

MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-A

User's Manual

Positioning module type AD71S2 (Hardware)

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.

MITSUBISHI ELECTRIC
IB (NA) 66561-C

SAFETY INSTRUCTIONS

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly. The instructions given in this manual are concerned with this product. For the safety instructions of the programmable logic controller system, please read the CPU module user's manual. In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

- DANGER** 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 medium or slight personal injury or physical damage.

Note that the CAUTION level may lead to a serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

Please save this manual to make it accessible when required and always forward it to the end user.

[Design Instructions]

DANGER

- Provide a safety circuit outside the programmable logic controller so that the entire system will operate safely even when an external power supply error or PLC fault occurs. Failure to observe this could lead to accidents for incorrect outputs or malfunctioning.
 - (1) Configure an emergency stop circuit and interlock circuit such as a positioning upper limit/lower limit to prevent mechanical damage outside the PLC.
 - (2) The machine zero point return operation is controlled by the zero point return direction and zero point return speed data. Deceleration starts when the near-point dog turns ON. Thus, if the zero point return direction is incorrectly set, deceleration will not start and the machine will continue to travel. Configure an interlock circuit to prevent mechanical damage outside the PLC.
 - (3) Set the parameters to the positioning system specifications. Make sure that the zero point return parameter and positioning data are within the parameter setting values.

[Design Instructions]

CAUTION

- Do not bundle or adjacently lay the control wire or communication cable with the main circuit or power wire. Separate these by 100mm or more. Failure to observe this could lead to malfunctioning caused by noise.

[Mounting Instructions]

CAUTION

- Use the PLC within the general specifications environment given in this manual. Using the PLC outside the general specification range environment could lead to electric shocks, fires, malfunctioning, product damage or deterioration.
- Always securely insert the module latches at the bottom of the module into the fixing holes on the base unit. (Always screw the AnS Series module onto the base unit with the specified torque.) Improper mounting of the module could lead to malfunctioning, faults or dropping.
- Securely connect the drive unit connector and peripheral device connector to the module connectors. Improper connection could lead to a connection fault, and to incorrect inputs and outputs.
- When not connecting the drive unit, always install a cover on the connector section. Failure to observe this could lead to malfunctioning.

[Wiring Instructions]

DANGER

- Always confirm the terminal layout before connecting the wires to the module.
- Make sure that foreign matter such as cutting chips and wire scraps does not enter the module. Failure to observe this could lead to fires, faults or malfunctioning.

[Startup/Maintenance Instructions]

DANGER

- Be sure to shut off all phases of the external power supply used in the system before cleaning or tightening the screws. Failure to turn all phases OFF could lead to electric shocks.

[Startup/Maintenance Instructions]

CAUTION

- Never disassemble or modify the module. Failure to observe this could lead to trouble, malfunctioning, injuries or fires.
- Be sure to shut off all phases of the external power supply used in the system before installing or removing the module. Failure to turn all phases OFF could lead to module trouble or malfunctioning.
- Before starting test operation, set the parameter speed limit value to the slowest value, and make sure that operation can be stopped immediately if a hazardous state occurs.
- Connect the battery correctly. Do not charge, disassemble, heat, throw into fire, short, or solder it. Incorrectly handling the battery may cause injury or fire due to heat buildup, burst, ignition, etc.

CAUTION

- Do not drop or impact the battery fitted to the module. To do so may damage the battery, causing the battery liquid to leak inside the battery. Dispose of the dropped or impacted battery without using it.
- Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module. Failure to do so may cause a failure or malfunctions of the module.

[Precautions for use]

CAUTION

- Note that when the reference axis speed is designated for interpolation operation, the speed of the partner axis (2nd axis) may be larger than the set speed (larger than the speed limit value).
- When no parameters have been set or any one parameter is erroneous (outside the setting range), all parameter data are controlled as default values.

[Disposal Instructions]

CAUTION

- When disposing of the product, handle it as industrial waste.

[Transportation Instructions]

CAUTION

- When a lithium-containing battery is to be transported, it must be handled in conformance to the transportation restrictions.

Conformation to the EMC and Low Voltage Directives

For details on making Mitsubishi PLC conform to the EMC and low voltage directives when installing it in your product, please refer to Chapter 3, "EMC Directive and Low Voltage Instruction" of the using PLC CPU module User's Manual (Hardware). The CE logo is printed on the rating plate on the main body of the PLC that conforms to the EMC and low voltage directives.

1. GENERAL DESCRIPTION

1. GENERAL DESCRIPTION

This manual describes the specifications, nomenclature and I/O interface of the AD71S2 type positioning module (hereafter called the AD71S2). Confirm that all of the following components are included in the package.

Component	Quantity
AD71S2 positioning module	1
External wiring connector (Type)	1
Connector cover	

1.1 Detailed Manual

- AD71(S1/S2/S7), A1SD71-S2(S7) Positioning Module User's Manual (IB-66563)

1.2 Related Manual

- Teaching Unit for positioning module type AD71TU Operation Manual (IB-66067) (Packed with AD71TU)
- SW0GP-AD71P (for Positioning Module) Operating Manual (IB-66099) (Packed with SW0GP-AD71P)
- SW0IX-AD71PE (for Positioning module) Operating Manual (IB-66508) (Packed with SW0IX-AD71PE)

2. PERFORMANCE SPECIFICATIONS

2. PERFORMANCE SPECIFICATIONS

Item	Performance and Specifications
Number of I/O points	32 points
Number of control axes	2 (simultaneous or independent)
Interpolation	Linear interpolation (for simultaneous 2 axes)
Positioning data	Capacity: 400 points per axis
	Setting method: Input from peripheral device or sequence program
RAM memory backup	15 minutes without battery (25 °C) Lithium battery guarantees power failure backup for a total of 300 days. Battery guaranteed for five years. Lithium content of a lithium battery: 0.48g
Positioning	Modes Positioning control mode Speed/positioning control switching mode Speed control mode Select using parameters (Same mode is applied to the X and Y axes)
	Method Absolute and/or incremental method Speed/positioning control switching mode: Incremental method (current address is switched to 0 when starting)
	Positioning units 1 to 16,252,928 (PULSE) Max. 162 (mm) (command unit: 0.1 to 10 μm/PLS) Max. 16200 (inch) (command unit: 1 × 10 ⁻⁵ to 0.001 inch/PLS) Max. 16200 (degree) (command unit: 1 × 10 ⁻⁵ to 0.001 degree/PLS)
	Positioning speed 10 to 200000 (PLS/sec) (command unit: 10 PLS/sec) 10 to 120000 (mm/min) (command unit: 10 mm/min) 1 to 12000 (inch/min) (command unit: 1 inch/min) 1 to 12000 (degree/min) (command unit: 1 degree/min)
	Acceleration and deceleration Automatic trapezoidal acceleration and deceleration
	Acceleration and deceleration times 64 to 50000 (msec)
	Backlash compensation 0 to 65535 × position command unit (0 to 255 pulse if unit is PULSE)
	Error compensation In the positioning control mode and speed/positioning control switching mode Mechanical system error compensation function
	Zero return With zero address change function Zero return direction and speed can be selected
	Jog operation function Jog operation by jog start signal input
Inching function Operation using manual pulse generator	
M function M code output	
Internal current consumption 5 VDC, 1.5 A	
External supply voltage, current 4.75 to 26.4 V, Max. 50 mA	
Size 250(H) × 37.5(W) × 121(D) (9.84 × 1.48 × 4.76) [mm (inch)]	
Weight 0.63 kg	

For other general specifications, refer to the User's Manual for the relevant PC CPU.

3. I/O INTERFACE

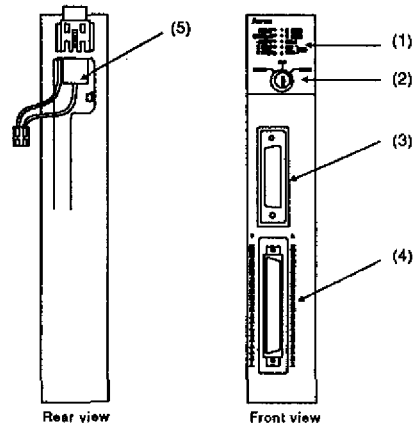
3. I/O INTERFACE

I/O	Internal Circuit	Pin Number		Signal	Description	
		X axis	Y axis			
Input	5V	5A	7A	Common	5 to 24 VDC (external supply)	
		5B	7B	Drive unit ready READY	(1) LOW indicates the servo drive unit is serviceable and the feed pulse is acceptable. (2) The AD71S2 checks the drive unit ready signal prior to start. If not ready, the AD71S2 outputs a zero return request. (3) Arrange for drive unit errors e.g. control power error to set this signal HIGH. (4) Switching the signal to HIGH during positioning stops the operation. Resetting the signal will not restart the operation.	
	5V	6A	8A	Stop signal STOP	(1) LOW to stop positioning. Signal duration 20 msec or more. (2) AD71S2 stops positioning by using this signal and switches the start signal OFF (HIGH). When switching from HIGH to LOW, positioning is not started.	
		6B	8B	Near point signal DOG	(1) Used to detect near-point during zero return. Switched to LOW by using the near point actuator. The grid point is resolver phase angle 0. (2) When zero return by using the zero-phase signal, the zero point is away from the dog and becomes the first grid point after detecting the near-point dog.	
	5V	1A	3A	Enable signal	(1) Used to select control switching signal enable/disable. (2) LOW enables the control switching signal.	
		2A	4A	Control switching signal	(1) Used as the control switching command in the speed/positioning control switching mode. (2) LOW selects positioning control.	
	5V	2B	4B	Zero phase signal	(1) Used as the zero signal at zero return. The zero-phase grid signal of the pulse encoder is normally used. LOW at zero. (2) Used when the zero return method uses stopper stop and zero return complete is externally input.	
		9A	10A	PGO		
	Output	5V	11A	13A	Start START	(1) LOW while positioning. (2) ON (LOW) during feed pulse output and dwell. Used as a brake release signal for servos with mechanical brake. Feed pulse is output after this signal goes ON.
			11B	13B		
5V		12A	14A	Error counter clear CLEAR	Given before and after zero return. Resets deviations in the servo error counter. 20 msec (1st time) 20 msec (2nd time)	
		12B	14B			
5V		17A	20A	(+24 V power)	Supplied from either one. Improper wiring may fail the module.	
		17B	20B			
5V		15A	18A	A type Forward feed pulse PULSE F	B type Feed pulse PULSE	Forward and reverse feed pulses. The operation direction follows the direction sign (SIGN). PULSE SIGN 25 msec + direction travel - direction travel
		15B	18B			
5V		16A	19A	Reverse feed pulse PULSE R	Direction sign SIGN	PULSE R PULSE R
		16B	19B			

Select the A or B type by parameter setting.

4. NOMENCLATURE

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No	Name	Explanation																		
(1)	LED indicator	<table border="1"> <thead> <tr> <th>LED</th> <th>Contents</th> </tr> </thead> <tbody> <tr> <td>READY</td> <td>Lights when the AD71S2 ready signal goes ON</td> </tr> <tr> <td>SERVO X ERR</td> <td>Lights when the READY signal from the servo unit for the X or Y axis goes OFF</td> </tr> <tr> <td>X BUSY</td> <td>Lights when the X axis BUSY signal goes ON</td> </tr> <tr> <td>Y BUSY</td> <td>Lights when the Y axis BUSY signal goes ON</td> </tr> <tr> <td>X ZERO</td> <td>Lights when the X axis zero return request signal goes ON</td> </tr> <tr> <td>Y ZERO</td> <td>Lights when the Y axis zero return request signal goes ON</td> </tr> <tr> <td>HOLD</td> <td>Lights when there is an AD71S2 hardware fault</td> </tr> <tr> <td>BAT WDT</td> <td>Lights when the battery error signal or WDT error signal goes ON</td> </tr> </tbody> </table>	LED	Contents	READY	Lights when the AD71S2 ready signal goes ON	SERVO X ERR	Lights when the READY signal from the servo unit for the X or Y axis goes OFF	X BUSY	Lights when the X axis BUSY signal goes ON	Y BUSY	Lights when the Y axis BUSY signal goes ON	X ZERO	Lights when the X axis zero return request signal goes ON	Y ZERO	Lights when the Y axis zero return request signal goes ON	HOLD	Lights when there is an AD71S2 hardware fault	BAT WDT	Lights when the battery error signal or WDT error signal goes ON
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(2)	Keyswitches	M.PRO: Sets memory protect for the setting data and positioning data areas																		
		LOCK: Prohibits a pulse chain output from the AD71S2																		
(3)	RS 422 connector	Used for connections with a peripheral device such as an A6GPP, A6PHP, A7PHP, A7HGP, A7LMS, and AD71TU																		
(4)	40 pin connector	Used for connections with a drive unit.																		
		<p>The following figure shows the pin layout of the external wiring connector supplied as an accessory. Make wire connections according to the I/O interface</p> <p>Pin arrangement seen from the connection side Connection pins include A1 to A20 and B1 to B20</p>																		
(5)	Battery	For backup of positioning data Always connect the battery leads before using the AD71S2																		

5. HANDLING INSTRUCTION

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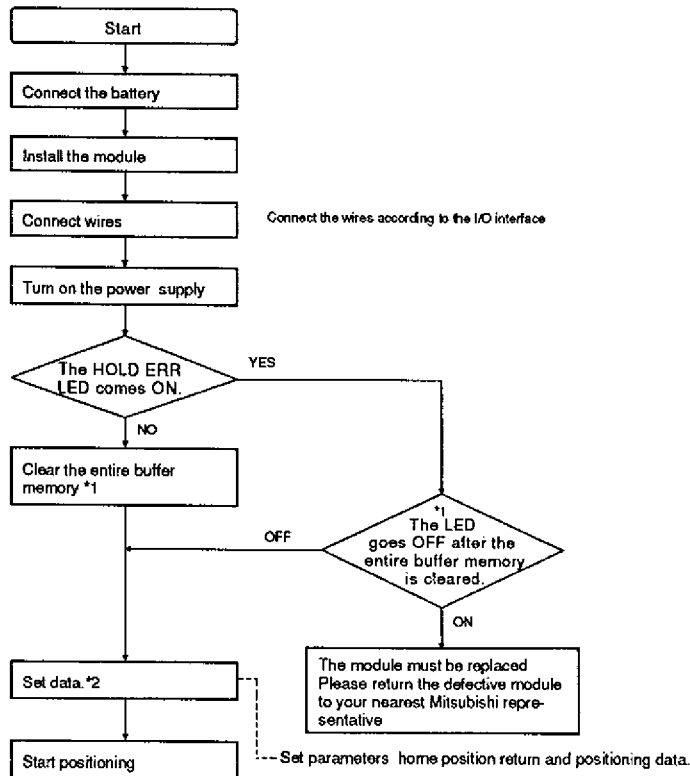
This section explains the handling (Installation preparations) and nomenclature of the AD71S2

- Since the body case is made of plastic, protect the AD71S2 from dropping and sudden impacts
- Take care not to allow conductive debris, such as wire scraps generated during wiring or chips produced by drilling, to drop into the module. If debris does get into the module, remove it
- Turn the PC PU power supply OFF before installing or removing the unit to or from the base
- Turn the PC CPU and drive module power supply OFF before connecting or disconnecting the drive unit connector
After confirming the correct insertion direction, insert the connector directly from the front. Then, tighten the two fixing screws
When the drive unit is not connected, keep the connector area cover closed
- When the AD71S2 is not BUSY, connect a peripheral device to the AD71S2
After confirming the correct insertion direction, insert the connector directly from the front. Then tighten the two fixing screws
When a peripheral device is not connected, keep the connector area cover closed

6. MODULE START-UP

6. MODULE START-UP

Shown below is the AD71S2 start-up procedure. For details, consult the AD71(S1/S2/S7) or AD71S7-S2(S7) Type Positioning Module User's Manual

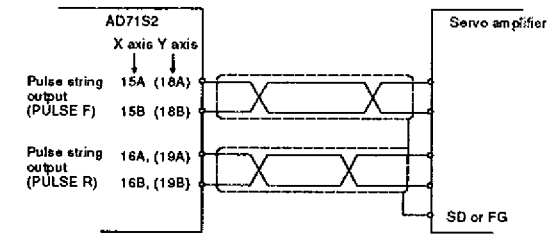


- *1 Clear the entire buffer memory from a peripheral device or by using a sequence program. However, the following data will not be cleared by executing an all clear operation from a peripheral device. *0 must be written using the sequence program to clear it.
- Deceleration time for emergency stop
 - Positioning mode
- *2: Even if using only the X-axis or only the Y-axis, write parameters and zero return data for the axis that is not used as well as the one that is. If an attempt is made to execute a zero return without having written this data, an error will occur.

7. LOADING AND INSTALLATION

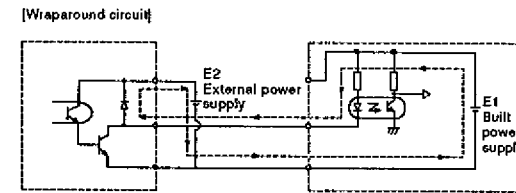
7. LOADING AND INSTALLATION

- When there is a lot of noise between the AD71S2 and servo amplifier, provide wiring from the pulse string output terminal from the AD71S2 using shielded twisted-pair cable that is different from other shielded cables.



- 24 VDC wiring notes

When a servo drive unit has a built-in power supply of 24 VDC, a wraparound circuit is made by the state of a power supply. A malfunction will occur if a separate power supply is supplied externally. Therefore, do not use the built-in power supply and external power supply together.

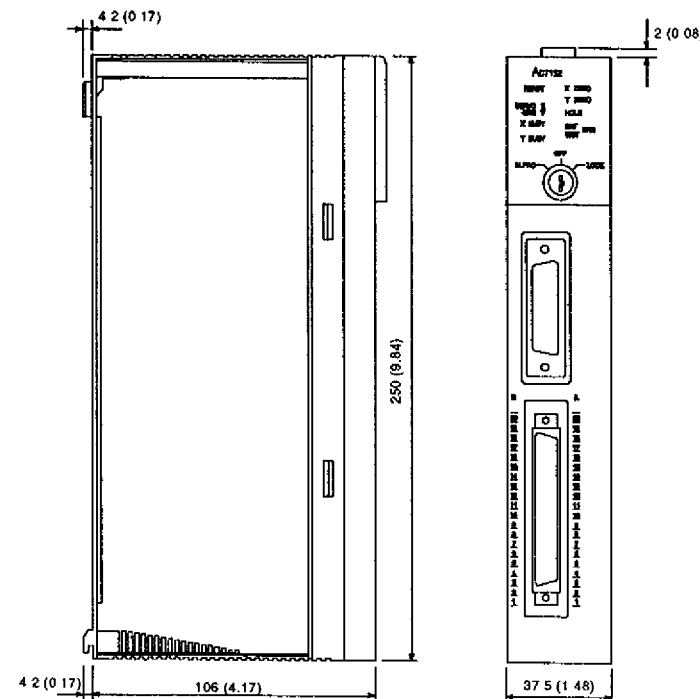


E1 > E2

Even if the pulse output of AD71S2 is OFF, the power supply flows in a servo unit pulse input line.

8. OUTSIDE DIMENSIONS

8. OUTSIDE DIMENSIONS



Unit: mm (Inch)

REVISIONS

A	B	C
Mar., 1995	Aug., 2004	Sep., 2005

Appendix 1 Transportation Precautions

When transporting lithium batteries, make sure to treat them based on the transport regulations.

Appendix 1.1 Controlled Models

The batteries for AD71S2 (including memory cards) is classified as follows:

Product Name	Model	Product supply status	Classification for transportation
A series battery	A6BAT	Lithium battery	Non-dangerous goods

Appendix 1.2 Transport Guidelines

Comply with IATA Dangerous Goods Regulations, IMDG code and the local transport regulations when transporting products after unpacking or repacking, while Mitsubishi ships products with packages to comply with the transport regulations. Also, contact the transporters.

Warranty

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; machine damage or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

For safe use

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

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