User Manual

BPA121

Compact Waterproof Weighing Scale





Table of Contents

1	Safet	y Instructions	3					
2	Intro	Introduction						
	2.1	Specifications	4					
	2.2	Display and Keypad	6					
3	Insta	llation	7					
	3.1 Selecting the Installation Site							
	3.2	Working Environment Requirement	7					
	3.3	Unpacking	7					
	3.4	Installing the Scale	7					
4	Oper	ation	8					
	4.1	Powering On	8					
	4.2	Powering Off	8					
	4.3	Weighing	8					
	4.4	Zeroing	8					
	4.5	Weighing with Tare	8					
		4.5.1 Taring	8					
		4.5.2 Clearing Tare	8					
5	Setu	and Configuration	8					
-	5.1	Enterina Setup Menu	g					
		5.1.1 Entering User Menu	g					
		5.1.2 Entering Service Menu	9					
	5.2	Exiting Setup Menu	9					
	5.3	Display in Setup Menu Mode	10					
	5.4	Use of Function Kevs with Menus	10					
	5.5	Menu Structure	10					
		5.5.1 User Menu Structure	10					
		5.5.2 Service Menu Structure	11					
	56	Calibration	12					
	0.0	5.6.1 Selecting the Calibration Mode	12					
		5.6.2 Two-Point Calibration	12					
		5.6.3 Three-Point Calibration	13					
		5.6.4 Zero Calibration	14					
6	Main	Maintenance and Service						
0	6 1	Multimenunce und Service						
	6.2		10					
	0.2	Dellony Charaina	10					
	0.3		10					
	0.4 6.5	Error Codes and Corrective Response	16					
	0.0							
7	GEO	Code	17					

1 Safety Instructions



The BPA121 scale is not designed for use in areas classified as hazardous because of combustible or explosive atmospheres. Do not install a BPA121 scale into an explosive environment.

\land WARNING

1) This device is an electrostatic sensitive equipment. Please take necessary electrostatic precautions when using and maintaining it. 2) Please ensure the device is grounded during the weighing process, otherwise static buildup may cause damage to the weighing platform or the items being weighed.



\land WARNING

Only permit qualified personnel to service the terminal. Exercise care when making checks, tests and adjustments that must be made with power on. Failing to observe these precautions can result in bodily harm and/or property damage.



🗥 WARNING

Do not charge the battery in a humid or dusty environment or when the temperature is below 0°C.



\land WARNING

Use caution when testing the battery. A large amount of current may be present in the battery.



\land WARNING

Dispose of used battery promptly. Keep away from children. Do not disassemble and do not dispose of in fire.



\land WARNING

Use the BPA121 scale for weighing only. Do not use it for other purposes.



🗥 WARNING

Avoid falling loads, shocks and lateral impacts. Do not overload the scale.



\land WARNING

1) Lead-acid battery version: The battery used in this device may present a risk of fire or chemical burn if mistreated. Do not crush, disassemble, heat or incinerate. Replace battery with the original type only. Use of another battery may present a risk of burn, fire or explosion. 2) Dry-cell version: Use the screw foot tool to tighten battery cover screws (torque: 1.1-1.6Nm) to safeguard battery seal and preserve product life. Exposure to water and moisture can cause electrical hazards and product failure.

Disposal

In conformance with the European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements. Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment. If you have any questions, please contact the responsible authority or the distributor from which you purchased this device. Should this device be passed on to other parties, the content of this regulation must also be related.



Compliance Documents Download

National approval documents, e.g. the FCC Supplier Declaration of Conformity, are available online and/or included in the packaging.

www.mt.com/ComplianceSearch

Manuals Download

Visit the website www.mt.com/BPA121-downloads OR scan the QR-Code to download more manuals of BPA121.



2 Introduction

The BPA121 compact weighing scale is specifically designed for food processing applications. It offers high protection against water penetration and humidity and is built to withstand wet and harsh environments. It is uniquely suitable for moist environments.

The BPA121 scale is not designed for use in areas classified as hazardous because of combustible or explosive atmospheres.

WARNING : Lead-acid battery version includes standard lead-acid batteries upon factory delivery; dry-cell version does not include dry batteries and requires customers to purchase them separately.

2.1 Specifications

BPA121 scale conforms to the specifications listed in the following tables.

Asia Pacific

1) Lead-acid Battery Version:

Model	Capacity	Verification Division	Display Individual Division			
		2×1,500e	3,000d / 3,750d	6,000d / 7,500d	15,000d	30,000d / 37,500d
BPA121-1211 / BPA121-1221	0.75 / 1.5 kg	0.5 / 1 g	0.5 g	0.2 g	0.1 g	0.05 g
BPA121-2211 / BPA121-2221	1.5 / 3 kg	1 / 2 g	1 g	0.5 g	0.2 g	0.1 g
BPA121-3211 / BPA121-3221	3 / 7.5 kg	2 / 5 g	2 g	1 g	0.5 g	0.2 g
BPA121-4211 / BPA121-4221	7.5 / 15 kg	5 / 10 g	5 g	2 g	1 g	0.5 g
BPA121-5211 / BPA121-5221	15 / 30 kg	10 / 20 g	10 g	5 g	2 g	1 g

2) Dry-cell Version:

Model	Capacity	Verification Division	Display Individual Division			
		3,000e	6,000d / 7,500d	12,000d / 15,000d	30,000d / 37,500d	
BPA121-2121 D-cell	3 kg	1 g	0.5 g	0.2 g	0.1 g	
BPA121-3121 D-cell	6 kg	2 g	1 g	0.5 g	0.2 g	
BPA121-4121 D-cell	15 kg	5 g	2 g	1 g	0.5 g	
BPA121-5121 D-cell	30 kg	10 g	5 g	2 g	1 g	

BPA121 Specifications

Parameter	Lead-acid Battery Version	Dry-cell Version			
Power	AC-DC 100-240V / 50-60Hz or rechargeable lead-acid batteries (6V, 5A/ h)	Five pieces of D-size alkaline dry batteries			
Power Consumption	6V / 60mA	7.5V / 20mA			
Display	6-bit 7-section red LED display	6-bit 7-section red LED display			
	Six-step brightness adjustable	Six-step brightness adjustable			
	Single or dual display	Dual display only			
Working Temperature	-10°C to +40°C / -14°F to +104°F, ≤	95% relative humidity, non-condensing			
Storage Temperature	-10°C to +70°C / -14°F to +158°F, 10%	%-95% relative humidity, non-condensing			
Tare Range	Full weighing division: when tare exists, the net weighing capacity reduces accordingly.				
Accessories	Stainless steel scale pan	Stainless steel scale pan			
	• 6V/5Ah rechargeable lead-acid battery	• AC-DC 100-240V / 50-60Hz power			
	 Charger station, capable of charging 6V/5Ah lead acid battery simulta- neously 	supply			
Keypad	Mechanical k	eypad, 2 keys			
Dimensions	300 x 230 x 133 mm				
Shipping Dimensions	380 x 282 x 200 mm				
Platter Size	182 x 226 mm				
Net Weight	3.24 kg (with lead-acid battery)	2.23 kg (without battery)			
Shipping Weight	3.81 kg (with lead-acid battery)	2.86 kg (without battery)			
Approval	CPA OIML, CPA, CE				
Accuracy Class					
Hazardous Areas	The BPA121 scale cannot be operated in areas classified as Hazardous because of combustible or explosive atmospheres in those areas.				

2.2 Display and Keypad



Figure 1: BPA121 Display and Keypad

1	Battery Indicator	 The battery indicator lights in the following pattern: Green: The battery is full. Red: The battery is low. Please charge the battery immediately.
		 Blinking Red: The battery is low and the scale will turn off.
		Yellow: The battery is charging.
		The battery indicator does not indicate which power supply (DC or AC) is in use.
2	Level Bubble	Indicates the levelling status of the scale.
3	Zero Indicator	When the Zero indicator is on, the scale is in gross zero.
4	g Indicator *	When the g indicator is on, the scale weighs in grams.
5	Kg Indicator *	When the Kg indicator is on, the scale weighs in Kilograms. In this case, the Kg indicator is off, and the scale is not weighing in Kilograms.
6	Net Indicator	When the Net indicator is on, the scale displays a net weight. When the Net indicator is off, the scale displays a gross weight. In this case, the Net indicator is off, and the scale is displaying a gross weight.
7	Tare Key	 In weighing mode: Press: Captures or clears a tare. Press and hold: Enters setup mode. In setup mode: Press: Toggles through menu item selections.
8	Zero/Power Key	 In weighing mode: Press: Resets the display weight to Zero. Press and hold: Powers the scale on or off. In setup mode: Press: Toggles through menu items or accepts the menu item selection.
9	LED Display	Displays weight value.

* When both g and Kg indicators are off, the scale is weighing in Ib. Ib is only available after the scale has been calibrated in Ib.

3 Installation

3.1 Selecting the Installation Site

The correct location is important to the accuracy of the weighing results.

- The foundation at the installation site must be capable of safely supporting the total weight of the scale at its support points, when a maximum load is on the scale.
- Select a stable, vibration-free and horizontal location for the scale.
- Observe the following environmental conditions:
 - No direct sunlight
 - No strong drafts
 - No excessive temperature fluctuations

3.2 Working Environment Requirement

- Working Temperature: -10°C to +40°C / -14°F to +104°F, ≤95% relative humidity, non-condensing.
- Storage Temperature: -10°C to +70°C / -14°F to +158°F, 10% 95% relative humidity, non-condensing.



NOTICE

Fully dry the scale regularly to prolong its service life.

3.3 Unpacking

Verify the contents and inspect the package immediately upon delivery. If the shipping container is damaged, check for internal damage and file a freight claim with the carrier if necessary. If the container is not damaged, remove the scale from its protective package, noting how it was packed, and inspect each component for damage.

If shipping the scale is required, it is best to use the original shipping container. The scale must be packed correctly to ensure its safe transportation.

The package should include:

Item	QTY
BPA121 Compact Waterproof Weighing Scale	1
Quick Guide	1
Power Adapter ¹	1

¹: Lead-acid battery version includes a power adapter. Dry-cell version does not include a power adapter.

3.4 Installing the Scale

- 1. Unpack the scale.
- Place the scale at an installation site that meets the requirements described in [Selecting the Installation Site ▶ Page 7].
- 3. For Dry-cell version, please install five pieces of D-size alkaline dry batteries first. For Lead-acid battery version, skip the steps to insert the dry cells.
- 4. Turn the adjustable feet (2) of the scale until the level bubble (1) is inside the inner circle.





4 Operation

4.1 Powering On

- 1 Press and hold the Zero/Power Key ^{→0+} until the display illuminates.
- 2 The scale performs a self-test. Then the display lights up and shows the software version number.
- 3 The scale captures zero and then is ready for operation.

4.2 Powering Off

 In basic weighing mode, press and hold the Zero/ Power Key →0 ← until "OFF" is displayed.





4.3 Weighing

- 1 Place weighing sample on the scale.
- 2 Wait until the weight value in the display is stable.
- 3 Read the weighing result.

4.4 Zeroing

Zeroing corrects the influence of slight changes on the platter or minor deviations from the zero point.

→0←

- 1 Unload the scale.
- 2 Press the Zero/Power key→0+
- 3 Zero appears in the display.

4.5 Weighing with Tare

4.5.1 Taring

- Place the empty container on the scale and press the Tare key →T
- 2 Zero appears in the display and the Net indicator turns on.
- 3 The tare weight remains stored until it is cleared.

4.5.2 Clearing Tare

- 1 Empty the scale.
- 2 The scale displays a negative weight value, which is the tare weight.
- 3 Press the Tare key $\rightarrow T \leftarrow$.
- 4 The gross zero displays. The Net indicator turns off and the Zero indicator turns on.

5 Setup and Configuration

BPA121 provides two levels of setup menus:

• User Menu: Allows the user to edit operation parameters. Refer to [User Menu Structure ▶ Page 10] for a complete list of operation parameters and selections.



a







Net

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8

Service Menu: Allows the technician to edit system parameters. Refer to [Service Menu Structure > Page 11] for a complete list of system parameters and selections.



NOTICE

Note that if the scale is approved and sealed the service menu can only be accessed by an authorized METTLER TOLEDO service technician.

5.1 Entering Setup Menu

5.1.1 Entering User Menu



1. When the scale is in weighing mode, press and hold the Tare key $\rightarrow T \leftarrow$ until "F1...x" is displayed.

5.1.2 Entering Service Menu



NOTICE

Do not attempt to break the lead seal if the scale is approved. Only allow authorized METTLER TOLEDO service technicians to access the service menu if the scale is approved and sealed.

- 1. Make sure that the scale is in weighing mode.
- 2. Unscrew the M4x10 screw (1) at the bottom of the scale.



- 3. Insert a metal object (for instance, a screwdriver) into the hole to short circuit the measuring switch (2).
- 4. When successful, the display shows "S1...x".



5.2 Exiting Setup Menu

1. Press the Zero/Power key →0← multiple times until "E...O" is displayed.



2. Press the Tare key $\rightarrow T \leftarrow$ to select between 0 and 1. (0 to discard all changes; 1 to save all changes.)

- 3. Press the Zero/Power key →0← to confirm.
- 4. The scale shows the software version number and then returns to weighing mode.

5.3 Display in Setup Menu Mode

The setup menu will be displayed combining both the menu code (1) and the current selection (2). Refer to [Menu Structure ▶ Page 10] for detailed information on menu codes and menu selections.



5.4 Use of Function Keys with Menus

The Zero/Power key $\rightarrow_{\text{overf}}^{0\leftarrow}$ and the Tare key $\rightarrow T\leftarrow$ have a different function when the scale enters setup menu mode.

Zero/Power	→0 ← _{ON/OFF}	•	Toggle through menu codes / parameters. Accepts the parameter selection and moves to the next menu codes / parameter.
Tare	→T←	•	Toggle through parameter selections.



Figure 2: Function Keys with Menus

5.5 Menu Structure

5.5.1 User Menu Structure

Default values are indicated in bold and by an asterisk [*].

NOTICE

Note:

1) F4 and F5 only work when there is no DC power supply and the weight remains zero.

2) The table below shows parameter settings for a standard BPA121. The actual settings of the scale may be different from what are listed in the table when the scale is sold to different countries.

User Menu Structure

Menu Code	Parameter	Selection
F1	Display Speed	0 – Slow
		1* - Fast
F2	LED Brightness	03 5 * (Brightness from high to low)
F3	Second Dislay	0 – Second display (at the rear panel) is turned off
		1* - Second display (at the rear panel) is turned on
F4	Sleep Time	0 – Never Sleep
		1* - Sleep after 30s without use
		2 – Sleep after 60s without use
		3 – Sleep after 180s without use
		4 – Sleep after 300s without use
F5	Auto Off	0 - Never turn off automatically
		1 – Turn off after 5min without use
		2 – Turn off after 15min without use
		3 – Turn off after 30min without use
		4* – Turn off after 60min without use
F6	Power Light	0 – Battery indicator is off
		1* - Battery indicator is on and indicates battery level
F7	Maintenance	O* - Do not display statistical data
		1 – Display firmware version number
		2 – Display terminal ID
		3 – Display statistical data
		4 – Display AD original data
E	End	0* - Discard changes
		1 – Save changes

5.5.2 Service Menu Structure

Default values are indicated in bold and by an asterisk [*].



NOTICE

The table below shows parameter settings for a standard BPA121. The actual settings of the scale may be different from what are listed in the table when the scale is sold to different countries.

Service Menu Structure

Menu Code	Parameter	Selection
S1	Approval	0 – OIML
		1 — Sri Lanka
		2* - None
S2	Expanded Display	0* – Normal display
		1 – Expanded display (display internal division 30000)
GEO	GEO Code	0 12 *31
SP	Range	1.5, 3 *, 6, 7.5, 15, 30
S3	Calibration	0* - Bypass calibration status
		1 – Two-point calibration
		2 – Three-point calibration
		3 – Zero calibration

Menu Code	Parameter	Selection
S4 ²	Power Supply Mode	0 – Power supply without battery
		1* - Battery powered
S5	Division	0 - 1500 (dual range)
		1* – 3000 (single range)
		2 – 7500 (single range) [for 3 kg scale to indicate 6000 division]
		3 – 15000 (single range) [for 6 kg scale to indicate 12000 division]
		4 – 30000 (single range)
S6	External Display Unit	0 * - g (only selectable in calibration with g/kg)
		1 – kg (only selectable in calibration with g/kg)
		2 - Ib (only selectable in calibration with Ib)^{\!\!\!\Delta}
S7	Automatic Zero	0 – Off
	Tracking Range	1* - 0.5e
		2 - 1.0e
		3 – 1.5е
		4 – 2.0e
		5 – 2.5e
		6 – 5e
		7 – 10e
S8	Display in Underload	0* - Display UUUUUU
		1 – Display underload weight value
S9	Power-on Reset	0 - ±3%
	Range	1* -±10%
		2 - ±30%
E	End	0* - Discard changes
		1 – Save changes

Δ: Ib is only available when the scale is calibrated using the weight unit of Ib. See [Two-Point Calibration ► Page 12] or [Three-Point Calibration ► Page 13] for instructions on calibration.

²: The Dry-cell version does not include the S4 menu code.

5.6 Calibration

5.6.1 Selecting the Calibration Mode

- 1. Follow the instructions in [Entering Service Menu > Page 9]



- 3. Press the Tare key $\rightarrow T \leftarrow$ to select the appropriate calibration mode.
 - 1 Two-point calibration
 - 2 Three-point calibration
 - 3 Zero calibration



4. Press the Zero/Power key →0← to confirm and start calibration.

5.6.2 Two-Point Calibration

1. Make sure that the two-point calibration (selection value: 1) is selected in "S3".



2. Press the Zero/Power key $\rightarrow 0 \leftarrow 0$ to confirm and start calibration. The display shows the weight unit.



Press the Tare key →T ← to switch to other weight unit options; skip this step if the current weight unit is correct.



4. Press the Zero/Power key →0+ to start the first point (zero) calibration. The display shows "L...0".



- 5. Empty the scale platter and then press the Zero/Power key $\rightarrow 0 \leftarrow \infty$
- 6. The scale starts to count down from 5 to 0, indicating the process of zero calibration. Note that if motion is detected during calibration, the calibration will restart.



7. When countdown is completed, the scale continues to the second point (2/3 of scale capacity) calibration. The display shows "H...0".



- 8. Place weight equal to 2/3 of the scale capacity on the platter and then press the Zero/Power key →04
- 9. The scale starts to count from 5 to 0, indicating the process of 2/3 capacity calibration. Note that if motion is detected during calibration, the calibration will restart.
- 10. When countdown is completed, the scale automatically moves to the next menu code "S4".



11. Press the Zero/Power key →0← until the display shows "E...0".



- 12. Press the Tare key →T ← to select between 0 and 1. (0 to discard all changes and 1 to save all changes.)
- 13. Press the Zero/Power key →0← to confirm.

5.6.3 Three-Point Calibration

1. Make sure that the three-point calibration (selection value: 2) is selected in "S3".



2. Press the Zero/Power key 20 to confirm and start calibration. The display shows the weight unit.



3. Press the Tare key →T ← to switch to other weight unit options; skip this step if the current weight unit is correct.



4. Press the Zero/Power key $\rightarrow 0 \leftarrow$ to start the first point (zero) calibration. The display shows "L...0".



- 5. Empty the scale platter and then press the Zero/Power key →0←
- 6. The scale starts to count down from 5 to 0, indicating the process of zero calibration. Note that if motion is detected during calibration, the calibration will restart.



7. When countdown is completed, the scale continues to the second point (1/2 of scale capacity) calibration. The display shows "N...O".



- 8. Place weight equal to 1/2 of the scale capacity on the platter and then press the Zero/Power key 2004.
- 9. The scale starts to count from 5 to 0, indicating the process of 1/2 capacity calibration. Note that if motion is detected during calibration, the calibration will restart.
- 10. When countdown is completed, the scale continues to the third point (full scale capacity) calibration. The display shows "H...0".



- 11. Place weight equal to full scale capacity on the platter and then press the Zero/Power key →0+
- 12. The scale starts to count down from 5 to 0, indicating the process of full capacity calibration. Note that if motion is detected during calibration, the calibration will restart.
- 13. When countdown is completed, the scale automatically moves to the next menu code "S4".



14. Press the Zero/Power key →0 ← until the display shows "E...0".



- 15. Press the Tare key →T ← to select between 0 and 1. (0 to discard all changes and 1 to save all changes.)
- 16. Press the Zero/Power key →0← to confirm.

5.6.4 Zero Calibration

1. Make sure that the zero calibration (selection value: 3) is selected in "S3".



2. Press the Zero/Power key →0 to start zero calibration. The display shows "L...0".



- 3. Empty the scale platter and then press the Zero/Power key $\frac{20}{0000F}$.
- 4. The scale starts to count down from 5 to 0, indicating the process of zero calibration. Note that if motion is detected during calibration, the calibration will restart.



5. When countdown is completed, the scale automatically moves to the next menu code "S4".



6. Press the Zero/Power key →0← until the display shows "E...0".



- Press the Tare key →T ← to select between 0 and 1. (0 to discard all changes and 1 to save all changes.)
- 8. Press the Zero/Power key ^{→0}/_{NVFF} to confirm.

🗥 DANGER

6 Maintenance and Service

6.1 Cleaning and Maintenance



BEFORE CLEANING THE SCALE, REMOVE THE POWER PLUG TO DISCONNECT THE UNIT FROM THE POWER SUPPLY.

- Clean the terminal's keypad and cover with a clean, soft cloth that has been dampened with a mild glass cleaner.
- Do not use any type of industrial solvent such as toluene or isopropanol (IPA) that could damage the terminal's finish.
- Do not spray cleaner directly on the terminal.
- Care should be taken to avoid any punctures to the front panel or any vibrations or shocks to the unit. If the front panel is punctured, ensure that steps are taken to prevent dust and moisture from entering the unit until the front panel can be repaired.
- Tighten the battery cover screws with screw foot (1.1-1.6Nm torque), or it may affect the sealing and shorten the life of product. Please tighten the two screws on long side first, then the two screws on short side.

6.2 Service



NOTICE ONLY QUALIFIED PERSONN

ONLY QUALIFIED PERSONNEL SHOULD PERFORM INSTALLATION, PROGRAMMING, AND SERVICE. PLEASE CONTACT A LOCAL AUTHORIZED METTLER TOLEDO REPRESENTATIVE FOR ASSISTANCE.

METTLER TOLEDO recommends periodic preventative maintenance to the terminal and scale system to ensure reliability and to maximize service life. All measurement systems should be periodically calibrated and certified as required to meet production, industry and regulatory requirements. We can help you maintain uptime, compliance and quality system documentation with periodic maintenance and calibration services. Contact your local METTLER TOLEDO authorized service organization to discuss your requirements.

6.3 Battery Charging

In battery powered BPA121 scales, if the battery voltage is below a minimum limit, the display will not turn on when the Zero/Power key is pressed.

Use a multi-meter to check the battery voltage. The battery voltage can be tested at the end of the internal battery housing where the harness from the main board connects to the battery housing. Make sure that the two meter leads do not get shorted together during this test as a large amount of current could be present.



A CAUTION

USE CAUTION WHEN TESTING THE BATTERY. A LARGE AMOUNT OF CURRENT MAY BE PRESENT IN THE BATTERY.

The minimum voltage required to operate the BPA121 is 6 volts DC. If the battery voltage is below this limit, the battery should be recharged. The value for a fully charged battery is approximately 7.5 volts DC.

Do not charge the battery in a humid or dusty environment or when the temperature is below 0°C. Reinstall the socket cap after the battery is charged.

*: This section does not apply to Dry-cell version.

6.4 Disposal

In conformance with the European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.



Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment. If you have any questions, please contact the responsible authority or the distributor from which you purchased this device. Should this device be passed on to other parties, the content of this regulation must also be related.

6.5 Error Codes and Corrective Response

Error Code	Possible Reason	Remedy
888888	Calibration error	• Recalibrate and make sure that correct weights are used in the calibration procedure.
		Check the wire or replace the load cell.
	EEPROM check error	Restart the scale.
L . J. L . U. U. U.		Replace the main board.
8.8.8 .8.8.8.	EEPROM hardware error	• Turn off the scale and then replace the main board.
8. 8. 8. 8. 8. 9. 9 .	Overload	 Reduce the weight on the platter until the error disappears.
	Underload	Make sure the scale is level.
		• Zero the scale.
		Restart the scale.
	Weighing error	• Zero the scale.
@. Q. Q. Q. Q. Q.		Empty the platter and restart the scale.
		• Check the connection between the load cell and the main board.
		Calibrate the scale.
		• Replace the main board and recalibrate the scale.
	Low battery	Recharge the battery.
C. J. D. D. D. C.		Replace the battery.

7 GEO Code

Latitude	Altitude (m)										
	0 325	325 650	650 975	975 1300	1300 1625	1625 1950	1950 2275	2275 2600	2600 2925	2925 3250	3250 3575
	Altitude	Altitude (inch)									
	0 1060	1060 2130	2130 3200	3200 4260	4260 5330	5330 6400	6400 7460	7460 8530	8530 9600	9600 10660	10660 11730
0° 0′ — 5° 46′	5	4	4	3	3	2	2	1	1	0	0
5° 46′ — 9° 52′	5	5	4	4	3	3	2	2	1	1	0
9° 52′ — 12° 44′	6	5	5	4	4	3	3	2	2	1	1
12° 44′ — 15° 6′	6	6	5	5	4	4	3	3	2	2	1
15° 6′ — 17° 10′	7	6	6	5	5	4	4	3	3	2	2
17° 10′ — 19° 2′	7	7	6	6	5	5	4	4	3	3	2
19° 2′ — 20° 45′	8	7	7	6	6	5	5	4	4	3	3
20° 45′ — 22° 22′	8	8	7	7	6	6	5	5	4	4	3
22° 22′ — 23° 54′	9	8	8	7	7	6	6	5	5	4	4
23° 54′ — 25° 21′	9	9	8	8	7	7	6	6	5	5	4
25° 21′ — 26° 45′	10	9	9	8	8	7	7	6	6	5	5
26° 45′ — 28° 6′	10	10	9	9	8	8	7	7	6	6	5
28° 6′ — 29° 25′	11	10	10	9	9	8	8	7	7	6	6
29° 25′ — 30° 41′	11	11	10	10	9	9	8	8	7	7	6
30° 41′ — 31° 56′	12	11	11	10	10	9	9	8	8	7	7
31° 56′ — 33° 9′	12	12	11	11	10	10	9	9	8	8	7
33° 9′ — 34° 21′	13	12	12	11	11	10	10	9	9	8	8
34° 21′ — 35° 31′	13	13	12	12	11	11	10	10	9	9	8
$35^{\circ} 31' - 36^{\circ} 41'$	14	13	13	12	12	11	11	10	10	9	9
$36^{\circ} 41' - 37^{\circ} 50'$	14	14	13	13	12	12	11	11	10	10	9
$37^{\circ} 50' - 38^{\circ} 58'$	15	14	14	13	13	12	12	11	11	10	10
$38^{\circ} 58' - 40^{\circ} 5'$	15	15	14	14	13	13	12	12	11	11	10
$40^{\circ} 5' - 41^{\circ} 12'$	16	15	15	14	14	13	13	12	12	11	11
41° 12′ — 42° 19′	16	16	15	15	14	14	13	13	12	12	11
$42^{\circ} 19' - 43^{\circ} 26'$	17	16	16	15	15	14	14	13	13	12	12
$43^{\circ} 26' - 44^{\circ} 32'$	17	17	16	16	15	15	14	14	13	13	12
44° 32′ — 45° 38′	18	17	17	16	16	15	15	14	14	13	13
$45^{\circ} 38' - 46^{\circ} 45'$	18	18	17	17	16	16	15	15	14	14	13
$46^{\circ} 45' - 47^{\circ} 51'$	19	18	18	17	17	16	16	15	15	14	14
$47^{\circ} 51' - 48^{\circ} 58'$	19	19	18	18	17	17	16	16	15	15	14
$48^{\circ} 58' - 50^{\circ} 6'$	20	19	19	18	18	17	17	16	16	15	15
$50^{\circ} 6' - 51^{\circ} 13'$	20	20	19	19	18	18	17	17	16	16	15
$51^{\circ} 13' - 52^{\circ} 22'$	21	20	20	19	19	18	18	17	17	16	16
$52^{\circ} 22' - 53^{\circ} 31'$	21	21	20	20	19	19	18	18	17	17	16
$53^{\circ} 31' - 54^{\circ} 41'$	22	21	21	20	20	19	19	18	18	17	17
$54^{\circ} 41' - 55^{\circ} 52'$	22	22	21	21	20	20	19	19	18	18	17
$55^{\circ} 52' - 57^{\circ} 4'$	23	22	22	21	21	20	20	19	19	18	18
$57^{\circ} 4' - 58^{\circ} 17'$	23	23	22	22	21	21	20	20	19	19	18
$58^{\circ} 17' - 59^{\circ} 32'$	24	23	23	22	22	21	21	20	20	19	19
$59^{\circ} 32' - 60^{\circ} 49'$	24	24	23	23	22	22	21	21	20	20	19
$60^{\circ} 49' - 62^{\circ} 9'$	25	24	24	23	23	22	22	21	21	20	20
$62^{\circ} 9' - 63^{\circ} 30'$	25	25	24	20	20	22	22	21	21	20	20
$63^{\circ} 30' - 64^{\circ} 55'$	26	25	25	24	24	23	23	22	22	21	21
64° 55′ — 66° 24′	26	26	25	25	24	24	23	23	22	22	21
66° 24′ — 67° 57′	27	26	26	25	25	24	24	23	23	22	22
67° 57′ — 69° 35′	27	20	26	26	25	25	24	20	23	23	22
69° 35′ — 71° 21′	28	27	20	26	26	25	25	27	20	23	23
71° 21′ — 73° 16′	28	28	27	20	26	26	25	25	21	20	23
$73^{\circ} 16' - 75^{\circ} 24'$	20	20	28	27	20	26	26	25	25	24	20
75° 24′ — 77° 52′	29	29	28	28	27	27	26	26	25	25	24
10 27 11 02	20	20	20	20	- '	<i>L</i> /	20	20	20	20	L-T

77° 52′ — 80° 56′	30	29	29	28	28	27	27	26	26	25	25
80° 56′ — 85° 45′	30	30	29	29	28	28	27	27	26	26	25
85° 45′ — 90° 00′	31	30	30	29	29	28	28	27	27	26	26

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