F701+

WEIGHING INDICATOR

OPERATION MANUAL

01AUG2020REV.1.03

UNIPULSE

Operation overview for F701+

Basic operation procedures

Please read P.13 "2 Key Operation"

Weighing settings

Please read P.17 "3 Weighing"

Weighing to fit the purpose

Please read P.28 "4 Performing Final Discharge Control"

Other useful functions

Please read P.60 "6 Useful Functions"

Please make sure you read "Safety precautions" (pages 1 to 3)

Contents

1 Before Getting Started

1-1. Introduction

Thank you for purchasing the F701+.

Read this manual and understand the content prior to use. Please keep this manual ready for further use at any time.

1-2. Safety precautions

Be sure to read for safety.

Make sure that installation, maintenance, and inspection of the F701+ are performed by personnel with electrical knowledge.

In this manual, precautions for safe use of the F701+ are described separately as ⚠ Warning and ⚠ Caution in the following text. The precautions described in this text are important content regarding safety. Use this product having understood the content accurately.

⚠ Warning

Events that may cause death or severe injury to persons in cases of misuse.

⚠ Caution

Events that may cause injury to persons or material damage in cases of misuse.

⚠ **Warning**   Events that may cause death or severe injury to persons in cases of misuse.

Design warning

● Be sure to install and fix the product to the control panel and so forth. In doing so, install a breaker so that an operator can turn power OFF immediately, and place an appropriate indication showing the breaker installation.

● Prepare a safety circuit outside the F701+ so that the entire system functions safely.

● Be sure to contact our sales representative before use if the F701+ will be used in the following situations:
   - If the product is used in an environment not described in the operation manual;
   - If the product is used in a way that may have a substantial effect on medical devices, transportation equipment, entertainment devices, safety devices, etc.

Installation warning

● Do not disassemble, repair or alter the F701+.

● Do not install the product in the following environments:
   - Locations with corrosive gases or combustible gases;
   - Locations over which water, oil, or chemicals splash.

Wiring warning

● Do not connect commercial power supply directly to the signal I/O terminal.

● Be sure to perform class D grounding when installing the main unit.

● The rating of the AC cable included is AC125V, 10A. Prepare a separate AC cable if the product is used at a voltage higher than the rating or is used overseas.

● Be sure to check that the power is off before the following actions:
   - Removal and installation of optional connectors and so forth;
   - Wiring and connection of cables to a terminal block;
   - Connection to frame grounding terminals.

● Be sure to check signal names and pin assignment numbers before connecting to the signal I/O terminal in order to wire cables properly.

● No connection is necessary for unused terminals.

● Be sure to check the wiring and so on carefully before turning the power on.

Startup/maintenance warning

● Use power supply voltage and load within the specified range and rating.

● Do not damage the power cords. Fire or electric shock may occur.

● Do not touch the terminal while power is on. This may cause electric shock and malfunction.

● Do not open the main unit cover. Contact us for inspection and/or repair of internal parts.

● Turn power off and unplug power cable immediately if smoke, abnormal smell, or abnormal noise is detected.

⚠ **Caution** Events that may cause injury to persons or material damage in cases of misuse.

Installation precautions

● Do not install the product in the following environments:
- Locations where temperature or humidity exceeds specifications;
- Locations subject to drastic temperature fluctuations or icing and condensation;
- Outdoors or locations above 2,000m;
- Locations exposed to direct sunlight;
- Locations subject to dust accumulation;
- Locations with poor ventilation;
- Locations with a lot of salt and metal powder;
- Locations where the main unit is subject to direct vibration and/or shock.

● Perform adequate shielding if the product is used in the following locations:
- Near power lines;
- Locations subject to strong electric and/or magnetic field;
- Locations subject to noise such as static electricity and relays.

● Install as far away as possible from equipment generating high frequency, high voltage, large current, surge, etc. Moreover, perform wiring of cables separately from these power lines. Do not perform parallel wiring and identical wiring.

● Do not use the product if it is damaged.

Wiring precautions

● Use shielded cables for cables (load cell, external I/O, SI/F, optional interface).

● Avoid a temporary overvoltage exceeding 1500V to be applied to the power source.

Startup/maintenance precautions

● Be sure to allow an interval of five seconds or longer between turning power ON and OFF.

● Use after warming up for 30 minutes or longer following the startup of power supply.

● Protective performance of the F701+ may be lost if it is not used as specified.

● Cleaning
- Unplug the power supply when cleaning.
- Do not wipe with a wet cloth, benzine, thinner, alcohol, etc. This may lead to discoloration and/or warping of the F701+. When dirty, clean using a well squeezed cloth soaked in diluted neutral detergent. Afterwards wipe with a soft, dry cloth.

Transportation precautions

● When sending the F701+ to us for repair and so on, pack it with sufficiently shock-absorbing materials.

Disposal precautions

● Handle this product as industrial waste when disposing.

1-3.   Unpacking precautions

The attachments are packed in the carton box with the product. Take out the attachments and the product holder from the individual box. Then take out the product from the product holder as shown in the figures below.

(1)Take out the operation manual, attachments and product holder from the individual box.

(2)Take out the product from the product holder. Fold the bent parts of the cardboard back down.

(3)Then restore the lower part of the cardboard in the 90 degrees of (2) upward to ease the tension of the film.

(4)Take out the product from between the film and cardboard.
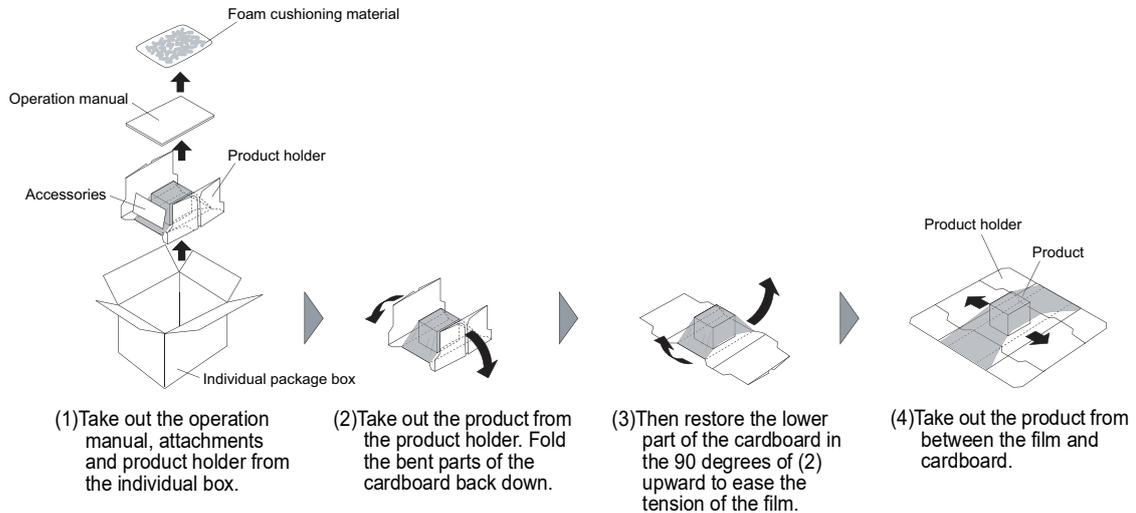
1-4.   Product compliant to RoHS2 Directive

The parts and attachments (including the instruction manual, packaging box, etc.) used for this unit are compliant with the RoHS2 Directive, restricting the use of hazardous substances with regard to adverse effects on the environment and human body.

■RoHS2 Directive

It is based on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE). The Directive restricts the use of specific substances in electrical and electronic equipments that could harm environment and human body. The substances are lead, mercury, cadium, hexavalent chromium, PBB (polybrominated biphenyls), PBDE (polybrominated diphenyl ethers), DEHP (bis(2-ethylhexyl) phthalate), BBP (benzyl butyl phthalate), DBP (dibutyl phthalate), and DIBP (diisobutyl phthalate).

1-5.   Package contents

The following items are included in the package box. Be sure to check the contents before use.

F701+ main unit
--- One unit

F701+ operation manual
--- One copy

AC input cord
--- One piece

Mini-screwdriver
--- One piece

External I/O connector
--- One set

Load cell connector
--- One piece

Connector rubber for load cell
--- One piece
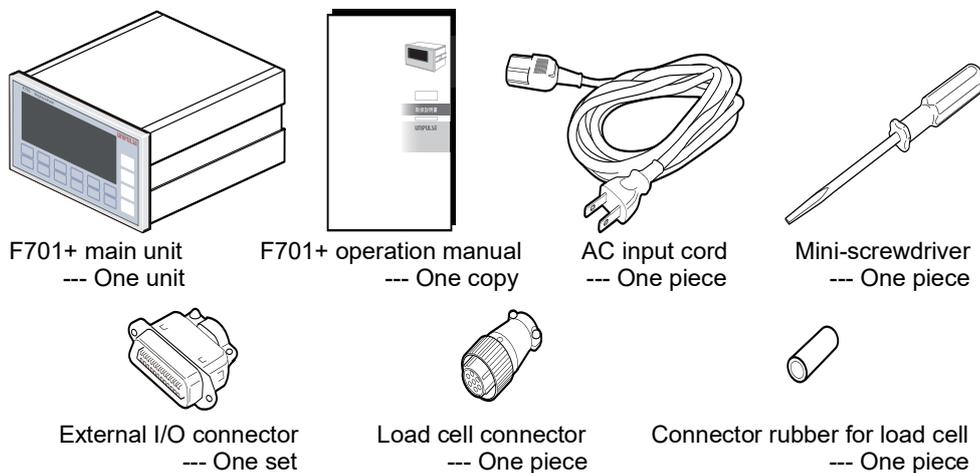
1-6.   Connection with other devices
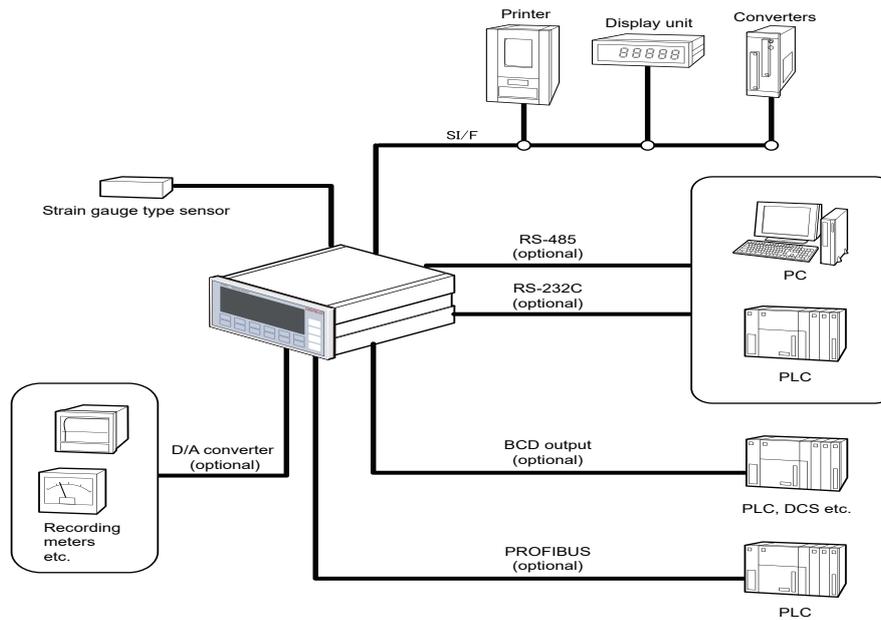
1-7.   Installation to panel

Use the following procedures when installing the F701+ to the panel.

1. Prepare an installation panel and make a hole in it.

Panel cutout size
186 (W) x92 (H) (mm)

Installation panel thickness
1.6 to 3.2 (mm)

186

92

Unit: mm
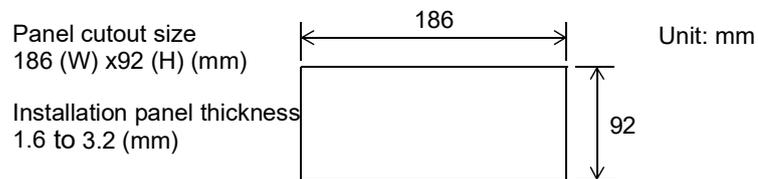
2. Remove installation rails on both sides of the indicator and insert the indicator into the panel.
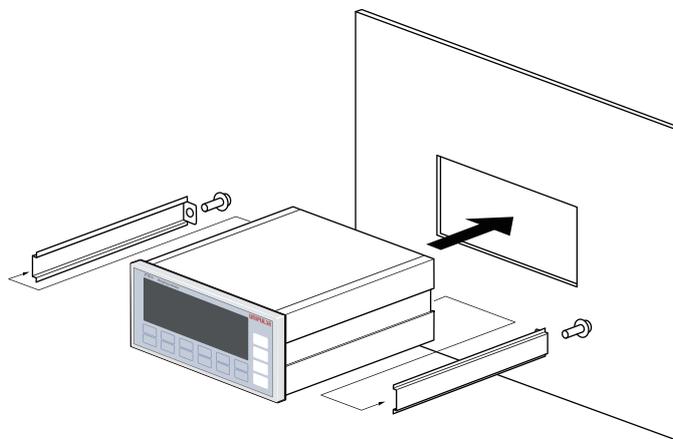
3. Insert the installation rails into both sides from the rear of the indicator.
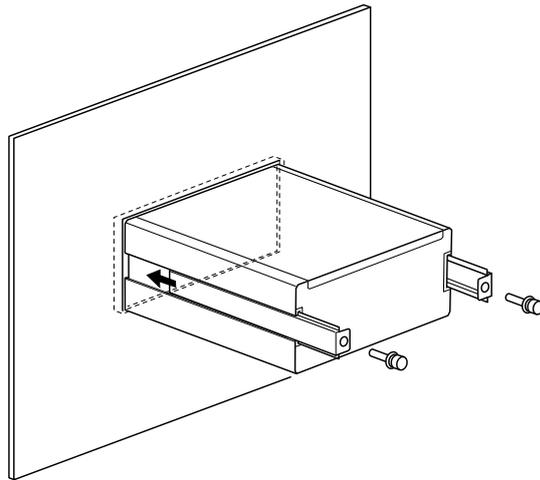
4. Tighten securely the clasp on both sides using the included M4 screws.

⚠ **Caution**
Be sure to avoid extreme shock and/or vibration when transporting after installing the panel.

1-8.   Front panel

(1) Number display

(3) Status display

(4) Setting keys

(2) Units display

(5) Designated keys
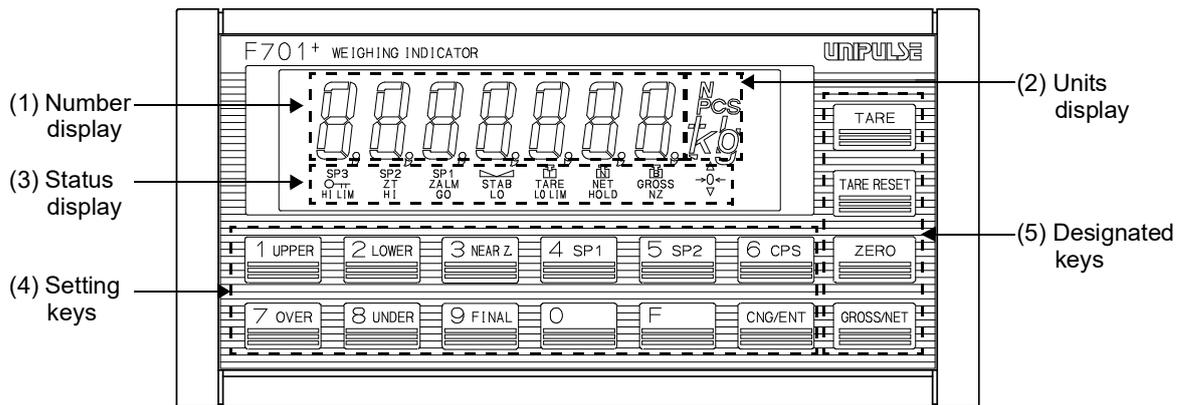
(1) Number display

The following three kinds of information are displayed.

1) Weight value display

Gross weight (GROSS) or net weight (NET) is displayed.

In case of a Calibration Error or Sequence Error, error display and weight value are displayed alternately.

2) Over scale and error display

Over scale and other errors are displayed.

(Refer to P.125 "7-1.Over-scale display".)

3) Setting value display

(2) Units display

The unit can be selected from six setting types: N, t, g, kg, lb, or None.

(3) Status display

Status of the F701+ is displayed.

(4) Setting keys

Refer to P.14 "■How to use the setting keys" for details.

(5) Designated keys

Item change is started during setting item display, and setting item is confirmed during item change.

Refer to P.14 "■How to use the designated keys" for details.

1-9.   Rear panel

(7) Space for options (A)
(8) Space for options (B)
(1) AC power input connector

(2) Frame grounding

(3) LOCK switch
(4) SI/F terminal block
(5) Connector for external I/O signal
(6) Load cell connector
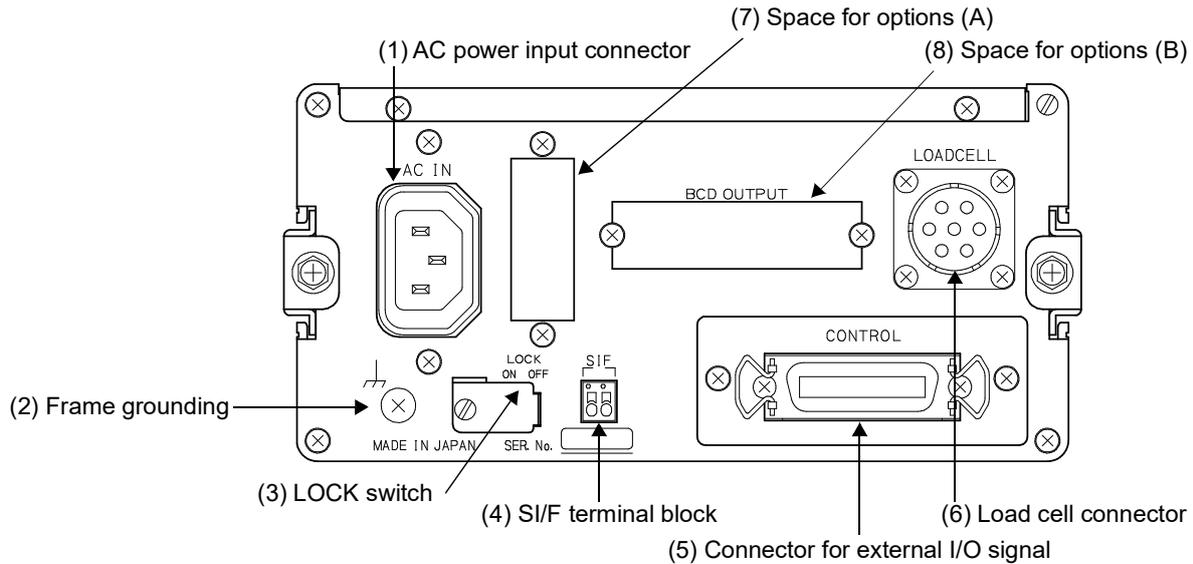
(1) AC power input connector

This connector is used to input AC power supply. Input voltage is AC100 to 240V [50/60Hz].

(2) Frame grounding

Be sure to install in order to prevent problems arising from static electricity. (A case and frame grounding terminal are in continuity.) In some installation environments, it may perform better without the grounding.

(3) LOCK switch

This LOCK switch is used to prevent setting values from being changed accidentally.
It prohibits the setting value change when ON.

(4) SI/F terminal block

This serial interface (SI/F) terminal block is used to connect printers, external display units, data converters, etc. made by UNIPULSE.

(5) Connector for external I/O signal

This connector is used to input and output external signals. I/O circuits and internal circuits are electrically insulated by photo-coupler. A compatible connector is 57-30240 manufactured by DDK (accessory) or equivalent.

(6) Load cell connector

This connector is used to connect load cell. A compatible connector is JR16PN-7S manufactured by HIROSE ELECTRIC CO., LTD.

(7) Space for options (A)

- 232:   RS-232C interface
- 485:   RS-485 interface

(8) Space for options (B)

- BCD: BCD parallel data output interface
- DAC: D/A converter interface
- PRF: PROFIBUS interface

(RS-232C and RS-485 can be mounted in combination with other options. However, RS232C and RS-485 can not be mounted at the same time.)

1-10. Connection procedure

The following are precautions related to connection to the signal I/O terminal block. Connect this product having understood the content accurately.

⚠ Warning
- Do not connect commercial power supply directly to the signal I/O terminal.
- To avoid electric shock when connecting to the signal I/O terminal, connect the product when power is off.
- Be sure to check signal names and pin assignment numbers before connecting to the signal I/O terminal in order to wire cables properly.
- Be sure to check the wiring and so on carefully before turning the power on.
- Do not touch the signal I/O terminal while power is on. This may cause electric shock and malfunction.
- The F701+ complies with EMC Directives as a product for industrial environments (class A). It may induce electronic jamming if used in domestic environments. In such cases, take necessary precautions.

⚠ Caution
- Tighten terminal screws to the specified torque. Tightening torque: 0.5N・m
- Use shielded cables for cabling.

1-11. Load cell connection

The excitation voltage of the F701+ is 10V, the maximum current is 120mA, and up to four 350Ω load cells can be connected in parallel.
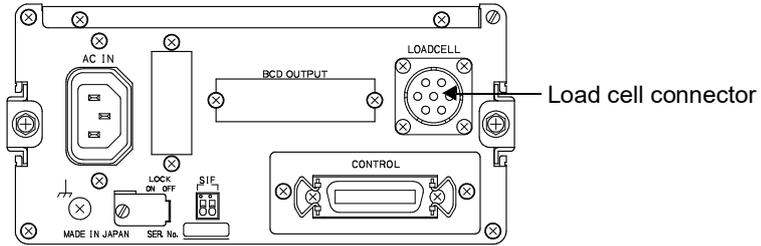
Connector pin assignments of load cell

Pin no.	Signal (Six-line type)	Signal (Four-line type)
1	+EXC	+EXC (Connect No.1 and 2)
2	+S	
3	-S	-EXC (Connect No.3 and 4)
4	-EXC	
5	+SIG	+SIG
6	-SIG	-SIG
7	SHIELD	SHIELD

■Six-line type connection

The input terminal block of load cell of this device is six-line type (remote sensing type). Be sure to use a six-core shield wire for connection with the load cell and perform separate wiring for lines with a lot of noise (wiring for electrical power equipment, digital equipment and so on) and AC lines.
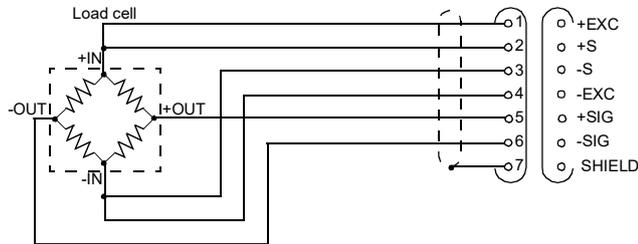
A remote sensing type is used to stabilize excitation voltage value near load cell in order to prevent excitation voltage to the load cell from fluctuating (cable resistance value from varying due to temperature change).

■Four-line type connection

As outlined below, connect 1 with 2 and 3 with 4 respectively at the terminal block. Normal operation appears possible if 2 and 3 of the terminal block are left open; however, high voltage is placed on the load cell, which may cause heat and/or breakdown.
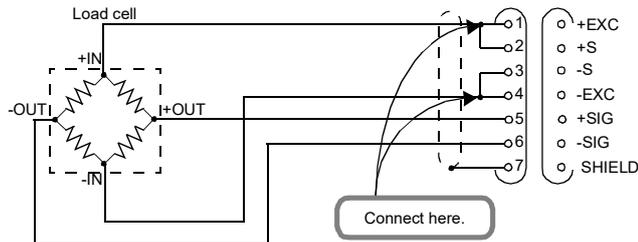
> ⚠ **Caution**
>
> - The F701+ excitation voltage is 10V. Heat and/or breakdown may result if the maximum excitation voltage of a load cell is not 10V or more.
>
> - Be sure to connect +EXC and +S with -EXC and -S in case a four-line type load cell is used with the F701+. Normal operation appears possible if -S and +S are not connected; however, high voltage is placed on the load cell, which may cause heat and/or breakdown.

■Load cell parallel connection

With industrial weighing devices, hopper scale and truck scale configuration is possible for parallel connection of multiple load cells. The connection procedure is outlined in the diagram below.
Simple parallel connection is possible using an optional B410 (junction box for four-point multi load cells).
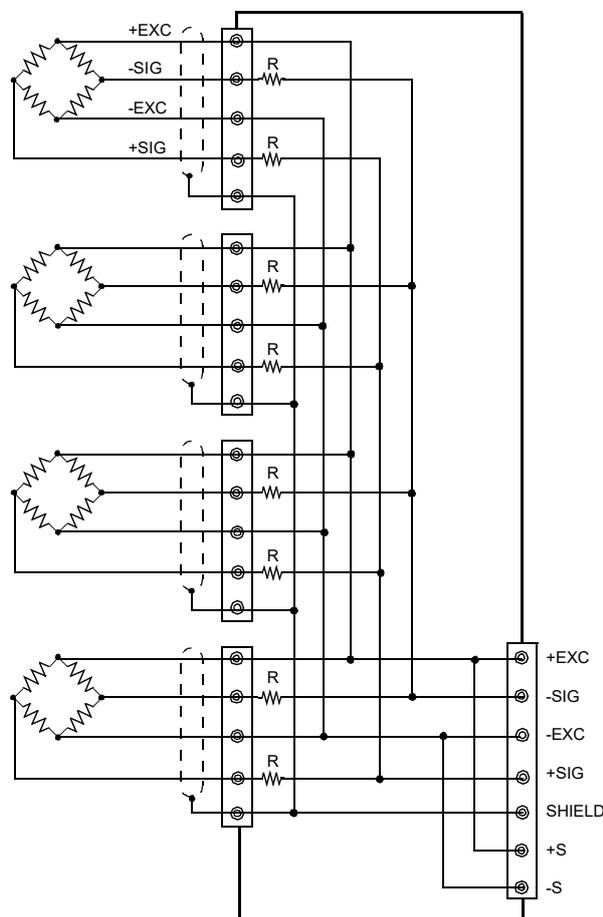
For the group of n pieces of parallel load cells seen on this device, the rated capacity is n times and the sensitivity can be considered as a load cell of unchanging units.

Attention

When performing parallel connection, select a load cell with an adequate capacity in order to prevent individual load cells from overloading due to offset load, shock and so forth.

■Sensor cable

Cable colors of sensors differ from one manufacturer to another. (They may also differ from one model to another for some products.)
Refer to the sensor manual (or data sheet) and check signal names and colors in order to connect the cables correctly.

1-12. Protective grounding connection

The grounding pole for the input connector of the AC power supply is the protective grounding.

⚠ **Warning**
- The rating of the AC cable included is AC125V, 10A. Prepare a separate AC cable if the product is used at a voltage higher than the rating or is used overseas.
- Be sure to ground the protective grounding.
- Be sure to install and fix the F701+ to a panel and so forth. Install a breaker so that an operator can turn power OFF immediately, and place an appropriate indication showing the breaker installation.

1-13. Frame grounding connection

This grounding terminal is used to prevent problems arising from noise and so forth.
Use a thick electric wire (approx. 0.75 mm^2) and be sure to perform grounding.

⚠ **Warning**
- Connect the product when power is OFF in order to prevent electric shock.
- Be sure to ground the frame grounding terminal to prevent problems arising from noise and so forth. (The case and frame grounding terminal are in continuity.)
- Do not use screws other than those used for attaching the main body.

2 Key Operation

2-1. Front panel and setting mode configuration chart

The setting keys consist of nine setting modes. In each setting mode, one function is assigned to each of keys 1 to 9.

(1) Number display
(3) Status display
(4) Setting keys
(2) Units display
(5) Designated keys
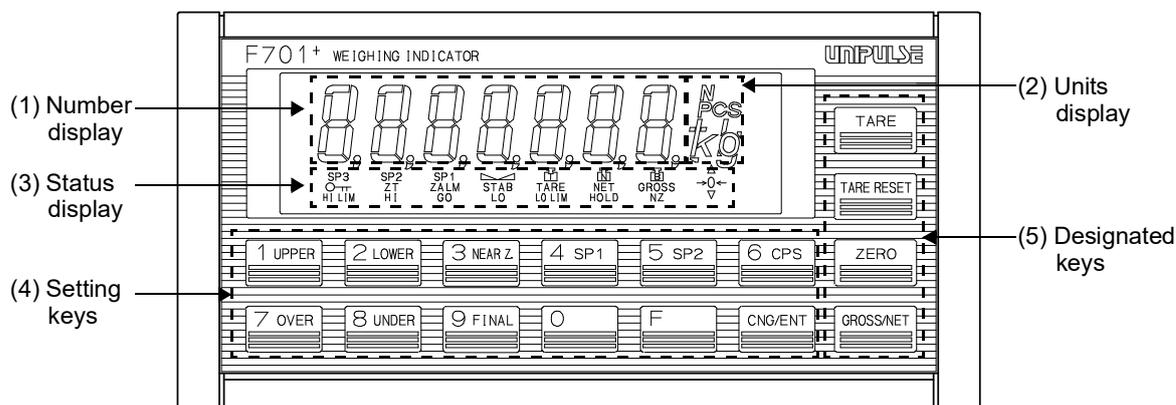
Chart 1 : Setting mode configuration chart

	Setting item keys									
	1	2	3	4	5	6	7	8	9	ZERO
Setting mode 0	Upper limit (P.14)	Lower limit (P.14)	Near zero (P.14)	Set point 1 (P.14)	Set point 2 (P.14)	Compensation (P.14)	Over (P.14)	Under (P.14)	Final (P.14)	----
Setting mode 1	Comparison inhibit time 1 (P.33)	Judging time (P.33)	Complete output time (P.33)	Compensation feeding time (P.35)	Number of times for AZ (P.34)	Number of times for judging (P.34)	Auto free fall compensation regulation (P.31)	Comparison inhibit time 2 (P.33)	Tare setting (P.27)	----
Setting mode 2	Weighing function 1 (P.29, 31, 32)	Weighing function 2 (P.32, 33, 37)	Weighing function 3 (P.31)	Sequence mode (P.29, 35)	Function key inhibited (P.60)	Filter (P.23)	Motion detection (P.24)	Zero tracking (P.25)	Setting value LOCK (P.19)	----
Setting mode 3	Balance weight value (P.19)	Capacity (P.19)	Min. scale division (P.19)	Net over (P.131)	Gross over (P.131)	DZ regulation value (P.26)	Function selection (P.19, 21, 23)	Compensation for gravitational acceleration (P.20)	Option substrate (P.60)	----
Setting mode 4	DA output mode (P.104)	DA zero output weight (P.104)	DA full scale setting (P.104)	RS-232C/ RS-485 I/F setting (P.65, 74)	ID setting (0000) (P.74)	Transmission delay time (P.75)	Extended function selection 1 (P.24)	Moving average filter (P.24)	Measurement Act compliance (P.27)	----
Setting mode 5	Input selection (P.37)	Output selection (P.37)	Restart setting set point 1 (P.36)	Restart setting set point 2 (P.36)	Restart setting set point 3 (P.36)	Number of times for knocking (P.35)	Knocking period (P.35)	Number of digits for accumulated display (P.124)	Automatic filter adjustment (P.23)	----
Setting mode 6	PROFIBUS I/F setting (P.106)	PROFIBUS baud rate display (P.106)	PROFIBUS station No. (P.106)	----	----	----	----	----	----	----
Setting mode 7	Print settings (P.118)	Printer command (P.118)	Printer settings (P.119)	Individual print format (P.119)	Total print format (P.119)	Print count (P.120)	Year settings (P.120)	Date settings (P.120)	Time settings (P.120)	----
Setting mode 8	Average weight (P.123)	Max. weight (P.123)	Min. weight (P.123)	General standard deviation (P.123)	Sample standard deviation (P.123)	Number of data (P.123)	Latest data (P.123)	Maximum - Minimum (P.123)	Accumulated value (P.124)	
Setting mode 9	Span calibration (P.21)	Equivalent calibration (P.22)	----	----	----	----	A/D conversion speed (P.61)	Password (P.60)	Zero calibration (P.21)	

2-2.   How to use the keys

■How to use the setting keys

F (Function key)

This function key is used to switch between setting modes.

1 UPPER to 9 FINAL (Numeric keys)

These are used to change the settings.

■How to use the one-touch keys

1 UPPER to 9 FINAL (One-touch keys)

Press these keys while the weight is displayed to switch directly to the corresponding setting mode 0.

Setting item keys in setting mode 0								
1	2	3	4	5	6	7	8	9
Upper limit	Lower limit	Near zero	Set point 1	Set point 2	Compensa-tion	Over	Under	Final
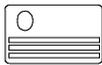
O (Numeric zero key)

Press this key to display one-touch tare subtraction weight. " ⛶TARE " will flash. (If tare weight display is enabled using the Measurement Act compliance key in setting mode 4-9.) Press the key again to display the accumulated value (the same as in setting mode 8-9). Press the key again to return to weight display.

[Weight display] ——→ [Tare subtraction weight]* ——→ [Accumulated value]

* When the tare subtraction display is invalid, the display switches directly to [accumulated value] without displaying the [tare subtraction weight].

■How to use the designated keys

ZERO (ZERO key)

The gross weight immediately becomes zero if this key is pressed.
A zero error will occur and the "ZALM" will flash if this operation is performed while the DZ regulation value is exceeded.

GROSS/NET (GROSS/NET key)

Switch between gross weight and net weight is performed immediately if this key is pressed while the weight value is displayed.
Net weight display appears if this key is pressed during gross weight display (" ⛶GROSS " lights up). Gross weight display appears if this key is pressed during net weight display (" ⛶NET " lights up).

CNG/ENT (CNG/ENT key)

Item change is started during setting item display, and setting item is confirmed during item change.

TARE (TARE key)

Tare subtraction is performed immediately and the net weight becomes zero if this key is pressed. " ⛶TARE " lights up at the same time.

TARE RESET (TARE RESET key)

This key is used to reset tare subtraction. However, tare weight by digital tare subtraction (preset tare subtraction) is not released.

2-3. Selection procedure for the setting mode

Change the setting in the order of "Selection of setting mode" → "Selection of setting item" → "Registration of setting value".

■ Specified basic operation of setting mode and setting items

[Selection of setting mode] F → CNG/ENT → 6 CPS → CNG/ENT ......Switches to the specified setting mode

Press the key from 0 to 9 that corresponds to the setting mode number.

(after switching to setting mode by performing the above procedure)

[Selection of setting item] 1 UPPER → CNG/ENT → 6 CPS → CNG/ENT ......Changes the setting

Press the key from 0 to 9 that corresponds to the setting item number.

Use the keys to enter a setting value for each setting item.

■ (Example 1: Setting from numerical value input)
Setting the balance weight value to 50 kg.

The balance weight value is item 1 in setting mode 3. (Refer to the setting mode calibration chart in P.13.) The normal status (weight value display) is shown below.
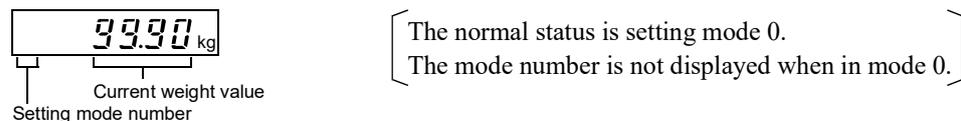
99.90 kg

Setting mode number
Current weight value

The normal status is setting mode 0.
The mode number is not displayed when in mode 0.

1. Pressing the F key and CNG/ENT key in order will change the status to waiting for input and the rightmost number will flash.

F,   0 kg

Current setting mode number

Flashing means waiting for input.

2. Confirm the change by pressing the 3 NEAR Z key and the CNG/ENT key in order.

3   99.90 kg

The setting mode number after changing

Returns to weight value display after confirming.
The setting mode number is displayed on the left.
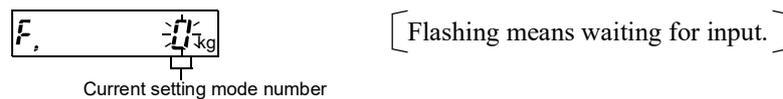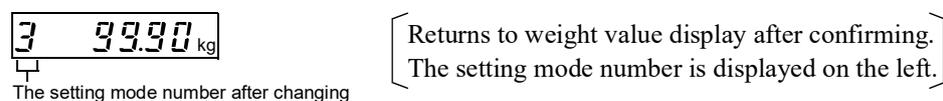
3. Pressing the 1 UPPER key and the CNG/ENT key in order will change the status to waiting for input and the balance weight value will flash.

3 1 00.00 kg

Balance weight value
Setting item number
Setting mode number

The blinking moves to a lower order digit each time a number is pressed. Once a number is entered for the least significant digit, the most significant digit will start to blink again and you can re-do the settings.
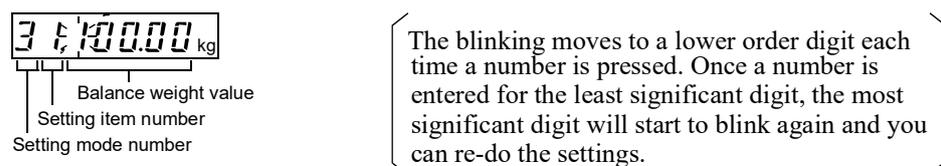
4. Once the correct setting value is input, press the ⌨CNG/ENT key to confirm the setting value.

```
3    99.90 kg
```
Current setting mode number
Setting mode number
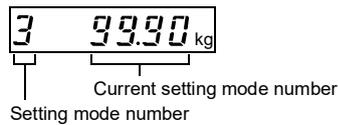
Once the setting is complete, the display returns to show the setting mode number and the current weight value display.
Setting is now complete.

■(Example 2: Setting from numerical value input)
Setting the 1/4 scale division to OFF.

The 1/4 scale division is item 7 in setting mode 3 (Refer to the setting mode calibration chart in P.13.)

The normal status (weight display) is shown below.
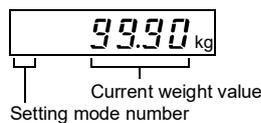
```
99.90 kg
```
Current weight value
Setting mode number

The normal status is setting mode 0.
The mode number is not displayed when in mode 0.

1. Pressing the ⌨F key and ⌨CNG/ENT key in order will change the status to waiting for input and the rightmost number will flash.

```
F,         0 kg
```
Current setting mode number

Flashing means waiting for input.

2. Confirm the change by pressing the ⌨3 NEAR Z key and the ⌨CNG/ENT key in order.

```
3    99.90 kg
```
The setting mode number after changing
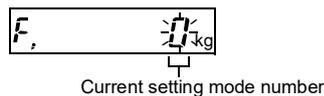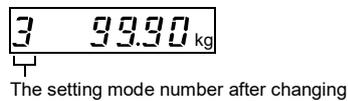
Returns to weight value display after confirming.
The setting mode number is displayed on the left.

2-4.   How to abort a setting

Returns to normal display (setting mode 0) when the ⌨O key is pressed while the setting mode number is displayed.
While changing the setting value after selecting an item, press the ⌨F to skip that item. (Display returns to showing the setting mode number.)

3 Weighing

3-1. Calibration

"Calibration" means matching the F701+ with load cells. There are two types of calibration procedure, "actual load calibration" and "equivalent calibration".

<Actual load calibration> ..... Calibration by applying actual weight or pressure to the sensor

<Equivalent calibration> ...... Calibration by directly inputting electrical signals equivalent to the electrical signal changes produced when actual weight or pressure is applied to the sensor.

3-2. Load cell junction

Multiple load cells can be connected to the F701+ by using junction boxes or terminal blocks.

■Single load cell

[Hopper]

[F701+]

[Load cell]
    Rated capacity: 10kg
    Rated output: 2mV/V

Example 1) How do you display 10,000kg?
    Capacity: 10,000kg
    Equivalent calibration: 2.0000mV/V

■Three load cells

[Junction box] (B412 etc.)
    Rated capacity: 30kg
    Rated output: 2mV/V

[Hopper]

[F701+]

All load cells are
    Rated capacity: 10kg
    Rated output: 2mV/V

Example 2) How do you display 10,000kg?
    Capacity: 10,000kg
    Equivalent calibration: 0.6667mV/V

Example 3) How do you display 30,000kg?
    Capacity: 30,000kg
    Equivalent calibration: 2.0000mV/V

3-3.   Calibration procedure

Turn OFF hardware LOCK	Turn OFF the LOCK switch on the rear panel to enable calibration.
Software LOCK release	Release the setting value LOCK (Lock2) that prohibits calibration.
Units display (Setting mode 3-7)	Set the units to display.
Decimal place (Setting mode 3-7)	Set the decimal place.
Capacity (Setting mode 3-2)	Set the maximum value (weight) for use as a scale. " $_o F_L Z$ " over scale is displayed if the value set here is exceeded by nine scale divisions.
Min. scale division (Setting mode 3-3)	Set the minimum measurement units (scale interval).
Balance weight value (Setting mode 3-1)	Set the load (weight) value to be placed onto the load cell (scale). Or, set the weight value corresponding to the output value intended to be registered in equivalent calibration.
Gravitational acceleration (Setting mode 3-8)	Input the gravitational acceleration of the region where calibration will be performed.

<Actual load calibration>

<Equivalent calibration>

<Actual load calibration>		<Equivalent calibration>	
Zero calibration (Setting mode 9)	Register default zero point.	Equivalent calibration (Setting mode 9-2)	Set the load cell output value (mV/V).
Span calibration (Setting mode 9-1)	Apply a load to the load cell to register the span.	Zero calibration (Setting mode 9)	Register default zero point

Turn ON software LOCK	Enable the settings that prohibit calibration.
Turn ON hardware LOCK	Turn ON the LOCK switch on the rear panel to prohibit calibration.
Tuning	Perform tuning as necessary.

3-4.   Settings and operations related to calibration

3-4-1. Setting value LOCK

The LOCK can be activated to prevent calibration and setting values from being changed due to operational errors. There are two types of LOCK: hardware LOCK and software LOCK. Both LOCKs must be disabled during calibration. After calibration, activate the LOCK to protect the setting values and calibrated values. Refer to P.129 "8List of Setting Items" for setting values that are protected.

Disabling and enabling LOCKs

1. Turn OFF the LOCK switch on the rear panel to disable. Turn ON to enable. (Hardware LOCK)

2. Select setting mode 2-9. Set to "0" to disable. Set to "1" to enable.
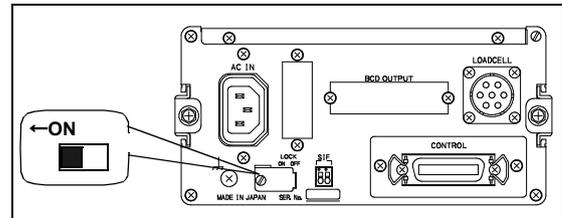
[Setting value LOCK] (Setting mode 2-9)

0: Lock2 OFF
1: Lock2 ON
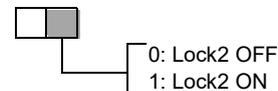
3-4-2. Units display (Setting mode 3-7)

Set the weighing units.

[Function selection] (Setting mode 3-7)

Units display
0: None   3: kg
1: t   4: lb.
2: g   5: N
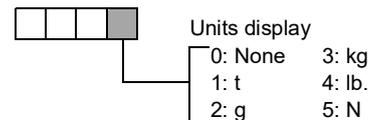
3-4-3. Decimal place (Setting mode 3-7)

Set the common decimal place for displays, setting items etc. related to weight.

[Function selection] (Setting mode 3-7)

Decimal place
0: None
1: 0.0
2: 0.00
3: 0.000
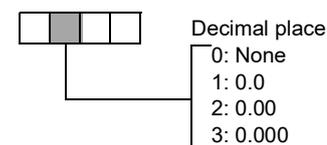
3-4-4. Capacity (Setting mode 3-2)

Set the maximum value (weight) for use as a scale. " $o F L 2$ " over scale is displayed if the value set here is exceeded by nine scale divisions. The input range is from 1 to 99999.

[Capacity] (Setting mode 3-2)

(Input range: 1 to 99999)

3-4-5. Min. scale division (Setting mode 3-3)

Set the minimum measurement units (scale interval). The input range is from 1 to 100.

[Min. scale division] (Setting mode 3-3)

(Input range: 1 to 100)
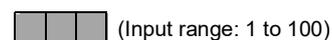
3-4-6. Balance weight value (Setting mode 3-1)

Preset the weight that is placed on the load cell (scale) during span calibration. The input range is from 0 to 99999.

[Balance weight value] (Setting mode 3-1)

(Input range: 0 to 99999)

Chapter

3

Weighing
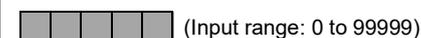
3-4-7.Gravitational acceleration (Setting mode 3-8)

This function corrects weight discrepancies when the scale calibration region and installation region differ based on the different gravitational accelerations of each region.

[Gravitational acceleration] (Setting mode 3-8)

9. ☐☐☐☐ (Input range: 9.7500 to 9.8500)

Setting is not required when the calibration and installation regions are the same.

Actual load calibration is performed after searching from within the below gravitational acceleration chart for the acceleration of the region in which actual load calibration is to be performed and setting the corresponding value. This corrects for gravitational acceleration discrepancies between calibration regions.

■Table of worldwide gravitational accelerations

Region	Acceleration (G)	Region	Acceleration (G)	Region	Acceleration (G)
Amsterdam	9.8128m/s^2	Hanoi	9.7870m/s^2	Oslo	9.8191m/s^2
Athens	9.7999m/s^2	Havana	9.7883m/s^2	Ottawa	9.8066m/s^2
Oakland	9.7986m/s^2	Helsinki	9.8193m/s^2	Paris	9.8097m/s^2
Bangkok	9.7832m/s^2	Ho Chi Minh	9.7820m/s^2	Phnom Penh	9.7824m/s^2
Beijing	9.8155m/s^2	Hong Kong	9.7878m/s^2	Rio de Janeiro	9.7879m/s^2
Berlin	9.8129m/s^2	Kuala Lumpur	9.7805m/s^2	Rome	9.8034m/s^2
Birmingham	9.8127m/s^2	Kuwait	9.7928m/s^2	San Francisco	9.7994m/s^2
Brussels	9.8115m/s^2	Lisbon	9.8006m/s^2	Seoul	9.7995m/s^2
Buenos Aires	9.7970m/s^2	London	9.8120m/s^2	Shanghai	9.7946m/s^2
Kolkata	9.7878m/s^2	Los Angeles	9.7965m/s^2	Singapore	9.7804m/s^2
Cape Town	9.7964m/s^2	Madrid	9.8021m/s^2	Stockholm	9.8186m/s^2
Chicago	9.8030m/s^2	Manila	9.7836m/s^2	Sydney	9.7961m/s^2
Copenhagen	9.8156m/s^2	Melbourne	9.7995m/s^2	Taipei	9.7896m/s^2
Nicosia	9.7975m/s^2	Mexico	9.7860m/s^2	Tokyo	9.7979m/s^2
Jakarta	9.7809m/s^2	Milan	9.8065m/s^2	Vancouver	9.8099m/s^2
Frankfurt	9.8107m/s^2	Mumbai	9.7856m/s^2	Washington, D.C.	9.8007m/s^2
Glasgow	9.8155m/s^2	New Delhi	9.7922m/s^2	Wellington	9.8028m/s^2
Istanbul	9.8026m/s^2	New York	9.8021m/s^2	Zurich	9.8082m/s^2

■Table of gravitational acceleration in China

Region	Acceleration (G)	Region	Acceleration (G)	Region	Acceleration (G)
Beijing	9.8155m/s^2	Wuhan	9.7936m/s^2	Kaifeng	9.7966m/s^2
Tianjin	9.8011m/s^2	Hohhot	9.7986m/s^2	Nanchang	9.7920m/s^2
Tangshan	9.8016m/s^2	Jilin	9.8048m/s^2	Guangzhou	9.7883m/s^2
Shijiazhuang	9.7997m/s^2	Changchun	9.8048m/s^2	Qingdao	9.7985m/s^2
Kunming	9.7836m/s^2	Xian	9.7944m/s^2	Nanjing	9.7948m/s^2
Nanning	9.7877m/s^2	Chongqing	9.7914m/s^2	Shanghai	9.7946m/s^2
Liuzhou	9.7885m/s^2	Chengdu	9.7913m/s^2	Fuzhou	9.7891m/s^2
Urumqi	9.8015m/s^2	Harbin	9.8067m/s^2	Hangzhou	9.7936m/s^2
Hong Kong	9.7878m/s^2				

3-4-8. 1/4 scale division (Setting mode 3-7)

This function detects the center point of the scale interval of the indicated value. "CZ" is displayed if the indicated value is at its center point after further dividing the min. scale division by 4. Select OFF/ON for 1/4 scale division.

[Function selection] (Setting mode 3-7)

1/4 scale division
0: OFF
1: ON

[1/4 scale division ON]

n   n+1

1/4 scale interval
Min scale division (1 scale interval)
"CZ" lights up
(Check the center point of the scale interval for the display value.)

[1/4 scale division OFF]

-1   0   1

"CZ" lights up
(Check the center point only for "0" position)
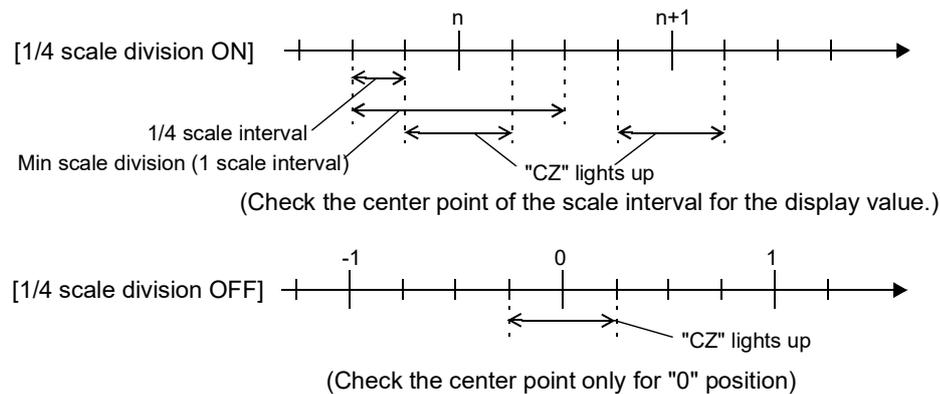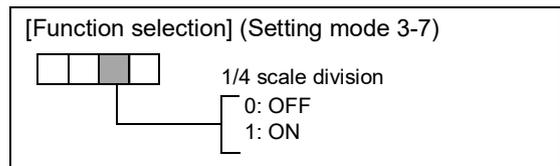
3-4-9. Calibration operation

Zero calibration, span calibration and equivalent calibration operations are described below.

Zero calibration

Register default zero point.

- Confirm that there is no unnecessary load applied to the load cell (scale).

- Confirm that " $\overset{\frown}{STAB}$ " is lit. (Correct calibration cannot be performed when the indicated value is not stable.)

[Zero calibration]
(Setting mode 9 & designated key)

ZERO → CNG/ENT
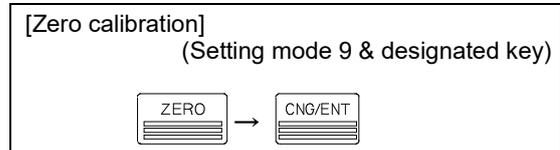
1. Select setting mode 9 (calibration mode).

2. Register the zero point.

ZERO → CNG/ENT → $2E, \quad 0.00$ kg ⎡Display during zero calibration⎤

Lights up during calibration and goes out when calibration is complete.
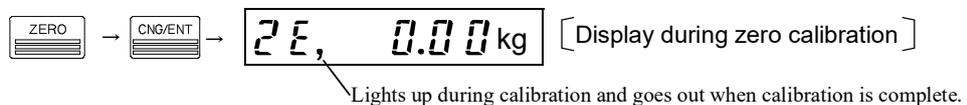
3. Zero calibration is complete when the weight value display becomes "0".
(Refer to P.125 "7-1.Over-scale display" in case a calibration error is displayed.)

3-4-10. Span calibration <Actual load calibration> (Setting mode 9-1)

Place weight onto the load cell (scale) and register the span (gain).

[Span calibration] (Setting mode 9-1)

(Input range: 0 to 99999)
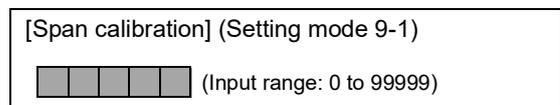
1. Place the weight that was set as the balance weight value (setting mode 3-1) onto the load cell (scale). (Calibration using 50% of the capacity or more is favorable for linearity.)

2. Select setting mode 9-1 (span calibration).

3. Confirm that " STAB " is lit and execute span calibration.

CNG/ENT → [Balance weight value set] → CNG/ENT → 5P, 100.00 kg [Display during span calibration]
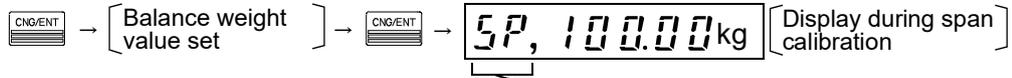
Lights up during calibration and goes out when calibration is complete.

4. Span calibration is complete if the displayed weight value is equal to the balance weight value. (Refer to P.125 "7-1.Over-scale display" if an error message is displayed)

3-4-11.Equivalent calibration <Equivalent calibration> (Setting mode 9-2)

When weight value corresponding to the load cell output value (mV/V) is input with the keys, it is calibrated to the weight value display registered by inputting the output value registered.

[Equivalent calibration] (Setting mode 9-2)

▢▢▢▢▢ (Input range: 0.0001 to 3.2000)

1. Select setting mode 9-2 (equivalent calibration).

2. Execute equivalent calibration. Set the load cell output value.

CNG/ENT → [Set load cell output value [mV/V]] → CNG/ENT [Confirm the value immediately]
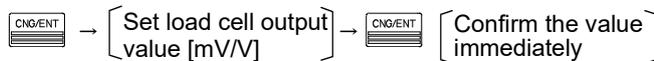
(Refer to P.125 "7-1.Over-scale display" if an error message is displayed)

3. Register the zero point by executing zero calibration.

```
Attention
```

- Set the balance weight value below capacity.

- When performing rated value calibration based on the load cell specifications, set the capacity setting to the same value as the load cell rated value.

- Because the wire causes a voltage drop depending on the connection procedure when load cells are connected in parallel, , the input value may differ from the output value based on the load cell specifications.
  In this case, register the actual input value in order to perform correct calibration.

- There may be a weight discrepancy due to a difference in gravitational acceleration if the calibrated region and region of use are not the same.

- Use the gravitational acceleration setting of a region with a similar latitude if the desired calibration region is not found within the list. However, recalibrating in the actual region is recommended if accuracy is required.

3-5. Tuning the display and internal functions

Built-in functions for easier use when actually measuring etc. after completing calibration are described below. Select the most appropriate value for the kind of measurement and the setting environment.

3-5-1. Display update rate (Setting mode 3-7)

Set the rate of indicated value update per second.

Reduce the display update rate if the indicated value flickers.

```
[Function selection] (Setting mode 3-7)

┌─┬─┬─┬─┐         Display update rate
│▓│ │ │ │         ┌ 3: 25 times/sec
└─┴─┴─┴─┘         ├ 2: 13 times/sec
                  ├ 1:  6 times/sec
                  └ 0:  3 times/sec
```
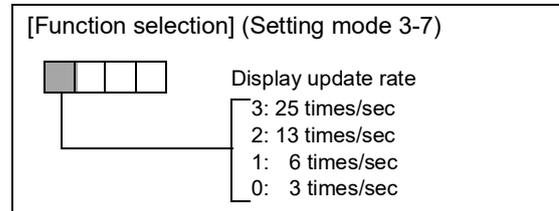
3-5-2. Automatic filter adjustment (Setting mode 5-9)

This function recognizes indicated value fluctuation due to noise and vibration and automatically sets the analog filter, digital low pass filter and moving average filter. Status display "HI", "GO" and "LO" flash during adjustment. Execute this during test operation to perform automatic adjustment.

```
[Automatic filter adjustment] (Setting mode 5-9)

┌─┐
│▓│         ┌ 1: Execute
└─┘         └ 0: Cancel
```

Also, fine adjustments can be made manually.
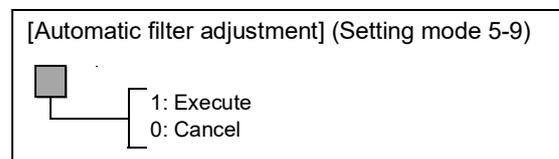
3-5-3. Analog low pass filter (Setting mode 2-6)

This is a low pass filter that simultaneously removes noise content from the input signal of the load cell and averages the analog signal to stabilize the weight value.

```
[Filter] (Setting mode 2-6)

┌─┬─┐         Analog low pass filter
│ │▓│         ┌ 3: 8Hz
└─┴─┘         ├ 2: 6Hz
              ├ 1: 4Hz
              └ 0: 2Hz
```
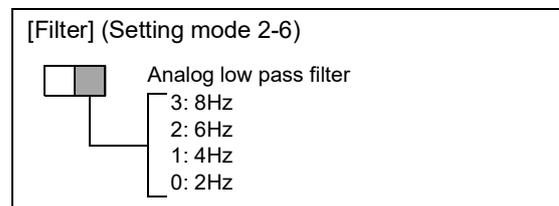
Cut-off frequency	8Hz	←←←←→→→→	2Hz
Response speed	Fast		Slow
Stability of indicated value	Unstable		Stable

3-5-4. Digital low pass filter (Setting mode 2-6)

This filter screens the A/D converted data and cancels unnecessary noise. Like the low pass filter of an analog circuit, set the cut-off frequency.

```
[Filter] (Setting mode 2-6)

┌─┬─┐         Digital low pass filter
│▓│ │         ┌ 7: 5.0Hz    3: 2.0Hz
└─┴─┘         ├ 6: 4.0Hz    2: 1.5Hz
              ├ 5: 3.0Hz    1: 1.0Hz
              └ 4: 2.5Hz    0: OFF
```
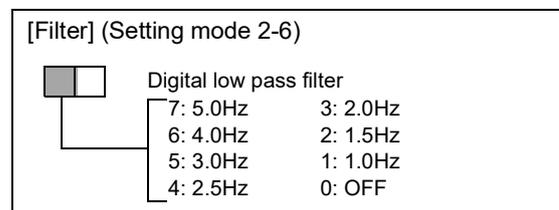
Cut-off frequency	OFF	←←←←→→→→	1.0Hz
Response speed	Fast		Slow
Stability of indicated value	Unstable		Stable

3-5-5. Moving average filter (Setting mode 4-8)

This filter takes the moving averages of the A/D converted data and reduces fluctuation of indicated values. The setting for the moving average rate depends on the setting for the A/D convert rate.

[Moving average filter] (Setting mode 4-8)

Signal input range
A/D convert rate500 times/sec: 1 to 512
A/D convert rate100 times/sec: 1 to 128
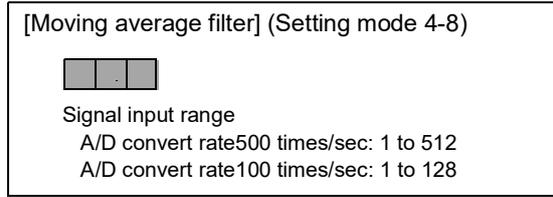
A/D 500 times/sec	1 time	←←←←←→→→→	512 times
A/D 100 times/sec	1 time	←←←←←→→→→	128 times
Response speed	Fast		Slow
Stability of indicated value	Unstable		Stable

3-5-6. Filter in stable condition (Setting mode 4-7)

This function automatically inserts a digital filter to reduce fluctuation when the indicated value is stable.
Stable is defined in motion detection (MD).

[Extended function selection 1] (Setting mode 4-7)

Filter in stable condition
1: Not insert
0: Insert

(If inserted, 256 times when the A/D convert rate is 500 times/sec and 64 times when it is 100 times/sec.)
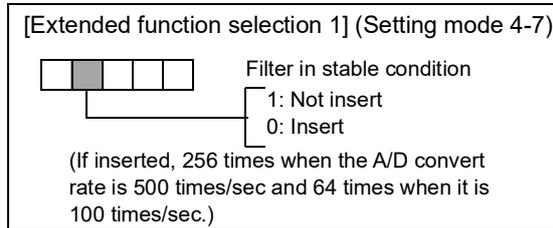
3-5-7. Motion detection (MD) (Setting mode 2-7, 4-7)

Parameters are set to detect indicated value stability. If the weight value change range is lower than the set range and this condition continues longer than the set time, weight value is considered to be stable and the stable signal turns ON. Motion detect contains two modes: stable mode and checker mode.

[Extended function selection 1] (Setting mode 4-7)

Motion detect mode
1: Checker mode
0: Stable mode

[Motion detect] (Setting mode 2-7)

Change range (00 to 99)
Compared time (0.0 to 9.9 sec)
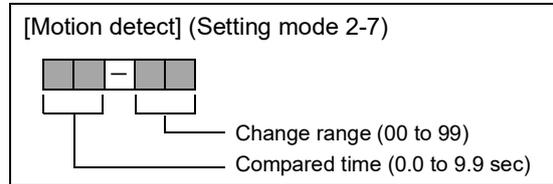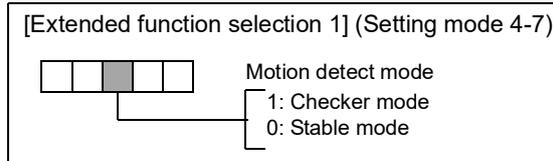
● Stable mode
The stable signal immediately turns OFF if the difference between the weight value and the current weight value exceeds even a single setting range.

- Compared point (1 second before, 0.95 second before, 0.8 second before, 0.6 second before and 0.3 second before)

● Checker mode
The stable signal immediately turns OFF if the difference between the weight value and the current weight value exceeds even a single setting range.

- Compared point (0.09 second before, 0.06 second before, and 0.3 second before)

Filter block diagram

F701+

load cell → Analog filter → A/D → Digital Low pass filter → Moving average filter → Digital filter → Display and such

(Filter in stable condition)
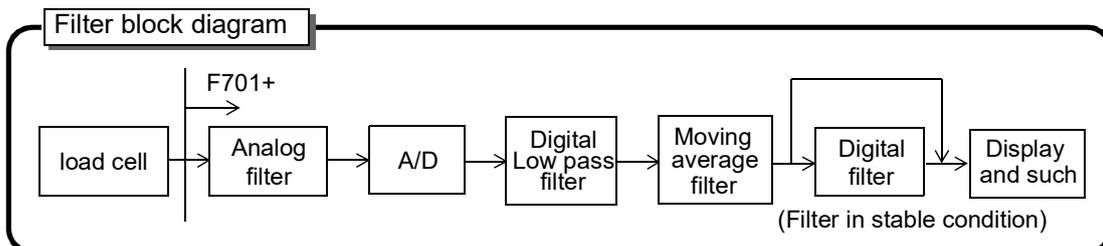
3-5-8.Zero tracking (ZT) (Setting mode 2-8)

Zero tracking is a function that sets the gross weight value to 0 (zero) automatically when the condition that the travel of zero point is within the set tracking range continues for the set period of time or longer.

[Zero tracking] (Setting mode 2-8)

Change range from zero point (0 to 99)

Duration (0.0 to 9.9 seconds)
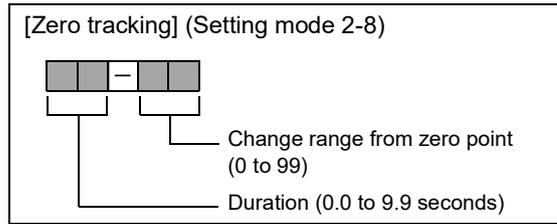
Set zero tracking period at 0.0 to 9.9 seconds, and zero tracking range (digit) at 1/4 increments of the weight display value from 0 to 99. (Setting value 02 is 0.5, and 12 corresponds to 3) Also, when the time is set to 0.0 sec and the range is set to 00, zero tracking does not work.

■Operation image of zero tracking

Limit of zero tracking deviation

Restarts at the point where an indicated value returns into the range

+

0

−

Change range

Change range

Duration

Indicated value

Duration
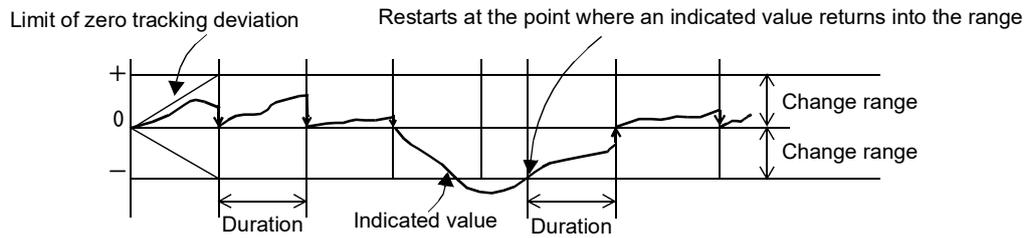
(Example) When zero tracking range is "20" and the units are "g".

20 (zero tracking range) × 1/4=5g (change range)

Zero tracking range Setting	Change range	Min. scale division = 1g (5 scale divisions)	Min. scale division = 5g (1 scale division)
Setting value = 20	5g		
	4g		
	3g		
	2g		
	1g		
	0g		
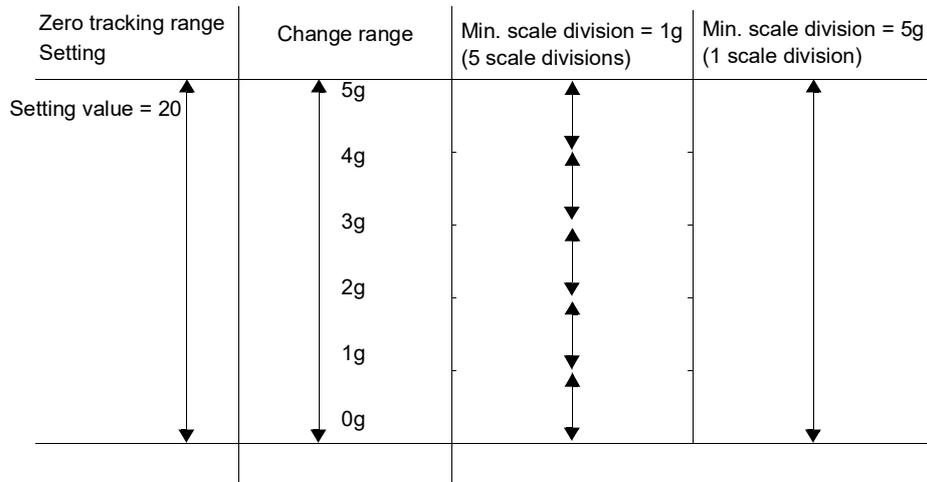
3-5-9.Digital zero (DZ) (Designated key)

This is a function that zeros the gross weight (GROSS) forcibly. Gross weight that exceeds DZ regulation value cannot be zeroed.

[Digital zero] (Designated key)
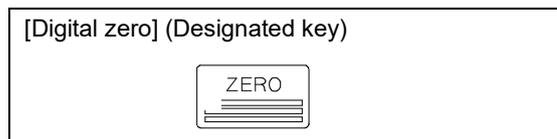
ZERO

1. Press the ⊟ZERO key once.

2. Gross weight (GROSS) becomes zero.

   Perform the following procedure if digital zero operation is carried out when gross weight is larger than the DZ regulation value.

   Weight value equivalent to DZ regulation value is subtracted, and " ZALM " flashes to warn error.

Perform the following measures if zero error has occurred.

Measures
Change the setting value of DZ regulation value, and perform digital zero operation again. (However, this procedure is meant as a temporary action; perform zero calibration at the earliest convenience.)
Remove weighing residue attached to the tank and so forth.
Check that there is no mechanical contact around the load cell (scale).

3-5-10. DZ regulation value (Setting mode 3-6)

Zero point correction amount (deviation from zero calibration point) range is set using digital zero or zero tracking. If digital zero operation is performed just as DZ regulation value is

> [DZ regulation value] (Setting mode 3-6)
>
> ▢▢▢▢ (Input range: 0 to 9999)

exceeded or if zero tracking is operated, "ZALM" flashes and an error warning is displayed.

3-5-11. Gross weight display/Net weight display (Designated key)

Gross weight or net weight is displayed alternately every time the [GROSS/NET] key is pressed. "GROSS" lights up when gross weight is displayed and "NET" lights up when net weight is displayed.

Displayed as net weight = gross weight - tare weight.

Tare weight is determined by tare subtraction. One-touch tare subtraction and preset tare weight are used for tare subtraction.

(Refer to P.26 "3-5-12.One-touch tare subtraction (TARE) (Dedicated key)" for details regarding one-touch tare subtraction.) (Refer to P.27 "3-5-14.Preset tare subtraction (Digital tare subtraction) (Setting mode 1-9, 2-3)" for details regarding preset tare subtraction.)

> **Differences between the tare subtractions**
>
> One-touch tare subtraction immediately sets the new weight to zero when executed. Preset tare subtraction subtracts a given value from the net weight.

3-5-12. One-touch tare subtraction (TARE) (Dedicated key)

This is a function that equalizes gross weight and tare weight, and then zeros net weight.

1. Press the [TARE] key.

2. One-touch tare subtraction is complete and " TARE " lights up.

The following causes are assumed when the net weight does not become zero even if tare subtraction operation is performed. Take the following measures.

Cause	Measures
Gross weight is displayed	Press the [GROSS/NET] key, and set the display to net weight. (Net weight is displayed if " NET " is lit.)

3-5-13. One-touch tare subtraction reset

This is a function that resets tare subtraction. If this operation is performed, tare weight can be cleared using the one-touch tare subtraction operation.

1. Press the [TARE RESET] key.

2. Tare subtraction is reset.

3-5-14. Preset tare subtraction (Digital tare subtraction) (Setting mode 1-9, 2-3)

This is a function that subtracts a given setting value from net weight.
Preset tare subtraction (digital tare subtraction) can be performed by setting tare value and specifying the setting of preset tare weight to "1: ON".

One-touch and preset tare subtraction operate independently. Even when preset tare weight is

```
[Weighing function 3] (Setting mode 2-3)

┌──┬──┬──┬──┐
│  │  │  │▓ │
└──┴──┴──┴──┘
              Preset tare weight
               1: Preset tare weight ON
               0: Preset tare weight OFF


[Tare setting] (Setting mode 1-9)

┌──┬──┬──┬──┬──┐
│▓ │▓ │▓ │▓ │▓ │   (Input range: 0 to 99999)
└──┴──┴──┴──┴──┘
```

ON, one-touch tare subtraction is performed immediately after the [TARE] key is pressed and the net weight value becomes zero.
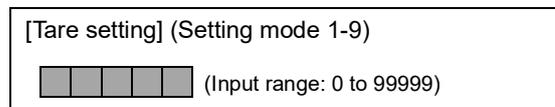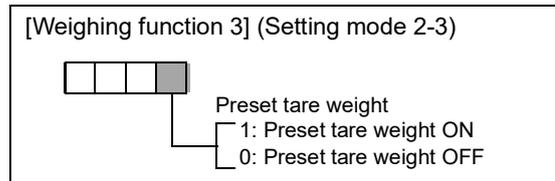
However, ON/OFF of preset tare weight as well as setting of tare subtraction are prohibited when one-touch tare subtraction is operating, depending on the limitation setting of tare subtraction function.

3-5-15. Limitation of the tare subtraction function (Setting mode 4-9)

Limitation can be imposed on the operation of preset tare weight and one-touch tare subtraction.

```
[Measurement Act compliance] (Setting mode 4-9)

┌──┬──┬──┬──┐
│▓ │▓ │▓ │▓ │
└──┴──┴──┴──┘
              Tare weight displayed with [0] key
               1: Enabled
               0: Disabled

              Prohibits the ON/OFF of tare setting
              and preset tare weight when one-touch
              tare subtraction is enabled.
               1: Enabled
               0: Disabled

              Tare subtraction range
               1: Tare ≦ Capacity
               0: Total range

              One-touch tare subtraction
               1: Accept only when stable
               0: Always accept
```
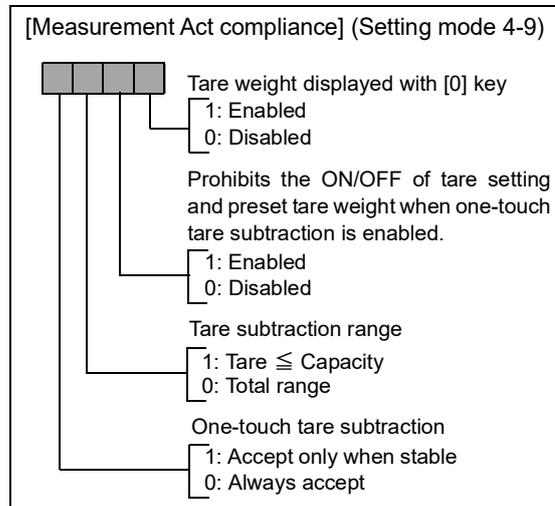
3-5-16. Tare weight display (Designated key)

This is a function that displays current tare weight. The tare weight that is displayed here is the result including the one-touch tare subtraction and preset tare weight. This is displayed when "Tare weight displayed with [0] key" of Measurement Act compliance (setting mode 4-9) is enabled.

- When tare weight is 0, " ⛁TARE " goes out.

- When tare weight is other than 0, " ⛁TARE " lights up.

- When (tare weight by one-touch tare subtraction) - (tare weight by preset tare weight) = 0, " ⛁TARE " goes out.

4 Performing Final Discharge Control

Final discharge control is a procedure to control discharge of raw material for each final from tanks such as hoppers. A constant amount can be accurately discharged by appropriately combining control settings such as final/set point 2/set point 1/compensation, judging settings such as over/under/go and timer settings such as comparison inhibit/judging and so on.

For discharge procedures, there are feed weighing and discharge weighing, and for control procedures, there are simple comparison control and sequence control.

4-1. Feed weighing and discharge weighing

<Feed weighing>   <Discharge weighing>
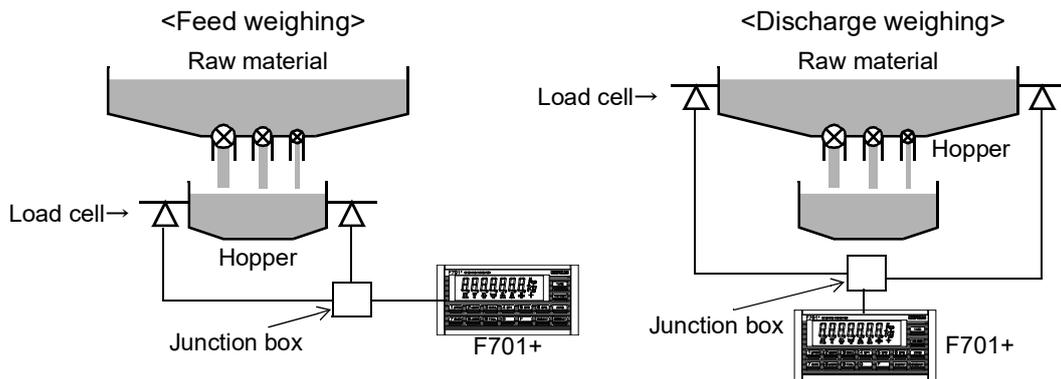
Feed weighing Weighing procedure to control weight value when feeding raw material into weighing tank (hopper).

Discharge weighing Weighing procedure to control weight value when refilling raw material into weighing tank (hopper) and discharging raw material from the tank.

4-2. Simple comparison control and sequence control

Difference between simple comparison control and sequence control

Item	Simple comparison control	Sequence control
Final discharge condition	Compares regularly	Starts comparison after the start signal is input
SP1	Turns ON when the condition is met	Turns ON after the start signal is input and turns OFF after the condition is met
SP2	Turns ON when the condition is met	Turns ON after the start signal is input and turns OFF after the condition is met
SP3	Turns ON when the condition is met	Turns ON after the start signal is input and turns OFF after the condition is met
Under	Turns ON when the condition is met	Turns ON when the condition is met
Over	Turns ON when the condition is met	Turns ON when the condition is met
Go	Turns ON when the condition is met	Turns ON when the condition is met
Feeding control/ Discharging control	○	○
External judging function for over/ under comparison	○	○
External judging function for upper/ lower limit comparison	○	×
External hold input function	○	×
Adjust feeding function	×	○
Power failure restoration function	×	○
Pause input function	×	○
Condition for start of next weighing	From the point when the weight value falls below 25% after completion of the previous measurement	After the start signal is input after completion of the previous measurement

Chapter 4

Performing Final Discharge

4-3.   Setting procedures

Selecting a discharge procedure	Select the feeding/discharging control.
(Setting mode 2-1)	
Selecting a control procedure	Select simple comparison/sequence mode.
(Setting mode 2-4)	
Comparison setting	Select the net and gross weight.
(Setting mode 2-1, 2-2)	
Judgment settings	Make selections for weighing comparison and judging.
Auto free fall compensation	Set to correct for fluctuation of compensation.
(Setting mode 2-3)	
Sequence control settings	Set additional functions to perform weighing more accurately.

4-4.   Discharging Control Mode

Perform the feeding/discharging control settings. The "external selection" can switch between feeding/discharging via signals from external I/O connector.

When set to external selection, set one of the input selections 1 to 6 (A8 and pins B1 to B5) to "feeding/discharging" to switch between feeding/ discharging.

Feeding control applies when OFF (HI), and discharging control applies when ON (LO).

(Refer to P.37 "4-9.External I/O signal (control connector)" for settings for input selections 1 to 6.)

[Weighing function 1] (Setting mode 2-1)

Discharging control mode
2: External selection
1: Discharging control
0: Feeding control
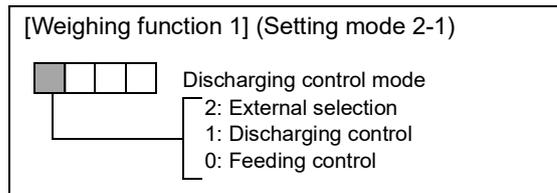
4-5.   Selecting a control procedure

Set sequence mode and simple comparison mode.

When set to "sequence mode (with power failure restoration)", operation will restart based on the restart setting (P.48 "5-3.Sequence control (with adjust feeding)"P.50 "5-4.Sequence control (with external judging)"P.52 "5-5.Sequence control (with pause input/power failure restoration) [CASE 1]") in the event of a power outage.

[Sequence mode] (Setting mode 2-4)

Weighing mode
2: Sequence mode
(with power failure restoration)
1: Sequence mode
(with power failure restoration)
0: Simple comparison mode

Chapter

4

Performing Final Discharge
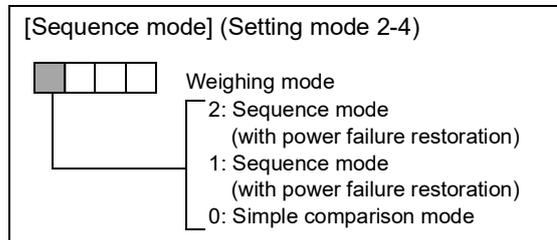
4-6.   Auto free fall compensation

This function is used to automatically compensate for of compensation, a major factor in weighing errors, and to perform accurate weighing. After set point 3 is complete, the weighing value is sampled when the complete signal turns ON.

$$\underbrace{\frac{\text{Sum of accumulated value of weighing errors}}{\text{Number of times for auto free fall}} \times \text{Auto free fall coefficient}}_{\text{Value added to/subtracted from compensation setting value}}$$

Auto free fall compensation regulation value

Perform auto free fall compensation if the value is in the following range: (final + regulation value) $\geqq$ weighing value $\geqq$ (final - regulation value). In addition, when adjust feeding is enabled in sequence mode, sample the weighing value before starting adjust feeding.

Example)

- Final setting value	20.000		
- Number of times for auto free fall	4 (Computed once every four times)		
- Auto free fall compensation regulation value	0.100		
- Auto free fall coefficient	2/4		

Weighing times	Actual weighing value	Weighing error	Number of times for auto free fall	Compensation
1	20.050	+0.050	1	0.500
2	20.040	+0.040	2	0.500
3	20.070	+0.070	3	0.500
4	20.080	+0.080	4	0.500

+0.240/4 = 0.060   *Auto free fall compensation coefficient*

Sum of accumulated value of weighing errors   0.060×2/4 = 0.030

Add → 0.530

5	20.020	+0.020	1	0.530
6	20.000	0.000	2	0.530
7	20.010	+0.010	3	0.530
8	20.110	(+0.110)	Disabled	0.530
9	20.010	+0.010	4	0.530

+0.040/4 = 0.010   *Auto free fall compensation coefficient*

0.010×2/4 = 0.005

Invalid due to being outside auto free fall compensation regulation value

Add → 0.535

10	19.880	(-0.120)	Disabled	0.535
11	19.990	-0.010	1	0.535
12	20.010	+0.010	2	0.535
13	20.000	0.000	3	0.535
14	19.980	-0.020	4	0.535

-0.020/4 = -0.005

-0.005×2/4 = -0.003

Add → 0.532

> **Key point**
>
> The compensation function will not work if number of times for judging is set to zero times (no judging). Set the number of times for judging to once or more when using auto free fall compensation function.
> Values of number of times for auto free fall and free fall compensation counter become 0 when compensation setting value is changed.
> Auto free fall coefficient can be selected from 1/4, 2/4, 3/4 and 1.
> Select 1 for weighing where the weighing value remains nearly the same every time and 1/4 to 2/4 for weighing where the weighing value fluctuates every time so that free fall compensation value can be calculated more precisely.

4-6-1. Auto free fall compensation

Select whether to enable/disable the auto free fall compensation function.

[Weighing function 3] (Setting mode 2-3)
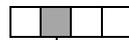
　Auto free fall compensation
　1: Auto free fall compensation ON
　0: Auto free fall compensation OFF

4-6-2. Auto free fall compensation regulation value

Set the regulation value to prevent the compensation value from becoming too large (or too small).

[Auto free fall compensation regulation value]
　(Setting mode 1-7)
(Input range: 0 to 99999)

4-6-3. Average number of times for auto free fall compensation

Set the number of times to record weighing values so that average value can be calculated.

[Weighing function 3] (Setting mode 2-3)
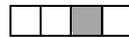
(Input range: 1 to 9)

4-6-4. Auto free fall compensation coefficient

This is a setting that prevents compensation values from fluctuating by multiplying coefficient of 1 or below.

[Weighing function 3] (Setting mode 2-3)

　Auto free fall compensation coefficient
　3: Auto free fall compensation coefficient　1/4
　2: Auto free fall compensation coefficient　2/4
　1: Auto free fall compensation coefficient　3/4
　0: Auto free fall compensation coefficient　1

4-7.　Comparison setting

Functions and settings to make the final discharge control more convenient are described below.

4-7-1. Near zero comparison mode

This function detects that the weight value is a value near zero. Near zero can be arbitrarily set.

Comparison condition is selected depending on near zero comparison mode. (" NZ " lights up when near zero signal is ON.)

[Near zero] (Setting mode 0-3)

(Input range: 0 to 99999)

[Weighing function 1] (Setting mode 2-1)
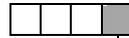
　Near zero comparison mode
　4: Comparison OFF
　3: |Net weight|
　2: |Gross weight|
　1: Net weight
　0: Gross weight

4-7-2.Upper/lower limit comparison

Upper limit and lower limit can be arbitrarily set. Set the target weight for comparison with upper/lower limit comparison weight.

In addition, set the timing of comparison in upper/lower limit comparison mode.

<Conditional equation>

External signals are output according to the following conditions.

- Upper limit output (HI LIM lights on)
  Lights up when [weight value] > [upper limit setting value].

- Lower limit output (LO LIM lights up)
  Lights up when [weight value] < [lower limit setting value].

4-7-3.Over/under comparison

Over and under can be set from 0 to 999. Set the target weight for comparison using final and over/under comparison weight.

In addition, set the timing of comparison in over/under comparison mode.

<Conditional equation>

External signals are output according to the following conditions.

- Over output (HI lights up)
  ON when [weight value] > [(final + over)]

- Go output (GO lights up)
  ON when [(final - under)] $\leqq$ [weight value] $\leqq$ [(final + over)]

- Under output (LO lights up)
  ON when [weight value] $<$ [(final - under)]

[Upper/lower limit] (Setting mode 0-1/0-2)

(Input range: 0 to 99999)

[Weighing function 1] (Setting mode 2-1)

Upper/lower limit comparison
2: Comparison OFF
1: Net weight
0: Gross weight

(When comparison OFF is selected, the external output signals for upper/lower limit and over accelerated injection will be OFF at all times.)

[Weighing function 2] (Setting mode 2-2)

Upper/lower limit comparison mode
1: Compare when external judging input is ON
0: Compare regularly

(Accelerated injection will be compared regularly.)

[Over/under] (Setting mode 0-7/0-8)

(Input range: 0 to 999)

[Final] (Setting mode 0-9)

(Input range: 0 to 99999)

[Weighing function 1] (Setting mode 2-1)

Final and over/under comparison
2: Comparison OFF
1: Net weight
0: Gross weight

Determine the weight to be compared to (final + over) and (final - under).

(When comparison OFF is selected, the external output signals for over, under, and go are also OFF at all times.)

[Weighing function 2] (Setting mode 2-2)

Over/under comparison mode
3: Compare when complete output is ON and hold the weight value.
2: Compare when complete output is ON.
1: Compare when external judging input is ON
0: Compare regularly

(If the weighing mode is set to "1: Sequence mode", the timing is compared and is held when the complete output is ON, regardless of the setting of over/under comparison mode.)

4-7-4.Judging time/Comparison inhibit time

Comparison can be inhibited for a certain period of time to prevent inappropriate control operation due to mechanical vibration caused by valve opening/closing. Comparison inhibit time operates when the weight value reaches (final - set point 2), (final - set point 1).

[Comparison inhibit time 1/judging time/ comparison inhibit time 2]

(Setting mode 1-1/1-2/1-8)

(Input range: 0.00 to 9.99)

Similar to comparison inhibit time, this function is used to inhibit comparison judgment for a certain period of time to prevent inappropriate judgment due to mechanical vibration caused by valve opening/closing. Judging time operates when the weight value reaches (final - compensation).
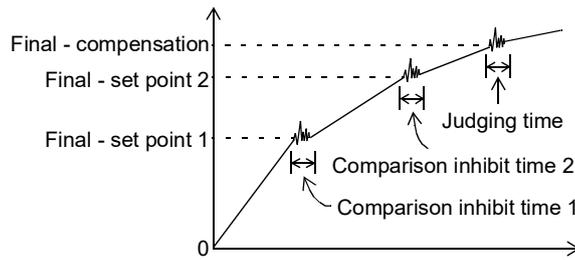
4-7-5. Complete output time/Complete signal output mode

Set the time to output the complete signal when weighing is complete.

Determine the timing to output the complete signal in complete signal output mode.

[Complete output time] (Setting mode 1-3)

(Input range: 0.00 to 9.99)

[Weighing function 2] (Setting mode 2-2)

Complete signal output mode

2: Turns ON only for the complete output time either after the SP3 signal has turned ON and the judging timer has elapsed or from when the weight value has become stable.

1: Only complete signal is OK from when the weight value has become stable after the judging timer has elapsed

0: Complete signal after judging timer has elapsed.
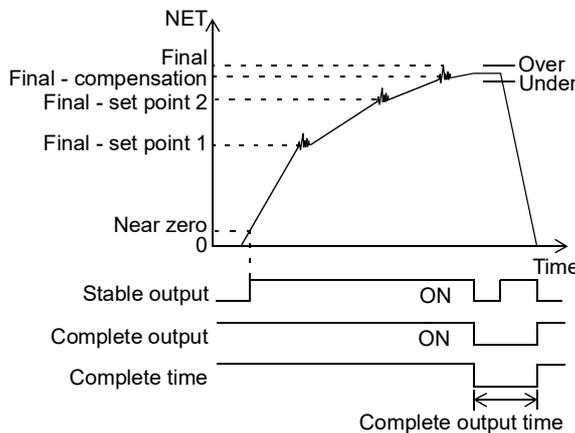
4-8.   Sequence control settings

Set various parameters to perform a series of operations from weighing start to weighing complete.

Normal sequence control

This is a control procedure to begin weighing by weighing start signals and to end weighing by outputting complete signals.

Sequence control with adjust feeding

This is a control procedure to perform adjust feeding only for the period set in the adjust time when weighing result is under.

4-8-1. Number of times for judging

This function is used to select over, under, or go for judging when complete signal is output after weighing has been completed.

[Number of times for judging] (Setting mode 1-6)

(Input range: 00 to 99)

00 : No judgment (Judgment of over, go, or under is not made)
01: Judgment is made every time.
02: Judgment is made once every two weighings.
03: Judgment is made once every three weighings.
 ⌇
99: Judgment is made once every 99 weighings.

Attention

Auto free fall compensation function uses over/under judging signals to save compensation samples.
If number of times for judging is set to 00 (no judging), the F701+ cannot save samples for auto free fall compensation and compensation function will not operate. Set the number of times for judging to a number which is 01 or more when using auto free fall compensation function.

4-8-2. Number of times for AZ

This function is used to select whether or not to set the weighing value to zero when starting weighing. This sets the weighing value to zero by performing digital zero if the weighing value is gross weight and by performing tare subtraction if the value is net weight.

[Number of times for AZ] (Setting mode 1-5)

(Input range: 00 to 99)

00 : No auto-zero (Auto-zero is not performed)
01 : Auto-zero is performed every time.
02 : Auto-zero is performed once every two weighings.
03 : Auto-zero is performed once every three weighings.
 ⌇
99 : Auto-zero is performed once every 99 weighings.

Attention

- Auto-zero is performed with the following timing.
  - Right after receiving ON edge of start.
- **Seq. error 3** is displayed when zero alarm is activated because auto-zero has been performed.
- Operations of TARE from front panel keys and external I/O connector as well as operations of digital zero are enabled even if no auto-zero (00) is set at this point.

4-8-3.At start NZ confirmation

This setting is used to check whether or not near zero signal is ON when starting weighing.

Weighing starts normally if near zero is ON; **Seq. error 4** is displayed if OFF.

Refer to P.31 "4-7-1.Near zero comparison mode" for near zero settings.

[Sequence mode] (Setting mode 2-4)

Sequence control
1: At start NZ confirmation ON
0: At start NZ confirmation OFF
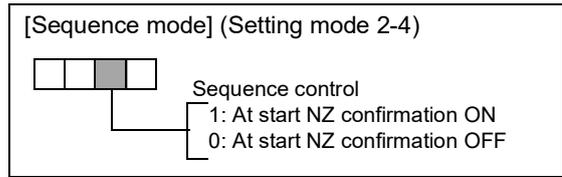
4-8-4.At start weight value confirmation

This setting is used to check whether or not the weighing value has reached the point of set point 1 (final - set point 1) when starting weighing. (Select from 0: Off/1: On.)

Sequence 5 is displayed when the weighing value reaches the setting value of set point 1.

[Sequence mode] (Setting mode 2-4)

Sequence control
1: At start weight value confirmation ON
0: At start weight value confirmation OFF
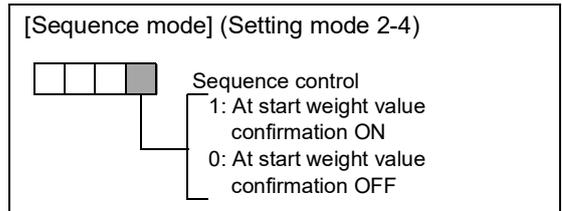
4-8-5.Adjust feeding/compensation feeding time

Set whether or not to perform adjust feeding after weighing complete. When ON is selected, set the time to perform adjust feeding after weighing complete.

[Sequence mode] (Setting mode 2-4)

Adjust feeding
1: Adjust feeding ON
0: Adjust feeding OFF

[Compensation feeding time] (Setting mode 1-4)

(Input range: 0.00 to 9.99)
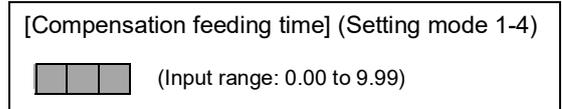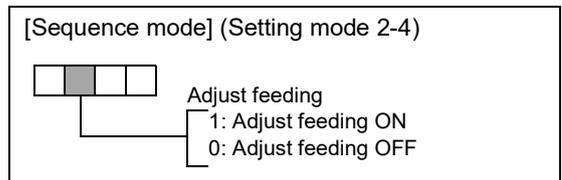
4-8-6.Number of times for knocking/knocking time

Set the duration for which and number of times that the knocking output repeatedly turns ON and OFF after SP3 is turned ON.

[Number of times for knocking]
(Setting mode 5-6)

(Input range: 00 to 99)
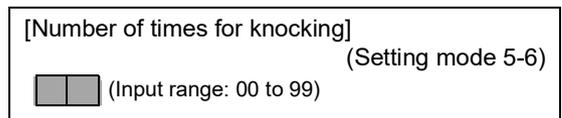
What is knocking?

In order to shake off residue inside a tank, a fixed number of times and duration for the pulse can be output from the external signal (output selection) of F701+.

[Knocking time] (Setting mode 5-7)

(Input range: 0.00 to 9.99)

Residue

Hopper
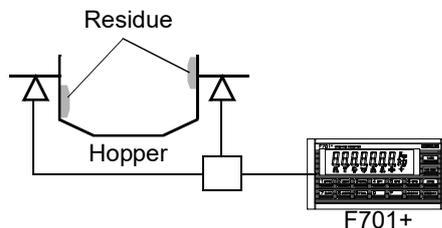
F701+

4-8-7.Restart setting (SP1, SP2, SP3)

This parameter determines the restarting condition for the weighing operation of F701+.

The restarting condition on restart can be set as percentages (%) of the ranges of each of SP1 (set point 1), SP2 (set point 2) and SP3 (set point 3). In addition, [sequence mode (setting mode 2-4)/2: sequence mode (power failure restoration ON)] must be set in order to restart weighing after a power failure.

```
[Restart setting] (Setting mode 5-3, 5-4, 5-5)

[ ][ ][ ]   (Input range: 0 to 100)

SP1 range  Setting mode 5-3
SP2 range  Setting mode 5-4
SP3 range  Setting mode 5-5
```

■Example condition for restarting operation using the restart setting

(when weighing 100.00 kg)

Weighing setting example	Area	Restart setting example	Operation when restarting after pause
Final 100.00kg			
Final - free fall (3) 90.00kg *2	SP3 area 100% (100% = 10.00kg)	[Setting mode 5-5] Restart setting set point 3 50% (10.00kg × 0.5 = 5.00kg)	SP3 is ON during adjust feeding time when over 85.00kg
Final - set point 2 (2) 80.00kg *2	SP2 area 100% (100% = 30.00kg)	[Setting mode 5-4] Restart setting set point 2 80% (30.00kg × 0.8 = 24.00kg)	Only SP3 turns ON when over 74.00kg
Final - set point 1 (1) 50.00 kg *2	SP1 area 100% (100% = 50.00kg)	[Setting mode 5-3] Restart setting set point 1 80% (50.00kg × 0.8 = 40.00kg)	SP2 and SP3 turn ON when over 40.00kg.

* Refer to P.52 "5-5.Sequence control (with pause input/power failure restoration) [CASE 1]"P.54 "5-6.Sequence control (with pause input/power failure restoration) [CASE 2]"P.56 "5-7.Sequence control (with pause input/power failure restoration) [CASE 3]" for the timing chart.

* Area indicates the range of the weighing setting of SP1, SP2 and SP3.

SP1 (set point 1) area The weight value of (1)

SP2 (set point 2) area The weight value of (2) - (1)

SP1 (set point 1) area The weight value of (3) - (2)

4-9.   External I/O signal (control connector)

I/O circuits and internal circuits are electrically insulated by photo-coupler.

An external DC24V (power source for the external I/O signal circuit) must be prepared separately.

4-9-1. Connector pin assignments

Compatible connector: 57-30240 manufactured by DKK

No.		Signal	No.		Signal
1	*	COM (sink type)/+24V(source type)	13	*	COM (sink type)/+24V(source type)
2	IN	G/N	14	IN	Input selection 1
3	IN	D/Z	15	IN	Input selection 2
4	IN	One-touch tare subtraction	16	IN	Input selection 3
5	IN	Input selection 5	17	IN	Input selection 4
6	OUT	Near zero	18	OUT	Lower limit
7	OUT	SP1	19	OUT	Upper limit
8	OUT	SP2	20	OUT	Stable
9	OUT	SP3	21	OUT	Output selection 1
10	OUT	Under	22	OUT	Output selection 2
11	OUT	Over	23	OUT	Output selection 3
12	*	COM (sink type)/ +24V RTN (source type)	24	*	COM (sink type)/ +24V RTN (source type)

* COM [1, 12, 13, 24 pin] is internally connected for sink type.

* COM [1, 13 pin] is internally connected as +24V and [12, 24 pin] as +24V_RTN respectively for source type.

[Top view]

12 11 10 9 8 7 6 5 4 3 2 1

24 23 22 21 20 19 18 17 16 15 14 13
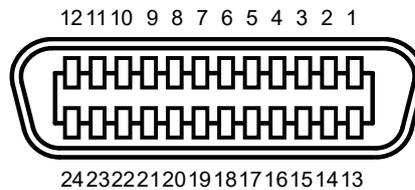
4-9-2. I/O selection setting

Perform the setting for I/O input signal.

[Input selection] (Setting mode 5-1)

Input selection 1 *1
Input selection 2 *1
Input selection 3 *1
Input selection 4 *1
Input selection 5 *1

* 1
0: Hold/judging   1: Feeding/discharging
2: Start   3: Stop
4: Accumulation command 5: Accumulation clear
6: Total print   7: Erase printing
8: Pause   9: Tare reset

[Weighing function 2] (Setting mode 2-2)

Output selection (22 pin)
1: Complete Output
0: Go output

Output selection (21 pin)
2: Weight error and seq. error
1: Seq. error
0: Weight error

[Output selection] (Setting mode 5-2)

Output selection *2

* 2
0: Run   1: Paus.ed
2: Waiting for external judging input   3: Knocking

4-9-3. Connecting an external control device

The external input signal and external output signal can only be connected to either the sink type or the source type. Please specify when placing an order.

<Equivalent circuit and connection example for when sink type is specified>

- Input

Signal input circuit inputs signal by making the short-circuit and open-circuit between input terminals and the COM terminal.

Short-circuit is performed with contacts (relays, switches and so on) and non-contacts (transistors, TTL of open collector output and so on).

Open-circuit	OFF
Short-circuit	ON
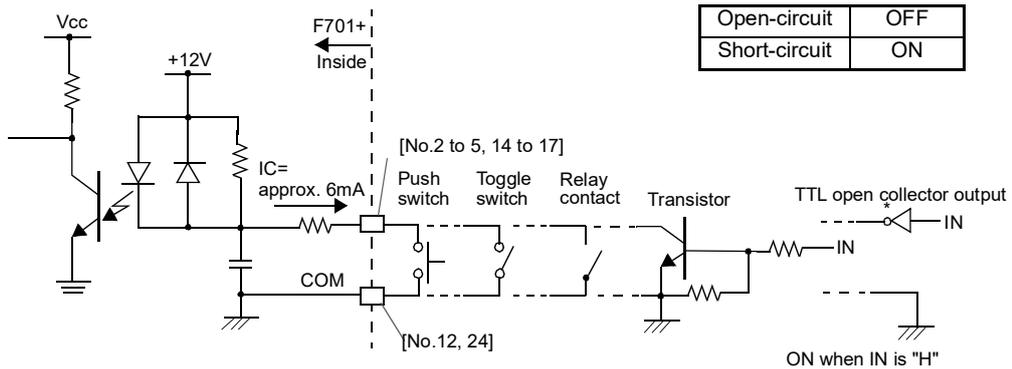
- Do not apply voltage to the signal input circuit from outside.
- The external element must be an element in which Ic=10mA or more can be applied.
- External element leak must be 100μA or below.

- Output

Signal output circuit is the open collector output of transistor.

- Prepare an external power supply for the relay drive (vext).
- Do not short-circuit loads (such as a coil of a relay). The output transistor will be damaged.
- Connect surge absorber or spark killer to the relay circuit (coil side and contact side) as shown in the figure above in order to prevent surge voltage as much as possible. This can decrease noise problems and extend the lifetime of the relay.

●Transistor status

Output data	Tr
0	OFF
1	ON

<Equivalent circuit and connection example for when source type is specified>

- Output

The signal output circuit is a photo-coupler insulated output (current source type).
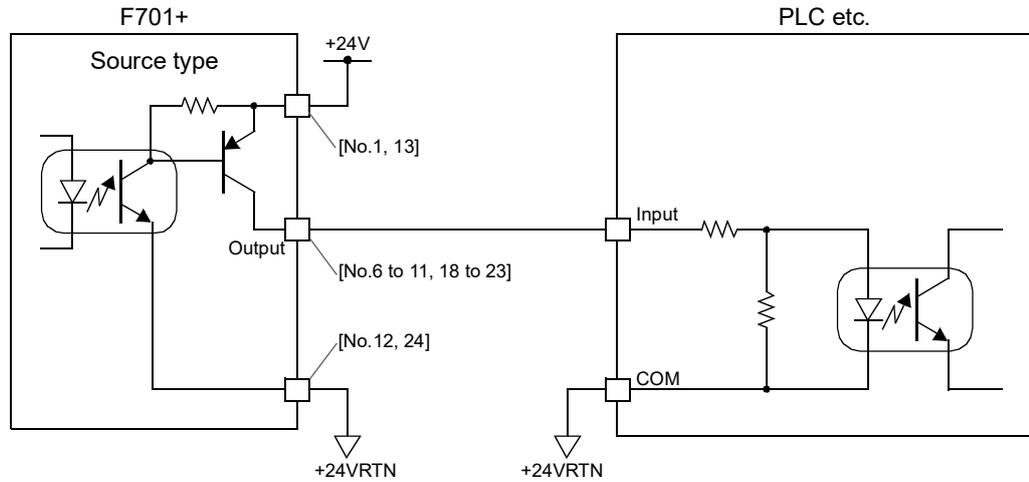
- Input

The device can be connected to switches, relays, transistors, photo-couplers etc.

A source type unit must be connected when connecting transistors, photo-couplers etc.
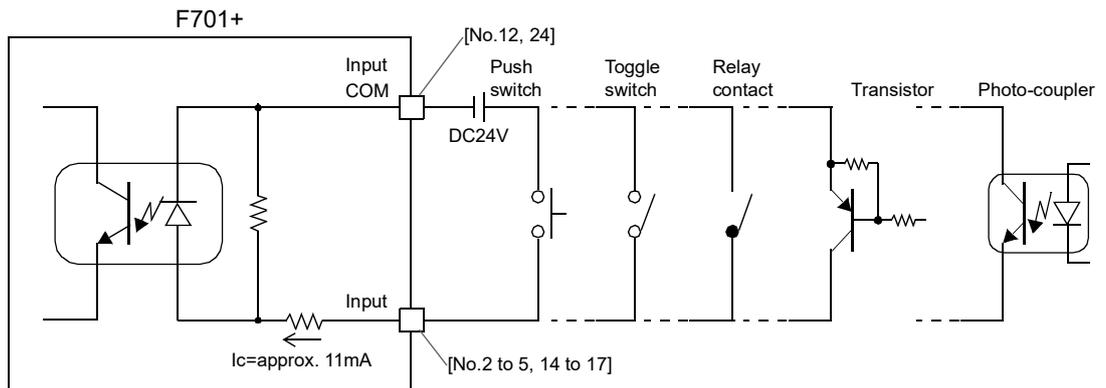
4-9-4. External input signal

There are edge input and level input for external input.

<Edge input>

Switch processes at ON edge (OFF→ON) or OFF edge (ON→OFF) of external input.

When processing at ON edge (OFF→ON).

<Level input>
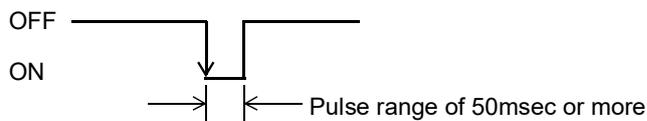
Switches processes when external input is switched between ON and OFF.

Example) Feed/discharge switching

OFF ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
Feeding control | Discharging control

When external input is OFF Feeding control
When external input is ON Discharging control

ON ____

→| |← Undefined section (within 50msec)
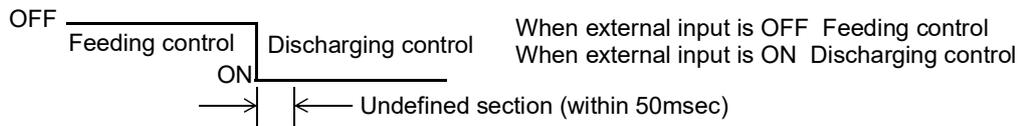
When processing is executed while external input is ON.

Example) HOLD

OFF ‾‾‾‾‾‾‾‾   ‾‾‾‾‾‾‾

ON ____

|← Hold →|

Undefined section (within 50msec)

Signal	Explanation
Start <Edge input>	Use this signal in sequence mode. Weighing starts when switched to ON edge (OFF → ON).
Stop <Level input, edge input>	Use this signal in sequence mode. Seq. error is displayed and weighing stops when this signal is turned ON during weighing. In addition, seq. error is cleared at ON edge.
Accumulation clear <Edge input>	Clears the accumulation data at ON edge.
G/N <Edge input>	Net weight (NET) is displayed at ON edge. Gross weight (GROSS) is displayed using OFF edge.
D/Z ON <Edge input>	Gross weight becomes 0 at ON edge.
TARE ON <edge input>	Tare subtraction is immediately performed at ON edge and the net weight is zeroed. ("⊓̶ TARE" lights up during tare subtraction.)
TARE OFF <Edge input>	Reset tare subtraction mentioned above at ON edge. However, tare setting is not released.
Accumulation command <Edge input>	Cumulatively adds up the weight value and counts up the number of times at ON edge. The target to add the weight value to depends on the final and over/under comparison weight. (The negative weight value is neither added nor counted up.)
Feeding/discharging <Level input>	This signal is enabled when discharging control mode is set to "external selection". This function is feeding control when OFF, and discharging control when ON.
HOLD <Level input>	This signal holds (maintains) weight value and comparison when ON. This input terminal turns to JUDGE in accordance with setting. This signal cannot be used as HOLD when over/under comparison mode or upper/lower limit comparison mode is set to "comparison is made when the external judging input is ON". Also, this input is disabled during sequence mode. ("HOLD" lights up during HOLD.)

Chapter **4**

Performing Final Discharge

Signal	Explanation
JUDGE <Level input, edge input>	Comparison judge is performed while this is turned ON during simple comparison control. This input terminal becomes HOLD in accordance with setting. This signal cannot be used as JUDGE unless over/under comparison mode or upper/lower limit comparison mode is set as "comparison is made when the judging input is ON". Furthermore, if over/under comparison mode is set to "comparison is made when external judging input is ON" during sequence mode, weighing is completed with over/under comparison at ON edge after operation of complete signal output mode.
Pause <Edge input>	This signal is enabled when sequence mode is set to "restoration ON". Weighing is paused at ON edge.
Total print <Edge input>	Prints and clears the accumulated data at ON edge. However, an RS-232C interface (optional) and printer must be connected or the total will not be printed.
Delete print <Edge input>	This signal deletes the last printed data at ON edge. However, an RS-232C interface (optional) and printer must be connected or delete print will not be performed.

4-9-5. External output signal

Signal	Explanation
Set point 1, set point 2, set point 3	● In simple comparison mode Conditions under which each signal turns ON are as follows: -SP1 output: Weight value $\geqq$ final setting value - set point 1 setting value - SP2 output: Weight value $\geqq$ final setting value - set point 2 setting value - SP3 output: Weight value $\geqq$ final setting value - compensation setting value (Select the value in accordance with final and over/under comparison weight) ● In sequence mode When weighing start signal is ON, weighing sequence starts and each signal turns ON. Conditions under which each signal turns OFF are as follows: - SP1 output: Weight value $\geqq$ final setting value - set point 1 setting value - SP2 output: Weight value $\geqq$ final setting value - set point 2 setting value - SP3 output: Weight value $\geqq$ final setting value - compensation setting value (Select the value in accordance with final and over/under comparison weight)
Complete	● In simple comparison mode Select output mode in complete signal output mode. The timing with which output turns ON depends on complete output time. ● In sequence mode [When judging is ON] Select output mode in complete signal output mode. The timing with which output turns ON depends on complete output time. [When judging is OFF] Complete output turns ON in the event of OFF edge of SP3 signal, ignoring setting of complete signal output mode. The timing with which output turns ON depends on complete output time.
Near Zero	Output turns ON when weight value (selected in near zero comparison mode) $\leqq$ near zero setting value with comparison set to compare regularly only.
Stable	Output turns ON when the weight value is stable. (Refer to P.24 "3-5-7. Motion detection (MD) (Setting mode 2-7, 4-7)" for details.)
Over, under, go	● In simple comparison mode Select comparison timing in over/under comparison mode. ● In sequence mode Hold weight value, ignoring setting of over/under comparison mode and comparing when complete output is ON. (Only when judging is ON.) Conditions for which each signal turns ON - Under: weight value $<$ final setting value - under setting value - Over: weight value $>$ final setting value + over setting value (Select the value in accordance with final and over/under comparison weight) - Final: final setting value + over setting value $\geqq$ weight value $\qquad\qquad\qquad\qquad\qquad\geqq$ final setting value - under setting value
Upper limit, lower limit	Select comparison regularly or comparison is made when the external judging input is ON for upper/lower limit comparison mode. Conditional equation: Lower limit output turns ON when weight value < lower limit setting value. Upper limit output turns ON when weight value > upper limit setting value. (Select the value in accordance with upper/lower limit comparison weight)

Chapter 4

Performing Final Discharge

Signal	Explanation
Weight error	Output turns ON when display is ±LOAD, OFL or ZALM (zero error). (Refer to P.125 "7-1.Over-scale display" for details regarding error display.)
Seq. error	Output turns ON in seq. error. (Refer to P.126 "7-2.Sequence error display" for details regarding seq. error.)
RUN	Output turns ON when normal operation is performed.
Paused	Output turns ON when paused.
Waiting for judging input	Output turns ON while waiting for judging input when "comparison is made when external judging input is ON" during sequence mode.
Knocking	Output turns ON during knocking operation if number of times for knocking and knocking time are set.

Chapter

4

Performing Final Discharge

5 Timing Chart for Weighing

An example of a timing chart for simple comparison control and sequence control.

5-1.   Simple comparison control

t0: comparison inhibit time 1
t1: comparison inhibit time 2
t2: judging time
t3: complete output time
SP1: set point 1
SP2: set point 2
SP3: set point 3
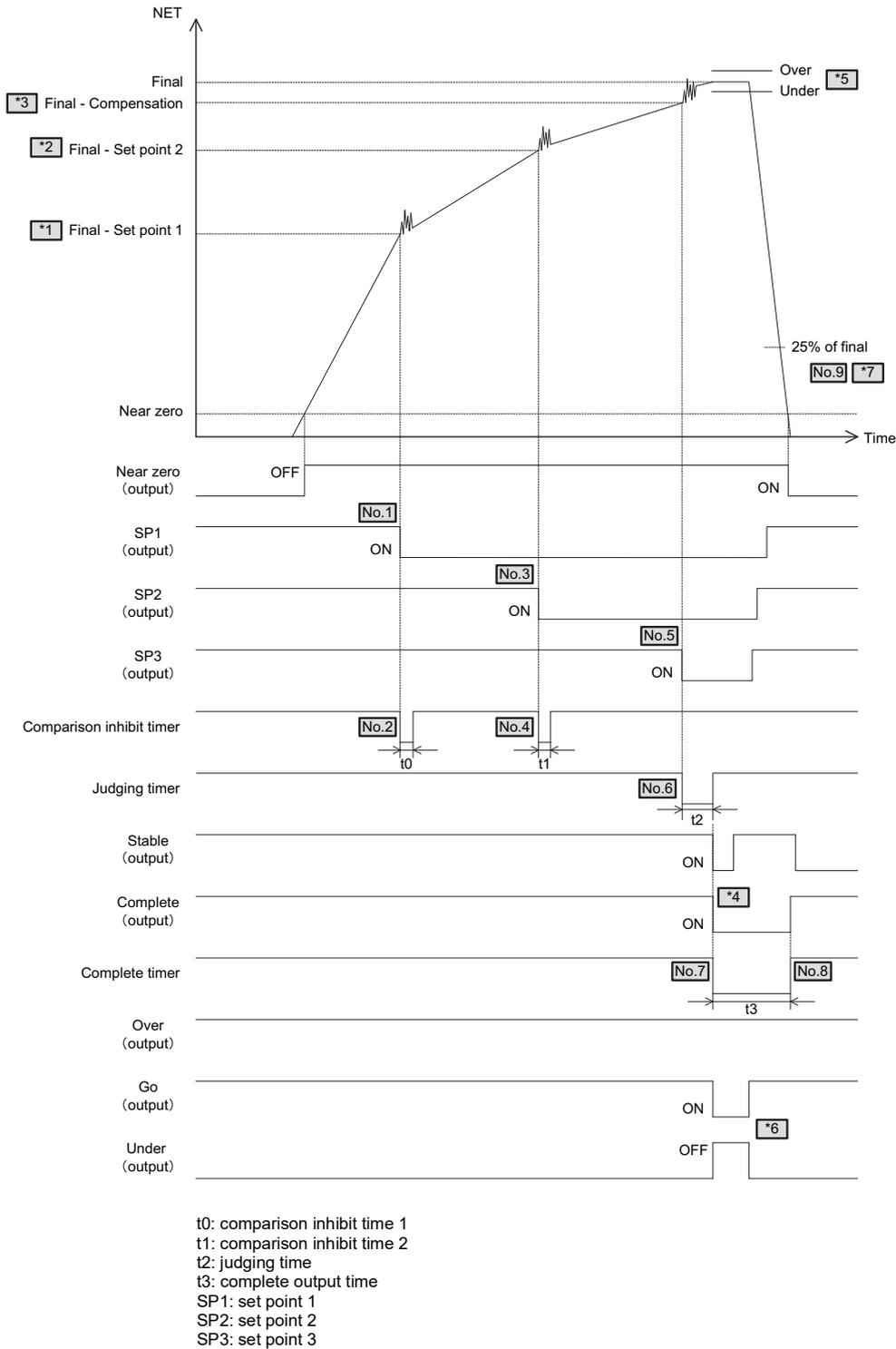
This setting is used to control or judge final discharge.

No.	Simple comparison control operation	Checking status display	Keys for relevant settings	External input signal to be used	External output signal to be used
1	ON condition for set point 1	SP1 lights up	Setting mode 0-4: set point 1 Setting mode 0-9: Final Setting mode 2-1: 　Final and over/under comparison		Set point 1 (7 pin) ON
* 1	Set point 1 output is ON when compared weight value ≧ final setting value - set point 1 setting value				
2	Operation of the comparison inhibit timer		Setting mode 1-1: 　comparison inhibit time (t0)		
* 1	Set point 1 output is ON when compared weight value ≧ final setting value - set point 1 setting value				
3	ON condition for set point 2	SP2 lights up	Setting mode 0-5: set point 2 Setting mode 0-9: final Setting mode 2-1: 　final and over/under comparison		Set point 2 (8 pin) ON
* 2	Set point 2 output is ON when compared weight value ≧ final setting value - set point 2 setting value				
4	Operation of the comparison inhibit timer		Setting mode 1-8: 　comparison inhibit time (t1)		
5	Final - compensation ≦ net weight	SP3 lights up	Setting mode 0-6: compensation Setting mode 0-9: final Setting mode 2-1: 　final and over/under comparison		Set point 3 (9 pin) ON
* 3	Set point 3 output is ON when compared weight value ≧ final setting value - compensation setting value				
6	Operation of the judging timer		Setting mode 1-2: judging time (t2)		
7	Output of complete signal and output of judging signal	HI, GO or LO lights up	Setting mode 0-7: over Setting mode 0-8: under Setting mode 0-9: final Setting mode 1-3: 　complete output time (t3) Setting mode 2-1: 　final and over/under comparison Setting mode 2-2: 　output selection (22 pin) Setting mode 2-2: 　over/under comparison mode Setting mode 2-2: 　complete signal output mode		Over (10 pin) ON Under (11 pin) ON Output selection: GO (22 pin) ON Output selection: complete (22 pin) ON
* 4	The timing of the complete signal output depends on setting mode 2-2: complete signal output mode (shown in the chart as 1: stable and after the judging timer has elapsed)				
* 5	Under is ON when compared weight value ＜ final setting value - under setting value Over is ON when compared weight value ＞ final setting value + over setting value GO is ON when final setting value + over setting value ≧ compared weight value ≧ final setting value - under setting value				
* 6	The timing of over/under comparison depends on setting mode 2-2: over/under comparison mode (shown in the chart as 0: compare regularly)				
8	After complete output timer has elapsed		Setting mode 1-3: 　complete output time (t3) Setting mode 2-2: 　output selection (22 pin)		Output selection: complete (22 pin) OFF
9	Start of next weighing		Setting mode 0-9: final		
* 7	After the previous weighing is complete, considered to be ready for the next weighing when the weight value falls below 25% of final.				
	......				

Chapter

5

Timing Chart for Weighing

5-2. Normal sequence control

t0: comparison inhibit time 1
t1: comparison inhibit time 2
t2: judging time
t3: complete output time
SP1: set point 1
SP2: set point 2
SP3: set point 3

No.	Sequence control operation	Checking status display	Keys for relevant settings	External input signal to be used	External output signal to be used
1	Waiting for input of start signal	SP1/SP2/SP3 blinks	Setting mode 0-4: set point 1 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 1 (7 pin) ON
	SP1/SP2/SP3 blinks at medium speed				
2	Execution of tare subtraction	Tare lights up	Setting mode 2-1: final and over/under comparison	Tare subtraction (5 pin)	
	Sets the compared weight value to zero (In the chart, tare subtraction is executed by external input and the NET weight is set to zero.)				
3	Input of start signal ON	SP1/SP2/SP3 lights up	Setting mode 5-1: input selection	Start (input selection)	Set point 1 (7 pin) ON Set point 2 (8 pin) ON Set point 3 (9 pin) ON
4	OFF condition for set point 1	SP1 light goes out	Setting mode 0-4: set point 1 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 1 (7 pin) OFF
* 1	Set point 1 output is OFF when compared weight value $\geqq$ final setting value - set point 1 setting value				
5	Operation of the comparison inhibit timer		Setting mode 1-1: comparison inhibit time (t0)		
6	OFF condition for set point 2	SP2 light goes out	Setting mode 0-5: set point 2 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 2 (8 pin) OFF
* 2	Set point 2 output is OFF when compared weight value $\geqq$ final setting value - set point 2 setting value				
7	Operation of the comparison inhibit timer		Setting mode 1-8: comparison inhibit time (t1)		
8	Final - compensation $\leqq$ net weight	SP3 light goes out	Setting mode 0-6: compensation Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 3 (9 pin) OFF
* 3	Set point 3 output is OFF when compared weight value $\geqq$ final setting value - compensation setting value				
9	Operation of the judging timer		Setting mode 1-2: judging time (t2)		

10	Output of complete signal and output of judging signal	HOLD lights up
		HI, GO or LO lights up
			Setting mode 0-7: over
			Setting mode 0-8: under
			Setting mode 0-9: final
			Setting mode 1-3:
			    complete output time (t3)
			Setting mode 2-1:
			    final and over/under comparison
			Setting mode 2-2:
			    output selection (22 pin)
			Setting mode 2-2:
			    complete signal output mode
					Over (10 pin) ON
					Under (11 pin) ON
					Output selection: GO (22 pin) ON
					Output selection: complete (22 pin) ON

* 4	Under is ON when compared weight value $<$ final setting value - under setting value Over is ON when compared weight value $>$ final setting value + over setting value GO is ON when final setting value + over setting value $\geqq$ compared weight value $\geqq$ final setting value - under setting value				
* 5	The timing of complete signal output depends on setting mode 2-2: complete signal output mode (shown in the chart as 1: after judging timer has elapsed) The timing of over/under comparison holds the weight value compared at complete ON regardless of setting mode 2-2: over/under comparison mode				

11	After complete output timer has elapsed	HOLD light goes out
		HI, GO or LO light goes out
			Setting mode 1-3:
			    complete output time (t3)
			Setting mode 2-2:
			    output selection (22 pin)
					Over (10 pin) OFF
					Under (11 pin) OFF
					Output selection: GO (22 pin) OFF
					Output selection: complete (22 pin) OFF

12	Waiting for input of start signal for next weighing	SP1/SP2/SP3 blinks			
	......				

5-3.   Sequence control (with adjust feeding)

t0: comparison inhibit time 1
t1: comparison inhibit time 2
t2: judging time
t3: complete output time
SP1: set point 1
SP2: set point 2
SP3: set point 3

No.	Sequence control operation	Checking status display	Keys for relevant settings	External input signal to be used	External output signal to be used
1	Waiting for start signal input	SP1/SP2/SP3 blinks			
	SP1/SP2/SP3 blinks at medium speed				
2	Execution of tare subtraction	Tare lights up	Setting mode 2-1: final and over/under comparison	Tare subtraction (5 pin)	
	Sets the compared weight value to zero (In the chart, tare subtraction is executed by external input and the NET weight is set to zero.)				
3	Start signal ON is input	SP1/SP2/SP3 lights up	Setting mode 5-1: input selection	Start (input selection)	Set point 1 (7 pin) ON Set point 2 (8 pin) ON Set point 3 (9 pin) ON
4	Final - set point 1 ≦ net weight	SP1 light goes out	Setting mode 0-4: set point 1 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 1 (7 pin) OFF
* 1	Set point 1 output is OFF when compared weight value ≧ final setting value - set point 1 setting value				
5	Operation of the comparison inhibit timer		Setting mode 1-1: comparison inhibit time (t0)		
6	Final - set point 2 ≦ net weight value	SP2 light goes out	Setting mode 0-5: set point 2 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 2 (8 pin) OFF
* 2	Set point 2 output is OFF when compared weight value ≧ final setting value - set point 2 setting value				
7	Operation of the comparison inhibit timer		Setting mode 1-8: comparison inhibit time (t1)		
8	Final - compensation ≦ net weight	SP3 light goes out	Setting mode 0-6: compensation Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 3 (9 pin) OFF
* 3	Set point 3 output is OFF when compared weight value ≧ final setting value - compensation setting value				
9	Operation of the judging timer Adjust feeding judging		Setting mode 0-8: under Setting mode 0-9: final Setting mode 1-2: judging time (t2) Setting mode 2-1: final and over/under comparison Setting mode 2-4: adjust feeding		
* 4	Executes adjust feeding judging if adjust feeding selection in setting mode 2-4: sequence mode is 1: Adjust feeding ON - Judged to be under and switches to [No.10] sequence when compared weight < final setting value − under setting value - Switches to [No.12] sequence when compared weight ≧ final setting value − under setting value				
10	Operation of the adjust feeding timer	SP3 lights up	Setting mode 1-4: adjust feeding time		Set point 3 (9 pin) ON
* 5	While the adjust feeding timer is running, set point 3 signal is ON				
11	Operation of the judging timer Adjust feeding judging		Setting mode 0-8: under Setting mode 0-9: final Setting mode 1-2: judging time (t2) Setting mode 2-1: final and over/under comparison Setting mode 2-4: adjust feeding		
* 4	Executes adjust feeding judging if adjust feeding selection in setting mode 2-4: sequence mode is 1: Adjust feeding ON - Judged to be under and switches to [No.10] sequence when compared weight < final setting value - under setting value - Switches to [No.12] sequence when compared weight ≧ final setting value − under setting value				
12	Output of complete signal and output of judging signal	HOLD lights up HI or GO lights up	Setting mode 0-7: over Setting mode 0-9: final Setting mode 1-3: complete output time (t3) Setting mode 2-1: final and over/under comparison Setting mode 1-3: complete output time (t3) Setting mode 2-2: output selection (22 pin) Setting mode 2-2: complete signal output mode		Over (10 pin) ON Output selection: GO (22 pin) ON Output selection: complete (22 pin) ON
* 4	Over is ON when compared weight value > final setting value + over setting value GO is ON when final setting value + over setting value ≧ compared weight value ≧ final setting value - under setting value				
* 6	The timing of complete signal output depends on setting mode 2-2: complete signal output mode (shown in the chart as 1: after judging timer has elapsed) The timing of over/under comparison holds the weight value compared at complete ON regardless of setting mode 2-2:over/under comparison mode				
13	After complete output timer has elapsed	HOLD light goes out HI or GO light goes out	Setting mode 1-3: complete output time (t3) Setting mode 2-2: output selection (22 pin)		Over (10 pin) OFF Output selection: GO (22 pin) OFF Output selection: complete (22 pin) OFF
	......				

5-4. Sequence control (with external judging)

t0: comparison inhibit time 1
t1: comparison inhibit time 2
t2: judging time
t3: complete output time
SP1: set point 1
SP2: set point 2
SP3: set point 3

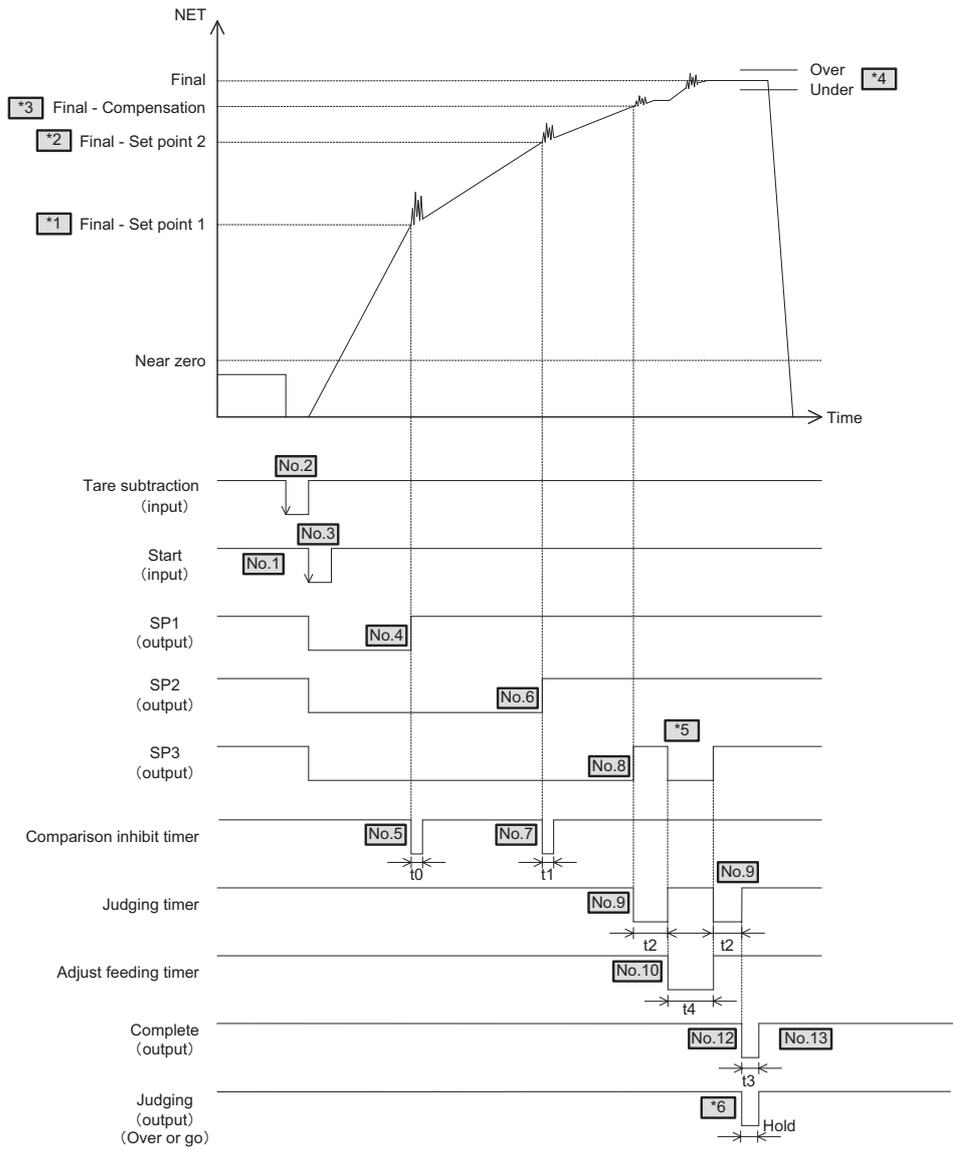| No.	Sequence control operation	Checking status display	Keys for relevant settings	External input signal to be used	External output signal to be used
1	Waiting for start signal input	SP1/SP2/SP3 blinks			
	SP1/SP2/SP3 blinks at medium speed				
2	Execution of tare subtraction	Tare lights up	Setting mode 2-1: final and over/under comparison	Tare subtraction (5 pin)	
	Sets the compared weight value to zero (In the chart, tare subtraction is executed by external input and the NET weight is set to zero.)				
3	Start signal ON is input	SP1/SP2/SP3 lights up	Setting mode 5-1: input selection	Start (input selection)	Set point 1 (7 pin) ON Set point 2 (8 pin) ON Set point 3 (9 pin) ON
4	Final - set point 1 ≦ net weight	SP1 light goes out	Setting mode 0-4: set point 1 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 1 (7 pin) OFF
* 1	Set point 1 output is OFF when compared weight value ≧ final setting value - set point 1 setting value				
5	Operation of the comparison inhibit timer		Setting mode 1-1: comparison inhibit time (t0)		
6	Final - set point 2 ≦ net weight value	SP2 light goes out	Setting mode 0-5: set point 2 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 2 (8 pin) OFF
* 2	Set point 2 output is OFF when compared weight value ≧ final setting value - set point 2 setting value				
7	Operation of the comparison inhibit timer		Setting mode 1-8: comparison inhibit time (t1)		
8	Final - compensation ≦ net weight	SP3 light goes out	Setting mode 0-6: compensation Setting mode 0-9: final Setting mode 2-1: final and over/under comparison	.	Set point 3 (9 pin) OFF
* 3	Set point 3 output is OFF when compared weight value ≧ final setting value - compensation setting value				
9	Operation of the judging timer		Setting mode 1-2: judging time (t2)		
10	Waiting for judging signal input Output of adjust feeding in progress signal	HI or LO blinks	Setting mode 0-7: over Setting mode 0-8: under Setting mode 0-9: final Setting mode 2-1: final and over/under comparison Setting mode 2-2: over/under comparison mode Setting mode 5-2: output selection		Output selection: waiting for external judging (23 pin) ON
* 4	External judging input is enabled when setting mode 2-2: over/under comparison mode is set to 1: compare when external judging input is ON. If the over-under comparison result is anything other than GO, the displayed result will blink and a waiting for external judging signal will turn ON (signal for over/under comparison result will also turn ON) Switches to [No.12] sequence if over/under comparison result is GO.				
* 6	Judged to be under when compared weight value < final setting value − under setting value Judged to be over when compared weight value > final setting value + over setting value Judged to be GO when final setting value + over setting value ≧ compared weight value ≧ final setting value − under setting value				
11	Waiting for input of judging signal Output of adjust feeding in progress signal	HI or LO light goes out	Setting mode 0-7: over Setting mode 0-8: under Setting mode 0-9: final Setting mode 2-1: final and over/under comparison Setting mode 1-2: judging time (t2) Setting mode 5-1: input selection Setting mode 5-2: output selection	Judging (input selection)	Output selection: waiting for external judging (23 pin) OFF
* 5	When judging signal ON is input, the blinking judging result will go out, output of waiting for external judging will turn OFF, and judging timer will begin operating. Switches to [No.10] sequence if the over/under comparison result is anything other than GO when judging is re-executed after the judging timer has elapsed. Switches to [No.12] sequence if over/under comparison result is GO.				
* 6	Judged to be under when compared weight value < final setting value − under setting value Judged to be over when compared weight value > final setting value + over setting value Judged to be GO when final setting value + over setting value ≧ compared weight value ≧ final setting value − under setting value				
12	Output of complete signal and output of judging signal	HOLD lights up GO lights up	Setting mode 1-3: complete output time (t3) Setting mode 2-2: output selection (22 pin) Setting mode 2-2: complete signal output mode		Output selection: GO (22 pin) ON Output selection: complete (22 pin) ON
* 7	The timing of complete signal output depends on setting mode 2-2: complete signal output mode (shown in the chart as 1: after judging timer has elapsed.) The timing of over/under comparison holds the weight value compared at complete ON regardless of setting mode 2-2:over/under comparison mode				
13	After complete output timer has elapsed	HOLD light goes out GO light goes out	Setting mode 1-3: complete output time (t3) Setting mode 2-2: output selection (22 pin)		Output selection: GO (22 pin) OFF Output selection: complete (22 pin) OFF
14	Waiting for input of start signal for next weighing	SP1/SP2/SP3 blinks			
	SP1/SP2/SP3 blinks at medium speed				
	......				

5-5. Sequence control (with pause input/power failure restoration) [CASE 1]

t0: comparison inhibit time 1
t1: comparison inhibit time 2
t2: judging time
t3: complete output time
SP1: set point 1
SP2: set point 2
SP3: set point 3

* With power failure restoration, the operation restarts on start input.

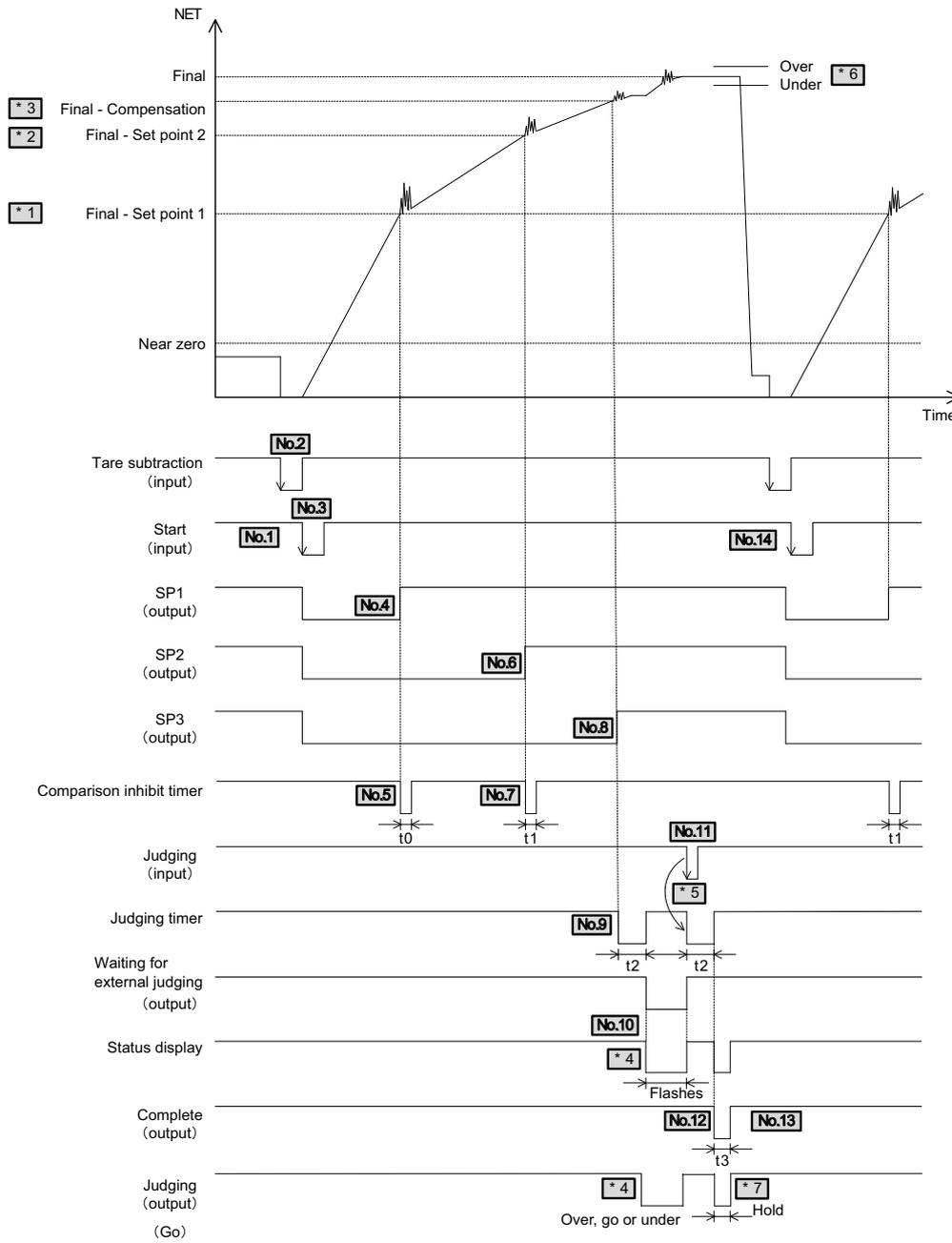| No.	Sequence control operation	Checking status display	Keys for relevant settings	External input signal to be used	External output signal to be used
1	Waiting for start signal input	SP1/SP2/SP3 blinks			
	SP1/SP2/SP3 blinks at medium speed				
2	Execution of tare subtraction	Tare lights up	Setting mode 2-1: final and over/under comparison	Tare subtraction (5 pin)	
	Sets the compared weight value to zero (In the chart, tare subtraction is executed by external input and the NET weight is set to zero.)				
3	Start signal ON is input	SP1/SP2/SP3 lights up	Setting mode 5-1: input selection	Start (input selection)	Set point 1 (7 pin) ON Set point 2 (8 pin) ON Set point 3 (9 pin) ON
4	Input of pause signal ON and waiting for restart	SP1/SP2/SP3 blinks	Setting mode 5-1: input selection Setting mode 5-2: output selection	Pause (input selection)	Set point 1 (7 pin) OFF Set point 2 (8 pin) OFF Set point 3 (9 pin) OFF Output selection: paused (23 pin) ON
* 1	When pause signal ON is input, status switches to paused, paused status output turns ON, and set point 1/set point 2/set point 3 turns OFF. SP1/SP2/SP3 blinks at low speed				
5	Input of start signal ON and control status after restart	SP1/SP2/SP3 lights up	Setting mode 5-1: input selection Setting mode 5-2: output selection Setting mode 5-3: restart setting set point 1	Start (input selection)	Set point 1 (7 pin) ON Set point 2 (8 pin) ON Set point 3 (9 pin) ON Output selection: paused (23 pin) OFF
* 2	During paused status, the operation is restarted when start signal ON is input. When restarting, returns to the last control output status, after confirming stability.				
* 3	The following restrictions apply to each of the control output statuses when restarting - Restored with OFF if previous status was OFF - Set point 1 output is OFF when weight value at restart ＞ (final - set point 1) × restart setting set point 1 when set point 1 is ON.				
6	Final - set point 1 ≦ net weight	SP1 light goes out	Setting mode 0-4: set point 1 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 1 (7 pin) OFF
* 4	Set point 1 output is OFF when compared weight value ≧ final setting value - set point 1 setting value				
7	Operation of the comparison inhibit timer		Setting mode 1-1: comparison inhibit time (t0)		
8	Final - set point 2 ≦ net weight value	SP2 light goes out	Setting mode 0-5: set point 2 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 2 (8 pin) OFF
* 5	Set point 2 output is OFF when compared weight value ≧ final setting value - set point 2 setting value				
9	Operation of the comparison inhibit timer		Setting mode 1-8: comparison inhibit time (t1)		
10	Final - compensation ≦ net weight	SP3 light goes out	Setting mode 0-6: compensation Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 3 (9 pin) OFF
* 6	Set point 3 output is OFF when compared weight value ≧ final setting value - compensation setting value				
11	Operation of the judging timer		Setting mode 1-2: judging time (t2)		
12	Output of complete signal and output of judging signal	HOLD lights up HI, GO or LO lights up	Setting mode 0-7: over Setting mode 0-8: under Setting mode 0-9: final Setting mode 1-3: complete output time (t3) Setting mode 2-1: final and over/under comparison Setting mode 2-2: output selection (22 pin) Setting mode 2-2: complete signal output mode		Over (10 pin) ON Under (11 pin) ON Output selection: GO (22 pin) ON Output selection: complete (22 pin) ON
* 7	Under is ON when compared weight value ＜ final setting value - under setting value Over is ON when compared weight value ＞ final setting value + over setting value GO is ON when final setting value + over setting value ≧ compared weight value ≧ final setting value - under setting value				
* 8	The timing of complete signal output depends on setting mode 2-2: complete signal output mode (shown in the chart as 1: after judging timer has elapsed.) The timing of over/under comparison holds the weight value compared at complete ON regardless of setting mode 2-2:over/under comparison mode				
13	After complete output timer has elapsed	HOLD light goes out HI, GO or LO light goes out	Setting mode 1-3: complete output time (t3) Setting mode 2-2: output selection (22 pin)		Over (10 pin) OFF Under (11 pin) OFF Output selection: GO (22 pin) OFF Output selection: complete (22 pin) OFF
14	Waiting for input of start signal for next weighing	SP1/SP2/SP3 blinks			
	SP1/SP2/SP3 blinks at medium speed				
	......				

5-6. Sequence control (with pause input/power failure restoration) [CASE 2]

t0: comparison inhibit time 1
t1: comparison inhibit time 2
t2: judging time
t3: complete output time
SP1: set point 1
SP2: set point 2
SP3: set point 3

* With power failure restoration, the operation restarts on start input.

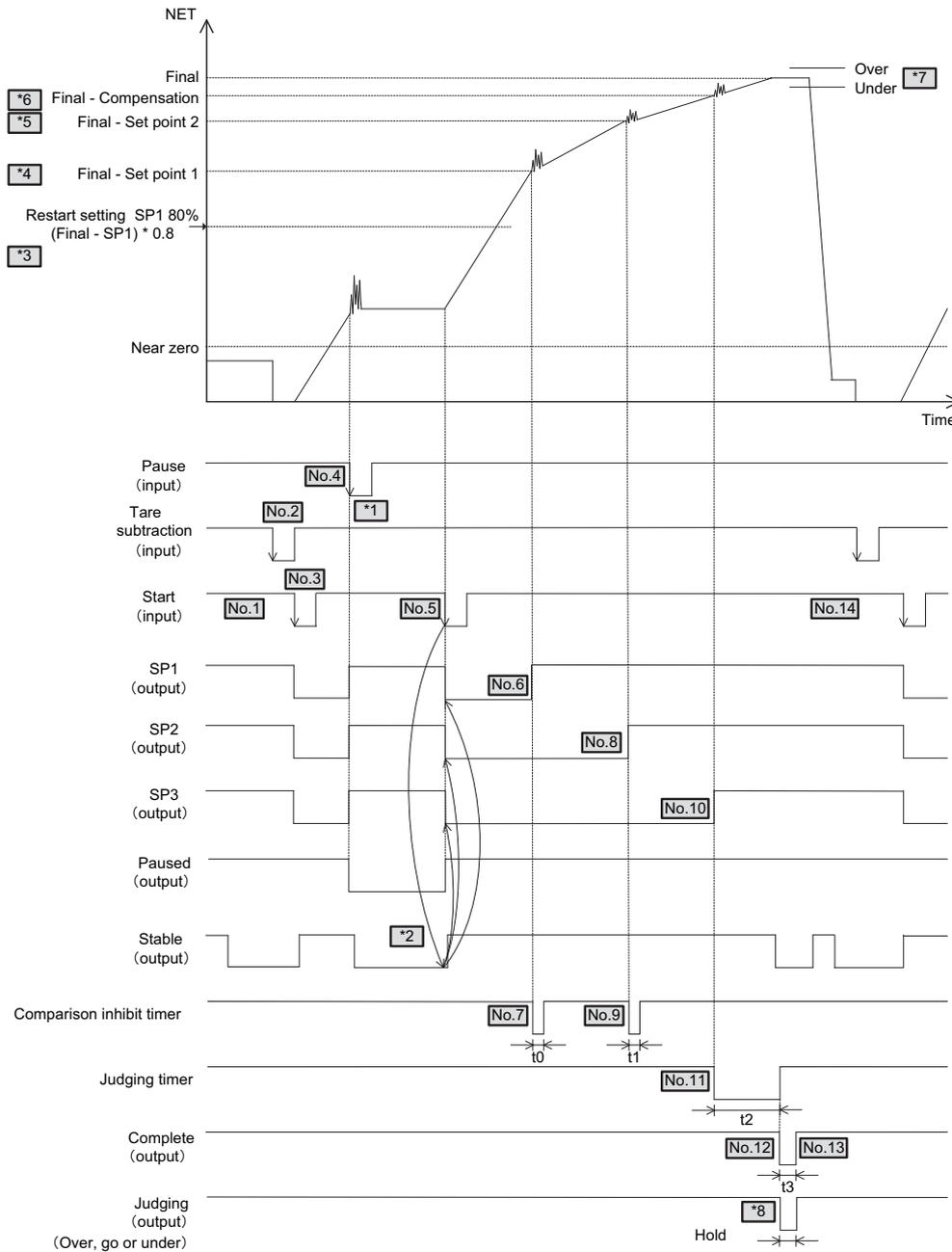| No.	Sequence control operation	Checking status display	Keys for relevant settings	External input signal to be used	External output signal to be used
1	Waiting for start signal input	SP1/SP2/SP3 blinks			
	SP1/SP2/SP3 blinks at medium speed				
2	Execution of tare subtraction	Tare lights up	Setting mode 2-1: final and over/under comparison	Tare subtraction (5 pin)	
	Sets the compared weight value to zero (In the chart, tare subtraction is executed by external input and the NET weight is set to zero.)				
3	Start signal ON is input	SP1/SP2/SP3 lights up	Setting mode 5-1: input selection	Start (input selection)	Set point 1 (7 pin) ON Set point 2 (8 pin) ON Set point 3 (9 pin) ON
4	Input of pause signal ON and waiting for restart	SP1/SP2/SP3 blinks	Setting mode 5-1: input selection Setting mode 5-2: output selection	Pause (input selection)	Set point 1 (7 pin) OFF Set point 2 (8 pin) OFF Set point 3 (9 pin) OFF Output selection: paused (23 pin) ON
* 1	When the pause signal ON is input, status switches to paused, paused status output turns ON, and set point 1/set point 2/set point 3 turns OFF. SP1/SP2/SP3 blinks at low speed				
5	Start signal ON input and the control status after restarting	SP2/SP3 lights up SP1 goes out	Setting mode 5-1: input selection Setting mode 5-2: output selection Setting mode 5-3: restart setting set point 1	Start (input selection)	Set point 1 (7 pin) ON Set point 2 (8 pin) ON Set point 3 (9 pin) ON Output selection: paused (23 pin) OFF
* 2	During paused status, the operation is restarted when start signal ON is input. When restarting, returns to the last control output status, after confirming stability.				
* 3	The following restrictions apply to each of the control output status when restarting - Restored with OFF if previous status was OFF - Set point 1 output is OFF when weight value at restart > (final - set point 1) × restart setting set point 1 when set point 1 is ON.				
* 4	Set point 1 output is OFF when compared weight value ≧ final setting value - set point 1 setting value * In the chart, the OFF condition is met through set point 1 of restart setting.				
6	Final - set point 2 ≦ net weight value	SP2 goes out	Setting mode 0-5: set point 2 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 2 (8 pin) OFF
* 5	Set point 2 output is OFF when compared weight value ≧ final setting value - set point 2 setting value				
7	Operation of the comparison inhibit timer		Setting mode 1-8: comparison inhibit time (t1)		
8	Final - compensation ≦ net weight	SP3 goes out	Setting mode 0-6: compensation Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 3 (9 pin) OFF
* 6	Set point 3 output is OFF when compared weight value ≧ final setting value - compensation setting value				
9	Operation of the judging timer		Setting mode 1-2: judging time (t2)		
10	Output of complete signal and output of judging signal	HOLD lights up HI, GO or LO lights up	Setting mode 0-7: over Setting mode 0-8: under Setting mode 0-9: final Setting mode 1-3: complete output time (t3) Setting mode 2-1: final and over/under comparison Setting mode 2-2: output selection (22 pin) Setting mode 2-2: complete signal output mode		Over (10 pin) ON Under (11 pin) ON Output selection: GO (22 pin) ON Output selection: complete (22 pin) ON
* 7	Under is ON when compared weight value < final setting value - under setting value Over is ON when compared weight value > final setting value + over setting value GO is ON when final setting value + over setting value ≧ compared weight value ≧ final setting value - under setting value				
* 8	The timing of complete signal output depends on setting mode 2-2: complete signal output mode (shown in the chart as 1: after judging timer elapse.) The timing of over/under comparison holds the weight value compared at complete ON regardless of setting mode 2-2:over/under comparison mode				
11	After complete output timer has elapsed	HOLD goes out HI, GO or LO goes out	Setting mode 1-3: complete output time (t3) Setting mode 2-2: output selection (22 pin)		Over (10 pin) OFF Under (11 pin) OFF Output selection: GO (22 pin) OFF Output selection: complete (22 pin) OFF
12	Waiting for input of start signal for next weighing	SP1/SP2/SP3 blinks			
	......				

Chapter

5

Timing Chart for Weighing

5-7. Sequence control (with pause input/power failure restoration) [CASE 3]

t0: comparison inhibit time 1
t1: comparison inhibit time 2
t2: judging time
t3: complete output time
t4: compensation feeding Time
SP1: set point 1
SP2: set point 2
SP3: set point 3

* With power failure restoration, the operation restarts on start input.

No.	Sequence control operation	Checking status display	Keys for relevant settings	External input signal to be used	External output signal to be used
1	Waiting for start signal input	SP1/SP2/SP3 blinks			
	SP1/SP2/SP3 blinks at medium speed				
2	Execution of tare subtraction	Tare lights up	Setting mode 2-1: final and over/under comparison	Tare subtraction (5 pin)	
	Sets the compared weight value to zero (In the chart, tare subtraction is executed by external input and the NET weight is set to zero.)				
3	Start signal ON is input	SP1/SP2/SP3 lights up	Setting mode 5-1: input selection	Start (input selection)	Set point 1 (7 pin) ON Set point 2 (8 pin) ON Set point 3 (9 pin) ON
4	OFF condition for set point 1	SP1 light goes out	Setting mode 0-4: set point 1 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 1 (7 pin) OFF
*1	Set point 1 output is OFF when compared weight value $\geqq$ final setting value - set point 1 setting value				
5	Operation of the comparison inhibit timer		Setting mode 1-1: comparison inhibit time (t0)		Set point 2 (8 pin) OFF
6	OFF condition for set point 2	SP2 light goes out	Setting mode 0-5: set point 2 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 2 (8 pin) OFF
*2	Set point 2 output is OFF when compared weight value $\geqq$ final setting value - set point 2 setting value				
7	Operation of the comparison inhibit timer		Setting mode 1-8: comparison inhibit time (t1)		
8	Input of pause signal ON and waiting for restart	SP1/SP2/SP3 blinks	Setting mode 5-1: input selection Setting mode 5-2: output selection	Pause (input selection)	Set point 3 (9 pin) OFF Output selection: paused (23 pin) ON
*3	When the pause signal ON is input, status switches to paused, paused status output turns ON, and set point 1/set point 2/set point 3 turns OFF. SP1/SP2/SP3 blinks at low speed				
9	Input of start signal ON and control status after restarting	SP3 lights up	Setting mode 5-1: input selection Setting mode 5-2: output selection Setting mode 5-5: restart setting set point 3	Start (input selection)	Set point 3 (9 pin) ON Output selection: paused (23 pin) OFF
*4	During paused status, the operation is restarted when start signal ON is input. When restarting, returns to the last control output status, after confirming stability.				
*5	The following restrictions apply to each of the control output statuses when restarting - Restarting does not take place when the previous set point 3 was in OFF status (because either the weighing has already completed or weighing has not yet started) - Set point 3 output turns ON in the following condition, weight value at restart > (final - compensation)× restart setting set point 3 when set point 3 is ON.				
10	Operation of the adjust feeding timer	SP3 lights up	Setting mode 1-4: adjust feeding time (t4)		Set point 3 (9 pin) ON
*6	Set point 3 signal is ON for the duration of compensation feeding time.				
11	Judgment of set point 3 control		Setting mode 0-6: compensation Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		
*7	Switches to [No.10] sequence when compared weight < final setting value − compensation setting value Switches to [No.12] sequence when compared weight $\geqq$ final setting value − compensation setting value				
*8	Set point 3 output is OFF when compared weight value $\geqq$ final setting value - compensation setting value (Set point 3 control in the chart due to the condition of set point 3 of restart setting)				
12	Operation of the judging timer	SP3 light goes out	Setting mode 1-2: judging time (t2)		Set point 3 (9 pin) OFF
13	Output of complete signal and output of judging signal	HOLD lights up HI, GO or LO lights up	Setting mode 0-7: over Setting mode 0-8: under Setting mode 0-9: final Setting mode 1-3: complete output time (t3) Setting mode 2-1: final and over/under comparison Setting mode 2-2: output selection (22 pin) Setting mode 2-2: complete signal output mode		Over (10 pin) ON Under (11 pin) ON Output selection: GO (22 pin) ON Output selection: complete (22 pin) ON
*9	Under is ON when compared weight value < final setting value - under setting value Over is ON when compared weight value > final setting value + over setting value GO is ON when final setting value + over setting value $\geqq$ compared weight value $\geqq$ final setting value - under setting value				
*10	The timing of complete signal output depends on setting mode 2-2: complete signal output mode (shown in the chart as 1: after judging timer elapse) The timing of over/under comparison holds the weight value compared at complete ON regardless of setting mode 2-2:over/under comparison mode				
14	After complete output timer has elapsed	HOLD light goes out HI, GO or LO light goes out	Setting mode 1-3: complete output time (t3) Setting mode 2-2: output selection (22 pin)		Over (10 pin) OFF Under (11 pin) OFF Output selection: GO (22 pin) OFF Output selection: complete (22 pin) OFF
	......				

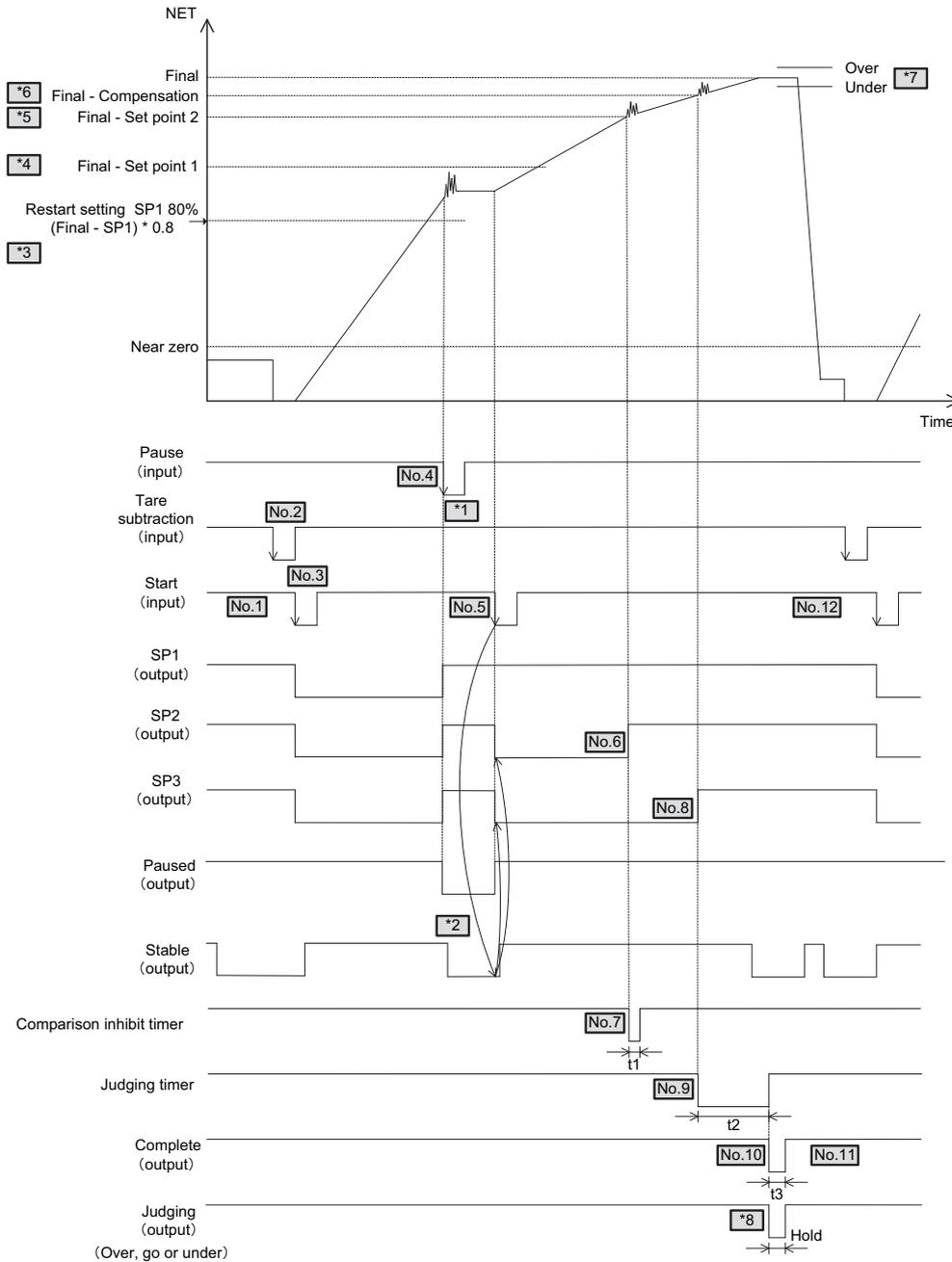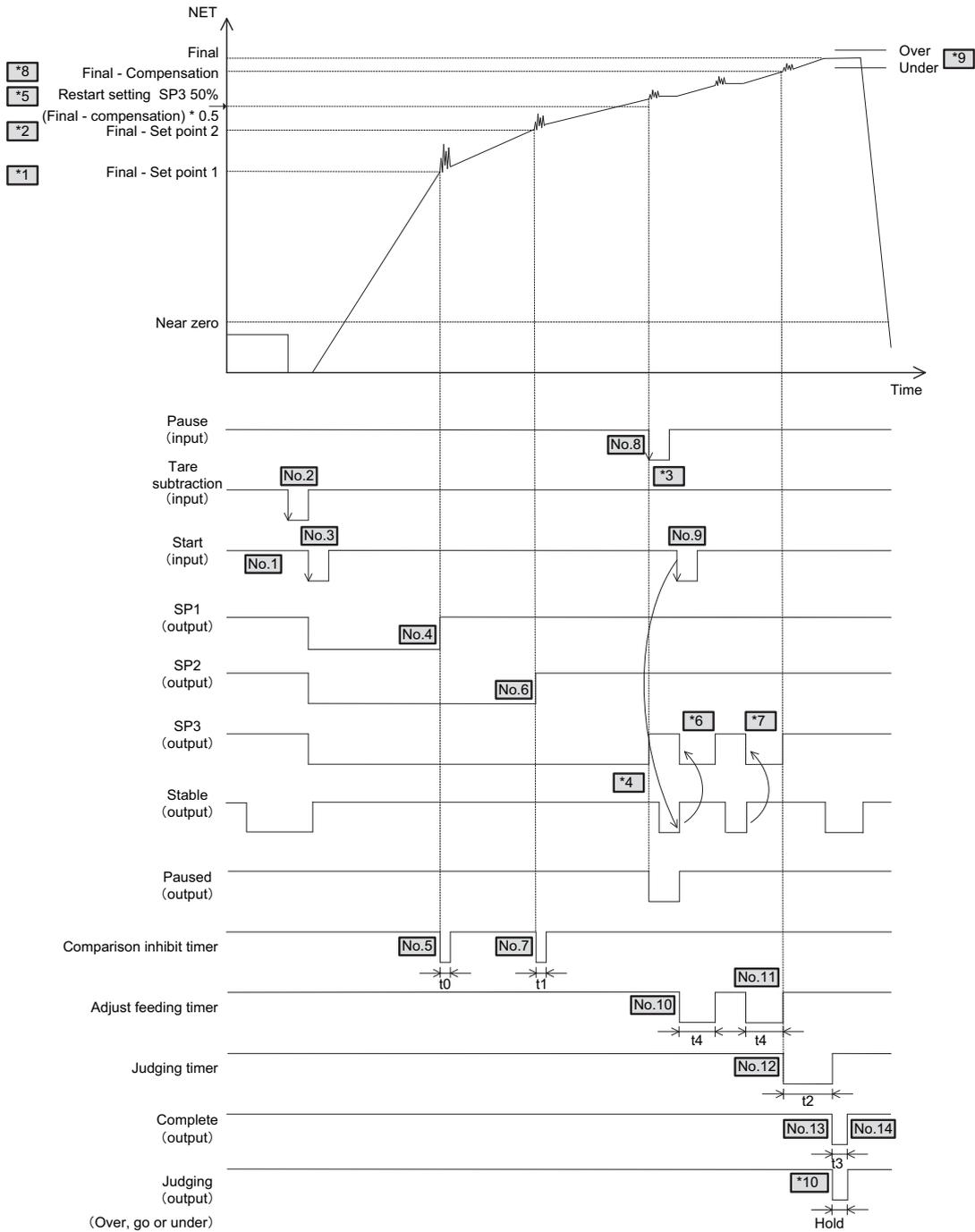## 5-8.   Sequence control (knocking)

t0: comparison inhibit time 1
t1: comparison inhibit time 2
t2: judging time
t3: complete output time
t4: knocking time
SP1: set point 1
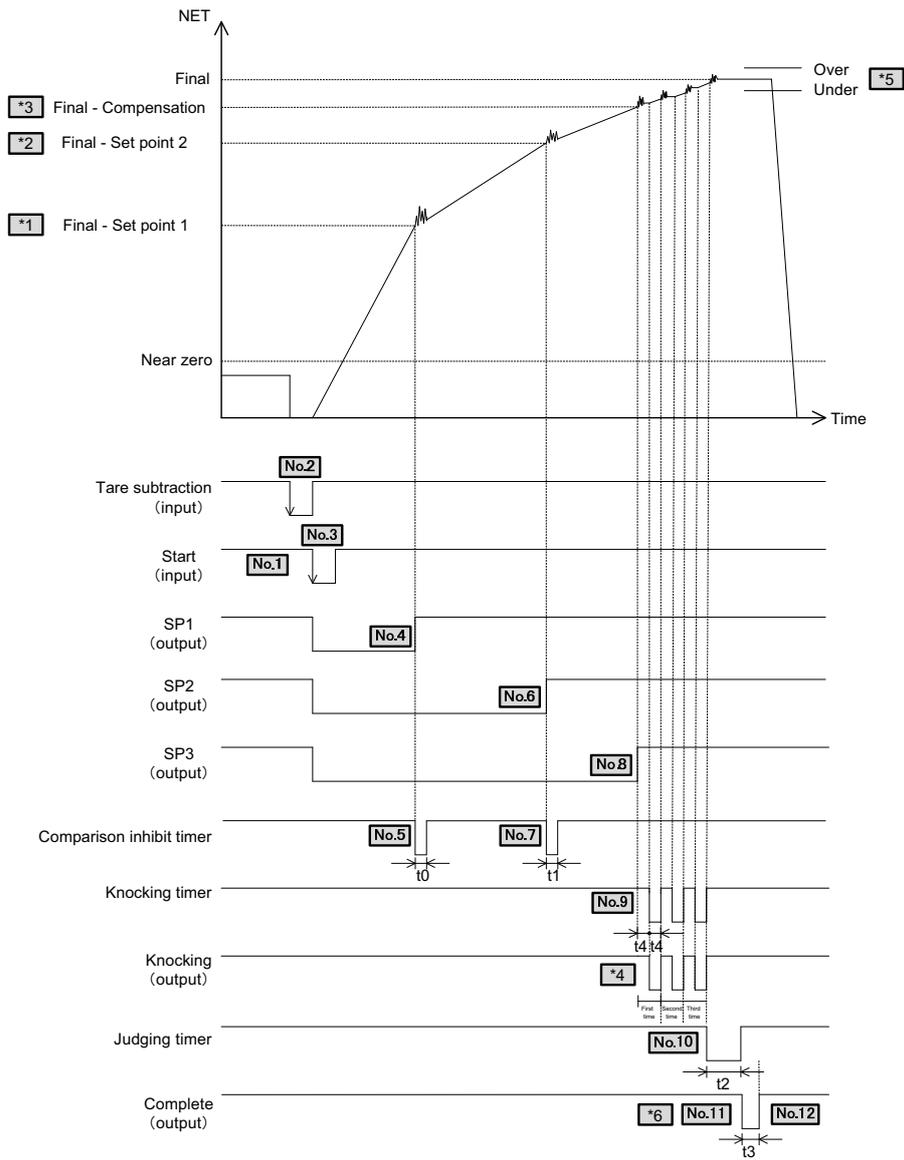SP2: set point 2
SP3: set point 3

No.	Sequence control operation	Checking status display	Keys for relevant settings	External input signal to be used	External output signal to be used
1	Waiting for start signal input	SP1/SP2/SP3 blinks			
	SP1/SP2/SP3 blinks at medium speed				
2	Execution of tare subtraction	Tare lights up	Setting mode 2-1: final and over/under comparison	Tare subtraction (5 pin)	
	Sets the compared weight value to zero (In the chart, tare subtraction is executed by external input and the NET weight is set to zero.)				
3	Start signal ON is input	SP1/SP2/SP3 lights up	Setting mode 5-1: input selection	Start (input selection)	Set point 1 (7 pin) ON Set point 2 (8 pin) ON Set point 3 (9 pin) ON
4	Final - set point 1 ≦ net weight	SP1 light goes out	Setting mode 0-4: set point 1 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 1 (7 pin) OFF
*1	Set point 1 output is OFF when compared weight value ≧ final setting value - set point 1 setting value				
5	Operation of the comparison inhibit timer		Setting mode 1-1: comparison inhibit time (t0)		
6	Final - set point 2 ≦ net weight value	SP2 light goes out	Setting mode 0-5: set point 2 Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 2 (8 pin) OFF
*2	Set point 2 output is OFF when compared weight value ≧ final setting value - set point 2 setting value				
7	Operation of the comparison inhibit timer		Setting mode 1-8: comparison inhibit time (t1)		
8	Final - compensation ≦ net weight	SP3 light goes out	Setting mode 0-6: compensation Setting mode 0-9: final Setting mode 2-1: final and over/under comparison		Set point 3 (9 pin) OFF
*3	Set point 3 output is OFF when compared weight value ≧ final setting value - compensation setting value				
9	Operation of the knocking timer		Setting mode 5-2: output selection (23 pin) Setting mode 5-6: number of times for knocking Setting mode 5-7: knocking time (t4)		Output selection: knocking output (23 pin) ON
*4	While the knocking timer is running, the knocking output repeatedly turns OFF → ON in accordance with the number of times set.				
10	Operation of the judging timer		Setting mode 1-2: judging time (t2)		
11	Output of complete signal and output of judging signal	HOLD lights up HI, GO or LO lights up	Setting mode 0-7: over Setting mode 0-8: under Setting mode 0-9: final Setting mode 1-3: complete output time (t3) Setting mode 2-1: final and over/under comparison Setting mode 1-3: complete output time (t3) Setting mode 2-2: output selection (22 pin) Setting mode 2-2: complete signal output mode		Over (10 pin) ON Under (11 pin) ON Output selection: GO (22 pin) ON Output selection: complete (22 pin) ON Output selection: knocking output (23 pin) OFF
*7	Under is ON when compared weight value < final setting value - under setting value Over is ON when compared weight value > final setting value + over setting value GO is ON when final setting value + over setting value ≧ compared weight value ≧ final setting value - under setting value				
*8	The timing of complete signal output depends on setting mode 2-2: complete signal output mode (shown in the chart as 1: after judging timer elapse) The timing of over/under comparison holds the weight value compared at complete ON regardless of setting mode 2-2:over/under comparison mode				
12	After complete output timer has elapsed	HOLD light goes out HI, GO or LO light goes out	Setting mode 1-3: complete output time (t3) Setting mode 2-2: output selection (22 pin)		Setting mode 1-3: complete output time (t3) Setting mode 2-2: output selection (22 pin)
13	Waiting for input of start signal for next weighing				
	SP1/SP2/SP3 blinks at medium speed				
	......				

6 Useful Functions

Here are some useful functions when using F701+.

6-1. Prohibiting operation of designated keys

The operation of designated keys (P.14"■ How to use the designated keys") on the front panel can be prohibited to prevent malfunctions due to key operation.

[Function key prohibition] (setting mode 2-5)

<TARE> key
1: Enabled
0: Prohibited

<TARE RESET> key
1: Enabled
0: Prohibited

<GROSS/NET> key
1: Enabled
0: Prohibited

<ZERO> key
1: Enabled
0: Prohibited
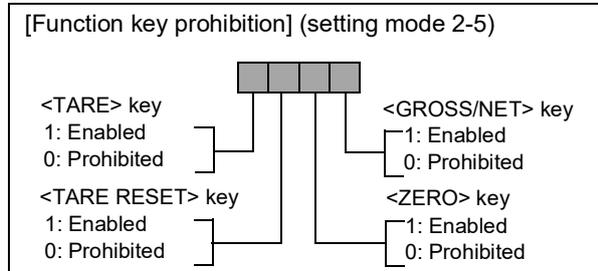
6-2. Locking changes made to setting values

LOCK can be enabled to prevent calibration and setting values from being changed due to operational errors.

There are two types of LOCK: hardware LOCK and software LOCK. Both LOCKs must be released during calibration. After calibration, enable the LOCK to protect the setting and calibrated values. Refer to (P.19"3-4-1.Setting value LOCK") for procedures.

6-3. Checking the option substrate (display only)

If an option substrate has been mounted, "1" will be displayed.

[Option substrate] (setting mode 3-9)

(1: Substrate implementation)
RS-232C I/F substrate
RS-485 I/F substrate
D/A converter I/F substrate
BCD parallel data output I/F substrate
PROFIBUS I/F substrate
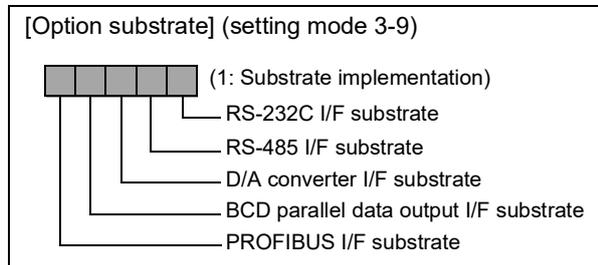
6-4. Using the function for setting value restoration

The current setting value (value registered for restoration) can be saved. The saved value can be restored.

6-4-1.Procedures for saving and restoration

■ Saving a setting value

Input "3964" in setting mode 9-9 to save the current setting value as the setting value for restoration.

[Save setting value] (setting mode 9-9)

3 9 6 4
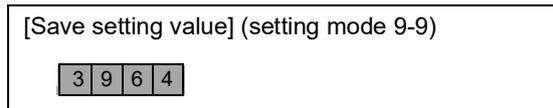
■ Restoring a setting value

Input "3965" in setting mode 9-9 to restore the setting value for restoration.

[Restore setting value] (setting mode 9-9)

3 9 6 5
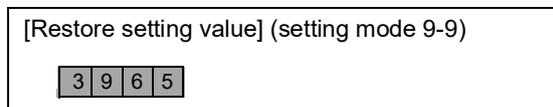
6-5.   Using the function for power failure restoration

This function is to recover the status from the previous operation after turning the power back on or when the device is restored from a power failure in sequence mode. The status of the immediately preceding operation (sequence no., control output ON/OFF) is recovered. This function is enabled only when setting mode 2-4 is set to "sequence mode (with power failure restoration)".

6-6.   Changing the A/D conversion rate

The conversion rate of the A/D converter in F701+ can be switched between 100 times/sec and 500 times/sec. To enable this setting, the device must be restarted. The conversion rate can also be changed with the following procedure.

[A/D conversion rate] (setting mode 9-8)

(Input range: 100 or 500)

Turn the power ON while pressing [O] to change to 500 times/sec.
Turn the power ON while pressing [O] + [F] to change to 100 times/sec.

6-7.   Using the self-check function

■ Self-check

This device is equipped with a self-check function in which the memory is checked automatically to detect errors, as well as a visual check function in which the display unit can be checked visually.

Turn the power ON while pressing the [GROSS/NET] key.

	Content		Type	
1	Software version		Display	
2	Display unit lights up fully		Display	
3	RAM read/write	check	Automatic	← "Error1" in the event of an error
4	ROM checksum	check	Automatic	← "Error2" in the event of an error
5	Status display lights up in sequence		Visual	
6	Display unit 7 segment lights up		Visual	
7	NOV RAM read/write	check	Automatic	← "Error3" in case of an error
8	PASS is displayed and the check is complete.		Display	

(Software version displays may differ depending on time of purchase.)
(NOV RAM check is not performed when the lock switch on the rear panel is ON.)
(Confirm the display unit by visual check.)
(Check stops when there is a memory check error.)
(If check stops or the display unit does not display information correctly, it is a sign of failure.
Repair can be performed at UNIPULSE or at the point of purchase.)

■ Memory clear

Performs a self-check after clearing the setting values and the work area. (ALLCLr (ALLCLr) is displayed.) However, setting and calibration values on the NOV RAM (Non-volatile memory) do not change.

Turn the power ON while pressing [GROSS/NET] and [CNG/ENT].

6-8.   Replacing the I/O substrate

The I/O substrate can be replaced.
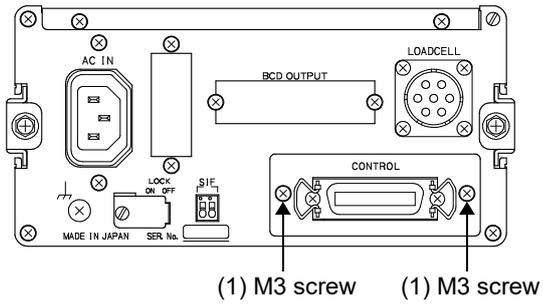
(1) M3 screw   (1) M3 screw

To replace the I/O substrate, remove the two M3 screws (1), pull out the whole control panel, and then replace. After replacement, retighten the M3 screws (1).

6-9.   Using the SI/F interface

SI/F interface is a dedicated interface for connecting external devices such as printers and large display units made by UNIPULSE.

- Transmitting distance: Approx. 300 meters.

- Up to three external devices can be connected with no polarity (The information to be displayed can be selected separately for each device.)

- Wires to be used are parallel two-core cables or cabtire cables (However, AC lines and high-pressure lines should not be connected in parallel.)

Connection example 1: Three units of the same model are connected, each with different display content selected

F701+ SI/F

LD514 Small display unit
Tare (TARE) display

LD514 Small display unit
Gross weight (GROSS) display

LD514 Small display unit
Net weight (NET) display

Connection example 2: Three units of different model are connected

F701+ SI/F

LD557A
Large display unit

LD514
Small display unit

M252B
Printer

■ Automatic print command

F701+ can output automatic print commands to printers and display units connected to SI/F.

In sequence mode .... Outputs a command when the judging signal (GO, OVER, UNDER) turns ON. Therefore, automatic print commands will not be output when it is set to "no judging" (judging times = 00).

In simple comparison mode...... Outputs a command when the complete signal turns ON. Therefore, the automatic print command will not be output when final and over/under comparison are set to "compare OFF" (setting mode 2-1).

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6-10. Using an RS-232C interface (option)

The details for an RS-232C interface are as follows.

6-10-1. Communication specifications

■ Standards

Signal level	RS-232C compliant	
Transmitting distance	Approx. 15 m	
Transmitting method	Asynchronous, full duplex	
Transmitting speed	Select from 4800, 9600, 19200, 38400, 57600, 115.2k bps	
Bit configuration	Start bit	1 bit
	Character length	Select from 7 or 8 bits
	Stop bit	Select from 1 or 2 bits
	Parity bit	Select from none, odd or even
Code	ASCII	

■ Connector pin assignment

Compatible connector: 9-pin D-SUB connector

(DE-09SN manufactured by JAE, XM2D-0901 manufactured by OMRON and so on)

1			6	IN	DSR
2	IN	RXD	7		
3	OUT	TXD	8		
4	OUT	DTR	9		
5	*	GND			

■ Cables

Use a cross type cable if the cable is connected to a DTE (data terminal device, PC and so on) and a straight type cable if connected to a DCE (data circuit terminator, modem and so on). Below are examples of using cross cables.

6-10-2.Settings related to SRS-232C

■ Settings for RS-232C I/F

The setting values for the PC or PLC to be connected to and the RS-232C of the main unit must be the same.

```
[Settings for RS-232C I/F] (setting mode 4-4)

Baud rate selection        ▭▭▭▭▭
  6: Printer mode                        Terminator
  5: 115.2kbps                             7: Communication mode 6
  4: 57600 bps                             6: Communication mode 5
  3: 38400 bps                             5: Communication mode 4
  2: 19200 bps                             4: Communication mode 3
  1: 9600  bps                             3: Communication mode 2
  0: 4800  bps                             2: Communication mode 1
                                           1: Communication mode 0/CR+LF
Character length                           0: Communication mode 0/CR
  1: 8 bits
  0: 7 bits                             Stop bit
                                          1: 2 bits
Parity bit                                0: 1 bit
  2: Even
  1: Odd
  0: None
```

6-10-3.Communication mode

- Communication mode 0

Communicates by command from the host computer.
(Weight values are not transmitted automatically.)
In-transmission delimiter is selectable from CR and CR+LF.

- Communication mode 1

Transmits gross weight continuously.
Ignores all R, W, and C commands.

| Transmission format 1 | (20 bytes) |

- Communication mode 2

Transmits net weight continuously.
Ignores all R, W, and C commands.

| Transmission format 2 | (20 bytes) |

- Communication mode 3

Transmits gross weight and net weight continuously.
Ignores all R, W, and C commands.

| Transmission format 3 | (23 bytes) |

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- Communication mode 4

Transmits gross weight once when outputting an automatic print command.

Ignore all R, W, and C commands.

Transmission format 1	(20 bytes)
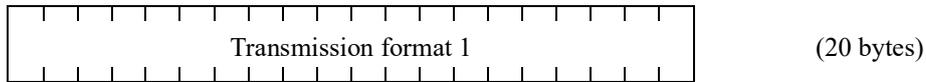
- Communication mode 5

Transmits net weight once when outputting an automatic print command.

Ignores all R, W, and C commands.

Transmission format 2	(20 bytes)
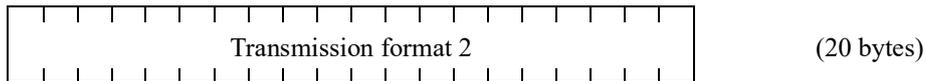
- Communication mode 6

Transmits gross weight and net weight once when outputting an automatic print command.

Ignores all R, W, and C commands.

Transmission format 3	(23 bytes)
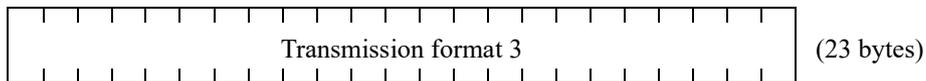
Attention

Refer to P.67"6-10-4.Transmission format" for details on the transmission format and P.63"■ Automatic print command" for details on the automatic printing function.

Key point

Timing of continuous transmission

When transmission mode 1, 2 or 3 is selected, the remote continuous transmissions are as follows, according to the communication baud rate settings.

Communication baud rate	Remote continuous transmission
115.2k bps	When the A/D convert rate is 500 times/sec, 250 times/sec When the A/D convert rate is 100 times/sec, 100 times/sec
57600 bps	When the A/D convert rate is 500 times/sec, 125 times/sec When the A/D convert rate is 100 times/sec, 100 times/sec
38400 bps	100 times/sec
19200 bps	50 times/sec
9600 bps	25 times/sec
4800 bps	12 times/sec

6-10-4. Transmission format

- Transmission format 1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
G	S	,	*1	,	*2	,	*3	,	*4	,	±							CR	LF

HEADER — Sign + or - — 5-digit gross weight + decimal point

- Transmission format 2

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
N	T	,	*1	,	*2	,	*3	,	*4	,	±							CR	LF

HEADER — Sign + or - — 5-digit net weight + decimal point

- Transmission format 3

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
SOH	W	T	STX	*1	*2	*3	*4	*5	±						±						ETX	BCC

HEADER — 5-digit gross weight — 5-digit net weight
Sign (gross weight) + or - — Sign (net weight) + or -
BCC calculation range

ASCII codes for SOH, STX and ETX

SOH: 01
STX: 02
ETX: 03

BCC calculation method

Every code in the BCC calculation range is represented in hexadecimals, XORed with all data, and the results put into BCC.

*1   O : Overload
            (LOAD, OFL)
      S : Stable
      M : Unstable
      H : Hold

      Priority: H > O > (S or M)

*2   A : Zero tracking OFF
      T : Zero tracking ON
      Z : Zero error

      Priority: Z > (T or A)

*3   H : Upper limit ON
      L : Lower limit ON
      G : Upper and lower limits OFF
      N : Upper and lower limits ON
      F : Comparison OFF

      Priority N > (H or L)

*4   N : Near zero OFF
      Z : Near zero ON

*5   Decimal place
      3 : 0.000
      2 :   0.00
      1 :   0.0
      0 :   0

6-10-5. Communication format

- Read gross weight (sign, 5-digit weight, decimal point)

Host	R	A	CR								

F701+			R	A	+	1	0	0	.	0	0	CR	LF
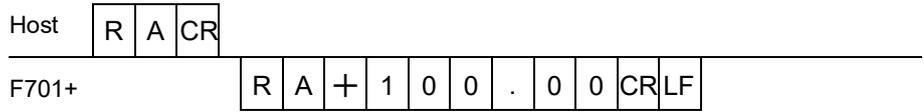
- Read net weight (sign, 5-digit weight, decimal point)

Host	R	B	CR

F701+			R	B	+	1	0	0	.	0	0	CR	LF
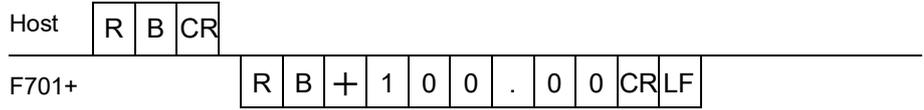
- Read tare weight (sign, 5-digit weight, decimal point)

Host	R	C	CR

F701+			R	C	+	1	0	0	.	0	0	CR	LF

- Status 1 (7 digits)

Host	R	D	CR

F701+			R	D							CR	LF

Weight value HOLD
1: ON
1: OFF

Weight value zero error
1: ON
0: OFF

Weight value stable
1: ON
0: OFF

Tare subtraction
1: ON
0: OFF

Undefined

Rear terminal LOCK
1: ON
0: OFF

Weight display
1: Net weight
0: Gross weight

- Status 2 (7 digits)

Host	R	E	CR

F701+			R	E							CR	LF

SP1 signal
1: ON
0: OFF

SP2 signal
1: ON
0: OFF

SP3 signal
1: ON
0: OFF

Under output signal
1: ON
0: OFF

Complete output signal
1: ON
0: OFF

Over output signal
1: ON
0: OFF

Go output signal
1: ON
0: OFF

- Status 3 (7 digits)

Host: R F CR

F701+: R F _ _ _ _ _ _ CR LF

Near zero output signal
1: ON
0: OFF

Lower limit output signal
1: ON
0: OFF

Upper limit output signal
1: ON
0: OFF

Undefined

- Status 4 (7 digits)

Host: R G CR

F701+: R G _ _ _ _ _ _ CR LF

Weight error output signal
1: ON
0: OFF

Error output signal
1: ON
0: OFF

Operating mode
3: SPAN calibration
2: ZERO calibration
1: Weighing
0:

Weight value overflow
5: -LOAD
4: +LOAD
3: OFL1
2: OFL2
1: OFL1
0:

Undefined

Sequence error (in sequence error)
0 or 1 to 5

Calibration error
0 or 2 to 9

- Read accumulated count (5-digit count)

Host: R H CR

F701+: R H 9 9 9 9 9 CR LF
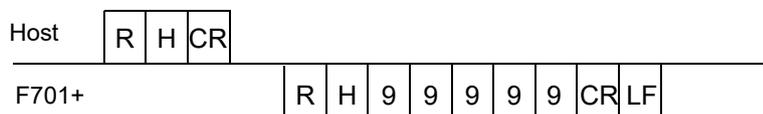
- Read accumulated value (9-digit weight, decimal point)

Host: R I CR

F701+: R I 9 9 9 9 9 9 9 . 9 9 CR LF

- Read accumulated data

| Host | R | J | CR |

| F701+ | R | J | + | 1 | 0 | 0 | 0 | . | 0 | 0 | CR | LF |

Weighed value
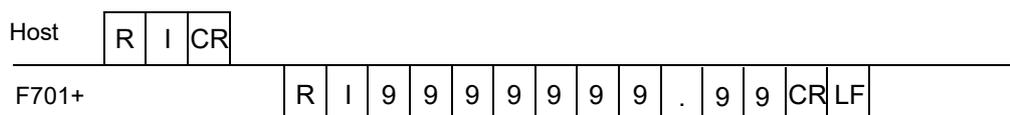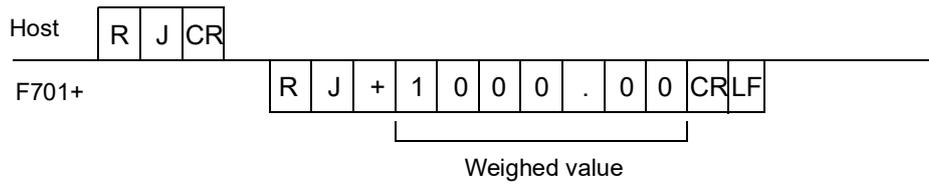
* Up to 256 data can be saved in the memory buffer,
and the data are deleted starting from the oldest when they are read.

| Host | R | J | CR |

| F701+ | R | J | CR | LF |

Return data with no accumulated data in the buffer.
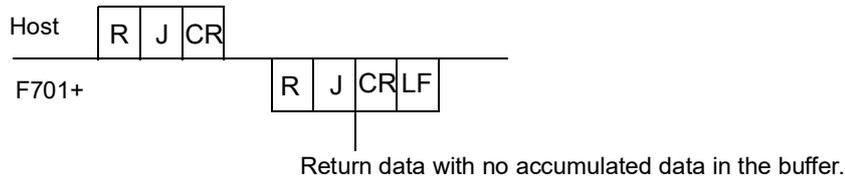
- Read setting value [Example: final]

| Host | W | 1 | 2 | CR |

Setting value No.

| F701+ | W | 1 | 2 | 1 | 0 | 0 | 0 | 0 | CR | LF |

Setting value No.   5-digit setting value (no decimal point)
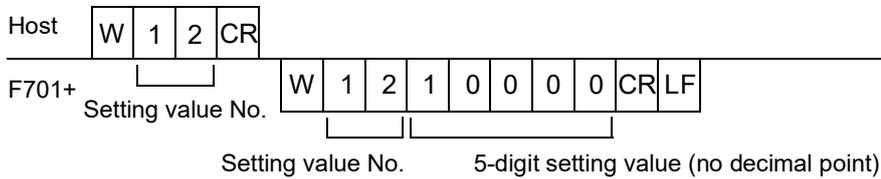
- Writing setting values [Example: final]

| Host | W | 1 | 2 | 1 | 0 | 0 | 0 | 0 | CR | LF |

| F701+ |

Setting value No.   5-digit setting value
(no decimal point)   * No return data
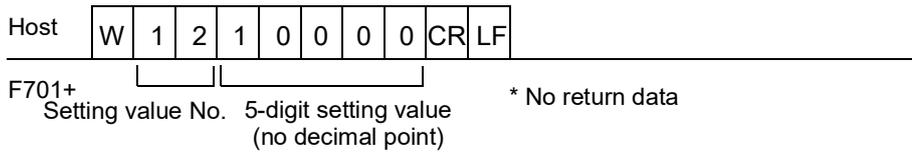
- Command [Example: tare subtraction]

| Host | C | E | CR |

| F701+ | * No return data

- Zero calibration

| Host | C | A | CR |

| F701+ | N | A | 0 | CR | LF |

Calibrating   0: Normal end, 2 to 9: Error
(same as error display no. of main unit)

- Span calibration

| Host | C | B | CR |

| F701+ | N | B | 0 | CR | LF |

Calibrating   0: Normal end, 2 to 9: Error
(same as error display no. of main unit)
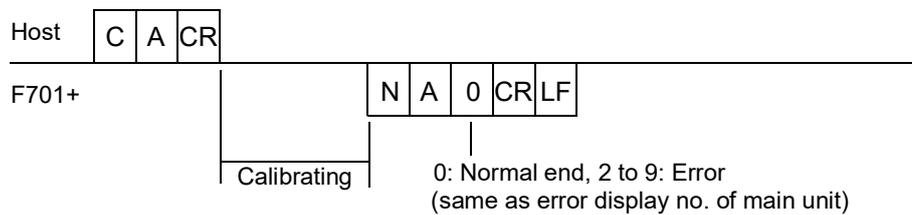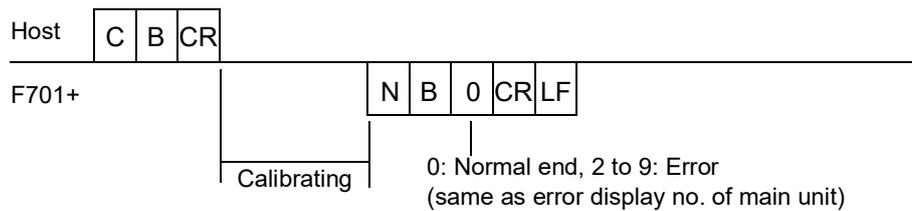
* Set capacity, min. scale division, balance weight, etc. before sending this command.

6-10-6. List of setting values

Use when writing or reading setting values. Fill blanks with setting values.

Setting												Note
Set point 1	W	1	0							CR	LF	(LOCK1 to prohibit writing)
Set point 2	W	1	1							CR	LF	(LOCK1 to prohibit writing)
Final	W	1	2							CR	LF	(LOCK1 to prohibit writing)
Over	W	1	3	0	0					CR	LF	(LOCK1 to prohibit writing)
Under	W	1	4	0	0					CR	LF	(LOCK1 to prohibit writing)
Compensation	W	1	5	0						CR	LF	(LOCK1 to prohibit writing)
Auto free fall compensation regulation value	W	1	6							CR	LF	(LOCK2 to prohibit writing)
Compensation feeding time	W	1	7	0	0					CR	LF	(LOCK2 to prohibit writing)
Judging time	W	2	0	0	0					CR	LF	(LOCK2 to prohibit writing)
Comparison inhibit time	W	2	1	0	0					CR	LF	(LOCK2 to prohibit writing)
Upper limit	W	2	2							CR	LF	(LOCK1 to prohibit writing)
Lower limit	W	2	3							CR	LF	(LOCK1 to prohibit writing)
Near Zero	W	2	4							CR	LF	(LOCK1 to prohibit writing)
Tare setting	W	2	5							CR	LF	(LOCK1 to prohibit writing)
Number of times for AZ	W	2	6	0	0	0				CR	LF	(LOCK2 to prohibit writing)
Number of times for judging	W	2	7	0	0	0				CR	LF	(LOCK2 to prohibit writing)
Complete output time	W	2	8	0	0					CR	LF	(LOCK2 to prohibit writing)
Comparison inhibit time 2	W	2	9	0	0					CR	LF	(LOCK2 to prohibit writing)
Sequence mode	W	3	0	0						CR	LF	(LOCK2 to prohibit writing)
Weighing function 1	W	3	1	0						CR	LF	(LOCK2 to prohibit writing)
Weighing function 2	W	3	2							CR	LF	(LOCK2 to prohibit writing)
Weighing function 3	W	3	3	0						CR	LF	(LOCK2 to prohibit writing)
Function key inhibited	W	3	4	0						CR	LF	(LOCK2 to prohibit writing)
Filter	W	3	5	0	0	0				CR	LF	(LOCK2 to prohibit writing)
Motion detect	W	3	6			0				CR	LF	(LOCK2 to prohibit writing)
Zero tracking	W	3	7			0				CR	LF	(LOCK2 to prohibit writing)
Set value LOCK	W	3	8	0	0	0				CR	LF	
Moving average filter	W	3	9	0	0					CR	LF	(LOCK2 to prohibit writing)
Balance weight value	W	4	0							CR	LF	(LOCK2 and LOCK SW to prohibit writing)
Capacity	W	4	1							CR	LF	(LOCK2 and LOCK SW to prohibit writing)
Min. scale division	W	4	2	0	0					CR	LF	(LOCK2 and LOCK SW to prohibit writing)
Net over	W	4	3							CR	LF	(LOCK2 and LOCK SW to prohibit writing)
Gross weight over	W	4	4							CR	LF	(LOCK2 and LOCK SW to prohibit writing)
Function selection	W	4	5	0						CR	LF	(LOCK2 to prohibit writing)
Compensation for gravitational acceleration	W	4	6							CR	LF	(LOCK2 to prohibit writing)

Description												Notes
DZ regulation value	W	4	7	0					CR	LF		(LOCK2 and LOCK SW to prohibit writing)
Extended function selection 1	W	4	8						CR	LF		(LOCK2 to prohibit writing)
Measurement Act compliance	W	4	9	0					CR	LF		(LOCK2 to prohibit writing)
D/A output mode	W	5	0	0	0	0			CR	LF		(LOCK2 to prohibit writing)
D/A zero output weight value	W	5	1						CR	LF		(LOCK2 to prohibit writing)
D/A full scale setting	W	5	2						CR	LF		(LOCK2 to prohibit writing)
Input selection	W	6	0						CR	LF		(LOCK2 to prohibit writing)
Output selection (23 pin)	W	6	1	0	0	0	0		CR	LF		(LOCK2 to prohibit writing)
Restart setting SP1	W	6	2	0	0				CR	LF		(LOCK2 to prohibit writing)
Restart setting SP2	W	6	3	0	0				CR	LF		(LOCK2 to prohibit writing)
Restart setting SP3	W	6	4	0	0				CR	LF		(LOCK2 to prohibit writing)
Number of times for knocking	W	6	5	0	0	0			CR	LF		(LOCK2 to prohibit writing)
Knocking time	W	6	6	0	0	0			CR	LF		(LOCK2 to prohibit writing)
Number of digits for accumulated display	W	6	7	0	0	0	0		CR	LF		(LOCK2 to prohibit writing)
Print settings	W	7	0	0					CR	LF		(LOCK2 to prohibit writing)
Printer settings	W	7	2	0					CR	LF		(LOCK2 to prohibit writing)
Individual print format	W	7	3						CR	LF		(LOCK2 to prohibit writing)
Total print format	W	7	4						CR	LF		(LOCK2 to prohibit writing)
Print count	W	7	5	0					CR	LF		(LOCK2 to prohibit writing)
Average weight	W	8	0						CR	LF		(Read only)
Max. weight	W	8	1						CR	LF		(Read only)
Min. weight	W	8	2						CR	LF		(Read only)
Gen. stan. dev.	W	8	3						CR	LF		(Read only)
Smp. stan. dev.	W	8	4						CR	LF		(Read only)
Number of data	W	8	5	0					CR	LF		(Read only)
Latest data	W	8	6						CR	LF		(Read only)
Max. - min.	W	8	7						CR	LF		(Read only)
Accumulated value	W	8	8						CR	LF		(Read only)
Equivalent calibration	W	9	2						CR	LF		(LOCK2 and LOCK SW to prohibit writing)

6-10-7. List of commands

Command from the host to F701+.

Zero calibration	C	A	CR	Digital zero	C	G	CR
Span calibration	C	B	CR	Digital zero reset	C	H	CR
Display selection Gross weight	C	C	CR	Accumulation command	C	I	CR
Display selection Net weight	C	D	CR	Accumulation clear	C	J	CR
Tare subtraction	C	E	CR	Equivalent calibration	C	V	CR
Tare OFF	C	F	CR				

6-11. Using an RS-485 interface (option)

RS-485 is an interface to read the indicated values and status of the F701+ and to write the setting values into the F701+. This interface is convenient for processing such as controls, totals, and records by connecting the F701+ to a PLC, programmable display unit and so forth.

6-11-1. Communication specifications

■ Standards

Message format	Modbus-RTU/UNI-Format
Signal level	RS-485 compliant, 2-wire
Transmitting distance	Approx. 1 km
Transmitting method	Asynchronous, half duplex
Transmitting speed	4800/9600/19200/38400/57600/115.2kbps
Number of connectible units	Maximum 32 (including 1 master unit)

Bit configuration	Start bit	1 bit
	Character length	Select from 7 or 8 bits (8 bits for Modbus-RTU)
	Stop bit	Select from 1 or 2 bits
	Parity bit	Select from none, odd or even
	Terminator	Select from CR, CR-LF

Communication mode	Hand shake/Modbus-RTU
Selection code	Binary (Modbus-RTU)/ASCII (UNI-Format)

6-11-2. RS-485 connection

■ Two-wire (point to point)

- Mark status (OFF)
  $V_A - V_B < -0.2V$
- Space status (ON)
  $V_A - V_B > 0.2V$

(V_A A terminal voltage)
(V_B B terminal voltage)
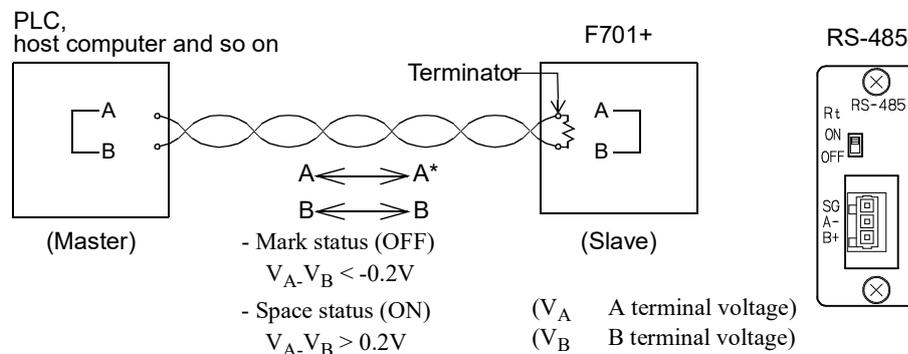
- Use twisted pair wires for connection cables. (Noise margin increases.) However, two-core parallel cables are sufficient for short-distance connection.
- SG terminal is a ground terminal (which protects circuits) used on the circuit. SG terminal does not normally need to be used if the main unit of the F701+ and connection counterpart device are class D grounded.
  However, if connection is necessary based on the on-site conditions, check the specifications of the counterpart device before connecting.

> **Attention**
>
> - Depending on the master device, A and B may be indicated in reverse. If communication is not possible, switch A and B.
> - Attach terminators on both the host and the F701+ sides.
> - On the F701+ side, the switch should be on the upper side.

■ Two-wire (multi point)

6-11-3.Settings related to RS-485

■ Settings for RS-485 I/F

The setting values for the PC or PLC to be connected and RS-485 of the main unit must be the same.

■ ID settings

- When connecting multiple units of F701+, set a separate ID no. for each F701+.

- If a start command including an ID no. is transmitted from the host, only one device will be able to transmit, and it will be possible to read weight data, read/change setting values, give commands, etc.

- Be sure to transmit an end command before making another F701+ able to transmit/receive.

- Since tri-state control is performed using start and end commands, normal communication is not possible due to output collision if only start commands are transmitted to multiple devices.

- If the ID no. is "0000", the device will be able to transmit/receive from the moment the power is turned ON. Therefore, be sure to set an ID no. other than "0000" when connecting multiple devices.

- If the ID no. is not "0000", other formats (R--, W--, C--, etc.) are disabled until the following start command is received.

- Start command

| Host | S | 1 | 2 | 3 | 4 | CR |
| F701+ |

ID no.

| I | D | 1 | 2 | 3 | 4 | CR | LF |

ID no.

* Returns only when the ID-no. matches the number set with the keys.

- End command

| Host | E | 1 | 2 | 3 | 4 | CR |
| F701+ |

ID No.

| I | D | 1 | 2 | 3 | 4 | CR | LF |

ID no.

* Returns only when the ID-no. matches the number set with the keys.
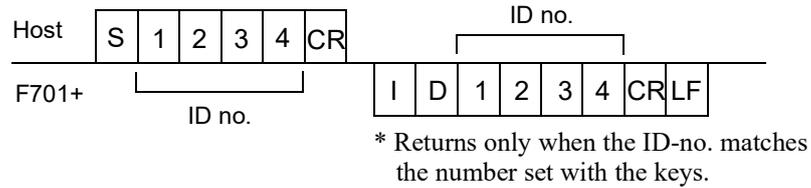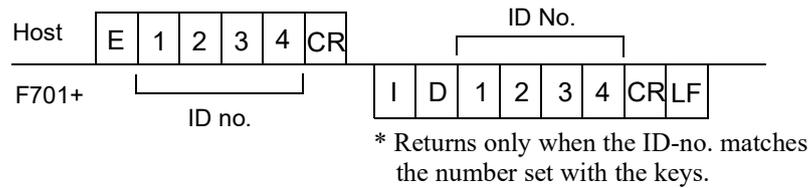
■ Transmission delay time

- Set the delay time when the master device cannot process a response from F701+.

[Transmission delay time] (setting mode 4-6)

(Input range: 0 to 99)

Frame   Frame

3.5 char + transmission delay time (mSec)
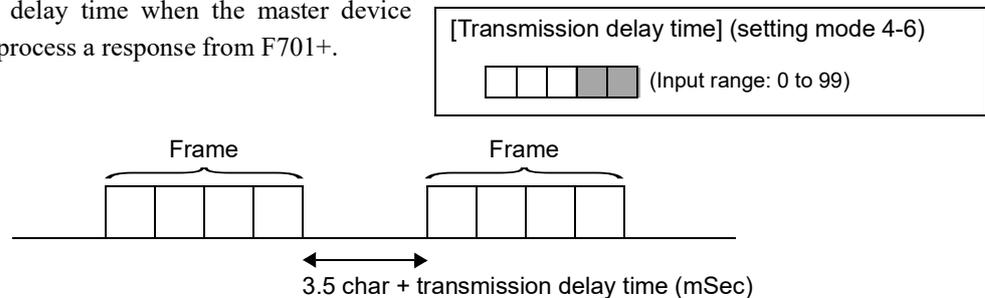
6-11-4. Modbus-RTU

■ Function code for Modbus

The actual message frame consists of an address field, function field, data field, and error check field, and they are transmitted in this order.

List of function codes

Code	Function name	Command
01 (0x01)	Read Coils	Read coils
02 (0x02)	Read Discrete Inputs	Read discrete inputs
03 (0x03)	Read Holding Registers	Read holding registers
04 (0x04)	Read Input Register	Read input register
05 (0x05)	Write Single Coil	Write to single coil
06 (0x06)	Write Single Register	Write to single holding register
15 (0x0F)	Write Multiple Coils	Write to multiple coils
16 (0x10)	Write Multiple Registers	Write to multiple holding registers
08 (0x08)	Diagnostics	Diagnostic mode
11 (0x0B)	Get Comm Event Counter	Read event counter
12 (0x0C)	Get Comm Event Log	Read communication events
17 (0x11)	Report Slave ID	Read slave ID information

01 (0x01) Read Coils

The ON/OFF status of slave coils is read.

Since it is a read command, broadcast cannot be specified.

The start address of the coil and the number of coils are specified.

[Request]

Function	1 byte	0x01
Start address	2 bytes	0x0000 to 0xFFFF
Number of coils	2 bytes	1 to 2000 (0x07D0)

[Response]

Function	1 byte	0x01
Data bytes	1 byte	N *
Coil status	N bytes	N or N+1

* N = Number of coils/8, N = N+1 in case the division is not possible.

[Error response]

Error code	1 byte	0x81 (Function +0x80)
Exception code	1 byte	01 or 02 or 03

Example) Reading the digital zero (address 00005) status.

[Request]

Function	01
Start address (HI)	00
Start address (LO)	04
Number of coils (HI)	00
Number of coils (LO)	01

[Response]

Function	01
Data bytes	01
Digital zero	00

Note that the relative address is 0x04 when reading the digital zero value.

The remaining bit is 0 when less than 8 bits.

* The F701+ response (coil status) is 0 at all times.

(The process is carried out as soon as the command is read.)

Consider execution confirmation of the coil to be something that is completed by a normal response from the function code 05 (0x05) Write Signal Coil or 15 (0x0F) Write Multiple Coils.

02 (0x02) Read Discrete Inputs

The ON/OFF status of discrete input is read.

Broadcast cannot be specified.

The start address of the input and the number of inputs is specified.

[Request]

Function	1 byte	0x02
Start address	2 bytes	0x0000 to 0xFFFF
Number of inputs	2 bytes	1 to 2000 (0x07D0)

[Response]

Function	1 byte	0x02
Data bytes	1 byte	N *
Input status	n bytes	N or N+1

* N = Number of inputs/8, N = N+1 if division is not possible.

[Error response]

Error code	1 byte	0x82 (Function +0x80)
Exception code	1 byte	01 or 02 or 03

Example) Reading the status from HI LIM (address 10001) to SP3 (address 10008).

[Request]

Function	02
Start address (HI)	00
Start address (LO)	00
Number of inputs (HI)	00
Number of inputs (LO)	08

[Response]

Function	02
Data bytes	01
HI LIM to SP3	E8

Note that the relative address is 0x00 when reading the HI LIM value.

The F701+ settings for this example are as follows.

HI LIM	OFF (0)
LO LIM	OFF (0)
HI	OFF (0)
GO	ON (1)
LO	OFF (0)
SP1	ON (1)
SP2	ON (1)
SP3	ON (1)

The LSB of the first data is the status of the initial address.

11101000 (0xE8) represented in binary digits.

* The status can also be read by function code 04 (0x04) Read Input Registers.
  In function code 04, the status can be read along with the weight value.

03 (0x03) Read Holding Registers

The contents of slave holding registers are read.

Broadcast cannot be specified.

The start address of the holding register and the number of registers are specified.

Slave devices transmit data by converting the contents of each register to 2 bytes.

* Be sure to specify the setting code prior to reading setting values for each item.

[Request]

Function	1 byte	0x03
Start address	2 bytes	0x0000 to 0xFFFF
Number of registers	2 bytes	1 to 125 (0x7D)

[Response]

Function	1 byte	0x03
Data bytes	1 byte	2 x N *
Register value	N x 2 bytes	

* N = Number of registers

[Error response]

Error code	1 byte	0x83 (Function +0x80)
Exception code	1 byte	01 or 02 or 03

Example) Reading the contents from compensation (address 40057) to over (address 40058).

[Request]

Function	03
Start address (HI)	00
Start address (LO)	38
Number of registers (HI)	00
Number of registers (LO)	02

[Response]

Function	03
Data bytes	04
Compensation (HI)	00
Compensation (LO)	64
Over (HI)	00
Over (LO)	32

Note that the relative address is 0x38 when reading the compensation value.

The F701+ settings for this example are as follows.

Compensation	100 (0x0064)
Over	50 (0x0032)

* In function code 03, only the LO words or the HI words are read when the start address specifies the LO words from a 32-bit integer data area, or the end of the start address + number of registers specifies HI words from a 32-bit integer data area.

04 (0x04) Read Input Registers

The contents of slave input registers are read.

Broadcast cannot be specified.

The start address of the input register and the number of registers are specified.

Slave devices transmit data by converting the contents of each register to 2 bytes.

[Request]

Function	1 byte	0x04
Start address	2 bytes	0x0000 to 0xFFFF
Number of registers	2 bytes	1 to 125 (0x7D)

[Response]

Function	1 byte	0x04
Data bytes	1 byte	2 x N *
Register value	N x 2 bytes	

* N = Number of registers

[Error response]

Error code	1 byte	0x84 (Function +0x80)
Exception code	1 byte	01 or 02 or 03

Example) Reading the contents of gross weight (address 30005 to 30006).

[Request]

Function	04
Start address (HI)	00
Start address (LO)	04
Number of registers (HI)	00
Number of registers (LO)	02

[Response]

Function	04
Data bytes	04
Gross weight (HI) (HI)	20
Gross weight (HI) (LO)	00
Gross weight (LO) (HI)	25
Gross weight (LO) (LO)	1C

Note that the relative address is 0x04 when reading the gross weight value.

The indicated value of the F701+ for this example is as follows.

Weight status

Sign	OFF (0)
Unused	OFF (0)
Unused	OFF (0)
OVER	OFF (0)
1/4 scale division ▼	OFF (0)
CZ	ON (1)
1/4 scale division ▲	OFF (0)
Real CZ	OFF (0)

Weight data: 9500 (0x251C)

* In function code 04, only the LO words or the HI words are read when the start address specifies the LO words from a 32-bit integer data area, or the end of the start address + number of registers specifies HI words from a 32-bit integer data area.

05 (0x05) Write Single Coil

The coils of slave devices are changed to ON or OFF.
When broadcast (0) is specified, coils of all slave devices with the same address will be rewritten.
The coil address and output value are specified in the request.

    When ON 0xFF, 0x00
    When OFF 0x00, 0x00

Data other than the above are treated as improper data and not modified.

* If rewriting a coil which turns the signal to ON level or OFF level (0011 to 0015), be sure to change the input selection so it does not overlap the signal to be rewritten.

[Request]

Function	1 byte	0x05
Start address	2 bytes	0x0000 to 0xFFFF
Output data	2 bytes	0x0000 or 0xFF00

[Response]

Function	1 byte	0x05
Start address	2 bytes	0x0000 to 0xFFFF
Output data	2 bytes	0x0000 or 0xFF00

[Error response]

Error code	1 byte	0x85 (Function +0x80)
Exception code	1 byte	01 or 02 or 03

Example) Turning ON the GROSS display (address 00001).

[Request]

Function	05
Start address (HI)	00
Start address (LO)	00
GROSS display (HI)	FF
GROSS display (LO)	00

[Response]

Function	05
Start address (HI)	00
Start address (LO)	00
GROSS display (HI)	FF
GROSS display (LO)	00

Note that the relative address is 0x00 when writing in GROSS display.
The response in the case of being written in normally is the same as request.

* Consider execution confirmation of the coil to be something that is completed by a normal response.

06 (0x06) Write Single Register

The values of slave holding registers are changed (rewritten).

When broadcast (0) is specified, holding registers of all slave devices with the same address will be rewritten.

The holding register address and data to be changed are specified in the request.

* Be sure to specify the setting code prior to writing setting values for each item.

[Request]

Function	1 byte	0x06
Start address	2 bytes	0x0000 to 0xFFFF
Output data	2 bytes	

[Response]

Function	1 byte	0x06
Start address	2 bytes	0x0000 to 0xFFFF
Output data	2 bytes	

[Error response]

Error code	1 byte	0x86 (Function +0x80)
Exception code	1 byte	01 or 02 or 03

Example) Changing the value of compensation (address 40059) to 20 (0x0014).

[Request]

Function	06
Start address (HI)	00
Start address (LO)	3A
Compensation (HI)	00
Compensation (LO)	14

[Response]

Function	06
Start address (HI)	00
Start address (LO)	3A
Compensation (HI)	00
Compensation (LO)	14

Note that the relative address is 0x3A when writing in compensation.

The response in the case of being written in normally is the same as request.

* In function code 06, be sure to write in a 16-bit integer data after address 40057. (If the start address specifies a 32-bit integer data area, an error response will be returned.)

15 (0x0F) Write Multiple Coils

For slave coils, data for a specified number of coils starting from a specified address is changed.
When broadcast (0) is specified, coils of all slave devices with the same address will be rewritten.
The coil address, new number of bytes and output value are specified in the request.

* If rewriting a coil which turns the signal to ON level or OFF level, be sure to set the priority of the level input signal (setting mode 4-7) to "1: communication priority".

[Request]

Function	1 byte	0x0F
Start address	2 bytes	0x0000 to 0xFFFF
Number of coils	2 bytes	0x0001 to 0x07B0
Number of bytes	1 byte	N *
Changed data	N x 2 bytes	

* N = Number of coils/8, N = N+1 in case the division is not possible.

[Response]

Function	1 byte	0x0F
Start address	2 bytes	0x0000 to 0xFFFF
Number of coils	2 bytes	0x0001 to 0x07B0

[Error response]

Error code	1 byte	0x8F (Function +0x80)
Exception code	1 byte	01 or 02 or 03

Example) Turning ON/OFF accumulation clear (address 00009) starting
from digital zero (address 00005).

[Request]

Function	0F
Start address (HI)	00
Start address (LO)	04
Number of coils (HI)	00
Number of coils (LO)	05
Data bytes	01
(Digital zero to accumulation clear)	10

[Response]

Function	0F
Start address (HI)	00
Start address (LO)	04
Number of coils (HI)	00
Number of coils (LO)	05

Note that the relative address is 0x04 when writing in digital zero.
The example shows how ON (1) and OFF (0) of the F701+ is rewritten.
Unused bits are filled in with 0.

Coil	00012	00011	00010	Accumulation clear	Hold Off	Hold On	Digital zero reset	Digital zero
Bit	0	0	0	1	0	0	0	0

0x10

* Consider execution confirmation of the coil to be something that is completed by a normal response.
* Do not execute commands in the address combinations listed below.
  When executed, commands will be carried out one by one, but may not operate properly.

- Addresses 00001 and 00002   - Addresses 00009 and 00010
- Addresses 00003 to 00006   - Addresses 00011 to 00013
- Addresses 00007 and 00008

16 (0x10) Write Multiple Registers

For slave holding registers, a specified number of data are changed starting from a specified address. When broadcast (0) is specified, holding registers of all slave devices with the same address will be rewritten.

The register address, new number of registers, and data to be changed are specified in the request.

Slave devices transmit data by converting the contents of each register to 2 bytes.

[Request]

Function	1 byte	0x10
Start address	2 bytes	0x0000 to 0xFFFF
Number of registers	2 bytes	0x0001 to 0x0078 (120)
Number of bytes	1 byte	2 x N *
Changed data	N x 2 bytes	

* N = Number of registers

[Response]

Function	1 byte	0x10
Start address	2 bytes	0x0000 to 0xFFFF
Number of registers	2 bytes	0x0001 to 0x007B (123)

[Error response]

Error code	1 byte	0x90 (Function +0x80)
Exception code	1 byte	01 or 02 or 03

Example 1) Changing the complete output time for 16-bit integer data area (address 40064) to 20 (0x0014), and the compensation feeding time (address 40065) to 100 (0x0064).

[Request]

Function	10
Start address (HI)	00
Start address (LO)	40
Register (HI)	00
Register (LO)	02
Data bytes	04
Complete output time (HI)	00
Complete output time (LO)	14
Compensation feeding time (HI)	00
Compensation feeding time (LO)	64

[Response]

Function	10
Start address (HI)	00
Start address (LO)	40
Register (HI)	00
Register (LO)	02

Note that the relative address is 0x40 when writing in the complete output time.

Example 2) Changing the upper limit for 32-bit integer data area (address 40009 to 40010) to 99999 (0x0001869F), and the lower limit (address 40011 to 40012) to 5000 (0x00001388).

[Request]

Function	10
Start address (HI)	00
Start address (LO)	08
Register (HI)	00
Register (LO)	04
Data bytes	08
Upper limit (HI) HI	00
Upper limit (HI) LO	01
Upper limit (LO) HI	86
Upper limit (LO) LO	9F
Lower limit (HI) HI	00
Lower limit (HI) LO	00
Lower limit (LO) HI	13
Lower limit (LO) LO	88

[Response]

Function	10
Start address (HI)	00
Start address (LO)	08
Register (HI)	00
Register (LO)	04

Note that the relative address is 0x08 when writing in the upper limit.

* In function code 16, an error response is returned when the start address specifies the LO words from a 32-bit integer data area, or the end of the start address + number of registers specifies HI words from a 32-bit integer data area.

11 (0x0B) Get Comm Event Counter

Every time a request is processed by the slave device, the event counter is incremented by 1.
The counter is not incremented when there is a frame error or when other counters are being read.
The master device reads this counter before and after a request to judge whether the process has been executed or not.
The status is generally 0x0000 when the slave device is not busy.

[Request]

Function	1 byte	0x0B

[Response]

Function	1 byte	0x0B
Status	2 bytes	0x0000
Event counter	2 bytes	0x0000 to 0xFFFF

[Error response]

Error code	1 byte	0x8B (Function +0x80)
Exception code	1 byte	01

Example) Reading the event counter.

[Request]

Function	0B

[Response]

Function	0B
Status (HI)	00
Status (LO)	00
Event counter (HI)	01
Event counter (LO)	08

In the example, the slave device is not busy (0x0000) and has processed a total of 264 (0x0108) commands.

12 (0x0C) Get Comm Event Log

This function is for reading the event status from slave devices.

The contents of the status and the event counter are the same as status 11 (Get Comm Event Counter). Message count is the same as sub-function 11 (Return Bus Message Count) of status 08. The event log retains 64 bytes worth of messages communicated by the slave device.

The newest event is always the 0th byte, and old events are discarded when it exceeds 64. The detailed contents of the events will be defined later on.

[Request]

Function	1 byte	0x0C

[Response]

Function	1 byte	0x0C
Byte count	1 byte	N *
Status	2 bytes	0x0000
Event counter	2 bytes	0x0000 to 0xFFFF
Message count	2 bytes	0x0000 to 0xFFFF
Event counter	n bytes	0 to 64 (number of events)

* N = Number of events + (3 x 2)

[Error response]

Error code	1 byte	0x8C (Function +0x80)
Exception code	1 byte	01

Example) Reading the event status.

[Request]

Function		0C

[Response]

Function	0C
Byte count	08
Status (HI)	00
Status (LO)	00
Event counter (HI)	01
Event counter (LO)	08
Message count (HI)	01
Message count (LO)	21
Event 0	C0
Event 1	00

The example shows 264 times for the event counter (0x0108), 289 times for the message counter (0x0121), and not busy (0x0000). The newest event is 11000000 (0xC0) and bit 6 is 1,which means that the broadcast was received. The previous event is 00, indicating that the slavedevice received a request for Communications Restart.

Event log / Event details

Events are categorized into four types.

◎ Receive event (when bit 7 is 1)

Bit

0   Unused

1   Communication error

2   Unused

3   Unused

4   Character overrun

5   Listen Only Mode (0 for F701+)

6   Receive broadcast

7   1

◎ Transmit event (when bit 7 is 0)

Bit

0   Transmit exception code 1 to 3

1   Transmit exception code 4

2   0

3   0

4   Transmit (write in) time out

5   Listen Only Mode (0 for F701+)

6   1

7   0

◎ Slave is in Listen Only Mode

04 is recorded for Listen Only Mode.

◎ Communication is initialized by Communication Restart

This event is recorded when communication restarts.

Event is 00.

If the slave device is in Continue on Error mode, the event is written in the existing log.

For Stop on Error mode, the log is cleared and 00 is written in event 0.

(The F701+ is fixed in Stop on Error mode.)

17 (0x11) Report Slave ID

The slave device returns the current status and the operation mode.
The content of the response will vary according to the product.

[Request]

Function	1 byte	0x11

[Response]

Function	1 byte	0x11
Number of bytes	1 byte	
Slave ID	1 byte	
RUN Indicator	1 byte	0x00: Weight error or calibration error 0xFF: Normal
Additional information	3 byte	Version

* The slave ID is different from the Address.

[Error response]

Error code	1 byte	0x91 (Function +0x80)
Exception code	1 byte	01

Example) Reading the slave ID.

[Request]

Function		11

[Response]

Function	11
Number of bytes	5
Slave ID	
RUN Indicator	00
Additional information	*

* Version information is represented in 3 bytes.
  Version is 1.23 in the case of 0x01, 0x02 and 0x03.

08 (0x08) Diagnostic code (Diagnostics)

The communication status between the master and slaves can be checked by requesting a diagnosis.
Content of check differs depending on the sub-functions added after the general functions.
The slave device responds by returning the received request frame except when there is an error.
Also, all counters for diagnosis are cleared when the power is turned ON.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	
Data	N x 2 bytes	

[Response]

Function	1 byte	0x08
Sub-function	2 bytes	
Data	N x 2 bytes	

[Error response]

Error code	1 byte	0x88 (Function +0x80)
Exception code	1 byte	01 or 03

List of sub-function codes

Code	Function name	Command
00 (0x0000)	Return Query Data	Request echo
01 (0x0001)	Restart Communications Option	Initialize communication port
02 (0x0002)	Return Diagnostic Register	Request echo
03 (0x0003)	Change ASCII Input Delimiter	-
04 (0x0004)	Force Listen Only Mode	Receive only mode
05 to 09	Unused	
10 (0x000A)	Clear Counters and Diagnostic Register	Clear counters and registers
11 (0x000B)	Return Bus Message Count	Read message count
12 (0x000C)	Return Bus Communication Error Count	Read CRC error count
13 (0x000D)	Return Bus Exception Error Count	Read exception error count
14 (0x000E)	Return Slave Message Count	Read slave receive count
15 (0x000F)	Return Slave No Response Count	Read no-response count
16 (0x0010)	Return Slave NAK Count	-
17 (0x0011)	Return Slave Busy Count	Read busy count
18 (0x0012)	Return Bus Character Overrun Count	Read character overrun error counter
20 (0x0014)	Clear Overrun Counter and Flag	Clear character overrun error counter

* Codes 03, 05 to 09, and 16 are not available in F701+.

* With code 04, receive only mode applies, but the counters and the event log are updated (always 0x04 when code 04).

00 (0x0000) Return Query Data

The request frame is returned.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x00
Data	N x 2 bytes	Arbitrary 16-bit data

[Response]　　　　Request echo

01 (0x0001) Restart Communication Option

Communication ports are initialized. The communication event counters are cleared.
Response is given before the initializing operation.
This is processed in Listen Only Mode, but no response is given.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x01
Data	2 bytes	

* Event log is cleared when data is 0xFF, 0x00.
　Event log is saved when 0x00, 0x00.

02 (0x0002) Return Diagnostic Register (not available for the F701+)

The request frame is returned.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x02
Data	N x 2 bytes	Arbitrary 16-bit data

[Response]   Request echo

04 (0x0004) Force Listen Only Mode

The slave device is turned to receive only mode.
The slave device will ignore all messages, not operate or respond, but will process the counters and the event log.
However, the slave device responds to sub-function 1, which will initialize and restart communication as well as release the receive only mode.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x04
Data	2 bytes	0x00, 0x00

[Response]   None

10 (0x000A) Clear Counters and Diagnostic Register

All counters and diagnostic registers are cleared.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x0A
Data	2 bytes	0x00, 0x00

[Response]   Request echo

11 (0x000B) Return Bus Message Count

The total number of frames detected by a slave device is read.
These are counted when the slave ID matches or when a message is transmitted simultaneously to all devices.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x0B
Data	2 bytes	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x0B
Data	2 bytes	Message count

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12 (0x000C) Return Bus Communication Error Count

The total number of CRC errors detected by a slave device is read.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x0C
Data	2 bytes	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x0C
Data	2 bytes	CRC error count

13 (0x000D) Return Bus Exception Error Count

The total number of exception errors transmitted by a slave device is read.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x0D
Data	2 bytes	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x0D
Data	2 bytes	Exception response count

14 (0x000E) Return Slave Message Count

The total number of frames that match the slave address is read.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x0E
Data	2 bytes	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x0E
Data	2 bytes	Actual address message count

15 (0x000F) Return Slave No Response Count

The number of times not responded to frames that match the slave address is read.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x0F
Data	2 bytes	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x0F
Data	2 bytes	No-response count

17 (0x0011) Return Slave Busy Count (no count-up for the F701+)

The count of the slave busies issued by a slave device is returned.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x11
Data	2 bytes	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x11
Data	2 bytes	Busy

18 (0x0012) Return Bus Character Overrun Count (no count-up for the F701+)

The number of times character overrun errors have been detected for the frame that matches the slave address is read.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x12
Data	2 bytes	0x00, 0x00

[Response]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x12
Data	2 bytes	Character, overrun, count

20 (0x0014) Clear Overrun Counter and Flag

The overrun counter is cleared, and the error flag is dropped.

[Request]

Function	1 byte	0x08
Sub-function	2 bytes	0x00, 0x14
Data	N x 2 bytes	0x00, 0x00

[Response]   Request echo

■ Error responses

The slave device returns an error response without executing the command when a request from the master contains a failure. The value used for the function code is the requested function code with 0x80 added to it.

Exception code is judged after the received frame.
The priority of the exception code judgment is 1→3→2.

Exception code No.	
1	Function code error
2	Address out of range error
3	Data value error

Exception code = 01

A function code that does not exist has been specified.
Confirm the function code.

Exception code = 02

An address that cannot be used has been specified.

- Confirm the start address or the start address + (the number of coils, statuses or registers). (Function codes 1 to 6, 15 and 16)

- Confirm that the start address is at the HI position of the 32-bit variable, or the start address + number of registers includes the LO position of 32-bit. (Function codes 3, 6 and 16)

Exception code = 03

Specified data is out of range.

- Confirm that the number of coils, statuses or registers are within readable range. (Function codes 1 to 4)

- Confirm that the output value is 0x0000 or 0xFF00. (Function code 5)

- Confirm that the output value is from 0x0000 to 0xFFFF, or that they are not specified within start address 54. (Function code 6)
  * 32-bit variables cannot be written with function code 6.

- Confirm that the number of coils or registers is within range. (Function codes 15 and 16)

- Confirm that the number of bytes can be obtained from the number of coils or registers. (Function codes 15 and 16)

- Confirm that the total number of bytes for the transmitted format is correct. (Function codes 1 to 6, 8, 15 and 16)

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Key point

The slave device ignores requests from the master device and will not respond in the following cases.

- When the specified slave address no. and the actual address do not match.
- When the error-check code does not match.
- When communication errors such as parity errors are detected.
- When there is a spacing of 1.5 characters or more in the frame configuration data.
- When the slave address no. is set to 0.

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■ Data address

Data type	Address	Data name	Data format
Coil 0XXXX	00001	GROSS display	1 bit
	00002	NET display	
	00003	One-touch tare subtraction	
	00004	One-touch tare subtraction reset	
	00005	Digital zero	
	00006	Digital zero reset	
	00007	Hold ON	
	00008	Hold OFF	
	00009	Accumulation clear	
	00010	Accumulation command	
	00011	Start ON	
	00012	Stop ON	
	00013	Stop OFF	
	00014	Pause ON	
	00015	External judging ON	
	00016 to 00018	Backup (not allocated)	
	00019	Zero calibration	
	00020	Span calibration (actual load calibration)	
	00021	Span calibration (equivalent calibration)	
	00022 to 09999	Reserved area (cannot be used)	

Data type	Address	Data name	Data format
Discrete input 1XXXX	10001	HI LIM	1 bit
	10002	LO LIM	
	10003	HI	
	10004	GO	
	10005	LO	
	10006	SP1	
	10007	SP2	
	10008	SP3	
	10009	NEAR ZERO	
	10010	PAUSE	
	10011	WAITING FOR JUDGMENT	
	10012	KNOCKING	
	10013	COMPL.	
	10014	STAB	
	10015	HOLD	
	10016	TARE	
	10017	G/N	
	10018	ZT	
	10019	LOCK	
	10020	LOCK2	
	10021	LOCK3	
	10022	RUN	
	10023	WEIGHT ERROR	
	10024	SEQ.ERROR	
	10025	ZALM	
	10026 to 19999	Backup (not allocated)	

Data type	Address	Data name	Data format	
Input register 3XXXX	30001	Status 1	-	16 bit
	30002	Status 2		
	30003	Status 3		
	30004	Undefined		
	30005	Gross weight (HI)	Decimal point None	32 bits
	30006	Gross weight (LO)		
	30007	Net weight (HI)		
	30008	Net weight (LO)		
	30009	Tare weight (HI)		
	30010	Tare weight (LO)		
	30011 to 39999	Backup (not allocated)		

Data type	Address	Data name	Data format	
Holding register 4XXXX	40001	Set point 1 (HI)	No sign	32 bits
	40002	Set point 1 (LO)		
	40003	Set point 2 (HI)		
	40004	Set point 2 (LO)		
	40005	Final (HI)		
	40006	Final (LO)		
	40007	Auto free fall compensation regulation value (HI)		
	40008	Auto free fall compensation regulation value (LO)		
	40009	Upper limit (HI)		
	40010	Upper limit (LO)		
	40011	Lower limit (HI)		
	40012	Lower limit (LO)		
	40013	Near zero (HI)		
	40014	Near zero (LO)		
	40015	Weighing function 2 (HI)		
	40016	Weighing function 2 (LO)		
	40017	Tare setting (HI)		
	40018	Tare setting (LO)		
	40019	Balance weight value (HI)		
	40020	Balance weight value (LO)		
	40021	Capacity (HI)		
	40022	Capacity (LO)		
	40023	Net over (HI)		
	40024	Net over (LO)		
	40025	Gross over (HI)		
	40026	Gross over (LO)		
	40027	Compensation for gravitational acceleration (HI)		
	40028	Compensation for gravitational acceleration (LO)		
	40029	Equivalent calibration (HI)		
	40030	Equivalent calibration (LO)		
	40031	D/A zero output weight value (HI)		
	40032	D/A zero output weight value (LO)		
	40033	D/A full scale setting (HI)		
	40034	D/A full scale setting (LO)		
	40035	Extended function selection 1 (HI)		
	40036	Extended function selection 1 (LO)		
	40037	Input selection (HI)		
	40038	Input selection (LO)		
	40039	Average weight (HI) (read only)		
	40040	Average weight (LO) (read only)		
	40041	Max. weight (HI) (read only)		
	40042	Max. weight (LO) (read only)		
	40043	Min. weight (HI) (read only)		
	40044	Min. weight (LO) (read only)		

Holding register 4XXXX	40045	Gen. Stan. Dev. (HI) (read only)	No sign	32 bit
	40046	Gen. Stan. Dev. (LO) (read only)		
	40047	Smp. Stan. Dev. (HI) (read only)		
	40048	Smp. Stan. Dev. (LO) (read only)		
	40049	Max. - min. (HI) (read only)		
	40050	Max. - min. (LO) (read only)		
	40051	Latest accumulation data (HI) (read only)		
	40052	Latest accumulation data (LO) (read only)		
	40053	Accumulated value (HI) (read only)		
	40054	Accumulated value (LO) (read only)		
	40055 to 40058	Backup (not allocated)		
	40059	Compensation	No sign	16 bits
	40060	Over		
	40061	Under		
	40062	Comparison inhibit time 1		
	40063	Comparison inhibit time 2		
	40064	Judging time		
	40065	Complete output time		
	40066	Compensation feeding time		
	40067	Number of times for AZ		
	40068	Number of times for judging		
	40069	Weighing function 1		
	40070	Weighing function 3		
	40071	Sequence mode		
	40072	Function key inhibited		
	40073	Filter		
	40074	MD (time - range)		
	40075	ZT (time - range)		
	40076	DZ regulation value		
	40077	Function selection		
	40078	D/A output mode		
	40079	Moving average filter		
	40080	Measurement Act compliance		
	40081	Output selection		
	40082	Restart setting Set point 1		
	40083	Restart setting Set point 2		
	40084	Restart setting Set point 3		
	40085	Number of times for knocking		
	40086	Knocking time		
	40087	Number of digits for accumulated display		
	40088	Min. scale division		
	40089	Set value LOCK		
	40090	Number of data (read only)		
	40091 to 49999	Backup (not allocated)		

Key point

The address nos. used in messages are relative addresses.

Relative addresses are obtained using the formula below.

Relative address = last 4 digits of the address no. -1

For example, relative address is 0014 (0x0E) when 40015 is specified for the holding register.

■ Data

Data type	Data name	Description of data
Coil	GROSS display	Changes the weight display to gross weight.
	NET display	Changes the weight display to net weight.
	One-touch tare subtraction	Performs one-touch tare subtraction
	One-touch tare subtraction Reset	Resets one-touch tare subtraction
	Digital zero	Sets the gross weight to 0.
	Digital zero Reset	Resets digital zero.
	Hold ON	Holds the weight value.
	Hold OFF	Releases weight value hold.
	Accumulation clear	Clears the accumulated value for weighing code.
	Accumulation command	Accumulates the weight value.
	Start ON	Becomes a start signal at ON edge.
	Stop ON	Turns the stop signal to ON level.
	Stop OFF	Turns the stop signal to OFF level.
	Pause	Weighing is paused at ON edge.
	Judging input	Rejudges the result at ON edge when the over/under comparison mode is set to "external judging input ON" in sequence mode.
	Zero calibration	Performs zero calibration.
	Span calibration (actual load calibration)	Performs span calibration (actual load calibration).
	Span calibration (equivalent calibration)	Performs equivalent calibration.
Discrete input	HI LIM	Indicates the status of the upper limit signal of the indicator. ON (1), OFF (0)
	LO LIM	Indicates the status of the lower limit signal of the indicator.
	HI	Indicates the status of the over signal of the indicator.
	GO	Indicates the status of the go signal of the indicator.
	LO	Indicates the status of the under signal of the indicator.
	SP1	Indicates the status of the SP1 signal of the indicator.
	SP2	Indicates the status of the SP2 signal of the indicator.
	SP3	Indicates the status of the SP3 signal of the indicator.
	NEAR ZERO	Indicates the status of the near zero signal of the indicator.
	PAUSE	Turns ON during pause.
	KNOCKING	Turns ON during knocking.
	COMPL.	Indicates the status of the complete signal of the indicator.
	STAB	Turns ON when the weight value is stable.
	HOLD	Turns ON during weight value hold.
	TARE	Turns ON during tare subtraction.
	G/N	Turns ON when the display weight of the indicator is net weight. Turns OFF when gross weight.
	ZT	Turns ON during zero tracking operation of the indicator.
	LOCK (SW)	Indicates the status of LOCK SW.
	LOCK1 (setting)	Indicates the status of LOCK1.
	LOCK2 (setting)	Indicates the status of LOCK2.
	RUN	Indicates the status of the RUN signal of the indicator.
	WEIGHT ERROR	Turns ON when there is a weight error.
	SEQ.ERROR	Turns ON when there is a sequence error.
	ZALM	Turns ON when there is a zero error (when the indicator ZALM is ON).
Input register	Status 1	Indicates an abnormal status. (*2)
	Status 2	Indicates a weighing status. (*3)
	Status 3	Indicates a weighing status. (*4)
	Gross weight (HI)	Indicates gross weight. (-99999 to 99999) (*5)
	Gross weight (LO)	
	Net weight (HI)	Indicates net weight. (-99999 to 99999) (*5)
	Net weight (LO)	
	Tare weight (HI)	Indicates tare weight. (0 to 99999) (*5)
	Tare weight (LO)	

Chapter
6

Useful Functions

	Set point 1	Indicates SP1. (0 to 99999)
	Set point 2	Indicates SP2. (0 to 99999)
	Final	Indicates final. (0 to 99999)
	Auto free fall compensation regulation value	Indicates auto free fall compensation regulation value. (0 to 99999)
	Upper limit	Indicates upper limit. (0 to 99999)
	Lower limit	Indicates lower limit. (0 to 99999)
	Near zero	Indicates near zero. (0 to 99999)
	Weighing function 2	Indicates weighing function 2.
	Tare setting	Indicates tare setting. (0 to 99999)
	Balance weight value	Indicates valance weight value. (0 to 99999)
	Capacity	Indicates capacity. (0 to 99999)
	Net over	Indicates net over. (0 to 99999)
	Gross over	Indicates gross over. (0 to 99999)
	Equivalent calibration	Indicates the equivalent calibration value. (0.1000 to 3.2000)
	D/A zero output weight value	D/A zero output weight value (0 to 99989)
	D/A full scale setting	D/A full scale setting (1 to 99999)
	Extended function selection 1	Indicates extended function selection 1
	Input selection	Indicates input selection.
	Average weight	Indicates average weight. (read only) (0 to 99999)
	Max. weight	Indicates max. weight. (read only) (0 to 99999)
	Min. weight	Indicates min. weight. (read only) (0 to 99999)
	Gen. stan. dev.	Indicates gen. stan. dev. (read only) (0 to 99999)
	Smp. stan. dev.	Indicates smp. stan. dev. (read only) (0 to 99999)
	Max. - min.	Indicates max. - min. (read only) (0 to 99999)
	Latest accumulation data	Indicates the latest accumulation data. (read only) (0 to 99999)
	Accumulated value	Indicates the accumulated value. (read only) (0 to 999999999)
Holding register	Compensation	Indicates the compensation. (0 to 9999)
	Over	Indicates over. (0 to 999)
	Under	Indicates under. (0 to 999)
	Comparison inhibit time	Indicates comparison inhibit time. (0 to 999)
	Judging time	Indicates judging time. (0 to 999)
	Complete output time	Indicates complete output time. (0 to 999)
	Compensation feeding time	Indicates compensation feeding time. (0 to 999)
	AZ times	Indicates the number of times for AZ. (0 to 99)
	Number of times for judging	Indicates judging time. (0 to 99)
	Weighing function 1	Indicates weighing function 1.
	Weighing function 3	Indicates weighing function 3.
	Sequence mode	Indicates sequence mode.
	Function key inhibited	Indicates function key inhibited
	Filter	Indicates filter.
	MD (time - range)	Indicates MD (time - range). (00-00 to 99-99)*6
	ZT (time - range)	Indicates ZT (time - range). (00-00 to 99-99)*6
	DZ regulation value	Indicates DZ regulation value. (0 to 9999)
	Function selection	Indicates function selection.
	Compensation for gravitational acceleration	Indicates compensation for gravitational acceleration. (97500 to 98500)
	D/A output mode	Indicates D/A output mode.
	Moving average filter	Indicates moving average filter.
	Measurement Act compliance	Indicates Measurement Act compliance.
	Output selection	Indicates output selection.
	Restart setting Set point 1	Indicates restart setting, set point 1. (0 to 100)
	Restart setting Set point 2	Indicates restart setting, set point 2. (0 to 100)
	Restart setting Set point 3	Indicates restart setting, set point 3. (0 to 100)
	Number of times for knocking	Indicates number of times for knocking. (0 to 99)
	Knocking time	Indicates knocking time. (0 to 99)
	Number of digits for accumulated display	Indicates number of digits for accumulated display. (5 to 9)
	Min. scale division	Indicates min. scale division. (1 to 100)
	Setting value LOCK	Indicates setting value LOCK.
	Number of data	Indicates number of data. (read only)

*1: Net over, gross over, LOAD, -LOAD, ZALM

*2: Status 1
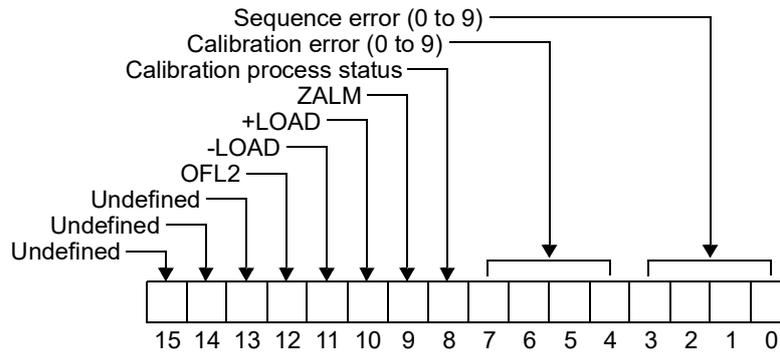
- LOAD, +LOAD, ZALM: "1" is indicated every time an error occurs.

    Zero error, span error

- Calibration process status: "1" is indicated during zero calibration or span calibration.

*3: Status 2
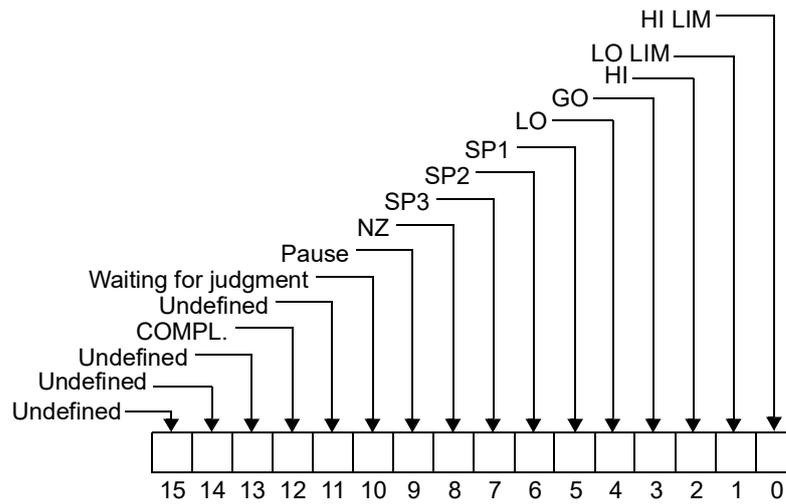
*4: Status 3
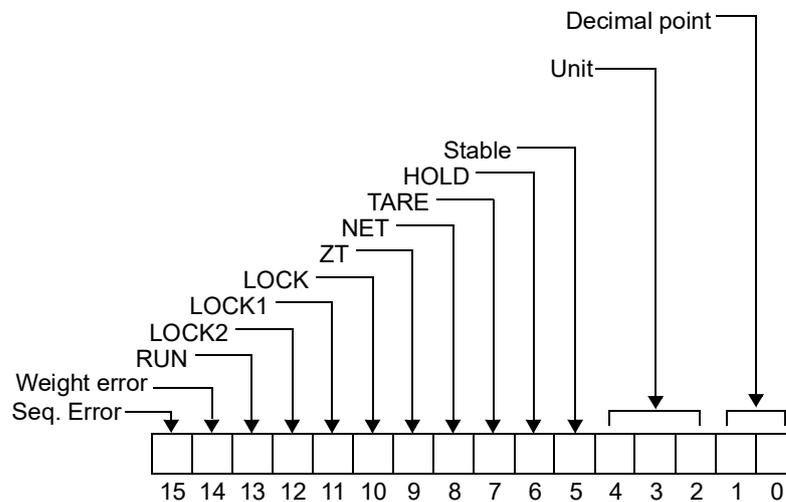
- Units setting:　　　　　Indicates units.

Units	Bit No.		
	4	3	2
None	0	0	0
kg	0	1	1
t	0	0	1
g	0	1	0
lb	1	0	0
N	1	0	1

- Decimal place:　　　　　Indicates decimal place.

Decimal place	Bit no.	
	1	0
None	0	0
0.0	0	1
0.00	1	0
0.000	1	1

*5: Gross weight, net weight, tare weight
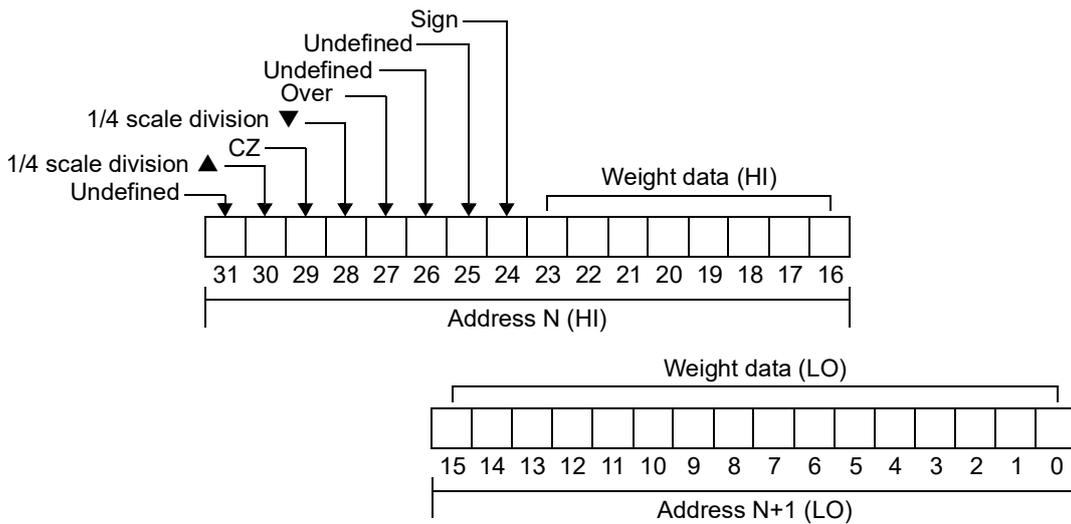
- Over:　Gross over, net over, tare > 99999

- Sign:　Turns to "1" when the weight data is a negative value.

*6: MD, ZT (time - range)
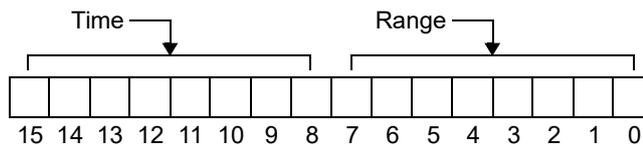
6-12. Using the BCD parallel data output interface (option)

BCD data output is an interface to retrieve a weight value as a BCD code data. This interface is convenient for processing such as controls, totals, and records by connecting to a computer, process controller, sequencer, etc. The I/O circuit and internal circuits are electrically insulated with a photo-coupler.

6-12-1. Connector pin assignments

Compatible connector: 57-30360 manufactured by DDK (accessory) or equivalent

1	*	COM	19	*	COM
2	OUT	1	20	OUT	20000
3	OUT	2	21	OUT	40000
4	OUT	4	22	OUT	80000
5	OUT	8	23	OUT	MINUS
6	OUT	10	24	OUT	OVER
7	OUT	20	25	OUT	P.C
8	OUT	40	26	OUT	STROBE
9	OUT	80	27	IN	Data hold
10	OUT	100	28	IN	Logic switch
11	OUT	200	29	IN	Output selection 1
12	OUT	400	30	IN	Output selection 2
13	OUT	800	31	IN	
14	OUT	1000	32	IN	
15	OUT	2000	33	IN	
16	OUT	4000	34	IN	
17	OUT	8000	35		
18	OUT	10000	36		

*:   The common (COM: 1, 19pin) is internally connected.

6-12-2. Equivalent circuit (input)

The signal input circuit inputs signals by making a short-circuit or open-circuit between the input terminal and COM terminal. Short-circuit is achieved with contacts (relays, switches andso on) and non-contacts (transistors, TTL open collector output and so on).

Open-circuit	OFF
Short-circuit	ON
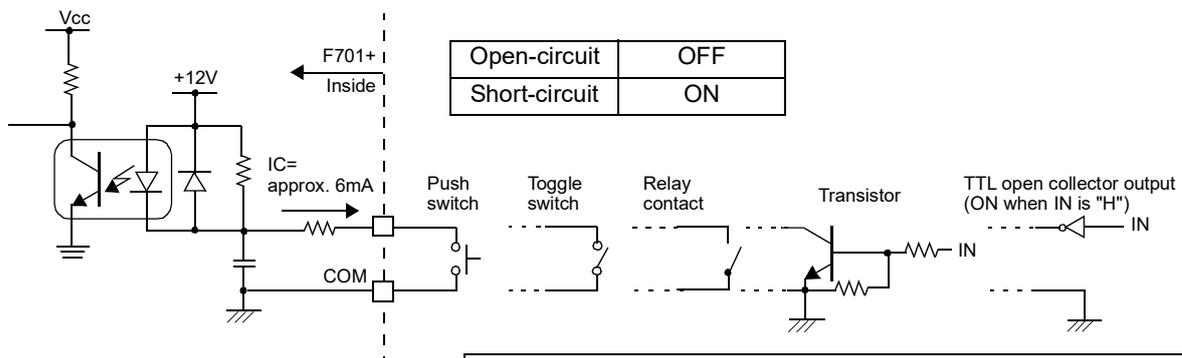
- Do not apply voltage to the signal input circuit from outside.
- An external element must be an element in which Ic=10mA or more can be applied.
- External element leak must be 100µA or below.

6-12-3.Equivalent circuit (output)

Signal output circuit is open collector output.
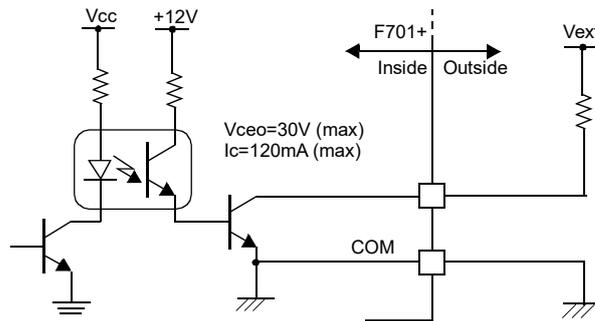
● Internal transistor status

Output data	Negative	Positive
0	OFF	ON
1	ON	OFF

In accordance with the logic switch (28 pin)

● Level of output pin

Output data	Negative	Positive
0	H	L
1	L	H

6-12-4.BCD data output

Outputs the weight value in 5-digit BCD. Each digit is output as 0/1 data in 4 bits (8, 4, 2, 1).

Digit data	8	4	2	1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

6-12-5.Polar output (MINUS)

Outputs the polarity of weight value being output as BCD data.
Outputs "0" when the polarity is positive (+), and "1" when negative (-).

6-12-6.Over status output (OVER)

Outputs 1 (over) when the weight value being output as BCD data satisfies the following conditions.

Weight value		Conditional equation		
Net weight	(NET)	Net weight	> Setting value for net over	oF_L1
Gross weight	(GROSS)	Gross weight	> Setting value for gross over	oF_L3
Tare	(TARE)	Tare	> 99999 (over digit)	

6-12-7. Print command output (P.C)

For reading the data, use the rising edge of pulse.

P.C is output in synchronization with a complete signal for over/under comparison judgment.
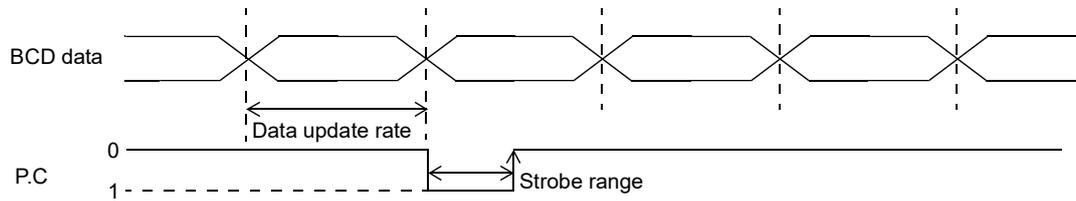
6-12-8. Data strobe (STROBE)

BCD data is updated for each A/D convert, and a strobe pulse is output in synchronization with the BCD data. For reading the data, use the rising edge of pulse.
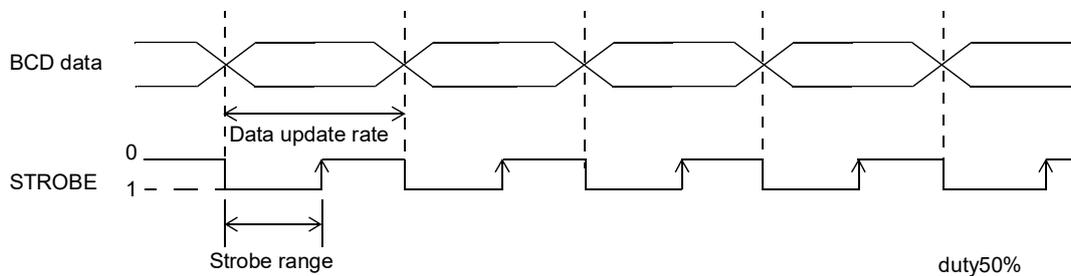
The data update rate is usually the same as the operation speed of the main unit (100 or 500 times/sec). However, depending on external devices which are connected, the speed may be too fast to read. In such cases, set the data update rate to be longer (fewer times).

6-12-9. Data hold input

When this input terminal is short-circuited to the COM terminal, the BCD data is held.

(Also, strobe pulse will not be output.)

6-12-10. Logic switch input

Select the logic of output signals.

On open-circuit: negative logic
On short-circuit: positive logic

6-12-11. Output selection input

Select weight value which is output as BCD data.

Selection 1	Selection 2	Weight value
Open-circuit	Open-circuit	Weight value displayed on the main unit
Open-circuit	Short-circuit	Net weight (NET)
Short-circuit	Short-circuit	Gross weight (GROSS)
Short-circuit	Open-circuit	Tare (TARE)

6-13. Using the D/A converter interface (option)

D/A converter is an interface to output the weight value as an electrical signal. The converter can output a current (4mA to 20mA) proportional to the weight value. The over range is ±5% of the full scale. The center line has a plus polarity.

6-13-1. How to adjust D/A zero/gain

D/A converter of F701+ sets the weight value which outputs 4mA current and the weight value which outputs 20mA current respectively to obtain an analog output. Input for each setting value and selection of D/A output mode is performed in setting mode 4.

Weight value

Resolution 1/10000

4

20   Current
(mA)

D/A zero output weight
(4mA)

D/A full scale value
(20mA)
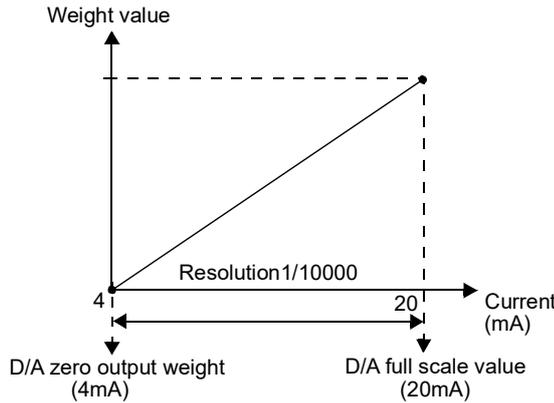
6-13-2. Settings related to D/A converter

■ D/A output mode

Select the output mode. Test mode is used when making fine adjustments to zero/gain.

[D/A output mode] (setting mode 4-1)

Output weight mode
1: Net weight
0: Gross weight

Test mode
2: 20mA fixed output
1: 4mA fixed output
0: Weight value linked
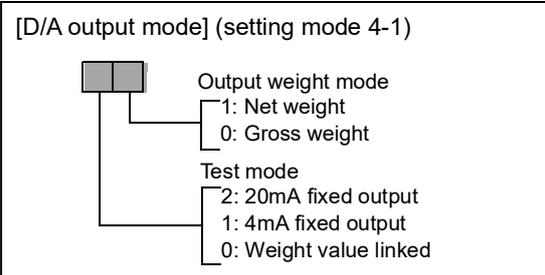
■ D/A zero output weight value

Set the weight value which outputs 4mA. The default value is "0".

[D/A zero output weight value] (setting mode 4-2)

(Input range: 0 to 99998)
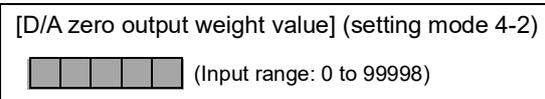
■ D/A full scale setting

Set the range for weight value which outputs 20mA. The default value is "10000".

[D/A full scale settings] (setting mode 4-3)

(Input range: 1 to 99999)
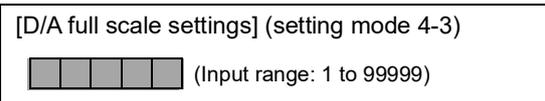
6-13-3. D/A resolution

The resolution of the D/A converter is 1/10000 for 4 to 20mA. Thus, the minimum unit of current is:

- Current (20－4mA) x 1/10000 = 1.6μA.

In addition, the minimum unit of weight value is:

- Weight value (D/A full scale setting value) x 1/10000.

6-14. Using the PROFIBUS interface (option)

F701+ PROFIBUS I/F is explained below. Basic knowledge for PLC and PROFIBUS is required to read it. Refer to specialized materials for basic knowledge on PROFIBUS.

6-14-1. Specifications

- F701+ equipped with PROFIBUS interface can be connected as a slave device for PROFIBUS field bus. (supports PROFIBUS-DP V0).

- Communication speed   Supports 9.6kbps to 12Mbps (follows the master automatically)
                            (However, 45.45kbps is not supported)

- Occupying memory   OUT 12 bytes (6 words)
                            IN 26 bytes (13 words)
                            (When assigning the address, ensure that the address is not
                            the same as other slaves.)

- Station no.   The station address can be set from between 0 and 125.

- GSD file name   UNIP0F61.GSDIN 26 bytes (13 words)

- Supports Sync Mode and Freeze Mode.

- Does not support Special Clear Mode (Fail Safe Mode).

6-14-2. Details for each section

1. Communication connector
   Connector for connecting to PROFIBUS.

2. Status LED
   Indicates communication status.
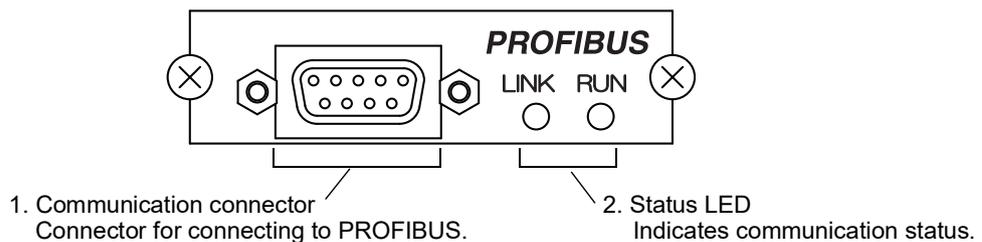
1. Connector for communication

Pin no.	Signal	Function
1		(Unused)
2	-	(Unused)
3	RxD/TxD-P	Data reception/transmitted data Plus
4	CNTR-P	Control signal (RTS)
5	DGND	Data ground (0V)
6	VP	Power supply for communication (5V)
7		(Unused)
8	RxD/TxD-N	Data reception/transmitted data Minus
9	-	(Unused)

* Prepare a connector of 9-pin D-SUB connector plug type for connection.

* Use PROFIBUS certified items for connector and cables. Ask the PROFIBUS Organization about PROFIBUS certified items.
   (Straight type, equivalent to 2744380 manufactured by Phoenix Contact.)

* Be sure to connect a terminator when the F701+ is at the end. Refer to specialized documents for the procedure to connect a terminator.

2. Status LED

- LINK: Lights up while linking to the master device.
- RUN: Lights up when normal.

6-14-3.Settings related to PROFIBUS

■ DWORD (long word) mode (setting mode 6-1)

When the data on the address map is DWORD (long word), the position of HI and LO can be determined (initial value: 00). The content set here will be common to both IN data and OUT data.

[PROFIBUS I/F setting] (setting mode 6-1)

1: Mode 1 (in the order LO to HI words) (PLC manufactured by Yokogawa Electric Corporation and so on)

0: Mode 0 (in the order HI to LO words) (PLC manufactured by Siemens K.K. and so on)

■ PROFIBUS baud rate display (setting mode 6-2)

Follows the master automatically during communication. The baud rate during the period is displayed.

[PROFIBUS baud rate] (setting mode 6-2)

Display pattern					Function
			1	2	12Mbps
				6	6Mbps
				3	3Mbps
			1	5	1.5Mbps
		5	0	0	500kbps
1	8	7	5		187.5kbps
9	3	7	5		93.75kbps
		1	9	2	19.2kbps
			9	6	9.6kbps
	-	-	-	-	Not linked, or not equipped with PROFIBUS I/F

■ Station No. (setting mode 6-3)

Set the station address (initial value: 125). This does not support station address change from the master.

[PROFIBUS station no.] (setting mode 6-3)

(Input range: 0 to 125)

6-14-4. Address map

This product occupies 12 bytes (6 words) of memory for OUT and 26 bytes (13 words) for IN. When assigning the address, ensure that the address is not the same as other slaves. All data used for writing and reading are handled after omitting the decimal points. However, the F701+ main unit recognizes the decimal point at a specified digit location.

(Example) When 500 is written into the judging time, F701+ handles the data as 5.00 [sec]. In the following explanation, ON represents 1 and OFF represents 0. Furthermore, the ON edge represents (0 →1), and OFF edge represents (1→0).

■ OUT data (6 words)

PLC → F701+

		DWORD mode	
		Mode 0	Mode 1
1st word	Write data	(HI)	(LO)
2nd word	Write data	(LO)	(HI)

3rd word — Command bit

(1) Gross weight/net weight display switch
(2) One-touch tare subtraction
(3) One-touch tare subtraction reset
(4) Digital zero
(5) Digital zero reset
(6) Hold
(7) Accumulation clear
(8) Accumulation command
(9) Start
(10) Stop
(11) Pause
(12) Judging input

Note
Do not perform (1) to (10) simultaneously. Perform them one by one.

4th word — Command bit

(1) Zero calibration
(2) Span calibration (actual load calibration)
(3) Span calibration (equivalent load calibration)

Note
Do not perform (1) to (3) simultaneously. Perform them one by one.

5th word — Command no.

6th word — Command bit

(1) R/W (R:1/W:0)
(2) Command request
(3) Survival verification request

■ Descriptions related to OUT data

○ Write data

Used when writing data using a command request. The write data is configured with a 32-bit binary (2 words) and the order of HI and LO positions changes with the DWORD mode of F701+ (setting mode 6-1).

○ Command no.

When writing data, specify the command no. for the data to specify. Upper byte is not used. Refer to the list below for command no. Please note that both the command no. response and the read data will be turned OFF and the command response will be turned ON for invalid command no. In addition, data cannot be written in while LOCK is ON. (In this case, the command response returns ON.)

Setting value	Command no.	Input range	Writing prohibited
Upper limit	1	0 to 99999	
Lower limit	2	0 to 99999	
Near zero	3	0 to 99999	
Set point 1	4	0 to 99999	
Set point 2	5	0 to 99999	
Compensation	6	0 to 9999	
Over	7	0 to 9999	
Under	8	0 to 9999	
Final	9	0 to 99999	
Comparison inhibit time	11	0 to 999	
Judging time	12	0 to 99	
Complete output time	13	0 to 99	
Compensation feeding time	14	0 to 999	
Number of times for AZ	15	0 to 99	
Number of times for Judging	16	0 to 99	
Auto free fall compensation regulation value	17	0 to 99999	
Tare setting	19	0 to 99999	
Weighing function 1	21	0000 to 2224	
Weighing function 2	22	00000 to 21312	
Weighing function 3	23	0000 to 3191	
Sequence mode	24	0000 to 2111	
Function key inhibited	25	0000 to 1111	
Filter	26	00 to 73	
Motion detect	27	00-00 to 99-99	
Zero tracking	28	00-00 to 99-99	
Setting value LOCK	29	00 to 11	
Balance weight value	31	0 to 99999	
Capacity	32	1 to 99999	
Min. scale division	33	1 to 100	
Net over	34	0 to 99999	
Gross over	35	0 to 99999	
DZ regulation value	36	0 to 9999	
Function selection	37	0000 to 3315	
Compensation for gravitational acceleration	38	97500 to 98500	
Option substrate	39	00000 to 11111	
D/A output mode	41	00 to 21	
D/A zero output weight value	42	0 to 99999	
D/A full scale setting	43	1 to 99999	

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Setting value	Command no.	Input range	Writing prohibited
Extended function selection 1	47	00000 to 61111	A/D conversion rate 100 times/sec
		00000 to 71111	A/D conversion rate 500 times/sec
Moving average	48	1 to 128	A/D conversion rate 100 times/sec
		1 to 512	A/D conversion rate 500 times/sec
Measurement Act compliance	49	0000 to 1111	
Input selection	51	00000 to 99999	
Output selection	52	0 to 3	
Restart setting Set point 1	53	0 to 100	
Restart setting Set point 2	54	0 to 100	
Restart setting Set point 3	55	0 to 100	
Number of times for knocking	56	0 to 99	
Knocking time	57	0 to 999	
Number of digits for accumulated display	58	0 to 99999	
Average weight	81	0 to 99999	
Max. weight	82	0 to 99999	
Min. weight	83	0 to 99999	
Gen. stan. dev.	84	0 to 99999	
Smp. stan. dev.	85	0 to 99999	
Number of data	86	0 to 9999	
Latest data	87	0 to 99999	
Max. - min.	88	0 to 99999	
Accumulated value (upper 4 digits)	89	0 to 9999	
Accumulated value (upper 5 digits)	90	0 to 99999	
Equivalent calibration value	92	0.1000 to 3.2000	

* During communication, all setting values are handled after omitting the decimal point.

* For command No. 27 and 28, two types of setting values are divided per word for both reading and writing.

- Command No. 27

Motion detect (time)   15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)   HI words

Motion detect (range)   15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)   LO words

- Command No. 28

Zero tracking (time)   15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)   HI words

Zero tracking (range)   15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)   LO words

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6

Useful Functions

○ Command bit

- Gross weight/net weight display switch	Changes gross weight display to net weight display at ON edge. Changes gross weight display to gross weight at OFF edge.
- One-touch tare subtraction	Performs tare subtraction at ON edge.
- One-touch tare subtraction reset	Resets tare subtraction at ON edge.
- Digital zero	Turns the gross weight to zero at ON edge.
- Digital zero reset	Resets digital zero at ON edge.
- Hold *1	Holds the current weight value at ON edge. Releases hold at OFF edge.
- Accumulation clear	Clears the accumulation data at ON edge.
- Accumulation command	Accumulates the current weight value at ON edge.
- Start	Starts weighing at ON edge.
- Stop	Stops weighing and turns the stop signal to ON level at ON edge. Turns the stop signal to OFF level at OFF edge.
- Pause	Pauses weighing at ON edge.
- Judging input	Rejudges the result at ON edge. Please note that rejudging is performed when the over/under comparison mode is set to "external judging input" in sequence mode.
- Zero calibration	Performs zero calibration at ON edge.
- Span calibration (actual load)	Performs span calibration (actual load calibration) at ON edge.
- Span calibration (equivalent input)	Performs span calibration (equivalent calibration) at ON edge.
- R/W (R:1/W:0)	Specifies READ/WRITE of command. READ: Turn ON when reading setting values for F701+. WRITE: Turn OFF when writing setting values for F701+.
- Command request	Give ON edge when performing read or write command.
- Survival verification request	Change this bit to check whether F701+ is operating normally. F701+ reverses this bit status in order to output a response to a survival verification request.

■ IN data (13 words)

		DWORD mode	
F701+ → PLC		Mode 0	Mode 1

1st word
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)
Gross weight (HI) (LO)

2nd word
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)
Gross weight (LO) (HI)

3rd word
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)
Net weight (HI) (LO)

4th word
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)
Net weight (LO) (HI)

7th word
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)
(7)(6)(5)(4)(3) (2) (1) Status 1

(1) Sequence error (0 to 9)   (2) Calibration error (0 to 9)
(3) Calibration process status   (4) ZALM
(5) +LOAD   (6) -LOAD
(7) OFL2

8th word
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)
(10)(9)(8)(7)(6)(5)(4)(3)(2)(1) Status 2

(1) HI LIM   (2) LO LIM
(3) HI   (4) GO
(5) LO   (6) SP1
(7) SP2   (8) SP3
(9) NZ   (10) COMPL.

9th word
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)
(9) (8)(7)(6)(5)(4)(3) (2) (1) Status 3

(1) Decimal place (0;None, 1:0.0, 2:0.00, 3:0.000)
(2) Unit (0;None, 1:t, 2:g, 3:kg, 4:lb, 5:N)
(3) STAB   (4) HOLD
(5) TARE   (6) NET
(7) ZT   (8) LOCK(SW)
(9) LOCK (settings)

10th word
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)
(12)(11)(10)(9)(8)(7)(6)(5)(4)(3)(2)(1) Command response

(1) Gross weight/net weight display switch response
(2) One-touch tare subtraction response
(3) One-touch tare subtraction reset response (4) Digital zero response
(5) Digital zero reset response   (6) Hold response
(7) Accumulation clear response   (8) Accumulation command response
(9) Start response   (10) Stop response
(11) Pause response   (12) Judging input response

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)

11th word ☐☐☐☐☐☐☐☐☐☐☐☐☐(3)(2)(1) Command bit response
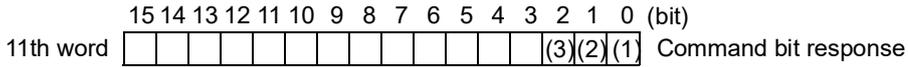
(1) Zero calibration response
(2) Span calibration (actual load calibration) response
(3) Span calibration (equivalent calibration) response

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)

12th word ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Command no. response

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)

13th word ☐☐☐☐☐☐☐☐☐☐☐☐(4)(3)(2)(1) Command bit response
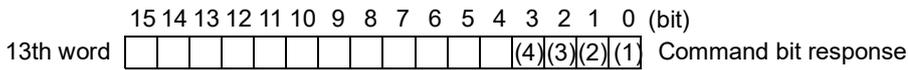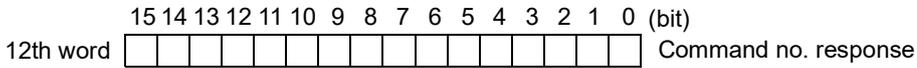
(1) R/W response
(2) Command response
(3) Survival verification response (The survival bit status is reversed and set.)
(4) Remote READY ("1" is set after initialization.)

■ Descriptions related to IN data

○ Gross weight (32 binary/0 to 99999)

○ Net weight (32 binary/0 to 99999)

Indicates gross weight or net weight. The weight status can be read at the same time, as in the example below. The sign can be checked within the weight status. The weight displayed here is updated constantly. No request signal etc. is needed. The order of HI and LO positions changes with the DWORD mode of F701+ (setting mode 6-1).

1) When DWORD mode is set to mode 0

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)

Nth word   0 ☐☐☐ 0 0 ☐☐☐☐☐☐☐☐☐   Weight

▲   ▼   Sign   Weight data (HI)
CZ over
RESERVE (always 0)

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)

N+1th word ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Weight

Weight data (LO)

2) When DWORD mode is set to mode 1

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)

Nth word ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Weight

Weight data (LO)

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 (bit)

N+1th word 0 ☐☐☐ 0 0 ☐☐☐☐☐☐☐☐☐ Weight

▲   ▼   Sign   Weight data (HI)
CZ over
RESERVE (always 0)
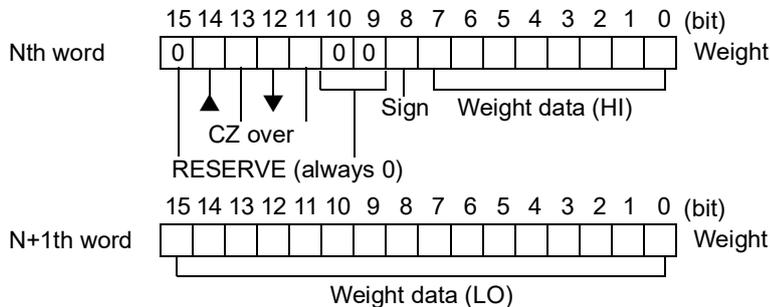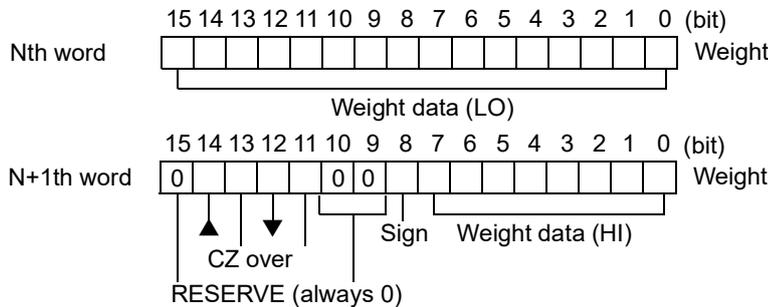
- ▲   Turns ON when at +1/4 scale division from the center point of each indicated scale interval. Please note that it is necessary to set the 1/4 scale division (setting mode 3-7) to ON.

- CZ   Turns ON when at the actual zero point (0±1/4 scale division). Please note that when the 1/4 scale division (setting mode 3-7) is set to ON, it also turns ON at the center point of each indicated scale interval.

- ▼   Turns ON when it is at +1/4 scale division from the center point of each indicated scale interval. Please note that it is necessary to set the 1/4 scale division (setting mode 3-7) to ON.

- Over   Displays OFL3 (gross weight > gross over setting value) for gross weight and OFL1 (net weight > net over setting value) for net weight.

- Sign   Turns ON when the target weight value is a negative value.

○ Read data (32-bit binary without sign)

Indicates data specified by the command no. Signs are not included. Please note that when performing command no. 19 (read tare value), the format will be the same as the 1st to 4th words (in this case, over is when tare > 99999). The data indicated here are updated each time the ON edge of a command request is received. The order of HI and LO positions changes with the DWORD mode of F701+ (setting mode 6-1).

○ Status 1 (error information)

- Sequence error   (4-bit binary: 0 to 9) Indicates sequence error no. 0 means no error.
- Calibration error   (4-bit binary: 0 to 9) Indicates the calibration error no. 0 means no error.
- Calibration in process Turns ON during zero calibration or span calibration.
- ZALM   Turns ON with ZALM generation when the total weight for digital zero exceeds the DZ regulation value as a result of digital zero or zero tracking operation.
- +LOAD   Turns ON when a signal that exceeds the F701+ signal input range is input.
- -LOAD   Turns ON when a signal that falls below the F701+ signal input range is input.
- OFL2   Turns ON when the gross weight > capacity + 9 scale divisions.

○ Status 2 (weighing information)

- HI LIM   Comparison timing depends on the setting for HI/LO limit comparison mode, but it normally turns ON when the weight value > upper limit setting value.
- LO LIM   Comparison timing depends on the setting for HI/LO limit comparison mode, but it normally turns ON when the weight value < lower limit setting value.
- HI   Comparison timing depends on the setting of over/under comparison mode, but it normally turns ON when the weight value > (final + over).
- GO   Comparison timing depends on the setting for over/under comparison mode, but it normally turns ON when (final - under) ≦ weight value ≦ (final + over).
- LO   Comparison timing depends on the setting for upper/under comparison mode, but it normally turns ON when the weight value < (final - under).
- SP1   Turns ON when the weight value ≧ (final - set point 1) during weighing.
- SP2   Turns ON when the weight value ≧ (final - set point 2) during weighing.
- SP3   Turns ON when the weight value ≧ (final - compensation) during weighing.
- NZ   Comparison timing depends on the setting for near zero comparison mode, but it normally turns ON when the weight value ≦ near zero.
- COMPL.   Turns ON during complete signal output.

○ Status 3 (weighing information, LOCK status)

- Decimal place	(2-bit binary: 0 to 3) Indicates decimal place of F701+ (setting mode 3-7).
- Units display	(4-bit binary: 0 to 4) Indicates units display of F701+ (setting mode 3-7).
- STAB	Turns ON when the weight value is stable.
- HOLD	Turns ON during weight value hold.
- TARE	ON while the tare subtraction is being performed.
- NET	ON while net weight is being displayed and OFF while gross weight is being displayed.
- ZT	ON when the zero tracking function is operating.
- LOCK(SW)	ON if LOCK SW on the rear panel is ON and OFF if it is OFF.
- LOCK (setting)	(2-bit binary: 0 to 3) Indicates setting LOCK of F701+ (setting mode 2-9).

○ Command bit response

- Gross weight/net weight display switch response	Returns the same status as the gross weight/net weight display switch in the command bit.
- One-touch tare subtraction response	Turns ON after receiving and performing one-touch tare subtraction in the command bit. Turns OFF after confirming that one-touch tare subtraction in the command bit is OFF.
- One-touch tare subtraction reset response	Turns ON after receiving and performing one-touch tare subtraction reset in the command bit. Turns OFF after confirming that one-touch tare subtraction reset in the command bit is OFF.
- Digital zero response	Turns ON after receiving and performing one-touch tare subtraction in the command bit. Turns OFF after confirming that digital zero in the command bit is OFF.
- Digital zero reset response	Turns ON after receiving and performing digital zero reset in the command bit. Turns OFF after confirming that digital zero reset in the command bit is OFF.
- Hold response	Returns the same status as hold in the command bit.
- Accumulation clear response	Turns ON after receiving and performing accumulation clear in the command bit. Turns OFF after confirming that accumulation clear in the command bit is OFF.
- Accumulation command response	Turns ON after receiving and performing an accumulation command in the command bit. Turns OFF after confirming that the accumulation command in the command bit is OFF.
- Start response	Turns ON after receiving and performing a start signal in the command bit. Turns OFF after confirming that the start signal in the command bit is OFF.
- Stop response	Turns ON after receiving and performing a stop signal in the command bit. Turns OFF after confirming that the stop signal in the command bit is OFF.
- Pause response	Turns ON after receiving and performing pause in the command bit. Turns OFF after confirming that pause in the command bit is OFF.
- Judging input response	Turns ON after receiving and performing judging input in the command bit. Turns OFF after confirming that judging input in the command bit is OFF.
- Zero calibration response	Turns ON after receiving and performing zero calibration in the command bit. Turns OFF after confirming that zero calibration in the command bit is OFF.
- Span calibration response (actual load calibration)	Turns ON after receiving and performing span calibration (actual load calibration) in the command bit. Turns OFF after confirming that span calibration (actual load calibration) in the command bit is OFF.

- Span calibration response (equivalent calibration)	Turns ON after receiving and performing span calibration (equivalent calibration) in the command bit. Turns OFF after confirming that span calibration (equivalent calibration) in the command bit is OFF.
- Command No. response	Returns the same value as the command No. for OUT data as soon as the command response is turned ON. Upper byte is not used.
- R/W response	Returns the same status as R/W in the command bit for OUT data as soon as the command response is turned ON.
- Command response	Turns ON when a read or write command execution is completed. Turns OFF after confirming that the command request is OFF.
- Survival verification request response	Regularly reverses and outputs a survival verification request.
- Remote READY	Turns ON when initialization of F701+ is completed.

6-14-5. Procedures for writing, reading and commanding

■ Procedure for writing

1. Turn OFF R/W and specify write (WRITE).

2. Specify the command no. for the setting value to write.

3. Set data in the write data area.

4. Perform ON edge of command request.

5. Take the write data on the F701+ side and turn ON command response.

6. Be sure to confirm that command response is ON before turning OFF command request.

7. When command request is turned OFF, command response will also be turned OFF.

> **Attention**
>
> - Be sure to confirm that command response is OFF before performing ON edge of command request.
>
> - Remote READY may not be ON immediately after power ON.
>   In such cases, wait until it turns ON before performing the procedure.

Chapter 6

Useful Functions
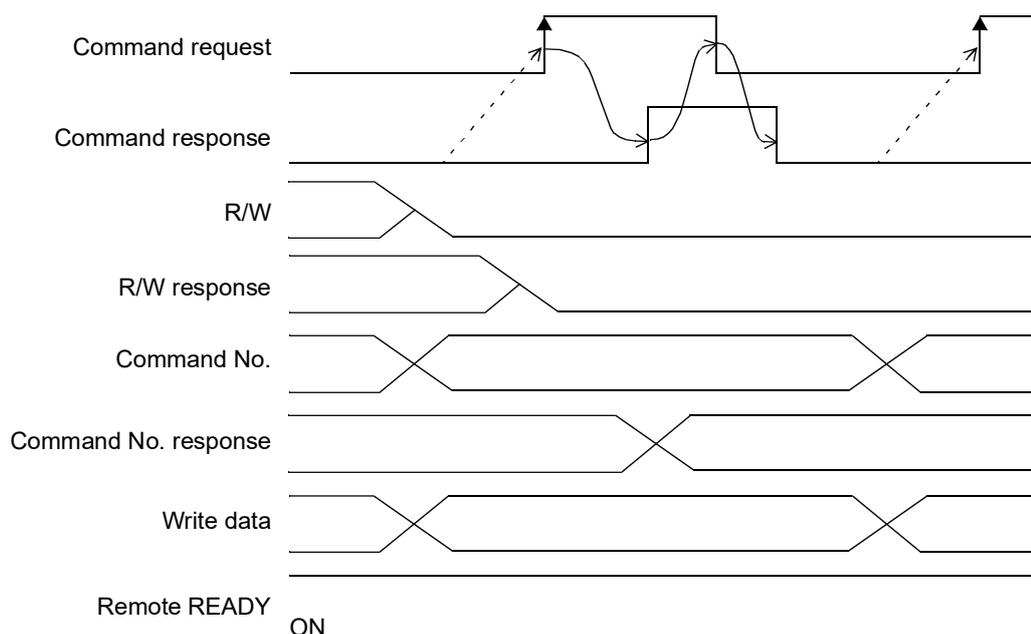
■ Procedure for reading

1. Turn ON R/W and specify read (READ).

2. Specify the command no. for the setting value to read.

3. Perform ON edge of command request.

4. Set the setting value in the read data area on the F701+ side and turn ON command response.

5. After confirming command response ON, read the data.

6. When command request is turned OFF, command response will also be turned OFF.

> **Attention**
>
> - Be sure to confirm that command response is OFF before performing ON edge of command request.
>
> - Remote READY may not be ON immediately after power ON.
>   In such cases, wait until it turns ON before performing the procedure.

Command request	
Command response	
R/W	
R/W response	
Command No.	
Command No. response	
Read data	
Remote READY	ON
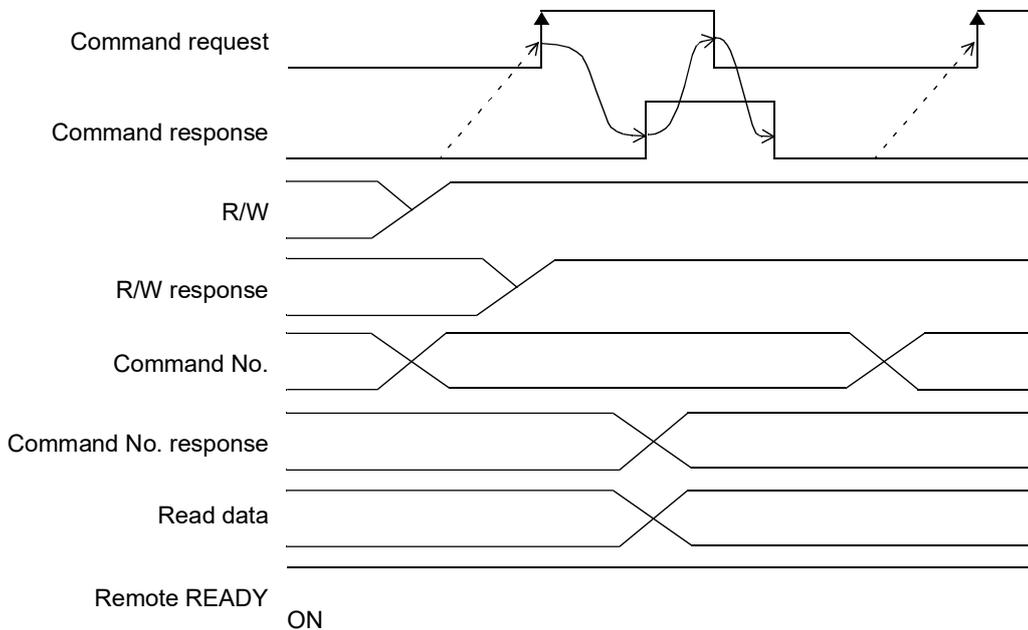
■ Procedure for sending commands

1. Turn OFF the bits for the 3rd and 4th words in OUT data.
   Please note that commands which detect OFF edges and OFF levels (hold, stop) should keep the immediately preceding status.
   When using start, stop, pause or judging input, it must not be the same as input signal set for input selection (setting mode 5-1).

2. Turn ON the bit for the command to be executed.
   Change the status level of commands which detect OFF edges and OFF levels to the desired level to be specified.

3. On the F701+ side, turn ON the command bit response which will be made after the command is performed.
   Commands which detect OFF edges and OFF levels return the same status to the corresponding response.

4. When turning OFF the command bit immediately after execution, do so after confirming the response in "3".
 Commands which detect OFF edges and OFF levels do not require a reset to the previous status.

5. When the command bit is turned OFF, the corresponding command response will also be turned OFF.

> **Attention**
>
> - When performing commands by command bits, be sure to check the status of the corresponding command bit response prior to making changes. (If the ON/OFF level of the bit does not change, the command will not be performed on the F701+ side.)
>
> - Perform commands by command bits one by one, following the procedure, and do not perform multiple commands at once.
>
> - Remote READY may not be ON immediately after power ON. In such cases, wait until it turns ON before performing the procedure.

Example 1) Performing one-touch tare subtraction
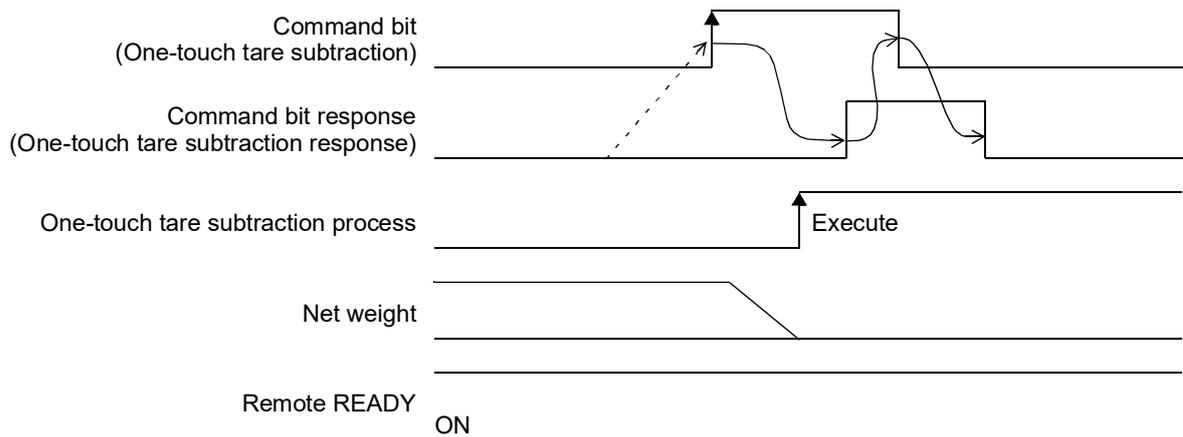
Example 2) Starting hold by giving ON edge to hold command bit, and then releasing hold by giving OFF edge.

Chapter
6

Useful Functions
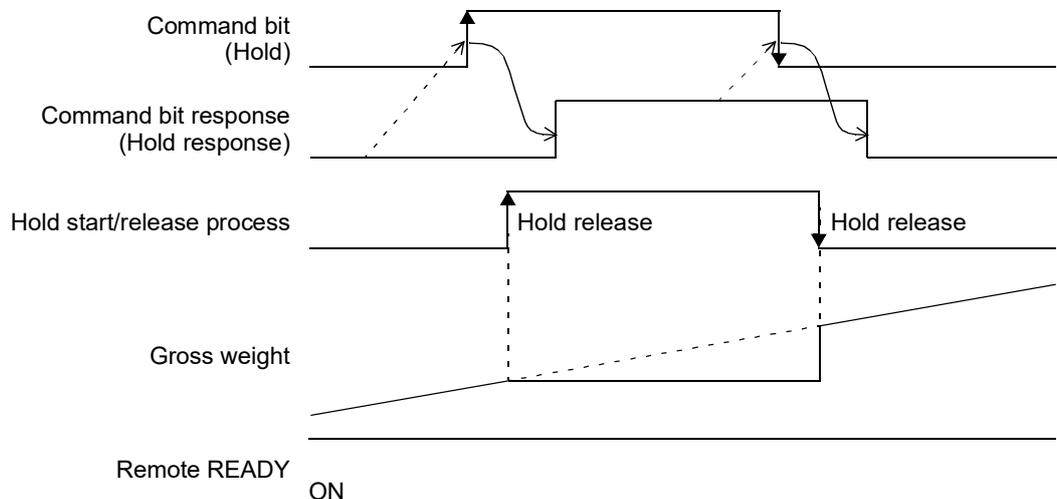
6-15. Connecting a printer

The F701+ can be connected to a printer to print weight values and so on in real time.

6-15-1.Printer mode

Set the baud rate (setting mode 4-4: RS-232C communication setting) to 6: printer mode. By simply changing to printer mode, the settings change automatically within the device to enable it to communicate with the printer in use. Other communication conditions are not relevant. Printing will not be carried out properly unless the device is set to printer mode. Furthermore, the printer to be connected to must be ONLINE to print.

When the device is set to printer mode, the following communication settings will be applied. Check the communication settings for the printer to be connected before using it.

Baud rate	4800 bps
Character length	8 bits
Parity bit	None
Stop bit	1 bit

6-15-2.Printer settings

■ Print settings

Perform setting related to printing.

[Print settings] (setting mode 7-1)

Auto print
1: ON
  (manual print OFF)
0: OFF
  (manual print ON)

* Undefined

* Undefined

Near zero print
1: ON
0: OFF
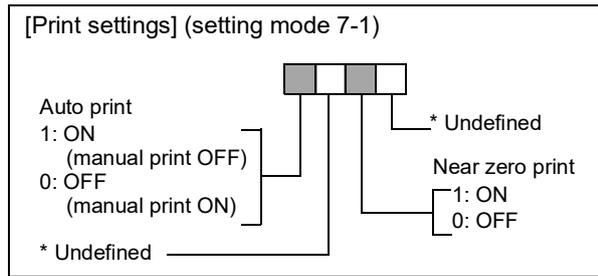
■ Printer command

Perform setting related to printer commands.

[Printer command] (setting mode 7-2)

4: Paper feed
3: Date print
2: Erase print
1: Total print
0: Cancel
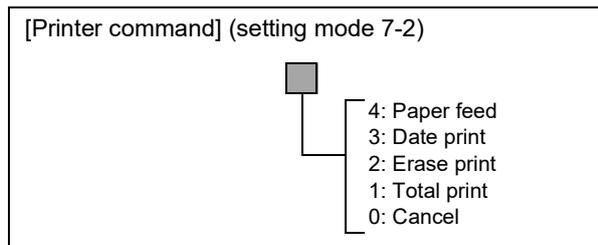
■ Printer settings

Perform setting related to printing size and line breaks.

[Printer settings] (setting mode 7-3)

* Undefined

Double size print
1: ON
0: OFF

Line breaks after total print
(input range: 0 to 9)

Line breaks after individual print
(input range: 0 to 9)
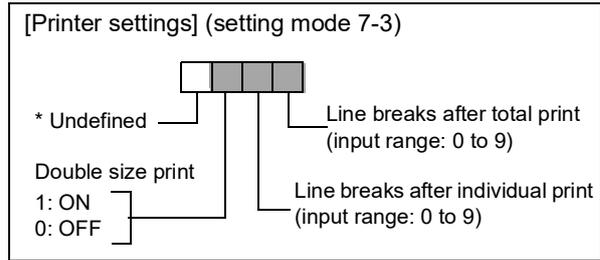
■ Individual print format

Items other than the weight value of individual print can be selected for printing.

Count	Current print count (accumulated value)
Tare weight	Current tare weight value
Time	Current time
Year/date	Current year, month and day
Upper/lower limit comparison result	Upper/lower comparison result of the weight values

[Individual print format] (setting mode 7-4)

Count
1: ON
0: OFF

Tare display
1: ON
0: OFF

Time
1: ON
0: OFF

Upper/lower limit comparison result
1: ON
0: OFF

Year/date
1: ON
0: OFF
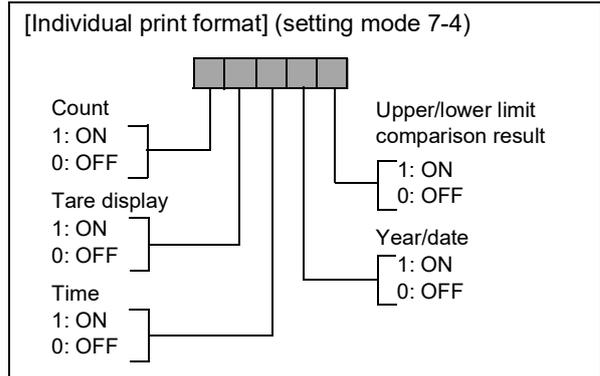
■ Total print format

Items other than the accumulated value of total print can be selected for printing. The printing count can be limited to an arbitrary number (setting mode 7-6).

Count	Current print count (accumulated value)
Statistics data	Statistical data such as maximum, minimum and average values.
Year/date/time	Current year, month, day and time

[Total print format] (setting mode 7-5)

Count
1: ON
0: OFF

Stan. dev.
2: ON
(Smp. stan. dev.)
1: ON
(Gen. stan. dev.)
0: OFF

Upper/lower limit comparison result
1: ON
0: OFF

Year/date/time
1: ON
0: OFF

Statistics data
1: ON
0: OFF
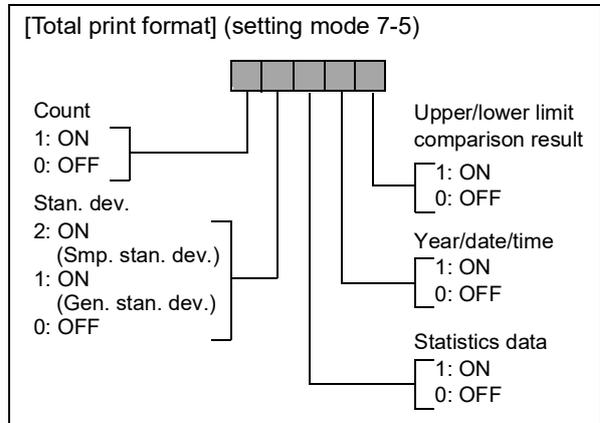
Upper/lower limit comparison

Upper/lower limit setting values and upper/lower limit counter
0: OFF   Does not print
1: ON   Prints

Stan. dev.   Gen. stan. dev. or smp. stan. dev
0: OFF   Does not print
1: ON (gen. stan. dev.)   Prints the gen. stan. dev.
2: ON (smp. stan. dev.)   Prints the smp. stan. dev.

Chapter 6

Useful Functions

■ Print count

Set print count. Also used as an accumulation count setting even when not in printer mode.

[Print count] (setting mode 7-6)

(Input range: 0 to 9999)

■ Year setting (setting mode 7-7)

Set current year. Year between 2000 and 2099 can be set.

[Print count] (setting mode 7-7)

2 0   (Input range: 00 to 99)
Y Y Y Y

■ Date setting (setting mode 7-8)

Set current date.

[Date setting] (setting mode 7-8)

(Input range: MM: 01 to 12
M M D D   DD: 01 to 31)

■ Time setting (setting mode 7-9)

Set current time.

[Time setting] (setting mode 7-9)

(Input range: hh: 00 to 23
h h m m   mm: 00 to 59)

Key point

Year, date and time work only when equipped with RS-232C interface for printer connection (option).

6-15-3. Examples of print format

■ Individual print

Digit No. → 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	↓ Printer settings
G ⎵ 1 2 . 3 4 5 ⎵ k g	Weight value only
9 8 7 6 ⎵ G ⎵ 1 2 . 3 4 5 ⎵ k g	With count print
9 8 7 6 ⎵ G ⎵ 1 2 . 3 4 5 ⎵ k g T ⎵ 2 . 3 4 5 ⎵ k g	With tare weight print
1 2 : 3 4 ⎵ G ⎵ 1 2 . 3 4 5 ⎵ k g	With time print
1 2 : 3 4 9 8 7 6 ⎵ G ⎵ 1 2 . 3 4 5 ⎵ k g	With time and count print
2 0 1 5 / 0 3 / 1 8 G ⎵ 1 2 . 3 4 5 ⎵ k g	With date print
2 0 1 5 / 0 3 / 1 8 9 8 7 6 ⎵ G ⎵ 1 2 . 3 4 5 ⎵ k g	With date and count print
2 0 1 5 / 0 3 / 1 8 ⎵ 1 2 : 3 4 G ⎵ 1 2 . 3 4 5 ⎵ k g	With date and time print
2 0 1 5 / 0 3 / 1 8 ⎵ 1 2 : 3 4 9 8 7 6 ⎵ G ⎵ 1 2 . 3 4 5 ⎵ k g	With date, time and count print
2 0 1 5 / 0 3 / 1 8 9 8 7 6 ⎵ - N ⎵ 7 . 3 4 5 ⎵ k g	With date and count print With reversed sign of net weight
9 8 7 6 ⎵ G ⎵ 1 2 . 3 4 5 ⎵ k g ⎵ H	With upper/lower limit comparison result print H: HI LIM L: LO LIM N: HI LIM & LO LIM
9 8 7 6 ⎵ G ⎵ 1 2 . 3 4 5 ⎵ k g -	Erase print, data accumulation -: Erase print *: Data accumulation OFF

■ Total print

```
Digit No. →  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24      ↓ Printer settings
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                                                                                         Total data only
T  O  T  A  L                    5  1  2  7  7  8  9  .  8  4        k  g
= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
                                                                                         With date and time print
D  A  T  A            2  0  1  5  /  0  3  /  1  9        1  0  .  3  6

T  O  T  A  L                    5  1  2  7  7  8  9  .  8  4        k  g
= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
C  O  U  N  T                                      9  8  7  6                            With count print
T  O  T  A  L                    5  1  2  7  7  8  9  .  8  4        k  g
= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
T  O  T  A  L                    5  1  2  7  7  8  9  .  8  4        k  g               With stan. dev. print
S  D  n  -  1                                3  5  5  8  .  6  3
= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
T  O  T  A  L                    5  1  2  7  7  8  9  .  8  4        k  g               With statistical data print
S  D  n  -  1                                3  5  5  8  .  6  3                        (Average/max./min.
A  V  E                                      5  5  6  .  8  8        k  g                        /max. - min.)
M  A  X                                      1  2  3  .  4  5        k  g
M  I  N                                3  5  5  8  .  6  3        k  g
R  (  M  A  X  -  M  I  N  )                  8  6  4  .  2  0        k  g
= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
D  A  T  A            2  0  1  5  /  0  3  /  1  9        1  0  .  3  6               With date, count, stan. dev.,
C  O  U  N  T                                      9  8  7  6                          statistical data,
T  O  T  A  L                    5  1  2  7  7  8  9  .  8  4        k  g               and upper/lower limit
S  D  n  -  1                                3  5  5  8  .  6  3                        comparison result print
A  V  E                                      5  5  6  .  8  8        k  g
M  A  X                                      1  2  3  .  4  5        k  g
M  I  N                                3  5  5  8  .  6  3        k  g
R  (  M  A  X  -  M  I  N  )                  8  6  4  .  2  0        k  g
H  I     L  I  M                             1  4  0  .  0  0        k  g
L  O     L  I  M                             1  1  0  .  0  0        k  g
H  I     L  I  M     C  O  U  N  T                           5
G  O              C  O  U  N  T                     9  8  6  6
L  O     L  I  M     C  O  U  N  T                           5
= = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = = =
```

Chapter 6

Useful Functions

6-16. Using statistical data functions

Data accumulated in F701+ can be displayed statistically.

6-16-1. Average weight

The average weight is displayed.

[Average weight] (setting mode 8-1)

☐☐☐☐☐ (Display range: 0 to 99999)

6-16-2. Max. weight

The maximum weight is displayed.

[Max. weight] (setting mode 8-2)

☐☐☐☐☐ (Display range: 0 to 99999)

6-16-3. Min. weight

The minimum weight is displayed.

[Min. weight] (setting mode 8-3)

☐☐☐☐☐ (Display range: 0 to 99999)

6-16-4. Gen. stan. dev.

The gen. stan. dev. is displayed.

[Gen. stan. dev.] (setting mode 8-4)

☐☐☐☐☐ (Display range: 0 to 99999)

6-16-5. Smp. stan. dev.

The smp. stan. dev. is displayed.

[Smp. stan. dev.] (setting mode 8-5)

☐☐☐☐☐ (Display range: 0 to 99999)

6-16-6. Number of data

The number of data is displayed.

[Number of data] (setting mode 8-6)

☐☐☐☐ (Display range: 0 to 9999)

6-16-7. Latest data

The number of latest data is displayed.

[Latest data] (setting mode 8-7)

☐☐☐☐☐ (Display range: 0 to 99999)

6-16-8. Max. - min.

The value obtained from subtracting the min. weight from the max. weight is displayed.

[Max. - min.] (setting mode 8-8)

☐☐☐☐☐ (Display range: 0 to 99999)

Chapter
6

Useful Functions

6-16-9.Accumulated value

The accumulated value of measured weight value is displayed. Accumulated values can be stored internally from 0 to 999999999, but only an arbitrary 5 digits can be displayed.

[Accumulated value] (setting mode 8-9)

(Display range: 0 to 99999) *

* The digits to be displayed can be changed by the number of accumulated display digits.

[Accumulated display digits] (setting mode 5-8)

(Setting range: 5 to 9)

Digit setting value: 5 9 8 7 6 5 4 3 2 1

Digit setting value: 6 9 8 7 6 5 4 3 2 1

Digit setting value: 7 9 8 7 6 5 4 3 2 1

Digit setting value: 8 9 8 7 6 5 4 3 2 1

Digit setting value: 9 9 8 7 6 5 4 3 2 1

7   Troubleshooting

7-1.   Over-scale display

Display	Error name	Error content/countermeasures
LoAd	A/D converter input over	Signals that exceed the F701+ signal input range are input. Confirm that the load cell output does not exceed the span calibration range and that the cable which connects F701+ to the load cell is not disconnected. This may also appear if nothing is connected to the load cell connector on the rear panel.
- LoAd	A/D converter minus over	Signals lower than the F701+ signal input range are input. Confirm that the load cell output is not below the span calibration range and that the cable which connects F701+ to the load cell is not disconnected. This may also appear if nothing is connected to the load cell connector on the rear panel.
oFL1	Net weight over	Net weight value exceeds the net over setting value. In order to return to a normal weight display from this over scale display, reduce the input signal from the load cell until the over scale display disappears, or change the net over setting value. Set the same value for net over setting value as capacity in order to prevent error display.
oFL2	Capacity + 9 scales over	Gross weight exceeds capacity by + 9 scale divisions. In order to return to a normal weight display from this over scale display, reduce the input signal from the load cell until the over scale display disappears.
oFL3	Gross over	Gross weight value exceeds the gross over setting value. In order to return to a normal weight display from this over scale display, reduce the input signal from the load cell until the over scale display disappears, or change the gross over setting value. Set the same value for gross over setting value as capacity in order to prevent error display.

(Net weight = gross weight - tare)

(Capacity is a basic value to use F701+ as a weighing device. Be sure to re-calibrate after changing capacity. Be sure not to change capacity accidentally to return the error to normal.)

7-2.   Sequence error display

Sequence error output turns ON.

Display	Error name	Error content/countermeasures
$Err1$	Seq. error 1	The stop signal is ON when the weighing start signal is turned ON. Turn OFF the stop signal and re-input a start signal to start weighing.
$Err2$	Seq. error 2	This is displayed when the stop signal turns ON while weighing with sequence control. Turn the stop signal OFF → ON.
$Err3$	Seq. error 3	This is displayed when ZALM status occurs while performing auto-zero sequence control. Remove the cause of zero shift (such as adhering substances) and reset digital zero.
$Err4$	Seq. error 4	This is displayed when near zero signal is OFF when weighing starts (only when "setting mode 2-4: confirm near zero at start" is enabled). First, check near zero setting value and near zero comparison target. Then, confirm that situations such as "the device was started before complete discharge", "the start signal was turned ON too early" and "discharged substances have caused clogging" have not occurred, and turn the stop signal OFF → ON.
$Err5$	Seq. error 5	This is displayed when set point 1 output (SP1) signal is ON when weighing starts (only when "setting mode 2-4: confirm weight value at start" is enabled). First, check the setting values for SP1 and final. Then, confirm that situations such as "the device was started before complete discharge" have not occurred, and turn the stop signal OFF → ON.

(Net weight = gross weight - tare)

7-3.   Calibration error display

Display	Error content	Countermeasures
ᴄ Err2	Calibration error 2	The amount of initial tare elimination exceeds the zero adjustment range of F701+. Confirm that there is no unnecessary load applied to the load cell. If an error is displayed while a normal load is applied, connect a resistance between +EXC and -SIG terminals of the load cell. After shifting the zero point, zero calibration will need to be re-performed. Refer to the table below for the relationship between the resistance for connection and input signal. +EXC +SIG -EXC -SIG Connect a resistance between +EXC and -SIG.
ᴄ Err3	Calibration error 3	The amount of initial tare elimination is on the minus (negative) side. Confirm that load is applied to the load cell in a correct direction and that the wiring for load cell +SIG and -SIG are not reversed. If an error is displayed even with correct load applied and proper wiring, connect a resistance between -EXC and -SIG terminals of the load cell. After shifting the zero point, zero calibration will need to be re-performed. Refer to the table below for the relationship between the resistance for connection and input signal. +EXC +SIG -EXC -SIG Connect a resistance between -EXC and -SIG.
ᴄ Err4	Calibration error 4	Balance weight value or span calibration value is set higher than capacity. Re-set balance weight value or capacity, and re-perform span calibration. Force Capacity Balance weight value + 9 scales 50% 0 In order to perform span calibration correctly, it is recommended to perform it so that the balance weight value falls between 50% of the capacity and the capacity.
ᴄ Err5	Calibration error 5	Balance weight value or span calibration value is set as "00000". Re-set balance weight value to an appropriate value.
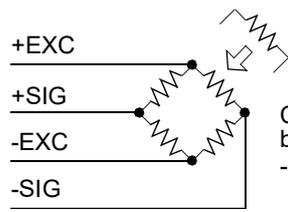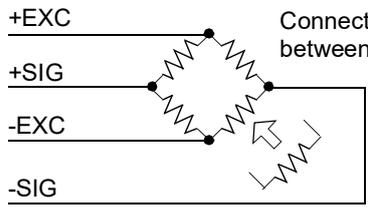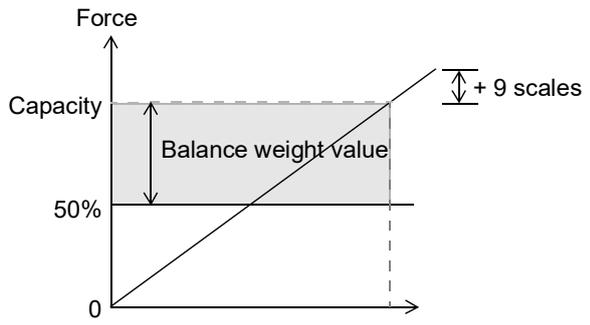
⊏ Err6	Calibration error 6	Load cell output value has not reached the span adjustment range of F701+. Confirm that the load is applied to the load cell correctly or that the load cell output is capable of reaching the span adjustment range, and then re-perform span calibration.
⊏ Err7	Calibration error 7	The load cell output is on the minus (negative) side. Confirm that load is applied to the load cell in the correct direction or that the wiring for load cell +SIG and -SIG are not reversed, and then re-perform Span Calibration.
⊏ Err8	Calibration error 8	Load cell output exceeds the span adjustment range of F701+. Confirm that the load is applied to the load cell correctly or that the rated output value of the load cell is within the span adjustment range, and then re-perform span calibration.
⊏ Err9	Calibration error 9	The value indicated on F701+ fluctuates during calibration, and calibration cannot be completed properly. Adjust the parameters for stable settings (time and range), confirm that "STAB" lights up, and then re-perform calibration.

■ Table for relationship between resistance value for connection and input signal

Resistance value		Input conversion distortion	
Calculation value	Approximate value	μ-STRAIN	mV/V
875 kΩ	866 kΩ	200	0.1
437 kΩ	442 kΩ	400	0.2
291 kΩ	294 kΩ	600	0.3
219 kΩ	221 kΩ	800	0.4
175 kΩ	174 kΩ	1000	0.5
146 kΩ	147 kΩ	1200	0.6
125 kΩ	124 kΩ	1400	0.7
109 kΩ	110 kΩ	1600	0.8
97 kΩ	97.6 kΩ	1800	0.9
87.3 kΩ	86.6 kΩ	2000	1.0
79.4 kΩ	78.7 kΩ	2200	1.1
72.7 kΩ	73.2 kΩ	2400	1.2
67.1 kΩ	66.5 kΩ	2600	1.3
62.3 kΩ	61.9 kΩ	2800	1.4
58.2 kΩ	57.6 kΩ	3000	1.5
54.5 kΩ	54.9 kΩ	3200	1.6
51.3 kΩ	51.1 kΩ	3400	1.7
48.4 kΩ	48.7 kΩ	3600	1.8
45.9 kΩ	46.4 kΩ	3800	1.9
43.6 kΩ	43.2 kΩ	4000	2.0
41.5 kΩ	41.2 kΩ	4200	2.1
39.6 kΩ	39.2 kΩ	4400	2.2
37.9 kΩ	38.3 kΩ	4600	2.3
36.3 kΩ	36.5 kΩ	4800	2.4
34.8 kΩ	34.8 kΩ	5000	2.5

- The numerical values in this table are the ones when one 350Ω series load cell is used.

- The temperature coefficient of the resistance connected here affects the indicator accuracy directly.
  Use a minimum 50ppm/°C resistance(5ppm/°C recommended).

Chapter 7

Troubleshooting

8   List of Setting Items

Initial value:	Factory default value
Per code:	Change the setting value per code
NOV.RAM:	Setting values are saved in NOV.RAM (non-volatile RAM).
F-RAM:	Setting values are saved in F-RAM (non-volatile RAM).
Lock1 (soft):	Setting value change is prohibited using Lock1 of the soft switch (setting mode 2-9).
Lock2 (soft):	Setting value change is prohibited using Lock2 of the soft switch (setting mode 2-9).
LOCK (SW):	Setting value change is prohibited using the LOCK switch on the rear panel.
Display only:	Settings cannot be changed.

■Setting mode 0

	Name	Initial value	Setting range	Lock1 (soft)	Lock2 (soft)	LOCK (SW)	Display only	Communication command
1	Upper limit	000.00	0 to 99999	◎				W22(R/W)
2	Lower limit	000.00	0 to 99999	◎				W23(R/W)
3	Near zero	000.00	0 to 99999	◎				W24(R/W)
4	Set point 1	000.00	0 to 99999	◎				W10(R/W)
5	Set point 2	000.00	0 to 99999	◎				W11(R/W)
6	Compensation	00.00	0 to 9999	◎				W15(R/W)
7	Over	0.00	0 to 999	◎				W13(R/W)
8	Under	0.00	0 to 999	◎				W14(R/W)
9	Final	000.00	0 to 99999	◎				W12(R/W)

■Setting mode 1

	Name	Initial value	Setting range	Lock1 (soft)	Lock2 (soft)	LOCK (SW)	Display only	Communication command
1	Comparison inhibit time 1	0.50	0.00 to 9.99		◎			W21(R/W)
2	Judging time	1.50	0.00 to 9.99		◎			W20(R/W)
3	Complete output time	3.00	0.00 to 9.99		◎			W28(R/W)
4	Compensation feeding time	1.00	0.00 to 9.99		◎			W17(R/W)
5	Number of times for AZ	01	00 to 99		◎			W26(R/W)
6	Number of times for judging	01	00 to 99		◎			W27(R/W)
7	Auto free fall compensation regulation value	98.00	00000 to 99999		◎			W16(R/W)
8	Comparison inhibit time 2	0.50	0.00 to 9.99		◎			W29(R/W)
9	Tare setting	000.00	00000 to 99999	◎				W25(R/W)

■Setting mode 2

		Name	Initial value	Setting range	Lock1 (soft)	Lock2 (soft)	LOCK (SW)	Display only	Communication command
1		Weighing function 1	0000	0000 to 2224					W31(R/W)
		Discharging control mode	0	2: External selection 1: Discharge control 0: Feeding control		◎			
		Final and over/under comparison	0	2: Comparison OFF 1: Net weight 0: Gross weight					
		Upper/lower limit comparison	0	2: Comparison OFF 1: Net weight 0: Gross weight					
		Near zero comparison mode	0	4: Comparison OFF 3: |Net weight| 2: |Gross weight| 1: Net weight 0: Gross weight					
2		Weighing function 2	00000	00000 to 21312					W32(R/W)
		Output selection (21 pin)	0	2: Weight error and seq. error 1: Seq. error 0: Weight error		◎			
		Output selection (22 pin)	0	1: Complete output 0: Go output					
		Over/under comparison mode	0	3: Compare when complete output is ON and hold the weight value 2: Compare when complete output is ON 1: Compare when external judging input is ON 0: Compare regularly					
		Complete signal output mode	0	2: Turns ON only for the complete output time either after the SP3 signal has turned ON and the judging timer has elapsed or from when the weight value has become stable 1: Turns ON only for the complete output time from when the weight value has become stable after the judging timer has elapsed 0: Compare regularly					
		Upper/lower limit comparison mode	0	1: Compare when external judging input is ON 0: Compare regularly					
3		Weighing function 3	0141	0010 to 3191					W33(R/W)
		Auto free fall compensation coefficient	0	3: 1/4 2: 2/4 1: 3/4 0: 1		◎			
		Auto free fall compensation	1	2: ON (communication option OFF) 1: ON 0: OFF					
		Average number of times for auto free fall compensation	4	1 to 9					
		Preset tare weight	1	1: ON 0: OFF					

				Lock1 (soft)	Lock2 (soft)	LOCK (SW)	Display only	Communication command
4	Sequence mode	0000	0000 to 2111					W30(R/W)
	Weighing mode	0	2: Sequence mode (with power failure restoration) 1: Sequence mode (without power failure restoration) 0: Simple comparison mode	◎				
	Adjust feeding	0	1: ON 0: OFF					
	At start near zero confirmation	0	1: ON 0: OFF					
	At start, weight value confirmation	0	1: ON 0: OFF					
5	Function key inhibited	1111	0000 to 1111					W34(R/W)
	TARE key	1	1: Enabled 0: Disabled					
	Tare reset key	1	1: Enabled 0: Disabled	◎				
	Gross/net Key	1	1: Enabled 0: Disabled					
	Zero key	1	1: Enabled 0: Disabled					
6	Filter	02	00 to 73					W35(R/W)
	Digital low pass filter	0	7: 5.0Hz 6: 4.0Hz 5: 3.0Hz 4: 2.5Hz 3: 2.0Hz 2: 1.5Hz 1: 1.0Hz 0: OFF	◎				
	Analog low pass filter	2	3: 8Hz 2: 6Hz 1: 4Hz 0: 2Hz					
7	Motion detect	1.5-05	0.0-00 to 9.9-99		◎	◎		W36(R/W)
8	Zero tracking	0.0-00	0.0-00 to 9.9-99		◎	◎		W37(R/W)
9	Setting value LOCK	00	00 to 11					W38(R/W)

■Setting mode 3

	Name	Initial value	Setting range	Lock1 (soft)	Lock2 (soft)	LOCK (SW)	Display only	Communication command
1	Balance weight value	100.00	0 to 99999		◎			W40(R/W)
2	Capacity	100.00	1 to 99999		◎			W41(R/W)
3	Min. scale division	0.01	1 to 100		◎			W42(R/W)
4	Net over	999.99	0 to 99999		◎			W43(R/W)
5	Gross over	999.99	0 to 99999		◎			W44(R/W)
6	DZ regulation value	2.00	0 to 9999		◎			W47(R/W)
7	Function selection	3213	0000 to 3315					W45(R/W)
	Display update rate	3	3: 25 times/sec 2: 13 times/sec 1: 6 times/sec 0: 3 times/sec		◎			
	Decimal place	2	3: 0.000 2: 0.00 1: 0.0 0: None					
	1/4 scale division	1	1: ON 0: OFF					
	Units display	3	5: N 4: lb 3: kg 2: g 1: t 0: None					
8	Compensation for gravitational acceleration	9.8067	9.7500 to 9.8500		◎			W46(R/W)
9	Option substrate	00000	00000 to 11111				◎	

■Setting mode 4

		Name	Initial value	Setting range	Lock1 (soft)	Lock2 (soft)	LOCK (SW)	Display only	Communication command
1		D/A output mode	00	00 to 21					W50(R/W)
		Test mode	0	2: 20mA fixed output 1: 4mA fixed output 0: Weight value linked		◎			
		Output weight mode	0	1: Net weight 0: Gross weight					
2		D/A zero output weight	000.00	0 to 99998		◎			W51(R/W)
3		D/A full scale setting	100.00	1 to 99999		◎			W52(R/W)
4		RS-232C/RS-485 I/F setting	10101	00000 to 61217					
		Baud rate selection	1	6: Printer mode (only with RS-232C) 5: 115.2kbps 4: 56800bps 3: 38400bps 2: 19200bps 1: 9600bps 0: 4800bps					
		Character length	0	1: 8bits 0: 7bits					
		Parity bit	1	2: Even 1: Odd 0: None					
		Stop bit	0	1: 2bits 0: 1bit					

		Terminator	1	(With RS-232C)
				7: Communication mode 6
				6: Communication mode 5
				5: Communication mode 4
				4: Communication mode 3
				3: Communication mode 2
				2: Communication mode 1
				1: Communication mode 0/
				  CR+LF
				0: Communication mode 0/
				  CR
				
				(With RS-485)
				2: Modbus-RTU
				1: Communication mode 0/
				  CR+LF
				0: Communication mode 0/
				  CR					

5		ID setting	0000	0000 to 9999		◎			
6		Transmission delay time	00	00 to 99		◎			

7	Extended function selection 1	00000	00000 to 91111						W48(R/W)
	BCD data update rate	0	(A/D conversion rate 100 times/sec) 6: Once/sec 5: Twice/sec 4: 5 times/sec 3: 10 times/sec 2: 20 times/sec 1: 50 times/sec 0: 100 times/sec (A/D conversion rate 500 times/sec) 7: Once/sec 6: Twice/sec 5: 5 times/sec 4: 10 times/sec 3: 20 times/sec 2: 50 times/sec 1: 100 times/sec 0: 500 times/sec		◎				
	Filter in stable condition	0	(A/D conversion rate 100 times/sec) 1: Do not insert 0: Insert (64 times) (A/D conversion rate 500 times/sec) 1: Do not insert 0: Insert (256 times)						
	Motion detect	0	1: Checker mode 0: Stable mode						
	Gross weight/net weight display switch	0	1: External input mode 0: Internal, external mode						
	During discharge control	0	1: Net weight displayed without sign reverse 0: Net weight displayed with sign reverse						
8	Moving average filter	030	(When A/D conversion rate 100 times/sec): 1 to 128 times (When A/D conversion rate 500 times/sec): 1 to 512 times		◎				W39(R/W)
9	Measurement Act compliance	0000	0000 to 1111						W49(R/W)
	One-touch tare subtraction	0	1: Accept only when stable 0: Accept regularly		◎				
	Tare subtraction range	0	1: 0 < tare ≦ capacity 0: Total range						
	Prohibits ON/OFF of tare setting and preset tare weight when one-touch tare subtraction is enabled	0	1: Enabled 0: Disabled						
	Tare weight displayed with [0] key	0	1: Enabled 0: Disabled						

■Setting mode 5

	Name	Initial value	Setting range	Lock1 (soft)	Lock2 (soft)	LOCK (SW)	Display only	Communication command
1	Input selection	93210	00000 to 99999		◎			W60(R/W)
	Input selection 5	9	9: Tare reset					
	Input selection 4	3	8: Pause					
	Input selection 3	2	7: Erase print					
	Input selection 2	1	6: Total print					
			5: Accumulation clear					
	Input selection 1	0	4: Accumulation command 3: Stop 2: Start 1: Feed/discharge 0: Hold/judge					
2	Output selection	0	3: Knocking 2: Waiting for judgment 1: Pause 0: RUN		◎			W61(R/W)
3	Restart settingSet point 1	100	000 to 100		◎			W62(R/W)
4	Restart settingSet point 2	100	000 to 100		◎			W63(R/W)
5	Restart settingSet point 3	100	000 to 100		◎			W64(R/W)
6	Number of times for knocking	00	00 to 99		◎			W65(R/W)
7	Knocking time	0.00	0.00 to 9.99		◎			W66(R/W)
8	Number of digits for accumulated display	5	5 to 9		◎			W67(R/W)
9	Automatic filter adjustment	0	1: Execute 0: Cancel				◎	

■Setting mode 6

	Name	Initial value	Setting range	Lock1 (soft)	Lock2 (soft)	LOCK (SW)	Display only	Communication command
1	PROFIBUS I/F setting	00	00 to 01		◎			
2	PROFIBUS baud rate display	----					◎	
3	PROFIBUS station no.	125	000 to 125		◎			
4							◎	
5							◎	
6							◎	
7							◎	
8							◎	
9							◎	

■Setting mode 7 (with RS-232C option)

	Name	Initial value	Setting range	Lock1 (soft)	Lock2 (soft)	LOCK (SW)	Display only	Communication command
1	Print setting	1010	0000 to 1010		◎			W70(R/W)
	Automatic print	1	1: ON (manual print OFF) 0: OFF (manual print ON)					
	Undefined	0						
	Near zero print	1	1: ON 0: OFF					
	Undefined	0						
2	Printer command	0	4: Paper feed 3: Date print 2: Erase print 1: Total print 0: Clear		◎		Command	

3	Printer settings	0000	0000 to 0199		◎				W72(R/W)
	Undefined	0							
	Double size print	0	1: ON 0: OFF						
	Line break after individual print	0	0 to 9						
	Line break after total print	0	0 to 9						
4	Individual print format	00000	00000 to 11111		◎				W73(R/W)
	Count	0	1: ON 0: OFF						
	Tare weight	0	1: ON 0: OFF						
	Time	0	1: ON 0: OFF						
	Year/date	0	1: ON 0: OFF						
	Upper/lower limit comparison result	0	1: ON 0: OFF						
5	Total print format	00000	00000 to 11111		◎				W74(R/W)
	Count	0	1: ON 0: OFF						
	Stan. dev.	0	1: ON 0: OFF						
	Statistics data	0	1: ON 0: OFF						
	Year/date/time	0	1: ON 0: OFF						
	Upper/lower limit comparison result	0	1: ON 0: OFF						
6	Print count	9999	0000 to 9999	◎					W75(R/W)
7	Year setting	Adjust	2000 to 2099	◎					
8	Date setting	Adjust	01 to 12 (month) 01 to 31 (day)	◎					
9	Time setting	Adjust	00 to 23 (hour) 00 to 59 (min)	◎					

■Setting mode 8

	Name	Initial value	Display range	Lock1 (soft)	Lock2 (soft)	LOCK (SW)	Display only	Communication command
1	Average weight	000.00	0 to 99999				◎	W80(R)
2	Max. weight	000.00	0 to 99999				◎	W81(R)
3	Min. weight	000.00	0 to 99999				◎	W82(R)
4	Gen. stan. dev.	000.00	0 to 99999				◎	W83(R)
5	Smp. stan. dev.	000.00	0 to 99999				◎	W84(R)
6	Number of data	0000	0 to 9999				◎	W85(R)
7	Latest data	000.00	0 to 99999				◎	W86(R)
8	Max. - min.	000.00	0 to 99999				◎	W87(R)
9	Accumulated value	000.00	Arbitrary 5 digits				◎	W88(R)

■Setting mode 9

	Name	Initial value	Setting range	Lock1 (soft)	Lock2 (soft)	LOCK (SW)	Display only	Communication command
1	Span calibration	100.00	0 to 99999		◎	◎	Command	
2	Equivalent calibration	2.0000	0.0001 to 3.2000		◎	◎	Command	W92(R/W)
3							◎	
4							◎	
5							◎	
6							◎	
7							◎	
8	A/D conversion rate	Adjust	100, 500				◎	
9	Password	0000	0000 to 9999				◎	
Zero	Zero calibration	0.00			◎	◎	Command	

Chapter
8

List of Setting Items

9 Specifications

9-1. Specifications

9-1-1.Analog section

Load cell power supply	DC10V±5%, output current 120mA or less, remote sensing type (Up to four 350Ω series load cells can be connected in parallel.)
Zero adjustment range	Automatically adjusted by digital computation -0.5 to 2.0 mV/V
Span adjustment range	Automatically adjusted by digital computation 0.3 to 3.0 mV/V
Minimum input sensitivity	0.3 µV/count
Accuracy	Non-linear: 0.01%/FS or less Zero drift: 0.2 µV/°CRTI or less Gain drift: 15 ppm/°C or less
Analog filter	Low pass vessel filter (-12 dB/oct) Selectable from 2, 4, 6, and 8Hz
A/D converter	Conversion rate: Switchable between 100 and 500 times/sec Conversion resolution: 24 bits (binary)
Minimum indicated resolution	1/10000
Secondary calibration	Equivalent calibration Minimum indicated resolution during secondary calibration: 1/1000 (room temperature)

9-1-2.Display section

Weight display unit	Character height 18.5mm
Weight display value	5 digits Sign: Minus sign display
Capacity	5 digits can be set
Min. scale division	Can be set from 1 to 100
Decimal point	Selectable from 0, 0.0, 0.00, and 0.000 (zero blank display based on decimal place)
Over scale display	A/D converter input over LOAD A/D converter input minus over -LOAD Net weight exceeds net over setting value OFL1 Gross weight exceeds capacity +9 scales OFL2 Gross weight exceeds gross over OFL3
Units	Selectable from lb/N/kg/g/t/none
Minimum indicated resolution	Fixed character display by fluorescent display tubes: Display item lights up SP3/SP2/SP1/ZT/ZALM/STAB/TARE/NET/GROSS/HI LIM/HI/GO/LO/ LO LIM/HOLD/NZ/CZ/LOCK

9-1-3.Setting section

Setting procedure	Setting by membrane key operation Setting by RS-232C interface (option) and RS-485 interface (option) is also possible
Saving of setting values	Initial setting values saved in NOV.RAM (non-volatile RAM) Other settings saved in F-RAM (non-volatile RAM)
Setting value protection	Protection is possible using LOCK switch

9-1-4. External signal input/output

Compatible plug	57-30240 manufactured by DDK (accessory) or equivalent
Input signal (8 points)	Considered ON when short-circuited with COM terminal by contact (such as relays and switches) or non-contact (such as transistors and TTL of open collector output).
Output signal (12 points)	Open collector output for transistor (emitter = COM terminal). Output turns ON when transistor is ON.

9-1-5. Interface (standard equipment)

Dedicated two-wire serial interface (SIF)	
Description	This interface can be used to connect printers, external display units and so on made by UNIPULSE.
Transmitting method	Asynchronous
Transmitting speed	600 bps

9-1-6. Interface (option)

Interface for BCD parallel data output (BCO)	
Description	This interface can be used to transmit weight data to printers, external displays, various data processing devices, etc. I/O signals are insulated from the internal circuit by a photo-coupler.
Output logic	Weight data (5 digits), sign, over, strobe, print command
Output logic	Positive/negative logic selectable
Output circuit	Open collector
Input signal	Logic switch, hold, output data selection
Input circuit	Drive by contact or open collector circuit

RS-232C communication interface (232)		
Description	This interface can be used to write, change, read, etc. weight data, various statuses and various setting values through commands from the host computer.	
Signal level	RS-232C compatible	
Transmitting distance	Approx. 15m	
Transmitting method	Asynchronous, full-duplex communication	
Transmitting speed	Select from 4800, 9600, 19200, 38400, 57600, 115.2k bps	
Bit configuration	Start bit:	1 bit
	Character length:	Select from 7 or 8 bits
	Stop bit:	Select from 1 or 2 bits
	Parity bit:	Select from none, odd, even
Code	ASCII	

D/A converter (DAC)	
Description	Outputs weighing value after converting it to an analog signal of the current. Zero output weight value and full scale weight value can be set.
Current output	4 to 20 mA (load resistance 350Ω or less)
D/A conversion rate	100 times/sec
Resolution	1/10000
Over range	±10% of full scale
Current	3.2 to 20.8mA

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RS-485 communication interface (485)	
Description	This interface enables a longer distance communication compared to RS-232C. Furthermore, multiple F701+ units can be connected in parallel by setting ID nos.
Signal level	RS-485 compliant
Transmitting distance	Approx. 1km
Transmitting method	Asynchronous, half duplex
Transmitting speed	Select from 4800, 9600, 19200, 38400, 57600, 115.2kbps
Bit configuration	Start bit: 1 bit Character length: Select from 7 or 8 bits Stop bit: Select from 1 or 2 bits Parity bit: Select from none, odd, even
Code	ASCII (for UNI-Format) Binary (for Modbus-RTU)

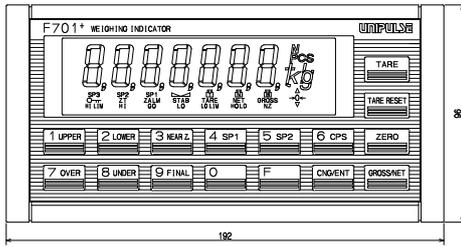| PROFIBUS interface (PRF)	
Description	This interface can be connected as a slave device for PROFIBUS field bus.
Standards	PROFIBUS-DPVO
Communication speed	Supports 9.6kbps to 12Mbps (automatic following) (Please note that 45.45kbps is not supported)
Occupying memory	OUT/12 bytes (6 words), IN/26 bytes (13 words)
Station no.	0 to 125
GSD file name	UNIP0DC4.GSD
Code	ASCII
Remarks	Supports Sync Mode and Freeze Mode Does not support Special Clear Mode (Fail Safe Mode)

9-1-7. General performance

Power supply voltage	AC100 to 240V (+10% -15%) [free power supply 50/60Hz]
Power consumption	7W typ. (11W max)
Operating conditions	Temperature: Operating temperature range -10 to +40°C Storage temperature range -20 to +85°C Humidity: 85%RH or less (no condensation)
External dimensions	192W x 96H x 140D (mm) (not including protruding sections)
Panel cutout size	186W x 92H (mm)
Weight	Approx. 1.5kg

9-1-8. Accessories

AC input cord (2m)	1
Small screwdriver for connection of terminal block	1
Load cell connector	1
CONTROL terminal connector	1
F701+ operation manual	1

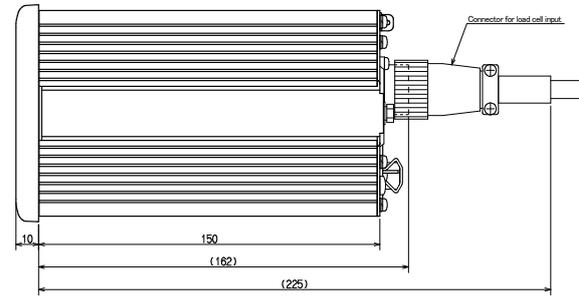## 9-2.   External dimensions

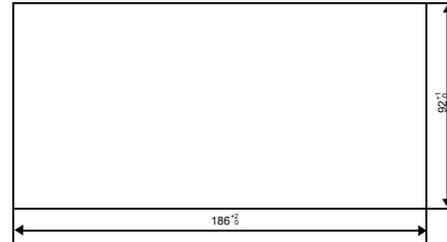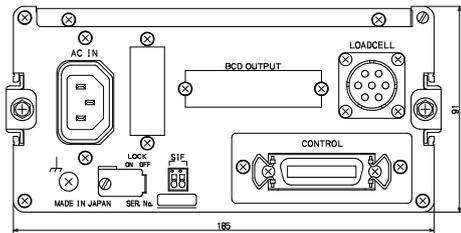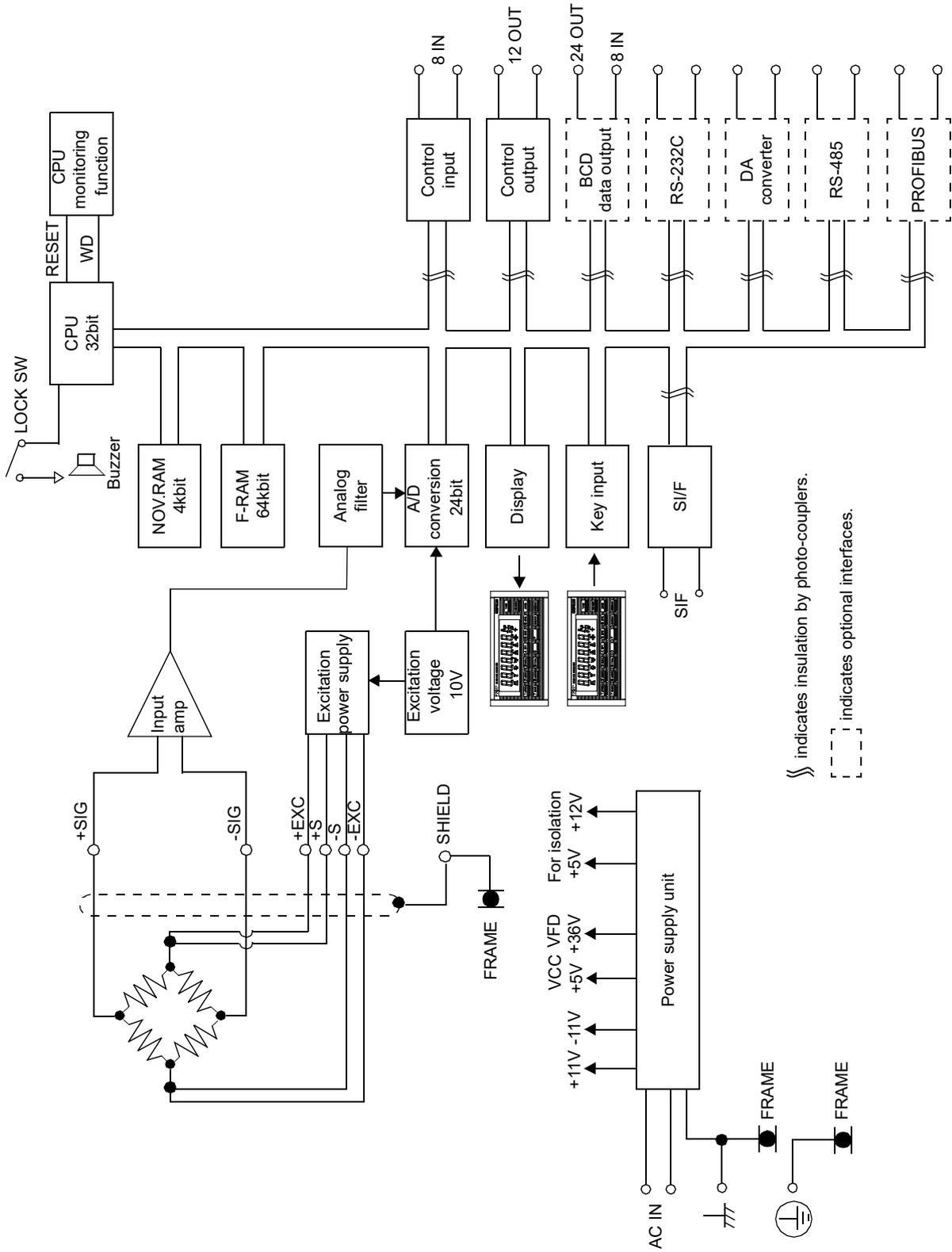[Front]   [Side]   Unit: mm

[Rear]

9-3. Block diagram

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9-4.   Compliance with EC Directives

F701+ is a product which meets CE requirements. Follow the instructions below when using.

The F701+ Weighing Indicator is a CE-marked product that complies with EC Directives (based on the European Community Council).

- Low voltage directive   EN61010-1:2010 $\left(\begin{array}{l} \text{Overvoltage category II} \\ \text{Pollution level 2} \end{array} \right)$

EN62311:2008 (test distance: 10cm)

- EMC Directive   EN61326-1:2006
EN55011:2009, A1:2010 Group 1, Class A
EN61000-3-2:2006, A1:2009, A2:2009
EN61000-3-3:2008
EN61000-4-2:2009
EN61000-4-3:2006, A1:2008, A2:2010
EN61000-4-4:2004, A1:2010
EN61000-4-5:2006
EN61000-4-6:2009
EN61000-4-8:2010
EN61000-4-11:2004

Pay attention to the following matters when installing the product.

1. Since F701+ is defined as an open type device (built-in device), be sure to install and fix it to a panel and so forth before using.

2. The power cable included in this product as standard may be used with an AC100V power supply in Japan (nominal rated voltage AC125V).
   When using this product overseas, use a power cable certified in that country.

3. Use shielded cables for cables other than the power cable (load cell, external I/O, options).

Caution

The combination of F701+ main unit and a lightning surge protector complies with EN61000-4-5 (lightning surge immunity) of the EMC Directives.
EN62311 (human exposure) of the Low Voltage Directives is complied with at a distance of 10cm.

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Unipulse Corporation

International Sales Department
9-11 Nihonbashi Hisamatsu-cho, Chuo-ku, Tokyo 103-0005
Tel: +81-3-3639-6120 Fax: +81-3-3639-6130

www.unipulse.tokyo/en/

☐	Head Office:	9-11 Nihonbashi Hisamatsu-cho, Chuo-ku, Tokyo 103-0005
☐	Technical Center:	1-3 Sengendainishi, Koshigaya, Saitama 343-0041
☐	Nagoya Sales Office:	TOMITA Bldg. 2-5 Ushijima-cho, Nishi-ku, Nagoya 451-0046
☐	Osaka Sales Office:	Sumitomo Seimei Shin Osaka Kita Bldg. 4-1-14 Miyahara, Yodogawa-ku, Osaka 532-0003
☐	Hiroshima Sales Office:	Hiroshima Dai-ichi Seimei OS Bldg. 1-2-21 Matoba-cho, Minami-ku, Hiroshima 732-0824