3-5 FINS Commands with Host Link Protocol

FINS commands can be sent and received using the Host Link protocol between interconnected host computers and PCs.

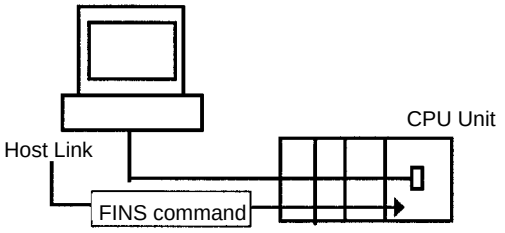
3-5-1 Connection Configurations

One of the following two methods can be used to send and receive FINS commands using the Host Link protocol.

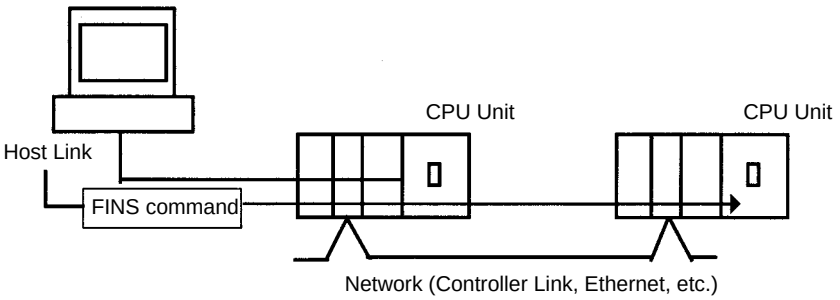
Sending from a Computer to a CPU Unit

Note The host computer can be connected to the peripheral port or RS-232C port on the CPU Unit or to a serial ports on a Serial Communications Unit/Board. The Host Link protocol must be used regardless of the point of connection.

CPU Unit Directly Connected to Host Computer



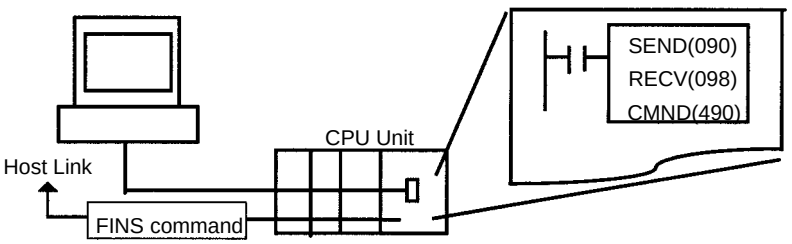
CPU Units on a Network



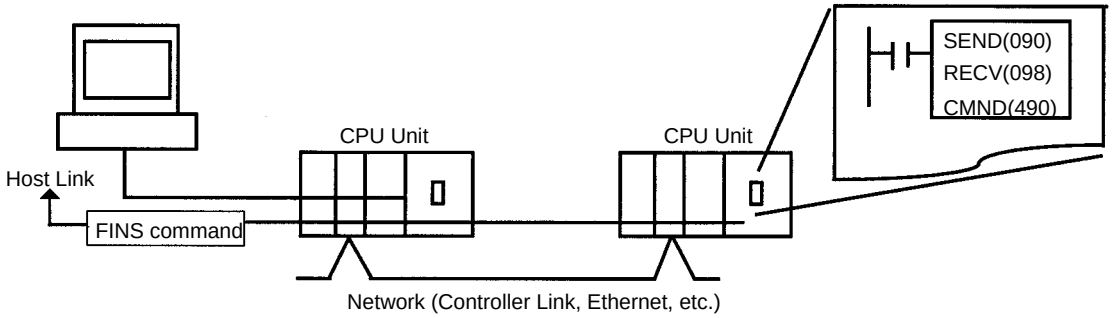
Sending from a CPU Unit to a Computer (Slave Initiation)

Note The host computer can be connected to the peripheral port or RS-232C port on the CPU Unit or to a serial ports on a Serial Communications Unit/Board. The Host Link protocol must be used regardless of the point of connection.

CPU Unit Directly Connected to Host Computer



CPU Unit Directly Connected to Host Computer on a Network



Note Host Link communications handle ASCII data, so data is sent and received in ASCII. Hexadecimal values in FINS command and response frames must, therefore, also be sent and received in ASCII when they are handled using Host Link communications.

3-5-2 Overview of Command and Response Frames

When FINS commands and responses are sent or received using Host Link communications, the frame must be preceded by a Host Link header and followed by a Host Link FCS and terminator as shown below.

Command Frame

Use the following format to send FINS command frames.

Note A FINS command frame also consists of the response wait time, the destination node address, the source node address, and other FINS command format data.

Response Frame

The CS1-series CPU Unit that receives the command will return the following response frame to the host computer.

Note A FINS response frame also consists of the contents set at the time of transmission and the FINS command response format data.

3-5-3 Sending Commands from the Computer to the CPU Unit

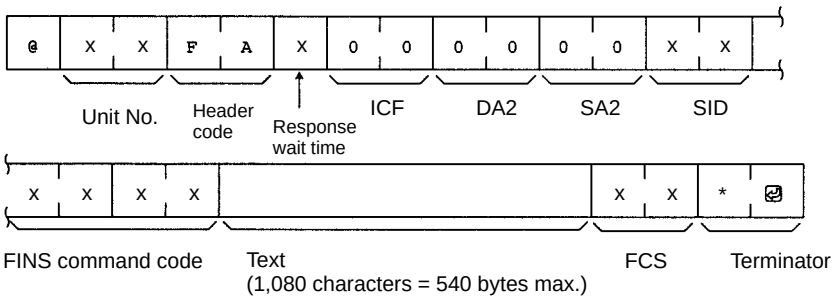
Command Format from Host Computer

Use the following command format to send FINS commands from the host computer to the CPU Unit.

Note The length of the command must be not more than 1,114 characters. FINS commands cannot be partitioned into separate frames for sending.

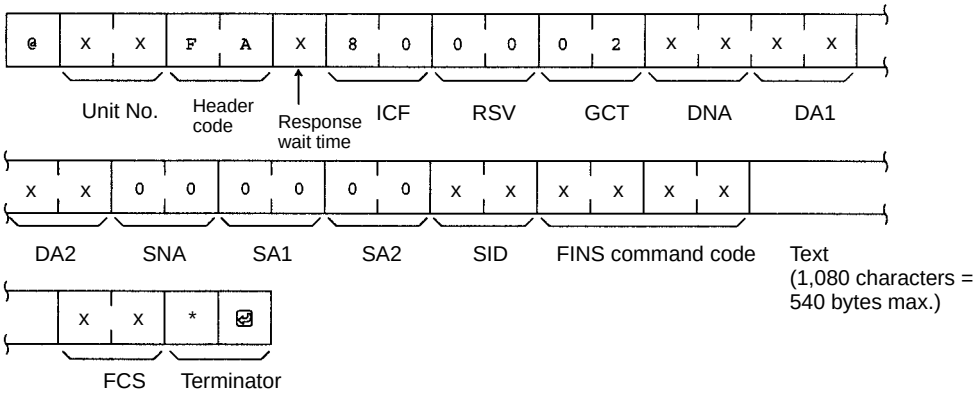
Sending Commands to a CPU Unit Directly Connected to the Host Computer

Note The following format is also applicable for a host computer connected to a Serial Communications Board or a Serial Communications Unit.



Sending Commands to a CPU Unit on a Network

Note The following format can also be used to send FINS commands to a CPU Unit connected to the host computer.



Host Link Settings

@

The @ symbol must be attached to the beginning of the command.

Unit Number

The unit number set is that of the destination CPU Unit connected to the host computer. When the host computer is connected to a CPU Unit, the unit number is designated in the PC Setup.

When the host computer is connected to a Serial Communications Board or a Serial Communications Unit, the unit number is the designated in the Setup for the Board or Unit.

Header Code

The header code distinguishes between different types of commands. Set “FA” (ASCII: 46, 41) when using FINS commands.

Response Wait Time

The response wait time sets the time from when the CPU Unit receives a command block until it starts to return a response. It can be set from 0 to F in hexadecimal, in units of 10 ms.

Example:

If F(15) is set, the response will begin to be returned 150 ms (15 × 10 ms) after the command block was received.

ICF (Information Control Field)

Specifies whether or not there are network relays. Set “80” (ASCII: 38,30) when sending an FINS command to a CPU Unit on a network. Set “00” (ASCII: 30,30) when sending to a CPU Unit connected directly to the host computer.

RSV (Reserved)
Set “00” (ASCII: 30,30). Setting RSV is required only when sending to a CPU Unit on a network.

GCT (Gateway Count)
This is the number of networks through which the transmission can be relayed. Set “02” (ASCII: 30,32). Setting GCT is required only when sending to a CPU Unit on a network.

DNA, DA1, DA2
Set the destination network, node, and unit addresses.

DNA (Destination Network Address)

Set between 00 and 7F hex (0 and 127 decimal). Setting DNA is required only when sending to a CPU Unit on a network.

DA1 (Destination Node Address)

Set within the following ranges. Setting DA1 is required only when sending to a CPU Unit on a network.

Ethernet Unit:	01 to 7E hex (1 to 126 decimal)
Controller Link Unit:	01 to 20 hex (1 to 32 decimal)
SYSMAC NET:	01 to 7E hex (1 to 126 decimal)
SYSMAC LINK:	01 to 3E hex (1 to 62 decimal)

DA2 (Destination Unit Address)

Refer to *3-4-2 Addresses in FINS Commands* for details on unit addresses.

In Host Link mode, it is assumed that the destination unit is the CPU Unit, so set “00” (ASCII: 30, 30).

SNA (Source Network Address), SA1 (Source Node Address)
Set the source network and node addresses. Set both to “00” (ASCII: 30, 30) regardless of whether or not there is a network relay.

Setting SNA and SN1 is required only when sending to a CPU Unit on a network.

SA2 (Source Unit Address)
Set the unit address of the Unit physically connected to the host computer. The setting changes depending on the connected Unit.

When connected to the CPU Unit, Serial Communications Board, or a Serial Communications Unit, set “00” to indicate the CPU Unit (ASCII: 30, 30). By setting “00”, the internal process will change the unit address to the unit address for the appropriate serial port. Refer to *3-4-2 Addresses in FINS Commands* and for details on unit addresses.

SID (Source ID)
The SID is used as a counter when resending. It should normally be set to “00” (ASCII: 30, 30).

Command Code, Text
Set the command code and text according to the FINS command and response formats.

FCS (Frame Check Sequence)
Set a 2-character FCS. Refer to *FCS Calculations* under *2-2 Command/Response Formats* for the FCS calculation method.

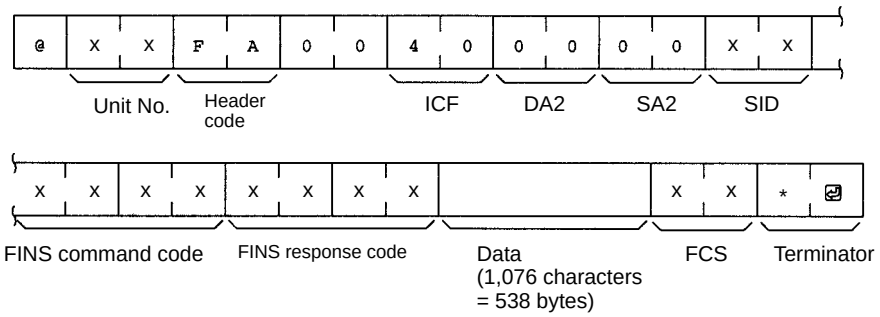
Terminator
The terminator is a required delimiter at the end of a command. Set the terminator to *CR (ASCII: 2A, 0D).

Response Format from a CPU Unit

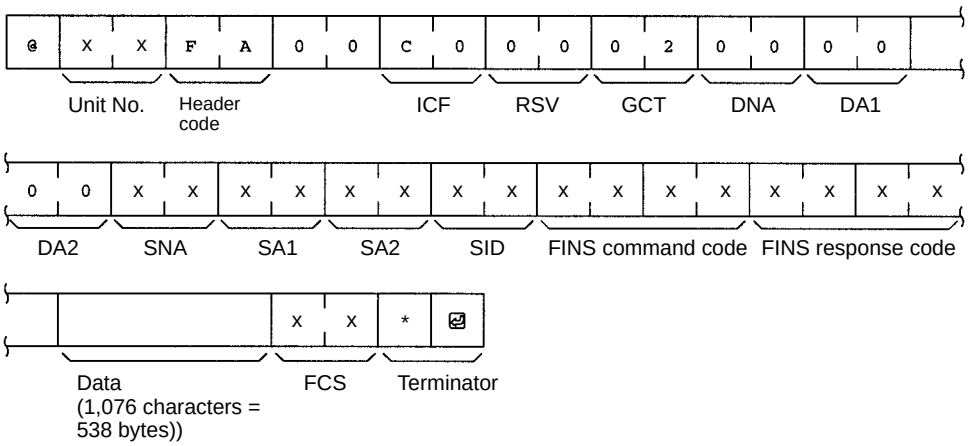
The following response format is used to return responses from the CPU Unit to the host computer.

Note The length of the response must be not more than 1,115 characters. Of this, the response data without the response code is 1,076 characters (538 bytes).

Responses from a CPU Unit Directly Connected to the Host Computer



Responses from a CPU Unit on a Network



Host Link Settings

@

The @ symbol must be attached to the beginning of the response.

Unit Number and Header Code

The same unit number and header code specified in the FINS command that was received will be returned.

ICF (Information Control Field)

For a CPU Unit on a network, “C0” (ASCII: 43, 30) will be returned. For a CPU Unit connected directly to the host computer, “40” (ASCII: 34,30) will be returned.

RSV (Reserved)

This section is reserved for the system. Set “00” (ASCII: 30,30).

GCT (Gateway Count)

The same GCT that was specified in the command that was received will be returned. Setting GCT is required in the response format only from a CPU Unit on a network.

DNA (Destination Network Address), DA1 (Destination Node Address), DA2 (Destination Unit Address)

The same contents specified for SNA, SA1, and SA2 in the command that was received will be returned.

Setting DNA and DA1 is required for response formats only from a CPU Unit on a network.

SNA (Source Network Address), SA1 (Source Node Address), SA2 (Source Unit Address)

The same contents specified for DNA, DA1, and DA2 in the command that was received will be returned.

Setting SNA and SN1 is required for response formats only from a CPU Unit on a network.

SID (Source ID)

The SID that was specified in the command that was received will be returned.

Command Code, Response Code, Text

The command code, response code, and text corresponding to the FINS command and response formats will be returned.

FCS (Frame Check Sequence)

A 2-character FCS will be returned. Refer to *FCS Calculations* under *2-2 Command/Response Formats* for the FCS calculation method.

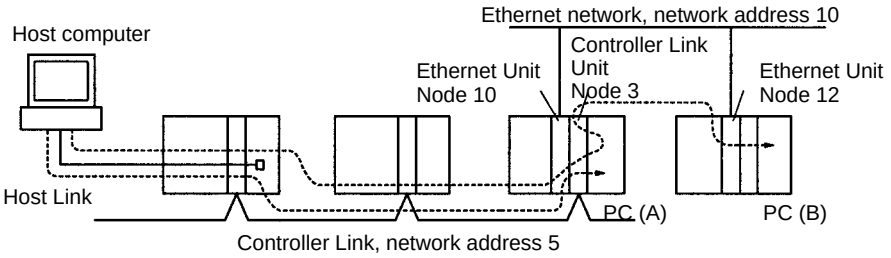
Terminator

The terminator is a required delimiter at the end of a command. The terminator *CR (ASCII: 2A, 0D) will be returned.

Example: FINS Command Settings for Sending to CPU Unit on a Network

With Host Link communications, FINS command transmissions and receptions are handled in ASCII, so hexadecimal values in FINS command frames must be sent as ASCII. For example, the hexadecimal value “0” would be “30 hex” in ASCII, and the hexadecimal value “A” would be “41 hex” in ASCII.

The destination network address, node address, and unit number address are explained using the following network as an example.



Sending a Command from a Host Computer to PC (A)

The following addresses are specified to the CPU Unit at network address 5, node address 3:

Destination network address (DNA): 05 (30, 35)
Destination node address (DA1): 03 (30, 33)
Destination unit address (DA2): 00 (30, 30)
(Command addressed to CPU Unit)

Sending a Command from a Host Computer to PC (B)

The following addresses are specified to the CPU Unit at network address 10, node address 12:

Destination network address (DNA): 0A (30, 41)
Destination node address (DA1): 0C (30, 43)
Destination unit address (DA2): 00 (30, 30)
(Command addressed to CPU Unit)

3-5-4 Sending FINS Commands to the Host Computer from the CPU Unit

With normal Host Link communications, FINS commands are sent from the host computer to the CPU Unit. Commands can also be sent, however, from the CPU Unit to the host computer. Any FINS command can be sent to the host computer using SEND(090), which sends CPU Unit data to the host computer, RECV(098), which receives data from the host computer, or CMND(490).

Slave-initiated communications allows the host computer to be notified (unsolicited communications) when an error is generated, for example, on a production line controlled by a CPU Unit. Since the host computer no longer needs to regularly communicate with the CPU Unit, the load on the host computer is reduced.

When an Ethernet Unit or Controller Link Unit are mounted to the Backplane of the CPU Unit, commands can be sent to the host computer from a CPU Unit on a network on another level (up to three network levels).

Note In principle, send commands to the host computer only when one host computer is connected to one CPU Unit. If more than one CPU Unit is connected to the host computer, the commands may collide with each other and prevent normal communications. Create a program that will exclusively control commands that are being sent to a host computer to which multiple CPU Units are connected.

Considerations when Sending Commands from a CPU Unit

Consider the following items when using instructions (SEND(090), RECV(098), and CMND (490)) to send commands from the CPU Unit.

1, 2, 3...

1. SEND(090), RECV(098), and CMND (490) executed by the CPU Unit are converted to the same format for FINS commands that are sent to CPU Units on networks.
2. A program must be created to process the commands received by the host computer.
3. When instructions (SEND(090), RECV(098), and CMND (490)) are executed in a CPU Unit, some of the control data settings will be different. Refer to the relevant instruction specifications.

3-5-5 Sending Commands from the CPU Unit

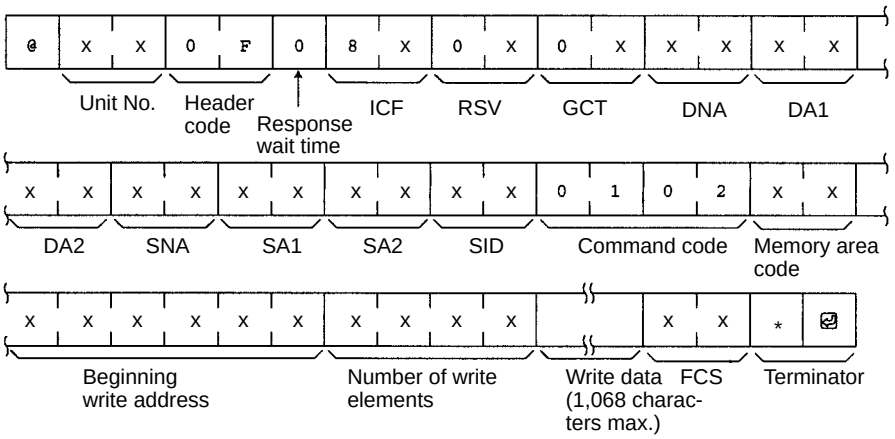
When controls are being implemented by sending commands from the local CPU Unit or another CPU Unit on a network to a host computer, three instructions can be used in the user program: SEND(090), RECV(098), and CMND(490).

Send(090)

Memory area data can be sent from the CPU Unit to the host computer by using SEND(090).

Command Format Received by the Host Computer

The FINS command transmitted to the host computer when SEND(090) is executed is MEMORY AREA WRITE (command code 0102). The command format received by the host computer is as shown in the following diagram. Refer to *MEMORY AREA WRITE: 0102* in *Section 5 FINS Commands* for details.



Control Words

Control data must be set before SEND(090) is executed. The control data is written in the following format, starting from the first control word.

Word	Bits 00 to 07	Bits 08 to 15
C	Number of send words	
C+1	Destination network address	Bits 08 to 10: Serial port number

Word	Bits 00 to 07	Bits 08 to 15
C+2	Destination unit address	Destination node address
C+3	Bits 00 to 03: No. of retries	Bits 08 to 10: Comm. port number Bit 15: Response setting
C+4	Response monitor time (unit: 0.1 s)	

Number of Send Words

Set the total number of words of data to be transferred to the host computer.

Serial Port Number

Set the serial port number to which the host computer is connected.

Destination Network Address

Set the network address of the destination node. Set “00” to send communications within the local network.

Destination Node Address

Set the node address of the destination node. Set “00” when transmitting within the local PC.

Destination Unit Address

Set the unit address of the Unit to which the host computer is connected.

Response Setting

Normally this bit is set to 0 to require a response. When a response is not required, set this bit to 1.

Communications Port Number

Set the port number in the CPU Unit which will transmit SEND(090).

Number of Retries

Set the maximum number of times SEND(090) is to be resent if no response is returned.

Response Monitor Time

If the Response Setting is set to require a response, set the response monitor time.

Control Word Settings

The setting range for each item is shown on the following table.

Item	Setting
Number of send words	0001 to 010B (1 to 267 words)
Serial port number	00: CPU Unit/ Inner Board/CS1 CPU Bus Unit 01: Port 1 02: Port 2
Destination network address	00: Local network 01 to 7F: Network address (1 to 127)
Destination node address	00: Internal communications in PC 01 to 7F: Node address (1 to 126) for Ethernet Unit 01 to 20: Node address (1 to 32) for Controller Link
Destination unit address	I0 to 1F: Host Link Unit (Unit No. 0 to 15)
Response setting	0 : Required 1: Not required
Communications port number	0 to 7 (0 to 7)
Number of retries	0 to F (0 to 15)
Response monitor time	0000: Default 0001 to FFFF: 0.1 to 6,553.5 s (unit 0.1 s)

Note To execute SEND(090) normally, programming needs to be written to process the data received by the host computer and return the proper response.

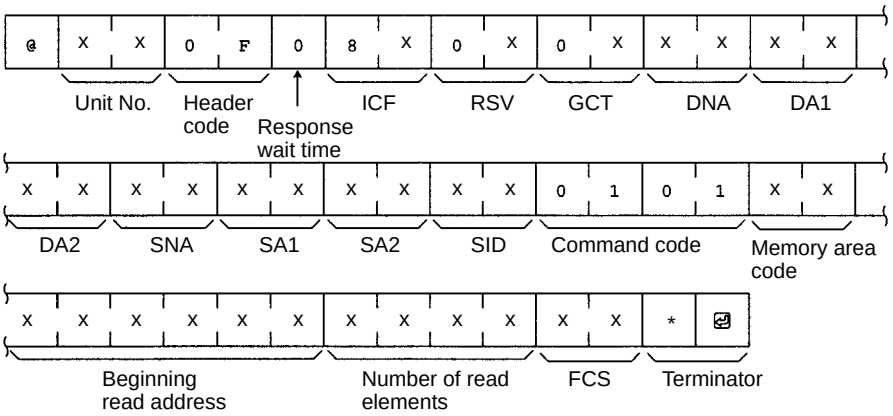
RECV(098)

By using RECV(098), data from the host computer can be written to a memory area in the CPU Unit.

Command Format Received by the Host Computer

The FINS command transmitted to the host computer when RECV(098) is executed is MEMORY AREA READ (command code 0101). The command format received by the host computer is shown in the following diagram.

Refer to *MEMORY AREA READ: 0101* in *Section 5 FINS Commands* for details



Control Words

Control data must be set before RECV(098) is executed. The control data is written in the following format, starting from the first control word.

Word	Bits 00 to 07	Bits 08 to 15
C	Number of read words	
C+1	Destination network address	Bits 08 to 10: Serial port number
C+2	Destination unit address	Destination node address
C+3	Bits 00 to 03: No. of retries	Bits 08 to 10: Comm. port number
C+4	Response monitor time (unit: 0.1 s)	

Number of Read Words

Set the total number of words of data to be read from the host computer.

Serial Port Number

Set the serial port number to which the host computer is connected.

Destination Network Address

Set the network address of the destination node (i.e., the computer). Set “00” to send communications within the local network.

Destination Node Address

Set the node address of the destination node (i.e., the computer). Set “00” when transmitting within the local PC.

Destination Unit Address

Set the unit address of the Unit to which the host computer is connected.

Communications Port Number

Set the port number in the CPU Unit which will transmit RECV(098).

Number of Retries

Set the maximum number of times RECV(098) is to be resent if no response is returned.

Response Monitor Time

Set the time to wait for a response

Control Word Settings

The setting range for each item is shown on the following table.

Item	Setting
Number of read words	0001 to 010D (1 to 269 words)
Serial port number	00: CPU Unit, Inner Board, CS1 CPU Bus Unit 01: Port 1 02: Port 2
Destination network address	00: Local network 01 to 7F: Network address (1 to 127)
Destination node address	00: Internal communications in PC 01 to 7E: Node address (1 to 126) for Ethernet Unit 01 to 20: Node address (1 to 32) for Controller Link
Destination unit address	10 to 1F: Host Link Unit (Unit No. 0 to 15)
Response required/not required	0: Response required 1: Response not required
Communications port number	0 to 7 (0 to 7)
Number of retries	0 to F (0 to 15)
Response monitor time	0000: Default 0001 to FFFF: 0.1 to 6,553.5 s (unit 0.1 s)

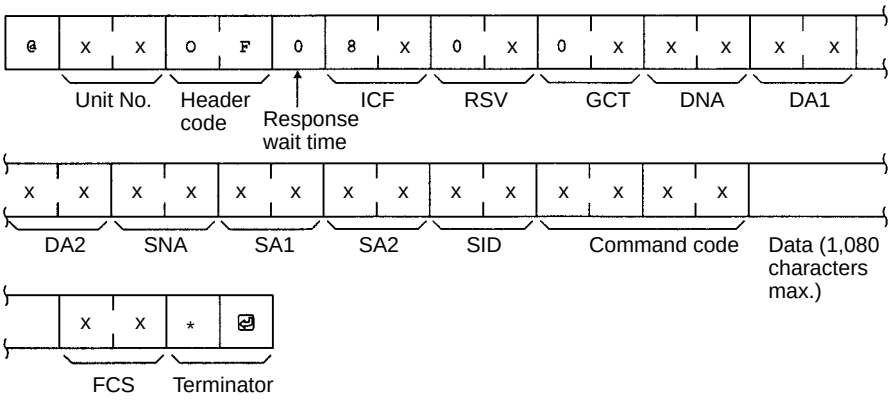
Note To execute RECV(098) normally, programming needs to be written to process the command received by the host computer and return the proper data.

CMND(490)

By using CMND(490), controls can be implemented by sending FINS commands to the host computer.

Command Format Received by the Host Computer

CMND(490) can be used to send any FINS command to the host computer The command format received by the host computer is shown in the following diagram.



Control Words

Control data must be set before CMND(490) is executed. The control data is written in the following format, starting from the first control word.

Word	Bits 00 to 07	Bits 08 to 15
C	Number of bytes of command data	
C+1	Number of bytes of response data	
C+2	Destination network address	Bits 08 to 10: Serial port number
C+3	Destination unit address	Destination node address

Word	Bits 00 to 07	Bits 08 to 15
C+4	Bits 00 to 03: No. of retries	Bits 08 to 10: Comm. port number Bits 15: Response setting
C+5	Response monitor time	

Number of Bytes of Command Data

Set the number of bytes of command data (including the command code) that are stored from the first command word

Number of Bytes of Response Data

Set the number of bytes of response data (including command code and end code) that are stored from the first response word.

Serial Port Number

Set the serial port number to which the host computer is connected.

Destination Network Address

Set the network address of the destination node (i.e., the computer). Set “00” to send communications within the local network.

Destination Node Address

Set the node address of the destination node (i.e., the computer). Set “00” when transmitting within the local PC.

Destination Unit Address

Set the unit address of the Unit to which the host computer is connected.

Response Setting

Normally this bit is set to 0 to require a response. When a response is not required, set this bit to 1.

Communications Port Number

Set the port number in the CPU Unit which will transmit CMND(490).

Number of Retries

Set the maximum number of times CMND(490) is to be resent if no response is returned.

Response Monitor Time

If the Response Setting is set to require a response, set the response monitor time.

Note If response data longer than that set in the Number of Bytes of Response Data is returned, all extra response data will not be stored. If response data shorter than that set in the Number of Bytes of Response Data is returned, the response data will be stored, and the remaining area will stay at its previous values.

Control Word Settings

The setting range for each item is shown on the following table.

Item	Setting
Number of bytes of command data	0002 to 021E (2 to 542 bytes)
Number of bytes of response data	0002 to 021E (2 to 542 bytes)
Serial port number	00: CPU Unit, Inner Board, CS1 CPU Bus Unit 01: Port 1 02: Port 2
Destination network address	00: Local network 01 to 7F: Network address (1 to 127)
Destination node address	00: Internal communications in PC 01 to 7E: Node address (1 to 126) for Ethernet Unit 01 to 20: Node address (1 to 32) for Controller Link
Destination unit address	10 to 1F: Host Link Unit (Unit No. 0 to 15)
Response setting	0 : Required 1: Not required
Communications port number	0 to 7 (0 to 7)
Number of retries	0 to F (0 to 15)
Response monitor time	0000: Default (2 s) 0001 to FFFF: 0.1 to 6,553.5 s (unit: 0.1 s)

Note To execute CMND(490) normally, programming needs to be written to process the command received by the host computer and return the proper response.

3-5-6 Flags for Network Communications

This section describes the flags in the Auxiliary Area that are used when executing SEND(090), RECV(098), and CMND(490).

Communications Port Enabled Flags

A Communications Port Enabled Flag turns ON when SEND(090), RECV(098), and CMND(490) can be executed. The Flag will turn OFF during execution of these commands and turn ON again when the command execution is completed. When creating the ladder diagram, use these Flags as input conditions when executing these instructions.

Word	Bit	Content
A202	08 to 15	Reserved
	07	Communications Port Enabled Flag, Port No. 7
	06	Communications Port Enabled Flag, Port No. 6
	05	Communications Port Enabled Flag, Port No. 5
	04	Communications Port Enabled Flag, Port No. 4
	03	Communications Port Enabled Flag, Port No. 3
	02	Communications Port Enabled Flag, Port No. 2
	01	Communications Port Enabled Flag, Port No. 1
	00	Communications Port Enabled Flag, Port No. 0

Communications Port Error Flags

A Communications Port Error Flag will turn ON in the following cases.

- When an error is generated during execution of SEND(090), RECV(098), or CMND(490).
- When an error response or retry error has been generated for the port.

These Flags will turn OFF when the corresponding Communications Port Enabled Flag is turned OFF at the start of operation or at the start of executing the SEND(090), RECV(098), or CMND(490).

Word	Bit	Content
A219	15 to 08	Reserved
	07	Communications Port Error Flag, Port No. 7
	06	Communications Port Error Flag, Port No. 6
	05	Communications Port Error Flag, Port No. 5
	04	Communications Port Error Flag, Port No. 4
	03	Communications Port Error Flag, Port No. 3
	02	Communications Port Error Flag, Port No. 2
	01	Communications Port Error Flag, Port No. 1
	00	Communications Port Error Flag, Port No. 0

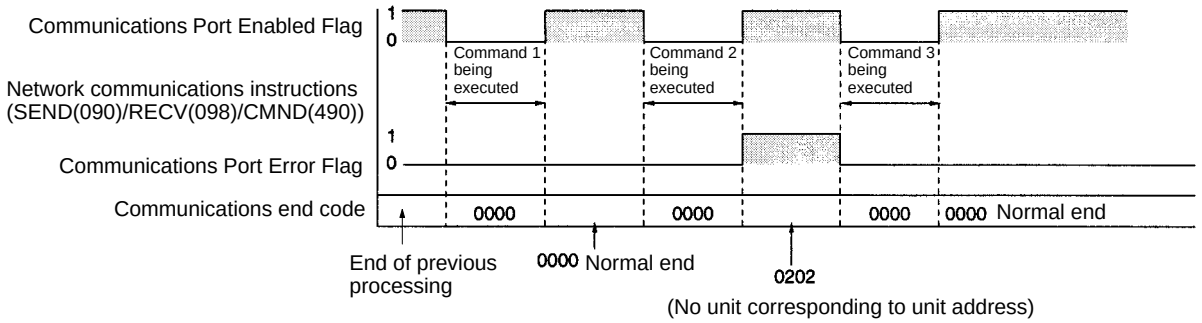
Communications Port Completion Codes

The Communication Port Completion Code words will contain the FINS end code after SEND(090), RECV(098), or CMND(490) has been executed.

If the Communications Port Enabled Flag turns OFF when operation is started or SEND(090), RECV(098), or CMND(490) are executed, the contents of these words will be cleared.

Word	Content
A203	Communications Port Completion Code, Port No. 0
A204	Communications Port Completion Code, Port No. 1
A205	Communications Port Completion Code, Port No. 2
A206	Communications Port Completion Code, Port No. 3
A207	Communications Port Completion Code, Port No. 4
A208	Communications Port Completion Code, Port No. 5
A209	Communications Port Completion Code, Port No. 6
A210	Communications Port Completion Code, Port No. 7
A211 to A218	Reserved

Flag Transitions

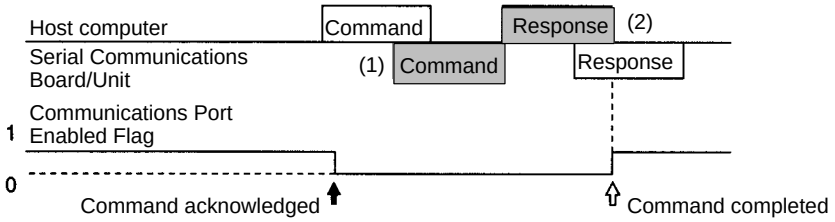


3-5-7 Timing of Commands to Host Computers

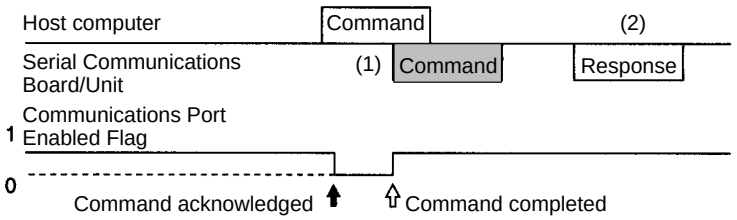
Commands sent to a host computer are transmitted with the timing shown below.

Data Received from Host Computer

Response Required



No Response Required

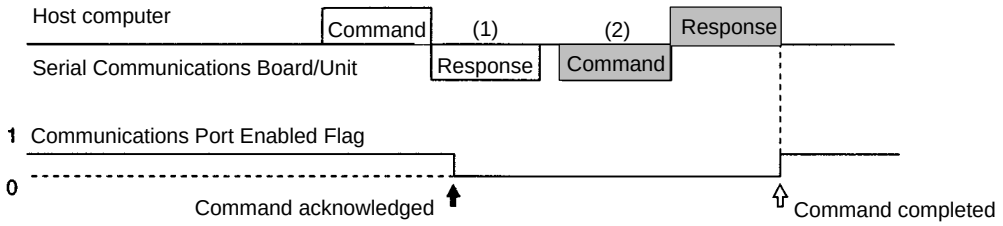


Command transmission to the host computer can commence even when the port is receiving a command from the host computer (1). The transmission of a response to the command from the host computer is postponed until the transmission of the command to the host computer is completed (2).

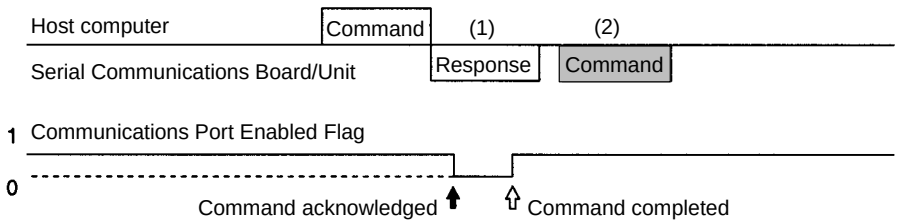
When a response is not required from the host computer, the Communications Port Enabled Flag will turn ON when the command to the host computer has passed from the CPU Unit to the port.

Host Computer Receiving Data

Response Required



No Response Required

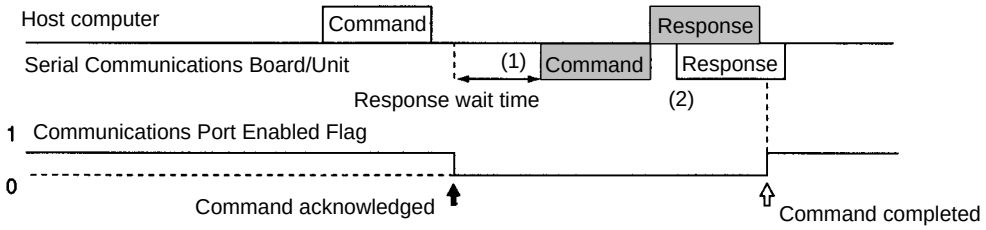


At (1) in the diagram, the response to a command sent from the host computer is being transmitted from the port. In this case, the command transmission to the host computer is postponed until the response transmission is completed (2).

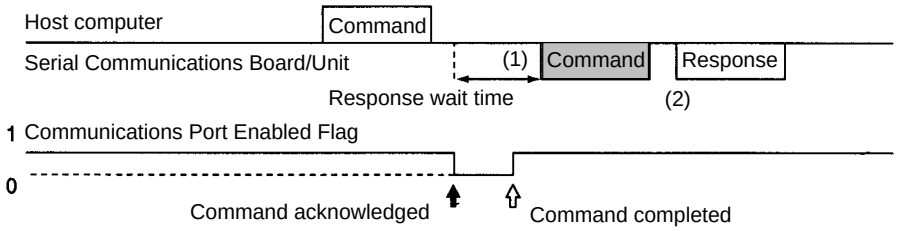
When a response is not required from the host computer, the Communications Port Enabled Flag will turn ON when the command to the host computer has passed from the CPU Unit to the port.

Response Wait Time

Response Required



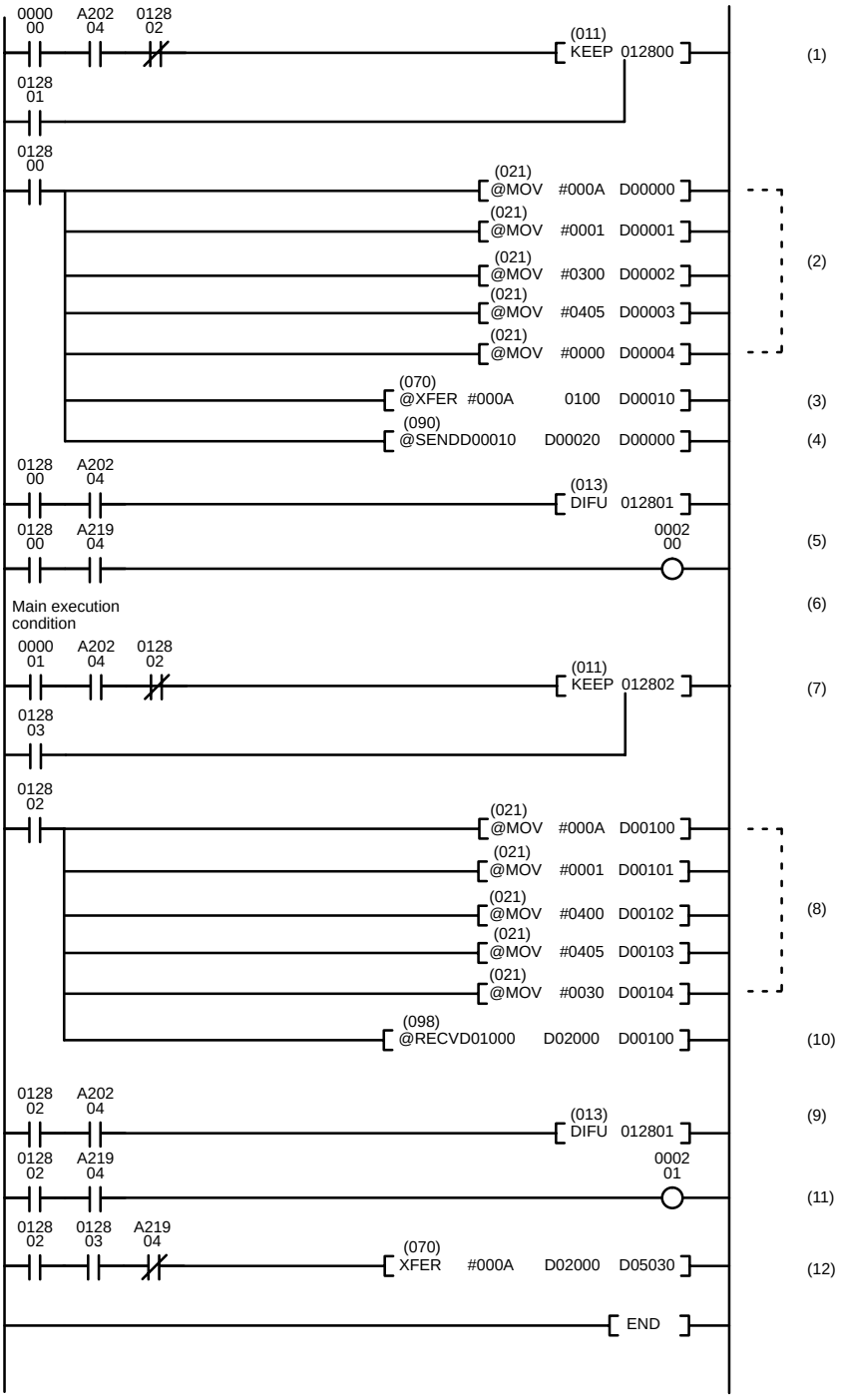
No Response Required



When response wait time has been set in the command format from the host computer, commands to the host computer will not be transmitted until the response time has elapsed (1). Transmission of responses to commands from the host computer will be postponed until the command transmission to the host computer has been completed.

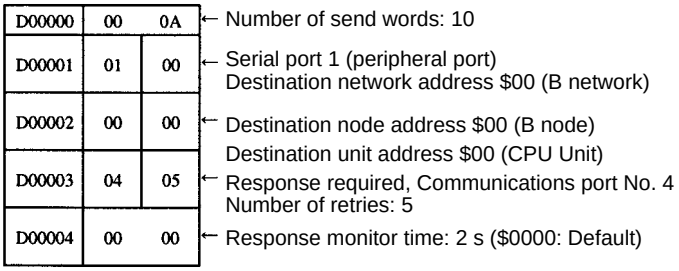
When a response is not required from the host computer, the Communications Port Enabled Flag will turn ON when the command to the host computer has passed from the CPU Unit to the port.

3-5-8 Programming Example



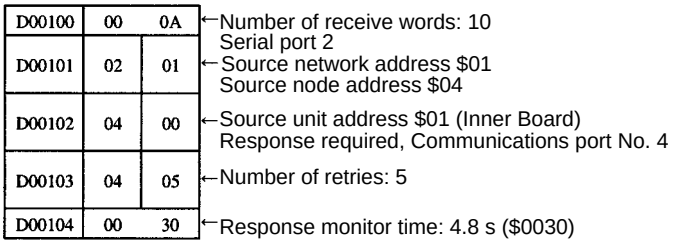
1, 2, 3... 1. When the SEND(090)/RECV(098) Enabled Flag is ON, and the execution condition CIO 000000 is ON, execution of the instructions for network transmissions are started. CIO 012800 will remain ON from when SEND(090) is started until execution has been completed.

2. Set the control data.



3. Transmit Data Stored

   Stores 10 words of data starting from CIO 0100 to D00010 and later.
4. Execute SEND(090).
5. When the instruction for network communications has been completed (A20204: ON), CIO 012801 will turn ON, and the instruction for sending on the network is completed.
6. Turns ON when an error is generated during execution of network communications.
7. When the Communications Port Enabled Flag is ON and execution condition CIO 000001 is ON, execution of the instruction for receiving via the network (RECV(098)) is started
8. Set the control data.



9. Execute RECV(098).
10. When the execution of network communications instructions has been completed (A20204: ON), CIO 012803 will turn ON, and the instruction for receiving via the network is completed.
11. Turns ON when an error is generated during execution of network communications.
12. Reception data processing

    When there is no reception error, 10 words of data (starting from D02000) are stored from D05030 onwards.

Programming Example for Host Computer Side (BASIC): Send

```
10  '************************************
20  '**** CS1W-SCU21 Serial Communications Unit ****
30  '**** Command to Host Computer (SEND(090)) ****
40  '**** Sample Send Program ****
50  '************************************
60  '
70  '============ Initial Settings ============
80  CLOSE 1
90  ON ERROR GOTO *EROPE
100 DIM CHDATA$ (300)                          :' Data array declaration
110 OPEN "COM:E73" AS #1                       :' Opens port.
120 '
130 '============ Main Process ============
```

```
140 INPUT #1, COMMAND$                                    :' Receives data from PC (line).
150 T$=LEFT$ (COMMAND$, LEN (COMMAND$) -3)              :' Checks FCS.
160 GOSUB *FCS
170 IF FCS$<>MID$ (COMMAND$, LEN (COMMAND$) -2, 2) THEN ENDCODE$="1004":GOTO *RESPONSE
180 CMNDCODE$=MID$ (COMMAND$, 27, 4)                    :' Checks command code.
190 IF CMNDCODE$<>"0102" THEN ENDCODE$="0401" :GOTO *RESPONSE
200 FOR I=0 TO VAL ("&H"+MID$ (COMMAND$, 39, 4) ) -1  :' Sets No. of write elements.
210     CHDATA$ (I) =MID$(COMMAND$, 43+I*4, 4)
220      PRINT "Data";":";CHDATA$(I)
230 NEXT I
240 ENDCODE$="0000"                                     :' Sets end code to "0000".
250 '=========================================
260 *RESPONSE                                           :' Creates a response frame.
270 RSV$=MID$ (COMMAND$, 9, 2)                          :' Returns received RSV, SID
280 DA$=MID$ (COMMAND$, 19, 6)                          :' without change.
290 SA$=MID$ (COMMAND$, 13, 6)                          :' Swaps DNA, DA1, DA2
300 SID$=MID$ (COMMAND$, 25, 2)                         :' with SNA, SA1, and SA2.
310 T$="@000F00C0"+RSV$+"02"+DA$+SA$+SID$+CMNDCODE$+ENDCODE$
320 GOSUB *FCS
330 RESPONSE$=T$+FCS$+"*"
340 PRINT #1, RESPONSE$                                 :' Transmits data to PC (line).
350 GOTO 140
360 '
370 '===== FCS Calculation Subroutine =====
380 *FCS                                                :' Adds FCS.
390 L=LEN (T$)
400 A=0
410 FOR J=1 TO L
420     TJ$=MID$ (T$, J, I)
430     A+ASC (TJ$)   XOR  A
440 NEXT J
450 FCS$=HEX$ (A)
460 IF LEN (FCS$) =1 THEN FCS$="0"+FCS$
470 RETURN
480 '
490 '========== Error processing ==========
500 *EROPE
510 PRINT "ERL=":ERL, "ERR";ERR
520 CLOSE 1
530 END
```

Programming Example for Host Computer Side (BASIC): Reception

```
10  '************************************
20  '**** CS1W-SCU21 Serial Communications Unit ****
30  '**** Command to Host Computer (RECV(098)) ****
40  '**** Sample Reception Program ****
50  '************************************
60  '
70  '============ Initial Settings ============
80  CLOSE 1
90  ON ERROR GOTO *EROPE
100 DIM CHDATA$ (300)                                   :' Data array declaration
110 CHDATA$ (0) ="0000":CHDATA$ (1) ="1111":CHDATA$ (2) ="2222"
120 CHDATA$ (3) ="3333":CHDATA$ (4) ="4444":CHDATA$ (5) ="5555"
130 OPEN "COM:E73" AS #1                                :' Opens port.
140 '
150 '============ Main Process ============
160 RESPDATA$=""
170 INPUT #1, COMMAND$                                  :' Receives data from PC (line).
180 T$=LEFT$ (COMMAND$, LEN (COMMAND$) -3)              :' Checks FCS.
190 GOSUB *FCS
200 IF FCS$<>MID$ (COMMAND$, LEN (COMMAND$) -2, 2) THEN ENDCODE$="1004":GOTO *RESPONSE
210 CMNDCODE$=MID$ (COMMAND$, 27, 4)                    :' Checks command code.
```

```
220 IF CMNDCODE$<>"0101" THEN ENDCODE$="0401" :GOTO *RESPONSE
230 FOR I=0 TO VAL ("&H"+MID$ (COMMAND$, 39, 4) ) -1  :' Sets No. of read elements.
240     RESPDATA$=RESPDATA$+CHDATA$ (I)
250 NEXT I
260 PRINT "Send data";RESPDATA$
270 ENDCODE$="0000"                                   :' Sets end code to "0000".
280 '=======================================
290 *RESPONSE                                         :' Creates a response frame.
300 RSV$=MID$ (COMMAND$, 9, 2)                        :' Returns received RSV, SID
310 DA$=MID$ (COMMAND$, 19, 6)                        :' without change.
320 SA$=MID$ (COMMAND$, 13, 6)                        :' Swaps DNA, DA1, DA2
330 SID$=MID$ (COMMAND$, 25, 2)                       :' with SNA, SA1, and SA2.
340 T$="@000F00C0"+RSV$+"02"+DA$+SA$+SID$+CMNDCODE$+ENDCODE$+RESPDATA$
350 GOSUB *FCS
360 RESPONSE$=T$+FCS$+"*"
370 PRINT #1, RESPONSE$                                   :' Transmits data to PC (line).
380 GOTO 160
390 '
400 '===== FCS Calculation Subroutine =====
410 *FCS                                                  :' Adds FCS.
420 L=LEN (T$)
430 A=0
440 FOR J=1 TO L
450     TJ$=MID$ (T$, J, I)
460     A+ASC (TJ$)   XOR  A
470 NEXT J
480 FCS$=HEX$ (A)
490 IF LEN (FCS$) =1 THEN FCS$="0"+FCS$
500 RETURN
510 '
520 '========== Error processing ==========
530 *EROPE
540 PRINT "ERL=":ERL, "ERR";ERR
550 CLOSE 1
560 END
```