AD4212L–R50/ AD4212L–R100
Weigh Module
A&D

Simplified Instruction Manual

Refer to the instruction manual on the A&D website.

URL: https://www.aandd.jp/

This Manual

- ❑ This manual describes how the product works and how to get the most out of it in terms of performance. Read this manual thoroughly before using the product and keep it at hand for future reference.
- ❑ Product specifications are subject to change without any obligation on the part of the manufacturer to notify of changes.
- ❑ This manual is subject to change without prior notice to improve the product. No part of this manual may be photocopied, reproduced, or translated into another language without the prior written consent of A&D Company, Limited.
- ❑ Do not attempt to repair, modify or disassemble the product. Doing so will void the warranty.

1. Precautions

1.1. Installation and Precautions Before Use

Before use, confirm the following for safe operation.
- ❑ For the installation site, avoid places with vibration, shock, extremely high temperature and humidity, direct sunlight, dust, splashing water, air containing salt or corrosive gases, and where inflammable gases are present.
- ❑ The operating temperature range is -10°C to +40°C (14°F to 104°F).
- ❑ Ground the weigh module.
- ❑ Use a stable 24 VDC power source free from instantaneous power failure or noise, which may cause malfunction. Do not share the power line with other devices.
- ❑ Do not share the ground line with other electrical power equipment.
- ❑ When extending the load cell cable, separate it from the power line and electrical lines with much noise.
- ❑ Turn the weigh module on only after installation is complete. The weigh module is not equipped with a switch to turn it off.
- ❑ When installation is complete, take the protective cover off before turning the weigh module on.

1.2. Precautions During Use

The weigh module is a precision instrument that handles micro signals. Prevent noise sources such as power lines, radios, electric welders or motors from affecting the instrument.
- ❑ Do not disassemble the weigh module.

2. General Specifications

Model	AD4212L-R50	AD4212L-R100
Maximum capacity	51 g	110 g
Minimum division	1 mg	1 mg
Repeatability (Standard deviation)	1 mg	2 mg
Stabilization time (With optimal filter set, under good ambient conditions)	0 to 5 g Approx. 0.3 s 5 g to 51 g Approx. 1.0 s	0 to 5 g Approx. 0.3 s 5 g to 110 g Approx. 1.3 s
Ability of the stopper to withstand overload	1 kg	
Weighing pan diameter	20.5 mm	
Weighing unit size/mass	30 × 165 × 56 mm (W×D×H)/Approx. 400 g	
Display unit size/mass	35.3 × 101.3 × 110 mm (W×D×H)/Approx. 200 g	
Cable dia./length/mass	4.5 mm/10 m/Approx. 350 g	
Power source	24 VDC +10%, -15%	
Operating conditions	-10 °C to +40 °C, 85%RH or less (no condensation)	

Accessories

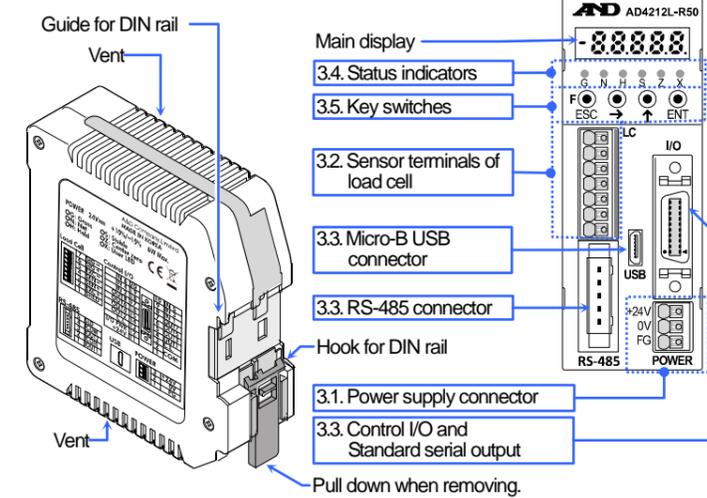| Accessories	RS–485 connector (2 pieces) 35505–6200–A00 GF manufactured by 3M Branch connector (1 piece) 35715–L010–A00 AK manufactured by 3M Leveling foot (3 pieces)

❑ Optimal digital filter setting example (FncθS setting)

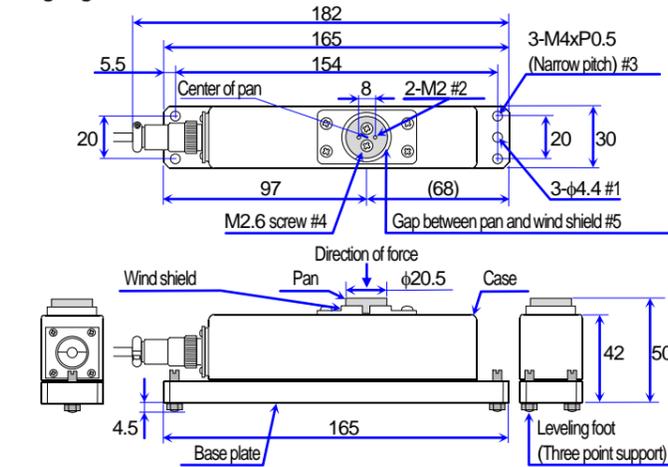| AD4212L-R50		AD4212L-R100	
Weighing range	Example (setting value)	Weighing range	Example (setting value)
0 g to 20 g	4.0 Hz (11)	0 g to 50 g	4.0 Hz (11)
20 g to 51 g	1.0 Hz (15)	50 g to 110 g	1.0 Hz (15)

※ For the setting procedure, refer to "5.3.2. Basic Function".

3. Individual Parts of the Module

Display unit

- Guide for DIN rail
- Vent
- Main display
- 3.4. Status indicators
- 3.5. Key switches
- 3.2. Sensor terminals of load cell
- 3.3. Micro-B USB connector
- 3.3. RS-485 connector
- Hook for DIN rail
- Vent
- Pull down when removing.
- 3.1. Power supply connector
- 3.3. Control I/O and Standard serial output

Weighing unit

- 182
- 165
- 154
- 5.5
- 3-M4xP0.5 (Narrow pitch) #3
- Center of pan
- 8   2-M2 #2
- 20
- 20   30
- 97   (68)
- 3-φ4.4 #1
- M2.6 screw #4
- Gap between pan and wind shield #5
- Direction of force
- Wind shield   Pan   φ20.5   Case
- 42   50
- 4.5   165
- Base plate
- Leveling foot (Three point support)

#1 Use the three φ4.4 holes to attach the weighing unit with a tightening torque of approx. 1 Nm.
#2 Use the two M2 holes to attach a jig to the pan with a depth of 5 mm and a tightening torque of 0.4 Nm or less.
#3 Insert the three leveling feet into the three M4xP0.5 holes (narrow pitch).
#4 Remove the two M2.6 screws when removing the pan.
#5 When dirt and dust accumulate in the gap between the pan and the wind shield, remove the pan and then remove dirt and dust.

3.1. Power Supply Connector

+24 V .... +24 VDC terminal
0 V .... 0 VDC terminal
FG (SHLD/SLD) .... Ground terminal
(All connector shields are connected internally with FG.)

POWER		
	3	+24V
	2	0V
	1	FG

3.2. Sensor Terminals of Load Cell

Load Cell

7 SIG–						
6 SIG+						
5 EXC–						
4 SEN–						
3 SEN+						
2 EXC+						
1 SHLD						

SIG–	SIG+	EXC–	SEN–	SEN+	EXC+	SHLD
Blue	Green	White	Purple	Orange	Red	Yellow

❑ **Connection**
Display unit
When connecting or removing the cable, push the connector button with a screwdriver. etc.

- Load cell cable
- Push the button to insert or remove the wire
- Rod type crimp terminal
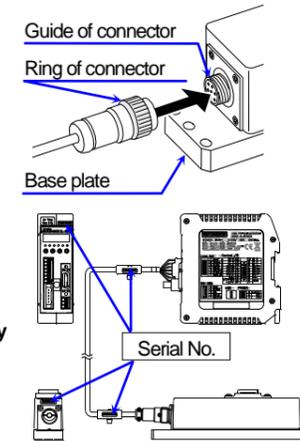- Load cell tag
- Power cable
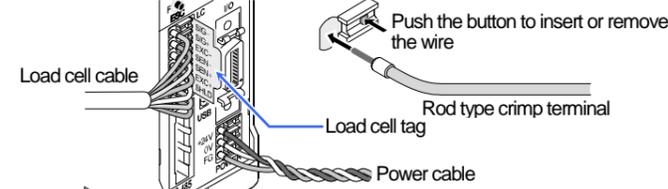
Weighing unit
The cable connector is detachable. Match the guides on the connectors and turn the ring to secure the cable connector.

- Guide of connector
- Ring of connector
- Base plate
- Serial No.

❑ **Note**
When connecting the cable, confirm that the display unit, the weighing unit and the cable have the same serial number. Otherwise, the display unit may not display the correct weighing value.

3.3. Control I/O, Standard Serial Output, RS–485 and Micro–B USB

- ❑ Control I/O circuit is isolated from load cell and power supply terminals. Supply +24 VDC between I/O PWR+24V terminals and COM terminals. (MDR connector with 20 pins, manufactured by 3M).
- ❑ Standard serial output (C.L.) circuit is isolated from other terminals. (MDR connector with 20 pins, manufactured by 3M.)
- ❑ For the RS–485, use a power clamp connector (A type) manufactured by 3M.
- ❑ Use a standard Micro B USB connector for USB so that the function settings can be read and written.

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
OUT 2	14	4	OUT1
C.L.	13	3	C.L.
I/O PWR	12	2	COM
+24V	11	1	

RS–485

5	SLD
4	RTRM
3	SG
2	DATA–
1	DATA+

USB

3.4. Status Indicators

LED	Description
G	Gross : The LED lights when a gross value is displayed.
N	Net : The LED lights when a net value is displayed.
H	Hold : The LED lights when the weighing value is being held.
S	Stable : The LED lights when the current weighing value is stable.
Z	Zero : The LED lights when the weighing value is within the center-zero range.
X	The LED indicates the function selected at Fncθ4 in the basic function.

3.5. Key Switches

When power is turned on with no keys pressed, the weigh module enters weighing mode.
In weighing mode, the key functions are as follows.

- **F**   Switches between the gross weight and the net weigh (default value)
- **➡**   Zeros
- **⬆**   Tares
- **ENT**   Turns the display off (when pressed and held)

To perform other operations, refer to the instruction manual available on the A&D website.

3.6. Operation Mode

- ❑ Function mode .... (In weighing mode, ENT + F) The mode to set various functions
- ❑ Check mode .... (In function mode, ➡ + ENT) The mode to check the performance of the weigh module
- ❑ Calibration mode .... (With the display turned off, F + ENT) The mode to calibrate zero point and span of the weigh module using a calibration weight or by inputting a value

4. Calibration

The weigh module measures the voltage of the load cell and displays it. Calibration corrects the signal from the load cell to convert it into mass correctly.
- ※ Perform stable measurement during calibration to prevent measurement errors.
- ※ During stable measurement, the **S** LED lights.
- ※ The blinking decimal point means that the current value is not the weight value.
- ※ When **C Er** with a number is displayed, it indicates that an error has occurred. Refer to "Calibration Errors" for details.
- ※ Before the calibration, allow the weigh module at least 10 minutes to warm up to avoid drift caused by changes in temperature.

4.1. Calibration Using a Weight (C-SEt)

Calibration is performed by loading and unloading a calibration weight.

Step 1   Turn off the display by pressing and holding the ENT key. Then, while holding the F key, press the ENT key. CAL will be displayed indicating calibration mode.

Step 2   Press the ENT key to enter calibration mode. C-SEt is displayed. To return to weighing mode, press the ESC key.
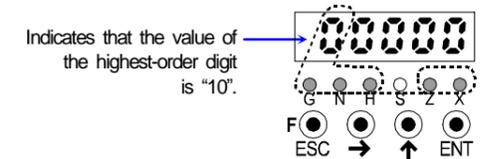
4.1.1. Zero Calibration

Step 3   Press the ENT key to display CAL 0. To skip zero calibration, press the ⬆ key and proceed to Step 5.

Step 4   Confirm that the **S** LED is lit, and then press the ENT key. Then · · · · · is displayed for 2 seconds. To skip span calibration, press the ESC key twice to return to weighing mode.

4.1.2. Span Calibration

Step 5   When C-SPn is displayed, press the ENT key. The current calibration weight value is displayed with the rightmost digit flashing. Specify a new value using the ➡ and ⬆ keys. To skip span calibration, press the ESC key three times to return to weighing mode.

Step 6   Place the weight on the weighing pan. Confirm that the **S** LED is lit and press the ENT key. Then · · · · · is displayed for 2 seconds. It is recommended to use a weight of 50g for AD4212L-R50, and 100g for AD4212L-R100. When using a weight other than the recommended one, use a weight with 1/2 or more of the maximum capacity.

Step 7   When C-End is displayed, remove the weight from the weighing pan. To calibrate span again, press the ⬆ key.

Step 8   Press the ESC key. Then C-SEt is displayed and calibration data is stored in nonvolatile memory (FRAM) of the weigh module.

Step 9   Press the ESC key to return to weighing mode.

Note
When the span calibration value is set to 100 g in Step 5, select the highest-order digit using the ➡ key, and then make the status indicator LEDs light as shown below using the ⬆ key.


- Indicates that the value of the highest-order digit is "10".

- G – N – H – S – Z – X
- F●   ●   ●   ●   ENT
- ESC   ➡   ⬆   ENT

※ The **S** LED lights when the display is stable.

4.2. Calibration Errors ($C\ Er$)

Display	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 the weigh module.
$C\ Er\ 2$	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. When the load cell or A/D converter may be the cause of error, confirm this by using check mode.
$C\ Er\ 3$	Voltage at zero calibration exceeds in the negative direction.	
$C\ Er\ 4$	The value of the calibration weight exceeds the maximum capacity.	Use an appropriate calibration weight and calibrate again.
$C\ Er\ 5$	The value of the calibration weight is less than the minimum division.	
$C\ Er\ 6$	The load cell sensitivity is not sufficient.	The load cell or A/D converter may be damaged.
$C\ Er\ 7$	Voltage at span calibration is less than voltage at the zero point.	Check the load cell connection.
$C\ Er\ 8$	The load cell output voltage is too high when the mass of maximum capacity is weighed.	The load cell or A/D converter may be damaged.

□ Gravity acceleration table

Amsterdam	9.813 m/s²	Manila	9.784	m/s²
Athens	9.800 m/s²	Melbourne	9.800	m/s²
Auckland NZ	9.799 m/s²	Mexico City	9.779	m/s²
Bangkok	9.783 m/s²	Milan	9.806	m/s²
Birmingham	9.813 m/s²	New York	9.802	m/s²
Brussels	9.811 m/s²	Oslo	9.819	m/s²
Buenos Aires	9.797 m/s²	Ottawa	9.806	m/s²
Calcutta	9.788 m/s²	Paris	9.809	m/s²
Chicago	9.803 m/s²	Rio de Janeiro	9.788	m/s²
Copenhagen	9.815 m/s²	Rome	9.803	m/s²
Cyprus	9.797 m/s²	San Francisco	9.800	m/s²
Djakarta	9.781 m/s²	Singapore	9.781	m/s²
Frankfurt	9.810 m/s²	Stockholm	9.818	m/s²
Glasgow	9.816 m/s²	Sydney	9.797	m/s²
Havana	9.788 m/s²	Tainan	9.788	m/s²
Helsinki	9.819 m/s²	Taipei	9.790	m/s²
Kuwait	9.793 m/s²	Tokyo	9.798	m/s²
Lisbon	9.801 m/s²	Vancouver, BC	9.809	m/s²
London (Greenwich)	9.812 m/s²	Washington DC	9.801	m/s²
Los Angeles	9.796 m/s²	Wellington NZ	9.803	m/s²
Madrid	9.800 m/s²	Zurich	9.807	m/s²

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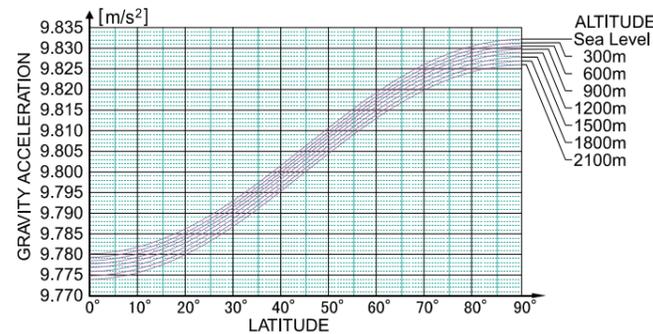
5. Function Mode

The function mode stores parameters to control the weigh module.
The parameters are stored even without power supplied.

5.1. Stability Detection/Digital Filter/RS-485

Stability detection	$C\cdot F08$: Stability detection time
	$C\cdot F09$: Stability detection width
Digital filter	$Fnc05$: Digital filter 1
	$Fnc06$: Digital filter 2
RS-485	$rS\ 02$: Communication mode
	$rS\ 03$: Baud rate
	$rS\ 08$: Slave address

5.2. Key Operations

5.2.1. Selecting Functions

ENT + F ····Proceeds to function mode from weighing mode.
↑ ········· Selects a type of function (upper 3 digits).
ENT ······ Enters a selected function.
↑ ········· Selects an item under the selected function (lower 2 digits).
ENT ······ Enters the item.
ESC ······ Stores parameters and returns to weighing mode.

5.2.2. Changing Values

→ ········· Moves the digit to be selected.
↑ ········· Changes the numerical value.
ENT ······ Stores the value and returns to the function selecting mode.
ESC ······ Does not store the value and returns to the function selection mode.

5.3. Function Table

5.3.1. Calibration Function ($C\cdot Fnc$)

Step 1 Turn off the display by pressing and holding the ENT key. Then, while holding the F key, press the ENT key. CAL will be displayed indicating calibration mode.

Step 2 Press the ENT key to enter calibration mode. $C\cdot SEt$ is displayed. To return to weighing mode, press the ESC key.

Step 3 Select $C\cdot Fnc$ using the ↑ key, and then press the ENT key.

Item & Function	Description, Range &	Default value
$C\cdot F08$ Stability detection time	Used with $C\cdot F09$ for stability detection. Range (in 0.1 s intervals):	0.0 to 1.0 to 9.9
$C\cdot F09$ Stability detection width	Used with $C\cdot F08$ for stability detection. Range (in 1 digit intervals):	0 to 2 to 100

5.3.2. Basic Function ($Fnc\ 1$)

Step 1 While holding the ENT key, press the F key. Fnc will be displayed indicating function mode.

Step 2 Press the ENT key to enter function mode. To return to weighing mode, press the ESC key.

Step 3 Select $Fnc\ 1$ using the ↑ key, and then press the ENT key.

Item & Function	Description, Range &	Default value
$Fnc05$ Digital filter 1	Selects a cutoff frequency. 0 : None 6 : 20.0 Hz 12 : 2.8 Hz 1 : 100.0 Hz 7 : 14.0 Hz 13 : 2.0 Hz 2 : 70.0 Hz 8 : 10.0 Hz 14 : 1.4 Hz 3 : 56.0 Hz 9 : 7.0 Hz 15 : 1.0 Hz 4 : 40.0 Hz 10 : 5.6 Hz 16 : 0.7 Hz 5 : 28.0 Hz 11 : 4.0 Hz	
$Fnc06$ Digital filter 2	Selects a cutoff frequency. 0 : None 6 : 20.0 Hz 12 : 2.8 Hz 18 : 0.40 Hz 1 : 100.0 Hz 7 : 14.0 Hz 13 : 2.0 Hz 19 : 0.28 Hz 2 : 70.0 Hz 8 : 10.0 Hz 14 : 1.4 Hz 20 : 0.20 Hz 3 : 56.0 Hz 9 : 7.0 Hz 15 : 1.0 Hz 21 : 0.14 Hz 4 : 40.0 Hz 10 : 5.6 Hz 16 : 0.7 Hz 22 : 0.10 Hz 5 : 28.0 Hz 11 : 4.0 Hz 17 : 0.56 Hz 23 : 0.07 Hz	

□ Optimal digital filter setting example ($Fnc05$ setting)

AD4212L-R50		AD4212L-R100	
Weighing range	Example (setting value)	Weighing range	Example (setting value)
0 g to 20 g	4.0 Hz (11)	0 g to 50 g	4.0 Hz (11)
20 g to 51 g	1.0 Hz (15)	50 g to 110 g	1.0 Hz (15)

5.3.3. RS-485 Function ($rS\ F$)

Step 1 While holding the ENT key, press the F key. Fnc will be displayed indicating function mode.

Step 2 Press the ENT key to enter function mode. To return to weighing mode, press the ESC key.

Step 3 Select $rS\ F$ using the ↑ key, and then press the ENT key.

Item & Function	Description, Range &	Default value
$rS\ 02$ Communication mode	5 : Modbus RTU 6 : Interval output at 100 times/s 7 : Interval output at 200 times/s 8 : Interval output at 500 times/s	
$rS\ 03$ Baud rate	5 : 9600 bps 7 : 38400 bps 6 : 19200 bps 8 : 115200 bps	
$rS\ 08$ Slave address	0 : None 1 to 99	

※ The default value of the communication mode ($rS\ 02$) is Modbus RTU.
   Modbus RTU communication parameters are as below:
   Character bit length: 8 bits fixed   Parity: Even fixed

□ Modbus RTU data address

Weighing values

Data Address (Holding Register)	R/W	Item	Remarks
400001 - 400002	R	Displayed value (Digital filter 1)	
400003 - 400004		Gross value (Digital filter 1)	
400005 - 400006		Net value (Digital filter 1)	
400007 - 400008		Tare value	
400009 - 400010		Status indicator (Status LED)	#6
400043 - 400044		Displayed value (Digital filter 2)	
400045 - 400046		Gross value (Digital filter 2)	
400047 - 400048		Net value (Digital filter 2)	

Error code (Data address : 400065 - 400068)

Error code		Error sub code	
Error item	Code No.	Item	Code No.
No error	0	N/A	0
A/D converter error	1	N/A	0
Nonvolatile memory error	2	N/A	0
RAM error	3	N/A	0
Calibration error	4		1 to 8
Weighing display error	5	N/A	0
Load cell connection verification error	6		1 to 255

#6 Bit address of status indicators (Data address : 400009 - 400010)

Data Address (Holding Register)		R/W	Item	Remarks
400009.	15-00	R	Reserved internally	0 fixed
400010.	15-07		Reserved internally	0 fixed
400010.	06		Z : Zero	
400010.	05		S : Stable	
400010.	04		G : Gross	LED to turn on = 1
400010.	03		N : Net	LED to turn off = 0
400010.	02		H : Hold, Hold busy	
400010.	01		X : Basic function $Fnc04$	
400010.	00		Reserved internally	0 fixed

Internal write cycle/write result (Data address : 400099 - 400100)

No.	Item	Reference
0	Write success	
1	Write failure	
1 to 8	Calibration error	
15	Internal write cycle	Writing to the nonvolatile memory
Other	None	Not used

Access interval timer (Data Address : 400097 - 400098)

This is an interval timer to count up every 1 ms. When the values are read, the interval timer is initialized to "0". By reading the values periodically, an approximate communication time can be measured.