

MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-A

User's Manual

Positioning module type A1SD71-S7 (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) 66489-A (9406) MEE

1. GENERAL DESCRIPTION

1 GENERAL DESCRIPTION

This manual describes specifications, handling and wiring of an A1SD71-S7 positioning module (hereinafter referred to as the A1SD71).

1.1 Related Manual

- A1SD71-S7 user's manual (IB-66424)
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 ² JIS C 0911	Frequency	Acceleration	Amplitude	Sweep Count *1 (1 octave/minute)
		10 to 55 Hz	—	0.075 mm (0.003 inch)	
		55 to 150 Hz	9.8 m/s ² (1 g)	—	
Shock resistance	Conforms to ² JIS C 0912 (98 m/s ² (10 g) x 3 times in 4 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	500 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 mist. Dust should be minimal.
Cooling method	Self-cooling

REMARK

- (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) ²JIS: 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

The United States	Mitsubishi Electronics America Inc. (Industrial Automation Division) 800 Biermann Court, Mt. Prospect, IL 60056 Phone: (708)298-9223
Canada	Mitsubishi Electric Sales Canada, Inc. (Industrial Automation Division) 4299 14th Avenue, Markham, Ontario L3R 0J2 Phone: (416)475-7728
United Kingdom	Mitsubishi Electric UK Ltd. (Industrial Automation Division) Travellers Lane, Hatfield, Herts AL10 8XB Phone: (0707)276100
Germany	Mitsubishi Electric Europe GmbH, (Industrial Automation Division) Gotheer Strasse 8 Postfach 1548, D 4030 Ratingen 1 Phone: (02102)4860
Taiwan	Setsuyo Enterprise Co., Ltd., (106) 11th Fl., Chung Ling Bldg., 363, Sec 2 Fu Hsing S. Rd., Taipei, Taiwan R.O.C. Phone: (02)732 0161
Hongkong (& China)	Ryoden International Ltd., (Industrial & Electrical Controls Division) 10/F. Manulife Tower, 169 Electric Rd., North Point, Hong Kong Phone: 8878870
Singapore (& Malaysia)	MELCO Sales Singapore Pte. Ltd. (Industrial Division) 307 Alexandra Rd., #05 01/02, Mitsubishi Electric Bldg., Singapore 0315 Phone: 4732308
Thailand	F. A. Tech Co. Ltd., 1138/33 34 Rama 3 Rd., Yannawa, Bangkok 10120 Phone: (02)295 2861-4
Australia	Mitsubishi Electric Australia Pty Ltd. (Industrial Controls Division) 348 Victoria Rd., Rydalmere, N.S.W. 2116 Phone: (02)684 7200
Republic of South Africa	M. S. A. Manufacturing (Pty) Ltd., (Factory Automation Division) P.O. Box 39733, Bramley, Johannesburg 2018 Phone: (011)444 8080

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: MITSUBISHI DENKI BLDG. MARUNOUCHI, TOKYO 100. TELEX: 22652. CABLE: MELCO.
TOKYO NAGOYA WORKS: 1-14, YADA MIYAJI, HIGASHI-KU, NAGOYA, JAPAN

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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 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.	
Positioning	Method: Absolute and/or incremental method	
	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 × 10 ⁻⁶ 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 4999 (msec)
	Backlash compensation	0 to 65535 × 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
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 V DC, 0.8 A	
External supply voltage, current	4.75 to 26.4 V, max. 50 mA	
Size mm (inch)	130(H) × 69.5(W) × 93.6(D) (5.12 × 2.74 × 3.69)	
Weight kg (lb)	0.38(0.84)	

REMARK

* I/O allocation for the 2 slots are as follows: First half slot: Empty slot 16 points, Second half slot: Special-function module 32 points

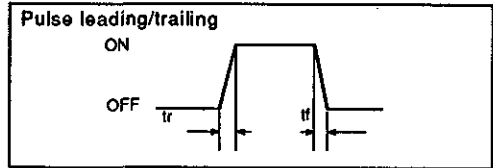
2.3.2 Pulse leading/trailing edge-timing of A1SD71 output signals

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	26
	100	< 0.1	3.0	40	< 0.1	3.4	36	< 0.1	3.6	32
	10	< 0.1	3.2	49	< 0.1	6.0	48	< 0.1	9.0	48
10	200	< 0.1	0.7	42	< 0.1	1.0	40	< 0.1	1.6	38
	100	< 0.1	0.7	46	< 0.1	1.1	45	< 0.1	1.6	44
	10	< 0.1	0.7	50	< 0.1	1.1	50	< 0.1	1.6	50
50	200	< 0.1	0.4	46	< 0.1	0.5	46	< 0.1	0.5	45
	100	< 0.1	0.4	48	< 0.1	0.5	48	< 0.1	0.5	48
	10	< 0.1	0.4	50	< 0.1	0.5	50	< 0.1	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	< 0.1	0.6	49	< 0.1	1.0	47	< 0.1	1.3	46
	10	< 0.1	0.6	50	< 0.1	1.0	50	< 0.1	1.5	50
10	200	< 0.1	0.3	50	< 0.1	0.4	50	< 0.1	0.4	50
	100	< 0.1	0.3	50	< 0.1	0.4	50	< 0.1	0.4	50
	10	< 0.1	0.3	50	< 0.1	0.4	50	< 0.1	0.4	50
50	200	0.1	0.3	52	0.1	0.3	52	0.1	0.3	52
	100	0.1	0.3	52	0.1	0.3	52	0.1	0.3	52
	10	0.1	0.3	50	0.1	0.3	50	0.1	0.3	50

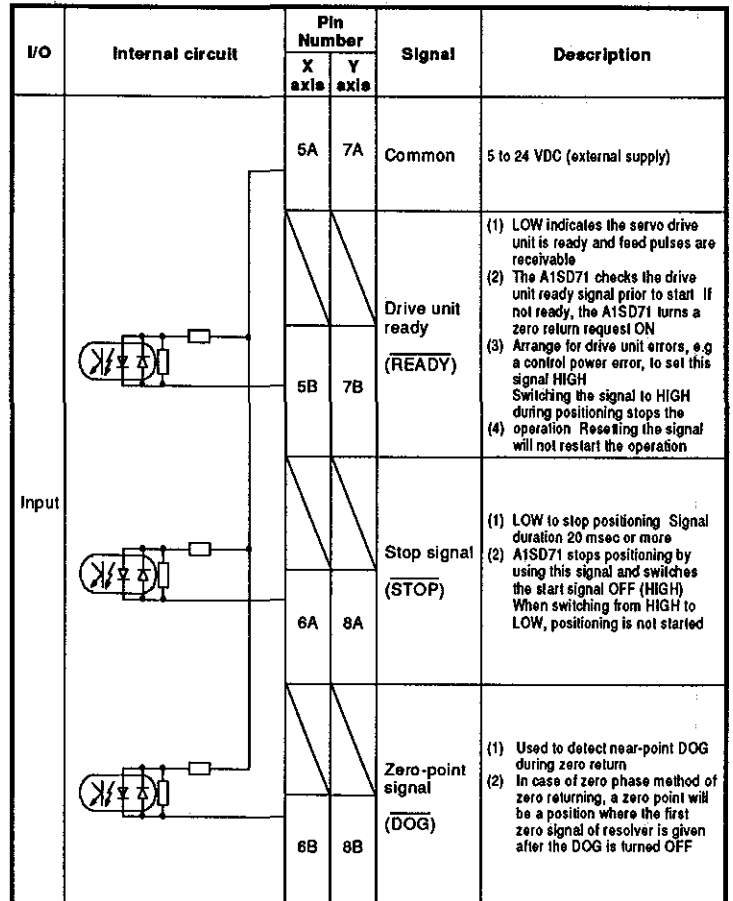


2.3 I/O Interface with External Equipment

2.3.1 Electrical specifications

I/O	Signal	Description
Input	Supply power	5 to 24V DC (Use a 4.75 to 26.4V stabilized power supply) 50mA (maximum)
	Drive unit ready (READY) Stop signal (STOP) Near-point signal (DOG)	High: (Supply power voltage - 1V) or more (Input current 0.3mA or less) Low: (Supply power voltage - 3V) or less (Input current 2.5mA or more)
	Inching A phase (PULSER A) Inching B phase (PULSER B)	Input voltage: 5 VDC +20% High: 4.5 V or more, 3 mA or more Low: 1.0 V or less, 0 mA Pulse width: 2ms or longer Phase difference: A phase leads B phase by 0.5ms or longer Input pulse rise, fall time: 500 μs max
	Zero phase signal (PGO)	High: (Supply power voltage - 1V) or more (Input current 0.3 mA or less) Low: (Supply power voltage - 3V) or less (Input current 3.5 mA or more) Pulse width: 50 μs or more Pulse rise time: 3 μs or less Pulse fall time: 3 μs or less
Output	Start signal (START) Error detector clear (CLEAR)	Output type: Open collector Load voltage: 4.75 to 26.4V DC Load current: 10mA (maximum) Max. voltage drop at ON: 0.6V or less Leakage current at OFF: 0.1mA 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 26.4V DC Load current: 50mA (maximum)

2.3.3 Input/output interface specifications of the A1SD71



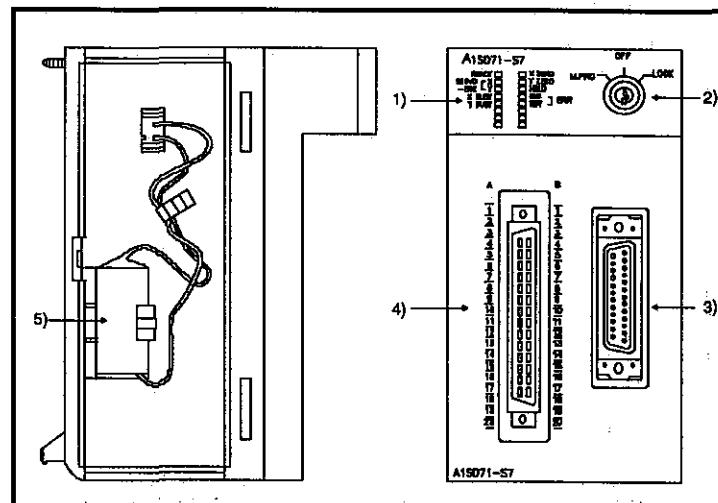
I/O	Internal circuit	Pin Number		Signal	Description
		X axis	Y axis		
Input		1A	3A	Inching A phase Pulser A	Refer to table 3 10
		1B	3B		
		2A	4A	Inching B phase Pulser B	
		2B	4B		
		9A	10A	Zero-phase signal (PGO)	(1) Used as the zero signal at zero return. The zero phase grid signal of the pulse encoder 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		

24 Battery Specifications

Type	A6BAT
Items	
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) × 30

3. NOMENCLATURE

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I/O	Internal circuit	Pin Number		Signal	Description	
		X axis	Y axis			
Output		12A	14A	Error counter clear (CLEAR)	Given before and after zero return. Resets deviations in the servo error counter. CLEAR pulse: 20 msec (1st time), 20 msec (2nd time). 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			
		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 ms pulse. + direction travel, - direction travel.
		15B	18B	Reverse feed pulse PULSE R	Direction sign SIGN	
		16A	19A	Reverse feed pulse PULSE R	Direction sign SIGN	PULSE F
		16B	19B	Reverse feed pulse PULSE R	Direction sign SIGN	PULSE R

Select the A or B type by parameter setting

No	Name	Explanation	
1)	LED indicator	Indicates operating states and error occurrences	
		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
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
3)	RS-422 connector	LOCK	Prohibits a pulse train output from the A1SD71
			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

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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 (A1S5[] 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

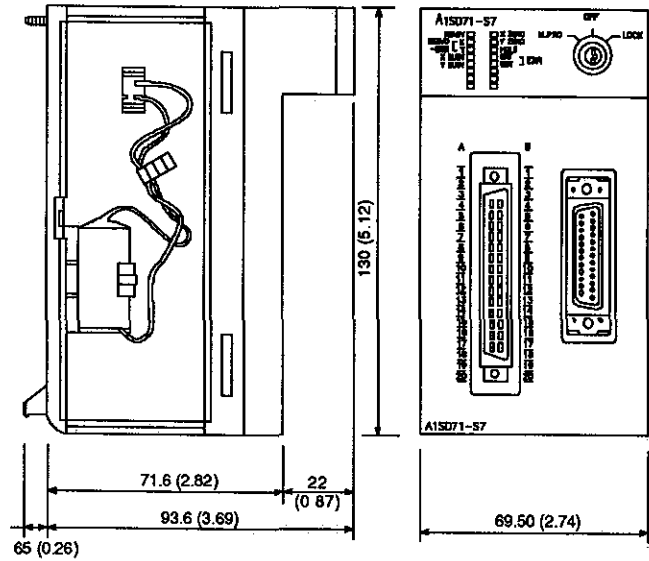
4.2.1 Wiring precautions

(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 a 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

5. OUTSIDE DIMENSIONS

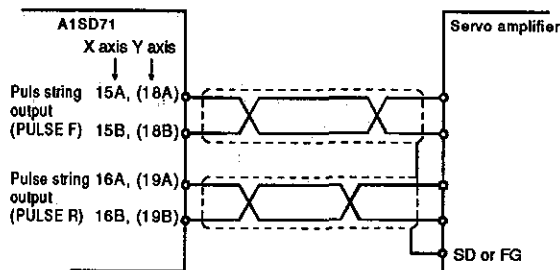
5. OUTSIDE DIMENSIONS



Unit: mm (inch)

REMARK

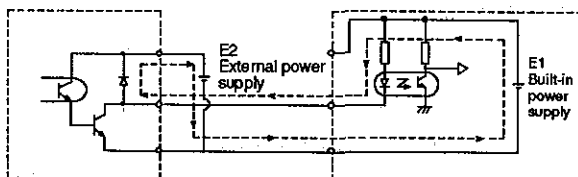
Where excessive noise may apply to the pulse train signals, use shielded twisted paired cables to connect the A1SD71 and a drive unit



(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

REVISIONS

Revision	Date	Description
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