AD-4421

Weighing Indicator

INSTRUCTION MANUAL

A&D Company, Ltd.

1WMPD4005322

WARNING DEFINITIONS

The warnings described in this manual have the following meanings:

⚠WARNING	A potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	A potentially hazardous situation which, if not avoided, may result in minor or moderate injury or damage to the instrument.

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Contents

1. Introduction

The AD-4421 is a weighing indicator that can convert signals from strain gauge load cells to weighing values and outputs them.

- Segment LCD display with character height of 10 mm and display resolution of ±999999.
- High speed AD conversion of 1200 times/second and digital filter enable high speed and accuracy weighing.
- Cutout 138x68 panel mount type with IP65 protection on the front panel.
- Equipped with a code memory function that stores 100 types of setpoint values and accumulation results.
- PC can update the settings via USB port.

1.1. Precautions on designing

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

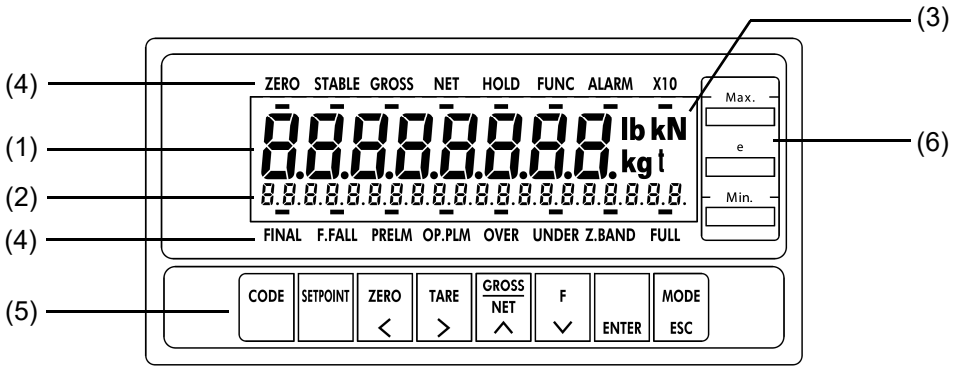
Please read the following precautions carefully before using this product.

⚠ WARNING
・ Provide an external safety circuit to the indicator so that the safety of the whole system can be secured even if errors occur in the external power supply or in the indicator. ・ This indicator must be used indoors. Do not use the indicator in the following environment: - where the temperature and the humidity exceed the specifications - where corrosive gases or flammable gases exist - where the indicator gets wet with oil, chemicals or water Please note that securing the indicator to the control panel will provide the indicator outside of the control panel the IP65 protection. ・ When installing or removing the indicator, be sure to turn off all the external power supplies used beforehand. ・ When wiring the indicator, be sure to turn off all the external power supplies used beforehand. ・ Be sure to earth ground the indicator.

⚠ CAUTION
・ Do not clamp control wires or communication cables with power lines, or do not place them close to power lines. ・ Place the load cell cable sufficiently away from high frequency circuits such as high voltage power lines and inverter load circuit. ・ When the front cover have dirt, wipe them with wet soft cloth. Do not use organic solvent such like benzine, thinner and alcohol. Doing so may result in deformation or discoloration of the unit. ・ Suitable for use at pollution degree of 2 or less. ・ Use within an altitude of 0 to 2000m. ・ To an external connection port other than AC power supply terminal and AC input/output terminal, connect the circuit separated from a dangerous voltage by a double/reinforced insulation. ・ This product's Overvoltage Category is Category II.

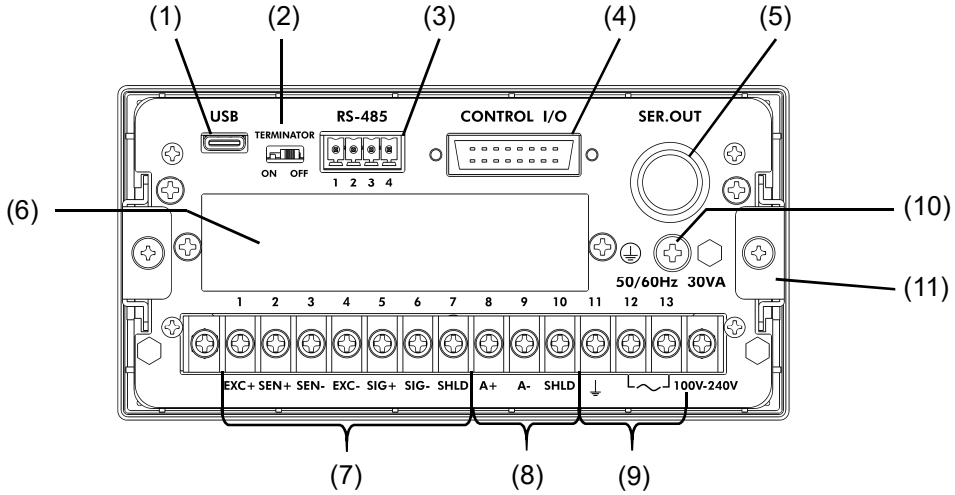
2. Part names

2.1. Front panel



No.	Name			
(1)	Main display			
(2)	Sub display			
(3)	Unit display			
(4)	Status display (Upper)	ZERO	Status display (Lower)	FINAL
		STABLE		F.FALL
		GROSS		PRELM
		NET		OP.PLM
		HOLD		OVER
		FUNC（FncF-05）		UNDER
		ALARM		N.BAND
		X10		FULL
(5)	Key switches	[CODE]		
		[SETPOINT]		
		[ZERO / ←]		
		[TARE / →]		
		[GROSS|NET / ↑]		
		[F / ↓]		
		[ENTER]		
		[MODE / ESC]		
(6)	Rating label (Accessory)			

2.2. Rear panel



No.	Name
(1)	USB Type-C connector
(2)	Switch for termination resistor of RS-485
(3)	RS-485 connector
(4)	Control I/O connector
(5)	SER.OUT (Standard serial output) connector
(6)	Option slot
(7)	Load cell input terminal block
(8)	Optional analog output terminal block
(9)	AC power input terminal block
(10)	Protective conductor terminal
(11)	Slide rail

2.3. Accessories (AD-4421)

Name		A&D Part Number	Qty.
Terminal block cover		1074005384-4	1
Terminal block cover securing screw		11702FN-S3X6	2
Connector for the control I/O	Connector	1JI361J016-AG	1
	Connector cover	1JI360C016-B	1
Connector for the serial out		1JATCP0576	1
Connector for the RS-485		1JIMC1.5/4-ST	1
Panel mount packing		1063038193B	1
Rating label		1084063608	1

2.4. Accessories (AD4421-01)

Name		A&D Part Number	Qty.
Connector for the BCD OUTPUT	Connector	1JI361J040-AG	1
	Connector cover	1JI360C040-B	1

3. Mounting option board

Please follow the procedure below to mount an option board.

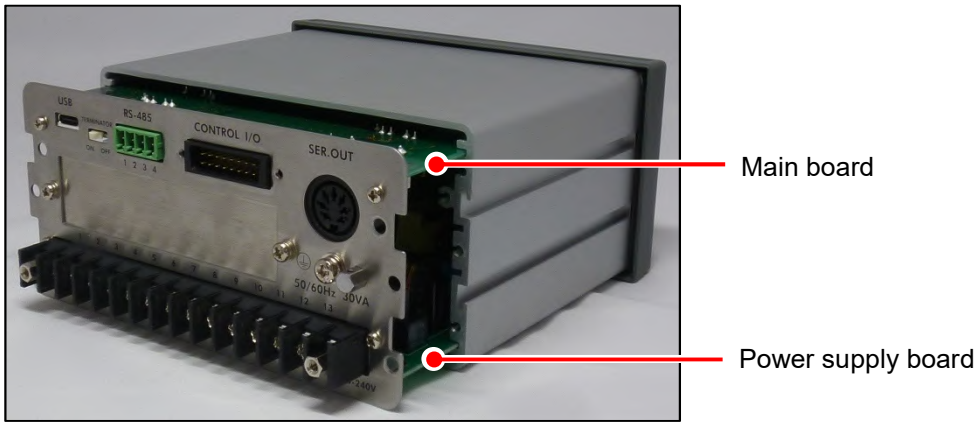
Note: Disconnect all cables from AD-4421 before mounting the option board.

Note: Electrostatic discharge may damage the board.

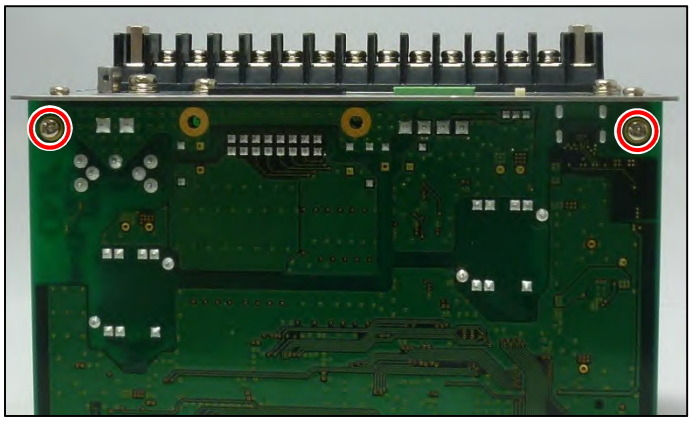
Be sure to take measures to prevent electrostatic discharge when performing operations.

1. Remove the four M3 Phillips screws and two M3 hex bolts from the rear panel and pull out the slide rails on both sides.

2. Pull the rear panel and pull out the main board and power supply board.

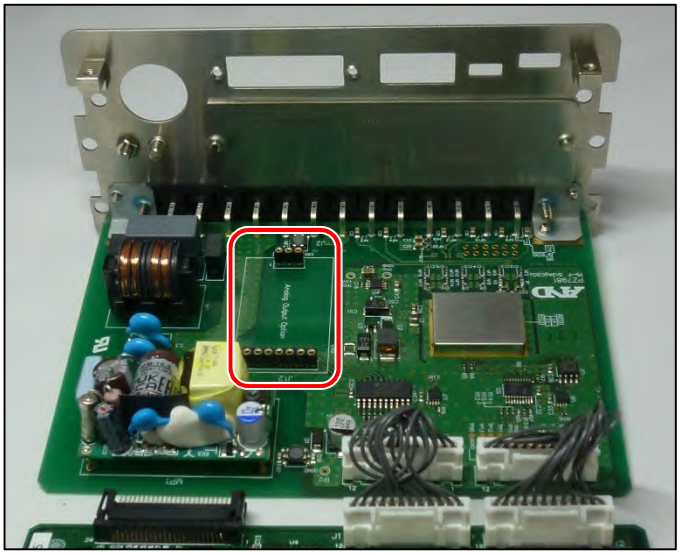


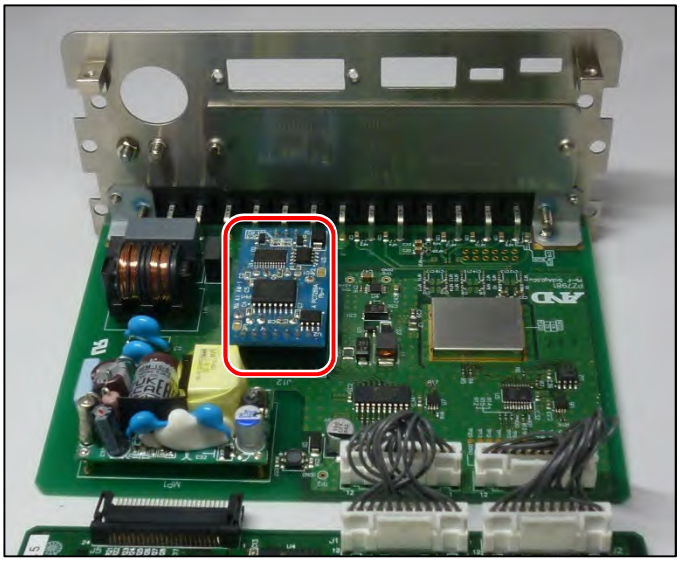
3. Remove the two M2.6 Phillips screws securing the main board to the angle bracket.



4. To mount the AD4421-07

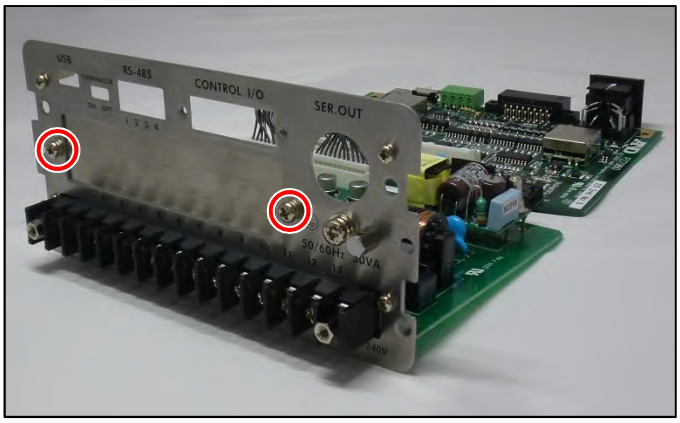
Plug the option board into the J11/12 connector on the power board.



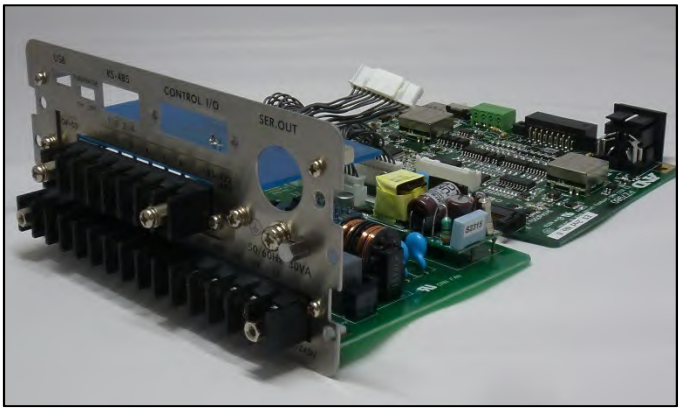


5. To mount the AD4421-01 / 03 / 04 / 23

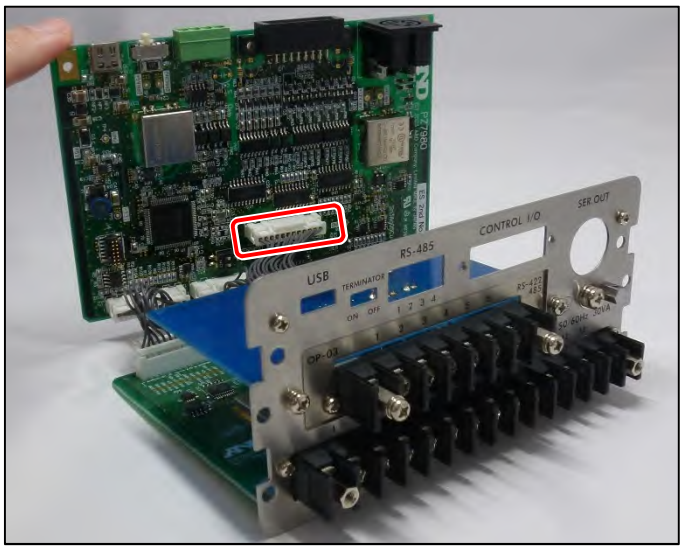
Remove the two M3 Phillips-head screws from the option slot section and remove the blank panel.



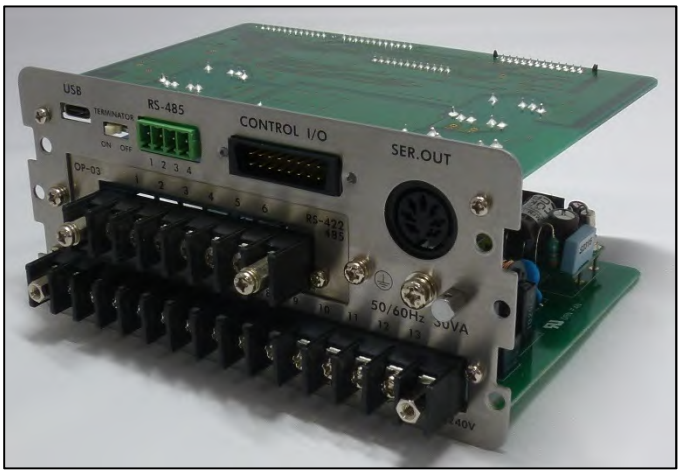
Insert the option board from the inside of the rear panel and secure it with the removed screws.



Plug the cable from the option board into the J3 connector on the main board.



6. Fix the main board to the angle bracket using the M2.6 Phillips screw removed in step 3.

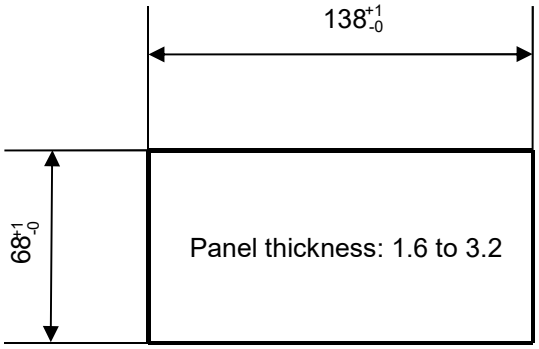


7. Slide the mainboard and power supply board into the case as it was originally placed, aligning them with the case guides. As the main board and display board are connected by connectors, push them in until the rear panel touches the case.

8. Install the slide rail and secure the rear panel using the M3 Phillips head screws and M3 hex bolts removed in step 1.

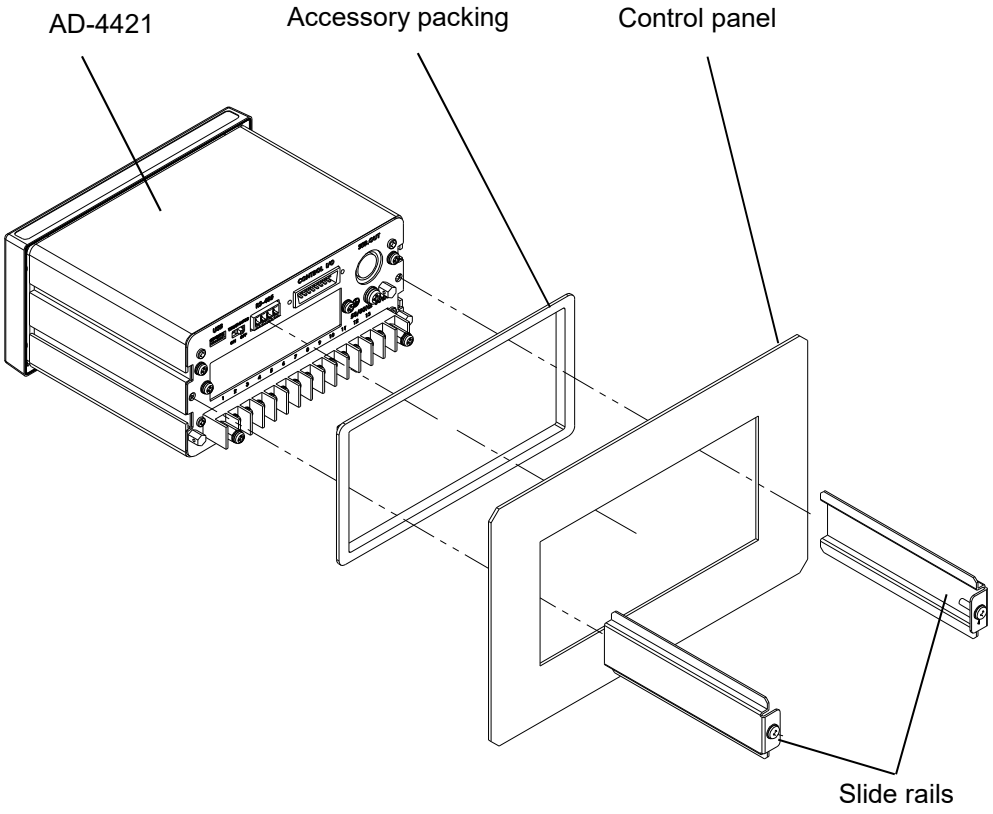
4. Mounting to control panel

Make a hole in a control panel as shown below.



Unit: mm

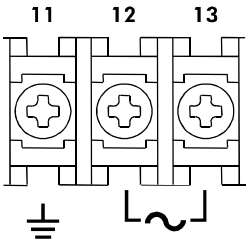
Remove the slide rails on both sides and insert the AD-4421 with the accessory packing through the hole into the panel. Insert the slide rails from behind. (Recommended Torque : 0.4 Nm)



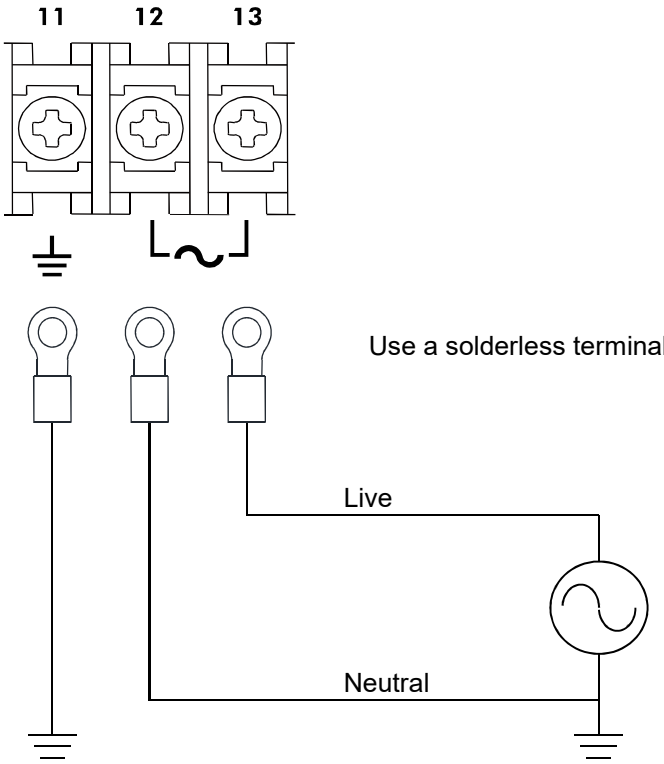
5. Connection to power supply

5.1. AC Power Input Terminal Assignment

Terminal No.	Symbol	Description
11	⏚	Ground terminal
12	∿	AC power input (Neutral) Earthed conductive part
13		AC power input (Live) Unearthed conductive part



5.2. Connection diagram

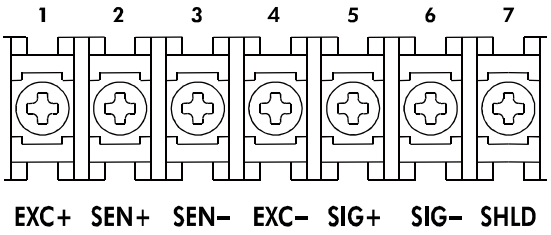


Use a solderless terminal with a width of 6.2 mm or less.

6. Connection to load cell

6.1. Load Cell Input Terminal Assignment

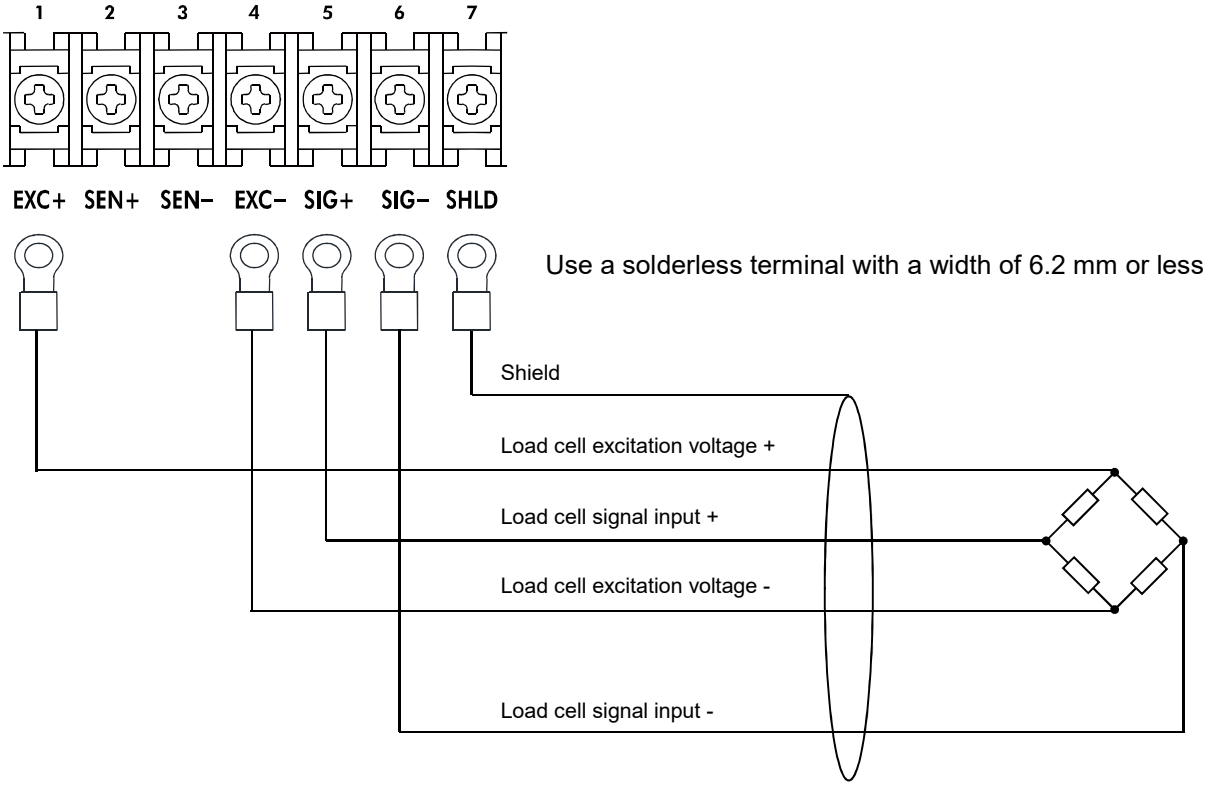
Terminal No.	Symbol	Description
1	EXC+	Load cell excitation voltage +
2	SEN+	Sensing input +
3	SEN-	Sensing input -
4	EXC-	Load cell excitation voltage -
5	SIG+	Load cell signal input +
6	SIG-	Load cell signal input -
7	SHLD	Frame ground



6.2. Connection diagram

- 4-wire connection type

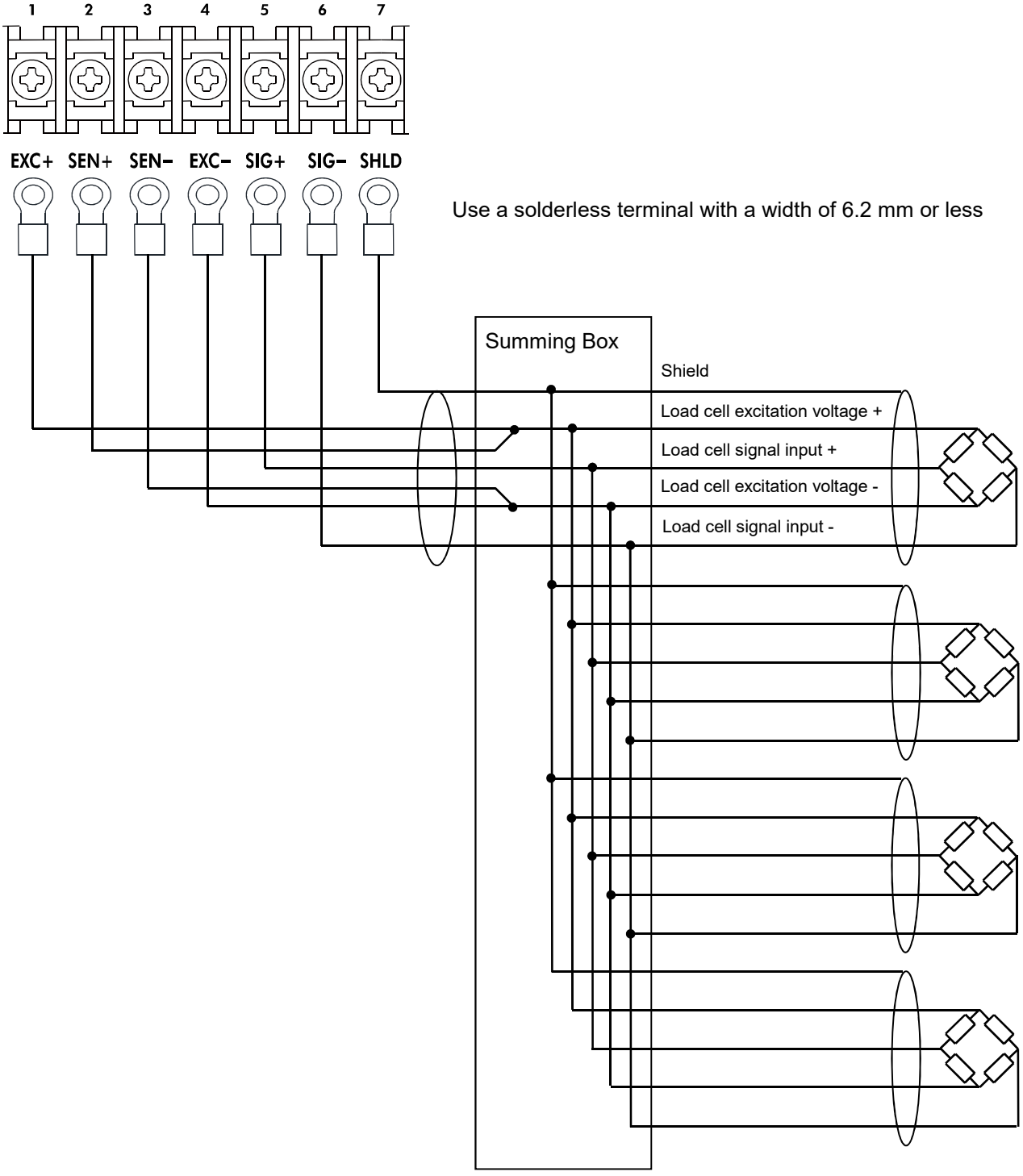
Change the load cell connection type (CALF-25) in the calibration function to 0: 4-wire type (default value = 1: 6-wire type).



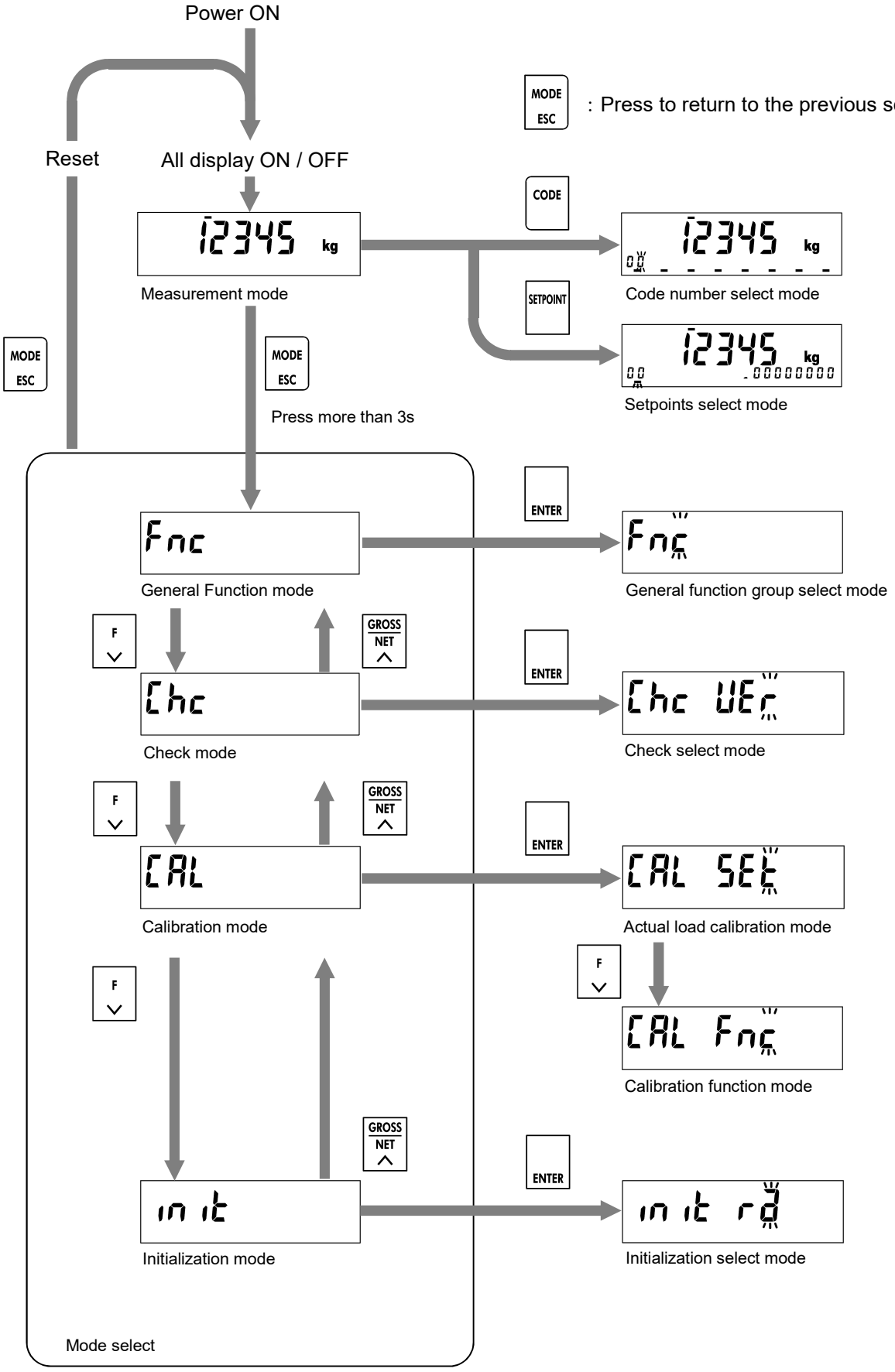
- 6-wire connection type

Change the load cell connection type (CALF-25) in the calibration function to 1: 6-wire type (default value = 1: 6-wire type).

When you connect the load cells in parallel, use a summing box. Attach the accessory load cell connector and wire as shown below.



7. Operation mode



8. Calibration

Calibration the AD-4421 so that it can properly convert the signal from the load cell to a load value.

8.1. Settings required before calibration

Before calibration, the following settings required.

- Unit: (CALF-01)
  Select the unit of the scale.
  0: None / 1: g / 2: kg (Default)/ 3: t / 4:lb / 5:N / 6:kN

- Decimal point position: (CALF-02)
  Select the position of a decimal point.
  0: 0 (None) (Default)
  1: 0.0
  2: 0.00
  3: 0.000
  4: 0.0000

- Minimum division: (CALF-03)
  Set the minimum division of the scale.
  1: 1d (Default) / 2: 2d / 3: 5d / 4: 10d / 5: 20d / 6: 50d

- Maximum capacity: (CALF-04)
  Set the maximum weighing capacity of the scale.
  0 to 999999

8.2. Digital calibration

Once the calibration using calibration weights has been completed, the following calibration functions are automatically set.

It is recommended to make a note of the updated settings. If AD-4421 is replaced, it can be re-calibrated without actual load calibration to set them.

- Load cell signal voltage at zero calibration: (CALF-15)
- (Load cell signal voltage at span calibration - CALF-15) x CALF-17 / Calibration weight value at span calibration: (CALF-16)
- Maximum capacity at span calibration: (CALF-17)

8.3. Actual load calibration

Move to the actual load calibration mode by referring to "7.Operation mode". And press the [ENTER] key.

8.3.1. Zero calibration

Press [ENTER] key to execute Zero calibration.

If the [CODE] key is pressed, zero calibration will be skipped and enter span calibration.

If zero calibration fails, "C Err X" will be displayed.

Refer to "8.3.3.Error in actual load calibration" for the error details.

If Zero calibration is successful, "PASS" will be displayed in the sub display and zero calibration will be completed.

Press the [ENTER] key to enter Span calibration.

Or press the [MODE/ESC] key four times to return to the measurement mode.

8.3.2. Span calibration

Set the weight value by operating the keys according to the following.

- [ZERO / ←] key: Moves the blinking digit to the left.
- [TARE / →] key: Moves the blinking digit to the right.
- [GROSS|NET / ↑] key: Adds a blinking digit.
- [F / ↓] key: Subtracts a blinking digit.

After setting, place the weight on the load cell.

Press the [ENTER] key to execute span calibration.

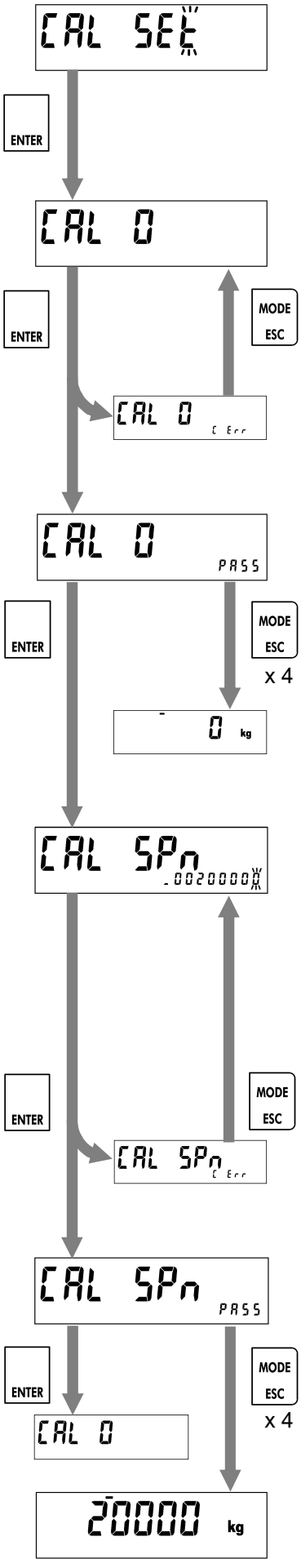
If span calibration fails, "C Err X" will be displayed.

Refer to "8.3.3.Error in actual load calibration" for the error details.

If span calibration is successful, "PASS" will be displayed in the sub display and span calibration will be completed.

Press the [MODE/ESC] key four times to return to the measurement mode.

Or press the [ENTER] to re-enter zero calibration again.



8.3.3. Error in actual load calibration

Error code	Description
C Err2	The load cell signal voltage at zero calibration exceeds 7 mV/V. Check that the load cell is connected correctly.
C Err3	The load cell signal voltage at zero calibration is less than -7 mV/V. Check that the load cell is connected correctly.
C Err4	The calibration weight value for the span calibration exceeds the maximum capacity. Set the calibration weight value to the maximum capacity or less.
C Err5	The calibration weight value for the span calibration is below the scale interval. Set the calibration weight value to the scale interval or more.
C Err7	The load cell input signal at span calibration is smaller one at zero calibration. Check that the load cell is connected correctly.
C Err8	The load cell signal voltage at span calibration exceeds 7 mV/V. Check that the load cell is connected correctly.

9. Basic functions

When the AD-4421 is powered ON, all the segments of the display turn ON and OFF for checking the display.

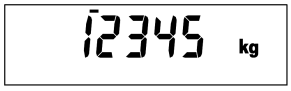
Then the AD-4421 is in the normal mode and starts weighing.

Refer to "24.Setting functions" for each function setting method.

9.1. Main display

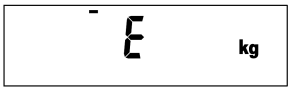
The following contents is displayed in measurement mode.

- Measurement value.



- Positive overload.

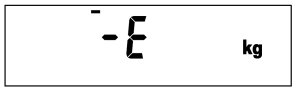
  The gross value exceeds the maximum capacity by +8d.



- Negative overload.

  The gross value meets negative overload condition (CALF-24).

  (Default = 0: Gross < - Maximum capacity + 8d)



9.2. Sub display

Select the function of the sub-display (FncF-04) from the following:

0: None

1: Gross value

2: Net value

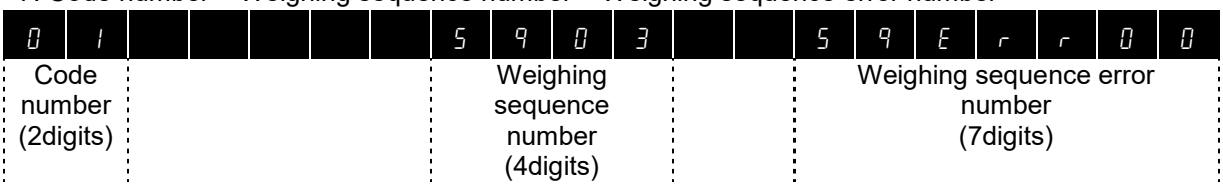
3: Tare value

4: Code number + Final weight

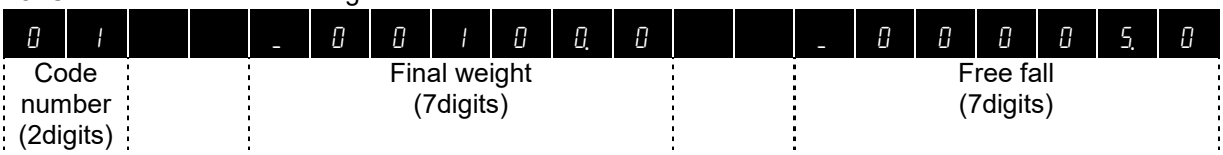
5: Code number + Total weight

6: Code number + Number of accumulations

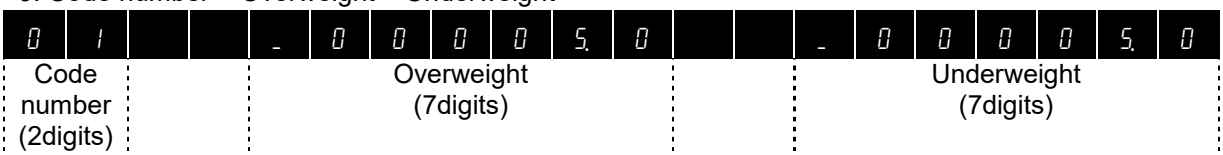
7: Code number + Weighing sequence number + Weighing sequence error number



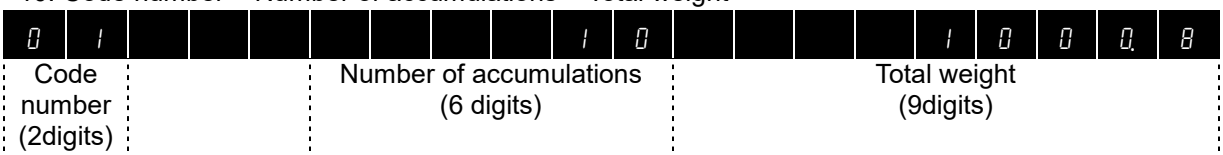
8: Code number + Final weight＋Free fall



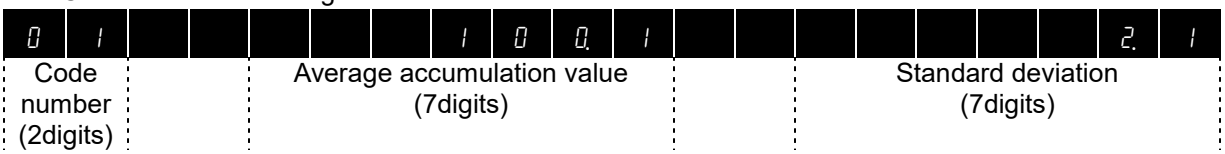
9: Code number + Overweight + Underweight



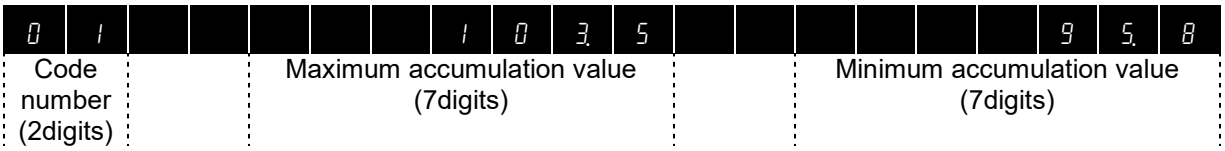
10: Code number + Number of accumulations + Total weight



11: Code number + Average accumulation value + Standard deviation



12: Code number + Maximum accumulation value + Minimum accumulation value



13：Comparison result

When the comparison result is Hi-Hi

When the comparison result is Hi

When the comparison result is OK

When the comparison result is Lo

When the comparison result is Lo-Lo

9.3. Power-on zero

After power-on, the gross value is set to zero automatically when the gross value is within the maximum capacity ± 10% and stable.

Set power- on zero (CALF-20) to 1: Enabled (Default = 0: Disabled) to use this function.

If the condition is not met, the "------" will be displayed until the condition is met.

Press the [MODE/EXC] key to skip the power-on zero and enter measurement mode.

9.4. Zero-setting

Executing zero-setting

Press the [ZERO / ←] key or request externally, to save the gross value as zero setting value and set to zero, when the measurement value is within the zero setting range (CALF-05).

Operation: [ZERO / ←] key, Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Setting: Zero setting range (CALF-05), Tare and zero setting at unstable weight (CALF-10)

Zero clear

Press a key to which zero clear function is assigned or request externally to clear the zero setting value.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Setting: Zero clear (CALF-21)

9.5. Zero tracking

The gross value is set to zero automatically when the tracking time has passed while the gross value is maintained within the zero tracking width.

Setting: Zero tracking time (CALF-06), Zero tracking width (CALF-07)

9.6. Tare

Executing tare

Press the [TARE / →] key or request externally, to save the gross value as the tare value and set the net value to zero.

Operation: [TARE / →] key, Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Setting: Tare and zero setting at unstable weight (CALF-10), Tare at negative gross value (CALF-11)

Tare clear

Press a key to which tare clear function is assigned or request externally to clear the tare value.

Set the followings to use this function.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

9.7. Gross / Net display selection

Press the [GROSS|NET / ↑] key or request externally, to switch the displayed value between gross and net.

GROSS status is ON when the gross value is displayed, NET status is ON when the net value is displayed.

Operation: [GROSS|NET / ↑] key (FncF-02), Control input, RS-485,
Option (RS-422/485, RS-232C, Modbus-TCP)

9.8. Center-zero detection

The center of zero is detected and the ZERO status turns ON when the gross value is within 1/4 of the minimum division.

9.9. Stability detection

Stability is detected and the stable status is ON, when the stability detection time has passed while the measured value is maintained within the stability detection width.

Setting: Stability detection time (CALF-08), Stability detection width (CALF-09)

9.10. Hold

Press a key to which manual print function is assigned or request externally to temporarily locked / released weight value. The HOLD status turns ON while the weight value is locked.

Select a hold function (FncF-08) from the following:

- Normal hold: The value when the holding operation is performed is locked.
- Peak hold: The maximum value after the holding operation is locked.

Operation: [F / ↓] key (FncF-02), Control input

Setting: Hold function (FncF-08), Comparison stop at hold (FncF-09)

Note: During Hold, the following functions cannot be executed.

- Zero-setting, Zero clear, Zero tracking
- Tare, Tare clear
- Gross / Net display selection
- Accumulation, Total Clear, Undoing accumulation
- High resolution display selection
- Weighing start, Discharge start, Manual correction flow

9.11. Manual print

Press a key to which manual print function is assigned or request externally to data output from the standard serial output or RS-485, option interface (BCD output, RS-422/485, RS-232C).

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

9.12. Accumulation

Press the key to which accumulation function is assigned or request externally to add the net value to the total weight, and update the accumulation result of the calling code.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Total clear

Press the key to which total clear function is assigned or request externally to clear the accumulation result of the calling code.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Total clear of all code memory

Press the key to which total clear of all code memory function is assigned or request externally to subtract last accumulated weighing value from the total weight and the number of accumulations, and the accumulation result are updated.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Undoing accumulation

Press the key to which undoing accumulation function is assigned or request externally to subtract the accumulation value from last total weight and number of accumulations.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Condition of accumulations overflow

Detects when the total weight and number of accumulations it has been accumulated exceeds the specified value and outputs an alarm.

Setting: Condition of accumulations overflow (FncF-11), Maximum total weight (FncF-12),
Maximum number of accumulations (FncF-13)

9.13. Function status

Select the condition to turn the FUNC status ON (FncF-05) from the following:

- None
- During discharge
- When zero tracking is enabled
- In weighing sequence
- Normal batching (/ loss-in-weight batching)
- When reverses the polarity of the net value

9.14. Alarm

Select the condition to turn the ALARM status ON (FncF-10) from the following:

- Overload
- Total weight / number of accumulations overflow
- Zero setting error
- Tare error
- Weighing sequence error

9.15. Error clear

Press the key to which error clear function is assigned or request externally to clear zero setting error or tare error, weighing sequence error.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

9.16. Reverse polarity of the net value

Displays the net value with reversed polarity when batch weighing mode (CALF-14) is 2: Simple comparison loss-in-weight batching or 4: Loss-in-weight batching.

Setting: When operating loss-in-weight batching mode, reverse polarity of the net value (CALF-27)

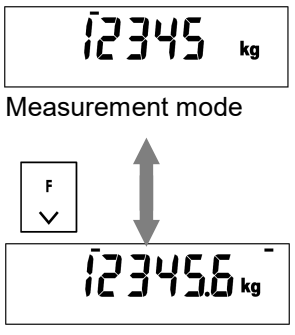
9.17. High resolution display selection

Press the key to which high resolution display function is assigned to switch the displayed value between high resolution mode, where resolution is increased 10X, and measurement mode. X10 status turns on during high resolution mode.

Operation: [F / ↓] key (FncF-02)

Note: During high resolution mode,
the following communications are interrupted.

- Standard serial output
- RS-485
- RS-422/485 (OP-03)
- RS-232C (OP-04)



Measurement mode

High resolution mode

10. BATCH WEIGHING FUNCTIONS

Batch weighing is a procedure to automatically weigh the final weight.

Select a batch weighing mode (CALF-14) from the following:

0: None

1: Simple comparison normal batching

2: Simple comparison loss-in-weight batching

3: Normal batching (default)

4: Loss-in-weight batching

10.1. Common functions

Comparison target

Select comparison target for batch weighing mode.

Setting: Comparison target (Sq F-01),

Comparison target excluding the near-zero and full values (Sq F-27)

Detect near zero

When the near-zero setpoint value is compared with the weighing value and the condition is satisfied, the near zero output turns ON.

Setting: Add the final weight to the near-zero setpoint value (Sq F-21),

Comparison target for the near-zero value (Sq F-26)

Condition	Control output
Weighing value ≤ Near-zero setpoint value	Near-zero

Detect full

When the full setpoint value is compared with the gross value and the condition is satisfied, the full output turns ON.

Condition	Control output
Gross value ≤ Full setpoint value	Full

Normal/Loss-in-weight batching selection

Press the key to which normal / loss-in-weight batching selection function is assigned or request externally to switch normal batching and loss-in-weight batching.

Operation: [F / ↓] key (FncF-02), Control input

Setting: Normal /loss-in-weight batching selection by the control input or function key (Sq F-25)

10.2. Normal batching

Weighing start

Press the key to which weighing start function is assigned or request externally to start feeding process.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Feeding process

1. The weighing start input is detected.
2. When the weighing start input delay time (Sq F-09) has passed, the large flow, medium flow and small flow outputs turn ON.
3. When the large flow comparison disable time (Sq F-10) has passed and the comparison target is greater than or equal to the (final weight - optional preliminary) value, the large flow output turns OFF.
4. When the medium flow comparison disable time (Sq F-11) has passed and the comparison target is greater than or equal to the (final weight - preliminary) value, the medium flow output turns OFF.
5. When the small flow comparison disable time (Sq F-12) has passed and the comparison target is greater than or equal to the (final weight - free fall) value, the small flow output turns OFF.
6. When the judging delay time (Sq F-13) has passed and the comparison target is stable (Sq F-07), the measurement value is judged.

End of the feeding process

7. The weighing end output turns ON and the OK/Over/Under output of the judgment result turns ON.
   Setting: OK/Over/Under output timing (Sq F-06)
   Reference: OK/Over/Under output of the judgment result is turned off at the next start of feeding.
8. When the weighing end output time (Sq F-14) has passed, the weighing end output turns OFF.

Discharge start

Press the key to which discharge start function is assigned or request externally to start discharge process.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

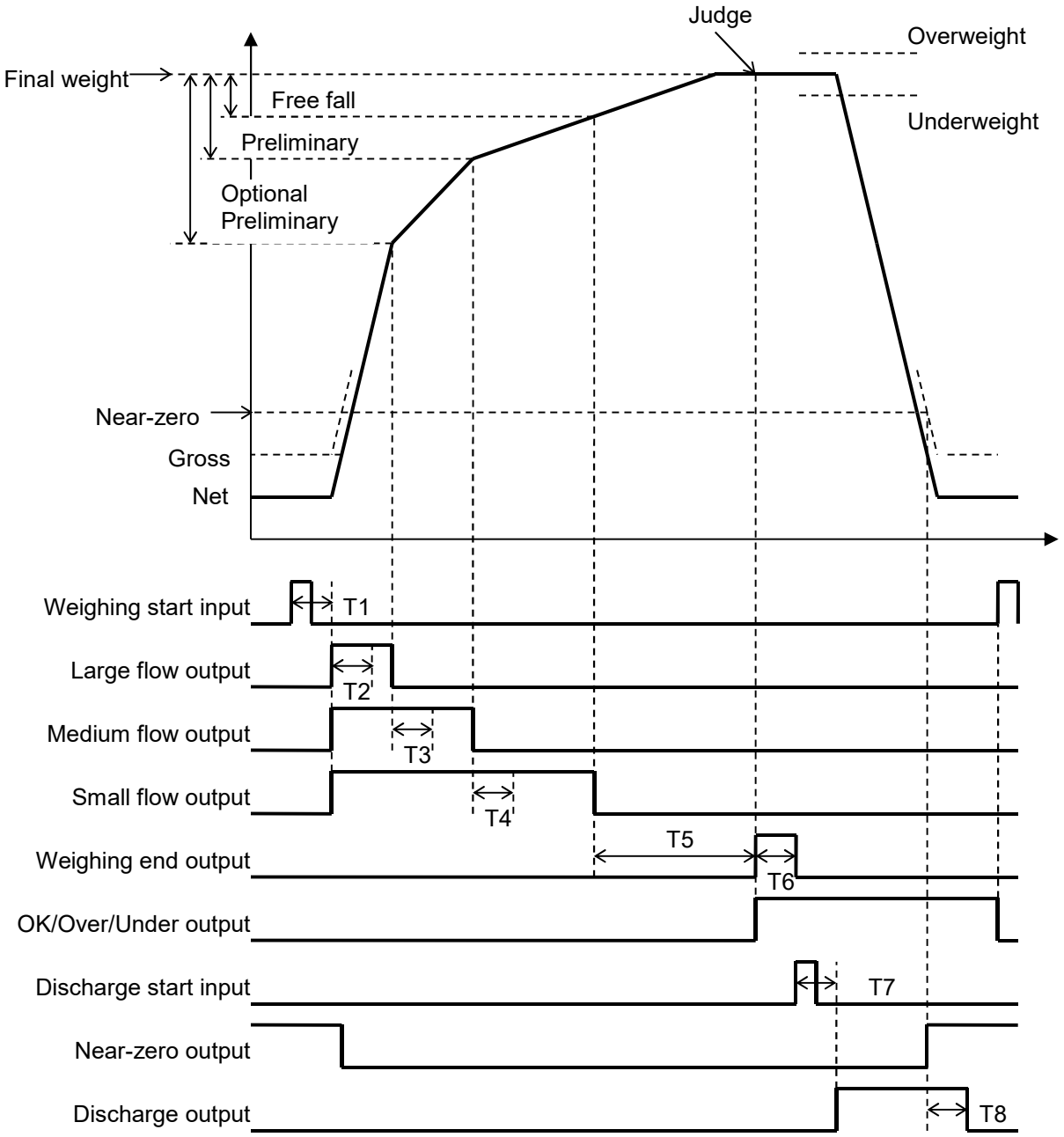
Discharging process

1. The discharge start input is detected.
2. When the discharge start input delay time (Sq F-18) has passed, the discharge output turns ON.

End of the discharge process

3. When the weighing value is below the near-zero value and the discharge end delay time (Sq F-19) has passed, the discharge output turns OFF.

Timing chart



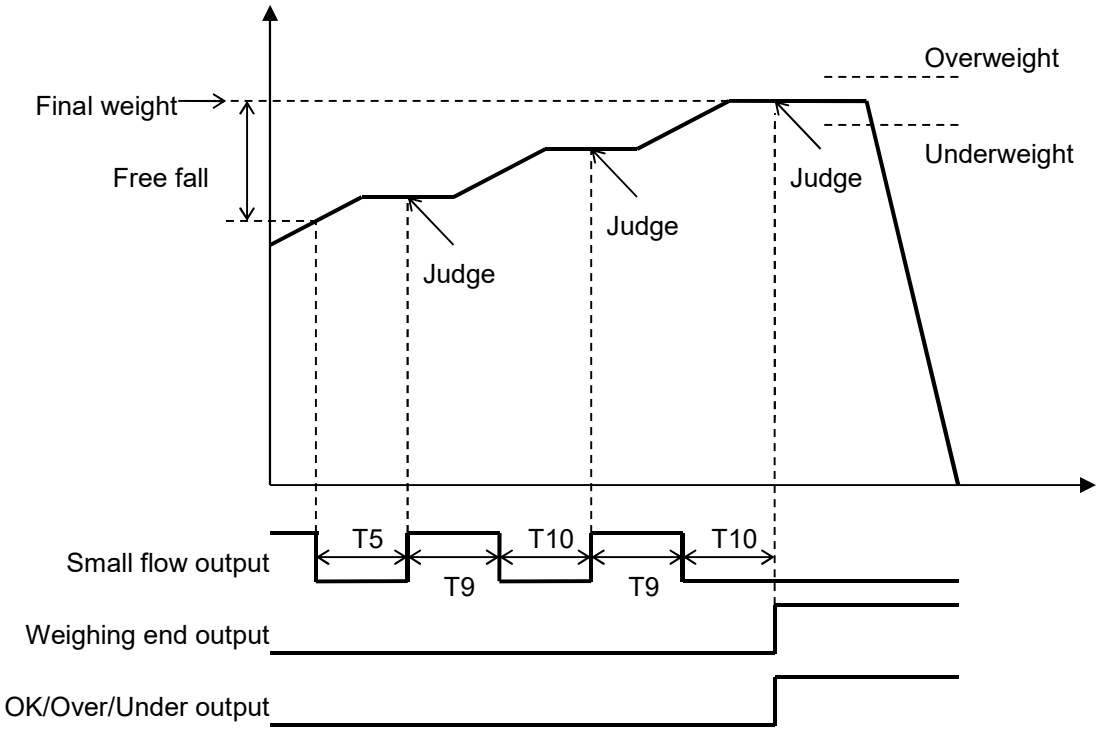
T1: Weighing start input delay time
T2: Large flow comparison disable time
T3: Medium flow comparison disable time
T4: Small flow comparison disable time
T5: Judging delay time
T6: Weighing end output time
T7: Discharge start input delay time
T8: Discharge end delay time

Correction flow

When the judgment result after the feeding process is underweight, the following is automatically performed up to the maximum number of correction flow (Sq F-08) to compensate for the underweight value.

1. When the comparison target is judged to be underweight, the small flow output turns ON.
2. When the correction flow ON time (Sq F-16) has passed, the small flow output turns OFF.
3. When the correction flow OFF time (Sq F-17) has passed and the net value is stable (Sq F-07), the net value is judged.

Timing chart



T5: Judging delay time

T9: Correction flow ON time

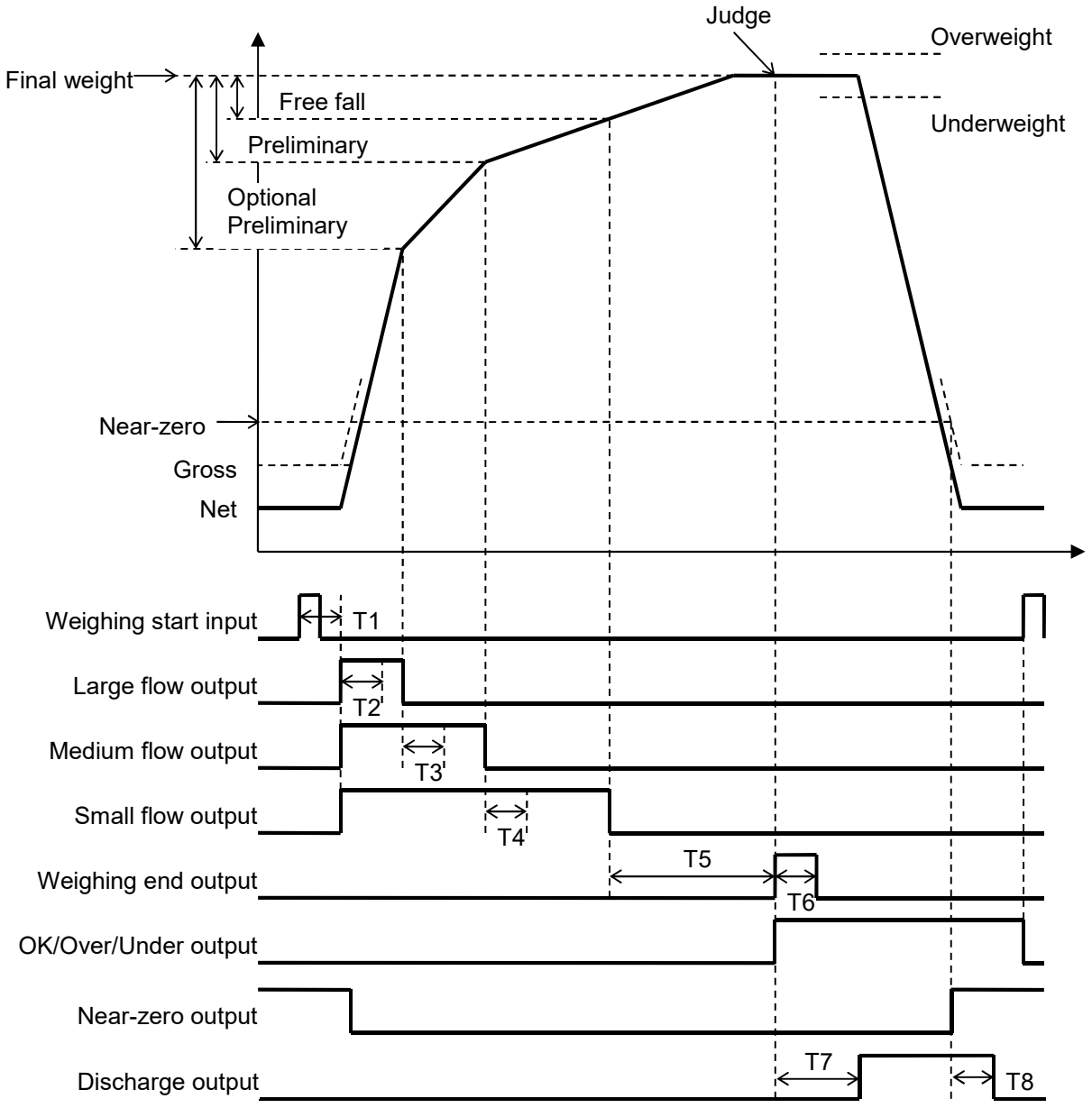
T10: Correction flow OFF time

Automatic discharge start

Discharge starts automatically after the end of feeding process.

Setting: Automatic discharge start at weighing end (Sq F-30)

1. When the weighing end output is ON and discharge start input delay time (Sq F-18) has passed, the discharge output turns ON.
2. When the weighing value is below the near-zero value and the discharge end delay time (Sq F-19) has passed, the discharge output turns OFF



T1: Weighing start input delay time
T2: Large flow comparison disable time
T3: Medium flow comparison disable time
T4: Small flow comparison disable time
T5: Judging delay time
T6: Weighing end output time
T7: Discharge start input delay time
T8: Discharge end delay time

10.3. Loss-in-weight batching

Weighing start

Press the key to which weighing start function is assigned or request externally to start feeding process.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

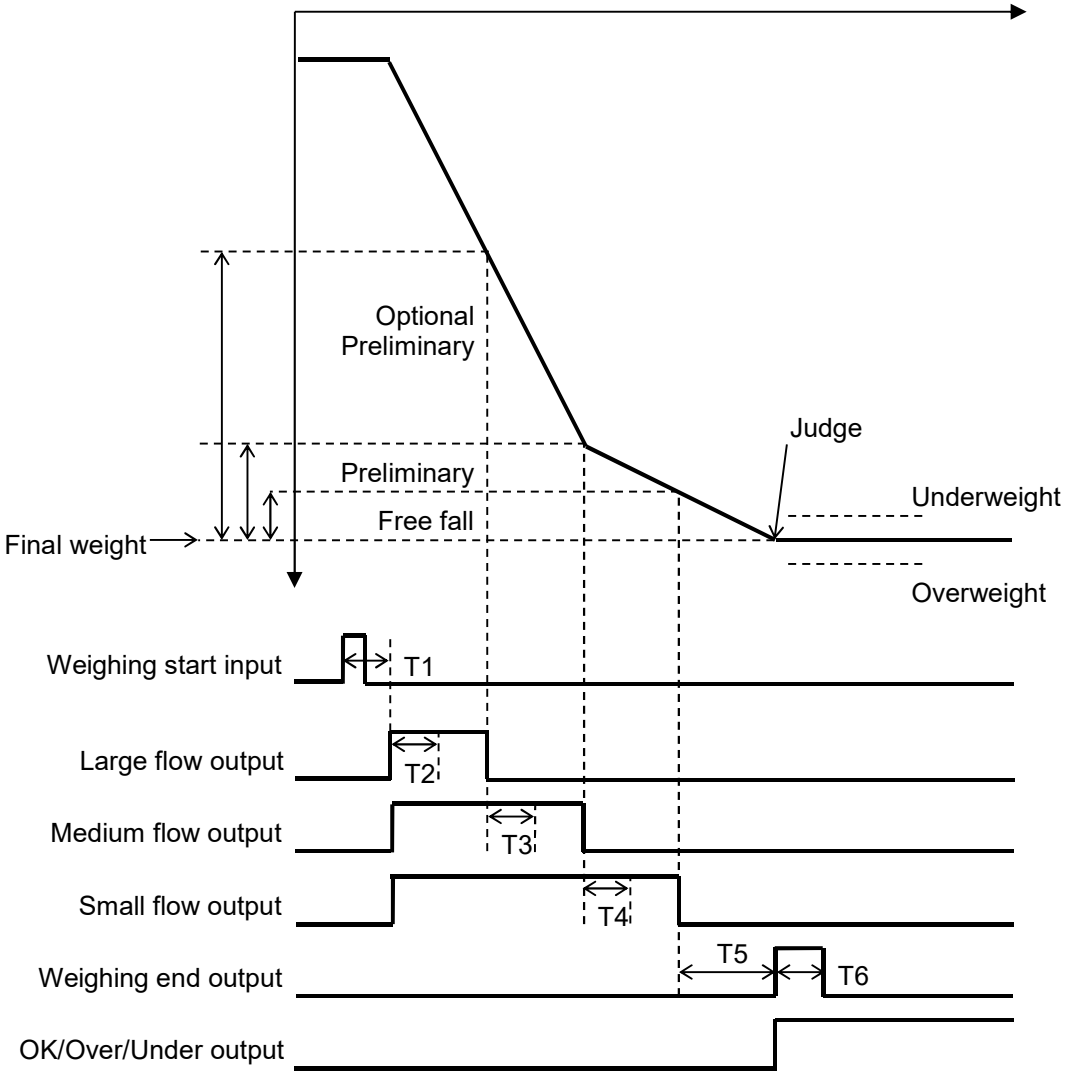
Feeding process

1. The weighing start input is detected.
2. When the weighing start input delay time (Sq F-09) has passed, the large flow, medium flow and small flow outputs turn ON.
3. When the large flow comparison disable time (Sq F-10) has passed and the -comparison target is greater than or equal to the (final weight - optional preliminary) value, the large flow output turns OFF.
4. When the medium flow comparison disable time (Sq F-11) has passed and the -comparison target is greater than or equal to the (final weight - preliminary) value, the medium flow output turns OFF.
5. When the small flow comparison disable time (Sq F-12) has passed and the -comparison target is greater than or equal to the (final weight - free fall) value, the small flow output turns OFF.
6. When the judging delay time (Sq F-13) has passed and the measurement value is stable (Sq F-07), the comparison target is judged.

End of the feeding process

7. The weighing end output turns ON and the OK/Over/Under output of the judgment result turns ON.
   Setting: OK/Over/Under output timing (Sq F-06)
   Reference: OK/Over/Under output of the judgment result is turned off at the next start of feeding.
8. When the weighing end output time (Sq F-14) has passed, the weighing end output turns OFF.

Timing chart



T1: Weighing start input delay time

T2: Large flow comparison disable time

T3: Medium flow comparison disable time

T4: Small flow comparison disable time

T5: Judging delay time

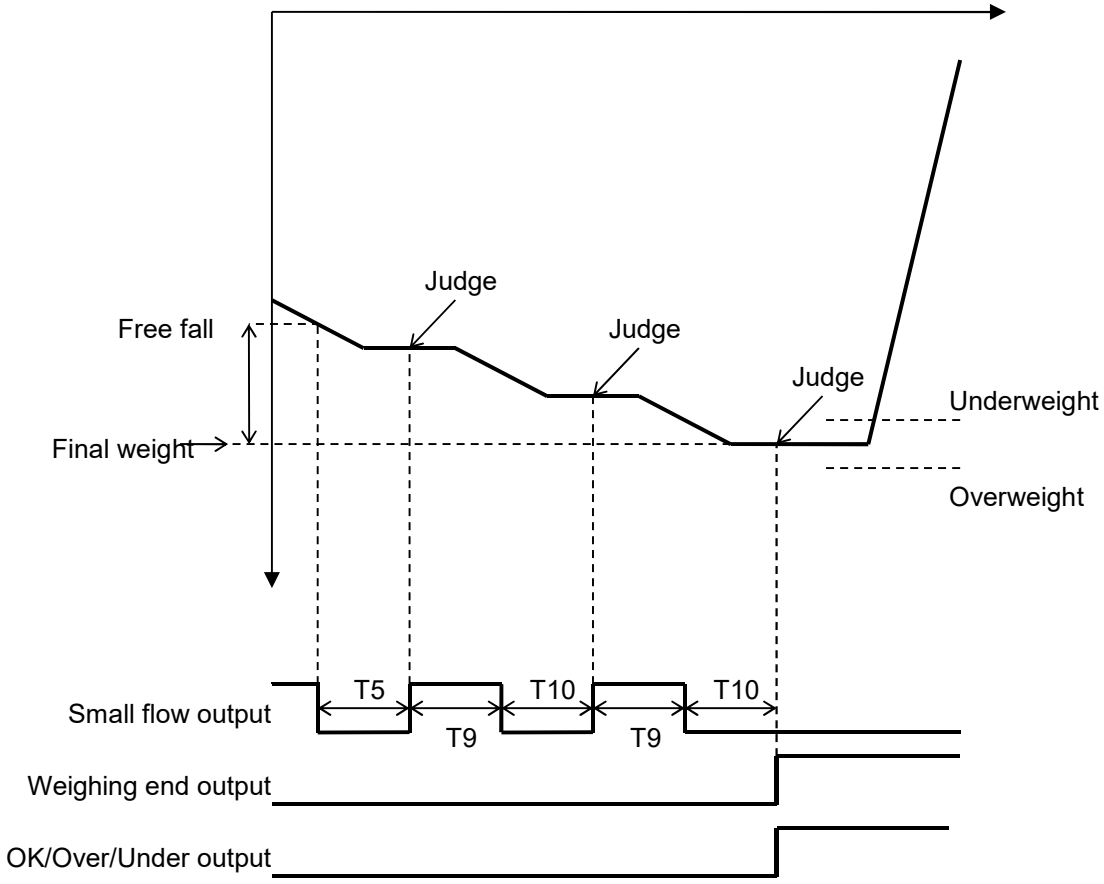
T6: Weighing end output time

Correction flow

When the judgment result after the feeding process is underweight, the following is automatically performed up to the maximum number of correction flow (Sq F-08) to compensate for the underweight value.

1. When the net value is judged to be underweight, the small flow output turns ON.
2. When the correction flow ON time (Sq F-16) has passed, the small flow output turns OFF.
3. When the correction flow OFF time (Sq F-17) has passed and the net value is stable (Sq F-07), the net value is judged.

Timing chart

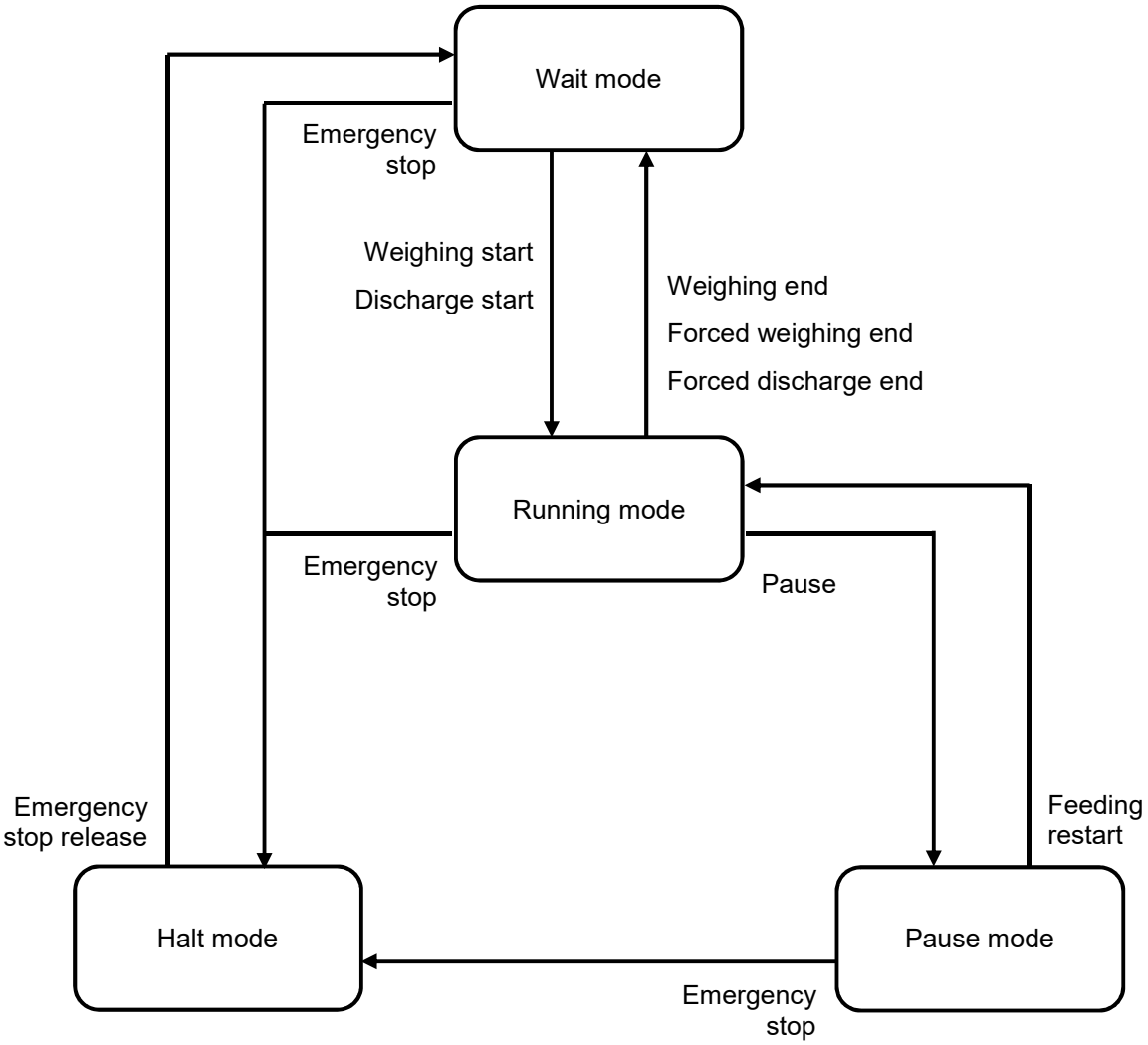


T5: Judging delay time

T9: Correction flow ON time

T10: Correction flow OFF time

10.4. Sequential state diagram



Weighing functions executable in each sequential state

Sequential state / Weighing function ✓ : Enabled －: Disabled	Wait mode	Running mode (Feeding process)	Running mode (Discharge process)	Pause mode	Halt mode
Basic functions					
Zero-setting, Zero-clear	✓	－	－	－	－
Zero tracking	✓	－	－	－	－
Tare, Tare clear	✓	－	－	－	－
Gross / Net display selection	✓	－	－	－	－
Hold	✓	－	－	－	－
Manual print	✓	－	－	－	－
Accumulation, Total clear, Undoing accumulation	✓	－	－	－	－
Error clear	✓	－	－	－	－
High resolution display selection	✓	－	－	－	－
Batch weighing functions					
Weighing start	✓	－	－	－	－
Discharge start	✓	－	－	－	－
Emergency stop	✓	✓	✓	✓	－
Emergency stop release	－	－	－	－	✓
Pause	－	✓	－	－	－
Feeding restart	－	－	－	✓	－
Forced weighing end	－	✓	－	－	－
Forced discharge end	－	－	✓	－	－
Manual correction flow (One-shot small flow)	✓	－	－	－	－
Normal /loss-in-weight batching selection	✓	－	－	－	－
Change setpoint value	✓	✓	✓	✓	✓
Change code number	✓	－	－	－	－
etc.					
Change function setting value via Modbus-RTU	✓	－	－	－	－
Zero / Span calibration via Modbus-RTU	✓	－	－	－	－

10.5. Sequential weighing functions

Status display

- FINAL : Always off.
- F.FALL : Turn on during small flow.
- PRELM : Turn on during medium flow.
- OP.PLM : Turn on during large flow.
- OVER : Turn on when judgment result is overweight.
- UNDER : Turn on when judgment result is underweight.

Automatic free fall correction

Under the following conditions, the correct free fall value is automatically set.

- Automatic free fall correction method (Sq F-03) is moving average of last four weighing result.
- The weight value after the feeding process is within the final weight ± automatic free fall correction range (Sq F-04).
- The minimum small flow time for the automatic free fall correction (Sq F-05) has passed.

Automatic print

When the weighing end output turns ON after the feeding process, data is output from the standard serial output (Si F-02) or RS-485 (485F-02), options (bCdF-02, rS F-02).

Automatic accumulation

When the weighing end output turns ON after the feeding process, the net value is accumulated on the total weight.

Setting: Automatic accumulation condition (Sq F-02)

Automatic tare at weighing start

Perform tare at weighing start.

Setting: Automatic tare at weighing start (Sq F-28)

Checking near zero at weighing start

If the near-zero output is turned on at weighing start, the large/medium/small feeding output is turn off, the sequence error output is turn on, and shifts to wait mode.

Setting: Checking near zero at weighing start (Sq F-29)

Emergency stop

Press the key to emergency stop function is assigned or request externally to turn off the large/medium/small feeding output and discharge output and turn on sequence error output, then shifts to halt mode. In case of an edge input, shifts to wait mode.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Pause

Press the key to emergency stop function is assigned or request externally to turn off the large/medium/small feeding output and discharge output and turn on sequence error output, then shifts to pause mode.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Feeding restart

Press the key to feed restart function is assigned or request externally to restart from pause mode.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Forced weighing end

Press the key to forced weighing end function is assigned or request externally to turn off the large/medium/small feeding output, then shifts to judge sequence.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Forced discharge end

Press the key to forced discharge end function is assigned or request externally to turn off discharge output, then shifts to wait mode.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Manual correction flow (One-shot small flow)

Press the key to manual correction flow function is assigned or request externally to turn on the small feeding output. After correction flow ON time has passed, the small feeding output is turn on.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Flow timeout error

When the duration from the flow output ON to the weighing end output ON has exceeded the flow timeout time (Sq F-15), the large flow, medium flow and small flow outputs turn OFF and the weighing sequence error output turns ON.

Setting: Flow timeout time (Sq F-15)

Discharge timeout error

When the duration from the discharge output ON to the weight value becoming near-zero has exceeded the discharge timeout time (Sq F-20), the discharge output turns OFF and the weighing sequence error output turns ON

Setting: Discharge timeout time (Sq F-20)

Sequence number

Sequence number	Description	Classification of sequential operation mode
00	Wait mode	Wait mode
01	Halt mode	Halt mode
02	Pause mode	Pause mode
03	Waits for weighing start input delay time to pass.	Running mode (Feeding process)
04	Waits for large flow comparison disable time to pass.	
05	Waits for the weight value to exceed (Final weight - Optional preliminary) setpoint value.	
06	Waits for medium flow comparison disable time to pass.	
07	Waits for the weight value to exceed (Final weight - Preliminary) setpoint value.	
08	Waits for small flow comparison disable time to pass.	
09	Waits for the weight value to exceed (Final weight – Free fall) setpoint value.	
10	Waits for judging delay time to pass.	
11	Waits for stable.	
12	Waits for correction flow ON time to pass.	
13	Waits for correction flow OFF time to pass.	
14	Waits for discharge start input delay time to pass.	Running mode (Discharge process)
15	Waits for the weight value to below near zero setpoint value.	
16	Waits for discharge end delay time to pass.	

Sequence error number

Sequence error number	Description	Sequential operation mode after error occurs
00	None	-
01	Started feeding process, but the Final weight setpoint value is set to 0.	Wait mode
02	Started feeding process, but the weight value to exceed (Final weight – Free fall) setpoint value.	
03	Started feeding process, but the near zero output is ON. (*1)	
04	Emergency stop is input during feeding process.	Halt mode
05	Pause is input during feeding process.	Pause mode
06	Flow timeout error	Wait mode
07	Emergency stop is input during discharge process.	Halt mode
08	Discharge timeout error	Wait mode

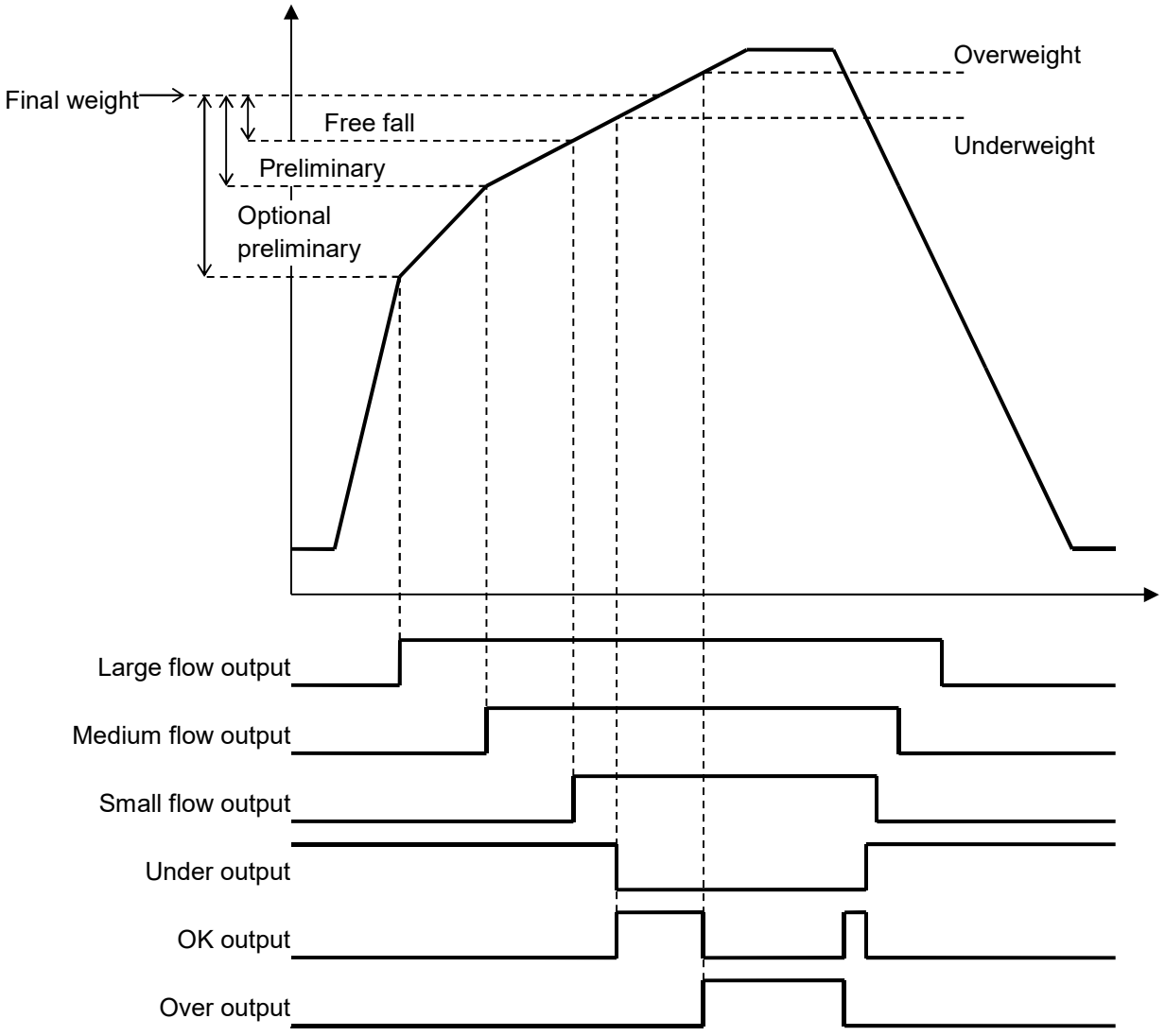
*1: Only when setting value of checking near zero at weighing start (Sq F-29) is "1: Enabled".

10.6. Simple comparison normal batching

When the weight value is compared with the setpoint and the condition is met, the control output turns ON.

Condition	Control output
Weight value ≧ Final weight - Optional preliminary	Large flow
Weight value ≧ Final weight - Preliminary	Medium flow
Weight value ≧ Final weight - Free fall	Small flow
Weight value > Final weight - Underweight	Underweight
Weight value > Final weight + Overweight	Overweight
Final weight + Overweight ≧ Weight value ≧ Final weight - Underweight	OK

Timing chart

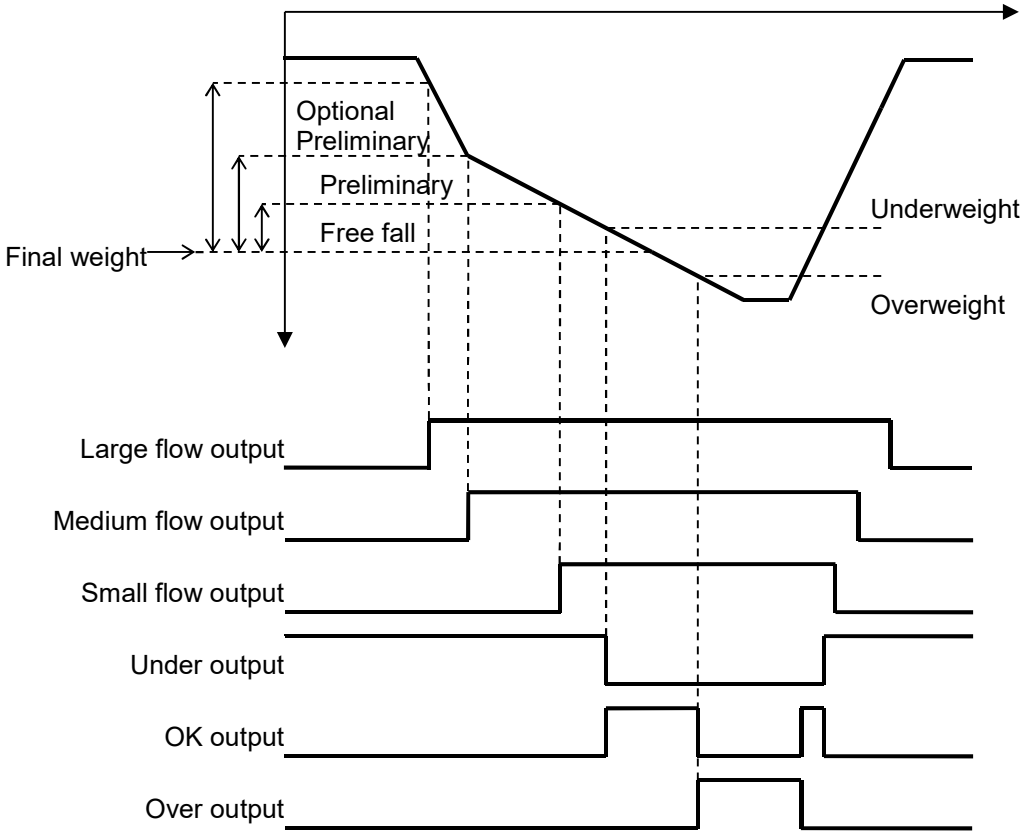


10.7. Simple comparison loss-in-weight batching

When the weight value is compared with the setpoint and the condition is met, the control output turns ON.

Condition	Control output
-Weight value ≧ Final weight - Optional preliminary	Large flow
-Weight value ≧ Final weight - Preliminary	Medium flow
-Weight value ≧ Final weight - Free fall	Small flow
-Weight value > Final weight - Underweight	Underweight
-Weight value > Final weight + Overweight	Overweight
Final weight + Overweight ≧ -Weight value ≧ Final weight - Underweight	OK

Timing chart



10.8. Simple comparison functions

Status display

- FINAL : Turn on when the weight value is within the OK range.
- F.FALL : Turn on when the weight value to exceed (Final weight – Free fall) setpoint value.
- PRELM : Turn on when the weight value to exceed (Final weight - Preliminary) setpoint value.
- OP.PLM : Turn on when the weight value to exceed (Final weight - Optional preliminary) setpoint value.
- OVER : Turn on when the weight value to exceed (Final weight + Overweight) setpoint value.
- UNDER : Turn on when the weight value to below (Final weight - Underweight) setpoint value.

Automatic print

When the weight value is five times the minimum division or more and the large flow, medium flow and small flow outputs turn ON, data is output once from the standard serial output (Si F-02) or RS-485 (485F-02), options (bCdF-02, rS F-02). To output again, wait for the -weight value to be four times the minimum division or less.

Automatic accumulation

When the weight value is five times the minimum division or more and the large flow, medium flow and small flow outputs turn ON, the net value is accumulated on the total weight.

Setting: Automatic accumulation condition (Sq F-02)

Manual free fall correction

Press the key to manual free fall correction function is assigned or request externally to perform free fall correction by moving average of last four weighing result.

Operation: [F / ↓] key (FncF-02), Control input, RS-485, Option (RS-422/485, RS-232C, Modbus-TCP)

Setting: Automatic free fall correction range (Sq F-04)

Switch the large/medium/small flow output logic

Switchable logic level of control outputs for large/medium/small flow.

Setting: Simple comparison large/medium/small flow output logic (Sq F-24)

10.9. Setting setpoint

Setting setpoint for batch weighing.

10.9.1. Setting value of setpoint

Setting item	Setting value	Default
Final weight	-999999 to 999999	0
Free fall	-999999 to 999999	0
Preliminary	-999999 to 999999	0
Optional preliminary	-999999 to 999999	0
Overweight	-999999 to 999999	0
Underweight	-999999 to 999999	0
Near zero	-999999 to 999999	0
Full	-999999 to 999999	0

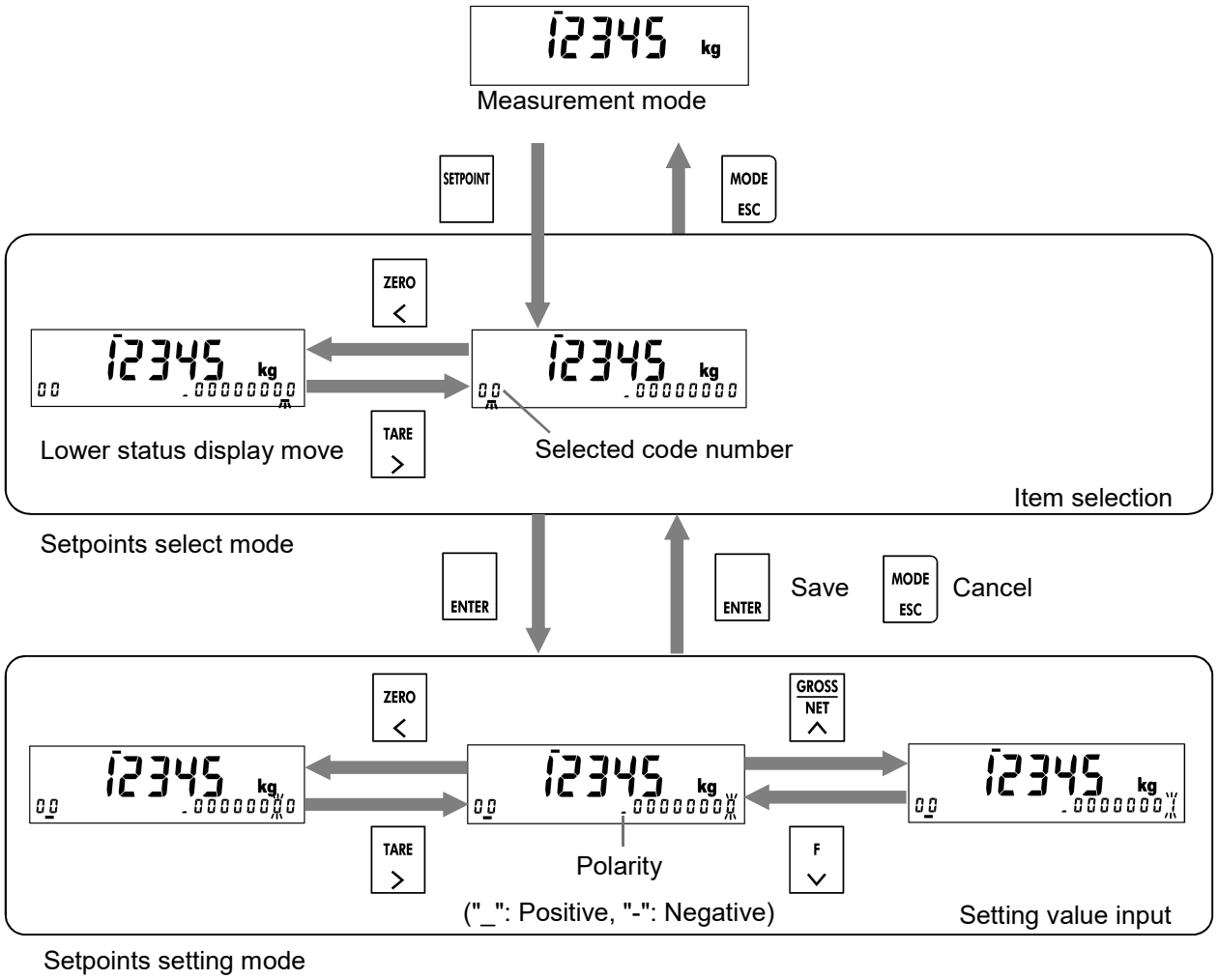
10.9.2. How to set up setpoint value

Setpoint value can be set via key switch or RS-485 or Option (RS-422/485, RS-232C, Modbus-TCP). For set via RS-485 or option interface, refer to "14.6.4.Format When Communication Type (485F-02) is 4" or "14.6.5.Format When Communication Type (485F-02) is 9 Modbus-RTU".

The following is how to set up via the key switch.

Operation:

Measurement mode		
	[SETPOINT] key	Enter the Setpoints select mode.
Item selection		
	[ZERO / ←] key	Shifts the blinking item in the lower status display to the left.
	[TARE / →] key	Shifts the blinking item in the lower status display to the right.
	[ENTER] key	Selects the displayed item and enter the setting value input.
	[MODE/ESC] key	Return to the measurement mode.
Setting value input		
	[ZERO / ←] key	Shifts the blinking digit to the left.
	[TARE / →] key	Shifts the blinking digit to the right.
	[GROSS|NET / ↑] key	Increases the blinking digit by one. The left most digit changes the polarity of the setting value. Under bar means positive. Hyphen means negative.
	[F / ↓] key	Decreases the blinking digit by one. The left most digit changes the polarity of the setting value. Under bar means positive. Hyphen means negative.
	[ENTER] key	Saves the inputted setting value and return to the item selection.
	[MODE / ESC] key	Cancels the inputted setting value and return to the item selection.


12345 kg
Measurement mode
SETPOINT
MODE ESC
ZERO <
12345 kg
12345 kg
Lower status display move
TARE >
Selected code number
Item selection
Setpoints select mode
ENTER
ENTER
Save
MODE ESC
Cancel
ZERO <
GROSS NET ^
12345 kg
12345 kg
12345 kg
TARE >
Polarity
("_": Positive, "-": Negative)
F v
Setting value input
Setpoints setting mode

10.10. Code memory function

The AD-4421 is equipped with a code memory function that can store setpoint values such as Final weight / Free fall / Preliminary value and accumulation results such as Total weight / Number of accumulations / Standard deviation for each code number. Up to 100 types of codes (00 to 99) can be stored.

10.10.1. Code memory data

Code memory data	
Setpoint	
	Final weight
	Free fall
	Preliminary
	Optional preliminary
	Overweight
	Underweight
	Near zero
	Full
Accumulation results	
	Total weight
	Number of accumulations
	Average accumulation value
	Standard deviation
	Recently accumulation value
	Maximum accumulation value
	Minimum accumulation value
	(Maximum - minimum) accumulation value

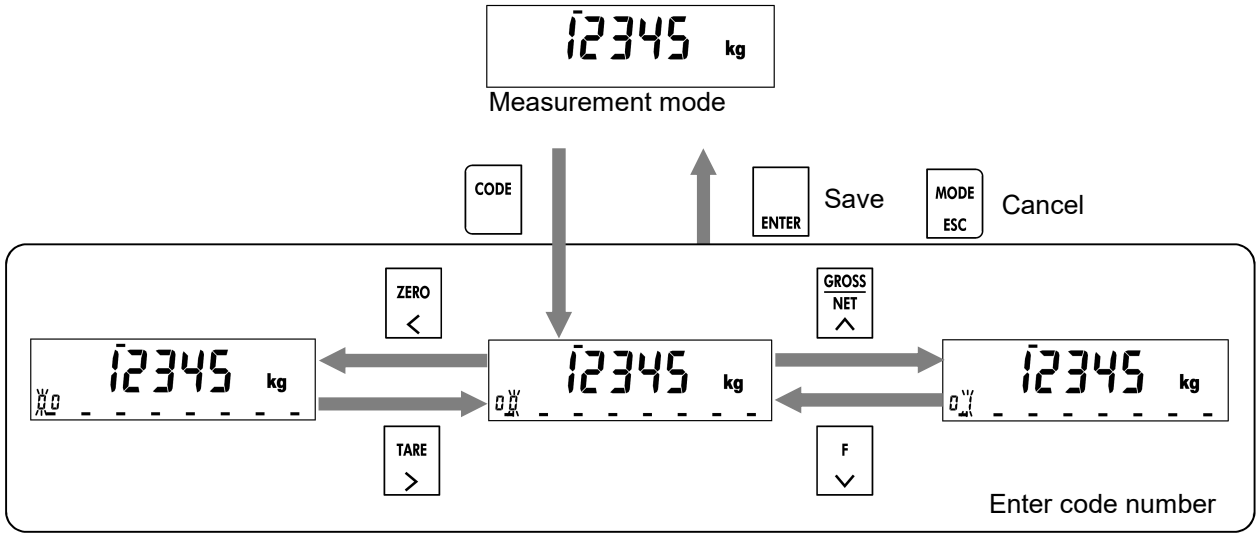
10.10.2. How to select code number

The code number can be set via key switch or RS-485 or Option (RS-422/485, RS-232C, Modbus-TCP). For set via RS-485 or option interface, refer to "14.6.4.Format When Communication Type (485F-02) is 4" or "14.6.5.Format When Communication Type (485F-02) is 9 Modbus-RTU".

The key switch selection method is described below.

Operation:

Measurement mode		
	[CODE] key	Enter the Code number select mode.
Enter code number		
	[ZERO / ←] key	Shifts the blinking item in the lower status display to the left.
	[TARE / →] key	Shifts the blinking item in the lower status display to the right.
	[GROSS|NET / ↑] key	Increases the blinking digit by one.
	[F / ↓] key	Decreases the blinking digit by one.
	[ENTER] key	Saves the selected code number and return to the measurement mode.
	[MODE / ESC] key	Cancels the selected code number and return to the measurement mode.



Code number select mode

11. CHECK WEIGHING FUNCTIONS

Check weighing separates the weight values into a maximum of five stages.

Select a weighing mode (CMPF-01) from the following.

0: None

1: Check weighing 1

2: Check weighing 2

3: Check weighing 3

4: Check weighing 4

The setpoint for check weighing is set by check weighing function.

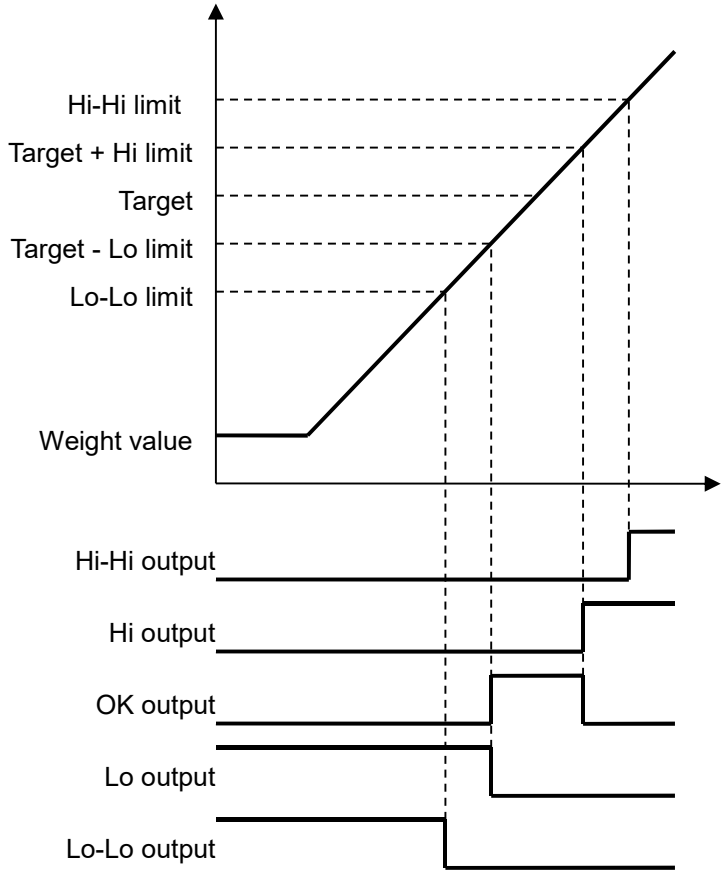
- Hi-Hi limit (CHKF-03)
- Hi limit (CHKF-04)
- Target (CHKF-05)
- Lo limit (CHKF-06)
- Lo-Lo limit (CHKF-07)

11.1. Check Weighing 1

When the weight value is compared with the setpoint and the condition is met, the control output turns ON.

Condition	Control output
Weight value > Hi-Hi limit	Hi-Hi
Weight value > Target + Hi limit	Hi
Target + Hi limit ≥ Weight value ≥ Target - Lo limit	OK
Weight value < Target - Lo limit	Lo
Weight value < Lo-Lo limit	Lo-Lo

Timing chart

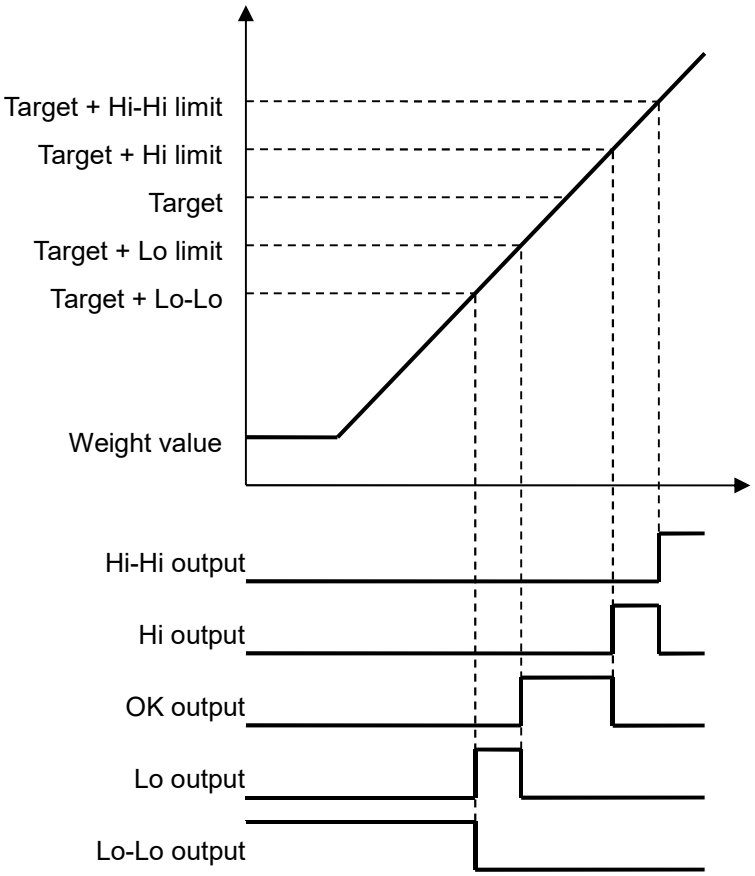


11.2. Check Weighing 2

When the weight value is compared with the setpoint and the condition is met, the control output turns ON.

Condition	Control output
Weight value > Target + Hi-Hi limit	Hi-Hi
Target + Hi-Hi limit ≥ Weight value > Target + Hi limit	Hi
Target + Hi limit ≥ Weight value ≥ Target - Lo limit	OK
Target - Lo limit > Weight value ≥ Target - Lo-Lo limit	Lo
Weight value < Target + Lo-Lo limit	Lo-Lo

Timing chart

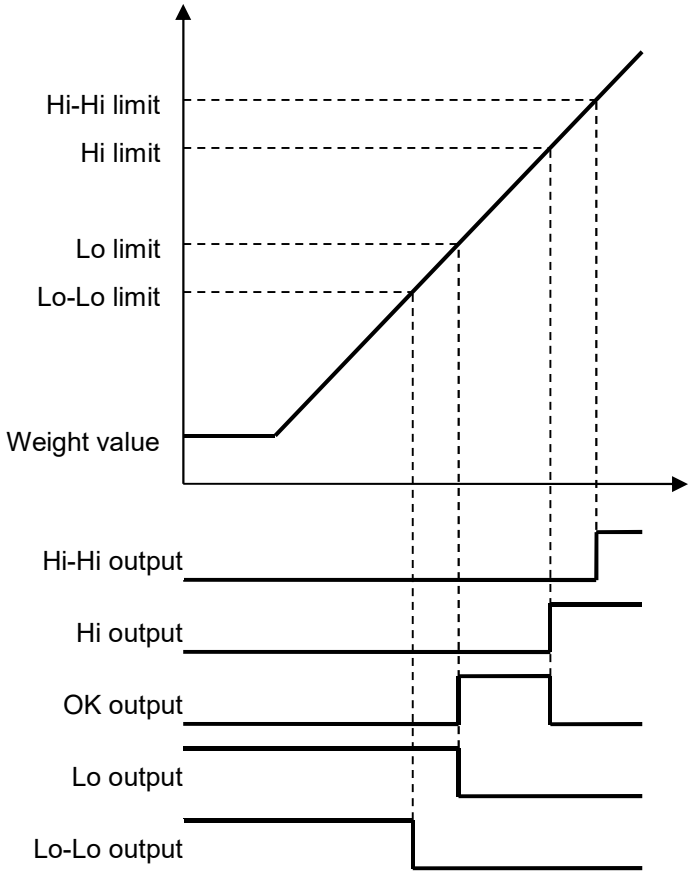


11.3. Check Weighing 3

When the weight value is compared with the setpoint and the condition is met, the control output turns ON.

Condition	Control output
Weight value > Hi-Hi limit	Hi-Hi
Weight value > Hi limit	Hi
Hi limit ≥ Weight value ≥ Lo limit	OK
Weight value < Lo limit	Lo
Weight value < Lo-Lo limit	Lo-Lo

Timing chart

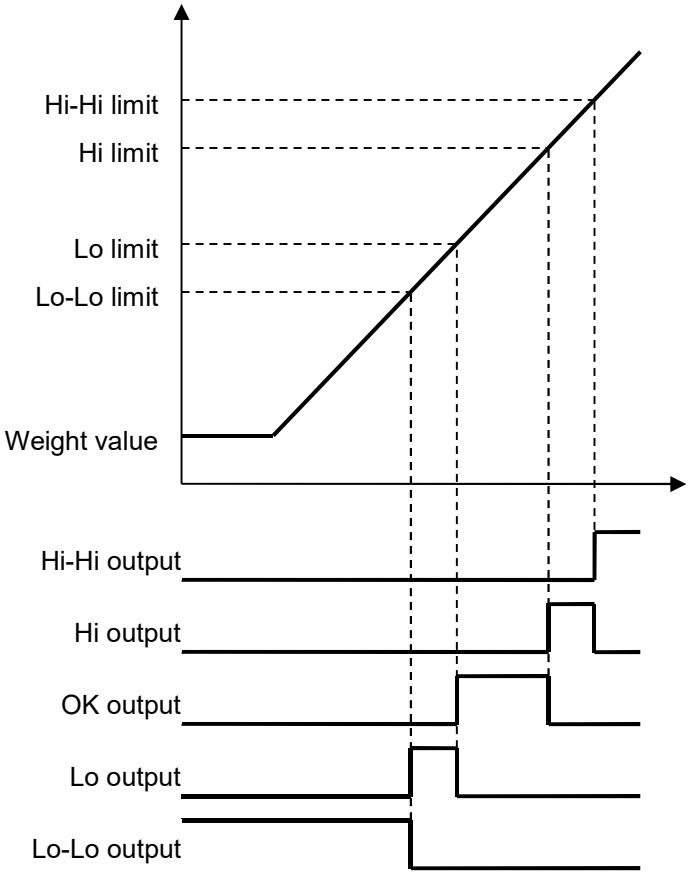


11.4. Check Weighing 4

When the weight value is compared with the setpoint and the condition is met, the control output turns ON.

Condition	Control output
Weight value > Hi-Hi limit	Hi-Hi
Hi-Hi limit > Weight value ≥ Hi limit	Hi
Hi limit > Weight value ≥ Lo limit	OK
Lo limit > Weight value ≥ Lo-Lo limit	Lo
Weight value < Lo-Lo limit	Lo-Lo

Timing chart



11.5. Check Weighing Functions

Comparison target

Select comparison target for check weighing.

Setting: Comparison target for check weighing (CHKF-02)

Switch check weighing start and stop

The check weighing start and stop can be toggled by external request.

Operation: Control input

Check weighing stop at hold

The check weighing can be stopped during hold.

Setting: Check weighing stop at hold (FncF-09)

Automatic print

In case the set value of the batch weighing mode (CALF-14) is 0 and the set value of the check weighing mode (CMPF-01) is 1, 2, 3 or 4, when the weight value is five times the minimum division or more and is stable, data is output once from the standard serial output (Si F-02) or RS-485 (485F-02), options (bCdF-02, rS F-02). To output again, wait for the weight value to be four times the minimum division or less.

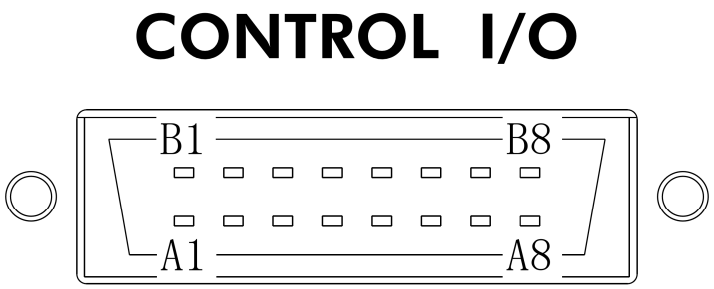
Automatic accumulation

In case the set value of the batch weighing mode (CALF-14) is 0 and the set value of the check weighing mode (CMPF-01) is 1, 2, 3 or 4, when the weight value is five times the minimum division or more and is stable, the net value is accumulated on the total weight.

Setting: Automatic accumulation condition (Sq F-02)

12. CONTROL I/O

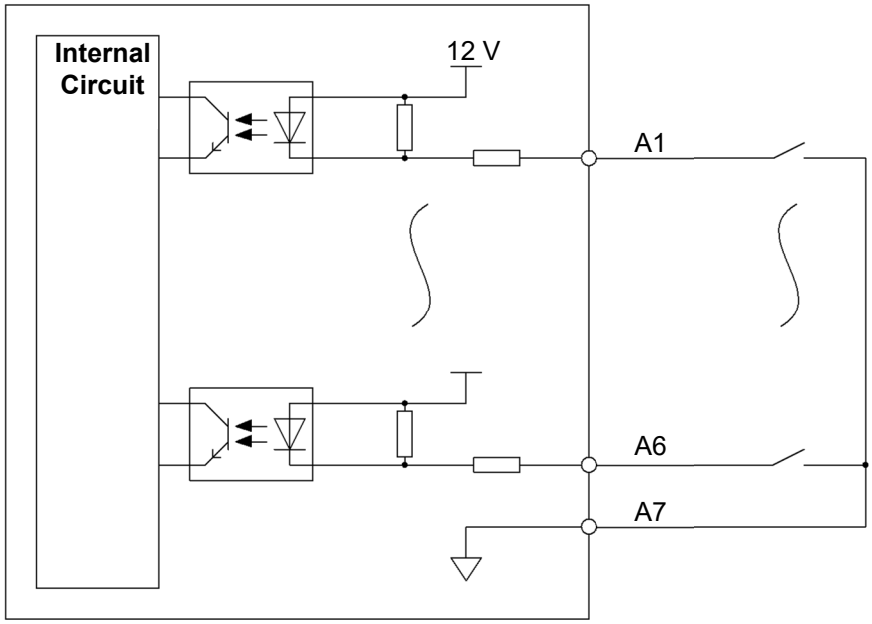
12.1. Pin Assignment



Connector for the control I/O is provided with AD-4421.

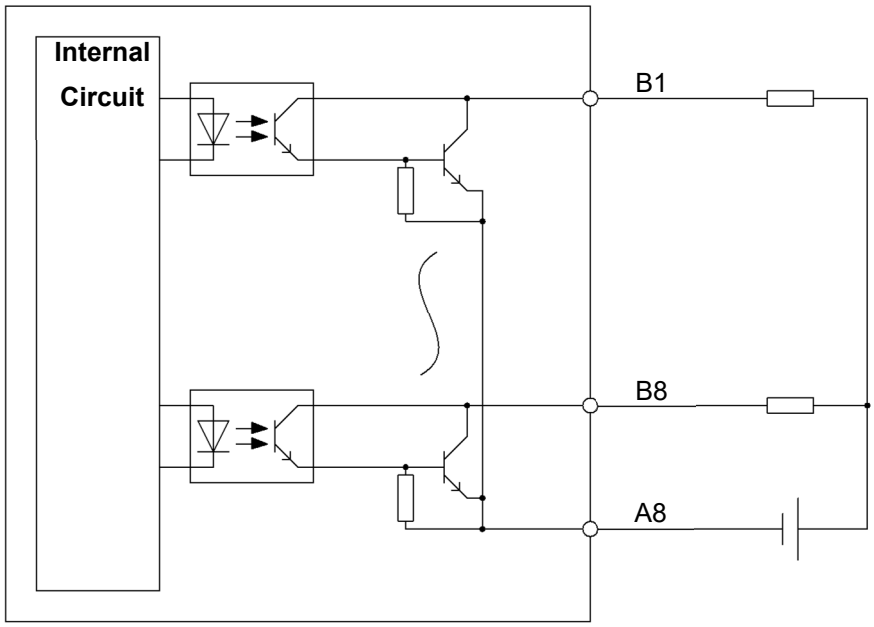
Pin No.	Description	Description	Pin No.
A1	Control input	Control output	B1
A2	Control input	Control output	B2
A3	Control input	Control output	B3
A4	Control input	Control output	B4
A5	Control input	Control output	B5
A6	Control input	Control output	B6
A7	Input common	Control output	B7
A8	Output common	Control output	B8

12.2. Connection Diagram



Control input

- ON voltage: 5 V or less
- ON current: 3 mA or more
- OFF current: 1 mA or less



Control output

- Maximum load voltage: 30 VDC
- Maximum load current: 50 mA/point
- Voltage drop at ON: 1 V or less
- Leakage current at OFF: 0.1 mA or less

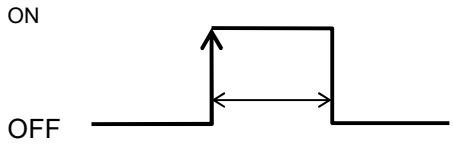
12.3. Control Input Method

Two methods of control input are available; edge detection and level detection.

Edge detection

Control input is performed when the control input is turned ON (short-circuit) from the OFF state (open-circuit).

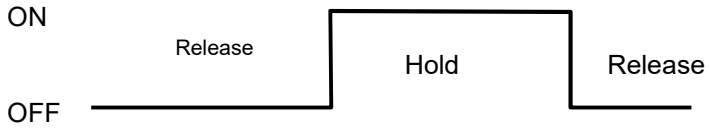
The pulse width is 50 ms or more.



Pulse width: 50 ms or more

Level detection

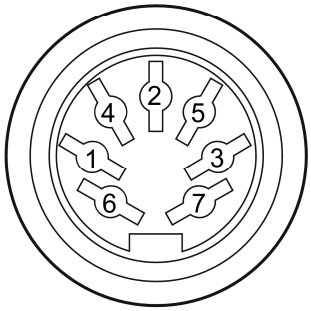
Control input is performed while the control input is ON (short-circuit).



13. STANDARD SERIAL OUTPUT

13.1. Pin Assignment

SER.OUT



Connector for the serial out is provided with AD-4421.

Pin No.	Description
1	NC
2	Frame ground
3	Current loop output No sign
4	NC
5	Current loop output No sign
6	NC
7	NC
Shell	Frame ground

13.2. Communication Specifications

Signal level	Current loop 0 to 20 mA
Baud rate (Si F-03)	600, 2400 bps
Character bit length	7 bits
Parity	Even
Star bit length	1 bit
Stop bit length	1 bit
Code	ASCII
Terminator	CR LF

13.3. Output Data

Select an output data (Si F-01) from the following:

1: Displayed weight value (default)

2: Gross value

3: Net value

4: Tare value

5: Gross value + Net value + Tare value

6: Total weight

7: Number of accumulations

8: Total weight and number of accumulations

13.4. Communication Type

Select a Communication Type (Si F-02) from the following:

1: Interval output at the display update rate (FncF-03) (default)

2: In synchronization with automatic print

3: In synchronization with manual print

4: In synchronization with automatic/manual accumulation

13.5. Output Data Format

Data format (Gross value, Net value, Tare value)

- Slave address(Si F-04) = 0, Code number output(Si F-05) = Disabled

Header 1	Header 2	Output data	Unit	Terminator
3 chars	3 chars	8 chars	2 chars	2 chars

- Slave address(Si F-04) = 0, Code number output(Si F-05) = Enabled

Code No.	Header 1	Header 2	Output data	Unit	Terminator
6 chars	3 chars	3 chars	8 chars	2 chars	2 chars

- Slave address(Si F-04) = 1 to 99, Code number output(Si F-05) = Enabled

Address	Code No.	Header 1	Header 2	Output data	Unit	Terminator
3 chars	6 chars	3 chars	3 chars	8 chars	2 chars	2 chars

Item	Value		
Address	@ 0 1	at Si F-04 = 1	Slave address
Code No.	C D , 0 1 ,	at Code No. = 1	Selected code number
Header 1	S T ,		Stable
	U S ,		Unstable
	O L ,		Overload
Header 2	G S ,	at CALF-18 = 1	Gross value
	N T ,		Net value
	T R ,		Tare value
	G SP ,	at CALF-18 = 2	Gross value
	N SP ,		Net value
	T SP ,		Tare value
Output data (Si F-01)	+ 0 0 1 2 . 3 4		Figure with a sign
	+ SP SP SP SP . SP SP		Positive overload
	+ 0 0 0 0 0 0 0		0
	- SP SP SP SP . SP SP		Negative overload
Unit (CALF-01)	SP SP		None
	SP g		g
	k g		kg
	SP t		t
	l b		lb
	SP N		N
	k N		kN

SP: space

Data format (Total weight, Number of accumulations)

- Slave address(Si F-04) = 0, Code number output(Si F-05) = Disabled

Header	Output data	Unit	Terminator
3 chars	11 chars	2 chars	2 chars

- Slave address(Si F-04) = 0, Code number output(Si F-05) = Enabled

Code No.	Header	Output data	Unit	Terminator
6 chars	3 chars	11 chars	2 chars	2 chars

- Slave address(Si F-04) = 1 to 99, Code number output(Si F-05) = Enabled

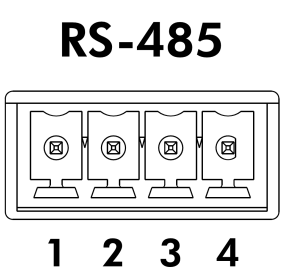
Address	Code No.	Header	Output data	Unit	Terminator
3 chars	6 chars	3 chars	11 chars	2 chars	2 chars

Item	Value		
Address	@ 0 1	at Si F-04 = 1	Slave address
Code No.	C D , 0 1 ,	at Code No. = 1	Selected code number
Header	T W ,		Total weight
	T N ,		Number of accumulations
Output data (Si F-01)	+ 0 0 0 0 0 1 2 . 3 4		Figure with a sign
	+ 0 0 0 0 0 0 0 0 0 0		0
Unit (CALF-01)	SP SP		None
	SP g		g
	k g		kg
	SP t		t
	l b		lb
	SP N		N
	k N		kN
	No unit is added when the number of accumulations is output.		

SP: space

14. RS-485

14.1. Pin Assignment



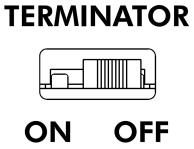
Connector for the RS-485 is provided with AD-4421.

Applicable wire

Item	Specifications
Wire size	0.14 to 1.5 mm² (AWG 26 to 16)
Wire strip length	7 mm
Tightening torque	0.22 to 0.25 Nm

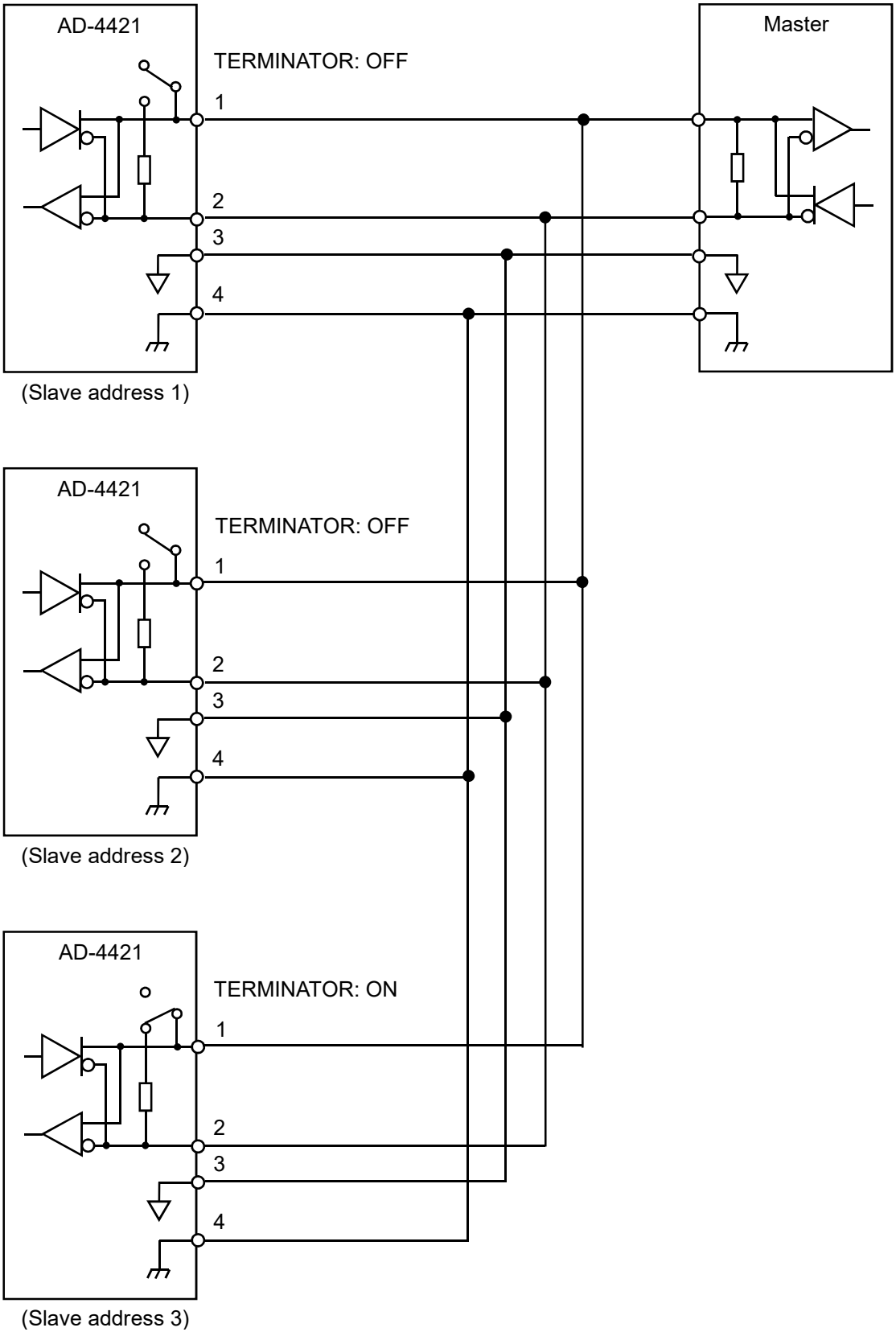
Pin No.	Description
1	DATA+
2	DATA-
3	SG
4	FG

14.2. Switch for termination resistor of RS-485



If TERMINATOR set ON, then enables the terminating resistor (100Ω).

14.3. Connection Diagram



14.4. Communication Specifications

Signal level	RS-485 compliant
Baud rate (485F-03)	600, 1200, 2400, 4800, 9600, 19200, 38400, 115200 bps
Character bit length (485F-05)	7, 8 bits
Parity (485F-04)	None, Odd, Even
Start bit length	1 bit
Stop bit length (485F-06)	1, 2 bits
Code	ASCII, Binary (for Modbus-RTU)
Terminator (485F-07)	CR LF, CR

14.5. Output Data

Select an output data (485F-01) from the following:

1: Displayed weight value (default)

2: Gross value

3: Net value

4: Tare value

5: Gross value + Net value + Tare value

6: Total weight

7: Number of accumulations

8: Total weight and number of accumulations

14.6. Communication Type

Select a communication type (485F-02) from the following:

1: Interval output at the display update rate (FncF-03) (default)

2: In synchronization with automatic print

3: In synchronization with manual print

4: Write data or read setpoint values by commands from the master

5: Interval output of comparison result and gross value at 100 times/s.

6: Interval output of comparison result and net value at 100 times/s.

7: In synchronization with automatic/manual accumulation

8: Interval output at 100 times/s

9: Modbus-RTU

14.6.1. Format When Communication Type (485F-02) is 1, 2, 3 or 7

Data format (Gross value, Net value, Tare value)

- Slave address(485F-09) = 0, Code number output(485F-11) = Disabled

Header 1	Header 2	Output data	Unit	Terminator
3 chars	3 chars	8 chars	2 chars	2 chars / 1 char

- Slave address(485F-09) = 0, Code number output(485F-11) = Enabled

Code No.	Header 1	Header 2	Output data	Unit	Terminator
6 chars	3 chars	3 chars	8 chars	2 chars	2 chars / 1 char

- Slave address(485F-09) = 1 to 99, Code number output(485F-11) = Enabled

Address	Code No.	Header 1	Header 2	Output data	Unit	Terminator
3 chars	6 chars	3 chars	3 chars	8 chars	2 chars	2 chars / 1 char

Item	Value		
Address	@ 0 1	at 485F-09 = 1	Slave address
Code No.	C D , 0 1 ,	at Code No. = 1	Selected code number
Header 1	S T ,		Stable
	U S ,		Unstable
	O L ,		Overload
Header 2	G S ,	at CALF-19 = 1	Gross value
	N T ,		Net value
	T R ,		Tare value
	G SP ,	at CALF-19 = 2	Gross value
	N SP ,		Net value
	T SP ,		Tare value
Output data (485F-01)	+ 0 0 1 2 . 3 4		Figure with a sign
	+ SP SP SP SP . SP SP		Positive overload
	+ 0 0 0 0 0 0 0		0
	- SP SP SP SP . SP SP		Negative overload
Unit (CALF-01)	SP SP		None
	SP g		g
	k g		kg
	SP t		t
	l b		lb
	SP N		N
	k N		kN

SP: space

Data format (Total weight, Number of accumulations)

- Slave address(485F-09) = 0, Code number output(485F-11) = Disabled

Header	Output data	Unit	Terminator
3 chars	11 chars	2 chars	2 chars / 1 char

- Slave address(485F-09) = 0, Code number output(485F-11) = Enabled

Code No.	Header	Output data	Unit	Terminator
6 chars	3 chars	11 chars	2 chars	2 chars / 1 char

- Slave address(485F-09) = 1 to 99, Code number output(485F-11) = Enabled

Address	Code No.	Header	Output data	Unit	Terminator
3 chars	6 chars	3 chars	11 chars	2 chars	2 chars / 1 char

Item	Value		
Address	@ 0 1	at 485F-09 = 1	Slave address
Code No.	C D , 0 1 ,	at Code No. = 1	Selected code number
Header	T W ,		Total weight
	T N ,		Number of accumulations
Output data (485F-01)	+ 0 0 0 0 0 1 2 . 3 4		Figure with a sign
	+ 0 0 0 0 0 0 0 0 0 0		0
Unit (CALF-01)	SP SP		None
	SP g		g
	k g		kg
	SP t		t
	l b		lb
	SP N		N
	k N		kN
	No unit is added when the number of accumulations is output.		

SP: space

14.6.2. Format When Communication Type (485F-02) is 5 or 6

Data format (Comparison result and gross value, Comparison result and Net value)

- Slave address(485F-09) = 0

Comparison result	Gross / Net value	Terminator
2 chars	6 chars	2 chars / 1 char

- Slave address(485F-09) = 1 to 99

Address	Comparison result	Gross / Net value	Terminator
3 chars	2 chars	6 chars	2 chars / 1 char

Item	Value		
Address	@ 0 1	at 485F-09 = 1	Slave address
Comparison result	F F		*1
Gross value (485F-02＝5) Net value (485F-02＝6)	0 0 0 0 7 F		*2

*1: Comparison results are converted from 8 binary digits into 2 hexadecimal digits.

2 hexadecimal digits								Comparison result for batch weighing (CALF-14 ≧ 1)	Comparison result for check weighing (CALF-14 = 0)
16^1				16^0					
8 binary digits 0: OFF 1: ON									
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0		
								Near Zero	
								Under weight	Hi-Hi
								Over weight	Hi
								Large flow	OK
								Medium flow	Lo
								Small flow	Lo-Lo
								Discharge	-
								Weighing end	-

***2:** The gross value and the net value are converted from a signed decimal number into a 6-digit hexadecimal number. Negative numbers are represented by the two's complement. A decimal point is not included.

Decimal	Hexadecimal
Positive overload	7FFFFF
…	…
1	000001
0	000000
-1	FFFFFF
…	…
Negative overload	800000

14.6.3. Format When Communication Type (485F-02) is 8

Data format (Weight value)

- Slave address(485F-09) = 0

Output data	Terminator
8 chars	2 chars / 1 char

- Slave address(485F-09) = 1 to 99

Address	Output data	Terminator
3 chars	8 chars	2 chars / 1 char

Item	Value		
Address	@ 0 1	at 485F-09 = 1	Slave address
Output data (485F-01)	+ 0 0 0 1 2 3 4		Figure with a sign
	+ 0 0 0 0 0 0 0		0
	+ SP SP SP SP SP SP SP		Positive overload
	- SP SP SP SP SP SP SP		Negative overload

No output if output data (485F-01) = 5, 6, 7, or 8.

A decimal point is not added to the output weight value.

14.6.4. Format When Communication Type (485F-02) is 4

Data format (Command)

- Slave address(485F-09) = 0

Command	Terminator
2 chars / 4 chars	2 chars / 1 char

- Slave address(485F-09) = 1 to 99

Address	Command	Terminator
3 chars	2 chars / 4 chars	2 chars / 1 char

Item	Value		
Address	@ 0 1	at 485F-09 = 1	Slave address
Command	R W	Read weight value	
	R B	Read comparison result + gross value / net value	
	R F	Read net value at weighing end	
	R T	Read total weight + number of accumulations	
	R S	Read setpoint value for the selected code memory	
	R S SP SP	Read setpoint value for the selected code memory	
	R S x x	Read setpoint value for the code memory specified by xx	
	M Z	Zero setting	
	M T	Tare	
	C T	Tare clear	
	D T	Total clear for the selected code memory	
	D T SP SP	Total clear for the selected code memory	
	D T x x	Total clear for the code memory specified by xx	
	E T	Total clear for all code memory	
	M G	Display gross value in the main display	
	M N	Display net value in the main display	
	B B	Weighing start	
	B D	Discharge start	
	H B	Emergency stop	
	A M	Accumulation	
	C A	Undoing accumulation	
	C C x x	Change code memory specified by xx	
	S S	Write setpoint values for the selected code memory	
	S S SP SP	Write setpoint values for the selected code memory	
	S S x x	Write setpoint values for the code memory specified by xx	

SP: space

Data format (Weight value)

Data format is the same as that when communication type (485F-02) is 1, 2, 3 or 7.

Refer to "14.6.1.Format When Communication Type (485F-02) is 1, 2, 3 or 7" for the data format.

Data format (Setpoint values)

Setpoint data format depends on the weighing mode (CALF-14).

Normal batching / Simple comparison normal batching: CALF-14 = 1, 3

Final	Free fall	Preliminary	Optional preliminary	Overweight	Underweight	Near zero	Terminator
6 chars	6 chars	6 chars	6 chars	6 chars	6 chars	6 chars	2 chars / 1 char

Loss-in-weight batching / Simple comparison loss-in-weight batching: CALF-14 = 2, 4

Final	Free fall	Preliminary	Full	Overweight	Underweight	Near zero	Terminator
6 chars	6 chars	6 chars	6 chars	6 chars	6 chars	6 chars	2 chars / 1 char

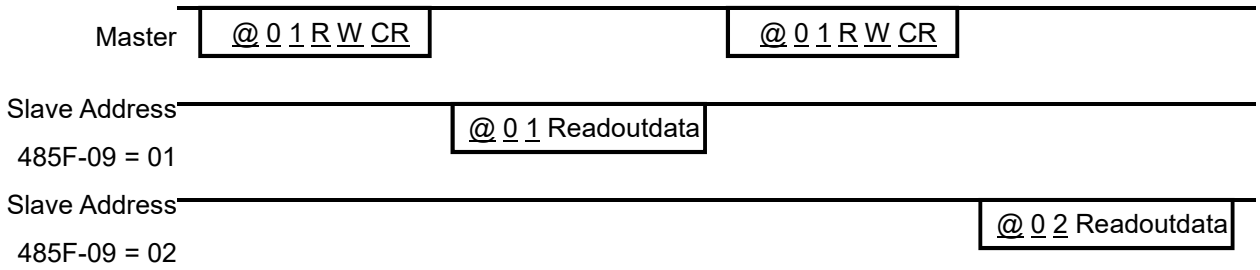
Check weighing 1/2/3/4: CALF-14 = 0

Target	Hi-Hi limit	Hi limit	Lo limit	Lo-Lo limit	-	Near zero	Terminator
6 chars	6 chars	6 chars	6 chars	6 chars	6 chars	6 chars	2 chars / 1 char

Item	Value (e.g. Unit = kg, Decimal point position = 0.000)	
Final weight / Target	0 2 0 0 0 0	20.000 kg
Free fall / Hi-Hi limit	0 0 0 1 0 0	0.100 kg
Preliminary / Hi limit	0 0 0 2 0 0	0.200 kg
Optional preliminary / Full / Lo limit	0 1 8 0 0 0	18.000 kg
Overweight / Lo-Lo limit	0 0 0 0 2 0	0.020 kg
Underweight / -	0 0 0 0 2 0	0.020 kg
Near-zero	0 0 0 2 0 0	0.200 kg

Multidrop connection

When a master and some AD-4421s are connected by a 1: n multidrop connection, a different slave address (485F-09) is assigned to each AD-4421. When the master sends a command by adding the slave address (@ 0 1 to @ 9 9) at the beginning, the AD-4421 with the matching slave address sends a response by adding the slave address (@ 0 1 to @ 9 9) at the beginning.



Communication diagram

Three communication diagrams are shown below.

Reading data

R W : Read weight data

R B : Read comparison result + gross value / net value

R F : Read net value at weighing end

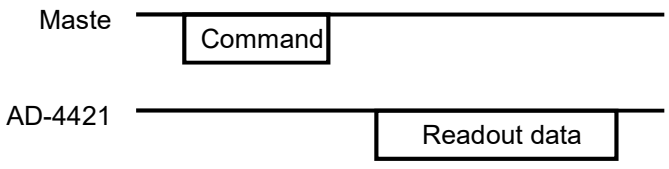
R T : Read total weight + number of accumulations

R S : Read setpoint values for the selected code memory

R S _ _ : Read setpoint values for the selected code memory

R S x x : Read setpoint value for the code memory specified by xx

When the command above is sent, the corresponding data is sent in response.



Function commands

M Z : Zero setting

M T : Tare

C T : Tare clear

D T : Total clear for the selected code memory

D T _ _ : Total clear for the selected code memory

D T x x : Total clear for the code memory specified by xx

E T : Total clear for all code memory

M G : Display gross value in the main display

M N : Display net value in the main display

B B : Weighing start

B D : Discharge start

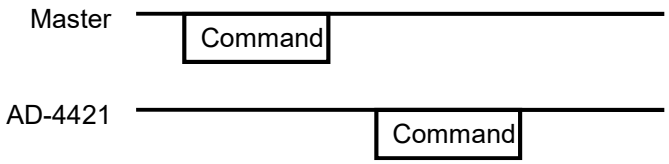
H B : Emergency stop

A M : Accumulation

C A : Undoing accumulation

C C x x : Change code memory specified by xx

When the command above is sent, the command is echoed back and is executed.

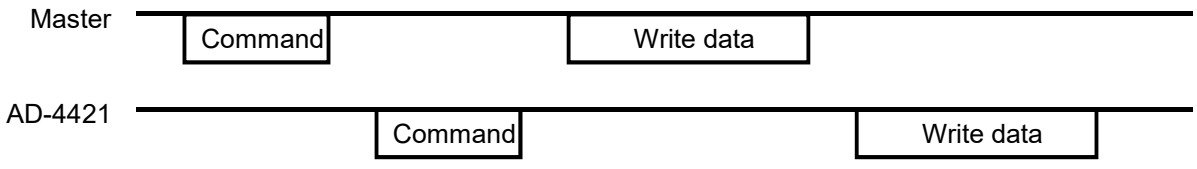


Writing setpoint values

S S : Write setpoint values for the selected code memory

S S _ _ : Write setpoint values for the selected code memory

C T x x : Write setpoint values for the code memory specified by xx



When the command above is sent, the command is echoed back.

Then, when setpoint data is sent, the data is echoed back and saved.

Error response

I E : Response to the mode that does not accept commands

V E : Response to data whose format is correct but whose value is out of range

? E : Response to illegal commands/formats

14.6.5. Format When Communication Type (485F-02) is 9 Modbus-RTU

When the communication type (485F-02) is set to 9: Modbus-RTU, communication settings are as the following.

Parity	Even
Character bit length	8 bits
Stop bit length	1 bit

Select a baud rate and a slave address from the following:

485F-	Item	Setting value	Default
03	Baud rate	5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 115200 bps	5
09	RS-485 slave address	1 to 99	0

Function code and maximum quantity

Code	Function name	Maximum quantity
01	Read coils	100
03	Read holding registers	100
05	Write single coil	1
06	Write single register	1
15	Write multiple coils	1
16	Write multiple registers	100

Data address

Data address	R/W	Item	Data address	R/W	Item
000001	R	Near-zero	000201	W *1	Zero setting
000002		Underweight	000202		Tare
000003		Overweight	000203		Weighing start
000004		Correct weight	000204		Emergency stop
000005		Large flow	000205		Discharge start
000006		Medium flow	000206		Manual free fall correction
000007		Small flow	000207		Tare clear
000008		Discharge	000208		Accumulation
000009		Weighing end	000209		Undoing accumulation
000010		Full	000210		Total clear
000011		Hi-Hi	000211		Manual print
000012		Hi	000212		Zero clear
000013		OK	000213		Display Gross
000014		Lo	000214		Display Net
000015		Lo-Lo	000215		Pause
000016		Stable	000216		Feeding restart
000017		Gross (0)/Net (1) display	000217		Forced weighing end
000018		In weighing sequence	000218		Forced discharge end
000019		Weighing sequence error	000219		Error clear
000020		Overload	000220		Manual correction flow
000021		When zero setting fails	000221-000300		Reserved internally
000022		When tare fails			
000023		Accumulations overflow			
000024-000100		Reserved internally			
000101-000200		Reserved internally	000301-000400	R/W	Reserved internally
			000401	W *1	Zero calibration
			000402		Span calibration *2
			000403-000500		Reserved internally

*1: When "1" is written, the operation is executed.

*2: Before span calibration, set CALF-23 Calibration weights at span calibration via Modbus (400145-400146).

Data address *1	R/W	Item
400001-400002	R	Displayed weight value
400003-400004		Gross value
400005-400006		Net value
400007-400008		Tare value
400009-400010		Status display *2
400011-400012		Reserved internally
400013-400014		Total weight *3
400015-400016		Number of accumulations *3
400017-400018		Gross value at weighing end
400019-400020		Net value at weighing end
400021-400022		Tare value at weighing end
400023-400024		Sequence number
400025-400026		Sequence error number
400027-400028		Average accumulation value *3
400029-400030		Standard deviation *3
400031-400032		Recently accumulation value *3
400033-400034		Maximum accumulation value *3
400035-400036		Minimum accumulation value *3
400037-400038		(Maximum - minimum) accumulation value *3
400039-400094		Reserved internally
400095-400096		Voltage ratio (nV/V)
400097-400098		Reserved internally
400099-400100		Reserved internally

*1: "Double Word" word order is low word first (L/H).

*2: For the detailed description, refer to the next page.

*3: The value is the code memory in the selection.

*2: Status display bit address

Data address	Item
400009.15-12	Reserved internally
400009.11	Lo-Lo
400009.10	Lo
400009.09	OK
400009.08	Hi
400009.07	Hi-Hi
400009.06	Full
400009.05	Small flow
400009.04	Medium flow
400009.03	Large flow
400009.02	Overweight
400009.01	Underweight
400009.00	Near-zero
400010.15-07	Reserved internally
400010.06	ZERO status
400010.05	STABLE status
400010.04	GROSS status
400010.03	NET status
400010.02	HOLD status
400010.01	FUNC (FncF-05) status
400010.00	ALARM status

Data address *1	R/W	Item
400101-400200	R/W	Calibration functions *2
400201-400202	R/W	Final weight *3
400203-400204		Free fall *3
400205-400206		Preliminary *3
400207-400208		Optional preliminary *3
400209-400210		Overweight *3
400211-400212		Underweight *3
400213-400214		Full *3
400215-400216		Near zero *3
400217-400298		Reserved internally
400299-400300		Selected code number
400301-400400	R/W	Basic functions *2
400401-400500	R/W	Weighing sequence functions *2
400501-400600	R/W	Control input functions *2
400601-400700	R/W	Control output functions *2
400701-400800	R/W	Standard serial output functions *2
400801-400900	R/W	BCD output functions *2
400901-401000	R/W	RS-485 functions *2
401001-401100	R/W	Reserved internally
401101-401200	R/W	Analog output functions *2
401201-401800	R/W	Reserved internally
401801-401900	R/W	Check weighing functions *2
401901-402000	R/W	RS functions *2
402001-410000	R/W	Reserved internally

*1: "Double Word" word order is low word first (L/H).

*2: Refer to "25.Function setting lists".

*3: The value is the code memory in the selection.

Message example 1

The following is an example reading contiguous data of the Gross Value (data address 400003~400004) and Net Value (data address 400005~400006) from the slave address 10 (485F-09 = 10).

Master -> Slave	0x0A 03 00 02 00 04 E4 B2	
Slave address	0x0A	Set 0x0A (= 485F-09: Slave address 10).
Function code	0x03	Set 0x03, which is a request to read the data address 400001~465535 (holding registers).
Starting data address	0x00 02	The Modbus protocol specifies that the starting data address be set to the value of the holding register data address minus 400001, so in this example set 0x0002 (= 400003 – 400001)
Read data points	0x00 04	In this example, set 0x04 to read 4 data from 400003 to 400006.
CRC	0xE4 B2	An error-checking field is based on a CRC method.

Slave -> Master	0x0A 03 08 86 9F 00 01 C3 4F 00 00 67 E3		
Slave address	0x0A	The slave address will be echoed back as is.	
Function code	0x03	The function code will be echoed back as is.	
Number of read data bytes	0x08	The number of read data bytes will be set.	
Data 1	0x86 9F	The data in 400003	The master can read the first 16-bit data as the low data of 32-bit value. In this example, the current gross value is 99999 (= 0x00 01 86 9F).
Data 2	0x00 01	The data in 400004	
Data 3	0xC3 4F	The data in 400005	In this example, the current net value is 49999 (= 0x00 00 C3 4F)
Data 4	0x00 00	The data in 400006	
CRC	0x67 E3	An error-checking field is based on a CRC method.	

Message example 2

The following is an example of executing a tare (data address 000202) for the slave address 10 (485F-09 = 10).

Master -> Slave	0x0A 05 00 C9 FF 00 5D 7F	
Slave address	0x0A	Set 0x0A (= 485F-09: Slave address 10).
Function code	0x05	Set 0x05, which is a request to write the data address 000001~065535 (coil).
Data address	0x00 C9	The Modbus protocol specifies that the starting data address be set to the value of the coil data address minus 000001, so set 0x00C9 (= 000202 – 000001).
Write data	0xFF 00	Set 0xFF 00 (= ON).
CRC	0x5D 7F	An error-checking field is based on a CRC method.

Slave -> Master	0x0A 05 00 C9 FF 00 5D 7F	
Slave address	0x0A	In this example, the send message will be echoed back as is.
Function code	0x05	
Data address	0x00 C9	
Write data	0xFF 00	
CRC	0x5D 7F	

15. USB

Backup of settings and logging of measurements can be performed from a PC via USB (virtual COM port) with WinCT4421. WinCT4421 can be downloaded from the A&D website (https://www.aandd.jp).
AD-4421 can be operated by USB bus power, but the USB circuit is not isolated, so a poor noise environment may affect the measurement performance.

15.1. Communication specification

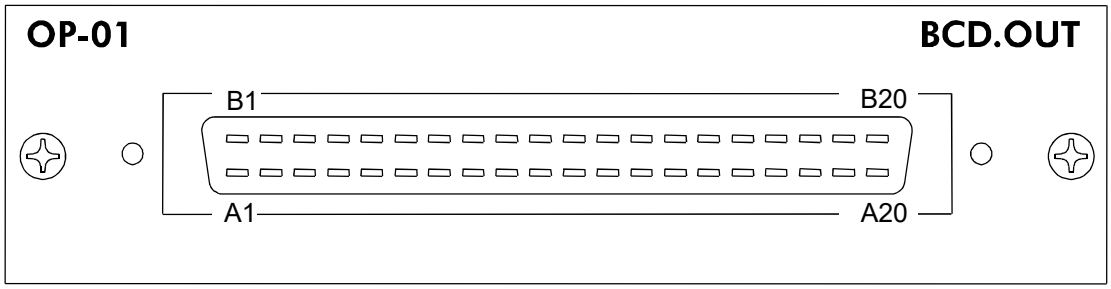
USB function is available in measurement mode.

USB Specification	Connector	Type-C
	Communication	USB 2.0 (Full-speed) virtual COM port
	Power	5V 3.0A at using bus power
Communication protocol		Modbus-RTU
Slave address		1
Baud rate		115200bps
Data length / Parity / Stop bit		8bits / None / 1bit

For Function code and its maximum quantity, the data address, refer to the data address in "14.6.5.Format When Communication Type (485F-02) is 9 Modbus-RTU"

16. AD4421-01 BCD OUTPUT

16.1. Pin Assignment

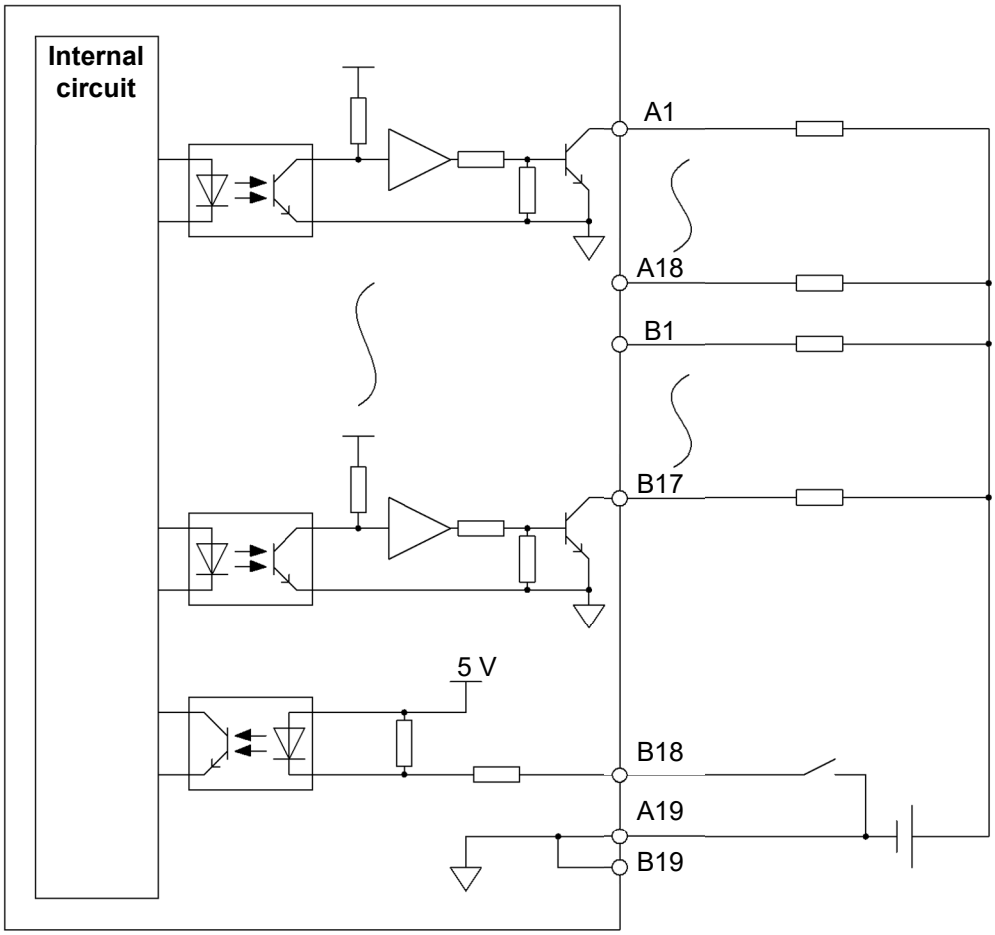


Connector for the BCD OUTPUT is provided with OPTION-01.

Pin No.	Description	Description	Pin No.
A1	1	2	B1
A2	4	8	B2
A3	10	20	B3
A4	40	80	B4
A5	100	200	B5
A6	400	800	B6
A7	1000	2000	B7
A8	4000	8000	B8
A9	10000	20000	B9
A10	40000	80000	B10
A11	100000	200000	B11
A12	400000	800000	B12
A13	OFF: Overload	ON: Positive OFF: Negative	B13
A14	ON: Stable	ON: Net value OFF: Gross or Tare value	B14
A15	Decimal point position		B15
A16	A15=ON, B15=ON, A16=ON, B16=ON: None A15=OFF, B15=ON, A16=ON, B16=ON: 0.0 A15=ON, B15=OFF, A16=ON, B16=ON: 0.00 A15=ON, B15=ON, A16=OFF, B16=ON: 0.000 A15=ON, B15=ON, A16=ON, B16=OFF: 0.0000		B16
A17	Unit A17=OFF, B17=OFF : None or kg A17=OFF, B17=ON : t A17=ON B17=OFF : lb or kN A17=ON, B17=ON : g or N		B17
A18	Strobe output	Hold input	B18
A19	Common	Common	B19
A20	Frame ground	Frame ground	B20

When the weight value is overloaded and the data output logic (bCdF-03) is set to negative logic (default), all of the output data is turned ON.

16.2. Connection Diagram



Data output, Strobe output

- Maximum load voltage: 30 VDC
- Maximum load current: 50 mA/point
- Voltage drop at ON: 1 V or less
- Leakage current at OFF: 0.1 mA or less

Hold input

- ON voltage: 1 V or less
- ON current: 3 mA or more
- OFF current: 1 mA or less

16.3. Data Output Timing

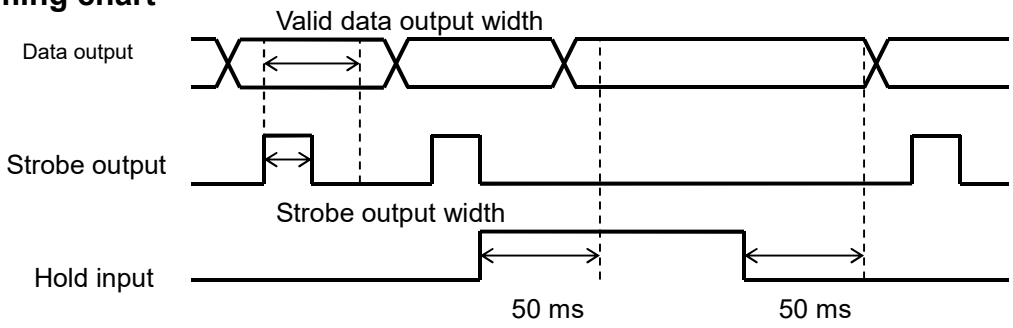
Select a data output timing (bCdF-02) from the following:

1: Interval output at the display update rate (FncF-03) (default)

2: In synchronization with automatic print

3: In synchronization with manual print

Timing chart



The valid data output width is twice the strobe output width. Read the data within the valid data output width.

The strobe output width depends on the display update rate (FncF-03).

Display update rate Strobe output width

- 20 times/s 20 ms
- 10 times/s 45 ms
- 5 times/s 95 ms

Update will stop within 50 ms after the hold input turns ON. Then, update will restart within 50 ms after the hold input turns OFF.

16.4. Data Output Logic and Strobe Output Logic

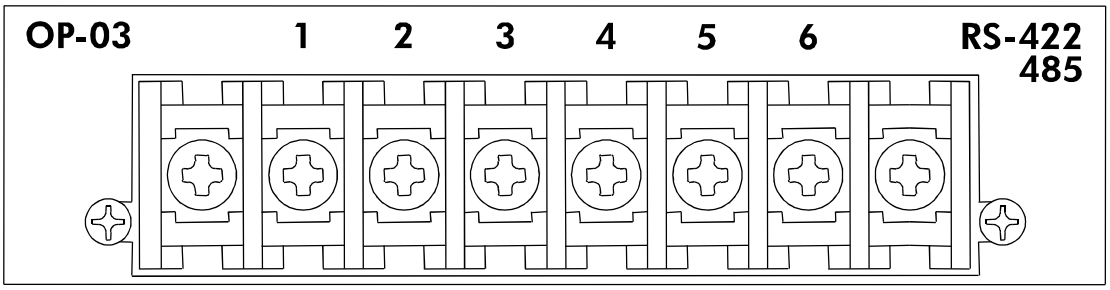
Select a data output logic (bCdF-03) and a strobe output logic (bCdF-04) from the following:

1: Positive logic

2: Negative logic (default)

17. AD4421-03 RS-422/485

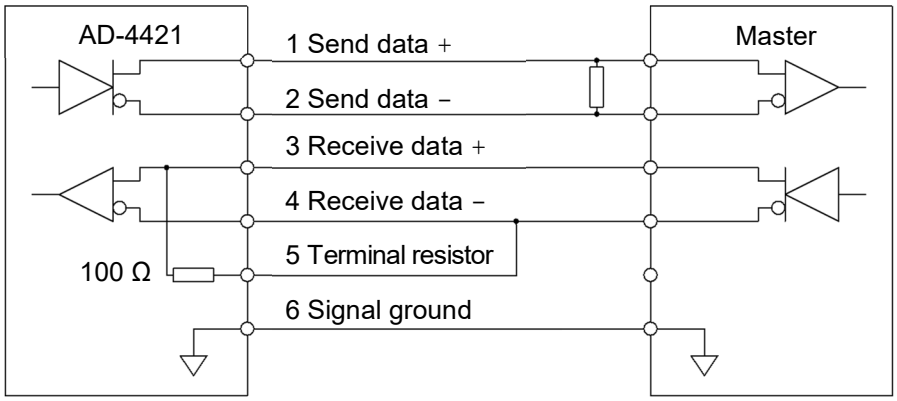
17.1. Terminal Assignment



Terminal No.	Description
1	Send data +
2	Send data −
3	Receive data +
4	Receive data −
5	Open-circuit: Disable the terminal resistor Short-circuited to No. 4 Enable the terminal resistor
6	Signal ground

17.2. Connection Diagram

17.2.1. RS-422

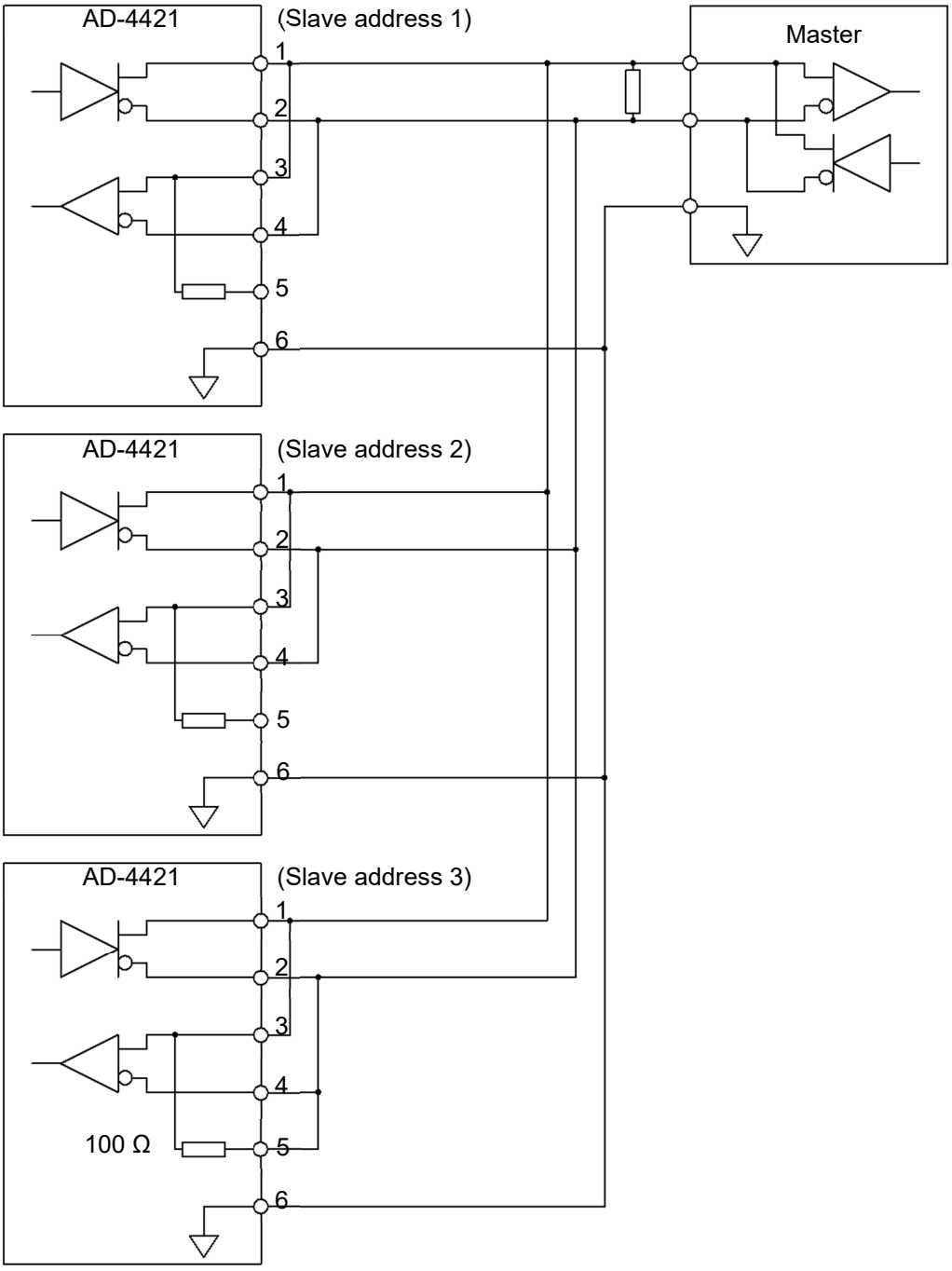


17.2.2. 2-wire RS-485

Short-circuit the terminals No.1 and No.3, and the terminals No.2 and No.4 as shown below.

Terminal resistors must be installed on both ends of the circuit.

When a multidrop connection is required, refer to “Multidrop connection” in “14.9. Format When Communication Type (rS F-02) is 4”.



17.3. Communication Specifications

Signal level (rS F-08, rS F-09)	RS-422/RS-485 compliant
Baud rate (rS F-03)	600, 1200, 2400, 4800, 9600, 19200, 38400, 115200 bps
Character bit length (rS F-05)	7, 8 bits
Parity (rS F-04)	None, Odd, Even
Start bit length	1 bit
Stop bit length (rS F-06)	1, 2 bits
Code	ASCII, Binary (for Modbus-RTU)
Terminator (rS F-07)	CR LF, CR

17.4. Output Data

Select an output data (rS F-01) from the following:

1: Displayed weight value (default)

2: Gross value

3: Net value

4: Tare value

5: Gross value + Net value + Tare value

6: Total weight

7: Number of accumulations

8: Total weight and number of accumulations

17.5. Communication Type

Select a communication type (rS F-02) from the following:

1: Interval output at the display update rate (FncF-03) (default)

2: In synchronization with automatic print

3: In synchronization with manual print

4: Write data or read setpoint values by commands from the master

5: Interval output of comparison result and gross value at 100 times/s.

6: Interval output of comparison result and net value at 100 times/s.

7: In synchronization with automatic/manual accumulation

8: Interval output at 100 times/s

9: Modbus-RTU

17.5.1. Format When Communication Type (rs F-02) is 1, 2, 3 or 7

Refer to "14.6.1.Format When Communication Type (485F-02) is 1, 2, 3 or 7".

17.5.2. Format When Communication Type (rs F-02) is 5 or 6

Refer to "14.6.2.Format When Communication Type (485F-02) is 5 or 6".

17.5.3. Format When Communication Type (rs F-02) is 8

Refer to "14.6.3.Format When Communication Type (485F-02) is 8".

17.5.4. Format When Communication Type (rs F-02) is 4

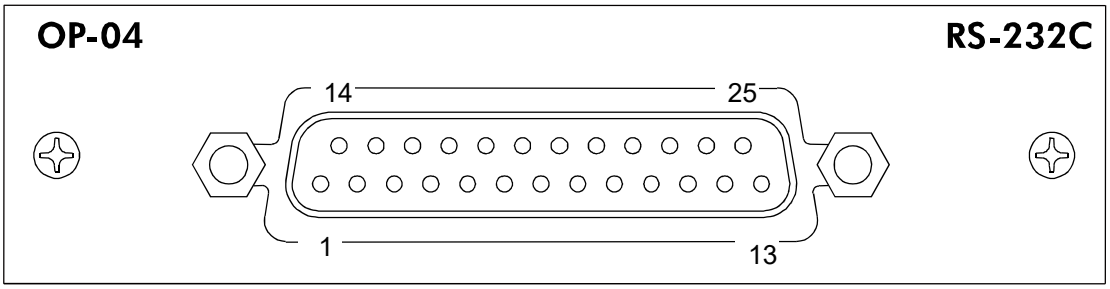
Refer to "14.6.4.Format When Communication Type (485F-02) is 4".

17.5.5. Format When Communication Type (rs F-02) is 9 Modbus-RTU

Refer to "14.6.5.Format When Communication Type (485F-02) is 9 Modbus-RTU".

18. AD4421-04 RS-232C

18.1. Pin Assignment



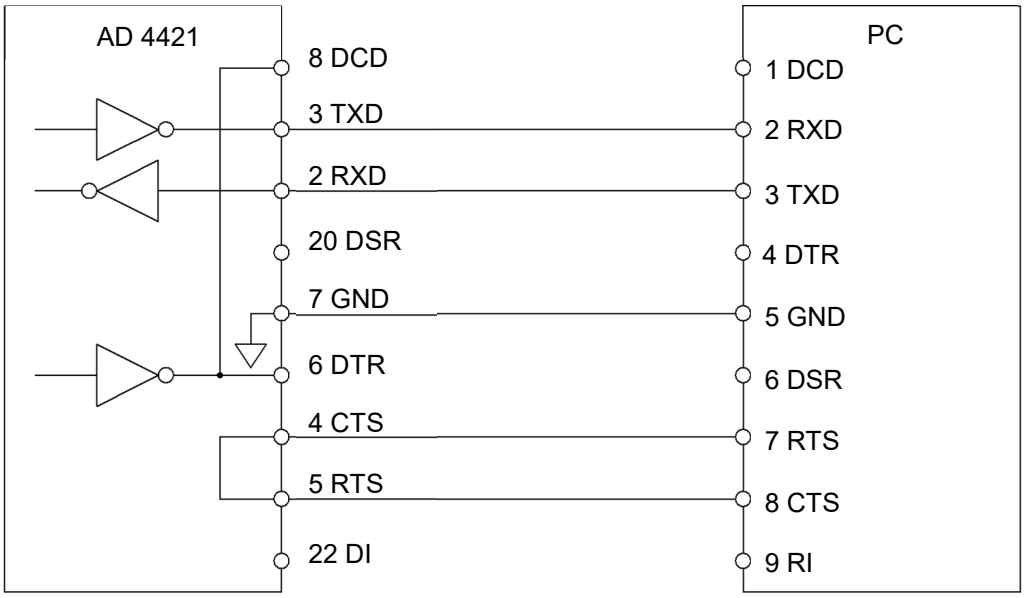
The applicable connector is a D-sub 25-pin male connector. The locking screw is M2.6.

The connector is not provided and must be prepared by the user.

Pin No.	Description
1	FG
2	RXD
3	TXD
4	CTS
5	RTS
6	DTR
7	GND
8	DCD
9 to 19	NC
20	DSR
21 to 25	NC

18.2. Connection Diagram

Connection to a PC serial port is as follows.



18.3. Communication Specifications

Signal Level	RS-232 compliant
Baud rate (rS F-03)	600, 1200, 2400, 4800, 9600, 19200, 38400, 115200 bps
Character bit length (rS F-05)	7, 8 bits
Parity (rS F-04)	None, Odd, Even
Start bit length	1 bit
Stop bit length (rS F-06)	1, 2 bits
Code	ASCII
Terminator (rS F-07)	CR LF, CR

18.4. Output Data

Refer to "17.4.Output Data".

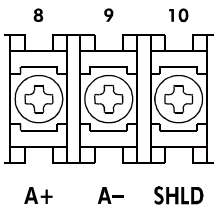
18.5. Communication Type

Refer to "17.5.Communication Type".

19. AD4421-07 ANALOG 4-20mA / 0-10V OUTPUT

19.1. Terminal Assignment

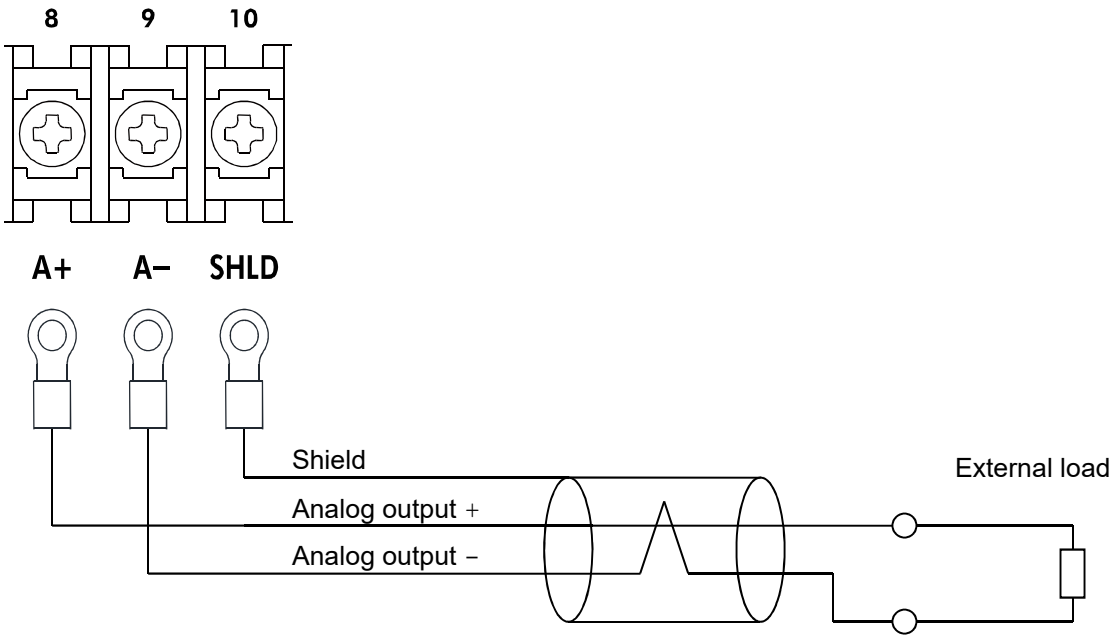
Terminal No.	Symbol	Description
8	A+	Analog output +
9	A−	Analog output −
10	SHLD	Frame ground



When the optional analog 4-20 mA / 0-10V output is not installed, the pins No.8 and No.9 are vacant.

Check the 07 column of the option list on the side of the indicator casing.

19.2. Connection Diagram



Applicable solderless terminal: R1.25-3

Applicable wire size: 0.3 to 0.75 mm^2. Use a 2-wire shielded twisted pair cable.

External load resistance: 600 Ω or less (for current output), 1kΩ or more (for voltage output)

19.3. Output Specifications

Analog current output	4 to 20 mA DC External load resistance: 600 Ω or less Maximum resolution: approx. 1/40000	
Analog voltage output	0 to 10 V DC External load resistance: 1kΩ or more Maximum resolution: approx. 1/29000	
Accuracy	±0.1%FS	
Offset drift temperature coefficient	Current output	±5ppm FSR/°C
	Voltage output	±3ppm FSR/°C
Gain drift temperature coefficient	Current output	±4ppm FSR/°C
	Voltage output	±3ppm FSR/°C
Conversion rate	1200 times/s	

19.4. Output Functions

Output type

Select an output type (An F-04) from the following:

1: Current output (default)

2: Voltage output

Output weight value

Select an output weight value (An F-01) from the following:

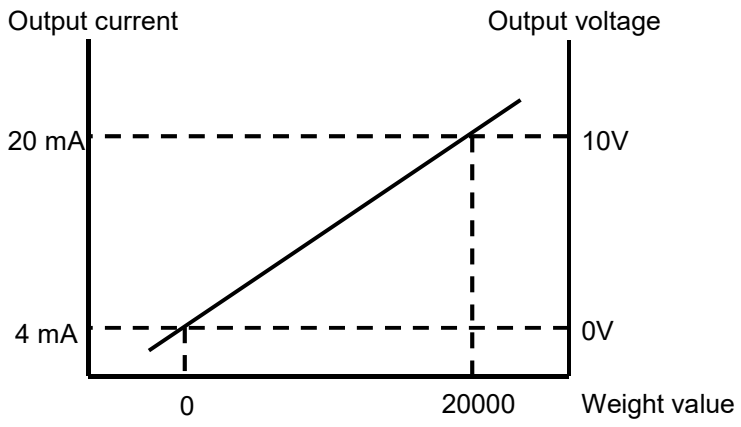
1: Displayed weight value (default)

2: Gross value

3: Net value

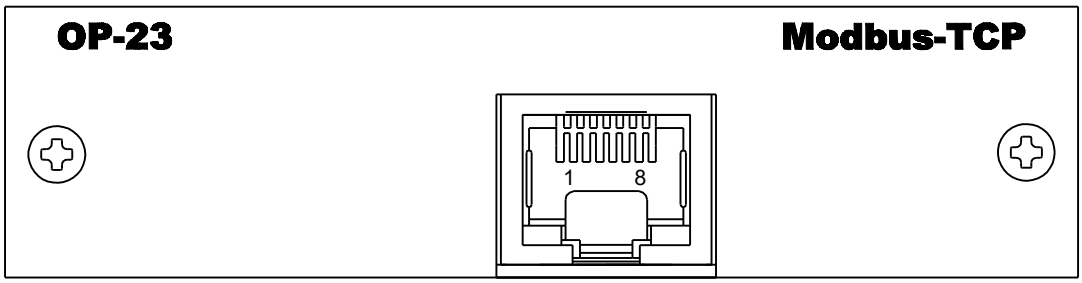
Output adjustment

Output characteristic is represented by the straight line obtained by connecting between the weight value at 4 mA / 0V output (An F-02) and the weight value at 20 mA / 10V output (An F-03).



20. AD4421-23 Modbus-TCP

20.1. Pin Assignment



The applicable connector is a RJ45.

The connector is not provided and must be prepared by the user.

Pin No.	Description（Fixed to MDI）
1	Send data +
2	Send data －
3	Receive data +
4	NC
5	NC
6	Receive data －
7	NC
8	NC

20.2. Communication Specifications

Ethernet standard	10Base-T/100Base-TX (Auto-negotiation)
Protocol	Modbus-TCP (Port 502、Unit ID 255）

20.3. IP Address、Subnet mast、Default gateway

Consult with the network administrator for the IP address, subnet mask, and default gateway setting.

EthF	Item	Setting Value	Default
01 02 03 04	IP address XXX. XXX. XXX. XXX	0.0.0.0 to 255.255.255.255	192.168.0.2
05 06 07 08	Subnet mask 255. 255. XXX. 0	Available only to 255.255.0.0 or 255.255.255.0	255.255.255.0
09 10 11 12	Default gateway XXX XXX. XXX. XXX	0.0.0.0 to 255.255.255.255	0.0.0.0

Refer to "14.6.5.Format When Communication Type (485F-02) is 9 Modbus-RTU"
for "Function code and maximum quantity" and "Data address".

●Message example 1

The following is an example reading contiguous data of the Gross Value (data address 400003~400004) and Net Value (data address 400005~400006).

Master -> Slave	0x00 00 00 00 00 06 FF 03 00 02 00 04	
Transaction ID	0x00 00	Used by the master for pairing of the response message from the slave. In this example, 0x00 00 is set.
Protocol ID	0x00 00	Set 0x00 00 in the case of Modbus-TCP.
Number of bytes	0x00 06	Set the number of bytes below the slave address. In this example, 0x00 06 is set.
Slave address (Unit ID)	0xFF	Used IP address to specify the device in the case of Modbus-TCP. Set 0xFF (=255). The setting value of rS F-09 is ignored.
Function code	0x03	Set 0x03, which is a request to read the data address 400001~465535 (holding registers).
Starting data address	0x00 02	The Modbus protocol specifies that the starting data address be set to the value of the holding register data address minus 400001, so in this example set 0x0002 (= 400003 – 400001).
Read data points	0x00 04	In this example, set 0x04 (=4 data) to read from 400003 to 400006.

Slave -> Master	0x00 00 00 00 00 0B FF 03 08 86 9F 00 01 C3 4F 00 00		
Transaction ID	0x00 00	The transaction ID will be echoed back as is.	
Protocol ID	0x00 00	The protocol ID will be echoed back as is.	
Number of bytes	0x00 0B	The number of bytes below the slave address is set. In this example, 0x00 0B (=11 bytes) is set.	
Slave address (Unit ID)	0xFF	The slave address will be echoed back as is.	
Function code	0x03	The function code will be echoed back as is.	
Number of read data bytes	0x08	The number of read data bytes will be set. In this example, 0x08 (=8 bytes) is set.	
Data 1	0x86 9F	The data in 400003	The master can read the first 16-bit data as the low data of 32-bit value. In this example, the current gross value is 99999 (= 0x00 01 86 9F).
Data 2	0x00 01	The data in 400004	
Data 3	0xC3 4F	The data in 400005	In this example, the current net value is 49999 (= 0x00 00 C3 4F)
Data 4	0x00 00	The data in 400006	

●Message example 2

The following is an example of executing a tare (data address 000202).

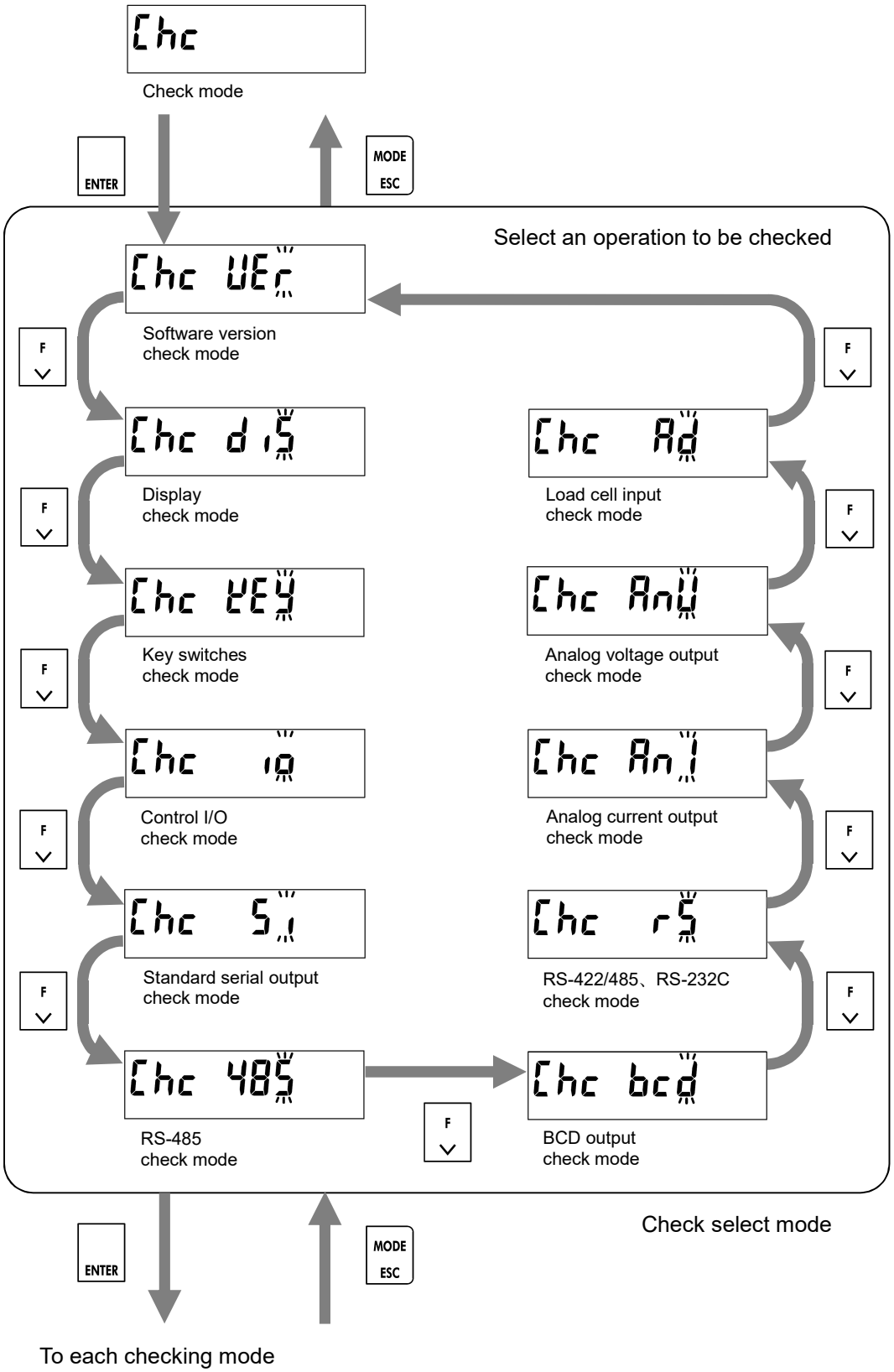
Master -> Slave	0x00 00 00 00 00 06 FF 05 00 C9 FF 00	
Transaction ID	0x00 00	Used by the master for pairing of the response message from the slave. In this example, 0x00 00 is set.
Protocol ID	0x00 00	Set 0x00 00 in the case of Modbus-TCP.
Number of bytes	0x00 06	Set the number of bytes below the slave address. In this example, 0x00 06 (=6 bytes) is set.
Slave address (Unit ID)	0xFF	Used IP address to specify the device in the case of Modbus-TCP. Set 0xFF (=255). The setting value of rS F-09 is ignored.
Function code	0x05	Set 0x05, which is a request to read the data address 000001~065535 (coil).
Data address	0x00 C9	The Modbus protocol specifies that the starting data address be set to the value of the coil data address minus 000001, so in this example set 0x00C9 (= 000202 – 000001).
Write data	0xFF 00	Set 0xFF 00 (= ON).

Slave -> Master	0x00 00 00 00 00 06 FF 05 FF 00	
Transaction ID	0x00 00	In this example, the send message will be echoed back as is.
Protocol ID	0x00 00	
Number of bytes	0x00 06	
Slave address (Unit ID)	0xFF	
Function code	0x05	
Data address	0x00 C9	
Write data	0xFF 00	

21. Checking software version / hardware

You can check the software version or that the hardware is operating properly in the check mode.

Move to "Check mode" by referring to "7.Operation mode". See below for the procedure in the check mode.

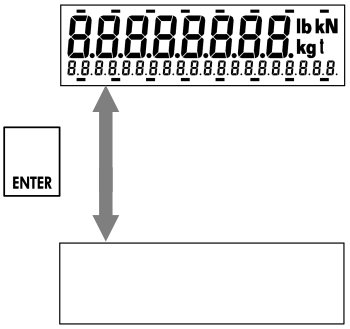


21.1. Checking software version

The AD-4421 software version is displayed in the sub-display.

21.2. Checking display

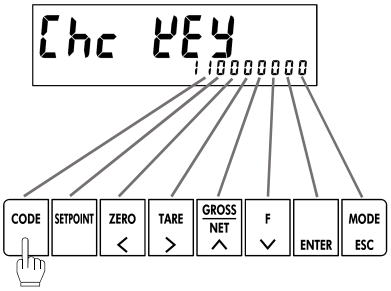
Press [ENTER] key to toggle all lights on/off.



21.3. Checking key switches

When a key switch is pressed,

"0" in the corresponding position turns to "1".



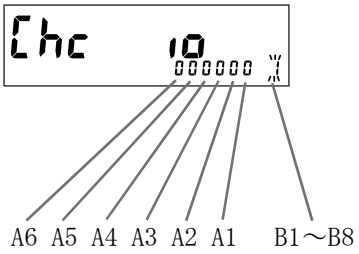
21.4. Checking Control I/O

When an input terminal is ON,

"0" in the corresponding position turns to "1".

When the [NET|GROSS / ↑] key or [F / ↓] key is pressed,

the corresponding pin No. of the control output B1 to B6 turns ON.

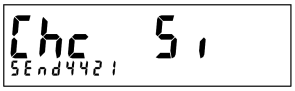


21.5. Checking standard serial output

When the [ENTER] key is pressed,

ST,GS,+0004421kg<CR><LF> is sent.

After sending, "Send4421" is displayed in the sub-display.



The communication specifications comply with

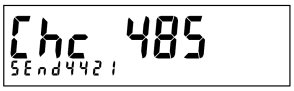
the standard serial output functions.

21.6. Checking RS-485

When the [ENTER] key is pressed,

ST,GS,+0004421kg<CR><LF> is sent.

After sending, "Send4421" is displayed in the sub-display.



When ST,GS,+0004421kg<CR><LF> is received,

"Get4421" is displayed in the sub display.

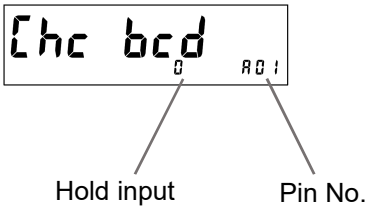
The communication specifications comply with the RS-485 functions.

21.7. Checking BCD output (AD4421-01)

When the hold input turns ON,

"0" turns to "1" and the output of the displayed pin No. turns ON.

Press the [NET|GROSS / ↑] key or Function key to switch pin Nos.



If the option is not connected,

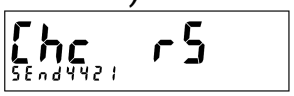
"no OP" is displayed in the sub-display.

21.8. Checking RS-422/485 (AD4421-03), RS-232C (AD4421-04)

When the [ENTER] key is pressed,

ST,GS,+0004421kg<CR><LF> is sent.

After sending, "Send4421" is displayed in the sub-display.



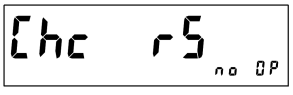
When ST,GS,+0004421kg<CR><LF> is received,

"Get4421" is displayed in the sub display.

The communication specifications comply with the RS functions.

If the option is not connected,

"no OP" is displayed in the sub-display.



21.9. Checking analog current output (AD4421-07)

The current value (mA) in the sub-display is output.
Press the [NET|GROSS / ↑] key or [F / ↓] key to
increase or decrease the current value.

If the option is not connected,
"no OP" is displayed in the sub-display.

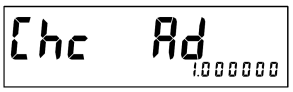
21.10. Checking analog voltage output (AD4421-07)

The voltage value (V) in the sub-display is output.
Press the [NET|GROSS / ↑] key or [F / ↓] key to
increase or decrease the current value.

If the option is not connected,
"no OP" is displayed in the sub-display.

21.11. Checking load cell input

The load cell signal voltage (mV/V) is displayed in the sub-display.



22. Troubleshooting

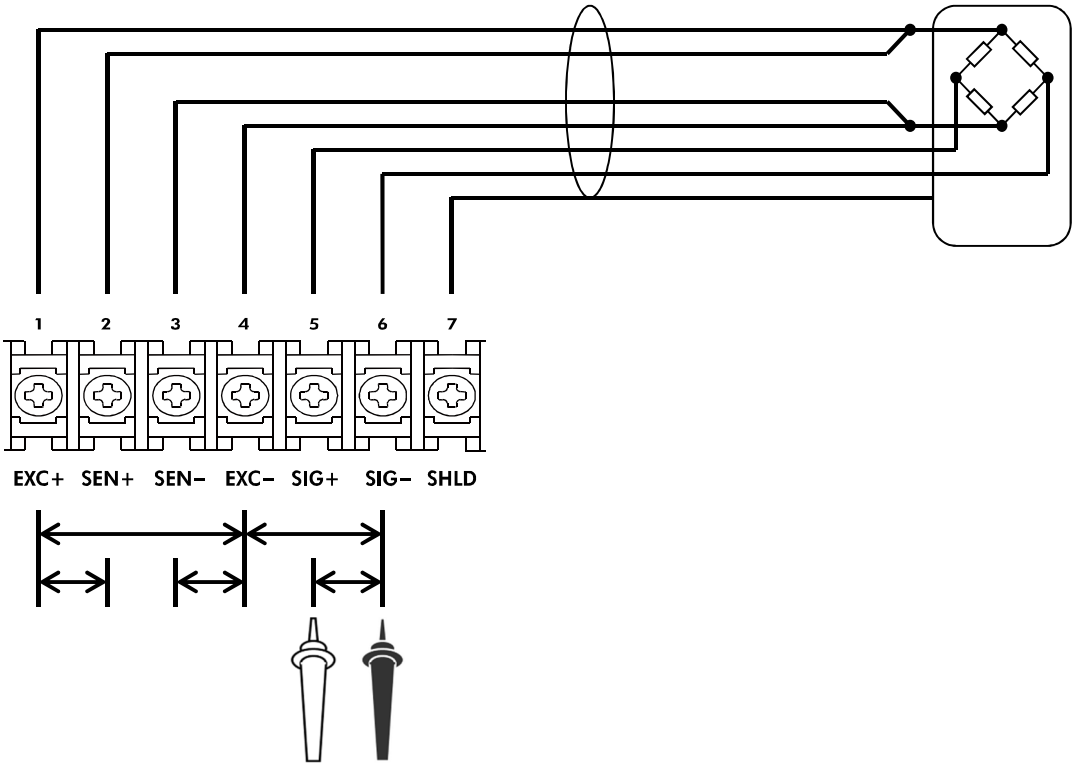
22.1. Hardware error

If the following error message is displayed after power-on, the product may be in failure. Please consult your local A&D representative.

Error code	Error description
ErrH01	A problem is detected with the memory on the main board.
ErrH02	A problem is detected with the AD converter on the main board.
ErrH03	A problem is detected with the network module on the field network board.

22.2. Checking the connection to load cell with using a multimeter

If the load cell signal is not converted correctly, measure and check the voltage between the following points with a digital multimeter.



Measurement point		Item to be measured	Judging
EXC+	EXC-	Load cell power supply voltage	Normally 5±0.25V.
SIG+	SIG-	Load cell signal voltage	Normally 100 mV or less.
EXC+	SEN+	EXC+ voltage drop by load cell cable	Normally 0.2 V or less. The value may exceed 2 V when a long cable is used. For the 4-wire connection, it is 0 V.
EXC-	SEN-	EXC- voltage drop by load cell cable	Normally 0.2 V or less. The value may exceed 2 V when a long cable is used. For the 4-wire connection, it is 0 V.
SIG-	EXC-	Load cell middle point voltage	Normally 2.5 V, half of the load cell excitation voltage.

22.3. Check list

If AD-4421 does not operate properly, please fill in the following table and consult your local A&D representative.

Checking item			Example
Serial No.			S/N 3C9700101
Weighed product			plastic pellet, livestock feed
Capacity of the instrument			20.00kg
minimum division of the instrument			0.01kg
Initial load on the instrument			30kg
Load cell connection type	6-wire / 4-wire		6-wire
Length of the extension load cell cable		m	Approx. 100m
Cross section of the load cell cable		mm^2	$0.5mm^2$
Number of load cells connected			3 units
Summing box	Used / Not used		Used
Load cell model number and manufacturer			LC4221-K050(A&D)
Load cell rated capacity			50.99kg
Load cell rated output		mV/V	2.0394mV/V
Load cell input resistance		Ω	400 Ω
Load cell output resistance		Ω	350 Ω
Load cell output at initial load *1		mV	approx. 2.000mV
Load cell output at capacity or any load. *1	at	 mV	at 20.00kg approx. 3.332mV
Field network	Connected to		PLC

*1 Please refer to "22.2.Checking the connection to load cell with using a multimeter".

Digital multimeter measurement value

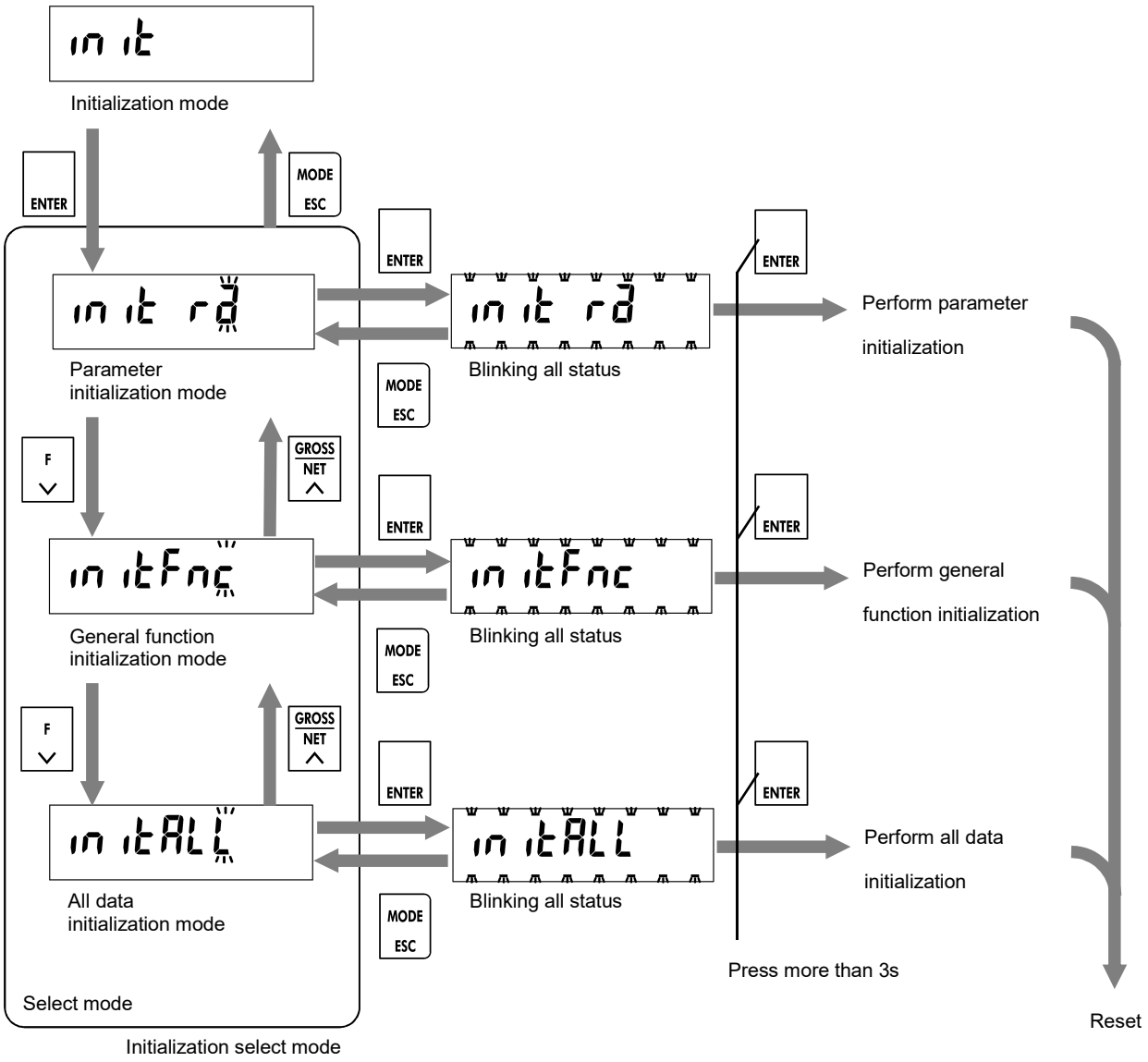
Measurement points		Measurement value	
EXC+	EXC-		V
SIG+	SIG-		mV
EXC+	SEN+		V
EXC-	SEN-		V
SIG-	EXC-		V

23. Initialization

You can initialize the internal values to their factory defaults in the initialization mode, if necessary.
The initialization has three types, each affecting a different area. Please note that if all data is initialized, you will have to calibrate AD-4421 again.

Initialization type	Initialization area		
	Zero-setting value, Tare value, Gross / Net display state	General function	Calibration function, Codememory
Parameter initialization	✓		
General function initialization	✓	✓	
All data initialization	✓	✓	✓

Move to the initialization mode by referring to "7.Operation mode". See below for the procedure in the initialization mode.



24. Setting functions

Functions for AD-4421 are classified as follows.

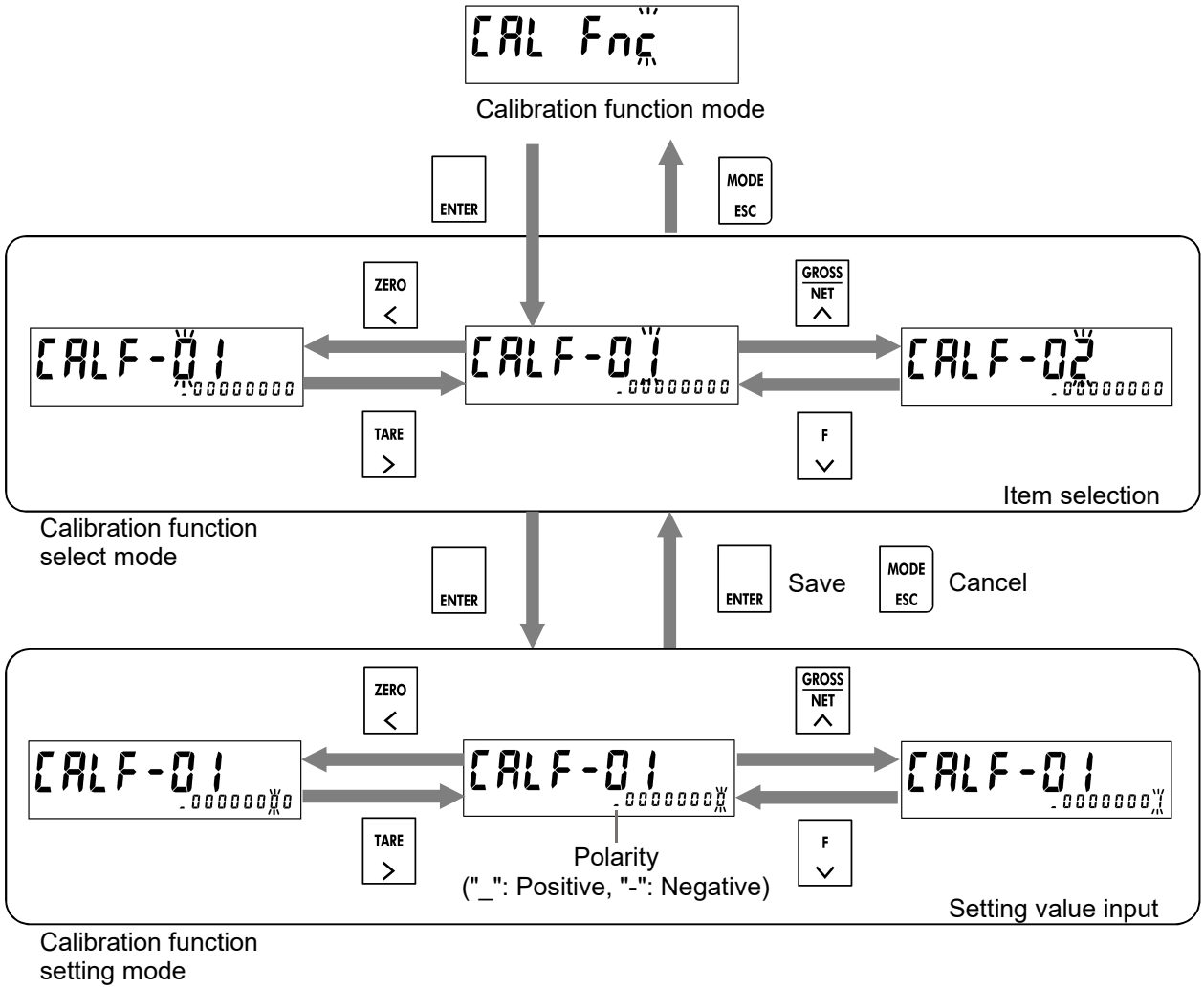
To change a setting value, move to the classification where that setting value is found.

Function name		Description
Calibration function		The setting values related legally relevant parameters, when AD-4421 is used for legally relevant purposes
General function	Basic function	The setting values related the measurement functions.
	Weighing sequence function	The setting values related the weighing sequence.
	Control input function	The setting values related the control inputs.
	Control output function	The setting values related the control outputs.
	Standard serial output function	The setting values related the standard serial output.
	RS-485 function	The setting values related the RS-485.
	Check weighing function	The setting values related the check weighing.
	BCD output function	The setting values related the BCD output.
	RS function	The setting values related the RS-422/485, RS-232C.
	Analog output function	The setting values related the analog 4-20mA/0-10V output.
	Modbus-TCP function	The setting values related the Modbus-TCP.

24.1. Setting calibration function

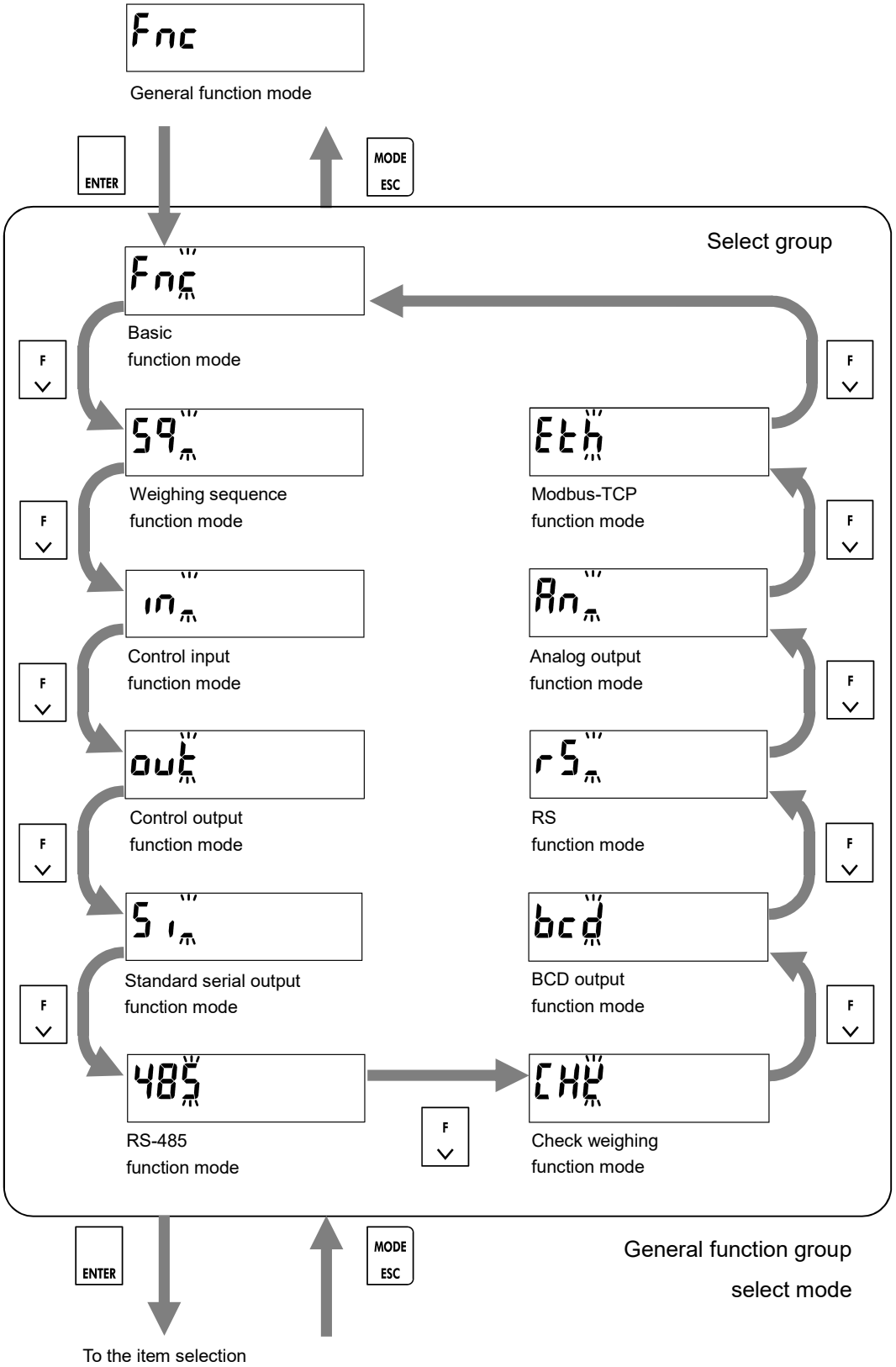
Move to "Calibration function mode" by referring to "7.Operation mode". The following explains how to change the setting value.

Item selection		
	[ZERO / ←] key	Shifts the blinking digit to the left.
	[TARE / →] key	Shifts the blinking digit to the right.
	[GROSS|NET / ↑] key	Increases the blinking digit by one.
	[F / ↓] key	Decreases the blinking digit by one.
	[ENTER] key	Selects the displayed item and enter the setting value input.
	[MODE/ESC] key	Return to the mode selection.
Setting value input		
	[ZERO / ←] key	Shifts the blinking digit to the left.
	[TARE / →] key	Shifts the blinking digit to the right.
	[GROSS|NET / ↑] key	Increases the blinking digit by one. The left most digit changes the polarity of the setting value. Under bar means positive. Hyphen means negative.
	[F / ↓] key	Decreases the blinking digit by one. The left most digit changes the polarity of the setting value. Under bar means positive. Hyphen means negative.
	[ENTER] key	Saves the inputted setting value and return to the item selection.
	[MODE / ESC] key	Cancels the inputted setting value and return to the item selection.



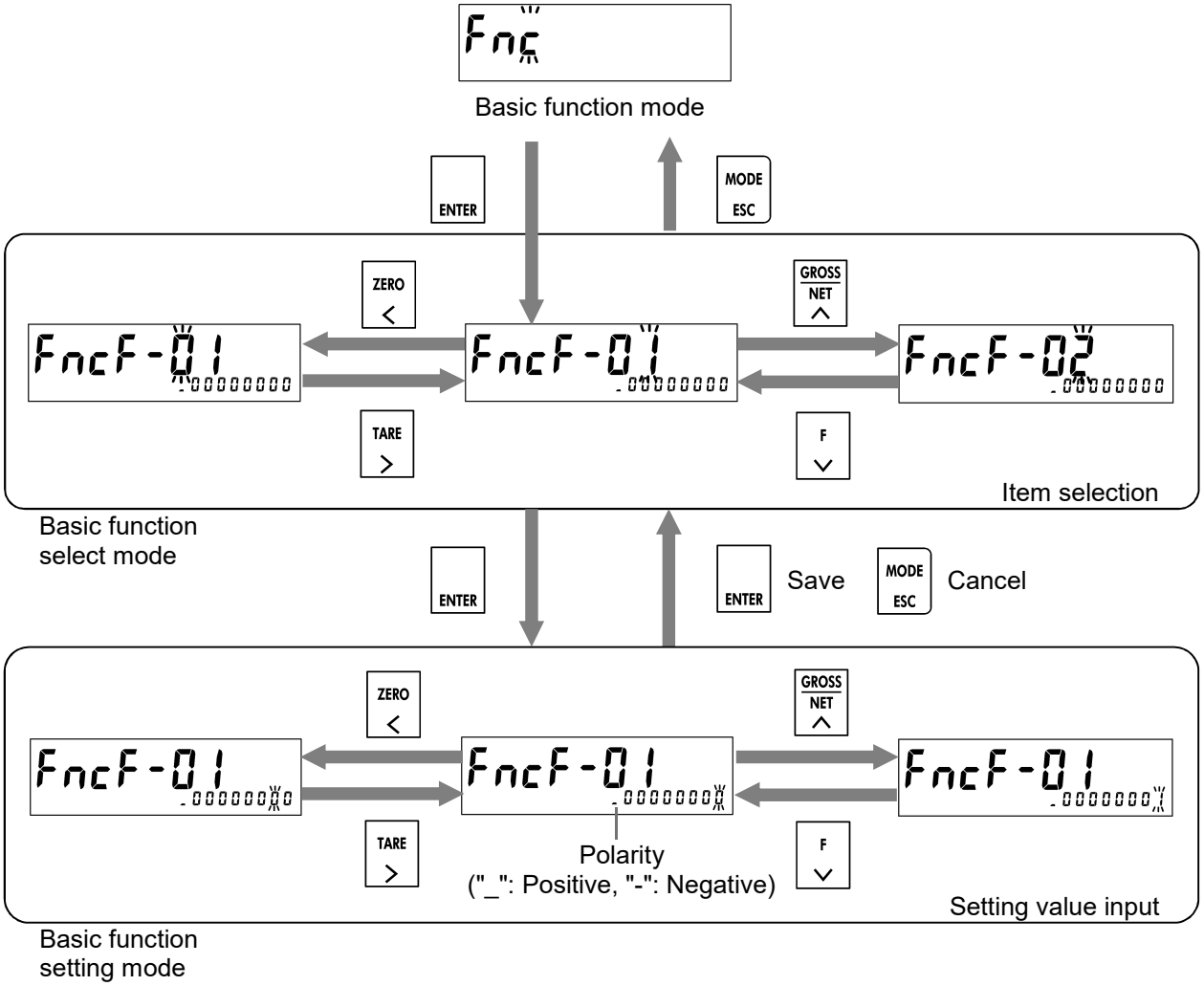
24.2. Setting general functions

Move to "General function mode" by referring to "7.Operation mode". The general functions are according to their functions. The following explains how to select a group.



The following explains how to change the setting value.

Item selection		
	[ZERO/←] key	Shifts the blinking digit to the left.
	[TARE/↑] key	Increases the blinking digit by one.
	[F1/↓] key	Decreases the blinking digit by one.
	[F2/ENTER] key	Selects the displayed item and enter the setting value input.
	[MODE/ESC] key	Return to the mode selection.
Setting value input		
	[ZERO/←] key	Shifts the blinking digit to the left.
	[TARE/↑] key	Increases the blinking digit by one. The left most digit changes the polarity of the setting value. Under bar means positive. Hyphen means negative.
	[F1/↓] key	Decreases the blinking digit by one. The left most digit changes the polarity of the setting value. Under bar means positive. Hyphen means negative.
	[F2/ENTER] key	Saves the inputted setting value and return to the item selection.
	[MODE/ESC] key	Cancels the inputted setting value and return to the item selection.



25. Function setting lists

Each column of the function setting lists in this chapter has the following meaning.

CALF-	Modbus	Setting Item	Setting value	Default	User Setting
01	400101	Unit	0: None 1: g 2: kg 3: t 4: lb 5: N 6: kN	2	
(1)	(2)	(3)	(4)	(5)	(6)

(1) is the function number in the item selection of function mode.

(2) is the first data address to be accessed via Modbus-RTU / Modbus-TCP. All data types are DWORD.

(3) is the setting Item Name.

(4) are the setting values and what the values mean.

(5) is the factory default value. It will return to this value after initialization.

(6) is a note column for when the setting value is changed by you.

25.1. Calibration function list

CALF-	Modbus	Setting Item	Setting value	Default	User Setting
01	400101	Unit	0: None 1: g 2: kg 3: t 4: lb 5: N 6: kN	2	
02	400103	Decimal point position	0: 0 (No decimal point) 1: 0.0 2: 0.00 3: 0.000 4:0.0000	0	
03	400105	Minimum division d	1: 1 d 2: 2 d 3: 5 d 4: 10 d 5: 20 d 6: 50 d	1	
04	400107	Maximum capacity	1 to 999999	20000	
05	400109	Zero setting range	0 to 100 %	2	
06	400111	Zero tracking time	0.0 to 9.9 s	0.0	
07	400113	Zero tracking width	0: Disabled 1: 0.5 d 2: 1.0 d 3: 1.5 d 4: 2.0 d 5: 2.5 d 6: 3.0 d 7: 3.5 d 8: 4.0 d 9: 4.5 d	0	
08	400115	Stability detection time	0.0 to 9.9 s	1.0	
09	400117	Stability detection width	0 to 100 d	2	
10	400119	Tare and zero setting at unstable weight	0: Disabled / 1: Enabled	1	
11	400121	Tare at negative gross value	0: Disabled / 1: Enabled	1	
12	400123	Standard serial output, when the weight value is overload or unstable	0: Disabled / 1: Enabled	1	
13	400125	BCD, RS-422/485, RS-232C output, when the weight value is overload or unstable.	0: Disabled / 1: Enabled	1	
14	400127	Batch weighing mode	0: None 1: Simple comparison normal batching 2: Simple comparison loss-in-weight batching 3: Normal batching 4: Loss-in-weight batching	3	

CALF-	Modbus	Setting Item	Setting value	Default	User Setting
15	400129	Load cell signal voltage at zero calibration	-7.000000 to 7.000000	0.000000	
16	400131	(Load cell signal voltage at span calibration - CALF-15) x CALF-17/Calibration weight value at span calibration	0.000001 to 7.000000	2.000000	
17	400133	Maximum capacity at span calibration	0 to 999999	20000	
18	400135	Symbol used for header 2 of standard serial output	1: GS / NT / TR 2: G / N / T	1	
19	400137	Symbol used for header 2 of RS-232C or RS-422/485	1: GS / NT / TR 2: G / N / T	1	
20	400139	Automatic zero setting upon power-on. Zero setting range is ±10% of the maximum capacity.	0: Disabled / 1: Enabled	0	
21	400141	Zero clear	0: Disabled / 1: Enabled	1	
22	400143	Reserved internally			
23	400145	Calibration weights at span calibration via Modbus	0 to 999999	20000	
24	400147	Condition of negative overload	0: Gross < -(Maximum capacity + 8d) 1: Gross < -19d	0	
25	400149	NTEP	0: Disabled / 1: Enabled	0	
26	400151	Load cell connection type (*1)	0: 4-wire type / 1: 6-wire type	1	
27	400153	When operating loss-in-weight batching mode, reverse polarity of the net value	0: Disabled / 1: Enabled	0	

*1: The instrument must be rebooted after changing the setting value via Modbus or USB.

25.2. Basic function list

FncF-	Modbus	Setting Item	Setting value	Default	User Setting
01	400301	Key lock in the normal mode	00000000: All keys unlock 10000000: CODE key lock 01000000: SETPOINT key lock 00100000: ZERO key lock 00010000: TARE key lock 00001000: NET/GROSS key lock 00000100: Function key lock 00000010: ENTER key lock	00000000	
02	400303	Function of Function key	0: None 1: Manual print 2: Hold 3: Weighing start 4: Emergency stop 5: Zero clear 6: Tare clear 7: Total clear 8: Reserved internally 9: Feeding restart 10: Discharge start 11: Forced weighing end 12: Forced discharge end 13: Error clear 14: Manual correction flow 15: Normal/Loss-in-weight batching selection 16: Accumulation 17: Undoing accumulation 18: High resolution display 19: Total clear of all code memory	0	
03	400305	Display update rate	1: 20 times/s 2: 10 times/s 3: 5 times/s	1	

FncF-	Modbus	Setting Item	Setting value	Default	User Setting
04	400307	Function of sub-display	0: None 1: Gross value 2: Net value 3: Tare value 4: Code number + Final weight 5: Code number + Total weight 6: Code number + Number of accumulations 7: Code number + Weighing sequence number + Weighing sequence error number 8: Code number + Final weight + Free fall 9: Code number + Overweight + Underweight 10: Code number + Number of accumulations + Total weight 11: Code number + Average accumulation value + Standard deviation 12: Code number + Maximum accumulation value + Minimum accumulation value 13: Comparison result	0	
05	400309	Condition to turn the FUNC status ON	0: None 1: During discharge 2: When zero tracking is enabled 3: In weighing sequence 4: Normal batching (/ loss-in-weight batching) 5: When reverses the polarity of the net value	0	
06	400311	Digital filter cut-off frequency [Hz]	0: 273.0 1: 120.0 2: 100.0 3: 84.0 4: 70.0 5: 68.0 6: 56.0 7: 48.0 8: 40.0 9: 34.0 10: 28.0 11: 24.0 12: 20.0 13: 17.0 14: 14.0 15: 12.0 16: 10.0 17: 8.4 18: 7.0 19: 6.8 20: 5.6 21: 4.8 22: 4.0 23: 3.4 24: 2.8 25: 2.4 26: 2.0 27: 1.7 28: 1.4 29: 1.2 30: 1.0 31: 0.84 32: 0.70 33: 0.68 34: 0.56 35: 0.48 36: 0.40 37: 0.34 38: 0.28 39: 0.24 40: 0.20 41: 0.17 42: 0.14 43: 0.12 44: 0.10 45: 0.08 46: 0.07	30	

FncF-	Modbus	Setting Item	Setting value	Default	User Setting
07	400313	Reserved internally			
08	400315	Hold function	1: Normal hold 2: Peak hold	1	
09	400317	Check weighing stop at hold	0: Disabled / 1: Enabled	0	
10	400319	Condition to turn the ALARM status ON	00000000: None 00000001: Overload 00000010: Accumulations overflow 00000100: Zero setting error 00001000: Tare error 00010000: Weighing sequence error	00000111	
11	400321	Condition of accumulations overflow	0: None 1: |Total weight| > Maximum total weight 2: Number of accumulation > Maximum number of accumulation	0	
12	400323	Maximum total weight	0 to 99999999	99999999	
13	400325	Maximum number of accumulations	0 to 999999	999999	

25.3. Weighing sequence function list

Sq F-	Modbus	Setting Item	Setting value	Default	User Setting
01	400401	Comparison target	1: Internal value 2: Displayed weight value	1	
02	400403	Automatic accumulation condition	0: Disabled 1: OK only 2: Regardless of the judgment result	0	
03	400405	Automatic free fall correction	0: Disabled 1: Moving average of last four weighings	0	
04	400407	Automatic free fall correction range	0 to 999999	0	
05	400409	Minimum small flow time for the automatic free fall correction	0.0 to 30.0 s	3.0	
06	400411	OK / Over / Under output timing	1: Always 2: In synchronization with weighing end	2	
07	400413	Wait for the weight value to be stable before the judgment	0: Disabled / 1: Enabled	1	
08	400415	Maximum number of correction flow	0: Disable correction flow 1 to 300	0	
09	400417	Weighing start input delay time	0.0 to 30.0 s	0.0	
10	400419	Large flow comparison disable time	0.0 to 30.0 s	0.0	
11	400421	Medium flow comparison disable time	0.0 to 30.0 s	0.0	
12	400423	Small flow comparison disable time	0.0 to 30.0 s	0.0	
13	400425	Judging delay time	0.1 to 30.0 s	0.1	
14	400427	Weighing end output time	0.0: Until the next weighing start 0.1 to 30.0 s	0.0	
15	400429	Flow timeout time	0: None 1: 1 to 86400 s	0	
16	400431	Correction flow ON time	0.01 to 3.00 s	0.10	
17	400433	Correction flow OFF time	0.1 to 30.0 s	0.1	
18	400435	Discharge start input delay time	0.0 to 30.0 s	0.0	
19	400437	Discharge end delay time	0.1 to 30.0 s	0.1	
20	400439	Discharge timeout time	0: None 1: 1 to 86400 s	0	
21	400441	Add the final weight to the near-zero setpoint value	0: Disabled / 1: Enabled	0	
22	400443	Add the final weight to the full setpoint value	0: Disabled / 1: Enabled	0	
23	400445	Reserved internally			
24	400447	Simple comparison large/medium/small flow output logic	1: Negative logic 2: Positive logic	1	

Sq F-	Modbus	Setting Item	Setting value	Default	User Setting
25	400449	Normal /loss-in-weight batching selection by the control input or function key	0: Disabled / 1: Enabled	0	
26	400451	Comparison target for the near-zero value	1: Gross value 2: |Gross value| 3: Net value 4: |Net value|	1	
27	400453	Comparison target excluding the near-zero and full values	1: Gross value 2: Net value	2	
28	400455	Automatic tare at weighing start	0: Disabled / 1: Enabled	0	
29	400457	Checking near zero at weighing start	0: Disabled / 1: Enabled	0	
30	400459	Automatic discharge start at weighing end	0: Disabled 1: OK only 2: Regardless of the judgment result	0	

25.4. Control input function list

in F-	Modbus	Setting Item	Setting value	Default	User Setting
01	400501	Control input 1 function	0: None 1: Zero setting 2: Tare 3: Weighing start 4: ON = Emergency stop / OFF = Release 5: Discharge start 6: ON=Disabled / OFF=Enable key lock (FncF-01) 7: Manual free fall correction 8: Reserved internally 9: Tare clear 10: Accumulation 11: Undoing accumulation 12: Total clear 13: ON = Hold / OFF = Release 14: Manual print 15: Zero clear 16: Gross value display 17: Net value display 18: ON=Display gross value OFF=Display net value 19: Feeding restart 20: Pause 21: Forced weighing end 22: Forced discharge end 23: Error clear 24: ON=Select loss-in-weight batching OFF=Select normal batching 25: Manual correction flow (One-shot small flow) 26: ON=Checking weighing start OFF=Checking weighing stop 27: Total clear of all code memory	1	
02	400503	Control input 2 function		2	
03	400505	Control input 3 function		3	
04	400507	Control input 4 function		4	
05	400509	Control input 5 function		5	
06	400511	Control input 6 function		6	

25.5. Control output function list

outF-	Modbus	Setting Item	Setting value	Default	User Setting
01	400601	Condition to turn control output 1 ON	0: None 1: Near-zero 2: Underweight 3: Overweight 4: Large flow 5: Medium flow 6: Small flow 7: Discharge 8: Weighing end 9: Stable 10: In the normal mode 11: In weighing sequence 12: Weighing sequence error 13: 0.5 s after detecting a rise edge of the control input 14: When zero setting fails 15: Overload 16: Reserved internally 17: When tare fails 18: When zero setting or tare fails 19: Total weight / number of accumulations overflow 20: When the judgment result is OK 21: Hold 22: ON = loss-in-weight batching / Off = Normal batching 23: Full 24: Hi-Hi 25: Hi 26: OK 27: Lo 28: Lo-Lo	1	
02	400603	Condition to turn control output 2 ON		2	
03	400605	Condition to turn control output 3 ON		3	
04	400607	Condition to turn control output 4 ON		4	
05	400609	Condition to turn control output 5 ON		5	
06	400611	Condition to turn control output 6 ON		6	
07	400613	Condition to turn control output 7 ON		7	
08	400615	Condition to turn control output 8 ON		8	

25.6. Standard serial output function list

Si F-	Modbus	Setting Item	Setting value	Default	User Setting
01	400701	Output weight value	1: Displayed weight value 2: Gross value 3: Net value 4: Tare value 5: Gross value + Net value + Tare value 6: Total weight 7: Number of accumulations 8: Total weight + number of accumulations	1	
02	400703	Communication type	1: Interval output at the display update rate (FncF-03) 2: In synchronization with automatic print 3: In synchronization with manual print 4: In synchronization with automatic / manual accumulation	1	
03	400705	Baud rate	1: 600 bps 2: 2400 bps	2	
04	400707	Standard serial output slave address	0: None 1 to 99	0	
05	400709	Code number output	0: Disabled / 1: Enabled	0	

25.7. RS-485 function list

485F-	Modbus	Setting Item	Setting value	Default	User Setting
01	400901	Output weight value	1: Displayed weight value 2: Gross value 3: Net value 4: Tare value 5: Gross value + Net value + Tare value 6: Total weight 7: Number of accumulations 8: Total weight + number of accumulations		
02	400903	Communication type	1: Interval output at the display update rate (FncF-03) 2: In synchronization with automatic print 3: In synchronization with manual print 4: Response to command 5: Interval output of comparison result and gross value at 100 times/s 6: Interval output of comparison result and net value at 100 times/s. 7: In synchronization with automatic/manual accumulation 8: Interval output at 100 times/s 9: Modbus-RTU	1	
03	400905	Baud rate	1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 115200 bps	5	
04	400907	Parity (*1)	0: None 1: Odd 2: Even	2	
05	400909	Character bit length (*1)	7: 7 bits 8: 8 bits	7	
06	400911	Stop bit length	1: 1 bit 2: 2 bits	1	
07	400913	Terminator	1:CR 2:CR LF	2	
08	400915	Reserved internally			
09	400917	RS-485 slave address	0: None 1 to 99	0	
10	400919	Command Response delay time	0.00 to 3.00 s	0.06	
11	400921	Code number output	0: Disabled / 1: Enabled	0	

*1: Cannot operate with parity = none and character bit length = 7 bits.

When set as such, it operates with parity = none and character bit length = 8 bits.

25.8. Check weighing function list

CHKF-	Modbus	Setting Item	Setting value	Default	User Setting
01	401801	Check weighing mode	0: None 1: Check weighing 1 2: Check weighing 2 3: Check weighing 3 4: Check weighing 4	0	
02	401803	Comparison target for check weighing	1: Gross value 2: Net value	2	
03	401805	Hi-Hi limit	-999999 to 999999	100	
04	401807	Hi limit	-999999 to 999999	10	
05	401809	Target	-999999 to 999999	0	
06	401811	Lo limit	-999999 to 999999	-10	
07	401813	Lo-Lo limit	-999999 to 999999	-100	

25.9. BCD output function list

bcdF-	Modbus	Setting Item	Setting value	Default	User Setting
01	400801	Output weight value	1: Displayed weight value 2: Gross value 3: Net value 4: Tare value	1	
02	400803	Data output timing	1: Interval output at the display update rate (FncF-03) 2: In synchronization with automatic print 3: In synchronization with manual print	1	
03	400805	Data output logic	1: Positive logic 2: Negative logic	2	
04	400807	Strobe output logic	1: Positive logic 2: Negative logic	2	

25.10. RS function list

rS F-	Modbus	Setting Item	Setting value	Default	User Setting
01	401901	Output weight value	1: Displayed weight value 2: Gross value 3: Net value 4: Tare value 5: Gross value + Net value + Tare value 6: Total weight 7: Number of accumulations 8: Total weight + number of accumulations		
02	401903	Communication type	1: Interval output at the display update rate (FncF-03) 2: In synchronization with automatic print 3: In synchronization with manual print 4: Response to command 5: Interval output of comparison result and gross value at 100 times/s 6: Interval output of comparison result and net value at 100 times/s. 7: In synchronization with automatic/manual accumulation 8: Interval output at 100 times/s 9: Modbus-RTU	1	
03	401905	Baud rate	1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 115200 bps	5	
04	401907	Parity (*1)	0: None 1: Odd 2: Even	2	
05	401909	Character bit length (*1)	7: 7 bits 8: 8 bits	7	
06	401911	Stop bit length	1: 1 bit 2: 2 bits	1	
07	401913	Terminator	1:CR 2:CR LF	2	
08	401915	RS-422/485 electrical specifications	1: RS-422 (rS F-09=0) 1: 4-wire RS-485 (rS F-09 ≠ 0) 2: 2-wire RS-485		
09	401917	RS-422/485 slave address	0: None 1 to 99	0	
10	401919	Command Response delay time	0.00 to 3.00 s	0.06	
11	401921	Code number output	0: Disabled / 1: Enabled	0	

*1: Cannot operate with parity = none and character bit length = 7 bits.

When set as such, it operates with parity = none and character bit length = 8 bits.

25.11. Analog output function list

An F-	Modbus	Setting Item	Setting value	Default	User Setting
01	401101	Output weight value	1: Displayed weight value 2: Gross value 3: Net value	1	
02	401103	Weight value at 4 mA / 0V output	-999999 to 9999999	0	
03	401105	Weight value at 20 mA / 10V output	-999999 to 9999999	20000	
04	401107	Output type (*1)	1: Current output 2: Voltage output	1	

*1: The instrument must be rebooted after changing the setting value via Modbus or USB.

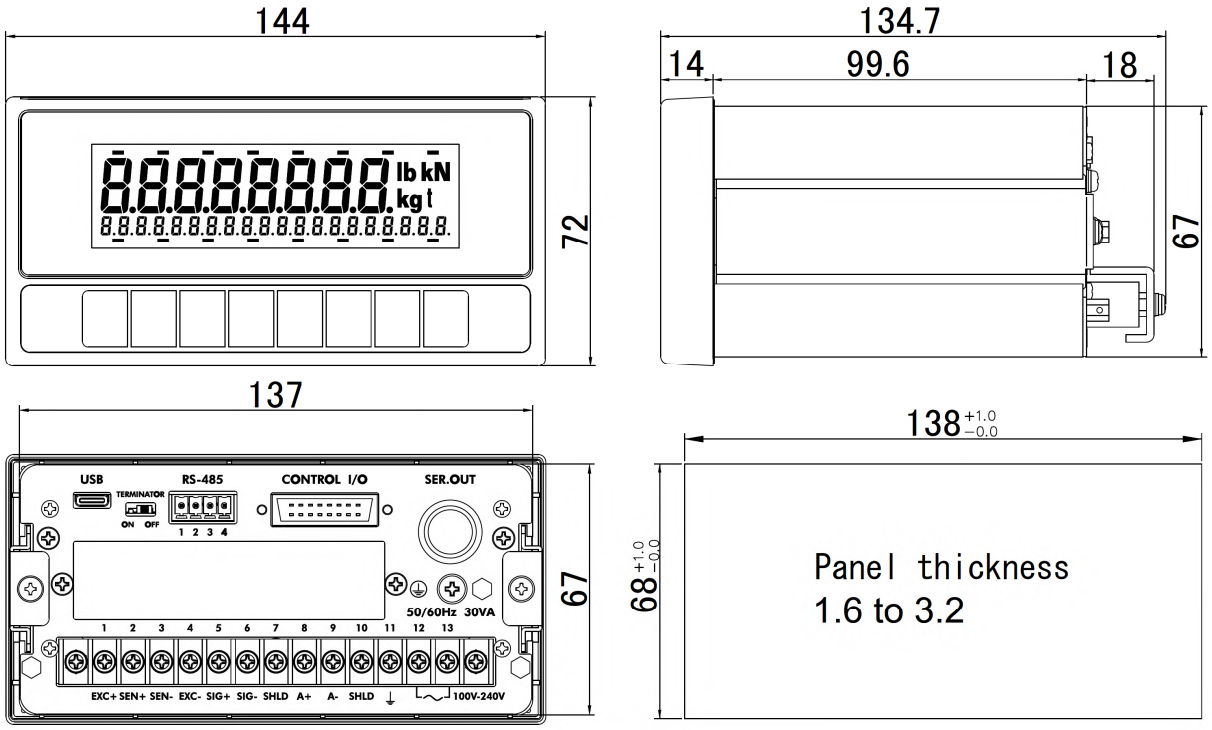
25.12. Modbus-TCP function list

EthF-	Modbus	Setting Item	Setting value	Default	User Setting
01	-	IP address XXX. XXX. XXX. XXX	0.0.0.0 to 255.255.255.255	192.168.0.2	
02	-				
03	-				
04	-				
05	-	Subnet mask XXX. XXX. XXX. XXX	Available only to 255.255.0.0 or 255.255.255.0	255.255.255.0	
06	-				
07	-				
08	-				
09	-	Default gateway XXX. XXX. XXX. XXX	0.0.0.0 to 255.255.255.255	0.0.0.0	
10	-				
11	-				
12	-				

26. Specifications

Dimension		144 (W) x 72 (H) x 134.7 (D) mm
Operating temperature and humidity range		-10 to 40°C Less than 85%RH, non-condensing
IP rating		When the indicator is secured to the control panel: Outside of the control panel: IP65 Inside of the control panel: IP2X
Power supply		
	Power supply voltage	AC 100 to 240 V +10% -15% 50/60 Hz ±5%
	Maximum apparent power	30 VA
	Rush current	AC 115 V: 25 A or less, AC 230 V:45 A or less
	Fuse	Internal (Not user replaceable)
Load cell input		
	Excitation voltage	DC5V ±5% 120 mA Up to eight 350 Ω load cells can be connected in parallel. 6-wire type with remote sensing
	Signal input range	-7.0 to 7.0 mV/V
	minimum input sensitivity	0.15 μV/d or more （d＝minimum division）
	Nonlinearity	0.005% of F.S. Max.
	Temperature coefficient	Zero drift: ±0.02 μV/°C Typ. ±0.1 μV/°C Max. Span drift: ±3 ppm/°C Typ. ±15 ppm/°C Max.
	Sampling rate	1200 times/s
Display		
	Main display	Segment LCD, character height 14.5 mm, 8 digits
	Sub display	Segment LCD, character height 5 mm, 20 digits
	Unit	g, kg, t, lb, N, kN or none (selectable)
	Status display	16
Key switches		8
Standard interface		
	Control I/O	Non-voltage contact input: 6 points NPN open collector output: 8 points
	Standard serial output	Current loop output
	RS-485	2-wire RS-485
	USB	USB 2.0 (Full-speed), Virtual COM Port
Option boards		
	BCD output	A dedicated slot is available only for analog 4-20 mA / 0-10V output. Among other option boards, only one can be installed.
	RS-422/485	
	RS-232C	
	Modbus-TCP	
	Analog 4-20 mA / 0-10V output	

External dimension



Unit mm

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