

**ESJ Series  
Analytical Balance**

**User Manual**

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## SECTION 1

# INTRODUCTION

This manual covers installation, operation and troubleshooting for the Electronic Analytical Balances. Models are ES – 180J, ES - 120J and ES – 60 J.

To insure proper operation of your balance, please read this manual completely before you start to use your new balance.

The ES-J Series of analytical balances are the products of years of research, design, development and infield testing. Every balance incorporates the latest advances in electronic and mechanical engineering and offers the advanced features listed below :

- Stable and rapid weighing
- Automatic calibration via a built-in calibration mass
- Ability to tare up to the maximum capacity of the balance
- An optional RS-232C interface for connecting to the printer or computer can be built into balance.
- Easy to read cobalt blue fluorescent display
- Below balance weighing

## SECTION 2

# SPECIFICATIONS

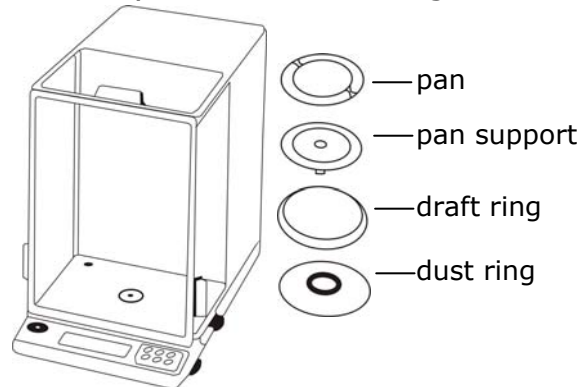
ESJ Series				
Model #	ES200J-4	ES180J-4	ES120J-4	ES60J-4
Maximum Capacity	200 g	180 g	120 g	60 g
Readability	0.0001 g			
Repeatability	± 0.0001 g			
Linearity	± 0.0002 g			
Sensitivity drift	2 ppm / °C (10 °C ~ 30 °C)			
Operating Temp.	5 °C ~ 40 °C			
Pan Size	Φ 90 mm			
Chamber size	185 x 225 x 155 mm			
Dimensions	195 x 275 x 406 mm			
Net Weight	11 kg			
Power	AC Adapter – 220 V; 50/60 Hz			
Calibration mass	200 g	100 g		50 g

## SECTION 3 INSTALLATION

### 3.1 Unpacking

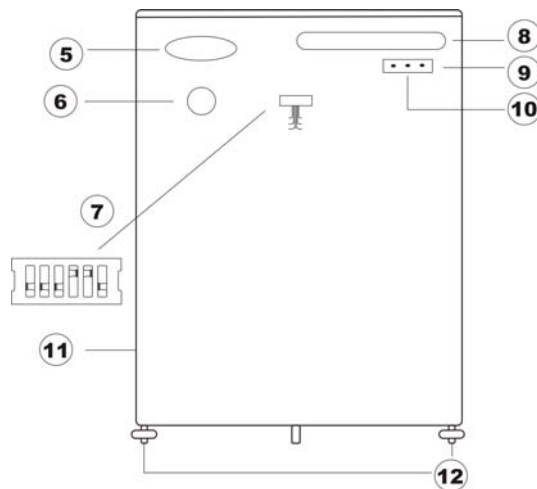
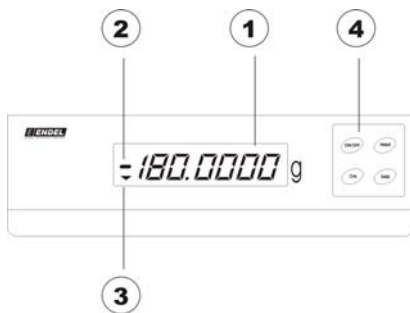
Remove the balance from the carton carefully with the following items:

- a. pan
- b. pan support
- c. draft ring
- d. dust guard
- e. AC power adapter
- f. Spare fuse (0.5A)
- g. Instruction manual
- h. Certificate of inspection



It is recommended to keep the carton intact for future use like storing, transporting or returning it for service.

### 3.2 PANEL DESCRIPTION

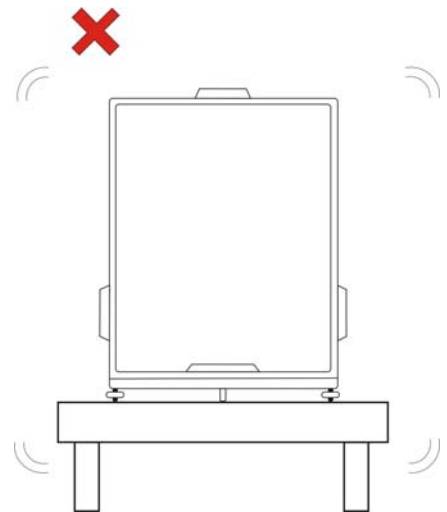
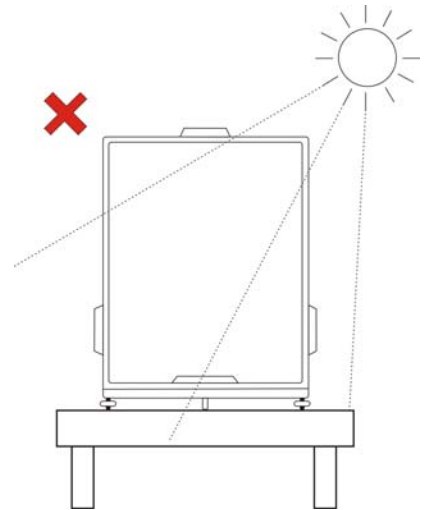


1. Display
2. Polarity Indicator (it is negative when "-" is displayed, and it is positive when "-" disappeared.)
3. Stability Indicator
4. Key Board
5. AC adaptor plug
6. Fuse holder (0.5A)
7. Dip - switch
8. Slot for installing RS-232C interface (optional)
9. Terminals for connecting external RE-ZERO switch
10. Earthing point
11. Handle for putting the calibration mass on or off the weighing system
12. Adjustable feet

### 3.3 Environmental Requirements

As a precision instrument, this analytical balance requires an environment which is free from excessive air currents, corrosive, vibration and temperature or humidity extremes. These factors will affect displayed weight readings. Note following instructions carefully:

- Keep weighing ambient always clean and dry.
- Best operating temperature is about 20 °C /68 °F at about 50% relative humidity
- Use a stable AC power
- Don't put the balance in direct sunlight, next to open window or door causing draft or rapid temperature change.
- Don't put the balance near heater or air conditioner
- Don't put the balance near vibrating, rotating or reciprocating equipment
- Don't put the balance near magnetic field or equipment that generates magnetic field
- Don't put the balance on the unstable weighing table or un-even surface
- Don't put the balance in areas containing aggressive chemical vapors
- Don't put the balance in areas where there is danger of explosion





### 3.4 Setting up your balance

Place the balance on a stable and level work surface and level the balance by turning the adjusting feet (check the bubble level indicator on the balance) until the bubble appears in the center circle of the indicator.






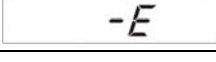
Put the parts on the balance as following sequence : dust guard, draft ring, pan support and pan.

Plug in the AC adaptor. The adaptor's input requirements could be 220 or 240 volts (50/60 Hz), so please check the adaptor is correct before you plug in the AC adaptor.

The balance displays  (standby) or  (power failure) that appears when power is interrupted due to power failure during normal use, or the adaptor is unplugged while the display is on.

## SECTION 4 DISPLAY AND KEYS

### 4.1 Displays

	Standby Indicator. This mark is displayed when you turn the display off while the AC adaptor is still connected.
	Stabilization mark. You can read out a stable weighing data when this mark is displayed
	A positive displayed value during normal weighing
	A negative displayed value during
	Over load error code. This indicates that the object placed on pan is beyond the capacity
	Pan error. This indicates that the pan and/or pan support has not been put on the balance, or not properly placed.

### 4.2 Keys

The key ON/OFF turns the display ON or OFF but does not switch the power ON or OFF. The balance will remain on standby (warm up) while the AC adaptor is plugged.

The key TARE is used to zero the display. It returns the balance to the center of zero when the pan is empty, and also tare total weight (container and sample) within capacity of the balance. It is helpful to use this key before each weighing to get best results.

The key CAL is used to Calibrate the balance.

The key PRINT will print the data on printer or transmit it to the computer if the RS 232C is plugged with the balance.

# SECTION 5

## OPERATION

### 5.1 Simple Weighing

Turn the display ON by pressing ON/OFF key with the pan empty. After displaying self – check mode “0.0000” will be displayed.

Note : Zero display using TARE key when the display is not zero.

- Place the sample to be weighed on the pan.
- Readout the data when stabilization indicator appears.
- Remove the sample from the pan.

If container should be used (Weighing liquid or powder etc.)

- Place a container on pan. The weight of the container will be displayed.
- Press TARE key to cancel the weight. “0.0000” will be displayed.
- Fill the sample be weighed into the container.
- Readout the data when the stabilization indicator appears.
- Remove sample and container from the pan. The display will show the negative reading. Press TARE key once again to return the display to “0.0000”.
- Remove all the things from the pan and turn the display off using ON/OFF key when the operation is ended.

Note : Unplug the adaptor if it takes a long period to do the next operation.

## 5.2 Weighing-OUT

- Press TARE key to zero the display.
- Place a container with sample in it. The total weight is displayed.
- Press TARE key to cancel the weight.
- Start removing sample from the container.
- A negative weight of the sample removed will be displayed
- Stop removing when the target is reached.

## 5.3 Weighing-IN

- Place a container on the pan. The weight of the container will be displayed.
- Press TARE key to cancel the weight. "0.0000" will be displayed.
- Start filling the sample into the container. Stop filling when target is reached.
- Press TARE key to cancel the weight. "0.0000" will be displayed.
- Start filling another sample into the container. Stop filling when the target is reached.

Continue to operate as the steps mentioned above.

## 5.4 Deviation Weighing

- Press TARE key to zero the display.
- Place a mass or a sample on the pan as a reference.
- Press TARE key to cancel the weight.
- Remove the mass or sample from the pan. A negative weight will be displayed.

- Place a comparison object on the pan.
- A deviation between the reference and comparison will be displayed.

## 5.5 Below Balance Weighing

The ES-J series analytical balance is equipped with a built-in below balance weighing. Common applications for below balance weighing include density determination or weighing some magnetic materials.

### 5.5.1 Preparation

- Place the balance on a table with the front portion of the balance out of the edge of the table. Now a round plastic plug will be found under the balance.
- Open the port by removing the plug and you will find the hook.
- Hang a fine thread from the hole.
- Place the balance on a table with a hole in it or a stand specially designed for below weighing, and let the thread hang through the hole.
- Suspend a plate like container on the other end of the thread.

Note : for best result, it is necessary to recalibrate the balance and use a shield to eliminate the drafts.

### 5.5.2 Density Determination

- Place an unknown material in the container when the display is zeroed.
- Read out the weight A of the material in air. Say  $A = 10.0000$  g.
- Press TARE key to cancel the weight.
- Immerse the container in the water at  $10\text{ }^{\circ}\text{C}$ .
- Read out the difference B between the weight of the material in air and the weight of the material in water. Say  $B = 0.0400$  g.

- Calculate the C value from following water density table.

Temperature	Density
0 °C	0.99984 g/cm <sup>3</sup>
4 °C	0.99997 g/cm <sup>3</sup>
10 °C	0.99970 g/cm <sup>3</sup>
15 °C	0.99910 g/cm <sup>3</sup>
20 °C	0.99920 g/cm <sup>3</sup>
25 °C	0.99704 g/cm <sup>3</sup>
30 °C	0.99565 g/cm <sup>3</sup>

$C = B \div \text{Density of water at particular temperature}$

$$C = 0.0400 \text{ g} \div 0.99970 \text{ g/cm}^3 = 0.0400 \text{ cm}^3$$

Now calculate the density of the material as follows :

$$A \div C = \text{Density of the material (g/cm}^3\text{)}$$

$$10.0000 \div 0.0400 = 250 \text{ g/cm}^3. \text{ The material is most likely } \mathbf{Cork}.$$

## SECTION 6

# CALIBRATION

Your balance should be calibrated when it is first used. It is necessary to recalibrate your balance when it is moved to another place, or after a period of use (about 30 days).

### 6.1 Procedure

- Turn the display ON by pressing ON/OFF key with the pan empty. Self check mode will be displayed and followed by "0.0000".
- If the display does not show a real zero, press TARE key to zero the display.
- Press CAL key. "CAL in" will be displayed.
- Then "CAL . . . ." will be displayed. Do nothing but wait for next display.
- "CAL dn" will be displayed after few seconds; it shows that you should put the calibration mass on the weighing system. Pull the

handle located on the right side of the balance toward you gently until it is stopped.

- While "CAL . . . ." is displayed, do nothing but wait for the next display.
- "CAL up" will be displayed after few seconds; it shows that you should take the calibration mass off the weighing system.
- Push the same handle backward gently until it is stopped.
- "CAL . . . ." will be displayed and then "CAL End" appears.
- After 1 second "0.0000" will appear on the display.

Calibration procedure is completed and balance is now returned into the weighing mode.

## 6.2 Calibration Check

It is necessary to check the result, using international mass or external mass, after calibration.

### 6.2.1 Check using the internal mass

First you should learn the exact value of the internal calibration mass from the plate in the rear of the balance.

Put the internal calibration mass on the weighing system by pulling the handle, located on the right side of the balance, toward you gently until it is stopped.

If the difference between the value displayed and the value of internal calibration mass is  $\pm 0.0001\text{g}$ , your balance is calibrated properly. Take the mass off the weighing system by pushing the same handle backward gently until it is stopped.

If the difference is more or than  $\pm 0.0001\text{ g}$ , please repeat the calibration procedure.

### 6.2.2 Check using the external mass

A 100 g standard mass should be used to check Models ES-180J and ES-120J; and a 50 g standard mass should be used to check the model ES-60J.

The mass must be accurate and the exact value should be known.

- Zero the display by using TARE key with nothing on the pan.
- Place the mass on the pan. If the difference between the value displayed and exact value of the mass is  $\pm 0.0001$  g, your balance is calibrated. Remove the mass from the pan.

If the difference is more than  $\pm 0.0001$  g, please repeat the calibration procedure.

## SECTION 7 TROUBLE SHOOTING

PROBLEM	CAUSES	SOLUTION
No segments appears on the display	<ul style="list-style-type: none"> <li>• The AC adaptor is not plugged in</li> <li>• The fuse is blown</li> </ul>	<ul style="list-style-type: none"> <li>• Plug in the AC Adaptor</li> <li>• Change the fuse with new one</li> <li>• Send your balance to service center if it is blown again after replacing new fuse</li> </ul>
The value displayed changes constantly	<ul style="list-style-type: none"> <li>• Unstable weighing environment</li> <li>• The door is not closed completely</li> <li>• A foreign object is caught between the pan and the balance housing</li> <li>• Under hook port is open</li> <li>• The object to be weighed is not stable (absorbs moisture or evaporates)</li> </ul>	<ul style="list-style-type: none"> <li>• Move your balance to a stable environment; where there is no breeze or vibration</li> <li>• Close the door completely</li> <li>• Remove the foreign object</li> <li>• Plug-in the plastic plug into Under hook port</li> </ul>
The value displayed is absolutely wrong	<ul style="list-style-type: none"> <li>• The balance is not calibrated</li> <li>• The balance was not tared before weighing</li> <li>• The balance is not leveled</li> </ul>	<ul style="list-style-type: none"> <li>• Calibrate your balance properly</li> <li>• Level the balance with adjustable feet until the bubble of the level indicator is within the circle completely</li> </ul>

## SECTION 8

# CARE AND MAINTENANCE

### Taking Care

ES-J series electronic analytical balance is a precision instrument. It should be handled as carefully as other precision instruments handled in your laboratory. Please, follow below mentioned directions for better care and maintenance of your ES-J analytical balance.

1. Do not use a sharp object (such like pencil or ballpen etc.) to touch the keys. Use your fingers gently.
2. Do not let the object fall on the pan, otherwise the weighing system will be damaged.
3. Do not place a weight beyond the maximum range of the balance. It may damage your balance severely.
4. Don't disassemble the balance without the permission of authorized technical personnel.
5. Do not expose your balance to extreme moisture or dust over long periods.
6. It is better to cover your balance after use.
7. Keep your balance clear and dry.
8. Do not use solvents to clean the balance.
9. Protect delicate internal parts from spills of liquid and excessive dust.

### Cleaning

- Unplug the AC adaptor before cleaning
- Do not use any aggressive cleaning agents (such as solvents or similar agents)

- Use a piece of damp cloth and mild detergents to clean the balance if necessary
- Be careful that no liquid enters the balance housing. After cleaning, wipe out the balance with the soft and dry cloth.

## SECTION 9 OPTIONS

### RS-232C INTERFACE

This RS-232C string interface should be compatible with standard RS-232C interface.

#### Specifications

Transmission form	:	Asynchronous transmission, unidirectional.
Data Format		
Baud Rate	:	300, 600, 1200, 2400
Data Bits	:	8 bits
Parity	:	none
Stop bit	:	1 bit
Code	:	ASCII

#### Data Output – Auto Print

There are three types of data output mode : Auto Print A, Auto Print B and Auto Print C

##### A. Auto print A

When the balance and a printer or a computer connected with the balance is turned on; the data in the balance will be transmitted to the respective device continuously, unless you turn off the balance and/or printer or computer.

##### B. Auto print B

Whenever the balance becomes stable(stability indicator appears), one group of the data will be transmitted to the connected device.

##### C. Auto print C

You should empty the pan and zero the display before each weighing in this Auto print C mode. Whenever the balance becomes stable (stability indicator appears), one group of data will be transmitted to the connected device.

**Data Format**

X X X W I X X X + 100.0000 X X g <CR> <LF> <LF>  
 X = space (20H)  
 <CR> = carriage return  
 <LF> = line feed

**Connection**

	balance		printer	
1	<u>STB</u>		<u>STB</u>	1
2	<u>DATA 1</u>		<u>DATA1</u>	2
3	<u>DATA 2</u>		<u>DATA2</u>	3
4	<u>DATA 3</u>		<u>DATA3</u>	4
5	<u>DATA 4</u>		<u>DATA4</u>	5
6	<u>DATA 5</u>		<u>DATA5</u>	6
7	<u>DATA 6</u>		<u>DATA6</u>	7
8	<u>DATA 7</u>		<u>DATA7</u>	8
9	<u>DATA 8</u>		<u>DATA8</u>	9
10	<u>ACK</u>		<u>ACK</u>	10
11	<u>BUSY</u>		<u>BUSY</u>	11
	:		:	
	:		:	
25	<u>GND</u>		<u>GND</u>	25

**Setting of Rate and Data Output modes**

- Press ON/OFF key to turn the display off.
- Unplug the AC adaptor from the balance.
- Remove the housing of the balance and you will find a group of 6 dip-switches segments on a dip-switch assembly on the interface board.
- Set the Baud rate and Data output modes by turning the dipswitch.

Segment	1	2	3	4	5	6
Function	Baud Rate			Data Output Mode		

Setting Baud Rate

Segment		Baud Rate
1	2	
ON	ON	300
OFF	ON	600
ON	OFF	1200
OFF	OFF	2400

Setting Data Output Modes

Segment		Data Output Modes
5	6	
ON	ON/OFF	Auto Print A
OFF	ON	Auto Print B
OFF	OFF	Auto Print C

The original Factory Setting

Segment	1	2	3	4	5	6
Function	OFF	OFF	OFF	OFF	OFF	OFF

*Example of a program for receiving a weighing data from the balance  
(Baud Rate : 2400)*

```

10 CLS
20 OPEN "COM1:2400, N, 8, 1, CS, DS" AS#1
30 OPEN "SCRN : "FOR OUTPUTAS#2
40 PRINT "1.START"
50 PRINT "2.STOP"
60 INPUT A%
70 IF A% < 1 OR A% > 2 THEN PRINT "AGAIN"; : GOTO 60
80 ON A% GOSUB 90, 140
90 B$ = INKEY $
100 IF B$ ="2" THEN CLOSE : GOTO 140
110 LINE INPUT #1, X$
120 PRINT #2, X$
130 GOTO 90
140 END
    
```

“**ENDEL**” is an internationally reputed brand name in Electronic Weighing Instruments since last 11 years.

Our products are produced in India & Taiwan and supplied & serviced from our India, UAE and Kenya hubs; distributed through a world wide dealer network.

All “**ENDEL**” products are carrying advanced technology, designed by our R & D experts for specific commercial & non-commercial use in Laboratory, Medical, Business and Industrial environments.

Brief summary of “**ENDEL**” product range is...

- Laboratory Balances
- Jewelry Balances
- Pocket Scales
- Gem Scales (Carat Scales)
- Table Top Scales / Super Market Scales
  - Simple Weighing Scales
  - Price Computing Scales
  - Piece Counting Scales
  - Wash Proof/ Water Proof Scales
- Platform Scales
- Deck Scales
- Pallet scales
- Crane Scales
- Hanging (fishing) Scales
- Postal / Parcel Scales
- Bathroom Scales
- Kitchen Scales
- Baby Weighing Scales
- Truck Weighing Scales (Weighbridges)
- Weighing Indicators
- Load Cells
- Accessories
- Customized auto weighing systems

“**ENDEL**” operates on approved quality management system and is certified to ISO 9001 : 2000

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*CONTACT for any further assistance*



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