FA SERIES

INSTRUCTION MANUAL

Oweners-FA Series-V.1.b 91.12.10 OGA

PRECISION ELECTRONIC BALANCES

MODELS:FA-200
FA-2000
FA-6000

A&D Company, Limited

COMPLIANCE WITH FCC RULES

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

CONTENTS

INTRODUCTION

THANK YOU FOR YOUR A&D PURCHASE

Every care has been taken during the manufacturing process of this balance to ensure that it will perform accurately and reliably for many years.

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. This manual will try to tell you in simple language how this balance works and how to get the most out of it in terms of performance.

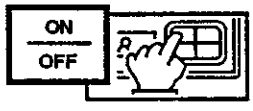
The FA series of precision balances are the product of years of research, design, development and in-field testing. They incorporate the latest advances in electronic & mechanical engineering and offer increased features, functions, precision and portability; all in a low profile balance, Options include rechargeable battery packs, an RS-232C/Current Loop interface and glass breeze breaks for all capacities except FA-6000.

In the FA series there are three single range balances:

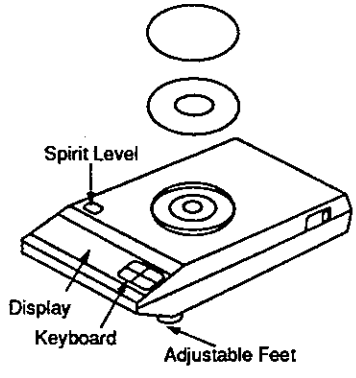
- ❑ **FA-200** (210g x 0.001g)
- ❑ **FA-2000** (2100g x 0.01g)
- ❑ **FA-6000** (6100g x 0.1g)

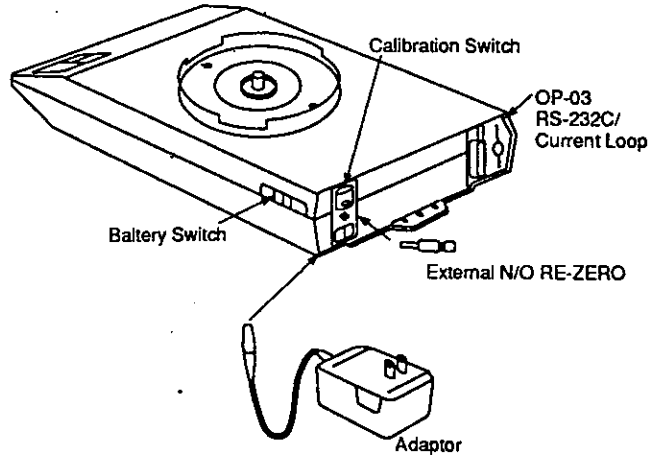
UNPACKING YOUR BALANCE

- Unpack the balance carefully and keep the packing material if you are likely to want to transport the balance again in the future.
- In the carton you should find this manual plus:
  - ❑ The balance
  - ❑ The pan and pan support (for FA-6000 these will be rectangular)
  - ❑ A free protective plastic cover for the balance
  - ❑ An AC/DC adaptor (check that the AC input rating is correct)
  - ❑ A spare fuse (0.5A)
  - ❑ A free plastic breeze break for FA-200
  - ❑ A free jack plug for connecting an external RE-ZERO switch
- Place the balance on a firm weighing table (see BEST CONDITIONS FOR WEIGHING section) and turn the adjustable feet until the spirit level shows that the balance is level.
- Plug in the AC/DC adaptor. The AC input requirements could be 100, 120, 220 or 240 Volts (50/60kHz) depending on the area in the would so please check that the adaptor is correct. The DC output should be 12 Volts (please note that an alternative 12V DC power supply may not be stable enough for this balance). Earth the balance chassis for electrostatic discharge if static electricity could be a problem.



- Press the ON/OFF key, all the display segments will come ON and then the display will zero in preparation for you to place a weight on the pan. at this stage any weight reading will not be very accurate because the balance has not been "calibrated".
- Please leave the balance switched on to "warm-up" for at least 30 minutes and finish reading this manual.





UNDERSTANDING YOUR BALANCE

How does the balance work?

When you put an object on the weighing pan it is pulled downwards under the action of gravity. This balance operates on a principle called "force restoration" which means it attempts to restore (push up) the object which is being pulled down. The balance uses an electromagnet to do this so if we know how much force (electricity) is needed to push against an object we know how heavy it is (how much it is being pulled down). In future we will call the object a "mass" and the measurement of its massiveness on Earth its "weight" (weight = mass X acceleration due to "g").

What is gravity?

Gravity is a force of attraction between material objects in space. The Earth is a large material object (mass) in space and things on its surface at sea level, in a vacuum, accelerate towards its center at a speed of about 9.80665m/s^2 (32.174ft/s^2). Fortunately they don't get there because the surface of the Earth stops them. Unfortunately, this "g" value varies from location to location by about ±0.3% because the force decreases with altitude above sea level or, more correctly, the distance from the center of the Earth ("g" is inversely proportional to the square of the distance between masses). The North and South poles are closer to the center of the Earth than the equator so "g" is greater at the poles and changes with latitude. The sun and the moon have an inconsistent effect with regards to gravity. Air buoyancy acts against gravity by making a mass float upwards at a rate of ≈ 0.0012g (±10% @ 20°C) per cm^3 of air displaced, but this also varies.

What is calibration?

When we weigh a mass we are trying to find its weigh expressed as grams. Because "g" and other factors vary from location to location, we must calibrate the balance whenever we move it otherwise a mass of 10g might display 10.0000g in one location and 10.0267g in another (ie:"g" may have changed by +0.267%. w=m x g). This would be an error but it can be prevented by placing an accurate mass on the balance (say 20g) and then telling the balance, in effect, "this is what 20g weighs at this location so please display "20.0000g"- this is calibration.

Best Conditions For Weighing

- ❑ The Balance must be level (check the spirit level on the Balance).
- ❑ Best 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 sunshine.
- ❑ Try to ensure a stable AC power supply when using an adaptor.
- ❑ Keep equipment containing magnets away from the balance.
- ❑ Warm-up before use or leave on standby (display off) overnight.
- ❑ Earth the balance chassis for electrostatic discharge.

CALIBRATING YOUR BALANCE

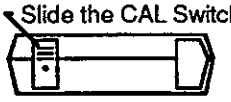
Please Note

Your balance should be calibrated when it is first installed, if it is moved, and then every other week. Please use a high quality non-magnetic, metric stainless steel, "standard Mass" for calibration (≈ 8.0g/cm³) OIML class Fz or better.

- ❑ Standard Mass required for FA-200 is **200g**
- ❑ Standard Mass required for FA-2000 is **2,000g**
- ❑ Standard Mass required for FA-6000 is **5,000g**

NOTE — *The balance must be warmed up (plugged in) for at least 30 minutes before starting calibration.*

Step 1. Turn the display **ON**, and have nothing on the weighing pan.

Step 2. 

Slide the rear calibration switch ON⇑.

DISPLAY 

"CAL 0" will be displayed.

Step 3. 

Press the **RE-ZERO** key.

Step 4. 

DISPLAY 

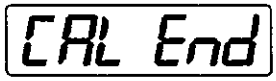
Wait for "CAL F" to be displayed.

Step 5. Place the appropriate Calibration Mass on the weighing pan.

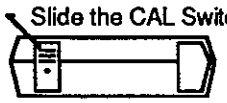
Step 6. 

Press the **RE-ZERO** key.

Step 7. 

DISPLAY 

Wait for "CAL End" to be displayed.

Step 8. 

Remove the Calibration Mass, and slide the rear calibration switch OFF⇓.

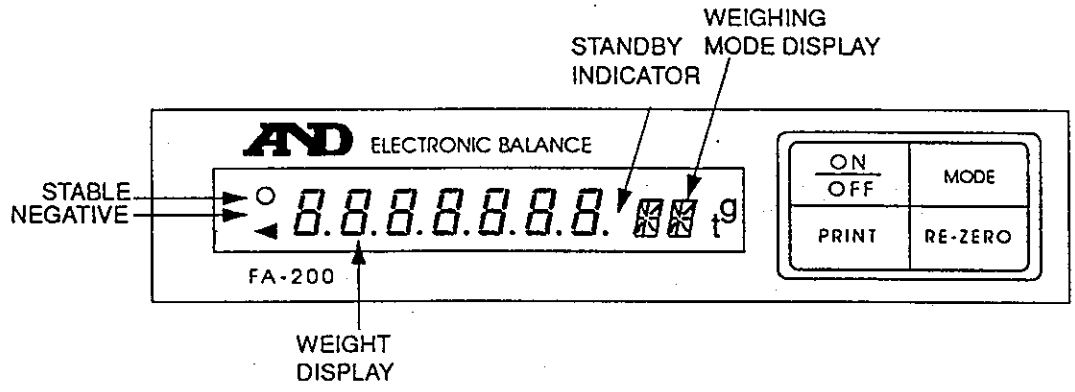
NOTES

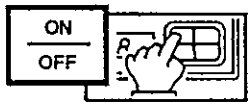
"Err CAL" means Error in Calibration method (display was off?).

"CAL E" means the calibration mass is too heavy (check that the CAL weight is correct).

"-CAL E" means the calibration mass is too light (check that nothing is touching the pan).

UNDERSTANDING THE DISPLAY



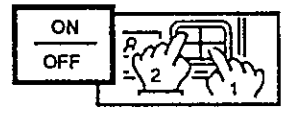


The ON/OFF Key

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 adaptor remains connected. The final decimal point will stay on. The FA series uses a cobalt blue fluorescent display. You can make sure that all the display segments are working properly by:

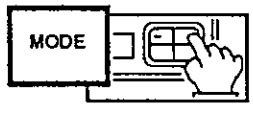
Step 1. 

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

Step 2. 

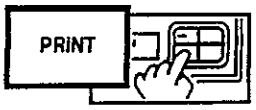
While holding the **RE–ZERO** key, press the **ON/OFF** key. All the display segments will switch ON (Press **OFF** when finished).

- Starting at the left end of the display you will see a circular stability indicator, a minus weight display symbol. Next you can see the display "8.8.8.8.8.8.8." used to display the weight, the final decimal point acts as a standby indicator and remains on when power is connected.



The MODE Key

The **MODE** key is used when changing internal parameter setting (See page 14).



The PRINT Key

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

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 scale.

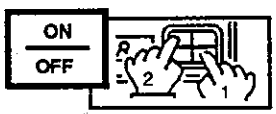
When the display shows a small deviation from zero and the weighing pan is empty (and tare is not being used), then press the **RE-ZERO** key to return the display to zero.

REFRESHING THE SEGMENTS

If you weigh mostly light samples, then only the digits at the lower end of the display get used. Sometimes this causes the upper end digits to become dim, or flicker - this can also happen after long periods of non-use. If this occurs, you can refresh the segments by the following procedure.

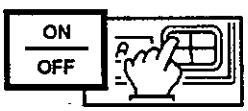
Step 1. 

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

Step 2. 

While holding the **RE–ZERO** key, press the **ON/OFF** key. All the display segments will switch ON (display burn-in mode).

Step 3. All segments will light, and leave them on for about 12 hours.

Step 4. 

Press the **ON/OFF** key. Go ahead and use the balance as normal.

ZERO TRACK FUNCTION

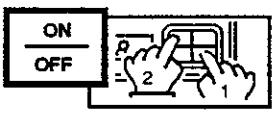
The FA series has a "Zero Track" Function which detects any drift from the zero point. The zero point can be changed from true zero by temperature, humidity, or air pressure. The effects can be very small, and happen gradually. If zero drifts by less than ±0.1mg per 3 seconds, then zero track can follow and the display will remain at zero.

Please Note

The Zero Track Function is normally ON. If you are weighing something very light (less than 0.3mg - such as powders), you can disable the Zero Track Function to make weighing more accurate.

Step 1. 

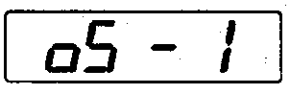
With the display **OFF**, press and hold the **RE-ZERO** key.

Step 2. 

While holding the **RE–ZERO** key, press the **ON/OFF** key. All the display segments will switch on (display burn-in mode).

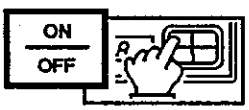
Step 3. 

Press the **RE–ZERO** key again.

Step 4. 

The display will show "o5- 1" which means zero track ON (from the factory).

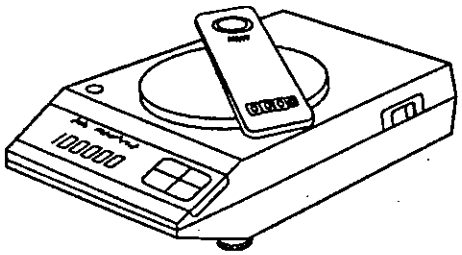
By pressing **RE–ZERO** again the display will change to "o5- 0" which means zero track OFF.

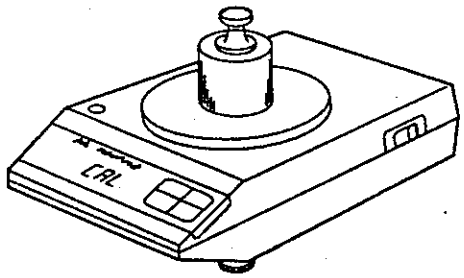
Step 5. 

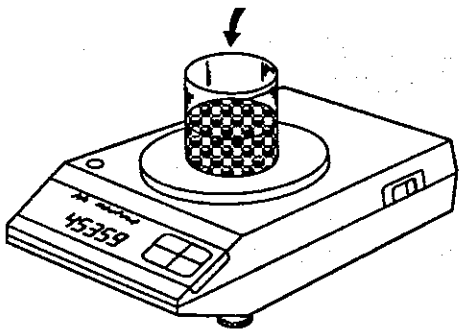
Press the **ON/OFF** key. Go ahead and use the balance as normal.

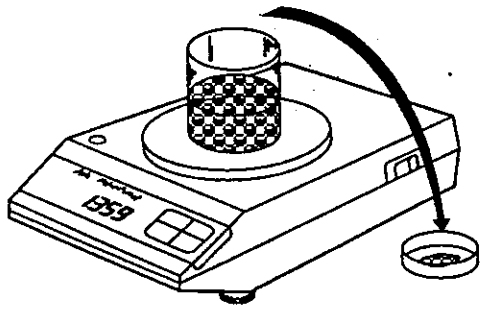
NOTE *The Zero Track Function function is now disabled, if you wish to enable it, simply follow the above procedure again.*

SIMPLE WEIGHING









Simple Weighing

Keep the balance on standby to keep it warmed-up. If you are operating the balance by battery, then remember to switch off the battery after use.

1) 

Turn the display on via the **ON/OFF** key.

2) Place the object(s) on the pan and read the weight when stable.

CALIBRATION

With display ON, slide switch up "CAL 0" display.

Press **RE-ZERO**. "CAL F" display Place mass on the pan.

Press **RE-ZERO** . "CAL End" display Slide CAL switch down

Weighing into a Container

1) Place the container on the pan.

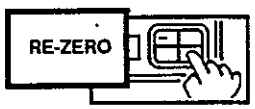
2) 

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

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

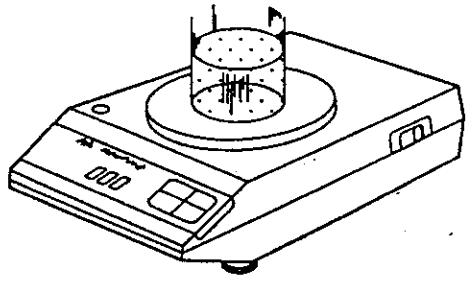
Weighing out of a Container

1) Place the full container on the pan.

2) 

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

3) Scoop the amount of material you need out of the container with reference to the negative display.



Deviational Weighing

1) Place a reference object on the pan.

2) 

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

- Comparative objects placed on the pan will now show their deviation from the reference weight (zero) in terms of a ± weight display.

DENSITY DETERMINATION

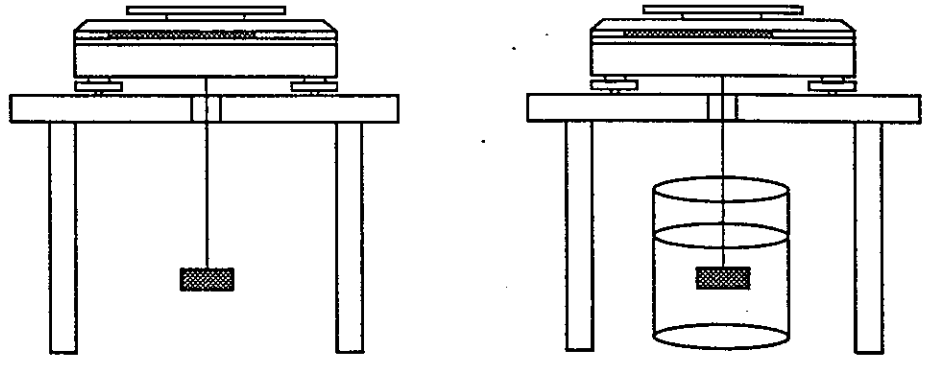
* Weighing with the built-in "underhook".

The FA series are equipped with a standard built-in underhook. This makes density determination a relatively simple matter. You can find the underhook behind the plastic plug in the under-side of your balance --- it is a hole through the lower end of the riser beam, directly below the pan support peg (lateral force cannot be applied to this beam). You may hang a light-weight weighing harness from this hole or thread a strand of thin string/wire 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 weight in air by the loss in weight in water (volume), you can find the relative density of the object (expressed as g/cm^3).

AN EXPERIMENT WITH A BAR OF SILVER COLORED METAL

- Press **RE-ZERO** to zero the display.
- Find the weight of the bar in air. It weighs 1000.00g in air.
- Press **RE-ZERO** to zero the display.
- Lower the bar into water at 4°C (maximum density).
- Display reads "- 46.50g" which is almost the same as $46.5cm^3$.
- $10000.00g \div 46.5cm^3 \approx 21.5g/cm^3$; thus the metal is probably platinum.

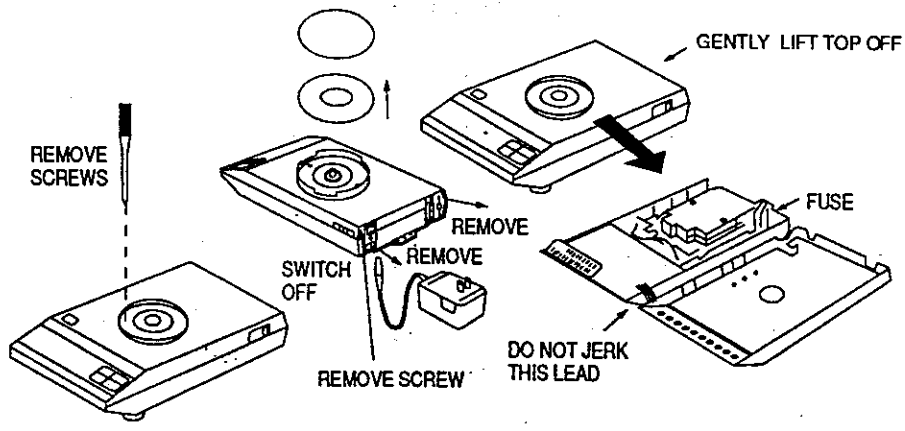


HELP, WHAT IF?

- **"HELP, What if** "-------" is displayed?" Answer: The power supply to the balance was cut during weighing. Press ON/OFF key twice.

- **"HELP, What if** the standby decimal point is not on when the adaptor is plugged in and the display doesn't switch on when I press ON/OFF?" Check external fuses and if they have not blown check the internal fuse. Open the balance carefully as shown in the diagrams below. If the internal fuse has not blown, check that the adaptor is working. If the internal fuse has blown and blows again immediately, have the balance repaired.

Opening the Case, Changing the Fuse

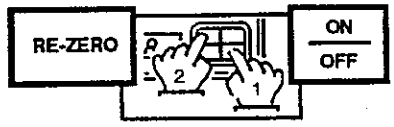


- **"HELP,** What if the weighing result is not stable?" Check that the weighing table is stable. Check that there are no drafts. Check that the breeze break (if any)is installed correctly. Check that the power supply voltage is stable.

- **"HELP,** What if the weight displayed is obviously incorrect?" Check that the balance is level. Check that it has been accurately calibrated. Check that the display started from zero before the mass was placed on the pan. Check that the mass is not overhanging and touching something else, like the sides of the breeze break or the top cover of the balance.

SETTING SOFTWARE PARAMETERS

Step 1. Turn the display **OFF**.

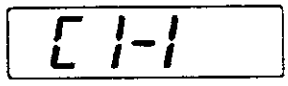
Step 2. 

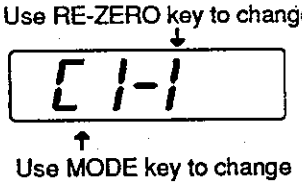
Press and hold the **RE–ZERO** key.While holding the **RE–ZERO** key, press the **ON/OFF** key.

Step 3. The display will come on with all segments illuminated.

Step 5. 

Press the **MODE** key.

DISPLAY 
"C1–1" will be displayed (or other if setting has been changed from the factory).

Step 2. 

Use the **MODE** key to move through the C–Functions cycle ex: "C1–0", "C2–0", "C3–0",...". Use the **RE–ZERO** key to move through the settings cycle ex: "C1–0", "C1–1", "C1–2".

Step 4. 

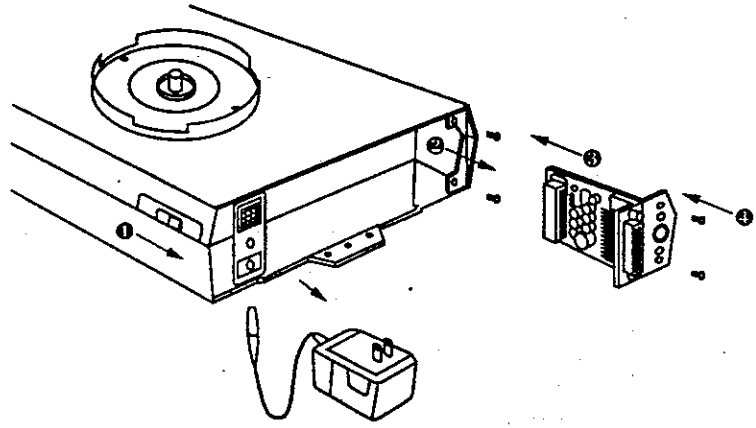
Continue setting the parameters in this way; end by pressing **ON/OFF**.

C#	Function	#	Description	Normal Setting	Notes
C1-	Stability Band Width	0	Narrow Band	C1-1	Motion Detection
		1	Normal Band		
		2	Wide Band Width		
C2-	Filter Strength	0	Weak/Good E.C.	C2-1	Environmental Conditions. Wind, Vibrations Etc.
		1	Normal/Fair E.C.		
		2	Strong/Bad E.C.		
C3-	RS-232C/CL Data Output (Option-03) Only	0	Print If Stable	C3-0	Please see page 15,16,17,18 Concerning The RS-232C Interface
		1	Print Accepted		
		2	Auto-print		
		3	Command Mode		
		4	Stream Mode		
C4-	Data Output Baud Rate	0	600 baud	C4-2	Must Be Set To C4-2 For AD-8121 Multi-Function Printer
		1	1200 baud		
		2	2400 baud		
		3	4800 baud		
C5-	Terminator	0	<CR> <LF>	C5-0	Command Mode
		1	<CR>		
C6-	Time Out	0	Time Limit On	C6-0	Command Mode
		1	Time Limit Off		

OPTIONAL RS-232C INTERFACE

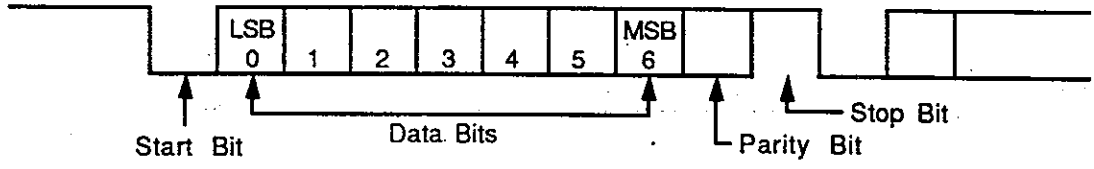
Installation

❶ Unplug the AC/DC adaptor and switch **OFF** the battery pack (if any).
❷ Remove the blanking plate held by two screws.
❸ Slide the Interface into the slot and push until the connector mates.
❹ Replace the two screws and restore power to the balance.



Specifications

Type EIA-RS-232C/Passive 20mA Current Loop Specifications
Method Half-duplex, Asynchronous Transmission, Bi-directional.
Format Baud rate: 600, 1200, 2400 and 4800 baud rates selectable.
Data bit: 7 Stop bit: 1
Parity bit: 1 Even Code: ASCII



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

Data Format

Four types of output HEADER are transmitted:

- OL-Overload/Underload (E, -E)
- US-Display is Unstable (in-motion)
- ST-Display is Stable"Pct" or weighing
- QT-Display is Stable in counting mode

Weight data is transmitted by ASCII, including these four codes:

- 2D (HEX) "–" (minus)
- 2E (HEX) "." (decimal point)
- 2B (HEX) "+" (plus)
- 45 (HEX) "E" (exponent)

❑ Terminator will always be <CR> <LF> for transmission data.

One Transmission Data Set Consists Of 17 Characters (X=Space)

Condition	Display	Transmission Data
Stable	° 300.000 g	ST, +0300.000 xxg CR LF
Unstable/Negative	- 1.25 g	US, -00001.25 xxg CR LF
Overload Error	E	OL, +9999999E +19 CR LF
Underload Error	-E	OL, -9999999E +19 CR LF

Transmission Modes

(see Software Parameter Settings C3-0/1/2/3/4)

You will learn how to set these transmission modes later. There are five possible transmission modes, two are designed for communication with computers and three are designed for communication with the AD-8121Multi-Function Printer (2400 baud only).

- ❑ **C3-0** Balance PRINT key will work only when the data is stable.
- ❑ **C3-1** Print accepted but is executed after the data becomes stable.
- ❑ **C3-2** Auto print once per weighing event when the data becomes stable.
- ❑ **C3-3** Data will be transmitted on command from an external device.
- ❑ **C3-4** Transmit data in a continuous stream (RS-232C/Current Loop).

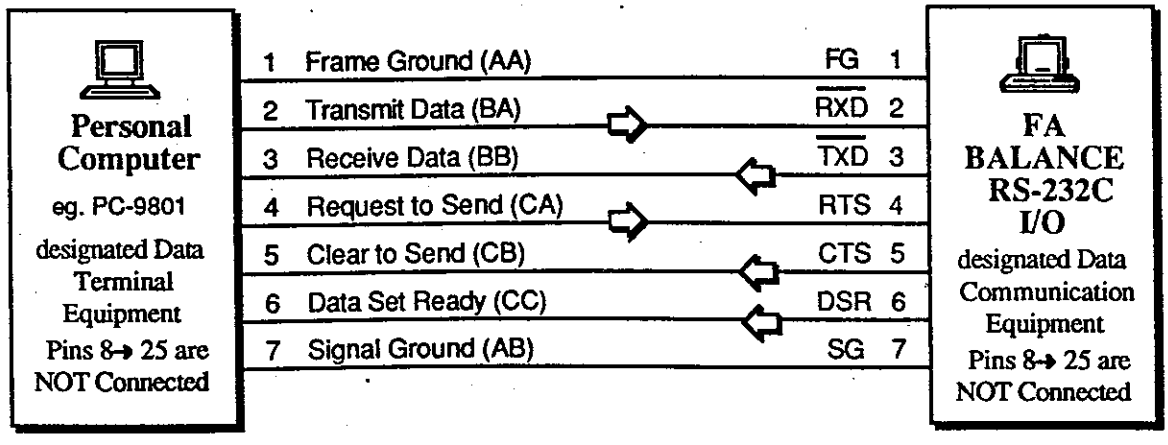
C3-3 and **C3-4** are designed for communication with computers. **C3-3** is called COMMAND Mode and when in this mode the balance can accept various commands from an external device or computer as follows:

- ❑ **<P>** <CR> <LF> **Power ON/OFF (remote ON/OFF control).** (50 0D 0A HEX)
- ❑ **<Q>** <CR> <LF> **Question the balance for data at any time.** (51 0D 0A HEX)
- ❑ **<R>** <CR> <LF> **RE-ZERO the balance (remote RE-ZERO).** (52 0D 0A HEX)
- ❑ **<S>** <CR> <LF> **Stable balance data only to be transmitted.** (53 0D 0A HEX)

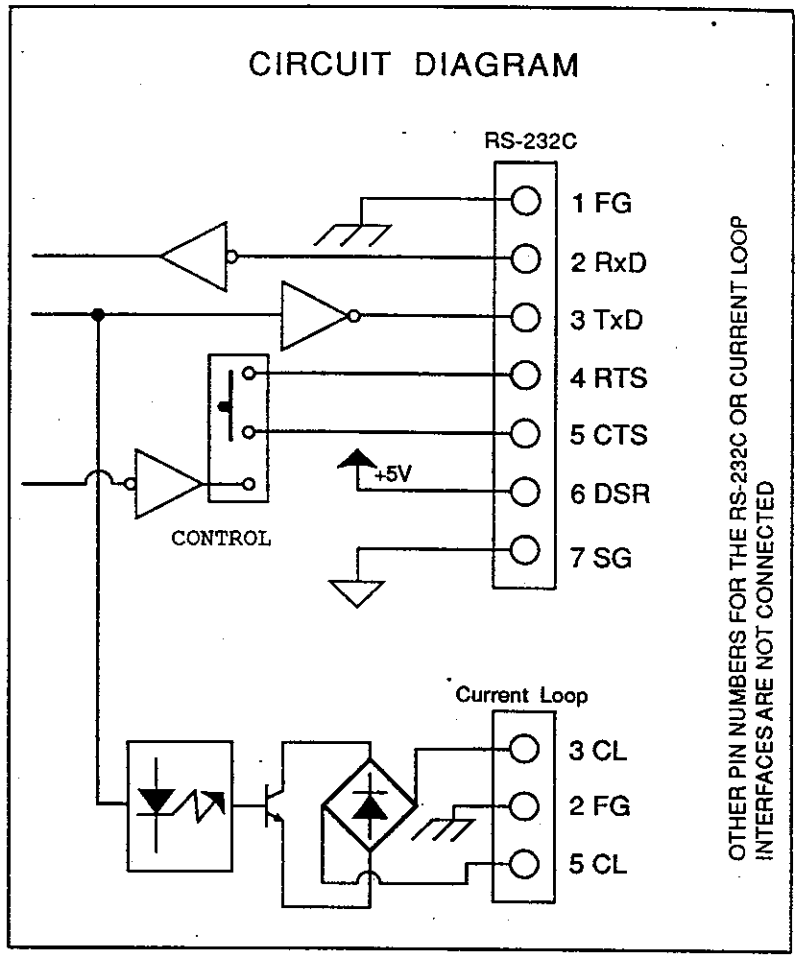
Note: *Commands can only be received when the balance is in normal weighing mode.*

C3-4 is called STREAM Mode and data will be transmitted continuously from the RS-232C I/O port and from the passive Current Loop connector (provide external 20mA power). If you connect AD-8121 (RS-232C) in STREAM mode and a computer to the Current Loop then the balance PRINT key will not function and you must use the AD-8121 DATA key (Mode 2). See the Parameter Setting section for baud rate (600, 1200, 2400, 4800) selection but remember that AD-8121 requires data at 2400 baud.

RS-232C I/O Pin Connections



- ❑ Use a high quality modem type cable between the computer and balance.
- ❑ AD-8121 is supplied with a cable for connection to the balance.



Printing With the AD-8121 (RS-232C, 2400 baud)

When connecting the AD-8121 Multi-Function Printer to an FA series for use in statistical mode, please note AD–8121 cannot accept mixed MODE data during statistical calculations.

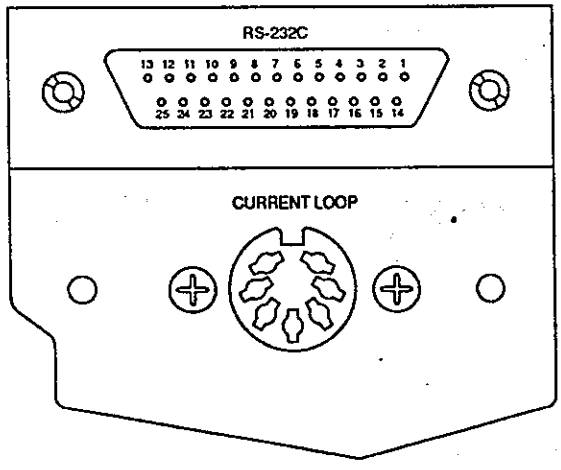
AD-8121 can be connected to the Current Loop interface of an FA balance if the optional adaptor cable (AD-8121 OP-01) is used. This converts the standard 25-pin RS-232C cable connector to match the 7-pin DIN Current Loop connector of the passive balance interface. The internal printer switch must be set to Current Loop to receive data this way.

- ❑ **C3-0** Balance PRINT key works when data stable. AD-8121 Mode 1.
- ❑ **C3-1** Print executed after data becomes stable. AD-8121 Mode 1.

- ❑ **C3-2** Stable data is automatically transmitted to the printer once per weighing event. A "weighing event" is defined as a stable weight of more than +10 minimum divisions in gram mode. The auto-print function will be reset when the weight data falls below 10 min. div. (grams) again, on the way to zero, at the end of the current weighing event. AD-8121 printer Mode 1.
- ❑ **C3-4** (Stream Mode) Use the AD-8121 DATA key only. AD-8121 Mode 2.

Print Command	Balance Mode	AD– 8121 Mode
PRINT key of Balance	Key A mode (C3-0) or Key B mode (C3-1)	1
Automatic	Auto Print (C3-2)	1
DATA key of AD-8121	Stream mode (C3-4)	2

A-25-pin RS-232C male connector and cover (HDB-25P & HDB-CTF) is not provided with this option. A 7-pin DIN male Current Loop connector (TCP 0576) is provided for the passive Current Loop interface. The CONTROL switch on the PCB permits shorting RTS and CTS lines, or for the balance to send the Clear to Send signal (RTS and CTS are normally shorted).



Bi-directional (Command Mode) RS-232C Interface

Unidirectional (Send Data Only) Passive Current Loop

Sample Computer Program to Load Weight Data

Microsoft BASIC running on NEC PC-9801. Balance set to: COMMAND mode (C3-3), at 2400 baud (C4-2), <CR> <LF> Terminator (C5-0), Time Out On (C6-0)

NOTE: HD$=Header string, DT=Data, UT$=Unit/MODE

```
1Ø  OPEN "COM:E/1NN" AS #1          (NN=PC-98Ø1 BASIC dialect)
2Ø  FOR J=1 TO 1ØØ: NEXT J          (Delay after buffer open)
3Ø  PRINT #1, "R"                   (RE-ZERO the balance)
4Ø  FOR J=1 TO 5ØØØ: NEXT J         (Delay after RE-ZERO)
5Ø  PRINT #1, "Q"                   (Question the balance)
6Ø  INPUT #1, HD$, DT, UT$          (Receive the data strings)
7Ø  PRINT HD$, DT, UT$              (Display the data strings)
8Ø  CLOSE                           (Close the file #1)
9Ø  END                             (Stop)
```

BASIC D3.10 running on IBM PC-XT under DOS 3.10.
Balance set to: STREAM mode (C3-4), at 4800 baud (C4-3), <CR> <LF> Terminator (C5-0), Time Out On (C6-0)

```
1Ø   T=5:ON ERROR GOTO 1ØØ
2Ø   OPEN "COM1:48ØØ,,,,CS" AS #1
3Ø   LINE INPUT #1,A$
4Ø   INPUT #1,HD$,DT$
5Ø   IF HD$<>"OL" THEN GOTO 7Ø
6Ø   DT$="     "+LEFT$(DT$,1)+"E":GOTO 9Ø
7Ø   IF HD$<>"US" THEN GOTO 9Ø
8Ø   DT$=LEFT$(DT$,9)
9Ø   PRINT HD$,DT$:GOTO 4Ø
1ØØ  T=T-1:IF T<>Ø THEN GOTO 3Ø
11Ø  END
```

BASIC D3.10 running on IBM PC-XT under DOS 3.10.
Balance set to: COMMAND mode (C3-3), at 4800 baud (C4-3), <CR> <LF> Terminator (C5-0), Time Out On (C6-0)

```
1Ø   OPEN "COM1:48ØØ,,,,LF" AS #1
2Ø   PRINT #1, "R"+CHR$(&HD);
3Ø   FOR I=1 TO 1ØØØ:NEXT
4Ø   Print #1, "Q"+CHR$(13);
5Ø   INPUT #1, HD$, DT$
6Ø   IF HD$<> "OL" THEN GOTO 8Ø
7Ø   DT$="    "+LEFT$(DT$,1)+"E":GOTO 1ØØ
8Ø   IF HD$<>"US" THEN GOTO 1ØØ
9Ø   DT$=LEFT$(DT$,9)
1ØØ  PRINT HD$, DT$
11Ø  GOTO 3Ø
12Ø  END
```

OPTIONAL NiCd BATTERY PACK (OP-04)

- *SERIOUS DAMAGE TO THE BATTERIES WILL RESULT from leaving the balance plugged in with the Battery Power/Charger Switch OFF for long periods!*
- *Do not overcharge the Battery Packs. 24 HOURS CHARGING MAXIMUM!*

Normal Use

- The Battery Power/Charger Switch positions:
  - **"ON"** •With the AC adaptor connected - means normal balance operation, power from the AC adaptor. The batteries can not be used while the AC adaptor is connected.
    •With the AC adaptor disconnected - means normal balance operation, power from the batteries.
  - **"OFF"** •With the AC adaptor connected - means battery recharging.
    •With the AC adaptor disconnected - means no power to the unit.
- When the AC adaptor is connected, the balance will draw power from it. Only when the adaptor is unplugged from the balance (not the wall), will the unit switch to battery operation.
- The Battery Packs will recharge in about 15 hours (with the AC adaptor plugged in, and the Battery Power/Charger Switch **OFF**).
- The packs can be expected to offer about 9 hours of continuous operation between charges.
- A display of "Lb" (Low battery) indicates that the battery power has become too low for reliable weighing.
- The life of the rechargeable battery will vary greatly with frequency of charge and use of the balance. If the battery cannot seem to hold a charge, check it by: charging for 15 hours, and if the balance cannot run for 5 hrs, then see your dealer.

To Preserve Battery Life

- When using the AC adaptor, turning the Battery Power/Charger Switch **OFF** is for recharging only. If you want to cut the balance power without recharging, unplug the AC adaptor from the wall, or, unplug the AC adaptor from the balance, and turn the Battery Power/Charger Switch **OFF**.
  •SERIOUS DAMAGE TO THE BATTERIES WILL RESULT from leaving the balance plugged in with the Battery Power/Charger Switch **OFF** for long periods!
- Do not overcharge the Battery Packs. 24 HOURS CHARGING MAXIMUM!
- Do not try to operate the balance in very cold temperatures using the battery pack (batteries don't work well in low temperatures)
- Do not try to operate the balance in very hot temperatures above 30°C (86°F) using the battery pack. At temperatures of 40°C (104°F), the life of the Battery Packs will be reduced to 40 percent of normal.
- Switch **OFF** the battery pack as soon as "Lb" is displayed and recharge as soon as possible.
- Do not use the Battery Packs needlessly since the number of times that rechargeable batteries can be recharged is not limitless.

TROUBLE ?

PROBLEM	POSSIBLE SOLUTIONS
Display Remains Dark	A) AC adaptor is not the correct one, or not plugged in. B) Internal Fuse has blown. C) AC power line voltage is too low. D) Battery switch is OFF. E) If Battery switch is ON, then adapter is connected to the balance, but not plugged in. F) Battery is discharged G) Battery is dead (no longer able to hold a charge).
"– – – – – – –" is Displayed	A) Power supply was cut during measurement
"Lb" is Displayed	A) AC adaptor is not the correct one. B) AC power line voltage is too low. C) Battery is discharged. D) Battery is dead (no longer able to hold a charge).
"Err CAL" is Displayed	A) The CAL (Calibration) Switch was turned on (slid up) while the display was off.
Balance Will Not Work by the Battery	A) Battery switch is OFF. B) Battery is discharged. C) Battery is dead (no longer able to hold a charge).
Weighing Values are Unstable	A) Weighing table is not stable. B) There is a draft or vibration. C) The pan, or pan support, is touching something. D) The object being weighed is touching the Breeze Break, or upper case.
Repeatability Error (Balance does not consistently display the same value for the same weight.)	A) The pan, or pan support, is touching something. B) The object being weighed is touching the Breeze Break, or upper case.
Measurement Value is Wrong	A) Balance is not Calibrated. B) The display wasn't at zero before the object was placed on the pan.
Display Remains "E" or "-E"	A) The pan, or pan support, balance weight, is missing. B) The pan, or pan support, weight, is not correctly installed.
"CAL E" or "– CAL E" is Displayed When Calibrating	A) Calibration weight is too heavy (CAL E), or too light (-CAL E).
After pressing RE-ZERO, display remains "." for Longer Than Normal	A) Weighing table is not stable. B) There is draft or vibration. C) The pan, or pan support, is touching something. D) The object being weighed is touching the Breeze Break, or upper case. E) Filter-strength is weak.
NiCd Battery Will Not Recharge	A) Battery switch is ON.

SPECIFICATIONS

CAPACITY x RESOLUTION	FA-200	FA-2000	FA-6000
GRAM	210x0.001g	2100x0.01g	6100x0.1g
REPEATABILITY/std.dev.	0.001g	0.01g	0.1g
LINEARITY	±0.002g	±0.02g	±0.1g
SENS DRIFT (10°-30°C)	±3ppm/°C	±3ppm°C	±8ppm/°C
STABILIZATION TIME	2.5sec(approx)	2.5sec(approx)	2.5sec(approx)
PAN SIZE mm	Ø105mm	Ø150mm	185x210mm
PAN SIZE inches	Ø4.1"	Ø5.9"	7.3"x8.3"
NET WEIGHT (approx)	4kg/8.8lb	4kg/8.8lb	4.7kg/10.3lb
CALIBRATION MASS	200g	2000g	5000g
BEST TEMP/REL HUMIDITY	20°C 50%RH	20°C 50%RH	20°C 50%RH

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