LIYAN PROGRAMMABLE LOGIC CONTROLLER

LYPLC
Computer Link

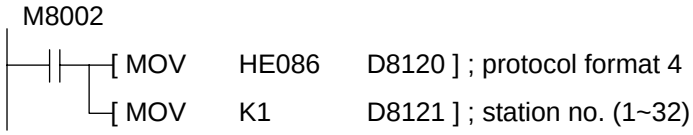
USER'S MANUAL

Computer Link

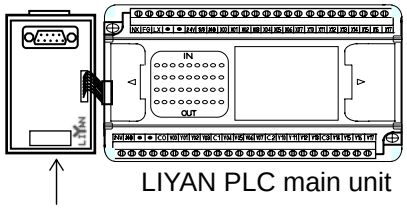
This manual contains text, diagrams and explanations which will guide the reader in the correct operation of the Computer Link. This explains the details and methods of specifying dedicated protocol used for linking of the EX series programmable logic controller and computer.

Applicable PLC : Ex1s, Ex1n, Ex2n series PLC

Before use this protocol, have to set the content of D8120 and D8121 first.



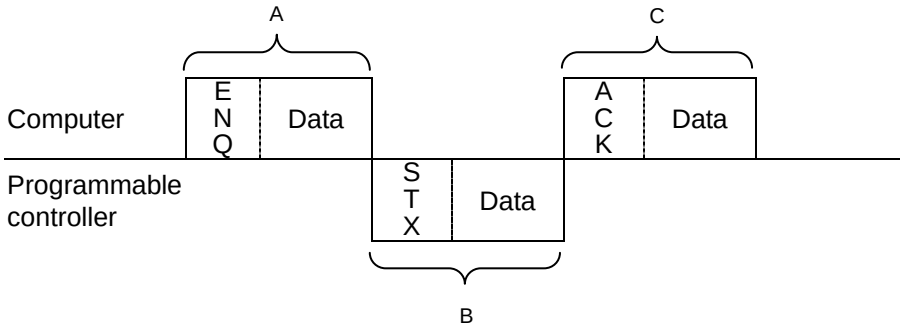
<Configuration> This protocol is only applicable to the second communication port.



1-1 How to Read a Control Protocol Diagram

1) When the computer reads data from the programmable controller

(computer ← programmable controller)

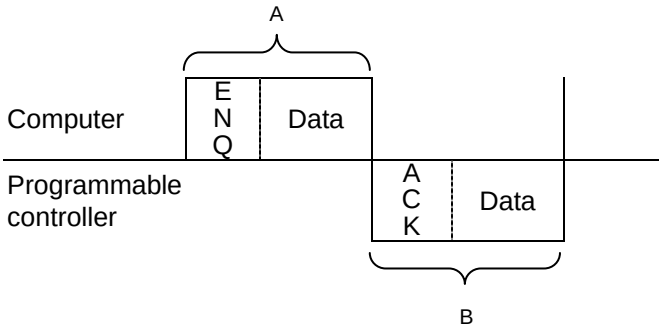


a) Area A and C indicate transmission from computer to PLC. (Area C could be omitted)

b) Area B denotes transmission from the programmable controller to the computer.

2) When writing data from the computer into the programmable controller

(computer → programmable controller)

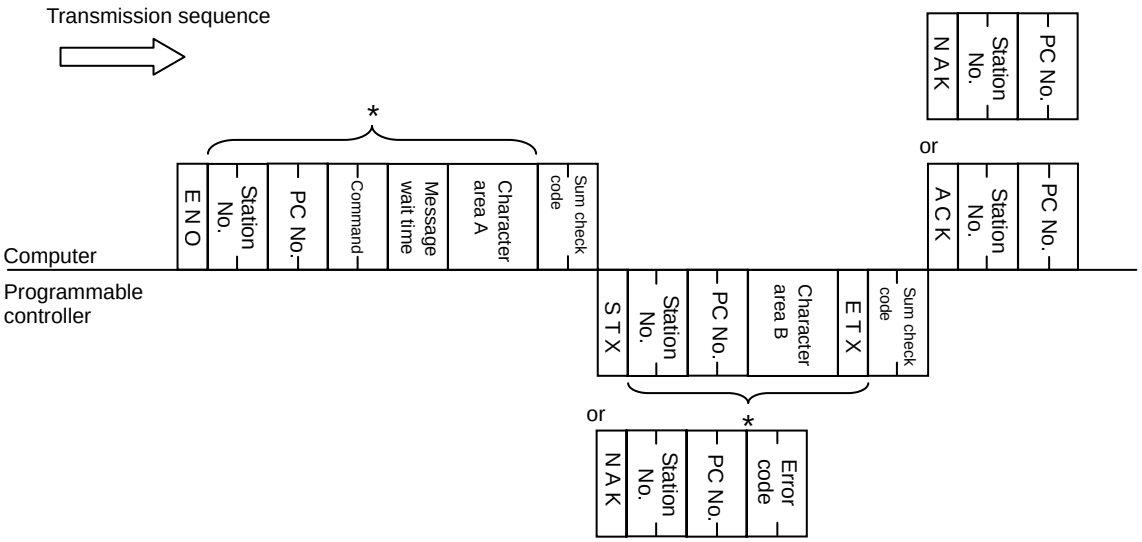
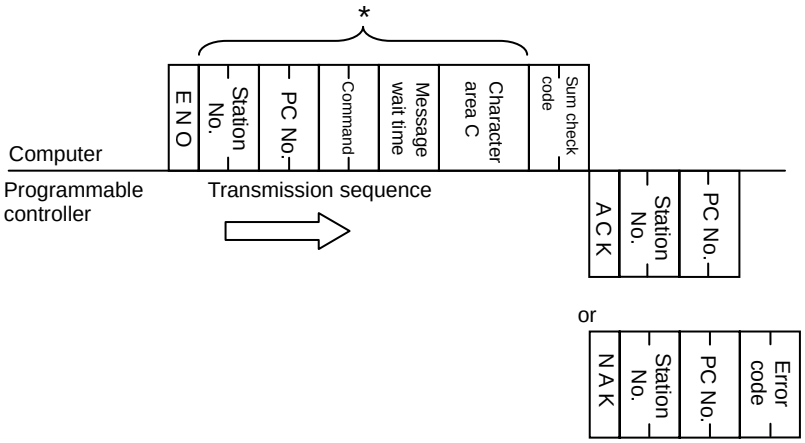


a) Areas A indicates transmission from the computer to the programmable controller.

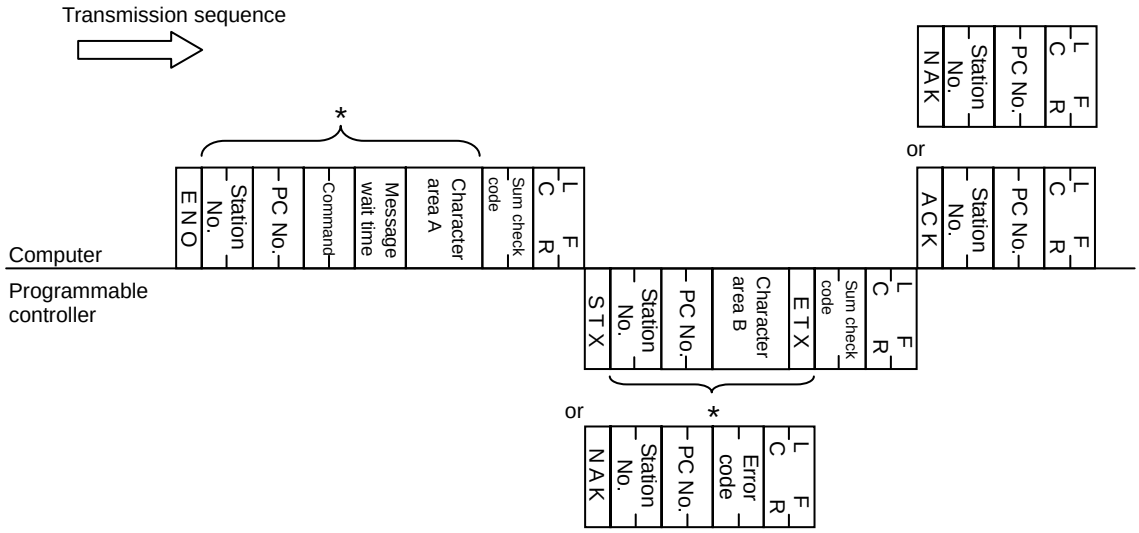
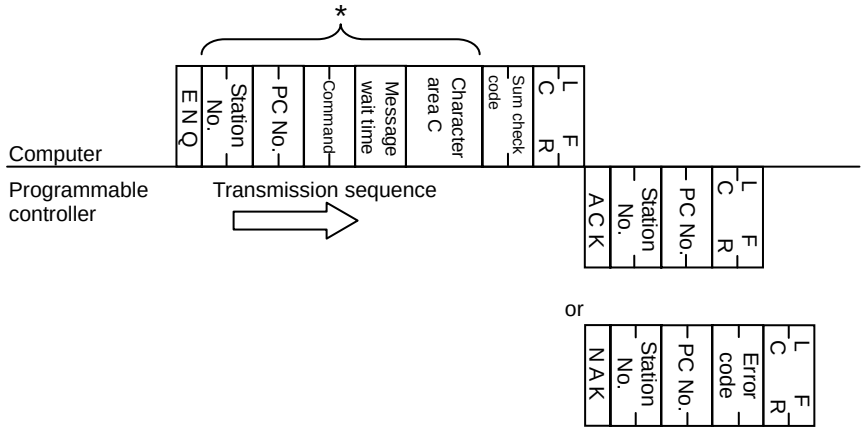
b) Area B denotes transmission from the programmable controller to the computer.

1-2 Control Protocol Format

1-2-1 Control Protocol Format 1

Description	Control protocol
To read data from the programmable controller to the computer	
To write data from the computer to the programmable controller	
Remarks	

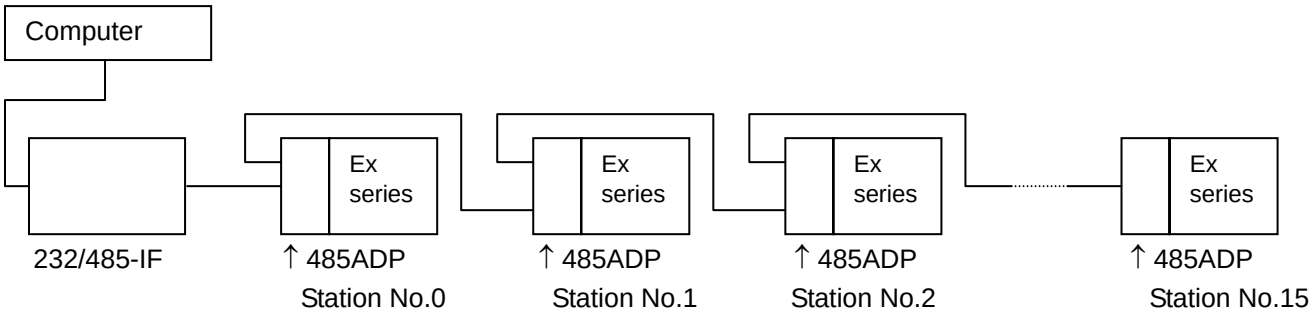
1-2-2 Control Protocol Format 4

Description	Control protocol
To read data from the programmable controller to the computer	
To write data from the computer to the programmable controller	
Remarks	

1-3 Control Protocol

1-3-1 Station number

The station number is the number provided at the programmable controller in order to determine which programmable controller the computer accesses. In the EX series programmable controller, the station number is set by the special data register D8121. 485ADP connect to the second communication port of PLC.



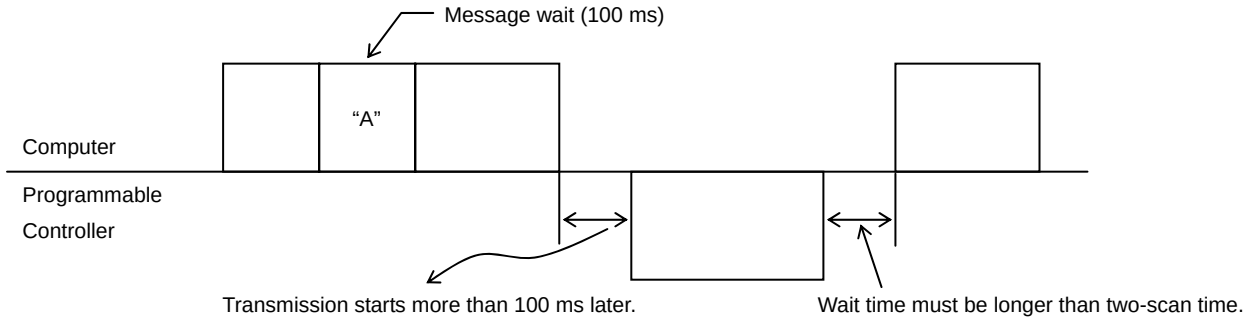
Notes

1) When setting station numbers, don't set the same number at more than 1 station. Otherwise, transmission data may become confused and communication irregular.
2) Station numbers need not be set in numerical order, but are free to be set within the specified range (00H to 1FH).

1-3-2 Message wait time

This is a delay time required by some computers to switch between send and receive states.
The message wait time may be set between 0 to 150 ms. The value is set using a single ASCII character ("0 to "F") representing 0_H to F_H (0 to 15).

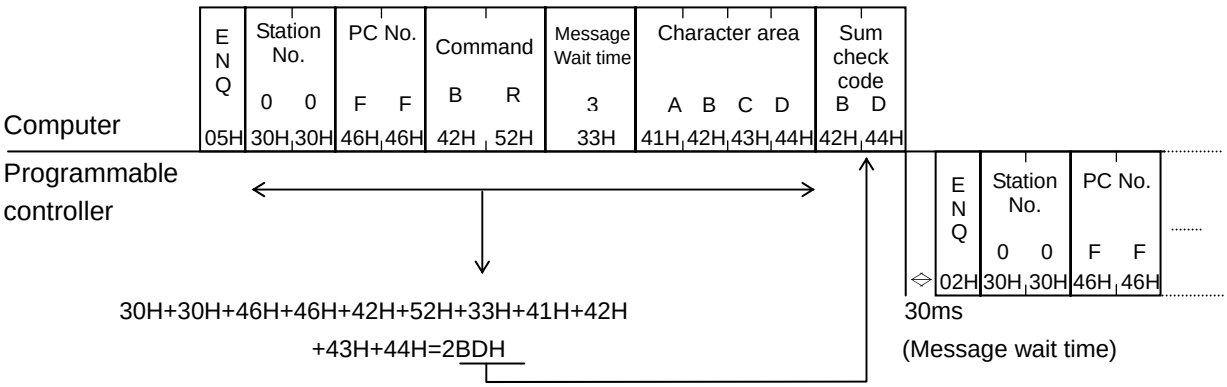
Example: Setting the message wait time



1-3-3 Sum check code

The sum check code is used to verify that the data in a message has not been corrupted.

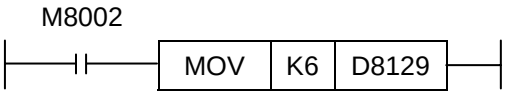
Example: When transmitting station number 0, PC number FF, command BR (device memory batch read), message wait time 30 ms, and data ABCD in format 1, the sum check code is calculated as follows.



1-4 Time-out Check Time

The time out check time refers to the duration after termination of receive (final character received) of a failed transmission from the computer(master) to the programmable controller(slaver), until the send sequence is initialized.

Example : To set the time-out check time as 60 ms:



1-5 Device specification ranges

The following is the device and device number range that can be used in the access of device memory. Each device is composed of five characters.

1) Bit devices

Devices		Ex1s	Ex1n, Ex2n	Expression
Inputs	(X)	X000~X017	X000~X177	Octal
Outputs	(Y)	Y000~Y017	Y000~Y177	
Auxiliary relays	(M)	M0000~M1535		Decimal
States	(S)	S0000~S0999		
Special auxiliary relays	(M)	M8000~M8255		
Timer contacts	(T)	TS000~TS255		
Counter contacts	(C)	CS000~CS255		

2) Word devices

Devices		Ex1s, Ex1n, Ex2n	Expression
Timer current value	(T)	TN000~TN255	Decimal
Counter current value	(C)	CN000~CN255	
Data registers	(D)	D0000~D3999	
Special data registers	(D)	D8000~D8255	

1-6 Character Area Data Transmission

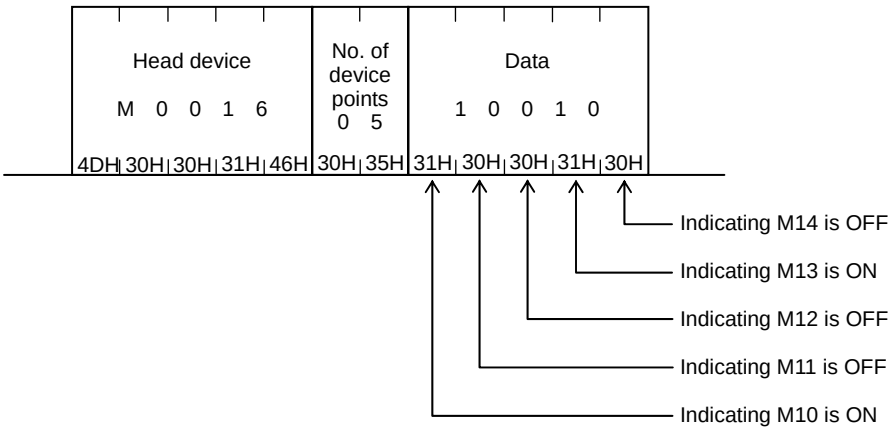
1-6-1 Bit Device Memory

Bit device memory is handled in 1 bit units (1 point) or in word unit (16 points).

1) Bit units (units of 1 points)

When handling bit device memory in bit units, the specified number of devices, in an increasing order from the specified head device, are represented sequentially from the left, as “1”(31H) when ON, and as “0”(30H) when OFF.

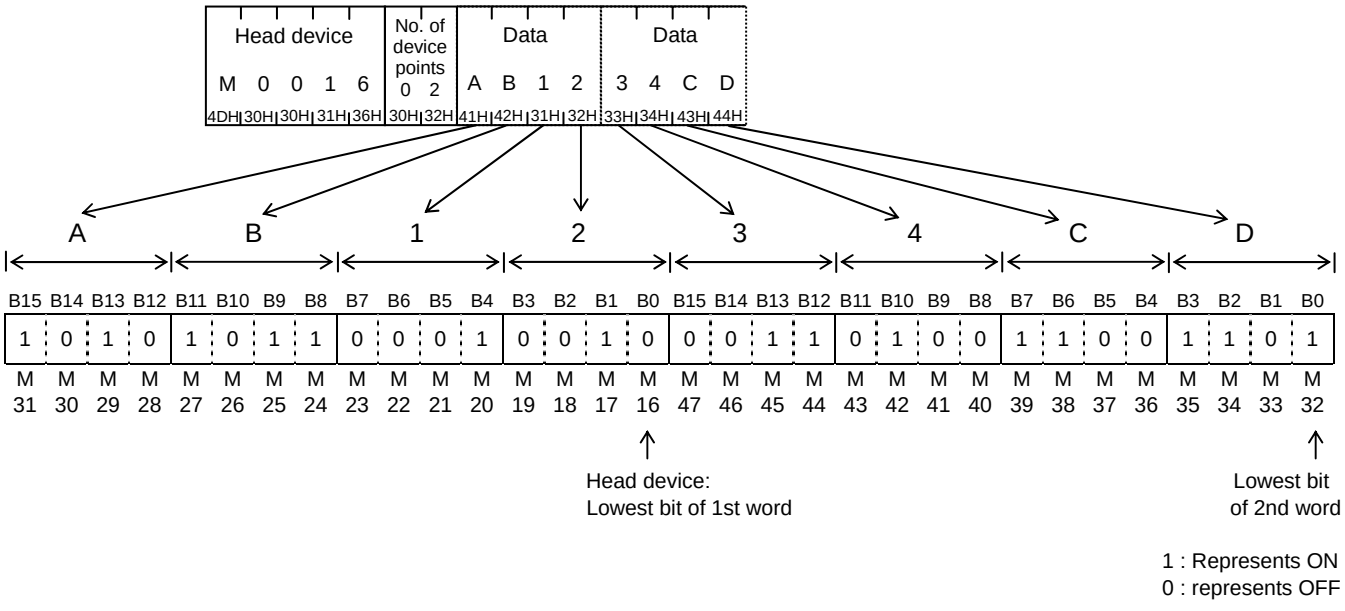
Example: When transmitting the on/off status of five points from M16



2) Word units (units of 16 points)

When handling bit device memory in word units, each word (16 bits, highest bit being first) is expressed as 4 hexadecimal digits (each of 4 bits) starting with the higher digit. Each digit being represented by the appropriate ASCII character.

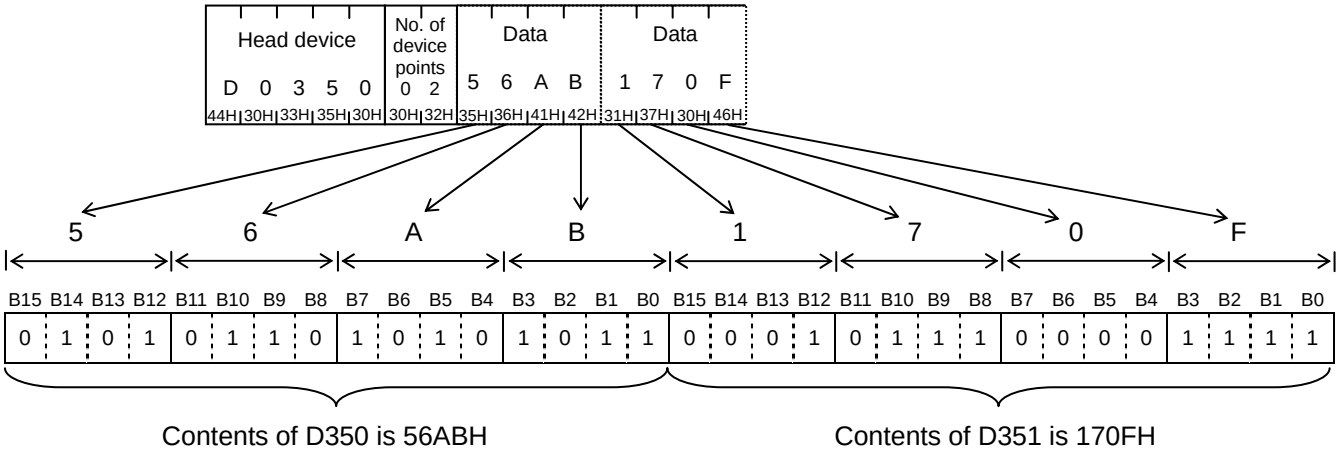
Example: When transmitting the on/off status of 32 points from M16



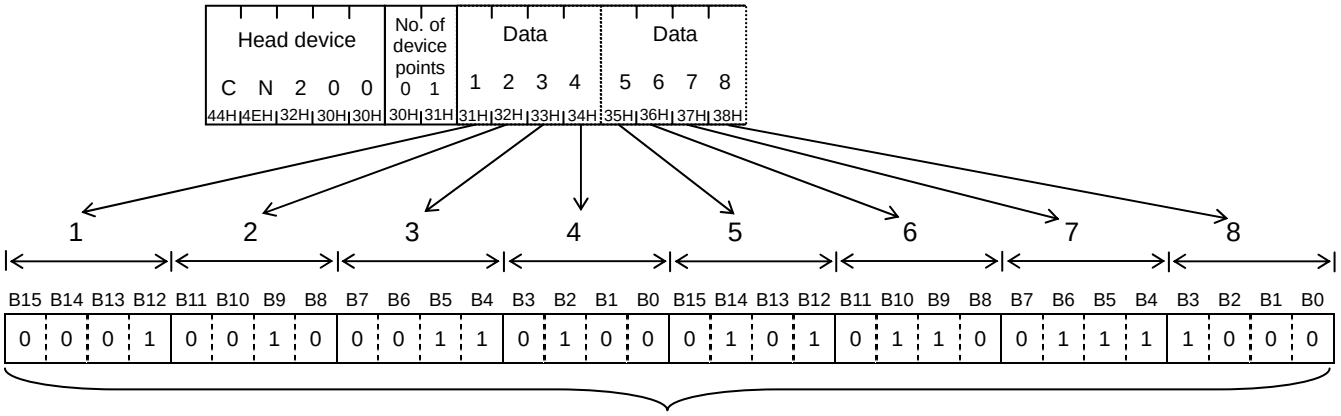
1-6-2 Word Device Memory

When handling word device memory, each word is expressed as 4 hexadecimal digits (each of 4 bits) starting with the higher digit. Each digit being represented by the appropriate ASCII character.

Example 1) When showing the contents of data registers D350, D351



Example 2) When showing the contents of C200 (32-bit counter), the device code of C200 is CN200



1-7 Commands and Device Ranges

1-7-1 Commands

			Command		Description	Remarks
			Symbol	ASCII code		
Device memory	Batch read	Bit unit	BR	42H, 52H	Reads a group of bit devices (X, Y, M, S, T, C), result is in units of 1 device.	
		Word unit	WR	57H, 52H	Reads a group of word devices (X, Y, M, S), result is in units of 16 devices.	
					Reads a group of word devices (D, T, C), result is in units of 1 device	
	Batch write	Bit unit	BW	42H, 57H	Writes a group of bit devices (X, Y, M, S, T, C), data is in units of 1 device.	
		Word unit	WW	57H, 57H	Writes a group of bit devices (X, Y, M, S), data is in units of 16 devices.	
					Writes a group of word devices (D, T, C), data is in units of 1 device.	
	Test (select write)	Bit unit	BT	42H, 54H	Set/reset individual bit devices (X, Y, M, S, T, C) selectively in units of 1 device.	
		Word unit	WT	57H, 54H	Set/reset bit devices (X, Y, M, S) selectively in units of 16 devices.	
					Write word devices (D, T, C*) selectively in units of 1 device.	
	Write data	Bit unit	BM	42H, 4DH	Write the bit device be monitored (X, Y, M, S, T, C)	
		Word unit	WM	57H, 4DH	Write the word device be monitored (X, Y, M, S, D, T, C)	
	Monitor the content of written data	Bit unit	MB	4DH, 42H	Monitor the bit device be written	
		Word unit	MN	4DH, 57H	Monitor the word device be written	
PC	Remote run		RR	52H, 52H	Remote run/stop request to programmable controller.	
	Remote stop		RS	52H, 53H		
Global			GW	47H, 57H	Set/reset the global flag (M8126 for Ex series) to all connected programmable controllers.	
Loopback test			TT	54H, 54H	Characters received from the computer are directly sent back to the computer	

* Computer except high speed (32-bit) counters C200 to C255.

2. Commands

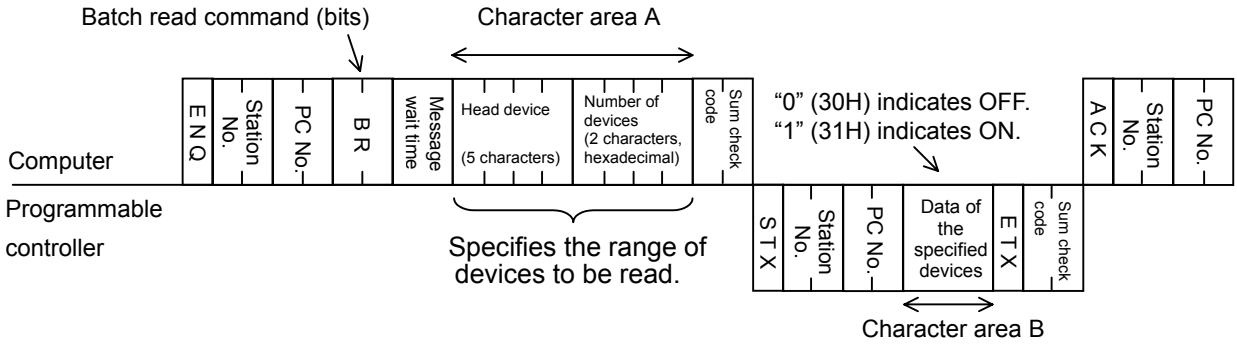
The reference pages for command are given below.

Command	Description	Section
BR	Bit devices read in units of 1 point.	2-1
WR	Bit devices read in units of 16 points, or word devices read in units of 1 point.	2-2
BW	Bit devices written in units of 1 point.	2-3
WW	Bit devices written in units of 16 points, or word devices written in units of 1 point.	2-4
BT	Bit devices specified in units of 1 point, and set/reset (forced on/off)	2-5
WT	Bit devices specified in units of 16 points, and set/reset (forced on/off), or word devices specified in units of 1 point, and data written.	2-6
BM	Set the bit device be monitored.	2-7
WM	Set the word device be monitored.	2-8
MB	Monitor the bit device be written.	2-9
MN	Monitor the word device be written.	2-10
RR	Programmable controller is started (RUN) by remote control.	2-11
RS	Programmable controller is stopped (STOP) by remote control.	2-11
GW	Global signal is turned on/off on all linked programmable controllers.	2-12
TT	Characters received from the computer are directly returned to the computer.	2-13

2-1 Batch Read of Bit Device (BR command)

1) Command specification

Protocol format 1 is shown.



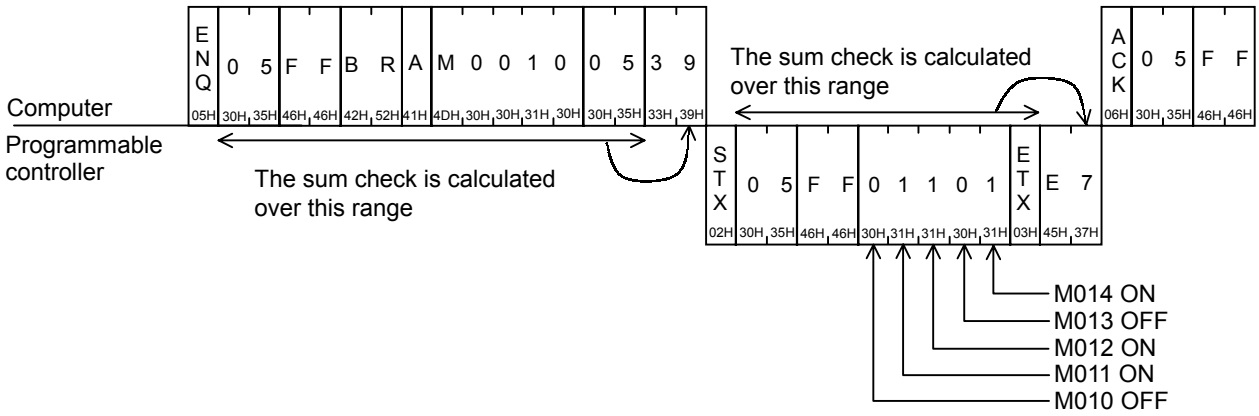
Notes

- Specify the range and number of devices, 1 ≤ number of devices ≤ 64
- The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.

2) Command example

To read five points of data from M010 to M014 at station No.5 (with message wait time set to 100 ms, expressed as "A").

(Assuming that M010 and M013 are OFF and M11, M12 and M14 are ON)



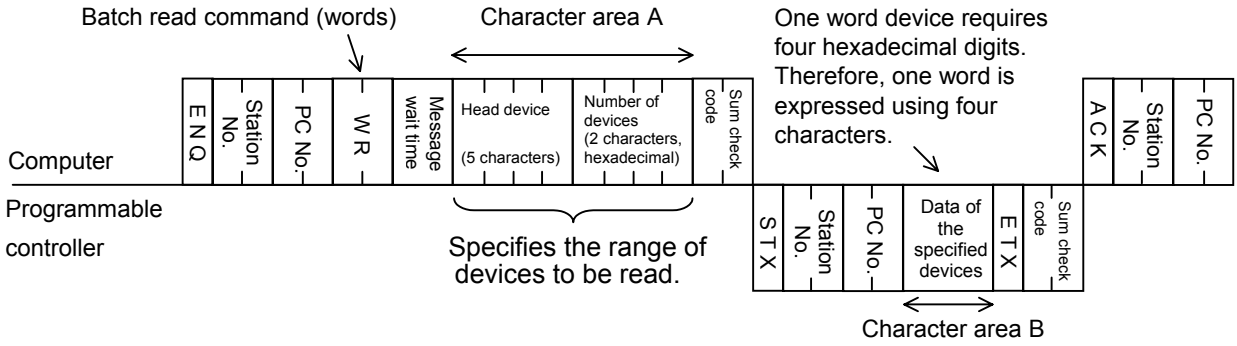
Notes

- Message wait time can be specified from 0 to 150 ms in 10 ms increments, expressed by 0H to FH (in hexadecimal).

2-2 Batch Read of Word Device (WR command)

1) Command specification

Protocol format 1 is shown



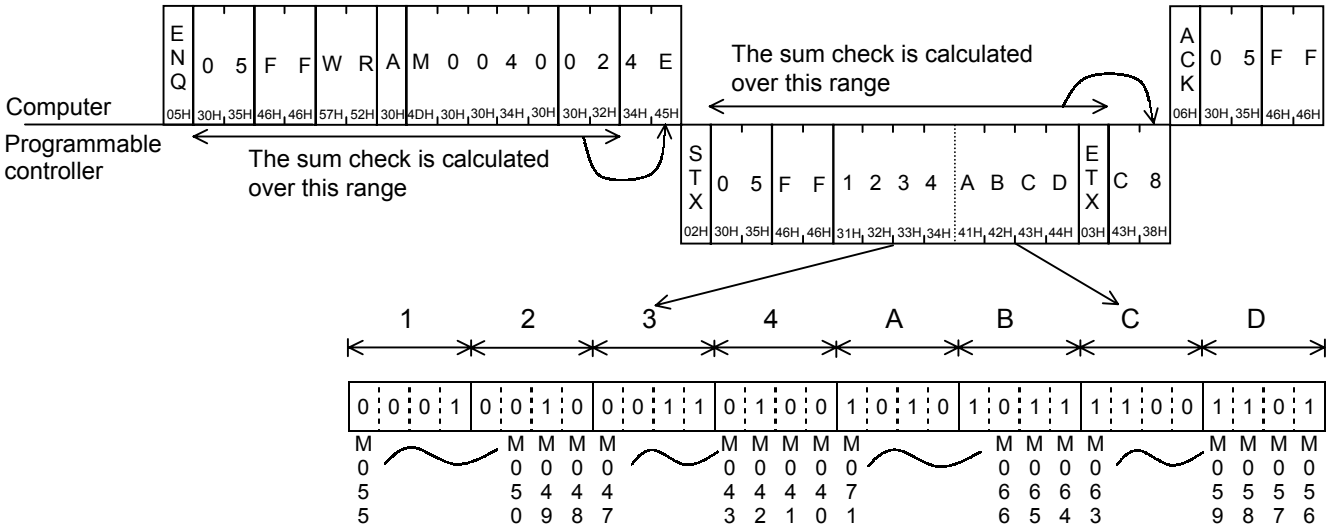
Notes

- ♦ Specify the range and number of devices (16 bit words), 1 ≤ number of devices ≤ 64
  - When reading 32-bit devices (C200 to C255), the returned data is a double word.
    Hence, the maximum number of devices is 16.
- ♦ The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.

2) Command examples

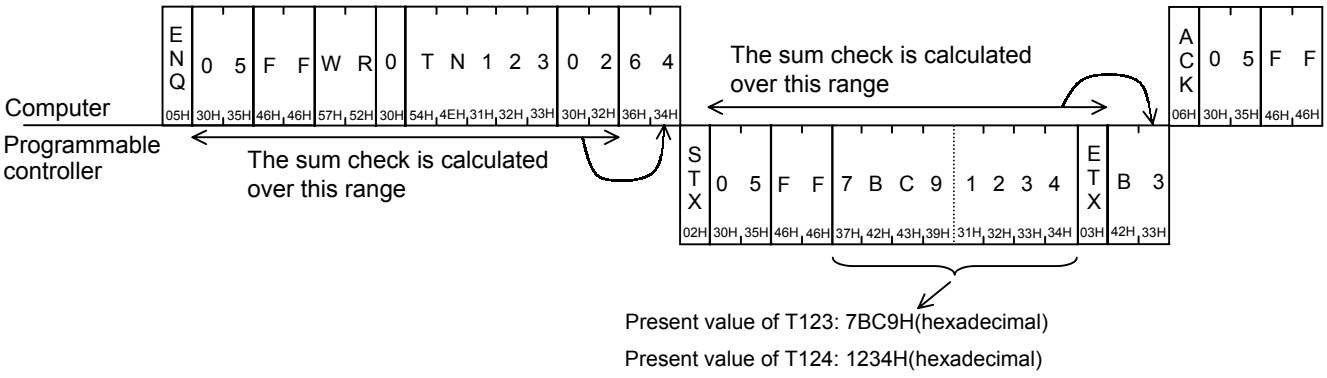
a) Example 1

To read 32 points of data from M040 to M071 at station No.5 (with message wait time set to 100 ms).



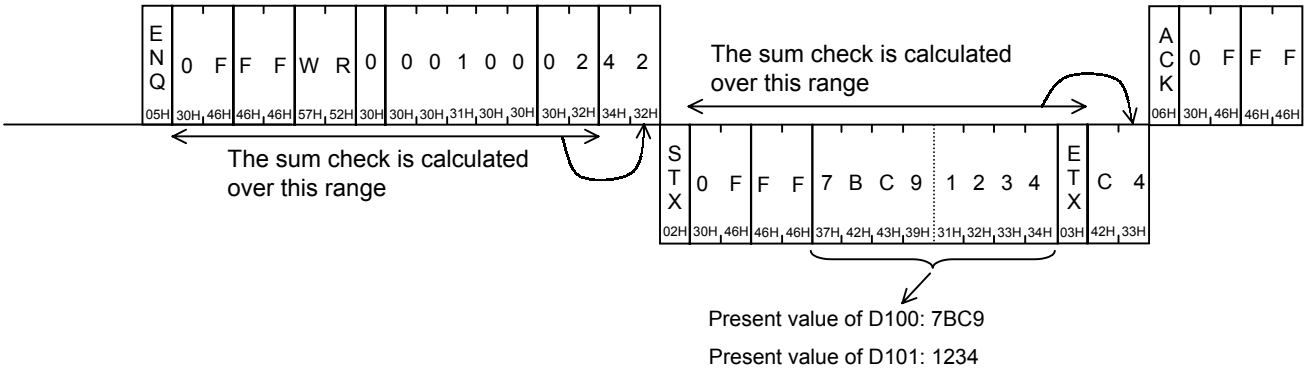
b) Example 2

To read the present value of two points, T123 and T124, at station No. 5.



c) Example 3

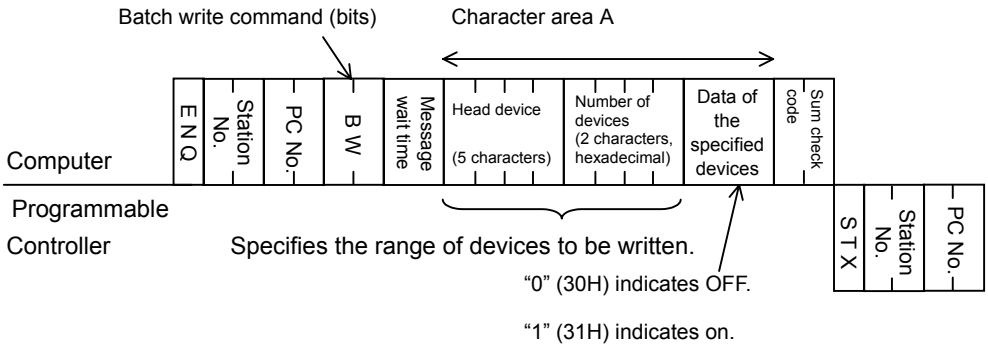
To read the present value of two points, D100 and D101 at station No.15 (F)



2-3 Batch Write of Bit Device (BW command)

1) Command specification

Protocol format 1 is shown

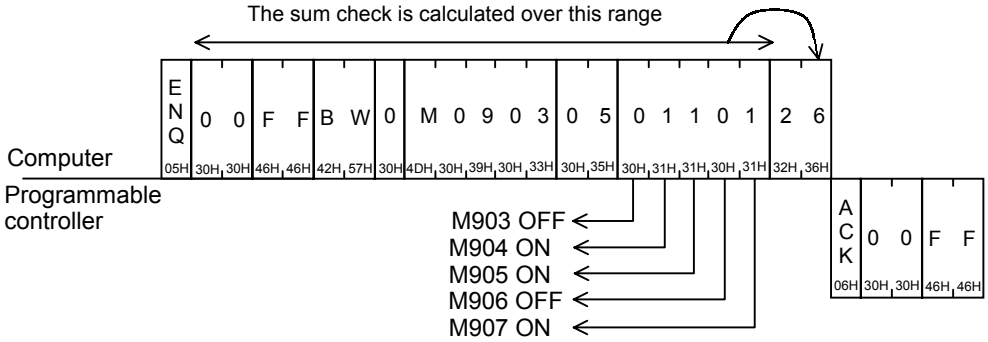


Notes

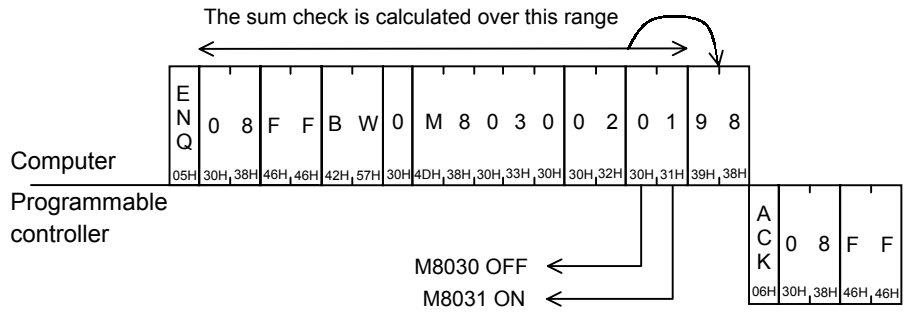
- Specify the range and number of devices, 1 ≤ number of devices ≤ 64
- The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.

2) Command example

a) To write data into five points from M903 to M907 at station No.0 (with message wait time set to 0 ms).



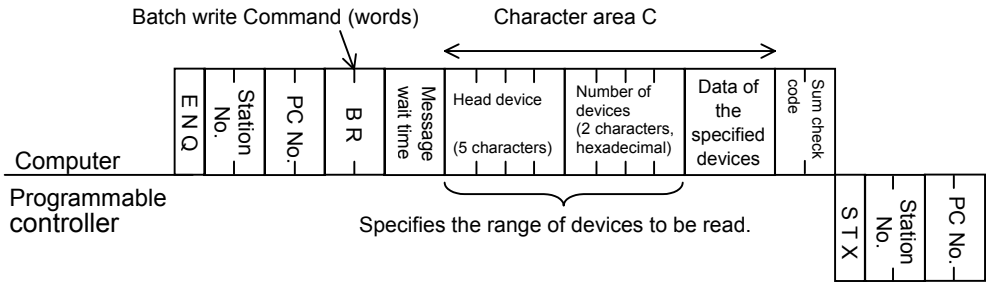
b) To write data into two points from M8030 to M8031 at station No.8 (with message wait time set to 10 ms.)



2-4 Batch Write of Word Device (WW command)

1) Command specification

Protocol format 1 is shown



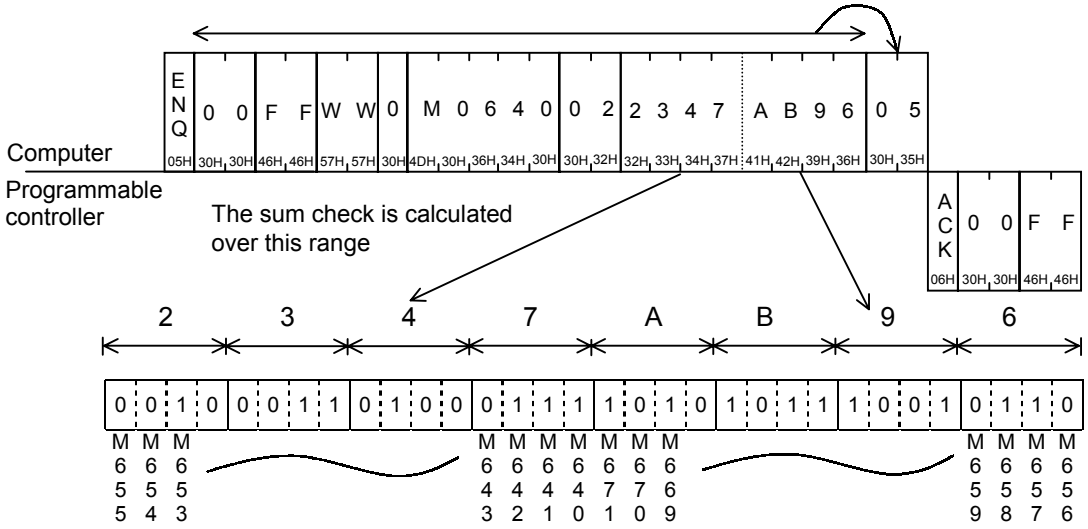
Notes

- Specify the range and number of devices (16 bit words), 1 ≤ number of devices ≤ 64 (8 words in the case of bit devices)
- The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.

2) Command examples

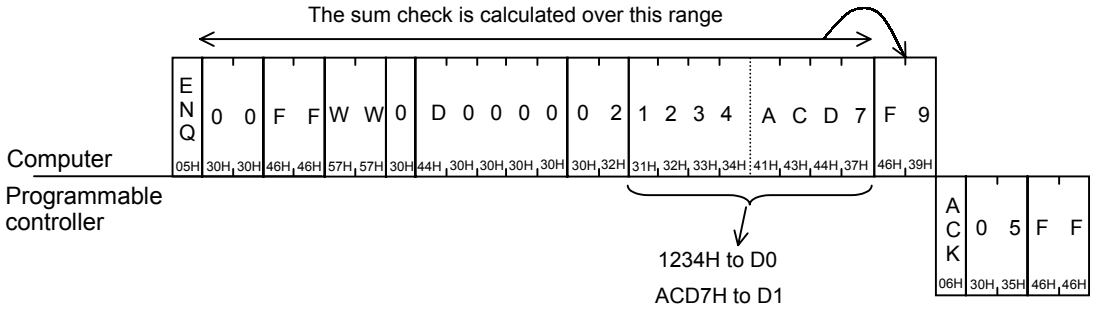
a) Example 1

To write to 32 points from M640 to M671 at station No. 0 (with message wait time set to 0 ms).



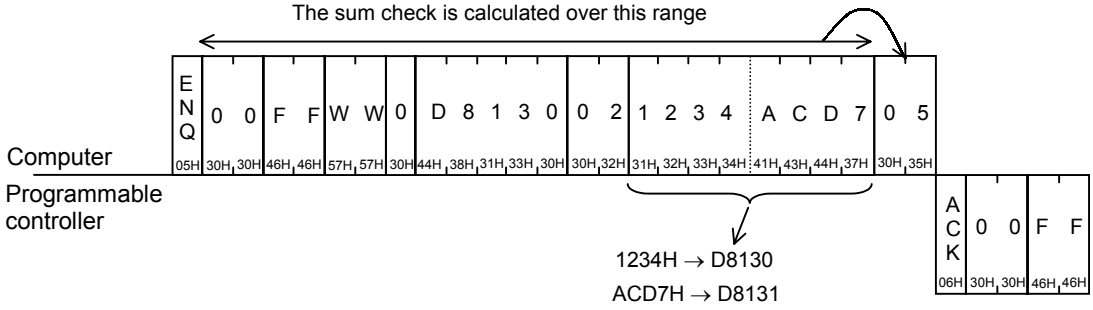
b) Example 2

To write to data to two points, D0 and D1, at station No.0 (with message wait time set to 0 ms).



c) Example 3

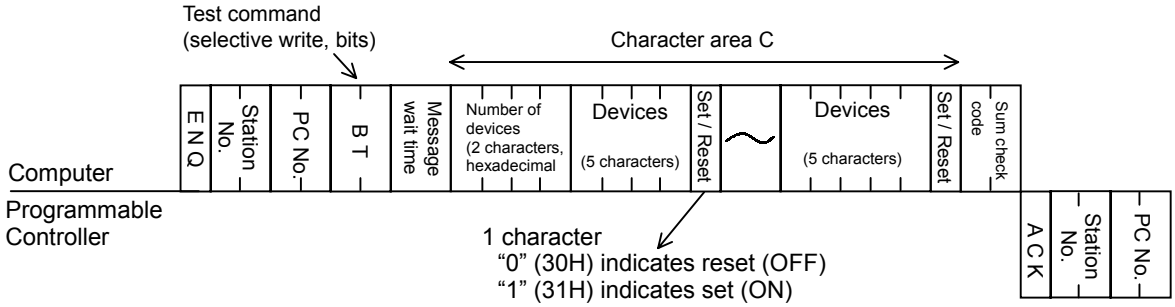
To write to data to two points, D8130 and D8131 (with message wait time set to 0 ms).



2-5 Test of Bit Device (BT command)

1) Command specification

Protocol format 1 is shown

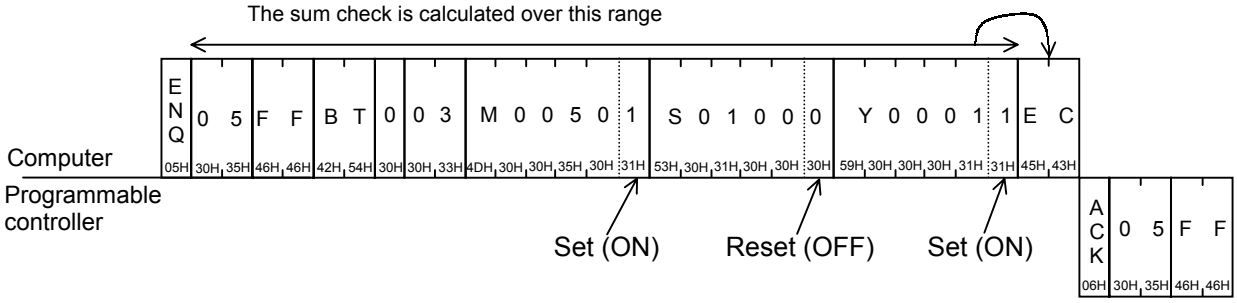


註

- ♦ Specify the range and number of devices, 1 ≤ number of devices ≤ 20
- ♦ The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.

2) Command example

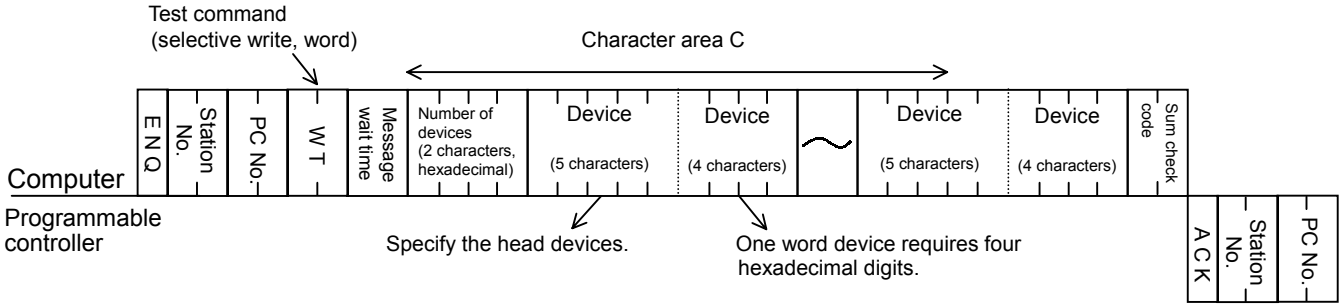
To set M50 ON, S100 OFF, and Y001 ON at station No.5 (with message wait time set to 0 ms).



2-6 Test of Word Device (WT command)

1) Command specification

Protocol format 1 is shown

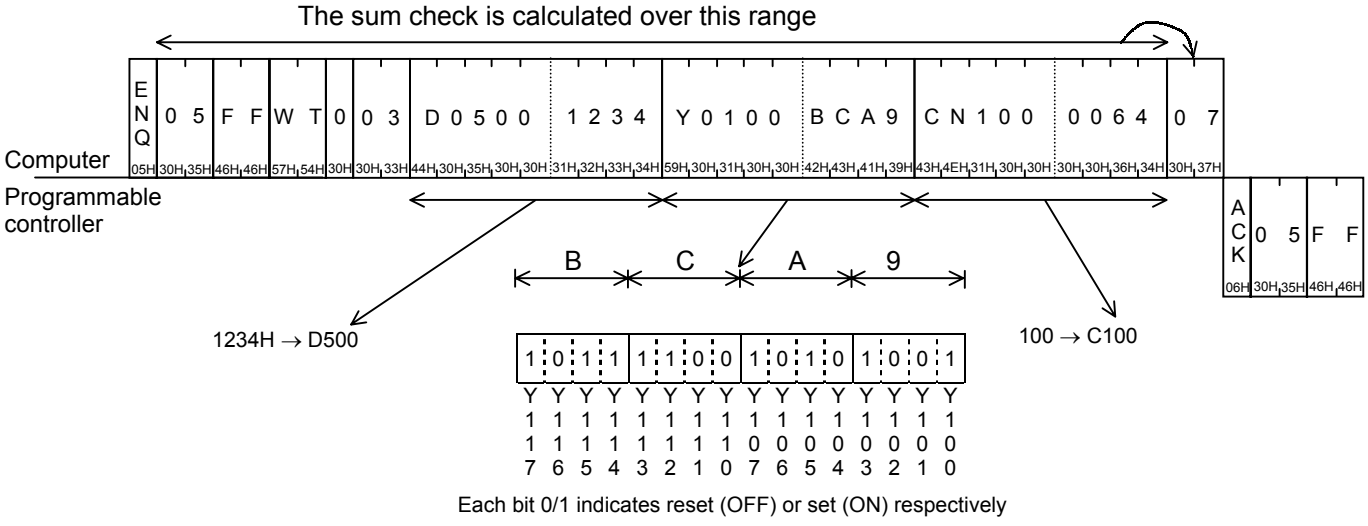


註

- ♦ Specify the range and number of devices (16 bit words), 1 ≤ number of devices ≤ 10
- ♦ The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.
- ♦ C200 to C255 (CN200 to CN255) which are 32-bit devices cannot be handled in this command

2) Command example

To changing the present value of D500 to 1234H, bits Y100 to Y117 to BCA9H, and the present value of C100 to 100 at station No.5 (with message wait time set to 0 ms).

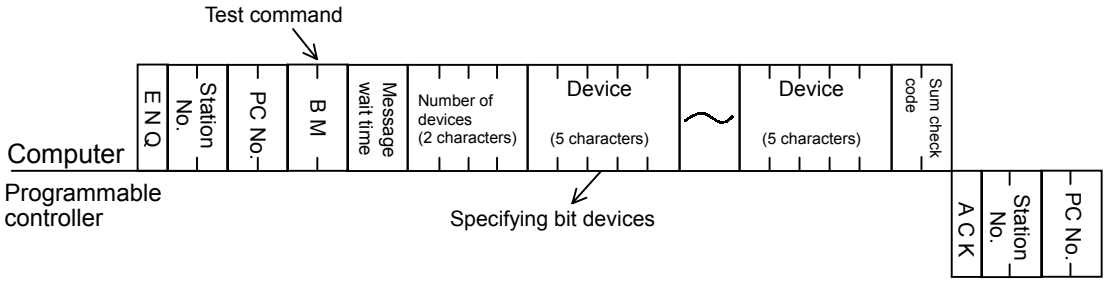


Each bit 0/1 indicates reset (OFF) or set (ON) respectively

2-7 Write the bit device be monitored (BM command)

1) Command specification

Protocol format 1 is shown

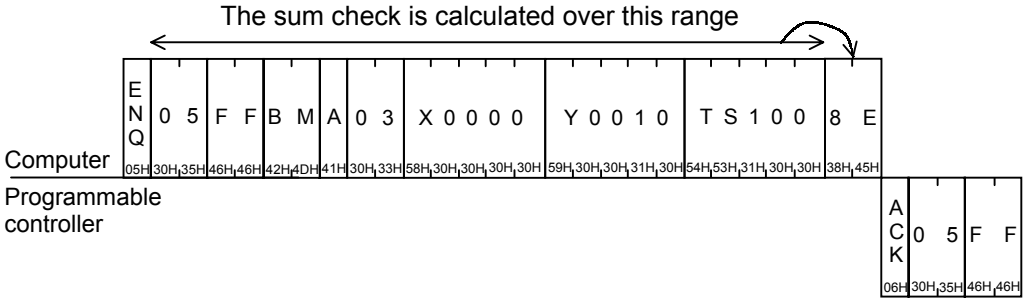


註

- ♦ Specify the range and number of devices (16 bit words), 1 ≤ number of devices ≤ 10
- ♦ The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.
- ♦ C200 to C255 (CN200 to CN255) which are 32-bit devices cannot be handled in this command

2) Command example

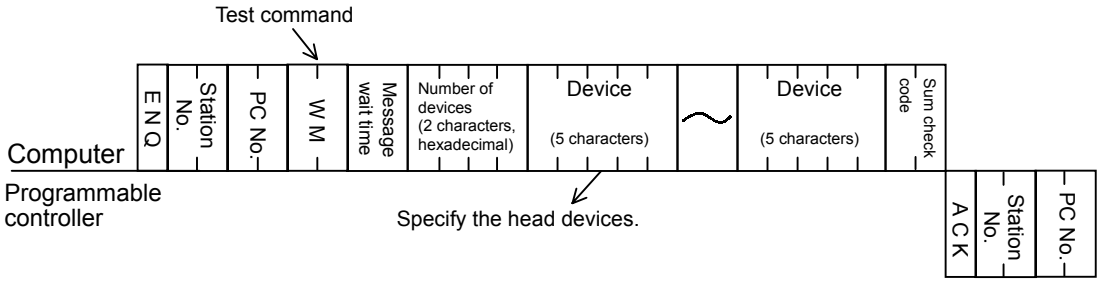
To changing the present value of D500 to 1234H, bits Y100 to Y117 to BCA9H, and the present value of C100 to 100 at station No.5 (with message wait time set to 0 ms).



2-8 Write the word device be monitored (WM command)

1) Command specification

Protocol format 1 is shown

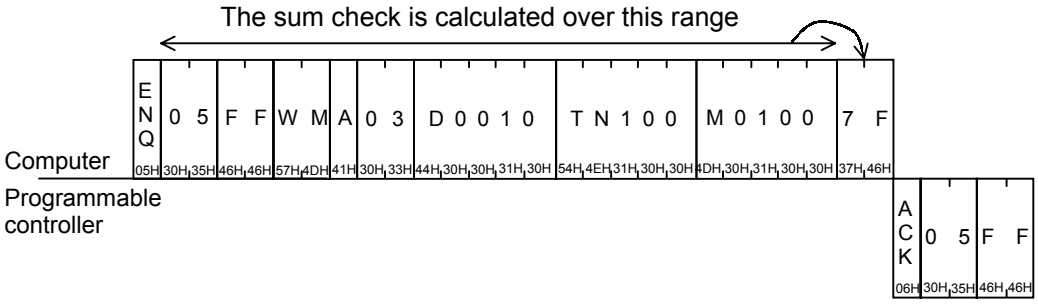


註

- ♦ Specify the range and number of devices (16 bit words), 1 ≤ number of devices ≤ 10
- ♦ The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.
- ♦ C200 to C255 (CN200 to CN255) which are 32-bit devices cannot be handled in this command

2) Command example

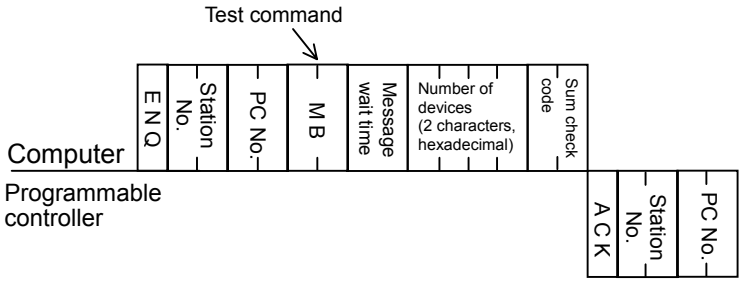
To changing the present value of D500 to 1234H, bits Y100 to Y117 to BCA9H, and the present value of C100 to 100 at station No.5 (with message wait time set to 0 ms).



2-9 Monitor the bit device be written (MB command)

1) Command specification

Protocol format 1 is shown

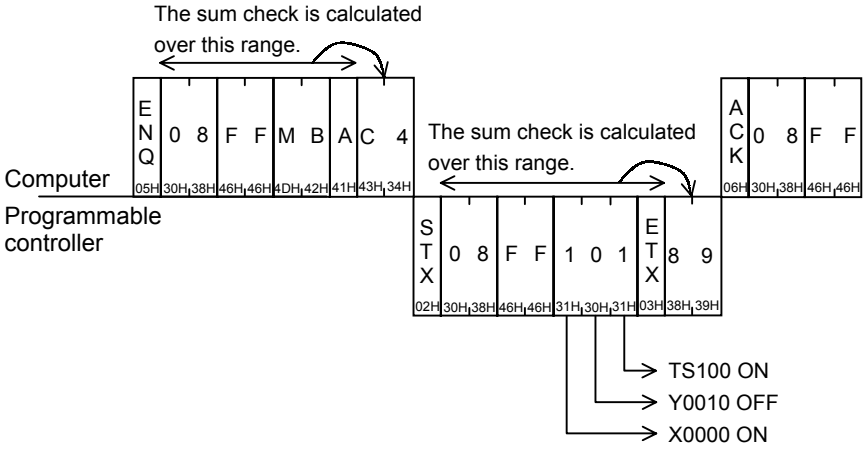


註

- ♦ Specify the range and number of devices (16 bit words), 1 ≤ number of devices ≤ 10
- ♦ The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.

2) Command example

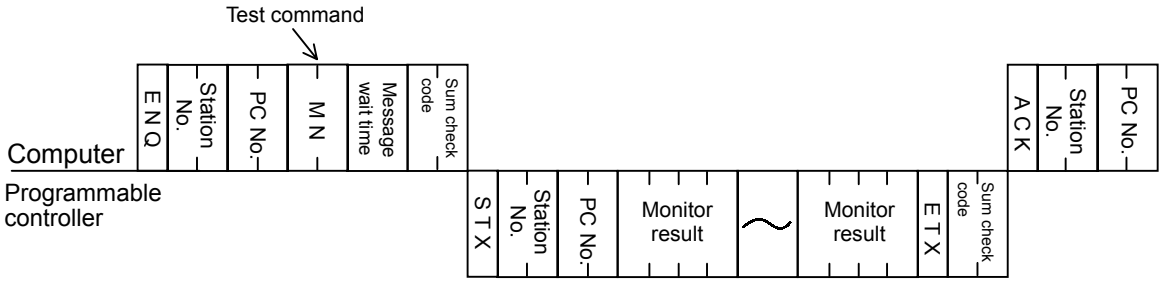
To changing the present value of D500 to 1234H, bits Y100 to Y117 to BCA9H, and the present value of C100 to 100 at station No.8 (with message wait time set to 0 ms).



2-10 Monitor the word device be written (MN command)

1) Command specification

Protocol format 1 is shown

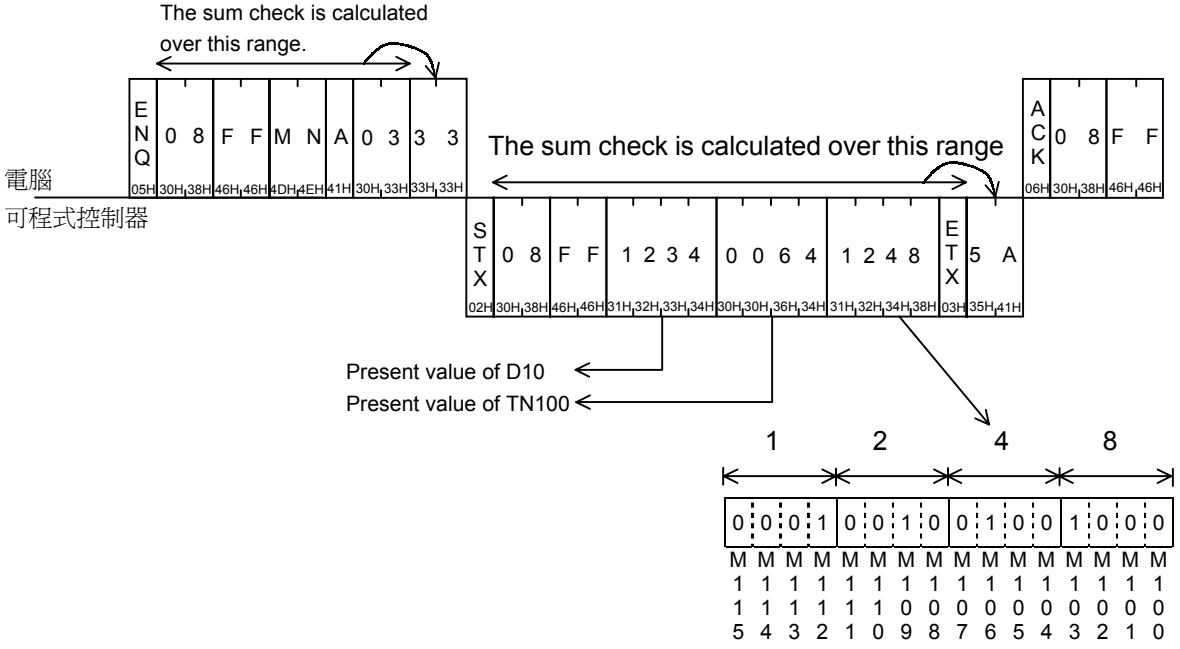


註

- ♦ Specify the range and number of devices (16 bit words), 1 ≤ number of devices ≤ 10
- ♦ The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.

2) Command example

To changing the present value of D500 to 1234H, bits Y100 to Y117 to BCA9H, and the present value of C100 to 100 at station No.8 (with message wait time set to 0 ms).



2-11 Remote RUN/STOP (RR, RS commands)

2-11-1 Operation of Remote RUN/STOP

When remote RUN/STOP is requested from the computer, the programmable controller forced run mode.

- ♦ Remote RUN

  When remote RUN (RR command) is requested, M8035 and M8036 are set ON at the programmable controller; the programmable controller switching to RUN.

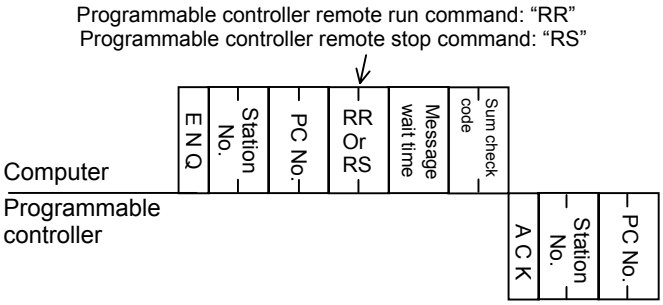
- ♦ Remote STOP

  When remote STOP (RS command) is requested, M8037 is set ON at the programmable controller. This in turn resets M8035, and M8036 to OFF; the programmable controller switching to STOP.

2-11-2 Control Specification and Examples of Remote RUN/STOP

1) Control specification

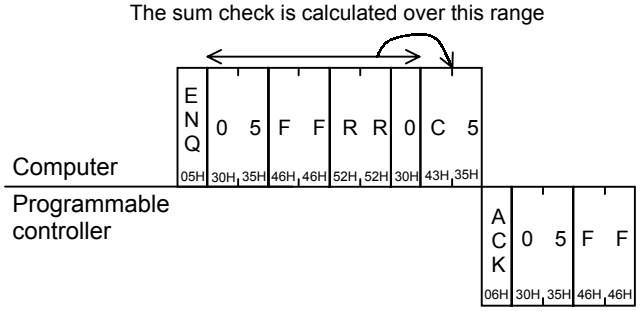
Protocol format 1 is shown



2) Operation examples

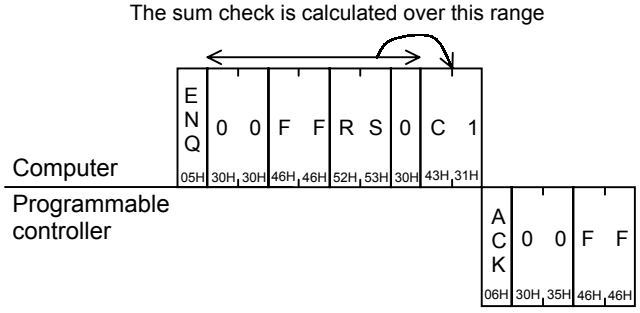
a) Example 1

To execute remote RUN at station No.5 (with a message wait time set to 0 ms).



b) Example 2

To execute remote STOP at station No.0 (with message wait time set to 0 ms).



2-12 Global Function (GW command)

This function is to turn on and off the global operation flag M8126 at all stations in the multidrop link.

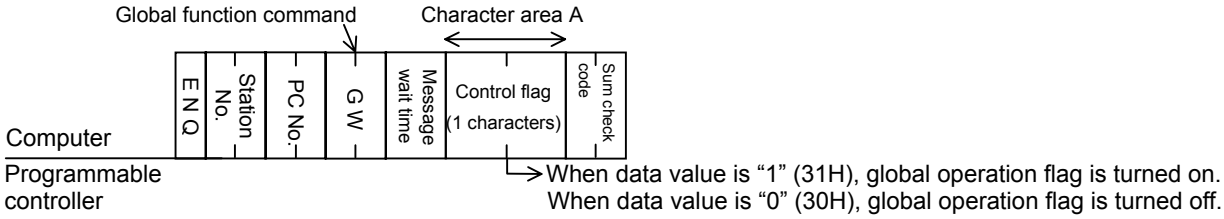
This function can be used for initialization, resetting or simultaneous start/stop of all programmable controller stations.

2-12-1 Control Specification and Example of Global Function

- ♦ The station number specified in the control protocol must indicate all stations, and is hence specified as FFH ("FF").
- ♦ No reply is given by the programmable controller to this command.

1) Control specification

Protocol format 1 is shown

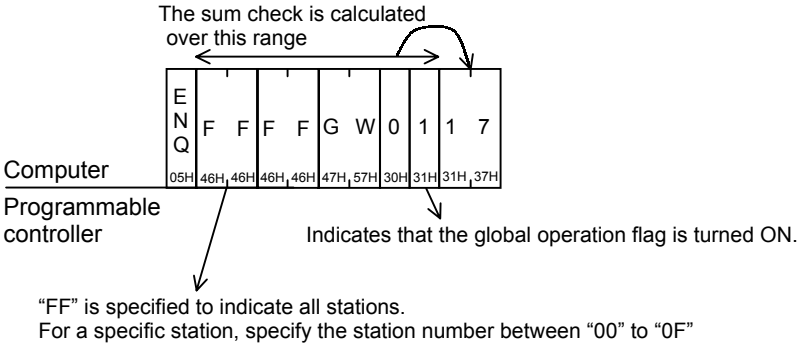


Notes

- ♦ The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.

2) Command example

To turn on the global operation flag M8126 at all programmable controller station s in the computer link.

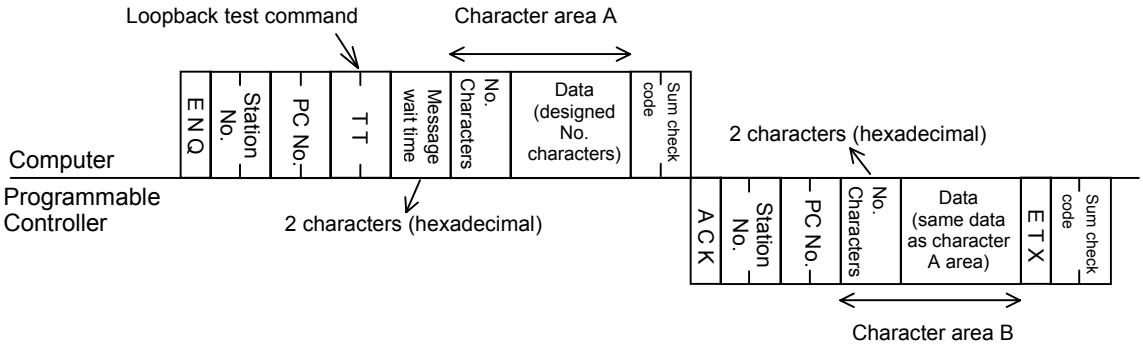


2-13 Loopback Test

The loopback test is the function for testing if communication between the computer and programmable controller is operating as normal or not.

1) Command Specification

Protocol format 1 is shown.

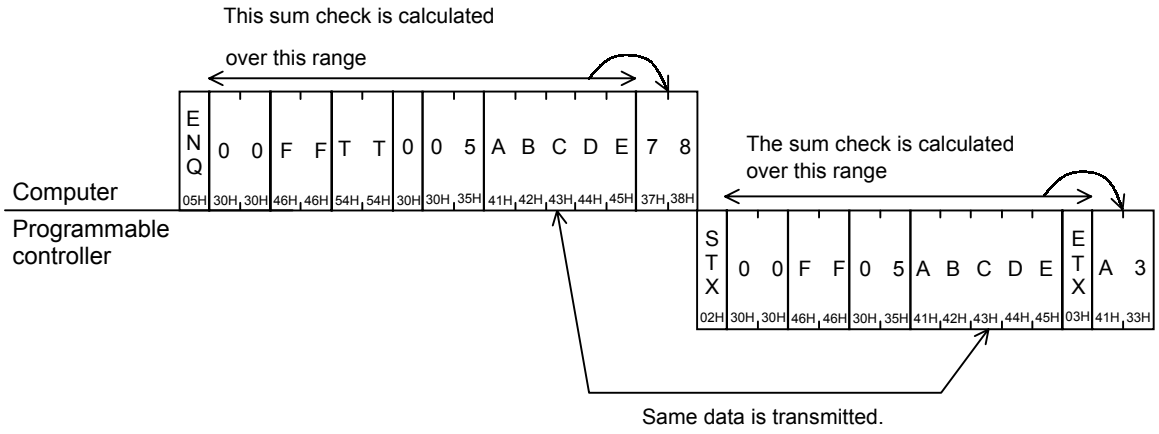


Notes

- ♦ Specify the number of characters range, 1 ≤ No. characters ≤ 128
- ♦ The station number, PC number, number of devices, and sum check code are expressed in hexadecimal.

2) Command example

To test the Loopback with data “ABCDE” at station No.0 (with message wait time set to 0 ms)



Appendix A

ASCII code Lists

Table : ASCII code Lists

Hex code	0	1	2	3	4	5	6	7
0		DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	“	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	‘	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	|
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	DEL

LIYAN PROGRAMMABLE LOGIC CONTROLLER

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