AD-4411-
BCD/485/232/DAC
Weighing Indicator

INSTRUCTION MANUAL

A&D Company, Ltd.

1WMPD4005535

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.

The contents of this manual and the specifications of the instrument covered by this manual are subject to change for improvement without notice.

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1. Introduction

The AD-4411-BCD/485/232/DAC is a weighing indicator that converts signals from strain gauge load cells to weighing values and outputs them as BCD output, RS-485, RS-232C, and analog 4-20mA/0-10V output, respectively.

- 7-segment green LED display with a character height of 10 mm and display resolution of ±999999.
- High-speed AD conversion of 1200 times/second and a digital filter enable high speed and accurate weighing.
- DIN96x48 panel mount type with IP65 protection on the front panel.
- Settings can be updated with a PC via a USB port.

1.1. Safety precautions

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 equipment.

⚠ WARNING

- Provide an external safety circuit for the indicator so that the safety of the whole system can be secured even if errors occur in the external power supply or the indicator.
- This indicator must be used indoors. Additionally, do not use in the following environments:
  - where temperature and humidity exceed the specified range.
  - with corrosive or flammable gases.
  - where oil, chemicals, or water may encounter the equipment.

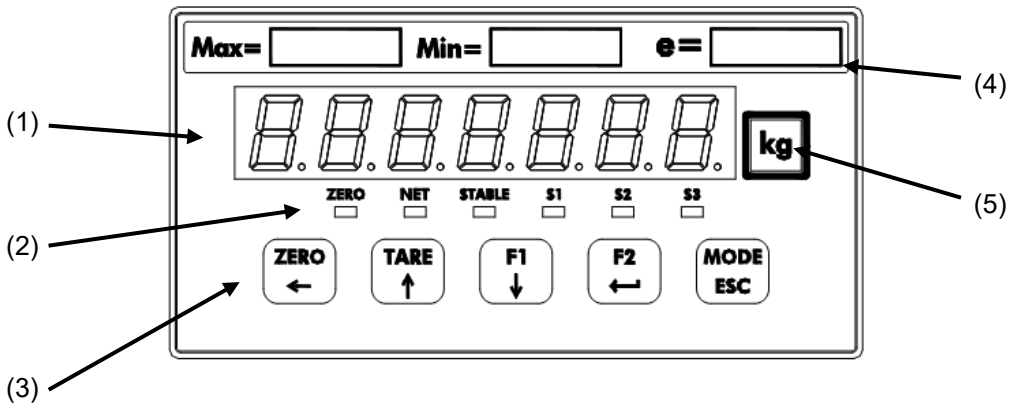
  However, by installing this equipment in the control panel, the exterior of the panel will comply with IP65 standards.
- Turn off all external power supplies when installing or removing the indicator.
- Turn off all external power supplies when wiring the indicator.
- Be sure to ground the indicator.

⚠ CAUTION

- Do not clamp control wires or communication cables with power lines, and do not position them close to power lines.
- Position the load cell cable a sufficient distance away from high frequency circuits such as high voltage power lines or inverter load circuits.
- When the front cover has 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.
- This equipment shall be supplied from a 24V DC power source that meets the limited energy circuit requirements, LPS, or NEC/CEC Class 2 (US/Canada), and is isolated from the mains by reinforced or double insulation.

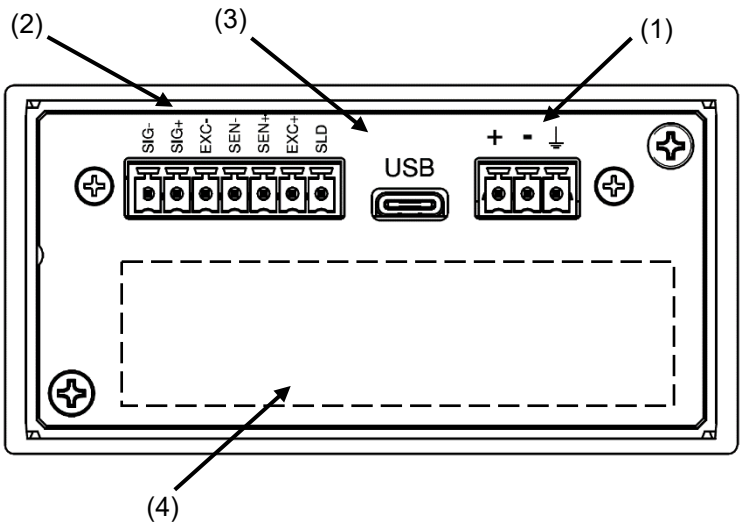
2. Part names

2.1. Front panel



No.	Name		Description
(1)	Main display		Displays the measured value and various settings.
(2)	Status LEDs	ZERO	The LED is ON when the measured value is within 1/4 of the minimum division
		NET	The LED is ON when the net value is displayed.
		STABLE	The LED is ON when the measured value is stable.
		S1	The LED is ON when the S1 status ON condition (FncF-07) is met.
		S2	The LED is ON when the S2 status ON condition (FncF-08) is met.
		S3	The LED is ON when the S3 status ON condition (FncF-09) is met.
(3)	Key switches	ZERO/←	Zeros the total value. Moves the blinking digit to the left when not in measurement mode.
		TARE/ ↑	Performs tare. Increases the blinking digit by one when not in measurement mode.
		F1/ ↓	Performs the function set for the F1 key function (FncF-05). Decreases the blinking digit by one when not in measurement mode.
		F2/ENTER	Performs the function set for the F2 key function (FncF-06). Updates the setting value entered when not in measurement mode.
		MODE/ESC	Changes the operation mode. Cancels the setting value entered when not in measurement mode
(4)	Capacity label		Attach the included capacity label if necessary.
(5)	Unit label		Attach the included unit label if necessary.

2.2. Rear panel



No.	Name	Description	
(1)	DC power input terminals	Terminals for connection of a DC24 V power supply	
(2)	Load cell input terminals	Terminals for connection of load cells.	
(3)	USB connector	Connector for connection with setting PC. (Type-C)	
(4)	Interface connector	AD-4411-BCD	BCD output connector.
		AD-4411-485	RS-485 connector. Termination resistor switch.
		AD-4411-232	RS-232C connector.
		AD-4411-DAC	Analog 4-20mA/0-10V output connector.

2.3. Accessories

Common accessories

Name	A&D Part Number	Qty.
Waterproof packing	1064053659A	1
Panel mounting bracket	1073035116A	2
Capacity label	1084054808	1
Unit label	1084023456A	1
Power connector	1JIMC1.5/3-ST	1
Load cell connector	1JIMC1.5/7-ST	1

AD-4411-BCD Dedicated accessories

Name		A&D Part Number	Qty.
BCD Output connector	connector	1JI361J040-AG	1
	connector cover	1JI360C040-B	1

AD-4411-485 Dedicated accessories

Name	A&D Part Number	Qty.
RS-485 connector	1JIMC1.5/4-ST	2

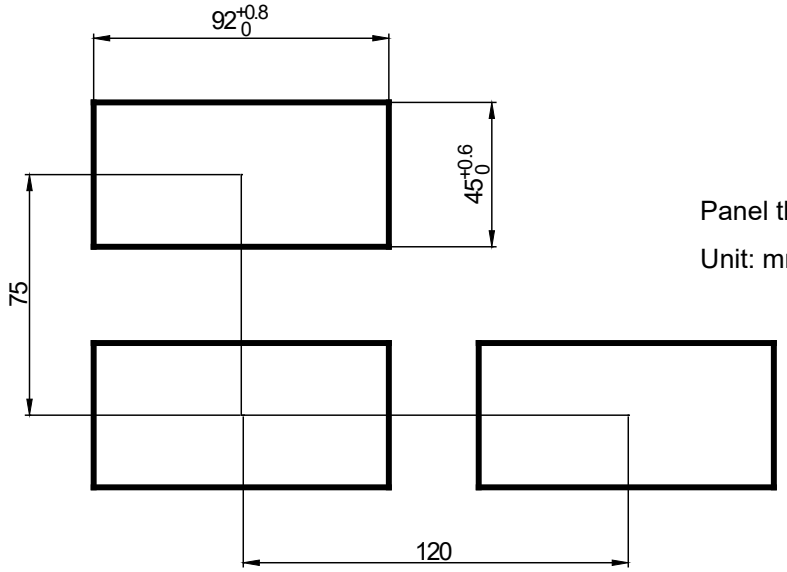
AD-4411-DAC Dedicated accessories

Name	A&D Part Number	Qty.
Analog output connector	1JIMC1.5/3-ST	1

3. Installing to the control panel

3.1. Installing the indicator to the control panel

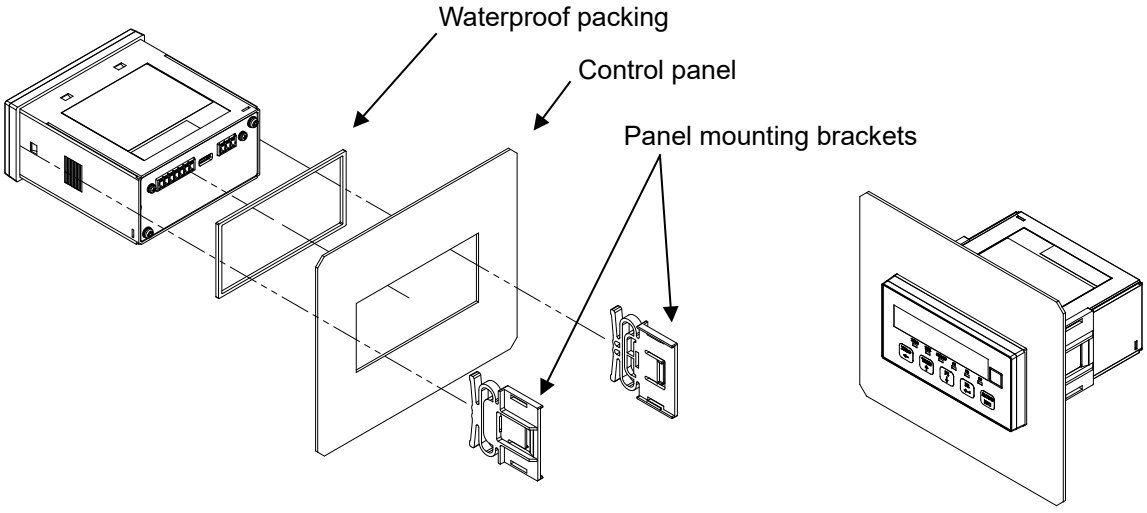
Make a hole in the control panel of the dimensions shown in the figure below. When installing multiple indicators, make sure there is sufficient space for heat dissipation on each unit.



Panel thickness: 1.6 to 3.2

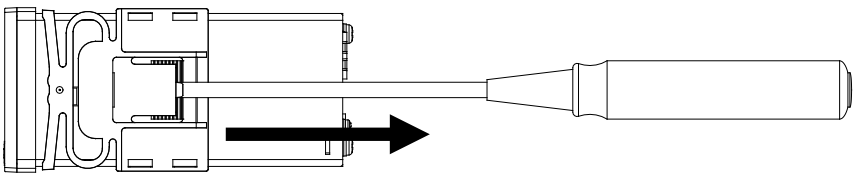
Unit: mm

Attach the waterproof packing to the main body, then insert the main body into the control panel from the front. Install the left and right panel mounting brackets into the grooves of the case and push them in until they are fully seated against the panel.



3.2. Removing the indicator from the control panel

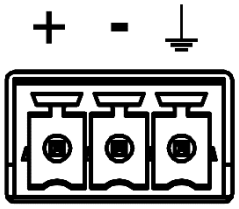
While lifting the tab of the panel mount bracket from the case using a flathead screwdriver or similar tool, slide the bracket towards the rear of the case.



4. Connection to power supply

4.1. DC power supply assignment

Symbol	Description
+	DC power input + (24 V)
-	DC power input - (0 V)
⏚	Functional ground

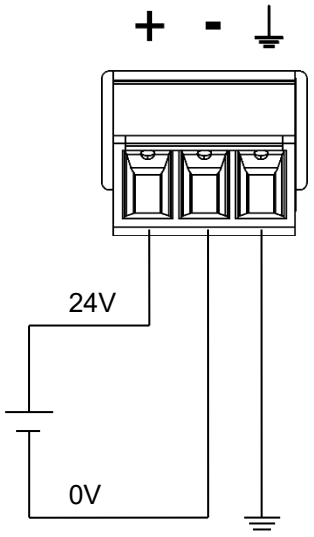


Applicable wire

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

4.2. Connection diagram

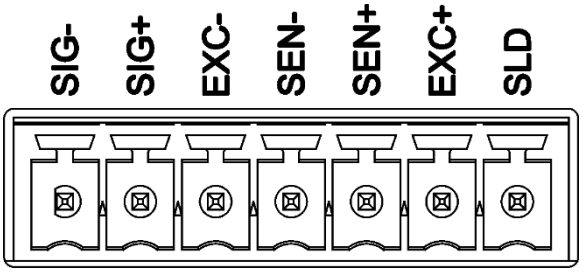
Attach and wire the included power connector as shown in the diagram below.



5. Connection to load cell

5.1. Load cell input terminal assignment

Symbol	Description
SIG-	Load cell signal input -
SIG+	Load cell signal input +
EXC-	Load cell excitation power supply -
SEN-	Sensing input -
SEN+	Sensing input +
EXC+	Load cell excitation power supply +
SLD	Shield



Applicable wire

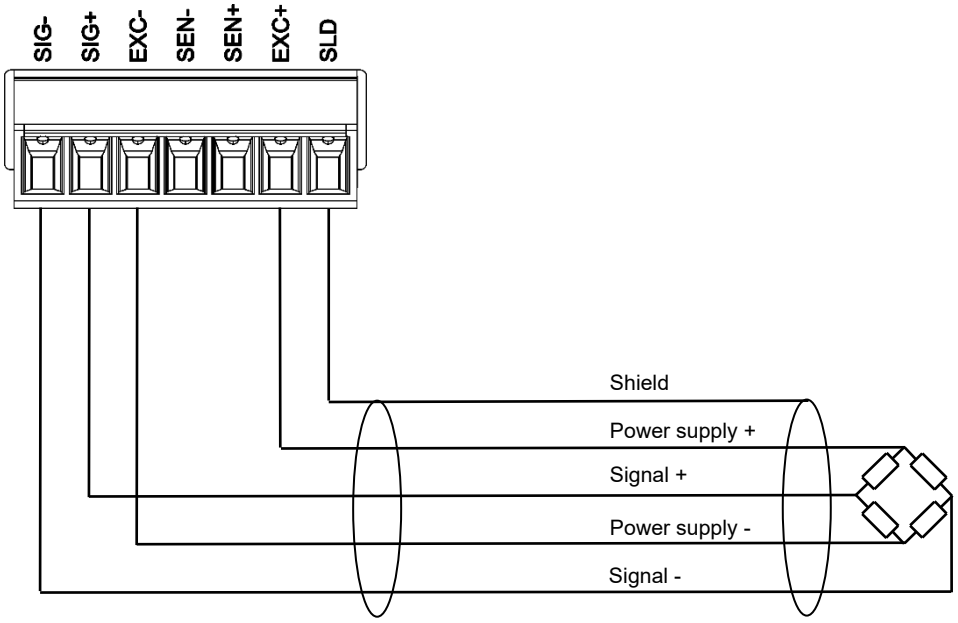
Item	Specifications
Wire size	0.14 to 1.5 mm^2 (AWG 26 to 16)
Wire strip length	7 mm
Tightening torque	0.22 to 0.25 Nm

5.2. Connection diagram

An example of the connection with the load cell is shown below.

4-Wire type

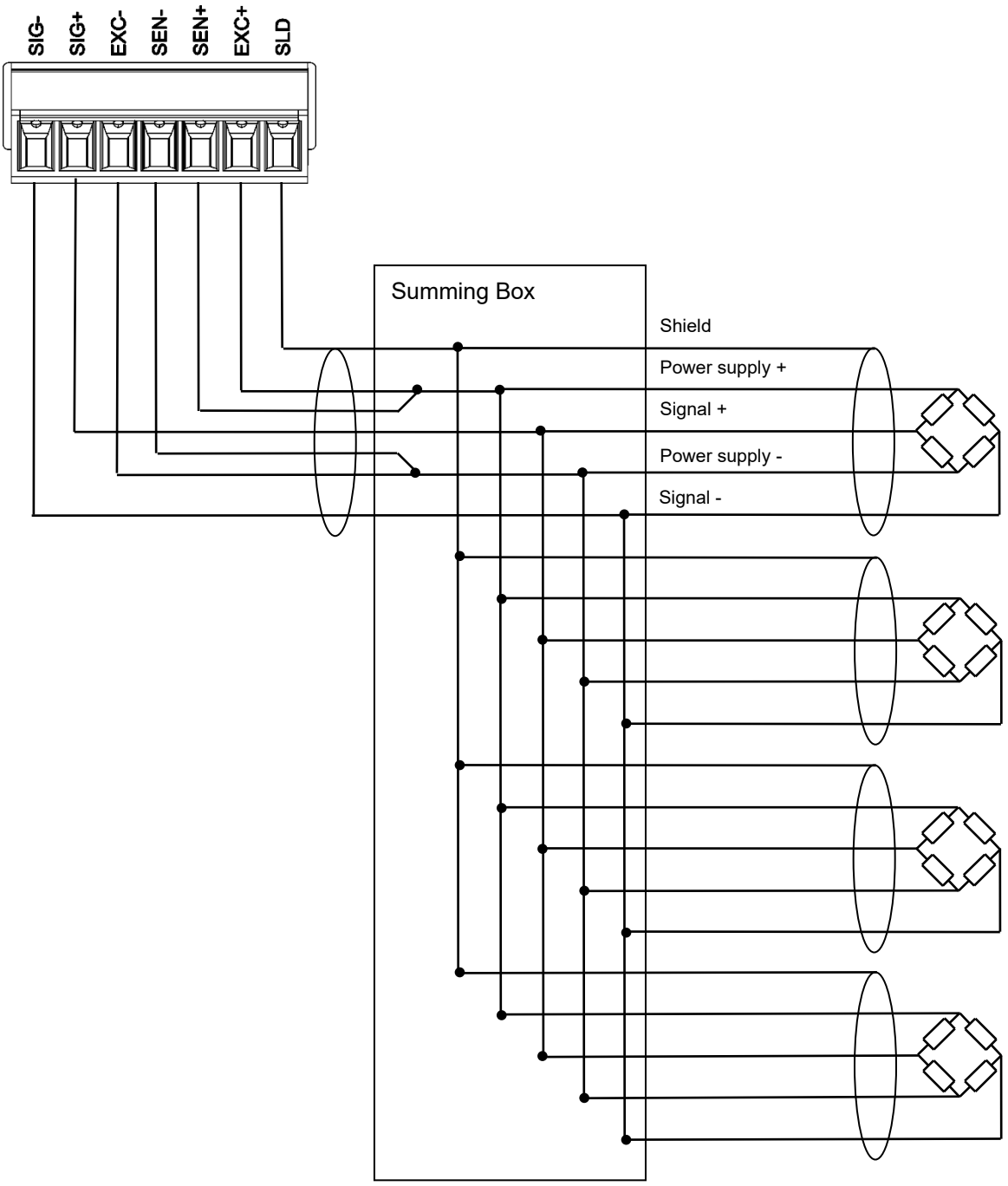
Set load cell connection type (CALF-17) to 0: 4 wire type (default = 1: 6 wire type).



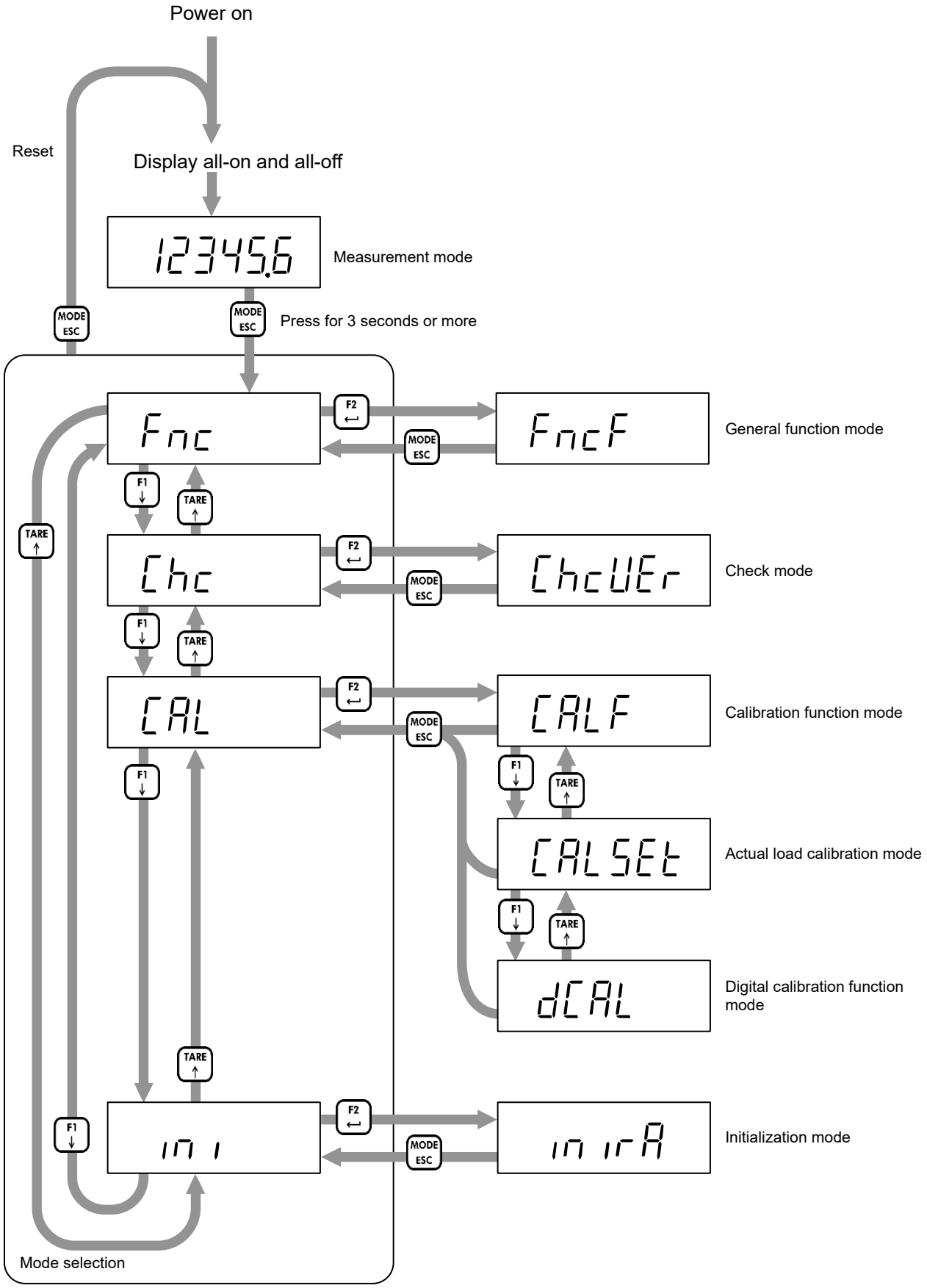
6-wire connection

Set load cell connection type (CALF-17) to 1: 6 wire type (default).

When you connect the load cells in parallel, use a summing box. Connecting AD-4411 to four load cells is as shown below.



6. Operation mode



7. Calibration

Calibrate the AD-4411 to be properly able to convert the signal from the load cell to a load value.

7.1. Settings required before calibration

Before calibration, the following settings are required.

- Select the measurement unit (CALF-01).
  The set unit is only used for external communication. Attach the unit label to the main display.
  0: None / 1: g / 2: kg (default) / 3: t

- Select decimal point position (CALF-02).
  0: 0 (None) (default)
  1: 0.0
  2: 0.00
  3: 0.000
  4: 0.0000
  5: 0.00000

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

- Set the maximum capacity (CALF-04). (Default=999999)

7.2. Digital calibration

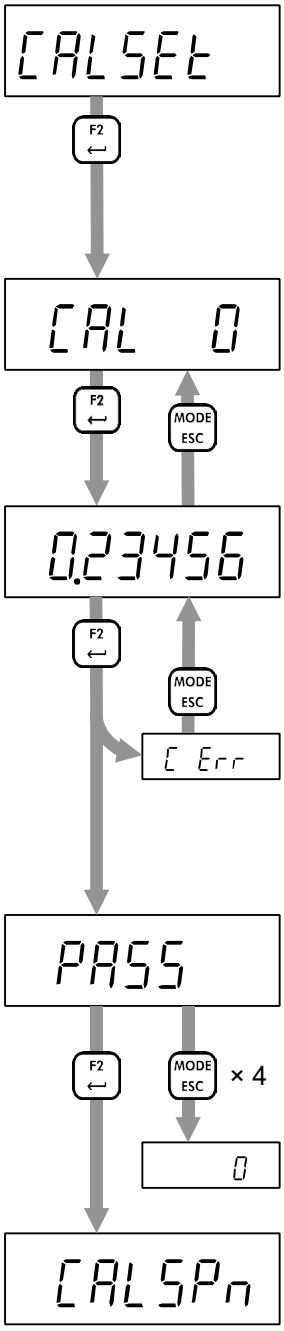
After calibration using calibration weights is completed, digital calibration function settings are automatically updated.

Recording the updated setting value is recommended. You can re-calibrate by setting the recorded value without applying actual load when the AD-4411 is replaced.

- Load cell input signal at zero calibration (dCAL01)
- "Load cell input signal at span calibration"-"Load cell input signal at zero calibration" (dCAL02)
- The calibration weights at span calibration (dCAL03)

7.3. Actual load calibration

Refer to "6. Operation mode" to move to actual load calibration mode, then press the [F2/ENTER] key.



7.3.1. Zero calibration

Press the [F2/ENTER] key.

If the [F1/↓] key is pressed, the indicator skips zero calibration and enters span calibration.

The current load cell input signal (mV/V) is displayed.

Check that the STABLE status is ON.

Press the [F2/ENTER] key to execute zero calibration.

If zero calibration fails, "C ErrX" is displayed.

Refer to "7.3.3. Error in actual load calibration" for error details.

If zero calibration is successful, "PASS" is displayed, and zero calibration is completed.

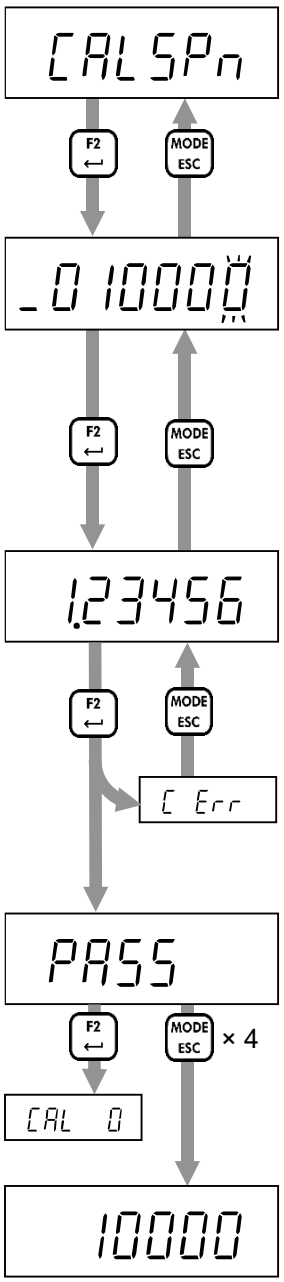
Press the [F2/ENTER] key to enter span calibration.

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

7.3.2. Span calibration

Press the [F2/ENTER] key.

If the [F1/↓] key is pressed, the indicator skips span calibration and enters zero calibration.



Set a calibration weight value by the following key operations

[ZERO/←] key: Moves 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: Confirm the setting value.

The current load cell input signal (mV/V) is displayed.

Place the calibration weight or apply load to the load cell.

Check that STABLE status is ON.

Press the [F2/ENTER] key to execute span calibration

If span calibration fails, "C ErrX" is displayed.

Refer to "7.3.3. Error in actual load calibration" for error details.

If span calibration is successful, "PASS" is displayed, and span calibration is completed.

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

Or press the [F2/ENTER] key to enter zero calibration again.

7.3.3. Error in actual load calibration

Error code	Description
C Err2	The load cell signal voltage at zero calibration exceeds 7.0 mV/V. Check that the load cell is properly connected.
C Err3	The load cell signal voltage at zero calibration is less than -7.0 mV/V. Check that the load cell is properly connected.
C Err4	The calibration weight value for span calibration exceeds the maximum capacity. Set the calibration weight value to the maximum capacity or less.
C Err5	The calibration weight value for span calibration is below the minimum scale interval. Set the calibration weight value to the minimum scale interval or higher.
C Err7	The load cell input signal at span calibration is smaller one at zero calibration. Check that the load cell is properly connected.
C Err8	The load cell signal voltage at span calibration exceeds 7.0 mV/V. Check that the load cell is properly connected.

8. Basic functions

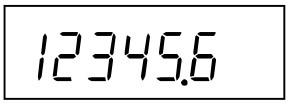
After AD-4411 is powered on, all indicators will turn on and off for a display check. Then AD-4411 enters measurement mode (measurement value display) and starts measuring.

Refer to "17. Setting functions" for function setting methods.

8.1. Main display

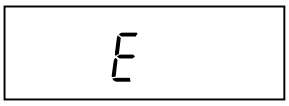
The following display appears when in measurement mode.

- Measurement value.



- Positive overload.

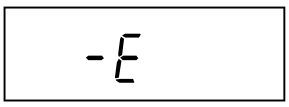
  The gross value exceeds the maximum capacity by +8d.



- Negative overload.

  The gross value meets the negative overload condition (CALF15).

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



8.2. Power-on zero

After power-on, when the measured value stabilizes within ±10% of the maximum capacity, the total amount is automatically zeroed.

Set power- on zero (CALF14) to 1: Enable (default = 0: Disable) to use this function.

If the conditions are not met, "------" is displayed until the conditions are satisfied.

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

8.3. Zero-setting

Executing zero-setting

When the measurement value is within the zero-setting range (CALF-05), press the [ZERO] key or request externally to save the gross value as the zero point setting value, and reset the total amount to zero.

The following settings are required to use this function:

- Set the zero-setting range (CALF-05) to a value other than 0 (default = 100%).
- Select the zero setting at unstable (CALF10) from 0: Disable / 1: Enable (default).

Zero clear

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

The following settings are required to use this function:

- Set the function of [F1] / [F2] key (FncF-05 / Fnc06) to 2: zero clear (default = 0: None).
- Set zero clear (CALF13) to 1: Enable (default).

8.4. 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.

The following settings are required to use this function:

- Set the zero-tracking time (CALF-06) to a value other than 0.0s (default).
- Set the zero-tracking width (CALF-07) to a value other than 0: Disable (default).

8.5. 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.

The following settings are required to use this function:

- Select taring at unstable (CALF-11) from 0: Disable / 1: Enable (default).
- Select taring at the negative gross (CALF-12) from 0: Disable / 1: Enable (default).

Tare clear

Press the assigned key to clear the tare weight, or use an external request to clear it.

The following settings are required to use this function:

- Set the function of [F1] / [F2] key (FncF-05 / Fnc06) to 1: tare clear (default = 0: None).

8.6. Gross / Net Amount Display switching

Press the assigned key to switch between gross weight and net weight display, or use an external request to change the display. Net status is ON when the net value is displayed.

Set the following settings to use this display switching function.

- Set the function of [F1] or [F2] key (FncF-05 / FncF-06) to 3: Gross / Net display selection (default = 0: None).

8.7. Center-zero detection

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

8.8. 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.

The following settings are required to use this function:

- Set the stability detection time (CALF-08) to a value other than 0.0s (default =1.0s).
- Set the stability detection width (CALF-09) to a value other than 0: Disable (default = 2d).

8.9. High resolution display selection

Press the key assigned to switch to high-resolution display to toggle between the high-resolution display, which expands the resolution by 10 times, and the normal measurement value display.

The following settings are required to use this function:

- Set the function of [F1] / [F2] key (FncF-05 / FncF-06) to 4: high resolution display selection (default = 0: None).

8.10. Comparator

The comparison value and the measured value are compared, and then Hi / OK / Lo is detected when the following conditions are met.

Hi	Measured value ＞ Upper limit value
OK	Upper limit value ≧ Measured value ≧ Lower limit value
Lo	Lower limit value ＞ Measured value

The following settings are required to use this function:

- Upper limit value (FncF-11). (Default = 10)
- Lower limit value (FncF-12). (Default = -10)
- Select the target for comparison (FncF-13) from 1: Gross (default) / 2: Net.

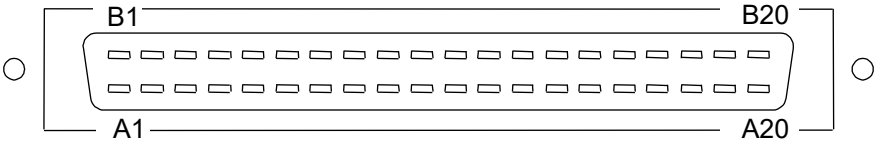
8.11. Manual print

Press the key assigned to the manual print function to output data from RS-485 or RS-232C.

- Set the function of [F1] / [F2] key (FncF-05 / FncF-06) to 5: Manual print (default = 0: None).

9. BCD Output AD-4411-BCD

9.1. Pin Assignment

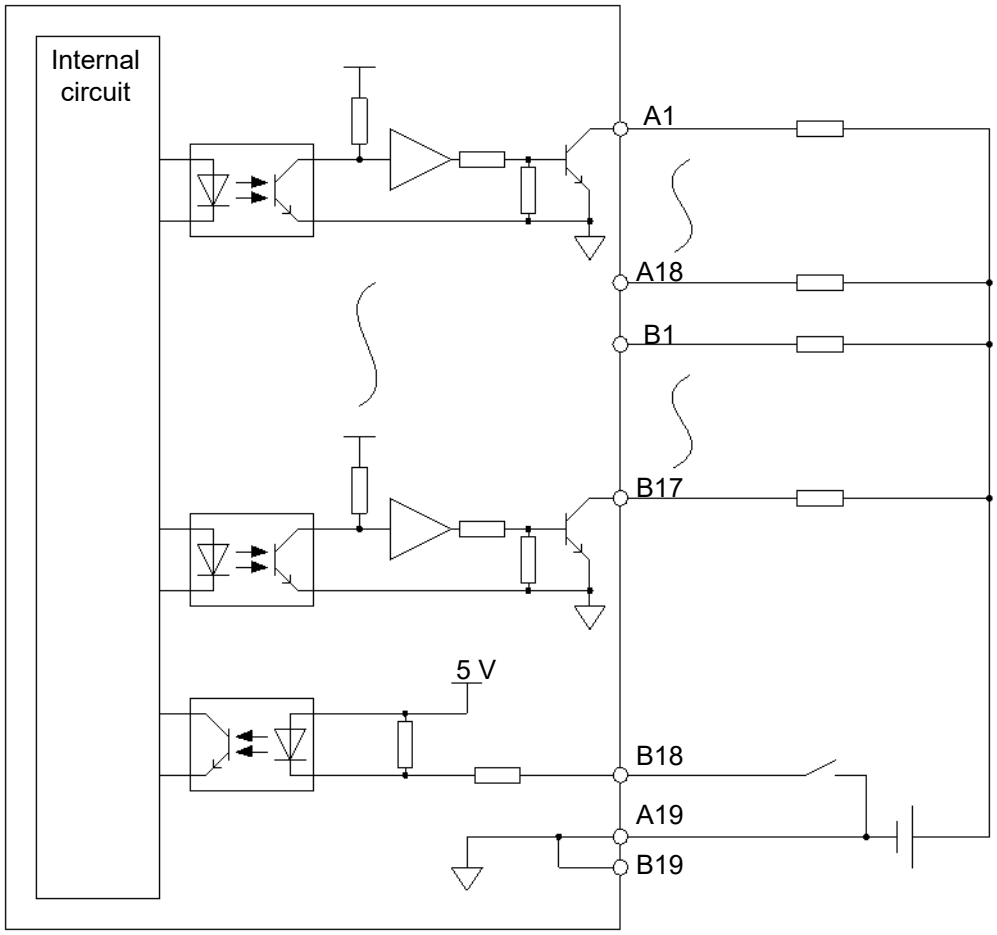


The AD-4411-BCD comes with a connector for BCD output.

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 A15=ON, B15=ON, A16=ON, B16=ON: 0.00000		B16
A17	Unit A17=OFF, B17=OFF : None or kg A17=OFF, B17=ON : t A17=ON, B17=ON : g		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 the output data is turned ON.

9.2. Connection Diagram



Data output, Strobe output

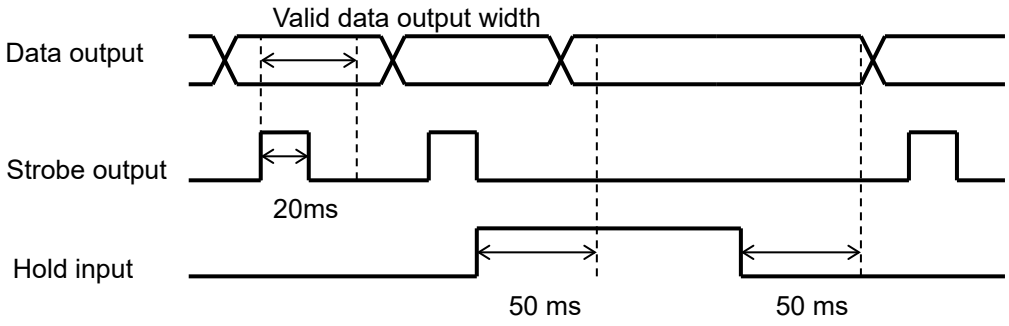
- Maximum load voltage: 30 VDC
- Maximum load current: 50 mA/point
- Voltage drop at ON: 1 V or less
- Leakage current at OFF 0.1 mA or less

Hold input

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

9.3. Data Output Timing

Timing chart



The valid data output width is 40ms. Please read the data within this period.

The update will stop within 50 ms after the hold input is turned ON. The data output update will restart within 50 ms after the hold input is turned OFF.

9.4. Data Output Logic and Strobe Output Logic

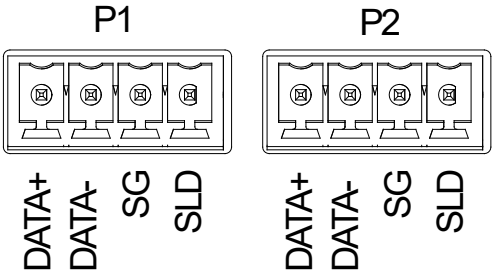
Select a data output logic (bCdF-03) and a strobe output logic (bCdF-04) from the following:

1: Positive logic

2: Negative logic (default)

10. RS-485 AD-4411-485

10.1. Pin Assignment



Applicable wire

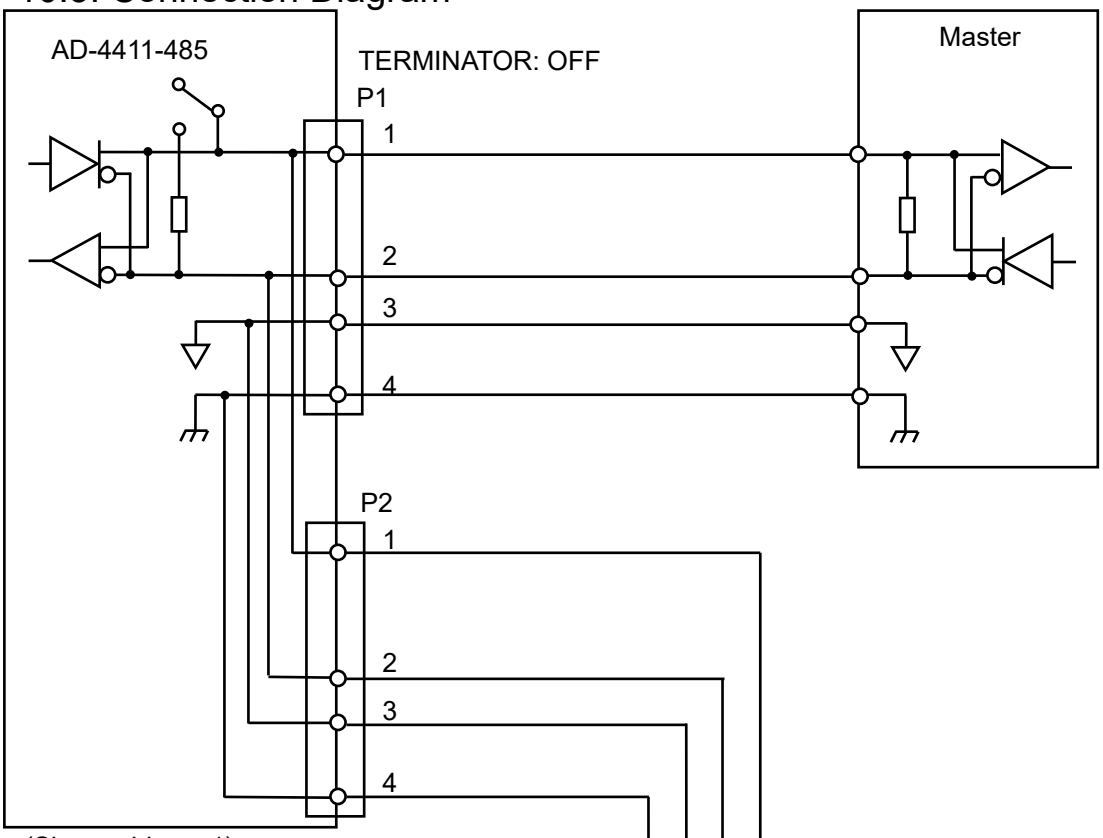
Item	Specifications
Wire size	0.14 to 1.5 mm² (AWG 26 to 16)
Wire strip length	7 mm
Tightening torque	0.22 to 0.25 Nm

AD-4411-485 comes with a connector for the RS-485.

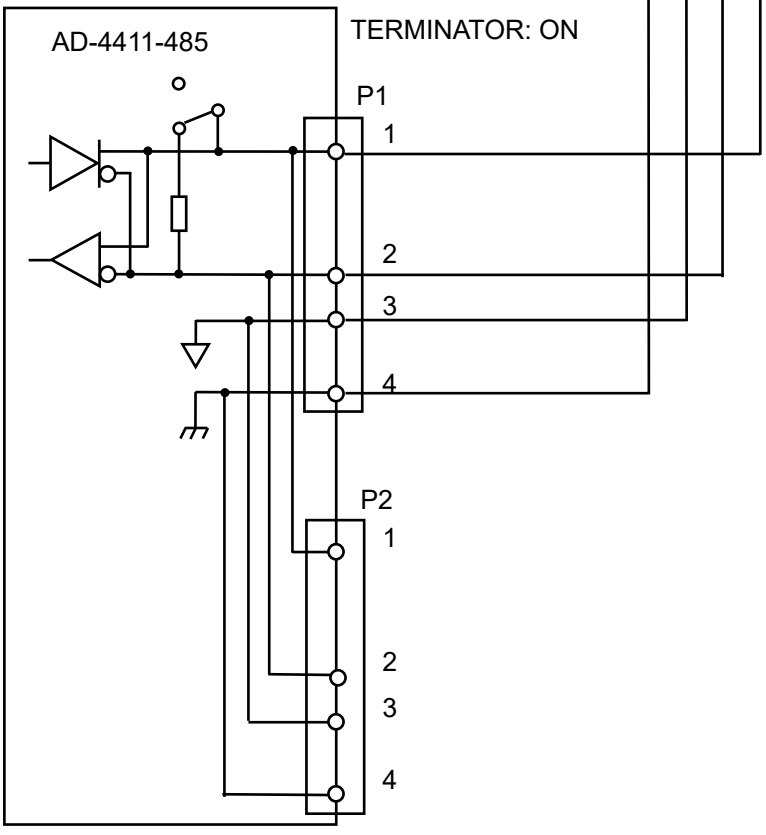
10.2. Termination Resistor Selector Switch of RS-485

If the TERMINATOR is turned ON, the terminating resistor will be enabled.

10.3. Connection Diagram



(Slave address 1)



(Slave address 2)

10.4. Communication Specifications

Signal level	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

10.5. 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

10.6. Communication Type

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

1: Outputs data (rS F-01) periodically at 20 times / second (default)

2: Reserved for internal use

3: Outputs data (rS F-01) synchronized with manual print

4: Reads and writes data based on commands from the master

5～7: Reserved for internal use

8: Outputs data (rS F-01) periodically at 100 times / second

9: Modbus-RTU

10.6.1. Format When Communication Type (rS F-02) = 1 or 3

- Slave address (rS F-09) = 0

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

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

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

Item	Value		
Address	@ 0 1	at rS F-09 = 1	Slave address
Header 1	S T ,		Stable
	U S ,		Unstable
	O L ,		Overload
Header 2	G S ,		Gross value
	N T ,		Net value
	T R ,		Tare value
Output data (rS 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

SP: space

10.6.2. Format When Communication Type (rS F-02) = 8

- Slave address (rS F-09) = 0

Output data	Terminator
8 chars	2 chars / 1 char

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

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

Item	Value		
Address	@ 0 1	at rS F-09 = 1	Slave address
Output data (rS F-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		Positive overload
	- SP SP SP SP SP SP		Negative overload

No output if output data (rS F-01) = 5

The output data does not include decimal points

10.6.3. Format When Communication Type (rS F-02) = 4

Data format (Command)

- Slave address (rS F-09) = 0

Command	Terminator
2 chars	2 chars / 1 char

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

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

Item	Value		
Address	@ 0 1	at rS F-09 = 1	Slave address
Command	R W	Read weight value	
	M Z	Zero setting	
	M T	Tare	
	C T	Tare clear	
	M G	Display gross value in the main display	
	M N	Display net value in the main display	

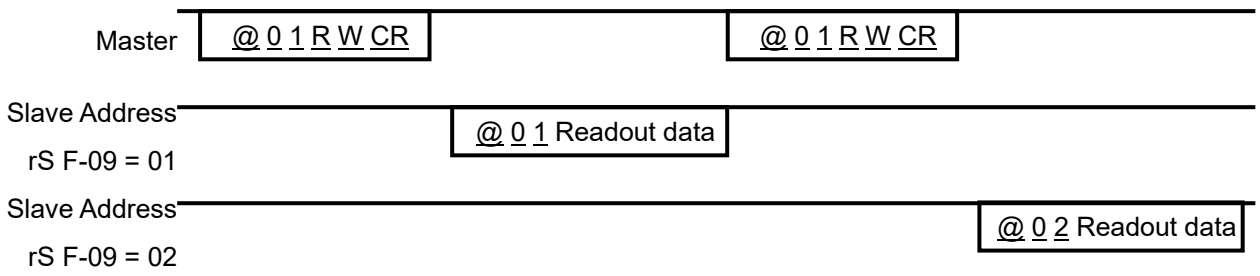
SP: space

Data format (Weight value)

The same as when the communication type (rS F-02) = 1, 3.

Multidrop connection

When a master and some AD-4411-485s are connected by a 1: n multidrop connection, a different slave address (rS F-09) is assigned to each AD-4411-485. When the master sends a command by adding the slave address (@ 0 1 to @ 9 9) at the beginning, the AD-4411-485 with the matching slave address sends a response by adding the slave address (@ 0 1 to @ 9 9) at the beginning.



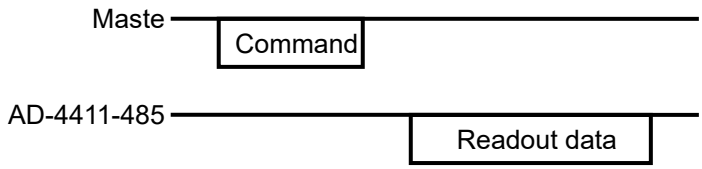
Communication diagram

Two types of communication diagrams are shown below.

Reading data

R W : Read weight data

When the above command is sent, the corresponding data will be returned.



Function commands

M Z : Zero setting

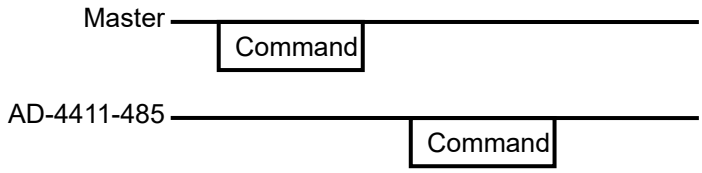
M T : Tare

C T : Tare clear

M G : Display gross value in the main display

M N : Display net value in the main display

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



Error response

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

? E : Response to illegal commands/formats

10.6.4. Format When Communication Type (rS F-02) = 9 Modbus-RTU

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

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

Select a baud rate and a slave address from the following table.

rS F-	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	1952
03	Read holding registers	122
05	Write single coil	1
06	Write single register	1
15	Write multiple coils	1
16	Write multiple registers	122

Coil data address

Data address	R/W	Item name
000001-000011	R	-
000012		Hi
000013		OK
000014		Lo
000015		-
000016		Stable
000017		Gross "0" / Net"1"
000018-000019		-
000020		Overload
000021		When zero-setting fails
000022		When tare fails
000023 - 000200		-
000201	W *1	Zero-setting
000202		Tare
000203-000206		-
000207		Tare clear
000208-000211		-
000212		Zero clear
000213		Switch gross on the display
000214		Switch net on the display
000215-000300		-
000301-000400	R/W	-
000401	W *1	Zero calibration
000402		Span calibration
000403-000500		-

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

Holding registers data address

All holding registers are DWORD. The first word is the low word of a 32-bit value.

The read settings value will be in a format that ignores the decimal point.

For example, if the displayed value is '123.4', the read value will be '1234'.

Data address	R/W	Item name
400001-400002	R	Displayed value
400003-400004		Gross value
400005-400006		Net value
400007-400008		Tare value
400009-400010		Status (See the next page for details)
400011-400094		-
400095-400096		Load cell input signal (1 count means 1 nV/V)
400097-400100		-
400101-400134	R/W	Calibration function *1
400135-400300		-
400301-400326		Basic function *1
400327-400800		-
400801-400808		BCD output function *1
400809-401100		-
401101-401108		Analog output function *1
401109-401500		-
401501-401506		Digital calibration function *1
401507-401900		-
401901-401920		RS function *1
401921-402000		-

*1: Refer to "18. Function setting lists".

Bit address details for status (40009－400010)

Data address	Item name
400009.15-05	-
400009.04	Lo
400009.03	OK
400009.02	Hi
400009.01	-
400009.00	-
400010.15-10	-
400010.09	S3 status is ON.
400010.08	S2 status is ON.
400010.07	S1 status is ON.
400010.06	ZERO status is ON.
400010.05	STABLE status is ON.
400010.04	During the gross value display
400010.03	During the net value display
400010.02	-
400010.01	-
400010.00	-

Example message for coil

The following is an example of executing a tare (data address 000202) from the slave address 1 (rS F-09 = 1).

Master -> Slave	0x01 05 00 C9 FF 00 5C 04	
Slave address	0x01	Set 0x01 (Slave address 01) in this example.
Function code	0x05	Set 0x05 for write requests to data addresses 000001-065535 (coil).
Data address	0x00 C9	The Modbus protocol specifies that the starting data address should be set to the value of the coil data address minus 000001. Therefore, set 0x00C9 (000202 – 000001).
Write data	0xFF 00	Set 0xFF 00 (= ON).
CRC	0x5C 04	An error-checking field is based on a CRC method.

Slave -> Master	0x01 05 00 C9 FF 00 5C 04	
Slave address	0x01	In this example, the sent message is echoed back as is.
Function code	0x05	
Data address	0x00 C9	
Write data	0xFF 00	
CRC	0x5C 04	

Example message for holding register

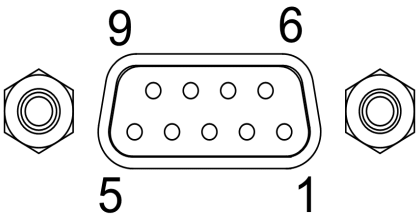
The following is an example reading contiguous data of the gross value (data address 400003~400004) and net value (data address 400005~400006) for the slave address 1 (rS F-09 = 1).

Master -> Slave	0x01 03 00 02 00 04 E5 C9	
Slave address	0x01	Set 0x01 (Slave address 01) in this example.
Function code	0x03	Set 0x03 for read requests to data addresses 400001-465535 (holding registers).
Starting data address	0x00 02	The Modbus protocol specifies that the starting data address should be set to the value of the holding register data address minus 400001. Therefore, 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	0x E5 C9	An error-checking field is based on a CRC method.

Slave -> Master	0x01 03 08 86 9F 00 01 C3 4F 00 00 42 C7		
Slave address	0x01	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 data bytes, not the number of read data points, will be set.	
Data 1	0x86 9F	The data in 400003	The master reads the first 16-bit data as the lower data of the 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	0x42 C7	An error-checking field is based on a CRC method.	

11. RS-232C AD-4411-232

11.1. Pin Assignment



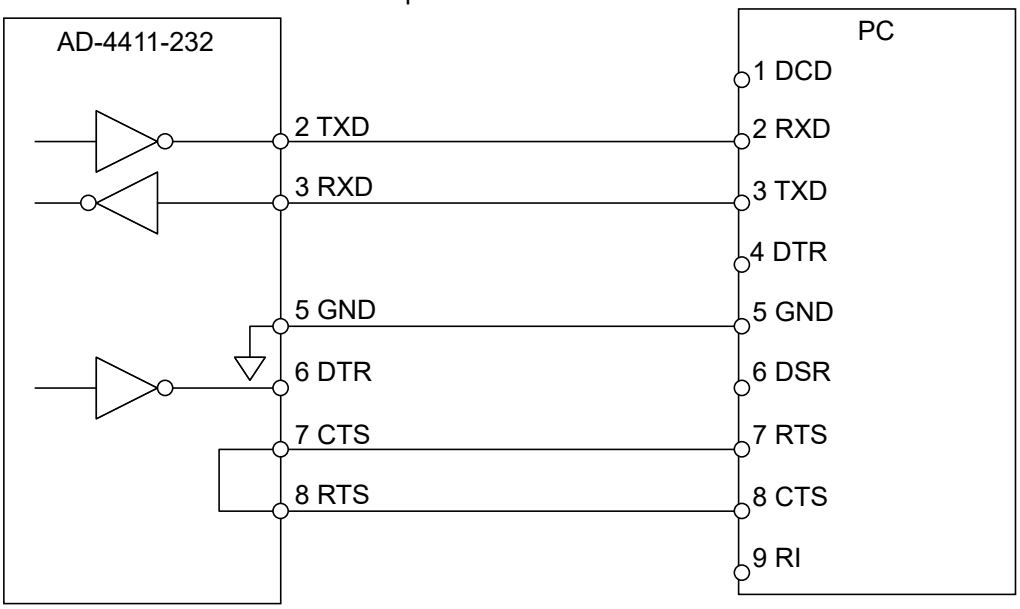
The applicable connector is a D-sub 9-pin female, and the mating fixing screws are in inches.

Please provide the connector yourself.

Pin No.	Description
2	TXD
3	RXD
5	GND
6	DTR
7	CTS
8	RTS
1,4,9	NC

11.2. Connection Diagram

The connection to the PC's serial port is as follows.



11.3. 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, Binary (for Modbus-RTU)
Terminator (rS F-07)	CR LF, CR

11.4. Output Data

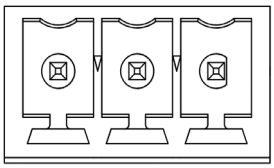
Refer to "10.5. Output Data".

11.5. Communication Type

Refer to "10.6. Communication Type".

12. ANALOG 4-20mA/0-10V OUTPUT AD-4411-DAC

12.1. Pin Assignment



A+ A- SLD

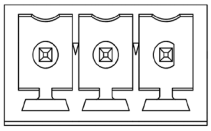
Symbol	Description
A+	Analog output +
A−	Analog output −
SLD	Frame ground

Applicable wire

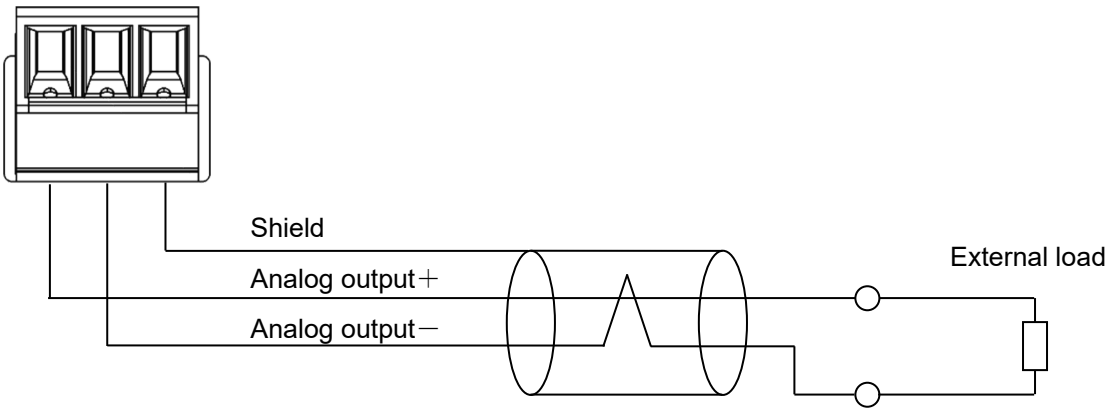
Item	Specifications
Wire size	0.14 to 1.5 mm² (AWG 26 to 16)
Wire strip length	7 mm
Tightening torque	0.22 to 0.25 Nm

AD-4411-DAC comes with a connector for the analog output.

12.2. Connection Diagram



A+ A- SLD



Use a 2-core twisted shielded cable for the wiring.

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

12.3. 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	

12.4. 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:

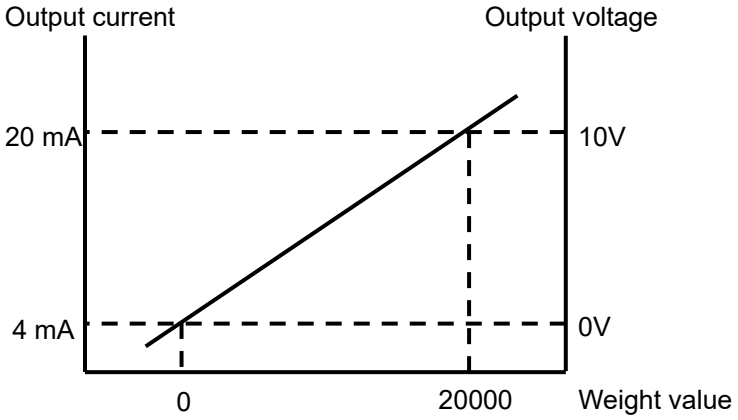
1: Linked to the displayed weight value (default)

2: Linked to the gross value

3: Linked to the net value

Output adjustment

The output characteristic is a straight line connecting the setting value at 4 mA/0V output (An F-02) and the setting value at 20 mA/10V output (An F-03).



13. USB

Measurement values can be read and setting values can be written from a PC via USB (virtual COM port). The AD-4411 can operate on USB bus power, but since the USB circuit is not isolated, measurement performance may be affected in noisy environments. For normal operation, use the 24 V power supply port.

13.1. Communication specification

USB function is available only in measurement mode.

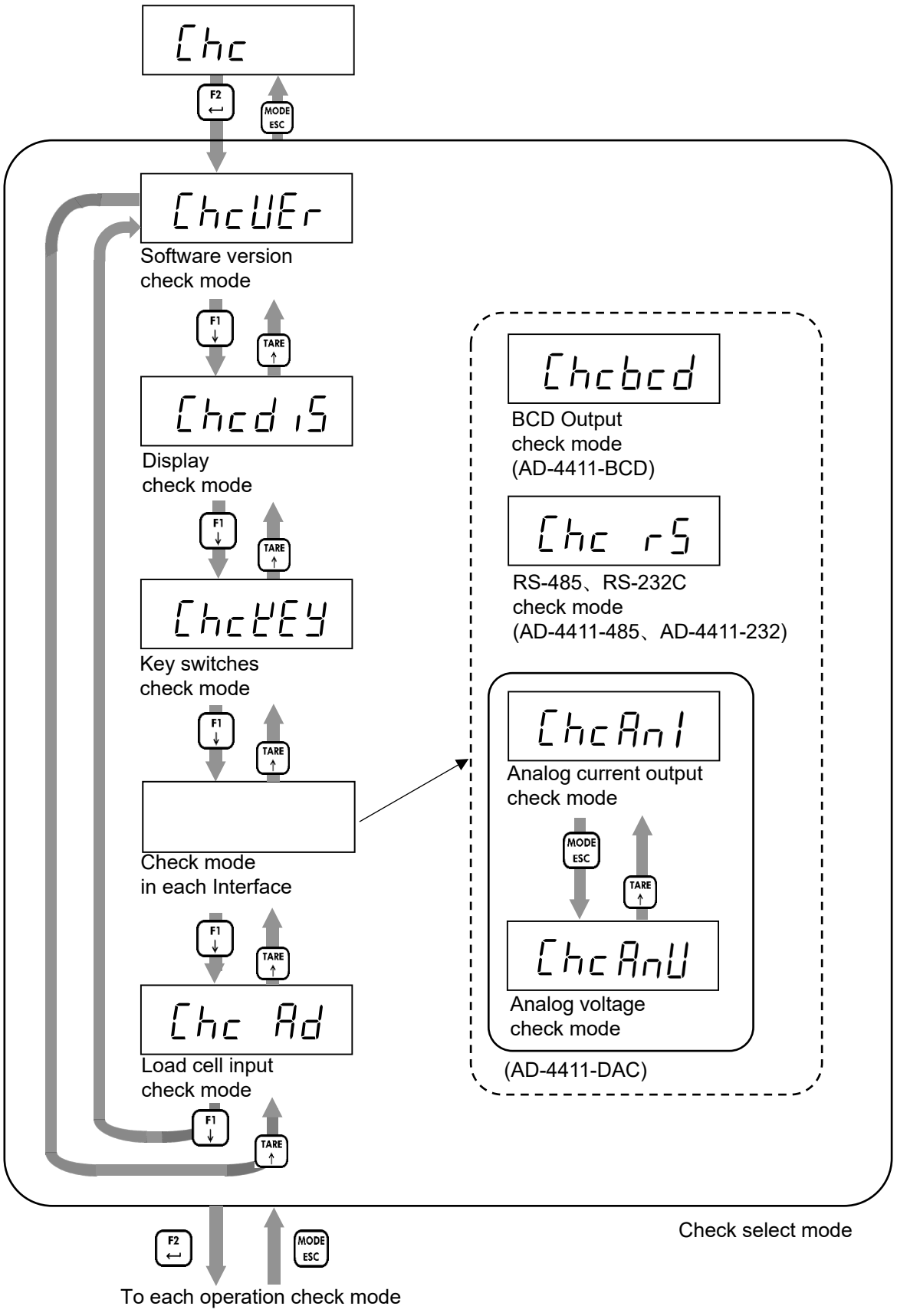
USB Specification	Connector	Type-C
	Communication	USB 2.0 (Full-speed) virtual COM port
	Power	5V 3.0A at using bus power
Communication protocol		Modbus RTU
Slave address		1
Baud rate		115200 bps
Data length / Parity / Stop bit		8bits / None / 1 bit

For Function code and its maximum quantity, the data address, refer to the data address in "10.6.4. Format When Communication Type (rS F-02) = 9 Modbus-RTU"

14. Checking Software Version / Hardware

You can check whether the software version or hardware is functioning properly in check mode.

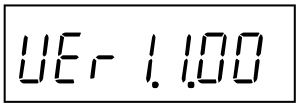
Refer to "6. Operation mode" to enter check mode. Please refer to the following steps in check mode.



14.1. Checking software version

The software version is displayed.

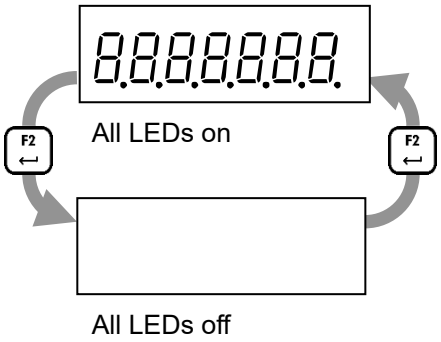
Press the [MODE/ESC] key to return to item selection.



14.2. Checking display

Press the [F2/ENTER] key to switch between all LEDs on and off.

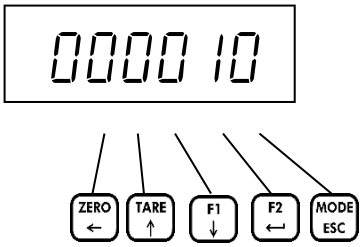
Press the [MODE/ESC] key to return to item selection.



14.3. Checking key switches

Press any key to change from "0" to "1" in the corresponding digit.

Press the [MODE/ESC] key for 3 seconds or more to return to item selection.

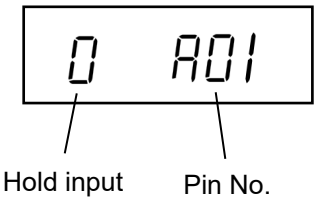


14.4. Checking BCD output (AD-4411-BCD)

When the hold input is ON, “0” changes to “1”.

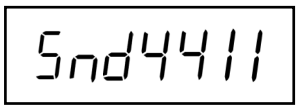
The displayed terminal number turns ON.

Press the [TARE/↑] key or [F1/↓] key to switch the terminal number.

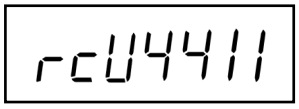


14.5. Checking RS-485, RS-232C (AD-4411-485, AD-4411-232)

When the [F2/ENTER] key is pressed,
ST,GS,+0004411kg <CR><LF> is sent.
After sending, "Snd4411" will be displayed.

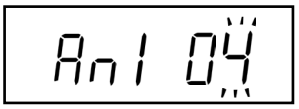


When ST,GS,+0004411kg <CR><LF> is received,
"rcV4411" will be displayed.



14.6. Checking analog current output (AD-4411-DAC)

Output the displayed current value (mA).
Press the [TARE / ↑] key or [F / ↓] key to
increase or decrease the current value.

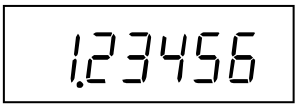


14.7. Checking analog voltage output (AD-4411-DAC)

Output the displayed voltage value (V).
Press the [TARE / ↑] key or [F / ↓] key to
increase or decrease the voltage value.

14.8. Checking load cell input

The current load cell input signal (mV/V) is displayed.
Press the [MODE/ESC] key to return to item selection.



15. Troubleshooting

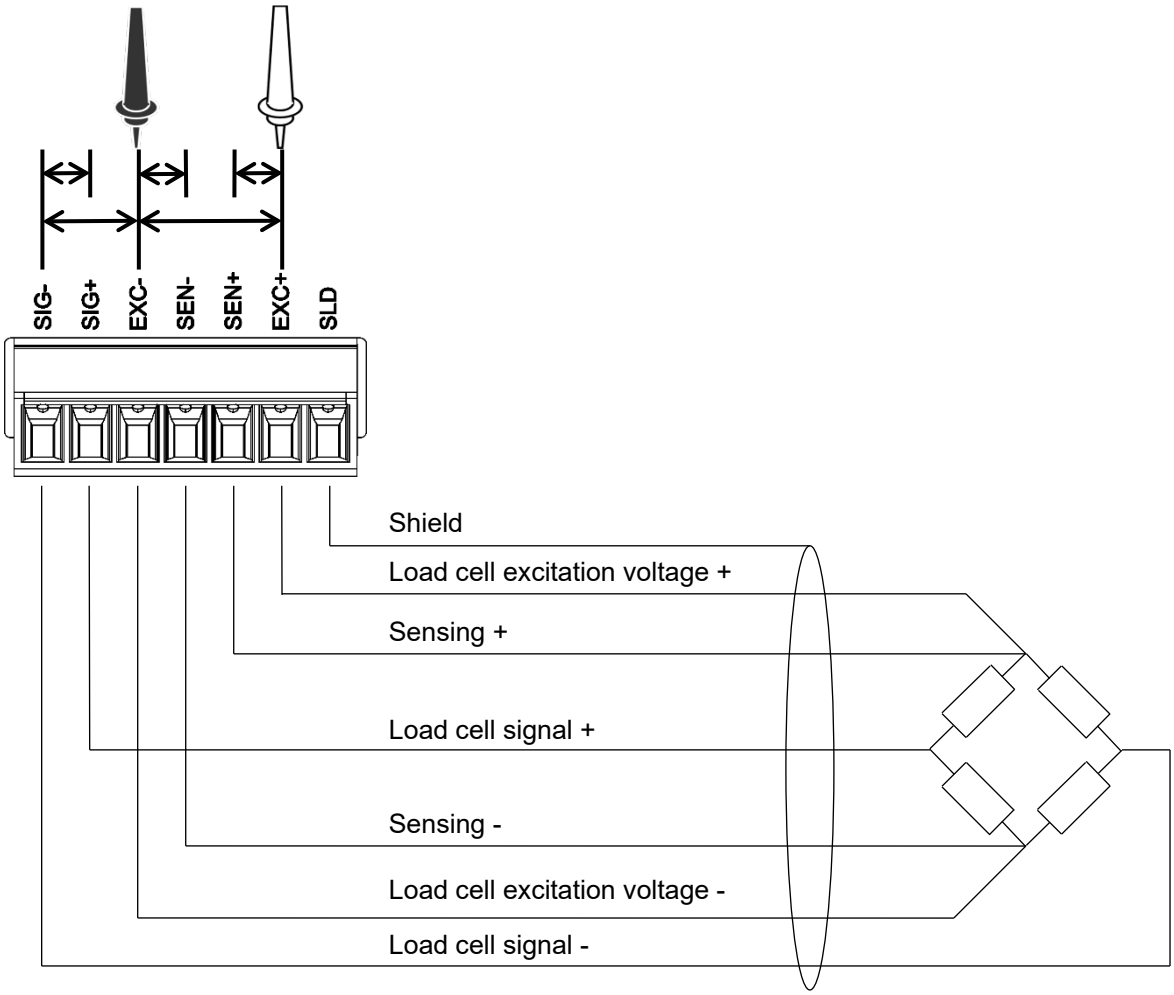
15.1. Hardware error

If the following error message is displayed after powering on, a malfunction of the device is suspected. Please consult your local A&D representative.

Error code	Error description
ErrH01	A problem is detected in the memory (FRAM) on the main board.
ErrH02	A problem is detected in the AD converter on the main board.
ErrH03	A problem is detected in the interface board.
ErrH04	A problem is detected in the memory (EEPROM) on the analog output board.

15.2. Checking the connection to load cell with using a digital 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		Measurement Item	Judgement
EXC+	EXC-	Load cell power supply voltage	Normally 5±0.25 V.
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.

15.3. Check list

If AD-4411 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
Instrument capacity			20.00 kg
Minimum division of the instrument			0.01 kg
Initial load on the instrument			30 kg
Load cell connection type	6-wire / 4-wire		6-wire
Length of the extension load cell cable		m	Approx. 100 m
Cross section of the load cell cable		mm^2	0.5 mm^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			50.99 kg
Load cell rated output		mV/V	2.0394 mV/V
Load cell input resistance		Ω	400 Ω
Load cell output resistance		Ω	350 Ω
Load cell output at initial load *1		mV	approx. 4.0 mV
Load cell output at capacity or any load. *1	at	mV	at 20.00 kg approx. 6.8 mV

*1 Please refer to "15.2. Checking the connection to load cell with using a digital multimeter".

Digital multimeter measurement value

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

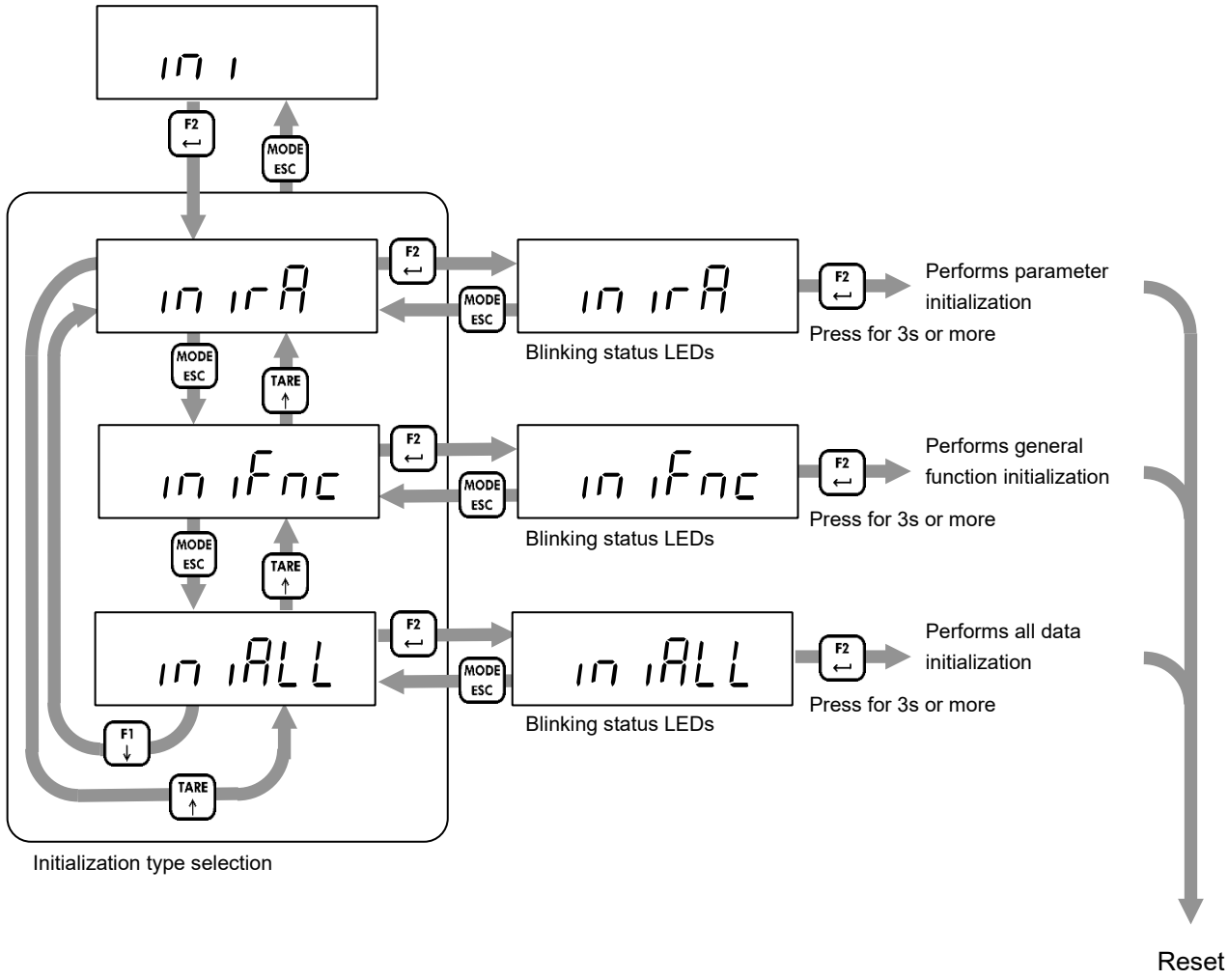
16. Initialization

You can initialize the internal values to their factory defaults in initialization mode if necessary.

There are three types of initializations, each affecting a different area. Please note that if all data is initialized, you must calibrate AD-4411 again.

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

Refer to "6. Operation mode" to enter initialization mode. See below for the procedure in initialization mode.



17. Setting functions

Functions for AD-4411 are classified as follows.

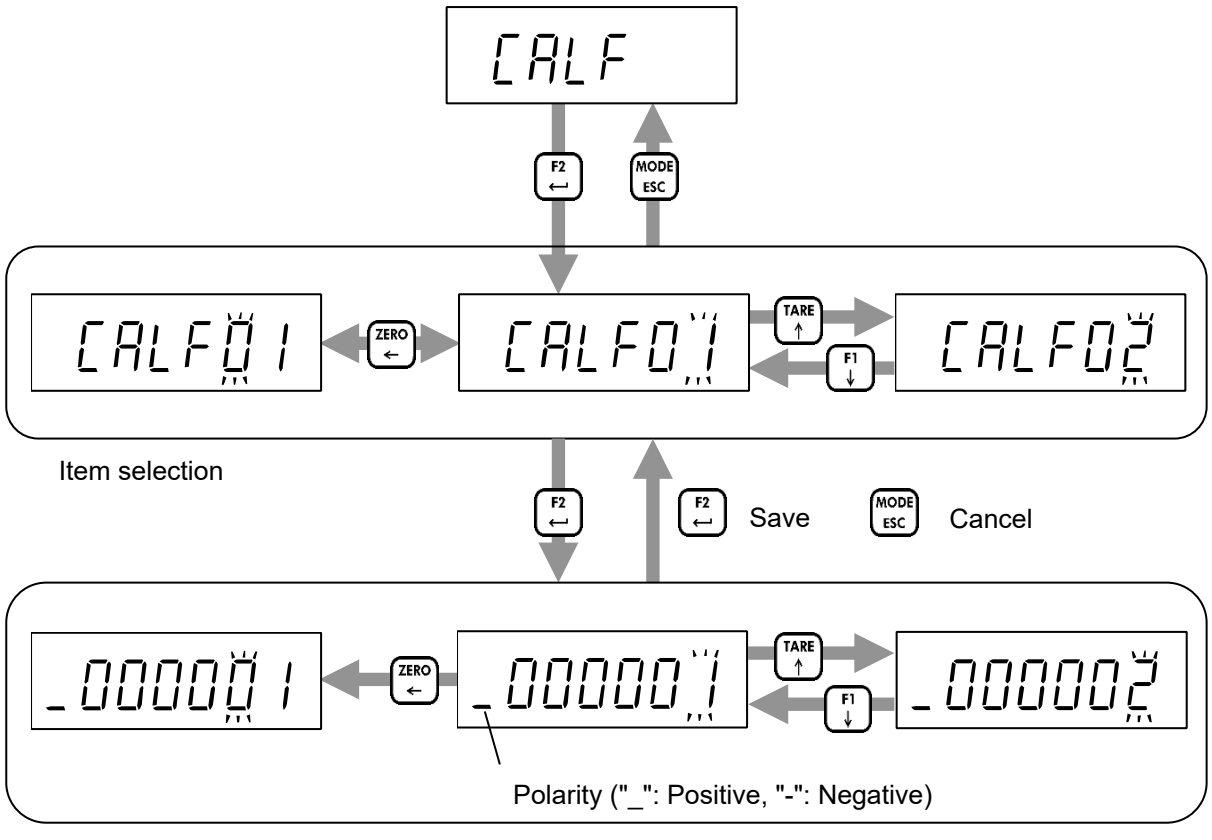
To change a setting, navigate to the category that contains the desired setting.

Function name		Description
Calibration function		The setting values related to legally relevant parameters when AD-4411 is used for such purposes.
Digital calibration function		The setting values related to calibration that depends on the individual instrument.
General function	Basic function	The setting values related to measurement functions.
	BCD output function	The setting values related to BCD output.
	RS function	The setting values related to RS-485、RS-232C.
	Analog output function	The setting values related to Analog output.

17.1. Setting calibration function

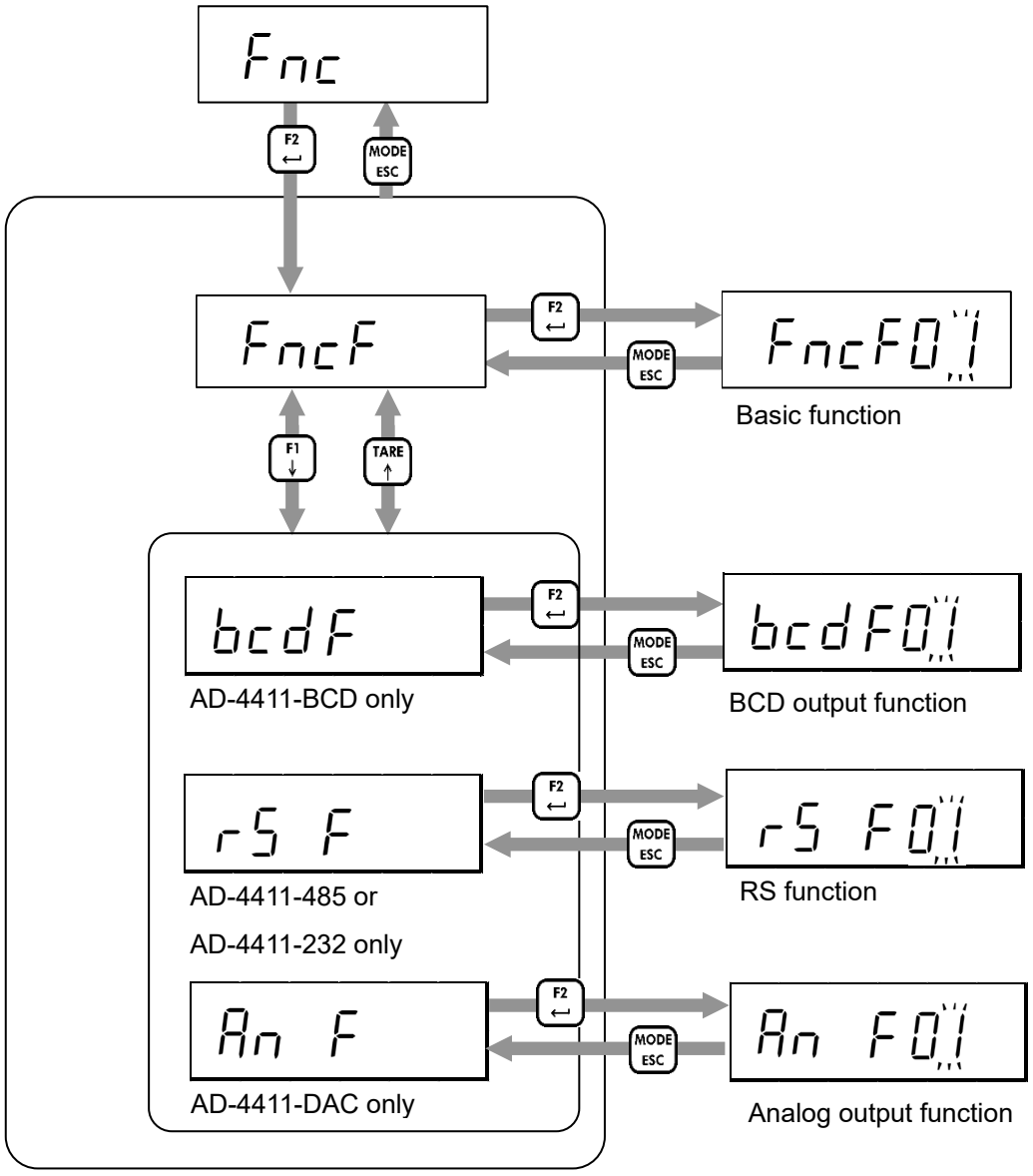
Refer to "6. Operation mode" to enter calibration function mode. The following explains how to change setting values.

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	Displayed item is selected, and the input of the setting value begins.
	[MODE/ESC] key	Return to mode selection.
Setting value input		
	[ZERO/←] key	Shifts the blinking digit to the left.
	[TARE/↑] key	Increases the blinking digit by one. Use the leftmost digit to change the polarity. An underscore (_) indicates a positive value and a hyphen (-) indicates a negative value.
	[F1/↓] key	Decreases the blinking digit by one. Use the leftmost digit to change the polarity. An underscore (_) indicates a positive value and a hyphen (-) indicates a negative value.
	[F2/ENTER] key	Saves the input setting value and returns to item selection.
	[MODE/ESC] key	Cancels the input setting value and returns to item selection.



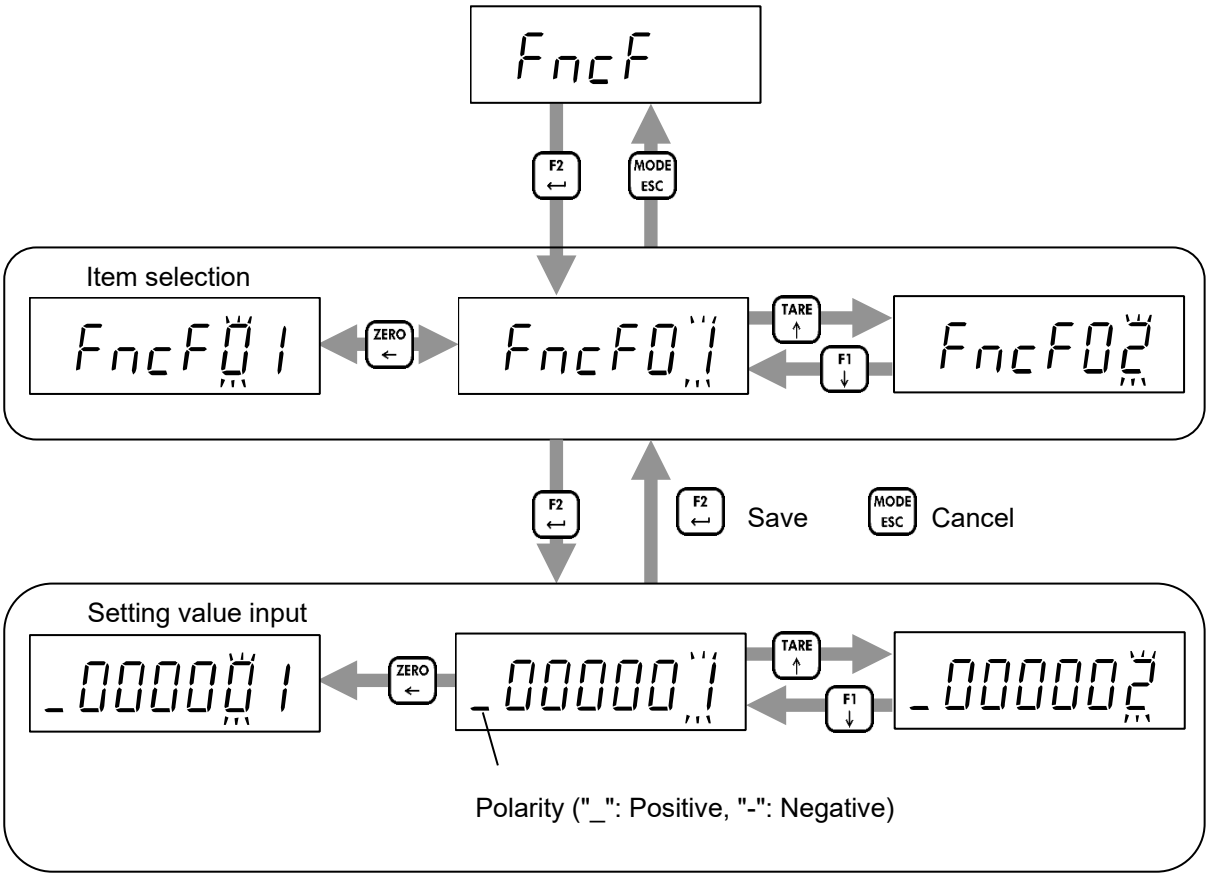
17.2. Setting general functions

Refer to "6. Operation mode" to enter general function mode. The general functions are grouped according to their functions. The following explains how to select a group.



The following explains how to change setting values.

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 inputs the setting value.
	[MODE/ESC] key	Returns to mode selection.
Setting value input		
	[ZERO/←] key	Shifts the blinking digit to the left.
	[TARE/↑] key	Increases the blinking digit by one. Use the leftmost digit to change the polarity. An underscore (_) indicates a positive value and a hyphen (-) indicates a negative value.
	[F1/↓] key	Decreases the blinking digit by one. Use the leftmost digit to change the polarity. An underscore (_) indicates a positive value and a hyphen (-) indicates a negative value.
	[F2/ENTER] key	Saves the input setting value and returns to item selection.
	[MODE/ESC] key	Cancels the input setting value and returns to item selection.



18. Function setting lists

The columns of the function setting list in this chapter indicate the following information.

CALF	Modbus	Setting item	Setting value	Default	User setting
01	400101	Unit	0: None / 1: g / 2: kg / 3: t	2	
(1)	(2)	(3)	(4)	(5)	(6)

(1) The function number in function mode item selection.

(2) The first data address to be accessed via Modbus. All data types are DWORD.

(3) The setting item name.

(4) The setting values and their meanings.

(5) The factory default value. It returns to this value after initialization.

(6) The note column for when the setting value is changed by the user.

18.1. Calibration function list

CALF	Modbus	Setting item	Setting value	Default	User setting
01	400101	Unit	0: None / 1: g / 2: kg / 3: t	2	
02	400103	Decimal point position	0: 0 (No decimal point) 1: 0.0 2: 0.00 3: 0.000 4: 0.0000 5: 0.00000	0	
03	400105	Minimum division	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	999999	
05	400109	Zero setting range	0 to 100 %	100	
06	400111	Zero tracking time	0.0 to 5.0 s *	0.0	
07	400113	Zero tracking width	0: Disable 4: 2.0 d 8: 4.0 d 1: 0.5 d 5: 2.5 d 9: 4.5 d 2: 1.0 d 6: 3.0 d 3: 1.5 d 7: 3.5 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	Zero-setting at unstable	0: Disable / 1: Enable	1	
11	400121	Taring at unstable	0: Disable / 1: Enable	1	
12	400123	Taring at the negative gross	0: Disable / 1: Enable	1	
13	400125	Zero clear	0: Disable / 1: Enable	1	
14	400127	Power on zero	0: Disable / 1: Enable	0	
15	400129	Condition of negative overload	0: Gross < -(Maximum capacity + 8d) 1: Gross < -19d	0	
16	400131	NTEP	0: Disable / 1: Enable	0	
17	400133	Load cell connection type	0: 4-wire / 1: 6-wire	1	

* When accessed via Ethernet/Modbus, the decimal point position is ignored.

18.2. Digital calibration function list

dCAL	Modbus	Setting item	Setting value	Default	User setting
01	401501	Load cell input signal at zero calibration	-7.00000 to 7.00000 mV/V *	0.00000	
02	401503	Load cell input signal (at span calibration – at zero calibration)	0.00001 to 7.00000 mV/V *	2.00000	
03	401505	Load value at span calibration	1 to 999999	20000	

* When accessed via Ethernet/ Modbus, the decimal point position is ignored.

18.3. Basic function list

FncF	Modbus	Setting item	Setting value	Default	User setting
01	400301	[ZERO/←] key lock	0: Disable / 1 : Enable	0	
02	400303	[TARE/ ↑] key lock	0: Disable / 1 : Enable	0	
03	400305	[F1/↓] key lock	0: Disable / 1 : Enable	0	
04	400307	[F2/ENTER] key lock	0: Disable / 1 : Enable	0	
05	400309	Function of [F1/↓] key	0: None 1: Tare clear 2: Zero clear 3: Gross / Net display selection 4: High resolution display selection 5: Manual print	0	
06	400311	Function of [F2/ENTER] key		0	
07	400313	Condition to turn S1 status ON	0: None 1: Hi 2: OK 3: Lo 4: Zero setting error 5: Taring error 6: High resolution display selection	0	
08	400315	Condition to turn S2 status ON		0	
09	400317	Condition to turn S3 status ON		0	
10	400319	Digital filter cut-off frequency [Hz]	0: 273.0 17: 8.4 31: 0.84 1: 120.0 18: 7.0 32: 0.70 2: 100.0 19: 6.8 33: 0.68 3: 84.0 20: 5.6 34: 0.56 4: 70.0 21: 4.8 35: 0.48 5: 68.0 22: 4.0 36: 0.40 6: 56.0 23: 3.4 37: 0.34 7: 48.0 24: 2.8 38: 0.28 8: 40.0 25: 2.4 39: 0.24 9: 34.0 26: 2.0 40: 0.20 10: 28.0 27: 1.7 41: 0.17 11: 24.0 28: 1.4 42: 0.14 12: 20.0 29: 1.2 43: 0.12 13: 17.0 30: 1.0 44: 0.10 14: 14.0 45: 0.08 15: 12.0 46: 0.07 16: 10.0	30	
11	400321	Upper limit value	-999999 ~ 999999	10	
12	400323	Lower limit value	-999999 ~ 999999	-10	
13	400325	Comparison target for upper / lower limit value	1: Gross / 2: Net	1	

18.4. BCD function list

The following functions are valid only for AD-4411-BCD.

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	Reserved internally			
03	400805	Data output logic	1: Positive logic 2: Negative logic	2	
04	400807	Strobe output logic	1: Positive logic 2: Negative logic	2	

18.5. RS function list

The following functions are valid only for AD-4411-485 and AD-4411-232.

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	1	
02	401903	Communication type	1: Interval output at the display update rate 2: Reserved internally 3: In synchronization with manual print 4: Response to command 5: Reserved internally 6: Reserved internally 7: Reserved internally 8: Interval output at 100 times/s 9: Modbus-RTU	1	
03	401905	Baud rate	1: 600bps 2: 1200bps 3: 2400bps 4: 4800bps 5: 9600bps 6: 19200bps 7: 38400bps 8: 115200bps	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	Reserved internally			
09	401917	slave address	0: None 1 to 99	0	
10	401919	Command Response delay time	0.03～3.00s	0.06	

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

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

18.6. Analog output function list

The following functions are valid only for AD-4411-DAC.

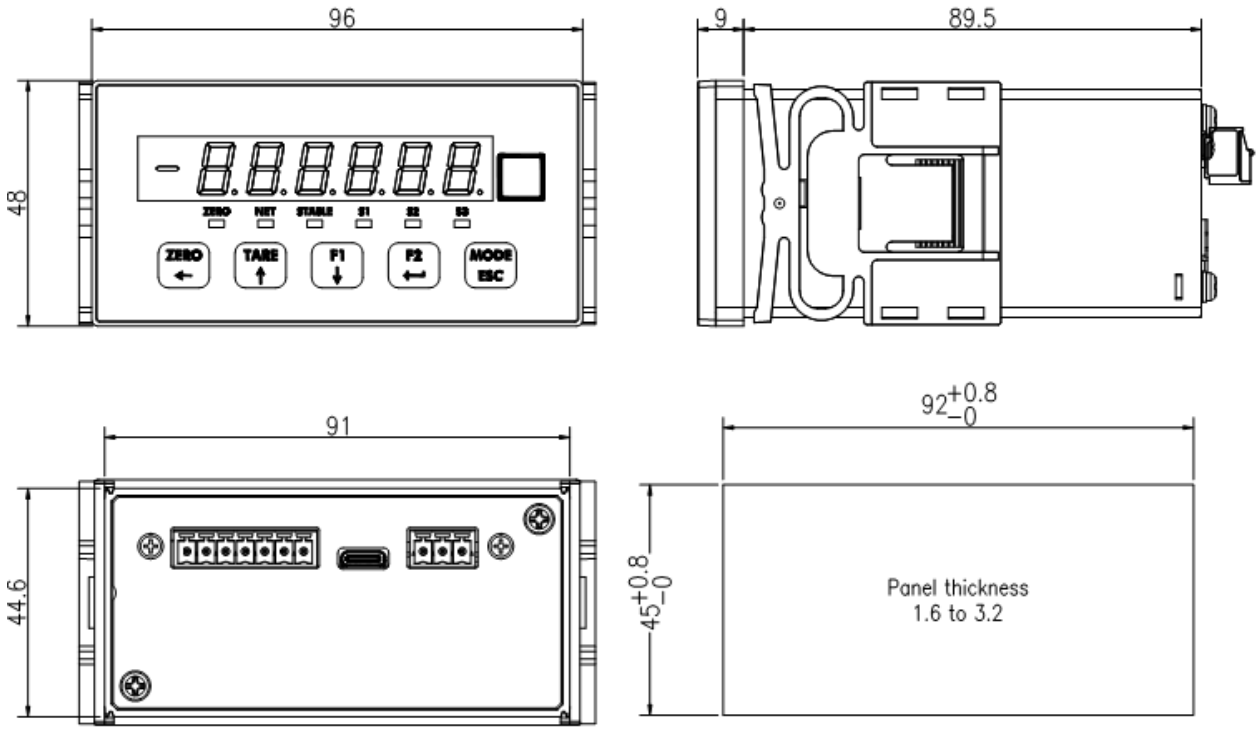
An F	Modbus	Setting Item	Setting value	Default	User Setting
01	401101	Output weight value	1: Displayed weight value 2: Gross value 3: Net value	1	
02	401103	Weight value at 4 mA / 0V output	-999999 ～ 999999	0	
03	401105	Weight value at 20 mA / 10V output	-999999 ～ 999999	20000	
04	401107	Output type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

*1: The instrument must be reset after changing the setting value.

19. Specifications

External dimension			96(W) x 48(H) x 98.5(D) mm
Installation method			Panel mount
Operating temperature and humidity range			-10°C to +40°C Less than 85% RH, non-condensing
IP rating			When the indicator is installed to the control panel: Outside of the control panel: IP65 Inside of the control panel: IP2X
Power supply			
	Power supply voltage		DC24V -15% to +10%
	Power consumption		4.5W max
Load cell input			
	Excitation voltage		DC5V ±5% 90 mA Up to six 350 Ω load cells can be connected in parallel. 6-wire type with remote sensing
	Signal input range		-7.0 mV/V to 7.0 mV/V
	Minimum input sensitivity		0.15μV/d or more (d=minimum division)
	Nonlinearity		0.005% of F.S. max.
	Temperature coefficient		Zero drift: ±0.02μV/°C Typ. ±0.1μV/°C max. Span drift: ±3ppm/°C Typ. ±15ppm/°C max.
	Sampling rate		1200 times/s
Display			
	Main display		7-digit LED (green) with character height of 10 mm
	Status display		LED (red) x 6
	Unit		Attach the g / kg / t label
Key switches			x 5
External interface			
	Interface	AD-4411-BCD	BCD output
		AD-4411-485	2-wire RS-485
		AD-4411-232	RS-232C
		AD-4411-DAC	Analog 4-20mA/0-10V Output
	USB		Type-C connector, USB 2.0 (Full-speed)

External dimensions



Unit: mm

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