A5000 Series

Communication Functions User's Manual

1. Overview

This manual explains the specifications of the communication functions provided by the A5000 series of digital panelmeters.
It also explains how to handle the A5000 series.

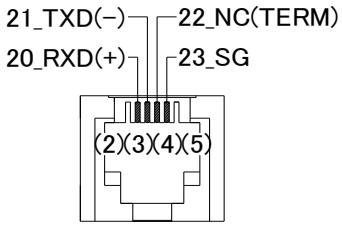
2. Specification

	RS-232C (Compatible with EIA RS-232C)	RS-485 (Compatible with EIA RS-485)
Synchronization	Start-stop	
Communication method	Full-duplex	Two-wire half-duplex (polling/selecting)
Transmission rate	38400bps / 19200bps / 9600bps (default) / 4800bps / 2400bps	
Number of start bits	1bit	
Data length	7bit (default) / 8bit	
Error detection (parity bits)	Even parity (default) / odd parity / no parity	
		Block check character (BCC) checksum
Number of stop bits	1bit / 2bit (default)	
Character code	ASCII	
Transmission control procedure	Non-procedural	
Signal name used	TXD、RXD、SG	Non-inverting (+), inverting (-)
Number of units that can be connected	1 unit	Max 31 units
Transmission line length	15m	500 m max. (overall length)
		* In CE conformity, it is under 30m
Delimiter	CR+LF (default) / CR	

3. Terminal description and connection method

The communication connector of the A5000 series is a modular jack RJ-14(6P4C) compatible with the FCC68 standard.
Use a modular plug RJ-14(6P4C) also compatible with the FCC68 standard when connecting the panelmeter.

3.1. Terminal Assignments

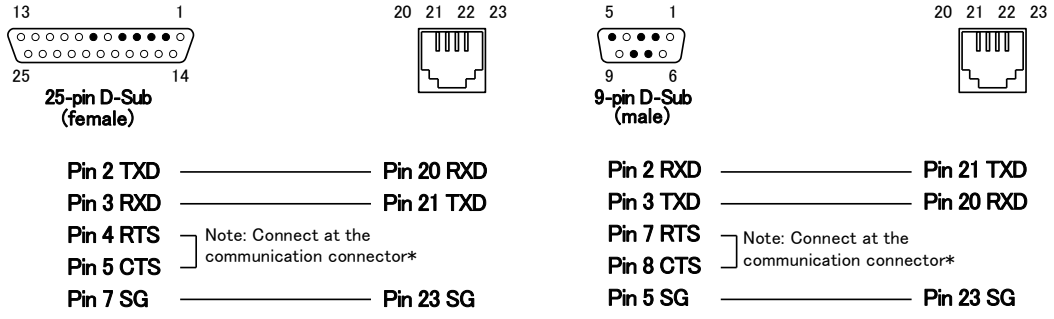


RS-232C		
Terminal No.	Name	Description
20	RXD	RS-232C Receive Data terminal
21	TXD	RS-232C Transmit Data terminal
22	NC	Do not connect.
23	SG	Common terminal for the communication functions (signal GND of the circuit)

RS-485		
Terminal No.	Name	Description
20	(+)	RS-485 Non-inverting output (+)
21	(−)	RS-485 Inverting output (-)
22	TERM	RS-485 terminator enable pin
23	SG	Common terminal for the communication functions (signal GND of the circuit)
*** Shorting between terminals 21 and 22 enables the terminator 200Ω.**		

*** Do not connect the shields wire to the SG terminal.**

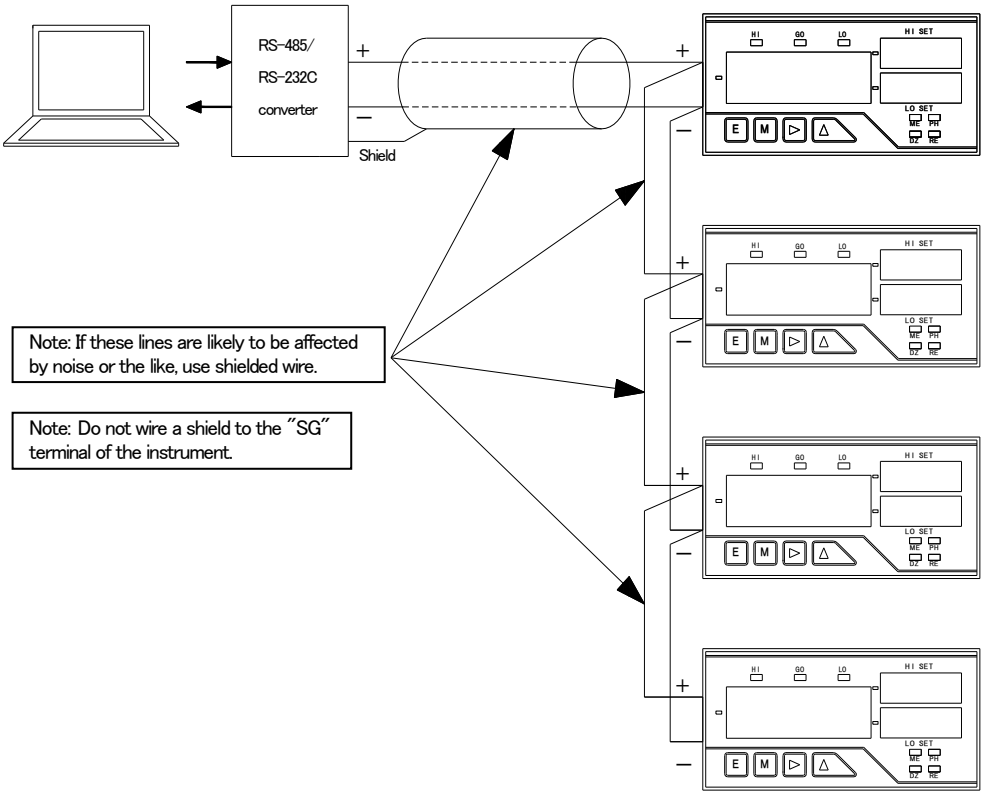
3.2. Example of RS-232C Connection



Note: The above-illustrated connection of the CTS and RTS terminals on the host side is only a typical example for hardware control. Consult your system designer for further details on how to cope with the terminals.

3.3. Example of RS-485 Connection

If the panelmeter is positioned to be an end station as the result of an RS-485 connection, short-circuit terminals 21-22 to enable the terminator.



4. Communication Function Parameters

The baud rate, data length, parity bit, stop bit, delimiter, and device ID (RS-485 only) are the user-selectable parameters of the communication functions provided by the A5000 panelmeter.

For details on how to set the parameters, see the user's manual of the A5000 main unit.

5. RS-485 Transmission/Reception Formats

5.1. Establishing and Releasing Communication Link

Functions / Description	Transmit Data																							Length	Received Data																							Length
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Establishment of communication Link •Shift to command acceptance state of module.	ENQ	0	1	CR	LF																			2	ACK	0	1	CR	LF																			2
	＊Set a two-digit number as the device ID (00 is void).																								(There is no response when the device ID is different, and released if communication is established.) (If the first data is EN and communication is established when a command error occurs, it is released.) ＊Normal response. Response time: 20 ms max.																						
•Release of communication.	EOT	CR	LF																																													
	＊Communication is still possible when another device ID is specified without releasing the communication link.																								(No response is made for release.) (If the first data is EN and communication is established when a command error occurs, it is released.)																						

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 A5000 panelmeter. See the following illustrations for details on the transmission and reception formats (which are as illustrated in the table of communication commands in Section6 for the RS-232C communication function).

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. Communicate Command

Functions/ Description	Transmit Data	Length	Received Data	Length
Measured value and comparison results response	DSP CR LF	3	5000 HI CR LF (+5000 reading, without decimal point, response when judgment result is HI.)	10
			-5000 HI CR LF (-5000 reading, without decimal point, response when judgment result is HI.)	10
			5000.0 HI CR LF (500.0 reading, with decimal point, response when judgment result is HI.)	11
			<=9800 HI CR LF (+ over reading, without decimal point, response when judgment result is HI.)	10
			<=-9800.0 HI CR LF (- over reading, with decimal point, response when judgment result is HI.)	11
			PH5000 HI CR LF (Peak hold reading, without decimal point, response when judgment result is HI.)	10
			1～2 characters : Normally 2 blank characters. "<=" for over reading. After 3 characters : Reading value & comparison result. Right justified when there are fewer digits. There is a space between the reading value and the comparison result. No response is returned if this is the configuration mode. During HOLD or simple average calculation, it responds after the simple average calculation is completed (After the reading value is calculated). If another command is sent or received while waiting for a response, there is no response. When "over value", the last calculated reading value is returned. Responds after indication update.	
Measured value response * Peak hold, other measurement states and comparison results do not respond.	MES CR LF	3	0 CR LF (0 reading, without decimal point.)	12
			0.01 CR LF (0.01 reading, with decimal point.)	12
			-1 CR LF (-1 reading, no decimal point.)	12
			-0.005 CR LF (-0.005 reading, with decimal point.)	12
			<=9800. CR LF (- over reading, with decimal point.)	12
			1～2 characters : Normally 2 blank characters. "<=" for over reading. 3 characters : Polarity indication at the maximum number of characters. If there is no polarity at the maximum character, it is blank. 4～12 characters : Reading value. If there are fewer characters., it is left justified. The remaining characters are blank. In the case of the configuration mode or during hold, the last calculated reading value is responded. If no calculation has been performed, the reading value is 0 (including cases with a decimal point). When "over value", the last calculated reading value is returned.	
Judgment (Comparison) result response * Measurement status does not respond.	JGM CR LF	3	HI CR LF (Response when the judgment result is HI.)	15
			GO CR LF (Response when the judgment result is GO.)	15
			LO CR LF (Response when the judgment result is LO.)	15
			NO? CR LF (Response when the product does not have comparison output specifications.)	5
			1～15 characters : The remaining characters are blank. In the case of the configuration mode, the last calculated comparison result is responded.	
Hold remote control response ・Checking hold control status via Communication.	STH CR LF	3	START CR LF (Response when there is no remote control or when the remote control's hold status is OFF.)	6
			HOLD CR LF (Response when hold state is ON by remote control.)	6
Hold terminal response ・External control terminal status response.	ESA CR LF	3	START CR LF (Response in hold OFF state.) * Note that this is the terminal state, not the hold state.	6
			HOLD CR LF (Response in hold ON state.)	6
Hold Remote Control ・Remote status OFF command via Communication.	STHS CR LF (Hold OFF)	5	YES CR LF (Received instructions) * Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Remote status ON command via Communication.	STHH CR LF (Hold ON)	5	YES CR LF (Received instructions) * Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
Trigger input	T CR LF	1	5000.0 HI CR LF (+500.0 reading, with decimal point) * The response is the same as the "DSP". * No response when the hold status is not ON (by remote or external control).	11
Hold remote control cancellation	ESM CR LF	3	YES CR LF (Received instructions.)	5

Functions/ Description	Transmit Data	Length	Received Data	Length
Digital zero remote control response ・Checking the digital zero control status.	DZR CR LF	3	DZR OFF CR LF (Response when digital zero configuration is OFF by remote, external control or key operation.) DZR 1000 CR LF (Response when digital zero configuration is ON by remote, external control or key operation.) ＊The main unit responds with the reading when the digital zero function is set to ON. Right-justified zero suppressed response. Includes decimal point if any.	7 9
Digital zero terminal response ・Checking the external control input terminal status.	EZA CR LF	3	DZR OFF CR LF (Response with the OFF status of the digital zero function.) ＊Note that this is a terminal state, not a configuration of digital zero function. DZR ON CR LF (Response with the ON status of the digital zero function.) ＊Note that this is a terminal state, not a configuration of digital zero function.	7 6
Digital zero remote control ・Sets the digital zero function to ON. ＊Digital zero is the reading value after control.	DZR ON CR LF (Digital zero ON.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response). When the digital zero backup function is ON by remote control, the digital zero configuration is memorized when the power is turned off.	5
・Sets the digital zero function to OFF.	DZR OFF CR LF (Digital zero OFF.)	7	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response). The control state will not be memorized when the remote OFF Instructions is transmitted (the remote OFF Instructions is also cancelled). "SAV" is Necessary.	5
	DZR 1000 CR LF ＊instructions range: −9999～9999 Out of range is not accepted ("NO ? " RESPONSE). ＊Left justified when there are fewer characters. Decimal points are not included.	8	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response). When the digital zero backup function is ON by remote control, the digital zero configuration is memorized when the power is turned off.	5
・Digital zero remote control cancellation.	EZM CR LF	3	YES CR LF (Received instructions) **"SAV" is Necessary** if you want to continue even after restarting the power.	5
Digital zero value OFF instruction save ・Storage of digital zero values. ＊The digital zero backup function must be ON.	SAV CR LF	3	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	When transmitting the DZR OFF and EZM commands, you must transmit the "SAV" command to memorizes the control state even if you restart the power.		NO ? CR LF (Response when digital zero backup configuration is OFF.)	5
Comparative output remote control response ・Checking of comparative output terminal simulated output status via communication.	RLY CR LF	3	RLY OFF CR LF (Response when there is no remote control or when all terminals are OFF by remote control.) RLY HI CR LF (Response when HI terminal is ON via remote control.) RLY GO CR LF (Response when GO terminal is ON via remote control.) RLY LO CR LF (Response when LO termina is ON via remote control.)	7 6 6 6
・Comparison judgment HI ON instruction via communication. ＊Values are GO, and LO in addition to the above.	RLY HI CR LF (Sets to ON for HI.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	RLY GO CR LF (Sets to ON for GO.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	RLY LO CR LF (Sets to ON for LO.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・All comparison output OFF instructions via communication.	RLY OFF CR LF (Sets all comparison outputs to OFF.)	7	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Comparison output remote control Cancellation.	RCM CR LF	3	YES CR LF (Received instructions.)	5
Remote control response ・Checking of remote control status of each function via communication.	REA CR LF	3	NO ? CR LF (Response with the status of every function not being remote-controlled.) DZR CR LF (Response with the status of the digital zero function being remote-controlled.) PVH CR LF (Response with the status of the peak hold function being remote-controlled.) STH CR LF (Response with the status of the hold function being remote-controlled.) RLY CR LF (Response with the status of the comparison output function being remote-controlled) ＊The main unit responds with the statuses of functions by separating them with delimiters if multiple functions are being remote-controlled. This does not include remote control with "Key operation prohibition".	5 3 3 3 3
・Peak hold remote control response ＊The response contents will differ depending on the condition data configuration.	PVH CR LF	3	PVH PH−OFF CR LF (Response with the status of the peak hold function being set to OFF by remote control.) PVH VH−OFF CR LF (Response with the status of the valley hold function being set to OFF by remote control.) PVH PV−OFF CR LF (Response with the status of the peak/valley hold function being set to OFF by remote control.) PVH PH−ON CR LF (Response with the status of the peak hold function being set to ON by remote control.) PVH VH−ON CR LF (Response with the status of the valley hold function being set to ON by remote control.) PVH PV−ON CR LF (Response with the status of the peak/valley hold function being set to ON by remote control.)	10 10 10 9 9 9
・Peak hold terminal response	EPA CR LF	3	PVH OFF CR LF (Response with the OFF status of the peak hold function) ＊Terminal status. PVH ON CR LF (Response with the ON status of the peak hold function) ＊Terminal status.	7 6
・Peak hold type configuration	PVH PH CR LF (Sets to the peak hold.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	PVH VH CR LF (Sets to the valley hold.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	PVH PH CR LF (Sets to the peak valley hold.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Peak hold remote control	PVH ON CR LF (Sets the peak hold function to ON.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	PVH OFF CR LF (Sets the peak hold function to OFF.)	7	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Peak hold value response	PVD CR LF	3	PH 500.0 CR LF (Response with the peak hold value.) VH −100.0 CR LF (Response with the valley hold value.) PV 600.0 CR LF (Response with the peak/valley hold values.) Batch response with delimiters.	10 10 10
・Peak hold value clear	PCL PH CR LF (Clears the peak hold value.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	PCL VH CR LF (Clears the valley hold value.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	PCL PV CR LF (Clears the peak/valley hold values.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Peak hold remote control Cancellation	EPM CR LF	3	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5

Functions/ Description	Transmit Data	Length	Received Data	Length
Max/Min/(Max-Min) Response ・Checking max, min and (max-min) Values.	MAX CR LF	3	MAX 500.0 CR LF (Response with a MAX value.) MIN -500.0 CR LF (Response with a MIN value.) M-M 600.0 CR LF (Response with a (MAX-MIN) value.) ＊Batch response with delimiters. Each value right-justified zero suppressed response. Includes decimal point if any.	10 10 10
Max/Min/(Max-Min) Clear				
	MCL MA CR LF (Clears the MAX value.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	MCL MI CR LF (Clears the MIN value.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	MCL MM CR LF (Clears the (MAX-MIN) value.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Range Response (except for thermometers)	RNG CR LF	3	RANGE 12 CR LF (Response with the status of range 12 being selected.) RANGE 24 CR LF (Response with the status of range 24 being selected.) RANGE 2A CR LF (Response with the status of range 2A being selected.) NO ? CR LF (Response with the status of no range being selected.) ＊The response varies depending on the input unit or the status of range selection (8 characters max.).	8 8 8 5
・Range response (thermometer)	RNG CR LF	3	RANGE KA CR LF (Response with the status of range KA being selected.) RANGE KB CR LF (Response with the status of range KB being selected.) RANGE J CR LF (Response with the status of range J being selected.) RANGE R CR LF (Response with the status of range T being selected.) RANGE R CR LF (Response with the status of range R being selected.) RANGE S CR LF (Response with the status of range S being selected.) RANGE B CR LF (Response with the status of range B being selected.) RANGE PA CR LF (Response with the status of range PA being selected.) RANGE JPA CR LF (Response with the status of range JPA being selected.)	8 8 7 7 7 7 8 9
・Range configuration	RNG 12 CR LF (Sets to range 12.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	RNG 24 CR LF (Sets to range 24.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	RNG 2A CR LF (Sets to range 2A.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	RNG KA CR LF (Sets to range KA.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	RNG T CR LF (Sets to range T.)	5	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	RNG JPB CR LF (Sets to range JPB.) ＊The command varies depending on the input unit or the range of interest.	7	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response). NO ? CR LF (Response when a nonexistent range is set.)	5 5
Averaging frequency response ・Response of setting value	AVG CR LF	3	AVG 1 CR LF (Response with the status of the averaging frequency being once.) AVG 80 CR LF (Response with the status of the averaging frequency being 80 times.)	5 6
Average frequency setting ・Change of setting value	AVG 1 CR LF 1 / 2 / 4 / 8 / 10 / 20 / 40 / 80	5	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	AVG 80 CR LF (Sets the averaging frequency to 80 times.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
Moving average calculation frequency response ・Response of setting value	MAV CR LF	3	MAV OFF CR LF (Response with the status of moving average calculation being set to OFF.) MAV ON=4 CR LF (Response with the status of the moving average calculation frequency being 4 times.) MAV ON=16 CR LF (Response with the status of the moving average calculation frequency being 16 times.)	7 9 9
Moving average calculation frequency setting ・Change of setting value	MAV 0 CR LF 0 / 2 / 4 / 8 / 16 / 32 (Cancels moving average calculation (OFF).)	5	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	MAV 16 CR LF (Sets the moving average calculation frequency to 16 times.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
Step wide response ・Response of setting value	SWD CR LF	3	SWD 1 CR LF (Response with the status of the step width being 1.)	5
Step wide setting ・Change of setting value	SWD 1 CR LF (Sets the step width to 1.) 1 (1digit) / 2 (2digit) / 5 (5digit) / 0 (10digit)	5	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
Communication function parameter response ・Response of setting value	RS- CR LF	3	RS-19200-7-E-2-CR/LF CR LF (Baud rate - data length - parity - stop bit - delimiter, in that order.) ＊Parity is "E" for even numbers, "O" for odd numbers, and "N" for none. ＊Delimiter is "CR" for CR, "CR/LF" for CR+LF.	21
	RS-9600-8-O-1-CR CR LF Baud rate - Data length - Parity - Stop bit - Delimiter, in that order Baud rate : 9600 / 4800 / 2400 / 38400 / 19200 (bps) Data length : 7 / 8 Parity : E (even) /O (odd) /N (none) Stop bit: 1 / 2 Delimiter : CR / CR/LF	17	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response). ＊The set value switches immediately after the response. However, the delimiter switches before the response.	5
Device ID response ・Response of setting value	ADR CR LF	3	ADR 01 CR LF (Response with the status of the device ID being 01.)	6
Device ID setting ・Change of setting value	ADR 01 CR LF 01-99 (2-digit fixed)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5

Functions/ Description	Transmit Data	Length	Received Data	Length
・Analog output type response	AOP CR LF	3	A.OUT OFF CR LF (Response with the status of the analog output type being OFF.)	9
			A.OUT 0-1 CR LF (Response with the status of the analog output type being 0-1 V.)	9
			A.OUT 0-10 CR LF (Response with the status of the analog output type being 0-10 V.)	10
			A.OUT 1-5 CR LF (Response with the status of the analog output type being 1-5 V.)	9
			A.OUT 4-20 CR LF (Response with the status of the analog output type being 4-20 mA.)	10
			NO ? CR LF (Response with the status of the analog output unit being not installed.)	5
・Analog output type setting	AOP OFF CR LF (Sets the analog output type to OFF.)	7	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	AOP 0-1 CR LF (Sets the analog output type to 0-1 V.)	7	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	AOP 0-10 CR LF (Sets the analog output type to 0-10 V.)	8	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	AOP 1-5 CR LF (Sets the analog output type to 1-5 V.)	7	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	AOP 4-20 CR LF (Sets the analog output type to 4-20 mA.)	8	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
			NO ? CR LF (Response if product is not with analog output.)	5
Digital zero backup status response ・Response of setting value	BDZ CR LF	3	BDZ ON CR LF (Response with the status of digital zero backup being ON.)	6
			BDZ OFF CR LF (Response with the status of digital zero backup being OFF.)	7
Digital zero backup status settings ・Change of setting value	BDZ ON CR LF (Sets digital zero backup to ON.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	BDZ OFF CR LF (Sets digital zero backup to OFF.)	7	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Input selection response ＊Frequency input specification (15) only.	ISEL CR LF	4	ISEL O.C CR LF (Response with the status of the input selection option being "open collector.")	8
			ISEL LGC CR LF (Response with the status of the input selection option being "logic.")	8
			ISEL MAG CR LF (Response with the status of the input selection option being "magnet.")	8
			NO ? CR LF (Response when not frequency input specification (15).)	5
・Input selection setting	ISEL O.C CR LF (Sets the input selection option to "open collector.")	8	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	ISEL LGC CR LF (Sets the input selection option to "logic.")	8	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	ISEL MAG CR LF (Sets the input selection option to "magnet.")	8	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
			NO ? CR LF (Response when not frequency input specification (15).)	5
Tracking zero response ・Response of setting value	TRK CR LF	3	TRK ON T=1 W=1 CR LF (Response with the status of the tracking zero is ON, tracking zero time is 1, and tracking zero width is 1.)	14
			TRK ON T=10 W=99 CR LF (Response with the status of the tracking zero is ON, tracking zero time is 10, and tracking zero width is 99.)	16
			TRK OFF CR LF (Response with the status of the tracking zero function being set to OFF.)	7
Tracking zero setting ・Change of tracking zero time	TRK T=1 CR LF ＊0～99 (Extend to the right for 2-digit.)	7	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Change of tracking zero width	TRK W=99 CR LF ＊0～99 (For single digits, subsequent commands are left-justified.)	8	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Tracking zero OFF	TRK T=0 CR LF (Sets the tracking zero function to OFF.)	7	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Sensor power supply response ＊Load cell input specification (17) only.	SNSR CR LF	4	SNSR 10 CR LF (Response with the status of sensor power supply being set to 10 V.)	7
			SNSR 5 CR LF (Response with the status of sensor power supply being set to 5 V.)	6
	SNSR 10 CR LF (Sets the sensor power supply to 10 V.)	7	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	SNSR 5 CR LF (Sets the sensor power supply to 5 V.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
Power-on delay time response ・Response of setting value	PON CR LF	3	PON OFF CR LF (Response with the status of the power-on delay function being set to OFF.)	6
			PON ON=1 CR LF (Response with the status of the power-on delay function being set to 1 sec.)	7
			PON ON=30 CR LF (Response with the status of the power-on delay function being set to 30 sec.)	8
Power-on delay time setting ・Change of setting value	PON 30 CR LF ＊1～30 (The above is for 30 seconds.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	PON 0 CR LF ＊Sets the power-on delay function to OFF.	5	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Protection response	PRO CR LF	3	PRO OFF CR LF (Response with the status of the protection function being set to OFF.)	7
			PRO ON CR LF (Response with the status of the protection function being set to ON.)	6
・Protection setting	PRO OFF CR LF (Sets the protection function to OFF.)	7	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	PRO ON CR LF (Sets the protection function to ON.)	6	YES CR LF ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
・Unit number response ＊Unit No. cannot be changed.	UNO CR LF	3	I-17.O-6 CR LF (Response with the status of the input unit being strain gauge measurement and the output unit being a combination of comparison output, analog output and RS-232C.)	8
			I-01.O-3 CR LF (Response with the status of the input unit being DC voltage measurement (11 ranges) and the output unit being RS-232C.)	8
Key operation prohibition response ・Response of key operation prohibited state	KEY CR LF ＊RE indicator does not light up.	3	KEY ON CR LF (Response with the status of the key operation prohibition function being set to OFF.) ＊Key operation is not allowed.	6
			KEY OFF CR LF (Response with the status of the key operation prohibition function being set to ON.)	7
・Key operation prohibition setting	KEY ON CR LF (Sets the key operation prohibition function to OFF.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	KEY OFF CR LF (Sets the key operation prohibition function to ON.)	7	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5

Functions/ Description	Transmit Data	Length	Received Data	Length
Comparator data response	COM CR LF ＊The reading of the main unit changes to COM the moment it receives a COM command.	3	S-HI 1000 CR LF (Response with the HI-side judgment value.)	10
	N CR LF	1	S-LO-500 CR LF (Response with the LO-side judgment value.)	10
	N CR LF	1	H-HI 0 CR LF (Response with the HI-side hysteresis.)	10
	N CR LF	1	H-LO 0 CR LF (Response with the LO-side hysteresis.)	10
	R CR LF ＊The main unit returns to measurement operation upon an R command. (Or returns to the HI-side judgment value if an N command is sent.)	1	YES CR LF	5
Comparator data setting ＊Set S-HI to 8000 and S-LO to 4000 (example).	COM CR LF ＊The reading of the main unit changes to COM the moment it receives a COM command.	3	S-HI 1000 CR LF	10
	8000 CR LF (Sets the HI-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 LO-side judgment value to 4000.)	4	S-LO 4000 CR LF	10
	R CR LF ＊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
Scaling data response ・Transition to scaling data settings	MET CR LF	3	FSC 9999 CR LF (Response with the set value of full-scale reading value is 9999.) The reading of the main unit changes to MET the moment it receives an MET command. ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	10
・Response of the setting value of the next setting item. ＊The response changes each time N is sent.	N CR LF	1	FIN 9999 CR LF (Response with the set value of full-scale input value is 9999.)	10
	N CR LF	1	OFS 0 CR LF (Response with the offset reading value is 0.)	10
	N CR LF	1	OIN 0 CR LF (Response with the offset input value is 0.)	10
	N CR LF	1	PS 2.000 CR LF (If it is not a frequency measurement model, proceed to the next item.) (Response with the pre-scale value is 2.000.)	11
	N CR LF	1	PR 100 CR LF (If it is not a frequency measurement model, proceed to the next item.) (Response with the set value of frequency divider is 10.0)	10
	N CR LF	1	DLHI 9999 CR LF (Response with the digital limiter HI value is 9999.)	10
	N CR LF	1	DLLO -9999 CR LF (Response with the digital limiter LO value is -9999.)	10
	N CR LF	1	AOHI 9999 CR LF (If it is not an analog output model, proceed to the next item.) (Response with analog output HI value is 9999)	10
	N CR LF	1	AOLO 0 CR LF (If it is not an analog output model, proceed to the next item.) (Response with analog output LO value is 0.)	10
	N CR LF	1	DEP 4 CR LF Each value right-justified zero suppressed response. Includes decimal point if any. (Response for no decimal point position. Decimal point position is 4th digit = 3, 3rd digit = 2, 2nd digit = 1, 1st digit = 0.)	6
	R CR LF 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	YES CR LF (Return to measurement operation.)	5
Scaling data setting ・Set FSC to 8000 and OFS to 20 (example)	MET CR LF	3	FSC 9999 CR LF (Response with the set value of full-scale reading value is 9999.)	10
・Full-scale reading value setting ＊Only when the current setting item is a full-scale reading value.	8000 CR LF ＊-9999～9999 ＊For fewer digits, left-justify the following commands. Decimal points are not included. (The same applies to other parameters.)	4	FSC 8000 CR LF (Response of the set value.)	10
＊Sending N will move on to the next item.	N CR LF	1	FIN 9999 CR LF (Response with the set value of full-scale input value is 9999.)	10
	N CR LF	1	OFS 0 CR LF (Response with the offset reading value is 0.)	10
・Offset reading value setting ＊Only when the current setting item is an offset reading value.	20 CR LF	2	OFS 20 CR LF (Response of the set value.)	10
	R CR LF ＊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 (Return to measurement operation.)	5
			Error CR LF (Response when a value outside the setpoint range is input.)	6
Linearization function status response ・Response of setting value	LIN CR LF	3	LIN OFF CR LF (Response with linearize function is OFF.)	7
			LIN ON CR LF (Response with linearize function is ON.)	6
			LIN CLR CR LF (Response with the status of the linearization function being cleared.)	7
Linearize function status setting ・Change of setting value	LIN OFf CR LF (Sets the linearization function to an OFF status.)	7	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	LIN ON CR LF (Sets the linearization function to an ON status.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
	LIN CLR CR LF (Sets the linearization function to a cleared status.)	7	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
			NO ? CR LF (Response with the status of the linearization function being cleared.) ＊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.	5
Response for number of linearization correction data items ・Response of setting value	LNO CR LF	3	LNO 00 CR LF (Response with the status of the linearization function being cleared.)	6
			LNO 02 CR LF (Response with the status of the number of linearization correction data items being 02.)	6
Setting for number of linearization correction data items ・Change of setting value	LNO 16 CR LF 02 to 16 (2 digits fixed) (Sets the number of linearization correction data items to 16.)	6	YES CR LF (Received instructions) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response).	5
			Error CR LF (Response when linearization data is not correctly set.) ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response). ＊Set the number of linearization correction data items after setting linearization data.	6

Functions/ Description	Transmit Data	Length	Received Data	Length
Linearization data response ・Transition to linearized data response.	LND01 CR LF ＊Setting possible from any position onwards.	6	LND01I= 0 CR LF (Response with the input value of linearization correction data N-01 is 0.) The reading of the main unit changes to LINE the moment it receives an LND command. ＊Instructions are not accepted in the case of the configuration mode or shift configuration mode ("NO ? " Response). If the number of linearization points is not set (00), "NO ? " Response.	14
・Response of the setting value of the next setting item. ＊The response changes each time N is sent.	N CR LF	1	LND01O= 0 CR LF (Response with the output value of linearization correction data N-01 is 0.)	14
	N CR LF	1	LND16I= 9999 CR LF (Response with the input value of linearization correction data N-16 is 9999.)	14
	N CR LF	1	LND16O=-9999 CR LF (Response with the output value of linearization correction data N-16 is -9999.) ＊Each value right-justified zero suppressed response. Decimal points are not included.	14
	R CR LF	1	YES CR LF (Return to measurement operation.)	5
	＊The main unit returns to measurement operation upon an R command. (In case of N command, return to the response of N-01 input value.)			
Linearization data setting	LND01 CR LF ＊Setting can be made from any of the data items 01 to 16.	6	LND01I= 0 CR LF (Response with the set value of input value of linearization data N-01 is 0.)	14
・Set the input value of N-01 to -1000 ＊Only when the current setting item is the N-01 input value. ＊Sending N will move on to the next item.	-1000 CR LF ＊For fewer digits, left-justify the following commands. Decimal points are not included. (The same applies to other parameters.)	5	LND01I=-1000 CR LF (Response of the set value.)	14
	N CR LF	1	LND01O= 0 CR LF (Response with the set value of the output value of linearization data N-01 is 0.)	14
・Set the output value of N-01 to -900 ＊Only when the current setting item is the N-01 output value.	-900 CR LF	4	LND01O=-900 CR LF (Response of the set value.)	14
	N CR LF	1	LND02I= 0 CR LF (Response with the set value of the input value of linearization data N-02 is 0).	14
・Set the input value of N-02 to -500 ＊Only when the current setting item is the N-02 input value.	-500 CR LF	4	LND02I=-500 CR LF (Response of the set value.)	14
	N CR LF	1	LND02O= 0 CR LF (Response with the set value of the output value of linearization data N-02 is 0.)	14
・Set the output value of N-02 to -600 ・・・・	-600 CR LF	4	LND02O=-600 CR LF (Response of the set value.)	14
	R CR LF	1	YES CR LF (Return to measurement operation.)	5
＊Only when the current setting item is an offset reading value.	＊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.		Error CR LF (Response when a value outside the setpoint range is input.)	6
・Calibration data response ＊Load cell input specification (17) only.	CAL2 CR LF ＊The reading of the main unit changes to CAL2 the moment it receives a CAL2 command.	4	ZERO 0.0000mV/V CR LF (Response with a zero-input value.)	15
	J CR LF	1	SPIN 2.0000mV/V CR LF (Response with a span input value.)	15
	N CR LF	1	SPAN 9000 CR LF (Response with a span reading.)	10
	R CR LF	1	YES CR LF	5
	＊The main unit returns to measurement operation upon an R command. (In case of N command, return to the zero-input value response.)			
・Calibration data setting (Calibration with actual load)	CAL1 CR LF	4	ZERO CR LF	4
	N CR LF (Executes zero calibration.)	1	ZERO CR LF SPAN 9000 CR LF (Response when zero calibration is executed correctly, and a transition is made to span calibration.)	4 10
	＊The main unit moves to the setting of a span reading without performing zero calibration if a J command is sent.		Error X CR LF (Response when an input signal outside the zero-adjustment range is applied.) ＊Apply an input signal within the zero-adjustment range (-0.3 to less than 1 mV/V) and resend the N command.	7
	5000 CR LF (Sets the span reading to 5000.)	4	SPAN 5000 CR LF	10
	N CR LF	1	YES CR LF (Response when span calibration is executed correctly.) ＊The main unit automatically returns to measurement operation when span calibration is executed correctly.	5
			Err X CR LF SPAN 9000 CR LF (Response when an input signal that is outside the zero-adjustment range or contains a gain error is applied.) ＊The main unit returns to the setting of a span reading. ＊Check the applied input signal level or span reading and set the calibration data again.	7 10
	R CR LF If an R command is sent during setting, the main unit saves data provided up to that moment and then returns to measurement operation (span reading is not saved, however).	1	YES CR LF	5
・Calibration data setting (Equivalent calibration)	CAL2 CR LF	4	ZERO 0.0000mV/V CR LF	15
	0004 CR LF (Sets the zero-input value to 0.004 mV/V.)	4	ZERO 0.0004mV/V CR LF	15
	N CR LF (Executes zero calibration.)	1	SPIN 2.0000mV/V CR LF (Response when zero calibration is executed correctly, and a transition is made to span input value setting.)	15
			Error X CR LF ZERO 0.0000mV/V CR LF (Response when a value outside the zero-adjustment range is set.) ＊Resend a value within the zero-adjustment range (-0.3 to less than 1 mV/V).	7 15
	1502 CR LF (Sets the span input value to 1.502 mV/V.)	4	SPIN 1.502mV/V CR LF	15
	N CR LF	1	SPAN 9000 CR LF	10
	5000 CR LF (Sets the span reading to 5000.)	4	SPAN 5000 CR LF	10
	R CR LF (Executes span calibration.)	1	YES CR LF (Response when span calibration is executed correctly.) ＊The main unit automatically returns to measurement operation when span calibration is executed correctly.)	5
			Error X CR LF SPIN 2.0000mV/V CR LF (Response when a value that contains a gain error or is outside the range is set.) ＊The main unit returns to span input value setting.	7 15
Shift data response	SHF CR LF	3	SHF 1234 CR LF	9
			SHF 12 CR LF	9
			SHF -1234 CR LF ＊If there is no decimal point, 9 digits are fixed.	9
			SHF 12.34 CR LF	10
			SHF -1.234 CR LF	10
			SHF -0.001 CR LF ＊If there is decimal point, 10 digits are fixed.	10
Shift data setting	SHF 1234 CR LF	8	YES CR LH	5
	SHF -1234 CR LF	9	YES CR LF	5
	SHF 12 CR LF	6	YES CR LF	5
	SHF -1 CR LF	6	YES CR LF	5

Functions/ Description	Transmit Data	Length	Received Data	Length
Low cut data response	LCT CR LF	3	LCT 1234 CR LF	8
			LCT 12 CR LF	8
			* If there is no decimal point, 8 digits are fixed.	
			LCT 12.34 CR LF	9
			LCT 1.234 CR LF	9
			LCT 0.001 CR LF	9
			* If there is decimal point, 9 digits are fixed.	
Low cut data setting	LCT 1234 CR LF	8	YES CR LF	5
	LCT 12 CR LF	6	YES CR LF	5
	LCT 1 CR LF	5	YES CR LF	5
Common Responses			YES CR LF	5
			(Normal response) *Response time: 20 ms max.	
			NO ? CR LF	5
			(Response to an undefined command)	
			Error CR LF	6
			(Response to data outside the setting range or data that does not meet the setting conditions.)	
・Response in case of data failure in the internal memory. * Under normal conditions, this response is made only once.			DATA LOST COND CR LF	14
			(Response in case of condition data failure.)	
			* Set the condition data again.	
			DATA LOST COM CR LF	13
			(Response in case of comparator data failure.)	
			* Set the comparator data again.	
			DATA LOST MET CR LF	13
			(Response in case of scaling data failure.)	
			* Set the scaling data again.	

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