Function	Command	Char. Length	Response	Char. Length
Calibration data response	C A L 2 CR LF	4	Z E R O 0 . 0 0 0 m V / V CR LF	15
	Note: The reading of the main unit changes to CAL2 the moment it receives a CAL2 command.		(Response with a zero input value.)	
	J CR LF	1	S P I N 2 . 0 0 0 m V / V CR LF	15
			(Response with a span input value.)	
	N CR LF	1	S P A N 9 0 0 0 CR LF	10
			(Response with a span reading.)	
	R CR LF	1	Y E S CR LF	5
	Note: The main unit returns to measurement operation upon an R command (or returns to the zero point input value response if an N command is sent.)			
Calibration data setting (Calibration with actual load)	C A L 1 CR LF	4	Z E R O CR LF	4
	N CR LF	1	Z E R O CR LF	4
	(Executes zero calibration.)		S P A N 9 0 0 0 CR LF	10
	Note: The main unit moves to the setting of a span reading if a J command is sent.)		(Response when zero calibration is executed correctly and a transition is made to span calibration.)	
			E r r o r X CR LF	7
			(Response when an input signal outside the zero adjustment range is applied.) Note: Apply an input signal within the zero adjustment range (±0.3 mV/V and re-send the N command.	
	5 0 0 0 CR LF	4	S P A N 5 0 0 0 CR LF	10
	(Sets the span reading to 5000.)			
	N CR LF	1	Y E S CR LF	5
	(Executes span calibration.)		(Response when span calibration is executed correctly.) Note: The main unit automatically returns to measurement operation when span calibration is executed correctly.)	
			E r r o r X CR LF	7
			S P A N 9 0 0 0 CR LF	10
			(Response when an input signal that is outside the zero adjustment range or contains a gain error is applied.) Note: The main unit returns to the setting of a span reading. Note: Check the applied input signal level or span reading and set the calibration data again.	
	R CR LF	1	Y E S CR LF	5
	Note: 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).			
Calibration data setting (Equivalent calibration)	C A L 2 CR LF	4	Z E R O 0 . 0 0 0 m V / V CR LF	15
	0 0 0 4 CR LF	4	Z E R O 0 . 0 0 4 m V / V CR LF	15
	(Sets the zero input value to 0.004 mV/V.)			
	N CR LF	1	S P I N 2 . 0 0 0 m V / V CR LF	15
	(Executes zero calibration.)		(Response when zero calibration is executed correctly and a transition is made to span input value setting.)	
			E r r o r X CR LF	
			Z E R O 0 . 0 0 0 m V / V CR LF	15
			(Response when a value outside the zero adjustment range is set.) Note: Resend a value within the zero adjustment range (±0.3 mV/V).	
	1 5 0 2 CR LF	4	S P I N 1 . 5 0 2 m V / V CR LF	15
	(Sets the span input value to 1.502 mV/V.)			
	N CR LF	1	S P A N 9 0 0 0 CR LF	10
	5 0 0 0 CR LF	4	S P A N 5 0 0 0 CR LF	10
	(Sets the span reading to 5000.)			
	N CR LF	1	Y E S CR LF	5
	(Executes span calibration.)		(Response when span calibration is executed correctly.) Note: The main unit automatically returns to measurement operation when span calibration is executed correctly.)	
			E r r o r X CR LF	7
			S P I N 2 . 0 0 0 m V / V CR LF	15
			(Response when a value that contains a gain error or is outside the range is set.) Note: The main unit returns to span input value setting.	
Common response			Y E S CR LF (Normal response)	5
			N O ? CR LF (Response to, e.g., undefined commands.)	5
			E r r o r CR LF (Response to out-of-range data or data that do not meet setting conditions.)	6
			E R R O R A CR LF (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.	7
Response in case of data failure in the internal memory Note: Under normal conditions, this response is made only once.			D A T A L O S T C O N D CR LF (Response in case of condition data failure.) Note: Set the condition data again.	14
			D A T A L O S T C O M CR LF (Response in case of comparator data failure.) Note: Set the comparator data again.	13
			D A T A L O S T M E T CR LF (Response in case of scaling data failure.) Note: Set the scaling data again.	13

FUJI ELECTRIC

No. 1, Fuji-machi, Hino-city, Tokyo, 191-8502, Japan
PHONE : +81-42-585-6201,6202
FAX : +81-42-585-6187

Fuji Electric Instruments Co.,Ltd.

(UU-33566)
2002.09

FD5000 Series Communication Functions User's Manual

1. Overview

This manual explains the specifications of the communication functions provided by the FD5000 series of digital panelmeters. It also explains how to handle the FD5000 series.

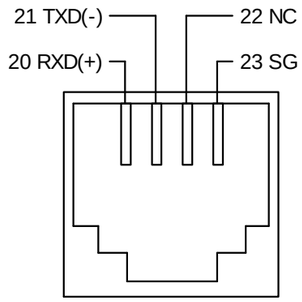
2. Specifications

	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	2400, 4800, 9600, 19200, 38400 bps	
Number of start bits	1bit	
Data length	7 bits / 8 bits	
Error detection	Even parity, odd parity, or no parity	
		Block check character (BCC) checksum
Number of stop bits	1 bits / 2 bits	
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	31 for meters
Transmission line length	15 m	500 m max. (overall length)
Delimiter	CR+LF/CR	

3. Terminal Assignments and Connection Method

The communication connector of the FD5000 series is a modular jack connector compatible with the FCC68 standard. Use a modular plug connector also compatible with the FCC68 standard when connecting the panelmeter.

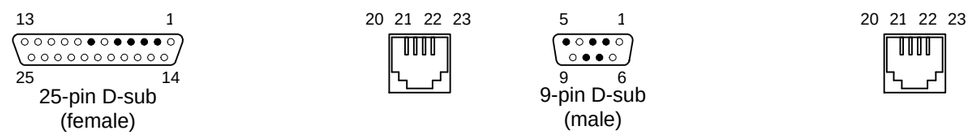
3.1. Terminal Assignments



RS-232C/RS-485 connector

Terminal No.	Name	Description
20	RXD(+)	RS-232C: Receive Data terminal; RS-485: Non-inverting output
21	TXD(-)	RS-232C: Transmit Data terminal; RS-485: Inverting output
22	NC	Do not connect.
23	SG	Common terminal for the communication functions

3.2. Example of RS-232C Connection



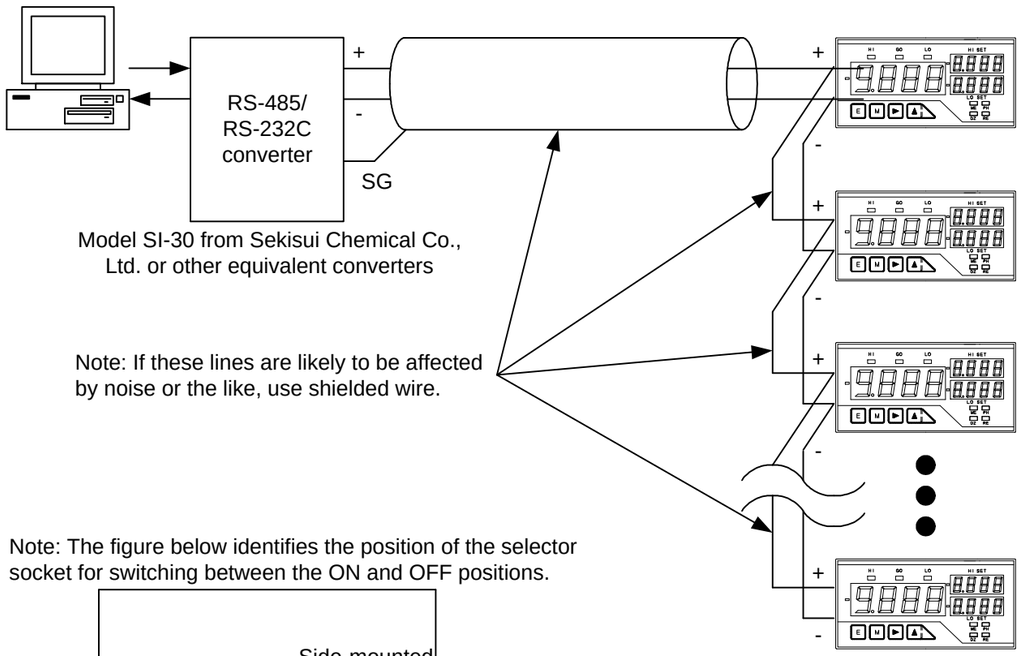
Pin 2: TXD ——— Pin 20: RXD
Pin 3: RXD ——— Pin 21: TXD
Pin 4: RTS, Pin 5: CTS — Note: Connect at the communication connector*
Pin 7: SG ——— Pin 23: SG

Pin 2: RXD ——— Pin 21: TXD
Pin 3: TXD ——— Pin 20: RXD
Pin 7: RTS, Pin 8: CTS — Note: Connect at the communication connector*
Pin 5: SG ——— Pin 23: SG

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, set the terminator to ON by using the selector socket in the FD5000 output unit.



Model SI-30 from Sekisui Chemical Co., Ltd. or other equivalent converters

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

Note: The figure below identifies the position of the selector socket for switching between the ON and OFF positions.

Parts-mounted side of FD5000 output unit

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 (RS-485 only) are the user-selectable parameters of the communication functions provided by the FD5000 panelmeter. For details on how to set the parameters, see the user's manual of the FD5000 main unit.

5. RS-485 Transmission/Reception Formats

5.1. Establishing and Releasing the Communication Link

	Function	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Char. Length	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Char. Length
	Establishment of communication link	ENQ	0	1	CR	LF																			3	ACK	0	1	CR	LF																	3
		Note: Set a two-digit number as the device ID (00 is void).																								Note: The response time is 40 ms maximum.																					
																										(Normal response)																					
																										(No response is made if the device ID is wrong.)																					
	Release of communication link	EOT	CR	LF																					1																					
		Note: Communication is still possible when another device ID is specified without releasing the communication link.																								(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.

	Function	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Char. Length	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Char. Length
	Scaling data response	M	E	T	CR	LF																			3	F	S	C					9	9	9	9	CR	LF								10
		Note: The reading of the main unit changes to MET the moment it receives an MET command.																								(Response with a full-scale reading.)																					
		N	CR	LF																					1	F	I	N					9	9	9	9	CR	LF								10
																										(Response with a full-scale input value.)																					
		N	CR	LF																					1	O	F	S									0	CR	LF								10
																										(Response with offset reading.)																					
		N	CR	LF																					1	O	I	N									0	CR	LF								10
																										(Response with an offset input value.)																					
		N	CR	LF																					1	D	L	H	I			9	9	9	9	CR	LF								10
																										(Response with the HI value of the digital limiter.)																					
		N	CR	LF																					1	D	L	L	O		-	9	9	9	9	CR	LF								10
																										(Response with the LO value of the digital limiter.)																					
		N	CR	LF																					1	A	O	H	I			9	9	9	9	CR	LF								10
																										(Response with the HI reading of the analog output.)																					
		N	CR	LF																					1	A	O	L	O								0	CR	LF								10
																										(Response with the LO reading of the analog output.)																					
		N	CR	LF																					1	D	E	P								4	CR	LF								6
																										(Response with the position of the decimal point.)																					
		R	CR	LF																					1	Y	E	S									CR	LF								5
		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.)																																												
	Scaling data setting	M	E	T	CR	LF																			3	F	S	C					9	9	9	9	CR	LF								10
	Note: This example shows a case where FSC is set to 8000 and OFS to 20.	Note: The reading of the main unit changes to MET the moment it receives an MET command.																																												
		8	0	0	0	CR	LF																		4	F	S	C					8	0	0	0	CR	LF								10
		(Sets the full-scale reading to 8000.)																																												
		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																				2	O	F	S								2	0	CR	LF								10
		(Sets the offset reading to 20.)																																												
		R	CR	LF																					1	Y	E	S									CR	LF								5
		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.																								E	r	r	o	r							CR	LF								6
																										(Response when a value outside the setpoint range is input.)																					
	Linearization function status response	L	I	N	CR	LF																			3	L	I	N				O	F	F	CR	LF											7
																										(Response with the status of the linearization function being set to OFF.)																					
																										L	I	N				O	N	CR	LF											6
																										(Response with the status of the linearization function being set to ON.)																					
																										L	I	N				C	L	R	CR	LF											7
																										(Response with the status of the linearization function being cleared.)																					
	Linearization function status setting	L	I	N			O	F	F	CR	LF														7	Y	E	S									CR	LF								5
		(Sets the linearization function to an OFF status.)																																												
		L	I	N			O	N	CR	LF															6	Y	E	S									CR	LF								5
		(Sets the linearization function to an ON status.)																																												
		L	I	N			C	L	R	CR	LF														7	Y	E	S									CR	LF								5
		(Sets the linearization function to a cleared status.)																																												
																										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											6
																										(Response with the status of the linearization function being cleared.)																					
																										L	N	O			0	2	CR	LF											6
																										(Response with the status of the number of linearization correction data items being 02.)																					
																										L	N	O			1	6	CR	LF											6
																										(Response with the status of the number of linearization correction data items being 16.)																					
	Setting for number of linearization correction data items	L	N	O			0	2	CR	LF															6	Y	E	S									CR	LF								5
		(Sets the number of linearization correction data items to 02.)																																												
		L	N	O			1	6	CR	LF															6	Y	E	S									CR	LF								5
		(Sets the number of linearization correction data items to 16.)																																												
																										E	r	r	o	r							CR	LF								6
																										(Response when linearization data is not correctly set.)																					
																										Note: Set the number of linearization correction data items after setting linearization data.)																					
	Linearization data response	L	N	D			0	1	CR	LF															6	L	N	D			0	1			I	=						0	CR	LF	14
		Note: A reading can be made from any of the data items 01 to 16.																								(Response with the input value of linearization data N-01.)																					
		Note: The reading of the main unit changes to LINE the moment it receives an LND XX command.																																												
		N	CR	LF																					1	L	N	D			0	1			O	=						0	CR	LF	14
																										(Response with the output value of linearization data N-01.)																					
		N	CR	LF																					1	L	N	D			0	2			I	=						0	CR	LF	14
																										(Response with the input value of linearization data N-02.)																					
		N	CR	LF																					1	L	N	D			0	2			O	=						0	CR	LF	14
																										(Response with the output value of linearization data N-02.)																					
		N	CR	LF																					1	L	N	D			0	3			I	=						0	CR	LF	14
		.																								.																			
		.																								.																			
		.																								.																			
		N	CR	LF																					1	L	N	D			1	6			I	=						0	CR	LF	14
																										(Response with the input value of linearization data N-16.)																					
		N	CR	LF																					1	L	N	D			1	6			O	=						0	CR	LF	14
																										(Response with the output value of linearization data N-16.)																					
		R	CR	LF																					1	Y	E	S									CR	LF								5
		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.)																																												
	Linearization data setting	L	N	D			0	1	CR	LF															6	L	N	D			0	1			I	=						0	CR	LF	14
		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.																																												
		-	1	0	0	0	CR	LF																	4	L	N	D			0	1			I	=	-	1	0	0	0	CR	LF	14
		(Sets the input value of linearization data N-01 to -1000.)																																												
		N	CR	LF																					1	L	N	D			0	1			O	=						0	CR	LF	14
		-	9	0	0	CR	LF																		1	L	N	D			0	1			O	=	-	9	0	0	CR	LF	14
		(Sets the output value of linearization data N-01 to -900.)																																												
		N	CR	LF																					1	L	N	D			0	2			I	=						0	CR	LF	14
		-	5	0	0	CR	LF																		1	L	N	D			0	2			I	=	-	5	0	0	CR	LF	14
		(Sets the input value of linearization data N-02 to -500.)																																												
		N	CR	LF																					1	L	N	D			0	2			O	=						0	CR	LF	14
		-	6	0	0	CR	LF																		1	L	N	D			0	2			O	=	-	6	0	0	CR	LF	14
		(Sets the output value of linearization data N-01 to -600.)																																												
		.																																												
		.																																												
		.																																												
		R	CR	LF																					1	Y	E	S									CR	LF								5
		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.																								E	r	r	o	r							CR	LF								6
																										(Response when a value outside the setpoint range is input.)																					

	Function		Char. Length		Char. Length
	Tracking zero response	TRKCRLF	3	ON T=1 W=1CRLF (Response with the status of the tracking zero time being 1 and tracking zero width being 1.) ON T=99 W=9 9CRLF (Response with the status of the tracking zero time being 99 and tracking zero width being 99.) TRK OFF CRLF (Response with the status of the tracking zero function being set to OFF.)	10 12 7
	Tracking zero setting	TRK T=1CRLF (Sets the tracking zero time to 1.) TRK T=9 9CRLF (Sets the tracking zero time to 99.) TRK W=1CRLF (Sets the tracking zero width to 1 digit.) TRK W=9 9CRLF (Sets the tracking zero width to 99 digits.) TRK T=0CRLF (Sets the tracking zero function to OFF.)	7 8 7 8 7	YES CRLF	5 5 5 5 5
	Sensor power supply response	SNSRCRLF	4	SNSR 10CRLF (Response with the status of sensor power supply being set to 10 V.) SNSR 5CRLF (Response with the status of sensor power supply being set to 5 V.)	7 6
	Sensor power supply setting	SNSR 1 0CRLF (Sets the sensor power supply to 10 V.) SNSR 5CRLF (Sets the sensor power supply to 5 V.)	7 6	YES CRLF	5 5
	Power-on delay time response	PONCRLF	3	PON OFFCRLF (Response with the status of the power-on delay function being set to OFF.) PON 1CRLF (Response with the status of the power-on delay function being set to 1 sec.) PON 30CRLF (Response with the status of the power-on delay function being set to 30 sec.)	7 5 6
	Power-on delay time setting	PON 1CRLF (Sets the power-on delay function to 1 sec.) PON 30CRLF (Sets the power-on delay function to 30 sec.) PON 0CRLF (Sets the power-on delay function to OFF.)	5 6 5	YES CRLF	5 5 5
	Protection response	PROCRLF	3	PRO OFFCRLF (Response with the status of the protection function being set to OFF.) PRO ONCRLF (Response with the status of the protection function being set to ON.)	7 6
	Protection setting	PRO OFFCRLF (Sets the protection function to OFF.) PRO ONCRLF (Sets the protection function to ON.)	7 6	YES CRLF	5 5
	Unit number response	UNOCRLF	3	I-17,,O-6CRLF (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.) I-01,O-3CRLF (Response with the status of the input unit being DC voltage measurement (11 ranges) and the output unit being RS-232C.)	8 8
	Key operation prohibition response	KEYCRLF	3	KEY OFFCRLF (Response with the status of the key operation prohibition function being set to OFF.) KEY ONCRLF (Response with the status of the key operation prohibition function being set to ON.)	7 6
	Key operation prohibition setting	KEY OFFCRLF (Sets the key operation prohibition function to OFF.) KEY ONCRLF (Sets the key operation prohibition function to ON.)	7 6	YES CRLF	5 5
	Comparator data response	COMCRLF Note: The reading of the main unit changes to COM the moment it receives a COM command. NCRLF NCRLF RCRLF Note: 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.)	3 1 1 1	S-HI 100CRLF (Response with the HI-side judgment value.) S-LO 500CRLF (Response with the LO-side judgment value.) H-HI 0CRLF (Response with the HI-side hysteresis.) H-LO 0CRLF (Response with the LO-side hysteresis.) YES CRLF	10 10 10 10 5
	Comparator data setting Note: This example shows a case where S-HI is set to 8000 and S-LO to 4000.	COMCRLF Note: The reading of the main unit changes to COM the moment it receives a COM command. 8000CRLF (Sets the HI-side judgment value to 8000.) NCRLF 4000CRLF (Sets the LO-side judgment value to 4000.) RCRLF 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.	3 4 1 4 1	S-HI 1000CRLF S-HI 8000CRLF S-LO 500CRLF S-LO 4000CRLF YES CRLF Error CRLF (Response when a value that does not meet the setting conditions is input.)	10 10 10 10 5 6

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 FD5000 panelmeter. See the following illustrations for details on the transmission and reception formats (which are as illustrated in the table of communication commands in Section 6 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		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		Char. Length		Char. Length
	Measured value and comparison results response	DSPCRLF	3	5000 HICRLF (+ reading, w/o decimal point) -5000 HICRLF (- reading, w/o decimal point) 5000. 0 HICRLF (+ reading, w/ decimal point) <=-9800 HICRLF (+ overrange reading, w/o decimal point) <=-9800. 0 HICRLF (- overrange reading, w/ decimal point) PH 5000 HICRLF (peak hold reading, w/o decimal point)	10 10 11 10 11 10
	Hold remote control response	STHCRLF	3	START CRLF (Response with the status of the hold function being set to OFF by remote control) HOLD CRLF (Response with the status of the hold function being set to ON by remote control)	6 5
	Hold terminal response	ESACRLF	3	START CRLF (Response with the OFF status of the hold function) HOLD CRLF (Response with the ON status of the hold function)	6 5
	Hold remote control	STH SCRLF (Sets the hold function to OFF.) STH HCRLF (Sets the hold function to ON.)	5 5	YES CRLF	5 5
	Trigger input	TCRLF	1	500.0 HICRLF (+ reading, w/ decimal point) Note: The response is the same as that of "DSP".	11
	Hold remote control cancellation	ESMCRLF	3	YES CRLF	5
	Peak hold remote control response	PVHCRLF	3	PVH PH-OFFCRLF (Response with the status of the peak hold function being set to OFF by remote control) PVH VH-OFFCRLF (Response with the status of the valley hold function being set to OFF by remote control) PVH PV-OFFCRLF (Response with the status of the peak/valley hold function being set to OFF by remote control) PVH PH-ONCRLF (Response with the status of the peak hold function being set to ON by remote control) PVH VH-ONCRLF (Response with the status of the valley hold function being set to ON by remote control) PVH PV-ONCRLF (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	EPACRLF	3	PVH OFFCRLF (Response with the OFF status of the peak hold function) PVH ONCRLF (Response with the ON status of the peak hold function)	7 6
	Peak hold type setting	PVH PHCRLF (Sets to the peak hold.) PVH VHCRLF (Sets to the valley hold.) PVH PVCRLF (Sets to the peak/valley hold.)	6 6 6	YES CRLF	5 5 5
	Peak hold remote control	PVH ONCRLF (Sets the peak hold function to ON.) PVH OFFCRLF (Sets the peak hold function to OFF.)	6 7	YES CRLF	5 5
	Peak hold value response	PVDCRLF	3	PH 500.0CRLF (Response with the peak hold value) VH -100.0CRLF (Response with the valley hold value) PV 600.0CRLF (Response with the peak/valley hold values)	12 12 12
	Peak hold value clear	PCL PHCRLF (Clears the peak hold value.) PCL VHCRLF (Clears the valley hold value.) PCL PVCRLF (Clears the peak/valley hold values.)	6 6 6	YES CRLF	5 5 5
	Peak hold remote control cancellation	EPMCRLF	3	YES CRLF	5

Function	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Char. Length	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Char. Length
Digital zero remote control response	D	Z	R	CR	LF																			3	D	Z	R		O	F	F	CR	LF												7
																									(Response with the status of the digital zero function being set to OFF by remote control)																				
																									D	Z	R		1	0	0	CR	LF												9
																									(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.																				
Digital zero terminal response	E	Z	A	CR	LF																			3	D	Z	R		O	F	F	CR	LF												7
																									(Response with the OFF status of the digital zero function)																				
																									D	Z	R		O	N	CR	LF													6
																									(Response with the ON status of the digital zero function)																				
Digital zero remote control	D	Z	R		O	N	CR	LF																6	Y	E	S			CR	LF														5
																									(Sets the digital zero function to ON.)																				
	D	Z	R		O	F	F	CR	LF															7	Y	E	S			CR	LF														5
																									(Sets the digital zero function to OFF.)																				
	D	Z	R		1	0	0	CR	LF															8	Y	E	S			CR	LF														5
																									(Sets the digital zero function to ON at 1000.)																				
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												7
																									(Response with the status of the comparison output being set to OFF by remote control)																				
																									R	L	Y		H	I	CR	LF													6
																									(Response with the status of the comparison output being set to ON for HI by remote control)																				
																									R	L	Y		G	O	CR	LF													6
																									(Response with the status of the comparison output being set to ON for GO by remote control)																				
																									R	L	Y		L	O	CR	LF													6
																									(Response with the status of the comparison output being set to ON for LO by remote control)																				
Comparison output remote control	R	L	Y		H	I	CR	LF																6	Y	E	S			CR	LF														5
																									(Sets to ON for HI.)																				
	R	L	Y		G	O	CR	LF																6	Y	E	S			CR	LF														5
																									(Sets to ON for GO.)																				
	R	L	Y		L	O	CR	LF																6	Y	E	S			CR	LF														5
																									(Sets to ON for LO.)																				
	R	L	Y		O	F	F	CR	LF															7	Y	E	S			CR	LF														5
																									(Sets all comparison outputs to OFF.)																				
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														5
																									(Response with the status of every function not being remote-controlled)																				
																									S	T	H	CR	LF																	3
																									(Response with the status of the hold function being remote-controlled)																				
																									P	V	H	CR	LF																	3
																									(Response with the status of the peak hold function being remote-controlled)																				
																									D	Z	R	CR	LF																	3
																									(Response with the status of the digital zero function being remote-controlled)																				
																									R	L	Y	CR	LF																	3
																									(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.																				
MAX/MIN/(MAX-MIN) value response	M	A	X	CR	LF																			3	M	A	X			5	0	0	.	0	CR	LF									9
																									(Response with a MAX value)																				
																									M	I	N		-	1	0	0	.	0	CR	LF									9
																									(Response with a MIN value)																				
																									M	-	M			6	0	0	.	0	CR	LF									9
																									(Response with a (MAX-MIN) value)																				
																									Note: The main unit responds with these values at one time by separating them with delimiters.																				
MAX/MIN/(MAX-MIN) value clear	M	C	L		M	A	CR	LF																6	Y	E	S			CR	LF														5
																									(Clears the MAX value.)																				
	M	C	L		M	I	CR	LF																6	Y	E	S			CR	LF														5
																									(Clears the MIN value.)																				
	M	C	L		M	M	CR	LF																6	Y	E	S			CR	LF														5
																									(Clears the (MAX-MIN) value.)																				
Range response (except for thermometers)	R	N	G	CR	LF																			3	R	A	N	G	E		1	2	CR	LF										8
																									(Response with the status of range 12 being selected)																				
																									R	A	N	G	E		2	4	CR	LF										8
																									(Response with the status of range 24 being selected)																				
																									R	A	N	G	E		2	A	CR	LF										8
																									(Response with the status of range 2A being selected)																				
																									N	O		?		CR	LF														5
																									(Response with the status of no range being selected)																				
																									Note: The response varies depending on the input unit or the status of range selection (8 characters max.).																				
Range response (thermometers)	R	N	G	CR	LF																			3	K	A	CR	LF																	2
																									(Response with the status of range KA being selected)																				
																									K	b	CR	LF																	2
																									(Response with the status of range KB being selected)																				
																									J	CR	LF																	1
																									(Response with the status of range J being selected)																				
																									T	CR	LF																	1
																									(Response with the status of range T being selected)																				
																									R	CR	LF																	1
																									(Response with the status of range R being selected)																				
																									S	CR	LF																	1
																									(Response with the status of range S being selected)																				
																									B	CR	LF																	1
																									(Response with the status of range B being selected)																				
																									P	A	CR	LF																	2
																									(Response with the status of range PA being selected)																				
																									P	b	CR	LF																	2
																									(Response with the status of range Pb being selected)																				
																									J	P	A	CR	LF																	3
																									(Response with the status of range JPA being selected)																				
																									J	P	b	CR	LF																	3
																									(Response with the status of range JPb being selected)																				
Range setting	R	N	G		1	2	CR	LF																6	Y	E	S			CR	LF														5
																									(Sets to range 12.)																				
																									Note: The main unit switches to the range immediately after the setting.																				
	R	N	G		2	4	CR	LF																6	Y	E	S			CR	LF														5
																									(Sets to range 24.)																				
																									Note: The main unit switches to the range immediately after the setting.																				
	R	N	G		2	A	CR	LF																6	Y	E	S			CR	LF														5
																									(Sets to range 2A.)																				
																									Note: The main unit switches to the range immediately after the setting.																				
	R	N	G		K	A	CR	LF																6	Y	E	S			CR	LF														5
																									(Sets to range KA.)																				
																									Note: The main unit switches to the range immediately after the setting.																				
	R	N	G		T	CR	LF																	5	Y	E	S			CR	LF														5
																									(Sets to range T.)																				
																									Note: The main unit switches to the range immediately after the setting.																				
	R	N	G		J	P	b	CR	LF															7	Y	E	S			CR	LF														5
																									(Sets to range JPb.)																				
																									Note: The main unit switches to the range immediately after the setting.																				
																									Note: The command varies depending on the input unit or the range of interest.																				
																									N	O		?		CR	LF														5
																									(Response when a nonexistent range is set.)																				

Function	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Char. Length	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Char. Length
Averaging frequency response	A	V	G	CR	LF																			3	A	V	G				1	CR	LF												6
																									(Response with the status of the averaging frequency being once.)																				
																									A	V	G				8	0	CR	LF												6
																									(Response with the status of the averaging frequency being 80 times.)																				
Averaging frequency setting	A	V	G		1	CR	LF																	5	Y	E	S					CR	LF												5
																									(Sets the averaging frequency to once.)																				
																									A	V	G				8	0	CR	LF												6
																									(Sets the averaging frequency to 80 times.)																				
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.)																				
Moving average calculation frequency setting	M	A	V		4	CR	LF																	5	Y	E	S					CR	LF												3
																									(Sets the moving average calculation frequency to 4 times.)																				
	M	A	V		1	6	CR	LF																6	Y	E	S					CR	LF												3
																									(Sets the moving average calculation frequency to 16 times.)																				
	M	A	V		0	CR	LF																	5	Y	E	S					CR	LF												3
																									(Cancels moving average calculation (OFF).)																				
																									Note: The main unit switches to the OFF status immediately after the setting.																				
Step width response	S	W	D	CR	LF																			3	S	.	W	D			1	CR	LF												6
																									(Response with the status of the step width being 1.)																				
																									S	.	W	D			1	0	CR	LF												7
																									(Response with the status of the step width being 10.)																				
Step width setting	S	W	D		1	CR	LF																	5	Y	E	S					CR	LF												5
																									(Sets the step width to 1.)																				
	S	W	D		1	0	CR	LF																6	Y	E	S					CR	LF												5
																									(Sets step width to 10.)																				
																									Note: The main unit switches to the setpoint immediately after the setting.																				
Communication function parameter response	R	S	-	CR	LF																			3	1	9	2	0	0	-	7	-	E	-	2	-	C	R	/	L	F	CR	LF	17
																									(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.)																				
																									9	6	0	0	-	8	-	N	-	1	-	C	R	CR	LF						13
																									(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.)																				
Communication function parameter setting	R	S	-	1	9	2	0	0	-	7	-	E	-	2	-	C	R	/	L	F	CR	LF		21	Y	E	S					CR	LF												3
																									(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	-	7	-	E	-	1	-	C	R	CR	LF						17	Y	E	S					CR	LF												3
																									(Sets the baud rate to 9600 bps, data length to 8 bits, parity to none, number of stop bits to 1, and delimiter to CR.)																				
																									Note: The main unit switches to the setpoints immediately after the setting.																				
Device ID response	A	D	R	CR	LF																			3	0	1	CR	LF																	2
																									(Response with the status of the device ID being 01)																				
																									9	9	CR	LF																	2
																									(Response with the status of the device ID being 99)																				
Device ID setting	A	D	R		0	1	CR	LF																6	Y	E	S					CR	LF												5
																									(Sets the device ID to 01.)																				
	A	D	R		9	9	CR	LF																6	Y	E	S					CR	LF												5
																									(Sets the device ID to 99.)																				
Analog output type response	A	O	P	CR	LF																			3	A	.	O	U	T		O	F	F	CR	LF												9
																									(Response with the status of the analog output type being OFF.)																				
																									0	-	1	CR	LF																	3
																									(Response with the status of the analog output type being 0-1 V.)																				
																									0	-	1	0	CR	LF																4
																									(Response with the status of the analog output type being 0-10 V.)																				
																									1	-	5	CR	LF																	3
																									(Response with the status of the analog output type being 1-5 V.)																				
																									0	-	2	0	CR	LF																4
																									(Response with the status of the analog output type being 0-20 mA.)																				
																									4	-	2	0	CR	LF																4
																									(Response with the status of the analog output type being 4-20 mA.)																				
																									N	O		?		CR	LF														5
																									(Response with the status of the analog output unit being not installed.)																				
Analog output type setting	A	O	P		O	F	F	CR	LF															7	Y	E	S					CR	LF												5
																									(Sets the analog output type to OFF.)																				
	A	O	P		0	-	1	CR	LF															7	Y	E	S					CR	LF												5
																									(Sets the analog output type to 0-1 V.)																				
	A	O	P		0	-	1	0	CR	LF														8	Y	E	S					CR	LF												5
																									(Sets the analog output type to 0-10 V.)																				
	A	O	P		1	-	5	CR	LF															7	Y	E	S					CR	LF												5
																									(Sets the analog output type to 1-5 V.)																				
	A	O	P		0	-	2	0	CR	LF														8	Y	E	S					CR	LF												5
																									(Sets the analog output type to 0-20 mA.)																				
	A	O	P		4	-	2	0	CR	LF														8	Y	E	S					CR	LF												5
																									(Sets the analog output type to 4-20 mA.)																				
																									N	O		?		CR	LF														5
																									(Response with the status of the analog output unit being not installed.)																				
Digital zero backup status response	B	D	Z	CR	LF																			3	B	D	Z		O	N	CR	LF												6
																									(Response with the status of digital zero backup being ON.)																				
																									B	D	Z		O	F	F	CR	LF												7
																									(Response with the status of digital zero backup being OFF.)																				
Digital zero backup control	B	D	Z		O	N	CR	LF																6	Y	E	S					CR	LF												5
																									(Sets digital zero backup to ON.)																				
	B	D	Z		O	F	F	CR	LF															7	Y	E	S					CR	LF												5
																									(Sets digital zero backup to OFF.)																				
Digital zero data save command	S	A	V	CR	LF																			3	Y	E	S					CR	LF												5
																									N	O		?		CR	LF														5
																									(Response with the status of digital zero backup being OFF.)																				
Input selection response	I	S	E	L	CR	LF																		4	O	.	C	CR	LF																	3
																									(Response with the status of the input selection option being "open collector.")																				
																									L	O	G	CR	LF																	3
																									(Response with the status of the input selection option being "logic.")																				
																									M	A	G	CR	LF																	3
																									(Response with the status of the input selection option being "magnet.")																				
																									N	O		?		CR	LF														5
																									(Response with the status of the frequency measurement unit not being installed.)																				
Input selection setting	I	S	E	L		O	.	C	CR	LF														8	Y	E	S					CR	LF												5
																									(Sets the input selection option to "open collector.")																				
	I	S	E	L		L	O	G	CR	LF														8	Y	E	S					CR	LF												5
																									(Sets the input selection option to "logic.")																				
	I	S	E	L		M	A	G	CR	LF														8	Y	E	S					CR	LF												5
																									(Sets the input selection option to "magnet.")																				
																									N	O		?		CR	LF														5
																									(Response with the status of the frequency measurement unit not being installed.)																				