

**GX-AE SERIES  
GX-A SERIES  
GF-A SERIES  
GX-M SERIES  
GF-M SERIES**

**Multi-Function Balance**

**INSTRUCTION MANUAL**

**ADDENDUM**

**Flow Rate Display (FRD) Function**



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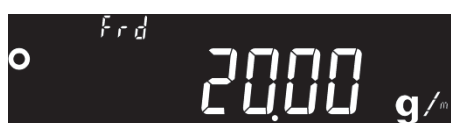
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# 1. Introduction

This manual provides a supplementary explanation about the usage of the Flow Rate Display (FRD) function of the GX-AE/GX-A/GF-A/GX-M/GF-M Series of multi-functional precision balances.

## 1-1. About Flow Rate Display (FRD) Function

- The balance calculates the flow rate from the weight change over time and indicates the flow rate value per unit time on its display.
- The flow rate can be calculated for both filling and discharging.
- The volume (mL) flow rate can be also calculated by setting the density of a measurement sample.

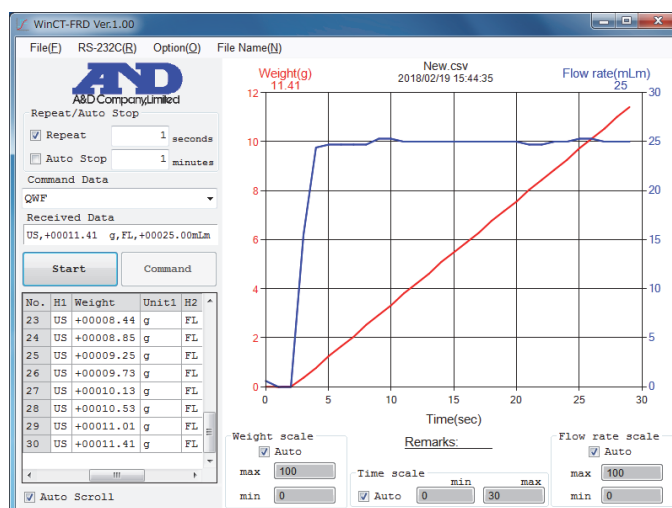


- The display switches between the weight value and the flow rate value by key operation, so the total value can be confirmed during filling or after filling.

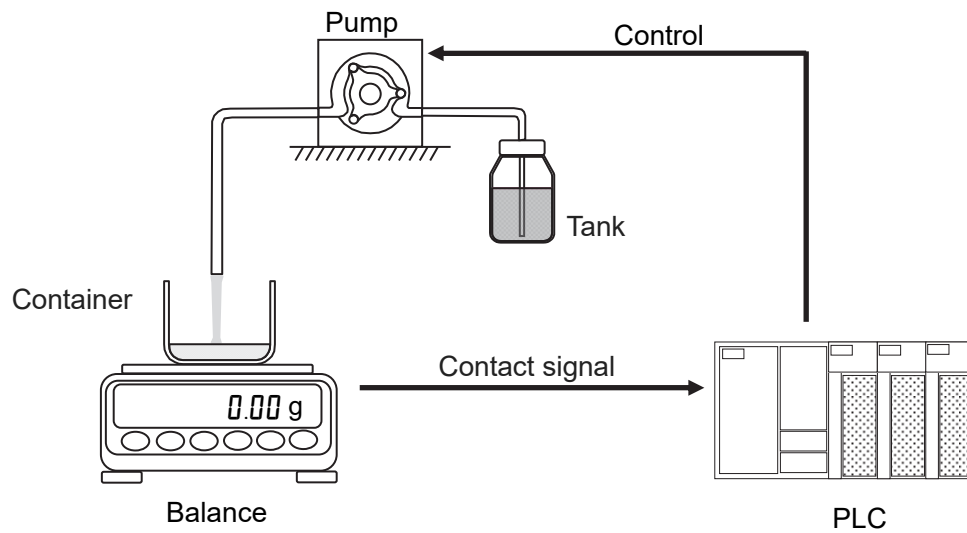


- By connecting the balance to a personal computer and using the WinCT-FRD software for Windows, the weight and flow rate values changing with time can be graphed in real-time and recorded on the PC.

The WinCT-FRD software can be downloaded from our website: <https://www.aandd.jp/>



- Weighing and flow rate data can be simultaneously output to an external device.  
It makes designing a device such as PLC easier when building dispensing systems and so on. In addition, it is possible to transmit a contact signal when a weight reaches the specified value by using the optional GXA-04 or GXM-04 (comparator output).



## 1-2. Flow Rate Calculation Method

The flow rate is calculated by the following formula.

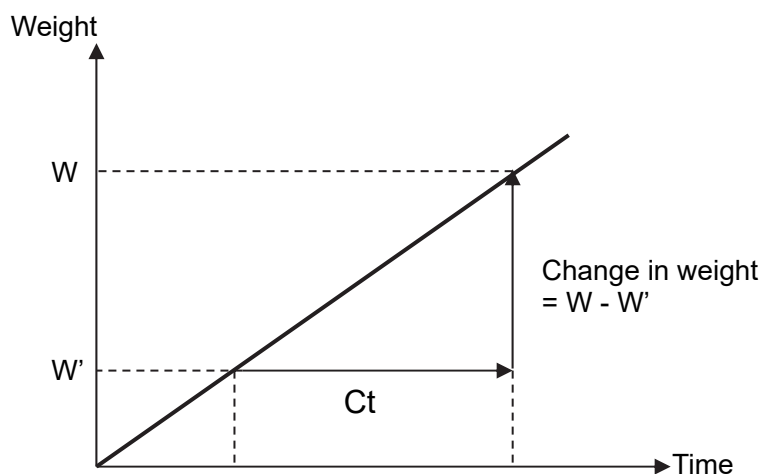
$$Q = \left| \frac{W - W'}{Ct} \right|$$

Q: Flow rate

Ct: Flow rate calculation time

W: Current weight

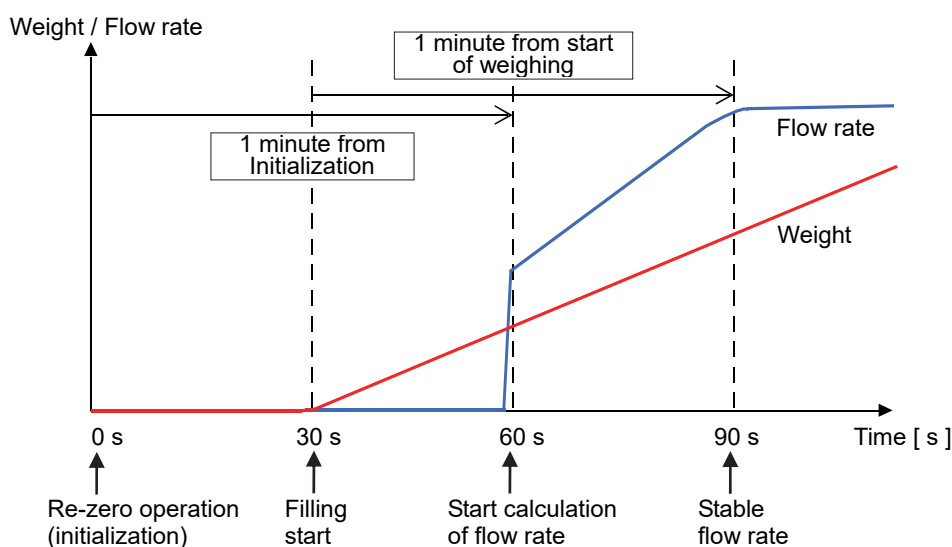
W': Weight before flow rate calculation time



The FRD function stores the weighing data in the balance and calculates the flow rate.

- By turning off the power or pressing the **RE-ZERO** key, the stored weighing data is initialized. After initializing the weighing data or switching to the flow rate measurement mode from the other mode, the flow rate value is displayed as "0" during the preset flow rate calculation time.
  - A stable flow rate value cannot be calculated until the preset flow rate calculation time has elapsed since weighing started.
  - The flow rate can be calculated in either for increasing weight (filling) or decreasing weight (discharging). Even in the case of decreasing weight, the flow rate is calculated as a positive value.
- ※ Variation in the calculated flow rate may change depending on the flow rate calculation time setting. Refer to "2-3 Setting the Flow Rate Calculation Time (Ct)".

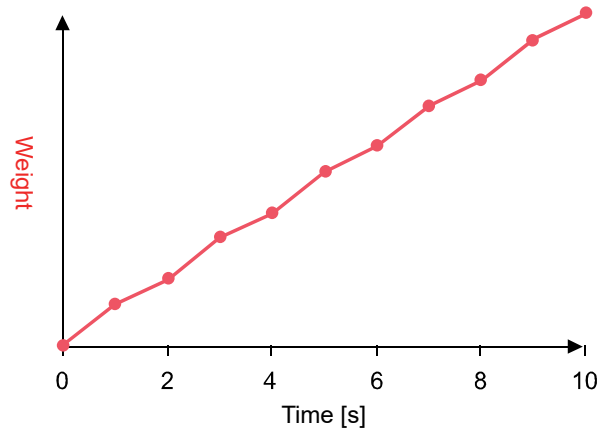
**(Example)** When the flow rate calculation time is 1 minute.



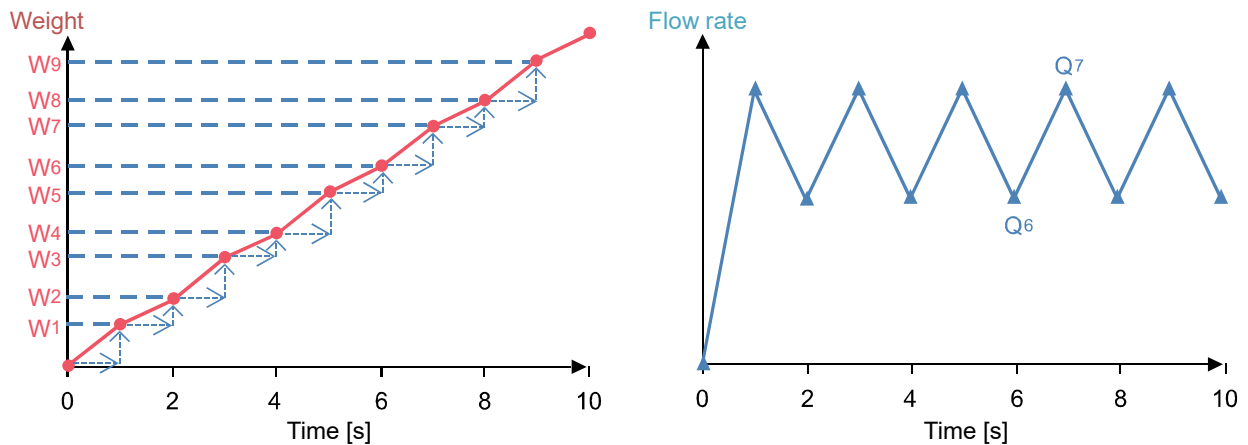
### 1-3. Examples of Manual Setting of Flow Rate Calculation Time (Ct)

The examples below show the affect of the flow rate calculation time setting on the flow rate value.

Inconstant flow rate



When the flow rate calculation time is 1 second.



Flow rate:

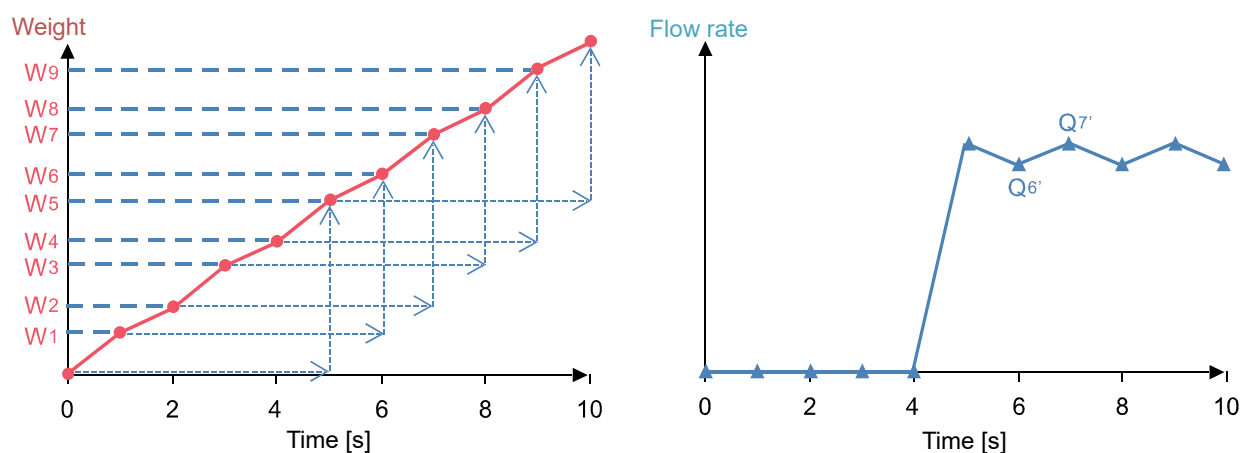
$$Q_6 = \frac{W_6 - W_5}{1}$$

$$Q_7 = \frac{W_7 - W_6}{1}$$

In this example the 1 second change in weight is the flow rate value.

Therefore, when the weighing value varies greatly, the flow rate value also fluctuates.

When the flow rate calculation time is 5 seconds.



Flow rate:  $Q_{6'} = \frac{W_6 - W_1}{5}$

$$Q_{7'} = \frac{W_7 - W_2}{5}$$

The flow rate per second is calculated from the change in weighing value over 5 seconds.  
Flow rate variation is lower compared with the 1 second flow rate calculation time.

- ※ When the flow rate calculation time is set to 5 seconds, the flow rate is displayed as "□" for 5 seconds from the start of weighing.

## 2. How to Use FRD Function

In order to use the FRD function, the function of the balance need to be changed.

The FRD function table is shown below.

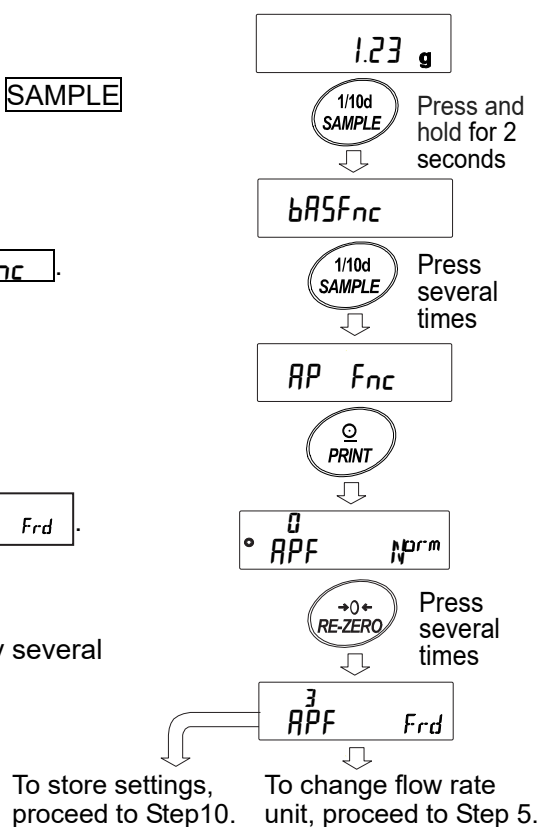
| Class                | Item                                          | Parameter | Description                                                  |                                                                                |
|----------------------|-----------------------------------------------|-----------|--------------------------------------------------------------|--------------------------------------------------------------------------------|
| bASFnC<br>:<br>USb   |                                               |           | See the GX-AE/GX-A/GF-A/GX-M/GF-M series instruction manual. |                                                                                |
| APFnC<br>Application | APF<br>Application mode                       | ■ 0       | Normal weighing mode                                         |                                                                                |
|                      |                                               | 1         | Weighing capacity indicator mode                             | Displays the relationship between load and weight as a percentage.             |
|                      |                                               | 2         | Statistical calculation mode                                 | Statistically calculates weighing values to display/output the result.         |
|                      |                                               | 3         | Flow measurement mode                                        | Calculates flow rate (change in weighing value for a period of time).          |
|                      |                                               | 4         | Gross, Net, Tare mode                                        | Can perform zero and tare separately.<br>Can output gross, net, and tare data. |
|                      | StAF<br>Statistical display output            |           | See the GX-AE/GX-A/GF-A/GX-M/GF-M series instruction manual. |                                                                                |
|                      | Frd Unit<br>Flow rate unit                    | ■ 0       | g/s (gram per second)                                        | Mass                                                                           |
|                      |                                               | 1         | g/m (gram per minute)                                        |                                                                                |
|                      |                                               | 2         | g/h (gram per hour)                                          |                                                                                |
|                      |                                               | 3         | mL/s (milliliter per second)                                 | Volume                                                                         |
|                      |                                               | 4         | mL/m (milliliter per minute)                                 |                                                                                |
|                      |                                               | 5         | mL/h (milliliter per hour)                                   |                                                                                |
|                      | Ct AUto<br>Calculation time automatic setting | ■ 0       | OFF                                                          | Can be set with the GX-AE/GX-A/GF-A software version 1.200 or later.           |
|                      |                                               | 1         | ON                                                           |                                                                                |
| MWFnC<br>:<br>CSin   |                                               |           | See the GX-AE/GX-A/GF-A/GX-M/GF-M series instruction manual. |                                                                                |

■ Factory setting

## 2-1. Switching to Flow Rate Measurement Mode

### Changing internal settings

- When the weighing display is shown, press and hold the **[SAMPLE]** key for 2 seconds until **bR5Fnc** appears.
- Press the **[SAMPLE]** key several times to display **AP Fnc**.
- Press the **[PRINT]** key to display **0 APF Norm**.
- Press the **[RE-ZERO]** key several times to display **3 APF Frd**.  
To change the flow rate unit, proceed to Step 5.  
To store the current settings, proceed to Step 10.  
To cancel the flow rate function, press the **[RE-ZERO]** key several times to return to **0 APF Norm**.



## 2-2. Changing Flow Rate Units

The default flow rate unit is g/s.

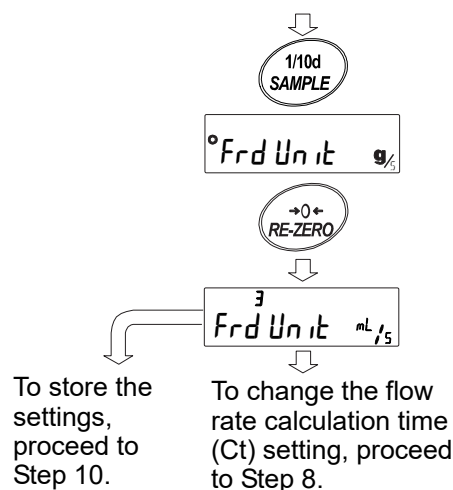
To change the flow rate unit, proceed from Step 5 below when **3 APF Frd** is displayed "2-1. Switching to Flow Rate Measurement Mode".

- Press the **[SAMPLE]** key to display **0 Frd Unit**.
- Press the **[RE-ZERO]** key to change to the desired parameter.

| Parameter | Contents                     |        |
|-----------|------------------------------|--------|
| 0         | g/s (gram per second)        | Mass   |
| 1         | g/m (gram per minute)        |        |
| 2         | g/h (gram per hour)          |        |
| 3         | mL/s (milliliter per second) | Volume |
| 4         | mL/m (milliliter per minute) |        |
| 5         | mL/h (milliliter per hour)   |        |

■ Factory setting.

- To change the flow rate calculation time (Ct) setting method, proceed to Step 8.  
To store the current settings, proceed to Step 10.  
If mL/s, mL/m, or mL/h is chosen, the density can be changed. The initial value is 1.0000 g/cm<sup>3</sup>.  
For details, refer to "2-4. Entering/Setting Density".



## 2-3. Setting the Flow Rate Calculation Time (Ct)

### 2-3-1. Switching between Manual/Automatic Settings

There are two ways to set the flow rate calculation time: automatically by the balance according to the flow rate value and manual selection of fixed values.

※ The automatically setting of the flow rate calculation time cannot be used with GX-AE/GX-A/GF-A software version 1.00 to 1.100. Manually select the flow rate calculation time. To check the software version of the balance, see "7. How to Check Software Version of Balance".

To switch between manual and automatic settings, perform the following operation. The default flow rate calculation time setting is manual (Ct AUTO "OFF").

Proceed from Step 8 below when  $\overset{3}{\text{Fr d Unit mL/s}}$  is displayed "2-2. Changing Flow Rate Units".

8. Press the **[SAMPLE]** key to display  $\overset{\circ}{\text{Ct AUTO}}$ .

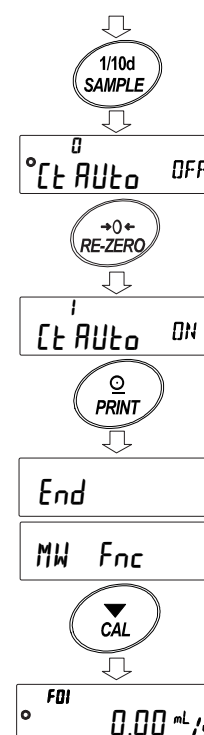
9. Press the **[RE-ZERO]** key to switch ON/OFF.

10. Press the **[PRINT]** key to store.

11. Press the **[CAL]** key to return to the weighing display.

If set to OFF, refer to "2-3-2. Manual Setting" to set the flow calculation time.

If set to ON, refer to "2-3-3. Automatic Setting" to set the flow rate calculation accuracy.



### 2-3-2. Manual Setting

When the manual setting is selected, the values shown in the table below can be set.

| Flow rate calculation time (Ct) |            |          |
|---------------------------------|------------|----------|
| Second [s]                      | Minute [m] | Hour [h] |
| 1                               | 1          | 1        |
| 2                               | 2          |          |
| 5                               | 5          |          |
| 10                              | 10         |          |
| 20                              | 20         |          |
| 30                              | 30         |          |

## Selecting the flow rate calculation time (Ct)

The flow rate calculation time can be changed by the following procedure.

1. When the weighing display is shown, press and hold the **MODE** key for 2 seconds until **Et 2 SEC** appears.

2. Calculation time can be changed by the following keys.  
Settings ranging from 1 second to 1 hour can be selected.

**RE-ZERO** (+) key ..Changes the flow rate calculation time.

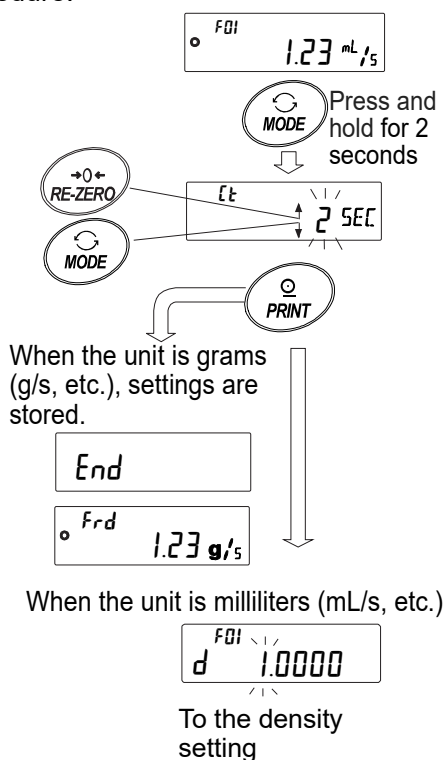
**MODE** (-) key .....Changes the flow rate calculation time.

**PRINT** key .....Stores the selected setting.

Proceeds to Step 3.

**CAL** key .....Returns to the weighing display or flow rate display without storing the set value.

3. If the flow rate unit is in grams (g/s, etc.) the weighing or flow rate display will appear. When the flow rate unit is milliliters (mL/s, etc.), the density setting display will appear.  
Refer to "2-4. Entering/Setting Density."



## General settings

- General standards of the flow rate value by model are as follows:

| Model in use   | Range of flow rate value (mL/m) |
|----------------|---------------------------------|
| 0.0001 g model | 0.001 ~ 10                      |
| 0.001 g model  | 0.01 ~ 100                      |
| 0.01 g model   | 0.1 ~ 1000                      |
| 0.1 g model    | 1 ~ 5000                        |

- ※ Depending on the type of sample to be measured, the above ranges may not apply.

- The general standard settings of flow rate value and flow rate calculation time by model in use:  
On the next page, the area marked in grey in each table shows the standard settings of the flow rate calculation time for various flow rates (mL/m).

\* If the flow rate value does not stabilize with the following settings, set a longer flow rate calculation time.

When the 0.0001 g model is used.

| Flow rate<br>(mL/min) | Priority to response ← |       |       |        | Ct setting |        | → Priority to accuracy |       |       |        |
|-----------------------|------------------------|-------|-------|--------|------------|--------|------------------------|-------|-------|--------|
|                       | 1 sec                  | 2 sec | 5 sec | 10 sec | 20 sec     | 30 sec | 1 min                  | 2 min | 5 min | 10 min |
| 0.001                 |                        |       |       |        |            |        |                        |       |       |        |
| 0.002                 |                        |       |       |        |            |        |                        |       |       |        |
| 0.005                 |                        |       |       |        |            |        |                        |       |       |        |
| 0.01                  |                        |       |       |        |            |        |                        |       |       |        |
| 0.02                  |                        |       |       |        |            |        |                        |       |       |        |
| 0.05                  |                        |       |       |        |            |        |                        |       |       |        |
| 0.1                   |                        |       |       |        |            |        |                        |       |       |        |
| 0.2                   |                        |       |       |        |            |        |                        |       |       |        |
| 0.5                   |                        |       |       |        |            |        |                        |       |       |        |
| 1                     |                        |       |       |        |            |        |                        |       |       |        |
| 2                     |                        |       |       |        |            |        |                        |       |       |        |
| 5                     |                        |       |       |        |            |        |                        |       |       |        |
| 10                    |                        |       |       |        |            |        |                        |       |       |        |

**(Example)** To measure the flow rate of 0.02 mL/m, set the flow rate calculation time to 30 seconds and 5 minutes.

When the 0.001 g model is used.

| Flow rate<br>(mL/min) | Priority to response ← |       |       |        | Ct setting |        | → Priority to accuracy |       |       |        |
|-----------------------|------------------------|-------|-------|--------|------------|--------|------------------------|-------|-------|--------|
|                       | 1 sec                  | 2 sec | 5 sec | 10 sec | 20 sec     | 30 sec | 1 min                  | 2 min | 5 min | 10 min |
| 0.01                  |                        |       |       |        |            |        |                        |       |       |        |
| 0.02                  |                        |       |       |        |            |        |                        |       |       |        |
| 0.05                  |                        |       |       |        |            |        |                        |       |       |        |
| 0.1                   |                        |       |       |        |            |        |                        |       |       |        |
| 0.2                   |                        |       |       |        |            |        |                        |       |       |        |
| 0.5                   |                        |       |       |        |            |        |                        |       |       |        |
| 1                     |                        |       |       |        |            |        |                        |       |       |        |
| 2                     |                        |       |       |        |            |        |                        |       |       |        |
| 5                     |                        |       |       |        |            |        |                        |       |       |        |
| 10                    |                        |       |       |        |            |        |                        |       |       |        |
| 20                    |                        |       |       |        |            |        |                        |       |       |        |
| 50                    |                        |       |       |        |            |        |                        |       |       |        |
| 100                   |                        |       |       |        |            |        |                        |       |       |        |

**(Example)** To measure the flow rate of 0.02 mL/m, set the flow rate calculation time to 5 minutes or longer.

When the 0.01 g model is used.

| Flow rate<br>(mL/min) | Priority to response ← |       |       |        | Ct setting |        | → Priority to accuracy |       |       |        |
|-----------------------|------------------------|-------|-------|--------|------------|--------|------------------------|-------|-------|--------|
|                       | 1 sec                  | 2 sec | 5 sec | 10 sec | 20 sec     | 30 sec | 1 min                  | 2 min | 5 min | 10 min |
| 0.1                   |                        |       |       |        |            |        |                        |       |       |        |
| 0.2                   |                        |       |       |        |            |        |                        |       |       |        |
| 0.5                   |                        |       |       |        |            |        |                        |       |       |        |
| 1                     |                        |       |       |        |            |        |                        |       |       |        |
| 2                     |                        |       |       |        |            |        |                        |       |       |        |
| 5                     |                        |       |       |        |            |        |                        |       |       |        |
| 10                    |                        |       |       |        |            |        |                        |       |       |        |
| 20                    |                        |       |       |        |            |        |                        |       |       |        |
| 50                    |                        |       |       |        |            |        |                        |       |       |        |
| 100                   |                        |       |       |        |            |        |                        |       |       |        |
| 200                   |                        |       |       |        |            |        |                        |       |       |        |
| 500                   |                        |       |       |        |            |        |                        |       |       |        |
| 1000                  |                        |       |       |        |            |        |                        |       |       |        |

**(Example)** To measure the flow rate of 20 mL/m, set the flow rate calculation time between 5 seconds and 30 seconds.

When the 0.1 g model is used.

| Flow rate | Priority to response ← |       |       |        | Ct setting |        |       | → Priority to accuracy |       |        |
|-----------|------------------------|-------|-------|--------|------------|--------|-------|------------------------|-------|--------|
| (mL/min)  | 1 sec                  | 2 sec | 5 sec | 10 sec | 20 sec     | 30 sec | 1 min | 2 min                  | 5 min | 10 min |
| 1         |                        |       |       |        |            |        |       |                        |       |        |
| 2         |                        |       |       |        |            |        |       |                        |       |        |
| 5         |                        |       |       |        |            |        |       |                        |       |        |
| 10        |                        |       |       |        |            |        |       |                        |       |        |
| 20        |                        |       |       |        |            |        |       |                        |       |        |
| 50        |                        |       |       |        |            |        |       |                        |       |        |
| 100       |                        |       |       |        |            |        |       |                        |       |        |
| 200       |                        |       |       |        |            |        |       |                        |       |        |
| 500       |                        |       |       |        |            |        |       |                        |       |        |
| 1000      |                        |       |       |        |            |        |       |                        |       |        |
| 2000      |                        |       |       |        |            |        |       |                        |       |        |
| 5000      |                        |       |       |        |            |        |       |                        |       |        |

**(Example)** To measure the flow rate of 2000 mL/m, set the flow rate calculation time between 1 second and 5 seconds.

### 2-3-3. Automatic Setting

Flow rate measurement can be performed without having to manually select the flow rate calculation time (Ct) for the flow rate.

The flow rate calculation time will be determined between 1 second and 60 seconds according to the flow rate value being measured.

With automatic setting, after stored data is initialized the flow rate can be calculated in 1 second from the start of weighing.

Additionally, flow rate calculation accuracy can be selected from three levels: "Priority to accuracy (resolution 500)", "Standard setting (resolution 200)", and "Priority to response (resolution 50)".

※ If the flow rate value does not stabilize after 1 minute has elapsed from the start of weighing, set the accuracy setting to "Priority to accuracy (resolution 500)", or set "Ct Auto" to "0" and set the flow rate calculation time manually to 2 minutes or longer.

#### Method of selecting flow rate calculation accuracy

The flow rate calculation accuracy can be changed by performing the following procedure.

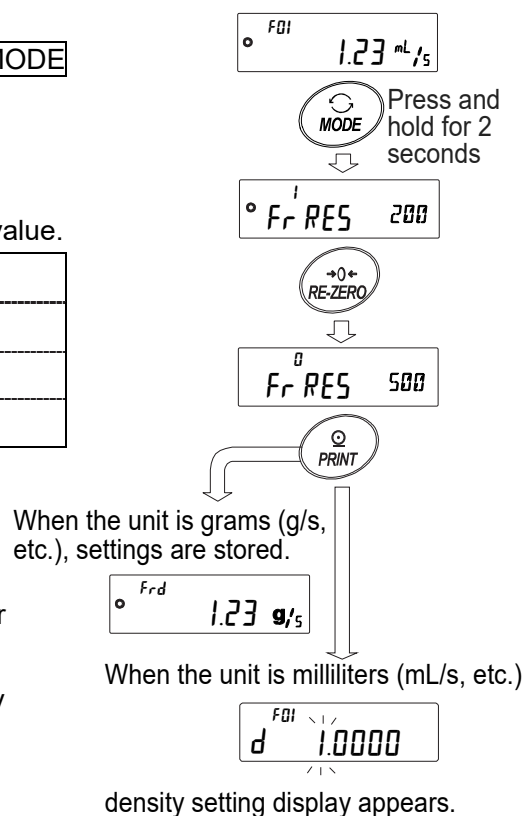
1. When the weighing display is shown, press and hold the **MODE** key for 2 seconds until **Fr RES** appears.

2. Press the **RE-ZERO** key to change to the desired setting value.

| Setting value | Description                           |
|---------------|---------------------------------------|
| 0             | Priority to accuracy (resolution 500) |
| 1             | Standard setting (resolution 200)     |
| 2             | Priority to response (resolution 50)  |

■ Factory setting

3. Press the **PRINT** key to store the setting.  
When the flow rate unit is grams (g/s, etc.), the weighing or flow rate display will appear.  
When the flow rate unit is milliliters (mL/s, etc.), the density setting display will appear.  
Refer to "2-4. Entering/Setting Density."



## 2-3-4. Flow Rate Display Update Timing

The display update timing is the interval at which the flow rate value displayed on the balance is updated.

### When the flow rate calculation time is set automatically.

The display update timing of the flow rate is 1 second or 2 seconds.

### When the flow rate calculation time is set manually.

The relationship between flow rate calculation time and flow rate update timing is as follows.

| Flow rate calculation time (Ct) | Display update | Flow rate calculation time (Ct) | Display update | Flow rate calculation time (Ct) | Display update |
|---------------------------------|----------------|---------------------------------|----------------|---------------------------------|----------------|
| 1 second                        | 1 second       | 30 seconds                      | 1 second       | 20 minutes                      | 10 seconds     |
| 2 seconds                       | 1 second       | 1 minute                        | 1 second       | 30 minutes                      | 15 seconds     |
| 5 seconds                       | 1 second       | 2 minutes                       | 1 second       | 1 hour                          | 30 seconds     |
| 10 seconds                      | 1 second       | 5 minutes                       | 3 seconds      |                                 |                |
| 20 seconds                      | 1 second       | 10 minutes                      | 5 seconds      |                                 |                |

## 2-4. Entering/Setting Density

When the flow rate unit is set to "mL/s," "mL/m," or "mL/h" (internal setting **Fr Unit** is "3", "4", or "5"), density can be entered. Entering density enables conversion of mass to volume and calculation of the flow rate value in mL.

A maximum of 10 densities can be saved to F01 to F10. Density can be set in advance for use with different measurement samples.

### Entry of density

After setting the flow rate calculation time or flow rate calculation accuracy, it is possible to input the density.

The selected density memory slot can be changed. Regardless of the density number, the initial value is 1.0000 g/cm<sup>3</sup>.

- When the weighing display is shown, press and hold the **MODE** key for 2 seconds, select the flow rate calculation time value or select the flow rate calculation accuracy, and press the **PRINT** key to enter.

- Density setting display **d 1.0000** is displayed.

- The density can be changed with the following keys.

It can be set in the range from 0.0001 g/cm<sup>3</sup> to 9.9999 g/cm<sup>3</sup>.

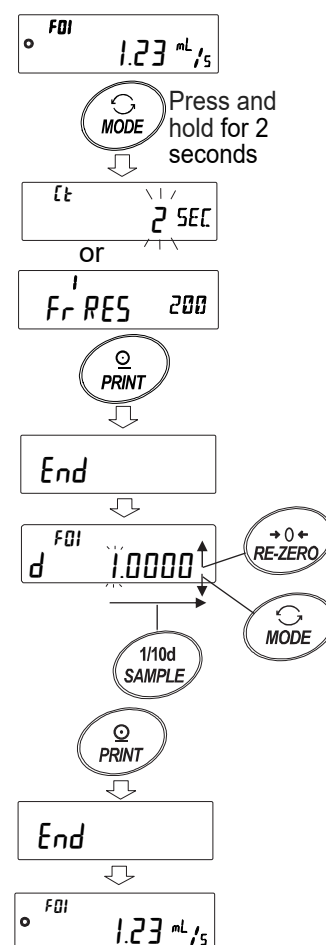
**RE-ZERO** (+) key ..... Changes the value of the blinking digit.

**MODE** (-) key ..... Changes the value of the blinking digit.

**SAMPLE** key ..... Shifts the blinking digit.

**PRINT** key ..... Stores the set value and returns to the weighing display or flow rate display.

**CAL** key ..... Without storing the set value, returns to the weighing display or flow rate display.



## Selection of the density memory slot

Up to 10 densities can be registered when the flow rate unit is in milliliters (mL).

To register a new density, select unused density memory slot and then register according to the density input procedure.

1. When the weighing display is shown, press and hold the **PRINT** key for 2 seconds until **d \* . \* \* \* \*** is displayed.

The blinking **f \* \*** shows the current density memory slot, and **d \* . \* \* \* \*** shows the registered density value.

2. The density memory slot can be changed with the following keys.

The setting range is from F01 to F10.

**RE-ZERO** (+) key ..... Changes the density memory slot.

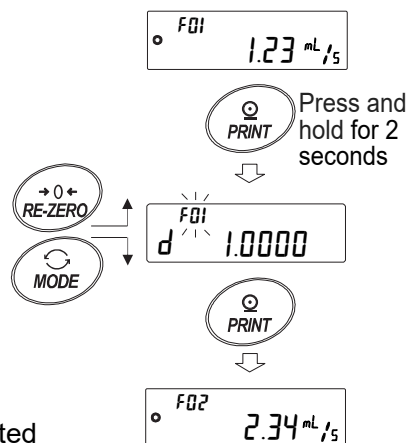
**MODE** (-) key ..... Changes the density memory slot.

**PRINT** key ..... Reads out the density stored in the selected density memory slot and returns to the weighing or flow rate display.

**CAL** key ..... Returns to the weighing or flow rate display without reading the density stored in the selected density memory slot.

※ **f \* \*** indicates the selected density memory slot.

**d \* . \* \* \* \*** indicates the registered density value.



## 2-5. Switching Displays

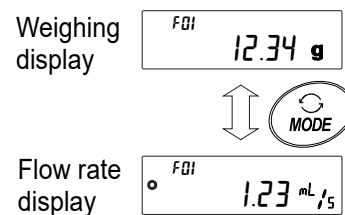
### Switching between the flow rate and weighing displays

In flow rate measurement mode, **Frd** or **f \* \*** is displayed and the unit is grams.

Press the **MODE** key to switch between the flow rate display and the weighing display.

※ **f \* \*** indicates the selected density memory slot.

Range: F01 ~ F10

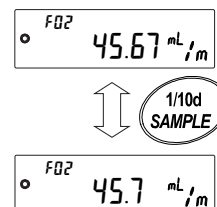


### Toggling readability

To turn ON/OFF of the readability setting, press the **SAMPLE** key.

When OFF, there will be less variation in flow rate values.

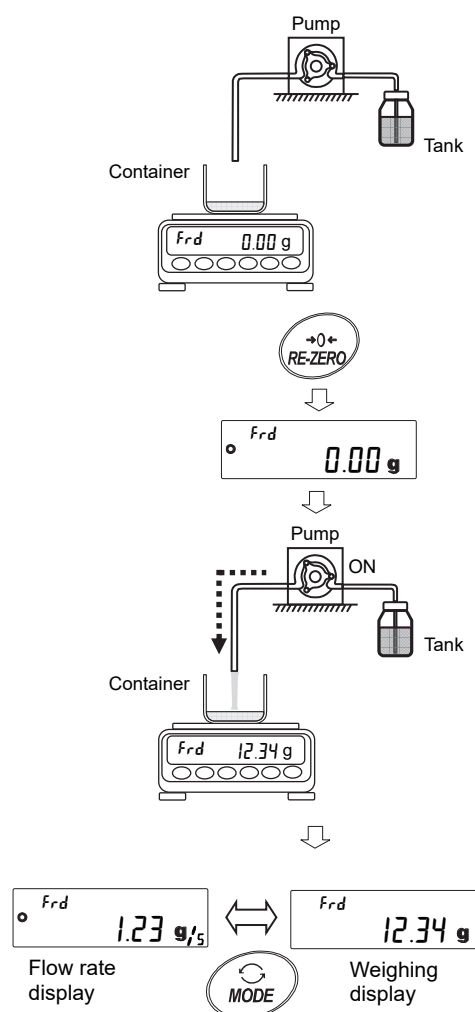
※ To reduce the variation of the flow rate without changing the display digit, change the flow rate calculation time setting.



## 3. Example of Use

### 3-1. Example of Flow Rate Measurement with Pump

1. Prepare the necessary equipment, such as pumps, sample fluids and containers. Confirm that the balance is in the flow rate measurement mode.
2. Press the **RE-ZERO** key of the balance to set the weighing display to zero.
3. Turn on the pump and start measurement.
4. By switching the displays with the **MODE** key, the flow rate value and the weighing value can be checked.
5. If the flow rate does not stabilize, turn off the readability setting with the **SAMPLE** key or set a longer flow rate calculation time (Ct).



## 4. Using Comparator

When the FRD function is used with a comparator, either weighing value (in grams) or flow rate value can be chosen as a comparison target.

The setting can be changed with "flow rate comparator [P-Frd]" in "Comparator [P Fnc]".

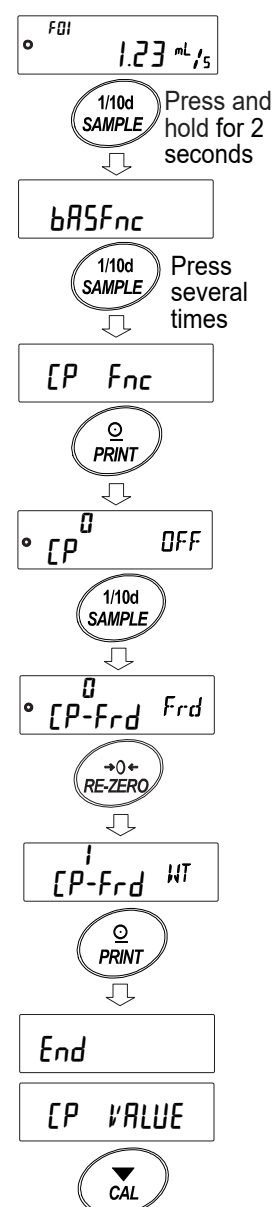
The default setting is comparison by flow rate value.

If the optional GXA-04 or GXM-04 are used, contact output of the comparison result can be performed.

For details about usage of the comparator functions, refer to the instruction manual of the balance.

### 4-1. Changing Comparison Target Value

1. When the weighing display is shown, press and hold the **[SAMPLE]** key for 2 seconds until **bASFnc** is displayed.
2. Press the **[SAMPLE]** key several times to display **[P Fnc]**.
3. Press the **[PRINT]** key to display **[P<sup>0</sup> OFF]**.
4. Press the **[SAMPLE]** key several times to display **[P-Frd]**.
5. Press the **[RE-ZERO]** key to switch *Frd* (comparison by flow rate value) to *WT* (comparison by weighing value).
6. Press the **[PRINT]** key to store.  
(To cancel, press the **[CAL]** key.)
7. To return to the weighing display, press the **[CAL]** key.



- ※ Compare the values displayed on the balance with GX-AE/GX-A/GF-A software version 1.00 to 1.100. Manually select the flow rate calculation time.  
Therefore, when using a comparator with a weighing value, the balances display must be the weighing value.  
If you switch the display in the middle, the comparison target will change.  
To check the software version of the balance, see "7. How to Check Software Version of Balance".

## 4-2. Example of Using Comparator

Filling 100 g with the contact output of the GXA-04 or GXM-04 and the pump.

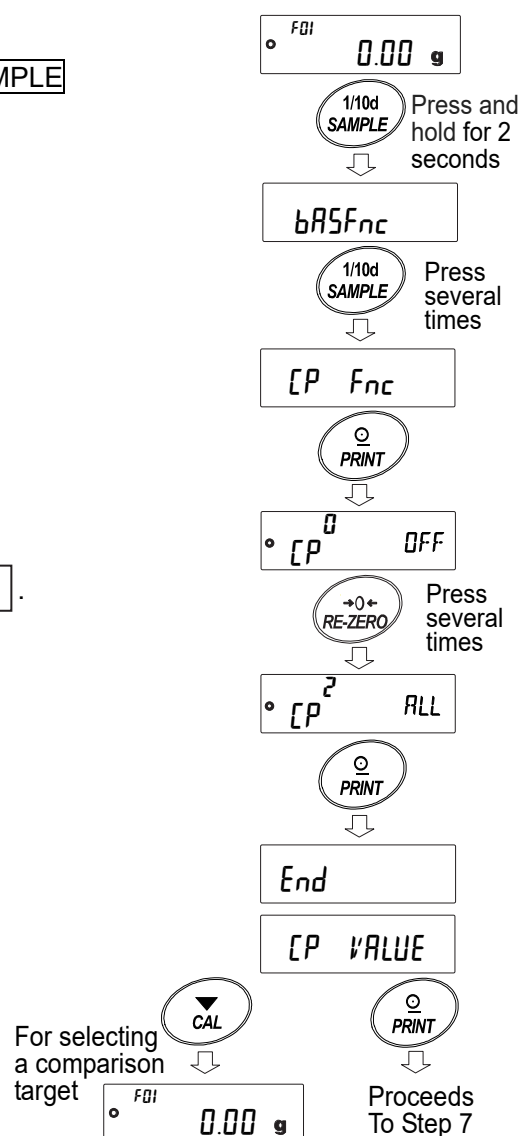
(When the weighing value reaches 100 g, HI contact output from the balance stops the pump.)

- ※ Make sure the pump is equipped with a contact input.
- ※ Refer to the pump instruction manual for details on wiring the cables for the GXA-04 or GXM-04 and the pump. (Wire HI output of GXA-04 or GXM-04 with the stop line of the pump.)

### Set "[P" to "2" in the setting "[P Fnc".

1. When the weighing display is shown, press and hold the **[SAMPLE]** key for 2 seconds until **bASFnC** is displayed.
2. Press the **[SAMPLE]** key several times to display **[P-Fnc**.
3. Press the **[PRINT]** key to display **[P<sup>0</sup> OFF**.
4. Press the **[RE-ZERO]** key several times to display **[P<sup>2</sup> ALL**.
5. Press the **[PRINT]** key to store.
6. **[P VALUE]** (comparator threshold) is displayed.  
Press the **[PRINT]** key.

To select a new comparison target (weighing value/flow rate value), press the **[CAL]** key to return to the weighing display and follow the procedure in "4-1 Changing Comparison Target Values".



## Entering a HI value

7. When **[CP HI]** is displayed, press the **[PRINT]** key.

8. The current value is displayed. (All lights on)

9. If the setting does not need to be changed, press the **[PRINT]** key or **[CAL]** key to proceed to Step 11.

10. To change the setting value, press the **[RE-ZERO]** key and perform registration with the following keys.

**[SAMPLE]** key ..... Shifts the blinking digit.

**[RE-ZERO]** key ..... Changes the value of the blinking digit.

**[MODE]** key ..... Changes the sign (+,-).

**[PRINT]** key ..... Registers and proceeds to Step 11.

**[CAL]** key ..... Cancels and proceeds to Step 11.

**(Example)** Set **[CP HI]** to 100 g and press the **[PRINT]** key.

11. Press the **[CAL]** key twice to return to the weighing display.

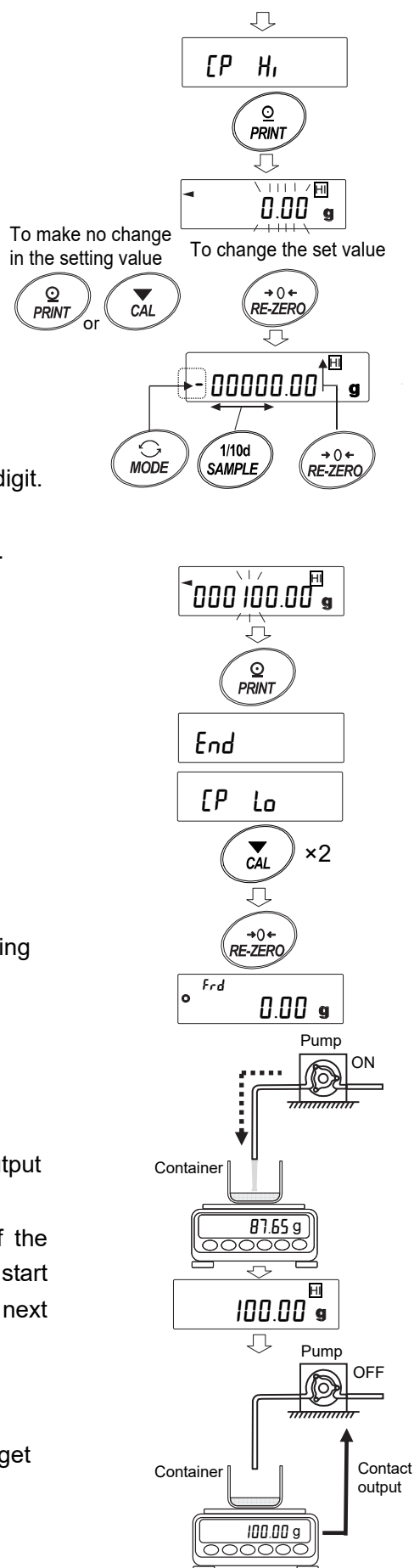
12. Press the **[RE-ZERO]** key on the balance to return the weighing value to zero.

Turn on the pump and start measurement.

13. When 100 g is reached, the balance generates a contact output to stop the pump.

※ In this state, if entering the internal setting or turning off the display, the contact output will be off and the pump may start again. Please turn off the pump before performing the next procedure.

14. Depending on the settings of the balance and pump, the target value may be exceeded. In that case, it can be adjusted by setting a smaller value.



## 5. Using Analog Voltage Output

Using the optional GXA-06 or GXM-06 analog voltage output for the GX-A/GF-A or GX-M/GF-M series allows the flow rate value to be output as analog voltage.

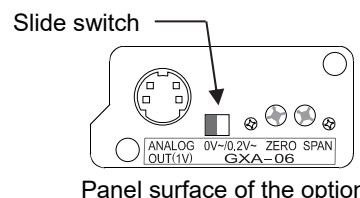
With this option, FRD mode operates differently than the normal weighing mode.

- Only flow rate value can be output as analog voltage.
- "Analog output method  $R_n$ " only supports two-digit output "0" or three-digit output "1".  
When net full scale output "2" or gross full scale "3" is selected, the output of analog voltage is always 0 V.

For details about the analog voltage output setting, refer to the instruction manual of the optional GXA-06 or GXM-06 analog voltage output for the GX-A/GF-A or GX-M/GF-M series.

### 5-1. Example of Using Analog Voltage Output

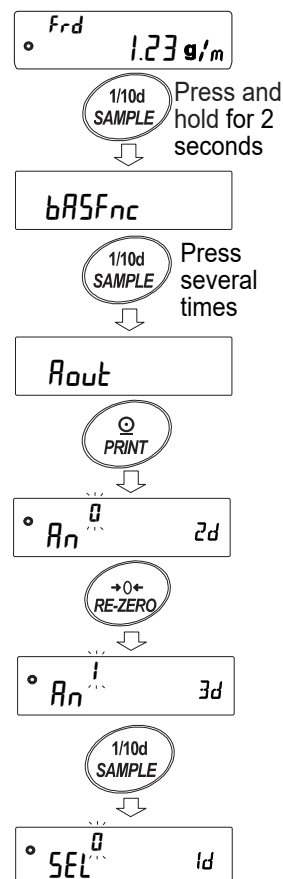
- ※ Install the GXA-06 or GXM-06 on the balance.
- ※ Switch the slide switch on the option panel to select the voltage output range. (0 - 1 V or 0.2 - 1 V)
- ※ Perform fine adjustment of the voltage output if necessary.



#### Changing the internal settings

In three-digit output mode, when the readability setting is configured to display the second digit:

1. When the weighing display is shown, press and hold the **SAMPLE** key for 2 seconds until the internal setting mode **bR5Fnc** appears.
2. Press the **SAMPLE** key several times to display **Rout**.
3. Press the **PRINT** key to display **Rn<sup>0</sup> 2d**.
4. Press the **RE-ZERO** key several times to change to three-digit mode **Rn<sup>1</sup> 3d**.
5. Press the **SAMPLE** key to display **SEL<sup>0</sup> 1d**.



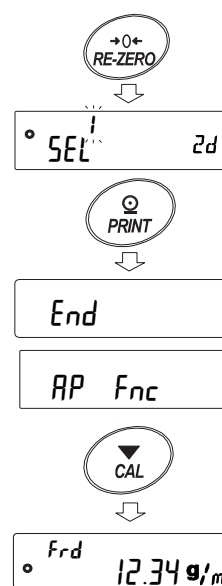
6. Press the **RE-ZERO** key to change the readability setting to display the second digit

5EL<sup>1</sup> 2d

7. Press the **PRINT** key to store.  
(To cancel, press the **CAL** key.)

8. Press the **CAL** key to return to the weighing display.

9. When the flow rate value is 12.34 g/m, the voltage output is 0.123 V (0 - 1 V), 0.298 V (0.2 - 1 V).



→0.123V (0 - 1V)  
→0.298V (0.2 - 1V)

## 6. Commands

The specified commands sent from a PC to the balance can be used to request weighing data, operate the keys, change the settings values and so on. To send a command to the balance, add a terminator (<CR> <LF> or <CR>, in internal setting [rLF]) to the command character string.

### Commands to request weighing data and flow rate data

| Command characters | Description/Example of response                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Q                  | Requests the current weighing data displayed on the balance.<br>Response example: ST, +000000.09 g or FL, +00010.00 g/s             |
| QW                 | Requests the current weighing data.<br>Response example: ST, +00010.00 g                                                            |
| QF                 | Requests the current flow rate data.<br>Response example: FL, +00010.00 g/s                                                         |
| QWF                | Requests the current weighing data and flow rate data after stabilization.<br>Response example: US, +000000.02 g, FL, +00000.01 g/s |

※ When the flow rate is excessive, the output may not be made correctly. In this case, please change the flow rate unit and reduce the number of digit.

└ Space, ASCII20h

### Commands to set the parameters (Enter the number to be set in place of \*)

| Command characters        | Description/Example of command                                                                                                                                                                    |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CT : * * s<br>Note 1)     | Changes the flow rate calculation time (Ct).<br>Example: Set to 5 seconds ... CT: 05 s<br>to 30 minutes ... CT: 30 m to 1 hour ... CT: 01 h                                                       |
| FN : * *                  | Changes the density memory slot.<br>Enter a number from 01 to 10 in place of * *.<br>Example: Change the density memory slot to 05 ... FN: 05                                                     |
| FD * . * * * *<br>Note 2) | Sets the density value of the currently selected density memory slot.<br>Example: Set the density to 0.9969 g/cm <sup>3</sup> ... FD: 0.9969                                                      |
| FD : ○ ○ ; * . * * * *    | Sets the density value of a specified density memory slot.<br>Example: Set the density value of density memory slot 03 to 0.9971 g/cm <sup>3</sup> ... FD: 03 ; 0.9971                            |
| FA : * *<br>Note 3)       | Sets the flow rate calculation accuracy for the automatic setting of the flow rate calculation time (Ct).<br>Example: Set the flow rate calculation accuracy to "Priority to response" ... FA: 02 |

Note 1) The numeric values that can be set with "\* \*" of the "CT: \* \* s" command are as follows.  
01, 02, 05, 10, 20, 30

Note 2) Can be set with the GX-AE/GX-A/GF-A software version 1.220 or later.

Note 3) Can be set with the GX-AE/GX-A/GF-A software version 1.211 or later.

To check the software version of the balance, see "7. How to Check Software Version of Balance".

## Commands to check the parameters

| Command characters | Description/Example of response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ?CT                | Requests the flow rate calculation time (Ct).<br>Response example: <span style="border: 1px solid black; padding: 0 2px;">C</span> <span style="border: 1px solid black; padding: 0 2px;">T</span> , <span style="border: 1px solid black; padding: 0 2px;">1</span> <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">m</span> <span style="border: 1px solid black; padding: 0 2px;">i</span> <span style="border: 1px solid black; padding: 0 2px;">n</span><br>... Flow rate calculation time (Ct) is 10 minutes.                                                                                                                                                                                                                                                                                                  |
| ?FN<br>Note 3)     | Requests the currently selected density memory slot.<br>Response example: <span style="border: 1px solid black; padding: 0 2px;">F</span> <span style="border: 1px solid black; padding: 0 2px;">D</span> , <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">5</span> ... The density memory slot is 05.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| ?FD                | Requests the density value stored in the currently selected density memory slot.<br>Response example: <span style="border: 1px solid black; padding: 0 2px;">F</span> <span style="border: 1px solid black; padding: 0 2px;">D</span> , <span style="border: 1px solid black; padding: 0 2px;">1</span> <span style="border: 1px solid black; padding: 0 2px;">.</span> <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">0</span> ... The density is 1.0000 g/cm <sup>3</sup> .                                                                                                                                                                                                       |
| ?FD * *            | Requests the density value stored in density memory slot * *.<br>Enter the number from 01 to 10 in place of * *.<br>Response example: <span style="border: 1px solid black; padding: 0 2px;">F</span> <span style="border: 1px solid black; padding: 0 2px;">D</span> , <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">5</span> ; <span style="border: 1px solid black; padding: 0 2px;">1</span> <span style="border: 1px solid black; padding: 0 2px;">.</span> <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">0</span><br>... The density stored in density memory slot 05 is 1.0000 g/cm <sup>3</sup> . |
| ?FA<br>Note 3)     | Requests the flow rate calculation accuracy for the automatic setting of the flow rate calculation time (Ct).<br>Response example: <span style="border: 1px solid black; padding: 0 2px;">F</span> <span style="border: 1px solid black; padding: 0 2px;">A</span> , <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">1</span><br>... The flow rate calculation accuracy is the standard setting.                                                                                                                                                                                                                                                                                                                                                                                                                     |

Note 3) Can be set with the GX-AE/GX-A/GF-A software version 1.211 or later.

To check the software version of the balance, see "7. How to Check Software Version of Balance."

The commands that can be used with the FRD function are described here.

For other commands to operate the keys, refer to the communication manual located on our website

<https://www.aandd.jp>.

## 7. How to Check Software Version of Balance

Specifications may vary depending on the software version of the balance.

The software version can be checked by the following procedure.

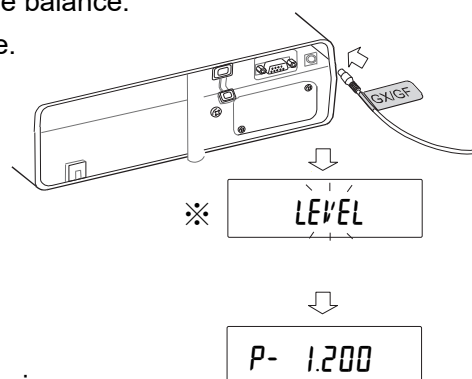
1 Reinsert the AC adapter of the balance.

2 The **LEVEL** display flashes.

※ This is no **LEVEL** indicator in the GX-M/GF-M series.

3 Then, **P- \* . \* \* \* \*** is displayed.

The number shown in place of “\* . \* \* \* \*” is the software version.



## 8. Restrictions on FRD

The following functions cannot be used at the same time as the FRD function.

- ▣ Statistical calculation function
- ▣ Data memory function
- ▣ Gross net tare function
- ▣ Output of "heading" and "end" of the GLP output function
- ▣ Environment setting/Self-check function
- ▣ Displaying of units other than g (measured value) and flow rate units ([g/s] [g/m] [g/h] [mL/s] [mL/m] [mL/h])
- ▣ Changing "Response characteristic [ond]" by holding down the **MODE** key

## 9. Q & A on FRD

| Question |                                                                          | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.       | I want to measure flow rate without worrying about complicated settings. | Switch the balance to the flow rate measurement mode, set the flow rate calculation time (Ct) to automatic (" <b>Flow Rate</b> " to ON) and measure.<br>(See "2-1. Switching to Flow Rate Measurement Mode" and "2-3-1. Switching between Manual/Automatic Settings")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 2.       | The flow rate does not stabilize.                                        | Press the <b>SAMPLE</b> key to reduce the number of digits displayed with the readability setting.<br>(See "2-5. Switching Displays"). Or, set a longer flow rate calculation time (Ct) manually.<br>(Refer to "2-3-1 Switching between Manual/Automatic Settings" and "2-3-2. Manual Setting")                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 3.       | I want to register multiple densities.                                   | Follow the steps below to register one by one.<br><div style="display: flex; align-items: flex-start;"> <div style="flex: 1;"> <ol style="list-style-type: none"> <li>1. Select the density memory slot to register a density.</li> <li>2. Enter the density and set.</li> <li>3. Repeat 1 and 2 above to register additional densities.<br/>(See "2-4. Entering/Setting Density")</li> </ol> </div> <div style="flex: 1; text-align: right;"> <p>The diagram shows the process of registering a density. It starts with a weighing display showing 'FB1 1.23 mL/s'. A 'PRINT' key is pressed and held for 2 seconds. This leads to a 'Determination of density' screen showing '10000'. Finally, the display shows 'FB2 2.34 mL/s'.</p> </div> </div> |





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