

# H-protocol driver guidance

Hitachi H-series and EH-series PLC is able to communicate to PC or HMI with H-protocol. Basically the information about H-protocol is mentioned in the COMM-2H manual, but the latest information is not reflected in this manual. Please read the following additional information and technical restrictions.

Hitachi PLC has three types of protocols, **standard H-protocol, station number H-protocol and Ethernet H-protocol.**

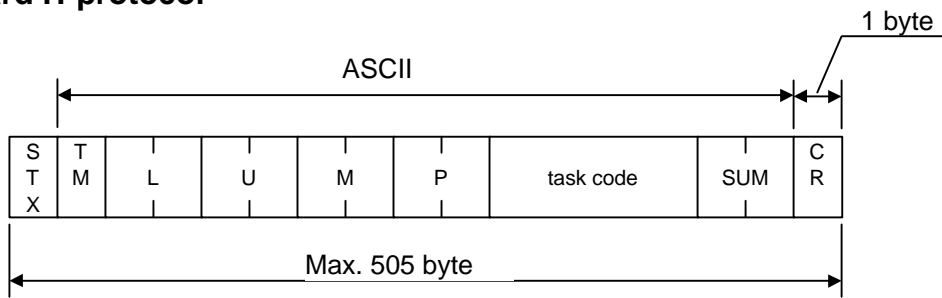
## 1. Supported protocol

CPU type / Port	Com. type	Standard	Station number	Ethernet
MICRO-EH port 1	RS-232C	X		
MICRO-EH port 2	RS-422/485	X	X	
EH-150 CPU104/208 port 1	RS-232C	X		
EH-150 CPU104/208 port 2	RS-232C	X		
EH-150 CPU308/316 port 1	RS-232C/422/485	X		
EH-150 CPU308/316 port 2	RS-232C	X		
EH-150 CPU448 port 1	RS-232C/422/485	X	X	
EH-150 CPU448 port 2	RS-232C	X		
H-20/28/40/60 port 1	RS-232C	X*		
H-200 port 1	RS-232C	X*		
H-250/252B/C port 1,2	RS-232C	X		
H-300/700/2000 port 1	RS-232C	X*		
H-302/702/1002/2002 port 1	RS-232C	X		
COMM-2H port 1	RS-232C	X	X	
COMM-2H port 2	RS-422		X	
EH-ETH	Ethernet			X
LAN-ETH	Ethernet			X

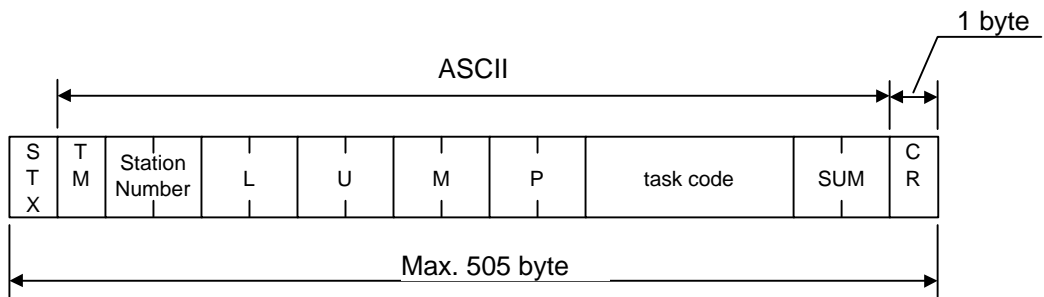
(\*) Note : These CPUs do not support new task code A0-A5. Please refer to X.X in details.

## 2. Message format

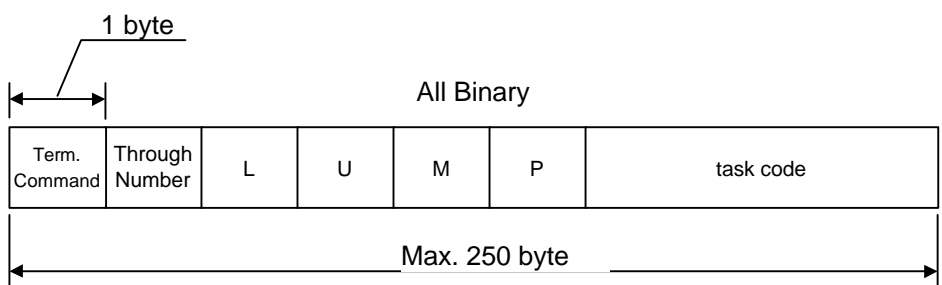
### 2.1 Standard H-protocol



### 2.2 Station number H-protocol



### 2.3 Ethernet H-protocol

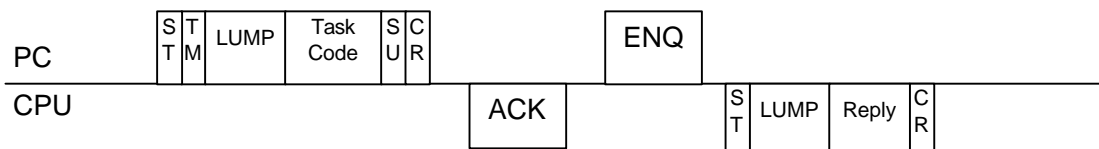


## 2.4 Details of message format

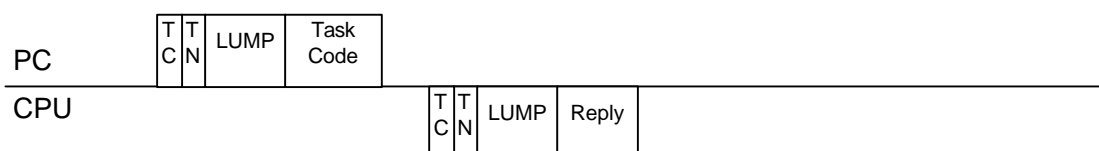
Standard / Station number H-protocol	
TM	<p>TM is response time of CPU. The CPU will reply after (TM×10) ms after receiving a command. The original purpose of this TM is for old low speed PC or HMI. The range of TM is 0 to F (30 to 46 by ASCII = 0 to 150 ms).</p> <p>In case of the station number H-protocol, be sure to use 20ms or more. Please refer to the followings for further information.</p>
Station Number	Be sure to set as BCD. The range is 00 up to 31.
LUMP address	LUMP address is for accessing to remote CPU via LINK system. In case of PC to PLC direct communication, the LUMP address is FFFF0000. Please refer to the COMM-2H manual for further information.
task code	Please refer to the COMM-2H manual.
SUM	<p>The last 2 digits of the sum from TM to task code end.</p> <p>&lt; Example &gt;</p> <p style="text-align: center;"> <math>H32 + H32 + H34 + \dots + H30 + H30 = H\ 3\ 2\ F</math>  <math>\rightarrow 2F \rightarrow 32\ 46\ (\text{ASCII})</math> </p>
Ethernet H-protocol	
Termination command	<p>H00 : For normal operation</p> <p>H01-HFE : PLC does nothing. Received data is ignored.</p> <p>HFF : Previous ongoing operation is cancelled.</p>
Through number	Any number can be set, but necessary. This number is for debugging or to handle many messages easily.

## 2.5 Communication Procedure

### [ Standard / Station number H-protocol ]

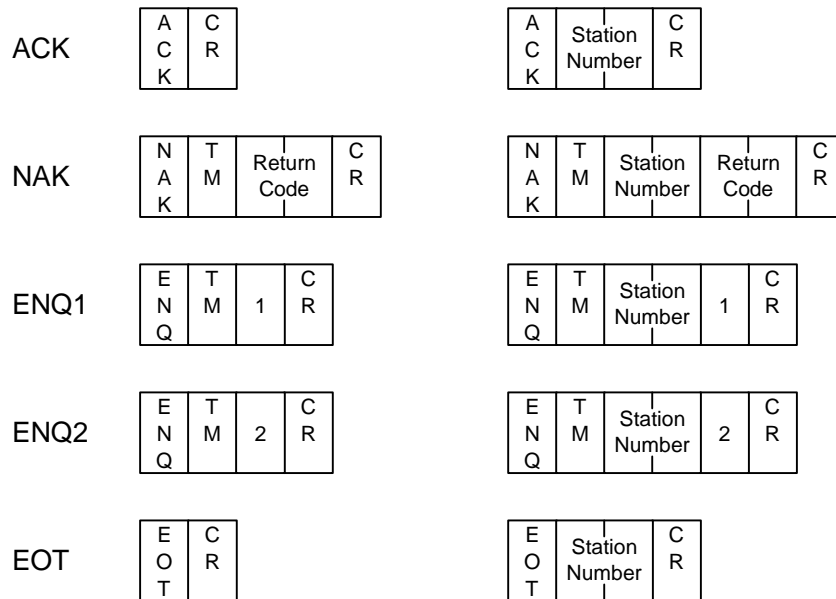


### [ Ethernet H-protocol ]



### 3. Standard / Station number H-protocol

#### 3.1 Command format



#### 3.2 NAK return code

03	Framing error	Priority high ↑ ↓ Priority low
01	Parity error	
04	Overrun error	
07	Receiving buffer error	
08	Receiving time over	
05	Protocol error	
06	ASCII error	
02	Sum error	

#### 3.3 Communication strings

STX	02	Start of Text
CR	0D	Carriage Return
ACK	06	Acknowledge
NAK	15	Negative Acknowledge
ENQ1	05	Enquiry 1
ENQ2	05	Enquiry 2
EOT	04	End of Transmission

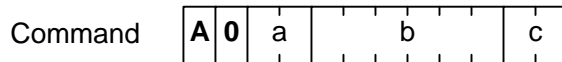
“ENQ2” is used in case of COMM-2H. “ENQ2” is an enquiry to a destination CPU. (Communication check between COMM2-H and CPU) When COMM-2H receives “ENQ2”, the COMM-2H will reply “EOT” to PC and forward “ENQ2” to CPU in parallel.

## 4. Task code format

### 4.1 Task code

Task Code	Function	CPU occupation
HA0	Read I/O (Continuous address)	-
HA2	Write I/O (Continuous address)	-
HA4	Read I/O (Random address)	-
HA5	Write I/O (Random address)	-

#### HA0 : Read I/O

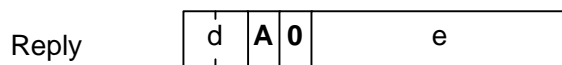


a : I/O code (see 4.2)

b : I/O address

c : I/O number

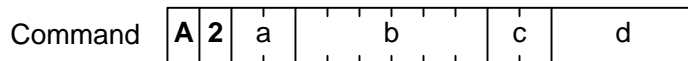
(Bit : 01H-F0H, Word : 1H-78H)



d : Reply code

e : Data

#### HA2 : Write I/O



a : I/O code (see 4.2)

b : I/O address

c : I/O number

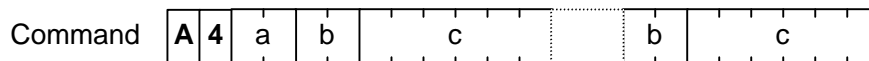
(Bit : 01H-C8H, Word : 01H-64H)



d : Data

e : Reply code

#### HA4 : Read I/O (Random)



a : I/O number

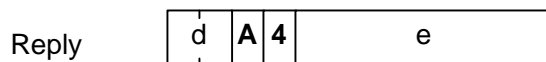
(Bit : 01H-3FH, Word : 01H-3FH)

b : I/O code (see 4.2)

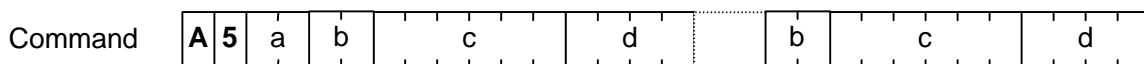
c : I/O address

d : Reply code

e : Data



#### HA5 : Write I/O (Random)



a : I/O number

(Bit : 01H-28H, Word : 01H-28H)

b : I/O code (see 4.2)

c : I/O address

d : Data

e : Reply code



## 4.2 I/O code

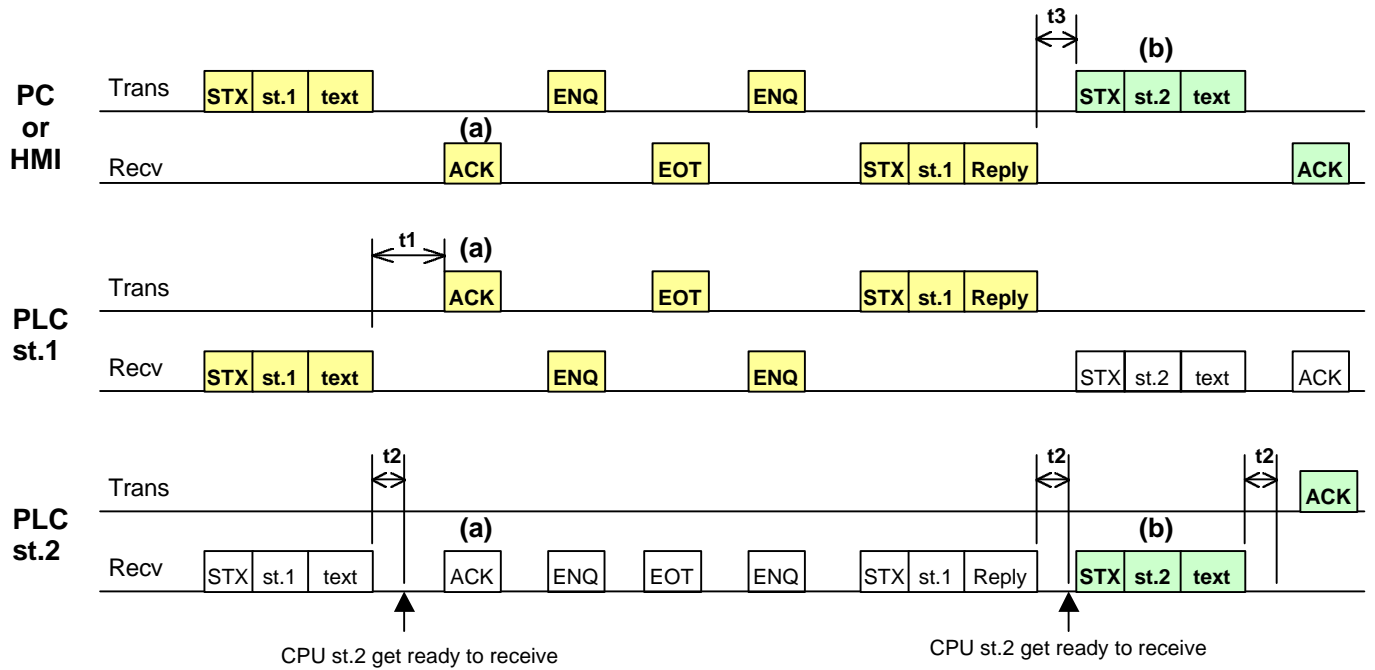
I/O code	I/O type
H00	X
H01	Y
H02	R
H03	L
H04	M
H05	Timer / Counter
H06	CL
H07	-
H08	WX
H09	WY
H0A	WR
H0B	WL
H0C	WM
H0D	TC
H0E	DIF
H0F	DFN

## 5. Task code A0-A5 and 40-45

In addition to the above mentioned task codes, we have old task code 40, 42, 44 and 45, which are taken over by A0, A2, A4 and A5. When you make H-protocol driver, please read the following information and use A0-A5 task code instead of 40-45 if the CPU accept.

	Task code <b>40-45</b> (old)	Task code <b>A0-A5</b> (new)
Function	H40 : Read I/O (continuous N points) H42 : Write I/O (continuous N points) H44 : Read I/O (designated N points) H45 : Write I/O (designated N points)	HA0 : Read I/O (continuous N points) HA2 : Write I/O (continuous N points) HA4 : Read I/O (designated N points) HA5 : Write I/O (designated N points)
CPU occupation	<b>Required</b>	<b>No required</b>
Procedure	As mentioned in page 77 of COMM-2H manual, <div style="text-align: center;"> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">“Read occupation” task code (H16 01)</div> <div style="text-align: center; margin: 5px 0;">↓</div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">“Read/Write I/O” task code (H40 xx xx / H42 xx xx)</div> <div style="text-align: center; margin: 5px 0;">↓</div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">“Release occupation” task code (H16 00)</div> </div>	CPU occupation is not necessary.  <div style="text-align: center; border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">“Read/Write I/O” task code (HA0 xx xx / HA2 xx xx)</div>
Supported by	H-20/28/40/64 H-200 H-300/700/2000	MICRO-EH series EH-150 series H-250/252B/C H-302/702/1002/2002

## 6. Response time : TM



$t_1$  :  $t_1 = TM + \alpha + (0 \text{ to } 10) \text{ ms}$  (depends on hardware character ,  $\alpha$  : CPU internal processing time)

$t_2$  : transition time to get ready to receive (depends on hardware character)

$t_3$  : interval time to next command for another station CPU (depends on H-protocol driver)

PLC is not able to be ready to receive immediately after receiving a command. It takes several ms ( $t_2$ ) and the time is not same for every PLC. It depends on hardware character.

If [  $t_1 < t_2$  ], the CPU st.2 cannot receive the message (a) and will wait 2 seconds. This means the CPU st.2 will not get the right message (b). To avoid this problem, please use  $TM=20\text{ms}$ . Then the CPU st.1 will reply 20ms after receiving a command, which does not lead to communication error of the CPU st.2.

Besides above, there is one more point needed.

If [  $t_3 < t_2$  ], the CPU st.2 is not able to get the message (b). Therefore,  $t_3$  must be more than 20ms also.

As a result,

- (1) Be sure to use 2 (= 20ms = 32 by ASCII) in TM for every command.
- (2) Be sure to add 20ms between the end of the message from one CPU and the head of the message to another CPU (see  $t_3$ ).

**Note** : These restrictions are not applied for standard H-Protocol (1:1 communication).