

# INSTRUCTION MANUAL

FOR

*MODELS*      *EX-200A*  
*EX-2000A*  
*EY-220A*  
*EY-2200A*



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## A.

## GENERAL

This instruction manual deals with four (4) electronic precision balance models: EX-200A , EX-2000A, EY-220A and EY-2200A.

The EX-A series are single-range, high-precision top-loading balances with a resolution of  $1/200,000$  , an internal resolution of  $1/1,600,000$  and a temperature co-efficient of max. 3ppm/°C.

The EY-A series are dual-range, high-precision top-loading balances with a resolution of  $1/20,000$  in each range and a temperature co-efficient of max. 10ppm/°C.

Every balance in both the EX-A and the EY-A series is housed in a sturdy die-cast casing and has the following features:

1. Ultra-stable weighing by rounding the extra lower digit and filtering.
2. Convenient optional interfaces such as the IEEE-488, RS-232C, parallel BCD and 20mA current loop.
3. Taring capability to the max. capacity of the balance with the press of a button or by using external terminals.
4. Easy-to-read cobalt blue display.
5. Clear visual annunciators for various functions.

*please read this manual  
before using the balance!*

## B.

## INSTALLATION

### 1. UNPACKING

A screw driver and fuse are attached to the top of the packing material. The weighing pan and its support are wrapped in plastic and can be found to the side of the packing material.

- 1 Lift the upper packing material and remove the screw driver and fuse.
- 2 Take out the instruction manual, protective cover, pan and its support.
- 3 Take out the main unit and remove the protective plastic.

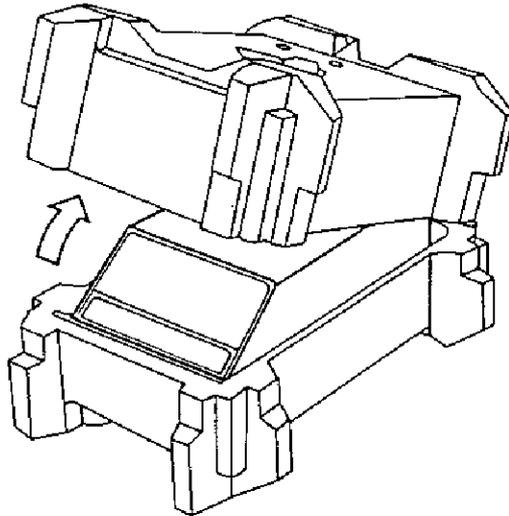


fig.no.1

### 2. POWER MAIN VOLTAGE

The power main voltage for each unit is factory preset at 100, 115, 220, or 240 VAC and CANNOT be adjusted by the user. The factory preset voltage is clearly marked on the rear of the case, just above where the power cable enters the case.

The balance can operate on a power frequency of either 50 or 60 hz.

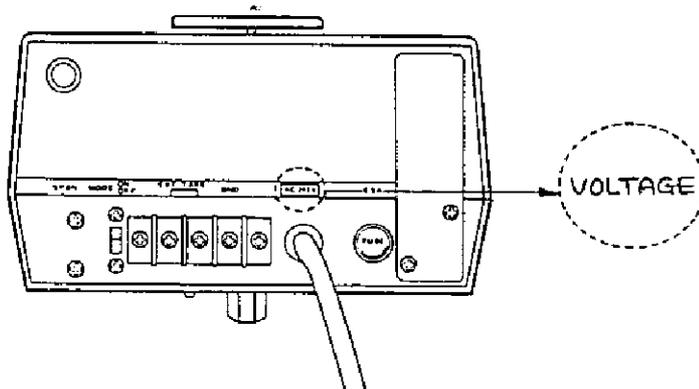
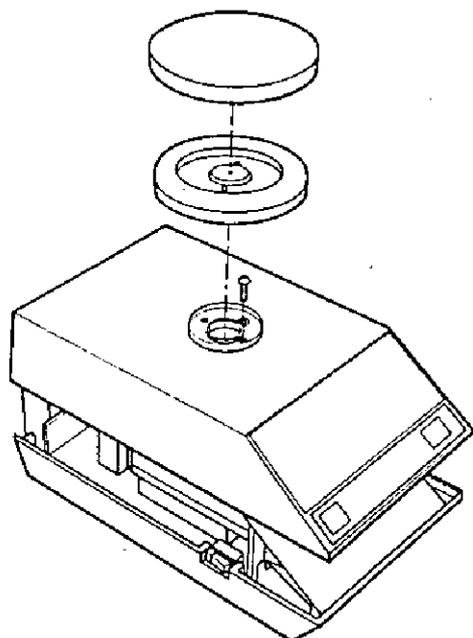


fig.no.2

### 3. OPENING THE CASE

Before opening the case you may wish to check the initial dip-switch settings as skipped on page 5, para -5 to see if it is necessary to change them and therefore if it is necessary to open the case.



- 1 Remove the weighing pan and its support if they are already installed.
- 2 Unscrew the single large screw that holds the upper and lower cases together.
- 3 Lift up the upper case.

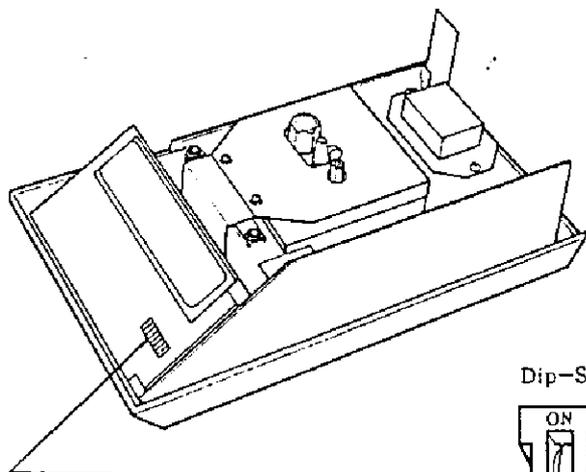
fig.no.3

### 4. DIP-SWITCH PROGRAMMING

The dip-switches located on the lower right side of the display board are to program the parameters for *averaging time*, *display rate* and *no-motion band*.

#### -1 Averaging time (segment no. 1 & 2)

Data displayed is the average of all past data measured within the programmed averaging time. The following table indicates the settings for the various averaging times.



Dip-Switch

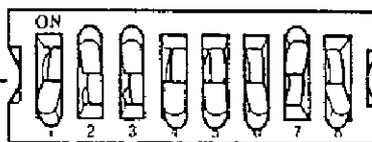


fig.no.4

Table 1 Averaging time

seg. no. 1	seg. no 2	Av. time
ON	ON	1 sec.
ON	OFF	2 sec.
OFF	ON	4 sec.
OFF	OFF	6 sec.

-2 Display rate (segment no. 3 & 4)

The display rate is the length of the time interval between each display. When the balance is to be used for filling applications, a faster display rate (when the weight indicated by the display changes at a faster rate) is appropriate. A slower display rate is suitable for stable weighing. The table below indicates the settings for the various display rates.

Table 2 Display rate (second)

seg. no. 3	seg. no. 4	in-motion	not-in-motion
ON	ON	1/8	1/4
OFF	ON	1/4	1/2
ON	OFF	1/4	1/4
OFF	OFF	1/2	1/2

-3 Automatic print (segment no. 5 & 6)

This function is used only when option-01 is installed. The details are described in F-3.

*Please do not set both segments "ON".*

-4 No-motion band (segment no. 7 & 8)

The No-motion band is the allowed band of weight deviation per 1 second. When weight deviation is within the programmed range, then the no-motion annunciator will be lit. The no-motion band can be programmed by setting the segments as shown in the following table.

Table 3 No-motion band

seg. no. 7	seg. no 8	No-motion band
ON	ON	± 1 d *
ON	OFF	± 2 d
OFF	ON	± 4 d
OFF	OFF	± 8 d

\* "d" means divisions or scale interval. "±1d" means ± 1 mg for EX-200A.

-5 Dip-switch settings

The dip-switches are set, at the time of shipment, as follows;

seg. no	1	2	3	4	5	6	7	8
	OFF	ON	ON	OFF	OFF	OFF	ON	OFF

5. CLOSING THE CASE ( Refer to the fig. no. 3. )

-1 Replace the upper case on the lower case.

-2 Replace the large screw.

## 6. INSTALLATION SITE

- 1 Avoid installing the balance in direct sunlight.
- 2 The balance should be operated in normal room temperature and other environmental conditions.
- 3 The balance should be used on a stable base, free of excessive vibration.

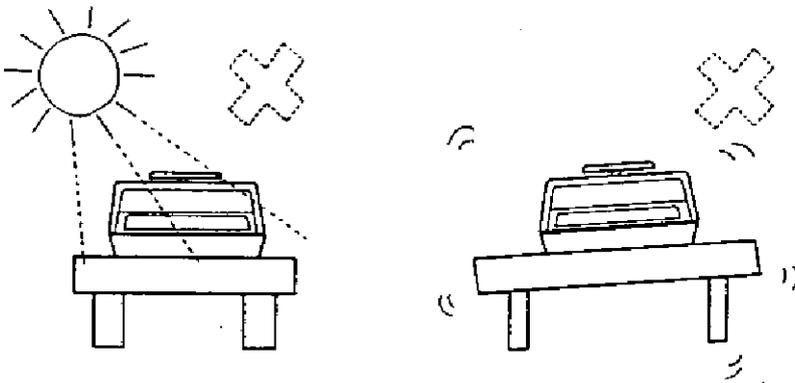


fig.no:5

## 7. LEVELING THE BALANCE

After placing the balance on an appropriate base, level the balance using the level vial located under the pan support. Rotate the front feet of the balance until the bubble in the vial is in the center of the red circle.

## 8. INSTALLATION OF THE PROTECTIVE COVER

- \* Remove the dust ring by unscrewing all the screws.
- \* Put protective cover on tightly without wrinkling.
- \* Replace the dust ring using the three screws.
- \* Replace the pan support and weighing pan.

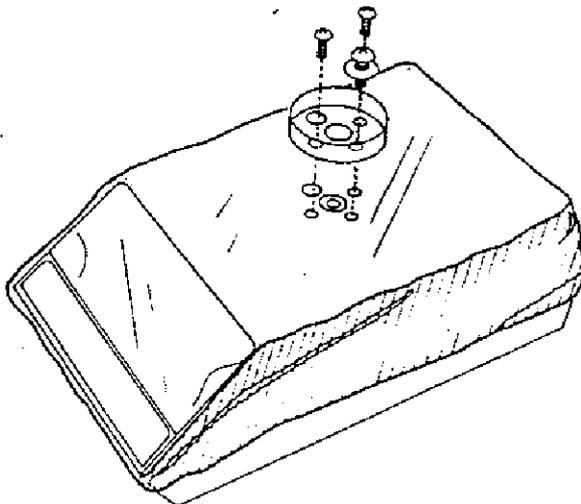


fig. no.6

C.

PANEL DESCRIPTION

- |                                  |                                     |
|----------------------------------|-------------------------------------|
| (1) Polarity annunciator         | (2) No-motion annunciator           |
| (3) Weight display               | (4) Tare key                        |
| (5) Model marking                | (6) Range key, for EY-A series only |
| (7) Adjustable front feet        | (8) Rear foot                       |
| (9) Weighing pan                 | (10) Plastic cover for span volume  |
| (11) Slot for optional interface | (12) Fuse                           |
| (13) Power cable                 | (14) Power main voltage marking     |
| (15) Ground Terminal             | (16) External tare terminal         |
| (17) Mode switch                 | (18) Power switch                   |

fig.no.7

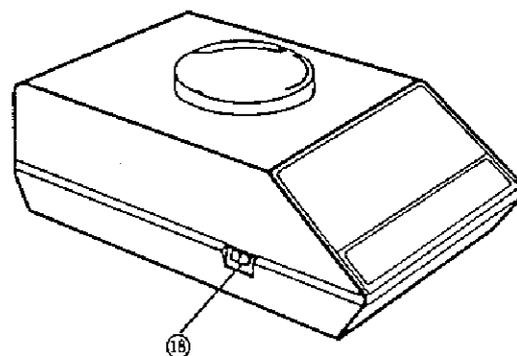
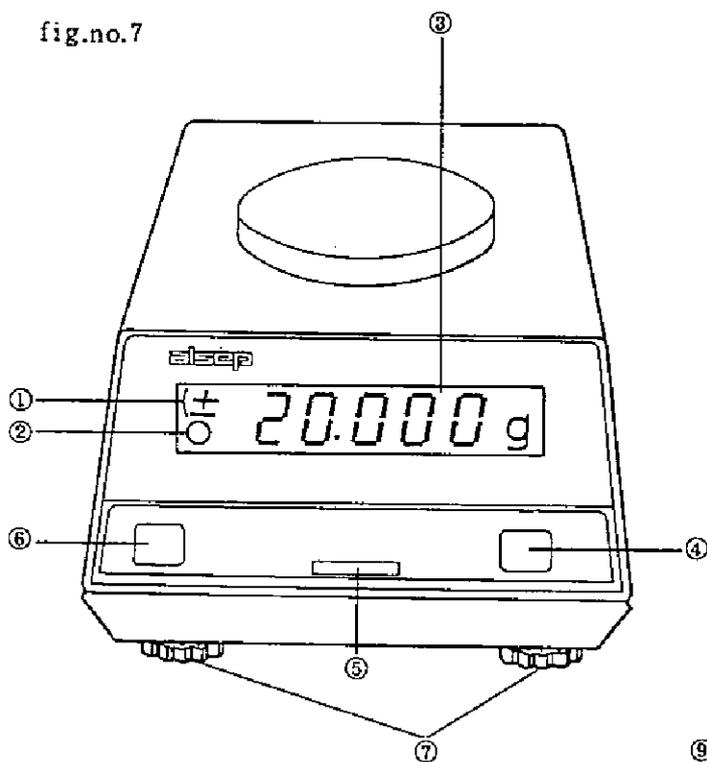


fig.no.8

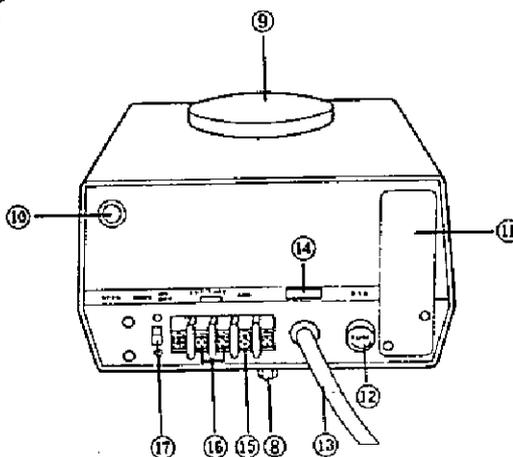


fig.no.9

## D.

### CALIBRATION

Calibration is required after the balance is initially installed, when the installation site is changed, and every few months.

#### 1. PREPARATION

- 1 Check that the balance is level.
- 2 Turn on the balance and wait for at least 30 minutes.
- 3 Prepare a standard weight equal to the max. capacity. In case of dual-range models, prepare a standard weight equal to the larger capacity.

#### 2. CALIBRATION PROCEDURE

- 1 Take off the plastic cover on the rear of the balance labeled "10" in Fig. no. 9. Inside the hole, the screw to set the span adjustment should be accessible.
- 2 With nothing on the weighing pan, press the "Tare" key and confirm that the display reads zero and is stable.
- 3 Place the standard weight on the weighing pan.
- 4 Using the screwdriver provided, turn the span adjustment screw clockwise if the weight displayed is less than the value of the standard weight, or counter-clockwise if the weight displayed is greater.
- 5 Remove the standard weight and if the display does not read zero, press the "Tare" key. (Zero and span are slightly interactive.)
- 6 Repeat steps -3 through -5 until the weight displayed is equal to the standard weight and zero is displayed when nothing is on the weighing pan.

*NOTE: For dual range models, calibrate only in the high capacity range.*

## E.

### OPERATION

#### 1. WEIGHING

- 1 Press the "Tare" key to bring the display to zero.
- 2 Place an object on the weighing pan.
- 3 Read the display anytime after the no-motion annunciator (2) is illuminated.

Select the proper range if a dual-range model is being used.

#### 2. WEIGHING-IN

- 1 Place the container on the weighing pan.
- 2 Press the "Tare" key to bring the display to zero.
- 3 Add objects or material until the target weight is reached.
  - \* Multiple filling can be easily accomplished by pressing the "Tare" key after each filling procedure has been completed.

### 3. WEIGHING-OUT

- 1 Place a container filled with objects on the weighing pan.
- 2 Press the "Tare" key to bring the weight display to zero.
- 3 Remove some of the objects from the container.

The weight display will indicate, together with a negative sign, the weight of the objects removed.

### 4. WEIGHING A DEVIATION

- 1 Place the reference weight (standard sample or weight) on the weighing pan.
- 2 Press the "Tare" key to bring the display to zero.
- 3 Remove the reference weight. The weight displayed will be the weight of the reference weight displayed as a negative value.
- 4 Place the object to be compared with the reference weight on the weighing pan.
- 5 Deviation from the reference weight will be displayed together with a positive or negative sign.

## F.

## OPTIONS

### 1. BREEZE-BREAKS

Two different type of breeze-breaks are available as options. They can be used only on the EX-200A and the EY-220A. Use a Breeze-Break wherever air disturbances are excessive.

- 1 Plastic breeze-break (option-02)

This is a simple plastic unit with a flip-open top.

It is easily installed by unfolding and placing it on top of the balance.

- 2 Glass breeze-break (option-04)

This is a tall rigid unit made of glass. The top metal panel and the right and left side glass panels all slide open.

Easy installation;

- (a) Remove the weighing pan and its support.
- (b) Place the glass breeze-break on top of the balance as shown.
- (c) Replace the weighing pan and its support.

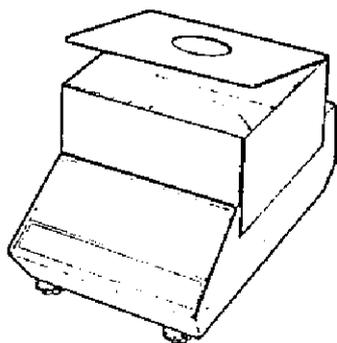


fig. no. 10

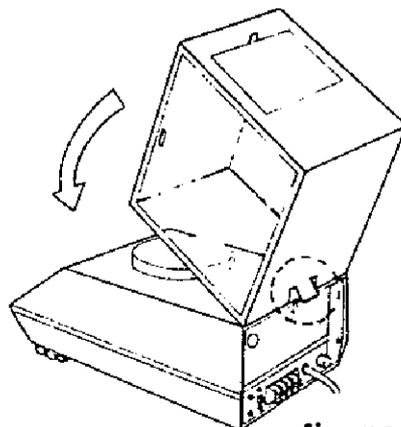


fig. no. 11

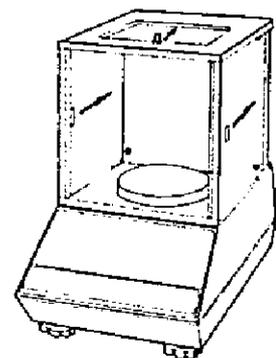


fig. no. 12

## 2. UNDER-HOOK

Under-hooks can be installed on any EX-A or EY-A series balance.

Option-05 is for the EX-200A and EY-220A.

Option-06 is for the EX-2000A and EY-2200A.

An under-hook is used to weigh objects which must be weighed in suspension.

- 1 Remove the metal cover under the balance. This will expose a bolt.
- 2 Lightly screw the under-hook on to the bolt.
- 3 Place the balance on a table with an appropriate hole for carrying out suspension weighing.
- 4 Install the pan support and weighing pan.
- 5 Install the necessary attachments and press the "Tare" key.
- 6 Place the object to be weighed in the suspension unit.

*Note: Calibrate the balance before weighing in suspension.*

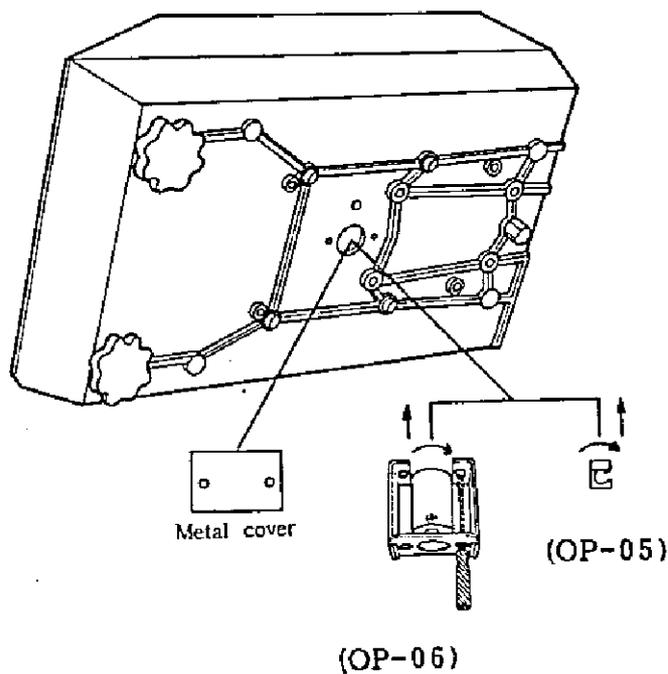


fig.no.13

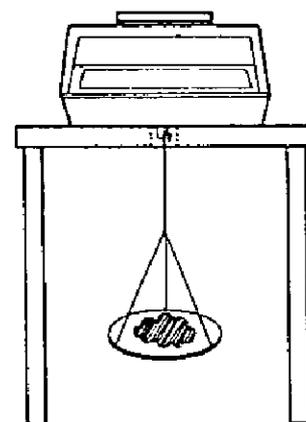


fig.no.14

### 3. INTERFACES

Only one optional interface can be installed in each balance.

-1 Parallel BCD output (Option-01)

This option is necessary to interface peripherals with a BCD input capability, such as A & D printers AD-8113 and AD-8114.

(a) Table BCD output

Pin no.	Signal	Pin no.	Signal
1	LOGIC GROUND	26	1 X 10 <sup>6</sup>
2	1 X 10 <sup>0</sup>	27	2 X 10 <sup>6</sup>
3	2 X 10 <sup>0</sup>	28	4 X 10 <sup>6</sup>
4	4 X 10 <sup>0</sup>	29	8 X 10 <sup>6</sup>
5	8 X 10 <sup>0</sup>	30	Decimal Point 10 <sup>5</sup>
6	1 X 10 <sup>1</sup>	31	Decimal Point 10 <sup>6</sup>
7	2 X 10 <sup>1</sup>	32	Decimal Point 10 <sup>7</sup>
8	4 X 10 <sup>1</sup>	33	Not-in-Motion (HI)
9	8 X 10 <sup>1</sup>	34	"Lo"
10	1 X 10 <sup>2</sup>	35	"Lo"
11	2 X 10 <sup>2</sup>	36	"Lo"
12	4 X 10 <sup>2</sup>	37	"Hi"
13	8 X 10 <sup>2</sup>	38	"Hi"
14	1 X 10 <sup>3</sup>	39	"Hi"
15	2 X 10 <sup>3</sup>	40	"Hi"
16	4 X 10 <sup>3</sup>	41	"Hi"
17	8 X 10 <sup>3</sup>	42	Positive polarity ("Hi")
18	1 X 10 <sup>4</sup>	43	Decimal point 10 <sup>1</sup>
19	2 X 10 <sup>4</sup>	44	Decimal point 10 <sup>2</sup>
20	4 X 10 <sup>4</sup>	45	Decimal point 10 <sup>3</sup>
21	8 X 10 <sup>4</sup>	46	Decimal point 10 <sup>4</sup>
22	1 X 10 <sup>5</sup>	47	Over-load
23	2 X 10 <sup>5</sup>	48	No polarity
24	4 X 10 <sup>5</sup>	49	Print command
25	8 X 10 <sup>5</sup>	50	Busy (INPUT)

TTL level, positive logic, fan out 3

Mating connector ---JA: 57-30500

Print command --- Positive pulse with 1m. sec width

No polarity --- "Lo" when display is zero, -P or being tared

Busy --- fan in 1, latches output data when input is "Lo".

(b) Mode switch and automatic printing

The mode switch, located on the rear panel of the balance, regulates the unit's automatic printing capability. For automatic printing the switch should be set at the "ON" position and for normal manual printing the switch should be set at the "OFF" position.

With the mode switch set at the "OFF" position, the unit gives a print command signal in every display cycle.

With the mode switch set at the "ON" position, the unit will only give a print command signal after an object has been placed on the weighing pan and has become stable. The next print command signal will be given after the object has been removed, the weight displayed has returned to within ten divisions of zero and the next object has been placed on the weighing pan.

-2 Serial interface (Option - 03) Compatible with Compact Printer AD-8116

(a) Specifications

Type -----EIA RS-232C and passive 20mA Current Loop

Method -----Half-duplex method

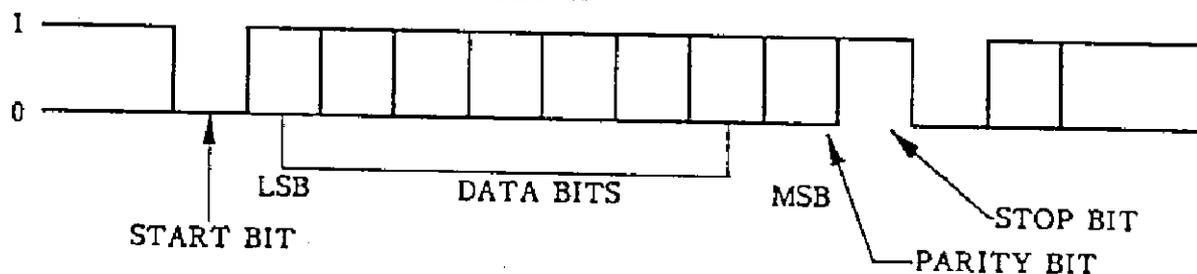
Format -----Baud rate : 600 or 2400 (switch selectable)

Data bit : 7

Parity bit : 1 (EVEN)

Stop bit : 1

Code : ASC II



RS-232C  $\left\{ \begin{array}{l} "1" = -15V \dots -5V \\ "0" = +15V \dots +5V \end{array} \right.$

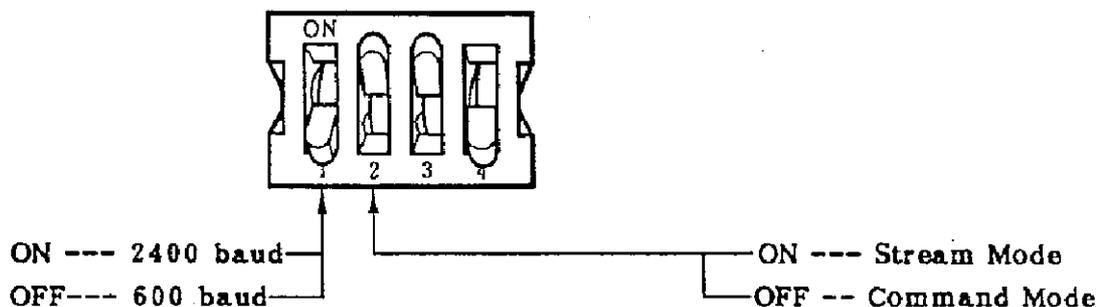
20mA current loop  $\left\{ \begin{array}{l} "1" = 20mA \\ "0" = 0mA \end{array} \right.$

(b) Transmission mode

Two transmission modes are available. Either Stream Mode or the Command Mode can be selected using dip switch no. 2.

(c) DIP-SWITCH SELECTION

Mode and baud rate can be selected by 4 bit dip-switch on PCB.

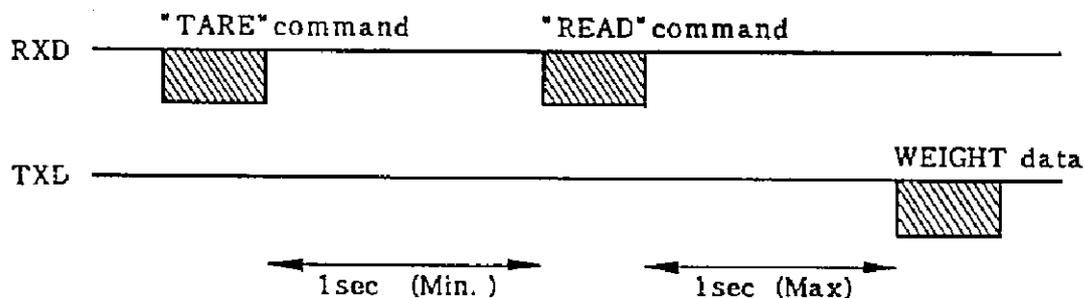


(d) Command mode

In this mode Data are transmitted each time after receiving "READ" Command from external device.

This mode is available only for RS-232C.

Timing



i) "TARE" Command

RXD --- (TARE) (CR) (LF)

When this "TARE" command is given, TARE function of balance is activated. 1 second is required for the execution of this command, therefore, next command should be given no sooner than 1 second after TARE command is given.

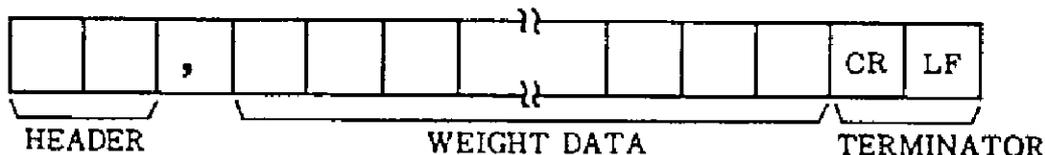
"READ" command is not accepted until after the display shows zero with no-motion when "READ" command is repeated.

ii) "READ" Command

RXD --- (READ) (CR) (LF)

When the "READ" command is given, weight data measured immediately following this command is transmitted.

\* Data format in Command mode



Three types of HEADER are transmitted:

OL ----- Overload

ST ----- Display being stable ( not in-motion )

US ----- Display being unstable ( in-motion )

Weight data are transmitted by ASCII numerals including following codes:

2D (HEX) - - - - - "-" ( minus )

2B (HEX) - - - - - "+" ( plus )

20 (HEX) - - - - - " " ( space )

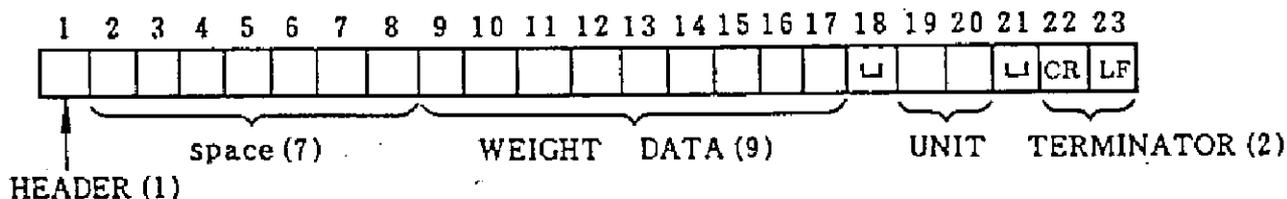
45 (HEX) - - - - - "E" ( exponential )

2E (HEX) - - - - - "." ( decimal point )

NOTE: Keep MODE switch OFF all the time when "Command" mode is in use.

(e) Stream mode

In this mode, weight data is transmitted repeatedly without a data request, and the data format is as shown below:



Two types of HEADER are transmitted as follows:

NULL: 00 (HEX) - - - - - Display being stable. ( not in-motion )

DC2 : 12 (HEX) - - - - - Display being unstable ( in-motion )

\* " " (space) is indicated by 20 (HEX).

NOTE: This is a passive type current loop output and a 20 mA source must be supplied externally.

(f) CIRCUIT

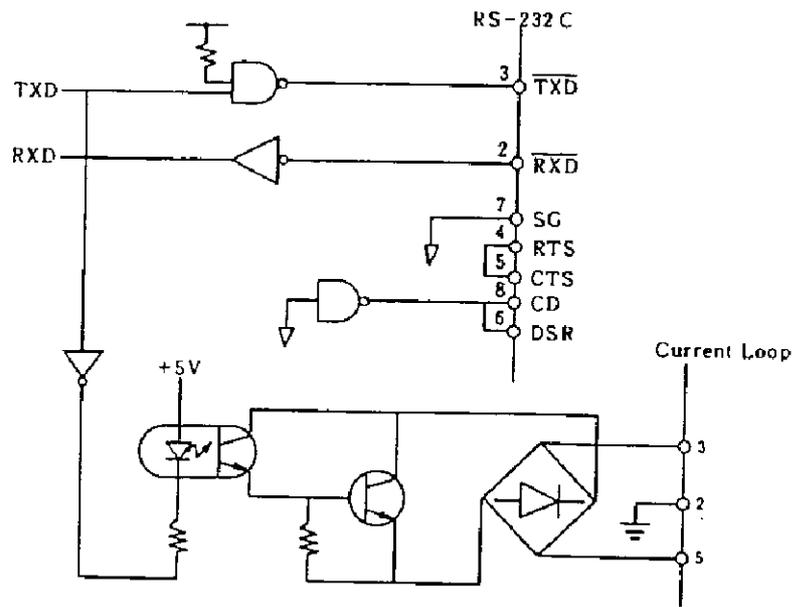


fig.no.15

(g) PIN DESIGNATION

(i) RS-232C \*

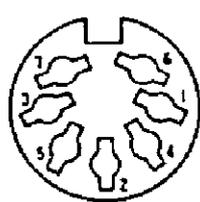
Pin no.	Signal	Pin no.	Signal
1	FG	14	NC
2	← RxD	15	
3	→ TxD	16	
4	← RTS	17	
5	→ CTS	18	
6	→ DSR	19	
7	SG	20	
8	→ CD	21	
9	NC	22	
10	↑ NC	23	
11	↓ NC	24	
12		25	NC
13			

\* Designated as Data Communication Equipment;

← = Signal Input; → = Signal Output.

(ii) 20mA Current loop (passive)

Pin no.	Signal
1	NC
2	FG
3	Current loop
4	NC
5	Current loop
6	NC
7	NC



(b) STANDARD ACCESSORY

Current loop connector (1) TCP 0576

\* RS-232C connector is not included with this option.

(i) SAMPLE COMPUTER PROGRAM (NEC PC-9801 Microsoft BASIC)

When interfacing to PC-9801 with RS-232C in "COMMAND" mode, type in the following:

```

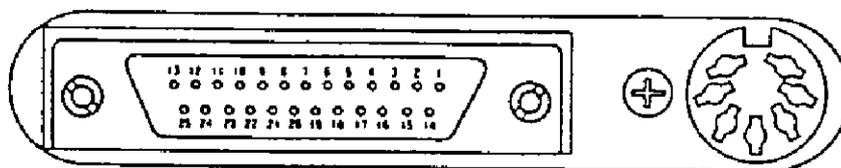
*M* *O* *N* *CR*
*S* *S* *W* *2* *CR*
*0* *4* *CR* (600 baud) *0* *6* *CR* (2400 baud)
*CTRL* *B*

10 T$="TARE"
20 R$="READ"
30 OPEN "COM:E71NN" AS #1
40 PRINT #1, T$ (TARE input)
50 FOR I=1 TO 1000 : NEXT I (Delay after TARE)
60 PRINT #1, R$
70 INPUT #1, HD$, DT
80 PRINT HD$, DT
90 FOR J=1 TO 100:NEXT J (Delay after (CR))*
100 GOTO 60
110 CLOSE #1
120 END

```

\*PC-9801 requires this delay.

OP-03



3. Option-09 GP-IB general-purpose interface bus (IEEE-488) is an interface for a controller. When selected, measured data data can be transmitted to, and "TARE" commands can be received from, a controller.

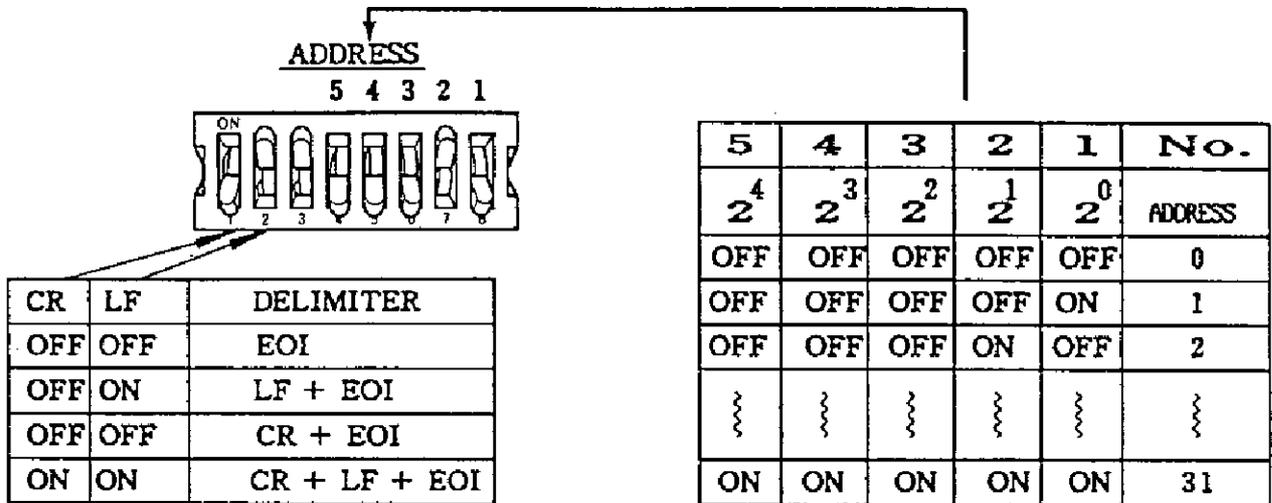
(1) Specifications (Inst.of Electrical & Electronics Engineers/International Electrotechnical Commission)

All specifications comply with IEEE-488-1975 and IEC-TC66 (CO) 22.

Interface functions-SH1, AH1, T6, L4, SR1, RL0, PP0, DC0, DT1, C0.

(2) Address and Delimiter switches

The dip switches for the address and delimiter are located on the option PCB.



(3) Commands

The following commands are available:

Commands

Function

SO . . . . . Prohibit the service request from the balance.

S1 . . . . . Permit the service request from the balance.

E . . . . . Memorize displayed data of the balance when E is received and when S1 has been received, SRQ will be sent out.

TARE . . . . The balance will be tared and display will zero.

NOTE:- Device trigger has an identical function with "E".

(4) SRQ (Service request)

SRQ will not be sent out until S1 is received after the power is turned on. When one of the following conditions is satisfied after receiving S1, SRQ will be sent out.

Condition 1. When data is accepted by the interface after E or E1 has been received.

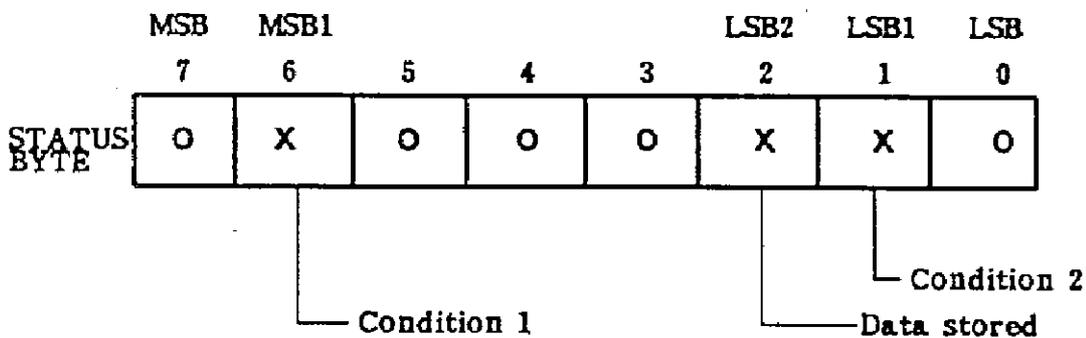
Condition 2. When an undefined code is received.

(5) STATUS BYTE

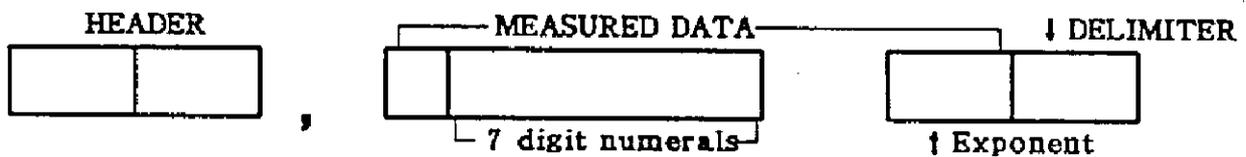
When SRQ is ready as a result of an S1 command, the status of MSB1 becomes 1, and after the status byte is read, MSB1 becomes 0.

When SRQ is ready as a result of an undefined code, LSB1 becomes 1, and after being designated as a listener, LSB1 becomes 0.

When SRQ is ready as a result of storing data, LSB2 becomes 1, and after being designated as talker, LSB2 becomes 0.



(6) DATA FORMAT



Header Code	Meaning
ST	The balance is stable (Not-in-motion)
US	The balance is not stable (In-motion)
OL	Overload or malfunction

(7) ACQUIRING MEASURED DATA

When "E" is received, the balance stores the data just measured, then transmits this data if it is designated as a talker. Unless another "E" is received, the former data instead of new data will be transmitted if it is designated as a talker. Therefore the balance should receive "E" to update the data before being designated as a talker.

When "E" is received after "S1" is accepted, the balance stores the data and transmits "SRQ".

(8) COMPUTER PROGRAM EXAMPLE (GP-IB IEEE-488)

When interfaced with HP-85,

program the addresses and delimiters of each machine as below:

MACHINE	HP-85	OP-09 of BALANCE
ADDRESS	21	1
DELIMITER	CR+LF+EOI	CR+LF+EOI

(a) Initialize

```
10 RESET 7 ----- Interface clear
15 CONTROL 7, 16;130 --- Set delimiter of HP-85 as CR+LF+EOI
```

(b) TARE the balance

```
10 OUTPUT 701 ; "TARE"
```

(c) Acquire data and display

```
20 OUTPUT 701; "E"
30 ENTER 701; A$ @ DISP A$ --- Receive data into A$ and display
40 GOTO 20
```

(d) Acquire data using SRQ.

```
10 ON INTR 7 GOSUB 100
15 CONTROL 7, 16; 130 ----- Not required with (a) 15 above.
20 ENABLE INTR 7;8 ----- Allow SRQ from balance
30 OUTPUT 701; "SI" ----- Allow balance to transmit SRQ
40 OUTPUT 701; "E" ----- Instruct balance to acquire data
50 GOTO 40 ----- Loop
100 S=SPOLL (701) ----- Read Status Byte from address No. 1
110 DISP S ----- Display Status Byte
120 STATUS 7, 1 ; Z ----- Read Status Register
130 ENTER 701 ; A$ ----- Read measured data into A$
140 DISP A$ ----- Display measured data
150 ENABLE INTR 7;8 @ RETURN -- Allow SRQ from balance and return
```

**G.**

**Printers**

**1. DIGITAL PRINTER AD-8114.**

Use interface cable; KO:145 between Input A of the printer and BCD output of balance which should have option-01 installed.

The internal switches of the printer should be programmed as follows;

SW 1		SW 2	
NO	ON/OFF	NO	ON/OFF
1	ON	1	OFF
2	ON	2	OFF
3	OFF	3	OFF
4	OFF	4	OFF
5	ON	5	OFF
6	ON	6	ON
7	OFF	7	ON
8	OFF	8	OFF

**\* Manual print**

MODE switch of the balance should be "OFF".

MAN/EXT switch of the printer should be "MAN".

Pressing the "PRINT" switch of printer will initiate the printing procedure.

**\* Auto print**

MODE switch of the balance should be "ON".

MAN/EXT switch of the printer should be "EXT".

Placing an object on the weighing pan initiates the printing procedure as soon as the weight display becomes stable.

**2. JOURNAL PRINTER AD-8113.**

Use a KO:183 interface cable between the balance BCD output port and printer.

The internal switches of the printer should be programmed as follows:-

SW 1	EX-200EY-220A	EX-2000EY-2200	SW 2	EX&EY Models
1	ON	OFF	1	OFF
2	ON	ON	2	OFF
3	OFF	OFF	3	OFF
4	ON	ON	4	OFF
5	ON	ON	5	N/A
6	OFF	OFF	6	N/A
7	OFF	OFF	7	N/A
8	OFF	OFF	8	N/A

3. COMPACT PRINTER AD-8116.

Uses a KO: 256 interface cable between the printer & RS-232C interface card.

Printer MODE switch should be set to ONE for Auto-print & TWO for Manual.

The dip-switches on the RS-232C interface card inside the balance should be set to one & two ON.