Panasonic

Ultra High-Speed, High-Accuracy
Laser Displacement Sensor

HL-C2 Series
User's Manual

RS-232C Communication Control

WUME-HLC2RS-11

2019.01 | panasonic.net/id/pidsx/global

Preface

Thank you for purchasing Ultra High-Speed, High-Accuracy Laser Displacement Sensor “HL-C2 Series”.
To fully use this product safely and properly, please read this manual carefully. See our Website (https://panasonic.net/id/pidsx/global) for the latest information about the product and latest user’s manual.

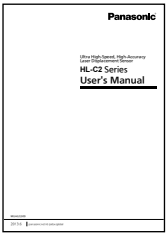
■ Note

1. Please notice that illustrations in this manual might be little different from the actual product.
2. Contents of this manual will be changed without notice due to improvements.
3. This manual and software must not be partially or totally copied or reprinted.
4. If there are any questions, mistakes, paging disorder, or missing pages in this manual, please contact our sales office nearest you.
5. We have no responsibility of any results of operations regardless of the above.

Whole USER'S MANUAL Construction

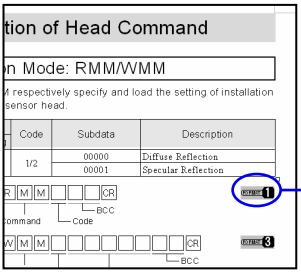
The HL-C2 Series is prepared for the following user's manuals.
Read them as necessary.

HL-C2 Series USER'S MANUAL (PDF)

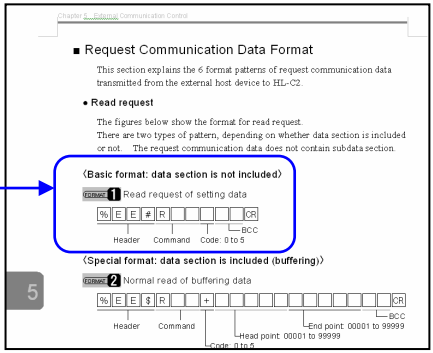


It describes cautions for using HL-C2 Series, and installation method, operation method, function details, specifications, maintenance and inspection method of system components (controller, sensor head and compact console). It also describes the method of controlling the system by RS-232 communication.
See it for various communication formats.
The communication formats described in this manual ("HL-C2 Series USER'S MANUAL: RS-232C Communication Control") are explained in "HL-C2 Series USER'S MANUAL", too. Read it as necessary.

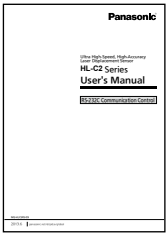
This manual



HL-C2 Series USER'S MANUAL



HL-C2 Series USER'S MANUAL: RS-232C Communication Control (PDF)



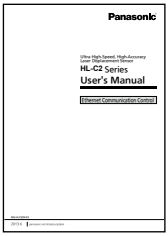
This manual

It describes various commands for controlling the system by PLC or PC using RS-232C communication.

HL-C2 Series USER'S MANUAL: USB Communication Control (PDF)

This manual describes API for controlling the system by PLC or PC using USB communication.

HL-C2 Series USER'S MANUAL: Ethernet Communication Control (PDF)

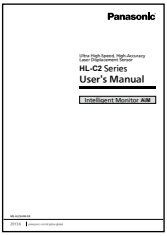


This manual explains various settings to acquire measurement information of the HL-C2 system by PLC using Ethernet communication.

■ USER'S MANUAL for Intelligent Monitor AiM

The Intelligent Monitor AiM, which contains various useful functions in addition to the compact console, is available when developing PC-based system.

HL-C2 Series USER'S MANUAL: Intelligent Monitor AiM (PDF)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HL-C2 Series
User's Manual

Intelligent Monitor AiM

This manual is included as a PDF file in the Intelligent Monitor AiM, which can be downloaded on our Internet website.
This manual describes installation method, operation method, functional details and error messages of the software.
It also describes an evaluation analysis of HL-C2 Series or use of buffering function and received light intensity waveform display function, which are useful for optimum system setting.

MEMO

Manual Construction

	Preface	This chapter provides cautions for safe and correct operation of the product. Be sure to read this chapter.
1	Head Command	This chapter explains the commands for controlling the sensor head.
2	OUT Command	This chapter explains various commands for function settings regarding output data processing.
3	Common Command	This chapter explains the commands for function settings common in Head setting and OUT setting.
4	System Command	This chapter explains various commands for function settings regarding the system of equipment, such as initialization, save and communication settings.
5	Buffering Command	This chapter explains various commands for function settings and execution of operation regarding data buffering.
Appendix	Appendix	This chapter describes index and revision history.

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Safety Precautions

This product is intended to detect the objects and does not have the control function to ensure safety such as accident prevention.
Do not use the product as a sensing device to protect human body.
Please use the products that comply with local laws and standards for human body protection specified by e.g., OSHA, ANSI and IEC.
Please read this manual carefully before using the product and use it correctly.

■ Symbol Indications

This manual uses symbols to indicate safety precautions, instructions, and reference.
Before reading this manual, fully understand the meanings of these indications.

⚠WARNING	“WARNING” indicates the possibility that death or serious injury could result if a handling error occurs.
⚠CAUTION	“CAUTION” indicates the possibility that the user could be injured or property could be damaged if a handling error occurs.

CHECK	“CHECK” indicates any instructions or precautions for using the system.
REFERENCE	“REFERENCE” indicates any hints for operation, detail explanations, or references.
TECHNIQUE	“TECHNIQUE” indicates useful conditions or techniques (know-how) for operation of the system.

⚠WARNING

- Install a fail-safe device when the product is used for the purpose that has a possibility of physical injury or serious extended damage.
- Do not use the product in the atmosphere of flammable gas, to prevent explosion.

⚠CAUTION

- Use the product within specifications.
  Abnormal heat or smoke generation may occur.
- Do not disassemble or remodel the product. Electrical shock or smoke generation may occur.
- Connect the electric wire securely with the terminal screws.
  Imperfect connection may cause abnormal heat or smoke generation.
- Do not touch the terminal during energization of the product, to prevent electrical shock.

For Correct Use

This manual describes various commands for controlling the HL-C2 system by RS-232C communication.
For the detailed description of each function and communication format on the system, refer to “HL-C2 Series USER’S MANUAL” (separate volume).

Correct Handling

For the items listed below, refer to “HL-C2 Series USER’S MANUAL” (separate volume).

- Installation Environment
- Use Environment
- Measures to Noise
- Warming Up Time
- Insulation Resistance and Voltage Resistance
- Power Supply
- Instantaneous Power Failure
- Grounding
- Installation

Cautions on Handling Laser Light

Refer to “HL-C2 Series USER’S MANUAL”.

Standards

Refer to “HL-C2 Series USER’S MANUAL”.

1

Head Command

This chapter explains the commands for controlling the sensor head.

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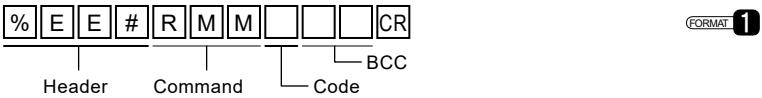
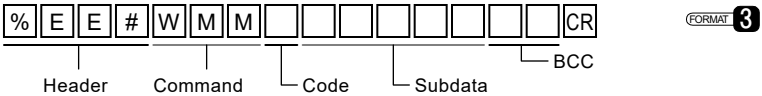
1-1 Explanation of Head Command

1-1-1 Installation Mode: RMM/WMM

WMM and RMM respectively specify and load the setting of installation mode for each sensor head.

Command		Code	Subdata	Description
Read	Setting			
RMM	WMM	1/2	00000	Diffuse Reflection
			00001	Specular Reflection





Ex

(1) Setting of Installation Mode is loaded.

Request: % E E # R M M 1 * * CR FORMAT 1

Response: % E E $ R M M 0 0 0 0 0 * * CR FORMAT 1

(2) Installation Mode is set to “Specular Reflection”.

Request: % E E # W M M 1 0 0 0 0 1 * * CR FORMAT 3

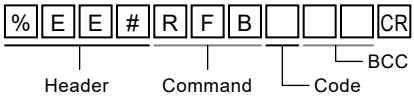
Response: % E E $ W M M * * CR FORMAT 9

1-1-2 Emission Adjustment: RFB/WFB

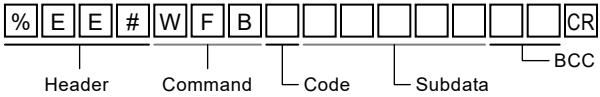
WFB and RFB respectively specify and load the setting of emission adjustment for each sensor head.

Command		Code	Subdata	Description
Read	Setting			
RFB	WFB	1/2	00000	Auto
			00001	0.04% Fixed
			00002	0.05% Fixed
			00003	0.06% Fixed
			00004	0.08% Fixed
			00005	0.11% Fixed
			00006	0.14% Fixed

Command		Code	Subdata	Description
Read	Setting			
RFB	WFB	1/2	00007	0.18% Fixed
			00008	0.24% Fixed
			00009	0.31% Fixed
			00010	0.40% Fixed
			00011	0.53% Fixed
			00012	0.68% Fixed
			00013	0.89% Fixed
			00014	1.16% Fixed
			00015	1.50% Fixed
			00016	1.95% Fixed
			00017	2.54% Fixed
			00018	3.30% Fixed
			00019	4.29% Fixed
			00020	5.58% Fixed
			00021	7.25% Fixed
			00022	9.43% Fixed
			00023	12.3% Fixed
			00024	15.9% Fixed
			00025	20.7% Fixed
			00026	26.9% Fixed
			00027	35.0% Fixed
			00028	45.5% Fixed
			00029	59.2% Fixed
			00030	76.9% Fixed
			00031	100% Fixed



FORMAT 1



FORMAT 3

Ex

(1) Setting of Emission Adjustment is loaded.

Request: % E E # R F B 1 * * CR FORMAT 1

Response: % E E $ R F B 0 0 0 0 0 * * CR FORMAT 1

(2) Emission Adjustment is set to “100% Fixed”.

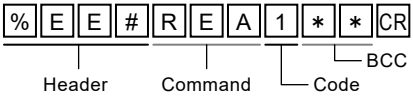
Request: % E E # W F B 1 0 0 0 3 1 * * CR FORMAT 3

Response: % E E $ W F B * * CR FORMAT 9

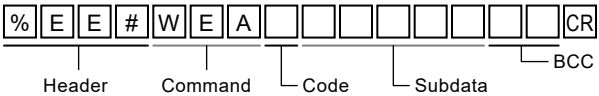
1

1-1-3 Emission Adjustment Area - a : REA/WEA

Command		Code	Setting value	Least input increment
Read	Setting			
REA	WEA	1/2	00001 to 00512	1



FORMAT 1



FORMAT 3

Ex

(1) Setting value of Emission Adjustment Area - a is loaded.

Request: % E E # R E A 1 * * CR — FORMAT 1

Response: % E E $ R E A 0 0 1 2 3 * * CR — FORMAT 1

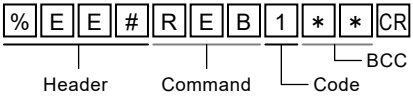
(2) Emission Adjustment Area – a is set to “00215”.

Request: % E E # W E A 1 0 0 2 1 5 * * CR — FORMAT 3

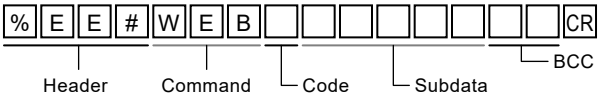
Response: % E E $ W E A * * CR — FORMAT 9

1-1-4 Emission Adjustment Area - b : REB/WEB

Command		Code	Setting value	Least input increment
Read	Setting			
REB	WEB	1/2	00001 to 00512	1



FORMAT 1



FORMAT 3

Ex

(1) Setting value of Emission Adjustment Area - b is loaded.

Request: % E E # R E B 1 * * CR — FORMAT 1

Response: % E E $ R E B 0 0 1 2 3 * * CR — FORMAT 1

(2) Emission Adjustment Area – b is set to “00215”.

Request: % E E # W E B 1 0 0 2 1 5 * * CR FORMAT 3
Response: % E E $ W E B * * CR FORMAT 9

1-1-5 Emitted Light Intensity Search: RFC/WFC

WFC automatically adjusts the emitted light intensity for each sensor head.

During command execution, the status of command execution can be loaded. After command execution, the value can be loaded by “Emission Adjustment”.

➔ “1-1-2 Emission Adjustment: RFB/WFB”

Command		Code	Subdata	Description
Read	Setting			
RFC	WFC	1/2	00000	No command
			00001	Execute
			00002	Searching

% E E # R F C ☐ ☐ ☐ CR FORMAT 1

Header — Command — Code — BCC

% E E # W F C ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ CR FORMAT 3

Header — Command — Code — Subdata — BCC

Ex

(1) Status of Emitted Light Intensity Search is loaded.

Request: % E E # R F C 1 * * CR FORMAT 1
Response: % E E $ R F C 0 0 0 0 3 * * CR FORMAT 1

(2) Emitted Light Intensity Search is set to “Execution”.

Request: % E E # W F C 1 0 0 0 0 1 * * CR FORMAT 3
Response: % E E $ W F C * * CR FORMAT 9

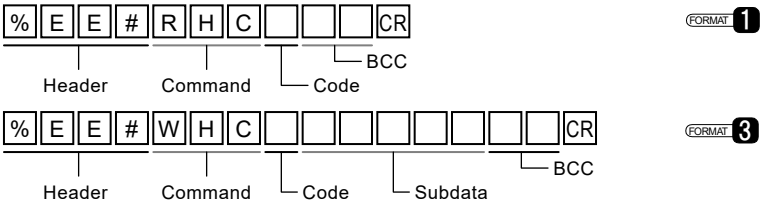
1

1-1-6 Alarm Delay Times: RHC/WHC

WHC and RHC respectively specify and load the setting of alarm delay times for each sensor head.

The setting here is reflected in digital measurement value, analog output, alarm terminal output and alarm indicator on the controller.

Command		Code	Subdata	Description
Read	Setting			
RHC	WHC	1/2	00000	OFF
			00001 to 65534	Fixed Value
			65535	Hold Previous Normal Value



Ex

(1) Setting of Alarm Delay Times is loaded.

Request: % E E # R H C 1 * * CR FORMAT 1

Response: % E E $ R H C 0 0 0 0 8 * * CR FORMAT 1

(2) Alarm Delay Times is set to “Hold Previous Normal Value”.

Request: % E E # W H C 1 6 5 5 3 5 * * CR FORMAT 3

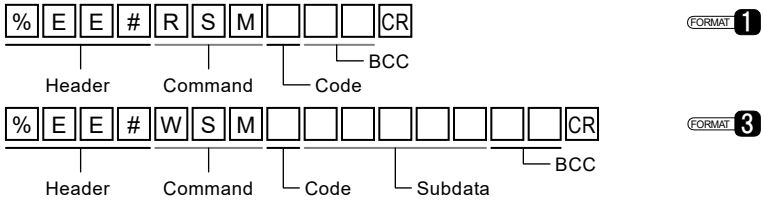
Response: % E E $ W H C * * CR FORMAT 9

1-1-7 Measurement Mode: RSM/WSM

WSM selects the optimum digital processing mode to the object to be measured.

By selecting the optimum measurement algorithm such as disturbance correction of received light waveform, steady measurement values can be acquired.

Command		Code	Subdata	Description
Read	Setting			
RSM	WSM	1/2	00000	Diffuse [Standard]
			00001	Specular[Standard]
			00002	Metal 1
			00003	Metal 2
			00004	Penetration
			00005	Glass
			00006	Glass Pattern



Ex

(1) Setting of Measurement Mode is loaded.

Request: % E E # R S M 1 * * CR FORMAT 1

Response: % E E $ R S M 0 0 0 0 0 * * CR FORMAT 1

(2) Measurement Mode is set to “Metal 1”.

Request: % E E # W S M 1 0 0 0 0 2 * * CR FORMAT 3

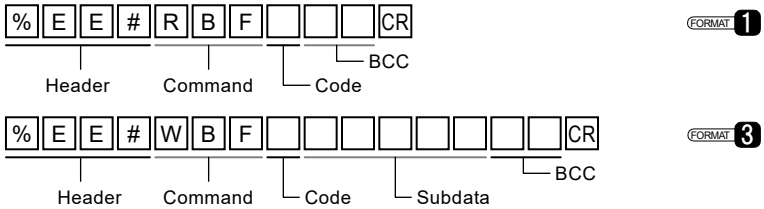
Response: % E E $ W S M * * CR FORMAT 9

1-1-8 Measurement Surface Reference: RBF/WBF

WBF and RBF respectively specify and load the setting of reference surface used for measurement for each sensor head.

It selects whether the measurement surface is counted from the near point of sensor head (Near) or from the far point (Far).

Command		Code	Subdata	Description
Read	Setting			
RBF	WBF	1/2	00000	Near
			00001	Far



Ex

(1) Setting of Measurement Surface Reference is loaded.

Request: % E E # R B F 1 * * CR FORMAT 1

Response: % E E $ R B F 0 0 0 0 0 * * CR FORMAT 1

(2) Measurement Surface Reference is set to “Far”.

Request: % E E # W B F 1 0 0 0 0 1 * * CR FORMAT 3

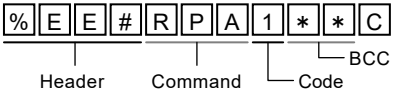
Response: % E E $ W B F * * CR FORMAT 9

1

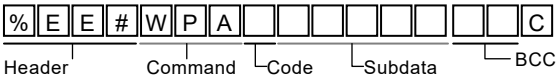
1-1-9 Measuring Range (a): RPA▪WPA

A given range can be specified for measurement.

Command		Code	Setting value	Least input increment
Read	Setting			
RPA	WPA	1/2	00003 to 00510	1



FORMAT 1



FORMAT 3

Ex

(1) Setting value of Measuring Range Point a is loaded.

Request: % E E # R P A 1 * * CR — FORMAT 1

Response: % E E $ R P A 0 0 1 2 3 * * CR — FORMAT 1

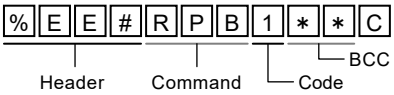
(2) Measuring Range Point a is set to “00215”.

Request: % E E # W P A 1 0 0 2 1 5 * * CR — FORMAT 3

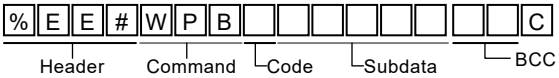
Response: % E E $ W P A * * CR — FORMAT 9

1-1-10 Measuring Range (b): RPB▪WPB

Command		Code	Setting value	Least input increment
Read	Setting			
RPB	WPB	1/2	00003 to 00510	1



FORMAT 1



FORMAT 3

Ex

(1) Setting value of Measuring Range Point b is loaded.

Request: % E E # R P A 1 * * CR — FORMAT 1

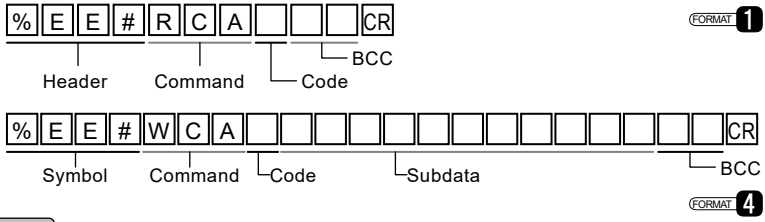
Response: % E E $ R P B 0 0 1 2 3 * * CR — FORMAT 1

1-1-11 Calibration Measurement Value A: RCA/WCA

WCA and RCA respectively specify and load the setting of calibration measurement value A for each sensor head.

For the execution procedures of calibration, refer to “1-1-11 Execute Calibration: WCE”.

Command		Code	Setting value	Least input increment
Read	Setting			
RCA	WCA	1/2	-950.000000 to +950.000000[mm]	0.000001[mm]



Ex

(1) Setting value of Calibration Measurement Value A is loaded.

Request: % E E # R C A 1 * * CR FORMAT 1

Response: % E E $ R C A + 0 0 5 . 0 0 0 0 0 0 0 * * CR FORMAT 2

(2) Calibration Measurement Value A is set to “+123.456789”.

Request: % E E # W C A 1 + 1 2 3 . 4 5 6 7 8 9 * * CR FORMAT 4

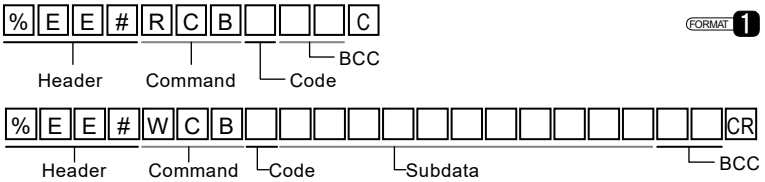
Response: % E E $ W C A * * CR FORMAT 9

1-1-12 Calibration Measurement Value B: RCB/WCB

WCB and RCB respectively specify and load the setting of calibration measurement value B for each sensor head.

For the execution procedures of calibration, refer to “1-1-11 Execute Calibration: WCE”.

Command		Code	Setting value	Least input increment
Read	Setting			
RCA	WCA	1/2	-950.000000 to +950.000000[mm]	0.000001[mm]



Ex

(1) Setting value of Calibration Measurement Value B is loaded.

Request: % E E # R C B 1 * * CR FORMAT 1

Response: % E E $ R C B − 0 0 5 . 0 0 0 0 0 0 * * CR FORMAT 2

(2) Calibration Measurement Value B is set to “-123.456789”.

Request: % E E # W C B 1 − 1 2 3 . 4 5 6 7 8 9 * * CR FORMAT 4

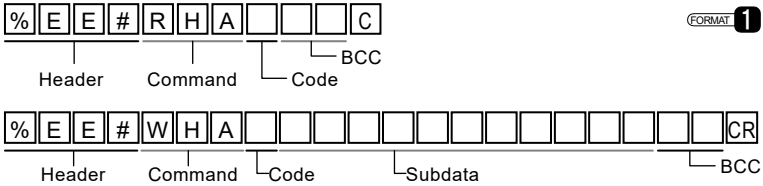
Response: % E E $ W C B * * CR FORMAT 9

1-1-13 Calibration Correction Value a: RHA/WHA

WHA and RHA respectively specify and load the setting of calibration correction value a for each sensor head.

For the execution procedures of calibration, refer to “1-1-11 Execute Calibration: WCE”.

Command		Code	Setting value	Least input increment
Read	Setting			
RHA	WHA	1/2	-950.000000 to +950.000000[mm]	0.000001[mm]



Ex

FORMAT 4

(1) Setting value of Calibration Correction Value a is loaded.

Request: % E E # R H A 1 * * CR FORMAT 1

Response: % E E $ R H A + 0 0 5 . 0 0 0 0 0 0 * * CR FORMAT 2

(2) Calibration Correction Value a is set to “+123.456789”.

Request: % E E # W H A 1 + 1 2 3 . 4 5 6 7 8 9 * * CR FORMAT 4

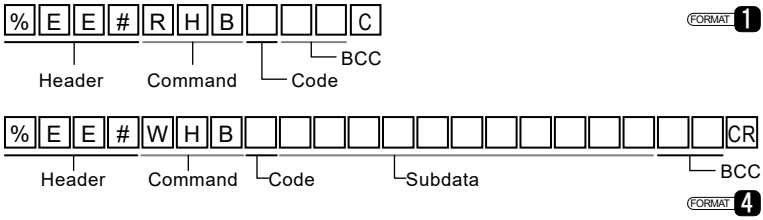
Response: % E E $ W H A * * CR FORMAT 9

1-1-14 Calibration Correction Value b: RHB/WHB

WHB and RHB respectively specify and load the setting of calibration correction value b for each sensor head.

For the execution procedures of calibration, refer to “1-1-11 Execute Calibration: WCE”.

Command		Code	Setting value	Least input increment
Read	Setting			
RHB	WHB	1/2	-950.000000 to +950.000000[mm]	0.000001[mm]



Ex

(1) Setting value of Calibration Correction Value b is loaded.

Request: % E E # R H B 1 * * CR FORMAT 1
Response: % E E $ R H B − 0 0 5 . 0 0 0 0 0 0 * * CR FORMAT 2

(2) Calibration Correction Value b is set to “-123.456789”.

Request: % E E # W H B 1 − 1 2 3 . 4 5 6 7 8 9 * * CR FORMAT 4
Response: % E E $ W H B * * CR FORMAT 9

1

1-1-15 Execute Calibration: WCE

WCE executes and cancels the calibration for each sensor head.

Measurement Value A (mm) = Correction Value a (mm),
Measurement Value B (mm) = Correction Value b (mm)
Set any two points A and B to correction values.

Execution procedures of calibration

1 Set Measurement Value A. Refer to ➔ “1-1-7”.
2 Set Measurement Value B. Refer to ➔ “1-1-8”.
3 Set Correction Value a. Refer to ➔ “1-1-9”.
4 Set Correction Value b. Refer to ➔ “1-1-10”.
5 Execute calibration by the WCE command.

Command		Code	Subdata	Description
Read	Setting			
-	WCE	1/2	00000	No command
			00001	Execute
			00002	Cancel

% E E # W C E □ □ □ □ □ □ □ □ CR FORMAT 3

Header: % E E #
Command: W C E
Code: □ □
Subdata: □ □ □ □ □ □
BCC: □ □

Ex

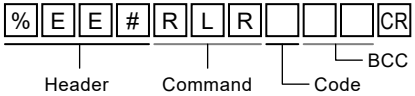
Calibration is executed.

Request: % E E # W C E 1 0 0 0 0 1 * * CR FORMAT 3
Response: % E E $ W C E * * CR FORMAT 9

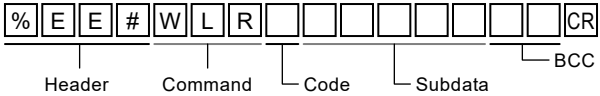
1-1-16 Laser Control: RLR/WLR

WLR and RLR respectively specify and load the status of laser control for each sensor head.

Command		Code	Subdata	Description
Read	Setting			
RLR	WLR	1/2	00000	Emission
			00001	Stop



FORMAT 1



FORMAT 3

Ex

(1) Status of Laser Control is loaded.

Request: % E E # R L R 1 * * CR FORMAT 1
Response: % E E $ R L R 0 0 0 0 1 * * CR

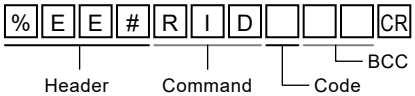
(2) Laser Control is set to “Emission”.

Request: % E E # W L R 1 0 0 0 0 0 * * CR FORMAT 3
Response: % E E $ W L R * * CR FORMAT 9

1-1-17 Received Light Intensity Readout: RID

RID loads the received light intensity for each sensor head.

Command		Code	Subdata	Description
Read	Setting			
RID	-	1/2	00000 to 01023	Received light intensity



FORMAT 1

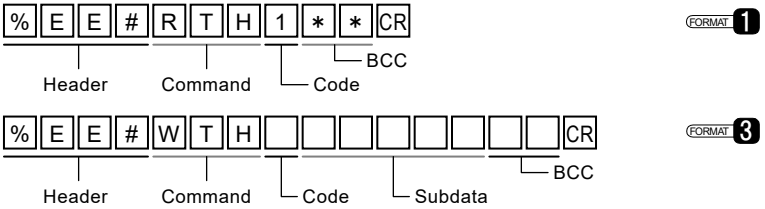
Ex

(1) Received Light Intensity is loaded.

Request: % E E # R I D 1 * * CR FORMAT 1
Response: % E E $ R I D 0 0 1 2 3 * * CR FORMAT 1

1-1-18 Peak Recognition Sensitivity: RTH/WTH

Command		Code	Setting value	Least input increment
Read	Setting			
RTH	WTH	1/2	00100 to 00400	1



Ex

(1) Setting value of Peak Recognition Sensitivity is loaded.

Request: % E E # R T H 1 * * CR (FORMAT 1)

Response: % E E $ R T H 0 0 1 0 0 * * CR (FORMAT 1)

(2) Peak Recognition Sensitivity is set to “00215”.

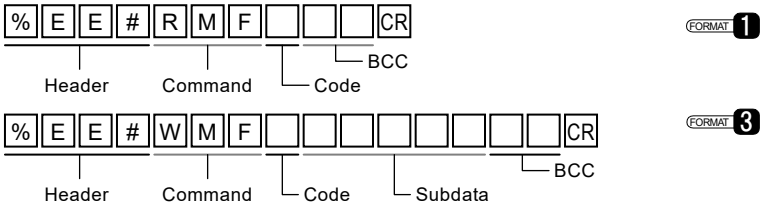
Request: % E E # W T H 1 0 0 2 1 5 * * CR (FORMAT 3)

Response: % E E $ W T H * * CR (FORMAT 9)

1-1-19 Median Filter RMF・WMF

Cut off changes in measurement values in order to prevent variation in measurement.

Command		Code	Subdata	Description
Read	Setting			
RMF	WMF	1/2	00000	OFF
			00001	7 points
			00002	15 points
			00003	31 points



Ex

(1) Setting value of Median Filter is loaded.

Request: % E E # R M F 1 * * CR (FORMAT 1)

Response: % E E $ R M F 0 0 0 0 0 * * CR (FORMAT 1)

(2) Median Filter is set to “15 points”.

Request: % E E # W M F 1 0 0 0 0 2 * * CR (FORMAT 3)

Response: % E E $ W M F * * CR (FORMAT 9)

MEMO

2

OUT Command

This chapter explains various commands for function settings regarding output data processing.

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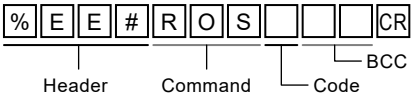
2-1 Explanation of OUT Command

2-1-1 Output Selection: ROS/WOS

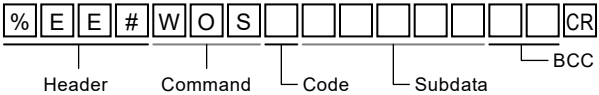
WOS and ROS respectively specify and load the setting of output selection for each OUT.

The default of OUT1 and OUT2 is “A” and “B” respectively.

Command		Code	Subdata	Description
Read	Setting			
ROS	WOS	3/4	00000	A
			00001	B
			00002	-A
			00003	-B
			00004	A+B
			00005	-(A+B)
			00006	A-B
			00007	B-A
			00008	Transparent Object A
			00009	Transparent Object B
			00010	Transparent Object -A
			00011	Transparent Object -B
			00012	[Transparent] A+B
			00013	[Transparent] -(A+B)
			00014	[Transparent] A-B
			00015	[Transparent] B-A



FORMAT 1



FORMAT 3

Ex

(1) Setting of Output Selection is loaded.

Request: % E E # R O S 3 * * CR FORMAT 1

Response: % E E $ R O S 0 0 0 0 0 * * CR FORMAT 1

(2) Output Selection of OUT1 is set to “Transparent Object A”.

Request: % E E # W O S 3 0 0 0 0 8 * * CR FORMAT 3

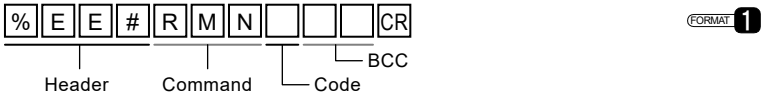
Response: % E E $ W O S * * CR FORMAT 9

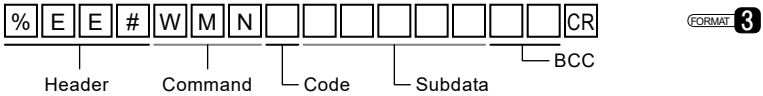
2-1-2 Transparent Object: RMN/WMN

WMN and RMN respectively specify and load the setting of transparent object for each OUT.

The commands are available while "Transparent Object" is selected in "Output Selection". Select the target surface(s) for measurement.

Command		Code	Subdata	Description
Read	Setting			
RMN	WMN	3/4	00000	1st Surface
			00001	2nd Surface
			00002	3rd Surface
			00003	4th Surface
			00004	Upper Limit Surface
			00005	1st Surface - 2nd Surface
			00006	1st Surface - 3rd Surface
			00007	1st Surface - 4th Surface
			00008	1st Surface - Upper Limit Surface
			00009	2nd Surface - 3rd Surface
			00010	2nd Surface - 4th Surface
			00011	2nd Surface - Upper Limit Surface
			00012	3rd Surface - 4th Surface
			00013	3rd Surface - Upper Limit Surface
			00014	4th Surface - Upper Limit Surface





Ex

(1) Setting of Transparent Object is loaded.

Request: % E E # R M N 3 * * CR FORMAT 1

Response: % E E $ R M N 0 0 0 0 0 * * CR FORMAT 1

(2) Transparent Object is set to "1st Surface - 4th Surface".

Request: % E E # W M N 3 0 0 0 0 7 * * CR FORMAT 3

Response: % E E $ W M N * * CR FORMAT 9

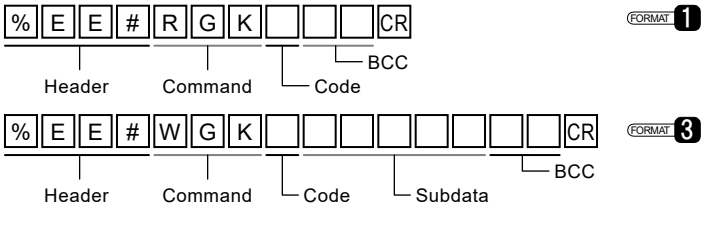
2

2-1-3 Refractive Index Calculation: RGK/WGK

WGK and RGK respectively specify and load the setting of refractive index calculation for each OUT.

The commands are available while "Transparent Object" is selected in "Output Selection". Select if calculation of refractive index is executed or not.

Command		Code	Subdata	Description
Read	Setting			
RGK	WGK	3/4	00000	OFF
			00001	ON



Ex

(1) Setting of Refractive Index Calculation is loaded.

Request: % E E # R G K 3 * * CR FORMAT 1
Response: % E E $ R G K 0 0 0 0 0 * * CR FORMAT 1

(2) Refractive Index Calculation is set to "ON".

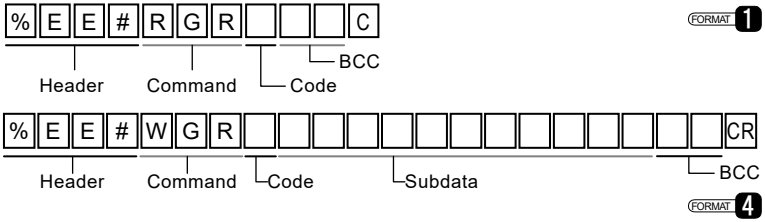
Request: % E E # W G K 3 0 0 0 0 1 * * CR FORMAT 3
Response: % E E $ W G K * * CR FORMAT 9

2-1-4 Refractive Index: RGR/WGR

WGR and RGR respectively specify and load the setting of refractive index for each OUT.

The commands are available while "Transparent Object" is selected in "Output Selection" and "Refractive Index Calculation" is set to "ON".

Command		Code	Setting value	Least input increment
Read	Setting			
RGR	WGR	3/4	+000.500000 to +002.000000	0.000001



Ex

(1) Setting value of Refractive Index is loaded.

Request: % E E # R G R 3 * * CR FORMAT 1
Response: % E E $ R G R + 0 0 1 . 0 0 0 0 0 0 * * CR FORMAT 2

(2) Refractive Index is set to “+002.000000”.

Request: % E E # W G R 3 + 0 0 2 . 0 0 0 0 0 0 * * CR FORMAT 4
Response: % E E $ W G R * * CR FORMAT 9

2-1-5 Zero Set: RZS/WZS

WZS and RZS execute and load the setting of zero set for each OUT.

After executing Zero Set, the measurement value will be set to zero.

CHECK

When a value other than 0 is specified as an offset value in “Offset”, the measurement value will be the specified value.

Command		Code	Subdata	Description
Read	Setting			
RZS	WZS	3/4	00000	OFF
			00001	ON

% E E # R Z S ☐ ☐ ☐ CR FORMAT 1

Header: % E E #
Command: R Z S
Code: ☐
BCC: ☐ ☐ CR

% E E # W Z S ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ CR FORMAT 3

Header: % E E #
Command: W Z S
Code: ☐
Subdata: ☐ ☐ ☐ ☐ ☐ ☐ ☐
BCC: ☐ CR

Ex

(1) Setting of Zero Set is loaded.

Request: % E E # R Z S 3 * * CR FORMAT 1
Response: % E E $ R Z S 0 0 0 0 0 * * CR FORMAT 1

(2) Zero Set is executed.

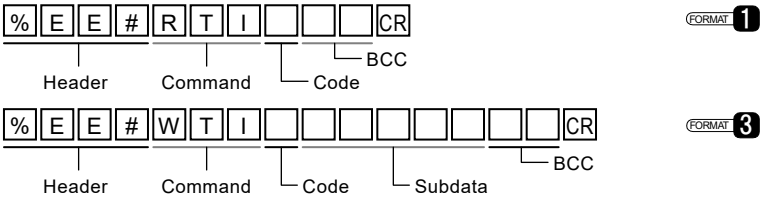
Request: % E E # W Z S 3 0 0 0 0 1 * * CR FORMAT 3
Response: % E E $ W Z S * * CR FORMAT 9

2

2-1-6 Timing: RTI/WTI

WTI and RTI execute and load the setting of timing for each OUT.

Command		Code	Subdata	Description
Read	Setting			
RTI	WTI	3/4	00000	OFF
			00001	ON



Ex

(1) Setting of Timing is loaded.

Request: % E E # R T I 3 * * CR FORMAT 1

Response: % E E $ R T I 0 0 0 0 0 * * CR FORMAT 1

(2) Timing is executed.

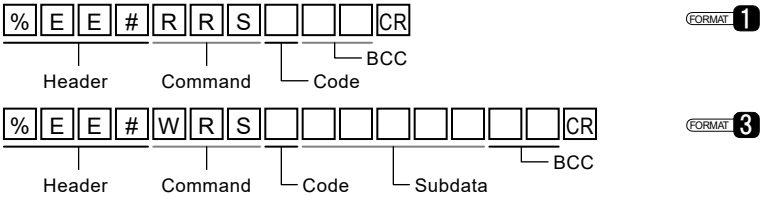
Request: % E E # W T I 3 0 0 0 0 1 * * CR FORMAT 3

Response: % E E $ W T I * * CR FORMAT 9

2-1-7 Reset: RRS/WRS

WRS and RRS execute and load the setting of reset for each OUT.

Command		Code	Subdata	Description
Read	Setting			
RRS	WRS	3/4	00000	Not execute
			00001	Execute



Ex

(1) Setting of Reset is loaded.

Request: % E E # R R S 3 * * CR FORMAT 1

Response: % E E $ R R S 0 0 0 0 0 * * CR FORMAT 1

* Response by this command is acquired only when reset is unexecuted at readout.

(2) Reset is executed.

Request: % E E # W R S 3 0 0 0 0 1 * * CR FORMAT 3
Response: % E E $ W R S * * CR FORMAT 9

2-1-8 Hold: RHD/WHD

WHD and RHD execute and load the setting of hold.

Command		Code	Subdata	Description
Read	Setting			
RHD	WHD	3/4	00000	OFF
			00001	ON

% E E # R H D ☐ ☐ ☐ CR FORMAT 1

Header Command Code BCC

% E E # W H D ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ CR FORMAT 3

Header Command Code Subdata BCC

Ex

(1) The setting of Hold is loaded.

Request: % E E # R H D 3 * * CR FORMAT 1
Response: % E E $ R H D 0 0 0 0 0 * * CR FORMAT 1

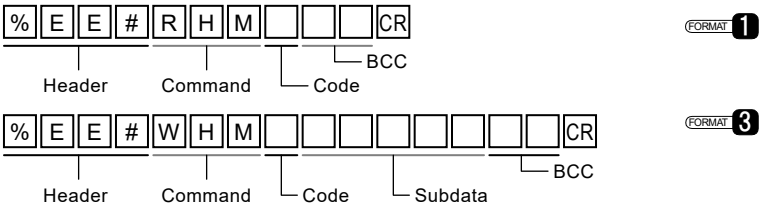
(2) Hold is executed.

Request: % E E # W H D 3 0 0 0 0 1 * * CR FORMAT 3
Response: % E E $ W H D * * CR FORMAT 9

2-1-9 Analysis Mode: RHM/WHM

WHM and RHM respectively specify and load the setting of analysis mode for each OUT.

Command		Code	Subdata	Description
Read	Setting			
RHM	WHM	3/4	00000	Normal Measurement
			00001	Peak Measurement
			00002	Bottom Measurement
			00003	Peak to Peak Measurement



Ex

(1) Setting of Analysis Mode is loaded.

Request: % E E # R H M 3 * * CR FORMAT 1
Response: % E E $ R H M 0 0 0 0 0 * * CR FORMAT 1

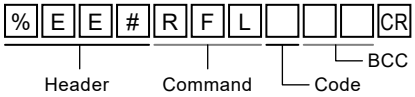
(2) Analysis Mode is set to “Peak to Peak Measurement”.

Request: % E E # W H M 3 0 0 0 0 3 * * CR FORMAT 3
Response: % E E $ W H M * * CR FORMAT 9

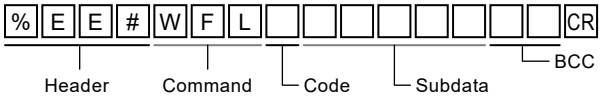
2-1-10 Filter Operation: RFL/WFL

WFL and RFL respectively specify and load the setting of filter operation for each OUT.

Command		Code	Subdata	Description
Read	Setting			
RFL	WFL	3/4	00000	Moving Average
			00001	Low-pass Filter
			00002	High-pass Filter



FORMAT 1



FORMAT 3

Ex

(1) Setting of Filter Operation is loaded.

Request: % E E # R F L 3 * * CR FORMAT 1

Response: % E E $ R F L 0 0 0 0 0 * * CR FORMAT 1

(2) Filter Operation is set to “High-pass Filter”.

Request: % E E # W F L 3 0 0 0 0 2 * * CR FORMAT 3

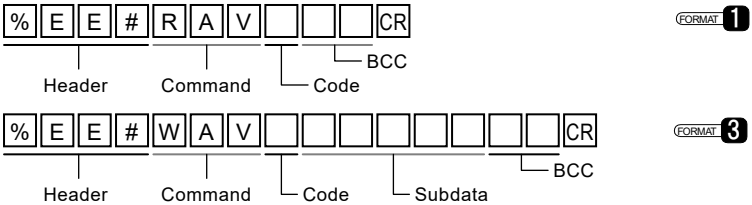
Response: % E E $ W F L * * CR FORMAT 9

2-1-11 Average Times: RAV/WAV

WAV and RAV respectively specify and load the setting of average times for each OUT.

The commands are available while Moving Average is selected in "Filter Operation".

Command		Code	Subdata	Description
Read	Setting			
RAV	WAV	3/4	00000	1 time
			00001	2 times
			00002	4 times
			00003	8 times
			00004	16 times
			00005	32 times
			00006	64 times
			00007	128 times
			00008	256 times
			00009	512 times
			00010	1024 times
			00011	2048 times
			00012	4096 times
			00013	8192 times
			00014	16384 times
			00015	32768 times
			00016	65536 times



Ex

(1) Setting of Average Times is loaded.

Request: % E E # R A V 3 * * CR FORMAT 1

Response: % E E $ R A V 0 0 0 0 9 * * CR FORMAT 1

(2) Average Times is set to "4096 times".

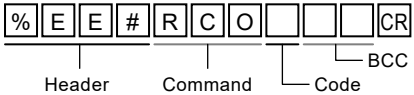
Request: % E E # W A V 3 0 0 0 1 2 * * CR FORMAT 3

Response: % E E $ W A V * * CR FORMAT 9

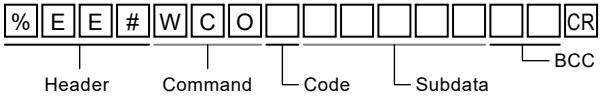
2-1-12 Cutoff Frequency: RCO/WCO

WCO and RCO respectively specify and load the setting of cutoff frequency for each OUT.

Command		Code	Subdata	Description
Read	Setting			
RCO	WCO	3/4	00000	1[Hz]
			00001	2[Hz]
			00002	4[Hz]
			00003	10[Hz]
			00004	20[Hz]
			00005	40[Hz]
			00006	100[Hz]
			00007	200[Hz]
			00008	400[Hz]
			00009	1000[Hz]
			00010	2000[Hz]



FORMAT 1



FORMAT 3

Ex

(1) Setting of Cutoff Frequency is loaded.

Request: % E E # R C O 3 * * CR — FORMAT 1

Response: % E E $ R C O 0 0 0 0 6 * * CR — FORMAT 1

(2) Cutoff Frequency is set to “400[Hz]”.

Request: % E E # W C O 3 0 0 0 0 8 * * CR — FORMAT 3

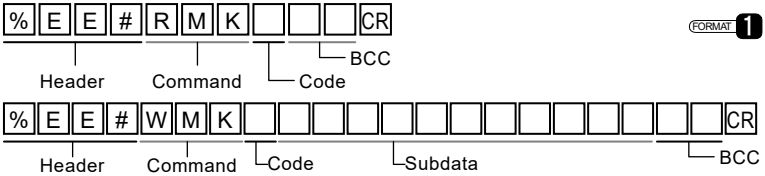
Response: % E E $ W C O * * CR — FORMAT 9

2

2-1-13 Operation Coefficient: RMK/WMK

WMK and RMK respectively specify and load the setting of operation coefficient for each OUT.

Command		Code	Setting value	Least input increment
Read	Setting			
RMK	WMK	3/4	+000.100000 to +009.999999	0.000001



Ex

(1) Setting value of Operation Coefficient is loaded.

Request: % E E # R M K 3 * * CR FORMAT 1

Response: % E E $ R M K + 0 0 1 . 0 0 0 0 0 0 * * CR FORMAT 2

(2) Operation Coefficient is set to “+001.500000”.

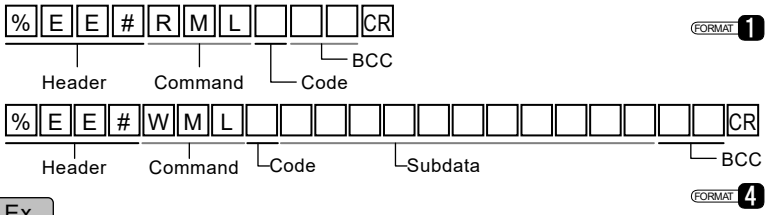
Request: % E E $ W M K 3 + 0 0 1 . 5 0 0 0 0 0 * * CR FORMAT 4

Response: % E E $ W M K * * CR FORMAT 9

2-1-14 Offset: RML/WML

WML and RML respectively specify and load the setting of offset for each OUT.

Command		Code	Setting value	Least input increment
Read	Setting			
RML	WML	3/4	-950.000000 to +950.000000[mm]	0.000001[mm]



Ex

(1) Setting value of Offset is loaded.

Request: % E E # R M L 3 * * CR FORMAT 1

Response: % E E $ R M L + 0 0 0 . 0 0 0 0 0 0 * * CR FORMAT 2

(2) Offset is set to “+123.456789”.

Request: % E E # W M L 3 + 1 2 3 . 4 5 6 7 8 9 * * CR FORMAT 4

Response: % E E $ W M L * * CR FORMAT 9

2-1-15 Judgment Output Upper Limit Value: RHL/WHL

WHL and RHL respectively specify and load the setting of upper limit value of judgment output for each OUT.

Command		Code	Setting value	Least input increment
Read	Setting			
RHL	WHL	3/4	-950.000000 to +950.000000[mm]	0.000001[mm]

% E E # R H L ☐ ☐ ☐ CR — FORMAT 1

Header — Command — Code — BCC

% E E # W H L ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ CR — FORMAT 4

Header — Command — Code — Subdata — BCC

Ex

(1) Setting value of Judgment Output Upper Limit Value is loaded.

Request: % E E # R H L 3 * * CR — FORMAT 1

Response: % E E $ R H L + 0 0 5 . 0 0 0 0 0 0 * * CR — FORMAT 2

(2) Judgment Output Upper Limit Value is set to “+123.456789”.

Request: % E E # W H L 3 + 1 2 3 . 4 5 6 7 8 9 * * CR — FORMAT 4

Response: % E E $ W H L * * CR — フォーマット 9

2-1-16 Judgment Output Lower Limit Value: RLL/WLL

WLL and RLL respectively specify and load the setting of lower limit value of judgment output for each OUT.

Command		Code	Setting value	Least input increment
Read	Setting			
RLL	WLL	3/4	-950.000000 to +950.000000[mm]	0.000001[mm]

% E E # R L L ☐ ☐ ☐ CR — FORMAT 1

Header — Command — Code — BCC

% E E # W L L ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ CR — FORMAT 4

Header — Command — Code — Subdata — BCC

Ex

(1) Setting value of Judgment Output Lower Limit Value is loaded.

Request: % E E # R L L 3 * * CR — FORMAT 1

Response: % E E $ R L L − 0 0 5 . 0 0 0 0 0 0 * * CR — FORMAT 2

(2) Judgment Output Lower Limit Value is set to “-123.456789”.

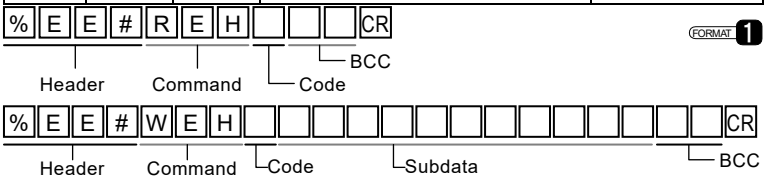
Request: % E E # W L L 3 − 1 2 3 . 4 5 6 7 8 9 * * CR — FORMAT 4

Response: % E E $ W L L * * CR — FORMAT 9

2-1-17 Judgment Output Upper Limit Hysteresis: REH/WEH

WEH and REH respectively specify and load the setting of upper limit hysteresis of judgment output for each OUT.

Command		Code	Setting value	Least input increment
Read	Setting			
REH	WEH	3/4	+000.000000 to +950.000000[mm]	0.000001[mm]



FORMAT 4

Ex

(1) Setting value of Judgment Output Upper Limit Hysteresis is loaded.

Request: % E E # R E H 3 * * CR FORMAT 1

Response: % E E $ R E H + 0 0 1 . 0 0 0 0 0 0 * * CR FORMAT 2

(2) Judgment Output Upper Limit Hysteresis is set to “+123.123456”.

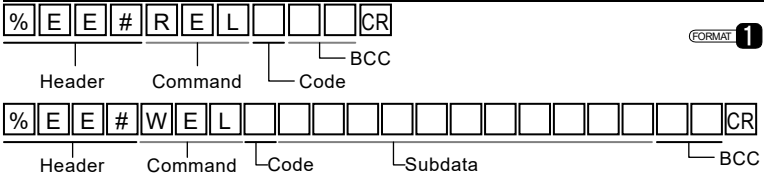
Request: % E E # W E H 3 + 1 2 3 . 1 2 3 4 5 6 * * CR FORMAT 4

Response: % E E $ W E H * * CR FORMAT 9

2-1-18 Judgment Output Lower Limit Hysteresis: REL/WEL

WEL and REL respectively specify and load the setting of lower limit hysteresis of judgment output for each OUT.

Command		Code	Setting value	Least input increment
Read	Setting			
REL	WEL	3/4	+000.000000 to +950.000000[mm]	0.000001[mm]



FORMAT 4

Ex

(1) Setting value of Judgment Output Lower Limit Hysteresis is loaded.

Request: % E E # R E L 3 * * CR FORMAT 1

Response: % E E $ R E L + 0 0 1 . 0 0 0 0 0 0 * * CR FORMAT 2

(2) Judgment Output Lower Limit Hysteresis is set to “+123.123456”.

Request: % E E # W E L 3 + 1 2 3 . 1 2 3 4 5 6 * * CR FORMAT 4

Response: % E E $ W E L * * CR FORMAT 9

2-1-19 Analog Scaling Measurement Value A: RAH/WAH

WAH and RAH respectively specify and load the setting of analog scaling measurement value A.

For the execution procedures of analog scaling, refer to ➔ "2-1-20 Execute Analog Scaling: WAS".

Command		Code	Setting value	Least input increment
Read	Setting			
RAH	WAH	3/4	-950.000000 to +950.000000[mm]	0.000001[mm]

% E E # R A H □ □ □ CR — FORMAT 1

Header — Command — Code — BCC

% E E # W A H □ □ □ □ □ □ □ □ □ □ □ □ □ □ CR — FORMAT 4

Header — Command — Code — Subdata — BCC

Ex

(1) Setting value of Analog Scaling Measurement Value A is loaded.

Request: % E E # R A H 3 * * CR — FORMAT 1

Response: % E E $ R A H + 0 0 5 . 0 0 0 0 0 0 * * CR — FORMAT 2

(2) Analog Scaling Measurement Value A is set to "100".

Request: % E E # W A H 3 + 1 0 0 . 0 0 0 0 0 0 * * CR — FORMAT 4

Response: % E E $ W A H * * CR — FORMAT 9

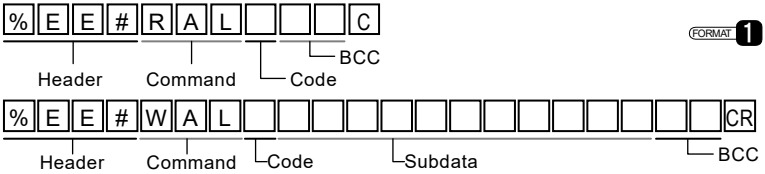
2

2-1-20 Analog Scaling Measurement Value B: RAL/WAL

WAL and RAL respectively specify and load the setting of analog scaling measurement value B.

For the execution procedures of analog scaling, refer to ➔ "2-1-20 Execute Analog Scaling: WAS".

Command		Code	Setting value	Least input increment
Read	Setting			
RAL	WAL	3/4	-950.000000 to +950.000000[mm]	0.000001[mm]



FORMAT 1

FORMAT 4

Ex

(1) Setting value of Analog Scaling Measurement Value B is loaded.

Request: % E E # R A L 3 * * CR FORMAT 1

Response: % E E $ R A L − 0 0 5 . 0 0 0 0 0 0 * * CR FORMAT 2

(2) Analog Scaling Measurement Value B is set to "-100".

Request: % E E # W A L 3 − 1 0 0 . 0 0 0 0 0 0 * * CR FORMAT 4

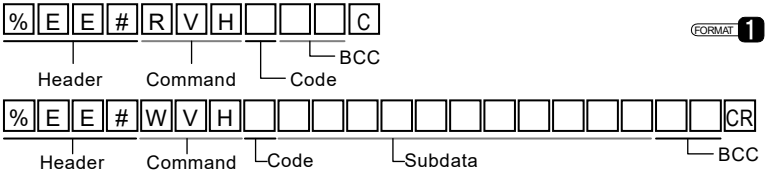
Response: % E E $ W A L * * CR FORMAT 9

2-1-21 Analog Scaling Voltage a: RVH/WVH

WVH and RVH respectively specify and load the setting of analog scaling voltage a.

For the execution procedures of analog scaling, refer to ➔ "2-1-20 Execute Analog Scaling: WAS".

Command		Code	Setting value	Least input increment
Read	Setting			
RVH	WVH	3/4	-010.000000 to +010.000000[V]	0.001



FORMAT 1

FORMAT 4

Ex

(1) Setting value of Analog Scaling Voltage a is loaded.

Request: % E E # R V H 3 * * CR FORMAT 1

Response: % E E $ R V H + 0 0 5 . 0 0 0 0 0 0 * * CR FORMAT 2

(2) Analog Scaling Voltage a is set to “8[V]”.

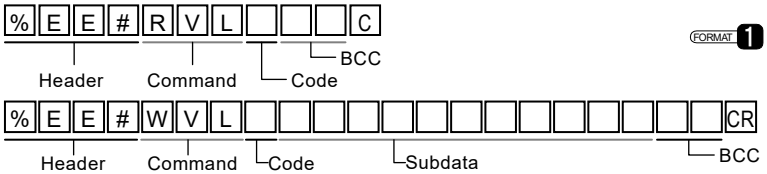
Request: % E E # W V H 3 + 0 0 8 . 0 0 0 0 0 0 * * CR FORMAT 4
Response: % E E $ W V H * * CR FORMAT 9

2-1-22 Analog Scaling Voltage b: RVL/WVL

WVL and RVL respectively specify and load the setting of analog scaling voltage b.

For the execution procedures of analog scaling, refer to ➔ “2-1-20 Execute Analog Scaling: WAS”.

Command		Code	Setting value	Least input increment
Read	Setting			
RVL	WVL	3/4	-010.000000 to +010.000000[V]	0.001



FORMAT 4

Ex

(1) Setting value of Analog Scaling Voltage b is loaded.

Request: % E E # R V L 3 * * CR FORMAT 1
Response: % E E $ R V L − 0 0 5 . 0 0 0 0 0 0 * * CR FORMAT 2

(2) Analog Scaling Voltage b is set to “-8[V]”.

Request: % E E # W V L 3 − 0 0 8 . 0 0 0 0 0 0 * * CR FORMAT 4
Response: % E E $ W V L * * CR FORMAT 9

2-1-23 Execute Analog Scaling: WAS

WAS executes respective analog scaling.

Measurement value A[mm]= a[V], Measurement value B[mm]=b[V]
Set appropriate voltage to any two points A and B.

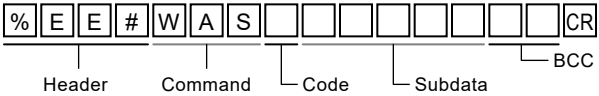
Execution procedures of analog scaling

1. Set Measurement Value A. Refer to ➔ "2-1-16".
2. Set Measurement Value B. Refer to ➔ "2-1-17".
3. Set Voltage a. Refer to ➔ "2-1-18".
4. Set Voltage b. Refer to ➔ "2-1-19".
5. Execute analog scaling by the WAS command.

CHECK

When analog scaling will be aborted during the procedures due to an abnormality such as communication error, make sure to transmit "Cancel" of the command.

Command		Code	Subdata	Description
Read	Setting			
-	WAS	3/4	00000	No command
			00001	Execution
			00002	Cancel



FORMAT 3

Ex

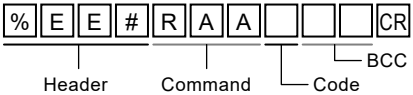
Analog Scaling is executed.

Request: % E E # W A S 3 0 0 0 0 1 * * CR FORMAT 3
Response: % E E $ W A S * * CR FORMAT 9

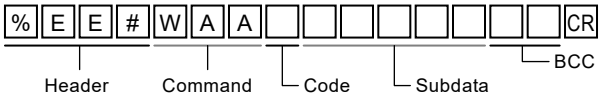
2-1-24 Analog Output at Alarm: RAA/WAA

WAA and RAA respectively specify and load the setting of analog output at alarm for each OUT.

Command		Code	Subdata	Description
Read	Setting			
RAA	WAA	3/4	00000	Hold Previous Value
			00001	Fixed Value



FORMAT 1



FORMAT 3

Ex

(1) Setting value of Analog Output at Alarm is loaded.

Request: % E E # R A A 3 * * CR — FORMAT 1
Response: % E E $ R A A 0 0 0 0 0 * * CR — FORMAT 1

(2) Analog Output at Alarm is set to “Fixed Value”.

Request: % E E # W A A 3 0 0 0 0 1 * * CR — FORMAT 3
Response: % E E $ W A A * * CR — FORMAT 9

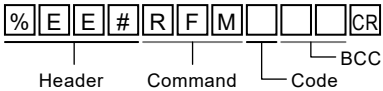
2

2-1-25 Analog Output at Alarm/ Fixed Value: RFM/WFM

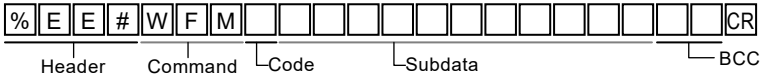
WFM and RFM respectively specify and load the setting of fixed value of analog output at alarm for each OUT.

The commands are available while “Fixed Value” is selected in “Analog Output at Alarm”.

Command		Code	Setting value	Least input increment
Read	Setting			
RFM	WFM	3/4	-010.800000 to +010.800000[V]	0.001[V]



FORMAT 1



FORMAT 4

Ex

(1) Fixed value of Analog Output at Alarm is loaded.

Request: % E E # R F M 3 * * CR — FORMAT 1
Response: % E E $ R F M + 0 1 0 . 8 0 0 0 0 0 * * CR — FORMAT 2

(2) Analog Output at Alarm is set to “+1.5[V]”.

Request: % E E # W F M 3 + 0 0 1 . 5 0 0 0 0 0 * * CR — FORMAT 4
Response: % E E $ W F M * * CR — FORMAT 9

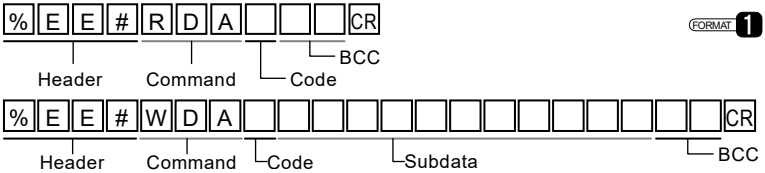
2

2-1-26 Analog Output at Data Unfixed: RDA/WDA

WDA and RDA respectively specify and load the setting of analog output at data unfixed for each OUT.

Analog output at data unfixed can be specified arbitrarily. The digital measurement value at data unfixed is “-999.999999”.

Command		Code	Setting value	Least input increment
Read	Setting			
RDA	WDA	3/4	-010.800000 to +010.800000[V]	0.001[V]



Ex

(1) Setting value of Analog Output at Data Unfixed is loaded.

Request: % E E # R D A 3 * * CR FORMAT 1

Response: % E E $ R D A − 0 1 0 . 8 0 0 0 0 0 * * CR FORMAT 2

(2) Analog Output at Data Unfixed is set to “-1.5[V]”.

Request: % E E # W D A 3 − 0 0 1 . 5 0 0 0 0 0 * * CR FORMAT 4

Response: % E E $ W D A * * CR FORMAT 9

2-1-27 Digital Output at Alarm: RAD/WAD

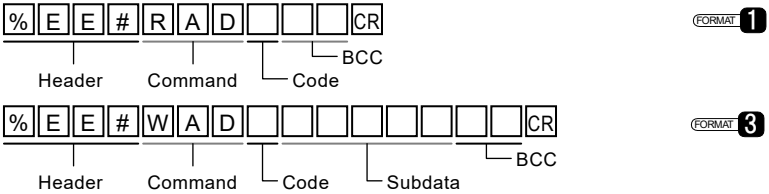
WAD and RAD respectively specify and load the setting of digital output at alarm for each OUT.

It is the setting related to digital output at alarm.

When “Fixed Value” is selected, the setting value is “+999.999999”.

When “Hold Previous Value” is selected, the value previously held at normal status is displayed.

Command		Code	Subdata	Description
Read	Setting			
RAD	WAD	3/4	00000	Hold Previous Value
			00001	Fixed Value



Ex

(1) Setting of Digital Output at Alarm is loaded.

Request: % E E # R A D 3 * * CR FORMAT 1
Response: % E E $ R A D 0 0 0 0 1 * * CR FORMAT 1

(2) Digital Output at Alarm is set to “Hold Previous Value”.

Request: % E E # W A D 3 0 0 0 0 0 * * CR FORMAT 3
Response: % E E $ W A D * * CR FORMAT 9

2-1-28 Alarm Output Delay: RAC/WAC

WAC and RAC respectively specify and load the setting of alarm output delay for each OUT.

While the setting is OFF, an alarm is output to the alarm output terminal in real time at alarm, regardless of the setting in “Alarm Delay Times”.

Command		Code	Subdata	Description
Read	Setting			
RAC	WAC	3/4	00000	OFF
			00001	ON

% E E # R A C □ □ □ CR FORMAT 1
Header Command Code BCC

% E E # W A C □ □ □ □ □ □ □ □ CR FORMAT 3
Header Command Code Subdata BCC

Ex

(1) Setting of Alarm Output Delay is loaded.

Request: % E E # R A C 3 * * CR FORMAT 1
Response: % E E $ R A C 0 0 0 0 1 * * CR FORMAT 1

(2) Alarm Output Delay is set to “OFF”.

Request: % E E # W A C 3 0 0 0 0 0 * * CR FORMAT 3
Response: % E E $ W A C * * CR FORMAT 9

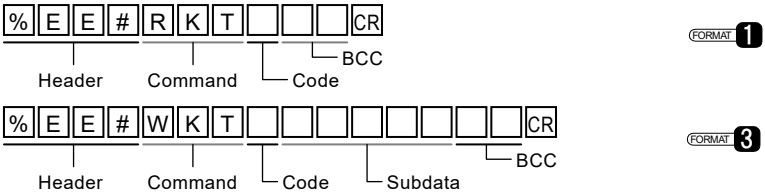
2

2-1-29 Digit Number of Measurement Value: RKT/WKT

WKT and RKT respectively specify and load the setting of digit number of measurement value displayed on the compact console for each OUT.

The command specifies the number of digits displayed after decimal point on the compact console at the measurement using the measurement value that consists of "1-character symbol + 3-character integral part + decimal point + 5-character decimal part". The setting has six choices shown below.

Command		Code	Subdata	Description
Read	Setting			
RKT	WKT	3/4	00000	6 Decimal Places
			00001	5 Decimal Places
			00002	4 Decimal Places
			00003	3 Decimal Places
			00004	2 Decimal Places
			00005	1 Decimal Place



Ex

(1) Setting of Digit Number of Measurement Value on the compact console is loaded.

Request: % E E # R K T 3 * * CR FORMAT 1

Response: % E E $ R K T 0 0 0 0 1 * * CR FORMAT 1

(2) Digit Number of Measurement Value on the compact console is set to "3 Decimal Places".

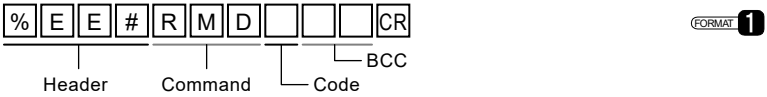
Request: % E E # W K T 3 0 0 0 0 3 * * CR FORMAT 3

Response: % E E $ W K T * * CR FORMAT 9

2-1-30 Measurement Value: RMD

RMD loads the measurement value for each OUT.

Command		Code	Setting value	Least input increment
Read	Setting			
RMD	-	3/4	-999.999999 to +999.999999[mm]	0.000001[mm]



Ex

Setting value of OUT1 Measurement Value is loaded.

Request: % E E # R M D 3 * * CR FORMAT 1
Response: % E E $ R M D + 1 2 3 . 4 5 6 7 8 9 * * CR FORMAT 2

2-1-31 Alarm Output: ROA

ROA loads the status of alarm output for each OUT.

Command		Code	Subdata	Description
Read	Setting			
ROA	—	3/4	00000	No alarm output (OFF)
			00001	Measurement alarm output
			00005	Sensor head A unconnected
			00006	Connection head unadapted
			00007	Head connection check error

% E E # R O A ☐ ☐ ☐ CR

Header — Command — Code — BCC

Ex

Status of Alarm Output is loaded.

Request: % E E # R O A 3 * * CR FORMAT 1
Response: % E E $ R O A 0 0 0 0 1 * * CR FORMAT 3

2-1-32 Strobe Output: ROB

ROB loads the status of strobe output for each OUT.

Command		Code	Subdata	Description
Read	Setting			
ROB	—	3/4	00000	No strobe output (OFF)
			00001	Strobe output (ON)

% E E # R O B ☐ ☐ ☐ CR FORMAT 1

Header — Command — Code — BCC

Ex

Status of Strobe Output is loaded.

Request: % E E # R O B 3 * * CR FORMAT 1
Response: % E E $ R O B 0 0 0 0 1 * * CR FORMAT 1

2-1-33 Judgment Output HI: RHI

RHI loads the status of judgment output HI for each OUT.

Command		Code	Subdata	Description
Read	Setting			
RHI	–	3/4	00000	No output (OFF)
			00001	Output (ON)

%	E	E	#	R	H	I				CR

Header — Command — Code — BCC

FORMAT 1

Ex

Status of Judgment Output HI is loaded.

Request: | % | E | E | # | R | H | I | 3 | * | * | CR | FORMAT 1

Response: | % | E | E | $ | R | H | I | 0 | 0 | 0 | 0 | 0 | * | * | CR | FORMAT 1

2-1-34 Judgment Output GO: RGO

RGO loads the status of judgment output GO for each OUT.

Command		Code	Subdata	Description
Read	Setting			
RGO	–	3/4	00000	No output (OFF)
			00001	Output (ON)

%	E	E	#	R	G	O				CR

Header — Command — Code — BCC

FORMAT 1

Ex

Status of Judgment Output GO is loaded.

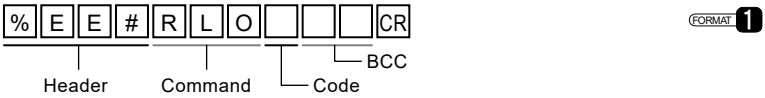
Request: | % | E | E | # | R | G | O | 3 | * | * | CR | FORMAT 1

Response: | % | E | E | $ | R | G | O | 0 | 0 | 0 | 0 | 1 | * | * | CR | FORMAT 1

2-1-35 Judgment Output LO: RLO

RLO loads the status of judgment output LO for each OUT.

Command		Code	Subdata	Description
Read	Setting			
RLO	–	3/4	00000	No output (OFF)
			00001	Output (ON)



Ex

Status of Judgment Output LO is loaded.

Request: % E E # R L O 3 * * CR FORMAT 1

Response: % E E $ R L O 0 0 0 0 0 * * CR FORMAT 1

MEMO

3

Common Command

This chapter explains the commands for function settings common in Head setting and OUT setting.

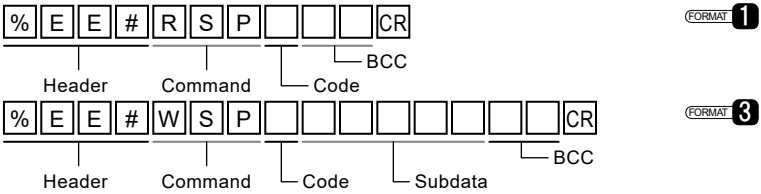
3-1 Explanation of Common Command ..... 3−2
3-1-1 Sampling Cycle: RSP/WSP ..... 3−2
3-1-2 Terminal Input Control: RIM/WIM ..... 3−3
3-1-3 Chattering Prevention for Terminal Input: RIC/WIC ..... 3−3
3-1-4 Judgment Output Off Delay: ROF/WOF ... 3−4
3-1-5 Interference Prevention: RXT/WXT ..... 3−5
3-1-6 2 Output Measurement Value: RMA ..... 3−5
3-1-7 All Output Read: RMB ..... 3−6

3-1 Explanation of Common Command

3-1-1 Sampling Cycle: RSP/WSP

WSP and RSP respectively specify and load the setting of sampling cycle.

Command		Code	Subdata	Description
Read	Setting			
RSP	WSP	5	00000	10 [μs]
			00001	20 [μs]
			00002	40 [μs]
			00003	100 [μs]
			00004	200 [μs]
			00005	400 [μs]
			00006	1 [ms]
			00007	2 [ms]



Ex

(1) Setting of Sampling Cycle is loaded.

Request: % E E # R S P 5 * * CR FORMAT 1

Response: % E E $ R S P 0 0 0 0 2 * * CR FORMAT 1

(2) Sampling Cycle is set to “2[ms]”.

Request: % E E # W S P 5 0 0 0 0 7 * * CR FORMAT 3

Response: % E E $ W S P * * CR FORMAT 9

CHECK

If this setting is changed between 10μs ↔ 20μs or above, the USB of the controller will be reset. To continuously use the USB device after such changes, reconnect following the USB device Close and Open procedures.

REFERENCE

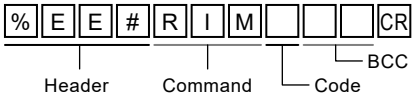
USB Close Function : HLC2_Close()

USB Open Function : HLC2_OpenByIndex(), HLC2_Open()

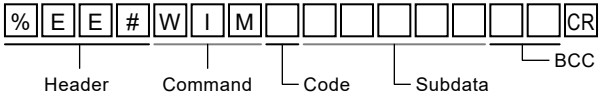
3-1-2 Terminal Input Control: RIM/WIM

WIM and RIM respectively specify and load the setting of terminal input control.

Command		Code	Subdata	Description
Read	Setting			
RIM	WIM	5	00000	Independent
			00001	All



FORMAT 1



FORMAT 3

Ex

(1) Setting of Terminal Input Control is loaded.

Request: % E E # R I M 5 * * CR FORMAT 1

Response: % E E $ R I M 0 0 0 0 0 * * CR FORMAT 1

(2) Terminal Input Control is set to “All”.

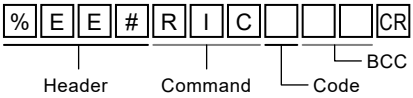
Request: % E E # W I M 5 0 0 0 0 1 * * CR FORMAT 3

Response: % E E $ W I M * * CR FORMAT 9

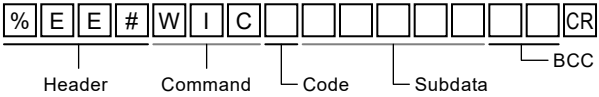
3-1-3 Chattering Prevention for Terminal Input: RIC/WIC

WIC and RIC respectively specify and load the setting of chattering prevention for terminal input.

Command		Code	Subdata	Description
Read	Setting			
RIC	WIC	5	00000	OFF
			00001	ON1
			00002	ON2



FORMAT 1



FORMAT 3

Ex

(1) Setting of Chattering Prevention for Terminal Input is loaded.

Request: % E E # R I C 5 * * CR FORMAT 1

Response: % E E $ R I C 0 0 0 0 1 * * CR FORMAT 1

(2) Chattering Prevention for Terminal Input is set to “OFF”.

Request: % E E # W I C 5 0 0 0 0 0 * * CR FORMAT 3

Response: % E E $ W I C * * CR FORMAT 9

3-1-4 Judgment Output Off Delay: ROF/WOF

WOF and ROF respectively specify and load the setting of judgment output off delay.

Command		Code	Subdata	Description
Read	Setting			
ROF	WOF	5	00000	OFF
			00001	2ms
			00002	10ms
			00003	100ms
			00004	Hold

% E E # R O F ☐ ☐ ☐ CR FORMAT 1

Header — Command — Code — BCC

% E E # W O F ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ CR FORMAT 3

Header — Command — Code — Subdata — BCC

Ex

(1) Setting of Judgment Output Off Delay is loaded.

Request: % E E # R O F 5 * * CR FORMAT 1

Response: % E E $ R O F 0 0 0 0 2 * * CR FORMAT 1

(2) Judgment Output Off Delay is set to “2[ms]”.

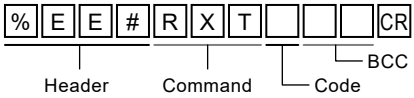
Request: % E E # W O F 5 0 0 0 0 1 * * CR FORMAT 3

Response: % E E $ W O F * * CR FORMAT 9

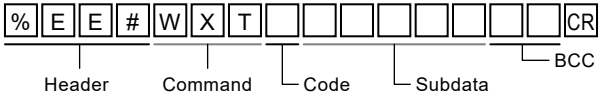
3-1-5 Interference Prevention: RXT/WXT

WXT and RXT respectively specify and load the setting of interference Prevention.

Command		Code	Subdata	Description
Read	Setting			
RXT	WXT	5	00000	OFF
			00001	ON



FORMAT 1



FORMAT 3

Ex

(1) Setting of Interference Prevention is loaded.

Request: % E E # R X T 5 * * CR FORMAT 1

Response: % E E $ R X T 0 0 0 0 0 * * CR FORMAT 1

(2) Interference Prevention is set to “ON”.

Request: % E E # W X T 5 0 0 0 0 1 * * CR FORMAT 3

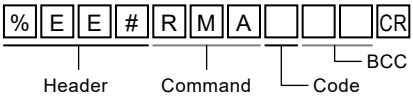
Response: % E E $ W X T * * CR FORMAT 9

3-1-6 2 Output Measurement Value: RMA

RMA loads the measurement value of OUT1 and OUT2 at the same time.

Use the RMD command to separately load the measurement value for OUT1 and OUT2. ➔“2-1-27 Measurement Value: RMD”.

Command		Code	Subdata	Description
Read	Setting			
RMA	-	5	-	-999.999999 to +999.999999[mm] Measurements simultaneous reading of OUT1 / OUT2.



FORMAT 1

Ex

(1) Measurement value of OUT1 and OUT2 are loaded at the same time.

Request: % E E # R M A 5 * * CR FORMAT 1

Response: % E E # R M A + 1 2 3 . 4 5 6 7 8 9 - 1 2

3 . 4 5 6 7 8 9 * * CR FORMAT 4

3-1-7 All Output Read: RMB

RMB loads the status of all terminal outputs simultaneously.

Command		Code	Subdata	Description
Read	Setting			
RMB	-	5	-	All Output Read

% E E # R M B ☐ ☐ ☐ CR FORMAT 1

Header: % E E #
Command: R M B
Code: ☐
BCC: ☐ ☐

Ex

All terminal outputs are loaded simultaneously.

Request: % E E # R M B 5 * * CR FORMAT 1

Response: % E E # R M B + 1 2 3 . 4 5 6 7 8 9 0 1 0
0 1 0 - 1 2 3 . 4 5 6 7 8 9 1 0 0 1 0 1 *
* CR FORMAT 5

4

System Command

This chapter explains various commands for function settings regarding the system of equipment, such as initialization, save and communication settings.

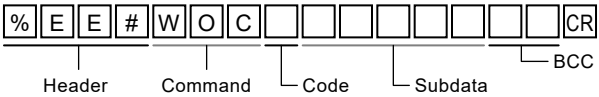
4-1 Explanation of System Command ····· 4–2
4-1-1 Copy Output Setting: WOC ····· 4–2
4-1-2 Priority Setting of Memory Change: RYU/WYU ····· 4–2
4-1-3 Memory Change: RMC/WMC ····· 4–3
4-1-4 Copy Source Memory: WSF ····· 4–3
4-1-5 Copy Destination Memory: WDF ····· 4–4
4-1-6 Memory Copy: WCF ····· 4–4
4-1-7 Initialize: WIN ····· 4–5
4-1-8 Save: WWR ····· 4–5
4-1-9 RS-232C Baud Rate: RSA/WSA ····· 4–6
4-1-10 RS-232C Data Length: RSB/WSB ····· 4–6
4-1-11 RS-232C Parity Check: RSC/WSC ····· 4–7
4-1-12 RS-232C Output Mode: RSD/WSD ····· 4–8
4-1-13 RS-232C Output Type: RSE/WSE ····· 4–8
4-1-14 Display Update Cycle of Measurement Value: RKS/WKS ····· 4–9
4-1-15 Change Indication Unit: RUT/WUT ····· 4–10
4-1-16 Console Start-up Screen: RKG/WKG ····· 4–11
4-1-17 Console Panel Lock: RPL/WPL ····· 4–12

4-1 Explanation of System Command

4-1-1 Copy Output Setting: WOC

WOC copies the setting of OUT1 or OUT2 to the other OUT.
In the memory No. selected in "Memory Change", the command copies the setting of OUT to the other (from OUT1 to OUT2 or from OUT2 to OUT1). However, Zero Set, Timing and Reset are not copied.

Command		Code	Subdata	Description
Read	Setting			
-	WOC	0	00000	No command
			00001	Copy Output 1 to Output 2.
			00002	Copy Output 2 to Output 1.



FORMAT 3

Ex

Setting of OUT1 is copied to OUT2.

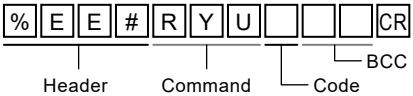
Request: % E E # W O C 0 0 0 0 0 1 * * CR FORMAT 3

Response: % E E $ W O C * * CR FORMAT 9

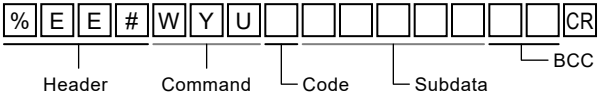
4-1-2 Priority Setting of Memory Change: RYU/WYU

WYU and RYU respectively specify and load the setting of Priority Setting of Memory Change.

Command		Code	Subdata	Description
Read	Setting			
RYU	WYU	0	00000	Command
			00001	Terminal



FORMAT 1



FORMAT 3

Ex

(1) Setting of Priority Setting of Memory Change is loaded.

Request: % E E # R Y U 0 * * CR FORMAT 1

Response: % E E $ R Y U 0 0 0 0 0 * * CR FORMAT 1

(2) Priority Setting of Memory Change is set to "Terminal".

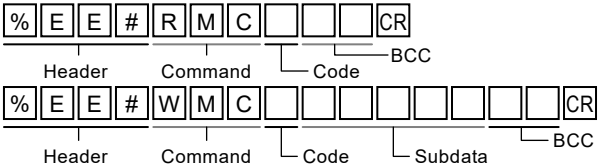
Request: % E E # W Y U 0 0 0 0 0 1 * * CR FORMAT 3

Response: % E E $ W Y U * * CR FORMAT 9

4-1-3 Memory Change: RMC/WMC

WMC and RMC respectively specify and load the setting of Memory Change.
Up to 16 settings can be saved.

Command		Code	Subdata	Description
Read	Setting			
RMC	WMC	0	00000 to 00015	Memory No.



FORMAT 1

FORMAT 3

Ex

(1) The memory No. currently set is loaded.

Request: % E E # R M C 0 * * CR — FORMAT 1

Response: % E E $ R M C 0 0 0 0 0 * * CR — FORMAT 1

(2) Memory Change is set to "No.1".

Request: % E E # W M C 0 0 0 0 0 1 * * CR — FORMAT 3

Response: % E E $ W M C * * CR — FORMAT 9

CHECK

If a memory switchover which changes the sampling cycle setting to more than 10μs ↔ 20μs is executed, the USB of the controller will be reset. To continuously use the USB device after such a memory switchover, reconnect following the USB device Close and Open procedures.

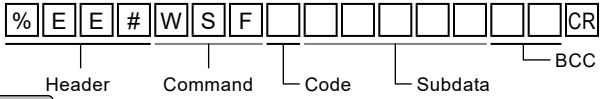
REFERENCE

USB Close Function : HLC2_Close()
USB Open Function : HLC2_OpenByIndex(), HLC2_Open()

4-1-4 Copy Source Memory: WSF

WSF specifies the memory number of copy source.
For the memory copy procedures, refer to ➔ "4-1-6 Memory Copy: WCF".

Command		Code	Subdata	Description
Read	Setting			
-	WSF	0	00000 to 00015	Memory No.



FORMAT 3

Ex

Copy Source Memory is set to "No.1".

Request: % E E # W S F 0 0 0 0 0 1 * * CR — FORMAT 3

Response: % E E $ W S F * * CR — FORMAT 9

4-1-5 Copy Destination Memory: WDF

WDF specifies the memory number of copy destination.

For the memory copy procedures, refer to ➔ “4-1-6 Memory Copy: WCF”.

Command		Code	Subdata	Description
Read	Setting			
-	WDF	0	00000 to 00015	Memory No.

%	E	E	#	W	D	F									CR

Header — Command — Code — Subdata — BCC

FORMAT 3

Ex

Copy Destination Memory is set to “No.2”.

Request: % E E # W D F 0 0 0 0 0 2 * * CR (FORMAT 3)

Response: % E E $ W D F * * CR (FORMAT 9)

4-1-6 Memory Copy: WCF

4

WCF copies the memory.

Copy Source Memory and Copy Destination Memory are required to be specified.

Memory copy procedures

1. Set the memory No. of copy source. Refer to ➔ “4-1-4”.
2. Set the memory No. of copy destination. Refer to ➔ “4-1-5.
3. Execute memory copy by the WCF command.

Command		Code	Subdata	Description
Read	Setting			
-	WCF	0	00000	No command
			00001	Execute Memory Copy

%	E	E	#	W	C	F									CR

Header — Command — Code — Subdata — BCC

FORMAT 3

Ex

Memory Copy is executed.

Request: % E E # W C F 0 0 0 0 0 1 * * CR (FORMAT 3)

Response: % E E $ W C F * * CR (FORMAT 9)

CHECK

If a memory copy which changes the sampling cycle setting to more than 10μs ↔ 20μs is executed on the currently specified memory, the USB of the controller will be reset. To continuously use the USB device after such a memory copy, reconnect following the USB device Close and Open procedures.

REFERENCE

USB Close Function : HLC2_Close()

USB Open Function : HLC2_OpenByIndex(), HLC2_Open()

4-1-7 Initialize: WIN

WIN initializes the memory.
The command resets the status of selected memory No. to factory default.
For the detail of "Selected Memory No.", refer to ➔ "4-1-3 Memory Change: RMC/WMC".

Command		Code	Subdata	Description
Read	Setting			
-	WIN	0	00000	No command
			00001	Initialize Selected Memory
			00002	Initialize All Memory

%	E	E	#	W	I	N								CR

Header Command Code Subdata BCC

FORMAT 3

Ex

All memory is initialized.

Request: % E E # W I N 0 0 0 0 0 2 * * CR FORMAT 3

Response: % E E $ W I N * * CR FORMAT 9

CHECK

If the setting initialization is executed while the sampling cycle of the controller is set to 10μs, the USB of the controller will be reset. To continuously use the USB device after the setting initialization, reconnect following the USB device Close and Open procedures.

REFERENCE

USB Close Function : HLC2_Close()

USB Open Function : HLC2_OpenByIndex(), HLC2_Open()

4-1-8 Save: WWR

WWR saves the memory.
The command saves all memory.

Command		Code	Subdata	Description
Read	Setting			
-	WWR	0	00000	No command
			00001	Save All Memory

%	E	E	#	W	W	R								CR

Header Command Code Subdata BCC

FORMAT 3

Ex

Memory save is executed.

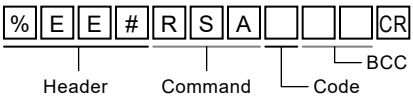
Request: % E E # W W R 0 0 0 0 0 1 * * CR FORMAT 3

Response: % E E $ W W R * * CR FORMAT 9

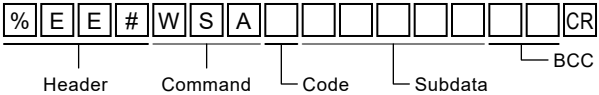
4-1-9 RS-232C Baud Rate: RSA/WSA

WSA and RSA respectively specify and load the setting of baud rate in RS-232C.

Command		Code	Subdata	Description
Read	Setting			
RSA	WSA	0	00000	9600[bps]
			00001	19200[bps]
			00002	38400[bps]
			00003	115200[bps]



FORMAT 1



FORMAT 3

4

Ex

(1) Setting of RS-232C Baud Rate is loaded.

Request: % E E # R S A 0 * * CR — FORMAT 1

Response: % E E $ R S A 0 0 0 0 3 * * CR — FORMAT 1

(2) RS-232C Baud Rate is set to “9600[bps]”.

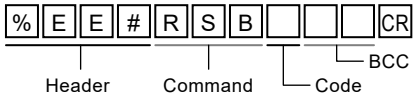
Request: % E E # W S A 0 0 0 0 0 0 * * CR — FORMAT 3

Response: % E E $ W S A * * CR — FORMAT 9

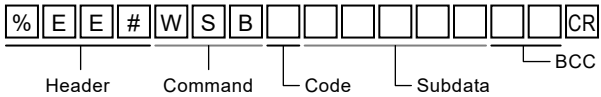
4-1-10 RS-232C Data Length: RSB/WSB

WSB and RSB respectively specify and load the setting of data length in RS-232C.

Command		Code	Subdata	Description
Read	Setting			
RSB	WSB	0	00000	7-bit
			00001	8-bit



FORMAT 1



FORMAT 3

Ex

(1) Setting of RS-232C Data Length is loaded.

Request: % E E # R S B 0 * * CR FORMAT 1

Response: % E E $ R S B 0 0 0 0 1 * * CR FORMAT 1

(2) RS-232C Data Length is set to “7-bit”.

Request: % E E # W S B 0 0 0 0 0 0 * * CR FORMAT 3

Response: % E E $ W S B * * CR FORMAT 9

4-1-11 RS-232C Parity Check: RSC/WSC

WSC and RSC respectively specify and load the setting of parity check in RS-232C communication.

Command		Code	Subdata	Description
Read	Setting			
RSC	WSC	0	00000	Even
			00001	Odd
			00002	None

% E E # R S C ☐ ☐ ☐ CR FORMAT 1

Header: % E E #; Command: R S C; Code: ☐; BCC: ☐ ☐ CR

% E E # W S C ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ CR FORMAT 3

Header: % E E #; Command: W S C; Code: ☐; Subdata: ☐ ☐ ☐ ☐ ☐ ☐; BCC: ☐ ☐ CR

Ex

(1) Setting of RS-232C Parity Check is loaded.

Request: % E E # R S C 0 * * CR FORMAT 1

Response: % E E $ R S C 0 0 0 0 2 * * CR FORMAT 1

(2) RS-232C Parity Check is set to “Even”.

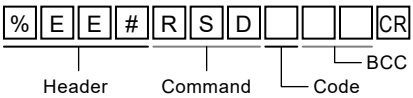
Request: % E E # W S C 0 0 0 0 0 0 * * CR FORMAT 3

Response: % E E $ W S C * * CR FORMAT 9

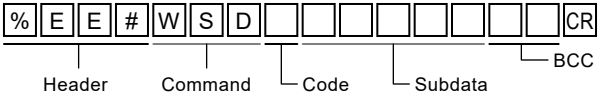
4-1-12 RS-232C Output Mode: RSD/WSD

WSD and RSD respectively specify and load the setting of output mode in RS-232C communication.

Command		Code	Subdata	Description
Read	Setting			
RSD	WSD	0	00000	Handshake
			00001	Timing
			00002	Continuous



FORMAT 1



FORMAT 3

Ex

(1) Setting of RS-232C Output Mode is loaded.

Request: % E E # R S D 0 * * CR FORMAT 1

Response: % E E $ R S D 0 0 0 0 0 * * CR FORMAT 1

(2) RS-232C Output Mode is set to “Continuous”.

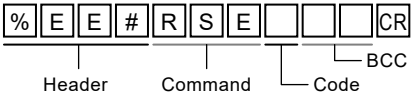
Request: % E E # W S D 0 0 0 0 0 2 * * CR FORMAT 3

Response: % E E $ W S D * * CR FORMAT 9

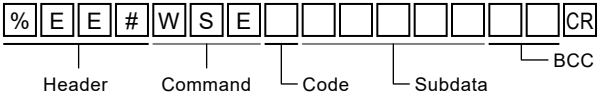
4-1-13 RS-232C Output Type: RSE/WSE

WSE and RSE respectively specify and load the setting of output type in RS-232C communication.

Command		Code	Subdata	Description
Read	Setting			
RSE	WSE	0	00000	OUT1&OUT2
			00001	OUT1 only
			00002	OUT2 only



FORMAT 1



FORMAT 3

Ex

(1) Setting of RS-232C Output Type is loaded.

Request: % E E # R S E 0 * * CR FORMAT 1

Response: % E E $ R S E 0 0 0 0 0 * * CR FORMAT 1

(2) RS-232C Output Type is set to “OUT2 only”.

Request: % E E # W S E 0 0 0 0 0 2 * * CR FORMAT 3

Response: % E E $ W S E * * CR FORMAT 9

4-1-14 Display Update Cycle of Measurement Value: RKS/WKS

WKS and RKS respectively specify and load the setting of display update cycle of measurement value on the compact console.

The update cycle of measurement value on the compact console is selectable from the four stages of rate.

Command		Code	Subdata	Description
Read	Setting			
RKS	WKS	0	00000	Fast
			00001	Standard
			00002	Slow
			00003	Very Slow

% E E # R K S ☐ ☐ ☐ CR FORMAT 1

Header: % E E # — Command: R K S — Code: ☐ ☐ — BCC: ☐ CR

% E E # W K S ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ CR FORMAT 3

Header: % E E # — Command: W K S — Code: ☐ ☐ — Subdata: ☐ ☐ ☐ ☐ — BCC: ☐ CR

Ex

(1) Setting of Display Update Cycle of Measurement Value is loaded.

Request: % E E # R K S 0 * * CR FORMAT 1

Response: % E E $ R K S 0 0 0 0 1 * * CR FORMAT 1

(2) Display Update Cycle of Measurement Value is set to “Very Slow”.

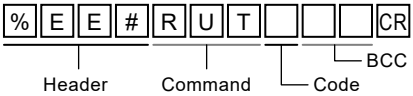
Request: % E E # W K S 0 0 0 0 0 3 * * CR FORMAT 3

Response: % E E $ W K S * * CR FORMAT 9

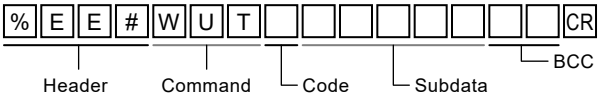
4-1-15 Change Indication Unit: RUT/WUT

WUT and RUT respectively specify and load the setting of change indication unit of measurement value.

Command		Code	Subdata	Description
Read	Setting			
RUT	WUT	0	00000	mm Unit
			00001	µm Unit



FORMAT 1



FORMAT 3

Ex

(1) Setting of Change Indication Unit is loaded.

Request: % E E # R U T 0 * * CR FORMAT 1

Response: % E E $ R U T 0 0 0 0 0 * * CR FORMAT 1

(2) Change Indication Unit is set to “µm Unit”.

Request: % E E # W U T 0 0 0 0 0 1 * * CR FORMAT 3

Response: % E E $ W U T * * CR FORMAT 9

4-1-16 Console Start-up Screen: RKG/WKG

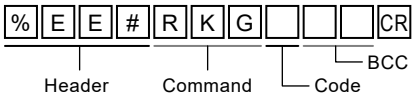
WKG and RKG respectively specify and load the setting of start-up screen on the compact console.

The setting command specifies the screen displayed after the Wake-Up screen on the compact console.

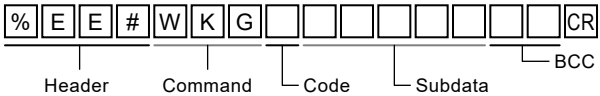
For the selectable screen, refer to ➔ "Console Setting" in "4-3-4 System Setting" of "HL-C2 Series USER'S MANUAL".

Command		Code	Subdata	Description
Read	Setting			
RKG	WKG	0	00000	OUT1 Display
			00001	OUT1 Operate
			00002	OUT2 Display
			00003	OUT2 Operate
			00004	OUT1&2 Display
			00005	Waveform(A)
			00006	Waveform(B)

Command		Code	Subdata	Description
Read	Setting			
RKG	WKG	0	00007	Top
			00008	Setting
			00009	Head A Menu
			00010	Head B Menu
			00011	OUT1 Menu
			00012	OUT2 Menu
			00013	Common Menu
			00014	System Menu
			00015	Measurement Value Menu



FORMAT 1



FORMAT 3

Ex

(1) Setting of Console Start-up Screen is loaded.

Request: % E E # R K G 0 * * CR FORMAT 1

Response: % E E $ R K G 0 0 0 0 0 * * CR FORMAT 1

(2) Console Start-up Screen is set to "OUT1 Operate".

Request: % E E # W K G 0 0 0 0 0 1 * * CR FORMAT 3

Response: % E E $ W K G * * CR FORMAT 9

4-1-17 Console Panel Lock: RPL/WPL

WPL and RPL respectively specify and load the setting of panel lock on the compact console.

Command		Code	Subdata	Description
Read	Setting			
RPL	WPL	0	00000	Panel Lock OFF (unlock)
			00001	Panel Lock ON

% E E # R P L ☐ ☐ ☐ CR FORMAT 1

Header: % E E #; Command: R P L; Code: ☐; BCC: ☐ ☐

% E E # W P L ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ CR FORMAT 3

Header: % E E #; Command: W P L; Code: ☐; Subdata: ☐ ☐ ☐ ☐ ☐; BCC: ☐ ☐

Ex

(1) Status of Console Panel Lock is loaded.

Request: % E E # R P L 0 * * CR FORMAT 1

Response: % E E $ R P L 0 0 0 0 0 * * CR FORMAT 1

(2) Console Panel Lock is set to “OFF” (unlock).

Request: % E E # W P L 0 0 0 0 0 0 * * CR FORMAT 3

Response: % E E $ W P L * * CR FORMAT 9

5

Buffering Command

This chapter explains various commands for function settings and execution of operation regarding data buffering.

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5-2-3 Buffering Type: RTT/WTT ····· 5-12
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5-1 Data Buffering Description

Buffering is the function that accumulates measurement data to the memory inside the controller and later loads them to external control devices.

The function can temporary accumulate up to 65,000 measurement data to the memory inside the controller before loading them to external control devices such as personal computers. All accumulated data can be loaded later by RS-232C/USB communication control or by the Intelligent Monitor AiM.

TECHNIQUE

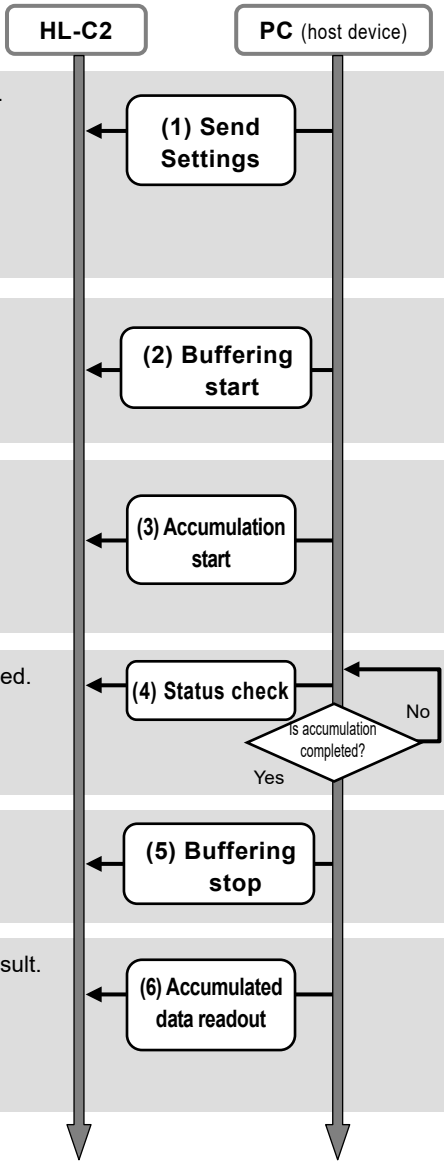
Use of the Intelligent Monitor AiM (option) is recommended to execute buffering. It makes accumulation and loading of measurement data easy by mouse operation. The measurement data can be saved, replayed and graphically displayed for data check and verification. They also can be saved in the CSV data format.

CHECK

Programs for buffering must be created by RS-232C/USB communication control. Use the sample program included in "our web site: https://panasonic.net/id/pidsx/global "to try to the basic buffering functions.

■ Data Buffering Procedures

Data buffering procedure



1 Perform necessary setting for buffering.
- · Buffering mode
- · Buffering type
- · Buffering rate
- · Accumulation amount
- · Sample trigger accumulation amount
- · Self-stop · Trigger conditions
- · Trigger delay · Trigger point

2 Transmit the start command and start buffering.
- · Buffering operation start

3 Start data accumulation.
Start accumulation to the controller memory.
*Start of accumulation differs depending on buffering mode.

4 Wait until accumulation is completed.
The accumulation status can be checked by "Status Readout".
- · Status Readout

5 Stop buffering by transmitting the stop command.
- · Buffering operation stop

6 Read out the accumulated data result.
- · Last data point
- · Data readout (normal)
- · Data readout (Rapid)
- · Trigger counter readout

CHECK

All the settings related to buffering cannot be changed during the buffering operation. Change the settings after buffering operation stops.

1. Send settings

This process configures the settings of buffering.

1 Select the self-stop.

This function stops the buffering operation automatically at completion of accumulation.

When the Self-stop function is set to ON (buffering operation is automatically stopped), stop input for buffering operation becomes unnecessary. This function is valid when the buffering mode is set to the continuous mode, trigger mode, or sample mode. This function is invalid when the timing mode is selected. When OUT1/OUT2 is set for the buffering type, this function operates immediately after completion of accumulation for OUT1/OUT2. When OUT1&OUT2 is selected, the self-stop function operates at completion of accumulation for both OUT1&OUT2.

(Command description ➔ "5-2-1 Self-stop: RSS/WSS")

2 Select the buffering mode.

Four types of buffering mode can be selected.

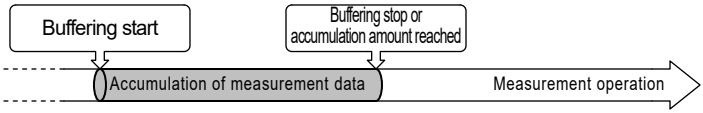
(Command description ➔ "5-2-2 Buffering Mode: RBD/WBD")

"Continuous Mode" is set as a default.

5

Continuous Mode

- Accumulation to the controller memory starts after buffering operation is initiated.
- The accumulation stops after the specified accumulation amount has been reached or buffering operation is stopped.

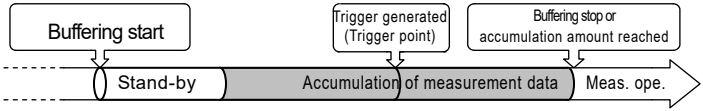


Trigger Mode

· When buffering operation starts, the trigger generation is turned to stand-by status.

· The measurement data before and after the trigger point where the trigger is generated is accumulated into the controller memory.

· Accumulation stops when the accumulation amount has reached the setting value or when buffering operation stops.

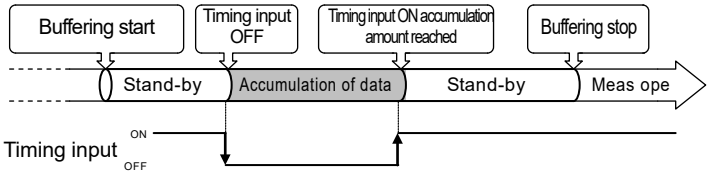


Timing Mode

• When buffering operation starts, the timing input is turned to stand-by status.

• Changing the timing input from "ON" to "OFF" during stand-by status starts data accumulation to the controller memory.

・Timing input stops when the accumulation amount has reached the setting value or when buffering operation stops.

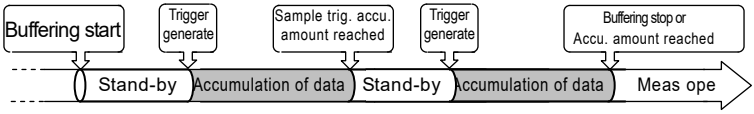


CHECK

Changing the timing input from "ON" to "OFF" again deletes the previous data and starts new data accumulation. Make sure to stop the buffering operation once and load/save the accumulated measurement data before performing the next accumulation.

Sample Trigger Mode

· When buffering operation starts, the trigger generation is turned to stand-by status.
· Accumulation of the measurement data for the setting sample trigger accumulation amount starts after the setting trigger condition is generated.
· After completion of sample trigger accumulation, the trigger generation is turned to stand-by status again.
(In this case, the status is indicated as "Accumulating".)
· When the setting trigger condition is generated again, accumulation of the setting sample trigger amount starts.
· Accumulation operation stops when the accumulation amount has reached the setting value or when buffering operation stops.



CHECK

Be sure to set the sample trigger accumulation amount so that (accumulation amount) ÷ (sample trigger accumulation amount) is an integer value.

3 Select the buffering type.

This function selects individual data accumulation or simultaneous data accumulation on OUT1 and OUT2.
(Command description ➔ "5-2-3 Buffering Type: RTT/WTT")
OUT1 is set as a default.

CHECK

The maximum accumulation data amount differs depending on buffering type.

4 Select the buffering rate.

The rate (interval) of data accumulation to sampling cycle can be adjusted to accumulate the measurement data for long period.
The rate can be selected from "1" (all measurement data) to "1/32768".
(When "1/4" is selected, measurement data is accumulated once in four sampling cycles.)

(Command description ➔ "5-2-4 Buffering Rate: RBR/WBR")

Ex The accumulated amount of data in case "OUT1" is specified in the "Buffering Type" with the sampling cycle of 40µs is shown below, depending of the setting in the "Buffering Rate".

1 ····· 65,000 data can be accumulated within approx. 2.6s.
1/32768 ····· One data is accumulated every 1.3s approximately. Approx. 23 hours of data can be accumulated (max. 65,000 data).

TECHNIQUE

All the measurement data can be accumulated; however, in case that the deviation amount of the measurement data is small to a sampling cycle, setting the data accumulation interval can execute a long-duration data accumulation than measurement at every sampling cycle. This is useful for the effective use of memory since the data accumulation amount is limited.

5

5 Specify the accumulated amount.

The number of measurement data to be accumulated can be specified.

Specify the data amount to be accumulated from 1 to the Maximum Accumulated Amount.
The maximum accumulated amount varies depending on the setting in "Buffering Type" currently selected.

OUT1 or OUT2 ·····Max. accumulated amount = 65,000 data
OUT1&OUT2 ·····Max. accumulated amount = 32,500 data
The default is 20,000.
An error occurs if the amount larger than the maximum accumulated amount set in "Buffering Type" is specified.

(Command description ➔ "5-2-5 Accumulated Amount: RBC/WBC")

CHECK

Accumulation cannot be started when the setting of the range of "accumulation amount" for each "buffering type", settings of "trigger point" and "sample trigger accumulation amount" corresponding with the "accumulation amount" are not correct (out of the setting range).

6 Specify the trigger conditions.

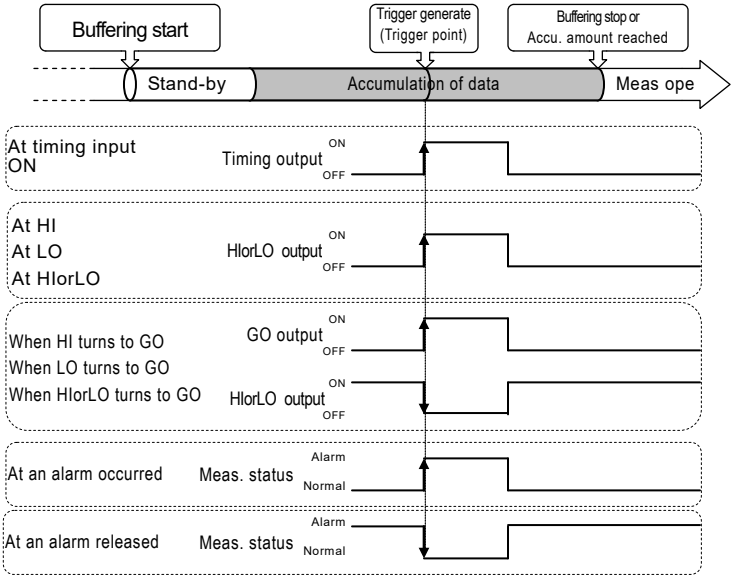
This function is used for setting the trigger generation conditions when the buffering mode is set to trigger mode or sample trigger mode.
(Command description ➔ "5-2-6 Trigger Conditions: RTR/WTR")
The trigger conditions are selectable from "At timing input ON", the results

of "judgment output" (HI, LO, HI or LO, HI to GO, LO to GO, HI or LO to GO), "At an alarm occurred", and "At an alarm released".
The initial value is set to "At timing input ON".

CHECK

- Note that the settings of "Upper Limit/Lower Limit Value of Judgment Output" and "Upper Limit/Lower Limit Hysteresis of Judgment Output" become effective when the result of judgment output is set as a trigger condition.
- Note that the setting of "Number of Alarm Delay Times" becomes effective when "At an alarm occurred" is set as a trigger condition.

Ex) When the "Buffering Mode" is set to trigger mode, the operations of each trigger condition are shown as follows:



CHECK

Normally, the measurement value is on hold at timing input ON status; however, only in the case that the buffering mode is set to trigger mode or sample trigger mode, and this function is set to "At timing input ON", the measurement value is not on hold at timing input ON status during buffering operation.

7 Specify the trigger delay.

This function is used for delaying the timing of trigger detection when the buffering mode is set to trigger mode or sample trigger mode.
(Command description ➔ "5-2-7 Trigger Delay: RTL/WTL")
Sets number of sampling times as the trigger delay value. Setting range is 0 to 100000000.
The status during the trigger delay is indicated as "Accumulating". The initial value is set to "0".

For trigger mode:
Loads the measured data from the actual trigger generated point to the delayed trigger point that has been set for this function.

For sample trigger mode:
Starts accumulation of the measured data from the delayed trigger point that has been set for this function after the trigger was generated. The function ignores even if a new trigger is generated during the trigger delay operation.

CHECK
When the buffering rate is already set, the trigger delay is counted with the extended sampling in accordance with the setting.

8 Specify the trigger point.
When the buffering mode is set to trigger mode, the measurement data can be loaded by setting the data at the trigger generated as a trigger point.
(Command description ➔ "5-2-8 Trigger Point: RTP/WTP")
Setting range is 1 to setting "accumulation amount".
The initial value is set to "10000".

CHECK
· If the "trigger point" is set to a larger value than the setting "accumulation amount", accumulation cannot be started.
· When the "Trigger Delay" function is set, the measurement data from the trigger delayed data point after the setting trigger is generated can be loaded.

8 Specify the sample trigger accumulation amount.
When the buffering mode is set to sample trigger mode, the sample trigger accumulation amount can be set at every trigger generation.
(Command description ➔ "5-2-9 Sample Trigger Accumulation Amount: RSR/WSR")
Setting range is 1 to setting "accumulation amount". The initial value is set to "1".

CHECK
Be sure to set the sample trigger accumulation amount so that (accumulation amount) ÷ (sample trigger accumulation amount) is an integer value.

2. Buffering start

Start buffering operation.
(Command description ➔ "5-2-10 Buffering Operation: RBS/WBS")
1 Set Buffering Operation to "Start".
* The initiation of accumulation differs depending on the buffering mode selected.

3. Accumulation start

Start data accumulation.
The initiation conditions of accumulation differ on the buffering mode selected.

For the initiation conditions of each buffering mode, refer to ➔ "5-1-① 2. Select the buffering mode."

4. Status check

Wait until accumulation is completed.

Starting conditions of accumulating performance differs on the buffering mode type.

The status of accumulation can be loaded by the "Status Readout" command.

(Command description ➔ "5-2-11 Status Readout: RTS")

Go to Step 5 Buffering Stop without waiting for completion of accumulation.

This function checks the status of the measurement data accumulation.

Use this function for checking the accumulation status before reading the accumulated data. After having checked the status, the controller replies one of the next status.

Status	Contents
Non-buffering	Buffering operation is not executed at all after turning on the power supply or after initialization, or buffering operation is stopped while waiting for trigger after buffering has started.
Wait for trigger	Wait for trigger status after buffering operation has started.
Accumulating	Buffering operation has started and measurement data is being accumulated, or trigger has being generated and measurement data is being accumulated.
Accumulation completed	Accumulation amount has reached the setting value or the buffering operation has stopped.

5. Buffering stop

Stop buffering operation.

(Command description ➔ "5-2-10 Buffering Operation: RBS/WBS")

Set "Buffering Operation" to "Stop".

Accumulation stops even in the middle of accumulation to the controller memory.

Accumulated data can be loaded after stopping the buffering operation.

CHECK

When the Self-stop function is set to ON (buffering operation is automatically stopped), stop input for buffering operation becomes unnecessary.

6. Accumulated data readout

The accumulated data is read.

1 Check the status of data accumulation by the "Status Readout" command.

- This checks the accumulation status of measurement data before readout.

Status	Contents
Non-buffering	Buffering operation is not executed at all after turning on the power supply or after initialization, or buffering operation is stopped while waiting for trigger after buffering has started.
Wait for trigger	Wait for trigger status after buffering operation has started.
Accumulating	Buffering operation has started and measurement data is being accumulated, or trigger has being generated and measurement data is being accumulated.
Accumulation completed	Accumulation amount has reached the setting value or the buffering operation has stopped.

(Command description ➔ "5-2-11 Status Readout: RTS")

2 Check the final data point.

The status of buffering data accumulation can be loaded as data point.

- "Final Data Point" is set to "0" when the "Status Readout" is set to "Non-buffering".

(Command description ➔ "5-2-12 Final Data Point: RLD")

3 Trigger counter readout

When the buffering mode is set to sample trigger mode, the number of times of the final trigger generation can be read out.

(Command description ➔ "5-2-15 Trigger Counter Readout: RLE")

5

CHECK

When readout of the trigger counter is performed, stop the data accumulation operation and confirm the "Final Data Point". If the result of "Status Readout" is indicated as accumulation completed and the "Final Data Point" is any values other than "0", readout of the trigger counter can be started.

4 Data Read (normal/rapid)

The accumulated measurement data in the controller memory can be read out.

The below shows two reading methods.

Read method	Contents
Normal read	Simply reads the accumulated measurement data as is. (Command description ➔ "5-2-13 Data (normal): RLA")
Rapid read	Reads the accumulated data by the difference from the previous data. Since data with less difference decreases with decreasing variation, the total transmission data amount decreases and the communication time is shortened. (Command description ➔ "5-2-14 Data (rapid): RLB")

CHECK

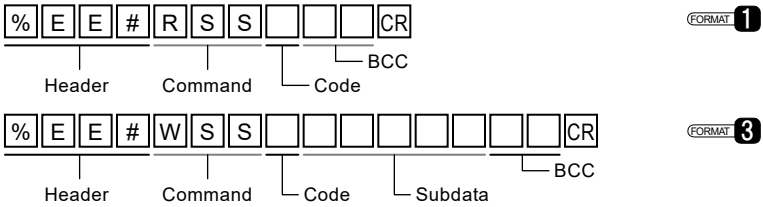
To read the buffering data, stop buffering operation and check the "Final Data Point". The accumulated data to the final data point can be read only when the result of "Status Readout" is "Accumulation Completed" and the final data point is the value "other than 0".

5-2 Explanation of Buffering Command

5-2-1 Self-stop: RSS/WSS

WSS and RSS respectively specify and load the setting of self-stop.

Command		Code	Subdata	Description
Read	Setting			
RSS	WSS	0	00000	OFF
			00001	ON



Ex

(1) Setting of Self-stop is loaded.

Request: % E E # R S S 0 * * CR FORMAT 1

Response: % E E $ R S S 0 0 0 0 0 * * CR FORMAT 1

(2) Self-stop is set to “ON”.

Request: % E E # W S S 0 0 0 0 0 1 * * CR FORMAT 3

Response: % E E $ W S S * * CR FORMAT 9

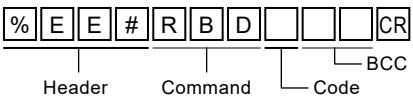
CHECK

When the Self-stop function is set to ON (buffering operation is automatically stopped), stop input for buffering operation becomes unnecessary.

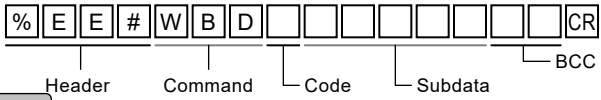
5-2-2 Buffering Mode: RBD/WBD

WBD and RBD respectively specify and load the setting of buffering mode.

Command		Code	Subdata	Description
Read	Setting			
RBD	WBD	5	00000	Continuous Mode
			00001	Trigger Mode
			00002	Timing Mode
			00003	Sample Trigger Mode



FORMAT 1



FORMAT 3

Ex

(1) Setting of Buffering Mode is loaded.

Request: % E E # R B D 5 * * CR — FORMAT 1
Response: % E E $ R B D 0 0 0 0 0 * * CR — FORMAT 1

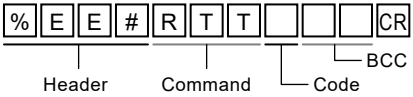
(2) Buffering Mode is set to “Timing Mode”.

Request: % E E # W B D 5 0 0 0 0 2 * * CR — FORMAT 3
Response: % E E $ W B D * * CR — FORMAT 9

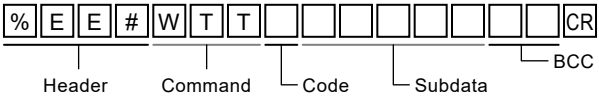
5-2-3 Buffering Type: RTT/WTT

WTT and RTT respectively specify and load the setting of buffering type.

Command		Code	Subdata	Description
Read	Setting			
RTT	WTT	5	00000	OUT1&OUT2
			00001	OUT1
			00002	OUT2



FORMAT 1



FORMAT 3

Ex

(1) Setting of Buffering Type is loaded.

Request: % E E # R T T 5 * * CR — FORMAT 1
Response: % E E $ R T T 0 0 0 0 1 * * CR — FORMAT 1

(2) Buffering Type is set to “OUT2”.

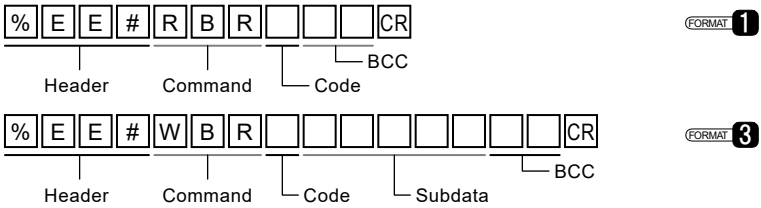
Request: % E E # W T T 5 0 0 0 0 2 * * CR — FORMAT 3
Response: % E E $ W T T * * CR — FORMAT 9

5-2-4 Buffering Rate: RBR/WBR

WBR and RBR respectively specify and load the setting of buffering rate.

The rate at buffering can be selected from “1” to “1/32768”.
When “1/4” is selected, data buffering is executed once in four sampling cycles.

Command		Code	Subdata	Description
Read	Setting			
RBR	WBR	5	00000	1
			00001	1/2
			00002	1/4
			00003	1/8
			00004	1/16
			00005	1/32
			00006	1/64
			00007	1/128
			00008	1/256
			00009	1/512
			00010	1/1024
			00011	1/2048
			00012	1/4096
			00013	1/8192
			00014	1/16384
			00015	1/32768



Ex

(1) Setting of Buffering Rate is loaded.

Request: % E E # R B R 5 * * CR FORMAT 1
Response: % E E $ R B R 0 0 0 0 0 * * CR FORMAT 1

(2) Buffering Rate is set to “1/512”.

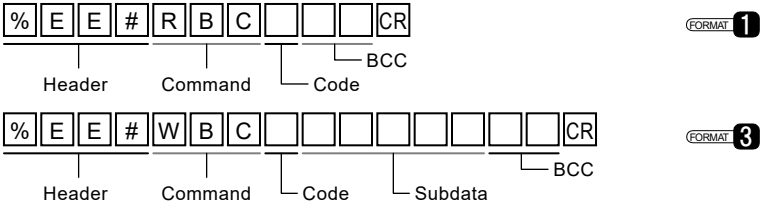
Request: % E E # W B R 5 0 0 0 0 9 * * CR FORMAT 3
Response: % E E $ W B R * * CR FORMAT 9

5-2-5 Accumulated Amount: RBC/WBC

WBC and RBC respectively specify and load the setting of accumulated amount of data.

The maximum accumulated amount is 65,000 data when “OUT1” or “OUT2” is selected in Buffering Type, or 32,500 data when “OUT1&OUT2” is selected.

Command		Code	Setting value	Least input increment
Read	Setting			
RBC	WBC	5	1 to Max. Accumulated Amount	1



Ex

(1) Setting of Accumulated Amount is loaded.

Request: % E E # R B C 5 * * CR FORMAT 1
Response: % E E $ R B C 2 0 0 0 0 * * CR FORMAT 1

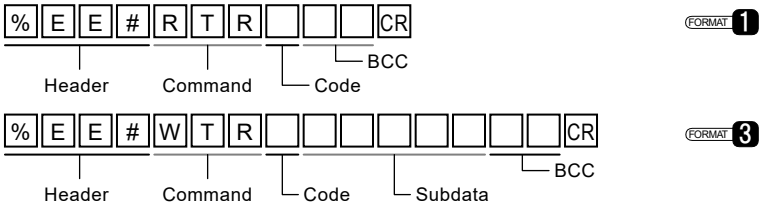
(2) Accumulated Amount is set to “1000”.

Request: % E E # W B C 5 0 1 0 0 0 * * CR FORMAT 3
Response: % E E $ W B C * * CR FORMAT 9

5-2-6 Trigger Conditions: RTR/WTR

WTR and RTR respectively specify and load the setting of trigger conditions.

Command		Code	Subdata	Description
Read	Setting			
RTR	WTR	3/4	00000	At timing input ON
			00001	At HI
			00002	At LO
			00003	At HI or LO
			00004	When HI turns to GO
			00005	When LO turns to GO
			00006	When HI or LO to GO
			00007	At an alarm occurred
			00008	At an alarm released



Ex

(1) Setting of Trigger Conditions is loaded.

Request: % E E # R T R 3 * * CR FORMAT 1

Response: % E E $ R T R 0 0 0 0 0 * * CR FORMAT 1

(2) Trigger Conditions is set to “When HI or LO to GO”.

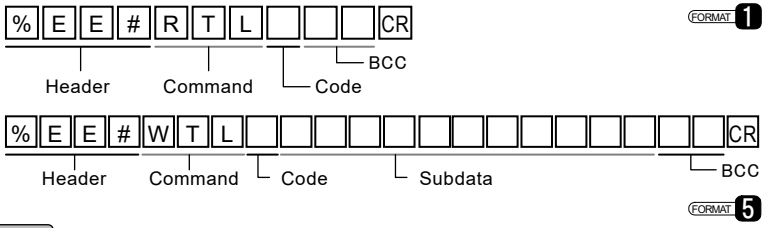
Request: % E E # W T R 3 0 0 0 0 6 * * CR FORMAT 3

Response: % E E $ W T R * * CR FORMAT 9

5-2-7 Trigger Delay: RTL/WTL

WTL and RTL respectively specify and load the setting of trigger delay.

Command		Code	Subdata	Description
Read	Setting			
RTL	WTL	5	-	+0000000000 to +0100000000



Ex

(1) Setting of Trigger Delay is loaded.

Request: % E E # R T L 5 * * CR FORMAT 1

Response: % E E $ R T L + 0 0 0 0 0 0 0 0 0 0 * * CR FORMAT 3

(2) Trigger Delay is set to “+0000500000”.

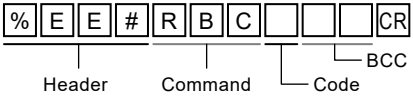
Request: % E E # W T L 5 + 0 0 0 0 5 0 0 0 0 0 * * CR FORMAT 5

Response: % E E $ W T L * * CR FORMAT 9

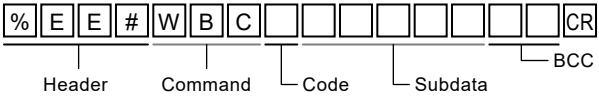
5-2-8 Trigger Point: RTP/WTP

WTP and RTP respectively specify and load the setting of trigger point of data.

Command		Code	Subdata	Description
Read	Setting			
RTP	WTP	5	-	1 to Accumulated amount



FORMAT 1



FORMAT 3

Ex

(1) Setting of Trigger Point is loaded.

Request: % E E # R T P 5 * * CR FORMAT 1

Response: % E E $ R T P 1 0 0 0 0 * * CR FORMAT 1

(2) Trigger Point is set to “2500”.

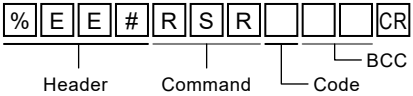
Request: % E E # W T P 5 0 2 5 0 0 * * CR FORMAT 3

Response: % E E $ W T P * * CR FORMAT 9

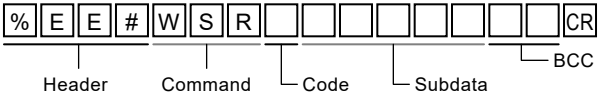
5-2-9 Sample Trigger Accumulation Amount: RSR/WSR

WSR and RSR respectively specify and load the setting of sample trigger accumulation amount of data.

Command		Code	Subdata	Description
Read	Setting			
RSR	WSR	5	-	1 to Accumulated amount



FORMAT 1



FORMAT 3

Ex

(1) Setting of Sample Trigger Accumulation Amount is loaded.

Request: % E E # R S R 5 * * CR FORMAT 1

Response: % E E $ R S R 0 0 0 0 1 * * CR FORMAT 1

(2) Sample Trigger Accumulation Amount is set to “10”.

Request: % E E # W S R 5 0 0 0 1 0 * * CR FORMAT 3

Response: % E E $ W S R * * He FORMAT 9

5-2-10 Buffering Operation: RBS/WBS

WBS and RBS respectively specify and load the setting of buffering operation.

The conditions for buffering are previously specified before starting buffering operation. Accumulated data can be loaded after stopping the operation.

Command		Code	Subdata	Description
Read	Setting			
RBS	WBS	0	00000	Stop
			00001	Start

% E E # R B S ☐ ☐ ☐ CR FORMAT 1

Header — Command — Code — BCC

% E E # W B S ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ CR FORMAT 3

Header — Command — Code — Subdata — BCC

Ex

(1) Status of Buffering Operation is loaded.

Request: % E E # R B S 0 * * CR FORMAT 1

Response: % E E $ R B S 0 0 0 0 0 * * CR FORMAT 1

(2) “Start” of Buffering Operation is executed.

Request: % E E # W B S 0 0 0 0 0 1 * * CR FORMAT 3

Response: % E E $ W B S * * CR FORMAT 9

5-2-11 Status Readout: RTS

RTS loads the status of accumulation.

Command		Code	Subdata	Description
Read	Setting			
RTS	-	3/4	00000	Non-buffering
			00001	Wait for Trigger
			00002	Accumulating
			00003	Accumulation Completed

% E E # R T S ☐ ☐ ☐ CR FORMAT 1

Header — Command — Code — BCC

Ex

(1) Status Readout setting is loaded.

Request: % E E # R T S 3 * * CR FORMAT 1
Response: % E E $ R T S 0 0 0 0 0 * * CR FORMAT 1

5-2-12 Final Data Point: RLD

RLD loads the final data point.

The status of buffering data accumulation can be loaded as data point. The final data point is 0 (zero) when the status is "Non-buffering" or "Wait for Trigger".

Command		Code	Subdata	Description
Read	Setting			
RLD	-	3/4	-	Final data point read

% E E # R L D _ _ _ CR FORMAT 1

Header: % E E #
Command: R L D
Code: _ _
BCC: _ CR

Ex

Final Data Point is loaded.

Request: % E E # R L D 3 * * CR FORMAT 1
Response: % E E $ R L D 1 0 0 0 0 0 * * CR FORMAT 1

5-2-13 Data (normal): RLA

RLA loads the accumulation data by normal readout.

To read the buffering data, stop buffering operation and check the final data point. The accumulated data can be read only when the status is "Accumulation Completed" and the final data point is not "0".

Command		Code	Setting value	Least input increment
Read	Setting			
RLA	-	3/4	5-digit start point + 5-digit end point 1 to final data point is specified.	1

% E E # R L A _ _ _ _ _ _ _ _ _ _ _ _ _ CR

Header: % E E #
Command: R L A
Code: _ _
Start point: _ _ _ _ _
End point: _ _ _ _ _
BCC: _ CR

FORMAT 2

Ex

Accumulation data is loaded by normal readout.

Request: % E E # R L A 3 0 0 2 0 1 0 0 4 0 0 * * CR FORMAT 2

Response: % E E $ R L A + 0 1 2 . 3 4 5 6 7 8 + 0 1 2 .
3 4 5 6 7 8 + 0 1 2 . 3 4 5 6 7 8 ··· * * CR FORMAT 6

5-2-14 Data (rapid): RLB

RLB loads the accumulation data by rapid readout.

To read the buffering data, stop buffering operation and check the final data point. The accumulated data can be read only when the status is "Accumulation Completed" and the final data point is not "0".
The data of specified head point is stored with the head data format shown below. For the data of second point and subsequent points, the differential by the previous data (the data based on the 6 places of decimals) is responded.

Head data format

1-character symbol + 3-digit integral part (no zero suppress)
+ decimal point + 6-digit decimal part

Command		Code	Setting value	Least input increment
Read	Setting			
RLB	-	3/4	5-digit start point + 5-digit end point 1 to final data point is specified.	1

% E E # R L B ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ CR

Header Command Code Start point End point BCC

FORMAT 2

Ex

Accumulation data is loaded by rapid readout.

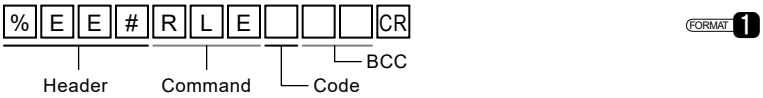
Request: % E E # R L B 3 0 0 2 0 1 0 0 4 0 0 * * CR FORMAT 2

Response: % E E $ R L B + 0 1 2 . 3 4 5 6 7 8 + 1 2 3 −
2 2 5 + 7 6 ··· + 2 3 − 5 9 + 3 + 7 8 * * CR FORMAT 7

5-2-15 Trigger Counter Readout: RLE

RLE loads the number of times of the trigger generation.

Command		Code	Setting value	Least input increment
Read	Setting			
RLE	-	3/4	0 to end data point	0



Ex

Setting of Trigger Counter is loaded.

Request: % E E # R L E 3 * * CR FORMAT 1

Response: % E E $ R L E 0 0 2 1 8 * * CR FORMAT 1

5

Appendix

This chapter describes index and revision history.

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Revision history

Released date	Revision No.
October 2007	First release
May 2008	Second release
July 2008	Third release
October 2008	Fourth release
September 2009	Fifth release
June 2010	Sixth release
February 2011	Seventh release
December 2012	Eighth release
June 2013	Ninth release
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