ANALYTICAL BALANCE

# OPERATION MANUAL

(FA/JA Series)

# CONTENT

# I. Brief Introduction

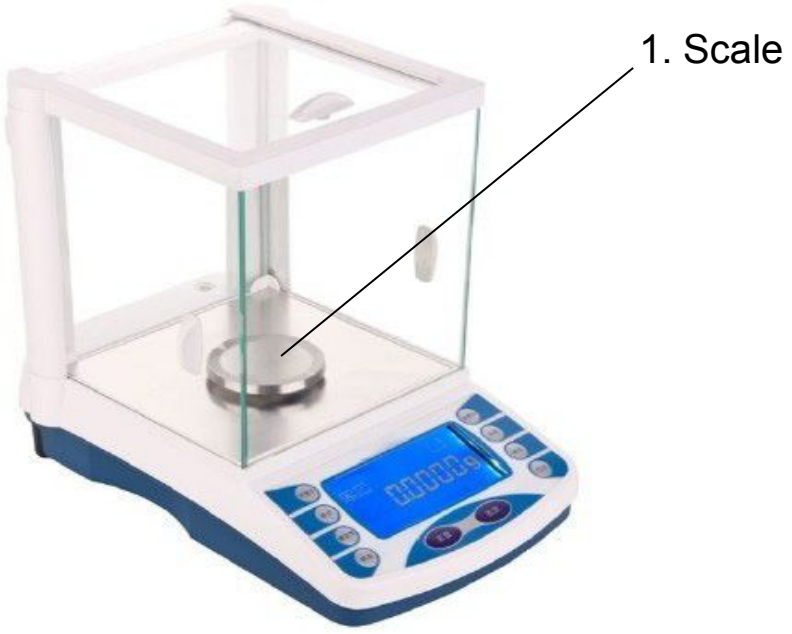
The balance is multifunctional electronic balance using MCS-51series single-chip microcomputer. This balance has gram, cant, ounce for users to select (cant and ounce for export) besides the functions of automatic calibration, integral time adjustment and stability adjustment embodied by the general intelligent electronic balance. This balance has RS232C data serial duplexing port to connect with microcomputer and serial port printer (e.g. TP μ P-T16S). Five modes of data output are set for selection, including three gears timing, continuous and manual output etc.

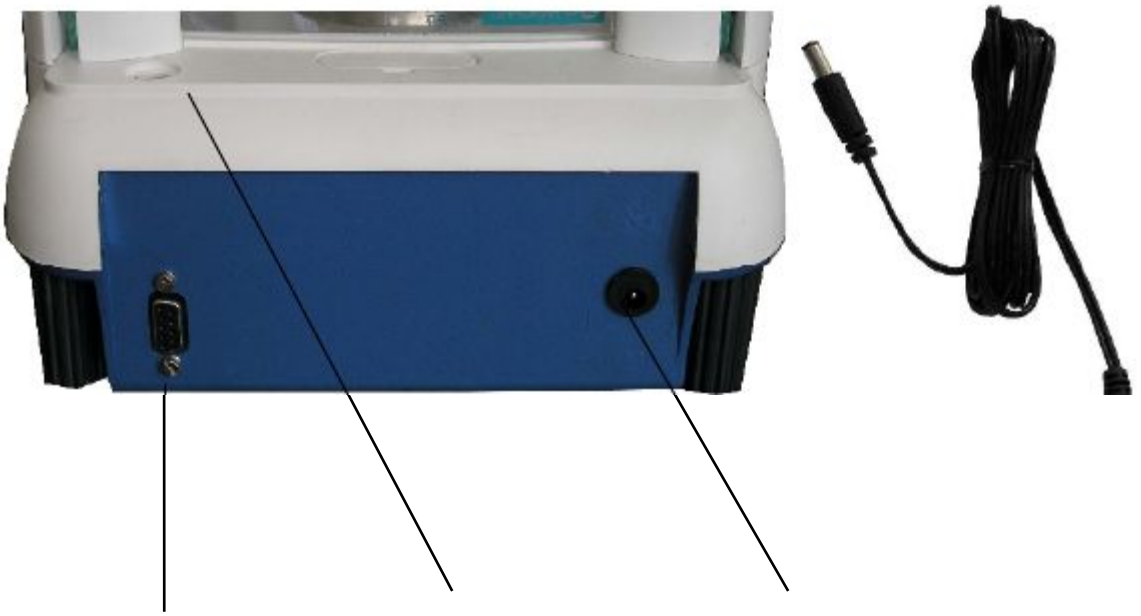
# II. Main Technical Specifications

| Model | FA1004B | FA1204B | FA2004B | FA2204B | JA1003N | JA2003N |
|---|---|---|---|---|---|---|
| Accuracy Degree | (I) | (I) | (I) | (I) | (I) | (I) |
| Weighing Range(g) | 0~100 | 0~120 | 0~200 | 0~200 | 0~100 | 0~200 |
| Reading Accuracy(mg) | 0.1 | 0.1 | 0.1 | 0.1 | 1 | 1 |
| Taring range (g) | 0~100 | 0~120 | 0~200 | 0~220 | 0~100 | 0~200 |
| Max | +/-0.5e 0r +/-1e | | | | | |
| Repeatability Standard Deviation(g) | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 |
| Stable Time (Typical)(s) | ≤8 | ≤8 | ≤8 | ≤8 | ≤8 | ≤8 |
| Integrating (s) | 2.5/5/10 | 2.5/5/10 | 2.5/5/10 | 2.5/5/10 | 2.5/5/10 | 2.5/5/10 |
| Pan Dia.(mm) | Φ80 | | | | | |
| Overall Dimensions (mm) | 350×210×346 | | | | | |
| Net Weight(kg) | 8.5 | | | | | |
| Auto-Cal Weight Range(g) | 100 | 200 | 200 | 200 | 100 | 200 |
| starting up Time(min) | 120 | 120 | 120 | 120 | 180 | 180 |
| * Standard deviation = 1/3 poor law , * Verification yardstick indexing value e = 10d | | | | | | |

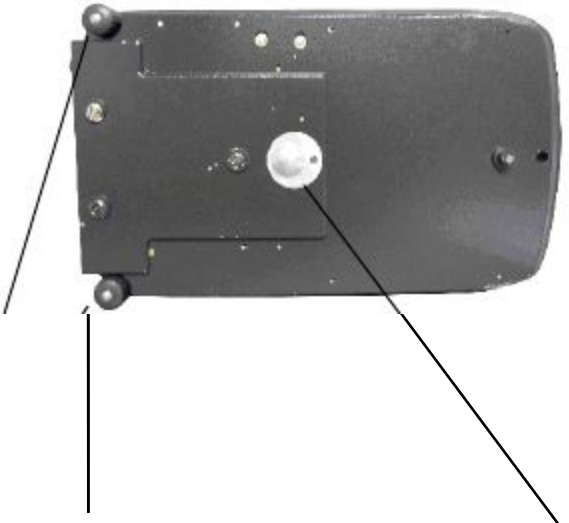
| Model | JA2603N | JA3003N |
|---|---|---|
| Accuracy Degree | (I) | |
| Weighing Range(g) | 0~260 | 0~300 |
| Reading Accuracy(mg) | 1 | 1 |
| net weight(g) | 0~260 | 0~300 |
| Max | +/-0.5e or +/-1e or 1.5e | |
| Repeatability Standard Deviation(g) | 0.0002 | 0.0002 |
| Stable Time (Typical)(s) | ≤8 | ≤8 |
| Integrating (s) | 2.5/5/10 | 2.5/5/10 |
| Pan Dia.(mm) | Φ80 | |
| Overall Dimensions (mm) | 350×210×346 | |
| Net Weight(kg) | 8.5 | |
| Auto-Cal Weight Range(g) | 200 | 200 |
| starting up Time(min) | 180 | 180 |
| * Standard deviation = 1/3 poor law , * Verification yardstick indexing value e = 10d | | |

## III. Drawings for Balance Installation





**2 . Data interface** **3. Level** **4. Power socket of Adapter**



**5. Leveling Adjuster** **6. Small rounded lid (with built-in hook)**

## IV.Operation

### A. Preparation

- Unpack the box and take out the buffer sponge in the wind proof cover and install the scale.
- Put the balance on a stable working table free form vibration, sunshine and air flow.
- Ambient temperature: Class (I) balance: 20℃ ±5℃ , with its temperature fluctuation no more than 1℃ /h; Class (II) balance: 20℃ ±10℃ , with its temperature fluctuation no more

than 5℃ /h.

- Relative humidity: Class (I) balance＜50%-75%; Class (II) balance＜50%-80%
- Working voltage: 220V±22/33V, 50Hz

## B. Operation

- Check the level before operation; If the bubble is not in the center, adjust the leveling adjuster to make the bubble in the center.
- Adopting soft touch buttons, this balance can realize multi-keyboard controlling which is flexible and convenient. Function change and selection can be realized simply by pressing the corresponding buttons.
- Introduction to the Panel keyboard

  <ON> ---- switching on LCD screen

  <OFF> ---- switching off LCD screen

  <TAR> ---- RESET (tare)

  <INT> ---- Integral time Adjustment

  <ASD> ---- Stability Adjustment

  <CAL> ---- Calibration, points function confirmation(see Article E for details), Percentage load confirmation(see Article G for details)

  <COU> ---- Points function (not for double-range balance; should be corrected into <RNG>)(see Article F for details)

  <UNIT> ---- Unit conversion, double-range balance setting(see article F for details)

  <PRT> ---- Output mode Setting
- Introduction to LCD screen introduction(see the schematic diagram)

  1: Integral time icon -------- When integral time is adjusted to “–INT-1”, only one wave appears at the bottom of the icon box.

  2: Stability adjustment icon --------When sensitivity is adjusted to “–ASD-1”, only one drop appears on the left of the icon box.

  3: When users do settings and select menu, the screen will flicker.

  4: The screen flickers when waiting is needed (except the occasion of pressing the button <CAL> in point function, see Article E for the details)

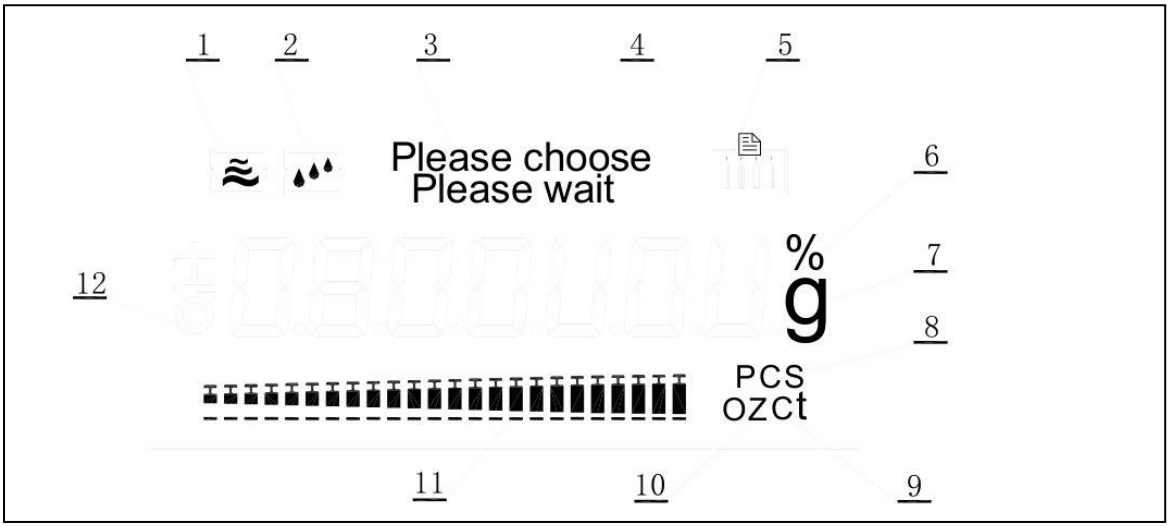
  5: Print mode icon -------- When users choose the mode “–PRT-1”, only a pen appears on the left of the icon box.

  6-10: Measuring units -------- For instance,”ct” means metric carat; ”oz” means gold medicine ounces

  11: Weighing icons -------- The weights increase in proportion to the metage and when metage is full, the weights display equivalent with dotted lines.

  12: Stability icon --------When the indicator “○” is off, the reading of the balance is correct, otherwise wrong.

**Schematic Drawing of the LCD screen**




## C. Starting Up

- Select an appropriate power supply and voltage and set the voltage switch to the corresponding position.
- Turn the power on and the balance is ready to run (but the display doesn't work). Normally after preheating, you can turn on the display to operate. In order to get accurate measurements, class Ⅰ balance needs to preheat for 3 hours, while class Ⅱ balance for 1 hour. If there is an emergency and no more time for preheating, users can weigh after calibration.
- Function of the keyboard:
  1. "ON": switch on the display. Only by pressing this button, the display will be lighted. Check the function of the display and about 2 seconds later, the model of the balance will be displayed

For example:

—2004—

Then the weighing mode:

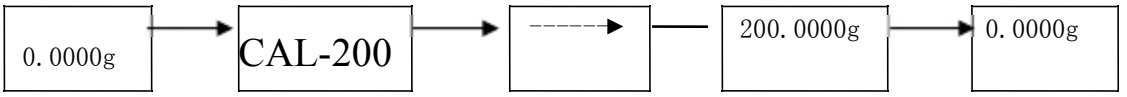
0.0000g Or 0.0000g

  2. "OFF": switch off the display; only by pressing slightly the button "OFF", the display will go out. (At this time the balance still energized.) If the balance will not be used for a long time, then users should plug out the power line and shut down the display.
  3. "TAR": Clear and Tare; Put the container on the pan, the weight of the container should be displayed. +18.9001g
     And then press the button "TAR", the display will go out and then will be all zeroes. The display of the container's weight value disappears. 0.0000g
     When the container is removed, a negative value of the container weight will be displayed -18.9001g
     Press the button "TAR" again, the display will be all zeroes, i.e. the balance clears 0.0000g

## D. Balance calibration

After a long period of storage, movement and change of environment, screens do not display the weight, and a weight appears on the left bottom of the screen. In order to weigh accurately, the balance should be calibrated before put into use.

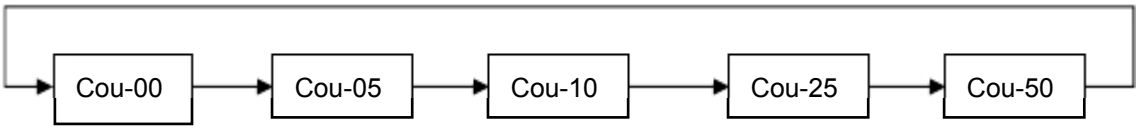
1. Preparation for the balance calibration: Take away all the objects to be weighed on the pan, eg: FA2004B balance; set COU-0. INT-3, ASD-2, UNT-0 mode (by default) and press slightly the button “TAR” to clear.
2. Calibration: press slightly the button “CAL” and hold on until “CAI-200” appears which means that 200g standard weight is necessary for the calibration. Then put the prepared 200g weight on the pan and the screen display “Please Wait” and “CAL-200” stops flickering. After several seconds, “200.000g” will be displayed, and “Please Wait” dies out. Remove the calibration weight, the screen should display 0.000g. A calibration is done. Clear again and repeat the above procedures if it doesn’t display zero. (Attention: More than two times of calibration is recommended in order to get accurate result.). The calibrate order is following:




## E. COU Count Function

The double -range electronic balances do not have counting function while simple balances do, and the average number are 5, l0, 25and 50.

The Range Setting of Average Numbers:
Press the button “COU” and hold, the screen will display ”Please wait” meanwhile the following menu will appear and circulate continuously:




It means the average value of (5, 10, 25, 50) objects respectively

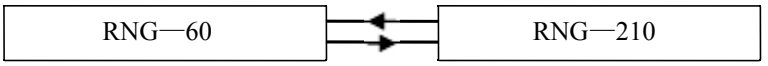
If a normal weighing function is required, release when COU-00 display, and waiting status “Please wait” will be indicated, at last weighing status 0.000g will be indicated. If you want to enter into counting, choose the average value of five objects and release when COU-5 is displayed, then wait until “please wait” die out. Then put 5 objects on the pan ,”Please wait” displays again and press the button CAL immediately before “Please wait” disappears. Then “……”and “please wait” status displays, about several seconds later, the balance displays “5”. Take away the objects to be weighed and the screen displays “0”. At that time the counting of the same objects to be weighed can be done (Attention: the weight of the objects to be weighed must not be greater than the maximum weighing rang of the balance).

If you choose the average value of over 10, 25 even 50 objects, the accuracy of counting will be higher

## F. RNG Weighing range conversion

Double-range Balance has two kinds of reading accuracy. For example, FA2104SB balance, its weighing range is 0~60g while its reading accuracy is 0.1mg. When the total weighing exceeds 60g, the balance will automatically convert into reading accuracy of 1mg. However, with tare function (0~210), it can be sectioned (within 60g) and used for 0.1 mg reading accuracy analysis when the total weighing does not exceed 210g. If the weight of the container exceeds 60g, users can press the button “TAR” slightly to eliminate the weight of the container and then weigh the objects (the weight of samples is within 60g), and its reading accuracy is maintained at 0.1mg.

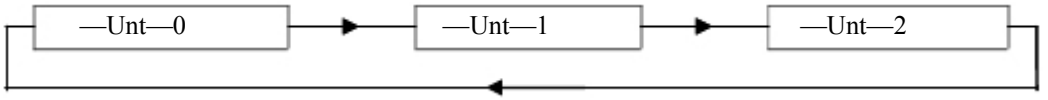
Weighing range setting:
By press the button <RNG> and hold, the screen will display menus below continuously:




If reading accuracy of 0.1mg is needed, release when RNG—60 is displayed. Then” -------“and “Please wait” appear, seconds later, the weighing status appears and the setting is done.

## G. UNT Unit Switch

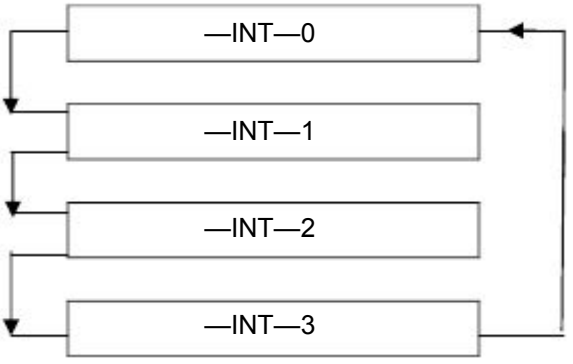
Press the button <Unit> and hold until the screen shows “Please choose” and the following menu appear continuously:




“0” means the unit “g”, “1” means the unit “metric carat/ct”. “2” means the unit “/oz”. The unit setting is as the same as that of <RNG> button.

## H. INT Integral Time Adjustment

Press the button <INT> and hold until the screen shows “Please choose”, and the following menu continuously:

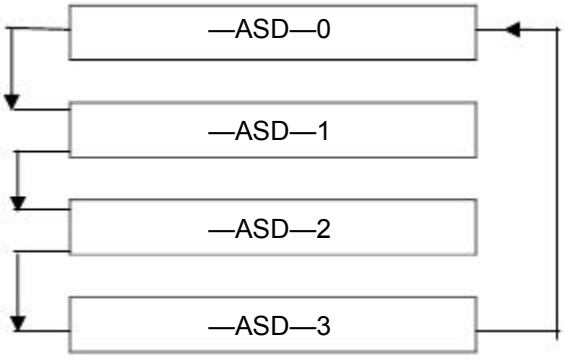



The corresponding integral time is as follows:
INT-0 fast, NT-1 short, INT-2 long, INT-3 longer

The selection of the integral time is also the same as that of the button <RNG>.

## I. ASD Sensitivity Adjustment

Press the button <ASD> and hold until the screen shows “Please choose”, and the following menu continuously:



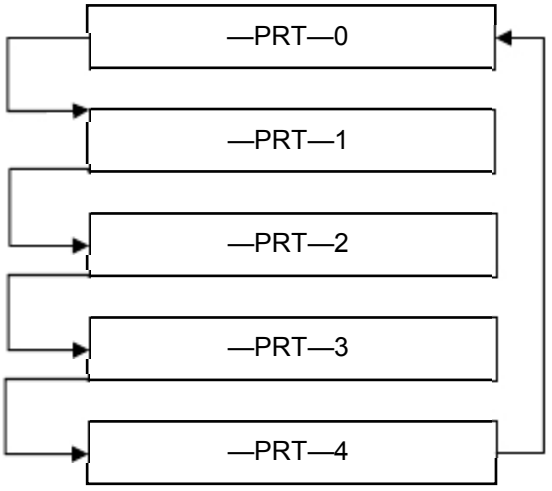

The corresponding sensitivity is as follows:
ASD—0 the highest ASD—1 higher ASD—2 high ASD—3 low
Among then, ASD—0 is used for test and not applicable for users. The selection of sensitivity by using the button <ASD> is the same as that of the button <RNG>.

Here is a list of the combination use of ASD and INT for user’s reference only.

| | | |
|---|---|---|
| The fastest weighing: | INT-1 | ASD-3 |
| Normal use: | INT-3 | ASD-2 |
| With undesirable environment | INT-3 | ASD-3 |

## J. PRT Output Mode Setting

Press the button <PRT> and hold until the screen shows “Please choose”, and the following menu continuously:



PRT-O is an output mode with indefinite time. Then press the button <PRT>, the weighing result will be output from the interface.
Attention: At this time you should press the button slightly and quickly, otherwise the next output mode will be displayed
PRT-1 output once every half a minute
PRT-2 output once every minute
PRT-3 output once every two minutes
PRT-4 output continuously.
The setting of <PRT> button is the same as that of <RNG>.

## K. Weighing, Taring, Adding Objects, Reading Deviations

**WEIGHING**
After the selection of the above modes (they are “INT-3, ASD-2, PRT-4” by default), press the button <TAR>, the balance will display zero. Then put the object to be weight on the pan. When the balance gets stable, namely, the indication of “0” and “please wait” on the left of the screen disappear, the value displayed is the weight of the object.

**TARING**
Put the container on the pan, the balance will display its weight. Then press the button <TAR>, the balance will display zero which means taring. Then the objects to be weighed into the container, the at that time the value displayed is the net weight of the object to be weighed.

**ACCUMULATIVE WETGHING**
Put the objects to be weighed on the pan one by one with taring method and clear for each one. Take away all the objects to be weighed, and then the absolute value displayed is the total weight of the objects.

**ADDING OBJECTS**
Set the mode of “INT-0, ASD-0”, and put the container on the pan, then tare. Add the objects to be weighed (liquid or loose objects) into the container one by one, the continuous reading value can be obtained quickly. When the added objects reach the required weight, “0” and “Please wait”on the left of the display goes out, and then the number display is the weighing value required by the user. When adding the mixed objects, users can use the method of taring to get the net weight of each object.

**READING DEVIATIONS**
Put the reference weight (or sample) on the pan and tare. Then take off the reference weight, the balance will display its negative value. And put the object to be weighed on the pan, the balance will display its positive or negative deviations according to the weight of the objects.

**TAKE THE BALANCE**
Loosen the small rounded screw at the bottom and uncover the hook. Put the balance on the working table, adjust and calibrate it, and then you can weigh with objects hanging on the hook.

# V. Maintenance and Failure Recovery

**MATNTENANCE**

The balance should be used carefully. Clean the pan and the case frequently with soft cloth and toothpaste. Don't wash the balance with strong agent.

| NO. | FAILURES | CAUSES | RECOVERY |
|---|---|---|---|
| **1** | Display failure | ·not well connected to the power supply;<br>·The display isn't switched on;<br>·Instant interference<br>·Fusing wire damage | ·Try to connect well with the power supply;<br>·Press the button "ON"<br>·Restart the balance or re-plug its power wire;<br>·Replace the fusing wire |
| **2** | Display the upper half only<br>"-------" | ·Overload<br>·The calibration in the internal memory may be damaged<br>·The pan is not installed correctly | ·Reduce the load immediately<br>·Recalibrate the balance according to the above procedures. About 8 seconds after the standard weight has been put on, the calibrated result may be displayed.<br>·Reinstall the pan. |
| 3 | Display the lower half only<br>"-------" | ·too light without pan<br>·The pan is not installed correctly | ·Reinstall the pan<br>. Refer to the recovery methods of Failure No. 2 |
| 4 | The weighing result is not stable (data changed swiftly) | ·there is air flow<br>·the working table is not stable<br>·the integral time is too short<br>·Room temperature fluctuates greatly | ·Close the windproof door<br>·Put the balance on a stable table<br>.Change to a longer integral time<br>-Control the room temperature |
| 5 | Wrong weighing result | ·no zeroing before weighing<br>·The balance is not calibrated or the weight for calibration is not accurate<br>·The power voltage is incorrect | ·Press the button <TAR><br>·Recalibrate the balance<br>. Use the correct power supply |

| NO. | FAILURES | CAUSES | RECOVERY |
|---|---|---|---|
| 6 | Display remains at a certain digit or indicates meaningful symbol | ·Instant interference<br>·Wrong power voltage | ·Restart the balance or re-plug the power cord<br>·Use the correct power supply |
| 7 | The stable mark "0"and "Please wait" on the left of the display doesn't go out | ·A higher balance sensitivity<br>·undesirable environment such as strong air flow, vibration and great fluctuation of the room temperature | ·Choose a lower sensitivity<br>·Improve the environment |

| | | | |
|---|---|---|---|
| 8 | Remain at waiting status “Please wait” | ·The balance is under an undesirable environment, e.g. with strong air flow, vibration or great fluctuation of room temp.<br>·The balance sensitivity is too high | ·Improve the environment<br>·Set to ASD-3 |
| 9 | Display “Cal Err” | ·There is an object on the pan before calibration<br>·not clear before calibration<br>·Cal weight is not correct<br>·Press the button <CAL> before the weighing model being displayed | ·Take away the object, clear and recalibrate<br>·Clear and recalibrate<br>. Refer to the above method<br>·Turn to weighing model |
| 10 | Display “Err-1” or “Err-2” | ·Instant interference<br>·Something wrong with the balance | ·Restart the balance<br>·Send it to the repair center |
| 11 | The weighing unit on the screen doesn’t appear and on the left there is a weight icon | ·The balance is not calibrated<br>·The calibrated number in the internal memory of the balance has been erased | ·Calibrate the balance<br>.Refer to the above recovery method |
| 12 | Display “Cou-Err” | ·No constant is set before counting<br>·Overload when setting constant<br>·Under-load when setting constant | ·Preset the counting average |

# VI. Date Interface

Date interface adopts the standard 9-core RS-232C socket with RS232C universal duel-way serial interface (no parallel port). And it can also be connected to the microcomputer and printer to facilitate users of connecting with system instrument or various terminal equipments. The pin and the corresponding signals are as follows:

| PIN | SIGNAL | ILLUSTATE |
|---|---|---|
| 2 | SI | input signal |
| 3 | SO | serial output signal (baud rate is 1200) |
| 5 | GND | |

## VII. Serial Port (RS232C)

The connection method between the balance and microcomputer serial port is as follows:

| Microcomputer (9pins) | | Balance (9pins) |
|---|---|---|
| 2 | ---------- | 3 |
| 3 | ---------- | 2 |
| 5 | ---------- | 5 |

1. The baud rate is 1200.
2. The date format is 10 digits, among which one is the start digit (0), 8 digits are data positions (ASCII Code, low digits in the front) and one stop digit.
3. No odd-even check
4. A detailed output frame is as follows:

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Space | */Space | +/- | Data | Data | Data | Dot | Data | Data | Data | Data | Unit1 | Unit2 | CR | LF |

## VIII. Accessories

1. 200g (and100g) calibration weights 1 Box
2. Adapter 1 Piece
3. Weights tweezers 1 Piece
4. Handkerchief 1 Piece
5. Operation manual 1 Copy