8

HOST-LINK COMMUNICATION FUNCTION

This chapter describes the operating principle, communication settings, command and response of host-link communication.

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8-1 Host-link Communication Function

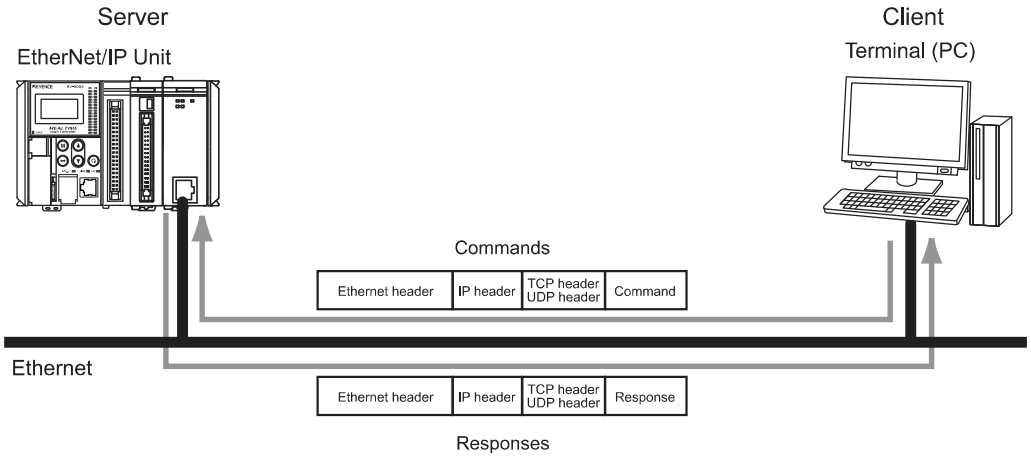
This section gives a general description on host-link communication function.

■ Application

The device values of CPU unit can be read/written by sending commands in preset format from a terminal (such as PC) connected to Ethernet.
The ladder program for communication is not required on CPU unit because a response is automatically returned to commands sent from external units.

■ Communication principle

By creating a communication program on the terminal (PC), data can be read from/written into the CPU unit, and the operation status can be monitored by sending commands to the EtherNet/IP unit via the Ethernet from the terminal (PC), and receiving responses via the Ethernet from the EtherNet/IP Unit.
During communication, PLC equipped with EtherNet/IP Units serve as servers, terminals (such as PCs) serve as clients. The server automatically returns to the client the appropriate responses to commands received from the client.
Host-link communication supports TCP/IP and UDP/IP communication protocols.



8-2 Communication Specification

This section describes the communication specification of the host-link communication function. Setting of EtherNet/IP Unit terminals is executed by the Unit Editor.

Setting Items of Unit Editor

Unit Editor is used for setting up EtherNet/IP Unit communication. Setting items of Unit Editor is as follows. For the setting method, see "3-1 Unit Editor Setting", page 3-2.

Item	Settings	Setting range	Default value	See page
Leading DM No.	Set No. not for any other purpose.	0 to 65304*1	To be set	3-8
Number of DMs in use	Number of DMs used by the unit	230	230	-
Leading relay No. (set up by channel)	Set No. not for any other purpose.	0 to 1960*2	To be set	3-8
Number of relays in use	Number of relays used by the unit	640	640	-
Baud rate	Set up according to the network used.	100M/10Mbps Auto/ 10Mbps	100M/10Mbps Auto	3-8
Setting method of IP address	Set up the IP address setting method.	Fixed IP address/ BOOTP->Fixed IP auto switching/BOOTP	Fixed IP address	3-8
IP address	Set up an IP address not duplicated with other nodes.	0.0.0.0 to 255.255.255.255	192.168.0.10	3-9
Subnet mask	Set up an appropriate subnet mask.	0.0.0.0 to 255.255.255.255	255.255.255.0	3-9
Default gateway	Set up an appropriate default gateway.	0.0.0.0 to 255.255.255.255	0.0.0.0	3-9
Port No. (host-link)	Change as required.	1 to 65535	8501	3-10
Receive time out [s]	Set to an appropriate value.	0 to 59	10	3-10
Keep-Alive [s]	Set to an appropriate value.	0 to 65535	600	3-10
Route setting	Set up as required.	Yes/No	No	3-12
Communication counterpart IP address 1 to 6	Set up as required.	0.0.0.0 to 255.255.255.255	0.0.0.0 (unused)	3-12
Communication counterpart subnet mask 1 to 6	Set up as required.	0.0.0.0 to 255.255.255.255	0.0.0.0 (unused)	3-12
Router IP address 1 to 6	Set up as required.	0.0.0.0 to 255.255.255.255	0.0.0.0 (unused)	3-12

*1 0 to 32538 when using KV-NC1EP.

*2 The setting range is 000 to 1960 when connecting to KV-8000 series and KV-7000 series with CPU function version 2.3 or later, 000 to 960 for CPU function version 2.2 or earlier, 10 to 960 when connecting to KV-5000/3000 series, and 10 to 560 for KV-NC1EP.

Communication Specification

The communication control of EtherNet/IP Units is based on TCP/IP and UDP/IP. Specification of TCP/IP and UDP/IP communication is as follows.

■ TCP/IP

Item	Description
Communication mode	TCP/IP
Used port No.	8501 (Changeable)
Number of sockets	15 (common for MC protocol communication)
Data code	ASCII code

■ UDP/IP

Item	Description
Communication mode	UDP/IP
Used port No.	8501 (Changeable)
Number of sockets	1
Data code	ASCII code

Devices Used for Host-link Communication

Devices used for host-link communication function are as follows.

Item	Device No.	Read/write
Send times	Leading DM+0 to 1	Read
Receive times	Leading DM+2 to 3	Read
Socket utilization (host-link)	Leading DM+9	Read
EtherNet/IP Unit system error	Leading DM+12	Read
MAC address	Leading DM+13 to 15	Read

Point

0 is stored in the error DM (leading DM + 12) if no error occurs on the EtherNet/IP Unit. In case of error, the corresponding error No. will be stored in this DM. For the setting method, see "A-4 Error List", page A-8.

8-3 Communication Procedure

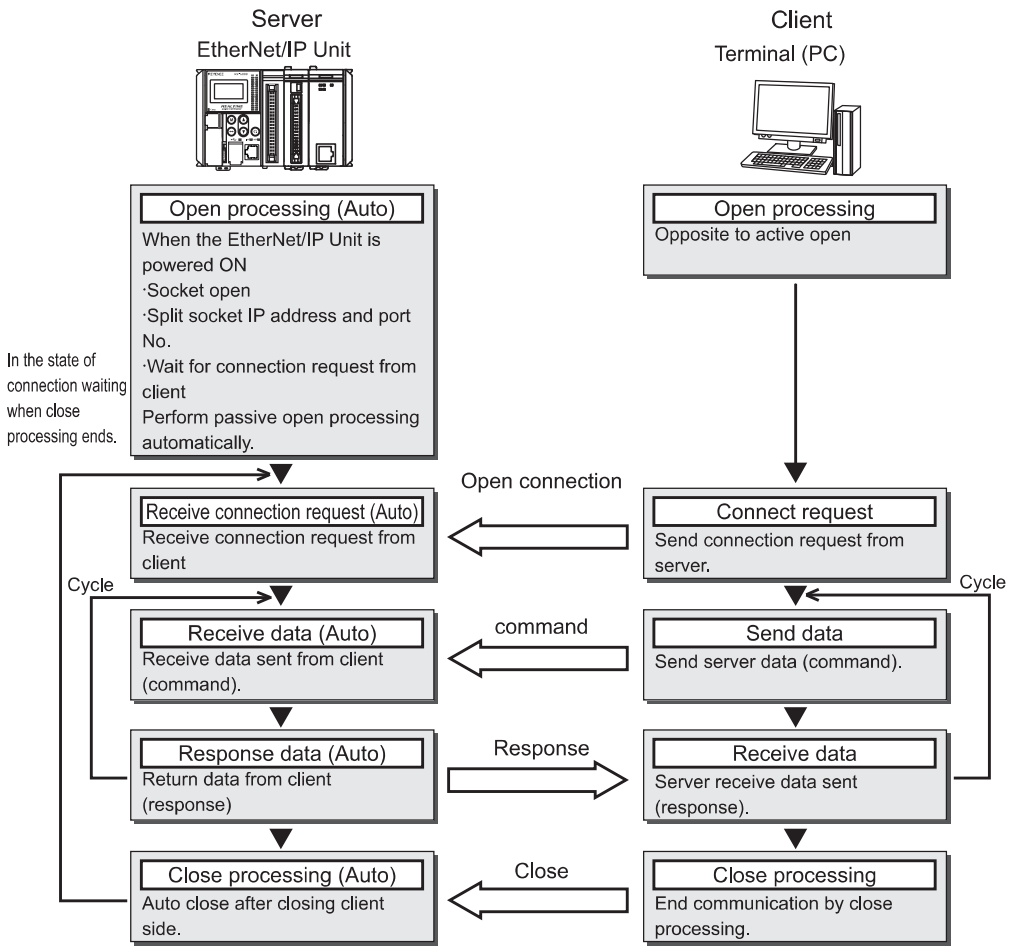
This section describes the principle of communication between EtherNet/IP Units and a terminal (e.g. PC) on the network using the host-link communication function, as well as the format of commands and responses.

Communication Principle

Host-link communication supports TCP/IP and UDP/IP communication protocols.
The following describes the communication principles based on TCP/IP and UDP/IP protocols.

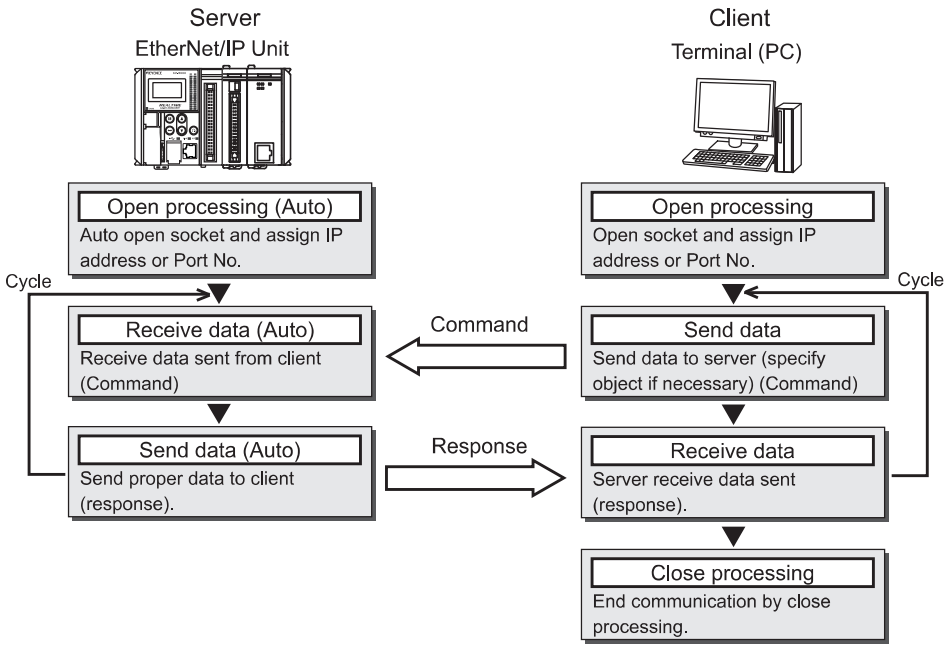
■ Communication principle based on TCP/IP protocol

Communication principle based on TCP/IP protocol is as follows.
During communication, the EtherNet/IP Unit serves as a server, and the communication target terminal (e.g. PC) serves as a client.
The EtherNet/IP Unit automatically responds to the requests from the client.



■ Communication principle based on UDP/IP protocol

Communication principle based on UDP/IP protocol is as follows.
During communication, the EtherNet/IP Unit serves as a server, and the communication target terminal (e.g. PC) serves as a client.
The EtherNet/IP Unit automatically responds to the requests from the client.



Command and Response Format

The following describes command and response format of communication data for host-link communication function. The format of command and response is different for TCP/IP and UDP/IP communication.

■ Format for TCP/IP communication

Command format

Send a command from the PC to the EtherNet/IP Unit according to the following format.
CR (0DH) is separator. The EtherNet/IP Unit ignores LF (0AH), characters after LF (0AH) are identified as the next command.

Ethernet header	IP header	TCP header	Command	CR

or

Ethernet header	IP header	TCP header	Command	CR	LF

Response format

The EtherNet/IP Unit returns a response to a command according to the following format. When PC generates a program, receive processing must be executed according to this response format.

Ethernet header	IP header	TCP header	Response	CR	LF

■ Format for UDP/IP communication

Command format

Send a command from the PC to the EtherNet/IP Unit according to the following format.

CR(0DH) is separator. The EtherNet/IP Unit ignores LF (0AH), characters after LF (0AH) are identified as the next command.

Ethernet header	IP header	UDP header	Command	CR	

or

Ethernet header	IP header	UDP header	Command	CR	LF

Response format

The EtherNet/IP Unit returns a response to a command according to the following format.

When PC generates a program, receive processing must be executed according to this response format.

Ethernet header	IP header	UDP header	Response	CR	LF

8-4 Command List

Host-link communication command list.

Function	Command	See page
Change mode	Mn	8-9
Clear error	ER	8-10
Check error No.	?E	8-10
Query model	?K	8-13
Confirm operating mode	?M	8-13
Time setting	WRT	8-14
Forced set/forced reset	ST/RS	8-15
Continuous forced set/forced reset	STS/RSS	8-16
Data read	RD	8-17
Consecutive data read	RDS	8-17
Consecutive data read	RDE	8-22
Data write	WR	8-23
Write consecutive data	WRS	8-23
Write consecutive data	WRE	8-26
Write set value	WS	8-26
Write consecutive set value	WSS	8-26
Register monitor	MBS/MWS	8-27
Read monitor	MBR/MWR	8-31
Read comments	RDC	8-32
BANK switching	BE	8-33
Read expansion unit buffer memory	URD	8-34
Write expansion unit buffer memory	UWR	8-35

8-5 Description of the Commands and Responses

This section describes various commands and responses and how to set up them.

Mn Change Mode

Switches the CPU unit to PROGRAM mode or RUN mode.

■ Command

M	Mode No.	C_R
4DH		0DH

Mode No. : If "0" is specified, CPU unit is switched to PROGRAM mode.
If "1" is specified, CPU unit is switched to RUN mode.

■ Response

O	K	C_R	L_F
4FH	4BH	0DH	0AH

OK: During normal command processing, code "OK" is prompted.

■ Error response

E	1	C_R	L_F
45H	31H	0DH	0AH

E1 : Instruction error

E	2	C_R	L_F
45H	32H	0DH	0AH

E2 : Program not registered

E	5	C_R	L_F
45H	35H	0DH	0AH

E5 : PLC error

" Response in case of exception", page 8-36

ER Clear Error

Removes the error in CPU unit.

■ Command

E	R	C_R
45H	52H	0DH

■ Response

O	K	C_R	L_F
4FH	4BH	0DH	0AH

OK: During normal command processing, code "OK" is prompted.

■ Error response

E	1	C_R	L_F
45H	31H	0DH	0AH

E1: Command error

" Response in case of exception", page 8-36

?E Confirm Error No.

Checks the error or exception in CPU unit. For specific error content, please check the error No. list.

■ Command

?	E	C_R
3FH	45H	0DH

■ Response

Error No.	C_R	L_F
	0DH	0AH

Error No. : Error content in CPU; error No. is prompted (no zero suppression).
If no error occurs in CPU, "000" will be displayed.

■ Error response

E	1	C_R	L_F
45H	31H	0DH	0AH

E1: Command error

" Response in case of exception", page 8-36

For error treatment method, see User's Manual of the CPU unit used.

Error No. List (for KV-8000(A))

No.	Error content	No.	Error content	No.	Error content
010	SBN Exceeds Nesting Limit	059	Unit Version Error	118	Invalid Data
011	FOR-NEXT Exceeds Nesting Limit	063	Power Restoring Needed	120	Watchdog Timer
015	Failed To Convert	080	Flash ROM Failure	122	System Error
022	Macro Exceeds Nesting Limit	083	Battery Voltage Degradation	125	Error Buffer Over flow
027	Invalid object	085	Clock Data Lost	127	Auto Loading Failed
029	Ladder Stack Error	086	RTC Failure	128	Ladder Calc
030	Scan Time Over	087	Memory Card Failure	129	Unit Error
031	Ladder Stack Overflow	088	Memory Card Removed	131	FLASH ROM Format
040	No Ladder Program	089	During Storage Access Power OFF	132	Invalid Ladder File
050	Unit Info Checksum Error	090	Waiting Storage Access	134	Auto loading folder
051	No Unit Info Set	092	Access Window failure	135	Memory Card Cover Open
052	No Unit Connected	095	File Access Busy	136	Memory Card Locked
053	Unit Timeout	102	POWER OFF Error	137	Unsupported Memory Card Type
054	Number of Units Mismatch	103	Shutdown Timeout	141	CPU Memory Write Frequency Over
055	Unit Type Mismatch	106	Abnormal Reset	142	CPU Memory Write Cycle Warning
056	Expansion Bus Comm Error	107	System Error	143	CPU Memory Write Cycle Over
057	No End Unit	108	Convert warning		

Error No. List (for KV-7500/7300)

No.	Error content	No.	Error content	No.	Error content
010	SBN Exceeds Nesting Limit	059	Unit Version Error	118	Invalid Data
011	FOR-NEXT Exceeds Nesting Limit	063	Power Restoring Needed	120	Watchdog Timer
015	Failed To Convert	080	Flash ROM Failure	122	System Error
022	Macro Exceeds Nesting Limit	083	Battery Voltage Degradation	125	Error Buffer Over flow
	Invalid object	085	Clock Data Lost	127	Auto Loading Failed
029	Ladder Stack Error	086	RTC Failure	128	Ladder Calc
030	Scan Time Over	087	Memory Card Failure	129	Unit Error
031	Ladder Stack Overflow	088	Memory Card Removed	131	FLASH ROM Format
040	No Ladder Program	089	During Storage Access Power OFF	132	Invalid Ladder File
050	Unit Info Checksum Error	090	Waiting Storage Access	134	Auto loading folder
051	No Unit Info Set	092	Access Window failure	135	Memory Card Cover Open
052	No Unit Connected	095	File Access Busy	136	Memory Card Locked
053	Unit Timeout	102	POWER OFF Error	137	Unsupported Memory Card Type
054	Number of Units Mismatch	103	Shutdown Timeout	141	CPU Memory Write Frequency Over
055	Unit Type Mismatch	106	Abnormal Reset	142	CPU Memory Write Cycle Warning
056	Expansion Bus Comm Error	107	System Error	143	CPU Memory Write Cycle Over
057	No End Unit				

Error No. List (for KV-5500/5000/3000)

No.	Error content	No.	Error content	No.	Error content
010	CALL nest	054	Unit quantity	121	Stack overflow
011	FOR nest	055	Unit switch	122	System error
012	INT nest	056	Expansion bus communication	123	Device range
013	MPS nest	057	END unit not connected	124	Resource
014	Number of BREAKs	059	Unit version	125	Error buffer memory overflow
015	Convert	080	FLASH ROM exception	126	Error buffer memory exception
019	Object size	081	SRAM exception	127	Auto reading
020	Code size	083	Replace battery	128	Ladder operation
022	Macro nest	084	Clear SRAM	129	Unit error
023	Invalid interrupt	085	RTC voltage drop	130	Direct IO
024	Invalid macro	087	Memory card exception	131	FLASH ROM format
025	Indirect specifying error	088	Memory card removed	132	Ladder file incorrect
026	Invalid address	089	Memory card access in progress OFF	133	KV-BT1 exception
027	Invalid object	090	Wait for memory card to complete	134	Auto loading folder
030	Scan time out of range	091	Ethernet controller exception	135	Memory card is opened
031	Ladder stack overflow	092	Access window exception	136	Memory card is locked
040	No ladder	093	Function expansion unit exception	250	StartUpError
050	Unit checksum	094	Function expansion unit ID		Reset
051	Unit setting information	095	File being accessed	251	AW Timeout Error
052	Unit not connected	118	Invalid transmission data		
053	Expansion bus unit time out	120	Watchdog timer		

Error No. List (for KV Nano Series)

No.	Error content	No.	Error content	No.	Error content
010	CALL nest	082	AW data exception	123	Device range
011	FOR nest	085	Clock data disappearance	125	Error buffer memory overflow
015	Convert	086	RTC exception	127	Auto loading failure
022	Macro nest	092	AW cassette exception	128	Ladder operation
030	Scan time out of range	095	File being accessed	129	Unit error
040	No ladder	096	Extension exception	131	FLASH ROM format
050	Unit checksum	097	Extension switch	132	Ladder file incorrect
051	Unit setting information	098	Extension non responsive	140	AW data OFF when writing
052	Unit not connected	099	Hot swapping	250	AccessWindow E250
053	Expansion bus unit time out	101	Expansion version		Connection Error
054	Unit quantity	102	POWER OFF error	251	AccessWindow E251
055	Unit switch	103	Power interruption processing excess		Connection Error
056	Expansion bus communication	104	Consumption current excess		
058	Expansion bus range	105	Power outage hold format		
059	Unit version	106	Reset exception		
060	I/O excess	107	System error		
061	Assigned device duplication	118	Invalid transmission data		
080	FLASH ROM exception	120	Watchdog timer		
081	RAM exception	122	System error		

?K Query Model

Checks PLC model.

■ Command

?	K	C_R
3FH	4BH	0DH

■ Response

Type	C_R	L_F
	0DH	0AH

Type : PLC model is displayed in "Type" in the form of No.

KV-8000	: '57'(35H, 37H)
KV-8000A	: '58'(35H, 38H)
KV-7300	: '54'(35H, 34H)
KV-7500	: '55'(35H, 35H)
KV-3000	: '51'(35H, 31H)
KV-5000	: '52'(35H, 32H)
KV-5500	: '53'(35H, 33H)
KV-NC32T	: '128'(31H, 32H, 38H)
KV-N60**	: '132'(31H, 33H, 32H)
KV-N40**	: '133'(31H, 33H, 33H)
KV-N24**	: '134'(31H, 33H, 34H)

■ Error response

E	1	C_R	L_F
45H	31H	0DH	0AH

E1: Command error

" Response in case of exception", page 8-36

?M Confirm Operating Mode

Confirms current operating status of CPU unit.

■ Command

?	M	C_R
3FH	4DH	0DH

■ Response

Model	C_R	L_F
	0DH	0AH

Data : Displays current status (mode) of CPU unit with No. It is "0" if CPU unit is in PROGRAM mode or Ladder is not registered, and it is "1" if CPU unit is in RUN mode

■ Error response

E	1	C_R	L_F
45H	31H	0DH	0AH

E1: Command error

" Response in case of exception", page 8-36

WRT Time Setting

Sets up time of the CPU unit

■ Command

W	R	T	␣	Data 1	␣	Data 2	␣	Data 3	␣	Data 4	␣	Data 5
57H	52H	54H	20H		20H		20H		20H		20H	

␣	Data 6	␣	Data 7	C_R
20H		20H		0DH

Data 1 : Enter a two-digit value in Gregorian calendar. 00 means the year of 2000. Data range: 00 to 99.
Data 2 : Enter two-digit month. Data range: 01 to 12.
Data 3 : Enter two-digit day. Data range: 01 to 31.
Data 4 : Enter two-digit hour. Data range: 00 to 23.
Data 5 : Enter two-digit minute. Data range: 00 to 59.
Data 6 : Enter two-digit second. Data range: 00 to 59.
Data 7 : Enter one-digit week. The following table shows the relations between weekday and input value.
Data range: 0 to 6.

input value	0	1	2	3	4	5	6
week	Sun.	Mon.	Tues.	Wed.	Thu.	Fri.	Sat.

■ Response

O	K	C_R	L_F
4FH	4BH	0DH	0AH

OK: During normal command processing, code "OK" is prompted.

■ Error response

E	1	C_R	L_F
45H	31H	0DH	0AH

E1: Command error

" Response in case of exception", page 8-36

Forced Set "ST"/Forced Reset "RS"

Forcibly sets the contacts of specified device to ON/OFF.

■ Command

<Forced set>

S	T	␣	Device type	Device No.	C_R
53H	54H	20H			0DH

<Forced reset>

R	S	␣	Device type	Device No.	C_R
52H	53H	20H			0DH

Device type		Device No. *1		
Device name		KV-8000/7500/7300	KV-5500/5000/3000	KV Nano
Relay *2	R (can be omitted)	00000 to 199915*6	00000 to 99915	00000 to 59915
Link relay	B	0000 to 7FFF	0000 to 3FFF	0000 to 1FFF
Internal auxiliary relay *2	MR	00000 to 399915*5	00000 to 99915	00000 to 59915
Latch relay *2	LR	00000 to 99915	00000 to 99915	00000 to 19915
Control relay	CR	0000 to 7915	0000 to 3915	0000 to 8915
Timer	T	0000 to 3999	0000 to 3999	0000 to 511
Counter	C	0000 to 3999	0000 to 3999	0000 to 255
High-speed counter comparator*3	CTC	—	0 to 3	0 to 7*4
Work relay	VB	0000 to F9FF	0000 to 3FFF	0000 to 1FFF

*1 Device No. supports zero suppression.

*2 Relays, internal auxiliary relays and latch relays can be expressed with XYM.
" XYM Expression", page 8-37

*3 High-speed counter comparator can be used only for RS command (forced reset).

*4 The Device No. which can be used differ according to the base unit.
KV-N14/KV-N24: CTC0 to CTC3
KV-N40/KV-NC32T: CTC0 to CTC5
KV-N60: CTC0 to CTC7

*5 When connected to KV-8000/7500/7300 and KV-EP21V and executed via KV-EP21V, MR00000 to MR99915. (In case of XYM expression, can be executed from M00000 to M63999).

*6 The range is R00000 to R99915 when connecting KV-8000/7500/3000 with KV-EP21V and executing via KV-EP21V.
The range is R00000 to R99915 for KV-7000 series with CPU function version 2.2 or earlier.

■ Response

O	K	C_R	L_F
4FH	4BH	0DH	0AH

OK: During normal command processing, code "OK" is prompted.

■ Error response

E	0	C_R	L_F
45H	30H	0DH	0AH

E0 : Device No. error

E	1	C_R	L_F
45H	31H	0DH	0AH

E1 : Command error

" Response in case of exception", page 8-36

Continuous Forced Set "STS"/Continuous Forced Reset "RSS"

Forcibly sets the contacts of specified devices to ON/OFF.

■ Command

<Forced set>

S	T	S	␣	Device type	Device No.	␣	Number of written data	C_R
53H	54H	53H	20H			20H		0DH

<Forced reset>

R	S	S	␣	Device type	Device No.	␣	Number of written data	C_R
52H	53H	53H	20H			20H		0DH

Device type		Device No. *1			Number of written devices
Device name		KV-8000/7500/7300	KV-5500/5000/3000	KV Nano	
Relay *2	R (can be omitted)	00000 to 199915*4	00000 to 99915	00000 to 59915	01 to 16
Link relay	B	0000 to 7FFF	0000 to 3FFF	0000 to 1FFF	01 to 16
Internal auxiliary relay *2	MR	00000 to 399915*3	00000 to 99915	00000 to 59915	01 to 16
Latch relay *2	LR	00000 to 99915	00000 to 99915	00000 to 19915	01 to 16
Control relay	CR	0000 to 7915	0000 to 3915	0000 to 8915	01 to 16
Work relay	VB	0000 to F9FF	0000 to 3FFF	0000 to 1FFF	01 to 16

*1 Device No. and number of written devices support zero suppression.

*2 Relay, internal auxiliary relay and latch relay can be expressed with XYM.

" XYM Expression", page 8-37

*3 When connected to KV-8000/7500/7300 and KV-EP21V and executed via KV-EP21V, MR00000 to MR99915. (In case of XYM expression, can be executed from M00000 to M63999).

*4 The range is R00000 to R99915 when connecting KV-8000/7500/3000 with KV-EP21V and executing via KV-EP21V.
The range is R00000 to R99915 for KV-7000 series with CPU function version 2.2 or earlier.

■ Response

O	K	C_R	L_F
4FH	4BH	0DH	0AH

OK: During normal command processing, code "OK" is prompted.

■ Error response

E	0	C_R	L_F
45H	30H	0DH	0AH

E0 : Device No. error

E	1	C_R	L_F
45H	31H	0DH	0AH

E1 : Command error

" Response in case of exception", page 8-36

Data Read "RD"/Consecutive Data Read "RDS"

RD: Reads one data of the specified device.
RDS: Reads device data of specified quantity consecutively.

■ Command

R	D	␣	Device type	Device No.	Data format*	CR
52H	44H	20H				0DH

R	D	S	␣	Device type	Device No.	Data format*	␣	Number of read data	CR
52H	44H	53H	20H				20H		0DH

* The data format (suffix) of device is specified as .U/.S/.D/.L/.H/(not specified).
.U : Decimal, 16bit, unsigned
.S : Decimal, 16bit, signed
.D : Decimal, 32bit, unsigned
.L : Decimal, 32bit, signed
.H : Hex, 16bit
(Not specified): Depends on device type
" Data simultaneity when the data format is specified as .D/.L", page 8-37

● Devices when using KV-8000/7500/KV-EP21V (when CPU unit is KV-8000/7500/7300)

Device type		Device No. *1	Data format not specified	Number of read data	
Device name		KV-8000/7500/7300		Bit/.U/.S/.H	.D/.L
Relay*2	R (can be omitted)	00000 to 199915*4	(Bit)	0001 to 1000	0001 to 0500
Link relay	B	0000 to 7FFF	(Bit)	0001 to 1000	0001 to 0500
internal auxiliary relay*2	MR	00000 to 399915*3	(Bit)	0001 to 1000	0001 to 0500
Latch relay*2	LR	00000 to 99915	(Bit)	0001 to 1000	0001 to 0500
Control relay	CR	0000 to 7915	(Bit)	0001 to 1000	0001 to 0500
Work relay	VB	0000 to F9FF	(Bit)	0001 to 1000	0001 to 0500
Data memory*2	DM	00000 to 65534	.U	0001 to 1000	0001 to 0500
Extended data memory*2	EM	00000 to 65534	.U	0001 to 1000	0001 to 0500
File register*2	FM	00000 to 32767	.U	0001 to 1000	0001 to 0500
	ZF	00000 to 524287	.U	0001 to 1000	0001 to 0500
Link register	W	0000 to 7FFF	.U	0001 to 1000	0001 to 0500
Temporary data memory	TM	000 to 511	.U	001 to 512	001 to 256
Index register	Z	01 to 12	.U	01 to 12	01 to 12
Timer	T	0000 to 3999	.D	001 to 120	001 to 120
Timer (current value)	TC	0000 to 3999	.D	001 to 120	001 to 120
Timer (set value)	TS	0000 to 3999	.D	001 to 120	001 to 120
Counter	C	0000 to 3999	.D	001 to 120	001 to 120
Counter (current value)	CC	0000 to 3999	.D	001 to 120	001 to 120
Counter (set value)	CS	0000 to 3999	.D	001 to 120	001 to 120
Digital trimmer	AT	0 to 7	.D	1 to 8	1 to 8
Control memory*5	CM	0000 to 5999	.U	0001 to 1000	0001 to 0500
Work memory*6	VM	00000 to 50999	.U	0001 to 1000	0001 to 0500

*1 Device No. and number of read data support zero suppression.
*2 Relays, internal auxiliary relays, latch relays, data memories, extended data memories, and file registers can be expressed with XYM. "XYM Expression", page 8-37
*3 When connecting KV-8000/7500/7300 and KV-EP21V, MR00000 to MR99915 is possible when executing via KV-EP21. (In case of XYM expression, M00000 to M63999.)
*4 The range is R00000 to R99915 when connecting KV-8000/7500/3000 with KV-EP21V and executing via KV-EP21V.
The range is R00000 to R99915 for KV-7000 series with CPU function version 2.2 or earlier.
*5 It will be CM0000~CM7599 for KV-8000.

*6 It will be VM00000~VM589823 for KV-8000. However, when connecting KV-8000 and KV-EP21V and executing via KV-EP21V, it becomes VM00000~VM63999.

● Devices when using KV-5500 and KV-EP21V (when CPU unit is KV-5500/5000/3000)

Device type		Device No. *1	Data format not specified	Number of read data	
Device name		KV-5500/5000/3000		Bit /.U/.S/.H	.D/.L
Relay *2	R (can be omitted)	00000 to 99915	(Bit)	0001 to 1000	0001 to 0500
Link relay	B	0000 to 3FFF	(Bit)	0001 to 1000	0001 to 0500
internal auxiliary relay*2	MR	00000 to 99915	(Bit)	0001 to 1000	0001 to 0500
Latch relay *2	LR	00000 to 99915	(Bit)	0001 to 1000	0001 to 0500
Control relay	CR	0000 to 3915	(Bit)	0001 to 1000	0001 to 0500
Work relay	VB	0000 to 3FFF	(Bit)	0001 to 1000	0001 to 0500
Data memory *2	DM	00000 to 65534	.U	0001 to 1000	0001 to 0500
Extended data memory *2	EM	00000 to 65534	.U	0001 to 1000	0001 to 0500
File register *2	FM	00000 to 32767	.U	0001 to 1000	0001 to 0500
	ZF	00000 to 131071	.U	0001 to 1000	0001 to 0500
Link register	W	0000 to 3FFF	.U	0001 to 1000	0001 to 0500
Temporary data memory	TM	000 to 511	.U	001 to 512	001 to 256
Index register	Z	01 to 12	.U	01 to 12	01 to 12
Timer	T	0000 to 3999	.D	001 to 120	001 to 120
Timer (current value)	TC	0000 to 3999	.D	001 to 120	001 to 120
Timer (set value)	TS	0000 to 3999	.D	001 to 120	001 to 120
Counter	C	0000 to 3999	.D	001 to 120	001 to 120
Counter (current value)	CC	0000 to 3999	.D	001 to 120	001 to 120
Counter (set value)	CS	0000 to 3999	.D	001 to 120	001 to 120
High-speed counter	CTH	0 to 1	.D	1 to 2	1 to 2
High-speed counter comparator (set value)	CTC	0 to 3	.D	1 to 4	1 to 4
Digital trimmer	AT	0 to 7	.D	1 to 8	1 to 8
Control memory	CM	0000 to 5999	.U	0001 to 1000	0001 to 0500
Work memory	VM	00000 to 49999	.U	0001 to 1000	0001 to 0500

*1 Device No. and number of read data support zero suppression.

*2 Relays, internal auxiliary relays, latch relays, data memories, extended data memories, and file registers can be expressed with XYM. "XYM Expression", page 8-37

● Devices when using KV-NC1EP

Device type		Device No. *1	Data format not specified	Number of read data*1	
Device name				Bit /.U/.S/.H	.D/.L
Relay*2	R (can be omitted)	00000 to 59915	(Bit)	001 to 256	001 to 128
Link relay	B	0000 to 1FFF	(Bit)	001 to 256	001 to 128
internal auxiliary relay*2	MR	00000 to 59915	(Bit)	001 to 256	001 to 128
Latch relay*2	LR	00000 to 19915	(Bit)	001 to 256	001 to 128
Control relay	CR	0000 to 8915	(Bit)	001 to 256	001 to 128
Work relay	VB	0000 to 1FFF	(Bit)	001 to 256	001 to 128
Data memory*2	DM	00000 to 32767	.U	001 to 256	001 to 128
Link register	W	0000 to 3FFF	.U	001 to 256	001 to 128
Temporary data memory	TM	000 to 511	.U	001 to 256	001 to 128
Index register	Z	01 to 12	.U	01 to 12	01 to 12
Timer	T	000 to 511	.D	01 to 64	01 to 64
Timer (current value)	TC	000 to 511	.D	01 to 64	01 to 64
Timer (set value)	TS	000 to 511	.D	01 to 64	01 to 64
Counter	C	000 to 255	.D	01 to 64	01 to 64
Counter (current value)	CC	000 to 255	.D	01 to 64	01 to 64
Counter (set value)	CS	000 to 255	.D	01 to 64	01 to 64
High-speed counter	CTH	0 to 3*3	.D	1 to 4	1 to 4
High-speed counter comparator (set value)	CTC	0 to 7*3	.D	1 to 8	1 to 8
Control memory	CM	0000 to 8999	.U	001 to 256	001 to 128
Work memory	VM	0000 to 9499	.U	001 to 256	001 to 128

*1 Device No. and number of read data support zero suppression.
*2 Relays, internal auxiliary relays, latch relays, data memories, extended data memories, and file registers can be expressed with XYM. "XYM Expression", page 8-37
*3 The Device No. which can be used differ according to the base unit.
KV-NC32T: CTH0 to CTH2 CTC0 to CTC5
KV-N24: CTH0 to CTH1 CTC0 to CTC3
KV-N40: CTH0 to CTH2 CTC0 to CTC5
KV-N60: CTH0 to CTH3 CTC0 to CTC7

■ Response

<R, B, MR, LR, CR, VB>

* n: Number of read data specified when sending command
Data 1 to n: The values stored in devices in turn from the specified device No..
The data range displayed varies with the data format specified when sending command.

Specified data format		Data 1 to n	
		size	range
Not specified	Bit	1byte	0 (OFF) or 1 (ON)
.U	Decimal, 16bit, unsigned	5byte	00000 to 65535
.S	Decimal, 16bit, signed	6byte	-32768 to +32767 (0 is expressed as +00000)
.D	Decimal, 32bit, unsigned	10byte	0000000000 to 4294967295
.L	Decimal, 32bit, signed	11byte	-2147483648 to +2147483647 (0 is expressed as 0000000000)
.H	Hex, 16bit	4byte	0000 to FFFF

Point

When specified in the data format of .U/.S/.H, the consecutive 16 bits will be processed.

- **When specified in the data format of .D/.L, the consecutive 32 bits will be processed.**
- **If any device (R002, MR311) other than the leading device of the channel is specified for the relay device, consecutive 16/32 bits will be processed by crossing over to the next channel.**

<DM, EM, FM, ZF, W, TM, Z, AT, CM, VM>

* n: Number of read data specified when sending command

Data 1 to n: The values stored in devices in turn from the specified device No..
The data range displayed varies with the data format specified when sending command.

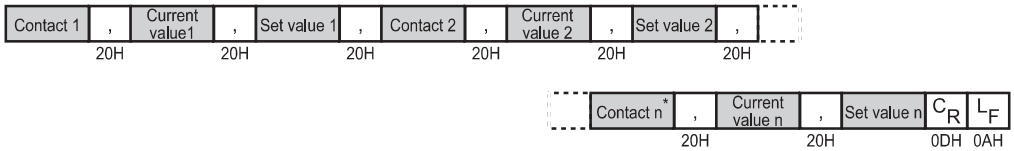
Specified data format		Data 1 to n	
		size	range
.U (can be omitted)	Decimal, 16bit, unsigned	5byte	00000 to 65535
.S	Decimal, 16bit, signed	6byte	-32768 to +32767 (0 is expressed as +00000)
.D	Decimal, 32bit, unsigned	10byte	0000000000 to 4294967295
.L	Decimal, 32bit, signed	11byte	-2147483648 to +2147483647 (0is expressed as 0000000000)
.H	Hex, 16bit	4byte	0000 to FFFF

Point

If Z is specified in the format of .U/.S/.H, the value of lower 16 bits will be displayed.

- **If AT is specified in the format of .U/.S/.H, the value of lower 16 bits will be displayed.**

<T, C, CTC, CTH>



* n: Number of read data specified when sending command

Contact 1 to n, current value 1 to n, set value 1 to n

: Displays the values stored in device in turn from the specified device No..
The data range displayed varies with the data format specified when sending command.
(For CTH, values of contact and set value are stored as fixed value 0)

Specified data format		Data 1 to n		Current value 1 to n, set value 1 to n	
		size	range	size	range
.U	Decimal, 16bit, unsigned	1byte	0 (OFF) or 1 (ON)	5byte	00000 to 65535
.S	Decimal, 16bit, signed			6byte	-32768 to +32767 (0 is expressed as +00000)
.D (can be omitted)	Decimal, 32bit, unsigned			10byte	0000000000 to 4294967295
.L	Decimal, 32bit, signed			11byte	-2147483648 to +2147483647 (0 is expressed as 0000000000)
.H	Hex, 16bit			4byte	0000 to FFFF

Point

When specified in the data format of .U/.S/.H, the value of lower 16 bits will be displayed.

<TC, CC>

Current value 1	␣	Current value 2	␣		Current value n*	CR	LF
	20H		20H			0DH	0AH

* n: Number of read data specified when sending command

Data 1 to n: the values stored in devices in turn from the specified device No..
The data range displayed varies with the data format specified when sending command.

Specified data format		Data 1 to n	
		size	range
.U	Decimal, 16bit, unsigned	5byte	00000 to 65535
.S	Decimal, 16bit, signed	6byte	-32768 to +32767 (0 is expressed as +00000)
.D (can be omitted)	Decimal, 32bit, unsigned	10byte	0000000000 to 4294967295
.L	Decimal, 32bit, signed	11byte	-2147483648 to +2147483647 (0 is expressed as 0000000000)
.H	Hex, 16bit	4byte	0000 to FFFF

Point

If the format of .U/.S/.H is specified, the value of lower 16 bits will be displayed.

<TS, CS>

Set value 1	␣	Set value 2	␣		Set value n*	CR	LF
	20H		20H			0DH	0AH

* n: Number of read data specified when sending command

Set value 1 to n: Displays the values stored in device in turn from the specified device No..
The data range displayed varies with the data format specified when sending command.

Specified data format		Set value 1 to n	
		size	range
.U	Decimal, 16bit, unsigned	5byte	00000 to 65535
.S	Decimal, 16bit, signed	6byte	-32768 to +32767 (0 is expressed as +00000)
.D (can be omitted)	Decimal, 32bit, unsigned	10byte	0000000000 to 4294967295
.L	Decimal, 32bit, signed	11byte	-2147483648 to +2147483647 (0 is expressed as 0000000000)
.H	Hex, 16bit	4byte	0000 to FFFF

Point

When specified in the data format of .U/.S/.H, the value of lower 16 bits will be displayed.

■ Error response

E	0	C_R	L_F
45H	30H	0DH	0AH

E0 : Device No. error

E	1	C_R	L_F
45H	31H	0DH	0AH

E1 : Command error

" Response in case of exception", page 8-36

■ Example of commands and responses

● Read R100 to R103 in the data format of "bit"

Command

R	D	S	␣	R	1	0	0	␣	4	C_R
52H	44H	53H	20H	52H	31H	30H	30H	20H	34H	0DH

Response

1	␣	0	␣	1	␣	0	C_R	L_F
31H	20H	30H	20H	31H	20H	30H	0DH	0AH

R100:ON R101:OFF R102:ON R103:OFF

● Read DM200 to DM202 in the data format of .S

Command

R	D	S	␣	D	M	2	0	0	.	S	␣	3	C_R
52H	44H	53H	20H	44H	4DH	32H	30H	30H	2EH	53H	20H	33H	0DH

Response

+	1	5	0	2	5	␣	−	2	5	4	0	0	␣	+	0	0	0	0	0	C_R	L_F
2BH	31H	35H	30H	32H	35H	20H	2DH	32H	35H	34H	30H	30H	20H	2BH	30H	30H	30H	30H	30H	0DH	0AH

DM200 = +15025 DM201 = -25400 DM202 = 0

Read Consecutive Data "RDE"

RDE command is compatible with Ethernet unit KV-LE20A. Its operation is the same as RDS.

"Data Read "RD"/Consecutive Data Read "RDS"", page 8-17

Write Data " WR"/Write Consecutive Data "WRS"

WR : Writes data to specified device.
WRS : Writes specified number of consecutive data.

■ Command

W	R	␣	Device type	Device No.	Data format*	␣	Data	CR
57H	52H	20H				20H		0DH

W	R	S	␣	Device type	Device No.	Data format*	␣	Number of written data	␣	Data 1	␣	Data 2	...	Data n	CR
57H	52H	53H	20H				20H		20H		20H				0DH

* The data format (suffix) of device is specified as .U/.S/.D/.L/.H/(not specified).
.U : Decimal, 16bit, unsigned
.S : Decimal, 16bit, signed
.D : Decimal, 32bit, unsigned
.L : Decimal, 32bit, signed
.H : Hex, 16bit
(Not specified): Depends on device type
" Data simultaneity when the data format is specified as .D/.L", page 8-37

Reference For individual device specifying method for "WR"/"WRS"command, see page 8-20.

● Devices when using KV-8000/7500/KV-EP21V (when CPU unit is KV-8000/7500/7300)

Device type		Device No. *1	Data format	Number of written devices	
Device name		KV-8000/7500/7300	not specified	Bit/.U/.S/.H	.D/.L
Relay *2	R (can be omitted)	00000 to 199915*6	(Bit)	0001 to 1000	0001 to 0500
Link relay	B	0000 to 7FFF	(Bit)	0001 to 1000	0001 to 0500
Internal auxiliary relay*2	MR	00000 to 399915*5	(Bit)	0001 to 1000	0001 to 0500
Latch relay *2	LR	00000 to 99915	(Bit)	0001 to 1000	0001 to 0500
Control relay	CR	0000 to 7915	(Bit)	0001 to 1000	0001 to 0500
Work relay	VB	0000 to F9FF	(Bit)	0001 to 1000	0001 to 0500
Data memory *2	DM	00000 to 65534	.U	0001 to 1000	0001 to 0500
Extended data memory *2	EM	00000 to 65534	.U	0001 to 1000	0001 to 0500
File register *2	FM	00000 to 32767	.U	0001 to 1000	0001 to 0500
	ZF	00000 to 524287	.U	0001 to 1000	0001 to 0500
Link register	W	0000 to 7FFF	.U	0001 to 1000	0001 to 0500
Temporary data memory	TM	000 to 511	.U	001 to 512	001 to 256
Index register	Z	01 to 12	.U	01 to 12	01 to 12
Timer (current value)*4	T*3, TC	0000 to 3999	.D	001 to 120	001 to 120
Timer (set value)*4	TS	0000 to 3999	.D	001 to 120	001 to 120
Counter (current value)*4	C*3, CC	0000 to 3999	.D	001 to 120	001 to 120
Counter (set value)*4	CS	0000 to 3999	.D	001 to 120	001 to 120
Control memory*7	CM	0000 to 5999	.U	0001 to 1000	0001 to 0500
Work memory*8	VM	00000 to 50999	(Bit)	0001 to 1000	0001 to 0500

*1 Device No. and number of written devices support zero suppression.
*2 Relays, internal auxiliary relays, latch relays, data memories, extended data memories, and file registers can be expressed with XYM. "XYM Expression", page 8-37
*3 If timers and counters are specified, the current value will be written.
*4 If the data format of .U/.S/.H is specified, data will be written in lower 16 bits.
*5 When connecting KV-8000/7500/7300 and KV-EP21V, MR00000 to MR99915 is possible when executing via KV-EP21. (In case of XYM expression, M00000 to M63999).
*6 The range is R00000 to R99915 when connecting KV-8000/7500/3000 with KV-EP21V and executing via KV-EP21V.
The range is R00000 to R99915 for KV-7000 series with CPU function version 2.2 or earlier.
*7 It will be CM0000~CM7599 for KV-8000.

*8 It will be VM00000~VM589823 for KV-8000. However, when connecting KV-8000 and KV-EP21V and executing via KV-EP21V, it becomes VM00000~VM63999.

● Devices when using KV-5500 and KV-EP21V (when CPU unit is KV-5500/5000/3000)

Device type		Device No. *1	Data format not specified	Number of written devices	
Device name		KV-5500/5000/3000		Bit /.U/.S/.H	.D/.L
Relay *2	R (can be omitted)	00000 to 99915	(Bit)	0001 to 1000	0001 to 0500
Link relay	B	0000 to 3FFF	(Bit)	0001 to 1000	0001 to 0500
Internal auxiliary relay*2	MR	00000 to 99915	(Bit)	0001 to 1000	0001 to 0500
Latch relay *2	LR	00000 to 99915	(Bit)	0001 to 1000	0001 to 0500
Control relay	CR	0000 to 3915	(Bit)	0001 to 1000	0001 to 0500
Work relay	VB	0000 to 3FFF	(Bit)	0001 to 1000	0001 to 0500
Data memory *2	DM	00000 to 65534	.U	0001 to 1000	0001 to 0500
Extended data memory *2	EM	00000 to 65534	.U	0001 to 1000	0001 to 0500
File register *2	FM	00000 to 32767	.U	0001 to 1000	0001 to 0500
	ZF	00000 to 131071	.U	0001 to 1000	0001 to 0500
Link register	W	0000 to 3FFF	.U	0001 to 1000	0001 to 0500
Temporary data memory	TM	000 to 511	.U	001 to 512	001 to 256
Index register	Z	01 to 12	.U	01 to 12	01 to 12
Timer (current value)*4	T*3, TC	0000 to 3999	.D	001 to 120	001 to 120
Timer (set value)*4	TS	0000 to 3999	.D	001 to 120	001 to 120
Counter (current value)*4	C*3, CC	0000 to 3999	.D	001 to 120	001 to 120
Counter (set value)*4	CS	0000 to 3999	.D	001 to 120	001 to 120
High-speed counter*4	CTH	0 to 1	.D	1 to 2	1 to 2
High-speed counter comparator*4	CTC*5	0 to 3	.D	1 to 4	1 to 4
Control memory	CM	0000 to 5999	.U	0001 to 1000	0001 to 0500
Work memory	VM	00000 to 49999	(Bit)	0001 to 1000	0001 to 0500

*1 Device No. and number of written devices support zero suppression.
*2 Relays, internal auxiliary relays, latch relays, data memories, extended data memories, and file registers can be expressed with XYM. "XYM Expression", page 8-37
*3 If timers and counters are specified, the current value will be written.
*4 If the data format of .U/.S/.H is specified, data will be written in lower 16 bits.
*5 If high-speed counter comparator (CTC) is specified, the set value will be written.

● Devices when using KV-NC1EP

Device name	Device type	Device No. *1	Data format not specified	Number of written devices*1	
				Bit /.U/.S/.H	.D/.L
Relay *2	R (can be omitted)	00000 to 59915	(Bit)	001 to 256	001 to 128
Link relay	B	0000 to 1FFF	(Bit)	001 to 256	001 to 128
Internal auxiliary relay*2	MR	00000 to 59915	(Bit)	001 to 256	001 to 128
Latch relay *2	LR	00000 to 19915	(Bit)	001 to 256	001 to 128
Control relay	CR	0000 to 8915	(Bit)	001 to 256	001 to 128
Work relay	VB	0000 to 1FFF	(Bit)	001 to 256	001 to 128
Data memory *2	DM	00000 to 32767	.U	001 to 256	001 to 128
Link register	W	0000 to 3FFF	.U	001 to 256	001 to 128
Temporary data memory	TM	000 to 511	.U	001 to 256	001 to 128
Index register	Z	01 to 12	.U	01 to 12	01 to 12
Timer (current value)*4	T*3, TC	000 to 511	.D	01 to 64	01 to 64
Timer (set value)*4	TS	000 to 511	.D	01 to 64	01 to 64
Counter (current value)*4	C*3, CC	000 to 255	.D	01 to 64	01 to 64
Counter (set value)*4	CS	000 to 255	.D	01 to 64	01 to 64
High-speed counter*4	CTH	0 to 3*6	.D	1 to 4	1 to 4
High-speed counter comparator*4	CTC*5	0 to 7*6	.D	1 to 8	1 to 8
Control memory	CM	0000 to 8999	.U	001 to 256	001 to 128
Work memory	VM	0000 to 9499	(Bit)	001 to 256	001 to 128

*1 Device No. and number of written devices support zero suppression.
*2 Relays, internal auxiliary relays, latch relays, data memories, extended data memories, and file registers can be expressed with XYM. "XYM Expression", page 8-37
*3 If timers (T) and counters (C) are specified, the current value will be written.
*4 If the data format of .U/.S/.H is specified, data will be written in lower 16 bits, and 0 will be written in upper 16 bits.
*5 If high-speed counter comparator (CTC) is specified, the set value will be written.
*6 The Device No. which can be used differ according to the base unit.
KV-NC32T: CTH0 to CTH2 CTC0 to CTC5
KV-N24: CTH0 to CTH1 CTC0 to CTC3
KV-N40: CTH0 to CTH2 CTC0 to CTC5
KV-N60: CTH0 to CTH3 CTC0 to CTC7

■ Response

O	K	C_R	L_F
4FH	4BH	0DH	0AH

OK: During normal command processing, code "OK" is prompted.

■ Error response

E	0	C_R	L_F
45H	30H	0DH	0AH

E0 : Device No. Error

E	1	C_R	L_F
45H	31H	0DH	0AH

E1 : Command Error

E	4	C_R	L_F
45H	34H	0DH	0AH

E4 : Write Protected

" Response in case of exception", page 8-36

■ Example of commands and responses

● Write in R100 to R103 in the data format of "bit"

Command

W	R	S	␣	R	1	0	0	␣	4	␣	1	␣	0	␣	1	␣	0	C_R
57H	52H	53H	20H	52H	31H	30H	30H	20H	34H	20H	31H	20H	30H	20H	31H	20H	30H	0DH

Response

O	K	C_R	L_F
4FH	4BH	0DH	0AH

● Write in DM200 to DM202 in the data format of .S

Command

W	R	S	␣	D	M	2	0	0	.	S	␣	3	␣
57H	52H	53H	20H	44H	4DH	32H	30H	30H	2EH	53H	20H	33H	20H

+	1	5	0	2	5	␣	−	0	5	4	0	0	␣	2	0	0	C_R
2BH	31H	35H	30H	32H	35H	20H	2DH	30H	35H	34H	30H	30H	20H	32H	30H	30H	0DH

Response

O	K	C_R	L_F
4FH	4BH	0DH	0AH

Reference Written data support zero suppression. For positive data, "+" can be omitted.

Write Consecutive Data "WRE"

WRE command is compatible with Ethernet unit KV-LE20A. Its operation is the same as WRS.

"Write Data " WR"/Write Consecutive Data "WRS"", page 8-23

Write Set Value "WS"/Write Consecutive Set Value "WSS"

WS/WSS command is compatible with Ethernet unit KV-LE20A. Its operation is the same as WR/WRS. However, "Device type" can only be specified as "T", "C", and "CTC". When "T" or "C" is specified, the set value will be written.

"Write Data " WR"/Write Consecutive Data "WRS"", page 8-23

Register Monitor "MBS"/"MWS"

Registers the specified device to bit device register table (MBS) or word device register table (MWS). At most 120 data can be registered.

MBS : Register bit device in monitor.
MBS : Register word device in monitor.

■ Command

<Register bit device in monitor>

Device type		Device No. *1		
Device name		KV-8000/7500/7300	KV-5500/5000/3000	KV Nano
Relay *2	R (can be omitted)	00000 to 199915*5	00000 to 99915	00000 to 59915
Link relay	B	0000 to 7FFF	0000 to 3FFF	0000 to 1FFF
Internal auxiliary relay*2	MR	00000 to 399915*4	00000 to 99915	00000 to 59915
Latch relay *2	LR	00000 to 99915	00000 to 99915	00000 to 19915
Control relay	CR	0000 to 7915	0000 to 3915	0000 to 8915
Timer	T	0000 to 3999	0000 to 3999	000 to 511
Counter	C	0000 to 3999	0000 to 3999	000 to 255
High-speed counter Comparator (contact)	CTC	—	0 to 3	0 to 7*3
Work relay	VB	0000 to F9FF	0000 to 3FFF	0000 to 1FFF

*1 Device No. supports zero suppression.

*2 Relays, internal auxiliary relays, latch relays, data memories, extended data memories, and file registers can be expressed with XYM.
" XYM Expression", page 8-37

*3 The Device No. which can be used differ according to the base unit.
KV-NC32T: CTH0 to CTH2 CTC0 to CTC5
KV-N24: CTH0 to CTH1 CTC0 to CTC3
KV-N40: CTH0 to CTH2 CTC0 to CTC5
KV-N60: CTH0 to CTH3 CTC0 to CTC7

*4 When connected to KV-8000/7500/7300 and KV-EP21V and executed via KV-EP21V, MR00000 to MR99915. (In case of XYM expression, can be executed from M00000 to M63999).

*5 The range is R00000 to R99915 when connecting KV-8000/7500/3000 with KV-EP21V and executing via KV-EP21V.
The range is R00000 to R99915 for KV-7000 series with CPU function version 2.2 or earlier.

<Register bite device in monitor>

M	W	S	␣	Device type	Device No.	Data format*	␣	Device type	Device No.	Data format*	␣	...
4DH	57H	53H	20H				20H				20H	

...	Device type	Device No.	Data format*	CR
				0DH

* The data format (suffix) of device is specified as .U/.S/.D/.L/.H/(not specified).

.U : Decimal, 16bit, unsigned
.S : Decimal, 16bit, signed
.D : Decimal, 32bit, unsigned
.L : Decimal, 32bit, signed
.H : Hex, 16bit

(Not specified): depends on device type

" Data simultaneity when the data format is specified as .D/.L", page 8-37

● Devices when using KV-8000/7500/KV-EP21V (when CPU units is KV-8000/7500/7300)

Device type		Device No. *1	Data format not specified
Device name		KV-8000/7500/7300	
Relay *2*3	R (can be omitted)	00000 to 199915*5	.U
Link relay *3	B	0000 to 7FFF	.U
Internal auxiliary relay *2*3	MR	00000 to 399915*4	.U
Latch relay *2*3	LR	00000 to 99915	.U
Control relay *3	CR	0000 to 7915	.U
Work relay	VB	0000 to F9FF	.U
Data memory *2	DM	00000 to 65534	.U
Extended data memory *2	EM	00000 to 65534	.U
File register *2	FM	00000 to 32767	.U
	ZF	00000 to 524287	.U
Link register	W	0000 to 7FFF	.U
Temporary data memory	TM	000 to 511	.U
Index register	Z	01 to 12	.U
Timer (current value)	TC	0000 to 3999	.D
Timer (set value)	TS	0000 to 3999	.D
Counter (current value)	CC	0000 to 3999	.D
Counter (set value)	CS	0000 to 3999	.D
Digital trimmer	AT	0 to 7	.D
Control memory*6	CM	0000 to 5999	.U
Work memory*7	VM	0000 to 50999	.U

*1 Device No. and number of read data support zero suppression.

*2 Relays, internal auxiliary relays, latch relays, data memories, extended data memories, and file registers can be expressed with XYM.

"XYM Expression", page 8-37

*3 Relays, link relays, internal auxiliary relays, latch relays, and control relays are registered by channel. Leading device should be specified when setting.

*4 When connecting KV-8000/7500/7300 and KV-EP21V, MR00000 to MR99915 is possible when executing via KV-EP21. (In case of XYM expression, M00000 to M63999.)

*5 The range is R00000 to R99915 when connecting KV-8000/7500/3000 with KV-EP21V and executing via KV-EP21V.
The range is R00000 to R99915 for KV-7000 series with CPU function version 2.2 or earlier.

*6 It will be CM0000~CM7599 for KV-8000.

*7 It will be VM00000~VM589823 for KV-8000. However, when connecting KV-8000 and KV-EP21V and executing via KV-EP21V, it becomes VM00000~VM63999.

● Devices when using KV-5500 and KV-EP21V (when CPU unit is KV-5500/5000/3000)

Device type		Device No. *1	Data format not specified
Device name		KV-5500/5000/3000	
Relay *2*3	R (can be omitted)	00000 to 99915	.U
Link relay *3	B	0000 to 3FFF	.U
Internal auxiliary relay *2*3	MR	00000 to 99915	.U
Latch relay *2*3	LR	00000 to 99915	.U
Control relay *3	CR	0000 to 3915	.U
Work relay	VB	0000 to 3FFF	.U
Data memory *2	DM	00000 to 65534	.U
Extended data memory *2	EM	00000 to 65534	.U
File register *2	FM	00000 to 32767	.U
Link register	W	0000 to 3FFF	.U
Temporary data memory	TM	000 to 511	.U
Index register	Z	01 to 12	.U
Timer (current value)	TC	0000 to 3999	.D
Timer (set value)	TS	0000 to 3999	.D
Counter (current value)	CC	0000 to 3999	.D
Counter (set value)	CS	0000 to 3999	.D
High-speed counter	CTH	0 to 1	.D
High-speed counter comparator (set value)	CTC	0 to 3	.D
Digital trimmer	AT	0 to 7	.D
Control memory	CM	0000 to 5999	.U
Work memory	VM	0000 to 49999	.U

*1 Device No. supports zero suppression.

*2 Relays, internal auxiliary relays, latch relays, data memories, extended data memories, and file registers can be expressed with XYM.

"XYM Expression", page 8-37

*3 Relays, link relays, internal auxiliary relays, latch relays, and control relays are registered by channel. Leading device should be specified when setting.

● Devices when using KV-NC1EP

Device type / Device name		Device No. *1	Data format not specified
Relay*2*3	R (can be omitted)	00000 to 59915	.U
Link relay*3	B	0000 to 1FFF	.U
Internal auxiliary relay*2*3	MR	00000 to 59915	.U
Latch relay*2*3	LR	00000 to 19915	.U
Control relay*3	CR	0000 to 8915	.U
Work relay	VB	0000 to 1FFF	.U
Data memory*2	DM	00000 to 32767	.U
Link register	W	0000 to 3FFF	.U
Temporary data memory	TM	000 to 511	.U
Index register	Z	01 to 12	.U
Timer (current value)	TC	000 to 511	.D
Timer (set value)	TS	000 to 511	.D
Counter (current value)	CC	000 to 255	.D
Counter (set value)	CS	000 to 255	.D
High-speed counter	CTH	0 to 3 *4	.D
High-speed counter comparator (set value)	CTC	0 to 7 *4	.D
Control memory	CM	0000 to 8999	.U
Work memory	VM	0000 to 9499	.U

*1 Device No. supports zero suppression.

*2 Relays, internal auxiliary relays, latch relays, data memories, extended data memories, and file registers can be expressed with XYM.

"XYM Expression", page 8-37

*3 Relays, link relays, internal auxiliary relays, latch relays, and control relays are registered by channel. The leading device should be specified when setting.

*4 The Device No. which can be used differ according to the base unit.

KV-NC32T: CTH0 to CTH2 CTC0 to CTC5
KV-N24: CTH0 to CTH1 CTC0 to CTC3
KV-N40: CTH0 to CTH2 CTC0 to CTC5
KV-N60: CTH0 to CTH3 CTC0 to CTC7

■ Response

O	K	C_R	L_F
4FH	4BH	0DH	0AH

OK: During normal command processing, code "OK" is prompted.

■ Error response

E	0	C_R	L_F
45H	30H	0DH	0AH

E0 : Device No. error

E	1	C_R	L_F
45H	31H	0DH	0AH

E1 : Command error

" Response in case of exception", page 8-36

Read Monitor "MBR"/"MWR"

Reads the device value in device register table.

MBR : Reads the value of bit device registered in monitor.

MWR : Reads the value of word device registered in monitor.

■ Command

<To read bit device register table. >

M	B	R	CR
4DH	42H	52H	0DH

<To read word device register table. >

M	W	R	CR
4DH	57H	52H	0DH

■ Response

Data	␣	Data	␣	···	␣	Data	␣	Data	CR	LF
	20H		20H		20H		20H		0DH	0AH

Data : Enters the monitor result of the device registered in bit device register table or word device register table. The format of monitor result is the same as that of response to RDS command*.
* Read monitor is available only to current value for CTH, and to set value for CTC.

■ Error response

E	1	CR	LF
45H	31H	0DH	0AH

E1: Command error

" Response in case of exception", page 8-36

Read Comments "RDC"

Reads comments of specified device.

■ Command

R	D	C	␣	Device type	Device No.	C_R
52H	44H	43H	20H			0DH

Device type		Device No. *1		
Device name		KV-8000/7500/7300	KV-5500/5000/3000	KV Nano
Relay *2	R (can be omitted)	00000 to 199915*5	00000 to 99915	00000 to 59915
Link relay	B	0000 to 7FFF	0000 to 3FFF	0000 to 1FFF
Internal auxiliary relay*2	MR	00000 to 399915*4	00000 to 99915	00000 to 59915
Latch relay *2	LR	00000 to 99915	00000 to 99915	00000 to 19915
Control relay	CR	0000 to 7915	0000 to 3915	0000 to 8915
Data memory *2	DM	00000 to 65534	00000 to 65534	00000 to 32767
Extended data memory *2	EM	00000 to 65534	00000 to 65534	-
File register *2	FM	00000 to 32767	00000 to 32767	-
	ZF	000000 to 524287	000000 to 131071	-
Link register	W	0000 to 7FFF	0000 to 3FFF	0000 to 3FFF
Temporary data memory	TM	000 to 511	000 to 511	000 to 511
Index register	Z	01 to 12	01 to 12	01 to 12
Timer	T	0000 to 3999	0000 to 3999	000 to 511
Counter	C	0000 to 3999	0000 to 3999	000 to 255
High-speed counter	CTH	—	0 to 1	0 to 3 *3
High-speed counter comparator	CTC	—	0 to 3	0 to 7 *3
Control memory*6	CM	0000 to 5999	0000 to 5999	0000 to 8999

*1 Device No. supports zero suppression.

*2 Relays, internal auxiliary relays, latch relays, data memories, extended data memories, and file registers can be expressed with XYM.
" XYM Expression", page 8-37

*3 The Device No. which can be used differ according to the base unit.
KV-NC32T: CTH0 to CTH2 CTC0 to CTC5
KV-N24: CTH0 to CTH1 CTC0 to CTC3
KV-N40: CTH0 to CTH2 CTC0 to CTC5
KV-N60: CTH0 to CTH3 CTC0 to CTC7

*4 When connected to KV-8000/7500/7300 and KV-EP21V and executed via KV-EP21V, MR00000 to MR99915. (In case of XYM expression, can be executed from M00000 to M63999).

*5 The range is R00000 to R99915 when connecting KV-8000/7500/3000 with KV-EP21V and executing via KV-EP21V.
The range is R00000 to R99915 for KV-7000 series with CPU function version 2.2 or earlier.

*6 It will be CM0000~CM7599 for KV-8000.

■ Response

Data	C_R	L_F
	0DH	0AH

Data : Enters the device comments specified by command (32 characters). If the comments are less than 32 characters, space (20H) should be added.

Reference When using KV-7500/7300 the converted strings will be added according to the project language setting.

■ Error response

E	0	C_R	L_F
45H	30H	0DH	0AH

E0 : Device No. error

E	1	C_R	L_F
45H	31H	0DH	0AH

E1 : Command error

E	6	C_R	L_F
45H	36H	0DH	0AH

E6 : No comment

" Response in case of exception", page 8-36

Point

In case of writing under RUN, even if comments are registered in the specified device, response "E6" will be added in case of exception.

BANK Switching "BE"

Switches the bank of file register.

Point

KV-NC1EP (KV Nano Series) does not respond to the BANK Switching "BE" instruction. If one is received, a "E1: Instruction error" response will be sent back.

■ Command

B	E	␣	Bank No.	C_R
42H	45H	20H		0DH

BANK No.: BANK No. of file register should be specified within the range of 0 to 3 (0 to 15 for KV-8000/7500/7300).

■ Response

O	K	C_R	L_F
4FH	4BH	0DH	0AH

OK: During normal command processing, code "OK" is prompted.

■ Error response

E	0	C_R	L_F
45H	30H	0DH	0AH

E0 : Device No. error

E	1	C_R	L_F
45H	31H	0DH	0AH

E1 : Command error

" Response in case of exception", page 8-36

Read Expansion Unit Buffer Memory "URD"

Reads expansion unit buffer memory data of specified quantity consecutively.

■ Command

U	R	D	␣	Unit No.*1	␣	Address*2	Data format*3	␣	Number of read data*4	C_R
55H	52H	44H	20H		20H			20H		0DH

*1 Unit No. : Unit No. should be specified within the range of 00 to 48.

*2 Address : The address of expansion unit buffer memory should be specified within the range of 00000 to 32767 (0 to 59999 for KV-7500/7300).

*3 Data format : The data format (suffix) of device should be specified as .U/.S/.D/.L/.H/(not specified).

.U : Decimal, 16bit, unsigned
.S : Decimal, 16bit, signed
.D : Decimal, 32bit, unsigned
.L : Decimal, 32bit, signed
.H : Hex, 16bit
(Not specified): Depends on device type

" Data simultaneity when the data format is specified as .D/.L", page 8-37

The method to specify data format is the same as RD/RDS command.

"Data Read "RD"/Consecutive Data Read "RDS"", page 8-17

*4 Number of read data: If the data format is specified as .U/.S/.H, it should be specified within the range of 0001 to 1000.
If the data format is specified as .D/.L, it should be specified within the range of 0001 to 0500.

■ Response

Data	␣	Data	␣	···	␣	Data	␣	Data	C_R	L_F
	20H		20H		20H		20H		0DH	0AH

Data : The data stored in the expansion unit buffer memory of specified address. The format of read result is the same as that of response of RDS command.

■ Error response

E	0	C_R	L_F
45H	30H	0DH	0AH

E0 : Device No. error

E	1	C_R	L_F
45H	31H	0DH	0AH

E1 : Command error

" Response in case of exception", page 8-36

Write Expansion Unit Buffer Memory "UWR"

Writes specified number of consecutive data into the expansion unit buffer memory.

■ Command

U	W	R	␣	Unit No.*1	␣	Address*2	Data format*3	␣	Number of read data*4	␣	Data 1*5	␣	Data 2*5	␣	...	Data n*5	C_R
55H	57H	52H	20H		20H			20H		20H		20H		20H			0DH

*1 Unit No. : Specifies the unit No. within the range of 00 to 48.

*2 Address : The address of expansion unit buffer memory should be specified within the range of 00000 to 32767 (0 to 59999 for KV-7500/7300).

*3 Data format : The data format (suffix) of device should be specified as .U/.S/.D/.L/.H/(not specifies).

.U : Decimal, 16bit, unsigned
.S : Decimal, 16bit, signed
.D : Decimal, 32bit, unsigned
.L : Decimal, 32bit, signed
.H : Hex, 16bit

(Not specified): Depends on device type

" Data simultaneity when the data format is specified as .D/.L", page 8-37

The method to specify data format is the same as WR/WRS command.

"Write Data " WR"/Write Consecutive Data "WRS"", page 8-23

*4 Number of written data: If the data format is specified as .U/.S/.H, it should be specified within the range of 0001 to 1000.
If the data format is specified as .D/.L, it should be specified within the range of 0001 to 0500.

*5 Data 1 to n : Specifies the data to be written in the expansion unit buffer memory. (N represents number of written data)

■ Response

O	K	C_R	L_F
4FH	4BH	0DH	0AH

OK: During normal command processing, code "OK" is prompted.

■ Error response

E	0	C_R	L_F
45H	30H	0DH	0AH

E0 : Device No. error

E	1	C_R	L_F
45H	31H	0DH	0AH

E1 : Command error

" Response in case of exception", page 8-36

Response in case of exception

A response different from normal one will be returned if a wrong command is sent or an exception occurs in the CPU unit. Response details, causes and measures to be taken in case of exception are shown below.

Code	Description	Cause	Measures
E0	Abnormal device No.	• The specified device No., BANK No., unit No. or address is out of range. • The specified timer, counter, CTH or CYC No. is unavailable in the program. • Not registered in monitor, but read monitor is executed.	• Specify a No. within the given range. • Check program and specify a No. used in the program. • Register in monitor before executing read monitor.
E1	Abnormal command	• Unsupported command is sent. • The method to specify command is incorrect.	• Send correct command after checking the command.
E2	Program not registered	• M1 command (switch to RUN mode) is sent in the condition that no program is registered in CPU unit. • M1 command (switch to RUN mode) is sent in the condition that the RUN/PROG switch of CPU unit is in PROG mode.	• Send the command after program is registered in CPU unit. • Switch the RUN/PROG switch of CPU unit to RUN mode.
E4	Write disabled	• Try to change set values of timer, counter and CTC against program to which write is disabled.	• Send the command again after program write is enabled.
E5	Unit error	• "Command M1 (switch to RUN mode)" is sent when the error of CPU unit is not removed.	• Send the command again after the CPU unit error is removed.
E6	No comments	• Comments are not registered in the selected device of read comments command (RDC). • Failed to read the comments due to high load of PLC.	• If required, register the comments in device. • Execute when the load of PLC is lower or try again.

XYM Expression

For relay, internal auxiliary relay, latch relay, data memory, extended data memory and file register, devices can be specified based on XYM expression in the following table.

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Device name	KEYENCE expression	XYM expression	Device No. in XYM expression		
			KV-8000/7500/7300	KV-5500/5000/3000	KV Nano
Relay	R	X	0000 to 1999F*	0000 to 999F	0000 to 599F
		Y	0000 to 1999F*	0000 to 999F	0000 to 599F
Internal auxiliary relay	MR	M	00000 to 63999	00000 to 15999	00000 to 15999
Latch relay	LR	L	0000 to 999F	00000 to 15999	0000 to 3199
Data memory	DM	D	00000 to 65534	00000 to 65534	00000 to 32767
Extended data memory	EM	E	00000 to 65534	00000 to 65534	-
File register	FM	F	00000 to 32767	00000 to 32767	-

* The relay range is 0000 to 999F for KV-7000 series with CPU function version 2.2 or earlier.

Data simultaneity when the data format is specified as .D/.L

If the data format of R, B, MR, LR, CR, DM, EM*, FM*, ZF*, W, TM, CM, VB, and VM is specified as .D/.L, the device of specified device No. is lower 16 bits, the device of next No. is upper 16 bits, and the device will be processed as 32-bit data.

Only when the device No. is an even number, the simultaneity of upper 16 bits and lower 16 bits can be ensured.

* EM, FM and ZF cannot be used when KV-NC1EP is being used.