MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-A

User's Manual

Positioning module type AD75P1/P2/P3 (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) 66585-A

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IB (NA) 66585 A (9508) MEE Printed in Japan

Cautions on Safety

(Please read before using the module)

Please carefully read this manual and related ones mentioned herein to ensure safety and operate this module properly
The following cautions are applecable only to the module For the cautions on safety relating to the PC CPU system, see the PC CPU User's Manual
The cautions in this cautions on safety are classified into two ranks, "DANGER" and "CAUTION", according to their importance

⚠ DANGER	A warnig given when improper operation could result in a dangerous situation causing death or serious injuries
⚠ CAUTION	A caution given when improper operation could result in a dangerous situation causing moderate or injuries, and physical damage to the module, etc

Even failure to observe a caution marked ⚠ CAUTION may bring about a serious accident depending on the situation Do not fail to follow the cautions
Retain this manual for consultation whenever necessary, and provide a copy to the end user

[Cautions on Design]

⚠ DANGER

- To ensure that the system as a whole will continue to operate satety even if there is a fault in the external power supply or in the PC itself, provide a safety circuit external to the PC Otherwise accidents may be caused by erroneous outputs and malfunctions

(1) Construct interlock circuitry to prevent damage to the machime, such as an emergency stop cicuit, positioning upper/lower limit interlock, etc , external to the PC

(2) Home position return operations are controlled by two data: the home position return direction and the home position return speed and deceleration starts when the near-point dog comes ON Consequently, if an incorrect home position return direction is set, motion may continue without deceleration To prevent damage to the machine if this happens, construct a circuit such as an interlock circuit external to the PC

(3) When the module detects as error, a normal deceleration to stop or emergency stop is executed in accordance with the setting for stop group n in the parameters Match the parameter settings to the system specifications Also, set home position return data and positioning data with values no greter than the values specified in the parameters

⚠ CAUTION

- Do not bundle the control wire and the communication cable with the main circuit or power line or keep them close to one another
Keep the control wire and the communication cable at least 100 mm away from the main circuit or power line: otherwise, noise or malfunctions will occur.

[Cautions on Installation]

⚠ CAUTION

- Use the PC in the environment specified in the General Specifications section in this manual
Using it in an environment which does not meet the general specifications could cause electric shock, fire or malfunctions, and damage or deterioration of the module
- Install the module by engaging the module mounting projections on the lower part of the module in the mounting holes of the base unit Incorrect installation could result in malfunctions, failure of detachment
- Engage the drive unit connector and peripheral device connector securely with the connectors on the module: you will hear a click on engagement Failure to engage the connectors properly could result in a faulty connection leading to erroneous inputs and outputs
- If no drive unit is connected, be sure to fit the cover on the connector
Failure to fit the cover could result in malfunctions.

[Cautions on Wiring]

⚠ CAUTION

- Carry out wiring to the module correctly, checking the terminal arrangement
- Take all possible measures to prevent chips or wire scraps from entering the module
Entry of foreign material will cause fire, failure of malfunctions.

[Cautions on Start-Up and Maintenance]

⚠ DANGER

- Switch the power off before cleaning the module If the power is left on, the module will break down or malfunction.

⚠ CAUTION

- Do not disassemble or tamper with the module This will cause failure, malfunctions, injuries or fire
- Switch the power off before installing or removing the module. If the power is left on, the module will break down or malfunction
- For test operation, set lower speed restriction values in the parameters and make sure that motion can be stopped immediately in the event of any hazard before starting the operation.

[Cautions on Method of Use]

⚠ CAUTION

- When specifying the speed for the reference axis in an interpolation operation, note that the speed for the corresponding axis (second axis) may be greater than the set speed (i.e. greater than the speed restriction).

[Caution on Disposal]

⚠ CAUTION

- Dispose of the module as industrial waste.

1. GENERAL DESCRIPTION

1. GENERAL DESCRIPTION

This manual explains the specifications, names of parts, and I/O interface of the AD75P1/P2/P3 positioning module

On unpacking the AD75, check that the following items have been supplied.

Part Name		Quantity		
Type AD75P1 positioning module		1		
Type AD75P2 positioning module			1	
Type AD75P3 positioning module				1
Connector for external wiring (made by Sumitomo 3M)				
(Model name)				
Connector	10136-3000VE	1	2	3
Connector cover	10336-56F0-008	1	2	3

The following manuals are also related to this product If necessary, order them by quoting the details in the tables below

- Detailed Manual
  A1SD75P1/P2/P3, AD75P1/P2/P3 User's Manual (IB-66589)

2. PERFORMANCE SPECIFICATIONS

2. PERFORMANCE SPECIFICATONS

Item \ Model		AD75P1	AD75P2	AD75P3
Number of control axes		1	2	3
Interpolation		None	2 axis linear interpolation 2-axis circular interpolation	2-axis linear interpolation 2-axis circular interpolation
Control method		PTP control, locus control (both linear and circular can be set) Speed control, Speed/positioning control switching		
Control units		mm, inch, degree, pulse		
Positioning data		Peripheral device : 600 patterns/axis PC : 100 patterns/axis only can be set		
Peripheral device		IBM PC/AT or 100% compatible : SW0IVD AD75P		
Backup		Parameters and positioning data are stored in a flash ROM (no battery required) *1		
Positioning	Method	PTP control:Incremental method / Absolute method Speed/positioning control switching: Incremental method Locus control: Incremental method / Absolute method		
	Positioning range	For the absolute method		
		• -214748364 8 to 214748364 7 (μm)		
		• -21474 83648 to 21474 83647 (inch)		
		• 0 to 359 99999 (degree)		
		• -2147483648 to 2147483647 (pulse)		
		For the incremental method		
		• 214748364 8 to 214748364 7 (μm)		
		• 21474 83648 to 21474 83647 (inch)		
		• 21474 83648 to 21474 83647 (inch)		
		• 2147483648 to 2147483647 (pulse)		
		For the speed/positioning control switching mode		
		• 0 to 214748364 7 (μm)		
		• 0 to 21474 83647 (inch)		
		• 0 to 21474 83647 (inch)		
		• 0 to 2147483647 (pulse)		
	Speed commands	0 01 to 6000000 00 (mm/min) 0 001 to 600000 000 (inch/min) 0 001 to 600000 000 (degree/min) 1 to 1000000 (pulse/s)		
	Acceleration and deceleration	Automatic trapezoidal acceleration and deceleration, Automatic S-pattern acceleration and deceleration		
	Acceleration and deceleration time	1 to 65535 (ms) 4 patterns can be set for both acceleration and deceleration		
	Deceleration time for emergency stop	1 to 65535 (ms)		
Compensation		Electronic gear, backlash compensation		
Home position return method		Near-zero point dog method, time-out method, stopper method		
Jog operation function		Provided		
Manual pulse generator operation function		Provided		
M code output function		Provided (WITH mode or AFTER mode can be selected)		
Error indication		17 segment indicator		
I/O indication		17 segment indicator and LED indicators		
Internal current consumption		5 VDC, 1.0 A		
Number of occupied I/O points		32 points (I/O allocation special, 32 points)		
Size (mm)[inch]		250 [9 84] (H) X 37 5 [1 48] (W) X 106 [4 17] (D)		
Weight (kg)[lb]		0 5 [1 1]		

*1 The sequence program can be transferred from the buffer memory to a flash ROM (backup possible)

3. I/O INTERFACE

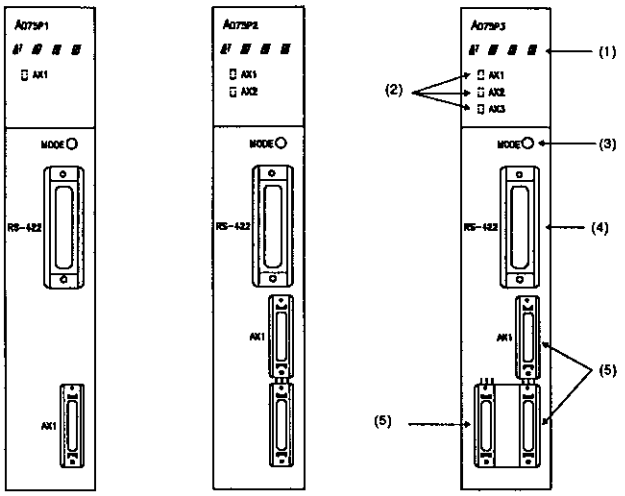
I/O	External Wiring	Pin No	Internal Wiring	Signal Name	Description
Input		7		Drive unit ready READY	(1) ON when the drive unit is normal and feed pulses can be accepted (READY status) (2) The AD75 checks the drive unit ready signal: if the ready status has not been established, it outputs a home position return request signal (3) Arrange for drive unit errors that make the unit inoperative, e g a control power supply fault, to set this signal OFF (HIGH) (4) Switching this signal OFF (HIGH) during positioning stops the operation Switching the signal back ON (LOW) will not restart the operation (5) When this signal goes OFF (HIGH) the home position return complete signal also goes OFF (HIGH)
		8		In-position signal INPOS	(1) Input the in-position signal from the drive unit
		26		Common	The input voltage is 24 VDC
		11		Near-zero point signal DOG	(1) Used to detect the near-zero point during home position return Comes ON when the near zero point dog signal is detected (LOW) ON / OFF Dog OFF → ON detected at leading edge Dog ON → OFF at trailing edge
		12		Upper limit LS FLS	(1) This is the limit switch installed at the upper limit of the stroke (2) Positioning stops when it comes ON (3) It is also required for execution of home position return retries
		13		Lower limit LS RLS	(1) This is the limit switch installed at the lower limit of the stroke (2) Positioning stops when it comes ON (3) It is also required for execution of home position return retries
		14		Stop signal STOP	(1) Switched ON (LOW) for 4 ms or longer to stop positioning (2) When this signal is input the AD75 stops the positioning it is executing and switches the start signal (START) OFF (HIGH) After this, positioning will not restart even if the STOP signal is switched from ON (LOW) to OFF (HIGH)
		15		Control switching signal CHG	(1) Used as the control switching signal in the speed/positioning control switching mode
		16		External start START	(1) The external start signal is used as the input signal for: 1 External positioning start 2 External speed change request 3 Skip request (2) Set the functions of extercal signals by parameter setting (3) In order for an external start signal to be effective, it must remain ON for 4 ms or longer
		17 18		Common	The input voltage is 24 VDC
		(+) 9 (-) 27		Manual pulse generator, phase A PULSER A	Input signal voltage level: 5 V +20% -10% HIGH level: Voltage 4 5 V or higer; Current 3 mA or higer LOW level: Voltage 1 0 V or lower; Current 0 mA Pulse width: 2 ms or longer; 1 ms or longer; 1 ms or longer (Duty ratio: 50%) Timing: The positioning address changes in the way indicated below in accordance with the pulses from the manual pulse (Address incremented) Phase A, Phase B, Positioning address +1 +2 (Address decremented) Phase A, Phase B, Positioning address 1 2 Phase difference: Parse A, Parse B, 0 5 ms or shorter If phase A is more advanced than phase B the positioning address (present value) is incremented Input pulse rise time/fall time: 500 µs or less
		(+) 10 (-) 28		Manual pulse generator, phase B PULSER B	
		(24 V) 6 (5 V) 24		Zero phase signal PG0	(1) Used as the home position signal in home position return operations: the zero phase grid signal of the pulse encoder is normally used LOW at zero (2) This signal is used too if the home position return method is the stopper method and the home position return complete signal is input from an external source
		25		Common	The input voltage is 24 VDC/5 VDC
Output		5		Deviation counter clear CLEAR	(1) This signal is output after completion of home position return and resets the acumulated pulses in the deviation counter at the drive unit side Example: Home position return method: stopper method (2) Home position return speed, Creep speed, v, t, Near zero point dog, Home position detection signal, CLEAR, 10 ms (second time), Stop after feed pulse output
		23		Common	Load voltage 5 VDC to 24 VDC
		1 19		CW Phase A PULSE	Open collector output (5/24 V)
		3 21		CW Phase A PULSE	Differential drive equivalent to Am62LS31
		2 20		CCW Phase B SIGN	Open collector output (5/24 V)
		4 22		CCW Phase B SIGN	Differential drive equivalent to Am62LS31

Explanation of the relationship between the mode set by parameter and pulse output

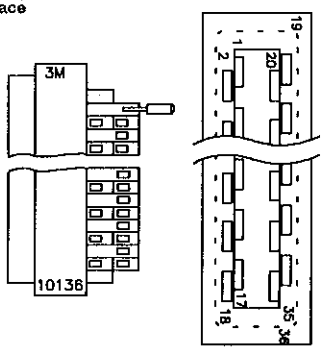
Mode selection	Forward	Reverse
CW CCW		
A ϕ B ϕ		
PULSE SIGN		

4. NOMENCLATURE

This section gives the name of each part of the AD75



Front face of AD75P1 Front face of AD75P2 Front face of AD75P3

No	Name	Explanation
(1)	17 segment LED	• Indicates the operating status • Displays the message for the specified mode when the mode switch is pressed. (See Section 4.1)
(2)	Axis indicator LEDs AX1 to AX3	• Indicate the status of the axis corresponding to the message displayed by the 17-segment LED indicator (See Section 4.1)
(3)	Mode switch	Repeatedly pressing this switch causes the mode to change in the cycle indicated below Operation monitor 1 → Operation monitor 2 → Internal information 1 → Internal information 2 → Internal information 3 → Internal information n → Operation monitor 1
(4)	RS 422 connector	Used for connection to a peripheral device
(5)	36-pin connector	Used for connection to the drive unit The applicable wire size for connection to the connector is AWG24 to 30 (0 2 to 0 05) The pin arrangement of the connector for external wiring provided as an accessory is shown below Connect the power supply by referring to the I/O interface  The pin arrangement as seen from above is shown here The connector pins are designated 1 to 36

4 1 Indications of 17-Segment and Axis LED Indicators

When the power supply to the PC is switched ON, the "operation monitor 1" indication shown below is executed When the mode switch is pressed, the message and status of the specified mode are indicated.

Mode	17-Segment LED	Axis Indicator LED
Operation monitor 1	When no error has occurred	
	Gives one of the following indications: RUN (normal) TEST (test mode in effect)	OFF
	If an error has occurred	
	Gives the indication below Indication: ERR	The LED corresponding to the axis the error relates to lights
Operation monitor 2	Indicates the operating status of the axis whose indicator LED is lit (See Section 4 1 1)	The relevant AXn indicators are lit successively for 1 second each
Internal information 1	Indicates the OS type information Indication: S***	OFF
Internal information 2	Indicates the OS version information Indication: V***	OFF
Internal information 3	Indicates the user data number set by the user Indication: P***	OFF
Internal information n	Indicates the signal name selected with the mode switch (See Section 4 1 2)	Lights when the selected signal is ON

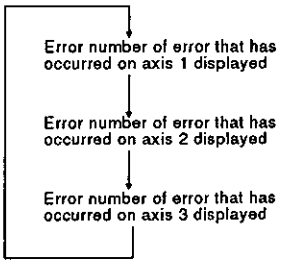
Remark "***" in the table indicates arbitrary data

4 1 1 Contents of Operation Monitor 2 Message

<Message>	<Explanation>
IDLE	On standby (operation starts from the beginning when start signal received)
STOP	Operation stopped (restarts when start signal received)
JOG	JOG operation in progress
HNDL	Manual pulse generator operation in progress
RTN	Home position return in progress
POSI	Positioning control in progress
SPED	Speed control in progress
S- P	Speed control in progress in speed/positioning control
S -P	Positioning control in progress in speed/positioning control
BUSY	Waiting, e g for condition
E***	Error has occurred

Error number display

If errors have occurred on more than one axis, the error numbers for each of the axes are indicated in sequence for one second each
(The example sequence to the right shows a case where there are errors on three axes)



4 1 2 Signal name of internal information n

Repeatedly pressing the mode switch switches the displayed message in the following sequence

<Signal name>	<Explanation>
SVON	Servo ON
↓	
Z-ON	Zero-phase signal
↓	
ULMT	Upper limit signal
↓	
LLMT	Lower limit signal
↓	
S-P	Speed/positioning switching signal
↓	
KDOG	Near-zero point dog ON

4 1 3 Explanations of other messages

The following messages may be displayed on the 17-segment LED indicator regardless of the mode

<Message>	<Explanation>
FALT	Watchdog error or other error has occurred
HDOG	Watchdog error or other error has occurred

5. HANDLING

5. HANDLING

The following handling instructions apply to the AD75 in isolation

(1) The case of the module is made of plastic Do not drop it or subject it to strong impact

(2) Make sure that no conductive debris such as drilling chips enters the module during wiring If anything does enter the module, remove it

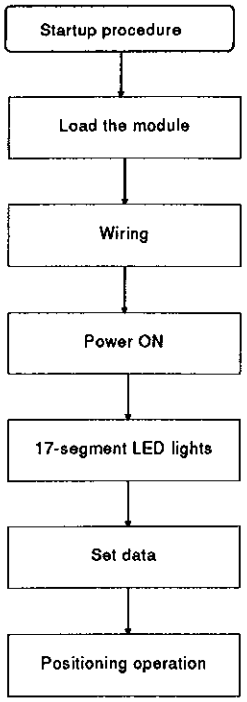
(3) Switch off the power to the PC before loading the module on the base or removing it from the base

(4) Switch off the power to the PC and drive unit before connecting or disconnecting the drive unit connector The connector must be engaged in the correct orientation Check the orientation, and keep it straight and square while connecting it
If no drive unit is connected, the connector cover must be fitted

6. STARTUP PROCEDURE

6. STARTUP PROCEDURE

The following is a brief guide to the procedure for starting up the AD75
For details, see the User's Manuals for the A1SD75P1/P2/P3, AD75P1/P2/P3 models



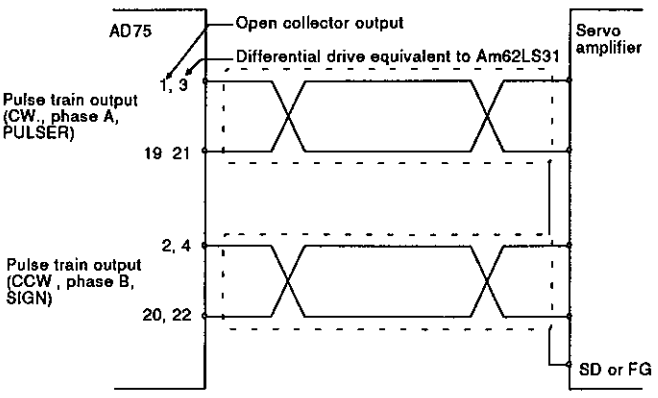
Refer to the I/O interface

Set the parameters, home position return data, and positioning data

7. WIRING PRECAUTIONS

7. WIRING PRECAUTIONS

(1) If the environment is such that there is likely to be a lot of noise in the wiring connecting the AD75 and servo amplifier, use twisted-pair shielded cable - independent of other shielded wiring - for the wiring from the pulse train output terminals of the AD75



8. OUTSIDE DIMENSIONS

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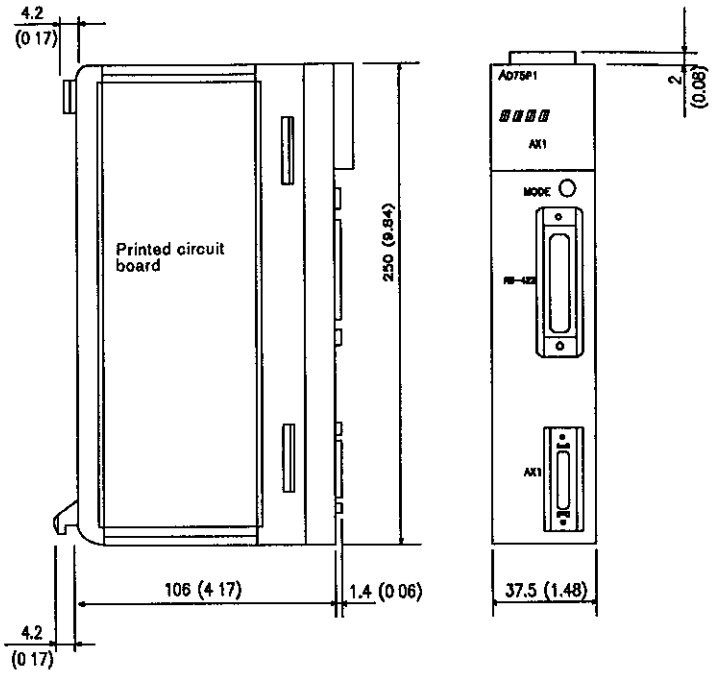

Unit: mm(inch)

The AD75P1 is shown here

* The outside dimensions are the same for AD75P1/P2/P3

REVISION

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Aug.,1995	

INPORTANT

(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 will 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 and non-grounded tools etc