

HA-200A

PRECISION ELECTRONIC BALANCES

INSTRUCTION MANUAL

Instruction-HA-A-v.1.b 92.12.04.OGA

PRECISION ELECTRONIC BALANCES





Table of Contents

Section A • Set-Up

Unpacking Your HA-200A.....	page	A•2
Best Conditions For Weighing	page	A•3
Setting Up Your HA-200A Balance	page	A•4
Power Supply Notes.....	page	A•6
Display OFF State	page	A•6
Display ON & Power Errors	page	A•7
Setting the Built-in Clock	page	A•9
Displaying The Time and Date	page	A•9
Confirming and Altering the time.....	page	A•11
Confirming and Altering the Date.....	page	A•13

Section B • Introduction

Welcome !.....	page	B•2
Specifications.....	page	B•3
Features.....	page	B•4
Accessories & Options.....	page	B•5
Standby and Operating Modes	page	B•6
C-Parameters.....	page	B•6
ACAI Automatic Counting Accuracy Improvement	page	B•6
Opening/Closing The Breeze Break Door.....	page	B•7
The Display and Keyboard.....	page	B•8
The ON:OFF Key.....	page	B•10
The DOOR Key.....	page	B•10
The SAMPLE Key.....	page	B•11
The CALIBRATION Key	page	B•11
The RANGE Key	page	B•12
The MODE Key	page	B•12
The PRINT Key.....	page	B•14
The DOOR SET Key.....	page	B•14
The RE-ZERO Key	page	B•14
Selecting Weighing Units.....	page	B•15
To Turn Weighing Units OFF or ON	page	B•15
Weighing Units and Their Conversions	page	B•17

Setting an Arbitrary Coefficient (MLt Unit Mode)	page B•17
Separating the Display Unit.....	page B•20
Automatically Controlled	
Breeze Break Door	page B•22
Automatic Open/Close Mode 1.....	page B•25
Automatic Open/Close Mode 2.....	page B•28
One-Touch Open/Close Mode.....	page B•30

Section C • Calibration

Calibration.....	page C•2
Auto Self-Calibration	page C•3
One Touch Calibration.....	page C•5
Manual Calibration	page C•6
Entering a Different CAL Mass Value.....	page C•6
Calibration Notes and Errors.....	page C•8
Confirmation of Calibration	page C•9
Checking the Deviation form the Calibration Value.....	page C•9
Checking of One Touch Calibration.....	page C•9
Calibration Errors	page C•11

Section D • Weighing Mode

Simple Weighing	page D•2
Weighing Using the Environment	
Setting Monitor.....	page D•3
Weighing Errors.....	page D•5
Comparator function	page D•7
Setting HI/LO Limits	page D•8
Digital Setting HI/LO Limits.....	page D•11
Using RE-ZERO to Tare (or TARE key on RK).....	page D•15
Weighing into a Container.....	page D•15
Weighing Out of a Container.....	page D•15
Weighing Out, Goal Remains in Container	page D•16
Deviational Weighing (Difference from an Ideal)	page D•17
Making Weighing More Precise	page D•18
Underhook Weighing Density	

Determination	page	D•20
Underhook Weighing Example.....	page	D•21

Section E • Counting Mode

'cnt' Counting Mode.....	page	E•2
Counting by using a sample.....	page	E•2
Confirming the Unit Weight and Inputting Digital Data from the Front Panel Keys.....	page	E•5
Counting Mode Errors	page	E•8

Section F • Percent Mode

'%' Percentage Mode.....	page	F•2
Percentage Mode Notes	page	F•4
Confirming the "100%" Weight and Inputting Digital Data from the Front Panel Keys.....	page	F•5
Percentage Mode Errors	page	F•7

Section G • Internal C-Parameter Settings

Internal Parameter C-Functions	page	G•2
Expanding the Applications of the HA-200A by Internal Setting	page	G•3
Changing C-Parameter Settings.....	page	G•4
The C-Parameter Settings (C0~C9).....	page	G•6
C0 • Environment.....	page	G•6
C1 • Display.....	page	G•7
C2 • Calibration.....	page	G•9
C3 • Auto Re-ZERO Function.....	page	G•10
C4 • Auto door.....	page	G•11
C5 • Data Output	page	G•12
C6 • Serial Interface	page	G•15
C7 • Analog Output.....	page	G•17
C8 • Comparator Output.....	page	G•18
C9 • System Selection.....	page	G•19

Section H • AD-1652 Wireless Remote Keyboard

AD-1652 Remote Keyboard.....	page	H•2
Operating the AD-1652 keys instead of the front panel keys of the HA-200A.....	page	H•3
Entering Values with FUNC. Keys	page	H•5
SAMPLE / 100% WT. Key	page	H•6

MODE / UNIT WT. Key ([FUNC] + [UNIT WT])	page H•7
START / H.LIMIT Key ([FUNC] + [H•LIMIT])	page H•7
STOP / L.LIMIT Key ([FUNC] + [L•LIMIT])	page H•8
PRINT / INTVL. Key ([FUNC] + [INTVL])	page H•8
CODE NO. Key ([FUNC] + [CODE NO.])	page H•9
ZERO / TARGET Key ([FUNC] + [TARGET])	page H•9
CAL / MULTI Key ([FUNC] + [MULTI])	page H•9
FUNC. key, Plus a 10-key.....	page H•11
The Internal Setting ([FUNC] + [1]).....	page H•11
Unit Registration ([FUNC] + [2])	page H•12
Setting the Code Number ([FUNC] + [3])	page H•12
Setting the Date Func. + 4 key.....	page H•13
Setting the Time Func. + 5 key.....	page H•14
Setting the Door Open Position ([FUNC] + [8])	page H•15
Setting the Door Close Position ([FUNC] + [9])	page H•16
AD-1652 Remote Code Number.....	page H•17
The internal Setting for ID Cord of HA-200A	page H•17

Section J • AD-1651 Vibratory Spoon

AD-1651 Vibratory Spoon.....	page J•2
Target Weight	page J•2
Notes on Feeding Accuracy	page J•3
Connector Hook-up.....	page J•3
Registering the Target Weight by Weighing an actual object	page J•4
Registering the Target Weight by Entering Digital Data from the Front Panel Key	page J•5
Setting (or Viewing) Target Weight.....	page J•7

Setting (or Viewing) Target Weight.....	page J•7
To START Spoon Feeding	page J•8
To STOP Spoon Feeding	page J•8
To Re-START Spoon Feeding.....	page J•8

Section K • RS-232C Serial Interface

Installing the OP-03	page K•2
Specifications.....	page K•2
Computer Connection	page K•3
RS-232C Pin Connection	page K•3
OP-03 Circuit Diagram	page K•4
Data Output	page K•5
PRINT Key Mode (when PRINT key is pressed).....	page K•5
Auto Print Mode	page K•5
Stream Mode.....	page K•6
Output by Command Mode.....	page K•6
Timed Mode (Interval Data Output).....	page K•6
Sample Computer Programs.....	page K•9
Connection to AD-8121 (Ordinary Printing).....	page K•10
Connection to AD-8121 Printing with data No. etc. assigned	page K•11
Weighing Data formats	page K•12
A&D Standard Format	page K•12
DP Format.....	page K•12
KF Format	page K•12
Weighing Data Format Examples.....	page K•13
Stable Data Examples	page K•13
Unstable Data Example	page K•14
Overload Data Examples.....	page K•14
Unit Codes Examples.....	page K•15
Independent Data Formats.....	page K•16
Code Number.....	page K•16
Code String	page K•16
Time	page K•16
Date.....	page K•16
Parameter Setting	page K•17
Commands for the RS-232C Serial Interface.....	page K•18
Commands to Control the Balance.....	page K•22

Commands to Output the Weighed Data	page K•25
Commands to request Settings.	page K•26
Commands to output data from the balance.....	page K•30
Error Codes for the Command Mode	page K•37
Command Examples Illustrated	page K•40
1 Display ON/OFF.....	page K•40
MV" Command (to rotate the breeze break door to the specified position)	page K•41
2 ReZero or Tare.....	page K•42
3 Calibration.....	page K•43

Section L • Serial Interface OP-04 (Option)

Difference between OP-04 and OP-03	page L•2
Installing the OP-04	page L•3
Specifications.....	page L•3
Pin Connection	page L•6
Circuitry	page L•7
Example of Using Comparator Output.....	page L•8
Example of Using the External Input Terminal	page L•8

Section M • Miscellaneous

OP-11 Anti-theft Device.....	page M•2
Trouble ?	page M•3
Fuse Replacement	page M•4
Error Display and Countermeasures.....	page M•4
Maintenance	page M•8
External Dimensions.....	page M•9



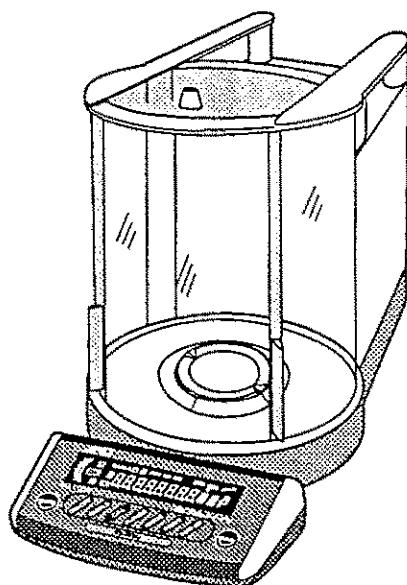
FCC Rules

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.)

HA-200A • Section A

Set-Up

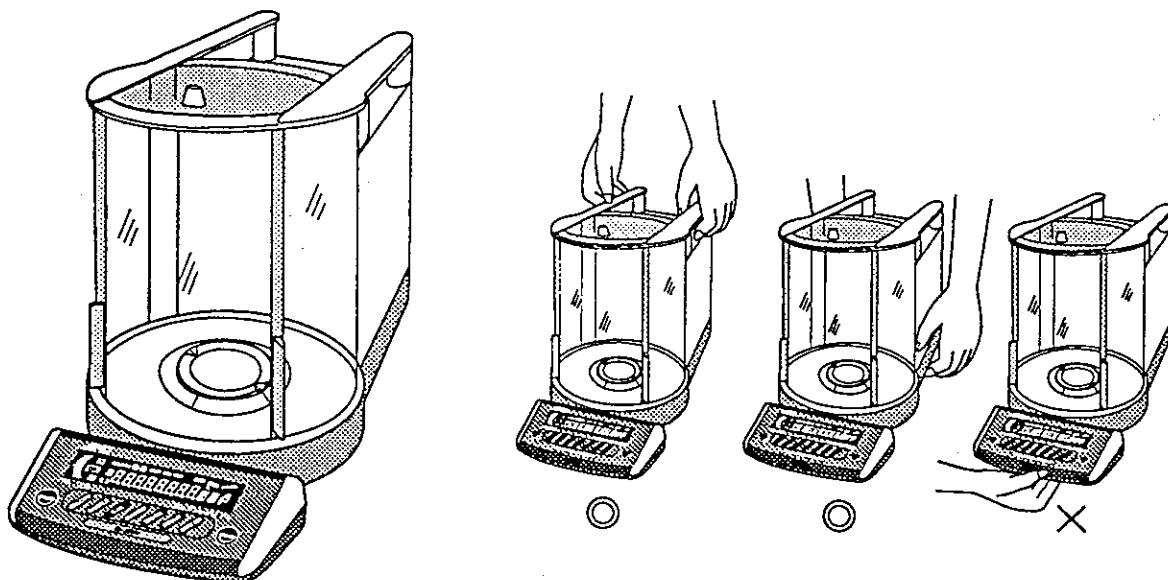


Unpacking Your HA-200A



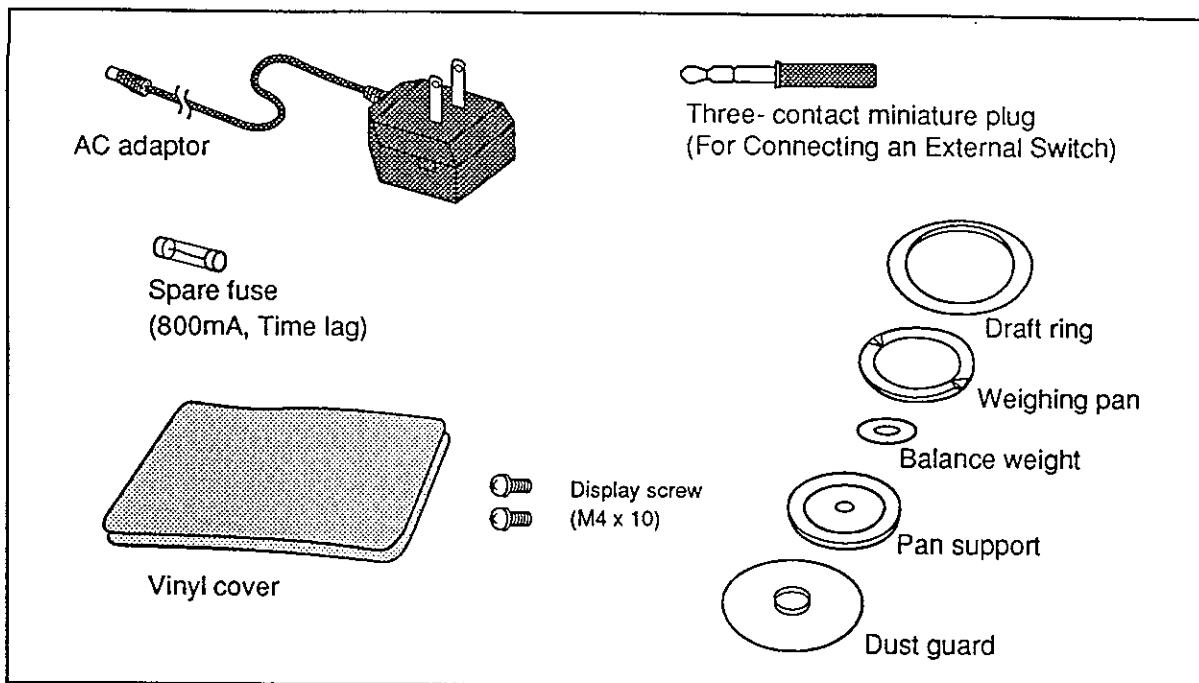
Unpack the balance carefully and keep the packing material if you are likely to transport the scale again in the future.

- ☒ In the carton you should find this manual plus:
 - The Balance.
 - The Weighing Pan, Pan Support, Dust Guard, Blance Weight, Draft Ring.
 - An AC adaptor (check that the AC input rating is correct).
 - A spare fuse (800mA, Time Lag).
 - Three-contact miniature plug for connecting an external switch.



Special care should be taken when handling a precision balance.

- ☒ Do not hold the display when you carry the balance.
- ☒ The display is removable and may be slightly loose. However, this is not a malfunction. (To fasten the display, see page B •21)



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.
- Do not place the balance near equipment that tends to generate noise (e.g. an electric motor). If you have to place the balance near such equipment, ground the balance.

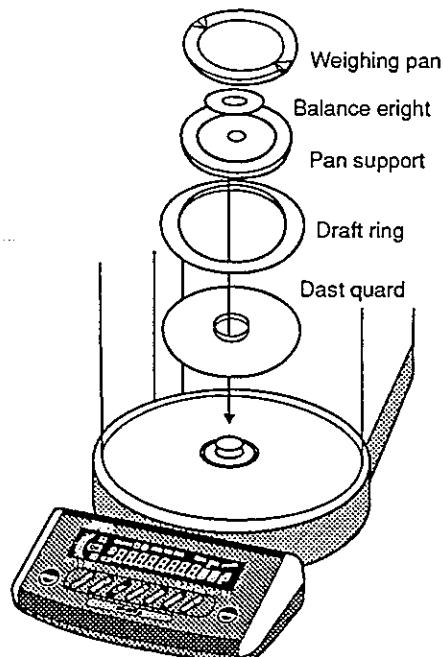
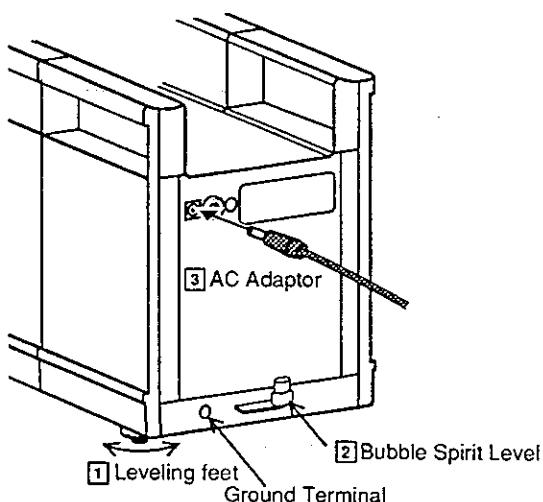


Setting Up Your HA-200A Balance

1

Place the balance on a suitable weighing surface (see BEST CONDITIONS FOR WEIGHING, previous page). 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).

Turn the leveling feet **1** until the spirit level **2** indicates the balance is level. Install the Dust Guard, Draft Ring, Pan Support, Balance Weight, and Weighing Pan.

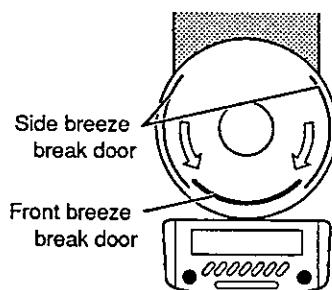
**2**

Connect the AC adaptor **3**.



The front breeze break door will automatically rotate to the center position.

Top view

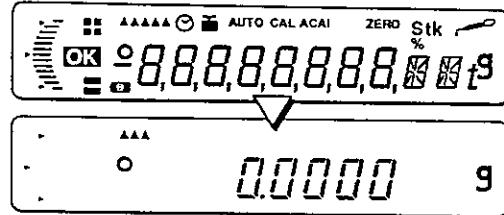


P FAIL

Power Failure may be displayed when you plug in the AC Adapter.

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 displayed.

**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 HA-200A, before proceeding to calibration SECTION C.

5

Perform One Touch Caribration once the balance has warmed up.
(Refer to "One Touch Caribration" on page C-5).

- Press the **CAL** key.



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!**



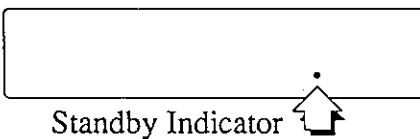
Display OFF State

- 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**

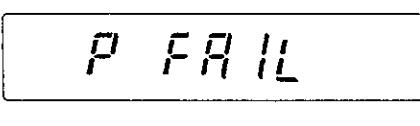
The rightmost decimal point should illuminate.

This display usually appears in the "Display OFF State."



- **Power Failure**

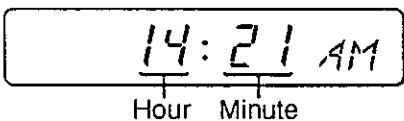
"P-FAIL" power failure is displayed if power was interrupted during weighing the last time the balance was used (see next page).



- **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.)

(Refer to "Setting the Built-in Clock" on page A-9)





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

"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

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

- Make sure that nothing is touching the weighing pan. Press the **ON:OFF** key to clear the error display.
- If there is nothing touching the weighing pan or interfering with the balance, then it is a "stability" error.

A



Press the **RE-ZERO** key and the display should 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 **ON:OFF** key, and set the internal setting "**Land XLO**" to "**Land 4LO**"(See page B-13). If the error still persists, call your dealer for service.

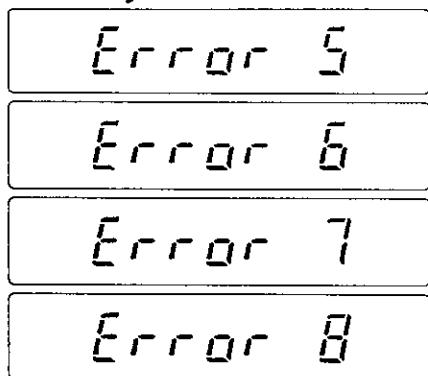
Weighing Pan Error:

Error 4

'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 was pressed.

- 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' to '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.

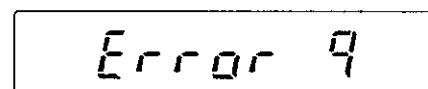
Power voltage error:



A blinking (battery) indicates that the power supply voltage is too low.

- Confirm that the power supply voltage is within a range of +10% and -15%.

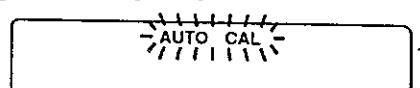
Door drive error:



'Error 9' will be displayed if the automatic control door drive has a problem.

- Disconnect the AC adaptor and connect it again. If the error still persists, call your dealer for service.

AUTO CAL:



Blinking "AUTO CAL" informs that the outside air temperature has changed. This is not an error.

- The auto self-calibration function activates and the system starts calibration approximately two minutes later
(See "Auto Self-Calibration" on page C-3.)



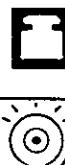
Setting the Built-in Clock



- ❑ The HA-200A has clock function to display the time and date. The time and date will be continuously updated even if the AC adaptor is disconnected from the balance.
- ❑ The data of time and date are roughly adjusted to Japanese standard time before shipment. Under normal conditions, the allowable error of the time is approximately 1 minute per month after adjustment.
- ❑ The date can be displayed in three styles by changing the internal setting. The date is set as "year, month, date" before shipment. This can be changed to either "month, date, year" or "date, month, year" by changing the internal setting. (See "Internal Setting" on pages G•4 and G•8 for more details.)
- ❑ Connecting the optional serial output (OP-03 or OP-04) allows you to perform the functions listed below by using the clock function.
 - Output timed data at constant intervals. (See page K•6.)
 - Record the time and date on output data by changing the internal setting. (See pages G•4 and G•12.)
 - Automatically output the calibration result with the time and date after calibration by changing the internal C-Parameter setting. (See pages C•2 and G•9.)

2:00PM

92-01-28



Displaying The Time and Date

- ❑ To display or check the time and date, perform the procedure described below.
- ❑ The time and date can also be displayed when the display is in the OFF state ("oFF 1 C1") by changing the "internal C-Parameter setting". (See pages A•6 and G•8.)

1

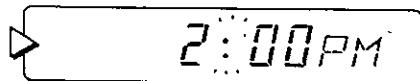


- ❑ Press the **ON:OFF** key to turn the display to the OFF state.

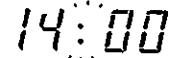


2

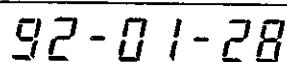
- ▣ Press the **ON:OFF** key, while holding down the **CAL** key.
- The current time will be displayed.

**3**

- ▣ Display of the time changes between the 12-hour and 24-hour modes each time the **SAMPLE** key is pressed.

**4**

- ▣ Display of the time changes to the date and vice versa each time the **MODE** key is pressed.

**5**

- ▣ To exit this mode, press the **ON:OFF** key. The display will be turned to the OFF state again.





Confirming and Altering the time

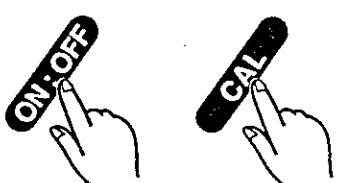
1



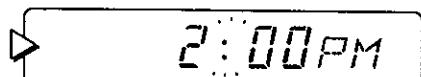
- ▣ Press the **ON:OFF** key to turn the display to the OFF state.



2



- ▣ With the **CAL** key held down, press the **ON:OFF** key.
- The current time is displayed.

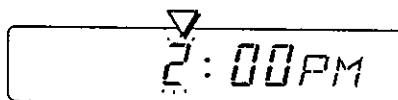


[Or, it is displayed in the 24-hour mode. Pressing the **SAMPLE** key allows you to change the 12-hour/24-hour mode.]

3



- ▣ When altering the time, press the **RE-ZERO** key first.
- First, the 'Hour' digit blinks.



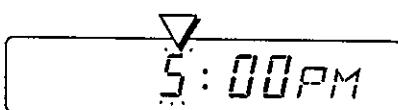
4

- ▣ Use the **RE-ZERO** and **MODE** keys to input the time. The example below shows how to input "5:35 PM."

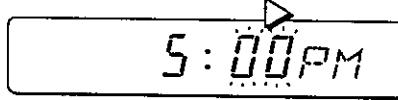
RE-ZERO key: Changes the number of the blinking digits.

MODE key: Selects hours or minutes.

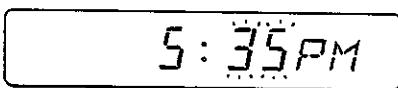
- ▣ Press the **RE-ZERO** key three times.

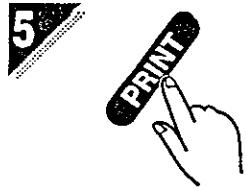


- ▣ Press the **MODE** key to blink the "minute" digits.



- ▣ Hold down the **RE-ZERO** key and release it when the display shows "35."





- Press the **PRINT** key to store the data.
- The system returns to normal time display.
- To return to the weighing mode, press the **ON:OFF** key.

5:35PM

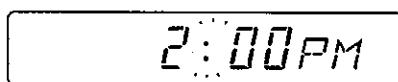
Confirming and Altering the Date

1

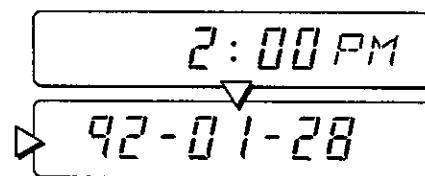
- Press the **ON:OFF** key to turn the display OFF state.

**2**

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

**3**

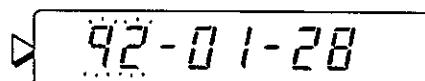
- Press the **MODE** key.
○ The current date is displayed.



- The date is displayed in the order of "year, month and date" (based on Japanese standard time) by default. This can be changed to other styles by changing the internal setting. (See pages G•4 and G•8)

4

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



5

- Use the [RE-ZERO] and [MODE] keys to input the date. The example below shows how to input "93-05-13."

[RE-ZERO] key: Changes the number of the blinking digits.

[MODE] key: Selects year, month or date.

- Press the [RE-ZERO] key.

93-01-28

93-01-28

93-05-28

93-05-28

93-05-13

- Press the [MODE] key to blink the "month" digits.

- Press the [RE-ZERO] key four times.

- Press the [MODE] key to blink the "date" digits.

- Hold down the [RE-ZERO] key and release it when the display shows "13."

6

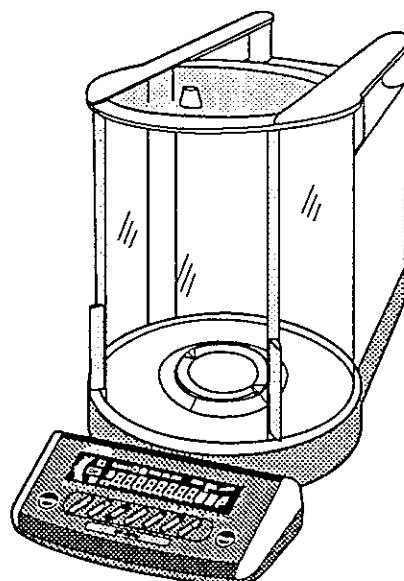
- Press the [PRINT] key to store the data.

- The system returns to normal time display.
- To check the date, press the [MODE] key.
- To return to the weighing mode, press the [ON:OFF] key.

2:05PM

HA-200A • Section B

Introduction





Welcome!

*Thank You for Your **A&D** Purchase!*

This is an owner's INSTRUCTION MANUAL for the A&D Electronic Balances,
 HA-200A 210g x 0.0001g

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 HA 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; **mg** milligram; **OZ** ounce (avoird); **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.

	HA-200A
Gram (g)	210 x 0.0001g
milligram (mg)	210000 x 0.1mg
Decimal Ounce (OZ)	7.4x 0.00001OZ
Troy Ounce (OZt)	6.7 x 0.00001OZt
Penny Weight (dwt)	135 x 0.0001dwt
Carat (ct)	1050 x 0.001ct
Momme (mm)	56 x 0.0001mm
Grain Unit (GN)	3,240 x 0.002GN
Tola (t)	18x 0.00001t
Tael (TL)	5 x 0.00001TL
Display by arbitrary (MLt) Coefficient factor*	2100000 x 1 (Max.)
Maximum Displayed capacity	210.0009g
Standard deviation	0.00008g
Linearity	±0.0002g
Stabilization time	Approx. 3.5seconds (TYP)
Sensitivity drift	± 1ppm/°C (10°C to 30°C)
Operating temperature and humidity ranges	5°C (41°F) to 40°C (104°F), RH<85%
Display refreshment	4 times 1 second (When data stable) 8 times 1 second (When data unstable)
Weighing modes except weighing units	Counting mode (Cnt), Percent mode (%)
Breeze Break Door Opening/Closing	Automatically open/close by Motor Drive
Pan size	ø90mm (3.5inches)
Chamber dimensions	ø176 x 209(H) mm
External dimensions	204(W) x 494 (B) x 265 (H) mm
Power supply	100, 200, 220, 240 VAC as required (factory preset) 50/60Hz
Net weight	Approx 9.5kg/10lb

* Display by an arbitrary coefficient.

The value when the gram value is multiplied by an arbitrary coefficient is displayed.



The following sections introduce you to some of the major features of your HA-200A. Please take a moment to familiarize yourself with these items as they will be helpful for proper balance operation.



Features

- Thanks to the new automatically controlled breeze break door, opening/closing of the door can be operated by just pressing a single key, thus facilitating analytic weighing.
- This electronic balance has an automatic self-calibration function. With this function, as soon as an change in ambient temperature is sensed, calibration is automatically performed using built-in calibration weights. (Sensitivity drift and linearity are also compensated.)
- One Touch Automatic Calibration with motor driven internal calibration weight. Calibration can also be done using an external calibration mass (within weight limits).
- The display can be installed and removed from the balance easily. Therefore, the balance can be accessed from any angle and easily incorporated to other equipment.
- The Environment Setting Monitor (**▲▲▲**) allows you to check the "internal C-Parameter setting" according to the atmospheric environment (wind, vibration, etc.) of the balance. This setting can be easily changed.
- A dedicated range key easily enables speedy measurement according to the required measuring accuracy.
- Comparator display (**■■■** , **OK** , **■■**) useful for checking the weight. The reference weight can be set by inputting from the front panel of the balance or by actually placing an object of the reference weight on the balance.
- An input jack on the rear of the balance enables external re-zero control, external command, or a vibratory spoon (option).
- Interval data output settings, with clock function.
- Weighing units can be grams ("g"), milligrams ("mg"), decimal ounces ("oz") (avoir), troy ounces ("ozt"), penny weights ("dwt"), carats ("ct"), mommes ("mm"), grain units ("GN") tolas ("t") and taels ("TL"). Also, "MLt," which is a product of a grain value multiplied with an arbitrary coefficient, can also be displayed.
- The system has the percentage ("%) and counting ("cnt") modes as standard.
- 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 HA-200A functions with a 3m, 60° operating range for remote or isolated spaces. It has the same keys as the HA-200A 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 HA-200A balance.

The Target Weight can be set using the front panel keys on the HA-200A.

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.

OP-03 (Option)

This serial interface (bidirectional RS-232C and current loop) can be installed by the user.

OP-04 (Option)

This serial interface with comparator contact output can be installed by the user. Also, it can be used as four external input terminals such as opening/closing the door by using available pins. (Bidirectional RS-232C, current loop, comparator contact output and four external input terminals.)

OP-06(Option)

This analog output with current loop can be installed by the user. Analog output (0 to 1 V/0.2 to 1 V) in accordance with the balance display can be taken.

OP-07 (Option)

This display extension cable (3m) may be installed before shipment. (The OP-07 cannot be installed by the user.)

OP-11 (Option)

The OP-11 is a locked anti-theft device which secures a balance on a table to prevent victimization by theft. (The balance table mounting section should have a thickness of 10cm max. and a ø20mm to ø25mm hole.)



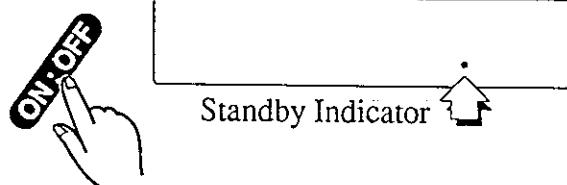
Standby and Operating Modes



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.

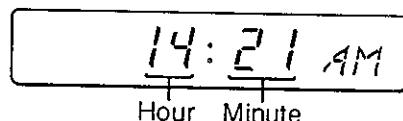
WARM-UP
YOUR
BALANCE
BEFORE USE!

- 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.



Standby Indicator

- **Time Display**
If you want the current time to be displayed during the "Display OFF State", set the internal setting "oFF 0 c1" to "oFF 1c1". (see page G-8.)



The HA-200A 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 HA-200A 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.



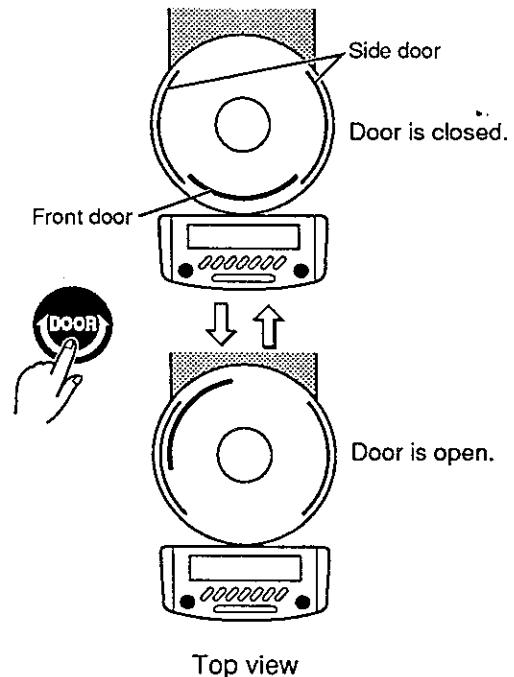
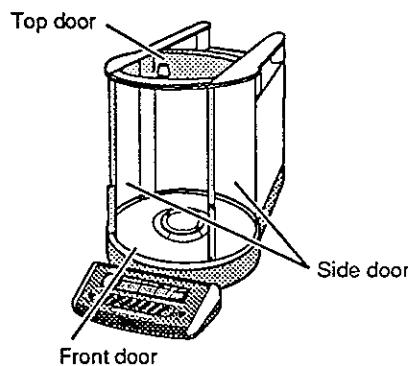
ACAI Automatic Counting Accuracy Improvement

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.



Opening/Closing The Breeze Break Door

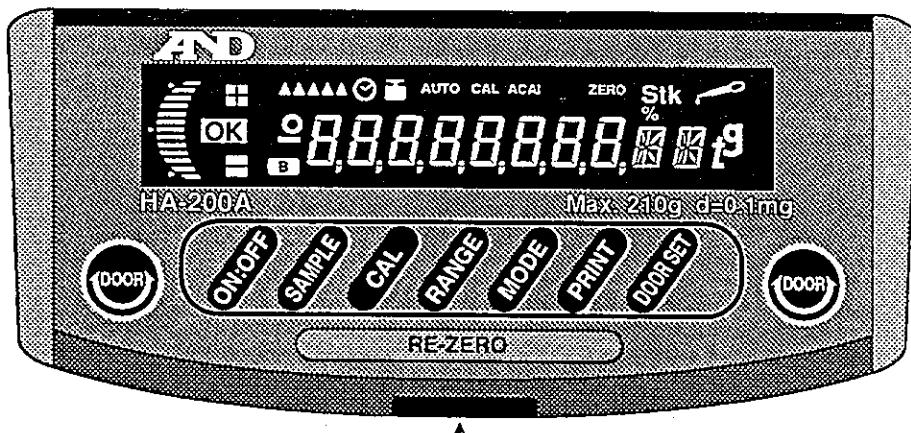
- ▣ The front door opens/closes each time the **(DOOR)** key is pressed. (Both right and left **(DOOR)** keys function the same.)



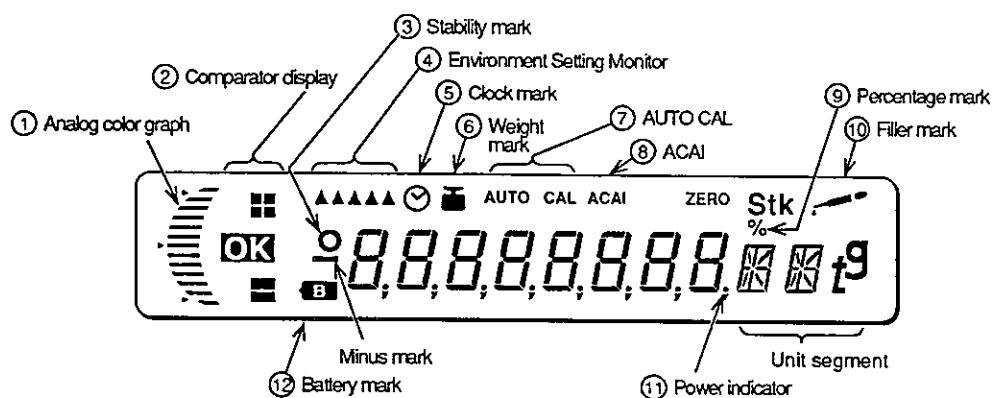
Top view

- ▣ Set the opening space of the door as small as possible, because the effect caused by the flow of air must be minimized when performing weighing with high precision. To change the setting for the opening or closing position of the door, see "Door Key" on page B-10.

The Display and Keyboard



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



(1)	Analog color bar graph 	(7)	AUTO CAL:  AUTO CAL
(2)	Comparator display 	(8)	 ACAI Automatic Counting Accuracy Improvement function re-calculates the unit weight as more pieces are added, to improve count accuracy.
(3)	Stability indicator 	(9)	 percent mark  A weighed result is displayed in terms of percentage against the set 100% weight value.
(4)	Setting monitor mark 	(10)	 Filler mark  Illuminated during feeding mode.
(5)	Clock mark 	(11)	 Power indicator  Lights up when the balance is switched ON and the display is in the OFF state.
(6)	Weight mark 	(12)	 Battery mark  Informs you if the supply input voltage is too low.



- 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

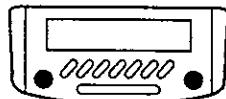


The **ON:OFF** key switches the display ON and OFF but does not cut the power to the balance - so the balance will remain on standby (warmed-up) while the AC adaptor remains connected (See POWER SUPPLY NOTES section). The HA-200A uses a cobalt blue and orange fluorescent display.

- All the display segments light for approximately 10 seconds after the display is turned to on. During this period of time, the two built-in weights go up and down to check operations of the balance.



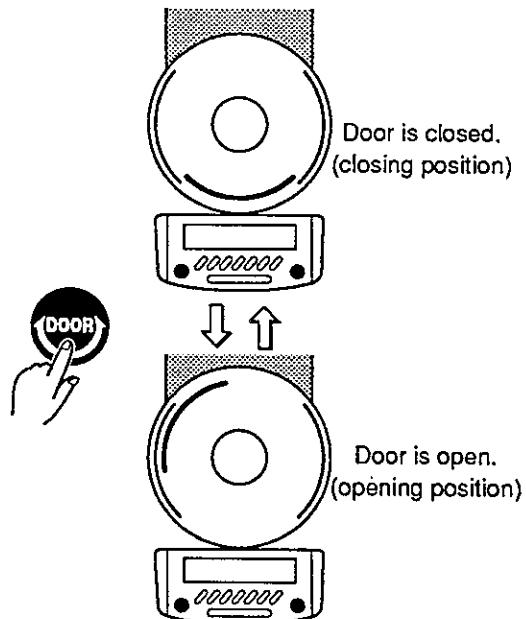
The DOOR Key



- Each time the **DOOR** key is pressed, the front door opens and/or closes.

Both right and left **DOOR** keys function the same.

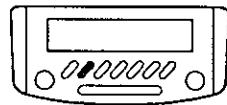
- To change the opening position of the door, rotate the front door manually to a desired position, then press the **DOOR** key. A new opening position will be set.
- To change the closing position of the door, rotate the front door manually to a desired position, then press the **DOOR SET** key. A new closing position will be set. (See "Door Set Key" on page B-14.)



For details of door operation, please refer to "Automatically Controlled Breeze Break Door" (page B-22).



The SAMPLE Key



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

- The system enters the Digital Input mode by holding down the **SAMPLE** key for approximately two seconds. In this mode, you can check set values and input digital data from the keys on the display panel. For more details, see "Counting Mode" (page E•1), "Percent Mode" (page F•1), "Comparator Function" (page D•7) and "Setting the Target Weight by Vibratory spoon (Optional)" (page J•4).



The CALIBRATION Key



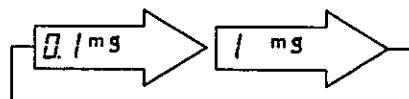
- When the **CAL** key is pressed, calibration is performed. After warming up the balance sufficiently, make sure that nothing is on the pan and press the **CAL** key. A built-in calibration weight is automatically applied to the balance mechanism, and then removed. (Refer to "Calibration" on page C•2.)
- To make precise weighing, calibration should be made at least once a day.
- When the operating temperature changes, the auto self-calibration function (on page C•3) is activated to perform full-auto calibraton without touching the key.



The RANGE Key



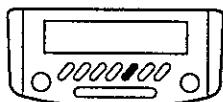
- When the **RANGE** key is pressed quickly, the minimum number for the weighing units will change.



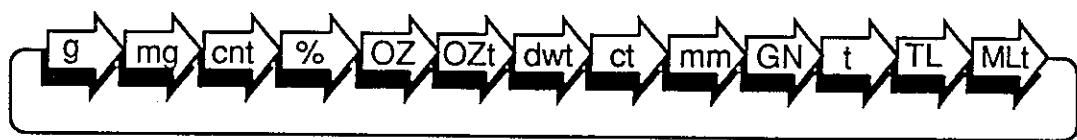
- Reducing the digits by using the **RANGE** key will reduce the time required to stabilize the balance. This facilitates faster weighing.
- The system enters the Set Value Input by Actual Weight mode by holding down the **RANGE** key for approximately two seconds. In this mode, you can register set values by placing an object on the weighing pan. For more details, see "Comparator Function" (page D-7) and "Setting the Target Weight by Vibratory spoon (Optional)" (page J-4).



The MODE Key



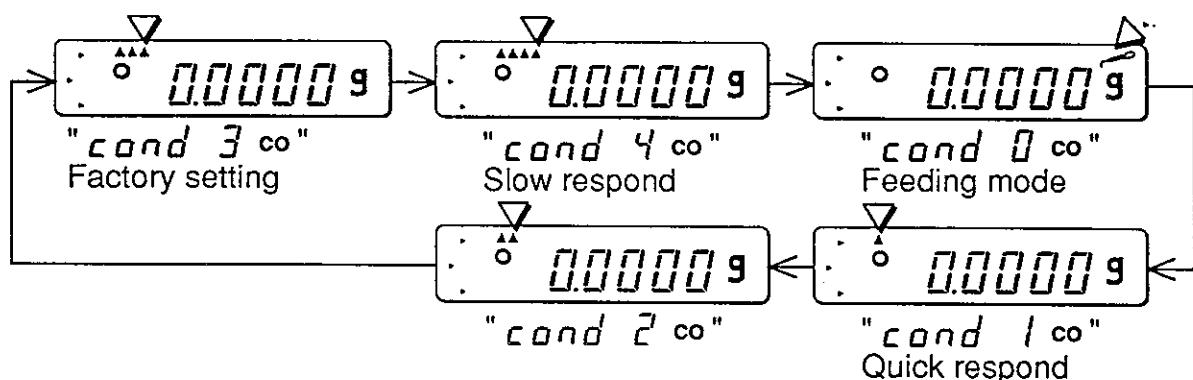
- Press the **MODE** key quickly to rotate through the balance weighing modes.
- The weighing units are g gram; mg milligram; OZ ounce (avoirdupois); OZt troy ounce; dwt pennyweight; ct carat; mm momme; GN grain; t tola; and TL tael (see the WEIGHING UNITS AND THEIR CONVERSIONS section (page B-17) for more information concerning the different weighing unit). The 'MLt' when the gram value is multiplied by an arbitrary coefficient can also be displayed. There is also a percentage mode "%", and counting mode "cnt".
- The **MODE** key changes the units in the following sequence:



- In the MLt mode, no display is made on the unit section during weighing. Coefficient is 1 at shipment time.

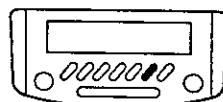
- Holding down the [MODE] key (approx. 2 seconds) will change the environment setting of the balance. The Environment Setting Monitor "▲▲▲" will change in accordance with the changed setting. There are five levels for environment setting. The more the triangle symbols "▲" are displayed, the more insensitive the balance becomes towards ambient environment and the response speed becomes slower.

Selecting the Feeding mode (the filler mark ".FILLER" lights up) enables the system to quickly respond to very small weight. If varying range is large, a maximum of two lower digits will automatically be blank. (See "Internal Setting" on page G-7.)





The PRINT Key

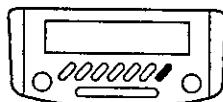


The **PRINT** key can be used to transmit data to the AD-8121 printer, or to a computer, via the RS-232C.

In this case, the serial interface OP-03 or OP-04 is also needed.



The DOOR SET Key



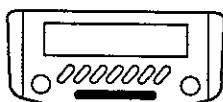
- Pressing the **DOOR SET** key sets the current position of the front door as the closing position. After that, the door will stop at the set closing position.
- For setting the opening position of the door, see "DOOR Key" (page B•10).



For details of door operation, please refer to "Automatically Controlled Breeze Break Door" (page B•22).



The RE-ZERO Key



- 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.

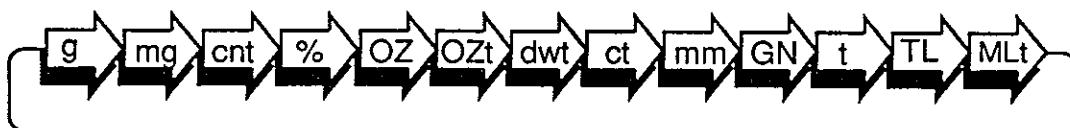


Selecting Weighing Units



The HA-200A balance is a multi-functional instruments where switching between the weighing units contained in the balance software is done by pressing the **MODE** key.

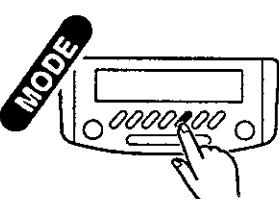
If the law in your area permits, you may use all of the units, or at this software level *you can disable the weighing units you don't regularly use*. Also, some dealers may initially turn OFF units which are not regular used, but you may want to turn them back ON. The complete weighing mode cycle is as follows (if some are missing please refer to your dealer):



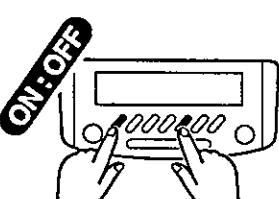
To Turn Weighing Units OFF or ON



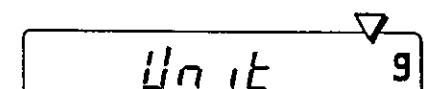
In this procedure, *all available weighing units are initially turned OFF – you will have to select all the units you want to use!* You can escape at any time by pressing the **ON:OFF** key.



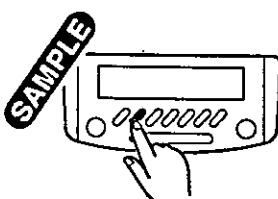
- With the display OFF:
Press and hold the **MODE** key



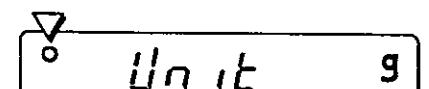
- While holding **MODE** key, press the **ON:OFF** key.
- "Unit g" will be displayed.



- 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.

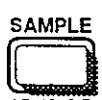


- If you wish to keep "g", press the **SAMPLE** key.
- The "O" stability indicator will come ON, indicating that the unit is enabled.



4

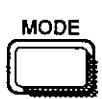
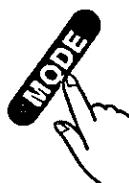
- Press the **MODE** key to move to the next unit.
- "Unit mg" will be displayed.

Unit**mg****5**

- If you wish to keep "mg" as a mode, then press the **SAMPLE** key.
- The "O" will come ON, the unit is enabled.

Unit**mg**

— or —



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

Unit **cnt**

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

In the 'MLt' mode, the value when the gram value is multiplied by an arbitrary coefficient is displayed. ("MLt" does not appear on the display during weighing).

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**^R 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
mg	Milligram	0.001 g
OZ	Ounce (Avoir)	28.349 523 1g
OZt	Troy Ounce	31.103 476 8g
dwt	Pennyweight	1.555 173 84g
ct	Metric Carat	0.2g
mm	Momrne (Japan)	3.75g
GN	Grain (UK)	0.064 798 91g
t	Tola (India)	11.663 803 8g
TL	Tael (HK, general)	37.7994g
TL	Tael (HK, jewellery)	37.4290 g
TL	Tael (China)	31.25g
TL	Tael (Sing.)	37.793g
TL	Tael (Taiwan)	37.5g

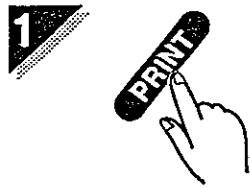
Setting An Arbitrary Coefficient (MLt Unit Mode)

- In the multi-unit mode 'MLt', the value displayed is the gram value multiplied by an arbitrary coefficient. (Example: In 'MLt' mode, at a coefficient of 0.5, "50,000" is displayed when a 100g weight is placed on the balance.)
- During weighing in the multi-unit, no display is made on the unit section.
- The coefficient is "1" at shipment time. (A numerical value the same as that in gram is displayed.)
- The coefficient can be set and checked by the keys on the front panel, RS-232C (option) and the AD-1652 (option).

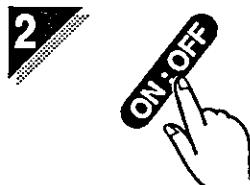
The following is an example of setting and checking the coefficient by the keys on the front panel.



To return to the normal mode during operation, press the [ON:OFF] key



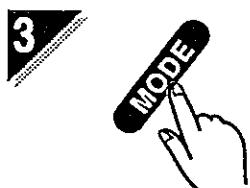
- With the display OFF, press and hold the **PRINT** key.



- With the **PRINT** key held down, press the **ON:OFF** key.

MLt

- The value previously set is displayed. Coefficient = "1" in the example
- When checking the coefficient only, press the **PRINT** key to return to the normal.

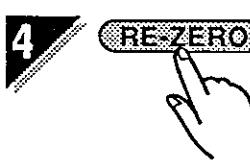


- Press the **MODE** key.

The display on the left end is changed to "0" and blinks.

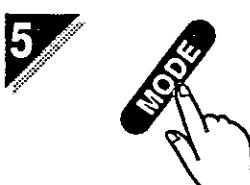
MLt

- A coefficient of up to 7 digits, with the positive polarity only, can be entered. The input range for the coefficient is:
"0.000000 ~ 10000.00"
- The coefficient will be set to "25.00000" in subsequent examples.



- Press the **RE-ZERO** key twice to set "2".

MLt



- Press the **MODE** key to move to the next digit.

20 MLt

- Thereafter, set the numerical value by the **RE-ZERO** and **MODE** keys. Use the **RANGE** key to enter a decimal point.

6



- After entering the necessary numerical values, press the **PRINT** key.
- After the set values are stored, the unit is returned to the weighing mode.

25.00000 MLt

This example shows that when the unit is set to the "MLt" mode after returning to the weighing mode, "2500.00" is displayed with a 0000000 weight placed on the pan.



To set and check the coefficient using the RS-232C (option), proceed as follows:

□ **Confirming the set value (by RS-232C)**

?	M	L	cr
---	---	---	----

A personal computer requests the balance to send the currently set coefficient.

Example of response

M	L	,	+	2	5	.	0	0	0	0	0	cr
---	---	---	---	---	---	---	---	---	---	---	---	----

(25.00000 set)

□ **Changing the set value (by RS-232C)**

Example)

M	L	3	.	0	cr
---	---	---	---	---	----

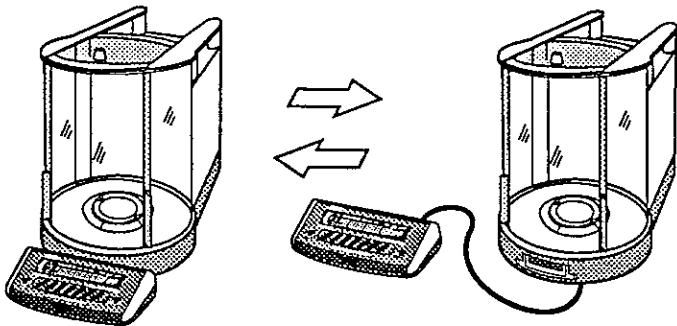
This example shows that 3.0 is newly set.
The input range of coefficient is 0.000000 to 10000.00.)



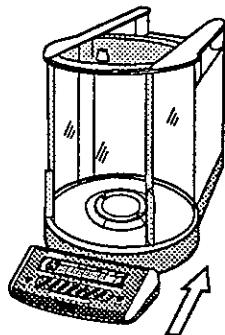
Separating the Display Unit



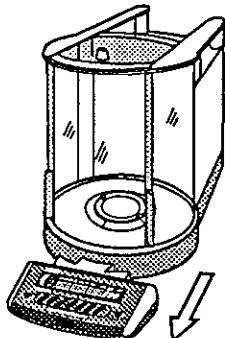
- ▣ The display of HA-200A can be installed and removed from the balance easily. Therefore, the balance can be accessed from any angle, resulting in facilitated weighing. In addition, the balance can be easily incorporated to other equipment.
- ▣ The display can be installed firmly in the balance by using the supplied screws (see the next page).
- ▣ The display can also be connected to the balance by using the 3-m OP-07 extension cable (optional), allowing you to operate the balance through remote control. Please specify the OP-07 when you purchase the balance. (Note that the OP-07 cannot be installed by the user.)



- ▣ Push the display slightly into the balance until it clicks and is unlocked.

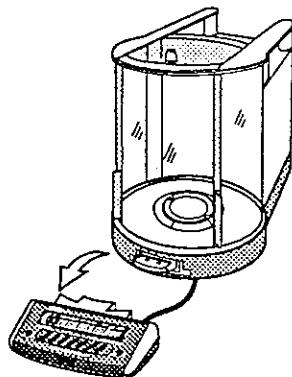


- ▣ Pull out the display.

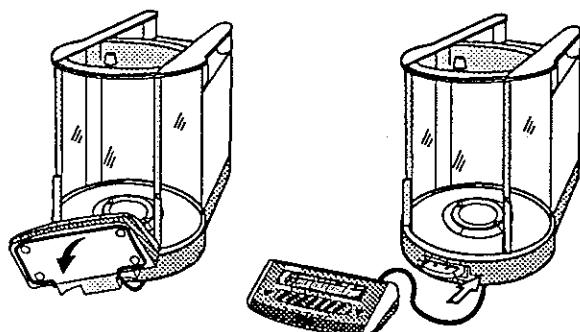


3

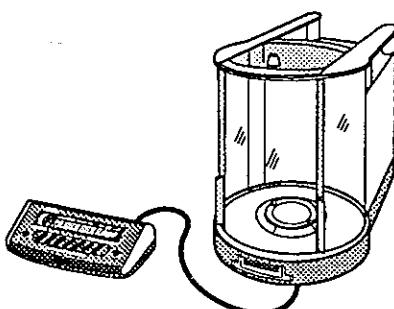
- Lift the display and remove it from the balance.

**4**

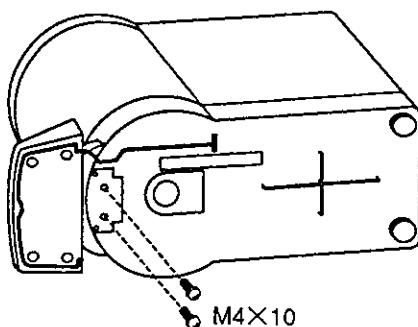
- Remove the cable from the groove in the bottom of the display.
► Push in the lock unit of the balance.

**5**

- You can place the display in a desired place and perform weighing.



- To install the display to the balance, perform steps **1 to 5** in the reverse order. Insert the display into the balance until it clicks. (The display may be slightly loose after it is locked, but this is not a malfunction.)
► The display can be installed to the balance by using the supplied screws. This will securely fasten the display. Insert the display into the balance until it clicks, then use the two supplied screws (M4 x 10) to fasten the display to the balance from the bottom.





Automatically controlled Breeze/Break Door



The HA-200A has a motor driven automatic breeze break door, which has greatly improved the troublesome door controls found in former analytical balances.

There are three kinds of controls for this automatic door, and it is possible to select the type that is best suited to the user's needs using the "internal C-Parameter" settings.

▣ Automatic Open/Close Mode 1



This is the control method that is set at the time of shipment.

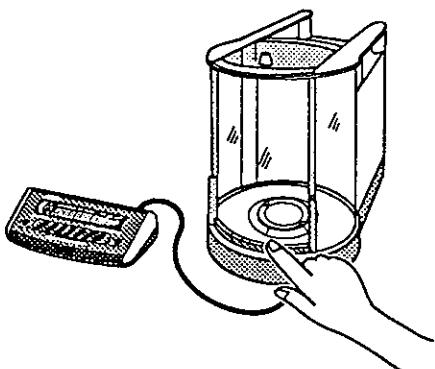
Every time the **DOOR** key is pressed the open operation and close operation of the door are repeated (see page B-23). The internal setting is "*door 0 C4*" (see page G-11).

▣ Automatic Open/Close Mode 2



The open position of the door is controlled by selecting automatically the desired door position every time. This is very convenient when the object to be weighed changes every time (see page B-28). The internal setting is "*door 1 C4*" (see page G-11).

▣ One-Touch Open/Close Mode



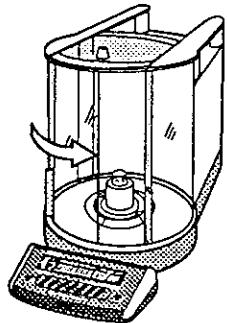
If the door is touched and moved just a little (about 1cm), the open and close operation of the door is performed automatically after that.

This is useful when the balance is separated from the display (see page B-20).

The internal setting is "*door 2 C4*" (see page G-11).



Automatic-Close Function



- ▣ It is possible to change the "internal C-Parameter" settings and use the automatic-close function.

This function automatically closes the door after the object to be weighed has been placed on the weighing pan.

The door is automatically closed after the object has been placed on the weighing pan and so it is very helpful when the weighing operation is performed using a set procedure.

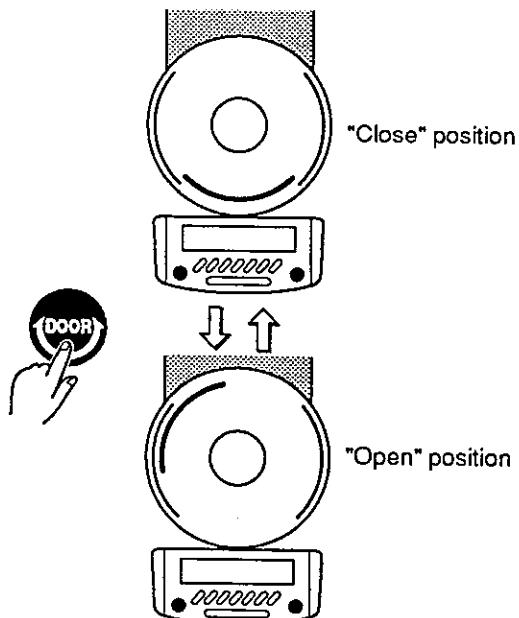
- ▣ After the display of the balance has become stable, the door will automatically close 2 seconds or more after a change of 0.1g occurs.

- ▣ It is possible to use this function in conjunction with the three open/close modes mentioned above. (This function is OFF at the time of shipment. The "internal C-Parameter" setting is "door L C4" (see page G•11).

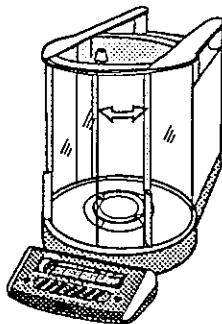
- The open and closed position of the door immediately after connecting an AC adaptor always become as shown in the figure.

From the internal setting it is possible to store in memory the previous open and closed position of the door even though the AC adaptor is removed.

The "internal C-Parameter" setting is "door S ? C4" (see page G•11).

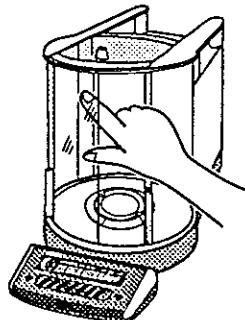


- It is possible to reset the door's open and closed position. (Refer to pages B-23 to B-25)
When doing so, in order to reduce the effects of air flow, it is necessary to keep the width that the door opens as narrow as possible.



-  The door's newly set "open" and "closed" positions are stored in memory even if the [ON:OFF] key is pressed and the balance is in the "OFF state".

- If a hand or other object comes in contact with the door while it is turning, the door automatically stops at the position or it automatically returns to its original position.



In place of the  key, it is possible to use a foot switch (SW128 accessory) connected to the external input terminal to control the door.

Also, in place of the  key, it is possible to control the door using a personal computer. (See pages K-22 and K-40)

If Remote controller AD-1652 (accessory) is used, it is also possible to control the door from a remote location. (Refer to page H-1)

When the HA-200A is used as part of a system, the door always turns immediately after the AC adaptor is connected, and it is possible that errors may occur. If this happens, the internal setting should be changed to read "the door does not turn after the AC adaptor is connected".

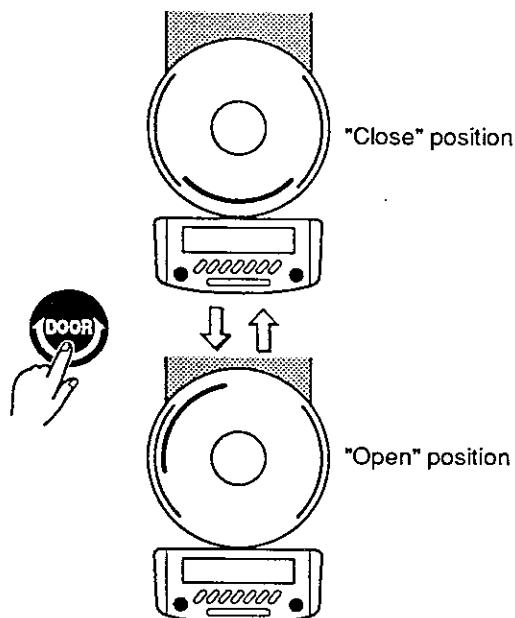
The "internal C-Parameter" setting is changed from "*doorP* 0 C4" to "*doorP* 1 C4" (see pages G-2 and G-11).

Automatic Open/Close Mode 1

- The "Automatic Open/Close Mode 1" is set at the time of shipment.

The "internal C-Parameter" setting is "*door* □ C4" (see page G-11).

When the  key is pressed, the front door opens and closes automatically.
(In this mode, both the right and left  key operate the same.)



Resetting the Door's "Open" Position

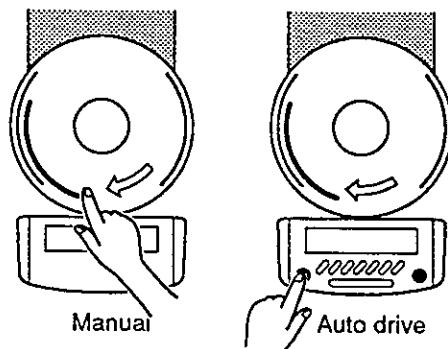
1

- The front door is moved manually or using automatic-drive* to the position to be newly set (= "open" position).

* Automatic-Drive

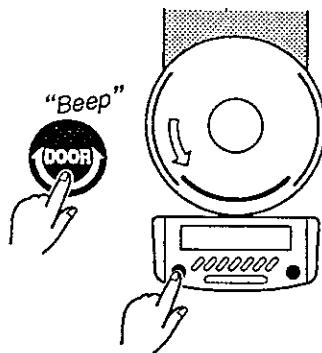
If the  key is pressed continuously for 2 seconds or more, the door begins to move slowly and stops at the desired position by releasing the key.

The right and left  keys change the direction that the door moves.

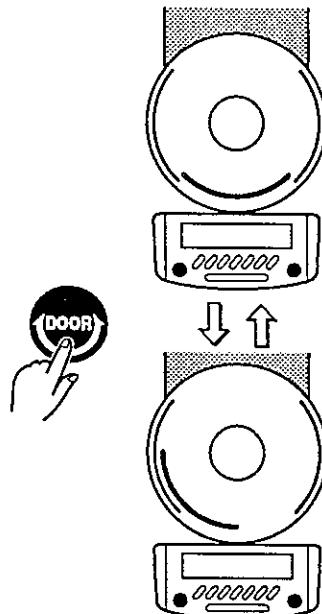


Keep on pressing the  key over 2 seconds.

- 2** □ If the **DOOR** key is pressed quickly, the door's position is stored in memory and setting is complete.
(When doing this, the door automatically closes.)



- 3** □ After setting is complete, the door opens and closes to the new positions every time the **DOOR** key is pressed.



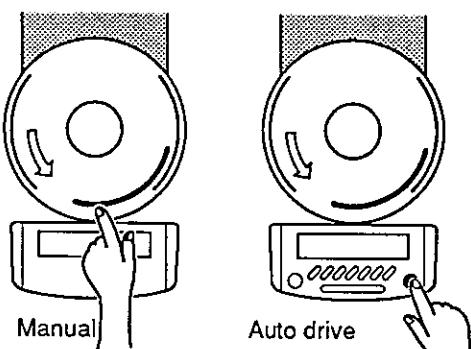
Resetting the Door's "Closed" Position

- 1** □ The front door is moved manually or using automatic-drive* to the position to be newly set (= "closed" position).

* Automatic-Drive

If the **DOOR** key is pressed continuously for 2 seconds or more, the door begins to move slowly and stops at the desired position by releasing the key.

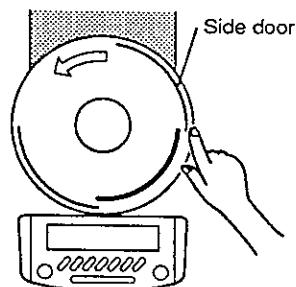
The right and left **DOOR** keys change the direction that the door moves.)



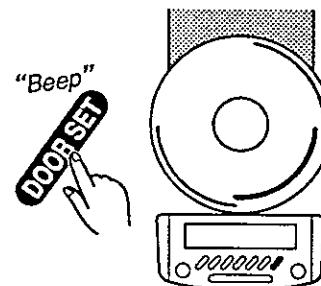
Keep on pressing
the **DOOR** key over
2 seconds.

- In the example below, the door is set so that access is performed from the front right side.

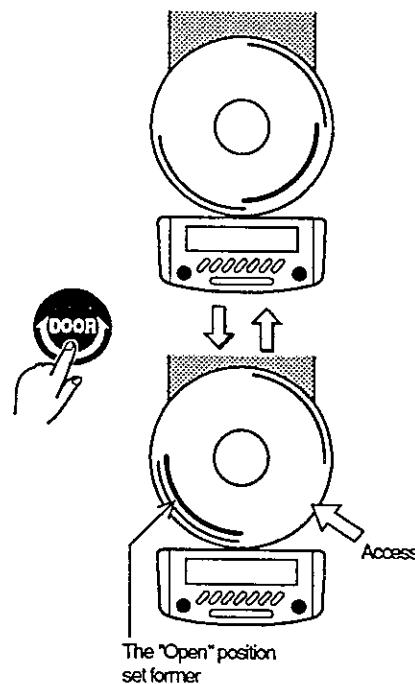
- 2** □ The side door is moved together with the front door.
(Make sure that there are no gaps.)



- 3** □ When the **DOOR SET** key is pressed, the door position is stored in memory and setting is complete.



- 4** □ After setting is complete, the door opens and closes to the new positions every time the **DOOR** key is pressed.

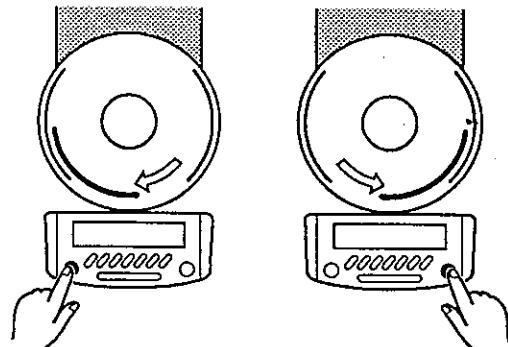


Automatic Open/Close Mode 2

- ▣ To use the "Automatic Open/Close Mode 2", it is necessary to change the "internal C-Parameter" setting set at time of shipment. The internal setting is changed from "door 0 C4" to "door 1 C4" (see pages G•2 and G•11).

- 1** □ The door opens corresponding to length of time the  key is pressed.

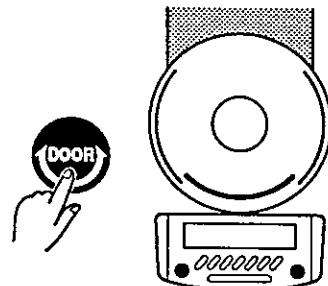
The direction the door turns differs by using the right or left  key.



The door can be rotate clockwise, only pressing the left  key.

The door can be rotate counter-clockwise, only pressing the right  key.

- 2** □ If the  key is pressed quickly, the door returns to the "closed" position.

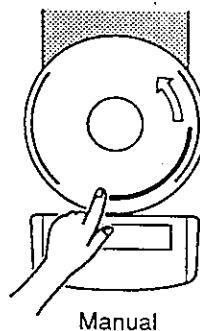


- 3** □ By repeating steps **1** and **2** above, the door can be opened and closed.



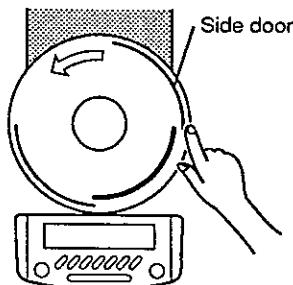
Resetting the Door's "Closed" Position

- 1** □ The front door is moved manually to the position to be newly set (= "closed" position).

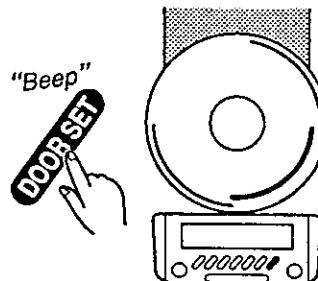


- 2** □ In the example below, the door is set so that access is performed from the front right side.

- 2** □ Move the side door together with the front door. (Make sure that there are no gaps.)



- 3** □ When the **DOOR SET** key is pressed the door's position is stored in memory and setting is complete.
□ When the door is closed after setting has been completed, the door stops at the newly set position when the **DOOR** key is quickly pressed.



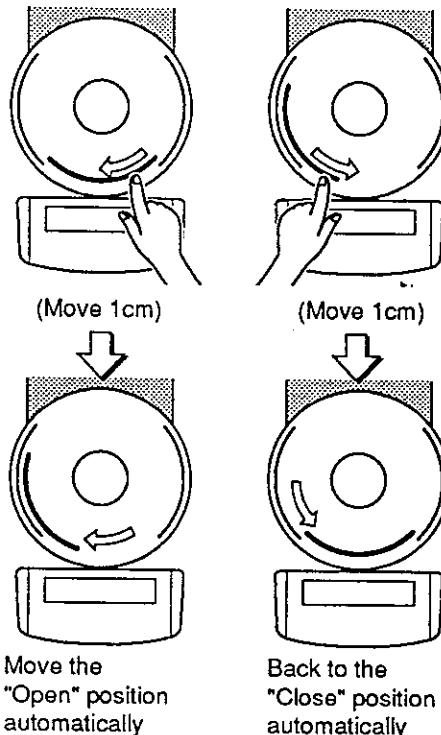


One-Touch Open/Close Mode

- To use the "One-Touch Open/Close Mode", it is necessary to change the "internal C-Parameter" setting which was set at time of shipment.

The internal setting is changed from "door 1 C4" to "door 2 C4" (see pages G-2 and G-11).

- In the one-touch open/close mode, the door moves automatically to the set positions after the door is moved just a little by hand.
- The front door should be moved by hand about 1cm. After that it automatically opens to the "open" position.
When closing the door, it should be moved about 1cm in the same way. The door then moves automatically to the "closed" position.
- The door can also be opened and closed automatically using the **(DOOR)** key. The door automatically opens and closes each time the **(DOOR)** key is pressed quickly.



Resetting the Door's "Open" Position

1

- The front door is moved using automatic-drive* to the position to be newly set (= "open" position).

* Automatic-Drive

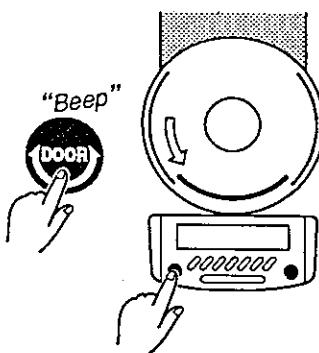
If the **(DOOR)** key is pressed

continuously for 2 seconds or more, the door begins to move slowly and stops at the desired position by releasing the key.

The right and left **(DOOR)** keys change the direction that the door moves.



- 2** When the  key is pressed quickly, the door position is stored in memory and setting is complete.
(The door closes automatically.)



- 3** After setting has been completed, the door opens and closes to the newly set position by using the one-touch open/close operation.



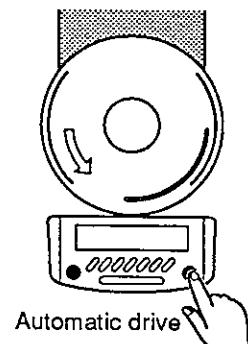
Resetting the Door's "Closed" Position

- 1** The front door is moved using automatic-drive* to the position to be newly set (= "closed" position).

* Automatic-Drive

If the  key is pressed continuously for 2 seconds or more, the door begins to move slowly and stops at the desired position by releasing the key.

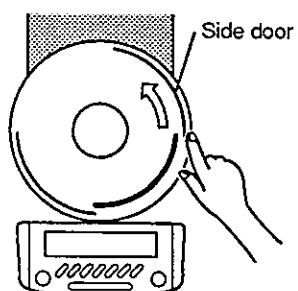
The right and left  keys change the direction that the door moves.



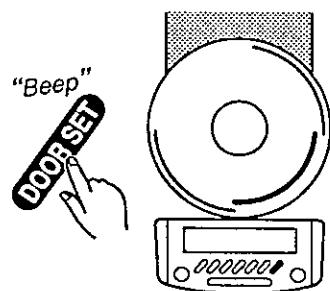
Keep on pressing the  key over 2 seconds.

- In the example below, the door is set so that access is performed from the front right side.

- 2** Move the side door together with the front door.
(Make sure that there are no gaps.)



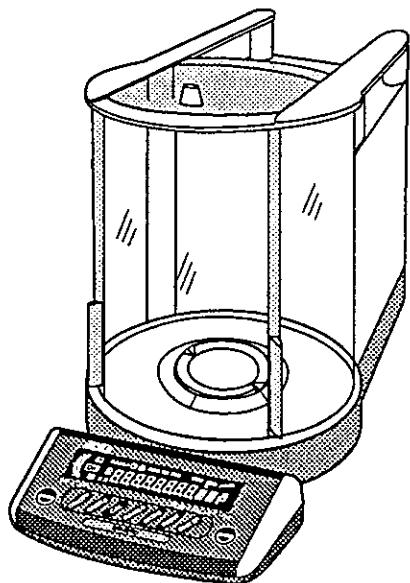
- 3** When the **DOOR SET** key is pressed the door's position is stored in memory and setting is complete.



- 4** After setting has been completed, the door opens and closes to the newly set position using the one-touch open/close operation.

HA-200A • Section C

Calibration





Calibration



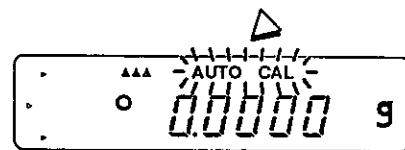
A high-precision electronic balance like the HA series is generally affected by the installation conditions (longitude and altitude) and ambient environmental conditions (temperature, humidity and atmospheric pressure), and may cause errors in the value weighed.

The HA-series balances can be calibrated using the built-in or external reference weight.

There are three calibration methods as follows:

Auto self-calibration

Balances of the HA series always monitor the ambient temperature. As soon as the balance detects a change in ambient temperature, calibration is automatically performed using the built-in weight. (The sensitivity and linearity of the balance are compensated.)



When the system starts calibration, the "AUTO CAL" indicator blinks. After about 2 minutes, calibration is automatically started. Usually, the balance is kept in the calibrated state by this auto self-calibration feature.

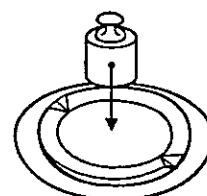
One-touch calibration

Pressing the **CAL** key after making sure that nothing is on the pan, the balance is calibrated by means of the built-in weight. (The sensitivity and linearity of the balance are compensated.) For example, when changing the installation conditions of the balance, calibration can be performed at any time by simply pressing the **CAL** key.



Manual calibration

This calibration can be performed with the user's weight. (Only the sensitivity of the balance is compensated.)



During operation, special attention should be paid for the vibration and air flow.

- Usually, the balance is kept calibrated by the auto self-calibration function. However, you can perform one-touch calibration and manual calibration at any time. Also, changing the internal setting allows you to disable auto self-calibration or all calibration functions. (See "**[RL ? C2**" of "Internal Setting" on pages G-2 and G-9.)

- Calibration can be confirmed by changing the internal C-Parameter setting. Also, error during calibration can be displayed, and current error of the balance can be checked. For more details, see "Confirmation of Calibration" on page G-9.
- Connecting a serial output (OP-03 or OP-04, optional) and changing the internal C-Parameter setting allows you to automatically output the calibration results with the time and date after executing calibration. If you connect a printer to the system, you can automatically print out calibration records. (See page G-9.)

Auto Self-Calibration



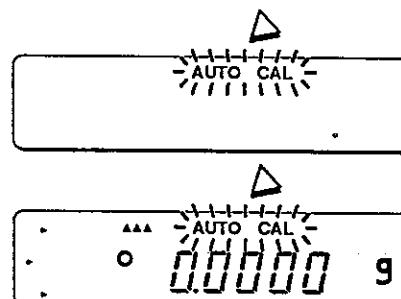
The HA-series balances detects the change in ambient temperature and performs calibration by using the built-in weight.

The HA-series balances detects the change in ambient temperature and performs calibration by using the built-in weight. This function activates regardless of display mode (gram, milligram, counting, percentage, etc.).

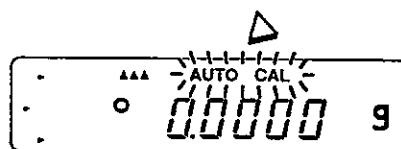


With power applied, the auto self-calibration function is active, even when in the display-off state; calibration is performed automatically.

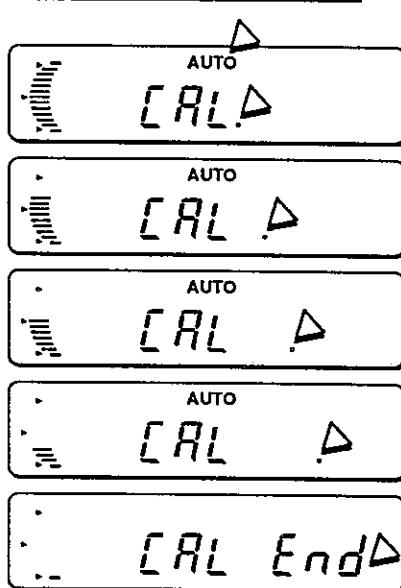
(In this case, the "AUTO CAL" blinks to inform of a change in ambient temperature.)

**1**

- When the balance detects a change in ambient temperature, the "AUTO CAL" indicator blinks for approximately 2 minutes. Remove the object from the pan, if any..

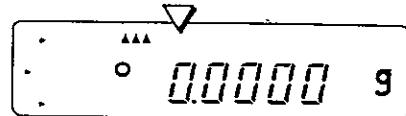
**2**

- The display changes to "[RL]" and the balance starts calibration.





- After calibration is completed, the balance returns to normal weighing mode.





One Touch Calibration

1

- Have the display ON for one hour or more, in normal weighing mode and stable. Check that there is nothing on the weighing pan and the balance is level.

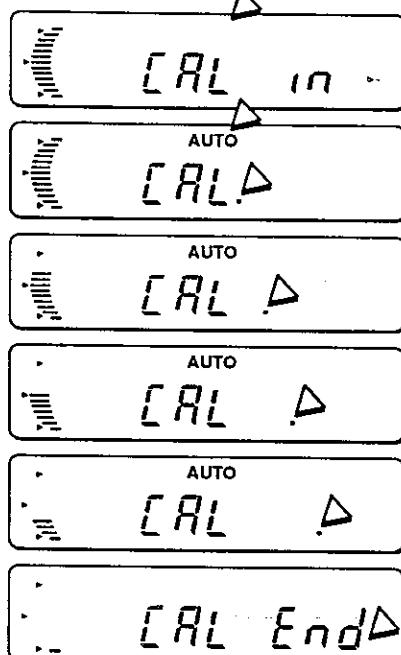
0.0000 g

2



- Press the CAL key.

- You will hear the calibration mechanism working as the display goes to CRL. 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.

0.0000 g



Manual Calibration



You can easily calibrate your HA-200A balance by using your own calibration mass. Weights of 100g, 150g and 200g can be used, each of which required a compensation of $\pm 15.0\text{mg}$. If you want to enter the precise weight of the calibration mass, or use a different size mass, see the following page for instructions (ENTERING A DIFFERENT CAL MASS VALUE).

1

- ▣ Have the display ON for at least one hour, in normal weighing mode and stable. Verify that there is nothing on the weighing pan and the balance is level.

0.0000 g

2

- ▣ Press the **CAL** key, and then immediately press the **PRINT** key.
- The last set CAL weight will be displayed. If you wish to change this setting see page C-7.



CRL in



200.0000 g

3

- ▣ Press the **RE-ZERO** key.
- "CRL D", then the "■" mark, and "CRL F" will be flashing.

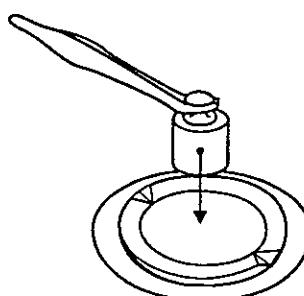


CRL D

CRL F

4

- ▣ When "CRL F" and "■" are displayed, place the calibration mass on the pan with the breeze break door closed firmly.
- The "■" mark, and then "CRL End" will be displayed.

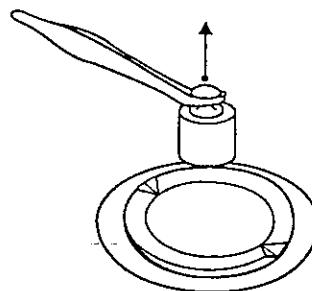


CRL F

CRL End

5

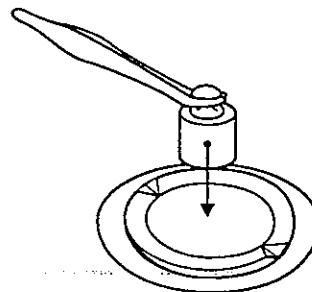
- Remove the calibration mass and the display will return to normal weighing.



00000 g

6

- Place the calibration mass on the pan again, and confirm that the allowance range to the weight value is within ± 2 digits.

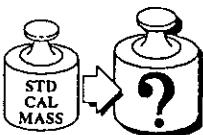


200000.1 g

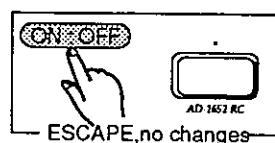
- If the allowance range exceeds ± 2 digits, check for vibration and air flow, then place the calibration mass on the pan again.



Entering a Different CAL Mass Value

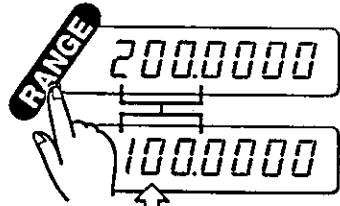


If you want to enter the precise weight of the calibration mass, or want to use a different size mass, then between Step 2 and 3 on the previous page, use the keys as shown below to enter the new mass value.

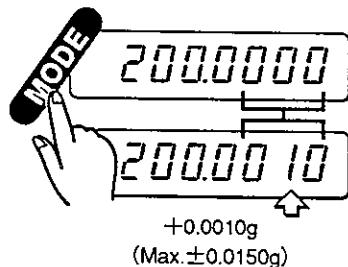


HA-200A : 100g 150g 200g $\pm 0.0150\text{g}$

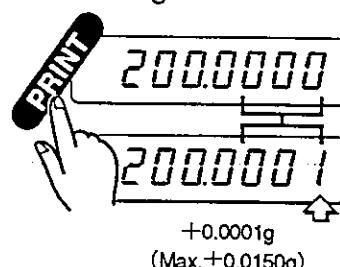
- When the **RANGE** key is pressed, the value is changed 200g, 100g and 150g.



- When the **MODE** key is pressed, the value is changed by 0.0010g.



- When the **PRINT** key is pressed, the value is changed by 0.0001g.



Calibration Notes and Errors

CAL Errors:

-CAL E

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

CAL E

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

- Check all measured objects are removed, the weighing pan is installed properly, and the value of a weight is set correctly, and press the RE-ZERO key.

CAL no

'CAL no' will be displayed when calibration cannot be performed because the balance is unstable due to factors such as vibration and air flow.

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



Confirmation of Calibration



- By changing the internal C-Parameter setting, you can check the current deviation from the calibration value or confirm if calibration was performed correctly.
- To confirm calibration, perform either two methods as follows:
 - Checking the deviation from the calibration value at any time.
 - Confirm if calibration is performed correctly only when one touch calibration is performed (see "Checking of One Touch Calibration").



Checking the Deviation From the Calibration Value

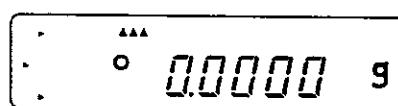


- This function is useful in the following cases:
 - Turn the auto self-calibration function to off and check the error appropriately when taking data continuously for a long time.
 - After performing one touch calibration, confirm manually if calibration was performed correctly.
- Deviation from the current calibration can be easily checked by using the built-in weight.
- Use the same weight for checking manual calibration.
- Preparation
The default internal C-Parameter setting must be changed. Change the internal setting to "All calibrations disabled" ("**[RL 3 C2]**"). The default is "**[RL 0 C2]**".
- In this state, all calibrations are disabled. If this is temporary checking, return the internal setting as before after confirmation of error is completed.

1



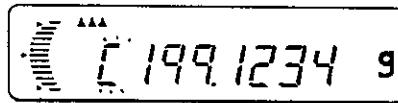
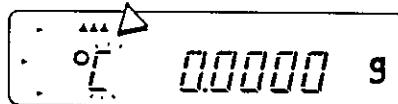
- Press the **MODE** key to change the unit segment to gram ("g").



2

- Press the **CAL** key.

- The balance resets (RE-ZERO) and the display shows a blinking "L."
- The built-in weight automatically lowers.
- Read the measured value after the stability indicator ("o") appears. This display will last for approximately 4 seconds.



- The balance is calibrated correctly if "200.0000 g" is displayed.
- In the above example, calibration is deflected by +6 digits due to change in the temperature. In this case, deflection of approximately +3 digits is expected at the point of 100 g.
- Immediately after one touch calibration, the allowable range should be within ±2 digits to "200.0000 g."

3

- The built-in weight automatically lowers.
- The "L" goes off and the display returns to normal weighing mode.



Checking of One Touch Calibration



- Press the **CAL** key to perform one touch calibration. After that, error of that calibration can be automatically displayed.
- The default internal C-Parameter setting must be changed to "Automatically check after one touch calibration" ("LRL - L / C2"). The default is "LRL - L / C2." (See pages G-4 and G-9.)

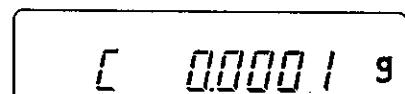
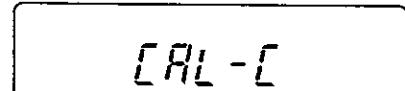
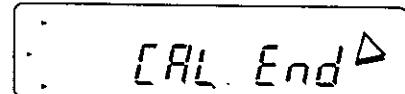
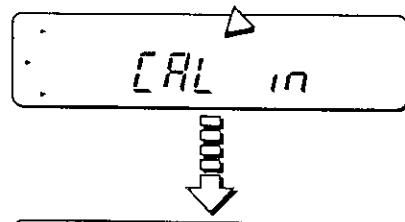
1

- Switch the balance ON at least one hour before weighing. Remove all objects from the pan.



2

- ▣ Press the **CAL** key.

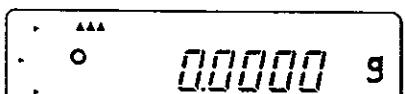


- Checking of one touch calibration starts automatically.
- The display shows the error of calibration.

(Allowable range is within ± 2 digits. If this range is exceeded, see the "Best Conditions for weighing" on page A-3.)

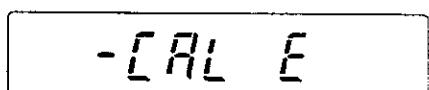
3

- ▣ Press the **RE-ZERO** key.
- The display returns to normal weighing mode.

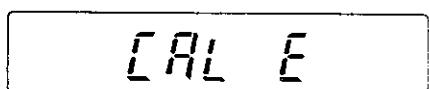


Calibration Errors

Error display

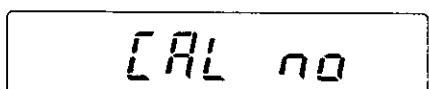


"-CAL E" will be displayed if the calibration mass is too light.



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

- ▣ Confirm that all objects have been removed from the pan, and the pan is correctly installed. Check if the correct calibration mass is used in accordance with the set. After checking these, press the **RE-ZERO** key.



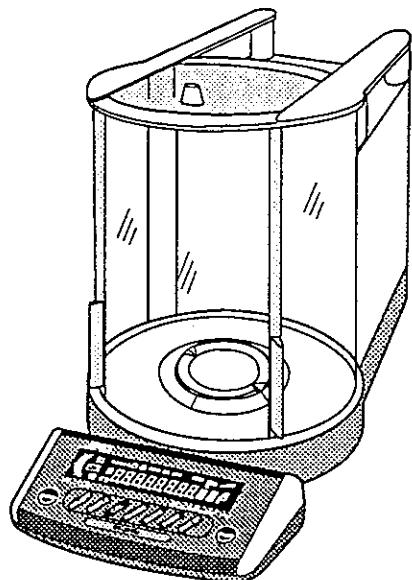
"CAL no" will be displayed if the balance cannot perform calibration because the balance is unstable due to adverse environment such as vibration.

- ▣ Check for excessive vibrations or drafts, then press the **RE-ZERO** key. (See "Best Conditions for Weighing" on page A-3.)

This page blank

HA-200A • Section D

Weighing Mode





Simple Weighing



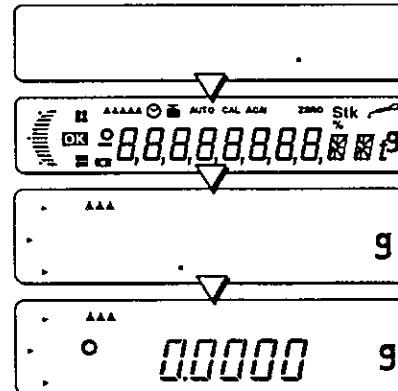
For accurate weighing, please warm-up the balance for an hour before using and try to meet the BEST CONDITIONS FOR WEIGHING.

1



- Press the **ON:OFF** key.

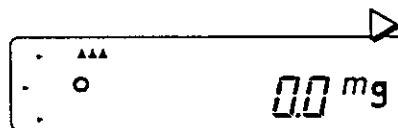
- The display will come ON with all segments lit.
- The display will blank for a moment while the balance zero's.
- The display will show zeros, the stability indicator (○) and the Environment Setting Monitor (▲).



2



- Press the **MODE** quickly as required to select a unit and the weighing mode.



3



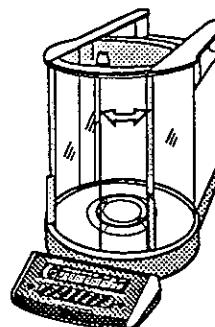
- To change the display of minimum digits, press the **RANGE** key. (See "RANGE Key" on page B-12)



4

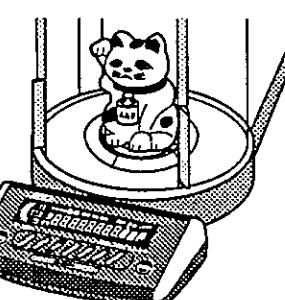


- Open the front door by pressing the **DOOR** key.
○ Set the opening space of the door as necessary. (See "DOOR Key" on page B-10)



5

- Place the object to be weighed on the center of the pan.
□ Close the door.
□ Wait for the round stability indicator to come ON and read the weight.





Weighing Using the Environment Setting Monitor



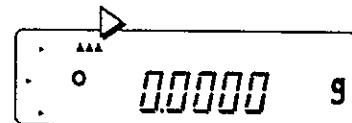
- ▶ Use the Environment Setting Monitor (▲▲▲) and the **MODE** key of the HA-200A to change to an optimum weighing condition when adapting the balance to ambient environment (vibration, air flow, etc.), or when feeding objects to the target weight.



When the balance display is slightly unstable due to adverse environment:



- ▶ Turn the display to on to get weighing mode.
 ○ In this example, the internal setting is default, showing three triangles (▲▲▲) on the Environment Setting Monitor.



- ▶ Hold down the **MODE** key, and release it after four triangles (▲▲▲▲) appear on the Environment Setting Monitor.
 ○ At this time, the internal C parameter of the condition is changed to "The least sensitive to fluctuation" ("*L and 4 C0*"). (See "MODE Key" on page B-13 and "Internal Setting" on page G-7.)



- ▶ Place the object on the pan and close the door. Although the display responds slowly to the weight, the weight will be stabilized.
 ○ In this setting, it takes approximately 7 seconds to read a weight of 200 g by units of 0.1 mg after the object is placed.

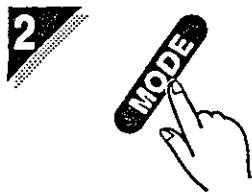


To read the weight at response speed as fast as possible:

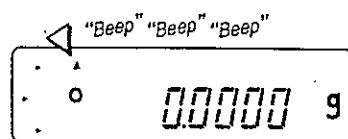


- ▶ Turn the display to on to get weighing mode.





- ▣ Hold down the **MODE** key, and release it after one triangle (\blacktriangle) appears on the Environment Setting Monitor.



- At this time, the internal C parameter of the condition is changed to "The most sensitive to fluctuation" (" $L and / C0$ "). (See "MODE Key" on page B-13 and "Internal Setting" on page G-7)



- ▣ Place the object on the pan and close the door. Although the display responds quickly to the weight, attention should be paid because the balance becomes very sensitive to ambient environment.



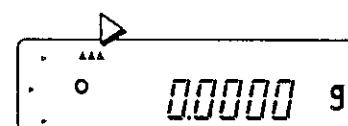
- In this setting, it takes approximately 3.5 seconds to read a weight of 200 g by units of 0.1 mg after the object is placed.



To feed liquid to the target value:



- ▣ Turn the display to on to get weighing mode.



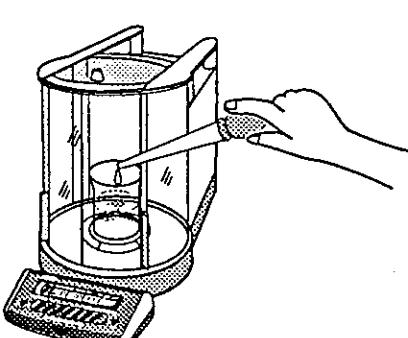
- ▣ Hold down the **MODE** key, and release it after the filler mark appears.



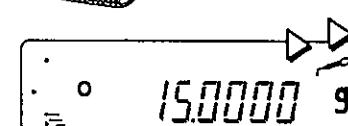
- At this time, the internal C parameter of the condition is changed to "Feeding Mode" (" $L and \square C0$ "). (See "MODE Key" on page B-13 and "Internal Setting" on page G-3.)



- ▣ Add liquid carefully and gradually until the target weight is obtained.

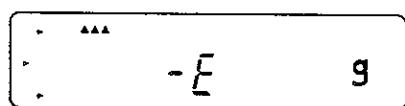


- A maximum of two lower digits blank if fluctuation of weight is large. The display shows up to the units of 0.1 mg after it is stabilized.
- In this mode, attention should be paid to air flow because the balance responds sensitively to very small changes in environment.



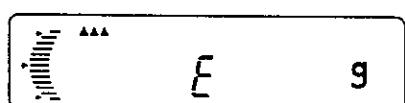
Weighing Errors

Weighing Pan Error



- '~-E' will be displayed if the weighing pan or pan support are not installed.
- ▣ When an error continues, even after the weighing pan or pan support is properly assembled, call for service.

Overload Error



- 'E' will be displayed if the weight is beyond the balance capacity.
- ▣ When an error continues, even after the weighing object is removed, call for service.

Internal Operation Error



- "Error 0" will be displayed if an internal operation error occurred.
- ▣ Call for service.

Stability Error



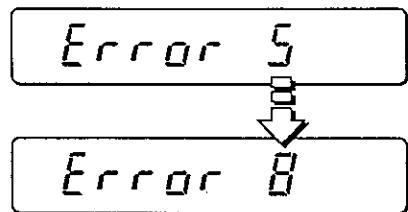
- "Error 1" will be displayed if the balance can not become stable while zeroing, or weighing.
- ▣ Check for excessive vibrations or drafts. Press the **RE-ZERO** key and see BEST CONDITIONS FOR WEIGHING.

Stability Error



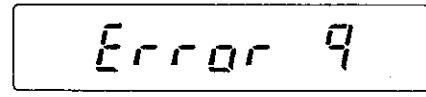
- "Error 2" will be displayed if the balance can not become stable while registering the unit weight or 100% weight.
- ▣ Check for excessive vibrations or drafts. Press the **RE-ZERO** key and see BEST CONDITIONS FOR WEIGHING.

 **Memory Error**



- "Error 5" to "Error 8" will be displayed if the balance has a memory problem.
- ☒ Disconnect and connect AC power and try again. If error persists, call for service.

 **Door Drive Error**



- Error 9' will be displayed if the drive of the front door has a problem.
- ☒ Check for an obstacle touching the front door, then disconnect the AC adaptor and connect it again. If the error still persists, call for service.

 **Power Voltage Error**



- A blinking "B" (battery) indicates that the power voltage is too low.
- ☒ Confirm that the power voltage is within a range of +10% and -15%.



Comparator Function



- ▶ With HA-200A, which can change the internal setting, two types of weight-compare judgement result can be indicated with showing the marks **■**, **OK**, **=** on the display; i.e., an object is "heavier" or "lighter" than a reference weight or it is "too heavy", "accepted", or "too light".
- ▶ To perform the comparator function, it is required to register reference weights; i.e., the upper and lower limit values. To register the value, two methods are provided; "registration with actual sample" and "registration with digital entry". Furthermore, "registration with digital entry" is classified into "setting entry using front panel key" (page D-11), "setting entry from personal computer through serial output (option)" (page K-28) and "setting entry using the AD-1652 Remote keyboard" (page H-7 and H-8).
- ▶ When both of the upper and lower limits are registered, judgement result whether "accepted" or "not accepted" is as follows:



Too heavy	■ lit,
Accepted	OK lit
Too light	= lit

However, when either of the limits is registered, judgement result **■** or **=** is indicated after a weight is compared with the limit as follows:

Too heavy	■ lit,
Too light	= lit

- ▶ With option "OP-04 (Interface for comparator output)", the judgement result can be extracted as a contact output. (Refer to page L-1)

Setting HI/LO Limits



- ☒ To indicate the results of a comparison, internal factory setting should be changed to "[P-d] / c8" (indicates comparator result) in advance. (Refer to pages G-4 and G-18)
- ☒ The following example shows registration where two kinds of actual samples set the upper limit (HI) to "51.2345 g" and lower limit (Lo) to "50.2345"

1



- ☒ Press the **MODE** key to select "gram (g) mode".



- Note that although the following procedure can be available in other mode than "gram mode", converted values from "g" values are displayed for the upper and lower limit.

2



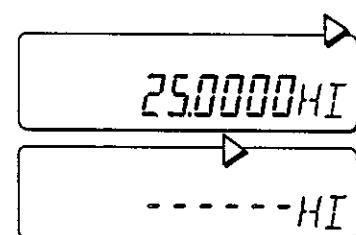
- ☒ Press and hold the **RANGE** key for about two seconds to change the unit to "TG".



3



- ☒ Press the **MODE** key within four seconds after "TG" appears.

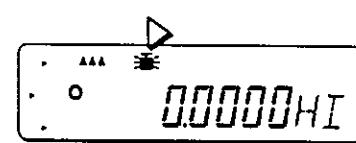


- The unit is changed to "HI" and the previously registered upper limit (HI) appears for visual checking.
- If the upper limit is not registered, "---- HI" will appear.
- In the case of visual checking for the upper limit, wait for about four seconds in this state and you will be automatically returned to weighing mode.

4



- ☒ If a new upper limit is to be entered, press the **RE-ZERO** key within four seconds after "HI" appears.
- You enter "input mode" and "weight" mark "■" blinks.



5

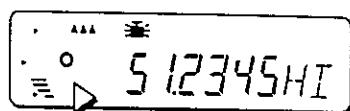
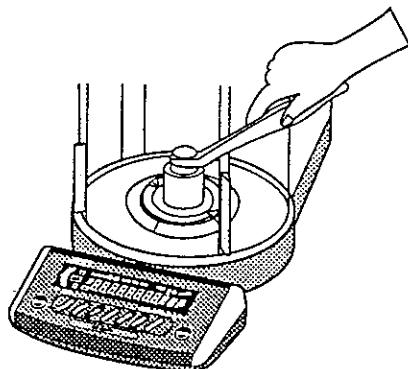


- ☒ After closing door, press the **RE-ZERO** key to perform re-zero operation.

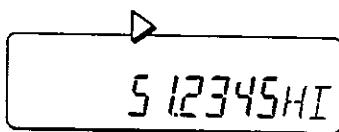


6

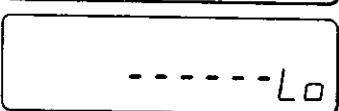
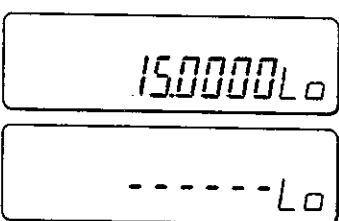
- ▣ After opening door, place an actual sample corresponding to the upper limit on the weighing pan.
- After closing door, check the stability indicator "°".

**7**

- ▣ Press the **PRINT** key to store the data.
- The weight mark (■) disappears.
- In the case of setting of only the upper limit, wait for about four seconds in this state and you will be automatically returned to the weighing mode.

**8**

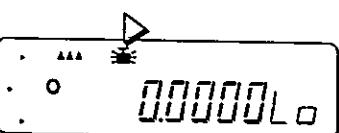
- ▣ Press the **MODE** key within four seconds after the "weight" mark (■) disappears.
- The unit is changed to "*L_o*" and the previously registered lower limit (*L_o*) appears for visual checking.
- If no lower limit is registered, "-----*L_o*" will appear.
- In the case of visual checking for the lower limit, wait for about four seconds in this state and you will be automatically returned to the previous weighing mode.

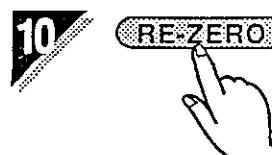


If you register only the upper limit without the lower limit (*L_o*), the comparator displays "too heavy ■" or "too light ■" assuming the upper limit to be reference. When you delete the lower limit, press the **CAL** key while "*L_o*" is displayed and unregistration state "-----*L_o*" will appear.

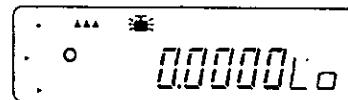
9

- ▣ If you enter a new lower limit, press the **RE-ZERO** key within about four seconds after "*L_o*" appears.
- You enter the "input mode" and "weight" mark (■) blinks.

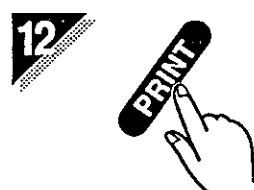
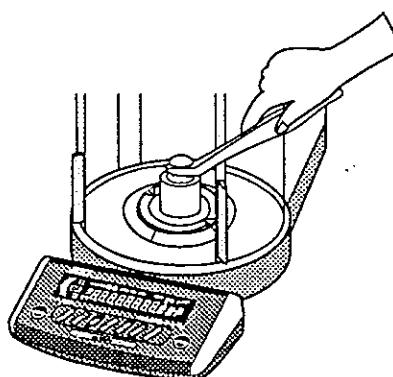




- After closing door, press the **RE-ZERO** key to perform re-zero operation.



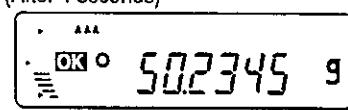
- 11** After opening door, place an actual sample corresponding to the lower limit on the weighing pan.
 ○ After closing door, check the stability indicator "°".



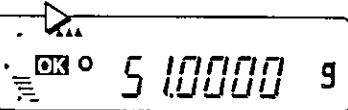
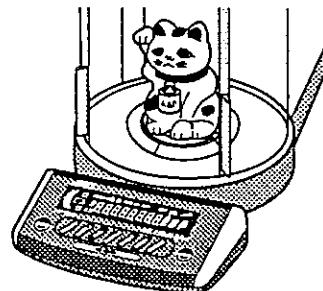
- Press the **PRINT** key to store the data.
 ○ The weight mark (■) disappears.
 ○ If you wait for about four seconds in this state, you will be returned to the previous state and the setting ends.



(After 4 seconds)



- 13** When you place a desired object on the weighing pan, judgement results for the upper and lower limits will be displayed.



- This example shows the judgement results as follows:

Negative sign - 50.2344g, " ■ " indication
 (but no judgement for error within zero 0.0010g),
 50.2345g - 51.2345g, "OK" indication,
 51.2346g - 210g, " ■ " indication

- * If you want to display the judgement result near zero (within zero 0.0010g), set the internal setting to "[P-0 / c8". (Refer to pages G-16 and G-18)
 ○ A buzzer can be used to inform you of judgement result. For more information, refer to "internal setting" (page G-18).

Digital Setting HI/LO Limits



- ▣ The front panel keys can be used to directly digital-enter the upper and lower limits.
- ▣ To display judgement result after digital entry, the internal factory setting should be changed to "[P-d / c8" (indicates comparator result) in advance. (Refer to pages G-4 and G-18)

1



- ▣ Press the [MODE] key to select "gram (g) mode".
- Note that although the following procedure can be available in other mode than "gram mode", converted values from "g" values are displayed for the upper and lower limits.



2



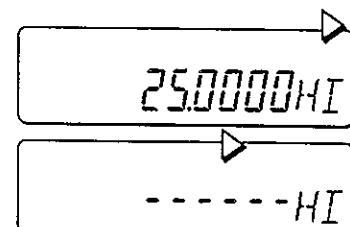
- ▣ Keep pressing the [RANGE] key for about two seconds to change the unit to "TG".



3



- ▣ Press the [MODE] key within four seconds after "TG" appears.
- The unit is changed to "HI" and the previously registered upper limit (HI) appears for visual checking.
- If the upper limit is not registered, "---- HI" will appear.
- In the case of visual checking for the upper limit, wait for about four seconds in this state and you will be automatically returned to weighing mode.



4

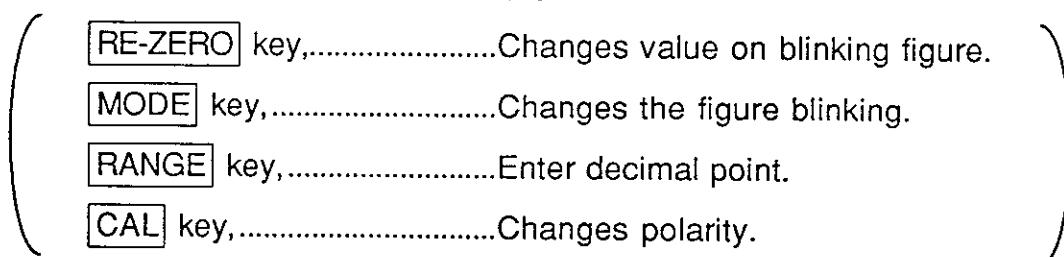


- ▣ If a new upper limit is entered, press the [RE-ZERO] key within four seconds after "HI" appears.
- "0" blinks.



- 5** Use the **RE-ZERO**, **MODE**, **RANGE**, and **CAL** keys to digital-enter the upper limit.

This example uses entry of **12345g**.



- ▣ Press the **RANGE** key.



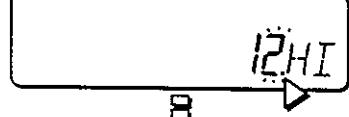
- ▣ Press the **MODE** key to shift figures.



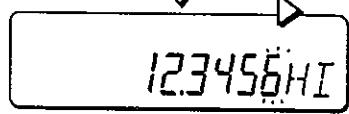
- ▣ Press the **RE-ZERO** key twice.



- ▣ Press the **RANGE** key to add a decimal point.



- ▣ Similarly, use the **MODE** and **RE-ZERO** keys to enter "12.3456HI".



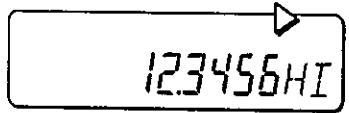
- !** Set the input data in the range within 0.0000g - 210g.
If the data is out of range, "Error 3" will appear.

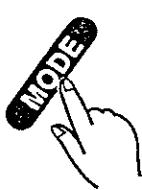
- 6**



- ▣ Press the **PRINT** key to store the data.

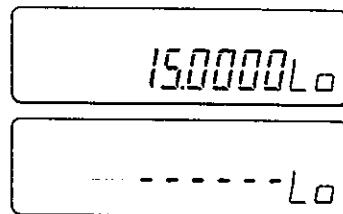
- The number on the lowest figure is changed from "blinking" to "lighting".
- In the case of setting of only the upper limit, wait for about four seconds in this state and you will be automatically returned to the weighing mode.



7

- ▶ Press the **MODE** key within four seconds after pressing the **PRINT** key.

- The unit is changed to "*L_a*" and the previously registered lower limit (*L_a*) appears for visual checking.
- If no lower limit is registered, "---- *L_a*" will appear.
- In the case of visual checking for the lower limit, wait for about four seconds in this state and you will be automatically returned to the previous weighing mode.



! If you register only the upper limit without the lower limit (*L_a*), the comparator displays "too heavy ■■" or "too light ■■" assuming the upper limit to be reference. When you delete the lower limit, press the **CAL** key while "*L_a*" is displayed and unregistration state "---- *L_a*" will appear.

8

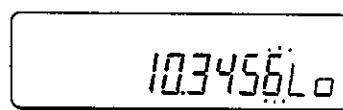
- ▶ If you enter a new lower limit, press the **RE-ZERO** key within about four seconds after "*L_a*" appears.



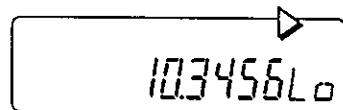
- "0" blinks.

9

- ▶ Use the **RE-ZERO**, **MODE**, **RANGE**, and **CAL** keys to enter a value.
Refer to step **5** on preceding page.
This example uses value of "*10.3456L_a*".

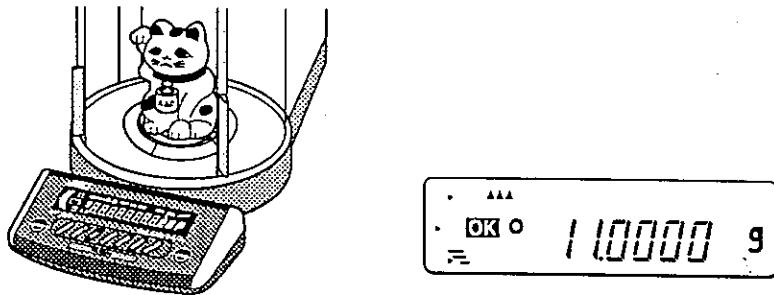
**10**

- ▶ Press the **PRINT** key to store the data.
- The number on the lowest figure is changed from "blinking" to "lighting".
 - If you wait for about four seconds in this state, you will be automatically returned to the weighing mode.



11

- When you place a desired object on the weighing pan, judgement results for the upper and lower limits will be displayed.



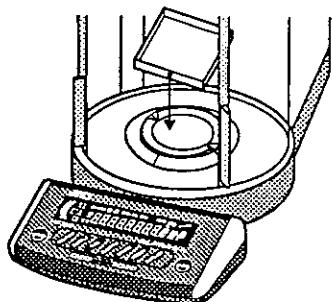
- This example shows the judgement results as follows:

Negative sign - 10.3455g, " ■ " indication
(but no judgement for error within zero 0.0010g),
10.3456g - 12.3456g, " OK " indication,
12.3457g - 210g, " ■ " indication

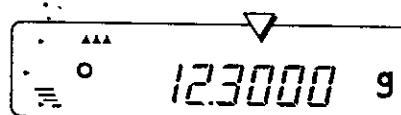
- * For information on judgement near zero and use of buzzer, refer to step **13** (page D-10)

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

Weighing into a Container

1

- Place a container on the weighing pan.

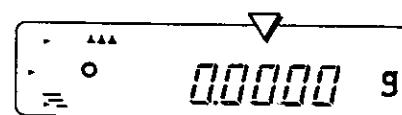
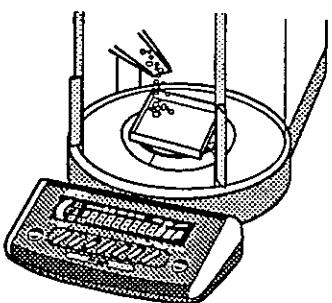


- The display will show the container weight.

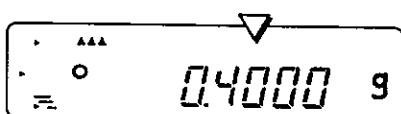
2

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

- The display goes to zero.

**3**

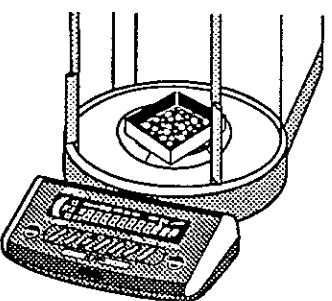
- Fill the container until the target weight is reached. •When adding more than one ingredient to the container, press the **RE-ZERO** key after each.



- The display will show the sample weight.



Weighing Out of a Container

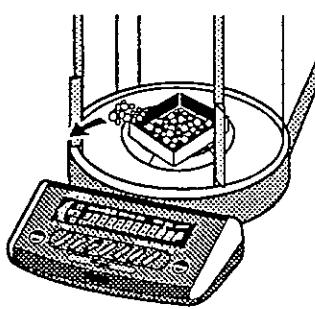
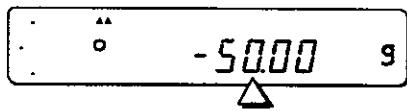
1

- Place a full container on the weighing pan.

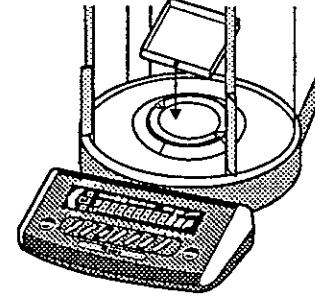
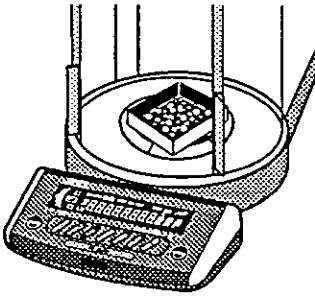


- The display will show the weight of the container and its contents.

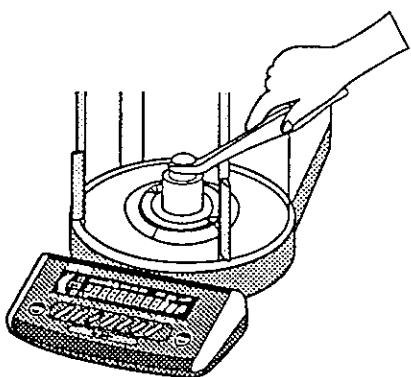
- 2**  Press the **RE-ZERO** (**TAPE^{RK}** on **AD-1652 Remote**) to cancel the weight.
 The display goes to zero.

- 3**  Remove until target weight is reached, as shown by the negative display.

 When weighing out into several containers, press the **RE-ZERO** key after each weighing is complete.

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.
- 2**  Fill the container (the container may be removed and filled outside the weighing chamber).
 Remove until the target weight is reached.

Deviations 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.

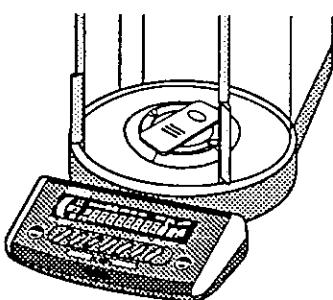
2**RE-ZERO**

- Press the **RE-ZERO** (TAPE^R on the AD-1652

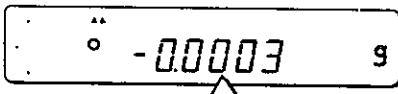
Remote) to cancel the weight.



- The display goes to zero.

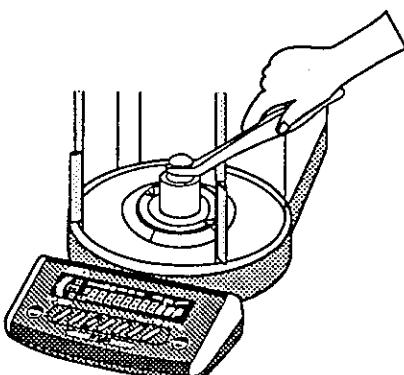
3

- 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.



Making Weighing More Precise

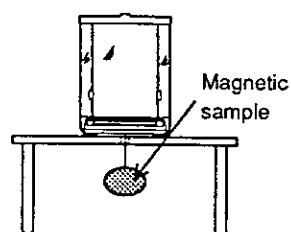
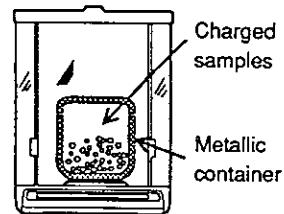


To make full use of the HA-200A balance performance for more precise weighing, care should be given to the following items:

- Selection of the installation site and ambient environment of the balance.
Refer to the "Best Conditions For Weighing" (on page A•3).
Specify an optimum environment setting by using the Environment Setting Monitor and the **MODE** key, if necessary (see page D•3).
- To make stable and precise measurements, be sure to warm up the balance 4 hours or more before using.
- Swiftly perform the weighing operation with care. Taking time for weighing will increase the risk of error due to changes in temperature and humidity in the weighing chamber, fluctuation in air, reaction of sample, and humidity absorption.
Keep the opening space of the door as narrow as possible to minimize disturbance from air flow.
- To precisely weigh the absolute weight of an object, use the **CAL** key and perform calibration (see page C•2). Error of the weight can be monitored for every weighing by checking the error as described in "Checking the deflect from calibration value"(page C•9).

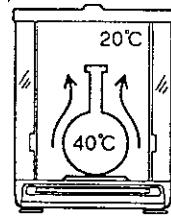


- When the display is turned to on by pressing the **ON:OFF** key, the built-in weight (approx. 200 g) will lift and lower. This applies auxiliary load to the balance, and after that, stabilizes accuracy of weighing. Use this function of the **ON:OFF** key according to your need.
- The static electricity may cause errors in the weighing. When the ambient humidity drops below 45%, an insulating material such as plastic can easily be charged with static electricity. Increase the relative humidity or place the sample in a conductive container for weighing.
- The influence of magnetism may cause an error. When measuring the magnetic substance (such as iron), use the underhook weighing, keeping the balance body away from the sample. (Refer to page D•20).



- If the temperature of the weighing chamber is different from that of an object to be weighed (including the tare), weighing error may occur. For example, when placing a flask of 40°C into the chamber of 20°C, convection is generated and the weight displayed by the balance will be lighter than actual weight. (In such a case, the displayed value gradually increases as the temperature difference becomes smaller.) Therefore, leave the object to be weighed in the weighing chamber for a while before weighing.
- The weighing results may include an error caused by air buoyancy. Air buoyancy varies with the volume of sample, atmospheric pressure, temperature, and humidity. Compensate for the buoyancy for precise weighing.

For details, contact A&D.





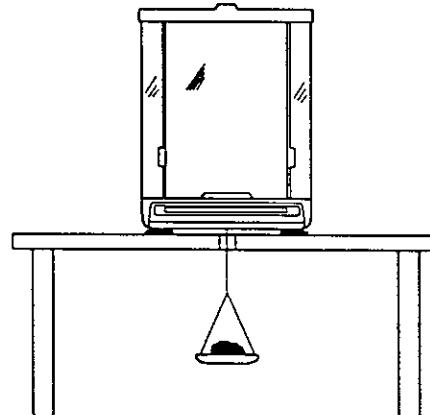
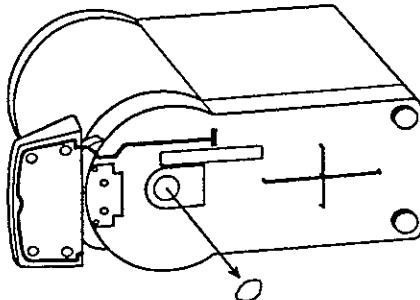
Underhook Weighing Density Determination



The HA-200A 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.

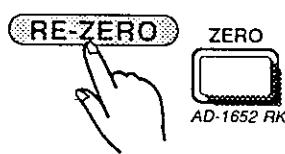


You can find the relative density (specific gravity) of a metal or some other material from its loss in weight when weighed in water. Because one gram of water is almost exactly one cubic centimeter in volume, the loss in weight (floating weight through displacement) associated with weighing an object 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/cm³).



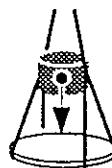
Underhook Weighing Example

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



00000 g

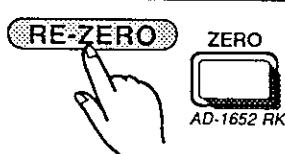
- 2** Place an object on the weighing pan and record the weight.



10.0000 g

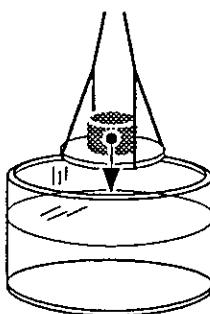
- In this example, the mass weighs 10g in the air.

- 3** After removing the object to put the pan in the water, Press the **RE-ZERO** key to cancel the weight of the mass.



00000 g

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



-0.4662 g

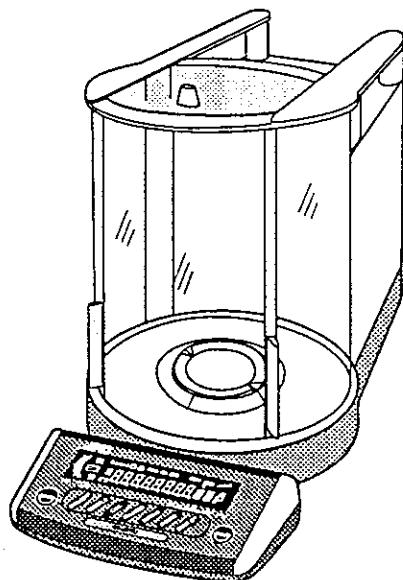
- In this example, the mass weighs -0.4662g in water, which is almost the same as 0.4662 cm³.

- 5** Compute: $10.0000\text{g} \div 0.4662\text{cm}^3 \approx 21.45\text{g/cm}^3$. The mass is most likely platinum.

[Reference]	
Density of water (g/cm ³)	
0°C	0.99984 g/cm ³
4°C	0.99997
10°C	0.99970
15°C	0.99910
20°C	0.99821
25°C	0.99705
30°C	0.99565

HA-200A • Section E

Counting Mode



'cnt' Counting Mode



- ▣ The HA-200A balance counts by calculating the average weight of a single piece-weight called the *unit weight*, 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.
- ▣ You can register the unit weight by either placing a sample on the pan ("Registering the unit weight by weighing a sample") or by inputting digital data ("Registering the unit weight by inputting digital data"). In addition, digital data can be input either from the keys on the front panel, by a personal computer via optional serial output (page K-28'), or by the optional remote keyboard AD-1652 (page H-6).
- ▣ The registered unit weight will be stored in memory and remains even after the AC adaptor is disconnected.

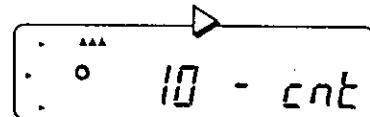
Counting by using a sample

- ▣ Perform weighing using a sample as follows:
- ▣ In this case, error may occur to counting due to uneven weight of the sample. Using **ACAI** (Automatic Counting Accuracy Improvement) on the HA-200A will improve the precision of the unit weight and reduce the counting error.

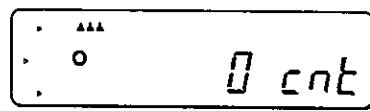
1



- ▣ Press the **MODE** key to select the Counting Mode ("cnt").

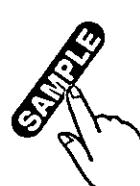


- If the display as shown in the figure appears, proceed to step 3.



- If the display as shown in the figure appears, the previous unit weight is stored in memory. In such a case, proceed to step 2.

2



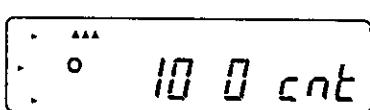
- ▣ Press the **SAMPLE** key.



3

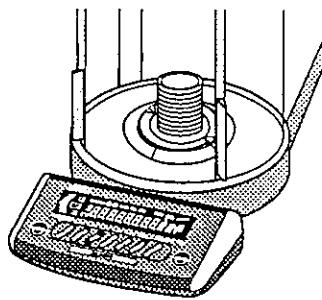


- ▣ Press the **RE-ZERO** key.



4

- Count ten objects to be measured, then open the door and place the objects on the pan.



- The display shows "10 - cnt."

5

- Close the door and press the **SAMPLE** key.

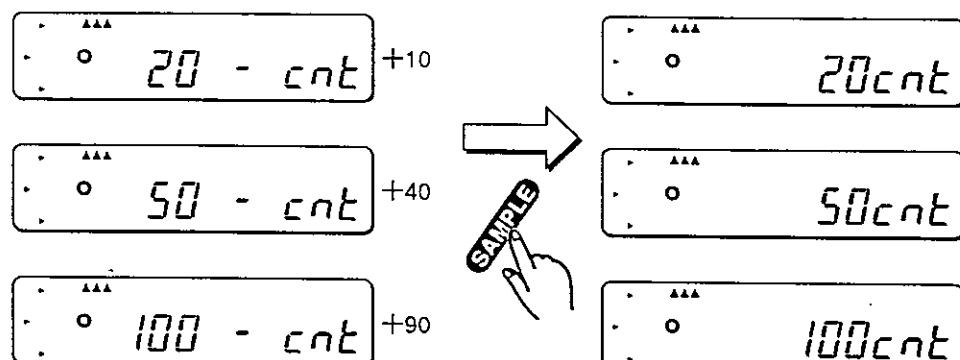
- The display shows "10cnt" to show the number of the objects on the pan.



- If the weight of these ten objects are lighter than the correct value, counting error becomes too large and the balance asks you to place the required number of samples (see the table below).

If the display shows "20 -," "50 -" or "100 -," count and place the remaining 10, 40 or 90 samples on the pan.

- After that, press the **SAMPLE** key. The display shows "20cnt," "50cnt" or "100cnt."



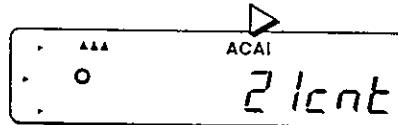
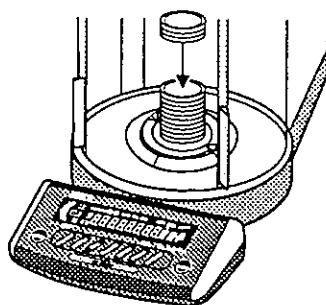
- If the total weight of the ten objects is too light and the unit weight cannot be specified, the balance displays "La" and the display automatically returns to "10-cnt."

Weight of ten objects (W)	Display
$w \geq 0.01g$	10 cnt
$0.01g > w \geq 0.005g$	20 - cnt
$0.005g > w \geq 0.002g$	50 - cnt
$0.002g > w \geq 0.001g$	100 - cnt
$0.001g > w \geq$	La cnt

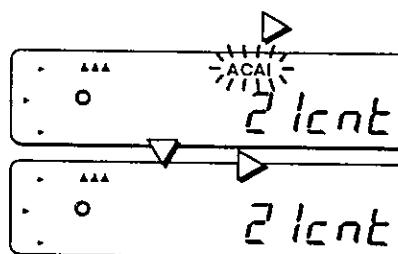
6

Perform the procedure explained below when you use the ACAI function to increase the precision of the unit weight. If you do not use the ACAI function, proceed to step **7** and perform counting.

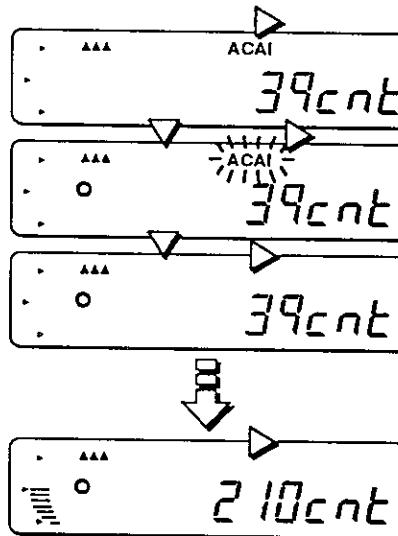
- ▶ Open the door and add an appropriate number within the range while the ACAI indicator is lit.



- ▶ In this case, the ACAI indicator lights for a range of "13cnt" and "26cnt." (A rough reference value may be around 20 or a number twice the original count.)
- ▶ Close the door. After a while, the ACAI indicator starts blinking, then goes off.
- The balance recalculates the unit weight with 21 samples, thus improving the precision.



- ▶ In the same manner, add samples approximately twice that of the number displayed by the balance to blink the ACAI indicator.
- ▶ Repeat this process until the target number is obtained.
- In this example, approximately 200 samples are counted every time. Improve the precision of the unit weight up to 210 samples by using the ACAI function. (The balance calculates the unit weight with 210 samples.)

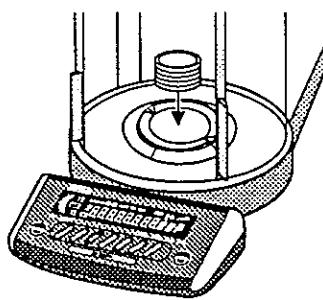


- ACAI table

Pcs on the weighing pan	ACAI addition range
10	13 → 26
20	23 → 47
40	43 → 81
60	63 → 108
80	83 → 128
100	103 → 148
over 101	104 → capacity

7

- The balance displays the number of objects when an arbitrary number of objects is placed on the pan.



200cnt



Confirming the Unit Weight and Inputting Digital Data from the Front Panel Keys



- You can confirm the unit weight by operating the front panel keys, or directly input digital data from the keys.

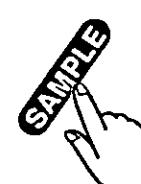
1

- Press the **MODE** key and select the Counting ("cnt") Mode.

10 - cnt

- You can display either styles as shown in the figure.

0cnt

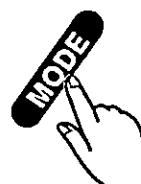
2

- Hold down the **SAMPLE** key for approximately 2 seconds.

----- UW

- Once the display shows "---- UW" proceed to step **3**.
- Once the display shows "XXXXXTG," proceed to step **4**.

123TG

3

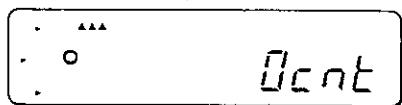
- Press the **MODE** key three times within approximately 4 seconds after "TG" is displayed. The display changes in the sequence of "TG," "HI," "Lo" and "UW."

0.0056 UW

- After "UW" is displayed, the previous unit weight appears by units of grams. (In the example, the display shows 0.0056 g.)

- If you only confirm the unit weight, wait approximately 4 seconds. The balance automatically returns to the Counting ("cnt") Mode.

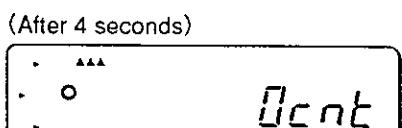
(After 4 seconds)



- ▣ To input a new unit weight, press the [RE-ZERO] key within 4 seconds after "UW" is displayed.

- A blinking "0" will be displayed.
- The balance returns to the Counting Mode ("cnt") after 4 seconds, if the [RE-ZERO] key is not pressed.

(After 4 seconds)



- ▣ Use the [RE-ZERO], [MODE] and [RANGE] keys to input the unit weight by units grams ("g").

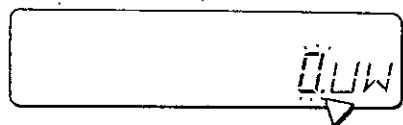
In the example, "0.0345 g" is input.

[RE-ZERO] key Changes the number of a blinking digit.

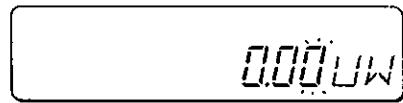
[MODE] key..... To move to the next digit.

[RANGE] key..... To input digits smaller than the decimal point.

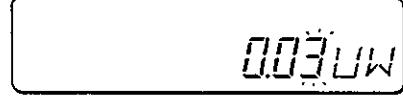
- Press the **RANGE** key to indicate the decimal point.



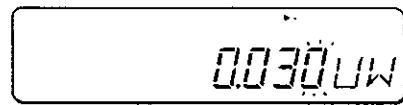
- Press the **MODE** key twice to move to the second digit right from the decimal point.



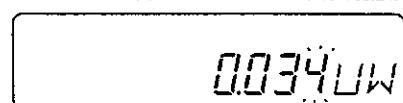
- Press the **RE-ZERO** key three times.



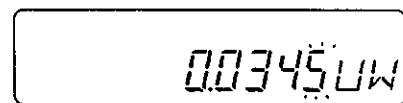
- Press the **MODE** key to move to the next digit.



- Press the **RE-ZERO** key four times.



- In the same manner, use the **RE-ZERO** and **MODE** keys and display "0 .0345 UW "



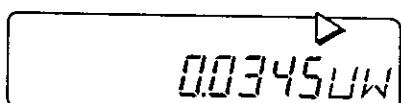
Input the digital data within a range between 0.0001 and 210 g. The balance displays "Error 3" if this range is exceeded.

6



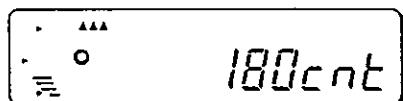
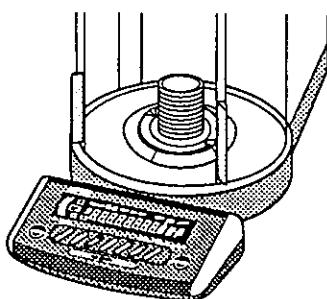
- Press the **PRINT** key to store the input data.

- The lowest digit stops blinking, indicating that data input is completed.
- The balance automatically returns to the Counting Mode ("c nt") after approximately 4 seconds.



7

- After that, the balance displays the number of objects based on the unit weight when they are placed on the pan.





Note that the ACAI function does not work if the unit weight is digitally input (see page E-4).

Counting Mode Errors

- Count Sample too light:

The display shows "Lo cnt".

- "Lo cnt" will be displayed when the unit weight to be registered is too light (less than 0.0001 g).
- ▶ The display automatically returns to "10-cnt" after displaying "Lo cnt".

- Stability Error:

The display shows "Error 2".

- "Error 2" will be displayed if the balance is not stable when the unit weight of ten samples is registered.
- ▶ Check for vibration and air flow, then press the **RE-ZERO** key. (See "Troubleshooting" on page M-3).

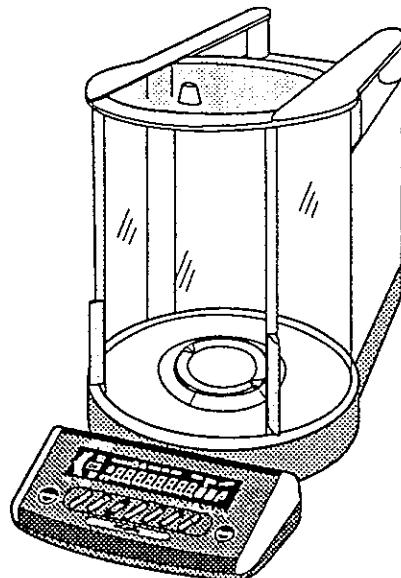
- Error during inputting digital data:

The display shows "Error 3".

- "Error 3" will be displayed when the number to be digitally registered as unit weight exceeds the input range.
- ▶ Specify a correct number within the allowable range (0.0001 to 210 g).

HA-200A • Section F

Percent Mode





'%' Percentage Mode



The HA-200A 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).

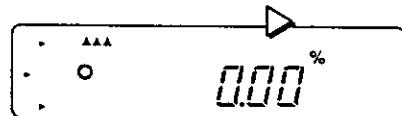
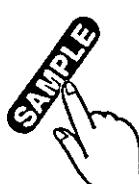
- ▣ The "100%" weight can be registered either by actual weight of an object or by digital data. In addition, digital data can be input either from the keys on the front panel, by a personal computer via optional serial output (page K-27), or by the optional remote keyboard AD-1652 (page H-1).
- ▣ The registered unit weight will be stored in memory and remains even after the AC adaptor is disconnected.

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.

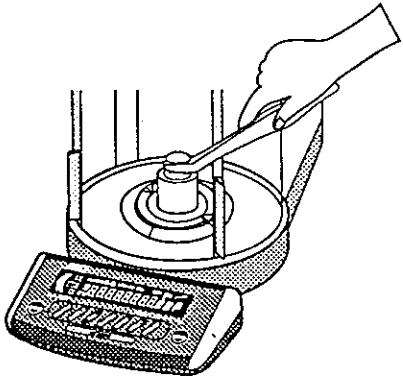
**2**

- ▣ Press the **SAMPLE** key.
○ "100 0 %" will be displayed.

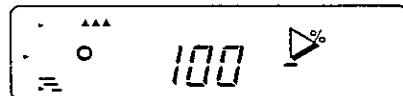
**3**

- ▣ Press the **RE-ZERO** key to ZERO the display.

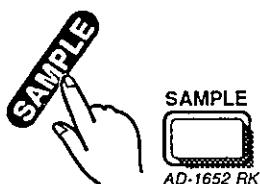


4

- Open the door and load the ideal 100% sample.

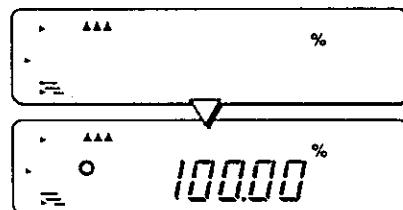


- "100 - %" will be displayed.

5

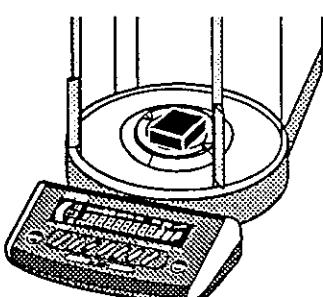
- Close the door and press the [SAMPLE] key.

- "100.00 %" will be displayed when the ideal weight has been registered.

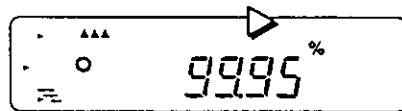


- The display may show either "100.0%" or "100.00%," rather than "100.000%." The minimum percentage display automatically changes if the "100%" weight is light.

100% weight	Min. percentage	Display immediately after 100% weight
0.01~0.1g	1%	100%
0.1~1g	0.1%	100.0%
1~210g	0.01%	100.00%

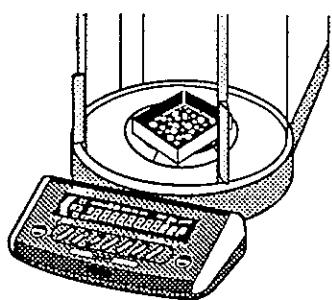
6

- Remove the object used for registration, and place a desired object.
- Items will now show their deviation from the ideal weight.

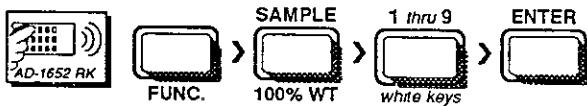


- In this example the bar is 99.95% of the ideal, or 0.05% under weight.

Percentage Mode Notes

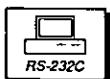


⚠ If you want to use a container: Load the container before pressing the \X(RE-ZERO) key in Step 3 (you may also use the **ZERO^R** or **TARE^R** key on the AD-1652 Remote Keyboard).



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).



Confirming the "100%" Weight and Inputting Digital Data from the Front Panel Keys

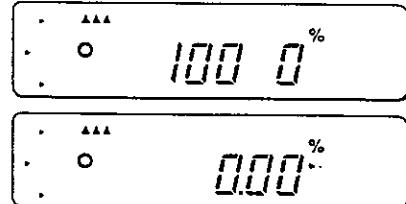


- You can confirm the "100%" weight by operating the front panel keys, or directly input digital data from the keys.

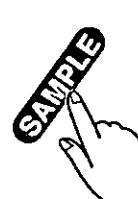
1



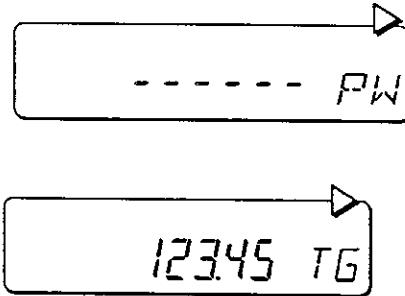
- Press the **MODE** key and select the Percentage ("%) Mode.
- You can display either styles as shown in the figure.



2



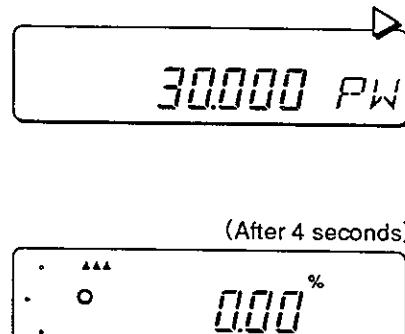
- Hold down the **SAMPLE** key for approximately 2 seconds.
- Once the display shows "---- PW" proceed to step 4.
- Once the display shows "XXXXXX TG," proceed to step 3.



3



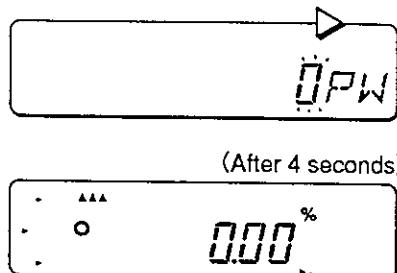
- Press the **MODE** key three times within approximately 4 seconds after "TG" is displayed. The unit segment changes in the sequence of "TG," "HI," "Lo" and "PW."
- After "PW" is displayed, the previous "100%" weight appears by units of grams. (In the example, the display shows 30.000 g.)
- If you only confirm the "100%" weight, wait approximately 4 seconds. The balance automatically returns to the Percentage ("%) Mode.





- 4 **RE-ZERO**
- To digitally input a new "100%" weight, press the **RE-ZERO** key within 4 seconds after "PW" is displayed.

- A blinking "0" will be displayed.
- The balance returns to the Percentage ("%) Mode after 4 seconds, if the **RE-ZERO** key is not pressed.



- 5 Use the **RE-ZERO**, **MODE** and **RANGE** keys to digitally input the "100%" weight by unit of grams ("g").

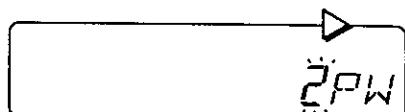
In the example, "23.4567 g" is input.

RE-ZERO key: Changes the number of a blinking digit.

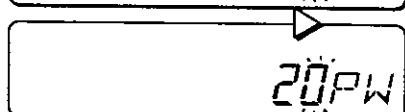
MODE key: To move to the next digit.

RANGE key: To input digits smaller than the decimal point.

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



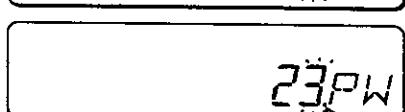
- Press the **MODE** key to move to the next digit.



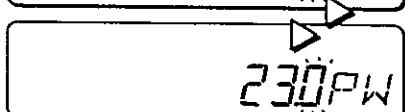
- Press the **RE-ZERO** key three times.



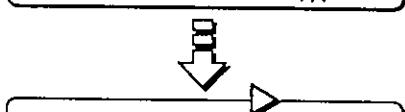
- Press the **RANGE** key to indicate the decimal point.



- Press the **MODE** key to move to the next digit.



- In the same manner, use the **RE-ZERO** and **MODE** keys and display "23.4567 PW."



Input the digital data within a range between 0.01 and 210 g.
The balance displays "Error 3" if this range is exceeded.

6

- Press the **PRINT** key to store the input data.

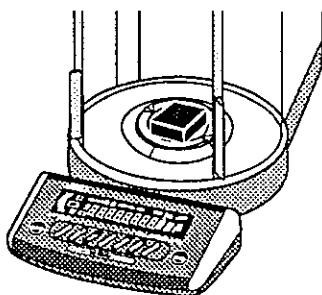
- The lowest digit stops blinking, indicating that data input is completed.
- The balance automatically returns to the Percentage Mode ("%) after approximately 4 seconds.

23456.7%

0.00%

7

- After that, the balance displays the percentage to the "100%" weight when an object is placed on the pan.



99.95%



Percentage Mode Errors

- 100% Sample too light:** "Lo %" 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.

- Stability Error:**

Error 2

"Error 2" will be displayed if the balance can not become stable while registering the 100% weight (ideal weight).

- Check for excessive vibrations or drafts. Press the **RE-ZERO** key and see Troubleshooting.

- Error during inputting digital data:**

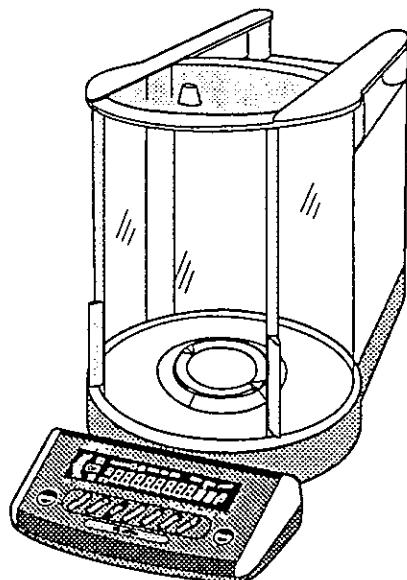
Error 3

- "Error 3" will be displayed when the number to be digitally registered as "100%" weight exceeds the input range.

- Specify a correct number within the allowable range (0.01 to 210 g).

HA-200A • Section G

Internal C-Parameter Settings





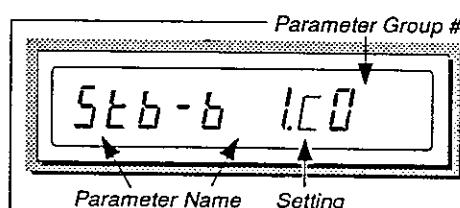
Internal Parameter C-Functions



Your HA-200A 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.

E0 Environment	Stability Band Width	Cond	Zero Tracking		
E1 Display	Refresh Rate	dISP	Point	P-on	off
	dRTE				
E2 Calibration	CAL	CAL-C	info		
E3 Auto Re-Zero	Ar-0	Ar-S	Ar-t		
E4 Auto Door	door	doorC	doorP	doorS	
E5 Data Output	Print	RP-P	RP-b	d-out	t-out
	Code	PRUSE	Ar-F	Ar-d	
E6 Serial Interface	bPS	Par	bit	Stop	Cr-LF
	EYPE	E-UP	dp	E-Code	EES
E7 Analog Output	Rn	SEL			
E8 Comparator Out	CP	CP-d	CP-o	bEEP-	bEEP-
	bEEP-				
E9 Input Selectin	Cont	id	bEEP	PF	
	External Input Terminal	Remote Keybd.II	Buzzer Inhibition	Parameter Protect Initialization	

-Not displayed without options (op-03/04/06)



Expanding the Applications of the HA-200A by Internal Setting

- How to automatically reset the display after removing the object from the balance?

Answer: Use the Auto RE-ZERO function.

Change the internal C-Parameter setting to "*Rr - 0* / C3." (See page G•10.)

- How to automatically close the door after placing or removing the object?

Answer: Use the Auto Close function.

Change the internal C-Parameter setting to "*door L* / C4 ." (See page G•11.)

- How to display by activating the comparator function?

Answer: Use the Comparator Output function.

Change the internal C-Parameter setting to "*C P - d* / C8." (See page G•18.)

- How to automatically print out data after weighing the object?

Answer: Use the Auto Print A/B function.

Change the internal C-Parameter setting to either "*P r int 2* C5" or "*P r int 3* C5."

After the balance is stabilized, the data will be printed out once. (See page G•12.)

- How to retrieve data as much as possible via RS-232C?

Answer: Specify the display C-Parameter refreshing interval as "Always High Speed."

Change the internal C-Parameter setting to "*SPEED 2* C1." The data will be output eight times per second. (See page G•7)

- How to incorporate the HA-200A into a system?

Answer: Specify Auto Start as "*P - on* / C1" and Door Auto Start as "*door P* / C4." The display will automatically turn to on after switching the balance ON, without pressing the **ON:OFF** key. (See page G•8.) Also, the door will not rotate immediately after the power is switched ON, allowing you to freely control the door later. (See page G•11.)

Changing C-Parameter Settings



- ❑ The C-Parameters can't be changed when the memory is protected by "PF" C9 group. If this parameter is set to 'protect', **PF 1C9**, change to **PF 0C9**
- ❑ You can escape without saving any changes, at any time, by pressing the **[ON:OFF]** key.

1

RE-ZERO

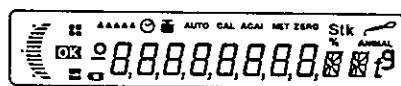
- ❑ With the display OFF:
Press and hold the **RE-ZERO** key.



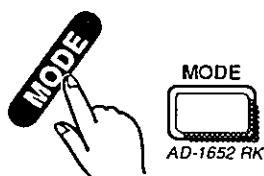
2



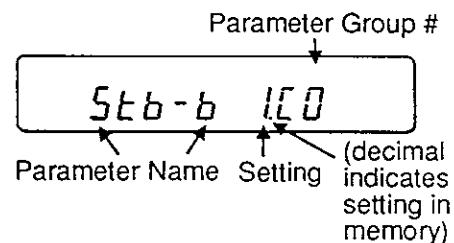
- ❑ While holding **RE-ZERO**, press the **[ON:OFF]** key.
- ❑ All display segments will come ON.



3

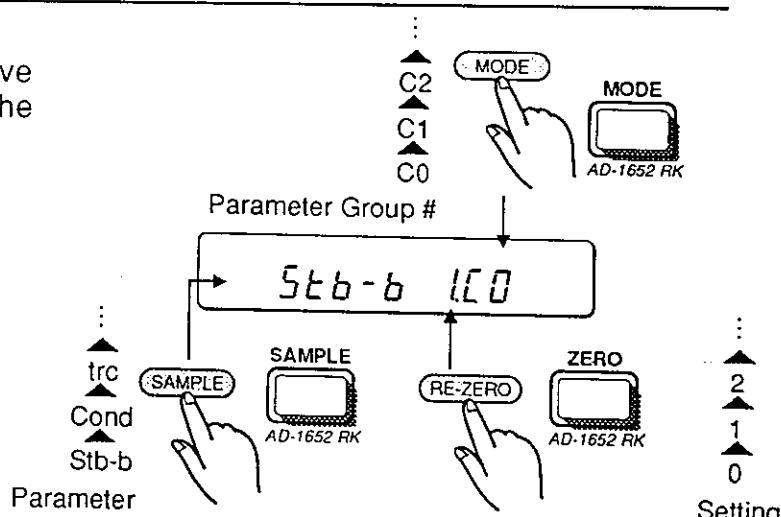


- ❑ Press the **MODE** key to move to C-Parameter Settings mode.
- ❑ The software version number will be displayed briefly, then the first **Parameter Name**, **Setting** and **Group Number** will be displayed.



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.

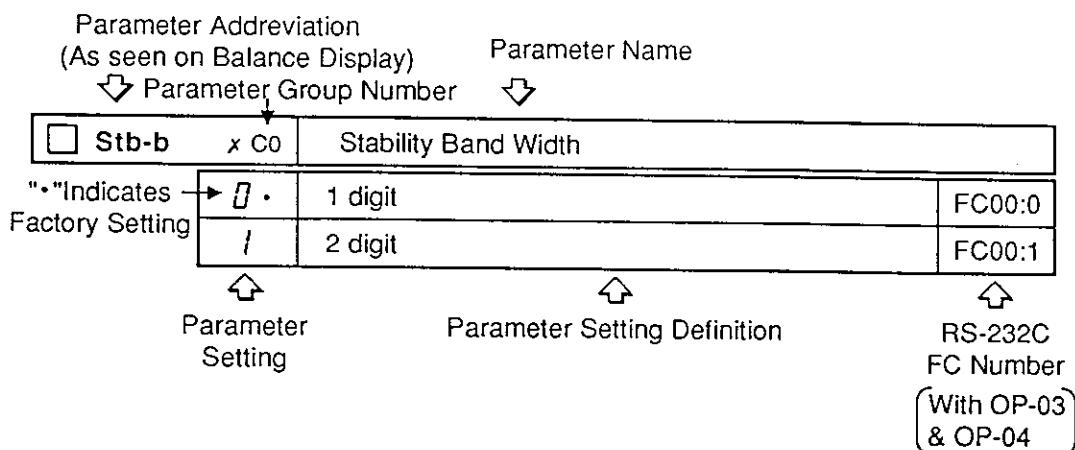


- Remember that you can escape at any time *without saving any changes*, by pressing the **ON:OFF** key.



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

The C-Parameter Settings (C0~C9)



 C0 • Environment

<input type="checkbox"/> Stb-b xco	Stability Band Width	
NOTE: The Stability Indicator turns ON when display deviation is within the range set by "Stb-b".		
5	• Stable when 1 digit	FC00:0
6	1 Stable when 2 digits	FC00:1
7	2 Stable when 3 digits	FC00:2

- * The minimum change of a number displayed is called one digit. For example, when the **RANGE** key is pressed to display a number with minimum digit of 0.1 mg, one digit is 0.1 mg. Similarly, when a number with minimum digit of 1 mg is displayed, one digit is 1 mg. (For the **RANGE** key, refer to page B-12)

<input type="checkbox"/> Cond Xco	Response / Environment	
	This setting can also be easily changed by holding down the MODE key (see page B-12). To use the feeding mode, "Land 0" is the most suitable environment setting.	

Land	0	Quick response/proper environment Indicator 	FC01:0
	1	The Feeding mode responds to very small changes. The lower two digits blank if the fluctuation is large. See page D-4.	
	2	Very quick response/very good environment Internal Setting (approx. 3.5 sec) Monitor: ▲	FC01:1
	3	Quick response/good environment ▲▲	FC01:2
	4	Normal response/normal environment▲▲▲	FC01:3
	5	Slightly slow response/slightly poor environment (approx. 7 sec)	FC01:4

<input type="checkbox"/> trc Xco	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
	4	Very Short (Very Strong Tracking)	FC02:4

C1 • Display

<input type="checkbox"/> 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

Internal C-Parameter Settings

<input type="checkbox"/> diSP	Xc1	Blanking Digit	
<i>d,SP</i>	0 •	1 digit	FC11:0
	1	2 digits	FC11:1
	2	5 digits	FC11:2

<input type="checkbox"/> Point	Xc1	Decimal Point Display	
<i>Point</i>	0 •	Point (.)	FC12:0
	1	Comma (,)	FC12:1

<input type="checkbox"/> P-on	Xc1	Auto Start Function	
<i>P-on</i>	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

<input type="checkbox"/> oFF	Xc1	Display at 'Display OFF State'	
<i>oFF</i>	0 •	Power Indicator (right decimal ".")	FC14:0
	1	Time Displayed	FC14:1

<input type="checkbox"/> dA t E	Xc1	Date Order	
<i>DATE</i>	0 •	yy-mm-dd	FC15:0
	1	mm-dd-yy	FC15:1
	2	dd-mm-yy	FC15:2


C2 • Calibration

<input type="checkbox"/> CAL	?c2	Calibration selection	
<i>CAL</i>	0 •	All Calibration enabled (Refer to page C•2)	FC20:0
	1	Only auto self-calibration disabled. (When the ambient temperature changes, the "CAL" indicator blinks.)	FC20:1
	2	Only auto self-calibration disabled. No warning is given even if the ambient temperature changes.	FC20:2
	3	All calibration disabled. (The built-in weight lowers when the CAL key is pressed in this mode. However, the balance does not perform calibration, and the deflection from the calibration value will be displayed. See page C•9)	FC20:3

<input type="checkbox"/> CAL-C	?c2	Auto check after one touch calibration	
<i>CAL - E</i>	0 •	No auto check is made after one touch calibration	FC21:0
	1	Auto check is made after one touch calibration. (Note that auto check is not activated for auto self-calibration or manual calibration. See page C•10)	FC21:1

<input type="checkbox"/> info	?c2	Send Calibration Date & Time (Effective when optional 03, 04 or 06 is installed.)	
<i>info</i>	0	No calibration date and time.	FC22:0
	1 •	Output "CALIBRATED" and the date and time after calibration. AD-8121 printing example CALIBRATED 92-02-17 20:32:43	FC22:1

The setting affixed with "." is default.

C3 • Auto Re-ZERO Function

<input type="checkbox"/> Ar-0	Xc3	Auto Re-ZERO function near ZERO	
<i>Ar-0</i>	0	No Auto Re-ZERO	FC30:0
	1	Auto Re-ZERO (NOTE: If display is ZERO ± 5 digits for the time set by "Ar-t Xc3" parameter, re-ZERO will be executed automatically)	FC30:1

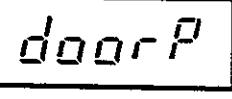
<input type="checkbox"/> Ar-b	Xc3	Auto Re-ZERO Band Width.	
<i>Ar-b</i>	0	ZERO when within 5 digits	FC31:0
	1	ZERO when within 50 digits	FC31:1
	2	ZERO when within 500 digits	FC31:2

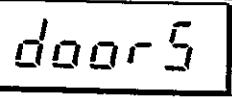
<input type="checkbox"/> Ar-t	Xc3	Detecting Time for near ZERO	
<i>Ar-t</i>	0	0.5 seconds	FC32:0
	1	1 second	FC32:1
	2	2 seconds	FC32:2
	3	4 seconds	FC32:3

C4 • Auto door

<input type="checkbox"/> door ?c4	Select door opening/closing mode (See page B-23.)	
	<p>0 • Automatic open/close mode 1 The door opens/closes each time the DOOR key is pressed.</p>	FC40:0
	<p>1 Automatic open/close mode 2 The door opens while the DOOR key is held down.</p>	FC40:1
	<p>2 • One-touch open/close mode The door automatically opens/closes by touching and move it slightly.</p>	FC40:2

<input type="checkbox"/> doorC ?c4	Automatic close (See page B-24.)	
	<p>0 • The automatic close function disabled.</p>	FC41:0
	<p>1 The automatic close function enabled. (If a change larger than 0.1 g occurs after the balance is stabilized, the door will automatically close after approximately 2 seconds.)</p>	FC41:1

<input type="checkbox"/> doorP ?c4	Automatically door start (See page B-26.)	
	<p>0 • When the AC adaptor is connected, the door automatically rotates to the Close position.</p>	FC42:0
	<p>1 When the AC adaptor is connected, the door will not rotate. The door rotates to the Close position by pressing the DOOR key. (Effective function when using the balance with a system.)</p>	FC42:1

<input type="checkbox"/> doors ?c4	Storing data for the Open/Close position	
	<p>0 • The data for the Open/Close position will be initialized when the AC adaptor is disconnected. (See page B-25.)</p>	FC43:0
	<p>1 The data set for the Open/Close position will be stored in memory after disconnecting the AC adaptor.</p>	FC43:1

The setting affixed with "•" is default.

C5 • Data Output

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

<input type="checkbox"/> Print Xc5		Data Out Mode	
Print	0	Print key Mode A: Print key command accepted only if the display is stabled. The display will blink when data is transmitted.	FC50:0
	1	Print key Mode B: the PRINT key command is always acceptable. One data is output after the display becomes stable.	FC50:1
	2	Auto print Mode A: One data stream is output when the display becomes stable at the fixed value (Auto Print Band) or a larger shift away from zero. After output, when the displayed value is returned within the Auto Print Band, the next data can be output.	FC50:2
	3	Auto print Mode B: One data stream is output when the display becomes stable at the fixed value (Auto Print Band) or a larger shift (Auto Purint Band) away from a displayed value.	FC50:3
	4	Stream mode: Data is automatically output in sequence each time the display is refreshed.	FC50:4
	5	Command mode: Data is output via a command from an external unit such as a computer. In addition to the data output command, there are many commands which can externally control the balance.	FC50:5

<input type="checkbox"/> AP-P Xc5		Polarity at Auto Print Mode	
AP-P	0	Send only positive data.	FC51:0
	1	<ul style="list-style-type: none"> • At Auto Print Mode A: both positive and negative data sent. • At Auto Print Mode B: Negative data only 	FC51:1

<input type="checkbox"/> AP-b Xc5	Auto Print Band	
<i>AP-b</i>	0 • 10 digits	FC52:0
	1 100 digits	FC52:1
	2 1,000 digits	FC52:2
	3 10,000 digits	FC52:3
	4 100,000 digits	FC52:4

<input type="checkbox"/> d-out Xc5	Send Date Data	
<i>d-out</i>	0 • No Date Data.	FC53:0
	1 Send Date Data before the weighing result.	FC53:1

<input type="checkbox"/> t-out Xc5	Send Time Data	
<i>t-out</i>	0 • No Time Data.	FC54:0
	1 Send Time Data before the weighing result.	FC54:1

<input type="checkbox"/> CODE Xc5	Send Code Number	
<i>CODE</i>	0 • No Code Number.	FC55:0
	1 Send Code Number before the weighing result is sent and the code number is increased by 1.	FC55:1

<input type="checkbox"/> PAUSE Xc5	Pause Between Data	
<i>PAUSE</i>	0 • No Pause.	FC56:0
	1 Pause 1 second (NOTE: When AD-8121 compact printer is connected with HA, set 'PAUSE' to 1 so that the printer has time to print a line of data).	FC56:1

Internal C-Parameter Settings

□ At Xc5 Auto Paper Feed Function		
AE-F	0 •	No Paper Feed.
	1	Paper Feed (NOTE: When AD-8121 compact printer is connected with HA, <CR> and <LF> are sent after weighing result is printed.)
□ Ar-d Xc5 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
	1	Auto Re-ZERO

C6 • Serial Interface

The settings explained in C6 are available with the HA-series balances with optional equipment (OP-03/OP-04 serial output and OP-06 analog output). For more detail, see pages K•1 to L•7.

<input type="checkbox"/> bPS	Xc6	Baud Rate	
bPS	0	600 bps	FC60:0
	1	1200 bps	FC60:1
	2	2400 bps (for AD-8121)	FC60:2
	3	4800 bps	FC60:3
	4	9600 bps	FC60:4

<input type="checkbox"/> PAr	Xc6	Parity bit	
PAr	0	Even	FC61:0
	1	Odd (NOTE: When data bit length is selected as 8, "bit 1c3", it is regarded as No Parity)	FC61:1

<input type="checkbox"/> bit	Xc6	Data Bit Length	
bit	0	7 bits	FC62:0
	1	8 bits	FC62:1

<input type="checkbox"/> Stop	Xc6	Stop Bit	
Stop	0	1 bit	FC63:0
	1	2 bits	FC63:1

<input type="checkbox"/> Cr-LF	Xc6	Terminator		
		NOTE: This parameter is applied to both transmitted or received data.		
Cr-LF	0	<cr><lf>	FC64:0	
	1	<cr>	FC64:1	

tYPE Xc6**Data Format**

NOTE: Weighing result format can be changed by this parameter. For further information, see DATA FORMAT section.

E4PE

A&D Standard

FC65:0

Dump Print format

FC65:1

KF format

FC65:2

 t-Up Xc6**Time for Command Receiving****E-UP**

Timer ON

FC66:0

Timer OFF

FC66:1

 dP Xc6**ASCII Code of the Decimal Point****dP**

2EH(.)

FC67:0

2CH(,)

FC67:1

 E-Cod Xc6**Error Code at Command Mode****E-Cod**

No Error Code

FC68:0

Transmit Error Code (NOTE: The balance transmits Error Code and "AK" in the command mode when command is received.)

FC68:1

 CtS Xc6**CTS Control(Selects CTScontrol or RTS check)****ES**

Setting when the balance is connected to a computer or the AD-8121 printer. Usually, this setting is used.

FC69:0

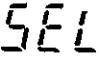
In the stream mode, data output is stopped when the RTS pin is set to a negative value.

FC69:1

C7 • Analog Output

The settings explained in C7 are available with the HA-series balances with the optional OP-06 analog output.

<input type="checkbox"/> An	?c7	Analog output	
	0	Output two digits displayed after converting from digital to analog data. (00 to 99) To specify the two digits, use "SEL" function.	FC70:0
	1	Output three digits displayed after converting from digital to analog data. (000 to 999) To specify the three digits, use "SEL" function.	FC70:1
	2	Output "200.0000" as 1 V. (Full output by NET 200 g.)	FC70:1
	3	Output the point of 200 g from the calibrated zero point as 1 V, regardless of resetting by the RE-ZERO function. (Full output by GROSS 200 g.)	FC70:1

<input type="checkbox"/> SEL	?c7	Position of the output analog digits	
	0	The lowest digit for D/A conversion: Specify the utmost right digit. 200 .0000g	FC71:0
	1	Specify the second digit from the utmost right. 200 .0000g	FC71:1
	2	Specify the third digit from the utmost right. 200 .0000g	FC71:2
	3	Specify the fourth digit from the utmost right. 200 .0000g	FC71:3
	4	Specify the fifth digit from the utmost right. 200 .0000g	FC71:4
	5	Specify the sixth digit from the utmost right. 200 .0000g	FC71:5
	6	Specify the seventh digit from the utmost right. 200 .0000g	FC71:6
	7	Specify the eighth digit from the utmost right. 200 .0000g	FC71:7

The setting affixed with "." is default.


C8 • Comparator Output

<input type="checkbox"/> CP	xc8	Comparison Mode	
<i>CP</i>	0	Compare all Data	FC80:0
	1	Compare Stable or Overload Data	FC80:1

<input type="checkbox"/> CP-d	xc8	Comparison Result Display	
<i>CP-d</i>	0	No Display	FC81:0
	1	Display Comparison Result	FC81:1

<input type="checkbox"/> CP-0	xc8	Comparison Near ZERO	
<i>CP-0</i>	0	Compare	FC82:0
	1	No Compare near ZERO	FC82:1

<input type="checkbox"/> bEEP_	xc8	Buzzer for LO Limit	
<i>bEEP_</i>	0	No beep at LO limit	FC83:0
	1	Beep at LO limit	FC83:1

<input type="checkbox"/> bEEP-	xc8	Buzzer for GO Range	
<i>bEEP-</i>	0	No beep for GO range	FC84:0
	1	Beep for GO range	FC84:1

<input type="checkbox"/> bEEP^-	xc8	Buzzer for HI Limit	
<i>bEEP^-</i>	0	No beep at HI limit	FC85:0
	1	Beep at HI limit	FC85:1

 **C9 • System Selection**
 Cont

?c9

Select an external input terminal function.

Cont

0	External input terminal in the rear panel of the balance (page B•14)	OP-04 external input function S1 S2 S3 S4 door (Left) door (Right) door SET RE-ZERO	FC90:0
1 •	PRINT (page.B•14)	door (Left) door (Right) door SET RE-ZERO	FC90:1
2	Controlling of the Vibratory spoon (page J•2)	door (Left) door (Right) door SET RE-ZERO	FC90:2
3	door (right) (page B•10)	RE-ZERO PRINT CAL NO:OFF	FC90:3

 idx_{c9}

ID Code for Remote Keyboard AD-1652

id

0	No action to Remote Keyboard	FC91:0
1 •	ID Code Number "1"	FC91:1
2	ID Code Number "2"	FC91:2
3	ID Code Number "3"	FC91:3
4	ID Code Number "4"	FC91:4
5	ID Code Number "5"	FC91:5
6	ID Code Number "6"	FC91:6
7	ID Code Number "7"	FC91:7

Internal C-Parameter Settings

<input type="checkbox"/> bEEP Xc9		Buzzer	
bEEP	<input checked="" type="radio"/>	No Beep	FC92:0
	<input type="radio"/>	Beep (For example, when keys of the balance are pressed.)	FC92:1

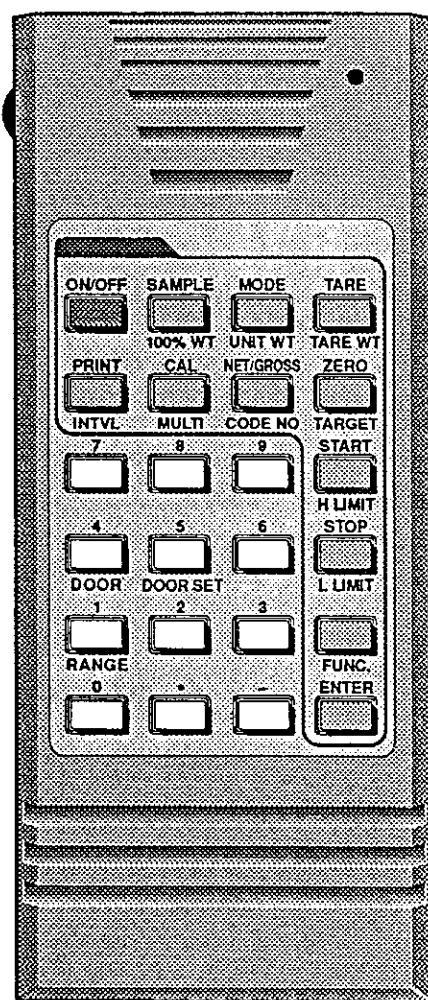
<input type="checkbox"/> PF Xc9		Protect the set Parameters/Initialization	
PF	<input checked="" type="radio"/>	Parameters can be changed	FC93:0
	<input type="radio"/>	Parameters cannot be changed If you want to change the internal settings, set 'PF 0 Cg' to 'PF 1 C9'.	FC93:1
	<input type="radio"/>	If you set the parameter to 2 and press the PRINT key, all the internal settings will be initialized.	FC93:2

HA-200A • 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 HA-200A 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 AD-1652 can be used for three purposes as follows:

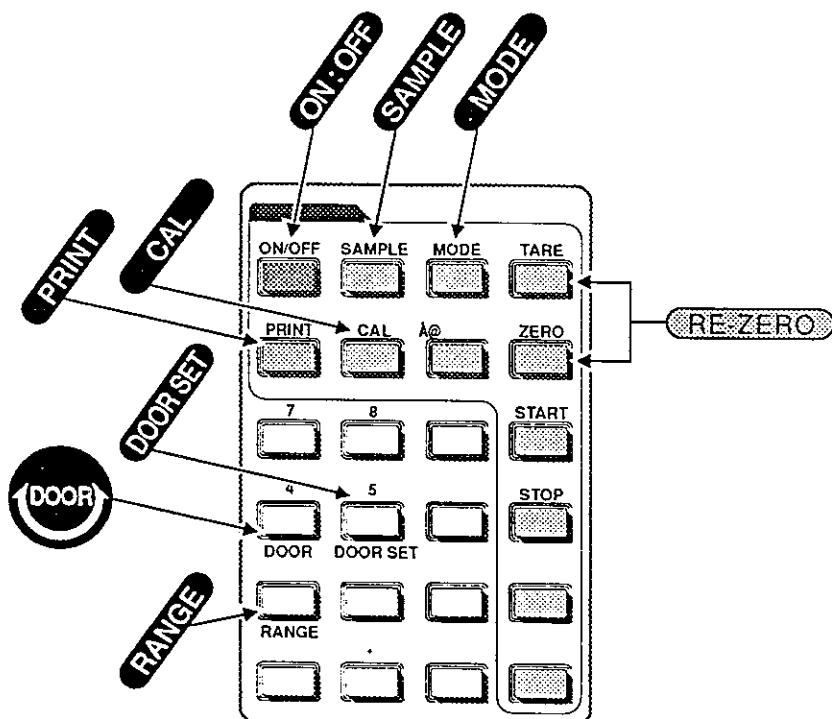
1. To operate the balance through remote control by pressing keys of the AD-1652, which have the same function as with the front panel keys of the HA-200A balance. When the Vibratory Spoon AD-1651 (accessory) is used with the balance, starting and stopping can be directly controlled by the AD-1652.
2. To confirm or input digital data in the Data Input mode by using the **FUNC** key and the blue keys. (See page H-5) Data can be input by using the 10-key pad keys.
The following data can be confirmed and input:
100% weight, unit weight, upper and lower limits, interval time, code number target weight and an arbitrary coefficient.
3. To confirm or input digital data other than (2) in the Data Input mode by using the **FUNC** key and the 10-key pad keys. (See page H-11) Data can be input by using the 10-key pad keys.
The following data can be confirmed and input:
Internal setting, unit registration, code string, date, time, door Open position, and door Close position.



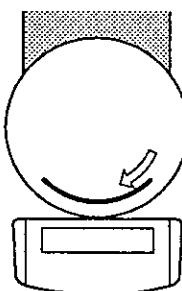
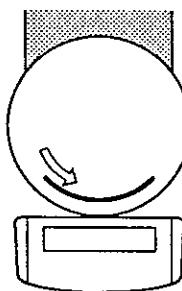
Operating the AD-1652 keys instead of the front panel keys of the HA-200A



- The balance can be operated by using the keys of the AD-1652 from a remote place, instead of the front panel keys of the HA-200A balance. The keys indicated with black letters function the same as with the front panel keys of the balance.



- 1) Functions the same as with the **ON:OFF** key on the front panel of the balance.
- 2) Functions the same as with the **DOOR** key on the front panel of the balance.
- 3) Functions the same as with the **SAMPLE** key on the front panel of the balance.
- 4) Functions the same as with the **CAL** key on the front panel of the balance.
- 5) Functions the same as with the **RANGE** key on the front panel of the balance.
- 6) Functions the same as with the **MODE** key on the front panel of the balance.

- 7)  Functions the same as with the **PRINT** key on the front panel of the balance.
- 8)  Functions the same as with the **DOOR SET** key on the front panel of the balance.
- 9)  Functions the same as with the **RE-ZERO** key on the front panel of the balance.
- 10)  Functions the same as with the **RE-ZERO** key on the front panel of the balance.
- 11)  Pressing this key once functions the same as when the left  key on the front panel of the balance is pressed. The door slowly rotates clockwise. Pressing the key again stops the door. (See page B•23)
- 
- 12)  Pressing this key once functions the same as when the right  key on the front panel of the balance is pressed. The door slowly rotates counterclockwise. Pressing the key again stops the door. (See page B•23)
- 
- 13)  Pressing this key functions the same as when the **MODE** key on the front panel of the balance is pressed. Each time the key is pressed, the Environment Setting monitor "▲" changes, corresponding to the change of internal setting. (See "MODE key" on page B•13)
- 14)  To start the Vibratory Spoon AD-1651 (accessory) when the AD-1651 is connected to the balance. (See page J•8)
- 15)  To stop the Vibratory Spoon AD-1651 (accessory) when the AD-1651 is connected to the balance. (See page J•8)



Entering Values with FUNC. Keys



- The following data can be confirmed or input in the Data Input mode by using the **[FUNC]** key and the blue keys:

100% weight, unit weight, upper and lower limits, interval time, data number and target weight.

- The following example shows how to confirm and set the upper limit.



- Press the **[FUNC]^R** key.

- "-F-" will be displayed.

- ⚠** Press the **[FUNC]^R** key again

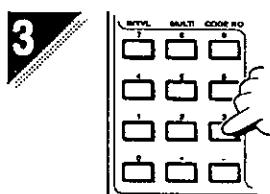
anytime to exit, without saving any changes.



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

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

- If you don't change the previous data, go to Step 4.



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

- In this example: 90 keys, or 90g.



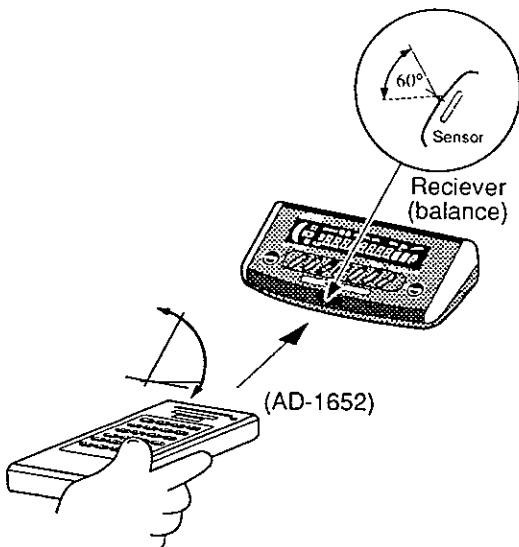
- Press the **[ENTER]^R** key to enter the value.

- The display will return to where you left it.



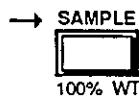
- "Error 3" will be displayed if the value entered is out of the range permitted for the function. To return to weighing mode, press any key.

- ⚠ 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.

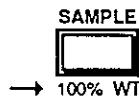


Perform remote control within a distance of 3 m from the front of the HA-200A and a range of 60 degrees and 2-m width.

SAMPLE / 100% WT. Key



- SAMPLE The [100% WT.] 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).



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

Example: [FUNC]^R > [100% WT.] key > 20.02 > [ENTER]^R



The balance will enter 20.0200g as the 100% weight (if "g" unit weight is being used).



MODE / UNIT WT. Key (FUNC + UNIT WT.)

Input the unit weight in the Counting ("cnt") mode by using the 10-key pad keys. (See "Counting Mode" on page E•1.) The unit weight will be set by using the keys in the sequence as shown below.

[FUNC]^R > [UNIT WT.] key > <N> > [ENTER]^R key

- (1) Change the display to either Percentage ("%") or Gram ("g") mode.
- (2) **[FUNC]^R > [UNIT WT.] key > [1] . [2] [3] > [ENTER]^R key**
- (3) The display shows "123.00 g" as the unit weight.

The digital display shows the value 123 followed by a decimal point and the unit weight indicator "g".



START / H.LIMIT Key (FUNC + H•LIMIT)

Specify the upper limit for the comparator function by using the 10-key pad keys. (See "Comparator Function" on page D•7)

→ **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.

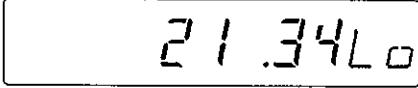
Example: **[FUNC]^R > [H. LIMIT] key > [1] [5] [0] . [2] > [ENTER]^R** The digital display shows the value 150.2 followed by the indicator "HI".

the balance will enter 150.2000g as the comparator's high limit (if "g" unit weight is being used).

STOP / L. LIMIT Key (FUNC + L•LIMIT)

Specify the lower limit for the comparator function by using the 10-key pad keys. (See "Comparator Function" on page D-7)

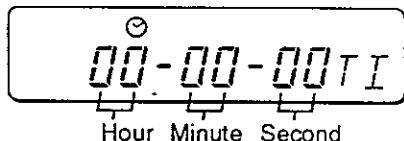
-  The **FUNC**^R → **L. LIMIT** key → <N> → **ENTER**^R key combination digitally sets the comparator lower limit. A negative number is permitted and the acceptable range is from -9999999 to +9999999.

Example: **FUNC**^R → **L. LIMIT** key 
→ **2** **1** **.** **3** **4** → **ENTER**^R

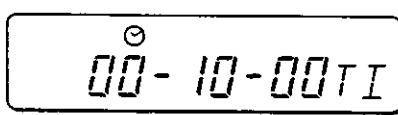
the balance will enter 21.3400g as the comparator's lower limit (if "g" unit weight is being used).

PRINT / INTVL. Key (FUNC + INTVL.)

-  When connecting the serial interface (optional) to the balance and using the Interval Output function (page K-6), the interval time can be specified by using the 10-key pad keys. To set the interval time, use the 10-key pad keys in the sequence shown below. The value entered from the 10-key pad key of the AD-1652 will be set for the blinking digit.



Interval OFF is "00:00:00".

Example: **FUNC**^R → **INTVL.** key → **0** **0** **1** **0** **0** → **PRINT**^R 

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

Interval Stop: _____

To stop interval data output, press the **PRINT** key either on the balance or on the AD-1652.



CODE NO. Key (FUNC + CODE NO.)

- The **FUNC^R** > **CODE NO.** key > <N> > **ENTER^R** 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 999999. Please see Parameter setting "Code C5" page G-13.

Example: **FUNC^R** > **CODE NO.** key **1234** · No
 > **1 2 3 4** > **FUNC^R**

The balance will enter code number '1234'.



ZERO / TARGET Key (FUNC + TARGET)

When Feeding is performed using the AD-1651 Vibratory spoon, the target weight can be entered via 10-key pad keys.

- The **FUNC^R** > **TARGET** key > <N> > **ENTER^R** 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^R** > **TARGET** key **20 TG**
 > **2 0** > **ENTER^R**

The balance will enter 20.0000g as the target weight (if "g" unit weight is being used).



CAL / MULTI Key (FUNC + MULTI)

An arbitrary coefficient can be entered via 10-key pad keys to display the value which is the gram value multiplied by the coefficient.

The input range for the coefficient is:

"0.000000 to 10000.00"

- The **FUNC^R** > **MULTI** > <N> > **ENTER^R** key

- ▣ Set the balance unit mode to "MLt" unit mode.

Example: **[FUNC]^R** > **[MULTI]** key > **[5][.]** **[2]** > **[ENTER]^R** key

- "5.2" will be stored in memory as the coefficient.

This example shows that when the unit is set to the "MLt" mode after returning to the weighting mode, "520.000" is displayed with a 100g weight placed on the weighing pan.

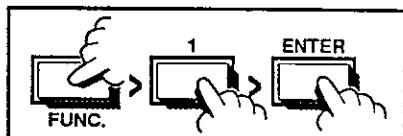


FUNC. key, Plus a 10-key

- ▣ The following data can be confirmed or input in the Data Input mode by using the **FUNC** key and the 10-key pad keys: Internal setting, unit registration, code number, date, time, door Open position, and door Close position. (**FUNC**^R + **<N>** + **ENTER**^R)



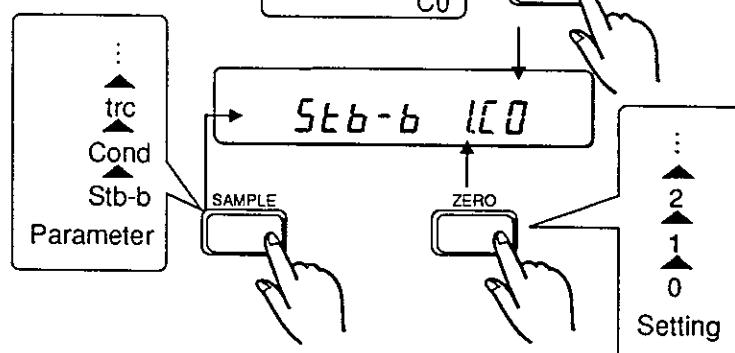
The Internal Setting (FUNC + 1)



The balance enters the Internal Setting mode by pressing **FUNC**, **1** and **ENTER** keys.



- ▣ After that, use the keys corresponding to the front panel keys of the balance. (**MODE**, **ZERO** and **SAMPLE** keys)
(See "Changing the Internal Setting" on page G-4.)



- ▣ To store the new data, press the **PRINT** key. The balance returns to the weighing mode after storing the data.

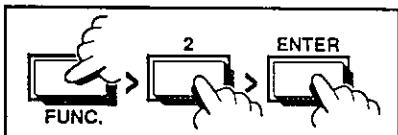


- ▣ To exit the Internal Setting mode without storing the data, press the **ON/OFF** key.





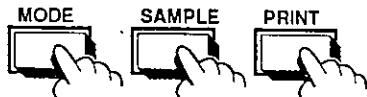
Unit Registration (FUNC + 2)



The balance enters the Unit Registration mode by pressing the **FUNC**, **2** and **ENTER** keys.



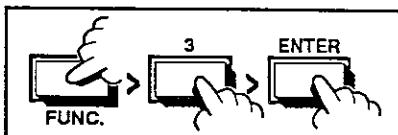
To register the unit, use the **MODE**, **SAMPLE** and **PRINT** keys. For more details, see "Registration of the Unit" on page B-15.



Setting the Code Number (FUNC + 3)



When using the serial interface (optional) to output code numbers, they can be entered by using the 10-key pad keys. (See "Code Number" on page G-13.)



The balance enters the Code Number Setting mode by pressing the **FUNC**, **3** and **ENTER** keys.

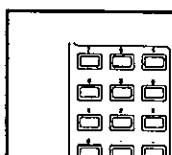


A code number should be within six characters, including a space or hyphen (-). (See page K-16.)

Example: **0 1 □ 3 - 5**



In the Code Number Setting mode, the keys have the following functions:

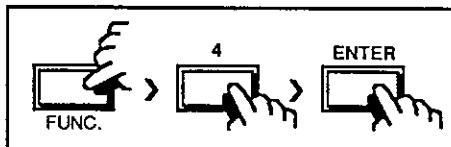


□ Pressing one of ten keys from **0** to **9**, the balance display shows the corresponding number. When the **.** (decimal point) key is pressed, the display shows a space. To enter a hyphen **-**, use the **-** key.

	<input type="checkbox"/> Pressing this key stores the code number and returns the balance to the weighing mode.
---	---

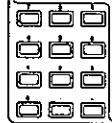
	<input type="checkbox"/> Use this key to exit from the Code Number Setting mode. The display of the balance will be turned off.
---	---

■ Setting the Date Func. + 4 key



The date is set in YY-mm-dd (or other depending on the setting 'Date Order' "dAtE X c1" using the 10-key pad. Enter flashing digit as it moves to the right.

	<input type="checkbox"/> Pressing the MODE key moves a blinking digit to the right.
--	---

	<input type="checkbox"/> The keys 0 → 9 will display the numbers 0→9. The blinking digit will be incremented by 1 by pressing the ZERO key.
---	---

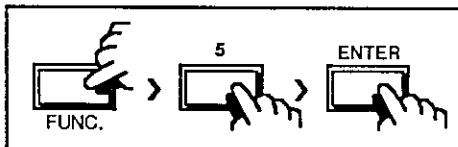
	<input type="checkbox"/> Save the date and return to weighing mode.
---	---

	<input type="checkbox"/> Press the ON:OFF key to exit and go to display OFF state.
---	--

Setting the Time Func. + 5 key



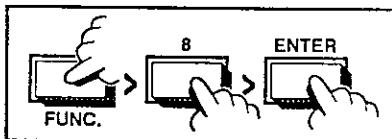
Using the setting "Display at 'Display OFF State' "OFF 1c1 the time can be shown while the display is OFF. It can also transmitted before the weighing result via the RS-232C



	<ul style="list-style-type: none"> <input type="checkbox"/> Pressing the MODE key moves a blinking digit to the right.
	<ul style="list-style-type: none"> <input type="checkbox"/> Pressing the SAMPLE key selects the 12-hour mode and 24-hour mode alternately.
	<ul style="list-style-type: none"> <input type="checkbox"/> The keys 0 → 9 will display the numbers 0→9. The flashing digit as it moves to the right. <div data-bbox="668 1117 1064 1251" style="text-align: center;"> </div> <p>The blinking digit will be incremented "1" by pressing the ZERO key.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Although the displayed time is fixed, the clock is still working.
	<ul style="list-style-type: none"> <input type="checkbox"/> Save the time and return to weighing mode.
	<ul style="list-style-type: none"> <input type="checkbox"/> Press the ON:OFF key to exit and go to display OFF state.



Setting the Door Open Position (FUNC + 8)



- The balance enters the Door Open Position Setting mode for the front door by pressing the **[FUNC]**, **[8]** and **[ENTER]** keys.
(See "Command OP" on page K-26)

Example:

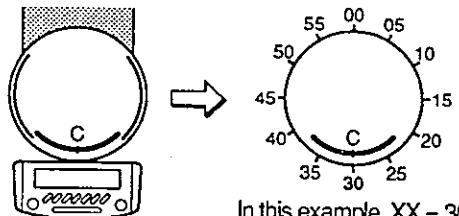


Door Open position

- ▣ The display shows "XXOP" to indicate that the Door Open position is specified by the two digits XX (XX: 00 to 59).

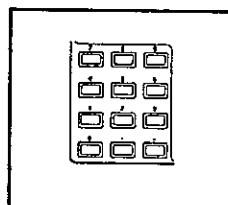
- XX

Looking from the top of the balance, the weighing chamber is divided into 60 sections clockwise. Specify a Door Open position by determining on which point the center (C) of the front door is positioned.

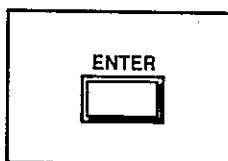


In this example, XX = 30

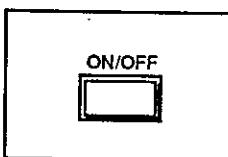
- ▣ In the Door Open Position Setting mode, the keys have the following functions:



- A number from 0 to 9 can be specified by using the 10-key pad keys from **0** to **9**. Enter a number within a range between 00 and 59.

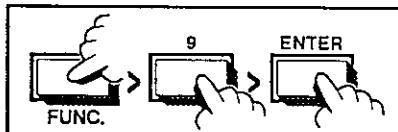


- Pressing this key stores the Door Open position and returns the balance to the weighing mode.



- Use this key to exit from the Door Open Position Setting mode. The display of the balance will be turned to off.

Setting the Door Close Position (FUNC + 9)



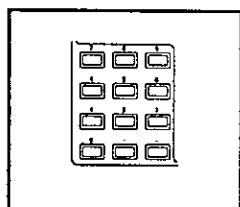
- The balance enters the Door Close Position Setting mode for the front door by pressing the **FUNC**, **9** and **ENTER** keys. (See "Command CL" on page K-27.)

Example:

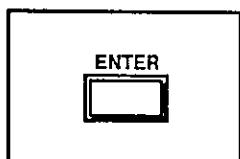


Door Close position

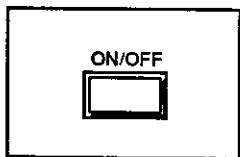
- The display shows "XXCL" to indicate that the Door Close position is specified by the two digits XX (XX: 00 to 59). For details of the value XX, see the previous page.
- In the Door Close Position Setting mode, the keys have the following functions:



- A number from 0 to 9 can be specified by using the 10-key pad keys from **0** to **9**. Enter a number within a range between 00 and 59.



- Pressing this key stores the Door Close position and returns the balance to the weighing mode.

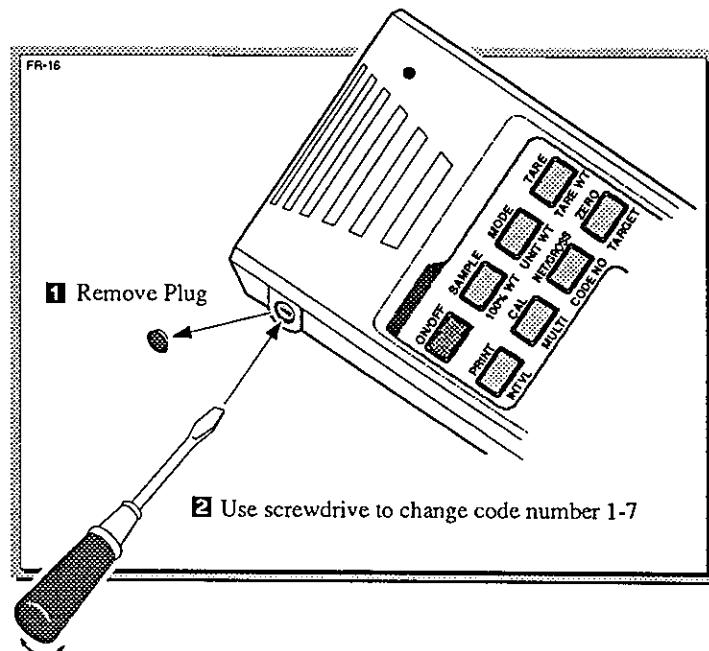


- Use this key to exit from the Door Close Position Setting mode. The display of the balance will be turned to off.

AD-1652 Remote Code Number



- ▶ When controlling multiple HA-200A balances separately, each balance should have an identification number (ID code). If you have changed an ID code set in the AD-1652, be sure to change the ID code in the internal setting of the balance, too.
- ▶ The ID codes can be set for a maximum of seven balances. Default ID code of both HA-200A and AD-1652 are "1."
- ▶ Note that data can be input from the AD-1652 to a balance with the same ID code.



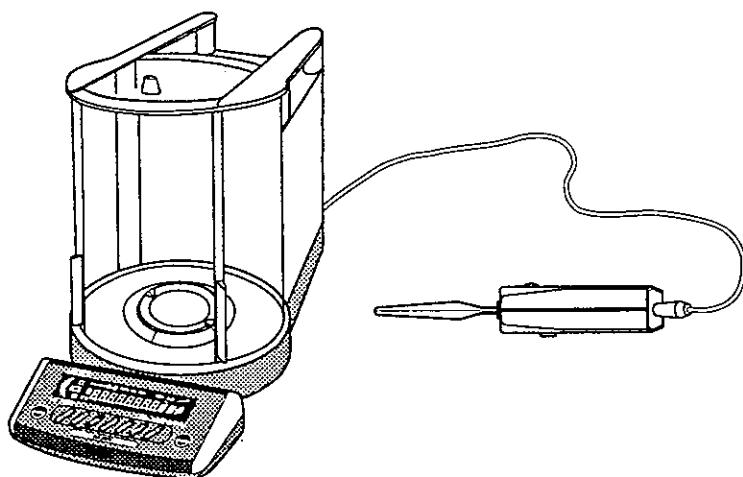
The internal Setting for ID Cord of HA-200A

<input type="checkbox"/> id	Xc9	ID Code for Remote Keyboard AD-1652
id	0	No action to Remote Keyboard FC91:0
	1	ID Code Number "1" FC91:1
	2	ID Code Number "2" FC91:2
	3	ID Code Number "3" FC91:3
	4	ID Code Number "4" FC91:4
	5	ID Code Number "5" FC91:5
	6	ID Code Number "6" FC91:6
	7	ID Code Number "7" FC91:7

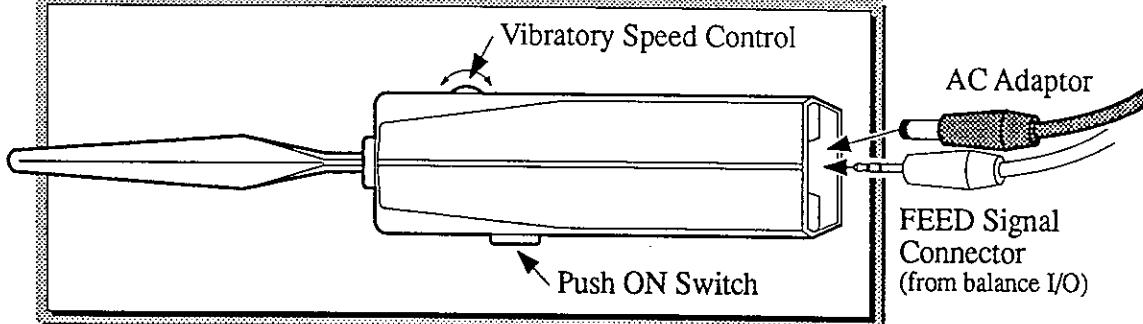
The factory setting is "1", ID Code Number 1

HA-200A • Section J

AD-1651 Vibratory Spoon



AD-1651 Vibratory Spoon



- Using the AD-1651 Vibratory Spoon (accessory) makes it easy to accurately feed powders to be weighed.
- Set the C-Parameter setting of "Selection of External Input Terminal" to "2." Refer to "Cont 2 C9" on pages G-6 and G-19.
- 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.

Target Weight

- To set 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.
- The target weight can be set by the following four ways:
 - (1) Weigh an object and register the weight as the target weight.
 - (2) Enter digital data from the front panel keys of the balance.
 - (3) Specify the target weight via RS-232C (optional).
 - (4) Enter digital data by using the AD-1652 Remote Keyboard (see page J-7).



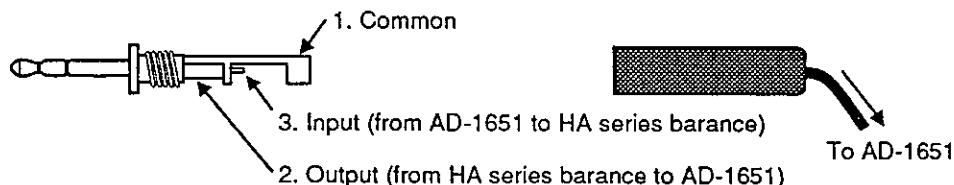
Notes on Feeding Accuracy

- 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").
- It would be helpful to change the response speed of the balance to increase the Feeding accuracy. Press the **MODE** key as required to select the setting monitor (▲).



Connector Hook-up

Connect the plug supplied to the "EXT. SW" jack on the rear of the balance as shown in the figure below:



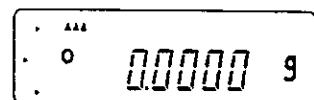

Registering the Target Weight by Weighing an actual object


- ▣ The following example shows how to register the target weight by weighing an object. Also, the previous target weight can be checked.
- ▣ To interrupt the registration process and return to normal mode, press the **ON:OFF** key.

1

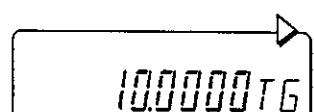
- ▣ Press the **MODE** key and specify the Gram ("g") mode.

○ Registration of the target weight can be made in modes other than the Gram mode. Note that the target weight will be displayed after conversion of unit.

**2**

- ▣ Hold down the **RANGE** key for approximately 2 seconds.

○ "TG" will be displayed on the unit segment and the previous target weight will appear. (In this example, the target weight is 10 g.)

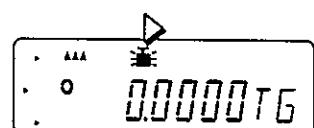


○ If you only confirm the target weight, wait approximately 4 seconds. The balance automatically returns to normal weighing mode.

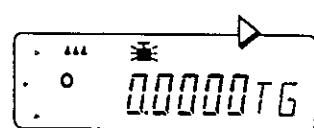
3

- ▣ To set a new target weight, press the **RE-ZERO** key within 4 seconds after "TG" is displayed.

○ The balance enters the Input mode, and the weight (■) mark starts blinking.

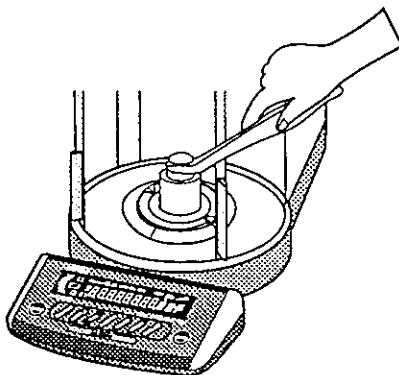
**4**

- ▣ Close the door and press the **RE-ZERO** key to return the display to zero.



- 5** □ Open the door and place the object to be used for registration of the target weight.

- Close the door and confirm the stability "○" mark is displayed.



412345TG

6

- Press the **PRINT** key to store the data.

- The weight (■) mark goes off.
○ Wait for approximately 4 seconds. "g" will be displayed on the unit segment again, indicating the registration is completed.

412345TG

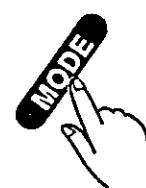
412345 g



Registering the Target Weight by Entering Digital Data from the Front Panel Key



The target weight can be input by entering digital data from the front panel key.

1

- Press the **MODE** key and specify the Gram "g" mode.

- Registration of the target weight can be made in modes other than the Gram mode. Note that the target weight will be displayed after conversion of unit.

0.0000 g

2

- Hold down the **SAMPLE** key for approximately 2 seconds.

- "E G" will be displayed on the unit segment and the previous target weight will appear. (In this example, the target weight is 10 g.)
○ If you only confirm the target weight, wait approximately 4 seconds. The balance automatically returns to normal weighing mode.

10.0000 TG



- ▣ To enter a new target weight, press the **RE-ZERO** key within 4 seconds after "TG" is displayed.
- The display shows a blinking "0."



- ▣ Use the **RE-ZERO**, **MODE**, **RANGE** and **CAL** keys to enter digital data for the target weight. In this example, "32.0000 g" is entered.

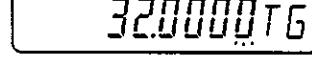
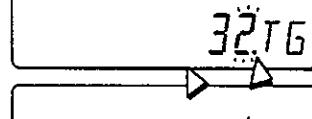
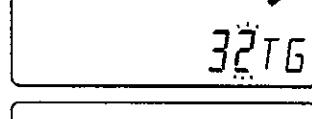
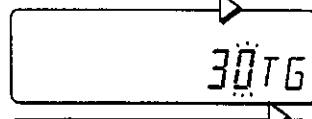
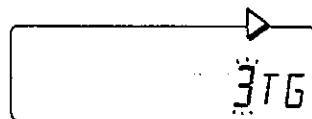
RE-ZERO key: Changes the number of a blinking digit.

MODE key: To move to the next digit.

RANGE key: To input digits smaller than the decimal point.

CAL key: To change the polarity.

- ▣ Press the **RANGE** key three times.
- ▣ Press the **MODE** key to move to the next digit.
- ▣ Press the **RE-ZERO** key twice.
- ▣ Press the **RANGE** key to indicate the decimal point.
- ▣ Press the **MODE** key four times to move to the fourth digit from the decimal point.



- ▣ Press the **PRINT** key to store the data.
- The lowest digit stops blinking and stays on.
- Wait for approximately 4 seconds. The balance automatically returns to normal weighing mode.





Setting (or Viewing) Target Weight

1



- Press the **FUNC**^R key,
then the **TARGET** key.

40000 TG

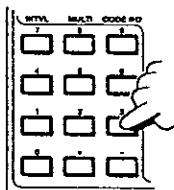
- Any previously set value
will be displayed, in this
example: 4g.



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



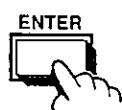
2



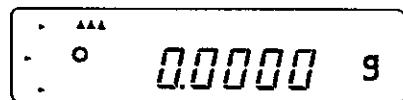
- Use the 10-key pad to display
value to be entered.
○ In this example: **3 . 5** keys,
or 3.5g.

35 TG

3



- Press the **ENTER**^R key to enter.
○ The display will return to where
you left it.



Setting (or Viewing) Target Weight

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	(20H)	(20H)	g	cr
---	---	---	---	---	---	---	---	---	---	---	-------	-------	---	----

Ex 2.

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

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

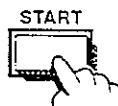
T	G	4	.	0	(20H)	o	z	cr
---	---	---	---	---	-------	---	---	----

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

To START Spoon Feeding



A Press the AD-1651 Vibratory Spoon button.



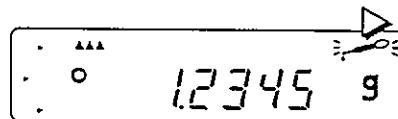
B Press the **START** key on the AD-1652 Remote Key-board.



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



- ❑ When feeding is activated, the AD-1651 Vibratory Spoon starts vibration to feed the object. The vibration speed can be adjusted by the Vibratory Speed Control on the Spoon.
- ❑ The syringe () mark on the balance display will blink while the AD-1651 is operating.

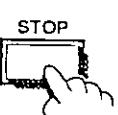


To STOP Spoon Feeding

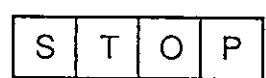


A Spoon feeding stops when the display is near the target weight; or when the display becomes stable, even though under the target weight.

Press the AD-1651 Vibratory Spoon button.



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



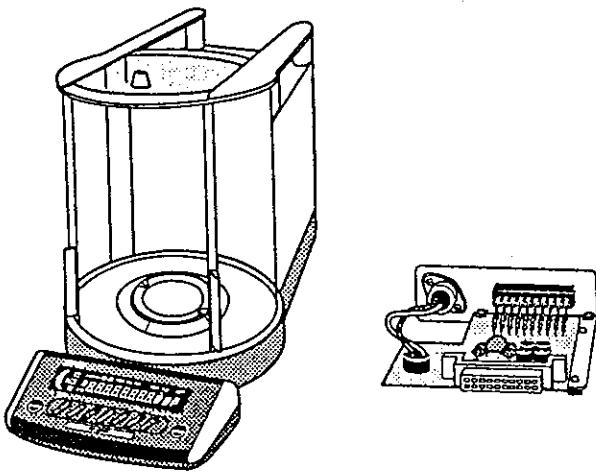
C Send a 'STOP' command via the RS-232C.

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.

HA-200A • Section K

RS-232C Serial Interface





Installing the OP-03

- ▣ The OP-03 consists of the RS-232C interface (1) and current loop output (2). The OP-04 consists of the RS-232C interface (1), current loop output (2), comparator contact output (3) and external contact input function.
- ▣ The specifications of the RS-232C interface and the current loop output are the same for both OP-03 and OP-04.

1

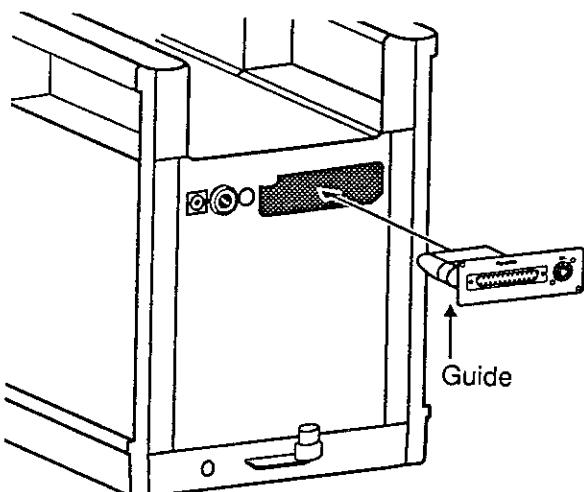
- ▣ Disconnect the AC adaptor from the balance. Remove two set screws on the rear of the balance.

2

- ▣ Insert the OP-03 board guide into the body of the balance. Make sure that the connector is aligned correctly.

3

- ▣ Attach the OP-03 with the two screws removed in step number one.



Specifications

The specifications of the RS-232C and the current loop are the same for both OP-03 and OP-04.

Type EIA-RS-232C

Method Asynchronous Transmission, Bi-directional.

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

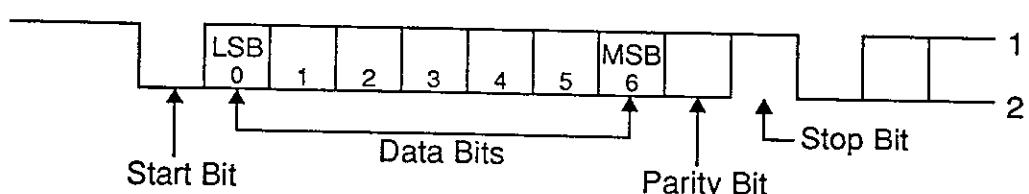
Data bit 7 or 8.

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

Cautions on connection

- 1) The OP-03 is a DCE (Data Communication Equipment).
- 2) The current loop is of a passive type, requiring an external power of 20mA.
- 3) The current loop outputs the same data as that from the RS-232C.
- 4) Before connection, read the instruction manual for the equipment to be connected.
- 5) Use a modem cable for connection to host computer RS-232C interface connectors.

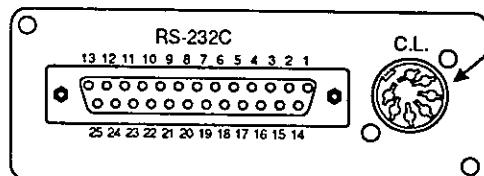
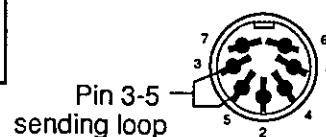
RS-232C Pin Connection

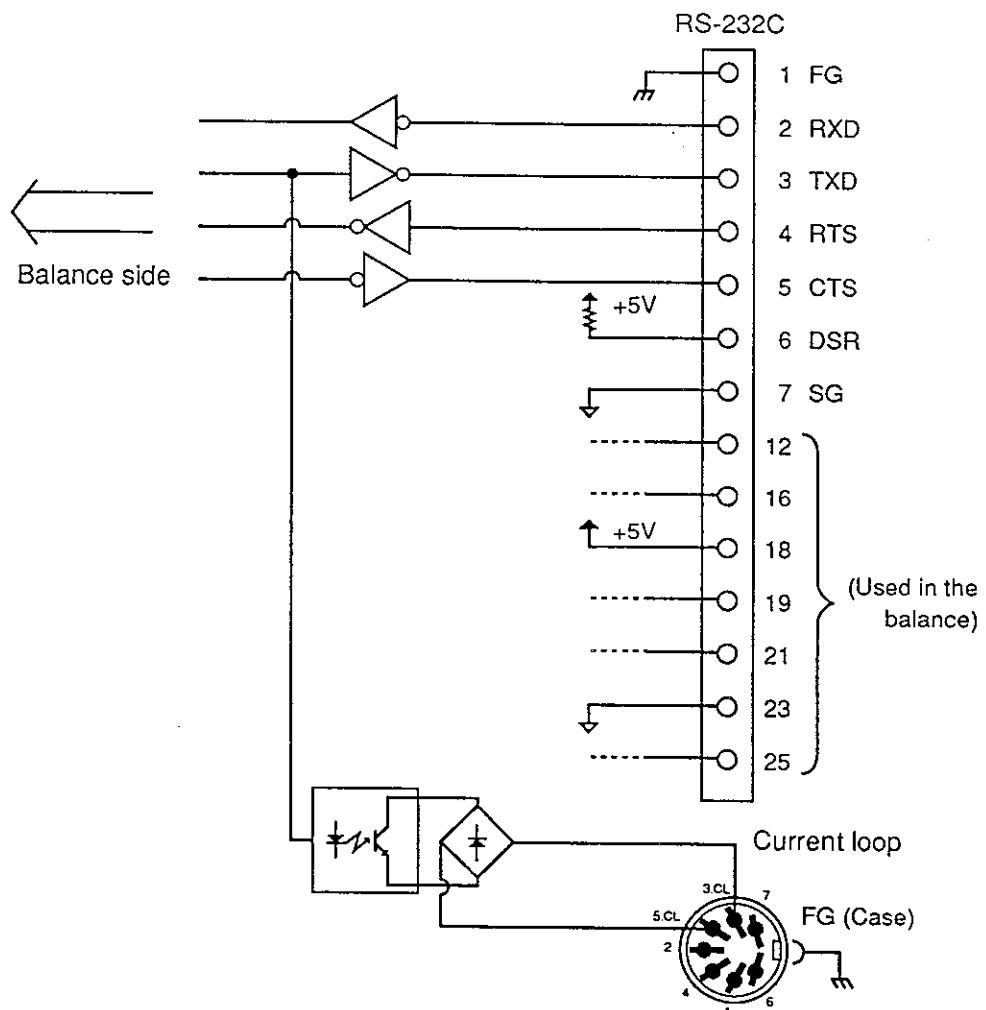
RS-232C

Pin No.	Signal Name	Direction	Meaning
1	FG	↔	Frame ground
2	RXD	In	Receive data
3	TXD	Out	Transmit data
4	RTS	In	Request to send
5	CTS	Out	Clear to send
6	DSR	Out	Data set ready
7	SG	↔	Signal ground
18	—	—	Used on the balance side(+5V)
12,16,19,21,25	—	—	Used on the balance side
23	—	—	Used on the balance side (SG)
8,9,10,11,13,14, 15,17,20,22,24	N.C.		No connection

Current Loop

Pin No.	Signal Name
3, 5	Sending loop
Connector shell	Case
Others	No connection




OP-03 Circuit Diagram




Data Output



There are five modes to handle the transmission of weighing data and each mode can be changed through "C Parameter Settings", 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.
- 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 c5

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

Print 1 c5

[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 c5

Auto Print A Mode: Data is output if display is over the 'Auto Print Band' "**AP-b c5**" setting and stable, data is output once. Polarity is set by "**AP-P c5**". •Next transmission is done after the display falls below the selected band

Print 3 c5

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 c5**" setting and stable, data is output once. Polarity is set by "**AP-P c5**". •Next transmission is done after the display falls below the selected band

Stream Mode

Print 4 c5

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.
- Note that the default timing for display/refreshing is 4 times per second for stable condition and 8 times per second for unstable condition. To specify the display/refreshing speed, use the "*SP EEd c1*" function (see page G•7). If the baud rate is slow (600 or 1200 bps), the timing of data output may be slower than the display/refreshing timing.
- If "1" is specified to "*L E S cs*" (page G•16), data output will stop by changing the RTS terminal of the OP-03 to negative.

Output by Command Mode

Print 5 c5

- 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•12 →15.
[Data output by a command is enabled in any of the key mode, auto print mode, and stream mode.]

Timed Mode (Interval Data Output)

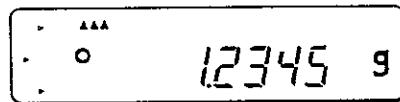


- In this mode, data will be transmitted at the time intervals.
- The interval data output can be started in the **PRINT** key A/B mode, Auto Print A/B mode or Command mode. Note that this function cannot be used in the Stream mode ("*Print 4 c5*"). Also OP-03, 04 or 06 must be connected to the balance.
- The interval time can be specified by the following three methods:
 - (1) By using the front panel keys.
 - (2) By using commands via the RS-232C. (See page K•29.)
 - (3) By using the AD-1652 Remote Keyboard (accessory). (See page H•8)

Setting the Interval Time by Using the Front Panel Keys and Outputting Data

1

- ▶ Press the **MODE** key to select a mode (weighing unit, counting or percentage) for outputting data.

**2**

- ▶ Press the **PRINT** key for two seconds.
- The previous interval time will be displayed. (If no interval time is specified, "0:00:00 TI" will be displayed.)
- The interval time is displayed in the sequence of hours, minutes and seconds. (The segment of hours blinks.)



Hours Minutes Seconds

3

- ▶ Use the **RE-ZERO** and **MODE** keys to enter data.

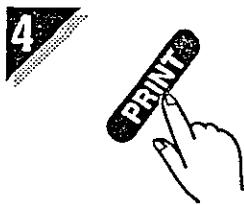
RE-ZERO key: Changes the number of a blinking digit.

MODE key: To move to the next digit.

ON:OFF key: To exit from the current mode.
The display turns to the OFF State.

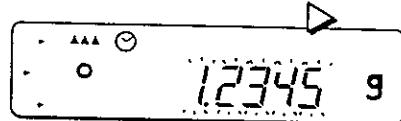
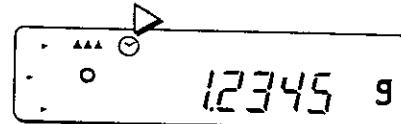
- Enter data within the following range: 0:00:01 (1 second) to 23:59:59 (23 hours, 59 minutes and 59 seconds)
- In this example, the interval time is specified as 1 hour and 20 minutes.



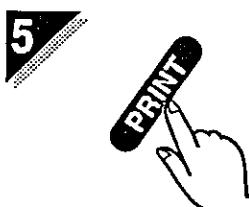


- Pressing the **PRINT** key stores the data and activates interval data output.

- The display returns to normal weighing mode and the clock "🕒" mark appears.
- The display blanks and the first data will be output.
- After that, the data will be automatically output at the set intervals.



(The display blanks before the data is output.)



- To terminate interval output, press the **PRINT** key.

- After outputting the current data, the clock "🕒" mark goes off and the display returns to normal weighing mode.
- Interval output can also be terminated by pressing the **ON:OFF** key.





Sample Computer Programs

- The C-Parameter settings and an example of a program for the connection of the balance to an IBM PC-AT are shown below:
- The C-Parameter settings of the balance

<i>Print</i>	5	. c5 (Command mode)
<i>bPS</i>	3	. c6 (4800 bps)
<i>PRr</i>	0	. c6 (Parity: eEven)
<i>b,t</i>	0	. c6 (Data bits: 7)
<i>Stop</i>	0	. c6 (Stop bit: 1)
<i>Cr-LF</i>	1	. c6 (Terminator <CR>)
<i>Type</i>	0	. c6 (A&D standard format)
<i>T-uP</i>	0	. c6 (Timer ON)
<i>bP</i>	0	. c6 (Decimal point 2EH)
<i>E-Cod</i>	1	. c6 (Transmit error code)
<i>ES</i>	0	. c6 (Setting for personal computer or AD-8121)

- Example of a program for a personal computer [IBM PC-AT]
After the re-zero operation, access data items one after another.
The contents are displayed by the computer.

```

10 OPEN "COM1:4800" AS #1
20 PRINT #1, "R"+CHR$ (&HD)
30 LINE INPUT #1, AK$           {Reply to "R" command}
40      IF AK$<>CHR$ (6) THEN GOTO 130
50 LINE INPUT #1, AK$           {End of RE-ZERO}
60      IF AK$="EC, E0" THEN GOTO 140
70      IF AK$="EC, E11" THEN GOTO 150
80 FOR I=1 TO 1000: NEXT I
90 PRINT #1, "Q"+CHR$ (13)
100 INPUT #1, HD$, DT$
110 PRINT HD$, DT$
120 GOTO 80
130 PRINT "BALANCE NOT READY!" : CLOSE : END
140 PRINT "COMMUNICATION ERROR!" : CLOSE : END
150 PRINT "ERROR 1 . . .BALANCE NOT STABLE!" : CLOSE : END

```



Connection to AD-8121 (Ordinary Printing)

To connect the balance to the AD-8121 Multi-function printer (accessory), set the C-Parameter settings as follows:

Select *Pr int* 0 . c5 (Key A mode, AD-8121 is used in MODE 1.)
 one of: *Pr int* 1 . c5 (Key B mode, AD-8121 is used in MODE 1.)
 Pr int 2 . c5 (Auto Print A mode, AD-8121 is used in MODE 1.)
 Pr int 3 . c5 (Auto Print B mode, AD-8121 is used in MODE 1.)
 Pr int 4 . c5 (Stream mode, AD-8121 is used in MODE 2.)

d-out 0 . c5 (Data not assigned.)
t-out 0 . c5 (Time not assigned.)
Code 0 . c5 (Data No. not assigned.)
bPS 2 . c6 (2400 bps)
PRr 0 . c6 (Parity: EVEN)
b.it 0 . c6 (Bits per character: 7 bits)
Stop 0 . c6 (Stop bit: 1 bit)
[r-LF 0 . c6 (Terminators <CR> and <LF>)
Type 0 . c6 (A&D standard format)
dP 0 . c6 (Decimal point: 2EH point)
ES 0 . c6 (Setting for a personal computer or the AD-8121)

- Connect using the cable (KO: 256A) supplied with the AD-8121.
- The connection for a current loop requires an adaptor cable (Option 01 of AD-8121).
- For details about the AD-8121, refer to the printer instruction manual.



Connection to AD-8121. Printing with data No. etc. assigned.

The connection of the balance to the AD-8121 Multi-function printer (accessory) will allow printing of the data number, code number and the C-Parameter with DIP switch set to "MODE 3" setting list. Set the C-Parameter settings as follows:

Select *Pr int* 0 . c5 (Key A mode)
 one of: *Pr int* 1 . c5 (Key B mode)
Pr int 2 . c5 (Auto Print A)
Pr int 3 . c5 (Auto Print B)
Pr int 4 . c5 (Stream mode)

PRUSE 0 . c5 (Setting data output intervals)
bPS 2 . c6 (2400 bps)
PRr 0 . c6 (Parity: EVEN)
b ET 0 . c6 (Bits per character: 7 bits)
StoP 0 . c6 (Stop bit: 1 bit)
Cr - LF 0 . c6 (Terminators <CR> and <LF>)
TYPE 0 . c6 (AD-8121 format)
ES 0 . c6 (Setting for a personal computer or the AD-8121)

- Connect the balance using the cable (KO: 256A) supplied with the AD-8121.
- The connection for a current loop requires an adaptor cable (Option 01 of AD-8121).
- Set the DIP switch of the AD-8121 to MODE 3. Keys and switches on the DA-8121 except the FEED key and POWER switch are disabled.
- For details about the AD-8121, refer to the printer instruction manual.



Weighing Data Formats



Some weighing data output is formatted according to how '**tYPE**' (Data Format, see page G-16) 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 0c6**).
- 2) **DP Format** Adapted for A&D's AD-8121 printer (MODE 3) (**tYPE 1c6**).
- 3) **KF Format** Adapted for Karl-Fischer moisture tester which cannot communicate by A&D Standard Format (**tYPE 2c6**).



A&D Standard Format

Adapted for peripheral instruments made by A&D, such as the AD-8121 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	
DP	W	T	(20H)	(20H)	(20H)	(20H)	(20H)	0	.	0	0	0	0	(20H)	(20H)	g	cr
KF	(20H)	(20H)	(20H)	(20H)	0	.	0	0	0	0	(20H)	g	(20H)	cr			

- 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	
DP	W	T	(20H)	(20H)	+	1	0	0	.	5	6	7	8	(20H)	(20H)	g	cr
KF	+	(20H)	1	0	0	.	5	6	7	8	(20H)	g	(20H)	cr			

- Example: display="67.8%":

	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	0	6	7	.	8	(20H)	(20H)	%	cr	
DP	W	T	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	+	6	7	.	8	(20H)	(20H)	%	cr
KF	+	(20H)	(20H)	(20H)	(20H)	(20H)	6	7	.	8	(20H)	(20H)	(20H)	cr			

- Example: display="1345678 cnt":

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

Unstable Data Example

- ☒ Example: display="-98.3210g":


- 98.32 10 g

	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	
AD-8117A	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":


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)	E	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	cr								
KF	(20H)	(20H)	(20H)	(20H)	H	.	(20H)	cr									

- ☒ Example: display="-E g":


- 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)	-	E	(20H)	(20H)	(20H)	(20H)	(20H)	(20H)	cr							
KF	(20H)	(20H)	(20H)	(20H)	L	.	(20H)	cr									


Unit Codes Examples

A&D Standard & DP

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

KF

(20H)	g	(20H)
(20H)	(20H)	(20H)

Independent Data Formats



Some data formats are independent of how parameter 'tYPE c6' 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

The upper figures less than 6 digits are filled with 0. After output, the numerical value is increased by 1 (999999→000000)



Code String

- The code string itself must consist of six digits, including spaces or hyphens. It cannot be output with weight data everytime.

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 'dRTE c1' 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



The data numbers and the time are separated by the "<CR><LF>" or "<CR>" terminator, and output as an independent data, respectively.

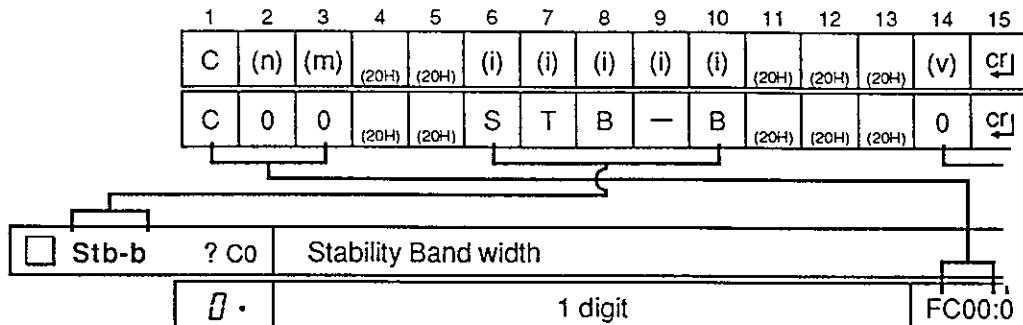
When outputting weight data together with the data number and the time, three data will be output in the sequence of the time, data number and weight data.

Example:

01:23:45
No. 000000
ST,+010.2345_g

Parameter Setting

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





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 0c6), 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 1c6), then when the following commands are accepted by the balance: 'P', 'ON', 'R', 'T' or 'TARE', 'Z', 'CAL', 'EXC', 'SMP', the HA 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 HA sends various codes to inform the host computer.

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

- There are roughly four types of commands:
 - 1) Commands to control the balance.
 - 2) Commands to output the weight data.
 - 3) Commands to set data.
 - 4) Commands to output data from the balance.

1) Commands to control the balance

1) DOOR	DOOR key command	10)	CAL	CAL key command
2) DRST	DOOR SET key command	11)	EXC	Command to execute manual calibration
3) MV	Command to rotate the door to the specified position.			
4) P	ON:OFF key command	12)	RUG	RANGE key command
5) ON	Command to turn the display to on.	13)	U	MODE key command
6) OFF	Command to turn the display to off.	14)	U:XXX	Command to change the unit.
7) R	RE-ZERO key command	15)	PRT	PRINT key command
8) TARE	Command to tare.	16)	FEED	Command to start the feeding
9) SMP	SAMPLE key command	17)	STOP	Command to stop the feeding

2) Commands to output the weight data.

1) Q	Command to output the weight data (immediately).
2) SI	Command to output the weight data (immediately).
3) READ	Command to output the weight data (immediately).
4) S	Command to output the weight data (when the balance is stable).
5) SIR	Command to output the weight data (repeat immediately).
6) C	Command to cancel SIR.

3) Commands to set data.

1)	FC	Command for the internal setting.	8)	LO	Command to set the lower limit.
2)	OP	Command to set the Door Open position.	9)	CK	Command to set the time.
3)	CL	Command to set the Door Close position.	10)	DT	Command to set the date.
4)	CW	Command to set the calibration mass value.	11)	TI	Command to set the interval time.
5)	%	Command to set the 100% weight.	12)	#	Command to set the data number.
6)	@	Command to set the unit weight.	13)	\$	Command to set the code number.
7)	HI	Command to set the upper limit.	14)	TG	Command to set the target weight.
			15)	ML	Command to set the arbitrary coefficient.

4) Commands to output data from the balance.

1)	?C(n)(m)	Command to output the internal setting.	11)	?HI	Command to output the upper limit.
2)	LIST	Command to output the internal setting list.	12)	?LO	Commnd to output the lower limit.
3)	?ALL	Command to output the all set values.	13)	?CK	Command to output the time.
4)	?OP	Command to output the Door Open position.	14)	?DT	Command to output the date.
5)	?CL	Command to output the Door Close position.	15)	?TI	Command to output the interval time.
6)	?DR	Command to output the current door position.	16)	?#	Command to output the data number.
7)	?CW	Command to output the set value of the calibration mass.	17)	?\$	Command to output the code number.
8)	?U	Command to confirm the unit.	18)	?TG	Command to output the target weight.
9)	?%	Command to output the 100% weight.	19)	?ML	Command to output the arbitrary coefficient.
10)	?@	Command to output the unit weight.			

Commands to Control the Balance.

1) **D O O R** DOOR key command

- This command functions the same as with the **DOOR** key on the front panel.
-

2) **D R S T** DOOR SET key command

- This command functions the same as with the **DOOR SET** key on the front panel.
-

3) **M V** Rotate the door to the specified position.

- This command is sent in the format of "**M V X X**" to rotate the door up to a position specified by the two digits of "XX" (XX: 00 to 59).

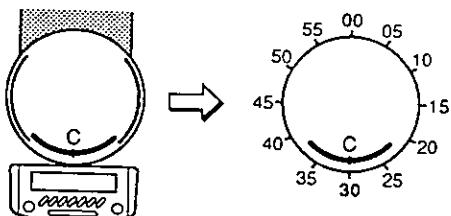
XX

Looking from the top of the balance, the weighing chamber is divided into 60 sections clockwise. Specify a Door Open position by determining on which point the center (C) of the front door is positioned. In this example, XX = 30.

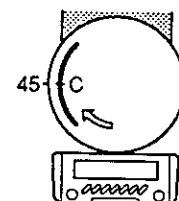
Operation example:

Command

M	V	4	5	cr
---	---	---	---	-----------



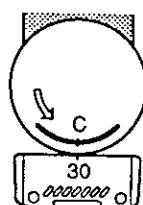
After receiving the command "MV45 <CR>," the door rotates to the position "45."



Command

M	V	3	0	cr
---	---	---	---	-----------

After receiving the command "MV30 <CR>," the door rotates to the position "30."



4) **P** ON:OFF key command

- This command functions the same as with the **ON:OFF** key on the front panel.

5) **O|N** Turn the display to on.

- Turns the display to on. If the display is already on, the command will be ignored.
-

6) **O|F|F** Turn the display to off.

- Turns the display to off. If the display is already off, the command will be ignored.
-

7) **R** RE-ZERO key command

- This command functions the same as with the **RE-ZERO** key on the front panel.
-

8) **T|A|R|E** Tare the balance

- This command functions the same as with the **RE-ZERO** key on the front panel.
-

9) **S|M|P** SAMPLE key command

- This command functions the same as with the **SAMPLE** key on the front panel.
-

10) **C|A|L** CAL key command

- This command functions the same as with the **CAL** key on the front panel.
-

11) **E|X|C** Execute manual calibration

- This command executes manual calibration.
-

12) **R|N|G** RANGE key command

- This command functions the same as with the **RANGE** key on the front panel.

13) [U] MODE key command

- This command functions the same as with the **[MODE]** key on the front panel.
-

14) [U]:[X][X][X] Change the unit.

- This command changes the unit to another unit specified by the three characters of "XXX." Specify the same character string output by the "?U" command. If they are not matched, or if a unit not registered is specified, an error (EC, E6) will occur. After the new "U" command is executed, changing unit by using the command or the **[MODE]** key will be executed on the unit registered next to the currently displayed unit. Command example:

Command

U	:	(20H)	m	g
---	---	-------	---	---

15) [P][R][T] PRINT key command

- This command functions the same as with the **[PRINT]** key on the front panel.
-

16) [F][E][E][D] Start feeding by the AD-1651 Vibratory Spoon.

- This command starts feeding by the AD-1651 Vibratory Spoon (accessory).
-

17) [S][T][O][P] Stop feeding by the AD-1651 Vibratory Spoon.

- This command stops feeding by the AD-1651 Vibratory Spoon (accessory).

Commands to Output the Weight Data

- 1) **O** Output the weight data (immediately)
 - This command outputs the current data once, regardless of the stability condition of the balance.

- 2) **S I** Output the weight data (immediately)
 - This command outputs the current data once, regardless of the stability condition of the balance. (Functions the same as with the "Q" command.)

- 3) **R E A D** Output the weight data (immediately)
 - This command outputs the current data once, regardless of the stability condition of the balance. (Functions the same as with the "Q" command.)

- 4) **S** Output the weight data (when the balance is stable)
 - This command outputs the weight data once when the balance is stable after receiving the command. The display blinks when the data is output.

- 5) **S I R** Output the weight data (repeat immediately)
 - This command outputs the weight data, regardless of the stability condition of the balance (Stream mode by command). To resume the balance to the state able to receive other commands, the "C" command must be sent.

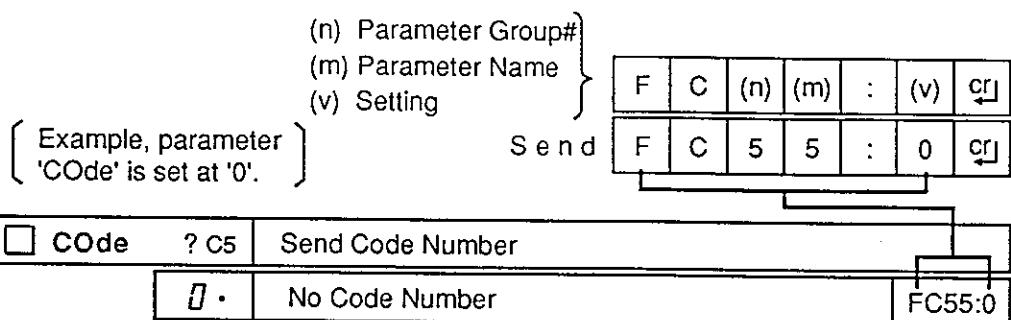
- 6) **C** Release the SIR.
 - This command terminates data output by the "SIR" command.



Commands to request Settings.

1) **F C** To Change a Parameter Setting

- This command specifies the set value for the internal setting. The "FC" command should be followed by a Parameter Group number, Parameter Name, colon (:), and Setting.

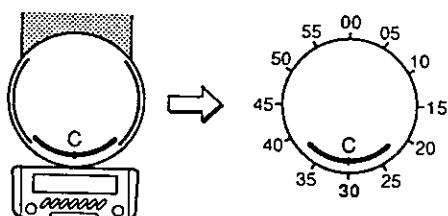


2) **O P** Set the Door Open position.

- This command specify the Door Open position. Use the format of "**O P X X**" by specifying 2-digit number to "XX" (XX: 00 to 59).

XX

Looking from the top of the balance, the weighing chamber is divided into 60 sections clockwise. Specify a Door Open position by determining on which point the center (C) of the front door is positioned. In this example, XX = 30.



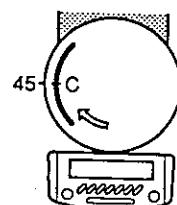
Operation example:

Command

O	P	4	5	cr
---	---	---	---	----

After receiving the command "MV45 <CR>," the Door Open position is changed to "45."

The door will open to the position "45" when the door is opened next time.



3) **C L** Set the Door Close position.

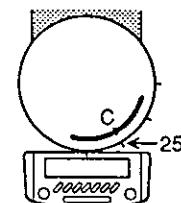
- This command specifies the Door Close position. Use the format of "**C L X X**" by specifying 2-digit number to "XX" (XX: 00 to 59). (For details of the value "XX," see the section of the "OP" command.)

○ Operation example:

Command

C	L	2	5	cr
---	---	---	---	----

After receiving the command "CL25 <CR>," the Door Close position is specified as "25."



The door will close to the position "25" when the door is closed next time.

4) **C W** Set the external calibration mass weight.

- This command specifies the weight for the calibration mass used in manual calibration. The unit should be the same three characters specified in the "**? U**" command. Note that you cannot use a value exceeding capacity, less than half of the weight (99.9850 g) or a negative value.

It is not necessary to attach a leading zero or trailing zero after the decimal point.

Command example:

Reply	C	W	2	0	0	.	0	0	1	2	(20H)	(20H)	g	cr
-------	---	---	---	---	---	---	---	---	---	---	-------	-------	---	----

5) **%** Set the 100% weight.

- This command specifies the 100% weight in the Percentage mode. The unit should be the same three characters specified in the "**? U**" command.

Command example:

Reply	%	1	0	.	1	2	(20H)	(20H)	g	cr
-------	---	---	---	---	---	---	-------	-------	---	----

6) **@** Set the unit weight.

- This command specifies the unit weight in the Counting mode. The unit should be the same three characters specified in the "? **U**" command.

Command example:

Reply	@	0	.	1	2	3	(20H)	(20H)	g	cr	lf
-------	---	---	---	---	---	---	-------	-------	---	----	----

7) **H I** Request the HI limit.

- This command specifies the upper (HI) limit. If no unit is specified after the value, the upper limit will be set by the unit currently displayed. To specify the unit, use the same three characters specified in the "? **U**" command.

- The upper limit can be a maximum of seven digits. A negative value can be also used. No need to enter zeros to fill up the left side of the value or add unnecessary zeros after the decimal point.

Command example:

Reply	H	I	.	+	1	2	8	.	0	0	0	0	(20H)	(20H)	g	cr	lf
-------	---	---	---	---	---	---	---	---	---	---	---	---	-------	-------	---	----	----

8) **L O** Set the LO limit.

- This command specifies the lower (LO) limit. To specify the unit, use the same three characters specified in the "? **U**" command.

- The lower limit can be a maximum of seven digits. A negative value can be also used. No need to enter zeros to fill up the left side of the value or add unnecessary zeros after the decimal point.

Command example:

Reply	L	O	.	-	1	0	0	.	0	0	0	0	(20H)	(20H)	g	cr	lf
-------	---	---	---	---	---	---	---	---	---	---	---	---	-------	-------	---	----	----

9) **C K** Request the time.

- Set the time in the format of "hours : minutes : seconds" in the 24-hour style.

Command example:

Reply	C	K	1	4	:	3	4	:	5	6	cr	lf
-------	---	---	---	---	---	---	---	---	---	---	----	----

Hours Minutes Seconds

10) **D T** Request the date.

- This command sets the date (year, month and date). The order of the year, month and date can be changed by the internal setting (page 10-8).

Command example:

Reply	D	T	9	2	-	0	9	-	2	3	cr
	Year				Month				Date		

11) **T I** Request the interval time.

- Specify the interval time in the format of "hours : minutes : seconds" in the 24-hour style.

Command example:

Reply	T	I	0	0	:	0	5	:	0	0	cr
	Hours				Minutes				Seconds		

12) **#** Set the code number.

- This command specifies the code number to be affixed to the next data output. The "#" command should be followed by a maximum of 6-digit positive. Using a negative sign or decimal point will result in an error.

Command example:

Send	#	1	2	3	4	5	6	cr	
	or	#	1	2	3	4	5	6	cr

13) **\$** Set the code string.

- This command specifies the code string. The "\$" command should be followed by a 6-digit characters, including a space or hyphen (-). Note that a code string must consist of six characters.

Command example:

Send	\$	8	8	-	1	(20H)	2	cr
------	----	---	---	---	---	-------	---	----

14) **T G** Set the target weight

- This command specifies the target weight for the Vibratory Spoon. If no unit is specified after the value, the target value will be set by the unit currently displayed. To specify the unit, use the same three characters specified in the "? U" command. No need to enter zeros to fill up the left side of the value or add unnecessary zeros after the decimal point.

Command example:

Send	T	G	2	.	0	0	0	0	(20H)	(20H)	g	cr
------	---	---	---	---	---	---	---	---	-------	-------	---	----

15) **M L** Set the coefficient in the MLT mode.

Send	M	L	3	.	0	cr
------	---	---	---	---	---	----

This example shows that 3.0 is newly set.

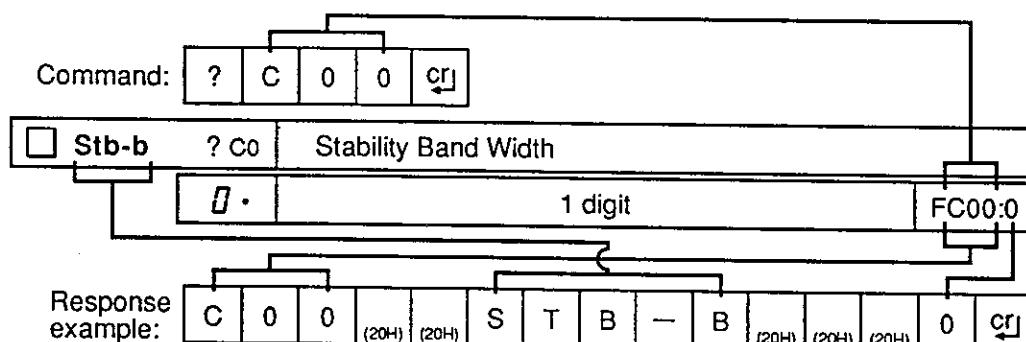
The input range of coefficient is 0.000000 to 10000.00.



Commands to output data from the balance

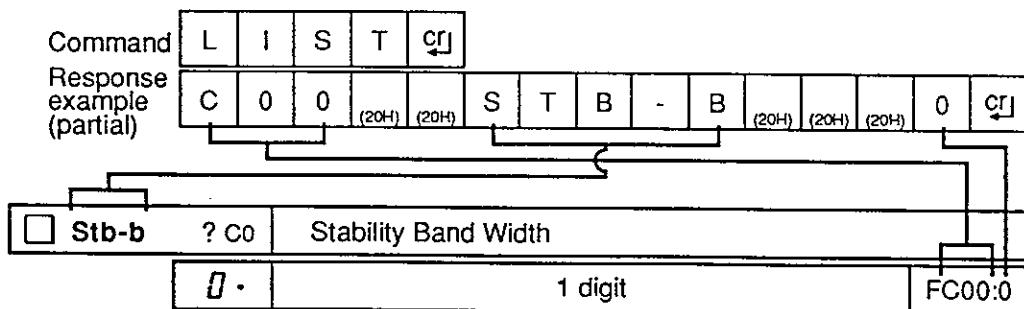
1) **? C (n) (m)** Request a Parameter Setting

- This command outputs the set value of the internal setting. The "? C" command should be followed by the Parameter Group # and the Parameter Name.



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

- This command outputs the internal setting list.

3) **? A L L** Request all user defined Parameters.

- Nine sets of data will be sent by the balance in reply.

Command

?	A	L	L	cr
---	---	---	---	----

Response example

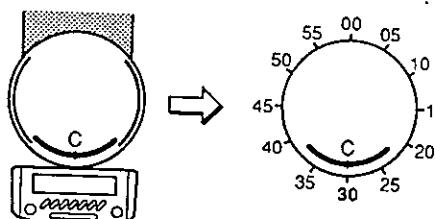
Target weight	T	G	,	+	0	0	2	.	0	0	0	0	(20H)	(20H)	g	cr
HI limit	H	I	,	+	1	5	0	.	0	0	0	0	(20H)	(20H)	g	cr
LO limit	L	O	,	-	0	5	0	.	0	0	0	0	(20H)	(20H)	g	cr
100% weight	%	W	,	+	1	2	3	.	4	5	6	7	(20H)	(20H)	g	cr
Calibration mass set value	C	W	,	+	2	0	0	.	0	0	0	0	(20H)	(20H)	g	cr
Interval time	T	I	,	0	0	:	0	5	:	0	0	0	0	0	0	cr
Time	C	K	,	0	1	:	2	3	:	4	5	5	5	5	5	5
Code number	N	o	.	(20H)	1	2	3	4	5	6	6	6	6	6	6	6
Code string	C	O	D	E	(20H)	1	2	3	-	5	6	6	6	6	6	6

4) **? O P** Output the Door Open position.

- This command outputs the set Door Open position. The data will be output from the balance in the format of "**O P X X**" The position is specified by the two digits "XX" (XX: 00 to 59).

○ XX

Looking from the top of the balance, the weighing chamber is divided into 60 sections clockwise. Specify a Door Open position by determining on which point the center (C) of the front door is positioned. In this example, XX = 30.



○ Operation example:

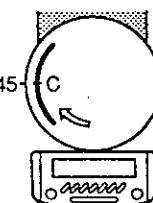
Command

?	O	P	cr
---	---	---	-----------

Response example:

O	P	,	4	5	cr
---	---	---	---	---	-----------

(The Door Open position is specified as "45" as shown in the figure.)

5) **? C L** Output the Door Close position.

- This command outputs the set Door Close position. The data will be output from the balance in the format of "**C L X X**" The position is specified by the two digits "XX" (XX: 00 to 59).

○ For details of the value XX, see the section of the "**? O P**" command.

○ Operation example:

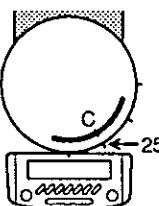
Command

?	C	L	cr
---	---	---	-----------

Response example:

C	L	,	2	5	cr
---	---	---	---	---	-----------

(The Door Close position is specified as "25" as shown in the figure.)



6) **?D|R** Output the current door position.

- This command outputs the current door position.
- The data will be output from the balance in the format of "**A|C|X|X**" or "**N|A|X|X**." The door position is expressed by the two digits "XX" (00 to 59). (For details of the value XX, see the section of "?OP" command.) If the door is rotating when the balance receives the "**?D|R**" command, "**A|C**" will prefix to the value XX. Otherwise "**N|A**" will prefix to the value XX.

○ Example:

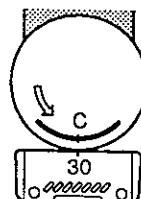
Command

?	D	R	cr
---	---	---	----

Response example 1:

A	C	,	3	0	cr
---	---	---	---	---	----

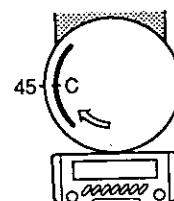
(The door is rotating and is in the position "30" as shown in the figure.)



Response example 2:

N	A	,	4	5	cr
---	---	---	---	---	----

(The door is in the position "45" as shown in the figure.)

7) **?C|W** Output the weight of the external calibration mass.

Command

?	C	W	cr
---	---	---	----

Response example:

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

8) **?U** Request the Balance's present weighing unit

- This command outputs the unit currently indicated on the display. The unit should be the same three characters affixed to the weight data in the A&D standard format.

Command

?	U	cr
---	---	----

Response example:

(20H)	m	g	cr
-------	---	---	----

9) **?% Output the 100% weight.**

- This command outputs the 100% weight stored in memory. The unit of the data to be output is the unit currently indicated on the display. (However, the unit of the output data is grams ("g") in the Counting or Percentage mode.)

Command

?	%	cr
---	---	----

Response example:

%	W	,	+	1	2	3	.	4	5	6	7	(20H)	(20H)	g	cr
---	---	---	---	---	---	---	---	---	---	---	---	-------	-------	---	----

10) **?@ Output the unit weight.**

- This command outputs the unit weight. The unit of the data to be output is the unit currently indicated on the display. (However, the unit of the output data is grams ("g") in the Counting or Percentage mode.)

Command

?	@	cr
---	---	----

Response example:

U	W	,	+	0	0	0	.	0	0	0	5	(20H)	(20H)	g	cr
---	---	---	---	---	---	---	---	---	---	---	---	-------	-------	---	----

11) **?HI Output the upper limit.**

Command

?	H	I	cr
---	---	---	----

Response example:

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

12) **?LO Output the lower limit.**

Command

?	L	O	cr
---	---	---	----

Response example:

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

13) **?CK Request the time.**

- This command outputs the current time (in the 24-hour style).

Command

?	C	K	cr
---	---	---	----

Response example:

C	K	,	1	4	:	2	3	:	4	5	cr
---	---	---	---	---	---	---	---	---	---	---	----

Hours Minutes Seconds

14) **?DT** Request the date.

- This command outputs the date (year, month and date). The order of the year, month and date can be changed by the internal setting (page 10-7).

Command **?DT**

Response example: **D A T E (20H) 9 2 — 1 2 — 3 1**
 Year Month Date

15) **?TI** Request the interval time.

Command **?TI**

Response example: **T I , 0 1 : 0 5 : 0 0**
 Hours Minutes Seconds

16) **?#** Request the code number.

Command **?#**

Response example: **N o . (20H) 1 2 3 4 5 6**

17) **?\$** Request the code string.

Command **?\$**

Response example: **C O D E (20H) 1 2 3 — 5 6**

18) **?TG** Request the target weight.

Command **?TG**

Response example: **T G , + 0 0 2 . 0 0 0 0 (20H) (20H) g**

19) **? M L Request the coefficient.**

Command

?	M	L	cr
---	---	---	----

Response example:

M	L	,	+	2	5	.	0	0	0	0	0	cr
---	---	---	---	---	---	---	---	---	---	---	---	----

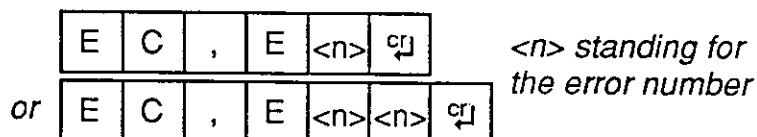


Error Codes for the Command Mode



In the command mode, the computer can receive an error code from the balance if the software parameter 'E - L ad c6' is set at '1'.

- If no error is detected, the balance outputs the data requested by the data request command ("S," etc.) and "AK (06E)" for other commands. Therefore, the balance always responds to every command, enhancing the reliability of external control.
- For example, the "Q" command is sent when the balance is not ready for outputting data. This may cause the computer to be stuck, waiting for the data to be sent. If the balance is set to send error codes, the flow of control can be changed by these error codes.
- The error code will be output in the format beginning with a header "EC," followed by an "E" and a number expressing the error type. <n> is the error number.



E0 Communication Error

- A communication error is detected.
 - (1) Parity error: Parity does not match. The data length may different from the setting.
 - (2) Framing error: The data length, etc. may be different form the setting.
 - (3) Other communication error

E1 Undefined Command Error

- The command does not comply with the standard format (excluding numerical value).

Example: ? t g cr (The command must be in uppercase.)

E2 Execution impossible Error

- The balance cannot execute the command.
 - (1) When the balance is not in the weighing mode, the data request commands such as "Q" cannot be executed.
 - (2) While the RE-ZERO function is performed, the data request commands cannot be executed.

E3 Time Over Error

- After the balance receives a character other than the terminator, this error will occur when there is a blank more than 1 second until the next start bit is received. (See "*L-UP D.c6*" of "Internal Setting" on page G-16.)

E4 Too Many Characters Error

- The numerical value in a command exceeds the allowable digit range.

Example:

C	W	+	1	5	0	.	1	2	3	4	5	(20H)	(20H)	g	cr
---	---	---	---	---	---	---	---	---	---	---	---	-------	-------	---	----

E5 Terminator Error

- When using the terminator <CR><LF>, more than two characters other than <LF> follow <CR>, or the balance receives <LF> before <CR>.

E6 Format Error

- The numerical value (including ";" "+" and "-") in a command is written incorrectly. Example:

Example:

C	W	1	0	0	(20H)	(20H)	g	cr
---	---	---	---	---	-------	-------	---	----

(The unit must be "g" for gram.)

E7 Out of range Error

- The numerical value in a command exceeds the allowable range.

Example:

T	G	+	3	2	0	.	0	(20H)	(20H)	g	cr
---	---	---	---	---	---	---	---	-------	-------	---	----

E11 Stability Error

- Balance display: "Error 1"
- See page M-5.

E12 Stability Error

- Balance display: "Error 2"
- See page M-5.

E14 Weighing Pan Error

- Balance display "Error 4"
 - See page M•5.
-

E15-18 Internal Error

- Balance display: "Error 5→8"
 - See page M•5.
-

E20 Calibration Error

- Balance display "CAL E"
 - See page M•6.
-

E21 Calibration Error

- Balance display "- CAL E"
 - See page M•6.
-

E23 Calibration Error

- Balance display "CAL no"
 - See page M•6.
-

E40 RE-ZERO Error

- RE-ZERO cannot be performed.

Command Examples Illustrated



The following examples illustrate the interaction between the host computer and the HA 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:

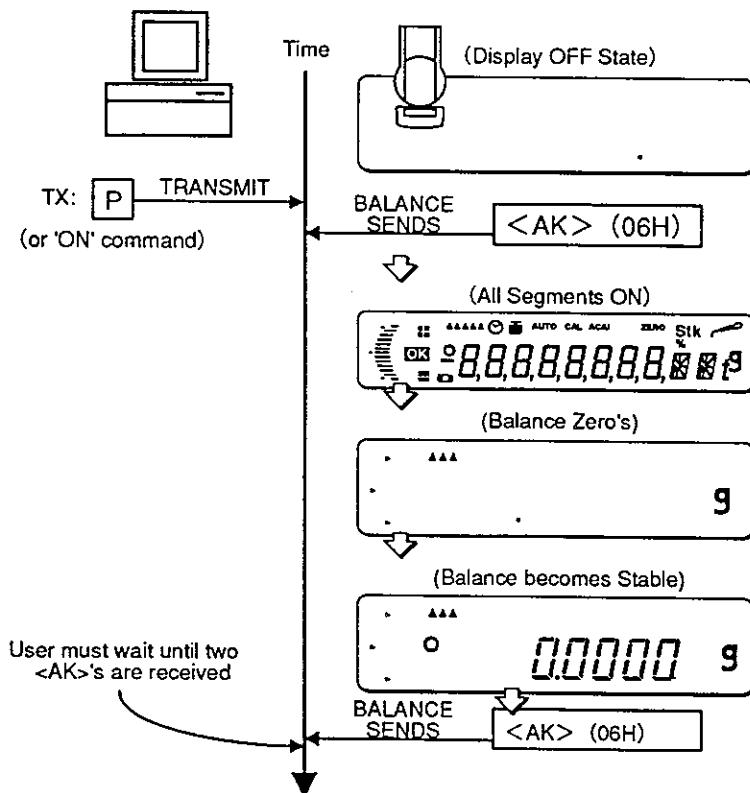
```

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...

```

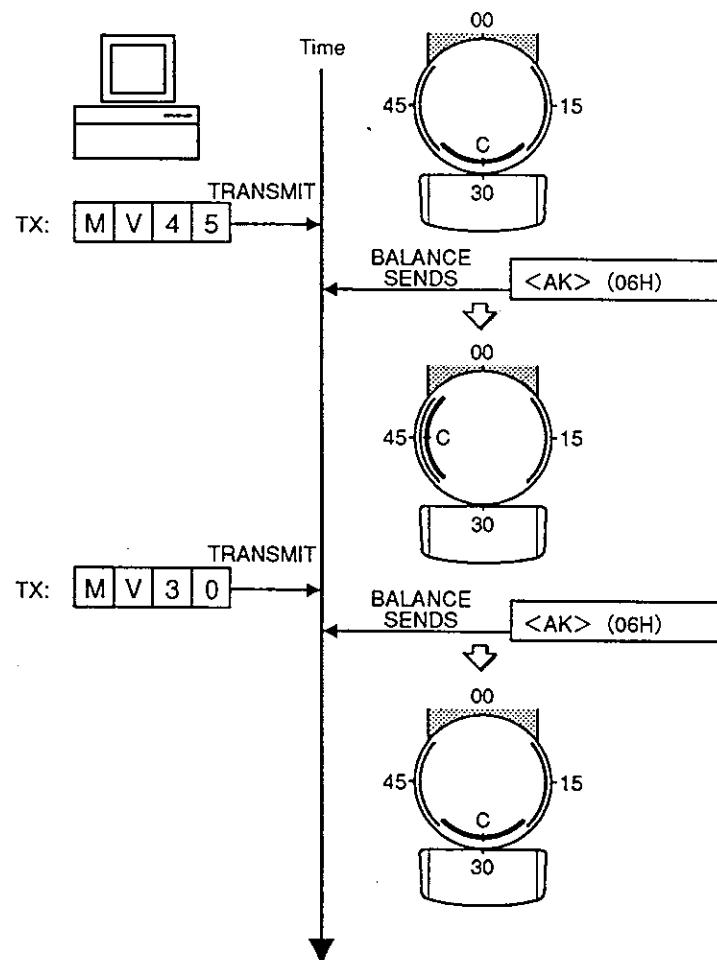
Where n = a value ~ 100, 1000, 5000 that will set the computer to wait for about one second.

I P | O N | Display ON/OFF

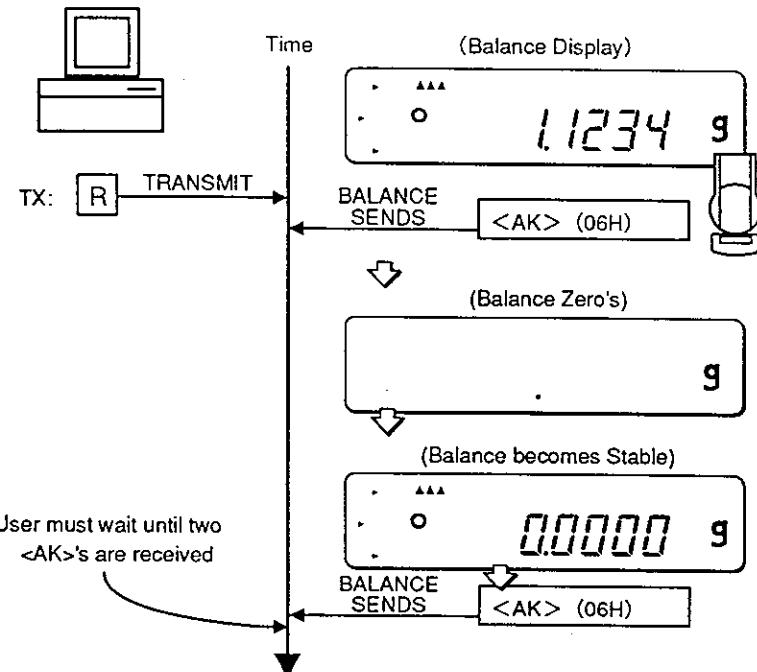


**MV" Command (to rotate the breeze break door to the specified position)**

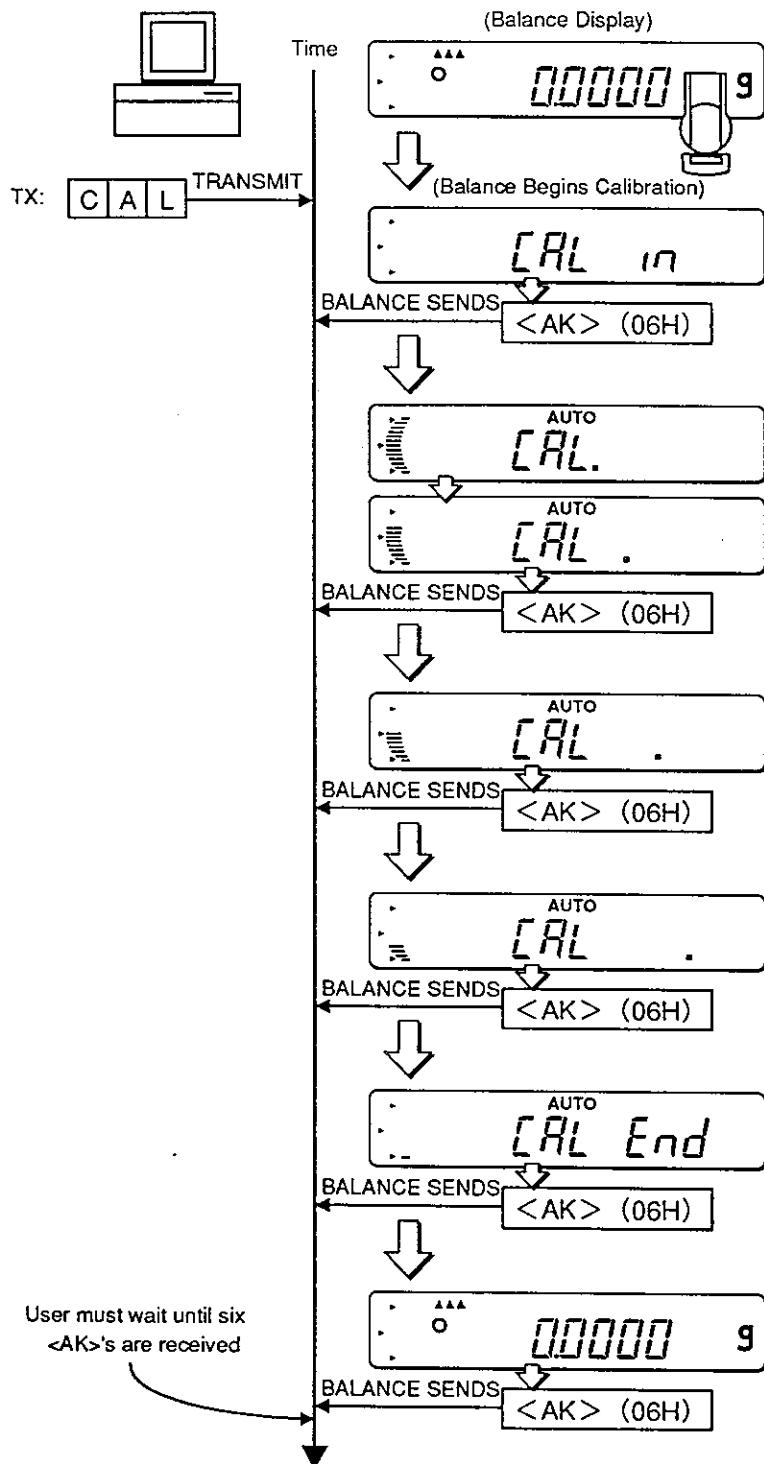
- See "MV Command" on page K-22.



2 R T T A R E ReZero or Tare



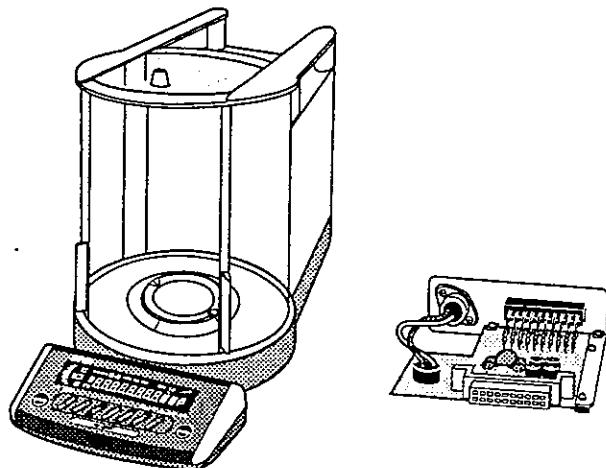
3 C A L Calibration



HA-200A • Section L

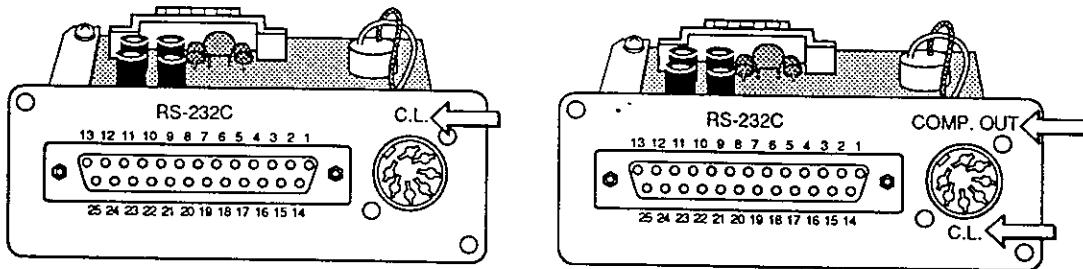
Serial Interface OP-04 (Option)

* This chapter applies to the HA-200A balances in which the OP-04 is installed.



Difference between OP-04 and OP-03

□ Overview difference



While "C.L." is indicated on the panel of the OP-03, "COMP.OUT" and "C.L." are indicated on that of OP-04. Note that the shape and connector positions are the same for both OP-03 and OP-04.

□ Functional difference

The OP-04 has two more functions than the OP-03.

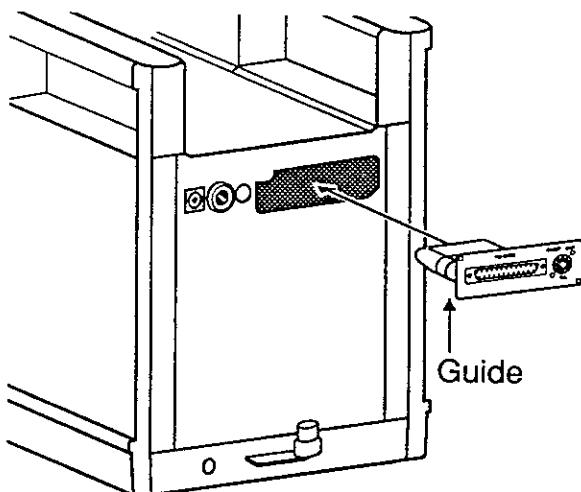
- Functions of the OP-03:
 - (1) RS-232C interface
 - (2) Current loop output
- Functions of the OP-04:
 - (1) RS-232C interface
 - (2) Current loop output
 - (3) Comparator contact output
 - (4) External input function

□ The specifications of the RS-232C and current loop connectors are the same for both OP-03 and OP-04. For details of the RS-232C and current loop connectors of the OP-04, see "OP-03 Serial Interface" on page K-1.



Installing the OP-04

- 1** Disconnect the AC adaptor from the balance. Remove the two screws from the rear panel of the balance.
- 2** Insert the OP-04 board guide into the substrate slot of the balance. Confirm that the connector is correctly connected.
- 3** Fasten the OP-04 with the two screws removed in step **1**.

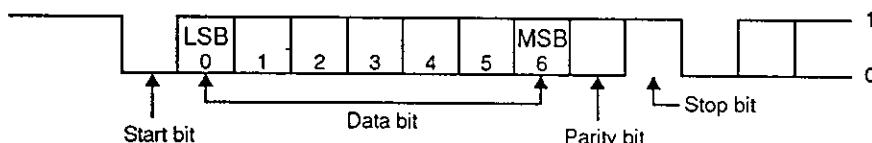


Specifications

RS-232C and current loop

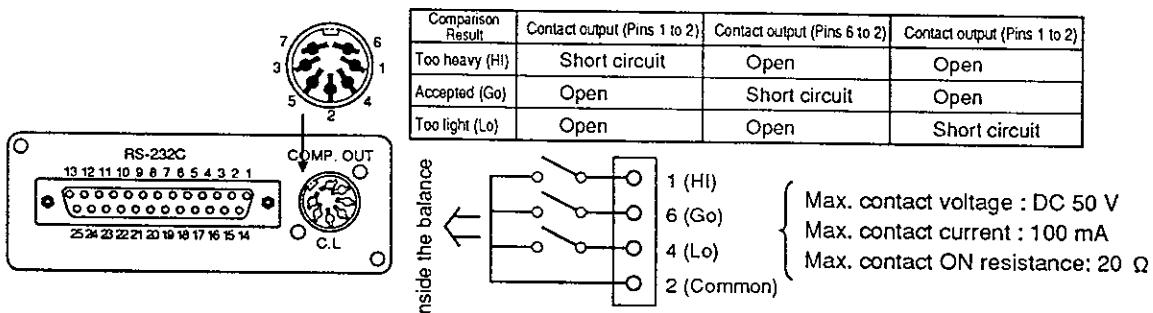
Transmission mode: EIA RS-232C, 20 mA current loop (passive)
 Transmission format: Start-stop (asynchronous), bidirectional, half-duplex
 Signal format:
 Baud rate: 600, 1200, 2400, 4800, 9600 bps
 Data bit: 7 or 8 bits
 Parity: EVEN/ODD (7 bits)
 NONE (8 bits)
 Stop bit: 1 or 2 bits
 Code: ASCII

RS-232C	20mA current loop
1=-5V~-15V	20mA
0=+5V~+15V	0mA



▣ Comparator contact output

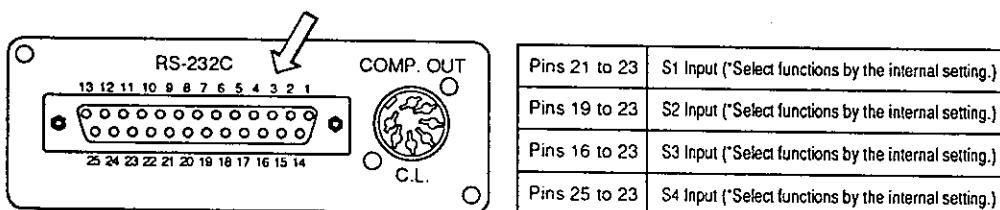
The comparator of the balance outputs the result in either "HI," "GO" or "LO," and this can be retrieved by contact output. (See "Comparator Function" on page D-7.)



▣ External contact input

Contact input can be performed from external equipment by using available pins of the RS-232C connector. Contact input from S1 to S4 can be performed, resulting in the same operations as when using the keys on the front panel of the balance. The contact inputs S1 to S4 can be assigned by changing the internal setting.

* For details of changing the internal setting, see pages G-4 and G-19.



<i>Cont</i>	<input type="checkbox"/> Cont ?c9	Select external input terminal function.
-------------	--	--

④ •	External input terminal in the rear panel of the balance	OP-04 external input function S1 S2 S3 S4	FC90:0
	RE-ZERO (page B•14)	door door door SET RE-ZERO (Left) (Right)	
/	PRINT (page.B•14)	door door door SET RE-ZERO (Left) (Right)	FC90:1
2	Controlling of the Vibrospoon (page J•2)	door door door SET RE-ZERO (Left) (Right)	FC90:2
3	door (right) (page B•10)	RE-ZERO PRINT CAL NO:OFF	FC90:3

The setting marked with "." is the default.

Pin Connection

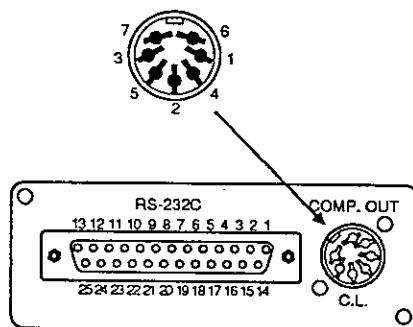
25-pin connector

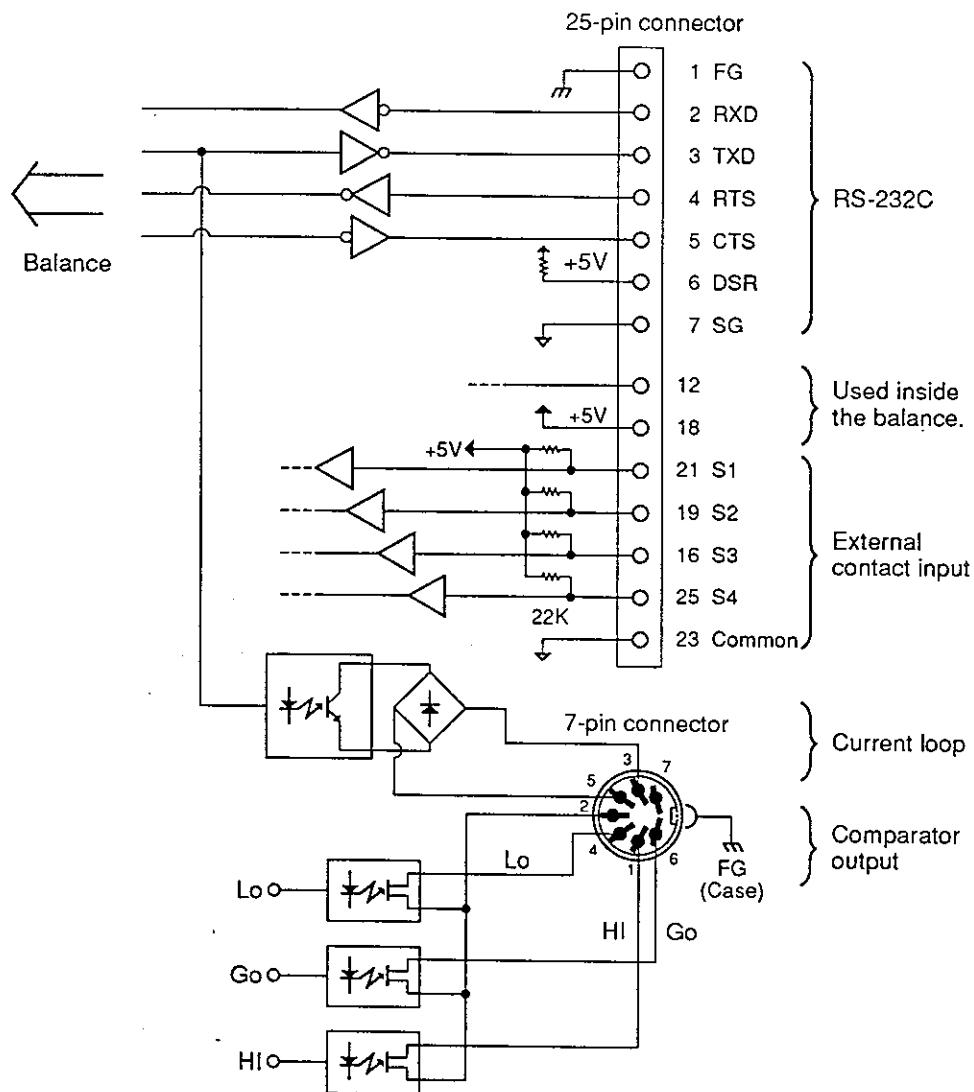
	Pin No.	Signal name	Direction	Descriptions
RS-232C	1	FG	↔	Frame ground
	2	RXD	IN	Receiving data
	3	TXD	OUT	Sending data
	4	RTS	IN	Request to send data.
	5	CTS	OUT	Sending enabled.
	6	DSR	OUT	Data set ready.
	7	SG	↔	Signal ground
External Input	21, 23	S1	IN	Functions the same as with the left DOOR key when short-circuiting.*
	19, 23	S2	IN	Functions the same as with the right DOOR key when short-circuiting.*
	16, 23	S3	IN	Functions the same as with the DOOR SET key when short-circuiting.*
	25, 23	S4	IN	Functions the same as with the left PRINT key when short-circuiting.*
	12	—	—	Used by the balance.
	18	—	—	Used by the balance (+5V).
	8, 9, 10, 11, 13, 14, 15, 17, 20, 22, 24	N.C.		Not connected.

*** Indicates factory setting.

7-pin connector

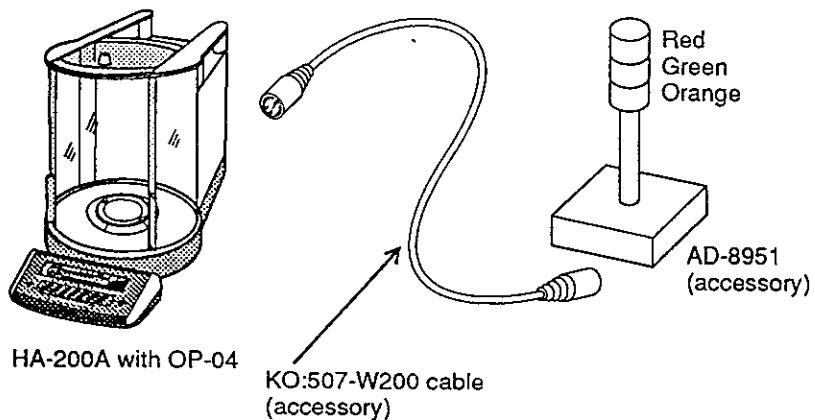
	Pin No.	Signal name
Current loop	3, 5	Transmitting loop
Comparator output	1, 2	Outputs short circuit by Hi.
	6, 2	Outputs short circuit by Go.
	4, 2	Outputs short circuit by Lo.
	7	Not connected.
Connector shell		Case




Circuitry


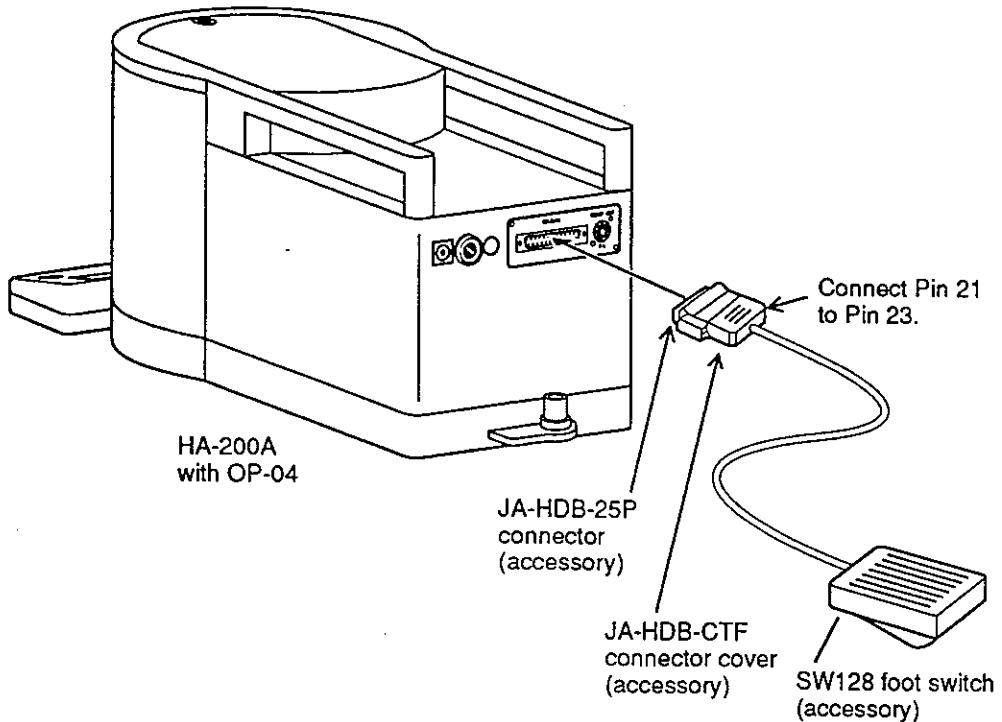
Example of Using Comparator Output

- When connecting the AD-8951 comparator light (accessory) to the balance: The comparison results ("HI/Gd/Ld") of the balance are displayed by the comparator light (red/green/orange).



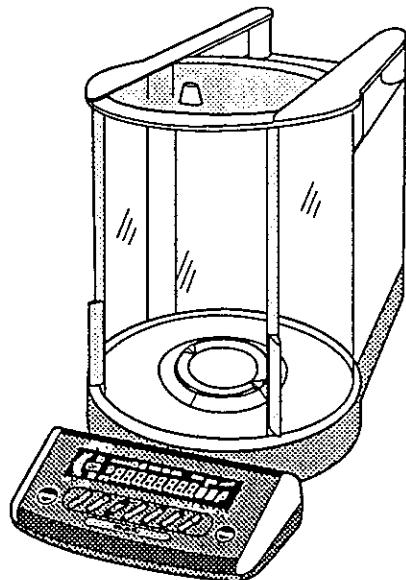
Example of Using the External Input Terminal

- When connecting the SW128 foot switch (accessory) to the balance: The door opens/closes each time the foot switch is turned ON.



HA-200A • Section M

Miscellaneous

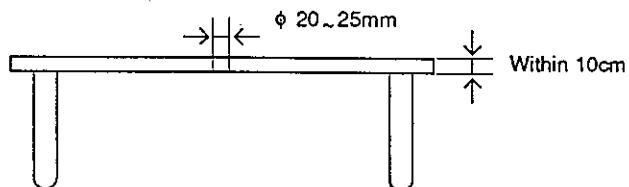




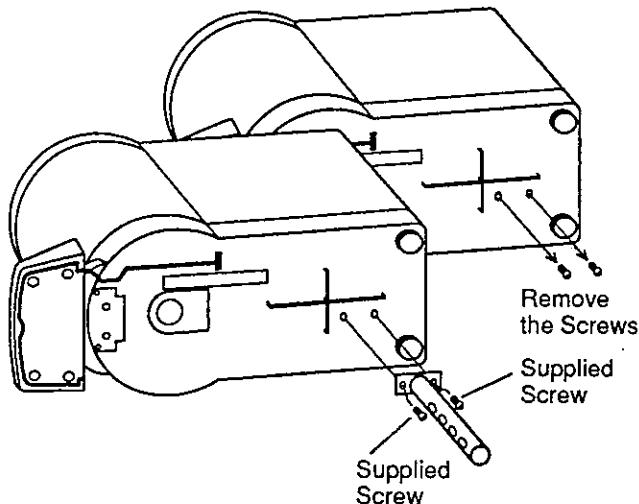
OP-11 Anti-theft Device

- !** ○ The OP-11 is an anti-theft device to securely connect the balance table to the balance to prevent theft.
- Lock-in table type
- The balance table mounting section should have a thickness of 10cm max.
- The balance table mounting section should have a ø25mm hole.

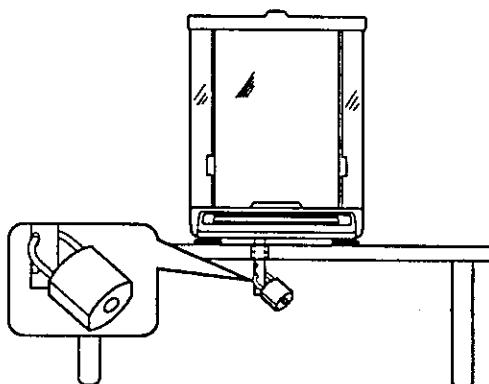
- 1** Cut a hole ($\phi 20\sim\phi 25\text{min}$) in the balance table



- 2** Remove the two screws on the bottom of the balance to mount the anti-theft device.
 Mount the anti-theft device with supplied two screws.



- 3** Put the anti-theft device through the table hole and lock it.





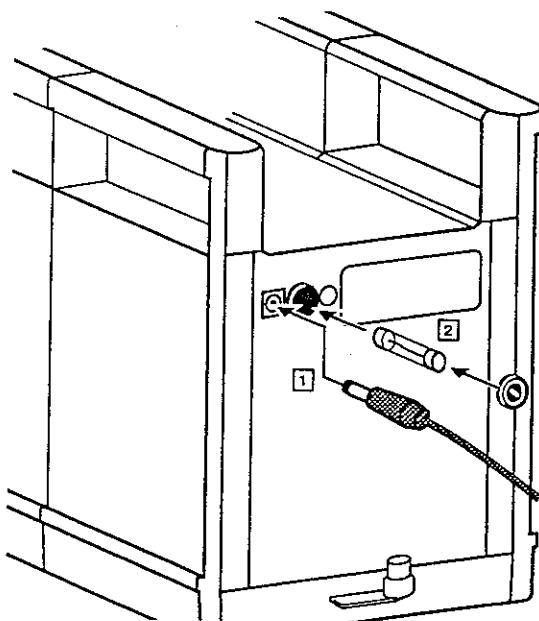
Trouble?

- Display does not stabilize.
 - Check if the balance table is steady. Use a steady table.
 - Check if the draft ring and weighing pan are set correctly.
 - Check if the balance breeze break door is closed properly. Close it so that drafts do not cause instability.
 - Check for the air flow around the balance. Block off the air flow as much as possible.
 - After checking all of the above, hold down the **MODE** key for 2 seconds and display four indicators (**▲▲▲▲**) on the Environment Setting monitor (or change the internal setting "Land Co" to "4"). (See pages G-4 and G-7)
 - Ask for servicing if the display remains unstable.

- There is no repeatability of the weighing value. An apparently incorrect value is displayed.
 - Check if the balance is leveled using the Spirit Level.
 - Check if the breeze break door is properly opened.
 - Check if the balance has been warmed up for over one hour.
 - Check if calibration has been performed under stable conditions.
 - Check if the **RE-ZERO** key has been pressed before putting the sample on the pan.
 - Check if the sample comes into contact with any part of the weighing chamber other than the pan.
 - Check if the sample is on the center of the pan. Putting the sample on the edge of the pan may cause an error.
 - Check if the sample has been charged by static electricity. If charged, put the sample in the conductive container for weighing. (Refer to page D-18)
 - Check if a magnetic substance such as iron has been used as a sample. Since the HA series uses a magnet, weighing of a magnetic substance may cause an error. In this case, perform underhook weighing. (Refer to page D-20)
 - Check for temperature difference between air inside the weighing chamber and the sample and tare. Leave the sample and tare in the weighing chamber for a while before weighing. (Refer to page D-18)
 - Check the air density for the day of data recording. With changes in atmospheric pressure, temperature, and humidity, the air density may cause fluctuation of the air buoyancy of the sample, causing reduced reliability of the results of a weighing. Special care should be given to a relatively large volume sample.
 - After checking the above, if there is still no repeatability of the balance, ask for servicing.

- The power indicator (standby decimal point at the right side) does not illuminate even when the AC adaptor is plugged in. The display does not react, even if the **ON:OFF** key is pressed.
 - Replace the fuse on the rear of the balance according to the procedure shown in the figure on the next page.

Fuse Replacement



Disconnect the AC adaptor cable from the balance. **[1]**

With the fuse holder pressed in, make a half turn to the left and pull out the fuse with the cap.

Replace the fuse in the cap with a new 800 mA, slow blow fuse. Align the projected part of the cap to the fuse holder. With the holder pressed in, make a half turn to the right. **[2]**

After replacement, if the fuse burns out again, ask for servicing.

Error Display and Countermeasures

- Power failure

P-FR IL

"P-FR IL" indicates that the power was interrupted during the last time the balance was used.

- Press the **[ON:OFF]** key.

- Internal operation error

Error 0

"Error 0" indicates that an error occurred during the internal operation of the balance.

- Ask for servicing.

Error indicating unstable state

Error 1

- "Error 1" indicates that the zero display does not appear because the balance is unstable during the RE-ZERO operation.

Error 2

- "Error 2" indicates that the balance is unstable when the unit weight or 100% weight is stored in memory in the Counting or Percentage mode.

- Check for vibrations and drafts and press the **RE-ZERO** key. Refer to "Trouble?" on page M-3.

Digital input error

Error 3

- "Error 3" indicates that the value digitally entered for the unit weight or the percentage weight is out of the specified range.

- Confirm the range and enter the correct value.

Weighing pan error

Error 4

- "Error 4" indicates that the **ON:OFF** key was pressed with the weighing pan, balance weight and pan support assembled incorrectly, or with an object on the weighing pan.

- Assemble the weighing pan, balance weight and pan support correctly. Remove any objects from the weighing pan. If the error still continues, ask for servicing.

Memory error

Error 5

- "Error 5" to "Error 8" indicates a balance memory error.

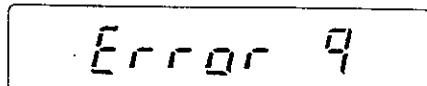
Error 6

- Disconnect the AC adaptor from the balance and reconnect it after several seconds. If this error still continues, ask for servicing.

Error 7

Error 8

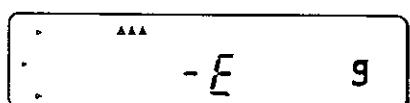
Door drive error



"Error 9" indicates that the front door drive operates improperly.

- ▶ Check for an obstacle touching the front door, then reconnect the AC adaptor. If this error still continues, ask for servicing.

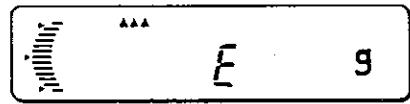
Weighing pan error



"- E" indicates that the weighing pan, balance weight and pan support are not assembled correctly.

- ▶ After assembling correctly, if the error still continues, ask for servicing.

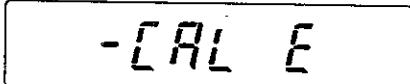
Overload error



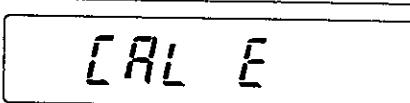
"E" indicates that the weight of a weighed object exceeds the balancing capacity.

- ▶ After removing the object, if the error still continues, ask for servicing.

Calibration error



"- CAL E" indicates that the calibration mass is too light for calibration.



"CAL E" indicates that the calibration mass is too heavy for calibration.

- ▶ Check that all objects are removed from the pan, the weighing pan is assembled correctly, and the value of the weight corresponds to the set value, then press the [RE-ZERO] key.

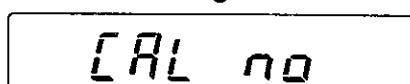
Power voltage error



A blinking **B** (battery) indicates that the power voltage is too low.

- ▶ Confirm that the power voltage is within a range of +10% and -15%.

Error indicating unstable state

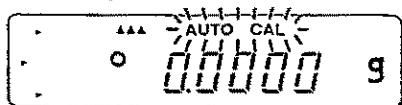


"CAL no" indicates that calibration cannot be performed because the balance is unstable due to factors such as vibrations and drafts.

- ▶ Check for vibrations and drafts, and then press the [RE-ZERO] key.

Refer to "BEST CONDITIONS FOR WEIGHING" on page A-3.

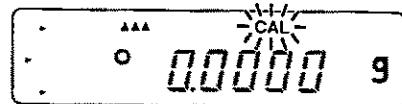
□ Blinking "AUTO CAL" indicator



The "AUTO CAL" indicator blinks to indicate a change in the ambient temperature. This is not an error.

- After about two minutes, calibration is automatically started by the auto self-calibration function.
Refer to "Automatic Self-Calibration" on page C•3.

□ Blinking "CAL" indicator



The "CAL" indicator blinks to indicate a change in the ambient temperature. This is not an error. Only a warning is given, and calibration does not start automatically. This is because the internal setting is set to "[RL / C2]." Refer to page G•9.



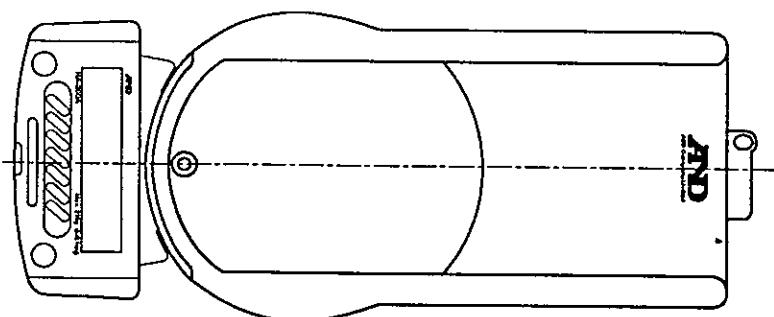
Maintenance

- Maintenance method
- Keep the inside of the weighing chamber clean. The adhesion of samples to the weighing pan causes error in weighing.
- If the balance is dirty, wipe with a soft cloth. Never use solvents such as thinner.
- If the breeze break glass, pan, and floor plate (made of glass) are dirty, clean with alcohol.

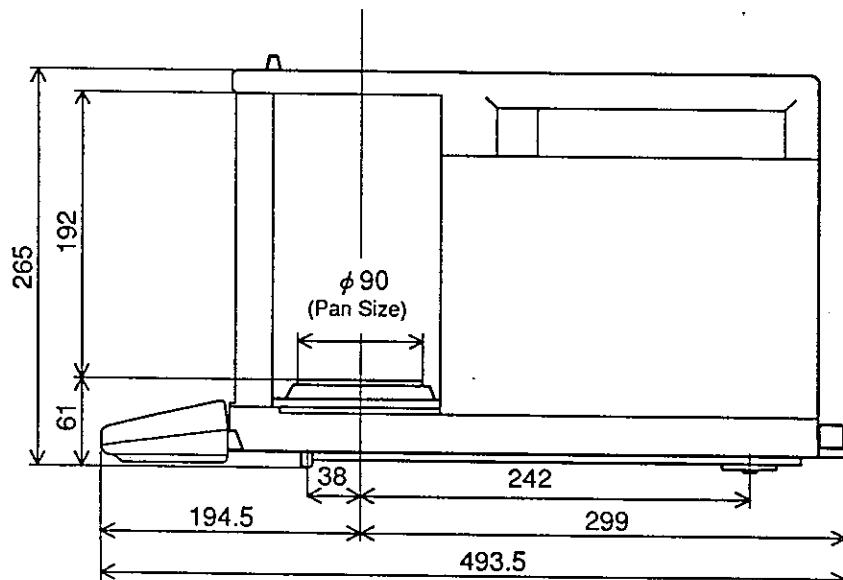
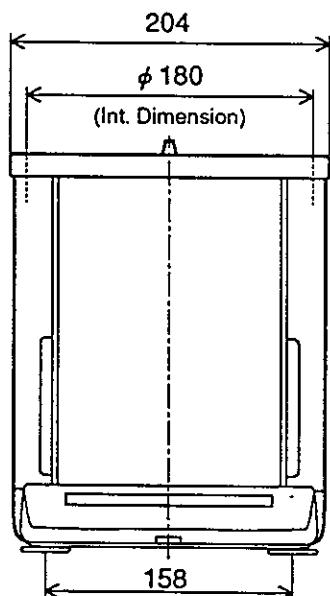
- Uneven brightness of the display
The prolonged disuse of the balance may produce unevenness in display brightness. In this case, take the following procedures:
 - Turn off the display.
 - With the [RE-ZERO] key held down, press the [ON:OFF] key. All displays are illuminated.
 - Leave it on for several hours.
 - Press the [ON:OFF] key to cancel this state.



External Dimensions



TOP VIEW



FRONT VIEW

SIDE VIEW

A

A&D Standard Format.....K•12
ACAI.....E•2, E•4
Accessories & Options.....B•5
AD-1651 Vibratory Spoon.....J•1
AD-1652 Remote Code Number.....H•17
AD-1652 Wireless Remote Keyboard.....H•1
AD-8121.....K•10, K•11
Air buoyancy.....D•19
Analog color bar graph.....B•9
Analog output.....B•5
Analog Output (C-Parameter).....G•17
Anti-theft Device.....M•2
Arbitrary coefficientB•3, B•17
Auto Door (C-Parameter).....G•11
Auto Print Mode.....K•5
Auto Re-Zero (C-Parameter).....G•10
Auto Self-Calibration.....C•3
Automatic Open/Close Mode 1.....B•25
Automatic Open/Close Mode 2.....B•28

B

Battery Mark.....B•9
Best Conditions For Weighing.....A•3

C

Calibration (C-Parameter).....G•9
Calibration key.....B•11
Chamber dimensions.....B•3
Changing C-Paramer Settings.....G•4
Clock mark.....B•9
Code Number.....K•16
Code String.....K•16
Command Examples Illustrated.....K•40
Commands.....K•18
Commands to Control the Balance.....K•22
Commands to Output data from the balance.....K•30
Commands to Output the Weight Data.....K•25
Commands to Request Settings.....K•26
Comparator Display.....B•9, D•7
Comparator Function.....D•7
Comparator Output (C-Parameter).....G•18
Confirmation of Calibration.....C•9
Confirming and Altering the Date.....A•13
Confirming and Altering the time.....A•11
Counting Mode.....E•1

D

Data from the Front Panel key.....J•5
Data Output (C-Parameter).....G•12
Date (RS-232C).....K•16
Difference between OP-04 and OP-03.....L•2
Digital Setting HI/LO Limits.....D•11
Display (C-Parameter).....G•7
Displaying the Time and Date.....A•9

Door key.....B•10
Door Set key.....B•14
DP (Dump Print) Format.....K•8, K•12

E

Environment (C-Parameter).....G•6
Error 0.....M•4
Error 1.....M•5
Error 2.....M•5
Error 3.....M•5
Error 4.....M•5
Error 5.....M•5
Error 6.....M•5
Error 7.....M•5
Error 8.....M•5
Error 9.....M•6
Error Display and Countermeasures.....M•4
Expanding the Applications of the HA-200A by internal settingG•3
Extension cable.....B•5
External dimensions.....B•3
External input terminal.....B•5, L•8

F

Feeding Accuracy.....J•3
Filler mark.....B•9
Fuse Replacement.....M•4

I

Influence of magnetism.....D•18
Inputting digitally 100% weight.....F•5
Installing the OP-03.....K•2
Installing the OP-04.....L•3
Internal C-Parameter Settings.....B•6, G•1

K

KF Format.....K•12

L

Linearity.....B•3

M

Making Weighing More Precise.....D•18
Manual Calibration.....C•6
Maximum Displayed capacity.....B•3
Minimum percentage display.....F•3
"MLt" unit mode.....B•17
Mode key.....B•12

O

ON : OFF key.....B•10
One Touch Calibration.....C•5
One-Touch Open/Close Mode.....B•30
Output by Command Mode.....K•6

P

Percent mark.....B•9
Percent Mode.....F•1
Percentage Mode.....F•2
PRINT key.....B•14
Print key Mode.....K•5

R

Range key.....B•12
RE-ZERO key.....B•14
Registering the Target Weight by Entering Digital.....J•5
Registering the Target Weight by weighing an actual object.....J•4

S

Sample key.....B•11
Selecting Weighing Units.....B•15
Sensitivity drift.....B•3
Serial Interface (C-Parameter).....G•15
Setting HI/LO Limits.....D•8
Setting monitor mark.....B•9, D•3, G•7
Setting Target Weight via RS-232C.....J•7
Setting the Built-in Clock.....A•9
Specifications.....B•3
Stability indicator.....B9
Stabilization time.....B•3, D•4
Standard deviation.....B•3
Standby and Operating Modes.....B•6
Static electricity.....D•18
Stream Mode.....K•6
System Selection (C-Parameter).....G•19

T

Target WeightJ•2
Time (RS-232C).....K•16
Timed mode.....K•6
To Start Spoon Feeding.....J•8
To Stop Spoon Feeding.....J•8
Trouble.....M•3

U

Underhook Weighing.....D•20
Underhooking Weighing Example.....D•21
Unit Weight.....E•2
Using RE-ZERO to Tare.....D•15

W

Weight mark.....B•9



A&D Company, Limited

3-23-14 Higashi-Ikebukuro, Toshima-ku, Tokyo 170 Japan
Telephone: [81] (03) 5391-6132 Fax: [81] (03) 5391-6148 Telex: 2422816 AANDD J

A&D ENGINEERING, INC.

1555 McCandless Drive, Milpitas, CA, 95035 U.S.A.
Telephone: [1] (408) 263-5333 Fax: [1] (408) 263-0119

A&D INSTRUMENTS LTD.

Abingdon Science Park, Abingdon, Oxford OX14 3YS England
Telephone: [44] (0235) 550420 Fax: [44] (0235) 550485

A&D MERCURY PTY. LTD.

32 Dew Street, Thebarton, South Australia 5031 Australia
Telephone: [61] (08) 352-3033 Fax: [61] (08) 352-7409

A&D KOREA Limited

3rd Floor Hanam Bldg 44-27 Yoido-dong Youngdeungpo-ku Seoul, Korea
Telephone: [82] (02) 784-4264 Fax: [82] (02) 784-6557