

# AD-4402

## INSTRUCTION MANUAL

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### Multi Function Weighing Indicator

The logo for A&D Company, Limited, featuring the letters 'A', '&', and 'D' in a bold, stylized, black font. The 'A' and 'D' are connected to the ampersand, and the entire logo is rendered in a thick, blocky typeface.

A&D Company, Limited

WM : PD4000243



This is a hazard alert mark.



This mark informs you about the operation of the product.

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# 1. Compliance

## 1.1.1. Compliance with FCC rules

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

## 1.1.2. Compliance with European Directive

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**CE** This appliance complies with the statutory EMC (Electromagnetic Compatibility) directive 89/336/EEC and the Low Voltage Directive 73/23/EEC for safety of electrical equipment designed for certain voltages.

Note: The displayed value may be adversely affected under extreme electromagnetic influences.



## 2. Outline and Features

- The AD-4402 is the multi-function weighing indicator for batch weighing and filling weighing. This indicator has control I/O for weighing sequence and options.
- Large display  
This indicator has blue vacuum fluorescent display (VFD).  
The character height of the main display is 18 mm.  
Current weighing data, material names, comparison references and accumulation data are displayed in the same time.  
Material names and recipe
- Operation guidance  
Message that assists current operation are displayed in the front panel, anyone could operate the indicator without instruction manuals.
- Full weighing sequences  
The AD-4402 can combine plural materials and the plain mixture function is equipped.  
Filling nozzle and agitation sequence is equipped.  
Using the forecast control function, the flow control can be performed that is equivalent to A/D conversion of 1000 times per second.
- RS-485 interface  
32 indicators can be connected to a programmable controller or a personal computer.  
These protocols are according to public formats.
- Options  
There are built-in options of AC 250 V direct drive relay, serial interface, parallel interface, analog output and etc.  
There are built-in options of CC-Link, DeviceNet, PROFIBUS.  
There are three expansion slots to install options.
- Check mode during operation  
The monitor mode can confirm system situation during operation.  
The test mode can test Input / Output interface.  
Even if there is not monitor instrument, interface can be confirmed.
- Recipes and raw material data stored in the indicator  
The recipe is described a combination of material codes and weights.  
The material code is described the weighing sequence parameters for a raw material.
- Water-resistant panel  
The classification code of the front panel is equivalent to IP-65 of IEC 529 using accessory rubber packing. The "IP-65" code is explained as follows:  
IP: International Protection.  
6: Against ingress of solid foreign objects.  
Dust-tight. No ingress of dust.  
5: Against ingress of water with harmful effects.  
Protected against water jets (no powerful jets). Water projected in jets against the enclosure from any direction shall have no harmful effects.



## 2.1. Precaution

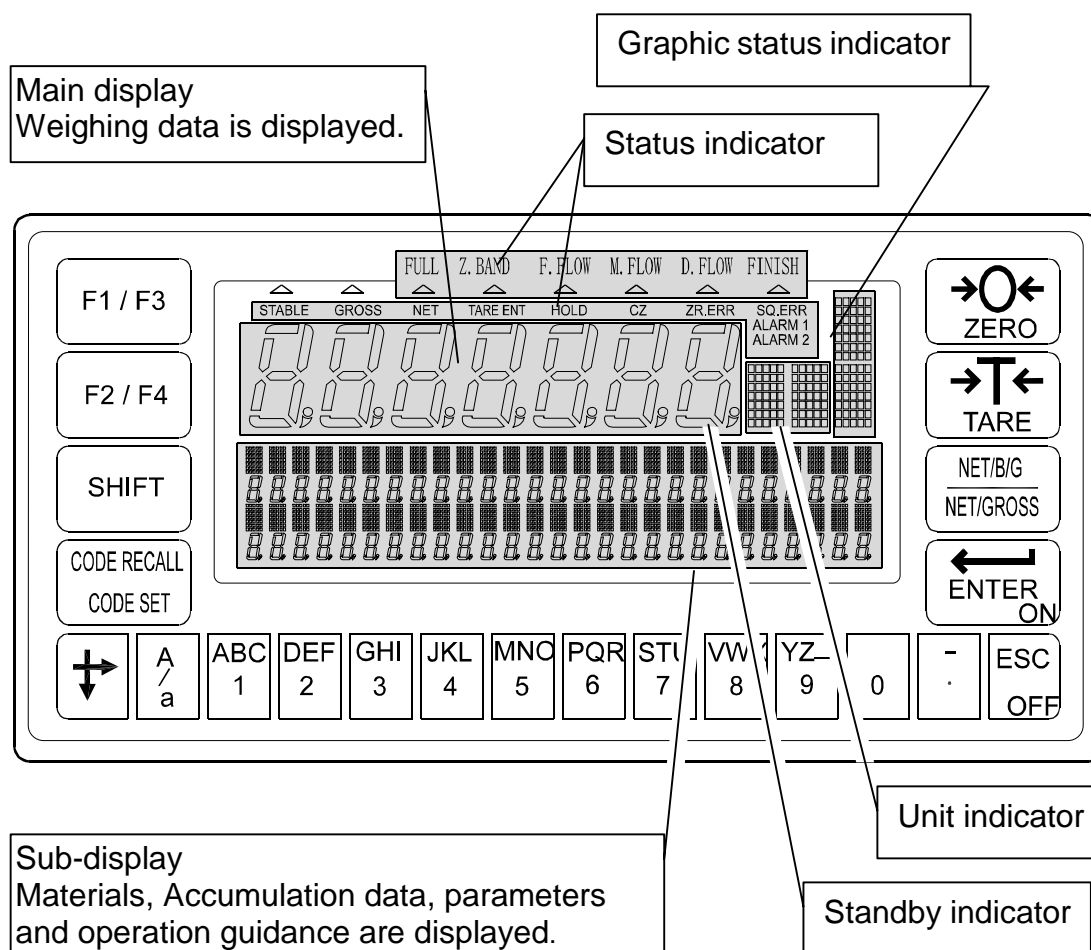
Before any use, confirm the following articles for the safe operation.

- Grounding the indicator  
Ground the indicator certainly. The earth terminal ⊕ is the rear panel.  
Separate this earth line from other ground line like a motor, inverter or a power source.  
Unless the indicator is grounded, it may cause to receive an electric shock, be happen operation error or catch fire
- Use adaptable power cord  
Confirm the AC voltage and current of the power cord. If the voltage range of cord is lower than power line voltage, it may cause of a leak or catching fire. Use compression terminals to connect the power cord to the terminal of the rear panel.
- Fuse  
The fuse is installed to prevent the indicator from catching fire.  
The indicator is equipped many safety circuits. Therefore, the fuse is not broken in normal operation. If the fuse is broken, do not replace the fuse and contact your local or A&D dealer. This trouble may cause of an electric discharge of thunder.
- Splashing water  
The indicator is not water-resistant. When the indicator is mounted to panel with accessory rubber, the front panel is equivalent to IP-65.
- Flammability gas  
Do not install the indicator in any flammable gas.
- Radiation of the indicator  
Space out instruments to radiate heat sufficiently.
- Removing the cover  
Remove the power cord terminals in the side of the power source before removing the cover to avoid receiving an electric shock.  
Do not touch the internal circuit within 10 seconds after turning off the indicator because of receiving an electric shock.





## 2.2. Front Panel



### 2.2.1. Keys

F1 / F3

Pressing this key, the key works as the **F1** key.  
Pressing the **SHIFT** key and this key, the key works as the **F3** key.

F2 / F4

Pressing this key, the key works as the **F2** key.  
Pressing the **SHIFT** key and this key, the key works as the **F4** key.

SHIFT

The key to select a function of the key.

CODE RECALL  
CODE SET

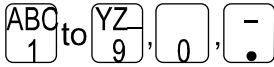
The key to open the material code or recipe code.  
Pressing the **SHIFT** key and this key, the key works as the material code edit key.  
Pressing the **ENTER** key and this key, the key works as the recipe code edit key.



The key to move the cursor or scroll the function number.  
Press and hold the **SHIFT** key and press the key is used to decrease the code number.



The key to select alphabetical keys, upper keys, lower keys or numerical keys.



**Alphanumeric** keys.



The escape key. Pressing and holding the key above three seconds in normal weighing mode, the display is turned off (standby mode). The **ESC** key is used to undo the last key and to return to the last mode.



The **ENTER** key for parameter settings.  
The key to be turned on the display.  
Pressing the key and this key, the key works as the menu key.



The key to select net or gross



The tare key. The key is displayed the net value that subtracts tare weight from a current weighing.



The zero key to zero current weighing display.

## 2.2.2. Symbols

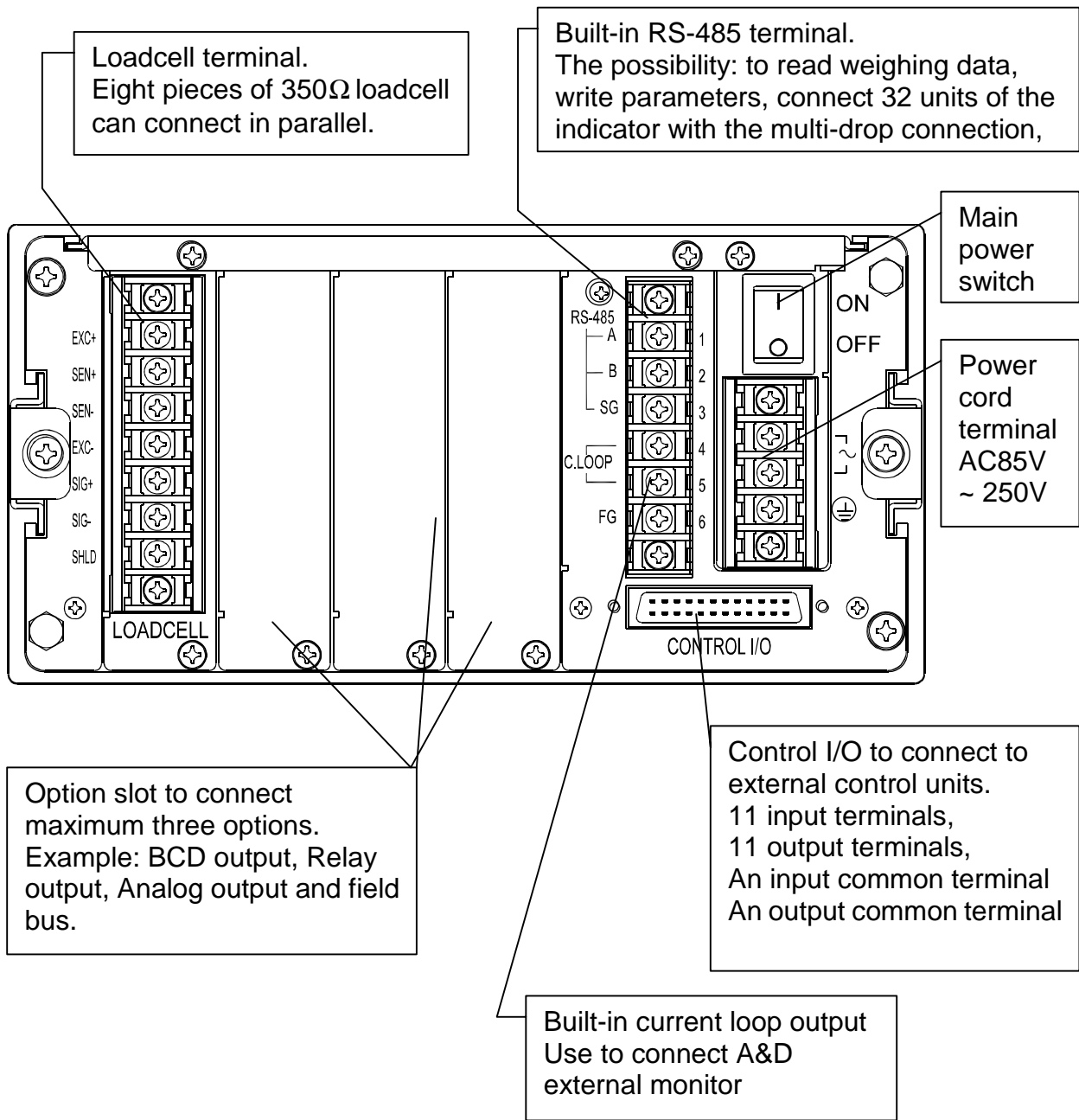
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Main display	Gross or net is displayed.
Sub display	Code numbers, operation guidance, graph, comparison parameter and other are displayed selectively.
Unit indicator	The indicator is displayed that the weighing unit is selected in the calibration mode. Refer to section "5. Calibration".
Status indicator	The current weighing status is displayed. The classification number is displayed, when occurred an error or informed an alarm.
Graphic status indicator	The current weighing situation is displayed with symbols.
STABLE	Lighting the sign, the current weighing display is stable.
GROSS	Displaying the gross data in the main display, the sign is lighted.

NET	Displaying the net data in the main display, the sign is lighted.
TARE ENT	Tare entered. Storing the net value, the sign is lighted.
HOLD	Fixing the main display, the sign is lighted.
CZ	Center of zero. When the gross weight is in the center of the zero point, the sign is lighted.
ZR.ERR	Zero error. Error message for zeroing the gross data of the main display.
SQ.ERR	The sequence error sign. A message for weighing sequence error.
ALARM 1	An error sign for over load or emergency stop mode.
ALARM 2	A fatal error sign. Example: The wire form loadcell is broken.
Standby indicator	In the standby mode, all interfaces are turned off and internal circuit works only.
▲FULL	When the gross data exceeds the full limit, the sign is lighted.
▲Z. BAND	The zero band sign. When the gross data is within the range of the zero band (around the zero point), the sign is lighted.
▲F.FLOW	The full flow gate sign.
▲M.FLOW	The medium flow gate sign.
▲D.FLOW	The dribble flow gate sign.
▲FINISH	The finish sign.



## 2.3. Rear Panel





## 3. Installation

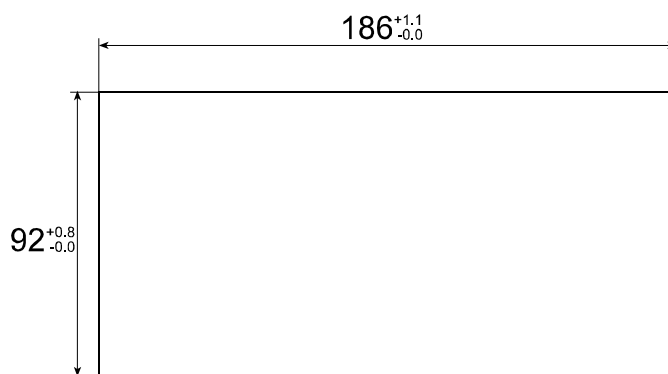
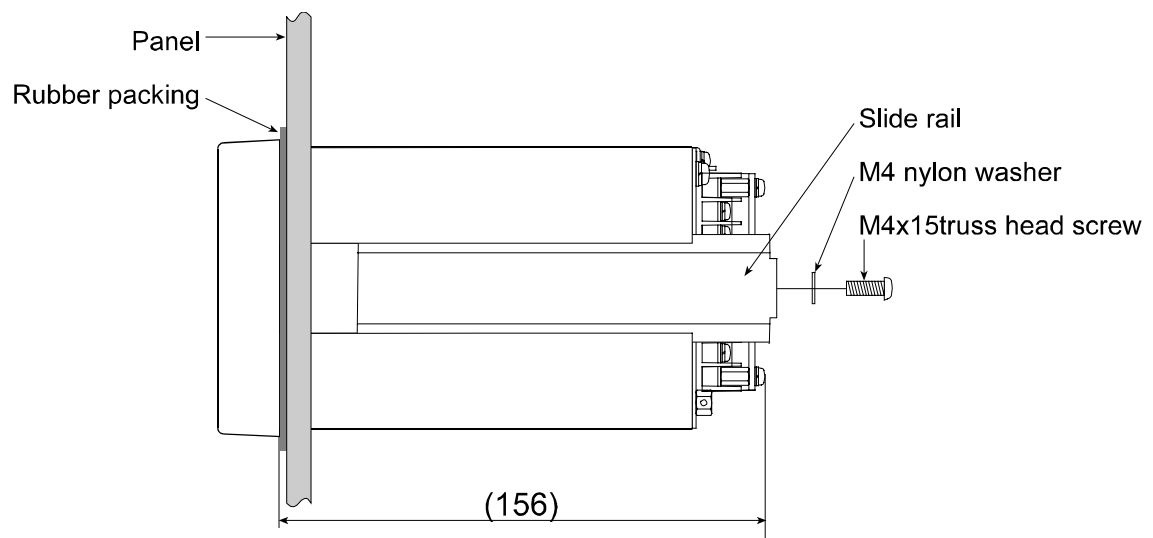
### Caution

- Remove the power cord before installing the indicator and other.
- Build in the option before installing the indicator.



### 3.1. Mounting Indicator

- The indicator can mount on the panel using the slide rail.
- If the accessory packing rubber is used, the front panel is equivalent to IP-65 of IEC 529.



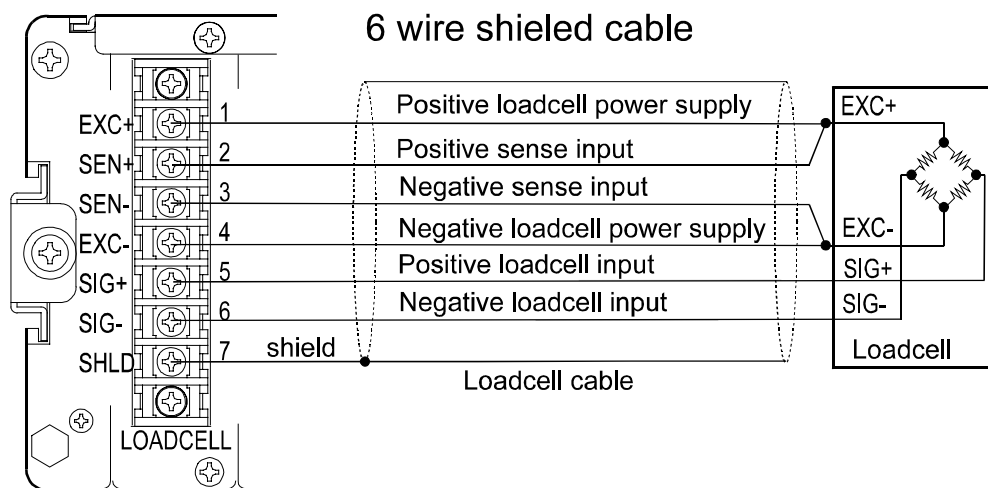
Panel Cutout size



## 3.2. Connecting Loadcell Cable

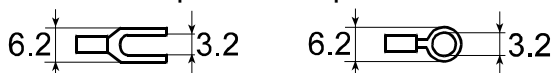
### Caution

- Share the loadcell cable from noise-generating device and these power lines because loadcell signal is sensitive.
- We recommend you to use the 6 wire shielded cable to prevent loss of weighing precision.
- The loadcell cable length is shorter than 5 m, you may be use a 4 wire shielded cable with terminals 1 & 2 shorted (EXC+ & SEN+ shorted) and terminals 3 & 4 shorted (EXC- & SEN- shorted).



### Adaptable Compression Terminal Parts

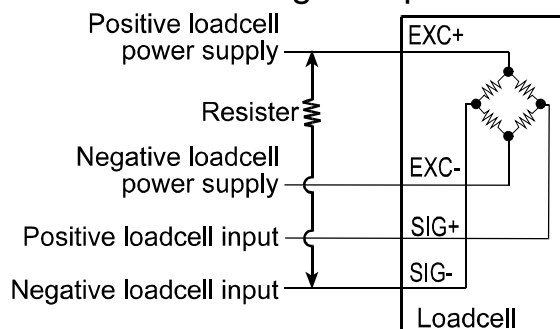
- Use the adaptable compression terminal parts to the cables



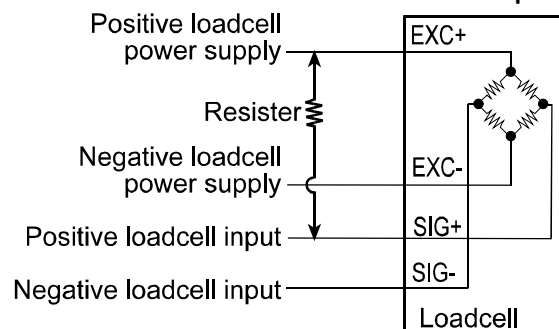
### Loadcell Output Adjustment for Zero Calibration (Zero Point)

- When a message "CERR2" is displayed, zero point of zero calibration is too large.
- When a message "CERR3" is displayed, zero point of zero calibration is too small.
- Use the resistor more than 50 kΩ with low (good) temperature coefficient, when adding a resistor to adjust the loadcell output to indicator terminals.

#### In Case of Too Large Output



#### In Case of Too Small Output



### 3.2.1. Verifying Loadcell Output and Input Sensitivity

The input sensitivity of the indicator is 0.3µV/division or more. Adapt to the following inequality, when you design a weighing instrument using the indicator and loadcell(s).

#### Caution

- A change in input voltage sensitivity is equivalent to a one division change of the display. Select as large an input voltage sensitivity voltage as possible so that the weighing interval becomes stable.
- Consider the leverage if a lever is used.

Weighing instrument using one loadcell.	$0.3 \leq \frac{E * B * D}{A}$	A: Rated capacity of loadcell [kg] B: Rated output [mV/V] D: Weighing interval [kg]
Weighing instrument using multi-loadcell	$0.3 \leq \frac{E * B * D}{A * N}$	E: Excitation voltage [mV] N: Number of loadcells

#### Verification Example

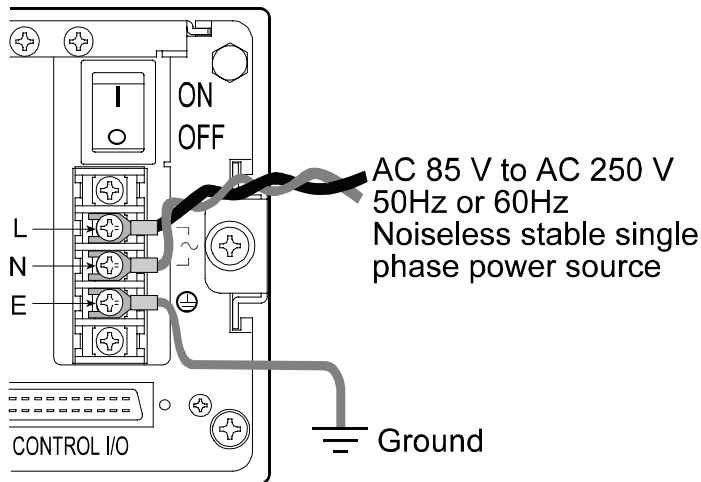
Design:		
Loadcell	N=1	
Rated capacity	A=750 [kg]	$\frac{5000 * 3 * 0.05}{750} = 1 \geq 0.3$ . Therefore, regard the instrument as a good design.
Rated output	B=3 [mV/V]	
Excitation voltage	E=5000 [mV]	
Weighing interval	D=0.05 [kg]	
Weighing capacity	300 [kg]	



## 3.3. Wiring Power Cord

### Caution

- Ground the indicator with terminal E to avoid receiving an electric shock and an error due to discharge a static electricity.
  - Share the ground wire from electrical device that generats noise.
  - Do not use unstable power source.
  - Share the power cord form the moter system (as noise-generating device) to avoid operation error.
- 
- The power source can use AC 85V to AC 250V with 50 Hz or 60 Hz.



### Adaptable Compression Terminal Parts



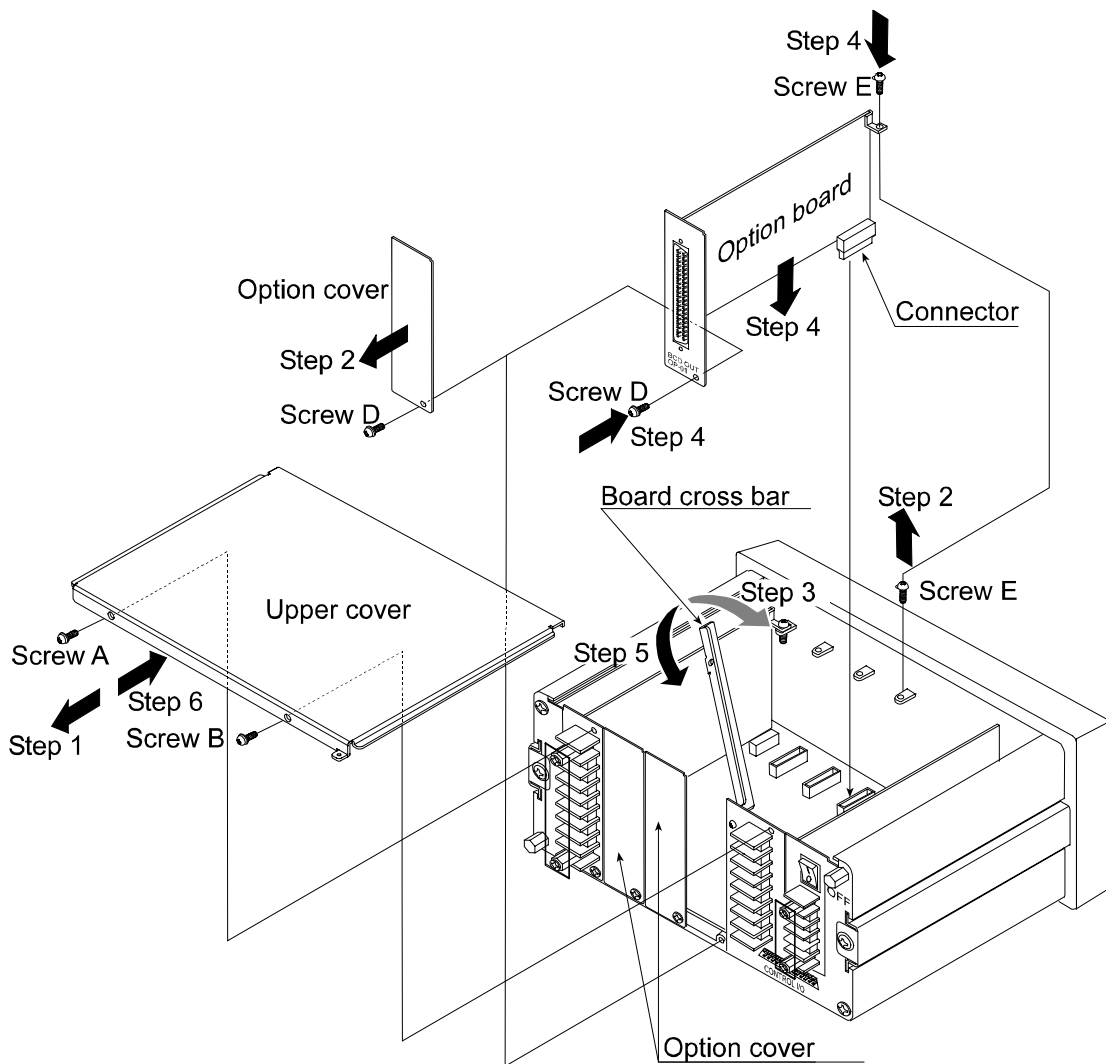




## 3.4. Installing Options

### Caution

- ❑ Remove the power cord before operation to install the option.
- ❑ Do not touch an inside parts within ten seconds after removing the power cord because you may receive an electric shock.
- ❑ Do not forget to tighten the screw. If the screw is not tightened, it may cause short circuit or an error due to noise.
  
- ❑ Three option boards can install in the slots.
- ❑ Initialize the RAM data in accordance with section 9.4. Initializing Parameters.





## 4. Basic Operation



### 4.1. Key Operation Examples

- This section is described the way of key operation.

#### 4.1.1. Standby Mode

---

<b>OFF</b>	Press and hold the <b>OFF</b> key above three seconds in the weighing mode. Then the indicator enters the standby mode and displays standby indicator. In the standby mode, All interface is turned off and internal circuit works only.
<b>ON</b>	The <b>ON</b> key is used to turn on the indicator.

#### 4.1.2. Cursor Operation

---

There is the cursor on a segment (an item) that is turned on and off.

<b>↔</b>	The <b>↔</b> key is used to move the cursor forward.
<b>SHIFT + ↔</b>	Press and hold the <b>SHIFT</b> key and press the <b>↔</b> key is used to move the cursor backward.
<b>ENTER</b>	The <b>ENTER</b> key is used to enter the selected item.
<b>ESC</b>	The <b>ESC</b> key is used to return to the last mode and to undo the last key operation.

#### 4.1.3. Inputting Characters

---

The character can be input in a current segment (an item) in adaptable mode.

<b>A/a</b>	The <b>A/a</b> key is used to change numerical key, upper keys, lower keys and alphabetical key.
<b>Alphanumeric</b>	The <b>alphanumeric</b> keys and the <b>ENTER</b> key is used to enter the parameters and to select a code number directly.
<b>ENTER</b>	The <b>ENTER</b> key is used to specify the alphanumeric data.
<b>ESC</b>	The <b>ESC</b> key is used to undo the last key operation and to return to the last mode.

## 4.1.4. The Way of Calling a Code

---

### In Case of a Material Code:

Step 1 Suppose that is set the function parameter [5<sup>9F</sup> - 8] to [0] .

Step 2 Press the **CODE RECALL** key in weighing mode.

Step 3 Set the number of a material code with the following keys:

↵	The ↵ key is used to increase the code number.
<b>SHIFT + ↵</b>	Press and hold the <b>SHIFT</b> key and press the ↵ key is used to decrease the code number.
<b>Numerical</b>	The <b>numerical</b> keys and the <b>ENTER</b> key is used to select a code number directly and to enter the parameters.
<b>ENTER</b>	The <b>ENTER</b> key is used to specify the number.
<b>ESC</b>	The <b>ESC</b> key is used to undo the last key and to return to the last mode.

### In Case of a Recipe Code:

Step 1 Suppose that is set the function parameter [5<sup>9F</sup> - 8] to [1] or [2].

Step 2 Press the **CODE RECALL** key in weighing mode.

Step 3 Set the number of a recipe code with the following keys:

↵, **SHIFT + ↵**, **Numerical**, **ENTER**, **ESC** keys

## 4.1.5. The Way of Entering a Correction Mode

---

### In Case of a Material Code:

Step 1 Press and hold the **SHIFT** key and press the **CODE RECALL** key in weighing mode.

Step 2 Select a number of a material code using the following keys:

↵, **SHIFT + ↵**, **Numerical**, **ENTER**, **ESC** keys

Step 3 Edit some items of a material code using **numerical** keys and the **ENTER** key.

Step 4 Press the **ESC** key to return to weighing mode.

### In Case of a Recipe Code:

Step 1 Press and hold the **ENTER** key and press the **CODE RECALL** key in weighing mode.

Step 2 Select a number of a recipe code using the following keys:

↵, **SHIFT + ↵**, **Alphanumeric**, **A/a**, **ENTER**, **ESC** keys

Step 3 Edit some items of a recipe code using alphanumeric keys and the **ENTER** key.

Step 4 Press the **ESC** key to return to weighing mode.

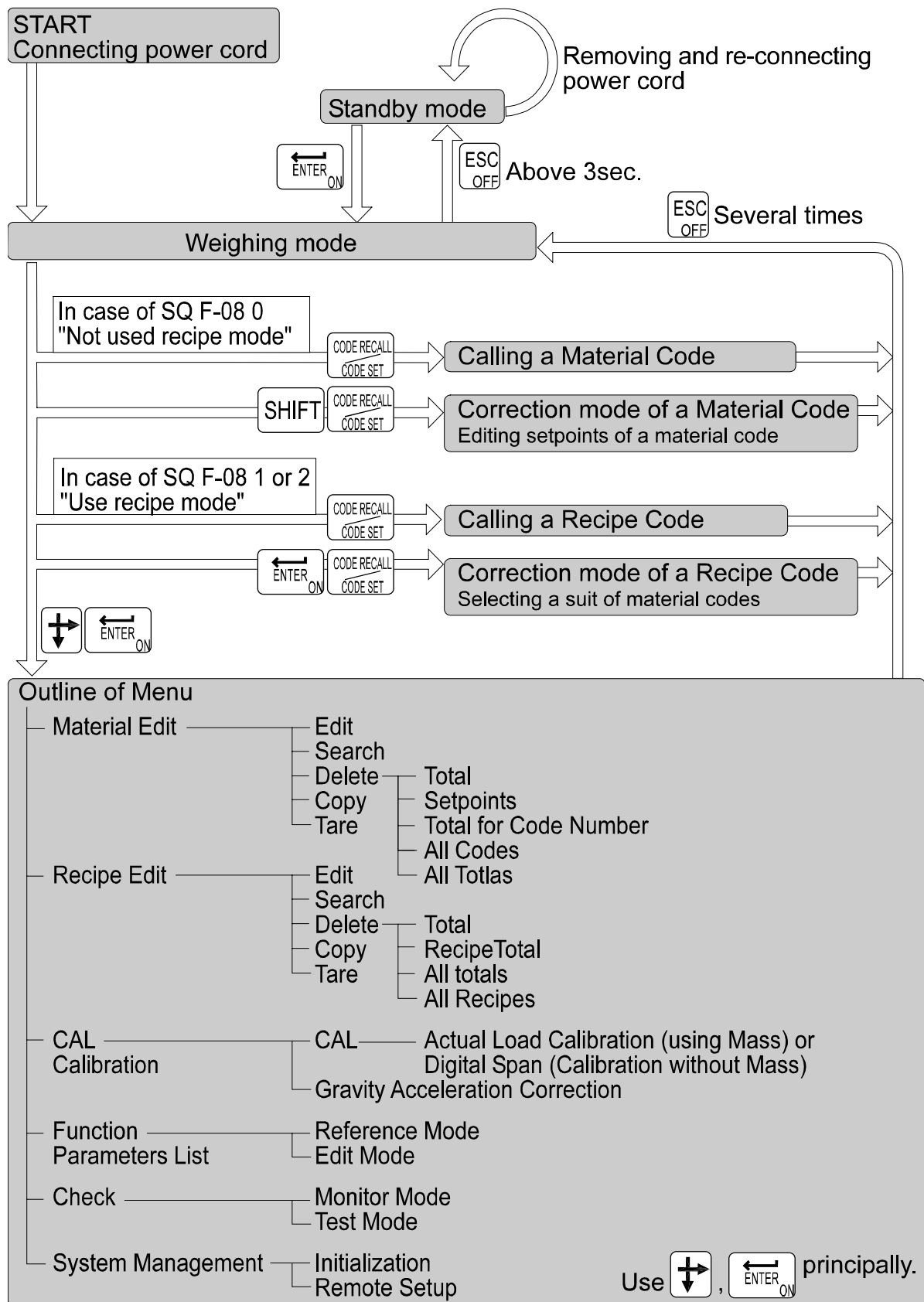
## 4.1.6. The Way of Entering Menu

---

- Step 1 Press and hold the **ENTER** key and press the **↵** key in weighing mode.  
Then the first layer of menu is display.
- Step 2 Use the following keys in the menu :  
**↵**, **SHIFT**, **Alphanumeric**, **A/a** , **ENTER**, **ESC** keys
- Step 3 Press the **ESC** key to return to weighing mode several times.



## 4.2. Status Chart (Mode map)





## 5. Calibration

- The indicator, which is connected loadcell unit, can weigh the "weight" value on the loadcell pan and display its "mass" value. The calibration function is used to adjust the weighing value (displaying value) so that the weighing system can weigh correctly.
- There are two way of the calibration. The "**actual load calibration**" uses a rated mass and zero output from the loadcell. The "**digital span**" inputs arbitrary values (calculated by hand). These methods are selected in the calibration procedure.
- There is a compensation function of the "**gravity acceleration correction**". This function is used, when a calibrated weighing system is moved to other place.
- These calibration parameters are stored in the indicator without any power supply.

### Common Calibration Items

Unit	The "g", "kg" and "t" or "lb" can be selected.
Decimal point	The decimal point can be selected form "not used" to "four decimal places".
Minimum division	The minimum division of the weighing display.
Weighing capacity	The maximum display of the weighing display.

### Items for the "Actual Load Calibration"

Common items	Unit, decimal point, minimum division and weighing capacity
Zero point adjustment	A zero point output is used from the loadcell unit.
Span adjustment	Rated mass is place on the weighing pan and is weighed. The sensitivity is adjusted. This sensitivity is the same as "sensitivity " of digital span.

### Items for "Digital Span"

Common items	Unit, decimal point, minimum division and weighing capacity
Zero point output	The numerical data is input as zero point output of loadcell unit.
Rated capacity	The rated capacity of the loadcell is input. The sensitivity of the loadcell is input.

### Caution

- **When the CAL switch on the A/D board is "DISABLE", any calibration can not perform.**
- **Do not perform any calibration during a weighing sequence operation.**
- **Entering calibration mode during a weighing sequence operation, the weighing sequence operation is terminated. Calibrate the weighing system, when a weighing sequence operation does not work**
- **The accuracy of the "Digital Span (Calibration without Mass)" is 1/1000.**
- **Do not use a "loadcell summing box", the "digital span" is performed.**
- **It is necessary that the loadcell sensitivity is exactly known, if the "digital span" is used.**



## 5.1. Actual Load Calibration (using Mass)

- ESC** key      If you want to return to the weighing mode during the calibration mode, press the **ESC** key anytime. And it has effect until the last displayed parameter.  
Example: zero adjustment only, etc.
- ENTER** key    When the key is pressed, the procedure stores a current parameter and proceeds to next step.

- Step 1 Press and hold the **ENTER** key and press the  $\blacktriangledown$  key to display the menu in a weighing mode.
- Step 2 Press the  $\blacktriangledown$  key twice to select the menu `CAL`.  
Press the **ENTER** key to enter the calibration mode.
- Step 3 Press the **ENTER** key to enter the menu `CAL`.
- Step 4 Select a unit using the numerical keys and press the **ENTER** key to store it.
- Step 5 Select a decimal point using the numerical keys and press the **ENTER** key to store it.
- Step 6 Select a minimum division using the numerical keys and press the **ENTER** key to store it.
- Step 7 Select a weighing capacity using the numerical keys and press the **ENTER** key to store it.
- Step 8 Perform the zero point adjustment.  
Place nothing on the weighing pan and press the **ENTER** key to store it after the **STABLE** indicator is displayed.  
Whether the **STABLE** indicator is displayed or not, if you want to store it, wait for ten seconds and press the **ENTER** key.
- Step 9 Specify a total mass value to place on the weighing pan using the numerical keys and press the **ENTER** key to store it.
- Step 10 Place the specified mass on the weighing pan and press the **ENTER** key to store it after the **STABLE** indicator is displayed.  
Whether the **STABLE** indicator is displayed or not, if you want to store it, wait for ten seconds and press the **ENTER** key.
- Step 11 Press the **ESC** key to return the weighing mode.



## 5.2. Digital Span (Calibration without Mass)

- ESC** key      If you want to return to the weighing mode during the calibration mode, press the **ESC** key anytime. And it has effect until the last displayed parameter.  
Example: zero adjustment only, etc.
- ENTER** key    When the key is pressed, the procedure stores a current parameter and proceeds to next step.

- Step 1 Press and hold the **ENTER** key and press the  $\uparrow$  key to display the menu in a weighing mode.
- Step 2 Press the  $\uparrow$  key twice to select the menu `CAL`.  
Press the **ENTER** key to enter the calibration mode.
- Step 3 Press the **ENTER** key to enter the menu `CAL`.
- Step 4 Select a unit using the numerical keys and press the **ENTER** key to store it.
- Step 5 Select a decimal point using the numerical keys and press the **ENTER** key to store it.
- Step 6 Select a minimum division using the numerical keys and press the **ENTER** key to store it.
- Step 7 Select a weighing capacity using the numerical keys and press the **ENTER** key to store it.
- Step 8 Press the F1 key to proceed to the digital span procedure.
- Step 9 Input the zero point value using the numerical keys and press the **ENTER** key to store it.
- Step 10 Input the rated capacity of a loadcell using the numerical keys and press the **ENTER** key to store it.
- Step 11 Input the sensitivity of the loadcell in the unit of mV/V using the numerical keys and press the **ENTER** key to store it.
- Step 12 Press the **ESC** key to return the weighing mode.

**Advise** The digital span can be used for trimming of the actual load calibration using mass.





## 5.3. Gravity Acceleration Correction

- The function compensates the weighing error due to the difference of gravity acceleration.
  - G1** The place where the weighing system is calibrated.
  - G2** The place where the weighing system is used.

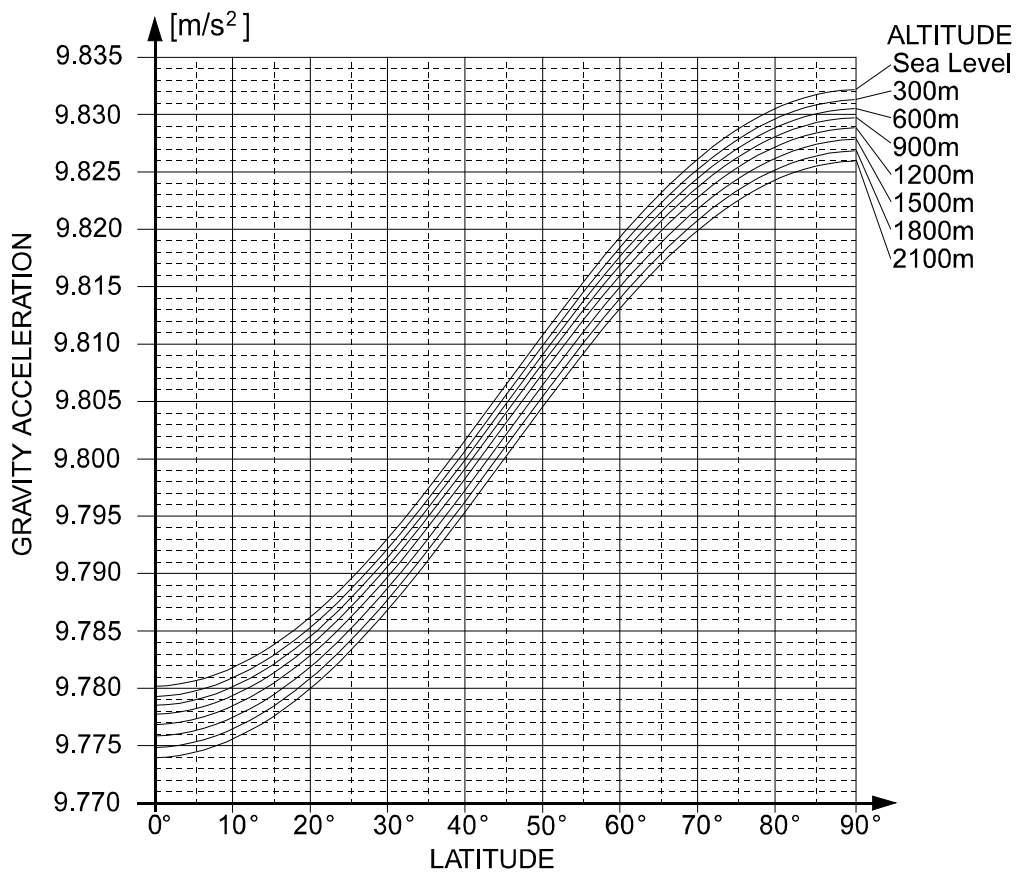
**ESC** key If you want to return to the weighing mode during the calibration mode, press the **ESC** key anytime.

**ENTER** key When the key is pressed, the procedure stores a current parameter and proceeds to next step.

- Step 1 Press and hold the **ENTER** key and press the  $\blacktriangleright$  key to display the menu in a weighing mode.
- Step 2 Press the  $\blacktriangleright$  key twice to select the menu **CAL**. Press the **ENTER** key to enter the calibration mode.
- Step 3 Select the menu **G** with the  $\blacktriangleright$  key. Press the **ENTER** key to enter it.
- Step 4 Input the gravity acceleration at **G1** using the numerical keys and press the **ENTER** key to store it.
- Step 4 Input the gravity acceleration at **G2** using the numerical keys and press the **ENTER** key to store it.
- Step 5 Press the **ESC** key to return the weighing mode.

### 5.3.1. Gravity Acceleration Reference

Amsterdam	9.813 m/s <sup>2</sup>	Manila	9.784 m/s <sup>2</sup>
Athens	9.800 m/s <sup>2</sup>	Melbourne	9.800 m/s <sup>2</sup>
Auckland NZ	9.799 m/s <sup>2</sup>	Mexico City	9.779 m/s <sup>2</sup>
Bangkok	9.783 m/s <sup>2</sup>	Milan	9.806 m/s <sup>2</sup>
Birmingham	9.813 m/s <sup>2</sup>	New York	9.802 m/s <sup>2</sup>
Brussels	9.811 m/s <sup>2</sup>	Oslo	9.819 m/s <sup>2</sup>
Buenos Aires	9.797 m/s <sup>2</sup>	Ottawa	9.806 m/s <sup>2</sup>
Calcutta	9.788 m/s <sup>2</sup>	Paris	9.809 m/s <sup>2</sup>
Chicago	9.803 m/s <sup>2</sup>	Rio de Janeiro	9.788 m/s <sup>2</sup>
Copenhagen	9.815 m/s <sup>2</sup>	Rome	9.803 m/s <sup>2</sup>
Cyprus	9.797 m/s <sup>2</sup>	San Francisco	9.800 m/s <sup>2</sup>
Djakarta	9.781 m/s <sup>2</sup>	Singapore	9.781 m/s <sup>2</sup>
Frankfurt	9.810 m/s <sup>2</sup>	Stockholm	9.818 m/s <sup>2</sup>
Glasgow	9.816 m/s <sup>2</sup>	Sydney	9.797 m/s <sup>2</sup>
Havana	9.788 m/s <sup>2</sup>	Tainan	9.788 m/s <sup>2</sup>
Helsinki	9.819 m/s <sup>2</sup>	Taipei	9.790 m/s <sup>2</sup>
Kuwait	9.793 m/s <sup>2</sup>	Tokyo	9.798 m/s <sup>2</sup>
Lisbon	9.801 m/s <sup>2</sup>	Vancouver, BC	9.809 m/s <sup>2</sup>
London (Greenwich)	9.812 m/s <sup>2</sup>	Washington DC	9.801 m/s <sup>2</sup>
Los Angeles	9.796 m/s <sup>2</sup>	Wellington NZ	9.803 m/s <sup>2</sup>
Madrid	9.800 m/s <sup>2</sup>	Zurich	9.807 m/s <sup>2</sup>



## 5.4. Calibration Error

Error Code	Treatment and Situation
CERR1	Resolution (Weighing capacity / minimum division) is exceeds the limitation. Increase minimum division or decrease weighing capacity.
CERR2	The initial load (no load output) is larger than 2mV/V. Confirm the loadcell cable.
CERR3	Negative loadcell output value. Check wiring. Confirm the loadcell cable.
CERR4	Mass value exceeds the weighing capacity. Use a mass within the weighing capacity. (Decrease mass value)
CERR5	Mass value is too light for the calibration. Increase mass value.
CERR6	The loadcell output to be equivalent to minimum division is too small. Use more rough minimum division.
CERR7	The polarity of loadcell output is inversed. Confirm the loadcell cable.
CERR8	The mass value of the weighing capacity exceeds 3.2 mV/V. Confirm the mass and weighing capacity.
CERR9	Gravity acceleration is out of range. Correct the value within the range of 9.770 ~ 9.835 $m/s^2$ .
CERR10	Zero output of loadcell unit is out of range. Trim the zero output within 0.0 ~ 2.0 mV/V.
CERR11	The loadcell output to be equivalent to minimum division is out of range. Trim the output within 0.0 ~ 3.2 mV/V.



## 6. Applications

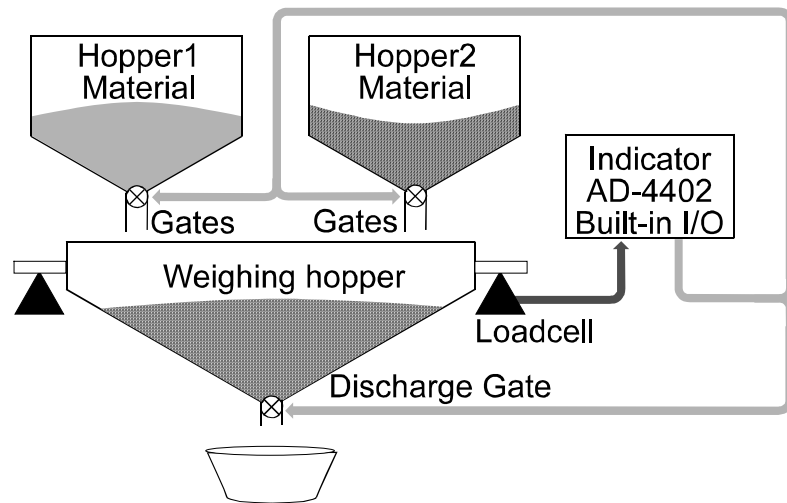


### 6.1. Hopper Scale with Material Code

In the section, applications are explained according to the right hopper scale that performs batch weighing using a material code.

An application is explained mixture of materials using a recipe code.

The foundation of hopper scale design is explained.



Example: Basic Hopper Scale

#### 6.1.1. Definition of Material Code

- The material code is necessary to store the details before use. And the code is called with code number in a weighing.
- The material code is used in the procedure that performs batch weighing or loss-in weigh. As the result of the procedure, a constant weight of the material, is called "full" or "full filling", can be got.
- The material code consists of some index number (name) and some comparison values to get a constant weight of the material.
- The AD-4402 can store a hundred kinds of material codes.

#### 6.1.2. Recalling Material Code

The following steps are the explanation to recall the material code stored in the indicator. Suppose that the recipe code is not used. (The menu [Function] - [Function setting] - [Sequence] - [Basic] - [Recipe mode] is set to [5<sup>9</sup> F- 8] [0] )

##### Caution

**The material code can be recalled during the last weighing. But the code effects after the batch finish (after finishing the last weighing).**

Step 1 Press the **CODE RECALL** key.

Then the material code blinks.

Step 2 Enter the material code using **numerical** keys

The details of the material code are displayed in the sub-display.

Step 3 Press the **ENTER** key to decide the code.

### 6.1.3. Editing Principle Parameters of Material Code

---

You can edit the parameters of target weight, free fall and etc. displayed on the sub-display during a weighing. And items of sub-display can be selected at the menu [Function] - [Function setting] - [General] - [Sub-display].

#### Caution

**If the flash memory is selected for memory backup (DLHF-11), a current sequential weighing is stopped.**

- Step 1 Press and hold the **SHIFT** key and press the **CODE RECALL** key.  
Then the material code blinks.
- Step 2 Enter the material code using **numerical** keys  
The details of the material code are displayed in the sub-display.
- Step 3 Press the **ENTER** key to decide the code.
- Step 4 Select a parameter using the **↔** key on the sub-display.
- Step 5 Enter the parameter using **numerical** keys and press the **ENTER** key to store it.
- Step 6 If you continue the change, proceed step 4 and 5.
- Step 7 If you want to finish the change, press the **ESC** key to return to weighing mode several times.

### 6.1.4. Referring next Material Code

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You can refer to next material code in the sequential mode that uses plural material codes. Suppose that the recipe code is not used. (The menu [Function] - [Function setting] - [Sequence] - [Basic] - [Recipe mode] is set to [59 F- 8] [0])

- Step 1 Press the **CODE RECALL** key.  
Then principle parameters of the next material code are displayed in the sub-display.
- Step 2 Press the **ESC** key to return to current mode.

## 6.1.5. Editing Full Parameters of Material Code

- A material code consists of the following parameters.

Name	Display Name	Display Symbol	Display Example	Memory
Material Code	Code	Code	11	Backed up RAM (factory setting) or flash memory
Material name	Mat Name		Grain	
Material Hopper No.	Mat Hopper	Hopper	1	
Final	Final	Final	10.00 kg	
Free Fall	Free Fall	FFall	0.01 kg	
Preliminary	Preliminary	Plm	1.00 kg	
Optional Preliminary	OP.Preliminary	OPPlm	2.00 kg	
Over	Over	Over	0.10 kg	
Under	Undr	Undr	0.10 kg	
Zero Band	Zero Band	0Band	0.02 kg	
Full	Full	Full	0.05 kg	
Tare	Tare	Tare	5.00 kg	
Supplementary Flow Open Timer	SF open timer	SFOT	0.00 s	
Supplementary Flow Close Timer	SF close	SFCT	0.00 s	
Automatic Free Fall Range	AFFC range	AFFC	0.00 kg	
Initial Dribble Flow	Initial DF	IDF	0.00 kg	
Initial Medium Flow	Initial MF	IMF	0.00 kg	
Total Weight	Tot	Tot	10.00 kg	Backed up RAM
Total Counts	Tot#	Tot#	1	

- These parameters are stored in backup memory without power supply.
- Refer to the backup method [0LHF - 11] of the function list.

### Caution

If the flash memory is selected for memory backup [0LHF - 11], a current sequential weighing is stopped.

### Edit Material Code

Step 1 Press and hold the **ENTER** key and press the **↔** key.

Then menu `MatEdit` blinks.

Step 2 Press the **ENTER** key to enter the material code edit. Then menu `Edit` blinks.

Step 3 Press the **ENTER** key to enter menu edit.

Step 4 Select the material code using **numerical** keys and press the **ENTER**.

Step 5 Enter the material name using **alphanumeric** keys and press the **ENTER** key.

Step 5 Edit other parameters using **numerical** keys, **ENTER** key and **↔** key.

Step 6 If you want to finish the change, press the **ESC** key to return to weighing mode several times.

## Search Material Code

Use this menu to search blank material code.

- Step 1 Press and hold the **ENTER** key and press the **↵** key.  
Then menu `MatEdit` blinks.
- Step 2 Press the **↵** key to select menu `Search`. And press the **ENTER** key.
- Step 3 Then the message is displayed.
- Step 4 Press the **ENTER** key to proceed next step.  
Then the result is displayed.
- Step 5 Press the **ESC** key to return to weighing mode several times.

## Delete Material Code

The parameter of the material code can be reset in the following menu.

- Total value
- Setpoints
- Total of a material code
- All material code
- All total

## Example of Deleting Total Value

- Step 1 Press and hold the **ENTER** key and press the **↵** key.  
Then menu `MatEdit` blinks.
- Step 2 Press the **↵** key to select menu `Delete`. And press the **ENTER** key.
- Step 3 Select menu `Total` using the **↵** key. And press the **ENTER** key.
- Step 4 Enter the material code using **numerical** keys and press the **ENTER** key.
- Step 5 Press the **ESC** key to return to weighing mode several times.

## Copy Material Code

- The parameters of material code are copied. This copy includes a total weight value and times of accumulation.

- Step 1 Press and hold the **ENTER** key and press the **↵** key.  
Then menu `MatEdit` blinks.
- Step 2 Press the **↵** key to select menu `Copy`. And press the **ENTER** key.
- Step 4 Specify a original code number using **numerical** keys and press the **ENTER** key.
- Step 5 Specify a duplicated code number using **numerical** keys and press the **ENTER** key.
- Step 6 Press the **ESC** key to return to weighing mode several times.

## Tare of Material Code

- Use to copy current tare to the preset tare.
- Set a preset tare function [GEEbF- 12 ] of the function list.
  - [GEEbF- 12] [0] If the preset tare of the code is zero, the last tare value effects.  
(factory settings)
  - [GEEbF- 12] [1] If the preset tare of the code is zero, tare value is reset.

Step 1 Press and hold the **ENTER** key and press the **↵** key.

Then menu MatEdit blinks.

Step 2 Press the **↵** key to select menu Tare. And press the **ENTER** key.

Step 4 Specify a code number using **numerical** keys and press the **ENTER** key.

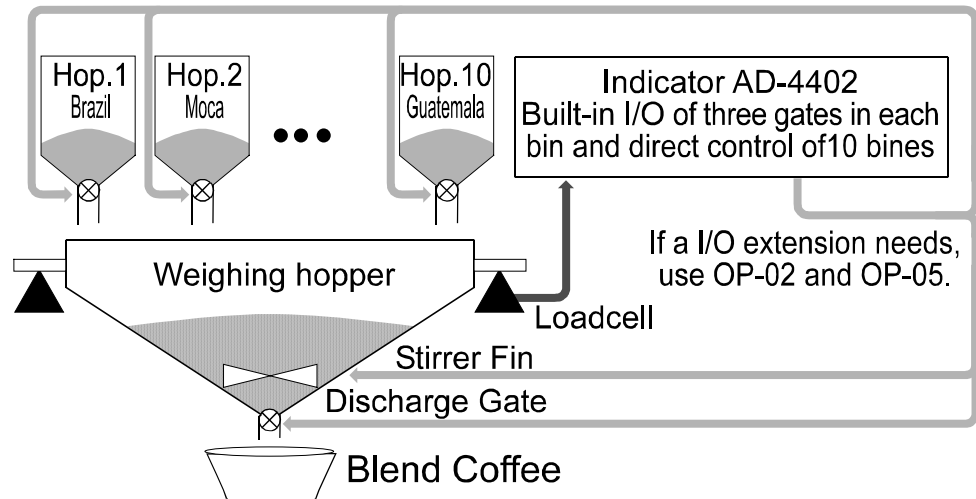
Then current tare value is copied to preset tare.

Step 5 Press the **ESC** key to return to weighing mode several times.

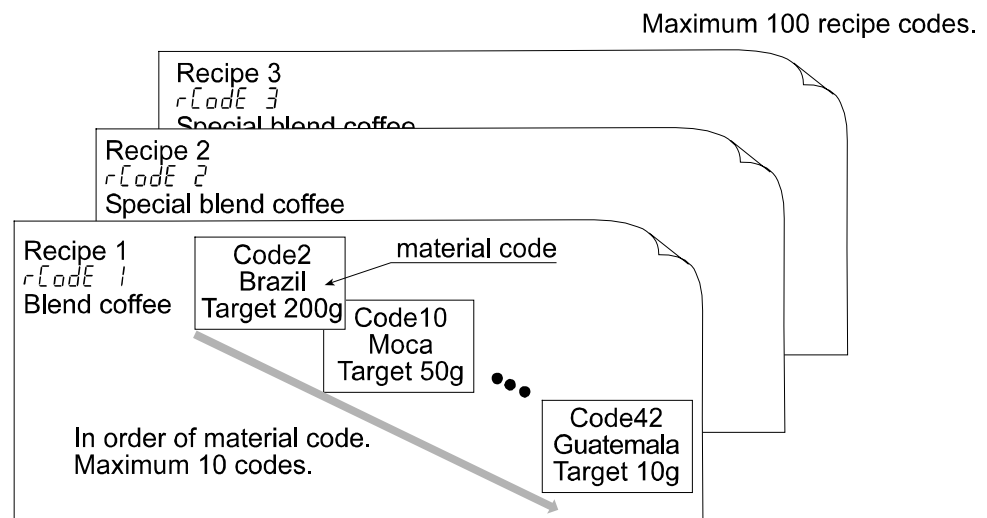


## 6.2. Simple Hopper Scale with Recipe Code

The section explains for recipe code (another name: formal function). The recipe code is used on a simple hopper scale to mix several materials that are preset target value. "The simple hopper scale" means that does not control the ratio and a weight of ingredient, but simply accumulates the preset target weight of the material code. Therefore, the recipe code is a code to accumulate the preset target weight of the material code.



Example: Simple Hopper Scale



### 6.2.1. Definition of Recipe Code (Formal Function)

- ❑ A recipe code consists of plural preset material codes. Maximum ten material codes can be stored in a recipe code.
- ❑ A recipe code is described in order to accumulate target weight of the material code.
- ❑ The indicator AD-4402 can store a hundred recipe codes.
- ❑ The recipe code is necessary to store the details before use. And the code is called with code number in a weighing.
- ❑ The recipe code is a code to accumulate the preset target weight of the material code. If a recipe code is used in the batch weighing (or loss-in weight), you can get a weight that is accumulated the preset target weight of the material code.
- ❑ The recipe sequence that is used recipe code calls formula sequence, too.



## 6.2.2. Using a Recipe Code

- Set the menu [Function] - [Function setting] - [Sequence] - [Basic] - [Recipe mode] to sequential mode ( [59 F- 8] to [1] or [2] ), when the recipe code is used.
  - [59 F- 8] [1] Semi-automatic mixture sequence
  - [59 F- 8] [2] Automatic mixture sequence

## 6.2.3. Construction of Recipe Code

- The indicator AD-4402 can store a hundred recipe codes.
- A recipe code can store maximum ten material codes in order of accumulating them.
- These parameters are stored in backup memory without power supply.
- Refer to the backup method [0LHF- 11] of the function list.

### Caution

**If the flash memory is selected for memory backup [0LHF- 11], a current sequential weighing is stopped.**

Name	Display Symbol & Example	Memory
Recipe code	rCodE	Backed up RAM ( factory setting) or flash memory
Recipe name	Blend coffee	
Material codes of maximum ten codes. It is stored in order to accumulate them.	CodE 1	
Accumulated Weight for recipe code	Total Weight 10.00 kg	Backed up RAM
Accumulation Counts for recipe code	Total Counts 10.00 kg	

## 6.2.4. Recalling a Recipe Code

- The following steps are the explanation to recall the recipe code stored in the indicator. Suppose that the recipe code is used (The menu [Function] - [Function setting] - [Sequence] - [Basic] - [Recipe mode] is set to [59 F- 8] [1] or [2]). .

### Caution

**The code can be recalled during the last weighing. But the code effects after the butch finish (after finishing the last weighing).**

- Step 1 Press the **CODE RECALL** key.  
Then the recipe code blinks.
- Step 2 Enter the material code using **numerical** keys  
The details of the recipe code are displayed in the sub-display.
- Step 3 Press the **ENTER** key to decide the code.

## 6.2.5. Arranging Material Code in Recipe Code

---

- The way of arranging material code described in a recipe code.
- Step 1 Press and hold the **ENTER** key and press the **CODE RECALL** key.
- Step 2 Select a recipe code number using **numerical** keys and press the **ENTER** key.  
Then first material code blinks.
- Step 3 Select a material code using the following keys.  
↵ key, **numerical** keys and **SHIFT** key
- Step 4 Press the **ENTER** key to store it. Then the next code blinks.
- Step 5 Continue step 3 and 4 until the last material code is stored.
- Step 6 Press the **ESC** key to return to weighing mode several times.

## 6.2.6. Editing Full Parameters of Recipe Code

---

All parameters of the recipe code can be edited in this menu.

### Edit Name of Recipe Code

- Step 1 Press and hold the **ENTER** key and press the ↵ key.  
Press the ↵ key. Then menu `RecipeEDIT` blinks.
- Step 2 Press the **ENTER** key to enter the recipe code edit. Then menu `edit` blinks.
- Step 3 Press the **ENTER** key to enter menu edit.
- Step 4 Select a recipe code using **numerical** keys and press the **ENTER**.
- Step 5 Name a recipe code using **alphanumeric** keys and press the **ENTER** key.
- Step 6 If you want to finish the change, press the **ESC** key to return to weighing mode several times.

### Search of Recipe Code

Use this menu to search blank material code.

- Step 1 Press and hold the **ENTER** key and press the ↵ key.  
Press the ↵ key. Then menu `RecipeEDIT` blinks.
- Step 2 Press the ↵ key to select menu `Search`. And press the **ENTER** key.
- Step 3 Then the message is displayed.
- Step 4 Press the **ENTER** key to proceed next step.  
Then the result is displayed.
- Step 5 Press the **ESC** key to return to weighing mode several times.

### Delete of Recipe Code

The parameter of the recipe code can be reset in the following menu.

- Total value
- Recipe total value
- All total value
- All Recipes

## Example of Deleting Total Value

- Step 1 Press and hold the **ENTER** key and press the **↔** key.  
Then menu `RecipeEDIT` blinks.
- Step 2 Press the **↔** key to select menu `Delete`. And press the **ENTER** key.
- Step 3 Select menu `Total` using the **↔** key.  
And press the **ENTER** key.
- Step 4 Enter the recipe code using **numerical** keys and press the **ENTER** key.
- Step 5 Press the **ESC** key to return to weighing mode several times.

## Copy of Recipe Code

- The parameters of recipe code are copied. This copy includes a total weight value and times of accumulation.
- Set a preset tare function [ `GENF-12` ] of the function list.  
[ `GENF-12` ] [ 0 ] If the preset tare of the code is zero, the last tare value effects.  
(factory settings)  
[ `GENF-12` ] [ 1 ] If the preset tare of the code is zero, tare value is reset.

- Step 1 Press and hold the **ENTER** key and press the **↔** key.  
Then menu `RecipeEDIT` blinks.
- Step 2 Press the **↔** key to select menu `Copy`. And press the **ENTER** key.
- Step 4 Specify a original code number using **numerical** keys and press the **ENTER** key.
- Step 5 Specify a duplicated code number using **numerical** keys and press the **ENTER** key.
- Step 6 Press the **ESC** key to return to weighing mode several times.



## 6.3. System Design of Hopper Scale

### 6.3.1. Operation and I/O Design

In General, looking an old type hopper scale design, the simplest indicator only displayed weighing value, other system devices communicated the control signal with each I/O interface. And the key operation and monitoring the system separately were controlled.

- The indicator AD-4402 has the I/O interface to control the system, sub-display to monitor system information, main display to display weighing data and keys to control the system in a unit.
- The indicator is designed so as to be able to select arbitrary keys and terminals to control the system form front panel keys and the I/O interface with the menu function. And the function of keys and terminals can be designed in the same way.
- The system information of sub-display can select at the function list.

### 6.3.2. Design Example

Suppose that the I/O, keys and sub-display are as follows:

Supply start:	F1 key,	[O <sub>u</sub> t F - 2] [6]
Emergency stop key:	F2 key,	[O <sub>u</sub> t F - 3] [13]
Dribble signal (low power):	terminal B1,	[O <sub>u</sub> t F - 1] [6]
Batch finish signal (low power):	terminal B2,	[O <sub>u</sub> t F - 2] [14]
Not used recipe code at "Not used recipe sequence"		[S <sub>q</sub> F - 8] [0]
Use default setting about sub-display		[S <sub>ub</sub> F 1] [0]

#### Setup

- Step 1 Enter the function list.
- Step 2 Select the menu **F1** key.([Function] - [Function setting] - [General] - [Other] - [F1 key])
- Step 3 Select [6] of Batch start at **F1** key and store it.
- Step 4 Select [13] of Forced batch finish at **F2** key and store it.
- Step 6 Select the menu terminal B1.  
([Function] - [Function setting] - [Control I/O Function] - [Output] - [OUT (B1)])
- Step 8 Select [6] of Dribble flow at terminal B1 and store it.
- Step 9 Select [14] of Batch finish at terminal B2 and store it.
- Step 10 Set [6] of "Not used recipe code" at Recipe sequence.  
([Function] - [Function setting] - [Sequence] - [Basic] - [Recipe mode])
- Step 11 Select [0] of the default menu in the and store it.  
([Function] - [Function setting] - [General] - [Sub-display] - [Weighing display])
- Step 12 Press the **ESC** key several times to return to the weighing mode.

#### Operation and Response

- When the F1 key is pressed, a batch weighing is started and terminal B1 works.
- When the F2 key is pressed, batch weighing is stopped.
- When the target weight is got, terminal B2 is turned on.



## 7. Weighing Mode

### 7.1.1. Contents of Batch Weighing Mode

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#### Batch Weighing

Normal Batching	Section 7.2
Normal Batching using Sequential Weighing Mode	Section 7.3.1
Normal Batching using Customer Programmed Control	Section 7.4.1
Loss-in weight	Section 7.2
Loss-in weight using Sequential Weighing Mode	Section 7.4.1
Loss-in weight using Customer Programmed Control	Section 7.4.2
Selection of Batch Weighing	Section 7.2.1

#### Controlled Output Signals

The type of the signal output to control gates (valves) in the batch weighing.	
Sequential Weighing Mode (built-in automatic program mode)	Section 7.3
Customer Programmed Control (Comparison Output)	Section 7.4

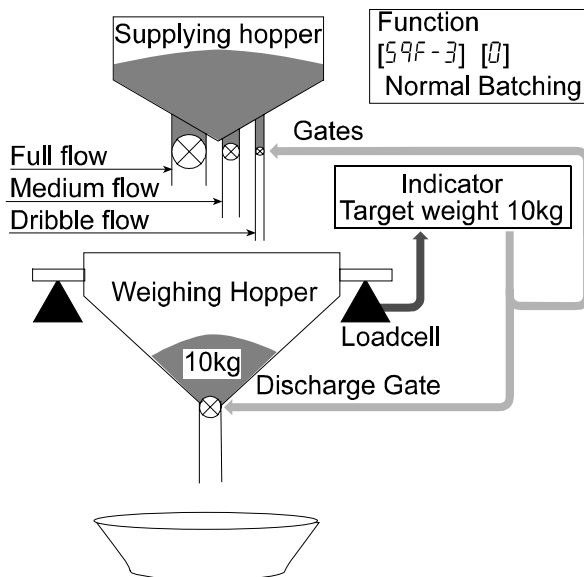
#### Partial Sequence of Sequential Weighing Mode

Compensation Sequence	Section 7.3.3
Approach Sequence	Section 7.3.4
Discharge Sequence	Section 7.3.5
Plain Recipe Sequence	Section 7.3.6
Automatic Selection of Supplying Mat	Section 7.3.7
Nozzle Operation (vacuum cleaner)	Section 7.3.8
Mixture Sequence	Section 7.3.9
Safety Check Function	Section 7.3.10
Pause and Emergency Stop	Section 7.3.11
Restart Sequence	Section 7.3.12
Automatic Free Fall Compensation	Section 7.3.13
Real Time Free Fall Compensation	Section 7.3.14

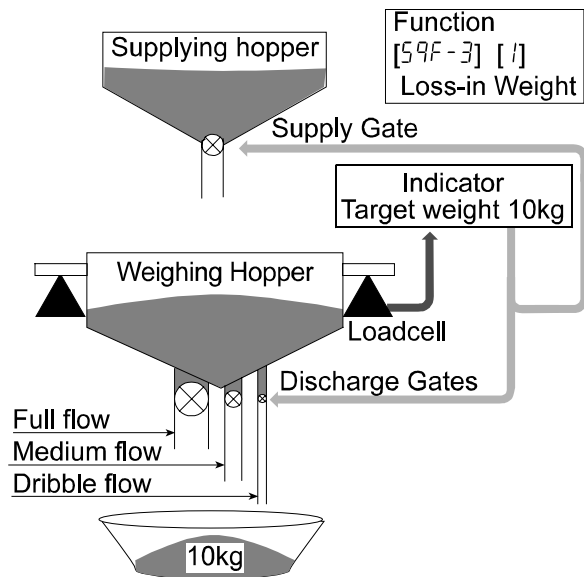


## 7.2. Batch Weighing Mode

- The mode is used to get a (constant) target weight from a supplying Mat for the hopper scale and filling machine. And the mode can be classified to normal batch weighing and loss-in weight.
- There are two control methods of the customer programmed control and sequential control (built-in automatic program mode).



Example: Normal Batching



Example: Loss-in Weight

### Normal Batching

- Normal batch weighing weighs the material charged into the hopper.
- The control gates (valves) can be used. (The full flow, medium flow and dribble flow)

### Loss-in-weight

- Loss-in weight weighs the material discharged from the hopper.
- The control gates (valves) can be used. (The full flow, medium flow and dribble flow)

### Caution

**Use the PLC (programmable logic controller unit) to supply material into the weighing hopper and monitor the bulk of material of the hopper.**

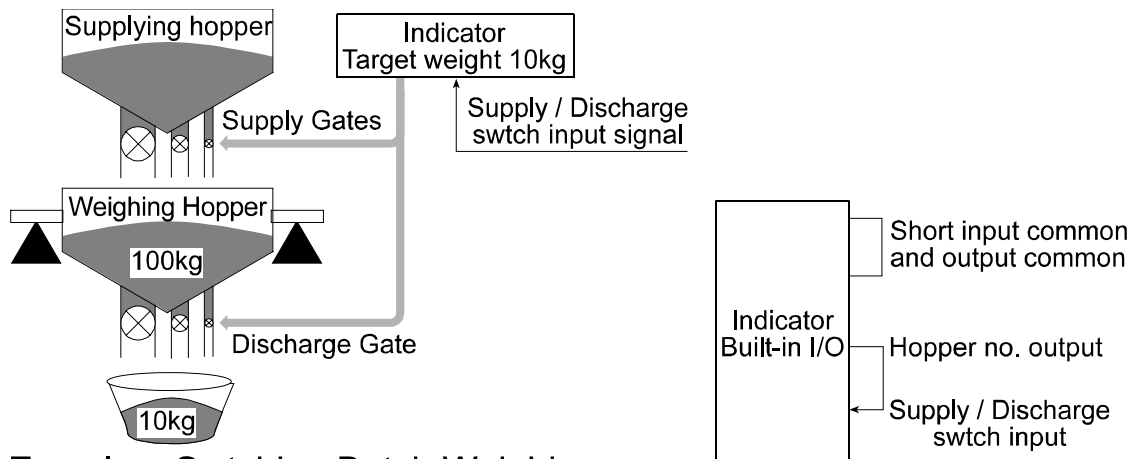
## 7.2.1. Selection of Batch Weighing

### Selection of Normal Batching or Loss-in-weight

- The mode can be selected at **Loss-in weight** at the Function list.  
 ([Function] - [Function setting] - [Sequence] - [Basic] - [Current weighing])  
 [59 F- 3] [0] Normal batch weighing  
 [59 F- 3] [1] Loss-in weight  
 [59 F- 3] [2] External selection (Normal batch weighing or Loss-in weight)

### External Selection (Normal batch weighing or Loss-in weight)

- Normal batch weighing and Loss-in weight can be selected by a signal of the input terminal that is set to [9] of **External switch control**.  
 (The menu [Function] - [Function setting] - [Control I/O Function] - [Input] )
- Example of use: The material of 100 kg is supplied to the hopper in first step. It is subdivided into material of 10kg.



Example: Switching Batch Weighing

### Advise

If the mode is switched concerning a specified material only, set the hopper no. in the material code, short the hopper no. output line and the supply/discharge switch input line. Set the delay timer [59 F- 32] to "above 0.1sec."



## 7.3. Sequential Weighing Mode

- The sequential weighing mode (built-in automatic program mode) directly outputs control signals (example: medium flow valve, batch finish) without the PLC.
- The sequential weighing mode can include several partial sequences like an approach sequence, mixture sequence and etc. into basic sequential weighing.
- The power of the control I/O signal output is too small to drive a large valve directly. Use option relay output ( OP-02 ) to drive them.
- If the number of the control I/O terminals is not enough, use option parallel I/O ( OP-05 ).

### Forecast Control Function

- The function forecasts a timing to close the dribble flow (valve) and realizes more precision weighing. The forecast method calculates the weighing value at some points between sampling data and compares it with the dribble setpoint. The effect is equivalent to use a high speed A/D converter. The sampling rate of this indicator is 100 [times/second]. But the ratio is equivalent to 1000 [times/second], when the function is used.

### Caution

- **If prual supplying mat is used (the recipe code is used), the mode can not use. Relation section is " 7.3.7. Automatic Selection of Supplying Mat".**
- **Use the high speed high precision valve like a direct voltage solenoid valve.**
- **Design the mechanical valve so as to minimize the delay time.**

## 7.3.1. Normal Batching of Sequential Weighing

---

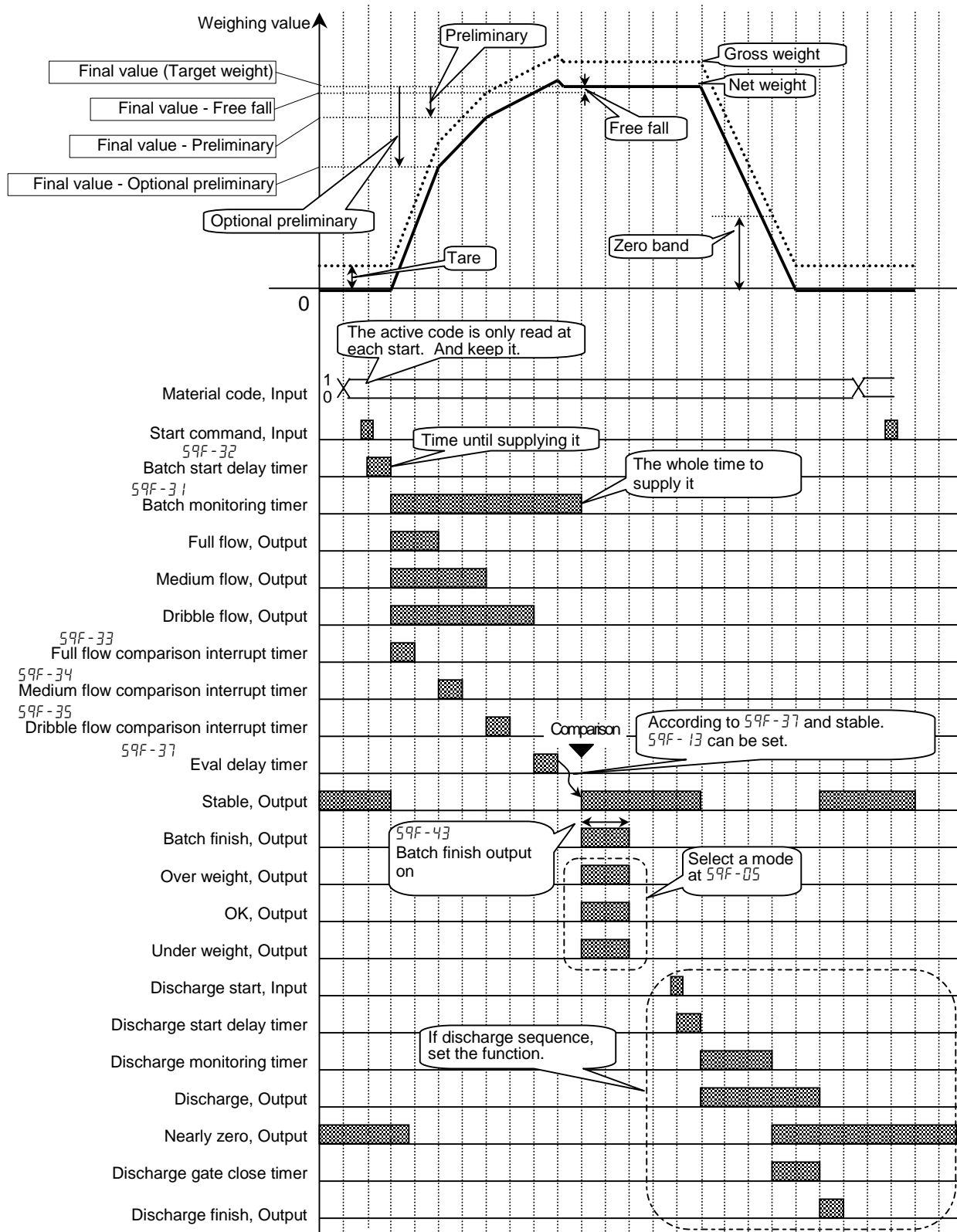
- Normal batch weighing weighs the material charged into the hopper.
- The control gates (valves) can be used. (The full flow, medium flow and dribble flow)

### Concerning Parameters of the Function

- Selecting normal batching of sequential weighing.
  - [59 F- 1] [2] Sequential weighing  
[Function] - [Function setting] - [Sequence] - [Basic] - [Weighing mode]
  - [59 F- 3] [0] Normal batch weighing  
[Function] - [Function setting] - [Sequence] - [Basic] - [Loss-in weight]
- Making zero display automatically when starting the sequence.
  - [59 F- 11] [Function] - [Function setting] - [Sequence] - [Control] - [Batch start settings]
- Preventing vibration due to gate operation.
  - [59 F-33] [Function] - [Function setting] - [Sequence] - [Timer] - [Full flow comparison interrupt timer]
  - [59 F-34] [Function] - [Function setting] - [Sequence] - [Timer] - [Medium flow comparison interrupt timer]
  - [59 F-35] [Function] - [Function setting] - [Sequence] - [Timer] - [Dribble flow comparison interrupt timer]



- Making alarm when the sequence is time over.  
 [59 F-31]      Maximum weighing time between start and batch finish can be set.  
                   Error code [SO.ERR 4] is displayed, when an error occurs.  
                   [Function] - [Function setting] - [Sequence] - [Timer] - [Batch monitoring  
                   timer]
  
- Removing "stable" from comparison condition.  
 [59 F-13]      [Function] - [Function setting] - [Sequence] - [Control] - [Eval condition]
  
- Changing the timing of comparison.  
 [59 F-37]      [Function] - [Function setting] - [Sequence] - [Timer] - [Eval delay timer]
  
- Changing accuracy of comparison.  
 [59 F-48]      The time to average weighing value at batch finish can be set. The  
                   timing of batch finish delays for the time.  
                   [Function] - [Function setting] - [Sequence] - [Timer] - [Average Eval time]
  
- Changing the pulse width of weighing finish output.  
 [59 F-43]      If zero is set to this, the output leaves until next start signal.  
                   [Function] - [Function setting] - [Sequence] - [Timer] - [Batch finish output  
                   on]
  
- Mixing it at weighing finish.  
 [59 F-14]      [Function] - [Function setting] - [Sequence] - [Control] - [Batch finish action]
  
- Discharging it at weighing finish.  
 [59 F-15]      [Function] - [Function setting] - [Sequence] - [Control] - [Discharge finish  
                   action]
  
- Using customer programmed control for hi signal, go signal and low signal.  
 [59 F- 5]      [Function] - [Function setting] - [Sequence] - [Basic] - [Comparison]



Drawing: Normal Batching of Sequential Weighing

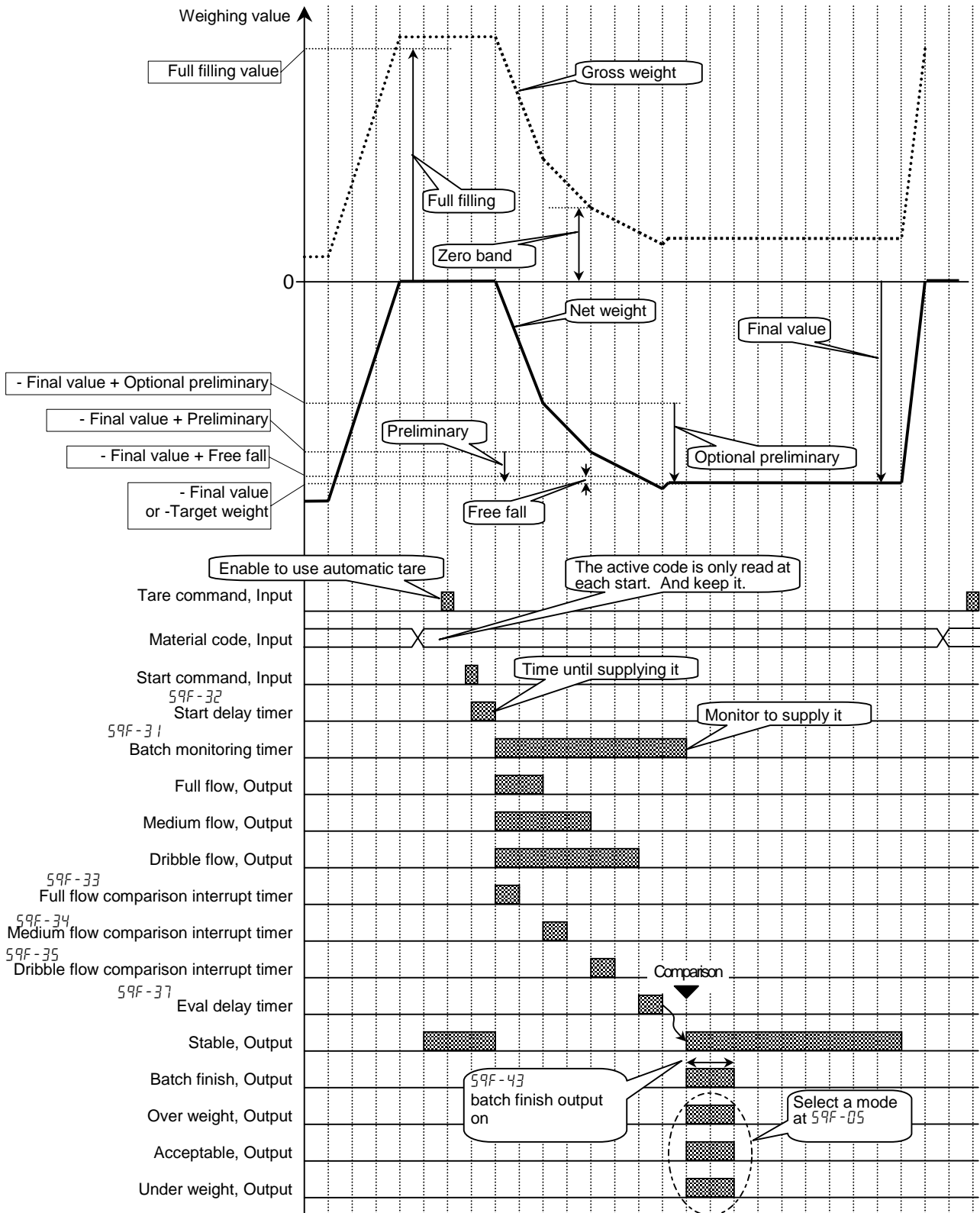
## 7.3.2. Loss-in Weight of Sequential Mode

---

- Loss-in weight weighs the material discharged from the hopper.
- The control gates (valves) can be used. (The full flow, medium flow and dribble flow)

### Concerning Parameters of the Function

- Selecting normal batching of sequential weighing.
  - [59 F- 1] [1] Sequential weighing  
[Function] - [Function setting] - [Sequence] - [Basic] - [Weighing mode]
  - [59 F- 3] [0] Normal batch weighing  
[Function] - [Function setting] - [Sequence] - [Basic] - [Loss-in weight]
- Making zero display automatically when starting the sequence.
  - [59 F- 11] [Function] - [Function setting] - [Sequence] - [Control] - [Batch start settings]
- Switching normal batching and loss-in weight from the I/O interface.
  - [59 F- 3] [2] External exchange  
Set an input terminal to switch the mode at the I/O interface. Material can be supplied to the hopper with three gates (valves).  
[Function] - [Function setting] - [Sequence] - [Basic] - [Loss-in weight]
- Checking whether is there the remainder weight for one batch weighing.
  - [59 F-55] [1] When the remainder weight decreases under target weight + nearly zero, the signal "nearly zero" is output.  
[Function] - [Function setting] - [Sequence] - [Setpoint (Compared value)] - [Add final value and zero band]
  - [59 F-56] [1] If this is set, when the hopper is filled fully, the signal "Full" is output.  
[Function] - [Function setting] - [Sequence] - [Setpoint (Compared value)] - [Add final value and full value]



Drawing: Loss-in Weight of Sequential Weighing

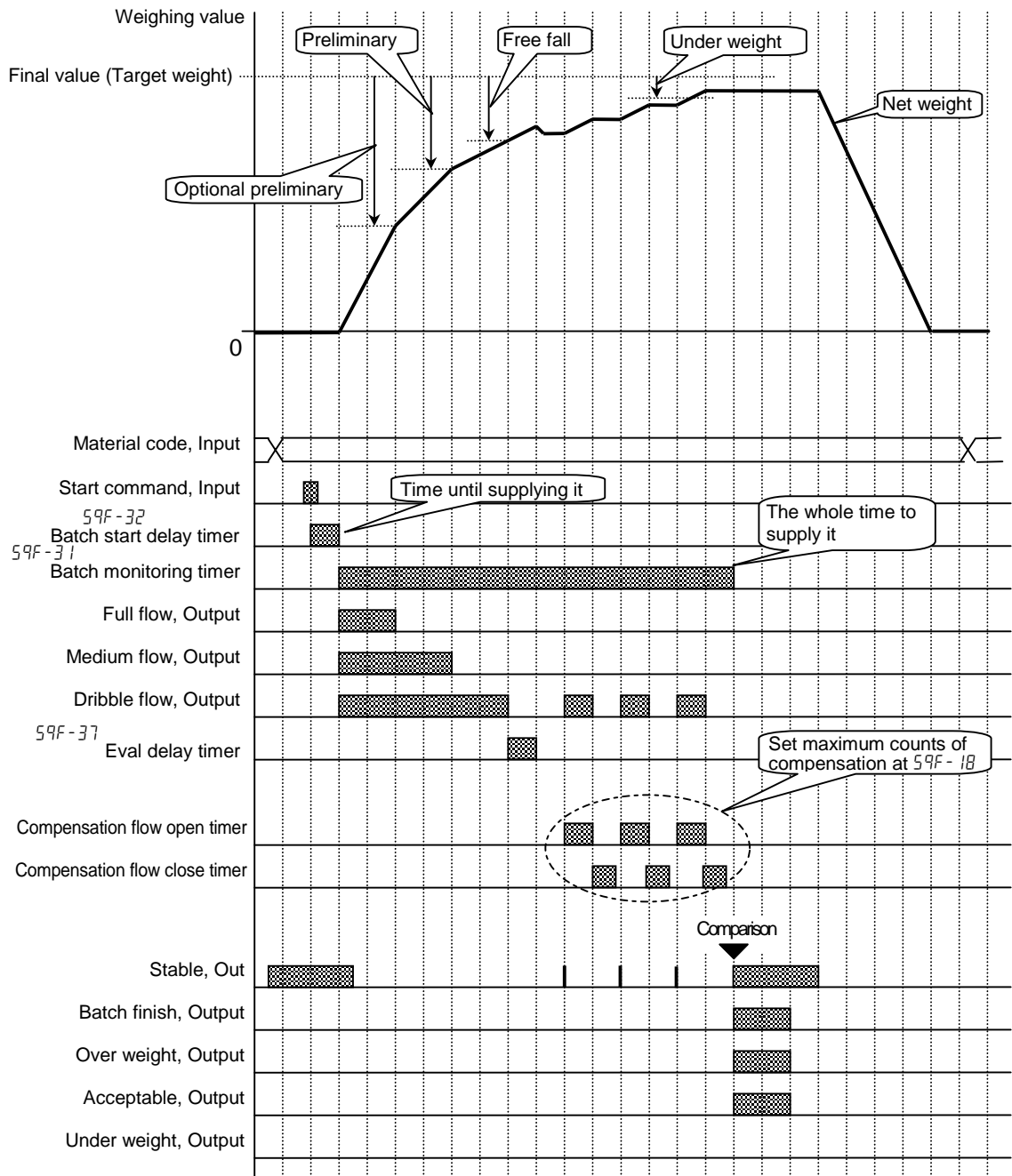
## 7.3.3. Compensation Sequence

---

- The compensation sequence is used to make up (add) the material automatically, when the result of current batch weighing is under weight.

### Concerning Parameters of the Function

- Storing a maximum repeat counts of compensation sequence.  
[59 F- 18] If number is zero, this sequence is canceled. When the result is under weight after the sequence, An error `SO.ERR 2` is displayed.  
[Function] - [Function setting] - [Sequence] - [Control] - [Maximum number of compensation]
- Setting the time to open the dribble gate.  
Set the time at each material code.  
[Function] - [Function setting] - [MatEDIT] - [Edit] - [Compensation flow open timer]
- Setting the time to close the dribble gate.  
Set the time at each material code.  
When the weighing value is stable and under weight, the compensation is repeated. Take a longer time closing gate, if it does not use a stable signal.  
[Function] - [Function setting] - [Material Edit] - [Edit.] - [Compensation flow close timer]
- Removing the nozzle at this sequence, when the nozzle operation is used.  
[59 F- 12] [2] `Nozzle contact stop sequence`  
Factory setting is "not used". When it is necessary to shift up the nozzle to reduce a weighing error, use this parameter of [59 F- 12].  
[Function] - [Function setting] - [Sequence] - [Control] - [Nozzle control]



Drawing: Compensation Sequential

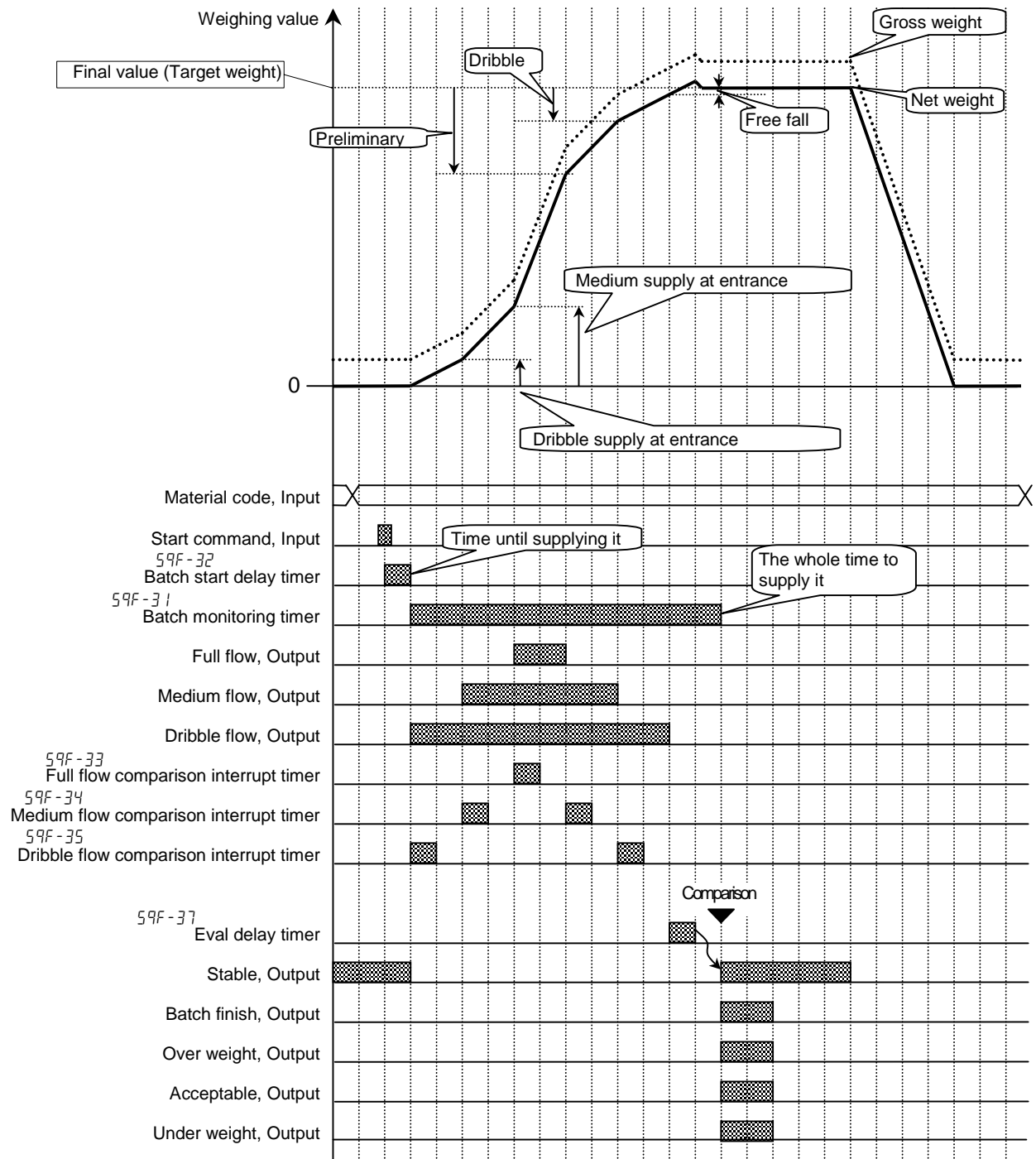
## 7.3.4. Entrance Sequence

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- The entrance sequence is used to prevent the material from scattering before the batch weighing when a liquid or powder is weighed. When the sequence starts, dribble gate is opened at first, medium gate is opened next and full gate is opened at last. The parameter can be set in each material code.

### Concerning Parameters of the Function

- Using this sequence to prevent the material from scattering.  
Set the following parameters in each material code.  
Medium supply effective bandwidth  
Dribble supply effective bandwidth
- Editing these parameters.  
Edit the parameters in the function mode.  
[Function] - [Function setting] - [MatEDIT] - [Edit]
- Inhibiting the comparison during the sequence.  
[59 F-35] Store the time of the dribble flow comparison inhibit timer.  
[Function] - [Function setting] - [Sequence] - [Timer] - [Dribble flow comparison interrupt timer]
  
- [59 F-34] Store the time of the medium flow comparison inhibit timer.  
[Function] - [Function setting] - [Sequence] - [Timer] - [Medium flow comparison interrupt timer]



Drawing: Entrance Sequence



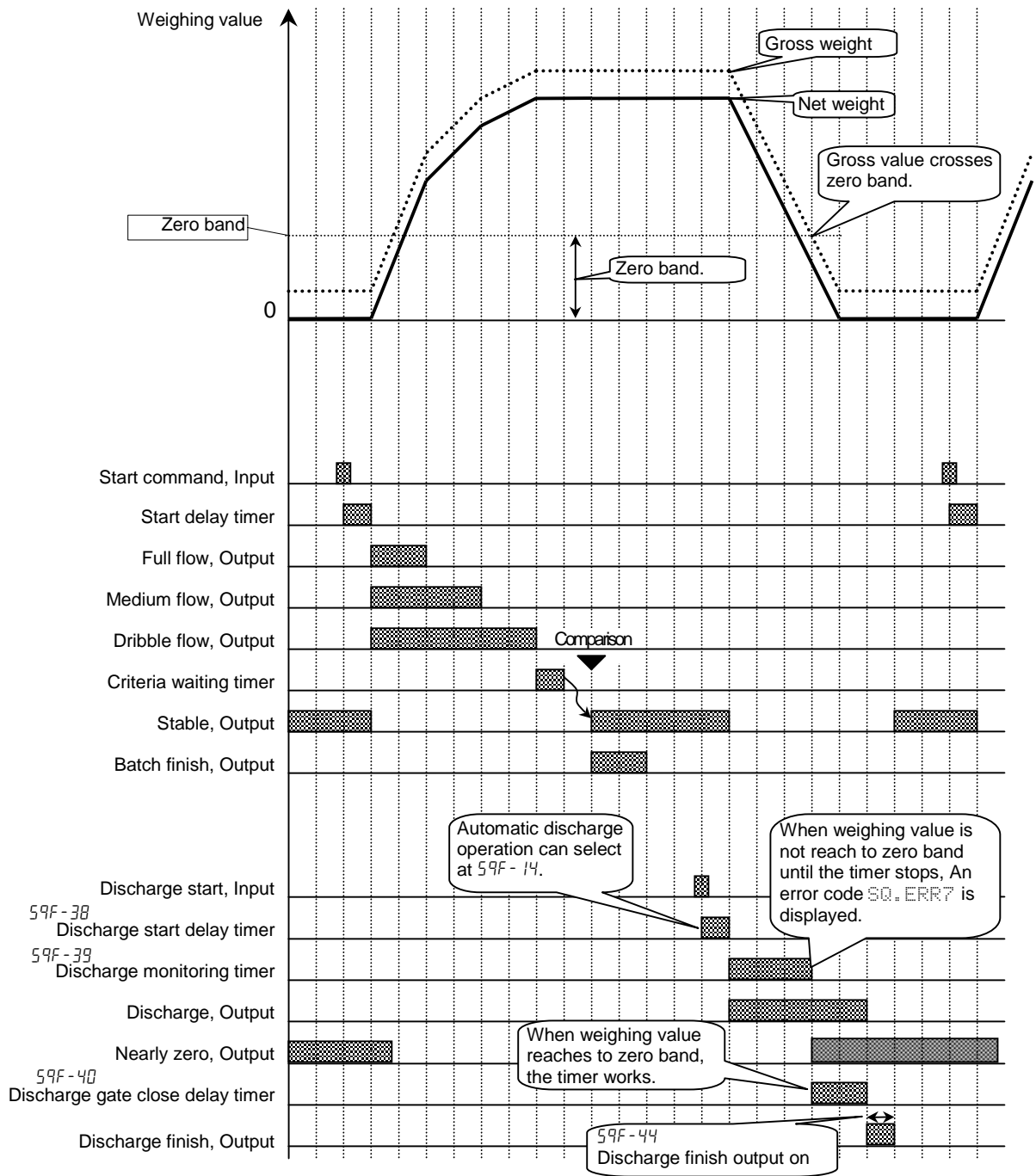
## 7.3.5. Discharge Sequence

---

- The discharge sequence is used to discharge the material from the hopper and clear the hopper after finishing a batch weighing.

### Concerning Parameters of the Function

- Storing the time between receiving start command and opening the discharge gate.  
[59 F-38] [Function] - [Function setting] - [Sequence] - [Timer] - [Discharge start delay timer]
- Using the alarm for the discharge time limit.  
[59 F-39] If it is over, an error `SO.ERR 7` is displayed.  
[Function] - [Function setting] - [Sequence] - [Timer] - [Discharge monitoring timer]
- Storing the time between cleared hopper and closed the gate.  
[59 F-40] [Function] - [Function setting] - [Sequence] - [Timer] - [Discharge gate close delay timer]
- Discharging it automatically when finished the weighing.  
[59 F-14] When the finish signal is turned off, the discharge start timer starts.  
[Function] - [Function setting] - [Sequence] - [Control] - [Batch finish action]
- Discharging it automatically when finished the mixture weighing.  
[59 F-17] When the finish signal is turned off, the discharge start timer starts.  
[Function] - [Function setting] - [Sequence] - [Control] - [Recipe finish action]



Drawing: Discharge Sequence

## 7.3.6. Plain Recipe Sequence

---

- The plain recipe sequence mixes preset target weights of plural materials that are stored in a recipe code. A hundred recipe codes can be stored in the indicator. A recipe code can store ten material codes and the order to mix them.
- There are the following two modes that can select at Recipe mode.
  - Semi-automatic [59F- 8] [1] The mode that uses (external) start command for each material.
  - Automatic [59F- 8] [2] The mode that does not need each start command. When the under weight occurs in a material, an error code SO.ERR 2 is displayed and sequence stops.

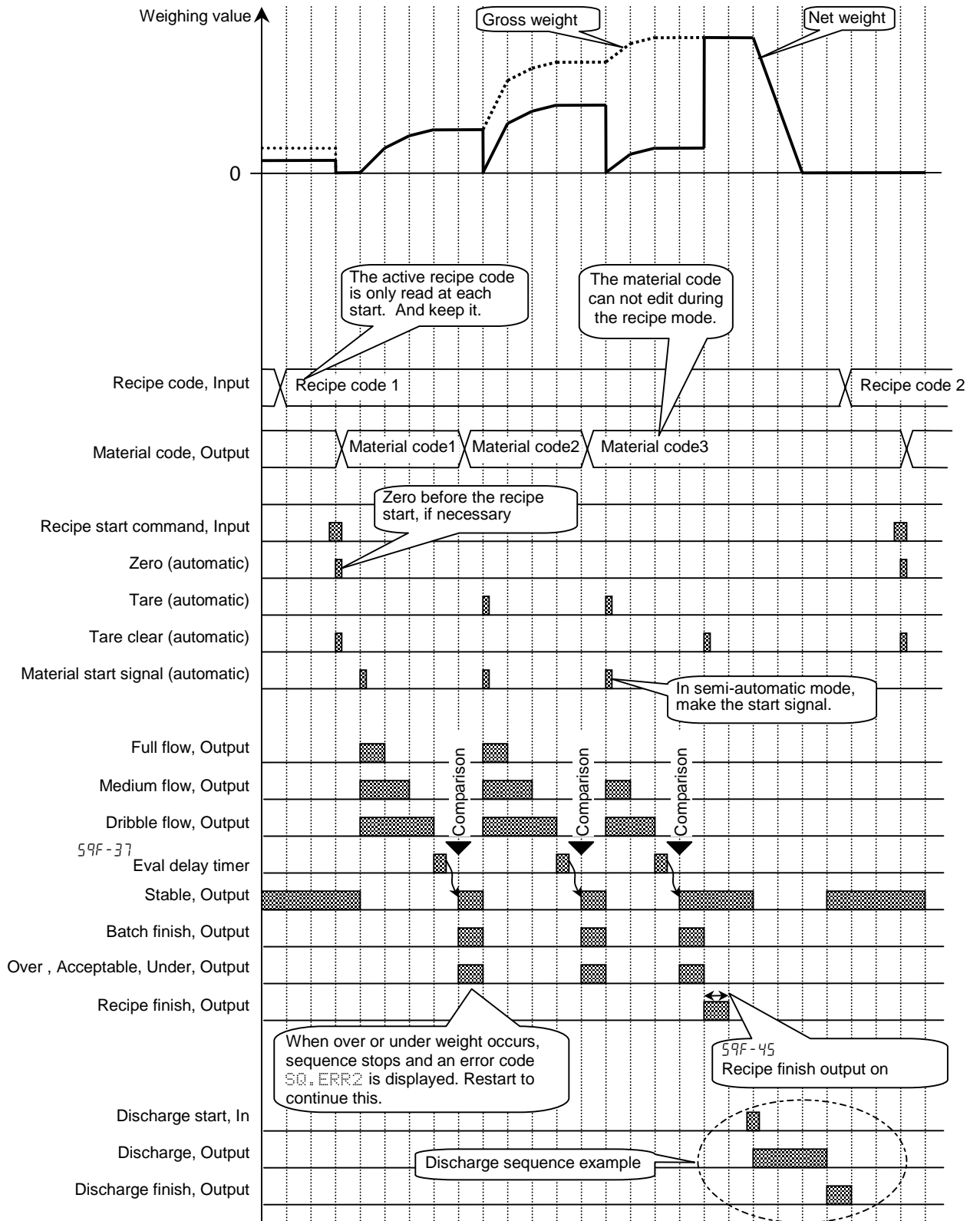
### Concerning Parameters of the Function

- Selecting normal batching of sequential weighing.
  - [59 F- 8] Recipe mode
  - [59 F- 8] [1] Semi-automatic mode, or
  - [59 F- 8] [2] Automatic mode[Function] - [Function setting] - [Sequence] - [Basic] - [Recipe mode]
- Making zero display automatically when starting the recipe sequence.
  - [59 F- 16] [Function] - [Function setting] - [Sequence] - [Control] - [Recipe start action]
- Clearing tare value, mixing them and discharging them when finishing the recipe sequence.
  - [59 F- 17] [Function] - [Function setting] - [Sequence] - [Control] - [Recipe finish action]
- Changing the width of the finish signal output of the recipe sequence.
  - [59 F-45] [Function] - [Function setting] - [Sequence] - [Timer] - [Recipe finish output on]
- Calculating totals in each recipe code.
  - [59 F-62] [Function] - [Function setting] - [Sequence] - [Accumulation] - [Automatic recipe code total]

### Weighing a single material code during a recipe sequence

When it have to weigh the material code temporarily during a recipe sequence, use formulation (recipe) prohibition command of the external I/O or OP-05. When the prohibition works, the material code can be used and total of the recipe is not accumulated.

- Setting of the I/O.
  - [In F- nn] [49] Prohibition of recipe sequence.  
nn: terminal number of I/O.  
[Function] - [Function setting] - [Control I/O] - [Input]



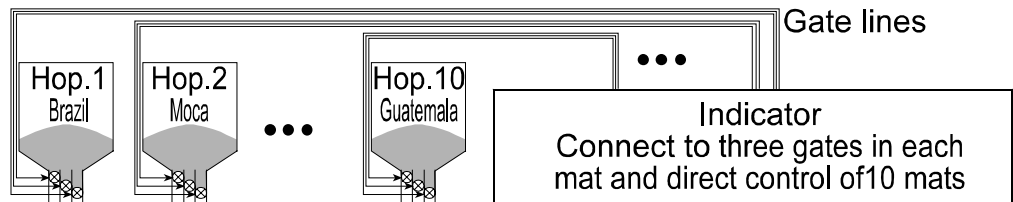
Drawing: Plain Recipe Sequence

## 7.3.7. Automatic Selection of Supplying Mat

- When there are plural supplying mats of materials, the indicator has to control these gates. There are the following two method to control them.

### Case 1: Direct Gate Control

- The method is that connects each gate control lines of supplying mats to the I/O terminals of the indicator and the indicator directly controls them.
- Three kinds of gates can be used in a supplying hopper. (Full, medium, dribble gate)
- Number of supplying hopper: **Ten hoppers** can be used.
- Preset material codes and recipe codes can be used.
- The selection of the supplying mat is [MatEDIT] - [Material code] - [Material hopper].  
The selection of the I/O terminals is [Function] - [Function setting] - [Control I/O Function] - [Output].
- Even if a code is recalled during the sequence, the code does not work until the sequence finishes.
- When number of the I/O terminals is not enough, use options of relay output (OP-02) and parallel I/O (OP-05).



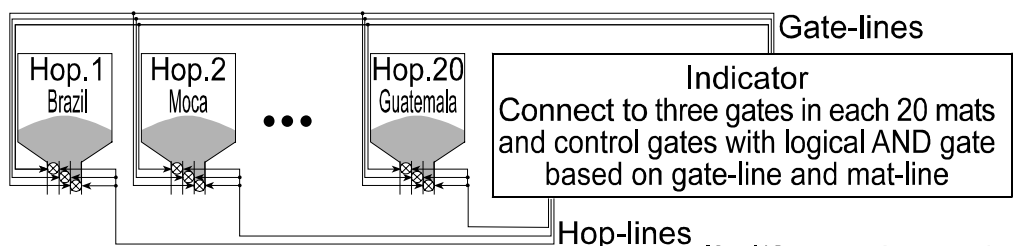
Example: Direct Gate Control

If a I/O extension needs, use OP-02 and OP-05.

### Case 2: Gate Control with Supplying Mat Selection

The method:

- Make **gate-lines** that gates of a kind in each supplying mat are connected to the I/O terminal of the indicator in parallel.
- Make **Hop-lines** that lines identified each mat are connected to the I/O terminal.
- The indicator can control any gate which the gate-line and mat-line is active. (logical AND gate)
- Three kinds of gates can be used in a supplying hopper. (Full, medium, dribble gate)
- Number of supplying hopper: **Twenty hoppers** can be used.
- Preset material codes and recipe codes can be used.
- The selection of the supplying mat is [MatEDIT] - [Material code] - [Material hopper].  
The selection of the I/O terminals is [Function] - [Function setting] - [Control I/O function] - [Output].
- When number of the I/O terminals is not enough, use options of relay output (OP-02) and parallel I/O (OP-05).



Example: AND Gate Control

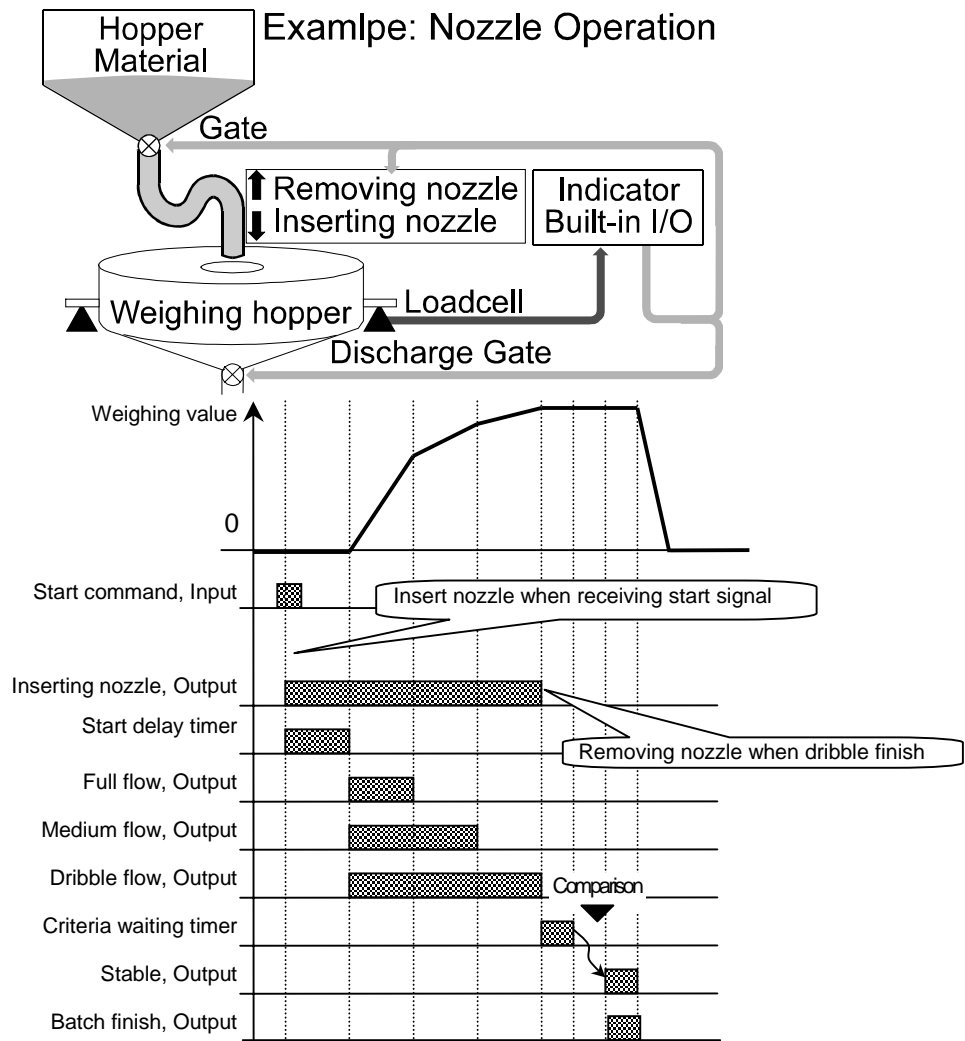
If a I/O extension needs, use OP-02 and OP-05.

## 7.3.8. Nozzle Control Sequence (vacuum cleaner)

- The nozzle is used for filling liquid or powder to bottle. The procedure is that inserts the nozzle to the bottle automatically using the signal "nozzle down" before the weighing, weighs it and removes the nozzle when dribble flow is finished. Therefore, the result (comparison) of weighing is not affected.

### Advise

- In case of using the nozzle control sequence  
 [59 F-12] [Function] - [Function setting] - [Sequence] - [Control] - [Nozzle control]
- In case of using the timer to ready nozzle.  
 [59 F-32] [Function] - [Function setting] - [Sequence] - [Timer] - [Batch start delay timer]
- In case of using the nozzle down  
 [OutF-nn] Nozzle down  
 nn: terminal number of the I/O.  
 [Function] - [Function setting] - [Control I/O] - [Output]
- In case of compare it after shifting up nozzle  
 [59 F-12] [Function] - [Function setting] - [Sequence] - [Control] - [Nozzle control]



## 7.3.9. Mixture Sequence

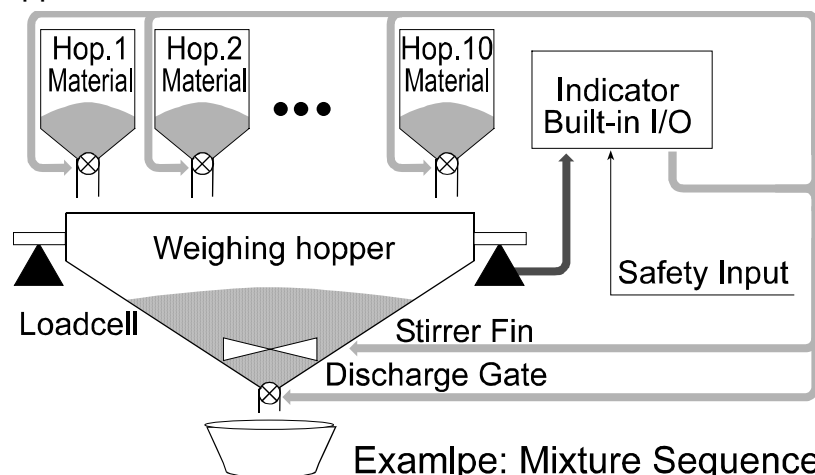
- The mixture sequence is used to mix or stir it. The signal is output from the I/O terminal set to `mixing`. The timing of weighing finish, discharge finish and mixture finish can be selected.

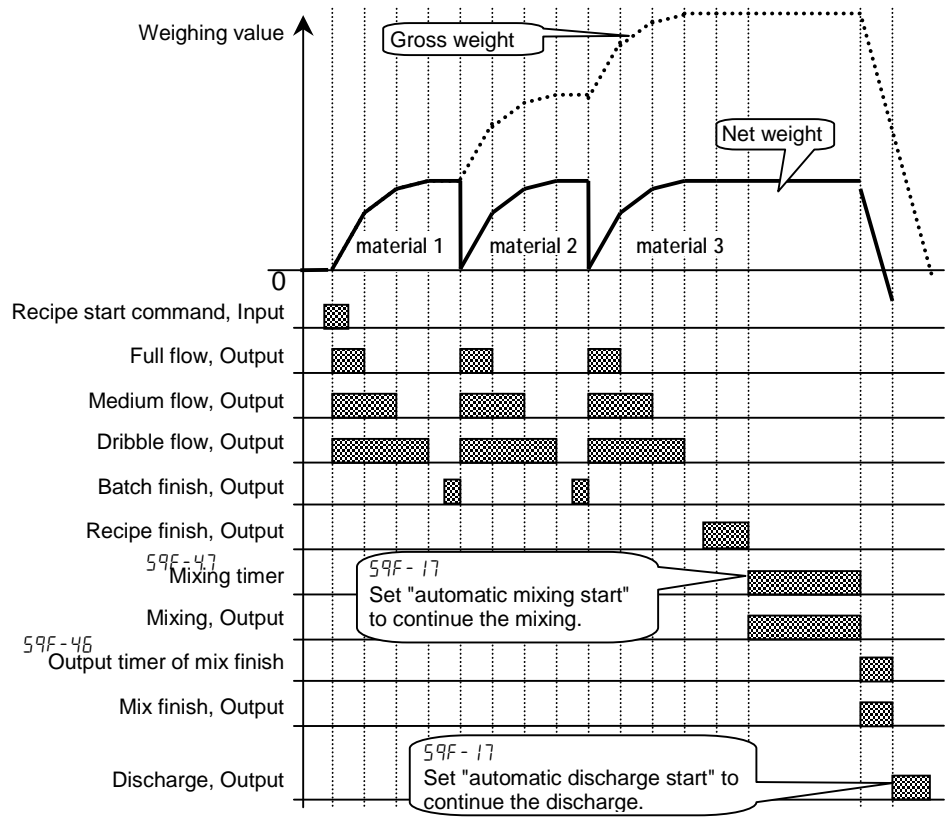
### Concerning Parameters of the Function

- Using the mixture sequence  
`[Out F- nn] [12] Mixture`  
 nn: terminal number of I/O.  
`[Function] - [Function setting] - [Control I/O] - [Output]`  
 Relay output (OP-02), parallel I/O (OP-05) can be used.
- Mixing it at weighing finish  
`[59 F- 14] [Function] - [Function setting] - [Sequence] - [Control] - [Batch finish action]`
- Mixing it after discharge  
`[59 F- 15] [Function] - [Function setting] - [Sequence] - [Control] - [Discharge finish action]`
- Mixing it after formula  
`[59 F- 17] [Function] - [Function setting] - [Sequence] - [Control] - [Recipe finish action]`
- Storing the time of mixture  
`[59 F- 47] [Function] - [Function setting] - [Sequence] - [Timer] - [Mixing time output on]`
- Safety check during mixture  
`[59 F- 74] [Function] - [Function setting] - [Sequence] - [Safety] - [Mixing safety check]`

### Advise

- Safety check during mixture  
 When the specified input terminals at `[59 F- 74]` are all ON, it supposes that the sequence is safety and is continued. If a terminal of them is OFF, an error code is output and sequence is stopped.



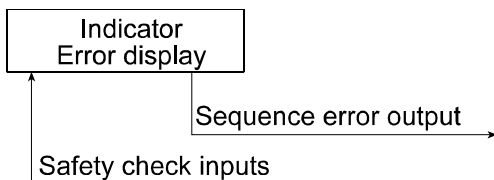




## 7.3.10. Safety Check Function

- The function is used to stop the sequence when an error or an emergency happens.
- When the function works, an error code is displayed and an error signal is output from preset I/O terminal that `weighing sequence error [22]` is selected at [Function] - [Function setting] - [Control I/O] - [Output].
- The control inputs of the function use the preset I/O terminals or OP-05 terminals that select `safety confirmation`.
- In maximum, eight input terminals can use.
- The kind of the safety check functions is as follows:

Code	Classification	Action
<code>59F-71</code>	Condition of the start	Specify the safety confirmation inputs on the I/O or OP-05. When all inputs are not ON (active), the sequence is stopped, an error code is displayed.
<code>59F-72</code>	Condition of the discharge	
<code>59F-73</code>	Condition of the recipe (compound)	
<code>59F-74</code>	Condition of the mix	
<code>59F-75</code>	Condition of the whole sequence	



Example: Safety check

## 7.3.11. Pause and Emergency Stop

- The pause input is used to stop the sequence temporarily. When the sequence pauses, `SO.ERR 0` is displayed and an error code is output.
- The emergency stop input is used to stop the sequence. When the sequence is stopped, the alarm1 sounds and `No. alarm 19` is displayed. When the emergency stop is canceled, the status move to the pause (temporary stop).
- Refer to section "7.5.11. Error Message and Alarm" for the details.
- The I/O terminal and OP-05 terminal can be assigned to the pause input and emergency input.

### Concerning Parameters of the Function

- Selecting the I/O terminal as the pause input or the emergency input.
  - `[In F-nn] [22] Pause (Temporary stop)`
  - `[In F-nn] [13] Emergency Stop`
  - nn: terminal number of I/O.
  - [Function] - [Function setting] - [Control I/O Function] - [Input]
- Selecting the OP-05 terminal as the pause input or the emergency input.
  - `[05 F-nn] [22] Pause (Temporary stop)`
  - `[05 F-nn] [13] Emergency Stop`
  - nn: terminal number of I/O.
  - [Function] - [Function setting] - [slot kk]
  - kk: The slot number installed OP-05.

## 7.3.12. Restart Sequences from Pause

- The restart input is used to start from the point that is stopped the last sequence.
- The control inputs of the function use the preset I/O terminals or OP-05 terminals that select Restart.
- The action of the function is as follows:

When stopped it	Before the restart	Action of the restart
During dribble supply of entrance sequence	All gates are closed	Start from dribble supply of entrance. sequence
During preliminary supply of entrance sequence		Start from preliminary supply of entrance sequence
During optional preliminary		Start from optional preliminary
During preliminary		Start from preliminary
During dribble		Start from dribble
Waiting batch finish signal		Waiting batch finish signal
During compensation		Start from compensation
During nozzle operation	Stopping the operation	Start from nozzle operation
When mixing them	Stopping the mix	Start from the mix
During discharge	Stopping discharge	Start from discharge
During recipe sequence	According to above list	According to above list

## 7.3.13. Automatic Free Fall Compensation

---

- The function arranges the free fall parameter using value averaged the last four weighing values so as to get more precision weighing.

### Concerning Parameters of the Function

- Using the automatic free fall compensation  
[59 F-20] [1] Average of last four times free fall.  
[Function] - [Function setting] - [Sequence] - [Control] - [Free fall compensation]
- Using the automatic free fall effective bandwidth  
[Function] - [Function setting] - [MatEDIT] - [Code No.] - [AFFC range]  
Refer to section 6.1.5.Editing Full Parameters of Material Code.
- Using the normal free fall  
[59 F-20] [0] No (Not used)  
When using the signal form the I/O terminal to control free fall, use this.  
[Function] - [Function setting] - [Sequence] - [Control] - [Free fall compensation]
- Storing the result of the automatic free fall compensation of each material.  
[59 F-9] [1] Change free fall value  
When using the flash memory, set to [0tHF-11] [2].  
[Function] - [Function setting] - [Sequence] - [Basic] - [Material code, free fall value]

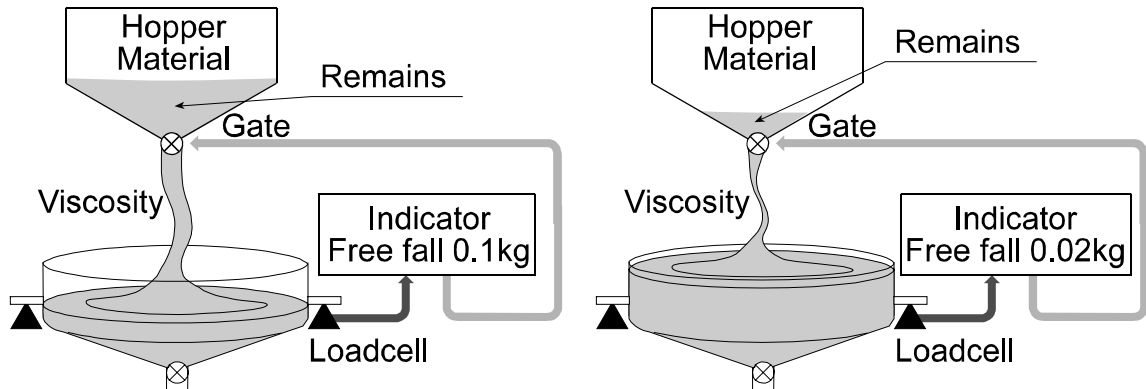
### Advise

- When the automatic free fall compensation can not work.
  - Check the flux of dribble flow.  
When the error (| result - final value |) of weighing value is bigger than this parameter, the function does not work.
  - Check that dribble flow timer is shorter.  
When the timer is shorter than dribble flow auto-free fall override time [59 F-36], the function does not work.
- When the accuracy does not improve, even if automatic free fall compensation is used.
  - Check the stability of the dribble flow.  
When the dribble flow is unstable and dribble flow timer is shorter, the function can not work correctly.
- When the result becomes over, even if automatic free fall compensation is used.
  - Remove between preliminary and free fall  
When the value of preliminary and free fall are near, medium flow only works to reach to final value and the dribble flow can not work.

## 7.3.14. Real Time Free Fall Compensation

- The function arranges the free fall parameter to get more precision weighing during the sequence (in real-time calculation).

Example: this function fits a liquid weighing (water, cement, tar) that flow rate is not constant due to temperature, viscosity and the remains.



Example: Real Time Free Fall Compensation

### Concerning Parameters of the Function

- Using the real time free fall compensation.  
[59 F-20] [2] Real time Free Fall compensation  
[Function] - [Function setting] - [Sequence] - [Control] - [Free fall compensation]
- Using the automatic free fall effective bandwidth  
[Function] - [Function setting] - [MatEDIT] - [Code No.] - [AFFC range]  
Refer to section 6.1.5.Editing Full Parameters of Material Code.
- Storing the result of the automatic free fall compensation of each material.  
[59 F- 9] [1] Store  
When using the flash memory, set to [0LHF- 11] [2].  
[Function] - [Function setting] - [Sequence] - [Basic] - [Memory of free fall value by material code]

### Advise

- When the accuracy does not improve, even if automatic free fall compensation is used.
- Check the stability of the dribble flow.  
If material includes big lump, when the dribble flow is unstable and irregular and when dribble flow timer is shorter, this function can not work correctly.
- When the dribble flow timer is shorter than dribble flow unstable time [59 F-36].  
When the timer is used default value of each material code.



## 7.4. Customer Programmed Control (Comparison Output)

- The "customer programmed control" simply outputs the comparison result of the setpoints and weighing value.  
The setpoint : It means the preset standard value to compare the weighing value.
- The comparison and output of the result are performed at every sampling time.
- If the function is used, the PLC (programmable logic controller unit) needs for a batch weighing on the hopper scale.
- The power of the control I/O signal output is too small to drive a large valve directly. Use option relay output ( OP-02 ) to drive them.
- If the number of the control I/O terminals is not enough, use option parallel I/O ( OP-05 ).

### Caution

- **Approach sequence and compensation sequence can not use in the the "customer programmed control"**

### Advise

- Automatic free fall compensation and Accumulation function  
If the start key is used, in the same as sequential mode, when three gates are closed, criteria timer has worked and weighing value becomes stable, the batch finish signal can output.
- The start key is not necessary to compare weighing value basically.

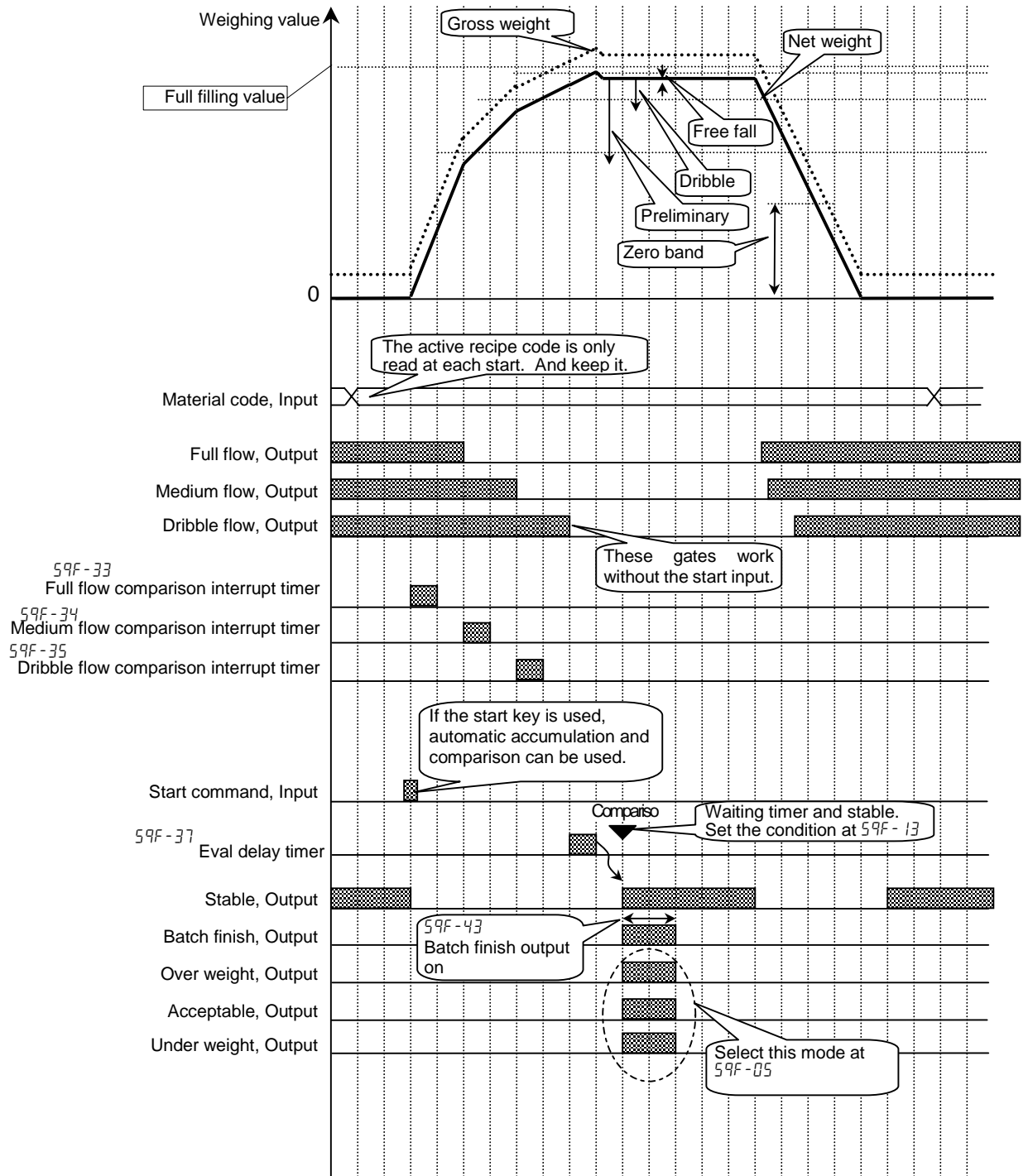
## 7.4.1. Normal Batching of Comparison Function

---

- The function outputs the gate control signals that are compared setpoint and weighing data that is accumulated materials to hopper.
- When the weight increases above the setpoint, the gate control signal turns off. When the weight decreases under the setpoint, the gate control signal turns on.
- There is not direction for the weighing sequence in this function. Therefore, the comparison is repeatable (reversible).

### Concerning Parameters of the Function

- Using the normal batching of comparison function  
[59F- 1] [1] Customer programmed control  
[59F- 3] [0] Normal batch weighing  
[Function] - [Function setting] - [Sequence] - [Basic]
- Changing waiting time of judgment  
[59F-37] Eval delay timer  
[Function] - [Function setting] - [Sequence] - [Timer]
- Changing the pulse width of batch finish output  
[59F-43] Batch finish output on  
The arbitrary width can be set.  
If zero is set, the output keeps until next start.  
[Function] - [Function setting] - [Sequence] - [Timer]
- Using signals of "over", "acceptable" and "under" in the comparison function.  
[59F- 5] Comparison  
[Function] - [Function setting] - [Sequence] - [Basic]
- Changing the accuracy of the comparison  
[59F-48] Averaging Eval time  
The average time of batch finish output is set. The output of batch finish delays by the average time.  
[Function] - [Function setting] - [Sequence] - [Timer]
- Using the manual compensation  
[In F-nn] [10] Manual free fall compensation  
[OS F-nn] [10] Manual free fall compensation  
nn: terminal number of the I/O.  
The input to control free fall by the external PLC.  
[Function] - [Function setting] - [Control I/O] - [Input]



Drawing: Normal Batching of Comparison Function

## 7.4.2. Loss-in Weight of Comparison Function

---

- The function outputs the gate control signals that are compared setpoint and weighing data that is discharged materials from hopper.
- When the weight decreases above the setpoint, the gate control signal turns off. When the weight increases under the setpoint, the gate control signal turns on.
- There is not direction for the weighing sequence in this function. Therefore, the comparison is repeatable (reversible).

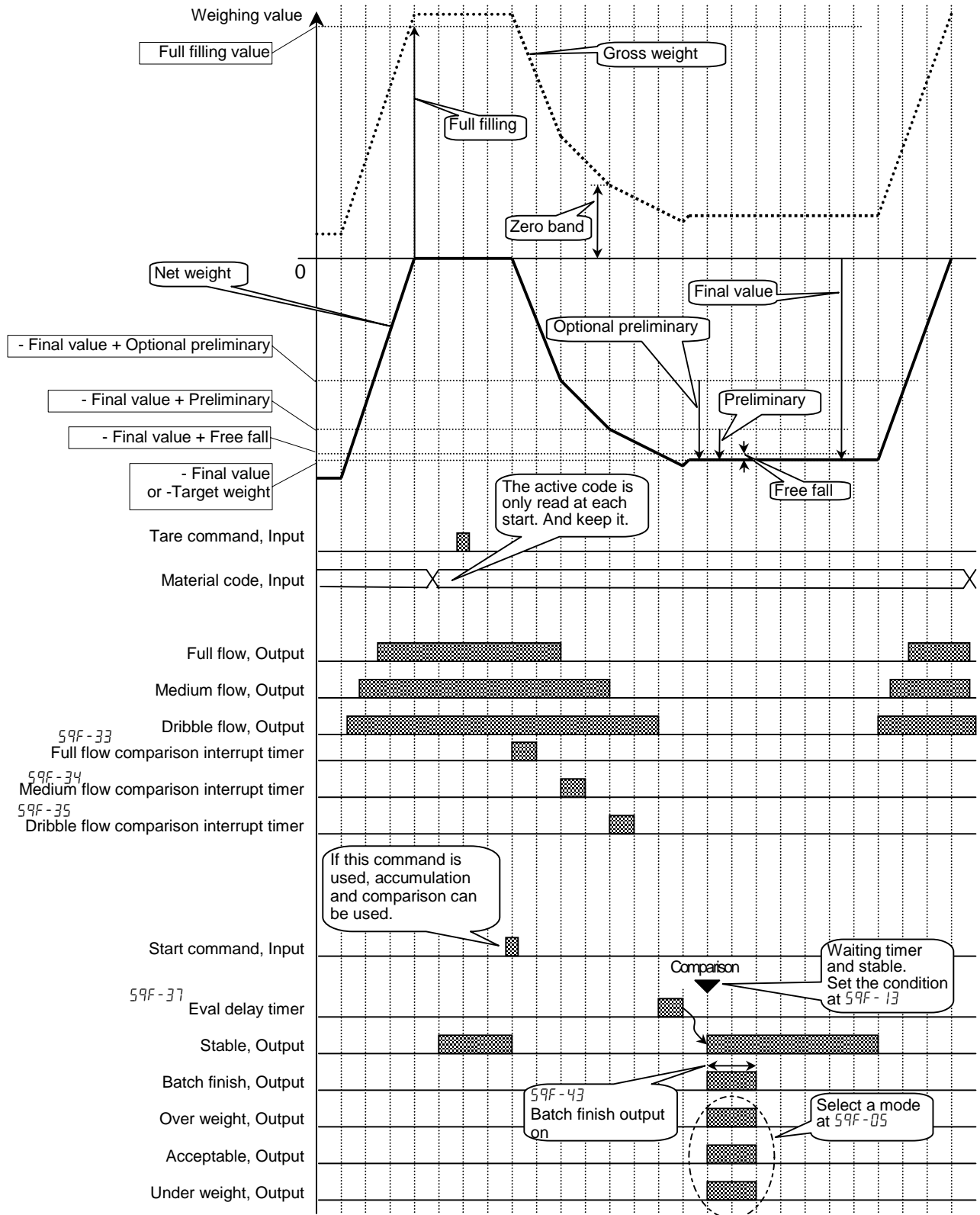
### Concerning Parameters of the Function

- Using the loss-in weight of comparison function  
[59F- 1] [1] Constomer Programmed control  
[59F- 3] [1] Loss-in weight  
[Function] - [Function setting] - [Sequence] - [Basic]
- Using the external control switch for normal batch and loss-in weight.  
[59F- 3] [2] External exchange  
If the external switch is used, connect to the I/O terminal. This mode can use three gates.  
[Function] - [Function setting] - [Sequence] - [Basic]
- Checking the remains of the hopper whether is there the weight of the last operation.  
[59F-55] Add final value and zero band  
When the remains reach under the **final value + zero band**, the zero band signal is output.  
[Function] - [Function setting] - [Sequence] - [Setpoint (Compared value)]
- Using the external switch  
[In F-nn] [9] Supply swiacth control  
nn: terminal number of the I/O.  
[Function] - [Function setting] - [Control I/O] - [Input]
- Checking the remains of the hopper whether is there the weight of the last operation.  
[59F-56] Add final value and full value  
When the **final value + full filling value** is negative, the full filling signal is output.  
[Function] - [Function setting] - [Sequence] - [Setpoint (Compared value)]
- Changing the accuracy of the comparison  
[59F-48] Average time at criteria  
The average time of batch finish output is set. The output of batch finish delays by the average time.  
[Function] - [Function setting] - [Sequence] - [Timer]
- Using the manual compensation  
[In F-nn] [10] Manual free fall compensation  
[05 F-nn] [10] Manual free fall compensation  
nn: terminal number of the I/O.  
The input to control free fall by the external PLC.  
[Function] - [Function setting] - [Control I/O Function] - [Input]



# Advise

- Using the automatic switch of normal batch and loss-in weight. Specify the output terminal for the hopper number in the material code on the I/O. Specify the input terminal to change the mode on the I/O. [In F-nn] [9] Connect the output terminal to the input terminal. Connect the output common terminal to the input common terminal. Set the delay time above 0.1 second at [59F-32] Batch start delay timer.





## 7.5. Other Functions

### 7.5.1. Re-Zero Operation

---

- Performing the function, a gross display is zeroed and an current weighing value is used as a standard point.
- The operation of the function can perform form the front key, the input terminal of the I/O and command input.
- The adjustable range is based on the zero calibration and Zero range [GEnF- 6] of the function list. The range is displayed in the unit of percentage of the weighing capacity.
- The re-zero data is stored in the memory without power supply.
- Resetting the re-zero data, use the I/O terminal or the F1 ~ F4 key that is set to Zero clear [In F-nn] [2].

nn: terminal number of I/O.

#### Caution

- **When the internal A/D converter is out of range, the re-zero operation be not performed and the error code ZR.ERR is displayed.**

#### Concerning Parameters of the Function

- Changing the range to do the re-zero operation.  
[GEnF- 6]      Zero range  
                  The maximum range is 30% of the capacity.  
                  [Function] - [Function setting] - [General] - [Weighing]
- Using the prohibition of the re-zero operation in the unstable condition.  
[GEnF- 9]      Tare and zero compensation at unstable status  
                  [Function] - [Function setting] - [General] - [Weighing]
- Turning on the display, the re-zero function is used.  
[GEnF- 13]     Clear mode at power ON  
                  [Function] - [Function setting] - [General] - [Weighing]

### 7.5.2. Zero Tracking Function

---

- The function automatically traces the weighing deviation at nearly zero point and keeps zero display of gross display.

#### Concerning Parameters of the Function

- Changing the time of zero tracking  
[GEnF- 7]      Zero tracking time  
                  [Function] - [Function setting] - [General] - [Weighing]
- Changing the range of zero tracking  
[GEnF- 8]      Zero tracking band width  
                  [Function] - [Function setting] - [General] - [Weighing]

## 7.5.3. Tare

---

- The relation of display is as follows:  
Net = Gross - Tare

### Concerning Parameters of the Function

- Prohibiting tare during unstable weighing  
[GE<sub>n</sub>F- 9]      Tare and zero compensation at unstable status  
[Function] - [Function setting] - [General] - [Weighing]
- Prohibiting tare during negative weighing  
[GE<sub>n</sub>F- 10]      Tare at negative GROSS weight  
[Function] - [Function setting] - [General] - [Weighing]
- Resetting tare at turning on the indicator  
[GE<sub>n</sub>F- 13]      Clear mode at Power ON  
[Function] - [Function setting] - [General] - [Weighing]

## 7.5.4. Preset Tare (Fixed Tare Function)

---

- The preset tare can store in each material code.

### Concerning Parameters of the Function

- Using preset tare  
[GE<sub>n</sub>F- 11]      Preset tare  
[Function] - [Function setting] - [General] - [Weighing]
- Using preset tare for partial material code  
[GE<sub>n</sub>F- 12]      Preset tare=0  
[Function] - [Function setting] - [General] - [Weighing]
- Classifying normal tare and preset tare on the serial data  
[GE<sub>n</sub>F- 16]      Activation of fixed tare action  
[Function] - [Function setting] - [General] - [Weighing]

## 7.5.5. Customizing Function Key (Key Design)

---

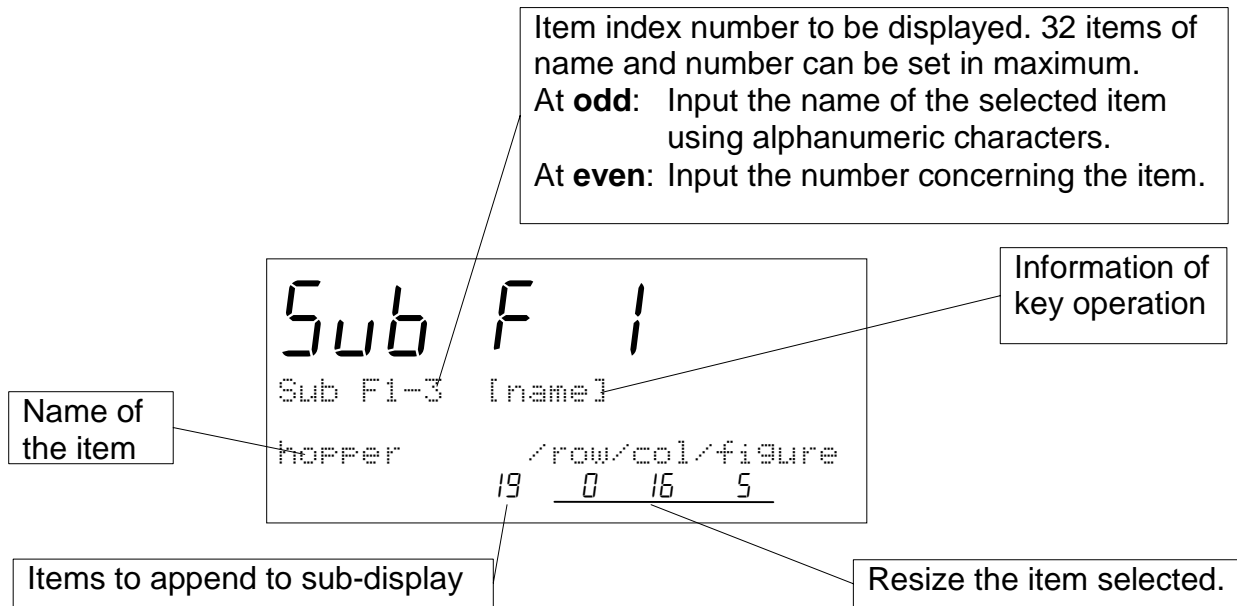
Refer to 2.2.1. Keys of Front panel regarding key operation.  
Refer to 10.4. Parameter List of Function list regarding key function.

### Concerning Parameters of the Function

- Setting F1, F2, F3 and F4 keys  
[DL<sub>H</sub>F- 2] to [DL<sub>H</sub>F- 5]  
[Function] - [Function setting] - [General] - [Other]

## 7.5.6. Customizing Sub Display

- Use default sub-display pattern, if you want to reset it.
- Refer to 10.4. Parameter List of Function list regarding items.



### Row and Colum Address

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
0																												
1																												
2																												
3																												

Row 0 and 2 is dot matrix display for alphanumerical charactor.  
 Row 1 and 3 is 7-segment display for numerical charactor.

### Items to append to sub-display

Number	Name and Number to Display the Item	Row size	Columsize	Figures
0	Not displayed	0 to 3	0 to26	1 to12
1	Material			
2	Hopper			
3	Target value or final value			
4	Free fall			
5	Preliminary			
6	Optional preliminary			
7	Over			
8	Under			
9	Zero Band			
10	Full filling			
11	Tare			
12	Supplementary flow open timer			
13	Supplementary flow close timer			

Number	Name and Number to Display the Item	Row size	Columnsize	Figures
14	Automatic Free Fall Compensation			
15	Internal reserved			
16	Internal reserved			
17	Dribble supply at entrance			
18	Medium supply at entrance			
19	Accumulated weight			
20	Accumulation counts			
21	Recipe , rCode			
22	Accumulated weight for recipe mode			
23	Accumulation counts for recipe mode			

### Concerning Parameters of the Function

- Setting sub-display

[SubF- 1] [1] Weighing display

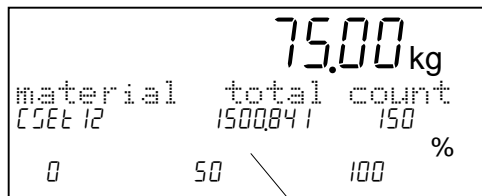
[Function] - [Function setting] - [General] - [Sub-display]

## 7.5.7. Graphic Display

---

- Use to display a bar-graph in the sub-display.

Example:



Bar graph

### Concerning Parameters of the Function

- Using bar graph display

[SubF- 3] Bar Graph location

[Function] - [Function setting] - [General] - [Sub-display]

- Selecting ratio of graph display

[SubF- 4] Ratio of Graph display

[Function] - [Function setting] - [General] - [Sub-display]

## 7.5.8. Accumulation Operation

---

- Accumulate weight data and weighing count of each material code or recipe code.

### Concerning Parameters of the Function

- Using F1 ~ F4 key for accumulation  
[DELHF - 2] to [DELHF - 5]  
[Function] - [Function setting] - [General] - [Other]
- Using the I/O terminals for accumulation  
[In F - nn] nn: terminal number of the I/O.  
[Function] - [Function setting] - [Control I/O] - [Input]
- Using parallel terminals for accumulation  
[OS F - nn] nn: terminal number of the option.  
n: slot number installed the option.  
[Function] - [Function setting] - [slot n] - [OP-05]

## 7.5.9. Undoing Accumulation Operation

---

- Assign a operation input to undo the last result.  
Refer to 10.4. Parameter List of Function list regarding key function.

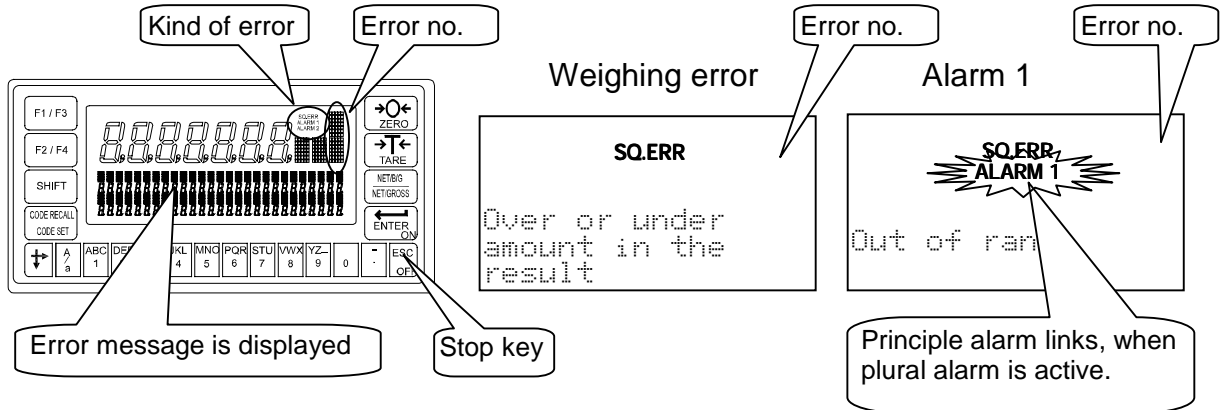
## 7.5.10. Clearing (Deleting) Accumulation Data

---

- Accumulation data can delete (clear) using preset operation input.
- There are four types of clearing the data.
- Assign a operation input to undo the last result on the function list.  
Refer to 10.4. Parameter List of Function list regarding key function.

## 7.5.11. Error Message and Alarm

- When the indicator detects an error in the weighing system, an error message is displayed.
- When the indicator becomes to preset condition, it is announced with the preset alarm.



### Kind of Alarm and Error

There is the following priority.

Weighing sequence error < Zero error < Alarm 1 < Alarm 2  
 SQ.ERR                      ZR.ERR                      ALARM 1                      ALARM 2

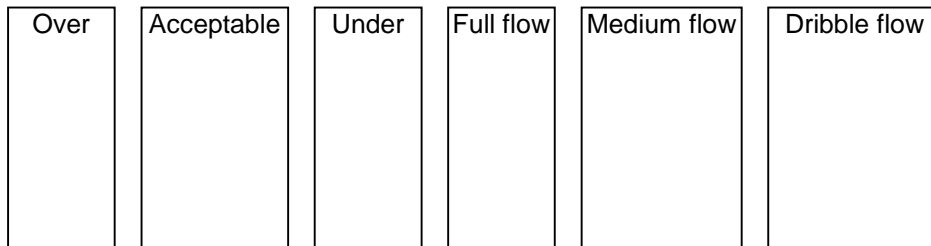
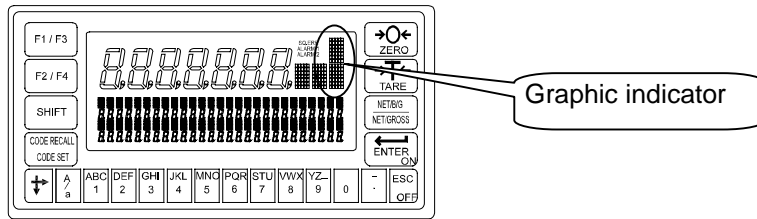
Kind	No.	Description
Weighing sequence error SQ.ERR		When the weighing can not continue, message is displayed and the sequence is stopped. Cope with cause and restart the weighing.
	0	The weighing sequence is stopped. Cope with cause and restart the sequence.
	1	Safety check can not complete. Check the safety.
	2	Under weight or over weight. Compensate weight and restart.
	3	There is conflict in setpoint. Check setpoint.
	4	Time over of batch weighing. Check the gate and remains of hopper mat.
	5	Time over of discharge. Check the discharge gate.
	6	The remain is not enough to weigh it. Add the material.
	7	When the batch is started, the weight is full already.
	8	Nozzle is touched to hopper. Check the nozzle.
9	There is not tare (vessel) on the weighing pan.	

Kind	No.	Description
Zero error ZR.ERR	When weighing value can not set to zero with re-zero or tare, message is displayed.	
	0	Dispaly can not be zeroed by zero compensation.
	1	Dispaly can not be zeroed by tare operation.
Alarm 1 ALARM 1	When weighing value is outof range and emergency stop is performed, the symbol is displayed.	
	1	Weighing value is out of range.
	9	Emergency stop is performing.
Alarm 2 ALARM 2	It can not wegh. Check the weighing system. Example: loadcell cable, connctors.	
	1	A/D converter is positive over counts. Check the loadcell cable.
	2	A/D converter is negative orver counts. Check the loadcell cable.
	4	RAM error. Check backup battery



## 7.5.12. Graphic Status Indicator

- The indicator can display weighing status, result on the graphic indicator.



### Concerning Parameters of the Function

- Using graphic indicator  
`[SubF- 5]`      Activity indicator  
 [Function] - [Function setting] - [General] - [Sub display]

## 7.5.13. Memory Backup

- The indicator has two kinds of memory.
  - Flash memory      The memory is used to store the important data without power supply that the count of re-writing them is few. Life of re-writing them is approximately 100,000 times or more. Data example: Calibration data, Function data
  - Backupted RAM      The memory is used to store temporary data that the count of re-writing them is many. Life of battery is approximately 10 years at 25 °C, normal use. Data example: Tare value, accumulation data, re-zero data
- When re-writing data, the sequence is stopped.
- Material code and recipe code can store in flash memory or backup RAM.

### Concerning Parameters of the Function

- Selecting the memory for material code or recipe code  
`[OEHF- 11]`      Save data  
 [Function] - [Function setting] - [General] - [Other]



# 8. Interface



## 8.1. Control I/O Function

Input terminals  
Output terminals

11 lines that can select the function  
11 lines that can select the function  
Open collector transistor

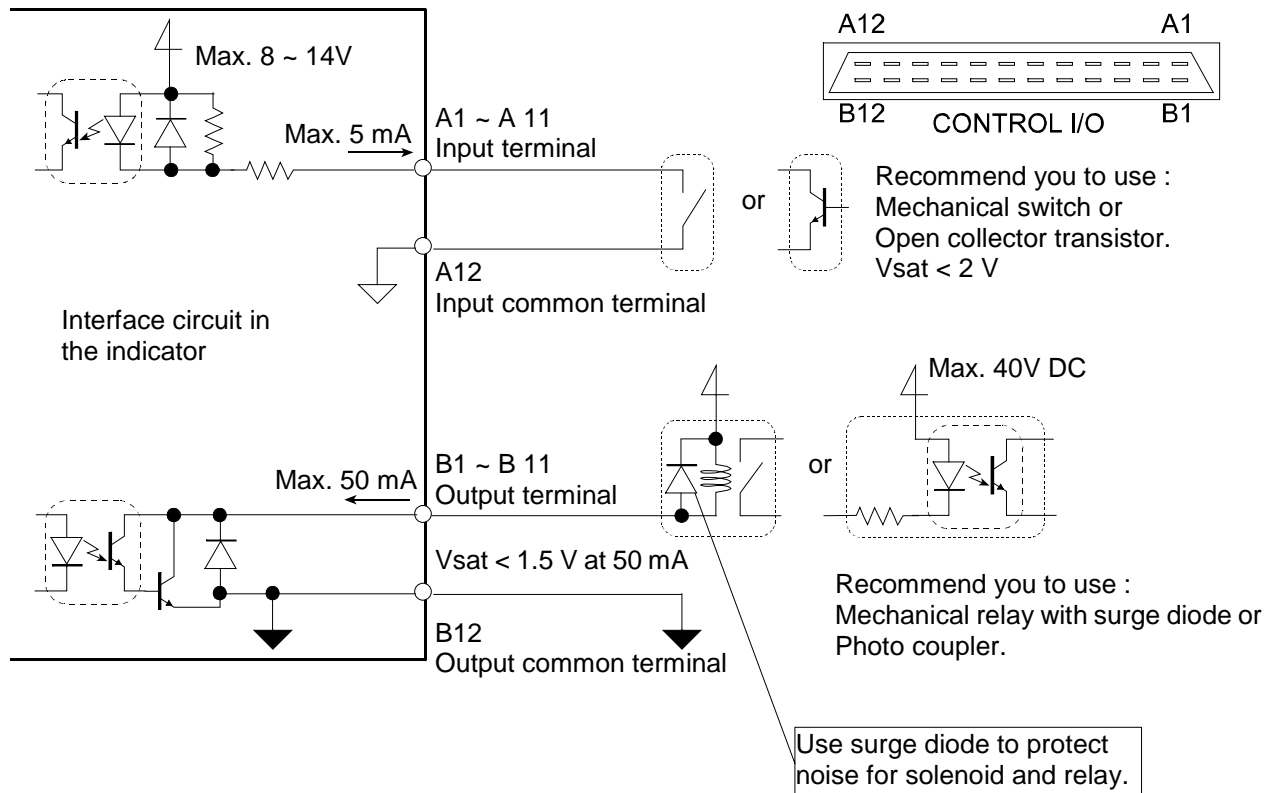
### Input terminal

	Maximum	typ.
Input open voltage	14V DC	8 V DC
Input drive current	5 mA	3 mA
Saturation tralence voltage	2 V DC	

### Output terminal

	Maximum
Output voltage	40 V DC
Output current	50 mA
Saturation tralence voltage	1.5 V at 50 mA

### 8.1.1. Interface circuit



## The function assigned to terminals

The function of the terminal can assign arbitrarily. Refer to 10.4. Parameter list of the Function list

### 8.1.2. Timing Chart

---

#### Caution

**Keep the delay time to avoid mis-operation and noise.**

Set the Communication mode in [0 | F - 3] [without 5].

The transmission of BCD data synchronizes with displaying it in the following modes.  
Stream mode, auto print mode, manual print mode and accumulation print.



## 8.2. Built-in RS-485 Interface

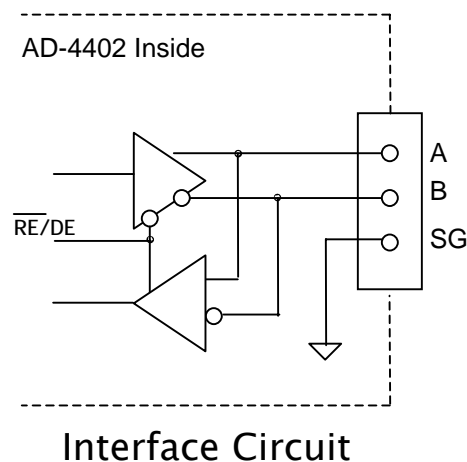
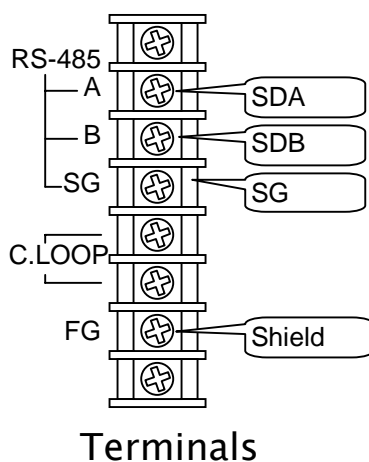
- The RS-485 interface can use command to control the indicator. The interface can read weighing data or parameters or store parameter to the indicator.
- The interface can connect max. 32 units and a personal computer in a communication cable.
- These unit is specified by address appended to the command.

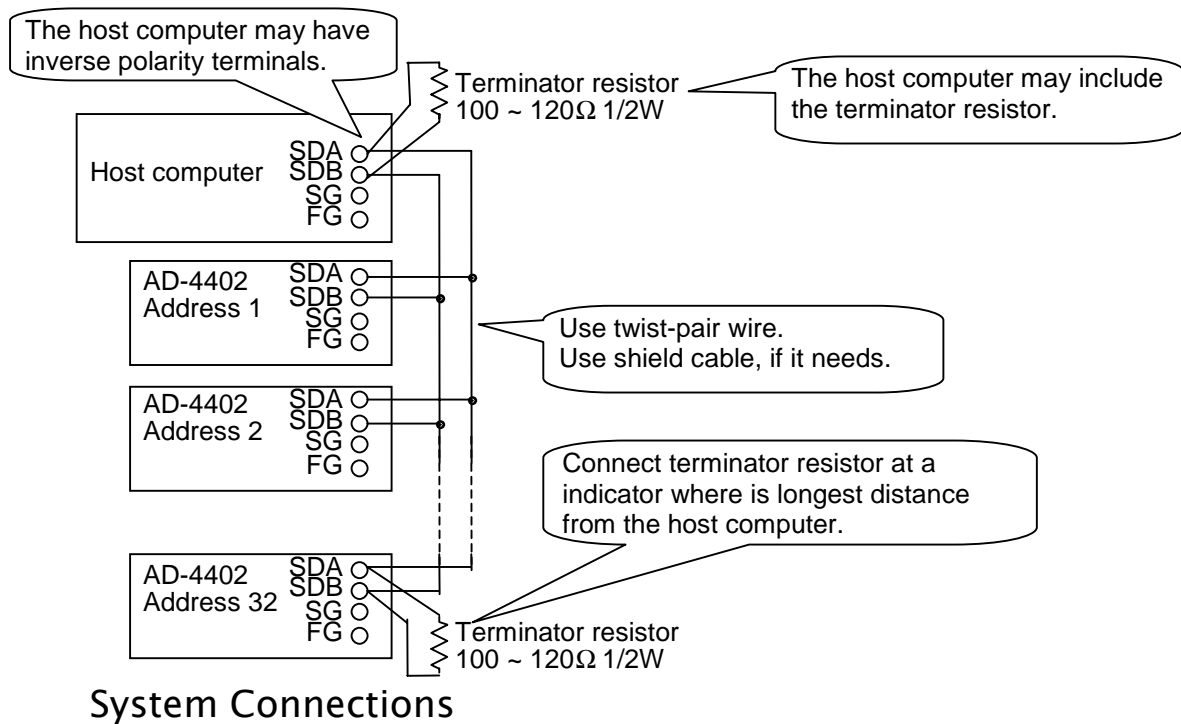
Transmission system	EIA RS-485, Asynchronous, bi-directional, half-duplex
Data length	7 bis ot 8 bits
Start bit	1 bit
Parity bit	Odd, Even, not used
Stop bits	1 bit, 2 bits
Baud rate	600 bps, 12000 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps
Line	2 wires (2-balanced wires)
Connection	Max. 32 units
Character code	ASCII code
Terminator	CR, CR LF

### The way of Use and Note

- When use terminator, connect between SDA and SDB terminals with accessory resistor.
- If there is not signal ground at host computer, it is not necessary to use the SG terminal.
- If the shield cable is used, connect the FG teminal to shield line.
- When connecting to RS-232C, Use AD-7491 or converter of RS-232C/ RS-485 on market.
- Use multi-dropped connection for command mode.  
Do not use multi-dropped connection in stream mode or jet stream mode.

### 8.2.1. Connection



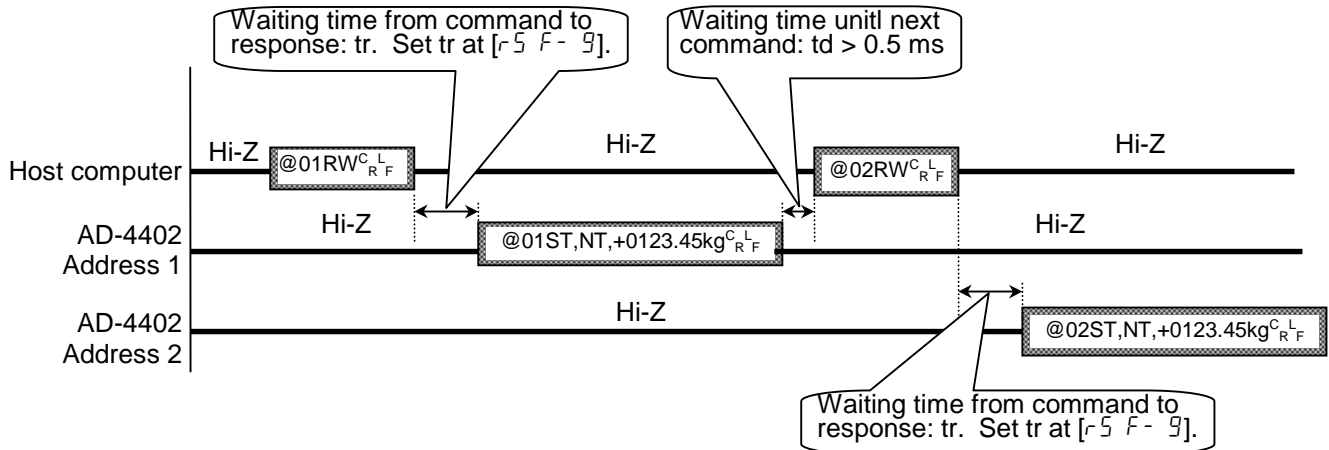


## 8.2.2. Settings of Parameters

Refer to the 10.4. Parameter list of Function list.

## 8.2.3. Timing Chart

- Keep delay time above 0.5 ms between last response and next command.
- Set response time ( $t_r$ ).  $[r5 F- 9] < t_r < [r5 F- 9] + 50 \text{ ms}$
- Make long delay time, when there is noise.
- Hi-Z: Hi impedance



## Communication Modes

- There are the following modes.

### Stream Mode

The data is output at every update of display. If the data can not output due to slow baud rate completely, data is output at next update.

### Auto Print Mode

The data is printed at batch finish and recipe finish automatically.

### Accumulation Print Mode

When accumulating it or canceling the last result, the result of batch finish and recipe finish is printed.

### Manual Print Mode

When the preset print key or terminal is pressed, data is output.

### Command Mode

The mode is used to control the indicator, to store parameters and to read data or parameter.

### Jet Steam Mode

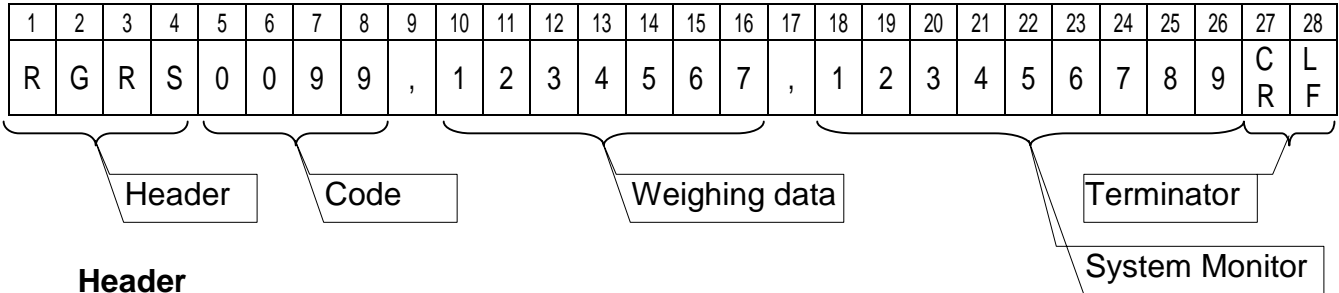
The weighing data and state is output on 100 time/s. Data is gross or net value. The format is the same as command RGRS or RNET.

Set baud rate to 38400 bps.

When slow baud rate is  $1/2^n$  times 38400 bps, the same data is output  $2^n$  times

## 8.2.4. General Data Format

This format is used at command mode and jet stream mode.



### Header

Command is replayed. The replayed command is 4 characters

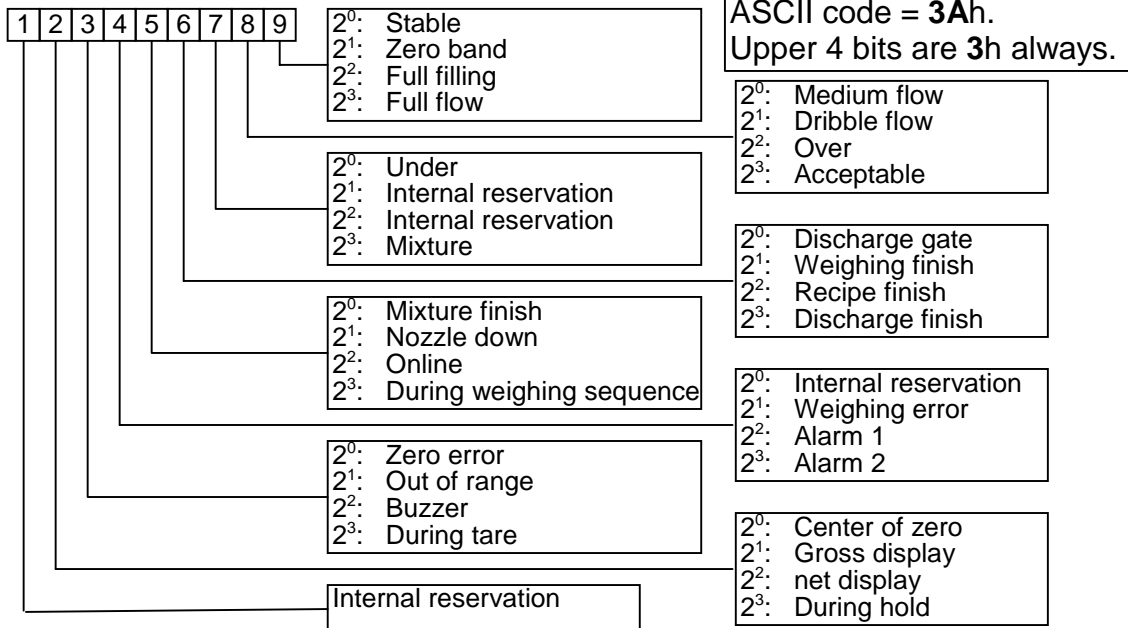
### Code

Material code or recipe code number. The code is 4 characters

### Weighing data

Data uses BCD code, is 7 figures and is not include decimal point.  
When data is negative, minus sign is appended to the head.

### System Monitor



### Terminator

CR or CR + LF

CR: **0Dh**, LF: **0Ah**

## 8.2.5. A&D Data Format

The format is used for stream mode, auto print mode and accumulation print.  
The format is compatible to the indicator AD-4325.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
S	T	,	N	T	,	+	0	0	1	2	.	3	4	k	g	CR	LF

### Header 1

ST Stable  
US Unstable  
LO Out of range

### Header 2

GS Gross value  
NT Net value  
TR Tare value

### Weighing data

Data uses BCD code, is 7 figures and is include decimal point.  
When data is negative, minus sign is appended to the head.  
When data is out of range, all numerical characters are space (20h).

### Unit

Kg, g or t

### Terminator

CR or CR + LF

CR: 0Dh, LF: 0Ah

## 8.2.6. Address

Set the address in [r5 F- 8].

32 indicators can connect to a computer.

There is not relation between communication mode [r5 F- 2] and address [r5 F- 8].

### Broadcast Address

When address @00 is used, send a command to all indicators in the same time.

Exmample:

@	0	0	C	T	A	R	CR	LF
---	---	---	---	---	---	---	----	----



## 8.2.7. Command List

### Monitor Commands

Name	Code	Description
Read weighing value	RDSP	
	RW	
Read gross data	RGRS	
Read net value	RNET	
Read Tare value	RTAR	
Read weighing result	RFIN	
	RF	#1
Read setpoint or Read comparison parameters	RSPTxxxx	
	RSPT####	
	RSxx	#1
Read material code	RCODxxxx	To read the details of the code. # 1
Read recipe code	RRCdxxxx	To read the details of the code. # 1
Read accumulation data of material code	RTTLxxxx	
Read accumulation data of recipe code	RRTLxxxx	
Read error code	RERR	

xxxx: Material code or recipe code.

#1: Compatible command to AD4401, AD-4403 and AD4325.

### Write Commands

Name	Code	Description
Store setpoints Store comparison parameters	WSPTxxxx	
	WSPT%%%%	
	SSxx	#1
	SA	To store optional preliminary and zero band. #1
Store material code	WCODxxxx	To store all parameters of the code.
Store recipe code	WRCDxxxx	To store all parameters of the code.

xxxx: Material code or recipe code.

####: When reading an active material code or recipe code during the sequence, place four space codes (ASCII 20h).

%%%%: When storing new parameters to material code or recipe code that is recalled as next code in the sequence, place four space codes (ASCII 20h).

#1: Compatible command to AD4401, AD-4403 and AD4325.

## Control Commands

Name	Code	Description
Make zero display	CZER	
	MZ	#1
Make zero clear	CCZR	
Tare	CTAR	
	MT	#1
Tare clear	CCTR	
	CT	#1
Change to gross display	CGRS	
	MG	#1
Change to net display	CENT	
	MN	#1
Call material code	CCODxxxx	
	CCxx	#1
Call recipe code	CRCDxxxx	
Accumulation command	CACC	
	AM	#1
Cancel the last result	CCAC	
	CA	#1
Batch start	CBAT	
	BB	#1
Discharge start	CDSC	
	BD	#1
Recipe start	CBLD	
Mixture start	CMIX	
Re-start	CRES	
Stop	CHLT	
Emergency stop	CSTP	
	HB	#1
Clear accumulation data of material code	CDTLxxxx	Accumulation data is set to 0.
	DTxx	Accumulation data is set to 0. #1
Clear accumulation data of all material code	CETL	All accumulation data is set to 0.
	ET	All accumulation data is set to 0. #1
Clear accumulation data of recipe code	CDRTxxxx	Accumulation data is set to 0.
Clear accumulation data of all recipe code	CERT	All accumulation data is set to 0.
Reset an error	CRER	
No operation	CNOP	

xxxx: Material code or recipe code.

#1: Compatible command to AD4401, AD-4403 and AD4325.

## Response Error Code

Response	Description	Note
?E	The format of command is not correct.	When address is used, address is appended to the response, too.
VE	The data of command is not correct.	
IE	Indicator is busy.	

## ASCII Code for AD-4402

The characters are special code for the name of material code and recipe code. Therefore, some characters are not the same as U.S. code.

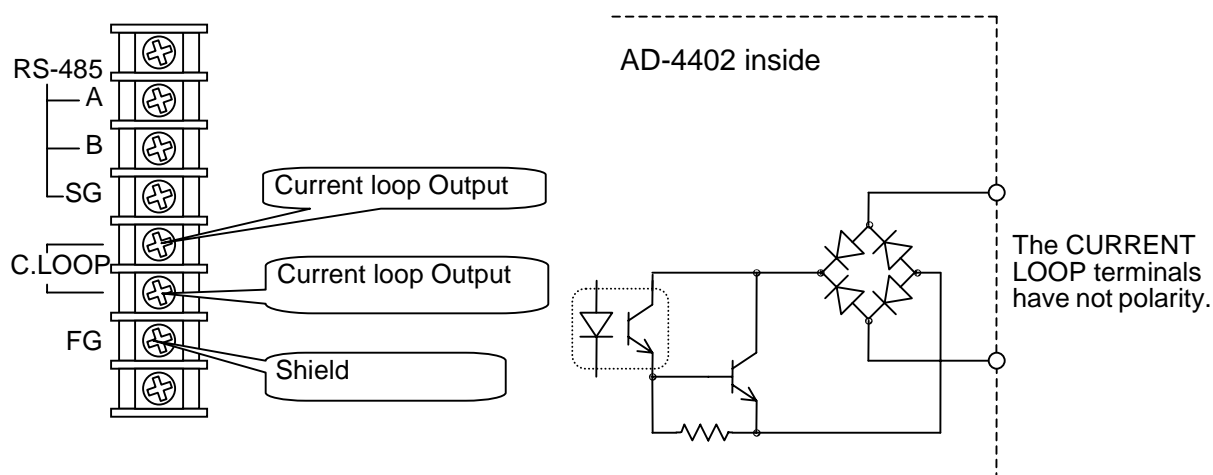
		Lower bits							
		0	1	2	3	4	5	6	7
Upper bits	0			Space	0	@	P	Space	p
	1			!	1	A	Q	a	q
	2			"	2	B	R	b	r
	3			#	3	C	S	c	s
	4			\$	4	D	T	d	t
	5			%	5	E	U	e	u
	6			&	6	F	V	f	v
	7			'	7	G	W	g	w
	8			(	8	H	X	h	x
	9			)	9	I	Y	i	y
	A	LF		*	:	J	Z	j	z
	B			+	;	K	[	k	{
	C			,	<	L	¥	l	
	D	CR		-	=	M	]	m	}
	E			.	>	N	^	n	●
	F			/	?	O	_	o	○



## 8.3. Built-in Current Loop Output

Transmission system	EIA RS-232C, Asynchronous, bi-directional, half-duplex
Current	1 = 20mA, 0 = 0 mA, external DC current source
Data length	7 bis
Start bit	1 bit
Parity bit	Even
Stop bits	1 bit
Baud rate	600 bps, 12000 bps, 2400 bps
Code	ASCII code

### 8.3.1. Connection



The current loop output has not polarity.  
 Use an external DC current source.  
 Connect the FG terminal when using the shield cable.

### 8.3.2. Communication Modes

- There are the following modes.

#### Stream Mode

The data is output at every update of display. If the data can not output due to slow baud rate completely, data is output at next update.

#### Auto Print Mode

The data is printed at batch finish and recipe finish automatically.

#### Manual Print Mode

When the preset print key or terminal is pressed, data is output.

#### Accumulation Print Mode

When accumulating it or canceling the last result, the result of batch finish and recipe finish is printed. When canceling the last result, the inverse polarity data is output.

### 8.3.3. Data Format

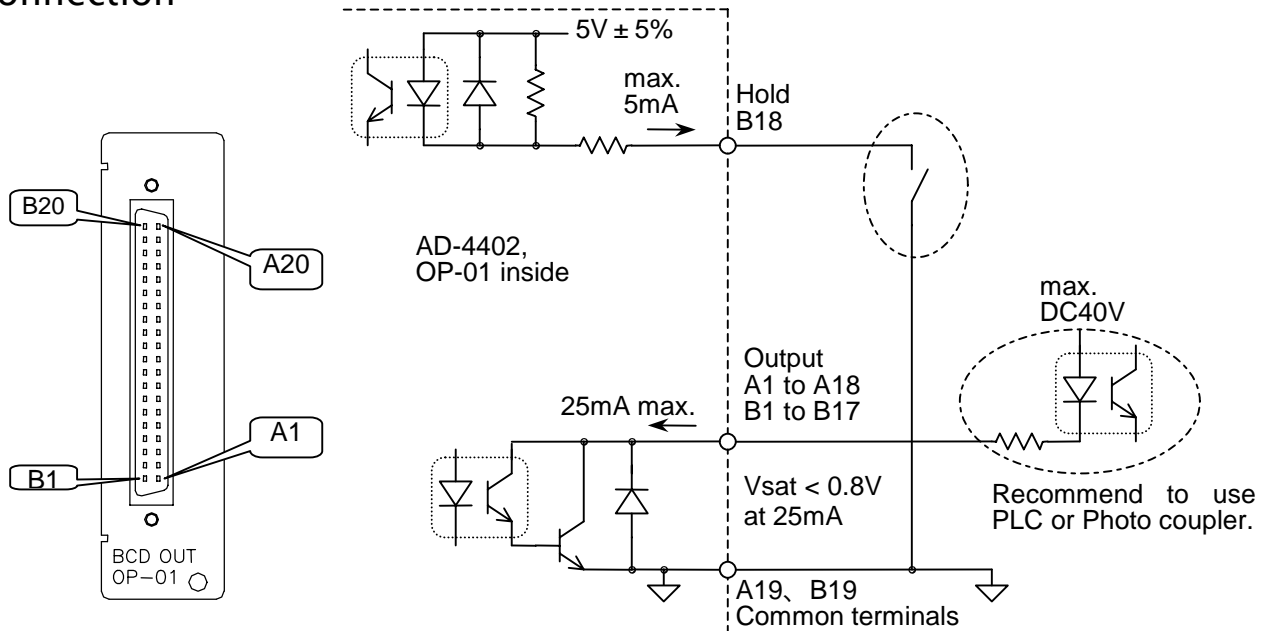
The format is the same as A&D format of the built-in RS-485.



## 8.4. BCD Output of Option, OP-01

Output circuit	Open collector transistor
Output voltage	40 V DC max.
Output saturation voltage	0.8 V at 25 mA
Input control	Contact to ground
Input open voltage	5 V DC $\pm 5\%$
Input current	5 mA max.
Threshold voltage	1.5 V max.

### Connection



## Terminals

When **weighing display, gross display, net display and tare display** [0 IF- 1] [1, 2, 3, 4] is used, the function of terminals are as follows:

A1	1	B1	2	Unit	Unit 1	Unit 2
A2	4	B2	8	blank	0	0
A3	10	B3	20	kg	0	0
A4	40	B4	80	t	0	1
A5	100	B5	200	g	1	1
A6	400	B6	800			
A7	1,000	B7	2,000			
A8	4,000	B8	8,000			
A9	10,000	B9	80,000			
A10	40,000	B10	80,000			
A11	100,000	B11	200,000			
A12	400,000	B12	800,000			
A13	Over	B13	Positive polarity			
A14	Stable	B14	Net			
A15	Decimal point 0.0	B15	Decimal point 0.0			
A16	Decimal point 000.0	B16	Decimal point 000.0			
A17	Unit 1	B17	Unit 2			
A18	Strobe	B18	Hold input			
A19	Common ground	B19	Common ground			
A20	Frame ground	B20	Frame ground			

When **accumulation weight and accumulation counts** [0 IF- 1] [5, 6, 7, 8] is used, the function of terminals are as follows:.

A1	1	B1	2
A2	4	B2	8
A3	10	B3	20
A4	40	B4	80
A5	100	B5	200
A6	400	B6	800
A7	1,000	B7	2,000
A8	4,000	B8	8,000
A9	10,000	B9	80,000
A10	40,000	B10	80,000
A11	100,000	B11	200,000
A12	400,000	B12	800,000
A13	1,000,000	B13	2,000,000
A14	4,000,000	B14	8,000,000
A15	10,000,000	B15	20,000,000
A16	40,000,000	B16	80,000,000
A17	Over	B17	Positive polarity
A18	Strobe	B18	Hold input
A19	Common ground	B19	Common ground
A20	Frame ground	B20	Frame ground

When **recipe code and material code** [0 IF- 1] [9] is used, the function of terminals are as follows:.

A1	Material code at weighing sequence	1	B1	Material code at weighing sequence	2
A2		4	B2		8
A3		10	B3		20
A4		40	B4		80
A5	Referred material code	1	B5	Referred material code	2
A6		4	B6		8
A7		10	B7		20
A8		40	B8		80
A9	Recipe code at weighing sequence	1	B9	Recipe code at weighing sequence	2
A10		4	B10		8
A11		10	B11		20
A12		40	B12		80
A13	Referred recipe code	1	B13	Referred recipe code	2
A14		4	B14		8
A15		10	B15		20
A16		40	B16		80
A17			B17		
A18	Strobe		B18	Hold input	
A19	Common ground		B19	Common ground	
A20	Frame ground		B20	Frame ground	

When **Error and alarm** [0 IF- 1] [10] is used, the function of terminals are as follows:.

A1	Sequence error number	1	B1	Sequence error number	2
A2		4	B2		8
A3		Error	B3		
A4			B4		
A5	Zero error number	1	B5	Zero error number	2
A6		4	B6		8
A7		Error	B7		
A8			B8		
A9	Alarm 1 number	1	B9	Alarm 1 number	2
A10		4	B10		8
A11		Error	B11		
A12			B12		
A13	Alarm 2 number	1	B13	Alarm 2 number	2
A14		4	B14		8
A15		Error	B15		
A16			B16		
A17			B17		
A18	Strobe		B18	Hold input	
A19	Common ground		B19	Common ground	
A20	Frame ground		B20	Frame ground	

## Communication Modes

- There are the following modes.

### Stream Mode

The data is output at every update of display. If the data can not output due to slow baud rate completely, data is output at next update.

### Auto Print Mode

The data is printed at batch finish and recipe finish automatically.

### Manual Print Mode

When the preset print key or terminal is pressed, data is output.

### Accumulation Print Mode

When accumulating it or canceling the last result, the result of batch finish and recipe finish is printed. When canceling the last result, the inverse polarity data is output.

### Jet Steam Mode

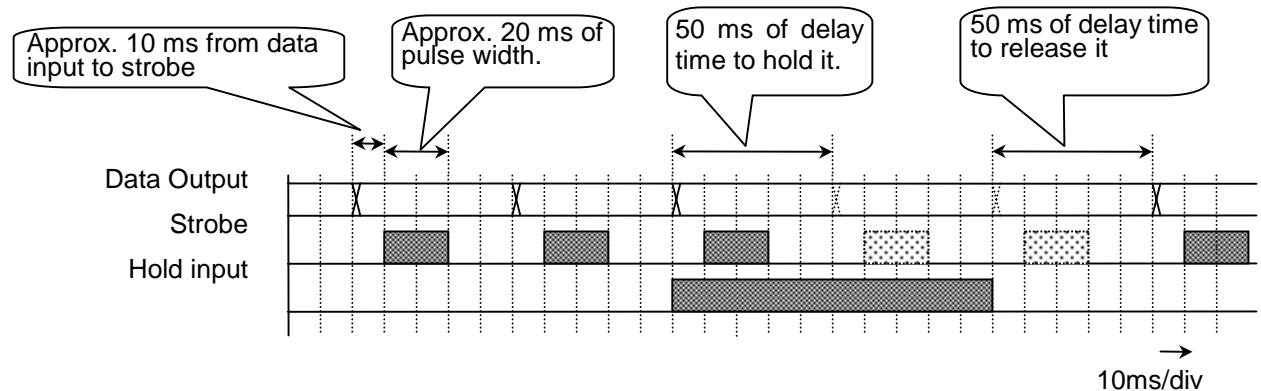
The weighing data and state is output on 100 time/s. Data is gross or net value. The format is the same as command RGRS or RNET.

Set baud rate to 38400 bps.

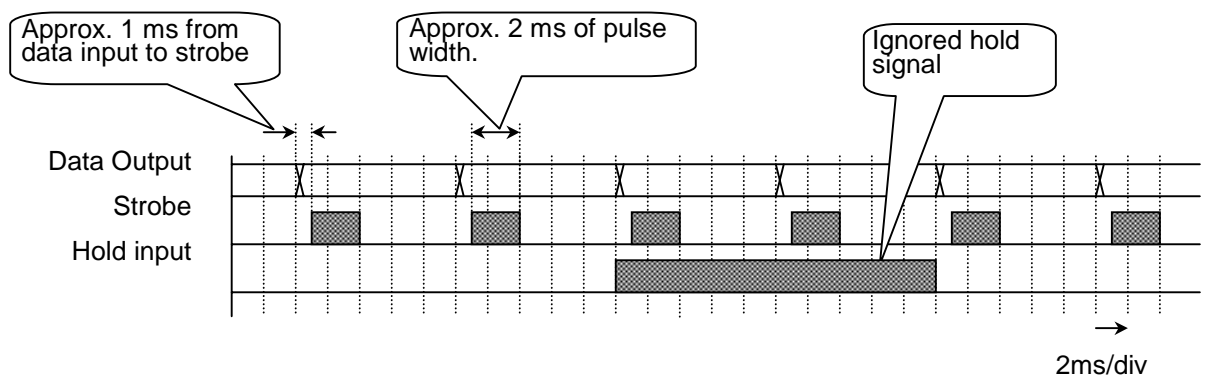
When slow baud rate is  $1/2^n$  times 38400 bps, the same data is output  $2^n$  times

## Timing Chart

When **normal output** [0 IF- 3] [without 5] is used



When **normal output** [0 IF- 3] [without 5] is used



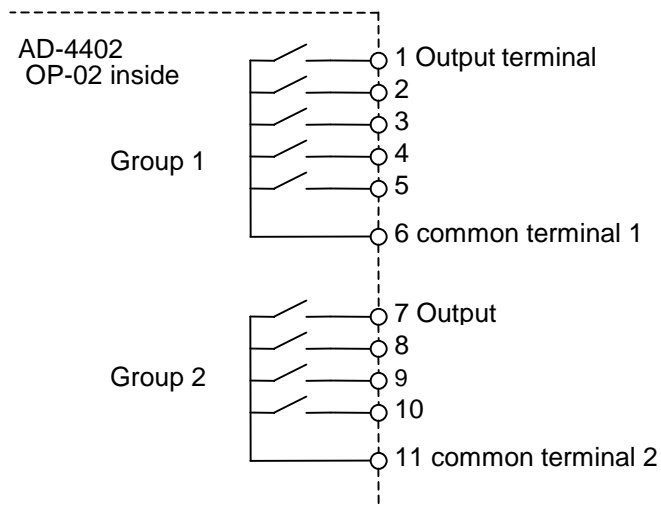
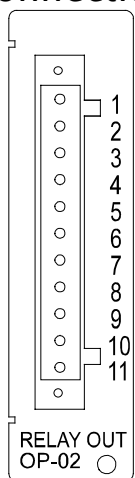




## 8.5. Relay Output of Option, OP-02

Rated load	250 V AC, 3 A 30 V DC, 3 A
Current at common terminal	Max. 10A DC
Minimum load	100 mV 100 $\mu$ A
Life	20,000,000 times or more at no load 100,000 times or more at rated load

### Connection



### Terminal List

Refer to 10.4. Parameter list of the function list.



## 8.6. RS-422/485 Interface of Option, OP-03

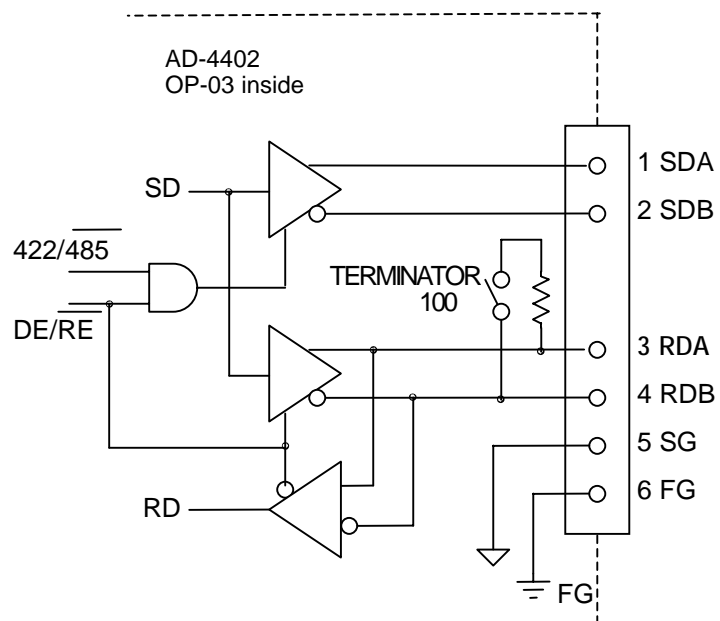
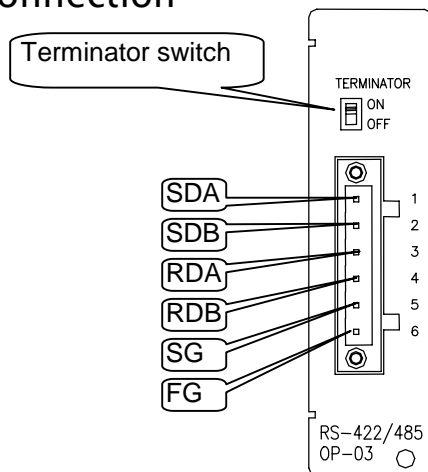
- The RS-422/485 interface can use command to control the indicator. The interface can read weighing data or parameters or store parameter to the indicator.
- The interface can connect max. 32 units and a personal computer in a communication cable.
- These unit is specified by address appended to the command.
- TS-485 can use 2-wire or 4- wire.
- The command and format is the same as the built-in RS-485.

Transmission system	EIA RS-422 / 485, Asynchronous, bi-directional, half-duplex
Data length	7 bis ot 8 bits
Start bit	1 bit
Parity bit	Odd, Even, not used
Stop bits	1 bit, 2 bits
Baud rate	600 bps, 12000 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps(Jet stream mode)
Line	RS-422: 4 wires RS-485: 2 wires or 4 wires
Connection	Max. 32 units
Character code	ASCII code
Terminator	CR, CR LF

### Caution

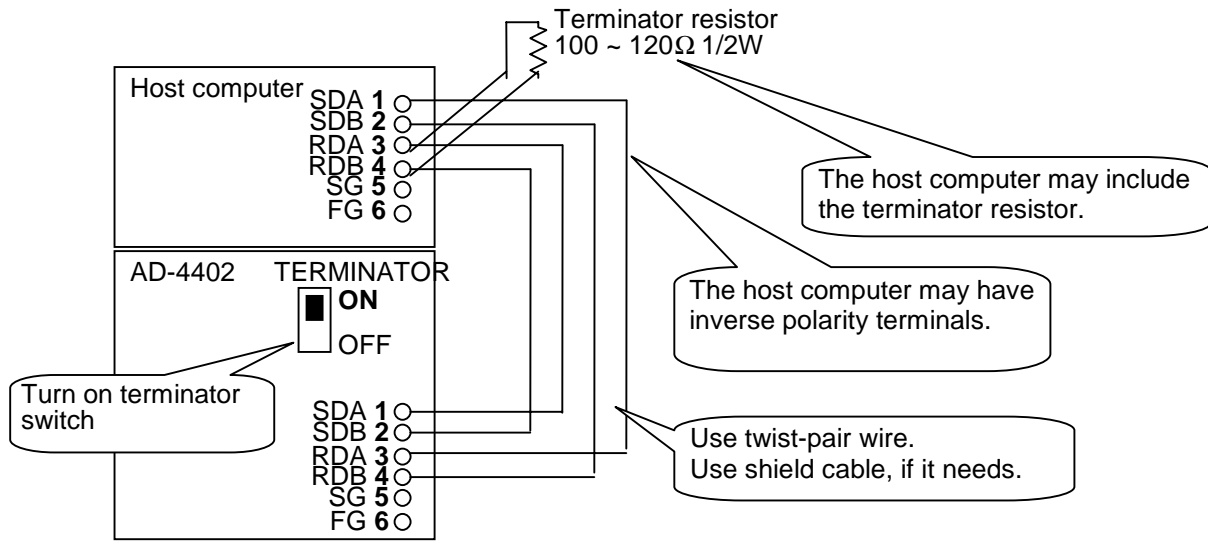
The option can install either OP-03 or OP-04

### Connection



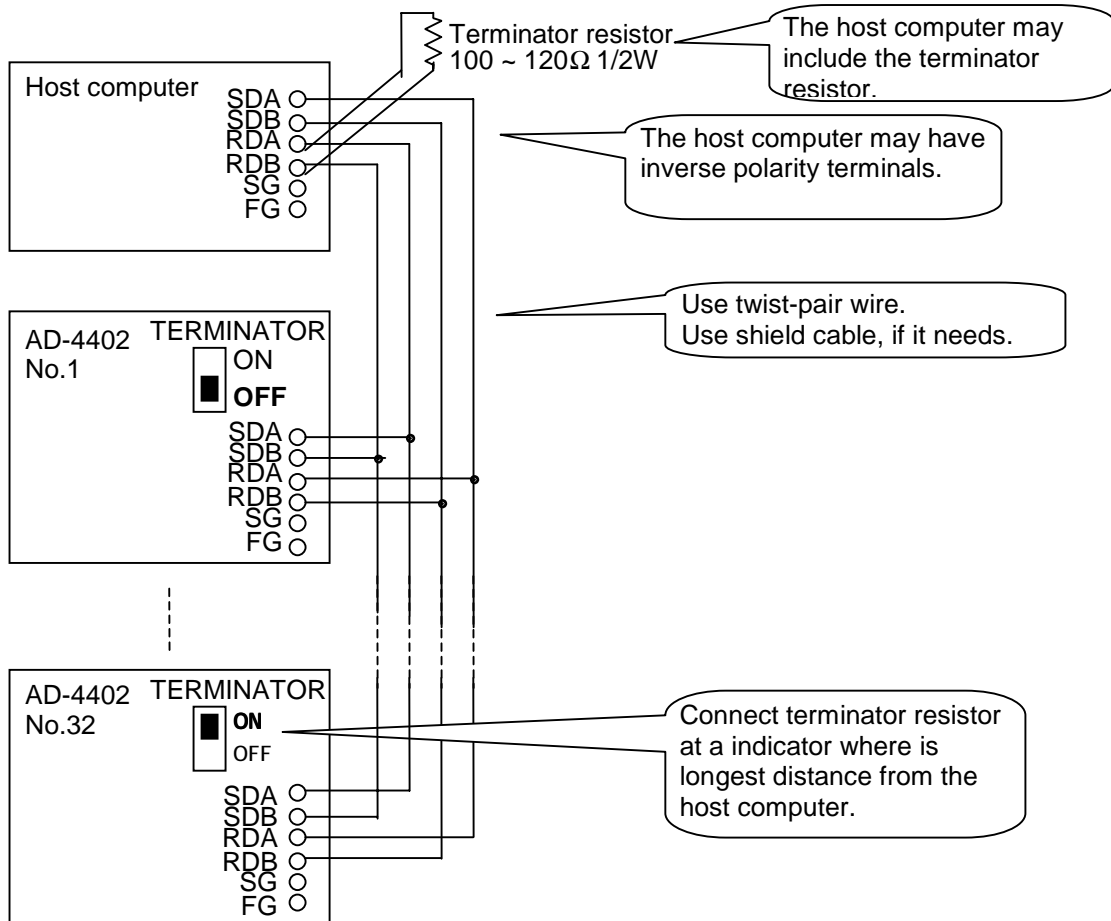
## RS-422 Connections

Settings RS-422 [03 F-11] [1]  
 Address Number 0 [03 F-8] [0].



## RS-485 4 Wire Connections

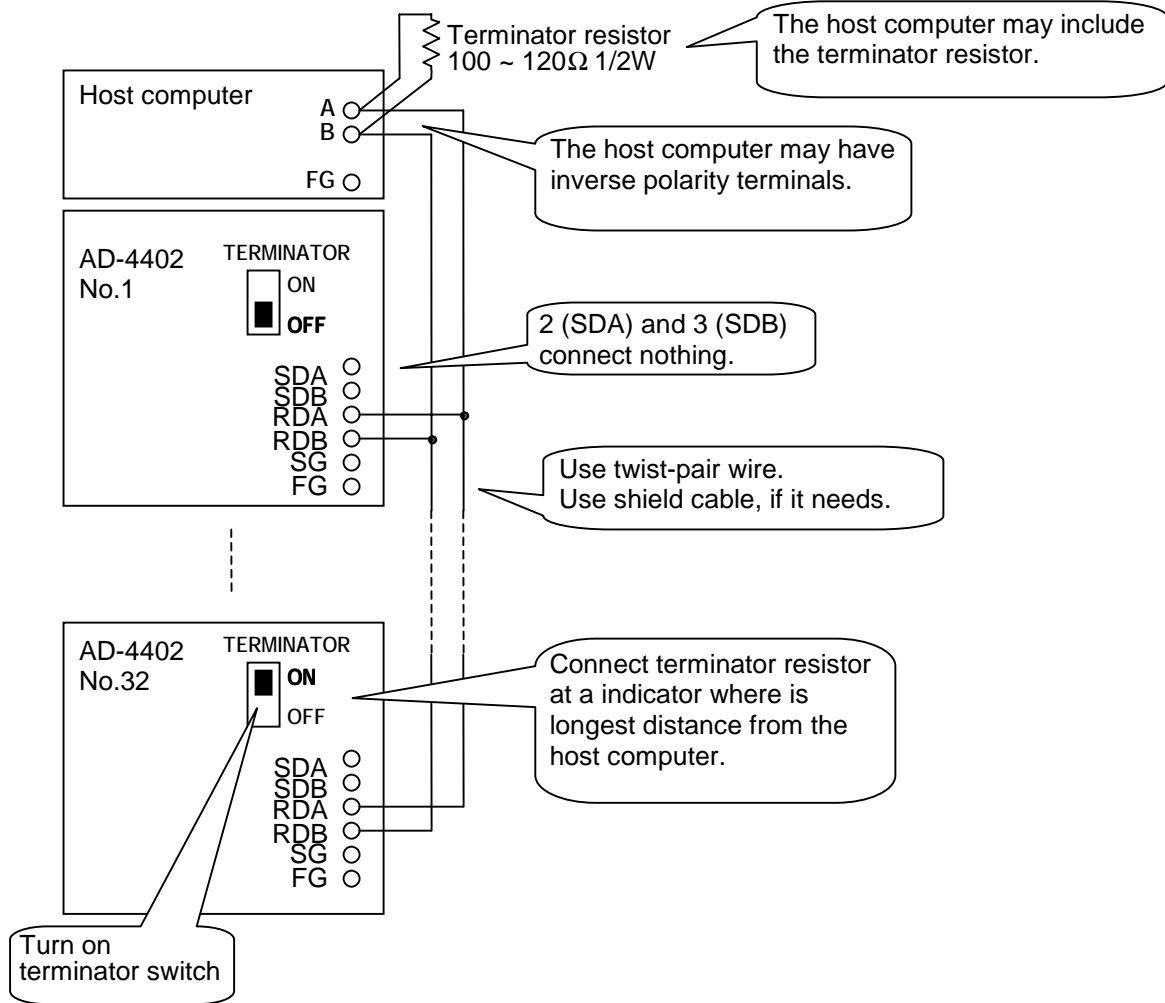
Settings RS-422 [03 F-11] [1]  
 Address Number [03 F-8] [without 0].



# RS-485 2 Wire Connections

Settings RS-485

[03 F-11] [2]

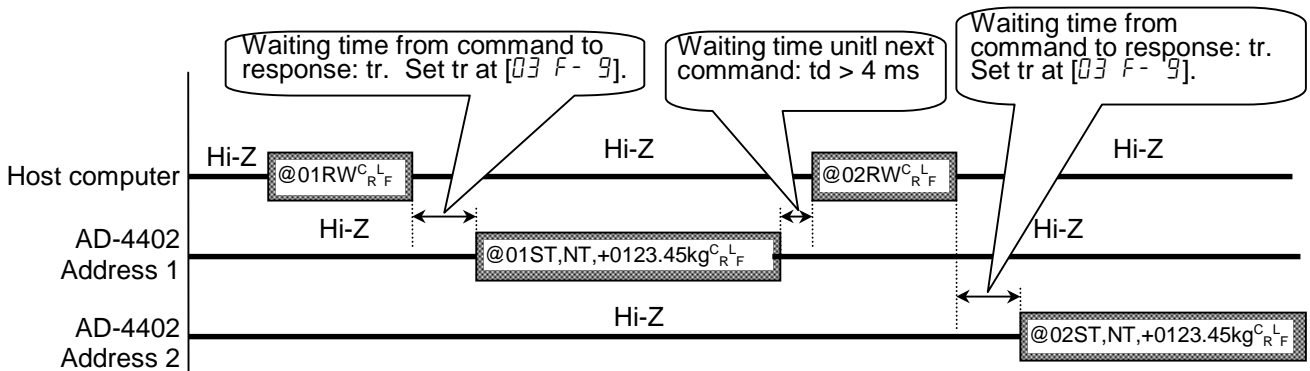


## Settings of Parameters

Refer to 10.4. Parameter list of the function list.

## Timing Chart

- Keep delay time above 0.5 ms between last response and next command.
- Set response time (tr).  $[03 F-9] < tr < [03 F-9] + 50 \text{ ms}$
- Make long delay time, when there is noise.
- Make 4 ms or more from output finish to receiving next command
- Hi-Z: Hi impedance





## 8.7. RS-232C Interface of Option, OP-04

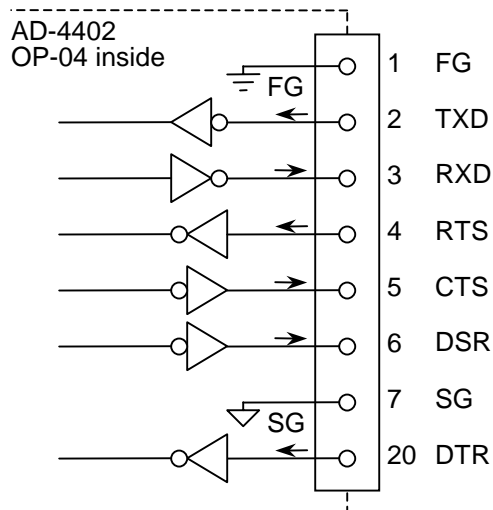
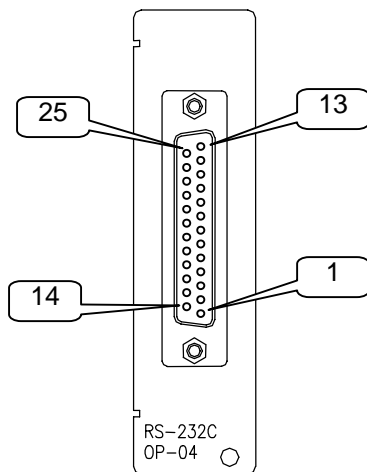
- The RS-232C is used to connect to the DEC (modem).
- The command and parameters of RS-232C is the same as the built-in RS-485.

Transmission system	EIA RS-232C, Asynchronous, bi-directional, half-duplex
Data length	7 bis or 8 bits
Start bit	1 bit
Parity bit	Odd, Even, not used
Stop bits	1 bit, 2 bits
Baud rate	600 bps, 12000 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps

### Caution

The option can install either OP-03 or OP-04

### Connection



### Settings of Parameters

Refer to 10.4. Parameter list of the function list.

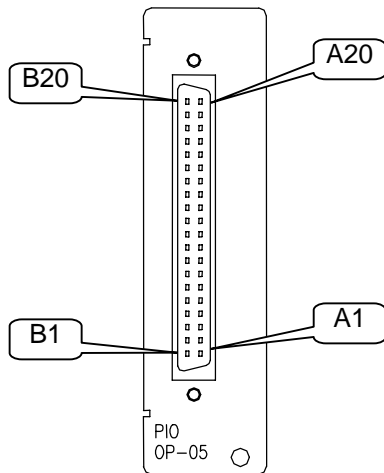


## 8.8. Parallel I/O of Option, OP-05

- Use the option to extend I/O terminals
- The function, settings, interface circuit and timing chart of the option is the same as built-in I/O terminal.

Input control	Contact to ground
Input open voltage	7 ~ 11 V DC
Input current	5 mA max.
Input threshold voltage	2 V max.
Output circuit	Open collector transistor
Output voltage	40 V DC max.
Output saturation voltage	1.5 V at 50 mA

### Connection



A1 ~ A16	Input terminals
A17	Input common
A18	
A19	
A20	Frame ground
B1 ~ B16	Output terminals
B17	Output common
B18	
B19	
B20	Frame ground

### Terminal List

Refer to 10.4. Parameter list of the function list.

### Caution

**Do not assign the same function to plural input terminals and keys.**

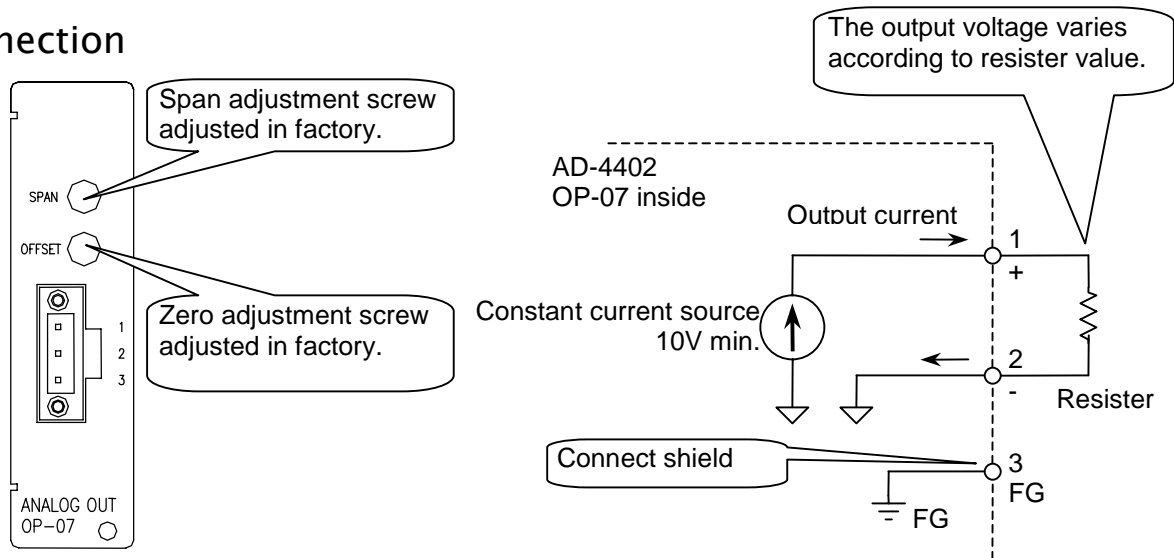


## 8.9. Analog Output of Option, OP-07

- The option outputs DC current that is proportion to the display value.  
It is adjusted by 4 mA output at zero display and 20 mA output at full scale.

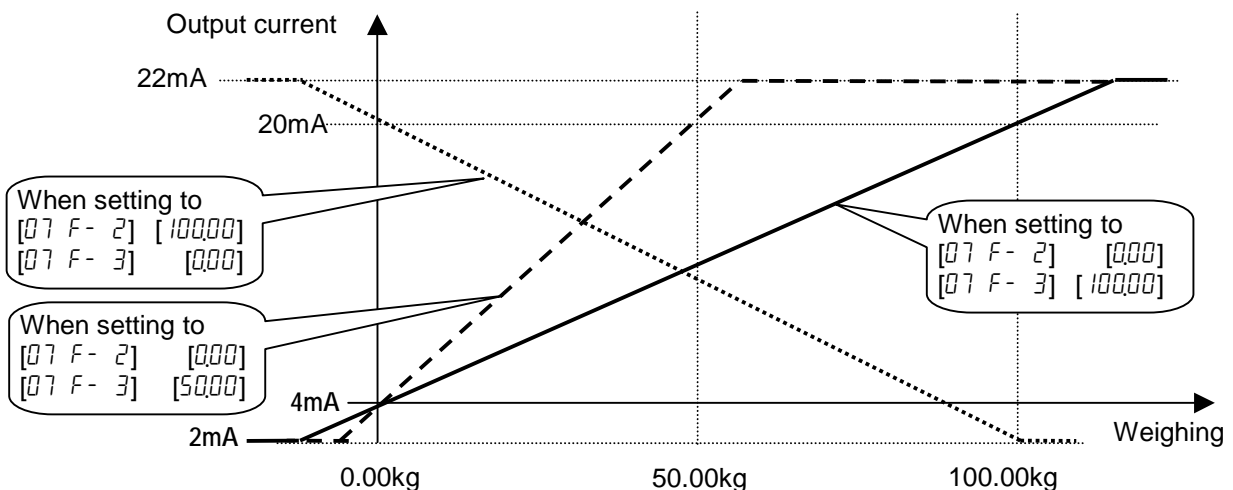
Analog output	Contact to ground
Output voltage	11 V DC min.
Adaptable resistance	0 Ω ~ 500 Ω
Update ratio	100 times per second with Sampling frequency divider [EF-3]
Zero temperature coefficient	±150 ppm/°C max.
Span temperature coefficient	±150 ppm/°C max.
Non-linearity	0.1% max.
Resolution	smaller value of either 1/40000 or resolution of display

### Connection



### Settings of Parameters

Refer to 10.4. Parameter list of the function list.





## 9. Maintenance

### 9.1.1. Basic Operation

- |  |  |
|--|--|
| To enter the maintenance                         | Press and hold the <b>ENTER</b> key and press the $\uparrow$ key in weighing mode.<br>Select menu <code>maintenace</code> using the $\uparrow$ key and the <b>ENTER</b> key. |
| To select an address of the parameter            | The $\uparrow$ , <b>SHIFT</b> + $\uparrow$ , <b>ENTER</b> , <b>ESC</b> keys.   |
| To change the parameter                          | The $\uparrow$ , <b>SHIFT</b> + $\uparrow$ , <b>Alphanumerical</b> , <b>ENTER</b> , <b>ESC</b> keys.   |
| To exit the mode<br>(To return to weighing mode) | The <b>ESC</b> key.  |



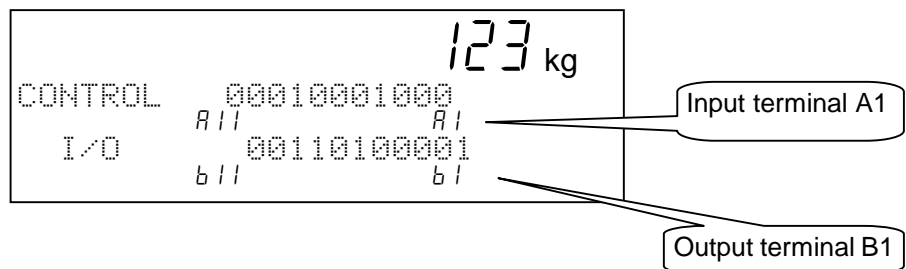
## 9.2. Monitor Mode

- The monitor mode is used to check the indicator during the weighing sequence.

### 9.2.1. Monitoring Control I/O Function

- Use to monitor the status of the I/O terminals.

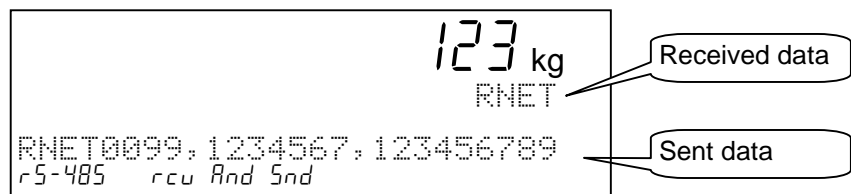
When [`GENF- I`] is slow, it may not display all data.



### 9.2.2. Monitoring Built-in RS-485 Interface

- The current communication data are displayed.

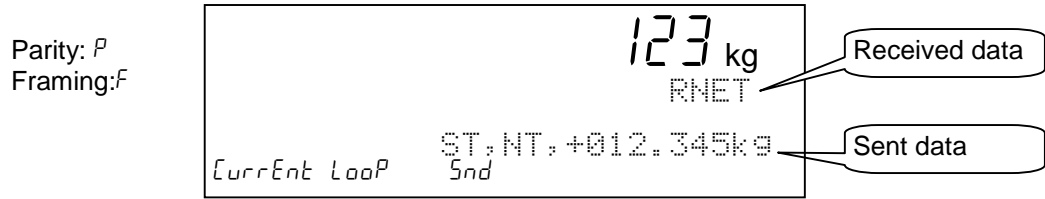
Parity: *P*  
Framing: *F*





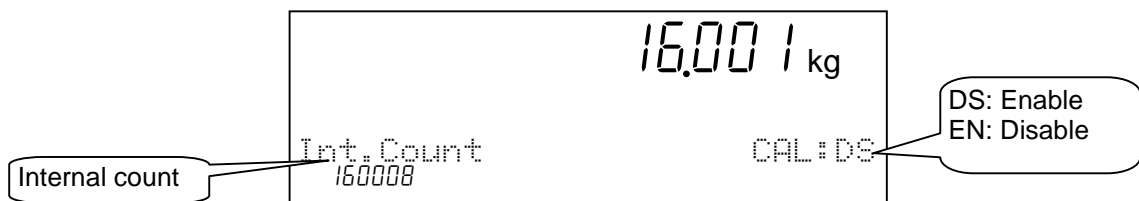
### 9.2.3. Monitoring Built-in Current Loop Output

- The current communication data are displayed.



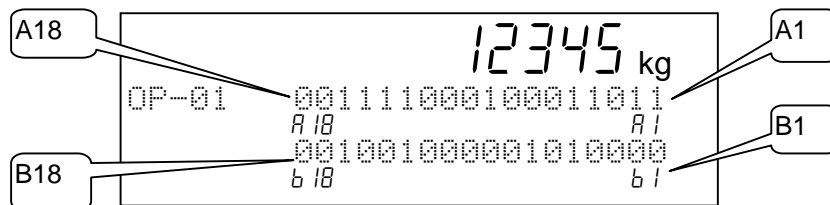
### 9.2.4. Monitoring A/D Converter

- The current A/D converter data are displayed.



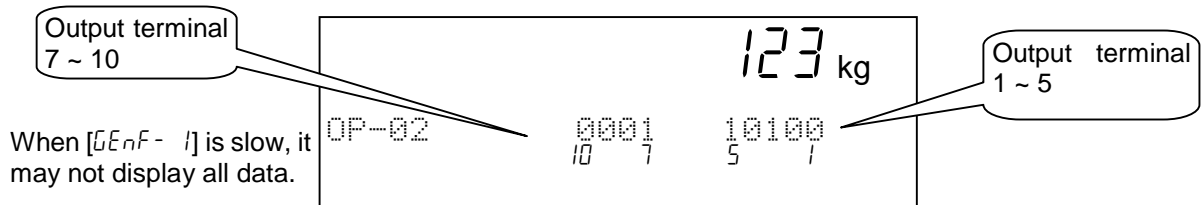
### 9.2.5. Monitoring BCD Output of OP-01

- The current BCD output data are displayed.



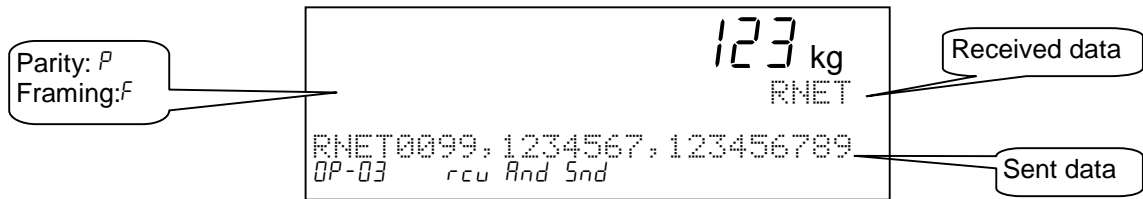
### 9.2.6. Monitoring Relay Output of OP-02

- The status of the current relay outputs is displayed.



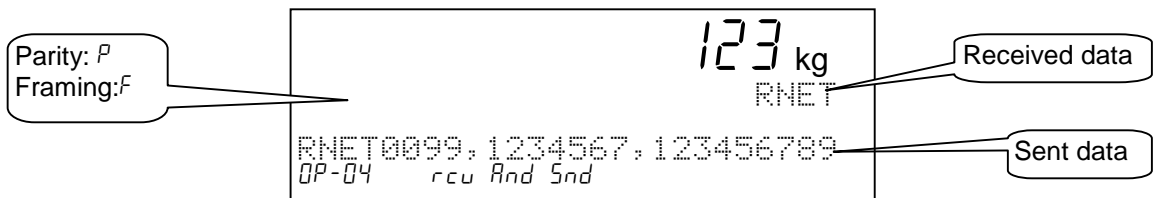
## 9.2.7. Monitoring RS-422/485 Interface of OP-03

- The current communication data are displayed.



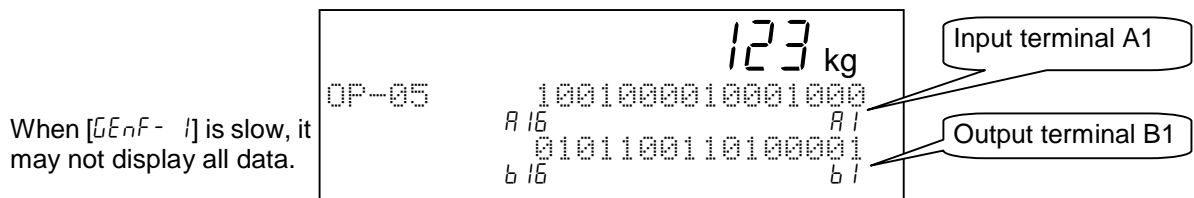
## 9.2.8. Monitoring RS-232C Interface of OP-04

- The current communication data are displayed.



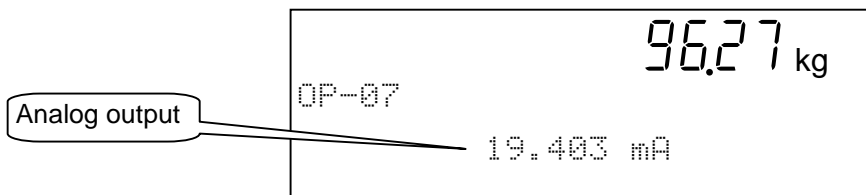
## 9.2.9. Monitoring Parallel I/O of OP-05

- The status of current parallel I/O is displayed.



## 9.2.10. Monitoring Analog Output of OP-07

- The current communication data are displayed.





## 9.3. Test Mode

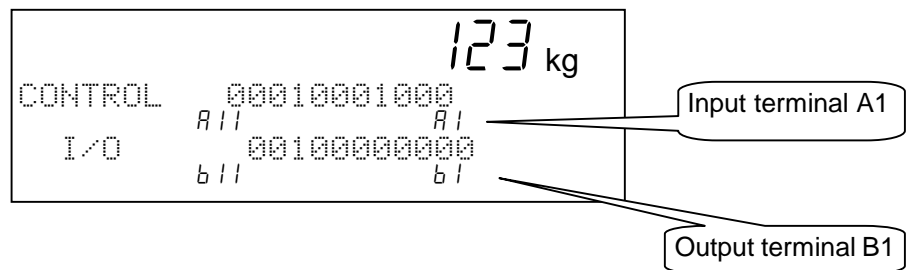
- The test mode is used to check the indicator and weighing system with test signal output.
- When the test mode is used, the weighing sequence is stopped.

### Caution

- The test mode outputs the test signal. Therefore, the devices connected to system are influenced and it may cause mis-operation.

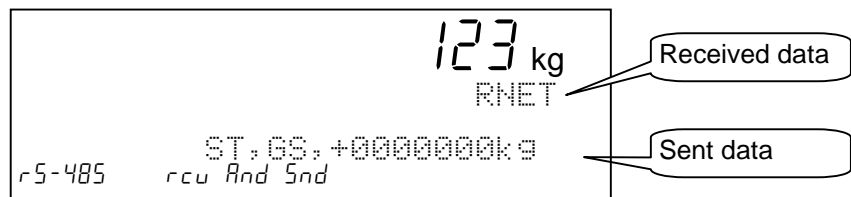
### 9.3.1. Testing Control I/O Function

- Test the output of the I/O terminal. An active output of level "1" shifts for each terminal.



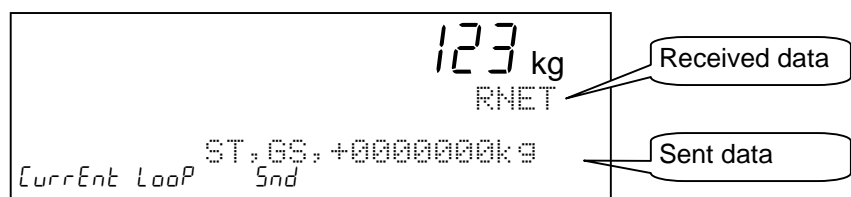
### 9.3.2. Testing Built-in RS-485 Interface

- When pressing the **ENTER** key each time, a test data "ST,GS,+0000000kg CR LF" is output.



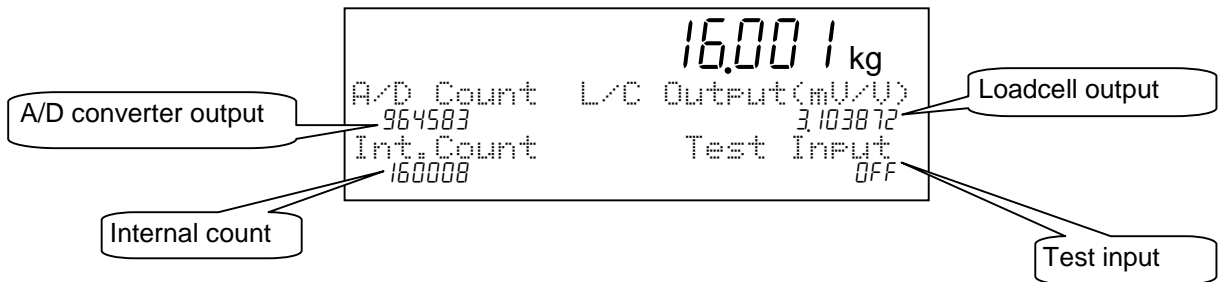
### 9.3.3. Testing Built-in Current Loop Output

- When pressing the **ENTER** key each time, a test data "ST,GS,+0000000kg CR LF" is output.



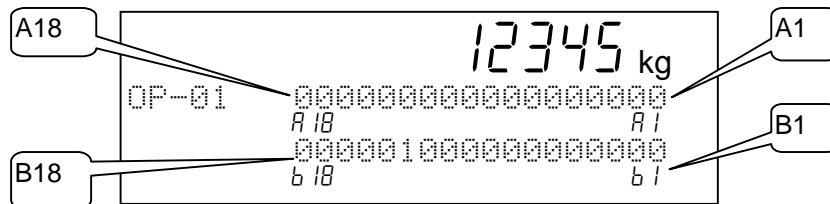
### 9.3.4. Testing A/D Converter

- The A/D converter data is displayed.
- When pressing the **ENTER** key, a test voltage can be input to the A/D converter.



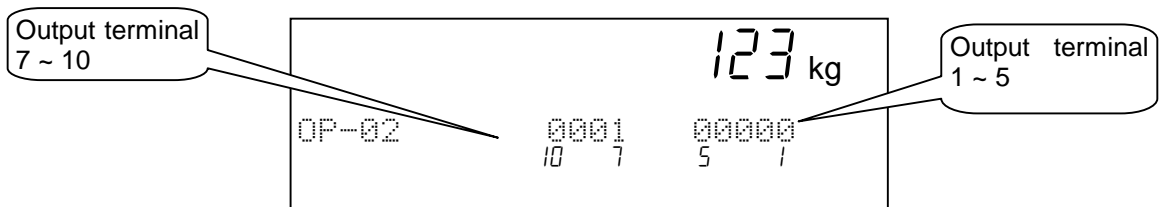
### 9.3.5. Testing BCD Output of OP-01

- Test the output of the terminal. An active output of level "1" shifts for each terminal.



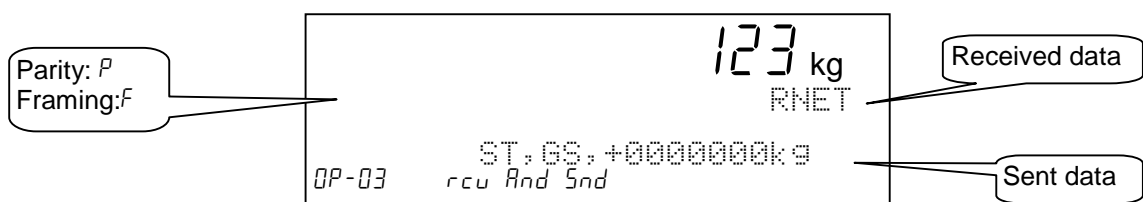
### 9.3.6. Testing Relay Output of OP-02

- Test the output of the terminal. An active output of level "1" shifts for each terminal.



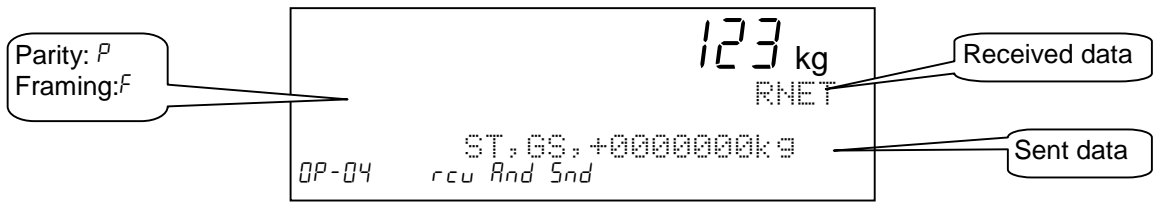
### 9.3.7. Testing RS-422/485 Interface of OP-03

- When pressing the **ENTER** key each time, a test data "ST,GS,+0000000kg CR LF" is output.



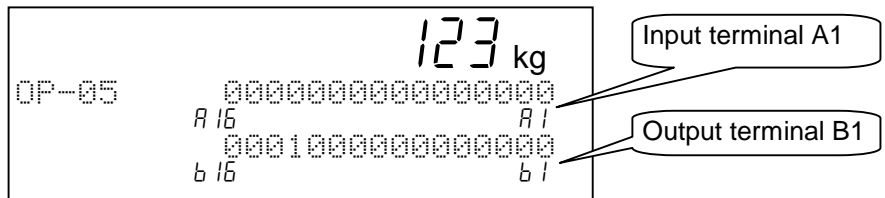
### 9.3.8. Testing RS-232C Interface of OP-04

- When pressing the **ENTER** key each time, a test data "ST,GS,+0000000kg CR LF" is output.



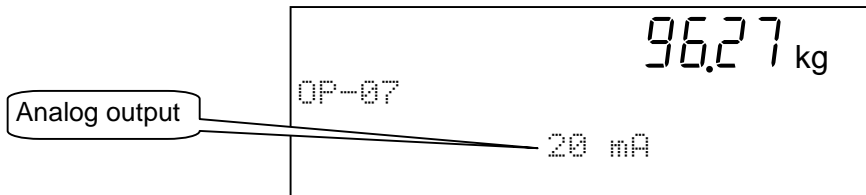
### 9.3.9. Testing Parallel I/O of OP-05

- Test the output of the terminal. An active output of level "1" shifts for each terminal.



### 9.3.10. Testing Analog Output of OP-07

- When pressing the **1** key, output current is increases.
- When pressing the **2** key, output current is decreases.





## 9.4. Initializing Parameters

- The function initializes the parameters stored in the indicator.
- The parameters are stored in the flash memory and backup RAM.

### Caution

- **There are the kinds of reset function that must re-calibrate the indicator**
- **Note the parameters where is stored in.**

### Kinds of initialization mode

Kinds of initialization	Description
Initializing RAM	The backup RAM is reset. Zero point of gross display, tare value zeroes.
Initializing material code or recipe code	Material code and recipe code is reset.
Initializing function list	It is reset parameters of function list in the flash memory.
Initializing caribration data	It is reset parameters of calibration data in the flash memory. If this function is used, calibrate the indicator.
Initializing all parameters	It resets all parameters.

### The location of the parameters and objects of initialization mode

		Zero	Tare	Material code		Recipe code		Function list	Calibration data
				Material code	Accumulation data	Recipe code	Accumulation data		
Location	Backup RAM	○	○	○	○	○	○		
	Flash memory			○		○		○	○
Initialization mode	Initializing RAM	○	○						
	Initializing material code or recipe code			○	○	○	○		
	Initializing function list							○	
	Initializing caribration data								○
	Initializing all parameters	○	○	○	○	○	○	○	○

## Prucedure

### Caution

- Do not intialize them while any operation. Cut off the power supply of other system. When initializing the indicator, the output may change.
- When intializing the indicator, do not turn off it before it is resetted.

### To enter intialization

- Step 1 Press and hold the **ENTER** key and press the **↵** key to display the menu in a weighing mode.
- Step 2 Select the menu "**Initialization**" using the **↵** key, **ENTER** key and **ESC** key. Category address: [Maintenance] - [Initialization]

### To enter intialization

- Step 1 Select the menu intialization using the **↵** key, **ENTER** key and **ESC** key.  
Menu: RAM / Code / Function / CAL / All
- Step 2 Select "**yes**" to initialize them using the **↵** key, **ENTER** key.
- Step 3 Wait for the indicator resetted.



## 9.5. Remote Operation

- The mode can read and write the parameters of function list, data of material code and recipe code and calibration data.
- The build-in RS-485, RS-422/485 (OP-03) or RS-232C (OP-04) is used for the remote operation.
- It is necessary to install the **remote setup program** in the computer or controller before use. Refer to <http://www.aandd.co.jp>
- Refer to the instruction manual for the details of the program.

### Caution

**Do not download data during a weighing operation.**  
**Remove all connections to prevent an irregular operation.**  
**Maintain the power supply during the remote operation.**

### Entering to the Remote Operation Mode

Step 1 Press and hold the **ENTER** key and press the **↵** key.

Step 2 Press the **↵** key to select menu `remote operation`. And press the **ENTER** key.

### Advise

The following RS-232C to RS-485 converter can use.  
AD-7491, other converter on the market.



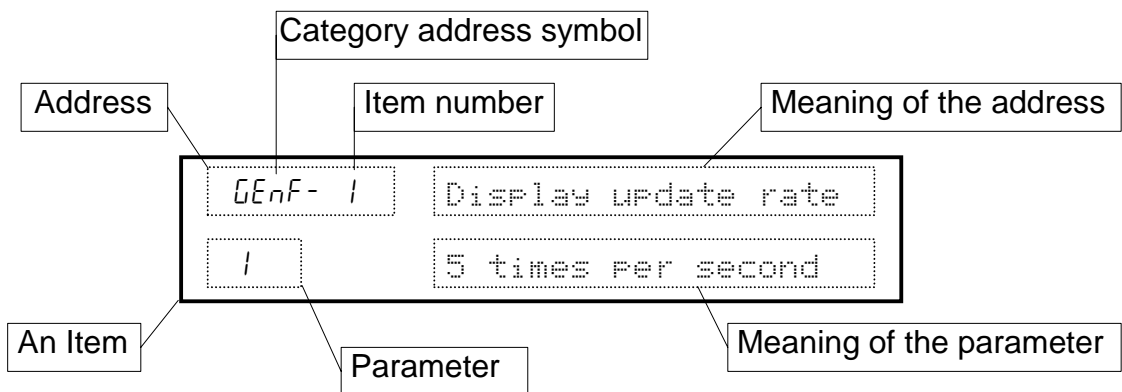


# 10. Function List

- The function list stores parameters to control the indicator.
- The parameter is stored in an item without power supply.
- An item is classified by a category address, and is classified by an item number. Refer to " 10.1.2. Outline of the Function List".
- The category address has a symbol for the 7-segments display
- There are two kind of the function mode to operate the function list.
  - Parameter settings                   The mode is used to change the parameter.
  - Referring Parameters                The mode is used to refer the parameter in the weighing sequence.

Example of an item:

Category address: [Function] - [Function setting] - [General] - [Weighing]



## Caution

- **When entering Parameter settings of the function mode, the current weighing sequence are stopped.**

### 10.1.1. Operation Keys

- |  |  |
|--|--|
| To enter the function list   | Press and hold the <b>ENTER</b> key and press the <b>↵</b> key in weighing mode.<br>Select menu <b>Function</b> using the <b>↵</b> key and the <b>ENTER</b> key. |
| To select an address of the parameter                                  | The <b>↵</b> , <b>SHIFT + ↵</b> , <b>ENTER</b> , <b>ESC</b> keys.  |
| To change the parameter  | The <b>↵</b> , <b>SHIFT + ↵</b> , <b>Alphanumerical</b> , <b>ENTER</b> , <b>ESC</b> keys.  |
| To store it and exit the function list<br>(To return to weighing mode) | The <b>ESC</b> key.  |

## 10.1.2. Outline of the Function List

Category Address	Start Item
Function	
Function reference	
General	
Weight	GenF- 1
Sub display	Sub F 1
Other	othF- 1
Sequence	
Basic	59 F- 1
Control	59 F- 11
Timer	59 F- 31
Setpoint (Compared value)	59 F- 51
Tall (Accumulation)	59 F- 61
Safety	59 F- 71
Control I/O function	
Input	In F- 1
Output	OutF- 1
Serial interface	
Current Loop	CL F- 1
RS-485	rS F- 1
Option	
Slot1	Refer to Options in this page.
Slot2	
Slot3	
Function setting	
The same as the "Function reference".	

### Options

Category Address	Start Item
Option	
Slot nn nn: Slot number to be installed the option	
BCD output, OP-01	01 F- 1
Relay output, OP-02	02 F- 1
RS-422/485, OP-03	03 F- 1
RS-232C, OP-04	04 F- 1
Parallel output, OP-05	05 F- 1
Analog output, OP-07	07 F- 1



## 10.2. Referring Parameters

- Use the mode to refer the parameter in the weighing sequence.
- The mode can change the parameters concerning the digital filter and weighing sequence timers in the weighing sequence.

[GEnF- 2]      Digital filtering  
[Function] - [Function setting] - [General] - [Weighing]

[GEnF- 3]      Sampling frequency divider Proportion  
[Function] - [Function setting] - [General] - [Weighing]

[59 F-31] to [59 F-48]  
Weighing sequence timers  
[Function] - [Function setting] - [Sequence] - [Timer]



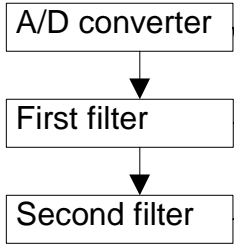
## 10.3. Parameter Settings

- Use the mode to change the parameter.
- The weighing sequence and the I/O interfaces are stopped and closed during this mode.
- New parameters have effective after returning to weighing mode.



## 10.4. Parameter List

Category address: [Function] – [Function setting] – [General] – [Weighing]

Category address symbol	Name	Descriptions	Range and choices	Default
GE <sub>n</sub> F- 1	Display refresh rate	1: five times per second 2: ten times per second	1 to 2	2
GE <sub>n</sub> F- 2	Digital filter	0: Not used 1: 11 Hz 2: 8.0 Hz 3: 5.6 Hz 4: 4.0 Hz 5: 2.8 Hz 6: 2.0 Hz 7: 1.4 Hz 8: 1.0 Hz 9: 0.7 Hz Select 3dB band for two low pass filters. 	0 to 99	4 8
GE <sub>n</sub> F- 3	Sampling frequency divider	Use to decrease the cut-off frequency of digital filter.	0 to 10	1
GE <sub>n</sub> F- 4	Stability detection time	The detection condition concerning stability.	0.0 to 9.9 s	1.0 s
GE <sub>n</sub> F- 5	Stability detection band width	0.0 : stable at anytime.	0.0 to 9.9 d	2.0 d
GE <sub>n</sub> F- 6	Zero Range	The range to zero gross display. Center of range is zero calibration. Unit: percentage of weighing capacity.	0 to 30 %	5 %
GE <sub>n</sub> F- 7	Zero tracking time	The function automatically traces the weighing deviation at nearly zero point and keeps zero display of gross display.	0.0 to 9.9 s	0.0 s
GE <sub>n</sub> F- 8	Zero tracking band width		0.0 to 9.9 d	0.0 d
GE <sub>n</sub> F- 9	Tare and zero compensation at unstable status	When unstable weighing, whether zero or tare command is used. 0 :Disabled 1 :Enabled	0 to 1	1
GE <sub>n</sub> F- 10	Tare at negative GROSS weight	When negative weighing, whether tare command is used. 0 :Prohibition to tare. 1 :Permission to tare.	0 to 1	1
GE <sub>n</sub> F- 11	Preset tare	Preset tare of material code 0 :Not used 1 :Use	0 to 1	1
GE <sub>n</sub> F- 12	Preset tare =0 choice	1: If tare value of material code is zero, the last tare value is used. 2: If tare value of material code is zero, Tare is set to zero.	1 to 2	1

Category address symbol	Name	Descriptions	Range and choices	Default
<i>EE<sub>n</sub>F-13</i>	Clear mode at power ON	The action at turning on indicator. First bit: Zero Second bit: Zero clear Third bit: Tare Fourth bit: Tare clear  0: Not used 1: Use	0000 to 1111	0000
<i>EE<sub>n</sub>F-14</i>	Hold function	1: Hold 2: Hold at batch finish 3: Hold at recipe finish	1 to 3	1

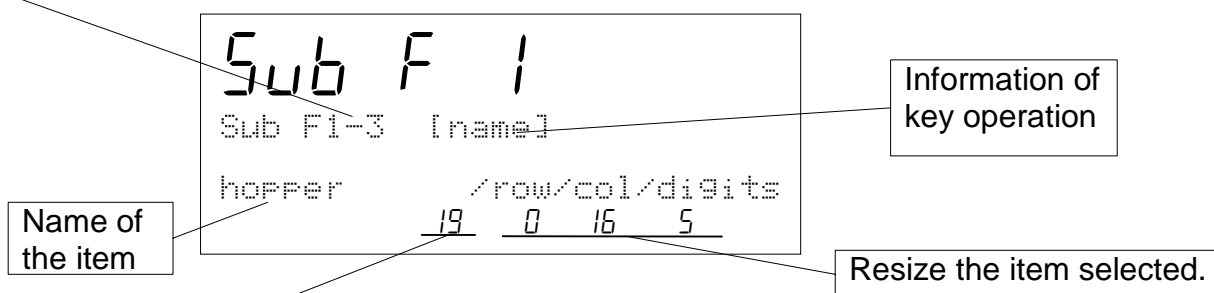
**s** : second  
**d** : digit

Category address: [Function] – [Function setting] – [General] – [Sub-display]

Category address symbol	Name	Descriptions	Range and choices	Default
SubF- 1	Weighing display	0: Basic format 1: Custom format	0 to 1	0

When arranged format is used (When [SubF- 1] [ 1 ]), set items to be displayed in the sub-display.

Item index number to be displayed. 32 items of name and number can be set in maximum.  
 At **odd**: Input the name of the selected item using alphanumeric characters.  
 At **even**: Input the number concerning the item.



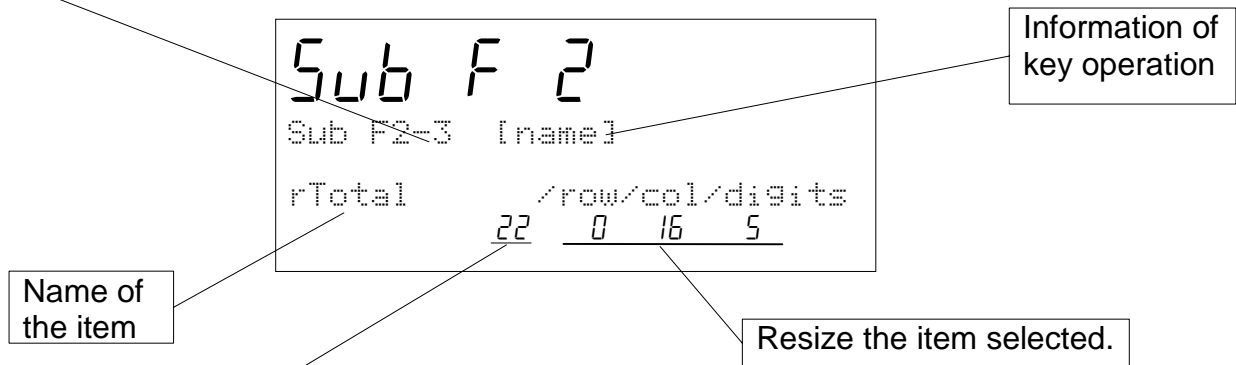
Number	Name and Number to Display the Item	Row size	Columnsize	Figures
0	Not displayed			
1	Material			
2	Hopper			
3	Final			
4	Free fall			
5	Preliminary			
6	Optional preliminary			
7	Over			
8	Under			
9	Zero Band			
10	Full (full filling)			
11	Tare			
12	Supplementary flow open timer			
13	Supplementary flow close timer			
14	Automatic Free Fall Compensation			
15	Internal reserved			
16	Internal reserved			
17	IDF at entrance sequence			
18	MDF at entrance sequence			
19	Accumulated weight			
20	Accumulation counts			
21	Recipe , r[odE			
22	Accumulated weight for recipe mode			
23	Accumulation counts for recipe mode			
		0 to 3	0 to26	1 to12

Category address: [Function] – [Function setting] – [General] – [Sub-display]

Category address symbol	Name	Descriptions	Range and choices	Default
SubF- 2	Recipe display	0: Basic format 1: Custom format	0 to 1	0

When arranged format is used (When [SubF- 2] [ 1 ]), set items to be displayed in the sub-display.

Item index number to be displayed. 32 items of name and number can be set in maximum.  
 At **odd**: Input the name of the selected item using alphanumeric characters.  
 At **even**: Input the number concerning the item.



Number	Name and Number to Display the Item	Row size	Columnsize	Figures
0	Not displayed	0 to 3	0 to26	1 to12
22	Total weight for recipe mode			
23	Total counts for recipe mode			

Category address: [Function] – [Function setting] – [General] – [Sub-display]

Category address symbol	Name	Descriptions	Range and choices	Default
<i>Sub F 1</i>	Refer to previous pages.			
<i>Sub F 2</i>				
<i>Sub F 3</i>	Bar graph location	0: Hide 1: Upper side. 2: Lower side.	0 to 2	0
<i>Sub F 4</i>	Ratio of graph display	1: Gross weight to capacity. 2: Net weight to final value.	0 to 2	1
<i>Sub F 5</i>	Activity indicator	0: Off (Not used) 1: On (Use)	0 to 1	1

Category address: [Function] – [Function setting] – [General] – [Others]

Category address symbol	Name	Descriptions	Range and choices	Default
<i>othF- 1</i>	Key lock	Set the action of each key. Bit 1: F1 key Bit 2: F2 key Bit 3: F3 key Bit 4: F4 key Bit 5: Code recall key Bit 6: Code set key Bit 7: Not defined Bit 8: Zero key Bit 9: Tare key Bit 10: Net / Gross key Bit 11: Not defined Bit 12: Off key  0: Unlock 1: Lock	0000000 00000 to 1111111 11111	00000 00000 00



Category address symbol	Name	Descriptions	Range and choices	Default
<i>oethF- 2</i>	F1 key function	0: Not used 1: Display exchange (current weighing / recipe) 2: Manual print 3: Hold 4: Zero clear ( to be zero) 5: Tare clear ( to be zero) 6: Batch start	0 to 24	0
<i>oethF- 3</i>	F2 key function	7: Recipe start 8: Discharge 9: Mixture 10: Pause 11: Internal reserved 12: Restart 13: Forced batch finish 14: Forced recipe finish		
<i>oethF- 4</i>	F3 key function	15: Forced discharge finish 16: Total command 17: Manual free fall compensation 18: Cancel the last result 19: Error reset 20: Clear the total weight and counts for each material code.		
<i>oethF- 5</i>	F4 key function	21: Clear the total weight and counts for each recipe code. 22: Clear all total data for material codes. 23: Clear all total data for recipe codes. 24: Clear all total data of material code and recipe code.		
<i>oethF- 6</i>	Parallel I/O Buzzer	Buzzer output is 2 s. Beep is 0.2 s. It is used in Contolol I/O, OP-02, OP-05. Bit 1: Beep (Click sound) Bit 2: Over Bit 3: OK Bit 4: Under Bit 5: Zero band Bit 6: Bach finish Bit 7: Discharge finish Bit 8: Recipe finish Bit 9: Mixture finish Bit 10: Weighing sequence in process Bit 11: Full (Full filling) Bit 12: Stable condition Bit 13: Weighing sequence error Bit 14: Alarm 1 Bit 15: Alarm 2 Bit 16: Zero error  0: Off (Not used: Open) 1: On (Use: Short or Open)		

Category address symbol	Name	Descriptions	Range and choices	Default
<i>athF- 7</i>	Tare Header	Use for the current loop out put or RS-485 of serial interface. This parameter can not be used in command mode and stream mode. 0: All header of tare is "TR" 1: Use "PT" of preset tare header and "T" of tare header	0 to 1	0
<i>athF- 8</i>	Preset tare printing with net weight	Use for the current loop output or RS-485 interface at net display. This parameter can not use in command mode and stream mode. 0: No (Not output preset tare) 1: Yes (To output preset tare)	0 to 1	0
<i>athF- 9</i>	Printing when unstable condition	Use for the current loop output or RS-485 interface at "out of range" or "unstable condition". 0: No 1: Yse	0 to 1	0
<i>athF- 10</i>	Repeat lock	The function to avoid key operation error. Bit 0: Total Bit 1: Manual print operaton  0: Unlock 1: Lock (Cancel duplicated command input)	00 to 11	00
<i>athF- 11</i>	Save data	Select a backup method of material code and recipe code. 0: Store in RAM 1: Store in flash memory	1 to 2	1

Category address: [Function] – [Function setting] – [Sequence] – [Basic]

Category address symbol	Name	Descriptions	Range and choices	Default
59 F- 1	Weighing mode	1: Constomer programmed control 2: Sequential weighing	1 to 2	2
59 F- 3	Loss-in weight	0: Normal batch weighing 1: Loss-in weight 2: External exchange	0 to 2	0
59 F- 4	Setpoint comparison	0: Comparison with internal count 1: Comparison with display count	1 to 2	1
59 F- 5	Comparison	0: Always output 1: Stable condition 2: At batch finish	0 to 2	2
59 F- 7	Output of zero band	0: Gross <= Zero band 1:   Gross   <= Zero band	1 to 2	1
59 F- 8	Recipe mode	0: Not used recipe sequence 1: Semi-automatic mode 2: Automatic mode	0 to 2	0
59 F- 9	Material code, free fall value	The selection to store free fall value on the automatic free fall compensation or realtime free fall compensation. 0: No change Even if automatic free fall compensation is used, parameter of the free fall stored in the material code is not changed. 1: Change free fall value The result is memorized to the parameter of the free fall in the material code.	0 to 1	0

Category address: [Function] – [Function setting] – [Sequence] – [Control]

Category address symbol	Name	Descriptions	Range and choices	Default
59 F-11	Batch start settings	<p>Select a action at starting the weighing sequence.</p> <p>Bit 1: When loading it above zero band, start the sequence.</p> <p>Bit 2: Not used</p> <p>Bit 3: Automatic tare at the starting sequence</p> <p>0: No (Not worked) 1: Yes (work)</p>	000 to 111	000
59 F-12	Nozzle control	<p>Bit 1: Use nozzle control. "Nozzle down" operation signal is output at starting the sequence.</p> <p>Bit 2: Nozzle contact stop sequence Use start delay timer to prevent weighing error at touching to hopper.</p> <p>Bit 3: "Nozzle up" after compensate.</p> <p>0: No (Not used) 1: Yes (Use)</p>	000 to 111	000
59 F-13	Eval conditions	<p>After dribble flow, select the stability condition of comparison. Refer to Eval delay timer [59F-37].</p> <p>0: Timer is up Compare when time is up.</p> <p>1: Stable and timer is up Compare when weighing is stable and the time is up.</p> <p>2: Stable or timer is up Compare when weighing is stable or the time is up.</p>	0 to 2	1

Category address: [Function] – [Function setting] – [Sequence] – [Control]

Category address symbol	Name	Descriptions	Range and choices	Default
59 F-14	Batch finish actions	Select a action at batch finish. Bit 1: Auto-start mixing (Mixture start automatically) Bit 2: Auto-start discharge (Discharge start automatically)  0: No (Not used) 1: Yes (Use)	00 to 11	00
59 F-15	Discharge finish actions	Select a action at discharge finish. Bit 1: Auto-clear tare (Tare clear automatically) Bit 2: Start mixing (Mixture start automatically)  0: No (Not used) 1: Yes (Use)	00 to 11	00
59 F-16	Recipe start actions	Selection of rezeroing it at recipe start. 0: No (Not used) 1: Yes (Use)	0 to 1	1
59 F-17	Recipe finish actions	Select a action at recipe finish. Bit 1: Auto-clear tare (Clear tare automatically) Bit 2: Auto-start mixing (Start mixture automatically) Bit 3: Auto-start discharge. (Start discharge automatically)  0: No (Not used) 1: Yes (Use)	000 to 111	000
59 F-18	Maximum number of compensation	Set the number of compensation flow. When 0 is set, there is not flow.	0 to 255	0
59 F-19	Comparison flow Eval	Set the condition with compensation close timer and stability. 0: Timer is up Comparison when compensation close timer is up. 1: Stable and timer is up. Comparison after stable mark and compensation close timer is up. 2: Stable or timer is up. Comparison after stable mark or compensation close timer is up.	0 to 2	0
59 F-20	Free fall compensation	0: No (Not used) 1: Average of last four times free fall. 2: Real time free fall compensation	0 to 2	0

Category address symbol	Name	Descriptions	Range and choices	Default
59 F-21	Batch finish output off	0: Off at next start (Turning off until next start) 1: Off at over or unstable. (Turning off when "out of range" or "unstable condition") 2: Off at zero band. (Turning off at zero band)	0 to 2	0

Category address: [Function] - [Function setting] - [Sequence] - [Timer]

Category address symbol	Name	Descriptions	Range and choices	Default
59 F-31	Batch monitoring timer	Set the upper limit of the time of sequence. If the sequence is not finished, sequence error SO. ERR4 is displayed. If 0 is set, the timer does not work.	0 to 65535 s	0 s
59 F-32	Batch start delay timer	Set the delay time between start operation and the flow start	0.0 to 65535 s	0.0 s
59 F-33	Full flow comparison interrupt timer	The timer to prevent weighing error due to vibration of open/close operation. While the timer is not up, the comparison does not work.	0.0 to 25.5 s	0.0 s
59 F-34	Medium flow comparison interrupt timer		0.0 to 25.5 s	0.0 s
59 F-35	Dribble flow comparison interrupt timer		0.0 to 25.5 s	0.0 s
59 F-36	Drible flow auto-Free Fall override time	Set the time until the dribble flow is can stant. Use to prevent compensation error of automatic free fall compensation or real time free fall compensation.	0.0 to 25.5 s	3.0 s
59 F-37	Eval delay timer	Set the time between closing dribble flow and comparing the result. Refer to Eval conditions [59 F-13]	0.1to 25.5 s	0.1 s
59 F-38	Discharge start delay timer	Set the time between operating discharge start and opening the discahrge gate	0.0 to 25.5 s	0.0 s

Category address symbol	Name	Descriptions	Range and choices	Default
59 F-39	Discharge monitoring timer	Set the time limit to discharge it When time is up and weighing value is not zero band, sequence error SO. ERR5 is displayed. If 0 is set, the timer does not work.	0 to 65535 s	0 s
59 F-40	Discharge gate close delay timer	Set the waiting time from reaching to zero band to closing discharge gate for gross.	0.1 to 25.5 s	0.1 s
59 F-43	Batch finish output on	Set the active (ON) time of batch finish signal. If 0 is set, output is kept until next sequence.	0.00 to 2.55 s	0.00 s
59 F-44	Discharge finish output on	Set the time to keep the ON for discharge signal.	0.00 to 2.55 s	0.00 s
59 F-45	Recipe finish output on	Set the time to keep the ON for recipe finish signal.	0.00 to 2.55 s	0.00 s
59 F-46	Mixing finish output on	Set the time to keep the ON for mixture finish signal.	0.00 to 2.55 s	0.00 s
59 F-47	Mixing time output on	Set the time to keep the ON for mixture time signal.	0 to 255 s	0 s
59 F-48	Averaging Eval time	Set the time to average the result. This time controls precision of the result. Refer to Eval delay timer [59 F-37] and Eval conditions [59 F-13].	00.0 to 2.55 s	0.00 s

**s :** second  
**d:** digit

Category address: [Function] – [Function setting] – [Sequence] – [Setpoint]

Category address symbol	Name	Descriptions	Range and choices	Default
59 F-51	Code recall method	1: Key operation (including serial interface, field bus) 2: Parallel interface (Digital switch) 3: External switch	1 to 3	1
59 F-53	Hide elements of material code	Select the parameter to hide of material code. Bit 1: Free fall Bit 2: Preliminary Bit 3: Optional preliminary Bit 4: Over Bit 5: Under Bit 6: Zero band Bit 7: Full filling Bit 8: Tare Bit 9: Compensation flow open timer Bit 10: Compensation flow close timer Bit 11: AFFC range Bit 12: Dribble supply at entrance Bit 13: Medium supply at entrance  0: Show 1: Hide	0000000 000000 to 1111111 111111	00000 00000 000
59 F-55	Add Final value and zero band	0: No (Not added) 1: Yes (Add)	0 to 1	1
59 F-56	Add Final value and Full value	0: No (Not added) 1: Yes (Add)	0 to 1	1

Category address: [Function] – [Function setting] – [Sequence] – [Total]

Category address symbol	Name	Descriptions	Range and choices	Default
59 F-61	Automatic material code total	0: Not totaled automatically 1: Auto-total OK results To total OK result automatically 2: Auto-total all results To total all result automatically	0 to 2	0
59 F-62	Automatic recipe code total	0: No (Not totaled) 1: Yes (Total the result)	0 to 1	0



Category address: [Function] – [Function setting] – [Sequence] – [Safety]

Category address symbol	Name	Descriptions	Range and choices	Default
59 F-71 to 59 F-75		<p>The maximum eight inputs for safety check are assigned to the I/O or OP-05. If an input be inactive, the sequence is stopped and displays sequence error. Refet to 7.5.11. Error Message and Alarm. These safety checks can use during the sequence.</p> <p>Bits map            Bit 1: Safety input 1            Bit 2: Safety input 2            Bit 3: Safety input 3            Bit 4: Safety input 4            Bit 5: Safety input 5            Bit 6: Safety input 6            Bit 7: Safety input 7            Bit 8: Safety input 8</p> <p>0: No (Not used)            1: Yes (Use)</p>		
59 F-71	Batching safety check	If the assigned input is inactive during the weighing sequence, it occurs an sequence error.	0000000 0 to 1111111 1	00000 000
59 F-72	Discharge safety check	If the assigned input is inactive during the discharge sequence, it occurs an sequence error.		
59 F-73	Recipe safety check	If the assigned input is inactive during the recipe sequence, it occurs an sequence error.		
59 F-74	Mixing safety check	If the assigned input is inactive during the mixture sequence, it occurs an sequence error.		
59 F-75	General safety check	If the assigned input is inactive during the all sequence, it occurs an sequence error.		

Category address: [Function] – [Function setting] – [Control I/O Function] – [Input]

The list to assign the function for the input terminal of the I/O

No.	Function description	Read	No.	Function description	Read
0	No function	-	26	Clear totals of active recipe code	Edge
1	Zero	Edge	27	Clear totals of all recipe code	Edge
2	Zero clear	Edge	28	Safety check input 1	Level
3	Tare	Edge	29	Safety check input 2	Level
4	Tare clear	Edge	30	Safety check input 3	Level
5	Batch start	Edge	31	Safety check input 4	Level
6	Recipe start	Edge	32	Safety check input 5	Level
7	Discharge start	Edge	33	Safety check input 6	Level
8	Mixtire start	Edge	34	Safety check input 7	Level
9	External switch control 0: Normal bach 1: Loss-in weight	Level	35	Safety check input 8	Level
10	Manual free fall compensation	Edge	36	Foced batch finish	Edge
11	Accumulation command	Edge	37	Foced recipe finish	Edge
12	Cancel the last result	Edge	38	Foced discharge finish	Edge
13	Emergency stop	Level	39	Manual full flow	Level
14	Material / Recipe code, BCD 1	Level	40	Manual medium flow	Level
15	Material / Recipe code, BCD 2	Level	41	Mnaual dribble flow	Level
16	Material / Recipe code, BCD 4	Level	42	Manual discharge	Level
17	Material / Recipe code, BCD 8	Level	43	Manual mixture	Level
18	Material / Recipe code, BCD 10	Level	44	Error reset	Edge
19	Material / Recipe code, BCD 20	Level	45	Hold	Level
20	Material / Recipe code, BCD 40	Level	46	Key unlock	Level
21	Material / Recipe code, BCD 80	Level	47	Manual print command	Edge
22	Pause	Edge	48	Code recall external switch control OFF: key, ON: digital switch	Level
23	Restart	Edge	49	Recipe interrupt	Level
24	Clear totals of active material code	Edge	50	Net / gross	Edge
25	Clear totals of all material code	Edge			

Input terminals of the I/O and default functions

Category address symbol	Terminal name	Default choices	Default No.
<i>I<sub>n</sub> F- 1</i>	Input terminal A1	Zero	1
<i>I<sub>n</sub> F- 2</i>	Input terminal A2	Tare	3
<i>I<sub>n</sub> F- 3</i>	Input terminal A3	Tare clear	4
<i>I<sub>n</sub> F- 4</i>	Input terminal A4	Batch start	5
<i>I<sub>n</sub> F- 5</i>	Input terminal A5	Emergency stop	13
<i>I<sub>n</sub> F- 6</i>	Input terminal A6	Material / Recipe code, BCD 1	14
<i>I<sub>n</sub> F- 7</i>	Input terminal A7	Material / Recipe code, BCD 2	15
<i>I<sub>n</sub> F- 8</i>	Input terminal A8	Material / Recipe code, BCD 4	16
<i>I<sub>n</sub> F- 9</i>	Input terminal A9	Pause	22
<i>I<sub>n</sub> F- 10</i>	Input terminal A10	Restart	23
<i>I<sub>n</sub> F- 11</i>	Input terminal A11	Error reset	44

Category address: [Function] – [Function setting] – [Control I/O Function] – [Output]

The list to assign the function for the output terminal of the I/O

No.	Function description	No.	Function description	No.	Function description
0	No function	30	Gross display	60	Material hopper 2 <b>DF</b>
1	Stable	31	Net display	61	Material hopper 3 <b>FF</b>
2	Zero band	32	During hold	62	Material hopper 3 <b>MF</b>
3	FULL (Full filling)	33	Internal reservation	63	Material hopper 3 <b>DF</b>
4	Full flow	34	Internal reservation	64	Material hopper 4 <b>FF</b>
5	Medium flow	35	Material hopper 1	65	Material hopper 4 <b>MF</b>
6	Dribble flow	36	Material hopper 2	66	Material hopper 4 <b>DF</b>
7	Over	37	Material hopper 3	67	Material hopper 5 <b>FF</b>
8	OK	38	Material hopper 4	68	Material hopper 5 <b>MF</b>
9	Under	39	Material hopper 5	69	Material hopper 5 <b>DF</b>
10	Internal reservation	40	Material hopper 6	70	Material hopper 6 <b>FF</b>
11	Internal reservation	41	Material hopper 7	71	Material hopper 6 <b>MF</b>
12	Mixture	42	Material hopper 8	72	Material hopper 6 <b>DF</b>
13	Discharge (Open the dscharge gate)	43	Material hopper 9	73	Material hopper 7 <b>FF</b>
14	Batch finish	44	Material hopper 10	74	Material hopper 7 <b>MF</b>
15	Recipe finish	45	Material hopper 11	75	Material hopper 7 <b>DF</b>
16	Discharge finish	46	Material hopper 12	76	Material hopper 8 <b>FF</b>
17	Mixture finish	47	Material hopper 13	77	Material hopper 8 <b>MF</b>
18	Nozzle down	48	Material hopper 14	78	Material hopper 8 <b>DF</b>
19	Online. If sequence is enable, 0.5 sec. pulse is output.	49	Material hopper 15	79	Material hopper 9 <b>FF</b>
20	Weighing sequence in process	50	Material hopper 16	80	Material hopper 9 <b>MF</b>
21	Input acknowledge. If there is a input signal, 0.5 sec. pulse is output.	51	Material hopper 17	81	Material hopper 9 <b>DF</b>
22	Weighing sequence error	52	Material hopper 18	82	Material hopper10 <b>FF</b>
23	Alram 1	53	Material hopper 19	83	Material hopper10 <b>MF</b>
24	Alram 2	54	Material hopper 20	84	Material hopper10 <b>DF</b>
25	Zero error	55	Material hopper 1 <b>FF</b>		
26	Capacity exceeded (Out of range)	56	Material hopper 1 <b>MF</b>		
27	Buzzer	57	Material hopper 1 <b>DF</b>		
28	During tare	58	Material hopper 2 <b>FF</b>		
29	Center of zero	59	Material hopper 2 <b>MF</b>		

Full flow: **FF**  
 Medium flow: **MF**  
 Drrible flow: **DF**

Output terminals of the I/O and default functions

Category address symbol	Terminal name	Default choices	Default No.
OUTF- 1	Output terminal B1	Zero band	2
OUTF- 2	Output terminal B2	Full flow	4
OUTF- 3	Output terminal B3	Medium flow	5
OUTF- 4	Output terminal B4	Dribble flow	6
OUTF- 5	Output terminal B5	Over	7
OUTF- 6	Output terminal B6	OK	8
OUTF- 7	Output terminal B7	Under	9
OUTF- 8	Output terminal B8	Batch finish	14
OUTF- 9	Output terminal B9	Weighing sequence error	22
OUTF- 10	Output terminal B10	Alarm 1	23
OUTF- 11	Output terminal B11	Alarm 2	24

Category address: [Function] – [Function setting] – [Serial] – [RS-485]

Category address symbol	Name	Descriptions	Range and choices	Default
r5 F- 1	Output data	When jet stream mode of Communication mode [r5 F- 2] is used, the 1, 2, 3 can select. And if freeze mode is used in jet stream mode, output is stopped. 1: Displayed value 2: Gross value 2: Net value 4: Tare value 5: Gross value/ Net value/ Tare value 6: Weighing value with material code 7: Gross value with material code 8: Net value with material code 9: Tare value with material code 10: Gross value/ Net value/ Tare value with material code	1 to 10	1
r5 F- 2	Communication mode	1: Stream mode 2: Auto print mode 3: Manual print mode 4: Print at total 5: Jet stream mode 6: Command mode	1 to 6	6
r5 F- 3	Baud rate	1: 600 bps 2: 12000 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps (Common mode can not select)	1 to 7	5
r5 F- 4	Parity check	0: Not used 1: Odd 2: Even	0 to 2	0
r5 F- 5	Character length	7: 7 bits 8: 8 bits	7, 8	8
r5 F- 6	Stop bits	1: 1 bit 2: 2:bits	1 to 2	1
r5 F- 7	Terminator	1: CR                      CR: 0Dh 2: CR LF                 LF: 0Ah	1 to 2	2
r5 F- 8	Address	0: Address not used 1 to 99: Address used	0 to 99	0
r5 F- 9	Response timer	Set the waiting timer from receiving command to transmitting a response.	0.0 to 25.5 s	0.0 s

s: Second

Category address: [Function] – [Function setting] – [Serial] – [Current loop]

Category address symbol	Name	Descriptions	Range and choices	Default
[L F- 1]	Output data	1: Weighing value 2: Gross value 2: Net value 4: Tare value 5: Gross value/ Net value/ Tare value 6: Weighing value with material code 7: Gross value with material code 8: Net value with material code 9: Tare value with material code 10: Gross value/ Net value/ Tare value with material code	1 to 10	1
[L F- 2]	Communication mode	1: Stream mode 2: Auto print mode 3: Manual print mode 4: Print at accumulation 5: Jet Stream mode	1 to 4	1
[L F- 3]	Baud rate	1: 600 bps 2: 12000 bps 3: 2400 bps	1 to 3	3
[L F- 4]	Burst rate of continuous output	Set the burst time when gross, net or tare is output continuously. Stream mode uses 0.0 s.	0.00 to 2.55 s	0.00 s

**s:** Second

Category address: [Function] – [Function setting] – [Option] – [slotn] – [OP-01]

OP-01: Option BCD Output

slot n : slot number

Category address symbol	Name	Descriptions	Range and choices	Default
01F-1	Out put data	1: Weighing value 2: Gross value 2: Net value 4: Tare value 5: Current material code total 6: Current material code total # 7: Current recipe code total 8: Current recipe code total # 9: Current material code and recipe code 10: Error alarm No.	1 to 10	1
01F-3	Communication mode	1: Stream mode 2: Auto print mode 3: Manual print mode 4: Print at total 5: Jet stream mode (each sampling)	1 to 5	1
01F-4	Output logic	1: Positive logic 2: Negative logic	1 to 2	2



Category address: [Function] – [Function setting] – [Option] – [slotn] – [OP-02]

OP-02: Option Output Relay Output

slot n : slot number

Category address symbol	Name		Descriptions	Range and choices	Default
02 F- 1	Output terminal	1	Material hopper 1 Medium flow	0 to 84	56
02 F- 2	Output terminal	2	Material hopper1 Drrible flow	0 to 84	57
02 F- 3	Output terminal	3	Material hopper 2 Medium flow	0 to 84	59
02 F- 4	Output terminal	4	Material hopper 2 Drrible flow	0 to 84	60
02 F- 5	Output terminal	5	Material hopper 3 Medium flow	0 to 84	62
02 F- 7	Output terminal	7	Material hopper 3 Drrible flow	0 to 84	63
02 F- 8	Output terminal	8	Material hopper 4 Medium flow	0 to 84	65
02 F- 9	Output terminal	9	Material hopper 4 Drrible flow	0 to 84	66
02 F- 10	Output terminal	10	Material hopper 5 Medium flow	0 to 84	69

Default parameters are set to double gates hopper

Category address: [Function] – [Function setting] – [Option] – [slotn] – [OP-03] or  
 [Function] – [Function setting] – [Option] – [slotn] – [OP-04]

OP-03: Option RS-422 / 485 Serial Interface

OP-04: Option RS-232C Serial Interface

slot n : slot number

Category address symbol	Name	Descriptions	Range and choices	Default
03 F- 1 04 F- 1	Output data	When jet stream mode of Coumnication mode [r 5 F- 2] is used, the 1, 2, 3 can select. And if freeze mode is used in jet stream mode, output is stoped. 1: Weighing value 2: Gross value 2: Net value 4: Tare value 5: Gross value/ Net value/ Tare value 6: Weighing value with material code 7: Gross value with material code 8: Net value with material code 9: Tare value with material code 10: Gross value/ Net value/ Tare value with material code	1 to 10	1
03 F- 2 04 F- 2	Comunication mode	1: Stream mode 2: Auto print mode 3: Manual print mode 4: Print at total 5: Jet stream mode 6: Command mode	1 to 6	6
03 F- 3 04 F- 3	Baud rate	1: 600 bps 2: 12000 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps (Command mode can not select)	1 to 7	5
03 F- 4 04 F- 4	Parity check	0: Not used 1: Odd 2: Even	0 to 2	0
03 F- 5 04 F- 5	Charactor length	7: 7 bits 8: 8 bits	7, 8	8
03 F- 6 04 F- 6	Stop bits	1: 1 bit 2: 2:bits	1 to 2	1
03 F- 7 04 F- 7	Terminator	1: CR                   CR: 0Dh 2: CR LF             LF: 0Ah	1 to 2	2

Category address symbol	Name	Descriptions	Range and choices	Default
03 F- 8 04 F- 8	Address	0: Address is not used 1 to 99: Address is used	0 to 99	0
03 F- 9	Response timer	Set the waiting timer from receiving command to transmitting a response.	0.00 to 2.55 s	0.00 s
03 F- 11	RS-422 / 485 switch	1: RS-422 2: RS-485	1 to 2	1

Category address: [Function] – [Function setting] – [Option] – [slotn] – [OP-05]

OP-05: Option Parallel input / output

slot n : slot number

Category address symbol	Name	Descriptions	Range and choices	Default
05 F- 1	Input terminal A1	Set the number of the function.  <b>Caution</b> <b>Avoid to select the same function to plural terminals and keys.</b>	0 to 50	0
05 F- 2	Input terminal A2		0 to 50	0
05 F- 3	Input terminal A3		0 to 50	0
05 F- 4	Input terminal A4		0 to 50	0
05 F- 5	Input terminal A5		0 to 50	0
05 F- 6	Input terminal A6		0 to 50	0
05 F- 7	Input terminal A7		0 to 50	0
05 F- 8	Input terminal A8		0 to 50	0
05 F- 9	Input terminal A9		0 to 50	0
05 F- 10	Input terminal A10		0 to 50	0
05 F- 11	Input terminal A11		0 to 50	0
05 F- 12	Input terminal A12		0 to 50	0
05 F- 13	Input terminal A13		0 to 50	0
05 F- 14	Input terminal A14		0 to 50	0
05 F- 15	Input terminal A15		0 to 50	0
05 F- 16	Input terminal A16		0 to 50	0

Category address symbol	Name	Descriptions	Range and choices	Default
05 F- 17	Input terminal B1	Material hopper 1 Medium flow	0 to 84	56
05 F- 18	Input terminal B2	Material hopper 1 Drrible flow	0 to 84	57
05 F- 19	Input terminal B3	Material hopper 2 Medium flow	0 to 84	59
05 F- 20	Input terminal B4	Material hopper 2 Drrible flow	0 to 84	60
05 F- 21	Input terminal B5	Material hopper 3 Medium flow	0 to 84	62
05 F- 22	Input terminal B6	Material hopper 3 Drrible flow	0 to 84	63
05 F- 23	Input terminal B7	Material hopper 4 Medium flow	0 to 84	65
05 F- 24	Input terminal B8	Material hopper 4 Drrible flow	0 to 84	66
05 F- 25	Input terminal B9	Material hopper 5 Medium flow	0 to 84	68
05 F- 26	Input terminal B10	Material hopper 5 Drrible flow	0 to 50	69
05 F- 27	Input terminal B11	Material hopper 6 Medium flow	0 to 50	71
05 F- 28	Input terminal B12	Material hopper 6 Drrible flow	0 to 50	72
05 F- 29	Input terminal B13	Material hopper 7 Medium flow	0 to 50	74
05 F- 30	Input terminal B14	Material hopper 7 Drrible flow	0 to 50	75
05 F- 31	Input terminal B15	Material hopper 8 Medium flow	0 to 50	77
05 F- 32	Input terminal B16	Material hopper 8 Drrible flow	0 to 50	78

Category address: [Function] – [Function setting] – [Option] – [slotn] – [OP-07]

OP-07: Option Analog Output

slot n : slot number

Category address symbol	Name	Descriptions	Range and choices	Default
07 F- 1	Out put data	1: Displayed value 2: Gross value 3: Net value	1 to 3	1
07 F- 2	Weight at 4 mA	Set the weight value when 4 mA is output.	-999999 to 9999999	0
07 F- 3	Weight at 20 mA	Set the weight value when 20 mA is output.	-999999 to 9999999	16000



# 11. Specifications

## General

Power supply	85 to 250 VAC, 50 or 60Hz, (Stable power source)
Power consumption	Approximately 30 VA
Physical dimensions	192 (W) x 96 (H) x 135 (D) mm
Weight	Approximately 1.8 kg
Panel cutout size	186 x 92 mm
Operation temperature	-5 °C to 40 °C
Battery life of backup RAM	typ. 10 years at 25 °C. 5 years at 40 °C.

## Analog to Digital Unit

Input sensitivity	Up to 0.3 $\mu$ V / digit
Zero adjustment range	0 to 2 mV / V (0 to 20 mV)
Measurement range	0 to 3.2 mV / V (0 to 32 mV)
Input impedance	10 M $\Omega$
Loadcell excitation voltage	10 V DC $\pm$ 5%
Maximum loadcells	8 pieces in parallel with 350 $\Omega$ loadcell
Span temperature coefficient	8 ppm/ °C
Zero temperature coefficient	0.2 $\mu$ V + 8 ppm/ °C of dead load typ.
Non-linearity	0.01 % of F. S.
Input noise	Below $\pm$ 0.3 $\mu$ Vp-p
A/D conversion	$\Delta$ - $\Sigma$ conversion
A/D resolution	Approximately 1/1,000,000
Maximum display	16000 (to be able cancel limitation)
Sampling rate	100 times per second
Digital span function	Loadcell offset, calibration using key operation to enter the sensitivity, resolution 1/1000
Re-calibration at A/D board replacement	Omissible (resolution 1/500)
Backup method	A/D data: EEPROM Calibration: Flash memory Function: Flash memory Material code data: Backup RAM or flash memory Recipe code data: Backup RAM or flash memory

## Display

Main display	Fluorescent display, cobalt blue, height: 18mm, 7seg., 7 figures
Sub-display	Fluorescent display, cobalt blue, height: 5mm, 7seg., 54 figures and 5x7 dots, 54 figures
State indicator	Fluorescent display, cobalt blue, 8 $\Delta$ pieces, 10 symbols, 5x7 dots
Unit indicator	Fluorescent display, cobalt blue, height: 11mm, 5x7 dots, 2 figures
Symbols	Fluorescent display, cobalt blue, height: 11mm, 5x7 dots, 2 figures

## Weighing

Weighing mode

Batch Weighing Mode:

Normal batch weighing, loss-in weight

Sequential Weighing Mode:

Normal batch weighing, loss-in weight

Element of sequential weighing mode

Compensation Sequence

Approach Sequence

Discharge Sequence

Plain Recipe Sequence

Automatic Selection of Supplying Mat

Nozzle Control Sequence (vacuum cleaner)

Mixture Sequence

Safety Check Function

Pause and Emergency Stop

Restart Sequence

Automatic Free Fall Compensation

Real Time Free Fall Compensation

## Code data

Max. number of material code 100 codes

Element of material code Name, hopper No., Target value, free fall, preliminary, optional preliminary, over, under, accumulation count, accumulation weight, tare value, compensation open timer, compensation close timer

Max. number of recipe code 100 codes

Element of recipe code Name, material codes (max. 10, in mixture order), accumulation count, accumulation weight

## Connectors and interfaces

Power supply terminal, Loadcell terminal, Standard I/O terminal, Standard RS-485 interface, Current loop, keys and display

## Standard I/O terminal

Refer to "8.1. Control I/O Function".

## Standard RS-485 interface

Refer to "8.2. Built-in RS-485 Interface".

## Current loop

Refer to "8.3. Built-in Current Loop Output".

## BCD Output of Option, OP-01

Refer to "8.4. BCD Output of Option, OP-01".

## Relay Output of Option, OP-02

Refer to "8.5. Relay Output of Option, OP-02".

## RS-422/485 Interface of Option, OP-03

Refer to "8.6. RS-422/485 Interface of Option, OP-03".

## RS-232C Interface of Option, OP-04

Refer to "8.7. RS-232C Interface of Option, OP-04".

## Parallel I/O of Option, OP-05

Refer to "8.8. Parallel I/O of Option, OP-05".

## Analog Output of Option, OP-07

Refer to "8.9. Analog Output of Option, OP-07".

## CC Link interface of Option, OP-20

Refer to OP-20 instruction manual regarding the details.

## DeviceNet interface of Option, OP-21

Refer to OP-21 instruction manual regarding the details.

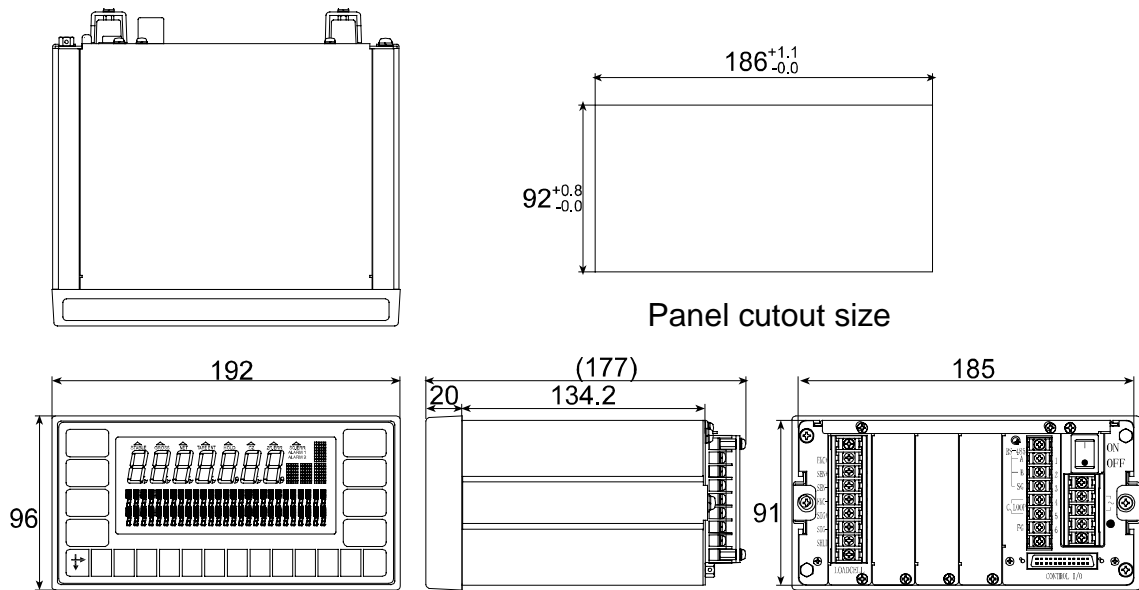
## PROFIBUS interface of Option, OP-22

Refer to OP-22 instruction manual regarding the details.





## 11.1. Dimensions



## 11.2. Accessories

Capacity label .....	1
I/O connector .....	1
I/O connector cover .....	1
RS-485, terminator resistor 100 $\Omega$ .....	1
Cover of power supply terminal .....	1
Cover of RS-485 and current loop .....	1
Cover of loadcell terminal .....	1
Rubber packing for mounting to panel .....	1



## 12. References



### 12.1. Abbreviation

#	counts	TC	Tare clear
#Tot	total count	RTot	recipe total
0Band	zero band	RTot#	recipe total count
0T	tare is not used	SF	supplemental flow (compensation flow)
ADC	Analog to digital converter	SFOT	Supplementary Flow Open Timer
AFFC	active free fall compensation	SFCT	Supplementary Flow Close Timer
Brate	baud rate	T	tare
CZ	center of zero	TC	Tare clear
D	division	Tot	Total Weight
DFlow	dribble flow	Tot#	Total Counts
Eval	evaluation, (criteria)	TR	tare
FFall	free fall	w/	with
FFlow	full flow	w/0	with zero
FNC	function	WGT	weight
GS	gross	WGTTot	weight total
Hop.	Hopper	ZR	zero
I/O	input / output		
IDF	initial dribble flow		
IFF	initial medium flow		
L	loadcell		
LC	loadcell		
MCode	material code		
MFlow	medium flow		
Neg	negative		
NT	net		
NWT	net weight		
Op.	optional		
OPPln	Optional Preliminary		
P I/O	parallel I/O		
Pln	Preliminary		
PLC	programmable logic controller unit		
PT	preset tare		
RTot	recipe total		
RTot#	recipe total count		
SF	supplemental flow (compensation flow)		
SFOT	Supplementary Flow Open Timer		
SFCT	Supplementary Flow Close Timer		
T	tare		












## 12.2. ASCII Code for AD-4402

The characters are special code for the name of material code and recipe code. Therefore, some characters are not the same as U.S. code.

		Lower bits							
		0	1	2	3	4	5	6	7
Upper bits	0			Space	0	@	P	Space	p
	1			!	1	A	Q	a	q
	2			"	2	B	R	b	r
	3			#	3	C	S	c	s
	4			\$	4	D	T	d	t
	5			%	5	E	U	e	u
	6			&	6	F	V	f	v
	7			'	7	G	W	g	w
	8			(	8	H	X	h	x
	9			)	9	I	Y	i	y
	A	LF		*	:	J	Z	j	z
	B			+	;	K	[	k	{
	C			,	<	L	¥	l	
	D	CR		-	=	M	]	m	}
	E			.	>	N	^	n	●
	F			/	?	O	_	o	○



## 12.3. Index

#	137
#Tot	137
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[General] - [Sub-display]	109
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[OP-03]	129
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[OP-05]	131
[OP-07]	132
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[Sequence] - [Control]	115
[Sequence] - [Safety]	120
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[Sequence] - [Timer]	117
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**A&D Company, Limited**

3-23-14 Higashi-Ikebukuro, Toshima-ku, Tokyo 170-0013 JAPAN  
Telephone: [81] (3) 5391-6132 Fax: [81] (3) 5391-6148

**A&D ENGINEERING, INC.**

1555, McCandless Drive, Milpitas, CA. 95035 U.S.A.  
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**A&D INSTRUMENTS LTD.**

Unit 24/26 Blacklands Way, Abingdon Business Park, Abingdon, Oxon OX14 1DY United Kingdom  
Telephone: [44] (1235) 550420 Fax: [44] (1235) 550485

**<German Scales Office>**

Berner Straße 64, 60437 Frankfurt/Main 50 GERMANY  
Telephone: [49] (69) 507-1017 Fax:[49] (69) 507-2054

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32 Dew Street, Thebarton, South Australia 5031 AUSTRALIA  
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**A&D KOREA Limited**

8th Floor, Manhattan Bldg. 36-2 Yoido-dong, Youngdeungpo-ku, Seoul, KOREA  
Telephone: [82] (2) 780-4101 Fax: [82] (2) 782-4280