CONTENTS

COMMON

COMPUTER LINK FUNCTION

PRINTER FUNCTION

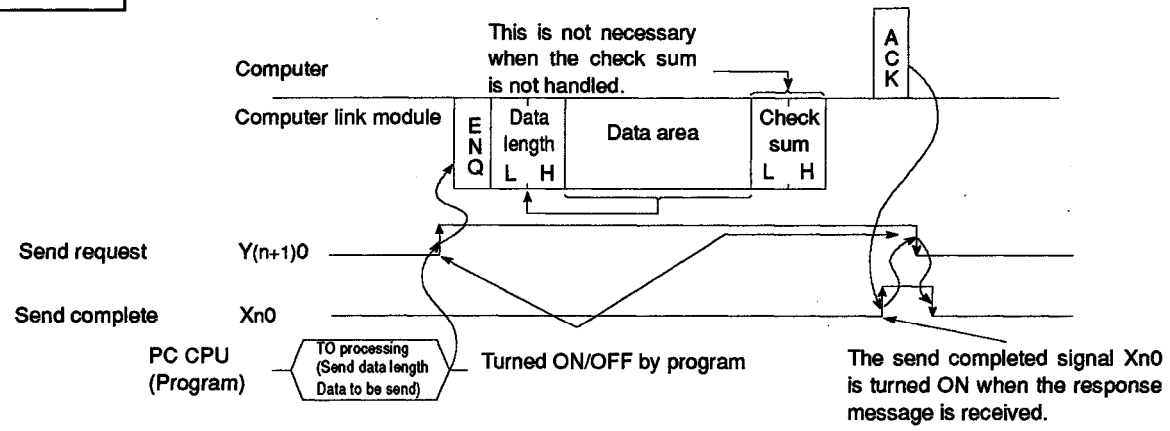
7.6 Data Sending Procedure in the Bidirectional Mode (Computer link module → Computer)

"Data sending" is outputting data which was written to the bidirectional mode send buffer memory area (hereafter referred to as the send area), fromo the computer link module to a computer in response to turning ON the PC CPU send request signal ($Y_{(n+1)}0$)

7.6.1 Data sending procedure

The chart given below shows the send protocol when the data written in send area is sent to the computer.

PROCEDURE



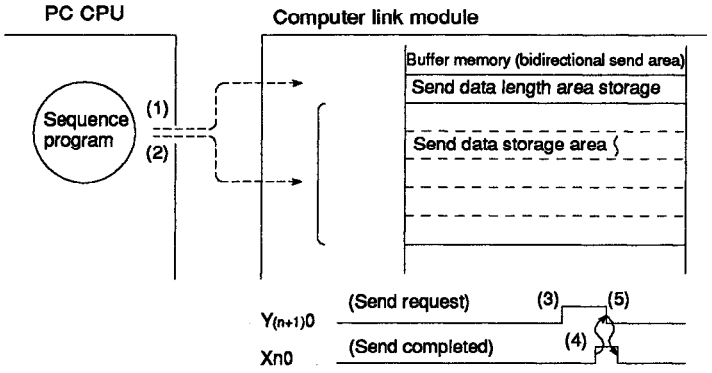
POINTS

(1) An error occurs if the send data length is (a) greater than the send area, or equal to "0". In this case, "1" is written as send error information to the most significant bit (bit 15) of address 116H (data send area storage area) in the special applications memory area. (Refer to Section 7.2.3 (2) (j) and 13.2.)

(2) The send data length written to the send data length storage area of buffer memory is transmitted as the data length.

7.6.2 Data sending program

Shown below are basic programs and programming examples when data is sent from the PC CPU to the computer by using an application instruction.
The send data is written to the send area (default addresses: 0H to 7FH).



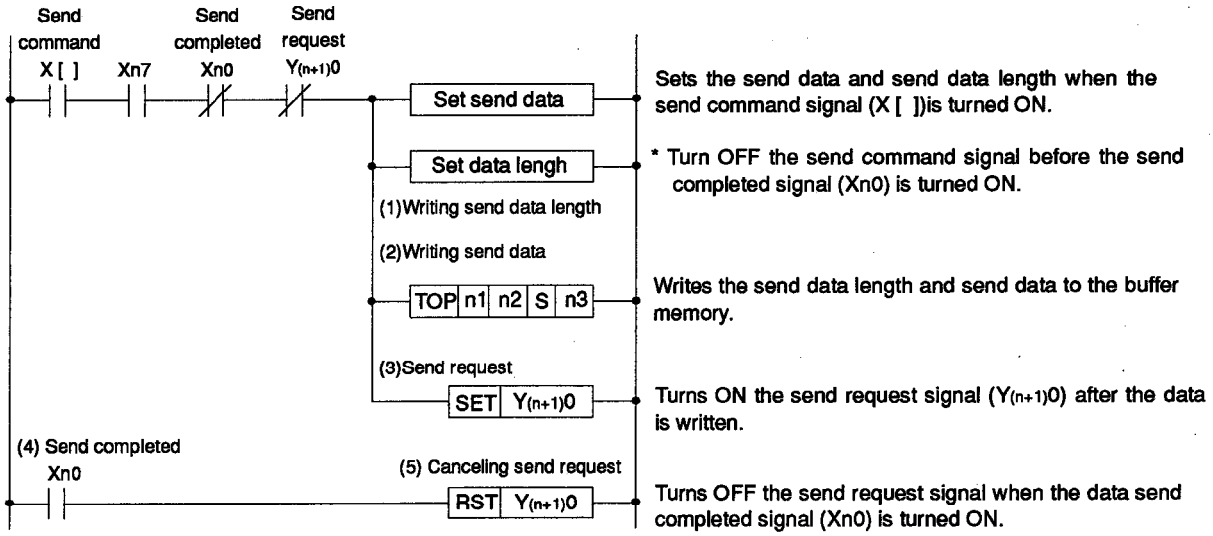
(1) to (5) in the diagram corresponds to (1) to (5) in (1)(a) and (2)(a) of this section.

(1) Basic sequence program (TO, TOP, DTO, and DTOP instructions)

(a) Format to write the send area

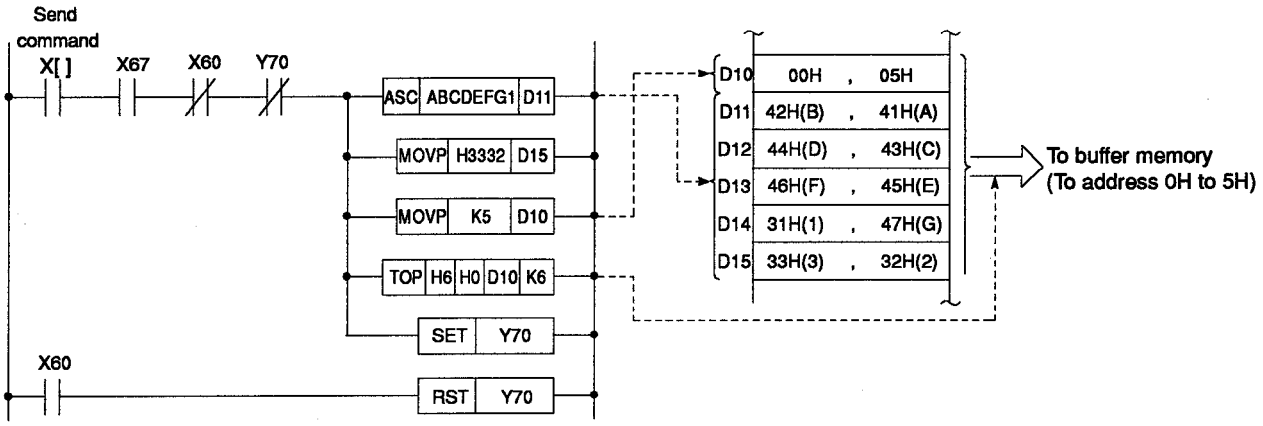
Refer to the Programming Manual (Common Instructions) for the details.

FORMAT



(b) Programming example

To transmit 5-word data after writing "ABCDEFG123" to the buffer memory area from 1H when the computer link module I/O numbers are allocated to 60H to 7FH. (The designated unit of data is "word" in the example.)



REMARK

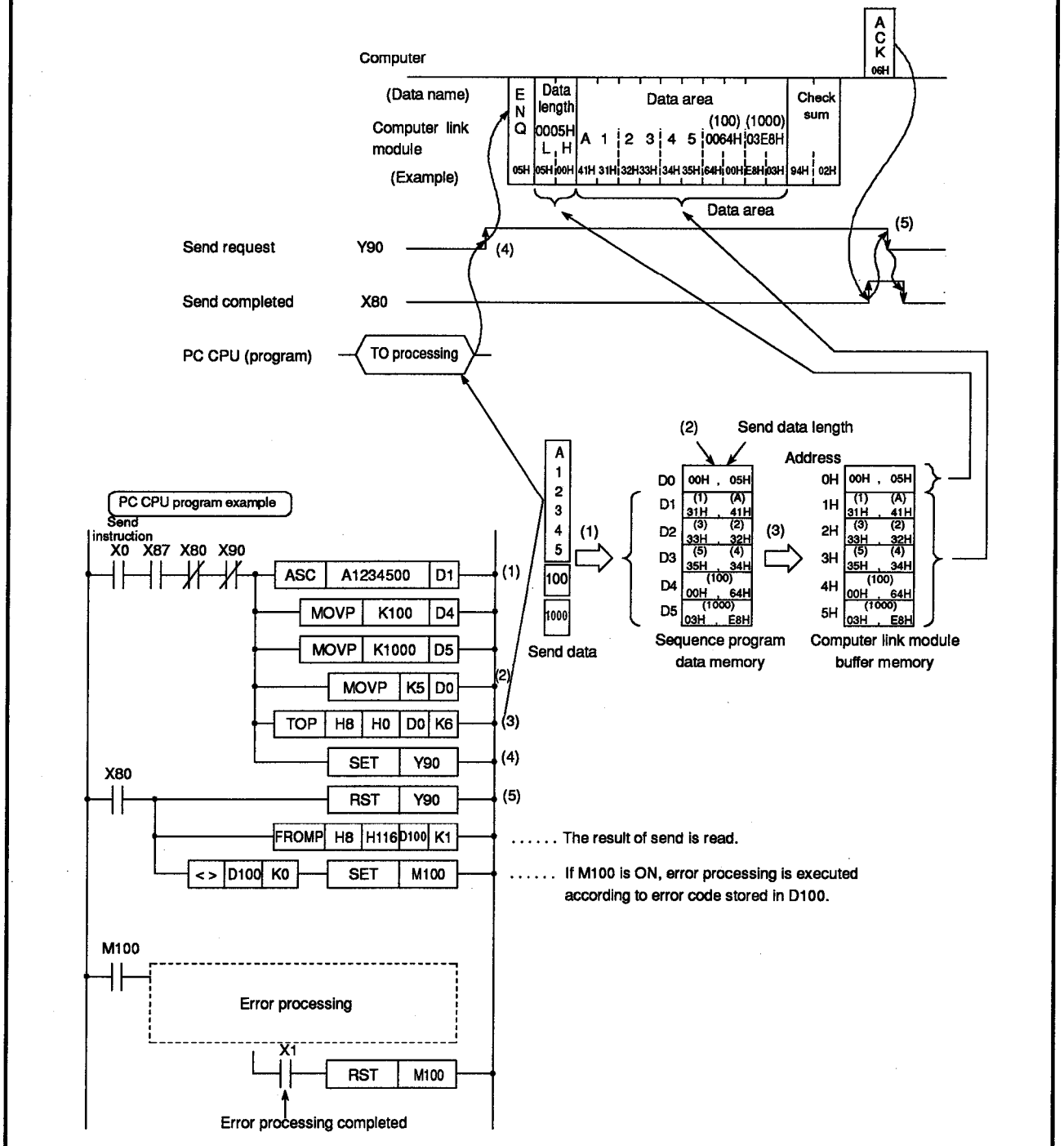
The AnA/AnUCPU dedicated instructions are not available for bidirectional mode.

(2) Application example

The following gives an application example to send data to the computer.

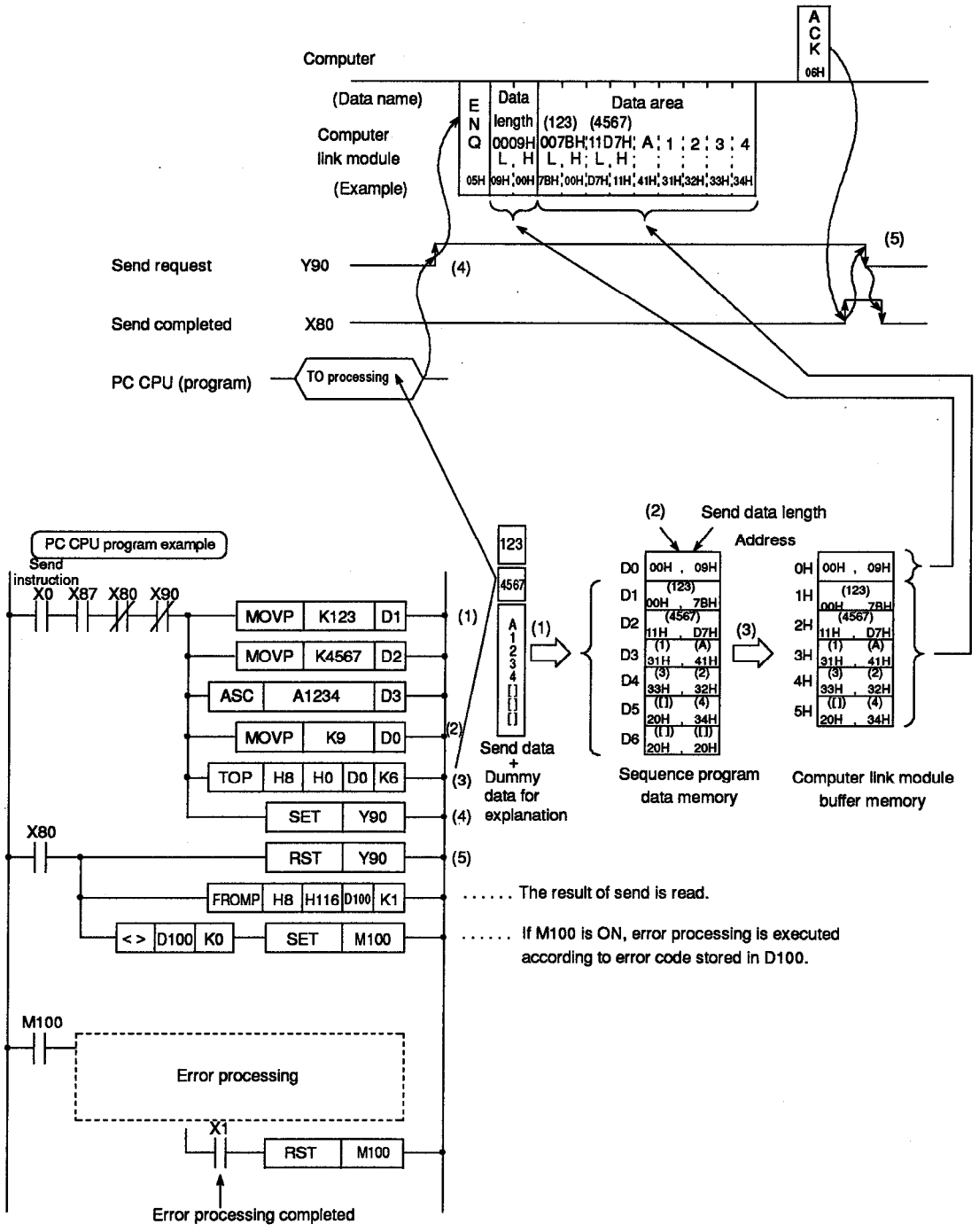
Example 1: Check sum enabled, in word units (Send area allocation: default)

To transmit character data "A12345" and integer data "100,1000" (decimal) from the sequence program to a computer after writing it to buffer memory. (Computer link module I/O signal: 80H to 9FH)



Example 2: Check sum disabled, in word units (Send area allocation: default)

To transmit character data "A1234" and integer data "123,4567" (decimal) from the sequence program to a computer after writing it to buffer memory. (Computer link module I/O signal: 80H to 9FH)



POINT

- Even if transmission data units are set byte units, the TO instruction in a sequence program operates in word units. Therefore, the length of send data differs from the data length set with the TO instruction.

8. WHEN READING SIGNAL/SETTING INFORMATION IN THE COMPUTER LINK

This section gives the procedures etc. to check the computer link module status or signal status by using a sequence program when a computer link is established with dedicated protocols and in no-protocol mode or bidirectional mode.
Insert necessary parts into the program.

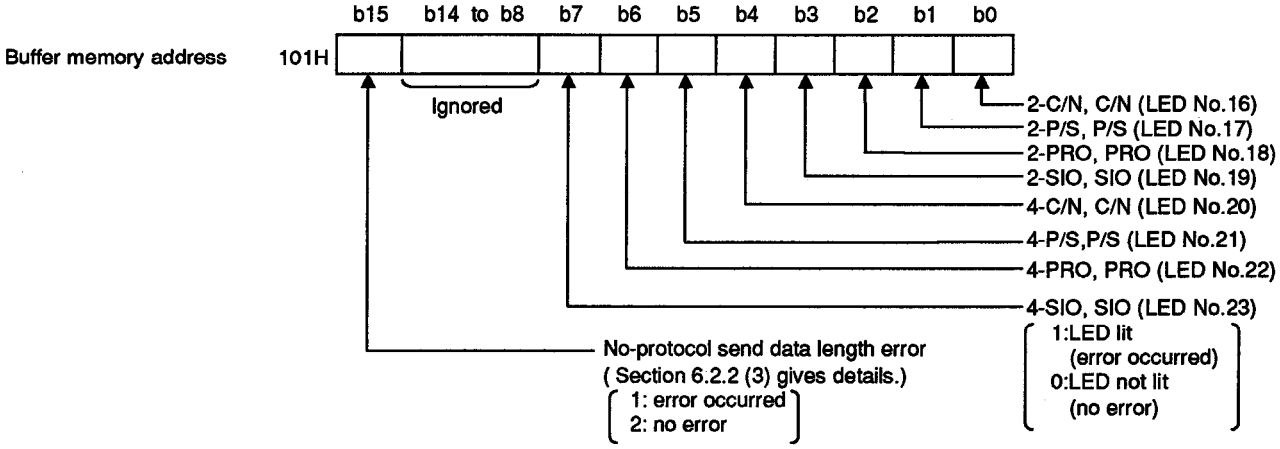
8.1 Reading Transmission Error Data and Turn-OFF Request

This section explains the contents of the buffer memory area where the ON/OFF status of the error LEDs are stored. It also shows how to turn OFF LEDS which are lit.

8.1.1 Reading the error LED display status

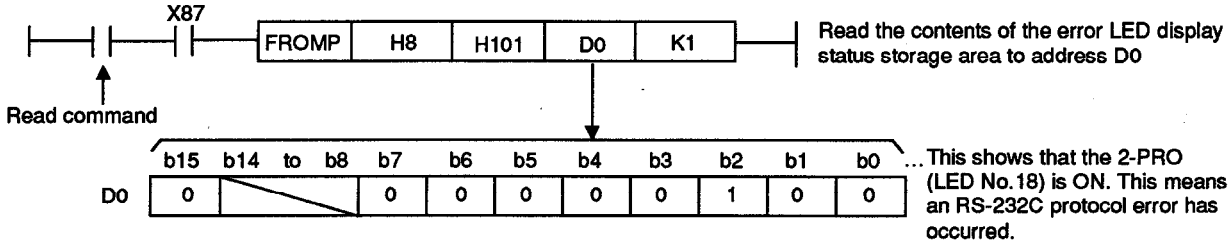
(1) Error LED display status storage area (Address: 101H)

The ON/OFF status of the error LEDs are stored in address 101H of the buffer memory (see below).



(2) Program example to read the error LED display status storage area

The following gives an example program used to read the error LED display status by using FROM instruction. (Computer link module I/O signal: 80H to 9FH)



REMARK

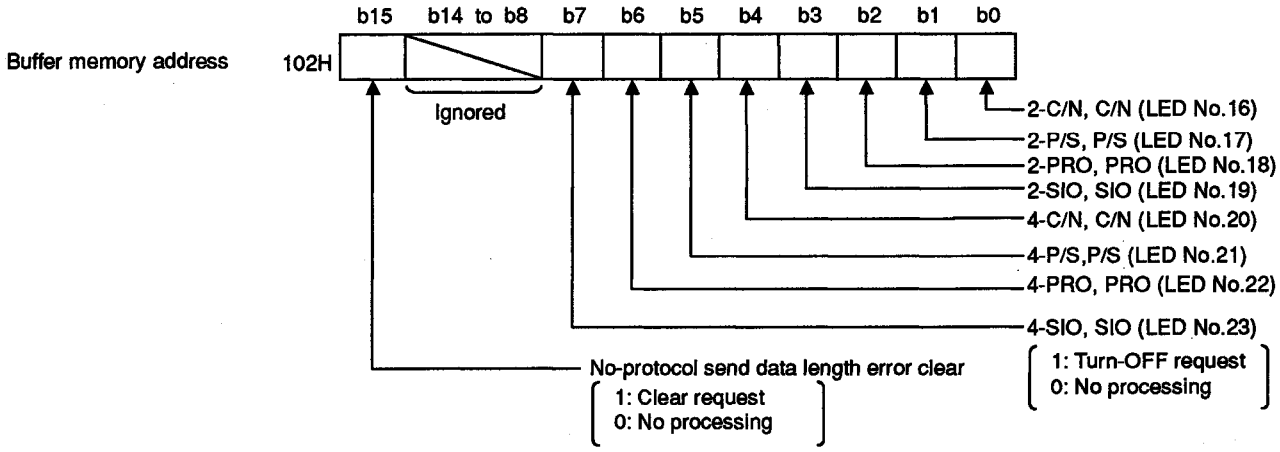
Section 4.3 gives details about the ON/OFF state of each bit in the error LED display area.
Section 13 gives details about error processing.
Section 9 and gives details about 2-SIO (LED No.19) and 4-SIO (LED No.23).

8.1.2 Turning OFF error LEDs

When an error LED turns ON, it stays ON (lit) even when the cause of the error has been eliminated.

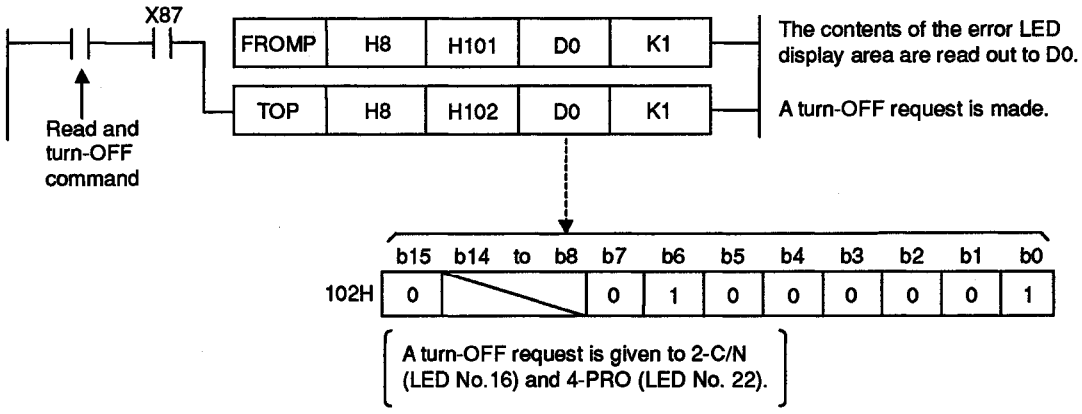
To turn OFF the lit LED, "1" must be written to the appropriate bit of address 102H of the buffer memory, using the sequence program TO instruction.

(1) Error LED turn-OFF request area (Address: 102H)



(2) Program example to turn OFF error LEDs

The following gives an example program used to issue a turn-OFF request with a TO instruction to all lit LEDs.
(computer link module I/O signals: 80H to 9FH)



POINTS

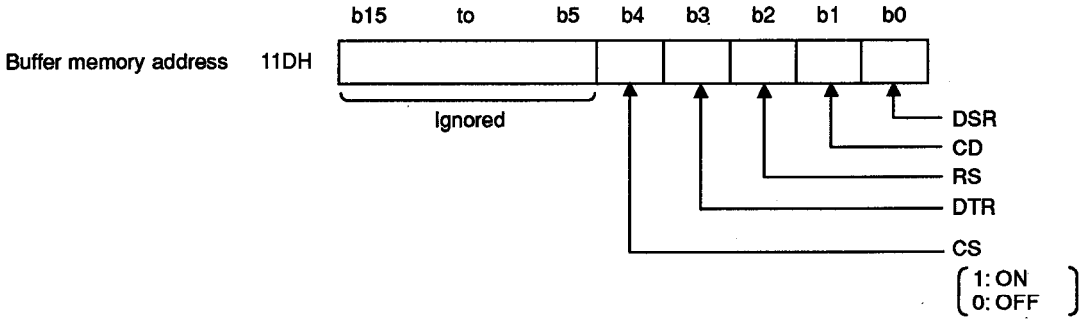
(1) The LED turn-OFF request is only valid when it is written.
(2) Relevant data in the error LED display status storage area at address 101H is cleared when the LED turn-OFF request is made.
Data at address 102H remains as written.
(3) If the error data has not been cleared after the LED turn-OFF request is made, the corresponding bit in the error LED display status storage area turns the error LED ON again

8.2 Reading the RS-232C Signal Status

This section explains the reading of the RS-232C control signal status stored in buffer memory.

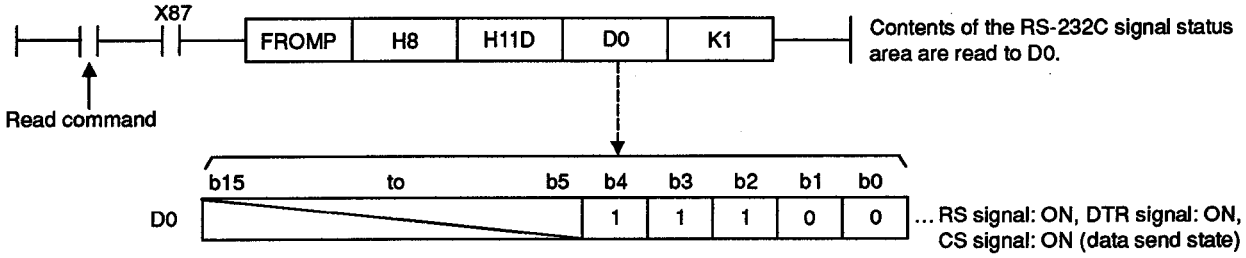
(1) RS-232C signal status storage area (address: 11DH)

The RS-232C signal status is stored to buffer address 11DH as shown below.



(2) Program example to read the RS-232C signal status storage area

The following gives an example program used to read the RS-232C signal status by using a FROM instruction.
(Computer link module I/O signals: 80H to 9FH)



REMARKS

(1) Refer to Section 3.7.1 for the RS-232C signals.
(2) The signals (RS, DTR) output from the computer link module are controlled by the OS of the computer link module.
They cannot be controlled directly by the sequence program.

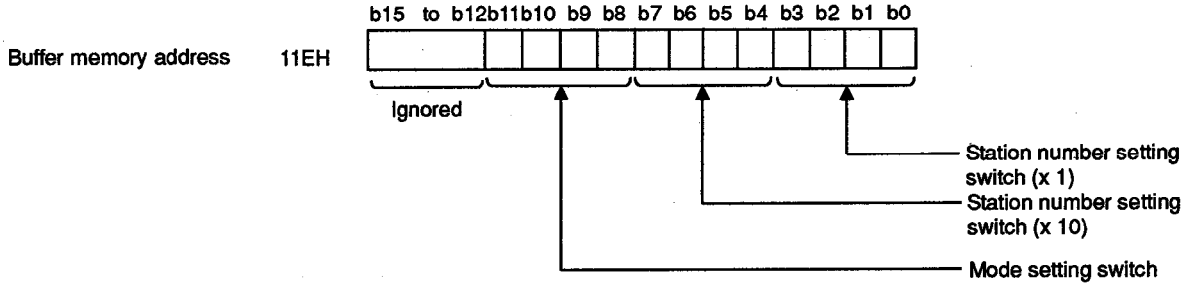
8.3 Reading Switch Settings and Operation Mode

This section describes how to read the switch settings and the operation mode from the buffer memory.

8.3.1 Reading the settings of the mode setting switch and station number setting switches

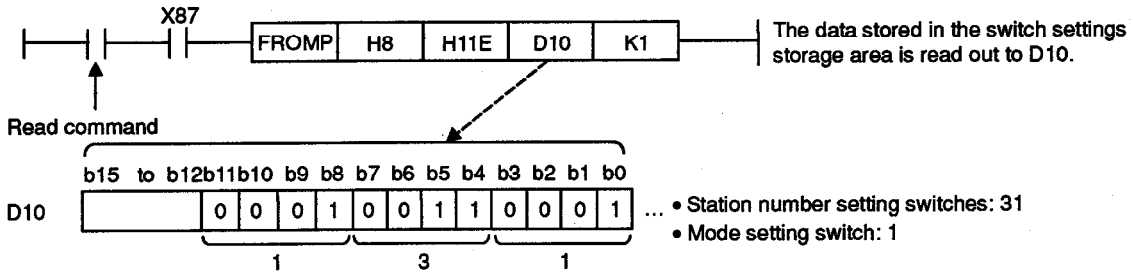
(1) Switch settings storage area (address: 11EH)

The settings of the mode setting switch and station number setting switches are stored at buffer memory address 11EH, as shown below. Ignore the setting(s) of the switch(es) which the computer link module does not have.



(2) Programming example for reading the switch settings storage area

The following gives an example program used to read the switch settings from the switch settings storage area with a FROM instruction:
(Computer link module I/O signals: 80H to 9FH)



REMARK

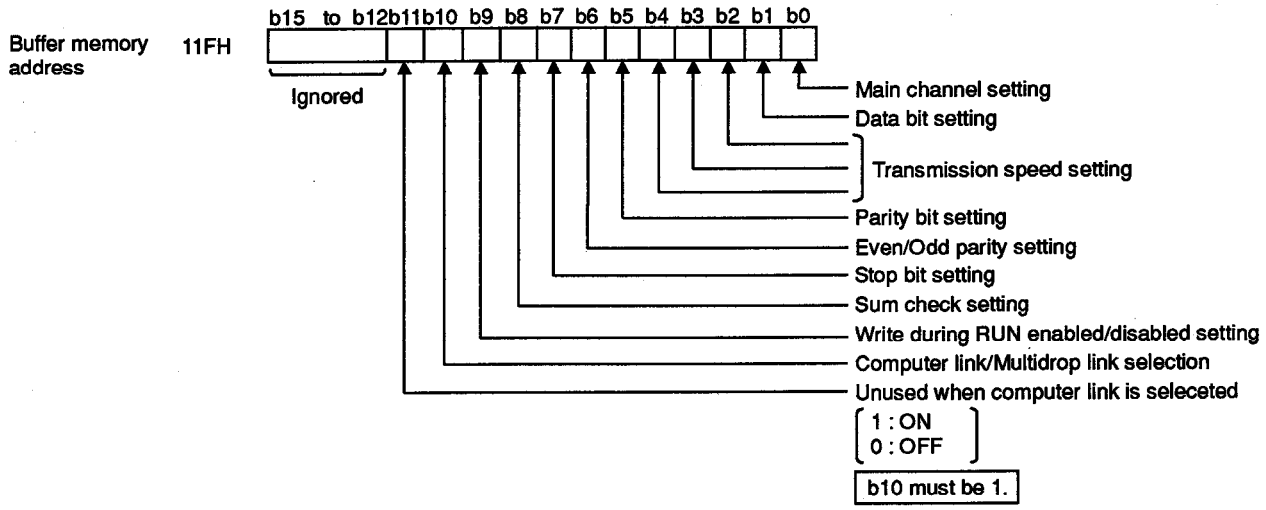
When the ongoing operation mode does not correspond to the setting of the mode setting switch after mode switching described in Section 12, their settings can be verified at the following addresses:

- Ongoing operation mode number ..... (Address 118H, refer to Section 8.3.3.)
- Set number of mode setting switch .... (Address 11EH, refer to Section 4.2.1 for details of the numbers.)

8.3.3 Reading the settings of the transmission specification setting switches

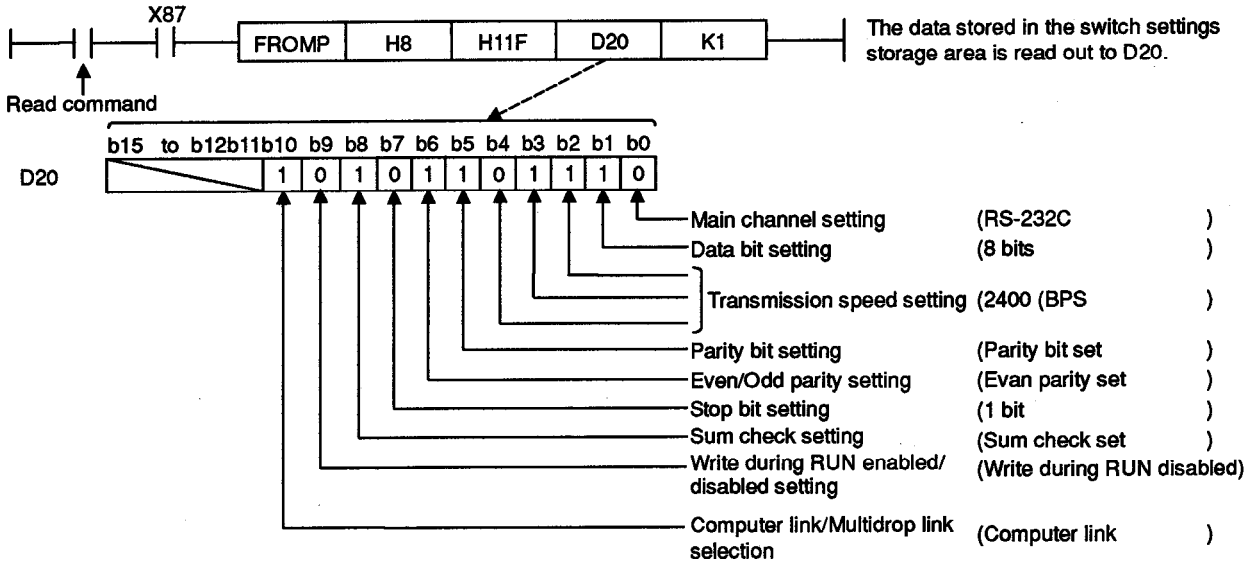
(1) Switch settings storage area (address: 11FH)

The settings of the transmission specification setting switches are stored at buffer memory address 11FH, as shown below. Ignore the setting(s) of the switch(es) which the computer link module does not have.



(2) Programming example for reading the switch settings storage area

The following gives an example program used to read the switch settings from the switch settings storage area with a FROM instruction:
(Computer link module I/O signals: 80H to 9FH)



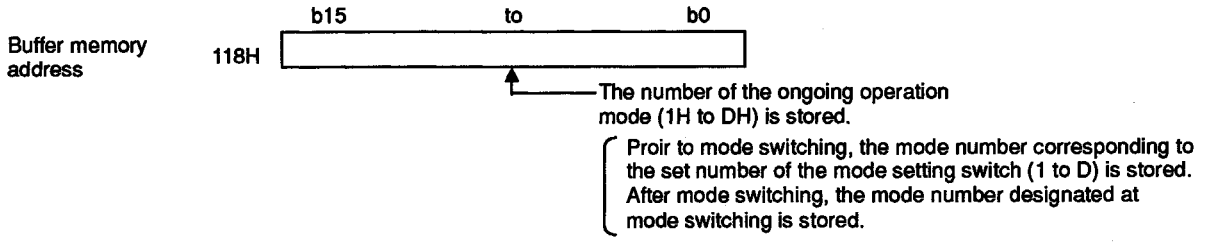
REMARK

The data of each bit in the switch settings storage area depends on the setting of the corresponding transmission specification setting switch (refer to Section 4.2.2) on the computer link module.

8.3.3 Reading the ongoing operation mode

(1) Operation mode storage area (address: 118H)

The operation mode is stored at buffer memory address 118H, as shown below:



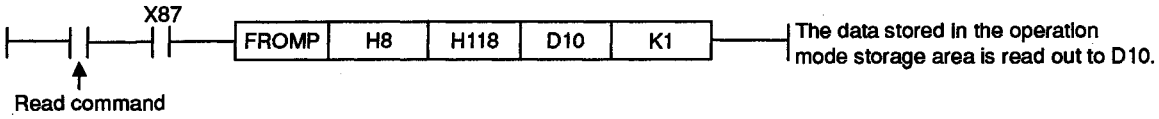
POINT

The mode number (1H to DH) stored in the operation mode storage area corresponds to the set number of the mode setting switch (1 to D) described in Section 4.2.1.
The mode numbers and their operation modes (modes at each interface) are as follows:

Mode No./Mode Setting Switch No.	Mode at Each Interface	
	RS-232C	RS-422
0	(Unusable)	
1	Protocol 1	No-protocol mode
2	Protocol 2	No-protocol mode
3	Protocol 3	No-protocol mode
4	Protocol 4	No-protocol mode
5	No-protocol mode	Protocol 1
6	No-protocol mode	Protocol 2
7	No-protocol mode	Protocol 3
8	No-protocol mode	Protocol 4
9	No-protocol mode	No-protocol mode
A	Protocol 1 ◄►	Protocol 1
B	Protocol 2 ◄►	Protocol 2
C	Protocol 3 ◄►	Protocol 3
D	Protocol 4 ◄►	Protocol 4
E	(Unusable)	
F	(For module test)	

(2) Programming example for reading the operation mode storage area

The following gives an example program used to read the ongoing operation mode from the operation mode storage area with a FROM instruction:
(Computer link module I/O signals: 80H to 9FH)



REMARK

When the ongoing operation mode does not correspond to the setting of the mode setting switch after mode switching described in Section 12, their settings can be verified at the following addresses:

- Ongoing operation mode number ..... (Address 118H)
- Set number of mode setting switch ..... (Address 11EH, refer to Section 4.2.1 for details of the numbers.)

9. WHEN COMMUNICATING DATA AFTER CHANGING TO DC1 TO DC4 CONTROL METHOD

This section describes the function used to turn ON and OFF the DTR/DSR signal (at the RS-232C interface only) between the computer link module and the external device, or to control data communications with a DC signal (DC1 to DC4).
The DTR/DSR control is available every time the computer link module is turned ON, however, the user can switch the transmission control method according to the external device specifications.

POINT

The computer link module controls all transmission from the PC CPU in the user-designated transmission control method.

It is not necessary to control it using the sequence program.

9.1 Precautions when Controlling Transmission

This section gives the precautions to take when using the computer link module transmission control function.

(1) Determing which items are required to control data communications between the external device and the PC CPU

(a) Is the transmission control function used? If so, which type of control is used?

(b) How is transmission controlled?

(c) If DC code control is used, which combination of codes is utilized?

(DC1 to DC4 codes can be switched.)

(2) Conditions for using the transmission control function

(a) Transmission cannot be controlled using both DTR/DSR signals and DC codes at the same time.
Select one type of control using the computer link module buffer's transmission control designation area (address 11AH).

(b) In DC control, the same transmission control is performed at both RS-232C interface and RS-422 interface of the computer link module.

(c) In DTR/DSR control, connect the DTR signal and DSR signal pins of the computer link module to the external device. (Refer to Section 4.6.)

(3) Interfaces and modes available for transmission control

The following table shows the transmission control methods, and the interfaces and computer link module modes available for transmission control:

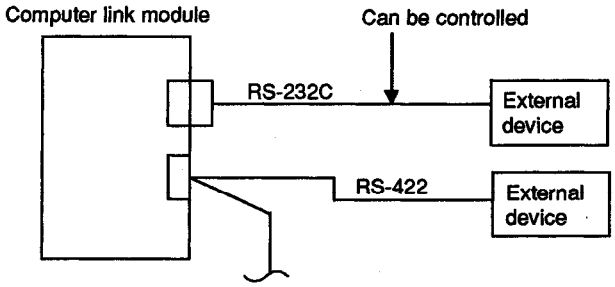
Transmission Control Function	Type of Control	Interface Used	Modes Where Transmission Controls are Valid			Remarks	
			No-Protocol	Bidirectional	Dedicated Protocol		
DTR/DSR controls *1	DTR control	RS-232C	O	—	—	The RS-422 is ignored.	DTR/DSR control or DC code control can be used.
	DSR control		O	O	O		
DC code control *1	DC1/DC3 transmission control	RS-232C RS-422	O	—	—	Controlled via both the RS-232C and RS-422.	
	DC1/DC3 receive control		O	O	O		
	DC2/DC4 transmission control		O	O	O		
	DC2/DC4 receive control		O	O	O		

O : Enabled (Transmission is controlled)
— : Disabled

*1 For full-duplex transmission through a computer link in the bidirectional mode, refer to POINTS in Section 7.2.4.

(4) DTR/DSR control

Since there are no DTR/DSR signals in the RS-422 interface, when DTR/DSR control is designated, data cannot be communicated via the RS-422.



(5) DC code control

(a) DC1/DC3 transmission codes and DC1/DC3 receive codes can be controlled when executing full-duplex data communications between the computer link module and its communicating device.
Data communications cannot be controlled using DC1/DC3 codes when executing half-duplex data communications.

(b) Avoid using DC1 to DC4 codes in the user's data.
If those codes must be used, take one of the following measures:

- Use DTR/DSR controls.
- Switch DC codes (refer to Section 9.3.2).
- Do not use the transmission control function (refer to Section 9.3.1).

POINT

When using a DC1/DC3 code to control data receive or DC2/DC4 code to control data receive, the computer link module will execute the corresponding DC code control if the user's data (received from the external device) contains a DC code.
However, if the user's data (whose request to send was transmitted by a PC CPU) contains a DC code, that data will be transmitted.

(6) Handling DTR/DSR signals when DTR/DSR controls are not used

When DTR/DSR controls are not used, the computer link module handles DTR/DSR signals as follows:

(a) DTR signal is normally ON.

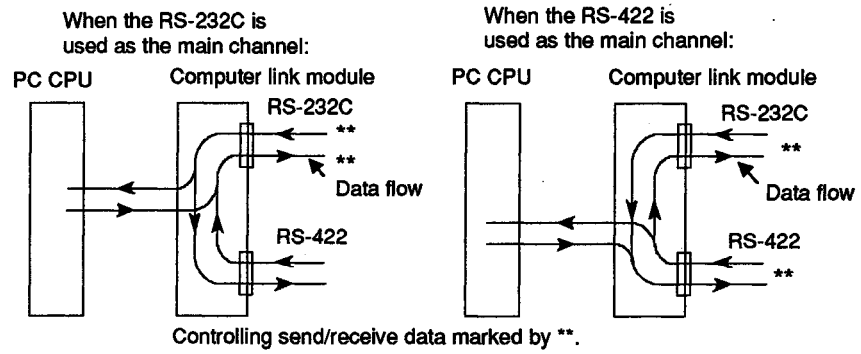
(b) The DSR signal ON/OFF state is ignored.

(7) Transmission control when the computer link module mode number is 9 to D

When the computer link module RS-232C and RS-422 are set to the same mode, the computer link module controls data communications as shown below:

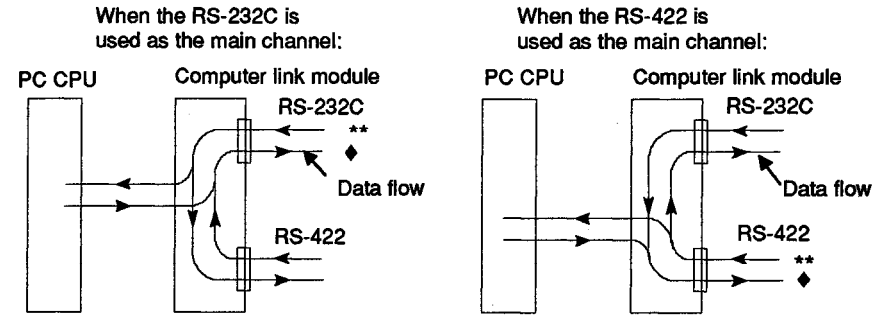
(mode number 9: no-protocol mode, modes A to D: dedicated protocol (formats 1 to 4))

(a) When DTR/DSR controls are executed



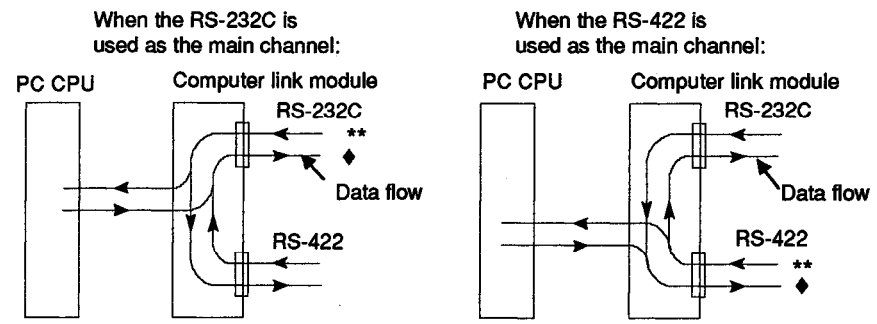
Controlling send/receive data marked by **.

(b) When DC1/DC3 transmission control is executed



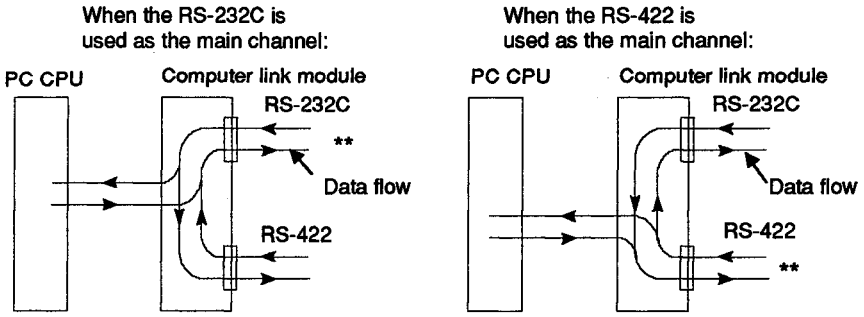
The ♦ mark indicates controlling receive data marked by**.

(c) When DC1/DC3 receive control is executed



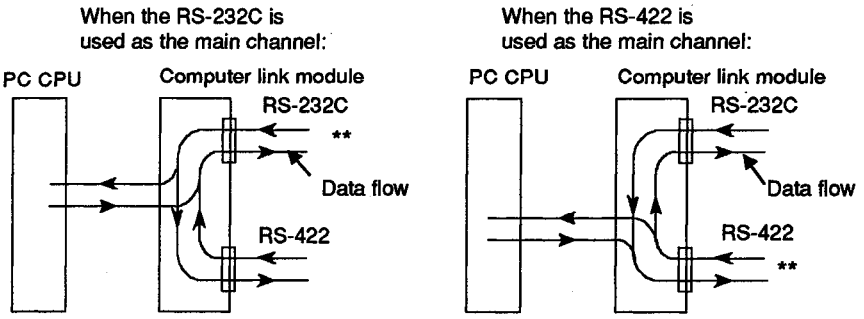
The ♦ mark indicates controlling receive data marked by**.

(d) When DC2/DC4 transmission control is executed



DC2/DC4 indicates controlling send/receive data marked by **.

(e) When DC2/DC4 receive control is executed



DC2/DC4 indicates controlling send/receive data marked by **.

9.2 Transmission Control

This section describes the details of DTR/DSR control and DC code control of the computer link module.

9.2.1 DTR/DSR (ER/DR) control

This section describes DTR/DSR (ER/DR) control.

(1) What is DTR/DSR control?

DTR/DSR control enables and disables data communications with an external device via the computer link module RS-232C by means of the DSR (DR) and DTR (ER) signals.
DTR/DSR control is not available for the RS-422.

(2) Description of computer link module DTR control

This control function, using a DTR signal, informs the external device of whether the computer link module receives data normally.
Data transmitted from the external device in the no-protocol mode will be stored through the OS area into the no-protocol receive buffer memory area. (Refer to Section 6.2.1 (2) *1.)
Under the following conditions, the computer link module temporarily stores received data to its OS area. When transfer to the no-protocol receive buffer memory is enabled (read request signal Xn1 is OFF), data is transferred until the receive completed code is received, or until the fixed length of data has been transmitted.

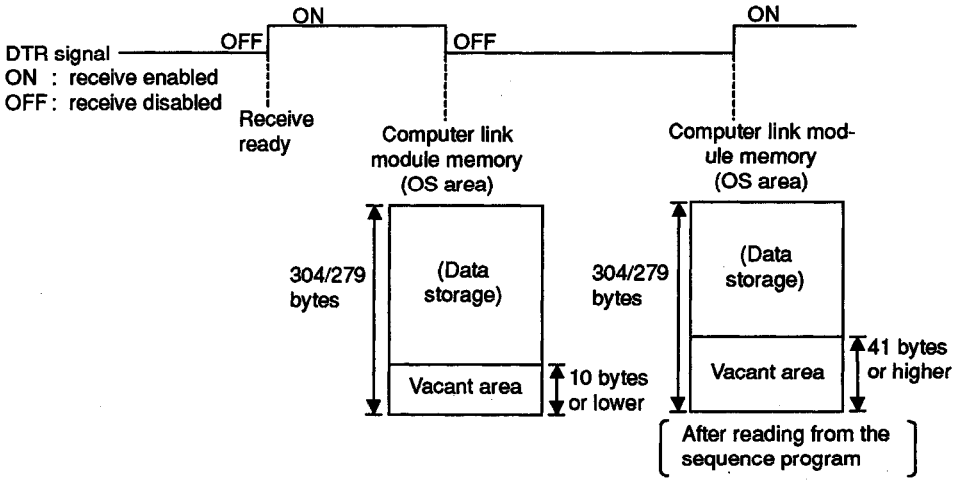
Conditions:

(a) When there is too much data for the buffer memory because the received data length exceeds the no-protocol receive buffer memory area.

(b) When the next data received before the PC CPU reads the data received previously.

According to the free capacity of the OS area, the computer link module turns the DTR signal ON and OFF as follows:

- Less than 10 bytes vacant area: OFF
- More than 41 bytes vacant area: ON



REMARKS

- When received data is cleared as described in Section 6.2.1(4), all data in the OS area is cleared at the same time as data in the no-protocol receive buffer memory area.
- When the above-mentioned OS area has no vacant area, receiving data causes an error, and the data is ignored until the OS area has enough vacant area.
  When this happens, the 2-SIO, 4-SIO LED goes ON (refer to Section 4.3).

(3) Computer link module DSR control

This control function, using a DSR signal, allows the computer link module to check whether the external device receives data normally, thereby controlling data transmission to the external device by turning ON or OFF the signal, as described below:

(a) When the computer link module DSR signal is ON, if there is send data that data will be sent to an external device.

(b) When the computer link module DSR signal is OFF, even if send data exists that data will not be sent to an external device.

9.2.2 DC1/DC3 transmission control

This section describes DC1/DC3 transmission control.

(1) What is DC1/DC3 transmission control?

When data communications is executed in the no-protocol mode, this notifies the external devices whether the computer link module can or cannot receive data using the DC1/DC3 code.

(2) Description of computer link module DC1/DC3 transmission control

The principles behind it are the same as those of DTR control in Section 9.2.1 (2).

The computer link module sends DC1 or DC3 to the external device without turning the DTR signal ON/OFF.

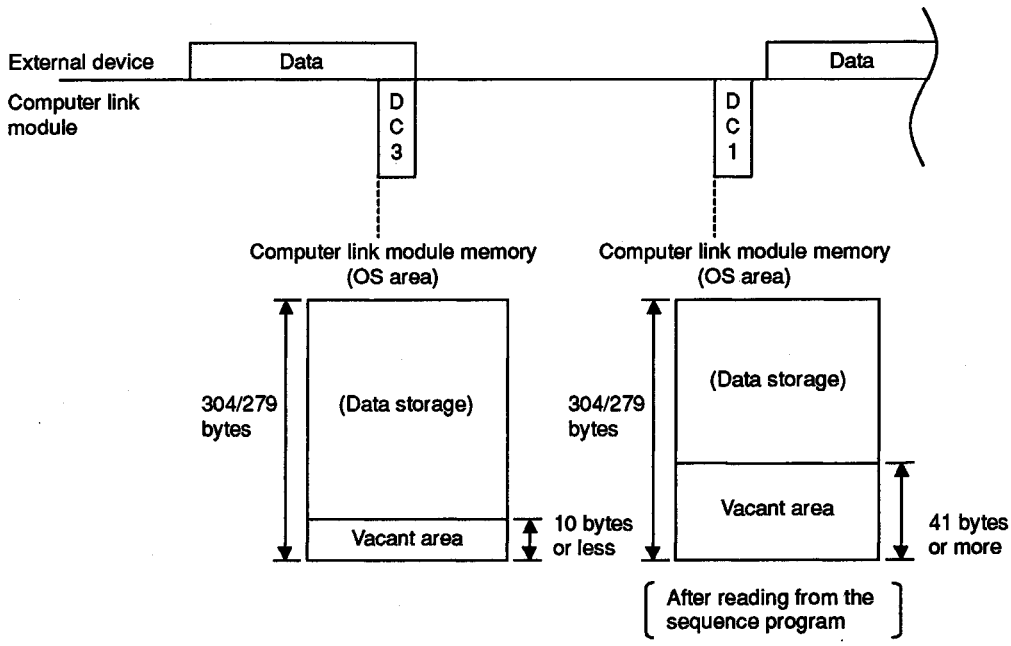
Section 9.2.1 gives details about DC1/DC3 transmission timing.

DTR signal state corresponds to the data transmission as shown below:

(DTR control) (DC1/DC3 transmission control)

DTR signal is OFF : DC3 transmission
Transmitted when the free capacity of the OS area is 10 bytes or less.

DTR signal is ON : DC1 transmission
Transmitted when the free capacity of the OS area is 41 bytes or over.



POINTS

(1) When power to the PC CPU is turned ON, the PC CPU is reset, or the mode is switched, DC1 code is not sent to the external device.
This is the same state as when DC1 has already been sent.

(2) DC1/DC3 codes to be sent can be changed.
Section 9.3 tells how to change codes.

REMARKS

- When received data is cleared according to Section 6.2.1 (4), the data stored in the OS area as well as in the no-protocol receive buffer memory area will also be cleared.
- When data is transmitted to the above-mentioned OS area with no free capacity, an SIO error will occur, and all the data transmitted will be ignored until an enough free capacity is reserved. In such a case, the 2-SIO and 4-SIO LEDs will come ON. (Refer to Section 4.3.)

9.2.3 DC1/DC3 receive control

This section describes DC1/DC3 receive control.

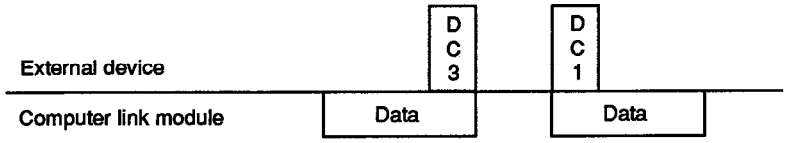
(1) What is DC1/DC3 receive control?

This control function allows the computer link module to check when a DC1 or DC3 code is received whether the external device receives data normally, thereby controlling data transmission to the external device.

(2) Description of computer link module DC1/DC3 receive control

(a) Receiving DC3 code from an external device suspends computer link module data send.
The received DC3 code cannot be read by the sequence program.

(b) Receiving DC1 code from an external device resumes computer link module data send.
(The computer link module restarts transmitting data from where transmission was suspended by receiving DC3.)
The received DC1 code cannot be read by the sequence program.



(c) After DC1 code is received, if another DC1 code is received, that code will be ignoted and will be removed from the received data.

POINT

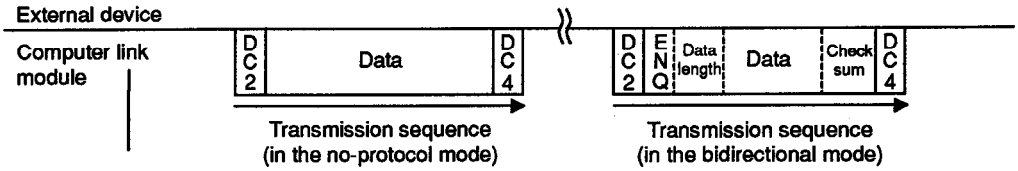
When power to the PC CPU is turned ON, the PC CPU is reset, or the mode is switched, even if a DC1 code is not transmitted, the state will be the same as when DC1 code has already been sent.

9.2.4 DC2/DC4 transmission control

This section describes DC2/DC4 transmission control.

(1) What is DC2/DC4 transmission control?

When data is sent from the computer link module to an external device, the computer link module adds DC2 and DC4 codes at the beginning and end of data respectively.



9.2.5 DC2/DC4 receive control

This section describes DC2/DC4 receive control.

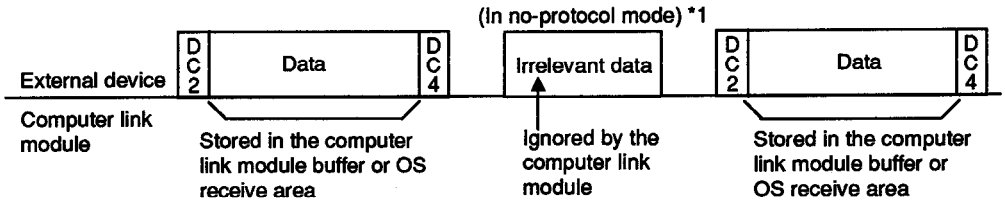
(1) What is DC2/DC4 receive control?

By using DC2 and DC4 codes, this function determines the data range when the computer link module receives data from an external device.

(2) Description of computer link module DC2/DC4 receive control

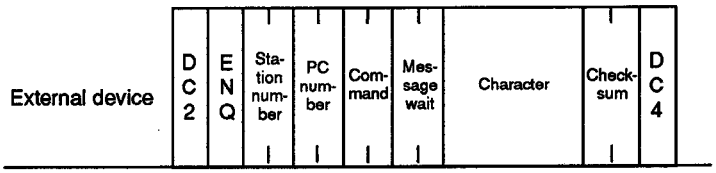
(a) When the computer link module receives DC2 code from an external device, the computer link module handles data in the range between DC2 and DC4 as valid data.
The received DC2 code cannot be read by the sequence program.

(b) When DC4 code is received from the external device, the computer link module will ignore subsequent received data until another DC2 code is received.
The received DC4 code cannot be read by the sequence program.



(c) After DC2 code is received, if another DC2 code is received, that code will be ignored, and will be removed from the received data.

*1 Message in dedicated protocol format 1



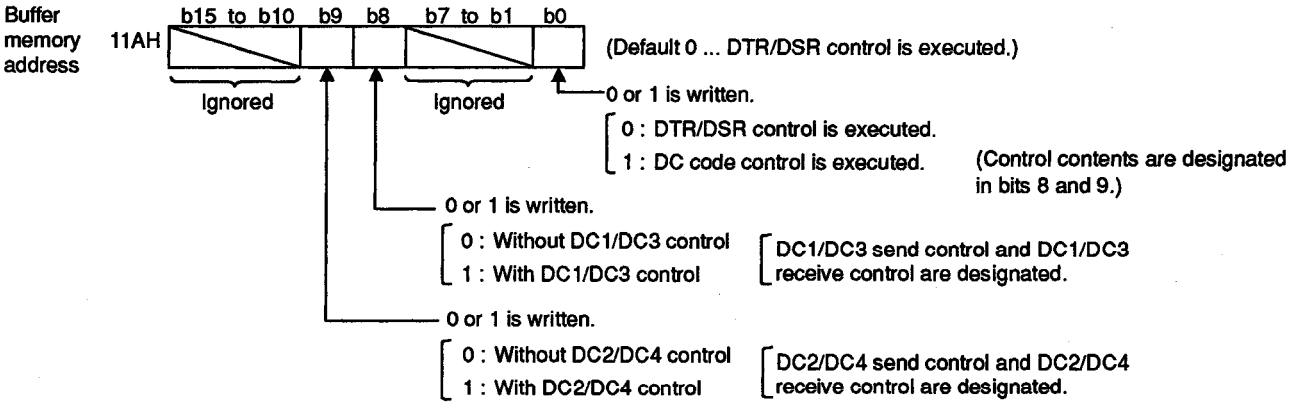
9.3 Writing Data to Buffer Memory Specific Use Area

To switch the transmission control method from DTR/DSR control to DC code control for data communications or to change DC codes (control codes), the corresponding value must be written to the appropriate buffer memory specific use areas.
This section describes how to write values to such buffer memory specific use areas for changing the transmission control method and DC codes.

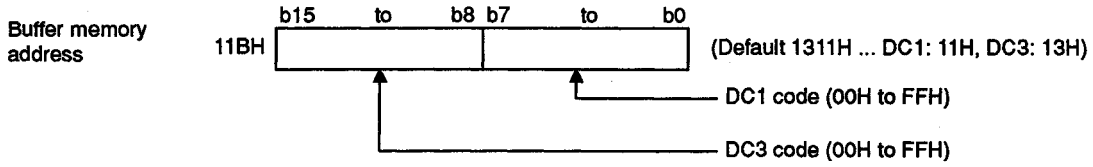
Every time the computer link module is turned ON, DTR/DSR control is available at the RS-232C interface only, and 11H to 14H can be used as the DC1 to DC4 codes for DC code control.
By writing proper data to the transmission control specification area at buffer memory address 11AH or to the control code specification areas at addresses 11BH and 11CH when data communications is not carried out with the computer link module ON, the transmission control method for the RS-232C and RS-422 interfaces or the DC codes to be used can be changed.

(1) Transmission control specification area and control code specification areas (addresses: 11AH to 11CH)

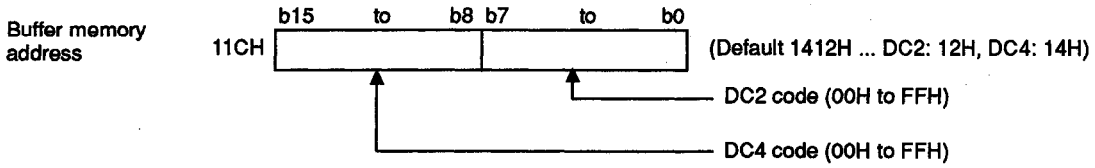
(a) Transmission control specification area



(b) DC1/DC3 control code specification area



(c) DC2/DC4 control code specification area



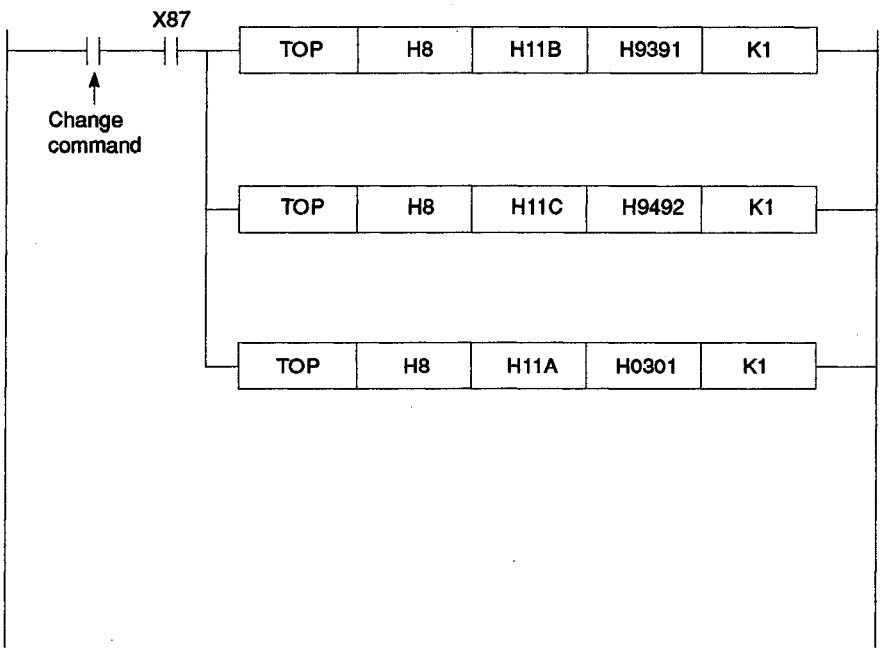
POINT

When changing the default values of DC codes, designate DC1/DC3 control and DC2/DC4 control to buffer address 11AH after changing the values in buffer addresses 11BH to 11CH.

(2) Programming examples for changing the transmission control method and the control codes

The following gives example programs used to change the transmission control method and the DC1 to DC4 codes with a TO instruction:
(Computer link module I/O signals 80H to 9FH)

(a) When DC code control is executed



When changing the DC1 and DC3 codes to 91H and 93H (*1) Write 91H for the DC1 code and 93H for the DC3 code to buffer memory address 11BH.

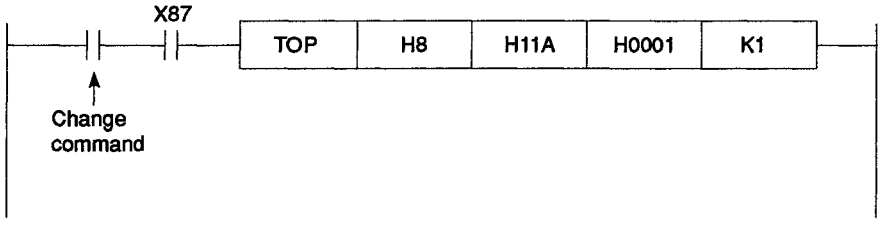
When changing the DC2 and DC4 codes to 92H and 94H (*2) Write 92H for the DC2 code and 94H for the DC4 code to buffer memory address 11CH.

Write DC code control set to buffer memory address 11AH (when DC1/DC3 or DC2/DC4 control is set).
Write one of the following values (*3):

- When DC1/DC3 control is set but DC2/DC4 control is not → 0101H
- When DC1/DC3 control is not set but DC2/DC4 control is set → 0201H
- When both DC1/DC3 control and DC2/DC4 control are set → 0301H

*1 When the DC1 and DC3 codes are not changed, writing to buffer memory address 11BH is not necessary.
*2 When the DC2 and DC4 codes are not changed, writing to buffer memory address 11CH is not necessary.
*3 Write one of the values listed above according to the control method to be used.

(b) When the transmission control function is not used



Write 0001H to buffer memory address 11AH.

- Bit 0 ... DC code control will be executed.
- Bit 8 ... DC1/DC3 control will not be executed.
- Bit 9 ... DC2/DC4 control will not be executed.

POINT

Values designated to use or disuse the transmission control function

The following table shows what value should be written to the buffer memory transmission control specification area (address 11AH) to use or disuse the transmission control function of the computer link module.

A value must be designated and written when the power to the PC CPU is ON or the PC CPU is reset, or when data is not transmitted or received at computer link module mode switching.

Mode No.		1 to 4		5 to 8		9		A to D		Refer to Section 4.2.1.
Interface		232C	422	232C	422	232C	422	232C	422	232C: RS-232C 422: RS-422
Mode		Dedicated protocol	No-protocol/ Bidirectional	No-protocol/ Bidirectional	Dedicated protocol	No-protocol		Dedicated protocol		
Value designated for transmission control	DTR/DSR control	0000H (default value)								Only 232C will be controlled.
	DC code control	0101H, 0201H or 0301H								Both 232C and 422 will be controlled in the same method.
	When transmission control function is not to be used	0001H								Transmission control will not be executed.

10. WHEN COMMUNICATING DATA AFTER CHANGING TO HALF-DUPLEX TRANSMISSIONS

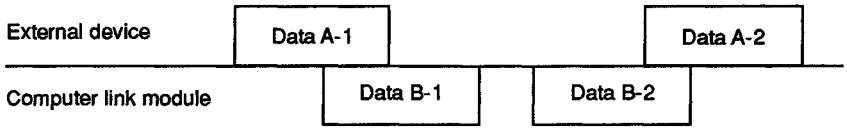
This section describes the half-duplex transmission function which prevents the computer link module and the external device from transmitting data simultaneously during data communications between them through the RS-232C interface.
Full-duplex transmission is available every time the computer link module is turned ON, however, the user can change the communications mode according to the external device specifications.

POINTS

(1) The computer link module controls communications at the PC CPU in either of the following user-designated communications modes. It is not necessary to control it using the sequence program.

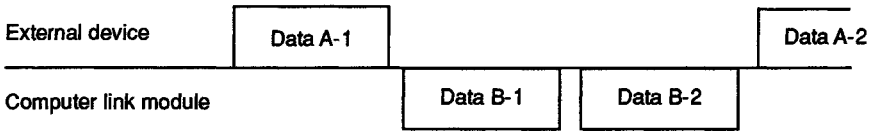
(a) Full-duplex transmission

This communications mode provides data communications with the communicating device just like a conversation over the phone.
The computer link module can receive data while transmitting data to the external device.
It can also transmit data while receiving data from the external device.



(b) Half-duplex transmission

This communications mode provides data communications with the communicating device just like a conversation on a transceiver.
When it receives data from the external device while transmitting data to the device, the computer link module controls the transmission and receipt of data according to the "setting of priority/non-priority at simultaneous transmission".
The computer link module does not transmit data while receiving data from the external device.

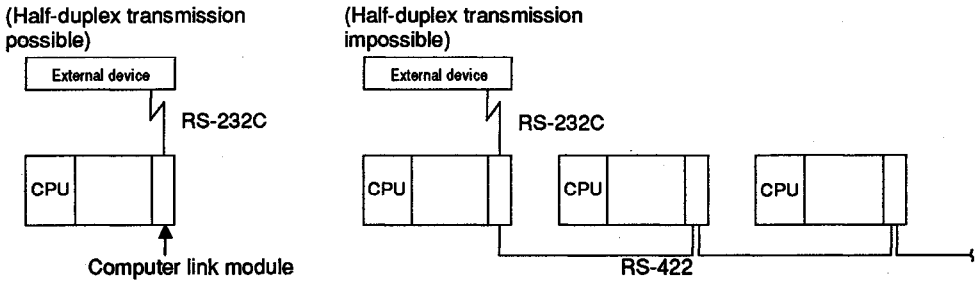


(2) On a computer link module equipped with RS-232C and RS-422/485 interfaces, the data will be controlled by full-duplex transmission even if half-duplex transmission has been selected for the former.

10.1 Precautions for Half-Duplex Transmission

Described below are precautions for half-duplex transmission between the external device and the computer link module through the RS-232C interface.

(1) System configuration and functions enabling half-duplex transmission
Half-duplex transmission can be expected only from a system composed of a PC CPU and an external device.



Functions / System Configurations (External device : PC CPU)	Dedicated Protocol		No-Protocol Mode/ Bidirectional Mode
	Data Communications by a Command Transmitted from the External Device	Data Send from the PC CPU by the On-Demand Function	Data Send and Data Receive
1 : 1	O	O *1	O *2
1 : n	X *3	X	X

O : Usable
X : Unusable

*1 During data communication, the send timing of data that a sequence program requested to send changes due to the on-damand function. Refer to Section 5.14.2. The send timing also changes as mentioned in *2 below.

*2 Send timing of data sent from the computer link module and the external device changes according to the set timing of "priority/non-priority at the simultaneous transmission" set with the computer link module. Refer to Section 10.3.

*3 The computer link module executes data communications by half-duplex transmission. It is not necessary to make settings necessary for half-duplex transmission shown in this section.

(2) Items to be determined and/or verified between the external device and the PC CPU

The following items should be determined and/or verified between the external device and the PC CPU:

(a) Whether half-duplex transmission can be executed with the RS and CD signals at the computer link module.

(b) ON/OFF timing of the RS and CD signals at the computer link module.

(c) Data transmission timing from the computer link module and from the external device.

(d) RS-232C cable connection.

(3) Transmission control

Do not designate DC1/DC3 transmission control or DC1/DC3 receive control for half-duplex transmission using the transmission control function described in Section 9, because neither is executable during that communications.

10.2 Connector Cable Connections for Half-Duplex Transmission

This section describes connector cable connections between the computer link module and the external device for half-duplex transmission through the RS-232C interface.

For half-duplex transmission, connect the connector cables between the computer link module and the external device according to (1) and (2) below and Section 4.6.2 (2) (a) "When connecting an external device which can turn ON and OFF the CD signal to the computer link module".

(1) Connect the RS signal pin in the computer link module connector to a half-duplex transmission signal pin (CS, DSR or CD) in the external device connector.

(2) Connect the CD signal pin in the computer link module connector to a half-duplex transmission signal pin (RS or DTR) in the external device connector.

(Connection examples)

- When the computer link module connector is a 25-pin type

Computer Link Module		Cable Connections and Signal Directions	External Device
Pin Number	Signal		Signal
FG	1		FG
SD (TXD)	2		SD (TXD)
RD (RXD)	3		RD (RXD)
RS	4		RS
CS (CTS)	5		CS (CTS)
DSR (DR)	6		DSR (DR)
SG	7		SG
CD	8		CD
DTR (ER)	20		DTR (ER)

- When the computer link module connector is a 9-pin type

Computer Link Module		Cable Connections and Signal Directions	External Device
Signal	Pin Number		Signal
CD	1		CD
RD (RXD)	2		RD (RXD)
SD (TXD)	3		SD (TXD)
DTR (ER)	4		DTR (ER)
SG	5		SG
DSR (DR)	6		DSR (DR)
RS (RTS)	7		RS (RTS)
CS (CTS)	8		CS (CTS)

POINT

The ON/OFF timing of the RS and CD signals at the computer link module for half-duplex transmission is described in Section 10.3.

10.3 ON/OFF Timing of the CD and RS Signals of the Computer Link Module

When doing half-duplex communications, the data transmission timing is shown by using the CD and RS signals of the computer link module.

In half-duplex communications, an external device controls the CD signal of the computer link module.

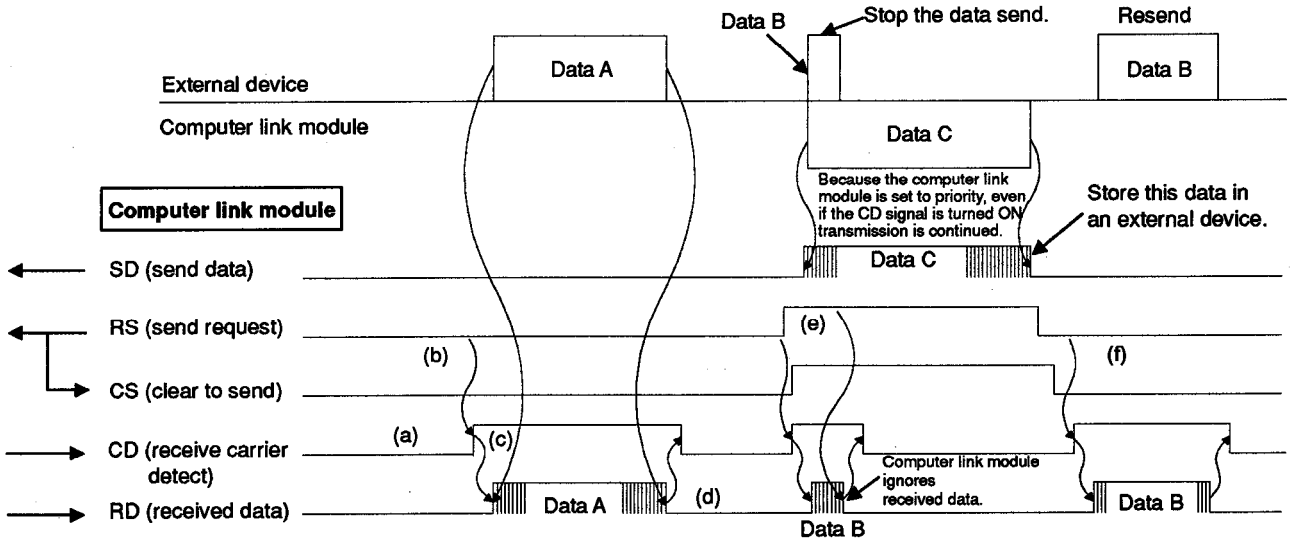
The computer link module system controls the RS signal of the computer link module.

10.3.1 Data transmission timing from an external device

When doing half-duplex communications, the data transmission timing from the external device is shown by using the CD and RS signals of the computer link module.

Setting the buffer memory of the computer link module to "priority/non-priority at simultaneous transmission" controls the CD signal of the computer link module.

(1) Computer link module is set to "priority".



The following steps describe the operations required for an external device at every timing mentioned by (a) to (f) in the above figure.
The signal names are of the signals of the computer link module.

(a) When not transmitting data from the external device to the computer link module, turn the CD signal OFF.

(b) When doing a data send, check the RS signal. If the RS signal is OFF, turn the CD signal ON.
If the RS signal is ON, wait until it turns OFF. After the RS is turned OFF, turn the CD signal ON.

(c) After turning the CD signal ON, transmit data.

(d) After completing the data send, turn OFF the CD signal.

(e) If the RS signal turns ON during the data send, stop the data send. Then, turn the CD signal OFF, and perform data receive processing. (When the computer link module and an external device start data transmission simultaneously, the RS signal turns ON.)

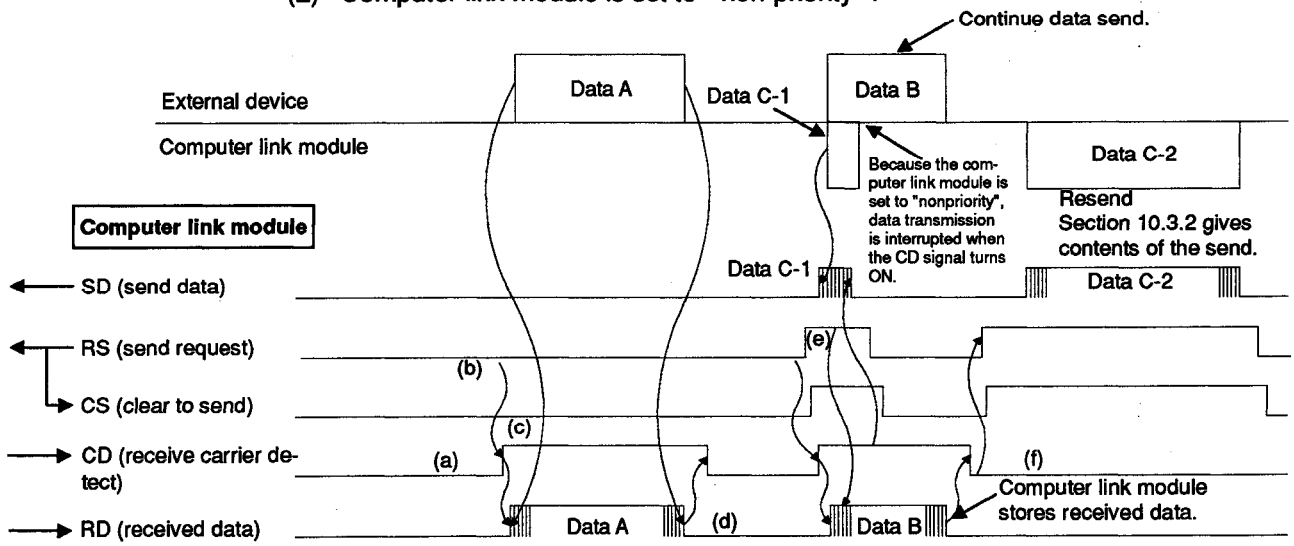
(f) Resend all interrupted data from the external device to the computer link module after the data send from the computer link module is completed.

REMARK

When DTR/DSR control is selected from among the transmission control functions shown in Section 9, control data transmission from the external device to the computer link module, as described below:

- If the DTR signal is turned OFF at the computer link module, suspend data transmission.
- As soon as the DTR signal is turned ON at the computer link module after data transmission was suspended, restart transmitting data (from where transmission was suspended).

(2) Computer link module is set to " non-priority ".



The following steps describe the operations required for an external device at every timing mentioned by (a) to (f) in the above figure.

The signal name is the signal of the computer link module.
As described in (1), turn ON/OFF the CD signal of the computer link module with the external device and do data transmission to the computer link module. (Note that (e) and (f) are different in the non-priority setting.)

(a) When not transmitting data from the external device to the computer link module, turn the CD signal OFF.

(b) When doing a data send, check the RS signal. If the RS signal is OFF, turn the CD signal ON.
If the RS signal is ON, wait until it turns OFF. After the RS is turned OFF, turn the CD signal ON.

(c) After turning the CD signal ON, transmit data.

(d) After completing the data send, turn OFF the CD signal.

(e) Even if the RS signal turns ON during data transmission, continue the data send to the computer link module.
(This occurs when the computer link module and the external device start data transmission simultaneously.)

(f) After the send from the external device is completed, transmit data from the computer link module to the external device.
Section 10.3.2 gives details.

REMARK

When DTR/DSR control is selected from among the transmission control functions shown in Section 9, control data transmission from the external device to the computer link module, as described below:

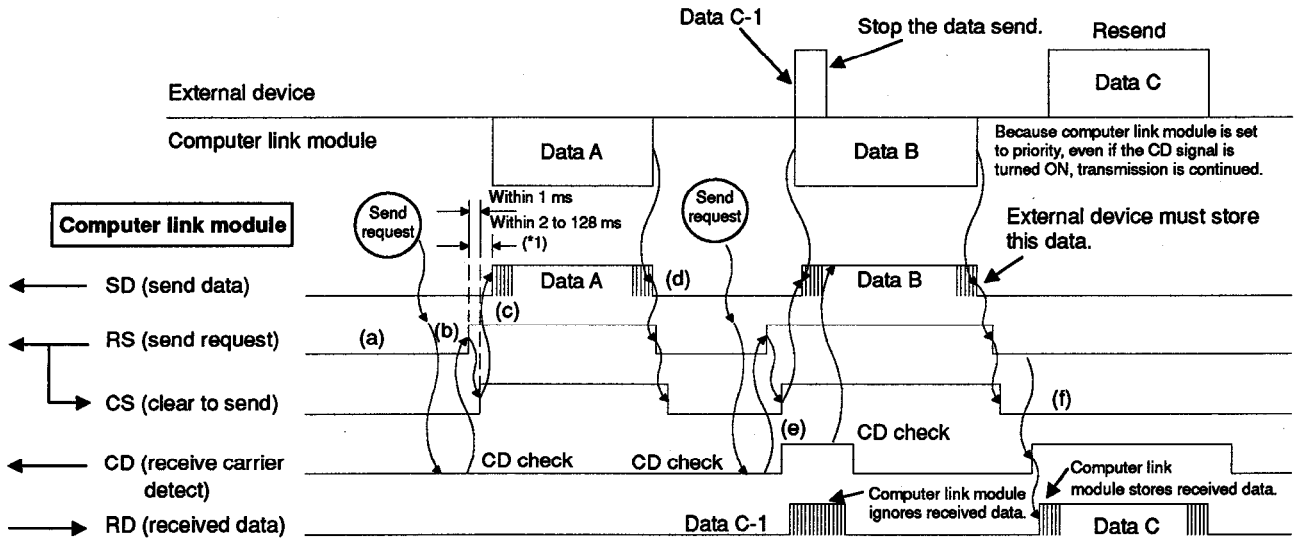
- If the DTR signal is turned OFF at the computer link module, suspend data transmission.
- As soon as the DTR signal is turned ON at the computer link module after data transmission was suspended, restart transmitting data (from where transmission was suspended).

10.3.2 Data transmission timing from a computer link module

When doing half-duplex communications, data transmission timing from an computer link module is shown by using the CD signal and RS signal of the computer link module.

Control the CD signal of the computer link module by setting the buffer memory of the computer link module to "priority/non-priority at simultaneous transmission" for data transmission.

(1) Computer link module is set to "priority".



The following steps describe the operation at every timing mentioned by (a) to (f) in the above figure.

The signal names are of the signals of the computer link module.

As described in (1), turn ON/OFF the RS signal of the computer link module with the external device and transmit data to the computer link module.

(a) When not transmitting data from the external device to the computer link module, turn the RS signal OFF.

(b) When doing a data send, check the CD signal. If the CD signal is OFF, turn the CD signal ON.
When the CD signal is ON, wait until it turns OFF. After the CD is turned OFF, turn the RS signal ON.

(c) After turning the RS signal ON, transmit data.

(d) After completing the data send, turn OFF the RS signal.

(e) If the CD signal turns ON during the data send, continue transmitting data send to the computer link module. (This occurs when the computer link module and the external device start data transmission simultaneously.)

(f) Transmit all interrupted data from the external device to the computer link module after data send from the computer link module is completed.

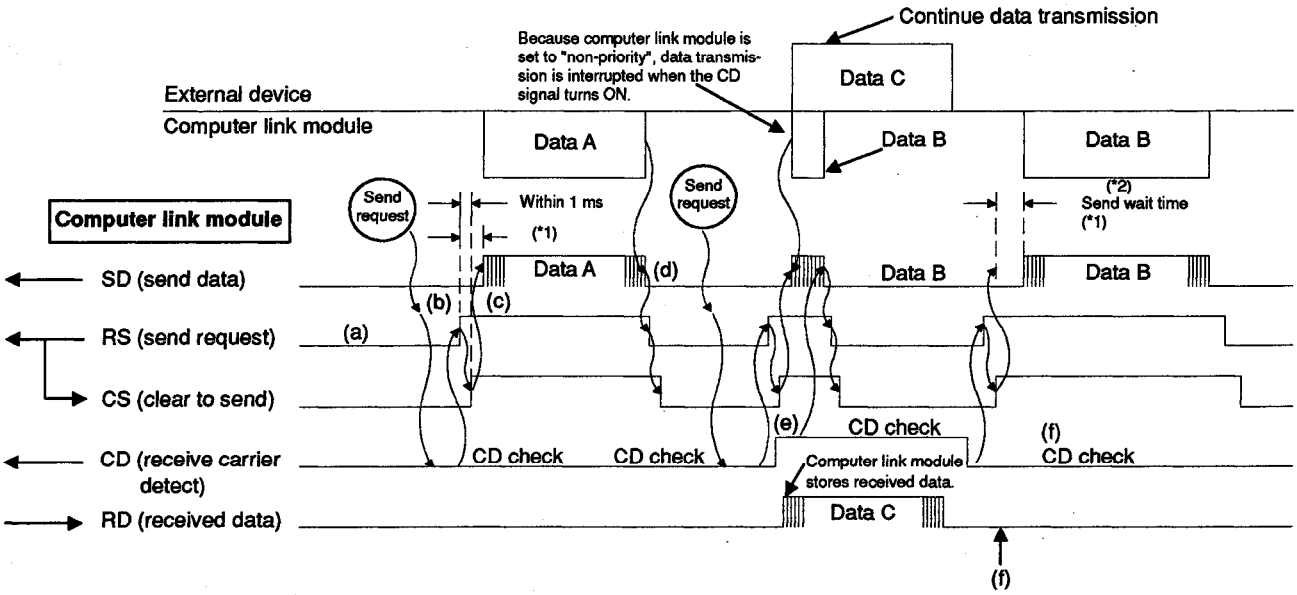
*1 The time from when the RS signal turns ON until communications start varies with the data transmission speed.
The faster the transmission speed is, the sooner communications will start.

REMARK

When DTR/DSR control is selected from among the transmission control functions shown in Section 9, control data transmission from the computer link module to the external device, as described below:

- If the DSR signal is turned OFF at the computer link module, suspend data transmission.
- As soon as the DSR signal is turned ON at the computer link module after data transmission was suspended, restart transmitting data (from where transmission was suspended).

(2) Computer link module is set to "non-priority".



The following steps describe the operations performed by computer link module at every thing. The signal names are of the signals of the computer link module.

As described in (1), turn ON/OFF the RS signal of the computer link module and do data transmission to the external device.

Note that e) is different.

(a) When not transmitting data from the external device to the computer link module, turn the RS signal OFF.

(b) When doing a data send, check the CD signal. If the CD signal is OFF, turn the RS signal ON.
If the CD signal is ON, wait until it turns OFF. After the CD is turned OFF, turn ON the RS signal.

(c) After turning the RS signal ON, transmit data.

(d) After completing the data send, turn OFF the RS signal.

(e) If the CD signal turns ON during data send, stop the data send. Then, turn the RS signal OFF and perform data receive processing. (This occurs when the computer link module and an external device start data trans-mission simultaneously.)

(f) After transmission from the external device is completed, resend all data from the beginning, or transmit data remaining after the send interruption in 5).

*1 Data set at buffer address 110H is not transmitted.

*2 Resend all data from the beginning, or transmit data remaining after the send interruption according to the setting of buffer address 111H.

REMARK

When DTR/DSR control is selected from among the transmission control functions shown in Section 9, control data transmission from the computer link module to the external device, as described below:

- If the DSR signal is turned OFF at the computer link module, suspend data transmission.
- As soon as the DSR signal is turned ON at the computer link module after data transmission was suspended, restart transmitting data (from where transmission was suspended).

10.4 Writing Data to Buffer Memory Specific Use Areas

To switch the communications mode from full-duplex transmission to half-duplex transmission for data communications, the corresponding value must be written to the appropriate buffer memory specific use area.
This section describes how to write a value to such a buffer memory specific use area to switch the communications mode.

Every time the computer link module is turned ON, full-duplex transmission is available at the RS-232C interface.
By writing proper data to buffer memory addresses 10FH (RS-232C communications mode setting area) to 111H (send method setting area when transmission is resumed) when data communications are not executed with the computer link module on, the RS-232C interface communications mode can be switched.

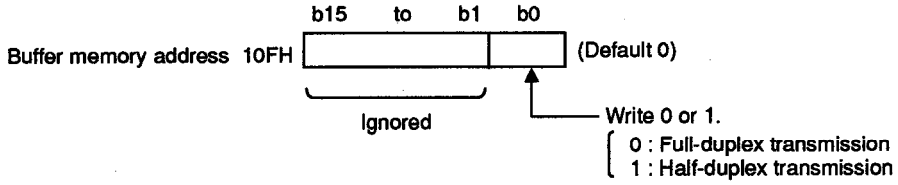
REMARK

Full-duplex transmission does not require writing data to buffer memory addresses 10FH, 110H and 111H.

(1) Buffer memory specific use area for half-duplex transmission

(a) RS-232C communications mode setting area (address: 10FH)

Set "1" for half-duplex transmission.

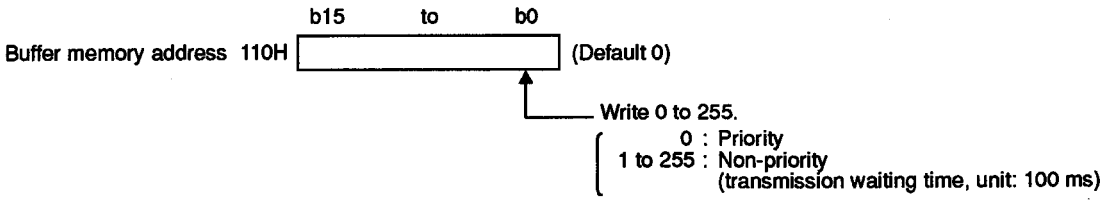


POINT

15 bits b1 to b15 of address 10FH to either 0 or 1.
(The computer link module will ignore the settings.)

(b) Simultaneous send priority/non-priority setting area (address: 110H)

This area is used to determine whether data transmission from the computer link module should be continued ("priority") or suspended ("non-priority") when the external device and the module simultaneously start transmitting data in half-duplex transmission.
Designate "0" for "priority".
To select "non-priority", designate a number between "1" and "255".
The designated value represents the transmission waiting time (unit: 100 ms) from the point when data transmission can be restarted to the point when data is actually transmitted.



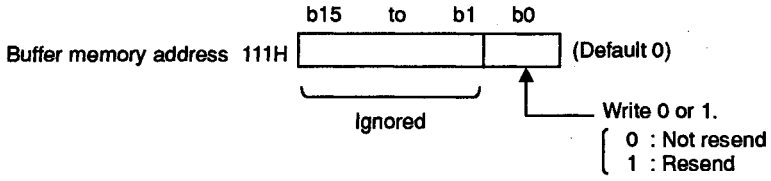
POINTS

(1) When "priority" is selected for the computer link module, it ignores data transmitted from the external device after it started transmitting data, and continues data transmission.
To stop the computer link module from ignoring data received from the external device, set them to do the following between them:
- Transmission and receipt of a response message to data transmitted
- Response message time-out check and data retransmission in case of time-out error

(2) Selecting priority (0) between priority and non-priority at simultaneous transmission is not required to be written to buffer memory address 111H.

(c) Send method setting area when transmission is resumed (address: 111H)

The setting in this area becomes valid only when "half-duplex transmission" and "non-priority" are set in the areas described in (1) and (2) above. This area is used to determine whether the computer link module, which suspends data transmission after starting transmission simultaneously with the external device, should restart transmitting the suspended data from the beginning ("retransmission") or from where it was suspended ("no retransmission").
Set "1" for "retransmission".
To select "no retransmission", set "0".



POINT

15 bits b1 to b15 of address 10FH to either 0 or 1.
(The computer link module will ignore the settings.)

(d) RS-232C CD terminal check setting area (address: 10BH)

In half-duplex transmission, the computer link module CD signal must be controlled by the external device.
Do not change the default value of this area (0: check CD terminal).
Refer to the following sections for the description of the check in each mode:

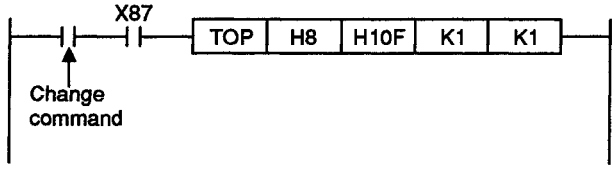
- Dedicated protocol..... Section 5.2.1 (2) (b)
- No-protocol mode..... Section 6.2.4 (2) (f)
- Bidirectional mode..... Section 7.2.6 (2) (d)

(2) Programming examples for switching the transmission mode

The following gives example programs used to switch the transmission mode with a TO instruction:

(Computer link module I/O signals: 80H to 9FH)

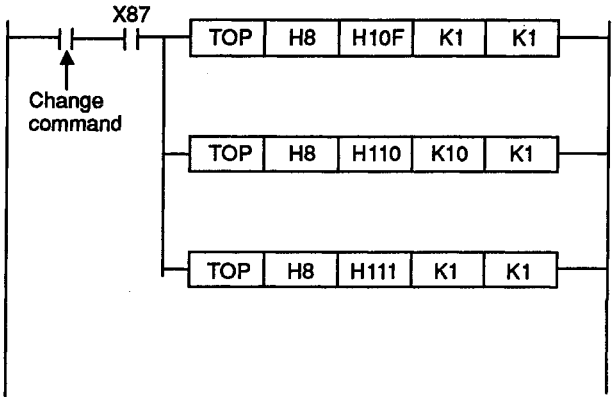
(a) When selecting priority for transmission from the computer link module in half-duplex transmission



Designate half-duplex transmission.
Write "1" to buffer memory address 10FH.

Do not change the default values at buffer memory addresses 10BH, 110H and 111H.

(b) When selecting non-priority for transmission from the computer link module in half-duplex transmission



Designate half-duplex transmission.
Write "1" to buffer memory address 10FH.

Designate non-priority (transmission waiting time: 1000 ms).
Write "10" to buffer memory address 110H.

To select retransmission (*1)
Write "1" to buffer memory address 111H.

Do not change the default value at buffer memory addresses 10BH.

*1 It is not necessary to change the value at address 111H to select no retransmission.

11. WHEN COMMUNICATING DATA WITH M:N RATIO OF COMPUTER TO PC CPU FOR CONNECTION

This section describes how to do data communications using an m : n multidrop link. This section only applies to m : n multilink data communications.

A computer link module can perform data communications with several computers by constructing a multidrop link consisting of several computers (m stations) and several computer link modules (n stations). (The maximum number of m and n stations is 32.)

A computer link can be made with the full-duplex communications method using the RS-232C and RS-422 lines by constructing an m : n multidrop link. In addition, data transmission is initiated by a command from the computer in the dedicated protocol.

11.1 Key Points

(1) When using an m : n multidrop link system, only one computer can perform data communications with a single PC CPU.

Set up the computers so that a computer and a PC CPU can do 1 : 1 communications. Sections 11.2 and 11.3 give the conditions and procedures for computer interlocking.

(2) Data communications between a computer and a PC CPU can only be done in the following way:

- Full-duplex communications must be used. (m : n data communications cannot be done with half-duplex communications.)
- Transmit a command from a computer using the dedicated protocol (except for protocol 3). (Data communications with protocol 3 and data transmission from the sequence program using the on-demand function cannot be done.)

(3) All computers (including the computer that transmitted the data) receive data from either computer. In addition, all computers receive data transmitted from a PC CPU.
Therefore, every computer that receives data addressed to other stations (as specified by the station number in the message) must ignore that data.

The computer link module which is connected to the PC CPU ignores the receive data which is addressed to other stations.

(4) The station number of a computer is expressed as eight-bit data. Use switch SW12 to set the data bit for communications to eight bits (refer to Section 4.2.2).

Section 11.2.1 gives details about data bit setting.

(5) Follow the procedure described in Section 4.6.3 (2) (C) in connecting more than one computer to a PC CPU.
Connect or set a terminal resistor to the RS-232C interface according to Section 4.7 or 4.2.2.

(6) The mode setting switch set at "A", "B", or "D" enabled the computer link module to communicate data only with the computer connected to the interface set as the main channel (refer to Section 4.2.2).

11.2 Conditions for Computer Interlock

When constructing an m : n multidrop link using computers and PC CPUs, all computers must be interlocked to prevent several computers from simultaneously communicating with PC CPUs.

This section explains how to interlock computers to allow data communications between a computer and a PC CPU. The term "interlocking" used in this section means the procedure which provides a computer priority to use a communications line. This priority is called an "access right".

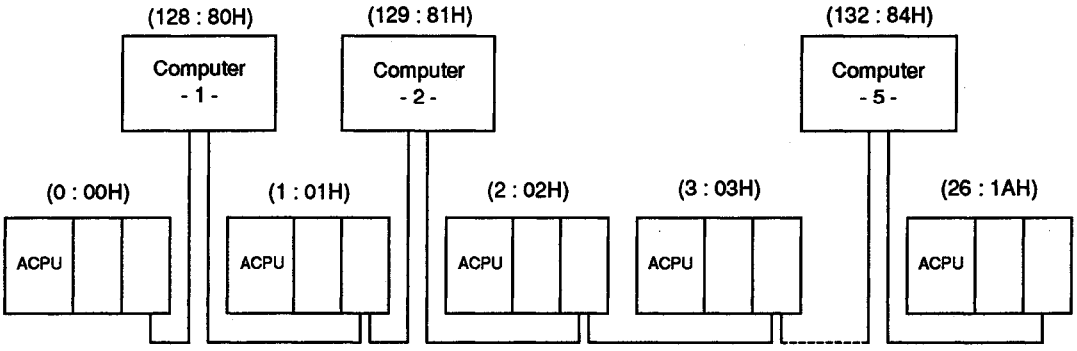
11.2.1 Computer station number allocation

For data communications with a designated computer, allocate a station number within the range of 128 to 159 (80H to 9FH) to each computer.

Set the station number for broadcasting to all computers at 160 (A0H).

Example: m : n = 5 : 27

( ) shows each station number of a computer and an computer link module.
(Decimal : hexadecimal)

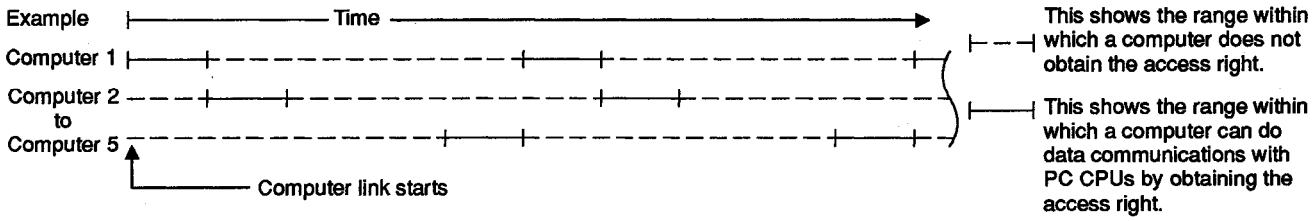


11.2.2 Maximum data communications time per computer

Set the maximum time so that, after obtaining an access right, each computer can perform data communications with PC CPUs.

(In the following figure, each of these ⊢——⊣ means time duration.)

Even if the computer that obtains the access right malfunctions, data communications can be done between other computers and PC CPUs by setting the maximum data communications time.



POINT

Set the maximum data communications time per computer to a time that is sufficient for data communications with PC CPUs in the computer link system. After the computer link system starts, the computer that obtains the access right must complete data communications with PC CPUs within the maximum data communications time.

(When unable to complete data communications, the computer with the access right transmits the CL code to communicating PC CPUs within the maximum data communications time, and initializes a transmission sequence to a computer link module (refer to Section 5.4.6 (1)(c)).)

While a computer and PC CPUs are performing data communications, the time-out check function must be used with other computers to block data transmission from those computers.

11.2.3 Command and message format for data communications among computers

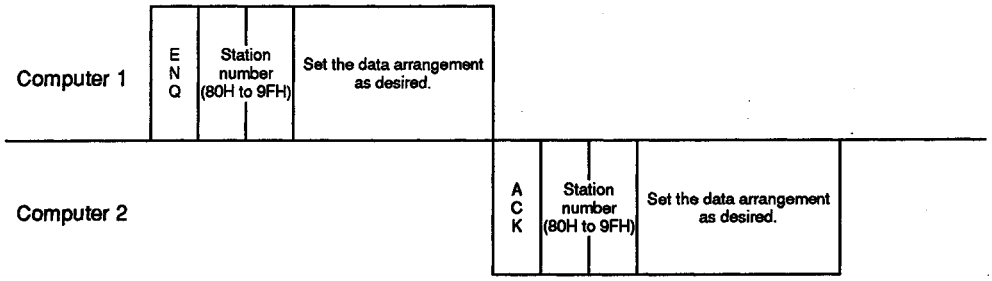
A command and message format for data communications among computers with the dedicated protocol must be set.

Use any command except the commands used with the dedicated protocol of a computer link module. Refer to Section 3.2.1.

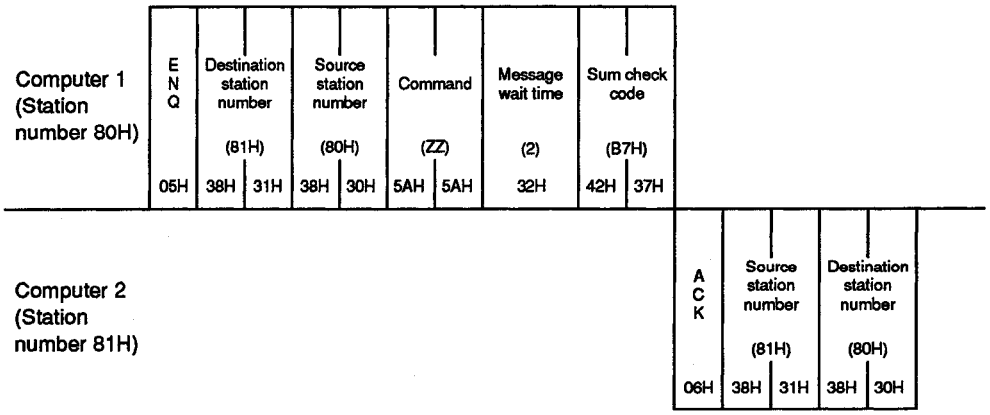
The message format basically follows the control procedure set by the mode setting switch of each computer link module. Refer to Section 5.4.

Set the data arrangement after the PC number in the message as desired.

(1) Protocol 1 when doing data communications



(2) Example of a message format (when station numbers 80H and 81H perform data communications)



REMARKS

(1) When the mode setting switch of a computer link module is set for the dedicated protocol mode (1 to 4) and when the station number written in a message to be transmitted from computer 1 is 00H to 31H (designating computer link module), the designated station (computer link module) determines that message to be a faulty message. Then, it transmits back a message beginning with NAK to computer 1.
Always use station numbers 80H to 9FH for communications between the computers.

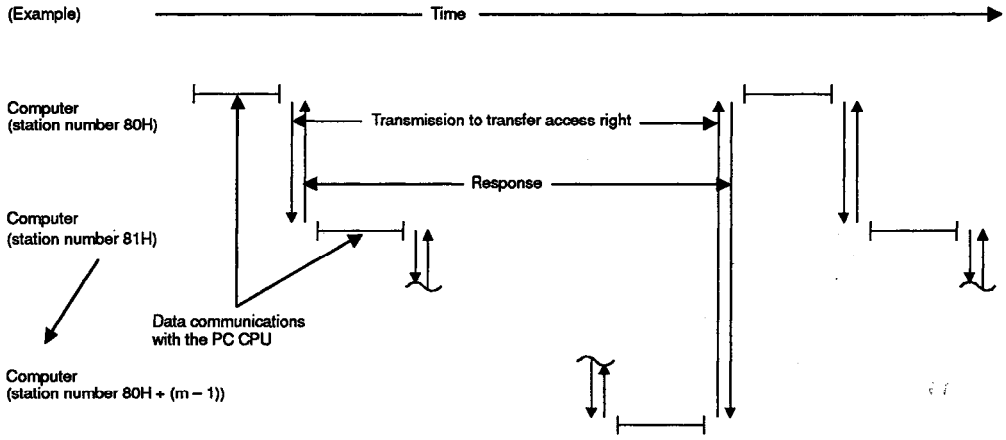
(2) Section 5.4.1 explains how to read the message format figures.

11.3 Procedure for Data Communications with a PC CPU

This section explains the procedure for computer interlocking and data communications with a PC CPU when constructing an m : n multidrop link.

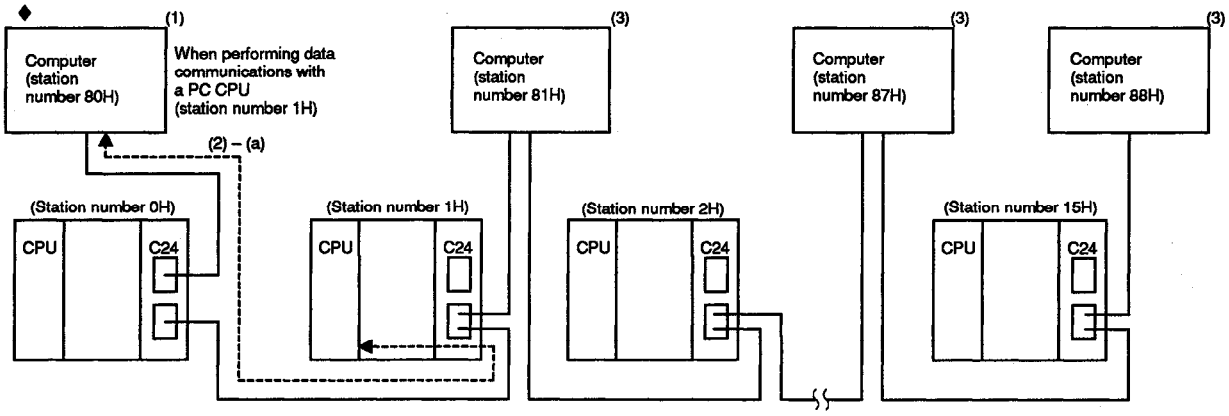
11.3.1 Communications between each computer and PC CPUs

Each computer obtains the access right (one after another according to the order of the station number of each computer) and then does data communications with PC CPUs.



The following example shows the procedure for data communications between each computer and PC CPUs.

♦ : Computer with the access right



(1) When starting a system, the computer allocated with the minimum station number (80H) obtains the access right.

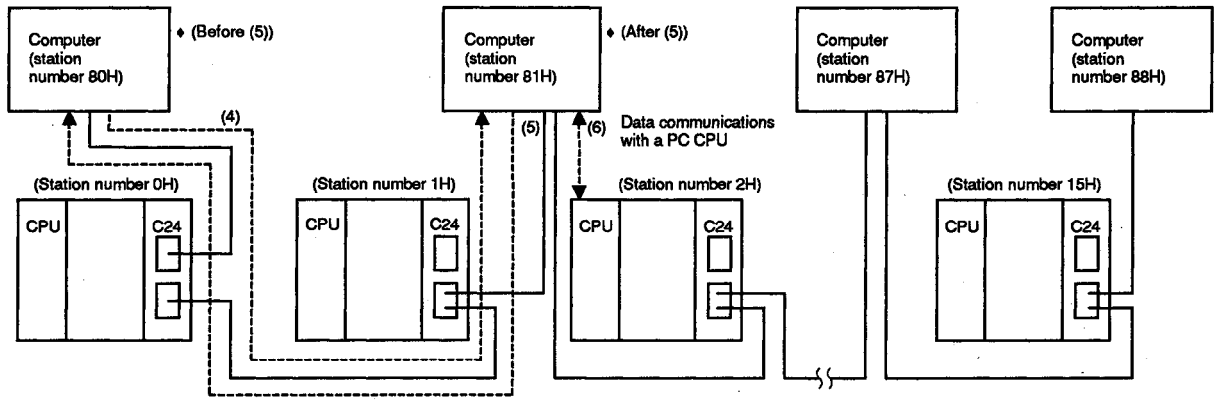
(2) The computer which has the access right:

(a) Performs data communications with PC CPUs within the maximum data communications time set among computers, and then, starts procedure (4).

(b) Starts procedure (4) if it does not perform data communications with PC CPUs.

(3) Each computer without the access right checks the access right time (the maximum data communications time) of the computer with the access right and ignores incoming data which is addressed to others.
When the access right time exceeds the maximum data communications time, each computer executes the processing mentioned in (7).

♦ : Computer with the access right

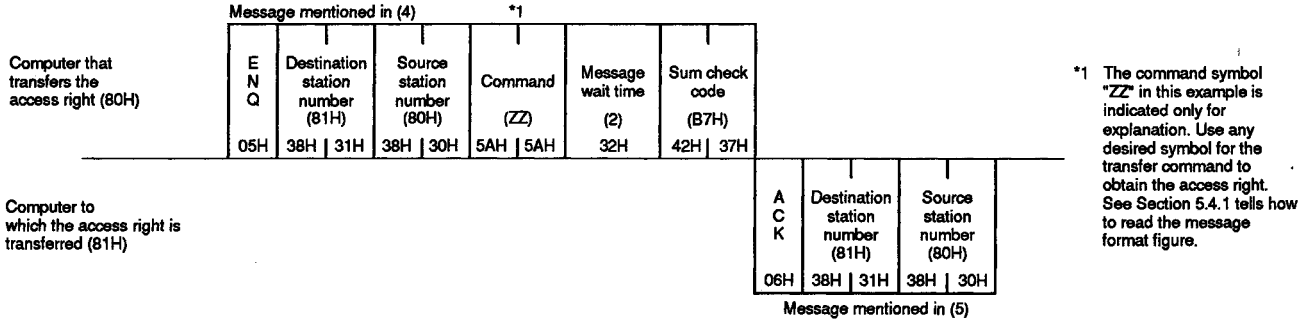


(4) The computer that has finished data communications with PC CPUs and the computers that do not need data communications with PC CPUs transmit the access right transfer data to the computer at the next station number.

When a computer is unable to receive a response message (refer to (5) from the next computer to which the access right is to be transferred, it keeps on transmitting the access right transfer data to the following computers in the order of station numbers until the access right transfer is completed.

(5) The computer to which the access right is given transmits a response message to the computer that gave the access right.

(An example of data communications using dedicated protocol 1)

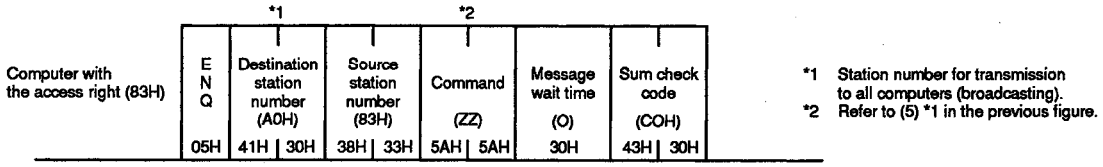


(6) The computer that transmitted a response message and obtained the access right executes the processing mentioned in (2).

(7) When the access right time of a computer with the access right exceeds the maximum data communications time

(a) The computer at the next station number transmits broadcast data to all computers, obtains the access right, and executes the processing mentioned in (2).

(An example of data communications using dedicated protocol 1)



(b) Other computers check if they received the data transmitted to all computers.

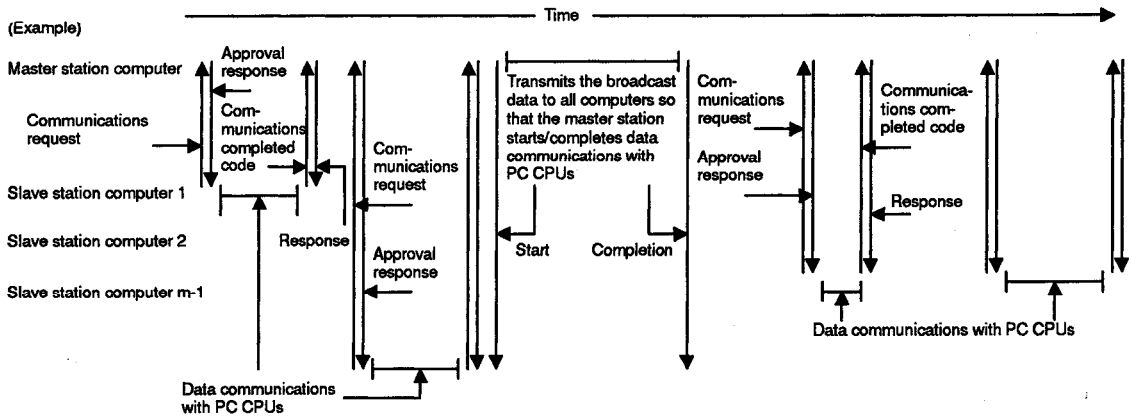
Computers which received the data execute the processing mentioned in (3).

If a computer failed to receive the data, the next computer transmits data to all computers, obtains the access right, and executes the processing mentioned in (2).

Other computers execute the check mentioned above.

11.3.2 Data communications with PC CPUs by setting a master station and slave stations

One of the computers is set as a master station and the other computers are set as slave stations which need the approval of the master station to perform data communications with PC CPUs.

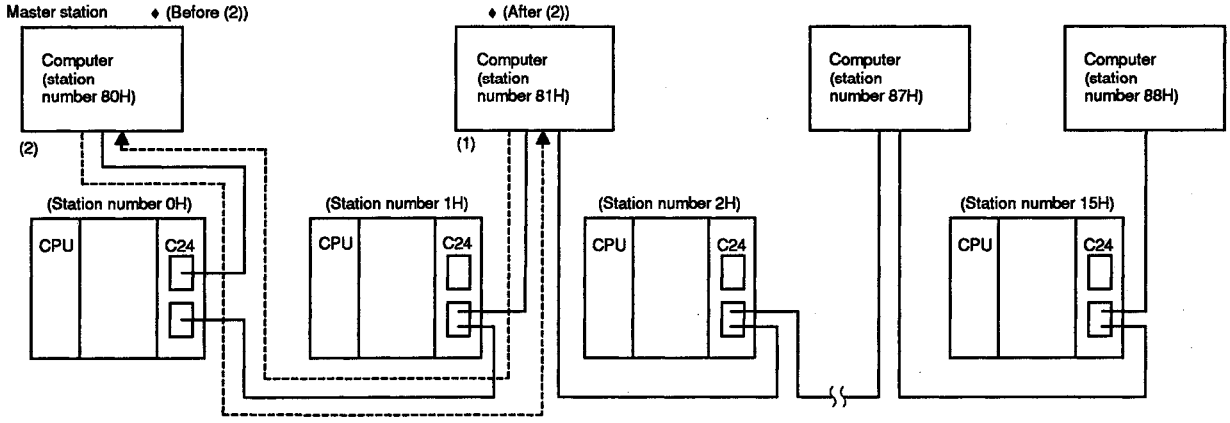


The following example shows how each computer performs data communications with PC CPUs.

After the start of data communications between a computer and PC CPUs, each computer executes the time-out check of the maximum data communications time.
A computer at a slave station that is not performing data communications with a PC CPU checks the communications completed code which is transmitted from the computer when it has completed data communications with PC CPUs.

In the following figure, the computer at the minimum station number 80H is set as the master station and other computers are set as slave stations.

♦ : Computers with the access right

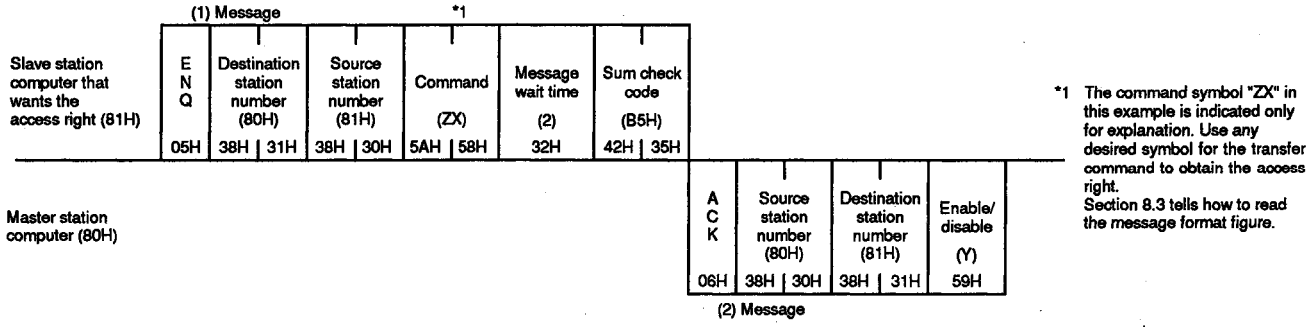


(1) A slave station that requires data communications with a PC CPU transmits a communications request to obtain the access right to the master station.

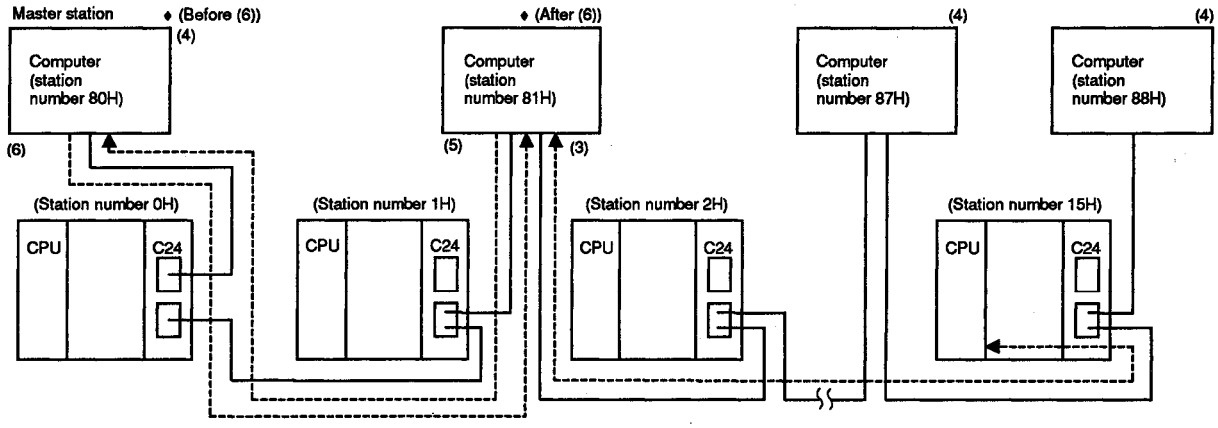
An example of the message format is shown in (2) below.

(2) The master station transmits an approval response to the slave station that made the communications request.

(An example of data communications using dedicated protocol 1)



♦ : Computer with the access right



(3) After performing data communications with a PC CPU within the maximum data communications time set among computers, the slave station that received an approval response executes the processing as shown in (5) below.

(4) The master station that transmitted the approval response and the slave stations that do not have the access right check the access right time of the slave station that obtains the access right, and, ignore received data which is addressed to other stations.

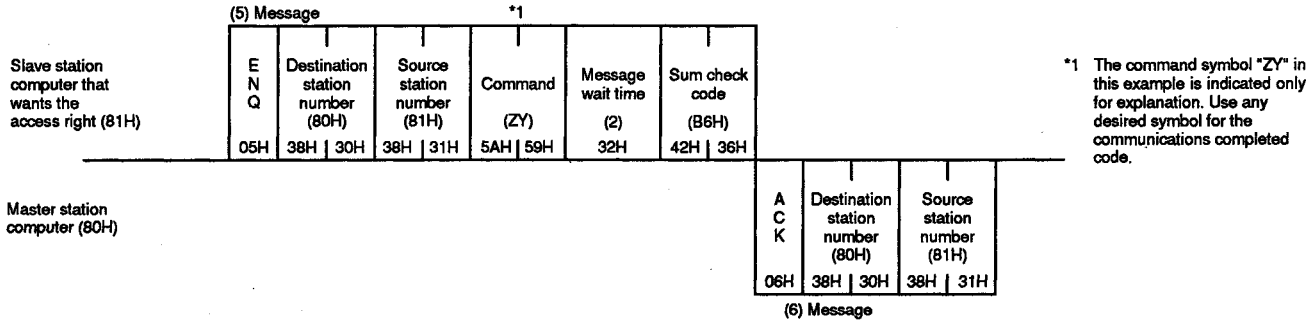
If the access right time of a computer with the access right exceeds the maximum data communications time, each computer executes the processing mentioned in (7).

(5) A slave station that has finished data communications with PC CPUs transmits the communications completed code to the master station. An example of the message format is shown in (6) below.

Slave stations which are not performing data communications with PC CPUs check the transmission of the communications completed code. During this checking, the slave stations must not perform data communications with the master station.

(6) The master station that received the communications completed code transmits a response to the slave station that transmitted the communications completed code.

(An example of data communications using dedicated protocol 1)



(7) After the processing given in (6) is completed or when the access right time of a slave station with the access right exceeds the maximum data communications time:

(a) The master station waits for a communications request from a slave station.

When the master station receives a communications request, the processing mentioned in (2) is executed.

(b) Until data communications with PC CPUs is required, a slave station does not perform data communications with the master station.

When data communications with PC CPUs is required, the processings in and after (1) are executed.

(8) If no slave station obtains the access right, the master station transmits broadcast data to all stations and obtains the access right and performs data communications with PC CPUs.

The master station transmits the broadcast data to all computers after completing data communications with PC CPUs to inform slave stations of the completion of data communications with PC CPUs.

(An example of data communications using dedicated protocol 1)

					*1		
Master station computer with the access right (80H)	ENQ	Destination station number (A0H)	Source station number (80H)	Command	Message wait time	Sum check code	
	05H	41H | 30H	38H | 30H	(ZX) 5AH | 58H	(0) 30H	(BBH) 42H | 42H	

*1 The command symbols "ZX"and "ZY" in this example are indicated only for explanation. Use any desired symbol for communications between the master station and slave stations.

				*1		
The master staiton computer transmits the communications completed code. (80H)	ENQ	Destination station number (A0H)	Source station number (80H)	Command	Message wait time	Sum check code
	05H	41H | 30H	38H | 30H	(ZY) 5AH | 59H	(0) 30H	(BCH) 42H | 43H

12. WHEN CHANGING OVER MODE DURING OPERATION OF COMPUTER LINK

This section describes the function capable of switching the current mode of the computer link module's RS-232C and RS-422 interfaces (dedicated protocol, no-protocol or bidirectional mode) to another from the computer or PC CPU after starting computer linking.
The RS-232C and RS-422 interfaces are controlled in the mode set by the mode setting switch when the computer link module is turned ON, however, the user can change the mode of each interface according to the application of the computer link function.

12.1 Precautions When Mode Switching

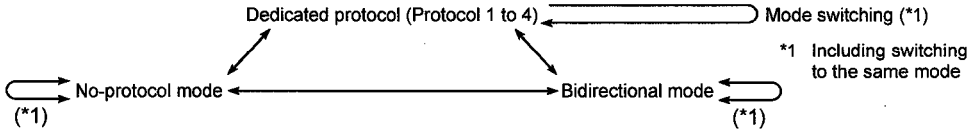
Described below are precautions for data communications by switching the mode of the computer link module after starting computer linking.

(1) Settings between an external device and a PC CPU

Set the following items required to switch the mode between an external device and a PC CPU.

(a) Is the mode switched from an external device or a PC CPU?

(b) At what intervals are modes switched for each mode switching pattern?



(c) How is an interlock provided for all connected devices?

- Method and message used to notify all connected stations of mode switching.
- Method and message used to notify all connected stations that mode switching has been completed.
- Device number and data description when PC CPU word devices are used.

(d) Structure of message for mode switching in the no-protocol or bidirectional mode

(2) Mode switching from an external device

(a) After switching the mode, a computer cannot be used to switch set data in the computer link module buffer's specific use area.

If set data must be changed after switching the mode, write necessary data from the PC CPU (refer to Section 12.4 and 12.5 for the write timing).

When set data is not changed from the PC CPU, communicate by using the default data in the specific use area.

(b) When both the RS-232C and RS-422 are set to the no-protocol mode (mode switching designation data in 0109H), the mode cannot be switched by using a computer.

(This is because data cannot be written from the computer to the buffer's specific use area.)

POINT

Mitsubishi recommends using a PC CPU for mode switching.

12.2 Mode Switching Function and Operation of the Computer Link Module

12.2.1 Mode switching function

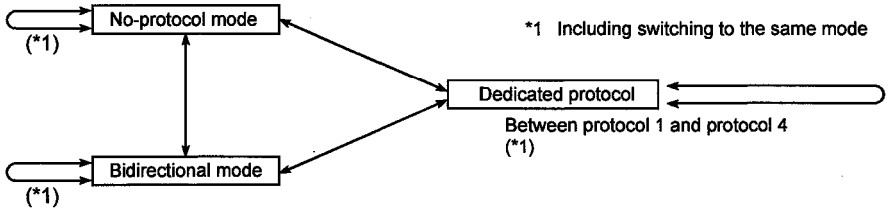
There are two types of mode switching function: normal mode switching and forced mode switching. As shown in the following table, the mode can be switched from the PC CPU or computer.

(1) Mode switching function

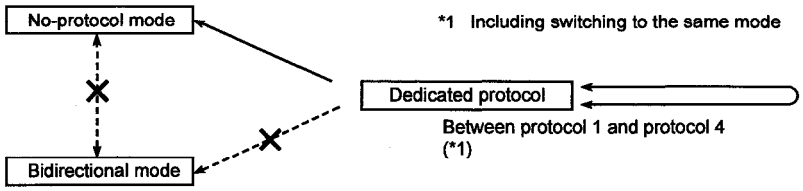
Mode Switching Function	State When Mode Switching Request is Made	Description of Processing
Normal mode switching	When data communications is executed	The mode will be switched after data communications is completed.
	When data communications is not executed	The mode will be switched when a mode switching request is issued.
Forced mode switching	When data communications is executed	Data communications will be forced to complete when a mode switching request is issued to switch the mode.
	When data communications is not executed	The mode will be switched when a mode switching request is issued.

(2) Modes that can be switched

(a) Modes that can be switched from the PC CPU



(b) Modes that can be switched from the computer



12.2.2 Operation (Processing) of the computer link module during mode switching

This section describes the processing the computer link module performs when it receives a mode switching request from the PC CPU or computer.

(1) The initial processing when a mode switching request is received is as follows:

(When the computer link module receives a normal mode switching request)

- When data communication is not executed, mode switching immediately starts.
- When data communication is executed, mode switching starts after the ongoing communications are completed.
  (When data communication is executed using a dedicated protocol or in the bidirectional mode, mode switching starts after a response message is transmitted or received. In the case of data communications in the no-protocol mode, mode switching starts after the request-to-send signal is turned OFF and the received-data-read signal is turned ON.)

(When the computer link module receives a forced mode switching request)

- When data communication is not executed, mode switching immediately starts.
- When data communication is executed, mode switching starts after the ongoing communication is forced to complete.

(2) First turns OFF the computer link module READY signal (Xn7).

(3) Initializes the computer link module and starts it up (takes about four to six seconds).

During this operation, the following processings take place at the same time:

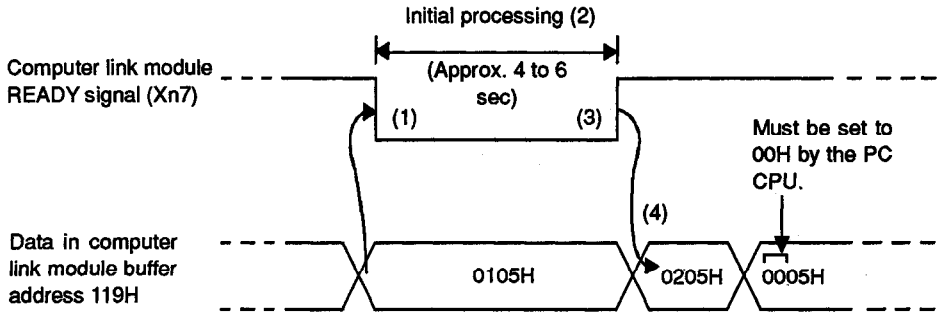
- Signals sent to the PC CPU (input signals (X) at the PC CPU) are all turned OFF.
- Set data in the specific use area of the computer link module buffer memory (addresses 100H to 11FH) is returned to the default state (except for address 119H).
- Received data (stored in the computer link module's buffer memory and the OS area) during data communications in the no-protocol/bidirectional mode is cleared.

(4) Turns ON the computer link module READY signal (Xn7).

(5) Switches the higher bytes in the computer link module buffer memory's mode switching designation area (address 119H) from 01H to 02H.
The mode switching operation is completed.

Example:

When switching the RS-232C to the no-protocol mode and the RS-422 to the dedicated protocol (protocol 1) mode respectively
(Example of processing in response to a normal mode switching request)



POINTS

(1) The only difference between normal mode switching and forced mode switching is the processing by the computer link module between the receive of the mode switching request and the start of mode switching ((1) above).
The forced mode switching function starts mode switching, irrespective of whether data communications is being executed. This function should be used to restart communications avoiding communications trouble.

(2) When sending a forced mode switching request from the PC CPU or computer to the computer link module to enable the module to establish a normal computer link after mode switching, turn OFF all output signals (Y) from the PC CPU to the module beforehand.

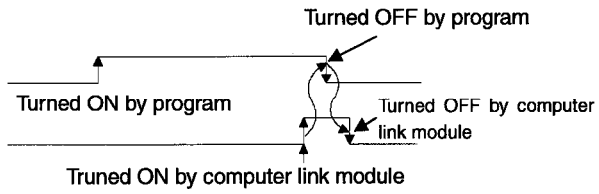
12.3 Handshake I/O Signals for Mode Switching and Buffer Memory

This section describes the handshake I/O signals to be exchanged with the PC CPU when the PC CPU or computer requests the computer link module to switch the mode, and a buffer memory specific use area for reading and writing data.

For use of the handshake I/O signals and the buffer memory specific use area, refer to Sections 12.4 and 12.5.

(1) Handshake I/O signals to be exchanged with the PC CPU

The following handshake I/O signals are used to switch the mode from the PC CPU.

	Signal	Timing
Mode switching	Y(n+1)9 (Mode switching request) Xn9 (Mode switching completed)	

The number "n" appended to X and Y is determined according to the position where the computer link module is loaded and the number of I/O modules loaded prior to this module.

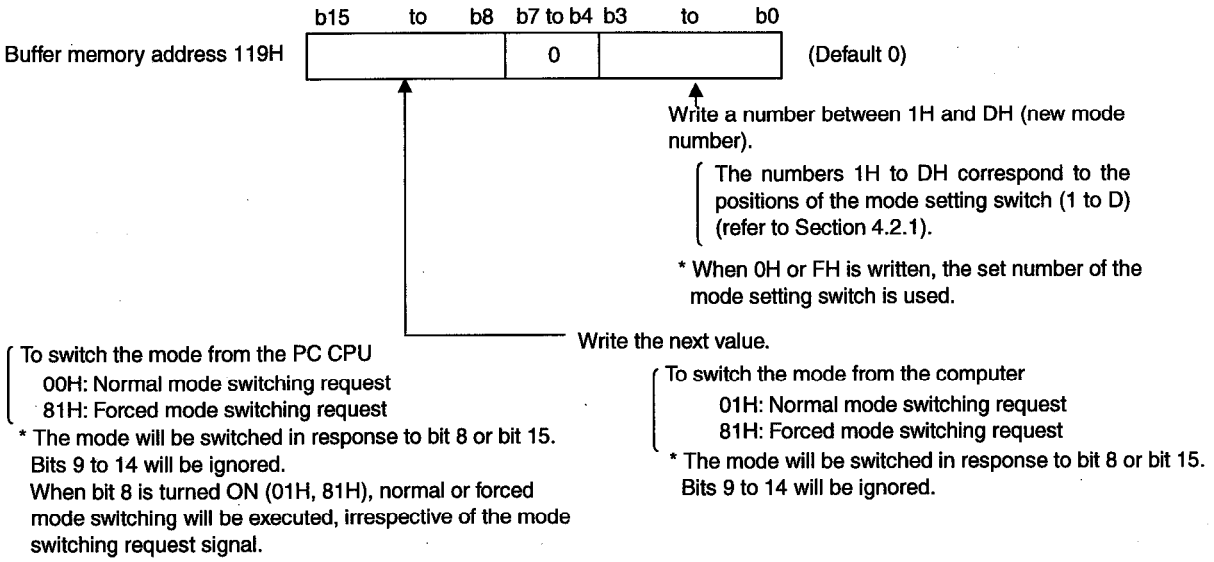
REMARK

The I/O signals, other than those mentioned above, available in bidirectional mode are: Xn7 (computer link module READY signal) and XnD (computer lihk module watchdog timer error signal).
Refer to Section 3.9 for the I/O signals used with the PC CPU.

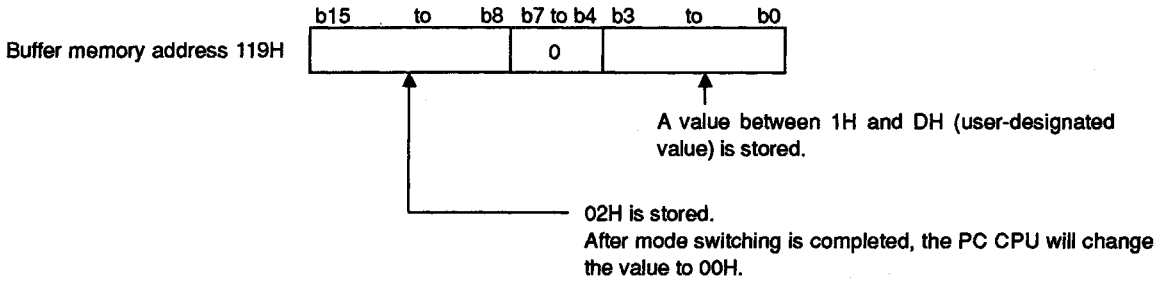
(2) Buffer memory specific use area (mode switching designation area)

The buffer memory area illustrated below is intended to make normal or forced mode switching from the PC CPU or computer.

(a) When mode switching is requested



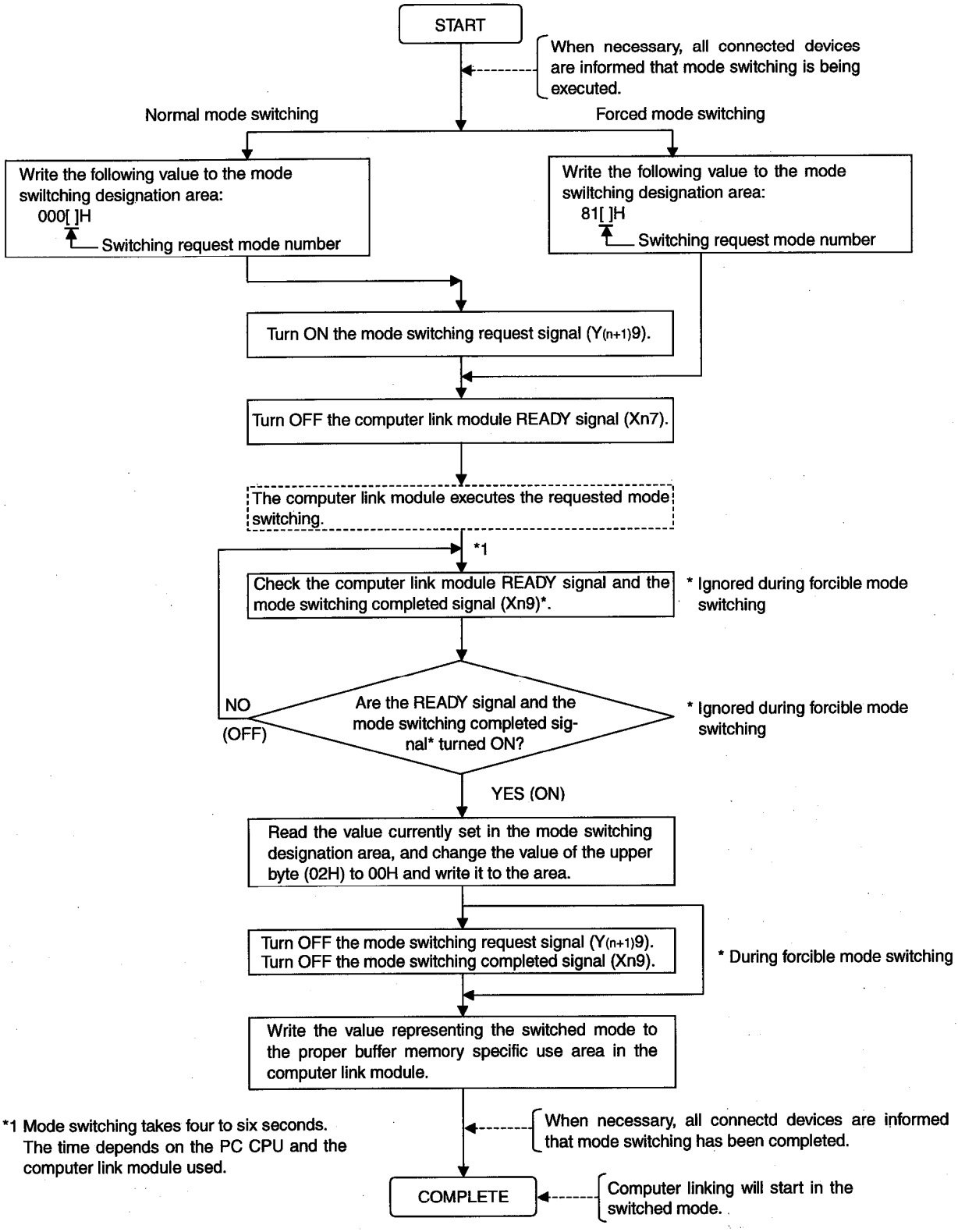
(b) When mode switching is completed



12.4 Mode Switching from the PC CPU

This section describes how to switch the mode from the PC CPU, and a sequence program for switching the mode and writing a mode switching request value to the mode switching designation area.

12.4.1 Mode switching procedure



*1 Mode switching takes four to six seconds. The time depends on the PC CPU and the computer link module used.

12.4.2 Mode switching program example

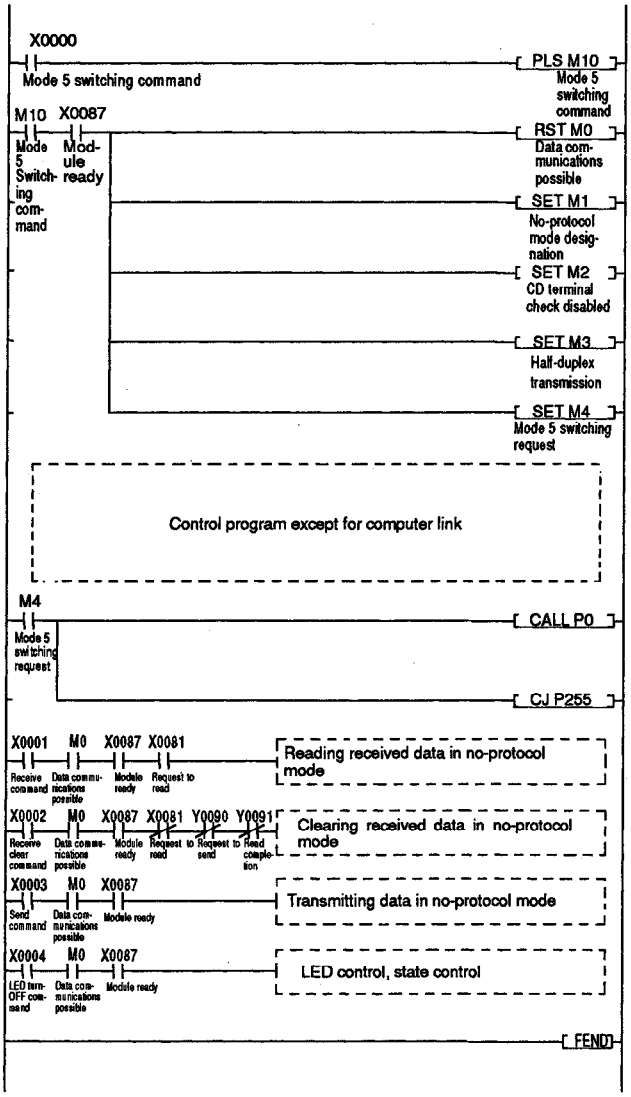
Shown below is an example of a sequence program which carries out the following processing after computer linking starts.
For details, refer to the sections mentioned in the program.
(Computer link module I/O signals 80H to 9FH)

(1) Set mode number 5 to switch the mode. (Switch the mode of the RS-232C interface from dedicated protocol 1 to the no-protocol.)

(2) After mode switching, write values to the appropriate buffer memory specific use areas for computer linking in the no-protocol mode through the RS-232C interface and using the control function.

(3) After mode switching, execute computer linking in the no-protocol mode through the RS-232C interface.

A comment is attached to each device used in the program, which describes the application of the device.
The numbers in parentheses in the program correspond to the numbers in the explanatory diagram shown at the end of this section.



A mode switching command is entered.

The data communications enable flag (M0) is turned ON to switch the mode.
*M0 is set to turn ON after the computer link module is turned ON.
After mode switching, the initial setting flags (M1, M2, M3) in the buffer memory specific use area concerned are turned ON to start data communications in the no-protocol mode.

The mode switching request flag (M4) is turned ON.

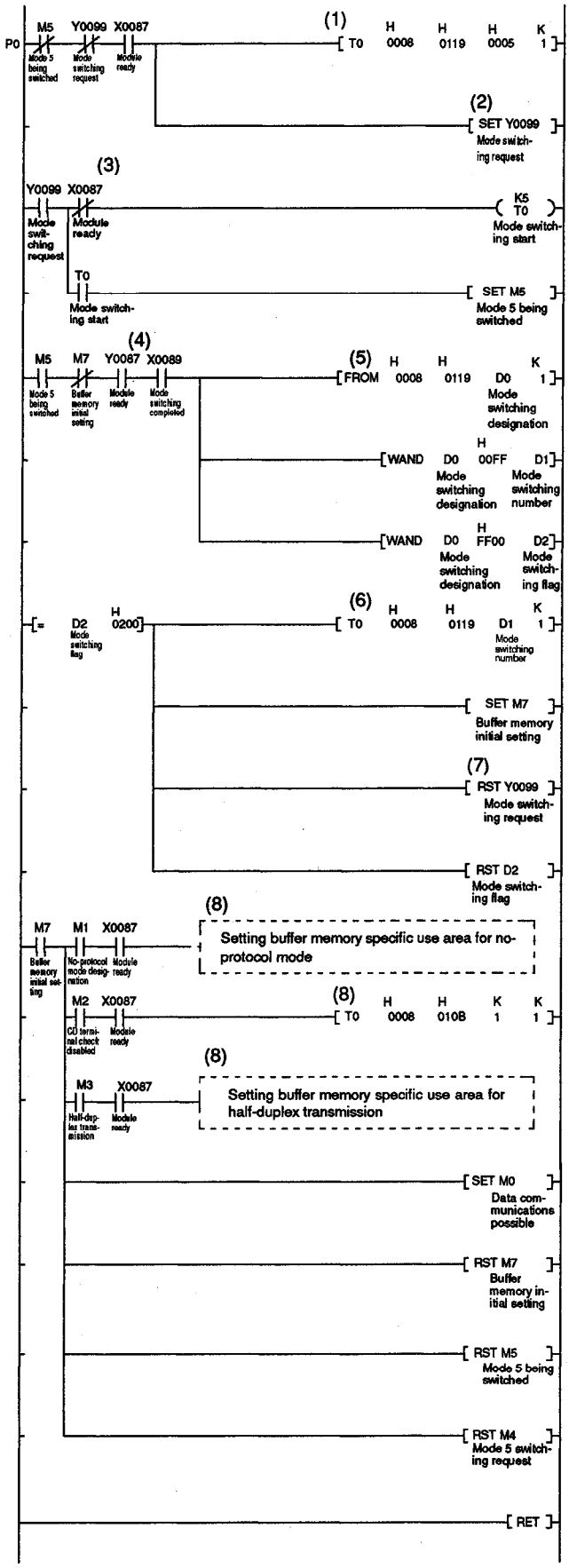
Refer to Section 6.4.

Refer to Section 6.2.1 (4)

Refer to Section 6.5.

Program for data communications through RS-232C interface after mode switching

Refer to Section 8.



CIRCUIT END

Write a normal mode switching request.
For forced mode switching, write 8005H.

The mode switching request signal is turned ON.

The start of mode switching is confirmed with the module ready signal turned OFF.

When mode switching is completed, the data stored in the mode switching designation area is read.

The value of the lower byte is fetched (for writing to buffer memory).

The value of the upper byte is fetched (for checking whether mode switching is completed).

Write 0005H to the mode switching designation area.

When mode switching is completed, the initial setting request flag (M7) in the buffer memory specific use area concerned is turned ON.

Mode switching request signal is turned OFF.

The mode switching completed confirmation register (D2) is initialized.

Refer to Section 6.2.4 (2) (3).

CD terminal check disabled is set.
Refer to Section 6.2.4 (2)(f).

Refer to Section 10.

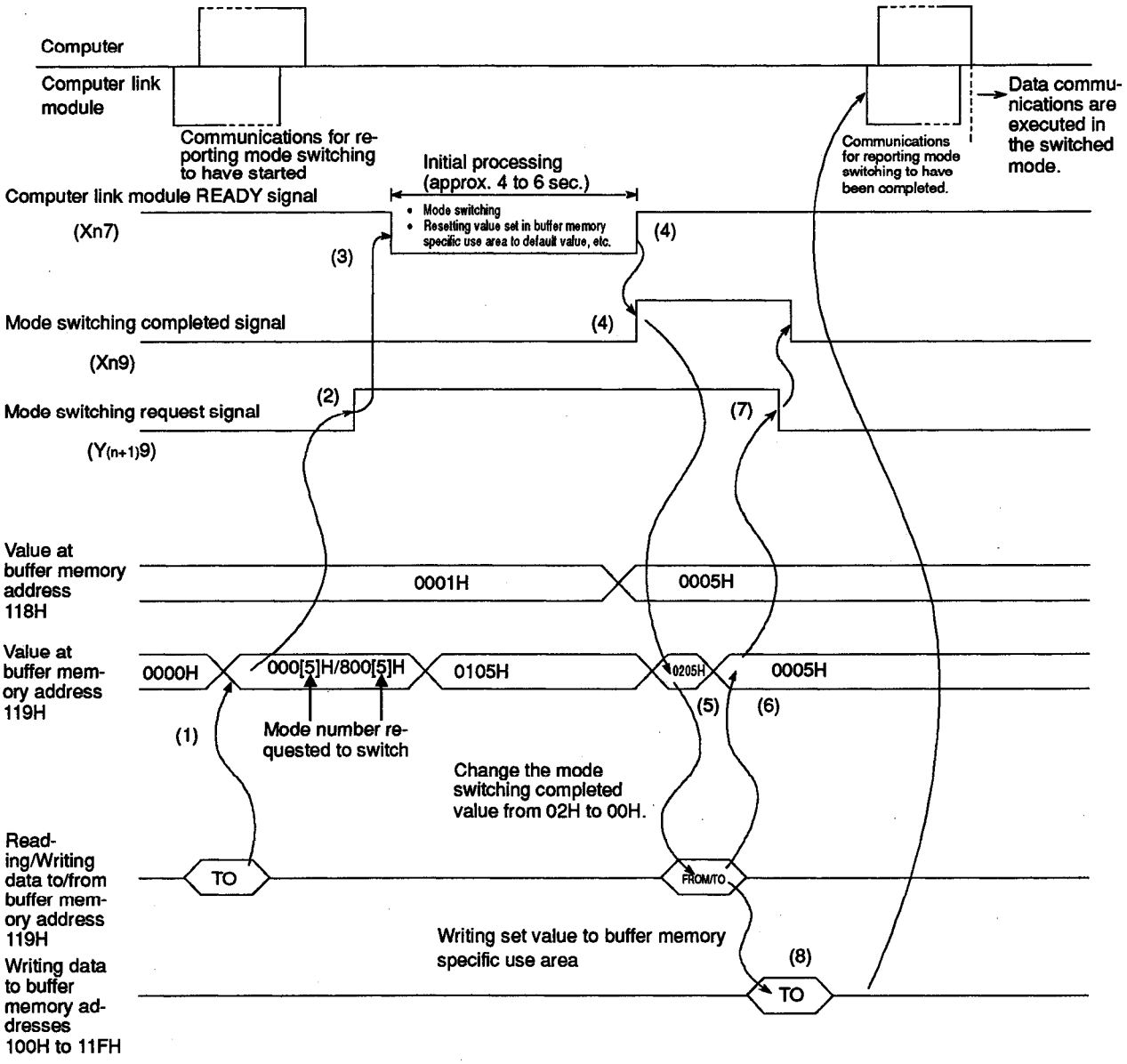
Initial setting program for data communications in the no-protocol mode through the RS-232C interface after mode switching

When mode switching and initial setting are completed, the data communications enable flag (M0) is turned ON.

When mode switching is completed, the initial setting request flag (M7) in the buffer memory specific use area concerned is turned OFF.

The mode switching start detection flag (M5) is initialized.

The mode switching request flag (M4) is turned OFF.



POINTS

(1) Whether normal or forced mode switching is executed from the PC CPU, the sequence program initially set in the proper buffer memory specific use area must be processed in the same manner later.

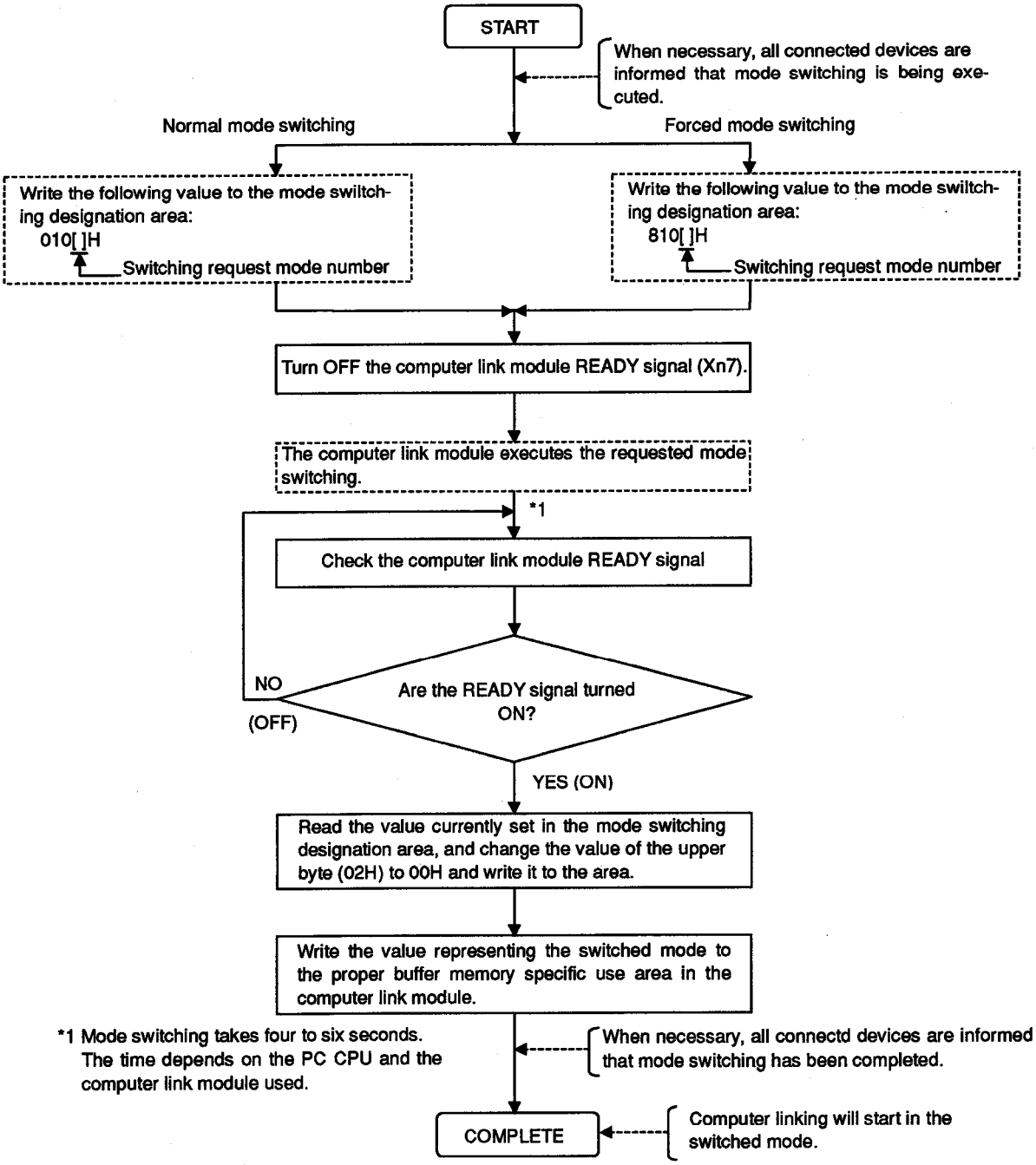
(2) The current mode number switched by the mode switching function can be verified with the mode setting state storage area (address 118H) in the buffer memory.
For the procedure, refer to either of the following sections:
- For verification using the sequence program, refer to Section 8.3.3. The mode number can be read from the buffer memory using a FROM instruction.
- For verification on the computer, refer to Section 5.9. The mode number can be verified by the buffer memory read function using a dedicated protocol.

12.5 Mode Switching from the Computer

This section describes the procedure for mode switching from the computer, and a sequence program for writing a mode switching request value to the mode switching designation area.

The mode of the computer link module can be switched only from a computer which is computer-linked with a dedicated protocol.

12.5.1 Mode switching procedure



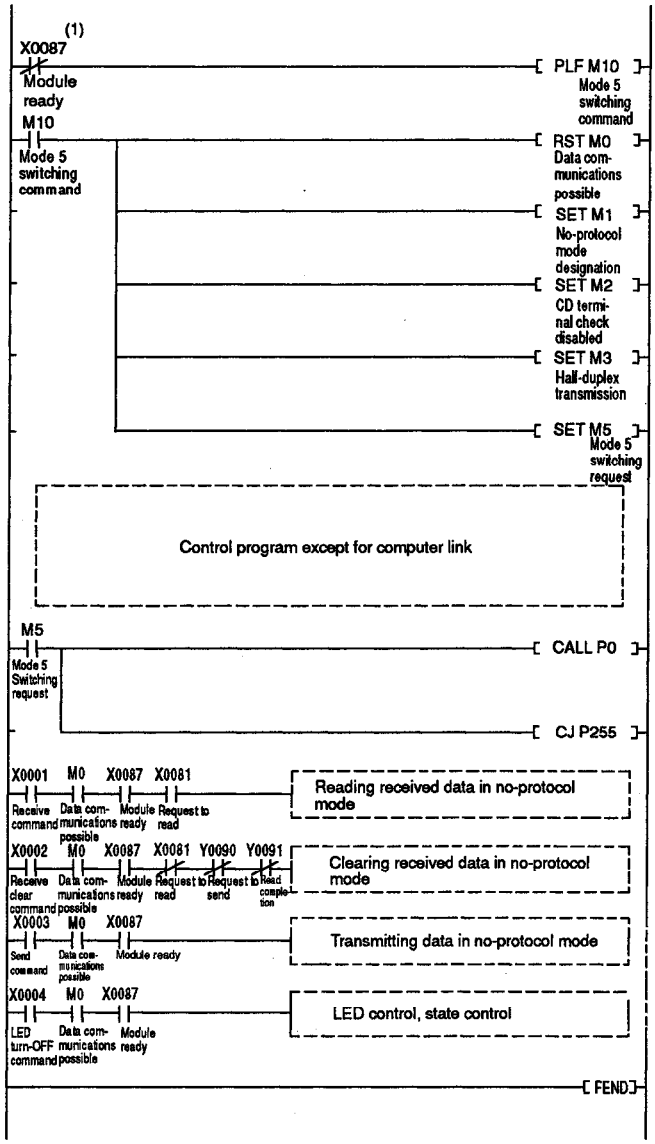
12.5.2 Mode switching program example

Shown below is an example of a program which carries out the following processing after mode number 5 is set and the computer switches the mode. (Example of program after the mode of the RS-232C interface is switched from dedicated protocol 1 to the no-protocol)
For details, refer to the sections mentioned in the program.
(Computer link module I/O signals: 80H to 9FH)

(1) After mode switching, write values to the appropriate buffer memory specific use areas for computer linking in the no-protocol mode through the RS-232C interface and using the control function.

(2) After mode switching, execute computer linking in the no-protocol mode through the RS-232C interface.

A comment is attached to each device used in the program, which describes the application of the device.
The numbers in parentheses in the program correspond to the numbers in the explanatory diagram shown at the end of this section.



The start of mode switching is confirmed with the module ready signal which is turned OFF as soon as mode switching actually starts.

The data communications enable flag (M0) is turned ON to switch the mode.
*M0 is set to turn ON after the computer link module is turned ON.

After mode switching, the initial setting flags (M1, M2, M3) in the buffer memory specific use area concerned are turned ON to start data communications in the no-protocol mode.

The mode switching request flag (M5) is turned ON.

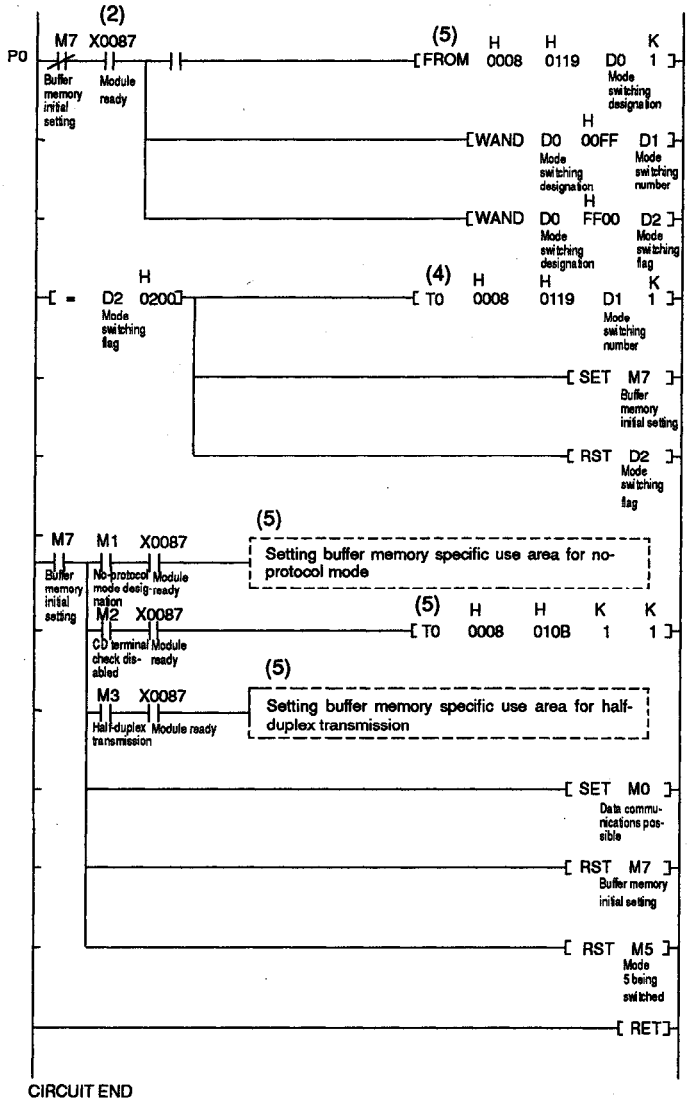
Refer to Section 6.4.

Refer to Section 6.2.1 (4).

Refer to Section 6.5.

Program for data communications through RS-232C interface after mode switching

Refer to Section 8.



CIRCUIT END

When mode switching is completed, the data stored in the mode switching designation area is read.

The value of the lower byte is fetched (for writing to buffer memory).

The value of the upper byte is fetched (for checking whether mode switching is completed).

Write 0005H to the mode switching designation area.

When mode switching is completed, the initial setting request flag (M7) in the buffer memory specific use area concerned is turned ON.

The mode switching completed confirmation register (D2) is initialized.

Refer to Section 6.2.4 (2) (3).

CD terminal check disabled is set. Refer to Section 6.2.4(2)(f).

Refer to Section 10.

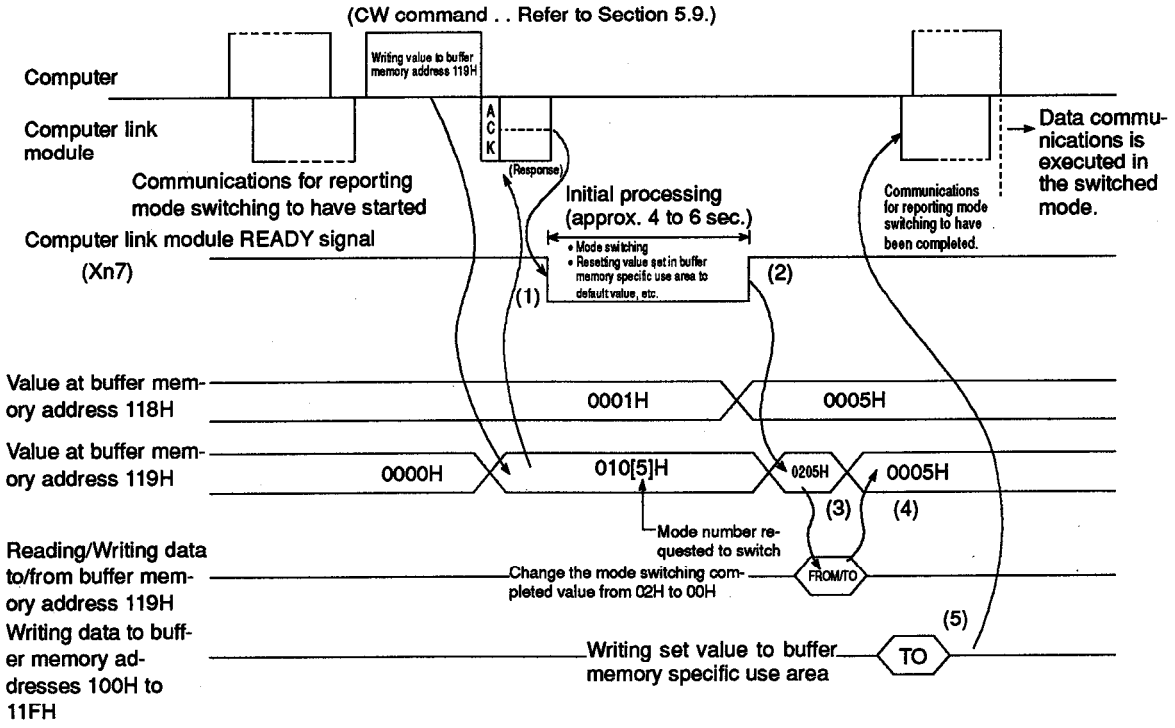
Initial setting program for data communications in the no-protocol mode through the RS-232C interface after mode switching

When mode switching and initial setting are completed, the data communications enable flag (M0) is turned ON.

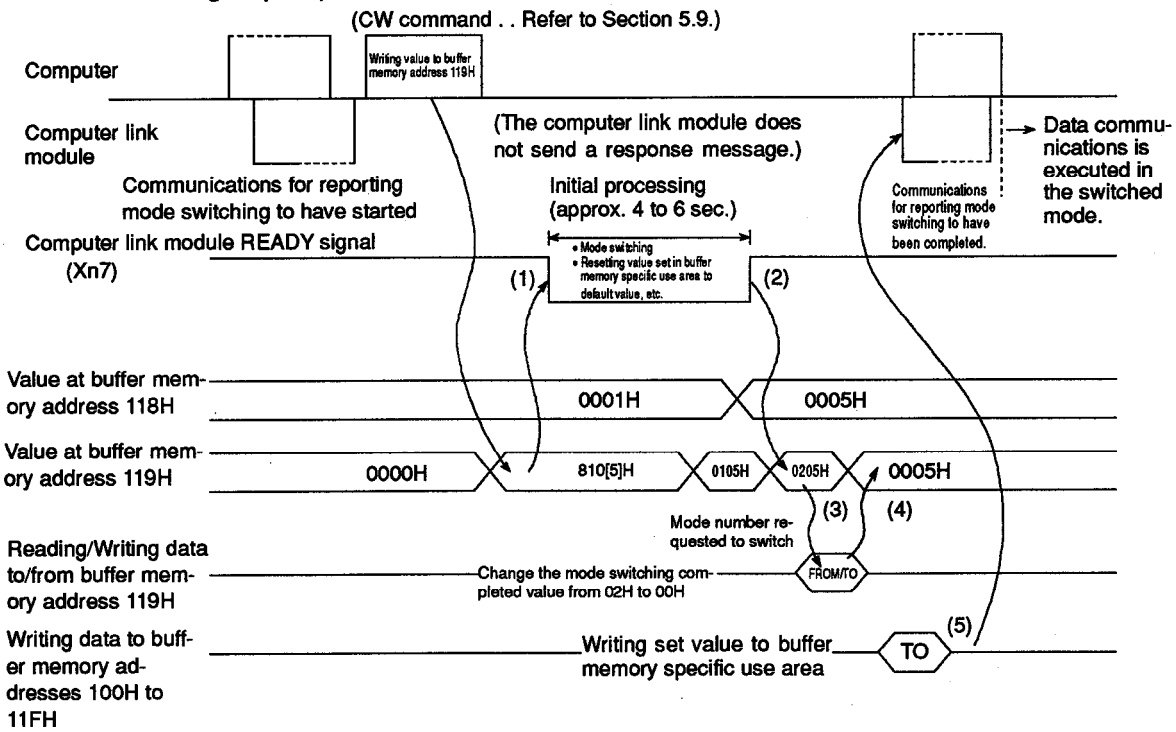
When mode switching is completed, the initial setting request flag (M7) in the buffer memory specific use area concerned is turned OFF.

The mode switching request flag (M5) is turned OFF.

(Normal mode switching request)



(Forced mode switching request)



POINTS

(1) Whether normal or forced mode switching is executed from the PC CPU, the sequence program initially set in the proper buffer memory specific use area must be processed in the same manner later.

(2) The current mode number switched by the mode switching function can be verified with the mode setting state storage area (address 118H) in the buffer memory.
For the procedure, refer to either of the following sections:
- For verification using the sequence program, refer to Section 8.3.3. The mode number can be read from the buffer memory using a FROM instruction.
- For verification on the computer, refer to Section 5.9. The mode number can be verified by the buffer memory read function using a dedicated protocol.

13. TROUBLESHOOTING OF COMPUTER LINK FUNCTIONS

This chapter describes errors which can occur with the computer link module procedures.

13.1 NAK Error Codes with Dedicated Protocols

Table 13.1 gives the error codes and their descriptions when the NAK code is transmitted between the computer and the computer link module as 2-digit ASCII (hexadecimal) between 00H and FFH.
If two or more errors occur at the same time, the computer link module sends the error code of the error it detects first. If any of the following errors occur, the transmission sequences are initialized and LEDs 2-NEU and 4-NEU (LED Nos. 4 and 7) are turned ON.

Table 13.1 Error Code List

Error Code (Hexadecimal)	Error	Error Description	Indicator LED No.	Corrective Actions
00H	Disable during RUN	Invalid access has been made during RUN. (1) Data has been written to a PC CPU with the write during RUN enabled/disabled setting switch OFF (write disable during RUN). (2) Sequence program and parameters have been written	2-C/N (LED No.16) 4-C/N (LED No.20)	(1) Start communications after turning ON the switch. (2) Write parameters after setting the PC CPU to STOP.
01H	Parity error	Parity error With the parity bit setting switch ON (parity enabled), the parity check result does not match the state of the even/odd parity setting switch (odd/even parity).	2-P/S (LED No.17) 4-P/S (LED No.21)	Check control protocol, change the SW setting or data.
02H	Sum check error	Sum check error With the sum check setting switch ON (sum check enabled), the sum check result of received data does not match the sum check code of transmitted data, i.e., send data is different from received data.	2-P/S (LED No.17) 4-P/S (LED No.21)	Check data transmitted from computer and sum check result. Correct invalid data.
03H	Protocol error	Communications protocol not valid. Communications have been made with a protocol different from the one set by the mode setting switch.	2-PRO (LED No.18) 4-PRO (LED No.22)	Check and correct the mode setting switch position and control protocol and restart data communications.
04H	Framing error	Framing error Data does not match the setting of the stop bit setting switch.	2-SIO (LED No.19) 4-SIO (LED No.23)	Change the SW setting.
05H	Overrun error	Overrun error New data has been transmitted before computer link module receives all the preceding data.	2-SIO (LED No.19) 4-SIO (LED No.23)	Decrease the data transmission speed and restart data communications.

Error Code (Hexadecimal)	Error	Error Description	Indicator LED No.	Corrective Actions
06H	Character area error	Character area A, B, or C error, or designated command does not exist. (1) The designation of the character area A, B, or C for the control protocol set with the mode setting switch is not correct. (2) A command used with the protocol does not exist. The number of processing points is outside the allowable range, or the designated device number does not exist in the designated PC CPU. The set device number does not exist in the set PC CPU. (3) The device number is not set with the required number of characters. (ACPU common command: 5 characters, AnA/AnUCPU dedicated command: 7 characters)	2-PRO (LED No.18) 4-PRO (LED No.22)	(1) Check and correct the character area A,B, or C and restart data communications. (2) Refer to the functions list in Section 3.2.1 and the PC CPU User's Manual to correct the designated commands, and restart data communications. (3) Refer to Section 5.7.1 to correct the number of setting characters of the device number, and restart data communications.
07H	Character error	Character error received. A character other than "A to Z", "0 to 9", "—" and control codes in Section 5.4.6 (1) has been received.	2-PRO (LED No.18) 4-PRO (LED No.22)	Check and correct data.
08H	PC CPU access error	Buffer memory is unable to make communications with the PC CPU. It indicates that the PC CPU cannot communicate with the computer link module.	2-C/N (LED No.16) 4-C/N (LED No.20)	Use a PC CPU which can perform data communications.
10H	PC CPU number error	Defined PC CPU number does not exist. The PC CPU number designated with the protocol was not the self (FFH), or a station number set with the MELSECNET link parameters or network parameters.	2-C/N (LED No.16) 4-C/N (LED No.20)	Change the PC CPU number to the self (FFH) or a station number set with the MELSECNET link parameters, and restart data communications.
11H	Mode error	Incorrect communications between a computer link module and a PC CPU. After the computer link module has correctly received a request from the computer, normal data communications is not performed between the computer link module and PC CPU due to noise or some other reason.	—	Restart data communications. If the error recurs, (a) check for noise and/or other causes, or (b) replace the computer link module. Restart data communications. Or, perform a self-loopback test to check the computer link module for operation.
12H	Special function module designation error	Special function module designation error. A special function module, having buffer memory and capable of performing data communications, is not placed in the designated special function module number's position. Or the module number is wrong.	2-C/N (LED No.16) 4-C/N (LED No.20)	Check control protocol data or change the special function module location.
13H	Program step number designation error	Error in the designation of a sequence program step number. (1) A step number was designated which lies outside the program range designated by the PC CPU parameters. (2) A subsequence program that does not exist (or cannot be designated) was designated.	2-PRO (LED No.18) 4-PRO (LED No.22)	(1) Designate a step number which lies within the designated range, or change the parameters and restart transmission. (2) Check the model name and the set parameter values of the corresponding PC CPU.
18H	Remote error	Remote RUN/STOP impossible. Remote STOP/PAUSE has already been executed from another module (such as another computer link module).	2-PRO (LED No.18) 4-PRO (LED No.22)	Check for and reset remote STOP/PAUSE from another module.

Error Code (Hexadecimal)	Error	Error Description	Indicator LED No.	Corrective Actions
20H	Data link error	Access was made to MELSECNET(II) or MELSECNET/10 has been discontinued.	2-C/N (LED No.16) 4-C/N (LED No.20)	Check the state of data link.
21H	Special function module bus error	Memory access to the special function module cannot be made (for command TR, TW). (1) Special function module control bus error. (2) Special function module breakdown.	2-C/N (LED No.16) 4-C/N (LED No.20)	PC CPU, base unit, special function module or computer link module hardware fault. Consult the nearest Mitsubishi representative.
31H	Command error	An AnUCPU dedicated command has been given to a PC CPU other than the AnU.	2-PRO (LED No.18) 4-PRO (LED No.22)	Check the available commands (refer to Section 3.2.1.).
32H	Network data error	Normal access to the designated PC CPU on the MELSECNET/10 is impossible.	2-C/N (LED No.16) 4-C/N (LED No.20)	Examine the network. Check the routing parameter to see if it matches the station to be accessed.
40H	MELSEC-NET/10 error	The MELSECNET/10 has developed an error.	2-C/N (LED No.16) 4-C/N (LED No.20)	Read four-digit error codes by network reading (refer to Section 5.15.4), and identify the existing error with the MELSECNET/10 Reference Manual to take corrective action.
41H	AnUCPU error	An error occurs in the AnUCPU of the self station on the MELSECNET/10.	2-C/N (LED No.16) 4-C/N (LED No.20)	Read four-digit error codes by network reading (refer to Section 5.15.4), and identify the existing error with the MELSECNET/10 Reference Manual to take corrective action.

REMARKS

(1) Error codes 00H to 08H are transmitted to a computer after diagnosis by a computer link module, when access is made by the computer to the computer link module.
(2) Error codes 10H to 21H, 31H to 32H, and 41H are transmitted from a computer link module to a computer after diagnosis by a PC CPU when access is made by a computer link module to the PC CPU.
(3) Error code 40H is transmitted from the computer link module to the computer according to the decision by the PC CPU on the MELSECNET/10 accessed by the module.

13.2 NAK Error Codes in the Bidirectional Mode

Table 13.2 gives the error codes, error descriptions, and corrective actions for errors which may occur during bidirectional mode communications.

The following error codes (1-word integers) are transmitted in order of the lower byte and the higher byte immediately following the NAK code when an error has occurred. (e.g., when the error code is 01H, 01H is transmitted first, and then 00H is transmitted.)

Table 13.2 Error Code List

Error Code (Hexadecimal)	Error Description	Corrective Actions
01H	Send data length error	Either (a) make the setting size of the send data length storage area in the buffer memory for bidirectional transmission smaller than the size of the send data storage area, or (b) set the send data length to "1" or greater. (Data which does not have a data part cannot be transmitted using the bidirectional mode.)
02H	Response message time-out error	Set the computer so that it transmits the response message (in response to the data received from the computer link module) to the computer link module within the set value of the time-out time setting area (address 113H) in the computer link module buffer memory.
03H	Simultaneous transmission error	Either (a) interlock the computer with the computer link module so that they cannot begin transmitting data simultaneously to each other, or (b) set the data valid/invalid setting area (address 114H) in the computer link module buffer memory to "valid".
10H	Error code is not received when the NAK code is received	When the computer transmits the NAK code to the computer link module in response to the data received from the computer link module, an error code should be added immediately after the NAK code.
22H to 5FH	Errors designated by the user	These error codes are added to immediately after the NAK code. Take corrective actions according to the procedure fixed by user.

80H	SIO error at data receive
	[Framing error
	[Overrun error
		• Transmit data from the computer according to the following settings with the computer link module (refer to Section 4.2.2 for setting switches).
		  • Data bit length
		  • Transmission speed
		  • Stop bit length
		• Use insulation transformers (noise-cutting transformers) to eliminate noise.

81H	Check sum error Parity error (only at data receive)	• To transmit the check sum to the computer link module, obtain the check sum as described in Section 7.4.3 (4). Set the check sum enable/disable setting area (address 115H) in the computer link module buffer memory to "disable", so that the check sum is not transmitted. • Transmit data from the computer according to settings with switches of the computer link module.
82H	Received data length error	Either (a) make the data part length and the set value of the data part length of the receive message less than the size of the received data storage area, or (b) transmit correctly the data length (0001H or more) contained in the message which is transmitted to the computer link module. (Data which does not have the data part cannot be transmitted using the bidirectional mode.)
83H	Received data time-out error	When data is transmitted from the computer, set the actual length of the data area to the data length area. (The computer link module executes the time-out check (as set with address 113H of the buffer memory) if it fails to receive data of a set length. This error occurs when it fails to receive the next data within the set time.)

13.3 Indications of LEDs in Case of Trouble and Corrective Action

This section describes the indications of the LEDs in case of trouble and corrective action.

<table>
<tr><th rowspan="2">LED Name</th><th rowspan="2">Normal State</th><th colspan="3">Corrective Actions</th></tr>
<tr><th>During Communications Using Dedicated Protocol</th><th>During Communications in No-Protocol Mode</th><th>During Communications in Bidirectional Mode</th></tr>
<tr><td>RUN</td><td>ON</td><td colspan="3">• Examine the transmission speed setting. (Refer to Section 4.2.2.)
• Check the mode setting switch (refer to Section 4.2.1) for set number.
• Take corrective action according to Section 13.4.2.</td></tr>
<tr><td>2-SD</td><td>Flashes during transmission</td><td colspan="3">• Examine the RS-232C connector cable connections (refer to Section 4.6.2) by setting CD terminal check enabled.
• Check the main channel setting to see if it matches the set number of the mode setting switch (9 to D, refer to Section 4.2.1). (Refer to Section 4.2.2.)
• Check the communications status in DC1/DC3 receive control (refer to Section 9.2.3).
• Check the states of the signals at the RS-232C interface in half-duplex transmission (refer to Section 10). Examine the RS-232C connector cable connections (refer to Section 10.2.).</td></tr>
<tr><td>2-RD</td><td>Flashes during receive</td><td colspan="3">• Examine the RS-232C connector cable connections (refer to Section 4.6.2).
• Check the signals at the RS-232C interface whether they are turned ON or OFF (refer to Section 3.7.1).
• Check the communications status in DC1/DC3 transmission control (refer to Section 9.2.2).
• Check the states of the signals at the RS-232C interface in DTR/DSR control (refer to Section 9.2.1).
• Check the states of the signals at the RS-232C interface in half-duplex transmission (refer to Section 10). Examine the RS-232C connector cable connections (refer to Section 10.2).</td></tr>
<tr><td rowspan="2">2-NEU</td><td rowspan="2">ON during waiting for ENQ</td><td colspan="3">• Check the mode setting switch (refer to Section 4.2.1) for set number, and the main channel setting (refer to Section 4.2.2).</td></tr>
<tr><td colspan="2">• Examine the quantity of message data transmitted from the computer (refer to Section 5).
• Consult your nearest Mitsubishi representative.</td><td>——</td></tr>
<tr><td>2-ACK</td><td>ON after ACK transmission</td><td rowspan="2" colspan="2">• Check on the computer the error code received immediately after an NAK or NN code was sent, and take corrective action according to Section 13.1.</td><td rowspan="2">——</td></tr>
<tr><td>2-NAK</td><td>OFF</td></tr>
<tr><td rowspan="2">4-NEU</td><td rowspan="2">ON during waiting for ENQ</td><td colspan="3">• Check the mode setting switch (refer to Section 4.2.1) for set number, and the main channel setting (refer to Section 4.2.2).</td></tr>
<tr><td colspan="2">• Examine the quantity of message data transmitted from the computer (refer to Section 5).
• Consult your nearest Mitsubishi representative.</td><td>——</td></tr>
<tr><td>4-ACK</td><td>ON after ACK transmission</td><td rowspan="2" colspan="2">Check on the computer the error code received immediately after an NAK or NN code was sent, and take corrective action according to Section 13.1.</td><td rowspan="2">——</td></tr>
<tr><td>4-NAK</td><td>OFF</td></tr>
<tr><td>4-SD</td><td>Flashes during transmission</td><td colspan="3">• Check the mode setting switch (refer to Section 4.2.1) for set number.
• Check the communications status in DC1/DC3 receive control (refer to Section 9.2.3).</td></tr>
<tr><td>4-RD</td><td>Flashes during receive</td><td colspan="3">• Examine the RS-422 connector cable connections (refer to Section 4.6.3).
• Check the communications status in DC1/DC3 transmission control (refer to Section 9.2.2).</td></tr>
<tr><td>2-C/N</td><td>OFF</td><td colspan="3">• Check the write during RUN enabled/disabled setting (refer to Section 4.2.2).
• Take corrective action according to Section 13.4.4.
• The LED goes OFF by writing 1 to buffer memory address 102H in the computer link module.</td></tr>
</table>

LED Name	Normal State	Corrective Actions		
		During Communications Using Dedicated Protocol	During Communications in No-Protocol Mode	During Communications in Bidirectional Mode
2-P/S	OFF	• Match the transmission specifications of the computer link module (refer to Section 4.2.2) with those of the external device. • The LED goes OFF by writing 2 to buffer memory address 102H in the computer link module		
		• Examine how the sum check code should be treated (refer to Sections 4.2.2 and 5.4.6 (10)). • Examine the calculation of the sum check code on the computer (refer to Section 5.4.6 (10)).	——	
2-PRO	OFF	• The LED goes OFF by writing 4 to buffer memory address 102H in the computer link module.		
		• Check the mode setting switch (refer to Section 4.2.1) for set number. • Examine the transmitted message on the computer. (Refer to Section 5.) • Take corrective action according to Section 13.1.	——	
2-SIO	OFF	• Match the transmission specifications of the computer link module (refer to Section 4.2.2) with those of the external device. • Lower the transmission speed. • The LED goes OFF by writing 8 to buffer memory address 102H in the computer link module.		
		——	Reduce the quantity of message data transmitted from the computer (refer to Section 9.2.1 and 9.2.2).	
4-C/N	OFF	• Check the write during RUN enabled/disabled setting (refer to Section 4.2.2). • Take corrective action according to Section 13.4.4. • The LED goes OFF by writing 16 to buffer memory address 102H in the computer link module.		
4-P/S	OFF	• Match the transmission specifications of the computer link module (refer to Section 4.2.2) with those of the external device. • The LED goes OFF by writing 32 to buffer memory address 102H in the computer link module.		
		• Examine how the sum check code should be treated (refer to Sections 4.2.2 and 5.4.6 (10)). • Examine the calculation of the sum check code on the computer (refer to Section 5.4.6 (10)).	——	
4-PRO	OFF	• The LED goes OFF by writing 64 to buffer memory address 102H in the computer link module.		
		• Check the mode setting switch (refer to Section 4.2.1) for set number. • Examine the transmitted message on the computer (refer to Section 5). • Take corrective action according to Section 13.1.	——	
4-SIO	OFF	• Match the transmission specifications of the computer link module (refer to Section 4.2.2) with those of the external device. • Lower the transmission speed. • The LED goes OFF by writing 128 to buffer memory address 102H in the computer link module.		
		——	Reduce the quantity of message data transmitted from the computer (refer to Sections 9.2.1 and 9.2.2.).	
CPU R/W	ON/Flashes	• Examine the programs for the PC CPU and the computer. • Check the PC CPU and the computer for status. • Check the mode setting switch (refer to Section 4.2.1) for set number. • Consult your nearest Mitsubishi representative.		

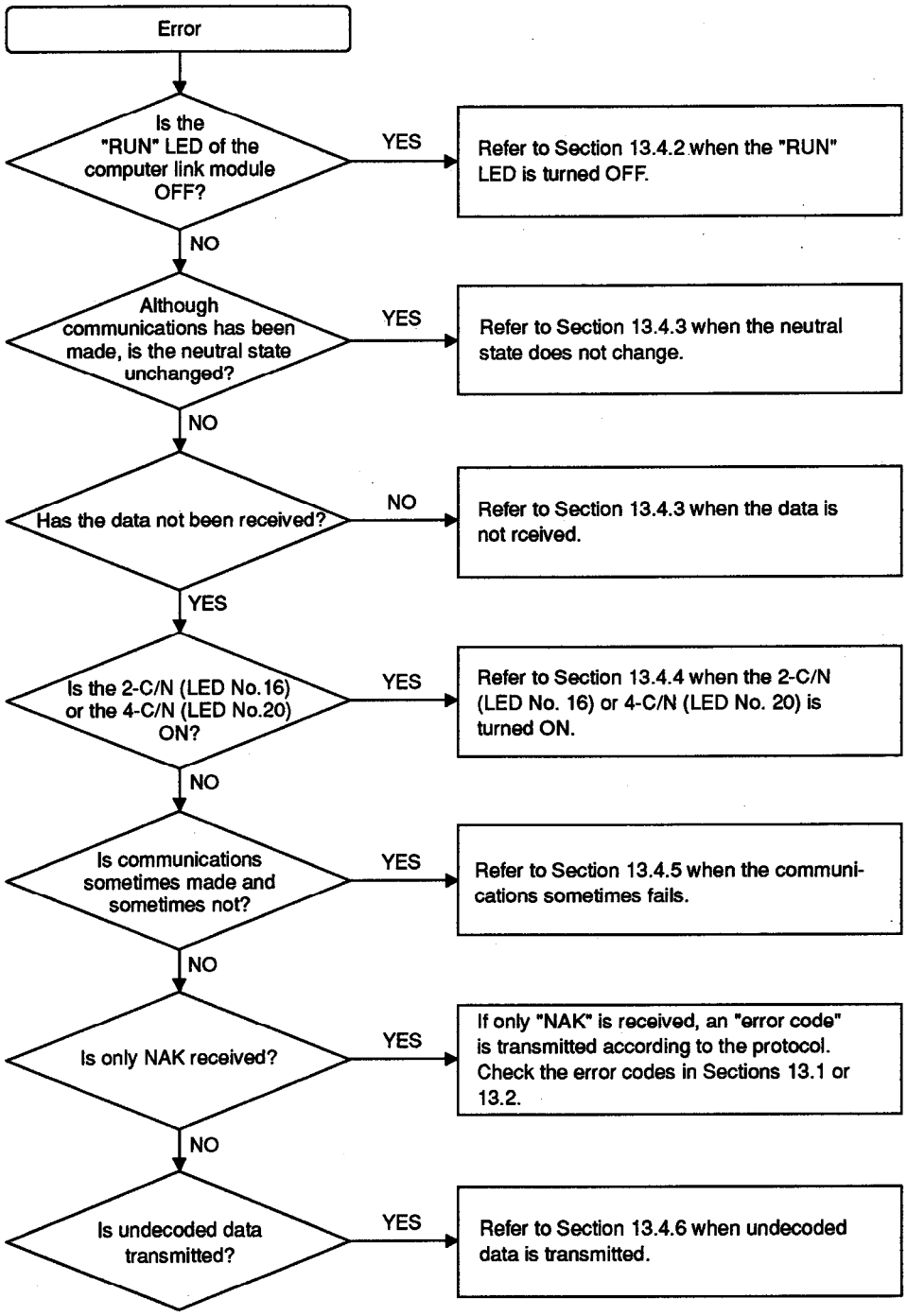
13.4 Troubleshooting OFF

This section describes basic troubleshooting procedures for the computer link module. The User's manuals give information on PC CPU module troubleshooting.

13.4.1 Troubleshooting flow chart

The state of errors is described as follows:

(1) Computer link function



REMARK

The matters to be noted when executing data communication with an external device via any interface of the computer link module are as follows:

(1) When turning on the power of the computer link module, a receiving error may occur in an external device. When turning on the power of an external device, a receiving error may occur in the computer link module.

(2) When turning on the power of an external device while sending data from the computer link module, a receiving error will occur in the external device. When turning on the power of the computer link module while sending data from an external device, a receiving error will occur in the computer link module.

(3) If the error LED is lit up by the occurrence of a receiving error, turn off the LED following the Section 8.1.2.

POINTS

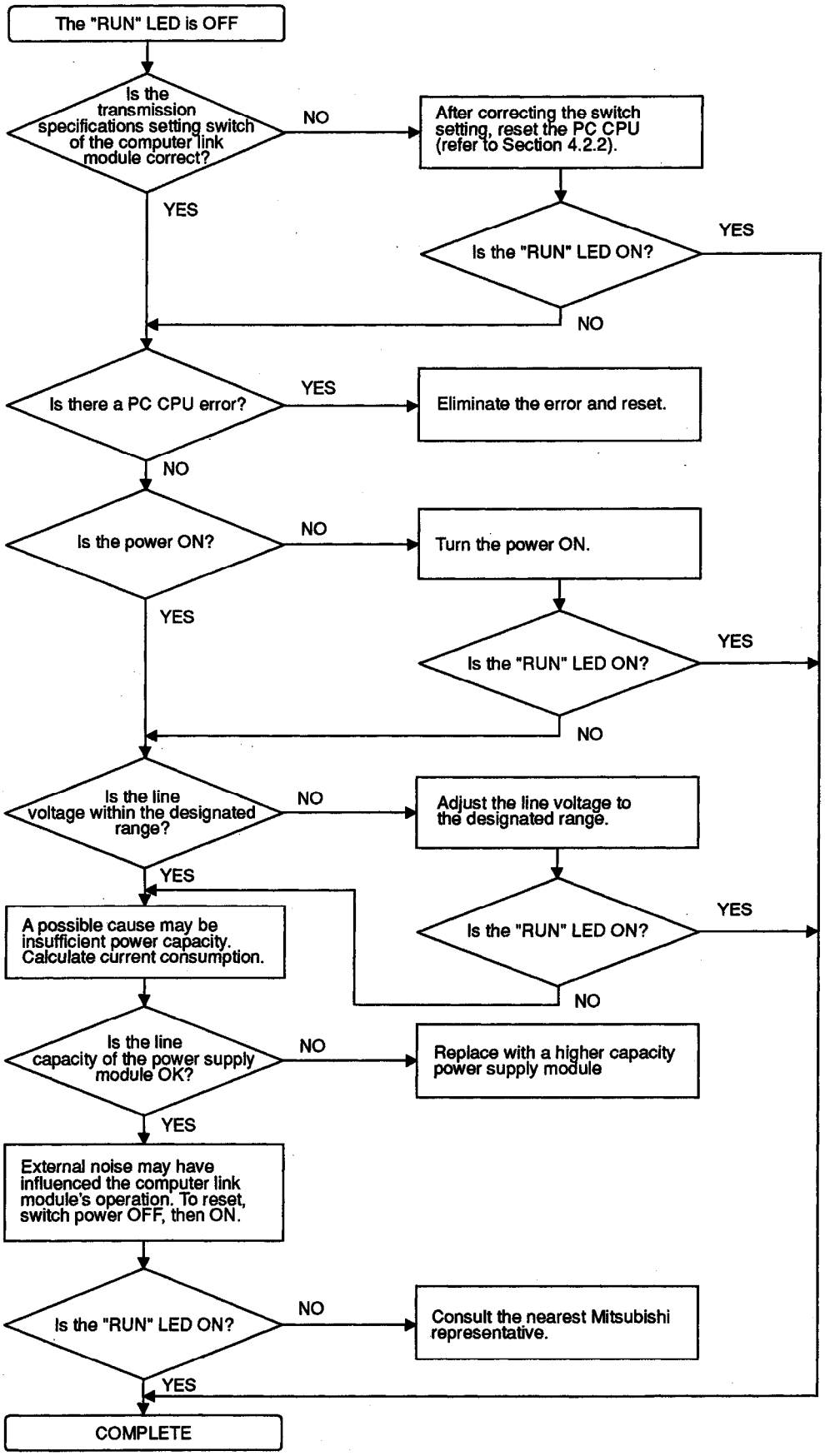
When a receiving error occurs in the computer link module, refer to the following explanations:

(1) When communicating with the dedicated protocol
When the calculator link module detects a receiving error after receiving the head data of command text in the set format, it ignores the received data, or returns the response text indicating an error end.
When the computer link module detects a receiving error before receiving the head data of command text in the set format, it ignores the received data.

(2) When communicating in non-protocol mode
When the computer link module detects a receiving error, it ignores only the data in which an error was detected.
Refer to Sections 6.2.1 or 8.1, or APPENDIX 6.1.3 to detect a receiving error and clear the received data.

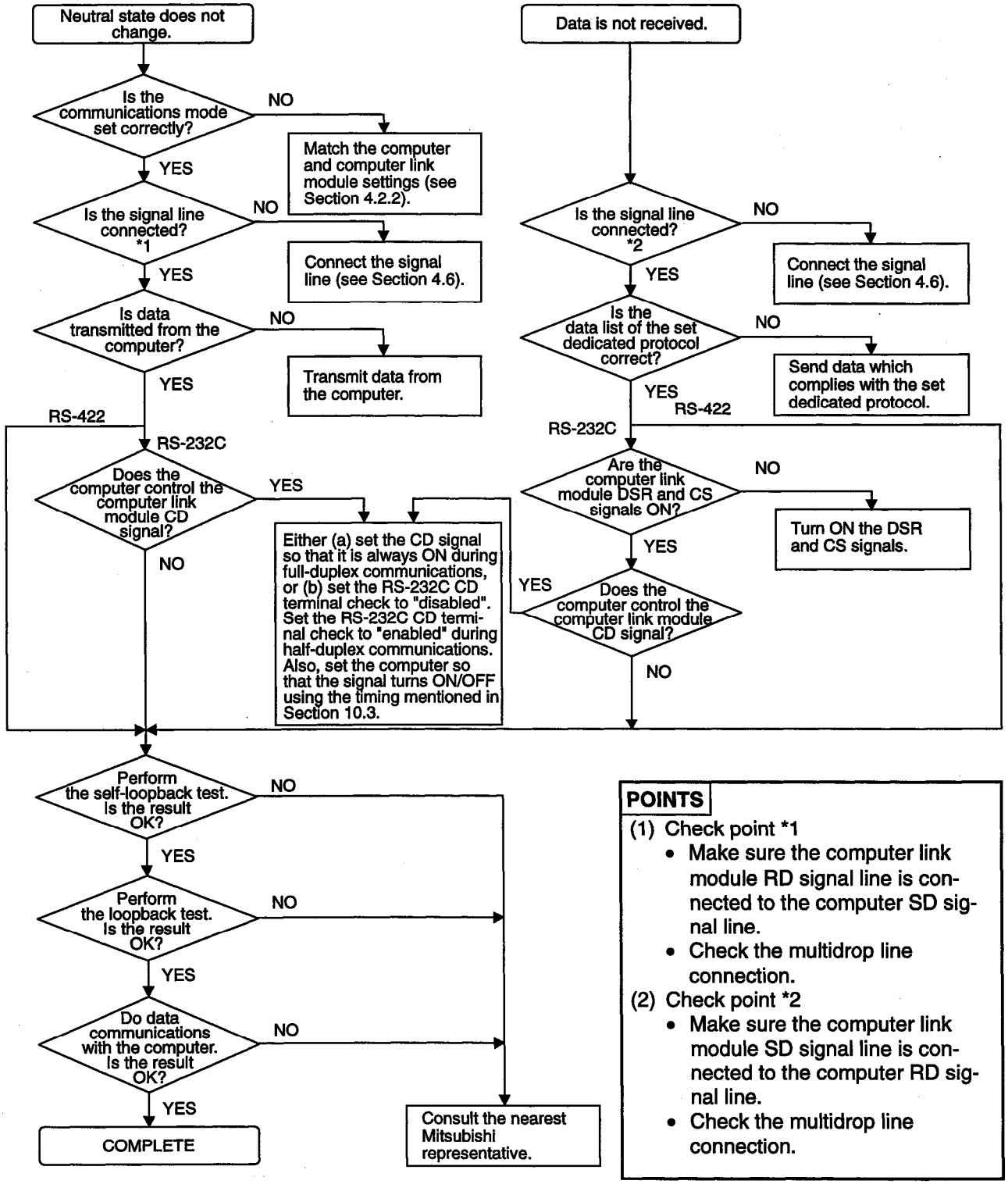
(3) When communicating in bidirectional mode
When the computer link module detects a receiving error after receiving the head data of command text in the set format, it returns the response text indicating an error end.
When the computer link module detects a receiving error before receiving the head data of command text in the set format, it ignores the received data.

13.4.2 When the "RUN LED" is turned OFF



13.4.3 When the neutral state does not change or data is not received

The computer link module LED remains ON indicating (a) the neutral state, or (b) that communications is disabled (even though a communications request is made to the computer link module). The computer cannot receive data.

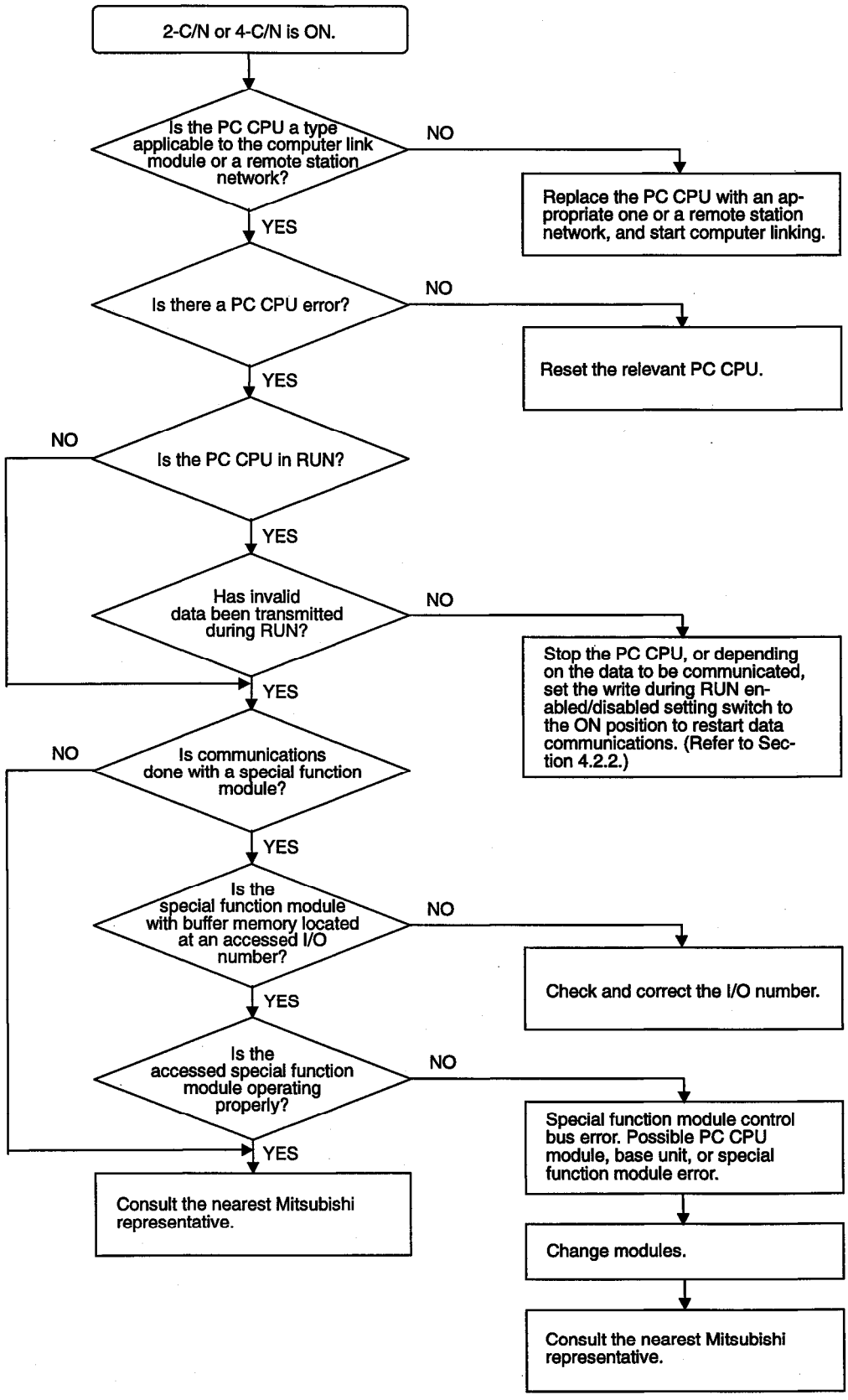


POINTS

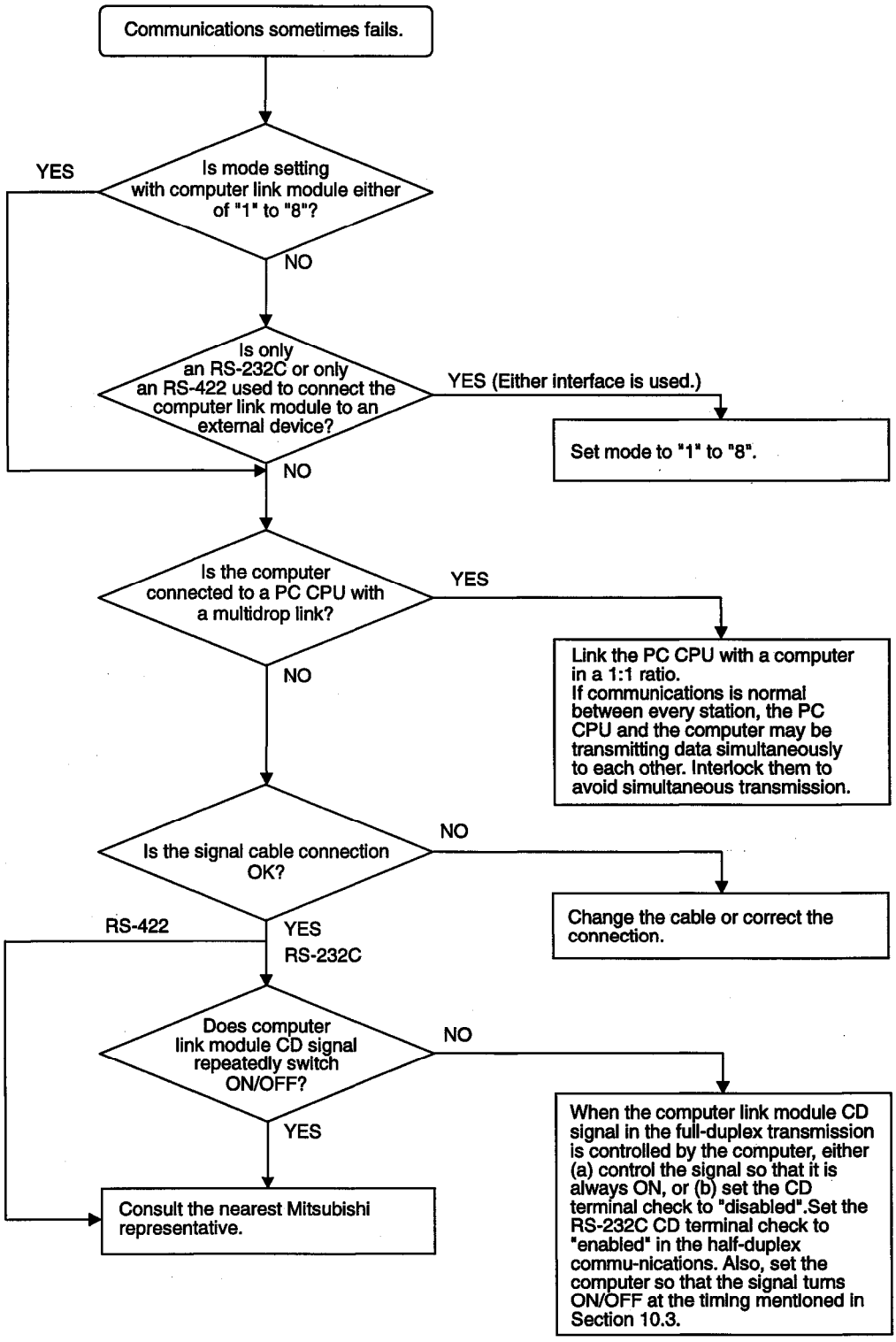
(1) Check point *1
- Make sure the computer link module RD signal line is connected to the computer SD signal line.
- Check the multidrop line connection.

(2) Check point *2
- Make sure the computer link module SD signal line is connected to the computer RD signal line.
- Check the multidrop line connection.

13.4.4 When the 2-C/N LED (C/N LED) or 4-C/N LED (C/N LED) is turned ON

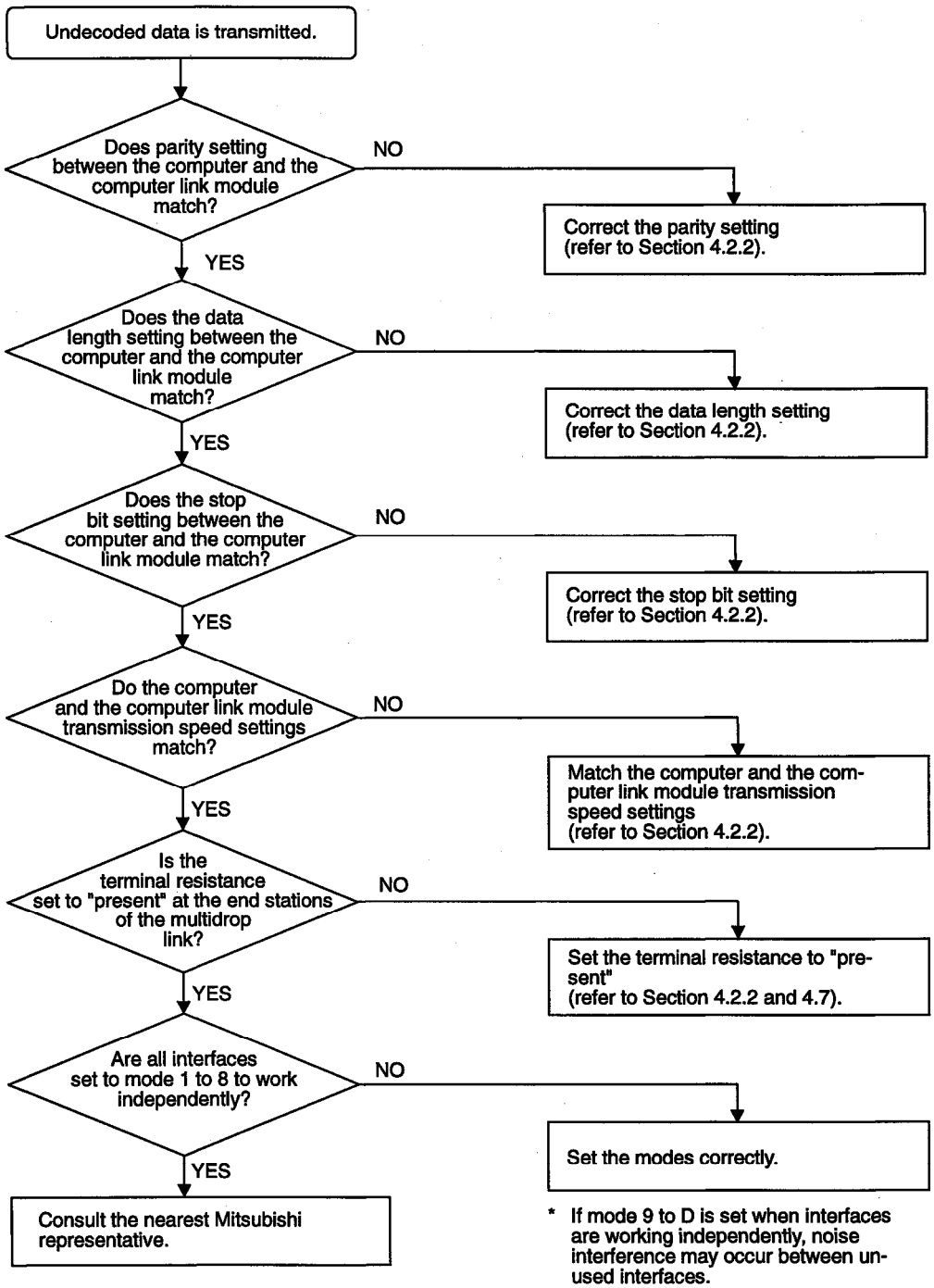


13.4.5 When communications sometimes fails



13.4.6 When undercoded data is transmitted

Use this flow chart when the computer link module (in response to data from the computer) transmits code and data which is not included in the control code.



* If mode 9 to D is set when interfaces are working independently, noise interference may occur between unused interfaces.

PRINTER FUNCTION

This part describes the registration, reading and output of messages when the printer functions are used with the computer link module.

14. SYSTEM CONFIGURATION AND AVAILABLE DEVICES

The printer functions of the computer link module is available for system configurations of which the printer- and computer-to-computer-link-module (PC CPU) ratios are 1:1 and 2:1 to 2:32.

Connect a printer which can be operated by the printer functions and a PC CPU to the RS-232C interface of the computer link module.

To the RS-422/485 interface (hereinafter called the RS-422 interface) of a computer link module, connect the computer and the PC CPU, which transmit and receive data between them using a dedicated protocol of the computer link function, in the ratio of 1:1 to 1:32 or m:n.

This section describes system configurations, and the printer functions and the computer link function available for such system configurations.

POINTS

(1) Among the computer link modules referred to in this manual, only the following types have the printer functions, and a printer or computer(s) can be connected to the interface(s) of each module:

(a) A1SJ71UC24-PRF, A1SJ71C24-PRF

- This type of module is equipped only with an RS-232C interface.
- The printer functions can be used only when the system is composed of a printer and a PC CPU.

(b) A2CCPUC24-PRF

- This type of module is equipped with an RS-232C interface and an RS-422/485 interface.
- The printer functions can be used for system configurations of which the printer- and computer-to-PC CPU ratios are 1:1, 2:1 to 2:32 or m:n.

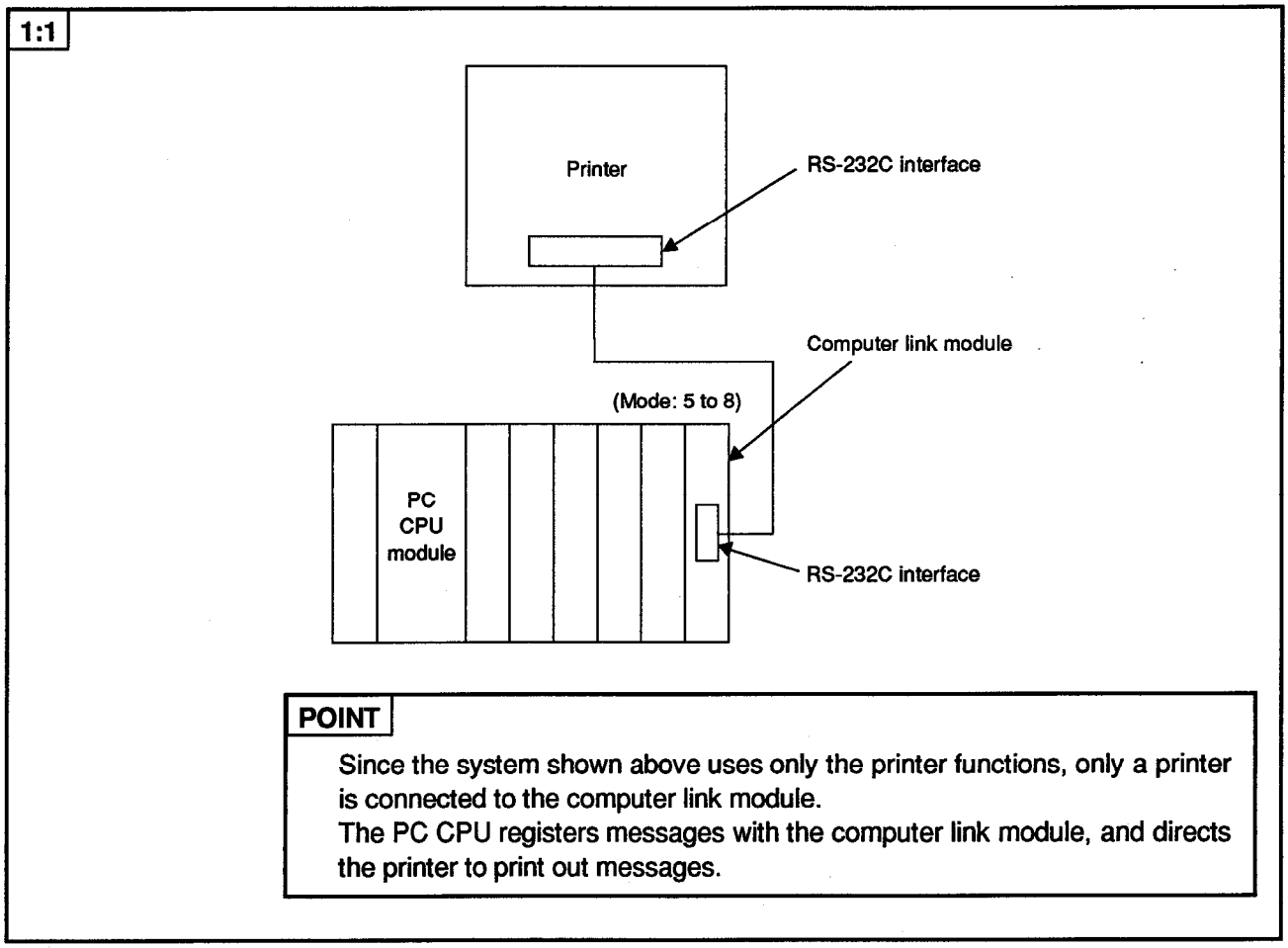
Note that some computer link modules cannot establish systems consisting of a printer or computers and PC CPUs (computer link modules in this section) in the ratios ([ ]:[ ]) specified in this section.

(2) For systems applicable to the computer link modules described herein, refer to the User's Manual (Hardware) for the computer link module used.

14.1 1 : 1 Ratio of a Printer to a PC CPU

(1) The system configuration for a 1:1 ratio of a printer to a PC CPU is shown in Fig. 14.1 below.

(Mode: [ ] — [ ]) in the figure indicates the range of setting set with the mode setting switch of an computer link module (refer to Section 4.2.1).



POINT

Since the system shown above uses only the printer functions, only a printer is connected to the computer link module.
The PC CPU registers messages with the computer link module, and directs the printer to print out messages.

Fig. 14.1 System Configurations (I)

(2) The following table shows the printer functions available when the system consists of a printer and a PC CPU:

(a) Functions available when using the PC CPU

		Available Functions	Interface Connected with Computer: RS-422	Interface Connected with Printer: RS-232C	Remarks
Data communications with computer link module	Printer function	Message registrations/read	O		For registering/reading fixed and free messages
Data transmission to printer		Printer output	O		Message output to printer
		Test output	O		For test output to printer

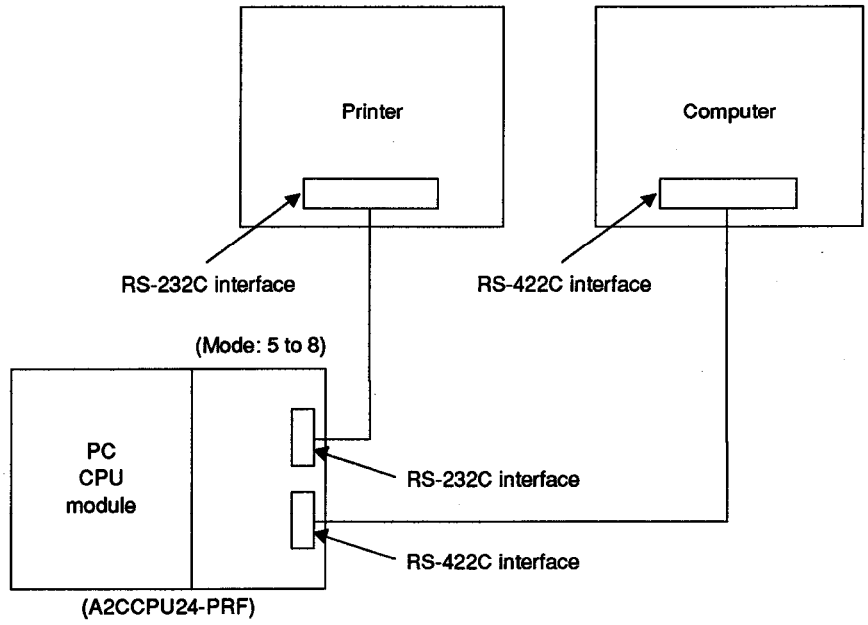
14.2 2 : 1 Ratio of a Computer and Printer to a PC CPU

(1) The system configuration for a 2:1 ratio of a computer and a printer to a PC CPU is shown in Fig. 14.2 below.

(Mode: [ ] to [ ]) in the figure indicates the range of setting designated with the mode setting switch of a computer link module (refer to Section 4.2.1).

2:1

(A combination of two systems each of which has a 1:1 configuration.)



POINTS

(1) The system shown above uses the RS-422 interface with one of dedicated protocols 1 to 4, and allocates the RS-232C interface to the printer functions.
Messages can be registered with the computer link module from the PC CPU and the computer.
Messages can be sent from the PC CPU to the printer.

(2) For computer linking with a computer using a dedicated protocol through the RS-422 interface, refer to the User's Manual (Computer Link Function).

Fig. 14.2 System Configurations (II)

(2) The following tables list the functions available when a computer and a printer are linked with the PC CPU to make a 2:1 configuration.

(a) Functions available when using a PC CPU

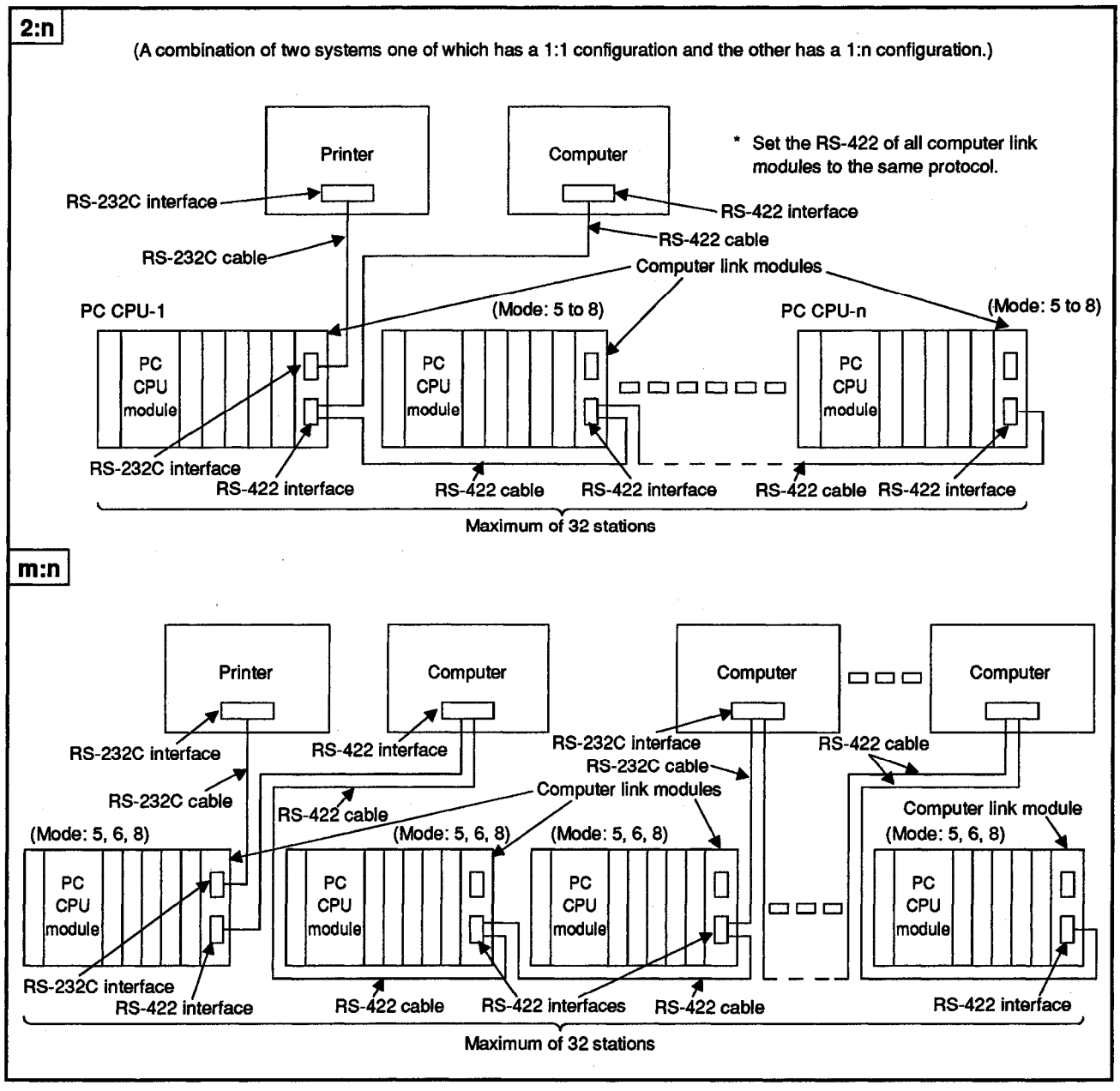
		Available Functions	Interface Connected with Computer: RS-422	Interface Connected with Printer: RS-232C	Remarks
Data communications with computer link module	Printer function	Message registrations/read	O		For registering/reading fixed and free messages
Data transmission to printer		Printer output	O		For message output printer
		Test output	O		For test output to printer
Data communications with computer	Dedicated protocols	On-demand	O		For transmitting data from PC CPU to computer
	No-protocol mode	Send/Receive	X		For data communications between PC CPU and external device
	Bidirec-tional mode	Send/Receive	X		For data communications between PC CPU and external device

(b) Functions available when using a computer

Available Functions				Interface Connected with Computer: RS-422	Interface Connected with Printer: RS-232C	Remarks
Data transmission to printer	Printer function	Printer output		X		For message output printer
		Test output		X		For test output to printer
Data communications with computer link module	(For printer function)	Message registration/read (by the use of a dedicated protocol)		O		For registering/reading fixed messages
Data communications with PC CPU	Dedicated protocols	Device memory	Read/Write	O		Including extension comments
			Test			
			Monitor			
		Extension file register	Read/Write	O		—
			Test			
			Monitor			
		Buffer memory (Computer link module of the self)	Read/Write	O		
		Special function module's buffer memory	Read/Write	O		
		Sequence/ microcomputer program	Read/Write	O		
		Comment	Read/Write	O		Including extension comments
		Parameter	Read/Write	O		—
		PC CPU	Remote RUN/Stop	O		
			PC CPU type read			
		Global	Input signal (X) ON/OFF	O		
		Self-loopback test	Transmission of received data	O		
	No-protocol mode	Send/Receive		X		For data communications between PC CPU and external device
	Bidirec-tional mode	Send/Receive		X		For data communications between PC CPU and external device

14.3 When the Computer- and Printer-to-PC CPU Ratios are 2:n and m:n

(1) Fig. 14.3 below shows system configurations of which the computer- and printer-to-PC CPU ratios are 2:n (n = max. 32 stations) and m:n (m and n = max. 32 in all).
(Mode: [ ] to [ ]) in the figure indicates the range of setting set with the mode setting switch of a computer link module (refer to Section 4.2.1).



POINTS

(1) The systems shown in the previous page use the RS-422 interface with one of dedicated protocols 1 to 4, and allocate the RS-232C interface to the printer functions.
Messages can be registered with the computer link module connected with the printer from the PC CPU connected with the printer and each computer.
Messages can be sent from the PC CPU connected with the printer to the printer.

(2) For computer linking with a computer using a dedicated protocol, refer to the User's Manual (Computer Link Function).

(2) The following tables list the functions available when the printers are linked with the PC CPU to make a 2:n/m:n configuration.

(a) Functioins available when using PC CPUs (station connected with printer)

		Available Functions	Interface Connected with Computer: RS-422	Interface Connected with Printer: RS-232C	Remarks
Data communications with computer link module	Printer function	Message registration/read	O		For registering/reading fixed and free messages
Data transmission to printer		Printer output	O		For message output printer
		Test output	O		For test output to printer
Data communications with computer	Dedicated protocols	On-demand	X		For transmitting data from PC CPU to computer
	No-protocol mode	Send/Receive	X		For data communications between PC CPU and external device
	Bidirectional mode	Send/Receive	X		For data communications between PC CPU and external device

(b) Functions available when using a computer

		Available Functions		Interface Connected with Computer: RS-422	Interface Connected with Printer: RS-232C	Remarks
Data transmission to printer	Printer function	Printer output		X		For message output printer
		Test output		X		For test output to printer
Data communications with computer link module	(For printer function)	Message registration/ read (by the use of a dedicated protocol)		O		For registering/reading fixed messages
Data communications with PC CPU	Dedicated protocols	Device memory	Read/Write	O		Including extension comments
			Test			
			Monitor			
		Extension file register	Read/Write	O		—
			Test			
			Monitor			
		Buffer memory (Computer link module of the self)	Read/Write	O		
		Special function module's buffer memory	Read/Write	O		
		Sequence micro-computer program	Read/Write	O		
		Comment	Read/Write	O		Including extension comments
		Parameter	Read/Write	O		—
		PC CPU	Remote RUN/Stop	O		
			PC CPU type read			
		Global	Input signal (X) ON/OFF	O		
		Self-loopback test	Trans-mission of received data	O		
	No-protocol mode	Send/Receive		X		For data communications between PC CPU and external device
	Bidirectional mode	Send/Receive		X		For data communications between PC CPU and external device

15. SPECIFICATIONS

This section describes the printer functions and the commands (for dedicated protocols) for registering or reading free and fixed messages with or from the computer, which will be sent to the printer.

15.1 Printer Function

15.1.1 Printer functions list

This section describes the printer functions.

Table 15.1 Printer Functions List

Function	Description	Reference Sections
Printer message registration and reading functions by a computer	Fixed messages of up to 80 characters can be registered and read out by using a CI (fixed message registration) command and a CJ (fixed message read) command in dedicated protocols 1 to 4 (modes 1 to4).	Section 17.3
Printer message registration and reading functions by a sequence program	Fixed messages or free messages of up to 80 characters can be registered and read out by using a sequence program.	Section 17.4
Printer output function	Fixed\free messages for designated data length can be output by a printer output request given from a sequence program.	Section 17.7
Printer test output function	Two kinds of test output are enabled by a printer output request given from a sequence program. (1) Registered fixed messages are output to the printer. (Registered message test output function) (2) ASCII codes (21H to 7FH) are output to the printer. (printer test function)	Section 17.5 Section 17.6

POINT

When using the following printer functions to send messages to the printer, refer to the corresponding sections:

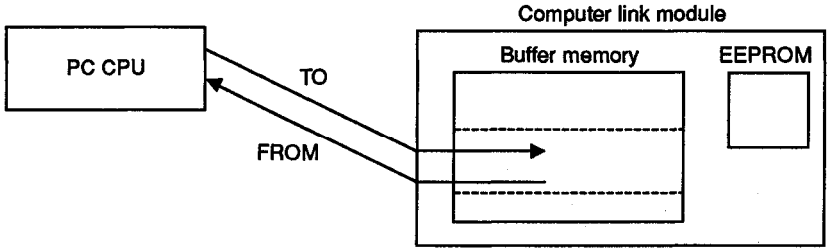
(1) Transmission control function
This function enables the computer link module to control data communications with the external device with a DC code or DTR/DSR signal.
Refer to Section 3.3 and 9.

(2) Half-duplex transmission
This function function enables the computer link module to prevent itself and the external device with RS and CD signals from transmitting data simultaneously to each other during data communications between them through the RS-232C interface.
Refer to Sections 3.4 and 10.

15.1.2 Free message and fixed message

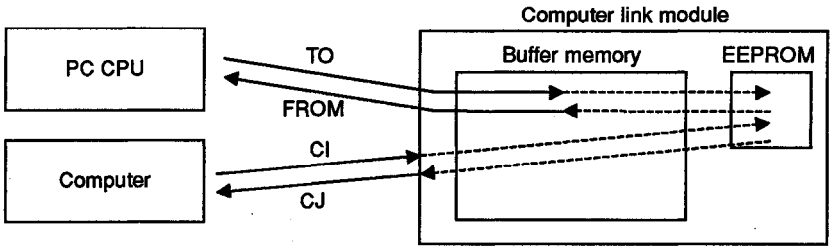
(1) Free message

- It is a message to be sent to the printer and registered in the computer link module buffer memory. Up to 31 free messages can be registered.
- To register free messages, designate addresses in the buffer memory with a TO instruction from the PC CPU. To read them, use a FROM signal.
- In the following output example using the printer functions, character strings of "O.K" and "Fault" are sent to the printer as free messages.



(2) Fixed message

- It is a message to be sent to the printer and registered in the computer link module EEPROM. Up to 400 fixed messages can be registered.
- To register fixed messages, designate messages number with a TO instruction from the PC CPU. To read them, use a FROM instruction. They can also be registered by designating message numbers with a CI command for dedicated protocols from the computer, or can be read with a CJ command.
- In the following output example using the printer functions, table frames, "Model", "Check Result" and character strings of model names ("A3UCPU", "A4UCPU") are registered as fixed messages and sent to the printer.



(3) Output example of table by the printer functions

(a) Register table frames, "Model", "Check Result" and model names as fixed messages.

Model	Check Result
A3UCPU	
A4UCPU	

(b) Register check results "O.K" and "Fault" as free messages.

(c) The above fixed and free messages can create such a table as shown below:

Model	Check Result
A3UCPU	O.K
A4UCPU	Fault

15.1.3 List of commands for registering or reading messages from the computer (for dedicated protocols)

This section describes the ACPU common commands for registering or reading messages, which will be sent to the printer by the printer functions, from the computer using one of dedicated protocols 1 to 4.

Table 15.2 List of Functions Available with Dedicated Protocols

Item	Command		Processing Contents	Number of Points Processed per Communication	Status of PC CPU		
	Symbol	ASCII Code			During Stop	During RUN	
						Write Enabled	Write Disabled
Message Registration	CI	43H, 49H	Registration of fixed message data (for up to 80 characters)	40 words	O	O	O
Message Read	CJ	43H, 4AH	Read of fixed message data	40 words	O	O	O

POINTS

(1) When the computer is connected to the RS-422 interface of the A2CCPUC24-PRF, using a dedicated protocol for the computer link function makes it possible to register or read the above messages from the computer and to gain access to the PC CPUs shown in the User's Manual (Computer Link Function).

(2) This section describes only the commands for the printer functions. For commands for the computer linking dedicated protocols and their applications, refer to the User's Manual (Computer Link Function).

15.2 RS-232C Interface Specifications

For the specifications of the computer link module RS-232C interface (including the connector and RS-232C cable specifications) to which a printer will be connected, refer to Section 3.7 of the User's Manual (Computer Link Function).

REMARK

The RS-232C connectors of all the computer link modules with the printer functions (A1SJ71UC24-PRF, A1SJ71C24-PRF, A2CCPUC24-PRF) described herein are a 9-pin type.

15.3 RS-422 Interface Specifications

For the specifications of the RS-422/RS-485 interface (terminal block specifications, RS-422 cable specifications) of the computer link module (A2CCPUC24-PRF) for computer linking using the printer functions and a dedicated protocol, refer to Section 3.8 of the User's Manual (Computer Link Function).

15.4 List of I/O Signals to the PC CPU

The computer link module I/O signals for the printer functions to be sent to or received from the PC CPU are as shown below.

The number (n) in the X and Y signal names depends on the I/O number of the slot in which the A1SJ71UC24-PRF or A1SJ71C24-PRF is loaded. (Example: When the computer link module is loaded in slot 0 in the main base unit Xn0 → X0)

The A2CCPUC24-PRF I/O signals for computer linking are fixed as X/Y1E0 to 1FF.

(1) Input signals (Computer link module → PC CPU)

Input signals are turned ON and OFF by the computer link module.

Table 15.3 Input Signals List

Input Signal	Signal Name	Description	Reference Sections
Xn7	Computer link module READY signal	(1) Goes ON when the computer link module is ready (after the power is turned ON, the PC CPU is reset, or the mode is switched). Turns ON when the computer link module becomes READY after the PC CPU is reset after (a) power to the PC CPU was turned ON, or (b) the mode was switched. (Turns ON a few seconds after the power is turned ON.) Turns OFF when an error (which discontinues the computer link module's operation) occurs. (2) Used as a communication READY signal when printer function is used.	——
Xn8	Printer processing completed	Turns ON when the message registration, read, or output to the printer is completed after Y(n+1)8 is turned ON. Turns OFF when Y(n+1)8 is turned OFF.	17.4 to 17.7
XnD	Watch dog timer error	Turns ON when a computer link watch dog timer error occurs or when the mode setting switch is improperly set. Remains OFF during normal operation.	——

(2) Output signals (PC CPU → Computer link module)

Output signals are turned ON and OFF by the sequence program.

Table 15.4 Output Signals List

Output Signal	Signal Name	Description	Reference Sections
Y(n+1)8	Printer processing request	Starts message registration, read, or output to the printer by turning ON this signal. With the Xn8 (printer processing completed) turned ON, the Y(n+1)8 turns OFF.	17.4 to 17.7
Y(n+1)C	Printer processing interrupt	Interrupts output to the printer by turning ON this signal. output to the printer by turning OFF this signal.	——

POINTS

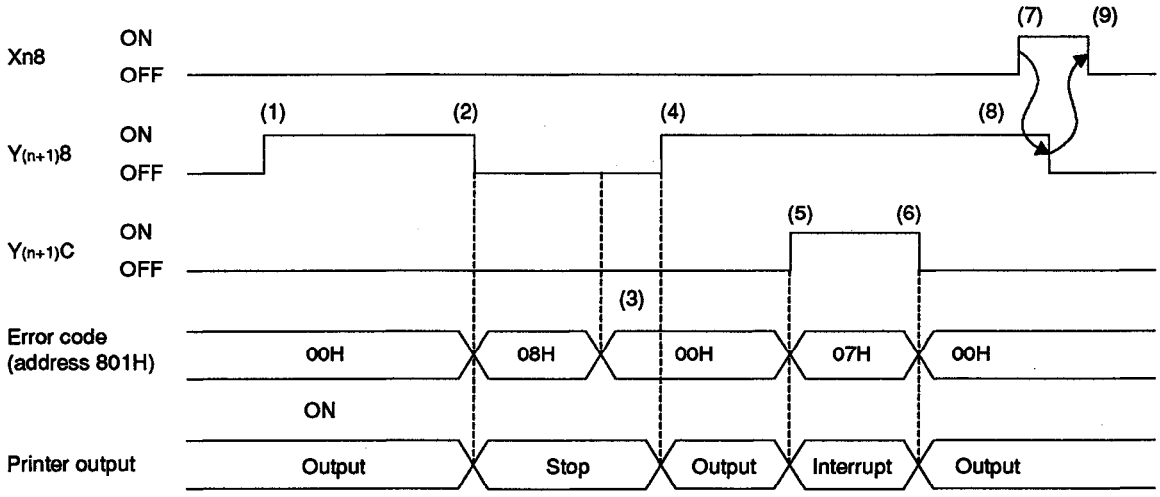
(1) When a computer is connected to the computer link module used, using a dedicated protocol for the computer link function makes it possible to register or read messages for the printer function from the computer and to gain access to the PC CPUs shown in the User's Manual (Computer Link Function).
This section describes only the I/O signals for the printer functions. For I/O signals for computer linking and their applications, refer to the Computer Link Function section.

(2) In this manual, I/O signal numbers for the printer function are those used for A1S71UC24-PRF and A1SJ71C24-PRF unless otherwise specified. If you use A2CCPUC24-PRF, the numbers should be regarded as indicated below.

	(Nos. in manual)		(To be regarded as)
Input signals	Xn7, Xn8, XnD	→	X1E7, X1E8, X1ED
Output signals	Y(n+1)8, Y(n+1)C	→	Y1F8, Y1FC

REMARK

Use of Xn8, $Y_{(n+1)}8$, and $Y_{(n+1)}C$ when printer function is used.



• Operation contents

(1) When $Y_{(n+1)}8$ is turned ON, the message output to the printer is started.
(2) When $Y_{(n+1)}8$ is turned OFF, the message output to the printer is forcibly completed. At this time, an error(08H) occurs.
(3) 00H is written to buffer address 801H and an error is reset.
(4) When $Y_{(n+1)}8$ is turned ON, the message output to the printer is started.
(5) When $Y_{(n+1)}C$ is turned ON, the message output to the printer is interrupted. At this time, an error(07H) occurs.
(6) When $Y_{(n+1)}C$ is turned OFF, the interrupted messages are output to the printer. At this time, an error is automatically reset to 00H.
(7) When the message output is completed, X_n8 is turned ON.
(8) $Y_{(n+1)}8$ is turned OFF by a sequence program.
(9) When $Y_{(n+1)}8$ is turned OFF, Xn8 is turned OFF.

15.5 Buffer Memory Applications and Allocation

The term "buffer memory" used in this manual refers to a memory area of an a computer link module used to store the control and communications data which is transmitted between an external device (e.g., a computer or a printer) and a PC CPU.

The buffer memory can be accessed from the sequence program by using the FROM/TO instruction.

The buffer memory can be accessed from a computer by using the buffer memory read/write command (CR, CW) with dedicated protocols 1 to 4 and the message registration/read commands (CI, CJ) for the printer functions.

(1) Buffer memory applications

There are two types of buffer memory area. One area may be used freely by the user, but the other area has a special application.

(a) User area (Address 0H to FFH, 120H to 7FFH)

It is used for the computer link function.

(b) Specific use area (Address 100H to 11FH, 800H to DFFH)
..... when printer function is used

The applications of this memory area are fixed. They are used to determine the data communications format and to change the allocation of the memory area for section (a) above.

The areas at buffer memory addresses 800H to DFFH are specific use areas exclusively for the printer functions.

When the power is turned ON or the PC CPU is reset, default values are written to this special applications area.

Default values can be changed to suit the purposes and applications of data transmission and the specifications of the external device.

For areas among the specific use areas at addresses 100H to 11FH, which allow data to be read or written even when a dedicated protocol for the computer link function or the printer functions are used, refer to Section 3.10 of the User's Manual (Computer Link Function) and the reference sections mentioned in the table of the buffer memory addresses.

(2) Buffer memory allocation

The buffer memory consists of 16-bit addresses. The buffer memory has no back-up battery.

The buffer memory address names and values for each address are listed in the following table.

IMPORTANT

Among buffer memory addresses 100H to 11FH and 800H to DFFH, those with a note of "system area (unavailable)" are used by the system. The user should not write data to the areas. Data written to this area will prevent correct operation of the computer link module.

The following table shows the contents of the buffer memory allocation

Table 15.5 Buffer Memory

Addresses	Buffer Memory Address Names			Default Values	Related Mode: Dedicated Protocol	Related Mode: Printer function	Related Mode: (Reference Sections)
0H 1H to 7FH 80H 81H to FFH	User area (256 words)	Area for default	No-protocol send data length storage area No-protocol send buffer memory area (Send data storage area) No-protocol received data length storage area. No-protocol receive buffer memory area (Received data storage area)	No-protocol send area 0 No-protocol receive area	○	—	5.9 5.14
100H	Area to specify receive completed code in no-protocol mode			0D0AH (CR, LF)	—	—	
101H	Error LED display OFF state storage area			0	△	△	8.1
102H	Error LED turn OFF request area			0	●	●	
103H●	Area to specify word or byte units in no-protocol mode			0 (words)	●	—	5.2.1(2)(a)
104H	Area to specify head address of send buffer memory for protocol mode			0	—	—	
105H	Area to specify send buffer size for no-protocol mode			80H			
106H	Area to specify head address of receive buffer memory for no-protocol mode			80H			
107H	Area to specify receive buffer size for no-protocol mode			80H			
108H	Area to specify receive completion 1 on data length in no-protocol mode			127 (words)			
109H	Area to specify head address of on-demand buffer memory			0	●	—	5.14
10AH	Area to specify on-demand buffer size			0	●	—	
10BH●	Area to specify RS-232C CD terminal check			—	●	●	5.2.1(2)(b) 17.2.1(2)(a)
10CH	Storage area for on-demand errors			0	△	—	5.14
10DH	Receive data clear request area for no-protocol mode			0	—	—	
10EH	System area (unavailable)			—	—	—	
10FH●	RS-232C communications mode setting area			0 (Full-duplex transmission)	●	●	10.4
110H●	Simultaneous send priority/non-priority setting area			0 (Priority)	●	●	
111H●	Send method setting area when transmission is resumed			0 (No retransmission)	●	●	
112H	Bidirectional mode setting area			0 (No-protocol mode)	—	—	
113H	Time-out check time setting area			0 (Infinite)			
114H	Simultaneous transmission data valid/invalid setting area			0 (Data valid)			
115H	Check sum enable/disable setting area			0 (Check sum enabled)			
116H	Data send error storage area			0			
117H	Data receive error storage area			0			

Table 15.5 Buffer Memory (Continued)

Addresses	Buffer Memory Address Names	Default Values	Related Mode: Dedicated Protocol	Related Mode: Printer function	Related Mode: (Reference Sections)
118H	Operation mode storage area	Set number of switch	Δ	Δ	8.3.3
119H	Mode switching specification area	0 (No switching)	O	O	12.4 12.5
11AH•	Transmission control specification area (DTR/DSR control, DC code control)	0 (DTR/DSR control)	●	●	9.3
11BH•	DC1/DC3 control code specification area	1311H	●	●	
11CH•	DC2/DC4 control code specification area	1412H	●	●	
11DH	RS-232C signal state storage area	—	Δ	Δ	8.2
11EH	Mode setting switch/Station number setting switch positions storage area	—	Δ	Δ	8.3.1
11FH	Transmission specification setting switch positions storage area	—	Δ	Δ	8.3.2
120H to 7FFH	User free area (1760 words)	0	O	—	5.9 5.14
800H to DF6H	Specific use area for printer function For details of allocation, refer to the following page.	(Shown on the following page)			
DF7H to DFFH	System area (Unavailable)	—	—	—	

The ●, O, Δ and — symbols in the table indicate the following:

● : PC CPUs can read/write data from/to this area, and computers can read data from this area.

O : PC CPUs and computers can read/write from/to this area.

Δ : PC CPUs and computers can only read from this area.

— : PC CPUs and computers do not need to read/write form/to this area.

IMPORTANT

Change the default values marked by the dot symbol (•) attached to the right of the address only when the READY signal of the computer link module is turned ON.

Table 15.6 List of Buffer Memory Specific Use Areas for Printer Functions

Addresses	Buffer Memory Address Names			Default Values	Related Mode: Dedicated Protocol	Related Mode: Printer Function	Related Mode: (Reference Sections)
800H	Printer function designation area			0	—	●	17.2.1(2)(b) 17.4 to 17.7
801H	Printer function error storage area				—	●	17.2.1(2)(c) 17.4 to 17.7
802H	Output status storage area				—	Δ	17.2.1(2)(d)
803H to 81FH	System area (Unusable)			—	—	—	—
820H	Schedule area	CR/LF output designation area		0	—	●	17.2.1(2)(e) 17.2.4(4)
821H		Output pointer designation area					
822H		Output quantity designation area					
823H		Output number designation area	1st				
824H to 887H			2nd to 100th				
888H to 89FH	System area (Unusable)			—	—	—	—
8A0H	Fixed message access area	Message data length designation area		0	—	●	17.2.1(2)(f) 17.2.4(4) 17.3 17.4.1 17.4.2
8A1H		Message number designation area					
8A2H to 8C9H		Fixed message registration data storage area					
8CAH to 8FFH	System area (Unusable)			—	—	—	—
900H	Free message registration area *1	Message data length designation area	Registration No. 1	0	—	●	17.2.1(2)(g) 17.2.4(4) 17.4.3 17.4.4
		Free message area					
to		to					
DF6H		Message data length designation area	Registration No. 31				
		Free message area					

*1 The following table shows registration numbers and their corresponding addresses in registering free messages from the PC CPU.

Address = (Registration number (n) - 1) x 29H + 900H n=1 to 3+

Registration No.	Message Data Length Designation Area	Free Message Area
1	900H	901H to 928H
2	929H	92AH to 951H
3	952H	953H to 97AH
4	97BH	97CH to 9A3H
5	9A4H	9A5H to 9CCH
6	9CDH	9CEH to 9F5H
7	9F6H	9F7F to A1EH
8	A1FH	A20H to A47H
9	A48H	A49H to A70H
10	A71H	A72H to A99H
11	A9AH	A9BH to AC2H
12	AC3H	AC4H to AEBH
13	AECH	AEDH to B14H
14	B15H	B16H to B3DH
15	B3EH	B3FH to B66H
16	B67H	B68H to B8FH
17	B90H	B91H to BB8H
18	BB9H	BBAH to BE1H
19	BE2H	BE3H to C0AH
20	C0BH	C0CH to C33H
21	C34H	C35H to C5CH
22	C5DH	C5EH to C85H
23	C86H	C87H to CAEH
24	CAFH	CB0H to CD7H
25	CD8H	CD9H to D00H
26	D01H	D02H to D29H
27	D2AH	D2BH to D52H
28	D53H	D54H to D7BH
29	D7CH	D7DH to DA4H
30	DA5H	DA6H to DCDH
31	DCEH	DCFH to DF6H

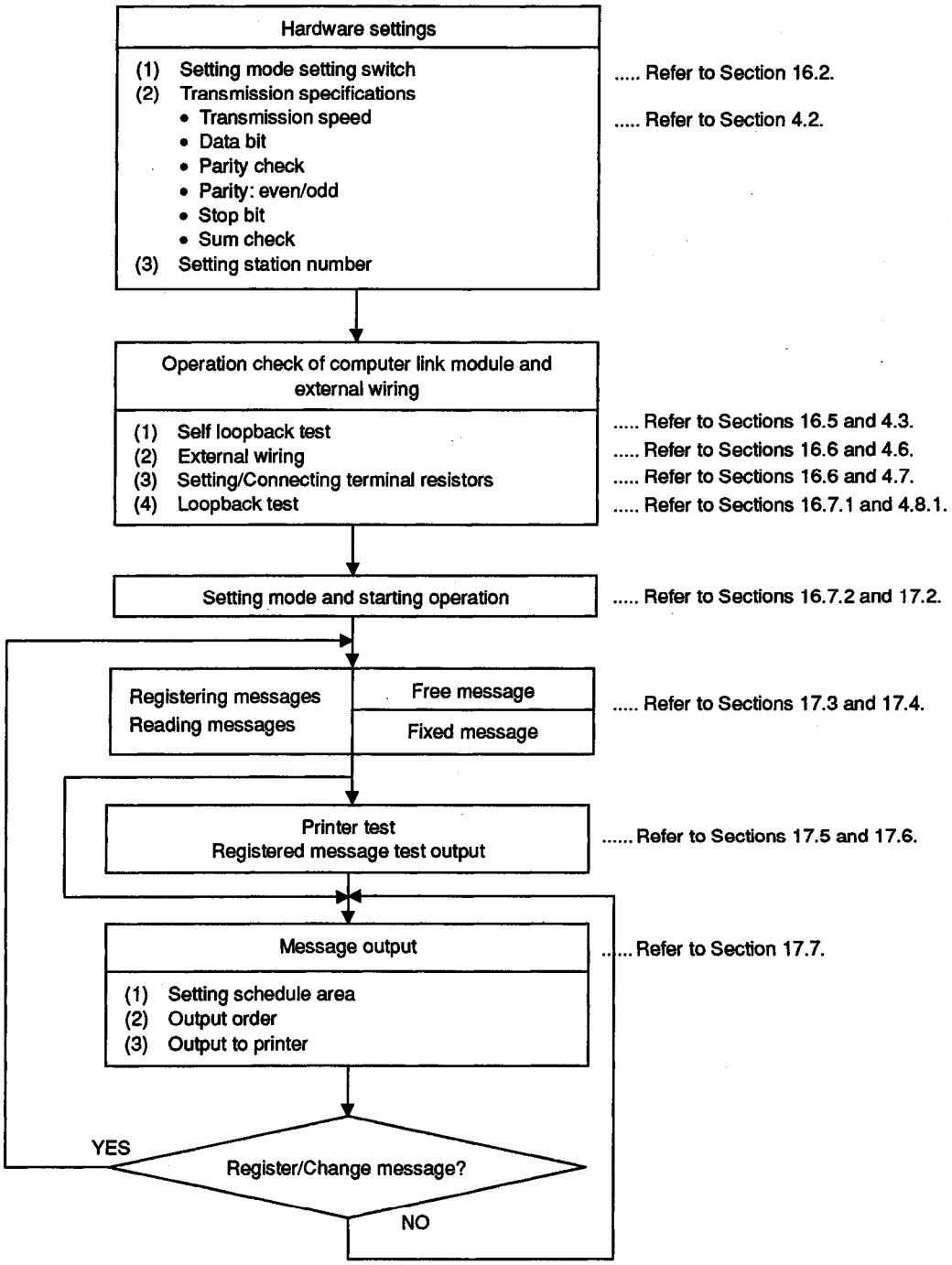
POINT

When a computer is connected to the computer link module used, using a dedicated protocol for the computer link function makes it possible to register or read messages for the printer functions from the computer and to gain access to the PC CPUs shown in the User's Manual (Computer Link Function).
This section describes only the buffer memory addresses exclusively for the printer functions. For buffer memory addresses for the computer link function and their applications, refer to the reference sections mentioned in the table of the buffer memory addresses.

16. SETTING AND PROCEDURES BEFORE OPERATION

16.1 Outline of Procedure Before Operation

This section outlines the procedure, from making settings to starting up the computer link module, to use the printer function.



16.2 Switch Setting

This section describes the settings of the switches on the computer link module necessary for the printer functions.
Set the transmission specifications according to the specifications of the printer used.

POINTS

(1) After changing the switch settings described in this section, turn ON then OFF the power to the PC CPU, or reset the PC CPU.
(2) The positions and shapes of the switches described in this section are different depending on the computer link module.
Check the positions and shapes with Sections 4.1.2 and 4.2 of the User's Manual (Computer Link Function), and set the switches.

	Setting Switch				Setting Position			Reference Section
					A1SJ71 UC24-PRF	A1SJ71 C24-PRF	A2CCPU C24-PRF	
(1)	Mode setting switch				5		5 to 8 *2	4.2.1
(2)	Transmission specification setting	A1SJ71-UC24 PRF	A1SJ71 C24-PRF	A2CCPU C24-PRF				
	Transmission speed setting	SW05 to SW07		SW11 to SW13	*1			4.2.2
	Data bit setting	SW08		SW14				
	Parity bit setting	SW09		SW15				
	Even/Odd parity setting	SW10		SW16				
	Stop bit setting	SW11		SW17				
	Sum check setting	SW12		SW18	OFF		OFF *2	
	Main channel setting	–		SW19	–		OFF	
	Write during RUN enabled/disabled setting	SW04		SW20	OFF		OFF *2	
(3)	Setting of terminal resistor setting pins				–		C *3	
(4)	Setting of station number setting switches				–		00 *2	4.2.3

– : setting switch unequipped

*1 Set the switches according to the specifications of the printer.
*2 When a computer, which executes data communications using a dedicated protocol for the computer link function, is connected to the RS-422 interface, set the switches according to the specifications and set number of it.
*3 Set the pins to A or B if the computer link module is a terminal station when a computer is connected to the RS-422 interface. (Refer to Sections 4.2.2 and 4.7)

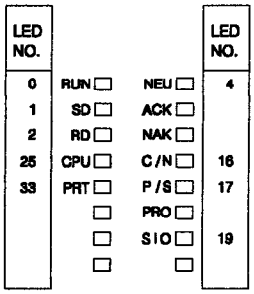
POINT

Set the mode setting switch to one of the numbers specified above.
If not, error 09H will occur when the PC CPU turns ON the printer processing request signal ($X_{(n+1)8}$) and the request is executed. (The printer processing completed signal (X_{n8}) will not turn ON.)
In case of error 09H, reset the mode setting switch to the proper number and start up the computer link module again.

16.3 Description of the Indicator LEDs

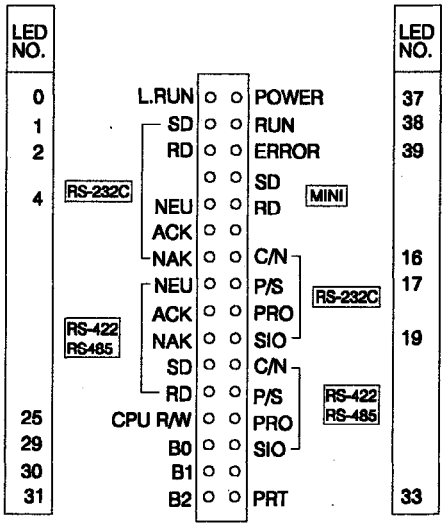
(Indicator LEDs on the A1SJ71UC24-PRF and A1SJ71C24-PRF)

(For description) (For description)



The LED numbers shown above are just for description.
The actual modules do not bear such numbers.
The LED numbers correspond to the numbers in Section 4.3.
The LEDs without a number are those which are not used or necessary for the printer functions.

(Indicator LEDs on the A2CCPU-PRF)



LED NO.	LED Name *1		Indication of LED	LED ON (Comes On/Flickers)							LED OFF (Goes Off)	Initial Status of LED
0	RUN	L.RUN	Normal run	Normal							Error	ON
1	SD		Data transmission status at RS-232C	Flickers during transmission of data								OFF
2	RD		Data receive status at RS-232C	Flickers during receipt of data								OFF
4	NEU		Dedicated protocol status	Improper setting of the mode setting switch							Normal	OFF
16	C/N		Result of communications between RS-232C and PC CPU	Refer to (4)							Normal	OFF
17	P/S		Parity/sum check error at RS-232C	Parity/Sum check error							Normal	OFF
19	SIO		SIO error at RS-232C	Overrun, framing error							Normal	OFF
25	CPUR/W	CPU	Status of communications with PC CPU	Flickers during communications with PC CPU (ON at no communications)								ON
			Transmission speed (BPS)	300	600	1200	2400	4800	9600	19200		*2
29	B0		Transmission speed setting	OFF	ON	OFF	ON	OFF	ON	OFF		
30	B1			OFF	OFF	ON	ON	OFF	OFF	ON		
31	B2			OFF	OFF	OFF	OFF	ON	ON	ON		
33	PRT		Printer message output	Comes ON when a printer message is output								OFF
37	POWER		Normal power supply	Normal							Error	ON
38	RUN		PC CPU run	ON: The sequence program is executed with the RUN key switch set in the RUN position. (The LED remains ON in case of error that the sequence program continues to be executed.) OFF: (1) The power is not turned on. (2) The RUN key switch is set in the STOP position. (3) A remote stop is set. (4) A remote pause is set. Flickers: (1) An error of suspending the execution of the sequence program was detected in a self-diagnosis. (2) A latch is cleared.									OFF

LED NO.	LED Name		Indication of LED	LED ON (Comes On/Flickers)	LED OFF (Goes Off)	Initial Status of LED
39	ERROR		PC CPU error	Error detection status in a self-diagnosis. ON: An error was detected in a self-diagnosis. (It remains OFF in case of error for which "OFF" is selected in setting the LED indication priority.) OFF: Normal Flickers: The annunciator (F) is turned ON by the sequence program.		OFF

*1 The LEDs, which have two names in the LED column of the above table, are represented by the left names in this manual. (LED No. 0 with the names RUN and L.RUN, for example, is called RUN.)

*2 The LEDs come ON or go OFF according to the transmission speed setting of the transmission specification setting and main channel setting switches.

(1) LEDs C/N to SIO (LED Nos.16 to 19) light when an error occurs.

The ON/OFF status of the LED Nos. 16 to 19 are stored in the buffer memory at address 101H. The status can be read using the PC CPU instruction which permits checking by a sequence program.

(Section 13 gives details about processing when an error is indicated.)

(2) After any LED C/N to SIO (LED Nos. 16 to 19) is ON, they remain ON even when the cause of the error is eliminated.

It is necessary to send a turn-off request to address 102H of the buffer memory using the sequence program TO instruction to turn OFF the LED.

(Refer to Section 8.1)

(3) LEDs RUN to NEU (LED Nos. 0 to 4), CPU R/W (LED No.25) and PRT (LED No. 33) light corresponding to the relevant status.

(4) LEDs C/N (LED No. 16) light in the following circumstances:

(a) When the computer link module attempts to make an illegal access while the PC CPU is running (a write during program execution, for example).

(b) During abnormal PC CPU access.

(5) The LED initial state means the state when the computer link module READY signal (Xn7) is ON after the power is turned, the PC CPU is reset or the mode is switched.

16.4 Loading and Installation

For general precautions for handling computer link modules, from unpacking to installation, and the desirable installation environment, refer to Section 4.4 of the User's Manual (Computer Link Function).
For details of the loading and installation of the computer module to be used, refer to its User's Manual.

16.5 Self-Loopback Test

The self-loopback test function is used to check the computer link module with no external device connected to see if its functions for data communications with an external device or PC CPU works properly.
For details of the self-loopback test procedure, functions to be checked and checking results, refer to Section 4.5 of the User's Manual (Computer Link Function).

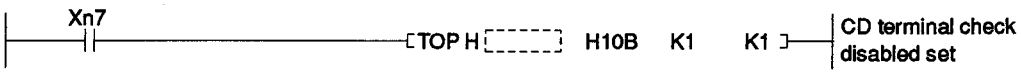
16.6 Connecting External Devices to the Computer Link Module

Precautions for connecting a printer to the RS-232C interface of the computer link module and their connections are described in Section 4.6 of the User's Manual (Computer Link Function).
Connect the printer cable according to either of the following sections, depending on whether the printer can turn ON and OFF the computer link module CD signal.

(1) For a printer which can turn ON and OFF the CD signal
.....Refer to Section 4.6.2 (2) (a).

(2) For a printer which cannot turn ON and OFF the CD signal
.....Refer to Section 4.6.2 (2) (b).

To connect a printer incapable of turning ON and OFF the computer link module CD signal, write the following sequence program (for details, refer to Section 17.2.1 (2) (a)):



REMARKS

(1) The RS-232C connectors of all the computer link modules with the printer functions (A1SJ71UC24-PRF, A1SJ71C24-PRF, A2CCPUC24-PRF) described herein are a 9-pin type.
(2) The specifications of the computer link module RS-232C interface (including the connector and RS-232C cable specifications) to which a printer will be connected are shown in Section 3.7 of the User's Manual (Computer Link Function).
(3) For the connection of a computer for computer linking with a dedicated protocol to the A2CCPUC24-PRF to use the printer functions, refer to Section 4.6.3.
The specifications of the RS-422/485 interface (including the terminal block and RS-422 cable specifications) are shown in Section 3.8 of the User's Manual (Computer Link Function). .

16.7 Setting the Operation Mode and Starting Operation

After the computer link module proves normal and an external device is connected to it, the printer functions become available.
Sections 16.2 through 16.6 describe the flow of steps, from the completion of each operation to the execution of the printer functions.

16.7.1 Loopback test

The loopback test function is to check the connection between the computer and the computer link module as well as the communications functions by the use of dedicated protocols 1 to 4 and a dedicated command (TT).
Before reading or writing fixed or free messages for the printer functions from or to the computer, conduct a loopback test described in Section 4.8.1, if necessary.

16.7.2 Setting the mode

After connecting a printer or computer to the computer link module and checking the communications functions, set (or switch) a mode so that the RS-232C interface of the computer link module will be put in the no-protocol mode.
The available modes and their mode numbers are as shown in the table below.
Any mode can be set by the mode setting switch or by the mode switching function.
For details of the mode setting switch, refer to Section 4.2.1. After setting a mode, reset the power to the PC CPU or the PC CPU itself, and start up the computer link module again.
To set a mode by the mode switching function, follow Section 12, and start up the computer link module again

Mode Setting Switch Number	Mode Settings		A1SJ71 UC24-PRF	A1SJ71 C24-PRF	A2CCPU C24-PRF
	RS-232C	RS-422			
0	Unusable		–	–	–
1	Protcol 1	No-protocol	–	–	–
2	Protcol 2	No-protocol	–	–	–
3	Protcol 3	No-protocol	–	–	–
4	Protcol 4	No-protocol	–	–	–
5	No-protocol	Protcol 1	O	O	O
6	No-protocol	Protcol 2	–	–	O
7	No-protocol	Protcol 3	–	–	O
8	No-protocol	Protcol 4	–	–	O
9	No-protocol	No-protocol	–	–	–
A	Protcol 1 ◄——►	Protcol 1	–	–	–
B	Protcol 2 ◄——►	Protcol 2	–	–	–
C	Protcol 3 ◄——►	Protcol 3	–	–	–
D	Protcol 4 ◄——►	Protcol 4	–	–	–
E	Unusable		–	–	–
F	For loop-back test of single module				

O: Can be set – : Cannot be set

16.7.3 Writing values to buffer memory specific use areas and starting operation

When mode setting and restart-up of the computer link module are completed, the printer functions can be used.
Execute the printer functions according to Section 17.
Regarding the buffer memory specific use areas of the which set values must be changed (written) when the computer link module READY signal (Xn7) is ON (the areas indicated by • in Sections 3.10 and 15.5), follow the procedures described in the sections listed below:

(1) When a computer for computer linking with a dedicated protocol is also connected.....Section 5.2.1

(2) When only a printer is connected .....Section 17.2.1

16.8 Maintenance and Inspection

There is no special need to inspect the computer link module alone, however, to keep the whole system in the optimum condition, inspect it for the points specified in the PC CPU User's Manual.

17. MESSAGE PRINTING METHOD USING PRINTER FUNCTIONS

This section describes the message output method using the printer functions.

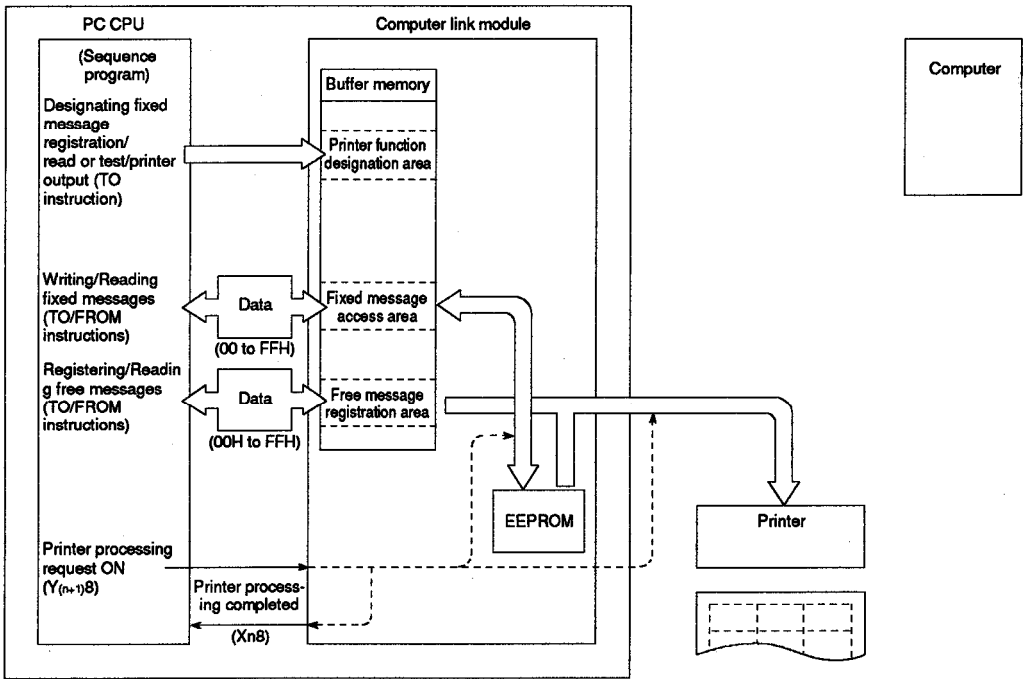
17.1 Flow of Data When the Printer Functions are Used

The following diagrams show the flow of data when registering or writing messages from the PC CPU or computer and when sending messages from the PC CPU to the printer.

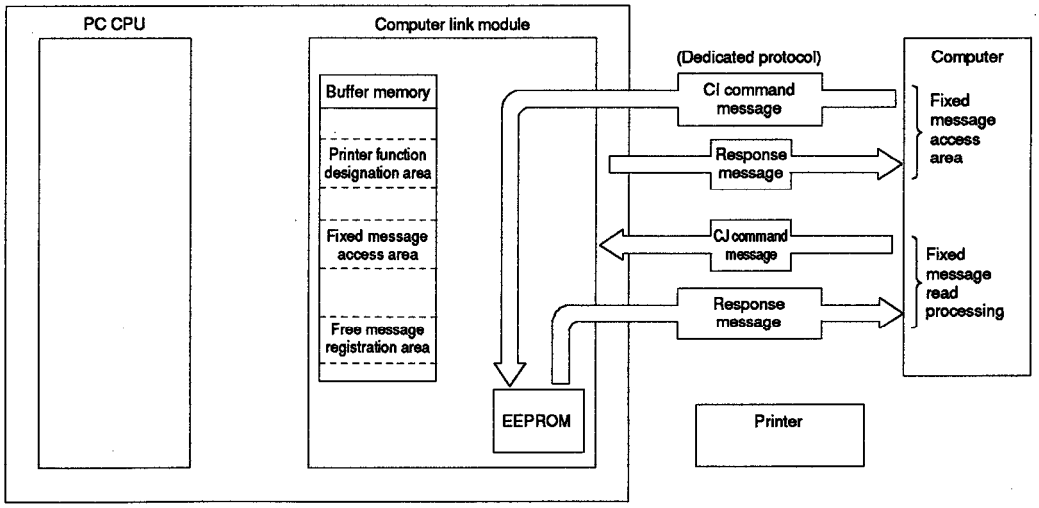
The computer link module registers messages designated by the PC CPU or computer as they are.

The computer link also sends out registered messages to the printer in the order in which they are designated.

(1) When registering/reading/sending messages to the printer or testing the printer from the PC CPU



(2) When registering/reading messages from the computer



17.2 Precautions Before Programming

This Section gives the precautions to take before starting the programming to use a printer function.

17.2.1 Reading/Writing data from/to buffer memory specific use areas

To use the printer functions, a sequence program and a computer program for reading or writing data from or to the buffer memory are required. (A list of the buffer memory addresses is shown in Sections 3.10 and 15.5.)

Before carrying out the following operations, read or write data from or to the buffer memory, if necessary.

Every time the computer link module is turned ON, the default values are stored in the buffer memory specific use areas.

	Reading and Writing Operations that Need Sequence and Computer Programs	Reference Section
(1)	To change the default value set to the buffer memory specific use area of the computer link module to communicate data with the computer using a dedicated protocol	Section 5.2.1 (2)
(2)	To register a fixed message from the computer	Section 17.3.2
(3)	To read a fixed message out to the computer	Section 17.3.3
(4)	To register a fixed message from the PC CPU	Section 17.4.1
(5)	To read a fixed message out to the PC CPU	Section 17.4.2
(6)	To register a free message from the PC CPU	Section 17.4.3
(7)	To read a free message out to the PC CPU	Section 17.4.4
(8)	To conduct a printer test from the PC CPU	Section 17.5
(9)	To test registered message output from the PC CPU	Section 17.6
(10)	To send a registered message from the PC CPU to the printer	Section 17.7
(11)	To read the LED ON/OFF statuses of the computer link module or turn OFF LEDs during computer linking	Section 8
(12)	To read the module/signal status during computer linking	Section 8
(13)	To execute the transmission control with the external device using the DC code	Section 9
(14)	To execute half-duplex transmission on the RS-232C interface of the computer link module	Section 10

(1) Precautions on reading/writing the buffer memory specific use areas

(a) The buffer is not backed up by a battery.

All data in buffer memory is reset to the default values when power is turned ON, when the PC CPU is reset, or when the mode is switched. Data changed from the default values must be written whenever any of these events takes place.

(b) Data can be written to the specific use area (100H to 11FH, 800H to DFFH) excluding the mode switching area only by using a TO instruction in a sequence program.

(c) Once the printer functions are used, the areas at buffer memory addresses 800H to DFFH become specific use areas exclusively for the functions. (They are user free areas when the computer link module is first turned ON.)

(d) For reading or writing fixed messages from or to the computer with a dedicated protocol or for reading or writing data from or to the PC CPU, refer to Section 5.2.1 of the User's Manual (Compute Link Function).

(2) Reading or writing data from or to the buffer memory specific use areas

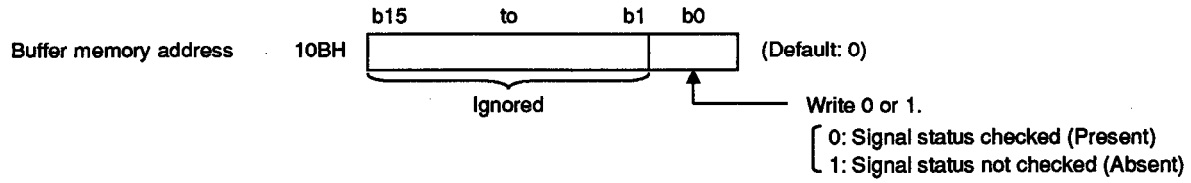
For reading or writing data from or to the buffer memory specific use areas in the computer link module in order to utilize the printer functions, proper sequence programs must be written according to the following.

Examples of programs for reading or writing data from or to the buffer memory specific use areas for the printer functions are shown in the sections from 17.4.

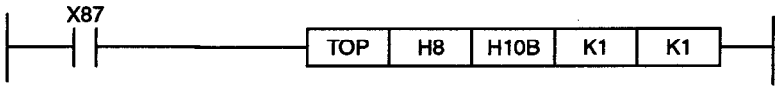
(a) RS-232C CD terminal check setting area (address: 10BH)

- When an external device is connected to the RS-232C interface of the computer link module, the setting described in Section 4.6.2 must be made.
- When the computer link module is first turned ON, CD terminal check enables is set.
- To select CD terminal check disabled, write "1" to the address after the computer link module is turned ON.

SETTING METHOD



The following is an example of a program for changing the default value of the RS-232C CD terminal check setting area.
If necessary, write it to the sequence program.
In this examples, the computer link module I/O signals viewed from the PC CPU are 80H to 9FH.



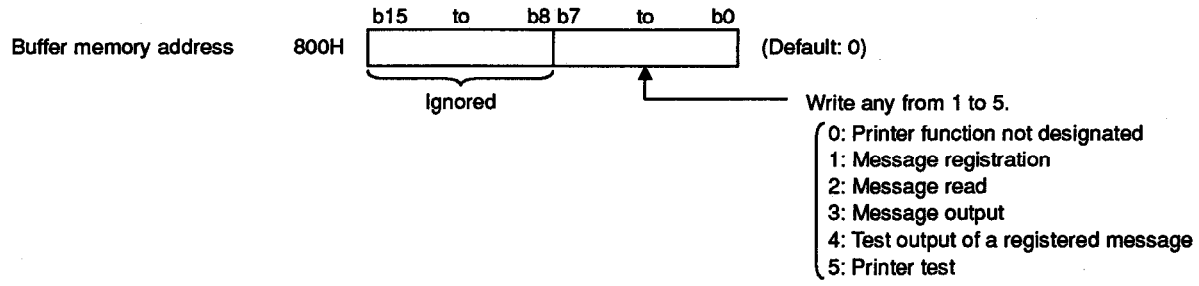
REMARK

For the operation of the computer link module in response to the CD signal when the RS-232C CD terminal check setting is made, refer to Section 4.6.2.

(b) Printer function designation area (address: 800H)

- This area is used to designate which of the printer functions will be used from the PC CPU.
- To use a printer function, write the number between "1" and "5" which corresponds to the function.

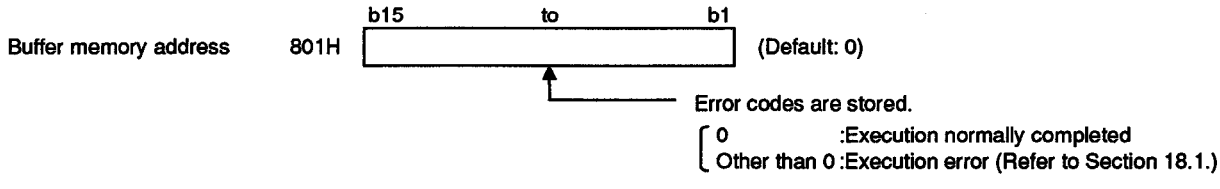
SETTING METHOD



(c) Printer function error storage area (address: 801H)

- If an error arises from the execution of a printer function requested by the PC CPU, the computer link module stores its error code in the printer function error storage area.
  (The error codes of errors related to the reading or writing of fixed messages in response to requests from the computer will not be stored.)
- When more than one error occurs, the computer link module stores the error code of the first error.an error code is stored in the printer function error storage area, write "0" to buffer memory address 801H from the PC CPU. (If an error code exists, the printer functions cannot operate.)
- After a PC CPU-requested printer function is executed, read the execution result from buffer memory address 801H.
- Refer to Section 18.1 for printer function error codes.

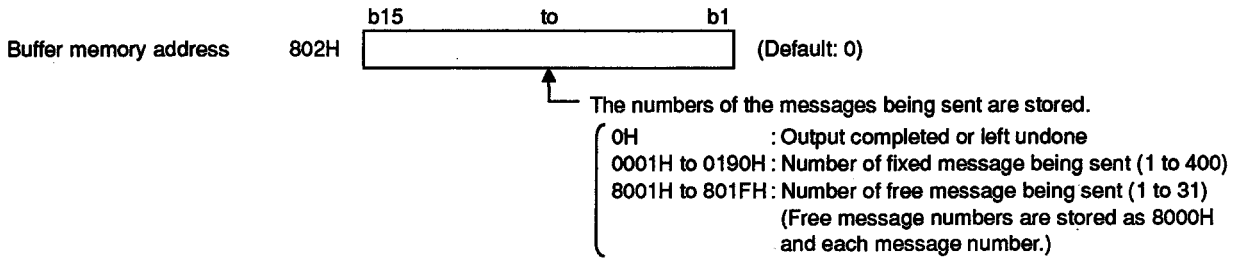
READING METHOD



(d) Output status storage area (address: 802H)

- While a message is being sent to the printer by request from the PC CPU, the computer link module stores the number of the message sent in the output status storage area.
  "0" will be stored after all messages are sent.
- To check the number of the message being sent, read the data from buffer memory address 802H.

READING METHOD



POINT

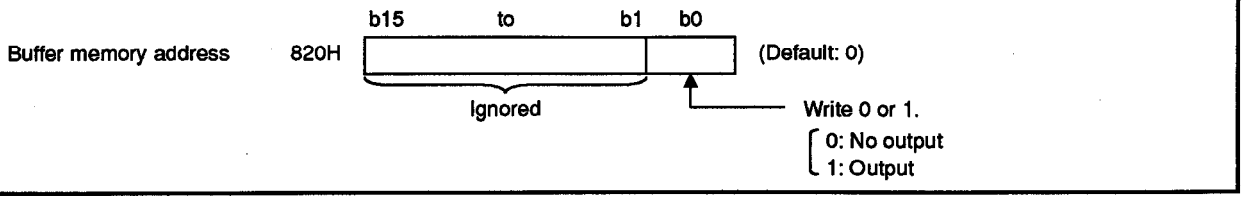
The number stored in the area will be cleared by turning ON the printer processing completed signal (Xn8).

(e) Schedule area (addresses: 820H to 887H)

These areas are used to designate the output message number designation positions, the number of messages sent to the printer, and the output numbers.

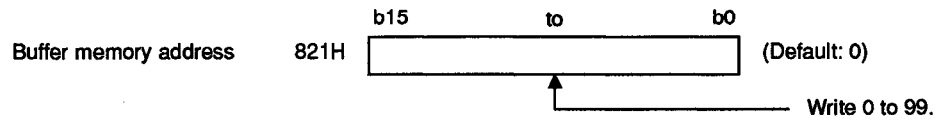
1) CR/LF output designation area (address: 820H)
   - When sending messages, which do not include a CR (code: 0DH) and an LF (code: 0AH), to the printer, this area is used to set whether the CR and the LF should be transmitted from the computer link module.
   - To send the CR and the LF, write "1" to buffer memory address 820H before sending a message to the printer.
   - When CR and LF output is set, the computer link module sends them after it transmits 80 characters of message which does not include the codes (or transmits two or more messages in sequence).
   - For preparation of messages, refer to Section 17.2.4.
   - Only messages including the CR and the LF can be transmitted whether CR and LF output is designated in the CR/LF output designation area or not.

SETTING METHOD



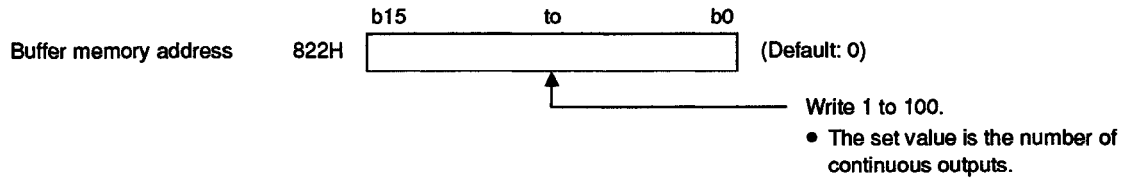
2) Output pointer designation area (address: 821H)
   - For the purpose of sending messages to the printer in order of designation in the output number designation area (addresses: 823H to 887H), this area is used to designate the location of the output number designation area storing the number of the message to be transmitted first. (The number at the first output number designation area (address: 823H) is "0".)
   - Before sending messages to the printer, write a number between "0" and "99" to buffer memory address 821H.

SETTING METHOD



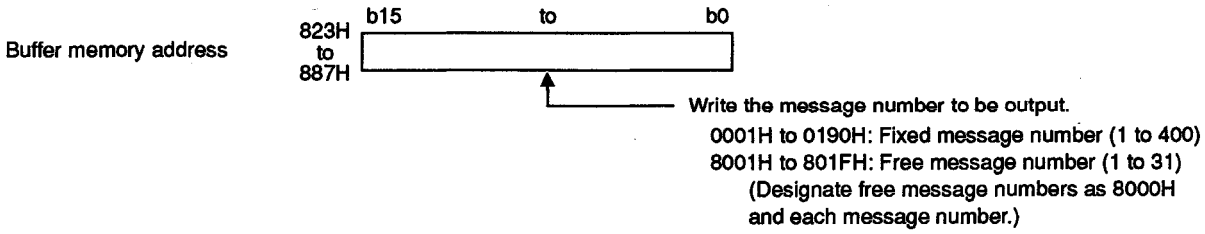
3) Output quantity designation area (address: 822H)
   - For the purpose of sending messages to the printer in order of designation in the output number designation area (addresses: 823H to 887H), this area is used to set the quantity of messages to be transmitted from the area designated in the output pointer designation area (address: 821H).
   - Before sending messages to the printer, write a number between "1" and "100" to buffer memory address 822H.

SETTING METHOD



4) Output number designation area (addresses: 823H to 887H)
- These area is used to designate the numbers of messages to be sent to the printer in order of output.
- The computer link module transmits all messages designated in the output quantity designation area (address: 822H) from the area selected in the output pointer designation area (address: 821H) in the order set in this area.
- Before sending messages, write message numbers between "0001H" and "0190H" and between "8001H" and "801FH" to buffer memory addresses 823H to 887H.

SETTING METHOD



REMARK

The following is an example of designation in the schedule area to send the messages designated at addresses 82DH to 831H (11th to 15th) in the output number designation area without CR and LF output (Section 17.7 (2) (b) shows an explanatory diagram):

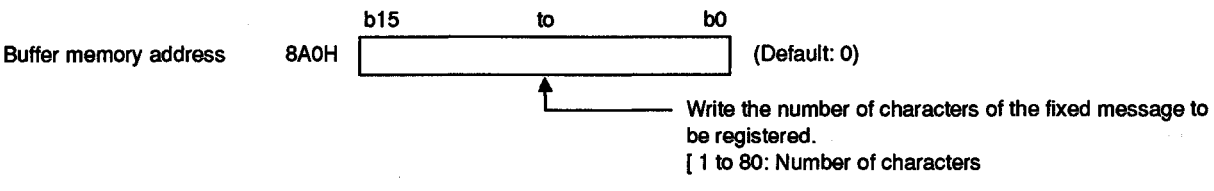
- CR/LF output designation area (address: 820H).....0
- Output pointer designation area (address: 821H).....10
- Output quantity designation area (address: 822H).....5
- Output number designation area (addresses: 82DH to 831H).....Random message number to each address

(f) Fixed message access area (addresses: 8A0H to 8C9H)

A fixed message is written to or read from this area in registering or reading it from the PC CPU.

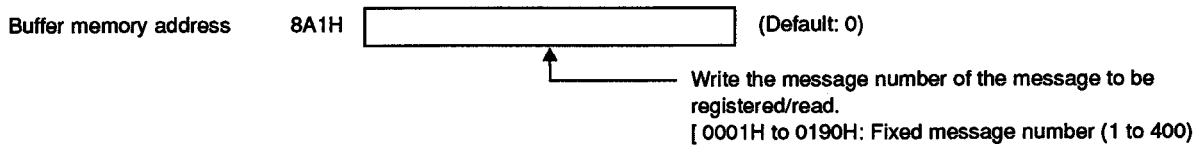
1) Message data length designation area (address: 8A0H)
- When registering a fixed message in the fixed message registration data storage area (addresses: 8A2H to 8C9H), write the number of characters comprising it ("1" to "80") to this area.
- Fixed messages can be read without writing them to this area.

SETTING METHOD



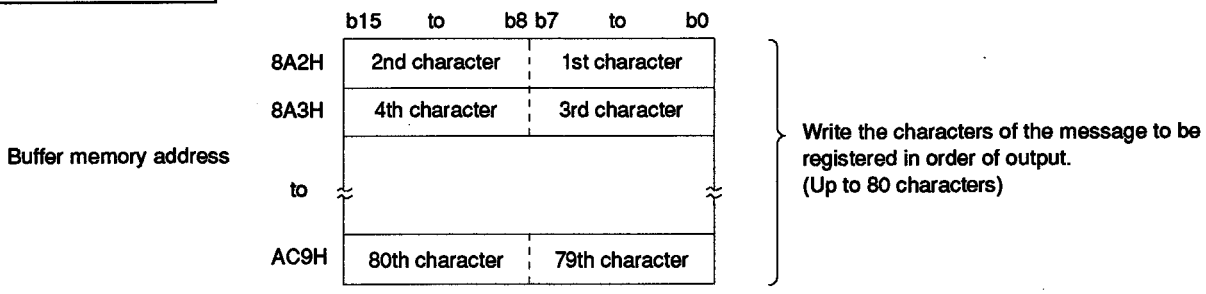
2) Message number designation area (address: 8A1H)
   - When registering a fixed message in the fixed message registration data storage area (addresses: 8A2H to 8C9H), write the corresponding message number between "0001H" and "0190H" (1 to 400) to this area.
   - To read a fixed message, write the corresponding message number between "0001H" and "0190H" (1 to 400) to this area.

SETTING METHOD



3) Fixed message registration data storage area (addresses: 8A2H to 8C9H)
   - A fixed message should be registered with less than 80 characters.
   - Fixed messages can be read without writing them to this area.

SETTING METHOD



POINT

A registered message will be sent to the printer, as shown in the above figure.

REMARK

The following is an example of designation in the fixed message access area when registering a 18-character-long fixed message as message No. 2:

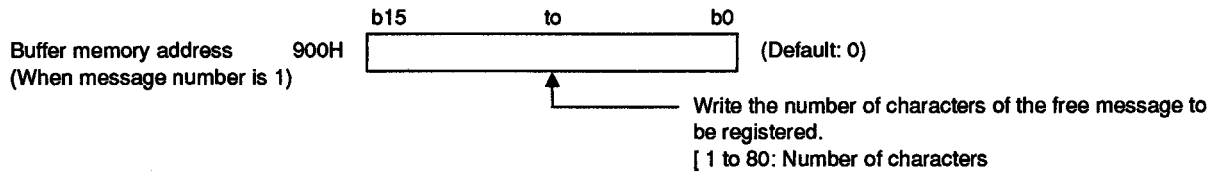
- Message data length designation area 18
  (address: 8A0H)
- Message number designation area (address: 8A1H) ... 2
- Fixed message registration data storage area..... Character string of the message to be registered
  (addresses: 8A2H to 8C9H)

(g) Free message registration area (addresses: 900H to DF6H)

A free message is written to or read from this area in registering or reading it from the PC CPU. (Free messages cannot be registered or read from the computer.)

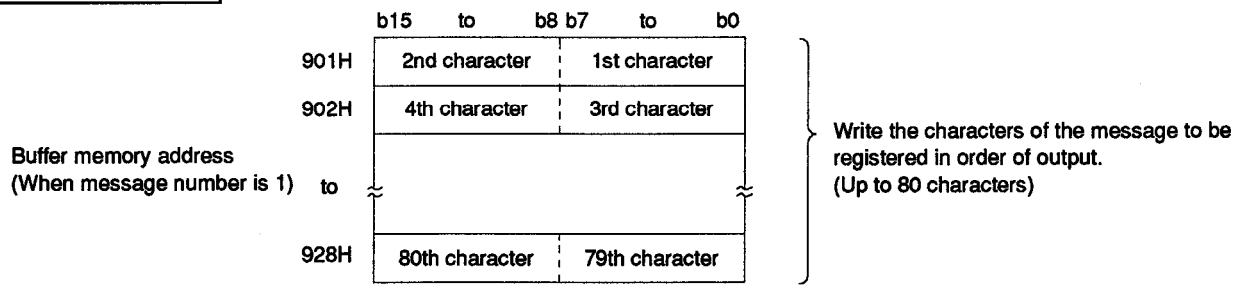
1) Message data length designation area (address: 900H etc.)
   - When registering a free message in a proper free message area (addresses: 901H to 928H, etc.), write the number of character comprising it ("1" to "80") to this area.
   - To read a free message, designate the address of the area where it is registered.
   - The message data length designation area and the free message area in the free message registration area allocated to each free message number are shown at the end of Section 15.

SETTING METHOD



2) Free message area (addresses: 901H to 928H, etc.)
   - As a free message to be registered, write one consisting of the designated number of characters (less than 80 half-size characters) in the corresponding message data length designation area (address: 900H etc.).
   - To read a free message, designate the address of the area where it is registered.
   - The message data length designation area and the free message area in the free message registration area allocated to each free message number are shown at the end of Section 15.

SETTING METHOD



POINT

A registered message will be sent to the printer, as shown in the above figure.

REMARK

The following is an example of designation in the free message registration area when registering a 18-character-long free message as message No. 2. The message number is managed by the registration area.

- Message data length designation area 18
  (address: 929H)
- Free message area ..... Character string of the message to be registered
  (addresses: 92AH to 951H)

(h) Areas for changing the RS-232C communications mode

RS-232C communications mode setting area (address: 10FH)

Simultaneous send priority/non-priority setting area (address: 110H)

Send method setting area when transmission is resumed (address: 111H)

- When an external device is connected to the RS-232C interface of the computer link module, the full-duplex transmission with the external device is possible when the computer link module is started up.
- To perform half-duplex transmission, change the default values according to Section 10 when the computer link module is started up.

(i) Areas for changing the transmission control mode with the external device

Transmission control specification area (address: 11AH)
DC1/DC3 control code specification area (address: 11BH)
DC2/DC4 control code specification area (address: 11CH)

- When the computer link module is started up, DTR/DSR control for the external device is executed only at the RS-232C interface.
- To execute DC code control at the RS-232C and RS-422 interfaces, change the default settings according to Section 9 when the computer link module is started up.
- The setting is valid for communications using a protocol through the RS-422 interface.

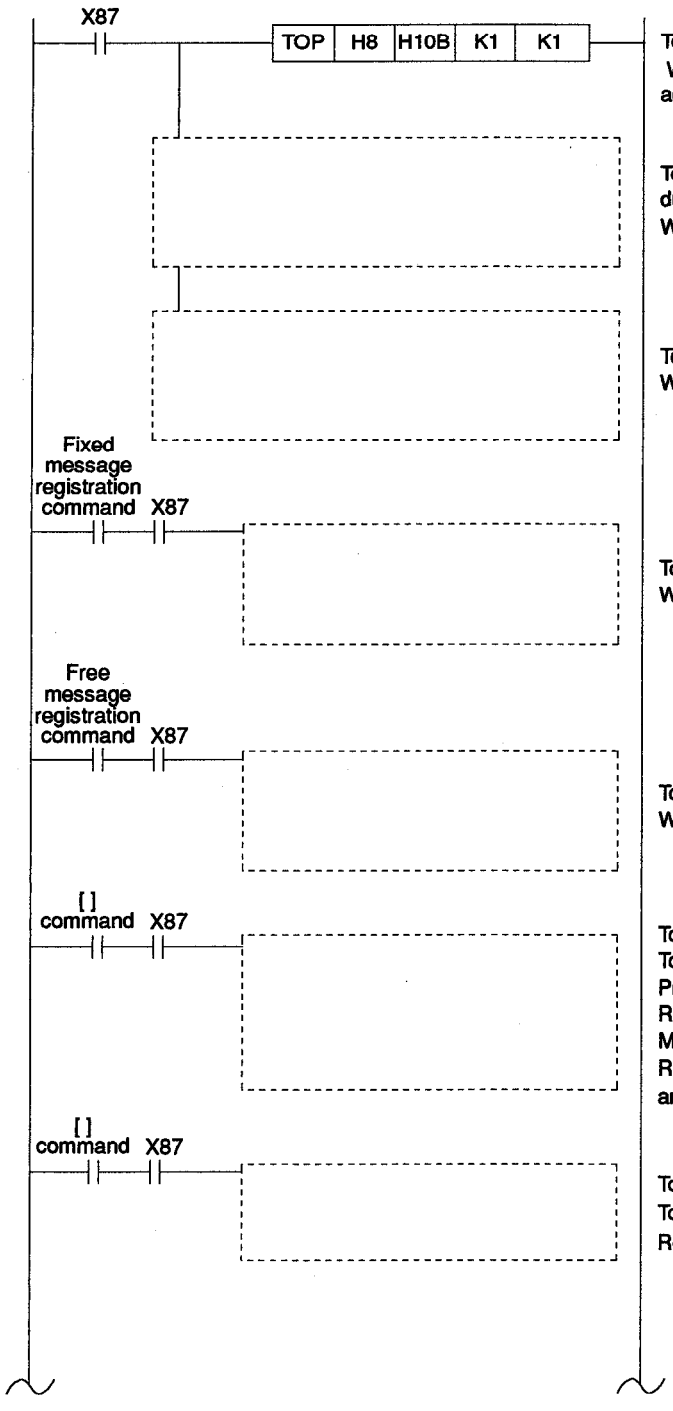
(3) Program example to change the default values in buffer memory specific use areas

The following is a program example to change the default values in the buffer memory specific use areas.

Incorporate necessary programs only.

In this example, the computer link module I/O signals are 80H to 9FH which are handled by the PC CPU.

SETTING METHOD (Computer link module I/O signals: 80H to 9FH)



To set CD terminal check disabled
Write "1" (CD terminal check disabled) to buffer memory address 10BH.

To set the RS-232C interface communications mode (for half-duplex transmission).
Write a proper value according to Section 10.

To designate the transmission control method
Write a proper value according to Section 9.

To register a fixed message
Write a fixed message according to Section 17.4.1.

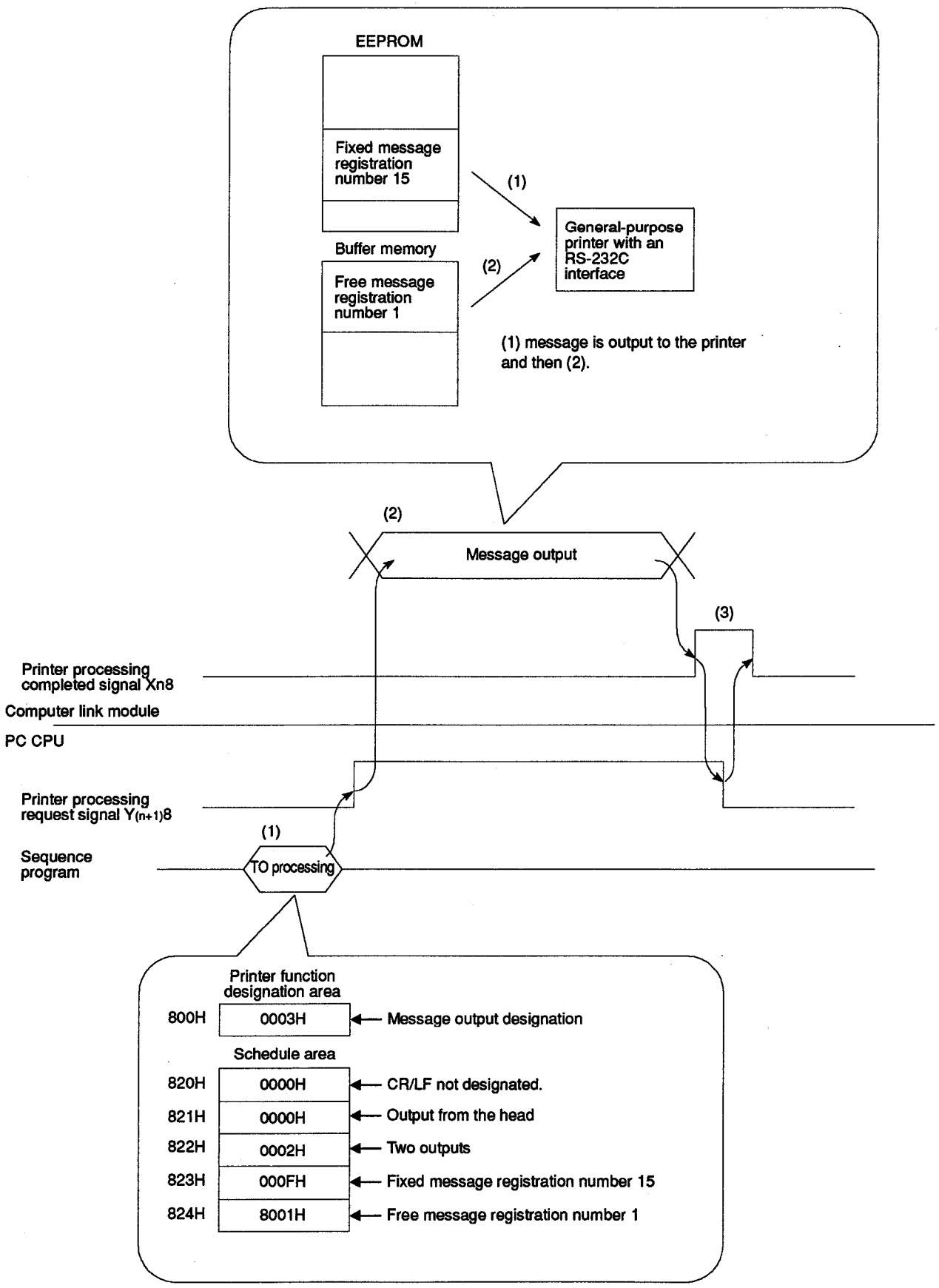
To register a fixed message
Write a free message according to Section 17.4.3.

To read a fixed message
To read a free message
Printer test
Registered message test output
Message output to printer
Read or write messages according to Sections 17.4.2, 17.4.4 and 17.5 through 17.7.

To read ON/OFF states of LEDs, writing LED turn-OFF
To read signal states and switch settings
Read or write the states and settings according to Section 8.

17.2.2 Message output timing

The following example explains the timing when registration number 15 of a fixed message and registration number 1 of a free message are output.



(1) Write a message output (03H) in buffer 800H with a sequence program, and set each item of a schedule area.

After writing to the buffer, use a sequence program to turn ON the printer processing request signal ($Y_{(n+1)}8$).

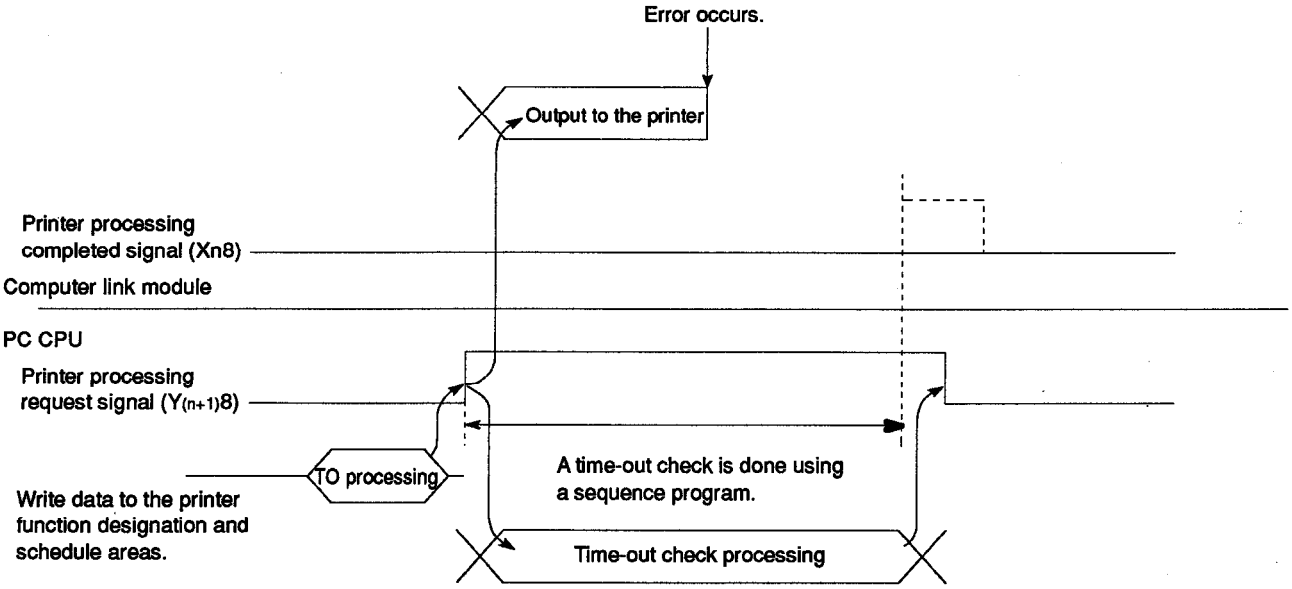
(2) When the printer processing request signal ($Y_{(n+1)}8$) goes ON, messages are output in the order set by the computer link module at the schedule area. After outputting is completed, the computer link module turns ON the printer processing completed signal (Xn8).

(3) After the printer function has turned ON the printer processing completed signal (Xn8), turn OFF the printer processing request signal ($Y_{(n+1)}8$) with a sequence program.

17.2.3 Method of detecting a printer function error

When outputting messages to the printer, if (a) an error occurs, or (b) the printer is not connected, the printer processing completed signal (Xn8) will not go ON.

Therefore, it is necessary to do a time-out check using a sequence program.

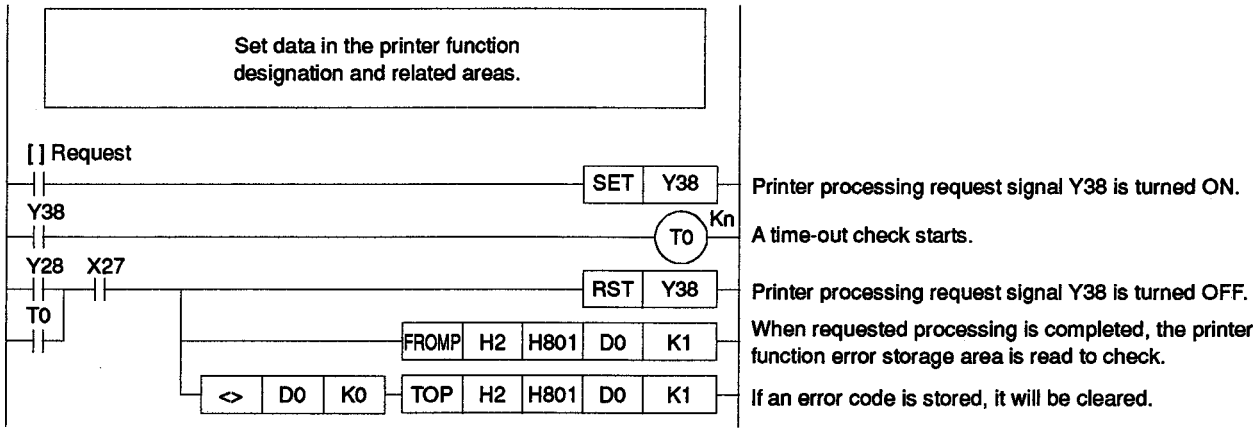


After the printer processing request signal (Y(n+1)8) goes ON, continue the time-out check until the printer processing completed signal (Xn8) is turned ON.

If an error occurs when a message is being output, the printer processing request signal (Y(n+1)8) goes OFF.

To detect a printer error, add a sequence program as shown below.

(Computer link module I/O signals: 20H to 3FH)



POINT

Set the time-out period according to the printer specifications and the number of characters to be sent.

17.2.4 Precautions when using a printer function

(1) Dealing with an error while a printer function is used

Even if the printer processing request signal ($Y_{(n+1)}8$) is turned ON, the printer processing completed signal (Xn8) may not be turned ON because of an error. In such a case, carry out the following operations on the PC CPU:

(a) Perform a time-out check described in Section 17.2.3 to detect the existing error.

(b) When the printer processing completed signal (Xn8) is ON or a time-out error occurs, read the printer function error storage area (address: 801H) in the buffer memory to check whether it stores an error code.

(c) If an error code is stored, turn OFF the printer processing request signal ($Y_{(n+1)}8$), then write "0" to the printer function error storage area.

(2) Number of fixed message registration times

More than 100,000 fixed messages cannot be written to EEPROM.

(3) Preparing messages to be registered

(a) How to prepare messages

- A message can be 1 to 80 characters long (1 to 80 bytes).
- If necessary, insert the control codes for printing (CR (code: 0DH), LF (code: 0AH), etc.) in the message in the code understandable for the printer connected.

(b) Message output

- Of the fixed messages (up to 400) or free messages (up to 31) registered by the user with the computer link module, one to 100 can be sent at a time. Or, two or more messages can be printed out on a line on a sheet of paper. Combine messages according to the number of characters the printer connected can print out on a line.

(c) CR and LF output control

- When sending a message without the CR and the LF (or sending more than one message continuously), whether the codes should be sent from the computer link module after sending the 80 characters of the message can be set in the CR/LF output designation area (address: 820H) in the buffer memory. (Refer to Section 17.2.1 (2) (e).)
- The CR and LF code output cannot be set in the CR/LF output designation area if a message is more than 80 characters long, including the control codes for printing.
  When a message is less than 80 characters long (80 bytes), add the required number of SPs (code: 20H) to the end of the message to make it 80 characters long.
  * If CR/LF output is set when sending a message without the CR and the LF (or sending more than one message continuously), the codes will be sent after the 80 characters of the message are all sent.
- When CR/LF output is not set in the CR/LF output designation area, it is advisable to prepare a message or combine messages, including the control codes for printing, so that they can be printed out on a line on a sheet of paper.

(4) Precautions for using the computer link function

The A2CCPUC24-PRF can use the RS-232C interface for the printer functions and the RS-422 interface for the computer link function.

For precautions for using the computer link function, refer to Section 5.2 of the User's Manual (Computer Link Function).

IMPORTANT

When using the contents of buffer memory by registering them to a EEPROM in a module, do not switch off the power of the station where the module is mounted, or reset the PC CPU.
If the power is switched off at the station where the module is mounted or the PC CPU is reset, the contents of the data in the EEPROM will become indefinite, requiring the data to be registered to the EEPROM again. The module may also fail or malfunction.

17.3 Registering/Reading Fixed Messages from the Computer

In this section, a control protocol in format 1 is taken as a designation example to describe what must be designated for registering or reading fixed messages from the computer by the use of a dedicated protocol for the computer link function.

17.3.1 Commands and their functions

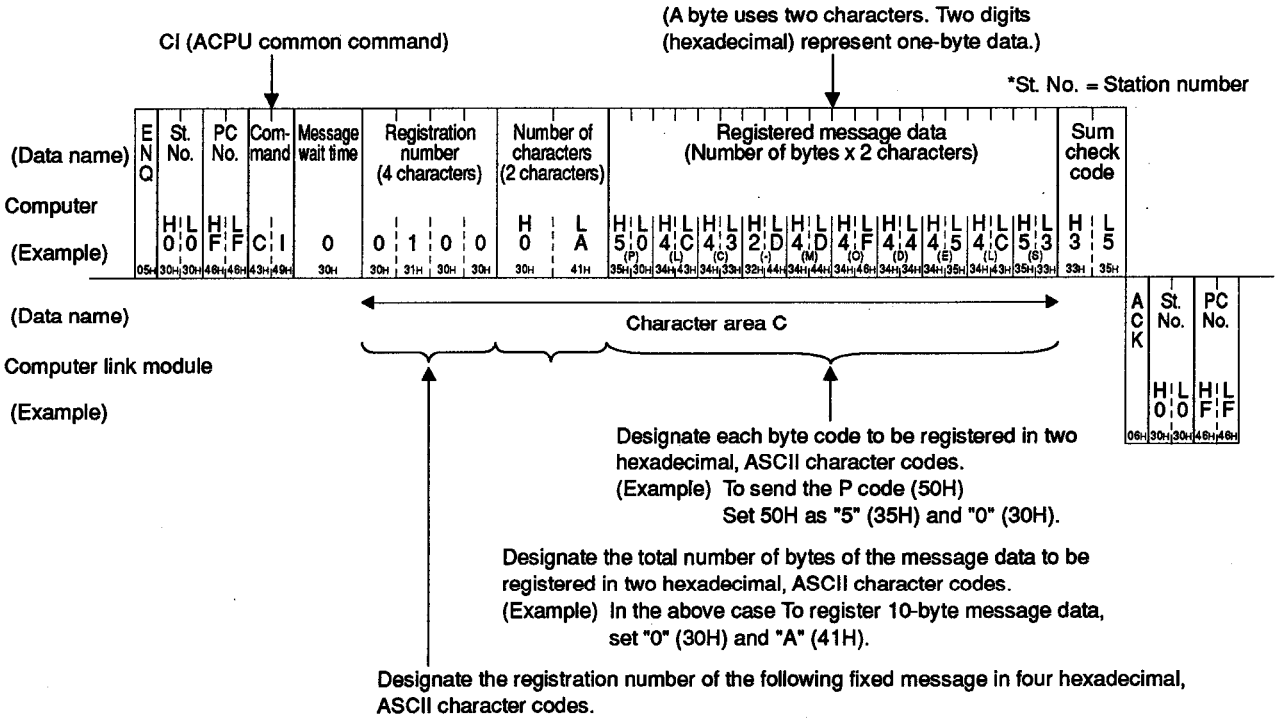
Item	Command		Processing Contents	Number of Points Processed per Communication	Status of PC CPU		
					During STOP	During RUN	
	Sym-bol	ASCII				Write Enabled	Write Disabled
Message registration	CI	43H, 49H	Registration of fixed message data	40 words	O	O	O
Message read	CJ	43H, 4AH	Read of fixed message data	40 words	O	O	O

17.3.2 Method of registering fixed messages

This section quotes a control protocol example to describe the method of registering fixed messages using a CI command.

[Control protocol] The protocol shown below is in control format 1.
To register fixed messages in control format 2, 3 or 4, use the protocol described in Section 5.4.3, 5.4.4 or 5.4.5 as well as by reference to the protocol in this section.

(Registration conditions)
1) The message "PLC-MODELS" is to be registered as message No. 100.



POINTS

(1) The designated range of or registration number and the number of characters must satisfy the following conditions.
- 1 ≤ registration number ≤ 400 ..... (Set at "0001" to "0400".)
- 1 ≤ number of characters ≤ 80 .... (Set at "01" to "50".)

(2) For the description of the error codes when the computer link module responds with an NAK code and corrective action against them, refer to Section 18.1.

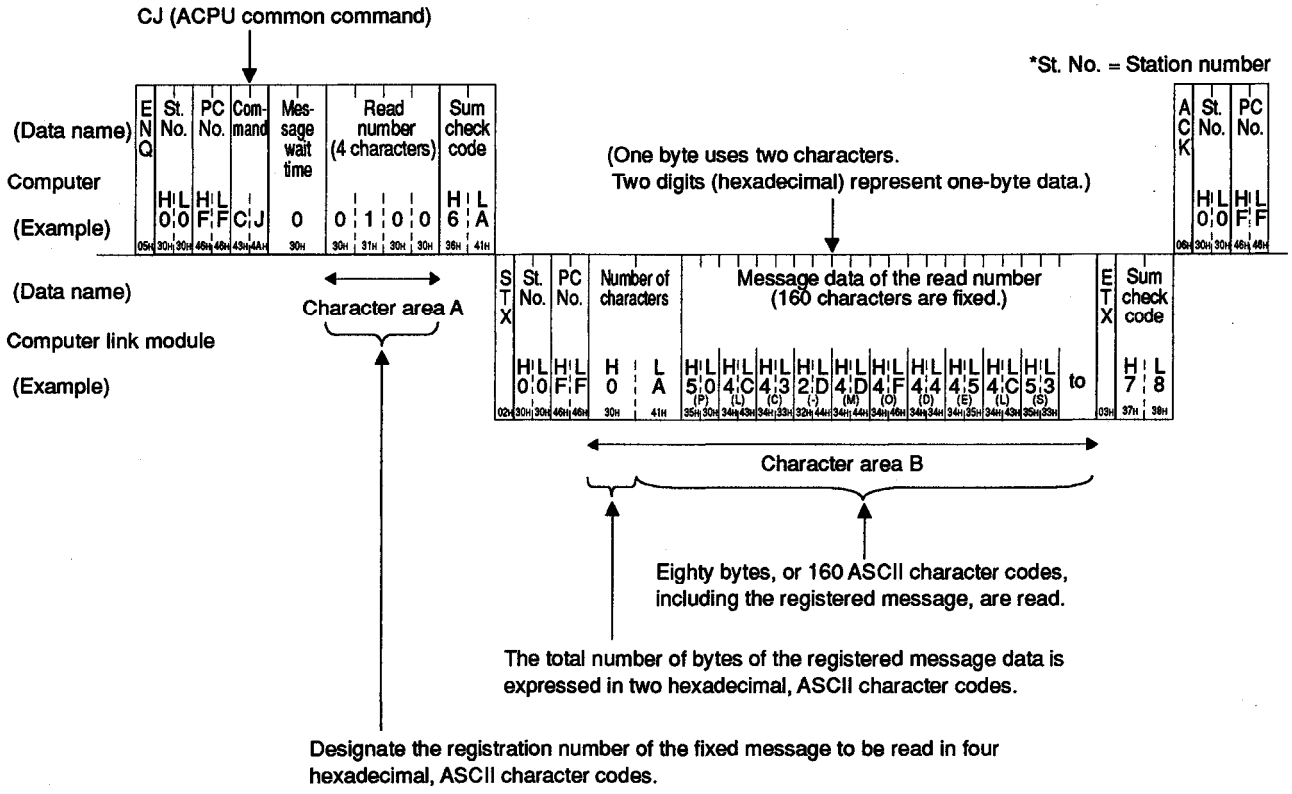
(3) For the preparation of messages, refer to Section 17.2.4.

17.3.3 Method of reading fixed messages

This section quotes a control protocol example to describe how to read fixed messages using a CJ command.

[Control protocol] The protocol shown below is in control format 1.
To read fixed messages in control format 2, 3 or 4, use the protocol described in Section 5.4.3, 5.4.4 or 5.4.5 as well as by reference to the protocol in this section.

(Reading condition)
1) Registered message No. 100 is to be read.



POINTS

(1) The designated range of the read number must satisfy the following condition:
- 1 ≤ registration number ≤ 400 ..... (Set at "0001" to "0400".)

(2) Eighty-byte (160-character) message data consisting of the registered message and the added characters (undefined characters) will be read.

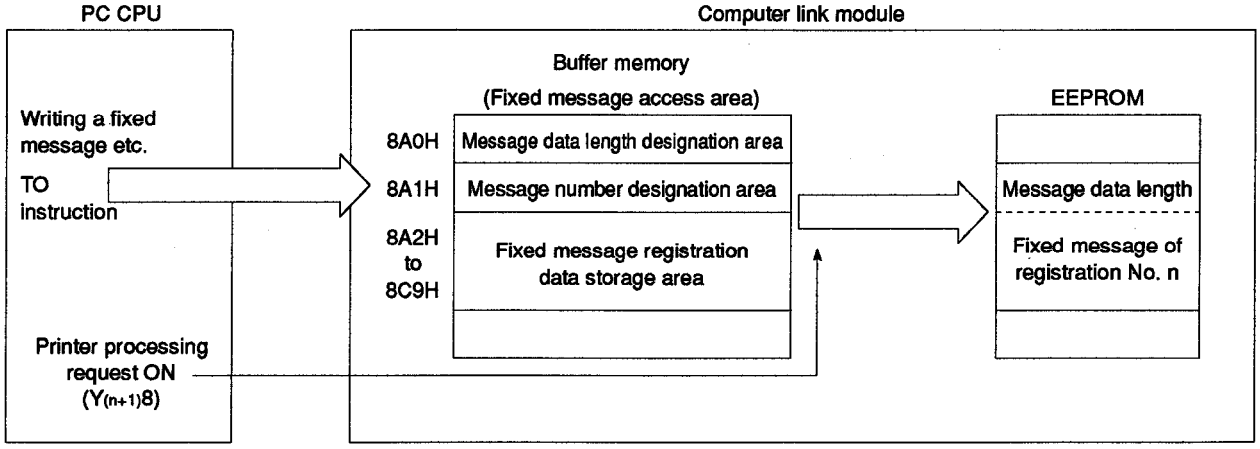
(3) For the description of the error codes when the computer link module responds with an NAK code and corrective action against them, refer to Section 18.1.

17.4 Registering/Reading Messages from the PC CPU

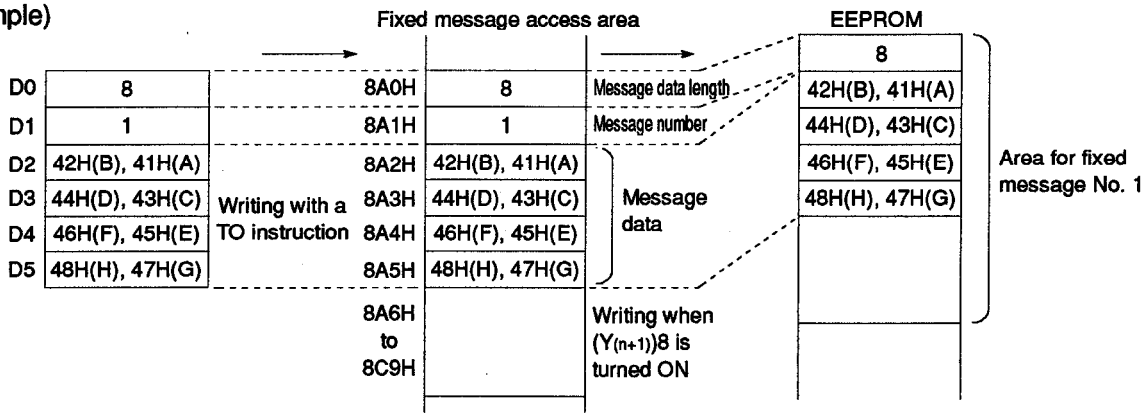
This section describes how to register or read messages from the PC CPU, and the sequence programs for these operations.

17.4.1 Method of registering fixed messages

This section describes how to register fixed messages in EEPROM from the PC CPU through the fixed message access area.

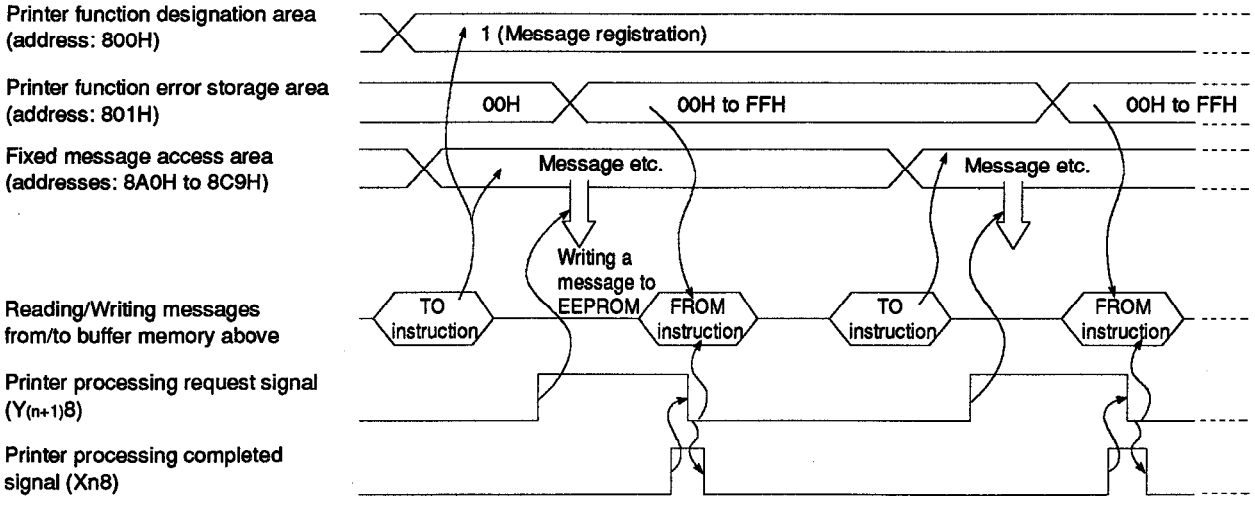


(Example)



(1) Procedure for registering fixed messages

The following is the procedure for registering fixed messages from the PC CPU:



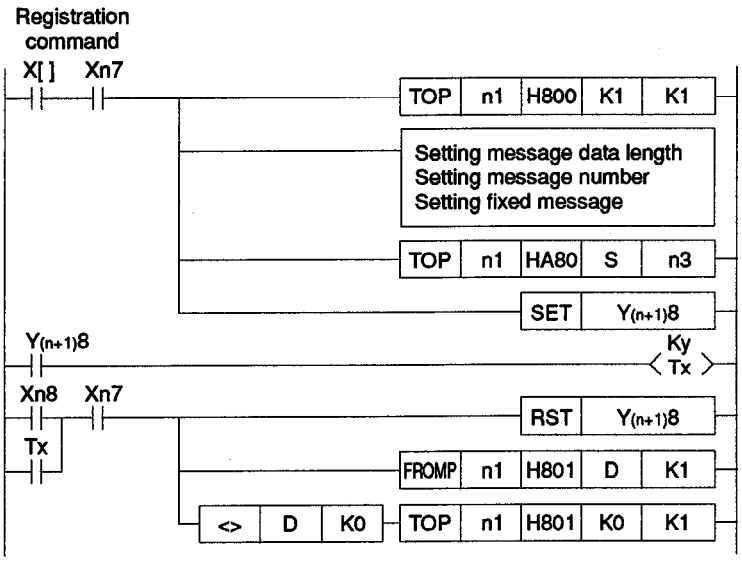
(2) Program for registering fixed messages

The format of the basic sequence program for registering fixed messages from the PC CPU and a program example are shown below:

(a) Basic sequence program format

For details, refer to the Programming Manual (Common Instructions).

Format



POINTS

(1) To designate the message data length (the number of characters) and the message number (registration number), the following conditions must be met:

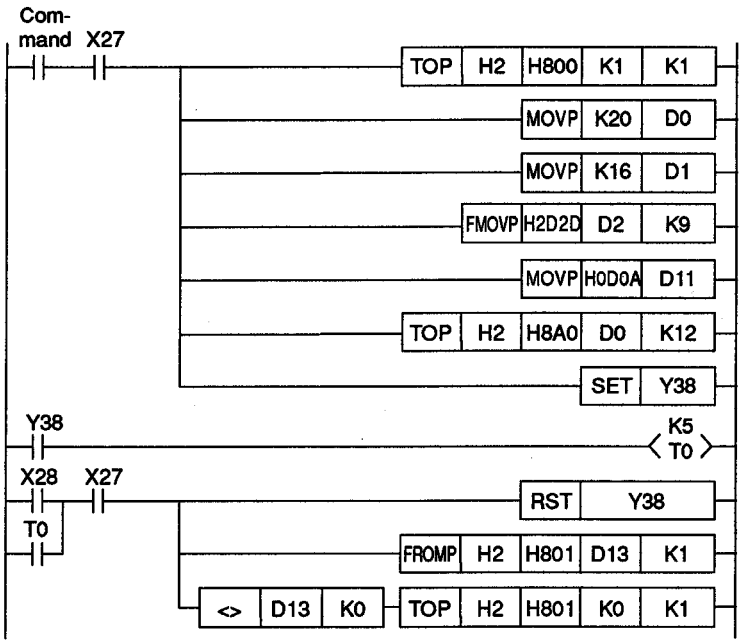
- 1 ≤ message data length ≤ 80
- 1 ≤ message number ≤ 400

(2) For the preparation of messages, refer to Section 17.2.4.

(b) Programming example

Program for registering a fixed message when computer link module I/O signals are allocated to 20H to 3FH

1) Example of registering " - -⌇- - $^{C}_{R}{}^{L}_{F}$" as fixed message No. 16



Message registration is designated.

The message data length is stored in D0.

The number of the message to be registered is stored in D1.

The message data is stored in D2 to D11.

The message is written in the fixed message access area.

Registration is directed.

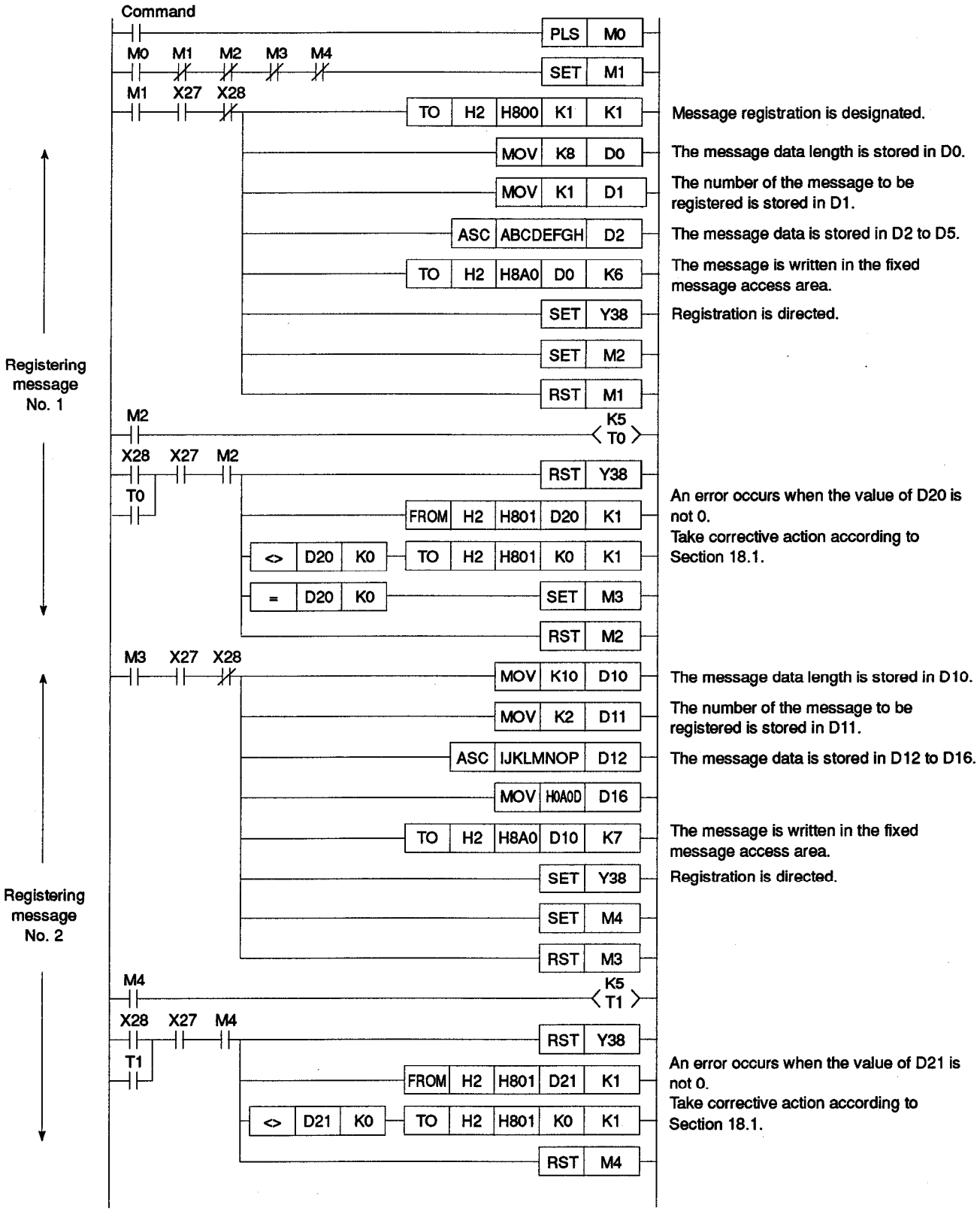
An error occurs when the value of D13 is not 0.
Take corrective action according to Section 18.1.

REMARK

In the above example, the message is registered by the use of the control codes for the connected printer shown below:

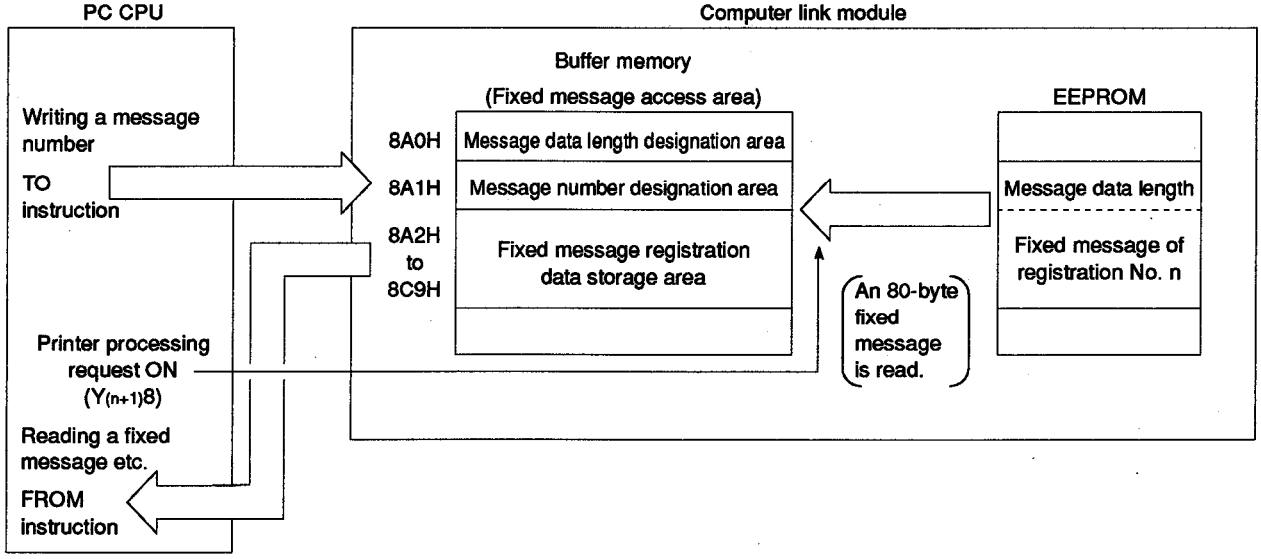
- For CR, LF 0DH, 0AH

2) Example of registering "ABCDEFGH" as fixed message No. 1 and "IJKLMNOP $^{C}R^{L}F$" as fixed message No.2

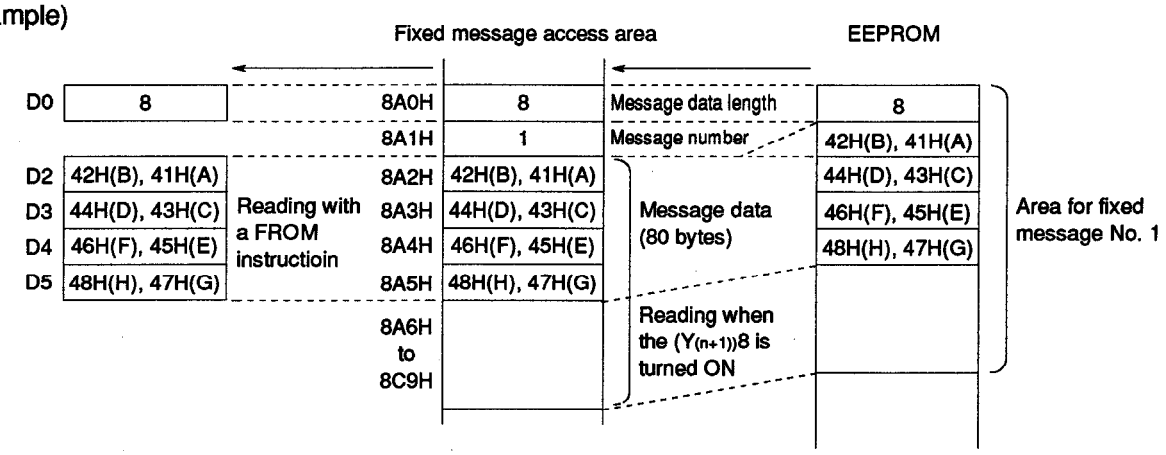


17.4.2 Method of reading fixed messages

This section describes how to read fixed messages from EEPROM into the PC CPU through the fixed message access area.

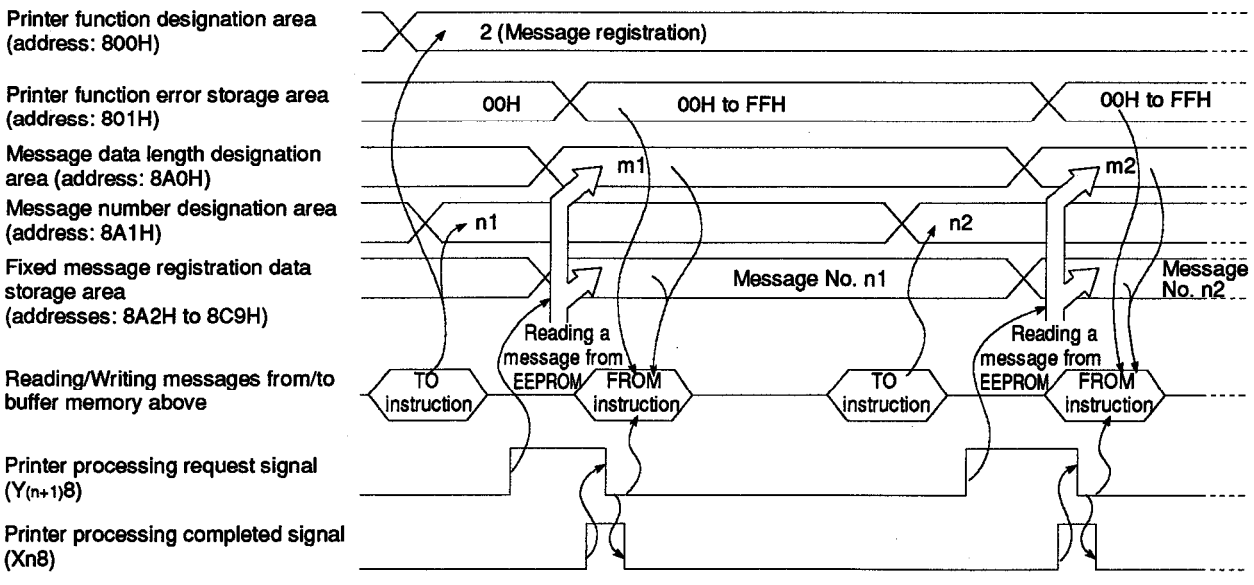


(Example)



(1) Procedure for reading fixed messages

The following is the procedure for reading fixed messages out into the PC CPU:



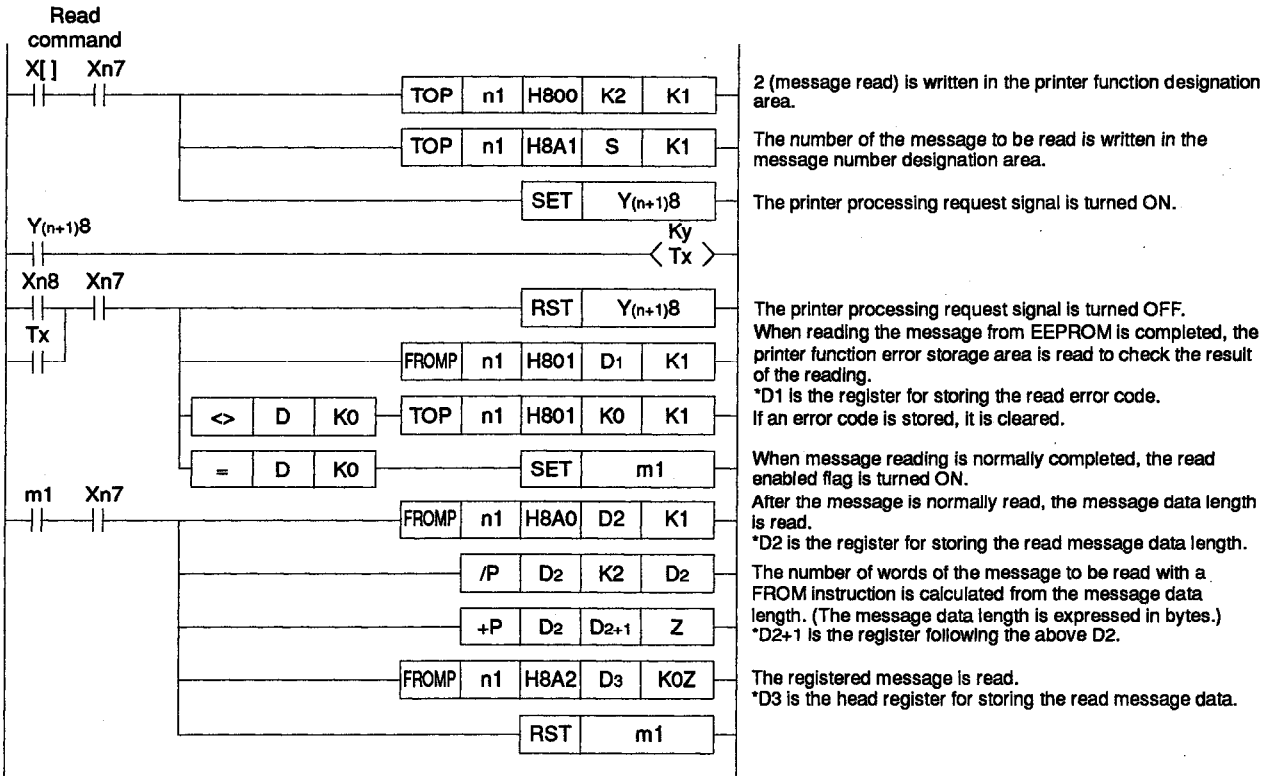
(2) Program for reading fixed messages

The format of the basic sequence program for reading fixed messages out into the PC CPU and a program example are shown below:

(a) Basic sequence program format

For details, refer to the Programming Manual (Common Instructions).

Format



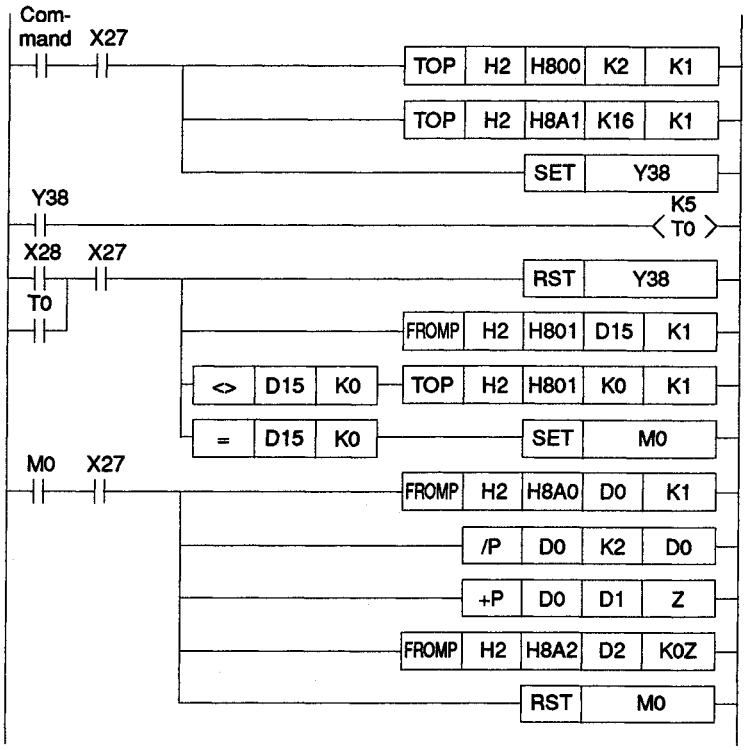
POINTS

(1) Designate the message number (registration number) between 1 and 400.

(2) An 80-byte fixed message consisting of the registered message and the added characters (undefined characters) will be read from EEPROM into the fixed message access area.

(b) Programming example

Program for reading a fixed message when computer link module I/O signals are allocated to 20H to 3FH.



Message read is designated.

The message number (16) is designated.

Reading is directed.

An error occurs when the value of D15 is not 0.
Take corrective action according to Section 18.1.

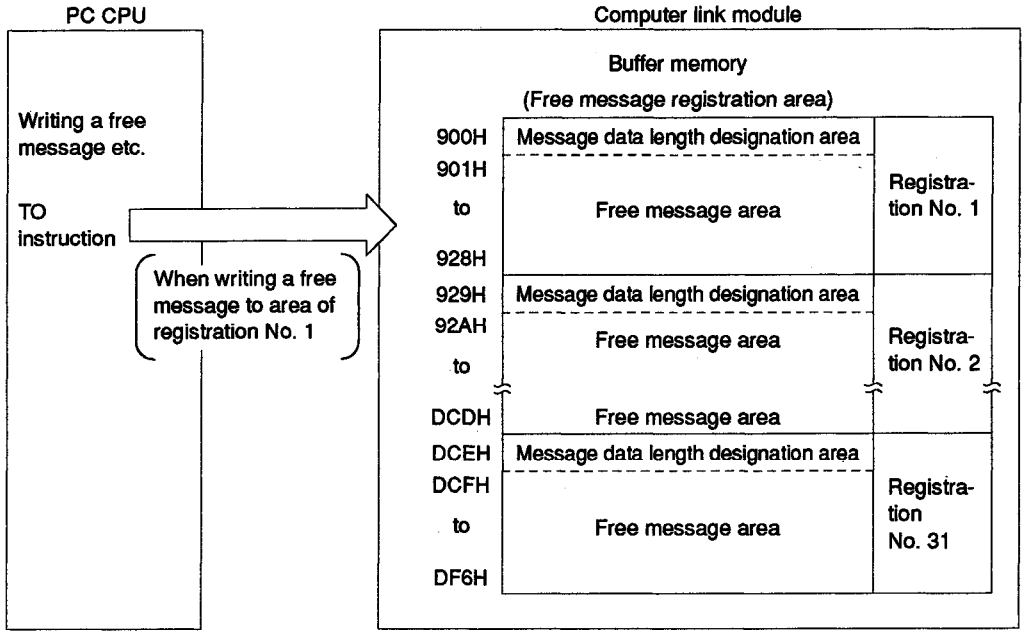
The message data length is read.

The number of words of the message to be read is calculated.

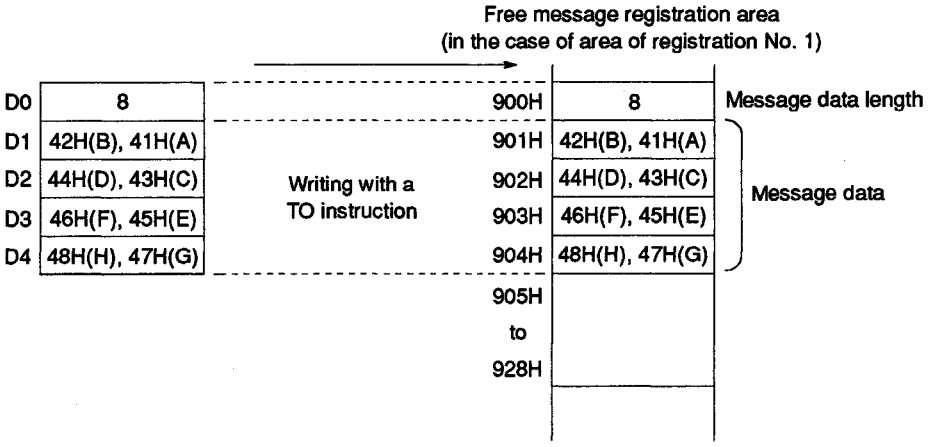
The registered fixed message is read into D2 to Dn.

17.4.3 Method of registering free messages

This section describes how to register free messages from the PC CPU into the free message registration area.

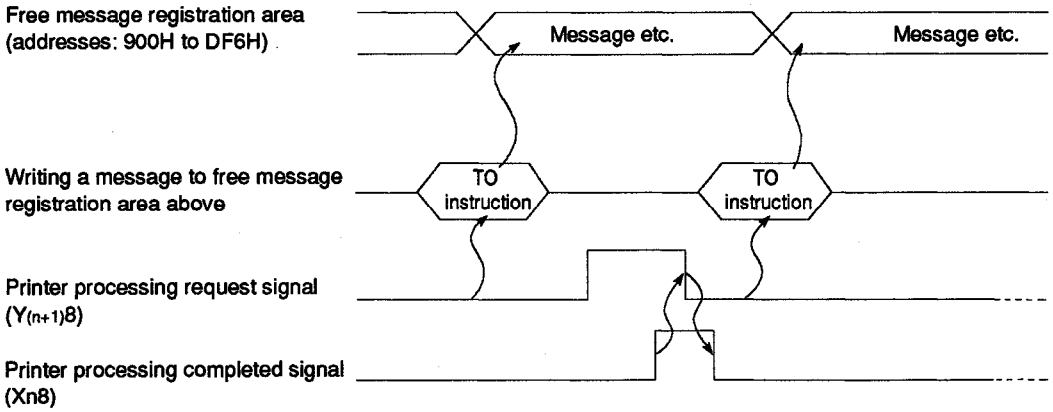


(Example)



(1) Procedure for registering free messages

To register a free message from the PC CPU, designate the address of the buffer memory free message registration area, and write the message data length and the message.



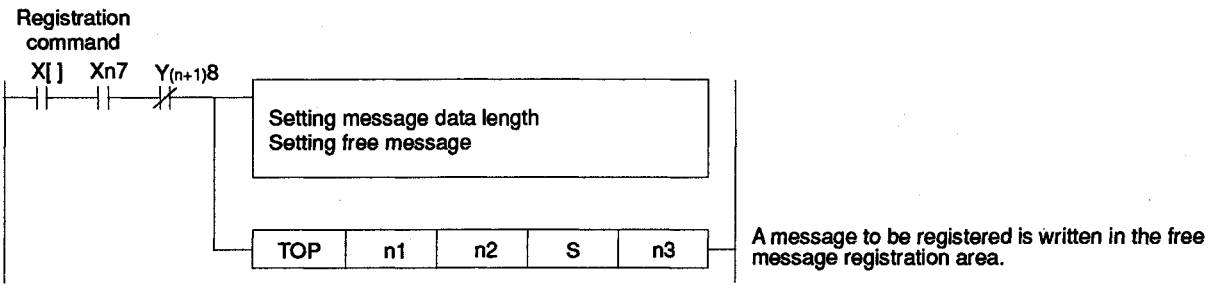
(2) Program for registering free messages

The format of the basic sequence program for registering free messages from the PC CPU and an program example are shown below:

(a) Basic sequence program format

For details, refer to the Programming Manual (Common Instructions).

Format



POINTS

(1) Designate the message data length (the number of characters) between 1 and 80.

(2) For the preparation of messages, refer to Section 17.2.4.

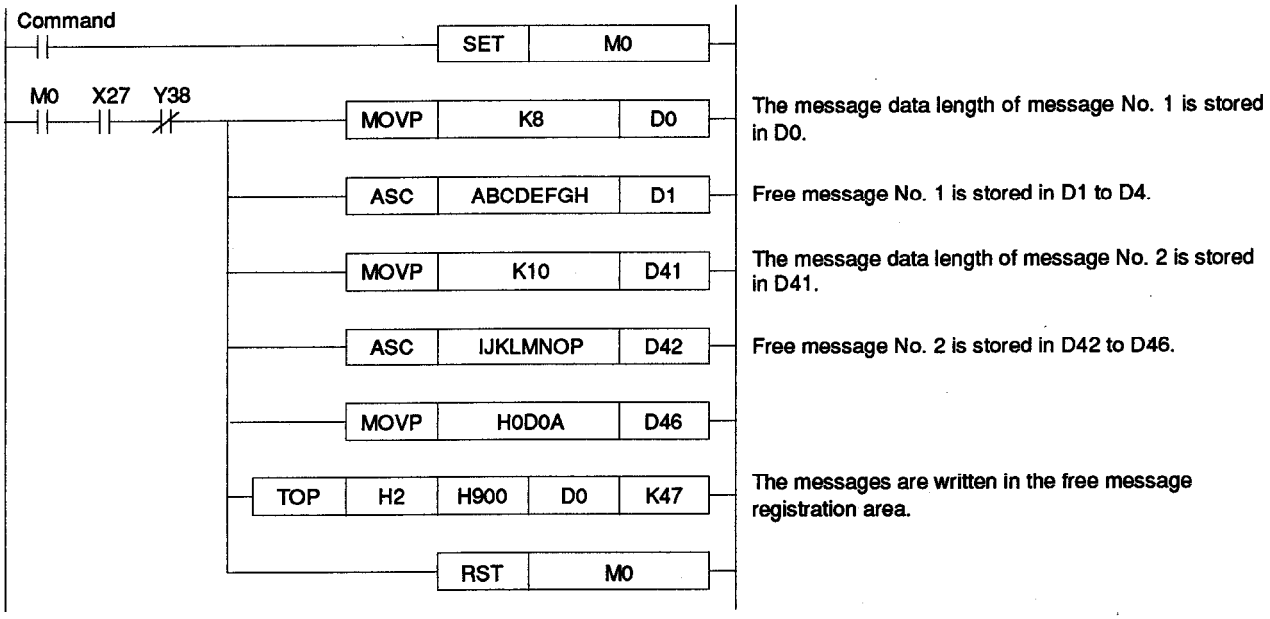
(3) More than one free message can be registered at a time. In such a case, however, a PC CPU device for storing free messages, which has a capacity of 41 words x the number of messages to be registered, is required.

(4) Register free messages when the printer processing request signal (Y(n+1)8) is OFF.

(b) Programming example

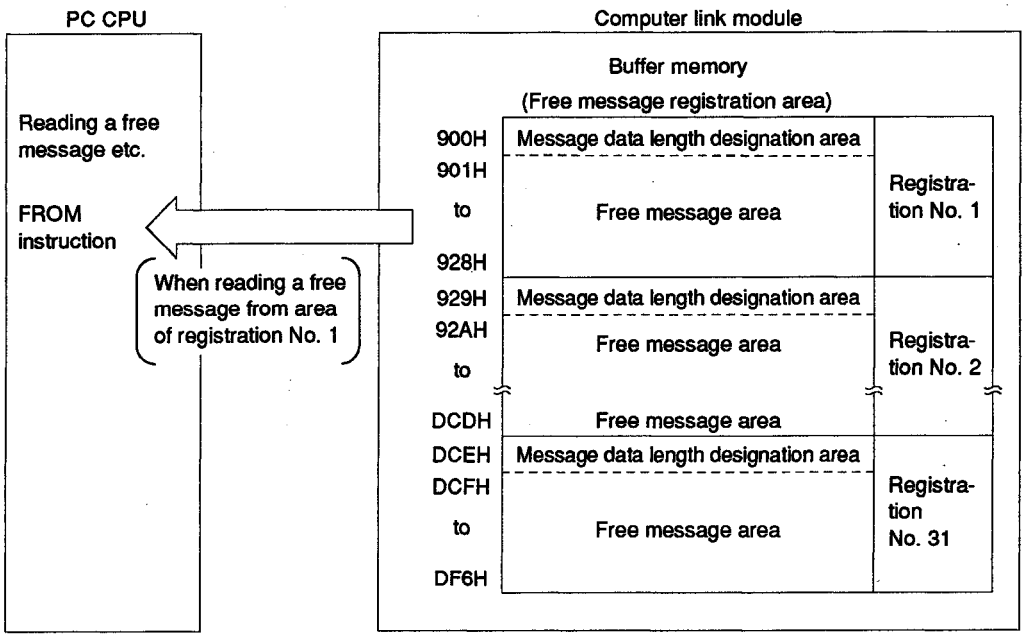
Program for registering a free message when computer link module I/O signals are allocated to 20H to 3FH

- Example of registering "ABCDEFGH" as free message No. 1 and "IJKLMNOP $^{C}_{R}{}^{L}_{F}$" as free message No. 2

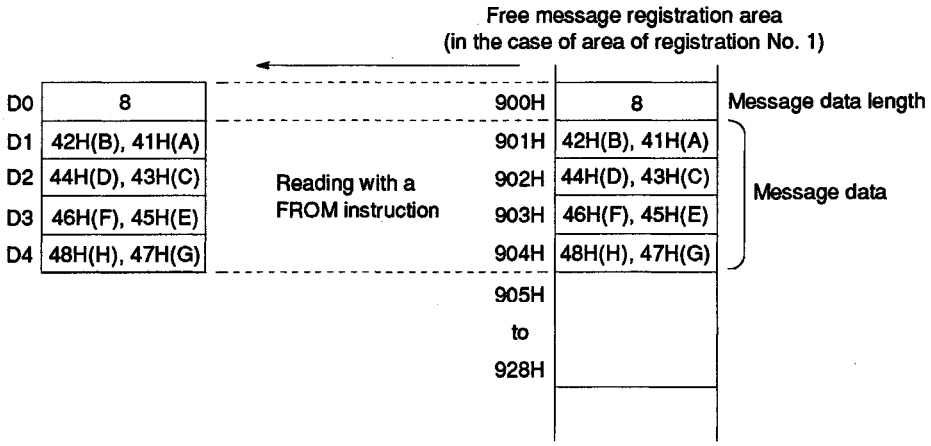


17.4.4 Method of reading free messages

This section describes how to read free messages from the free message registration area into the PC CPU.

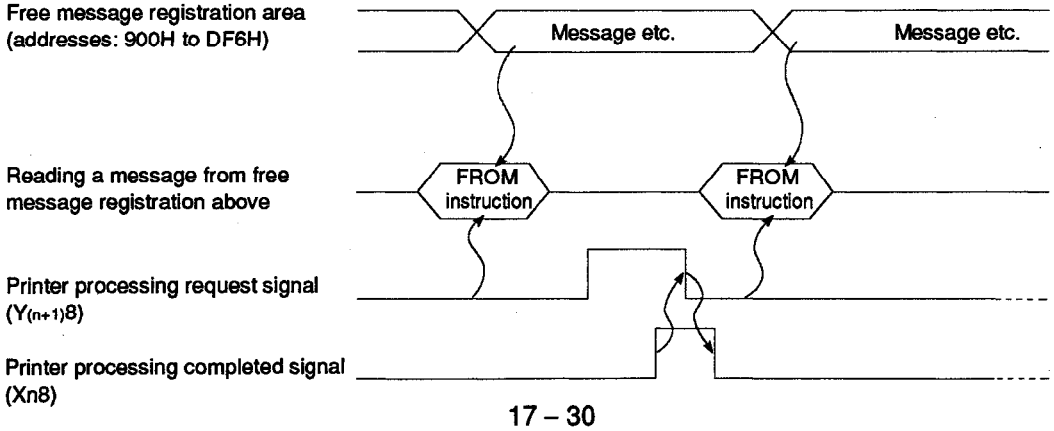


(Example)



(1) Procedure for reading free messages

To read a free message into the PC CPU, designate the address of the buffer memory free message registration area, and read the message data length and the message.



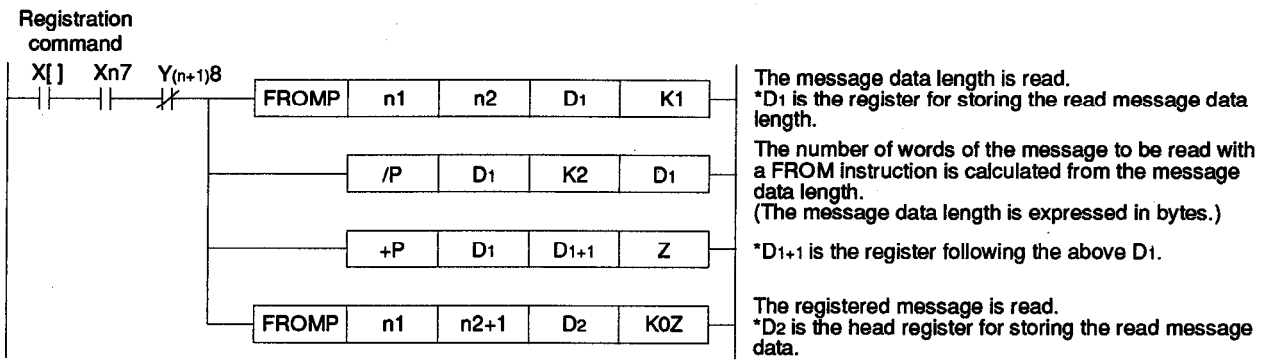
(2) Program for reading free messages

The format of the basic sequence program for reading free messages into the PC CPU and a program example are shown below:

(a) Basic sequence program format

For details, refer to the Programming Manual (Common Instructions).

Format

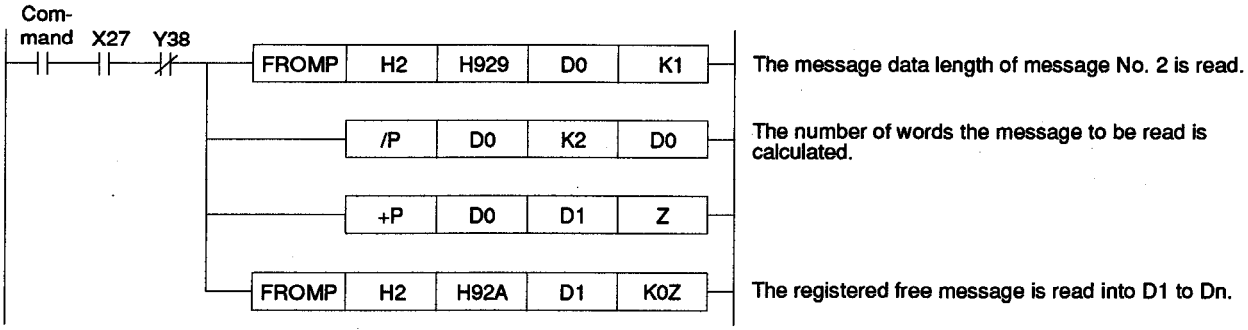


POINT

More than one free message can be read. In such a case, however, a PC CPU device for storing free messages, which has a capacity of 41 words x the number of messages registered, is required.

(b) Programming example

Program for reading free message No. 2 with computer link module I/O signals are allocated to 20H to 3FH.

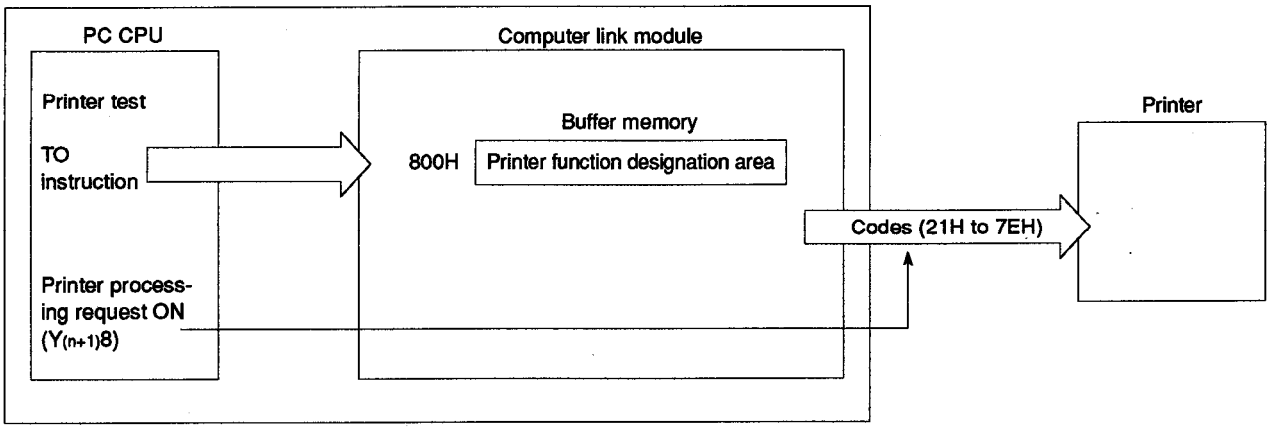


17.5 Printer Test

The printer test function is to test the connection between the computer link module and the printer and the printing function of the printer.

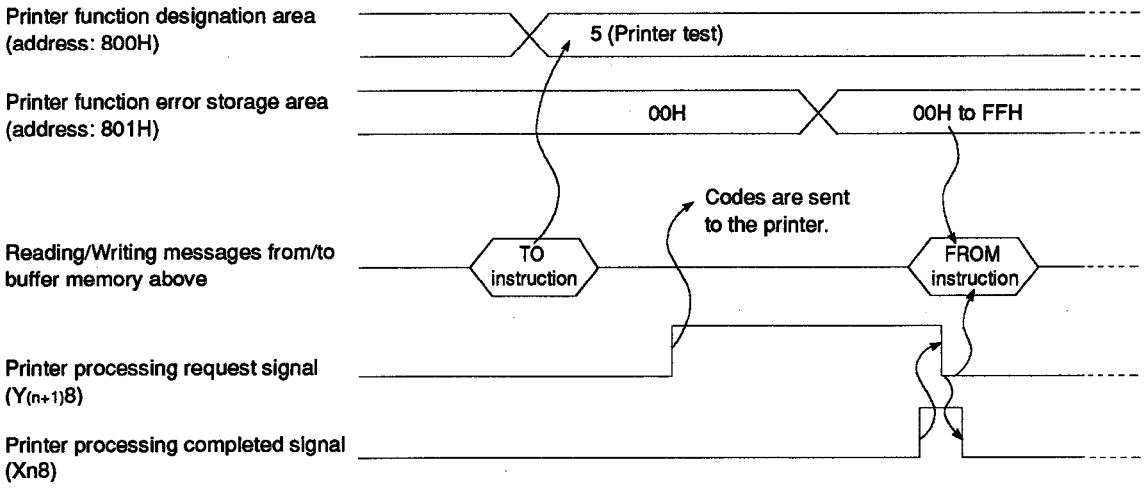
Since the computer link module sends ASCII character codes 21H to 7EH in sequence to the printer, it is possible to check whether the printer can print out the corresponding characters correctly.

This section describes the procedure for printer test from the PC CPU, and the printer test sequence program.



(1) Procedure for printer test

The procedure for printer test from the PC CPU is shown below:



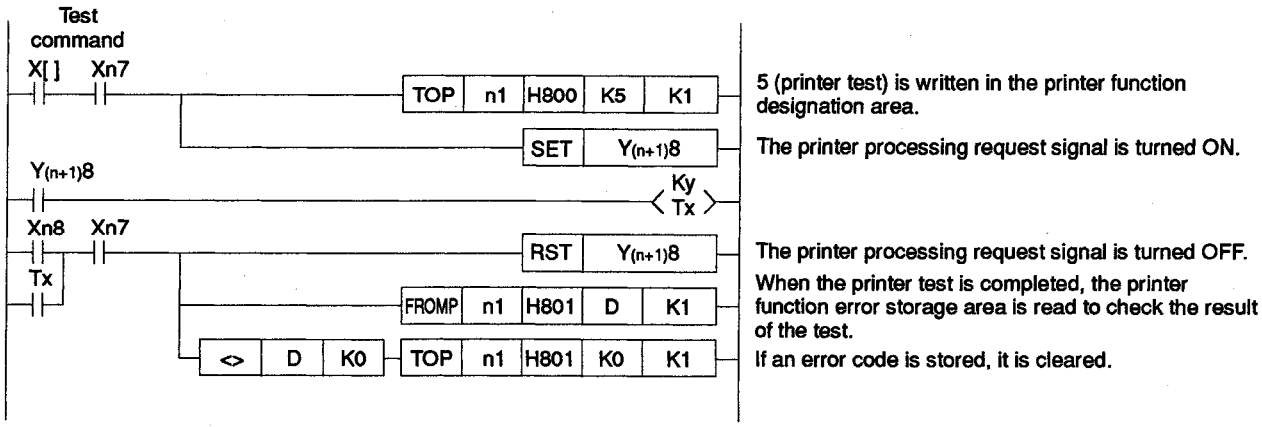
(2) Program for printer test

The format of the basic sequence program for testing the printer from the PC CPU and a program example are shown below:

(a) Basic sequence program format

For details, refer to the Programming Manual (Common Instructions).

Format



5 (printer test) is written in the printer function designation area.

The printer processing request signal is turned ON.

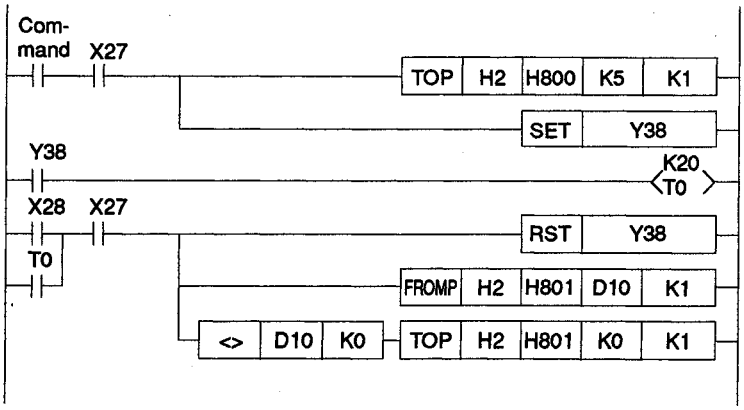
The printer processing request signal is turned OFF.

When the printer test is completed, the printer function error storage area is read to check the result of the test.

If an error code is stored, it is cleared.

(b) Programming example

Program for conducting a printer test when computer link module I/O signals are allocated to 20H to 3FH.



Printer test is designated.

Printer test is directed.

An error occurs when the value of D10 is not 0.
Take corrective action according to Section 18.1.

Printer test example

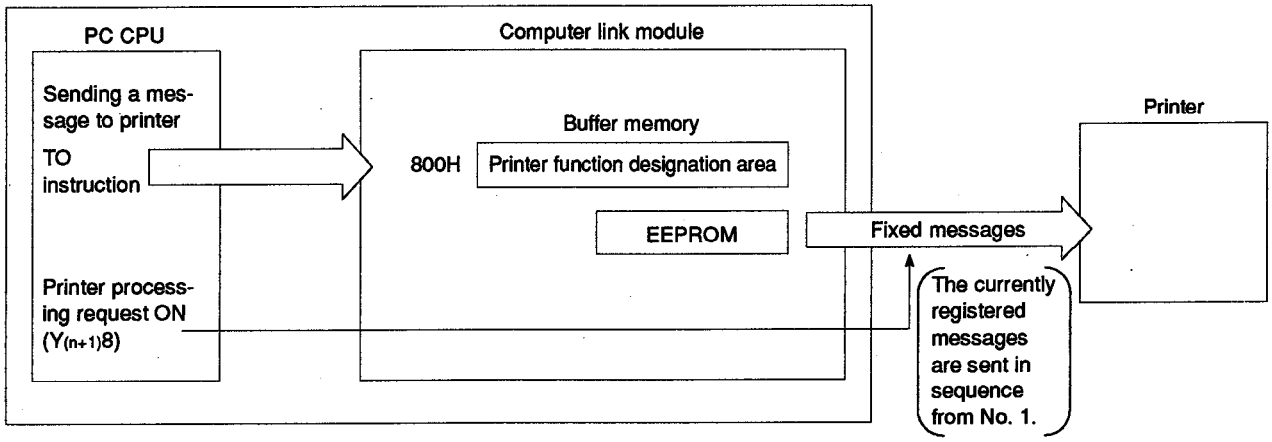
!"#$%&'()*+,./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[]^_'abcdefghijklmnopqrstuvwxyz{|}

17.6 Registered Message Test Output (Test Printing)

The registered message test output (test printing) function is to check if fixed messages from the PC CPU or computer are registered correctly.

Since the computer link module sends fixed messages in order of number, it is possible to check whether the messages are registered or printed out correctly.

This section describes the procedure for test output from the PC CPU, and the test output sequence program.

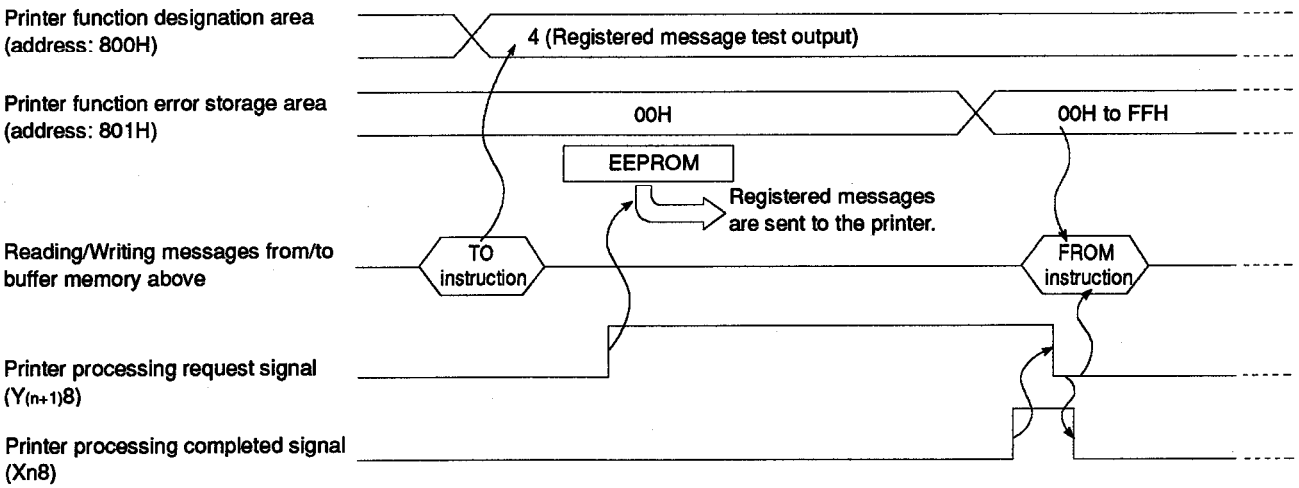


POINT

Before performing test output, register fixed messages from the computer or PC CPU.
An error will occur if a number with no registered message is found.

(1) Procedure for test output

The procedure for test output is shown below:



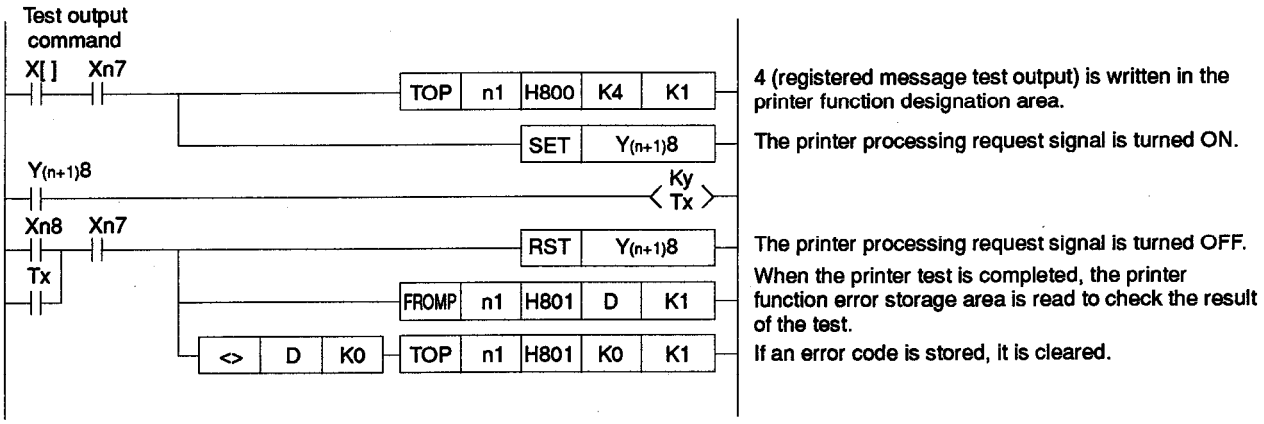
(2) Program for test output

The format of the basic sequence program for test output from the PC CPU and a program example are shown below:

(a) Basic sequence program format

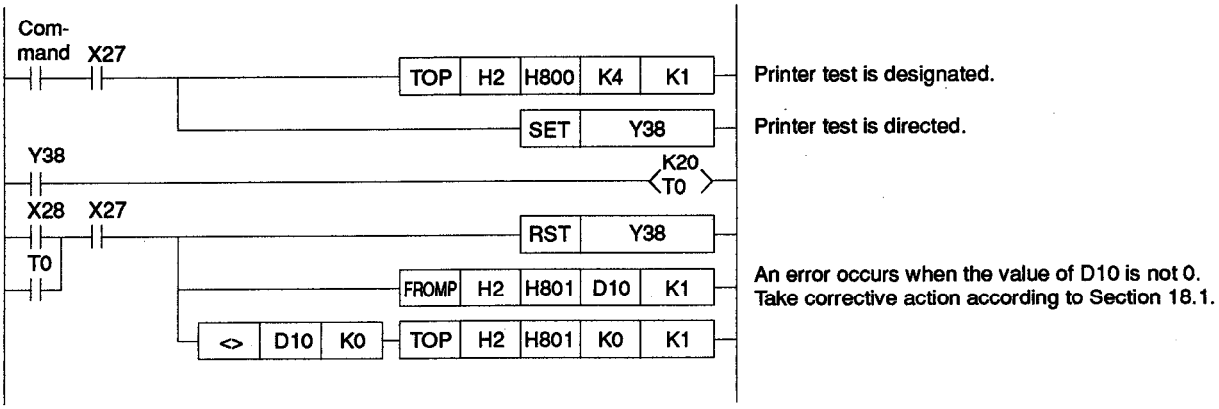
For details, refer to the Programming Manual (Common Instructions).

Format



(b) Programming example

Program for test output when computer link module I/O signals are allocated to 20H to 3FH.

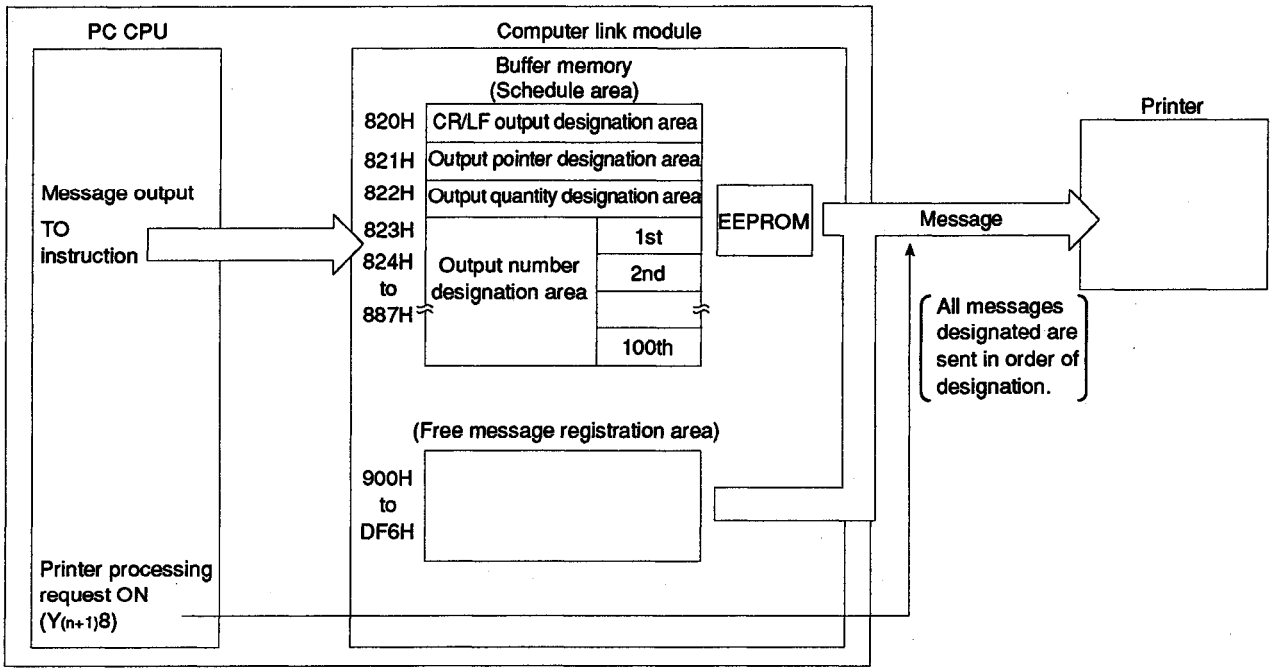


Registered message test output example

**** 001 ****
MITSUBISHI
**** 002 ****
ELECTRIC
**** 003 ****
COMPUTER LINK
**** 004 ****
MODULE

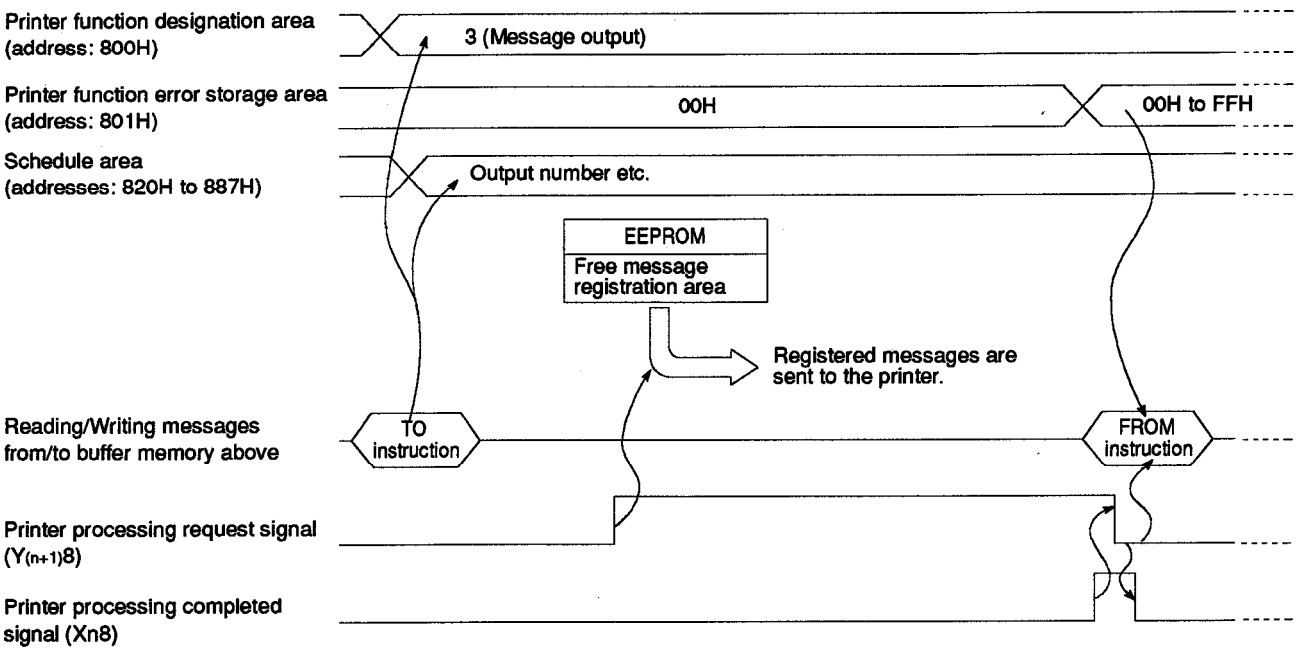
17.7 Message Output to the Printer

This section describes how to send to the printer fixed messages registered from the PC CPU or computer and free messages registered from the PC CPU when the system is in operation.
Up to 100 fixed messages or free messages (or both) can be sent at a time by designating them in the buffer memory schedule area (addresses: 820H to 887H).



(1) Procedure for message output

The procedure for sending fixed and free messages registered with the computer link module to the printer is shown below:



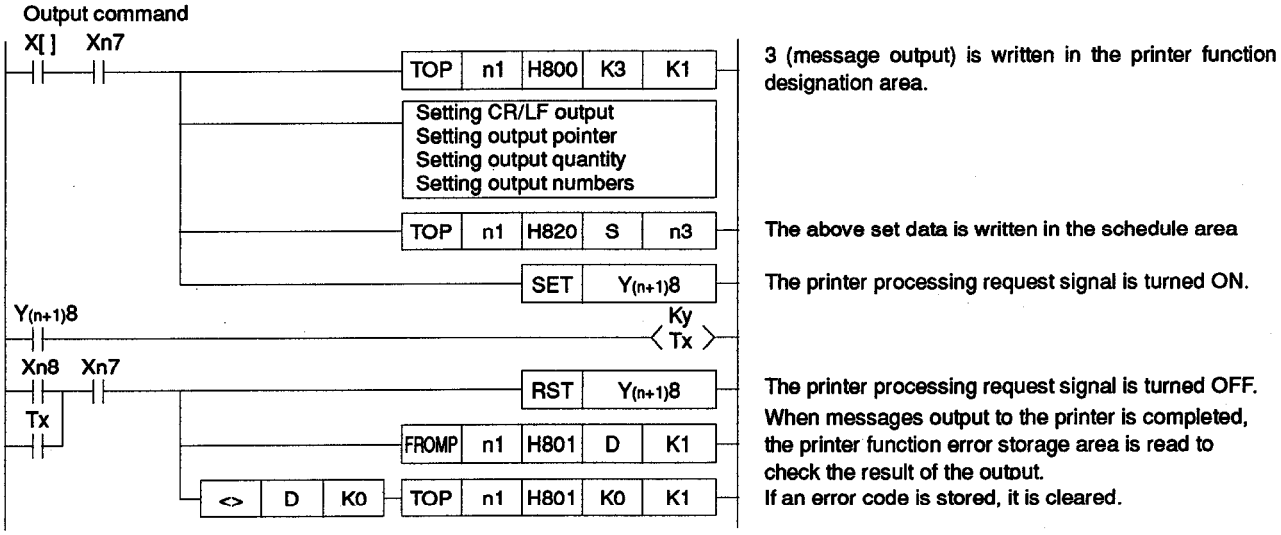
(2) Program for sending messages to printer

The format of the basic sequence program for sending registered messages from the PC CPU to the printer and a program example are shown below:

(a) Basic sequence program format

For details, refer to the Programming Manual (Common Instructions).

Format



3 (message output) is written in the printer function designation area.

The above set data is written in the schedule area

The printer processing request signal is turned ON.

The printer processing request signal is turned OFF.

When messages output to the printer is completed, the printer function error storage area is read to check the result of the output.
If an error code is stored, it is cleared.

POINTS

(1) Described below is the outline of what should be designated in the buffer memory schedule area.
For details of designation, refer to Section 17.2.1 (2) (e).

(a) CR/LF output designation area (address: 820H)

- This area is used to designate whether the CR (code: 0DH) and the LF (code: 0AH) should be sent from the computer link module after an 80-character message without these codes is transmitted (or after two or more messages are transmitted). (Refer to Section 17.2.4 (4).)
- To send the CR and the LF, set "1" in the CR/LF output designation area.

(b) Output pointer designation area (address: 821H)

- This area is used to designate the address in the output number designation area, where the message number to be sent first is stored, to send the messages designated in the area in order of designation.
- Set "0" for the first output number designation area (address: 823H), and a number between "0" and "99" in the output pointer designation area.

(c) Output quantity designation area (address: 822H)

- This area is used to designate how many messages will be sent from the address designated in the output pointer designation area in sending messages to the printer in order of designation in the output number designation area.
- Set a number between "1" and "100" in the output quantity designation area.

(d) Output number designation area (addresses: 823H to 887H)

- This area is used to designate the message numbers (registration numbers) in the order in which they will be sent to the printer.
- Set the following designation values in the output number designation area:

Type of Message	Message No.	Designation Value	Remarks
Fixed message	1 to 400	0001H to 0190H (1 to 400)	Set as they are.
Free message	1 to 31	800H to 801FH (-32767 to -32737)	Set 8000H and each message number together.

(Designation example)

When sending messages designated at addresses 82DH to 831H (11th to 15th addresses) in the output number designation area to the printer without CR/LF output

- CR/LF output designation area (address: 820H) 0
- Output pointer designation area (address: 821H)..... 10
- Output quantity designation area (address: 822H) 5
- Output number designation area (addresses: 82DH to 831H)
  ..... Desired message number to each address

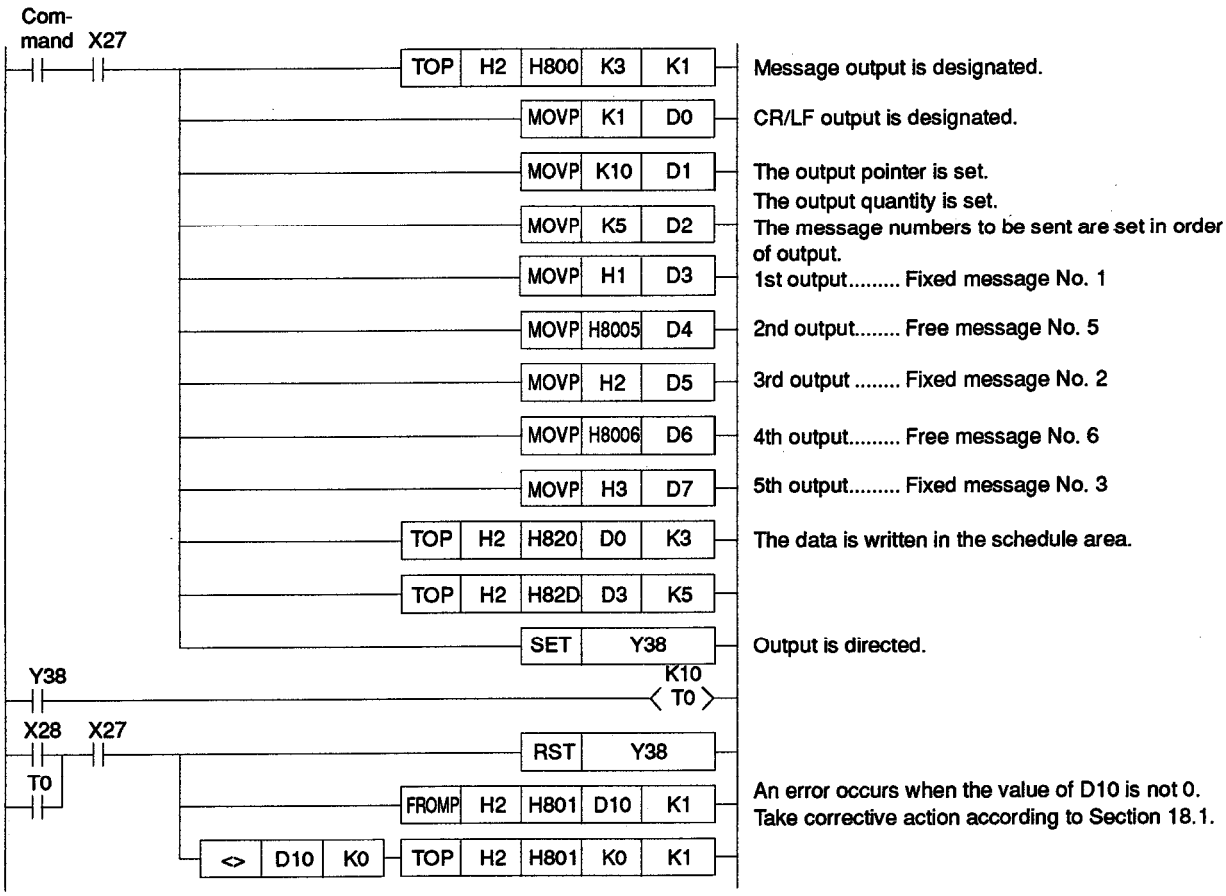
REMARK

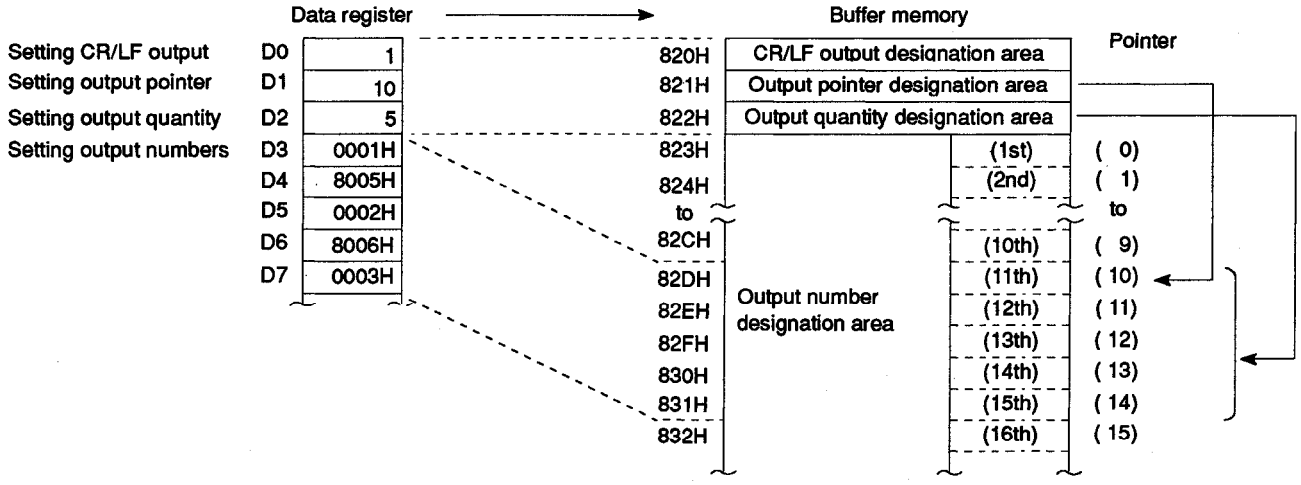
When the printer processing interrupt signal ($Y_{(n+1)}C$) is turned ON in the middle of registered message output to the printer, the output will be suspended. After the signal is turned OFF, the output will restart.

(b) Programming example

Program for sending messages to the printer when computer link module I/O signals are allocated to 20H to 3FH.

- Example of sending five messages in the order in which they are stored at addresses 82DH to 831H in the output number designation area




Data register
Buffer memory
Pointer
Setting CR/LF output
Setting output pointer
Setting output quantity
Setting output numbers
D0
D1
D2
D3
D4
D5
D6
D7
1
10
5
0001H
8005H
0002H
8006H
0003H
820H
821H
822H
823H
824H
to
82CH
82DH
82EH
82FH
830H
831H
832H
CR/LF output designation area
Output pointer designation area
Output quantity designation area
Output number designation area
(1st)
(2nd)
(10th)
(11th)
(12th)
(13th)
(14th)
(15th)
(0)
(1)
to
(9)
(10)
(11)
(12)
(13)
(14)
(15)

17.8 Example of Program for Message Output to the Printer Using the Printer Functions

An example of a sequence program for sending the message shown in the output example below to the printer using the printer functions is shown below:

(1) Printer used A7PR

(2) Mode setting switch 5

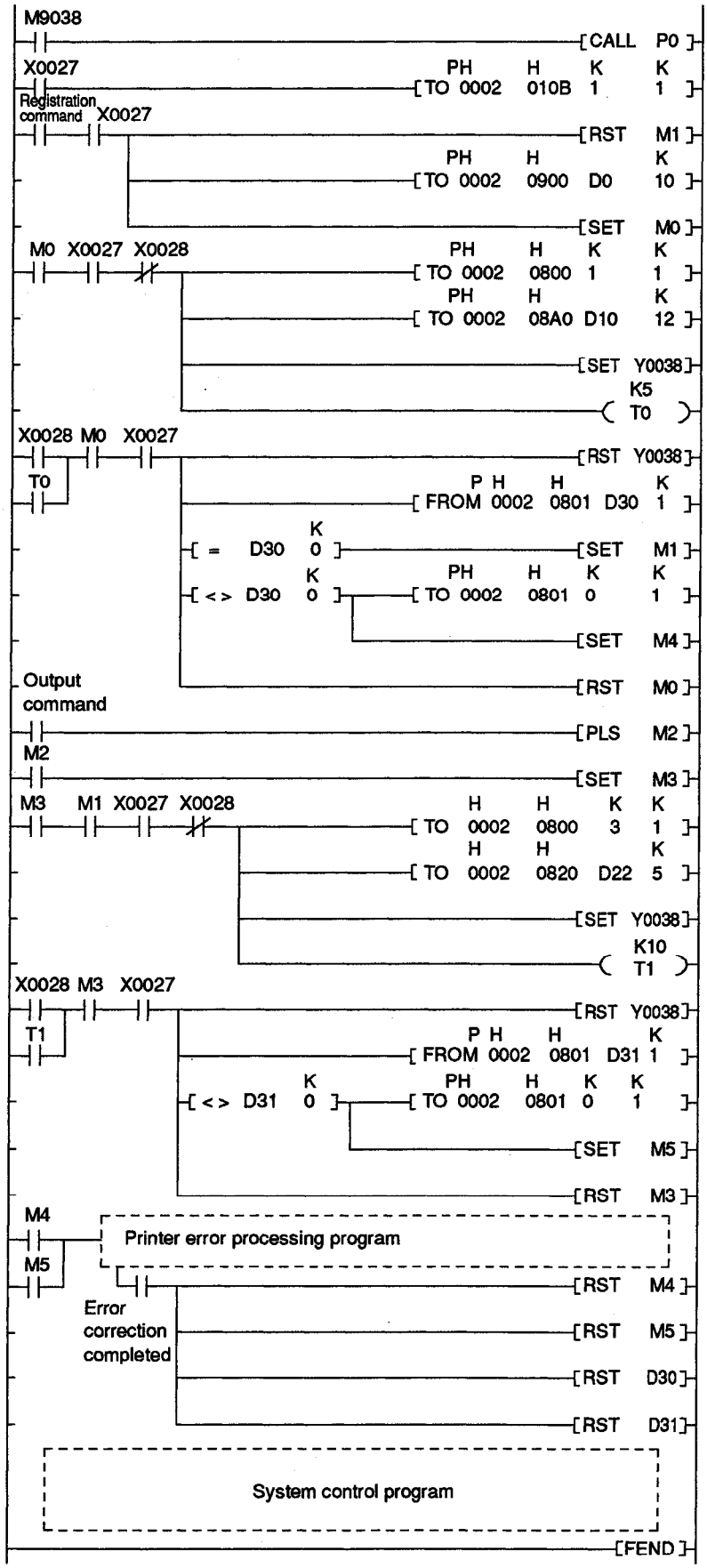
(3) Setting switches (transmission specifications etc.)

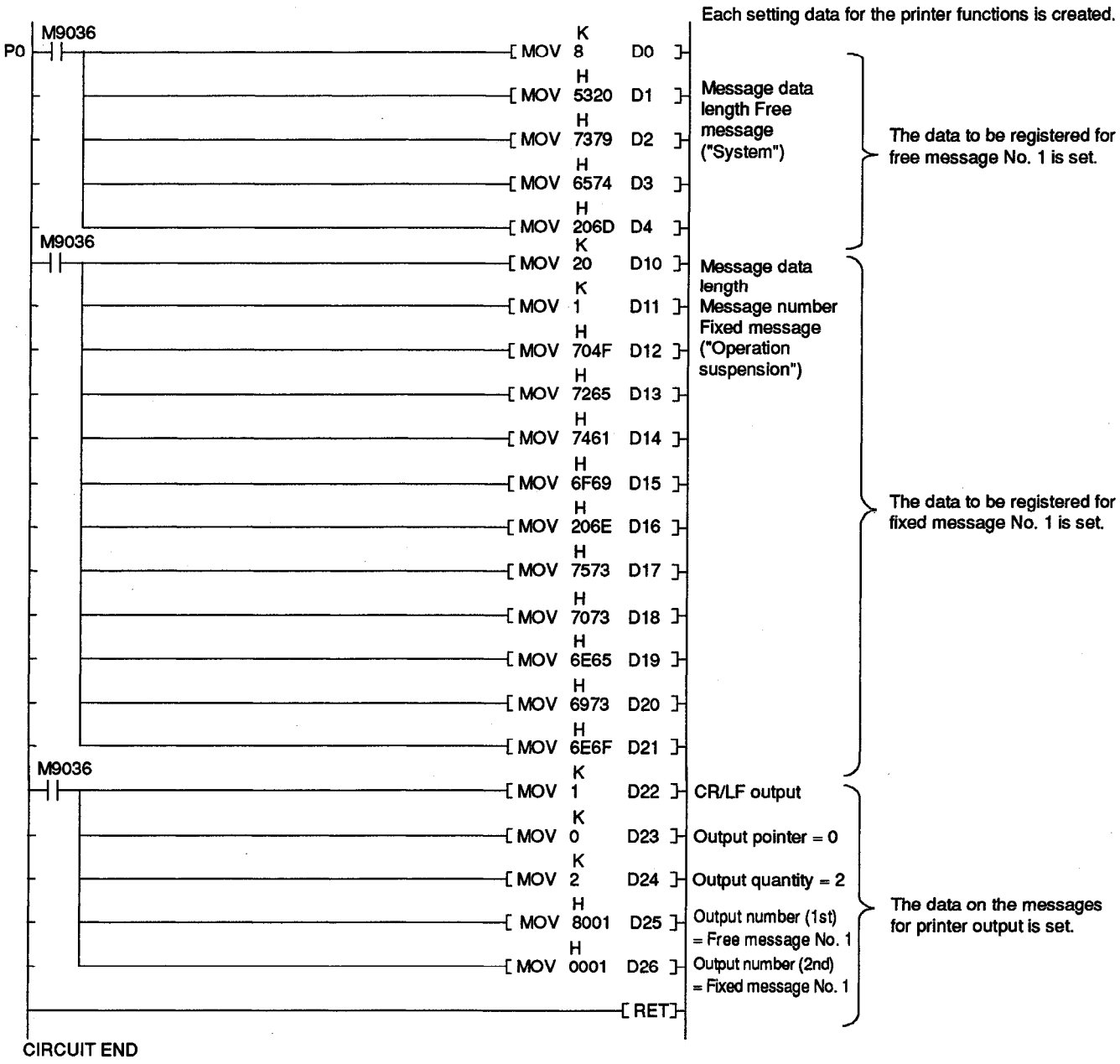
Setting Items	Setting Contents	A1SJ71UC24-PRF A1SJ71C24-PRF		A2CCPUC24-PRF	
		Setting Switch	Setting	Setting Switch	Setting
Unused	—	SW03	OFF	—	
Write during RUN enabled/disabled setting	Enabled	SW04	ON	SW20	OFF
Transmission speed setting	9600BPS	SW05	ON	SW11	ON
		SW06	OFF	SW12	OFF
		SW07	ON	SW13	ON
Data bit setting	8 bit	SW08	ON	SW14	ON
Parity bit setting	Set	SW09	ON	SW15	ON
Even/odd parity setting	Even parity	SW10	ON	SW16	ON
Stop bit setting	1 bit	SW11	OFF	SW17	OFF
Sum check setting	Not set	SW12	OFF	SW18	OFF
Main channel setting	RS-232C	—		SW19	OFF

(4) Output example

System operation suspension

(5) Sequence program example




Each setting data for the printer functions is created.
M9036
P0
[MOV K8 D0]
[MOV H5320 D1]
[MOV H7379 D2]
[MOV H6574 D3]
[MOV H206D D4]
Message data length Free message ("System")
The data to be registered for free message No. 1 is set.
M9036
[MOV K20 D10]
[MOV K1 D11]
[MOV H704F D12]
[MOV H7265 D13]
[MOV H7461 D14]
[MOV H6F69 D15]
[MOV H206E D16]
[MOV H7573 D17]
[MOV H7073 D18]
[MOV H6E65 D19]
[MOV H6973 D20]
[MOV H6E6F D21]
Message data length
Message number
Fixed message ("Operation suspension")
The data to be registered for fixed message No. 1 is set.
M9036
[MOV K1 D22]
[MOV K0 D23]
[MOV K2 D24]
[MOV H8001 D25]
[MOV H0001 D26]
CR/LF output
Output pointer = 0
Output quantity = 2
Output number (1st) = Free message No. 1
Output number (2nd) = Fixed message No. 1
The data on the messages for printer output is set.
[RET]
CIRCUIT END

18. TROUBLESHOOTING OF PRINTER FUNCTIONS

18.1 Error codes when using a printer function

Table 18.1 gives the error codes, error contents, and corrective actions for errors which occur when using a printer function.

If an error code exists in the printer function error storage area (address: 801H) of the buffer memory, write "0" to the area after the PC CPU turns OFF the printer processing request signal (Y(n+1)8). (The printer functions are unavailable unless the existing error code is cleared from the area.)

Table 18.1 Error Code List

Error Code (Hexadecimal)	Error Description	Corrective Actions
00H	No error	—
01H	Function designation error	The number designated at buffer memory address 800H is not within the following range: 0 ≤ designated number ≤ 5 . Designate a number between 0 and 5.
02H	Designated number error	The designated message number is not in the following range: 0 < Designated number ≤ 400 Set the designated number in this range.
03H	Number of characters (Message data length) error	The designated number of characters is not in the following range: 0 < Number of characters ≤ 80 Set the number of characters in this range.
04H	Number of outputs error	The designated number of outputs is not in the following range: 0 < Number of outputs ≤ 99 Set the number of outputs in this range.
05H	Message designation error	The designated message does not exist in the free/fixed message areas. Designate a registered message number.
06H	EEPROM error	The designated fixed message is not written correctly in EEPROM. Check, correct, and rewrite it to EEPROM.
07H	Interruption	Because the printer processing interrupt signal (Y(n+1)C) is turned ON, printer output is interrupted. To restart printer output, turn OFF the signal.
08H	Printer processing error	The printer processing request signal (Y(n+1)8) turns ON but does not turn OFF before the printer processing completed signal (Xn8) turns ON.
09H	Mode setting error	The mode setting switch is not set to a number from "5" to "8". Set it to "5" to "8".
30H	EEPROM write error	The writing frequency to the same area exceeds 100,000 cycles. Replace the module.
FFH	Buffer write error	An error occurred during data communications with a PC CPU. Reset the PC CPU and retry communications.

18.2 Indications of LEDs in Case of Trouble and Corrective Action

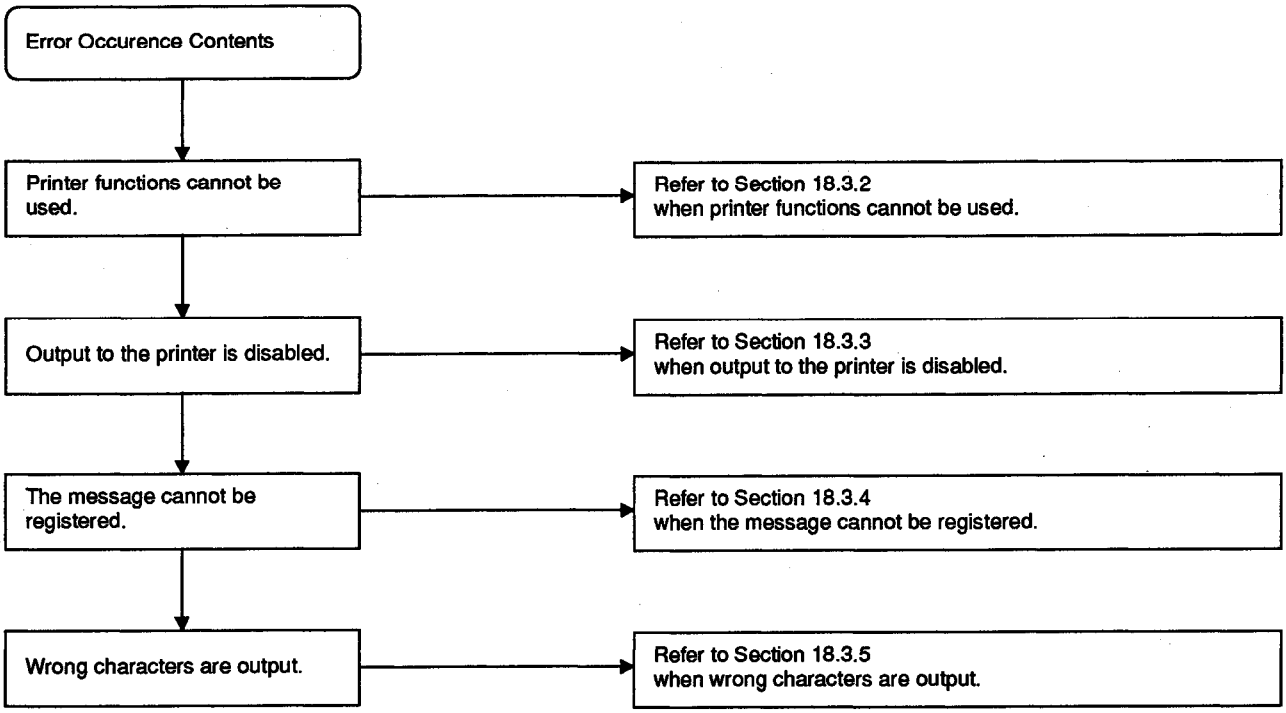
The following table shows corrective action to take when an LED indicates an error:

	LED Name	Normal State	Corrective Actions	
			During Communications Using Dedicated Protocol	During Output Using Printer Functions
—	RUN	ON	• Examine the transmission speed setting(refer to Section 4.2.2.). • Check the mode setting switch (refer to Section 4.2.1) for set number (refer to Section 16.7.2.). • Take corrective action according to Section 13.4.2.	
RS-232C interface	SD	Flashes during transmission	• Examine the RS-232C connector cable connections (refer to Section 4.6.2.) by setting CD terminal check enabled. • Check the states of the signals at the RS-232C interface in half-duplex transmission (refer to Section 10). Examine the RS-232C connector cable connections (refer to Section 4.6.2).	
	NEU	OFF	• Check the mode setting switch (refer to Section 4.2.1) for set number (refer to Section 16.7.2.).	
RS-422 interface	NEU	ON during waiting for ENQ	• Check the mode seswitch (refer to Section 4.2.1) for set number (refer to Section 16.7.2.).	
			• Examine the quantity of message data transmitted from the computer (refer to Section 5). • Consult your nearest Mitsubishi representative.	—
	ACK	ON after ACK transmission	Check on the computer the error code received immediately after an NAK or NN code was sent, and take corrective action according to Section 13.1.	—
	NAK	OFF		
	SD	Flashes during transmission	• Check the mode setting switch (refer to Section 4.2.1) for set number (refer to Section 16.7.2.). • Check the communications status in DC1/DC3 receive control (refer to Section 9.2.3).	
	RD	Flashes during receive	• Examine the RS-422 connector cable connections (refer to Section 4.6.3). • Check the communications status in DC1/DC3 transmission control (refer to Section 9.2.2).	
	C/N	OFF	• Check the write during RUN enabled/disabled setting (refer to Section 4.2.2). • Take corrective action according to Section 13.4.4. • The LED goes OFF by writing 16 to buffer memory address 102H in the computer link module.	
	P/S	OFF	• Match the transmission specifications of the computer link module (refer to Section 4.2.2) with those of the external device. • The LED goes OFF by writing 32 to buffer memory address 102H in the computer link module.	
			• Examine how the sum check code should be treated (refer to Sections 4.2.2 and 5.4.6 (10).). • Examine the calculation of the sum check code on the computer (refer to Section 5.4.6 (10).).	—

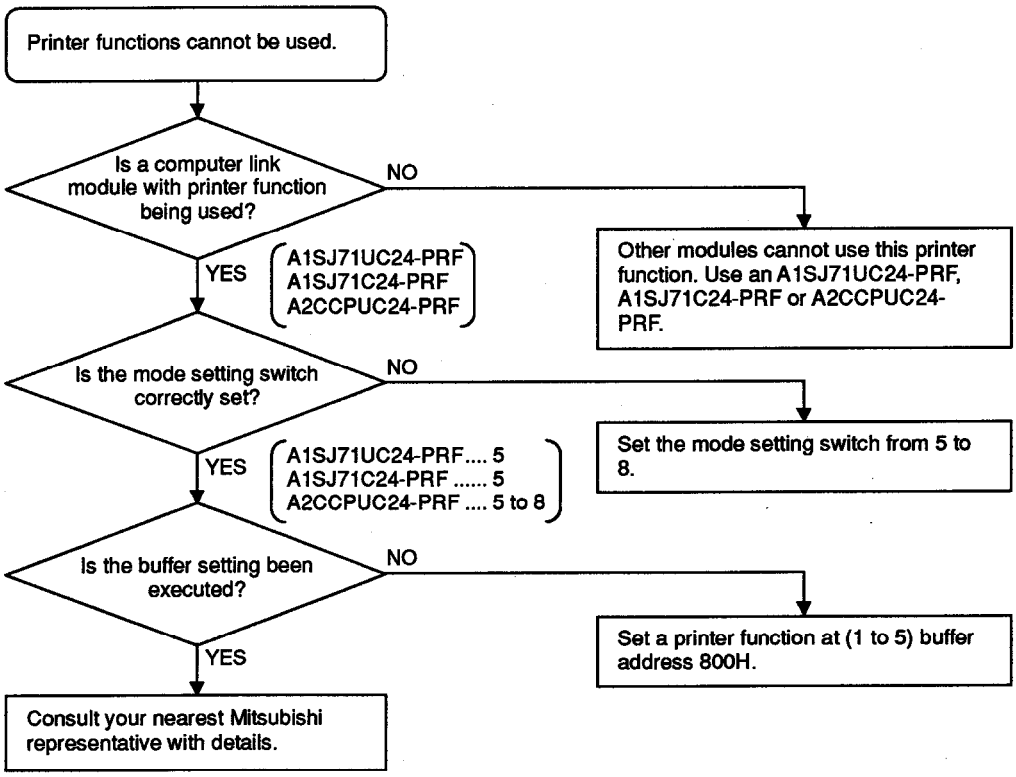
	LED Name	Normal State	Corrective Actions	
			During Communications Using Dedicated Protocol	During Output Using Printer Functions
RS-422 interface	PRO	OFF	• The LED goes OFF by writing 64 to buffer memory address 102H in the computer link module.	
			• Check the mode setting switch (refer to Section 4.2.1) for set number. • Examine the transmitted message on the computer (refer to Section 5). • Take corrective action according to Section 13.1.	—
	SIO	OFF	• Match the transmission specifications of the computer link module (refer to Section 4.2.2) with those of the external device. • Decelerate the transmission speed • The LED goes OFF by writing 128 to buffer memory address 102H in the computer link module.	
	CPU R/W	ON/Flashes	• Examine the program for the PC CPU and the computer. • Check the PC CPU and the computer for status. • Check the mode setting switch (refer to Section 4.2.1) for set number (refer to Section 16.7.2.). • Consult your nearest Mitsubishi representative.	

18.3 Troubleshooting

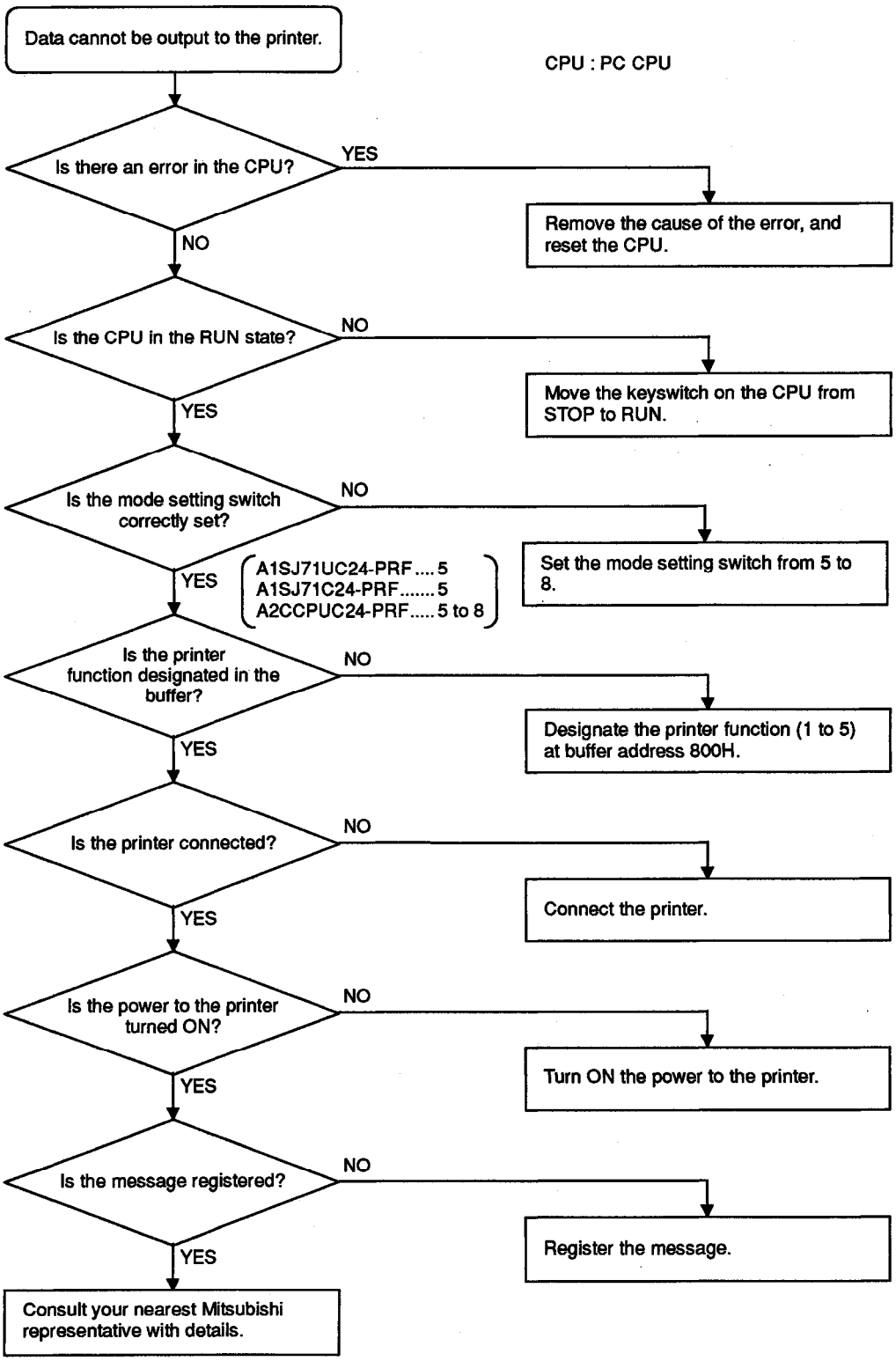
18.3.1 Troubleshooting flow chart



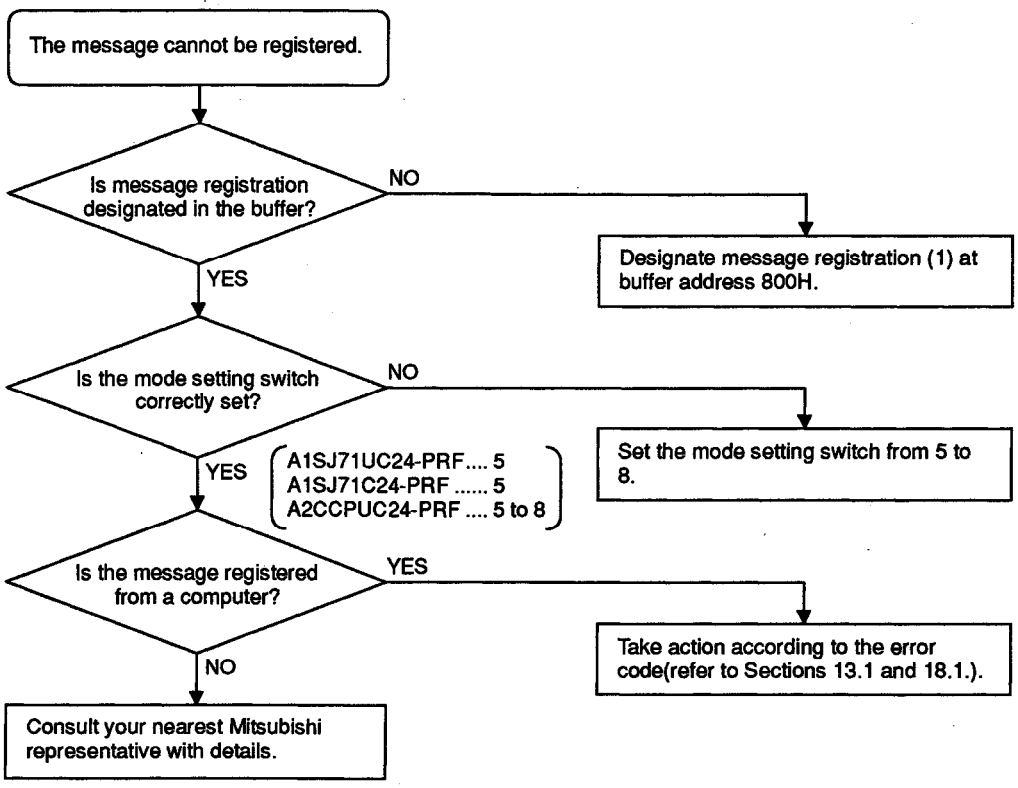
18.3.2 When printer functions cannot be used



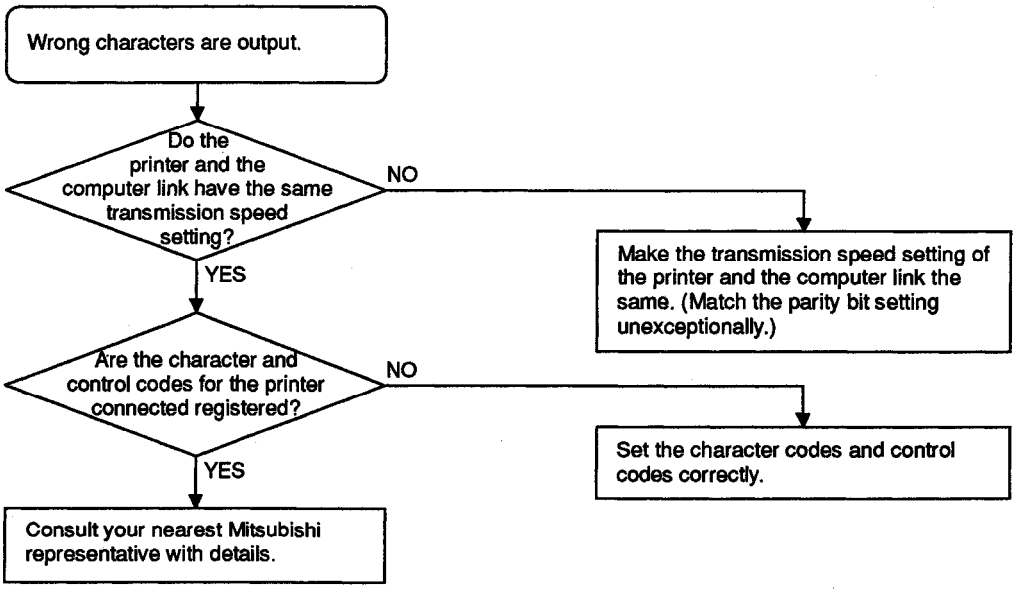
18.3.3 When output to the printer is disabled



18.3.4 When the message cannot be registered



18.3.5 When wrong characters are output



MEMO

APPENDICES

This part describes ASCII code table, communication time between a CPU and a computer link, and the A-series special function module buffer addresses.

APPENDICES

APPENDIX 1 ASCII CODE TABLE

The following is the ASCII character codes table (7-bit codes).
Among ASCII character codes 00H and 1FH, those indicated by ★ are used as control codes for the computer link module. (DC codes 11H to 14H can be changed by the user.)

LSD \ MSD		0	1	2	3	4	5	6	7
		000	001	010	011	100	101	110	111
0	0000	NUL ★	DLE	SP	0	@	P		p
1	0001	SOH	DC1 ★	!	1	A	Q	a	q
2	0010	STX ★	DC2 ★	"	2	B	R	b	r
3	0011	ETX ★	DC3 ★	#	3	C	S	c	s
4	0100	EOT ★	DC4 ★	$	4	D	T	d	t
5	0101	ENQ ★	NAK ★	%	5	E	U	e	u
6	0110	ACK ★	SYN	&	6	F	V	f	v
7	0111	BEL	ETB	'	7	G	W	g	w
8	1000	BS	CAN	(	8	H	X	h	x
9	1001	HT	EM	)	9	I	Y	i	y
A	1010	LF ★	SUB	*	:	J	Z	j	z
B	1011	VT	ESC	+	;	K	[	k	{
C	1100	FF ★	FS	,	<	L	\	l	|
D	1101	CR ★	GS	-	=	M	]	m	}
E	1110	SO	RS	.	>	N	↑	n	~
F	1111	SI	VS	/	?	O	←	o	DEL

APPENDIX 2 COMMUNICATION TIME BETWEEN A PC CPU AND A COMPUTER LINK MODULE (SCAN TIME INCREASE)

In response to a request from the computer link module using a dedicated protocol, the PC CPU, while running, processes as much data as it can deal with in a cycle of processing, which is described in Section 3.2.1, every time the END instruction is executed.

The intervening times (i.e. by how much the scan time increases) for each processing operation and its corresponding processing times (indicated in number of scans) are shown below. (For the scan time, refer to (2) of POINTS.)

(1) ACPU common command

Item				Com-mand	Intervening Times [ms] (Scan Time Increases)					Scan Count Required for Processing
					A0J2H, A1S, A1N, A2N, A3N	A3H	AnA	AnU	Access Data Unit	
Device data	Device memory	Batch read	Bit units	BR	0.76 ms	0.57 ms	1.38 ms	1.95 ms	256 devices	1 scan (2 scans for device "R" only)
			Word devices	WR	1.13 ms	0.81 ms	2.42 ms	3.51 ms	64 devices	
		Batch write	Bit units	BW	1.13 ms	0.94 ms	1.06 ms	1.65 ms	160 devices	2 scans (1 scan when "enable during RUN" is set [excluding R])
			Word devices	WW	1.13 ms	0.84 ms	2.60 ms	3.90 ms	64 devices	
		Test (random write)	Bit units	BT	1.13 ms	0.90 ms	1.06 ms	1.55 ms	20 devices	2 scans (1 scan when "enable during RUN" is set [excluding R])
			Word devices	WT	1.13 ms	0.90 ms	1.06 ms	0.95 ms	10 devices	
		Monitor data regist-ration	Bit units	BM	—	—	—	—	—	—
			Word devices	WM						0 scan (1 scan for device "R" only)
		Monitor	Bit units	MB	2.02 ms	0.93 ms	1.46 ms	0.70 ms	40 devices	1 scan
			Word devices	MN	2.08 ms	0.96 ms	1.47 ms	0.70 ms	20 devices	
	Extension file register	Batch read		ER	1.27 ms	0.76 ms	2.42 ms	5.00 ms	64 devices	2 scan (3 scans for ET [only AnA/AnUCPU])
		Batch write		EW	1.27 ms	0.76 ms	2.60 ms	5.40 ms	64 devices	
		Test (Random write)		ET	1.31 ms	0.87 ms	0.97 ms	1.75 ms	10 devices	
		Monitor data registration		EM	—	—	—	—	—	—
		Monitor		ME	1.75 ms	0.98 ms	1.42 ms	0.85 ms	20 devices	1 scan
	Buffer memory	Batch read		CR	—	—	—	—	—	—
		Batch write		CW						
Special function module buffer memory		Batch read		TR	FROM instruction processing time + 1.13 ms	FROM instruction processing time + 0.81 ms	FROM instruction processing time + 0.75 ms	FROM instruction processing time + 1.20 ms	128 bytes	1 scan
		Batch write		TW						2 scans (1 scan when "enable during RUN" is set)

Item				Command	Intervening Times [ms] (Scan Time Increases)				Access Data Unit	Scan Count Required for Processing
					A0J2H, A1S, A1N, A2N, A3N	A3H	AnA	AnU		
Program	Sequence program	Batch read	Main	MR	1.20 ms	0.78 ms	0.70 ms	1.10 ms	64 steps	1 scan
			Sub	SR	1.20 ms	0.84 ms	0.70 ms	1.05 ms		
			Main	XR	1.20 ms	0.78 ms	0.70 ms	1.00 ms		2 scans (1 scan when "enable during RUN" is set)
			Sub 1		1.20 ms	0.84 ms	0.70 ms	1.00 ms		
			Sub 2		—	—	—	1.10 ms		2 scans
			Sub 3		—	—	—	1.05 ms		
		Batch write	Main	MW	1.35 ms	0.75 ms	0.70 ms	0.75 ms		
			Sub	SW	1.70 ms	0.76 ms	0.70 ms	1.45 ms		
			Main	XW	1.35 ms	0.75 ms	0.70 ms	0.90 ms		2 scans
			Sub 1		1.70 ms	0.76 ms	0.70 ms	1.30 ms		
			Sub 2		—	—	—	1.20 ms		2 scans
			Sub 3		—	—	—	1.25 ms		—
	Micro-computer program	Batch read	Main	UR	1.35 ms	0.76 ms	—	—	128 bytes	2 scans
			Sub	VR	1.35 ms	0.76 ms				
		Batch write	Main	UW	1.35 ms	0.73 ms				
			Sub	VW	1.53 ms	0.73 ms				
	Comment	Batch read		KR	1.35 ms	0.76 ms	2.42 ms	4.90 ms	128 bytes	2 scans
		Batch write		KW	1.53 ms	0.73 ms	2.60 ms	5.35 ms		
	Parameter	Batch read		PR	0.68 ms	0.50 ms	2.42 ms	4.95 ms	128 bytes	2 scans (4 scans for AnUCPU)
		Batch write		PW	—	—	—	—	—	—
		Analysis request		PS						
PC CPU		Remote RUN		RR	—	—	—	—	—	—
		Remote STOP		RS						
		PC type read		PC, PU	—	—	—	—	—	—
Global				GW	—	—	—	—	—	—

(2) AnA/AnUCPU common command

Item				Com-mand	Intervening Times (Scan Time Increases)			Scan Count Required for Processing
					AnA	AnU	Access Data Unit	
Device data	Device memory	Batch read	Bit units	JR	1.19 ms	1.60 ms	256 devices	1 scan (2 scans for device "R" only)
			Word units	QR	2.07 ms	3.61 ms	64 devices	
		Batch write	Bit units	JW	0.99 ms	1.65 ms	160 devices	2 scans (1 scan when "enable during RUN" is set [excluding R])
			Word units	QW	2.32 ms	0.80 ms	64 devices	
		Test (random write)	Bit units	JT	0.91 ms	1.85 ms	20 devices	2 scans (1 scan when "enable during RUN" is set [excluding R])
			Word units	QT	0.93 ms	0.95 ms	10 devices	
		Monitor data registration	Bit units	JM	—	—	—	—
			Word units	QM				1 scan for device "R" only
		Monitor	Bit units	MJ	1.34 ms	0.70 ms	40 devices	1 scan
			Word units	MQ	1.35 ms	0.70 ms	20 devices	
	Extension file register	Direct read		NR	2.30 ms	4.90 ms	64 devices	3 scans (4 scans when a set range covers several blocks)
		Direct write		NW	2.57 ms	5.25 ms	64 devices	
Pro-gram	Extension comment	Batch read		DR	2.31 ms	5.05 ms	128 bytes	2 scans
		Batch write		DW	2.59 ms	5.45 ms		

(3) AnUCPU common command

Item		Com-mand	Intervening Times (Scan Time Increases)		Scan Count Required for Processing
			AnU	Access Data Unit	
Network	Network registration	ZE	—	—	—
	Network read	ZR	—	—	—
	Routing parameter read	ZT	4.10 ms	—	1 scan

POINTS

(1) The PC CPU can only process one of these operations with each END processing. If the A6GPP and computer link module access a given PC CPU at the same time, one processing must wait until the other processing is completed. Therefore, the scan count required for processing further increases (refer to Section 5.2.3 (2)).

(2) Even though communications using computer link module is not performed, scan time increases 0.2 ms (0.1 ms with A3HCPU, AnACPU, and AnUCPU).

APPENDIX 3 SPECIAL FUNCTION MODULE BUFFER MEMORY ADDRESSES

The special function module buffer memory addresses are listed below. They are used to read and write (commands TR, TW) data to and from the special function module buffer memory with protocols 1 to 4.

(1) Formula

The following formula converts the address (hexadecimal) to be designated in a computer using the address for the FROM/TO instructions.

> Designated address (hexadecimal) =
>
> address used with FROM/TO instructions x 2
> converted into hexadecimal + head address of each module

The User's Manual for each module gives details about the addresses of FROM/TO instructions.

Calculation example 1:

To designate the head address (the designated address of the FROM/TO instructions is 100H) of the specific use area of the AJ71UC24

Designated address (600H) =

address used with FROM/TO instructions (100H) x 2
+ head address (400H)

Calculation example 2:

To designate the preset value storage address (the designated address of the FROM/TO instructions is 1H) of CH1 of the AD61 high-speed counter module

Designated address (82H) =

address used with FROM/TO instructions (1H) x 2
+ head address (80H)

(2) Linkable special function modules and module numbers

Special Function Module Name	Buffer Memory Head Address (hexadecimal)	Module Number When Loaded in Slot No. 0
AD61(S1) high-speed counter module	80H	01H
A616AD analog-digital converter module	10H	01H
A616DAI digital-analog converter module	10H	01H
A616DAV digital-analog converter module	10H	01H
A616TD temperature-digital converter module	10H	01H
A62DA(S1) digital-analog converter module	10H	01H
A68AD(S2) analog-digital converter module	80H	01H
A68ADN analog-digital converter module	80H	01H
A68DAV/DAI digital-analog converter module	10H	01H
A68RD3/4 temperature-digital converter module	10H	01H
A84AD analog-digital converter module	10H	02H
A81CPU PID control module	200H	03H
A61LS position detection module	80H	01H
A62LS(S5) position detection module	80H	02H
AJ71(P)T32(S3) MELSECNET/MINI master module	20H	01H

Special Function Module Name	Buffer Memory Head Address (hexadecimal)	Module Number When Loaded in Slot No. 0
AJ65BT11 CC-Link system master · local module	2000H (*2)	01H
AJ71C22(S1) multidrop link module	1000H	01H
AJ71C24(S3/S6/S8) computer link module	1000H	01H
AJ71UC24 computer link module	400H	01H
AD51(S3) intelligent communications module	800H	02H
AD51H(S3) intelligent communications module	800H	02H
AJ71C21(S1) terminal interface module	400H	01H
AJ71B62(S3) B/NET interface module	20H	01H
AJ71P41 SUMINET interface module	400H	01H
AJ71E71(S3) Ethernet interface module	400H (*3)	01H
AD51FD(S3) external fault diagnosis module	280H	02H
AD57G(S3) graphic controller module	280H	02H
AS25VS vision sensor module	100H	02H
AS50VS vision sensor module	100H	02H
AS50VS-GN vision sensor module	80H	02H
AD59(S1) memory card interface module	1800H (*1)	01H
AJ71ID1(2)-R4 type ID interface module	280H	01H
AD70(D)(S2) positioning module	80H	01H
AD71(S1/S2/S7) positioning module	200H	01H
AD72 positioning module	200H	02H
AD75P1(P2/P3)(S3) positioning module	800H	01H
AD75M1(M2/M3) positioning module	800H	01H
A1SD61 high-speed counter module	10H	01H
A1SD62(E/D(S1))high-speed counter module	10H	01H
A1S62DA digital-analog converter module	10H	01H
A1S62RD3/4 temperature-digital converter module	10H	01H
A1S64AD analog-digital converter module	10H	01H
A1SJ71(U)C24-R2(R4/PRF) computer link module	400H	01H
A1SD51S type intelligent communication module	800H	01H
A1SJ71ID1(2)-R4 type ID interface module	280H	01H
A1SJ71E71-B2/B5(S3) Ethernet interface module	400H (*3)	01H
A1SD70 positioning module	80H	01H
A1SD71-S2(S7) positioning module	200H	02H
A1SD75P1(P2/P3)(S3) positioning module	800H	01H
A1SD75M1(M2/M3) positioning module	800H	01H
A1S63ADA analog I/O module	10H	01H
A1S64TCTT(BW)-S1 type temperature control module	20H	01H
A1S64TCRT(BW)-S1 type temperature control module	20H	01H
A1S62TCTT(BW)-S2 type temperature control module	20H	01H
A1S62TCRT(BW)-S2 type temperature control module	20H	01H
A1S68DAV/A1S68DAI type digital-analog conversion module	20H	01H
A1S68AD type analog-digital conversion module	20H	01H
A1S68TD type thermocouple input module	20H	01H
A1SJ71PT32-S3 MELSECNET/MINI master module	20H	01H
A1SJ65BT11 CC-Link system master · local module	2000H (*2)	01H

*1 Read/write of the memory area where a memory card accesses is possible by changing the bank of the memory card with Y10 and Y11, which are input/output signals between the PC CPU and the AD59 (S1).

*2 To read or write the buffer memory to the applicable bank, switch the buffer memory bank with the input/output signal Y1C/Y1D applied between the PC CPU and AJ61BT11/A1SJ61BT11.

*3 To read/write the fixed buffer and random access buffer to the applicable bank, switch the buffer memory bank (channel) with the input/output signal Y1C applied between the PC CPU and Ethernet interface module.

REMARK

The head addresses 400H and 1000H in the computer link module designated by the computer are the head addresses in the buffer memory for reading or writing data from or to a computer link module unconnected to the computer which requests the operation.

(3) Addresses in special function modules to be designated from the computer

The following tables show the addresses in some special function modules to be designated from the computer:

(For AD61 high-speed counter module)

Buffer Memory Contents	Address Set by Computer		Address Set with FROM/TO Instruction	
	Channel 1	Channel 2	CH1	CH2
Unused area (unavailable)	80H	C0H	0	32
	81H	C1H		
Preset value write (lower bits)	82H	C2H	1	33
Preset value write (middle bits)	83H	C3H		
Preset value write (higher bits)	84H	C4H	2	34
	85H	C5H		
Mode register	86H	C6H	3	35
	87H	C7H		
Present value read (lower bits)	88H	C8H	4	36
Present value read (middle bits)	89H	C9H		
Present value read (higher bits)	8AH	CAH	5	37
	8BH	CBH		
Set value read/write (lower bits)	8CH	CCH	6	38
Set value read/write (middle bits)	8DH	CDH		
Set value read/write (higher bits)	8EH	CEH	7	39
	8FH	CFH		

APPENDIX4 COMPATIBILITY BETWEEN AJ71UC24 AND AJ71C24-S8 AND PRECAUTIONS FOR SIMULTANEOUS USE OF THESE MODULES

This appendix describes the compatibility of the AJ71UC24 computer link/multidrop link module with the AJ71C24-S8 computer link module and the usability of the AJ71C24-S8 programs for the AJ71UC24 as well as precautions for replacing or adding a module.

4.1 Compatibility

The AJ71UC24 and the AJ71C24-S8 are equivalent in size, and use the same installation method and basic programs (for the PC CPU and the computer).
All the functions of the AJ71C24-S8 can be expected from the AJ71UC24 which additionally provides higher transmission efficiency.

4.2 Precautions for Utilizing the AJ71UC24 Instead of the AJ71C24-S8

Described below are precautions for replacing the AJ71C24-S8 with the AJ71UC24:

(1) Connecting terminal resistors and setting the transmission specification setting switches

While the terminal resistance during communications through the RS-422 interface is set by switches on the AJ71C24-S8, terminal resistors suitable for communications are connected to the AJ71UC24 because communications is executed via the RS-422 or RS-485 interface.
Among the transmission specification setting switches, the SW23 and the SW24 are different as follows.

(1) The ON/OFF positions for switches are reversed.

(2) The switch functions are different:
AJ71C24-S8 : Terminal resistor present/absent setting
AJ71UC24 : Function selection, etc. (see Section 4.2.2)

To use an AJ71UC24 with the computer link/printer function, set SW23 to ON and SW24 to OFF.

(2) I/O signals to the PC CPU

The AJ71UC24 is provided with the mode switching request signal (Y(n+1)9) and the mode switching completed signal (Xn9) which the AJ71C24-S8 does not have.
Normal mode switching from the PC CPU takes place in response to the mode switching request signal.

(3) When an error occurs after replacing the AJ71C24-S8 with the AJ71UC24

Thanks to its improved transmission efficiency, the AJ71UC24 can transmit data at a rate almost equal to the set transmission speed.
It can also receive data transmitted as fast as the set transmission speed.
(AJ71C24-S8's transmission efficiency: approx. 91% at 4800 BPS, approx. 84% at 9600 BPS, approx. 76% at 19200 BPS)
If a communications error occurs in the communicating device because of the increase in transmission efficiency and data cannot be transmitted or received normally after replacing the AJ71C24-S8 of a computer link system, which operated normally with it, with an AJ71UC24, take the following corrective action:

(a) Lower the transmission speed.

(b) Set the stop bit length properly according to the computer link system.

(c) Examine the data receive software for the communicating device (to improve transmission efficiency).

(d) Use an AJ71C24-S8 again to establish a computer link within the capability of its functions.

* Calculation of data transmission time (unit: second) ... Reference value
Total number of bits to be transmitted = (number of start bits + number of data bits + number of parity bits + number of stop bits) x number of bytes to be transmitted
Data transmission time = (total number of bits to be transmitted/set transmission speed)/transmission efficiency

4.3 Comparison of Functions

The following table shows the functions of the AJ71UC24 which are upgraded from those of the AJ71C24-S8 and are added:

Function \ Module Type	AJ71C24-S8	AJ71UC24	Reference Section
Interface specifications	• RS-232C, RS-422	• RS-232C, RS-422/485	Section 3.1
New buffer memory	—	• The buffer memory stores the information about RS-232C signals and the settings of the switches on the AJ71UC24 (mode setting/station number setting/transmission specification setting switches).	Section 3.10
Mode switching function	• Normal mode switching	• Both normal mode switching and forced mode switching are possible.	Section 12
AnUCPU access function	• Access to all extension devices of the AnACPU is possible.	• Access to all extension devices of the AnUCPU is possible with an AnA/AnUCPU common command.	Section 3.2.1
Access function to another network through MELSECNET/10	Impossible	• Access to another network through the MELSECNET/10 network system is possible.	Section 5.15
Multidrop link function	Impossible	• A link system (multidrop link system) can be established between an inexpensive master station and a local or remote station through the RS-422/485 interface.	User's Manual (Multidrop Link Function)

APPENDIX 5 USING THE COMPUTER LINK MODULE WITH A QnA PROGRAMMABLE CONTROLLER

The restrictions and other information that applies when using the computer link module at a QnACPU station or at a remote station of a MELSECNET/10 network system are indicated in the table below.

(1) Availability of the data communication function
The table below shows whether the data communication function can be used between the PC in which the computer link module is mounted and the external device access station.

Station where Computer Llink Module Mounted	External Device Access Station	Possibility of Communication with an External Device		
		Dedicated Protocol	No-protocol Mode	Bi-directional Mode
QnACPU station	Self station (Station where computer link module is mounted)	Communication with the device memory is possible within the AnACPU ranges.	Communication possible	Communication possible
	Other stations (Via MELSECNET/10)	When communicating with a QnACPU station, only the AnACPU device ranges in the device memory can be used for communication. When using PC CPUs other than QnACPU, the entire ranges indicated in the specifications in section 5 can be used.	Communication not possible	Communication not possible
	Other stations (Via MELSECNET (II), Via MELSECNET/B		Communication not possible	Communication not possible
MELSECNET/10 remote station	Self station (Station where computer link module is mounted)	Communication with the following devices in the device memory is possible: B, W, X, Y, special devices in the M9000's, special devices in the D9000's. Communication with special function modules is possible.	Communication not possible	Communication not possible
	Other stations (Via MELSECNET/10)	When communicating with a QnACPU station, only the AnACPU device ranges in the device memory can be used for communication. When using PC CPUs other than QnACPU, the entire ranges indicated in the specifications in section 5 can be used.	Communication not possible	Communication not possible

(2) Mountable number of modules
At a QnA type programmable controller, a maximum of 6 computer link modules can be mounted.
For the mounting of a computer link module, refer to 2.7.

(3) Communications using the dedicated protocol
Carry out data communication after confirming the usable commands specified in Section 3.2.1.
Data can be read or write to the device memory of the QnACPU within the device range of the AnACPU (Data cannot be read or write to the file resisters, latch relays, and step relays).

(4) Communications in the no-protocol mode and bi-directional mode
Data communications between QnA CPU and an external device using a computer link module can be executed in the same manner as data communications between A series PC CPU and an external device.

POINT

Since the performance differs between QnA CPUs and A series PC CPUs, the response speed of the PC CPU to the read/write request which is output by the computer link module varies accordingly.
When using a computer link module by mounting it at a QnA type programmable controller, it is necessary to test the correctness of the operation.

APPENDIX 6 EXAMPLES OF COMPUTER LINK PROGRAMS

This appendix shows examples of sequence programs for data communications in the no-protocol mode described in Section 6 of the User's Manual (Computer Link Function).
For sequence program and computer program examples for data communications using a dedicated protocol and in the bidirectional mode, refer to the following guidebook (separately available).
The guidebook also includes sequence program and computer program examples for data communications in the no-protocol mode.

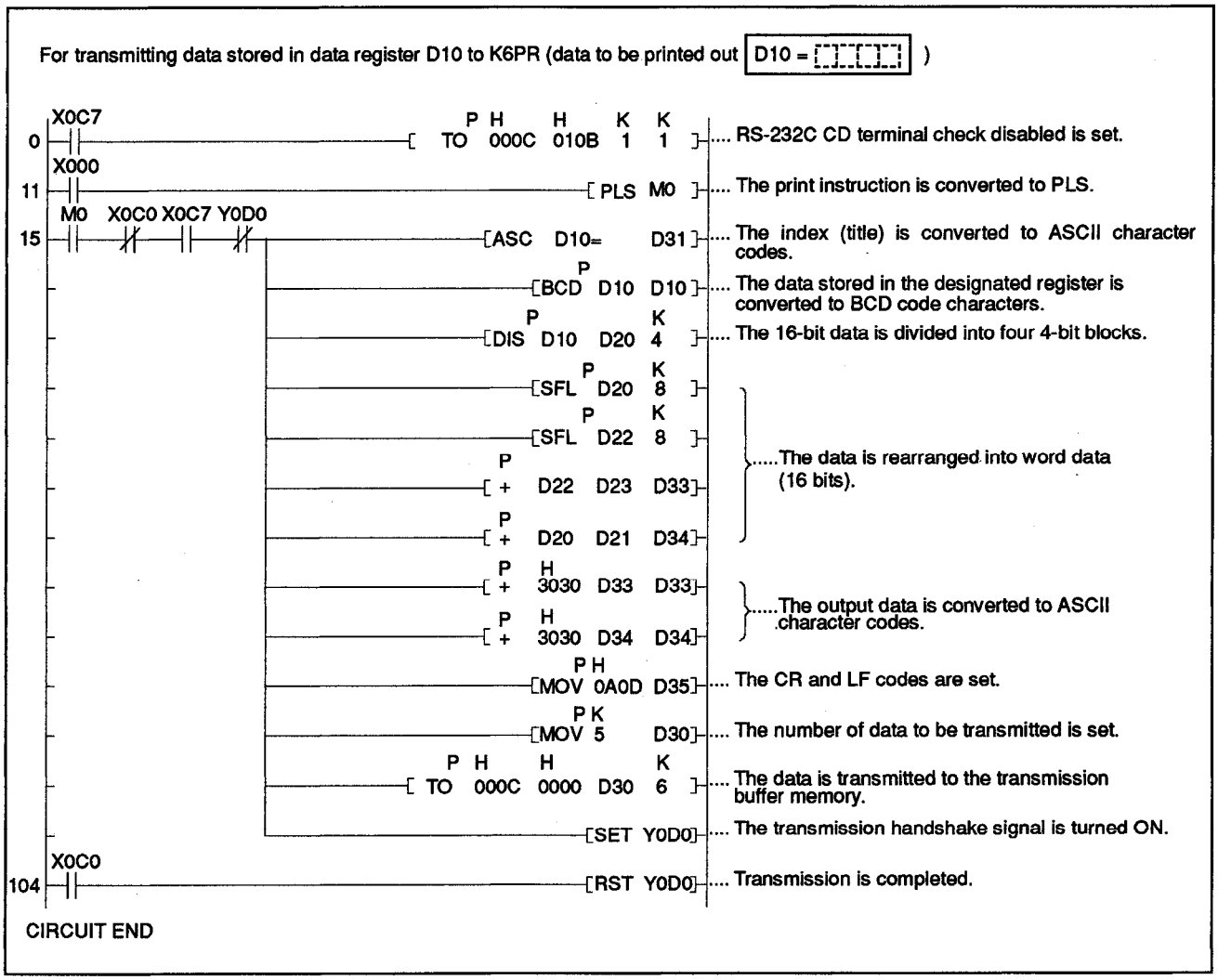
Computer Link Module Guidebook ... SH-3510

6.1 Examples of Sequence Programs for Data Communications in the No-protocol Mode

Shown below are sequence programs for sending data stored in the data register (D), link register (W), file register (R), etc. and the present values of the timer (T) and counter (C) to the printer in the no-protocol mode and printing them out on it.

6.1.1 Sequence program when application instructions are used

(1) Example of sequence program (Computer link module I/O signals: C0H to DFH)



REMARK

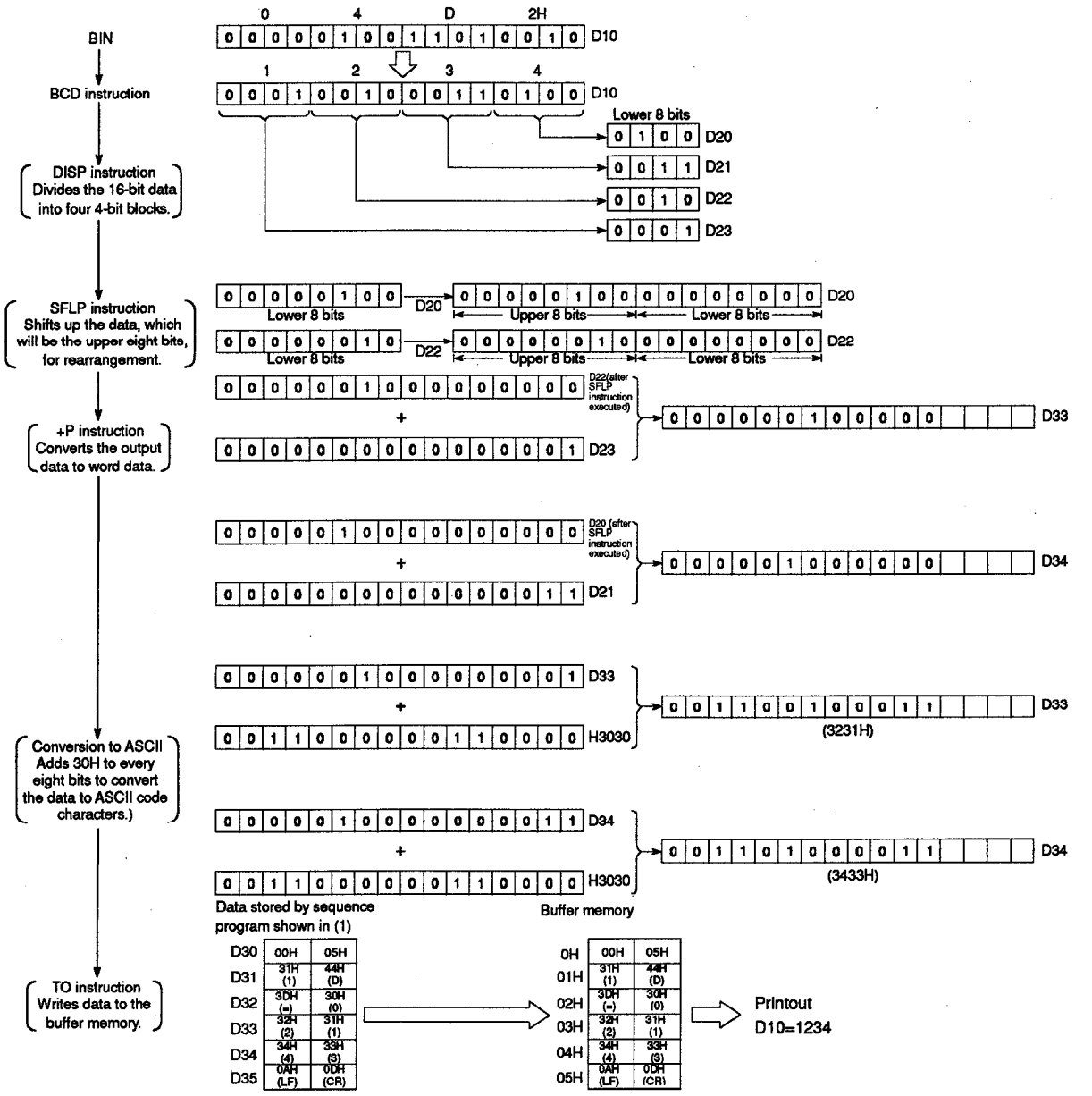
Computer link module transmission specifications for printer output

	K6PR	K6PR-k	K7PR	A7(N)PR
Transmission speed BPS	2400	2400	9600	9600
Data length	8	8	8	8
Stop bit	1	1	2	1
Parity check	Even	Even	Not set	Even
Remarks			The tansmission speed can be changed to 2400 BPS.	

(2) Protocol for converting data stored in a data register to printer output data

The PC CPU processes only binary numeric data.
It is, therefore, necessary to convert data to be printed out from BIN to ASCII.
Data is transmitted from the lower eight bits first, then the upper eight bits from the buffer memory (from the lowest-numbered (head) to the highest-numbered addresses) to the printer.
The data must be rearranged in the desired order in which it will be transmitted on the sequence program.
The following is an example of a conversion protocol based on the sequence program shown in (1).

(Example) When converting data (1234) stored in a data register to ASCII code characters



6.1.2 Sequence program when dedicated instructions are used

The following is an example of a program for executing the same processing as performed by the sequence program shown in Appendix 6.1.1 by the use of AnA/AnUCPU dedicated instructions (BINDA, PRN).

(Computer link module I/O signals: C0H to DFH)

For transmitting data stored in data register D10 to K6PR (data to be printed out D10 = □□□□□)

```
X0C7
0  ─┤├─[ TO  P H  000C  H 0103  K 1  K 1 ]─ .... Byte is set as the unit of the data to be transmited.
          [ TO  P H  000C  H 010B  K 1  K 1 ]─ .... RS-232C CD terminal check disabled is set.
X000 M9039
19 ─┤├─┤├─[ PLS  M0 ]─ .... The print instruction is converted to PLS.
M0
24 ─┤├─[ SET  M1 ]─ .... M1 for the print instruction is set.
          [ ASC  D10=  D31 ]─ .... The index (title) is converted to ASCII code characters.
          [ MOV  P H 0A0D  D36 ]─ .... The CR and LF codes are set (for printing).
          [ SET  M9049 ]─ .... The method of processing (D)+3 of the BINDA instruction is set.
          [ LEDA  BINDA ]─ .... The output data is converted to ASCII code characters.
          [ LEDC  D10 ]─ [ The ASCII-converted character String in D10 will be stored in D33 to D35. ]
          [ LEDC  D33 ]─
          [ LEDR ]─
M1  X0C0  X0C7  X0D0
67 ─┤├─┤├─┤├─┤/├─[ LEDB  PRN ]─ .... The data is transmitted.
                    [ SUB  H 000C ]─ .... The head I/O address in the computer link module is set.
                    [ SUB  K 12 ]─ .... The number of data (12 bytes) to be transmitted is set.
                    [ LEDC  D31 ]─ .... The head device for storing the data to be transmitted is set.
                    [ LEDC  M2 ]─ .... The bit device which will be turned ON after transmission is completed.
                    [ LEDR ]─
                    [ RST  M1 ]─ .... M1 for the print instruction is reset when the transmission is completed.
CIRCUIT END
```

POINT

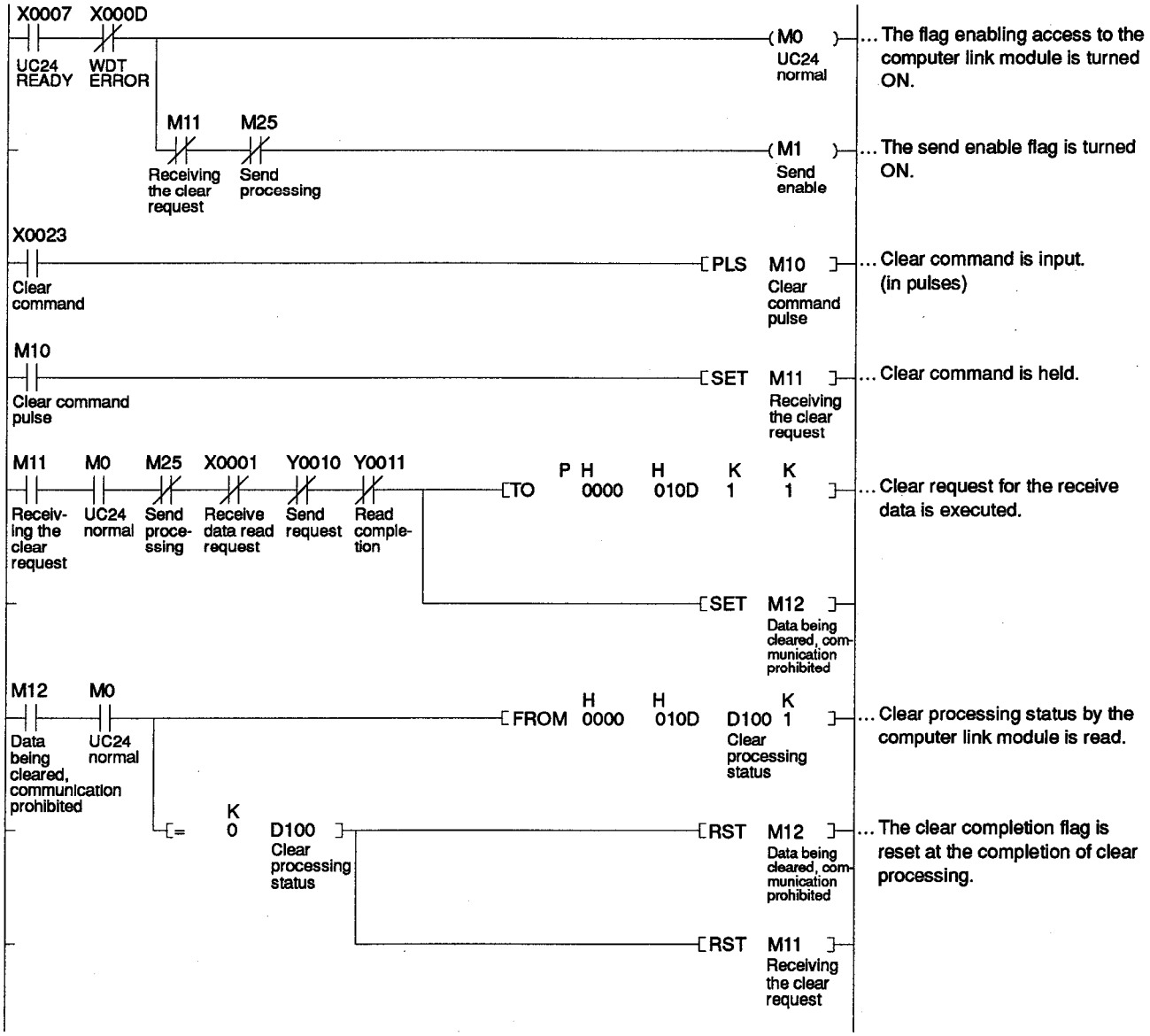
Before usintg a dedicated instruction for the computer link module, set the number of I/O points (F32 points) and the module type (refer to Section 6.4.2(2)) to the slot which holds the computer link module in it by I/O allocation of the parameters to be written to written to the PC CPU.

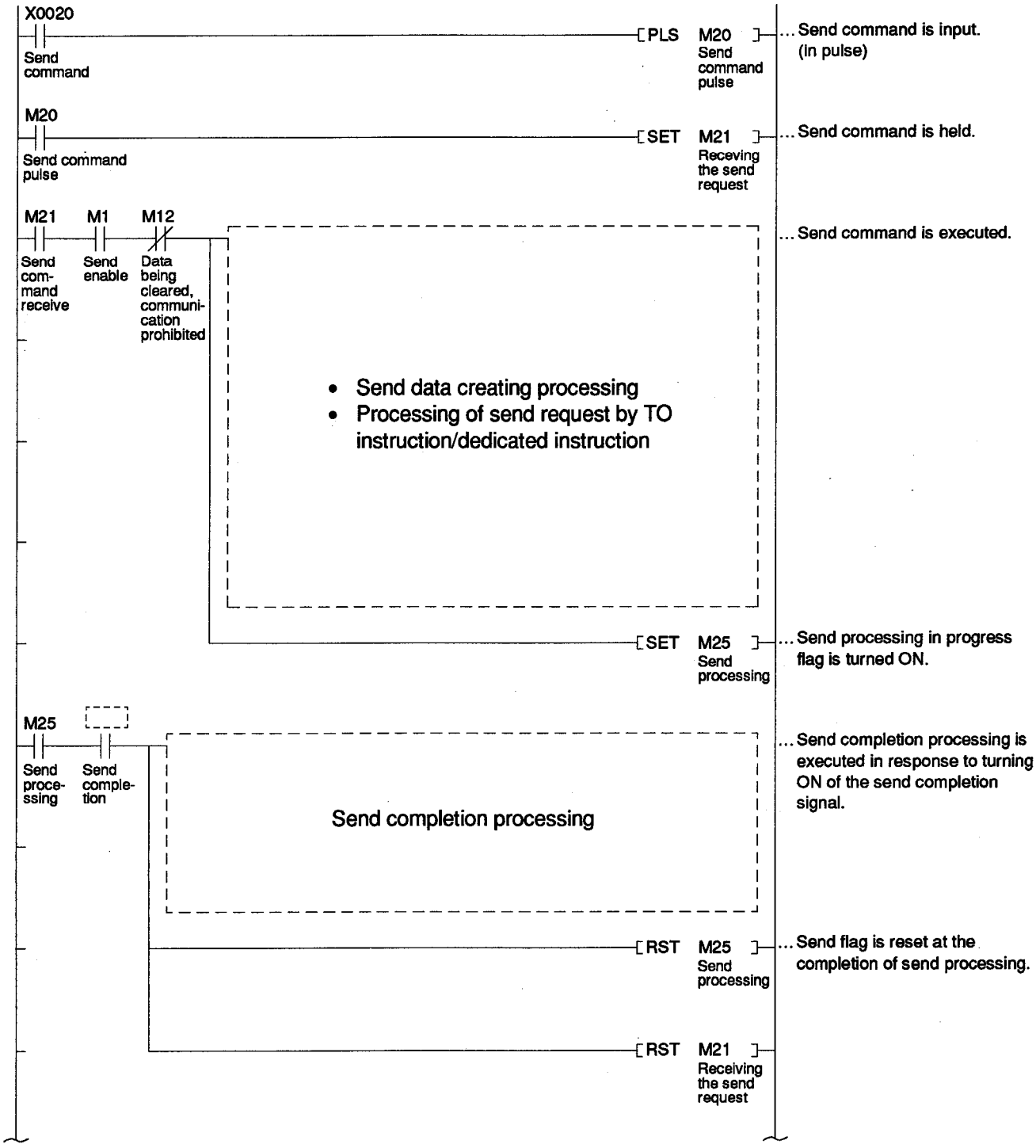
REMARK

For the transmission specifications of the computer link module for printer output, refer to Appendix 6.1.1.

6.1.3 Example of receive data clear processing program

An example of sequence program used for clearing the receive data which sent from an external device by using the receive data clear request area in the buffer memory as explained in 6.2.1 (4) is shown below for no-protocol mode data communications. (I/O signals of the computer link module: X/Y000 to X/Y01F)




X0020
Send command
PLS M20
Send command pulse
... Send command is input. (In pulse)
M20
Send command pulse
SET M21
Receving the send request
... Send command is held.
M21
Send command receive
M1
Send enable
M12
Data being cleared, communication prohibited
... Send command is executed.
• Send data creating processing
• Processing of send request by TO instruction/dedicated instruction
SET M25
Send processing
... Send processing in progress flag is turned ON.
M25
Send processing
Send completion
... Send completion processing is executed in response to turning ON of the send completion signal.
Send completion processing
RST M25
Send processing
... Send flag is reset at the completion of send processing.
RST M21
Receiving the send request

APPENDIX 7 Communication support tool (MX Component)

MX Component supports every communication path between the DOS-V PC and programmable logic controller. It is an ActiveX control library realizing communication through only simple processes without consciousness of various communication protocols.
As well, variable programming languages are supported and development of a wide range of applications is enabled.

An outline of functions of MX Component and the procedure up to creation of an application is described below.

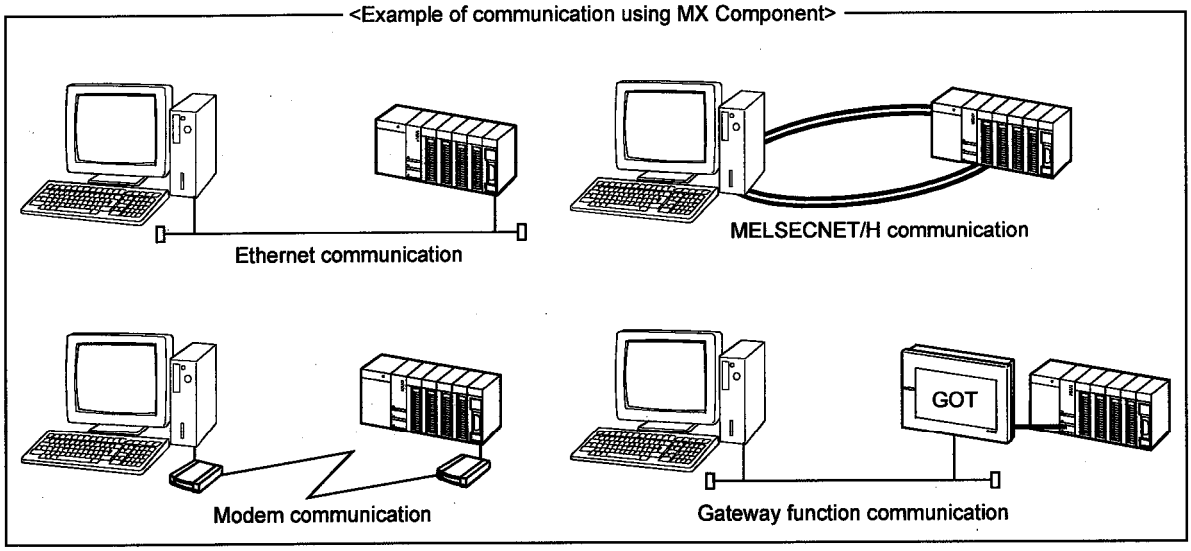
* Refer to the operating manual and programming manual of MX Component for details

7.1 Outline of MX Component

An outline of MX Component is described.
The communication path, OS, programming language and functions supported by MX Component vary according to the version of MX Component to be used.

(1) Support for various communication paths to PLC

Because a wide range of communication paths to the PLC is supported, the system just fitting the user can be configured.



(2) Substantially increased efficiency in development of application

MX Component prepares a wizard type communication setting utility. The user can enter settings through interactive operation on the screen to realize communication settings for accessing the desired PLC CPU.
Once the communication settings are set up, you can access the desired PLC CPU with simple designation of the logical station number of the PLC CPU stored in the communication setting utility.

(3) Support for various types of operating system

MX Component runs on the following types of DOS/V PC.

- Microsoft® Windows® 95 Operating System
- Microsoft® Windows® 98 Operating System
- Microsoft® Windows® NT Workstation Operating System Version 4.0
- Microsoft® Windows® Millennium Edition Operating System
- Microsoft® Windows® 2000 Professional Operating System
- Microsoft® Windows® XP Professional Operating System
- Microsoft® Windows® XP Home Edition Operating System

(4) Various programming languages are supported

MX Component supports the following programming languages.
Development of a wide range of applications is possible for each user.

Programming language	Development software
Visual Basic®	Microsoft® Visual Basic® 6.0
Visual C++®	Microsoft® Visual C++® 6.0
VBScript	Text editor and marketed HTML tool
VBA	Microsoft® Excel 2000, Microsoft® Excel 2002, Microsoft® Access 2000 or Microsoft® Access 2002

(5) Special functions exclusively for data communication with the PLC are supported.

MX Component prepares functions necessary for data communication with the PLC such as communication line opening/closing and device loading/writing.
Multi-function communication programs can be developed without difficulty.

Name of function	Function
Connect	Log-in the subscriber line
Open	Opening the communication line and subscriber line
Close	Closing the communication line
Disconnect	Disconnecting the subscriber line
Get Error Message	Showing description of error and remedy
Read Device Block	Batch loading devices (Long type)
Write Device Block	Batch writing devices (Long type)
Read Device Block 2	Batch loading devices (Short type/INT type)
Write Device Block 2	Batch writing devices (Short type/INT type)
Read Device Random	Random loading devices (Long type)
Write Device Random	Random writing devices (Long type)
Read Device Random 2	Random loading devices (Short type/INT type)
Write Device Random 2	Random writing devices (Short type/INT type)
Set Device	Setting one device point (Long type)
Get Device	Acquiring data from one device point (Long type)
Set Device 2	Setting one device point (Short type/INT type)
Get Device 2	Acquiring data from one device point (Short type/INT type)
Read Buffer	Loading buffer memory
Write Buffer	Writing buffer memory

Name of function	Function
Get Clock Data	Loading clock data of PLC CPU
Set Clock Data	Writing clock data to PLC CPU
Get Cpu Type	Loading PLC CPU model
Set Cpu Status	Remote RUN/STOP/PAUSE of PLC CPU
Entry Device Status	Monitoring and registering device status
Free Device Status	Canceling monitoring/registration of device status
On Device Status	Event notification

(6) Collecting data into Excel without program

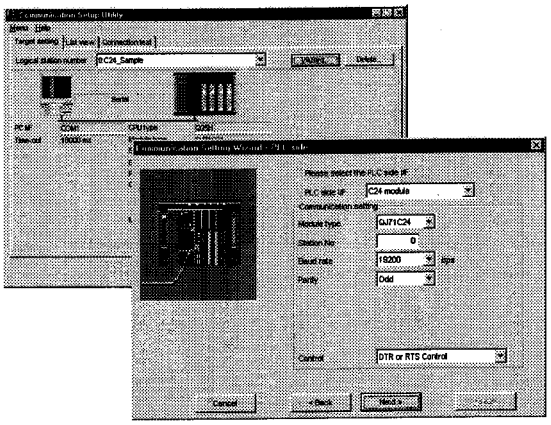
When MX Component is combined with MX Sheet (SWnD5C-SHEET-J), the device data of the PLC can be collected into Excel with simple settings.

7.2 MX Component operating procedure

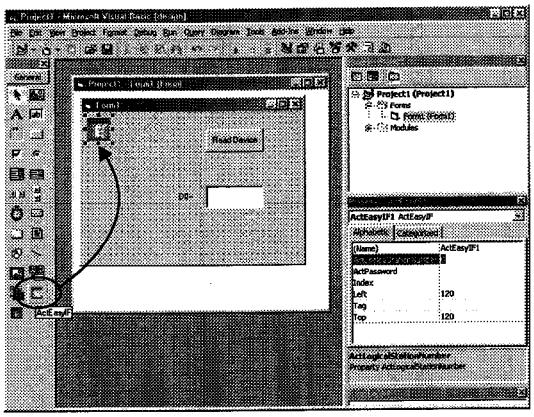
The programming procedure of MX Component and a sample program are shown below.

(1) Programming procedure

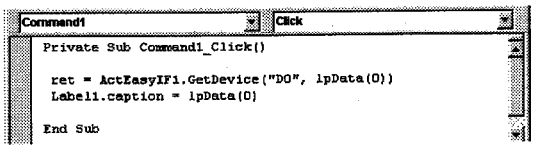
The programming procedure is as follows.
The following procedure is for Visual Basic® .



1) Set up the communication settings between the DOS/V PC and PLC through a wizard. (Only the program may be used instead of the wizard with some control.)
The wizard helps you to enter the logical station number, connection module type, destination PLC and other settings necessary for communications.

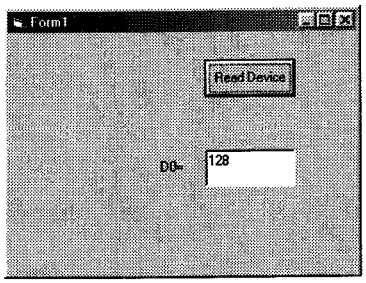


2) Paste the ACT control icon on the form and enter the logical station number, which is entered in step (1), in the properties of the pasted control.



```
Command1                                   Click
Private Sub Command1_Click()

 ret = ActEasyIF1.GetDevice("D0", lpData(0))
 Label1.caption = lpData(0)

End Sub
```

3) Use functions to describe a program for loading device data

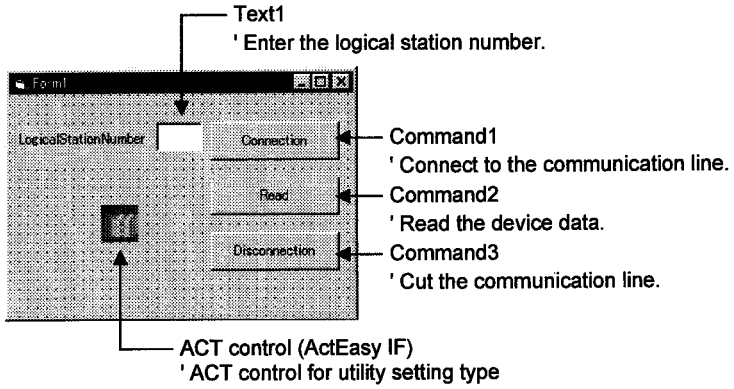


(2) Sample program

The following sample program reads D0 to D4 (five points) of the target PLC using the logical station number.

(a) When Visual Basic® is used

1) Screen example (Form1)



2) Program example

```
Private Sub Command1_Click()
' ********************
'    Connection
' ********************
Dim rtn As Long

    ' Get LogicalstationNumber
    ActEasyIF1. ActLogicalStationNumber = Val(Text1.Text)

    ' Connection
    rtn = ActEasyIF1. Open()
    If rtn = 0 Then
        MsgBox "The connection was successful"
    Else
        MsgBox "Connection Error:" & Hex(rtn)
    End If

End Sub

Private Sub Command2_Click()
' ********************
'    Read
' ********************
Dim rtn As Long
Dim idata(5) As Integer

    ' D0-D4 are read
    rtn = ActEasyIF1. ReadDeviceBlock2 ("D0", 5, idata(0))
    If rtn = 0 Then
        MsgBox "D0-D5 = " & idata(0) & ", " & idata(1) & ", " & idata(2) & ", " & idata(3) & "," & idata(4)
    Else
        MsgBox "Read Error:" & Hex(rtn)
    End If

End Sub
```

```
Private Sub Command3_Click()
' ********************
'    Disconnection
' ********************
Dim rtn As Long

    ' Disconnection
    rtn = ActEasyIF1. Close()
    If rtn = 0 Then
        MsgBox "The disconnection was successful"
    Else
        MsgBox "Disconnection Error:" & Hex(rtn)
    End If

End Sub
```

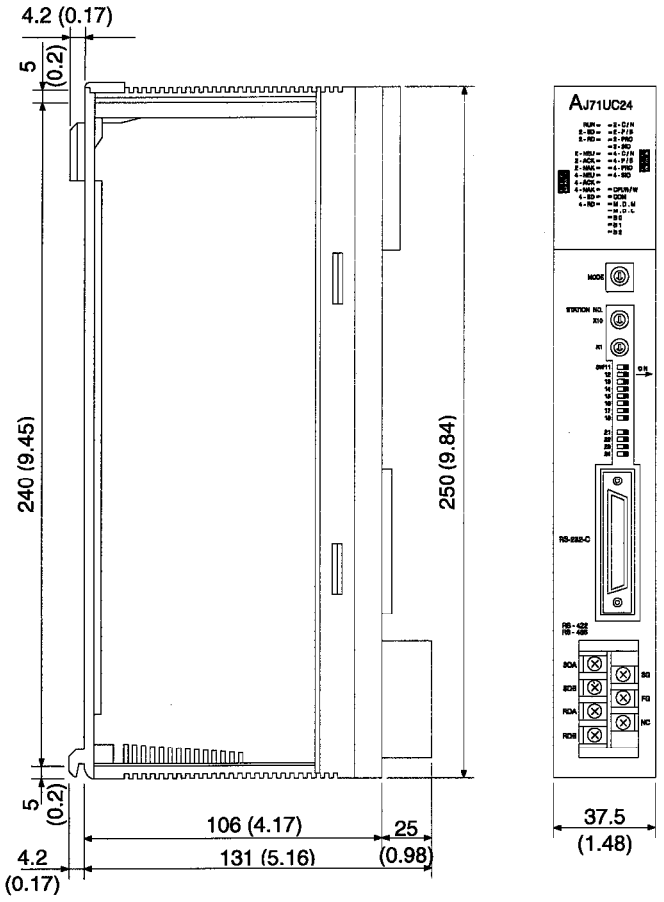
(b) When Visual C++® is used

```
// ********************
//    Connection
// ********************
void CVCDlg::OnOpen()
{
      long lRet;
      CString szMessage;

      // Reflects the logical station No. set in the text box on the variable.
      UpdateData();

    // Get LogicalStationNumber
      m_actEasyIf. SetActLogicalStationNumber ( m_lLogicalStationNumber );

    // Connection
      lRet = m_actEasyIf. Open();
      if ( lRet == 0) {
            MessageBox ( "The connection was successful" );
      } else {
            szMessage. Format ( "Connection Error: %x", lRet );
            MessageBox ( szMessage );
      }
}
```

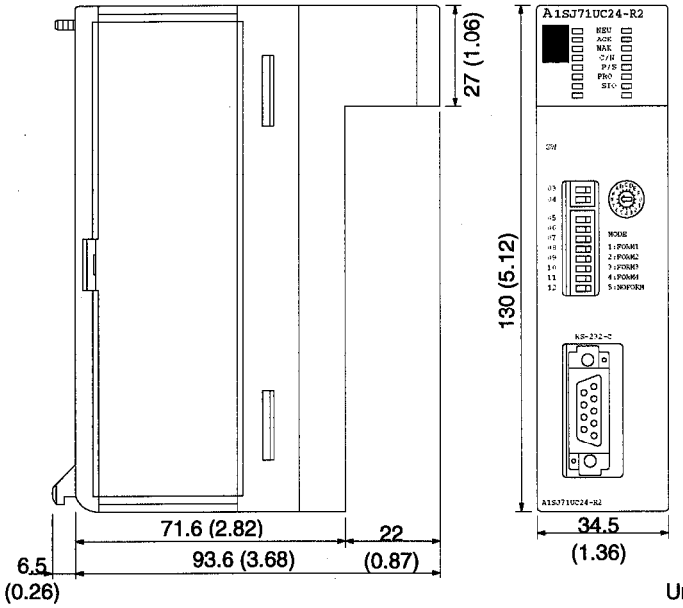
```
// ********************
//    Read
// ********************
void CVCDlg::OnRead()
{
      long lRet;
      short sData[5];
      CString szMessage;

    // D0-D4 are read
      lRet = m_actEasyIf. ReadDeviceBlock2 ( "D0", 5, sData );
      if ( lRet == 0) {
            szMessage. Format ( "D0-D5 = %d, %d, %d, %d, %d",
                                    sData[0], sData[1], sData[2], sData[3], sData[4] );
            MessageBox ( szMessage );
      } else {
            szMessage. Format ( "Read Error: %x", lRet );
            MessageBox ( szMessage );
      }
}

// ********************
//    Disconnection
// ********************
void CVCDlg::OnClose()
{
      long lRet;
      CString szMessage;

      // Disconnection
        lRet = m_actEasyIf. Close();
        if ( lRet == 0) {
              MessageBox ( "The disconnection was successful" );
      } else {
              szMessage. Format ( "Disconnection Error: %x", lRet );
              MessageBox ( szMessage );
      }
}
```

APPENDIX 8 EXTERNAL DIMENSIONS

(1) AJ71UC24



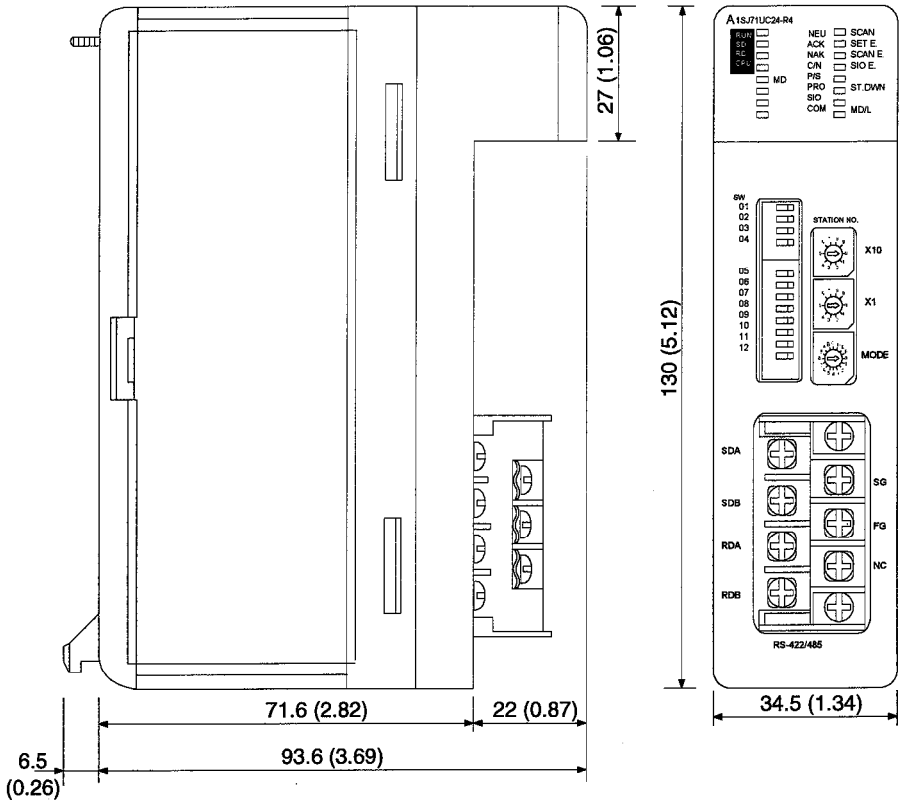
(2) A1SJ71UC24-R2/PRF, A1SJ71C24-R2/PRF



Unit: mm (inch)

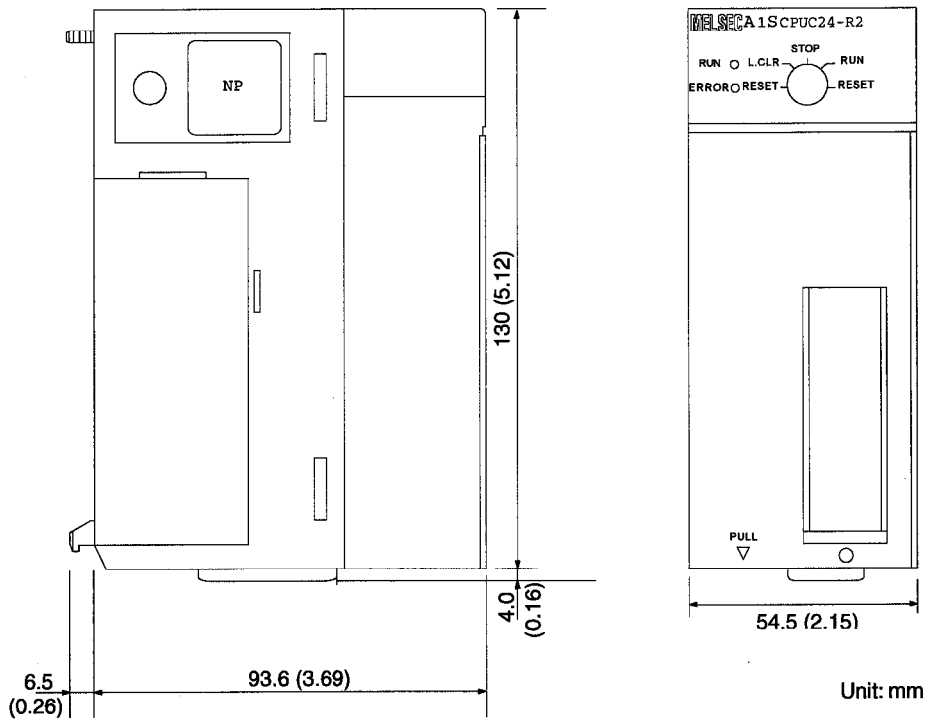
A1SJ71UC24-R2/PRF and A1SJ71C24-R2/PRF have the same external dimensions excluding the interface section. The illustrations above show A1SJ71UC24-R2.

(3) A1SJ71UC24-R4, A1SJ71C24-R4



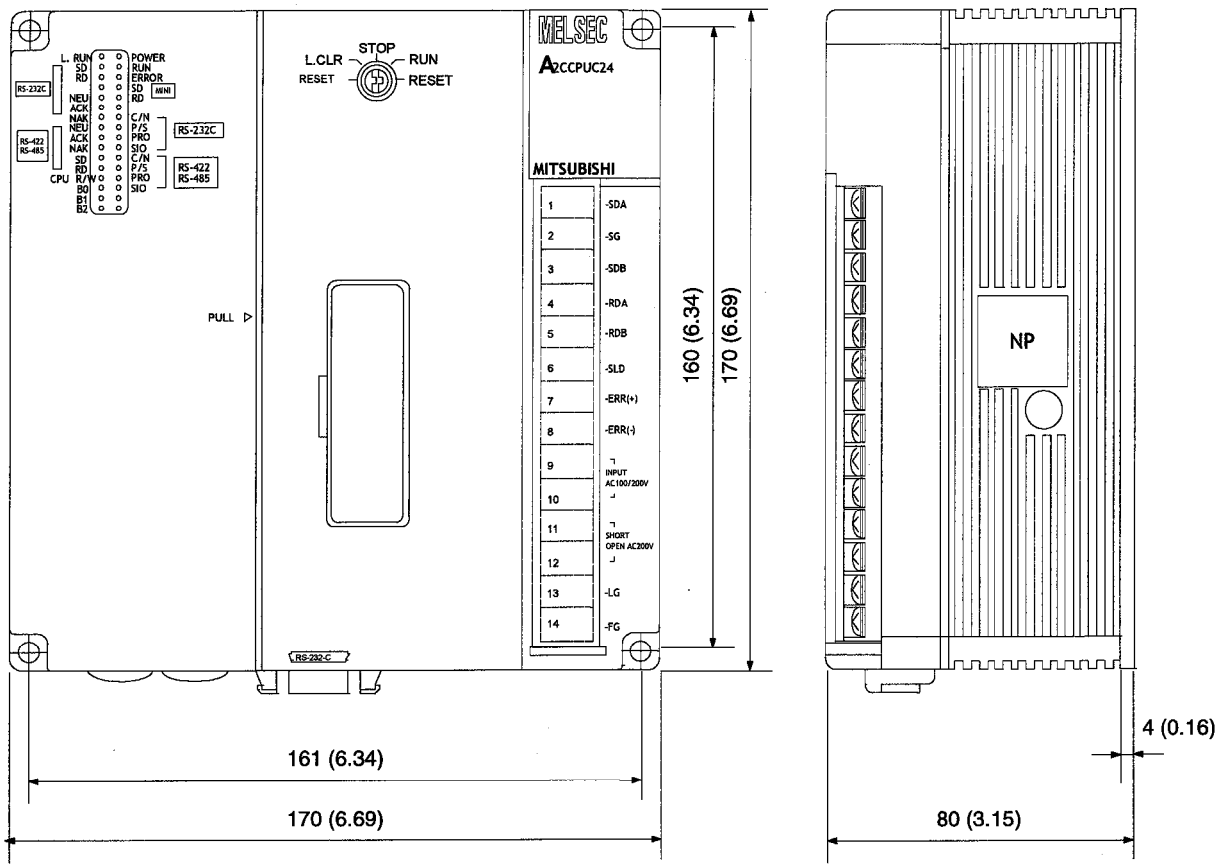
A1SJ71UC24-R4 and A1SJ71C24-R4 have the same external dimensions excluding the interface section. The illustrations above show A1SJ71UC24-R4.

(4) A1SCPUC24-R2



Unit: mm (inch)

(5) A2CCPUC24(-PRF)

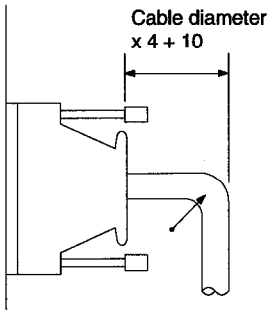


Unit: mm (inch)

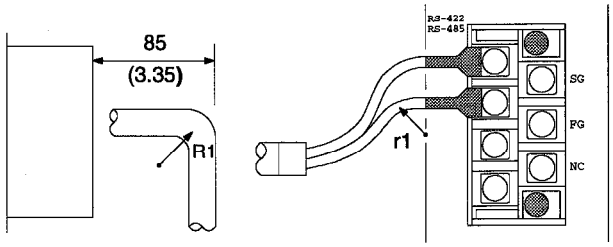
A2CCPUC24 and A2CCPUC24-PRF have the same external dimensions excluding the interface section. The illustrations above show A2CCPUC24.

* Cable bending radius for the cable connecting to an external device (for computer link function and printer function)

(Connection using a connector)



(connection using a terminal block)



R1 (bending radius near terminal block) : Cable diameter x 4
R2 (bending radius near connector) : Cable diameter x 4
r1 (bending radius near crimp style terminal) : Connection is possible without bending the cable excessively.

WARRANTY

Please confirm the following product warranty details before starting use.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the dealer or Mitsubishi Service Company. Note that if repairs are required at a site overseas, on a detached island or remote place, expenses to dispatch an engineer shall be charged for.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found to not be the responsibility of Mitsubishi or the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not possible after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of chance loss and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to damages caused by any cause found not to be the responsibility of Mitsubishi, chance losses, lost profits incurred to the user by failures in Mitsubishi products, damages and secondary damages caused from special reasons regardless of Mitsubishi's expectations, compensation for accidents, and compensation for damages to products other than Mitsubishi products and other duties.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

(1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.

(2) The Mitsubishi general-purpose programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for each Japan Railways company or the Department of Defense shall be excluded from the programmable logic controller applications.

Note that even with these applications, if the user approves that the application is to be limited and a special quality is not required, application shall be possible.

When considering use in aircraft, medical applications, railways, incineration and fuel devices, manned transport devices, equipment for recreation and amusement, and safety devices, in which human life or assets could be greatly affected and for which a particularly high reliability is required fin terms of safety and control system, please consult with Mitsubishi and discuss the required specifications.

Computer Link Module (Com. link func./Print. func.)

User's Manual

MODEL	Comp-Link-U(C)-E
MODEL CODE	13JE77
SH(NA)-3511-L(0312)MEE	

MITSUBISHI ELECTRIC CORPORATION

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