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

Send(090)  Recv(098)  Cmd(490)

CPU Units on a Network

Send 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
3-5 Section

FINS Commands with Host Link

CPU Unit Directly Connected to Host Computer on a Network

![Diagram of CPU Unit and Host Link](image)

**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.

```
Host Link header FINS command frame (See note.) Host Link FCS Host Link terminator
```

**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.

```
Host Link header FINS response frame (See note.) Host Link FCS Host Link terminator
```

**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.

![Diagram of FINS command format](image)

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.

![Diagram of FINS command format](image)

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 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 30 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

```
$ X X F A 0 0 4 0 0 0 0 X X
```

Unit No. Header code ICF DA2 SA2 SID

```
X X X X X X X X X X X X X X X X
```

FINS command code FINS response code Data (1,076 characters = 538 bytes) Terminator

Responses from a CPU Unit on a Network

```
$ X X F A 0 0 C 0 0 0 2 0 0 0 0
```

Unit No. Header code ICF RSV GCT DNA DA1 DA2 SNA SA1 SA2 SID

```
0 0 X X X X X X X X X X X X X X
```

DA2 SNA SA1 SA2 SID FINS command code FINS response code

```
X X *
```

Data (1,076 characters = 538 bytes) FCS Terminator

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)

**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)

**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. **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.

<table>
<thead>
<tr>
<th>Word</th>
<th>Bits 00 to 07</th>
<th>Bits 08 to 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Number of send words</td>
<td></td>
</tr>
<tr>
<td>C+1</td>
<td>Destination network address</td>
<td>Bits 08 to 10: Serial port number</td>
</tr>
</tbody>
</table>
### FINS Commands with Host Link

#### Section 3-5

<table>
<thead>
<tr>
<th>Word</th>
<th>Bits 00 to 07</th>
<th>Bits 08 to 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>C+2</td>
<td>Destination unit address</td>
<td>Destination node address</td>
</tr>
</tbody>
</table>
| 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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of send words</td>
<td>0001 to 010B (1 to 267 words)</td>
</tr>
</tbody>
</table>
| 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    | 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  
|                              | 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.

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

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.

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

### 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.

<table>
<thead>
<tr>
<th>Word</th>
<th>Bits 00 to 07</th>
<th>Bits 08 to 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Number of bytes of command data</td>
<td></td>
</tr>
<tr>
<td>C+1</td>
<td>Number of bytes of response data</td>
<td></td>
</tr>
<tr>
<td>C+2</td>
<td>Destination network address</td>
<td>Bits 08 to 10: Serial port number</td>
</tr>
<tr>
<td>C+3</td>
<td>Destination unit address</td>
<td>Destination node address</td>
</tr>
</tbody>
</table>
FINS Commands with Host Link

<table>
<thead>
<tr>
<th>Word</th>
<th>Bits 00 to 07</th>
<th>Bits 08 to 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>C+4</td>
<td>Bits 00 to 03: No. of retries</td>
<td>Bits 08 to 10: Comm. port number</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bits 15: Response setting</td>
</tr>
<tr>
<td>C+5</td>
<td>Response monitor time</td>
<td></td>
</tr>
</tbody>
</table>

**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.

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

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.

<table>
<thead>
<tr>
<th>Word</th>
<th>Bit</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>A202</td>
<td>08 to 15</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>07</td>
<td>Communications Port Enabled Flag, Port No. 7</td>
</tr>
<tr>
<td></td>
<td>06</td>
<td>Communications Port Enabled Flag, Port No. 6</td>
</tr>
<tr>
<td></td>
<td>05</td>
<td>Communications Port Enabled Flag, Port No. 5</td>
</tr>
<tr>
<td></td>
<td>04</td>
<td>Communications Port Enabled Flag, Port No. 4</td>
</tr>
<tr>
<td></td>
<td>03</td>
<td>Communications Port Enabled Flag, Port No. 3</td>
</tr>
<tr>
<td></td>
<td>02</td>
<td>Communications Port Enabled Flag, Port No. 2</td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>Communications Port Enabled Flag, Port No. 1</td>
</tr>
<tr>
<td></td>
<td>00</td>
<td>Communications Port Enabled Flag, Port No. 0</td>
</tr>
</tbody>
</table>

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).

<table>
<thead>
<tr>
<th>Word</th>
<th>Bit</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>A219</td>
<td>15 to 08</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>07</td>
<td>Communications Port Error Flag, Port No. 7</td>
</tr>
<tr>
<td></td>
<td>06</td>
<td>Communications Port Error Flag, Port No. 6</td>
</tr>
<tr>
<td></td>
<td>05</td>
<td>Communications Port Error Flag, Port No. 5</td>
</tr>
<tr>
<td></td>
<td>04</td>
<td>Communications Port Error Flag, Port No. 4</td>
</tr>
<tr>
<td></td>
<td>03</td>
<td>Communications Port Error Flag, Port No. 3</td>
</tr>
<tr>
<td></td>
<td>02</td>
<td>Communications Port Error Flag, Port No. 2</td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>Communications Port Error Flag, Port No. 1</td>
</tr>
<tr>
<td></td>
<td>00</td>
<td>Communications Port Error Flag, Port No. 0</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Word</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>A203</td>
<td>Communications Port Completion Code, Port No. 0</td>
</tr>
<tr>
<td>A204</td>
<td>Communications Port Completion Code, Port No. 1</td>
</tr>
<tr>
<td>A205</td>
<td>Communications Port Completion Code, Port No. 2</td>
</tr>
<tr>
<td>A206</td>
<td>Communications Port Completion Code, Port No. 3</td>
</tr>
<tr>
<td>A207</td>
<td>Communications Port Completion Code, Port No. 4</td>
</tr>
<tr>
<td>A208</td>
<td>Communications Port Completion Code, Port No. 5</td>
</tr>
<tr>
<td>A209</td>
<td>Communications Port Completion Code, Port No. 6</td>
</tr>
<tr>
<td>A210</td>
<td>Communications Port Completion Code, Port No. 7</td>
</tr>
<tr>
<td>A211 to A218</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

Flag Transitions

- Communications Port Enabled Flag
- Network communications instructions (SEND(090)/RECV(098)/CMND(490))
- Communications Port Error Flag
- Communications end code

End of previous processing 0000 Normal end 0202
(No unit corresponding to unit address)
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

<table>
<thead>
<tr>
<th>Host computer</th>
<th>Command</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Communications Board/Unit</td>
<td>(1) Command</td>
<td>(2) Response</td>
</tr>
<tr>
<td>Communications Port Enabled Flag</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Command acknowledged ➤ Command completed

### No Response Required

<table>
<thead>
<tr>
<th>Host computer</th>
<th>Command</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>0</td>
<td>Command acknowledged ➤ Command completed</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Host computer</th>
<th>Command</th>
<th>Response</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Communications Board/Unit</td>
<td>(1) Command</td>
<td>(2) Response</td>
<td></td>
</tr>
<tr>
<td>Communications Port Enabled Flag</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Command acknowledged ➤ Command completed

### No Response Required

<table>
<thead>
<tr>
<th>Host computer</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Communications Board/Unit</td>
<td>(2) Command</td>
</tr>
<tr>
<td>Communications Port Enabled Flag</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>Command acknowledged ➤ Command completed</td>
</tr>
</tbody>
</table>
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.
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.

<table>
<thead>
<tr>
<th>D0000</th>
<th>00 0A</th>
</tr>
</thead>
<tbody>
<tr>
<td>D0001</td>
<td>01 00</td>
</tr>
<tr>
<td>D0002</td>
<td>00 00</td>
</tr>
<tr>
<td>D0003</td>
<td>04 05</td>
</tr>
<tr>
<td>D0004</td>
<td>00 00</td>
</tr>
</tbody>
</table>

- Number of send words: 10
- Serial port 1 (peripheral port)
  - Destination network address $00 (B network)
- Destination node address $00 (B node)
- Destination unit address $00 (CPU Unit)
- Response required, Communications port No. 4
- Number of retries: 5
- Response monitor time: 2 s ($0000: Default)

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.

<table>
<thead>
<tr>
<th>D0010</th>
<th>00 0A</th>
</tr>
</thead>
<tbody>
<tr>
<td>D0011</td>
<td>02 01</td>
</tr>
<tr>
<td>D0012</td>
<td>04 00</td>
</tr>
<tr>
<td>D0013</td>
<td>04 05</td>
</tr>
<tr>
<td>D0014</td>
<td>00 30</td>
</tr>
</tbody>
</table>

- Number of receive words: 10
- Serial port 2
  - Source network address $01
- Source node address $04
- Source unit address $01 (Inner Board)
- Response required, Communications port No. 4
- Number of retries: 5
- Response monitor time: 4.8 s ($0030)

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 =============
```
3-5 Section

FINS Commands with Host Link

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$="1004":GOTO *RESPONSE
180 CMDNCODE$=MID$ (COMMAND$, 27, 4) :’ Checks command code.
190 IF CMNDNCODE$<->"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$="0000" :’ Sets end code to "0000".
250 *RESPONSE :’ Creates a response frame.
260 RSV$=MID$ (COMMAND$, 9, 2) :’ Returns received RSV, SID
270 DA$=MID$ (COMMAND$, 19, 6) :’ without change.
280 SA$=MID$ (COMMAND$, 13, 6) :’ Swaps DNA, DA1, DA2
290 SID$=MID$ (COMMAND$, 25, 2) :’ with SNA, SA1, and SA2.
300 T$="@000F00C0"+RSV$+"02"+DA$+SA$+SID$+CMNDNCODE$+ENDCODE$
310 GOSUB *FCS
320 RESPONSE$=T$+FCS$+"*"
330 PRINT #1, RESPONSE$ :’ Transmits data to PC (line).
340 GOTO 140
350 *
360 ’ FCS Calculation Subroutine
370 *FCS :’ Adds FCS.
380 L=LEN (T$)
390 A=0
400 FOR J=1 TO L
410 TJ$=MID$ (T$, J, I)
420 A=ASC (TJ$) XOR A
430 NEXT J
440 FCS$=HEX$ (A)
450 IF LEN (FCS$) =1 THEN FCS$="0"+FCS$
460 RETURN
470 *EROPE
500 PRINT "ERL=":ERL, "ERR";ERR
510 CLOSE 1
520 END

Programming Example for Host Computer Side (BASIC): Reception

10 ’++++++++++++++++++++ Initial Settings +++++++++++++++++++++
20 CLOSE 1
30 ON ERROR GOTO *EROPE
40 DIM CHDATA$(300) :’ Data array declaration
50 CHDATA$(0) ="0000":CHDATA$(1) ="1111":CHDATA$(2) ="2222"
60 CHDATA$(3) ="3333":CHDATA$(4) ="4444":CHDATA$(5) ="5555"
70 OPEN "COM:E73" AS #1 :’ Opens port.
80 *
90 ’++++++++++++++++++++ Main Process +++++++++++++++++++++
100 INPUT #1, COMMAND$ :’ Receives data from PC (line).
110 T$=LEFT$ (COMMAND$, LEN (COMMAND$) -3) :’ Checks FCS.
120 GOSUB *FCS
130 IF FCS$<->MID$ (COMMAND$, LEN (COMMAND$) -2, 2) THEN ENDCODE$="1004":GOTO *RESPONSE
140 CMDNCODE$=MID$ (COMMAND$, 27, 4) :’ Checks command code.
3-5 Section

FINS Commands with Host Link

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$="0000" :
 Sets end code to "0000".
280 *RESPONSE :
 Creates a response frame.
290 RSV$=MID$ (COMMAND$, 9, 2) :
 Returns received RSV, SID
300 DA$=MID$ (COMMAND$, 19, 6) :
 without change.
310 SA$=MID$ (COMMAND$, 13, 6) :
 Swaps DNA, DA1, DA2
320 SID$=MID$ (COMMAND$, 25, 2) :
 with SNA, SA1, and SA2.
330 TS="@000F00C0"+RSV$+"02"+DA$+SA$+SID$+CMNDCODE$+ENDCODE$+RESPDATA$
340 GOSUB *FCS
350 RESPONSE$=T$+FCS$+"*"
360 PRINT #1, RESPONSE$ :
 Transmits data to PC (line).
370 GOTO 160
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$, J, 1)
460 A+ASC (TJ$) 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