

mitsubishi

PROGRAMMABLE CONTROLLER

MELSEC-A

User's Manual

**Beckhoff network master module
type AJ71BH92**

REVISIONS

*The manual number is given on the bottom left of the back cover.

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INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC-A Series of General Purpose Programmable Controllers. Please read this manual carefully so that the equipment is used to its optimum. A copy of this manual should be forwarded to the end User.

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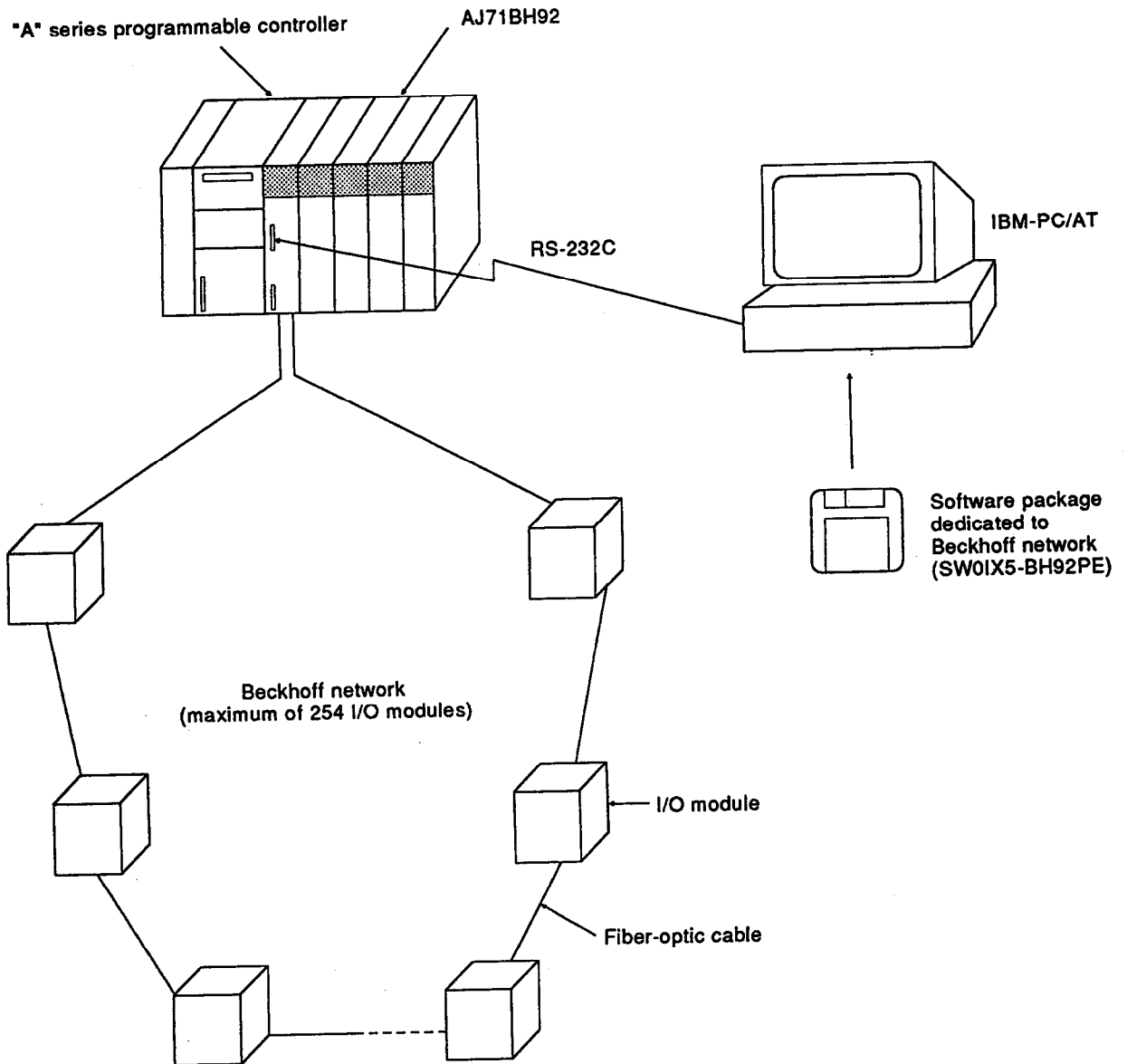
1. GENERAL DESCRIPTION

This manual describes the specifications, operation, and programming of the AJ71BH92 Beckhoff network master module (hereafter abbreviated to "AJ71BH92") which is used to connect a MELSEC-A series programmable controller to a Beckhoff network.

The AJ71BH92 functions as the master module for a Beckhoff network, allowing the "A" series programmable controller to control the I/O modules in the network.

A configuration of distributed I/O modules is set by using the SW01X5-BH92PE Beckhoff network software package, which runs on an IBM PC/AT.

The Beckhoff network is a field system network developed by the Beckhoff company; field devices such as I/O modules and sensors supplied by Beckhoff are connected in a network and controlled by a controller such as a programmable controller.



1.1 Characteristics of AJ71BH92

(1) Communications with up to 254 I/O modules

A single AJ71BH92 can be used to control a maximum of 254 stations including I/O modules and sensors (maximum number of I/O points = 8,128).

(2) High transmission speed: 2.5 MBPS

The Beckhoff network is a single loop system that uses fiber-optic cables, giving the high transmission speed of 2.5 MBPS between the AJ71BH92 and the I/O modules.

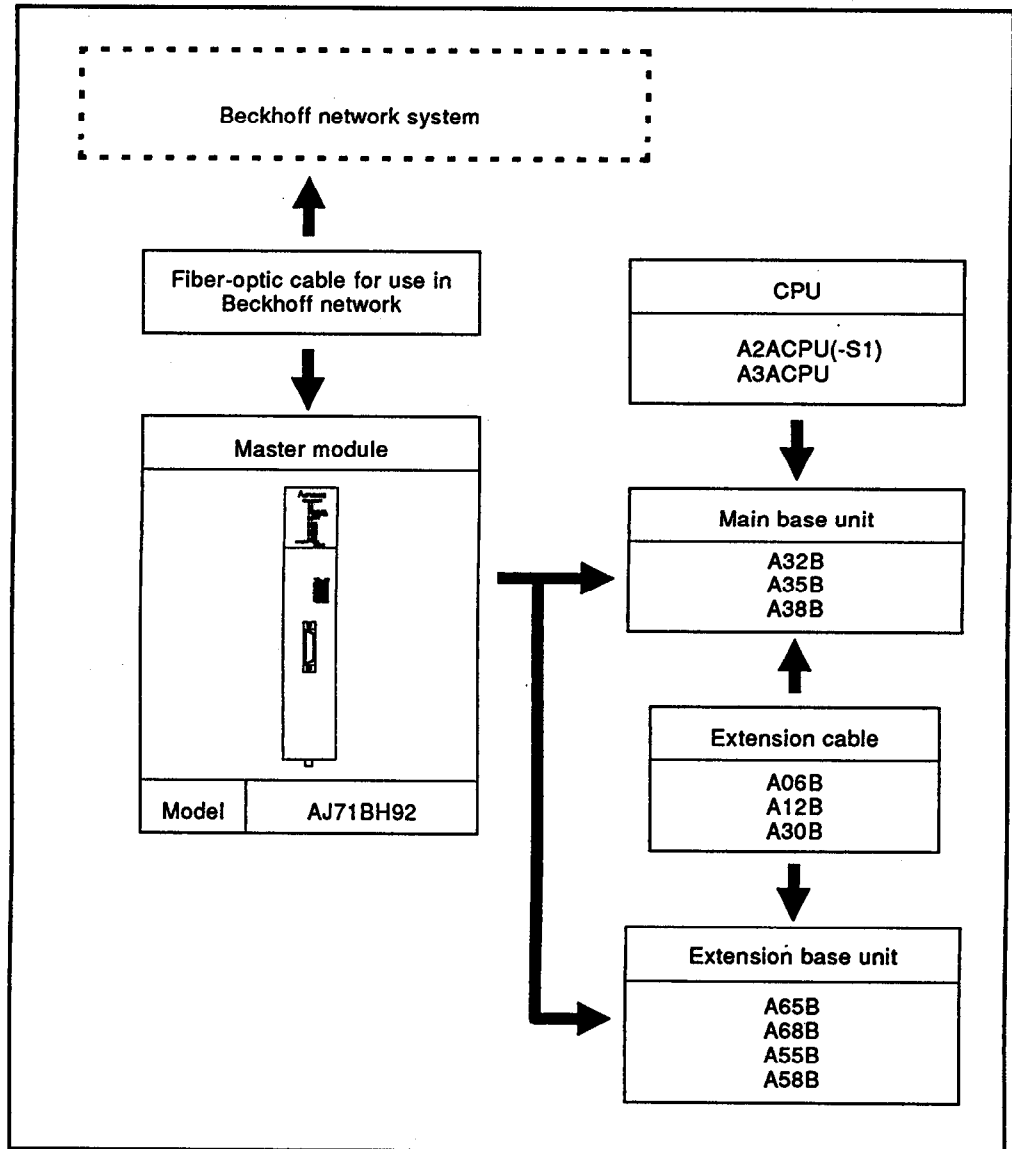
2. SYSTEM CONFIGURATION

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2. SYSTEM CONFIGURATION

This section describes the system configuration that be used in conjunction with the AJ71BH92.

2.1 Overall Configuration



*: For information on the Beckhoff network, please consult Beckhoff.

2.2 Applicable Systems

The following restrictions apply to systems in which an AJ71BH92 is used.

- (1) AJ71BH92 can be used in conjunction with the CPUs indicated below only.

Applicable models	
A2ACPU(-S1)	A3ACPU

- (2) With the exception of the cases indicated in (a) and (b) below, AJ71BH92 can be connected at any of the I/O slots of a base unit.
- (a) It is strongly recommended to avoid connection to extension base units that have no power supply module (A55B, A58B), since the current capacity may be insufficient.
- If such a connection has to be made, select a power supply module and extension cable while giving full consideration to the current capacity of the main base unit's power supply module and the voltage drop in the extension cable.
- (b) In a MELSECNET data link system, connections can be made to master stations and local stations only. The AJ71BH92 cannot be connected to remote I/O stations.

3. SPECIFICATIONS

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3. SPECIFICATIONS

3.1 General Specifications

Table 3.1 General Specifications

Item	Specifications				
Operating ambient temperature	0 to 55 °C				
Storage ambient temperature	-20 to 75 °C				
Operating ambient humidity	10 to 90 % RH, no condensation				
Storage ambient humidity	10 to 90 % RH, no condensation				
Vibration resistance	*2 Conforms to JIS C 0911	Frequency	Acceleration	Amplitude	*1 10 times (1 octave/minute)
		10 to 55 Hz	_____	0.075 mm (0.003 inch)	
		55 to 150 Hz	9.8 m/s ² (1 g)	_____	
Shock resistance	*2 Conforms to JIS C 0912 (98 m/s ² (10 g), 10 g x 3 times in 3 directions)				
Noise resistance	By noise simulator 1500 Vpp noise voltage, 1 μs noise width and 25 to 60 Hz noise frequency				
Dielectric withstand voltage	1500 VAC for 1 minute across AC external terminals and ground 500 VAC for 1 minute across DC external terminals and ground				
Insulation resistance	5 MΩ or larger by 500 VDC insulation resistance tester across AC external terminals and ground				
Grounding	Class 3 grounding; grounding is not required when it is impossible.				
Operating ambience	No corrosive gases, dust, or oil mist is allowed.				
Cooling method	Self-cooling				

REMARK

*1: One octave indicates a change from the initial frequency to double or half frequency. For example, any of the changes from 10 Hz to 20 Hz, from 20 Hz to 40 Hz, from 40 Hz to 20 Hz, and 20 Hz to 10 Hz are referred to as one octave.

*2: JIS: Japanese Industrial Standard

3.2 Performance Specifications

Table 3.2 Performance Specifications

Item	Performance
Max. number of I/O modules	254
Max. number of I/O control points	8,128 including both inputs and outputs (Note 1)
Number of occupied I/O points	32

(Note 1) Note that the maximum number of points per station (inputs and outputs) is 32.

3.3 Communication Specifications

(1) Beckhoff network

Table 3.3 Communication Specifications

Item		Specifications
Communication method		Asynchronous bit serial
Transmission path		Single loop
Transmission medium		Fiber-optic cable
Communication speed		2.5 MBPS
Transmission distance	Max. loop length	600 m
	Distance between stations	45 m
Number of stations connectable		Max. of 255 (1 master station, 254 I/O modules)
Modulation method		NRZI
Transmission format		Original
Error control method		CRC generating function
RAS function		Error detection and diagnosis functions such as the address check, cable break site location, dumping test, etc.

(2) RS-232C interface specifications

Table 3.4 RS-232C Interface Specifications

Item	Specification			
Communication method	Full duplex			
Communication speed	9600 BPS			
Synchronization	Start stop synchronization (asynchronous)			
Signal level	Conforms to CCITT V.24	Pin	Signal	Signal Direction AJ71BH92 ↔ PC/AT
		1	—	
		2	TXD	→
		3	RXD	←
		4	DTR	
		5	G	
		6	DSR	
		7	RTS	
		8	CTS	
		9	—	
Bit pattern	Start bit (1) + data bits (8) + stop bit (1) + parity bit (1)			

Note: (1) Modem (Straight) cable is required.

(2) The shield from cable should be connected with the metal-surface of the PC connector.

(3) The following connector is recommended for AJ71BH92 side.

17JE-23090-02 (D8A6)

DDK ELECTORNICS (EUROPE) LTD. Address: Grange Lodge, Markee square, Westerham, Kent TN16 1AR, UK Telephone: 44-959-561224 Fax: 44-959-561034

4. FUNCTIONS

4.1 I/O Control Function

The I/O control function is the function whereby the I/Os of the I/O modules in the Beckhoff network are controlled by the AJ71BH92.

- (1) Data to be sent to the I/O modules is written into the output image data storage area of the AJ71BH92's buffer memory; the data is sent to the I/O modules on execution of I/O refresh.

Data is written into the buffer memory of the AJ71BH92 by using a T0 instruction in the sequence program.

- (2) When data is received from the I/O modules, the data is stored in the input image data area of the AJ71BH92's buffer memory on execution of I/O refresh.

Data received in AJ71BH92 buffer memory is used by a FROM instruction of a sequence program.

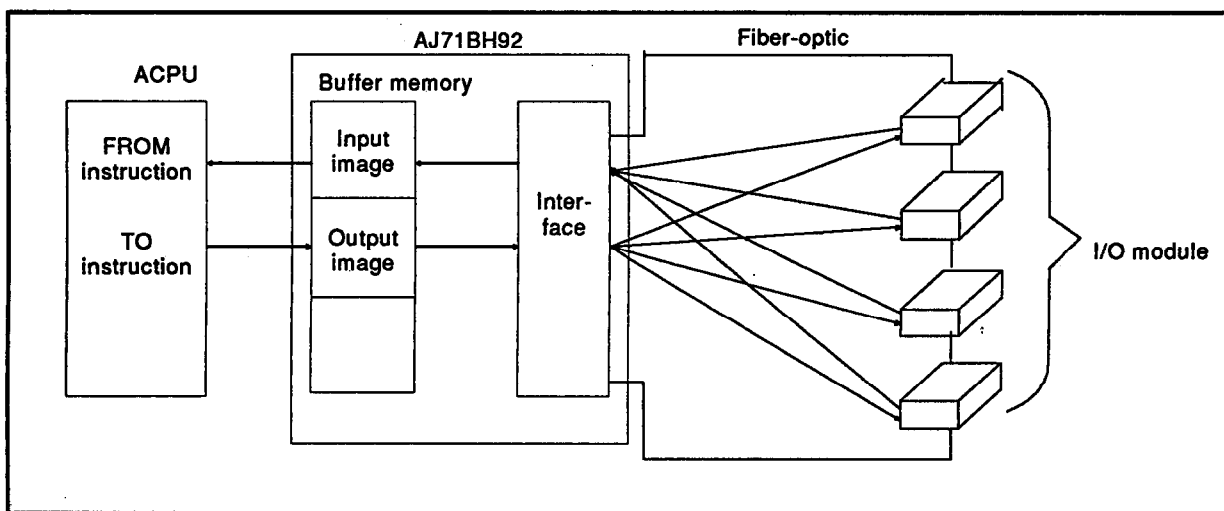


Fig. 4.1 Flow of I/O Image Data

4.1.1 I/O Assignment

I/Os are assigned to the I/O modules in accordance with the SW0IX5-BH92PE Beckhoff network software package.

It is possible to assign up to 32 I/O points in 8-point-unit to each I/O module. The data of each of these 8-point-unit are called "D0", "D1", "D2", and "D3"; their correspondence to addresses in the I/O images of each of the buffer memories is set by SW0IX5-BH92PE.

(1) I/O Assignment Example

The following gives an example of I/O assignment for explaining data flow.

This example shows the assignment of 6 I/O modules. The following explains the data flow of module address "5" as an example.

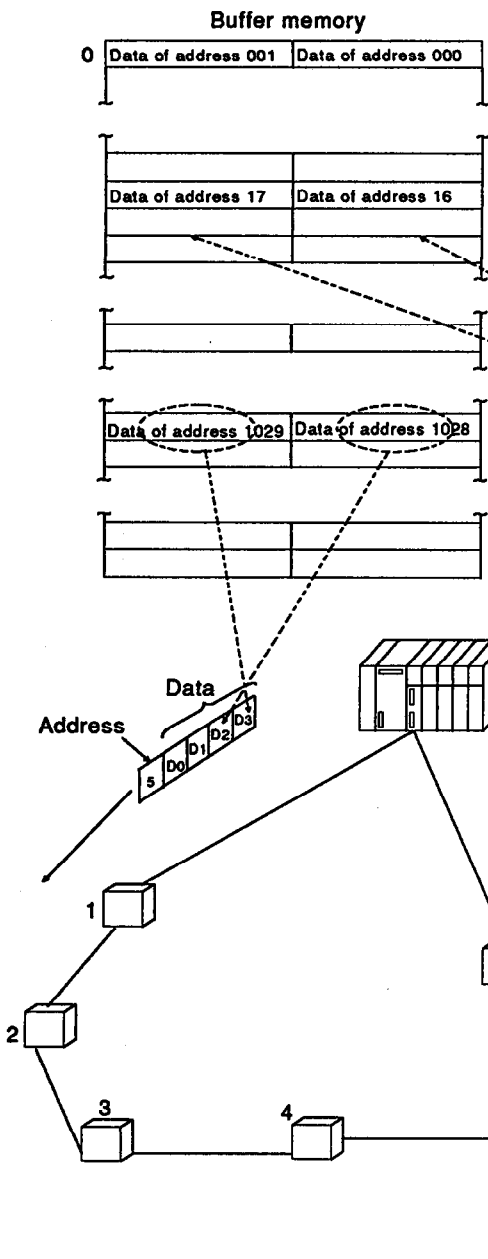
I/O-LIST / 6 MODULES										27.01.93 04:09:07	
No	Mod	Com	Description	D0		D1		D2		D3	
1	1	1	Digital Output	O	1024	O	1025	0	0	0	0
2	2	2	Digital Input	I	0	I	1	0	0	0	0
3	3	3	Digital Output	O	2000	O	2001	O	2002	O	2003
4	4	4	Digital Input/Output	I	2	O	2004	I	3	O	1026
5	5	5	Digital Input/Output	I	16	I	17	O	1028	O	1029
6	6	6	Digital Input	I	500	I	501	0	0	0	0
7	0	0		0	0	0	0	0	0	0	0
8	0	0		0	0	0	0	0	0	0	0
9	0	0		0	0	0	0	0	0	0	0
10	0	0		0	0	0	0	0	0	0	0

Serial interface :	COM2
Serial retries : 0	Filename : TEST

(C) MITSUBISHI ELECTRIC NAGOYA WORKS Nagoya, 461 Japan

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
INSERT	CLEAR	INSERT	INSERT	PRINT	LOAD	SAVE	PLC	AJ71	PREV
MODULE	MODULE	ROW	COMM	IOLIST	FILE	FILE	MENU	BH92	MENU

The image information is arranged in the buffer memory as indicated in the figure to the left.



- 1) Refresh starts in response to a refresh request from the user. The image information of address 1028 is set in the D2 of the sending data that will refresh the I/O module address 5, the information of address 1029 is set in D3 of the same data, and the data is sent.
- 2) When data D2 and D3 in the data are received at the I/O module 5, the data are reflected for output.
- 3) Input data at the I/O module address 5, is set in the D0 and D1 data and sent to the master module (AJ71BH92).
- 4) At the AJ71BH92, the D0 and D1 data received in the data from the I/O module sending address 5 is set in addresses 16 and 17 of the image information.
- 5) This operation is performed at all stations to complete refresh.

Fig. 4.3 CDL Setting Example/Operation

4.1.2 Refresh Timing

Requesting refresh by users, the image data in the buffer memory is output and the input information of each station is set in the input image area of the buffer memory. Refresh starts on occurrence of a user refresh request and is repeated until the refresh request goes off.

Note: Refresh time = $\frac{\text{I/O image transfer time} + \text{base processing time}}{2.3 \mu\text{s} * (\text{input image area max. address} + \text{output image area max. address})}$

1 ms

4.2 Test Function

There are three types of test function - the address test, the dumping test, and the fraction test - and it is possible to execute all three from the sequence program.

These three functions are described below.

4.2.1 Address test

This function tests whether the module addresses set by the configuration function are actually included in communications. The test results are notified via the buffer memory. (See section 6.3 for details of the programming method).

4.2.2 Dumping test

In the Dumping test, several types of test data are sent to determine whether the luminous intensity of the fiber-optic cable signals is normal. This test can be performed in three forms: a test on all modules in batch, a test on a single module, and a self-station test.

The results of each of these tests are notified via the buffer memory.

(See section 6.3.2 for details of programming).

4.2.3 Fraction test

The cable break check tests whether there is fracture in the fiber-optic cable. If there is fracture, a further test is performed to determine its location. The test results are notified via the buffer memory. (See section 6.3.3 for details of the programming method).

4.3 Communication Initialization Function

The communication initialization function resets the communication sequence to establish the same condition as that when the power is switched on. The following tests are also performed in conjunction the communication initialization function:

1. Fraction test
2. Address test
3. Dumping test

(See section 4.2 for details of these tests).

The test results are notified via the buffer memory.

4.4 Configuration function

The configuration for the I/O modules etc. connected to the AJ71BH92, and the I/O assignment, are set by the SW0IX5-BH92PE software package, which runs on an IBM PC/AT.

The configured data can be downloaded from or uploaded to the IBM PC/AT via the RS 232C port of the AJ71BH92.

5. OPERATION**5.1 Handling Instructions**

This section describes the handling instructions of the AJ71BH92.

- (1) Protect the AJ71BH92 from mechanical shock and vibration.
- (2) Do not remove the printed circuit boards from the housing.
There are no user-serviceable parts on the boards.
- (3) Ensure that no conductive debris can enter the module. If it does, make sure that it is removed. Guard particularly against wire offcuts.
- (4) Tighten the screws as specified below:

Screw	Tightening Torque Range (kg-cm)
Screw for terminal for connecting power supply cable (M4)	10 to 14
Module mounting screw (usually not required) (M4)	8 to 12

- (5) Do not touch the optical fiber cores in the connector or the optical module and keep them clean.

If such parts are contaminated, transmission loss becomes large and communications may often be disabled.

If contaminated with finger oil or dust, wipe it off with a soft cloth.

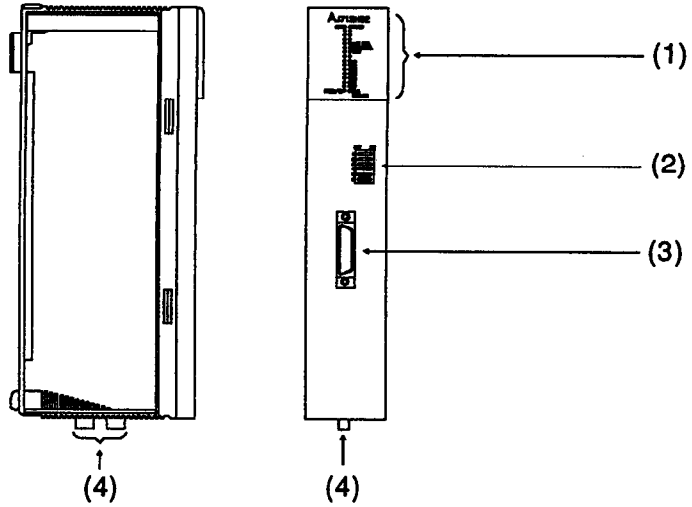
- (6) The following instruction environments are unsuitable for this equipment;

- Ambient temperature outside the range 0 to 55 °C.
- Ambient humidity outside the range 10 to 90 % RH.
- Excessive condensation (e.g. due to sudden temperature changes)
- Corrosive and/or combustible gases.
- Excessive amounts of conductive powder such as dust, iron filings, oil mist, salt, or organic solvent.
- Direct exposure to sunlight.
- In the vicinity of strong power and magnetic fields.
- Excessive vibration and shock transmitted directly to the main module.

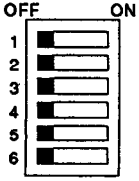
5. OPERATION

5.2 Nomenclature

This section names the various parts of the AJ71BH92 and describes setting methods.



No.	Name of Part	Description					
		LED name	Function	LED name	Function		
(1)	LEDs RUN ○ ○ READY ○ ○ RDY ○ ○ CPU-F ○ ○ BUS-F ○ ○ UNIT ERR. ○ ○ COMM. ERR. ○ ○ TEST ○ ○ S1 ○ ○ S2 ○ ○ S3 ○ ○ S4 ○ ○ S5 ○ ○ S6 ○ ○ S7 FROM/TO ○ ○ (S8) REFRESH	RUN	Lit while module is operational	READY	Lit while communications is enabled.		
				RDY	Lit when the communication part is operational		
				CPU-F	Lit when the communication part error detected		
				BUS-F	Lit when the fiber optic loop error detected		
				UNIT. ERR	Lit when module error detected		
				COMM. ERR	Lit when a communication error is detected.		
				TEST	Lit during execution of a test and when the test results are indicated.		
					Not used (always off)		
				S1	Test result indicators (same as buffer memory test results)		
				S2			
				S3			
				S4			
				S5			
				S6			
				S7			
				FROM/TO	Lit during execution of FROM/TO instructions	REFRESH (S8)	Usually: Lit during refresh processing During a test: Indicates test results

No.	Name	Function												
(2)	<p>Switch 1</p> 	<p>Switch used to set the operation of a module. The settings on switching the power on become effective and defaults are off.</p> <table border="1" data-bbox="628 349 1422 573"> <thead> <tr> <th data-bbox="628 349 743 405">SW</th> <th colspan="2" data-bbox="743 349 1422 405">Meaning</th> </tr> </thead> <tbody> <tr> <td data-bbox="628 405 743 465">1</td> <td data-bbox="743 405 1078 465">Automatic recover mode</td> <td data-bbox="1078 405 1422 465">ON: Automatic recover enabled OFF: Automatic recover disabled</td> </tr> <tr> <td data-bbox="628 465 743 517">2 to 5</td> <td data-bbox="743 465 1078 517">Not used</td> <td data-bbox="1078 465 1422 517">Always off</td> </tr> <tr> <td data-bbox="628 517 743 573">6</td> <td data-bbox="743 517 1078 573">On-line/Off-line selection switch</td> <td data-bbox="1078 517 1422 573">ON: Off-line OFF: On-line</td> </tr> </tbody> </table>	SW	Meaning		1	Automatic recover mode	ON: Automatic recover enabled OFF: Automatic recover disabled	2 to 5	Not used	Always off	6	On-line/Off-line selection switch	ON: Off-line OFF: On-line
SW	Meaning													
1	Automatic recover mode	ON: Automatic recover enabled OFF: Automatic recover disabled												
2 to 5	Not used	Always off												
6	On-line/Off-line selection switch	ON: Off-line OFF: On-line												
(3)	RS-232C interface	Interface used to connect the AJ71BH92 and IBM PC/AT												
(4)	Fiber-optic cable connector	Connector used to connect the fiber-optic cable for the Beckhoff network												

5.2.1 Switch 1

- (1) SW1-1: Automatic recover mode
: This is the mode in which data link operation is automatically resumed on resetting after a communication error. When this mode is OFF, data link operation will not be resumed until communications is reset or the CPU is reset.
- (2) SW1-6: On-line/Off-line selection switch
: On-line; normal communication mode
Off-line; parameter setting mode
- (3) SW1-2 to SW1-5: Not used; these switches should be left off.

5.3 Buffer memory map

The buffer memory used for data exchange with the AJ71BH92 programmable controller CPU is mapped below.

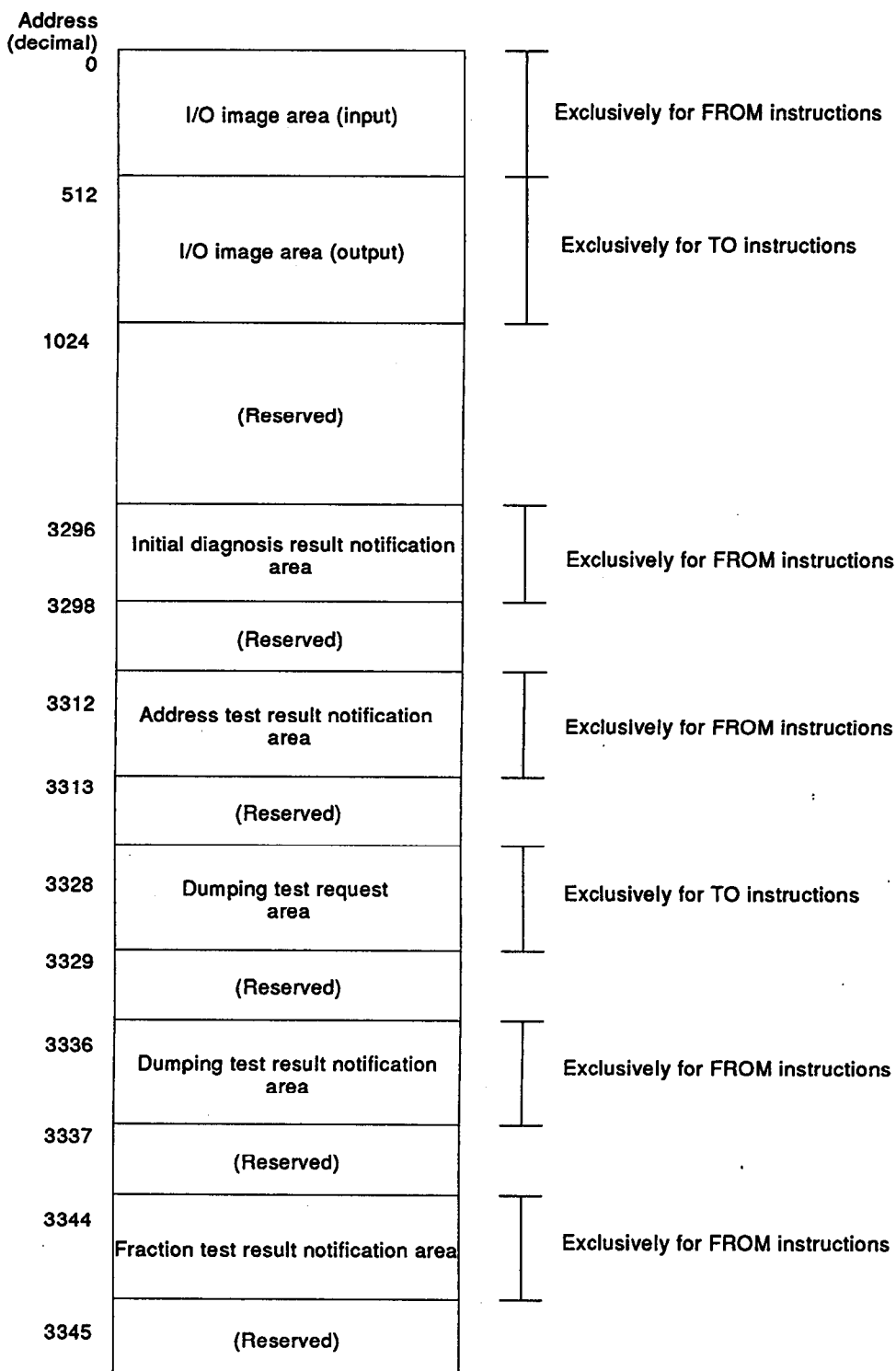


Fig. 5.1 Buffer Memory

5.3.1 I/O image area

The I/O data are assigned to the I/O modules in 8-point/1-byte unit in accordance with the SW0IX5-BH92PE.

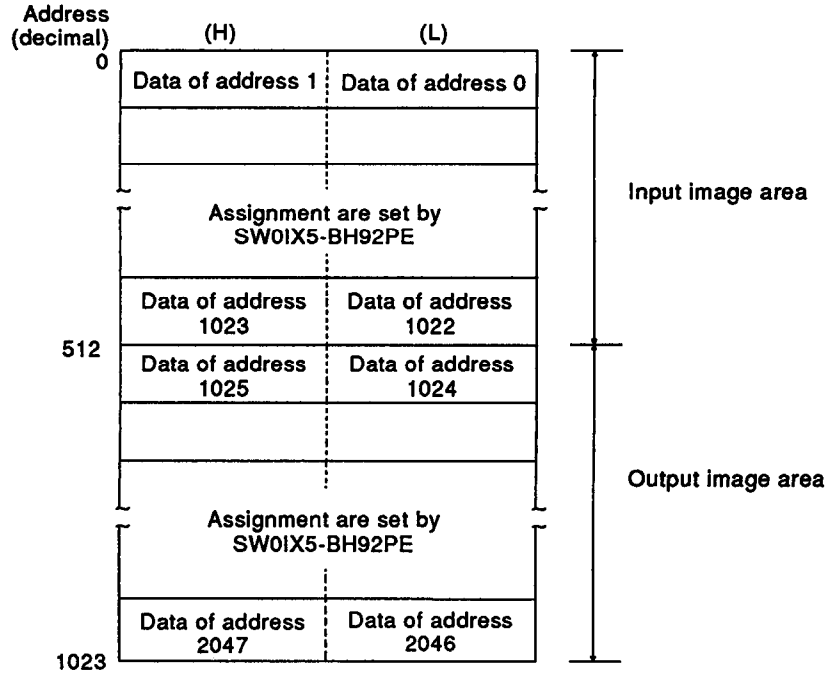


Fig. 5.2 I/O Image Area

An I/O image is depicted below.

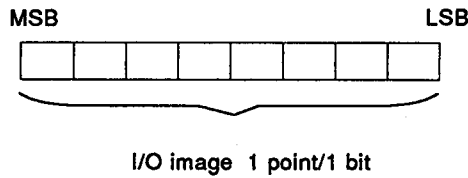


Fig. 5.3 I/O Image

5.3.2 Initial diagnosis result notification area

If an error occurs when communications is initialized, an error code is stored in this area. The details are presented in Fig. 5.4.

Address (decimal) 3296	(H)	(L)
	Test information 2	Test information 1
	Not used	Test information 3

Fig. 5.4 Initial Diagnosis Result

The results indicated by each combination of test information data are tabled below.

Test information 1	Test information 2	Test information 3	Descriptions
00	00	nn	Normal (Number of modules is stored in Test information 3)
01	01	00	Max. number of modules for transmission is exceeded
01	02	00	Network address downloading disabled
0a	01	nn	Fracture at module nn
0a	01	ff	Not possible to locate Fracture
07	01	nn	Address test (error in module nn)
05	02	00	Dumping test (high dumping intensity error)
05	03	nn	Dumping test (switch to low dumping intensity not possible)
05	04	nn	Dumping test (error at module nn in test of data pattern 00)
05	05	nn	Dumping test (error at module nn in test of data pattern FF)
05	06	nn	Dumping test (error at module nn in test of data pattern AA)
05	07	nn	Dumping test (switch to high dumping intensity not possible)

5.3.3 Address test result notification area (readout: FROM(P) instruction only)

The results of the address test is stored in this area.

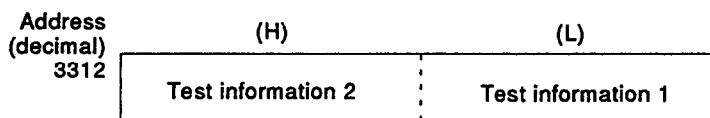


Fig.5.5 Address Test Result

Test information 1	Test information 2	Descriptions
00	00	Normal
01	nn	Fault (error at address nn)

Test information 1

00: Normal

01: Error (error detected)

Test information 2

The address number of the module where an error has been detected is stored here (only effective when test information 1 = 01, indicating error detected)

5.3.4 Dumping test request area (writing in: TO(P) instruction only)

This area specifies the modules to be tested for dumping. It is possible to perform a test on all modules or on specified modules only. Details are presented in Figure 5.6.

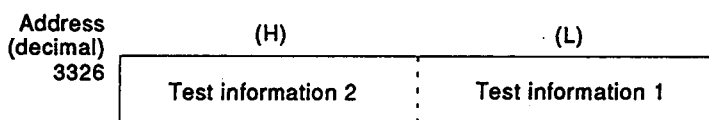


Fig. 5.6 Dumping test request area

Test information 1

00 : Test performed on all modules

01 ; Test performed on specified modules

Test information 2

When the test is performed on a single module, the address number of the module to be tested is set. If the module to be tested is AJ71BH92, the setting is 00. (Note that this information is set only when test information 1 is 01; the specified module test).

5.3.5 Dumping test result notification area (readout: FROM(P) instruction only)

The results of the dumping test is stored in this area.
 Details are given in Fig. 5.7 below.

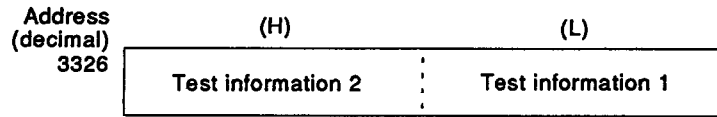


Fig. 5.7 Dumping Test Result Notification Area

Test information 1

Stores the test type where an error if detected.

Test information 2

Indicates the address of the module at which the error was detected.

The test results are described by the combination of test information data as shown in the table below.

Test information 1	Test information 2	Descriptions
00	nn	ormal
02	00	High dumping intensity error
03	nn	Not possible to switch to low dumping intensity at module nn
04	nn	Error at module nn on testing with test pattern 00
05	nn	Error at module nn on testing with test pattern FF
06	nn	Error at module nn on testing with test pattern AA
07	nn	Not possible to switch to high dumping intensity at module nn

5.3.6 Fraction test result notification area (readout: FROM(P) instruction only)

This area stores the results of the fraction test. Details are given in Fig. 5.8 below.

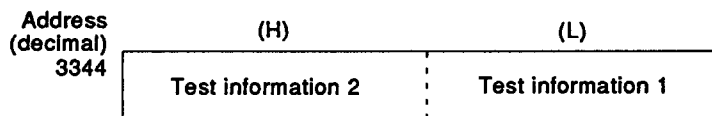


Fig. 5.8 Fraction Test Result Notification Area

Test information 1

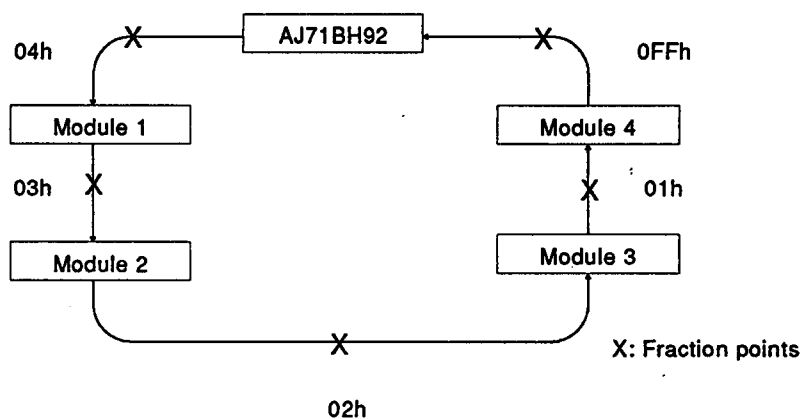
00: Normal

01: Fault (error)

Test information 2

When normal (when test information 1 = 00H), the number of modules is stored here.

In the error status (when test information 1 = 01H), the address of the last module where test data reached, is stored here. The example that 4 modules connected with AJ71BH92 is given below.



The value indicates a result in test information 2.

5.4 Inputs/Outputs to the CPU

This section describes the I/O signals of the AJ71BH92. The allocation of I/O signals when the AJ71BH92 is connected to the 0 slot of the main base unit is shown. X devices are input signals from the AJ71BH92 to the programmable controller CPU. Y devices are output signals from the programmable controller CPU to the AJ71BH92.

Table 5.1 Programmable Controller I/O Signals

Signal direction: AJ71BH92 → Programmable controller CPU		Signal direction: Programmable controller CPU → AJ71BH92	
Device No.	Signal Name	Device No.	Signal Name
X00	Not used	Y00 to Y10	Not used
X01	Initialization (LWL-reset) completion signal		
X02	Address test completion signal		
X03	Dumping test completion signal		
X04	Fraction test completion signal		
X05	Unit ready		
X06	Communication error		
X07	Not used		
X08	Refresh status signal		
X09 to X1F	Not used	Y11	Initialization request signal
		Y12	Address test request signal
		Y13	Dumping test request signal
		Y14	Fraction test request signal
		Y15 to Y17	Not used
		Y18	Refresh request signal
		Y19 to Y1F	Not used

IMPORTANT

The devices indicated as "Not used" in Table 5.1 are used by the system and are not for use by the user. If the user does use any of these devices, normal system functions cannot be assured.

5. OPERATION

MELSEC-A

5.4.1 ON/OFF timing for each signal

Signal Name	I/O Signal	Meaning	ON/OFF Timing
Initialization completion signal	X01	Indicates the completion of initialization	ON : When initialization is completed OFF: When the initialization request signal (Y11) goes OFF
Address test completion signal	X02	Indicates the completion of the address test	ON : When the address test is completed OFF: When the address test request signal (Y12) goes OFF
Dumping test completion signal	X03	Indicates completion of the dumping test	ON : When the dumping test is completed OFF: When the luminous energy test request signal (Y13) goes OFF
Fraction test completion signal	X04	Indicates completion of the fraction test	ON : When the fraction test is completed OFF: When the cable break check request signal (Y14) goes OFF
Unit READY	X05	Indicates the "communications enabled" status	ON : In "communications enabled" status OFF: When the initialization request signal (Y11) goes ON
Refresh status signal	X08	Indicates the refresh execution status	ON : Refresh stopped OFF: Refresh being executed
Communication error	X06	Indicates detection of an error during communications	ON : When an error is detected during communications OFF: On initialization after the cause of the error has been eliminated
Initialization (LWL-Reset) request signal	Y11	Request for execution of initialization	ON : When a request for initialization is made in the programmable controller program OFF: When initialization completion signal (X01) goes ON, turned OFF in the sequence program.
Address test request signal	Y12	Request for execution of address test	ON : When a request for an address test is made in the programmable controller program OFF: When address test completion signal (X02) goes OFF, turned OFF in the sequence program.
Dumping test request signal	Y13	Request for execution of dumping test	ON : When request for dumping test made in the sequence program OFF: When dumping completion signal (X03) goes OFF, turned OFF in the sequence program.
Fraction test request signal	Y14	Request for execution of fraction test	ON : When request for fraction test made in the sequence program OFF: When cable break check completion signal (X04) goes OFF, turned OFF in the sequence program.
Refresh request signal	Y18	Request for refresh	ON : When a request for refresh is made OFF: Turned OFF in the sequence program at a time determined by the user.

6. PROGRAMMING

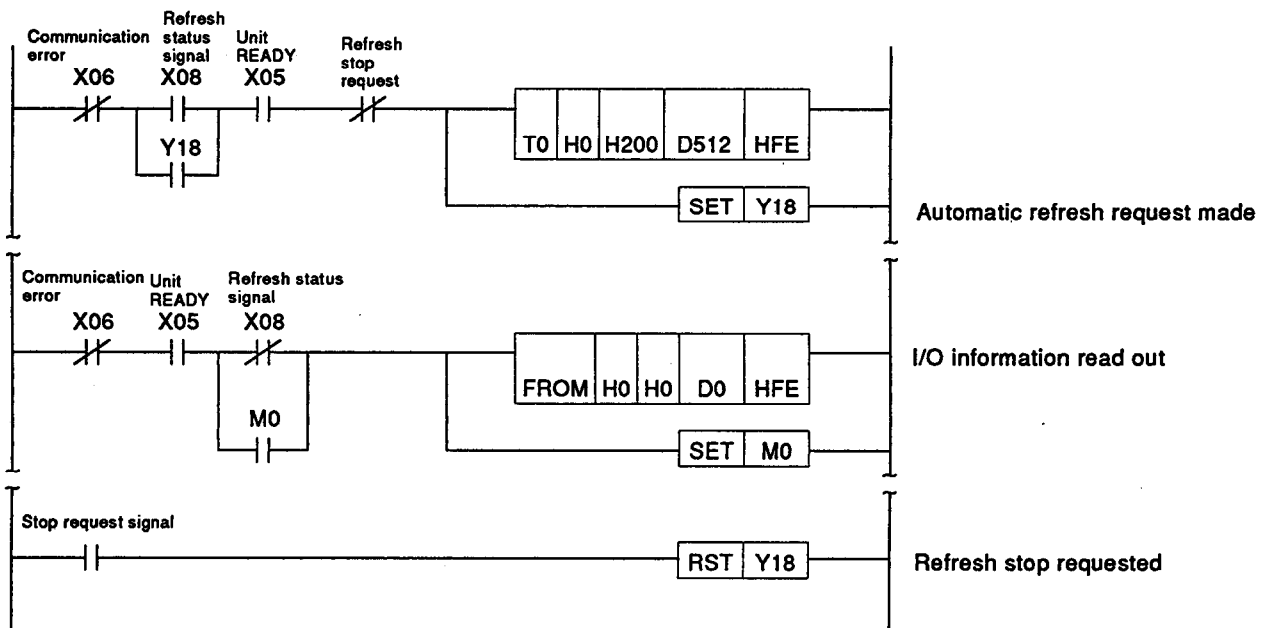
This section presents programming examples.

For the purposes of the programming examples that follow, the system is assumed to be configured as shown below.

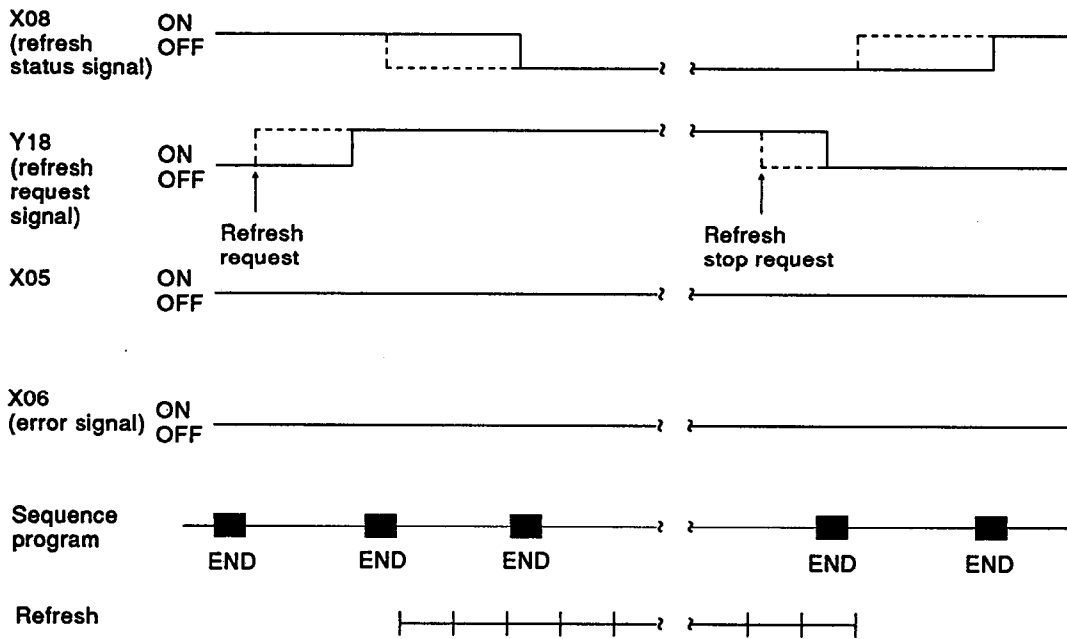
Power supply module	CPU module	AJ71-BH92	AX80	AX80	AX80	AX80
		X00 to X1F	X20 to X2F	X30 to X3F	X40 to X5F	X50 to X5F

6.1 Execution of I/O Control

A programming example for the refresh function is shown below.

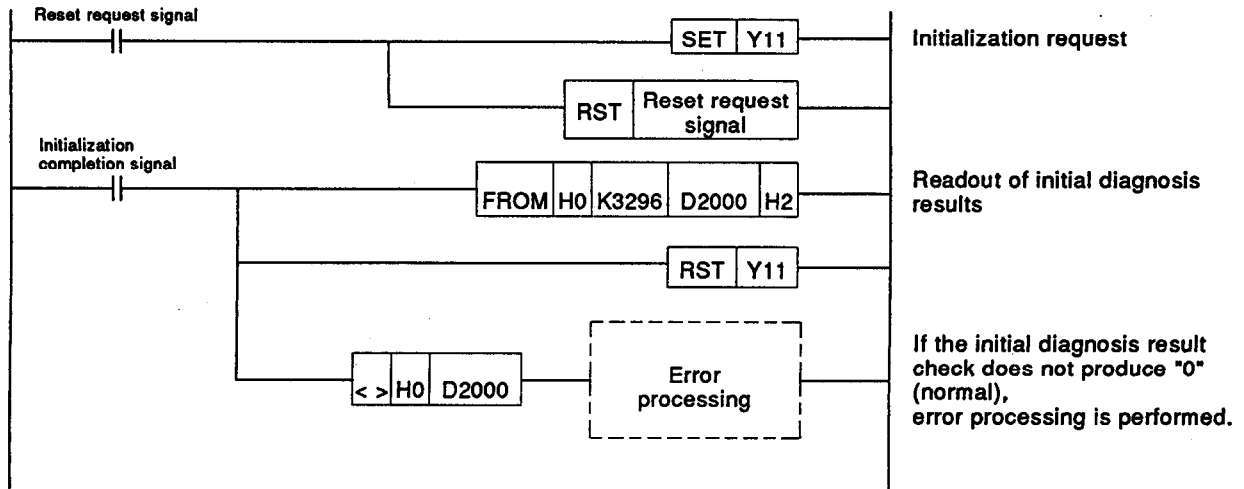


Timing Chart

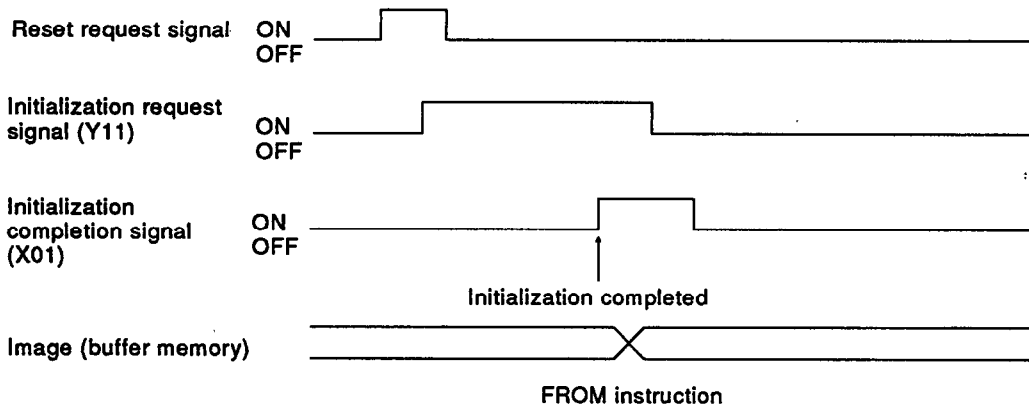


6.2 Execution of Initialization

An example of a program to execute initialization and check test results is presented below.



Timing chart

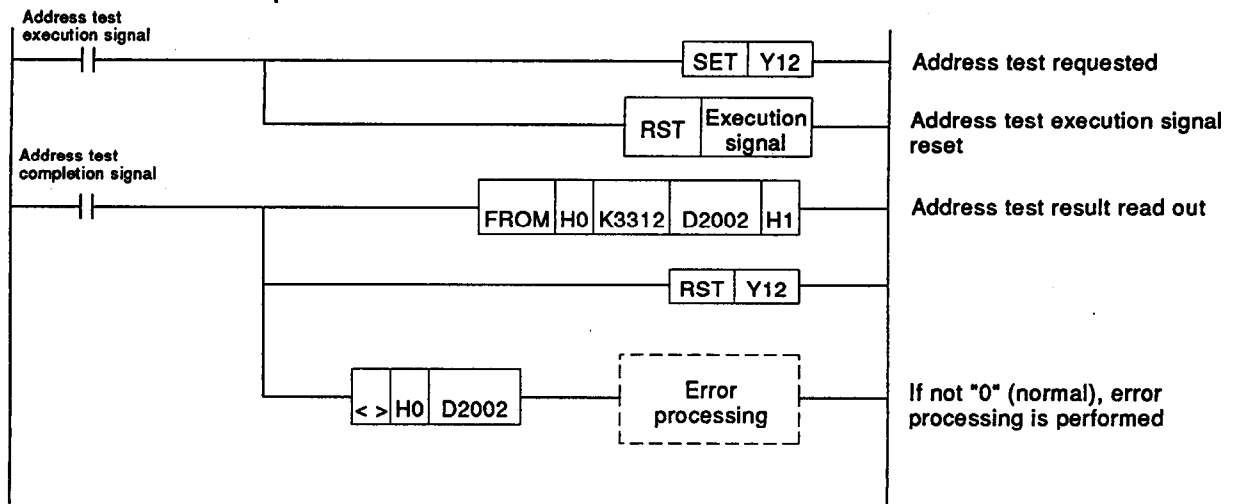


6.3 Test Execution

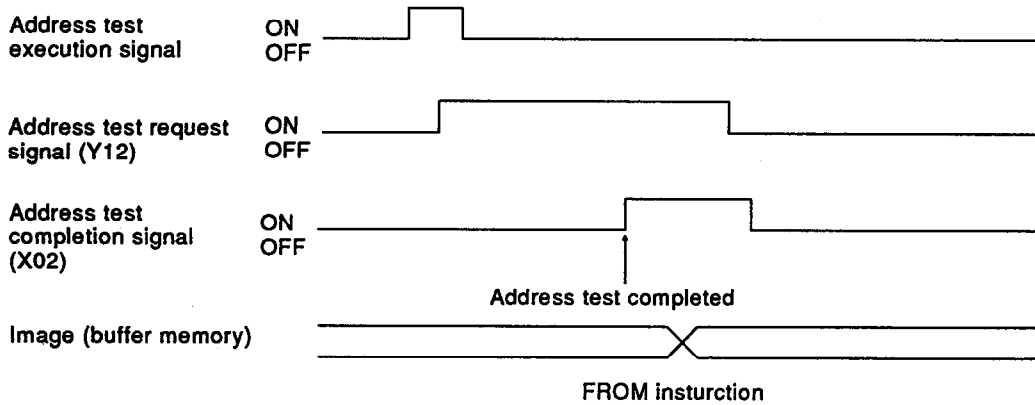
Examples of programming to execute tests and check the results are presented in this section.

6.3.1 Address test

Examples of programming to execute address test and check the results are presented in this section.

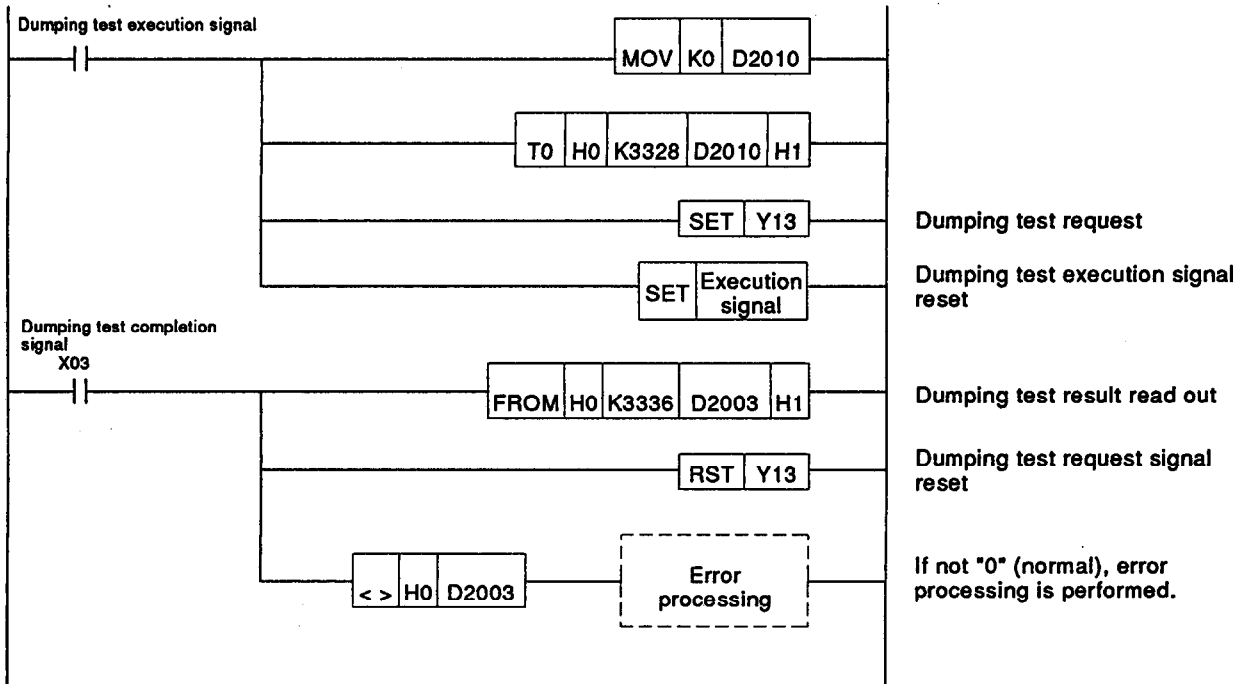


Timing chart

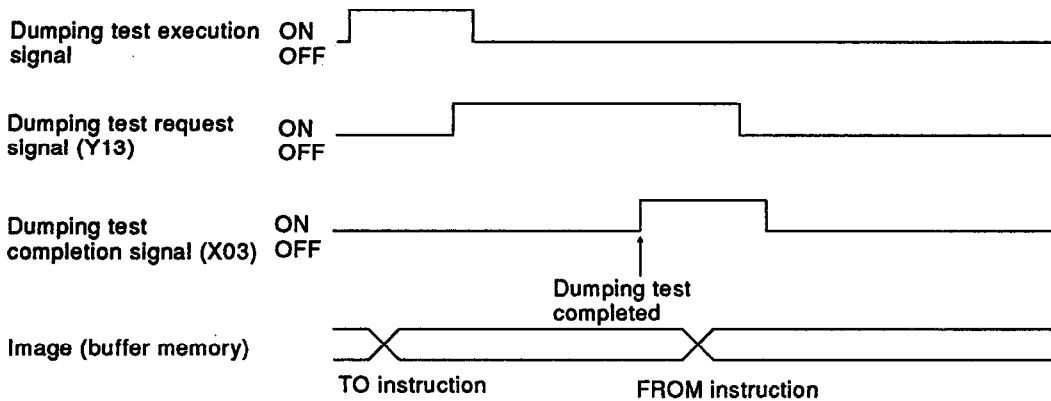


6.3.2 Dumping test

An example of programming to execute the dumping test and check the test results is presented here. (Note that the test is performed on all modules in this example).

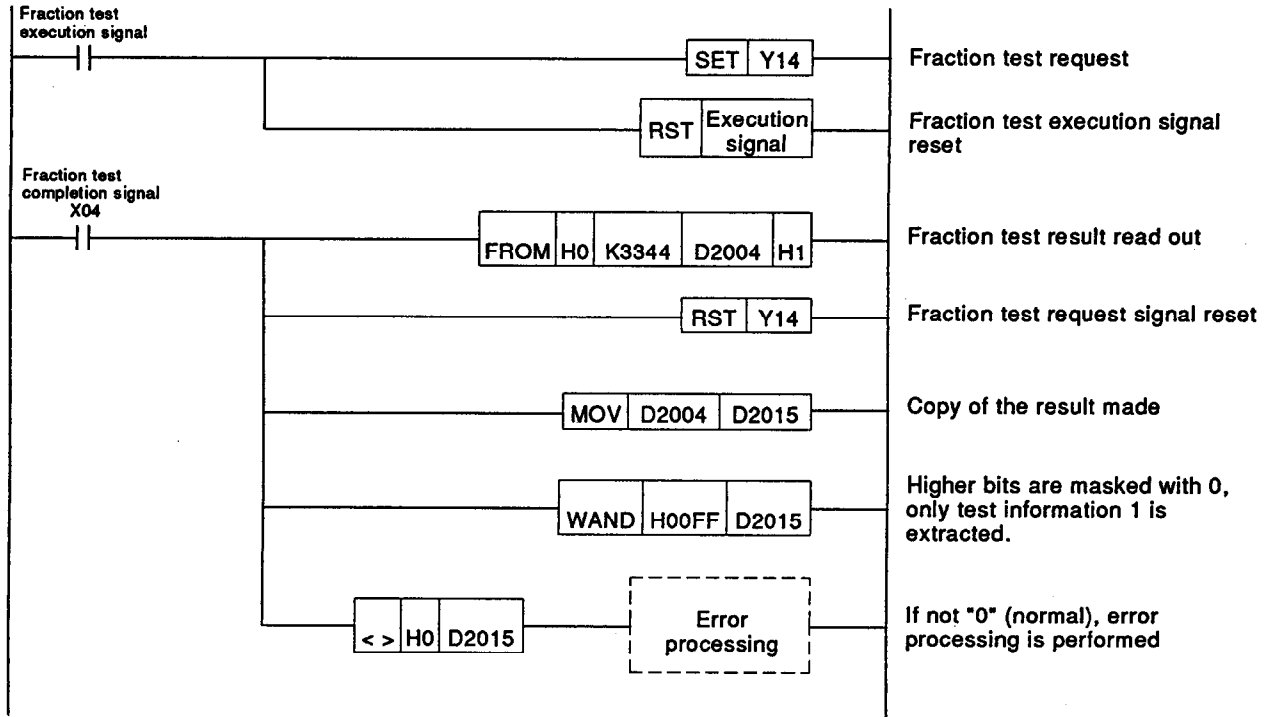


Timing Chart

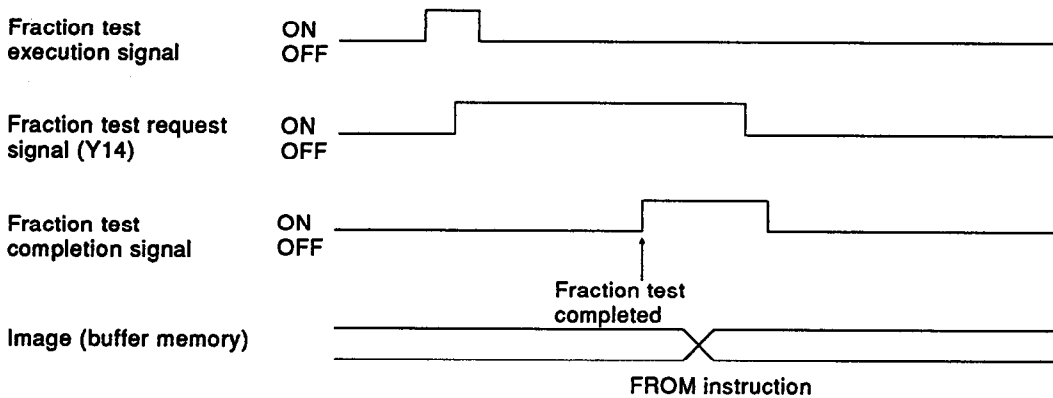


6.3.3 Fraction test

An example of programming to execute the fraction test and check the test results is presented here.

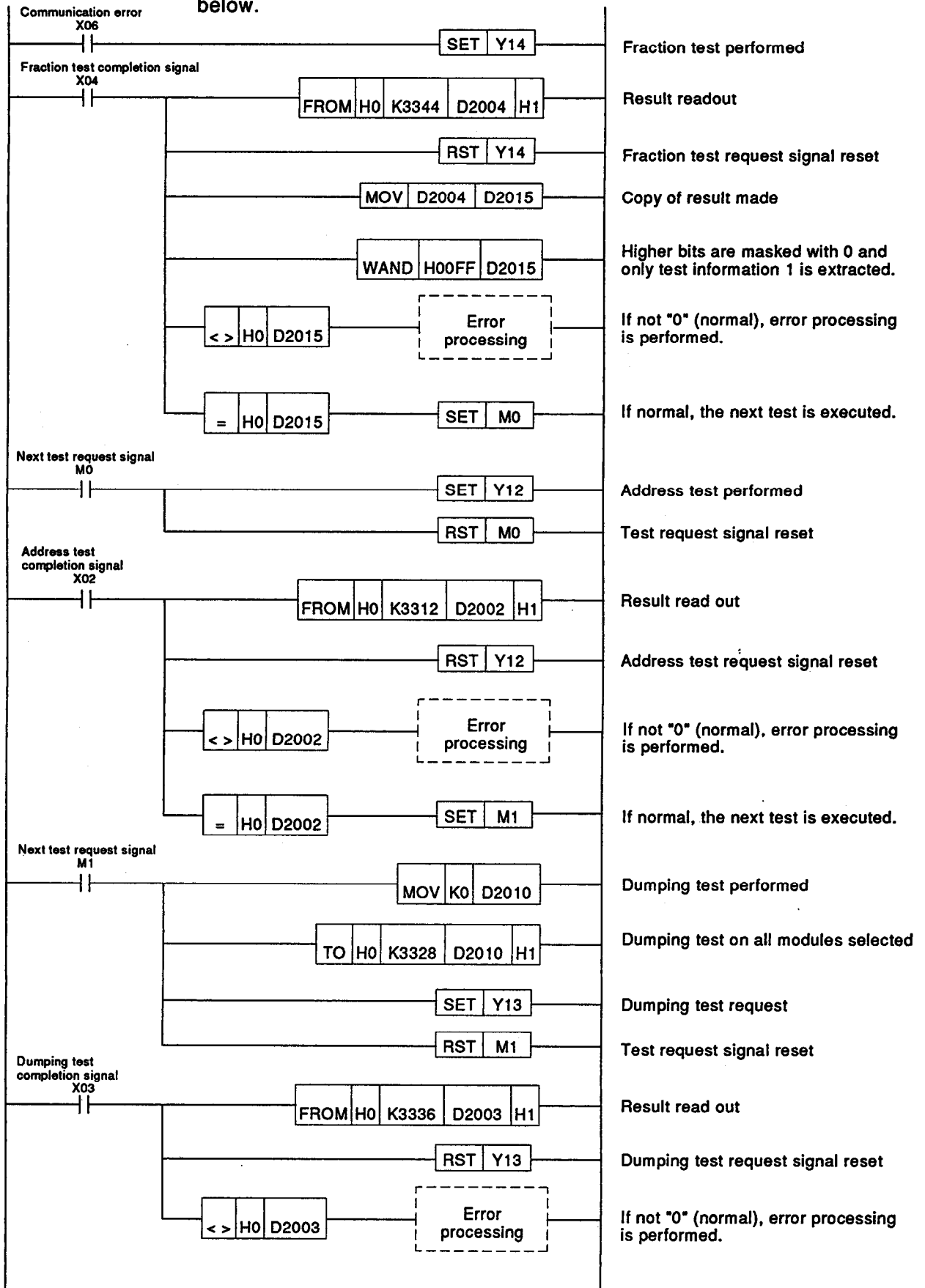


Timing Chart

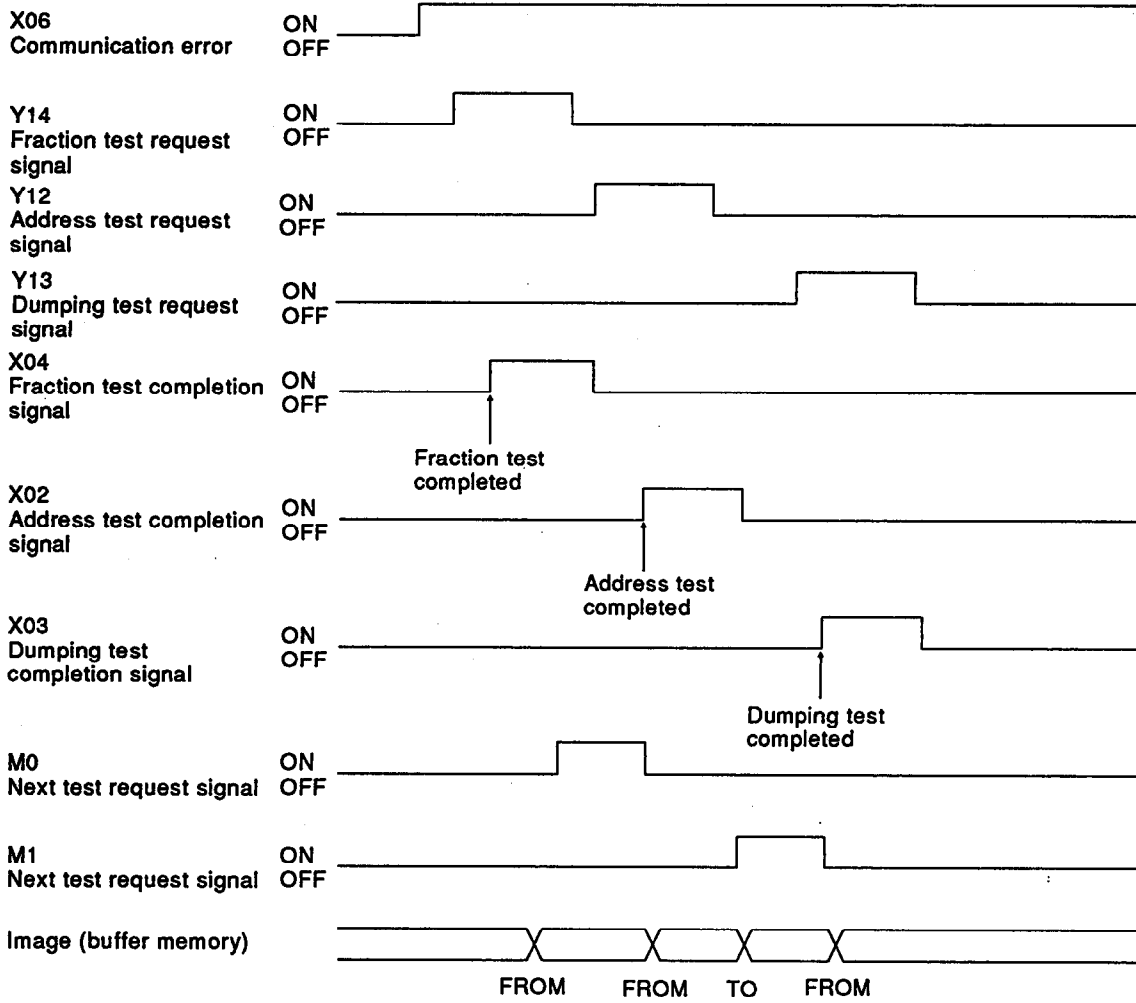


6.4 Processing on Error Occurrence

As an example of processing when an error occurs during normal communications, a programming example in which tests are executed is presented below.

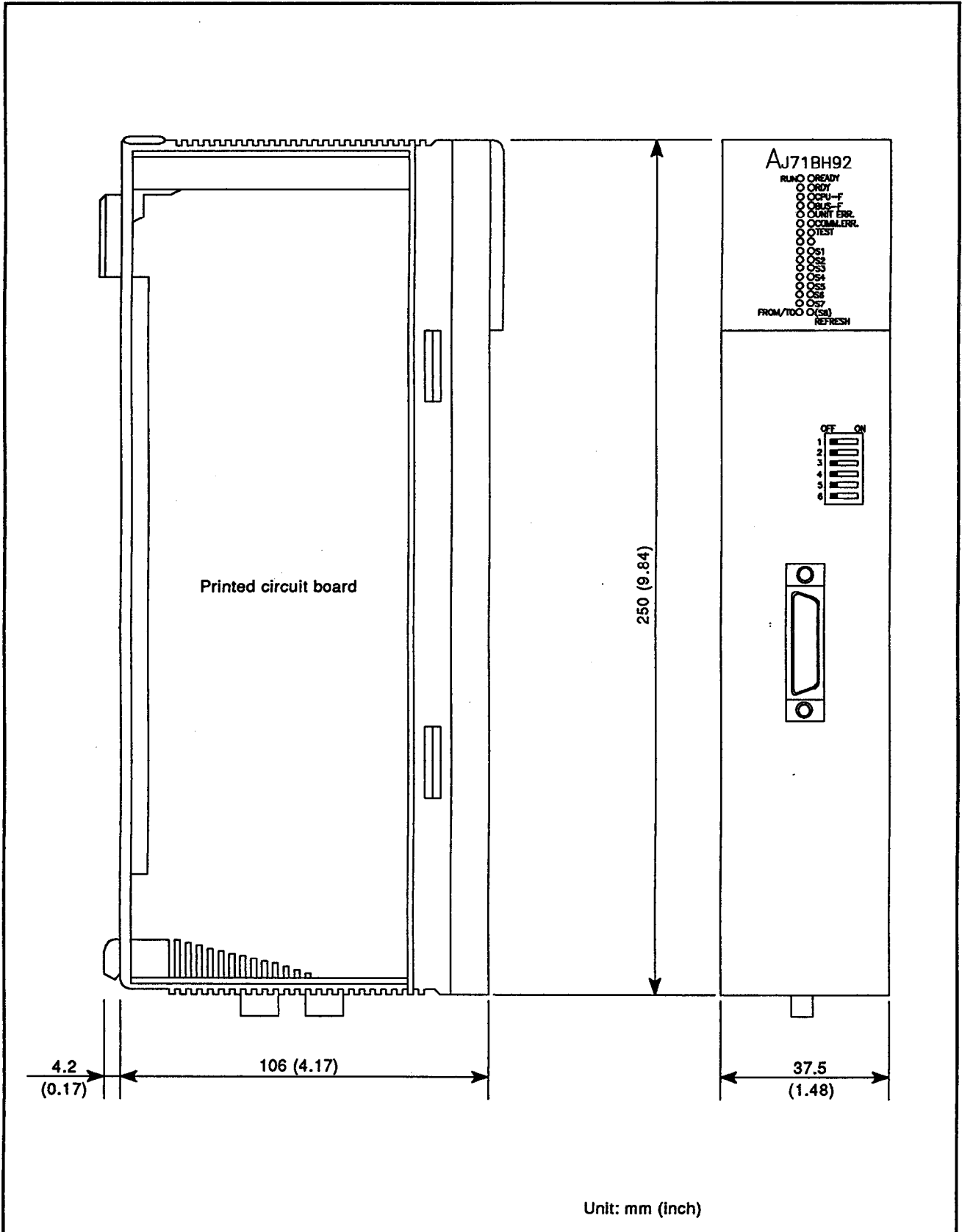


Timing Chart



APPENDIX

APPENDIX 1 DIMENSION DRAWINGS



IMPORTANT

- (1) Design the configuration of a system to provide an external protective or safety interlocking circuit for the PCs.
- (2) The components on the printed circuit boards will be damaged by static electricity, so avoid handling them directly. If it is necessary to handle them take the following precautions.
 - (a) Ground your body and the work bench.
 - (b) Do not touch the conductive areas of the printed circuit board and its electrical parts with non-grounded tools, etc.

Under no circumstances will Mitsubishi Electric be liable or responsible for any consequential damage that may arise as a result of the installation or use of this equipment.

All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.

Owing to the very great variety in possible applications of this equipment, you must satisfy yourself as to its suitability for your specific application.



MITSUBISHI ELECTRIC CORPORATION

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