AD-4212A/B
AD-4212A-100/200/600/1000
AD-4212B-23/101/102/201/301
Production Weighing Unit

INSTRUCTION MANUAL

A&D Company, Limited

1WMPD4001448F
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1. INTRODUCTION

This manual describes how the AD-4212A/B series balance works and how to get the most out of it in terms of performance.

Read this manual thoroughly before using the balance and keep it at hand for future reference.

1-1 Features

- Separate Weighing Unit and Display (standard connection cable length 2 m), suitable for building into a production line system. The weighing unit is compact, with a width of 80 mm.

- High Resolution and High Response Speed

<table>
<thead>
<tr>
<th>Model</th>
<th>Weighing capacity</th>
<th>Minimum weighing value</th>
<th>Stabilization time</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD-4212A-100</td>
<td>110 g</td>
<td>0.1 mg</td>
<td>1.1 to 1.3 seconds</td>
</tr>
<tr>
<td>AD-4212A-200</td>
<td>210 g</td>
<td>1 mg</td>
<td>0.8 to 1.0 seconds</td>
</tr>
<tr>
<td>AD-4212A-600</td>
<td>610 g</td>
<td>1 mg</td>
<td>0.9 to 1.1 seconds</td>
</tr>
<tr>
<td>AD-4212A-1000</td>
<td>1100 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD-4212B-23</td>
<td>21 g</td>
<td>0.001 mg</td>
<td>12 seconds</td>
</tr>
<tr>
<td>AD-4212B-101</td>
<td>110 g / 31 g</td>
<td>0.1 mg / 0.01 mg</td>
<td>2.5 / 4.0 seconds</td>
</tr>
<tr>
<td>AD-4212B-102</td>
<td>110 g</td>
<td>0.01 mg</td>
<td>4.0 seconds *3</td>
</tr>
<tr>
<td>AD-4212B-201</td>
<td>210 g</td>
<td>0.1 mg</td>
<td>2.5 seconds</td>
</tr>
<tr>
<td>AD-4212B-301</td>
<td>310 g</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 With FAST selected under good environment
*2 The AD-4212B-101 is equipped with a smart range function. When the minimum weighing value is set to 0.01 mg and the weight value exceeds 31 g, the minimum weighing value will switch to 0.1 mg automatically. Even under this circumstance, pressing the RE-ZERO key tares the value and weighing with the minimum weighing value of 0.01 mg is available up to 31 g.
*3 2.5 seconds when the minimum weighing value is 0.1 mg.

- Standard RS-232C Serial Interface / Standard Comparator Contact Output (*4)

Using the RS-232C serial interface, weighing data can be output to external devices and the balance can be controlled by external devices.

Using comparator contact output, the weight value is compared to the preset upper/lower limit values and the results are displayed as HI, OK or LO. The buzzer is also available in response to the results.

The RE-ZERO operation is possible using a signal from an external contact input, which allows easy system construction. (This function is only available when the external contact input is installed on the standard interface or OP-01.)

*4 AD-4212A series balance: 3-level output.
   AD-4212B series balance: 3-level or 5-level output, switched by the function table setting.

- Data Memory Function, storing weighing data, calibration data, unit mass in the counting mode or upper/lower limit values. Once stored, selection of the upper or lower limit value is easy.

- Dust-protected and Protected Against Splashing Water (Complying with IP54)
Clock and Calendar Function, adding the time and date to the output data.

GLP/GMP Output, using the RS-232C serial interface.

Reference Sheet, provided for a quick reference to the balance operation.

Windows Communication Tools (WinCT), allows easy communication with a Windows-based personal computer.

Windows is a registered trademark of Microsoft Corporation.

Multiple Weighing Units, with most of the common units used around the world.

Auto display-ON Function, that displays the weighing mode without any key operation when the AC adapter is plugged in, is available.

Stainless Steel Casing with high chemical resistance for the AD-4212B weighing unit

Stainless Steel Breeze Break, provided for the AD-4212B series balance and the AD-4212A-100, for more accurate weighing. For the other models, it is available as an option (OP-19).

BCD Output (OP-01) and Ethernet Interface (OP-08) are available as options

1-2 Compliance

Compliance with FCC Rules

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

(FCC = Federal Communications Commission in the U.S.A.)

Compliance With Directives of CE mark

This device features radio interference suppression, safety regulation and restriction of Hazardous Substances in compliance with the following Council Directives

Council directive 2004/108/EC EN61326 EMC directive
Council directive 2006/95/EC EN60950 Safety of Information Technology Equipment
Council directive 2011/65/EU EN50581 Restriction of the use of certain Hazardous Substances

The CE mark is an official mandatory European marking.

Please note that any electronic product must comply with local laws and regulations when sold or used anywhere outside Europe.
A & D Instruments Ltd. hereby declare that the following Weighing product conforms to the requirements of the council directives on...

Electromagnetic Compatibility (EMC) 2004/108/EC, 
Low Voltage Equipment (LVD) 2006/95/EC amended by 93/68/EEC and
Restriction of the use of certain Hazardous Substances (RoHS) 2011/65/EU

provided that they bear the CE mark of conformity.

Model/Series...AD-4212A Series

Standards applicable:

EN 61326-1:2013
Electrical equipment for measurement, control and laboratory use -EMC requirements Part 1: General requirements
Safety of Information Technology Equipment
EN 50581:2012
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

CE Mark first applied 30 November 2005
Signed for A&D Instruments in Oxford England 07 August 2015

J. Ghuman
General Manager

Part of The A&D Group of Companies, Japan
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Electromagnetic Compatability (EMC) 2004/108/EC,
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provided that they bear the CE mark of conformity.

Model/Series.... AD-4212B Series

Standards applicable:

EN 61326-1:2013
Electrical equipment for measurement, control and laboratory use - EMC requirements: Part 1: General requirements
Safety of Information Technology Equipment
EN 50581:2012
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

CE Mark first applied  30 November 2005
Signed for A&D Instruments in Oxford England 07 August 2015

J. Grumban
General Manager
2. UNPACKING THE BALANCE

2-1 Unpacking

- The balance is a precision instrument. Unpack the balance carefully. Keep the packing material to be used for transporting the balance in the future.

- See the illustrations to confirm that everything is included.

Stainless steel breeze break

Provided for the AD-4212B series balance and the AD-4212-100. For the other models, available as an option (OP-19).
Notes

- About how to attach the mounting fixtures, refer to “26. ATTACHING THE MOUNTING FIXTURES” on page 93.

- Please confirm that the AC adapter type is correct for your local voltage and receptacle type.
2-2 Installing the Balance

Caution

- The weighing unit and the display unit were adjusted as a unit. Therefore, make sure that the weighing unit and the display unit have the same serial number. The serial number is printed on the rear of the weighing unit and the display unit. The connection cable also carries the serial number. If the serial numbers of both units are different, the balance may not function properly. When a repair is necessary, submit both the weighing unit and the display unit for repair.

- There is no compatibility between The AD-4212A and the AD-4212B or AD-4212, for both the weighing unit and the display unit.

Install the balance as follows:

1. Refer to “3. PRECAUTIONS” for installing the balance.

2. Refer to "2-1 Unpacking" on the previous page to attach the dust guard, the breeze ring (AD-4212B-23/101/102 only), the pan support and the weighing pan on the weighing unit. The stainless steel breeze break is provided for the AD-4121B series balance and the AD-4212A-100 as a standard accessory, and for the other models as an option. Use it as necessary when performing calibration or checking accuracy.

How to install the breeze break

- AD-4212A-100/200 and the AD-4212B series balance
  Place the breeze break on the weighing pan so that it fits over the dust guard.

- AD-4212A-600/1000
  Follow the procedure below to install the breeze break.

  1. Remove the weighing pan and the pan support.
  2. Place the breeze break on the weighing pan so that it fits over the dust guard.
  3. Replace the pan support.
  4. Replace the weighing pan.

3. Connect the weighing unit and the display unit, firmly inserting one end of the connection cable into the jack located on the rear of the weighing unit and the other end into the jack located on the rear of the display unit. If the extension cable (OP-07: 3 m) is used, connect it between the connection cable and the display unit.
1. Slide the connector sleeve in the direction of the arrow to unlock and gently pull the connector out.

4. Adjust the leveling feet to level the weighing unit. Confirm it using the bubble spirit level.

5. Confirm that the adapter type is correct for the local voltage and power receptacle type.

6. Plug the AC adapter plug into the AC adapter jack located on the rear of the display unit and plug the AC adapter into the electrical outlet. Warm up the balance for the appropriate duration with nothing on the weighing pan.
   - AD-4212A series balance: 30 minutes or more
   - AD-4212B series balance: one hour or more

7. Set the pan unit and I/O unit to adapt to the peripheral system. Set the following for the I/O unit.
   - RS-232C (Refer to page 65)
   - Comparator contact output (Refer to page 66)
   - RE-ZERO operation using external contact input (Refer to page 66)
   - Auto-display ON function (Refer to pages 31 and 36)

   Set the weighing speed to adapt to the ambient conditions.

8. After the balance has been installed, calibrate the balance using the calibration weight provided with the balance. For details, refer to “8. CALIBRATION”.

9. A special weighing pan designed appropriately for the sample to be weighed or the peripheral system can be attached to the balance. About how to design a weighing pan, refer to “24 DESIGNING A SPECIAL WEIGHING PAN”.
3. PRECAUTIONS

To get the optimum performance from the balance and acquire accurate weighing data, note the following:

3-1 Before Use

- Install the balance in an environment where the temperature and humidity are not excessive. The best operating temperature is about 20°C / 68°F at about 50% relative humidity.
- Install the balance where it is not exposed to direct sunlight and it is not affected by heaters or air conditioners.
- Install the balance where it is free of dust.
- Install the balance away from equipment which produces magnetic fields.
- Install the balance in a stable place avoiding vibration and shock. Corners of rooms on the first floor are best, as they are less prone to vibration.
- The AD-4212A/B series balance responds even to very subtle airflow. To avoid the influence of ambient airflow or airflow caused by balance operation, make sure to use the dust guard and the breeze ring (AD-4212B-101/102 only).
- Level the weighing unit by adjusting the leveling feet and confirm it using the bubble spirit level.
- If the leveling adjustment is difficult to perform due to the installation conditions, perform calibration using a calibration weight or controlled actual sample before weighing.
- Ensure a stable power source when using the AC adapter.
- Warm up the balance for the appropriate duration. Plug in the AC adapter as usual.
  - AD-4212A series balance: 30 minutes or more
  - AD-4212B series balance: one hour or more
  In the case of the AD-4212B-23 high-precision model (minimum display: 0.001 mg), warm up the balance usually (if possible, keep connected the AC adapter connected to power at all times).
- Calibrate the balance before use or after having moved it to another location.
  In addition, calibrate it periodically to maintain the accuracy.

Caution

Do not install the balance where flammable or corrosive gas is present.
3-2 When Building into a System

The AD-4212A/B is a precision balance. When it is built into a system and used, errors such as unstable weight values may occur due to static electricity, vibration and materials used for the devices near the balance.

When using the balance that is built into a system, take the following precautions.

- **Errors due to a static charge**
  - When the ambient humidity is less than 45% RH, insulators such as plastic or glass are prone to static electricity. When charged material comes close to the balance, a pulling force is generated between the charged material and the weighing pan. This causes an unstable weight value.
  - To protect the balance against a discharge generated by charged material when it comes close to the balance, make sure to earth ground the weighing unit and the display unit.
  - (Static electricity generated by static induction will not be canceled by earth-grounding.)

![Diagram of charged plastic breeze break](image)

- **Measures to take** (Plastic is used in the measures below. They can be applied to glass, too.)
  - **When the sample or devices are plastic**
    - Use a static eliminator that generates no air blow such as the AD-1683, DC static eliminator, to remove static electricity.
    - Place the sample in a container that is made of a conductive material such as metal and that can be sealed and weigh it.
  
  - **When the sample is powdery**
    - When the balance is used in combination with a feeder for batch weighing of powdery samples, samples may be charged by rubbing sample particles against each other. Use a static eliminator and perform weighing while removing static electricity.
  
  - **When the sample container is made of material that is prone to static electricity such as plastic**
    - Cover the outside of the container with a metal such as aluminum foil.
    - Apply an anti-static agent onto the container.
  
  - **When making a breeze break using plastic**
    - Apply an anti-static agent onto the breeze break.
    - Use a conductive acrylic fiber.
  
  - **When plastic exists in the balance installation site**
    - Cover the plastic with a grounded metal.
    - Apply an anti-static agent onto plastic.
- When an operator is static charged
  If an operator's clothes are static charged, especially in winter, it may be a cause for unstable weight values.
  - Wear an anti-static wrist strap.

- Errors due to airflow
  - Where the influence of ambient airflow is great such as: close to an air conditioner, door or passage way. Even very subtle airflow that is hard to be detected may influence the weighing operation.
    - Avoid those areas as a weighing site.
    - If weighing is to be performed in such an area, use a breeze break or take other appropriate measures.

- Where the influence of heat or drafts is great
  - Eliminate temperature differences between a sample and the environment.
    When a sample is warmer (cooler) than the ambient temperature, the sample will be lighter (heavier) than the true weight. This error is due to a rising (falling) draft around the sample.
    - Do not touch the sample directly with your hand. Use tweezers or other tools.
      If you touch the sample, the same type error described above will occur.
    - Do not perform weighing where it is exposed to direct sunlight. Weighing errors may occur due to sudden temperature change or drafts.

- Where the influence of vibration is great, such as:
  1. Soft ground
  2. Second or higher floor
  3. Near center of a floor far from pillars
  4. Seismic isolated structures
  In the areas listed above, the scale may yield unstable weight values on windy days or after an earthquake. Especially in case of (4) and (5), weight values may be unstable during and for a long period of time after strong winds or an earthquake.

- Errors due to other causes
  - Change in temperature or humidity
    A sudden change in temperature or humidity can generate a draft and cause the balance to absorb or exude moisture, which leads to weighing errors.
    - Avoid sudden change in temperature or humidity.
    - Use an air conditioner to control the temperature or humidity.
Magnetic material

The balance uses a strong magnet as part of the balance assembly, so use much care when weighing magnetic materials.

- Place a non-magnetic object such as aluminum or brass between the sample and the balance, also keep an appropriate distance between them while weighing.

3-3 During Use

- To minimize the affect by electrical noises, earth ground the weighing unit and the display unit.
- Make each weighing gently and quickly to avoid errors due to changes in the environmental conditions.
- Do not drop things upon the weighing pan, or place a sample on the pan that is beyond the balance weighing capacity. Place a sample in the center of the weighing pan.
- Do not use a sharp instrument such as a pencil to press the keys. Use your finger only.
- Press the RE-ZERO key before each weighing to prevent possible errors. In addition, a RE-ZERO signal can be sent using external contact input/RS-232C command.
- Take into consideration the affect of air buoyancy on a sample when more accuracy is required.
- Keep the balance interior free of dust and foreign materials.

3-4 After Use

- Avoid mechanical shock to the balance.
- Calibrate the balance, using a calibration weight, periodically.
- Do not disassemble the balance. Contact the local A&D dealer if the balance needs service or repair.
- Do not use organic solvents to clean the balance. Clean the balance with a lint free cloth that is moistened with warm water and a mild detergent.
- Avoid dust and water so that the balance weighs correctly. Protect the internal parts from liquid spills and excessive dust.

3-5 Power Supply

- When the AC adapter is connected, the balance is in the standby mode if the standby indicator is on (refer to "4 DISPLAY SYMBOLS AND KEY OPERATION"). This is a normal state and does not harm the balance. For accurate weighing, plug in the AC adapter and warm up the balance for the appropriate duration before use.
4. DISPLAY SYMBOLS AND KEY OPERATION

Key operation

Key operation affects how the balance functions. The basic key operations are:

- “Press and release the key immediately” or “Press the key”
  = normal key operation during measurement
- “Press and hold the key”

Display symbols

- Displays memory data information
- Displays the weighing data relative to the weighing capacity, in percentage, in the weighing mode

<table>
<thead>
<tr>
<th>Display symbols</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turning the display ON and OFF. The standby indicator is displayed when the display is turned off. The weighing mode is enabled when the display is turned on. This key is available anytime. Pressing the key during operation will interrupt the operation and turn the display OFF.</td>
<td></td>
</tr>
<tr>
<td>In the weighing mode, switches the minimum weighing value. *</td>
<td></td>
</tr>
<tr>
<td>Displays the upper/lower limit values currently set. Switches between the upper and lower limit values when they are stored in memory.</td>
<td></td>
</tr>
<tr>
<td>No function.</td>
<td></td>
</tr>
<tr>
<td>Stores the weighing data in memory or outputs to a printer or personal computer depending on the function table settings. (Factory setting = output) Not available when OP-01 is installed.</td>
<td></td>
</tr>
<tr>
<td>Sets the display to zero.</td>
<td></td>
</tr>
</tbody>
</table>

* The factory setting of the minimum weighing value for the AD-4212B-101/102 is 0.1 mg.

<table>
<thead>
<tr>
<th>Key</th>
<th>When pressed</th>
<th>When pressed and held</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Turns the display ON and OFF. The standby indicator is displayed when the display is turned off. The weighing mode is enabled when the display is turned on. This key is available anytime. Pressing the key during operation will interrupt the operation and turn the display OFF.</td>
<td></td>
</tr>
<tr>
<td>VSTRy</td>
<td>In the weighing mode, switches the minimum weighing value. *</td>
<td></td>
</tr>
<tr>
<td>SAMPLE</td>
<td>In the counting or percent mode, enters the sample storing mode.</td>
<td></td>
</tr>
<tr>
<td>MODE</td>
<td>Displays the upper/lower limit values currently set. Switches between the upper and lower limit values when they are stored in memory.</td>
<td></td>
</tr>
<tr>
<td>CAL</td>
<td>No function.</td>
<td></td>
</tr>
<tr>
<td>PRINT</td>
<td>Stores the weighing data in memory or outputs to a printer or personal computer depending on the function table settings. (Factory setting = output) Not available when OP-01 is installed.</td>
<td></td>
</tr>
<tr>
<td>ADJUST</td>
<td>Performs weighing speed adjustment.</td>
<td></td>
</tr>
<tr>
<td>FACTORY</td>
<td>No function at the factory setting</td>
<td></td>
</tr>
<tr>
<td>SET</td>
<td>By changing the function table setting: Outputs “Title block” and “End block” for GLP report. Displays the data memory menu.</td>
<td></td>
</tr>
</tbody>
</table>

Each key, when pressed or when pressed and held, functions as follows:

![Diagram of display symbols and key operation]
5. WEIGHING UNITS

5-1 Units

With the AD-4212A/B series balance, the following weighing units and weighing modes are available:

![Diagram of weighing units and modes]

A unit or mode can be selected and stored in the function table as described in “5-2 Changing the Unit”. If a weighing mode (or unit of weight) has been turned off, that mode or unit will be missing in the sequence. Tael has four varieties, one of which can be selected and installed at the factory.

For details about the units and modes, see the table below:

<table>
<thead>
<tr>
<th>Name (unit, mode)</th>
<th>Display</th>
<th>Function table (Storing mode)</th>
<th>Conversion factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gram</td>
<td>g</td>
<td>g</td>
<td>1 g</td>
</tr>
<tr>
<td>Milligram</td>
<td>mg</td>
<td>mg</td>
<td>0.001 g</td>
</tr>
<tr>
<td>Counting mode</td>
<td>PC</td>
<td>PC</td>
<td></td>
</tr>
<tr>
<td>Percent mode</td>
<td>PC t</td>
<td>PC t</td>
<td></td>
</tr>
<tr>
<td>Ounce (Avoir)</td>
<td>OZ</td>
<td>OZ</td>
<td>28.349523125 g</td>
</tr>
<tr>
<td>Troy Ounce</td>
<td>OZ t</td>
<td>OZ t</td>
<td>31.1034768 g</td>
</tr>
<tr>
<td>Metric Carat</td>
<td>ct</td>
<td>ct</td>
<td>0.2 g</td>
</tr>
<tr>
<td>Momme</td>
<td>mm</td>
<td>mm</td>
<td>3.75 g</td>
</tr>
<tr>
<td>Pennyweight</td>
<td>dwt</td>
<td>dwt</td>
<td>1.55517384 g</td>
</tr>
<tr>
<td>Grain (UK)</td>
<td>GN</td>
<td>GN</td>
<td>0.06479891 g</td>
</tr>
<tr>
<td>Tael (HK general, Singapore)</td>
<td>TL</td>
<td>TL</td>
<td>37.7994 g</td>
</tr>
<tr>
<td>Tael (HK jewelry)</td>
<td></td>
<td></td>
<td>37.429 g</td>
</tr>
<tr>
<td>Tael (Taiwan)</td>
<td></td>
<td></td>
<td>37.5 g</td>
</tr>
<tr>
<td>Tael (China)</td>
<td></td>
<td></td>
<td>31.25 g</td>
</tr>
<tr>
<td>Tola (India)</td>
<td>t</td>
<td>t</td>
<td>11.6638038 g</td>
</tr>
<tr>
<td>Messghal</td>
<td>MS</td>
<td>MS</td>
<td>4.6875 g</td>
</tr>
<tr>
<td>Programmable-unit (Multi-unit)</td>
<td>MS t</td>
<td>MS t</td>
<td></td>
</tr>
</tbody>
</table>

(AD-4212A only)
The table below indicates the weighing capacity and the minimum display for each unit, depending on the balance model.

<table>
<thead>
<tr>
<th>Unit</th>
<th>AD-4212A-100</th>
<th>AD-4212A-200</th>
<th>AD-4212A-600</th>
<th>AD-4212A-1000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Capacity</td>
<td>Minimum display</td>
<td>Capacity</td>
<td>Minimum display</td>
</tr>
<tr>
<td>Gram</td>
<td>110</td>
<td>0.0001</td>
<td>210</td>
<td>0.001</td>
</tr>
<tr>
<td>Milligram</td>
<td>110000</td>
<td>0.1</td>
<td>210000</td>
<td>1</td>
</tr>
<tr>
<td>Ounce (Avoir)</td>
<td>3.88</td>
<td>0.000005</td>
<td>7.40</td>
<td>0.00005</td>
</tr>
<tr>
<td>Troy Ounce</td>
<td>3.53</td>
<td>0.000005</td>
<td>6.75</td>
<td>0.00005</td>
</tr>
<tr>
<td>Metric Carat</td>
<td>550</td>
<td>0.0005</td>
<td>1050</td>
<td>0.005</td>
</tr>
<tr>
<td>Momme</td>
<td>29.3</td>
<td>0.00005</td>
<td>56.0</td>
<td>0.0005</td>
</tr>
<tr>
<td>Pennyweight</td>
<td>70.7</td>
<td>0.0001</td>
<td>135.0</td>
<td>0.001</td>
</tr>
<tr>
<td>Grain (UK)</td>
<td>1697</td>
<td>0.002</td>
<td>3240</td>
<td>0.02</td>
</tr>
<tr>
<td>Tael (HK general, Singapore)</td>
<td>2.91</td>
<td>0.000005</td>
<td>5.55</td>
<td>0.00005</td>
</tr>
<tr>
<td>Tael (HK jewelry)</td>
<td>2.93</td>
<td>0.000005</td>
<td>5.61</td>
<td>0.00005</td>
</tr>
<tr>
<td>Tael (Taiwan)</td>
<td>2.93</td>
<td>0.000005</td>
<td>5.60</td>
<td>0.00005</td>
</tr>
<tr>
<td>Tael (China)</td>
<td>3.52</td>
<td>0.000005</td>
<td>6.72</td>
<td>0.00005</td>
</tr>
<tr>
<td>Tola (India)</td>
<td>9.43</td>
<td>0.0001</td>
<td>18.00</td>
<td>0.0001</td>
</tr>
<tr>
<td>Messghal</td>
<td>23.4</td>
<td>0.00005</td>
<td>44.8</td>
<td>0.0005</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit</th>
<th>AD-4212B-23</th>
<th>AD-4212B-101</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard range</td>
<td>Precision range</td>
</tr>
<tr>
<td></td>
<td>Capacity</td>
<td>Minimum display</td>
</tr>
<tr>
<td>Gram</td>
<td>21</td>
<td>0.000001</td>
</tr>
<tr>
<td>Milligram</td>
<td>210000</td>
<td>0.001</td>
</tr>
<tr>
<td>Ounce (Avoir)</td>
<td>0.741</td>
<td>0.000001</td>
</tr>
<tr>
<td>Troy Ounce</td>
<td>0.675</td>
<td>0.000001</td>
</tr>
<tr>
<td>Metric Carat</td>
<td>105</td>
<td>0.0001</td>
</tr>
<tr>
<td>Momme</td>
<td>5.60</td>
<td>0.000001</td>
</tr>
<tr>
<td>Pennyweight</td>
<td>13.50</td>
<td>0.000001</td>
</tr>
<tr>
<td>Grain (UK)</td>
<td>324.1</td>
<td>0.0002</td>
</tr>
<tr>
<td>Tael (HK general, Singapore)</td>
<td>0.556</td>
<td>0.000001</td>
</tr>
<tr>
<td>Tael (HK jewelry)</td>
<td>0.561</td>
<td>0.000001</td>
</tr>
<tr>
<td>Tael (Taiwan)</td>
<td>0.560</td>
<td>0.000001</td>
</tr>
<tr>
<td>Tael (China)</td>
<td>0.672</td>
<td>0.000001</td>
</tr>
<tr>
<td>Tola (India)</td>
<td>1.800</td>
<td>0.000001</td>
</tr>
<tr>
<td>Messghal</td>
<td>4.48</td>
<td>0.000001</td>
</tr>
<tr>
<td>Unit</td>
<td>AD-4212B-102</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td>Capacity</td>
<td>Minimum display</td>
</tr>
<tr>
<td>Gram</td>
<td>110</td>
<td>0.00001</td>
</tr>
<tr>
<td>Milligram</td>
<td>110000</td>
<td>0.1</td>
</tr>
<tr>
<td>Ounce (Avoir)</td>
<td>3.88</td>
<td>0.000001</td>
</tr>
<tr>
<td>Troy Ounce</td>
<td>3.53</td>
<td>0.000001</td>
</tr>
<tr>
<td>Metric Carat</td>
<td>550</td>
<td>0.0001</td>
</tr>
<tr>
<td>Momme</td>
<td>29.3</td>
<td>0.00001</td>
</tr>
<tr>
<td>Pennyweight</td>
<td>70.7</td>
<td>0.00001</td>
</tr>
<tr>
<td>Grain (UK)</td>
<td>1697</td>
<td>0.0002</td>
</tr>
<tr>
<td>Tael (HK general, Singapore)</td>
<td>2.91</td>
<td>0.000001</td>
</tr>
<tr>
<td>Tael (HK jewelry)</td>
<td>2.93</td>
<td>0.000001</td>
</tr>
<tr>
<td>Tael (Taiwan)</td>
<td>2.93</td>
<td>0.000001</td>
</tr>
<tr>
<td>Tael (China)</td>
<td>3.52</td>
<td>0.000001</td>
</tr>
<tr>
<td>Tola (India)</td>
<td>9.43</td>
<td>0.000001</td>
</tr>
<tr>
<td>Messghal</td>
<td>23.4</td>
<td>0.00001</td>
</tr>
</tbody>
</table>

### 5-2 Changing the Unit

A unit or mode can be selected and stored in the function table.

Select a unit or mode as follows:

1. Press and hold the **SAMPLE** key until the function table is displayed, then release the key.
2. Press the **SAMPLE** key several times to display "Unit".
3. Press the **PRINT** key to enter the unit selection mode.
4. Press the **SAMPLE** key to select a unit or mode to be used for weighing.
5. Press the **RE-ZERO** key to specify the unit or mode selected in step 4. (The stabilization indicator illuminates.)
6. Press the **PRINT** key to store the unit or mode. The balance displays "End" and then displays the next menu item of the function table.
7. Press the **CAL** key to exit the function table. Then the balance returns to the weighing mode with the selected unit or mode.
6. WEIGHING

6-1 Basic Operation (Gram Mode)

1. Plug in the AC adapter.

2. Press the ON:OFF key to display the weighing mode. (The decimal point position depends on the balance model.)

Notes

- The auto display-ON function is available to display the weighing mode without the key operation when the AC adapter is plugged in. (Function table: $bR5Fnc$ $P$-on)
- The function not to tare at start can be selected. (Function table: $bR5Fnc$ $P$-tr)
  For details on the function table settings, refer to "10. FUNCTION TABLE".

- About the minimum display when starting weighing
  With the factory setting, the AD-4212B-23 is 0.01 mg, and the AD-4212B-101/102 is 0.1 mg. To display 0.001 mg for the AD-4212B-23, or to display 0.01 mg for the AD-4212B-101/102, press the SAMPLE key. Then, make sure to warm up the balance for the appropriate duration.
  * In the case of the AD-4212B-23, the displayed unit, when starting weighing, is mg.

3. Place a container on the weighing pan, if necessary.
   Press the RE-ZERO key to cancel the weight (tare). The balance displays $0.0000$ g. (The decimal point position depends on the balance model.)

4. Place a sample on the pan or in the container. Wait for the stabilization indicator to be displayed and read the value.

5. Remove the sample and container from the pan.

Notes

- To use another unit, refer to “5-2 Changing the Unit”.
- Press the SAMPLE key to switch the minimum weighing value.
- The function to turn on or off the minimum weighing value automatically when weighing is started can be selected. (Function table: $bR5Fnc$ $r$-G) For details, refer to "10. FUNCTION TABLE".
- The weighing data can be stored in memory. For details, refer to “14. DATA MEMORY”.

![Weighing Pan and Container Diagram]
6-2 Smart Range Function

The AD-4212B-101 is equipped with two ranges. The precision range has a higher resolution. The standard range has normal resolution.

The range switches automatically, depending on the value displayed. Pressing the RE-ZERO key allows weighing in the precision range, regardless of the tare value.

The minimum weighing value can be fixed to 0.1 mg or 1 mg by pressing the SAMPLE key.

1. Press the RE-ZERO key.
   The balance will start weighing, using the precision range.

2. Place a container on the weighing pan.
   The weight value displayed exceeds the precision range value and the balance will switch to the standard range.

3. Press the RE-ZERO key.
   The balance will switch to the precision range.

4. Place a sample in the container.
   The weight value displayed is within the precision range value and the balance will perform a weighing, using the precision range.

### Precision range/standard range value

<table>
<thead>
<tr>
<th></th>
<th>Weighing range</th>
<th>Available minimum weighing value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precision range</td>
<td>0 g to 31 g</td>
<td>0.01 mg 0.1 mg 1 mg</td>
</tr>
<tr>
<td>Standard range</td>
<td>31 g to 110 g</td>
<td>0.1 mg 1 mg</td>
</tr>
</tbody>
</table>

* The factory setting of the minimum weighing value is 0.1 mg (0.0001 g).
7. CHANGING THE WEIGHING SPEED

The weighing speed can be selected from the following three rates to minimize the influence on weighing that is caused by drafts and/or vibration at the place where the balance is installed.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Parameter</th>
<th>Speed</th>
<th>Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAST</td>
<td>Cond 0</td>
<td>Fast</td>
<td>Sensitive value</td>
</tr>
<tr>
<td>MID.</td>
<td>Cond 1</td>
<td>Slow</td>
<td>Stable value</td>
</tr>
<tr>
<td>SLOW</td>
<td>Cond 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Operation**

1. Press and hold the **MODE** key until **RESPONSE** is displayed. And then, press the **MODE** key again quickly.

2. Press the **MODE** key to select a weighing speed. Either **FAST**, **MID** or **SLOW** can be selected.

3. After a few seconds of inactivity, the balance displays **End**. Then, it returns to the weighing mode and displays the updated weighing speed indicator. The weighing speed indicator remains displayed for a while.

**Note**

The weighing speed can be changed at “Condition (Cond)” of “Environment, Display (bR5Fnc)” in the function table. For details, refer to “10. FUNCTION TABLE”.

---

**Weighing speed indicators**

- **Press and hold the key**
- **Release the key and press again**
- **Each pressing switches the indicators**
- **After a while**
8. CALIBRATION

Calibration
Calibration using the calibration weight

Calibration test
To check the weighing accuracy using the calibration weight and output the result.
( Calibration test does not perform calibration. )

Caution
- Calibration adjusts the balance for accurate weighing.
  Besides periodic calibration and before each use, perform calibration when:
  • the balance is installed for the first time.
  • the balance has been moved.
  • the ambient conditions have changed.
- Do not allow vibration or drafts to affect the balance during calibration.
- To output the data for GLP using the RS-232C interface, set “GLP output ( info )” of “Data output ( dout )”. For details, refer to “10. FUNCTION TABLE”. Time and date are added to the GLP report. If the time or date is not correct, adjust them. For details, refer to “10-9 Clock and Calendar Function”.
- Calibration test is available only when “GLP output ( info )” of “Data output ( dout )” is set to “1” or “2”.
- The calibration and calibration test data can be stored in memory. To store them, set “Data memory ( data )” to “3”. For details, refer to “14. DATA MEMORY”.

Caution on using an external calibration weight
- The accuracy of the weight can influence the accuracy of weighing. Select an appropriate weight as listed below. A calibration weight ( conforming to OIML, Class E2 or equivalent ) is provided with the balance as a standard accessory.

<table>
<thead>
<tr>
<th>Model</th>
<th>Usable calibration weight</th>
<th>Adjustable range</th>
<th>Calibration weight provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD-4212A-100</td>
<td>20 g, 50 g, 100 g</td>
<td>-15.0 mg to +15.9 mg</td>
<td>50 g</td>
</tr>
<tr>
<td>AD-4212A-200</td>
<td>20 g, 50 g, 100 g, 200 g</td>
<td>15.0 mg to +15.0 mg</td>
<td>100 g</td>
</tr>
<tr>
<td>AD-4212A-600</td>
<td>20 g, 50 g, 100 g, 200 g, 300 g, 400 g, 500 g, 600 g</td>
<td>50.0 mg to +15.0 mg</td>
<td>200 g</td>
</tr>
<tr>
<td>AD-4212A-1000</td>
<td>20 g, 50 g, 100 g, 200 g, 300 g, 400 g, 500 g, 600 g, 700 g, 800 g, 900 g, 1000 g</td>
<td>50.0 mg to +15.0 mg</td>
<td>200 g</td>
</tr>
<tr>
<td>AD-4212B-23</td>
<td>1 g, 2 g, 5 g, 10 g, 20 g</td>
<td>-1.500 mg to +1.599 mg</td>
<td>1 g</td>
</tr>
<tr>
<td>AD-4212B-101</td>
<td>10 g, 20 g, 50 g, 100 g</td>
<td>-15.00 mg to +15.99 mg</td>
<td>50 g</td>
</tr>
<tr>
<td>AD-4212B-102</td>
<td>10 g, 20 g, 50 g, 100 g</td>
<td>-15.00 mg to +15.99 mg</td>
<td>50 g</td>
</tr>
<tr>
<td>AD-4212B-201</td>
<td>10 g, 20 g, 50 g, 100 g, 200 g</td>
<td>-15.0 mg to +15.9 mg</td>
<td>100 g</td>
</tr>
<tr>
<td>AD-4212B-301</td>
<td>10 g, 20 g, 50 g, 100 g, 200 g, 300 g</td>
<td>-15.0 mg to +15.9 mg</td>
<td>100 g</td>
</tr>
</tbody>
</table>

The calibration weight in bold type: factory setting
The calibration weight value can be adjusted within the range above.

Display
- This indicator means “the balance is measuring calibration data”. Do not allow vibration or drafts to affect the balance while this indicator is displayed.
8-1 Calibration

This function calibrates the balance using the calibration weight. (Display example: AD-4212B-102)

Operation
1. Plug in the AC adapter and warm up the balance with nothing on the pan.
   - AD-4212A series balance: 30 minutes or more
   - AD-4212B series balance: one hour or more

For the models with a minimum display of 0.1 mg, 0.01 mg or 0.001 mg, use the stainless steel breeze break provided with the balance for more accurate weighing.

2. Press and hold the CAL key until CAL0 is displayed, then release the key.

3. The balance displays CAL0.
   - If you want to change the calibration weight (a list of usable weights is shown on page 23), press the SAMPLE key and proceed to step 4.
   - If you use the calibration weight value stored in the balance, proceed to step 5.
   - If you want to cancel calibration, press the CAL key. The balance will return to the weighing mode.

4. Specify the calibration weight value as follows:
   - PRESS the SAMPLE key to switch the operation to: calibration weight selection mode (All of the segments blinking) or value adjustment mode (Digits to be changed blinking).
   - The value can be adjusted to five decimal places for the AD-4212B-101/102 and to six decimal places for the AD-4212B-23.

   - Press the RE-ZERO key to select the calibration weight or adjust the value.
   - PRINT key To store the new weight value. Even if the AC adapter is removed, the data is maintained in non-volatile memory.
   - CAL key To cancel the operation and return to CAL0.

Note
For details about the usable calibration weights and value adjustable range, refer to the previous page.
5 Confirm that there is nothing on the pan and press the \textbf{PRINT} key. The balance measures the zero point. Do not allow vibration or drafts to affect the balance.
   The balance displays the calibration weight value.

6 Place a calibration weight, of the weight value displayed, on the pan and press the \textbf{PRINT} key. The balance measures the calibration weight. Do not allow vibration or drafts to affect the balance.

7 The balance displays \textbf{End}. Remove the weight from the pan.

8 If the "GLP output (in\textit{F\textsubscript{0}})" parameter, of the function table, is set to "1" or "2", the balance displays \textbf{GLP} and outputs "Calibration Report" using the RS-232C interface or stores the data in memory. For details on the calibration report format, refer to "11-2 GLP Report".

9 The balance will automatically return to the weighing mode.

10 Place the calibration weight on the pan and confirm that calibration was performed correctly. If not, check the ambient conditions such as drafts or vibration, and repeat steps 2 through 10.
8-2 Calibration Test

This function tests the balance weighing accuracy using the calibration weight and outputs the result. This is available only when the "GLP output (INFO)" parameter is set to “1” or “2”. (Calibration test does not perform calibration. Display example: AD-4212B-102)

Operation

1. Plug in the AC adapter and warm up the balance with nothing on the pan.
   - AD-4212A series balance: 30 minutes or more
   - AD-4212B series balance: one hour or more
   For the models with a minimum display of 0.1 mg, 0.01 mg or 0.001 mg, use the stainless steel breeze break provided with the balance for more accurate weighing.

2. Press and hold the CAL key until $CC_{out}$ is displayed, then release the key.

3. The balance displays $CC_{out}$.
   - If you want to change the calibration weight (a list of usable weights is shown on page 23), press the SAMPLE key and proceed to step 4.
   - If you use the calibration weight value stored in the balance, proceed to step 5.
   - If you want to cancel calibration test, press the CAL key. The balance will return to the weighing mode.

4. Specify the calibration weight value as follows:
   - SAMPLE key: To switch the operation to: calibration weight selection mode (All of the segments blinking) or value adjustment mode (Digits to be changed blinking).
     The value can be adjusted to five decimal places for the AD-4212B-101/102 and to six decimal places for the AD-4212B-23.
   - RE-ZERO key: To select the calibration weight or adjust the value.
   - PRINT key: To store the new weight value. Even if the AC adapter is removed, the data is maintained in non-volatile memory.
   - CAL key: To cancel the operation and return to $CC_{out}$.

Note

For details about the usable calibration weights and value adjustable range, refer to page 23.
5 Confirm that there is nothing on the pan and press the PRINT key. The balance measures the zero point and displays the measured value. Do not allow vibration or drafts to affect the balance. The balance displays the calibration weight value.

6 Place a calibration weight, of the weight value displayed, on the pan and press the PRINT key. The balance measures the calibration weight and displays the measured value. Do not allow vibration or drafts to affect the balance.

7 The balance displays End. Remove the weight from the pan.

8 The balance displays GLP and outputs “Calibration Test Report” using the RS-232C interface or stores the calibration test data in memory. For details on the calibration test report format, refer to “11-2 GLP Report”.

9 The balance will automatically return to the weighing mode.
9. FUNCTION SWITCH AND INITIALIZATION

9-1 Permit or Inhibit

The balance stores parameters that must not be changed unintentionally (e.g. Calibration data for accurate weighing, data for adapting to the operating environment, control data for the RS-232C interface). There are two switches for protecting the parameters. The switches can select either “permit” or “inhibit”. The “inhibit” protects parameters against unintentional operations. There is an additional switch for the extended functions of the AD-4212A.

Switches

(The display shown left indicates the factory settings.)

Function table

0: To inhibit changes to the function table
1: To permit changes to the function table

Extended functions (For special applications)

0: Not to use the extended functions
1: To use the extended functions

Note: Only available for the AD-4212A series balance.
For details, refer to “20. EXTENDED FUNCTIONS

Calibration

0: To inhibit calibration
1: To permit calibration

No function

No function

Operation

1. Press the ON:OFF key to turn off the display.
2. While pressing and holding the PRINT key and the SAMPLE key, press the ON:OFF key. The balance displays p5.
3. Press the PRINT key. Then the balance displays the function switches.
4. Set the switches using the following keys.

   - SAMPLE key  To select the switch to change the parameter.
   - RE-ZERO key  To change the parameter of the switch selected.
   - 0: To inhibit changes.  1: To permit changes
   - PRINT key  To store the new parameter and return to the weighing mode.
   - CAL key  To cancel the operation and return to the weighing mode.
9-2 Initializing the Balance

This function returns the following parameters to factory settings.

- Calibration data
- Function table
- Upper/lower limit values
- The sample unit mass value (counting mode), 100% reference mass value (percent mode)
- The data that is stored in the balance using the data memory function
- Calibration weight value
- Function switch settings

**Note**
Be sure to calibrate the balance after initialization.

**Operation**
1. Press the ON:OFF key to turn off the display.
2. While pressing and holding the PRINT key and the SAMPLE key, press the ON:OFF key. The balance displays \(p5\).
3. Press the SAMPLE key to display \(\text{Clr}\).
4. Press the PRINT key.
   - To cancel this operation, press the CAL key.
5. Press the RE-ZERO key.
6. Press the PRINT key to initialize the balance.
   - The balance will automatically return to the weighing mode.
10. FUNCTION TABLE

The function table reads or rewrites the parameters that are stored in the balance. These parameters are maintained in non-volatile memory, even if the AC adapter is removed.

10-1 Structure and Sequence of the Function Table

The function table menu consists of two layers. The first layer is the “Class” and the second layer is the “Item”. Each item stores a parameter.

Example

This example sets “Stores weighing data” for “Data memory” and " 1 minute" for "Interval time".

10-2 Display and Keys

<table>
<thead>
<tr>
<th>Display/Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;</td>
<td>The symbol “○” indicates that the parameter displayed is in effect.</td>
</tr>
<tr>
<td>1/10d SAMPLE</td>
<td>When pressed and held in the weighing mode, enters the function table mode. Selects the class or item in the function table mode.</td>
</tr>
<tr>
<td>+b</td>
<td>Changes the parameter.</td>
</tr>
<tr>
<td>E</td>
<td>When a class is displayed, moves to an item in the class. When an item is displayed, stores the new parameter and displays the next class.</td>
</tr>
<tr>
<td>-CAL</td>
<td>When an item is displayed, cancels the new parameter and displays the next class. When a class is displayed, exits the function table mode and returns to the weighing mode.</td>
</tr>
</tbody>
</table>
## 10-3 Details of the Function Table

<table>
<thead>
<tr>
<th>Class</th>
<th>Item and Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cond</td>
<td>0 Fast weighing speed, sensitive value <strong>FAST</strong></td>
<td>Factory setting 2: AD-4212B-23 1: Other models</td>
</tr>
<tr>
<td></td>
<td>1 Slow weighing speed, stable value <strong>SLOW</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>St-b</td>
<td>0 Stable range is ±1 digit</td>
<td>The stabilization indicator illuminates when the display fluctuation is within the range.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 Stable range is ±3 digits</td>
<td></td>
</tr>
<tr>
<td>Hold *1</td>
<td>0 OFF</td>
<td>Holds the display when stable in animal mode. With &quot;Hold&quot; ON, <strong>ANIMAL</strong> turns on.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>trc</td>
<td>0 OFF</td>
<td>Keeps zero display by tracking zero drift. 3: AD-4212B-23 1: Other models</td>
</tr>
<tr>
<td></td>
<td>1 Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 Strong</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 Very strong</td>
<td></td>
</tr>
<tr>
<td>Spd</td>
<td>0 5 times/second</td>
<td>Period to refresh the display 0: AD-4212B-23 1: Other models</td>
</tr>
<tr>
<td></td>
<td>1 10 times/second</td>
<td></td>
</tr>
<tr>
<td>Pnt</td>
<td>0 Point (.)</td>
<td>Decimal point format</td>
</tr>
<tr>
<td></td>
<td>1 Comma (,)</td>
<td></td>
</tr>
<tr>
<td>P-on</td>
<td>0 OFF</td>
<td>Turns on the weighing mode display when the AC adapter is plugged in.</td>
</tr>
<tr>
<td></td>
<td>1 ON</td>
<td></td>
</tr>
<tr>
<td>P-off *1</td>
<td>0 OFF</td>
<td>Turns off the display after 10 minutes of inactivity.</td>
</tr>
<tr>
<td></td>
<td>1 ON (10 minutes)</td>
<td></td>
</tr>
<tr>
<td>G5 i</td>
<td>0 OFF</td>
<td>Capacity indicator Zero: 0%, Maximum capacity: 100%</td>
</tr>
<tr>
<td></td>
<td>1 ON</td>
<td></td>
</tr>
<tr>
<td>rNg</td>
<td>0 Displays the minimum weighing value</td>
<td>Factory setting 1: AD-4212B-23/101/102 0: Other models</td>
</tr>
<tr>
<td></td>
<td>1 Does not display the minimum weighing value</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 Retains the previous condition</td>
<td></td>
</tr>
<tr>
<td>P-tr</td>
<td>0 Does not tare (Displays the previous value)</td>
<td>When setting to P-tr 0, do not perform the RE-ZERO operation frequently.</td>
</tr>
<tr>
<td></td>
<td>1 Tares (Displays zero)</td>
<td></td>
</tr>
<tr>
<td>Clock</td>
<td>Refer to &quot;10-9 Clock and Calendar Function&quot;.</td>
<td>The time and date are added to the output data.</td>
</tr>
</tbody>
</table>

* Factory setting

*1 Only the AD-4212A series balance displays this item.
<table>
<thead>
<tr>
<th>Class</th>
<th>Item and Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPout Comparator output</td>
<td>CP-t Comparator output setting</td>
<td>Only the AD-4212B series balance displays this class and item.</td>
</tr>
<tr>
<td>CP Comparator mode</td>
<td>CP Comparator setting</td>
<td>No comparison</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comparison, excluding “near zero” when stable or overloaded</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comparison, including “near zero” when stable or overloaded</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous comparison, excluding “near zero”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous comparison, including “near zero”</td>
</tr>
<tr>
<td>CP Func Comparator</td>
<td>CP-r *2 Comparison results</td>
<td>Not added Use in A&amp;D standard format.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added</td>
</tr>
<tr>
<td></td>
<td>LL buzzer</td>
<td>Displayed only when 5-level comparator output (*3) is selected.</td>
</tr>
<tr>
<td></td>
<td>LO buzzer</td>
<td>Displayed only when 5-level comparator output (*3) is selected.</td>
</tr>
<tr>
<td></td>
<td>OK buzzer</td>
<td>Displayed only when 5-level comparator output (*3) is selected.</td>
</tr>
<tr>
<td></td>
<td>HI buzzer</td>
<td>Displayed only when 5-level comparator output (*3) is selected.</td>
</tr>
</tbody>
</table>

### CP HH Secondary upper limit
### CP HL Upper limit
### CP LO Lower limit
### CP LL Secondary lower limit

<table>
<thead>
<tr>
<th>dout Data output</th>
<th>P-r Data output mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Key mode (when stable)</td>
<td>Accepts the PRINT key or external contact input to output (or store) data only when the display is stable.</td>
</tr>
<tr>
<td>1</td>
<td>Auto print mode A (Reference = zero)</td>
<td>Outputs (or stores) data when the display is stable and conditions of ( d ) and ( b ) and the reference value are met.</td>
</tr>
<tr>
<td>2</td>
<td>Auto print mode B (Reference = last stable value)</td>
<td>With ( d ) and ( b ), outputs data continuously; with ( d ) and ( b ), uses interval memory.</td>
</tr>
<tr>
<td>3</td>
<td>Stream mode / Interval memory mode</td>
<td>Accepts the PRINT key or external contact input to output (or store) data, regardless of the display condition.</td>
</tr>
<tr>
<td>4</td>
<td>Key mode B (instantly)</td>
<td>Accepts the PRINT key or external contact input to output (or store) data, instantly when stable or after the display is stabilized.</td>
</tr>
<tr>
<td>5</td>
<td>Key mode C (when stable)</td>
<td>Accepts the PRINT key or external contact input to output (or store) data, instantly when stable or after the display is stabilized.</td>
</tr>
</tbody>
</table>

*2 This item is not displayed for the AD-4212B series balance or when BCD output (OP-01) is installed.

*3 AD-4212A series balance: when OP-04 is installed
AD-4212B series balance: when "CP-t" is set to "1"
<table>
<thead>
<tr>
<th>Class</th>
<th>Item and Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$RP-P$</td>
<td>Auto print polarity</td>
<td>- 0: Plus only Displayed value &gt; Reference&lt;br&gt;1: Minus only Displayed value &lt; Reference&lt;br&gt;2: Both Regardless of displayed value</td>
</tr>
<tr>
<td>$RP-b$</td>
<td>Auto print difference</td>
<td>0: 10 digits Difference between reference value and displayed value&lt;br&gt;1: 100 digits&lt;br&gt;2: 1000 digits</td>
</tr>
<tr>
<td>$dT$</td>
<td>Data memory</td>
<td>0: Not used&lt;br&gt;1: Stores unit mass in counting mode&lt;br&gt;2: Stores weighing data&lt;br&gt;3: Stores calibration data&lt;br&gt;4: Stores upper/lower limit values</td>
</tr>
<tr>
<td>$out$</td>
<td>Data output</td>
<td>Related items: $Prt, int, d-no, 5-td, info$</td>
</tr>
<tr>
<td>$\in\xi$</td>
<td>Interval time</td>
<td>0: Every measurement&lt;br&gt;1: 2 seconds&lt;br&gt;2: 5 seconds&lt;br&gt;3: 10 seconds&lt;br&gt;4: 30 seconds&lt;br&gt;5: 1 minute&lt;br&gt;6: 2 minutes&lt;br&gt;7: 5 minutes&lt;br&gt;8: 10 minutes</td>
</tr>
<tr>
<td>$d-no$</td>
<td>Data number output</td>
<td>0: No output&lt;br&gt;1: Output Refer to &quot;14. DATA MEMORY&quot;.</td>
</tr>
<tr>
<td>$5-td$</td>
<td>Time/Date output</td>
<td>0: No output&lt;br&gt;1: Time only&lt;br&gt;2: Date only&lt;br&gt;3: Time and date For details, refer to &quot;10-9 Clock and Calendar Function&quot;.</td>
</tr>
<tr>
<td>$5-id$</td>
<td>ID number output</td>
<td>0: No output&lt;br&gt;1: Output Selects whether or not the ID number is output.</td>
</tr>
<tr>
<td>$PUSE$</td>
<td>Data output pause</td>
<td>0: No pause&lt;br&gt;1: Pause (1.6 seconds) Selects the data output interval.</td>
</tr>
<tr>
<td>$Rt-f$</td>
<td>Auto feed</td>
<td>0: Not used&lt;br&gt;1: Used Selects whether or not automatic feed is performed.</td>
</tr>
<tr>
<td>$inf$</td>
<td>GLP output</td>
<td>0: No output&lt;br&gt;1: AD-8121 format&lt;br&gt;2: General data format Selects GLP output method. For how to set time and date to be added, refer to &quot;10-9 Clock and Calendar Function&quot;.</td>
</tr>
<tr>
<td>$Rr-d$</td>
<td>Zero after output</td>
<td>0: Not used&lt;br&gt;1: Used Adjusts zero automatically after data is output.</td>
</tr>
</tbody>
</table>

- Factory setting

Note: "Digit" is a unit of minimum weighing value
### Class Item and Parameter Description

<table>
<thead>
<tr>
<th>Class</th>
<th>Item and Parameter</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial interface</td>
<td>Baud rate</td>
<td>600 bps</td>
<td>1200 bps</td>
<td>2400 bps</td>
<td>4800 bps</td>
<td>9600 bps</td>
<td>19200 bps</td>
</tr>
<tr>
<td>Not displayed when BCD output (OP-01) is installed.</td>
<td>Data bit, parity bit</td>
<td>7 bits, even</td>
<td>7 bits, odd</td>
<td>8 bits, none</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminator</td>
<td>Type</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>CR LF</td>
<td>CR: ASCII code 0Dh</td>
<td>LF: ASCII code 0Ah</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baud rate</td>
<td>DP format</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KF format</td>
<td>Refer to &quot;10-6 Description of Item &quot;Data Format&quot;.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MT format</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NU format</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSV format</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data format</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data refresh completed when ON→OFF</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data refresh completed when OFF→ON</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Unit
- Refer to “5. WEIGHING UNITS”.

### ID number setting
- Refer to “11. ID NUMBER AND GLP REPORT”.

### Extended functions
- Available only for the AD-4212A series balance when “To use the extended functions” is selected for the function switch and is used for special applications.
- For details, refer to “20. EXTENDED FUNCTIONS”.

---

*4 “Not weighing” is a condition that a weight value is not displayed such as re-zero operation or display-off state.

**Caution**

The balance may not transmit the data completely at the specified refresh rate, depending on the baud rate or data added to the weighing data such as time, date or ID number.
10-4 Description of the Class “Environment, Display”

**Condition (Cond)**

| Cond 0 | This parameter is for sensitive response to the fluctuation of a weight value. Used when fast weighing speed is required. After setting, the balance displays [FAST]. |
| Cond 2 | This parameter is for stable weighing with slow response. Used to prevent a weight value drift due to vibration or drafts. After setting, the balance displays [SLOW]. |

**Note**

For the AD-4212A series balance, with “Hold function (Hold)” set to “ON (1)”, this item is used to set the averaging time.

**Stability band width (5t-b)**

This item controls the width to regard a weight value as a stable value. When the fluctuation per second is less than the parameter, the balance displays the stabilization indicator and outputs or stores the data. The parameter influences the “Auto print mode”

| 5t-b 0 | This parameter is for sensitive response of the stabilization indicator. Used for exact weighing. |
| 5t-b 2 | This parameter ignores slight fluctuations of a weight value. Used to prevent a weight value from drifting due to vibration or drafts. |

**Note**

For the AD-4212A series balance, with “Hold function (Hold)” set to “ON (1)”, this item is used to set the stabilization range.

**Hold function (Hold) (Animal weighing mode, AD-4212A only)**

This function is used to weigh a moving object such as an animal. When the weight value is over the weighing range from zero and the display fluctuation is within the stabilization range for a fixed period of averaging time, the processing indicator illuminates and the balance displays the average weight of the animal. When the animal is removed from the weighing pan, the display returns to zero automatically.

This function is available only when the hold function parameter is set to “1” (the animal mode indicator [ANIMAL] illuminates) and any weighing unit other than the counting mode is selected.

The averaging time and stabilization range are set in “Condition (Cond)” and “Stability band width (5t-b)”.

<table>
<thead>
<tr>
<th>Weighing range</th>
<th>Averaging time</th>
<th>Stabilization range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2 g or over</td>
<td>2 seconds Faster 5t-b 0 Small</td>
<td>4 seconds 5t-b 1</td>
</tr>
<tr>
<td></td>
<td>8 seconds More accurate 5t-b 2 Big</td>
<td></td>
</tr>
</tbody>
</table>
Zero tracking (trc)
This function tracks zero point drift caused by changes in the environment and stabilizes the zero point. Three levels of zero tracking are available. When the weight value is only a few digits, turn the function off for accurate weighing.

Note
Digit, when used for the AD-4212A/B series balance, indicates the minimum displayable weighing value.

<table>
<thead>
<tr>
<th>trc</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The tracking function is not used. Used for weighing a very light sample.</td>
</tr>
<tr>
<td>1</td>
<td>The tracking function is used. Normal zero tracking.</td>
</tr>
<tr>
<td>2</td>
<td>The tracking function is used. Strong zero tracking.</td>
</tr>
<tr>
<td>3</td>
<td>The tracking function is used. Very strong zero tracking</td>
</tr>
</tbody>
</table>

Display refresh rate (5pd)
Frequency to refresh the display. This parameter influences “BCD output”, "Comparator contact output" and “Stream mode”.

Note
The balance may not transmit the data completely at the specified refresh rate, depending on the baud rate or data added to the weighing data such as time, date or ID number.

Decimal point (pnt)
The decimal point format can be selected.

Auto display-ON (p-on)
When the AC adapter is plugged in, the display is automatically turned on without the ON:OFF key operation, to display the weighing mode. Used when the balance is built into an automated system. A warm up for the appropriate duration is necessary for accurate weighing.

Auto display-OFF (poff) (AD-4212A only)
When the AC adapter is connected and no operation is performed (inactivity state) for 10 minutes, the display is automatically turned off and the standby indicator is illuminated.

Capacity indicator (G5,)
In the weighing mode, the indicator displays the weighing data relative to the weighing capacity in percentage. (Zero = 0%, maximum capacity = 100%)

When the “Data memory (data)” parameter is set to parameters other than “0” (not used), the indicator displays the information stored in memory, such as the amount of memory data or data number.

Minimum weighing value display at start (rng)
When weighing is started, the digit of the minimum weighing value can be turned off without any key operation. (rng 1)

Weighing can be started with the minimum weighing value of the previous measurement displayed. (rng 2)
Tare at start \((P-tr)\)

When a hopper is attached to the weighing pan and loss-in weighing is performed, the remaining amount of the material will become unknown if tare is performed each time a weighing starts. When \("P-tr 0\) is selected, tare is not performed at weighing start. So, the remaining amount of the material can be monitored when the power is turned on. When setting to \(P-tr 0\), do not perform the RE-ZERO operation frequently.

10-5 Description of the Item “Data output mode”

The parameter setting of the “Data output mode \((Prb)\)” applies to the performance when the “Data memory \((dRtR)\)” parameter is set to “2” (to store the weighing data) and when the data is transmitted using the RS-232C interface.

Notes

- Data output to the RS-232C is not available when the BCD output (OP-01) is installed.
- BCD output is refreshed at the display refresh rate.

Key mode

When the PRINT key is pressed or the external PRINT contact input is used, with the stabilization indicator on, the balance outputs or stores the weighing data and the display blinks one time.

Required setting \(dout\ Prb 0\) Key mode

Auto print modes A and B

When the displayed value is stable and the conditions of “Auto print polarity”, “Auto print difference” and reference value are met, the balance outputs or stores the weighing data.

When the PRINT key is pressed with the stabilization indicator on, the balance outputs or stores the data and the display blinks one time.

Mode A: Required setting \(dout\ Prb 1\) Auto print mode A (reference = zero)
\(dout\ RP-P\) Auto print polarity
\(dout\ RP-b\) Auto print difference

Example “With \("Ar-d 1\) (to adjust zero after data is output), for weighing the added sample each time a sample is added.”

Mode B: Required setting \(dout\ Prb 2\) Auto print mode B (reference = last stable value)
\(dout\ RP-P\) Auto print polarity
\(dout\ RP-b\) Auto print difference

Example “For weighing while a sample is added.”

Stream mode

The balance outputs the weighing data continuously regardless of the display condition. The display does not blink in this mode. This mode is not available and the interval memory mode is used when the “Data memory \((dRtR)\)” parameter is set to “2” (to store the weighing data).

Required setting \(dout\ Prb 3\) Stream mode
\(dout\ dRtR 0\) Data memory function is not used.
\(bASFnc\ SPd\) Display refresh rate
\(SIF\ bP5\) Baud rate

Example “For monitoring data on a computer”
Caution
The balance may not transmit the data completely at the specified refresh rate, depending on
the baud rate or data added to the weighing data such as time, date or ID number.

Key mode B
When the PRINT key is pressed or the external PRINT contact input is used, the balance outputs or
stores the weighing data immediately regardless of the display condition. At this time, the display
does not blink.

Key mode C
When the PRINT key is pressed or the external PRINT contact input is used, with the stabilization
indicator on, the balance outputs or stores the weighing data immediately. If the stabilization indicator
is not on, the balance waits for the indicator to turn on, and then outputs the weighing data. At this
time, the display blinks one time.

Interval memory mode
The weighing data is periodically stored in memory.

<table>
<thead>
<tr>
<th>Required setting</th>
<th>dout</th>
<th>Prt 3</th>
<th>Interval memory mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>dout</td>
<td>dRtR 2</td>
<td>Data memory function is used.</td>
</tr>
<tr>
<td></td>
<td>dout</td>
<td>int</td>
<td>Interval time</td>
</tr>
</tbody>
</table>

Optional setting dout 5-t-d, 2, or t Adds the time and date.

Example “For periodical weighing without a computer command and to output
all of the data, to a computer, at one time”

10-6 Description of the Item “Data format”

A&D standard format 5, F, TYPE 0
This format is used when the peripheral equipment can receive the A&D format.
If an AD-8121B is used, set the printer to MODE 1 or 2.

- This format consists of fifteen or sixteen characters excluding the terminator.
  When numerical characters excluding a decimal point are exceeded eight characters for
  AD-4212B-23/102, the format becomes sixteen characters.
- A header of two characters indicates the balance condition.
- The polarity sign is placed before the data with the leading zeros. If the data is zero, the plus
  sign is applied.
- The unit, consisting of three characters, follows the data.
- When comparison results are to be added (Cp Fnc Cp-r l), the results appear between the
  header and the data.

`ST. + 000.1278 g CR LF`

Header Data Unit Terminator

| ST | Stable header |
| US | Unstable header |
| OL | Overload header |

Header Data (eight characters) Unit Terminator
DP (Dump print) format  5 tYPE 1
This format is used when the peripheral equipment cannot receive the A&D format.
If an AD-8121B is used, set the printer to MODE 3.

- This format consists of sixteen characters excluding the terminator.
- A header of two characters indicates the balance condition. No overload header is used.
- The polarity sign is placed before the data, with spaces in place of leading zeros, if the data is not zero or overloaded.
- The unit, consisting of three characters, follows the data.

| W T | Stable header | O T | Stable header of counting mode |
| U S | Unstable header | |

KF format  5 tYPE 2
This is the Karl-Fischer moisture meter format and is used when the peripheral equipment can only communicate using this format.

- This format consists of fourteen characters excluding the terminator.
- This format has no header characters.
- The polarity sign is placed before the data, with spaces in place of leading zeros, if the data is not zero or overloaded.
- This format outputs the unit only for a stable value.

<table>
<thead>
<tr>
<th>+</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>7</th>
<th>8</th>
<th>g</th>
<th>C R</th>
<th>L F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td>Unit</td>
<td>Terminator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MT format  5 tYPE 3

- A header of two characters indicates the balance condition.
- The polarity sign is used only for negative data.
- The weighing data uses spaces in place of the leading zeros.
- The character length of this format changes dependent upon the unit

<table>
<thead>
<tr>
<th>S</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>7</th>
<th>8</th>
<th>g</th>
<th>C R</th>
<th>L F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header</td>
<td>Data</td>
<td>Unit</td>
<td>Terminator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| S | Stable header |
| S D | Unstable header |
| S I | Overload header |

NU (numerical) format  5 tYPE 4
This format outputs only numerical data.

- This format consists of nine characters for the AD-4212A series balance or ten characters for the AD-4212B series balance, excluding the terminator.
- The polarity sign is placed before the data with the leading zeros. If the data is zero, the plus sign is used.

<table>
<thead>
<tr>
<th>+</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>7</th>
<th>8</th>
<th>C R</th>
<th>L F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td>Terminator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(AD-4212A series balance)

| + | 0 | 0 | 0 | 0 | 1 | 2 | 7 | 8 | C R | L F |
|---|---|---|---|---|---|---|---|-----|-----|
| Data | Terminator |

(AD-4212B series balance)
CSV format *SIF type 5*

- This format separates the data of A&D standard format and the unit by a comma (,).
- This format outputs the unit even when the data is overloaded.
- When a comma (,) is selected for decimal point, separators are set to semicolon (;).
- When the ID number, data number, time and date are added at "Data output (dout)" of the function table, outputs ID number, data number, date, time and weighing data in this order and separates each item by a comma and treats all the items as one group of data.

LAB-0123, No.012, 2004/07/01, 12:34:56, ST,+000.1278, g <CR><LF>

<table>
<thead>
<tr>
<th>ID number</th>
<th>Data number</th>
<th>Date</th>
<th>Time</th>
<th>Weighing data</th>
</tr>
</thead>
<tbody>
<tr>
<td>S T</td>
<td>+ 0 0 0 . 1 2 7 8</td>
<td>g</td>
<td>CR LF</td>
<td></td>
</tr>
<tr>
<td>O L</td>
<td>+ 9 9 9 9 9 9 E + 1 9</td>
<td>g</td>
<td>CR LF</td>
<td></td>
</tr>
</tbody>
</table>

10-7 Description of the Data Format Added to the Weighing Data

**ID number dout 5-id 1**

The number to identify a specific balance.

- This format consists of eight characters excluding the terminator.

LAB A B - 0 1 2 3 CR LF

**Data number dout d-no 1**

This format outputs the data number just before the data is transmitted using the RS-232C interface.

- This format consists of six characters excluding the terminator.
- When CSV format (SIF type 5) is selected, the period (.) is replaced with a comma (,).

N o . 0 0 1 CR LF

<table>
<thead>
<tr>
<th>Data number</th>
<th>Terminator</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 1</td>
<td>CR LF</td>
</tr>
</tbody>
</table>

**Date dout 5-td 2 or 3**

- The date output order can be changed in "Time/Date output (5-td)" and "Clock (Cl adj)".
- The year is output in a four-digit format.

2 0 0 4 / 0 7 / 0 1 CR LF

**Time dout 5-td 1 or 3**

- This format outputs time in 24-hour format.

1 2 : 3 4 : 5 6 CR LF
## 10-8 Data Format Examples

### Stable

<table>
<thead>
<tr>
<th>Format</th>
<th>A&amp;D</th>
<th>D.P.</th>
<th>KF</th>
<th>MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST</td>
<td>+000</td>
<td>.1278</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>DT</td>
<td>+0 0</td>
<td>1278</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>TF</td>
<td>+000</td>
<td>.1278</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>MT</td>
<td>+000</td>
<td>1278</td>
<td>g</td>
<td>g</td>
</tr>
</tbody>
</table>

### Unstable

<table>
<thead>
<tr>
<th>Format</th>
<th>A&amp;D</th>
<th>D.P.</th>
<th>KF</th>
<th>MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>-018</td>
<td>3690</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>DT</td>
<td>+0 0</td>
<td>1278</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>TF</td>
<td>-0 0</td>
<td>1278</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>MT</td>
<td>-0 0</td>
<td>1278</td>
<td>g</td>
<td>g</td>
</tr>
</tbody>
</table>

### Overload

#### Positive error

<table>
<thead>
<tr>
<th>Format</th>
<th>A&amp;D</th>
<th>D.P.</th>
<th>KF</th>
<th>MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>OL</td>
<td>+999</td>
<td>9999</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>DT</td>
<td>+0 0</td>
<td>1278</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>TF</td>
<td>+0 0</td>
<td>1278</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>MT</td>
<td>+0 0</td>
<td>1278</td>
<td>g</td>
<td>g</td>
</tr>
</tbody>
</table>

#### Negative error

<table>
<thead>
<tr>
<th>Format</th>
<th>A&amp;D</th>
<th>D.P.</th>
<th>KF</th>
<th>MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>OL</td>
<td>-999</td>
<td>9999</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>DT</td>
<td>-0 0</td>
<td>1278</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>TF</td>
<td>-0 0</td>
<td>1278</td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>MT</td>
<td>-0 0</td>
<td>1278</td>
<td>g</td>
<td>g</td>
</tr>
</tbody>
</table>

### Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>A&amp;D</th>
<th>D.P.</th>
<th>KF</th>
<th>MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>g</td>
<td>g</td>
<td></td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>mg</td>
<td>mg</td>
<td></td>
<td>mg</td>
<td>mg</td>
</tr>
<tr>
<td>Counting mode</td>
<td></td>
<td>PC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precent mode</td>
<td></td>
<td>PC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ounce (Av)</td>
<td>oz</td>
<td>T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Troy Ounce</td>
<td>oz</td>
<td>t</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metric Carat</td>
<td>c t</td>
<td></td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>Momme</td>
<td>m m</td>
<td></td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>Pennyweight</td>
<td>d w</td>
<td></td>
<td>d</td>
<td>d</td>
</tr>
<tr>
<td>Grain</td>
<td></td>
<td></td>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td>Tael (HK gen, S)</td>
<td>TL</td>
<td></td>
<td>t</td>
<td>t</td>
</tr>
<tr>
<td>Tael (HK, j)</td>
<td>TL</td>
<td></td>
<td>t</td>
<td>t</td>
</tr>
<tr>
<td>Tael (T)</td>
<td>TL</td>
<td></td>
<td>t</td>
<td>t</td>
</tr>
<tr>
<td>Tael (C)</td>
<td>TL</td>
<td></td>
<td>t</td>
<td>t</td>
</tr>
<tr>
<td>Tola (I)</td>
<td>t</td>
<td></td>
<td>t</td>
<td>t</td>
</tr>
<tr>
<td>Messghal</td>
<td></td>
<td>mes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ASCII Codes

- Space: ASCII 20h
- Carriage Return: ASCII 0Dh
- Line Feed: ASCII 0Ah
10-9 Clock and Calendar Function

The balance is equipped with a clock and calendar function. When the “GLP output (info)” parameter is set to “1” or “2” and the “Time/Date output (5-td)” parameter is set to “1”, “2” or “3”, the time and date are added to the output data. Set or confirm the time and date as follows:

Operation

1. Press and hold the **SAMPLE** key until **Func** of the function table is displayed, then release the key.

2. Press the **SAMPLE** key several times to display **Cl adj**.

3. Press the **PRINT** key. The balance enters the mode to confirm or set the time and date.

Confirming the time

4. The current time is displayed with all the digits blinking.
   - When the time is correct and the date does not need to be confirmed, press the **CAL** key and proceed to step 8.
   - When the time is correct and the date is to be confirmed, press the **SAMPLE** key and proceed to step 6.
   - When the time is not correct and is to be changed, press the **RE-ZERO** key and proceed to step 5.

Setting the time (with part of the digits blinking)

5. Set the time in 24-hour format using the following keys.
   - **SAMPLE** key: To select the digits to change the value. The selected digits blink.
   - **RE-ZERO** key: To increase the value by one.
   - **MODE** key: To decrease the value by one.
   - **PRINT** key: To store the new setting, display **End** and go to step 6.
   - **CAL** key: To cancel the new setting and go to step 6.
Confirming the date

6 The current date is displayed with all the digits blinking.
   ● To change the display order of year (Y), month (M) and day (D), press the MODE key. The date is output in the order as specified.
   ● When the date is correct and the operation is to be finished, press the CAL key and proceed to step 8.
   ● When the time is to be confirmed again, press the SAMPLE key and go back to step 4.
   ● When the date is not correct and is to be changed, press the RE-ZERO key and proceed to step 7.

Note
The year is expressed using a two-digit format. For example, the year 2001 is expressed as “01”.

Setting the date (with part of the digits blinking)

7 Set the date using the following keys.
   SAMPLE key To select the digits to change the value. The selected digits blink.
   RE-ZERO key To increase the value by one.
   MODE key To decrease the value by one.
   PRINT key To store the new setting, display End and go to step 8.
   CAL key To cancel the new setting and go to step 8.

 Quitting the operation

8 The balance displays the next menu of the function table. Press the CAL key to exit the clock and calendar function and return to the weighing mode.

Notes

□ Do not enter invalid values such as a non-existing date when setting the time and date.

□ When the clock backup battery has been depleted, the balance displays rtc PF. Under this condition, press any key and set the time and date. The dead battery only affects the clock and calendar function. Even so, the function works normally as long as the AC adapter is connected to the balance.
10-10 Comparator Function

The balance outputs the results of the comparison in three or five levels.

AD-4212A series balance: 3-level output (standard) or 5-level output when OP-04 is installed.
AD-4212B series balance: 3-level or 5-level output, switched by “Comparator output setting (CP-t)” of the function table.

The comparison results are indicated by HI OK LO on the display and are contact-output from the I/O unit.
The following five comparison conditions are available by “Comparator mode (CP)” of the function table CP fnc.

- No comparison
- Comparison when the weight value is stable or overloaded, excluding “near zero”
- Comparison when the weight value is stable or overloaded, including “near zero”
- Continuous comparison, excluding “near zero”
- Continuous comparison, including “near zero”

Note

“Near zero” indicates the amount of ten digits (digit = the minimum displayable weighing value).

The comparison is performed using the upper limit value and lower limit value.
The function table CP fnc has one more item: “Buzzer (bEP)” to select whether or not to sound the buzzer depending on the results.

Three-level comparison results

<table>
<thead>
<tr>
<th>Weighing data</th>
<th>Comparison results</th>
<th>Display</th>
<th>Contact output</th>
<th>Buzzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>H I (upper limit value&lt;weight value)</td>
<td>H I illuminated</td>
<td>short</td>
<td>open</td>
<td>open</td>
</tr>
<tr>
<td>OK (lower limit value&lt;weight value&lt;upper limit value)</td>
<td>OK illuminated</td>
<td>open</td>
<td>short</td>
<td>open</td>
</tr>
<tr>
<td>LO (weight value&lt;lower limit value)</td>
<td>LO illuminated</td>
<td>open</td>
<td>open</td>
<td>short</td>
</tr>
</tbody>
</table>

Five-level comparison results

<table>
<thead>
<tr>
<th>Weighing data</th>
<th>Comparison results</th>
<th>Display</th>
<th>Contact output</th>
<th>Buzzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>H H (secondary upper limit value&lt;weight value)</td>
<td>H H</td>
<td>upper limit value&lt;weight value&lt;secondary upper limit value</td>
<td>bEP^-</td>
<td></td>
</tr>
<tr>
<td>H I (upper limit value&lt;weight value&lt;secondary upper limit value)</td>
<td>H I</td>
<td>lower limit value&lt;weight value&lt;upper limit value</td>
<td>bEP^-</td>
<td></td>
</tr>
<tr>
<td>OK (lower limit value&lt;weight value&lt;upper limit value)</td>
<td>OK</td>
<td>secondary lower limit value&lt;weight value&lt;lower limit value</td>
<td>bEP^-</td>
<td></td>
</tr>
<tr>
<td>LO (weight value&lt;secondary lower limit value)</td>
<td>LO</td>
<td>weight value&lt;secondary lower limit value</td>
<td>bEP^-</td>
<td></td>
</tr>
<tr>
<td>LL (weight value&lt;secondary lower limit value)</td>
<td>LL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Five-level comparison

<table>
<thead>
<tr>
<th>Comparison results</th>
<th>Display</th>
<th>Contact output</th>
<th>Buzzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>H H</td>
<td>HH blinking</td>
<td>short open open open</td>
<td>open</td>
</tr>
<tr>
<td>HI</td>
<td>HI illuminated</td>
<td>open short open open</td>
<td>open</td>
</tr>
<tr>
<td>OK</td>
<td>OK illuminated</td>
<td>open open short open</td>
<td>open</td>
</tr>
<tr>
<td>LO</td>
<td>LO illuminated</td>
<td>open open open short open</td>
<td>open</td>
</tr>
<tr>
<td>LL</td>
<td>LL blinking</td>
<td>open open open open short</td>
<td>open</td>
</tr>
</tbody>
</table>

* Set the upper limit value equal to or higher than the lower limit value.
  Set the secondary upper limit value equal to or higher than the upper limit value.
  Set the secondary lower limit value equal to or lower than the lower limit value.

Setting the upper/lower limit values

When five-level comparison is to be performed, using the AD-4212B series balance, set the “Comparator output setting (CP-t)” parameter to “1”.

1. Press and hold the SAMPLE key until $P_{func}$ of the function table is displayed, then release the key.
2. Press the SAMPLE key several times to display the value name to be set.
   - $P_{HH}$ secondary upper limit value
   - $P_{Hi}$ upper limit value
   - $P_{Lo}$ lower limit value
   - $P_{ll}$ secondary lower limit value
3. Press the PRINT key. The value currently set is displayed with all of the digits blinking.
4. When the current setting is not to be changed, press the PRINT or CAL key to proceed to step 5.
   When the current setting is to be changed, press the RE-ZERO key. Change the setting using the following keys.
   - SAMPLE key To select the digit to change the value.
   - RE-ZERO key To change the value of the digit selected.
   - MODE key To switch the polarity.
   - PRINT key To store the new setting and go to step 5.
   - CAL key To cancel the new setting and go to step 5.
5. Repeat steps 2-4 to set values as necessary.

Note

The upper/lower limit values can be set by external commands using the RS-232C serial interface.

Command example

- H H :+100.00000 $g$ (to set secondary upper limit value)
- HI :+080.00000 $g$ (to set upper limit value)
- LO :+060.00000 $g$ (to set lower limit value)
- LL :+040.00000 $g$ (to set secondary lower limit value)

$g$ indicates a space (20h)
Confirming the upper/lower limit values

To confirm the upper/lower limit values during weighing operation, press the **MODE** key. The upper/lower limit values will be displayed. Even under this condition, weighing operation goes on and data output, contact output of the comparison results and **RE-ZERO** can be performed.

**When three-level comparison is selected**

- **Weighing mode**
- **Comparison OK**
- **Upper limit value** [H] illuminated
- **Lower limit value** [LO] illuminated

**When five-level comparison is selected**

- **Weighing mode**
- **Comparison OK**
- **Secondary upper limit value** [H] blinking
- **Upper limit value** [HI] illuminated
- **Lower limit value** [LO] illuminated
- **Secondary lower limit value** [LO] blinking
Note
The upper/lower limit values can be confirmed by external commands using the RS-232C serial interface.

e.g., Command ?HH (to confirm secondary upper limit value)
Response HH, +100.00000 g (secondary upper limit value=100.00000 g)
Command ?HI (to confirm upper limit value)
Response HI +080.00000 g (upper limit value=80.00000 g)
Command ?LO (to confirm lower limit value)
Response LO, +060.00000 g (lower limit value=60.00000 g)
Command ??LL (to confirm secondary lower limit value)
Response LL, +040.00000 g (secondary lower limit value=40.00000 g)
indicates a space (20h)

Adding the comparison results (AD-4212A only)
To add the comparison results to the output data, set “Comparison results (Cpr)” parameter of the function table to “1”.

ST, HH, 110.00000 g HH (Only when OP-04 is installed.)
ST, HI, +090.00000 g HI
ST, OK, +070.00000 g OK
ST, LO, +050.00000 g LO
ST, LL, +030.00000 g LL (Only when OP-04 is installed.)
ST, -, +000.00000 g No comparison when unstable or near zero
indicates a space (20h)

Notes
Select A&D standard format. Set “Data format (TYPE)” parameter of the function table to “O”.
The comparison results cannot be added to the weighing data stored in memory.
11. ID NUMBER AND GLP REPORT

- The ID number is used to identify the balance when Good Laboratory Practice (GLP) is used.
- The ID number is maintained in non-volatile memory even if the AC adapter is removed.
- The GLP output format is selected at “GLP output (inFO)” of the function table and can be output to a personal computer or printer using the RS-232C serial interface.
- The GLP output format includes the balance manufacturer, model, serial number, ID number, date, time and space for signature for weighing data, the weight used and results for calibration or calibration test data.
- The balance can output the following reports for GLP.
  - “Calibration report” of the calibration
  - “Calibration test report” of the calibration test
  - “Title block” and “End block” for the weighing data
- Calibration and calibration test data can be stored in memory to output several reports at the same time. Refer to “14. DATA MEMORY” for details.
- For details on confirming and setting the time and date, refer to “10-9 Clock and Calendar Function”.

11-1 Setting the ID Number

1. Press and hold the SAMPLE key until 8RSFnc of the function table is displayed, then release the key.
2. Press the SAMPLE key several times to display id.
3. Press the PRINT key. Set the ID number using the following keys.
   - SAMPLE key: To select the digit to change the value.
   - RE-ZERO key: To set the character of the digit selected. Refer to the display character set shown below.
   - PRINT key: To store the new ID number and display 8RSFnc.
   - CAL key: To cancel the new ID number and display 8RSFnc.
4. With 8RSFnc displayed, press the CAL key to return to the weighing mode.

Display character set

```
0 1 2 3 4 5 6 7 8 9 - A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
0 1 2 3 4 5 6 7 8 9 - a b c d e f g h i j k l m n o p q r s t u v w x y z
   Space
```
11-2 GLP Report

Set the following parameters to output the report.

- To print the report, set the “GLP output (info)” parameter to “1” and use MODE 3 of the AD-8121B. For details on using the printer, refer to “17-1 Connection to the AD-8121B Printer”.

- To output the report to a personal computer using the RS-232C interface, set the “GLP output (info)” parameter to “2”.

- If the time and date are not correct, set the correct time and date in “Clock (Cl Rdu)” of the function table.

Note

For operational details about calibration and calibration test, refer to “8. CALIBRATION”.

Calibration report

When the setting is “info 1”:

```
AD-8121 format

A & D
AD4212B-102
S/H 01234567
ID ABCDEFG
DATE 2000/12/31
TIME 12:34:56
CALIBRATED(EXT.)
CAL.WEIGHT +50.00000 g
SIGNATURE

... ... ... ...
```

When the setting is “info 2”:

```
General data format

--------A & D<TERM>
--------AD4212B-102<TERM>
S/N-----01234567<TERM>
ID-------ABCDEFG<TERM>
DATE<TERM>
TIME<TERM>
CALIBRATED(EXT.)<TERM>
CAL.WEIGHT +50.00000 g<TERM>
SIGNATURE<TERM>

--------<TERM>
--------<TERM>
--------<TERM>
--------<TERM>
---------<TERM>
--------<TERM>
---------<TERM>
--------<TERM>

Space, ASCII 20h
<TERM> Terminator, CR, LF or CR
CR Carriage return, ASCII 0Dh
LF Line feed, ASCII 0Ah
```
Calibration test report using an external weight

(Calendar test does not perform calibration.)

When the setting is "$inf_1$":

<table>
<thead>
<tr>
<th>AD-8121 format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
</tr>
<tr>
<td>Model</td>
</tr>
<tr>
<td>Serial number</td>
</tr>
<tr>
<td>ID number</td>
</tr>
<tr>
<td>Date</td>
</tr>
<tr>
<td>Time</td>
</tr>
<tr>
<td>Calibration test type</td>
</tr>
<tr>
<td>Zero point value</td>
</tr>
<tr>
<td>Target weight value</td>
</tr>
<tr>
<td>Target weight</td>
</tr>
<tr>
<td>Signature</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00000 g</td>
</tr>
<tr>
<td>+50.0020 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>+50.0000 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>- - - - - - - - - -</td>
</tr>
</tbody>
</table>

When the setting is "$inf_2$":

General data format

<table>
<thead>
<tr>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>A &amp; D</td>
</tr>
<tr>
<td>AD4212B-102</td>
</tr>
<tr>
<td>S/N 01234567</td>
</tr>
<tr>
<td>ID ABCDEFG</td>
</tr>
<tr>
<td>Date 2000/12/31</td>
</tr>
<tr>
<td>Time 12:34:56</td>
</tr>
<tr>
<td>CAL.TEST(EXT.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zero point value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00000</td>
</tr>
<tr>
<td>+50.00020</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Target weight value</th>
</tr>
</thead>
<tbody>
<tr>
<td>+50.00000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>- - - - - - - - - -</td>
</tr>
</tbody>
</table>

---

CR LF CR

Space, ASCII 20h

<TERM> Terminator, C_R, LF or C_R

C_R Carriage return, ASCII 0Dh

LF Line feed, ASCII 0Ah
**Title block and end block**

When weight values are recorded as GLP data, a “Title block” is inserted at the beginning and an “End block” is inserted at the end of a group of weight values in the GLP report.

**Notes**
- To output the report to an AD-8121B, use MODE 3 of the AD-8121B.
- If the data memory function is used, the “Title block” and “End block” cannot be output.

**Operation**

1. With the weighing data displayed, press and hold the PRINT key until \textit{Start} is displayed, then release the key. The “Title block” is output.
2. The weighing data is output according to the parameter setting of the data output mode.
3. Press and hold the PRINT key until \textit{RecEnd} is displayed, then release the key. The “End block” is output.

When the setting is “info 1”:

\hspace{1cm}

\begin{itemize}
  \item \textbf{Manufacturer} \hspace{2.5cm} A & D
  \item \textbf{Model} \hspace{2.5cm} AD4212B-102
  \item \textbf{S/N} \hspace{2.5cm} 01234567
  \item \textbf{ID} \hspace{2.5cm} ABCDEFG
  \item \textbf{DATE} \hspace{2.5cm} 2000/12/31
  \item \textbf{TIME} \hspace{2.5cm} 09:30:00
\end{itemize}

\begin{itemize}
  \item WT  +12.34564 g
  \item WT  +12.34615 g
  \item WT  +12.34625 g
  \item WT  +12.34630 g
  \item WT  +12.34701 g
  \item WT  +12.34648 g
\end{itemize}

\begin{itemize}
  \item \textbf{Date} \hspace{2.5cm} 2000/12/31
  \item \textbf{Time} \hspace{2.5cm} 09:30:00
\end{itemize}

When the setting is “info 2”:

\hspace{1cm}

\begin{itemize}
  \item \textbf{Manufacturer} \hspace{2.5cm} A & D
  \item \textbf{Model} \hspace{2.5cm} AD4212B-102
  \item \textbf{S/N} \hspace{2.5cm} 01234567
  \item \textbf{ID} \hspace{2.5cm} ABCDEFG
  \item \textbf{DATE} \hspace{2.5cm} 2000/12/31
  \item \textbf{TIME} \hspace{2.5cm} 09:30:00
\end{itemize}

\begin{itemize}
  \item WT  +12.34564 g
  \item WT  +12.34615 g
  \item WT  +12.34625 g
  \item WT  +12.34630 g
  \item WT  +12.34701 g
  \item WT  +12.34648 g
\end{itemize}

\begin{itemize}
  \item \textbf{Date} \hspace{2.5cm} 2000/12/31
  \item \textbf{Time} \hspace{2.5cm} 09:30:00
\end{itemize}

Space, ASCII 20h

\textit{<TERM>} Terminator, C_R, L_F or C_R

C_R Carriage return, ASCII 0Dh

L_F Line feed, ASCII 0Ah
12. COUNTING MODE (PC)

This is the mode to determine the number of objects in a sample based on the standard sample unit mass. The unit mass is the mass of one piece of the sample. The smaller the variables in each sample unit mass are, the more accurate the counting will be. The AD-4212A/B series balance is equipped with the Automatic Counting Accuracy Improvement (ACA) function to improve the counting accuracy.

Notes
- Use samples with a unit mass of 1 mg or more (AD-4212A-100, AD-4212B series) or 10 mg or more (AD-4212A-200/600/1000) for counting.
- If the sample unit mass variable is too large, it may cause a counting error.
- To improve the counting performance, use the ACA function frequently or divide the samples into several groups and count each group.

Selecting the counting mode
1 Set “Unit selection ( Unit)” parameter of the function table to PC (counting mode). For details, refer to “5-2 Changing the Unit”.

Storing a sample unit mass
2 Press the SAMPLE key to enter the sample unit mass storing mode.
   To return to the counting mode without storing the sample unit mass, press the CAL key.
3 To select the number of samples, press the SAMPLE key several times. It may be set to 10, 25, 50 or 100.

Note
A greater number of samples will yield more accurate counting result.

4 Place a container on the weighing pan, if necessary. Press the RE-ZERO key to cancel the weight (tare). The number specified in step 3 appears.
   e.g.: 25 0 PC is displayed if 25 is selected in step 3.

5 Place the number of samples specified on the pan. In this example, 25 pieces.

6 Wait for the stabilization indicator to be displayed. Press the PRINT key to calculate and store the unit mass. The balance displays 25 PC (counting mode) and is set to count samples with this unit mass. (The sample unit mass stored, even if the AC adapter is removed, is maintained in non-volatile memory.)

To improve the accuracy of the unit mass, proceed to step 8.
Notes

If the balance judges that the mass of the samples is too light and is not adequate to be used as the unit mass, it displays \( \text{LO} \). In that case, store the mass by some quantity. For example, when the model with the minimum weighing value of 0.01 g is used and 10 pieces of samples weigh 0.05 g, store 100 pieces of samples as 10 and multiply the weighing result by 10.

If the balance judges that the mass of the samples is too light to acquire accurate weighing, it displays an error requiring the addition of more samples to the specified number. In the example above, \( 50 \text{ PC} \) appears, requiring 25 more samples. Add 25 samples and press the PRINT key. When the unit mass is stored correctly, the balance proceeds to the counting mode.

Counting operation

7 Place the samples to be counted on the pan.

While the stabilization indicator is on, pressing the PRINT key will output the weight value, using the RS-232C serial interface.

Note

Peripheral equipment, that is sold separately, such as a printer or a personal computer is required.

Counting mode using the ACAI function

The ACAI is a function that improves the accuracy of the unit mass automatically by increasing the number of samples and averaging the unit mass variable to minimize the weighing error, as the counting process proceeds.

8 If a few more samples are added, the processing indicator turns on. To prevent an error, add three or more. The processing indicator does not turn on if overloaded. Try to add the same number of samples as displayed.

9 The balance re-calculates the unit mass while the processing indicator is blinking. Do not touch the balance or samples on the pan until the processing indicator turns off.

10 Counting accuracy is improved when the processing indicator turns off.

Each time the above operation is performed, a more accurate unit mass will be obtained. There is no definite upper limit of ACAI range for the number of samples exceeding 100. Try to add the same number of samples as displayed.

11 Remove all the samples used in ACAI and proceed with the counting operation using the improved unit mass.
13. PERCENT MODE (Pct)

This is the mode to display the weight value in percentage compared to a 100% reference mass and is used for target weighing or checking the sample variable.

Selecting the percent mode

1. Set “Unit selection ( UnPct )” parameter of the function table to Pct (percent mode). For details, refer to “5-2 Changing the Unit”.

Storing the 100% reference mass

2. Press the SAMPLE key to enter the 100% reference mass storing mode. To return to the percent mode without storing the 100% reference mass, press the CAL key.

3. Place a container on the weighing pan, if necessary. Press the RE-ZERO key to cancel the weight (tare). The balance displays 100.0 Pct.

4. Place the sample to be set as the 100% reference mass on the pan or in the container.

5. Wait for the stabilization indicator to be displayed. Press the PRINT key to store the reference mass. The balance displays 100.00 Pct. (The reference mass stored, even if the AC adapter is removed, is maintained in non-volatile memory.)

Notes

- If the balance judges that the mass of the sample is too light to be used as a reference, it displays Lo. Do not use the sample.
- The decimal point position depends on the 100% reference mass. (For details, refer to the table below*.)

6. Remove the sample.

Reading the percentage

7. Place a sample to be compared to the reference mass on the pan. The displayed percentage is based on the 100% reference mass. While the stabilization indicator is on, pressing the PRINT key will output the weight value, using the RS-232C serial interface.

Note

Peripheral equipment, that is sold separately, such as a printer or a personal computer is required.

* Relations between decimal point position and 100% reference mass

<table>
<thead>
<tr>
<th>Models (A series)</th>
<th>100% reference mass</th>
<th>Minimum weighing value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD-4212A-100</td>
<td>0.0100g to 0.9999g</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>0.1000g to 0.9999g</td>
<td>0.1%</td>
</tr>
<tr>
<td></td>
<td>1.0000g or greater</td>
<td>0.01%</td>
</tr>
<tr>
<td>AD-4212A-200</td>
<td>0.100g to 0.999g</td>
<td>1%</td>
</tr>
<tr>
<td>AD-4212A-600</td>
<td>0.1000g to 0.9999g</td>
<td>0.1%</td>
</tr>
<tr>
<td></td>
<td>1.0000g or greater</td>
<td>0.01%</td>
</tr>
<tr>
<td>AD-4212A-1000</td>
<td>1.0000g or greater</td>
<td>0.01%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Models (B series)</th>
<th>100% reference mass</th>
<th>Minimum weighing value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD-4212B-23</td>
<td>0.00100g to 0.09999g</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>0.01000g to 0.09999g</td>
<td>0.1%</td>
</tr>
<tr>
<td></td>
<td>0.1000g or greater</td>
<td>0.01%</td>
</tr>
<tr>
<td>AD-4212B-101</td>
<td>0.0100g to 0.0999g</td>
<td>1%</td>
</tr>
<tr>
<td>AD-4212B-102</td>
<td>0.1000g to 0.09999g</td>
<td>0.1%</td>
</tr>
<tr>
<td>AD-4212B-201</td>
<td>0.1000g to 0.9999g</td>
<td>0.1%</td>
</tr>
<tr>
<td>AD-4212B-301</td>
<td>1.0000g or greater</td>
<td>0.01%</td>
</tr>
</tbody>
</table>
14. DATA MEMORY

Data memory is a function to store weighing data or calibration data to display or output later. The data memory function can also store multiple upper/lower limit values or unit mass values, for later selection as necessary.

One of the following data sets can be stored:

- Weighing data (Up to 200 sets. 100 sets when the time and date are added.)
- Calibration and calibration test data (latest 50 sets)
- Unit mass in the counting mode (Up to 20 sets)
- Upper/lower limit values (Up to 20 sets)

Note

Data memory function is not available when the BCD output (OP-01) is installed.

14-1 Notes on Using Data Memory

To use the memory function, set the “Data memory (data)” parameter of the function table. In addition, for weighing data, set the “Time/Date output (5-td)” parameter. For details on setting the data memory, refer to “10. FUNCTION TABLE”.

For weighing data, the data contents to be stored and the storage capacity depend on the “Time/Date output (5-td)” parameter setting.

Releasing “Clr”

If a different type of data exists in memory when the data is stored, “Clr” appears blinking in the upper left of the display. For example, you want to store weighing data but calibration data or unit mass data remains in memory.

Under such a condition, before storing data, delete the data in memory as follows:

1. Press and hold the PRINT key until [Clr no] with “no” blinking is displayed, then release the key.
2. Press the RE-ZERO key to display [Clr go] with “go” blinking.

The type of data stored in memory appears on the upper left of the display as shown below:

<table>
<thead>
<tr>
<th>Type of Data</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit mass in the counting mode</td>
<td>PC</td>
</tr>
<tr>
<td>Weighing data without time and date</td>
<td>-d-</td>
</tr>
<tr>
<td>Weighing data with time and date</td>
<td>d-t</td>
</tr>
<tr>
<td>Calibration or calibration test data</td>
<td>Hi5</td>
</tr>
<tr>
<td>Upper/lower limit values</td>
<td>Cp</td>
</tr>
</tbody>
</table>

3. Press the PRINT key to delete all the data in memory.

4. The balance displays [End] and returns to the weighing mode.
14-2 Memory for Weighing Data

- The data memory function can store 200 sets of weighing data (100 set if time and date are added). Even if the AC adapter is removed, the data is maintained in non-volatile memory.
- It is not necessary that the printer or computer be continually connected to the balance, because the balance stores the weighing data in memory.
- The data in memory is available to be displayed on the balance for confirmation, or to output several sets of data at one time to a printer or personal computer. In the function table, what data is to be added to the output data (ID number, data number, time and date) can be selected.

Storing the weighing data

Note
If "CLR" appears blinking in the upper left of the display, delete the data in memory.

1. Set the “Data memory (dRb)” parameter to “2”.
2. Set the “Time/Date output (5-td)” parameter as necessary.
3. The storing operation depends on the “Data output mode (prt)” parameter setting. Four types of operating modes are available to store data.

   Key mode Each time the PRINT key is pressed while the displayed value is stable, the balance stores the weighing data.

   Auto print modes A and B When the displayed value is stable and the conditions of “Auto print polarity”, “Auto print difference” and reference value are met, the balance stores the weighing data.

   Interval memory mode Weighing data is stored at an interval specified in “Interval time (m)”. Press the PRINT key to start and stop this mode.

   (Display example: AD-4212A series balance)

   The data amount in memory
   Memory full
   Weighing data being displayed
   Interval memory standby indicator
   Interval memory active indicator
   Data number of the data currently displayed
   Memory data being displayed

Caution
- When weighing data is being stored in memory, the data output to a personal computer using the RS-232C interface is not available.
- “FUL” indicates that memory is full or the memory capacity has been reached. More data cannot be stored unless the memory data is deleted.
The following commands cannot be used during data storage.

- **Q** Query command for weighing data.
- **S** Query command for stable weighing data.
- **SI** Query command for weighing data.
- **SIR** Query command for continuous weighing data.

### Setting the function table

Parameter settings for each output mode are as follows:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Item</th>
<th>Data output mode</th>
<th>Auto print polarity, difference</th>
<th>Data memory function</th>
<th>Interval time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key mode</td>
<td></td>
<td>Prt 0, 4, 5</td>
<td>Not used</td>
<td>dREM 2</td>
<td></td>
</tr>
<tr>
<td>Auto print mode A</td>
<td></td>
<td>Prt 1</td>
<td>RP-R 0-2</td>
<td>dREM 2</td>
<td></td>
</tr>
<tr>
<td>Auto print mode B</td>
<td></td>
<td>Prt 2</td>
<td>RP-b 0-2</td>
<td>dREM 2</td>
<td></td>
</tr>
<tr>
<td>Interval memory mode</td>
<td></td>
<td>Prt 3</td>
<td>Not used</td>
<td>dREM 2</td>
<td>nt 0-8</td>
</tr>
</tbody>
</table>

Set each item, depending on the situation, as follows:

<table>
<thead>
<tr>
<th>Data number</th>
<th>No</th>
<th>d-no 0</th>
<th>Time and date</th>
<th>No</th>
<th>5-td 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>d-no 1</td>
<td></td>
<td></td>
<td>5-td 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ID number</th>
<th>No</th>
<th>5-id 0</th>
<th></th>
<th>Yes</th>
<th>5-id 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time only</td>
<td>Date only</td>
<td>Both</td>
<td>5-td 2</td>
<td>5-td 3</td>
</tr>
</tbody>
</table>

With 5-td 1, 5-td 2 or 5-td 3 selected, the amount of data to be stored is 100 sets.

### Recalling the memory data

Confirm that the “Data memory (dREM)” parameter is set to “2”.

1. Press and hold the **PRINT** key until **rECALL** is displayed, then release the key.
2. Press the **PRINT** key to enter the memory recall mode. Recall the data in memory using the following keys:
   - **RE-ZERO** key: To proceed to the next data set.
   - **MODE** key: To go back to the previous data set.
   - **PRINT** key: To transmit the current data using the RS-232C interface.

With **SAMPLE** held down, press the **CAL** key to delete the data currently displayed.

**Note:** Deleting the data will not increase the amount of data that can be stored.

3. Press the **CAL** key to exit the memory recall mode.

3. Press the **CAL** key to return to the weighing mode.
Transmitting all memory data at one time

Confirm that the “Serial interface ( $5\text{if}$ )” parameters are set properly. For details, refer to “10. FUNCTION TABLE” and “17. CONNECTION TO PERIPHERAL EQUIPMENT”.

1. Press and hold the \textbf{PRINT} key until \textit{reCall} is displayed, then release the key.
2. Press the \textbf{SAMPLE} key to display \textit{out}.
3. Press the \textbf{PRINT} key to display \textit{out no} with “no” blinking.
4. Press the \textbf{RE-ZERO} key to display \textit{out Go} with “Go” blinking.
5. Press the \textbf{PRINT} key to transmit all data using the RS-232C interface.
6. The balance displays \textit{Clear} when all data is transmitted. Press the \textbf{CAL} key to return to the weighing mode.

Deleting all memory data at one time

1. Press and hold the \textbf{PRINT} key until \textit{reCall} is displayed, then release the key.
2. Press the \textbf{SAMPLE} key several times to display \textit{Clear}.
3. Press the \textbf{PRINT} key to display \textit{Clr no} with “no” blinking.
4. Press the \textbf{RE-ZERO} key to display \textit{Clr Go} with “Go” blinking.
5. Press the \textbf{PRINT} key to delete all data.
6. The balance displays \textit{End} then \textit{reCall} when all data is deleted.
7. Press the \textbf{CAL} key to return to the weighing mode.
14-3 Memory for Calibration and Calibration Test Data

- Calibration data (when and how it is performed) and calibration test data can be stored in memory.
- All the data in memory is available to be output at one time to a printer or personal computer.
- Up to 50 data sets of the latest calibration or calibration test can be stored. When the memory capacity has been reached, “FUL” illuminates.

Storing the calibration and calibration test data

Note
If “CLR” appears blinking in the upper left of the display, delete the data in memory.

Store the calibration and calibration test data as follows:

1. Set the “Data memory (dRtR)” parameter to “3”.
2. Set the “GLP output (infO)” parameter to “1” or “2”.
3. With the settings above, each time calibration or calibration test is performed, the data is stored automatically.

Transmitting the memory data

Confirm that the “Serial interface (5IF)” parameters are set properly. For details, refer to “10. FUNCTION TABLE” and “17. CONNECTION TO PERIPHERAL EQUIPMENT” and also confirm that the “Data memory (dRtR)” parameter is set to “3”.

1. Press and hold the PRINT key until out is displayed, then release the key.
2. Press the PRINT key to display out no with “no” blinking.
3. Press the RE-ZERO key to display out go with “go” blinking.
4. Press the PRINT key to transmit all memory data using the RS-232C interface.
5. The balance displays [CLEAR] when all memory data is transmitted. Press the CAL key to return to the weighing mode.

Deleting the memory data

1. Press and hold the PRINT key until out is displayed, then release the key.
2. Press the SAMPLE key to display [CLEAR].
3. Press the PRINT key to display CLR no with “no” blinking.
4. Press the RE-ZERO key to display CLR go with “go” blinking.
5. Press the PRINT key to delete all data
6. The balance displays [out] when all the data has been deleted. Press the CAL key to return to the weighing mode.
14-4 Memory for Unit Mass in the Counting Mode

- The data memory function can store 20 sets of unit mass for the counting mode. Even if the AC adapter is removed, the data is maintained in non-volatile memory. Among the 20 sets, “P01” is the memory function for the standard counting mode.
- The unit mass in memory can be recalled and used for weighing.
- The unit mass in memory can be recalled and changed.

Recalling the unit mass

1. Set the “Data memory (dReA)” parameter to “1”.
2. Set “Unit selection (Un iC)” parameter of the function table to PC (counting mode). For details, refer to “5-2 Changing the Unit”.

Note
If “Clr” appears blinking in the upper left of the display, delete the data in memory.

3. Press and hold the PRINT key until the balance enters the sample unit mass selection mode as shown below.

```
| RE-ZERO key | To increase the unit mass number by one. |
| MODE key    | To decrease the unit mass number by one. |
| PRINT key   | To select the unit mass number to be used. |
| CAL key     | To cancel the operation and go to step 5. |
```

4. Select the unit mass to be used using the following keys.

5. To re-store the unit mass or perform Automatic Counting Accuracy Improvement (ACAI) on the re-stored unit mass, follow the procedure described in “12. COUNTING MODE (PC)”.

Notes
- ACAI cannot be performed directly on the recalled unit mass.
- Using “UN:mm” command, the unit mass can be recalled (mm represents 01-20, which corresponds to P01-P20).
14-5 Memory for Upper/lower limit values

- Upper/lower limit values stored in memory can be selected easily by pressing the MODE key.
- Storage capacity for the 3-level comparison is 20 sets of upper/lower limit values (code numbers C01-C20). "C01" is to store the upper and lower limit values that are set in the function table.
- The code number appears in the upper left of the display to label the value.
- Using commands, the upper/lower limit values can be recalled and changed.

Notes
- If the data memory function is used, the “Title block” and “End block” cannot be output.
- This function is not available when the BCD output (OP-01) is installed.

Setting the function table

1. Set the “Data memory (data)” parameter to “Y”.

Note
If “CLR” appears blinking in the upper left of the display, delete the data in memory.
Inputting the upper/lower limit values (3-level comparison)

1. Display the weighing mode.

2. Press and hold the PRINT key until the balance enters the upper/lower limit value selection mode as shown below.

   Display example

   The upper limit value of the currently selected code is displayed.

3. Select the code and upper/lower limit values to be used using the following keys.

   - **RE-ZERO** key: To switch the upper/lower limit values or codes (increases by one)
   - **MODE** key: To switch the upper/lower limit values or codes (decreases by one)

   - **PRINT** key: To display the upper or lower limit value of the code selected and to return to the weighing mode.
   - **CAL** key: To cancel the operation and return to the weighing mode.

4. To change the upper or lower limit value of the selected code, press the SAMPLE key. The balance enters the value inputting mode.

   Change the value using the following keys.

   - **SAMPLE** key: To select the digit to change the value.
   - **RE-ZERO** key: To set the value of the digit selected.
   - **MODE** key: To change the polarity.
   - **PRINT** key: To store the change, display \[ \text{end} \] and return to the upper/lower limit value selection mode.
   - **CAL** key: To cancel the changes and return to the upper/lower limit value selection mode.

5. Enter the upper and lower limit values as necessary and press the CAL key. The balance returns to the weighing mode with the upper and lower limit value, of the code entered last, valid.
Switching the upper/lower limit values (3-level comparison)

1. Display the weighing mode.

2. Press the MODE key to select the upper/lower limit value code.

3. Press the PRINT key to return to the weighing mode.

Upper/lower limit value code

Weighing mode

Code C01
Upper limit value

Code C01
Lower limit value

Code C02
Upper limit value

Code C02
Lower limit value

or leave as is

Weighing mode
15. PROGRAMMABLE-UNIT (AD-4212A only)

This is a programmable unit conversion function. It multiplies the weighing data in grams by an arbitrary coefficient set in the function table and displays the result.

The coefficient must be within the range between the minimum and maximum shown below. If the coefficient set is beyond the range, an error is displayed and the balance returns to the coefficient setting mode, prompting to enter an appropriate value. A coefficient of 1 was set at the factory.

<table>
<thead>
<tr>
<th>Model</th>
<th>Minimum coefficient</th>
<th>Maximum coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD-4212A-100</td>
<td>0.000001</td>
<td>10000</td>
</tr>
<tr>
<td>AD-4212A-200/600/1000</td>
<td></td>
<td>1000</td>
</tr>
</tbody>
</table>

Operation

1. Press and hold the **SAMPLE** key until **psFnc** of the function table is displayed, then release the key.
2. Press the **SAMPLE** key several times to display **mlb**.
3. Press the **PRINT** key. The balance enters the mode to confirm or set the coefficient.

Confirming the coefficient

4. The current coefficient is displayed with the first digit blinking.
   - When it is not to be changed, press the **CAL** key and proceed to step 6.
   - When it is to be changed, press the **RE-ZERO** key and proceed to step 5.

Setting the coefficient

5. Set the coefficient using the following keys.
   - **SAMPLE** key: To select a digit to change the value. The selected digit blinks.
   - **RE-ZERO** key: To change the value.
   - **MODE** key: To change the decimal point position. Each time the switch is pressed, the decimal point position changes as follows:
     0.000001 → 00.00001 → … → 000000.1 → 000001
   - **PRINT** key: To store the new setting, display **End** and go to step 6.
   - **CAL** key: To cancel the new setting and go to step 6.

Selecting the programmable-unit (ML t)

6. The balance displays **un t**. Press the **PRINT** key to enter the unit selection mode. Select the programmable-unit (ML t) as described in "5-2 Changing the Unit".
7. Press the **CAL** key to exit the programmable-unit function and return to the weighing mode.

Using the function

Perform weighing as described in "6-1 Basic Operation (Gram Mode)". After weighing, the balance displays the result (weighing data in grams x coefficient).
16. I/O UNIT SPECIFICATIONS (Standard interface)

16-1 RS-232C/Comparator Contact Output/External Contact Input

D-Sub 25 pin numbers

D-Sub 25 pin assignments

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal name</th>
<th>Interface type</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FG</td>
<td></td>
<td>-</td>
<td>Frame ground</td>
</tr>
<tr>
<td>2</td>
<td>RXD</td>
<td>RS-232C</td>
<td>Input</td>
<td>Receive data</td>
</tr>
<tr>
<td>3</td>
<td>TXD</td>
<td>RS-232C</td>
<td>Output</td>
<td>Transmit data</td>
</tr>
<tr>
<td>4</td>
<td>RTS</td>
<td>RS-232C</td>
<td>Input</td>
<td>Ready to send</td>
</tr>
<tr>
<td>5</td>
<td>CTS</td>
<td>RS-232C</td>
<td>Output</td>
<td>Clear to send</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
<td>RS-232C</td>
<td>Output</td>
<td>Data set ready</td>
</tr>
<tr>
<td>7</td>
<td>SG</td>
<td>RS-232C/external contact input</td>
<td>-</td>
<td>Signal ground</td>
</tr>
<tr>
<td>9</td>
<td>LL</td>
<td>Comparator</td>
<td>Output</td>
<td>Output LL (Only when five-level comparison is selected)*</td>
</tr>
<tr>
<td>12</td>
<td>HH</td>
<td>Comparator</td>
<td>Output</td>
<td>Output HH (Only when five-level comparison is selected)*</td>
</tr>
<tr>
<td>16</td>
<td>LO</td>
<td>Comparator</td>
<td>Output</td>
<td>Output LO</td>
</tr>
<tr>
<td>18</td>
<td>PRINT</td>
<td>External contact input</td>
<td>Input</td>
<td>Same as the PRINT key</td>
</tr>
<tr>
<td>19</td>
<td>RE-ZERO</td>
<td>External contact input</td>
<td>Input</td>
<td>Same as the RE-ZERO key</td>
</tr>
<tr>
<td>21</td>
<td>COM</td>
<td>Comparator</td>
<td>-</td>
<td>Common</td>
</tr>
<tr>
<td>23</td>
<td>HI</td>
<td>Comparator</td>
<td>Output</td>
<td>Output HI</td>
</tr>
<tr>
<td>25</td>
<td>OK</td>
<td>Comparator</td>
<td>Output</td>
<td>Output OK</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td>-</td>
<td>No connection</td>
</tr>
</tbody>
</table>

* AD-4212B: standard, AD-4212A: when OP-04 is installed

RS-232C

The balance is a DCE device. Connect the balance to a personal computer (DTE) using a straight through cable.

- Transmission system : EIA RS-232C
- Transmission form : Asynchronous, bi-directional, half duplex
- Transmission rate : 10 times/second or 5 times/second (same as data refresh rate)
- Data format : Baud rate : 600, 1200, 2400, 4800, 9600, 19200bps
  - Data bits : 7 or 8 bits
  - Parity : Even, Odd (Data bits 7 bits)
  - None (Data bits 8 bits)
  - Stop bit : 1 bit
    - (When sending, 2 bits; receiving, 1 bit.
    A personal computer will function with either setting.)
- Code : ASCII
- Code format : RS-232C
  - LSB 0
  - MSB 6
  - Data bits
  - Start bit
  - Stop bit
  - Parity bit

- Power supply : 
  - -5V to -15V
  - +5V to +15V

65
Comparator contact ratings
- Maximum contact voltage 100VDC
- Maximum contact current 100mA DC
- Maximum contact resistance 20 Ω

External contact input
- Minimum contact time 100 msec

Use a shielded cable.

Personal computer (DTE) example:
- Of DOS/V type (D-Sub9)
- Connector shell
  - Pin 3: RXD
  - Pin 2: TXD
  - Pin 7: RTS
  - Pin 8: CTS
  - Pin 6: DSR
  - Pin 5: SG

Use a shielded cable.

Balance (DCE)
- Balance interior
  - FG 1
  - TXD 2
  - RXD 3
  - RTS 4
  - CTS 5
  - DSR 6
  - SG 7

Use a shielded cable.

1. When a switch is used
   - 18 or 19 (Input terminal) SG 7

2. When a photocoupler is used
   - 18 or 19 (Input terminal) SG 7

Balance interior

*When OP-04 is installed in the AD-4212A series balance.

<table>
<thead>
<tr>
<th>Pin 3</th>
<th>Pin 2</th>
<th>Pin 7</th>
<th>Pin 8</th>
<th>Pin 6</th>
<th>Pin 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>RXD</td>
<td>TXD</td>
<td>RTS</td>
<td>CTS</td>
<td>DSR</td>
<td>SG</td>
</tr>
</tbody>
</table>

Balance interior

(cable shield)

When a photocoupler is used
(Auption switch-ON, make the voltage between the input terminal and the SG terminal 0.2V or less)
# 17. CONNECTION TO PERIPHERAL EQUIPMENT

## 17-1 Connection to the AD-8121B Printer

Set the following parameters to use the AD-8121B printer.

<table>
<thead>
<tr>
<th>Class</th>
<th>Item</th>
<th>Factory setting</th>
<th>AD-8121B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mode 1</td>
</tr>
<tr>
<td>dout</td>
<td>Prt</td>
<td>0</td>
<td>0, 1, 2, 4, 5</td>
</tr>
<tr>
<td></td>
<td>Data output mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RP-P</td>
<td>0</td>
<td>&quot;1&quot;</td>
</tr>
<tr>
<td></td>
<td>Auto print polarity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RP-b</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Auto print difference</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d-no</td>
<td>0</td>
<td>0, 0, 0, 0</td>
</tr>
<tr>
<td></td>
<td>Data number output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-td</td>
<td>0</td>
<td>0, 0, 0, 0</td>
</tr>
<tr>
<td></td>
<td>Time/date output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>s-id</td>
<td>0</td>
<td>0, 0, 0, 0</td>
</tr>
<tr>
<td></td>
<td>ID number output</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>POSSE</td>
<td>0</td>
<td>0, 0, 0, 0</td>
</tr>
<tr>
<td></td>
<td>Data output pause</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>f-Ft</td>
<td>0</td>
<td>0, 0, 0, 0</td>
</tr>
<tr>
<td></td>
<td>Auto feed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5_f</td>
<td>bps</td>
<td>2</td>
<td>2, 2, 2, 2</td>
</tr>
<tr>
<td></td>
<td>Baud rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PrPr</td>
<td>0</td>
<td>0, 0, 0, 0</td>
</tr>
<tr>
<td></td>
<td>Data bit, parity bit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CRLF</td>
<td>0</td>
<td>0, 0, 0, 0</td>
</tr>
<tr>
<td></td>
<td>Terminator</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TYPE</td>
<td>0</td>
<td>0, 0, 0, 0</td>
</tr>
<tr>
<td></td>
<td>Data format</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CTS</td>
<td>0</td>
<td>0, 0, 0, 0</td>
</tr>
<tr>
<td></td>
<td>CTS, RTS control</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 Set the parameter when the data output mode is set to the auto print mode (Prt 1 or Prt 2).

*2 When multiple lines are to be printed, set the parameter to 1.

### Note

**AD-8121B settings**

<table>
<thead>
<tr>
<th>Mode</th>
<th>AD-8121B DIP switches</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode 1</td>
<td><img src="https://example.com/1" alt="Mode 1" /></td>
<td>Prints upon data receipt Standard mode, statistical calculation mode</td>
</tr>
<tr>
<td>Mode 2</td>
<td><img src="https://example.com/2" alt="Mode 2" /></td>
<td>Prints using the AD-8121B DATA key or the AD-8121B built-in timer Standard mode, interval mode, chart mode</td>
</tr>
<tr>
<td>Mode 3</td>
<td><img src="https://example.com/3" alt="Mode 3" /></td>
<td>Prints upon data receipt Dump print mode</td>
</tr>
</tbody>
</table>

**DIP switch 3: Handling unstable data**

ON = To print unstable data
OFF = Not to print unstable data

**DIP switch 4: Data input specification**

ON = Use the current loop
OFF = Use the RS-232C
17-2 Connection to a Computer

The AD-4212A/B series balance is of the DCE type (Data Communication Equipment), which can be connected to a personal computer using the RS-232C interface.

Before connection, read the personal computer manual thoroughly.

Use a standard DCE cable for connection (cable type: straight through).

17-3 Using Windows Communication Tools (WinCT)

When Windows is used as an operating system in a personal computer, the WinCT software can be used to transmit the weighing data to the personal computer.

The current version of the WinCT can be downloaded from the A&D website. Check for applicable Windows versions when downloading the software.

For details on WinCT, refer to the WinCT instruction manual which is available on the A&D website.

The WinCT software has two communication methods: “RsCom” and “RsKey”.

RsCom

- Can transmit commands to control the balance.
- Can make bi-directional communication between the balance and a personal computer using the RS-232C interface.
- Can display or store the data using a text file format. Can also print the data using a printer connected to the personal computer.
- When several ports of a personal computer have balances connected, can communicate with each balance simultaneously.
- Can share a personal computer with other application software.
- Can receive the balance GLP report.

RsKey

- Can transmit the weighing data output from the balance directly to other application software such as Microsoft Excel.
- Can be used with most application software.
- Can receive the balance GLP report.

Note

Windows and Excel are registered trademarks of Microsoft Corporation.
Using the WinCT software, the balance can do the following:

1. Analyzing the weighing data and the statistics with “RsKey”
   The weighing data can be input directly into an Excel worksheet. Then, Excel can analyze the data to obtain total, average, standard deviation, maximum and minimum value, and display them in a graph.

2. Controlling the balance using commands from a personal computer
   By using “RsCom”, the personal computer sends commands such as “re-zero” or “send weighing data” to the balance and controls the balance.

3. Printing the balance GLP report using your printer
   The balance GLP report can be printed using a printer connected to the personal computer.

4. Receiving weighing data at a certain interval
   The weighing data can be received at a certain interval and data characteristic with elapsed time can be obtained.

5. Using the AD-4212A/B series balance memory function
   The data can be stored in the balance’s memory. Of the data stored, the weighing data and calibration data can be transmitted to a personal computer at one time.

6. Using a personal computer as an external indicator
   With the “RsKey” test mode function, a personal computer can be used as an external weight indicator for the balance. (To do this, set the balance data output mode to stream mode.)
## 18. COMMANDS

### 18-1 Command List

#### Commands to query weighing data

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Cancels the S or SIR command.</td>
</tr>
<tr>
<td>Q</td>
<td>Requests the weighing data immediately.</td>
</tr>
<tr>
<td>S</td>
<td>Requests the weighing data when stabilized.</td>
</tr>
<tr>
<td>SI</td>
<td>Requests the weighing data immediately.</td>
</tr>
<tr>
<td>SIR</td>
<td>Requests the weighing data continuously.</td>
</tr>
</tbody>
</table>

#### Commands to control the balance

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL</td>
<td>Same as the CAL key.</td>
</tr>
<tr>
<td>OFF</td>
<td>Turns the display off.</td>
</tr>
<tr>
<td>ON</td>
<td>Turns the display on.</td>
</tr>
<tr>
<td>P</td>
<td>Same as the ON:OFF key</td>
</tr>
<tr>
<td>PRT</td>
<td>Same as the PRINT key</td>
</tr>
<tr>
<td>R</td>
<td>Same as the RE-ZERO key</td>
</tr>
<tr>
<td>SMP</td>
<td>Same as the SAMPLE key</td>
</tr>
<tr>
<td>U</td>
<td>Same as the MODE key (Confirm the upper/lower limit values)</td>
</tr>
</tbody>
</table>

**HH:***. *****.**** g**

Sets the upper and lower limit values.

**HI:***. *****.**** g**

HI: Secondary upper limit value  HI: Upper limit value

**LO:***. *****.**** g**

LO: Lower limit value   LL: Secondary lower limit value

**LL:***. *****.**** g**

The unit is what is displayed in the weighing mode. Use a unit of three digits in A&D standard format.

Command e.g.: HI:100.00000, g

(To set the upper limit value to 100 g; \_ indicates a space.)

| ?HH     | Outputs the upper and lower limit values. |
| ?LL     | ?HI response e.g.: HI,+100 ,00000 , g |

#### Commands to query memory data

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCL</td>
<td>Deletes all weighing data in memory.</td>
</tr>
<tr>
<td>MD:nnn</td>
<td>Deletes weighing data with the data number nnn.</td>
</tr>
<tr>
<td>?MA</td>
<td>Outputs all weighing data in memory.</td>
</tr>
<tr>
<td>?MQnnn</td>
<td>Outputs weighing data with the data number nnn.</td>
</tr>
<tr>
<td>?MX</td>
<td>Outputs the number of weighing data in memory.</td>
</tr>
<tr>
<td>UN:mm</td>
<td>Recalls the unit mass stored in memory with the number of mm (01-20).</td>
</tr>
<tr>
<td>?UN</td>
<td>Outputs the unit mass number of the selected unit mass.</td>
</tr>
<tr>
<td>?CN</td>
<td>Outputs the upper/lower limit value code number of the selected limit value.</td>
</tr>
</tbody>
</table>

**CN:mm**

Changes to the upper/lower limit value in memory with the number of mm.

(mm is the upper/lower limit value code number. Standard=01 to 20)

**Notes:** nnn indicates a three-digit numerical value.

The command is sent to the balance with the terminator selected in the “Terminator (\[C\r\n\l\f\] )” parameter of “Serial interface (\[5\:\ i\ f\] )” added.
18-2 Acknowledge Code and Error Codes

When the “Serial interface function (SIIF)” parameter is set to “CFEd 1”, the balance outputs <AK> code or error code to each command as follows:

<AK> (06h) Acknowledge in ASCII code.

- When the balance receives a command to request data and cannot process it, the balance transmits an error code (EC, Exx).
- When the balance receives a command to request data and can process it, the balance outputs the data.
- When the balance receives a command to control the balance and cannot process it, the balance transmits an error code (EC, Exx).
- When the balance receives a command to control the balance and can process it, the balance transmits the acknowledge code.

Among commands to control the balance, the following transmit the acknowledge code both when the balance receives the command and when the balance has accomplished the command. If the command cannot be processed properly, the balance transmits an error code (EC, Exx). This error can be released using the CAL command.

CAL command (Calibration command) ON command (Display ON command)
P command (Display ON/OFF command) R command (RE-ZERO command)

R command example

- When a communication error has occurred due to external noise, or a parity error has occurred due to transmission error, the balance transmits an error code. In this case, send the command again.
18-3 Control Using CTS and RTS

Depending on the “Ct5” parameter of “Serial interface (S if )”, the balance performs as follows:

\[ Ct5 = 0 \]
Regardless of whether the balance can receive a command or not, the balance keeps the CTS line HI. The balance outputs data regardless of the condition of the RTS line.

\[ Ct5 = 1 \]
The CTS line is kept Hi normally. When the balance cannot receive the next command (e.g. while the balance is processing last command), the balance sets the CTS line to Lo. The balance confirms the level of the RTS line before outputting a set of data. If the RTS level is Hi, the balance outputs data. If the RTS level is Lo, data is not output (The data is canceled).

18-4 Settings Related to RS-232C

Concerning the RS-232C, the balance has two functions: “Data output (dout)” and “Serial interface (S if )”. Set each function as necessary.
19. BCD OUTPUT (OP-01)

Weighing data will be output in BCD, in sync with the display refreshing. In addition, the polarity (+/-) and balance condition (stable/not stable, overload(positive/negative)) will be output.

The strobe signal allows inputting data easily. Inputting BUSY will hold data or prevent data that is being output from being rewritten. The logic of weighing data, status, and strobe signal can be switched individually in the function table.

Contact input is available for RE-ZERO and ON/OFF. (The same operations as pressing the RE-ZERO and ON/OFF keys.)

19-1 Connector Pin Nos. and Specifications

I/O connector located on the rear of the display unit

![I/O connector on the rear of the display](image)

Plug (provided)

<table>
<thead>
<tr>
<th>Part name</th>
<th>Product number</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over mold cover</td>
<td>DX30M-50-CV</td>
<td>Hirose Electric</td>
</tr>
<tr>
<td>Plug unit (soldered type)</td>
<td>DX40M-50P</td>
<td></td>
</tr>
</tbody>
</table>

The products above are subject to be replaced with the equivalent.

Cable

<table>
<thead>
<tr>
<th>Wire size</th>
<th>AWG #28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core configuration</td>
<td>7/0.127</td>
</tr>
<tr>
<td>O.D. of insulator</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Use a shielded cable and connect the shield to the connector housing.
### Pin assignments and I/O logic

#### Output pin assignments

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>10^0</td>
</tr>
<tr>
<td>27</td>
<td>2</td>
</tr>
<tr>
<td>28</td>
<td>4</td>
</tr>
<tr>
<td>29</td>
<td>8</td>
</tr>
<tr>
<td>39</td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td>41</td>
<td>4</td>
</tr>
<tr>
<td>42</td>
<td>8</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>8</td>
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<tr>
<td>16</td>
<td>1</td>
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<tr>
<td>17</td>
<td>2</td>
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<tr>
<td>18</td>
<td>4</td>
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<td>19</td>
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<td>26</td>
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<td>8</td>
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</tr>
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<td>2</td>
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<tr>
<td>30</td>
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<td>32</td>
<td>1</td>
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<td>2</td>
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<td>34</td>
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<td>44</td>
<td>1</td>
</tr>
<tr>
<td>45</td>
<td>2</td>
</tr>
<tr>
<td>46</td>
<td>4</td>
</tr>
<tr>
<td>47</td>
<td>8</td>
</tr>
</tbody>
</table>

#### Input pin assignments

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>BUSY</td>
</tr>
<tr>
<td>9</td>
<td>RE-ZERO</td>
</tr>
<tr>
<td>5</td>
<td>ON/OFF</td>
</tr>
<tr>
<td>3</td>
<td>Input signal GND</td>
</tr>
<tr>
<td>11</td>
<td>Not used (Reserved)</td>
</tr>
</tbody>
</table>

- The pins, which are not specified, have no connection. (Pins 2, 4, 6, 8, 10, 36, 38)

#### Output logic

- **Factory settings**

<table>
<thead>
<tr>
<th>When</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td>/</td>
</tr>
<tr>
<td>Polarity</td>
<td>Positive or zero display</td>
</tr>
<tr>
<td>Stability</td>
<td>Stabilization indicator ON</td>
</tr>
<tr>
<td>Over</td>
<td>* display</td>
</tr>
<tr>
<td>Strobe</td>
<td>Data receiving enabled*</td>
</tr>
<tr>
<td>Status</td>
<td>Weighing ON</td>
</tr>
</tbody>
</table>

- *Data refresh when OFF→ON
- All output, open collector; withstand voltage 30 V; no pull-up resistor; low-level output current 48 mA
- Output logic of data, status, and strobe can be switched individually in the function table $bcd$.

#### Input logic

- **BUSY**
  - Data will be held during ON (when connected to input signal GND).
- **Input by switch**
  - Valid when ON (when connected to input signal GND).

*All input, no voltage contact or open collector (connected to 5 V internally)*

---

**Use a shielded cable.**

- Housing (Cable shield)
- Output pins
- BCD signals
- (Data from $10^{-1}$ to $10^{-8}$, Polarity, Stability, OVER, Status, Strobe)

---

**Balance interior**

---

**Use a shielded cable.**

- Housing (Cable shield)

---

**Balance interior**

---

**Balance interior**

---

**Balance interior**

---

**Balance interior**

---

**Balance interior**

---

**Balance interior**

---

**Balance interior**

---

**Balance interior**

---

**Balance interior**

---

**Balance interior**

---
OP-01 installation procedure

1. Remove the two screws that secure the I/O unit to the rear of the display unit.
2. Remove the I/O unit and disconnect the two cable connectors.
3. Connect the 14-pin cable connector that was removed in step 2 to the OP-01 connector.
4. Leave the 2-pin cable connector as is.
5. Secure the OP-01 board to the rear of the display unit using the two screws.

I/O timing chart

<table>
<thead>
<tr>
<th>Data, state (Output)</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tint</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tstr</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strobe (Output)</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tstr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tst</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BUSY (Input)</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tst</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RE-ZERO (Input)</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tst</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Status (Output)</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tst</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note

The time to start re-zero operation differs, depending on the timing of the re-zero input:

a. To enter re-zero operation without data update
b. To enter re-zero operation after data update

In addition, the time to complete re-zero operation is not constant due to ambient conditions such as external disturbance or vibration.

Using the status signal, confirm that RE-ZERO input is accepted or re-zero operation is complete.

“BUSY input ON” is the condition that pin 7 is connected to input signal GND (pin 3).
“RE-ZERO input ON” is the condition that pin 9 is connected to input signal GND (pin 3).

<table>
<thead>
<tr>
<th>Tint</th>
<th>Data output interval</th>
<th>Approx. 100 msec (Approx. 200 msec when the data refresh rate is 5 times/second.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tstr</td>
<td>Strobe pulse width</td>
<td>Approx. 70 msec (Approx. 170 msec when the data refresh rate is 5 times/second.)</td>
</tr>
<tr>
<td>Tst</td>
<td>Data setup</td>
<td>10 μsec or less</td>
</tr>
<tr>
<td></td>
<td>Data refresh rate</td>
<td>1 μsec or less</td>
</tr>
</tbody>
</table>

“Switch input ON” is the condition that is connected to input signal GND (pin 3).

ON

OFF

T on, T off : 100 m sec or longer
20. EXTENDED FUNCTIONS (AD-4212A only)

The AD-4212A series balance has several extended functions equipped for special applications or to troubleshoot when using the standard functions.

Some settings of the extended functions may affect the weighing accuracy. Therefore, they are set to disabled at the factory when shipped. To enable the extended functions, set the function switch "Extended functions" to "1" (To use the extended functions). For details, refer to "9-1 Permit or Inhibit".

When "To use the extended functions" is selected, one item has its setting range extended as shown below and some more items are added as shown on the next page.

<table>
<thead>
<tr>
<th>Class</th>
<th>Item</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment Display</td>
<td>Stability band width</td>
<td>0 1 2 3 4</td>
<td>Strict judgment: (±1 digit) (±2 digits)</td>
</tr>
<tr>
<td></td>
<td>The extended functions extend the setting range, (0:2 9)</td>
<td>5 6 7 8 9</td>
<td>When the weight value is within a certain width (stability band with: 5t-3t-b) for a certain period (stability detect time:5t-3t), the balance judges that the value is stable and illuminates the stabilization indicator. The extended functions extend the setting range. With the extended band width, the stabilization indicator illuminates even if the value is not stable.</td>
</tr>
</tbody>
</table>

- Factory setting
<table>
<thead>
<tr>
<th>Class</th>
<th>Item</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5e - b</td>
<td>0</td>
<td>Standard setting, (0.1 second)</td>
</tr>
<tr>
<td></td>
<td>Stability detect time</td>
<td>1</td>
<td>Less strict judgment, (0.2 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>(0.3 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>(0.4 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>(0.5 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>(0.6 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>(0.7 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>(0.8 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>(0.9 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>Strict judgment, (0.1 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The extended functions enable to set the stability detecting time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>With a less strict judgment, the stabilization indicator readily</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>illuminates. In the standard setting, an appropriate time is selected in</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>the function setting &quot;long&quot;.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The re-zero is an operation to wait for the weight value to stabilize,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>stores the point that the value is</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>stabilized, as the zero point, and to set the display to zero.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Here, the condition to wait for the display to stabilize for re-zero</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>operation is set.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>When re-zero operation is required each time weighing is performed, the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>operation time can be shortened if the parameter with a shorter time</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>is selected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>Standard setting, (0.1 second)</td>
</tr>
<tr>
<td></td>
<td>Averaging range</td>
<td>1</td>
<td>Narrow averaging range, (0.1 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>(0.2 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>(0.3 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>(0.4 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>(0.5 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>(0.6 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>(0.7 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>(0.8 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>Broad averaging range, (0.1 second)</td>
</tr>
<tr>
<td></td>
<td>Averaging time</td>
<td>0</td>
<td>Standard setting, (0.1 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Short, (0.5 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>(1.0 second)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>(1.5 seconds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>(2.0 seconds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>(2.5 seconds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>(3.2 seconds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>(4.8 seconds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>(6.4 seconds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>Long, (0.1 second)</td>
</tr>
</tbody>
</table>

* Factory setting

(See "Averaging range and averaging time").
20-1 Description of "Averaging range" and "Averaging time"

Averaging range (F l-b) and averaging time (F l-t)

1. When the fluctuation of a weight value is beyond the range that is selected in "F l-b", the averaging operation is disabled and the display reflects the varying value.

2. Once the fluctuation becomes within the selected range, the averaging operation starts to stabilize the weight value.

3. The process of averaging increases. When the selected time is reached, moving averaging will be performed.

When a small amount of sample is weighed or is filled, the fluctuation of a weight value is too small to be beyond the selected range and the averaging operation is not disabled. Consequently moving averaging is always performed and it takes a longer time to reach the final weight value. Under such a situation, change the setting of "F l-b" to a smaller range. But please note that the smaller the range is, the more prone to external disturbance the value will become.
21. MAINTENANCE

- Do not disassemble the balance. Contact the local A&D dealer if the balance needs service or repair.
- Use the original packing material for transportation.
- Do not use organic solvents to clean the balance. Clean the balance with a lint free cloth that is moistened with warm water and a mild detergent.

22. TROUBLESHOOTING

22-1 Checking the Balance Performance and Environment

The balance is a precision instrument. When the operating environment or the operating method is inadequate, correct weighing cannot be performed. Place a sample on the pan and remove it, and repeat this several times. If the balance seems to have a problem with repeatability or to perform improperly, check as described below. If improper performance persists after checking, contact the local A&D dealer for repair.

Checking that the balance performs properly (AD-4212A only)

- Check the balance performance using the self-check function.

**Operation**

1. Press and hold the **MODE** key until **RESPONSE** is displayed, and then release the key.
2. The balance automatically starts to check its internal performance.
3. After self-check, the balance displays the results and returns to the weighing mode.
   
   e.g. "**OK**"

   The example above indicates that the result of the self check is good.

   **Note**

   If improper performance is found in the self check, the balance displays **CH no**. Contact the local A&D dealer for repair.

- Check the balance repeatability using the calibration weight. Be sure to place the weight in the center of the weighing pan. Pay attention to the airflow and be sure to use the breeze break.
- Check the balance repeatability, linearity and calibrated value using external weights with a known value.
When the balance is built into a system, remove the balance from the system. Place it on a solid table. Install the breeze break and perform checking. When the balance proper performance is confirmed, refer to page 12 to set up the installation site.

Checking that the operating environment or weighing method is proper

**Operating environment**
- Is the weighing table solid enough
- Is the balance level? Refer to “3-1 Before Use”.
- Is the operating environment free from vibration and drafts? Has the stainless steel breeze break been installed?
- Is there a strong electrical or magnetic noise source such as a motor near the balance?
- Is there a heat source near the balance?

**Weighing method**
- Does the weighing pan touch the breeze break or anything? Is the weighing pan installed correctly?
- Is the [RE-ZERO] key pressed before placing a sample on the weighing pan? Or, is RE-ZERO performed using external contact input or an RS-232C command?
- Is the sample placed in the center of the weighing pan?
- Has the balance been warmed up for the appropriate duration before weighing?
  - AD-4212A series balance: 30 minutes or more
  - AD-4212B series balance: one hour or more
- Are the leveling feet of the weighing unit placed flat to the installation surface?
  If not, the weight value will be unstable or the specified repeatability cannot be obtained. Improve the installation condition, by securing the weighing unit or reducing the vibration that is conveyed to the weighing unit.

**Sample and container**
- Has the sample absorbed or lost moisture due to the ambient conditions such as temperature or humidity?
- Has the temperature of the container been allowed to equalize to the ambient temperature? Refer to “3-2 When Building into a System”.
- Is the sample charged with static electricity? Refer to “3-2 When Building into a System”.
- Is the sample of magnetic material such as iron? Use much care when weighing magnetic materials. Refer to “3-2 When Building into a System”.


## 22-2 Error Codes

<table>
<thead>
<tr>
<th>Display</th>
<th>Error code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="ConErr" /></td>
<td>Weighing unit connection error</td>
<td>The weighing unit is not connected to the display properly. Refer to “2-2 Installing the Balance” to perform a proper connection.</td>
</tr>
<tr>
<td><img src="image" alt="CH na" /> (CHECK NO)</td>
<td>Internal error</td>
<td>Indicates an internal error as the result of self-check function. Repair is required. Contact the local A&amp;D dealer.</td>
</tr>
<tr>
<td><img src="image" alt="Error!" /></td>
<td>EC, E11 Stability error</td>
<td>The balance cannot stabilize due to an environmental problem. Refer to “3-2 When Building into a System” to prevent vibration, drafts, temperature changes, static electricity and magnetic fields, from influencing the balance. To return to the weighing mode, press the [CAL] key.</td>
</tr>
<tr>
<td><img src="image" alt="CAL E" /></td>
<td>EC, E20 Calibration weight error</td>
<td>The calibration weight is too heavy. Confirm the calibration weight value. Press the [CAL] key to return to the weighing mode.</td>
</tr>
<tr>
<td><img src="image" alt="CAL E" /></td>
<td>EC, E21 Calibration weight error</td>
<td>The calibration weight is too light. Confirm the calibration weight value. Press the [CAL] key to return to the weighing mode.</td>
</tr>
<tr>
<td><img src="image" alt="E" /></td>
<td>Overload error</td>
<td>A sample beyond the balance weighing capacity has been placed on the pan. Remove the sample from the pan.</td>
</tr>
<tr>
<td><img src="image" alt="E" /></td>
<td>Weighing pan Error</td>
<td>The weight value is too light. Confirm that the weighing pan is properly installed and calibrate the balance.</td>
</tr>
<tr>
<td><img src="image" alt="Lo" /></td>
<td>Sample mass error</td>
<td>The balance cannot store the sample for the counting mode or for the percent mode because it is too light. Use a larger sample.</td>
</tr>
<tr>
<td>Display</td>
<td>Error code</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td>Unit mass error</td>
<td>The sample unit mass for the counting mode is too light. Storing and using it for counting will cause a counting error. Add samples to reach the specified number and press the PRINT key. Pressing the PRINT key without adding samples will shift the balance to the counting mode. But, to acquire accurate weighing, be sure to add samples.</td>
</tr>
<tr>
<td><img src="image2.png" alt="Image" /></td>
<td>Clock battery error</td>
<td>The clock backup battery has been depleted. Press any key and set the time and date. The clock and calendar function works normally as long as the AC adapter is connected to the balance. If this error appears frequently, contact the local A&amp;D dealer.</td>
</tr>
<tr>
<td><img src="image3.png" alt="Image" /> (Blinking)</td>
<td>Memory full</td>
<td>The amount of weighing data in memory has reached the maximum capacity. Delete data in memory to store new data. For details, refer to “14. DATA MEMORY”.</td>
</tr>
<tr>
<td><img src="image4.png" alt="Image" /> (Illuminated)</td>
<td>Memory full</td>
<td>The amount of calibration or calibration test data in memory has reached the maximum capacity (50 sets). The data in memory will be deleted automatically to store new data. For details, refer to “14. DATA MEMORY”.</td>
</tr>
<tr>
<td><img src="image5.png" alt="Image" /></td>
<td>Memory type error</td>
<td>Type of memory set in the function table and type of data stored are different. For details, refer to “14. DATA MEMORY”.</td>
</tr>
<tr>
<td>EC, E00</td>
<td>Communications error</td>
<td>A protocol error occurred in communications. Confirm the format, baud rate and parity.</td>
</tr>
<tr>
<td>EC, E01</td>
<td>Undefined command error</td>
<td>An undefined command was received. Confirm the command.</td>
</tr>
<tr>
<td>EC, E02</td>
<td>Not ready</td>
<td>A received command cannot be processed. e.g. The balance received a Q command, but not in the weighing mode. e.g. The balance received a Q command while processing a RE-ZERO command. Adjust the delay time to transmit a command.</td>
</tr>
</tbody>
</table>
### Error Code Description

<table>
<thead>
<tr>
<th>Display</th>
<th>Error code</th>
<th>Description</th>
</tr>
</thead>
</table>
|         | EC, E03    | **Timeout error**  
If the timeout parameter is set to "t:UP!", the balance did not receive the next character of a command within the time limit of one second.  
Confirm the communication. |
|         | EC, E04    | **Excess characters error**  
The balance received excessive characters in a command.  
Confirm the command. |
|         | EC, E06    | **Format error**  
A command includes incorrect data.  
e.g. The data is numerically incorrect.  
Confirm the command. |
|         | EC, E07    | **Parameter setting error**  
The received data exceeds the range that the balance can accept.  
Confirm the parameter range of the command. |
|         | Other errors | If the errors described above cannot be released or other errors are displayed, contact the local A&D dealer. |

### 22-3 Asking For Repair

If the balance needs service or repair, contact the local A&D dealer.

The balance is a precision instrument. Use much care when handling the balance and observe the following when transporting the balance.

- Use the original packing material.
- Remove the weighing pan from the weighing unit.
## 23. SPECIFICATIONS

<table>
<thead>
<tr>
<th></th>
<th>AD-4212A-100</th>
<th>AD-4212A-200</th>
<th>AD-4212A-600</th>
<th>AD-4212A-1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighing capacity</td>
<td>110 g</td>
<td>210 g</td>
<td>610 g</td>
<td>1100 g</td>
</tr>
<tr>
<td>Maximum display</td>
<td>110.0084 g</td>
<td>210.084 g</td>
<td>610.084 g</td>
<td>1100.084 g</td>
</tr>
<tr>
<td>Minimum weighing value (1 digit)</td>
<td>0.1 mg</td>
<td>1 mg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability (Standard deviation)</td>
<td>0.15 mg</td>
<td>1 mg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity</td>
<td>±0.3 mg</td>
<td>±2 mg</td>
<td>±3 mg</td>
<td></td>
</tr>
<tr>
<td>Stabilization time in seconds (typical at [FAST] under good environment)</td>
<td>0-30 g 1.1  0-30 g 0.8  0-30 g 0.9  0-30 g 0.9</td>
<td>30-110 g 1.3  30-210 g 1.0  30-610 g 1.1  30-1100 g 1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display refresh rate</td>
<td>10 times/second (5 times/second can be selected)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O unit</td>
<td>RS-232C</td>
<td>Bi-directional, 600-19200 bps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparator contact output</td>
<td>3-level output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External contact input</td>
<td>RE-ZERO, PRINT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buzzer</td>
<td>Sounds the connected buzzer for 3-level comparison results (It becomes 5-level when OP-04 is installed)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity drift</td>
<td>±2 ppm/°C (10°C-30°C/50°F-86°F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating environment</td>
<td>5°C to 40°C (41°F to 104°F), 85% RH or less (No condensation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calibration weight provided (Conforming to OIML Class E2)</td>
<td>50 g 100 g 200 g</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable weight values</td>
<td>20 g, 50 g, 100 g 20 g, 50 g, 100 g, 200 g 20 g, 50 g, 100 g, 200 g, 300 g, 400 g, 500 g, 600 g, 700 g, 800 g, 900 g, 1000 g</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighing unit</td>
<td>Dimensions 80 (W) × 230 (D) × 90 (H) mm 80 (W) × 230 (D) × 92.5 (H) mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighing pan</td>
<td>Mass Approx. 2 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>Dimensions 237 (W) × 150 (D) × 155 (H) mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>Approx. 2 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection cable</td>
<td>Approx. 2 m (between weighing unit and display)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC adapter</td>
<td>Confirm that the adapter type is correct for the local voltage and power receptacle type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>Approx. 15VA (supplied to the AC adapter)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counting mode</td>
<td>Minimum unit mass 0.1 mg 1 mg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of samples</td>
<td>10, 25, 50 or 100 pieces</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent mode</td>
<td>Minimum 100% reference mass 10.0 mg 100 mg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum 100% display</td>
<td>0.01%, 0.1%, 1% (Depends on the reference mass stored.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Options</td>
<td>OP-01 BCD output, external contact input (RS-232C and comparator contact output disabled)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OP-04 RS-232C, 5-level comparator contact output, external contact input (Not field installable. Must be ordered with the balance for installation at the factory.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OP-07* Extension cable 3 m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OP-08 Ethernet interface (RS-232C and comparator contact output disabled)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OP-19 Stainless steel breeze break (Provided as standard for AD-4212A-100)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OP-20 Metal leveling foot</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Only one extension cable can be used. The maximum distance between the weighing unit and the display unit is 5 m (connection cable 2 m + extension cable 3 m).
<table>
<thead>
<tr>
<th>Specification</th>
<th>AD-4212B-23</th>
<th>AD-4212B-101</th>
<th>AD-4212B-102</th>
<th>AD-4212B-201</th>
<th>AD-4212B-301</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighing capacity</td>
<td>21 g</td>
<td>110 g / 31 g*1</td>
<td>110 g</td>
<td>210 g</td>
<td>310 g</td>
</tr>
<tr>
<td>Maximum display</td>
<td>21.000084 g</td>
<td>110.0084 g / 31.00009 g*1</td>
<td>110.00084 g</td>
<td>210.0084 g</td>
<td>310.0084 g</td>
</tr>
<tr>
<td>Minimum weighing value (1 digit)</td>
<td>0.001 mg</td>
<td>0.1 mg / 0.01 mg*1</td>
<td>0.01 mg</td>
<td>0.1 mg</td>
<td></td>
</tr>
<tr>
<td>Repeatability (Standard deviation)</td>
<td>Loaded on the pan 0 to 10 g: 0.003 mg<em>2 10 g or greater: 0.004 mg</em>2</td>
<td>0.1 mg / 0.05 mg*1</td>
<td>30 g 0.02 mg</td>
<td>100 g 0.04 mg</td>
<td>0.1 mg 0.2 mg</td>
</tr>
<tr>
<td>Linearity</td>
<td>±0.01 mg</td>
<td>±0.2 mg / ±0.05 mg*1</td>
<td>±0.1 mg</td>
<td>±0.2 mg</td>
<td>±0.3 mg</td>
</tr>
<tr>
<td>Stability time (typical at FAST under good environment)</td>
<td>12 seconds</td>
<td>2.5 seconds / 4.0 seconds*1</td>
<td>4.0 seconds</td>
<td>2.5 seconds</td>
<td></td>
</tr>
<tr>
<td>Display refresh rate</td>
<td>10 times/second (5 times/second can be selected)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O unit</td>
<td>RS-232C Bi-directional, 600-19200 bps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparator contact output</td>
<td>3-level or 5-level output</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External contact input</td>
<td>RE-ZERO, PRINT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buzzer</td>
<td>Sounds the connected buzzer for 3-level or 5-level comparison results</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity drift</td>
<td>±2 ppm/°C (10°C-30°C/50°F-86°F)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating environment</td>
<td>5°C to 40°C (41°F to 104°F), 85% RH or less (No condensation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calibration weight provided (Conforming to OIML Class E2)</td>
<td>1 g</td>
<td>50 g</td>
<td>100 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable weight values</td>
<td>1 g, 2 g, 5 g, 10 g, 20 g</td>
<td>10 g, 20 g, 50 g, 100 g</td>
<td>10 g, 20 g, 50 g, 100 g, 200 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighing unit Dimensions</td>
<td>80 (W) × 230 (D) × 90 (H) mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighing pan</td>
<td>φ34 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>Approx. 2.3 kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display Dimensions</td>
<td>237 (W) × 150 (D) × 155 (H) mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>Approx. 2 kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection cable</td>
<td>Approx. 2 m (between weighing unit and display)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC adapter</td>
<td>Confirm that the adapter type is correct for the local voltage and power receptacle type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>Approx. 15VA (supplied to the AC adapter)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counting mode Minimum unit mass</td>
<td>0.1 mg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of samples</td>
<td>10, 25, 50 or 100 pieces</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent mode Minimum 100% reference mass</td>
<td>1 mg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum 100% display</td>
<td>0.01%、0.1%、1% (Depends on the reference mass stored.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Options</td>
<td>OP-01 BCD output, external contact input (RS-232C and comparator contact output disabled)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OP-07* Extension cable 3 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OP-08 Ethernet interface (RS-232C and comparator contact output disabled)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OP-19 Stainless steel breeze break (Provided as standard)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OP-20 Metal leveling foot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 Specifications when the precision range is used.
*2 With the instrument set to automatic, specifications when measured by loading and removing a 1g mass repeatedly.

Only one extension cable can be used. The maximum distance between the weighing unit and the display unit is 5 m (connection cable 2 m + extension cable 3 m).
24. DESIGNING A SPECIAL WEIGHING PAN

A weighing pan specially designed for the balance can be installed. Design the weighing pan as described below:

Using the pan support
The pan support can be removed.

AD-4212A-100/200
AD-4212B-201/301

Four points on the peripheral
M3 screw: Length 5 mm or less
Center
M3 flat head screw: Length 5 mm or less

AD-4212B-23/101/102

Two points on the center
M3 flat head screw: Length 5 mm or less

26 mm

φ32.8 mm

Four points on the peripheral
M3 screw: Length 5 mm or less

AD-4212A-600/1000

For the AD-4212A-600/1000, remove the screws to remove the pan support plate and the pan support.
Using the pan boss
The pan boss cannot be removed.

Shock absorber specifications
AD4212A/B series have specifications that the shock absorber functions at about 2 kg to protect the weighing sensor.
Also, avoid giving impact shock to the weighing pan while loading.
### Mass of the special weighing pan (AD-4212A series balance)

Design the weighing pan so that the mass falls in the ranges shown in the table below:

<table>
<thead>
<tr>
<th>Model</th>
<th>State</th>
<th>Mass of special weighing pan (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD-4212A-100</td>
<td>Pan support is used (with weighing pan removed)</td>
<td>20 to 70</td>
</tr>
<tr>
<td></td>
<td>Pan boss is used (with the weighing pan and pan support removed)</td>
<td>60 to 110</td>
</tr>
<tr>
<td>AD-4212A-200</td>
<td>Pan support is used (with weighing pan removed)</td>
<td>20 to 120</td>
</tr>
<tr>
<td></td>
<td>Pan boss is used (with the weighing pan and pan support removed)</td>
<td>60 to 160</td>
</tr>
<tr>
<td>AD-4212A-600</td>
<td>Pan support is used (with weighing pan and pan support plate removed)</td>
<td>110 to 510</td>
</tr>
<tr>
<td></td>
<td>Pan boss is used (with the weighing pan, pan support plate and pan support removed)</td>
<td>150 to 550</td>
</tr>
<tr>
<td>AD-4212A-1000</td>
<td>Pan support is used (with weighing pan and pan support plate removed)</td>
<td>110 to 1000</td>
</tr>
<tr>
<td></td>
<td>Pan boss is used (with the weighing pan, pan support plate and pan support removed)</td>
<td>150 to 1040</td>
</tr>
</tbody>
</table>

The weighing range for each pan design is shown below:

**AD-4212A-100**

- **When the weighing pan is removed:**
  - Mass range to be weighed: 20 g
  - Mass of special weighing pan: 110 g

- **When the weighing pan and pan support are removed:**
  - Mass range to be weighed: 70 g
  - Mass of special weighing pan: 60 g

**AD-4212A-200**

- **When the weighing pan is removed:**
  - Mass range to be weighed: 20 g
  - Mass of special weighing pan: 110 g

- **When the weighing pan and pan support are removed:**
  - Mass range to be weighed: 120 g
  - Mass of special weighing pan: 210 g

**AD-4212A-600**

- **When the weighing pan is removed:**
  - Mass range to be weighed: 20 g
  - Mass of special weighing pan: 60 g

- **When the weighing pan and pan support are removed:**
  - Mass range to be weighed: 160 g
  - Mass of special weighing pan: 210 g
If the balance is to be used in a range other than shown above, contact the local A&D dealer.

To avoid the effect by static electricity or magnetism, use materials other than resin or magnetic materials when designing a special weighing pan.

When a special weighing pan is used, the zero point may be shifted greatly right after the...
AC adapter is plugged in. Press the **RE-ZERO** key before weighing to cancel the amount of zero drift as necessary.

**Mass of the special weighing pan (AD-4212B series balance)**

Design the weighing pan so that the mass falls in the ranges shown in the table below:

<table>
<thead>
<tr>
<th>Model</th>
<th>State</th>
<th>Mass of special weighing pan (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD-4212B-23</td>
<td>Pan support is used (with weighing pan removed)</td>
<td>5 to 20</td>
</tr>
<tr>
<td></td>
<td>Pan boss is used (with the weighing pan and pan support removed)</td>
<td>30 to 45</td>
</tr>
<tr>
<td>AD-4212B-101/102</td>
<td>Pan support is used (with weighing pan removed)</td>
<td>5 to 55</td>
</tr>
<tr>
<td></td>
<td>Pan boss is used (with the weighing pan and pan support removed)</td>
<td>30 to 80</td>
</tr>
<tr>
<td>AD-4212B-201</td>
<td>Pan support is used (with weighing pan removed)</td>
<td>20 to 80</td>
</tr>
<tr>
<td></td>
<td>Pan boss is used (with the weighing pan and pan support removed)</td>
<td>60 to 160</td>
</tr>
<tr>
<td>AD-4212B-301</td>
<td>Pan support is used (with weighing pan and pan support plate removed)</td>
<td>20 to 220</td>
</tr>
<tr>
<td></td>
<td>Pan boss is used (with the weighing pan, pan support plate and pan support removed)</td>
<td>60 to 260</td>
</tr>
</tbody>
</table>

The weighing range for each pan design is shown below:

**AD-4212B-23**

- When the weighing pan is removed: 21g to 5g
- When the weighing pan and pan support are removed: 110g to 10g

**AD-4212B-101/102**

- When the weighing pan is removed: 110g to 5g
- When the weighing pan and pan support are removed: 30g to 20g

**AD-4212B-201**

- When the weighing pan is removed: 60g to 20g
- When the weighing pan and pan support are removed: 80g to 60g

**AD-4212B-301**

- When the weighing pan is removed: 60g to 20g
- When the weighing pan and pan support are removed: 80g to 60g
Notes

- If the balance is to be used in a range other than shown above, contact the local A&D dealer.
- To avoid the effect by static electricity or magnetism, use materials other than resin or magnetic materials when designing a special weighing pan.
- When a special weighing pan is used, the zero point may be shifted greatly right after the AC adapter is plugged in. Press the RE-ZERO key before weighing to cancel the amount of zero drift as necessary.
25. INSTALLING THE DISPLAY UNIT

Installing the display unit on a wall using the standard stand

1. Secure the stand, that is attached to the display unit, on the wall using the four screws
2. Adjust the angle of the display unit and tighten the angle adjustment knobs located on both sides of the display unit.

Installing in a panel

1. Cut the panel according to the size of the display unit.
2. Remove the angle adjustment knobs located on both sides of the display unit and remove the standard stand.
3. Remove the screws (one on each side) that secure the metal fixtures from rear side of the display unit and pull the metal fixtures out.
4. Insert the display unit from the front side of the panel.
5. From the rear side of the panel, insert the metal fixtures in the channels located on both sides of the display unit, and secure it with the screws (one on each side).
26. ATTACHING THE MOUNTING FIXTURES

The mounting fixtures provided with the AD-4212A/B series balance are used to secure the weighing unit from above in a determined position, when the weighing unit is built into a system. To attach the fixtures to the weighing unit, use the screw holes after the three leveling feet are removed from the bottom of the AD-4212A/B series balance weighing unit.

Attachment Procedure

1. Remove the weighing pan, pan support and dust guard. Then, remove the three leveling feet.

   **Caution**
   Removing any other screws from the bottom of the weighing unit could damage the weighing sensor.

2. Use the leveling feet screw holes to attach the mounting fixtures to the weighing unit.
   Using the screws and washers provided with the mounting fixtures, secure the attaching fixtures to the weighing unit, two screws in the front and one screw in the back.

   **Notes**
   When attaching a mounting fixture, press the tabs against the weighing unit casing (one fixture in the front and another in the back) and determine the fixture position.

   When the weighing unit is placed upside down to attach the mounting fixtures, use much care not to press on the pan boss directly. Applying excessive force to the pan boss may damage the weighing sensor.

3. Secure the weighing unit from above.

   **Notes**
   The screws to secure the weighing unit to the weighing platform are not provided. Prepare appropriate screws with a size corresponding to the M6 screw.
   The screw hole diameter: 6.5 mm

   When the leveling adjustment is difficult to perform due to the installation conditions, place a shim between the fixture and the securing surface, or use two nuts. If the adjustment is still difficult to perform, perform calibration before use. Then, the balance will function normally.
27. EXTERNAL DIMENSIONS

Display unit

Weighing unit

Weighing unit (Bottom)
Same for all the models

AD-4212A-100/200
AD-4212B-23/101/102
AD-4212B-201/301

Height up to the pan boss

* Adjustable range

Unit: mm
AD-4212A-600/1000

Weighing unit with the mounting fixtures attached

* Adjustable range

Unit: mm
28. OPTIONS

Options provided with the balance

OP-01: BCD output/External contact input

OP-04: RS232C/Five-level comparator contact output (AD-4212A only)
  - Only for the AD-4212A series balance. Order this option with the balance as only the factory can install it.

OP-07: Extension cable 3 m

OP-08: Ethernet interface
  - Used to connect the balance to a LAN.
  - The "WinCT-Plus" data communication software is provided as an accessory and can perform the following.
    - Acquire data from multiple balances connected to a LAN.
    - LAN connection enables reliable data acquisition.
    - Control these balances with commands.
    - Acquire data transmitted from balances.
      Example: When pressing the PRINT key of the balance, data is output and is acquired by the computer.
    - The stored data can be used with Microsoft Excel (if installed).

Note
If a USB converter such as the AX-USB-25P is used for communication between a PC and multiple balances, communication may be unstable.
When building into a system, use the Ethernet interface (OP-08).

OP-19: Stainless steel breeze break
  - Provided as a standard accessory for the AD-4212B series balance and AD-4212A-100.
  - Sold separately as an option (OP-19) for the other models.

OP-20: Metal leveling foot
  - The plate can be separated from the screw.

When using the metal leveling feet, the height to the top of the weighing pan will be:
  88-98 mm: AD-4212A-100/200
  AD-4212B series balance
  90.5-100.5 mm: AD-4212A-600/1000

Screw M6XP0.75
Width across flats 8 mm
120°
Other options

**AD-8121B: Printer**
- Compact dot-matrix printer
- Statistical function, clock and calendar function, interval print function, graphic print function, dump print mode
- 5 x 7 dots, 16 characters per line
- Print paper (AX-PP143, 45 (W) x 50 (L) mm, ø65 mm)
- AC adapter or alkaline battery

**AD-1691: Weighing environment analyzer**
- A tool to support various functions such as daily balance checks, uncertainty calculations and evaluations of the environment where the balance is installed.
- Being compact in size, can be carried to the balance installation site easily. One analyzer can manage several balances.

**AD-1687: Weighing environment logger**
- A data logger equipped with 4 sensors for temperature, humidity, barometric pressure and vibration that can measure and store environmental data. When connected to the RS-232C interface of the balance, the AD-1687 can store environmental data along with weighing data. Therefore, it is possible to store data in an environment where a computer cannot be used.
- The stored data can be read to a personal computer using USB. As the AD-1687 is recognized as USB memory, special software is not required to read the data.

**AD-1688: Data logger**
- When connected to the RS-232C interface of the balance, the AD-1688 can store the data in an environment where a personal computer cannot be used.

**AD-8526: Ethernet converter**
- Used to connect the RS-232C interface of the balance to the Ethernet (LAN) port of a computer. This allows management of the balance weighing data with a computer connected to a network.

**AD-8527: Quick USB adapter**
- No dedicated power supply required. / No software required.
- Transmits the weighing data to a personal computer in real time and inputs the data directly into applications such as Excel or Word.
- IP65 compliant

**AD-8920A: Remote display**
- Can be connected to the balance using the RS-232C interface.

**AD-8922A: Remote controller**
- Can be connected to the balance using the RS-232C interface and can control the balance remotely.
- Various options such as comparator output or analog output are available.

**AX-USB-25P-EX: USB converter**
- Adds a COM port to a PC.
- Enables bi-directional communication between the PC and the balance when a USB driver is installed.
- Can use serial communication software such as WinCT on a PC without COM ports.
- An RS-232C cable is provided to connect the USB converter to the balance.
AD-1683: DC static eliminator
- A compact design with efficient static elimination.
- No air blowing from a fan allows precision weighing.

AD-1684A: Electrostatic field meter
- Measures the amount of the static charge on the sample, tare or peripheral equipment and displays the result.
- If those are found to be charged, discharge them using the AD-1683 DC static eliminator.

AD-1689: Tweezers for calibration weight
- A pair of tweezers that are ideally suited for manipulating calibration weights.

### 29. TERMS/INDEX

**Terms**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable value</td>
<td>The weight data when the stabilization indicator appears.</td>
</tr>
<tr>
<td>Environment</td>
<td>Ambient conditions such as vibration, drafts, temperature, static electricity or magnetic fields which affect the weighing operation.</td>
</tr>
<tr>
<td>Store</td>
<td>To save the weighing data, unit mass, calibration data or upper/lower limit values using the data memory function.</td>
</tr>
<tr>
<td>Calibration</td>
<td>Adjustment of the balance so that it can weigh accurately.</td>
</tr>
<tr>
<td>Output</td>
<td>To output the weighing data using the RS-232C interface.</td>
</tr>
<tr>
<td>Zero point</td>
<td>A weighing reference point or the zero display. Usually refers to the value displayed when nothing is on the weighing pan.</td>
</tr>
<tr>
<td>Data number</td>
<td>Numbers assigned sequentially when weighing data or unit weight is stored.</td>
</tr>
<tr>
<td>Digit</td>
<td>Unit of digital resolution. Used for the balance, the minimum displayable weighing value</td>
</tr>
<tr>
<td>Tare</td>
<td>To cancel the weight of a container which is not included in the weighing data.</td>
</tr>
<tr>
<td>Mode</td>
<td>Balance operational function.</td>
</tr>
<tr>
<td>Re-zero</td>
<td>To set the display to zero.</td>
</tr>
<tr>
<td>GLP</td>
<td>Good Laboratory Practice.</td>
</tr>
<tr>
<td>Repeatability</td>
<td>Variation in measured values obtained when the same weight is placed and removed repetitively. Usually expressed as a standard deviation.</td>
</tr>
<tr>
<td>e.g. Standard deviation=1 digit: This means that measured values fall within ±1 digit in the frequency of about 68%.</td>
<td></td>
</tr>
<tr>
<td>Stabilization time</td>
<td>Time required after a sample being placed, until the stabilization indicator illuminates and the weighing data is displayed.</td>
</tr>
<tr>
<td>Sensitivity drift</td>
<td>An affect that a change in temperature causes to the weighing data. Expressed as temperature coefficient.</td>
</tr>
<tr>
<td>e.g. Temperature coefficient = 2 ppm/°C : If a load is 100 g and the temperature changes by 10°C, the value displayed changes by the following value.</td>
<td></td>
</tr>
<tr>
<td>0.0002%/°C x 10°C x 100 g = 2 mg</td>
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