AD-4430A

With Analog 4-20mA Output

DIN Rail Weighing Module

INSTRUCTION MANUAL

1WMPD4003460

A&D Company, Limited

The manual and Marks

All safety messages are identified by the following, “WARNING” or “CAUTION”, of ANSI Z535.4 (American National Standard Institute: Product Safety Signs and Labels). The meanings are as follows:

⚠**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.

⚠ This is a hazard alert mark.

- This manual is subject to change without notice, at any time, to improve the product.
- The contents of the product specifications and this manual are subject to change without any obligation on the part of the manufacturer.
- Under the copyright laws, the software (program) described in this manual is copyrighted, with all rights reserved.
  The software may be installed into one computer and may not be installed into other computers without the prior written consent of A&D Company, Limited. Copying includes translation into another language, reproduction, conversion, photocopying and offer or loan to another person.

Teflon is a registered trademark of DuPont.

Contents

Illustrations

1. Compliance

1.1. Compliance with FCC rules

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

1.2. Compliance with European Directives

CE This appliance complies with the statutory EMC (Electromagnetic Compatibility) directive 2004/108/EC and the Low Voltage Directive 2006/95/EC for safety of electrical equipment designed for certain voltages.

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

1.3. Precautions for Safety Use

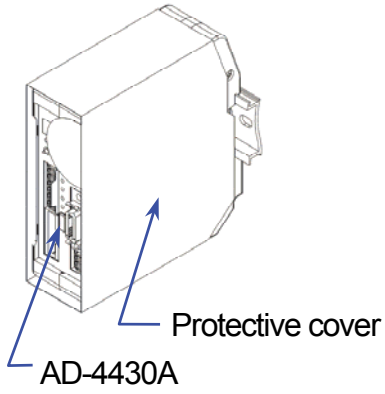
Before use, confirm the following articles for safe operation.

- **Grounding the Module**
  Ground the module to the DIN rail certainly. Separate this earth ground line from others, such as ground lines for the motor, inverter or power source. Unless the indicator is grounded, it may result in electric shock, operation error or fire.
- **Proper Power Source and Power Cable**
  Confirm the AC voltage, frequency and power tolerance of the power cable. If the voltage range of the cable is lower than the power line voltage, it may cause leakage or catch fire. Use pole compression terminals to connect the power cable to the terminals.
- **Fuse**
  The fuse is installed to help prevent the module from catching fire. The module is equipped with many safety circuits, so if the internal circuits are functioning properly, the fuse is not damaged. If the fuse is damaged, it may have been caused by strong electric discharge. If the fuse blows out, please contact us or our dealer. The fuse in this unit cannot be replaced.
- **Splashing Water**
  The module is not water resistant.
- **Flammable Gas**
  Do not install the module where flammable gas is present.
- **Heat Radiation of the Module**
  Space out instruments to radiate heat sufficiently. Use a cooling fan to keep the operating temperature of the module within specifications.

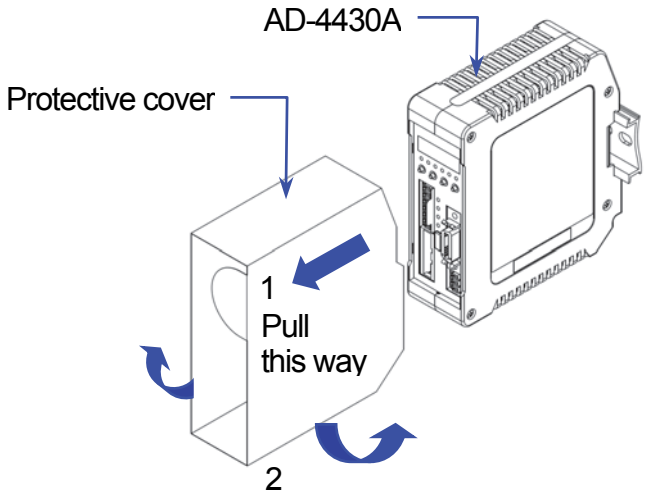
AD-4430A is covered with a protective transparent-resin cover. After the installation is complete, take off the protective cover prior to turning on the AD-4430A. Heat damage may be caused if you do not remove the protective cover.

The protective cover is for preventing wire chips when you will install and wire so please do not take off the cover until complete the installing and wiring.

AD-4430A with a protective cover



How to remove the protective cover



Take off the two tabs on the back of the protective cover.

2. Outline and Features

The AD-4430A has the following features.

- The AD-4430A is a weighing indicator that amplifies electrical signals from a load cell, converts it to digital data and displays it as a weight value.

- This indicator has the following performance :
  - Input sensitivity ····· 0.15 μV/d (d = minimum division)
  - Display resolution ····· 99,999 d in maximum
  - Sampling rate ····· 1000 times/second
  - Input voltage range ····· −35 to +35 mV (−7 to +7 mV/V)

- Analog 4-20mA output function
  The AD-4430A converts mass or flow rate into analog 4-20mA output. There are two output channels that are IOUT1 and IOUT2. The output data is selected at each channel. "Analog 4-20mA output" will be called "analog output" from now on.

- Flow rate calculation function
  Digital filter 2 that is a low cutoff frequency can calculate stable flow rate when extreme mass change has been occurred. You can set the dumping time, which is to moderate flow rate change, and to average the moving time of the flow rate.
  Flow rate is calculated a thousand times per second as same speed as A/D conversion. There is a "hold function" that is to control flow rate and constantly maintain output of the flow rate. There is a function that is "uncertain flow rate" to monitor flow rate. Uncertain flow rate is to monitor whether a calculation error has occurred or not from the control I/O.

- The calibration using gravity acceleration correction
  The function compensates for weighing error due to the difference of gravity acceleration between the calibration place and the measurement place.

- The digital linearization function
  The digital linearization function can rectify and reduce the deviation using weighing points during the zero and maximum capacity. Up to four weighing points excluding zero point can be specified. The high-order correction curve is used between each point.

- The digital span mode function
  Calibration is performed by numerical input of the load cell output (mV/V). Set the values to C-F17, C-F18, C-F19 in the calibration function.

- The digital filter
  The digital filter is used to prevent electrical signal movement from the load cell.
  This module has two channels so that each cutoff frequency can be set separately.
  - Digital filter 1 (Fnc05)
  - Digital filter 2 (Fnc06)

3. Specifications

3.1. Analog Part (Load cell Input, A/D Converter)

Input sensitivity		0.15 μV/d or greater (d = minimum division)
Input voltage range		−35 mV to +35 mV (−7 to +7 mV/V)
Zero range		−35 mV to +35 mV (−7 to +7 mV/V)
Load cell excitation voltage		5 VDC ±5%, 60 mA with remote sense capability (Maximum 4 x 350 Ω load cells)
Temperature coefficient	Zero	±0.02 μV/°C Typ. ±0.1 μV/°C max
	Span	±3 ppm/°C Typ. ±15 ppm/°C max
Non-Linearity		0.005% of full scale
A/D conversion method		Delta-sigma method
A/D resolution count		Approximately 16,000,000 counts
Display resolution		99,999 d max. (d = minimum division) within 20,000 d is recommended
Sampling rate		1000 times/second

3.2. Digital Part (Display and Keys)

Display element	Measurement display	5−digit 7−segment red LED Character height is 5.3mm, 1−digit red LED for negative polarity
	Status indicators	6 red LEDs
Measurement display	Numerical display	Switches between NET and GROSS
	Decimal point	Selectable decimal places (10^1, 10^2, 10^3, 10^4)
	Overflow display	All the digits turn OFF. (When the polarity is negative, the minus sign by LED appears at the highest-order digit.)
Status indicators	**G**: GROSS, **N**: NET, **H**: HOLD/HOLD BUSY, **S**: STABLE, **Z**: ZERO, **X**: Preset function selected at FnC04 in the basic function.	
Key switches	**F/ESC**, ➔(ZERO), ➚(TARE), **ENT**	

3.3. General

3.3.1. Interface

Interface	Specification	Connector
Load cell input	Refer to **"3.1. Analog Part (Load cell Input, A/D Converter)"**	Spring clamp terminal boad 7 pins
Analog output	Refer to **"6.1. Analog Output"**	Power clamp connector (3M)
Control I/O	Refer to **"6.2. Control I/O"**	MDR connector 20 pins female Connector is not included
Standard serial output	Refer to **"6.3. Standard Serial Output"**	
USB	USB 2.0 (High-speed)	Micro−B Cable is not included

3.3.2. Weighing Function

Zero operation	Sets the gross weight to zero by pressing the [→(ZERO)] key. Selection of disable or enable for the operation when unstable. The zero value is stored in the nonvolatile memory. Zero adjustable range : Can be set optionally in the range of 1 to 100% of the maximum capacity. LED on **Z** will illuminate when the weighing value is within the center-zero range.
Zero tracking	Tracks the weight drift around the zero point to maintain zero. Zero tracking time : 0.0 to 5.0 sec. Can be set optionally within the range Zero tracking band : 0.0 to 9.9 d Can be set optionally within the range
Tare	Sets the net weight to zero by pressing the [↑(TARE)] key. The inhibition / permission switch of the tare function can be used when the weighing value is unstable and negative. The tare value is stored in the nonvolatile memory (FRAM). Tare range : Gross weight ≤ Maximum capacity
Stability detection	Turns ON the stabilization indicator **S** when the variation amount of the weight values per sampling are within the set band in the set time. Detection time : 0.0 to 9.9 sec. Can be set optionally within the range Detection band : 0 to 9d Can be set optionally within the range
Digital filter 1	Cutoff frequency (−3 dB) range : 0.7 to 100 Hz
Digital filter 2	Cutoff frequency (−3 dB) range : 0.07 to 100 Hz
Near-zero detection	Non loading can be detected as near-zero and it is output.
Upper or lower limit detection	Compares the measurement with HI/OK/LO limits and outputs the results.
Hold function	Displays the measurement value held. Select from sample hold, peak hold, average hold.
Flow rate calculation	Calculate mass change value per unit time.

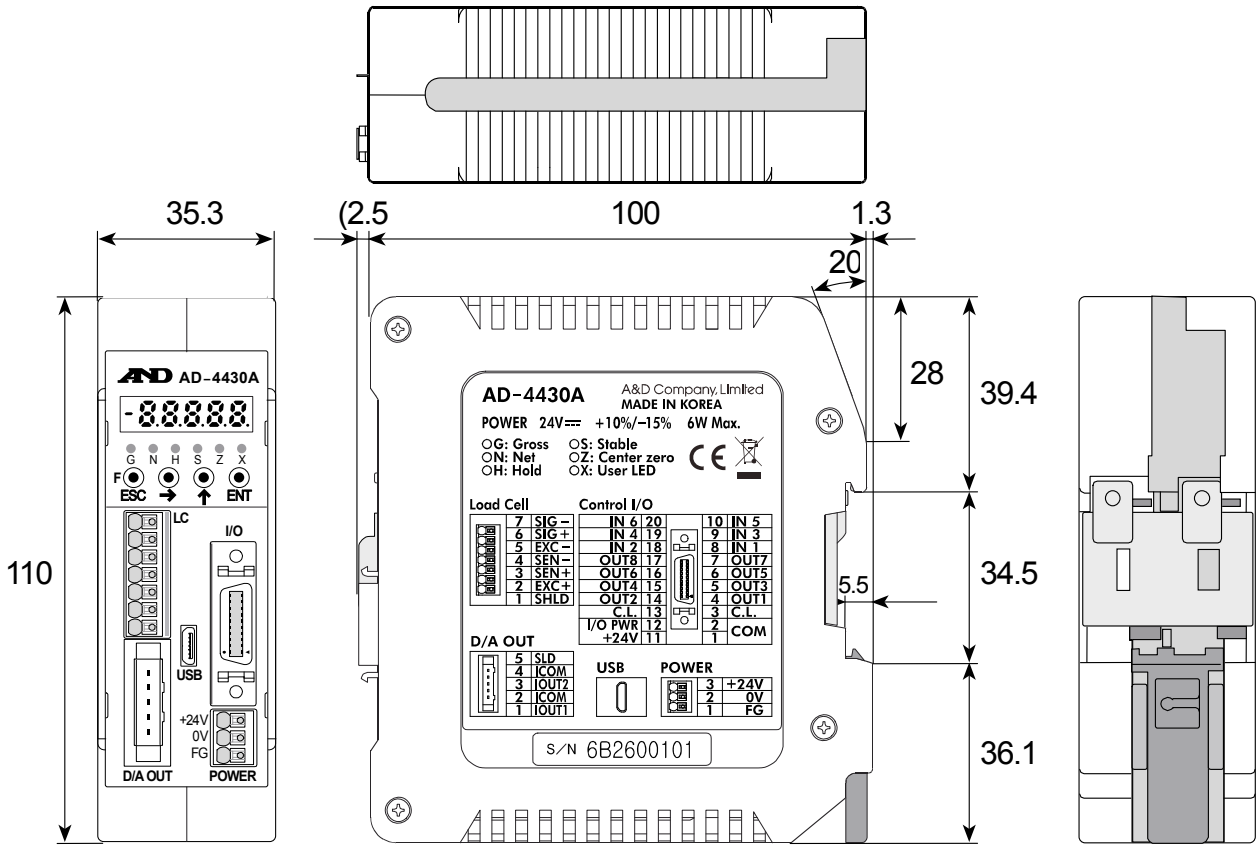
3.3.3. General

Data memory backup	Backed up using by nonvolatile memory. (More than 10 years)
Power source	DC 24 V, +10%, −15%
Power consumption	Approximately 6 W
Operating temperature Operating humidity	−10 °C to +50 °C, 85 %RH or less (no condensation)
Installation method	DIN rail mount
Mass	Approximately 200 g

3.3.4. Accessories

Item	Quantity	Model name
Analog output connector	1	Power clamp wire mount socket, 3M, 35505−6200−A00 GF

3.3.5. Dimensions



Unit : mm

Illustration 1 Dimensions

3.4. Names (The Front Panel and Rear Panel)

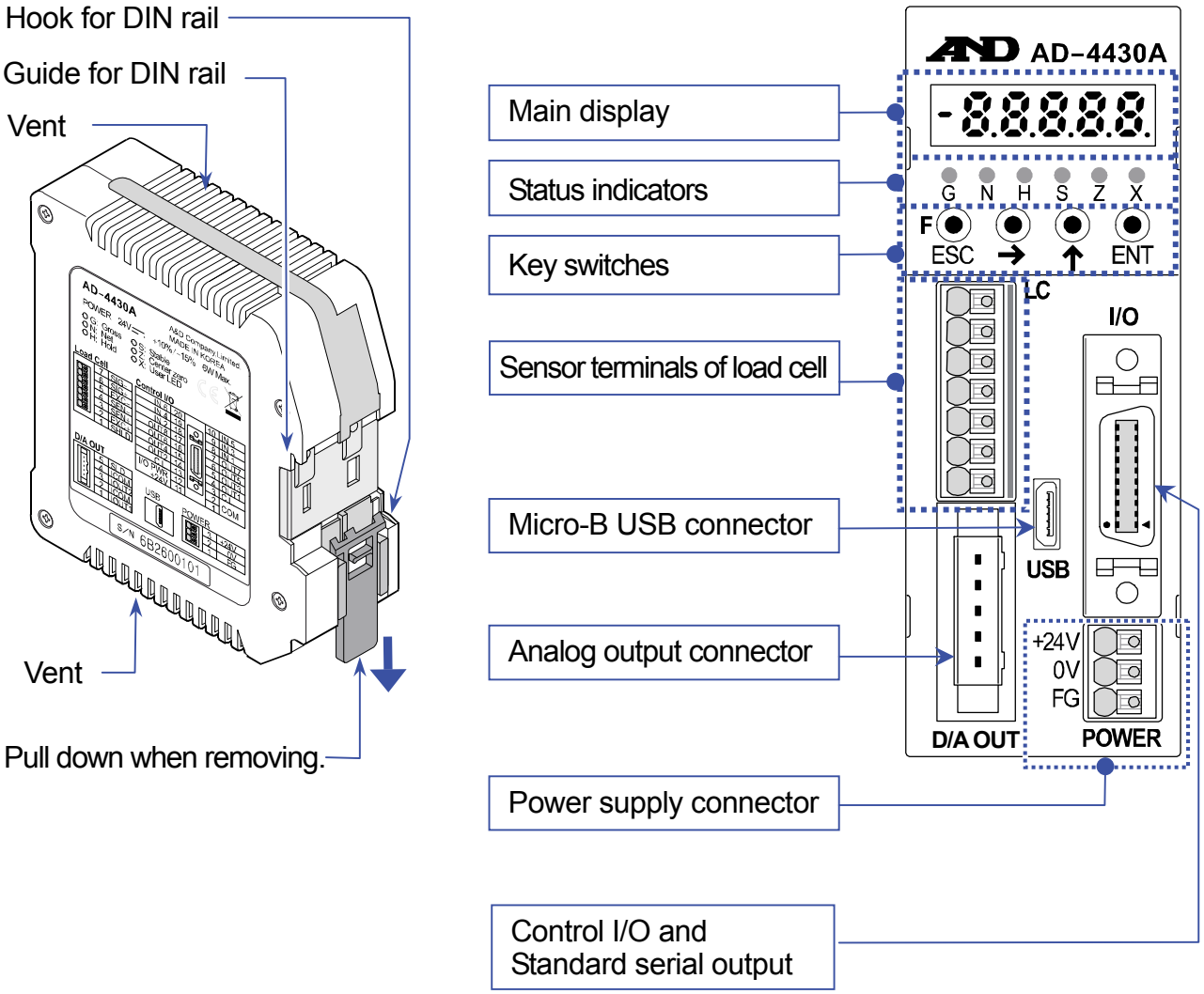


Illustration 2 Front panel & rear panel

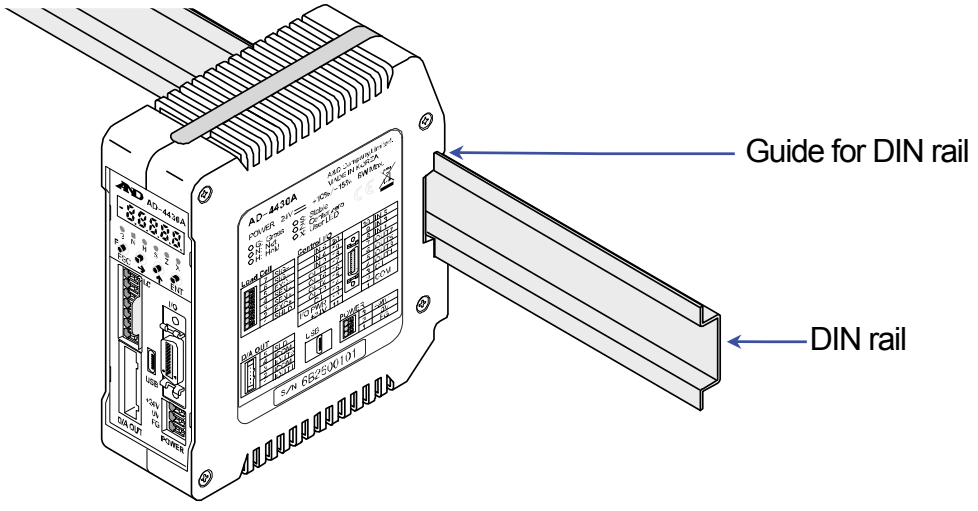


Illustration 3 Mounting the module

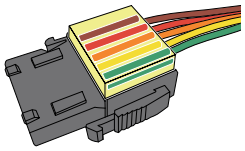
3.5. Procedure for Connecting the Analog Output Cable

Specifications of conforming cable

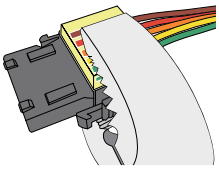
Wire outside diameter	ϕ1.6 ~ 2.0mm
Wire size	AWG#20 (0.5mm^2)

Procedure for connecting the cable

Step 1 Do not strip the cable jacket.
Insert the cable all the way into the yellow cover.

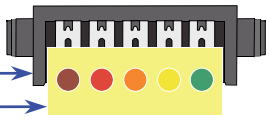


Step 2 Crimp the cover on the body using pliers from the side of the connector as shown in the illustration to the right.



Step 3 Be sure the cover and the body are parallel to each other and there is no space between the body and the cover.

After crimping



Before crimping

4. Installing the Module

In this section, installation environment, power terminal and load cell cable, and how to connect them are explained. Refer to each chapter for other external I/O.

4.1. Conditions to Install the Module

- ❑ The module is a precision electronic instrument. Handle it carefully.
- ❑ The operating temperature is −10 °C to +50 °C.
- ❑ Do not install the module in direct sunlight.

4.2. Power Supply

⚠CAUTION
Earth ground the module to prevent electrical shock or indicator malfunction. If the module is not grounded, it may cause of an electric shock, or malfunction due to static electricity.

- ❑ Before connecting the module to the power source, read the instruction manual thoroughly.
- ❑ Do not connect the module to the power source before the installation is complete.
- ⚠❑ To avoid electrical shock, do not handle the power cable with wet hands.
- ⚠❑ Earth ground the module. Do not share the ground line with other electrical power equipment.
- ❑ The power requirement is 24 DCV, +10% to −15%.
  Use a stable power source free from instantaneous power failure or noise.
- ❑ To avoid a malfunction, do not share the power line with other devices.
- ❑ The output voltage of a load cell is a very sensitive signal. Keep all electrical noise sources away from the load cell and load cell cable.
- ❑ Use cables shielded for input and output. Connect the cable shield to the F.G. terminal or the module housing.
- ❑ F.G. (frame ground) is internally connected to all the connector shields (SHLD/SLD).

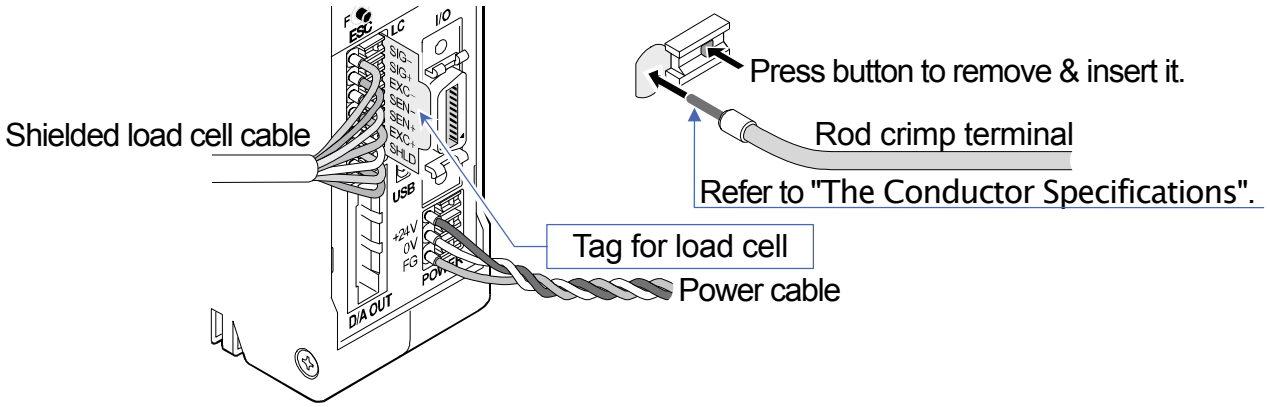


Illustration 4 Cables

The Conductor Specifications

Clamp range (typ.)		0.13 mm²	to	1.5 mm²
AWG		AWG24	—	AWG16
Solder plated wire		0.2 mm²	to	1.5 mm²
Twisted wire		0.2 mm²	to	1.5 mm²
Rod crimp terminal	DIN 46228 Part1	0.25 mm²	to	1.5 mm²
Rod crimp terminal with cover	DIN 46228 Part4	0.25 mm²	to	0.75 mm²
Lead length		8 mm		

4.3. Connecting Load Cell Cable

Load Cell

- The cable that extends from the load cell is a part of the load cell. Do not cut the load cell cable even if there is the remainder of the cable.
- Bundle the load cell cable if there is the remainder of the cable.
- The load cell is compensated for temperature change including the resistance value of this cable.
- Basically, connect the shield wire to a point of the shield terminal of the AD-4430A and do not ground it. If there are multiple ground points, it may result in noise due to a ground loop.

Remote Sensing (Compensation for length of the extension cable)

- The AD-4430A is equipped with the compensation function that monitors a drop voltage for the excitation voltage and rectifies the A/D conversion value.
- Use the 6-wire extension cable to use the remote sensing function for the load cell.
- Connect terminals of SEN+ and SEN−. If they are not connected, measurements cannot be performed.
- When the 4-wire cable is used , connect terminals of EXC+ and SEN+ and terminals of EXC− and SEN− at the load cell terminal of the AD-4430A.

Load Cell Cable

- Load cell cables should have high electrical insulation and shield performance.
- Use shielded cables with the insulator that is made of materials with high insulation resistance such as Teflon and polyethylene. **NOTE: Teflon is a registered trademark of DuPont.**
- We recommend using the load cell extension cable produced by A&D co., ltd. when using it.
  AX−KO162−5M to 100M (5m to 100m)
  Cable diameter ····· ϕ9 mm
  Cross-sectional area of the conducting wire ····· 0.5 mm^2, 6-wire cable equipped

Terminal No.	Terminal name & Function of the AD-4430A	
7	SIG−	Load cell input (−)
6	SIG+	Load cell input (+)
5	EXC−	Load cell excitation voltage (−)
4	SEN−	Sensing input (−)
3	SEN+	Sensing input (+)
2	EXC+	Load cell excitation voltage (+)
1	SHLD	Shield

6-wire connection to load cell (Recommended)

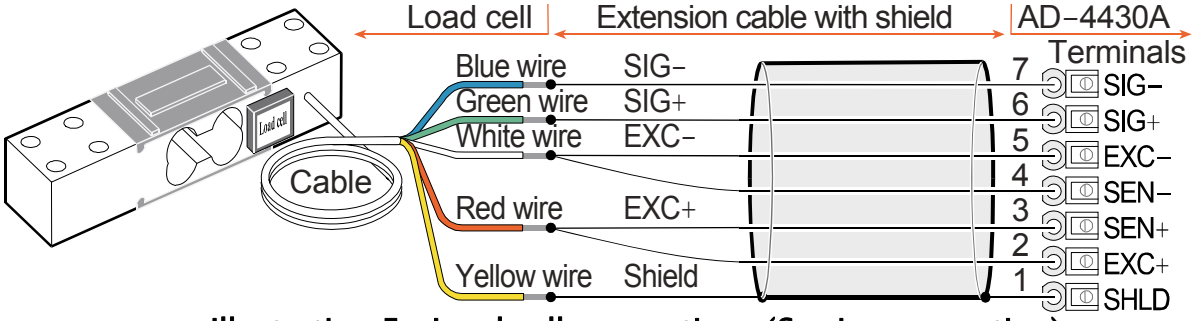
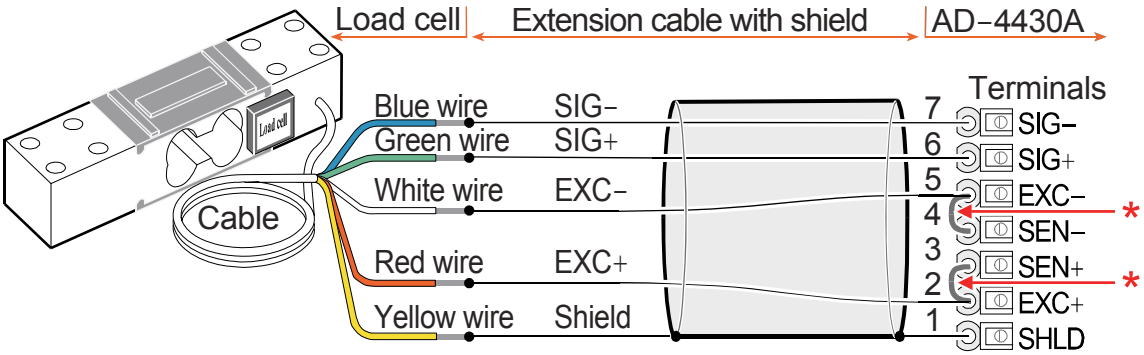
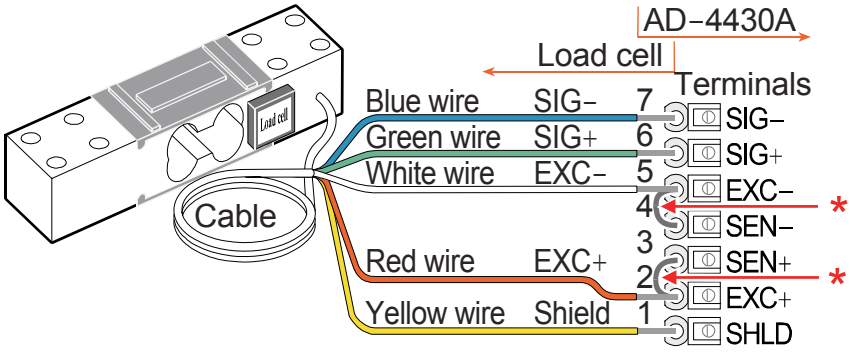


Illustration 5 Load cell connections (6-wire connection)

4-wire connection to load cell



Direct connection to load cell



* Be sure to connect terminals between EXC+ and SEN+ , SEN- and EXC-.

Illustration 6 Load cell connections (4-wire connection & direct connection)

4.4. Verifying Load Cell Cable

When the load cell connection is complete, perform a connection check using the following procedure.

- ❑ Perform a visual check to ensure that the wiring is correct.
- ❑ Turn the module on.
- ❑ Set the weighing mode.
- ❑ Enter to the check mode and check the load cell output value.
  Refer to "**7.2. Check Mode**" to enter to the A/D check mode.
- ❑ Confirm that the displayed load cell output value matches the specified value. Normally the displayed value will be the load cell rated output value or less.
- ❑ If an error occurs, refer to "**7.4. Verifying The Load Cell Connections (DIAGNOS)**" or "**7.5. Verifying The Load Cell Connections Using Multimeter**".

5. Operations

5.1. General Functions

5.1.1. Zero Operation

- Zero operation is a function to set the gross weight to zero.
  It is performed by pressing the [➔(ZERO)] key.
- The zero range is set in C-F05 (Zero range) and is expressed in percent of the maximum capacity with the calibration zero point as the center.
- Zero operation is disabled, even within the zero range, when the A/D converter overflow occurs.
- A ZERO error is output if zero operation is not performed when the value is unstable or out of range.
- The zero value is stored in the non-volatile memory and is maintained, even if the power is disconnected.
- Clearing the zero value is performed using the [F] key assigned to clear the zero value.

- **Functions Related to Zero Operation**
  - C-F05 (Zero range) : A value between 0% and 100% can be specified.
  - C-F 10 (Tare and zero at unstable weight value) **:**
    The selection to enable or disable tare and zero operation when unstable.
    0: Disable both functions 1: Enables both functions
  - C-F 16 (Zero setting when power is turned on) **:**
    The selection whether or not to perform zero setting when power is turned on.
    0: Not used 1: Use

5.1.2. Zero Tracking

- The zero tracking function traces the gross weight drift around the zero point to maintain zero.
- The zero tracking time is set in C-F06 (Zero tracking time) and the zero tracking band is set in C-F07 (Zero tracking band). When the gross weight drift is within the specified ranges, zero tracking is performed automatically.
- A ZERO error is not output even if zero tracking is not performed.

- **Functions Related to Zero Tracking**
  - C-F06 (Zero tracking time) **:** The value between 0.0 and 5.0 seconds can be specified.
  - C-F07 (Zero tracking band) **:** The value between 0.0 and 9.9 d can be specified.
    (d = minimum division)
    Zero tracking does not function when either of the settings is 0.0.

5.1.3. The Tare Function

- Tare is a function to store the gross weight as the tare value and set the net weight to zero. It is performed by pressing the [↑(TARE)] key.
- The tare value is stored in the non-volatile memory and is maintained, even if the power is disconnected.
- Clearing the tare value is performed using the [F] key assigned to clear the tare value.
- **Functions Related to the Tare Function**
  - C-F 10 (Tare and zero at unstable weight value) **:** The selection to enable or disable tare and zero operation when unstable.
    0: Disables both functions 1: Enables both functions
  - C-F 11 (Tare when the gross weight is negative) **:** The selection to enable or disable tare when the gross weight is negative.
    0: Disables tare 1: Enables tare

5.1.4. Clearing the Tare Value and Zero Operation

The way to clear the tare value and zero operation : While pressing and holding the [↑(TARE)] key, turn on the module.
Another way : In the off mode, while pressing and holding the [↑(TARE)] key, press the [ENT] key.

5.1.5. Customizing the Function of the F Switch

- Assign a function to the [F] key in the general functions.
- **Functions Related to the [F] Key**
  - Assigns a function to the [F] key from the functions of FnC02 ([F] key) below :

    0: None
    1: Manual print command
    2: Hold
    3: Operation switch 1
    4: Operation switch 2
    5: Display exchange
    6: Tare clear
    7: Zero clear
    8-11: Reserved by internally
    12: mV/V monitor (additional monitor)
    13: Digital filter 2 (additional monitor)
    14: Display output data selected in An 11 (additional monitor)
    15: Display output data selected in An 21 (additional monitor)

  - C-F 15 (Clear the zero value) **:** The selection to enable or disable clearing the zero value.
    0: Disable 1: Enable

Operation switch 1 and 2

By assigning the [F] key to the operation switches, manual input is possible. The output is from the control output (34: Output operation switch is on or off). To ensure that the operation switch is ON or OFF, the status indicator X, that is a red LED, is assigned to the operation switch status.

These switches work as follows:

Operation switch 1:

When pressing and releasing the switch once, the state of the switch is maintained. Press the switch again to turn off or on.

Operation switch 2:

Only while the switch is being pressed, the switch is ON. When it is released, it is OFF.

Additional monitor

The decimal points of other data flashes to separate weighing data, both LEDs of G: gross and N: Net are illuminated. When pressing the [F] key again, the AD-4430A returns to weighing mode.

mV/V	: Output voltage of load cell in the unit of mV/V.
Digital filter 2	: Response of weighing data by digital filter 2
Display output data selected in An 11	: Output data set from An 11 or An 21 in output data. When flow rate is set and the rate is over five digits, all digits disappear. In this case, set the flow rate setting magnification (An 15 and An 25) grater than the current setting.
Display output data selected in An 21	

5.1.6. Customizing the Function of the x Display

Assigns a function to the **x** display from the functions of Fnc04 (x display) below :

0: None
1: Zero tracking in progress
2: Alarm (Zero range setting error, over, failure tare calculation)
3: Display operation switch status as on or off
4: Near-zero
5: HI output
6: OK output
7: LO output

5.1.7. Memory Backup

- Zero value, tare value, display status, calibration data and function data are written into non-volatile memory. The data retention period is more than 10 years. This module is not equipped with a battery.

5.1.8. The Detection for the Near-Zero

- Near-zero is a function to detect whether an object has been placed on the weighing pan. Near-zero is defined as a state of the near-zero when the weighing value is within the preset value for the near-zero.

- **Functions Related to the Near-Zero**
  - Fnc08 (Set value of near-zero) **:** The value of near-zero can be specified.
  - Fnc09 (Comparison mass at near-zero) **:** The selection of the gross weight or net weight to compare the value of near-zero.
    1: Gross weight 2: Net weight

5.1.9. Upper or Lower Limit Detection Function

- This is a function to detect whether the weighed value is above an upper limit value or below a lower limit value.

- **Functions Related to the Detection Function**
  - A comparative upper or lower limit value can be set by Fnc 10 (Upper limit value) or Fnc 11 (Lower limit value).

Result of Detection	Required value
HI	Weighing value ＞ Upper limit value
OK	Upper limit value ≧ Weighing value ≧ Lower limit value
LO	Lower limit value ＞ Weighing value

  - Fnc 12 (Comparison mass of upper and lower limit) **:** Gross weight or net weight to be compared with the upper or lower limit value can be selected.
    1: Gross weight 2: Net weight

5.1.10. Digital Filter 1 and 2 (Fnc05 and Fnc06)

The AD-4430A has two digital filters. Each cutoff frequency setting range is different.

- Digital filter 1 (Fnc05 : None, 100.0Hz (high) to 0.7Hz (low))
- Digital filter 2 (Fnc06 : None, 100.0Hz (high) to 0.07Hz (low))

Setting cutoff frequency

The cutoff frequency is the frequency where the vibrations decline to $1/\sqrt{2}$ times.

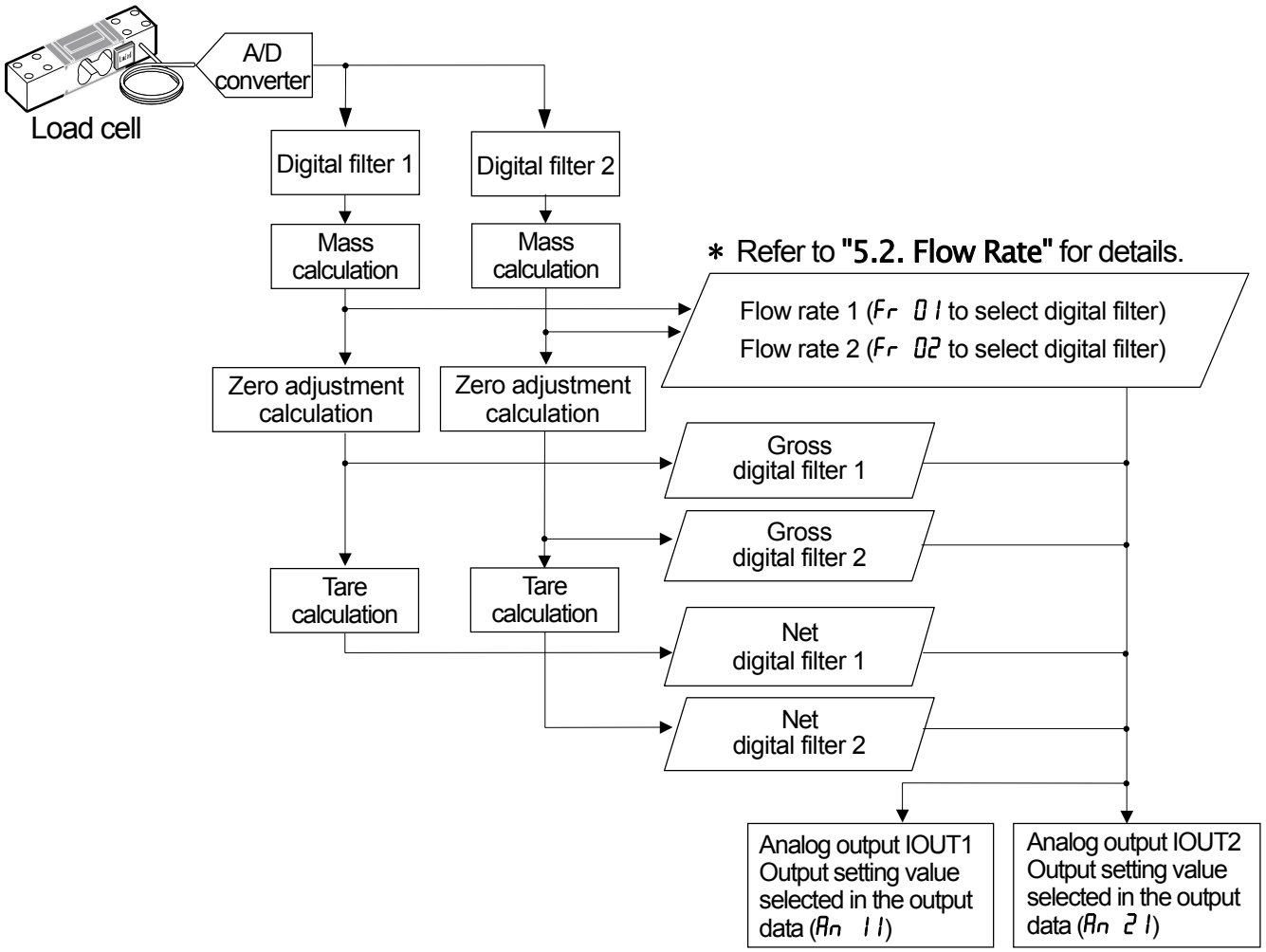
- If the weighing value is unstable, set the cutoff frequency lower. (Response rate is slow. Resistant to disturbance.)
- To make the response faster, set the cutoff frequency higher. (Response rate is fast. Susceptible to disturbance.)

It is possible to make adjustments while watching the effects of the digital filter with your own eyes.

By pressing the [→] key during setting values as shown in Step 4 in **"5.5.1. The Procedure to Store New Parameters"** to check the weight displayed.

- [↑] key is to change the cutoff frequency. You can check the setting value shown on the status indicator with LED (binary number).
- [→] key is to return to the value setting display. (The setting value changed above using the [↑] key will be displayed)

Digital filter flow is as follows.



5.1.11. The Hold Function

Hold functions are selected from the hold operations in FnC07.

- **Normal hold**
  The normal hold function holds the value displayed at the time the hold command was received.
- **Peak hold**
  The Peak hold function holds the maximum value reached after the hold command was received.
- **Averaging hold**
  The averaging hold function averages weighing data over a certain period of time and then holds the result.

Hold operations are controlled by the following.

- F key : FnC02 (F key function) 2
- Control input : in 01 ~ in 06 (hold) 9
- Above the near-zero and stable : HLd03 (Condition of automatic start) 1
- Above the near zero : HLd03 (Condition of automatic start) 2

Hold is released by the following.

- F key : FnC02 (F key function) 2
- Control input : in 01 ~ in 06 (hold) 9
- HLd04, HLd05, HLd06, HLd07 : Release the hold by each functions required.

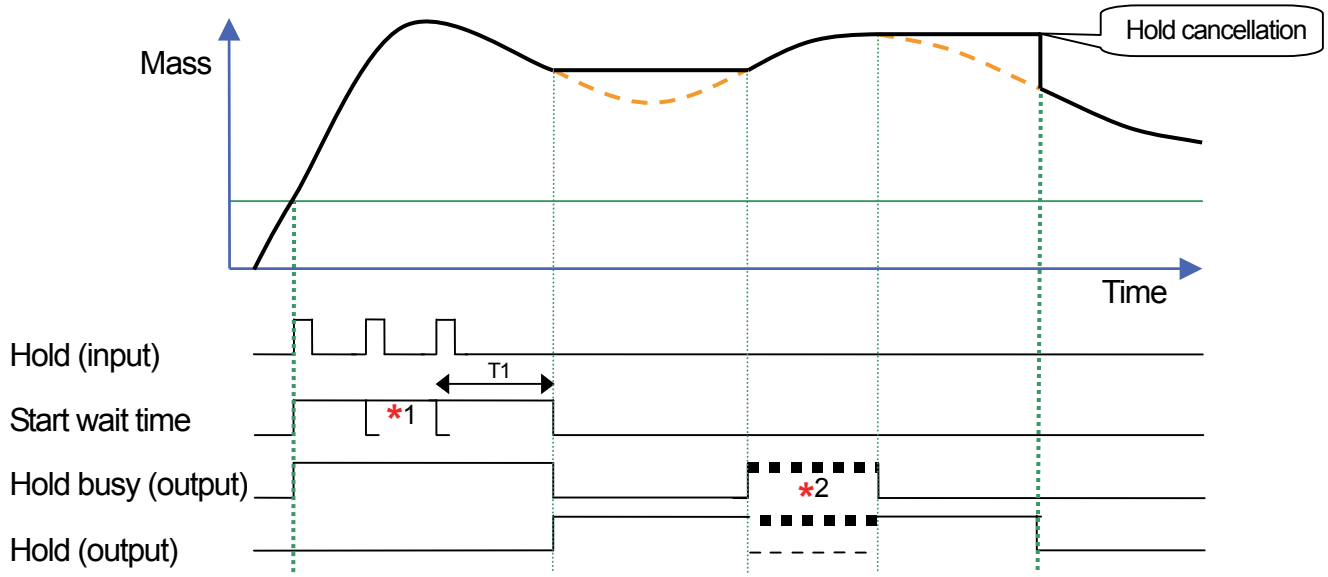
Hold functions are as follows.

Operation requisition		Hold operation (FnC07)		
		Nomal hold	Peak hold	Averaging hold
Average time	HLd01	Not available	Not available	Available
Start wait time	HLd02	Not available	Available	Available
Condition of automatic start	HLd03	Not available	Available *4	Available *4
Release using control input	HLd04	Not available	Available	Available
Release time	HLd05	Not available	Available	Available
Release using fluctuation range	HLd06	Not available	Available *2	Available *3
Release at the near-zero	HLd07	Not available	Available *1	Available

Weighing value to be held is the mass that is displayed on the main display.
As to be held, the gross, net, stable/unstable, and upper of lower limit detection result (HI / OK / LO) are also held. Near-zero is not be held.
The weighing value to be held is output from the standard serial output and the analog output.

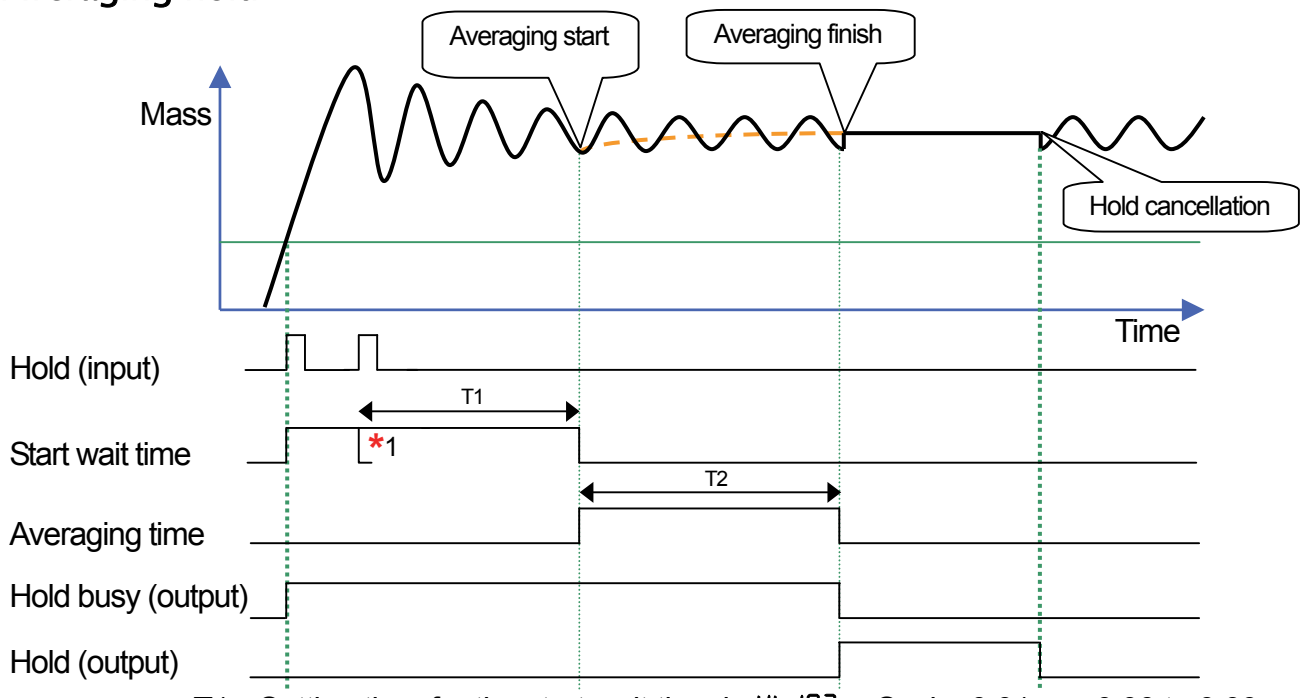
*1 : When the setting is "release at near zero, the peak hold does not work at the near zero.
*2 : In case of a peak hold, only a minus movement can be released.
*3 : The basic value is the weighing value that is when the average time is started.
*4 : When it is hold by the condition of automatic start, the hold can be released either when the F key or the hold is input from the control input.

Peak hold



T1 : Setting time of the start wait time in HLd02. Scale: 0.01sec. 0.00 to 9.99
*1 : Hold is input before reached to the start wait time so that the start wait time is extended.
*2 : As hold value is updated, the hold and the hold busy is on and off. (The hold busy variation is depending on the change of the mass value).

Averaging hold



T1 : Setting time for the start wait time in HLd02. Scale: 0.01sec. 0.00 to 9.99
T2 : Setting time for the averaging time in HLd01. Scale: 0.01sec. 0.00 to 9.99
*1 : Hold is input before reached to the start wait time so that the start wait time is extended.

Illustration 7 Peak hold / Averaging hold

5.2. Flow Rate

Flow rate is a movement of the mass per certain period of time.
AD-4430A has two digital filters so that the two flow rates such as flow rate and the second flow rate are available to output.

- Functions Related to the flow rate
  - Fr 01 (Filter of flow rate 1)
  - Fr 02 (Filter of flow rate 2)
    1: Digital filter 1 2: Digital filter 2

In addition to the digital filters, damping time that is to suppress shaking of flow rate is available.
The settings for suppress shaking of flow rate is set by "damping time setting" and that is a moving average time of damping the weighing values.
Ex. Damping time is 5 sec.: moving average is 5 sec.

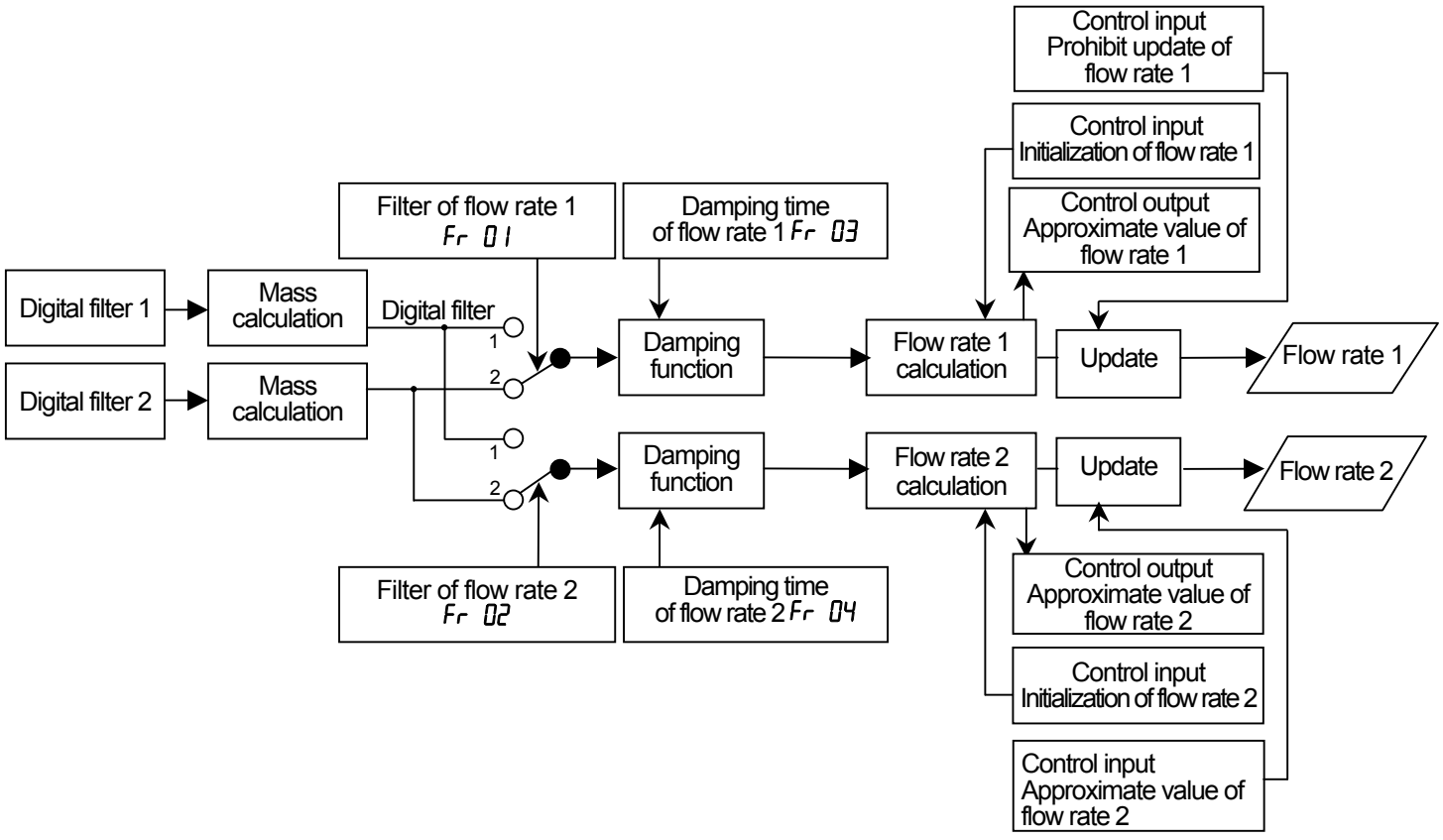
Damping time setting can be set by each flow rate 1 and flow rate 2 individually.

- Functions Related to the flow rate
  - Fr 03 (Damping time of flow rate 1)
  - Fr 04 (Damping time of flow rate 2) 1 to 1000 sec.

The state of the flow rate can be checked from the control input and output as follows.

- Control input
  Prohibit update of flow rate : Hold the flow rate from updating.
  Initialize flow rate : Make constant the movement of the mass that is temporally saved in the dumping time.
  Approximate flow rate value of flow rate : It shows the flow rate value with a slight error.

Following is the flow chart of flow rate calculation after digital filter.



5.3. State Diagram And Operation Switches

5.3.1. State Diagram

The nonvolatile memory always stores either "OFF mode" or "other mode". It starts from the following state depending on the mode that has been kept when the automatic power is on.

- OFF mode (standby): Starts from OFF mode.
- Other mode : Starts from Weighing mode.

State diagram can be switched as follows.

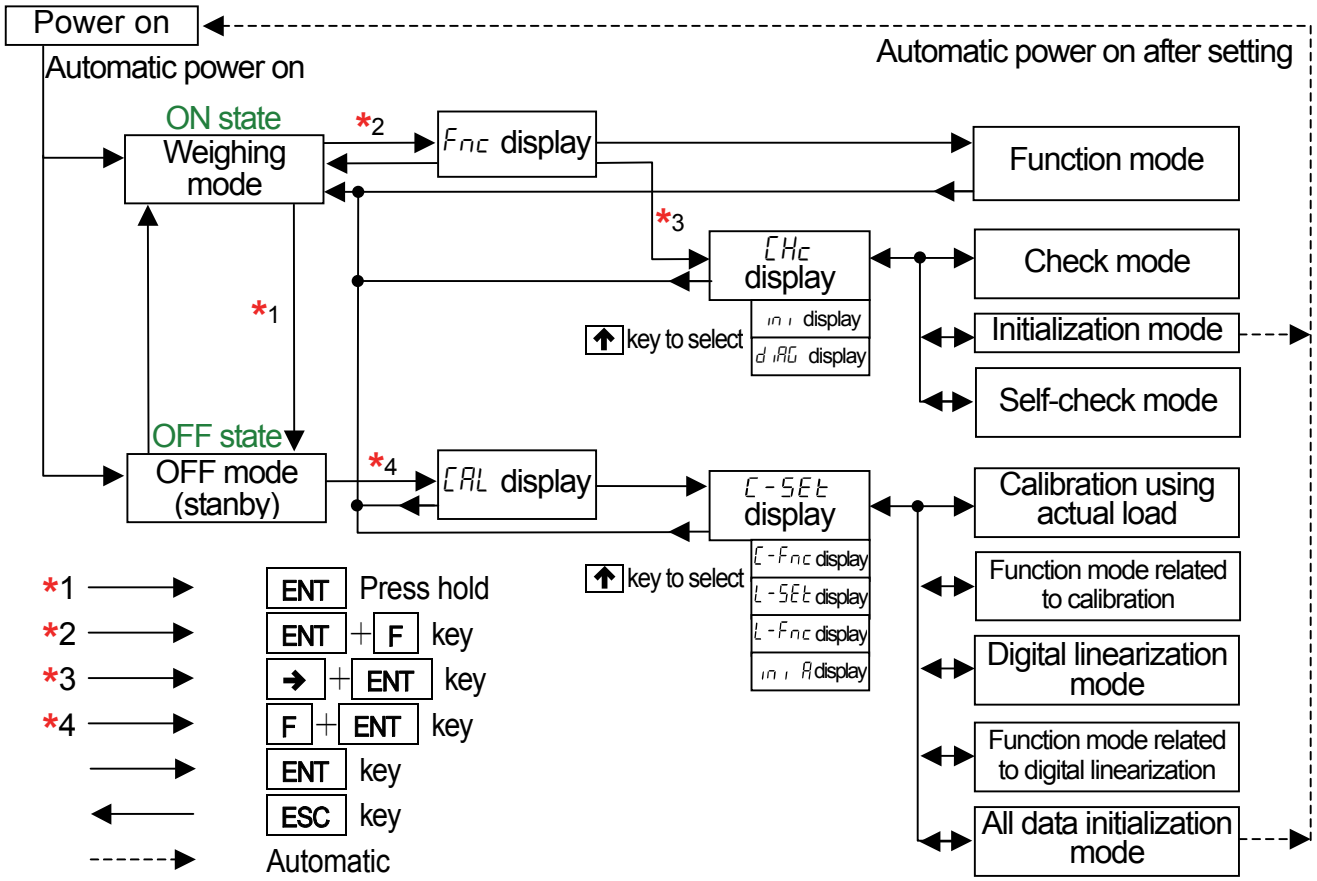


Illustration 8 State diagram

5.3.2. Operation Switches

Key	State	Function and Use
F	Weighing mode	The display switch between gross and net in factory setting. The function key to able to select an arbitrary function and use.
	Setting mode	The ESC key.
→	Weighing mode	The zero key to perform the zero operation.
	Setting mode	The key to change a selected item or move a flashed figure.
↑	Weighing mode	The tare key.
	Setting mode	The key to select parameter or increase number.
ENT	Weighing mode	The key to turn the module off when pressing and holding the key.
	OFF state (Standby)	The key to turn the module on.
	Setting mode	The key to store new settings.
ESC	Weighing mode	The function key (F key) to be selected the function and use.
	Setting mode	The return key or escape key.
ENT + F	Weighing mode	The keys to proceed to the function mode from weighing mode.
→ + ENT	Setting mode	The keys to proceed to the check mode from function mode.
F + ENT	OFF state (Standby)	The keys to proceed to the calibration mode from OFF state (Standby).

5.4. The Calibration

In the calibration mode, operations relating the load cell output voltage to the weighing value can be performed as well as operations directly related to weighing can be performed.

The calibration using actual load	The calibration is performed using a calibration weight. ■ Zero calibration **:** Press ENT key when no load is applied. ■ Span calibration **:** Enter the calibration weight value and place the calibration weight. When the module enters the calibration mode using an actual load, the tare value and the zero value will be automatically cleared.
Digital span	The calibration is performed without an actual load by numerical input of the load cell output voltage (mV/V). Set these functions related to the calibration. ■ Zero input voltage **:** Numerical input of the load cell output at zero. C-F 17 ■ Span input voltage **:** Numerical input of the load cell output of span. C-F 18 (Load cell output at full capacity – load cell output at zero) ■ The calibration weight value of span **:** Numerical input of the calibration weight value corresponding to the span input voltage. C-F 19 (These values relate the span input voltage and the calibration weight value.)
Gravity acceleration correction	The span error is calculated and corrected when gravity acceleration between the calibration location and use location is different.
Digital linearization	The nonlinearity correction function to correct weighing errors that occur halfway between the zero point and maximum capacity. Up to 4 points can be input in addition to the zero point, and the intervals between each point will be calculated using curves.
Function related to the calibration	The function stores basic parameters of the module such as the minimum division and maximum capacity and other data directly related to weighing is performed. Digital span calibration and gravity acceleration correction setting are also performed here.
All data initialization	All the data such as zero value, tare value, calibration data and function data are initialized.

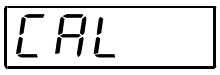
- ❑ All the parameters in the calibration mode are stored in the nonvolatile memory (FRAM).
- ❑ Actual load calibration and digital span can be mixed.
  Example**:** For the zero calibration, an actual load is used. For the span calibration, the digital span is used.

5.4.1. The Calibration using Actual Load (C-SEt)

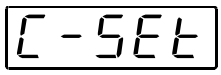
The calibration using actual load (C-SEt) is performed using a calibration weight. When performing the calibration for the first time, preset C-F01 (Unit), C-F02 (Decimal point position), C-F03 (Minimum division) and C-F04 (Maximum capacity) related to the calibration.

Note To avoid drift caused by changes in temperature, warm up the indicator for ten minutes or more before performing the calibration with an actual load.

Step 1 In the OFF mode (Standby), Press the F + ENT key to enter to the calibration mode and display CAL.

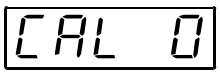


Step 2 Press the ENT key to start the calibration and display C-SEt. To return to the weighing mode, press the ESC key.

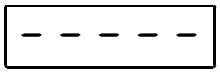


Zero Calibration

Step 3 Press the ENT key to display CAL 0. If zero calibration is not to be performed, press the ↑ key and proceed to Step 5. To check the current weighing value, press the → key. When pressing the ↑ key again, CAL 0 is display.

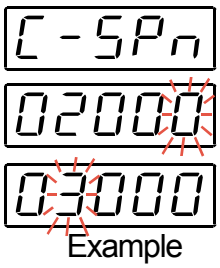


Step 4 Wait for the stabilization (S LED). Press the ENT key. ----- is displayed for approximately two seconds. If span calibration is not performed, press the ESC key twice to return to the weighing mode.



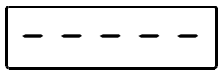
Span Calibration

Step 5 Press the ENT key when C-SPn is displayed. The calibration weight value (the current maximum capacity) is displayed and the least digit of the value blinks. Correct the value using the → and ↑ key so as to be the value of the calibration weight used. If span calibration is not performed, press the ESC key three times to return to the weighing mode.



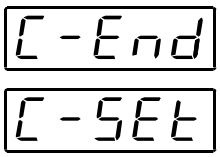
Example

Step 6 Place the calibration weight on the pan. Wait for the stabilization (S LED). Press the ENT key. ----- is displayed for approximately two seconds.



Step 7 C-End is displayed.

Step 8 Press the ESC key. C-SEt is displayed, and the calibration data is stored in the FRAM memory.



Step 9 The current state is the same as that of Step 2. To return to the weighing mode, press the ESC key.

* If C Er X is displayed, an error has occurred. Refer to "**5.4.7. Error Codes for the Calibration**" to take corrective action. X : error number.

* The blinking decimal point means that the current value is not the weight value.

5.4.2. Gravity Acceleration Correction

- When the scale (weighing indicator) has been calibrated in the same place as it is being used, gravity acceleration correction is not required.
- A span error will appear if gravity accelerations are different between the calibration place and the use place. The gravity acceleration correction calculates and corrects this span error by these gravity acceleration correction values for both points (the calibration place and use place).

*** When the span is calibrated using actual load, the gravity acceleration correction settings are cleared, and the two gravity acceleration settings return to their default values.**

- **Functions Related to the Gravity Acceleration Correction**
  - C-F26 (Gravity acceleration of the calibration place)**:**
    The gravity acceleration where the module has been calibrated.
  - C-F27 (Gravity acceleration of use place)**:**
    The gravity acceleration where the module is being used.

Gravity Acceleration Table

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

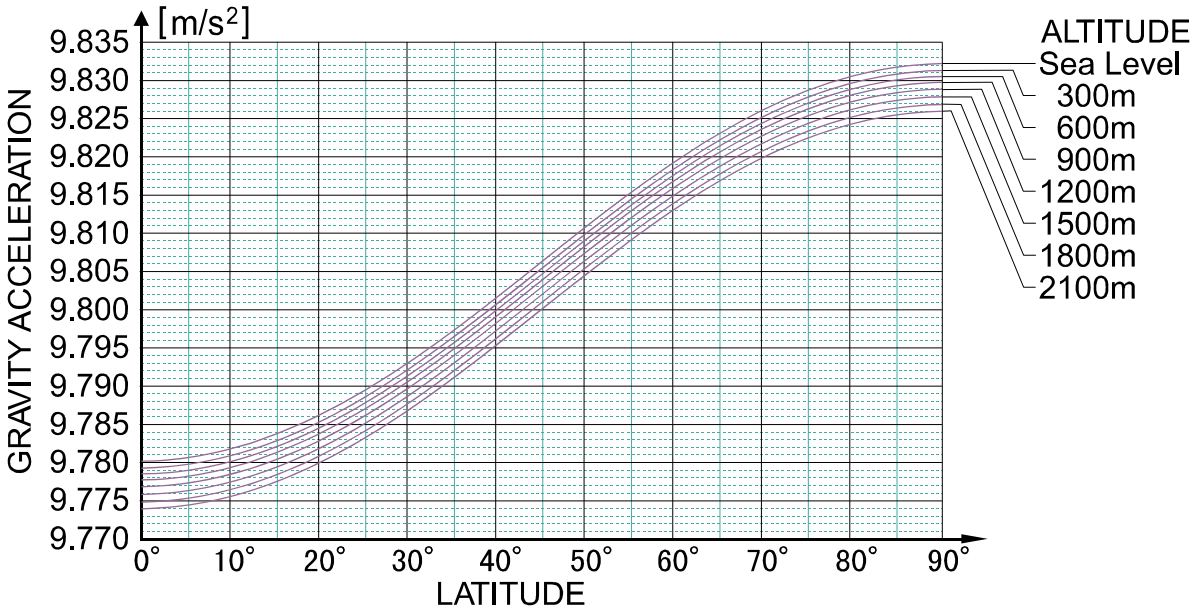


Illustration 9 Gravity acceleration graph

5.4.3. The Linearization Function

Even if zero and span calibration have been performed, weighing errors may occur between the zero point and maximum capacity. The digital linearization (L-SEt) is a corrective function designed to non-linearly correct weighing errors.

- It is possible to input up to four points in addition to the zero point.
- The zero point and each input point will be corrected to put them in a straight line.
- When the actual load input for digital linearization is performed, the calibrated data will be refreshed using zero point and final input point data. It is not necessary to calibrate again.

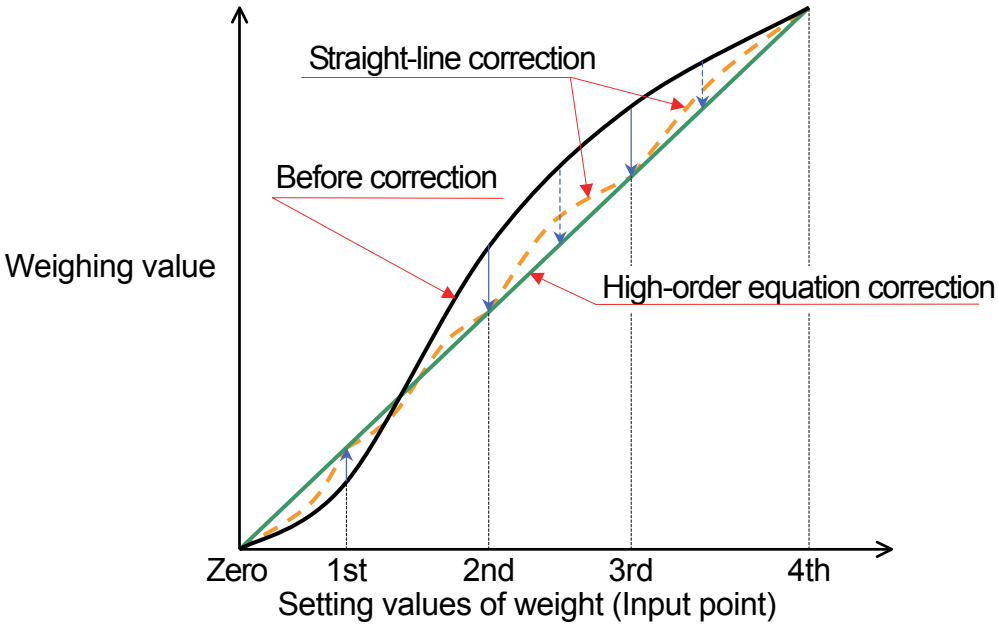


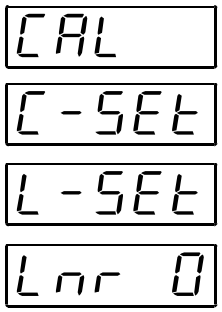
Illustration 10 Digital linearization

5.4.4. The Actual Load Linearization Function (L-SEt)

Set the digital linearization by loading/unloading masses.

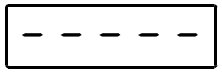
- ❑ Warm up the module for at least ten minutes to avoid the effects of temperature drift.
- ❑ The input order should proceed from the smallest mass to the largest mass.

Step 1 Press the **F** + **ENT** key to enter to the calibration mode and display CAL. Press the **ENT** key to start the calibration and display C-SEt. Select L-SEt using the ↑ key and press the **ENT** key.

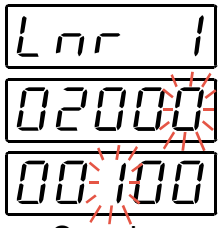


Step 2 Lnr 0 is displayed.
If monitoring the current weighing value, press the → key. When pressing the → key again, Lnr 0 is display.

Step 3 Placed nothing on the pan and wait for the stabilization (**S** LED). Press the **ENT** key. ----- is displayed for approximately two seconds.

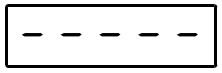


Step 4 Lnr 1 is displayed.
If you want to check the current weighing value, press the → key. When pressing the → key again, Lnr 1 is displayed. Press the **ENT** key. The weight value (the current maximum capacity) is displayed and the least digit of the value blinks. Correct the value using the → and ↑ key so as to be the weight value used.

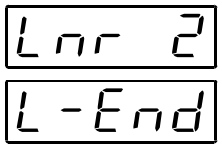


Sample

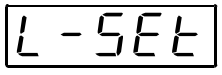
Step 5 Place the weight on the pan. Wait for the stabilization (**S** LED). Press the **ENT** key.
----- is displayed for approximately two seconds.



Step 6 Lnr 2 is displayed. Repeat step 4 and step 5. The procedure proceeds in order of Lnr 3 → Lnr 4 → L-End.



Step 7 Proceed to step 8 to finish the input operation.
If you re-input the digital linearization, select the input point using the ↑ key. All data following the new input point will be cleared.



Step 8 Press the **ESC** key. L-SEt is displayed and the inputted data will be stored in the FRAM. At the same time, the calibrated data is also refreshed. Press again the **ESC** key to return to weighing mode.

* When C Er X is displayed, an error will occur. X : error number.
Refer to "**5.4.7. Error Codes for the Calibration**" for details.

* The blinking decimal point means that the current value is not the weight value.

5.4.5. The Function Related to the Calibration (C-Fnc)

All the values set in the calibration function are stored in the nonvolatile memory (FRAM).

Step 1 Press the F + ENT key to enter to the calibration mode and display CAL .
Press the ENT key to start the calibration and display C-SEt .
Press the ESC key to return to weighing mode.

Step 2 Select C-Fnc using the ↑ key and press the ENT key.

Step 3 Select a desired function item (a function group name with function number) using the ↑ key and press the ENT key.
The current data is displayed.

Step 4 When changing data, two methods of parameter selection and digital input depending on the function are available.

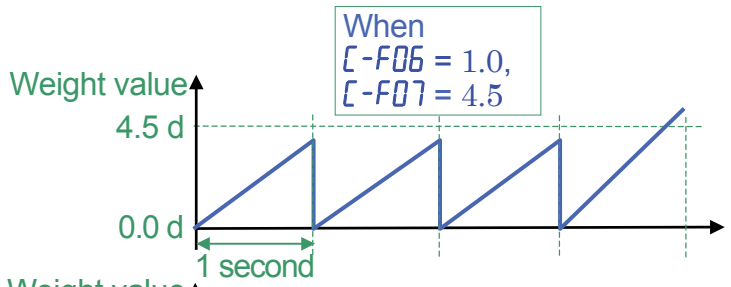
Type	Description of method to change data
Parameter selection	Only the available parameter is displayed and blinks. Select a number using the ↑ key.
Digital input	All the digits are displayed. A digit to be changed blinks. Select a digit using the → key and change the value using the ↑ key.

After changing data, press the ENT key. The next function number is displayed.
When the value is not to be changed, press the ESC key to return to the function number display.

Step 5 Press the ESC key to store new data in FRAM and C-Fnc is displayed.
Press again the ESC key to return to the weighing mode.

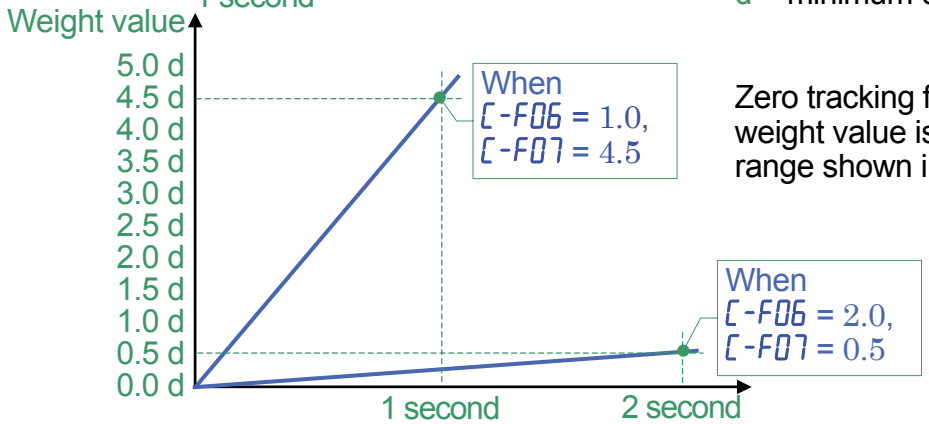
* The blinking decimal point means that the current value is not the weight value.
* If digital input data is out of range, Errdt is displayed, and the data is canceled.
* The function code on the next page is used for command of the USB.

Item Name	Function code	Description, Range and Default value
C-F01 Unit	1001	0 : No used 1 : g [2]: kg 3 : t 4 : N 5 : kN
C-F02 Decimal point position	1002	Decimal point position of the weighting value [0]: 0 1 : 0.0 2 : 0.00 3 : 0.000 4 : 0.0000
C-F03 Minimum division	1003	Minimum division (d) of the weighting value [1]: 1 2 : 2 3 : 5 4 : 10 5 : 20 6 : 50
C-F04 Maximum capacity	1004	Maximum capacity of the module. Weighing is possible up to the value of this setting plus 8 digits. If the value exceeds this, overflow will occur and will not be displayed. The decimal point position depends on C-F02 (Decimal point position). 1 to [70000] to 99999
C-F05 Zero range	1005	The range to enable zero operation by the [→(ZERO)] key expressed as a percentage of the maximum capacity with the calibration zero point as the center. For example, if 2 is set, the value in the range of ±2% of the maximum capacity with the center at the calibration zero point will be to zero. When a power-ON zero is performed, the initial zero point will be the center. 0 to [2] to 100
C-F06 Zero tracking time	1006	Performs zero tracking using this setting in combination with the setting of C-F07. When C-F06 stores 0.0, zero tracking will not be performed. Scale : 0.1 seconds. [0.0] to 5.0
C-F07 Zero tracking width	1007	Performs zero tracking using this setting in combination with the setting of C-F06. When C-F07 stores 0.0, zero tracking will not be performed. Scale : 0.1 d (minimum division). [0.0] to 9.9



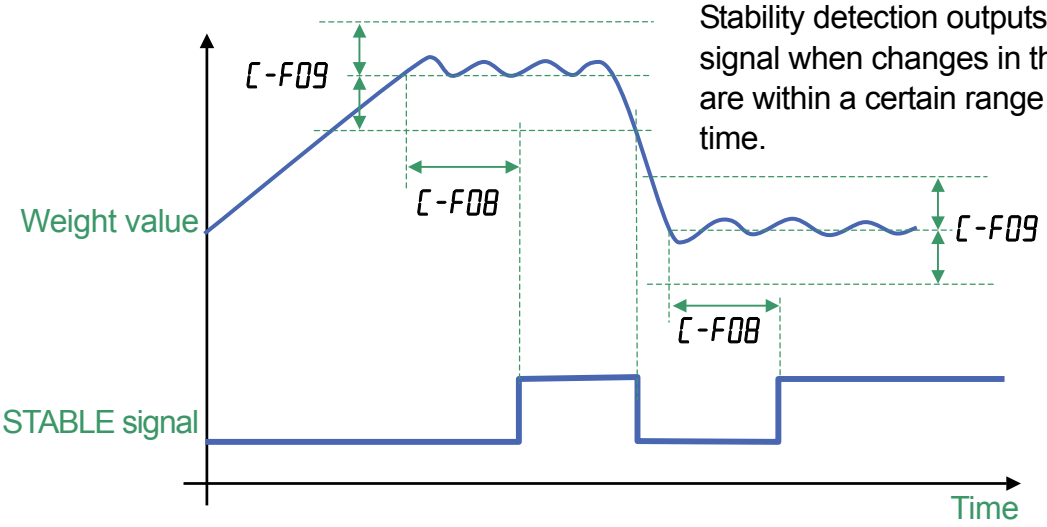
Zero tracking follows the weight value drifting around the zero point and adjusts to display as zero.

d = minimum division = 1 digit

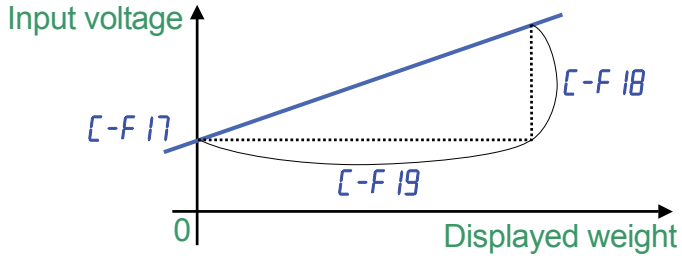


Zero tracking functions when the weight value is drifting within the range shown in the graph.

* The function code is used for the USB command.

Item Name	Function code	Description, Range and Default value
C-F08 Stability detection time	1008	Performs stability detection using this setting in combination with the setting of C-F09. When C-F08 stores 0.0, stability detection will not be performed. (Stable all the time) Scale : 0.1 seconds. 0.0 to [1.0] to 9.9
C-F09 Stability detection width	1009	Performs stability detection using this setting in combination with the setting of C-F08. When C-F09 stores 0, stability detection will not be performed. (Stable all the time) Scale : 0.1 d (minimum division). 0 to [2] to 100
		Stability detection outputs the STABLE signal when changes in the weight value are within a certain range during a certain time.
C-F10 Tare and zero at unstable weight value	1010	Tare and zero operation when unstable 0: Disables both functions. [1]: Enables both functions.
C-F11 Tare when the gross weight is negative	1011	Tare when the gross weight is negative. 0: Disables tare. [1]: Enables tare.
C-F12 Output when out of range and unstable	1012	Standard serial output when the weight value overflows or is unstable. 0: Disables output. [1]: Enables output.
C-F13 Exceeding negative gross weight	1013	To judge when the negative gross weight is exceeded. [1]: Gross weight < -99999 2: Gross weight < Negative maximum capacity 3: Gross weight < -19 d
C-F14 Exceeding negative net weight	1014	To judge when the negative net weight is exceeded. [1]: Net weight < -99999 2: Net weight < Negative maximum capacity
C-F15 Clear the zero value	1015	Select whether or not to clear the zero value. 0: Disables. [1]: Enables.
C-F16 Zero setting when power is turned on	1016	Select whether or not to perform zero setting when power is turned on. The available range of the zero setting is ±10% of the maximum capacity with the calibration zero point as the center. [0]: Not used. 1: Use.

Item Name / Function code	Description, Range and Default value
C-F 17 1017 Input voltage at zero	Input voltage from a load cell at zero. Scale : mV/V. This value is determined in zero calibration during the calibration with an actual load. Scale : 0.0001 mV/V. −7.0000 to [0.0000] to 7.0000
C-F 18 1018 Span input voltage	Input voltage from a load cell at span. This value and the value of C-F 19 are determined in span calibration during the calibration with an actual load. Scale : 0.0001 mV/V. 0.0100 to [3.2000] to 9.9999
C-F 19 1019 Weight against span Input voltage	The calibration weight value corresponding to the input voltage at span of C-F 18. When performing digital span, C-F 17, C-F 18 and C-F 19 are required for the calibration. The decimal point position depends on C-F02 (Decimal point position). 1 to [32000] to 99999



NOTE:

***1** Record the setting values of C-F 17, C-F 18 and C-F 19 in the "Function list" at the end of the manual to prepare against a malfunction.

***2** By changing the parameters of C-F 17, C-F 18 and C-F 19, "Zero calibration" and "Span calibration" can be adjusted optionally. (Digital span accuracy approximately 1/5000. The accuracy varies depending on the load cell output accuracy and the conditions of the calibration.)

C-F26 1026 Gravity acceleration of the calibration place	Gravity acceleration of the place where the scale is calibrated. Scale : 0.0001 m/s^2. 9.7500 to [9.8000] to 9.8500
C-F27 1027 Gravity acceleration of use place	Gravity acceleration of the place where the scale is being used. Scale : 0.0001 m/s^2. 9.7500 to [9.8000] to 9.8500
C-F28 1028 Suppression of the hold function	[0]: Permission 1: Prohibition
1029~1032 C-F29 ~ 32	Reserved internally

5.4.6. The Function Related to the Linearization Function (L-Fnc)

- Confirm and change linearity settings.
  To use this function, select [L-Fnc] in the same way as the function related to the calibration are selected.

Item Name / Function code	Description, Range and [Default value]
L-F01 1101 Number of input points	Number of points where linear input was done. The linear-zero input is included as one point. Digital linearization is not performed when the set value is between 0 and 2. [0] to 5
L-F02 1102 Linear−zero	Voltage for linear-zero input. Scale : 0.0001 mV/V. −7.0000 to [0.0000] to 7.0000
L-F03 1103 Setting value for linear 1	The setting value of weight for linear 1 input. The decimal point position depends on C-F02 (Decimal point position). [0] to 99999
L-F04 1104 Span at linear 1	The span voltage between linear-zero and linear 1 input. Scale : 0.0001 mV/V. [0.0000] to 9.9999
L-F05 1105 Setting value for linear 2	The setting value of weight for linear 2 input. The decimal point position depends on C-F02 (Decimal point position). [0] to 99999
L-F06 1106 Span at linear 2	The span voltage between linear-zero and linear 2 input. Scale : 0.0001 mV/V. [0.0000] to 9.9999
L-F07 1107 Setting value for linear 3	The setting value of weight for linear 3 input. The decimal point position depends on C-F02 (Decimal point position). [0] to 99999
L-F08 1108 Span at linear 3	The span voltage between linear-zero and linear 3 input. Scale : 0.0001 mV/V. [0.0000] to 9.9999
L-F09 1109 Setting value for linear 4	The setting value of weight for linear 4 input. The decimal point position depends on C-F02 (Decimal point position). [0] to 99999
L-F 10 1110 Span at linear 4	The span voltage between linear-zero and linear 4 input. Scale : 0.0001 mV/V. [0.0000] to 9.9999

5.4.7. Error Codes for the Calibration (C Er)

When an error occurs during the calibration, the error number is displayed. If calibration is finished without removing the error, the setting values will be restored to the state before calibration.

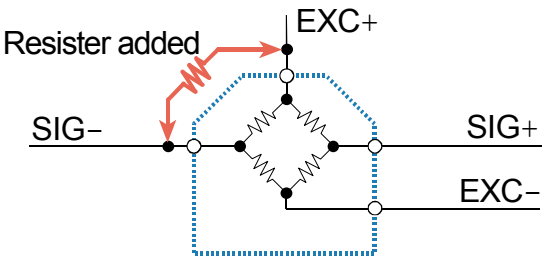
Calibration errors and remedies

Error No.	Description of cause	Treatment
C Er 1	The display resolution (maximum capacity / minimum division) exceeds the specified value.	Make the minimum division greater or make the maximum capacity smaller. The specified value depends on specifications of the weighing system.
C Er2	Voltage at zero calibration exceeds in the positive direction.	Check the load cell rating and connection. When nothing is wrong with the rating and connection, adjust the load cell output as described in the next section. When the load cell or A/D converter may be the cause of error, confirm this by using the check mode.
C Er3	Voltage at zero calibration exceeds in the negative direction.	
C Er4	The value of the calibration weight exceeds the maximum capacity.	Use an appropriate the calibration weight and calibrate again.
C Er5	The value of the calibration weight is less than the minimum division.	
C Er6	The load cell sensitivity is not sufficient.	Use a load cell with higher sensitivity or make the minimum division greater.
C Er7	Voltage at span calibration is less than voltage at the zero point.	Check the load cell connection.
C Er8	The load cell output voltage is too high when the mass of maximum capacity is weighed.	Use a load cell with a greater rating or make the maximum capacity smaller.

5.4.8. Adjustment of the Load Cell Output

Add a resistor as shown below to adjust the load cell output.
Use a resistor with a high resistance value and a low temperature coefficient.

C Er2
When exceeding in the positive direction.



C Er3
When exceeding in the negative direction

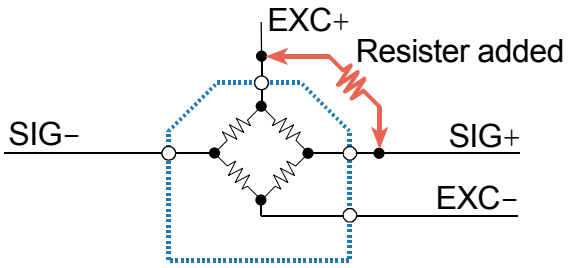


Illustration 11 Load cell output adjustment

* Because the zero point of the module has a wide adjustable range, correcting the output of a normal load cell is hardly ever required.
Before an output correction is carried out, confirm load cells (deformation, wiring mistakes, contact with anything, or model selection etc.) and connections.

5.5. The List of General Functions

General functions are divided into groups according to function and are indicated by function item (a function group name with function number).
All the settings selected in general functions are stored in the FRAM.

5.5.1. The Procedure to Store New Parameters

Step 1 Press the ENT + F key to enter to the function mode and display Fnc .
Press the ENT key to start the function mode.
To return to the weighing mode, press the ESC key.

Step 2 Press the ↑ key to select the function group to be set.
Press the ENT key. The function group is as follows :

Display	Group name
Fnc F	Basics function
HLd F	Hold function
Fr F	Flow rate function
io F	Control I/O function
CL F	Standard serial output function
An F	Analog output function

Step 3 Press the ↑ key to select the function number to be set.
Press the ENT key. The current setting value is displayed.

Step 4 When changing parameter, two methods of parameter selection and digital input depending on the function are available.

Type	Description of method to change data
Parameter selection	Only the available parameter is displayed and blinks. Select a number using the ↑ key.
Digital input	All the digits are displayed. The digit to be changed blinks. Select the digit using the → key. Change the value using the ↑ key.

After changing data, press the ENT key. The next function number is displayed.
When the value is not to be changed, press the ESC key to return to the function number display.

Step 5 Press the ESC key. The function number disappeared and the new parameters are stored in FRAM to return to Step 2. Press the ESC key again to return to the weighing mode.

- The blinking decimal point means that the current value is not the weight value.
- If a data exceeding the available range is inputted, Errdt is displayed, and the data is canceled.
- The function code on the next page is used for command of the USB.

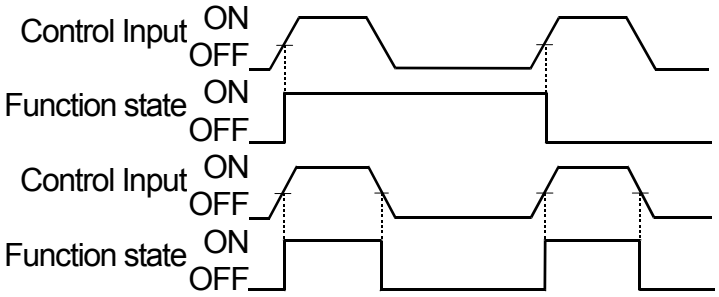
5.5.2. The Basics Function (Fnc F)

Item Function code Name	Description, Range and [Default value]
Fnc01 1201 Key switch disable	Each digit of the setting corresponds to a key switch. Only available in the weighing mode. Key assignment to each binary digit. 0: Permission 1: Prohibition 4th [ESC] 3rd [→] 2nd [↑] 1st1 [ENT] [0000] to 1111
Fnc02 1202 [F] key	0: None 1: Manual print command 2: Hold 3: Operation switch 1 4: Operation switch 2 [5]: Display exchange 6: Tare clear 7: Zero clear 8~11: Reserved internally 12: mV/V monitor 13: Digital filter 2 14: Display output data selected in An 11 15: Display output data selected in An 21
Fnc03 1203 Display rewrite rate	[1]: 20 times/sec. 2: 10 times/sec. 3: 5 times/sec.
Fnc04 1204 x display	[0] : None 1: Zero tracking in progress 2: Alarm 3: Display operation switch status as on or off 4: Near-zero 5: HI output 6: OK output 7: LO output
Fnc05 1205 Digital filter 1	Selects a cutoff frequency. 0 : None 1 :100.0 Hz 2 : 70.0 Hz 3 : 56.0 Hz 4 : 40.0 Hz 5 : 28.0 Hz 6 :20.0 Hz 7 :14.0 Hz 8 :10.0 Hz 9 : 7.0 Hz 10 : 5.6 Hz 11 : 4.0 Hz 12 :2.8 Hz 13 :2.0 Hz 14 :1.4 Hz [15] :1.0 Hz 16 :0.7 Hz
Fnc06 1206 Digital Filter 2	Selects a cutoff frequency. 0 : None 1 :100.0 Hz 2 : 70.0 Hz 3 : 56.0 Hz 4 : 40.0 Hz 5 : 28.0 Hz 6 :20.0 Hz 7 :14.0 Hz 8 :10.0 Hz 9 : 7.0 Hz 10 : 5.6 Hz 11 : 4.0 Hz 12 :2.8 Hz 13 :2.0 Hz 14 :1.4 Hz [15] :1.0 Hz 16 :0.7 Hz 17 :0.56 Hz 18 : 0.40 Hz 19 : 0.28 Hz 20 : 0.20 Hz 21 : 0.14 Hz 22 : 0.10 Hz 23 : 0.07 Hz
Fnc07 1207 Hold	[1]: Normal hold 2 : Peak hold 3 : Averaging hold
Fnc08 1208 Near-zero	Decimal point position depends on C-F02 (Decimal point position). −99999 to [10] to 99999

* The function code is used for the USB command.

Item Name / Function code	Description, Range and Default value
FncO9 1209 Comparison mass at near-zero	1: Gross weight 2: Net weight
Fnc 10 1210 Upper limit value	The decimal point position depends on C-F02 (Decimal point position). −99999 to 10 to 99999
Fnc 11 1211 Lower limit value	The decimal point position depends on C-F02 (Decimal point position). −99999 to −10 to 99999
Fnc 12 1212 Comparison mass of upper and lower limit	1: Gross weight 2: Net weight

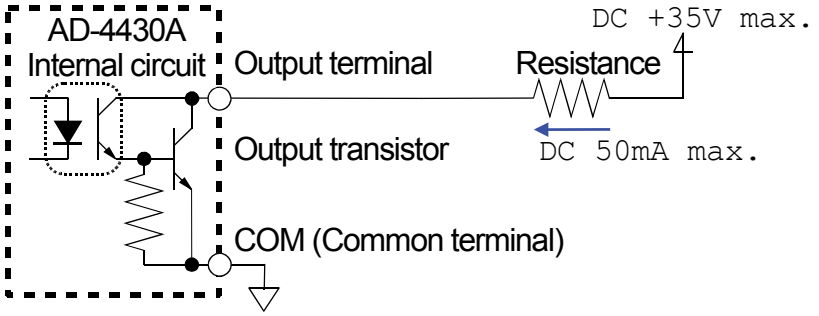
5.5.3. The Hold Function (HLd F)

Item Name / Function code	Description, Range and Default value
HLd01 1301 Averaging time	Time to perform the averaging. 0.00 is not averaged. Scale : 0.01 seconds. 0.00 to 9.99
HLd02 1302 Start wait time	Waiting time to commence a holding or averaging. Scale : 0.01 seconds. 0.00 to 9.99
HLd03 1303 Condition of automatic start	The condition to commence a holding or averaging. 0: Not used 2 : Above the near-zero 1: Above the near-zero, and stable
HLd04 1304 Release using control input	Release when control input of the hold terminal is falling. 0: Do not release 1: Release 
HLd05 1305 Release time	Release after a set amount of time has passed. 0.00 is not averaged. Scale : 0.01 seconds. 0.00 to 9.99
HLd06 1306 Release using fluctuation range	Release when fluctuation from the holding value exceeds a set value. The decimal point position depends on C-F02 (Decimal point position). 0 to 99999
HLd07 1307 Release at near-zero	Release when the weighing value is in the near-zero. 0 : Do not release. 1 : Release.

5.5.4. The Flow Rate Function (Fr F)

Item Name / Function code	Description, Range and Default value
Fr 01 1901 Filter of flow rate 1	1 : Digital filter 1 2 : Digital filter 2
Fr 02 1902 Filter of flow rate 2	
Fr 03 1903 Damping time of flow rate 1	Suppress shaking of flow rate. The higher value setting, the less shaking. Scale: 1 sec. 1 to 5 to 1000
Fr 04 1904 Damping time of flow rate 2	

5.5.5. The Control I/O Function (io F)

	Item Name / Function code	Description, Range and Default value	
IN	io 01 1601 Function of IN1	0 : Not used 1 to 6 : Reserved internally 7 : Zero 8 : Tare 9 : Hold 10 : Gross / Net exchange 11 : Diagnose 12 : Print command 13 to 21:Reserved internally 22 : Zero clear 23 : Tare clear 24 : Operation same as a [F] key * 25 : Prohibit update of flow rate 1 OFF=Update ON=Not update 26 : Prohibit update of flow rate 2 OFF=Update ON=Not update 27 : Initialize flow rate 1 28 : Initialize flow rate 2 29 : Specify flow rate in An 11 OFF: flow rate 1, ON: flow rate 2 30 : Specify flow rate in An 21 OFF: flow rate 1, ON: flow rate 2 * Not functioned for operation switch 2	0 to [7] to 30
	io 02 1602 Function of IN2		0 to [8] to 30
	io 03 1603 Function of IN3		[0] to 30
	io 04 1604 Function of IN4		[0] to 30
	io 05 1605 Function of IN5		[0] to 30
	io 06 1606 Function of IN6		[0] to 30
OUT	io 11 1611 Function of OUT1	0 : Not used 1 to 8 : Reserved internally 9 : Stability 10 : Over capacity 11 : Net display 12 : During tare 13 : Hold 14 : Hold busy 15 : HI output 16 : OK output 17 : LO output 18 : Near-zero 19 to 29 : Reserved internally 30 : In weighing (ON) 31 : In weighing (1 Hz) 32 : In weighing (50 Hz) 33 : Alarm 34 : Output operation switch is on or off 35 : Approximate flow rate value of flow rate 1 36 : Approximate flow rate value of flow rate 2	0 to [18] to 36
	io 12 1612 Function of OUT2		0 to [9] to 36
	io 13 1613 Function of OUT3		[0] to 36
	io 14 1614 Function of OUT4		[0] to 36
	io 15 1615 Function of OUT5		[0] to 36
	io 16 1616 Function of OUT6		[0] to 36
	io 17 1617 Function of OUT7		[0] to 36
	io 18 1618 Function of OUT8		[0] to 36
	io 21 1621 OUT1 Logic	1 : Inverting output If data is "0" level, the output transistor conducts (ON). [2] : Non inverting output If data is "1" level, the output transistor conducts (ON). 	
	io 22 1622 OUT2 Logic		
	io 23 1623 OUT3 Logic		
	io 24 1624 OUT4 Logic		
	io 25 1625 OUT5 Logic		
	io 26 1626 OUT6 Logic		
	io 27 1627 OUT7 Logic		
	io 28 1628 OUT8 Logic		

5.5.6. The Standard Serial Output Function (CL F)

Item Name / Function code	Description, Range and Default value
CL 01 1701 Serial data	1 : Weighing display 3 : Net 5 : Gross / Net / Tare 2 : Gross 4 : Tare
CL 02 1702 Communication mode	1 : Stream 2 : Automatic print 3 : Manual print
CL 03 1703 Baud rate	1 : 600 bps 2: 2400 bps

5.5.7. The Analog Output Function (An F)

Item Name	Function code	Description, Range and Default value
IOUT1	An 11 2011 Output data	1 : Weighing display (Digital filter 1) 2 : Gross (Digital filter 1) 3 : Net (Digital filter 1) 4 : Weighing display (Digital filter 2) 5 : Gross (Digital filter 2) 6 : Net (Digital filter 2) 7 : Flow rate 1 8 : Flow rate 2 9 : Flow rate 1 or Flow rate 2 (Select in control input)
	An 12 2012 Mass/flow rate at 4mA output	Select mass/flow rate by setting output data (An 11) Decimal point position linkage: ・Mass : C-F02 ・Flow rate : An 15 (setting magnification of flow rate) + C-F02 -99999 to 0 to 99999
	An 13 2013 Mass/flow rate at 20mA output	Select mass/flow rate by setting output data (An 11) Decimal point position linkage: ・Mass : C-F02 ・Flow rate : An 15 (setting magnification of flow rate) + C-F02 -99999 to 70000 to 99999
	An 14 2014 Flow rate unit	1 : Seconds 2 : Minutes 3 : Hours
	An 15 2015 Flow rate setting magnification(times)	1 : 1 2 : 10 3 : 100 4 : 1000 5 : 10000 Refer to **"6.1.2. Setting Magnification of Analog Output"** for details.
IOUT2	An 21 2021 Output data	1 : Weighing display (Digital filter 1) 2 : Gross (Digital filter 1) 3 : Net (Digital filter 1) 4 : Weighing display (Digital filter 2) 5 : Gross (Digital filter 2) 6 : Net (Digital filter 2) 7 : Flow rate 1 8 : Flow rate 2 9 : Flow rate 1 or Flow rate 2 (Select in control input)
	An 22 2022 Mass/flow rate at 4mA output	Select mass/flow rate by setting output data (An 21) Decimal point position linkage: ・Mass : C-F02 ・Flow rate : An 25 (setting magnification of flow rate) +C-F02 -99999 to 0 to 99999
	An 23 2023 Mass/flow rate at 20mA output	Select mass/flow rate by setting output data (An 21) Decimal point position linkage: ・Mass : C-F02 ・Flow rate : An 25 (setting magnification of flow rate) +C-F02 -99999 to 70000 to 99999
	An 24 2024 Flow rate unit	1 : Seconds 2 : Minutes 3 : Hours
	An 25 2025 Flow rate setting magnification (times)	1 : 1 2 : 10 3 : 100 4 : 1000 5 : 10000 Refer to **"6.1.2. Setting Magnification of Analog Output"** for details.

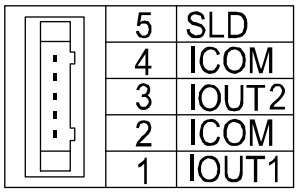
6. Interface

6.1. Analog Output

Analog output can be converted from mass or flow rate into electrical output.
The electrical output has two channels, IOUT1 and IOUT2).

Output type		4-20mA current output
Number of channel		2 channels（IOUT1 and IOUT2）
Load resistance		0～520Ω
Resolution		Approximately 4000
Conversion rate		1000 times/sec.
Non-linearity		±0.1% Max
Temperature coefficient	Zero point	±0.01% of F.S. /℃ Max.
	Sensitivity	±0.01% of F.S. /℃ Max.

D/A OUT



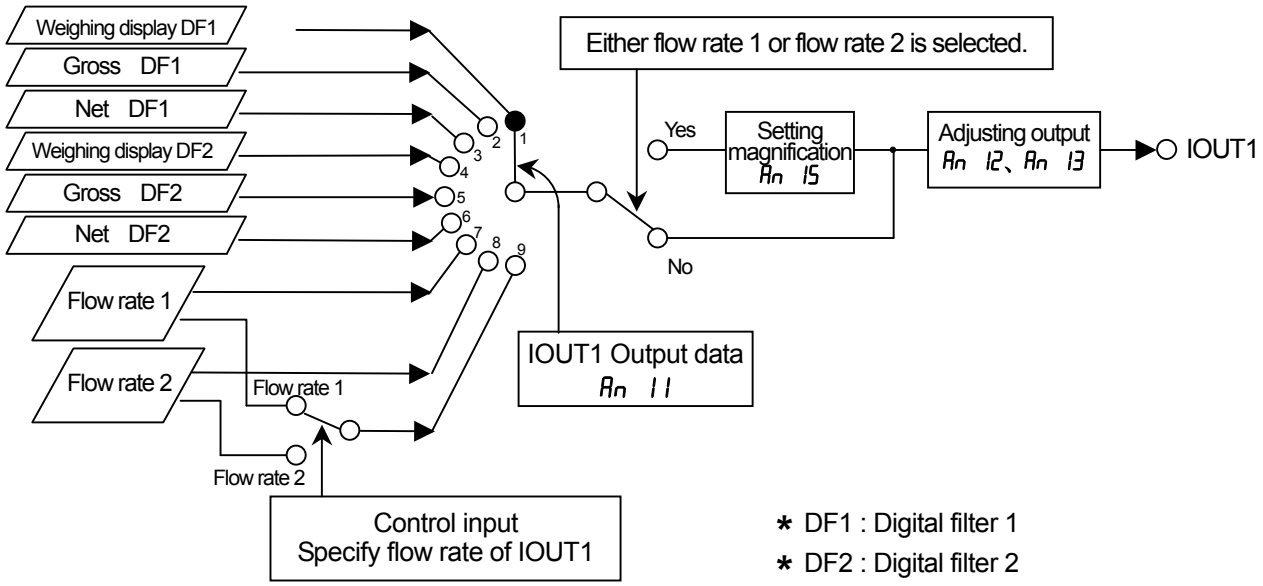
Pin No.	Symbol	Description
1	IOUT1	Analog current output 1+
2	ICOM	Analog current output - common (connected to 4 pins)
3	IOUT2	Analog current output 2+
4	ICOM	Analog current output - common (connected to 2 pins)
5	SLD	Connected with FG ground terminal on the power supply connector

When flow rate is output, the flow rate can be selected from the control input and output data to either IOUT1 or IOUT2.

- An 11 (IOUT1 output data)
- An 21 (IOUT2 output data)

6.1.1. Analog Output Diagram

Analog output of IOUT1 is constructed as follows. (The construction of IOUT2 is the same).



6.1.2. Setting Magnification of Analog Output

Details of the setting magnification are explained at IOUT1 and flow rate 1.

According to the limitation of the digit number at the main display, flow rate setting at 4mA or 20mA output (An 12 or An 13) can be set up to 99999.

It should be over 99999 in case the mass change is high and the flow rate setting is "Hours".

Ex. When a calibration setting is as follows;

Weighing capacity : 2000.0g, Minimum division : 0.1g, Flow rate : 20.0g/sec.,
Flow rate unit : Hours.

20.0g X 3600 sec. = 72000.0g/hour

The output setting of 72000.0g/hour at 20mA output is below.

An 12 (IOUT1 flow rate at 4mA output) : 0
An 13 (IOUT1 flow rate at 20mA output) : 72000
An 15 (setting magnification of flow rate 1): 10

After the setting magnification : 72000×10=720000

As the decimal point position is 0.0 (C-F02), the actual setting is following.

Flow rate at 4mA output : 0.0
Flow rate 20mA output : 72000.0

It is virtually available to set the flow rate at 20mA output by 72000.0.

- Related function

  Flow rate can be shown on the monitor by setting 14 or 15 in FnC02 (F key function).
  Refer to **"5.1.5. Customizing the Function of the F Switch"** for details.

6.2. Control I/O

- Using a control input from peripherals, data can be monitored and be output.
- Using a control output, a weighing status and weighing result can be output.
- The input and output circuit is isolated from the DC power supply terminals and load cell terminals.
- Supply DC +24 V between the power supply input terminal (I/O PWR +24V) and COM terminal.

Part of input (IN1 ~ IN6)

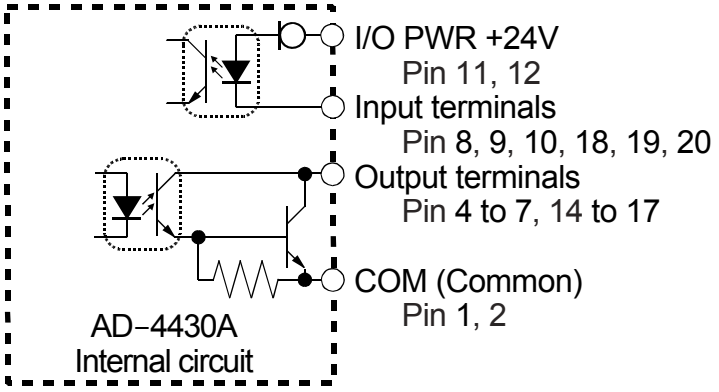
Input circuit type	No-voltage contact input (Photo coupler)
Input open voltage	According to use
OFF current	0.1 mA max.
ON current	2.7 mA min.
Input threshold voltage	2 V

Part of output (OUT1 ~ OUT8)

Output circuit type	Open collector
Isolation	Photo coupler
Output voltage	DC 35 V max.
Output current	50 mA max.
Output saturation voltage	1.1 V max.

Control I/O

IN 6	20	10	IN 5	
IN 4	19	9	IN 3	
IN 2	18	8	IN 1	
OUT8	17	7	OUT7	
OUT6	16	6	OUT5	
OUT4	15	5	OUT3	
OUT2	14	4	OUT1	
I/O PWR +24V	12	2	COM	
	11	1		



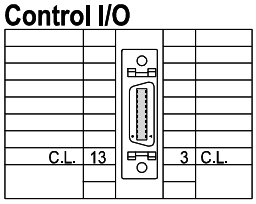
- **The function assigned to terminals**
  - Assign the function to these input terminals : io 01 (IN1 function) to io 06 (IN6 function)
  - Assign the function to these output terminals : io 11 (OUT1 function) to io 18 (OUT8 function)
  - Assign the logic to these output terminals : io 21 (OUT1 logic) to io 28 (OUT8 function)

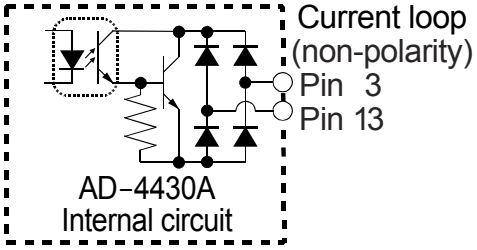
6.3. Standard Serial Output (Current Loop)

- The standard serial output (C.L.) circuit is isolated from all terminals.
- The standard serial output can connect to the A&D external display and printer.
- The standard serial output needs to supply DC current from an external DC power source.
- The standard serial output terminals of the AD-4430A have non-polarity.
- The standard serial output terminals are pin 3 and 13 of the control I/O connector.

Transmission	0 – 20mA, Current loop
Data length	7 bits
Start bit	1 bit
Parity bit	Even
Stop bit	1 bit
Baud rate	600 bps, 2400 bps
Code	ASCII

Control I/O





6.3.1. Data format of Serial Output

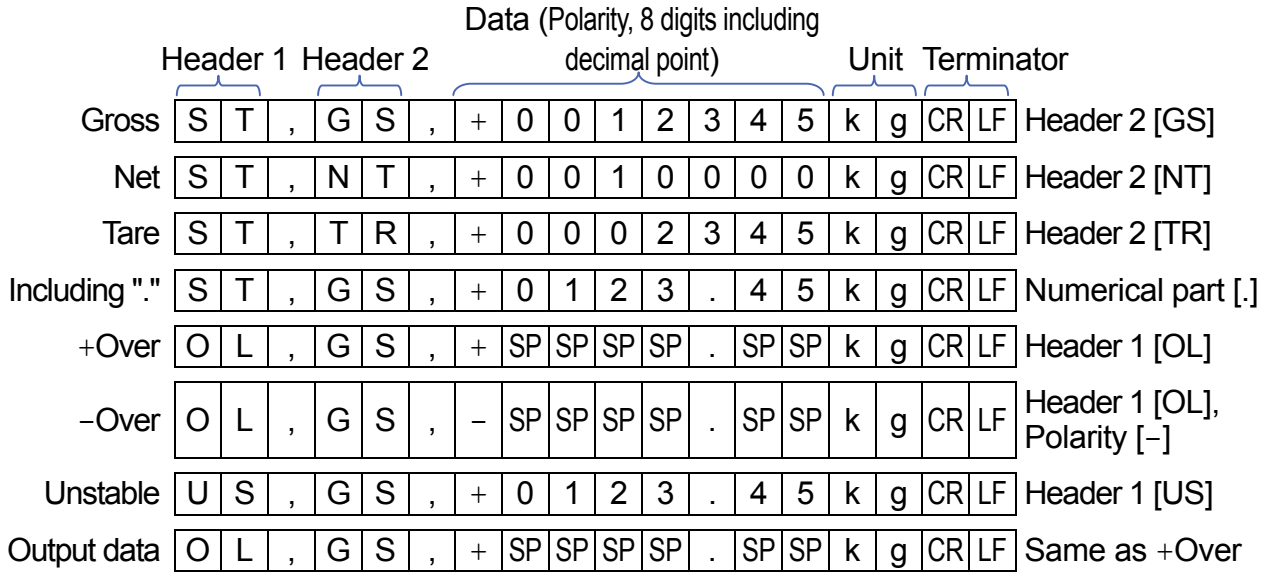
- The "A&D standard format" is used to the output format for communication with the A&D printer, and external display and consists of dual headers, data, unit and terminator.

A&D standard format

Header 1		Header 2			Data (Polarity, 8 digits including decimal point)								Unit		Terminator	
S	T	,	G	S	,	+	0	1	2	3	.	4	5	k	g	CR	LF

Item	ASCII code	Hexadecimal	Description
Header 1	ST	[53 54]	**St**able
	US	[55 53]	**Un**stable
	OL	[4F 4C]	**O**ver**l**oad
Header 2	GS	[47 53]	**G**ro**s**s
	NT	[4E 54]	**Net**
	TR	[54 52]	**Tar**e
Punctuation	,	[2C]	Comma
Data (ASCII code)	0 to 9	[30 to 39]	Numerical number
	+	[2B]	Positive sign
	–	[2D]	Negative sign
	SP	[20]	Space
	.	[2E]	Dot
Unit (6 types)	SP SP	[20 20]	Not used
	SP g	[20 67]	g (gram)
	kg	[6B 67]	kg (kilogram)
	SP t	[20 74]	t (ton)
	SP N	[20 4E]	N
	k N	[6B 4E]	kN

Examples of the A&D standard format



The position of decimal point is fixed even if data is out of range.

6.3.2. Transfer Mode of Serial Output

The type of the current loop output (CL 02) is 3 types of "stream", "automatic print" and "manual print".

Stream	The data is output at each display rewrite. If the data cannot be output completely due to a slow baud rate, the data is output at the next rewrite. The output data uses a displayed data. Therefore, hidden data is not output.
Automatic printing	When a weighing value becomes at 5 counts or more and is stable, data output is performed once. It is necessary that data become less than 5 counts to output data again. Select "Normal hold (1)" in Fnc07 "Hold function" for setting.
Manual printing	When "manual printing" is selected, data is output when receiving a printing command from the control input or pressing the assigned print key.

6.4. USB

- ❑ The function settings can be input and output form a device that is connected to the Micro-B USB connector.
- ❑ When USB is connected to a personal computer (PC), the PC recognizes the USB as a virtual COM port. The setting of virtual COM port is below.
  Baud rate: 9600 bps, Data bits: 7 bits, Parity: even, Stop bit: 1
- ❑ The communication tool can download the appropriate software form A&D home page. Communication parameters are fixed.
- ❑ In weighing, do not connect the cable. It may be easily influenced by environmental noise.
- ❑ Use the standard Micro-B USB connector.

***** Reading is available whenever the power is on.

***** Reading and writing of the function from the USB is effective except the weighing mode.

6.4.1. Format

Monitoring Command

Function code (4 figures) Terminator

Example of the near-zero (*FnC08*)

Command	1	2	0	8	CR	LF	

Function code (4 figures) Data (7 figures) Terminator

Response	1	2	0	8	,	+	0	0	0	0	1	0	CR	LF

Storing Command and Response

Function code (4 figures) Data (7 figures) Terminator

Example of the near-zero (*FnC08*)

Command	1	2	0	8	,	+	0	0	0	0	1	0	CR	LF

Function code (4 figures) Data (7 figures) Terminator

Response	1	2	0	8	,	+	0	0	0	0	1	0	CR	LF

***** The response of the monitoring command is the same as the storing command.

***** "+999999" means an irregular response. Ex.: In case that the function code is not correct and the command is not perform.

6.4.2. Monitoring the Function Setting

It specifies a function code in the command code and monitors the data.

Command	N	N	N	N	CR	LF

Response	N	N	N	N	,	±	X	X	X	X	X	X	CR	LF

NNNN is code, ±XXXXXX is numerical number.

6.4.3. Storing the Function Setting

It specifies a function code in the command code and stores the data.

Command	N	N	N	N	,	±	X	X	X	X	X	X	CR	LF
Response	N	N	N	N	,	±	X	X	X	X	X	X	CR	LF

NNNN is code, ±XXXXXX is numerical number.

* In case of parameter type, store branch number.
* FnC01 (Key switch disable) is a decimal.

6.4.4. Monitoring the Whole Function Settings

Functions of all can be monitored at once. It can make a list of functions.

Command	N	N	N	N	CR	LF

NNNN is command.

Command code	Description
0999	All functions
1000	Calibration
1100	Linearity
1200	Basic
1300	Hold
1600	Control I/O
1700	Standard serial output
1900	Flow rate
2000	Analog output

6.4.5. Monitoring Each Piece of Data

Each function can be monitored.

Command	N	N	N	N	CR	LF

NNNN is command.

Command code	Description
0101	Program version
0102	Serial No.(lower 5 digits)
0103	Program checksum
0104	FRAM checksum
0201	Gross count
0202	Net count
0203	Tare count
0204	Load cell output. Scale : 1 nV/V
0205	Load cell output. Scale : 10 nV/V

7. Maintenance

7.1. Error Messages

If an error message is displayed, use the following countermeasure.

Error message	Cause	Countermeasure
CS Er	Program checksum error	Repairer is required.
Ad Er	Data can not be acquired from the A/D converter.	Repairer is required.
FrAEr	Correct data can not be read from the nonvolatile memory (FRAM).	Initialize the module. If not be resolved, repairer is required.
C Err	Calibration data is incorrect.	Perform the calibration
C Er x	Calibration error.	Refer to **"5.4.7. Error Codes for the Calibration"**. x: error number
Errdt	The setting value is out of range.	Check the setting value.

7.2. Check Mode

The check mode can be used to check the performance of the display, key switches and external I/O.

7.2.1. Entering to the Check Mode

Step 1 Press the F key while pressing and holding the ENT key (ENT + F) to display Fnc. To return to the weighing mode, press the ESC key.

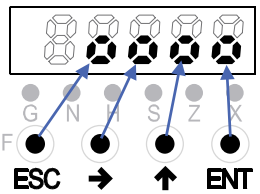
Step 2 Press the → key while pressing and holding the ENT key (→ + ENT) to display CHc of the check mode. Press the ENT key to display the check item.

Step 3 Select the check item using the ↑ key. Press the ENT key to enter to it. Press the ESC key when exiting it.

Display symbol	Item
CHKEY	Key check
CH io	Control I/O check
CH CL	Standard serial output check
CHAn1	Analog output (IOUT1) check
CHAn2	Analog output (IOUT2) check
CH Ad	A/D converter output check (Load cell check)
CH in	Internal count check
CHPr9	Program version
CH Sn	Serial number
CSPr9	Program checksum
CSFrA	Memory checksum
CF dt	C-Fnc check (C-F01 to C-F28)

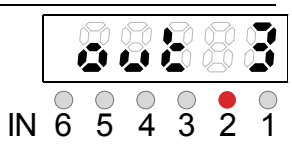
7.2.2. Verifying the Switch Operation

When pressing the key, the corresponding segment moves. "⊖" & "⊖". If stopping the current check mode, press the ESC key twice.



7.2.3. Checking the Control I/O

When pressing the ↑ key during displaying the terminal number of the control I/O in order, its output turns on in order (out 0 is all OFF). When turning on the input of the control I/O, its LED illuminates.

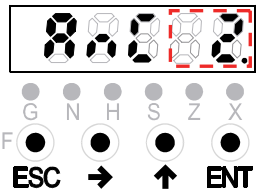


● : Lit, ○ : Not lit

7.2.4. Checking the Standard Serial Output

Test data "ST,GS,+00000.0kg<CR><LF>" is output using a preset baud rate when the ENT key is pressed every time.

7.2.5. Checking the Analog Output (IOUT1 and IOUT2)



The number that is in the red dot square in the figure to the right indicates the analog output power value (in this case, it is 2mA output).

Increase value by pressing the ↑ key.

Decrease value by pressing the → key.

(Analog output power value is also linked.)

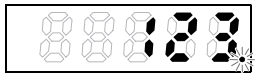
* The analog output range is from 2mA to 22mA.

7.2.6. Monitoring the A/D Converter (for Load Cell Output)

The voltage output rate of the load cell is displayed in unit of mV/V .

Example : When the internal counts is 1.2345 mV/V and the output rate is above ±7 mV/V, a damage or a connection error of the load cell may be cause. Refer to "**7.5. Verifying the Load Cell Connections Using Multimeter**".

7.2.7. Monitoring the Internal Value

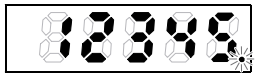


The current internal count (10 times of weighing value) is displayed. When the internal count is 123, the example display is as follows:

7.2.8. Monitoring the Program Version

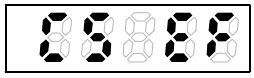
Program version is displayed. Example : Version 1.00 is as follows:

7.2.9. Monitoring the Serial Number



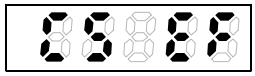
Last five digits of serial number is displayed.

7.2.10. Monitoring the Checksum of the Program



Checksum of the program is displayed. Example : Checksum is EF.

7.2.11. Monitoring the Checksum of an Internal FRAM



Checksum of FRAM is displayed. Memory of the general function is not checked. Example : Checksum is EF.

7.2.12. Displaying Function Parameters for the Calibration (C-F01~28)

The calibration function can be displayed.

7.3. Initializing Parameters

The initialization mode restores the parameters of the default values to the FRAM.
Three types of initialization mode are available as shown below.

Initialization mode	Display	Description
RAM initialization	inIt r	RAM memory is initialized. The center of zero and tare value will be restored to 0.
General functions initialization	inIt F	Data of the general functions stored in the FRAM and the RAM are reset to factory settings.
All data initialization	inIt A	All data stored in the FRAM, general functions and RAM are initialized. Data related to calibration is also initialized, so calibration must be performed again.

7.3.1. Initializing Mode for RAM and Function Parameters

Step 1 Press the F key while pressing and holding the ENT key (ENT + F) to display Func of the general functions mode. To return to the weighing mode, press the ESC key.

Step 2 Press the → key while pressing and holding the ENT key (→ + ENT) to display CHc of the check mode.

Step 3 Select the initialization mode inIt using the ↑ key. Press the ENT key.

Step 4 Select an item to be initialized using the ↑ key. Press the ENT key.

Step 5 Check that all LED status are blinking.
If performing the initialization, press the ENT key for 3 seconds or more.
After initialization, all segments light and return to the weighing mode.
If canceling the initialization, press the ESC key to return to the weighing mode.

7.3.2. Initializing the Whole Data

Step 1 In the OFF mode (Standby: While turning off the module),
Press F + ENT key to display CAL of the calibration mode.
To return to the weighing mode, press the ESC key.

Step 2 Press the ENT key to enter to the calibration mode.

Step 3 Press the ↑ key four times to select the all initialization mode and press the ENT key.

Step 4 Check that all LED status are blinking.
If performing the initialization, press the ENT key for 3 seconds or more.
After initialization, all segments light and return to the weighing mode.
If canceling the initialization, press the ESC key to return to the weighing mode.

* C-F29 ~ C-F32 is adjusted value of analog output. Please write down the values of calibration function in C-F29 ~ C-F32 before initialization and then to set the values of them.

7.4. Verifying the Load Cell Connections (DIAGNOS)

7.4.1. Guideline to Verify the Load Cell Connections

The faulty wiring or disconnection of the load cell can be checked using the AD-4430A. This verification is useful for new settings, pre-measurement inspections and periodic inspections.

No.	Diagnostic item	Diagnostic point	Judgment Criteria (Generally)
1	Load cell input voltage	Between SEN+ ⇔ SEN−	3 V or more
2	SEN+ voltage	Between SEN+ ⇔ AGND	4 V or more
3	SEN− voltage	Between SEN− ⇔ AGND	1 V or less
4	Load cell output voltage	Between SIG+ ⇔ SIG−	Within ±35 mV
5	Load cell output rate	Between SIG+ ⇔ SIG−	Within ±7 mV/V
6	SIG+ voltage	Between SIG+ ⇔ AGND	1 V to 4 V
7	SIG− voltage	Between SIG− ⇔ AGND	1 V to 4 V
8	Internal temperature		−20 °C to +60 °C

AGND : Internal analog circuit ground
EXC− : Load cell excitation voltage (−)
EXC+ : Load cell excitation voltage (+)
SIG− : Load cell output (−)
SIG+ : Load cell output (+)
SHLD : Shield. Frame ground.
SEN− : Sensing input (−)
SEN+ : Sensing input (+)

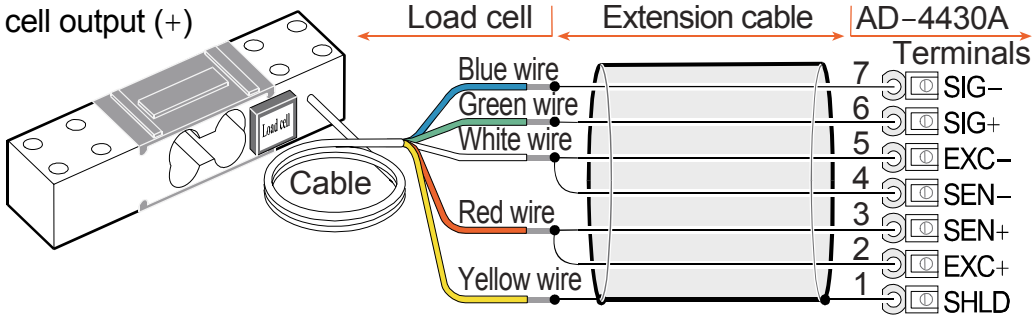


Illustration 12 Wire name of load cell

7.4.2. Verifying Load Cell Connections with Switch Operation

Step 1 Press the F key while pressing and holding the ENT key (ENT + F) to display Fnc.
To return to the weighing mode, press the ESC key.

Step 2 Press the → key while pressing and holding the ENT key (→ + ENT) to display the check mode CHc.

Step 3 Press the ↑ key twice to select the "load cell connections diagnosis" diAG and then press the ENT key to enter to it. Each item is automatically diagnosed. After approx.16 seconds, the diagnosis is displayed. Also, each diagnosis is checked by selecting items pressing the ↑ key.
Press the ESC key to return to display diAG.

7.4.3. Verifying Using the Control I/O

Step 1 When the input terminal of the control I/O set to "diagnose" remains "ON" for 1 second or more, the display shows diAG and checks each item automatically. After approx. 16 seconds, the diagnosis is displayed.

* If the control I/O is set to "OFF", the diagnosis is finished. Keep "ON" until the diagnosis is displayed.

Step 2 When turning off the input terminal of the control I/O set to "diagnose", AD-4430A returns to the weighing mode.

7.4.4. Display and Output of Verification

Items that have not been diagnosed are also totaled as errors. Refer to **"7.4.1. Guideline to Verify the Load Cell Connections"** concerning the detail of the diagnosis point and judgment criteria.
When scanning and changing items, diAG is displayed.

The diagnostic results of the scanning are displayed as follows.

There is no errors : Good

There is an error : ErXXX (a code XXX in which error codes are accumulated.)

When more than one error are occurs, the total value of the error codes are displayed.
Ex. When errors are Load cell excitation voltage (No.1) and Internal temperature (No.8):

1 + 128 = 129 129 is the error code of XXX

No.	Check item	Status LED G N H S Z X	Display Range	Error Code
1	Load cell excitation voltage	● ● ○ ○ ○ ●	0.001 V	1
2	SEN+ voltage	● ● ○ ○ ● ○	0.001 V	2
3	SEN− voltage	● ● ○ ○ ● ●	0.001 V	4
4	Load cell output voltage	● ● ○ ● ○ ○	0.001 mV	8
5	Load cell output rate	● ● ○ ● ○ ●	0.0001 mV/V	16
6	SIG+ voltage	● ● ○ ● ● ○	0.001 V	32
7	SIG− voltage	● ● ○ ● ● ●	0.001 V	64
8	Internal temperature	● ● ● ○ ○ ○	0.1 °C	128

● : Lit, ○ : Not lit

7.5. Verifying the Load Cell Connections Using Multimeter

The load cell connection can be checked easily using a digital multimeter.
The measurement points of the load cell connection are as follows :
When a summing box is used, the same measurement points inside of it must be measured.

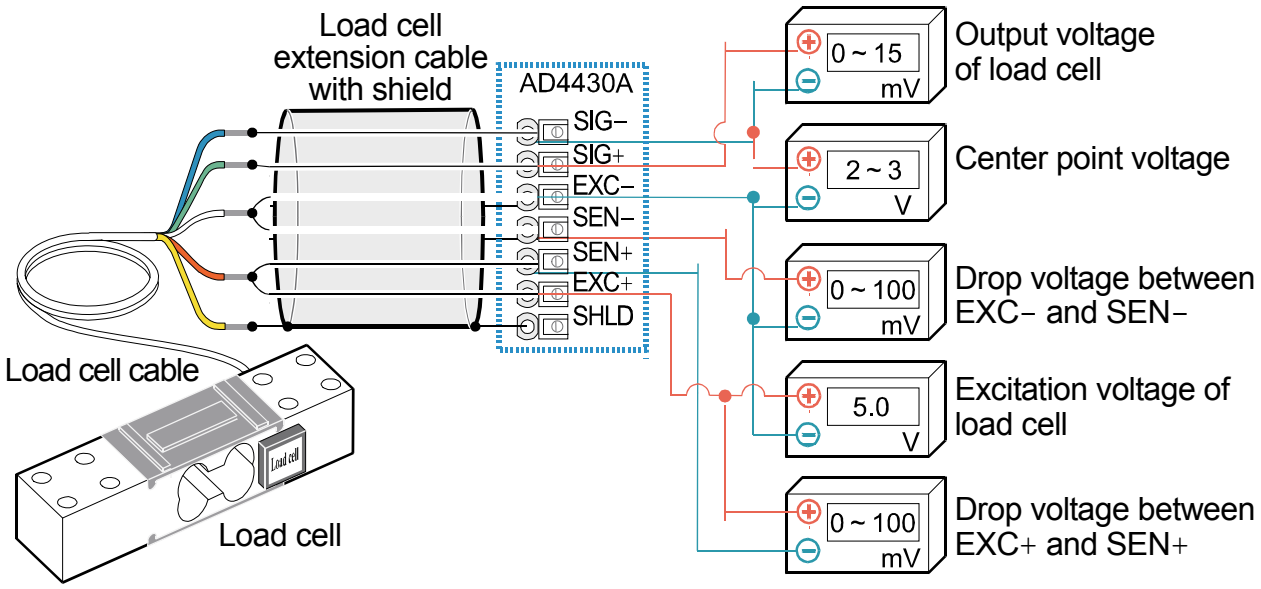


Illustration 13 Connection check of load cell

7.5.1. Check List of the Load cell Connections

Measurement points		Description	Judgment
EXC+	SEN+	A drop voltage of cable on EXC+ side.	Normally it is 100 mV or less. However, it may exceed 1V when an extremely long load cell cable is used. For the 4–wire connection, it must be 0 V.
SEN–	EXC–	A drop voltage of cable on EXC– side.	
EXC+	EXC–	Input voltage	Normal range is between 4.75 V to 5.25 V.
SIG–	EXC–	Center point voltage	It is approximately 2.5 V of a half of excitation voltage.
SIG+	SIG–	Output voltage	Generally it is within 0 V to 15 mV. Theoretical value is calculated from the load cell rated capacity, actual load and excitation voltage.

When the module does not operate properly, write the required items in the table below and contact your local A&D dealer.

Item	Usage circumstances, model number, rated, measurement value etc.	Note
Connection method	❑ 4−wire connection ❑ 6−wire connection	When using the 4−wire connection, connect between EXC+ and SEN+ and between EXC− and SIG−.
Model name & number		
Rated capacity	[Unit]	
Rated output	[mV/V]	
Allowable overload	[%]	
The number of load cells used	[pieces]	
Use of summing box		
Length of the extension cable	[m]	Length between the module and the summing box.
Initial load of weighing module	[Unit]	
Minimum division of weighing module	[Unit]	All digits including decimal figures. Ex: 0.002kg
Capacity of weighing module	[Unit]	All digits including decimal figures. Ex: 10.000kg
Output of load cell using initial load	[mV/V]	Between −0.1mV/V and rated sensitivity of load cell (using initial load)
Output of load cell using capacity or arbitrary load.	Load cell output at Load [Unit] [mV/V]	When loaded to capacity, the output value of the initial load + the rated output value of the load cell. (It must be within allowable overload.)

Measurement points		Measurement contents	Measurement result
EXC+	SEN+	A drop voltage of cable on EXC+ side.	[mV]
EXC+	EXC−	Input voltage	[V]
SEN−	EXC−	A drop voltage of cable on EXC− side.	[mV]
SIG−	EXC−	Center point voltage	[V]
SIG+	SIG−	Output voltage	[mV]

7.6. The Parameter List For The Function

When performing maintenance, use the following list as a memorandum.
When making inquiries about the product, inform your local A&D dealer of the user settings.

7.6.1. The Calibration Function (C Fnc)

Item Name / Function code	Description, Range and [Default value]	User setting
C-F01 Unit 1001	0 : No used 1 : g [2]: kg 3 : t 4 : N 5 : kN	
C-F02 Decimal point position 1002	[0]: 0 1 : 0.0 2 : 0.00 3 : 0.000 4 : 0.0000	
C-F03 Minimum division 1003	[1]: 1 2 : 2 3 : 5 4 : 10 5 : 20 6 : 50	
C-F04 Maximum capacity 1004	1 to [70000] to 99999	
C-F05 Zero range 1005	0 to [2] to 100	
C-F06 Zero tracking time 1006	[0.0] to 5.0	
C-F07 Zero tracking width 1007	[0.0] to 9.9	
C-F08 Stability detection time 1008	0.0 to [1.0] to 9.9	
C-F09 Stability detection width 1009	0 to [2] to 100	
C-F10 Tare and zero at unstable weight value 1010	0: Disables both functions. [1]: Enables both functions.	
C-F11 Tare when the gross weight is negative 1011	0: Disables tare. [1]: Enables tare.	
C-F12 Output when out of range and unstable 1012	0: Disables output. [1]: Enables output.	
C-F13 Exceeding negative gross weight 1013	[1]: Gross weight < -99999 2: Gross weight < Negative maximum capacity 3: Gross weight < -19d	
C-F14 Exceeding negative net weight 1014	[1]: Net weight < -99999 2: Net weight < Negative maximum capacity	
C-F15 Clear the zero value 1015	0: Disables. [1]: Enables.	
C-F16 Zero setting when power is turned on 1016	[0] : Not used. 1 : Use.	
C-F17 Input voltage at zero 1017	−7.0000 to [0.0000] to 7.0000	

Item Name	Function code	Description, Range and Default value	User setting
C-F 18 Span input voltage	1018	0.0100 to 3.2000 to 9.9999	
C-F 19 Weight against span Input voltage	1019	1 to 32000 to 99999	
C-F26 Gravity acceleration of the calibration place	1026	9.7500 to 9.8000 to 9.8500	
C-F27 Gravity acceleration of use place	1027	9.7500 to 9.8000 to 9.8500	
C-F28 Suppression of the hold function	1028	0: Permission. 1: Prohibition.	
C-F29 to 32	1029 to 1032	Reserved internally	

7.6.2. The Linearization Function (L-Fnc)

Item Name	Function code	Description, Range and Default value	User setting
L-F01 Number of input points	1101	0 to 5	
L-F02 Linear−zero	1102	−7.0000 to 0.0000 to 7.0000	
L-F03 Setting value for linear 1	1103	0 to 99999	
L-F04 Span at linear 1	1104	0.0000 to 9.9999	
L-F05 Setting value for linear 2	1105	0 to 99999	
L-F06 Span at linear 2	1106	0.0000 to 9.9999	
L-F07 Setting value for linear 3	1107	0 to 99999	
L-F08 Span at linear 3	1108	0.0000 to 9.9999	
L-F09 Setting value for linear 4	1109	0 to 99999	
L-F 10 Span at linear 4	1110	0.0000 to 9.9999	

7.6.3. The Basics Function (Fnc F)

Item Name / Function code	Description, Range and Default value	User setting
Fnc01 1201 Key switch disable	0000 to 1111	
Fnc02 1202 F key	0: None 1: Manual print command 2: Hold 3: Operation switch 1 4: Operation switch 2 5: Display exchange 6: Tare clear 7: Zero clear 8 to 11: Reserved internally 12: mV/V monitor 13: Digital filter 2 14: Display output data selected in An 11 15: Display output data selected in An 21	
Fnc03 1203 Display rewrite rate	1: 20 times/sec. 2: 10 times/sec. 3: 5 times/sec.	
Fnc04 1204 x display	0: None 1: Zero tracking in progress 2: Alarm 3: Display operation switch status as on or off 4: Near-zero 5: HI output 6: OK output 7: LO output	
Fnc05 1205 Digital filter 1	0: None 8: 10.0 Hz 16: 0.7 Hz 1: 100.0 Hz 9: 7.0 Hz 2: 70.0 Hz 10: 5.6 Hz 3: 56.0 Hz 11: 4.0 Hz 4: 40.0 Hz 12: 2.8 Hz 5: 28.0 Hz 13: 2.0 Hz 6: 20.0 Hz 14: 1.4 Hz 7: 14.0 Hz 15: 1.0 Hz	
Fnc06 1206 Digital Filter 2	0: None 8: 10.0 Hz 16: 0.7 Hz 1: 100.0 Hz 9: 7.0 Hz 17: 0.56 Hz 2: 70.0 Hz 10: 5.6 Hz 18: 0.40 Hz 3: 56.0 Hz 11: 4.0 Hz 19: 0.28 Hz 4: 40.0 Hz 12: 2.8 Hz 20: 0.20 Hz 5: 28.0 Hz 13: 2.0 Hz 21: 0.14 Hz 6: 20.0 Hz 14: 1.4 Hz 22: 0.10 Hz 7: 14.0 Hz 15: 1.0 Hz 23: 0.07 Hz	
Fnc07 1207 Hold	1: Normal hold 2: Peak hold 3: Averaging hold	
Fnc08 1208 Near-zero	−99999 to 10 to 99999	

Item Name / Function code	Description, Range and Default value	User setting
FncO9 Comparison mass at near-zero 1209	1: Gross weight 2: Net weight	
Fnc 10 Upper limit value 1210	−99999 to 10 to 99999	
Fnc 11 Lower limit value 1211	−99999 to −10 to 99999	
Fnc 12 Comparison mass of upper and lower limit 1212	1: Gross weight 2: Net weight	

7.6.4. The Hold Function (HLd F)

Item Name / Function code	Description, Range and Default value	User setting
HLd01 Averaging time 1301	0.00 to 9.99	
HLd02 Start wait time 1302	0.00 to 9.99	
HLd03 Condition of automatic start 1303	0: Not used 1: Above the near-zero, and stable 2: Above the near-zero	
HLd04 Release using control input 1304	0: Do not release 1: Release	
HLd05 Release time 1305	0.00 to 9.99	
HLd06 Release using fluctuation range 1306	0 to 99999	
HLd07 Release at the near-zero 1307	0: Do not release 1: Release	

7.6.5. The Flow Rate Function (Fr F)

Item Name / Function code	Description, Range and Default value	User setting
Fr 01 Filter of flow rate 1 1901	1 : Digital filter 1 2 : Digital filter 2	
Fr 02 Filter of flow rate 2 1902		
Fr 03 Damping time of flow rate 1 1903	Suppress shaking of flow rate. The higher the value setting, the less shaking. Scale: 1 sec. 1 to 5 to 1000	
Fr 04 Damping time of flow rate 2 1904		

7.6.6. The Control I/O Function (io F)

	Item / Name / Function code	Description, Range and Default value		User setting
IN	io 01 1601 Function of IN1	0 : Not used 1 to 6 : Reserved internally 7 : Zero 8 : Tare 9 : Hold 10 : Gross / Net exchange 11 : Diagnose 12 : Print command 13 to 21 : Reserved internally 22 : Zero clear 23 : Tare clear 24 : Operation same as a [F] key 25 : Prohibit update of flow rate 1 26 : Prohibit update of flow rate 2 27 : Initialize flow rate 1 28 : Initialize flow rate 2 29 : Specify flow rate in An 11 30 : Specify flow rate in An 21	0 to [7] to 30	
	io 02 1602 Function of IN2		0 to [8] to 30	
	io 03 1603 Function of IN3		[0] to 30	
	io 04 1604 Function of IN4		[0] to 30	
	io 05 1605 Function of IN5		[0] to 30	
	io 06 1606 Function of IN6		[0] to 30	
OUT	io 11 1611 Function of OUT1	0 : Not used 1 to 8 : Reserved internally 9 : Stability 10 : Over capacity 11 : Net display 12 : During tare 13 : Hold 14 : Hold busy 15 : HI output 16 : OK output 17 : LO output 18 : Near-zero 19 to 29 : Reserved internally 30 : In weighing (ON) 31 : In weighing (1 Hz) 32 : In weighing (50 Hz) 33 : Alarm 34 : Output operation switch is on or off 35 : Approximate flow rate value of flow rate 1 36 : Approximate flow rate value of flow rate 2	0 to [18] to 36	
	io 12 1612 Function of OUT2		0 to [9] to 36	
	io 13 1613 Function of OUT3		[0] to 36	
	io 14 1614 Function of OUT4		[0] to 36	
	io 15 1615 Function of OUT5		[0] to 36	
	io 16 1616 Function of OUT6		[0] to 36	
	io 17 1617 Function of OUT7		[0] to 36	
	io 18 1618 Function of OUT8		[0] to 36	

	Item Name	Function code	Description, Range and Default value	User setting
OUT	io 21 OUT1 Logic	1621	1: Inverting output If data is "0" level, the output transistor conducts (ON). 2: Non inverting output If data is "1" level, the output transistor conducts (ON).	
	io 22 OUT2 Logic	1622		
	io 23 OUT3 Logic	1623		
	io 24 OUT4 Logic	1624		
	io 25 OUT5 Logic	1625		
	io 26 OUT6 Logic	1626		
	io 27 OUT7 Logic	1627		
	io 28 OUT8 Logic	1628		

7.6.7. The Standard Serial Output Function (CL F)

Item Name	Function code	Description, Range and Default value	User setting
CL 01 Serial data	1701	1: weighing display 2: Gross 3: Net 4: Tare 5: Gross / Net / Tare	
CL 02 Communication mode	1702	1: Stream 2: Automatic print 3: Manual print	
CL 03 Baud rate	1703	1: 600 bps 2: 2400 bps	

7.6.8. The Analog Output Function (An F)

Item Name	Function code	Description, Range and Default value	User setting
IOUT1	An 11 Output data 2011	1 : Weighing display (Digital filter 1) 2 : Gross (Digital filter 1) 3 : Net (Digital filter 1) 4 : Weighing display (Digital filter 2) 5 : Gross (Digital filter 2) 6 : Net (Digital filter 2) 7 : Flow rate 1 8 : Flow rate 2 9 : Flow rate 1 or Flow rate 2 (Select in control input)	
	An 12 Mass/flow rate at 4mA output 2012	Select mass/flow rate by setting output data (An 11) Decimal point position linkage: ・Mass : C-F02 ・Flow rate : An 15 (setting magnification of flow rate) ＋ C-F02 -99999 to 0 to 99999	
	An 13 Mass/flow rate at 20mA output 2013	Select mass/flow rate by setting output data (An 11) Decimal point position linkage: ・Mass : C-F02 ・Flow rate : An 15 (setting magnification of flow rate) ＋ C-F02 -99999 to 70000 to 99999	
	An 14 Flow rate unit 2014	1 : Seconds 2 : Minutes 3 : Hours	
	An 15 Flow rate setting magnification (times) 2015	1 : 1 2 : 10 3 : 100 4 : 1000 5 : 10000	

Item Name	Function code	Description, Range and Default value	User setting
IOUT2	An 21 2021 Output data	1 : Weighing display (Digital filter 1) 2 : Gross (Digital filter 1) 3 : Net (Digital filter 1) 4 : Weighing display (Digital filter 2) 5 : Gross (Digital filter 2) 6 : Net (Digital filter 2) 7 : Flow rate 1 8 : Flow rate 2 9 : Flow rate 1 or Flow rate 2 (Assign to input terminals)	
	An 22 2022 Mass/flow rate at 4mA output	Select mass/flow rate by setting output data (An 21) Decimal point position linkage: ・Mass : C-F02 ・Flow rate : An 25 (setting magnification of flow rate) + C-F02 -99999 to 0 to 99999	
	An 23 2023 Mass/flow rate at 20mA output	Select mass/flow rate by setting output data (An 21) Decimal point position linkage: ・Mass : C-F02 ・Flow rate : An 25 (setting magnification of flow rate) C-F02 -99999 to 70000 to 99999	
	An 24 2024 Flow rate unit	1 : Seconds 2 : Minutes 3 : Hours	
	An 25 2025 Flow rate setting magnification (times)	1 : 1 2 : 10 3 : 100 4 : 1000 5 : 10000	

MEMO

MEMO

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

A&D ENGINEERING, INC.
1756 Automation Parkway, San Jose, California 95131, U.S.A.
Telephone: [1] (408) 263-5333 Fax: [1] (408)263-0119

A&D INSTRUMENTS LIMITED
Unit 24/26 Blacklands Way, Abingdon Business Park, Abingdon, Oxfordshire OX14 1DY United Kingdom
Telephone: [44] (1235) 550420 Fax: [44] (1235) 550485

A&D AUSTRALASIA PTY LTD
32 Dew Street, Thebarton, South Australia 5031, AUSTRALIA
Telephone: [61] (8) 8301-8100 Fax: [61] (8) 8352-7409

A&D KOREA Limited 한국에이.엔.디(주)
서울특별시 영등포구 국제금융로6길33 (여의도동) 맨하탄빌딩 817 우편 번호 150-749
(817, Manhattan Bldg., 33. Gukjegeumyung-ro 6-gil, Yeongdeungpo-gu, Seoul, 150-749 Korea)
전화: [82] (2) 780-4101 팩스: [82] (2) 782-4280

OOO A&D RUS ООО "ЭЙ энд ДИ РУС"
121357, Российская Федерация, г.Москва, ул. Верейская, дом 17
(Business-Center "Vereyskaya Plaza-2" 121357, Russian Federation, Moscow, Vereyskaya Street 17)
тел.: [7] (495) 937-33-44 факс: [7] (495) 937-55-66

A&D INSTRUMENTS INDIA PRIVATE LIMITED **ऐ&डी इन्स्ट्रूमेन्ट्स इण्डिया प्रा0 लिमिटेड**
509, उद्योग विहार , फेस -5, गुड़गांव - 122016, हरियाणा , भारत
(509, Udyog Vihar, Phase-V, Gurgaon - 122 016, Haryana, India)
फोन : 91-124-4715555 फैक्स : 91-124-4715599