

# MITSUBISHI

PROGRAMMABLE CONTROLLER

# MELSEC-A

User's Manual

## Positioning module type A1SD71-S2 (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.



IB (NA) 66488-A (9406) ROD

## 1. GENERAL DESCRIPTION

### 1 GENERAL DESCRIPTION

This manual describes specifications, handling and wiring of an A1SD71-S2 positioning module (hereinafter referred to as the A1SD71).

#### 1.1 Related Manual

- A1SD71-S2 user's manual (IB-66399)  
Describes details of specifications, functions and programming of an A1SD71.

## 2. SPECIFICATIONS

### 2 SPECIFICATIONS

#### 2.1 General Specifications

Item	Specifications				
Operating ambient temperature	0 to 55 °C (See the important notice described below)				
Storage ambient temperature	-20 to 75 °C				
Operating ambient humidity	10 to 90 %RH, non-condensing				
Storage ambient humidity	10 to 90 %RH, non-condensing				
Vibration resistance	Conforms to JIS C 0911	Frequency	Acceleration	Amplitude	Sweep Count 10 times (1 octave/minute)
		10 to 55 Hz	—	0.075 mm (0.003 inch)	
		55 to 150 Hz	9.8 m/s <sup>2</sup> (1 g)	—	
Shock resistance	Conforms to JIS C 0912 (98 m/s <sup>2</sup> (10 g) x 3 times in 3 directions)				

Item	Specifications
Noise durability	By noise simulator of 1500 Vpp noise voltage, 1 μs noise width and 25 to 60 Hz noise frequency
Dielectric withstand voltage	1500 VAC for 1 minute across AC external terminals and ground 500 VAC for 1 minute across DC external terminals and ground
Insulation resistance	5 MΩ or larger by 500 VDC insulation resistance tester across AC external terminals and ground
Grounding	Class 3 grounding; ground to the panel if proper grounding is not available
Operating ambience	Free of corrosive gases and oil mist. Dust should be minimal.
Cooling method	Self-cooling

### REMARKS

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

- (2) \*2 JIS: Japanese Industrial Standard

### IMPORTANT

Restriction for UL standard approved products

In order to be recognized as UL listed products, the following restrictions apply:

- (1) Operating ambient temperature is limited from 0 to 50 °C
- (2) A class 2 power supply recognized by the UL standard must be used

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Printed in Japan

Specifications subject to change without notice

## 2.2 Performance Specifications

Item		Specifications
Number of I/O points		48 points* (number of occupied slots: 2)
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 A6GPPE, A6PHPE 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
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)
Positioning	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 (m) (command unit: 0.1 to 10 μm/PLS) Max 16200 (inch) (command unit: 1 x 10 <sup>-5</sup> to 0.001 inch/PLS) Max 16200 (degree) (command unit: 1 x 10 <sup>-5</sup> 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 x position command unit (0 to 255 pulses if unit is PULSE)
	Error compensation	The A1SD71 calibrates mechanical errors in the positioning control mode and velocity/positioning control switching mode
Zero return		With zero address change function Zero return direction and speed can be selected

Item	Specifications
Jog operation function	Jog operation by jog start signal input
M function	M code output
Internal current consumption	5 VDC 0.8 A
External supply voltage, current	4.75 to 26.4 V, max 50 mA
Size mm (inch)	130(H) x 69.5(W) x 93.6(D) (5.12 x 2.74 x 3.69)
Weight kg (lb)	0.38 (0.84)

### REMARK

\* I/O allocation for the 2 slots are as follows  
 First-half slot : 16 vacant points  
 Second-half slot: 32 special-function module points

## 2.3 I/O Interface with External Equipment

### 2.3.1 Electrical specifications

I/O	Signal	Description
Input (5 to 24 VDC)	Power supply	5 to 24 VDC (Use a 4.75 to 26.4 V stabilized power supply) 50 mA (maximum)
	Drive unit ready (READY) Stop signal (STOP) Near point signal (DOG)	HIGH: (Supply power voltage - 1 V) or more (Input current: 0.3 mA or less) LOW: (Supply power voltage - 3 V) or less (Input current: 2.5 mA or more)
	Zero phase signal (PGO)	HIGH: (Supply power voltage - 1 V) or more (Input current: 0.3 mA or less) LOW: (Supply power voltage - 3 V) or less (Input current: 2.5 mA or more) Pulse width: 50 μs or more Pulse rise time: 3 μs or less Pulse fall time: 3 μs or less

I/O	Signal	Description
Input (5 VDC)	Supply power	5 VDC (Use 4.75 to 26.25 V stabilized power supply)
	Control switching signal Enables signal	HIGH level: Voltage 4.5 V or more Current 3 mA or more LOW level: Voltage 1.0 V or less Current 0 mA Pulse width 1 msec or more Response time from OFF to ON: 1 msec
Output	Start signal (START) Error detector clear (CLEAR)	Output type: Open collector Load voltage: 4.75 to 26.4 VDC Load current: 10 mA (maximum) Max. voltage drop at ON: 0.6 V or less Leadage current at OFF: 0.1 mA or less
	Forward feed pulse (PULSE F) Reverse feed pulse (PULSE R)	Output type: Open collector Section 3.7.2 gives details about the pulse leading/trailing edge time Load voltage: 4.75 to 26.4 VDC Load current: 50 mA (maximum)

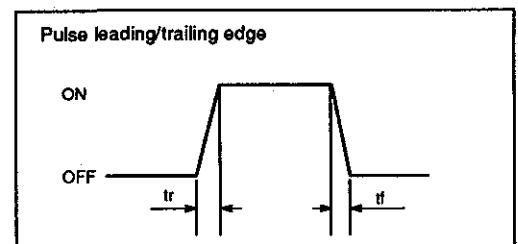
### 2.3.2 Pulse leading/trailing edge-timing of A1SD71 output signals

Unit:  $t_f, t_r$  μs, Duty %

Load voltage (V)	26.4									
	1			2			3			
Cable length (m)	$t_f$ (Leading edge)	$t_r$ (Trailing edge)	Duty	$t_f$ (Leading edge)	$t_r$ (Trailing edge)	Duty	$t_f$ (Leading edge)	$t_r$ (Trailing edge)	Duty	
2	200	<0.1	1.7	32	<0.1	1.8	30	<0.1	1.8	28
	100		3.0	40		3.4	36		3.6	32
	10		3.2	48		6.0	48		9.0	48
10	200	<0.1	0.7	42	<0.1	1.0	40	<0.1	1.6	38
	100		0.7	46		1.1	45		1.6	44
	10		0.7	50		1.1	50		1.6	50
50	200	<0.1	0.4	46	<0.1	0.5	46	<0.1	0.5	45
	100		0.4	48		0.5	48		0.5	48
	10		0.4	50		0.5	50		0.5	50

Unit:  $t_f, t_r$  μs, Duty %

Load voltage (V)	4.75									
	1			2			3			
Cable length (m)	$t_f$ (Leading edge)	$t_r$ (Trailing edge)	Duty	$t_f$ (Leading edge)	$t_r$ (Trailing edge)	Duty	$t_f$ (Leading edge)	$t_r$ (Trailing edge)	Duty	
2	200	<0.1	0.6	46	<0.1	1.0	44	<0.1	1.3	42
	100		0.6	49		1.0	47		1.3	46
	10		0.6	50		1.0	50		1.5	50
10	200	<0.1	0.3	50	<0.1	0.4	50	<0.1	0.4	50
	100		0.3	50		0.4	50		0.4	50
	10		0.3	50		0.4	50		0.4	50
50	200	0.1	0.3	52	0.1	0.3	52	0.1	0.3	52
	100		0.3	52		0.3	52		0.3	52
	10		0.3	50		0.3	50		0.3	50



### 2.3.3 Input/output interface specifications of the A1SD71

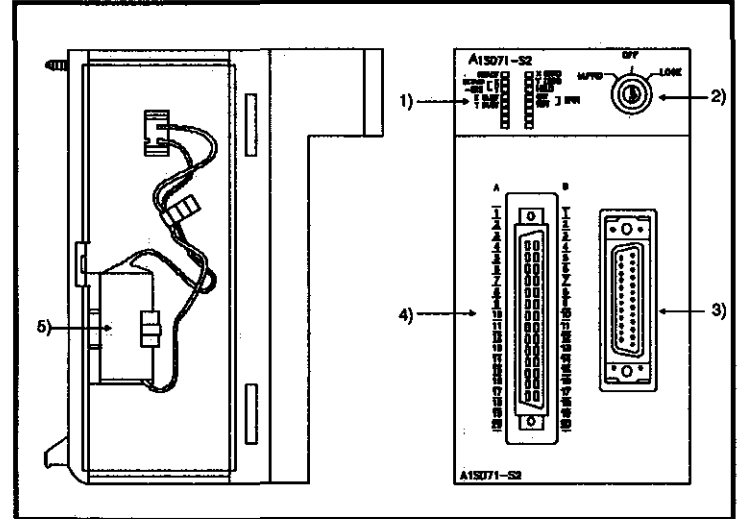
I/O	Internal circuit	Pin Number		Signal	Description
		X axis	Y axis		
Input		5A	7A	Common	5 to 24 VDC (external supply)
				Drive unit ready (READY)	(1) LOW indicates the servo drive unit is ready and feed pulses are receivable. (2) The A1SD71 checks the drive unit ready signal prior to start. If not ready, the A1SD71 turns a zero return request ON. (3) Arrange for drive unit errors, e.g. a 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.
	5B	7B			
		6A	8A	Stop signal (STOP)	(1) LOW to stop positioning. Signal duration 20 msec or more. (2) A1SD71 stops positioning by using this signal and switches the start signal OFF (HIGH). When switching from HIGH to LOW, positioning is not started.
				Zero-point signal (DOG)	(1) Used to detect near-point DOG during zero return. (2) In case of zero phase method of zero returning, a zero point will be a position where the first zero signal of resolver is given after the DOG is turned OFF.
		1A	3A	Enable signal	(1) Selects the control switching signal enable/disable. (2) LOW sets enable.
1B		3B			
2A		4A	Control switching signal	(1) Used as the control switching command in the velocity/positioning control switching mode. (2) LOW switches control.	
2B		4B			

### 2.4 Battery Specifications

Items	Type
Nominal voltage	3.6 VDC
Guarantee period	5 years
Total power failure time	300 days (7200 hours)
Application	Back-up for setting data
Size (mm)	φ 16 (dia) x 30

## 3. NOMENCLATURE

### 3 NOMENCLATURE



I/O	Internal circuit	Pin Number		Signal	Description	
		X axis	Y axis			
Input		9A	10A	Zerophase signal (PGO)	(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.	
		9B	10B			
Output		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 brakes. Feed pulse is output after this signal goes ON.	
		11B	13B			
		12A	14A	Error counter clear (CLEAR)	Given before and after zero return. Resets deviations in the servo error counter. CLEAR pulse width: 20 msec (1st time), 20 msec (2nd time). CLEAR pulse timing: Before feed pulse output, After feed pulse output.	
		12B	14B			
		17A	20A	(+ ) 24 V power (+ ) 5 to 15 V power	5 to 24 VDC (external supply) 17B and 20B for 5 to 12 VDC 17A and 20A for 24 VDC	
		17B	20B			
		A type	15A	18A	Forward feed pulse (PULSE F) Feed pulse (PULSE) Reverse feed pulse (PULSE R) Direction sign (SIGN)	Forward and reverse feed pulses. The operation direction follows the direction sign (SIGN). PULSE SIGN timing: 25 ms. + direction travel, - direction travel.
			B type	15B		
A type		16A	19A	Reverse feed pulse (PULSE R) Direction sign (SIGN)		
		16B	19B			

Select the A or B type by parameter setting

No	Name	Explanation																		
1)	LED indicator	Indicates operating states and error occurrences																		
		<table border="1"> <thead> <tr> <th>LED</th> <th>Contents</th> </tr> </thead> <tbody> <tr> <td>READY</td> <td>Lights when the A1SD71 ready signal (X11) goes ON.</td> </tr> <tr> <td>SERVO [ X -ERR ] Y</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 (X14) goes ON.</td> </tr> <tr> <td>Y BUSY</td> <td>Lights when the Y-axis BUSY signal (X15) goes ON.</td> </tr> <tr> <td>X ZERO</td> <td>Lights when the X-axis zero return request signal (X16) goes ON.</td> </tr> <tr> <td>Y ZERO</td> <td>Lights when the Y-axis zero return request signal (X17) goes ON.</td> </tr> <tr> <td>HOLD</td> <td>Lights when there is an A1SD71 hardware fault.</td> </tr> <tr> <td>BAT WDT ] ERR</td> <td>Lights when the battery error signal (X1A) or WDT error signal (X10) goes ON.</td> </tr> </tbody> </table>	LED	Contents	READY	Lights when the A1SD71 ready signal (X11) goes ON.	SERVO [ X -ERR ] Y	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 (X14) goes ON.	Y BUSY	Lights when the Y-axis BUSY signal (X15) goes ON.	X ZERO	Lights when the X-axis zero return request signal (X16) goes ON.	Y ZERO	Lights when the Y-axis zero return request signal (X17) goes ON.	HOLD	Lights when there is an A1SD71 hardware fault.	BAT WDT ] ERR	Lights when the battery error signal (X1A) or WDT error signal (X10) goes ON.
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HOLD	Lights when there is an A1SD71 hardware fault.																			
BAT WDT ] ERR	Lights when the battery error signal (X1A) or WDT error signal (X10) goes ON.																			
2)	Keyswitches	M PRO : Sets memory protect for the setting data and positioning data areas. OFF : Cancels memory protect for the setting data and positioning data areas. LOCK : Prohibits a pulse train output from the A1SD71.																		
3)	RS-422 connector	Used for connections with a peripheral device such as an A6GPP, A6PHP, and AD71TU.																		
4)	40 pin connector	Used for connections with a drive unit.																		
5)	Battery (A6BAT)	For backup of positioning data.																		

## 4. LOADING AND INSTALLATION

### 4 LOADING AND INSTALLATION

#### 4.1 Unit Wiring Precautions

When the A1SD71 is mounted on a base (main base unit or extension base), make sure of the following

- (1) Do not mount it on an extension base without a power supply module (A1SS[ ] extension base)  
(This is because of the high current consumption of A1SD71 )
- (2) If ambient temperature exceeds 55 °C, consider forcible ventilation

#### 4.2 Wiring

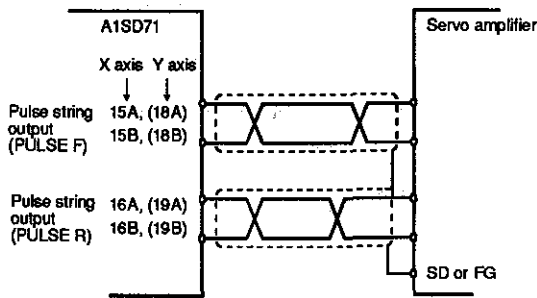
##### 4.2.1 Wiring precautions

###### (1) I/O signal wiring

- Do not place signal cables next to power or main circuit cables
- If signal cables have to be brought close to them, either separate the ducts or use conduit
- If the cables must be bundled together, use a batch-shielded cable and ground them on the PC CPU side
- If the cables are wired with conduit, make sure to ground the conduit
- Keep A1SD71 wiring and other electric wires at least 10 cm apart
- If signal cables are long, and are close to main circuit cables, noise may cause a malfunction

#### REMARK

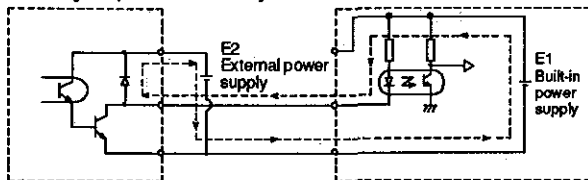
Where excessive noise may apply to the pulse train signals, use shielded twisted paired cables to connect the A1SD71 and a drive unit



###### (2) 24 VDC wiring notes

In case that a drive unit has a built-in power supply, do not use an external power supply with the built-in power supply for same circuitry. Otherwise a malfunction may occur by wraparound circuit current

#### [Wraparound circuit]

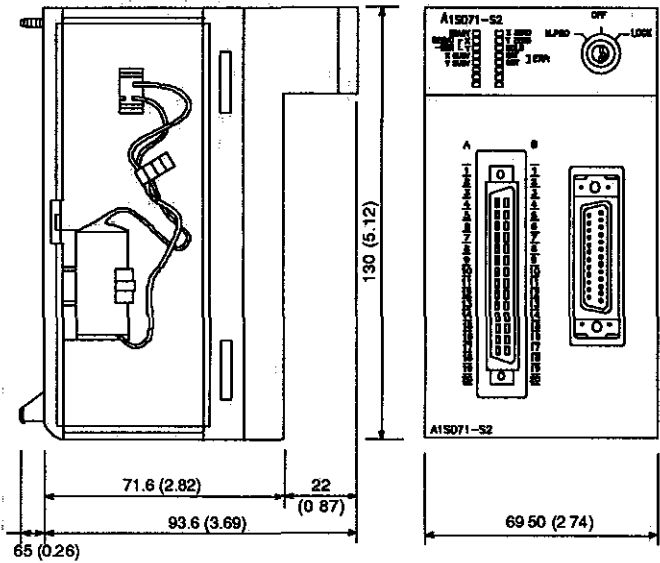


$E1 > E2$

Even if the pulse output of A1SD71 is OFF, the power supply flows in a servo unit pulse input line

## 5. OUTSIDE DIMENSION

### 5 OUTSIDE DIMENSION



Unit mm (inch)

#### REVISIONS

Revision	Content
A	
Jun, 1994	

#### IMPORTANT

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

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

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

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