F160

WEIGHING CONTROLLER

OPERATION MANUAL

07JUN2012REV.1.04

UNIPULSE

CC-Link

「CC-Link Ver.1.10」

Introduction

Thank you very much for purchasing our F160 weighing controller.
For good performance, and proper and safe use of the F160, be sure to read this instruction manual and properly understand the contents of it before use.

Description in this manual

Basically, initial (default) values are underlined for selecting settings and for set values.
For non-underlined set values, refer to the Setting Code List.

Example) Analog filter

Setting/ 0: 2Hz 1: 4Hz <u>2: 6Hz</u> 3: 8Hz

* In this case, “2: 6Hz” is the initial value.

Safety Precautions

For safety reasons, please read the following safety precautions thoroughly.

Installation, maintenance and inspection of the F160 should be performed by personnel having technical knowledge of electricity. In order to have an F160 weighing controller used safely, notes we would like you to surely follow divide into " ⚠ WARNING " and " ⚠ CAUTION ", and are indicated by the following documents.Notes indicated here are the serious contents related safely. Please use after understanding the contents well.

⚠ WARNING

This sign forewarns the presence of hazards that could result in serious injury or fatality when incorrectly handled.

⚠ CAUTION

This sign forewarns the presence of hazards that could result in personnel injury or property damage when incorrectly handled.

⚠ WARNING

This sign forewarns the presence of hazards that could result in serious injury or fatality when incorrectly handled.

Warning on design

- For the entire system to function safely when the F160 becomes faulty or malfunctions, provide a safety circuit outside the F160.

Warning on installation

- Do not modify the F160. Doing so may cause fire or electric shocks.
- Do not install in the following environments.
  - Places containing corrosive gas or flammable gas.
  - Where the product may be splashed with water, oil or chemicals.

Warning on wiring

- Do not connect a commercial power source directly to the signal input/output terminals.
- Be sure to ground the protective ground terminal.
- Before performing the following, make sure that no power is applied.
  - Attachment/detachment of load cell connector, external I/O connector, other options connector.
  - Wiring/connection of cables to terminal blocks.
  - Connection of the ground line.
- For connection to the signal input/output terminals, check the signal names and pin assignment numbers, and then carry out wiring properly.
  Any incorrect wiring may cause of electric shocks or leakage.
- Be sure to use crimp contacts for connection to terminal blocks, and do not to connect bare wires as they are.
- Be sure to install the attached terminal block cover after wiring to the power input terminals. Otherwise, electric shocks may result.
- Before applying power, carefully check the wiring, etc.

Warning during startup and maintenance

- Use at a proper power supply voltage. (DC24V±15%)
- Do not damage the power cord. Doing so may cause fire or electric shocks.
- Do not touch any signal input/output terminal while applying power. Doing so may cause electric shocks or malfunctions.
- If the cover of the main body is opened, it may cause an electric shock internally. Even if the power is off, the internal capacitor is charged. Contact us for internal inspection or repair.
- In the case of smoke, an abnormal smell or strange sound, immediately turn off the power, and disconnect the power cable.
- As for the batteries used in F160, do not at any time dismantle the batteries, change the batteries shape by subjecting it to pressure or throw the batteries into fires as these may cause the batteries to explode, catch fire or leak.

Model:	CR14250SE manufactured by Sanyo Electric, or equivalent
Voltage:	3 V
Capacity:	850 mAh
Battery life:	Approx 5-7 years

⚠ CAUTION

This sign forewarns the presence of hazards that could result in personnel injury or property damage when incorrectly handled.

Caution on installation

- Use the F160 as it is incorporated in a control panel, etc.
- Do not install in the following environments.
  - Where the temperature/humidity exceeds the range of the specifications.
  - Places exposed to direct sunlight.
  - Dusty places.
  - Places containing large quantities of salt or iron powder.
  - Where the main body is directly affected by vibrations or shocks.
- Take adequate shielding measures when using at the following locations.
  - Near a power line.
  - Where a strong electric field or magnetic field is formed.
  - Where static electricity, relay noise or the like is generated.

Caution on wiring

- Tighten the screws for the signal input/output terminals at the specified torque.
  If they are loose, shorts, fire or malfunctions may occur.
  Tightening torque: 0.5N•m
- For sensors and external inputs/outputs, use shielded cables.

Caution during startup and maintenance

- For turning on/off the power, be sure to keep intervals of 5 seconds or more.
- If the F160 is not used by the specified method, its protective performance may be impaired.
- Maintenance
  - When performing maintenance, disconnect the power.
  - Do not wipe with a wet rag, or with benzine, thinner, alcohol, etc. Doing so may cause discoloration or deformation of the F160. In the case of heavy contamination, wipe off the contamination with a cloth after dipping it into a diluted neutral detergent and wringing it well, and then wipe with a soft, dry cloth.

Caution during transportation

- When the F160 is shipped, spacers made of corrugated cardboard are used as cushioning materials.
  Though it is factory-designed so that shocks can sufficiently be absorbed, breakage may result if shocks are applied when the spacers are reused for transportation. If you send the F160 to us for repair, etc., take adequate measures against shocks by using polyurethane materials, etc., separately.

Caution during disposal

- If you dispose of the product, handle it as industrial waste.

RoHS-compliant Product

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

What is RoHS?

It is an abbreviation for Restriction on Hazardous Substances, which is implemented by the European Union (EU). The Directive restricts the use of six specific substances in electric and electronic equipment handled within EU borders. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).

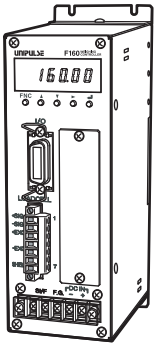
Contents

M E M O

1 OUTLINE

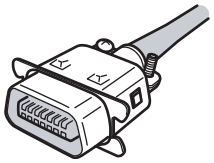
1-1. Contents of The Package

The packaging box contains the following.
Be sure to check them before use.

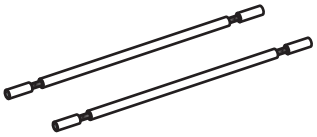


F160 body.....1
(With a load cell connector,
and mounting brackets)

F160 operation manual.....1

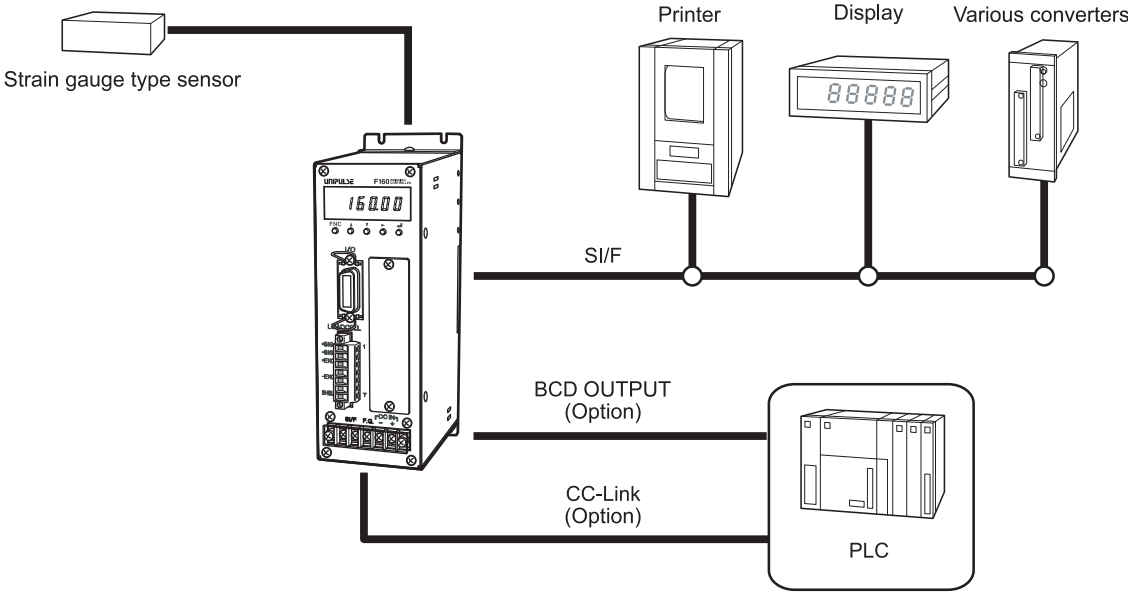


External input/output connector.....1
[57-30140]



Jumper wire.....2

1-2. About Connectable Devices

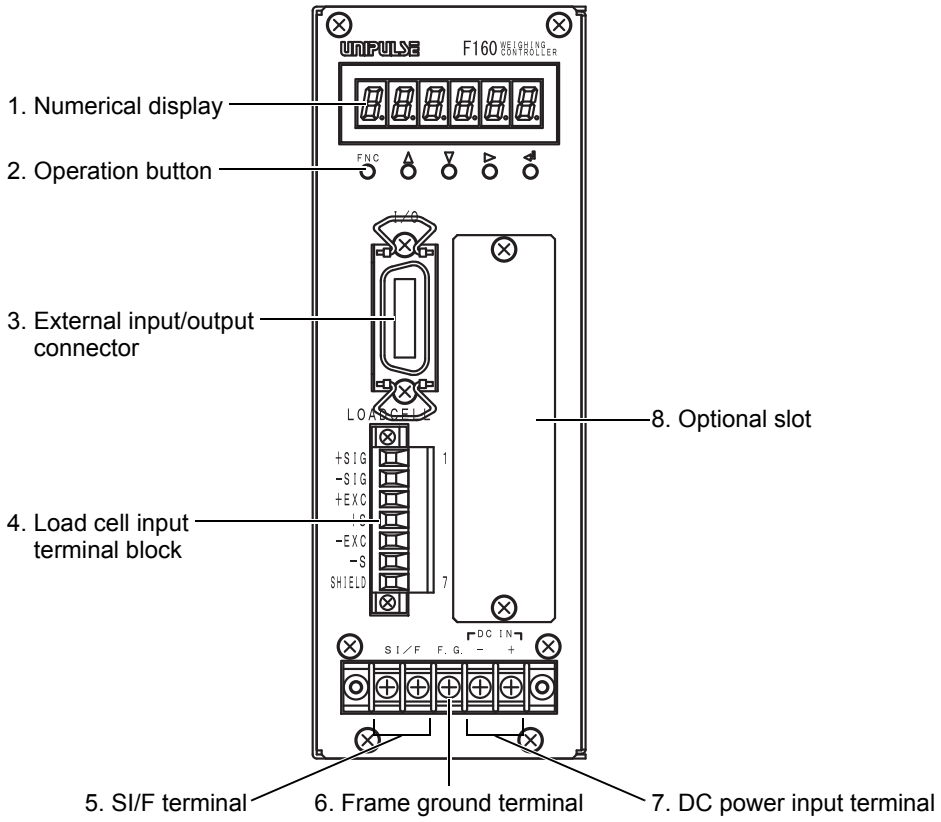


Chapter 1

OUTLINE

1-3. Appearance Description

■Front Panel



1. Numerical display

Displays indicated values, set values, and error messages.

2. Operation button

Buttons to select setting modes and setting items and to input set values.

Button	Indicated value display state	Setting mode selection state	Setting item selection state	Set value input state
FNC	Go to setting mode selection.	Go to indicated value display.	Go to setting mode selection. (The display shows the current setting mode.)	Cancel the current setting and go to a setting item selection state.
△	No function	Go to a setting item selection state. (The last item number is selected.)	Select the previous item number.	Increment the numerical value by one.
▽	No function	Go to a setting item selection state. (The first item number is selected.)	Select the next item number.	Decrement the numerical value by one.
▷	Switch the weight value (gross weight/ net weight/ tare weight) display.	Select the next setting mode.	Go to setting mode selection. (The display shows the next setting mode.)	Make a digit shift.
⏎	Confirm the weight value.	No function	Go to a set value change state.	Determine the set value.

3. External input/output connector

Feed/Discharge control outputs, control inputs, etc., are assigned as itemized below.

Open collector output: 7 ports

Contact input (photocoupler primary): 5 ports

Common (insulated power supply ground): 2 ports

The adaptable connector is DDK-manufactured 57-30140 (attachment) or equivalent.

4. Load cell input terminal block

This is a terminal block to connect load cell(s).

The adaptable plug is Osada-manufactured ETB42-07P or equivalent.

5. SI/F terminal

2-wire serial interface is to connect UNIPULSE peripheral equipment such as printer, remote display or data converter.

6. Frame ground terminal

F.G. terminal. Be sure to ground the protective ground terminal to prevent electric shocks and injury by static electricity. (There is continuity between the casing and F.G. terminal.)

7. DC power input terminal

Connect the DC power cord. The power supply voltage is 24V DC (±15%).

8. Optional slot

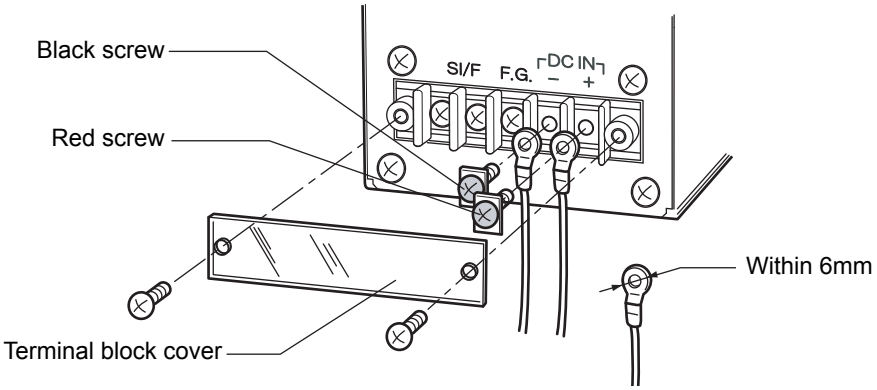
Any one of the following optional boards can be mounted.

- BCD parallel data output interface
- CC-Link interface

2 CONNECTION

2-1. Power Input Connection

Connect the DC power cord. (24V DC (±15%) 10W)



1. Check that no power is applied.
2. Remove the screws (two), and remove the terminal block cover.
3. Remove the screws (two) from the terminal block.
4. Fit the crimp contacts to the screw holes, and fix them with the screws.
   +: Red screw
   –: Black screw
5. Install the terminal block cover, and fix it with the screws (two).

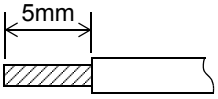
⚠ WARNING

- Be aware that the voltage drops depending on the wire thickness and length.
- Never input an AC power source. Doing so will cause a failure.
- Do not connect to the SI/F terminals. Doing so will cause a failure.
- Be sure to ground the protective ground terminal.
- Connection to the terminal block, make sure that no power is applied.

2-2. Load Cell Connection

How to connect

1. Strip 5mm of the covering of the wire to be connected.
The size of connectable wires is from 0.21 to 3.31mm^2 (AWG12 to 24).

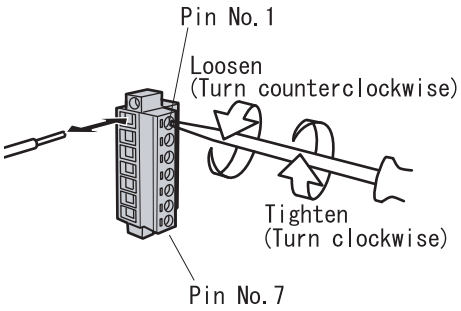


2. Twist the tip to such an extent that it will not spread out.

3. Loosen the screw with a screwdriver to open the connection hole.
A Phillips screwdriver 3 to 3.5mm #1 in shaft diameter is recommended.
(Precision screwdriver, etc.)

4. Insert the wire into the connection hole so as not to let the tip spread out.

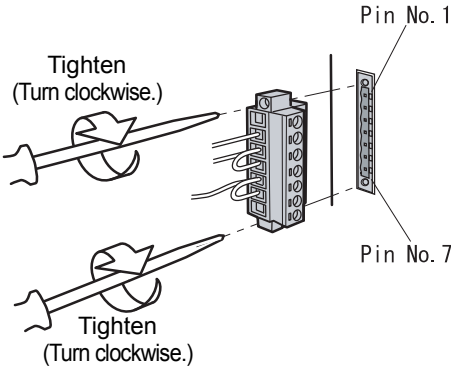
5. Tighten the screw with the screwdriver.
0.5Nm of tightening torque is recommended.



Adaptable plug: ETB42-07P

6. Lightly pull the wire to make sure that it is securely clamped.

7. Insert the wire-connected plug into the F160 body, and tighten the screws (two).

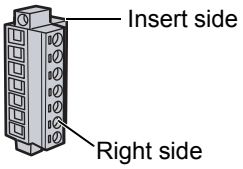


Pin No.	Signal (6-wire)	Signal (4-wire)
1	+SIG	+SIG
2	-SIG	-SIG
3	+EXC	+EXC (Short-circuit* 3 to 4)
4	+S	
5	-EXC	-EXC (Short-circuit* 5 to 6)
6	-S	
7	SHIELD	SHIELD

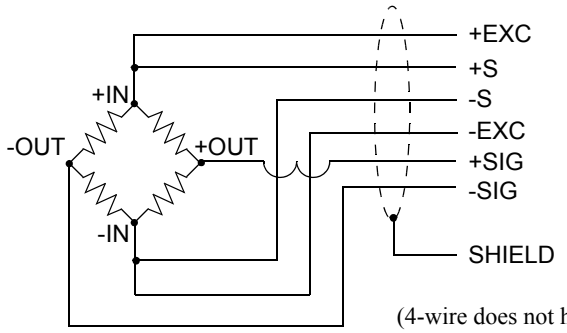
* For short-circuiting, use the attached jumper wires.

Attention

When installing the terminal block to the F160 body, check its orientation.
(Refer to the illustration at the right.)



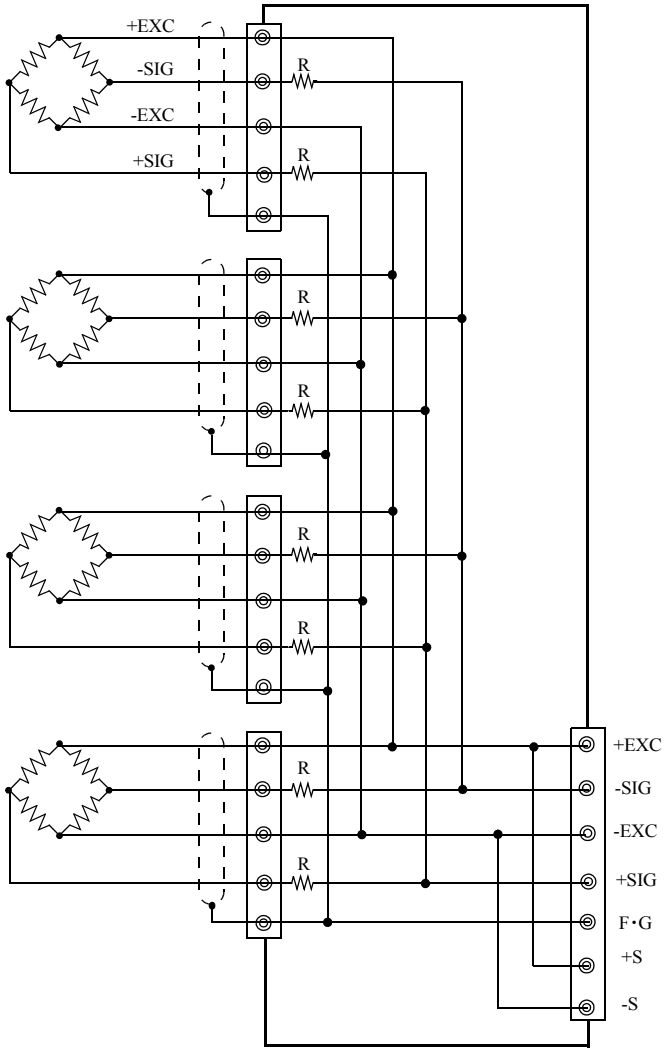
■Load Cell Signals



(4-wire does not have +S and -S.)

■Connecting Load Cells in Parallel

Some industrial applications require several load cells connected in parallel (e.g., tank or flow scales). A summing junction box should be used to facilitate connection and corner correction.



'n' (number) load cells connected in parallel are considered <u>one</u> unit whose capacity is 'n' x rated capacity of load cells (load cells must have the same capacity, bridge resistance, and mV/V). The averaging resistor (R) must be in same relative ratios with a low temperature coefficient.

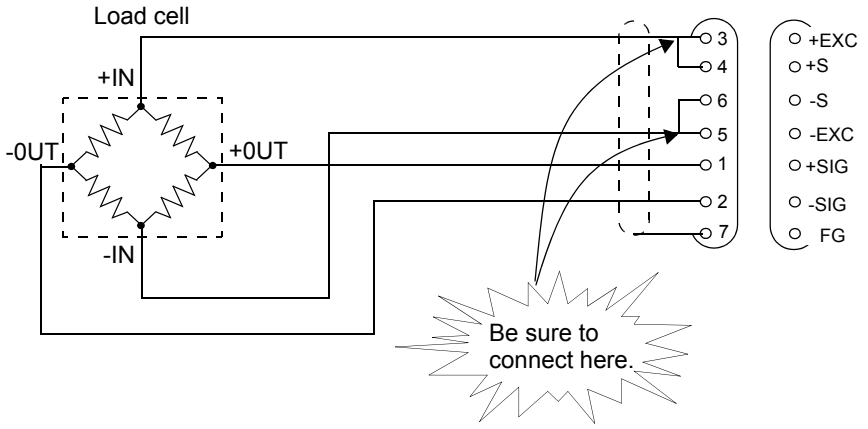
Averaging resistors are not needed if load cells were designed for parallel connection.

Attention

When connecting several load cells in parallel, load cell capacity should be higher than expected load to compensate for mechanical shock or eccentric loading.

⚠ CAUTION

- The load cell excitation voltage of the F160 is 10V. Unless its maximum excitation voltage is 10V or more, the load cell may generate heat or be damaged.
- For connecting a 4-wire load cell to the F160, be sure to connect +EXC and +S, and -EXC and -S. Even if +S and -S are not connected, normal operation will seem to be performed, but the load cell may generate heat or be damaged because excessive voltage is applied.

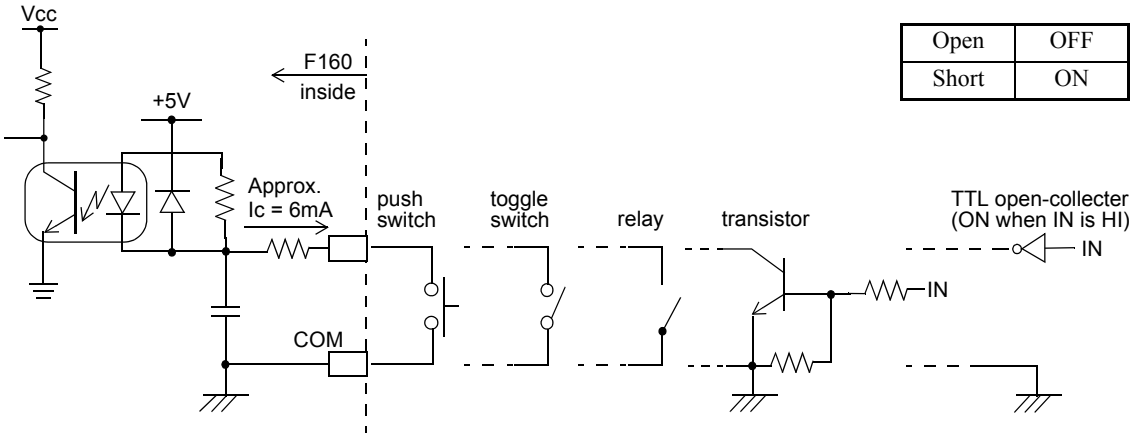


2-3. External Input/Output (Amphenol Connector) Connection

The adaptable connector (plug) is DDK-manufactured 57-30140 (included) or its equivalent.
Connect referring to the internal circuit diagram shown below.

For input

The signal input/output circuit inputs signals by short-circuiting and opening the input and COM terminals.
Short circuits are made by contact (relay, switch, etc.) or noncontact (transistor, TTL open collector output, etc.).

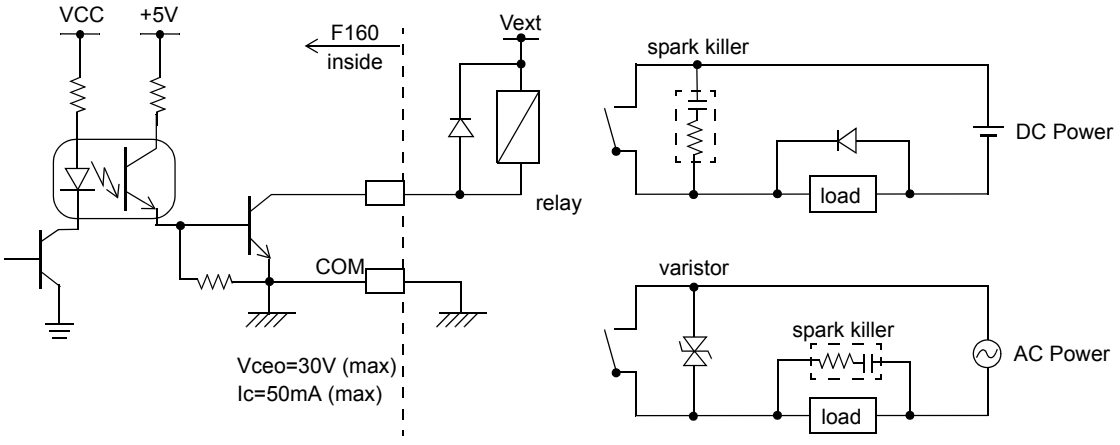


Open	OFF
Short	ON

- Use external elements which withstand Ic=10mA.
- Leakage of external elements must be within 30 μ A.

For output

The signal output circuit outputs signals by means of a transistor open collector.



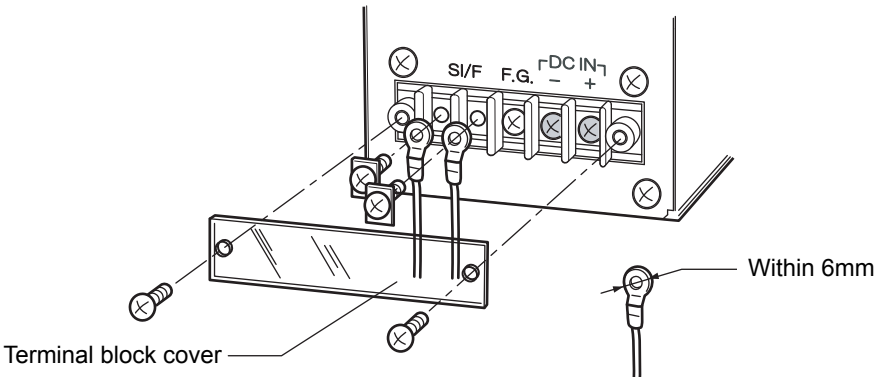
● Transistor status

Output data	Tr
0	OFF
1	ON

- Use external power source for driving relay (vext).
- Do not short-circuit the load,such as a coil of relay, that will break the output transistor.
- Connect a surge absorber or a spark killer to the relay circuit as shown in the draft so that to reduce noise trouble and extend the life of relay.

2-4. SI/F Interface Connection

■SI/F Connection



1. Check that no power is applied.
2. Remove the screws (two), and remove the terminal block cover.
3. Remove the screws (two) from the terminal block.
4. Fit the crimp contacts to the screw holes, and fix them with the screws.
5. Install the terminal block cover, and fix it with the screws (two).

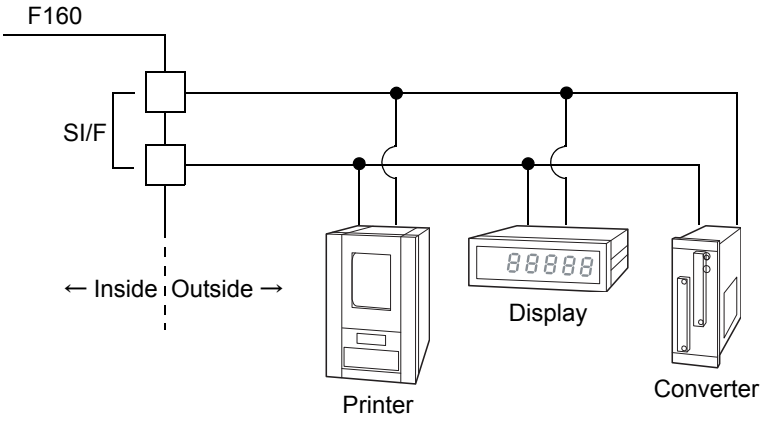
⚠ WARNING

- Do not connect to the DC power input terminals. Doing so will cause a failure.
- Connection to the terminal block, make sure that no power is applied.

■Connection of External Devices

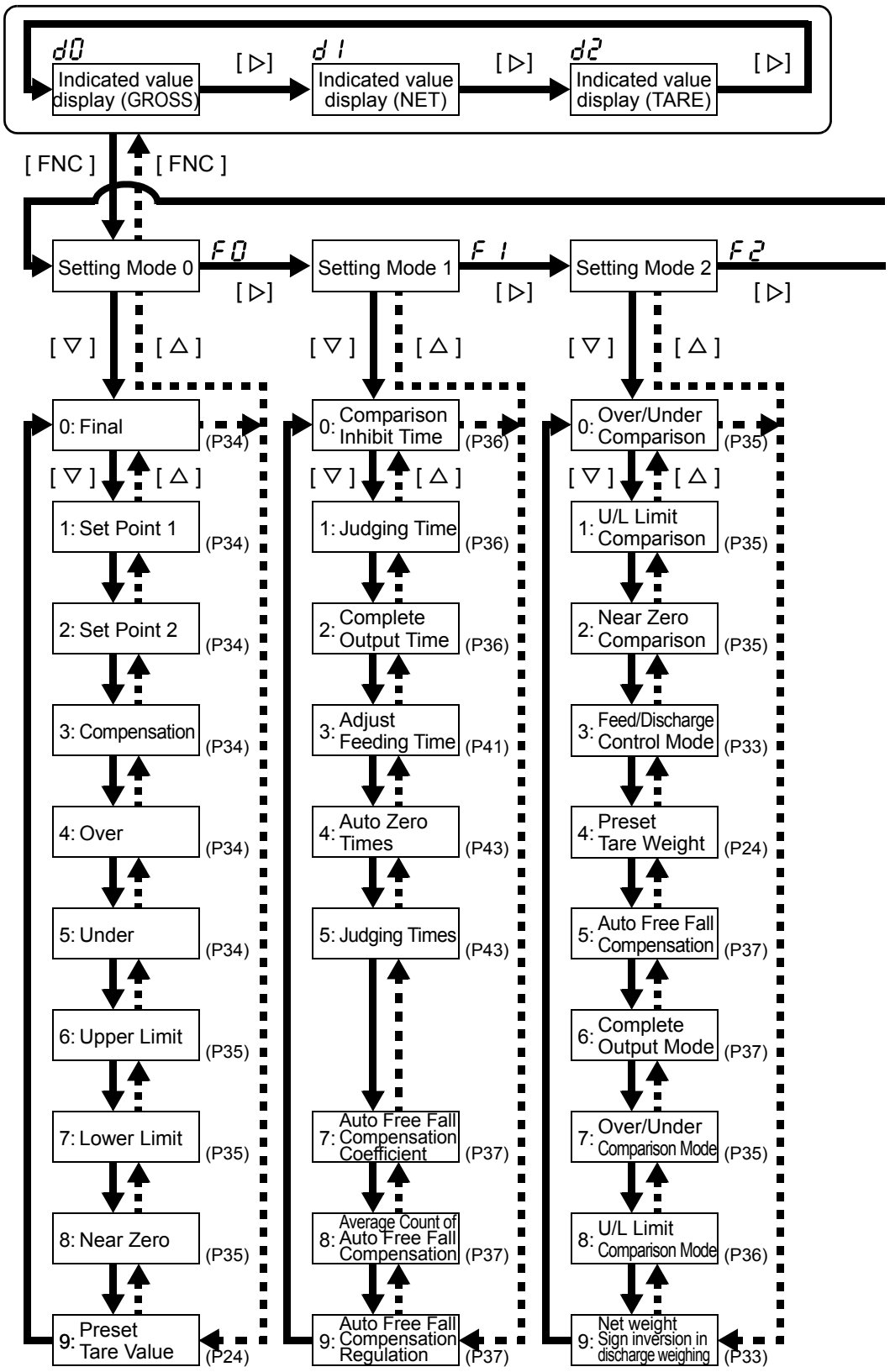
This is a 2-wire serial interface to connect a UNIPULSE-manufactured printer, external display, etc., which is a nonpolar type, and to which up to three external devices can be connected in parallel.

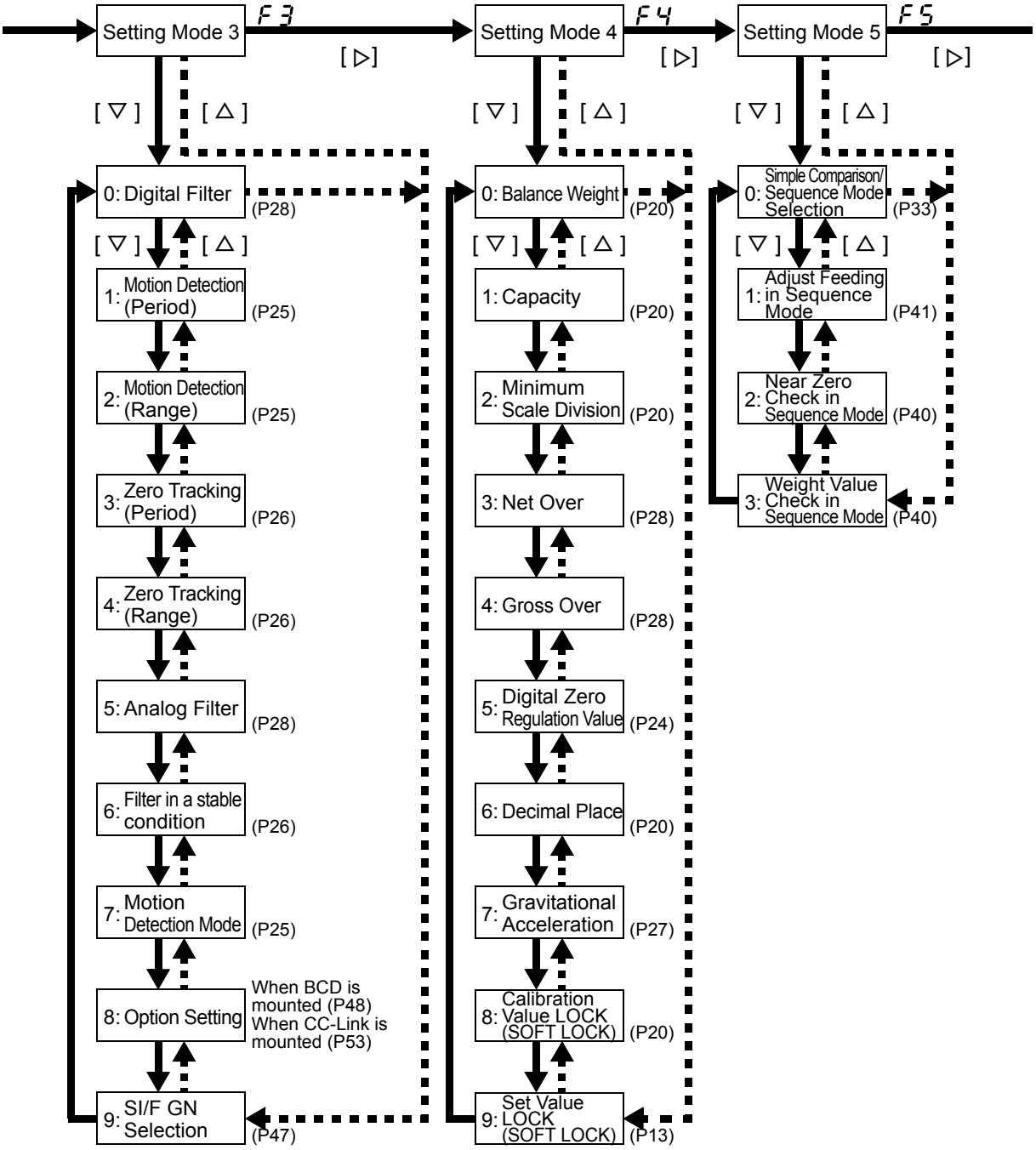
For connection, use parallel two-core cables, cabtyre cables, and the like.

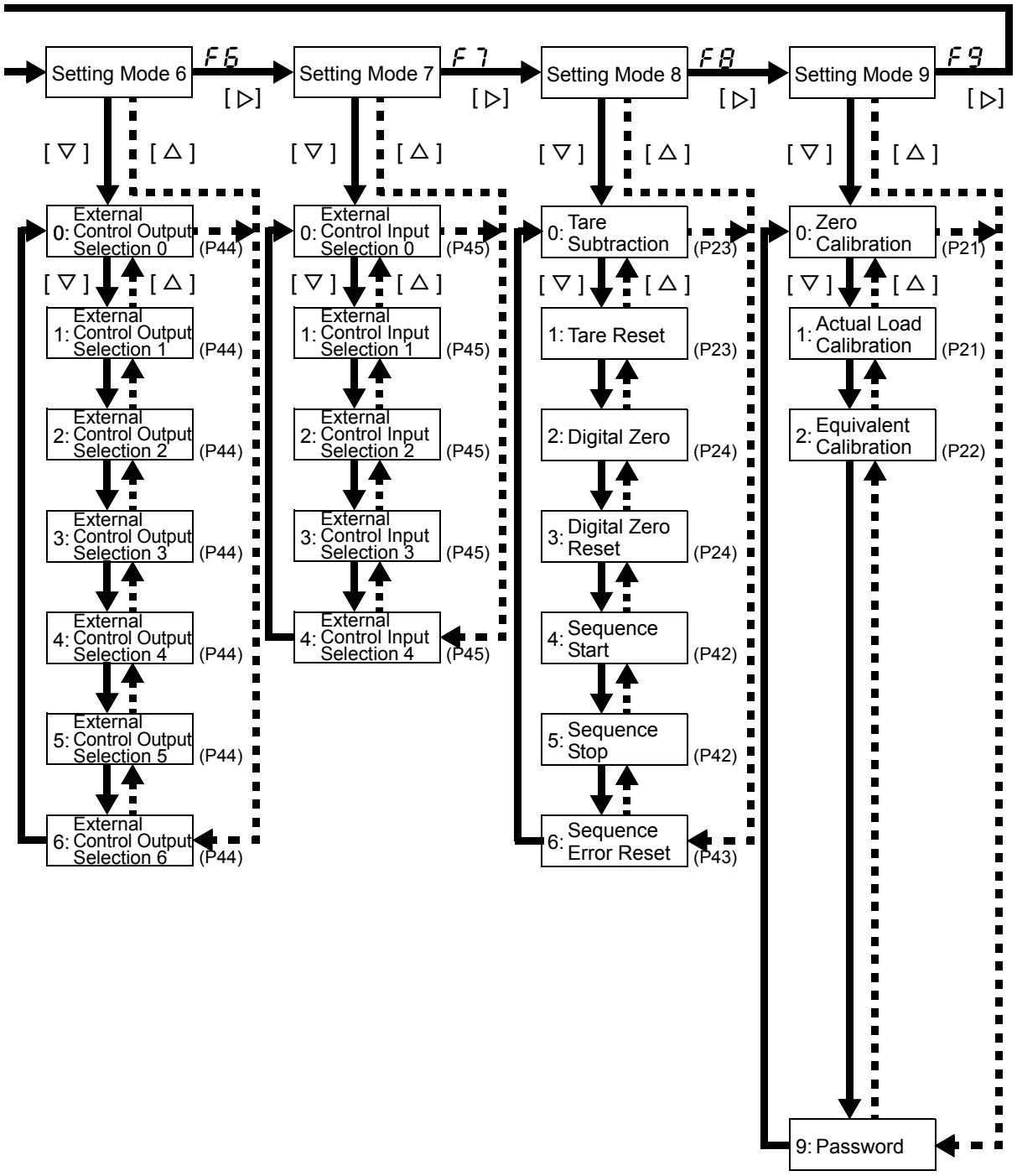


3 SETTING PROCEDURE

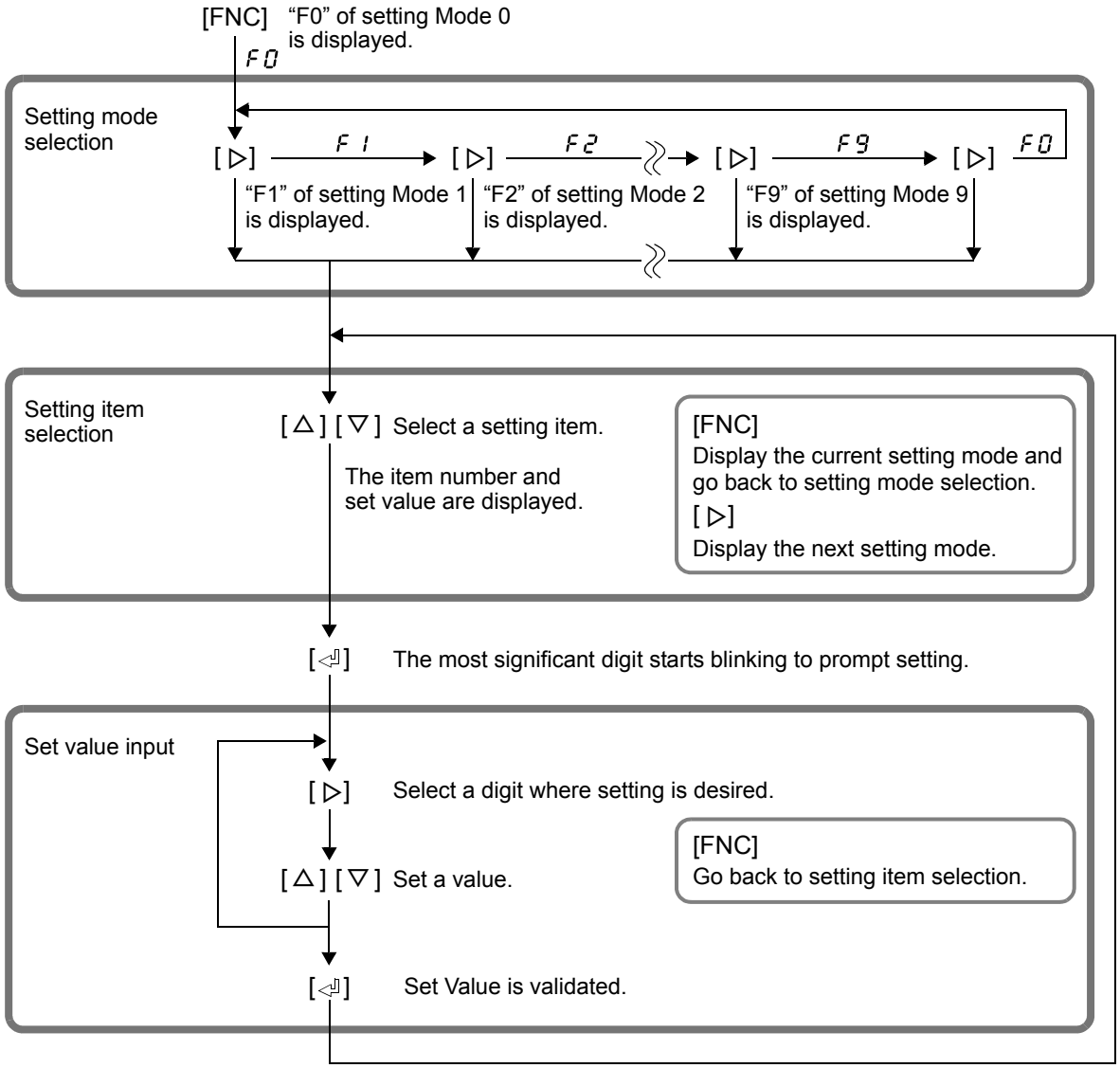
3-1. Setting Modes Composition




Setting Mode 3
F3
[▷]
[▽]
[△]
0: Digital Filter (P28)
1: Motion Detection (Period) (P25)
2: Motion Detection (Range) (P25)
3: Zero Tracking (Period) (P26)
4: Zero Tracking (Range) (P26)
5: Analog Filter (P28)
6: Filter in a stable condition (P26)
7: Motion Detection Mode (P25)
8: Option Setting
When BCD is mounted (P48)
When CC-Link is mounted (P53)
9: SI/F GN Selection (P47)
Setting Mode 4
F4
0: Balance Weight (P20)
1: Capacity (P20)
2: Minimum Scale Division (P20)
3: Net Over (P28)
4: Gross Over (P28)
5: Digital Zero Regulation Value (P24)
6: Decimal Place (P20)
7: Gravitational Acceleration (P27)
8: Calibration Value LOCK (SOFT LOCK) (P20)
9: Set Value LOCK (SOFT LOCK) (P13)
Setting Mode 5
F5
0: Simple Comparison/ Sequence Mode Selection (P33)
1: Adjust Feeding in Sequence Mode (P41)
2: Near Zero Check in Sequence Mode (P40)
3: Weight Value Check in Sequence Mode (P40)


Setting Mode 6
F6
[▷]
Setting Mode 7
F7
[▷]
Setting Mode 8
F8
[▷]
Setting Mode 9
F9
[▷]
[▽]
[△]
0: External Control Output Selection 0 (P44)
1: External Control Output Selection 1 (P44)
2: External Control Output Selection 2 (P44)
3: External Control Output Selection 3 (P44)
4: External Control Output Selection 4 (P44)
5: External Control Output Selection 5 (P44)
6: External Control Output Selection 6 (P44)
0: External Control Input Selection 0 (P45)
1: External Control Input Selection 1 (P45)
2: External Control Input Selection 2 (P45)
3: External Control Input Selection 3 (P45)
4: External Control Input Selection 4 (P45)
0: Tare Subtraction (P23)
1: Tare Reset (P23)
2: Digital Zero (P24)
3: Digital Zero Reset (P24)
4: Sequence Start (P42)
5: Sequence Stop (P42)
6: Sequence Error Reset (P43)
0: Zero Calibration (P21)
1: Actual Load Calibration (P21)
2: Equivalent Calibration (P22)
9: Password

3-2. Setting Procedure



Point

If one minute has elapsed after [FNC] key is pressed without any key hit before [↵] key is pressed,the setting is canceled and the indicated value is displayed again. The set value is not stored in this case.

■Setting Method

About set value LOCK and calibration value LOCK

Set values marked with "○" under Set value LOCK and Calibration value LOCK in "9-1.Setting Code List" on page 76 cannot be changed unless these LOCKs are released. Therefore, change setting(s) after checking that they are released.

Example 1) Setting method by alternatives

The F160 handles alternatives by number (numerical value).
Since a number is allocated to the set value you select, input that number referring to "9-1.Setting Code List" on page 76.

Setting Analog Filter to "0: 2Hz"

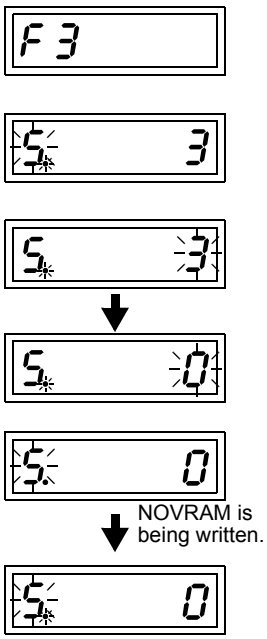
1. From the indicated value display screen, set setting mode 3 by pressing [FNC]→[▷][▷][▷].

2. Select item number 5 with [△]/[▽].
The item number and set value are displayed.

3. Enable change with [⏎] (The set value flashes.), and set "0" with [△]/[▽].

4. Determine it with [⏎].

* To cancel the set value change, press [FNC] without pressing [⏎] to go back to the set value display.



Example 2) Setting method by numerical value

Setting Balance Weight to 25000

1. From the indicated value display screen, set setting mode 4 by pressing [FNC]→[▷][▷][▷][▷].

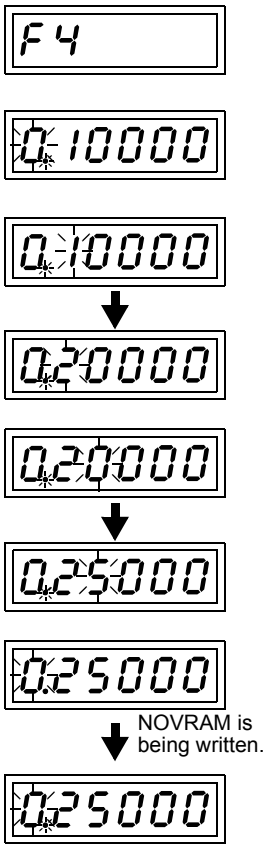
2. Select item number 0 with [△]/[▽].
The item number and set value are displayed.

3. Enable change with [⏎], so that the most significant digit of the set value flashes.
Set "2" with [△]/[▽].

4. Move one digit with [▷], so that the second digit (thousands place) from the most significant digit flashes.
Set "5" with [△]/[▽].

5. Determine it with [⏎].

* To cancel the set value change, press [FNC] without pressing [⏎] to go back to the set value display.



Example 3) Setting method ① for command execution

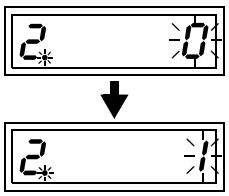
As for operational commands (setting codes from 80 to 86) in "9-1.Setting Code List" on page 76, operation is executed when each setting is changed from "0" to "1."

Executing Digital Zero (setting code 82)

1. From the indicated value display screen, set setting mode 8 by pressing [FNC]→[▷][▷][▷][▷][▷][▷][▷][▷].

2. Select item number 2 with [△]/[▽]. The item number and "0" are displayed.

3. Make "0" flash with [⏎]. Set "1" with [△]/[▽].



4. Determine it with [⏎], so that digital zero is executed.

* To cancel the execution, set "0" or press [FNC] to go back to the set value display ("0" display).

Example 4) Setting method ② for command execution

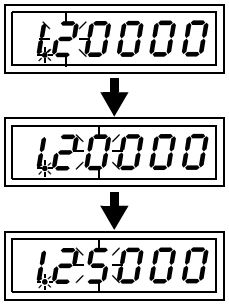
As for operational commands (setting codes 91 and 92) in "9-1.Setting Code List" on page 76, operation is executed when a set value is input and then determined.

Executing Actual Load Calibration (with Balance Weight set at 25000)

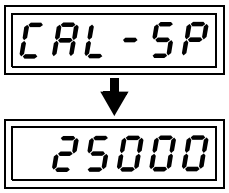
1. From the indicated value display screen, set setting mode 9 by pressing [FNC]→[▷][▷][▷][▷][▷][▷][▷][▷][▷].

2. Select item number 1 with [△]/[▽]. The item number and set value are displayed.

3. Enable change with [⏎], so that the most significant digit of the set value flashes. Move one digit with [▷], so that the second digit (thousands place) from the most significant digit flashes. Set "5" with [△]/[▽].



4. Determine it with [⏎], so that actual load calibration is executed.After execution, you will go back to the gross weight display.



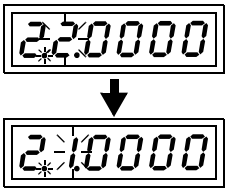
* To cancel the execution, press [FNC] to go back to the set value display.

Executing Equivalent Input Calibration (with the rated output value set at 1.0000mV/V and Balance Weight 25000)

1. From the indicated value display screen, set setting mode 9 by pressing [FNC]→[▷][▷][▷][▷][▷][▷][▷][▷][▷].

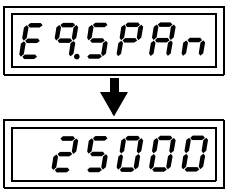
2. Select item number 2 with [△]/[▽]. The item number and set value are displayed.

3. Enable change with [⏎], so that the most significant digit of the set value flashes. Set "1" with [△]/[▽].



4. Determine it with [⏎], so that equivalent input calibration is executed.After execution, you will go back to the gross weight display.

* To cancel the execution, press [FNC] to go back to the set value display.



4 CALIBRATION

4-1. What is Calibration

Calibration is performed for matching the F160 to a strain-gage sensor.
The following two types of calibration are available for the F160.

Actual load calibration

For example, adjustments are made so that the F160 displays 100.00kg accurately when an actual load (or weight) of 100kg is applied to the load cell (scale part) of the weighing apparatus to which the F160 is connected. This operation is called actual load calibration.

Equivalent input calibration (Secondary calibration)

Equivalent input calibration is to perform calibration by simply inputting the rated output value (mV/V) and rated capacity described on the data sheet of the load cell in the case where actual load cannot be applied for some reason.

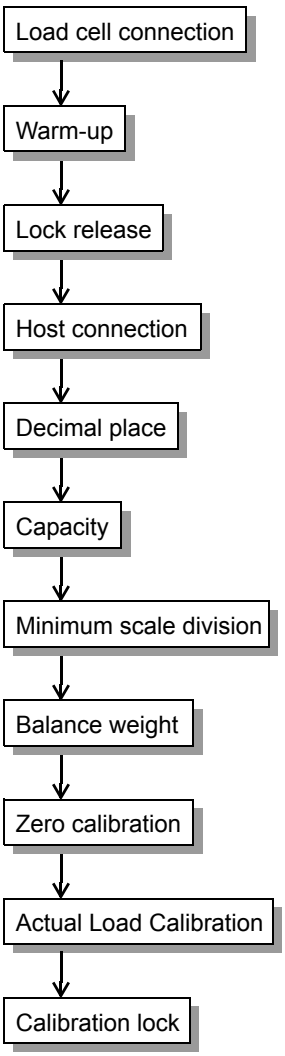
Point

Either actual load calibration or equivalent input calibration may be performed, while actual load calibration is more accurate. Perform actual load calibration if actual load can be applied.

4-2. Calibration Procedure

■Actual Load Calibration Procedure

Perform actual load calibration by the following procedure:



Connect the F160 and load cell according to the section "2.CONNECTION" on page 4.

Release the calibration value lock which locks calibration.

If the CC-Link option is mounted, make and establish connection.
* Only when performing calibration operation from the host.

Register the position of Decimal point.

Register the maximum capacity of the scale.
If the registered value is exceeded by 10 scale divisions or more, display shows over scale “OFL2”.

Register the minimum scale division of the scale.

Register the value of load (balance weight) for calibration.

Calibration the initial zero point.

Place the load (balance weight) on the load cell and calibrate the span value.

Disable changing set value related to calibration.

Attention

Once calibration is performed, the previous calibration values are lost and cannot be restored. Be sure to turn ON the calibration value lock except when performing calibration.

■Equivalent Input Calibration Procedure

By this method, calibration is performed by simply key inputting the output (mV/V) of the load cell and the corresponding weight (value you want to display) without using an actual load.
Rough actual load calibration can be performed without a weight in such a case that the F160 is replaced due to failure or actual load calibration is performed by mistake.
Since equivalent calibration is absolutely temporary, perform actual load calibration as soon as possible. Perform equivalent calibration by the following procedure:

Load cell connection	Connect the F160 and load cell according to the section "2.CONNECTION" on page 4.
↓	
Warm-up	
↓	
Lock release	Release the calibration value lock which locks calibration.
↓	
Host connection	If the CC-Link option is mounted, make and establish connection. * Only when performing calibration operation from the host.
↓	
Decimal place	Register the position of Decimal point.
↓	
Capacity	Register the maximum capacity of the scale. If the registered value is exceeded by 10 scale divisions or more, display shows over scale “OFL2”.
↓	
Minimum scale division	Register the minimum scale division of the scale.
↓	
Balance weight	Set the weight corresponding to the output to be registered in *1.
↓	
Equivalent calibration *1	Set the output of the load cell (mV/V).
↓	
Zero calibration	Register the initial zero point again if necessary.
↓	
Calibration lock	Disable changing set value related to calibration.

Attention

Set the calibrating weight below the capacity.
For performing calibration at the rated value according to the load cell specifications, set the capacity equal to the rated value of the load cell.
For parallel connection of load cells, the input may differ from the output of the load cell specifications because it may be accompanied by a voltage drop depending on the wiring material.
In such a case, register the actual input for correct calibration.

4-3. Actual Load Calibration Operation

■Calibration Value Lock Release (Setting code 48)

The F160 has a calibration inhibiting (Lock) function which prevents entered calibration data from unintentional change. This Lock must be released calibrating.

Setting/ 0: Release 1: LOCK

Point

When the calibration value LOCK is made LOCK, changing of initial setting items is also disabled. For the setting items the changing of which is disabled, refer to the "9-1.Setting Code List" on page 76.

■Decimal Place (Setting code 46)

Set the decimal place. The decimal place can be selected from 0/ 0.0/ 0.00/ 0.000.

Setting/ 0: 0 1: 0.0 2: 0.00 3: 0.000

Point

For weight values and others, the F160 has no concept of decimal point.
For example, to set the capacity at 100.00 and the minimum scale division at 0.01, set 10000 and 1, and then the decimal place “2: 0.00,” respectively.

■Capacity (Setting code 41)

Set the maximum capacity of the scale. If the registered value is exceeded by 10 scale divisions or more, display shows over scale “OFL2”.

Setting range/ 00000 to 99999 Initial value/ 10000

■Minimum Scale Division (Setting code 42)

Set the minimum unit for weighing (scale division). The value of (capacity ÷ minimum scale division) is the resolution of the display. Set a value so that the resolution of the display becomes 10000 or less.

Setting range/ 001 to 100 Initial value/ 001

■Balance Weight (Setting code 40)

Preset the value of the load (weight) to be applied to the load cell during actual load calibration.

Setting range/ 00000 to 99999 Initial value/ 10000

■Zero Calibration (Setting code 90)

Adjust the initial zero point.

In a set value input state, "0" flashes. Execute with the [⏎] button. (Refer to "3-2.Setting Procedure" on page 13.)
After execution, it goes back to the gross weight display.

When a calibration error is displayed, take measures according to the error message, and do zero calibration again.
For details of each error, refer to "9-2.Error List" on page 82.

■Actual Load Calibration (Setting code 91)

Calibrates the span with a weight on.

For the setting method, refer to "Example 4) Setting method ② for command execution" on page 15.

When a calibration error is displayed, take measures according to the error message, and do zero calibration again.
For details of each error, refer to "9-2.Error List" on page 82.

■Calibration Value Lock (Setting code 48)

Upon completion of zero calibration and span calibration, disable changing of calibrated values to prevent them from being changed carelessly. LOCK is set.

Setting/ 0: Release 1: LOCK

Point

When the calibration value LOCK is made LOCK, changing of initial setting items is also disabled. For the setting items the changing of which is disabled, refer to the "9-1.Setting Code List" on page 76.

4-4. Equivalent Input Calibration Operation (Setting Code 92)

Set the rated output value and reading of the sensor.

For the setting method, refer to "Example 4) Setting method ② for command execution" on page 15.

Setting range/ 0.3000 to 2.0000 Initial value/ 2.0000

■Cautions for Equivalent Input Calibration

Analog section specification

Signal input range 0 to +2mV/V

Rough adjustment and fine adjustment of zero and gain
Performed by digital computation

Actual load calibration

Perform span calibration after zero calibration.

With the zero calibration status taken into consideration, an error is displayed if the load cell output at capacity does not fall within +2mV/V during span calibration.

Equivalent input calibration

Whether or not the load cell output at capacity is within +2mV/V is not checked during span calibration.

Example) Scale making with: 3mV/V, 3000kg load cell
initial tare 1000kg
capacity 2000kg

* By actual load calibration,

Zero calibration	Initial tare 1000kg	No error
Span calibration	LOAD display of Weight 2000kg + Initial tare 1000kg	Calibration error (3mV/V)

it can be known that such a scale cannot be made.

* By equivalent input calibration,

Zero calibration	Initial tare 1000kg	No error
Span calibration	Weight 2000kg (2mV/V)	No error

no error is given, but weighing is possible only up to 1000kg.
(1000kg + initial tare 1000kg = 2mV/V)
Weighing up to capacity is not possible.

Point

When the initial tare + capacity > 2mV/V, the signal input range is exceeded.

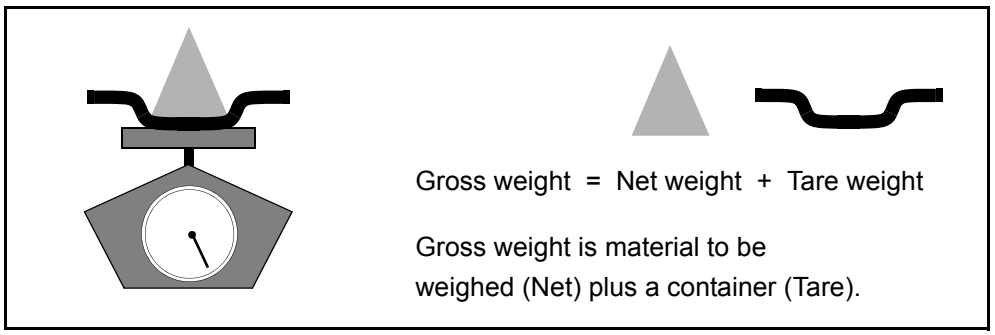
Be aware that a calibration error is given during actual load calibration, but no calibration error is given during equivalent input calibration.

5 FUNCTIONS

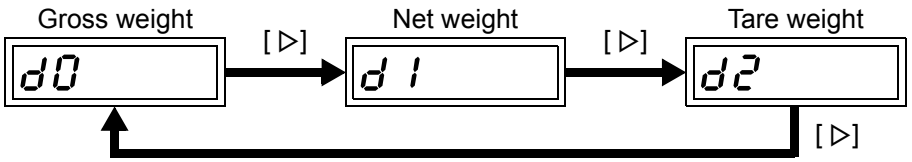
5-1. Weight Display

■Gross Weight and Net Weight • Tare Weight

The F160 allows weighing by switching the weight between gross weight and net weight.
The relationship between the gross weight and net weight is as follows:



On the indicated value display screen, switch the display between gross weight, net weight, and tare weight with the [▷] button.
After any of [d0] to [d2] is displayed for a while, a weight value is displayed.



Also, by pressing the [⏎] button, any of [d0] to [d2] is displayed for a while to indicate the current weight value.
After execution of calibration operation, gross weight display is forced.

5-2. Tare Subtraction

Tare subtraction (Setting code 80)

This function zeros the net weight. This operation does not change the gross weight.
Input TARE ON, or set the tare subtraction command.

Tare reset (Setting code 81)

This function resets tare subtraction. This operation resets the net weight and gross weight to the same value.
Input TARE OFF, or set the tare reset command.

5-3. Preset Tare Weight

This function subtracts a preset tare value from the net weight.
This function works when a weight value to be subtracted is input for a tare setting in setting code 09, and tare setting selection in setting code 24 is valid.

Preset tare value (Setting code 09)

Setting range/ 00000 to 99999 Initial value/ 00000

Preset tare weight (Setting code 24)

Setting/ 0: Invalid 1: Valid

5-4. Digital Zero Regulation Value (Setting Code 45)

Set a range of zero point adjustment (a gap from the registered Zero Calibration value) by digital zero or zero tracking. If digital zero operation is performed or zero tracking is actuated where the digital zero regulation value is exceeded, the “zero alarm” status turns on, and the digital zero regulation value is subtracted from the gross weight. (Refer to "9-2.Error List" on page 82.)

Setting range/ 0000 to 9999 Initial value/ 200

5-5. Digital Zero

Digital zero setting (Setting code 82)

This function forces the gross weight to be zeroed. However, if this operation is performed where the weight value exceeds the DZ regulation value in setting code 45, the “zero alarm” status turns ON. The net weight changes according to the following expression: (Net weight) = (Gross weight) – (Tare weight). Execute digital zero by setting code 82, or turn the digital zero input ON.

Digital zero reset (Setting code 83)

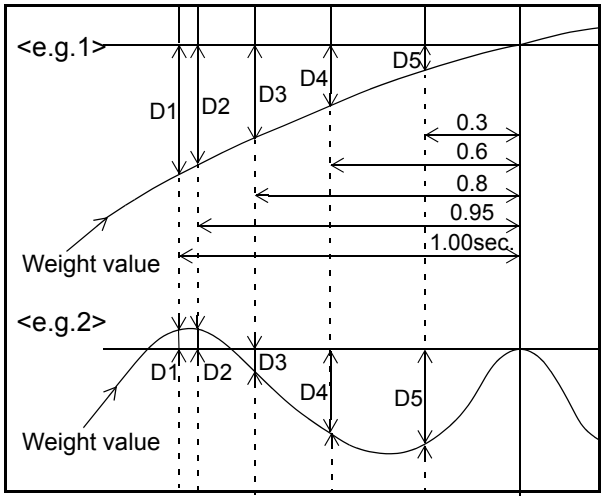
This function resets the digital zero. If this operation is performed with a "zero alarm," the digital zero is cleared, and the "zero alarm" is released. Execute digital zero reset by setting code 83, or turn the digital zero reset input ON.

5-6. Motion Detect (Setting Code 31,32,37)

Set the parameters to detect that the indicated weight is stable.
When the variation width of the weight falls within the set range and that state continues for the set period or more, it is regarded that the weight is stable, and the stability signal turns on. There are stable mode and checker mode in Motion Detection.

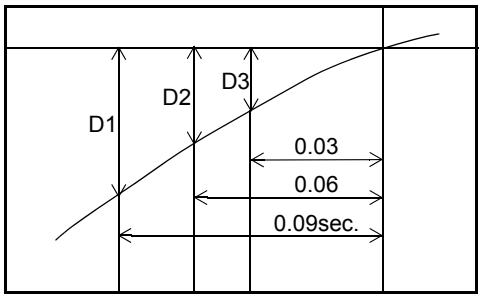
In stable mode, D1 to D5 in the figure at the right and the set range are compared each time A/D conversion is made, and if at least one of them exceeds the range, the STABLE signal turns OFF immediately.

* D1 is the difference between the current weight value and one-sec-old weight value.



In checker mode, D1 to D3 in the figure at the right and the set range are compared each time A/D conversion is made, and if at least one of them exceeds the range, the STABLE signal turns OFF immediately.

* D1 is the difference between the current weight value and 0.09-sec-old weight value.



When the Stab. is ON, it enables to insert the Digital Filter to restrain the instability of weight value. (Refer to "5-7.Filter in a Stable Condition (Setting Code 36)" on page 26.)

Setting the motion detect parameters

1) Motion detect period (Setting code 31)

Set the time to judge that the weight is stable.

Setting range/ 0.0 to 9.9 Initial value/ 1.5

2) Motion detect range (Setting code 32)

The variation width of the weight is compared with this set value multiplied by the minimum scale division.

Setting range/ 00 to 99 Initial value/ 05

3) Motion detect mode (Setting code 37)

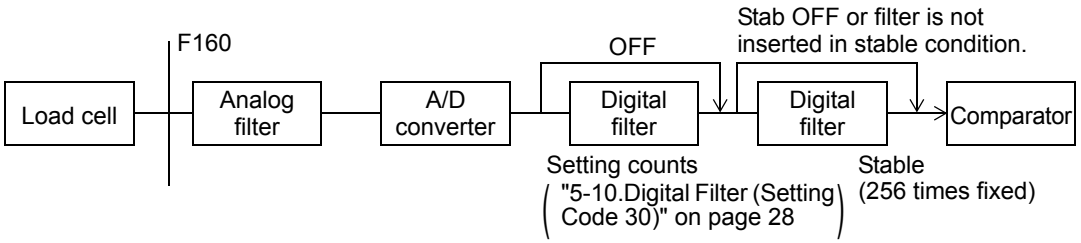
Select the condition from Stable mode or Checker mode in Motion Detect Mode.

Setting/ 0: Stable mode 1: Checker mode

5-7. Filter in a Stable Condition (Setting Code 36)

When the indicated value is stable, the digital filter to reduce fluctuations is automatically inserted by this function. Select whether or not it is inserted.
Stability is defined by "5-6.Motion Detect (Setting Code 31,32,37)" on page 25.

Setting/ 0: Insert (256 times) 1: Not insert

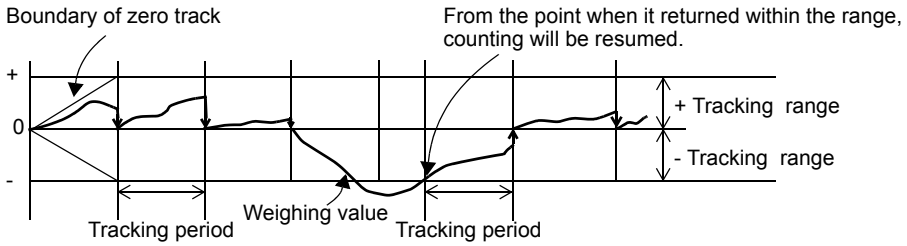


5-8. Zero Tracking (Setting Code 33,34)

This function automatically corrects slow zero drifts and micro-movements of the zero point caused by residue remaining after weighing.

Point

- Zero tracking is the function to reset gross weight to zero automatically when the state remaining the zero point drift within the zero tracking range continues more than set period.
- Zero tracking period must be set between 0.1 to 9.9 second and its range must be set between 0 to 99 using 1/4 resolution interval of Minimum scale division. For instance, 02 corresponds to 0.5 and 12 corresponds to 3 of set value. Zero tracking does not work if you set the period to 0.0 sec. and range to 00.



Setting range/ Period (Setting code 33): 0.0 to 9.9 Initial value/ 0.0
Range (Setting code 34): 00 to 99 Initial value/ 00

Point

- Since zero tracking should work from the point at which the gross weight is zero, it does not work when the weight is already over the tracking range. Adjust the zero point by digital zero or zero calibration.
- If the amount of zero correction by digital zero and zero tracking (deviation from the zero calibration point) exceeds the digital zero regulation value, a zero alarm will result without making zero correction.

5-9. Gravitational Acceleration (Setting Code 47)

If the scale calibration location and installation location are different, weight errors caused by the regional difference in gravitational acceleration are corrected by this function.
If the calibration location and installation location are in the same region, there is no need to set this item.
Find the code (01 – 16) of the region in which actual calibration is performed from the following gravitational acceleration table, set the number, and then perform actual calibration.
Next, find the region of actual installation from the table, and input the region code. Now, the difference in gravitational acceleration from the calibration location is corrected.

Setting range/ 01 to 16 Initial value/ 09

Gravitational accceleration

01	9.806	02	9.805	03	9.804	04	9.803
05	9.802	06	9.801	07	9.800	08	9.799
09	9.798	10	9.797	11	9.796	12	9.795
13	9.794	14	9.793	15	9.792	16	9.791

Point

Amsterdam	9.813m/s^2	Havana	9.788m/s^2	Paris	9.809m/s^2
Athens	9.800m/s^2	Helsinki	9.819m/s^2	Rio de janeiro	9.788m/s^2
Auckland NZ	9.799m/s^2	Kuwait	9.793m/s^2	Rome	9.803m/s^2
Bangkok	9.783m/s^2	Lisbon	9.801m/s^2	San Francisco	9.800m/s^2
Birmingham	9.813m/s^2	London (Greenwich)	9.812m/s^2	Singapore	9.781m/s^2
Brussels	9.811m/s^2			Stockholm	9.818m/s^2
Buenos Aires	9.797m/s^2	Los Angelse	9.796m/s^2	Sydney	9.797m/s^2
Calcutta	9.788m/s^2	Madrid	9.800m/s^2	Taichung	9.789m/s^2
Capetown	9.796m/s^2	Manila	9.784m/s^2	Tainan	9.788m/s^2
Chicago	9.803m/s^2	Melbourne	9.800m/s^2	Taipei	9.790m/s^2
Copenhagen	9.815m/s^2	Mexico City	9.779m/s^2	Tokyo	9.798m/s^2
Cyprus	9.797m/s^2	Milan	9.806m/s^2	Vancouver,BC	9.809m/s^2
Djakarta	9.781m/s^2	New York	9.802m/s^2	Washinton DC	9.801m/s^2
Frankfurt	9.810m/s^2	Oslo	9.819m/s^2	Wellington NZ	9.803m/s^2
Glasgow	9.816m/s^2	Ottawa	9.806m/s^2	Zurich	9.807m/s^2

5-10. Digital Filter (Setting Code 30)

This function minimizes instability of the weight value through moving average of A/D-converted data. The number of times of moving average can be set as desired up to 1024. The larger the number of times of moving average, the more the weight value becomes stable, but the slower the response becomes. On the contrary, the smaller the number of times of moving average, the quicker the response becomes, but the more the weight value becomes unstable. Select the most appropriate value according to the type of weighing.

Setting range/ 0000 (OFF), 0002 to 1024 [times] Initial value/ 0032

5-11. Analog Filter (Setting Code 35)

This is a low-pass filter to eliminate noise components from input signals from the load cell, and also stabilize the weight value by averaging.
Select the cutoff frequency from 2Hz, 4Hz, 6Hz and 8Hz.
By lowering the cutoff frequency, the display becomes more stable, but the response worsens. On the contrary, the higher the frequency, the better the response becomes, but the more difficult it is to make the display stable.

Setting/ 0: 2 1: 4 2: 6 3: 8 [Hz]

5-12. Net Over/ Gross Over (Setting Code 43,44)

This function gives a warning when the net weight or gross weight exceeds a fixed regulation value. Conditional expressions and indications are as follows:

	Conditional expression
Net over	Net weight > Net over set value
Gross over	Gross weight > Gross over set value

Setting range and code No. of each set value

Set value	Setting range	Initial value	Code No.
Net over	00000 to 99999	99999	43
Gross over			44

5-13.Discharging Control Mode

The discharging control means the control method for discharging raw material from the hopper or tank.

F160 enables to discharge accurate quantity with the proper combination of setting the control of Final, Set Point 2, Set Point 1, Compensation and Judging Over, Under, Go and Timer for Comparison Inhibit, Judging.

According to the way of discharging, Feeding, Discharging or Simple comparison control or Sequence control is selectable.

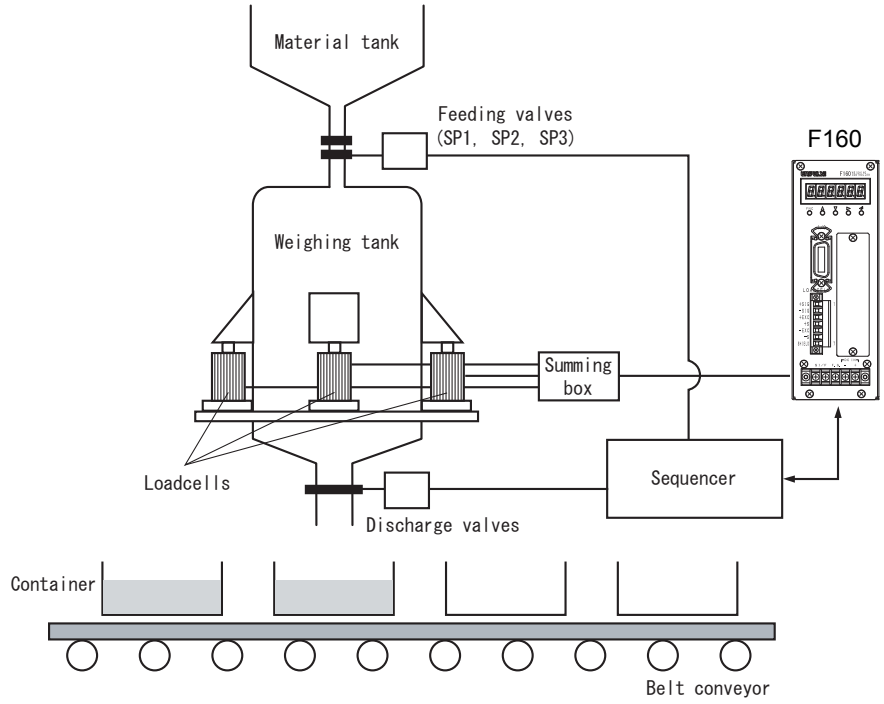
■Feeding Weighing and Discharging Weighing

Feeding weighing

A method controlling a weight while feeding raw materials into a measuring tank (hopper).

Example of feeding weighing.

In this example system, raw materials are to be fed from the material tank to the weighing tank. At first, the feeding valves are to be fully opened to feed, and closed in the order of SP1 → SP2, and SP2 → SP3 at the time of Final - Set Point 1, and Final - Set Point 2, respectively. The feeding valves are to be completely closed at the time of Final - Compensation. The weighed raw materials are to be discharged to a container by opening the discharge valves.



(1) By setting external input; Tare subtraction ON, etc., Net weight is zeroed. (Tare subtraction)

(2) The feeding valves are fully opened to start feeding. When the weighed value reaches (Final - Set Point 1), SP1 output signal turns ON. (If the comparison inhibit timer is set, the timer starts.) After the timer expires, SP1 valve of the material tank is closed to “SP2”.

(3) When the weighed value reaches (Final - Set Point 2), SP2 output signal turns ON. (If the comparison inhibit timer is set, the timer starts.) After the timer expires, SP2 valve of the material tank is closed to “SP3”.

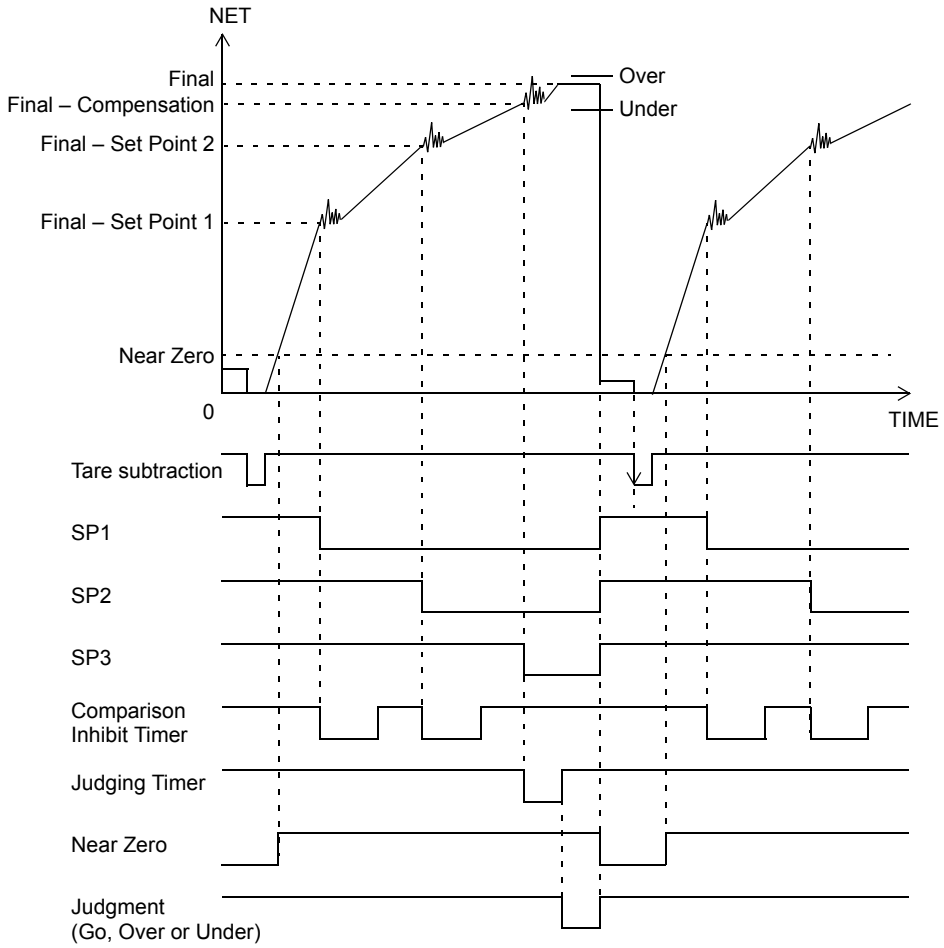
(4) When the weighed value reaches (Final - Compensation), SP3 output signal turns ON, and if the judging timer is set, the timer starts. The feeding valves are completely closed.

(5) After the judging timer expires, Over/Under judgment is made. If the weighed value exceeds the range of the Over/Under set value, the over signal or under signal turns ON.

(6) Raw materials are discharged from the weighing tank to a container. The valves of the weighing tank should be opened. Completion of discharge is confirmed with the Near Zero signal. In weighing from the second time onward, (1) to (5) are repeated.

Point

The feeding valves and discharge valves should be opened and closed through the PLC or relay sequence according to the control signals from the F160.

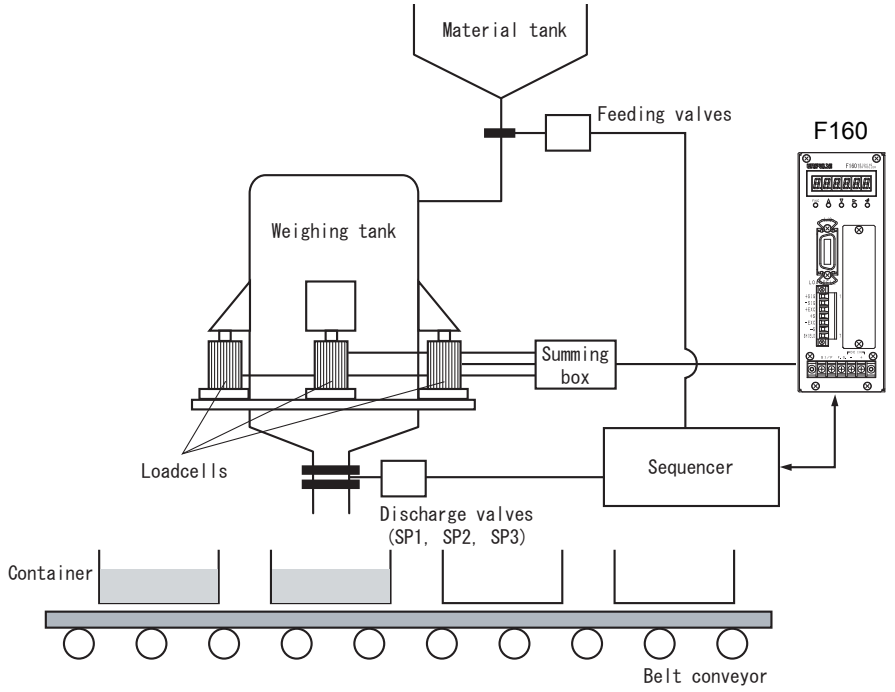


Discharging weighing

First supply raw material into a metering tank (hopper), then controls a weight while discharging raw material from the metering tank.

Example of discharging weighing

In discharging weighing, the amount of discharge can be weighed by adding negative weighed values. In this example system, raw materials are to be fed from the material tank to the weighing tank, and a fixed quantity of raw materials are to be discharged from the weighing tank to a container. At first, the discharge valves of the weighing tank are to be fully opened to discharge raw materials, and the discharge valves are to be closed in the order of SP1 → SP2, and SP2 → SP3 at the time of Final - Set Point 1, and Final - Set Point 2, respectively. The discharge valves are to be completely closed at the time of Final - Compensation, when one measurement is completed. When the weighing tank runs short, the feeding valves are to be opened to replenish the weighing tank with raw materials from the material tank to weigh.



(1) The valves of the material tank are opened by the lower limit signal, and raw materials are fed into the weighing tank.

(2) It is detected by the upper limit signal that the weighing tank is full, and the valves of the material tank are closed.

(3) By setting external input; Tare subtraction ON, etc., Net weight is zeroed. (Tare subtraction)

(4) The discharge valves are fully opened to start discharging. When the weighed value reaches (Final - Set Point 1), SP1 output signal turns ON. (If the comparison inhibit timer is set, the timer starts.) After the timer expires, the discharge valve (SP1) is closed to “SP2”.

(5) When the weighed value reaches (Final - Set Point 2), SP2 output signal turns ON. (If the comparison inhibit timer is set, the timer starts.) After the timer expires, the discharge valve (SP2) is closed to “SP3”.

(6) When the weighed value reaches (Final - Compensation), SP3 output signal turns ON, and if the judging timer is set, the timer starts. The discharge valves are completely closed.

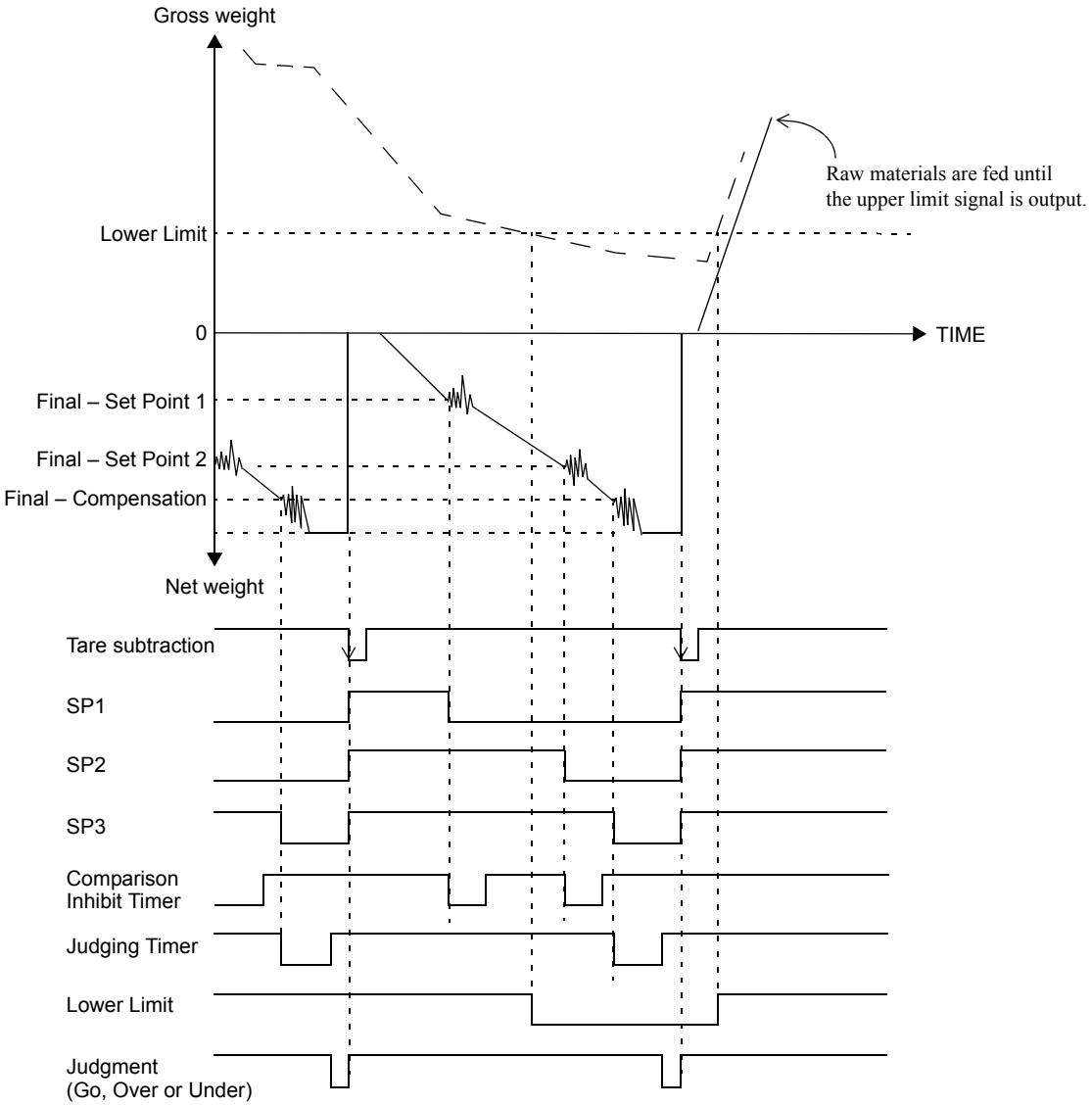
(7) After the judging timer expires, Over/Under judgment is made. If the weighed value exceeds the range of the Over/Under set value, the over signal or under signal is output. In weighing from the second time onward, (3) to (6) are repeated in a like manner.

(8) When the weighing tank runs short of raw materials, the valves of the material tank are opened by the output of the lower limit signal to feed raw materials into the weighing tank.

Point

The feeding valves and discharge valves should be opened and closed through the PLC or relay sequence according to the control signals from the F160.

Example) In the case when comparing Upper/Lower limit comparison and Near Zero comparison with Gross weight, Final and Over/Under with Net weight.



Point

The Near Zero signal is used for discharge completion confirmation as in the case of feeding weighing.

■Discharging Mode (Setting Code 23)

Setting/ 0: Feed control 1: Discharge control 2: External 3: Communication

The net weight is outputted as inverted in sign. (The direction that decreases the gross weight is positive.)

Setting to "External" enables feed and discharge control by external control input. (Refer to "- Feed/ Discharge (Level input)" on page 46.)
Setting to "Communication" enables feed and discharge control by the CC-Link interface (option). (Refer to "About RY (PLC→F160) signals" on page .61.)

■Net Weight Sign Inversion in Discharge Weighing (Setting Code 29)

When discharging a fixed quantity material from material bin, Net weight becomes negative.
Discharging weight can be revised to positive by reversing the polarity of Net weight.

Setting/ 0: Display with the sign inverted
1: Display without inverting the sign

■Simple Comparison Control and Sequence Control

Simple comparison control

Compares weight value with discharging value regulerly.
Output is always ON when the weight value satisfies the conditions of final discharging setting items.
In simple comparison control, the next weighing is judged to be possible when the weight falls short of 25% of the Final after completion of the previous weighing.

Sequence control

This is a control method which compares the weight value with discharging value after starting signal of weighing ON.
When the starting signal ON, output of each signal of SP1, SP2, and SP3 turns ON then the signal turns OFF after weight value satisfied the each condition.
Sequential control can be conducted without connecting external PLC in sequence control. For details, refer to "5-14.Sequence Control" on page 39.

Simple comparison mode/ Sequence mode (Setting code 50)

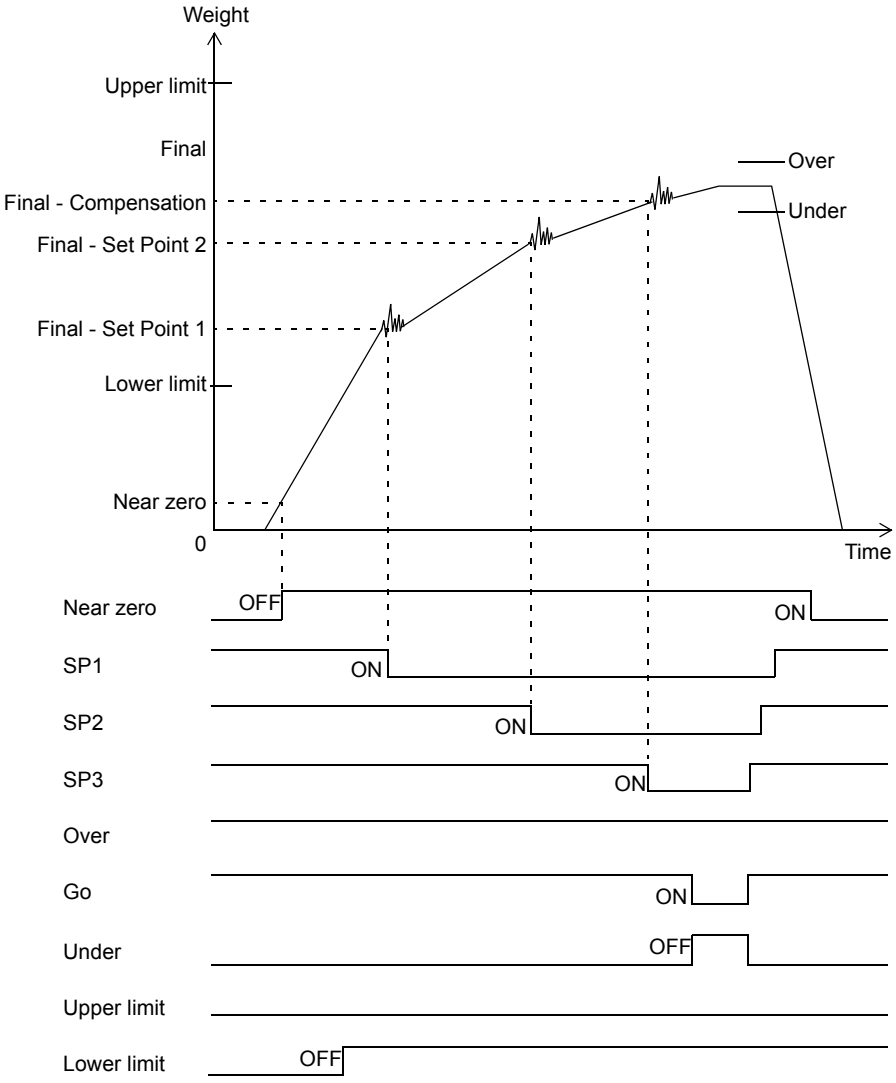
The control method is selected.

Setting/ 0: Simple comparison mode 1: Sequence mode

■Final/ Set Point2/ Set Point1/ Compensation (CPS)/ Over/ Under (Setting Code 00 to 05)

These settings are for controlling and judging feed/discharge.

ex) Simple comparison mode



Signal	Conditional formula
Near zero	Weight value ≦ set value of Near zero
SP1	Weight value ≧ Final - Set point 1
SP2	Weight value ≧ Final - Set point 2
SP3	Weight value ≧ Final - Compensation
Under	Weight value < Final - Under
Over	Weight value > Final + Over
Go	Final + Over ≧ Weight value ≧ Final - Under
Upper limit	Weight value > Upper limit
Lower limit	Weight value < Lower limit

Setting range and code No. of each set value

Set value	Setting range	Initial value	Code No.
Final	00000 to 99999	00000	00
Set point 1	00000 to 99999	00000	01
Set point 2	00000 to 99999	00000	02
CPS	0000 to 9999	0000	03
Over	000 to 999	000	04
Under	000 to 999	000	05

■Upper Limit/ Lower Limit/ Near Zero (Setting Code 06 to 08)

These settings are for feed/discharge control, and direct comparisons are made with these values irrespective of the final value.

Setting range and code No. of each set value

Set value	Setting range	Initial value	Code No.
Upper limit	00000 to 99999	00000	06
Lower limit			07
Near zero			08

■Over/Under Comparison/ Upper/Lower Limit Comparison/ Near Zero Comparison (Setting Code 20 to 22)

For each comparing point such as final, the comparing weight (gross weight or net weight) and timing can be selected. The following three items are selectable.

1) Over/under comparison (Code No.20)

Select the weight value for Over/under comparison.

Setting/ 0: Gross weight 1: Net weight 2: Comparison OFF

2) Upper/Lower limit comparison (Code No.21)

Select the weight value for upper/lower limit comparison.

Setting/ 0: Gross weight 1: Net weight 2: Comparison OFF

3) Near zero comparison (Code No.22)

Select the weight value for near zero comparison.

The Near Zero signal turns ON when the comparing weight ≦ near zero set value.

Setting/ 0: Gross weight 1: Net weight 2: Comparison OFF
3: |Gross weight| 4: |Net weight|

■Over/Under Comparison Mode (Setting Code 27)

Setting/ 0: Continuous comparison
1: Comparison when the external judgment input is ON
2: Comparison when the complete output is ON
3: Comparison, holding the weight value, when the complete output is ON

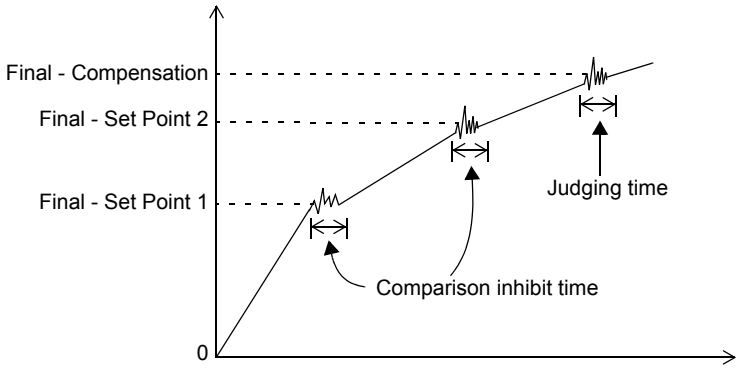
■Upper/Lower Limit Comparison Mode (Setting Code 28)

Setting/ 0: Continuous comparison
1: Comparison when the external judgment input is ON

■Comparison Inhibit Time/ Judging Time/ Complete Output Time (Setting Code 10 to 12)

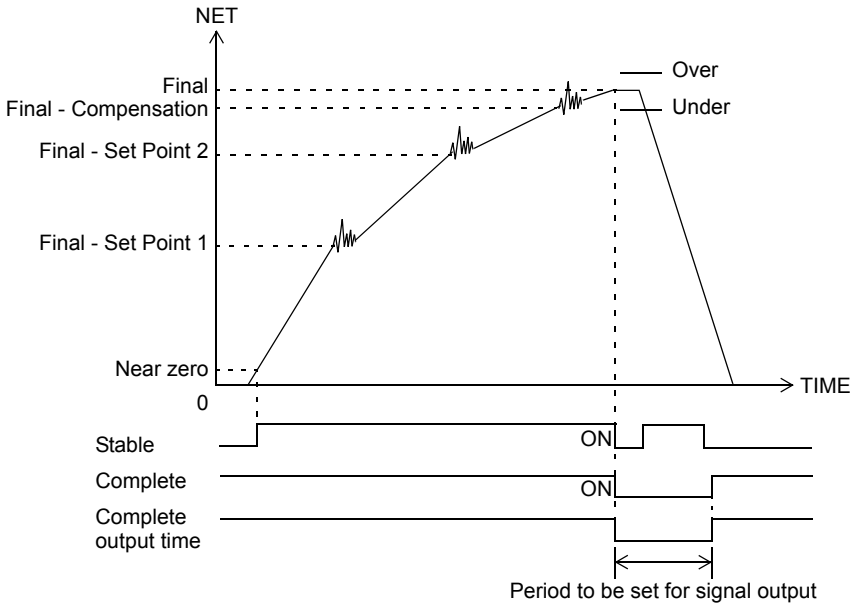
Comparison inhibit time/ Judging time

These functions inhibit comparison for a fixed period so that control and judgment will not be operated inappropriately due to mechanical vibrations caused by opening and closing of valves.



Complete output time

Set the length of the complete signal (complete relay) to be output when weighing is completed.



Setting range and code No. of each set value

Set value	Setting range	Initial value	Code No.
Comparison inhibit time	000 to 999 (0.00 to 9.99 sec.)	50	10
Judging time		150	11
Complete output time		300	12

■Complete Output Mode (Setting Code 26)

Set the timing to output the complete signal.

Parameters that determine the timing are the judging time and stable signal.

Setting/ 0: Output by the complete output time after the judging time is up with the SP3 signal ON

1: Output by the complete output time from when the weight value has become stable after the judging time is up with the SP3 signal ON

2: Output by the complete output time after the judging time is up or from when the weight value has become stable with the SP3 signal ON

■Auto Free Fall Compensation/ Auto Free Fall Compensation Coefficient/ Average Count of Auto Free Fall Compensation/ Auto Free Fall Compensation Regulation (Setting Code 25,17 to 19)

The auto free fall compensation function automatically corrects variations in free fall, which is a great factor of weight alarms, for accurate weighing. Here, set the parameters for this auto free fall compensation. Be aware that this function is initially set to be valid.

Principle of auto free fall compensation

The difference (D) between the final set value and the actual weighing-completed value is recorded by a fixed number of times (preset number of times) (A), where the average is calculated, and the average multiplied by the compensation coefficient (C) is added to the compensation set value.

Value adjusted to the compensation set value

$$\frac{(D_1 + D_2 + D_3 \cdots\cdots D_A)}{A} \times C$$

To minimize errors, the value of D (D1, D2, D3, ... DA) can also be regulated.

Example)	Final	20.000
	Auto free fall compensation regulation	0.100
	Average count of auto free fall compensation	4
	Auto free fall compensation coefficient	2/4

Times	Actual weighing	Error	Average count of AFFC.	CPS
0			0	← Power ON
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	0.500
		+0.240/4 = 0.060		
			0.060×2/4 = 0.030	→ CPS value
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)	←×3	0.530
9	20.010	+0.010	4→0	0.530
		+0.040/4 = 0.010		
			0.010×2/4 = 0.005	→ CPS value
10	19.880	(-0.120)	←×1	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	0.535
		-0.020/4 = -0.005		
			-0.005×2/4 = 0.003	→ CPS value
				0.532

Point

Compensation coefficient setting

The compensation coefficient can be selected from 1/4, 2/4, 3/4 and 1.
Select 1 for weighing such that each weight value is almost equal, and select 1/4 - 2/4 for weighing such that each weight value varies, so that a higher-precision free fall compensation value can be calculated.

◇Auto free fall compensation parameter setting

Auto free fall compensation (Code No.25)

0: Invalid 1: Valid 2: Communication

Select whether or not to use the auto free fall compensation function.
Setting to "Communication" enables switching between Invalid and Valid by the CC-Link interface (option).

Auto free fall compensation regulation (Code No.19)

00000 to 99999 Initial value/ 9800

Set a regulation value to prevent the compensation value from being extremely large (or small).

Average count of auto free fall compensation (Code No.18)

1 to 9 Initial value/ 4

Set the number of times of recording the weight value to calculate the average.

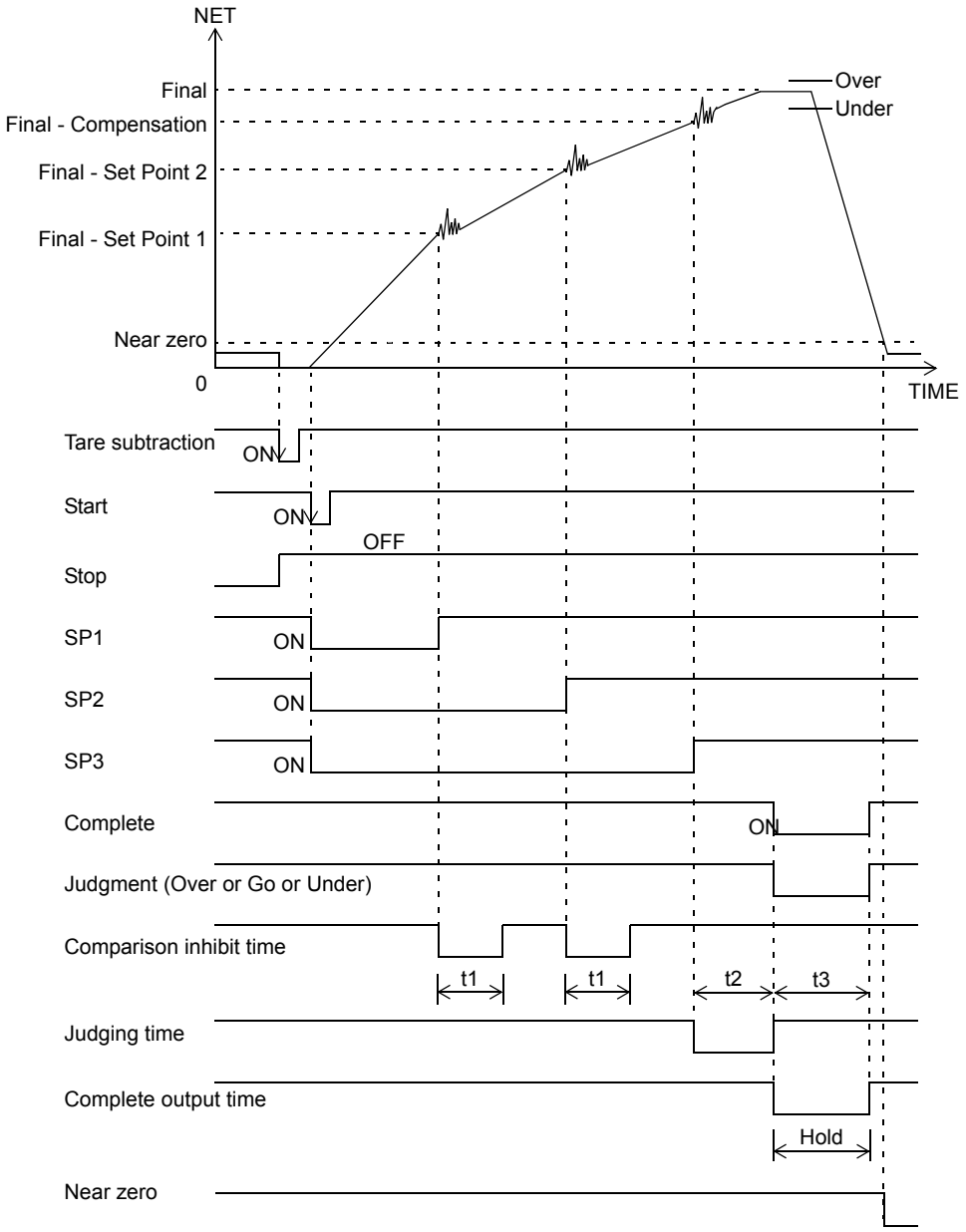
Auto free fall compensation coefficient (Code No.17)

0: 1 1: 3/4 2: 2/4 3: 1/4

Set a coefficient of 1 or less for multiplication to prevent variations in compensation value.

5-14.Sequence Control

■Normal Sequence (With Judgment)



● The complete signal output timing depends on the setting of the complete output mode of setting code 26.

● Over/Under comparisons are made, holding the weight value, when the complete output is ON, deregarding the setting of Over/Uunder comparison mode of setting code 27.

● Upper/Lower limit comparisons are always made deregarding the setting of the Upper/Lower limit comparison mode of setting code 28.

t1: Comparison inhibit time; comparison inhibit time of setting code 10

t2: Judging time; judging time of setting code 11

t3: Complete output time; complete output time of setting code 12

◆Conditional expressions

- Near zero: ON when the weight value ≦ near zero set value.
- SP1 output: OFF when the weight value ≧ final set value – set point 1 set value.
- SP2 output: OFF when the weight value ≧ final set value – set point 2 set value.
- SP3 output: OFF when the weight value ≧ final set value – compensation set value.

* These turn ON at start-time.

- Under: ON when the weight value < final set value – under set value.
- Over: ON when the weight value > final set value + over set value.
- Go: ON when the final set value + over set value ≧ weight value ≧final set value – under set value.

● Select the near zero comparison weight value from gross weight/ net weight with setting code 22.

● Select the SP1/SP2/SP3 output signal and over/go/under judgment signal comparing weight value from gross weight/ net weight with setting code 20.

Near zero confirmation at the sequence mode (Setting code 52)

Setting for confirming whether Near Zero signal ON at the start of weighing.

Weighing will normally start if the Near Zero is ON. “Sequence error 4” is displayed if the Near Zero is OFF. Refer to "■Upper Limit/ Lower Limit/ Near Zero (Setting Code 06 to 08)" on page 35 concerning Near Zero setting.

Setting/ 0: Invalid 1: Valid

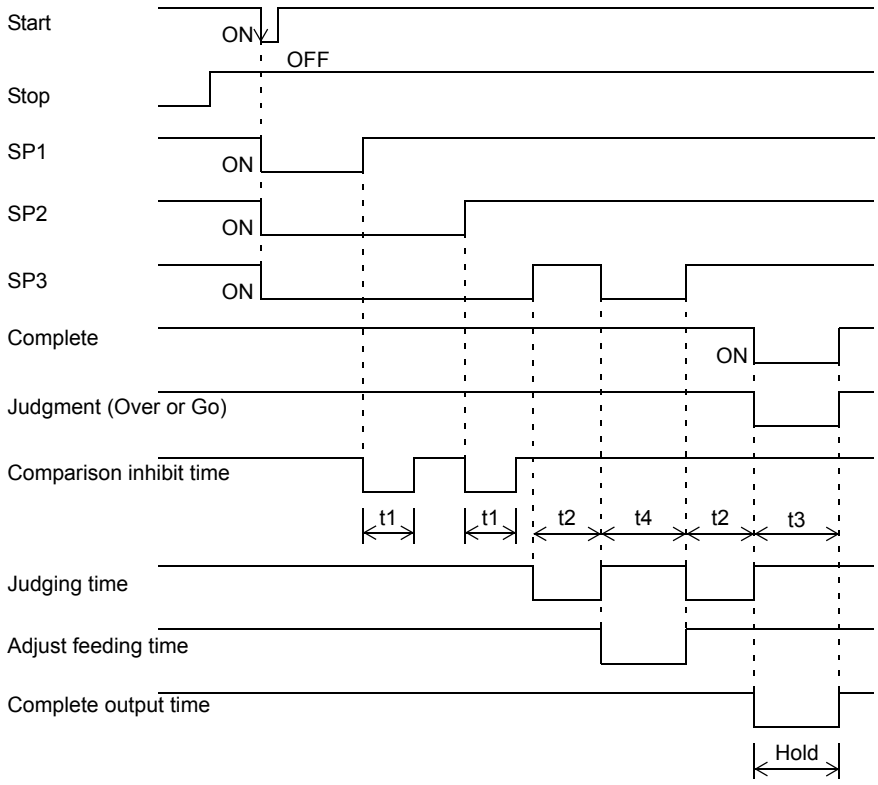
Weight value confirmation at the sequence mode (Setting code 53)

Confirm whether the weighing value has reached SP1 (final set value – set point 1 set value) at the start of weighing.

(select from ON or OFF) If it has, “Sequence error 5” will be displayed. Refer to "■Final/ Set Point2/ Set Point1/ Compensation (CPS)/ Over/ Under (Setting Code 00 to 05)" on page 34 concerning Set Point 1 setting.

Setting/ 0: Invalid 1: Valid

■Sequence with Adjust Feeding Valid



- Set adjust feeding ON/OFF in the sequence mode of setting code 51 to ON.
- The complete signal output timing depends on the setting of the complete output mode of setting code 26.
- Over/Under comparisons are made, holding the weight value, when the complete output is ON, deregarding the setting of Over/Under comparison mode of setting code 27.
- Upper/Lower limit comparisons are always made deregarding the setting of the Upper/Lower limit comparison mode of setting code 28.

t1: Comparison inhibit time; comparison inhibit time of setting code 10
t2: Judging time; judging time of setting code 11
t3: Complete output time; complete output time of setting code 12
t4: Adjust feeding time; adjust feeding time of setting code 13

Adjust feeding time (Setting code 13)

Set the adjust feeding time.

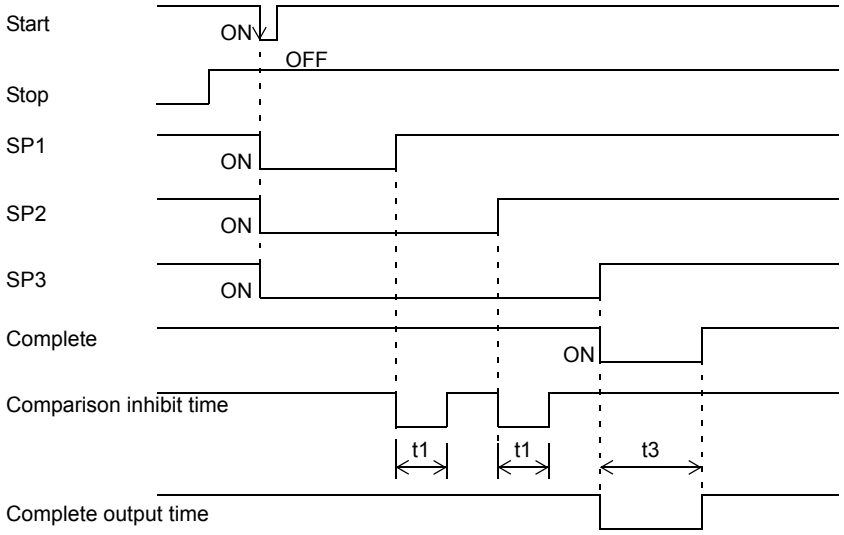
Setting range/ 000 to 999 Initial value/ 100

Adjust feeding at the sequence mode (Setting code 51)

Determines whether adjust feeding is valid or invalid.

Setting/ <u>0: Invalid</u> 1: Valid

■Sequence without Judgment

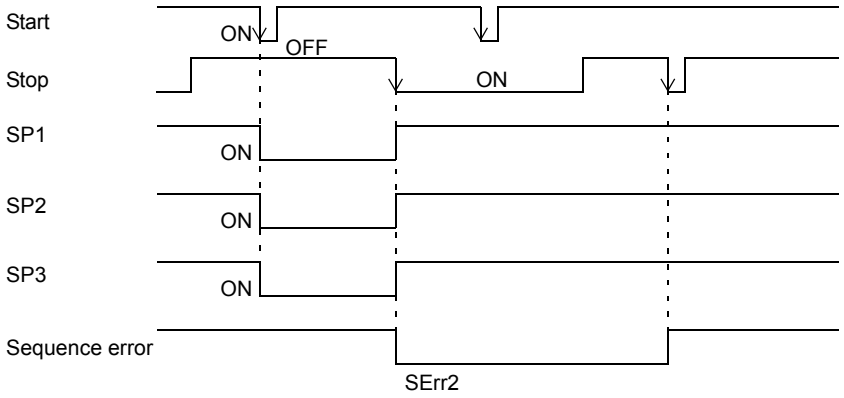


● Over/Under judgment is not made when the setting of the number of judging times of setting code 15 is 00.

● The complete signal is output at the OFF edge (ON→OFF) of the final (SP3) signal deregarding the setting of the complete output mode of setting code 26.

t1: Comparison inhibit time; comparison inhibit time of setting code 10
t3: Complete output time; complete output time of setting code 12
t4: Adjust feeding time; adjust feeding time of setting code 13

■About the Stop Signal (Setting Code 84,85)



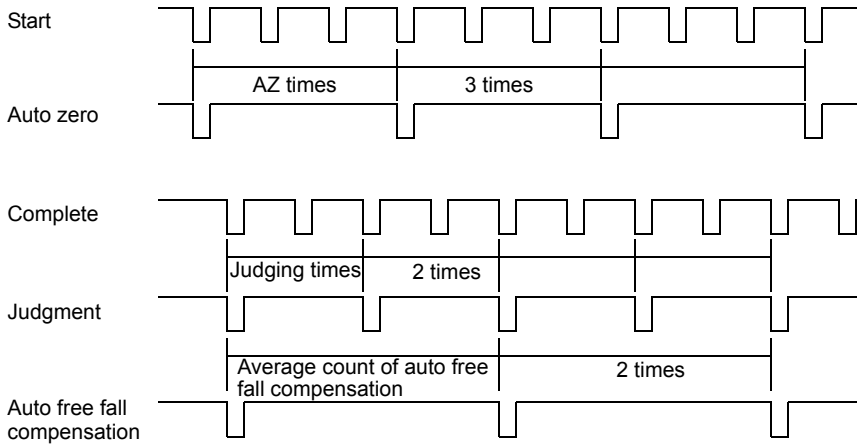
● When the stop signal turns ON, all of the SP1, SP2 and SP3 output signals turn OFF.

● If the start signal is inputted when the stop signal is on the ON level, sequence error 1 will result.

● To reset the sequence error, input the stop signal or the sequence error reset signal again.

* Sequence start and sequence stop can also be executed by setting code 84 (start) and setting code 85 (stop), respectively. For the setting method, refer to "Example 3) Setting method ① for command execution" on page 15.

■Relationship Between Auto Zero Times, Judging Times, And Auto Free Fall Compensation



● When the number of auto zero times is set at 01, auto (digital) zero is applied each time weighing starts. (For weighing in net weight, tare subtraction is carried out.)
When the number of auto zero times is set at 02 – 99, auto zero is applied for every set times.
When the number of auto zero times is set at 00, the auto zero function is OFF. However, digital zero and tare subtraction by key operation, external input signal, and Communication are valid.

● When the number of judging times is set at 01, judgment is made each time weighing ends.
When the number of judging times is set at 02 – 99, judgment is made every set times.
When the number of judging times is set at 00, Over/Under comparisons are not made.

● Since weight values for auto free fall compensation are sampled at judge-time, the auto free fall compensation function does not work when no judgment is made.

Auto zero times/ Judging times (Setting code 14,15)

Set the number of auto zero times and the number of judging times in the sequence mode.

Set value	Setting range	Initial value	Code No.
AZ times	00 to 99 (0 to 99 times)	01	14
Judging times		01	15

* When the number of auto zero times is set at zero, the auto zero at start-time becomes invalid.
* When the number of judging times is set at zero, the sequence becomes equal to "sequence without judgment".

■Sequence Error (Setting Code 86)

If the sequence start signal is input under conditions that weighing cannot be performed properly, or if the stop signal is inputted during weighing, a sequence error occurs, and weighing cannot be started until it is canceled. For details of each error, refer to "9-2.Error List" on page 82.
Such a sequence error is canceled by the sequence stop signal or sequence error reset signal.

* When sequence error 3 occurs, the zero alarm also occurs at the same time, but only the sequence error is canceled. For the method of canceling the zero alarm, refer to "Digital zero reset (Setting code 83)" on page 24.

* Sequence error reset can also be executed by setting code 86. For the setting method, refer to "Example 3) Setting method ① for command execution" on page 15.

6 STANDARD INTERFACES

6-1. External Input/Output (Amphenol Connector) (Setting Code 60 to 66,70 to 74)

The external input/output signals are selective.
Select necessary signals and set them to each port.
However, in the case of redundant settings to input signals, operation is performed as follows:

- For the timing of edge operation

Functional operation is performed at the edge of any of the input ports assigned with the same signal.

- For the timing of level operation

The port the largest in number among the input ports assigned with the same signal becomes valid.

■Connector Pin Assignments

Output assignments

Pin No.	Port	Setting code	Initially-specified signal
1	COM (External power GND)		
2	External control output 0	60	01 (SP1)
3	External control output 1	61	02 (SP2)
4	External control output 2	62	03 (SP3)
5	External control output 3	63	04 (Under)
6	External control output 4	64	05 (Go)
7	External control output 5	65	07 (Complete)
8	COM (External power GND)		
9	External control output 6	66	11 (Stable)

Output allocation

Set value	Signal	Set value	Signal
00	Near zero	09	Lower limit
01	SP1	10	Upper limit
02	SP2	11	Stable
03	SP3	12	Weight alarm
04	Under	13	Sequence error
05	Go	14	Final error
06	Over	15	In operation (RUN)
07	Complete	16	Clock (in an approximately one-second cycles)
08	Normally OFF		

Input assignments

Pin No.	Port	Setting code	Initially-specified signal
10	External control input 0	70	0 (Digital zero reset)
11	External control input 1	71	1 (Digital zero)
12	External control input 2	72	2 (Tare subtraction)
13	External control input 3	73	3 (Tare reset)
14	External control input 4	74	4 (Hold or Judge)

Input allocation

Set value	Signal	Operation timing
0	Digital zero reset	ON edge
1	Digital zero	ON edge
2	Tare subtraction	ON edge
3	Tare reset	ON edge
4	Hold or Judge	Level
5	Feed/Discharge	Level
6	Sequence start	ON edge
7	Sequence stop	Level, ON edge
8	No function	

■Output (Meanings of Signals)

◆ For normal feed/discharge signals, refer to "■Final/ Set Point2/ Set Point1/ Compensation (CPS)/ Over/ Under (Setting Code 00 to 05)" on page 34.

◆ For weight alarms and sequence errors, refer to "9-2.Error List" on page 82.

◆ No. 15 “In operation (RUN)” is normally ON, and turns OFF in the following cases:

① When an internal reset occurs due to overflow of the watchdog timer of the CPU.
② When the exciter power supply voltage drops.
③ When a calibration error occurs.
④ When an input-over (plus/minus) error occurs.
⑤ When the digital zero adjustment value exceeds the DZ regulation value of code 45.

◆ The final error turns ON when the CPS set value > final set value.

■Input (Meanings of Signals)

- Digital zero reset (Edge input)

Resets the zero point correction value by digital zero at the ON edge, and also cancels the zero alarm if it has occurred.

- Digital zero (Edge input)

Zeros the gross weight at the edge input. However, the zeroing range is within the set digital zero regulation value. If the value is outside this range, it is not zeroed but the weight error (zero alarm) occurs.

- Tare subtraction (Edge input)

Does tare subtraction at the edge input, and zeros the net weight.

- Tare reset (Edge input)

Cancels tare subtraction at the edge input.

- Hold or judgment (Level input)

Valid only in simple comparison mode.

If either or both of setting code 27; over/under comparison mode, and setting code 28; U/L limit comparison mode is set at 1 (comparisons are made when the external judgment input is ON), level input of judgment will result, while in other cases, the weight value and the result of comparison at the ON edge will be held until the input turns OFF. When the CC-Link option is mounted, in the case of hold input, operation will result on OR condition with the RY0014 signal.

- Feed/ Discharge (Level input)

Valid only in setting code 23; feed/discharge control mode is set at 2 (external selection (external control input)).

Feed control will result at OFF, and discharge control will result at ON.

- Sequence start (Edge input)

Valid only in sequence mode.

Starts the sequence at the ON edge. If the sequence stop is on the ON level, the sequence will not start but sequence error 1 will occur.

- Sequence stop (Edge input, Level input)

Valid only in sequence mode.

Resets the sequence error at the ON edge. If the sequence has already been in execution, the sequence will stop and sequence error 2 will newly occur.

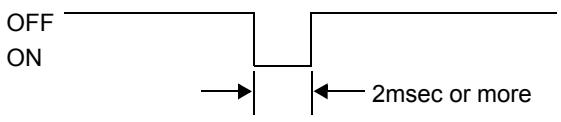
The sequence start is inhibited on the ON level.

- No function

Sets for input pins that are not used.

Point

All edges should be given a pulse width of 2msec or more.



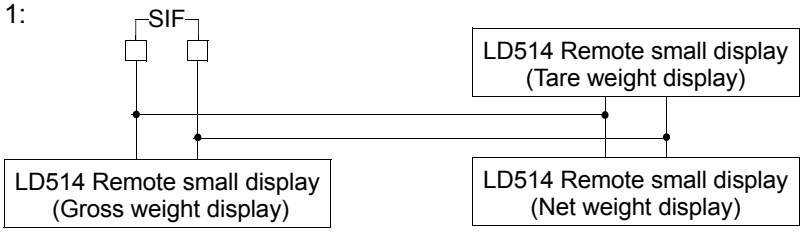
6-2. SI/F 2-wire Serial Interface

This 2-wire serial interface is for connecting F160 to peripheral equipment such as printers or remote displays. No polarity is needed for this simple, low-cost installation.
A two-core parallel cable or a cabtyre cable (Wire with covering thickened for construction) may be used for connection. When a two-core parallel cable or a cabtyre cable is used, the transmitting distance is approximately 30m (32.8yds). When a two-core shielded twisted pair cable is used, the transmitting distance is approximately 300m (328yds).

●Connection

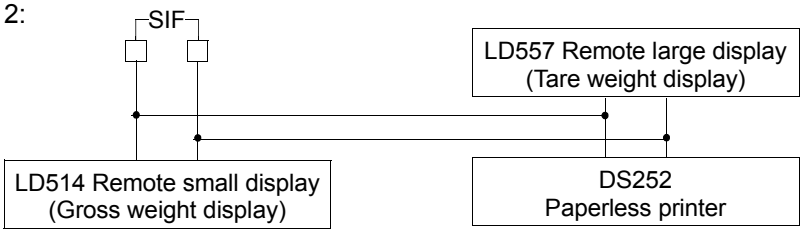
Up to 3 peripheral units can be connected in parallel.
It should not run along side AC or other high-voltage wiring. It may cause of malfunction.

Example 1:



Up to 3 remote small displays can be connected. The each display can display individual content according to the selection.

Example 2:



These indicated above are examples for the connection of Remote small displays, Remote large display and printer. Each display and printer can select the data individually.

●About the auto print command

The F160 can output the auto print command to the printer or display connected to the SI/F.
The auto print command is output when the complete signal turns ON. Therefore, if the final and over/under comparison is set at “comparison OFF,” the auto print command is not output.

SI/F G/N selection (Setting code 39)

Select the weight value displayed/printed on the device connected to the SI/F.

Setting/ <u>0: Gross weight</u> 1: Net weight

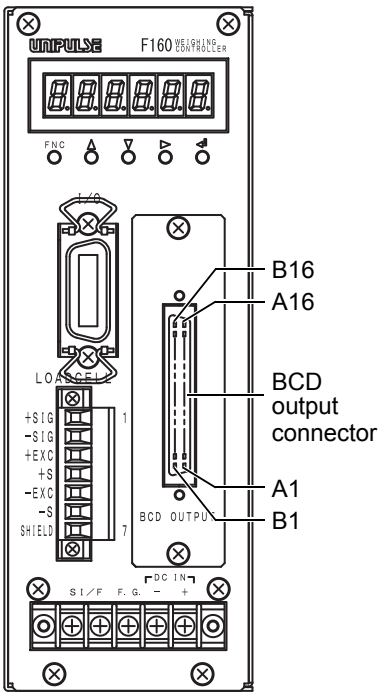
Point

Irrespective of this setting, information including net weight, gross weight, and tare weight is always sent from the F160, and some devices connected to the SI/F allow selection of the weight value displayed/printed on the device side. In such a case, this setting is validated by setting the weight value displayed/printed as indicator display value.

7 OPTION (Setting Code 38)

7-1. BCD Parallel Data Output Interface

The BCD data output is an interface to extract the indicated value of the F160 as BCD data. This interface is convenient to process controls, totals, records, etc., by connecting the F160 to a computer, process controller, sequencer or the like.
The I/O and internal circuits are electrically insulated by photocoupler.



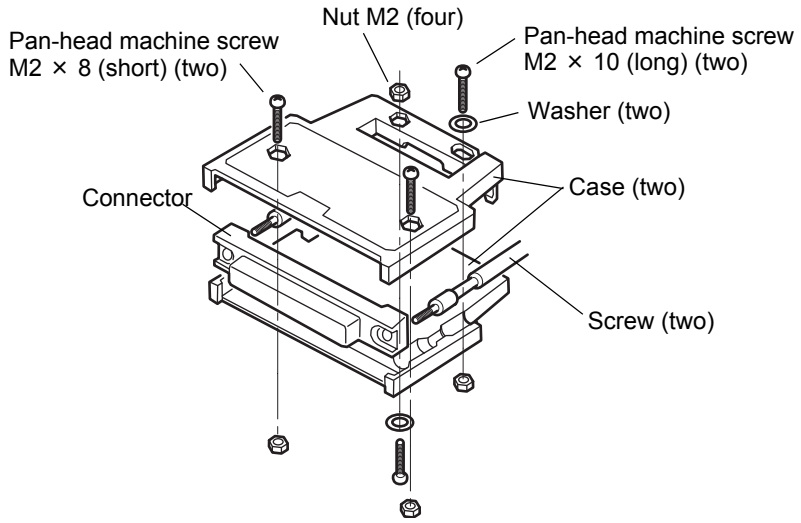
■Connector Pin Assignment

32 pin

No.		Signal	No.		Signal
A1	*	COM	B1	*	COM
A2	OUT	1	B2	OUT	1000
A3	OUT	2	B3	OUT	2000
A4	OUT	4	B4	OUT	4000
A5	OUT	8	B5	OUT	8000
A6	OUT	10	B6	OUT	10000
A7	OUT	20	B7	OUT	20000
A8	OUT	40	B8	OUT	40000
A9	OUT	80	B9	OUT	80000
A10	OUT	100	B10	OUT	Minus (Polarity)
A11	OUT	200	B11	OUT	OVER
A12	OUT	400	B12	OUT	Output Signal Selection
A13	OUT	800	B13	OUT	STROBE
A14	IN	BCD Data Hold	B14	IN	Logic Switch
A15	IN	BCD Data Switch 0	B15	IN	BCD Data Switch 1
A16	–		B16	–	

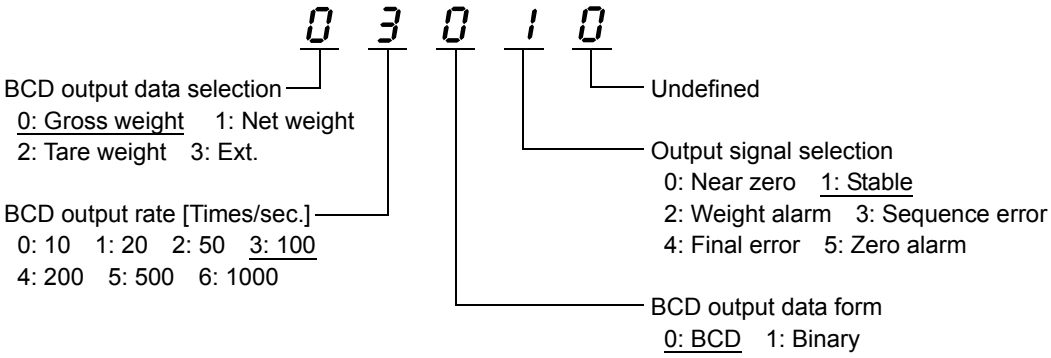
Compatible connector: FCN-361J032-AU (manufactured by FUJITSU COMPONENT or equivalent)
Connector cover: FCN-360C032-B (manufactured by FUJITSU COMPONENT or equivalent)
* COM is different from COM of the external signal input / output connector of the F160.

■How to Assemble the Connector



1. Set the connector and screws (two) into the grooves of the case (one side).
2. Cover with the other case, and fit the cases.
3. Tighten the M2 × 8 pan-head machine screws (two).
   Tighten the M2 × 10 pan-head machine screws (two).
   Be aware that washers should be set to the M2 × 10 pan-head machine screws (two).

■Setting Item (Setting Code 38)



BCD output data selection

Setting/ 0: Gross weight 1: Net weight 2: Tare weight 3: Ext.

BCD output rate

Setting/ 0: 10 1: 20 2: 50 3: 100 4: 200 5: 500 6: 1000 [Times/sec.]

BCD output data form

When the BCD option is mounted, you can select the output data form from BCD and binary.

Setting/ 0: BCD 1: Binary

- Connector pin assignments for binary output: FCN-365P032-AU/FCN-360C032-B

A1	–	COM	COM	–	B1
A2	OUT	2^0	2^{12}	OUT	B2
A3	OUT	2^1	2^{13}	OUT	B3
A4	OUT	2^2	2^{14}	OUT	B4
A5	OUT	2^3	2^{15}	OUT	B5
A6	OUT	2^4	2^{16}	OUT	B6
A7	OUT	2^5		OUT	B7
A8	OUT	2^6	BCD Data Switch 0 (Response)	OUT	B8
A9	OUT	2^7	BCD Data Switch 1 (Response)	OUT	B9
A10	OUT	2^8	Minus (Polarity)	OUT	B10
A11	OUT	2^9	OVER	OUT	B11
A12	OUT	2^{10}	Output Signal Selection	OUT	B12
A13	OUT	2^{11}	STROBE	OUT	B13
A14	IN	BCD Data Hold	Logic Switch	IN	B14
A15	IN	BCD Data Switch 0	BCD Data Switch 1	IN	B15
A16	–			–	B16

Currently-selected data can be confirmed by B8 and B9.

For the BCD output data list, refer to "■BCD Output Data List" on page 50.

Output signal selection

Any one of the following output signals can be assigned to B12.

Setting/ 0: Near zero 1: Stable 2: Weight alarm 3: Sequence error
4: Final error 5: Zero alarm

■BCD Output Data List

When the BCD output data selection is set to "External selection," switch data by A15 and B15.

BCD data switch 1*1	BCD data switch 0*1	Output data
OFF	OFF	Gross weight
OFF	ON	Net weight
ON	OFF	Tare weight
ON	ON	Gross weight

*1: BCD data switch input condition when the BCD Output Data Selection is "External selection".

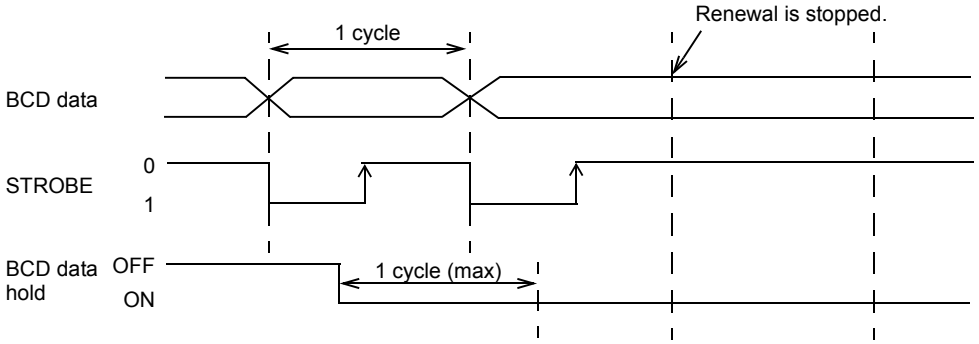
■Logic Switching

Switch the logic of output signals with pin B14.

When COM and pin B14 are open: negative logic, When they are short-circuited: positive logic.

■BCD Data Hold

Renewal of the BCD data output signal is stopped. Also the STROBE output is stopped. Switching is done by A14.When COM and A14 are open: hold cancel, When they are short-circuited: hold on.

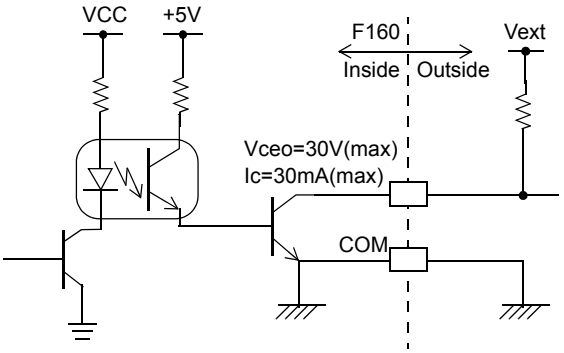


Read at least 2 cycles after inputting the BCD data hold.
As long as the BCD Data Hold signal is inputted, data can be read reliably, but because the data is not renewed, it may be different from proper data.

■Equivalent Circuit

- Output

The signal output circuit is operated through a TTL open collector.



●Output pin level

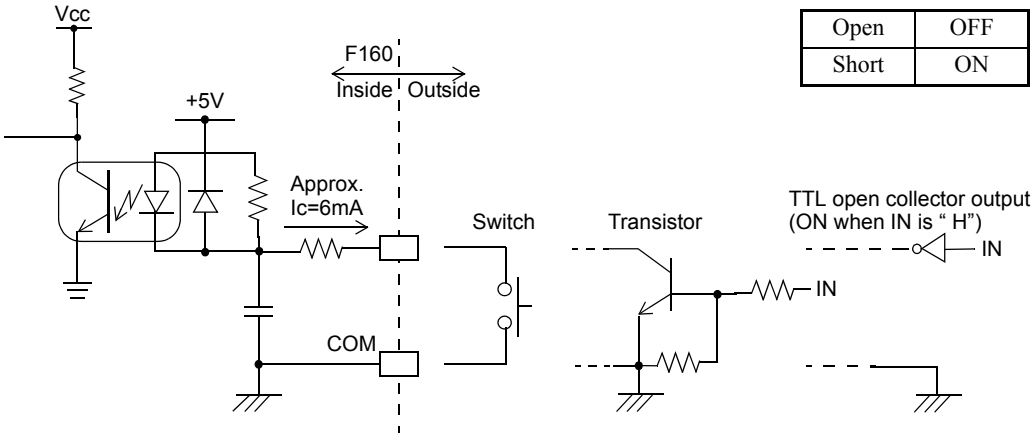
Output data	Negative	Positive
0	H	L
1	L	H

●Internal transistor status

Output data	Negative	Positive
0	OFF	ON
1	ON	OFF

Through logic switch (B14pin)

- Input



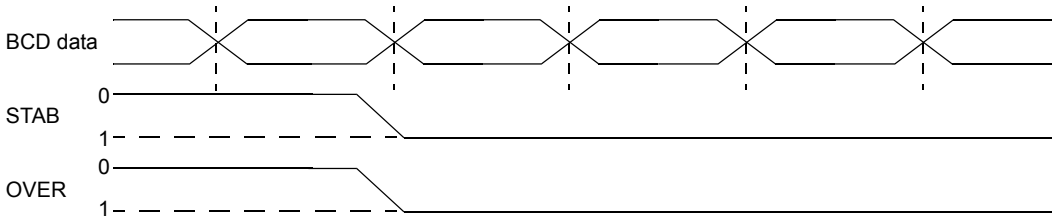
Open	OFF
Short	ON

⚠ CAUTION
- Do not apply external voltage to the signal input circuit. - The external element is required to withstand Ic=10mA. - Leakage from the external element is required to be 30 μA or below.

■Signal Timing

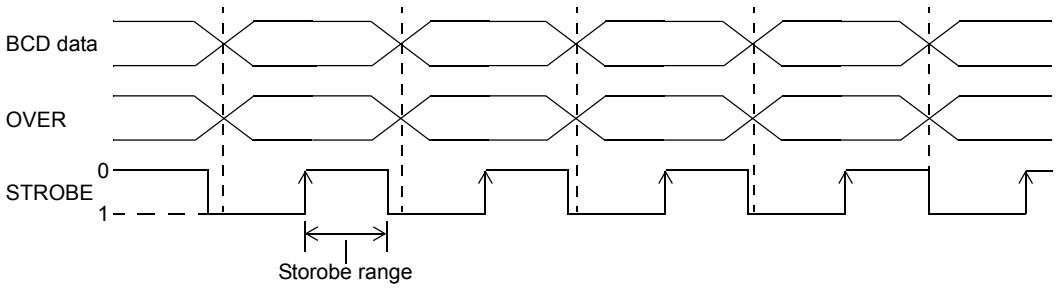
- STAB (B12) For example, if the output signal selection is set to "1: Stable," This signal turns on at the same time as BCD data when stability is detected by Motion Detect (MD).
("5-6.Motion Detect (Setting Code 31,32,37)" on page 25)
* Not only "Stable" but also any other output signal can be assigned.

- OVER (B11) The ON condition differs according to the output data.
Gross weight: OFL3, Net weight: OFL1 (Refer to "9-2Error List" on page 82),
Tare weight: Tare weight > 99999



- STROBE (B13) Strobe pulses are outputted in synchronization with BCD data (duty50%). Read data using the rising edges of the pulses. The BCD data update rate setting can be changed.

Example) Negative logic



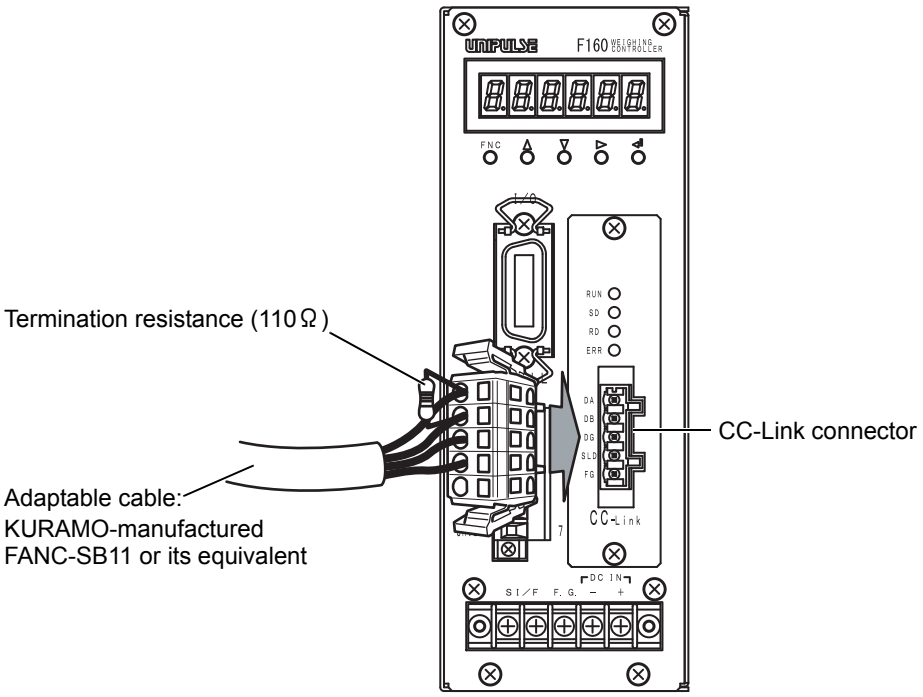
7-2. CC-Link Interface

■Outline

This document describes the standard specifications of the CC-Link I/F that links a PLC and F160. (For CC-Link Ver.1.10)
By using the CC-Link I/F, the F160 can be controlled directly from the PLC, so that wiring can be substantially reduced.
Readers this document should have basic knowledge of the programming of the PLC and basic knowledge of the CC-Link I/F.
(CC-Link is an abbreviation for Control & Communication Link.)

The F160 is a remote device occupying two stations. In the case of construction with the F160 alone, up to 32 units, including one master, can be connected to the bus.
Commands and parameters can be set on the CC-Link. Therefore, jobs can quickly be changed in a large-scale weighing system using a large number of load cells.

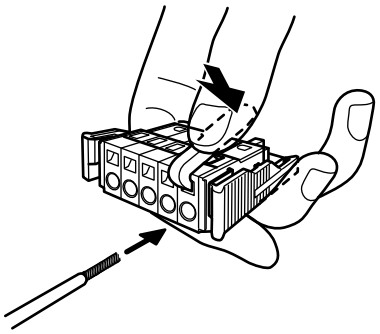
■CC-Link Interface Connection



Adaptable plug : WAGO 721-105/037-000 (Attachment)

Name	Signal type	Remarks
DA	DA side signal line	110Ω termination resistance between them at a bus end
DB	DB side signal line	
DG	Signal line ground	
SLD	Shield	Cable shield
F.G.	Frame ground	

How to connect

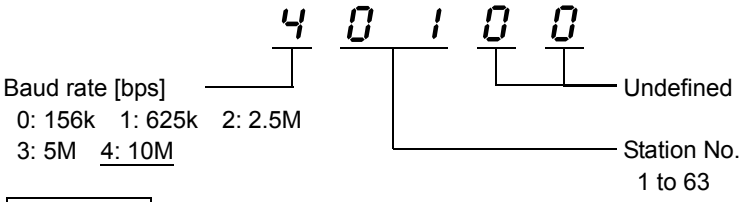


- Unsheathe the individual cable approximately 10mm, insert it in the upper round hole, and clamp it.
- At this time, operate the lever with your thumb, while pinching the plug by hand as shown in the illustration on the left-hand side.
- Never operate the lever as the plug is connected; otherwise, the board may be damaged.

Attention

When the DA and DB signal lines and resistance are to be connected to the connector, be aware that poor contact may result if the nipping conditions differ between the leg of the resistance and signal lines.

■Setting Item (Setting Code 38)



Attention

About setting of Mitsubishi general-purpose PLC CPU unit

If using Mitsubishi general-purpose PLC MELSEC-Q series, please set the mode configuration and station type as following in the configuration of master station network parameters.

- Mode configuration: Remote net Ver.1 mode
- Station type: Remote device stations

("Station information" → "Station type")

■Communication Status Indicators

The communication status is indicated by LED.

LED name	LED ON	LED OFF	LED Blinking
RUN	- Normal	- Reset action - No communication	———
SD	- Transmitting	———	———
RD	- Receiving	———	———
ERR	- Setting error - CRC error - Fault	- Normal	———

■Outline of the Buffer Memory for Communication

The PLC CC-Link master/local unit communicates with the F160 by using the buffer memory in the unit. Hereafter,
the master unit (master station) is called “M” and
the F160 (remote device station) is called “R” in the explanation.

Since one F160 occupies two stations, station numbers are set as shown below when two or more F160s are connected. The upper column and lower column show the buffer name and buffer address (head), respectively. As just described, the addresses allocated to the remote stations in the master station change according to the station number.

Station No.	Remote input 32 points/station	Remote output 32 points/station	Remote register	
			M→R 4 word/station	R→M 4 word/station
1	RX000h	RY000h	RWw0000	RWr0000
	00E0h	0160h	01E0h	02E0h
	RX020h	RY020h	RWw0004	RWr0004
	00E2h	0162h	01E4h	02E4h
3	RX040h	RY040h	RWw0008	RWr0008
	00E4h	0164h	01E8h	02E8h
	RX060h	RY060h	RWw0012	RWr0012
	00E6h	0166h	01ECh	02ECh
5	RX080h	RY080h	RWw0016	RWr0016
	00E8h	0168h	01F0h	02F0h

1st F160

2nd F160

Specified F160s are accessed by using these buffer addresses.
In the application program of the PLC, the buffer memory is accessed by the FROM/TO instruction at A series.

The following explanations are given on the F160 of station No. 1.

■Buffer Memory Assignments

Data area

Remote register M→R (PLC→F160)

Station	Buffer address	Device M→R	Description	
			MSB	LSB
1	01E0H	RWw0000	Unused	32bit
	01E1H	RWw0001		
	01E2H	RWw0002	Unused	32bit
	01E3H	RWw0003		
2	01E4H	RWw0004	Writing data area	L 32bit
	01E5H	RWw0005		H
	01E6H	RWw0006	0	Code No. 8bit
	01E7H	RWw0007	Unused	16bit

Chapter 7

OPTION

Explanation of remote resistor M→R

- Writing data area (32 bit binary) (0 to 99999)

  Use to write set values.

- Code No. (8 bit binary) (00 to 99)

  Set a code No. Be aware that the response flag does not turn on to an invalid command.
  The high byte is ignored.

Remote resistor R→M (F160→PLC)

Station	Buffer address	Device M→R	Description	
			MSB	LSB
1	02E0H 02E1H	RWr0000 RWr0001	Indicated value (Net weight/Gross weight) L 32bit H	
	02E2H	RWr0002	0	Error code 8bit
	02E3H	RWr0003	0	Error assistance code 8bit
2	02E4H 02E5H	RWr0004 RWr0005	Reading out data area L 32bit H	
	02E6H	RWr0006	0	Code No. (response) 8bit
	02E7H	RWr0007	Unused 16bit	

Explanation of remote resistor R→M

- Weight value (32 bit binary) (-99999 to 99999)

  Indicates the weight value. If the data is minus, two's-complement numbers will result.

- Error code (4bit BCD) (0 to 9)

  Indicates the error code of the indicator.
  For details, refer to "9-2.Error List" on page 82.

- Error assistance code (4bit BCD) (0 to 9)

  Indicates the error assistance code of the indicator.
  For details, refer to "9-2.Error List" on page 82.

- Reading out data area (32 bit binary) (0 to 99999)

  Area to read set values.

- Code No. response (8 bit binary) (00 to 255)

  Set a code No. for request ON.
  255 is set when the command makes an error and it responds.

Code list

Set value writing and operation instructions (R/W relay OFF)

Item	Code No. (RWw0006)	Setting Range (RWw0004 to 0005)
Final	00	0 to 99999
Set Point 1	01	0 to 99999
Set Point 2	02	0 to 99999
Compensation (CPS)	03	0 to 9999
Over	04	0 to 999
Under	05	0 to 999
Upper Limit	06	0 to 99999
Lower Limit	07	0 to 99999
Near Zero	08	0 to 99999
Preset Tare Value	09	0 to 99999
Comparison Inhibit Time	10	0 to 999
Judging Time	11	0 to 999
Complete Output Time	12	0 to 999
Adjust Feeding Time (Sequence Mode)	13	0 to 999
Auto Zero Times (Sequence Mode)	14	0 to 99
Judging Times (Sequence Mode)	15	0 to 99
Auto Free Fall Compensation Coefficient	17	0 to 3
Average Count of Auto Free Fall Compensation	18	1 to 9
Auto Free Fall Compensation Regulation	19	0 to 99999
Over/Under Comparison	20	0 to 2
Upper/Lower Limit Comparison	21	0 to 2
Near Zero Comparison	22	0 to 4
Feed/Discharge Control Mode	23	0 to 3
Preset Tare Weight	24	0 to 1
Auto Free Fall Compensation	25	0 to 2
Complete Output Mode	26	0 to 2
Over/Under Comparison mode	27	0 to 3
Upper/Lower Limit Comparison mode	28	0 to 1
Net weight sign inversion in discharge weighing	29	0 to 1
Digital Filter	30	0, 2 to 1024
Motion Detection (period)	31	0 to 99
Motion Detection (range)	32	0 to 99
Zero Tracking (period)	33	0 to 99
Zero Tracking (range)	34	0 to 99
Analog Filter	35	0 to 3
Filter in a stable condition	36	0 to 1
Motion Detection Mode	37	0 to 1
SI/F G/N Switch	39	0 to 1

Set value writing and operation instructions (R/W relay OFF) continued

Item	Code No. (RWw0006)	Setting Range (RWw0004 to 0005)
Balance Weight	40	0 to 99999
Capacity	41	0 to 99999
Minimum Scale Division	42	1 to 100
Net Over	43	0 to 99999
Gross Over	44	0 to 99999
Digital Zero Regulation Value	45	0 to 9999
Decimal Place	46	0 to 3
Gravitational Acceleration	47	1 to 16
Simple Comparison/ Sequence Mode Switch	50	0 to 1
Adjust Feeding in Sequence Mode	51	0 to 1
Near Zero Check in Sequence Mode	52	0 to 1
Weight Value Check in Sequence Mode	53	0 to 1
External Control Output Selection 0	60	0 to 16
External Control Output Selection 1	61	0 to 16
External Control Output Selection 2	62	0 to 16
External Control Output Selection 3	63	0 to 16
External Control Output Selection 4	64	0 to 16
External Control Output Selection 5	65	0 to 16
External Control Output Selection 6	66	0 to 16
External Control Input Selection 0	70	0 to 8
External Control Input Selection 1	71	0 to 8
External Control Input Selection 2	72	0 to 8
External Control Input Selection 3	73	0 to 8
External Control Input Selection 4	74	0 to 8
Tare Subtraction	80	(command)
Tare Reset	81	(command)
Digital Zero	82	(command)
Digital Zero Reset	83	(command)
Sequence Start	84	(command)
Sequence Stop	85	(command)
Sequence Error Reset	86	(command)
Zero Calibration	90	(command)
Actual Load Calibration	91	(command)
Equivalent input calibration (rated output value)	92	3000 to 20000

Point

At the operation instruction (command), the set data is ignored.
Moreover, when data (rated output value) is written, the Equivalent input calibration is executed.

Reading out of set value (R/W relay ON)

Item	Code No. (RWw0006)	Item	Code No. (RWw0006)
Final	00	Balance Weight	40
Set Point 1	01	Capacity	41
Set Point 2	02	Minimum Scale Division	42
Compensation (CPS)	03	Net Over	43
Over	04	Gross Over	44
Under	05	Digital Zero Regulation Value	45
Upper Limit	06	Decimal Place	46
Lower Limit	07	Gravitational Acceleration	47
Near Zero	08	Calibration value LOCK (SOFT LOCK)	48
Preset Tare Value	09	Set value LOCK (SOFT LOCK)	49
Comparison Inhibit Time	10	Simple Comparison/ Sequence Mode Switch	50
Judging Time	11	Adjust Feeding in Sequence Mode	51
Complete Output Time	12	Near Zero Check in Sequence mode	52
Adjust Feeding Time (Sequence Mode)	13	Weight Value Check in Sequence Mode	53
Auto Zero Times (Sequence Mode)	14	External Control Output Selection 0	60
Judging Times (Sequence Mode)	15	External Control Output Selection 1	61
Auto Free Fall Compensation Coefficient	17	External Control Output Selection 2	62
Average Count of Auto Free Fall Compensation	18	External Control Output Selection 3	63
Auto Free Fall Compensation Regulation	19	External Control Output Selection 4	64
Over/Under Comparison	20	External Control Output Selection 5	65
Upper/Lower Limit Comparison	21	External Control Output Selection 6	66
Near Zero Comparison	22	External Control Input Selection 0	70
Feed/Discharge Control Mode	23	External Control Input Selection 1	71
Preset Tare Weight	24	External Control Input Selection 2	72
Auto Free Fall Compensation	25	External Control Input Selection 3	73
Complete Output Mode	26	External Control Input Selection 4	74
Over/Under Comparison mode	27	Equivalent input calibration (rated output value)	92
Upper/Lower Limit Comparison mode	28		
Net Weight Sign Inversion in Discharge Weighing	29		
Digital Filter	30		
Motion Detection (period)	31		
Motion Detection (range)	32		
Zero Tracking (period)	33		
Zero Tracking (range)	34		
Analog Filter	35		
Filter in a Stable Condition	36		
Motion Detection Mode	37		
Option Setting (CC-Link)	38		
SI/F G/N Switch	39		

Remote output (PLC → F160)

Station	Buffer Address	Remote Output	Description	Class
1	0160H	RY0000		Use for communication handshake with the host
		RY0001		
		RY0002	Request	
		RY0003	R/W	
		RY0004		
		RY0005		
		RY0006		
		RY0007		
		RY0008		
		RY0009		
		RY000A		
		RY000B		
		RY000C		
		RY000D		
		RY000E		
		RY000F		
	0161H	RY0010	Digital Zero	
		RY0011	Digital Zero Reset	
		RY0012	Tare Subtraction	
		RY0013	Tare Reset	
		RY0014	Hold	
		RY0015		
		RY0016		
		RY0017		
		RY0018	Sequence Start	
		RY0019	Sequence Stop	
		RY001A	Sequence Error Reset	
		RY001B	Zero Calibration	
		RY001C	Actual Load Calibration	
		RY001D		
		RY001E		
		RY001F		
2	0162H	RY0020	Indicated Value Net weight/ Gross weight Selection	
		RY0021	Feed/Discharge Selection	
		RY0022	Auto Free Fall Compensation Selection	
		RY0023	CPS Write Inhibition Selection	
		RY0024		
		RY0025		
		RY0026		
		RY0027		
		RY0028		
		RY0029		
		RY002A		
		RY002B		
		RY002C		
		RY002D		
		RY002E		
		RY002F		
	0163H	:	:	:

About RY (PLC → F160) signals

Signal	Meaning
Request	Reads or writes set values or performs operational commands at ON edge.
R/W	Turns ON to read set values, and OFF to write set values or perform operational commands.
Tare Subtraction	Does tare subtraction at the edge input.
Tare Reset	Cancels tare subtraction at the edge input.
Digital Zero	Zeros the gross weight at the edge input.
Digital Zero Reset	Cancels digital zero at the edge input.
Hold	Holds the weight value at ON, and cancels holding at OFF. Note 1)
Sequence Start	Starts measurement in sequence mode at ON edge.
Sequence Stop	Stops the sequence at ON, and cancels the sequence stop at OFF. Note 2)
Sequence Error Reset	Resets the sequence error at the edge input.
Zero Calibration	Starts zero calibration at ON edge. Note 5)
Actual Load Calibration	Starts span calibration at ON edge. Note 5)
Indicated Value Net weight/ Gross weight Selection	Switches the indicated value to be output to RWr0000-0001. Indicates the gross weight at ON, and the net weight at OFF.
Feed/Discharge Selection	Can switch feed and discharge by setting this bit: discharge control at ON, and feed control at OFF. Note 3)
Auto Free Fall Compensation Selection	Validates the auto free fall compensation function at ON, and invalidates it at OFF. Note 4)
CPS Write Inhibition Selection	Inhibits writing of the CPS set value from the CC-Link at ON, and cancels it at OFF.

Note 1) Valid only in simple comparison mode.
Operation will result on OR condition with the hold function by external control input.

Note 2) Operation will result on OR condition with the sequence stop function by external control input.

Note 3) Valid only in setting code 23; feed/discharge control mode is set at 3 (Communication).

Note 4) Valid only in setting code 25; auto free fall compensation is set at 2 (Communication).

Note 5) Valid only when setting code 48; calibration value LOCK ("■Calibration Value Lock Release (Setting code 48)" on page 20) is OFF.
Be careful not to execute by mistake after calibration.

Relay domain Remote input (F160→PLC)

Station	Buffer Address	Remote Input	Description	Class
1	00E0H	RX0000		Use for communication handshake with the host
		RX0001		
		RX0002	Response	
		RX0003	R/W (Response)	
		RX0004		
		RX0005		
		RX0006	CPU Normal Operation	
		RX0007		
		RX0008	Decimal Place 0	
		RX0009	Decimal Place 1	
		RX000A		
		RX000B		
		RX000C		
		RX000D		
		RX000E		
		RX000F		
	00E1H	RX0010	Near Zero	
		RX0011	SP1	
		RX0012	SP2	
		RX0013	SP3	
		RX0014	Over	
		RX0015	Go	
		RX0016	Under	
		RX0017	Stable	
		RX0018	Complete	
		RX0019	Over Scale	
		RX001A	Hold	
		RX001B	Upper Limit	
		RX001C	Lower Limit	
		RX001D		
		RX001E	Sequence Error	
		RX001F	Weight Alarm	
2	00E2H	RX0020	Net weight/ Gross weight	
		RX0021	Feed/Discharge	
		RX0022		
		RX0023		
		RX0024		
		RX0025		
		RX0026		
		RX0027		
		RX0028	Calibration	
		RX0029		
		RX002A		
		RX002B		
		RX002C	Sequence	
		RX002D		
		RX002E		
		RX002F		
	00E3H	RX0030	:	
		:	:	
		RX003A	Error Status Flag	
		RX003B	Remote Ready	
		:	:	
		RX003F		

About RX (F160 → PLC) signal

Signal	Meaning
Response	It will be "1" when the command request is normally processed, and "0" results when the request is turned off.
R/W Response	Returns the R/W bit status at request-on.
CPU Normal Operation	Repeats ON and OFF in an approximately one-second cycles.
Decimal Place 0,1	Indicates the decimal place.
Near Zero	Turns ON when the weight value ≦ near zero set value.
SP1	Turns ON when the weight value ≧ final – set point 1 set value.
SP2	Turns ON when the weight value ≧ final – set point 2 set value.
SP3	Turns ON when the weight value ≧ final – compensation set value.
Over	Turns ON when the weight value > final + over set value.
Go	Turns ON when the weight value is neither over nor under.
Under	Turns ON when the weight value < final – under set value.
Stable	Turns ON when the weight value is stable. (Refer to the section "Motion detection".)
Complete	Turns ON when weighing is completed.
Over Scale	Turns ON when the gross weight > (capacity + 9 scale divisions) (OFL2).
Hold	Turns ON when the weight value is held.
Upper Limit	Turns ON when the weight value > upper limit set value.
Lower Limit	Turns ON when the weight value < lower limit set value.
Sequence Error	Turns ON when a sequence error occurs.
Weight Alarm	Turns ON when a weight alarm occurs. (LOAD, -LOAD, OFL1, OFL2, OFL3, ZALM)
Net weight/ Gross weight	It will be "0" when the display is net weight, and it will be "1" when the display is gross weight.
Feed/Discharge	Turns OFF in feed control, and turns ON in discharge control.
Calibration	Turns ON during calibration.
Sequence	Turns ON during sequence operation.
Error Status Flag	Turns ON when a calibration error occurs.
Remote Ready	Turns ON when initialization is completed with the error status flag OFF.

■Setting Procedures

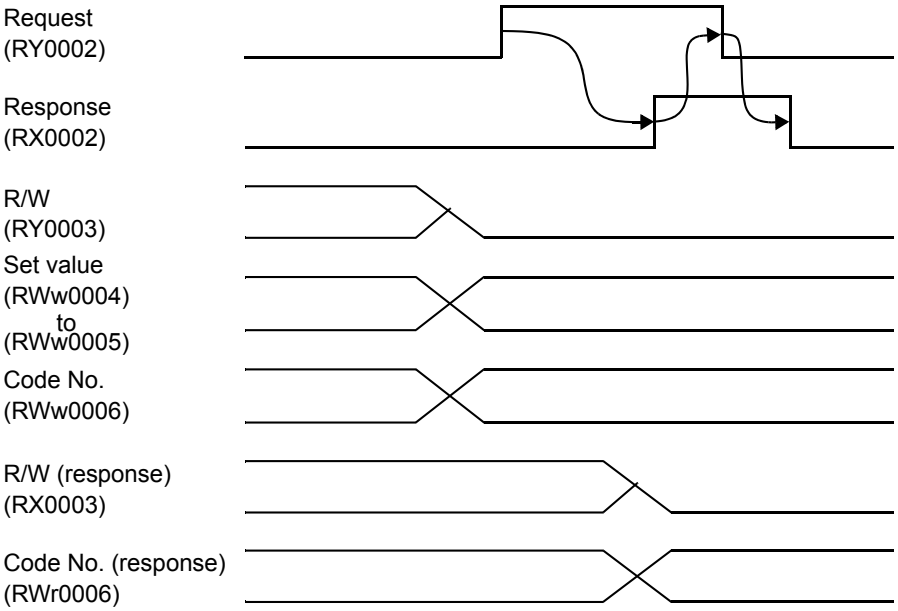
(The upper and lower levels of each signal correspond to ON and OFF, respectively.)

- Set value writing or operation instruction timing

When the response is OFF, operation is performed at the leading edge of the request.

To write set values and to do operation instructions, turn the R/W OFF.

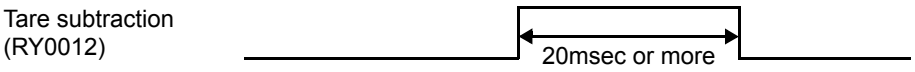
For operation instructions, writing data values are ignored.



- Operation instruction timing (using special operation instruction bits)

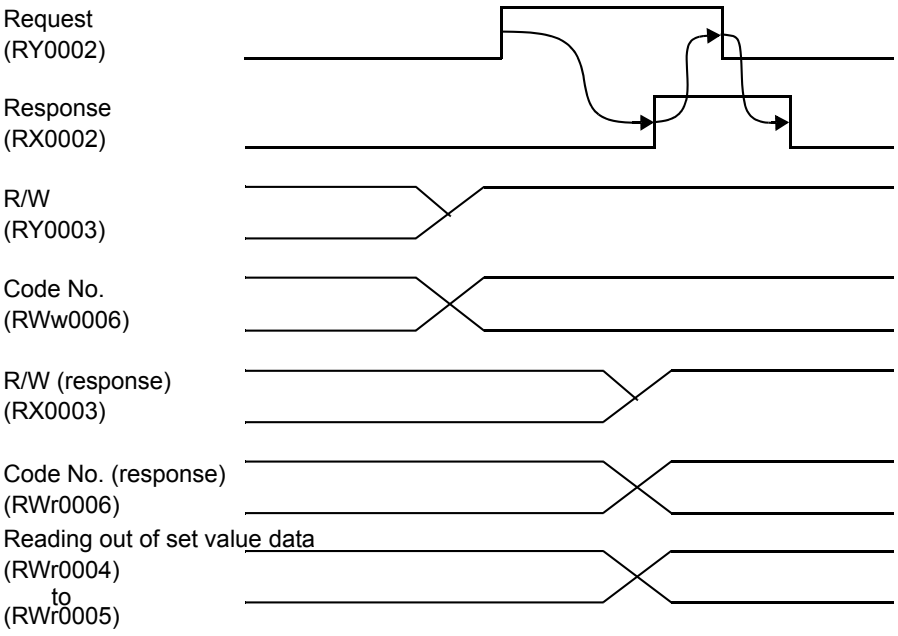
Operation instructions can also be given by using the bits from RY0010 to RY0014.
The R/W may be either ON or OFF.

When tare subtraction is taken as an example, the operation is performed at the tare subtraction edge input.
Pulse width should be ON more than 20ms.



- Reading out of set value timing

To read set values, turn the R/W ON.
Read the reading data area after making sure that the response has turned ON.



■Sample Ladder

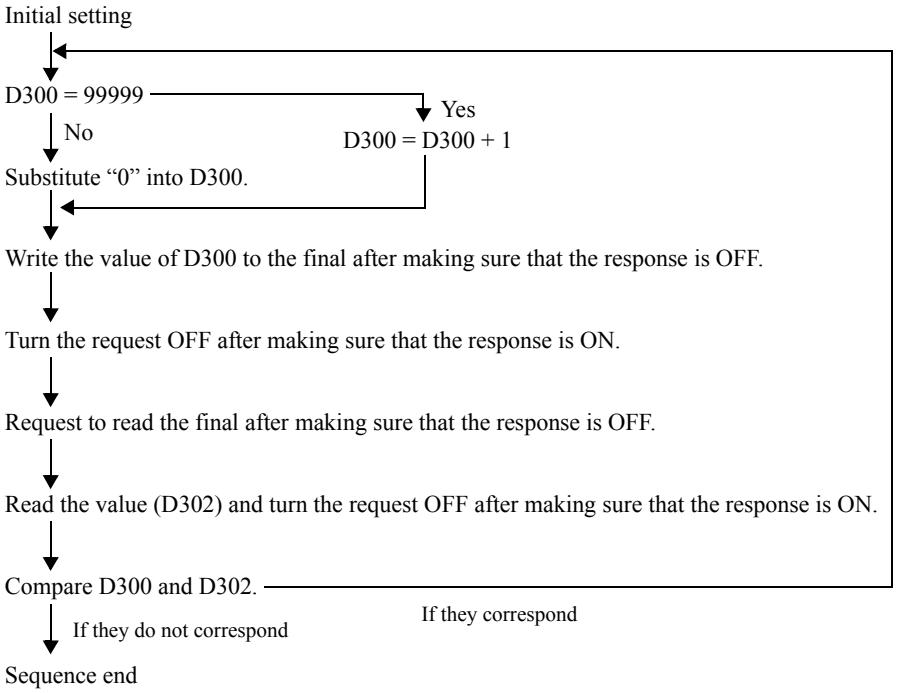
"Sample of incrementing the final value from 0 to 99999"

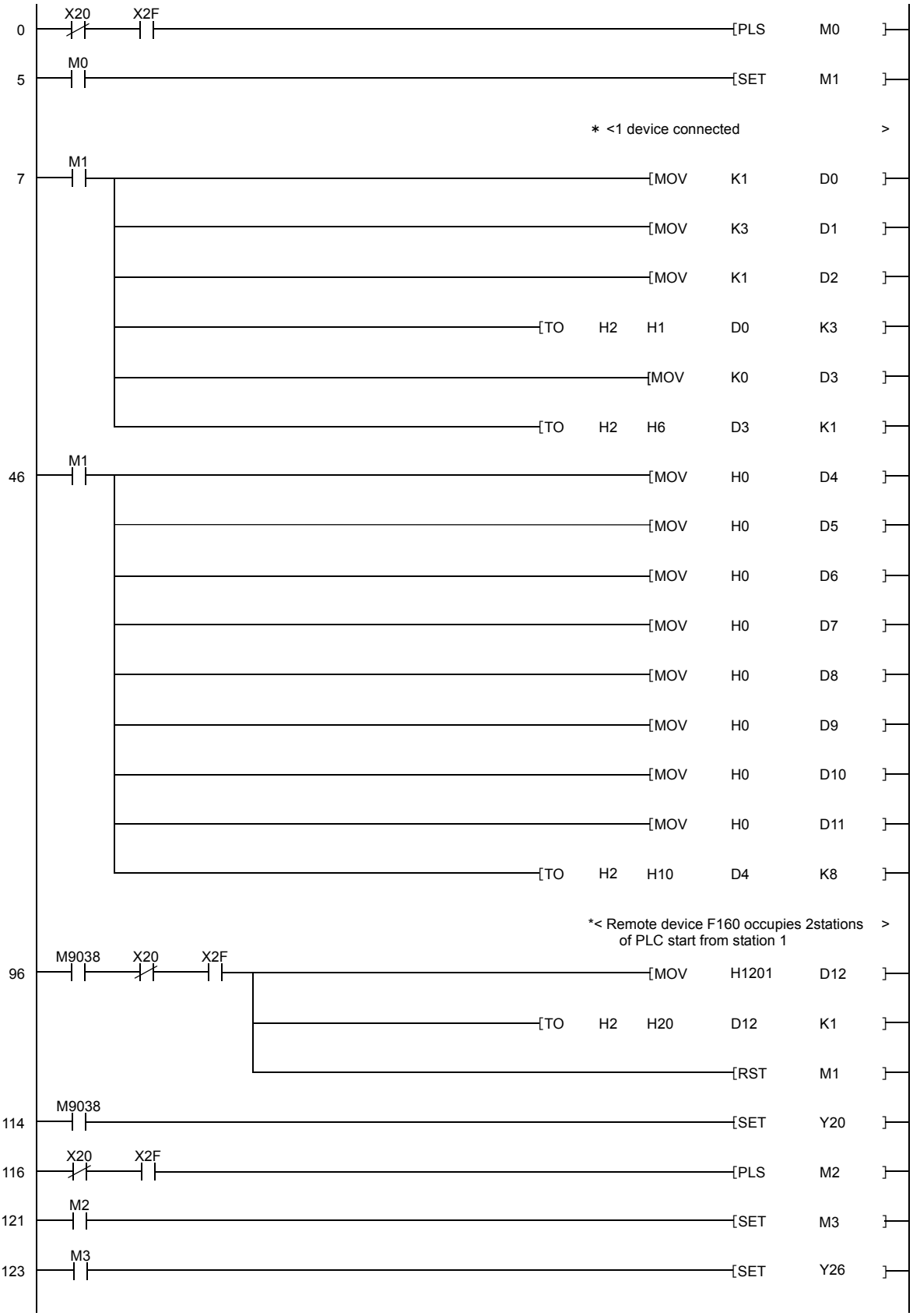
CPU..... A1SH
Station No. 1
Master slot 2

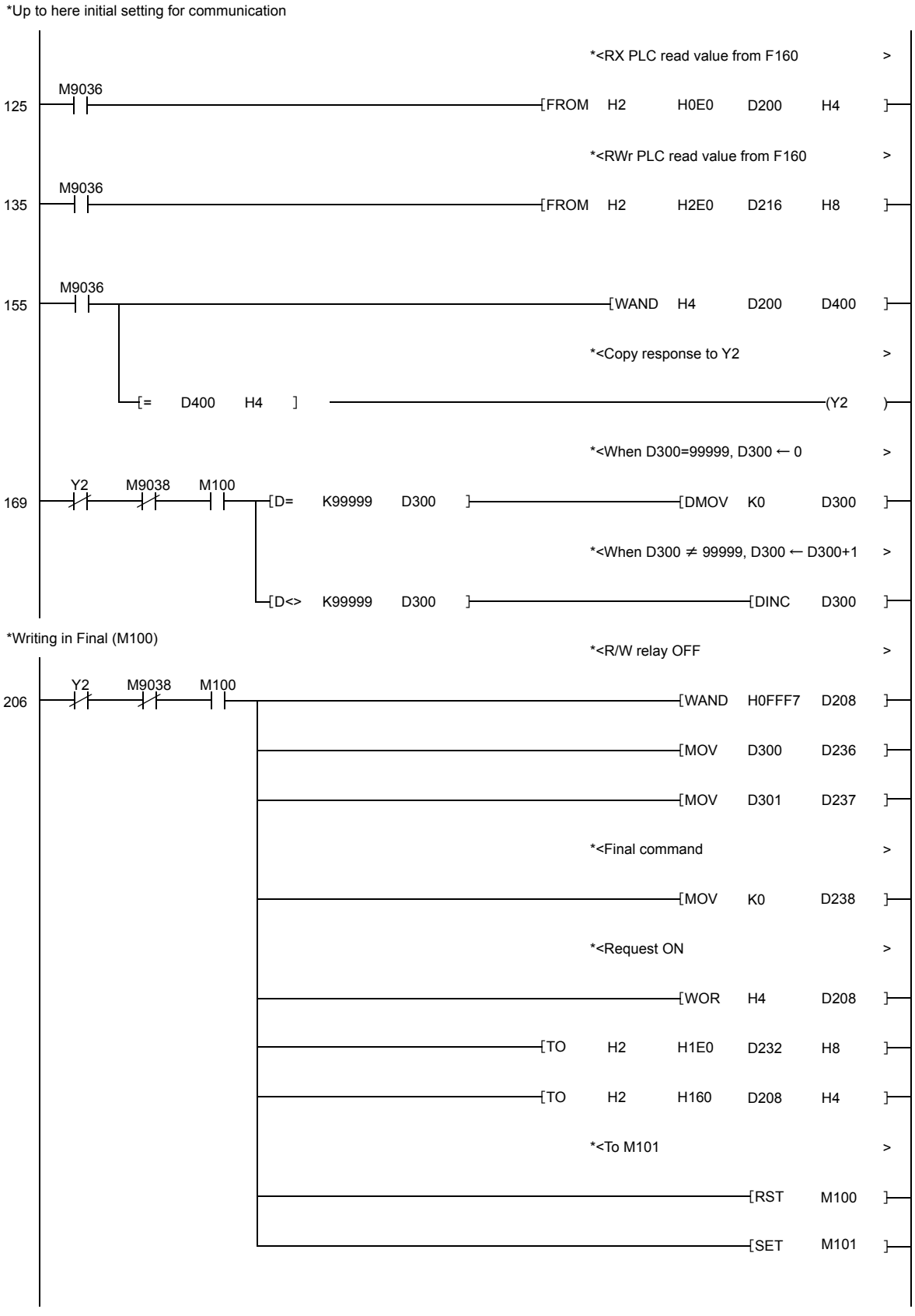
"CC-Link System Master/Local Unit User's Manual (Detailed Information)"
Model: AJ/A1SJ61BT11-U

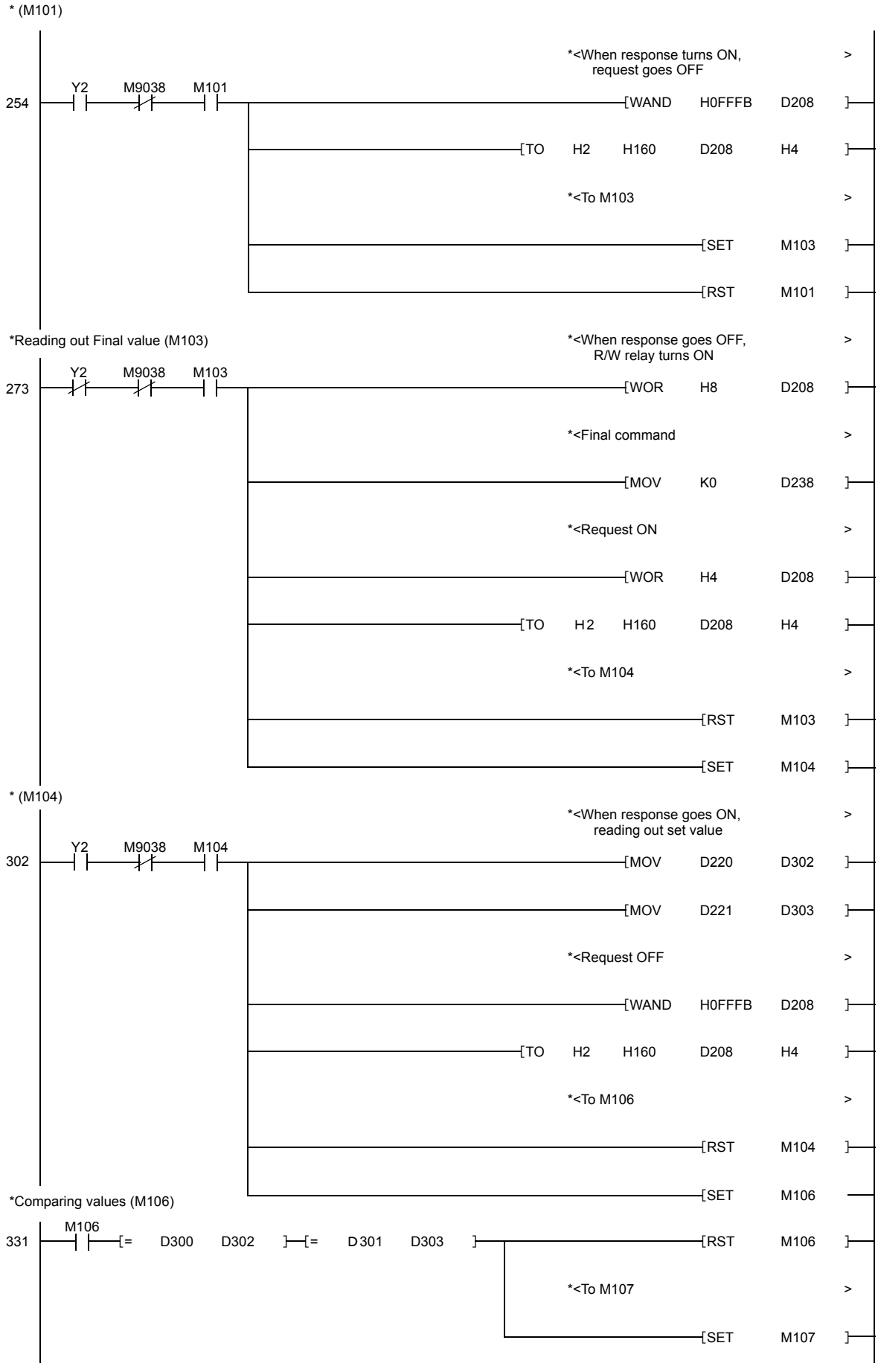
In this sample, the final value is written and read by using the request flag, and two values are compared, and if they correspond, the value is incremented, which is repeated up to "99999."
"0" follows after "99999".

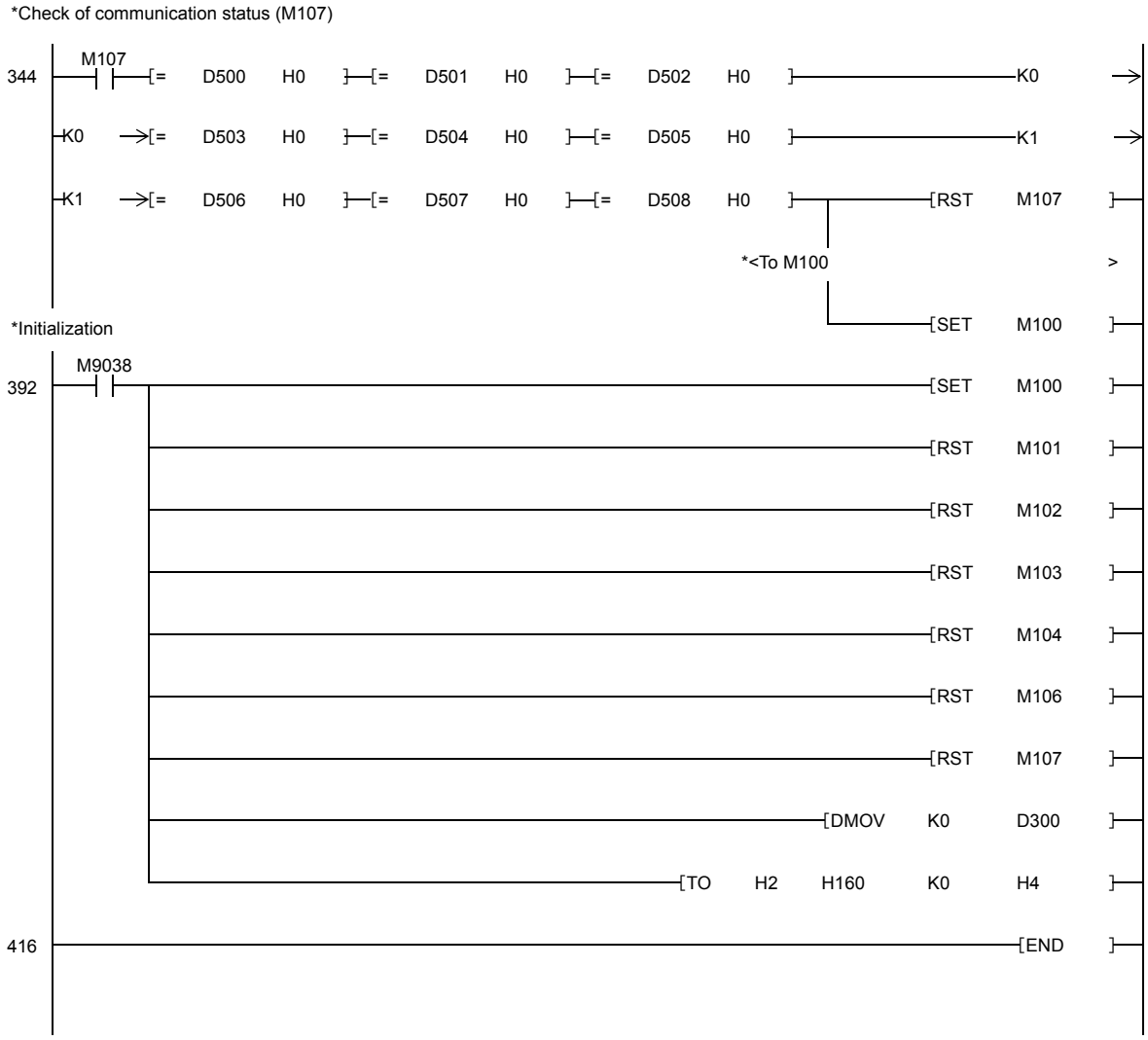
Flow




0
X20
X2F
[PLS M0]
5
M0
[SET M1]
* <1 device connected >
7
M1
[MOV K1 D0]
[MOV K3 D1]
[MOV K1 D2]
[TO H2 H1 D0 K3]
[MOV K0 D3]
[TO H2 H6 D3 K1]
46
M1
[MOV H0 D4]
[MOV H0 D5]
[MOV H0 D6]
[MOV H0 D7]
[MOV H0 D8]
[MOV H0 D9]
[MOV H0 D10]
[MOV H0 D11]
[TO H2 H10 D4 K8]
*< Remote device F160 occupies 2stations of PLC start from station 1 >
96
M9038
X20
X2F
[MOV H1201 D12]
[TO H2 H20 D12 K1]
[RST M1]
114
M9038
[SET Y20]
116
X20
X2F
[PLS M2]
121
M2
[SET M3]
123
M3
[SET Y26]


*Up to here initial setting for communication
*<RX PLC read value from F160 >
125 M9036 [FROM H2 H0E0 D200 H4]
*<RWr PLC read value from F160 >
135 M9036 [FROM H2 H2E0 D216 H8]
155 M9036 [WAND H4 D200 D400]
*<Copy response to Y2 >
[= D400 H4] (Y2)
*<When D300=99999, D300 ← 0 >
169 Y2 M9038 M100 [D= K99999 D300] [DMOV K0 D300]
*<When D300 ≠ 99999, D300 ← D300+1 >
[D<> K99999 D300] [DINC D300]
*Writing in Final (M100)
*<R/W relay OFF >
206 Y2 M9038 M100 [WAND H0FFF7 D208]
[MOV D300 D236]
[MOV D301 D237]
*<Final command >
[MOV K0 D238]
*<Request ON >
[WOR H4 D208]
[TO H2 H1E0 D232 H8]
[TO H2 H160 D208 H4]
*<To M101 >
[RST M100]
[SET M101]


* (M101)
*<When response turns ON, request goes OFF
254
Y2
M9038
M101
[WAND H0FFFB D208]
[TO H2 H160 D208 H4]
*<To M103
[SET M103]
[RST M101]
*Reading out Final value (M103)
*<When response goes OFF, R/W relay turns ON
273
Y2
M9038
M103
[WOR H8 D208]
*<Final command
[MOV K0 D238]
*<Request ON
[WOR H4 D208]
[TO H2 H160 D208 H4]
*<To M104
[RST M103]
[SET M104]
* (M104)
*<When response goes ON, reading out set value
302
Y2
M9038
M104
[MOV D220 D302]
[MOV D221 D303]
*<Request OFF
[WAND H0FFFB D208]
[TO H2 H160 D208 H4]
*<To M106
[RST M104]
[SET M106]
*Comparing values (M106)
331
M106
[= D300 D302]
[= D301 D303]
[RST M106]
*<To M107
[SET M107]


*Check of communication status (M107)
344
M107
[= D500 H0][= D501 H0][= D502 H0]
K0
K0
[= D503 H0][= D504 H0][= D505 H0]
K1
K1
[= D506 H0][= D507 H0][= D508 H0]
[RST M107]
*<To M100
>
[SET M100]
*Initialization
392
M9038
[SET M100]
[RST M101]
[RST M102]
[RST M103]
[RST M104]
[RST M106]
[RST M107]
[DMOV K0 D300]
[TO H2 H160 K0 H4]
416
[END]

8 SPECIFICATIONS

8-1. Specifications

■Analog Section

Load cell excitation	10V DC ± 5%, output current within 120mA Remote sensing (Up to four 350Ω load cells can be connected in parallel.)	
Zero and span	Zero adjustment range:	0 to approx. 2mV/V
	Span adjustment range:	0.3 to 2.0mV/V
Signal input range	0.0 to 2.0mV/V	
Minimum input sensitivity	0.3 μV/Count	
Accuracy	Non-linearity:	Within 0.01%FS
	Zero drift:	Within 0.1 μV/℃ RTI
	Gain drift:	Within 15ppm/℃
Analog filter	Bessel low-pass filter -12dB/oct, cutoff frequency 2/ 4/ 6/ 8Hz	
A/D converter	Rate:	1000times/sec
	Resolution:	24bit
Minimum indication resolution	1/10000 (internal resolution: 1/40000)	
Secondary calibration	Equivalent Calibration Minimum indication resolution for secondary calibration: 1/1000 (ordinary temperature)	

■Setting Section

Setting method	Setting by key operation When the CC-Link option is mounted, settings can be made from the host on the network.
Storage of set values	NOV RAM (nonvolatile RAM) or Lithium-battery-backed-up C-MOS RAM (Differ depending on a set value). * Rewriting can be locked in either case.

■Display Section

Display	7-segment red LED, 6 digits
Character height	8mm
Decimal point	0, 0.0, 0.00, 0.000
Display frequency	25times/sec.

■External Input/Output

Input (5 points): ON when short-circuited with the COM terminal.
(Dry contact type)
Each control input is selectable by setting.
Digital Zero Reset, Digital Zero, Tare Subtraction, Tare Reset, HOLD or Judge, Feed/Discharge, Sequence Start, Sequence Stop, No Function

Output (7 points): Transistor open collector output (sink type)
ON when the transistor is ON
Vce = 30V (Max), Ic = 50mA (Max)
Each control output is selectable by setting.
Near Zero, SP1, SP2, SP3, Under, Go, Over, Complete, Normally OFF, Lower Limit, Upper Limit, Stable, Weight Alarm, Sequence Error, Final Error, In Operation (RUN), Clock (in an approximately one-second cycles)

■Interface

Standard equipment

SI/F 2-wire serial interface

This is a simple output serial interface for connection of a UNIPULSE-manufactured printer, external display, etc.

Transmission method:	Start/stop synchronization
Transmission speed:	600bps

Option

BCD parallel data output interface [BCO]

Output circuit:	Open-collector
Output data:	Weight data in BCD or binary form is selectable.
Input circuit:	Dry contact type
Input signal:	Logic switch, Data update stop, Output data switch

CC-Link interface [CCL]

Serial bus interface for connection with PLC
CC-Link I/F operates as the remote device stations corresponding to CC-Link Ver.1.10.

Transmission medium:	3-wire type (shielded)
Transmission speed:	Selectable from 156k/ 625k/ 2.5M/ 5M/ 10M bps
Occupied station:	2 stations
Station No.:	1 to 63

■General Performance

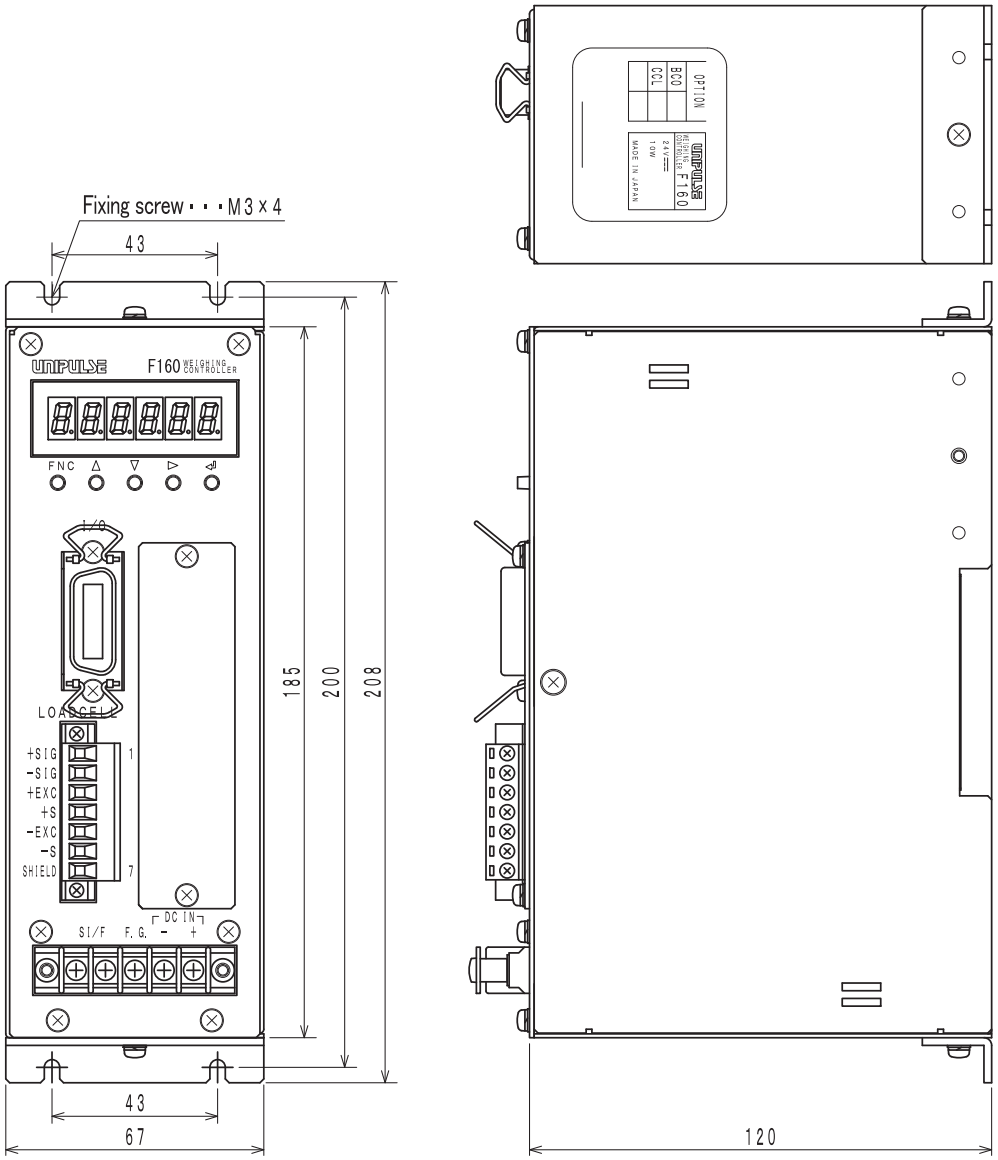
Power supply voltage	DC24V (±15%)	
Power consumption	10W (MAX) * At DC24V input	
Dimensions	67W×185H×120D (mm) (excluding projections)	
Operating conditions	Temperature:	Operating temperature range -10 to +40℃
		Storage temperature range -20 to +80℃
	Humidity:	85%RH or less (non-condensing)
Weight	Approx. 1.2kg	

■Accessories

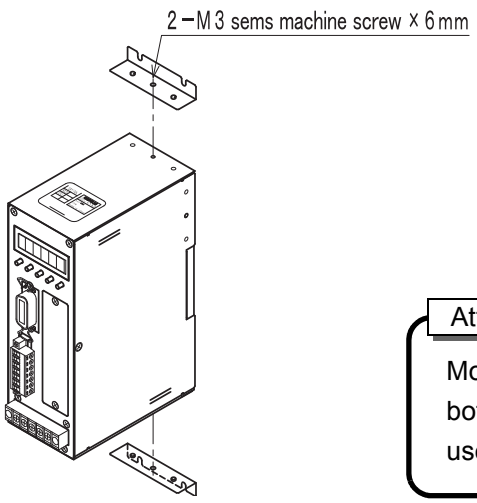
Operation manual 1
Control signal Input/Output connector 1
Jumper wire 2
Connector for BCD output (with BCD option) 1
Connector for CC-Link (with CC-Link option) 1

8-2. Dimensions

■Mounting Bracket Attachments (Upper/Lower)



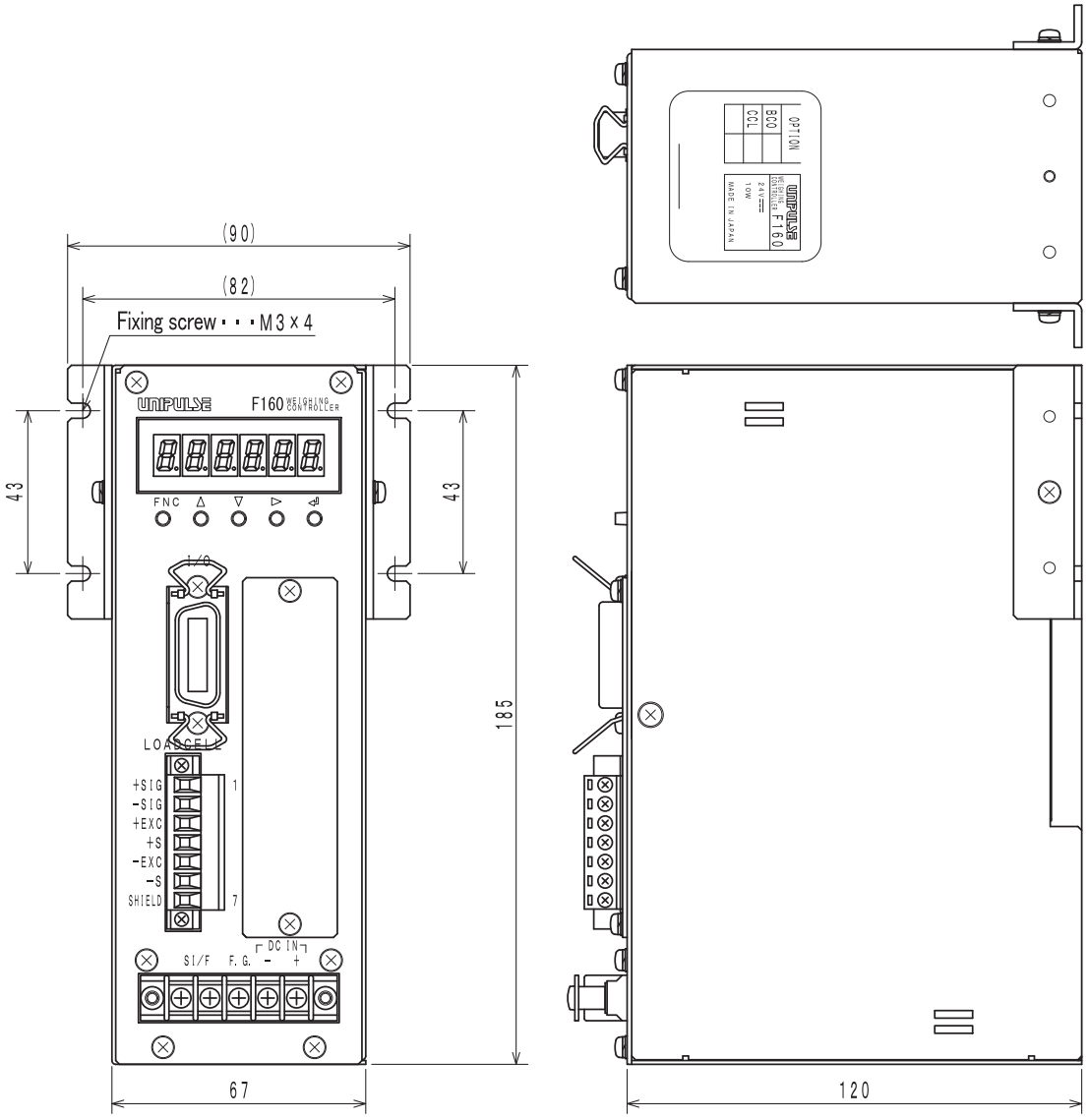
Unit: mm



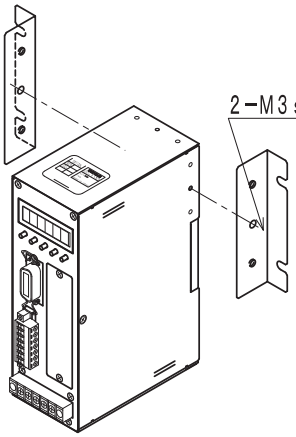
Attention

Mounting brackets can also be reattached to both sides, but the same screws should be used in doing so.

■Mounting Bracket Attachments (Left/Right)



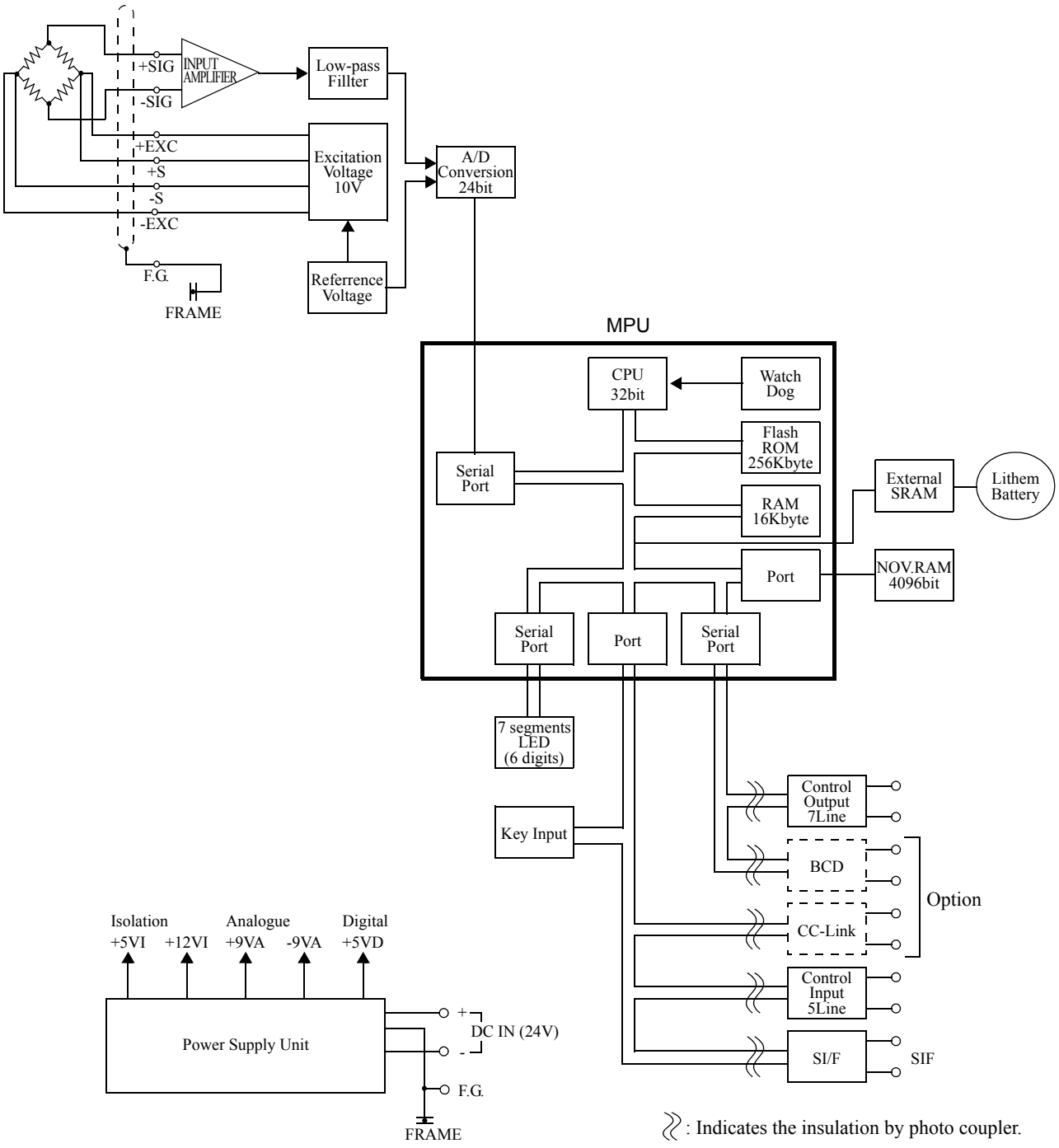
Unit: mm



Attention

The same screws should be used in reattaching the mounting brackets.

8-3. Block diagram



9 SUPPLEMENTS

9-1. Setting Code List

■Set value

Mode 0

Setting code	Function	Initial value	Set value LOCK	Calibration value LOCK	NOV RAM	Read/write in communication	Page number
00	Final	000.00	○			R/W	P.34
01	Set point 1	000.00	○			R/W	P.34
02	Set point 2	000.00	○			R/W	P.34
03	Compensation (CPS)	00.00	○			R/W	P.34
04	Over	0.00	○			R/W	P.34
05	Under	0.00	○			R/W	P.34
06	Upper limit	000.00	○			R/W	P.35
07	Lower limit	000.00	○			R/W	P.35
08	Near zero	000.00	○			R/W	P.35
09	Preset tare value	000.00	○			R/W	P.24

Mode 1

Setting code	Function	Initial value	Set value LOCK	Calibration value LOCK	NOV RAM	Read/write in communication	Page number
10	Comparison inhibit time	0.50	○		◎	R/W	P.36
11	Judging time	1.50	○		◎	R/W	P.36
12	Complete output time	3.00	○		◎	R/W	P.36
13	Adjust feeding time	1.00	○		◎	R/W	P.41
14	Auto zero times	01	○		◎	R/W	P.43
15	Judging times	01	○		◎	R/W	P.43
16							
17	Auto free fall compensation coefficient	0	○		◎	R/W	P.37
18	Average count of auto free fall compensation	4	○		◎	R/W	P.37
19	Auto free fall compensation regulation	098.00	○		◎	R/W	P.37

Mode 2

Setting code	Function	Initial value	Set value LOCK	Calibration value LOCK	NOV RAM	Read/write in communication	Page number
20	Over/Under comparison	0	○		◎	R/W	P.35
21	Upper/Lower limit comparison	0	○		◎	R/W	P.35
22	Near zero comparison	0	○		◎	R/W	P.35
23	Feed/discharge control mode	0	○		◎	R/W	P.33
24	Preset tare weight	0	○		◎	R/W	P.24
25	Auto free fall compensation	1	○		◎	R/W	P.37
26	Complete output mode	0	○		◎	R/W	P.37
27	Over/Under comparison mode	0	○		◎	R/W	P.35
28	Upper/Lower limit comparison mode	0	○		◎	R/W	P.36
29	Net weight sign inversion in discharge weighing	0	○		◎	R/W	P.33

Mode 3

Setting code	Function	Initial value	Set value LOCK	Calibration value LOCK	NOV RAM	Read/write in communication	Page number
30	Digital filter	0032	○		◎	R/W	P.28
31	Motion detection (period)	1.5	○		◎	R/W	P.25
32	Motion detection (range)	05	○		◎	R/W	P.25
33	Zero tracking (period)	0.0	○		◎	R/W	P.26
34	Zero tracking (range)	00	○		◎	R/W	P.26
35	Analog filter	2	○		◎	R/W	P.28
36	Filter in a stable condition	0	○		◎	R/W	P.26
37	Motion detection mode	0	○		◎	R/W	P.25
38	Option setting Option None BCD CC-Link	 00000 03010 40100	○		◎	R	P.48
39	SI/F G/N selection	0	○		◎	R/W	P.47

Mode 4

Setting code	Function	Initial value	Set value LOCK	Calibration value LOCK	NOV RAM	Read/write in communication	Page number
40	Balance weight	100.00	○	○	◎	R/W	P.20
41	Capacity	100.00	○	○	◎	R/W	P.20
42	Minimum scale division	0.01	○	○	◎	R/W	P.20
43	Net over	999.99	○	○	◎	R/W	P.28
44	Gross over	999.99	○	○	◎	R/W	P.28
45	Digital zero regulation value	02.00	○	○	◎	R/W	P.24
46	Decimal place	2	○	○	◎	R/W	P.20
47	Gravitational acceleration	09	○	○	◎	R/W	P.27
48	Calibration value LOCK (SOFT LOCK)	0			◎	R	P.20
49	Set value LOCK (SOFT LOCK)	0			◎	R	P.13

Mode 5

Setting code	Function	Initial value	Set value LOCK	Calibration value LOCK	NOV RAM	Read/write in communication	Page number
50	Simple comparison / Sequence mode selection	0	○		◎	R/W	P.33
51	Adjust feeding in sequence mode	0	○		◎	R/W	P.41
52	Near zero check in sequence mode	0	○		◎	R/W	P.40
53	Weight value check in sequence mode	0	○		◎	R/W	P.40
54							
55							
56							
57							
58							
59							

Mode 6

Setting code	Function	Initial value	Set value LOCK	Calibration value LOCK	NOV RAM	Read/write in communication	Page number
60	External control output selection 0	01	○		◎	R/W	P.44
61	External control output selection 1	02	○		◎	R/W	P.44
62	External control output selection 2	03	○		◎	R/W	P.44
63	External control output selection 3	04	○		◎	R/W	P.44
64	External control output selection 4	05	○		◎	R/W	P.44
65	External control output selection 5	07	○		◎	R/W	P.44
66	External control output selection 6	11	○		◎	R/W	P.44
67							
68							
69							

Mode 7

Setting code	Function	Initial value	Set value LOCK	Calibration value LOCK	NOV RAM	Read/write in communication	Page number
70	External control input selection 0	0	○		◎	R/W	P.45
71	External control input selection 1	1	○		◎	R/W	P.45
72	External control input selection 2	2	○		◎	R/W	P.45
73	External control input selection 3	3	○		◎	R/W	P.45
74	External control input selection 4	4	○		◎	R/W	P.45
75							
76							
77							
78							
79							

Operational commands

For details of each function, refer to "■Input (Meanings of Signals)" on page 45.

For sequence error reset, refer to "■Sequence Error (Setting Code 86)" on page 43.

Mode 8

Setting code	Function	Initial value	Set value LOCK	Calibration value LOCK	NOV RAM	Read/write in communication	Page number
80	Tare subtraction	---------				command	P.23
81	Tare reset	---------				command	P.23
82	Digital zero	---------				command	P.24
83	Digital zero reset	---------				command	P.24
84	Sequence start	---------				command	P.42
85	Sequence stop	---------				command	P.42
86	Sequence error reset	---------				command	P.43
87							
88							
89							

Mode 9

Setting code	Function	Initial value	Set value LOCK	Calibration value LOCK	NOV RAM	Read/write in communication	Page number
90	Zero calibration	---------	○	○	◎	command	P.21
91	Actual load calibration	---------	○	○	◎	command	P.21
92	Equivalent input calibration (rated output value)	2.0000mV/V	○	○	◎	R/W	P.22
93							
94							
95							
96							
97							
98							
99	Password						

* Set value LOCK corresponds to setting code 49. Also, calibration value LOCK corresponds to setting code 48.
Setting to "1" validates LOCK.

■Setting Range Details of the Set Value

Code	Function	Setting range
00	Final	00000 to 99999
01	Set point 1	00000 to 99999
02	Set point 2	00000 to 99999
03	Compensation (CPS)	0000 to 9999
04	Over	000 to 999
05	Under	000 to 999
06	Upper limit	00000 to 99999
07	Lower limit	00000 to 99999
08	Near zero	00000 to 99999
09	Preset tare value	00000 to 99999
10	Comparison inhibit time	0.00 to 9.99
11	Judging time	0.00 to 9.99
12	Complete output time	0.00 to 9.99
13	Adjust feeding time	0.00 to 9.99
14	Auto zero times	00 to 99
15	Judging times	00 to 99
17	Auto free fall compensation coefficient	0: 1, 1: 3/4, 2: 1/2, 3: 1/4
18	Average count of auto free fall compensation	1 to 9
19	Auto free fall compensation regulation	00000 to 99999
20	Over/Under comparison	0: Gross weight, 1: Net weight, 2: Comparison OFF
21	Upper/Lower limit comparison	0: Gross weight, 1: Net weight, 2: Comparison OFF
22	Near zero comparison	0: Gross weight, 1: Net weight, 2: Comparison OFF, 3: |Gross weight|, 4: |Net weight|
23	Feed/discharge control mode	0: Feeding control 1: Discharging control 2: External 3: Communication

Code	Function	Setting range
24	Preset tare weight	0: Invalid, 1: Valid
25	Auto free fall compensation	0: Invalid, 1: Valid, 2: Communication
26	Complete output mode	0: ON by the complete output time after a lapse of the judging time 1: ON by the complete output time after stability of the weight value and a lapse of the judging time 2: ON by the complete output time after stability of the weight value or a lapse of the judging time
27	Over/Under comparison mode	0: Continuous comparison 1: Comparison when the external judgment input is ON 2: Comparison when the complete signal is ON 3: Comparison, holding the weight value, when the complete signal is ON
28	Upper/Lower limit comparison mode	0: Continuous comparison 1: Comparison when the external judgment input is ON
29	Net weight sign inversion in discharge weighing	0: Display with the sign inverted 1: Display without inverting the sign
30	Digital filter	0000 (OFF), 0002 to 1024 [times]
31	Motion detection (period)	0.0 to 9.9
32	Motion detection (range)	00 to 99
33	Zero tracking (period)	0.0 to 9.9
34	Zero tracking (range)	00 to 99
35	Analog filter	0: 2, 1: 4, 2: 6, 3: 8 [Hz]
36	Filter in a stable condition	0: Insert (256times), 1: Not insert
37	Motion detection mode	0: Stable mode, 1: Checker mode
38	Option setting	No option 0 0 0 0 0 Undefined BCD Parallel Data Output Interface 0 3 0 1 0 Undefined Output signal selection 0: Near zero, 1: Stable, 2: Weight alarm, 3: Sequence error, 4: Final error, 5: Zero alarm BCD output data form 0: BCD, 1: Binary BCD output rate [Times/sec.] 0: 10, 1: 20, 2: 50, 3: 100, 4: 200, 5: 500, 6: 1000 BCD output data selection 0: Gross weight, 1: Net weight, 2: Tare weight, 3: Ext. CC-Link Interface 4 0 1 0 0 Undefined Station No. 1 to 63 Baud rate [bps] 0: 156k, 1: 625k, 2: 2.5M, 3: 5M, 4: 10M
39	SI/F G/N selection	0: Gross weight, 1: Net weight

Code	Function	Setting range
40	Balance weight	00000 to 99999
41	Capacity	00000 to 99999
42	Minimum scale division	001 to 100
43	Net over	00000 to 99999
44	Gross over	00000 to 99999
45	Digital zero regulation value	0000 to 9999
46	Decimal place	0: 0, 1: 0.0, 2: 0.00, 3: 0.000
47	Gravitational acceleration	01 to 16
48	Calibration value LOCK	0: Release, 1: LOCK
49	Set value LOCK	0: Release, 1: LOCK
50	Simple comparison / Sequence mode selection	0: Simple comparison, 1: Sequence mode
51	Adjust feeding in sequence mode	0: Invalid, 1: Valid
52	Near zero check in sequence mode	0: Invalid, 1: Valid
53	Weight value check in sequence mode	0: Invalid, 1: Valid
60	External control output selection 0	0: Near zero 1: SP1 2: SP2 3: SP3 4: Under 5: Go 6: Over 7: Complete 8: (Normally OFF) 9: Lower limit 10: Upper limit 11: Stable 12:Weight alarm 13: Sequence error 14: Final error 15: In operation (RUN) 16: Clock (in an approximately one-second cycle) * To disable the output, allocate “normally OFF” (8).
61	External control output selection 1	
62	External control output selection 2	
63	External control output selection 3	
64	External control output selection 4	
65	External control output selection 5	
66	External control output selection 6	

Code	Function	Setting range
70	External control input selection 0	0: Digital Zero Reset 1: Digital Zero 2: Tare Subtraction 3: Tare Reset 4: Hold or judgment 5: Feed/Discharge 6: Sequence Start 7: Sequence Stop 8: No Function
71	External control input selection 1	
72	External control input selection 2	
73	External control input selection 3	
74	External control input selection 4	

Code	Function	Setting range
92	Equivalent input calibration (rated output value)	0.3000 to 2.0000

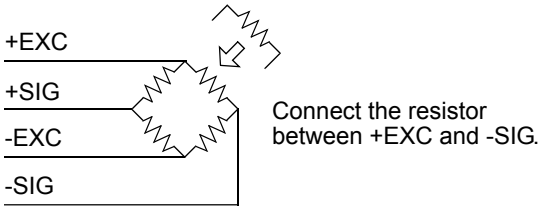
9-2. Error List

■Calibration Errors

Main body display	Code	Contents of error	Error release
cErr 1	1-1	Zero calibration error	Recalibration of the zero point is needed. Redo zero calibration.
cErr2	1-2	Initial tare > Zero adjustment range	Check the load cell for unnecessary load. If normal load is applied, there is a need to connect a resistor between the terminals of +EXC and -SIG of the load cell, shift the zero point, and then perform zero calibration again. For the relationship between the resistor connected and input signal, refer to "About calibration error 2 (cErr2)" on page 83.
cErr3	1-3	Initial tare < 0	Check to see if load is applied to the load cell in the correct direction, and check the wiring of +SIG and -SIG for reversal, and then perform zero calibration again. If load is applied in the normal direction and the wiring is correct, there is a need to connect a resistor between the terminals of -EXC and -SIG of the load cell, shift the zero point, and then perform zero calibration again. For the relationship between the resistor connected and input signal, refer to "About calibration error 3 (cErr3)" on page 83.
cErr4	1-4	Balance weight > Capacity	Decrease the balance weight below capacity.
cErr5	1-5	Balance weight = 00000	Set the balance weight correctly.
cErr6	1-6	Output of load cell < Span adjustment range	Check to see if load is applied to the load cell correctly and if the output of the load cell has such a performance capability that reaches the span adjustment range.
cErr7	1-7	Output of load cell < 0	Check to see if load is applied to the load cell in the correct direction, and check the wiring of +SIG and -SIG of the load cell for reversal.
cErr8	1-8	Output of load cell > Span adjustment range	Check to see if load is applied to the load cell correctly and if the output of the load cell is within the span adjustment range of the F160.
cErr9	1-9	The weight value is not stable and calibration stopped.	Adjust the parameters of motion detection, and check that the "Stable" status is ON, and then perform zero calibration again.

About calibration error 2 (cErr2)

How to connect a resistor to shift the zero point is as shown below.



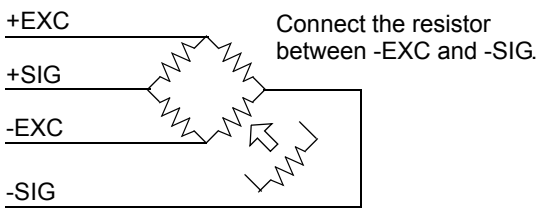
Point

- This table is for 350Ω load cell.
- The temperature coefficient of the connected resistor directly influences the accuracy of the indicator. Use a resistance having a temperature coefficient of 50ppm/℃ or more (recommended value of about 5ppm/℃).

Resistor		Strain	
Ideal	Approx.	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

About calibration error 3 (cErr3)

How to connect a resistor to shift the zero point is as shown below.



■Weight Alarms

Main body display	Code	Contents of error	Error release
LOAd	2-1	A/D converter input over	Magnitude of signal from the load cell exceeds the F160's signal input range. Check if the load cell output is properly within signal input range, or if any of the cables are broken. This error can also occur when the terminal block connections are all open.
- LOAd	2-2	A/D converter input minus over	Magnitude of signal from the load cell falls below the F160's signal input range. Check if the load cell output is properly within signal input range, or if any of the cables are broken. This error can also occur when the terminal block connections are all open.
oFL 1	2-3	Net weight > net over set value	Net weight is larger than the set value for Net over. To restore a normal weight indication, lower the input signal from the load cell until the over scale display goes out, or change the net weight over set value.
oFL2	2-4	Gross weight > capacity + 9 scale divisions	Gross weight is larger than Capacity + 9 scale division. To restore a normal weight indication, lower the input signal from the load cell until the over scale display goes out.
oFL3	2-5	Gross weight > gross over set value	Gross weight is larger than the set value for Gross over. To restore a normal weight indication, lower the input signal from the load cell until the over scale display goes out, or change the gross over set value.
d2 Err	2-6	Zero alarm	If digital zero operation is performed where gross weight exceeds the digital zero regulation value (page 24), a zero alarm will result. The error is canceled by executing digital zero reset.

■Command Errors

Main body display	Code	Contents of error	Error release
(No change)	3-1	Illegal command input	From the CC-Link interface (option), writing or reading is performed by specifying any code other than the setting codes described in "9-1.Setting Code List" on page 76. Recheck the code, and then perform writing and reading.
(No change)	3-2	R/W Condition disregard	From the CC-Link interface (option), writing is attempted to read-only set value(s), or reading of write-only set value(s) is attempted, or writing is attempted with LOCK applied.
(No change)	3-3	Writing data > number of set digits	From the CC-Link interface (option), writing of data larger than the number of set digits is attempted.
CAL-ZE	3-4	During Zero calibration	It is indicated that calibration is in progress. Wait until the calibration ends.
CAL-SP		During Actual load calibration	
E9.SPAn		During Equivalent input calibration	

■System Errors

Main body display	Code	Contents of error	Error release
Eu.Err	4-1	EXC alarm	The load cell excitation voltage is too low. Check all the cables for proper connection between F160 and the load cell, and if any of the cables are overloaded.
Lo bAt	4-2	Low battery	The voltage of the memory back-up lithium battery has dropped. Consult with us.

■Sequence Error

Main body display	Code	Contents of error	Error release
Err 1	5-1	The stop signal is ON when weighing starts.	The stop signal is ON when the weighing start signal is turned ON. Turn the stop signal OFF→ON→OFF to resolve the sequence error, and with the stop signal OFF, input the start signal to start weighing.
Err2	5-2	The stop signal turned ON during weighing.	This state results when the stop signal turns ON during weighing in sequence control. Turn the stop signal OFF→ON to resolve the sequence error.
Err3	5-3	Auto zero was operated by the setting of auto zero times, giving a zero alarm.	This state results when a zero alarm is given with auto zero operated in sequence control. Remove the cause of zero deviation (adherents, etc.), and reset the digital zero to resolve the zero alarm. Turn the stop signal OFF→ON to resolve the sequence error.
Err4	5-4	The near zero signal is OFF when weighing starts. (when the check is set at ON)	This state results when the near zero signal is "0" at the start of weighing. (Only when the "check" is set at ON) First, check the near zero set value and near zero comparison target. Next, check for the occurrences of: - Start without complete discharge, - Too early start-ON timing, - Clogging with discharged materials, etc. Turn the stop signal OFF→ON to resolve the sequence error.
Err5	5-5	The weight value ≧ (Final – Set point 1) when weighing starts. (when the check is set at ON)	This state results when the SP1 output signal is "1" at the start of weighing. (Only when the "check" is set at ON) First, check the SP1 set value and final set value. Next, check for the occurrences of: - Start without complete discharge, - Too early start-ON timing, - Clogging with discharged materials, etc. Turn the stop signal OFF→ON to resolve the sequence error.

When two or more errors occur, priority is given as shown below.

EXC error > Calibration error > Weight alarm > Sequence error > Command error > Low battery

When two or more weight alarms occur, priority is given as shown below.

-LOAD > LOAD > OFL2 > OFL3 > OFL1 > Zero alarm

About the codes in the error list (CC-Link option)

The codes show the following:

1 – 1

Error assistance code
1 - 9 (varies depending on error code)

Error code
1: Calibration error, 2: Weight alarm, 3: Command error, 4: System error, 5: Sequence error

* When there is no error, 0-0 results.

9-3. Initialization

It is possible to initialize it by the password input of setting mode 9 (setting code 99).

1231 : A set value of mode 0 is resumed to an initial value.

1232 : The set value memorized in NOVRAM other than Balance Weight, Capacity, Minimum Scale Division, Net Over, Gross Over, Digital Zero Regulation Value, Decimal Place, Gravitational Acceleration, Equivalent input calibration value, Zero Calibration point, and Span Calibration point is resumed to an initial value.

Initialization is only a key input.
Moreover, a set value other than the above cannot be initialized.

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