MITSUBISHI
Positioning module type A1SD70

User's Manual
(Hardware)

A1SD70

Thank you for buying the Mitsubishi general-purpose programmable logic controller MELSEC Series

Prior to use, please read both this manual and detailed manual thoroughly and familiarize yourself with the product.

MODEL	A1SD70(H/W)-U-E
MODEL CODE	13JE48
IB(NA)-66487-B(0707)MEE	

A MELSEC

©1994 MITSUBISHI ELECTRIC CORPORATION

1. GENERAL DESCRIPTION

1. GENERAL DESCRIPTION

This manual describes specifications, handling and wiring of an A1SD70 positioning module (hereinafter referred to as the A1SD70).

1.1 Related Manual

- A1SD70 user's manual (IB-66367)
  Describes details of specifications, functions and programming of an A1SD70.

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				
		Frequency	Acceleration	Amplitude	Sweep Count
Vibration resistance	Conforms to *2 JIS C 0911	10 to 55 Hz	—	0.075 mm (0.003 inch)	10 times *1 (1 octave/ minute)
		55 to 150 Hz	9.8 m/s² (1 g)	—	
Shock resistance	Conforms to *2JIS C 0912 (98 m/s² (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

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.

2.2 Performance Specifications

Item	Specifications	
Number of I/O points	48 points* (number of occupied slots: 2)	
Number of control axes	1	
Positioning data — Capacity	1 data (Two-phase trapezoidal control possible)	
Positioning data — Setting method	Using sequence program	
Positioning — Mode	Position control mode / Velocity/position control switchover mode	Can be selected
Positioning — Method	Position control mode: Absolute/incremental selectable Velocity/position control mode: Incremental	
Positioning — Positioning units	–2147483648 to 2147483647 (PULSE) (signed 32-bit)	
Positioning — Positioning speed	1 to 400000 (PLS/sec)	
Positioning — Acceleration and deceleration	Automatic trapezoidal acceleration and deceleration	
Positioning — Acceleration and deceleration times	Acceleration ...... 2 to 9999 (msec) Deceleration ...... 2 to 9999 (msec)	
Positioning — In-position range	1 to 2047 PLS	
Positioning — Backlash compensation	Not provided	
Positioning — Error compensation	Not provided	
Velocity command output	0 to ±10 VDC (adjustable between ±5 and ±10 V)	
Positioning feedback pulse input	Pulse frequency 100 KPPS Connectable encoder : Open collector, TTL, and differential output types Multiplication setting : Number of feedback pulses x 4, x 2, x 1 and x 1/2	
Zero return function	With zero address change function Zero return direction and method are selected by switches.	
Jog operation function	The jog operation is enabled by the jog start signal.	
M function	Not provided	
Internal current consumption	5 VDC 0.3 A	
External power supply voltage and current terminal block	+15 VDC 0.2 A, –15 VDC 0.02 A	

REMARK

* The I/O allocation of the two-slot area must be done as follows:
First-half slot : 16 vacant points
Second-half slot : 32 special-function module points

2.3 Interface with External Device

2.3.1 Electrical specifications

I/O	Signal	Description
Power supply — Common inputs	5 to 24 VDC (Use a 4.75 to 26.4 V stabilized power supply.) Current consumption: 60 mA max. (10 mA x 6)
Power supply — Terminal block	±15 VDC (±14.55 to 15.45 V) Current consumption:+ 15 V 200 mA – 15 V 200 mA
Input — Servo ready (READY), Stop signal (STOP), Near-zero point signal (DOG), Upper limit (FLS), Lower limit (RLS), Velocity/position switchover command (CHANGE)	HIGH: (Supply power voltage – 1 V) min. (External contact OFF) (Input current: 0.3 mA max.) LOW: (Supply power voltage – 3 V) min. (External contact ON) (Input current: 2.5 mA min.)
Input — (Open collector method) A-phase feedback pulse (PULSE A) B-phase feedback pulse (PULSE B) Z-phase feedback pulse (PULSE Z)	Pulse frequency: 100K PPS or less Pulse rise time: 1 µsec or less Pulse fall time: 1 µsec or less HIGH: 4 V or more LOW: 1 V or less
Input — (TTL method) A-phase feedback pulse (PULSE A) B-phase feedback pulse (PULSE B) Z-phase feedback pulse (PULSE Z)	Pulse frequency: 100K PPS or less HIGH: 2.8 V or more LOW: 0.8 V or less
Input — Differential output method A-phase feedback pulse (PULSE A) B-phase feedback pulse (PULSE B) Z-phase feedback pulse (PULSE Z)	Pulse frequency: 100K PPS or less The receiver used conforms to RS-422. Use a driver equivalent to SN75113.

I/O	Signal	Description
Output — Servo ON (SVON)	Output method: Open collector Load voltage: 4.75 to 26.4 VDC Load current: 30 mA max. *1 Max. voltage drop at Servo ON: 1.0 V or less Leakage current at Servo OFF: 0.1 mA or less
Output — Velocity command (analog signal)	Output voltage: 0 to ±10 V (10 mA)

*1 Since the maximum load voltage of Servo ON signal is 30 mA, pay close attention to the load voltage when a device like a miniature relay is used.

2.3.2 I/O interface between an external device and an A1SD70

Connector	I/O	Pin No.	Internal Circuit	Signal	Description
CONT	Input	5	2.7 KΩ	Power supply	5 VDC to 24 VDC
		1	2.7 KΩ	Near-zero point signal/DOG	Used to detect the "near-zero point" during zero return operation. The signal is turned on when near-zero point dog is detected.
		9	2.7 KΩ	Stop signal/STOP	Low to stop positioning. Signal duration should be longer than 20 msec.
		7	2.7 KΩ	Upper limit LS/FLS	Upper stroke limit switch. Positioning stops when OFF.*1
		6	2.7 KΩ	Lower limit LS/RLS	Lower stroke limit switch. Positioning stops when OFF.*1
		8	2.7 KΩ	Velocity/ position switchover command/CHANGE	Used as the control switchover command in the velocity/position control switchover mode.

Connector	I/O	Pin No.	Internal Circuit	Signal	Description
SERVO	Input	1	2.7 KΩ	Servo ready/READY	Turns ON when the servo drive unit is normal and ready to receive feed pulse signals.
		2			
	Output	3		Servo ON/SVON	The servo OFF signal is output when servo error is excessive or when an A1SD70 selfcheck error has occurred.
		4			
		15	100 Ω *2	Velocity command	The amount of accumulated pulses is converted into analog voltage output.
		14	0 V(Analog GND)		
	Input — Near-zero point signal	13	5V 1kΩ	Phase A feedback pulse	Connect to the encoder pulse output.
		11	Equivalent to SN75115		
		5	1kΩ	Phase B feedback pulse	
		10	1kΩ		
		6	1kΩ	Phase Z feedback pulse	
		7	1kΩ		
		9	0 V	Analog GND	
	Open collector input	13	12 V 1.2kΩ	Phase A feedback pulse	The input voltage is raised to 12 V inside the module. Connect to the encoder pulse output.
		11			
		5	12 V 1.2kΩ	Phase B feedback pulse	
		10			
		6	12 V 1.2kΩ	Phase Z feedback pulse	
		9	0 V	Analog GND	

Left table

Con-nector	I/O		Pin No.	Internal Circuit	Signal	Description
SERVO	Input	TTL input	13	5 V 900 Ω	Phase A feedback pulse	Connect to the encoder pulse output.
			11			
			5	5 V 900 Ω	Phase B feedback pulse	
			10			
			6	5 V 900 Ω	Phase Z feedback pulse	
			7			
			9	0 V	Analog GND	
Terminal block	Input		+15 V		External power supply	Connect to ±15 V power supply.
			0 V	0 V		
			−15 V			
			FG			

*1: Leave ON when not using the FLS or RLS.

*2: When the input impedance of the servo amplifier is small, the analog output level could be lowered by this resistance. Therefore, if necessary, read just the gain in the state of the connected servo amplifer.

3. NOMENCLATURE

3. NOMENCLATURE

No.	Name	Description
(1)	LED	Indicates the operation and error states of the A1SD70 (see Section 4.4).
(2)	OUT and GND terminals	Check pins for measuring output voltage.
(3)	GAIN volume	For adjusting the output voltage gain.
(4)	ZERO volume	For zero-adjusting the output voltage.
(5)	CONT.	Control signal connector.
(6)	SERVO	Drive module connector.
(7)	Terminal block	Terminal used for supplying power (±15 VDC) to the A1SD70. Grounding terminal FG.
(8)	Slide switches	Set the rotation direction, accumulated pulse, multiplication, zero-return direction, and adjustment mode.
(9)	Encoder interface setting pin	Sets output types for phases A, B, and Z.

4. SETTINGS

4. SETTINGS

4.1 Encoder Interfaces Setting

Select the type of encoder using the shorting pins located on the side of A1SD70.

	Short Circuit Pin Setting	Connection
Open collector output	Phase Z Phase B Phase A	PLG → Phase A: Pin 13 / Phase B: Pin 5 / Phase Z: Pin 6 — A1SD70 / Phase A: Pin 11 / Phase B: Pin 10 / Phase Z: Pin 7
TTL output	Phase Z Phase B Phase A	PLG → Phase A: Pin 13 / Phase B: Pin 5 / Phase Z: Pin 6 — A1SD70 / Phase A: Pin 11 / Phase B: Pin 10 / Phase Z: Pin 7
Differential output	Phase Z Phase B Phase A	PLG → Phase A: Pin 13 / Phase B: Pin 5 / Phase Z: Pin 6 — A1SD70 / Equivalent to SN75113 / Phase A: Pin 11 / Phase B: Pin 10 / Phase Z: Pin 7

The pins are factory-set for open collector output.

4.2 Zero Adjustment and Gain Adjustment

Refer to the A1SD70 user's manual about the detailed setting.

4.3 Rotation Direction Setting

[SW1]	OFF	Negative voltage is output when positioning addresses increase.
	ON	Positive voltage is output when positioning addresses increase.

4.4 Accumulated Pulse Setting

Slide Switches	0 to 3700 pulses	0 to 7400 pulses	0 to 11100 pulses	0 to 14800 pulses
[SW2]	OFF	ON	OFF	ON
[SW3]	OFF	OFF	ON	ON

4.5 Multiplication Setting

Sets the multiplication of feedback pulses from the pulse generator (PLG).
By using this function, the feedback pulse count can be multiplied by 4, 2, 1, and 0.5.

In other words, this function can change the axis travel distance by 1/4, 1/2, 1, and 2.

Slide Switches	x4.0	x2.0	x1.0	x0.5
[SW4]	OFF	ON	OFF	ON
[SW5]	OFF	OFF	ON	ON

4.6 Zero-Return Direction Setting

[SW6]	OFF	Reverse direction (address decreasing)
	ON	Forward direction (address increasing)

IMPORTANT

The zero-return operation is controlled by both the zero-return direction and the zero-return velocity. Turning the near-zero point dog ON starts deceleration. Make sure to set the zero return direction correctly.

4.7 Zero-Return Mode Setting

[SW7]	OFF	Near-zero point dog mode
	ON	Count mode

5. WIRING

5. WIRING

5.1 Wiring Precautions

(1) I/O signal wiring

- Don't place signal cables next to power or main circuit cables. If possible, keep the signal cables further than 20 cm (8 in) away from them. If the signal cable has 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 side.
- If the cables are wired with a conduit, make sure to ground the conduit.

(2) Since the A1SD70 is completely noise proof, it usually does not need special grounding. However, if the A1SD70 is placed in (a) noisy surroundings, or (b) in an unstable place, ground it as indicated below:

(a) The FG terminal of the power supply module and A1SD70 must be grounded separately and individually. Grounding should conform to JIS Class 3 grounding.

(b) The electric wire used for grounding must be larger than 2 mm². Grounded points should be as close as possible to the PC.

(3) Arrange surge suppressors in parallel for AC relays, valves or electric breakers, and diodes for DC relays, valves, etc. connected to a drive unit.

(4) Make sure to connect the servo ON signal of drive unit to the A1SD70, and do not switch the signal using another device. Otherwise, the motor may rotate during a CPU error.

5.2 Precautions for Encoder Connection

An A1SD70 has a deviation counter. Feedback pulses to the counter make the count value increment or decrement depending on the difference between Phase A and B.

As shown in Fig. (1), if the feedback pulses of Phase A are leading B by 90°, the number of pulses is subtracted from the counter.

As shown in Fig. (2), if the feedback pulses of Phase B are leading A by 90°, the number of pulses is added to the counter.
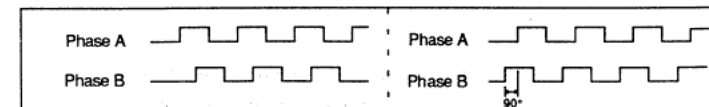

Fig. (1) Phase A Leading B by 90° Feedback Pulse

Fig. (2) Phase B Leading A by 90° Feedback Pulse

In the case that a positive voltage (rotation to forward) is generated by positive command pulses, the feedback pulses shown in Fig. (1) should be returned.

In the case that a negative voltage (rotation to reverse) is generated by negative command pulses, the feedback pulses shown in Fig. (2) should be returned.

6. OUTSIDE DIMENSIONS
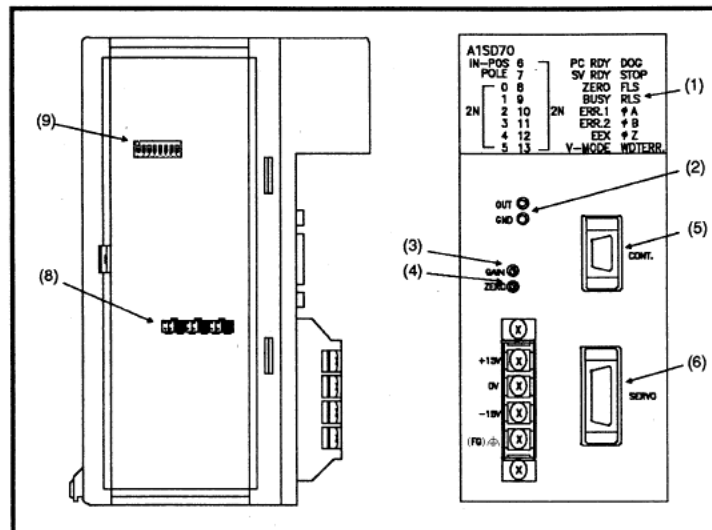
6. OUTSIDE DIMENSIONS
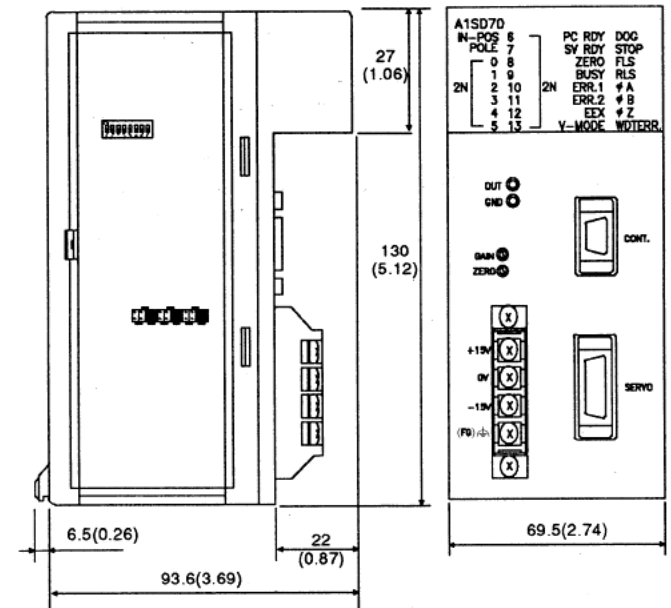
Unit: mm (inch)

Item	Specifications
Size (mm) (inch)	130(H) x 69.5(W) x 93.6(D) (5.12 x 2.74 x 3.69)
Weight (kg) (lb)	0.4 (0.88)

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.