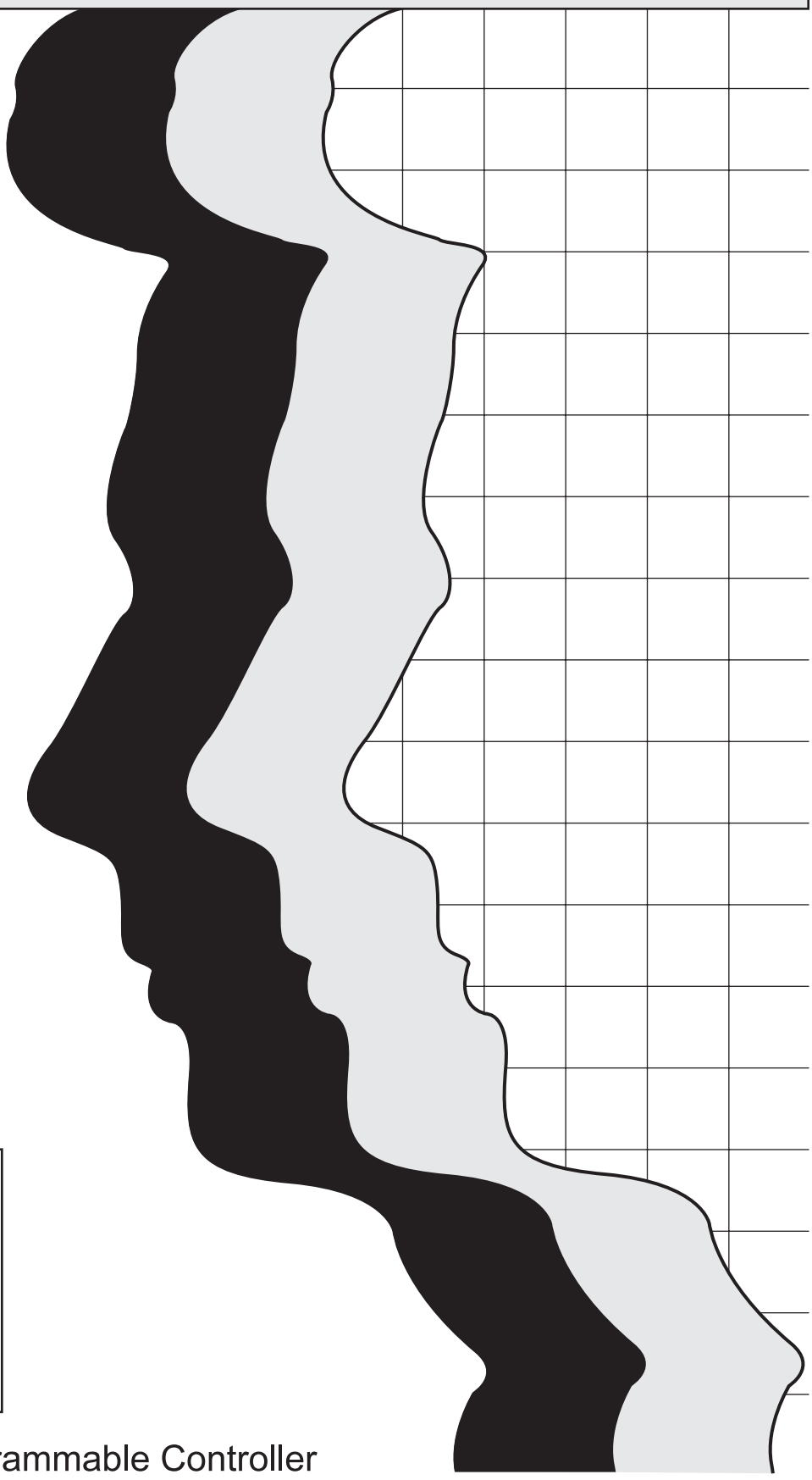
MITSUBISHI

AS-i Master module type A1SJ71AS92

User's Manual



MELSEC

Mitsubishi Programmable Controller

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.

These precautions apply only to Mitsubishi equipment. Refer to the CPU module user's manual for a description of the programmable controller system safety precautions.

In this manual, the safety precautions are classified into two levels: "⚠ WARNING" and "⚠ CAUTION".

⚠ WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[DESIGN PRECAUTIONS]

⚠ WARNING

- If a communication error occurs in the AS-i system, the input will turn OFF from the slave having the communication error.
  Output to the slave with communication error will be held or cleared depending on the slave specifications.
  The AS-i system communication error can be confirmed with the buffer memory's List of Active Slaves (LAS) (15 to 16H, 75 to 76H) and with the input signal Config OK (X4, X9).
  Using the above information, configure an interlock circuit on the sequence program so that the system activates safely.
  There is a risk of accidents caused by incorrect outputs or incorrect operations.
- Depending on the unit fault, the input/output could enter the ON state or OFF state.
  Provide a circuit for external monitoring for input/output signals that could lead to major accidents.

⚠ CAUTION

- Do not bundle AS-i cable together with main circuit or power lines, or lay them close to these lines.
  As a guide, separate these lines by a distance of at least 100 mm, otherwise malfunctions may occur due to noise.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION

- Use the programmable controller in an environment that conforms to the general specifications in CPU module user's manual.
  Using the programmable controller in the environments outside the ranges stated in the general specifications will cause electric shock, fire, malfunction, or damage to/deterioration of the product.
- Do not touch conductive parts or electronic components of the module with your bare hands.
  This could cause malfunction or failure of the module
- Insert the module fixing projection into the fixing hole in the base unit and then tighten the module fixing screw within the specified torque.
  Incorrect installation with no screws could result in malfunction, failure or fall of the module.
  Tightening the screw excessively may cause fall, short circuit, or malfunction of the module due to damage of the screw or the module.
- Always shut off all phases of the programmable controller power supply and AS-i power supply externally before mounting or removing the module.
  Failure to shut off all phases could lead to product damage.

[WIRING PRECAUTIONS]

⚠ WARNING

- Switch off all phases of the programmable controller power supply and AS-i power supply outside the programmable controller before starting installing or wiring work.
  If all phases are not switched off, there will be a danger of electric shock or damage to the product.
- Always install the terminal covers enclosed with the product before turning ON the power or operating the product after installation or wiring.
  Failure to install the terminal cover could lead to electric shocks.

⚠ CAUTION

- Always confirm the products terminal layout before wiring to the module.
  Incorrect wiring could lead to fires or faults.
- Tighten terminal screws to the specified torque.
  If a terminal screw is not tightened to the specified torque, the module may fall out, short circuit, or malfunction.
  If a terminal screw is tightened excessively, exceeding the specified torque, the module may fall out, short circuit, or malfunction due to breakage of the screw or the module.
- Make sure that no foreign matter such as chips or wire offcuts gets inside the module.
  It will cause fire, failure, or malfunction.

[WIRING PRECAUTIONS]

⚠ CAUTION

- AS-i cables connected to a module must always be run in a duct or held securely using clamps.
  If a cable is not run in a duct or not held securely using clamps, the cable will sag, move, or be pulled by mistake, which will cause damage to the module and the cable and also malfunctioning due to loose connection of the cable.
- When removing the AS-i cable from a module, do not pull it out by the cable.
  A cable loosen the screws that hold the cable onto the module then remove the cable.
  If the cable is pulled while it is connected to the module, the module and/or the cable will be damaged and may malfunction due to loose connection of the cable.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.

[STARTUP/MAINTENANCE PRECAUTIONS]

⚠ CAUTION

- Do not touch terminals while the power is ON.
  This will cause malfunctions.
- Do not disassemble or modify any module.
  This will cause failure, malfunction, injuries, or fire.
- Switch off all phases of the programmable controller power supply and AS-i power supply outside the programmable controller before cleaning or re-tightening screws. If all phases are not switched off, the module may fail or malfunction.
  If a screw is not tightened securely, the module may fall out, short circuit, or malfunction.
  If a screw is tightened excessively, the module may fall out, short circuit, or malfunction due to breakage of the screw or the module.
- Switch off all phases of the programmable controller power supply and AS-i power supply outside the programmable controller before mounting or removing the module.
  If all phases are not switched off, the module may fail or malfunction.
- Always make sure to touch the grounded metal to discharge the electricity charged in the electricity charged in the body, etc., before touching the module.
  Failure to do say cause a failure or malfunctions of the module.

[DISPOSAL PRECAUTIONS]

⚠ CAUTION

- Dispose of this product as industrial waste.

• CONDITIONS OF USE FOR THE PRODUCT •

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the PRODUCT in;
- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTs are required. For details, please contact the Mitsubishi representative in your region.

REVISIONS

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

Print Date	* Manual Number	Revision
Apr., 2000	SH (NA) 080085-A	First edition
Oct., 2000	SH (NA) 080085-B	Addition Appendix 2, Appendix 3 Correction Generic Terms and Abbreviations Used in Manual, Section 5.3
Dec., 2003	SH (NA) 080085-C	Correction SAFETY PRECAUTIONS, Section 2.4, 3.1, 3.4.2
Jun., 2004	SH (NA) 080085-D	Correction SAFETY PRECAUTIONS, Section 3.3.2, 3.4.2, 4.4.1, 4.5.1, Chapter 5, Section 5.3
Sep.,2010	SH(NA)080085-E	Change of a term "PLC" was changed to "programmable controller". Addition CONDITION OF USE FOR THE PRODUCT Correction SAFETY PRECAUTIONS, Compliance to EMC Directives and Low-Voltage Directives, Section 3.1, 4.1, 4.2, 4.4.1, 4.5.1, APPENDIX, WARRANTY

Japanese Manual Version SH-080084-E

INTRODUCTION

Thank you for purchasing the Mitsubishi general-purpose programmable controller MELSEC-A Series.
Please read this manual thoroughly before starting use to fully comprehend the functions and performance of the A Series programmable controller, and to ensure correct usage.

CONTENTS

Compliance to EMC Directives and Low-Voltage Directives

When incorporating the Mitsubishi programmable controller into other industrial machinery or equipment and keeping compliance with the EMC and low voltage directives, refer to Chapter 3 "EMC Directive and Low Voltage Instruction" of the User's Manual (Hardware) for the CPU module used or the programmable controller CPU supplied with the base unit.
The CE logo is printed on the rating plate of the programmable controller, indicating compliance with the EMC and low voltage directives.

For making this product compliant with the EMC and low voltage directives, please refer to Chapter 3 of CPU module User's Manual (Hardware).

Generic Terms and Abbreviations Used in Manual

Unless noted in particular, the following generic terms and abbreviations are used to explain the A1SJ71AS92 type AS-i master module in this manual.

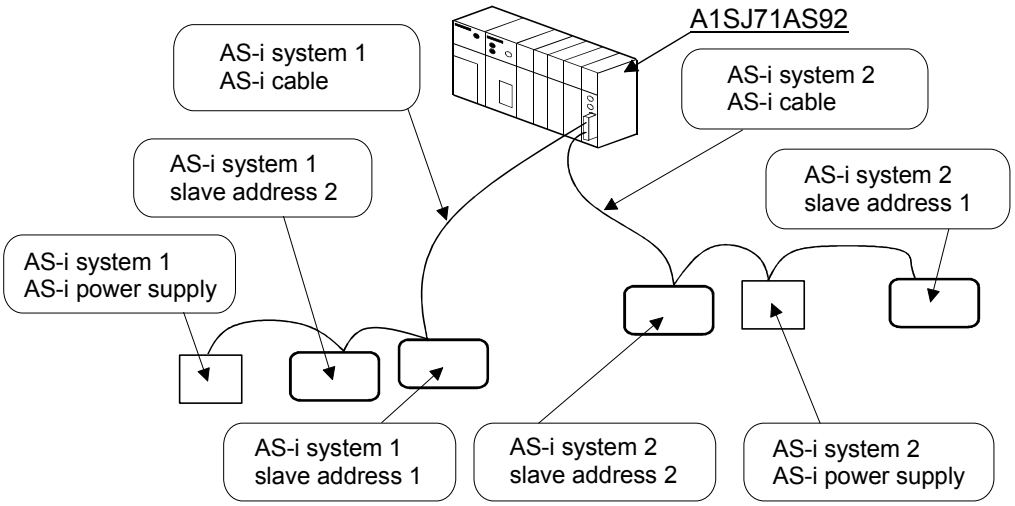
Generic term/abbrev.	Details of generic term/abbreviation
A1SJ71AS92	Abbreviation for A1SJ71AS92.
CPU module	Generic term for A1SJCPU-S3, A1SCPU, A2SCPU, A1SJHCPU (S8), A1SHCPU, A2SHCPU (S1), A2ASCPU (S1/S30), A2USHCPU-S1, Q2ASCPU (S1), Q2ASHCPU (S1), Q02CPU-A, Q02HCPU-A, Q06HCPU-A, Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU and Q25HCPU.
Main base unit	Generic term for A1S32B, A1S33B, A1S35B, A1S38B, A1S38HB, QA1S35B and QA1S38B type main base unit.
Extension base unit	Generic term for A1S52B (S1), A1S55B (S1), A1S58B (S1), A1S65B (S1), A1S68B (S1), QA1S65B and QA1S68B type extension base unit.
Extension cable	Generic term for A1SC01B, A1SC03B, A1SC07B, A1SC12B, A1SC30B, A1SC60B, A1SC05NB, A1SC07NB, A1SC30NB, A1SC50NB, QC06B, QC12B, QC30B, QC50B and QC100B type extension cable.
Data link system	Generic term for MELSECNET, MELSECNETII and MELSECNET/B data link system.
Network system	Generic term for MELSECNET/10 network system.
LAS	Abbreviation for List of Active Slaves.
LDS	Abbreviation for List of Detected Slaves.
LPS	Abbreviation for List of Projected Slaves.
EC flag	Abbreviation for Execution Control flag.

1 OVERVIEW

This manual explains the specifications, procedures for operation and troubleshooting of the A1SJ71AS92 type AS-i master module (hereinafter, A1SJ71AS92).

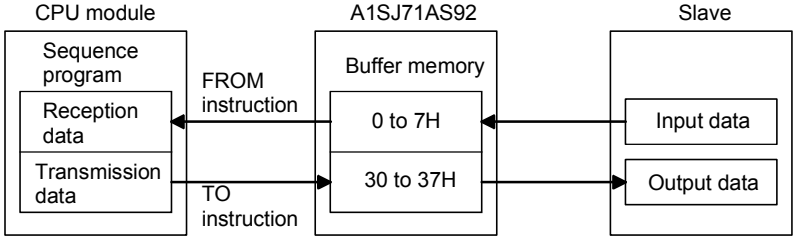
The AS-i is the abbreviation of the Actuator-Sensor-Interface, and is a network system specified by the IEC Standards: IEC62026-2.
The A1SJ71AS92 is compatible with the AS-Interface Specification Version 2.04, and can be used as the master module of the AS-i system.

> Refer to IEC 62026-2 for details on the specifications related to the AS-i system described in this manual.



Use AS-i cables, AS-i power supply units and slaves that complies with the AS-Interface Specification Version 2.04.

The CPU module transmits and receives the slave's input/output data via the A1SJ71AS92 buffer memory using the FROM/TO instructions.



1.1 Features

The A1SJ71AS92 has the following features.

(1) Automatic slave address assignment function (Automatic address assignment function)

When a fault occurs in a slave (when one of the set slaves is not recognized), the A1SJ71AS92 can automatically assign the slave address of a slave similar to the faulty slave, for which the slave address is set to 0, as the slave address for the faulty slave.

(2) Maximum number of connected slaves

The A1SJ71AS92 can control up to 31 slave modules per AS-i system. The A1SJ71AS92 can control two systems.
(The maximum number of input/output points per slave is 4 input points and 4 output points.)

(3) Overall distance

The overall distance is 100m.
Note that the overall distance can be extended to up to 300m by using two repeaters.

(4) Input/output signal refresh time

The refresh time for the input/output signals is approx. 5ms when using the maximum number of input/output points.

1.2 Enclosed Parts

After opening the A1SJ71AS92 package, confirm that the following products are enclosed.

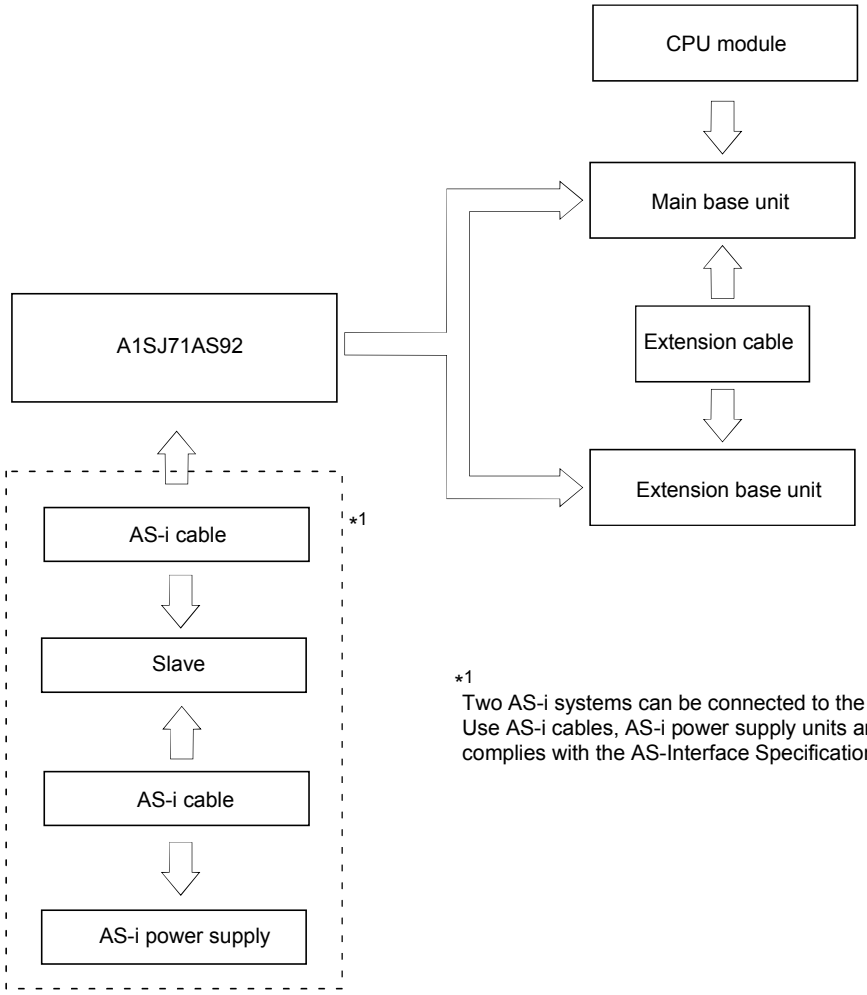
Type	Part name	Qty.
A1SJ71AS92	A1SJ71AS92 type AS-i master module	1
Manual	A1SJ71AS92 type AS-i Master Module User's Manual (Hardware)	1

2 SYSTEM CONFIGURATIONS

The configuration of the programmable controller system that can be combined with the A1SJ71AS92 is explained in this section.

2.1 General Configuration

The configuration for assembling the programmable controller into the AS-i system with the A1SJ71AS92 is shown below.



*1
Two AS-i systems can be connected to the A1SJ71AS92.
Use AS-i cables, AS-i power supply units and slaves that complies with the AS-Interface Specification Version 2.04.

Fig. 2.1 System configuration drawing

2 - 1

2.2 Applicable CPU and No. of Mountable Modules

The A1SJ71AS92 can be used with the following CPU modules.

Applicable CPU	No. of mountable modules
A1SJCPU-S3, A1SCPU, A2SCPU A1SJHCPU (S8), A1SHCPU, A2SHCPU (S1)	No limits *1
A2ASCPU (S1/S30), A2USHCPU-S1	
Q2ASCPU (S1), Q2ASHCPU (S1)	
Q02CPU-A, Q02HCPU-A, Q06HCPU-A	
Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU *2	

*1 : The A1SJ71AS92 can be used within the maximum number of input/output point range of the CPU module in use.
*2 : The A1SJ71AS92 can be mounted only on the extension base unit (QA1S65B, QA1S68B).

2.3 AS-i System Connection Methods

The following methods can be used to connect the AS-i system.

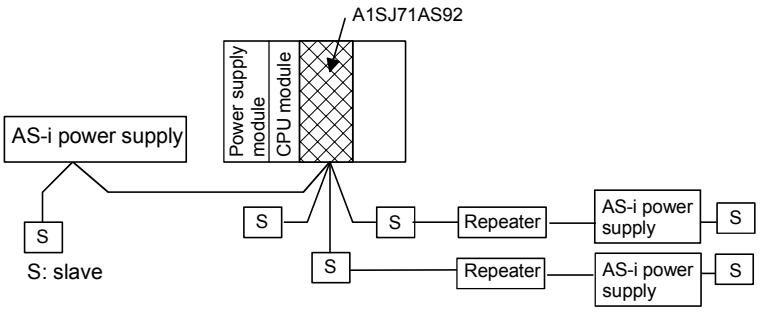
(1) The star method, line method, tree method or ring method can be used to connect the AS-i system.

(2) The AS-i system does not require a terminator. The overall distance is 100m when a repeater is not used, and 300m when two repeaters are used.

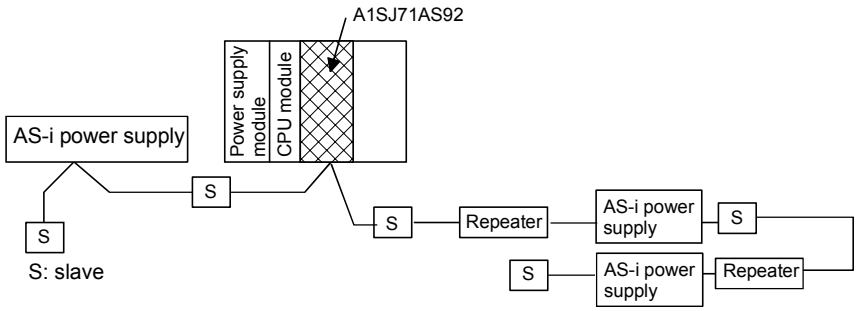
(3) One AS-i power supply unit is connected to the AS-i system. The power supply can be connected at any place on the AS-i system. When using a repeater, connect an AS-i power supply unit after the repeater is connected.

Examples of each connection method are shown below.

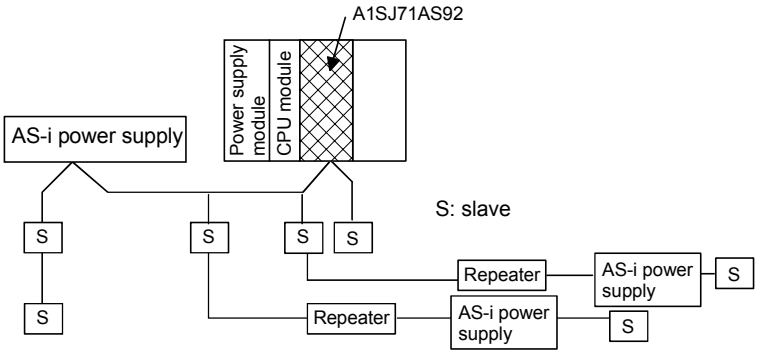
(1) Star method



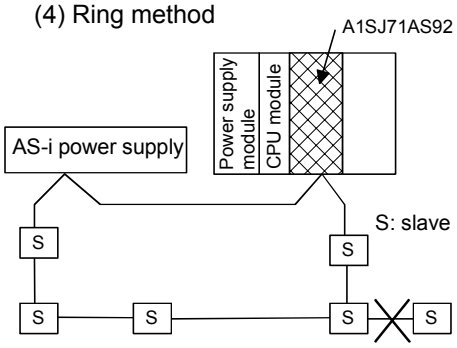
(2) Line method



(3) Tree method



(4) Ring method



(Note)

The system cannot be branched to a tree connection, etc., from the ring connection. A partial loop cannot be formed. A repeater cannot be used.

2.4 Precautions for System Configuration

(1) The A1SJ71AS92 can be mounted in a random slot of the base unit.

Note that when using the Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU or Q25HCPU module, the A1SJ71AS92 can be mounted only on the extension base unit (QA1S65B, QA1S68B).
If the A1SJ71AS92 is mounted on an extension base unit (A1S52B (S1), A1S55B (S1), A1S58B (S1)) to which the power supply module cannot be mounted, the power supply capacity may be insufficient.

(2) The A1SJ71AS92 can be used as the master station or local station in a data link system, and as a control station or normal station in the network system.

The A1SJ71AS92 cannot be used as the remote I/O station in the data link system or network system.

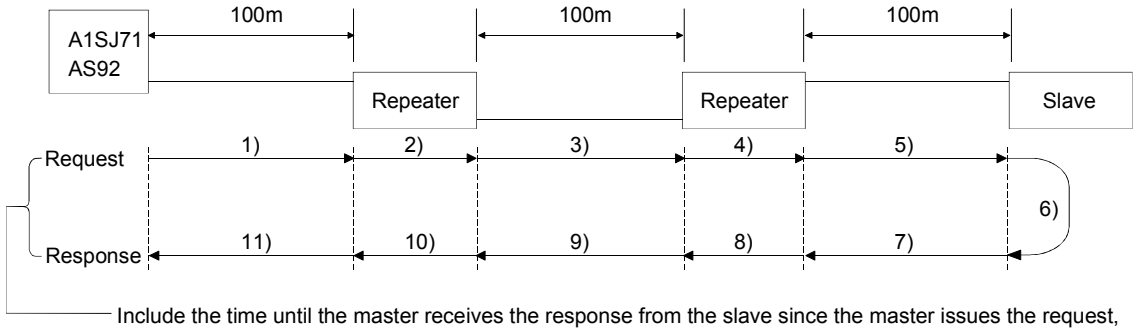
(3) To use a repeater, check the specification of the slave response time.

When two repeaters are used in series to extend the system of A1SJ71AS92 (hardware version A), A1SJ71AS92 may not recognize the slave if the slave response time is too long.
In this case, build the system so that the following equation (standard of As-i Ver. 2.04) is satisfied.
For A1SJ71AS92 (hardware version B or later), build the system so that the following equations are satisfied.

Slave response time + Repeater's delay + Cable's delay $\leqq$ 11 [T_{Bit}]
Slave response time + Repeater's delay + Cable's delay $\leqq$ 10 [T_{Bit}]
(where, in AS-I standard, 1 [T_{Bit} (bit time)] = about 6 [μs] is represented.)

For specifications of slave response time, repeater's and cable's delays, contact each respective manufacturer.

(Calculation example)



When each time is as follows with the system configuration as shown in the above figure:

(a) Repeater's delay (each time for 2), 4), 8), 10)) = about 1.17 [T_{Bit}] (per unit)

(b) Cable's delay (each time for 1), 3), 5), 7), 9), 11)) = about 0.00125 [T_{Bit}] (per 1m) $\times$ 100 [m]

(c) Slave response time (6)) = about 3 [T_{Bit}]

Slave response time + Repeater's delay + Cable's delay
= 6) + (2) + 4) + 8) + 10)) + (1) + 3) + 5) + 7) + 9) + 11)
= about 8.43 [T_{Bit}] $\leqq$ 10 [T_{Bit}]
Therefore, A1AJ71AS92 can recognize the slave.

On the other hand, when the slave response time (6)) is about 5 [T_{Bit}], Slave response time + Repeater's delay + Cable's delay = 10.43 [T_{Bit}] $\geqq$ 10 [T_{Bit}]
Therefore, A1SJ71AS92 (hardware version A) cannot recognize the slave.
In this case, use any of the following methods.

- Reduce the number of repeaters. Or, replace with a repeater with a short delay.
- Shorten the cable distance.
- Replace with a slave with a quick response time.

A1SJ71AS92 (hardware version B or later) applies to Slave response time + Repeater's delay + Cable's delay = 10.43 [T_{Bit}] $\leqq$ 11 [T_{Bit}], and, therefore, can recognize the slave.

3 SPECIFICATIONS

The general specifications and performance specifications of the A1SJ71AS92 are given in this section.

3.1 General Specifications

For the general specifications, refer to the User's Manual of the CPU module to be used.

3.2 Performance Specifications

The A1SJ71AS92 performance specifications are shown below.

Table 3.1 Performance Specifications

Item		Specification
Number of AS-i systems		Two systems
Maximum number of AS-i slaves		62 (31 × 2 systems)
Maximum number of AS-i system input/output points	Input	248 points (124 points × 2 systems)
	Output	248 points (124 points × 2 systems)
Input/output refresh time		Approx. 5ms (when maximum number of input/output points are connected)
Communication speed		167kbps
Transmission distance		Maximum 100m/system (Maximum 300m when two repeaters are used)
Connection type		Bus network type, independent for each system.(Star, line, tree or ring)
Communication method		APM modulation method (Alternating Pulse Modulation)
Error control method		Parity check
Internal memory		Flash ROM (for registering slave configuration) Number or writes: 10000 times or less
Number of occupied input/output points		32 points (I/O assignment: special 32 points)
Applicable wire		Use AS-i cables
Applicable crimp terminal		R2-3.5, RAV 2-3.5, RAP 2-3.5, RBV 2-3.5, RBP 2-3.5 (JIS C2805 compliant)
External power supply	Voltage	30.5VDC (supplied independently to each system from AS-i power supply)
	Current consumption	70mA/system (TYP 30.5VDC)
5VDC internal current consumption		0.15A
Weight		0.30kg

3.3 Input/Output Signals for CPU module

3.3.1 List of Input/Output Signals

A list of A1SJ71AS92 input/output signals is shown in Table 3.2.
The input/output signal assignment shows the case for when the A1SJ71AS92 is mounted in slot 0 of the main base unit.

Table 3.2 List of input/output signals

Signal direction: CPU module ← A1SJ71AS92		Signal direction: CPU module → A1SJ71AS92	
Input signal	Signal name	Output signal	Signal name
X0	Watchdog Timer Error (WDT error)	Y0	Not used
X1	Unit Ready	Y1	
X2	Not used	Y2	
X3	Not used	Y3	
X4	Config OK AS-i 1	Y4	
X5	AS-i Power Fail AS-i 1	Y5	
X6	Normal Operation Active AS-i 1	Y6	
X7	Configuration Mode AS-i 1	Y7	
X8	Not used	Y8	
X9	Config OK AS-i 2	Y9	
XA	AS-i Power Fail AS-i 2	YA	
XB	Normal Operation Active AS-i 2	YB	
XC	Configuration Mode AS-i 2	YC	
XD	Not used	YD	
XE		YE	
XF		YF	
X10	Not used	Y10	Not used
X11		Y11	
X12		Y12	
X13		Y13	
X14		Y14	Off-line Phase AS-i 1
X15		Y15	Automatic Address Assignment Function Valid AS-i 1
X16		Y16	Configuration Mode AS-i 1
X17		Y17	Protected Operation Mode AS-i 1
X18		Y18	Off-line Phase AS-i 2
X19		Y19	Automatic Address Assignment Function Valid AS-i 2
X1A		Y1A	Configuration Mode AS-i 2
X1B		Y1B	Protected Operation Mode AS-i 2
X1C		Y1C	Flash ROM write
X1D		Y1D	Refresh Instruction
X1E		Y1E	Not used
X1F		Y1F	

Important

The signals indicated as use prohibited in Table 3.2 are used by the system and cannot be used by the user.
If these are turned ON/OFF by the sequence program, correct operation of the module cannot be guaranteed.

3.3.2 Details of Input/Output Signals

The details of the A1SJ71AS92 input/output signals are explained below.

(1) X0: Watchdog Timer Error (WDT error)

This signal turns ON when a watchdog timer error occurs due to the A1SJ71AS92's self-diagnosis function.

OFF : Normal
ON : Watchdog timer error has occurred

(2) X1: Unit Ready

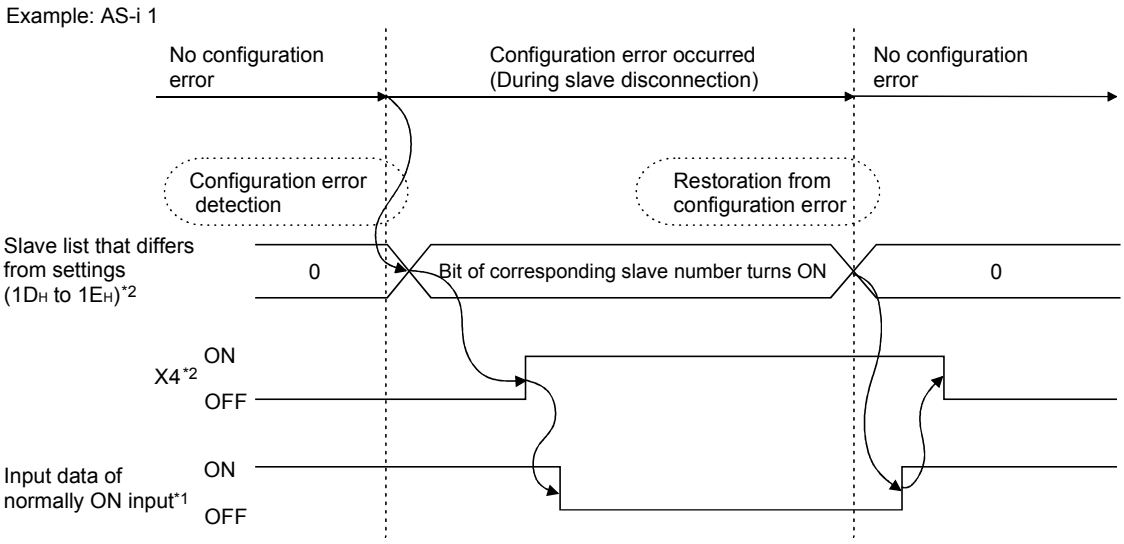
This signal turns ON when the A1SJ71AS92 enters the operation enabled state after the power is turned ON or the CPU module is reset.

OFF : Operation disabled
ON : Operation enabled

(3) X4, X9: Config OK (X4: AS-i 1, X9: AS-i 2)

This bit is used to check the setting error flag. If a setting error has occurred in the AS-i system, this bit will turn ON.
If this bit turns ON, check that the wiring is correct, and that the LPS is the same as the LDS.

OFF : No configuration error
ON : Configuration error found



*1: Shows the timing with the input data when the normally-ON input slave is disconnected.
*2: For AS-i 2 side, read the slave list that differs from settings as $7D_H$ to $7E_H$, and X4 as X9.

(4) X5, XA: AS-i Power Fail (X5: AS-i 1, XA: AS-i 2)

This bit is used to check the AS-i power supply error flag. This bit turns ON if the power supplied by the AS-i power supply is insufficient.
If this bit turns ON, check the AS-i power supply current rating value, the wiring and the overall distance of the system.

OFF : AS-i power supply normal
ON : AS-i power supply abnormal

(5) X6, XB: Normal Operation Active (X6: AS-i 1, XB: AS-i 2)

This bit checks the operation state.
This bit turns ON when the A1SJ71AS92 is not in the normal operation state. (Refer to section 4.6)

OFF : Normal operation
ON : Phase other than normal operation

(6) X7, XC: Configuration Mode (X7: AS-i 1, XC: AS-i 2)

This bit checks the configuration mode.
This bit turns ON when the A1SJ71AS92 is in the configuration mode.
This bit turns OFF when the A1SJ71AS92 is in another mode. (Refer to section 4.6)

OFF : Mode other than configuration mode
ON : Configuration mode

(7) Y14, Y18: Off-line Phase (Y14: AS-i 1, Y18: AS-i 2)

OFF → ON: The A1SJ71AS92 is set in the off-line phase.
ON → OFF: The status will change in order and change to normal operation.

(8) Y15, Y19: Automatic Address Assignment Function Valid (Y15: AS-i 1, Y19: AS-i 2)

This sets the validity of the automatic address assignment function.

OFF: Automatic address assignment function valid
ON: Automatic address assignment function invalid

(9) Y16, Y1A: Configuration Mode (Y16: AS-i 1, Y1A: AS-i 2)

OFF → ON: The A1SJ71AS92 is set in the configuration mode.
ON → OFF: The A1SJ71AS92 mode does not change.

(10) Y17, Y1B: Protected Operation Mode

OFF → ON: The A1SJ71AS92 is set in the protected operation mode.
ON → OFF: The A1SJ71AS92 mode does not change.

(11) Y1C: Flash ROM write

When this signal turns ON, the configuration data will be written into the flash ROM.

POINT
(1) FROM/TO instructions to A1SJ71AS92 is not executed at the time of writing in the flash ROM. A1SJ71AS92 might make an error if written in the flash ROM while executing the FROM/TO instruction. (2) Data can be written to the flash ROM 10,000 times. If the number of writings exceeds 10,000 times, "F70" (flash ROM write error) will appear on the A1SJ71AS92's 17-segment LED. If "F70" appears, a hardware error has occurred, so contact your nearest Mitsubishi representative.

(12) Y1D: Refresh instruction

This signal determines whether the contents of the "data output to slave" in buffer memory are valid.

OFF: Invalid (Only OFF data is transmitted to slave)

ON: Valid (The "output data to slave" in buffer memory are transmitted.)

3.4 Buffer Memory

3.4.1 Buffer Memory List

The list of the A1SJ71AS92's buffer memory is shown in Table 3.3.

Table 3.3 Buffer memory list

Address		Details	Read/write from CPU module
Hexa-decimal	Decimal		
0H	0	Input data from AS-i 1 slave 1 to 3 and part of EC Flags	Reading possible
1H	1	Input data from AS-i 1 slave 4 to 7	Reading possible
2H	2	Input data from AS-i 1 slave 8 to 11	Reading possible
3H	3	Input data from AS-i 1 slave 12 to 15	Reading possible
4H	4	Input data from AS-i 1 slave 16 to 19	Reading possible
5H	5	Input data from AS-i 1 slave 20 to 23	Reading possible
6H	6	Input data from AS-i 1 slave 24 to 27	Reading possible
7H	7	Input data from AS-i 1 slave 28 to 31	Reading possible
8H to FH	8 to 15	Not used	—
10H	16	EC Flags AS-i 1	Reading possible
11H to 12H	17 to 18	LDS AS-i 1	Reading possible
13H to 14H	19 to 20	Not used	—
15H to 16H	21 to 22	LAS AS-i 1	Reading possible
17H to 18H	23 to 24	Not used	—
19H to 1AH	25 to 26	LPS AS-i 1	Reading possible
1BH to 1CH	27 to 28	Not used	—
1DH to 1EH	29 to 30	List of slaves with configuration differences AS-i 1	Reading possible
1FH to 24H	31 to 36	Not used	—
25H to 29H	37 to 41	Command Buffer AS-i 1: <Result>	Reading possible
2AH to 2FH	42 to 47	Not used	—
30H	48	Output data from AS-i 1 slave 1 to 3	Writing possible
31H	49	Output data from AS-i 1 slave 4 to 7	Writing possible
32H	50	Output data from AS-i 1 slave 8 to 11	Writing possible
33H	51	Output data from AS-i 1 slave 12 to 15	Writing possible
34H	52	Output data from AS-i 1 slave 16 to 19	Writing possible
35H	53	Output data from AS-i 1 slave 20 to 23	Writing possible
36H	54	Output data from AS-i 1 slave 24 to 27	Writing possible
37H	55	Output data from AS-i 1 slave 28 to 31	Writing possible
38H to 48H	56 to 57	Not used	—
49H to 4AH	73 to 74	LPS AS-i 1	Writing possible
4BH to 54H	75 to 84	Not used	—
55H to 59H	85 to 89	Command Buffer AS-i 1: <Command>	Writing possible
5AH to 5FH	90 to 95	Not used	—

Address		Details	Read/write from CPU module
Hexa-decimal	Decimal		
60H	96	Input data from AS-i 2 slave 1 to 3 and part of EC Flags	Reading possible
61H	97	Input data from AS-i 2 slave 4 to 7	Reading possible
62H	98	Input data from AS-i 2 slave 8 to 11	Reading possible
63H	99	Input data from AS-i 2 slave 12 to 15	Reading possible
64H	100	Input data from AS-i 2 slave 16 to 19	Reading possible
65H	101	Input data from AS-i 2 slave 20 to 23	Reading possible
66H	102	Input data from AS-i 2 slave 24 to 27	Reading possible
67H	103	Input data from AS-i 2 slave 28 to 31	Reading possible
68H to 6FH	104 to 111	Not used	—
70H	112	EC Flags AS-i 2	Reading possible
71H to 72H	113 to 114	LDS AS-i 2	Reading possible
73H to 74H	115 to 116	Not used	—
75H to 76H	117 to 118	LAS AS-i 2	Reading possible
77H to 78H	119 to 120	Not used	—
79H to 7AH	121 to 122	LPS AS-i 2	Reading possible
7BH to 7CH	123 to 124	Not used	—
7DH to 7EH	125 to 126	List of slaves with configuration differences AS-i 2	Reading possible
7FH to 84H	127 to 132	Not used	—
85H to 89H	133 to 137	Command Buffer AS-i 2: <Result>	Reading possible
8AH to 8FH	138 to 143	Not used	—
90H	144	Output data from AS-i 2 slave 1 to 3	Writing possible
91H	145	Output data from AS-i 2 slave 4 to 7	Writing possible
92H	146	Output data from AS-i 2 slave 8 to 11	Writing possible
93H	147	Output data from AS-i 2 slave 12 to 15	Writing possible
94H	148	Output data from AS-i 2 slave 16 to 19	Writing possible
95H	149	Output data from AS-i 2 slave 20 to 23	Writing possible
96H	150	Output data from AS-i 2 slave 24 to 27	Writing possible
97H	151	Output data from AS-i 2 slave 28 to 31	Writing possible
98H to A8H	152 to 168	Not used	—
A9H to AAH	169 to 170	LPS AS-i 2	Writing possible
ABH to B4H	171 to 180	Not used	—
B5H to B9H	181 to 185	Command Buffer AS-i 2: <Command>	Writing possible
BAH	186	Not used	—

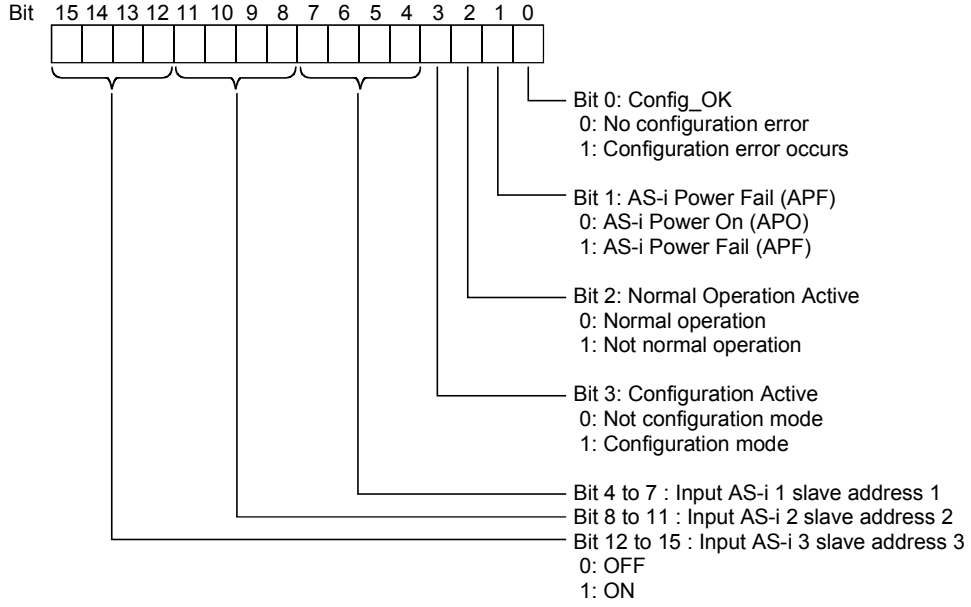
3.4.2 Details of Buffer Memory

The details of each item in the buffer memory, shown in Table 3.3 of section 3.4.1 are explained below.

(1) AS-i 1 slave addresses 1 to 3 input data, and some EC flags (Buffer memory address: 0H)

[AS-i 2 slave addresses 1 to 3 input data, and some EC flags (Buffer memory address: 60H)]

Example: Buffer memory address 0H



(a) Bit 0: Config_OK

This bit is for checking the configuration error flag. When a configuration error occurs in AS-Interface system, this bit is ON. If this bit is ON, check whether wiring is correct or LPS is the same as LDS.
(Corresponds to input signal X4 and X9. The timing is the same as input signal X4 and X9. See Section 3.3.2 (3).)

(b) Bit 1: AS-i Power Fail (APF)

This bit is for checking the AS-Interface Power Fail flag. When the AS-i power supply is insufficient, this bit is ON. If this bit is ON, check the current rating of AS-i power supply, wiring and, total distance of system.
(Corresponds to input signal X5 and XA.)

(c) Bit 2: Normal Operation Active

This bit is for checking normal operation. When A1SJ71AS92 is not in normal operation, this bit is ON. (Corresponds to input signal X6 and XB.)

(d) Bit 3: Configuration Active

This bit is for checking configuration mode. When A1SJ71AS92 is in configuration mode, this bit is ON. When A1SJ71AS92 is in other modes, this bit is OFF. (Corresponds to input signal X7 and XC.)

(e) Bit 4 to 7 : Input AS-i 1 slave address 1

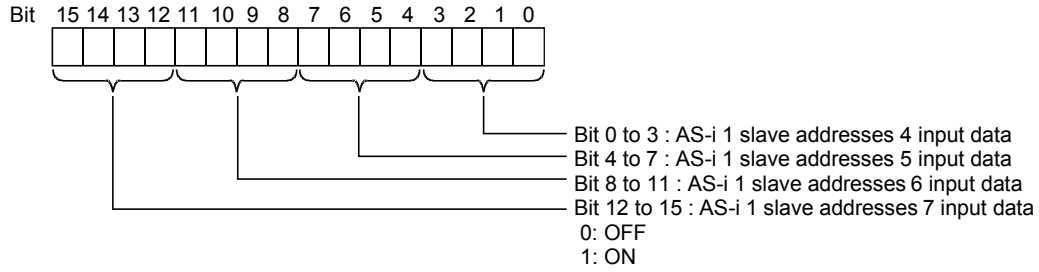
(f) Bit 8 to 11 : Input AS-i 1 slave address 2

(g) Bit 12 to 15 : Input AS-i 1 slave address 3

(2) AS-i 1 slave addresses 4 to 31 input data (Buffer memory address: 1H to 7H)

[AS-i 2 slave addresses 4 to 31 input data (Buffer memory address: 61H to 67H)]

Example: Buffer memory address 1H

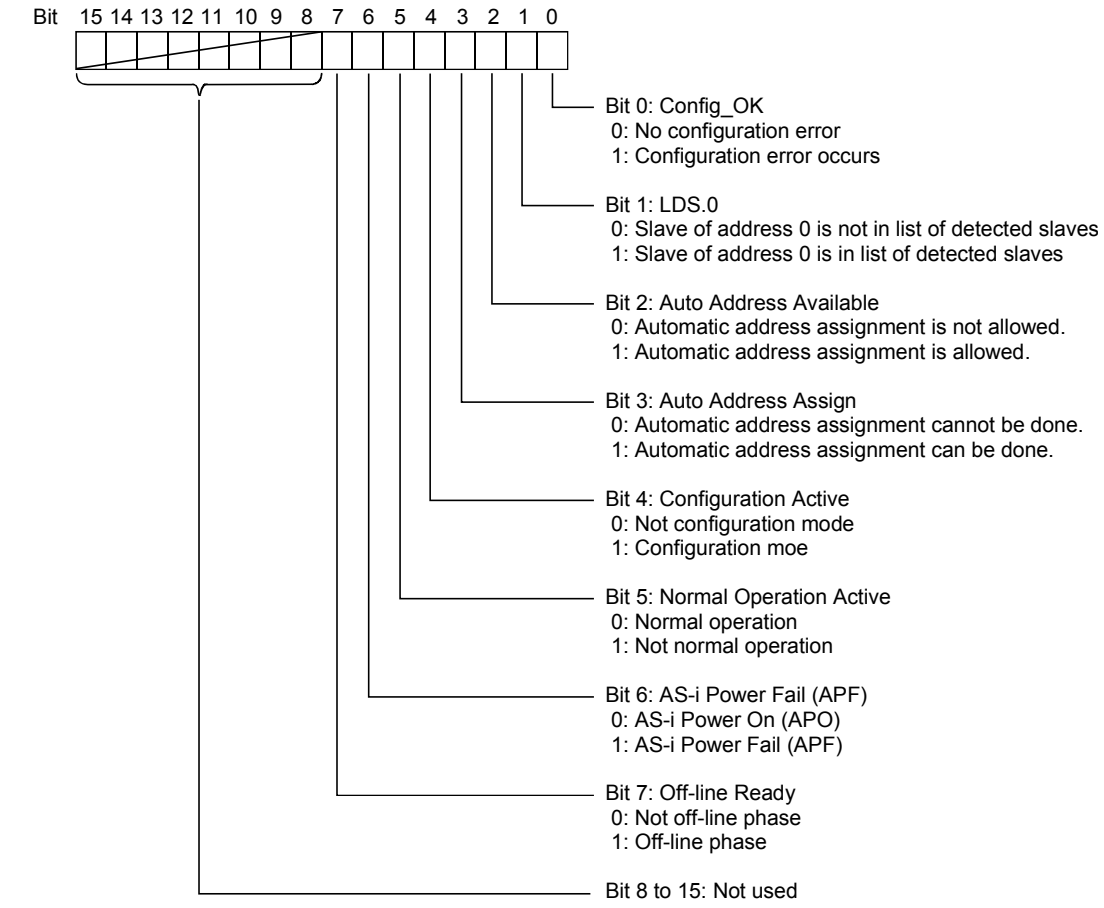


3 - 9

(3) AS-i 1 EC flags (Buffer memory address: 10H)

[AS-i 2 EC flags (Buffer memory address: 70H)]

Example: Buffer memory address 10H



(a) Bit 0: Config_OK

Refer to section 3.4.2 (1) (a).

(b) Bit 1: LDS. 0

This bit is for checking the slave having address 0. The slave of address 0 is a reserved slave. When A1SJ71AS92 has detected slave 0, this bit is ON.

(c) Bit 2: Automatic address assignment function valid

This bit is for checking status of the automatic address assignment. When the automatic address assignment is allowed in the protected operating mode, this bit is ON.

(d) Bit 3: Auto Address Assign

This bit is for checking if the Automatic Address Assignment is possible. This is the state in which the automatic address assignment is allowed and only one of the configured slaves is not recognized in the protected operating mode. In this case, this bit is ON.

(e) Bit 4: Configuration Active

Refer to section 3.4.2 (1) (d).

(f) Bit 5: Normal Operation Active

Refer to section 3.4.2 (1) (c).

(g) Bit 6: AS-i Power Fail (APF)

Refer to section 3.4.2 (1) (b).

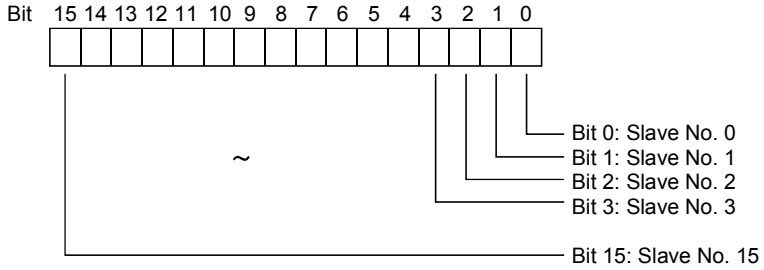
(h) Bit 7: Off-line Ready

This bit is for checking off-line phase. When A1SJ71AS92 is in the off-line phase, this bit is ON.

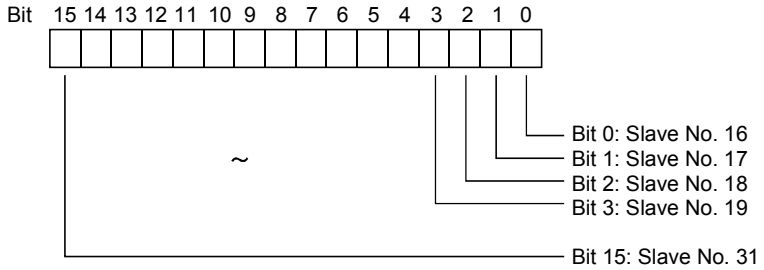
(4) AS-i 1 LDS (Buffer memory address: 11H to 12H)

[AS-i 2 LDS (Buffer memory address: 71H to 72H)]

Example: Buffer memory address 11H



Example: Buffer memory address 12H

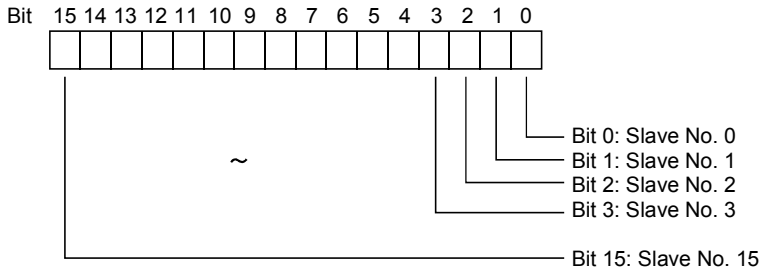


In this list one bit is set for each slave (0 to 31) that is detected by A1SJ71AS92 (through the start up).
When the bit is ON, the system has the slave which corresponds to the bit. If the bit is OFF, the system does not have the slave which corresponds to the bit.

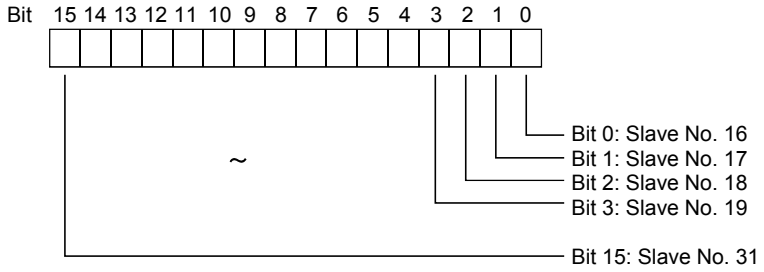
(5) AS-i 1 LAS (Buffer memory address: 15H to 16H)

[AS-i 2 LAS (Buffer memory address: 75H to 76H)]

Example: Buffer memory address 15H



Example: Buffer memory address 16H



In this list one bit is set for each activated slave (1 to 31).
When the bit is ON, the slave corresponding tot he bit is active in the system. If the bit is OFF, the slave corresponding to the bit is not active in the system.
List of active slaves are detected as follows:

(a) Activation phase

This phase activates the slave(s) which A1SJ71AS92 found in the detection phase.

(b) In the configuration mode

LAS is same as LDS, i.e. a detected slave always becomes an active slave.

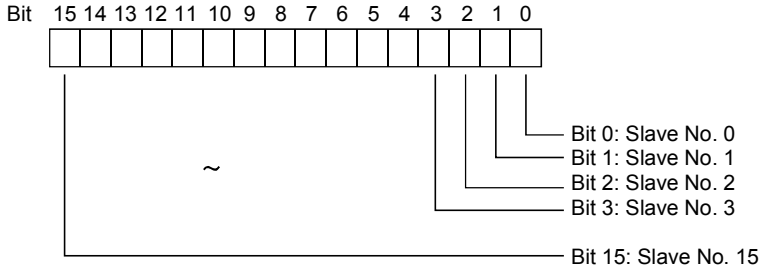
(c) In the protected operating mode

LAS consists of the slave that are ON in both the LDS and PLS, i.e. an active slave is both a detected slave and a projected slave.

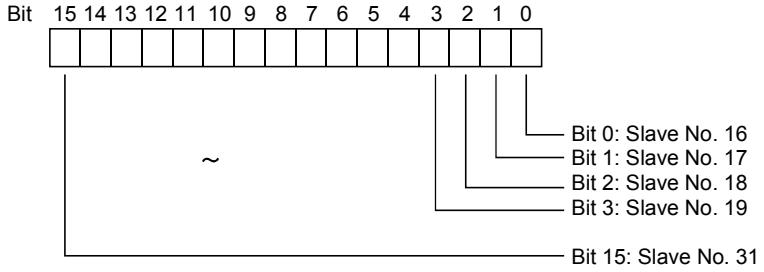
(6) AS-i 1 LPS (Buffer memory address: 19H to 1AH)

[AS-i 2 LPS (Buffer memory address: 79H to 7AH)]

Example: Buffer memory address 19H



Example: Buffer memory address 1AH



In this list one bit is status for each projected slave (1 to 31) in A1SJ71AS92. If the bit is ON, the slave corresponding to the bit is activated in the system. If the bit is OFF, the slave corresponding to the bit is not activated in the system.

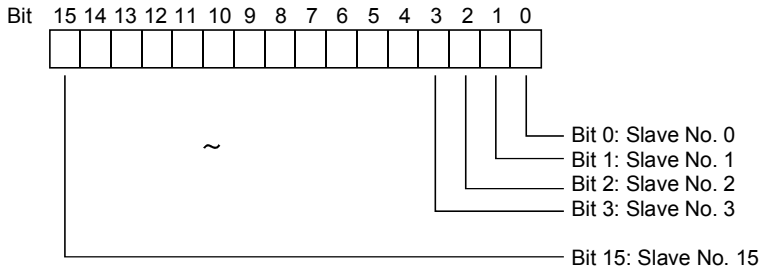
The data in the A1SJ71AS92 flash ROM is displayed when the programmable controller system power is turned ON.

3 - 13

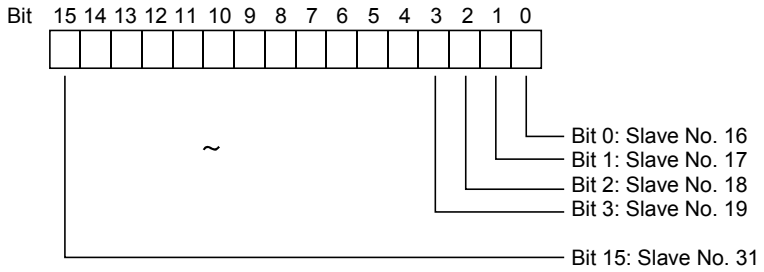
(7) List of slaves that differ from AS-i 1 settings (Buffer memory address: 1DH to 1EH)

[List of slaves that differ from AS-i 2 settings (Buffer memory address: 7DH to 7EH)]

Example: Buffer memory address 1DH



Example: Buffer memory address 1EH



The result of exclusive OR of the result of the logical sum of LDS, LPS and LAS is stored in this list. The result of “(LDS | LPS)^LAS” is displayed.

Example:

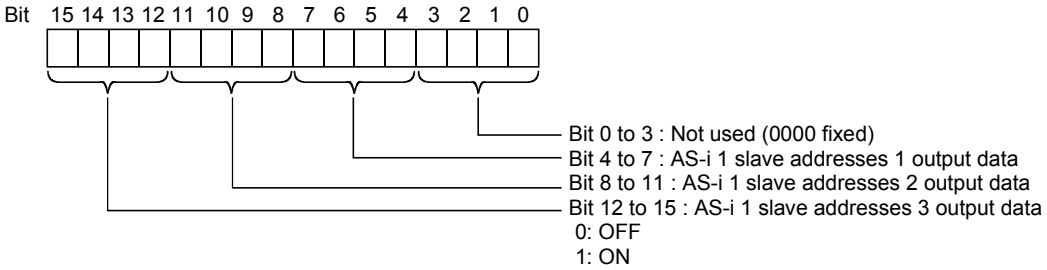
Bit	15	14	13	12	-
LDS(12H)	1	1	1	1	
LAS(16H)	0	1	0	1	
LPS(1AH)	1	1	0	1	
1EH	1	0	1	0	LPS,LAS and LPS were collated, so this bit was turned on due to the disagreement. 0:OFF 1:ON

3 - 14

(8) Data output to AS-i 1 slave addresses 1 to 3 (Buffer memory address: 30H)

[Data output to AS-i 2 slave addresses 1 to 3 (Buffer memory address: 90H)]

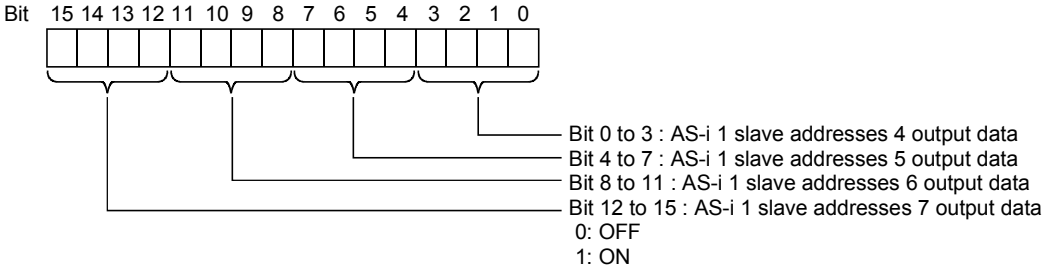
Example: Buffer memory address 30H



(9) Data output to AS-i 1 slave addresses 4 to 31 (Buffer memory address: 31H to 37H)

[Data output to AS-i 2 slave addresses 4 to 31 (Buffer memory address: 91H to 97H)]

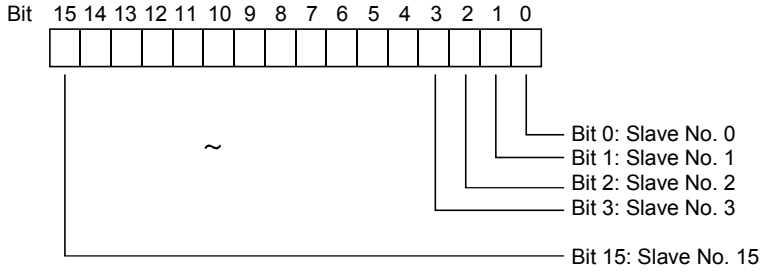
Example: Buffer memory address 31H



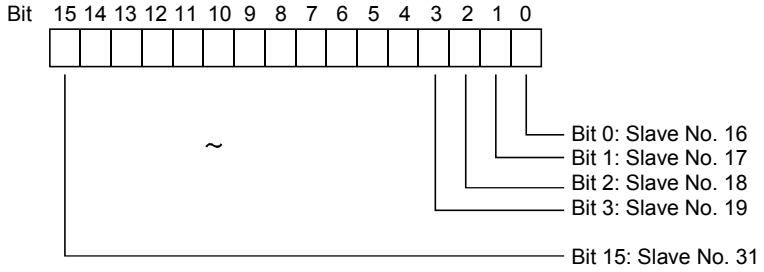
(10) AS-i 1 LPS (Buffer memory address: 49H to 4AH)

[AS-i 2 LPS (Buffer memory address: A9H to AAH)]

Example: Buffer memory address 49H



Example: Buffer memory address 4AH



In this list, each bit corresponds to the state of the LPS (1 to 31) in the A1SJ71AS92.
When the A1SJ71AS92 is set to the configuration mode (Y16: ON), and the bit turns ON, the details will be reflected onto the LPS of the buffer memory 19H to 1AH (79H to 7AH).

POINT
LPS is handled in 32 bit units by A1SJ71AS92. Even if A1SJ71AS92 writes the data only to buffer memory 49H, the contents of the buffer memory 4AH also becomes effective.

3 - 16

(11) AS-i 1 command buffer <command> (Buffer memory address: 55H to 59H)

[AS-i 2 command buffer <command> (Buffer memory address: B5H to B9H)]

Buffer memory address		Item
AS-i 1	AS-i 2	
0055H	00B5H	AS-i 1 command buffer <command>
0056H	00B6H	AS-i 1 command buffer <data word 0>
0057H	00B7H	AS-i 1 command buffer <data word 1>
0058H	00B8H	AS-i 1 command buffer <data word 2>
0059H	00B9H	AS-i 1 command buffer <data word 3>

By using the Command Buffer, programmable controller is able to instruct the A1SJ71AS92. If the programmable controller writes data in Command Buffer <command> the A1SJ71AS92 reads the Command Buffer <command> and, if necessary, one to three Data Words. The result is set to “08”. If the desired command is executed by the A1SJ71AS92, the result is set and, the value is no longer “08”. Results with data are transmitted in Data Word 0 to 3

POINT

After Data Words are set in the buffer memory first, Command Buffer is set in the buffer memory when there are Data Words 0 to 3 when Command Buffer is used.

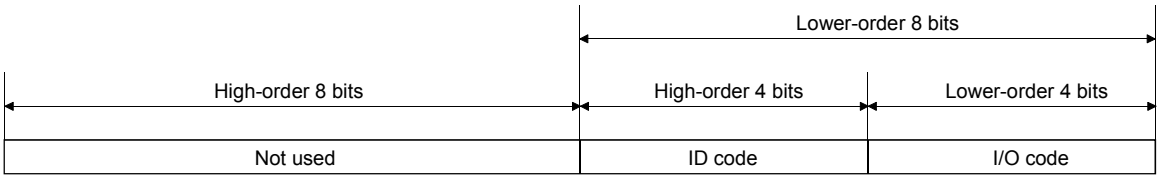
Command Code	Details	Usage state
01 to 1FH	Writes data word 0 to the actual parameter *1 in the AS-i slave n (n = “Command Code”). And reads the actual parameter form AS-i slave n to data word 0.	Normal operation
41 to 5FH	Reads the actual parameter *1 from AS-i slave n (n = “Command Code” - 40H) to data word 0.	Normal operation, Off-line phase
91 to 9FH	Writes data word 0 to permanent parameter *1 in the AS-i slave n (n = “Command Code” - 80H).	Normal operation, Off-line phase
C1 to DFH	Reads the permanent parameter *1 from AS-i slave n (n = “Command Code” - C0H) to data word 0.	Normal operation, Off-line phase
101 to 11FH	Reads actual configuration *2 from AS-i slave n (n = “Command Code” - 100H) to data word 0.	Normal operation
141 to 15FH	Writes data word 0 to permanent configuration *3 in the AS-i slave n (n = “Command Code” – 140H)	Configuration mode
181 to 91FH	Reads the permanent configuration *3 from AS-i slave n (n = “Command Code” - 180H) to data word 0.	Normal operation, Off-line phase
1C0H	Reads the counter of APF from AJ71AS92 to Data Word 0. And clear this value. (AS-i Power Fail)	Normal operation
1C1 to 1DFH	Reads counter of erroneous answers from AS-i slave n to Data Word 0. And clear this value. (n = “Command Code” – 1C0H)	Normal operation
200H	Change AS-i slave (LPS) with address n to m. (n = Data Word 0, m = Data Word 1).	Normal operation, Off-line phase
201H	Store actual AS-i configuration <This command copies LAS to LPS. And store actual configuration to permanent configuration, too.>	Configuration mode
202H	Store actual AS-i parameters to permanent parameter.	Normal operation, Off-line phase
203H	Validation/invalidation of SET switch and MODE switch, 0: Valid (default), 1: Invalid *4	Normal operation
204H	Read list of corrupted slaves from A1SJ71AS92 to Data Word 0 and 1, And clear this list.	Normal operation, Off-line phase

*1 : The meaning of this parameter is slave's parameter bits.

Actual parameter	Parameter of target slave
Permanent parameter	Sets slave parameter

*2 : The meaning of this parameter is slave's parameter bits. This contains the actual copies of the input/output configuration and the identification code of all slaves, determined by reading this data from the slaves. The configuration data of inactive slave is set to default values ("FF <Hex>").

Actual configuration	I/O code, ID code held by slave
Permanent configuration	I/O code, ID code held by master



*3 : This contains the projected input/output configuration and identification code of all slaves determined by the slave configuration of the A1SJ71AS92 using the Command Code "141 to 15F$_H$" or by the Command Code "201F$_H$". The permanent configuration data of slaves that are not projected shall be set to default values ("FF <Hex>"). This data is stored in Flash ROM.

*4 : It is effective/is nullified this Command Code regardless of 1 system or 2 systems.

(12) AS-i 1 command buffer <result> (Buffer memory address: 25H to 29H)

[AS-i 2 command buffer <result> (Buffer memory address: 85H to 89H)]

Buffer memory address		Item
AS-i 1	AS-i 2	
0025H	0085H	AS-i 1 command buffer <result>
0026H	0086H	AS-i 1 command buffer <data word 0>
0027H	0087H	AS-i 1 command buffer <data word 1>
0028H	0088H	AS-i 1 command buffer <data word 2>
0029H	0089H	AS-i 1 command buffer <data word 3>

By using the Command Buffer, programmable controller is able to instruct the A1SJ71AS92. If the programmable controller writes data in Command Buffer <command> the A1SJ71AS92 reads the Command Buffer <command> and, if necessary, one to four Data Words. The result is set to “08”. If the desired command is executed by the A1SJ71AS92, the result is set and, the value is no longer “08”. Results with data are transmitted in Data Word 0 to 3

Results value	Details
00	Command did not execute.
01	OK (Command executed.)
02	The address of the Slave which wants to change does not exist.
03	A slave already exists in address 0.
04	This address already has a slave.
05	This slave cannot be deleted.
06	This slave address cannot be set.
07	The slave address cannot be written to the slave’s EEPROM.
08	Command Word pending
09	The Command Word not recognized.
0A	The value of Data Word exceeds the range of setting.

MEMO

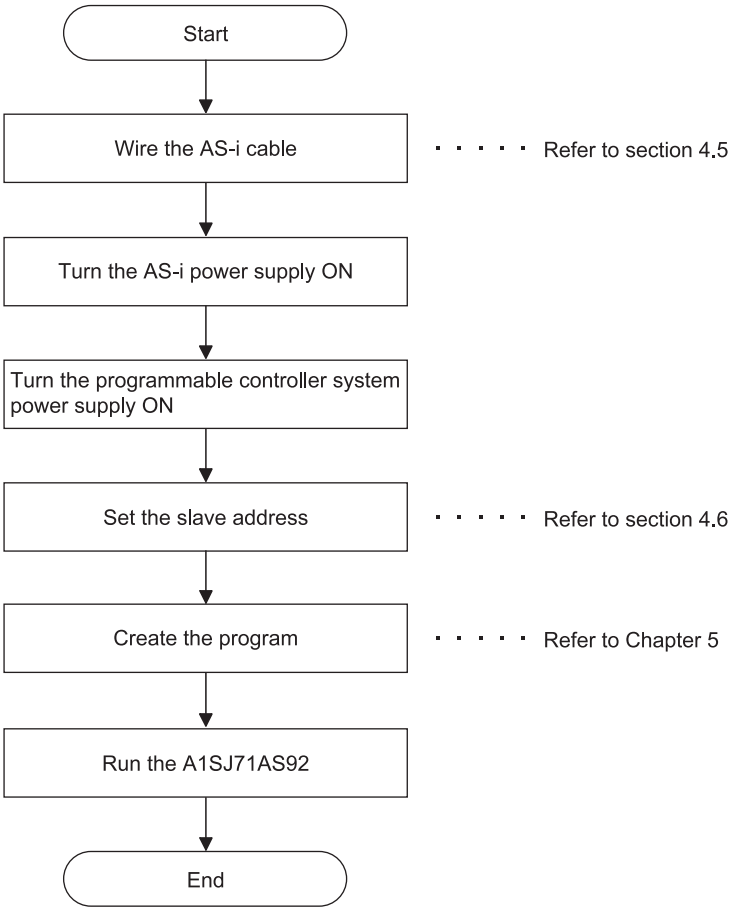
3 - 20

4 SETTINGS AND PROCEDURES FOR OPERATION

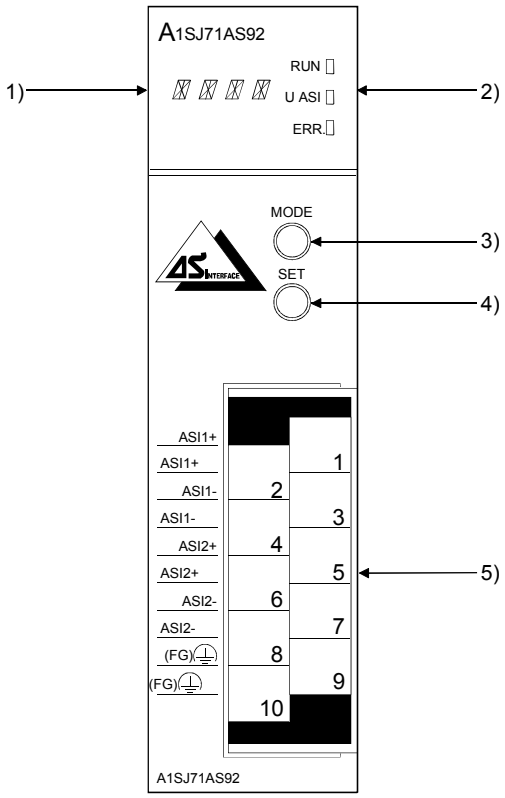
The procedures, names of each part, installation, connection to the AS-i system and settings for using the AS-i system with the A1SJ71AS92 are explained in this section.

4.1 Outline Procedures for Operation

The procedures for using the A1SJ71AS92 with the AS-i system are shown in the following flow chart.



4.2 Part Identification Nomenclature

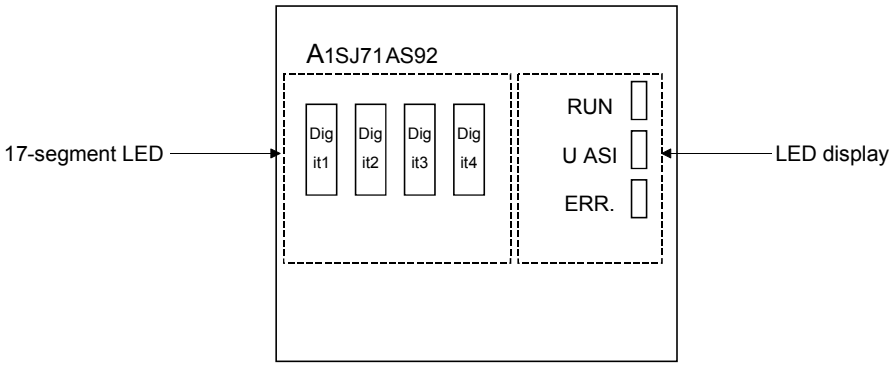


• The terminal block has two FG terminals that are connected internally.

No.	Name	Details
1)	17-segment LED	The operation status of the A1SJ71AS92 is displayed as a value. (Refer to section 4.3.1.)
2)	LED display	The operation status of the A1SJ71AS92 is shown by turning ON or OFF. (Refer to section 4.3.2.)
3)	MODE switch	This switch is used to change between the protected operation mode and configuration mode.
4)	SET switch	This switch is used to set or delete the slave address.
5)	Terminal block	This is connected to the AS-i system with an AS-i cable.

4.3 Details of LED displays

The A1SJ71AS92 LEDs display the following details.



In protected mode the displays of the A1SJ71AS92 are switched over from AS-i circuit 1 to AS-i circuit 2 in a measure of 5 seconds.
In configuration mode all detected AS-i slaves are displayed at first, before the MODE/SET switches to the other AS-i circuit.
The operation of the MODE/SET switches is always related to the currently displayed AS-i circuit (Digit 1 of the display). After a MODE/SET switch was pressed the display stays with the respective AS-i circuit until the operation is finished or the operator has not interfered for 10 seconds.

4.3.1 17-segment LED

(1) Digit1 : AS-i 1/ AS-i 2. Switching of Digit2 to 4 and push buttons between the two AS-i systems.
If this digit shows '1', all displays and button operations are related to AS-i system 1, otherwise (showing '2') AS-i system 2.

(2) Digit2 : This digit refers to the AS-i line shown on digit 1.
Showing 'C' : A1SJ71AS92 is in Configuration Mode
Showing ' ' : A1SJ71AS92 is in Protected Mode but conditions for 'P' are not fulfilled.
Showing 'P' : A1SJ71AS92 is in Configuration Mode and automatic address programming is enabled. Exactly one slave is missing in protected operating mode. The slave can be replaced by another slave of the same type with address zero. The A1SJ71AS92 addresses the new slave to the faulty address and thus eliminates the configuration error.
Showing 'E' : Internal error
Showing 'F' : Hardware error

(3) Digit3/4 : Higher/lower digit of the Address/Error display. This digit refers to the AS-i line shown on digit 1.

4.3.2 LED display

RUN : This turns ON when the A1SJ71AS92 is running normally.
U ASI : The AS-i circuit is sufficiently powered. This LED refers to the AS-i line shown on digit 1.
ERR. : Configuration error. This LED refers to the AS-i line shown on digit 1.

4.4 Mounting and Installation

The precautions to be observed when handling the A1SJ71AS92 from unpacking to installation, and the installation environment are explained in this section.
Refer to the User's Manual of the CPU module being used for details on the A1SJ71AS92 mounting and installation.

4.4.1 Precautions for Handling

⚠ CAUTION

- Use the programmable controller in an environment that conforms to the general specifications in CPU module user's.
  Using the programmable controller in the environments outside the ranges stated in the general specifications will cause electric shock, fire, malfunction, or damage to/deterioration of the product.
- Insert the module fixing projection into the fixing hole in the base unit and then tighten the module fixing screw within the specified torque.
  Incorrect installation with no screws could result in malfunction, failure or fall of the module.
  Tightening the screw excessively may cause fall, short circuit, or malfunction of the module due to damage of the screw or the module.
- Always shut off all phases of the programmable controller power supply and AS-i power supply externally before mounting or removing the module.
  Failure to shut off all phases could lead to product damage.
- Do not touch conductive parts or electronic components of the module with your bare hands.
  This could cause malfunction or failure of the module

(1) The module case and terminal block are made of resin, so take care not to drop or apply strong impacts.

(2) Tighten the module mounting screws, terminal block installation screws and terminal block terminal screws within the following range.

Screw position	Tightening torque range
Module mounting screw (M4)	78 to 118 N·cm
Terminal block installation screw	35.3 to 48 N·cm
Terminal block terminal screw	60.8 to 82.3 N·cm

4.4.2 Installation Environment

Refer to the User's Manual of the CPU module being used for details on the installation environment.

4.5 Connection to AS-i System

The items to observe when connecting the A1SJ71AS92 to the AS-i system, and the wiring methods are explained in this section.

4.5.1 Precautions for wiring

⚠ WARNING

- Switch off all phases of the programmable controller power supply and AS-i power supply outside the programmable controller before starting installing or wiring work.
  If all phases are not switched off, there will be a danger of electric shock or damage to the product.
- Always install the terminal covers enclosed with the product before turning ON the power or operating the product after installation or wiring.
  Failure to install the terminal cover could lead to electric shocks.

⚠ CAUTION

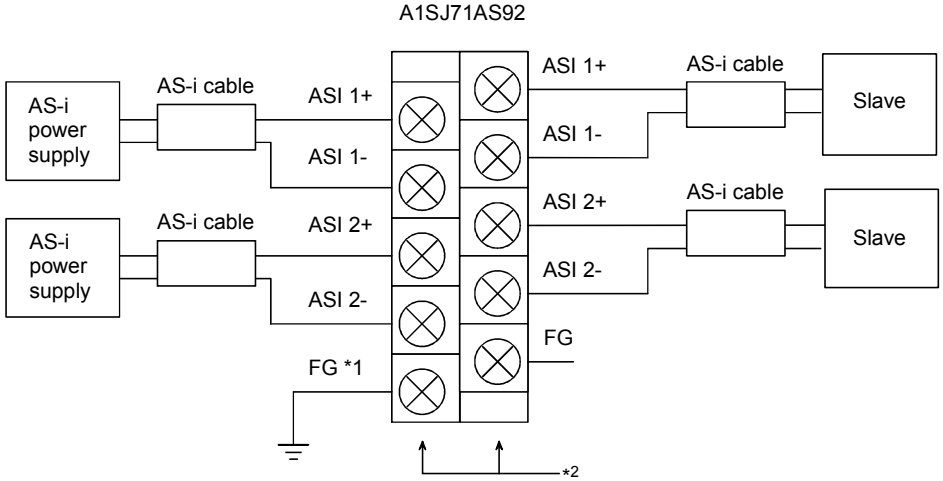
- Always confirm the products terminal layout before wiring to the module.
  Incorrect wiring could lead to fires or faults.
- Tighten terminal screws to the specified torque.
  If a terminal screw is not tightened to the specified torque, the module may fall out, short circuit, or malfunction.
- Make sure that no foreign matter such as chips or wire offcuts gets inside the module.
  It will cause fire, failure, or malfunction.
- AS-i cables connected to a module must always be run in a duct or held securely using clamps.
  If a cable is not run in a duct or not held securely using clamps, the cable will sag, move, or be pulled by mistake, which will cause damage to the module and the cable and also malfunctioning due to loose connection of the cable.
- Do not bundle AS-i cable together with main circuit or power lines, or lay them close to these lines.
  As a guide, separate these lines by a distance of at least 100 mm, otherwise malfunctions may occur due to noise.
- When removing the AS-i cable from a module, do not pull it out by the cable.
  A cable loosen the screws that hold the cable onto the module then remove the cable.
  If the cable is pulled while it is connected to the module, the module and/or the cable will be damaged and may malfunction due to loose connection of the cable.

(1) The overall distance is up to 100m.
When using a repeater, the distance can be extended by 100m per repeater.
Up to two repeaters can be used, so the maximum overall distance is 300m.

4.5.2 Wiring

Use an AS-i cable to connect the A1SJ71AS92 to the AS-i system.

An example of wiring to the A1SJ71AS92 is shown below.
(Confirm each module being used for the AS-i power supply and slave terminal layout.)



*1 : When the noise environment is bad, the terminal FG is grounded.

*2 : The terminal of the same signal name is connected internally with a right terminal and a left terminal.

4.6 Start-Up

When the programmable controller power is turned ON, the A1SJ71AS92 will turn ON the 17-segment LED and all LED displays for approx. one second. After that, the LED display will show the flag state. The 17-segment LED will show the AS-i system state.

Offline Phase (At this state, "40" is displayed at digit 3/4 of the 17-segment LED.)

The A1SJ71AS92 initializes, there is no data communication on the AS-i.
If the AS-i system is insufficiently powered from the AS-i power supply, the A1SJ71AS92 stays in the offline phase, and U ASI LED does not turn on.
When the AS-i power is supplied, the detection phase will be entered.

POINT

The A1SJ71AS92 will generate a setting error in the off-lien phase even if there is no setting error. (ERR. LED turns ON, and Config OK (X4, X9) turns ON.) Thus, ignore this error when the A1SJ71AS92 is in the off-line phase.

Detection Phase (At this state, "41" is displayed at digit 3/4 of the 17-segment LED.)

Start of the start-up phase, where the system looks for slaves located on the AS-i. The A1SJ71AS92 stays in the recognition phase until it finds at least one slave.

Activation Phase (At this state, "42" is displayed at digit 3/4 of the 17-segment LED.)

Condition at the end of the start-up operation where the parameters are transmitted to all connected and recognized slaves. This enables access to the AS-i slaves data connections.

Activation Phase (At this state, "42" is displayed at digit 3/4 of the 17-segment LED.)

In normal operation, the A1SJ71AS92 can exchange data with all active slaves It transmits management messages and looks for and activates newly connected slaves.

The normal operations include the protected operation mode and configuration mode.
If there is a slave that can communicate with the A1SJ71AS92 during the start up, the A1SJ71AS92 will enter the mode registered in the flash ROM.
The protected operation mode and configuration mode can be changed by operating the A1SJ71AS92 switch or writing a command from the CPU module. (Refer to section 4.7.)

(1) Configuration mode

This mode communicates without registering the slave configuration.
The slave address is set with this mode.
Communication is carried out with all detected saves, excluding the slave detected as slave address 0.

(2) Protected operation mode

This mode communicates after registering the slave configuration.
Communication is carried out only with the slave for which the registered confirmation and LDS match and the slave that matches the configuration data set by the actual configuration data.

4.6.1 Initial Registration of Slaves

The method for registering the slave detected by the A1SJ71AS92 in the normal operation is explained in this section.
The slave is registered into the A1SJ71AS92 with steps (1) and (2) below.
Note that if the power is reset or if the CPU is reset, the data registered in the A1SJ71AS92 will be cleared.
To prevent the data from being cleared, carry out step (3). The data will be written into the A1SJ71AS92's flash ROM.
To start in the configuration mode when the power is turned ON, skip step (1) and start from step (2).

(1) Press the MODE switch for 5 or more seconds. (Enter the configuration mode.)

(2) Press the MODE switch again for 5 or more seconds. (Enter the protected operation mode.)
The slave configuration will be registered in the protected operation mode.

(3) The CPU module is put into the state of STOP, and press the MODE switch and SET switch simultaneously for 5 seconds. (Register into the flash ROM.)
When A1SJ71AS92 completes registration, 17-segment LED displays "OK", other LED are turned off and start from an offline phase again.
The next time the power is turned ON or when the CPU module is reset, the communication will be carried out with the contents registered in the flash ROM.

POINT

(1) Please put the CPU module into the state of STOP at the time of writing in flash ROM.
A1SJ71AS92 might make an error if the slave composition when the CPU module is RUN is written in flash ROM.
(2) Data can be written to the flash ROM 10,000 times.
If the number of writings exceeds 10,000 times, "F70" (flash ROM write error) will appear on the A1SJ71AS92's 17-segment LED.
If "F70" appears, a hardware error has occurred, so contact your nearest Mitsubishi representative.

4.7 Changing the Operation Mode

The method for changing between the protected operation mode and configuration mode operations is explained in this section.
The mode of the A1SJ71AS92 can be changed by pressing the MODE switch or by setting the mode from the CPU module.
The method of changing the mode with the MODE switch is explained in this section.
The operation mode can be changed with the output signals (Y16, Y17, Y1A, Y1B) from the CPU module. (Refer to section 3.3.)

4.7.1 Switching to Protected Operation Mode

The configuration mode is ended by pressing the MODE switch. The mode changes to protected operating mode. At this time, A1SJ71AS92 follows these rules for pressing the MODE switch.

(1) Less than 5 seconds
A1SJ72AS92 exits the configuration mode without copying the actual configuration to permanent configuration.

(2) More than 5 seconds
A1SJ71AS92 exits the configuration mode simultaneously copying the actual configuration to permanent configuration. At this time, A1SJ71AS92 stores this configuration to LPS, and 17-segment LED's Digit2 is turned off, too.

POINT

(1) When the protected operation mode has been entered by pressing the switch for 5 seconds or more, the startup explained in section 4.6 will be carried out again. Thus, the slave output will turn OFF when starting up due to the mode changeover.
(2) If the A1SJ71AS92 recognizes a slave with address 0 on the AS-i system, it can not leave the configuration mode.

4.7.2 Switching to Configuration Mode

The Protected operation mode is ended by pressing the MODE switch for more than 5 seconds. The mode changes to Configuration mode.
The A1SJ71AS92 will display "C" at digit 2 of the 17-segment LED.

If the MODE switch is not pressed for 5 seconds, the configuration mode will not be entered.

4.8 Configuration Mode

The operation of the configuration mode is explained in his section.
This mode is for setting the slave address number.

4.8.1 Operating the A1SJ71AS92 in Configuration Mode

In the configuration mode, the 17-segment LED's Digit2 displays "C".

(1) For active slave

All recognized slave are activated with the exception of slave 0 when desired and actual configurations do not match.

(2) Displayed message

A1SJ71AS92 displays the slave address of all slaves entered in the in 17-segment LED's Digit3/4 at a speed of two per second. If the display is empty, the list is empty, i.e. no slaves were recognized.

4.8.2 Operation to Add Slave Addresses

This operation assign an available address to slave with address 0.

(1) The slave addresses of all recognized slaves are displayed one after the other in 17-segment LED.

(2) To display the next higher available operating address, press the SET switch. Each time pressing the SET switch, the next available address is displayed. If SET or MODE switch is not pressed for 10 seconds or more, A1SJ71AS92 returns to the state of the display of (1).

(3) Set the displayed address as the target address by pressing the switch for more than 5 seconds. The address display blinks.

(4) Pressing the SET switch again reprograms a connected slave with address 0 to the blinking address.
(The address is stored in the slave's non-volatile memory.)

(5) If error code did not display, the 17-segment LED displays the list of detected slaves again as described.

4.8.3 Delete Slave Address

This operation assign address 0 to a recognized slave.

(1) The slave addresses of all recognized slaves are displayed one after the other in 17-segment LED.

(2) Display the deleted Slave address.
Pressing SET switch for more than 5 seconds while the slave address which wants to be deleted displayed, this slave is reprogrammed to address 0 again, and the Digit3/4 shows “00”.
("0" is stored in the slave's non-volatile memory.)

(3) When releasing the switch, the 17-segment LED continues to display the list of detected slaves.

4 - 12

4.9 Protected Operation Mode

The operation of the protected operation mode is explained in this section.
This mode is used to normally run the A1SJ71AS92.

4.9.1 Operating A1SJ71AS92 in Protected Operation

In the Protected Operation mode, the 17-segment LED's Digit2 lights off. And, the following is done.

(1) For active slave

Only slaves that are entered on the LPS and whose actual configurations match the permanent configurations will be activated.

(2) Displayed message

The display is either blank or displays the address of faulty assignment.
If the SET switch is pressed in protected operating mode while there is not actual configuration error, the last slave address which caused an configuration error is displayed, or "39" is displayed.

4.9.2 Automatic Address Assignment

The automatic address programming is A1SJ71AS92 allocate the address which automatically fails in address 0 when one of the configured slaves is not recognized in the protected operating mode. For automatic address programming, the following requirements are necessary.

(1) The A1SJ71AS92 is necessary in protected operating mode.

(2) The automatic address assignment is allowed.

(3) Only one of the configured slaves is not recognized.

When these requirements are fulfilled, a slave with address 0 will be automatically assigned the operating address of the missing slave.
If the address is not to be assigned automatically, manually assign the addresses as explained in section 4.9.3.

POINT
If the two slaves have different configuration data (different slave type), the automatic address assignment is not executed.

4.9.3 Manual Address Assignment

If several slaves fail, they cannot be replaced automatically by the A1SJ71AS92. Set their necessary addresses manually. If you do not want to set their addresses via CPU module, you can set them with the switch and the 17-segment LED. In the protected operating mode, wrong assignments are displayed as errors.
The latter method is explained in this section. For the former method, use the command buffer command code "200". (Refer to section 3.4.2 (11).)
An incorrect assignment in the protected operation mode will be indicated as an error.

(1) By pressing the SET switch, you can display all faulty assignments one after the other.

(2) By pressing the SET switch for more than 5 seconds, you can select the currently displayed address as a potential target address, and the display starts to blink.
If the faulty slave was previously replaced by a slave with address 0, the new slave can now be programmed for the blinking address by pressing the SET switch again. As a requirement, the new slave's configuration data must match the configuration data for the blinking address.

(3) After the address has been successfully set, the next faulty assignment is displayed or the display erased.

4.10 Display Message Numbers

The A1SJ71AS92 indicates the A1SJ71AS92 state with the following numbers on the 17-segment LED.

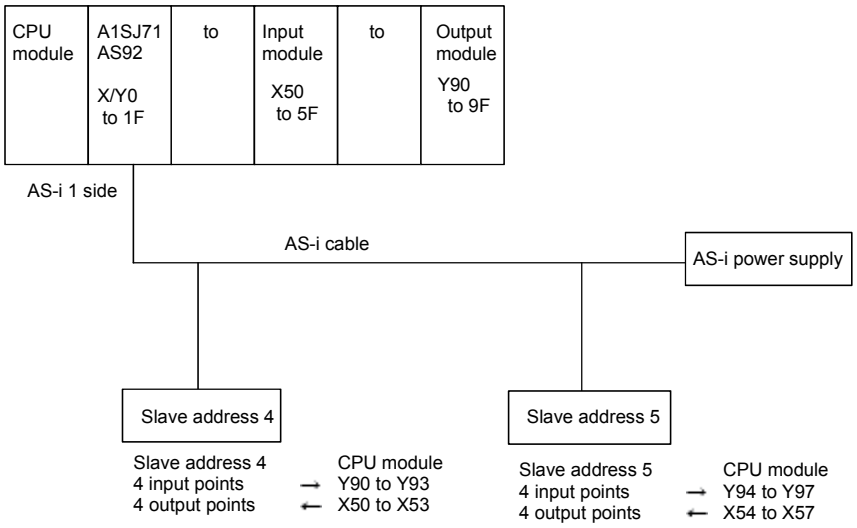
No.	Details
0 to 31	Slave address
39	The last reason for setting Config_OK to zero was entering offline Phase
40	A1SJ71AS92 is in offline phase
41	A1SJ71AS92 is in detection phase
42	A1SJ71AS92 is in activation phase
F50	Fatal hardware error : Consult Mitsubishi representative.
F70	Fatal hardware error : The Flash ROM cannot be written to. Consult Mitsubishi representative.
F72	Fatal hardware error : Consult Mitsubishi representative.
F73	Fatal hardware error : Consult Mitsubishi representative.
E51	Internal error : There are too many FROM/TO commands, or the command execution interval is short. Correct the sequence program.
E52	Internal error : Consult Mitsubishi representative.
E53	Internal error : Consult Mitsubishi representative.
E80	Slave with address zero detected. The system attempted to exit the configuration mode with a slave zero or the user tried to change a slave address while a slave with address zero was connected.
E81	General error while changing a slave address.
E82	Front panel operation blocked. Until the next power-up the only way of accessing the A1SJ71AS92 is via the programmable controller interface.
E90	Error while changing a slave address in protected operating mode. No slave with address 0 present.
E91	Error while changing slave address. Target address is already occupied.
E92	Error while changing slave address. New address could not be set.
E93	Error while changing slave address. New address could only be stored volatile in the slave.
E94	Error while changing slave address in protected operating mode. Slave has wrong configuration information.
E95	Error while changing slave address in protected operating mode. The configuration error is cause by one slave too many.
PROG	Flash ROM is being written. (Because writing will be completed in a short time, this message is hardly displayed in 17-segment LED.)
OK	Flash ROM writing completion.
XXXX	Display test while starting up the A1SJ71AS92.

5 PROGRAMMING

The program used to exchange the slave input/output information with the A1SJ71AS92 is explained in this section with a programming example.
When applying the following program examples to the actual system, make sure to examine the applicability and confirm that it will not cause system control problems.

5.1 System Configuration

With this program example, the information in the slave input/output is exchanged with the following system configuration.
The A1SJ71AS92 is mounted in slot 0 of the main base unit.



5.2 Details of Operation

The following operations are carried out with the system shown in section 5.1.

(1) The CPU module inputs X50 to X53 are output to the slave address 4 output data.

(2) The CPU module inputs X54 to X57 are output to the slave address 5 output data.

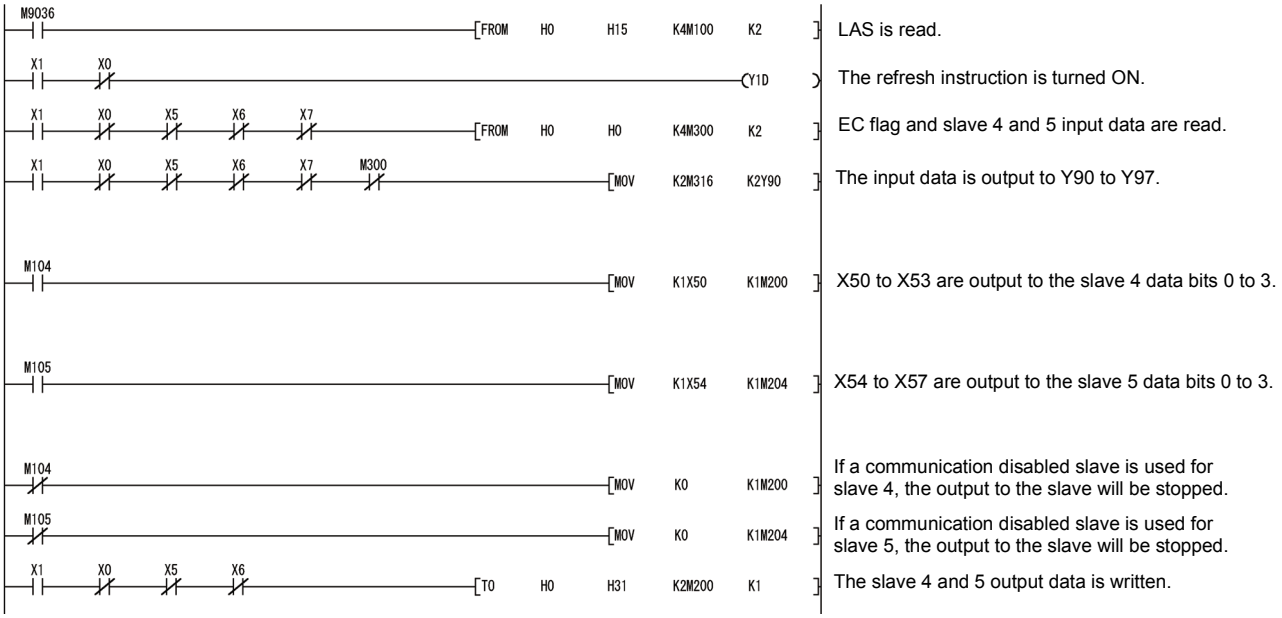
(3) The slave address 4 input data is output to the CPU module outputs Y90 to Y93.

(4) The slave address 5 input data is output to the CPU module outputs Y94 to Y97.

REMARK

Even if a configuration error occurs, the input/output control will be executed to the slave that can communicate.

5.3 Program Examples



5

Explanation of devices

X0	:	Watchdog timer error (Normally OFF)
X1	:	Unit ready (Normally ON)
X5	:	AS-i 1 AS-i Power Fail (Normally OFF)
X6	:	AS-i 1 Normal Operation Active (OFF during normal operation)
X7	:	AS-i 1 configuration mode (OFF in other than configuration mode)
M104	:	ON when slave address 4 can communicate
M105	:	ON when slave address 5 can communicate
M200 to M203	:	Data output to slave address 4
M204 to M207	:	Data output to slave address 5
M300	:	Configuration OK on AS-i 1 side (OFF during normal operation)
M316 to M319	:	Data input from slave address 4
M320 to M323	:	Data input from slave address 5

6 TROUBLESHOOTING

The troubleshooting methods to be taken when a fault occurs in the A1SJ71AS92 are explained in this section.

6.1 Preliminary Checks

First check the following items when checking the A1SJ71AS92.

(1) Check “RUN” and “U ASI” LED.
- If “RUN” LED of A1SJ71AS92 is OFF, check whether the power supply is supplied to programmable controller.
- If “U ASI” LED is OFF, check the current rating of AS-i power supply, wiring and, total distance of system.

(2) Check the 24VDC power supply for slave.
If whether this power supply capacity is not enough or miss-wiring is, the slave is not normal operation.

(3) Check “ERR.” LED.
- If “ERR.” LED is ON, check the wiring about the slave.

(4) Check total slave number.
- If total slave number is more than 32, please remove an unnecessary slave and adjust the number of total slaves to 31 or less.

(5) Check whether it is an intended slave configuration.
- If it is not so, please remake slave configuration.

(6) Check total extension distance
- The total extension distance must not exceed 100m. however, when the repeater is used, it is possible to extend by 100m repeater. Repeaters can be used up to two system.

6 - 1

6.2 Error Checking

If the A1SJ71AS92 does not seen to operate normally, check the following items.

6.2.1 LED Check

Check the status of the LEDs for theA1SJ71AS92 as follows.

(1) Check the status of the “RUN” LED

Status	Details
Lit.	There is a power supply of programmable controller.
Off	Check does the power supply of programmable controller.

(2) Check the status of the “U SAI” LED.

Status	Details
Lit.	AS-i power supply is OK.
Off	Check the wiring and capacity about AS-i power supply.

(3) Check the status of the “ERR.” LED.

Status	Details
Lit.	Existing slave was lost or response was lost from slave, so that the mismatch occurred in LPS and LDS. Check the following points.
Off	Slave configuration status is OK.

- Check the status of the slave.
  Refer to the slave manual for the confirmation methods.
  If the slave break, please replace the slave.
- Check the wiring for the slave. If the wire break, please exchange the cable.
- Check type of slave (permanent configuration of slave and actual configuration of slave). If type of slave is different type, please replace the slave, or please remake permanent configuration of slave.

NOTE

I/O code and ID code have two slaves as which it is the same and the slave address is the same. In that case, slave is operated by the same slave address as two.

- Please check this power supply if the AS-i power supply after the repeater fails.
  Refer to the AS-i power supply manual for the confirmation methods.
  If faulty, replace the AS-i power supply.
- Check whether the repeater is faulty. Refer to the repeater manual for the confirmation methods.
  If faulty, replace the repeater.

APPENDIX

Appendix 1. Outline Dimension Drawings

Unit: mm

APP

App - 1

Appendix 2. AS-i Protocol Implementation Conformance Statement (PICS)

List of implemented functions:

No.	Function or call at host interface		P_	remark / Implemented by
1	Image,Status =	Resd_IDI()	x	
2	Status =	Write_OD(Image)	x	
3	Status =	Set_permanent_parameter(Addr,Param)	x	
4	Param,Status =	Get_Permanent_Parameter(Addr)	x	
5	Status,RParam =	Write_parameter(Addr,Param)	x	
6	Status,Param =	Read_parameter(Addr)	x	
7	Status =	Store_actual_parameters()	x	
8	Status =	Set_permanent_configuration(Addr,Config)	x	
9	Status,Config =	Get_permanent_configuration(Addr)	x	
10	Status =	Store_actual_configuration()	x	
11	Status,Config =	Read_actual_configuration(Addr)	x	
12	Status =	Set_LPS(List31)	x	
13	Status,List31 =	Get_LPS()	x	
14	Status,List31 =	Get_LAS()	x	
15	Status,List32 =	Get_LDS()	x	
16.0	Status,Flag =	Get_flags()	x	
16.1	Status,Flag =	Get_flag_config_OK()	x	
16.2	Status,Flag =	Get_flag_LDS.0()	x	
16.3	Status,Flag =	Get_flag_auto_address_assign()	x	
16.4	Status,Flag =	Get_flag_auto_prog_available()	x	
16.5	Status,Flag =	Get_flag_configuration_active()	x	
16.6	Status,Flag =	Get_flag_normal_operation_active()	x	
16.7	Status,Flag =	Get_flag_APF()	x	
16.8	Status,Flag =	Get_flag_offline_ready()	x	
17	Status =	Set_operation_mode(Mode)	x	
18	Status =	Set_offline_mode(Mode)	x	
19	Status =	Activate_data_exchange(Mode)		
20	Status =	Change_slave_address(Addr1,Addr2)	x	
21.1	Status =	Set_auto_adress_enable(Mode)	x	
21.2	Mode =	Get_auto_adress_enable()	x	
22.1	Status,Resp =	Cmd_reset_AS-i_slave(Addr,RESET)		
22.2	Status,Resp =	Cmd_read_IO_configuration(Addr,CONF)		
22.3	Status,Resp =	Cmd_read_identification_code(Addr,IDCOD)		
22.4	Status,Resp =	Cmd_read_status(Addr,STAT)		
22.5	Status,Resp =	Cmd_read_reset_status(Addr,STATRES)		
22.6	Status,Resp =	Cmd_R1(Addr,R1CODE)		

Key to the symbols for column 3:

sign	meaning
x	implemented
	not available

APP

App - 2

Appendix 3. Formula how to calculate the cycle time depending on the number of slaves

AS-i cycle-time = 150 μs × (Number of slaves + 1)

App - 3

MEMO

App - 4

INDEX

Index - 1

MEMO

Index - 2

WARRANTY

Please confirm the following product warranty details before using this product.

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 sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[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 not to be the responsibility of Mitsubishi or that admitted not to be so by 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 available 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 loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not , compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

SH(NA)080085-E

AS-i Master module type A1SJ71AS92

User's Manual

MODEL	A1SJ71AS92-U-S-E
MODEL CODE	13JR15
SH(NA)-080085-E(1009)MEE	

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