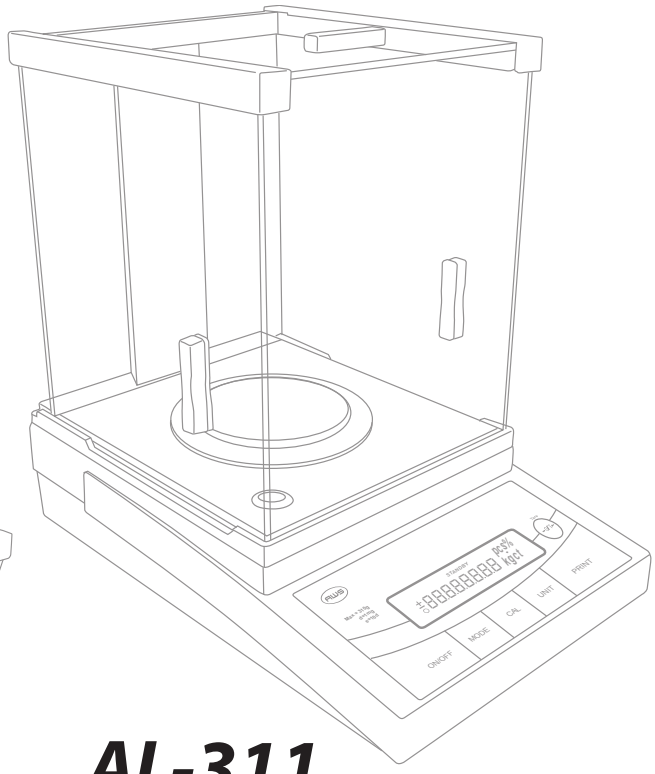
American
Weigh
Scales, Inc.

AL-Series
Analytical Balances

INSTRUCTION MANUAL



AL-311

AL-201S

CE

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1. INTRODUCTION

This AL-Series balance is an electronic analytical/precision balance which uses the principles of electromagnetic force restoration for high accuracy, and performance. The AL-Series features multiple weighing units, parts counting, percent weighing, and much more. This balance is also equipped with an RS232 data port for connection to a computer or printer. The AL-Series allows for a great deal of customization making it perfect for fields such as pharmaceutical, education, corporate research, and many others.

1.1. Scale Environment

Proper placement will help to ensure the most accurate and repeatable results from your balance. The ideal location is in a corner, on a stable, vibration free bench, protected against drafts from doors, windows, ac units, fans, etc. Many laboratories set precision and analytical balances on marble or granite slabs or desks for maximum stability and anti-vibration.

- The recommended working temperature for Accuracy Class II devices is 68°F ±45.5°F(20°C ±7.5°C) with a deviation of no more than 41°F/hour (5°C/hour).
- The recommended relative humidity for Accuracy Class II devices is 50-80%.
- The working voltage for the balance is 24V.

1.2. Safety Precautions

Do not operate the balance in hazardous environments. All outlets should be properly grounded for the operators security.

The balance receives power as long as the AC cord is plugged into the socket, even when the display is off. This is to keep the electronics warmed up and eliminate long start-up times. If you are not using the balance for longer than five days, you should unplug it. Otherwise, simply turn off the display with the ON/OFF button and turn it back on whenever you need it.

1.3. AL-201S Balance Structure

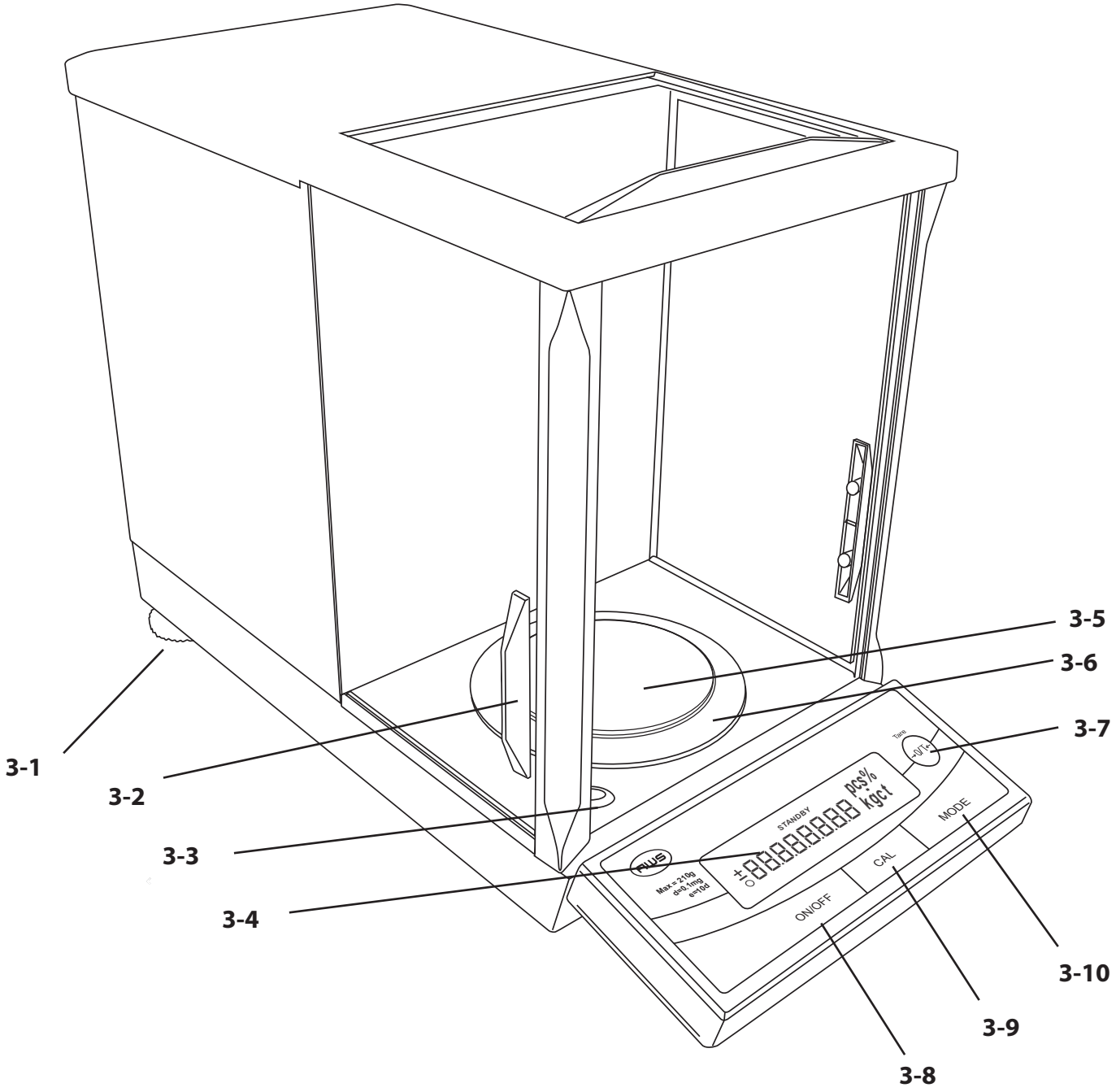


Figure 1.3

3-1	Leveling Foot
3-2	Slide Door Handle
3-3	Bubble Level
3-4	Weight Display

3-5	Weighing Pan
3-6	Draft Shield
3-7	Tare Button
3-8	On / Off Button

3-9	Cal Button
3-10	Mode Button

1.4. AL-311 Balance Structure

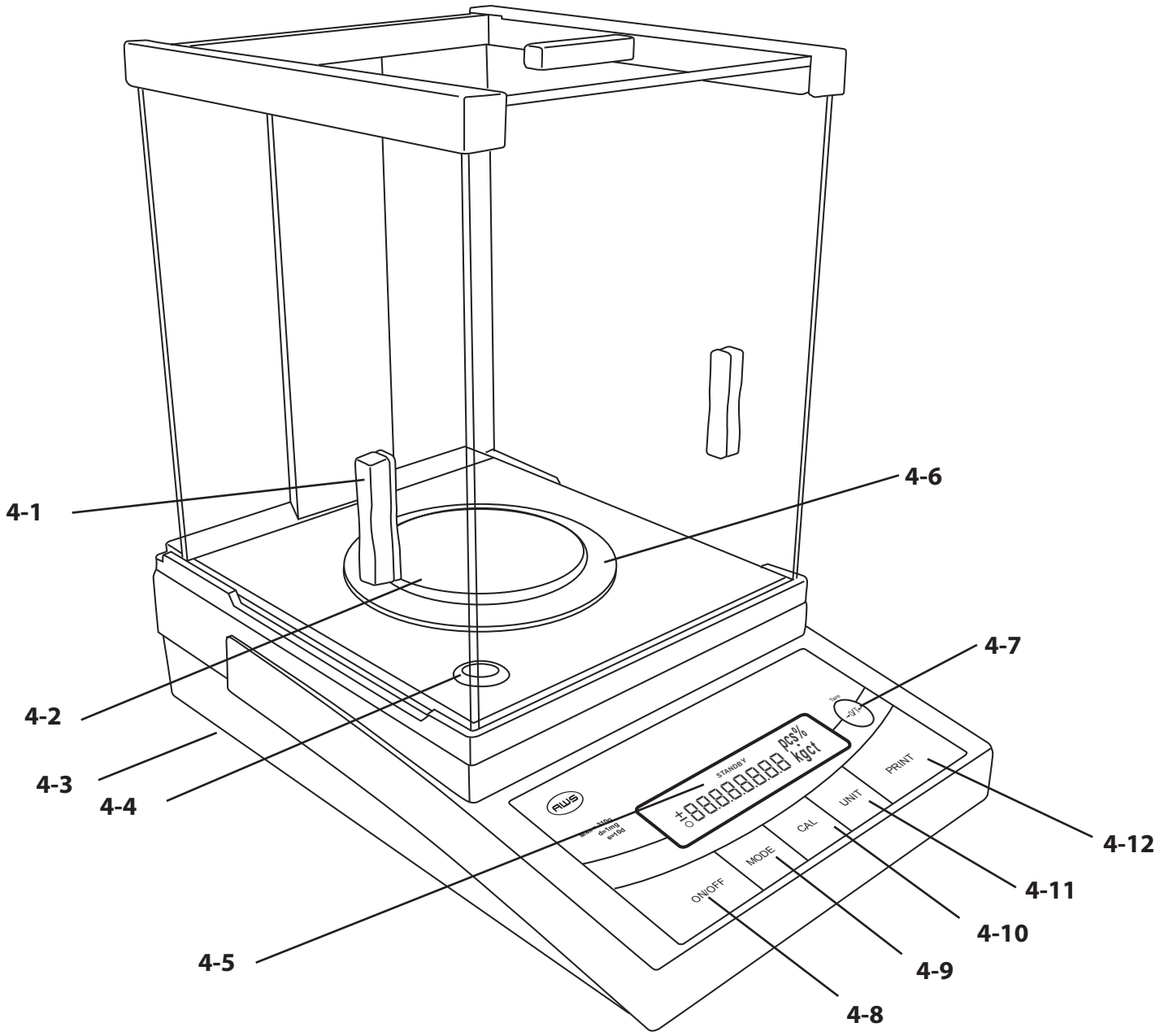


Figure 1.4

4-1	Slide Door Handle
4-2	Weighing Pan
4-3	Leveling Foot
4-4	Bubble Level

4-5	Weight Display
4-6	Draft Shield
4-7	Tare Button
4-8	On / Off Button

4-9	Mode Button
4-10	Cal Button
4-11	Unit Button
4-12	Print Button

1.5. Technical Specifications

Model	AL-201S	AL-311
Max. Capacity	200g	300g
Readability	0.1mg	1mg
Repeatability	±1d	±1d
Linearity	±2d	±2d
Calibration Weight	200g	
Response Time	3~5 sec.	
Pan Size	Ø3.5in / Ø90mm	Ø4.3in / Ø110mm
Dimensions	7.9 x 12 x 16.5in / 200 x 304 x 419mm	8.3 x 13.0 x 12.7in / 212 x 330 x 323mm
Net Weight	23.4lb / 10.6kg	13.9lb / 6.3kg
Power Requirements	Input: 100-240VAC 50/60Hz	Input 100-240VAC 50/60Hz Output: 24VDC 600mA
Output Interface	RS232	

2. INSTALLATION

2.1. Part List

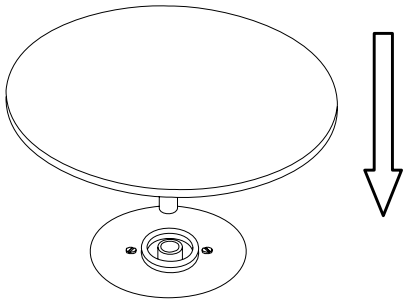
Balance . . . . . 1 pc.
200g Calibration Weight . . . . . 1 pc.
Weighing Pan . . . . . 1 pc.
AC Power Cord . . . . . 1 pc.
Extra Fuse . . . . . 2 pc.
Instruction Manual . . . . . 1 pc.
Warranty Card . . . . . 1 pc.

2.2. Unpacking

Carefully unpack the balance and remove it from its styrofoam supports. You may want to keep the original box and packing materials for storing the balance when not in use.

If the balance is damaged contact the supplier immediately. Keep all packing materials as they were when you received them.

2.3. Setting Up the Balance



1. Remove any tape used to hold the glass doors shut during shipping.
2. Set the metal draft shield into place around the platform mounting area.
3. Now place the weighing pan onto its mount carefully.
4. Adjust the two leveling feet until the bubble on the bubble level is centered.
5. Close all draft shield doors securely.

2.4. Turning on the Balance and Self-testing

1. Connect the power cord to an available wall socket and then into the balance
Note: For the AL-201S model there is just an AC mains plug, no external adapter.
2. Press the ON / OFF key to turn the display on. A self-test will be performed (30 seconds), including a display test.
3. Once the display shows "0.000g" or "0.0000g" the balance is ready to use.
4. To turn the display off, press the ON / OFF key. The balance will continue to use a low current to keep the electronics warmed up for quicker start-up times.

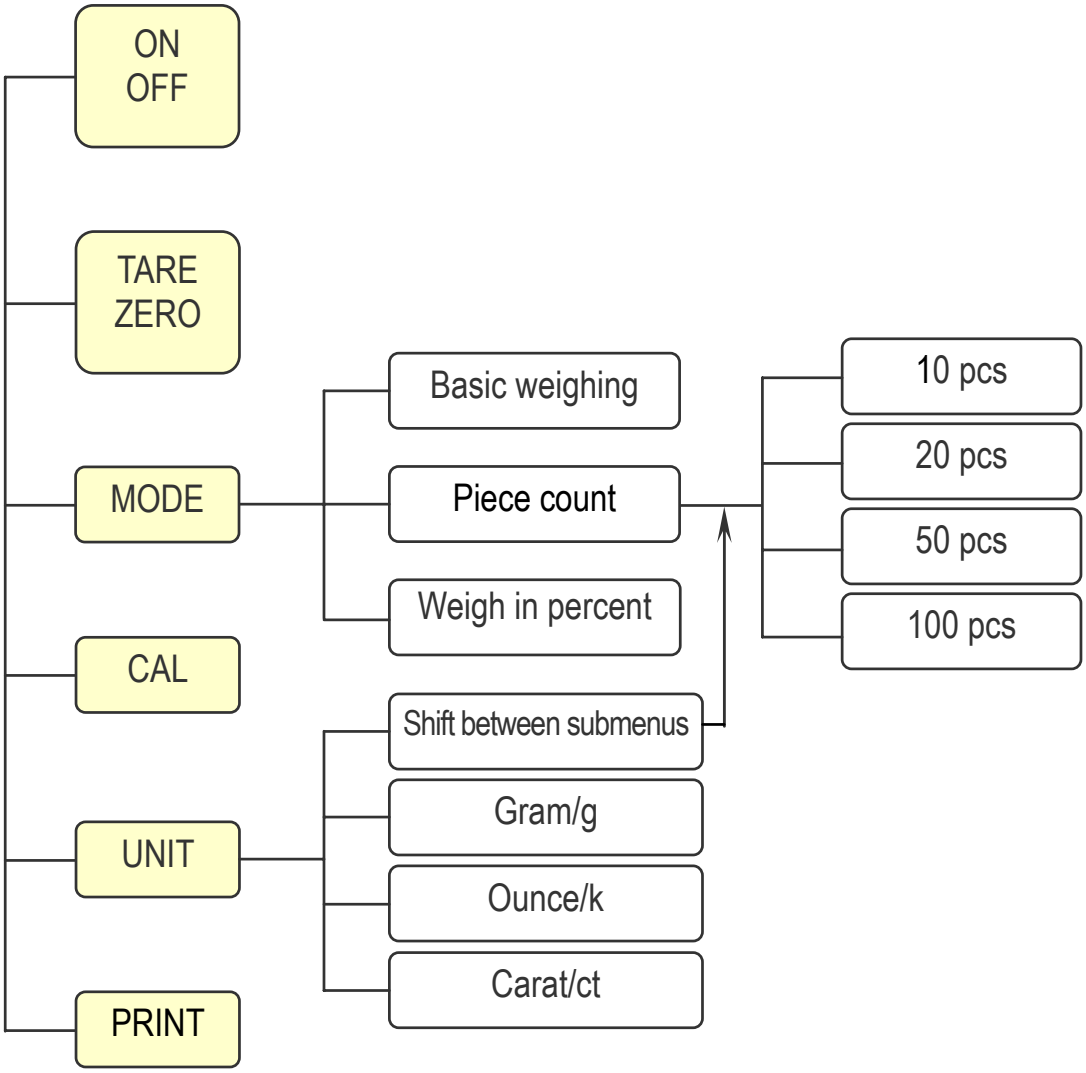
2.5. Underweighing

This balance is equipped with an underweighing feature that allows you to suspend items from an attachment below the balance. To use this feature, the balance should be supported in a way that allows the items to hang below the scale. This feature is useful for procedures such as specific gravity calculations.

IMPORTANT NOTE: The balance should be warmed up (ie. plugged in) for at least 3 hours before use for accurate results.

3. OPERATION

3.1. Menu Function Tree



3.2. Operating the Balance

3.2.1. Sample Weighing

1. Press TARE / ZERO to make the balance return to zero.
2. Load the sample onto the scale pan.
3. The weight is stable when g, oz/K, ct, %, or pcs (depending on mode) appears on the display.

3.2.2. Weighing with a container

Sometimes it is necessary to weigh an object (such as a liquid) using a container. To display just the weight of the contents (net weight) and not the whole combined weight (gross weight), the TARE button is used.

1. Place an empty container on the weighing pan.
2. Once the weight stabilizes, press the TARE / ZERO key briefly. The display will return to zero.
3. Add the sample to the container.
4. The weight is stable when g, oz/K, ct, %, or pcs (depending on mode) appears on the display.

3.2.3. Unit Switching

This balance has three possible weighing units. They are gram (g), ounce (oz/K), and carat (ct). Follow these instructions to change the weighing unit:

- AL-201S:
    1. Press and hold the MODE key for 3 seconds.
    2. The weighing unit will cycle between g, oz(K), ct, %, and pcs.
- AL-311:
    1. While in normal weighing mode press the UNIT button to switch between g, oz(K), ct.

3.2.4. Parts Counting

With items of uniform weight (ie. all the pieces are of equal weight value) it is possible to use this scales parts counting feature to quickly and accurately obtain a piece count. To use the parts counting feature, follow these instructions:

1. Press the MODE key until the display shows "pcs" to indicate parts counting mode.
2. Add a reference sample of pieces to the platform (or container). On the AL-201S, you should use 10 pieces. On the AL-311 You may select between a reference sample of 10, 20, 50, or 100 pcs using the UNIT key.
4. Once the display shows "pcs" the setting is stored. You can now add any number of pieces to the platform (or container) and the display will show a count.

Notes: The larger the sample size used, the more accurate the count will be. Tare can be used in this mode. Min. sample weight = 10d (1mg for AL-201S, 0.01g for AL-311). Min. piece weight = 1d (0.1mg for AL-201S, 1mg for AL-311). The reference sample is not stored upon exiting parts counting mode.

3.2.5. Percent Weighing

You can use this balances percent weighing feature to show a percent of a whole, rather than a weight.

1. Press the MODE key until the display shows "%" to indicate percent weighing mode.
2. Add the full reference sample (100%) to the platform (or container). Wait for the display to stabilize.
3. You may now add any quantity to the scale and the display will show the % as it relates to the reference sample.

Note: The reference sample is not stored upong exiting percent weighing mode.

3.2.6. Printing

This balance is configured to transmit weight data to a computer or printer via the RS232 port. To print the weight data to the RS232 port on the AL-201S, tap the MODE key. For the AL-311, press the PRINT key. You can also set the balance to continuously send the weight data, without having to press the PRINT key. For more information on configuring the RS232 output, see section 4.2.

3.2.7. Calibrating The Balance

The balance may need to be calibrated in certain situations such as:

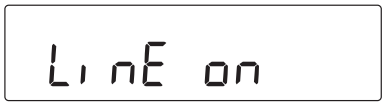
- Before weighing for the first time
- After the balance has not been used for some time
- If the balance location has changed
- If ambient temperatures have changed greatly

1. Prepare the calibration weight (200g for AL-201S and AL-311).
2. Clean the weighing pan and press TARE to re-zero the balance.
3. When the balance is stablized, press and hold the CAL button. "C" should appear on the display. If not, the balance was not stable, try again.
4. Carefully place the calibration weight onto the weighing pan.
5. The display will show "200.000g / 200.0000g". Once the "o" symbol at the lower left corner of the display disappears, the scale will beep once to indicate that calibration is complete.

3.2.8. Linear Calibration (available on model AL-311 only)

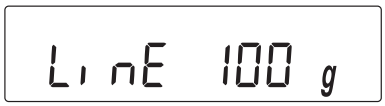
Linear calibration adjusts the balance at two or more points, rather than just one. To enter linear calibration, use configuration code "312". See Section 4 for information on entering configuration codes.

1. Once the code is entered, you should see "Line on" on the display.



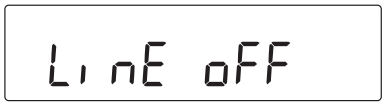
2. The display will then show "Line 0g" to indicate that it is setting the zero point. Make sure the device is stable and all glass doors are closed, then press TARE/ZERO.

3. The display will now show "Line 100g". Place a 100g calibration weight onto the center of the platform and close the glass doors. Press TARE / ZERO when you are ready to confirm the weight.



4. The display will now show "Line 200g". Place a 200g calibration weight onto the center of the platform and close the glass doors. Press TARE / ZERO when you are ready to confirm the weight.

5. The display will now show "Line 300g". Place both the 200g and 100g calibration weight onto the center of the platform and close the glass doors. Press TARE / ZERO when you are ready to confirm the weight. The display will show "Line off" then shut off.



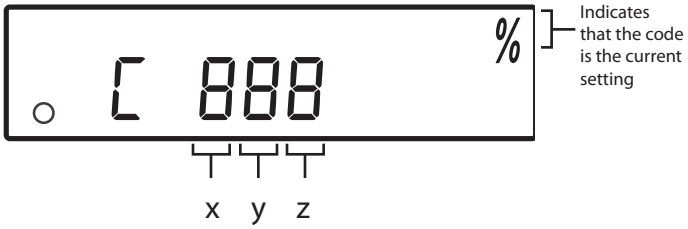
4. CONFIGURATION

4.1. Entering Configuration Codes

1. With the display off, press and hold the MODE key and tap the ON/OFF key to turn the balance on.

2. Release the MODE key once "EC2" is displayed.

3. The display will now prompt you to enter a 3 digit configuration code. Codes can be found in table 4.2 below. To enter the code, press TARE/ZERO when the desired value comes up for the first variable (x) (The number will continue to count from 0~9 until TARE/ ZERO is pressed). Do the same for the next variables (y) and (z). To go back a number, press the CAL button or select 0 as an option. Once all three numbers have been entered, the setting is confirmed.



4. To exit configuration, choose 0 as the first variable (x).

4.2. Configuration Codes

*Defaults are in grey

Setting	X	Y	Z	Options
Filter Intensity (affects weight update speed)	1	1	1	Fastest (use in highly stable conditions)
	1	1	2	Faster
	1	1	3	Fast
	1	1	4	Slow (use for unstable conditions)
Ambient Conditions Stability Range (AL-201S: d=0.1mg) (AL-311: d=1mg)	1	2	1	0.25d
	1	2	2	0.5d
	1	2	3	1d
	1	2	4	2d
	1	2	5	4d
	1	2	6	8d
	1	2	7	16d
	1	2	8	32d
	1	2	9	64d

Setting	X	Y	Z	Options
Display	1	3	1	Display all decimal places
	1	3	2	Do not display the last decimal place
	1	3	3	Display the last decimal place only when stable
	1	3	4	Display all decimal places only when stable
Tare	1	4	1	Allow taring regardless of stability
	1	4	2	Only allow taring when stable
Auto-Zero	1	5	1	Auto-Zero ON
	1	5	2	Auto-Zero OFF
RS232 Output	2	1	1	Print on request regardless of stability
	2	1	2	Print on request only when stable
	2	1	3	Continuous output regardless of stability
	2	1	4	Continuous output only when stable
Baud Rate	2	2	1	300
	2	2	2	600
	2	2	3	1200
	2	2	4	2400
	2	2	5	4800
	2	2	6	9600
	2	2	7	19200
Bit Parity	2	3	1	Mark
	2	3	2	Space
	2	3	3	Odd
	2	3	4	Even
Misc. (AL-311 only)	3	1	1	Display Edition
	3	1	2	Linear Calibration
	3	1	3	Reset Factory Settings

4.3. Configurations Settings & Tips

- For faster weight readout, choose settings 111 or 112.
- For ambient conditions, try using 113 for normal drafts and 114 for strong drafts.
- For ambient conditions stability range, try using a larger digit for quick weighing, or strong drafts
- Use caution if selecting 141 for Tare setting.
- To weigh objects close to the zero-point, make sure the Auto-zero function is turned off. If weighing with Auto-zero turned off (Config. Code 152), take note of any drifting and manually zero the scale if necessary. Weighing close to zero with Auto-zero turned on may cause inaccurate readouts.
- If you reset to factory settings (313), be sure to perform a linear calibration (312) afterwards to ensure accuracy.

5. APPENDIX

5.1. RS232 Serial Data Communication

T8051 MCU (Intel)
1 start bit
1 stop bit
7-bit ASCII (D6-D0)
1 parity (D7)
First setting <RS232 output>
<Baud>
<Parity>

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
±	Null	Weight Display									Null	Units		CR	LF

5.2. Care & Maintenance

Please read all operating instructions carefully before use. Scales are precision instruments and should always be handled with proper care. To ensure years of reliable service, keep these simple tips in mind:

• Do not exceed the scales maximum capacity. Overloading your scale can permanently damage it!
• Avoid exposure to extreme heat or cold. Scales perform best at normal room temperature. If temperatures have changed dramatically, recalibration may be necessary.
• Allow your scale to warm up for three hours before performing initial calibration.
• Store your scale in a clean, dry location. Dust, dirt, and moisture can accumulate on the weighing sensors and electronics causing inacuracy or malfunction.
• Avoid static electricity sources, as they can have an adverse effect on the weighing sensors.
• Always weigh on a flat and level surface, free from vibrations and drafts. The corner of a room is usually the most stable.
• Gently apply all items to be weighed. Do not drop items onto the weighing platform.
• Avoid dropping your scale. The warranty does not cover damage due to rough treatment or overload.
• Keep the weighing pan clean using a soft cloth. Do not use harsh chemicals.

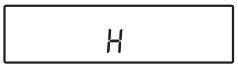
5.3. Troubleshooting

Problem: The self-test failed.

Solution: If the self-test fails, an error code will be displayed. Please contact Technical Support (1-866-643-3444) and give them the error code.

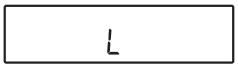
EC1	CPU Broken
EC2	Keyboard Error
EC3	Storage Lost
EC4	A/D converter is not started

Problem: The display shows "H" during weighing



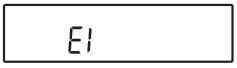
Solution:
1. Weight is too heavy. Decrease the sample weight.
2. No Grounding.
3. The balance may be calibrated incorrectly (using weight lighter than the standard). Try recalibrating.

Problem: The display shows "L" during weighing



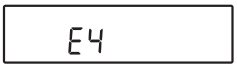
Solution:
1. Weight is too light.
2. No grounding.
3. The sample is leaning against something besides the weighing pan, or the pan is not properly in place.
4. Check below the weighing pan, see if it is touching any objects.

Problem: The display shows "E1" during weighing



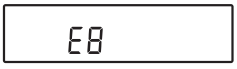
Solution:
1. The display capacity has been exceeded (over 9999999)
2. The reference sample is too small. Use a larger reference sample.

Problem: The display shows "E4" during weighing



Solution:
1. There is an error with the A/D converter. Unplug the power cord for 10 seconds, then plug it back in.

Problem: The display shows "E8" during weighing

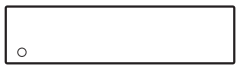


Solution:
1. The gross weight value (net weight + tare weight) < 0. Press the TARE key.
2. If the error persists, unplug the power cord for 10 seconds, then plug it back in.
3. There was an error with the RS232 communication. Press the TARE key and try the RS232 communication again.
4. The balance may be calibrated improperly, using a weight heavier than the standard. Try recalibrating the balance.

Problem: No display after power connection.

Solution: 1. Press the ON/OFF key.
2. The fuse may be blown. Unplug the balance and replace the fuse. The fuse box is in the socket.

Problem: After the display test, the balance continues to display "o" in the lower left corner.



Solution: 1. The balance is unstable. Make sure the glass doors are all shut properly.
2. Check below the weighing pan to make sure nothing is touching.
3. Strong drafts may be affecting the scale. Try a different stability range and/or filter intensity setting. (See Section 4)

Problem: The last decimal place rarely stabilizes

Solution: 1. The balance is unstable. Check that the glass doors are all shut properly.
2. Strong drafts may be affecting the scale. Try different stability range and filter intensity settings. (See Section 4)

Problem: The display continues to show zero when weighing small amounts close to zero (ie. 0.3mg-1mg for AL-201S)

Solution: 1. The Auto-zero function is turned on. Turn it off in the scale's configuration. (See Section 4)