MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-A

User's Manual

Positioning module type A1SD70 (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

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Specifications subject to change without notice

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				
Vibration resistance	Conforms to *2 JIS C 0911	Frequency	Acceleration	Amplitude	Sweep Count
		10 to 55 Hz	—	0 075 mm (0 003 inch)	10 times *1 (1 octave/ minute)
		55 to 150 Hz	9 8 m/s^2 (1 g)	—	
Shock resistance	Conforms to *2JIS C 0912 (98 m/s^2 (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) *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)
	Setting method	Using sequence program
Positioning	Mode	Position control mode Velocity/position control switchover mode (Can be selected)
	Method	Position control mode Absolute/incremental selectable Velocity/position control mode Incremental
	Positioning units	–2147483648 to 2147483647 (PULSE) (signed 32-bit)
	Positioning speed	1 to 400000 (PLS/sec)
	Acceleration and deceleration	Automatic trapezoidal acceleration and deceleration
	Acceleration and deceleration times	Acceleration 2 to 9999 (msec) Deceleration 2 to 9999 (msec)
	In position range	1 to 2047 PLS
	Backlash compensation	Not provided
	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
Input	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)
		Terminal block	±15 VDC (±14 55 to 15 45 V) Current consumption:+ 15 V 200 mA – 15 V 200 mA
	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)
	(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
	(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
	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
	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

Con-nector	I/O	Pin No	Internal Circuit	Signal	Description
CONT	Input	5		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

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

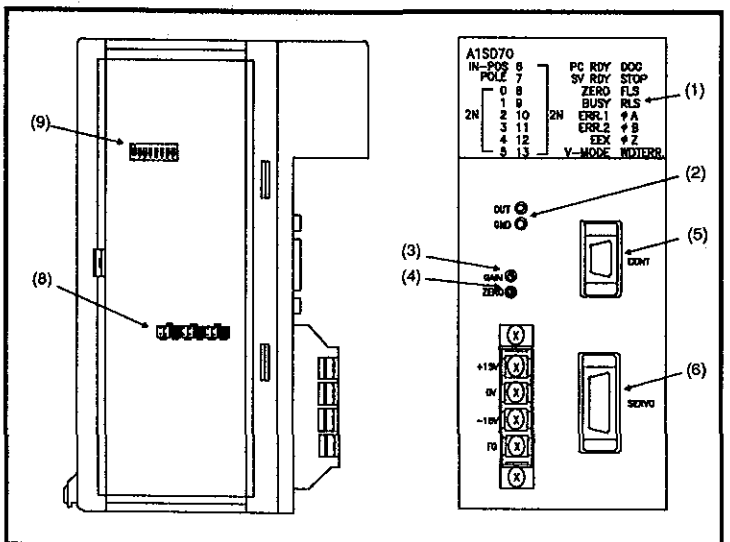
Con-nector	I/O		Pin No	Internal Circuit	Signal	Description
SERVO	Input	TTL input	13	5 V, 900 Ω	Phase A feedback pulse	Connect to the encoder pulse output
			11			
			5	5 V, 900 Ω	Phase B feedback pulse	
			10			
			6	5 V, 900 Ω	Phase Z feedback pulse	
			7			
			9	0 V	Analog GND	
Ter-minal block	Input		+15 V			
			0 V	0 V	External power supply	Connect to ±15 V power supply
			−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 — Phase A Pin 11, Phase B: Pin 10, Phase Z Pin 7; Equivalent to SN75113

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 mm^2 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

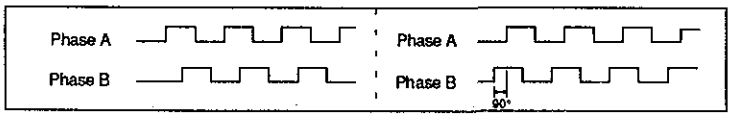


Fig (1) Phase A Leading B by 90° Feedback Pulse

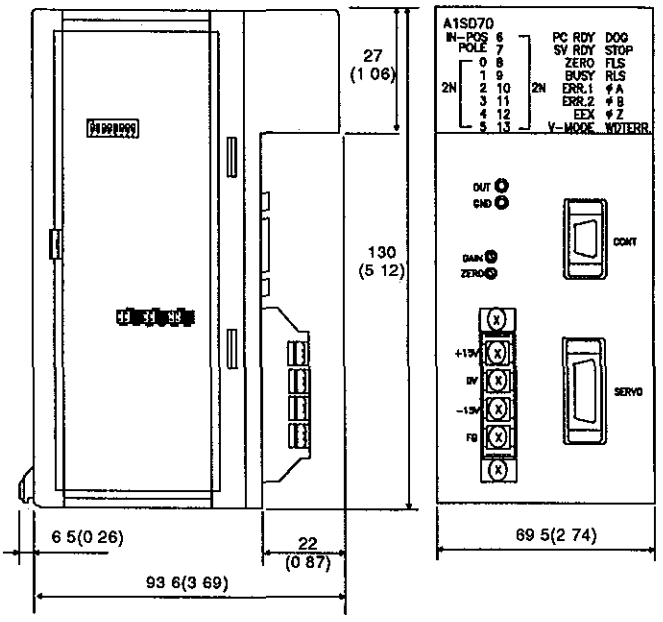
Fig (2) Phase B Leading A by 90° Feedback Pulse

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)

REVISIONS

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