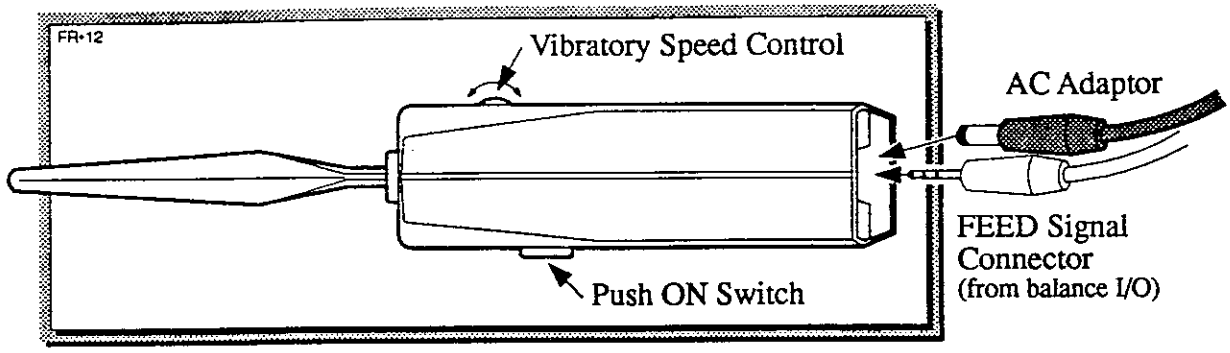
The factory setting is "1", ID Code Number 1

HX Series • Section J

AD-1651 Vibratory Spoon



AD-1651 Vibratory Spoon



- ❑ Using the OP-05, the optional AD-1651 Vibratory Spoon makes it easy to accurately feed powders to be weighed.
- ▣ With the cable supplied with the Vibratory Spoon, connect one end to the "I/O" connection in the back of the Spoon, and the other end to the "FEEDER" connection in the rear panel of the balance.
- ▣ Since no DC power is supplied from the balance, make sure that there are batteries in the Spoon, or connect the AC Adaptor.
- ▣ The push switch operates the spoon. If a Target Weight has been set (via AD-1652 Remote Keyboard or RS-232C), the spoon will stay ON until the limit is reached: unless a STOP signal is sent (see next page).

Target Weight

- ❑ To set, see next page. The target weight will be the weighing unit last seen on the balance display as you go into the setting mode. Later, if you change the weighing units, the target weight will also be converted. For example: the target weight of 10g is displayed as 50 ct in carat mode.
- ❑ If the unit weight (cnt) or 100% weight (%) is not registered in cnt/Pct mode, the target weight shows zero. However, after the registration, target weight is converted to each unit.
- ❑ You cannot set the target weight over the capacity.

Notes on Feeding Accuracy

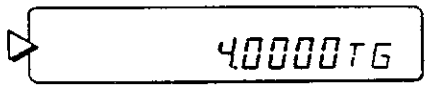
- ○ Feeding accuracy may be decreased by the following:
  - a) Flow rate changes due to the AD-1651 Spoon angle changing.
  - b) Free Fall weight (weight of airborne sample) changes due to AD-1651 Spoon being too high above the weighing pan.
  - c) Sample is not uniform.
  - d) Flow rate is too large for the target weight.
  - e) Flow rate is too small (display changes slowly on average).
  - f) Display is not in high-speed mode (see 'Display Refreshing Rate' **"Speed 1c1"**).

Setting (or Viewing) Target Weight

AD-1652 RK

1

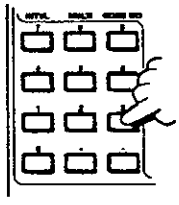
▶ Press the FUNC R/K key, then the TARGET key.



○ Any previously set value will be displayed, in this example: 4g.

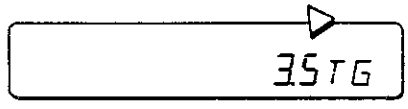
If you are just viewing the Target Weight, or want to exit without saving any changes, press the FUNC R/K key again.

2



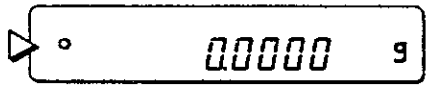
▶ Use the 10-key pad to display value to be entered.

○ In this example: 3 . 5 keys, or 3.5g.



3

▶ Press the ENTER R/K key to enter.



○ The display will return to where you left it.

▶ See START/STOP SPOON FEEDING sections, next page.

Setting (or Viewing) Target Weight

RS-232C

Ex 1.

?	T	G	cr

Request the balance to send the target weight presently set.

❑ For example if the balance has 2g set as the target weight, then it will send:

T	G	,	+	0	0	2	.	0	0	0	0	(20H)	(20H)	g	cr

Ex 2.

T	G	4	.	0	(20H)	(20H)	g	cr

Set a new target weight (ex: 4g).

T	G	4	.	0	(20H)	o	z	cr

Set a new target weight (ex: 4oz).

To START Spoon Feeding

A. Press the AD-1651 Vibratory Spoon button.

B. Press the START key on the AD-1652 Remote Key-board.

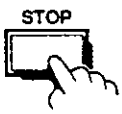
C. Send a 'FEED' command via the RS-232C.

F	E	E	D

To STOP Spoon Feeding

A. Spoon feeding stops when the display is near the target weight; or when the display becomes stable, even though under the target weight.

B. Press the STOP key on the AD-1652 Remote Key-board.



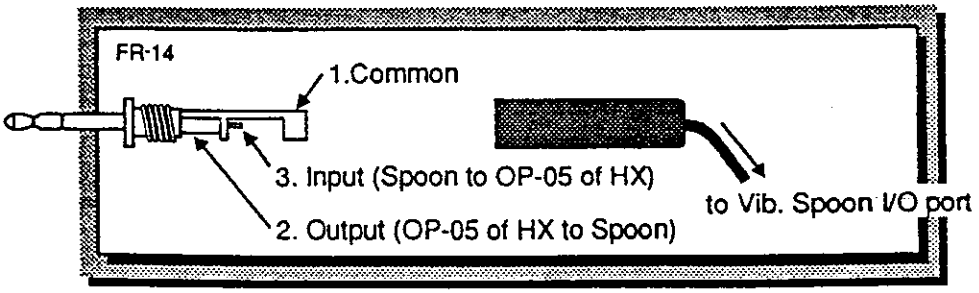
C. Send a 'STOP' command via the RS-232C.

S	T	O	P

To Re-START Spoon Feeding

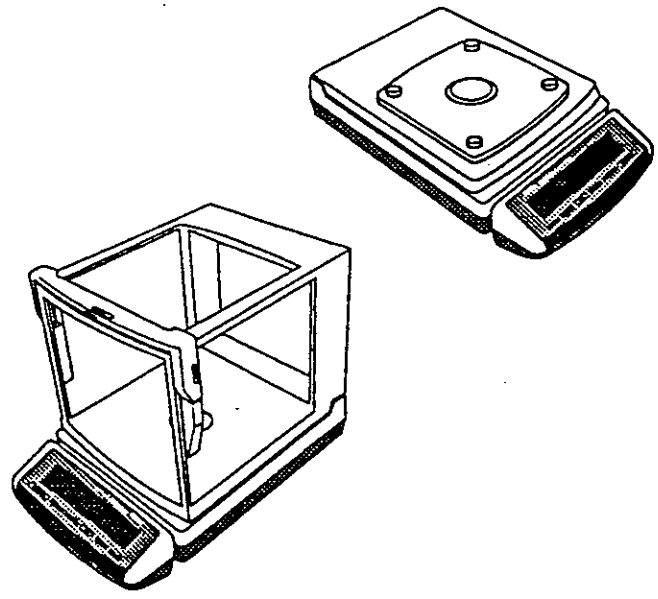
- If the display is under the target weight, you may restart by any of the methods in the To START section above.
- If the display is over the target weight, you must press the button on the AD-1651 Spoon to restart.

Connector Hook-up



HX Series • Section K

RS-232C Serial Interface



Specifications

Type EIA-RS-232C

Method Asynchronous Transmission, Bi-directional.

Format Baud rate: 600, 1200, 2400, 4800 and 9,600 baud. Rates user selectable.

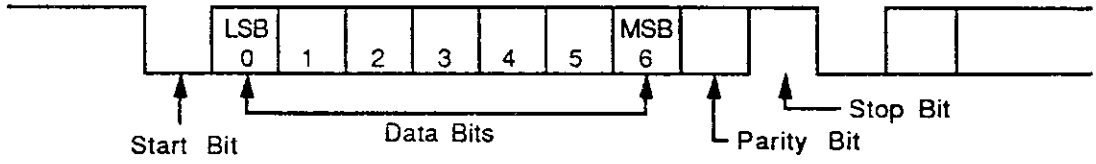
Data bit 7 or 8.

Parity Even/Odd (data 7 bit)
None (data 8 bit).

Stop bit 1 or 2

Code ASCII.

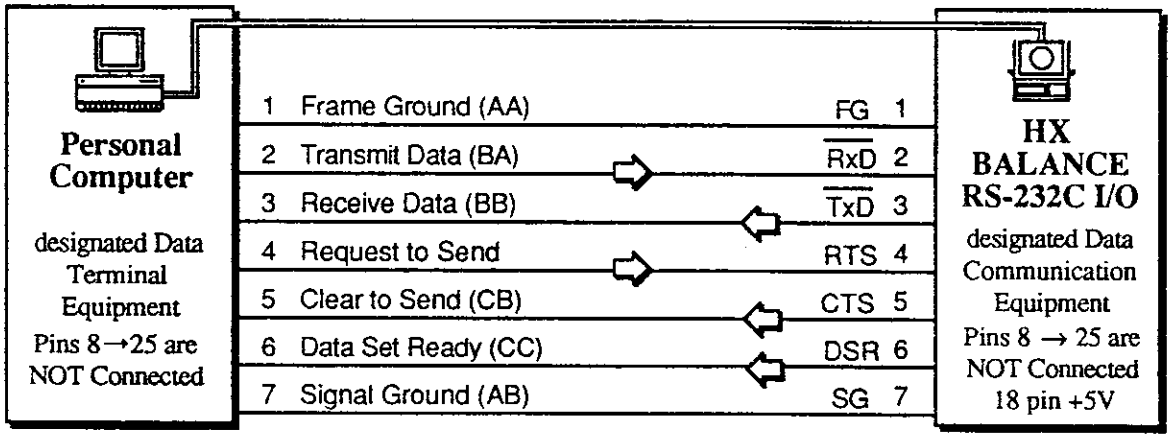
RS-232C	20mA Cur. Loop
1 = –5V → –15V	20mA
0 = +5V → +15V	0mA



Computer Connection

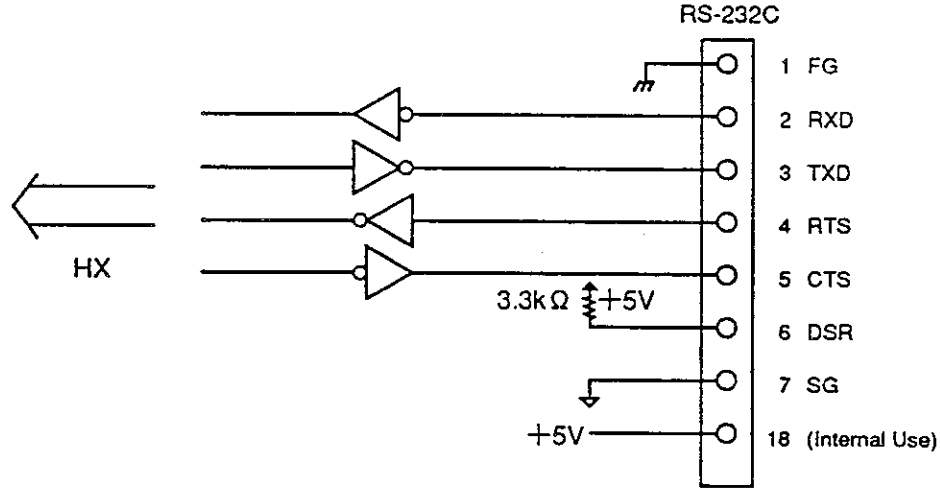
- ❑ The HX is designated as DCE (Data Communication Equipment).
- ❑ Please confirm that proper conditions have been met before connecting equipment. Refer to connection equipment's manual.
- ❑ The connecting cable should be of a high quality. For example: NEC PC-8895, Epson cable set #705, #724.

RS-232C Pin Connection



- ❑ No connector or connector covers are provided with this option.
- ❑ Use a high quality modem type cable between the computer and balance.
- ❑ AD-8121 is supplied with a cable for connection to the balance.

Circuit Diagram



Other pin numbers for the RS-232C or Current Loop interfaces are not connected.

Data Output

There are five modes to handle the transmission of weighing data, they are:

- ❑ PRINT Key **A** or **B** Mode. Sends Data when panel (or AD-1652 remote) PRINT key is pressed.
- ❑ Auto Print **A** or **B** Mode. Data is automatically sent when the display become stable, and other user set conditions are met.
- ❑ Stream Mode. Data is sent continuously.
- ❑ Output by Command. Data output is initiated by a request from an external computer or device.
- ❑ Timed Mode. Data is sent at user set time intervals.

PRINT Key Mode (when PRINT key is pressed)

❑ Print 0 c2

PRINT Key **A** Mode: PRINT key command accepted only if the display is stable. The display will blink when data is transmitted.

❑ Print 1 c2

PRINT Key **B** Mode: PRINT key command accepted and output if display stable. The display will blink when data is transmitted.

Auto Print Mode

❑ Print 2 c2

Auto Print **A** Mode: Data is output if display is over the 'Auto Print Band' **"AP-b c2"** setting and stable, data is output once. Polarity is set by **"AP-P c2"** •Next transmission is done after the display falls below the selected band

❑ Print 3 c2

Auto Print **B** Mode: Data is output when the difference between the display and the last transmitted data is over the 'Auto Print Band' **"AP-b c2"** setting and stable, data is output once. Polarity is set by **"AP-P c2"**.
•Next transmission is done after the display falls below the selected band

Stream Mode

❑ Print 4 c 2	Stream Mode: Data output is continuous.

❑ In this mode weighing data is transmitted continuously. The display does not blink when data is output, and the [PRINT] key is ignored.

Output by Command

❑ Weighing data output is controlled by commands from an external computer, or similarly equipped device. Various commands controlling the balance are listed on pages K•14 →20.

[Data output by a command is enabled in any of the key mode, auto print mode, and stream mode.]

Timed Mode (Interval Data Output)

Data is transmitted at the time interval set by the AD-1652 Remote Keyboard or by an RS-232C command:

❑ The interval output can be started only in the [PRINT] Key or Auto Print modes (**"Print 0c2** thru **3c2"**). When not using the interval output, the [PRINT] Key or Auto Print modes work normally.

❑ The balance also transmits data one time when the interval timer is started and stopped.

❑ The display will blink when the data is transmitted.

❑ The interval timer stops if you move from the weighing mode to another mode - including display OFF or the calibration mode.

❑ While the interval timer is ON, the mark is displayed.

❑ To stop the interval timer, press the [PRINT] key on the front panel, or the AD-1652 Remote Keyboard or [P] [R] [T] command via the RS-232C.

❑ Data output by a command is enabled in any of the key mode, auto print mode, and stream mode.

Sample Computer Programs

IBM PC-AT (STREAM Mode)

❑ Balance parameters set to:

Print	**4.c2**	(STREAM Mode)
t-out	**0.c2**	(no time data)
CODE	**0.c2**	(no code number)
PAUSE	**0.c2**	(no pause)
bPS	**3.c3**	(4800 bps)
PAr	**0.c3**	(parity even)
bit	**0.c3**	(data bit 7)
Cr-LF	**0.c3**	(terminator <CR><LF>)
tYPE	**0.c3**	(A&D Standard Format)
dP	**0.c3**	(decimal point 2EH)

```
1Ø   OPEN "COM1:48ØØ,,,,CS" AS #1
2Ø   LINE INPUT #1,DT$
3Ø   INPUT #1,HD$,DT$
4Ø         IF HD$<>"OL" THEN GOTO 6Ø
5Ø   DT$="      "+LEFT$(DT$,1)+"E":GOTO 8Ø
6Ø         IF HD$<>"US" THEN GOTO 8Ø
7Ø   DT$=LEFT$(DT$,9)
8Ø   PRINT HD$,DT$
9Ø   GOTO 3Ø
1ØØ  END
```

IBM PC-AT (Output by Command)

❑ Balance parameters set to:

Print	**0.c2**	(Key A Mode)
bPS	**3.c3**	(4800 bps)
PAr	**0.c3**	(parity even)
bit	**0.c3**	(data bit 7)
Cr-LF	**1.c3**	(terminator <CR>)
tYPE	**0.c3**	(A&D Standard Format)
t-UP	**0.c3**	(timer ON)
dP	**0.c3**	(decimal point 2EH)
E-Cod	**1.c3**	(transmit error code)

```
1Ø   OPEN "COM1:48ØØ" AS #1
2Ø   PRINT #1,"R"+CHR$(&HD)
3Ø   LINE INPUT #1,AK$ {Reply to "R" command}
4Ø              IF AK$<>CHR$(6) THEN GOTO 13Ø
5Ø   LINE INPUT #1,AK$ {End of REZERO}
6Ø              IF AK$="EC,EØ"  THEN GOTO 14Ø
7Ø              IF AK$="EC,E11" THEN GOTO 15Ø
8Ø   FOR I=1 TO 1ØØØ: NEXT I
9Ø   PRINT #1,"Q"+CHR$(13)
```

```
1ØØ  INPUT #1,HD$,DT$
11Ø  PRINT HD$,DT$
12Ø  GOTO 8Ø
13Ø  PRINT "BALANCE NOT READY!":CLOSE:END
14Ø  PRINT "COMMUNICATION ERROR!":CLOSE:END
15Ø  PRINT "ERROR 1...BALANCE NOT STABLE!":CLOSE:END
```

NEC PC-9801

❑ Balance parameters set to:

Print	**0.c2**	(Key A Mode)
bPS	**3.c3**	(4800 bps)
PAr	**0.c3**	(parity even)
bit	**0.c3**	(data bit 7)
Cr-LF	**0.c3**	(terminator <CR><LF>)
tYPE	**0.c3**	(A&D Standard Format)
t-UP	**0.c3**	(timer ON)
dP	**0.c3**	(decimal point 2EH)
E-Cod	**1.c3**	(transmit error code)

```
1Ø   OPEN "COM:E73 NN" AS #1  {NN=PC-9801 BASIC dialect}
2Ø   PRINT #1, "R" {RE-ZERO the balance}
3Ø   LINE INPUT #1,AK$ {Return <AK>}
4Ø   IF AK$<>CHR$(6) THEN *ERROR {If ERROR, "EC,EXX" is received}
5Ø   LINE INPUT #1,AK$ {End of REZERO}
6Ø   IF AK$<>CHR$(6) THEN *ERROR
7Ø   FOR I=1 TO 1ØØØ: NEXT I  {Delay after <AK> received}
8Ø   PRINT #1,"Q"   {Question the balance}
9Ø   INPUT #1,HD$,DT$  {Receive the data strings}
1ØØ  PRINT HD$,DT$  {Display the data strings}
11Ø  CLOSE
12Ø  END {Stop}
13Ø  *ERROR
14Ø  PRINT "ERROR HAS OCCURRED"
15Ø  CLOSE
16Ø  END
```

Weighing Data Formats

Some weighing data output is formatted according to how **'tYPE c3'** (Data Format, see page G•10) is set. This parameter allows for three types of data formats:

1) **A&D Standard Format** Adapted for peripheral instruments made by A&D, such as the AD-8121 printer (**tYPE 0c3**).

2) **DP Format** Adapted for A&D's AD-8121 printer (MODE 3) (**tYPE 1c3**).

3) **KF Format** Adapted for Karl-Fischer moisture tester which cannot communicate by A&D Standard Format (**tYPE 2c3**).

A&D Standard Format

Adapted for peripheral instruments made by A&D, such as the AD-8121 compact printer.

- Header of two characters indicate the status.
- Data with a polarity symbol, including the leading zeros.
- Unit code of three characters.
- One data set consists of fifteen characters (excluding terminator).

DP Format

Adapted for A&D's AD-8121(MODE 3) printer.

- Header of two characters indicate the status if not overloaded.
- Data with a polarity symbol, but omitted if data is zero.
- Leading zeros replaced by spaces.
- One data set consists of sixteen characters (excluding terminator).

KF Format

Adapted for Karl-Fischer moisture tester, which cannot communicate by A&D Standard Format.

- No header in data.
- Polarity symbol as the first character if not over-loaded, but omitted if data is zero.
- Leading zeros replaced by spaces.
- Unit code 'g' is transmitted only if stable and weighing in gram unit.
- One data set consists of thirteen characters (excluding terminator).

Weighing Data Format Examples

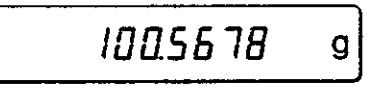
Space code is noted as (20H) in the following examples.

Stable Data Examples

Example: display="0.0000g":

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A&D Std.	S	T	,	+	0	0	0	.	0	0	0	0	(20H)	(20H)	g	CR LF	
DP	W	T	(20H)	(20H)	(20H)	(20H)	(20H)	0	.	0	0	0	0	(20H)	(20H)	g	CR LF
KF	(20H)	(20H)	(20H)	(20H)	0	.	0	0	0	0	(20H)	g	(20H)	CR LF			

Example: display="100.5678g":

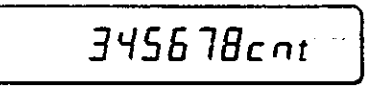


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A&D Std.	S	T	,	+	1	0	0	.	5	6	7	8	(20H)	(20H)	g	CR LF	
DP	W	T	(20H)	(20H)	+	1	0	0	.	5	6	7	8	(20H)	(20H)	g	CR LF
KF	+	(20H)	1	0	0	.	0	0	0	0	(20H)	g	(20H)	CR LF			

Example: display="0 cnt":

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A&D Std.	Q	T	,	0	0	0	0	0	0	0	0	0	(20H)	P	C	CR LF	
BP	Q	T	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	0	(20H)	P	C	CR LF
KF	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	0	(20H)	(20H)	(20H)	CR LF			

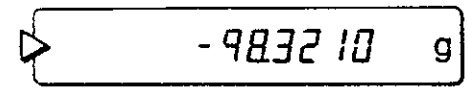
Example:display="345678 cnt":



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A&D std.	Q	T	,	+	0	0	3	4	5	6	7	8	(20H)	P	C	CR LF	
DP	Q	T	(20H)	(20H)	(20H)	(20H)	+	3	4	5	6	7	8	(20H)	P	C	CR LF
KF	+	(20H)	(20H)	(20H)	3	4	5	6	7	8	(20H)	(20H)	(20H)	CR LF			

Unstable Data Example

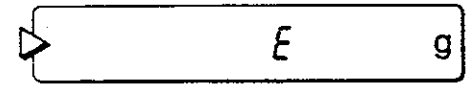
Example: display="–98.3210g":



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A&D Std.	U	S	,	–	0	9	8	.	3	2	1	0	(20H)	(20H)	g	cr	
DP	U	S	(20H)	(20H)	(20H)	–	9	8	.	3	2	1	0	(20H)	(20H)	g	cr
KF	–	(20H)	(20H)	9	8	.	3	2	1	0	(20H)	(20H)	(20H)	cr			

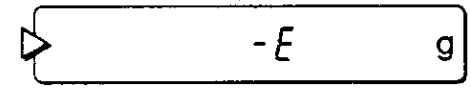
Overload Data Examples

Example: display="E g":



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A&D Std.	O	L	,	+	9	9	9	9	9	9	9	E	+	1	9	cr	
DP	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	E	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	g	cr
KF	(20H)	(20H)	(20H)	(20H)	H	.	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	cr			

Example: display="–E g":



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A&D Std.	O	L	,	–	9	9	9	9	9	9	9	E	+	1	9	cr	
DP	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	–	E	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	g	cr
KF	(20H)	(20H)	(20H)	(20H)	L	.	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	cr			

Unit Codes Examples

		A&D Standard & DP			KF		
Gram	(g)	(20H)	(20H)	g	(20H)	g	(20H)
Percent	(pct)	(20H)	(20H)	%	(20H)	(20H)	(20H)
Count	(cnt)	(20H)	P	C	(20H)	(20H)	(20H)
Decimal Ounce	(oz)	(20H)	o	z	(20H)	(20H)	(20H)
Troy Ounce	(OZt)	o	z	t	(20H)	(20H)	(20H)
Pennyweight	(dwt)	d	w	t	(20H)	(20H)	(20H)
Carat	(ct)	(20H)	c	t	(20H)	(20H)	(20H)
Momme	(mm)	m	o	m	(20H)	(20H)	(20H)
Grain Unit	(GN)	(20H)	G	N	(20H)	(20H)	(20H)
Tola	(t)	(20H)	(20H)	t	(20H)	(20H)	(20H)
Tael	(TL)	(20H)	T	L	(20H)	(20H)	(20H)

Independent Data Formats

Some data formats are independent of how parameter **'tYPE c3'** is set. *•Space code is noted as (20H) in the following examples.*

Code Number

▣ The code number itself must consist of six digits.

1	2	3	4	5	6	7	8	9	10	11
N	o	.	(20H)	0	1	2	3	4	5	cr

Code String

❑ The code string itself must consist of six digits, including spaces or hyphens.

1	2	3	4	5	6	7	8	9	10	11	12
C	O	D	E	(20H)	0	1	(20H)	3	–	5	cr

Code String

Time

1	2	3	4	5	6	7	8	9
0	1	:	2	3	:	4	5	cr

Hour Minute Second

Date

❑ The order of the date, yy-mm-dd, depends on how parameter **'dAtE c2'** is set.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
D	A	T	E	(20H)	9	2	–	0	2	–	2	8	cr

Parameter Setting

❑ (n) = the parameter group number 0 though 8.
(m) = the parameter number.
(i) = the parameter name (5 characters)
(v) = parameter setting value

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	(n)	(m)	(20H)	(20H)	(i)	(i)	(i)	(i)	(i)	(20H)	(20H)	(20H)	(v)	cr

C	0	0	(20H)	(20H)	S	T	B	–	B	(20H)	(20H)	(20H)	0	cr

☐ Stb-b	✗ C0	Stability Band Width
0 •	1>0.5 digit	FC00:0

Commands for the RS-232C Serial Interface

Please note that there needs to be a delay time between a balance acknowledgement <AK>, and the transmission of the next command to the balance. The FOR~NEXT loop times depend on your computer's operating clock and performance. Make the FOR~NEXT longer if the program does not work correctly.

For an example, using a BASIC program:

```
1..
123 LINE INPUT #1, AK$          Receive <AK>
124 FOR I=1 TO 100:NEXT I       Delay
125 PRINT #1, "Q"               TX: 'Q' command
1..
```

- If the ERROR CODE AT COMMAND MODE parameter is set at '**0**' (**E-Cod 0**c3), then the balance transmits no error codes nor acknowledgement code <AK> (ASCII 06H).
- If the ERROR CODE AT COMMAND MODE parameter is set at '**1**' (**E-Cod 1**c3), then when the following commands are accepted by the balance: '**P**', '**ON**', '**R**', '**T**' or '**TARE**', '**Z**', '**CAL**', '**EXC**', '**SMP**', the HX transmits the acknowledgement code <AK> (ASCII 06H).

  It will send not only after the command is received, but also after the command is executed. If the command can't be executed, then the HX sends various codes to inform the host computer.

⚠ *Space code is noted as (20H) in the following examples.*

1) | ? | # | **Request the Code Number**

Send	?	#	cr↵								
Reply	N	o	.	(20H)	1	2	3	4	5	6	cr↵

---

2) | ? | $ | **Request the Code String**

Send	?	$	cr↵									
Reply	C	O	D	E	(20H)	1	2	3	–	5	6	cr↵

---

3) | ? | % | **Request the 100% Weight**

- The balance reply is the weighing unit used last. If the balance is in Percent or Count mode, the reply is in grams (g).

Send	?	%	cr↵												
Reply	%	W	,	+	1	2	3	.	4	5	6	7	(20H)	(20H)	g	cr↵

---

4) ? @ Request the Unit Weight

❑ The balance reply is in the weighing unit used last.

Send	?	@	cr↵													
Reply	U	W	,	+	0	0	0	0	0	.	1	2	(20H)	m	g	cr↵

---

5) ? A L L Request All User Defined Parameters

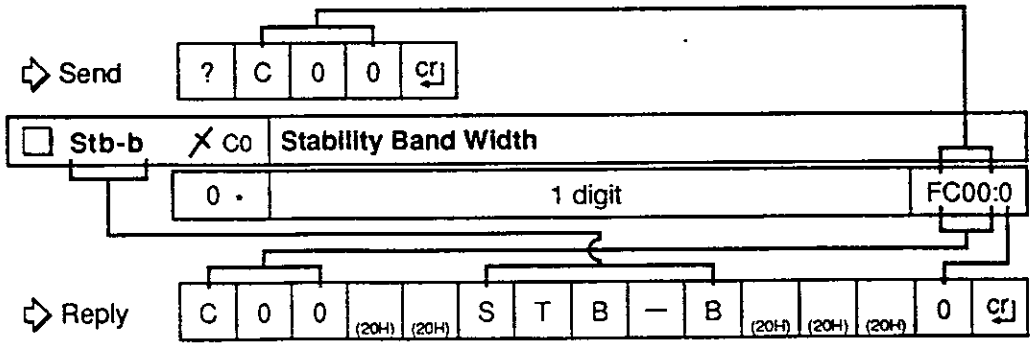
❑ 10 sets of data will be sent by the balance in reply.

Send	?	A	L	L	cr↵											
Reply:																
Target Weight	T	G	,	+	0	0	2	.	0	0	0	0	(20H)	(20H)	g	cr↵
HI Limit	H	I	,	+	1	5	0	.	0	0	0	0	(20H)	(20H)	g	cr↵
LO Limit	L	O	,	—	0	5	0	.	0	0	0	0	(20H)	(20H)	g	cr↵
Unit Weight	U	W	,	+	0	0	0	0	0	.	1	2	(20H)	(20H)	g	cr↵
100% Weight	%	W	,	+	1	2	3	.	4	5	6	7	(20H)	(20H)	g	cr↵
External CAL Weight	C	W	,	+	2	0	0	.	0	0	0	0	(20H)	(20H)	g	cr↵
Interval	T	I	,	0	0	:	0	5	:	0	0	cr↵				
Time	C	K	,	0	1	:	2	3	:	4	5	cr↵				
Code Number	N	o	.	(20H)	1	2	3	4	5	6	cr↵					
Code String	C	O	D	E	(20H)	1	2	3	—	5	6	cr↵				

---

6) ? C (n) (m) Request a Parameter Setting

❑ You must specify the parameter group number (n) and parameter number (m). See PARAMETER SETTING.



---

7) ? C K Request the Time

Send: ? C K cr

Reply: C K , 0 1 : 2 3 : 4 5 cr

Hour (01) Minute (23) Second (45)

---

8) ? C W Request the Weight of the External Calibration Weight

Send: ? C W cr

Reply: C W , + 2 0 0 . 0 0 0 0 (20H) (20H) g cr

---

9) ? H I Request the HI Limit

Send: ? H I cr

Reply: H I , + 1 5 0 . 0 0 0 0 (20H) (20H) g cr

---

10) ? L O Request the LO Limit set

Send: ? L O cr

Reply: L O , - 0 5 0 . 0 0 0 0 (20H) (20H) g cr

---

11) ? T G Request the Target Weight

Send: ? T G cr

Reply: T G , + 0 0 2 . 0 0 0 0 (20H) (20H) g cr

---

12) ? T I Request the Interval Time

Send: ? T I cr

Reply: T I , 0 0 : 0 5 : 0 0 cr

Hour (00) Minute (05) Second (00)

---

13) [?][U] Request the Balance's Present Weighing Unit

❑ The balance reply is in the weighing unit used last.

Send [?][U][cr]

Reply [(20H)][P][C][cr]

---

14) [#] Set the Code Number

❑ The balance will error if '–' or '.' are included. Code doesn't need to have exactly six digits.

Send [#][1][2][3][4][5][6][cr]

-or- Send [#][1][2][3][cr]

---

15) [$] Set the Code String

❑ The code string must be six digits including '–' or a space.

Send [$][8][8][–][1][(20H)][2][cr]

---

16) [%] Set the 100% Weight

❑ All weighing units are acceptable. If the weighing unit code is omitted, the balance assumes you want the last weighing unit used. If you are in Percentage mode and the weighing unit code is omitted, then gram (g) is assumed. •The balance will error if: 1) The value is over the capacity; 2) The value is negative; 3) The value is less than 100 digits. Example:

Send [%][1][0][.][1][2][(20H)][(20H)][g][cr]

-or- Send [%][1][0][.][1][2][cr] if in carat mode, then 10.12ct
if in ounce mode, then 10.12oz

---

17) [@] Set the Unit Weight

❑ All weighing units are acceptable. •The balance will error if: 1) The value is over the capacity; 2) The value is negative; 3) The value is less than 10 digits;

Send [@][0][.][1][2][3][(20H)][(20H)][g][cr]

or Send [@][0][.][1][2][3][cr]

balance assumes 'g' if the unit "g" is used..

---

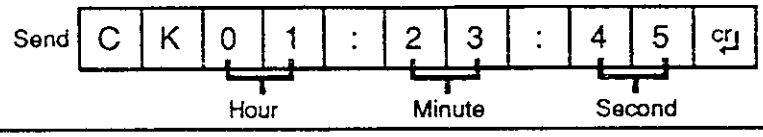
18) [C] Release the SIR ❑ See the SIR command that follows.

---

19) [C][A][L] Perform Calibration ❑ Same as pressing the [CAL] key.

---

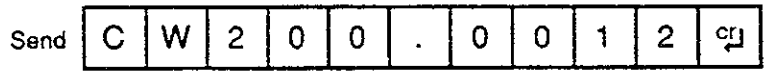
20) | C | K | **To Adjust the Clock** ❑ Send: <hour>:<minute>:<second>.



---

21) | C | W | **To set the External Calibration Weight**

❑ All weighing units are permitted. If the weighing unit is omitted, the balance will assume the present weighing unit. If in percent, or counting, then weighing unit will be grams (g). Example:



External Calibration weight would be registered as +200.0012g (balance was in grams). The balance will error if: 1) The value was over capacity; 2) The value was negative; 3) The value was less than half of capacity.

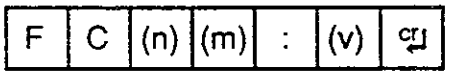
---

22) | E | X | C | **Go to External Calibration** ❑ See MANUAL CALIBRATION section, page C•4.

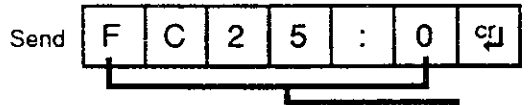
---

23) | F | C | **To change a Parameter Setting** ❑ Send <FC><nm>:<v>, the parameter section and parameter number, and setting.

(n) = the parameter group number 0→8.
(m) = the parameter number.
(v) = parameter setting value



❑ Example, parameter '**COde**' is set at '0', No Code Number:



❑ COde ✗ c2	Send Code Number
0•	No Code Number FC25:0

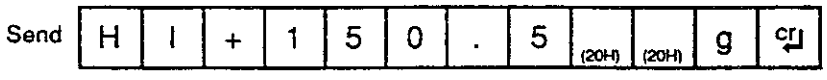
---

24) | F | E | E | D | **Start feeding by the AD-1651 Vibratory Spoon**

---

25) | H | I | **To set the HI Limit**

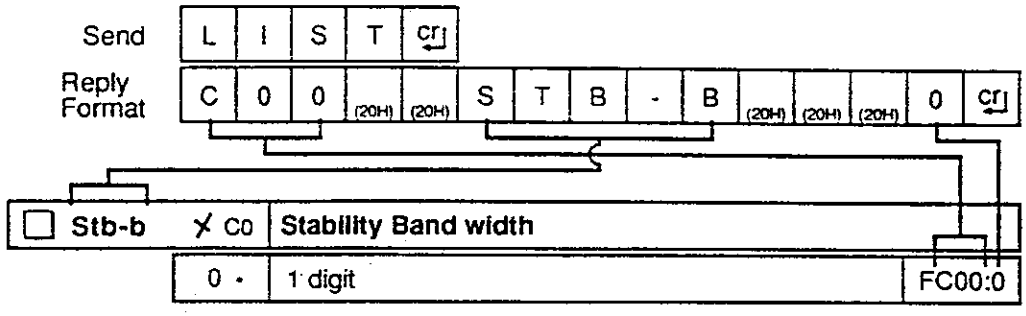
❑ All wighing units are permitted, including a negative value. If the weighing unit is omitted, the balance will assume the present one. If in percent, or counting.



---

26) L I S T **Request a listing of the Parameter Settings**

❑ A list of the 42 parameters will be sent by the balance. Example:



---

27) L O **To set the LO Limit**

❑ All weighing units are permitted. A negative value is permitted. If the weighing unit is omitted, the balance will assume the present weighing unit. If in percent, or counting.

Send L O – 1 0 0 . 5 cr

---

28) O F F **Go to Display OFF mode** ❑ No change if already in Display OFF mode.

---

29) O N **Go to Display ON mode** ❑ No change if already in Display ON mode.

---

30) P **Display ON/OFF** ❑ The same as pressing the ON:OFF key.

---

31) P R T **Print** ❑ The same as pressing the PRINT key.

---

32) Q **Question the balance for Weighing Data** ❑ Balance will send the weighing data immediately.

---

33) R **RE-ZERO** ❑ The same as pressing the RE-ZERO key.

---

34) R E A D **Read the balance Weighing Data** ❑ Balance will send weighing data immediately (same as 'Q').

---

35) S **Send Stable Data** ❑ Display will blink when data transmitted.

---

36) S I **Send Weighing Data Immediately** ❑ Balance will send the weighing data immediately (same as 'Q').

37) [S][I][R] **Send Immediately the Weighing Data & Repeat**

❑ Balance will send the weighing data immediately with continuous transmission (like a stream mode) until the 'C' command is received.

---

38) [S][M][P] **SAMPLE** ❑ The same as pressing the [SAMPLE] key.

---

39) [S][T][O][P] **Stop the AD-1651 Vibratory Spoon**

---

40) [T] **TARE the balance** ❑ The same as pressing the [RE-ZERO] key.

---

41) [T][A][R][E] **TARE the balance** (same as above)

---

42) [T][G] **Set the Target Weight**

❑ All weighing units are acceptable. If the weighing unit code is omitted, the balance assumes you want the last weighing unit used. •The balance will error if the value is over the capacity.

Send [T][G][2][.][0][0][0][0][(20H)][(20H)][g][cr↵]

---

43) [T][I] **Set the Interval Time**

❑ The value must be in the range of '00:00:00' to 24:59:59. Example of a 5 minute setting:

Send [T][I][0][0][:][0][5][:][0][0][cr↵]

Hour Minute Second

---

44) [U] **Change the Internal Setting Monitor(▲)** ❑ The same as pressing the [MODE] key.

Error Codes for the Serial Interface

In the Command mode, the computer may receive an error code from the balance if the software parameter '**E-Cod c3**' is set at '1' Also:

- In the case the Command requests the weighing data, ex: the 'Q' command: then:
  1) If there is no error, then the balance sends the data; or
  2) If there is an error, then the balance sends the error code.
- In the case the Command is not a request, ex: 'HI' command: then:
  1) If there is no error, then the balance sends <ak> (06H) code; or
  2) If there is an error, then the balance sends the error code.
- To raise the reliance of the RS-232C communication, the balance replies to all commands.
- The format of the error codes is:

E	C	,	E	<n>	cr

or

E	C	,	E	<n>	<n>	cr

<n> standing for the error number

E0 Communication Error

- Parity error, framing error, etc.

E1 Undefined Command Error

- Example:

?	h	i	cr

The command must be in uppercase – 'HI'

E2 Balance not ready Error

- If the display is OFF, then only 'P' and 'ON' commands accepted.
- Data request commands (such as 'Q', 'S' commands) cannot be accepted if the balance is not in the weighing mode.

E3 Time Over Error

- The balance couldn't receive the next character in 1 second after the last character was received.

E4 Too Many Characters Error

- Example, command contains more than 7 digits:

H	I	+	1	5	0	.	1	2	3	4	5	(20H)	(20H)	g	cr

E5 Terminator Error

❑ The command contains an illegal terminator.

E6 Format Error ❑ Examples:

T	I	0	0	:	1	0	cr↵

- missing Seconds

L	O	–	1	0	(20H)	(20H)	G	cr↵

- unit must be '__g' for gram (not capitalized)

E7 Out of Range Error ❑ Example:

- must be within balance capacity

E11 Stability Error ❑ Balance display shows Error 1

❑ The balance takes more than 30 seconds to ZERO.

E12 Stability Error ❑ Balance display shows Error 2

❑ Please follow the same recommendations as **Error 1** on p. A•4.

E13 Invalid Value Error ❑ Balance display shows Error 3

❑ Value entered by the AD-1652 RK is out of the range permitted for the function (example: TW 400g is out of the TARE range). To return to weighing mode, press any key.

E14 Weighing Pan Error ❑ Balance display shows Error 4

❑ The weighing pan touching something, or there is something on the pan when the ON:OFF key is pressed.

E15→17 Internal Error ❑ Balance display shows Error 5→8

❑ Disconnect the AC adaptor, wait a few seconds and try again. If the error persists, call your dealer for service.

E20 Calibration Error ❑ Balance display shows CAL E

❑ Calibration weight is too heavy.

E21 Calibration Error ❑ Balance display shows - CAL E

❑ Calibration weight is too light.

E22 Calibration Error ❑ Balance display shows CAL no

❑ Balance unstable during calibration.

E33 Sample Too Light Error ❑ Balance display shows Lo

❑ Individual sample weight too light.

Command Examples Illustrated

The following examples illustrate the interaction between the host computer and the HX Balance during RS-232C Serial Interface communication.

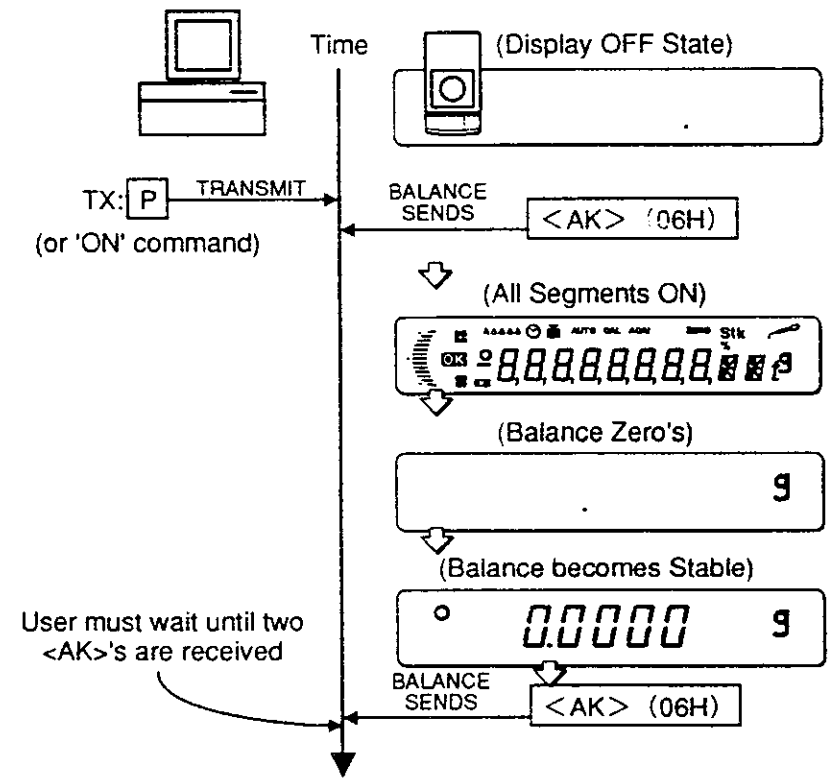
Please note that there needs to be a delay time between a balance acknowledgement <AK>, and the transmission of the next command to the balance. The FOR~NEXT loop times depend on your computer's operating clock and performance. Make the FOR~NEXT longer if the program does not work correctly.

- For an example using a BASIC program:

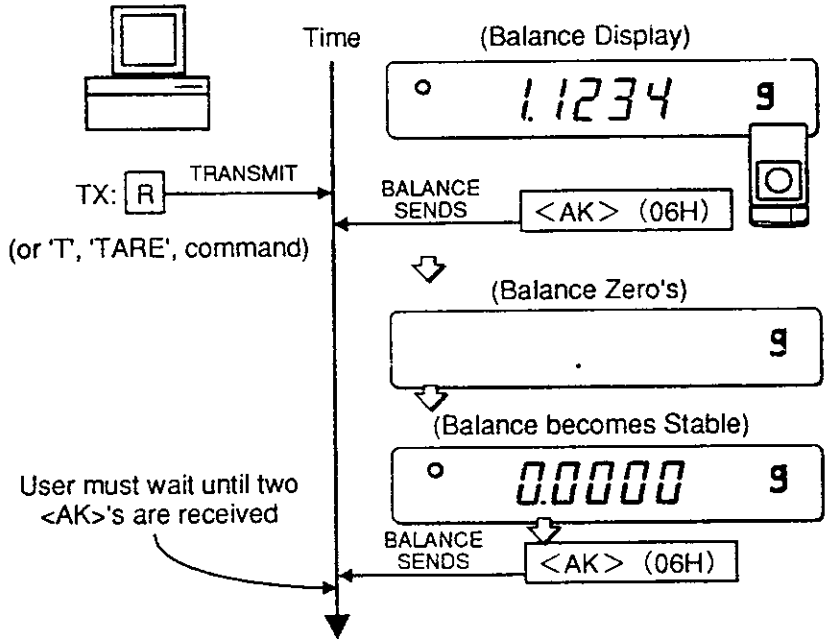
```
1..
123 LINE INPUT #1, AK$          Receive <AK>
124 FOR I=1 TO n:NEXT I         Delay
125 PRINT #1, "Q"               TX: 'Q' command
1..
```

Where n = a value ~ 100, 1000, 5000 that will set the computer to wait for about one second.

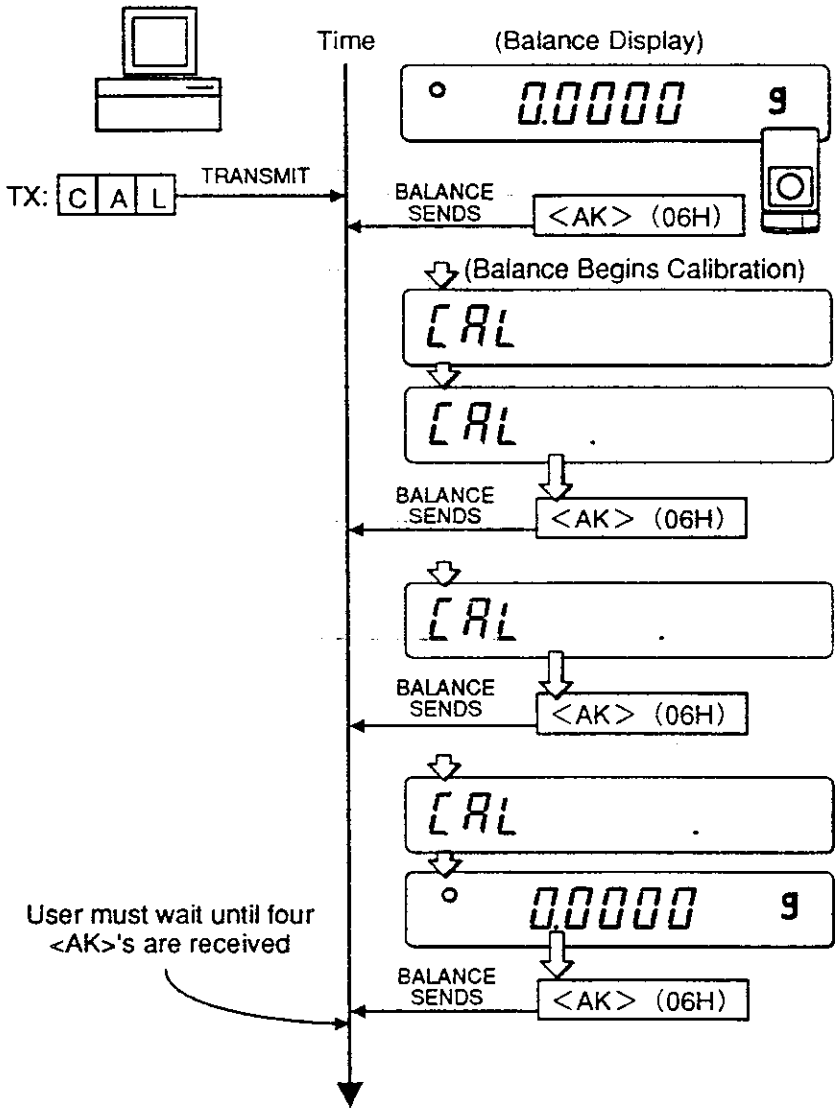
1 P O N Display ON/OFF



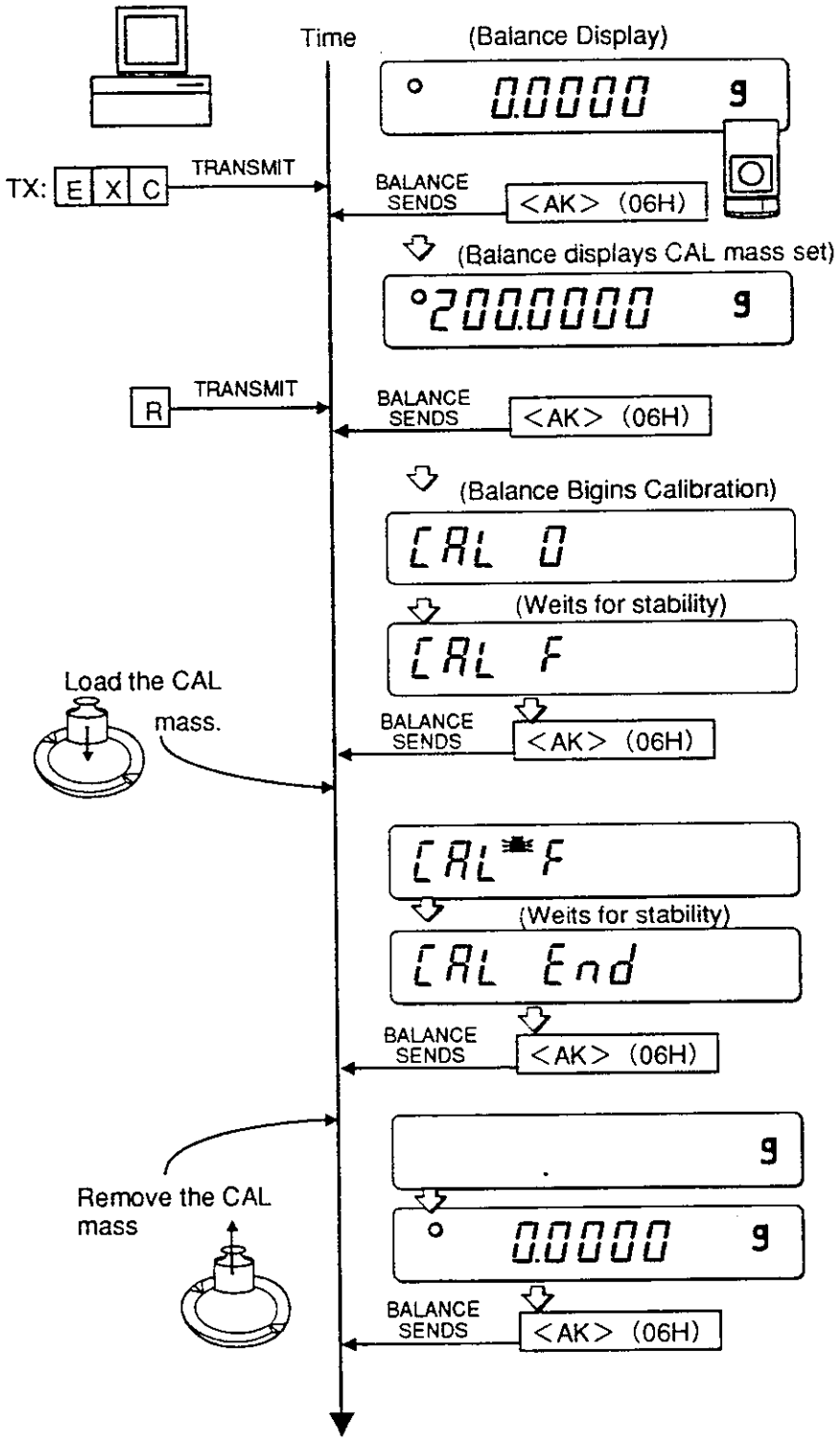
2 R T TARE ReZero or Tare



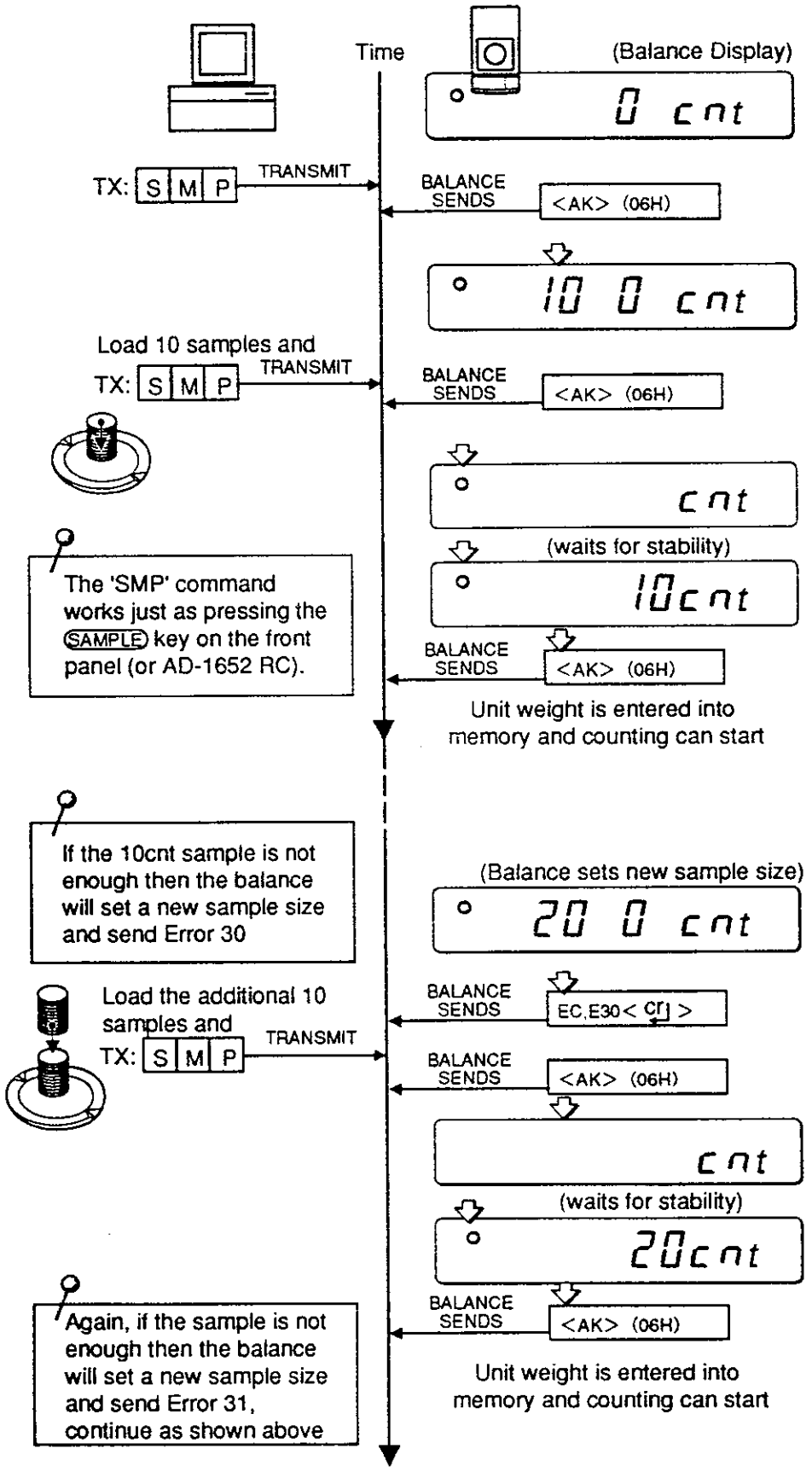
3 CAL Calibration



4 E X C Manual Calibration Command

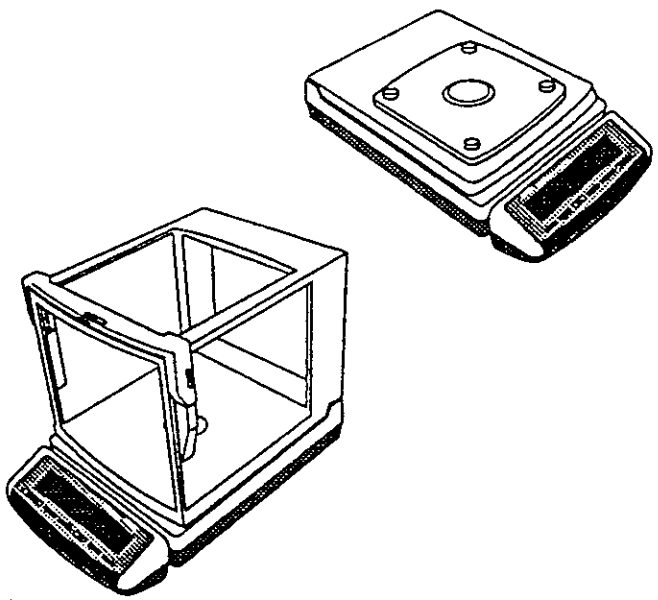


5 S M P Counting / Percentage



HX Series • Section L

Comparator Current Loop (part of OP-04)



Comparator

There are 3 methods for setting of HI/LO limits (See "Setting HI/LO limits" on page L-3, or Next page).
The comparator mode indicates whether the sample is too heavy or too light. This function is convenient for a product weight check, and so on. Select the internal setting "CP-d 1 c6."

When the HI/LO limits are set		
Too heavy	Indication	"+" illuminated
Accepted	Indication	"OK" illuminated
Too light	Indication	"-" illuminated

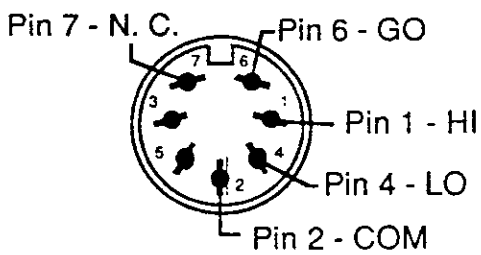
[The marks "+", "OK", and "-" are used to indicate the judgment results. When entering a set value or selecting a set value for internal setting, "HI", Go", "and "Lo" represent "+", "OK", and "-", respectively.]

[A buzzer can be sounded to inform you of the "too heavy", "accepted", and "too light" judgments. (Refer to Internal Setting)]

When either the HI or Lo limit is set		
Too heavy	Indication	"+" illuminated
Too light	Indication	"-" illuminated

Connecting the option OP-04 (comparator output board) allows you to output the judgement results to the external devices such as AD-8951.

Pin Connection and Specifications



Pin 1 - HI
Pin 2 - COM
(Pin 3 - LOOP)
Pin 4 - LO
(Pin 5 - LOOP)
Pin 6 - GO
Pin 7 - N. C.

Specifications: **Max. Voltage** 50V DC
Max. Current 200 mA

Setting HI / LO Limits

There are the following three ways to set the HI limit and Lo limit.

- Actually, prepare the samples for the HI limit and Lo limit, and make the balance memorize their respective set values. (Only one kind of sample is required when making either judgment whether too heavy or too light.)

You may set or view the HI/LO limits using the AD-1652 Remote controller, or via the serial interface. Also:

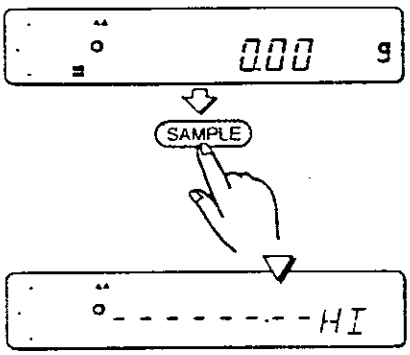
- If the weighing unit is changed, the HI/LO limits are converted to the unit displayed. For example: if the HI limit is 10g, if the unit is changed to carats, then then HI limit will be displayed as 50ct.
- If the unit weight or 100% weight is not registered in cnt/%mode, then the HI/LO limits will show zero. But after registration, the HI/LO limits are converted into each consecutive unit.
- The maximum HI/LO limits are limited to seven digits, -9999999 to +9999999.

Setting HI Limit and LO Limit

- Setting of the HI limit and Lo limit is performed with the unit presented on the display. (An RS-232C command allows you to set those values with the unit which is not presented on the display.)
- When the unit is changed after setting the HI limit and Lo limit, the limits are converted into the new unit. When the unit is swithced from "g" to "%", they are converted into "%", if the 100% weight has been set.
- The maximum number of digits for the HI and Lo limit is 7 digits (-9999999 to +9999999).

Select the internal setting "[P-d / C6."

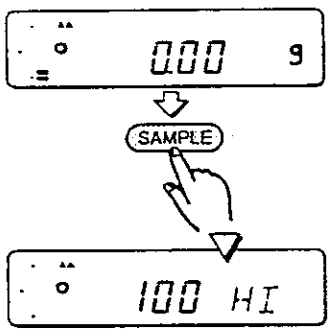
▶ Keep pressing the SAMPLE key for about 2 seconds in the weighing display state.



○ "- - - - - - - - - HI" is displayed. "HI" indicates that the set value is the HI limit.

⚠ "- - - - - - - - - HI" is displayed for about 2 seconds. After that, you will be returned to the weighing state automatically.

○ If the HI limit has been set and left intact, that value will be displayed first.



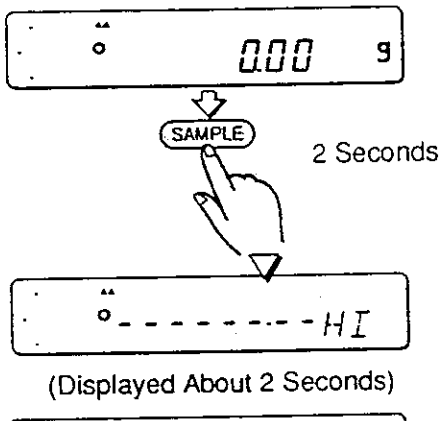
(When Previous Set Value Is 100g.)

○ "- - - - - - - - - HI" is displayed, and if you press the MODE key immediately, "- - - - - - - - - Lo" is displayed. Pressing the MODE key again displays "- - - - - - - - - rG" Pressing the MODE key again returns the display to "- - - - - - - - - HI" In the comparator mode

2 Prepare actual samples coresponding to the HI limit and Lo limit and, and set them sequentially . In the following, you set the HI limit and Lo limit. When you want either judgment whether too heavy or too light, however, set either HI limit or Lo limit.

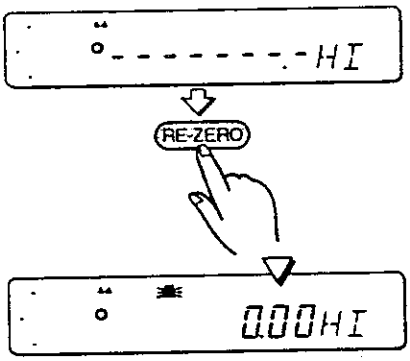
▶ In the weighing display state, press the [SAMPLE] key about 2 seconds.

○ "- - - - - - - - - HI" is displayed about 2 seconds.



(Displayed About 2 Seconds)

▶ Press the [RE-ZERO] key immediately.



○ The display changes and the weight mark (■) blinks.

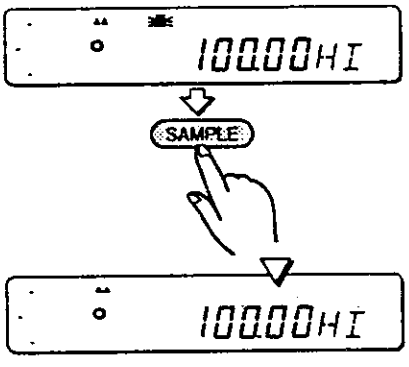
3 ▶ Place the sample on the weighing pan for the HI limit.

○ The variable for the HI limit "HI" is displayed.

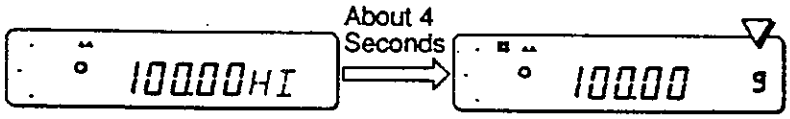
(When 100g Sample Is Placed)

4 ▶ To save the value, press the [SAMPLE] key.

○ The blinking weight mark "■" disappears, and the HI limit is saved.



○ If the HI limit value is left intact about 4 seconds after it was saved, the display is changed to "100.00 g" automatically.



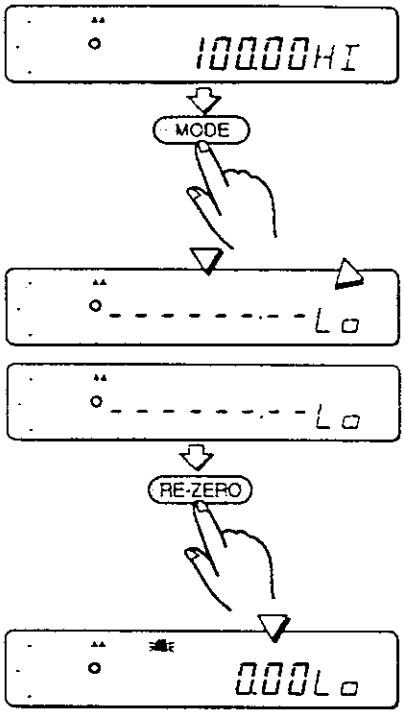
5 ▶ Set the Lo limit.

▶ After finishing Step 4, press the MODE key immediately (within 4 seconds).

○ "- - - - - - - - - Lo" is displayed. (If the lower limit value was set previously, that set value will be displayed.)

○ After "- - - - - - - - - Lo" is displayed, press the RE-ZERO key immediately.

○ When the display changes, the weight mark (■) blinks simultaneously.

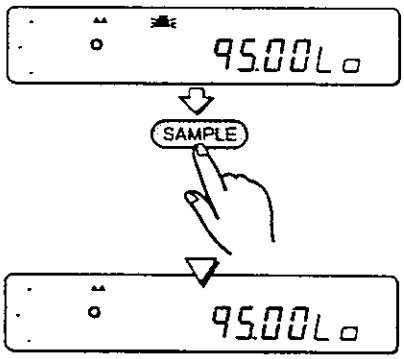


6 ▶ Place the sample on the weighing pan for the LO limit.

7 ▶ To save the value, press the SAMPLE key.

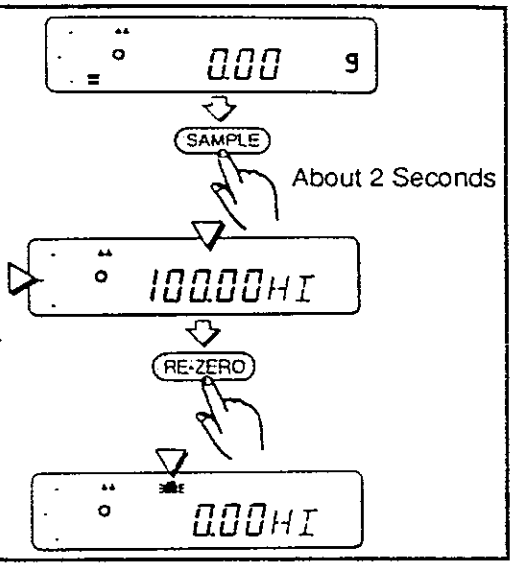
○ The blinking weight mark (■) disappears and the Lo limit is saved.

○ If it is left intact, you will be returned to the weighing display state automatically.



▶ When you press the SAMPLE key in the weighing display state to enter the comparator mode and alter the displayed HI/LO limits, press the RE-ZERO key quickly.

The weight mark (■) starts blinking.
When you set new HI/Lo limits, repeat from Step 2 or Step 5, respectively.



Using the AD-1652 Remote Controller

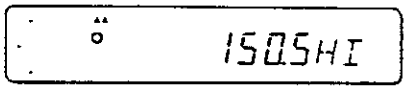
To set HI Limit

START
→ H. LIMIT

❑ The [FUNC]R › [H. LIMIT] key › <N> › [ENTER]R key combination digitally sets the comparator higher limit. A negative number is permitted and the acceptable range is from –9999999 to +9999999.

Example: [FUNC]R › [H. LIMIT] key › [1][5][0][.][5] › [ENTER]R

the balance will enter 150.5g as the comparator's high limit (if "g" unit weight is being used).



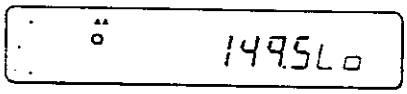
To set LO Limit

STOP
→ L. LIMIT

❑ The [FUNC]R › [L. LIMIT] key › <N> › [ENTER]R key combination digitally sets the comparator lower limit. A negative number is permitted and the acceptable range is from –9999999 to +9999999.

Example: [FUNC]R › [L. LIMIT] key › [1][4][9][.][5] › [ENTER]R

the balance will enter 149.5g as the comparator's lower limit (if "g" unit weight is being used).



Using the RS-232C Serial Interface

To set HI or LO limit. A unit code of three characters must be added after the value if the HI/LO limits is in a different unit from the one presently on the display.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
H	I	+	1	5	0	.	0	0	0	0	(20H)	(20H)	g	cr↵
HI or LO		Polarity					Value					Unit		

To view HI or LO limit.

?	H	I

Request the HI Limit

Send	?	H	I	cr↵											
Reply	H	I	,	+	1	5	0	.	0	0	0	0	(20H)	(20H)	g	cr↵

?	L	O

Request the LO Limit

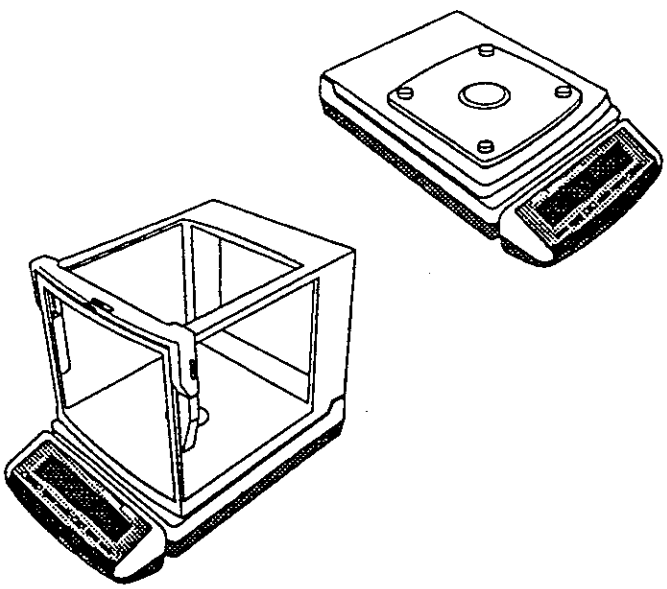
Send	?	L	O	cr↵											
Reply	L	O	,	-	0	5	0	.	0	0	0	0	(20H)	(20H)	g	cr↵

Comparator C-Parameters

There are a number of Parameters that can and need to be set. These include Comparison Mode, Comparator Output, Buzzer, etc. (see page G•14).

HX Series • Section M

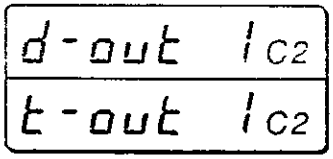
Miscellaneous



Applying the Clock Function

The Following can be enabled by making use of the built-in clock of the HX series.

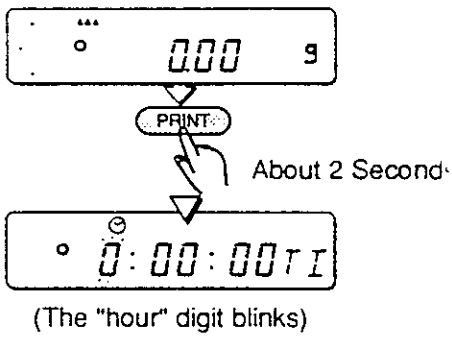
❑ Outputting the time/date together with the RS-232C output data.
Select the internal setting as follows:



❑ Outputting a weight change to the printer at constant intervals.
Make use of interval output. (During output, the time mark (⏲) is illuminated on the display of the balance.)

▣ Press the [PRINT] key in the weighing display state.

○ "0 00 00 TI" is displayed. (Or, the interval time currently set is displayed.)

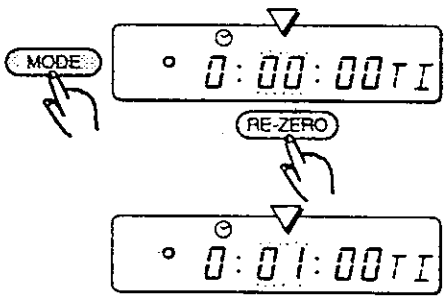


○ Pressing the [MODE] key moves the blinking digit to the right.

○ Pressing the [RE-ZERO] key increments the number in the blinking digits by 1. (The number keeps being incremented while the key is held down.)

○ Pressing the [PRINT] key memorizes the interval time, returns you to the weighing state, and starts outputting at every set time.

○ Pressing the [ON:OFF] key exits this mode and returns you to the display OFF state.



▣ Utilizing the remote controller AD-1652

Example: When setting the interval output time to 10 minutes; Operate the keys in the following sequence:
[FUNC] key › [INTVL] key › [0][0][1][0][0][0] › [ENTER] key
This sets the interval time to 10 minutes.

▶ Utilizing the RS-232C command

With the [T][I] command, set the interval time.

Set in the format, "hours:minutes:seconds."

"TI 00:10:00" sets the interval time to 10 minutes.

OP-04 Comparator/CL. Output Board

General

OP-04 is an optional comparator output and 20 mA, passive current loop output board.

The comparator output section provides HI, GO, and LO contact outputs matched to +, OK, and − of the balance.

The current loop output section outputs the same data as the RS-232C output of the balance.
Refer to Section • K " RS-232C Serial Interface " and Section • L " Comparator/ Current Loop ".

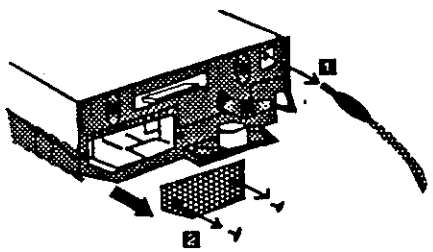
Packing

- **OP-04 Board**
- **7P Din Plug**

Installing Procedure

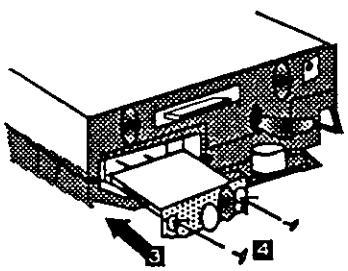
Step 1
Remove the AC adaptor from the balance.

Step 2
Remove the two screws indicated by the drawing at the right, at the rear of the balance.



NOTE: Do not remove any screws other than these two screws.

Step 3
Insert the option board into the grooves of the guide
inside the balance.
When the connector is installed firmly, the option board mount will be flushed with
the balance case.

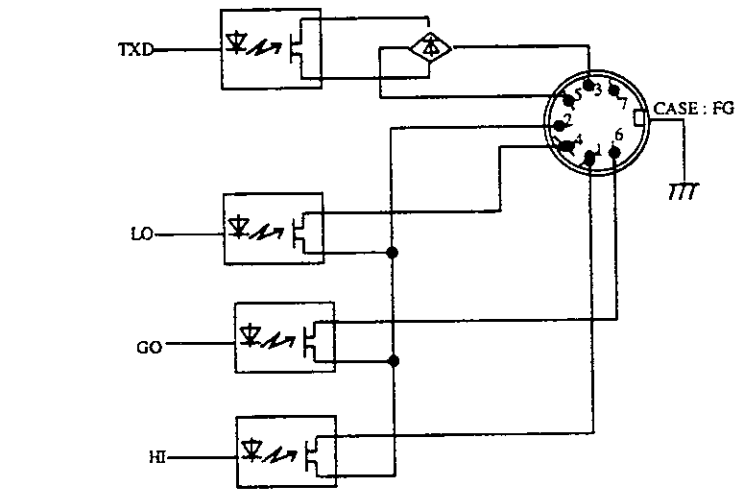


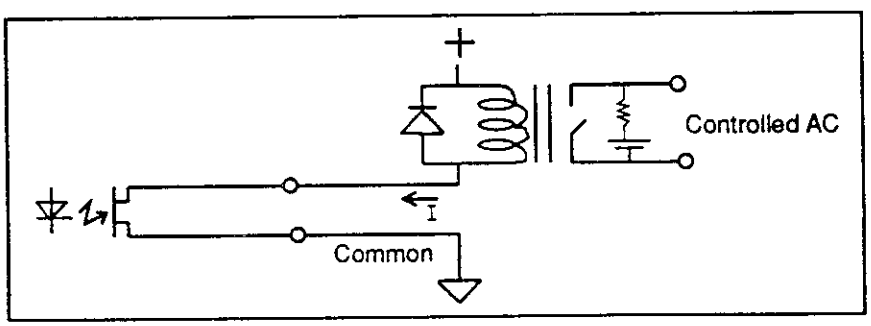
Step 4
Secure the board with the two screws previously removed.

Pin Connection

Pin No.	Signal Name
1	HI
2	COMMON
3	Send Loop
4	LO
5	Send loop
6	GO
7	Not connected
Connector shell	Frame Ground

Circuit Configuration





Specifications

Comparator section

Rated voltage	50 V DC
Rated current	100 mA
ON resistance	20 Ω Max.

- ☐ AD-8951 Comparator Light can be directly connected.
- ☐ Controlling AC voltage, use a relay.

Current loop section

Type	20 mA current loop (PASSIVE)
Transmission method	Asynchronous, output only
Signal format	Baud Rate : 600/1200/2400/4600/9600 bps Data Bits : 7/8 bits Parity : Even/Odd (Data length 7 bits) None (Data length 8 bits) Stop Bit : 2 bits Code : ASCII

- ☐ Since the current loop is the PASSIVE type, the receiving device must supply the loop current.

OP-05 Feeder/C.L. Output Board

General

OP-05 is an optional feeder control and 20mA, passive current loop output board.

- The feeder control section is used to connect the AD-1651, Vibratory Spoon to the HX balance.

  Setting a Target Weight in the HX balance enables you to feed powder to be weighed automatically.

  As OP-05 is also equipped with the general-purpose I/O terminal, the balance can be controlled by the other devices with this option.

- Current Loop output section outputs the same data as the RS-232C.

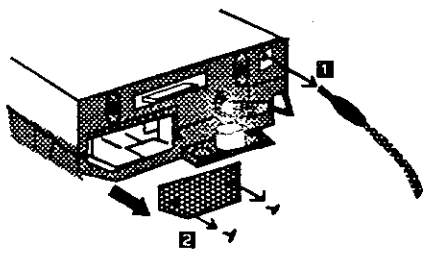
  Refer to Section •K " RS-232C Serial Interface " and Section • J " AD-1651 Vibratory Spoon ".

Packing

❑ **OP-05 Board** ❑ **7P Din Plug** ❑ **3P Mini Plug**

Installing Procedure

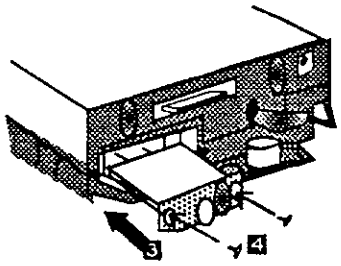
1. Remove the AC adaptor from the balance.



2. Remove the two screws at the rear of the balance, indicated by the drawing at the right.

Do not remove any other screws.

3 Insert the option board into the grooves of the guide inside the balance.
When the connector is installed firmly, the option board mount will be flush with the balance case.



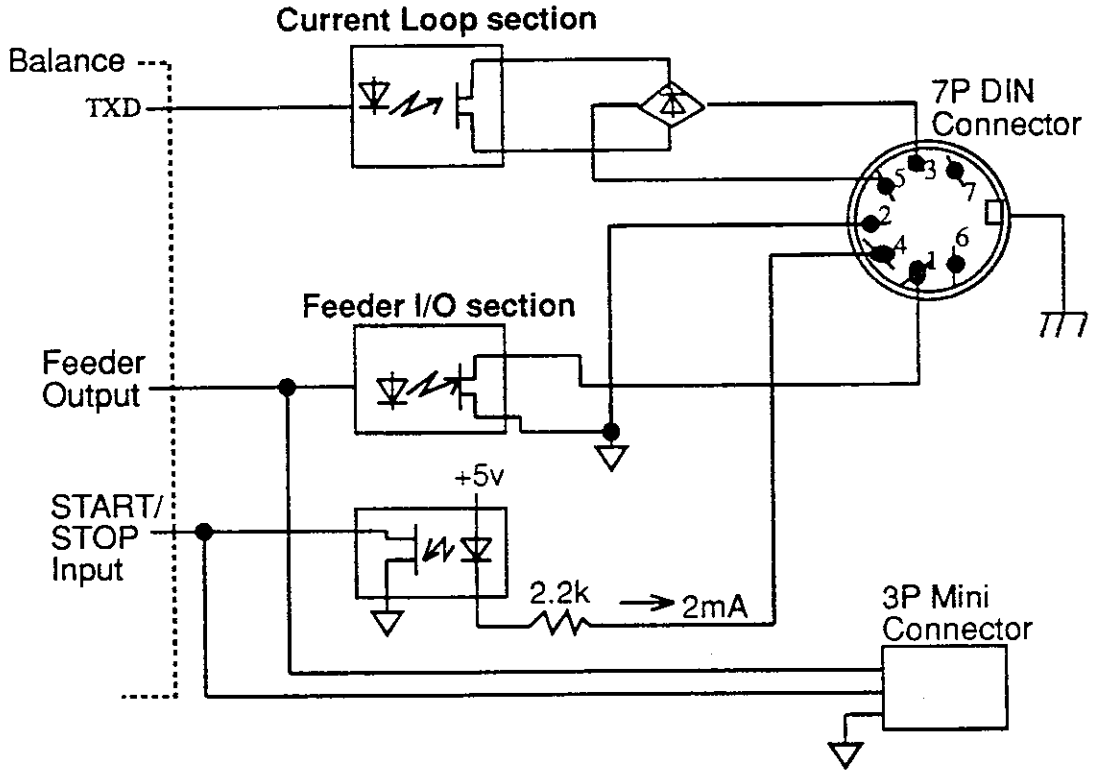
4 Secure the board with the two screws previously removed.

Pin Connection

3P Mini Connector	Connected to the AD-1651 Vibratory Spoon

7P DIN Connector	Connected to a general-purpose Feeder input/output or a Current Loop output
Pin No. 1	Feeder output
2	Common
3	Current loop (Not polarized)
4	Send a Feeder START/STOP input
5	Current loop (Not polarized)
6	Not connected
7	Not connected
Connector shell	Frame Ground

Circuit Configuration



Specifications

Feeder I/O section

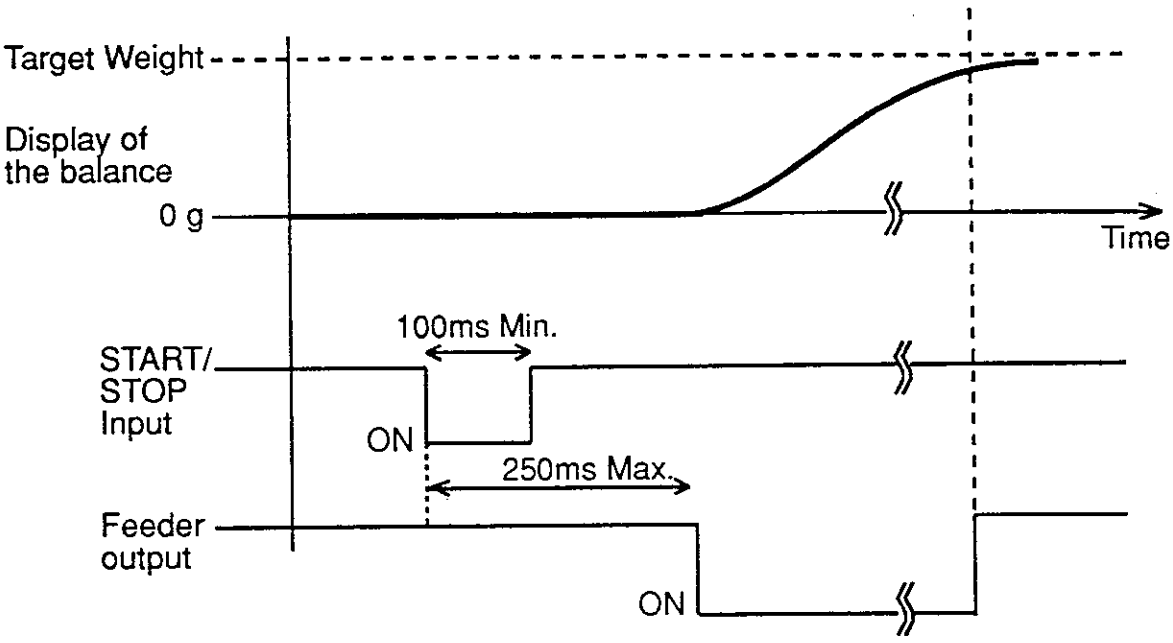
❑ 3P Mini Connector	▶ Connected to the Vibratory Spoon (AD-1651)
❑ 7P DIN Connector	▶ Rated Voltage: 30 v DC
	▶ Rated Current: 30 mA
	▶ Input Pulse: 100 msec Minimum

Current loop section

❑ Type	▶ 20mA current loop (passive)
❑ Transmission method	▶ Asynchronous, output only
❑ Signal format	▶ Baud Rate: 600/1200/2400/4800/9600 bps ▶ Data Bits: 7/8 bits ▶ Parity: Even/Odd (Data length 7 bits), None (Data length 8 bits) ▶ Stop Bit: 1 or 2 ▶ Code: ASCII ○ Since the current loop is the PASSIVE type, the receiving device must supply the loop current.

The Application of the General-Purpose I/O Terminal

Timing Chart



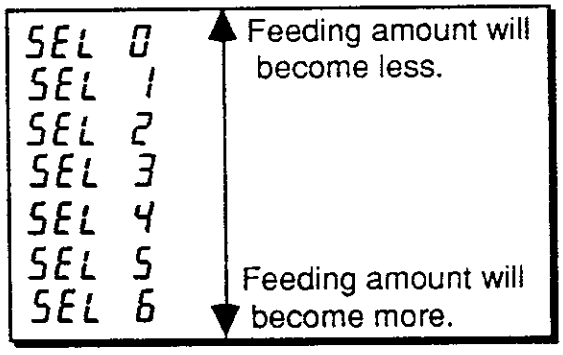
Operation

- When a pulse is applied to the START/STOP Input, Feeder Output will turn ON.
- When the weight values of the balance reach the Target Weight, Feeder Output will turn OFF.
- While the Feeder Input stays ON, which means that the weight values of the balance have not reached the Target Weight, Feeder output will be OFF if a pulse is applied to the START/STOP Input again.

Fine Adjustment of the Feeding Amount

Feeder accuracy (the difference between the Target Weight and actual fed amount) is affected by the powder flow rate or weighing condition.

- Internal setting, SEL x C7, adjusts the free fall compensation , and allows the feeding amount to be adjusted.
- If the Spoon Feeding stops under the Target Weight, increase the value of the C-Parameter setting, SEL x C7 . (x indicates setting values)



OP-06 Analog Output Board

General

OP-06 is an optional analog output board which allows the displayed values in the HX balance to be converted to voltage and then to be output.

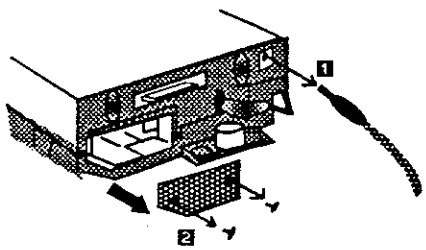
- There are two types of output modes. The first is that you can select the digits you like to output , and the second is that you can output within the range of the weighing capacity. Zero Span = 0V, Full Span = 1V
- The output voltage can be selected by jumper pins.

Packing

❑ OP-06 Board ❑ Adjusting screwdriver ❑ 7P DIN Plug

Installing Procedure

1 Remove the AC adaptor from the balance.

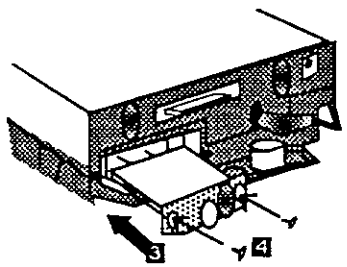


2 Remove the two screws at the rear of the balance, indicated by the drawing at the right.

Do not remove any other screws.

3 Insert the option board into the grooves of the guide inside the balance.

When the connector is installed firmly, the option board mount will be flush with the balance case.



4 Secure the board with the two screws previously removed.

Output Modes and Selecting Digits

Output mode can be selected by choosing the four types of the internal setting parameters. Factory setting is An - 0.

An 0	▶ Output voltage corresponding to any of two digits. When the displayed arbitrary two digits are 0 0, 0.00 v will be output and when the displayed arbitrary two digits are 9 9, 0.99 v will be output. ▶ Output voltage is decided by selecting the value of the internal setting parameter, SEL.
An 1	▶ Output voltage corresponding to any of three digits. When the displayed arbitrary three digits are 0 0 0, 0.000 v will be output and when the displayed arbitrary three digits are 9 9 9, 0.999 v will be output. ▶ Output voltage is decided by selecting the value of the internal setting parameter, SEL.
An 2	▶ The displayed values from 0 to full scale are output corresponding to 0.00 v and 1.00 v. When the net weight value is 0 g, 0.00 v will be output, and when the net weight value is full scale, 1.00 v will be output. ▶ If the RE-ZERO key is pressed to zero the displayed value, 0.00 v will be output. ▶ In this mode, the internal setting parameter, SEL does not control the output.
An 3	▶ The gross weight values on the weighing pan from 0 to full scale are output corresponding to 0.00v and 1.00 v. When the gross weight value containing a tare is 0 g, 0.00 v will be output, and when the gross weight value is the capacity, 1.00 v will be output. ▶ Even if the RE-ZERO key is pressed to zero the displayed value, the output voltage will not change. ▶ In this mode, the internal setting parameter, SEL does not control the output.

[An 0][An 1] Modes

- Digit position is set by selecting the value of the internal setting, SEL in the [An 0] or [An 1] mode.
- When the **SAMPLE** key is pressed in the internal setting - An, SEL 0 will be displayed.
- The values to be set and digit positions are described in the table on the next page. Factory setting is [SEL 0].

	Two digits [An 0]	Three digits [An 1]
SEL 0	6100.0	6100.0
SEL 1		
SEL 2		
SEL 3		
SEL 4		

The upper digit which is left blank is regarded as zero and also when the least digit is left blank by pressing the **SAMPLE** key, the digit is regarded as zero.

What is Full Scale in the [An 2] & [An 3]?

The value of full scale in the An 2 and An 3 modes is shown in the table below.

Please be careful as the output voltage could be over 1.00 v in the An 2 and An 3 modes.

Model	Full Scale	Model	Full Scale
HX-100	100 g	HX-3000	3000 g
HX-400	400 g	HX-6000	6000 g

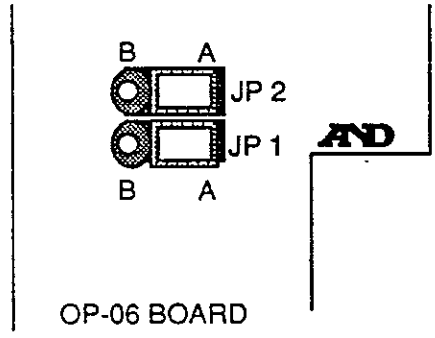
If the HX-400 is indicating the weight as 410g, the output voltage is as follows:

$$1.00V \times \frac{400g}{410g} = 1.025V$$

Changing output voltage

To change the jumper pins on board between jumper pin A and jumper pin B enable you to change the range of the output voltage. Factory setting is set to jumper pin A.

Setting of jumper pin	Output voltage range
A	0.00v to 1.00v
B	0.20v to 1.00v



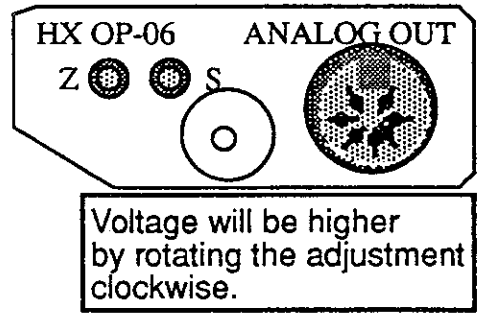
❑ When the output is to be 4 to 20 mA, select jumper pin B.

Fine Adjustment of Output Voltage

Though the output voltage was adjusted at our factory, you can perform a fine adjustment of the output voltage by rotating the adjustments on the output connector section.

❑ When the display of the HX balance is in the OFF state, the output is 0.00V.

1 Zero can be adjusted by rotating the left adjustment (**Z**).



2 With the **RE-ZERO** key held down, press the **ON:OFF** key.

○ The display will come ON with all segments lit.
At this time, the output voltage is 1.00V.
This can be adjusted by rotating the right adjustment (**S**).

❑ Repeat item **1** and **2** described above to get the proper output voltage.

Output Voltage Except In the Weighing Mode

Output voltage is fixed in the following five states.

❑ Display In the **OFF** state or During **Calibrating**

▶ 0.00 V will be displayed. (When setting of the jumper pin is B, 0.20 V is output.)

❑ During **Re-zeroing**

▶ 0.00 V will be output. (When setting of the jumper pin is B, 0.20 V is output.)
If the internal setting is set to An 3 C7, the last voltage value will be output.

❑ During " **-E** " being displayed

▶ 0.00 V will be output. (When setting of the jumper pin is B, 0.20 V is output.)

❑ During " **E** " being displayed

▶ Voltage shown in the table on the next page will be output in proportion to the internal settings.

	An 0, An 1	An 2, An 3
HX-100	1.00 V	1.010 V
HX-400	1.00 V	1.025 V
HX-3000	1.00 V	1.033 V
HX-6000	1.00 V	1.017 V

❑ During " **All segmements** " being displayed

▶ 1.00 V will be output. (Fine span adjustment can be performed in this state.)

Specifications

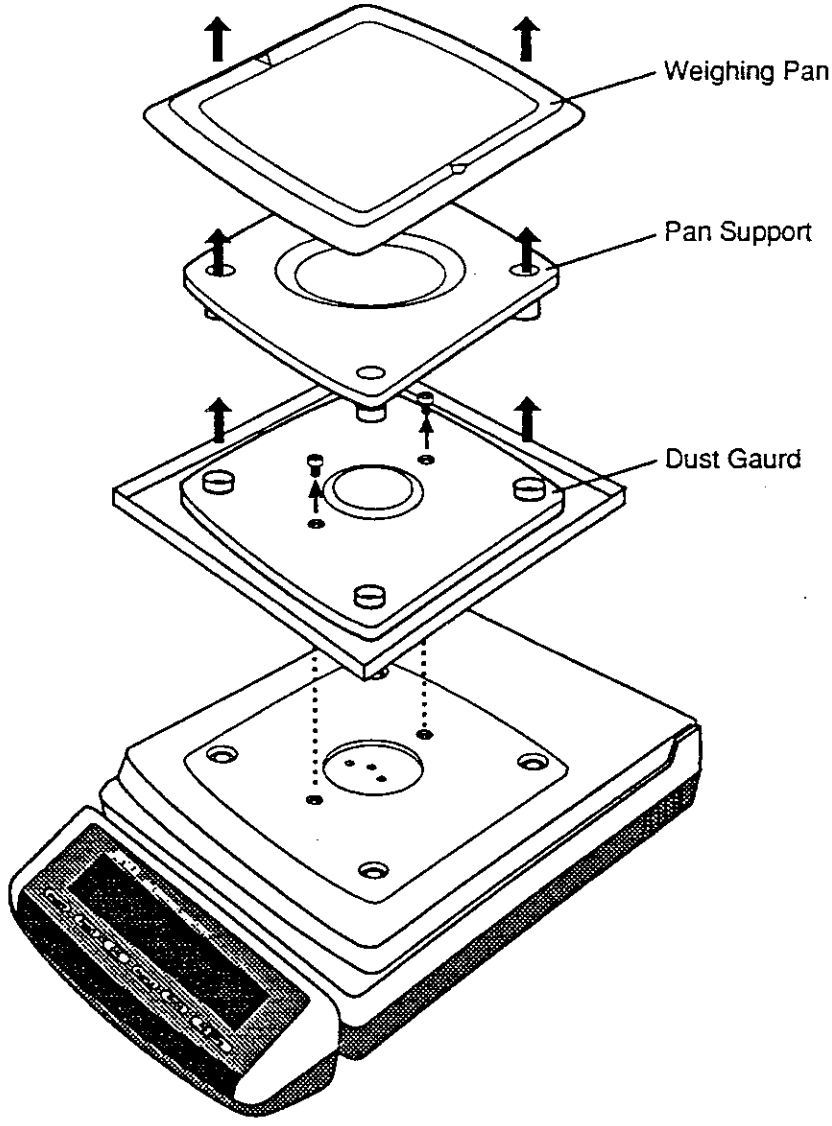
❑ Output impedance	▶ 100 Ω Maximum
❑ Linearity	▶ ± 0.3%
❑ Output connector	▶ 7 pins, DIN connector
❑ Pin connection	▶ Output : Pin 7 ▶ GND : Pin 2 Other pins are not connected.

Installing t he Optional Breeze Break OP -10/OP-11

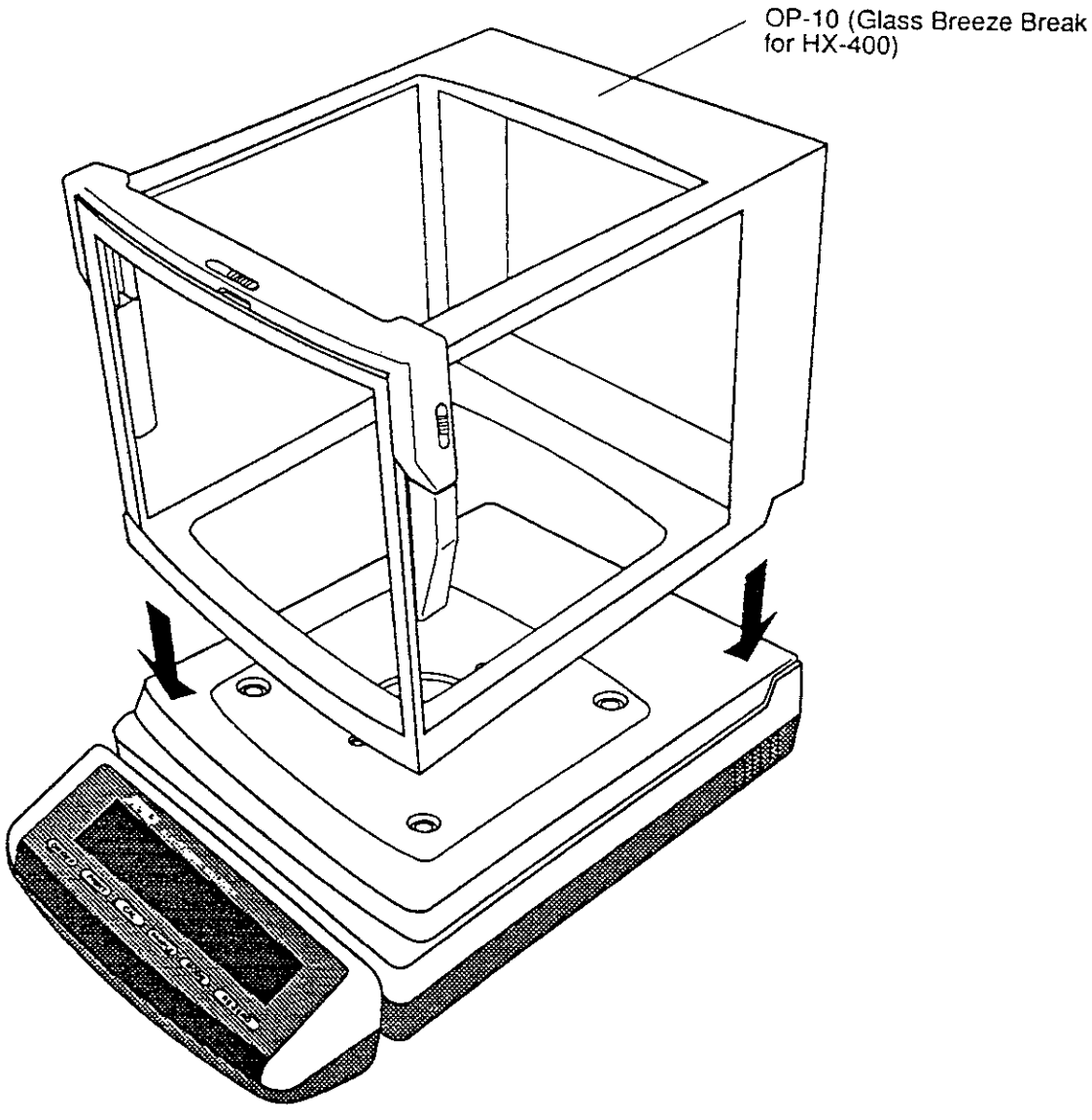
To prevent influences of a breeze during weighing, it is recommended to install an optional glass breeze break.

Installing the Glass Breeze Break OP-10 for HX-400

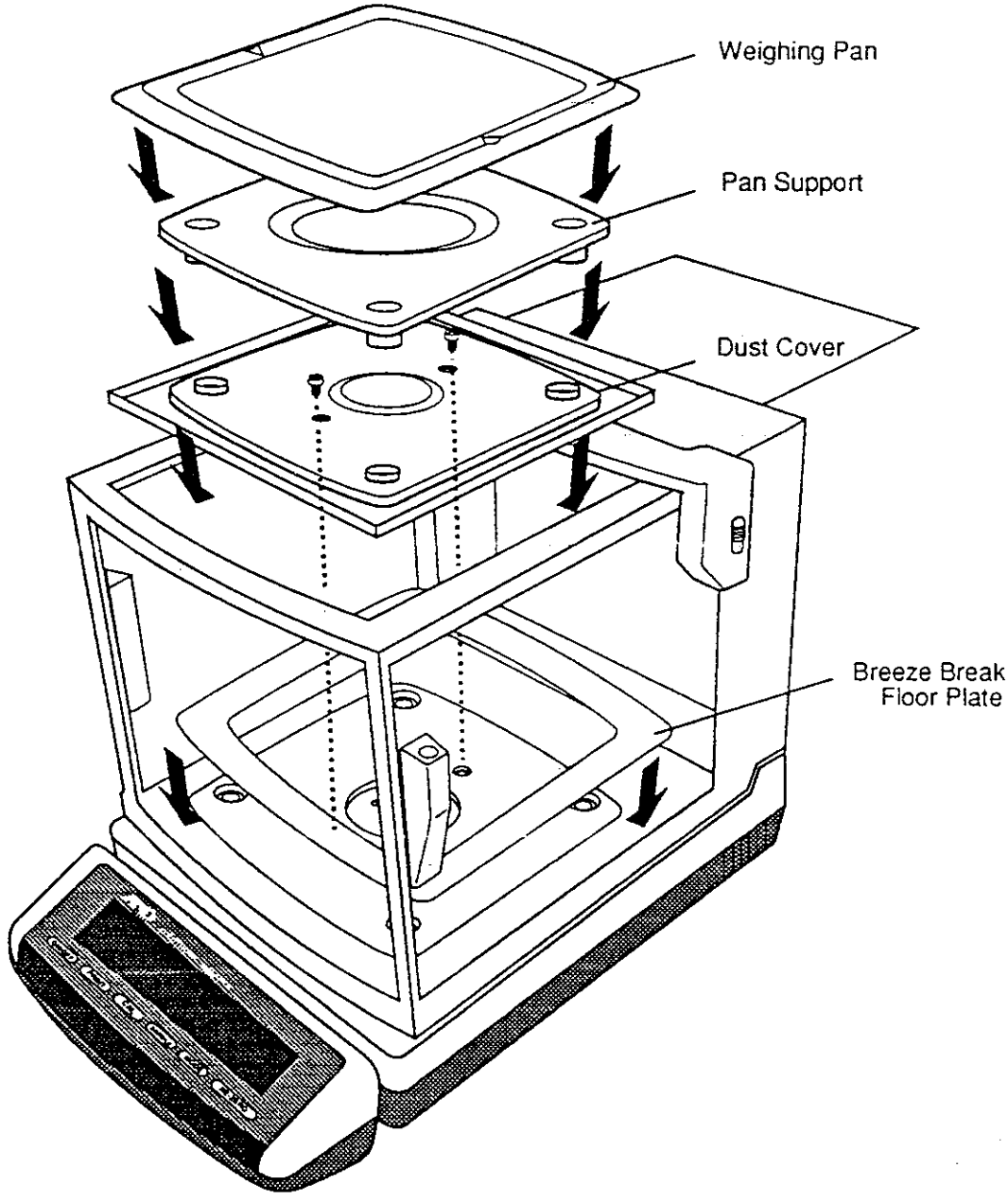
1 Remove the weighing pan, pan support, and dust guard of the HX-400.



2 Place the glass breeze break OP-10 on the main body.

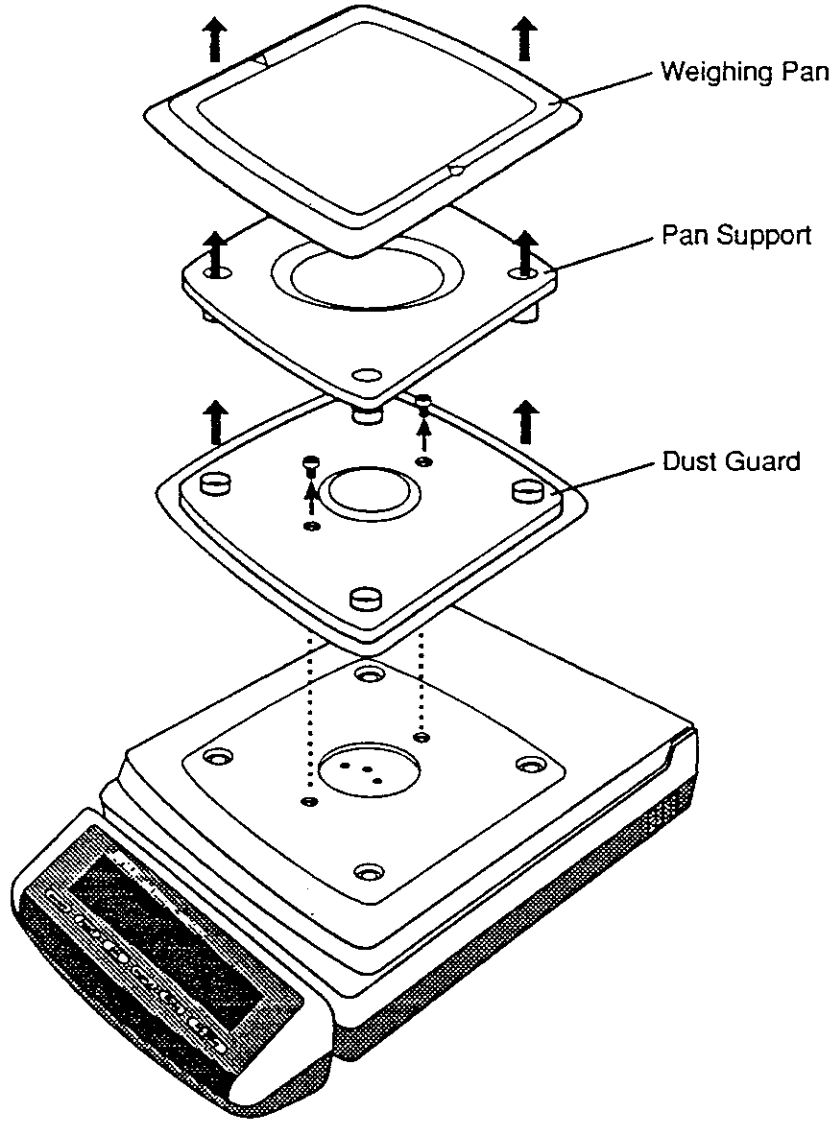


3 Remount the breeze break floor plate, dust cover, pan support, and weighing pan in that order as shown in the figure below.

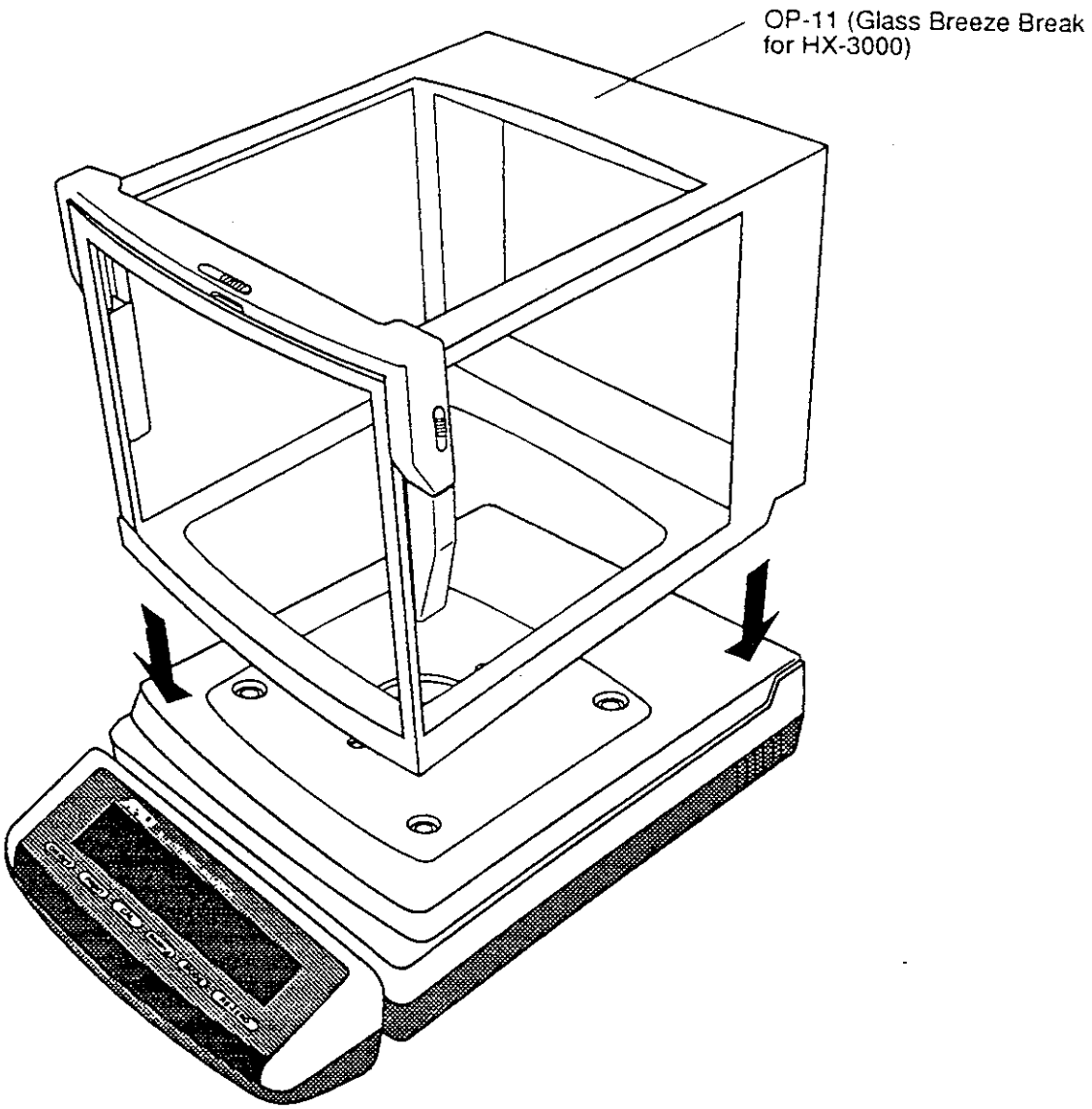


Installing the Glass Breeze Break OP-11 for HX-3000

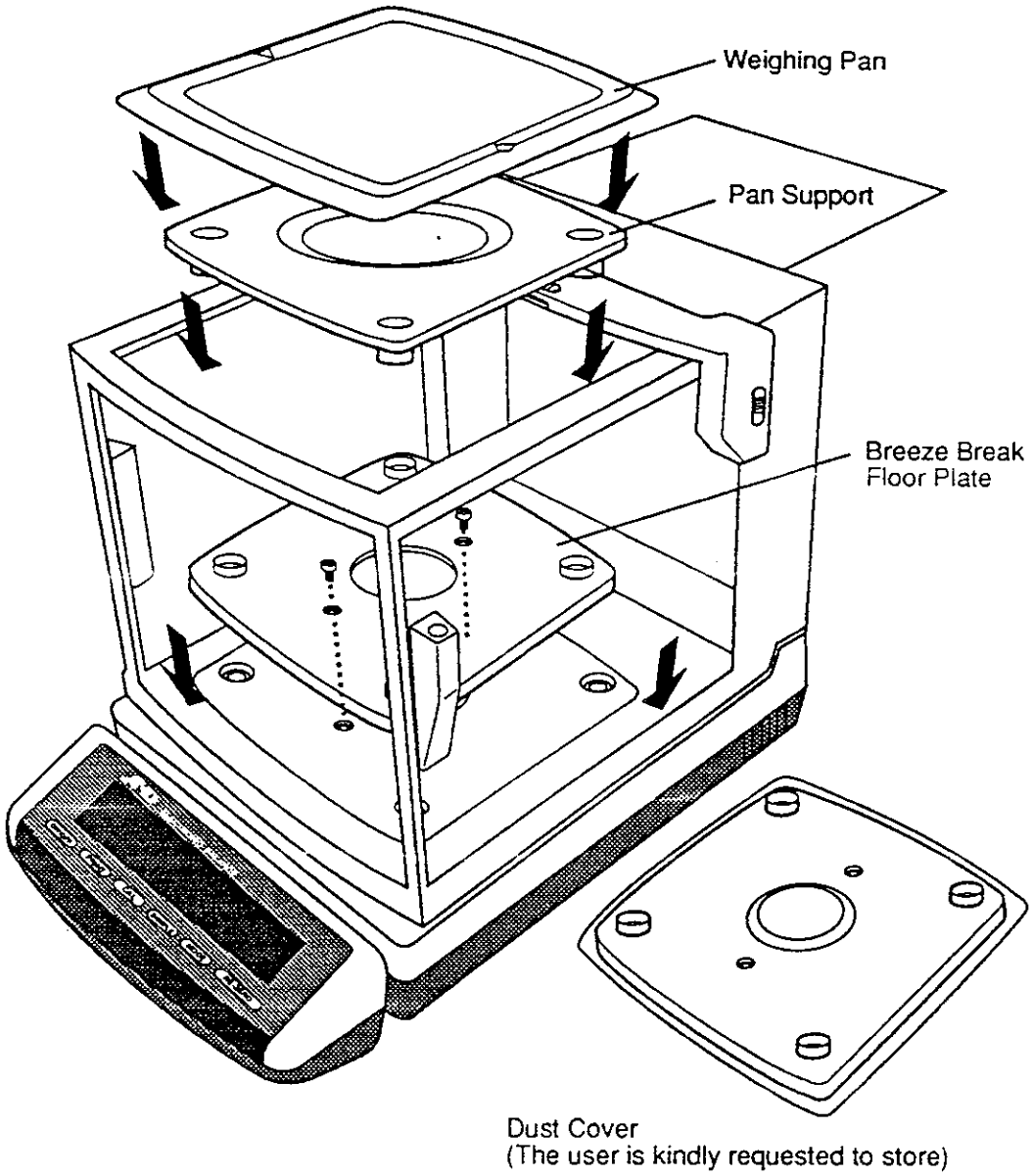
1 Remove the weighing pan, pan support, and dust guard of the HX-3000.



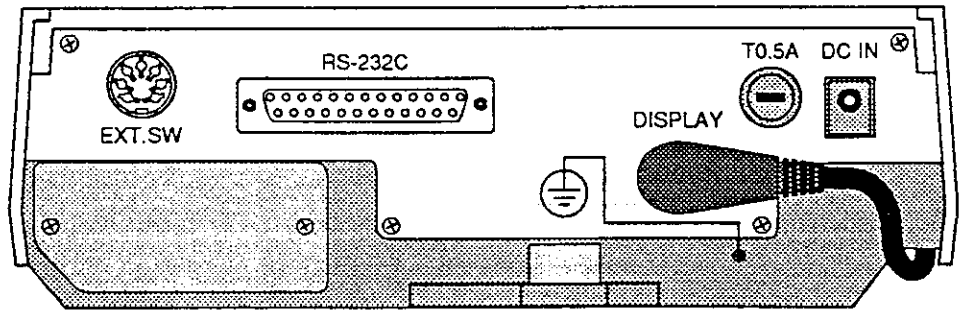
2 Place the glass breeze break OP-11 on the main body.



3 Remount the breeze break floor plate, pan support, and weighing pan in that order as shown in the figure below. (The dust guard is unnecessary. The user is kindly requested to store it.)

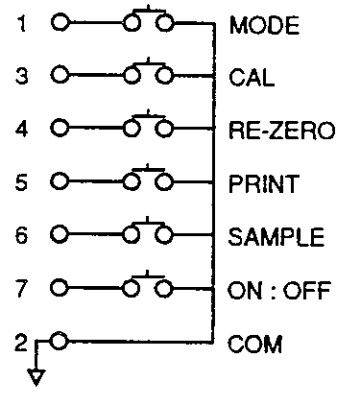


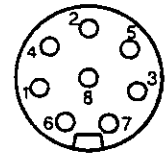
Rear Panel



External Key Input (EXT. SW)

It is also possible to operate with entries through the EXT. SW (External Switch) instead of pressing the six key switches of the balance.



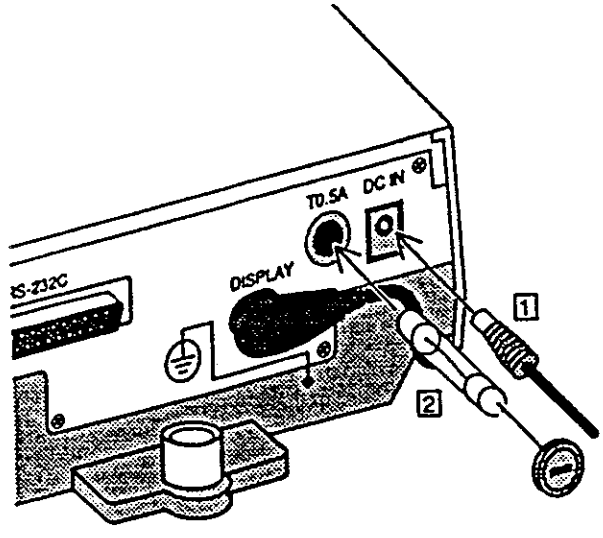


- The switching operation is available when the 100 msec pulse is input.

Trouble?

- What if the weighing result is not stable? Check that the weighing table is stable. Check that there are no drafts. Check that the breeze break (if any) is installed correctly. Check that the power supply voltage is stable.
- What if the weight displayed is obviously incorrect? Check that the balance is level. Check that it has been accurately calibrated. Check that the display started from zero before the mass was placed on the pan. Check that the mass is not overhanging and touching something else, like the sides of the breeze break or the top cover of the balance.
- What if "Lo" is displayed in "cnt" or "%" mode after I press the SAMPLE key? The weight of the sample was too low. In counting mode you will be prompted to increase the sample size from 10 units to 20, 50 or 100 units but remember that the minimum unit weight cannot be less than the resolution of the balance.
- What if the standby decimal point is not on when the adaptor is plugged in, and the display doesn't switch on when I press the ON:OFF key? Check external fuses as shown below.

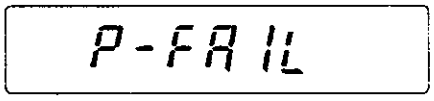
Changing the Fuse



1. Remove the AC adaptor from it's plug at the back of the balance **1**.
2. Find the fuse holder - press and turn it counter-clockwise, remove.
3. Replace the fuse with a new one. 500 mA, slow blow **2**.
4. If the fuse blows again, please contact your nearest A&D dealer for service.

Errors

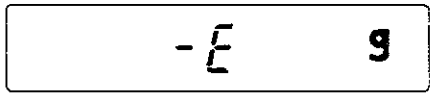
❑ **Power Failure Error:**



"P-FAIL" power failure is displayed if power was interrupted during weighing the last time the balance was used.

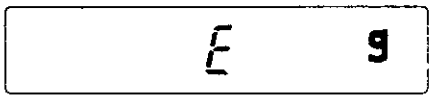
▶ Press the [ON:OFF] key.

❑ **Weighing Pan Error:**



○ **'-E'** will be displayed if the weighing pan or pan support are not installed.

❑ **Overload Error:**



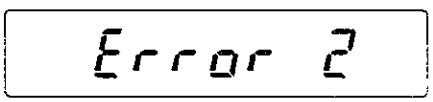
○ **'E'** will be displayed if the weight is beyond the balance capacity.

❑ **Stability Error:**

'Error 1' will be displayed if the balance can not become stable while zeroing, or weighing.

▶ Check for excessive vibrations or drafts. Press the [RE-ZERO] key and see BEST CONDITIONS FOR WEIGHING .

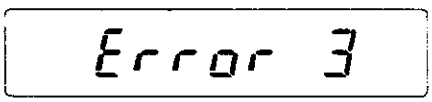
❑ **Stability Error:**



'Error 2' will be displayed if the balance can not become stable while registering the unit weight.

▶ Check for excessive vibrations or drafts. Press the [RE-ZERO] key and see BEST CONDITIONS FOR WEIGHING .

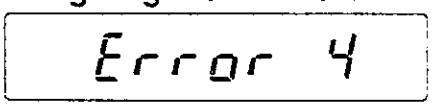
❑ **Value Error:**



'Error 3' will be displayed if the value entered is out of the range permitted for the function.

▶ To return to weighing mode, press any key.

❑ **Weighing Pan Error:**



'Error 4' will be displayed if the weighing pan or pan support is not correctly installed, touching something or if there is a sample on the weighing pan when the [ON:OFF] key is pressed.

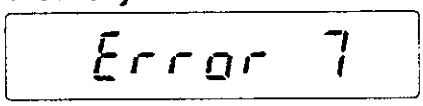
'Error 4' will be also displayed if you operate the balance with the internal weight set screws installed.

❑ **Memory Error:**

'**Error 6**' will be displayed if the balance has a memory problem.

▶ Disconnect and connect AC power and try again. If error persists, call for service.

❑ **Memory Error:**



'**Error 7**' will be displayed if the balance has a memory problem.

▶ Disconnect and connect AC power and try again. If error persists, call for service.

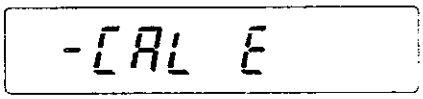
❑ **Count Sample too light:** '**Lo cnt**' will be displayed if the unit weight is too small. The display will show 'Lo' and returns to the "10 - cnt" display.

▶ Unit weight is less than 10 digits.

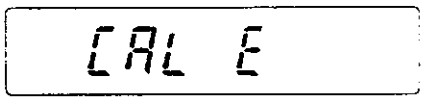
❑ **100% Sample too light:** '**Lo Pct**' will be displayed if the 100% weight is too small. The display will show 'Lo' and returns to the "100 - %" display.

▶ 100% weight is less than 100 digits.

❑ **CAL Errors:**

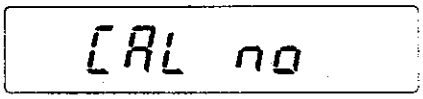


'**-CAL E**' will be displayed if the calibration mass is too light (varies by more than 10g of set weight).



'**CAL E**' will be displayed if the calibration mass is too heavy (varies by more than 10g of set weight).

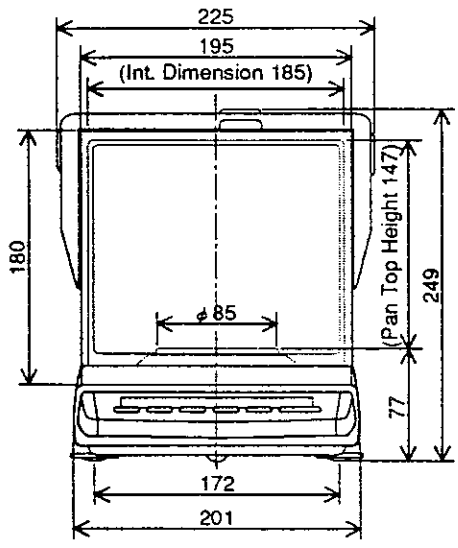
▶ Check the mass weight, look for something touching the weighing pan. Press the [RE-ZERO] key, then the [CAL] key (to use the balances' internal CAL mass) before trying again with an external CAL mass.



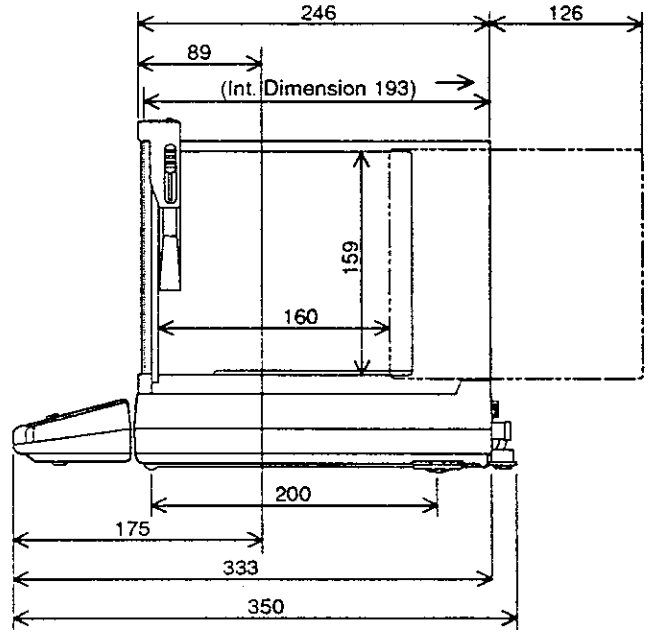
'**CAL no**' will be displayed if the balance can not become stable while weighing the calibration mass.

▶ Check for excessive vibrations or drafts. Press the [RE-ZERO] key and see BEST CONDITIONS FOR WEIGHING.

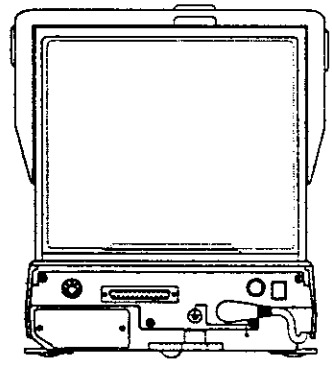
External Dimensions (HX-100 Type)



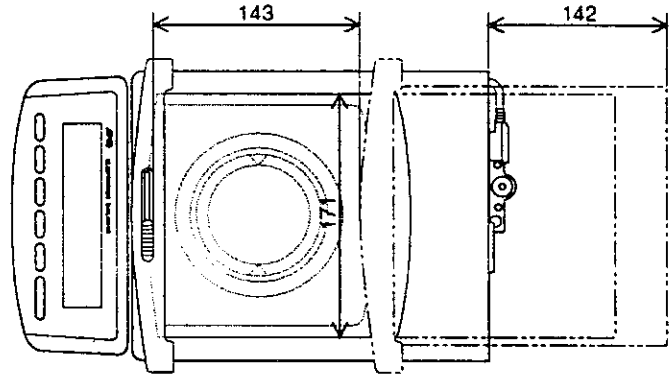
FRONT VIEW



SIDE VIEW



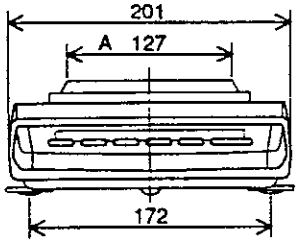
REAR VIEW



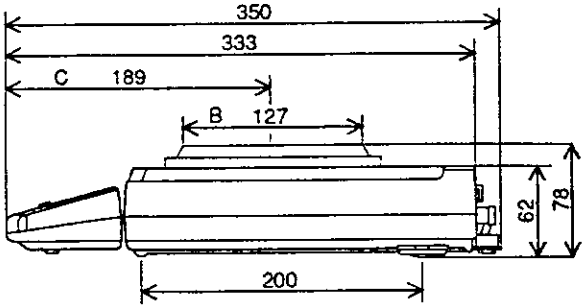
TOP VIEW

(Unit:mm)

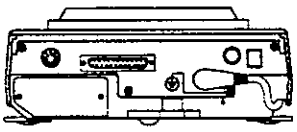
External Dimensions (X-400, 3000, 6000 Type)



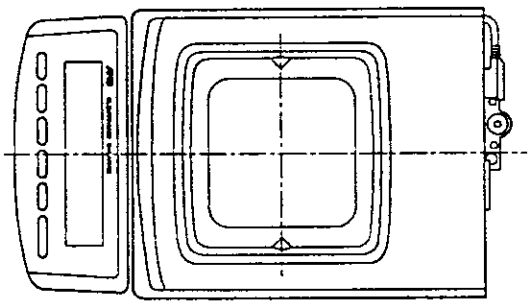
FRONT VIEW



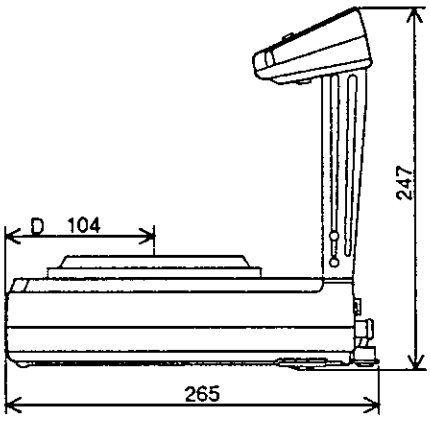
SIDE VIEW



REAR VIEW



TOP VIEW



STAND TYPE

Dimension / Type	A	B	C	D
HX-400	127	127	189	104
HX-3000	145	153	189	104
HX-6000	169	193	209	124

(Unit:mm)

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