

AD-1691

Weighing Environment Analyzer

INSTRUCTION MANUAL



1WMPD4002670

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1. INTRODUCTION

This manual describes how the AD-1691 Weighing Environment Analyzer works and how to get the most out of it in terms of performance.

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

1-1. Features

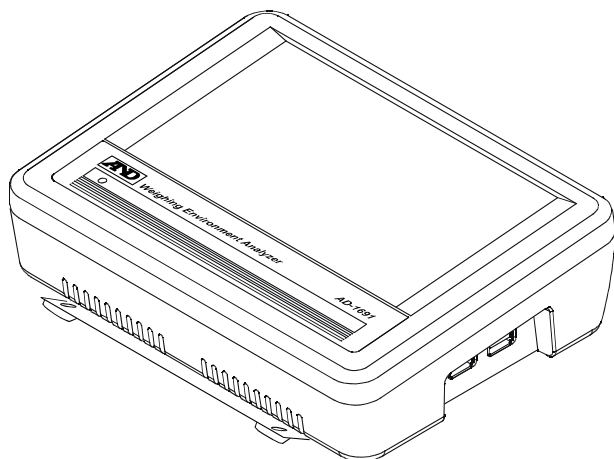
- The AD-1691 Weighing Environment Analyzer is a tool to support various functions such as daily balance checks, uncertainty calculations and evaluations of the environment where the balance is installed.
- The 7-inch color LCD with a pressure sensitive touch panel provides excellent visibility and operability.
- The AD-1691, being compact in size, can be carried to the balance installation site easily. One analyzer can manage several balances.
- Using the AD-1691, daily and periodic balance checks will become easier.
The results of the checks can be output to a USB memory as a PDF file or can be output directly to a printer.
→Daily balance check Page 8
→Periodic balance check Page 19
- Uncertainty can be calculated only by connecting the AD-1691 to a balance and entering the data in the screen.
At the balance installation site, the calibration results with the uncertainty data can be output as a PDF file and can be saved in a USB memory.
→Uncertainty calculation Page 35
- The AD-1691 displays the balance measurement data in real time and allows operating the balance keys.
The AD-1691, when used as a balance remote controller, enables the weighing operation without touching the balance, minimizing external disturbances caused by the balance operation.
→Balance remote controller Page 33
- The AD-1691 displays the AND-MEET data as a graph to evaluate the environment where a BM series analytical balance is installed and outputs the results to a USB memory as a PDF file.
→AND-MEET analysis..... Page 49

2. UNPACKING

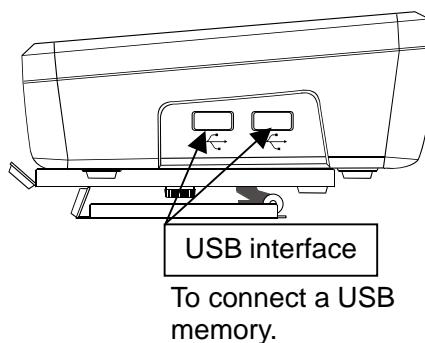
The analyzer is a precision instrument. Unpack the analyzer carefully. Keep the packing material to be used for transporting the analyzer in the future.

See the illustrations to confirm that everything is included.

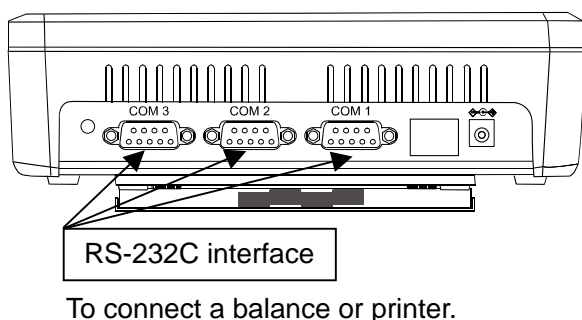
Main unit (With a stand attachment)



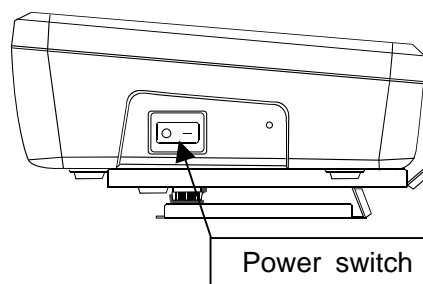
Right side view



Rear view

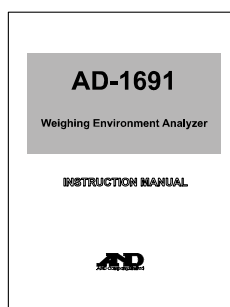


Left side view

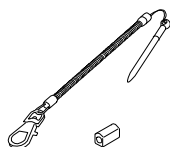


Accessories

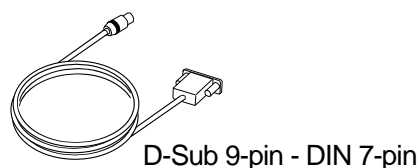
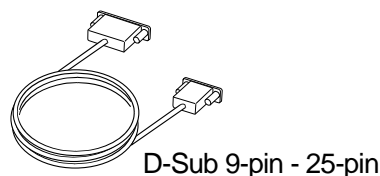
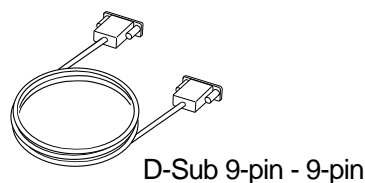
Instruction manual



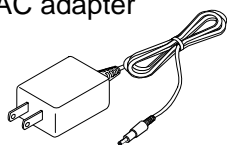
Touch pen with a holder



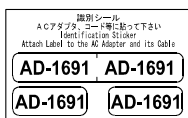
Balance connection cable



AC adapter



AC adapter label



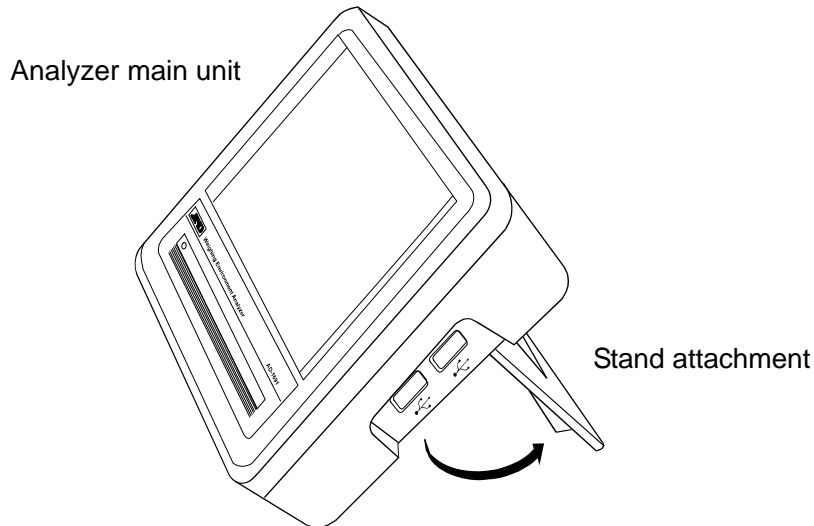
Note

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

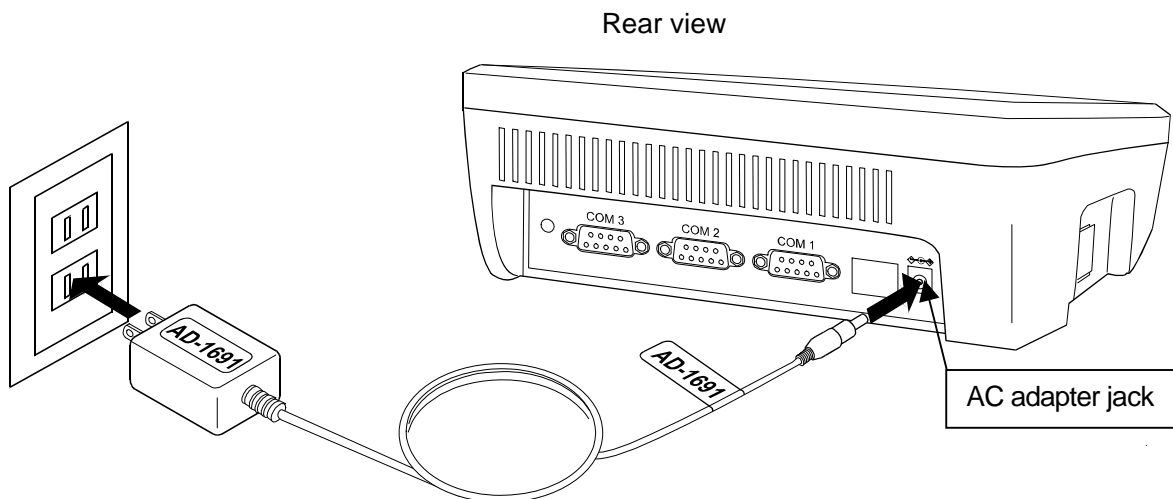
3. INSTALLATION / CONNECTION

3-1. Installing the analyzer

1. Open the stand attachment to install the analyzer. To remove the stand attachment, remove the two knurled thumbscrews located on the rear of the attachment.



2. Insert the AC adapter into the AC adapter jack located on the rear and the other plug of the AC adapter into an electrical outlet.

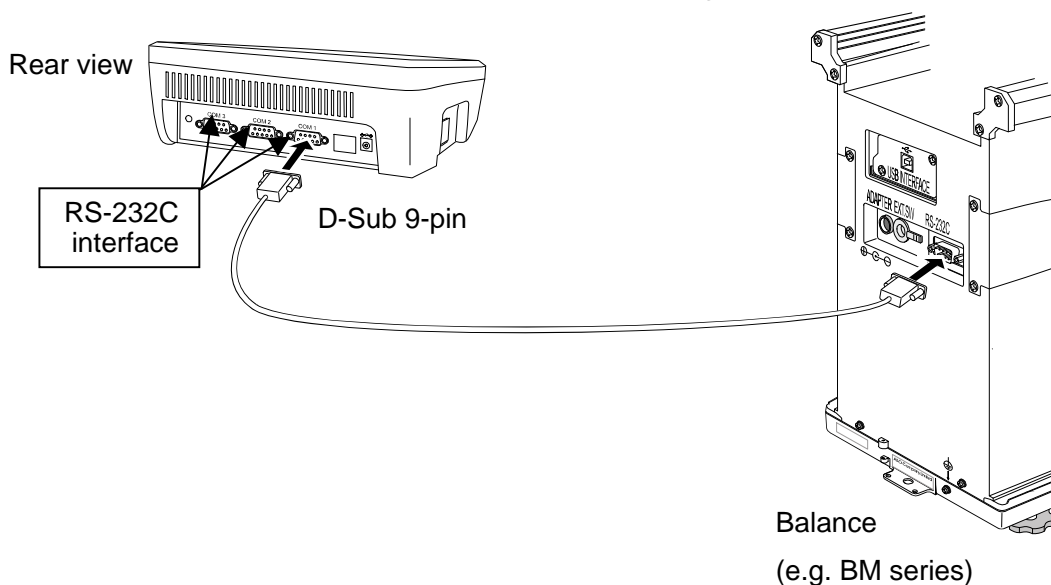


Note: Please confirm that the AC adapter type is correct for your local voltage and receptacle type.

3-2. Connecting a balance

Use the provided RS-232C cable to connect a balance to the analyzer. Select a cable appropriate for the RS-232C connector type on the balance.

Use either one of the COM1 to COM3 connectors for connecting a balance.



Note: Either one of the COM1 to COM3 connectors can be used for connecting a balance. The default value has been set to COM1.

To perform daily checks, the analyzer does not need to be connected to a balance.

3-3. Connecting a printer

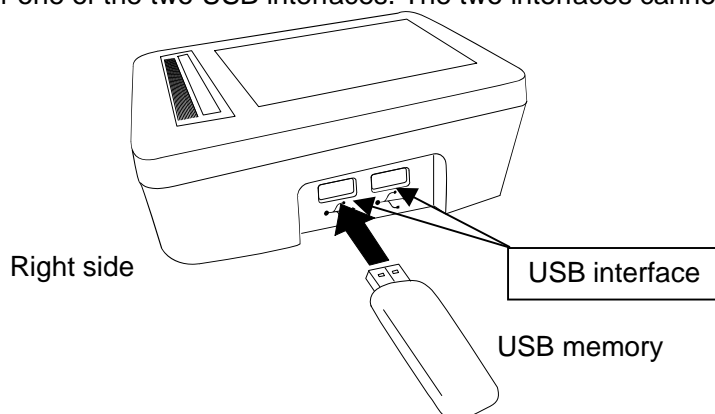
Use either one of the COM1 to COM3 connectors for connecting a printer.

3-4. Connecting a USB memory

Measurement results can be output to a USB memory as a PDF file. Using a personal computer, those data can be managed or printed.

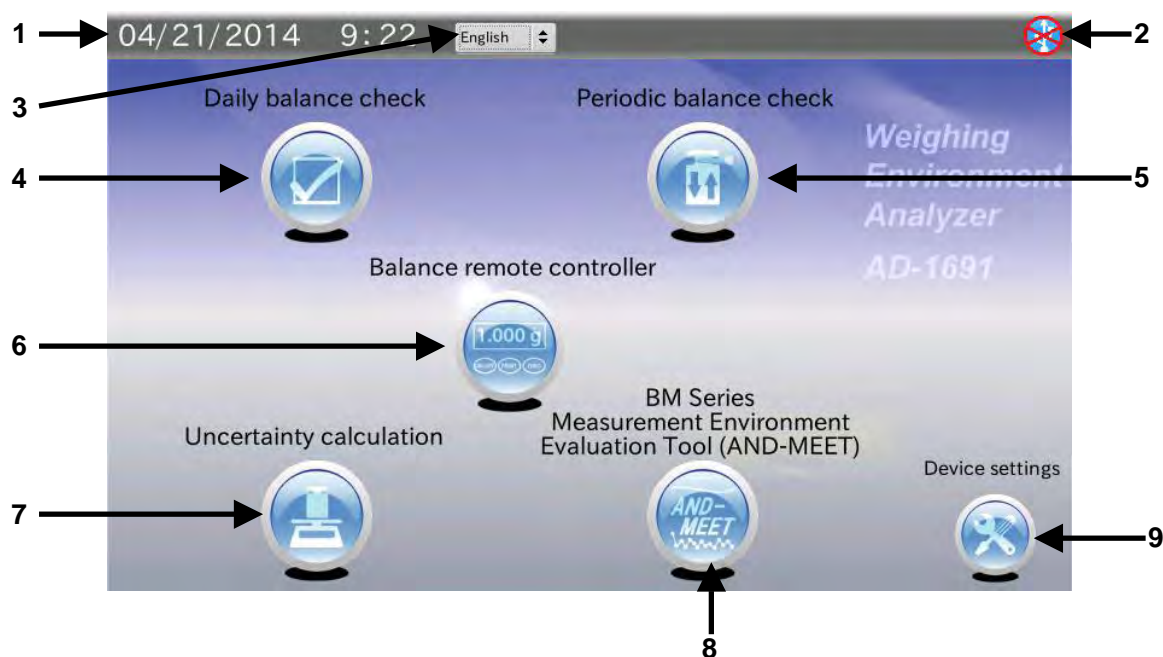
Insert a USB memory into the USB interface located on the right side.

Use either one of the two USB interfaces. The two interfaces cannot be used at the same time.



4. HOME SCREEN

Turn the Power switch on (I side). After the startup screen, the HOME screen appears.



No.	Name	Description
1	Date·Time	Displays the date and time in the format specified in the Date, Time settings screen. Set the date and time using the device settings (9).
2	USB memory	Displays the connection status to a USB memory. When not connected, the symbol is crossed out with an X.
3	Language	Select English or Japanese.
4	Daily balance check	Performs a daily balance check. Results can be output to a printer or to a USB memory as a PDF file.
5	Periodic balance check	Connects a balance and performs a periodic check. Results can be output to a printer or to a USB memory as a PDF file.
6	Balance remote controller	Connects a balance and displays measurement data. Can control the balance keys and functions as a remote controller.
7	Uncertainty calculation	Connects a balance and calibrates the balance using a weight with a defined correction value to obtain the expanded uncertainty. Results can be output to a USB memory as a PDF file.
8	BM series measurement environment evaluation tool (AND-MEET)	Displays the AND-MEET data of the BM series balance as a graph. Results can be output to a USB memory as a PDF file.
9	Device settings	Sets the analyzer date and time, the LCD backlight brightness and RS-232C.

5. DAILY BALANCE CHECK

Touch [Daily balance check] in the HOME screen to open the Daily check screen.

The daily check performs the minimum check required to use the balance and confirms that the balance is in proper operating conditions.

How to perform a daily check depends on the balance management level. It is recommended that a daily check be performed before use every day.

Items to be checked

- External appearance
 - The area surrounding the balance is not dirty.
 - The balance and inside of the weighing chamber are not dirty.
 - The balance is not damaged or deformed in any places.

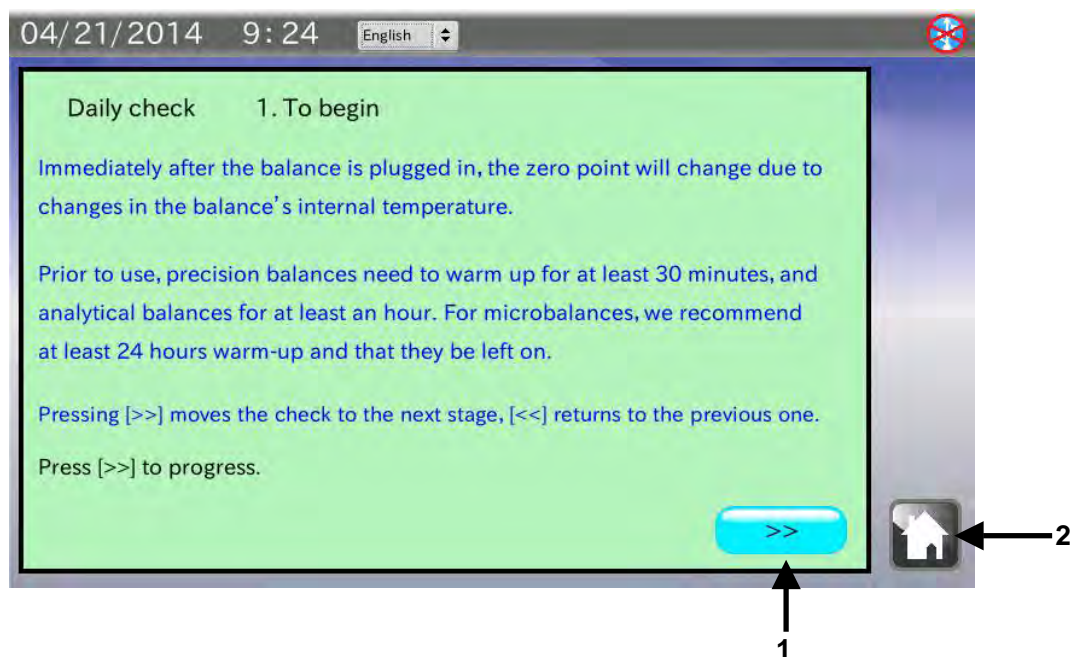
- Measurement environment
 - Temperature and humidity are within an acceptable range.
 - There is no breeze or vibration.

- Power supply
 - The AC adapter is connected.
 - No error messages are displayed.
 - The balance is in weighing mode.

- Balance level
 - The air bubble on the balance's spirit level is in the middle of the circle.
 - All of the balance's feet are flatly resting on the surface below.

- Measurement (Weighing operation)
 - The display reads zero after performing "Re-Zero".
 - After placing a standard weight on the balance, the measurement value is within an acceptable range.

5-1. Before starting a daily check

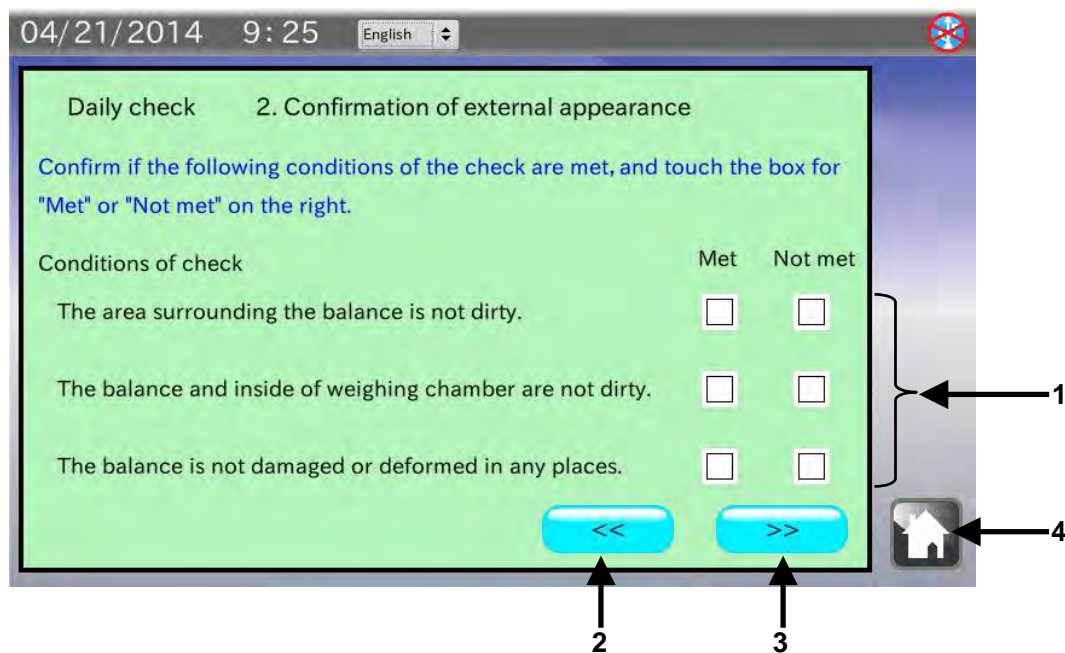


No.	Name	Description
1	NEXT button	Goes to the next stage.
2	HOME button	Exits the daily check and returns to the HOME screen.

Procedure

1. Confirm the balance warm-up duration.
2. Touch the NEXT button to go to the next stage.

5-2. Checking the external appearance

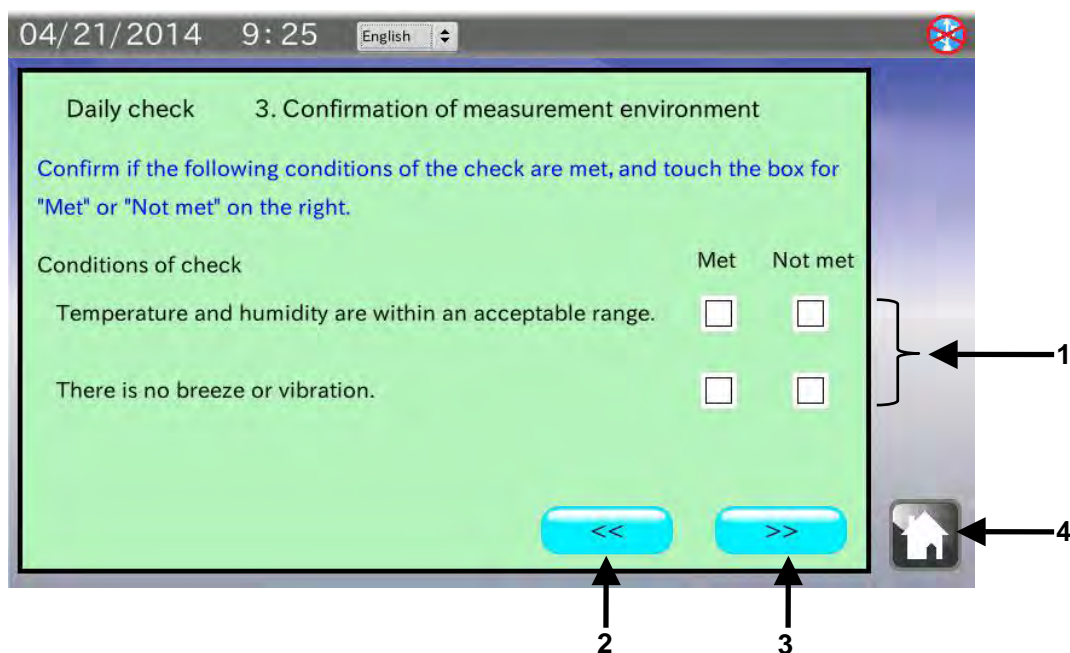


No.	Name	Description
1	Check results check box	Check each item and judge the result as “Met” or “Not met”. “√” appears when <input type="checkbox"/> is touched.
2	PREVIOUS button	Returns to the previous stage.
3	NEXT button	Goes to the next stage.
4	HOME button	Exits the daily check and returns to the HOME screen.

Procedure

- Confirm that the area surrounding the balance is clean.
If not, clean the area. A dirty environment will cause contamination.
- Confirm that the balance and inside of the weighing chamber are clean.
If not, clean them. A dirty balance and dirt inside the weighing chamber will cause contamination and balance failure.
- Confirm that the balance is not damaged or deformed.
A damaged or deformed balance will cause balance failure or user injury.
- Touch the appropriate check box for each checking item. Then, touch the NEXT button to go to the next stage.

5-3. Checking the measurement environment

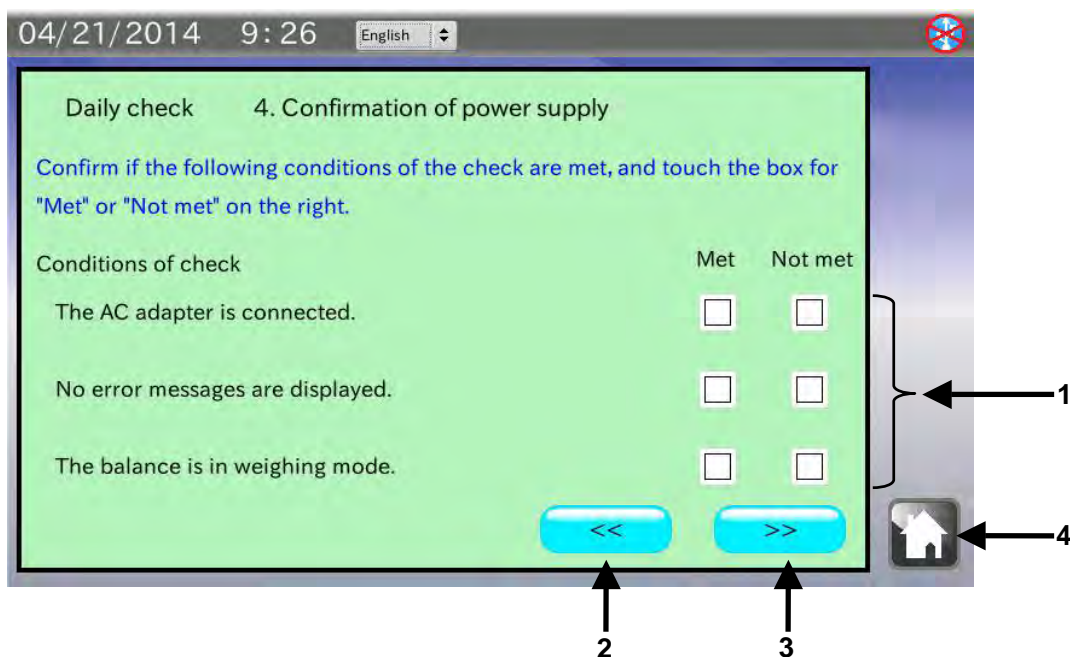


No.	Name	Description
1	Check results check box	Check each item and judge the result as “Met” or “Not met”. “√” appears when <input type="checkbox"/> is touched.
2	PREVIOUS button	Returns to the previous stage.
3	NEXT button	Goes to the next stage.
4	HOME button	Exits the daily check and returns to the HOME screen.

Procedure

1. Confirm that the temperature and humidity are appropriate for balance use.
Inappropriate temperature or humidity will cause balance failure or zero point drift.
2. Confirm that there is no breeze or vibration.
Avoid breeze and vibration. Breeze and vibration will cause an unstable displayed value.
3. Touch the appropriate check box for each checking item. Then, touch the NEXT button to go to the next stage.

5-4. Checking the power supply

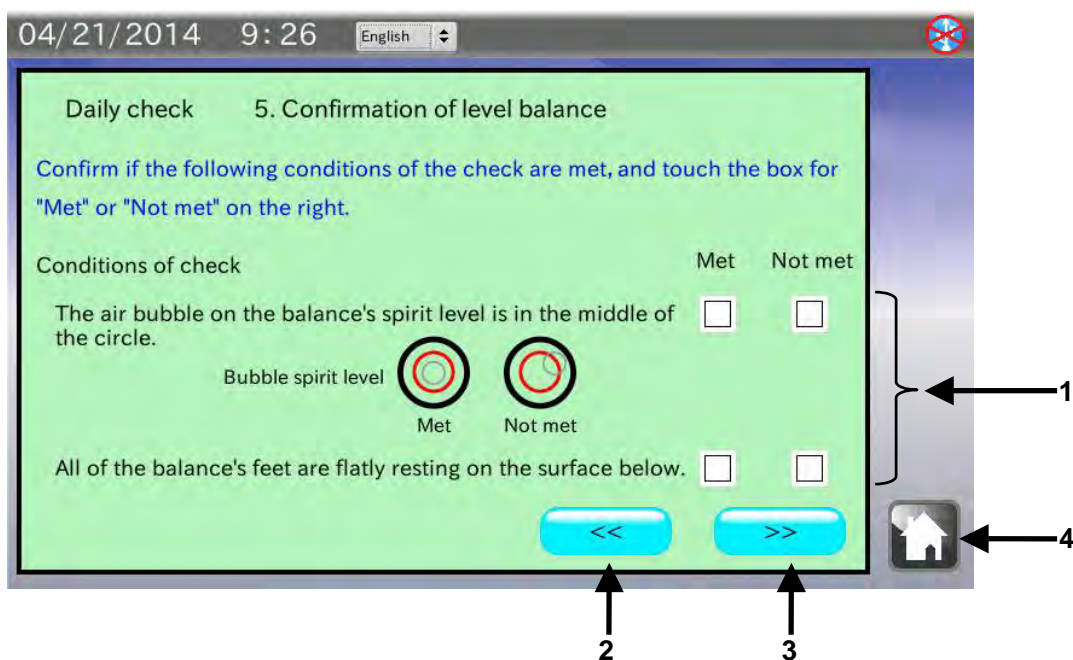


No.	Name	Description
1	Check results check box	Check each item and judge the result as “Met” or “Not met”. “√” appears when □ is touched.
2	PREVIOUS button	Returns to the previous stage.
3	NEXT button	Goes to the next stage.
4	HOME button	Exits the daily check and returns to the HOME screen.

Procedure

- Confirm that the AC adapter is connected to the balance.
If not, connect the AC adapter correctly.
- Confirm that there are no error messages (“Error”) in the balance display.
If there is an error message, refer to the balance instruction manual to take appropriate measures.
- Confirm that the balance is in the weighing mode (e.g. displaying “0.0000 g”).
If not, refer to the balance instruction manual to set the balance to the weighing mode.
- Touch the appropriate check box for each checking item. Then, touch the NEXT button to go to the next stage.

5-5. Checking the balance level

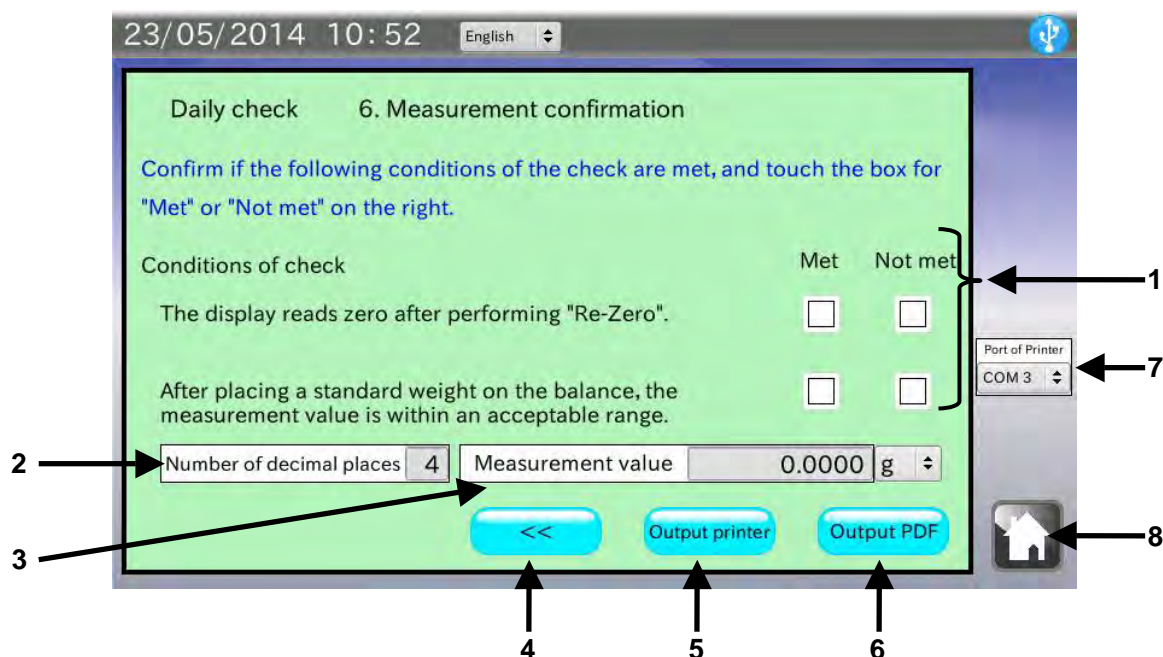


No.	Name	Description
1	Check results check box	Check each item and judge the result as "Met" or "Not met". "✓" appears when <input type="checkbox"/> is touched.
2	PREVIOUS button	Returns to the previous stage.
3	NEXT button	Goes to the next stage.
4	HOME button	Exits the daily check and returns to the HOME screen.

Procedure

1. Confirm that the bubble of the balance spirit level is in the middle of the circle.
If not, adjust the level using the balance leveling feet.
An unlevelled balance will cause incorrect measurement data.
2. Confirm that the balance is installed firmly with all the feet flatly resting on the weighing table surface.
If not, adjust the level using the balance leveling feet.
Using the balance without adjustment will cause the balance to become unlevel during measurement.
3. Touch the appropriate check box for each checking item. Then, touch the NEXT button to go to the next stage.

5-6. Checking the weighing operation



No.	Name	Description
1	Check results check box	Check each item and judge the result as “Met” or “Not met”. “√” appears when □ is touched.
2	Number of decimal places	Enter the number of decimal places for the balance to be checked.
3	Measurement value	Place a standard weight on the balance and enter the displayed value with a selected unit.
4	PREVIOUS button	Returns to the previous stage.
5	Output printer button	Prints the results using a printer.
6	Output PDF button	Goes to the location and operator entry screen. See note below. Outputs the daily check results to a USB memory as a PDF file. The weighing location and operator name can be added.
7	Port of Printer	Select a COM port to connect a printer. The default value has been set to COM3.
8	HOME button	Exits the daily check and returns to the HOME screen.

Note: When the USB memory is not recognized, the button is invalid.

Procedure

1. Re-zero or tare the balance and confirm that the displayed value is zero.

If not, refer to the balance instruction manual to set the display to zero.

2. Place a standard weight on the balance and confirm that the displayed value is within an acceptable range.

Touch [Measurement value] to enter the value. (e.g. 200.0000 g)

If the value is not within an acceptable range, calibrate the balance.

3. Touch the appropriate check box for each checking item.

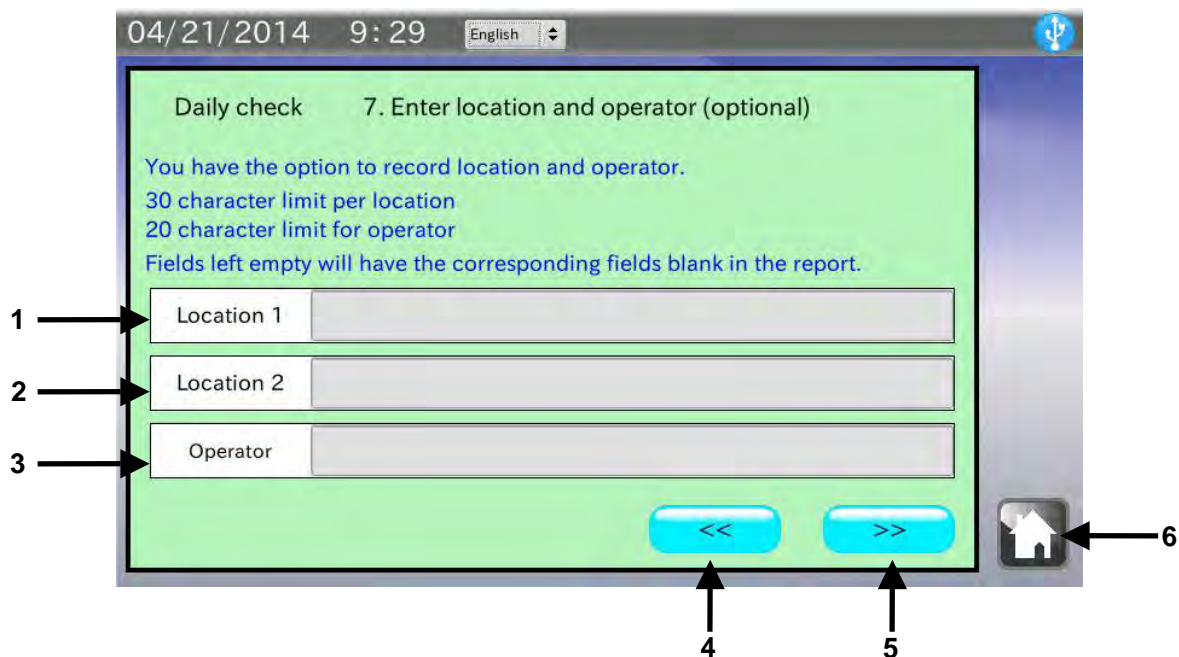
4. To print using a printer, touch the button.

Touch [Port of Printer] to select a COM port for connecting a printer.

5. To save data as a PDF file, connect a USB memory and touch the button.

When the analyzer does not recognize the USB memory, the button is invalid (gray).

5-7. Entering the location and operator



No.	Name	Description
1	Location 1	Enter the weighing location 1. (maximum 30 characters)
2	Location 2	Enter the weighing location 2. (maximum 30 characters)
3	Operator	Enter the operator name. (maximum 20 characters)
4	PREVIOUS button	Returns to the previous stage.
5	NEXT button	Goes to the next stage.
6	HOME button	Exits the daily check and returns to the HOME screen.

Procedure

1. Two weighing locations (maximum 30 characters) and an operator name (maximum 20 characters) can be entered.

When not entered, the corresponding fields in the PDF file will be left blank.

2. After data is entered or when the operation is canceled, touch the NEXT button to go to the next stage, the PDF Output screen.

5-8. Results output example (PDF file format)

Daily Balance Check Report	
Date of check	04/21/2014 09:35
Location of check	A&D Co., Ltd. Technical center
1. Balance	
<u>Model</u>	<u>Serial No.</u>
<u>Capacity</u>	<u>Min. display</u>
2. Confirmation of external appearance	
The area surrounding the balance is not dirty	Met
The balance and inside of weighing chamber are not dirty	Met
The balance is not damaged or deformed in any places	Met
3. Confirmation of measurement environment	
Temperature and humidity are within an acceptable range	Not met
There is no breeze or vibration	**
4. Confirmation of power supply	
The AC adapter is connected	Met
No error messages are displayed	Met
The balance is in weighing mode	Met
5. Confirmation of level balance	
The air bubble on the balance's spirit level is in the middle of the circle	Met
All of the balance's feet are flatly resting on the surface below	Met
6. Measurement confirmation	
The display reads zero after performing "Re-Zero"	Met
After placing a standard weight on the balance, the measurement value is within an acceptable range	Met
Measurement value	<u>50.0001 g</u>
7. Note	
Signature (Operator)	<u>Ichiro Kitamoto</u>
Signature (Manager)	_____

*1

*2

*1 Only items are output for "1. Balance." Fill in the blank as necessary.

*2 "**" appears when the "Met" or "Not met" check box has not been checked.

5-9. Results output example (Printer)

```

----DAILY BALANCE CHECK--
MODEL
S/N
ID
DATE      2014/02/04
TIME      14:03:37

SURROUNDING AREA      Met
WEIGHING CHAMBER      Met
DAMAGED                Met
TEMP. & HUMID.        NG
BREEZE OR VIB.        **
AC ADAPTER             Met
ERROR MESSAGES        Met
WEIGHING MODE         Met
SPIRIT LEVEL          Met
FLATLY RESTING        Met
RE-ZERO               Met
WEIGHT VALUE          Met
                    50.0001  g

REMARKS

SIGNATURE
-----

```

← Model *1
 ← Serial number *1
 ← ID number *1
 ← Date
 ← Time

• Surrounding area
 • Weighing chamber
 • Damaged/Deformed
 • Temperature/Humidity
 • Breeze/Vibration
 • Power supply
 • Error messages
 • Weighing mode
 • Spirit level
 • Installation
 • Re-zero (Tare)
 • Measurement value

← Checking items *2

← Remarks

← Signature

*1 Only items are output for “MODEL”, “S/N” and “ID.” Fill in the blank as necessary.

*2 “**” appears when the “Met” or “Not met” check box has not been checked.

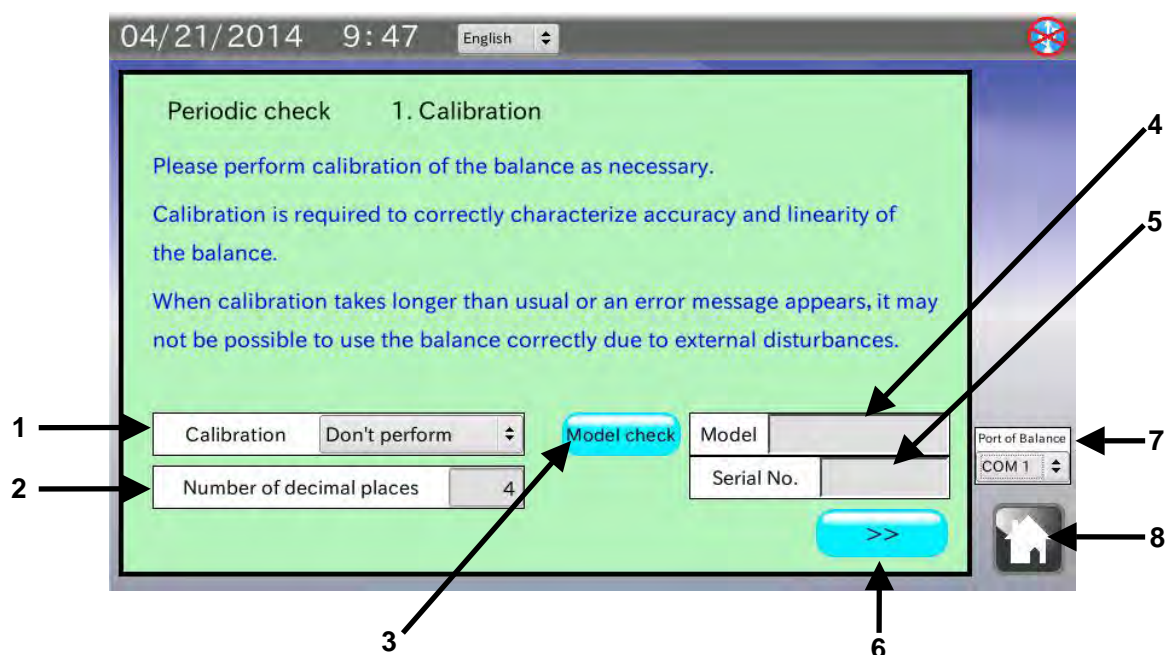
6. PERIODIC BALANCE CHECK

Touch [Periodic balance check] in the HOME screen to open the Periodic check screen.

In a periodic check, a weight is used to inspect the basic balance performance such as repeatability, linearity and eccentricity error and check the measurement value against the specifications.

How to perform a periodic check depends on the balance management level. It is recommended that a periodic check be performed once a week or a month.

6-1. Calibration

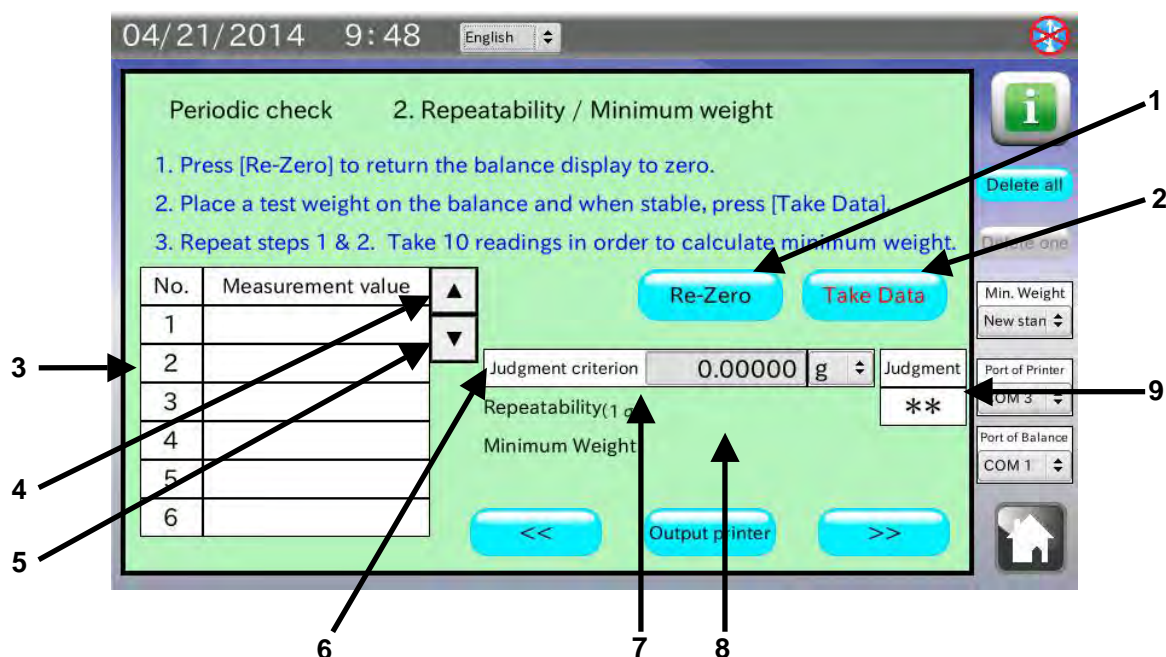


No.	Name	Description
1	Calibration	Select whether or not to perform a calibration.
2	Number of decimal places	Enter the number of decimal places for the balance to be checked. (0 to 7)
3	Model check button	Reads the model and serial number of the balance connected.
4	Model	Displays the read model.
5	Serial No.	Displays the read serial number.
6	NEXT button	Goes to the next stage.
7	Port of Balance	Select a COM port to connect a balance.
8	HOME button	Exits the periodic check and returns to the HOME screen.

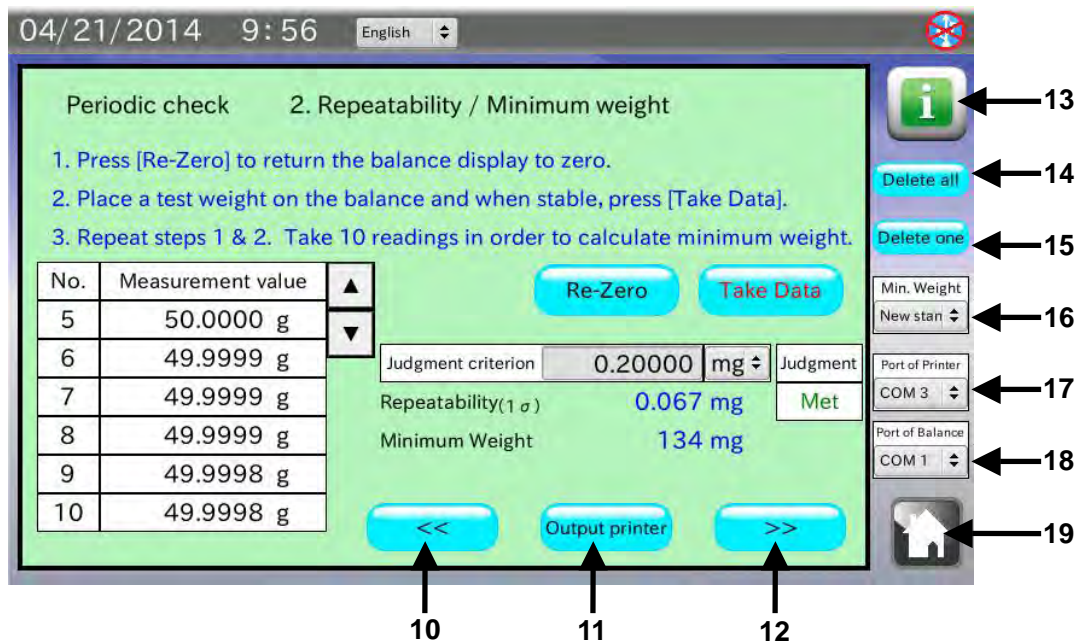
Procedure

1. Use the provided RS-232C cable to connect a balance to the analyzer.
Select a cable appropriate for the RS-232C connector type on the balance.
**Note: Set the output mode of the balance to the key mode or the auto print mode.
Data will not be received correctly by the stream mode or the interval mode.**
2. Touch [Port of Balance] to select the COM port to which the balance is connected.
3. Perform a calibration before a periodic check as necessary. Touch [Calibration] to select whether or not to perform a calibration.
4. Touch [Number of decimal places] to enter the number of decimal places for the balance to be checked.
The setting will be applied to the judgment criteria for the balance performance items which appear in the following sections.
5. Touch the button to display the model and serial number.
If those are not displayed, the RS-232C settings of the analyzer may not be the same with those of the balance.
6. Touch the NEXT button to go to the next stage.

6-2. Repeatability / Minimum weight



No.	Name	Description
1	Re-Zero button	Sets the balance display to zero.
2	Take Data button	Reads the balance measurement data.
3	Data history	Displays the history of the read measurement data.
4	Backward button	Moves the history backward by one.
5	Forward button	Moves the history forward by one.
6	Judgment criterion	Enter the criterion to judge the result as "Met" with a selected unit of measure.
7	Repeatability	Displays the repeatability when three or more data are read.
8	Minimum weight	Displays the minimum sample weight when three or more data are read.
9	Judgment	Displays "Met" or "Not met", by judging the repeatability against the criterion. "***" appears when the criterion is 0.



No.	Name	Description
10	PREVIOUS button	Returns to the previous stage.
11	Output printer button	Prints the results using a printer.
12	NEXT button	Goes to the next stage.
13	Information button	Goes to the information about repeatability.
14	Delete all button	Deletes all the read data.
15	Delete one button	Deletes one read datum.
16	Minimum weight	Select the method to calculate the minimum sample weight.
17	Port of Printer	Select a COM port to connect a printer.
18	Port of Balance	Select a COM port to connect a balance.
19	HOME button	Exits the periodic check and returns to the HOME screen.

Procedure

1. Touch [Judgment criterion] to enter the judgment criterion.

The criterion value can be entered up to one more decimal place than the decimal places set in the previous screen.

When not to judge, leave the default judgment criterion (0) as is or enter "0" (zero).

2. Touch the button and confirm that the balance display is set to zero.

If re-zeroing is not performed, the RS-232C settings of the analyzer may not be the same with those of the balance. Touch [Device settings] in the HOME screen to change the RS-232C settings to those of the balance.

3. Place a weight on the balance. When the stabilization indicator is displayed, touch the button.

Data can be read by pressing the balance key or using the auto print mode which the measurement value is output automatically when a load is applied.

4. The read data is entered in the data history table and the repeatability and the minimum sample weight are displayed when three or more data are read.

By touching [Minimum weight], the method to calculate the minimum sample weight can be selected.

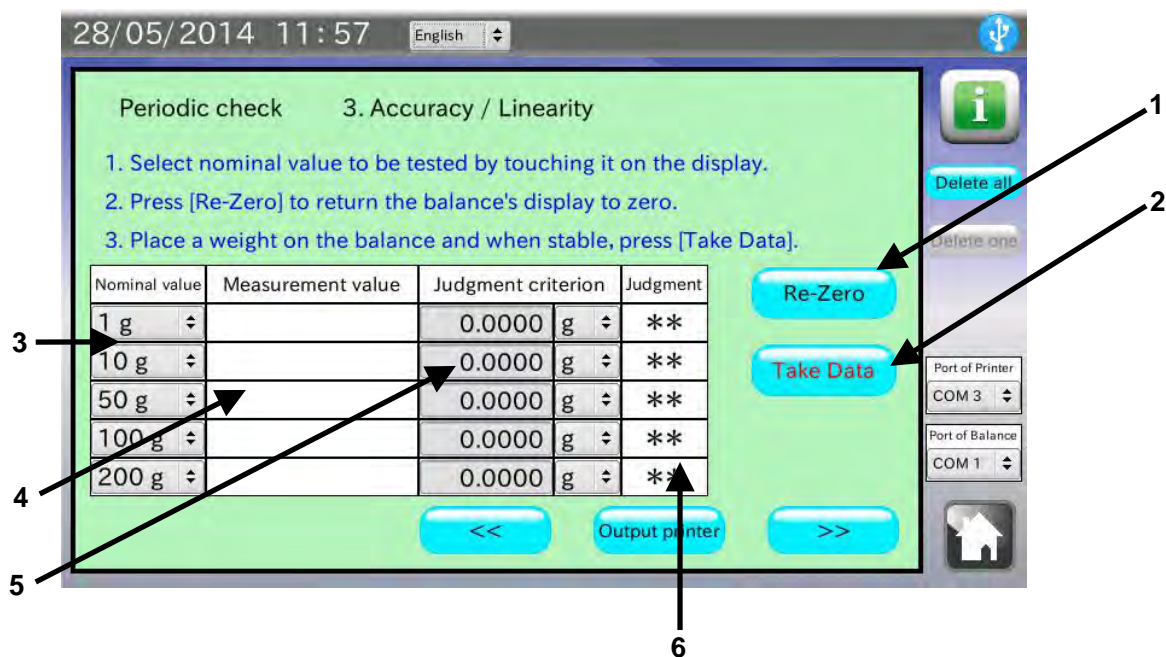
5. Repeat Steps 2 to 4 several times, preferably 10 times to obtain reliable data.

6. To print using a printer, touch the button.

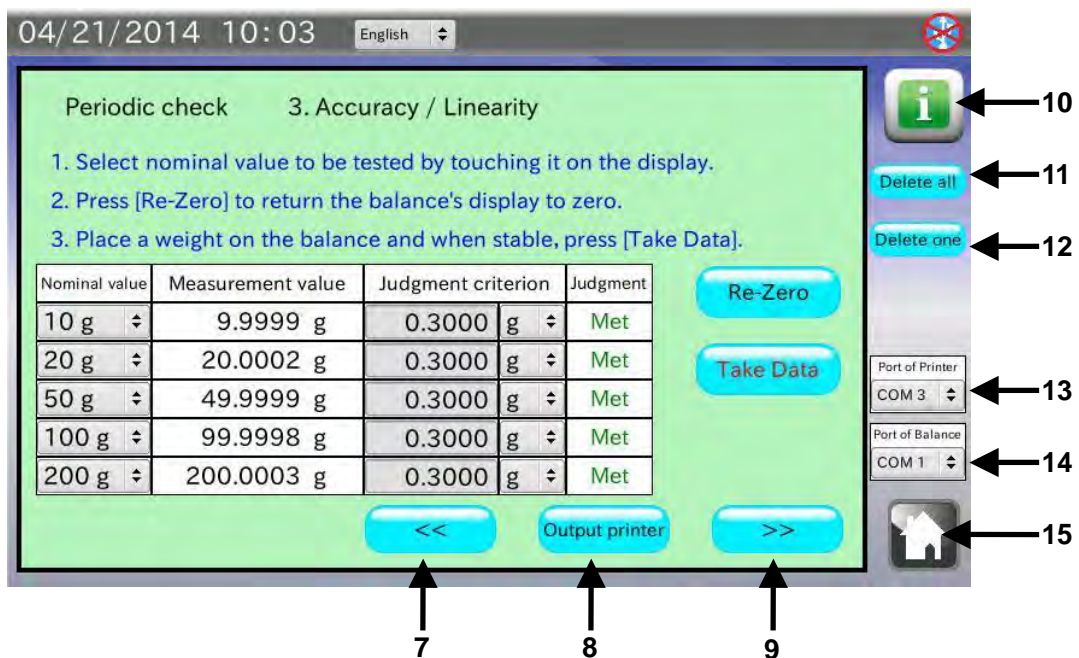
It is recommended that printing be performed when the weighing is complete.

7. After weighing is complete or the operation is canceled, touch the NEXT button to go to the next stage.

6-3. Accuracy / Linearity



No.	Name	Description
1	Re-Zero button	Sets the balance display to zero.
2	Take Data button	Reads the balance measurement data.
3	Nominal value	Select the nominal mass value of the weight to be used.
4	Data history	Displays the history of the read measurement data.
5	Judgment criterion	Enter the criterion to judge the result as "Met."
6	Judgment	Displays "Met" or "Not met", by judging the measurement value against the criterion. "***" appears when the criterion is 0.

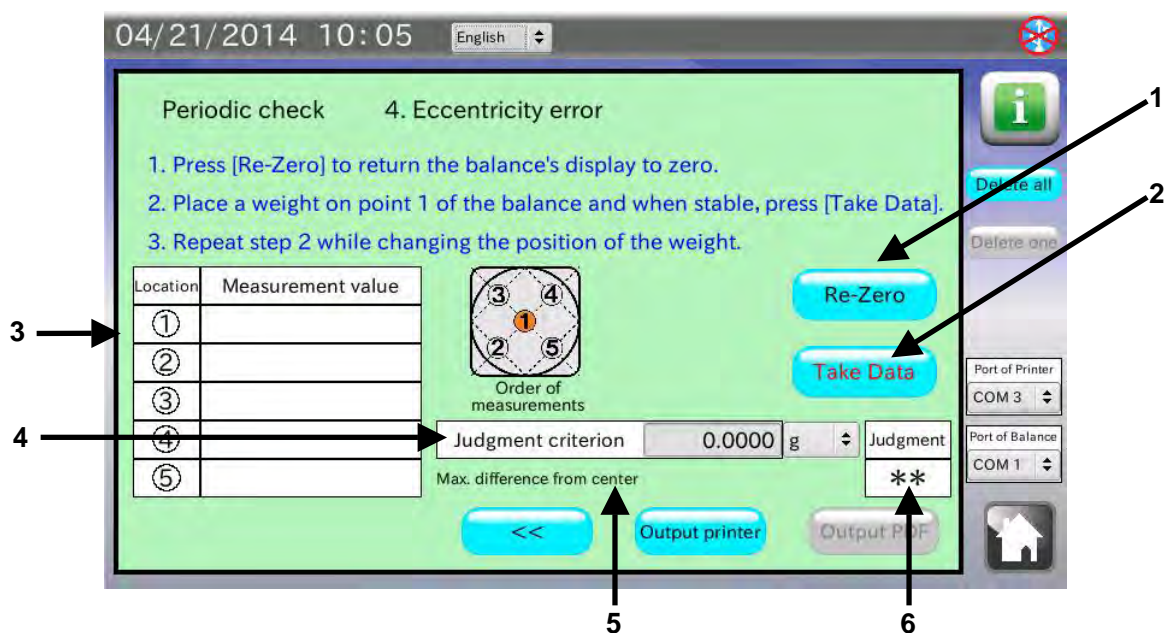


No.	Name	Description
7	PREVIOUS button	Returns to the previous stage.
8	Output printer button	Prints the results using a printer.
9	NEXT button	Goes to the next stage.
10	Information button	Goes to the information about linearity.
11	Delete all button	Deletes all the read data.
12	Delete one button	Deletes one read datum.
13	Port of Printer	Select a COM port to connect a printer.
14	Port of Balance	Select a COM port to connect a balance.
15	HOME button	Exits the periodic check and returns to the HOME screen.

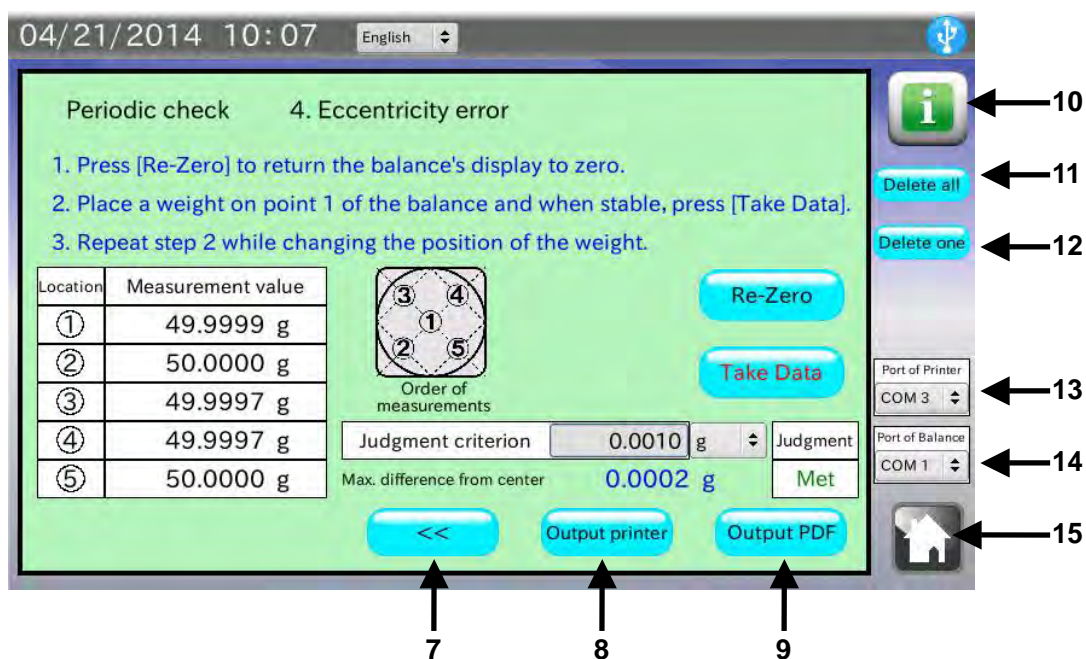
Procedure

1. Touch [Nominal value] to select the nominal mass values of the weights to be used.
2. Touch [Judgment criterion] to enter the judgment criterion.
When not to judge, leave the default judgment criterion (0) as is or enter "0" (zero).
3. Touch the button and confirm that the balance display is set to zero.
If re-zeroing is not performed, the RS-232C settings of the analyzer may not be the same with those of the balance. Touch [Device settings] in the HOME screen to change the RS-232C settings to those of the balance.
4. Place a weight on the balance. When the stabilization indicator is displayed, touch the button.
Data can be read by pressing the balance key or using the auto print mode which the measurement value is output automatically when a load is applied.
5. The read data is entered in the data history table.
6. To print using a printer, touch the button.
It is recommended that printing be performed when all the weighing is complete.
7. After weighing is complete or the operation is canceled, touch the NEXT button to go to the next stage.

6-4. Eccentricity error



No.	Name	Description
1	Re-Zero button	Sets the balance display to zero.
2	Take Data button	Reads the balance measurement data.
3	Data history	Displays the history of the read measurement data.
4	Judgment criterion	Enter the criterion to judge the result as "Met."
5	Maximum difference from the center	Displays the maximum difference from the center (① of the measurement positions in the screen) after the data is read using the Take Data button.
6	Judgment	Displays "Met" or "Not met", by judging the difference from the center against the criterion. "**" appears when the criterion is 0.



No.	Name	Description
7	PREVIOUS button	Returns to the previous stage.
8	Output printer button	Prints the results using a printer.
9	Output PDF button	Goes to the location and operator entry screen. See note below. Outputs the periodic check results to a USB memory as a PDF file. The weighing location and operator name can be added.
10	Information button	Goes to the information about eccentricity error.
11	Delete all button	Deletes all the read data.
12	Delete one button	Deletes one read datum.
13	Port of Printer	Select a COM port to connect a printer.
14	Port of Balance	Select a COM port to connect a balance.
15	HOME button	Exits the periodic check and returns to the HOME screen.

Note: When the USB memory is not recognized, the button is invalid.

Procedure

1. Touch [Judgment criterion] to enter the judgment criterion.

When not to judge, leave the default judgment criterion (0) as is or enter "0" (zero).

2. Touch the button and confirm that the balance display is set to zero.

If re-zeroing is not performed, the RS-232C settings of the analyzer may not be the same with those of the balance. Touch [Device settings] in the HOME screen to change the RS-232C settings to those of the balance.

3. Place a weight on the position ①. When the stabilization indicator is displayed, touch the button.

Data can be read by pressing the balance key or using the auto print mode which the measurement value is output automatically when a load is applied.

Repeat the procedure by placing the weight on the positions ② to ⑤ .

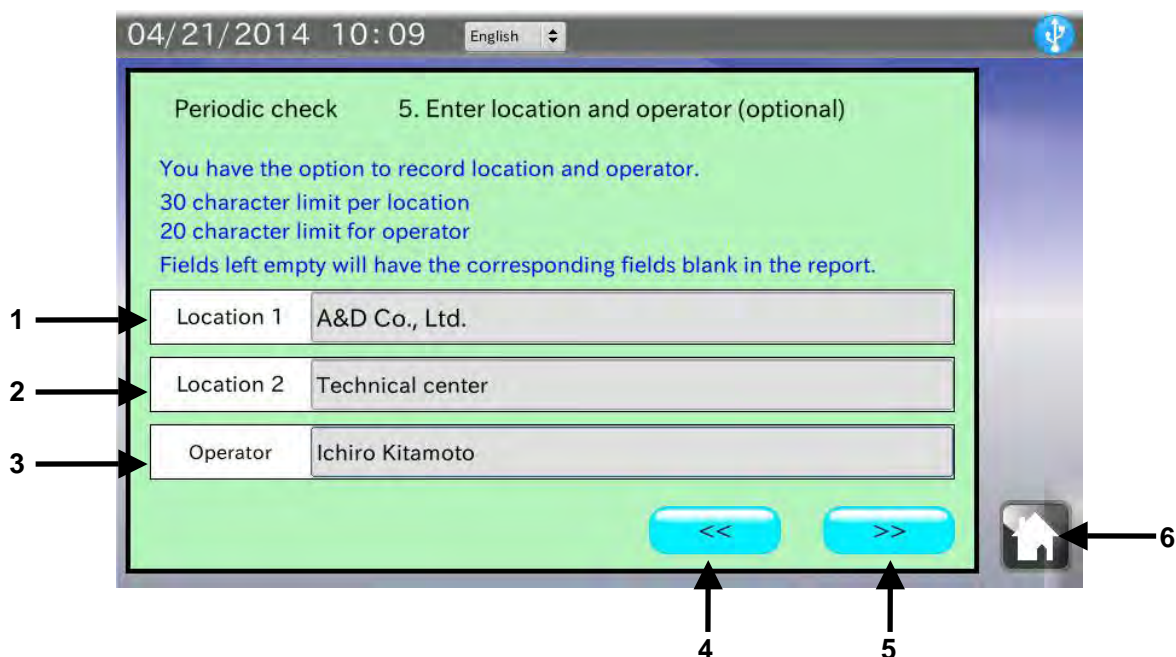
4. The read data is entered in the data history table

5. To print using a printer, touch the button.

6. To save data as a PDF file, connect a USB memory and touch button.

When the analyzer does not recognize the USB memory, the button is invalid (gray).

6-5. Entering the location and operator



No.	Name	Description
1	Location 1	Enter the weighing location 1. (maximum 30 characters)
2	Location 2	Enter the weighing location 2. (maximum 30 characters)
3	Operator	Enter the operator name. (maximum 20 characters)
4	PREVIOUS button	Returns to the previous stage.
5	NEXT button	Goes to the next stage.
6	HOME button	Exits the periodic check and returns to the HOME screen.

Procedure

1. Two weighing locations (maximum 30 characters) and an operator name (maximum 20 characters) can be entered.

When not entered, the corresponding fields in the PDF file will be left blank.

2. After data is entered or when the operation is canceled, touch the NEXT button to go to the next stage, the PDF Output screen.

6-7. Results output example (Printer)

```

-PERIODIC BALANCE CHECK-

MODEL          EM-300
S/N           12345678
ID            00000000
DATE          2014/02/05
TIME          14:11:38

REPEATABILITY
1             100.0001  g
2             100.0002  g
3             100.0001  g
4             100.0000  g
5             100.0000  g
6             100.0000  g
7             100.0000  g
8             100.0001  g
9             100.0001  g
10            100.0001  g

S.D.          0.067  mg
SPEC.         0.00020  g
JUDGMENT      Met

MINIMUM WEIGHT 134  mg
    
```

← Model
 ← Serial number
 ← ID number
 ← Date
 ← Time

Repeatability
 Minimum sample weight

Accuracy
 Linearity

← Measurement value

← Repeatability
 ← Judgment criterion
 ← Judgment

← Minimum sample weight
 ← Nominal mass value
 ← Judgment criterion
 ← Judgment

```

ACCURACY / LINEARITY
10g          10.0000  g
SPEC.        0.0005  g
JUDGMENT      Met

20g          20.0002  g
SPEC.        0.0005  g
JUDGMENT      Met

50g          50.0000  g
SPEC.        0.0005  g
JUDGMENT      Met

100g         99.9998  g
SPEC.        0.0005  g
JUDGMENT      Met

200g         199.9988  g
SPEC.        0.0005  g
JUDGMENT      Not met

ECCENTRICITY ERROR
1             50.0000  g
2             50.0001  g
3             50.0003  g
4             49.9999  g
5             49.9996  g

MAX. DIFFERENCE
              0.0004  g
SPEC.        0.0005  g
JUDGMENT      Met

REMARKS

SIGNATURE
    
```

← Repeatability
 ← Judgment criterion
 ← Judgment

← Measurement value

← Maximum difference from the center
 ← Judgment criterion
 ← Judgment

← Remarks

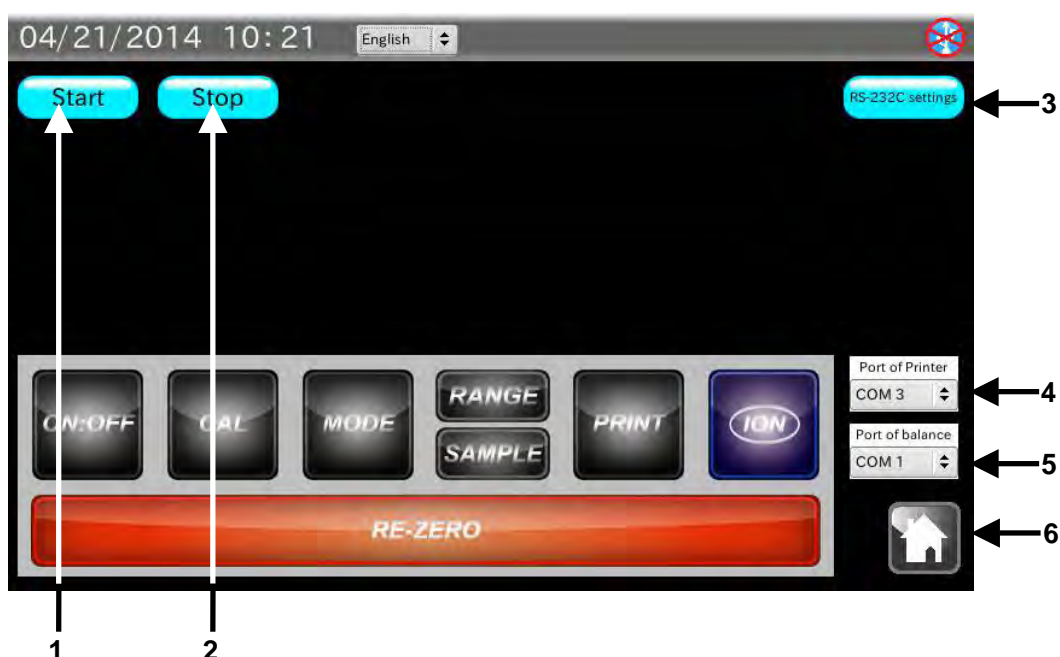
← Signature

7. BALANCE REMOTE CONTROLLER

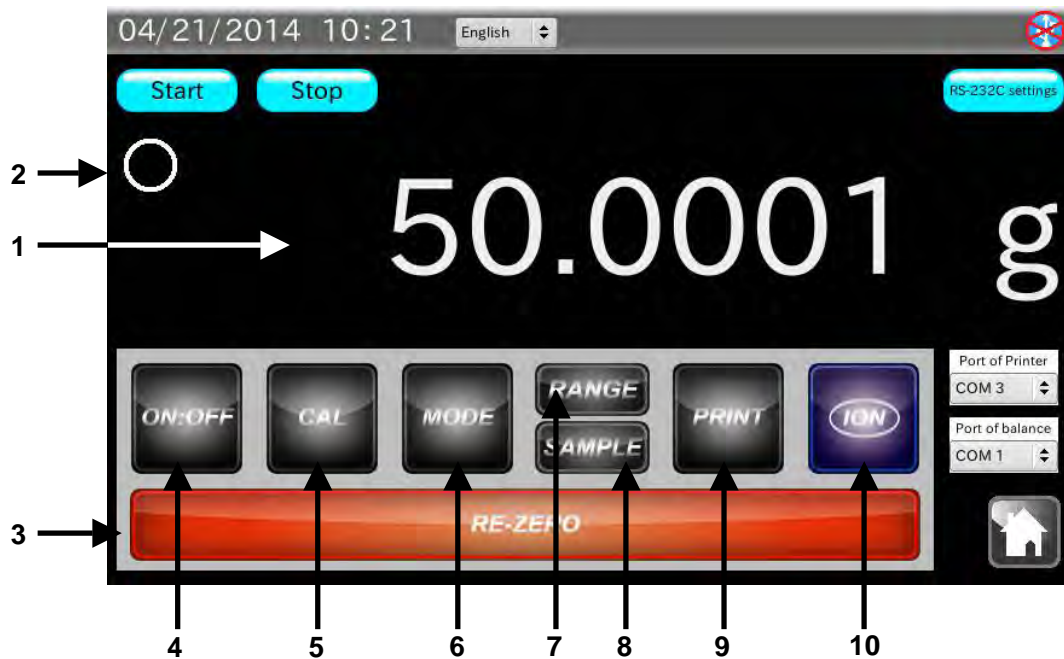
Touch [Balance remote controller] in the Home screen to open the balance remote controller screen.

The balance remote controller screen displays the balance measurement data. The balance key operation is also available in the screen. So, the balance remote controller screen can be used, for example, as a second display to perform the balance key operation such as re-zeroing without touching the balance.

7-1. Balance remote controller screen



No.	Name	Description
1	Start button	Sends the SIR command to the balance and starts reading the balance measurement data.
2	Stop button	Sends the C command to the balance and stops reading the balance measurement data.
3	RS-232C settings button	Goes to the RS-232C settings screen.
4	Port of Printer	Select a COM port to connect a printer.
5	Port of Balance	Select a COM port to connect a balance.
6	HOME button	Exits the balance remote controller and returns to the HOME screen.



No.	Name	Description
1	Measurement value display	Displays the balance measurement value.
2	Stabilization mark	Appears when the balance measurement value is stable.
3	Re-Zero button	Sets the balance display to zero. (R command)
4	ON:OFF button	Turns the balance display ON or OFF. (P command)
5	CAL button	Sets the balance to the calibration mode. (CAL command)
6	MODE button	Changes the balance unit of measure. (U command)
7	RANGE button	Changes the balance minimum display. (RNG command)
8	SAMPLE button	Changes the balance minimum display. (SMP command)
9	PRINT button	Outputs the current measurement value to the printer port.
10	ION button	Turns the BM series balance DC static eliminator ON.

Procedure

1. Use the provided RS-232C cable to connect a balance to the analyzer.

Select a cable appropriate for the RS-232C connector type on the balance.

2. Touch the **Start** button.

If the measurement value is not displayed, the RS-232C settings of the analyzer may not be the same with those of the balance.

When the balance output mode is set to the stream mode, the measurement value will start to appear without touching the **Start** button.

8. UNCERTAINTY CALCULATION

Expanded uncertainty is calculated and the calibration results with the expanded uncertainty can be recorded at the balance installation site. The calibration results are saved in a USB memory as a PDF file and can be managed or printed via a personal computer.

What is uncertainty

To express the reliability of the value obtained by weighing or measurement, “accuracy” or “error” has been used. However, to define “error” quantitatively is very hard. Therefore, “uncertainty” is used to quantify in terms of probability and indicates the estimate value to show the range where the true value exists.

Uncertainty does not indicate “error” which means the difference from the true value. It indicates the range of variation where the true value exists.

Causes of uncertainty and calculation

- Standard uncertainty of the calibration weight (U_s)

$$U_s = \frac{\text{Uncertainty of the weight}}{k} \quad (k = 2)$$

- Standard uncertainty of the calibration weight due to change in weight by age (U_h)

$$\text{Class E2 weight: } U_h = \frac{2}{3\sqrt{3}} \times \text{Tolerance}$$

$$\text{Class F1 or lower weight: } U_h = \frac{1}{3\sqrt{3}} \times \text{Tolerance}$$

- Standard uncertainty of the calibration weight due to air buoyancy (U_b)

$$\text{Air density during measurement } \rho = \frac{0.34848p - 0.0009h \times \exp(0.061t)}{273.15 + t}$$

(p = changes in barometric pressure, h = changes in humidity, t = changes in temperature)

$$\text{Air density under standard conditions } \rho_0 = \frac{0.34848p_0 - 0.009h_0 \times \exp(0.061t_0)}{273.15 + t_0} = 1.2000 \text{ kg / m}^2$$

($P_0 = 1013$ hPa, $h_0 = 46\%$, $t_0 = 20^\circ\text{C}$)

$$\text{Difference in volume } \Delta V = \left| \frac{\text{Weight nominal value}}{8000} - \frac{\text{Weight nominal value}}{\text{Weight density}} \right|$$

(Weight density: Stainless steel = 7950, Cast iron = 7800, Brass = 8400, Aluminum = 2700)

$$U_b = \frac{\rho - \rho_0}{\sqrt{3}} \times \Delta V$$

- Standard uncertainty due to rounding error (Ud)

$$U_d = \frac{\sqrt{2}}{2\sqrt{3}} \times \text{Minimum display}$$

- Standard uncertainty due to temperature characteristics (Ut)

$$U_t = \frac{\text{Changes in temperature} \times \text{Balance temperature coefficient}}{2\sqrt{3}}$$

- Standard uncertainty due to repeatability (Ur)

$$U_r = \sqrt{\frac{\sum_{n=1}^n (n - \text{the measurement value} - \text{Average measurement value})^2}{n-1}} \quad (\text{n} = \text{number of measurements})$$

- Standard uncertainty due to eccentricity error (Ue)

$$E = \text{Maximum difference from the center} \times \frac{\text{Capacity}}{3 \times \text{Load on the center}}$$

$$U_e = \frac{E}{\sqrt{3} \times \text{Capacity}}$$

The combined standard uncertainty is obtained by calculating the square root of the sum of the squared values of each standard uncertainty.

The expanded uncertainty (U) is obtained by multiplying the combined standard uncertainty by a coverage factor (k). For example, by two when the coverage factor (k) is 2 (95% confidence level).

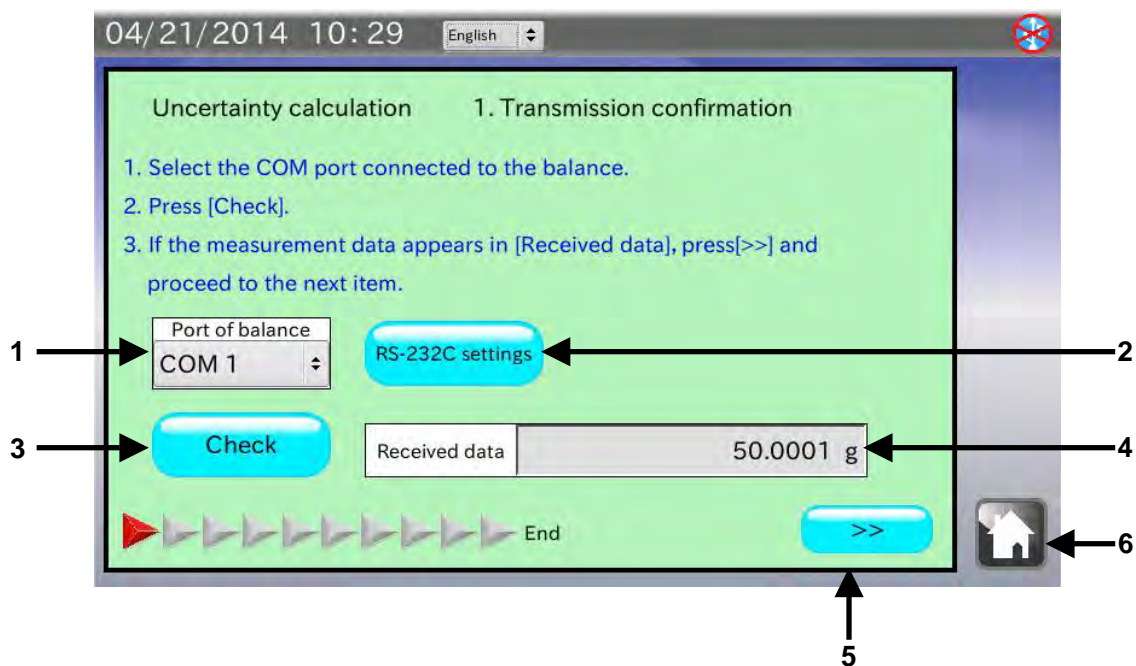
$$U = k \times \sqrt{U_s^2 + U_h^2 + U_b^2 + U_d^2 + U_r^2 + (U_t^2 + U_e^2)} \times \text{Weight nominal value} \quad (\text{k} = 2)$$

Required tools

- Calibration weight with a defined correction value (one or more)
- Temperature, humidity and barometric pressure measuring instruments

8-1. Checking the data transmission

Touch [Uncertainty calculation] in the HOME screen to open the Transmission confirmation screen.



No.	Name	Description
1	Port of Balance	Select the COM port to which the balance is connected.
2	RS-232C settings button	Goes to the RS-232C settings screen.
3	Check button	Reads the balance measurement data.
4	Received data	Displays the read data.
5	NEXT button	Goes to the next stage.
6	HOME button	Exits the uncertainty calculation and returns to the HOME screen.

Procedure

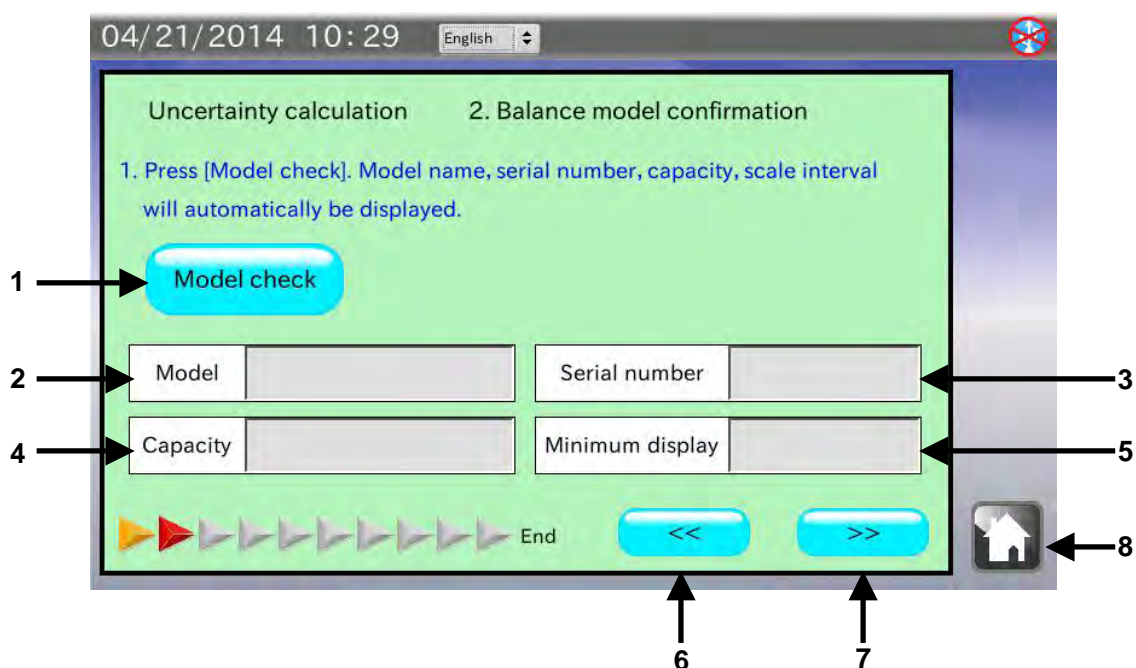
1. Use the provided RS-232C cable to connect a balance to the analyzer.

Select a cable appropriate for the RS-232C connector type on the balance.

**Note: Set the output mode of the balance to the key mode or the auto print mode.
Data will not be received correctly by the stream mode or the interval mode.
The default value has been set to the key mode.**

2. When the balance is connected to a COM port other than the one displayed, touch [Port of Balance] to select the COM port to which the balance is connected.
3. Touch the button. The measurement data is displayed in [Received data].
If the measurement data is not displayed, the RS-232C settings of the analyzer may not be the same with those of the balance. Touch the button to change the RS-232C settings to those of the balance.
4. Touch the NEXT button to go to the next stage.

8-2. Checking the balance model

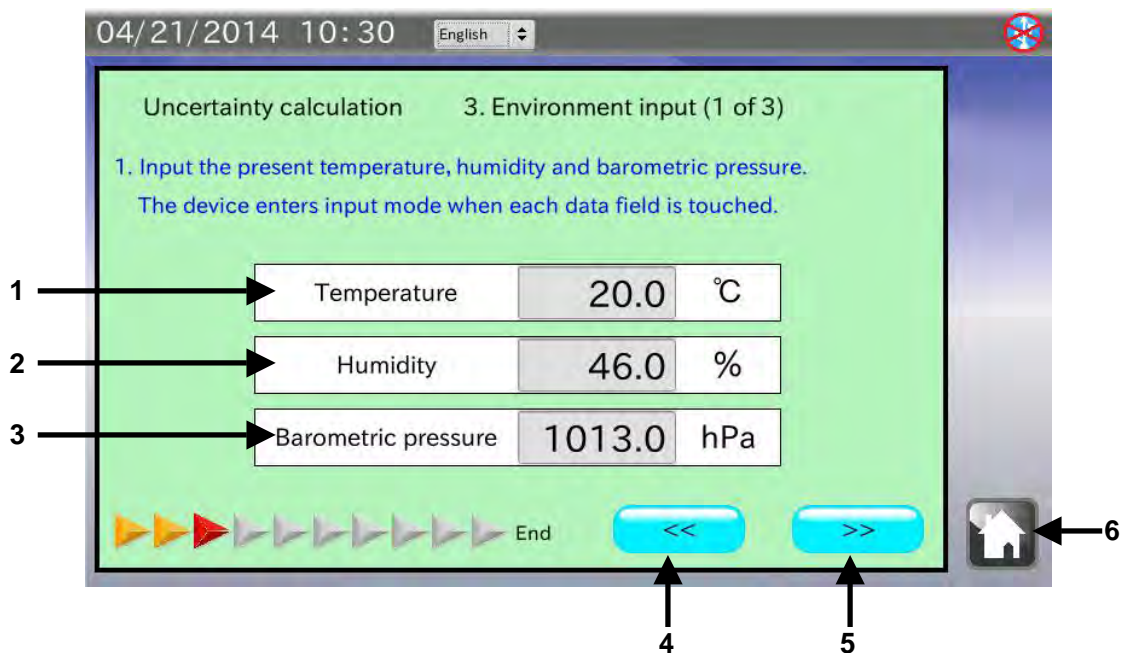


No.	Name	Description
1	Model check button	Reads the balance model information.
2	Model	Displays the balance model.
3	Serial number	Displays the balance serial number.
4	Capacity	Displays the balance weighing capacity.
5	Minimum display	Displays the balance minimum display (scale interval).
6	PREVIOUS button	Returns to the previous stage.
7	NEXT button	Goes to the next stage.
8	HOME button	Exits the uncertainty calculation and returns to the HOME screen.

Procedure


1. Touch the **Model check** button.
2. The balance model name, serial number, weighing capacity and minimum display (scale interval) are displayed.
3. Touch the NEXT button **>>** to go to the next stage.

8-3. Entering the environmental information 1

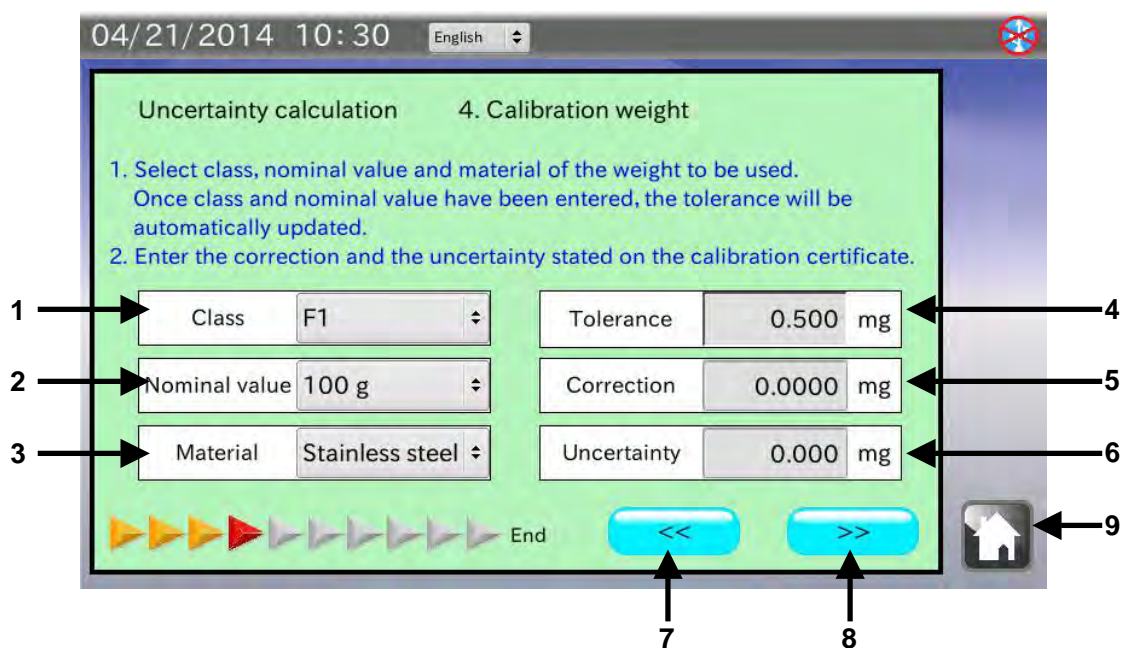


No.	Name	Description
1	Temperature	Enter the temperature. (0°C to 50°C)
2	Humidity	Enter the humidity. (0% to 100%)
3	Barometric pressure	Enter the barometric pressure. (600 hPa to 1200 hPa)
4	PREVIOUS button	Returns to the previous stage.
5	NEXT button	Goes to the next stage.
6	HOME button	Exits the uncertainty calculation and returns to the HOME screen.

Procedure

1. Touch [Temperature] to enter the current temperature.
2. Touch the [Humidity] to enter the current humidity.
3. Touch [Barometric pressure] to enter the current barometric pressure.
4. Touch the NEXT button  to go to the next stage.

8-4. Entering the calibration weight information

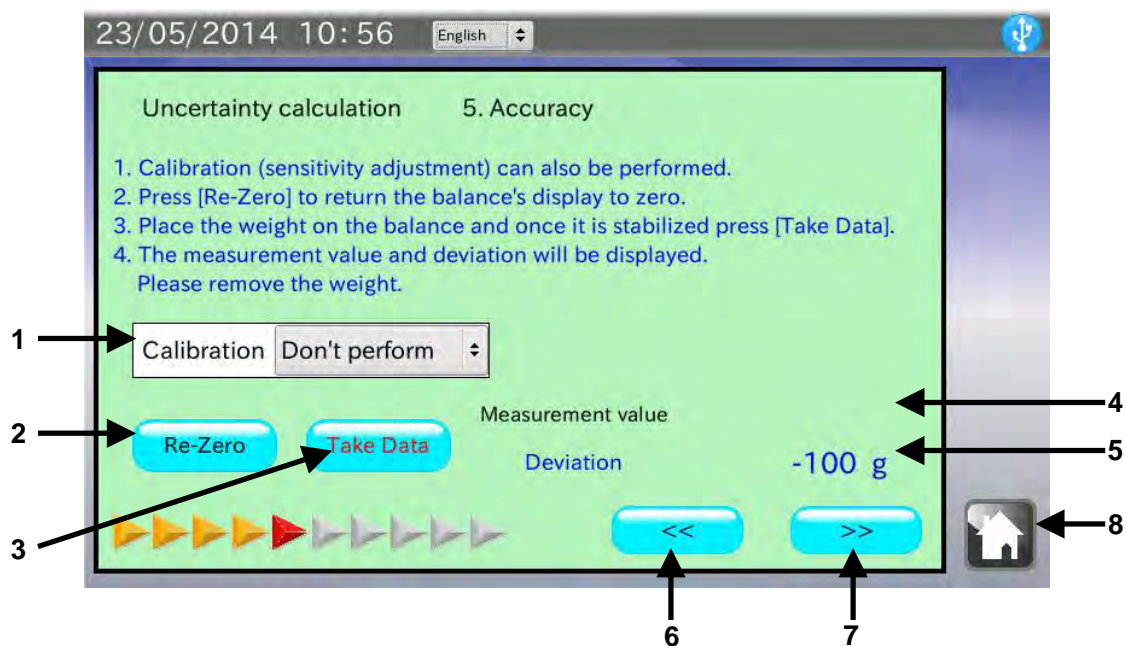


No.	Name	Description
1	Class	Select the class of the weight to be used.
2	Nominal value	Select the nominal mass value of the weight to be used.
3	Material	Select the material of the weight to be used.
4	Tolerance	Display the balance tolerance value. (Complying with OIML R111)
5	Correction	Enter the correction value of the weight to be used.
6	Uncertainty	Enter the uncertainty of the weight to be used.
7	PREVIOUS button	Returns to the previous stage.
8	NEXT button	Goes to the next stage.
9	HOME button	Exits the uncertainty calculation and returns to the HOME screen.

Procedure

1. Touch [Class] to select the OIML class of the weight to be used.
2. Touch [Nominal value] to select the nominal mass value of the weight to be used.
3. Touch [Material] to select the material of the weight to be used.
4. Touch [Correction] to enter the correction value stated in the calibration certificate for the weight to be used.
5. Touch [Uncertainty] to enter the uncertainty stated in the calibration certificate for the weight to be used.
6. Touch the NEXT button to go to the next stage.

8-5. Calibration / Accuracy



No.	Name	Description
1	Calibration	Select whether or not to perform a calibration.
2	Re-Zero button	Sets the balance display to zero.
3	Take data button	Reads the balance measurement data.
4	Measurement value	Displays the read measurement data.
5	Deviation	Displays the deviation (Nominal value + Correction - Measurement value).
6	PREVIOUS button	Returns to the previous stage.
7	NEXT button	Goes to the next stage.
8	HOME button	Exits the uncertainty calculation and returns to the HOME screen.

Procedure

1. Perform a calibration as necessary.

Touch [Calibration] to select "Perform" to perform a calibration.

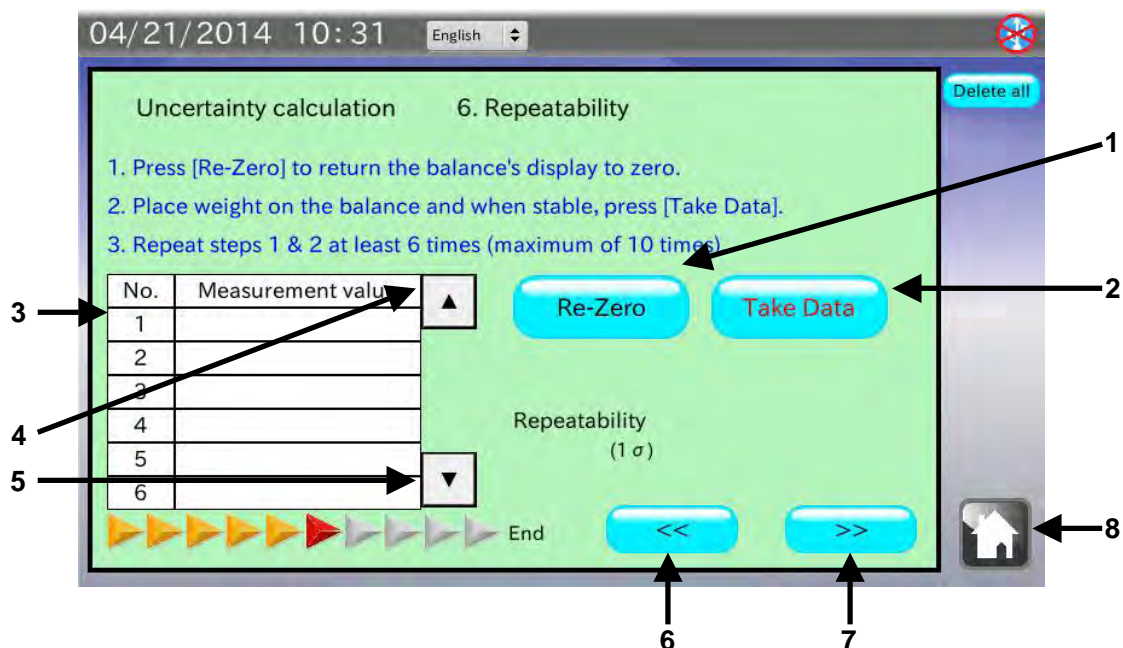
2. Touch the **Re-Zero** button and confirm that the balance display is set to zero.

3. Place a weight on the balance. When the stabilization indicator is displayed, touch the **Take data** button.

Data can be read by pressing the balance **PRINT** key or using the auto print mode which the measurement value is output automatically when a load is applied.

4. Touch the NEXT button **>>** to go to the next stage.

8-6. Repeatability



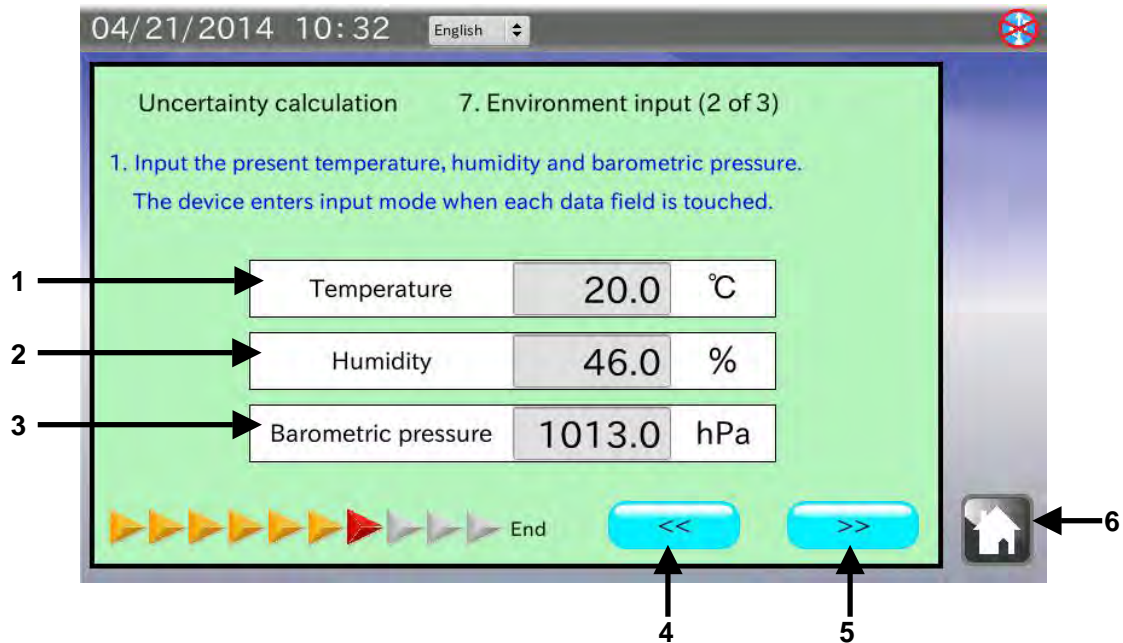
No.	Name	Description
1	Re-Zero button	Sets the balance display to zero.
2	Take Data button	Reads the balance measurement data.
3	Data history	Displays the history of the read measurement data.
4	Backward button	Moves the history backward.
5	Forward button	Moves the history forward.
6	PREVIOUS button	Returns to the previous stage.
7	NEXT button	Goes to the next stage.
8	HOME button	Exits the uncertainty calculation and returns to the HOME screen.

Procedure

1. Touch the **Re-Zero** button and confirm that the balance display is set to zero.
2. Place a weight on the balance. When the stabilization indicator is displayed, touch the **Take data** button.
Data can be read by pressing the balance **PRINT** key or using the auto print mode which the measurement value is output automatically when a load is applied.
3. The read data is entered in the data history table and the repeatability is displayed when three or more data are read.
4. Repeat Steps 1 to 3 at least six times. (Maximum of 10 times)
5. Touch the NEXT button **>>** to go to the next stage.

8-7. Entering the environmental information 2

The operating procedure is the same as that of “8-3. Entering the environmental information 1”.

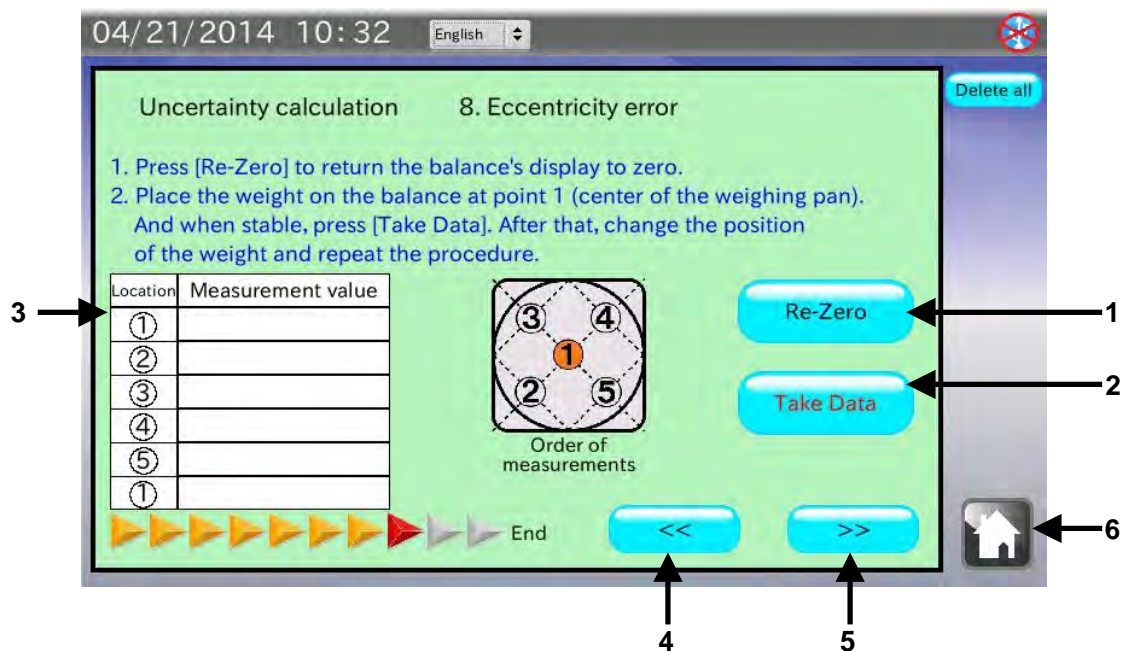


No.	Name	Description
1	Temperature	Enter the temperature. (0°C to 50°C)
2	Humidity	Enter the humidity. (0% to 100%)
3	Barometric pressure	Enter the barometric pressure. (600 hPa to 1200 hPa)
4	PREVIOUS button	Returns to the previous stage.
5	NEXT button	Goes to the next stage.
6	HOME button	Exits the uncertainty calculation and returns to the HOME screen.

Procedure

1. Touch [Temperature] to enter the current temperature.
2. Touch the [Humidity] to enter the current humidity.
3. Touch [Barometric pressure] to enter the current barometric pressure.
4. Touch the NEXT button to go to the next stage.

8-8. Eccentricity error



No.	Name	Description
1	Re-Zero button	Sets the balance display to zero.
2	Take Data button	Reads the balance measurement data.
3	Data history	Displays the history of the read measurement data.
4	PREVIOUS button	Returns to the previous stage.
5	NEXT button	Goes to the next stage.
6	HOME button	Exits the uncertainty calculation and returns to the HOME screen.

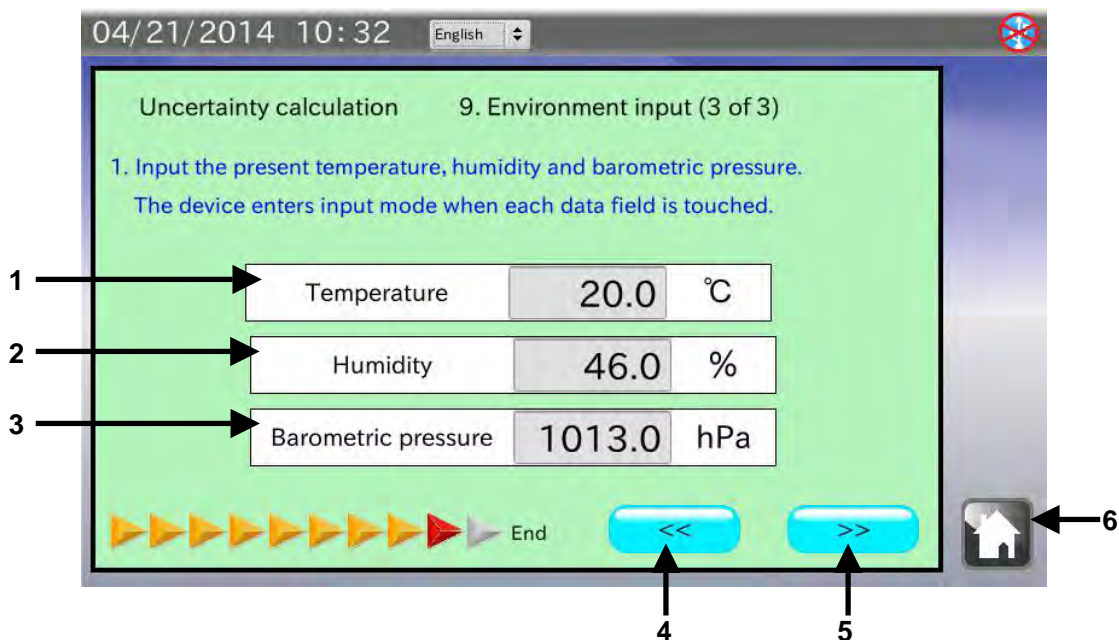
Procedure

1. Touch the **Re-Zero** button and confirm that the balance display is set to zero.
2. Place a weight on the center of the weighing pan (the position ①). When the stabilization indicator is displayed, touch the **Take data** button.
Data can be read by pressing the balance **PRINT** key or using the auto print mode which the measurement value is output automatically when a load is applied.
3. Repeat Steps 1 to 2 by placing the weight on the positions ② to ⑤.
The precise positions of ② to ⑤ are on the diagonal lines or one-fourth positions of the diameter.
4. Touch the NEXT button **>>** to go to the next stage.

Note: To obtain the eccentricity error, it is recommended that a weight with a value of one half or one-third of the weighing capacity be used.

8-9. Entering the environmental information 3

The operating procedure is the same as that of “8-3. Entering the environmental information 1” or “8-7. Entering the environmental information 2”.

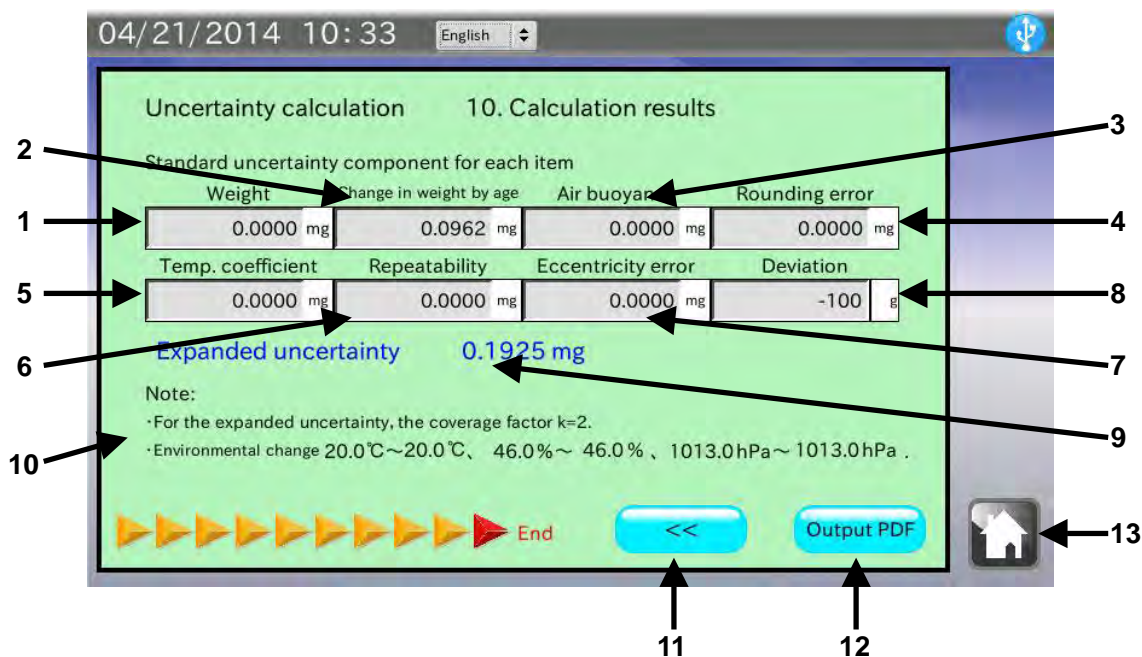


No.	Name	Description
1	Temperature	Enter the temperature. (0°C to 50°C)
2	Humidity	Enter the humidity. (0% to 100%)
3	Barometric pressure	Enter the barometric pressure. (600 hPa to 1200 hPa)
4	PREVIOUS button	Returns to the previous stage.
5	NEXT button	Goes to the next stage.
6	HOME button	Exits the uncertainty calculation and returns to the HOME screen.

Procedure

1. Touch [Temperature] to enter the current temperature.
2. Touch the [Humidity] to enter the current humidity.
3. Touch [Barometric pressure] to enter the current barometric pressure.
4. Touch the NEXT button to go to the next stage.

8-10. Displaying the calculation results



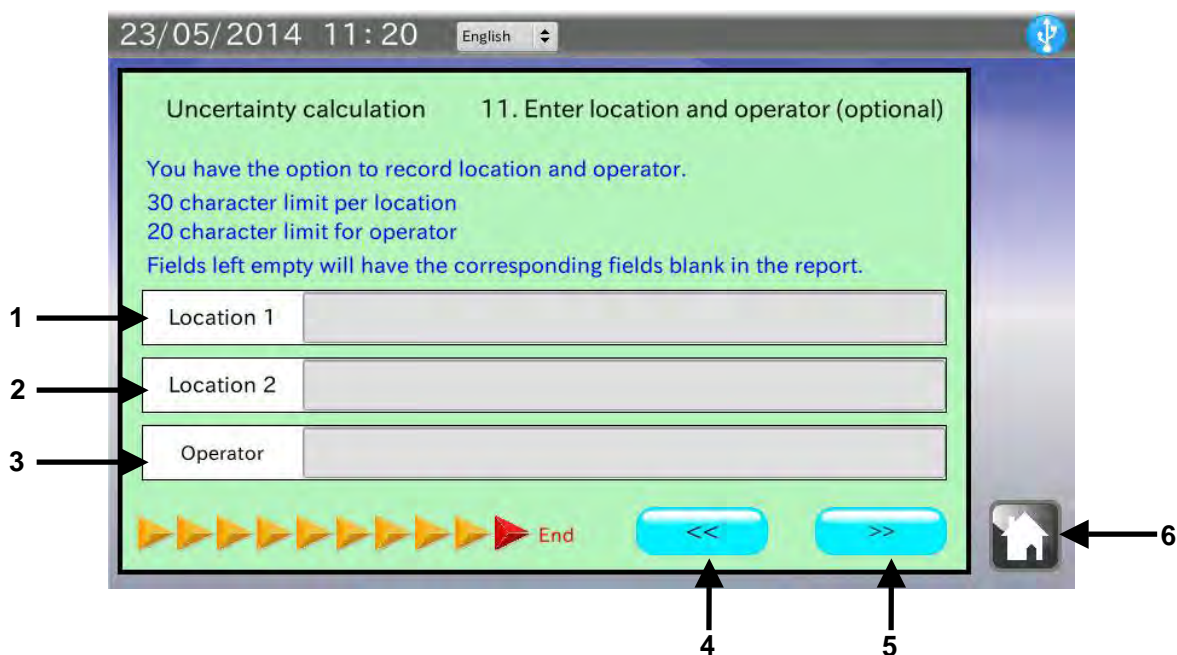
No.	Name	Description
1	Weight	Displays the uncertainty of the weight.
2	Change in weight by age	Displays the uncertainty due to change in weight by age.
3	Air buoyancy	Displays the uncertainty due to air buoyancy.
4	Rounding error	Displays the uncertainty due to rounding error.
5	Temperature coefficient	Displays the uncertainty due to temperature coefficient.
6	Repeatability	Displays the uncertainty due to repeatability.
7	Eccentricity error	Displays the uncertainty due to eccentric error.
18	Deviation	Display the deviation.
9	Expanded uncertainty	Displays the expanded uncertainty.
10	Note	Displays the remarks.
11	PREVIOUS button	Returns to the previous stage.
12	Output PDF button	Goes to the location and operator entry screen. See note below.
13	HOME button	Exits the uncertainty calculation and returns to the HOME screen.

Note: When the USB memory is not recognized, the button is invalid.

In the calculation results screen, calculated results of the uncertainty for each item are displayed.

To save the results in a USB memory as a PDF file, connect a USB memory and touch the Output PDF button.

8-11. Entering the location and operator



No.	Name	Description
1	Location 1	Enter the weighing location 1. (maximum 30 characters)
2	Location 2	Enter the weighing location 2. (maximum 30 characters)
3	Operator	Enter the operator name. (maximum 20 characters)
4	PREVIOUS button	Returns to the previous stage.
5	NEXT button	Goes to the next stage.
6	HOME button	Exits the uncertainty calculation and returns to the HOME screen.

Procedure

1. Insert a USB memory into the USB interface located on the right side.
2. Two weighing locations (maximum 30 characters) can be entered.
When not entered, the location field in the PDF file will be left blank.
3. An operator name (maximum 20 characters) can be entered.
When not entered, the name field in the PDF file will be left blank.
4. Confirm that the USB symbol in the upper right corner of the screen is not crossed out with an X. Touch the NEXT button .
5. The PDF Output screen appears. Enter the file name and touch the button.
6. The PDF file which is being output is displayed.
While the PDF file is displayed, do not remove the USB memory or do not turn the analyzer off.
It will take approximately 30 seconds to output a PDF file.

8-12. Calibration result report example

Calibration Result Report

Date 04/21/2014 10:41

Location A&D Co., Ltd.
Technical center

1. Balance model

Model	BM-300	Serial No.	12345678
Capacity	320g	Min. display	0.1mg

2. Weight to be used

Nominal value	Uncertainty	Uncertainty due to aging	Uncertainty due to air buoyancy
50g	± 0.0750 mg	0.0577 mg	0.0001 mg

3. Rounding error

Uncertainty	0.0408 mg
-------------	-----------

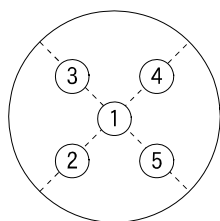
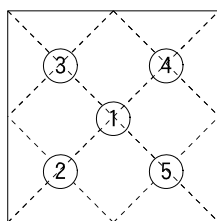
4. Temperature coefficient

Temp. coefficient	Temp. change	Uncertainty
2.0 ppm/°C	0.5 °C	0.0000 mg

5. Repeatability

No.	1	2	3	4	5	6
Value	50.0001 g	50.0002	50.0001 g	49.9999 g	50.0000 g	50.0000 g
No.	7	8	9	10		
Value						
Uncertainty	0.1049 mg					

6. Eccentricity error



Point	Value
①	50.0002 g
②	50.0005 g
③	50.0000 g
④	50.0000 g
⑤	50.0004 g
Max. difference from center	0.0003 g
Uncertainty	0.0012 mg

7. Expanded uncertainty

Nominal value	Deviation	Expanded uncertainty
50g	0.0000 g	± 0.2946 mg

Note 1) For the expanded uncertainty, the coverage factor $k = 2$.

2) Environment change Temp. 20.0 °C ~ 20.5 °C Humi. 46.0 % ~ 51.0 % Baro. 1012.8 hPa ~ 1013.0 hPa

Signature Ichiro Kitamoto

9. AND-MEET ANALYSIS

AND-MEET Measurement Environment Evaluation Tool

High-sensitivity analytical balances detect minute environmental changes that users cannot detect. This causes the measurement value to be unstable. This is especially so with the BM-20/22, a microbalance with a minimum display of $1\ \mu\text{g}$ or a semi-microbalance of a minimum display of $10\ \mu\text{g}$. Using these balances, the specified repeatability may not be obtained in many cases, depending on the environment where the balances are installed.

To help evaluate the environment where a balance is installed, we offer the AND-MEET Measurement Environment Evaluation Tool.

AND-MEET constantly monitors the installation environment of the balance while simultaneously loading and unloading the internal weight of the balance automatically over 24 hours. AND-MEET evaluates temperature changes and the corresponding repeatability of measurement data over time.

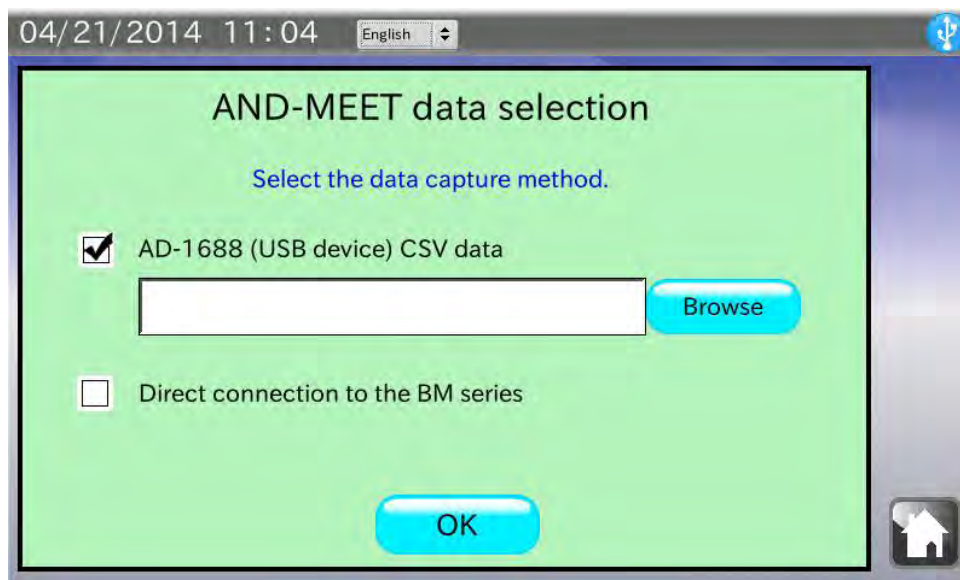
The span value is calculated by subtracting the zero point value from the value obtained when the internal weight is loaded on the balance. Then, the standard deviation of the ten consecutive span values is calculated to obtain the repeatability. The result is presented as a graph for visualization.

Time is plotted on the X-axis of the graph. Changes in the zero point, span value, repeatability and temperature are plotted on the Y-axis. Through the graph, interaction between each item (changes in the zero point, span value or repeatability) and environmental changes (time and temperature) can be evaluated.

The BM series balances are equipped with the AND-MEET function.

9-1. Selecting AND-MEET data

Touch [BM Series Measurement Environment Evaluation Tool (AND-MEET)] in the HOME screen to go into the AND-MEET analysis mode. The AND-MEET data selection screen appears.



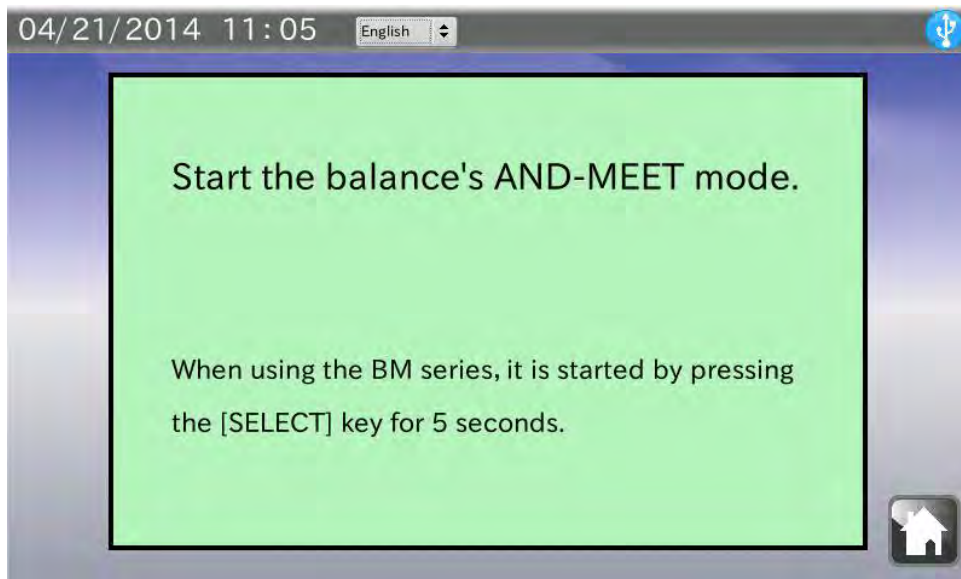
When “AD-1688 (USB memory) CSV data” is selected Procedure

1. Confirm that the check box of “AD-1688 (USB memory) CSV data” is checked.
If not, check the box.
2. Connect the AD-1688 weighing data logger or the USB memory in which the AND-MEET CSV files are saved.
3. Confirm that the USB memory is recognized and the USB symbol in the upper right corner of the screen is not crossed out with an X. Touch the **Browse** button.
4. A dialog box opens to show a list of files saved in the AD-1688 or USB memory.
Touch the AND-MEET CSV file to generate a graph and touch the **OK** button.
Note: Files inside the folders in the USB memory will not appear in the list.
5. The selected data is read and the graph is displayed.
It takes about 20 seconds to read data.

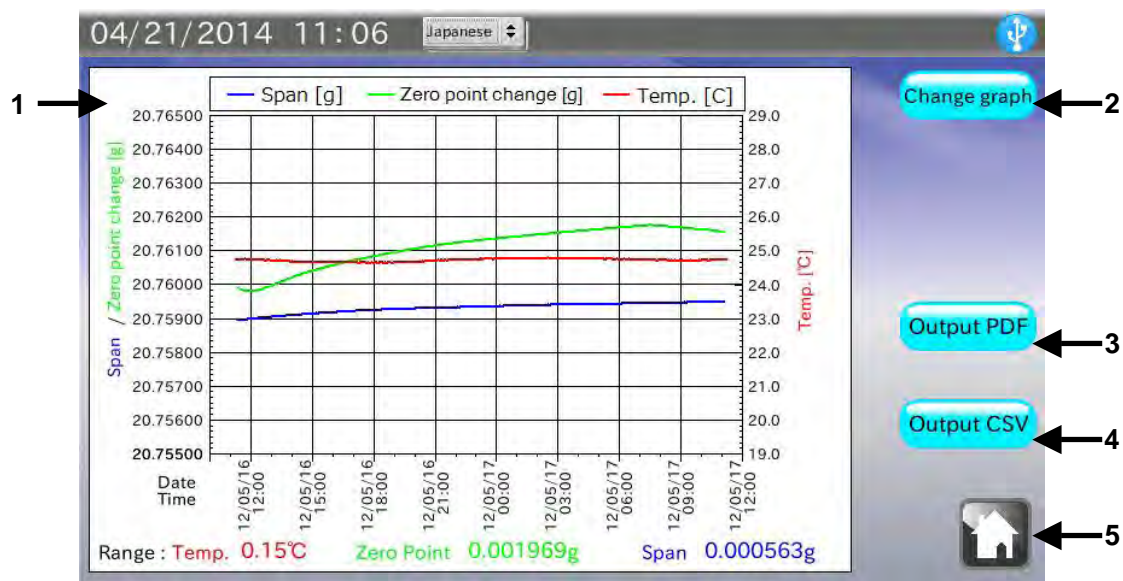
When “Direct connection to the BM series” is selected

Procedure

1. Touch the check box of “Direct connection to the BM series” to check it.
2. Touch the button. The screen shown below appears.
3. Press the key of the BM series balance for 5 seconds.
The AND-MEET data reading is started. The graph screen appears automatically to plot the graph in real time.



9-2. Graph screen

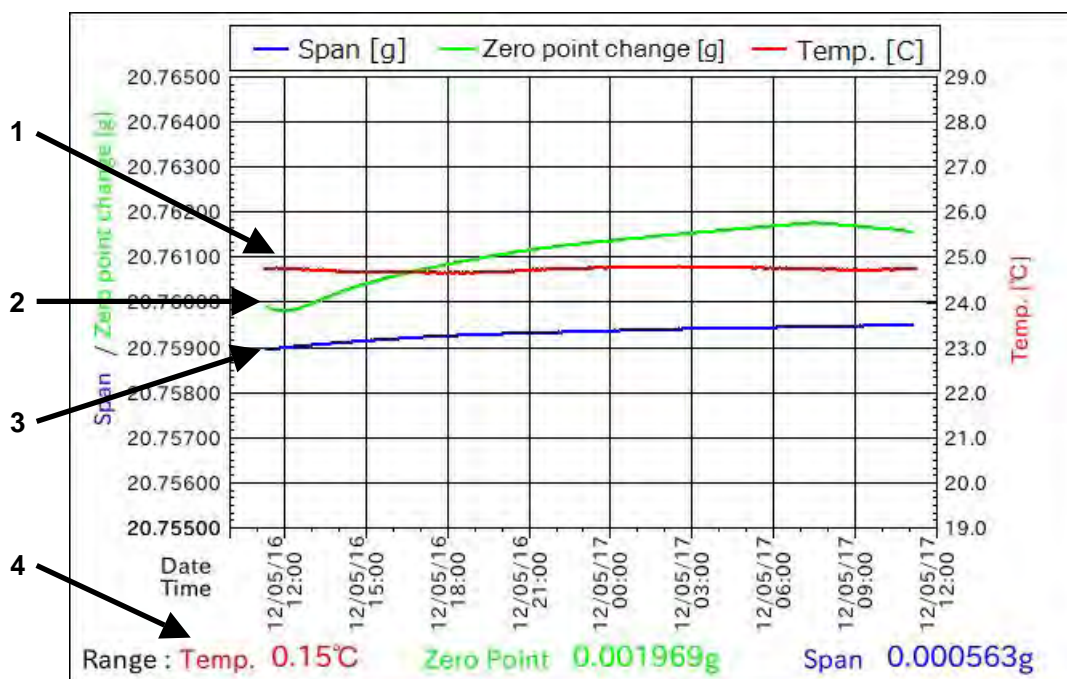


No.	Name	Description
1	Graph	Displays a graph. For the details, refer to the next section.
2	Change graph button	Changes graphs between “Zero point / Span value / Temperature” and “Repeatability / Temperature”.
3	Output PDF button	Outputs a report to a USB memory as a PDF file. *1
4	Output CSV button	Outputs the raw data to a USB memory in the CSV format. *1, *2
5	HOME button	Exits the AND-MEET analysis mode and returns to the HOME screen.

*1 When the USB memory is not recognized, the button is invalid.

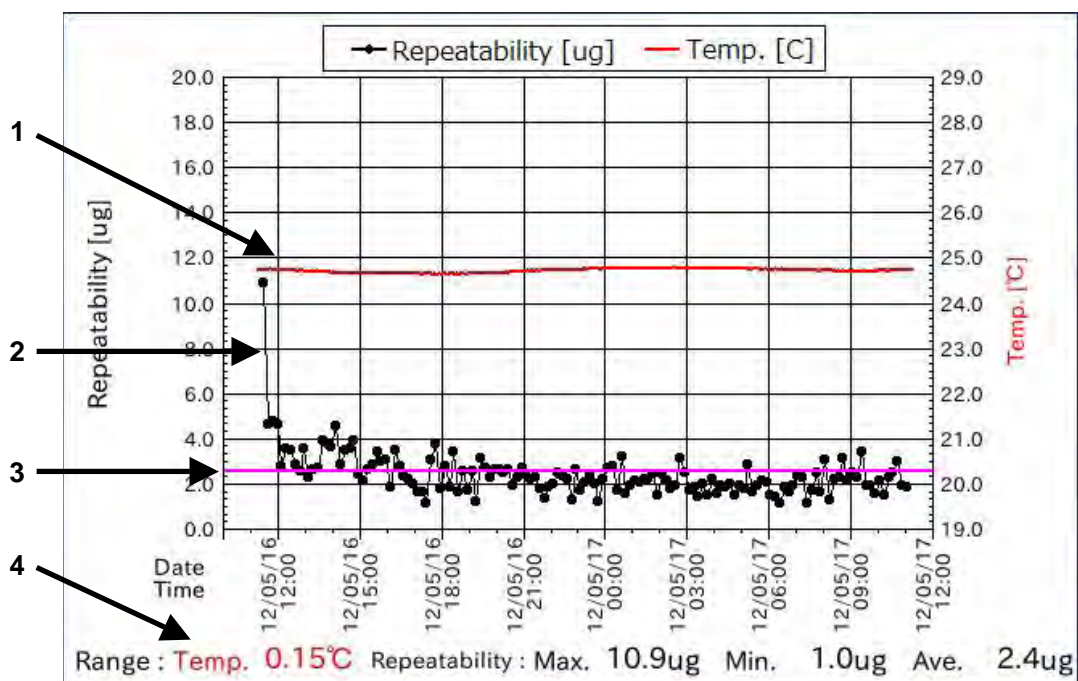
*2 The button appears only when “Direct connection to the BM series” is selected.

Description of a graph: temperature / changes in zero point / span value



No.	Name	Description
1	Temperature (red)	Indicates the temperature. The temperature scale is on the right side of the Y-axis.
2	Zero point change (green)	Indicates the changes in zero point. Although the actual value is near zero, the value in the graph has the offset value as large as the span value added to plot on the same graph with the span value. The zero point scale is on the left side of the Y-axis.
3	Span (blue)	Indicates the span value, the value obtained by subtracting the zero value from the value displayed when the internal weight is loaded. The span scale is on the left side of the Y-axis.
4	Range	Indicates the change (maximum value minus minimum value) in the temperature, changes in zero point and span value.

Description of a graph: temperature / repeatability

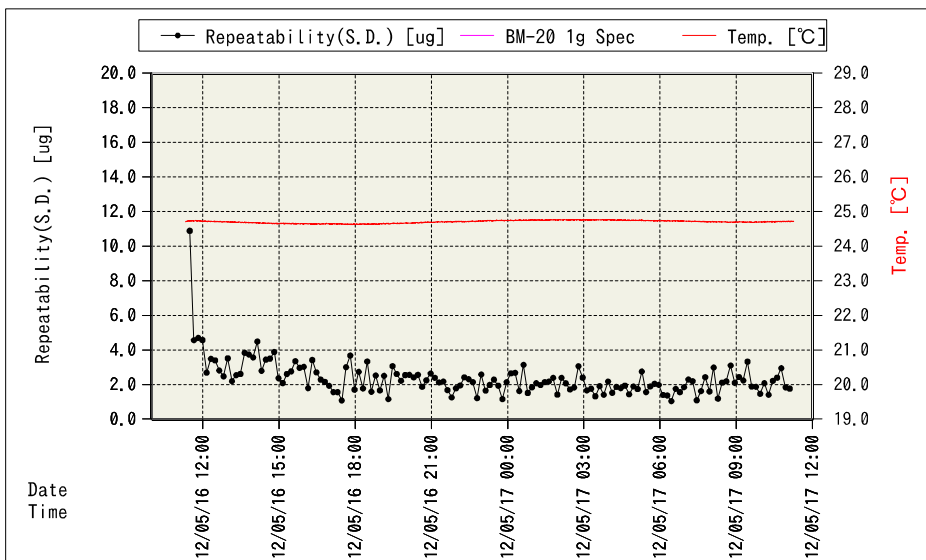
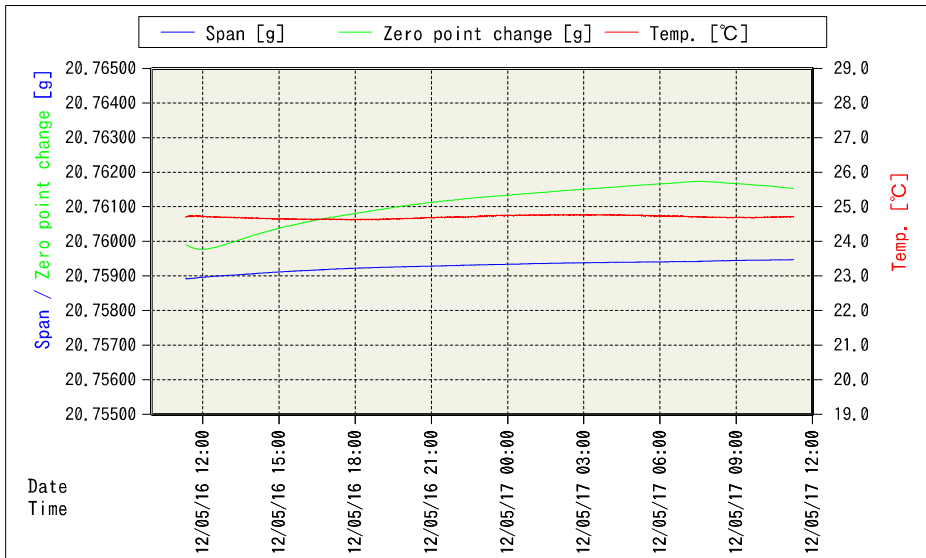


No.	Name	Description
1	Temperature (red)	Indicates the temperature. The temperature scale is on the right side of the Y-axis.
2	Repeatability (black)	Indicates the standard deviation of ten span values. The repeatability scale is on the left side of the Y-axis.
3	Spec. (pink)	Reference line for repeatability specified in the brochure.
4	Range	Indicates the change (maximum value minus minimum value) in the temperature, the maximum, minimum and average value of the repeatability.

9-3. AND-MEET analysis graph example

AND-MEET Analysis Graph

Name _____ Place _____ 04/21/2014



	Maximum	Minimum	Range	Average
Temp. [°C]	24.77	24.62	0.15	24.70
Zero point change [g]	0.001823	-0.000146	0.001969	0.001184
Span [g]	20.759474	20.758911	0.000563	20.759287
Repeatability [ug]	10.9	1.0	9.9	2.4

AND-MEET graph: points to check and measures to take

- Several hours after starting measurements:
 - A zero point drift occurs due to changes in the balance internal temperature caused by turning the power on.
 - Warm up the balance until the balance reaches equilibrium with room temperature.
- Changes in temperature in a day are great:
 - Use an air conditioner to avoid changes in temperature.
 - When using an air conditioner, use much care to avoid the direct airflow to the balance from the air conditioner.
- Sudden temperature changes occur:
 - If the causes of the temperature change such as a heat generating device are known, eliminate the causes.
- The temperature fine fluctuation occurs:
 - The air from the air conditioner may be blown directly to the balance.
 - Use a breeze break or change the balance installation site to avoid the direct airflow to the balance from the air conditioner.
- The repeatability is bad even if changes in temperature are small.
 - The air from the air conditioner may be strong. Use a breeze break to avoid the direct airflow to the balance from the air conditioner.
 - Sources of vibration may exist near the balance.
- The repeatability during the day is bad while the repeatability at midnight is good.
 - Human activities such as opening or closing the door, passing near the balance may influence the balance.
 - Take appropriate measures to avoid passing near the balance while the balance is in use.
- Temporal poor repeatability
 - Impact may have been applied to the balance or table on which the balance is installed.
 - Or an earthquake may have occurred.
- Others
 - Sudden changes in barometric pressure due to typhoon or building vibrations due to strong winds will influence the balance.

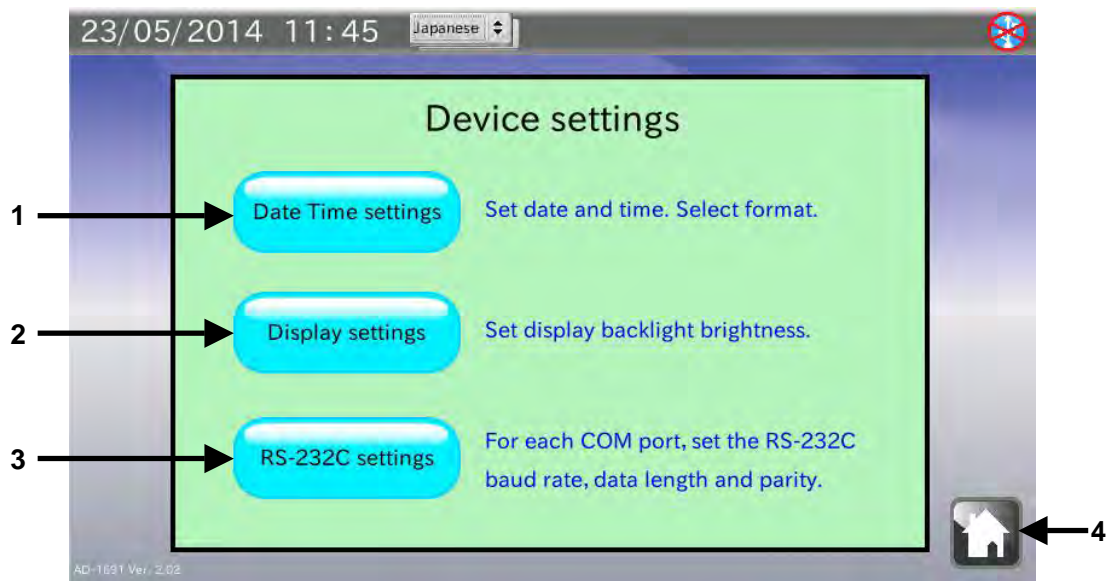
Environment to install a microbalance.

- Location
 - The best location is the first floor of the rigid building built on solid ground.
 - Locations along the coast or main roads may be influenced by winds and vibrations.
- Room
 - Corners of the rooms or areas near a pillar, far from the passage, door or air conditioner outlet and where there is no direct sunlight.
 - A weighing table should be solid and made of stone or wood having low heat conductivity.
- Temperature / barometric pressure / static electricity
 - Changes in temperature in a day: within 4°C
 - Changes in temperature in a short time: within 0.2°C/30 minutes
 - Changes in barometric pressure in a day: within 10 hPa
 - Static electricity: active elimination is required especially for the balance with a minimum display of 1 mg or less which is more prone to static electricity.

10. SETTING THE ANALYZER

In the Device settings screen, the analyzer date and time, the LCD backlight brightness and RS-232C are set.

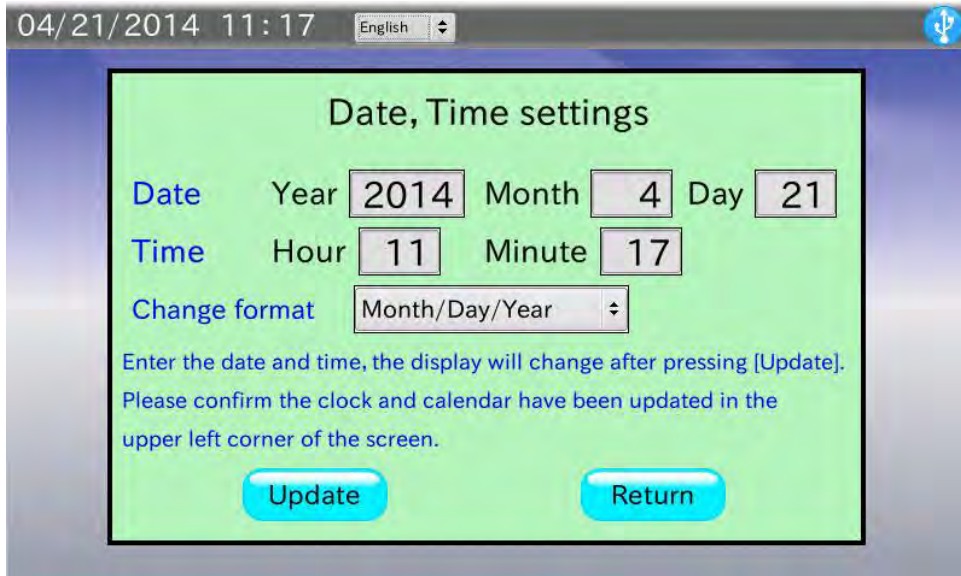
Touch [Device settings] in the HOME screen to open the device settings screen.



No.	Name	Description
1	Date Time settings button	Set the date and time in a selected format.
2	Display settings button	Set the LCD backlight brightness.
3	RS-232C settings button	Set the RS-232C baud rate, data length and parity for each COM port.
4	HOME button	Exits the device settings and returns to the HOME screen.

10-1. Setting the date and time

In the Device settings screen, touch the **Date Time settings** button to open the Date, Time settings screen.



Procedure

1. Touch the box for the date (year, month and day) and the time (hour and minute) to open the numerical value entry dialog. Enter the value for each box.
2. Touch the **Update** button. The date and time in the upper left corner of the screen will be updated. It takes several seconds to update the date and time.
3. Touch the **Return** button to return to the Device settings screen.

10-2. Setting the LCD backlight brightness

In the Device settings screen, touch the **Display settings** button to open the LCD setting screen.

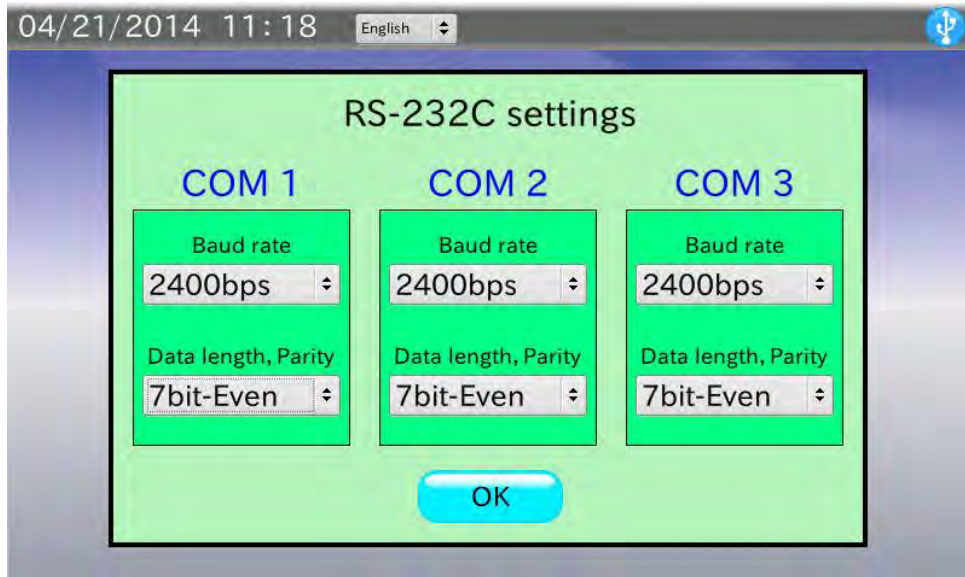


Procedure

1. Touch the **▼** button to decrease the brightness and touch the **▲** button to increase the brightness. There are ten brightness levels.
The default value has been set to the maximum level.
2. Touch the **OK** button to return to the Device settings screen.

10-3. Setting the RS-232C

In the Device settings screen, touch the **RS-232C settings** button to open the RS-232C settings screen.



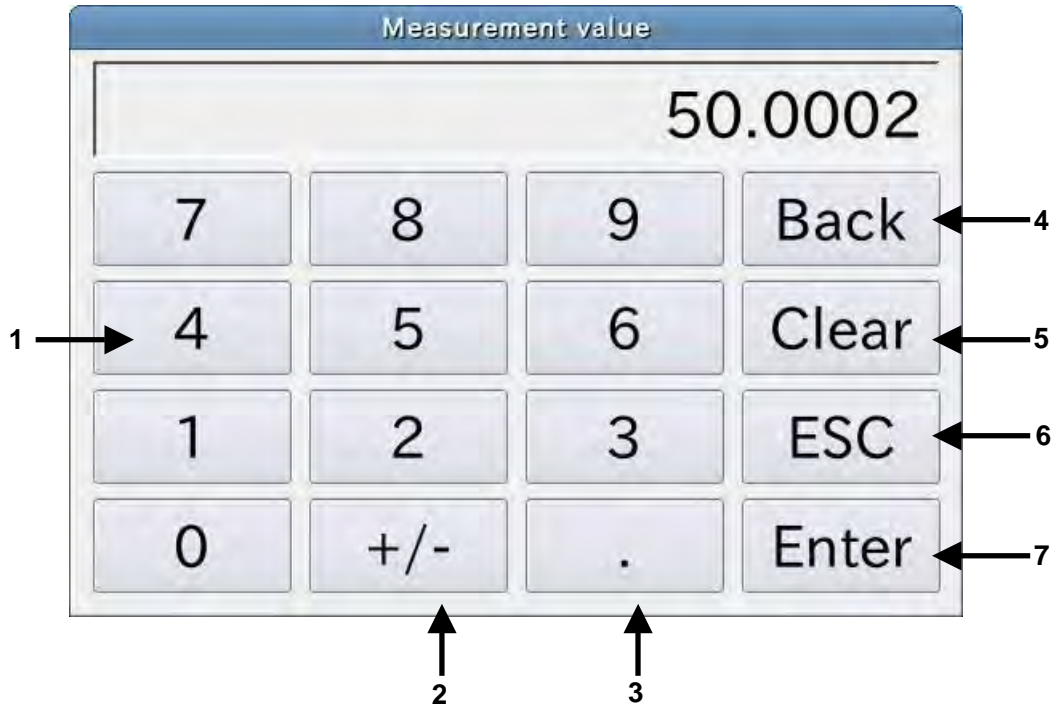
Procedure

1. Touch the box for Baud rate to open the baud rate selection dialog. Select a baud rate from 600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps and 38400 bps and touch the **OK** button. The default value has been set to 2400 bps.
2. Touch the box for Data length, Parity to open the data length / parity selection dialog. Select a data length and parity from 7Bit-Even, 7Bit-Odd and 8Bit-None and touch the **OK** button. The default value has been set to 7Bit-Even.
3. Touch the **OK** button to return to the Device settings screen.

11. DIALOGS

11-1. Numerical value entry dialog

When numerical values are required, the numerical value entry dialog box appears.



No.	Name	Description
1	Numerical value buttons	Enters numerical values.
2	+/- button	Switches the sign, + or -.
3	Decimal point button	Adds a decimal point.
4	Back button	Deletes one numerical value before the cursor.
5	Clear button	Deletes all the numerical values entered.
6	ESC button	Exits the dialog box without confirming the numerical values entered.
7	Enter button	Confirms the numerical values entered and exits the dialog box.

11-2. Character entry dialog

When characters are required, the character entry dialog box appears.

Touch the **MODE** button to switch between the alphabet entry dialog and the numerical value entry dialog.

Alphabet entry dialog



The Alphabet entry dialog box, titled "Location 1", shows the text "A&D" in the input field. Below the input field, it displays "[Alphabet]" and "[Remaining] 27". A "MODE" button is located to the left of left and right arrow buttons. Below these are four rows of buttons: "Caps", "ABC", "DEF", "Back"; "GHI", "JKL", "MNO", "Clear"; "PQRS", "TUV", "WXYZ", "ESC"; and "{[(", "@*#", "SP", "Enter".

Numerical value entry dialog

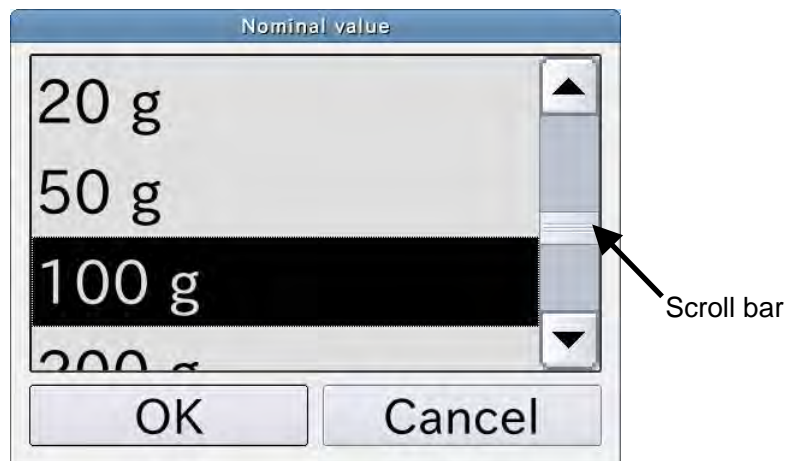


The Numerical value entry dialog box, titled "Location 1", shows the text "123456789" in the input field. Below the input field, it displays "[Numerical]" and "[Remaining] 21". A "MODE" button is located to the left of left and right arrow buttons. Below these are four rows of buttons: "1", "2", "3", "Back"; "4", "5", "6", "Clear"; "7", "8", "9", "ESC"; and "{[(", "0", "SP", "Enter".

11-3. Pulldown selection dialog

When an item selection is required, the pulldown selection dialog box appears.

Touch the item to be selected from the list and touch the **OK** button.



The Pulldown selection dialog box, titled "Nominal value", displays a list of items: "20 g", "50 g", "100 g", and "200 g". The "100 g" item is highlighted with a black background. A vertical scroll bar is located to the right of the list, with an arrow pointing to it labeled "Scroll bar". At the bottom of the dialog are "OK" and "Cancel" buttons.

12. INTERFACE SPECIFICATIONS

12-1. RS-232C

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

Transmission system : EIA RS-232C

Transmission form : Asynchronous, bi-directional, half duplex

Data format : Baud rate : 600, 1200, 2400, 4800, 9600, 19200, 38400 bps

Data length : 7 or 8 bits

Parity : Even, Odd (Data length 7 bits)

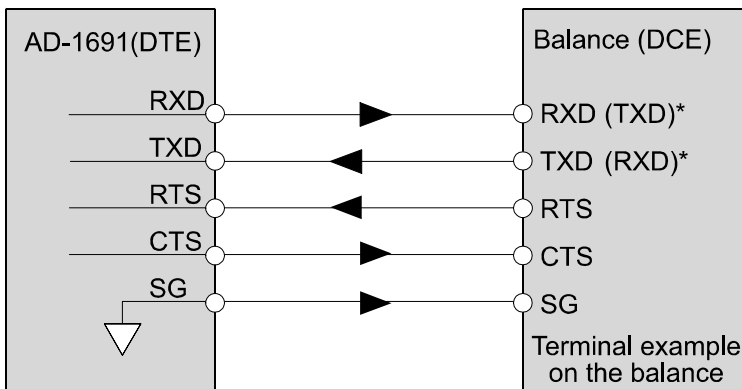
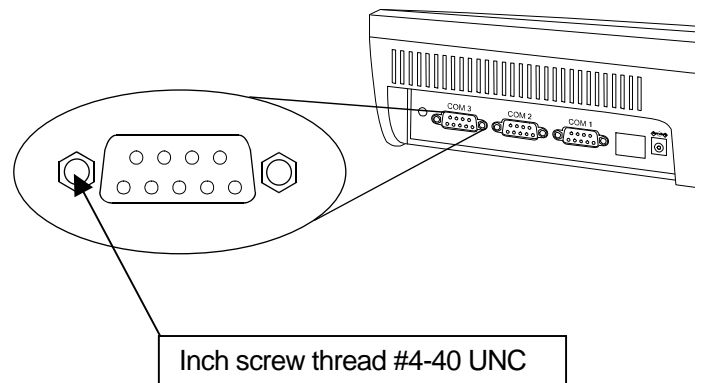
None (Data length 8 bits)

Stop bit : 1 bit

Code : ASCII

D-Sub 9-pin assignment

Pin No.	Signal name	Direction	Description
1	-	-	No connection
2	RXD	Input	Receive data
3	TXD	Output	Transmit data
4	-	-	No connection
5	SG	-	Signal ground
6	-	-	No connection
7	RTS	Output	Ready to send
8	CTS	Input	Clear to send
9	-	-	No connection



* The names in the parentheses are used for some balances in the instruction manual.

13. MAINTENANCE

- Do not use organic solvents or chemical cloth to clean the analyzer.
Clean the analyzer with a lint free cloth that is moistened with a mild detergent.
- Do not disassemble the analyzer.
- Use the original packing material for transportation.

14. TROUBLESHOOTING

14-1. Checking the analyzer performance

If the analyzer seems to have a problem, check the items described below.

If improper performance persists after checking, contact the local A&D dealer for repair.

Checking the power supply

- Is an appropriate AC adapter connected?

Checking the data transmission

- Is the analyzer connected to the balance using an RS-232C straight through cable?
- Are the RS-232C settings of the analyzer the same with those of the balance?
- Are the RS-232C settings of the analyzer the same with those of the printer, if connected?

14-2. Asking for repair

If improper performance persists after checking, contact the local A&D dealer for repair.

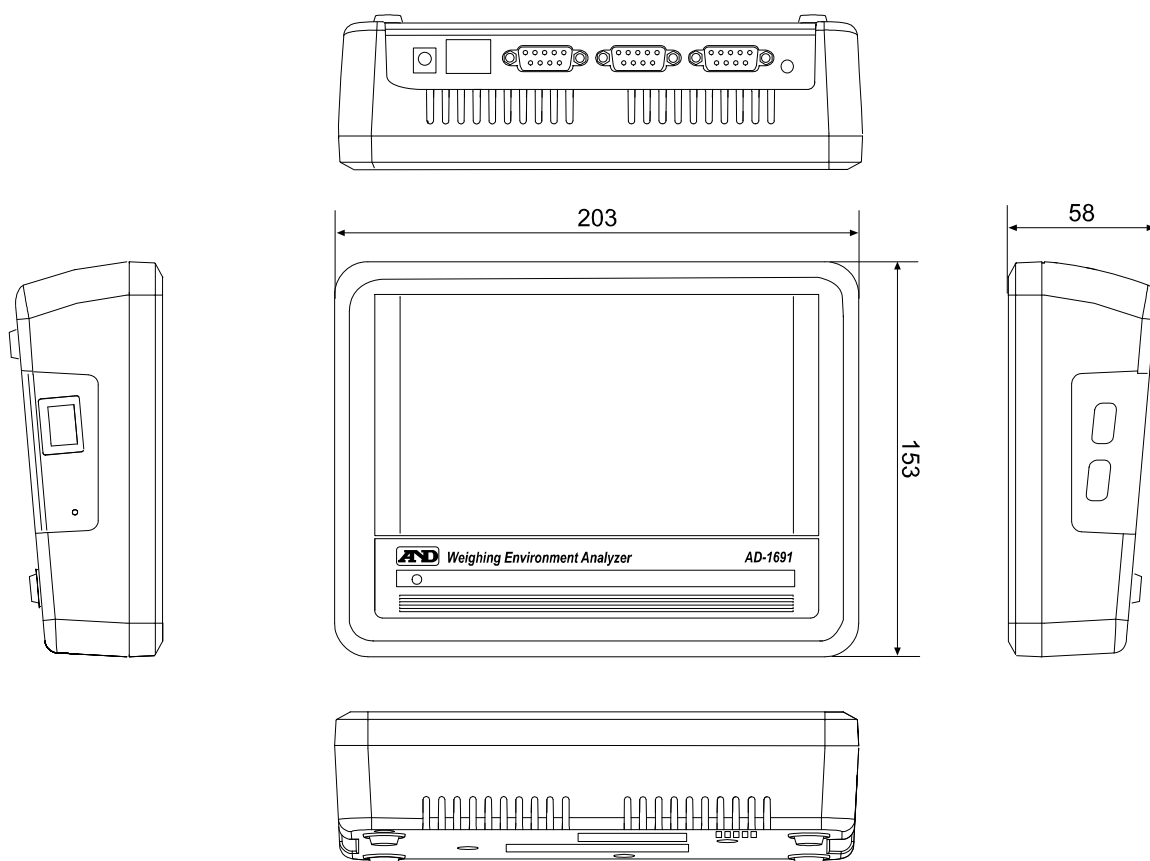
The analyzer is a precision instrument. Use the original packing material for transportation.

15. SPECIFICATIONS

Model	AD-1691
Display	TFT color LCD with backlight (7 inch, 800x480 dots)
Data transmission	RS-232C, USB (complying with USB1.1)*
Operating environment	5°C to 40°C, 85%RH or less (No condensation)
External dimensions	203 (W) x 153 (D) x 58 (H) mm, excluding protrusions
Power supply (AD adapter)	Please confirm that the AC adapter type is correct for your local voltage and receptacle type.
Power consumption	Approx. 30 VA
Mass	Approx. 1.0 kg

* USB interface is used for connecting a USB memory.

15-1. External dimensions



Unit: mm

15-2. Options

AD-1687 weighing environment logger

- Equipped with four sensors for temperature, humidity, barometric pressure and vibration, the AD-1687 can measure and store environmental data.

When connected to an RS-232C interface of a balance, the AD-1687 can store environmental data along with measurement data.

Can be used for balance daily checks, periodic checks and uncertainty calculations.

- When connected to a USB port of a computer, the stored data can be read into the personal computer. The AD-1687 is recognized as USB memory and special software is not required.

AD-1602 series calibration weight

- Calibration weight conforming to OIML, Class E2 or Class F1

Can be used for balance daily checks, periodic checks and uncertainty calculations.

- Wide range of capacities are available, from 1 g to 20 kg.

16. TERMS / INDEX

16-1. Terms

Calibration	To adjust the balance so that it can measure accurately.
Re-zero	To set the display to zero.
Repeatability	Refer to “6-2. Repeatability / Minimum weight.”
Minimum sample weight	Refer to “6-2. Repeatability / Minimum weight.”
Uncertainty	Refer to “8. UNCERTAINTY CALCULATION.”
AND-MEET	Refer to “9. AND-MEET ANALYSIS.”

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