SET POINT COMPARATOR
AM-215A INSTRUCTION MANUAL

⚠Caution
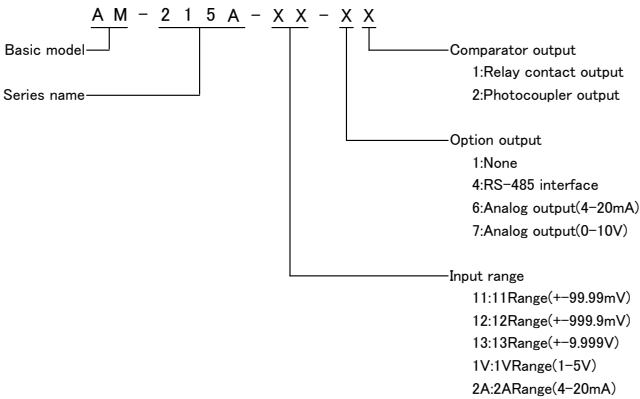
(1) The equipment may be damaged if the input current or voltage exceeds the maximum allowed value.
(2) Only use a supply voltage which is in the usable voltage range. Using a voltage outside this range may result in fire, electric shock, or damage to the equipment.
(3) Please note that the contents of this manual may be changed without notice due to product modifications.
(4) In preparing this manual, we made every effort to provide the best manual possible. Please contact your dealer or Watanabe if you notice any deficiencies, errors, omissions, etc.
(5) After you finish reading the manual, keep it handy for future access.

1.   Before using the product

Thank you for purchasing the AM-215A Series. Keep this operating manual handy so that you can refer to it in the future. Check the contents of your package and contact your dealer or Watanabe if you notice any problems (e.g., equipment damage).

1.1. Equipment numbers

The equipment numbers used with the AM-215A Series follow the chart shown below. Make sure the product you selected when you placed your order has the same model number and specifications as the product you received.

AM - 2 1 5 A - XX - XX

Basic model
Series name

Comparator output
1:Relay contact output
2:Photocoupler output

Option output
1:None
4:RS-485 interface
6:Analog output(4-20mA)
7:Analog output(0-10V)

Input range
11:11Range(+-99.99mV)
12:12Range(+-999.9mV)
13:13Range(+-9.999V)
1V:1VRange(1-5V)
2A:2ARange(4-20mA)

1.2.   Standard accessories check

The AM-215A package includes an operating manual (this document) and one unit seal.
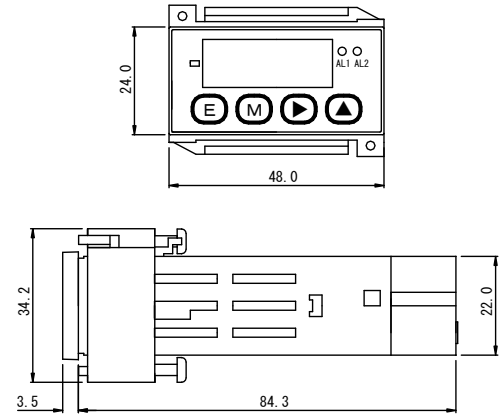
2.   Panel cutting dimensions

2.1.   Panel cutting dimensions

Follow the dimensions shown in the diagram below in cutting the panel in order to install the AM-215A Series.
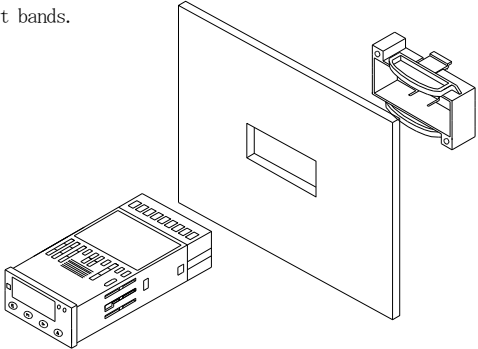
45.0 +0.5 -0
22.2 +0.3 -0
MIN 50
MIN 57

* Recommended panel thickness: 1-8 mm
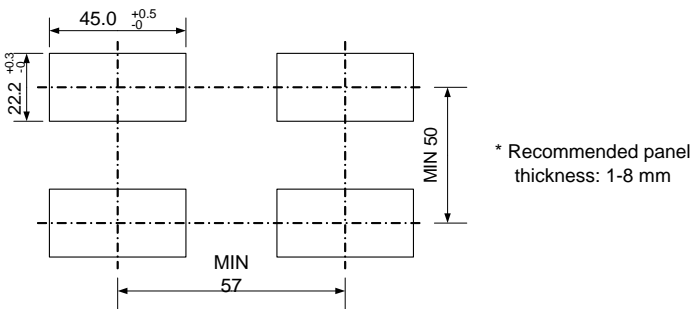
2.2.   External dimensions

24.0
48.0
34.2
22.0
3.5
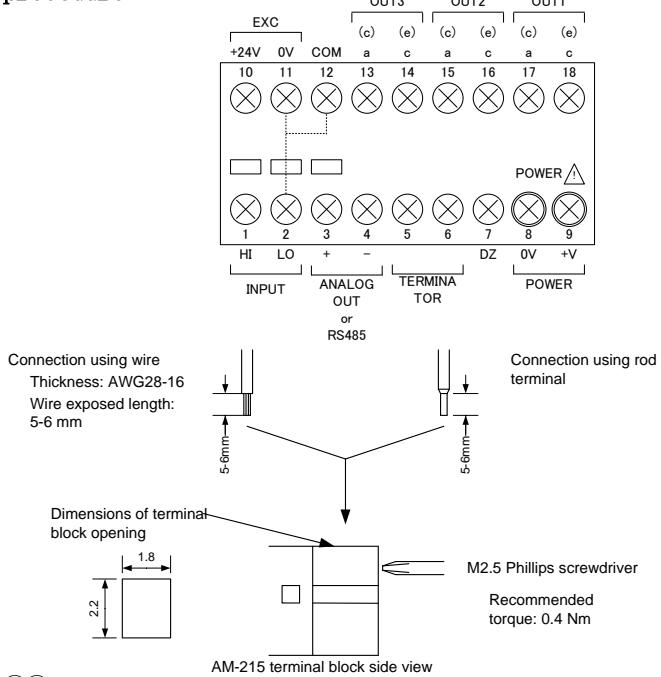84.3

2.3.   Panel attachment procedure

After removing the attachment bands from the main unit, insert the unit through the front of the panel, and fasten it from the rear side of the panel using the attachment bands.

⚠Caution

(1) Make sure the installation location is strong enough to support the unit's weight. If it is not strong enough, or if the unit is not properly attached, the display may fall, possibly resulting in injury.
(2) When installing the unit in a system, be sure there is sufficient heat dissipation so that the temperature inside the system does not reach or exceed 50°C.

3.   Description of terminals and connection procedure

EXC			OUT3 (c) (e)		OUT2 (c) (e)		OUT1 (c) (e)	
+24V	0V	COM	a	c	a	c	a	c
10	11	12	13	14	15	16	17	18

POWER ⚠

1	2	3	4	5	6	7	8	9
HI	LO	+	-			DZ	0V	+V
INPUT		ANALOG OUT or RS485		TERMINATOR			POWER	

Connection using wire
 Thickness: AWG28-16
Wire exposed length: 5-6 mm

Connection using rod terminal

5-6mm

Dimensions of terminal block opening
1.8
2.2

M2.5 Phillips screwdriver
Recommended torque: 0.4 Nm

AM-215 terminal block side view

①② : Input signals

・ Make the input signal lines as short as possible. Keep them away from other signal lines.
・ If there is a lot of external noise, use a two-wire shielded cable and form a single connection between the outer sheath and the LO side at the signal source.

③,④: Output terminals

· An analog output (4-20 mA or 0-10 V) or an RS485 interface can be selected.

⑦: DZ (Digital Zero)

The previously displayed value is set to zero. After this setting, measurement is performed based on this "zero" point for display. When the b.uP is OFF, turning the power OFF will cancel this setting.

* The DZ terminal is enabled by short-circuiting it with the COM terminal or setting it to level "0". It is disabled by open-circuiting it or setting it to level "1".

        Level "0": 0-1.5 V   Level "1": 3.5-5 V
        Input current: -0.5 mA or below

⑧, ⑨: Power source terminals (DC POWER)

· A power source is connected to a power source terminal. The AM-215A does not have a power switch. The power is turned ON as soon as the power source is connected.

⑩, ⑪: EXC (sensor power source)

· An EXC terminal can be used as a sensor power source (24 V DC 25 mA maximum).

⑬ - ⑱: Comparative output terminals

· Relay output
Contact capacity: 24 V DC/1 A (resistive load)
Mechanical lifespan: 5 million times min.
Electrical lifespan: 100,000 times min. (resistive load)

· Photocoupler output
Output capacity: Voltage: 30 V max., Current: 50 mA max.
The maximum output saturation voltage is 1.2 V at 50 mA.

* Use the relay output and photocoupler output within the range of the rated capacity.

⚠Caution

(1) Apply the rated voltage at once (gradually increasing the applied voltage may not turn the machine ON).
(2) The time interval for turning the power ON/OFF should be at least 10 seconds (turning the power ON/OFF within 10 seconds may not turn the machine ON).
(3) The INPUT LO, EXC 0V, and COM terminals are at the same potential, but they should be wired separately. (When using a 2-wire sensor, terminals 2-11 should be externally connected.)
(4) When no terminals are selected for outputting, do not connect anything to vacant terminals.

4 Parameter Setting

4.1 Component Name and Function
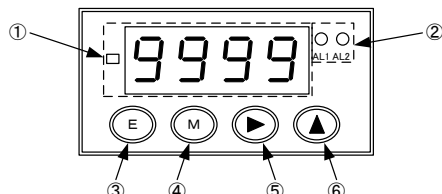
① Main display area: Displays measured values, as well as menus and their contents for parameter setting.

② Check results display area: Displays the check results (when using the GO output, neither the AL1 nor the AL2 is flashing).

③ ENTER switch: Move from the measurement mode to the parameter setting mode ("ENTER" + "Mode").

④ Mode switch: In the parameter setting mode, switch from one item to another.
                Move to the shift data setting mode ("Mode" + "Shift").
                Turn the DZ terminal ON/OFF on the front panel ("Mode" + "Increment").

⑤ Shift switch: In the parameter setting mode, switch from one digit to another.
                Move to the shift data setting mode ("Mode" + "Shift").

⑥ Increment switch: Select numerical value ("Increment") and the contents for parameter setting.
                Turn the DZ terminal ON/OFF on the front panel ("Mode" + "Increment").

*All parameters can be initialized by switching on a power supply, pushing all keys.

* When the b.uP of the condition data is turned OFF, turning the power OFF cancels the digital zero value.

● Parameter group

The parameters of the AM-215A fall into the five categories below. This manual does not explain the settings of the shift data and the linearize data. They are explained in a different manual. If that manual is needed, please contact our dealer or office.

Condition data	A group of parameters that relate to the basic operations and functions of the AM-215A, such as sampling rate.
Comparator data	A group of parameters that relate to comparative outputs.
Scaling data	A group of parameters that relate to measurements, such as decimal point and displayed value, and input signals.
Shift data	A parameter that relates to the function to forcibly shift a displayed value.
Linearize data	A parameter that performs corrections to determine a straight line representing input signals and displayed values.

4.1.1 Condition Data Setting

4.1.2 Comparator Data Setting

`1234` (Measurement operation)

↓ E + M

`cond`

↓ ▶

`coM`

↓ M

If M key is pushed in the state of each menu name or there is no key operation during 1 second, it will shift to contents selection of a parameter. Moreover, when there is no key operation during 8 seconds at the time of selection of the contents of a parameter, it returns to a menu.

▶ Digit shift
Ⓔ Back to measurement operation
▲ Numerical value or option change
▢ Default value

Menu name	The contents of a parameter
`coM.t` (Comparative outputtypr)	`HCL` HI-LO check operation (HI/GO/LO comparative output) / `HHHC` HH check operation (HH/HI/GO comparative output) / `CLLL` LL check operation (GO/LO/LL comparative output)
↓ M	
`S-HC` (Check value 1)	`-9999~9999` Check value 1 is set (setting varies depending on the COM.T setting. *The default value is 1000. *It is set to S-HH at the time of HHHG selection. *It is set to S-LO at the time of GLLL selection.
↓ M	
`S-Lo` (Check value 2)	`-9999~9999` Check value 2 is set (setting varies depending on the COM.T setting. *The default value is 500. *It is set to S-HH at the time of HHHG selection. *It is set to S-LO at the time of GLLL selection.
↓ M	
`H-HC` (Hysteresis 1)	`0~999` Hysteresis 1 is set (setting varies depending on the COM. Tsetting. *The default value is 0. *It is set to H-HH at the time of HHHG selection. *It is set to H-LO at the time of GLLL selection.
↓ M	
`H-Lo` (Hysteresis 2)	`0~999` Hysteresis 1 is set (setting varies depending on the COM. Tsetting. *The default value is 0. *It is set to H-LL at the time of HHHG selection. *It is set to H-GO at the time of GLLL selection.
↓ M	
`L-HC` (Output 1 Logic)	`no` Normally open / `nc` Normally closed *It is set to L-HH at the time of HHHG selection. *It is set to L-GO at the time of GLLL selection. *An output terminal will be out3.
↓ M	
`L-Co` (Output 2 Logic)	`no` Normally open / `nc` Normally closed *It is set to L-HI at the time of HHHG selection. *It is set to L-LO at the time of GLLL selection. *An output terminal will be out2.
↓ M	
`L-Lo` (Output 3 Logic)	`no` Normally open / `nc` Normally closed *It is set to L-GO at the time of HHHG selection. *It is set to L-LL at the time of GLLL selection. *An output terminal will be out1.
↓ M	
`AL1` (AL1 lighting selection)	`HH` AL1 is turned on by HH. / `Lo` AL1 is turned on by LO. / `HC` AL1 is turned on by HI. / `LL` AL1 is turned on by LL. / `Co` AL1 is turned on by GO.
↓ M	
`AL2` (AL2 lighting selection)	`HH` AL2 is turned on by HH. / `Lo` AL2 is turned on by LO. / `HC` AL2 is turned on by HI. / `LL` AL2 is turned on by LL. / `Co` AL2 is turned on by GO.
↓ M	*The parameter of AL1 and AL2 is set to GO with both sides immediately after changing a comparison output type parameter.

●Comparative operation type

In the AM-215A, use the comparator data to select one type of comparative operation from the three types below:

HI / GO / LO mode

Comparator condition	Output		
	OUT1	OUT2	OUT3
Measurement value > HI limit value	OFF	OFF	ON
LO limit value ≦ Measurement value ≦ HI limit value	OFF	ON	OFF
LO limit value > Measurement value	ON	OFF	OFF

HH / HI / GO mode

Comparator condition	Output		
	OUT1	OUT2	OUT3
Measurement value > HH limit value	OFF	ON	ON
Measurement value > HI limit value	OFF	ON	OFF
HI limit value ≧ Measurement value	ON	OFF	OFF

GO / LO / LL mode

Comparator condition	Output		
	OUT1	OUT2	OUT3
Measurement value ≧ LO limit value	OFF	OFF	ON
LO limit value > Measurement value	OFF	ON	OFF
LL limit value > Measurement value	ON	ON	OFF

4.1.3 Scaling Data Setting

●Displayed value setting

The concept of the scaling data and an example setting of a full-scale value are presented below:
Displayed value = (a×X) + b
a = (Displayed full-scale value − Displayed offset value) / (Input full-scale value − Input offset value)
b = Displayed offset value − (Input offset value×a)
where
X: Input value; a: Gain; b: Offset

`1234` (Measurement operation)

↓ E + M

`cond`

↓ ▶ Press twice

`MEt`

↓ M

If M key is pushed in the state of each menu name or there is no key operation during 1 second, it will shift to contents selection of a parameter. Moreover, when there is no key operation during 8 seconds at the time of selection of the contents of a parameter, it returns to a menu.

▶ Digit shift
Ⓔ Back to measurement operation
▲ Numerical value or option change
▢ Default value

Menu name	The contents of a parameter
`FSc` (Displayedfull-scale value)	`-9999~9999` The value to be displayed at the time of FIN signal input is set. *The default value is 9999.
↓ M	
`Fin` (Inputfull-scalevalue)	`-9999~9999` Input full-scale signal. *The default value is 9999 in the 11-13 range, 20.00 in the 2A range, and 5.000 in the 1V range.
↓ M	
`oFS` (Displayedoffset value)	`-9999~9999` The value to be displayed at the time of OIN signal input is set. *The default value is 0.
↓ M	
`oin` (Inputoffsetvalue)	`-9999~9999` Input offset signal. *The default value is 0 in the 11-13 range, 4.00 in the 2A range, and 1.000 in the 1V range.
↓ M	
`dLHC` (Digital limiter HI value)	`-9999~9999` The upper limit value of the displayable range is set. *The default value is 9999.
↓ M	
`dLLo` (Digital limiter LO value)	`-9999~9999` The lower limit value of the displayable range is set. *The default value is −9999. *A menu is displayed only the option output form 4.
↓ M	
`AoHC` (Analog output HI value)	`-9999~9999` A displayed value to obtain an output from the full-scale side of the analog output is set. *The default value is 9999.
↓ M	
`AoLo` (Analog output LO value)	`-9999~9999` A displayed value to obtain an output from the full-scale side of the analog output is set. *The default value is 0.
↓ M	
`dEP` (Decimalpoit)	At sahdira Flashing decimal indicator is turned ON/OFF. *The defaultvalue is OFF (during setting, all of the indicators are turned ON). * ▶ Set up by the key.
M	

Input voltage : 0-10 V
Displayed value range : 0-5000

⇩

FSC : 5000
FIN : 9999
OFS : 0
OIN : 0

●Analog output setting

The range of displayed values of the AM-215A' s analog output can be arbitrarily set, such that it corresponds to the range of 4-20 mA or 0-10 V. Analog output scaling sets a displayed value to the analog output HI that corresponds to 20 mA or 10 V. Likewise, it sets a displayed value to the analog output LO that corresponds to 4 mA or 0 V.

The scaling concept is presented below:
The operation for scaling is the same as that for the displayed value setting.

`AoH1` :Displayed value when the analog output is 20 mA or 10 V
`AoLo` :Displayed value when the analog output is 4 mA or 0 V

Output current : 4-20 mA
Displayed value range : 0-5000

⇩

AOHI : 5000
AOLO : 0
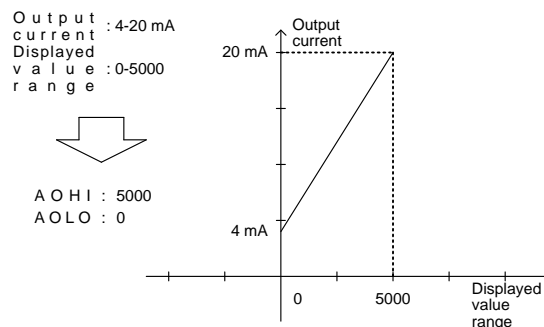
⚠ Caution

When the equipment input range is used, the full scale input values are initially set to 1 V → 5.000 and 2 A → 20.00. The offset input value is 0, so 1 V → 1.000 and 2 A → 4.00 are set.

5. Error messages

The error message of AM-215A and the solution at the time of an error are as follow.

Error Display	Details	Recovery Response
oL -oL	When an input or displayed value is out of the measured value range	Use the relay so that input and displayed values are in the measured value range.
uACt	When the micro-computer is waiting for data input	Make sure that the averaging frequency is not set too high.
dAtA.	Error in the internal memory of the relay	Turn the power of the relay OFF and turn it ON again. If the relay still does not recover, contact our dealer or office.
c.o.n.d.	Condition data error	Reset the condition data. * Change at least one of the data in a parameter and cycle through all of the other parameters.
c.o.N.	Comparator data error	Reset the comparator data. * Change at least one of the data in a parameter and cycle through all of the other parameters.
n.E.t.	Scaling data error	Reset the scaling data. * Change at least one of the data in a parameter and cycle through all of the other parameters.
L.i.n.E.	Linearize data error	Reset the linearize data. * Change at least one of the data in a parameter and cycle through all of the other parameters.
S.H.F.t.	Shift data error	Reset the shift data.
d. .E.	Digital zero value backup data error	Perform a writing operation for the digital zero value.

6. Specifications

Input specifications

DC voltage measurements

Range	Measurement range	Display	Input impedance	Maximum allowed input
11	±99.99mV	Offset ±9999 Full scale ±9999	100 MΩ or greater	±50V
12	±999.9mV		100 MΩ or greater	±50V
13	±9.999V		Approximately 1 MΩ	±50V
1V	1-5 V		Approximately 1 MΩ	±50V

Accuracy: ±(0.03% of rdg + 2 digits) (at 23°C± 5°C)

DC current measurements

Range	Measurement range	Display	Input impedance	Maximum allowed input
2A	4-20mA	Offset ±9999 Full scale ±9999	Approximately 50 Ω	±50 mA

Accuracy: ±(0.1% of rdg + 2 digits) (at 23°C ± 5°C)

* This accuracy is for $(FSC - OFS) / (FIN - OIN) \leq 1$ ^{*1}
* 1: 1V [(FIN-OIN)×2], 2A [(FIN-OIN)×5]

General specifications

Measurement function : Select either DC voltage or DC current (single range)
Input circuit : Single ended
Operation type : Sigma-Delta conversion
Sampling speed : Maximum 25 per second
Display : Red 7-segment LED display (character height: approximately 8 mm)
Polarity display : A minus sign is displayed if the operation result is negative.
Out-of-range warning : "oL" or "-oL" is displayed with respect to the input signal when the value is outside the display range.
Maximum display : ±9999 (full 4 digits)
Decimal point : Can be set at any position using the front-panel flat switches.
Zero display : Leading zero suppress
Backup : Settings are held in EEPROM (guaranteed for 100,000 writes)
Operating temperature and humidity ranges : 0 to 50°C, 35 to 85% RH (no condensation)
Storage temperature and humidity ranges : -20 to 70°C, 60% or lower RH (no condensation)
Supply voltage : DC 24 V ±20%
Consumed power : Approximately 2.2 W
External dimensions : 48 × 24 × 87.8
Weight : Weight: Approximately 100 g
Withstand voltage : DC 500 V for one minute across power terminals/input terminals and each output terminal
DC 500 V for one minute across input terminals/each output terminal
AC 1500 V for one minute across case/power terminals, input terminals, and each output terminal
Insulating resistance : 100 MΩor higher with DC 500 V across the terminals listed above
Standard accessories : Operating manual, unit seal
Conformity standard : EN61326-1:2006
E247481

External control unit
Digital zero : Digital Zero is turned ON when the DZ terminal and terminal are shorted or at the same potential.

External power supply unit
Rating : DC 24 V ±5%
Maximum load : 25mA

Comparator unit
Control method : Microcomputer computation
Setting range : −9999 to +9999
Comparator operation : Depends on sampling speed.
Comparator conditions : AL1 and AL2 judging monitor can be turned on at the time of arbitrary judgment results.

HI / GO / LO mode

Comparator condition		Output		
		OUT1	OUT2	OUT3
Measurement value > HI limit value		OFF	OFF	ON
LO limit value ≦ Measurement value ≦ HI limit value		OFF	ON	OFF
LO limit value > Measurement value		ON	OFF	OFF

HH / HI / GO mode

Comparator condition		Output		
		OUT1	OUT2	OUT3
Measurement value > HH limit value		OFF	ON	ON
Measurement value > HI limit value		OFF	ON	OFF
HI limit value ≧ Measurement value		ON	OFF	OFF

GO / LO / LL mode

Comparator condition		Output		
		OUT1	OUT2	OUT3
Measurement value ≧ LO limit value		OFF	OFF	ON
LO limit value > Measurement value		OFF	ON	OFF
LL limit value > Measurement value		ON	ON	OFF

Setting condition : HI / GO / LO mode HI limit value > LO limit value
HH / HI / GO mode HH limit value > HI limit value
GO / LO / LL mode LO limit value > LL limit value
Hysterisis : For each comparator all limit value can be set as 1 to 999 digits.

Relay output unit
Output ratings : DC 24 V, 1 A (resistance load)

Photocoupler output
Output ratings : MAX.30V 50mA
Output saturation voltage : 1.2V max. at 50mA

Optional unit
Analog output unit(can not be installed together with RS-485)
Output function : 4 to 20mA(AM-215A-XX-6X) or 0 to 10V(AM-215A-XX-7X)
Output specifications :

Mode	Load Resistance	Accuracy	Ripple
4 to 20mA	0 to 250 Ω	±(0.5 % of FS)	25mVp-p max.
0 to 10V	10k Ω min.	±(0.5 % of FS)	50mVp-p max.

Note) The ripple current for the 4 to 20mA output mode is specified for a load resistance of 250 Ω and an output current of 20mA.

RS-485 unit
Synchronization method : Start - stop synchronization
Communication method : 2 - wire half-duplex (polling selecting)
Transfer rates : 38400 / 19200 / 9600 / 4800 / 2400
Start bit : 1bit
Data length : 7bits / 8bits
Parity bit : Even / Odd / None
Error check : Block check character (BCC) checksum
Stop bit : 1bit / 2bits
Character code : ASCII code
Delimiter : CR + LF / CR
Transmission control protocol : None
Used signal name : Non - inverted (+), inverted(-)
Maximum connected units : Maximum 31 meters
Maximum line length : 500 meters(total) *In EN conformity, it is unber 30m.

7 Warranty and after-sales service

7.1 Warranty

The warranty lasts one year from the date of delivery. If an equipment failure which is considered to be clearly at the fault of Watanabe occurs during this period, we will repair the equipment at no charge.

7.2 After-sales service

This product was manufactured, tested, and inspected according to rigorous quality control procedures before it was shipped from the factory. If an equipment failure should occur, please contact your dealer or Watanabe(send the product to us). (Along with the failed product, please include a description with as much information as possible.)

watanabe
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(UX-34106j)

```
┌─────────────────────────────────────┐
│        Digital panel meter          │
│      M O D E L   AM-215A Series     │
│        Linearize function           │
│     /Shift functional handling      │
│            description              │
└─────────────────────────────────────┘
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1. Linearize compensation function

1.1 View

This linearize function depends the linearity between compensation mark on input value (display value before compensation), and output value (display value after compensation).
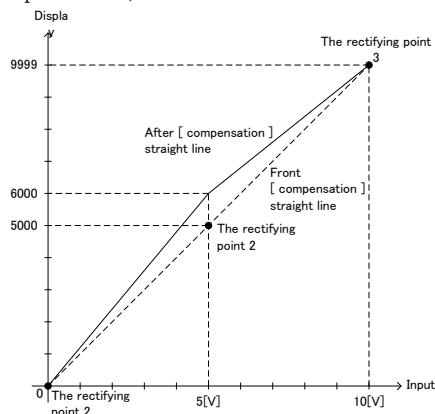
① A rectifying point is set up with 3.
② The input value (0) and the output value (0) of the rectifying point 1 are set up.
③ Since the value (scaling is an initial state) when inputting the rectifying point 2 5V to 13 ranges turns into input value, input value is set up with 5000 and output value is set up with 6000.
④ The input value (9999) and the output value (9999) of the rectifying point 3 are set up.

1.2 The operation method

In the state of the input value / output value of rectifying point X, when there is no key operation during about 8 seconds (0 etc.), it returns to the display of n-XX.

▶ Digit shift
▲ Numerical value or option change
Ⓔ Back to measurement operasion
▨ Default value

| 02～16 | Compensation mark are inputted. The setup of the rectifying point set up by this parameter is set up with the following parameters. |
*The default value is 00.

| −9999～+9999 | The input value (display value before linearity compensation) of the rectifying point 1 is inputted. |
*Setting condition (rectifying point n input value) >
(rectifying point n−1 input value)

| −9999～+9999 | The output value (display value before linearity compensation) of the rectifying point 1 is inputted. |

| −9999～+9999 | The input value (display value before linearity compensation) of the rectifying point 2 is inputted. |
*Setting condition (rectifying point n input value) >
(rectifying point n−1 input value)

| −9999～+9999 | The output value (display value before linearity compensation) of the rectifying point 2 is inputted. |

| −9999～+9999 | The input value (display value before linearity compensation) of the rectifying point 16 is inputted. |
*Setting condition (rectifying point n input value) >
(rectifying point n−1 input value)

| −9999～+9999 | The output value (display value before linearity compensation) of the rectifying point 16 is inputted. |

2. Shift function

2.1 View

This shift function is a function which shifts display value compulsorily (offset), and the uncontrollable numerical specification of it is attained in digital zero.

2.2 The operation method

| −9999～+9999 | The display value offset is inputted. |
*The default value is 0.
▶ Digit shift
▲ Numerical value or option change
*When there is no key operation during about 8 seconds, it returns to "SHF" display. Furthermore, when there is no key operation during about 8 seconds in the state of "SHF" display, it returns to measurement operation.

The value set up by M key is memorized and it checks that it is the display which contained shift operation to the display value equivalent to the present input.

Cautions :
The display will return to the setting of a shift value if M key has pressed more than twice.
Then please set a shift value again.
If you return to measurement operation without resetting, the shift value will affect the display value, but please note that set value will not be backed up.

*When there is no key operation during about 8 seconds, it returns to "SHF" display. Furthermore, when there is no key operation during about 8 seconds in the state of "SHF" display, it returns to measurement operation.
However, the memorized offset value (shift value) is reflected in display value.

┌─ Wish ──┐
│ Setting range of a shift function Although it becomes the range of −9999 to 9999, │
│ if a shift setup is carried out after setting up comparator data, │
│ the setting range of a shift may turn into the range of 0 to 9999, │
│ and it may not be able to perform a setup by the side of minus. │
└──┘

AM-215A Series

RS-485 User's Manual

1.   Overview

This manual explains the specifications of the communication functions provided by the AM-215A series of digital panelmeters.   It also explains how to handle the AM-215A series.

2.   Specifications

Synchronization	:	Start-stop
Communication method	:	Two-wire half-duplex (polling/selecting)
Transmission rate	:	2400, 4800, 9600, 19200, 38400 bps
Number of start bits	:	1bit
Data length	:	7bits, 8bits
Parity bit	:	Even parity, odd parity, or no parity
Error detection	:	Block check character (BCC) checksum
Number of stop bits	:	1bit, 2bits
Character code	:	ASCII
Delimiter	:	CR+LF, CR
Transmission control procedure	:	Non-procedural
Signal name used	:	Non-inverting (+), inverting (-)
Number of units that can be connected	:	31 for meters
Transmission line length	:	500 m max. (overall length)
		*In EN conformity, it is under 30m.

3.   Terminal Assignments and Connection Method

3.1. Terminal Assignments

Note: A terminator will be set to being turned on if No. 5 and No. 6 are short-circuited.

3.2. Example of RS-485 Connection

Model SI-30 from Line Eye Co., Ltd. or other equivalent converters

Note: If these lines are likely to be affected by noise or the like, use shielded wire.

Note: If the panelmeter is an end station, set the terminator to ON.

4   Communication Function Parameters

The baud rate, data length, parity bit, stop bit, delimiter, and device ID are the user-selectable parameters of the communication functions provided by the AM-215A panelmeter.   For details on how to set the parameters, see the user's manual of the AM-215A main unit.

5   RS-485 Transmission/Reception Formats

5.1   Establishing and Releasing the Communication Link

Function	1	2	3	4	5	6-23	Char. Length	1	2	3	4	5	6-20	Char. Length
Establishment of communication link	ENQ	0	1	CR	LF	Note: Set a two-digit number as the device ID (00 is void).	3	ACK	0	1	CR	LF	(Normal response) Note: The response time is 40 ms maximum. (No response is made if the device ID is wrong.)	3
Release of communication link	EOT	CR	LF			Note: Communication is still possible when another device ID is specified without releasing the communication link.	1						(No response is made for release.) Note: The response time is 20 ms maximum.	

5.2. Available Control Codes

Control Code	Hexadecimal	Name	Description
STX	02H	Start of Text	Marks the starting point of text.
ETX	03H	End of Text	Marks the ending point of text.
EOT	04H	End of Transmission	Marks the end of transmission.
ENQ	05H	Enquiry	Denotes an enquiry.
ACK	06H	Acknowledge	Denotes an affirmative reply.

5.3. BCC Checksum

As a means of error detection, a block check character (BCC) checksum is added to the RS-485 communication function of the AM-215A panelmeter.   See the following illustrations for details on the transmission and reception formats.

Example of BCC Checksum for Transmission

Character	STX	D	S	P	ETX	A	E	CR	LF
Hexadecimal	02H	44H	53H	50H	03H	41H	45H	0DH	0AH
		[1]	[2]	[3]	[4]				

BCC H = Higher-order 4 bits among the lower-order 8 bits of the sum of the hexadecimal values numbered from [1] to [4]
44H+53H+50H+03H=EAH

BCC L = Lower-order 4 bits among the lower-order 8 bits of the sum of the hexadecimal values numbered from [1] to [4]
44H+53H+50H+03H=EAH

Example of BCC Checksum for Reception

Character	STX				5	0	0	0		H	I	ETX	9	D	CR	LF
	02H	20H	20H	20H	35H	30H	30H	30H	20H	48H	49H	03H	39H	44H	0DH	0AH
		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]				

BCC L = Lower-order 4 bits among the lower-order 8 bits of the sum of the hexadecimal values numbered from [1] to [11]
20H+20H+20H+35H+30H+30H+30H+20H+48H+49H+03H=1D9H

BCC H = Higher-order 4 bits among the lower-order 8 bits of the sum of the hexadecimal values numbered from [1] to [11]
20H+20H+20H+35H+30H+30H+30H+20H+48H+49H+03H=1D9H

6. Communication Commands

Function	Command	Char. Length	Response	Char. Length
Measured value and comparison results response	D S P CR LF	3	5 0 0 0 H I CR LF (+ reading, w/o decimal point)	10
			− 5 0 0 0 H I CR LF (− reading, w/o decimal point)	10
			5 0 0 . 0 H I CR LF (+ reading, w/ decimal point)	11
			< = 9 8 0 0 H I CR LF (+ overrange reading, w/o decimal point)	10
			< = − 9 8 0 . 0 H I CR LF (− overrange reading, w/ decimal point)	11
Measured value response	M E S CR LF	3	0 CR LF (+ reading, w/o decimal point)	12
			0 . 0 1 CR LF (+ reading, w/ decimal point)	12
			− 1 1 CR LF (− reading, w/o decimal point)	12
			− 0 . 0 0 5 CR LF (− reading, w/ decimal point)	12
			< = 9 8 0 . 5 CR LF (+ overrange reading, w/ decimal point)	12
			< = − 9 8 0 . 5 CR LF (− overrange reading, w/ decimal point)	12
			All responses are the fixed length of 12 characters.	
Comparison results response	J G M CR LF	3	H I CR LF (In HI, a judgment result is.)	15
			G O CR LF (In GO, a judgment result is.)	15
			L O CR LF (In LO, a judgment result is.)	15
			H . H I CR LF (In HH and HI, a judgment result is.)	15
			L O . L L CR LF (In LO and LL, a judgment result is.)	15
Hold remote control response	S T H CR LF	3	S T A R T CR LF (Response with the status of the hold function being set to OFF by remote control)	6
			H O L D CR LF (Response with the status of the hold function being set to ON by remote control)	6
Hold terminal response	E S A CR LF	3	S T A R T CR LF (Response with the status of the hold function being set to OFF)	6
			H O L D CR LF (Response with the status of the hold function being set to ON)	6
Hold remote control	S T H S CR LF (Sets the hold function to OFF.)	5	Y E S CR LF	5
	S T H H CR LF (Sets the hold function to ON.)	5	Y E S CR LF	5
Trigger input	T CR LF	1	5 0 0 . 0 H I CR LF (+ reading, w/ decimal point) Note: The response is the same as that of "DSP".	11
Hold remote control cancellation	E S M CR LF	3	Y E S CR LF	5

Function	Command	Bytes	Response	Bytes
Digital zero remote control response	D Z R CR LF	3	D Z R O F F CR LF (Response with the status of the digital zero function being set to OFF by remote control) D Z R 1 0 0 0 CR LF (Response with the status of the digital zero function being set to ON by remote control) Note: The main unit responds with the reading when the digital zero function is set to ON.	7 9
Digital zero terminal response	E Z A CR LF	3	D Z R O F F CR LF (Response with the OFF status of the digital zero function) D Z R O N CR LF (Response with the ON status of the digital zero function)	7 6
Digital zero remote control	D Z R O N CR LF (Sets the digital zero function to ON.) D Z R O F F CR LF (Sets the digital zero function to OFF.) D Z R 1 0 0 0 CR LF (Sets the digital zero function to ON at 1000.)	6 7 8	Y E S CR LF Y E S CR LF Y E S CR LF	5 5 5
Digital zero remote control cancellation	E Z M CR LF	3	Y E S CR LF	5
Comparison output remote control response	R L Y CR LF	3	R L Y O F F CR LF (Response with the status of the comparison output being set to OFF by remote control) R L Y H I CR LF (Response with the status of the comparison output being set to ON for HI by remote control) R L Y G O CR LF (Response with the status of the comparison output being set to ON for GO by remote control) R L Y L O CR LF (Response with the status of the comparison output being set to ON for LO by remote control)	7 6 6 6
Comparison output remote control	R L Y H I CR LF (Sets to ON for HI.) R L Y G O CR LF (Sets to ON for GO.) R L Y L O CR LF (Sets to ON for LO.) R L Y O F F CR LF (Sets all comparison outputs to OFF.)	6 6 6 7	Y E S CR LF Y E S CR LF Y E S CR LF Y E S CR LF	5 5 5 5
Comparison output remote control cancellation	R C M CR LF	3	Y E S CR LF	5
Remote control response	R E A CR LF	3	N O ? CR LF (Response with the status of every function not being remote-controlled) S T H CR LF (Response with the status of the hold function being remote-controlled) D Z R CR LF (Response with the status of the digital zero function being remote-controlled) R L Y CR LF (Response with the status of the comparison output function being remote-controlled) Note: The main unit responds with the statuses of functions by separating them with delimiters if multiple functions are being remote-controlled.	5 3 3 3
MAX/MIN/(MAX-MIN) value response	M A X CR LF	3	M A X 5 0 0 . 0 CR LF (Response with a MAX value) M I N - 1 0 0 . 0 CR LF (Response with a MIN value) M - M 6 0 0 . 0 CR LF (Response with a (MAX-MIN) value) Note: The main unit responds with these values at one time by separating them with delimiters.	10 10 10
MAX/MIN/(MAX-MIN) value clear	M C L M A CR LF (Clears the MAX value.) M C L M I CR LF (Clears the MIN value.) M C L M M CR LF (Clears the (MAX-MIN) value.)	6 6 6	Y E S CR LF Y E S CR LF Y E S CR LF	5 5 5
Averaging frequency response	A V G CR LF	3	A V G 1 CR LF (Response with the status of the averaging frequency being once.) A V G 8 0 CR LF (Response with the status of the averaging frequency being 80 times.)	5 6
Averaging frequency setting	A V G 1 CR LF (Sets the averaging frequency to once.) A V G 8 0 CR LF (Sets the averaging frequency to 80 times.)	5 6	Y E S CR LF Y E S CR LF Note: The main unit switches to the frequency immediately after the setting.	5 5
Moving average calculation frequency response	M A V CR LF	3	M A V O F F CR LF (Response with the status of moving average calculation being set to OFF.) M A V O N = 4 CR LF (Response with the status of the moving average calculation frequency being 4 times.) M A V O N = 1 6 CR LF (Response with the status of the moving average calculation frequency being 16 times.)	7 9 9
Moving average calculation frequency setting	M A V 4 CR LF (Sets the moving average calculation frequency to 4 times.) M A V 1 6 CR LF (Sets the moving average calculation frequency to 16 times.) M A V 0 CR LF (Cancels moving average calculation (OFF).)	5 6 5	Y E S CR LF Y E S CR LF Y E S CR LF Note: The main unit switches to the frequency immediately after the setting.	5 5 5

Function	Command	Len	Response	Len
Step width response	S W D CR LF	3	S W D 1 CR LF (Response with the status of the step width being 1.) S W D 0 CR LF (Response with the status of the step width being 0.)	5 / 5
Step width setting	S W D 1 CR LF (Sets the step width to 1.) S W D 0 CR LF (Sets step width to 0.)	5 / 5	Y E S CR LF / Y E S CR LF Note: The main unit switches to the frequency immediately after the setting.	5 / 5
Digital limiter type response	D L T CR LF	3	D L T C U T CR LF (Response with the status of the digital limiter type being CUT.) D L T O V E R CR LF (Response with the status of the digital limiter type being OVER.)	7 / 8
Digital limiter type setting	D L T C U T CR LF (Sets the digital limiter type to CUT.) D L T O V E R CR LF (Sets the digital limiter type to OVER.)	7 / 8	Y E S CR LF / Y E S CR LF Note: The main unit switches to the frequency immediately after the setting.	5 / 5
Communication function parameter response	R S - CR LF	3	R S - 1 9 2 0 0 - 7 - E - 2 - C R / L F CR LF (Response with the status of the baud rate being 19200 bps, data length being 7 bits, parity being even, number of stop bits being 2, and delimiter being CR+LF.) R S - 9 6 0 0 - 8 - N - 1 - C R CR LF (Response with the status of the baud rate being 9600 bps, data length being 8 bits, parity being none, number of stop bits being 1, and delimiter being CR.)	21 / 17
Communication function parameter setting	R S - 1 9 2 0 0 - 7 - E - 2 - C R / L F CR LF (Sets the baud rate to 19200 bps, data length to 7 bits, parity to even, number of stop bits to 2, and delimiter to CR+LF.) R S - 9 6 0 0 - 8 - E - 1 - C R CR LF (Sets the baud rate to 9600 bps, data length to 8 bits, parity to none, number of stop bits to 1.)	21 / 17	Y E S CR LF / Y E S CR LF Note: The main unit switches to the frequency immediately after the setting.	5 / 5
Device ID response	A D R CR LF	3	A D R 0 1 CR LF (Response with the status of the device ID being 01) A D R 9 9 CR LF (Response with the status of the device ID being 99)	6 / 6
Device ID setting	A D R 0 1 CR LF (Sets the device ID to 01.) A D R 9 9 CR LF (Sets the device ID to 99.)	6 / 6	Y E S CR LF / Y E S CR LF	5 / 5
Digital zero backup status response	B D Z CR LF	3	B D Z O N CR LF (Response with the status of digital zero backup being ON.) B D Z O F F CR LF (Response with the status of digital zero backup being OFF.)	6 / 7
Digital zero backup control	B D Z O N CR LF (Sets digital zero backup to ON.) B D Z O F F CR LF (Sets digital zero backup to OFF.)	6 / 7	Y E S CR LF / Y E S CR LF	5 / 5
Digital zero data save command	S A V CR LF	3	Y E S CR LF / N O ? CR LF (Response with the status of digital zero backup being OFF.)	5 / 5
Tracking zero response	T R K CR LF	3	T R K O N T = 1 W = 1 CR LF (Response with the status of the tracking zero time being 1 and tracking zero width being 1.) T R K O N T = 9 9 W = 9 9 CR LF (Response with the status of the tracking zero time being 99 and tracking zero width being 99.) T R K O F F CR LF (Response with the status of the tracking zero function being set to OFF.)	14 / 16 / 7
Tracking zero setting	T R K T = 1 CR LF (Sets the tracking zero time to 1.) T R K T = 9 9 CR LF (Sets the tracking zero time to 99.) T R K W = 1 CR LF (Sets the tracking zero width to 1 digit.) T R K W = 9 9 CR LF (Sets the tracking zero width to 99 digits.) T R K T = 0 CR LF (Sets the tracking zero function to OFF.)	7 / 8 / 7 / 8 / 7	Y E S CR LF / Y E S CR LF / Y E S CR LF / Y E S CR LF / Y E S CR LF	5 / 5 / 5 / 5 / 5
Power-on delay time response	P O N CR LF	3	P O N O F F CR LF (Response with the status of the power-on delay function being set to OFF.) P O N O N = 1 CR LF (Response with the status of the power-on delay function being set to 1 sec.) P O N O N = 3 0 CR LF (Response with the status of the power-on delay function being set to 30 sec.)	7 / 8 / 9
Power-on delay time setting	P O N 1 CR LF (Sets the power-on delay function to 1 sec.) P O N 3 0 CR LF (Sets the power-on delay function to 30 sec.) P O N 0 CR LF (Sets the power-on delay function to OFF.)	5 / 6 / 5	Y E S CR LF / Y E S CR LF / Y E S CR LF	5 / 5 / 5
Key operation prohibition response	K E Y CR LF	3	K E Y O F F CR LF (Response with the status of the key operation prohibition function being set to OFF.) K E Y O N CR LF (Response with the status of the key operation prohibition function being set to ON.)	7 / 6
Key operation prohibition setting	K E Y O F F CR LF (Sets the key operation prohibition function to OFF.) K E Y O N CR LF (Sets the key operation prohibition function to ON.)	7 / 6	Y E S CR LF / Y E S CR LF	5 / 5

Description	Command	W	Response	W
Comparator data response	COM CR LF Note: The reading of the main unit changes to COM the moment it receives a COM command.	3	COMT HG.L CR LF (Response with the status of the conparative output type function being set to HI-GO-LO.)	10
			COMT HH.H.G CR LF (Response with the status of the conparative output type function being set to HH-HI-GO.)	11
			COMT G.L.LL CR LF (Response with the status of the conparative output type function being set to GO-LO-LL.)	11
	N CR LF	1	S-HI 1000 CR LF (Response with the HI-side judgment value.)	10
			S-HH 1000 CR LF (Response with the HH-side judgment value.)	10
			S-LO 500 CR LF (Response with the LO-side judgment value.)	10
	N CR LF	1	S-LO 500 CR LF (Response with the LO-side judgment value.)	10
			S-HI 500 CR LF (Response with the HI-side judgment value.)	10
			S-LL 500 CR LF (Response with the LL-side judgment value.)	10
	N CR LF	1	H-HI 0 CR LF (Response with the HI-side hysteresis.)	10
			H-HH 0 CR LF (Response with the HH-side hysteresis.)	10
			H-LO 0 CR LF (Response with the LO-side hysteresis.)	10
	N CR LF	1	H-LO 0 CR LF (Response with the LO-side hysteresis.)	10
			H-HI 0 CR LF (Response with the HI-side hysteresis.)	10
			H-LL 0 CR LF (Response with the LL-side hysteresis.)	10
	N CR LF	1	L-HI N.O CR LF (Response with the status of the HI-side logic function being set to N.O.)	8
			L-HI N.C CR LF (Response with the status of the HI-side logic function being set to N.C.)	8
			L-HH N.O CR LF (Response with the status of the HH-side logic function being set to N.O.)	8
			L-HH N.C CR LF (Response with the status of the HH-side logic function being set to N.C.)	8
			L-GO N.O CR LF (Response with the status of the GO logic function being set to N.O.)	8
			L-GO N.C CR LF (Response with the status of the GO logic function being set to N.C.)	8
	N CR LF	1	L-GO N.O CR LF (Response with the status of the GO logic function being set to N.O.)	8
			L-GO N.C CR LF (Response with the status of the GO logic function being set to N.C.)	8
			L-HI N.O CR LF (Response with the status of the HI-side logic function being set to N.O.)	8
			L-HI N.C CR LF (Response with the status of the HI-side logic function being set to N.C.)	8
			L-LO N.O CR LF (Response with the status of the LO-side logic function being set to N.O.)	8
			L-LO N.C CR LF (Response with the status of the LO-side logic function being set to N.C.)	8
	N CR LF	1	L-LO N.O CR LF (Response with the status of the LO-side logic function being set to N.O.)	8
			L-LO N.C CR LF (Response with the status of the LO-side logic function being set to N.C.)	8
			L-GO N.O CR LF (Response with the status of the GO logic function being set to N.O.)	8
			L-GO N.C CR LF (Response with the status of the GO logic function being set to N.C.)	8
			L-LL N.O CR LF (Response with the status of the LL-side logic function being set to N.O.)	8
			L-LL N.C CR LF (Response with the status of the LL-side logic function being set to N.C.)	8
	N CR LF	1	AL1 HH CR LF (Response with the HH-side, lighting up condition of AL1.)	7
			AL1 HI CR LF (Response with the HI-side, lighting up condition of AL1.)	7
			AL1 GO CR LF (Response with the GO-side, lighting up condition of AL1.)	7
			AL1 LO CR LF (Response with the LO-side, lighting up condition of AL1.)	7
			AL1 LL CR LF (Response with the LL-side, lighting up condition of AL1.)	7
	N CR LF	1	AL2 HH CR LF (Response with the HH-side, lighting up condition of AL2.)	7
			AL2 HI CR LF (Response with the HI-side, lighting up condition of AL2.)	7
			AL2 GO CR LF (Response with the GO-side, lighting up condition of AL2.)	7
			AL2 LO CR LF (Response with the LO-side, lighting up condition of AL2.)	7
			AL2 LL CR LF (Response with the LL-side, lighting up condition of AL2.)	7
	R CR LF Note: The main unit returns to measurement operation upon an R command (or returns to the comparison output if an N command is sent.)	1	YES CR LF	5
Comparator data setting Note: This example shows a case where COMT is HH-HI-GO and S-HH is set to 8000 and S-HI to 4000.	COM CR LF Note: The reading of the main unit changes to COM the moment it receives a COM command.	3	COMT HG.L CR LF (Response with the status of the conparative output type function being set to HI-GO-LO.)	10
	HH.H.G CR LF (Sets the comt to HH-HI-GO.)	6	COMT HH.H.G CR LF	11
	N CR LF	1	S-HH 1000 CR LF	10
	8000 CR LF (Sets the HH-side judgment value to 8000.)	4	S-HI 8000 CR LF	10
	N CR LF	1	S-LO 500 CR LF	10
	4000 CR LF (Sets the HI-side judgment value to 4000.)	4	S-LO 4000 CR LF	10
	N CR LF	1	H-HH 0 CR LF	10
	N CR LF	1	H-HI 0 CR LF	10
	N CR LF	1	L-HH N O CR LF	8
	N.C CR LF	3	L-HH N.C CR LF	8
	R CR LF Note: If an R command is sent after setting required data, the main unit saves data provided up to that moment and then returns to measurement operation.	1	YES CR LF	5
			Error CR LF (Response when a value that does not meet the setting conditions is input.)	6

Description	Command		Response	
Scaling data response	M E T CR LF Note: The reading of the main unit changes to MET the moment it receives an MET command.	3	F S C 9 9 9 9 CR LF (Response with a full-scale reading.)	10
	N CR LF	1	F I N 9 9 9 9 CR LF (Response with a full-scale input value.)	10
	N CR LF	1	O F S 0 CR LF (Response with an offset reading.)	10
	N CR LF	1	O I N 0 CR LF (Response with an offset input value.)	10
	N CR LF	1	D L H I 9 9 9 9 CR LF (Response with the HI value of the digital limiter.)	10
	N CR LF	1	D L L O - 9 9 9 9 CR LF (Response with the LO value of the digital limiter.)	10
	N CR LF	1	D E P 4 CR LF (Response with the position of the decimal point.)	6
	R CR LF Note: The main unit returns to measurement operation upon an R command (or returns to the response with the full-scale reading if an N command is sent.)	1	Y E S CR LF	5
Scaling data setting Note: This example shows a case where FSC is set to 8000 and OFS to 20.	M E T CR LF Note: The reading of the main unit changes to MET the moment it receives an MET command.	3	F S C 9 9 9 9 CR LF	10
	8 0 0 0 CR LF (Sets the full-scale reading to 8000.)	4	F S C 8 0 0 0 CR LF	10
	N CR LF	1	F I N 9 9 9 9 CR LF	10
	N CR LF	1	O F S 0 CR LF	10
	2 0 CR LF (Sets the offset reading to 20.)	2	O F S 2 0 CR LF	10
	R CR LF Note: If an R command is sent after setting required data, the main unit saves data provided up to that moment and then returns to measurement operation.	1	Y E S CR LF	5
			E r r o r CR LF (Response when a value outside the setpoint range is input.)	6
Linearization function status response	L I N CR LF	3	L I N O F F CR LF (Response with the status of the linearization function being set to OFF.)	7
			L I N O N CR LF (Response with the status of the linearization function being set to ON.)	6
			L I N C L R CR LF (Response with the status of the linearization function being cleared.)	7
Linearization function status setting	L I N O F F CR LF (Sets the linearization function to an OFF status.)	7	Y E S CR LF	5
	L I N O N CR LF (Sets the linearization function to an ON status.)	6	Y E S CR LF	5
	L I N C L R CR LF (Sets the linearization function to a cleared status.)	7	Y E S CR LF	5
			N O ? CR LF	5
			(Response with the status of the linearization function being cleared.) Note: Since the linearization data are all cleared when the linearization function is cleared, the main unit does not accept either a LIN ON or LIN OFF command. (Set the linearization function status after setting the linearization data again.)	
Response for number of linearization correction data items	L N O CR LF	3	L N O 0 0 CR LF (Response with the status of the linearization function being cleared.)	6
			L N O 0 2 CR LF (Response with the status of the number of linearization correction data items being 02.)	6
			L N O 1 6 CR LF (Response with the status of the number of linearization correction data items being 16.)	6
Setting for number of linearization correction data items	L N O 0 2 CR LF (Sets the number of linearization correction data items to 02.)	6	Y E S CR LF	5
	L N O 1 6 CR LF (Sets the number of linearization correction data items to 16.)	6	Y E S CR LF	5
			E r r o r CR LF (Response when linearization data is not correctly set.) Note: Set the number of linearization correction data items after setting linearization data.)	6
Linearization data response	L N D 0 1 CR LF Note: A reading can be made from any of the data items 01 to 16. Note: The reading of the main unit changes to LINE the moment it receives an LND XX command.	6	L N D 0 1 I = 0 CR LF (Response with the input value of linearization data N-01.)	14
	N CR LF	1	L N D 0 1 O = 0 CR LF (Response with the output value of linearization data N-01.)	14
	N CR LF	1	L N D 0 2 I = 0 CR LF (Response with the input value of linearization data N-02.)	14
	N CR LF	1	L N D 0 2 O = 0 CR LF (Response with the output value of linearization data N-02.)	14
	N CR LF	1	L N D 0 3 I = 0 CR LF	14
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	N CR LF	1	L N D 1 6 I = 0 CR LF (Response with the input value of linearization data N-16.)	14
	N CR LF	1	L N D 1 6 O = 0 CR LF (Response with the output value of linearization data N-16.)	14
	R CR LF Note: The main unit returns to measurement operation upon an R command (or returns to the response with the input value of linearization data N-01 if an N command is sent.)	1	Y E S CR LF	5
Linearization data setting	L N D 0 1 CR LF Note: Setting can be made from any of the data items 01 to 16. Note: The reading of the main unit changes to LINE the moment it receives an LND XX command.	6	L N D 0 1 I = 0 CR LF	14
	- 1 0 0 0 CR LF (Sets the input value of linearization data N-01 to -1000.)	5	L N D 0 1 I = - 1 0 0 0 CR LF	14
	N CR LF	1	L N D 0 1 O = 0 CR LF	14
	- 9 0 0 CR LF (Sets the output value of linearization data N-01 to -900.)	4	L N D 0 1 O = - 9 0 0 CR LF	14
	N CR LF	1	L N D 0 2 I = 0 CR LF	14
	- 5 0 0 CR LF (Sets the input value of linearization data N-02 to -500.)	4	L N D 0 2 I = - 5 0 0 CR LF	14
	N CR LF	1	L N D 0 2 O = 0 CR LF	14
	- 6 0 0 CR LF (Sets the output value of linearization data N-01 to -600.)	4	L N D 0 2 O = - 6 0 0 CR LF	14
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	R CR LF Note: If an R command is sent after setting required data, the main unit saves data provided up to that point and then returns to measurement operation.	1	Y E S CR LF	5
			E r r o r CR LF (Response when a value outside the setpoint range is input.)	6

Common response		YES CRLF	5
		(Normal response)	
		NO ? CRLF	5
		(Response to, e.g., undefined commands.)	
		Error CRLF	6
		(Response to out-of-range data or data that do not meet setting conditions.)	
		ERROR A CRLF	7
		(Response when there is any communication parameter failure.)	
		Note: Under normal conditions, this response is made only once.	
		Note: ERROR B to ERROR F are available as the response commands for acknowledgment.	
		Note: If a response to the ERROR X command is received, execute the same processing once again. If the panelmeter still does not recover, turn off the panelmeter once and then turn it on again.	
Response in case of data failure in the internal memory		DATA LOST COND CRLF	14
Note: Under normal conditions, this response is made only once.		(Response in case of condition data failure.)	
		Note: Set the condition data again.	
		DATA LOST COM CRLF	13
		(Response in case of comparator data failure.)	
		Note: Set the comparator data again.	
		DATA LOST MET CRLF	13
		(Response in case of scaling data failure.)	
		Note: Set the scaling data again.	

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