

INSTRUCTION MANUAL

EW-A/B Series

ELECTRONIC PERSONAL BALANCES

MODELS:EW-60A/B

EW-300A/B

EW-600A/B

EW-3000A/B

imno-EW-020a/b-v.1

A&D
A&D Company, Limited

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A. INTRODUCTION

This instruction manual concerns four different models from the A & D range of electronic precision personal balances; EW-60, EW-300, EW-600 & EW-3000A/B.

The EW series of high precision, top loading balances are products of years of research, design, development & in-field testing. Every component has been carefully chosen to permit optimum performance from the entire unit and each balance undergoes several levels of quality control before leaving the factory.

These computerized balances are housed in ultra-compact cases and have the following features:-

1. Ultra stable weighing, rounding an extra undisplayed digit and filtering.
2. Convenient optional output interface, serial EIA-RS-232C.
3. Ability to tare up to the max. capacity of balance via soft-touch key switch.
4. Easy-to-read 7 segment liquid crystal display.
5. Low-profile, high-accuracy load cell and state-of-the-art hybrid technology.
6. Portability; EW-B series may be operated for up to 8 hours on the internal rechargeable Nickel Cadmium battery pack (6 hours with Op-03 included).

SPECIFICATIONS

BALANCE (A/B)	EW-60	EW-300	EW-600	EW-3000
Max. Capacity	60g, 2oz	300g, 10oz	600g, 20oz	3000g, 100oz
Min. Division	20mg/0.001oz	0.1g/0.005oz	0.2g/0.01oz	1g/0.05oz
Operating Temp.	-5°→35°C (23°F→95°F)			
Display	7 segment liquid crystal			
Pan Size (mm)	110mm (dia)	132mm (D) × 170mm (W)		
Pan Size (inch)	4.33" (dia)	5.20" (D) × 6.69" (W)		
Dimensions (mm)	185mm (W) × 185mm [+20mm] (D) × 64mm (H)			
Dimensions (inch)	7.28" (W) × 7.28" [+0.8"] (D) × 2.52" (H)			
Weight approx. A type	600g	800g	800g	1000g
Weight in lb.	1.31lb	1.81lb	1.81lb	2.21lb
Weight of B type	Battery pack adds about 250g/8.8oz to the basic A type weight			
Weight of Op-03	RS-232C Interface adds about 30g/1oz to the basic weight			

please read this manual carefully before you start to use your new balance!

B INSTALLATION

1. UNPACKING

Please unpack the balance carefully making sure that no parts are mislaid during the process, including this manual!

ACCESSORY LIST

1. Balance
2. Weighing Pan
3. AC Adapter
4. 0.2A Fuse

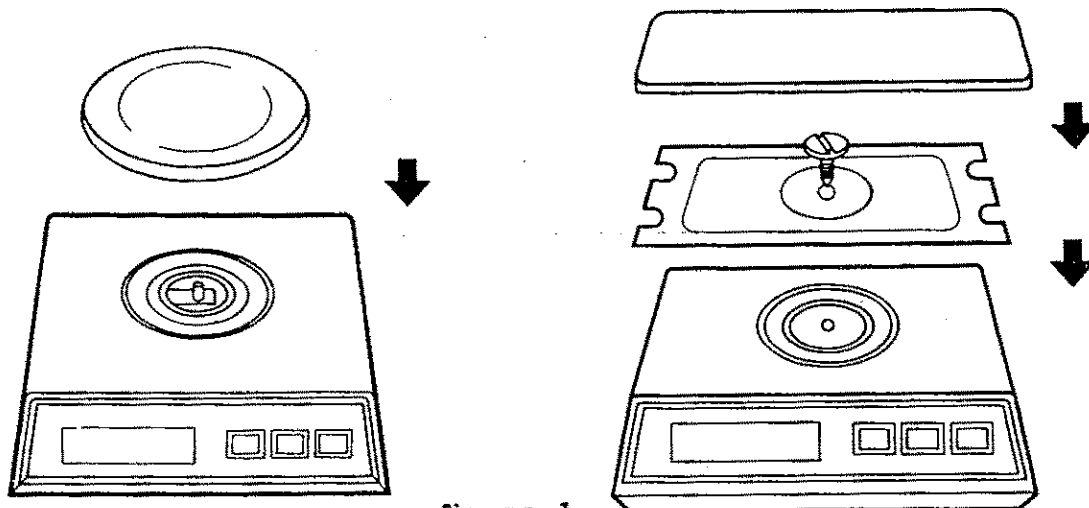


fig. no. 1

2. POWER REQUIREMENTS

This balance can be supplied with an AC adapter for: 100, 117, 220 or 240V AC $\pm 10\%$, converted to approx. DC12V @ 80mA. The Internal DC Fuse=0.2A.

The AC power requirements of your adapter are clearly marked on the adapter case and will depend upon the original shipping destination of the balance. Power frequency can be either 50 or 60Hz.

If you connect the balance to an alternative 12VDC power source (eg. via a car cigarette lighter adapter) take care that the polarity is *never* reversed!

The EW-B series, with the internal rechargeable Ni Cd battery pack, should normally have the recharging switch set to trickle charge in order to keep the power level "topped up". Fast recharging from "flat" (total discharge) may be achieved by setting the switch to "FULL" but *only keep the switch set to "FULL" for a maximum of 10-14 hours, overcharging will damage the battery pack!*

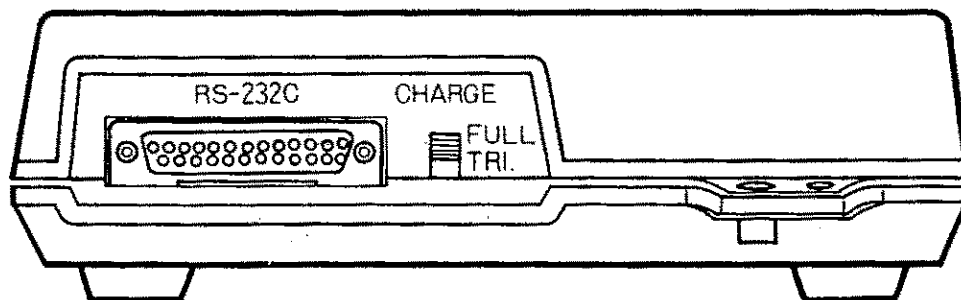
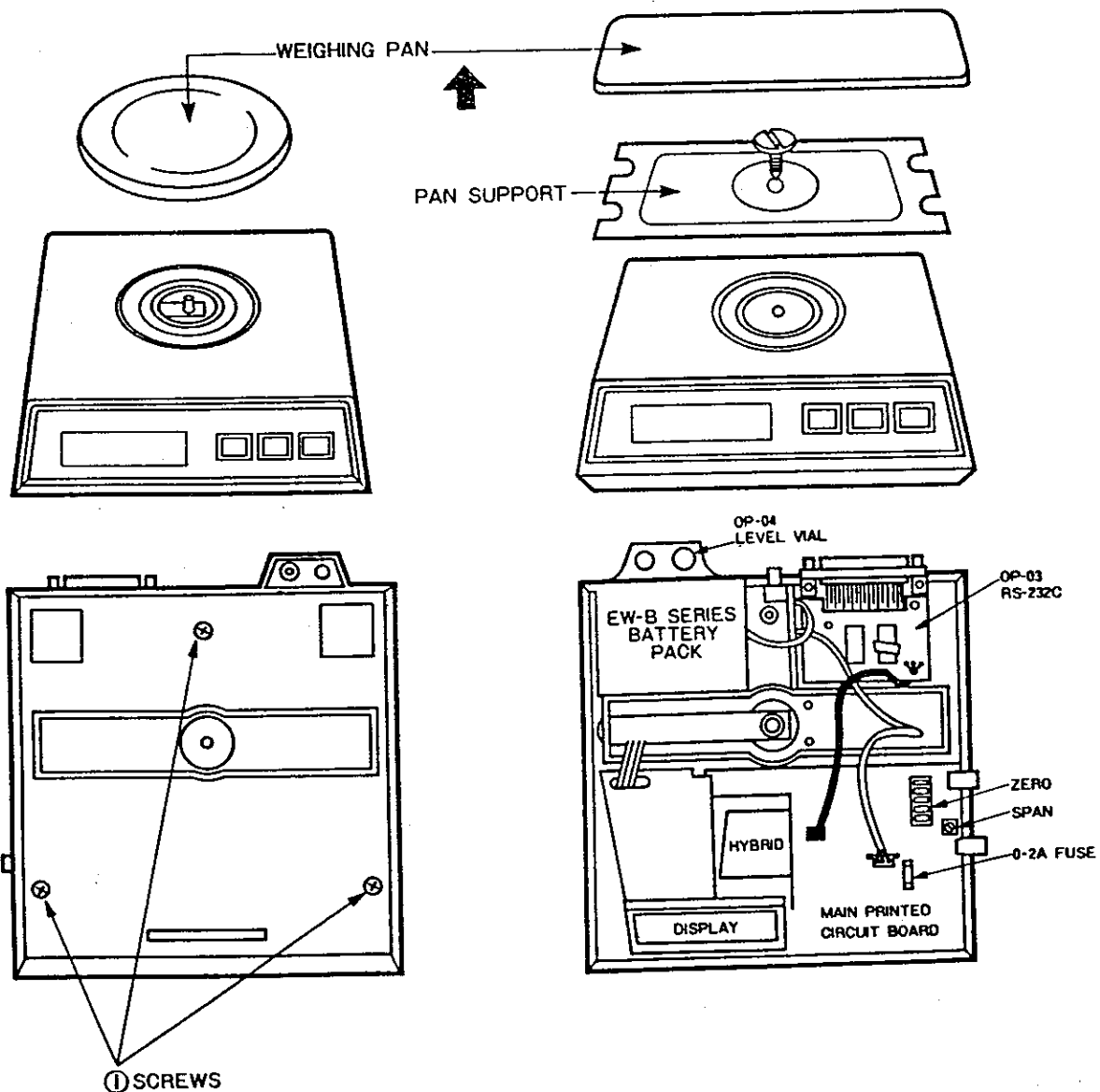


fig. no. 2

3. CHANGING THE FUSE

**If the display is blank the internal fuse may have blown.*

- a) If an AC fuse has not blown and you are certain that the balance is receiving power, the internal DC fuse may have blown.
- b) To open the case to change the internal DC fuse, remove the weighing pan and then unscrew the pan support screw (not applicable for EW-60A/B) while holding the pan support firmly to prevent it twisting. Leverage exerted by the pan support could damage the load cell if it is twisted or rocked, please take equal care when you close the case.
- c) Remove the pan support and turn the balance up-side-down. Unscrew the three recessed cross headed screws which connect the two halves of the case together.
- d) Turn the balance the right way up and gently lift the top half of the case vertically away. The keyboard lead will keep the top half of the case connected to the bottom so do not jerk or strain this lead by attempting to pull the case apart in a hurry.
- e) If the fuse has blown, replace it with a 0.2A fuse only. If this fuse immediately blows again, have the balance repaired.



4. CALIBRATION

Calibration of the balance is required when it is initially installed, when changing the installation site and additionally every three months or so. "Weight" = Mass \times acceleration due to Earth gravity which is about 9.8 metres per second per second in a vacuum. However gravity, air buoyancy (at about 1.2mg/cm³) and other factors vary from location to location and from time to time.

4-1 PREPARATION

- a) Check that the balance is horizontal.
- b) Turn on the power and allow a warm-up period of at least 30 minutes.
- c) Obtain a standard weight equal to the maximum capacity of the balance and a smaller weight which is greater than 50% of the maximum capacity.

4-2 PROCEDURE

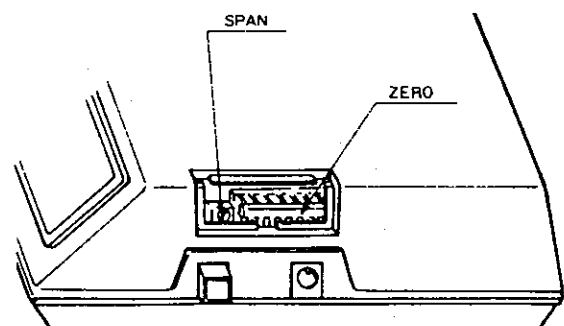
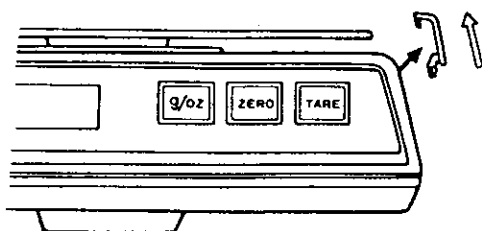
The zero and span adjustment points are located on the right hand side of the balance when facing the display, behind a protective cover which is removed by sliding the cover upwards.

ZERO ADJUSTMENT

- a) Switch off the balance, place the smaller weight on the weighing pan, wait 5 seconds and then switch on the balance again.
- b) Wait until the check display is over and an active weight has been displayed and then remove the weight. The display will now indicate the analogue zero point.
- c) Adjust the display to a reading which is as close to zero as possible via the 10 segment zero adjustment dip-switch. Segment N° 1 has the least effect on the display and Segment N° 10 has the most effect. Away from you is ON and towards you is OFF. After Span adjustment recheck that the zero point (b) is as close to zero as it is possible to make it when using the 10 segment dip-switch. If necessary repeat steps (a) to (f).

SPAN ADJUSTMENT

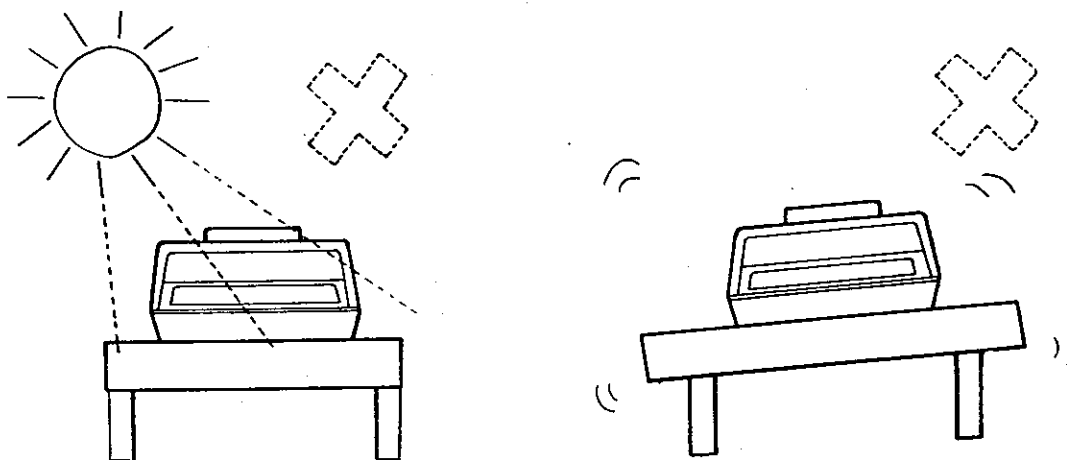
- d) After carrying out the procedure above, press the ZERO key so that the display reads zero precisely (only possible if it is already within $\pm 2\%$ of capacity).
- e) Place the standard weight equal to the maximum capacity on the weighing pan. Rotate the span adjustment trimmer clockwise to increase, and anticlockwise to decrease the display reading, stop when the display indicates the correct value for the standard weight.
- f) Span may effect zero slightly so if zero is not displayed when the weight is removed you must repeat steps (d), (e) & (f) until you achieve a stable zero and exact maximum capacity weight reading. Return to step (c).



5. LOCATION REQUIREMENTS

These balances are precision instruments and, like all precision instruments, must be treated with care.

- a) Please try to ensure a reasonably clean and dry environment.
- b) Avoid direct sunlight or excessive temperature fluctuations.
- c) The balance must be installed upon a solid surface, free from vibrations.
- d) The balance must be level, if Option-04 is fitted turn the adjustable feet until the level vial indicates that the unit is horizontal. If Op-04 is not fitted use a spirit level to make sure that the installation site is horizontal.
- e) Do not drop heavy objects on to the weighing pan! Try to avoid subjecting the sensitive load cell to unnatural forces such as lifting the balance by the pan support or by rocking or twisting the load cell.
- f) Because the EW series of balances are so eminently portable, a final location requirement might be to secure the balance to something immovable via the tie down hole at the rear of the unit! An anti-theft alarm wire or fibre optic cable may also be fed through this hole.

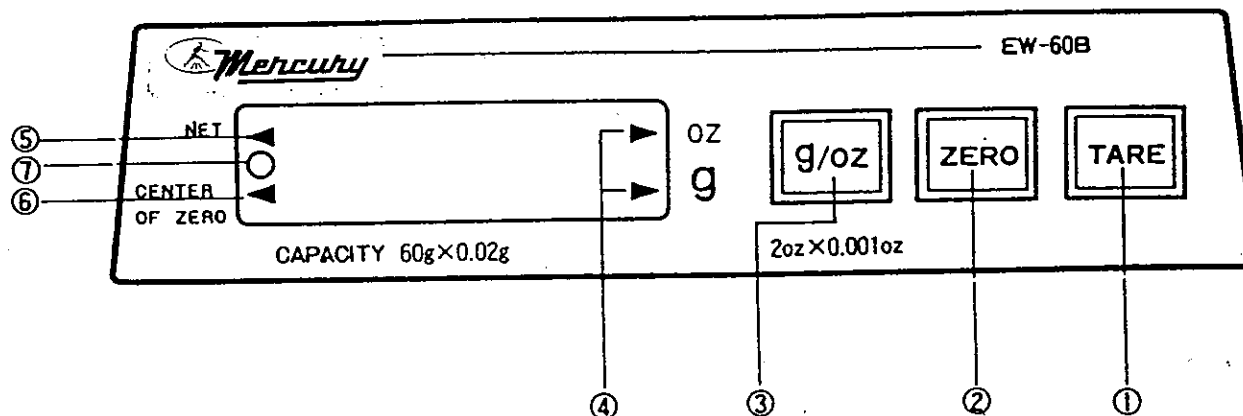


The EW series of balances provide weight readings in both grams and ounces (avoirdupois). For certain applications other weight units may be used and for this reason you may wish to convert (with a calculator) a gram reading to that of another unit. Round up final digits with reference to the gram display resolution.
GRAM DISPLAY ÷ CONVERSION FACTOR = ALTERNATIVE UNIT

CONVERSION FACTOR	ALTERNATIVE UNIT
0.200	CARAT (1carat=3.086grains, 1grain=64.7989mg)
1.5552	PENNYWEIGHT/dwt (24 grains per dwt)
3.8879	DRACHMS apoth. (8 drachms per troy oz)
31.1035	TROY OUNCES (20dwt per oz & 12oz per lb)
28.3495	OUNCES avoird. (16oz per lb avoird=7000grains)
1.7718	DRAMS avoird. (16 drams per oz avoird)
3.750	CHEN/MONME (about 1/10 th of a tael, not std.)

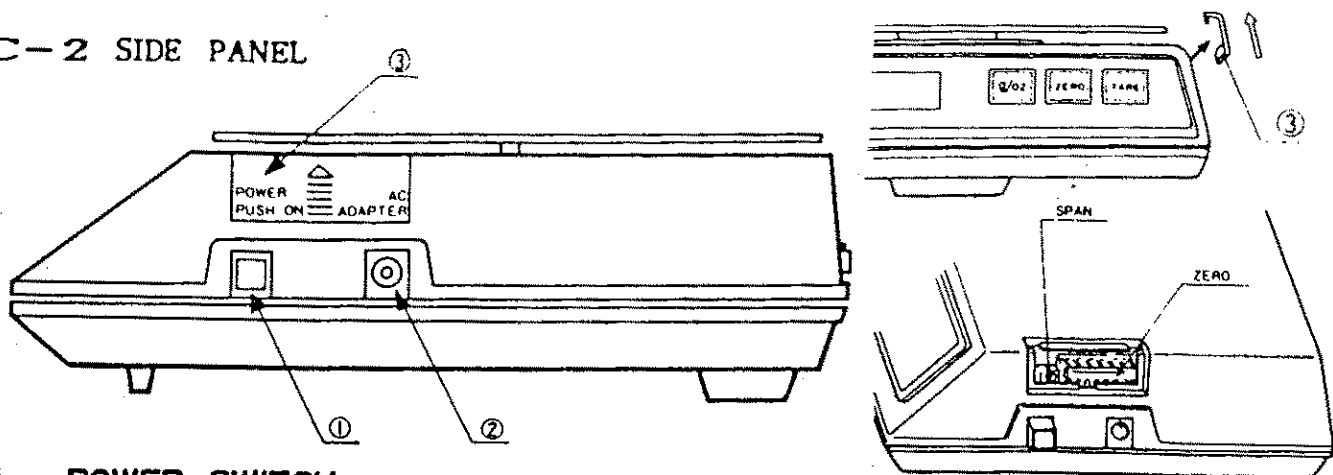
C PANEL DESCRIPTION

C-1 FRONT PANEL



1. **TARE KEY** (Tare band is +1 Min. Division to Max. Capacity)
May be used to zero the display to tare the weight of container and to switch the display to Net Mode. This balance is a "tare subtracting" instrument. Tare weight is added to Net weight and the total Gross weight must not exceed the max. capacity. This key only functions when the display is stable.
2. **ZERO KEY**
May be used to zero the display if the balance has drifted from zero during the warm-up period if (& only if) such drift is $\leq \pm 2\%$ of the maximum capacity of the balance, the display is stable and in Gross Mode.
3. **g/oz KEY**
May be used to switch the display from grams to ounces (avoirdupois), the calculation is carried out to several decimal places.
4. **g/oz ANNUNCIATORS**
These arrows indicate if the balance is calculating weight in grams or ounces.
5. **NET ANNUNCIATOR**
This arrow will switch on when the display indicates a Net weight (Net Mode).
6. **CENTER OF ZERO ANNUNCIATOR**
This arrow indicates that zero is stable and that the balance has centralized on zero.
7. **NO-MOTION ANNUNCIATOR**
This O symbol indicates that the display is stable and that the weight load is not-in-motion.

C-2 SIDE PANEL



1. POWER SWITCH

IN-ON and OUT-OFF. For EW-B series the battery charge circuit is disabled when the balance is switched ON and the battery pack will only be recharged when the balance is not in use (ie. OFF but supplied with power).

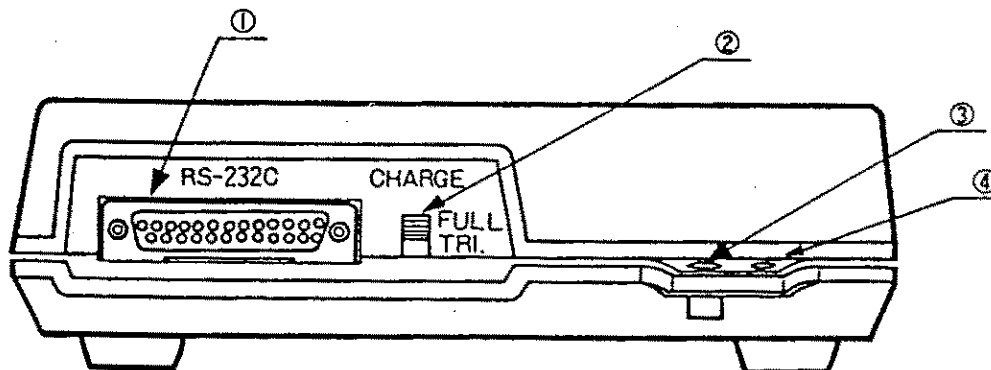
2. 12VDC INPUT SOCKET

Input socket for the AC to DC adapter supplied with the balance.

3. CALIBRATION COVER

This cover slides off vertically to reveal the 10 segment zero calibration dip-switch and the span adjustment trimmer.

C-3 REAR PANEL



1. OPTION-03

RS-232C output connector for interfacing the balance to AD-8116 Compact Printer or to a personal computer.

2. EW-B SERIES CHARGE SWITCH

Normally keep this switch set to TRI (trickle charge). FULL may be used for fast recharging from total discharge and this takes about 14 hours. DO NOT leave this switch permanently on FULL as overcharging the battery pack will damage it. Trickle charging compensates for battery leakage so long as the AC to DC adapter is plugged in.

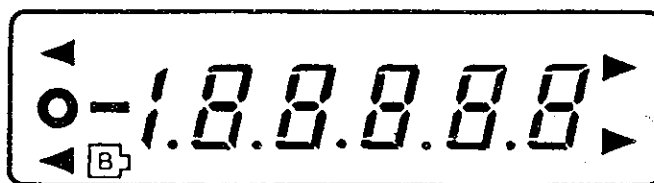
3. OPTION-04

Location of the Option-04 level vial, adjustable feet are also supplied with this option.

4. SECURITY POINT

This hole has been provided so that the user can secure the balance to something immovable and/or connect the balance to an anti-theft alarm.

C-4 DISPLAY PANEL



The illustration above shows the status of the display panel just after the power switch has been pressed and this display will last for about 3 seconds. The display is in check mode so that you may confirm that all the display segments are functioning correctly. It will be followed by a short pause of a few seconds while the balance waits for the weighing system data to stabilise and then the display will indicate a stable zero. The data will not stabilise if the balance is being subjected to excessive air movement or vibration.

When weighing with an electronic balance it is important to allow a warm up period of 20 minutes to achieve thermal stability in the weighing system. Accuracy, although good, cannot be assured if weighing takes place before thermal stability has been achieved.

If the display does not switch on when the power switch is depressed, please check:

- a) That the adapter is plugged in and is supplying DC power to the balance.
- b) For EW-B that the battery is charged and that the DC power plug is not in the input socket when the adapter is not plugged into an AC supply.
- c) That the internal fuse has not blown.

If the balance has just been switched off via the power switch please do not switch it on again immediately but wait for at least 2 or 3 seconds.

NOTES :

1. Before weighing anything the display must start from zero. If zero has drifted and the display indicates a low number ($\leq 2\%$ of Max. Capacity) then the display must be zeroed (when the display is stable) via the ZERO key.
2. The TARE switch is used to cancel the weight of a container so that only the Net Weight of the contents is displayed. After weighing has taken place and the container has been removed, the display will indicate the weight of the container as a minus or negative weight. This weight may in turn be cancelled by pressing TARE again so that the display will be zeroed with the NET annunciator off (the balance will be in Gross Mode ready for a new weighing operation).
3. If the combined weight of the container and contents exceeds the maximum capacity of the balance by more than 10 minimum display divisions, the display will read **E** (error). The display does not indicate a plus sign as this is implied if the display is not negative. **-E** is displayed if the weighing pan is removed.
4. "B" in a small box is displayed to the right of the Center of Zero arrow if the EW-B series battery pack contains an insufficient level of power for reliable weighing. Recharge the battery pack as soon as possible and only operate the balance via the AC to DC adapter.

D OPERATION

1. WEIGHING

- a) Press ZERO to zero the display.
- b) Place the object (s) to be weighed on the pan.
- c) Read the displayed weight after the display is stable (i. e. when the O symbol appears to indicate no-motion).

2. WEIGHING-IN

- a) Place a container on the pan.
- b) Press the TARE key to induce Net Mode and zero the display.
- c) Fill the container until the target weight is reached.
- d) When mixing ingredients in a container press TARE after each addition.

3. WEIGHING-OUT

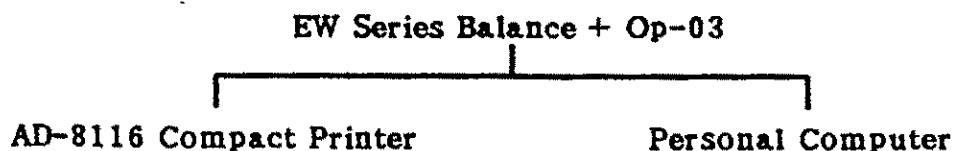
- a) Place a full container on the pan.
- b) Press TARE to zero the display.
- c) When anything is subsequently removed from the container the amount removed will be displayed as weight loss.

4. WEIGHING A DEVIATION

- a) Place a reference or standard sample weight on the pan.
- b) Press TARE and then remove weight, weight loss will be displayed.
- c) Now any sample weight (to be compared with the reference weight) placed on the pan will indicate its deviation from reference (zero display) in terms of a positive or negative display. This function is useful in check-weighing operations.

5. PRINTING

The EW series of balances can be very effectively coupled to the AD-8116 Compact Printer when the Op-03 RS-232C interface is installed in the balance. AD-8116 can print out weight data transmitted by the balance and statistical information (sequential number, total, maximum, minimum, average & standard deviation) concerning that data. Alternatively the data could be transmitted to a personal computer to be operated on, printed and stored by the computer.



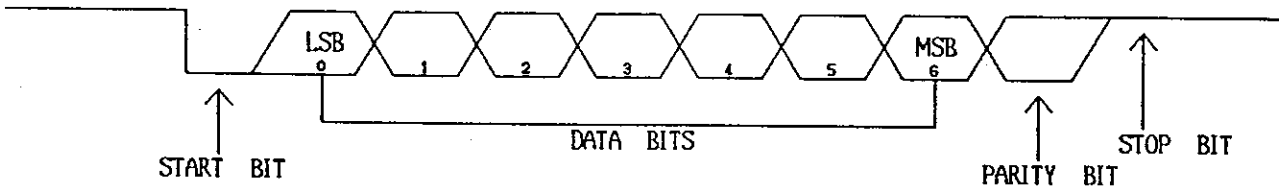
E OPTIONS

OPTION-03

RS-232C OUTPUT SPECIFICATIONS

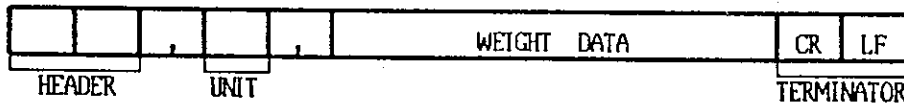
Type-----EIA-RS-232C
 SEND DATA ONLY (Data Communication Equipment)

Format-----Baud rate : 2400
 Data bit : 7
 Parity bit : EVEN
 Stop bit : 1
 Code : ASCII



Data is transmitted by ASCII code once every sampling cycle.

DATA FORMAT



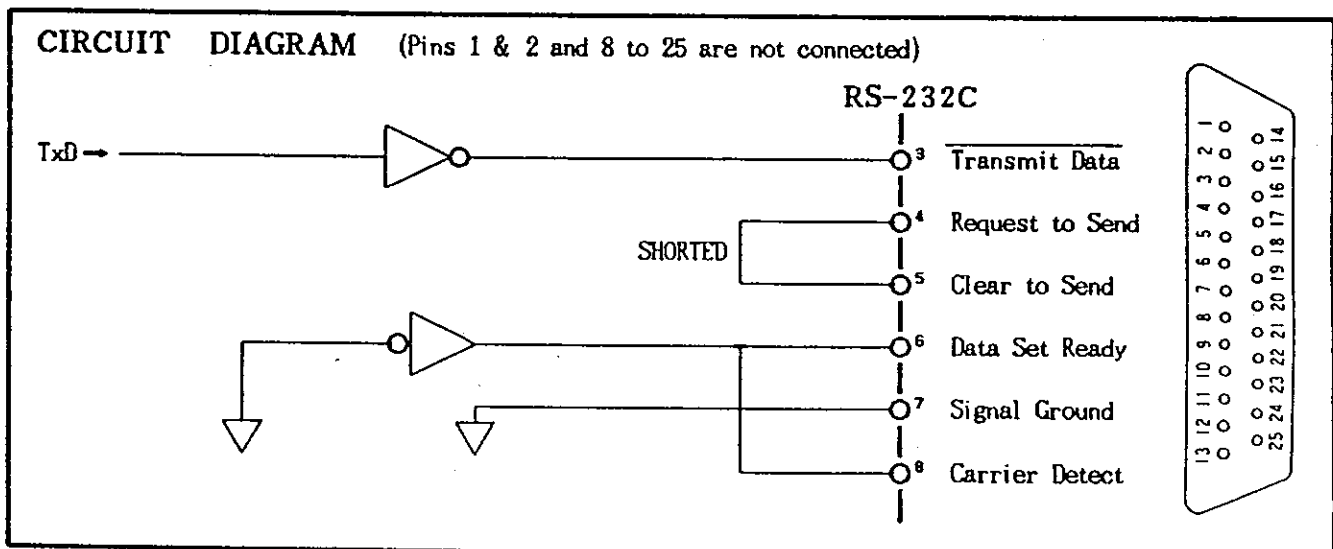
Three types of header are transmitted:

- OL, for OVERLOAD
- ST, for STABLE DATA
- US, for UNSTABLE DATA

Two types of weight unit are transmitted:

- G, for GRAMS
- O, for OUNCES (avoir)

5 digits of weight data are transmitted (-99999 → +99999)
 Terminator is transmitted as CR (0DH) and LF (0AH).



SAMPLE COMPUTER PROGRAM FOR AN EW BALANCE WITH OPTION-03

When interfacing an EW personal balance to a computer such as the Epson HC 40, connect the TxD output line (connector pin 3) of the RS-232C interface to the RxD input line of the computer.

The following computer program example is for the Epson HC 40 and is written in this computer's dialect of Microsoft BASIC.

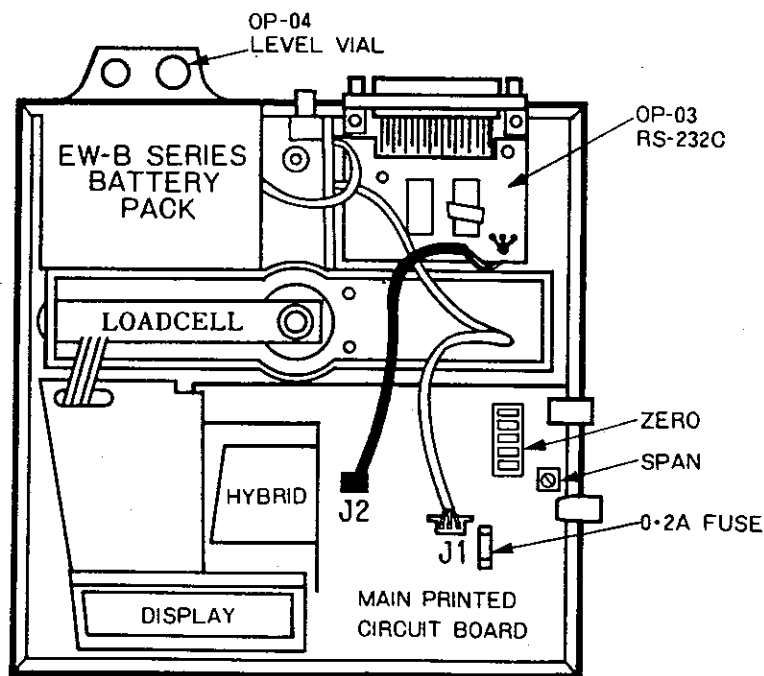
```
10 OPEN "i",#1,"com0:(c7e1)"
20 LINE INPUT#1,DS
30 INPUT#1,HD1$
40 INPUT#1,HD2$
50 INPUT#1,DS
60 CLOSE #1
70 PRINT HD1$,DS;HD2$
80 GOTO 10
```

EXPLANATIONS.

10	Open channel 1 for input mode. 7 bits, 2400baud, Even parity, 1 Stop bit.
20	Dummy read.
30	Header 1 read.
40	Header 2 (UNIT) read.
50	Data read.
60	Close channel.
70	Print the data.
80	Return to the start to repeat.

INSTALLING THE OPTION-03 RS-232C INTERFACE CARD

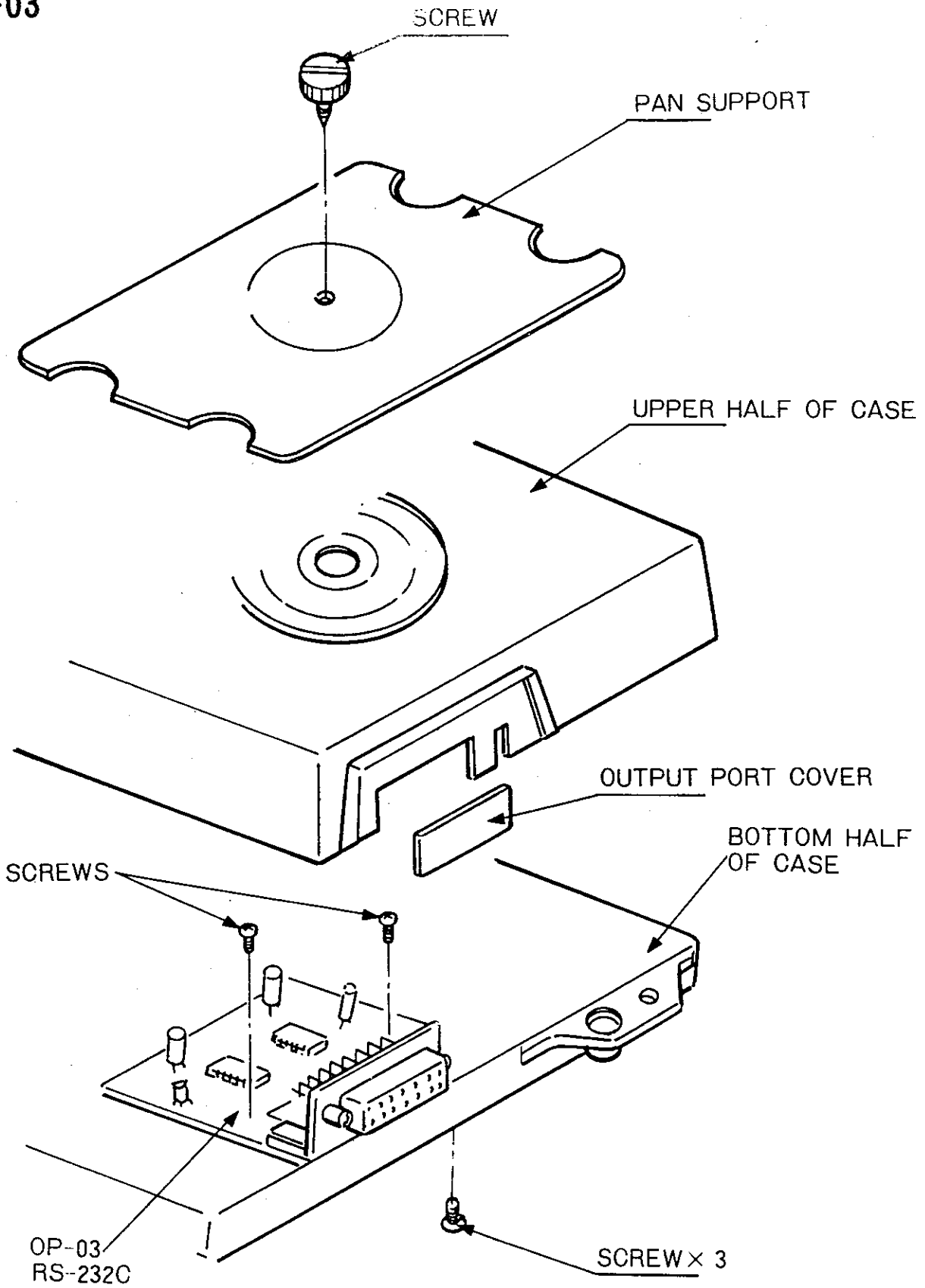
- a) Unplug the AC to DC adapter and remove the weighing pan and pan support (pan support is not applicable for EW-60A/B) as outlined on page 4.
- b) Turn the balance up-side-down and unscrew the three recessed cross headed screws which hold the two halves of the case together.
- c) Turn the balance the right way up again and gently separate the two halves of the case while taking care not to jerk the keyboard lead.
- d) If you unplug the keyboard lead remember to plug it back in to J5 before closing the case! Do not touch the load cell ribbon lead! If you unplug the EW-B series battery pack lead for safety, remember to plug it back into the J1 connector (not the RS-232C connector!!). If you do not unplug the battery pack take great care that you do not cause a short circuit by touching the circuitry of the balance or interface with anything metallic!!
- e) Remove the output port cover and instal Op-03 in the balance using the two screws provided. Plug the Op-03 connection lead into the main printed circuit board of the balance via the J2 connector and press the lead into the slots provided for it on the top of the load cell box, see the illustration below.



OPTION-04 LEVEL VIAL & LEVEL ADJUSTMENT FEET

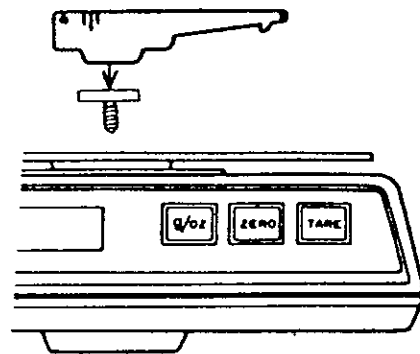
If the balance is to be used as a desk top unit in one location only, Op-04 might not be strictly necessary so long as it is clearly understood that the balance must be installed upon a perfectly level surface. If the balance is to be used as a portable weighing instrument in many different locations then the advantages of having a "built-in" level vial and adjustment feet are obvious.

OP-03

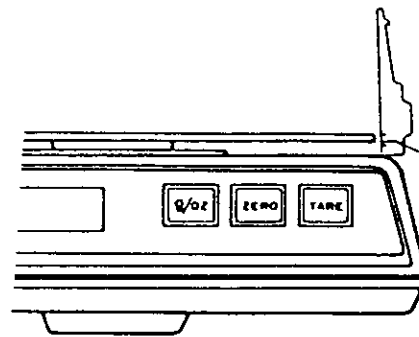


MULTI-PURPOSE TOOL

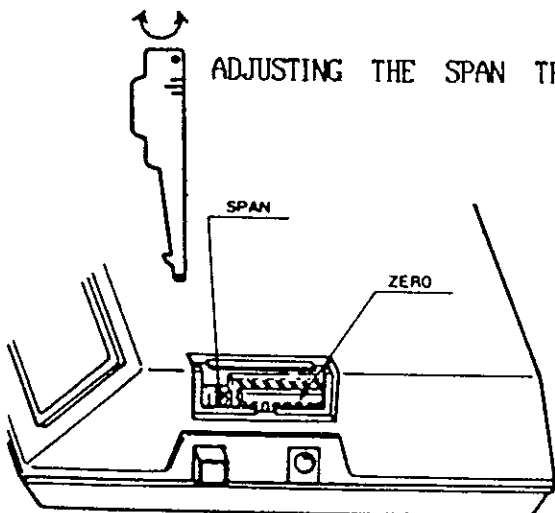
A multi-purpose tool is provided with this balance to help with the calibration procedure.



ATTACHING THE PAN SUPPORT

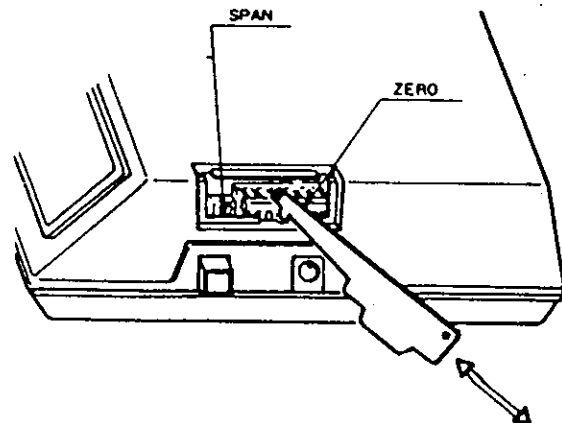


CHECKING THE PAN SUPPORT
HIGHT



ADJUSTING THE SPAN TRIMMER

ZERO ADJUSTMENT VIA THE 10 SEGMENT DIP-SWITCH



EW BALANCE SERIES

WARNING!

The key switches on the front panel of this balance are not designed to be pressed hard. Please press gently with your finger (only) until you feel slight click. Do not press with a force harder than is necessary to activate the switch.

Please note that the Zero key will only function when the zero point has drifted by less-than-or-equal-to 2% of the Maximum Capacity of the balance in Gross mode. If the Tare function has been activated (Net mode) the Zero key will not function at all. A slight drift from a zero display (not zero point) in Net mode should be eliminated with the Tare key, not the Zero key.

AND

A&D Company, Limited

Shintaiso Bldg., No. 5-1052, 10-7 Dogenzaka 2-Chome, Shibuya-ku Tokyo 150 Japan
Telephone: (03) 476-4741 Fax: (03) 462-1903 Telex: 02422816 AANDD J

A&D ENGINEERING, INC.

P.O. Box 32427 San Jose, CA. 95152-2427 U.S.A.
Telephone: (408) 263-5333 Fax: (408) 263-0119 Telex: 346949 AANDD SNJ

A&D INSTRUMENTS GmbH

Lyoner Straße 36, 6000 Frankfurt/Main 71, West Germany
Telephone: (069) 666-7006 Fax: (069) 666-6831 Telex: 417 0586 ANDI D