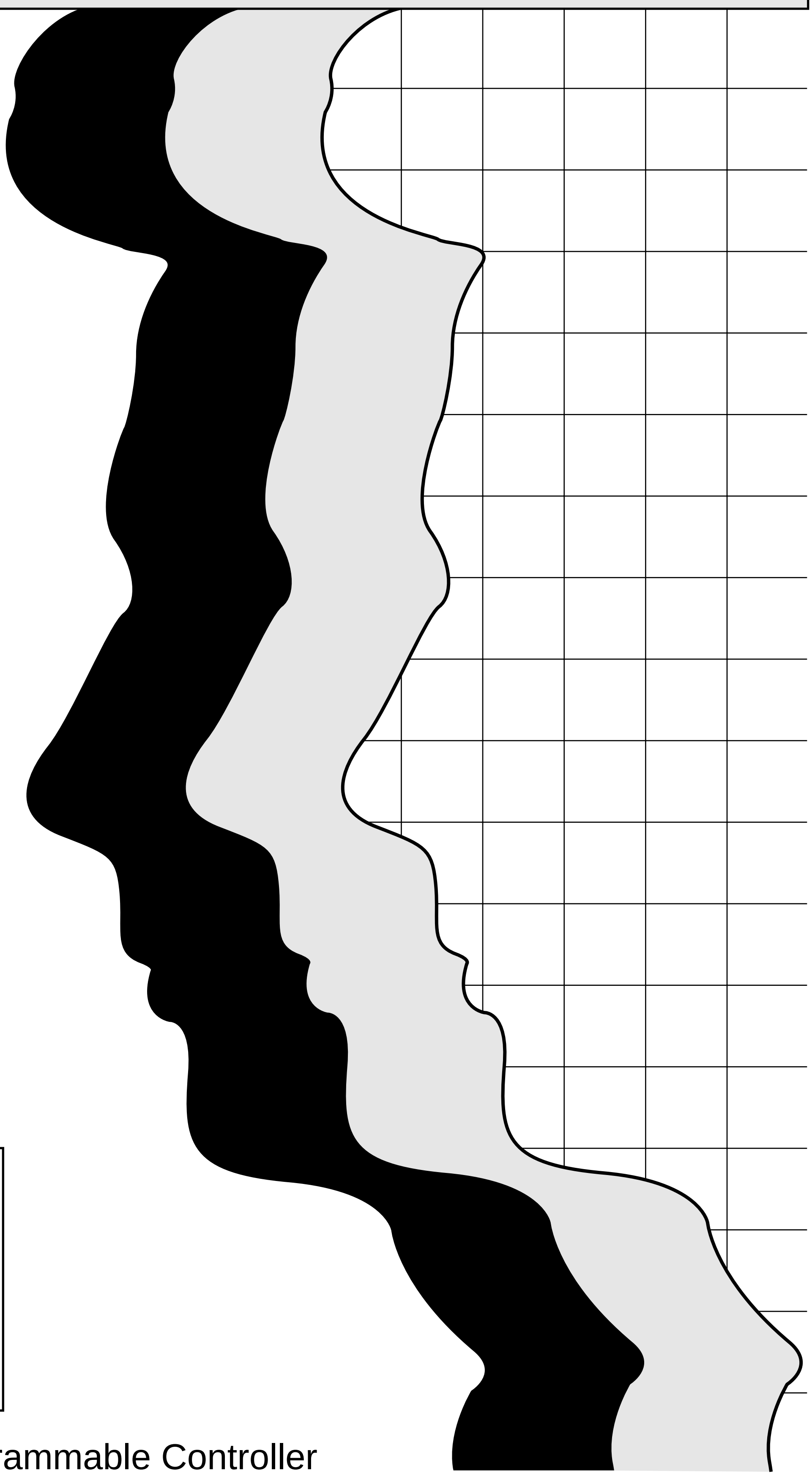
MITSUBISHI

Positioning Module
type A1SD75P1/P2/P3, AD75P1/P2/P3

# User's Manual



Mitsubishi Programmable Controller

## REVISIONS

*The manual number is given on the bottom left of the back cover.

| Print Date | *Manual Number | Revision |
|---|---|---|
| Nov., 1995 | IB (NA) 66589-A | First edition |
| May, 1996 | IB (NA) 66589-B | Overall, revision, additions/modifications made.<br>Addition<br>3.4.7, 3.6.6, APPENDIX 4 to APPENDIX 6<br>Correction<br>CONTENTS, 1.3, 2.1, 2.5, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.3.5, 3.3.8, 3.3.9, 3.3.10, 3.3.11, 3.3.12, 3.3.15, 3.3.18, 3.3.19, 3.3.21, 3.3.23, 3.3.24, 3.4.5, 3.5.2, 3.6.1, 3.6.2, 3.6.4, 5.1,<br>Program example of Chapter 6 to Chapter 11, 13.1 |
| | | |

# SAFETY CAUTIONS

(You must read these cautions before using the product)

In connection with the use of this product, in addition to carefully reading both this manual and the related manuals indicated in this manual, it is also essential to pay due attention to safety and handle the product correctly.
The safety cautions given here apply to this product in isolation. For information on the safety of the PC system as a whole, refer to the CPU module User's Manual.
These **SAFETY CAUTIONS** are classified into two grades: "DANGER" and "CAUTION".

| | |
|---|---|
| **DANGER** | Safety caution given when incorrect handling could result in hazardous situations involving the possibility of death or serious injury. |
| **CAUTION** | Safety caution given when incorrect handling could result in hazardous situations involving the possibility of moderate or light injury or damage to property. |

Note that, depending on the circumstances, failing to follow a **CAUTION** may also have very serious consequences.
Both of these classes of safety caution are very important and must be observed.
Store this manual carefully in a place where it is accessible for reference whenever necessary, and forward a copy of the manual to the end user.

[Cautions on Design]

**DANGER**

- To ensure that the system as a whole will continue to operate safety 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 machine, such as an emergency stop circuit, 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 porameters.

**CAUTION**

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

[Cautions on Installation]

**DANGER**

- 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 malfuncitons, 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).

[Cautions on Disposal]

**CAUTION**

- Dispose of this product as industrial waste.

# 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.

## CONTENTS

## About Manuals

The manuals related to this positioning module are listed below.
Please order those you require.

### Related Manuals

| Manual Title | Manual No. (Type Code) |
|---|---|
| AD75P1/P2/P3 Type Positioning Module User's Manual (Hardware)<br>Describes the performance specifications, I/O interface, nomenclature and start-up procedure of the AD75P1/P2/P3 type positioning modules. (Packed with the module) | IB-66585 |
| A1SD75P1/P2/P3 Type Positioning Module User's Manual (Hardware)<br>Describes the performance specifications, I/O interface, nomenclature and start-up procedure of the A1SD75P1/P2/P3 type positioning modules. (Packed with the module) | IB-66584 |
| SW0IVD-AD75P Type Positioning Module Software Package Operating Manual<br>Describes how to use the above software package to create and transmit data (parameters, positioning data, etc.) to a positioning module, and perform positioning monitoring and testing. (Packed with each software package) | IB-66596 |

## Manual Organization

This manual contains the general description, specifications, and details on functions and their use, connection to external devices, and the programming method, for the positioning modules indicated in Chapter 1.

(1) Chapter 1
Gives a general description of each positioning function, and the features of the positioning module.

(2) Chapter 2
Describes the system configuration and devices required for positioning, and gives the precautions on system configuration.

(3) Chapter 3
Describes the specifications and functions of the positioning module, and I/O signals from/to the PC CPU and buffer memory.

(4) Chapter 4
Describes the start-up procedure, handling and operation of the positioning module, and wiring with external devices.

(5) Chapters 5 to 11
These sections describe the software settings and programming required to use each function, including home position return and positioning.

(6) Chapter 12
Describes the program to set clock data, parameters, home position return data, positioning data and start information, from a sequence program.

(7) Chapter 13
Describes error and warning codes displayed when errors occur, and troubleshooting.

(8) APPENDICES
Describe the processing time of the positioning module, examples of connections to external devices, etc.

**POINT**

This manual describes the functions and method of use of the AD75P3 and A1SD75P3, both of which control three axes.
When using a positioning module controlling two axes or one axis, ignore the descriptions relating to these modules.
(Example) When using an AD75P1 or A1SD75P1, ignore the information relating to the following:
- Interpolation operation, simultaneous start
- I/O signals and buffer memory for controlling second and third axes
- Positioning parameters and data for controlling second and third axes

# 1. GENERAL DESCRIPTION

This manual describes the specifications, start-up procedure, positioning functions and their use, and programming method of the positioning modules indicated below (hereafter called the AD75).

| Number of Controllable Axes | Module Type | |
|---|---|---|
| | For Building Block Type | For Compact Building Block Type |
| 1 axis | AD75P1 | A1SD75P1 |
| 2 axes | AD75P2 | A1SD75P2 |
| 3 axes | AD75P3 | A1SD75P3 |

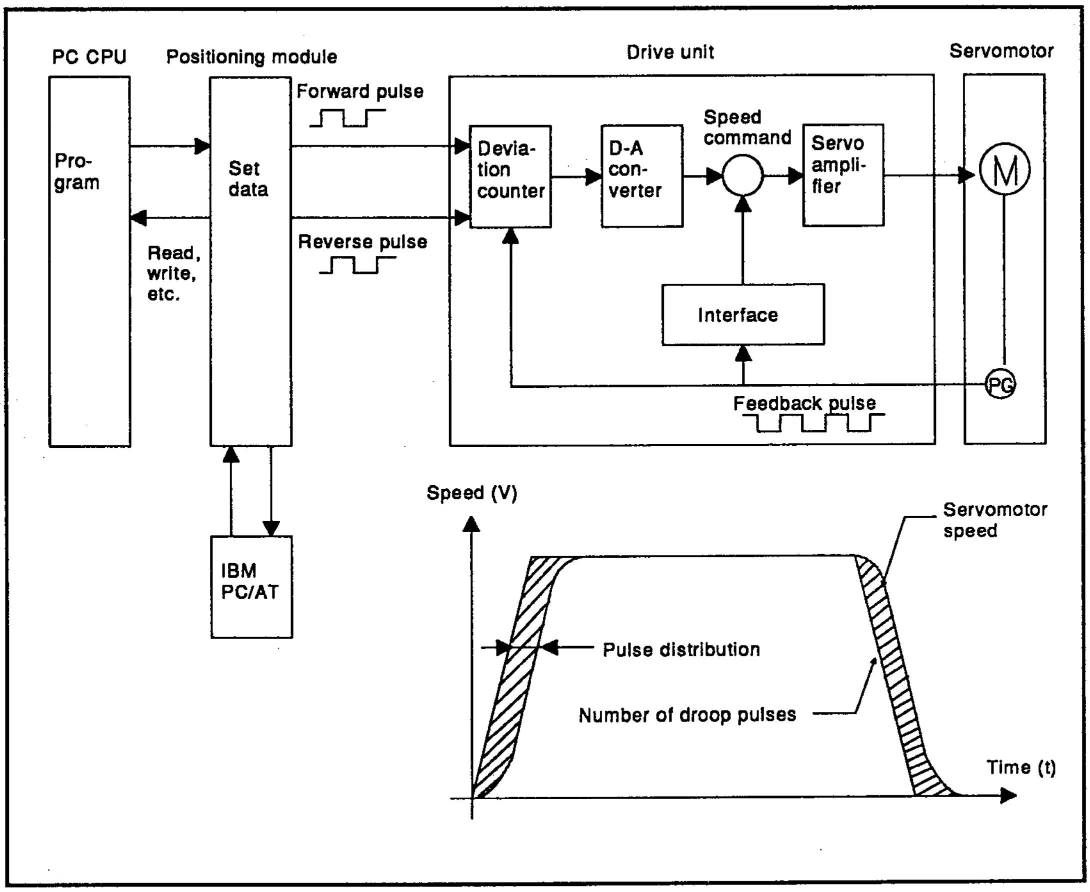



**Fig. 1.1 Positioning Control Block Diagram**

## 1.1 Features

The AD75 has the following features:

(1) Wide variety of positioning modules for 1-axis to 3-axis control

(a) A wide variety of positioning modules (six types) are available for 1-axis to 3-axis control.
The most suitable positioning module for the PC CPU type and the number of axes to be controlled can be selected.

(b) Two or more AD75s can be mounted at the same base unit slot, and the number of PC CPU I/O points occupied by each module is 32.
Any number of modules can be mounted provided the number of occupied I/O points they require exceeds the number of points available at the PC CPU.

(2) Diverse positioning control functions

(a) The AD75 incorporates diverse functions that enable the positioning system to control positioning to any specified position and execute fixed-pitch feed control, constant speed control, etc.
Section 1.2 outlines each of the positioning control functions.

1) Up to 600 data items, including positioning addresses, control method and operation pattern, can be set per axis.
This positioning data is used to position each axis in "independent operation" and "multi-axis (simultaneous) operation".

2) Linear control can be performed during positioning of each axis (simultaneous linear control of three axes is possible), and positioning can be executed on the basis of a single positioning data setting or by consecutively processing two or more data settings.

3) In multi-axis positioning, linear interpolation control and circular interpolation control can be performed with two axes. Positioning on each axis can be executed on the basis of a single positioning data setting or by consecutively processing two or more data settings.

(b) Position control, speed control or speed/position switching control can be specified as the control method for positioning data.

(c) The operation pattern set by the user as positioning data allows continuous positioning on each axis or on two or more axes on the basis of multiple positioning data settings.
These multiple positioning data settings are contained in a "block", and continuous positioning extending over more than one block is possible.

(d) Improved home position return control

1) Six home position return methods - near-zero point dog (one type), stopper (three types) and count (two types) - are available.

2) A home position return retry function is provided for positioning from any position to the machine home position.

(e) Either automatic trapezoidal acceleration/deceleration or S-pattern acceleration/deceleration can be selected as the acceleration/deceleration method.

(3) Faster start processing

Faster processing at the start of positioning has reduced the start processing time to 20 ms.
There is no delay between the axes when a simultaneous start is executed (independent operation, interpolation operation).

(4) Faster pulse output and longer distance between the module and the drive unit

(a) The AD75 is equipped with a differential driver pulse output interface and an open collector pulse output interface.
Connect the drive unit to the correct interface for the type of drive unit.

(b) Connecting the AD75 to a differential driver increases the pulse output speed and the possible communication distance.

- When connecting the AD75 to a differential driver
  : 400 kpps, max. 30 m
- When connecting the AD75 to an open collector
  : 200 kpps, max. 3 m

(5) Easy maintenance

The following points facilitate the maintenance of the AD75:

(a) Positioning data, parameters and other data are stored in the internal flash ROM of the AD75.
The data can therefore be retained without a battery.

(b) A 17-segment display shows errors, mechanical system input status and zero point input status.

(c) Errors are categorized to improve primary diagnosis performance.

(d) Since up to 16 of latest errors or warnings can be stored for each axis, it is easy to identify any error or warning which has occurred.

## 1.2 General Description of Positioning Control Functions

This section describes the AD75's positioning control functions.

### 1.2.1 Positioning control

Positioning on the basis of the positioning data is described below.

(1) Linear positioning control

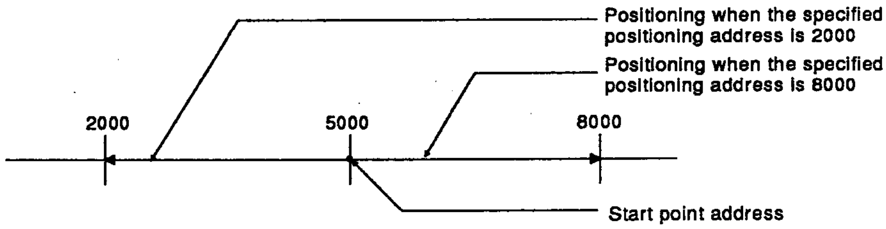
(a) 1-axis linear positioning control

This function controls positioning of a selected axis from the start point address (present stop position) to the specified position.

**Control by absolute data method**

1) This method controls positioning from the start point address to the specified positioning address.
2) The travel direction depends on the start point and specified positioning addresses.

[Example]
The figure below shows positioning control when the start point address is 5000 and the specified positioning addresses are 2000 and 8000.

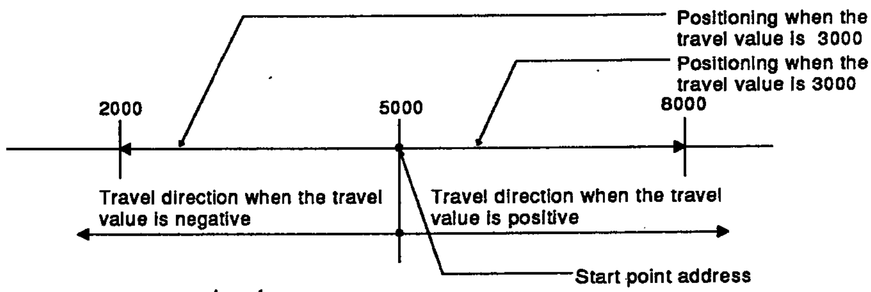



**Control by incremental method**

1) This method controls positioning for the specified travel value from the start point address.
2) The travel direction depends on the travel value sign.

- + travel direction ..... Positioning in forward direction (direction in which addresses increase)
- – travel direction ..... Positioning in reverse direction (direction in which addresses decrease)

[Example]
The figure below shows positioning control when the start point address is 5000 and the specified travel values are 3000 and -3000.



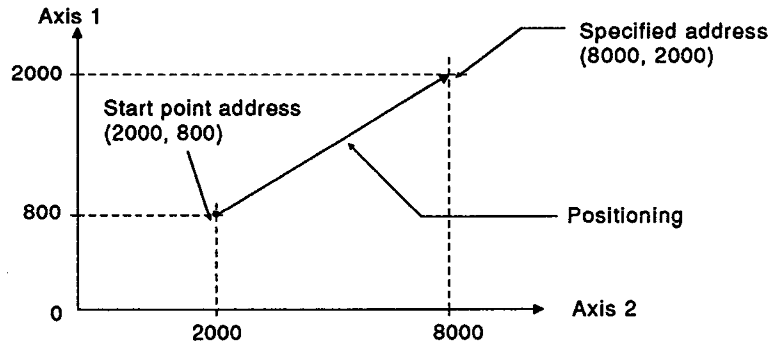
(b) 2-axis linear interpolation control *

This function performs linear interpolation control from the start point address (present stop position) using two specified axes.

Control by absolute data method

1) This method uses two axes to perform linear interpolation from the start point address to the specified positioning address.
2) The travel direction depends on the start point and specified positioning addresses of each axis.

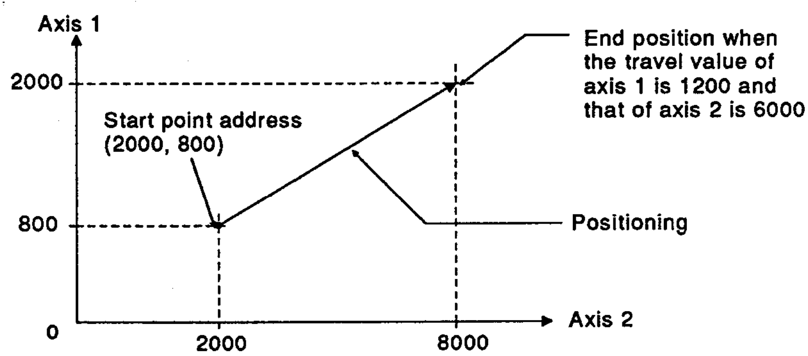
[Example]
The figure below shows positioning control when the start point address and specified positioning address of axis 1 are 800 and 2000 and those of axis 2 are 2000 and 8000.




Control by incremental method

1) This method controls positioning from the start point address to the position determined by the travel direction and distance specified for each axis.
2) The travel direction of each axis depends on the travel value sign.
   - + travel value .......... Positioning in forward direction (direction in which addresses increase)
   - - travel value ........... Positioning in reverse direction (direction in which addresses decrease)

[Example]
The figure below shows positioning control when the start point address and specified travel value of axis 1 are 800 and 2000 and those of axis 2 are 2000 and 8000.




**REMARK**

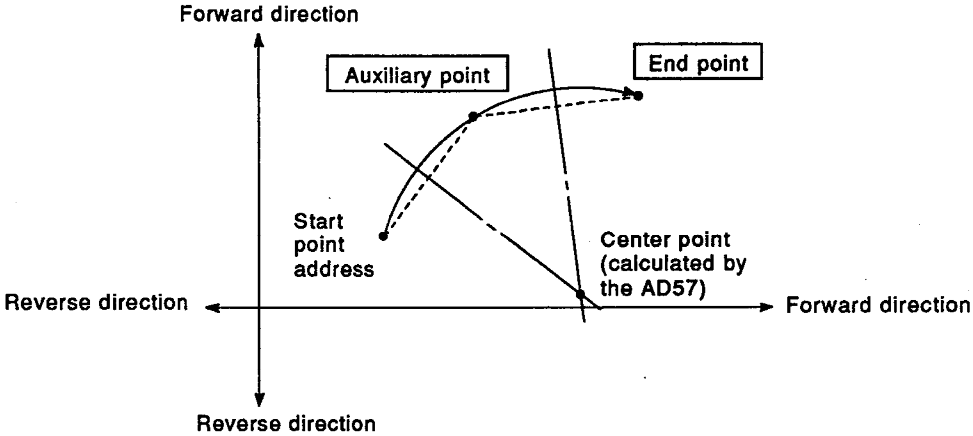
The interpolation speed for linear interpolation can be designated as either the "resultant speed" or "reference axis speed" in the extended parameter settings.
(For details on the extended parameters, See Section 3.4.2.)

(2) Circular interpolation positioning control *

Circular interpolation positioning control is classified into circular interpolation by designating an auxiliary point, and circular interpolation by designating a center point.

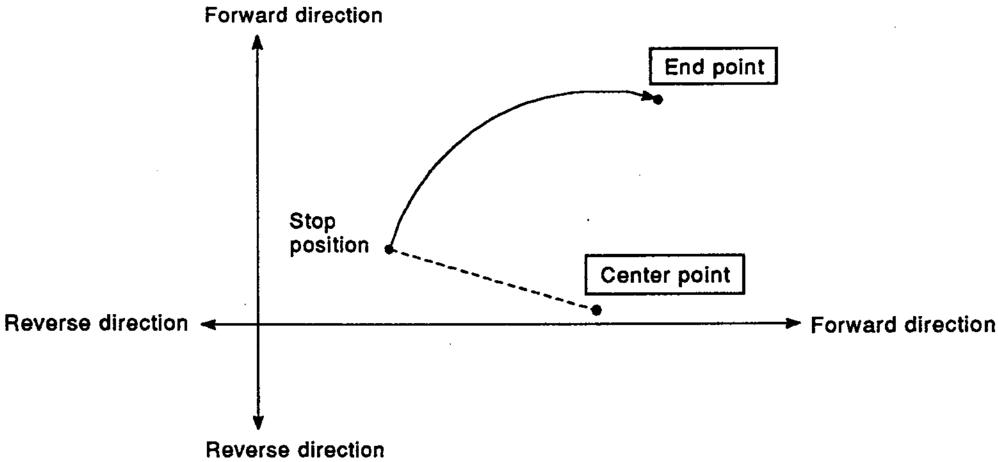
(a) Circular interpolation control by specifying an auxiliary point

This circular interpolation control is performed by designating an end point and an auxiliary point (pass point) for circular interpolation. The absolute data method or incremental method can be used.




(b) Circular interpolation control by designating a center point

This circular interpolation control is performed by designating the end point and center point of a circle for circular interpolation. The absolute dada method or incremental method can be used. The clockwise or counter-clockwise direction can be selected.

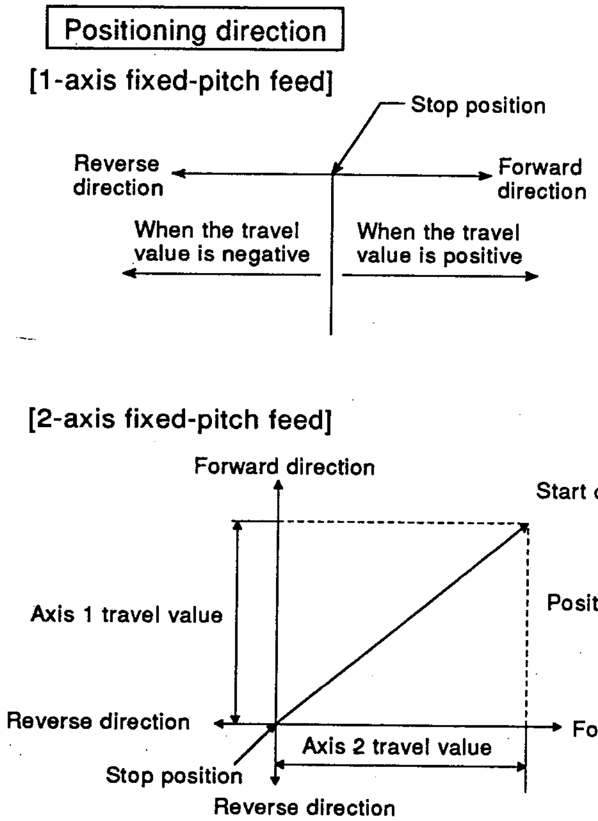


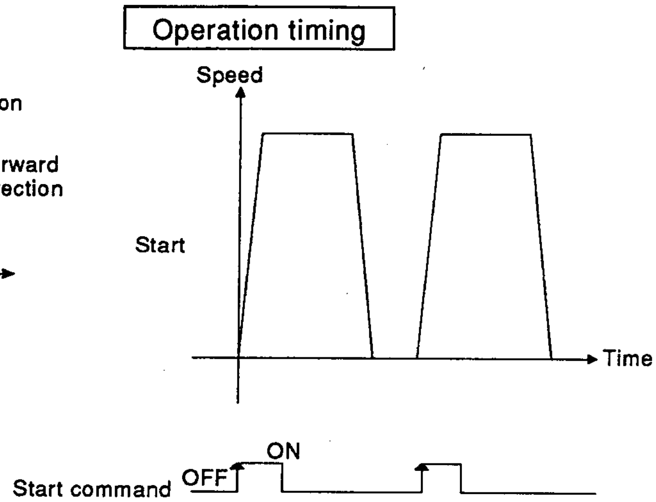

**REMARK**

The interpolation speed for arc interpolation can be designated as either the "resultant speed" or "reference axis speed" in the extended parameter settings.
(For details on the extended parameters, See Section 3.4.2.)

(3) Fixed-pitch feed control

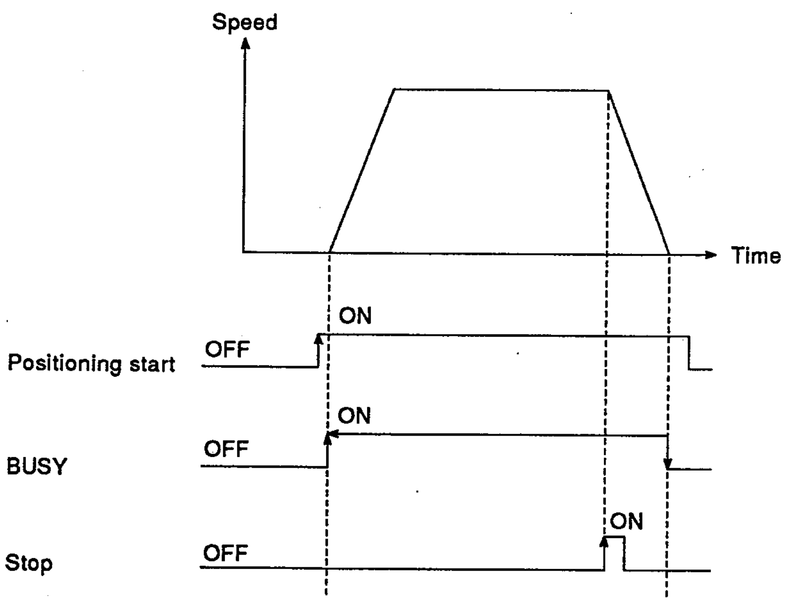
This function controls positioning for a specified travel value.
One-axis fixed-pitch feed control and fixed-pitch feed control by 2-axis linear interpolation are available.



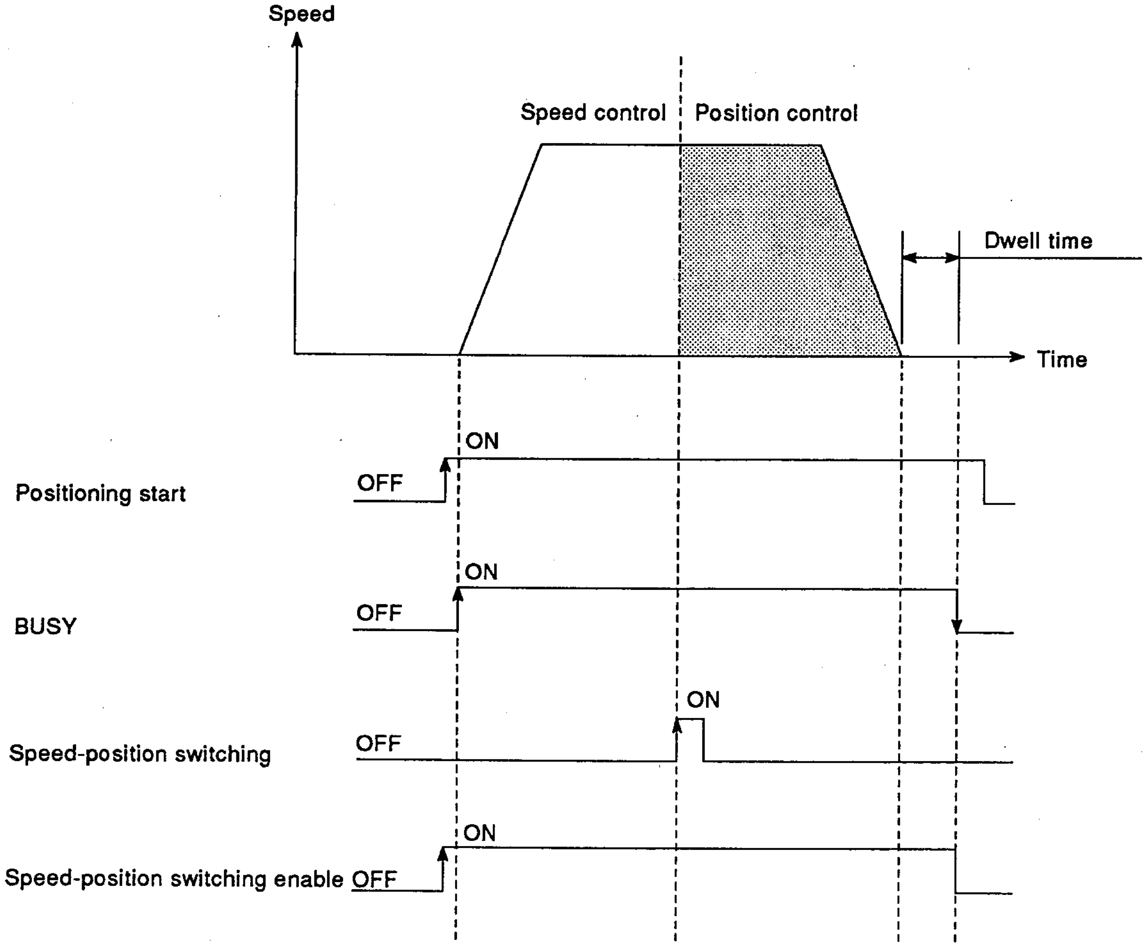

(4) Speed control

Positioning control is performed at the command speed until a stop command is issued after execution of an instruction



(5) Speed-position switching control

When a speed-position switching signal is input during speed control positioning, the control mode switches to position control to perform positioning for a specified travel value.



### 1.2.2 Individual positioning/continuous positioning control

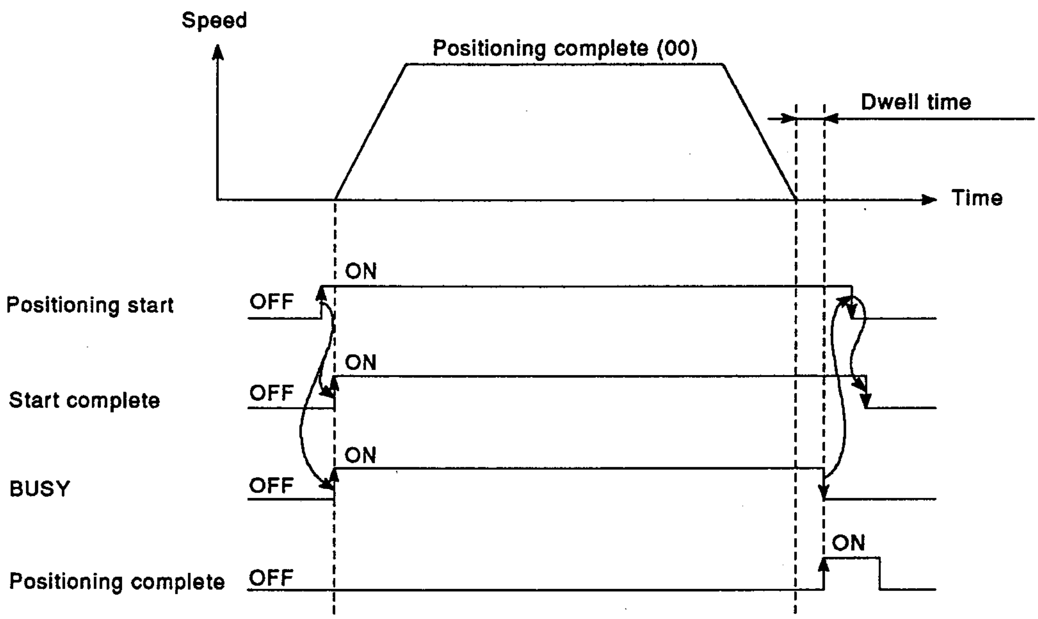
The AD75 performs positioning control according to a set of positioning data set by the user, including control method (position control, speed control or speed-position switching control), positioning addresses and operation pattern.

Up to 600 positioning data can be stored per axis in positioning data Nos. 1 to 600 of the AD75.

Whether positioning according to single positioning data setting or continuous positioning using multiple positioning data settings is performed depends on the operation pattern set by the user as positioning data.

(1) Individual positioning control
(operation pattern = 00: positioning complete)

On completion of positioning in accordance with the specified positioning data, the system stops positioning.
Individual positioning control is also used as the operation pattern for the final positioning data in continuous positioning and continuous locus positioning on completion of positioning in accordance with this operation pattern.

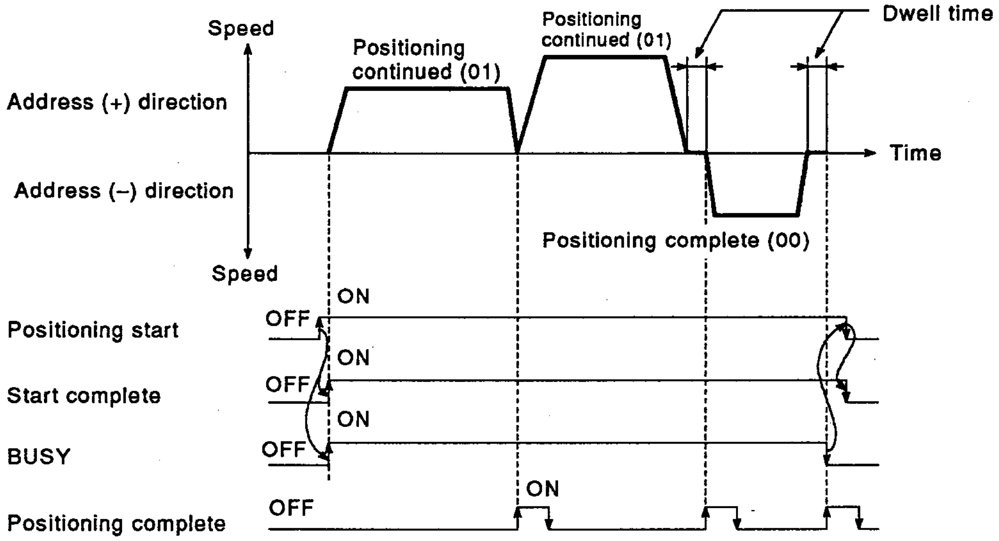



**REMARK**

Up to 100 positioning data (positioning data No.1 to 100) per axis can be set in the AD57 buffer memory with the sequence program.

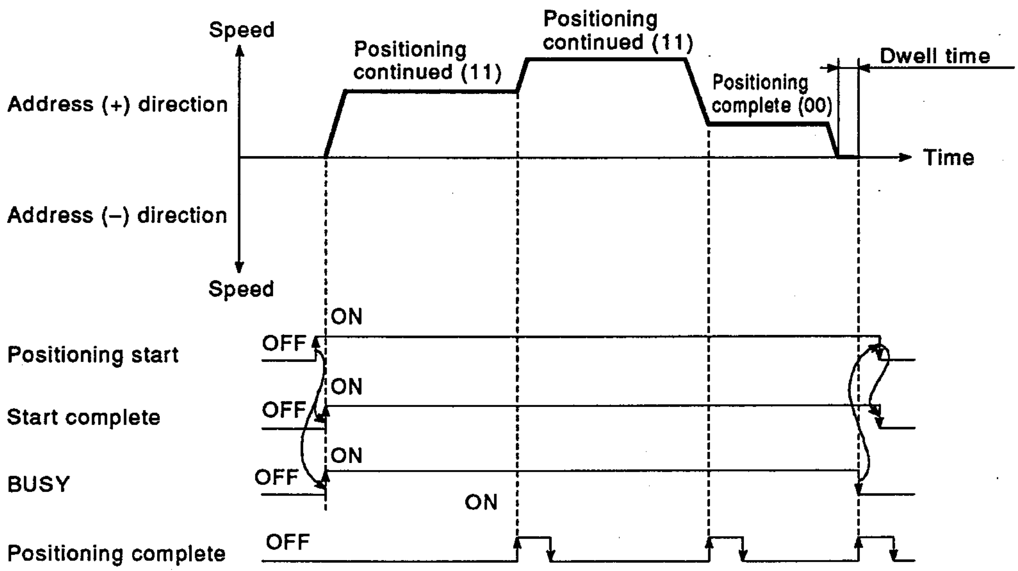
(2) Continuous positioning control
(operation pattern = 01: positioning continued)

The system temporarily stops positioning on completion of positioning using specified positioning data, then restarts positioning based on the data of the next positioning data number.
This mode is selected to perform continuous positioning with direction changes, based on multiple positioning data settings with consecutive numbers.




(3) Continuous locus positioning control
(operation pattern = 11: positioning continued)

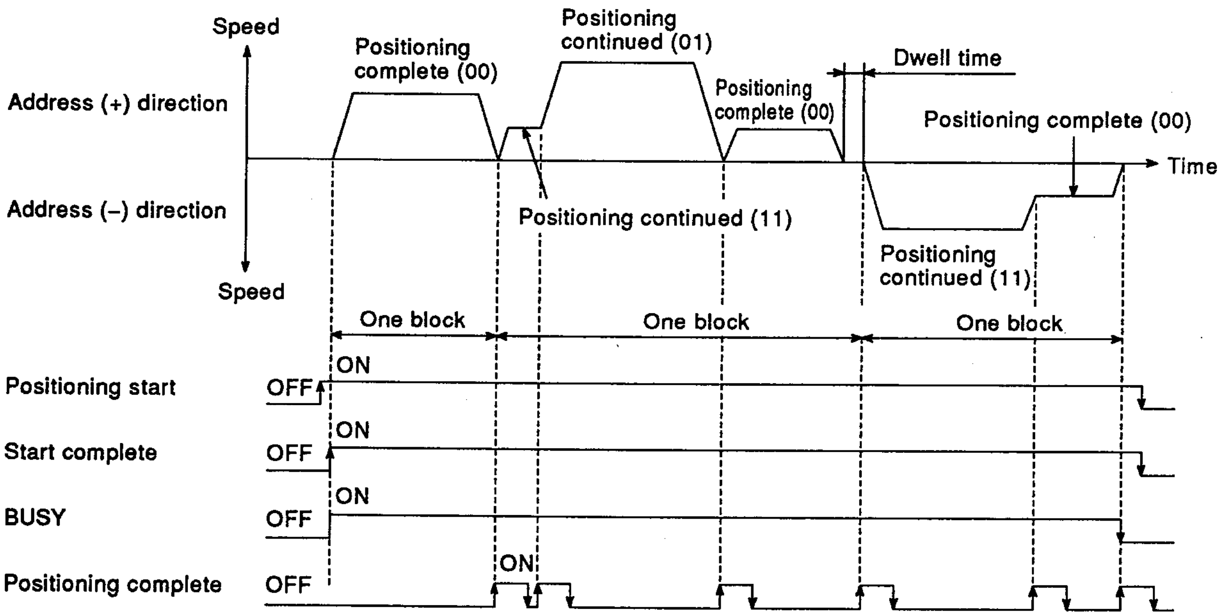
After executing positioning using specified positioning data, the system continues positioning at the speed specified for the next positioning data number.
This mode is selected to perform continuous positioning at a specified speed, based on multiple positioning data settings with consecutive numbers.



### 1.2.3 Block positioning control

The block positioning control function allows consecutive execution of a number of specified blocks.
A "block" is a single positioning control sequence up to "positioning complete" (operation pattern = 00) in the individual positioning or continuous positioning control mode.
Up to 50 blocks can be specified per axis.

This function allows complicated positioning control to be performed with only one start command from the ACPU or an external device.
To execute block positioning control, the positioning start number and its information must be written to the buffer memory.



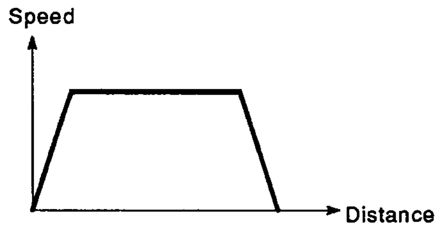
### 1.2.4 Acceleration/deceleration processing

During positioning, manual pulse generator operation, home position return or JOG operation, acceleration/deceleration processing takes place according to the user-specified method and acceleration and deceleration times.

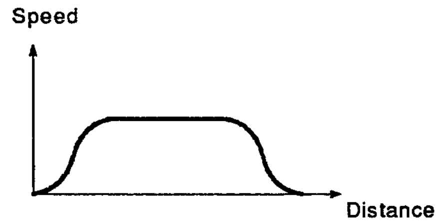
(1) Acceleration/Deceleration method

There are two acceleration/deceleration methods, "automatic trapezoidal acceleration/deceleration" and "S-pattern acceleration/deceleration": the method used is selected in the detailed parameter settings. The specified acceleration/deceleration processing method applies to acceleration/deceleration in all of the following operations: positioning, home position return, JOG operation start and end, speed change, etc.

(a) Automatic trapezoidal acceleration/deceleration method
This method performs linear acceleration and deceleration based on the user-set acceleration and deceleration times and the speed control limit.




(b) S-pattern acceleration/deceleration method
This method reduces the load on the motor when it starts and stops. Gradual acceleration/deceleration is performed based on the user-set acceleration and deceleration times, speed control limit and S-curve ratio (1 to 100%).




(2) Acceleration time, deceleration time, rapid stop/deceleration time

(a) Up to four acceleration times (1 to 65535 ms) and deceleration times (1 to 65535 ms) for positioning control can be specified when setting basic parameters and extended parameters.

- Acceleration time ......... Time required to accelerate from 0 to the speed control limit.
- Deceleration time ......... Time required to decelerate from the speed control limit to 0.

(b) Specify the rapid stop deceleration time (1 to 65535 ms) when setting the extended parameters.

### 1.2.5 Restart

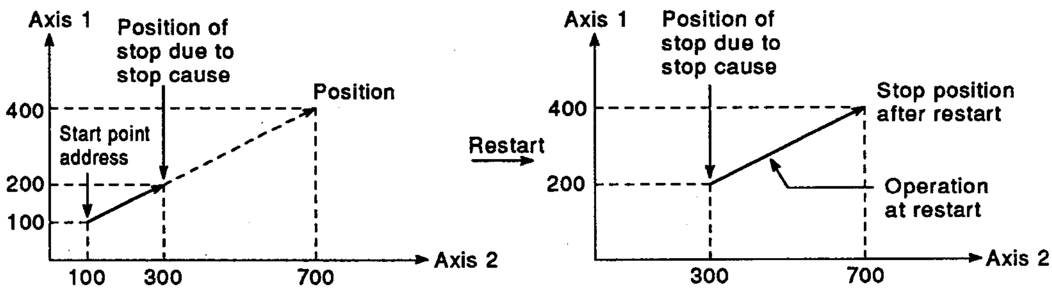
The restart command enables the machine to restart and move to the end point of the positioning data if the machine comes to a stop during positioning control due to a stop cause.

(1) When there is a restart command in the buffer memory

(a) When the axis is at a stop, positioning restarts from the present axis position and continues to the end point of the positioning data regardless of whether the absolute data method or incremental method is selected.

(b) When the axis in a state other than stopped or on standby, a restart disabled warning (error code: 104) is triggered and the restart command is ignored.

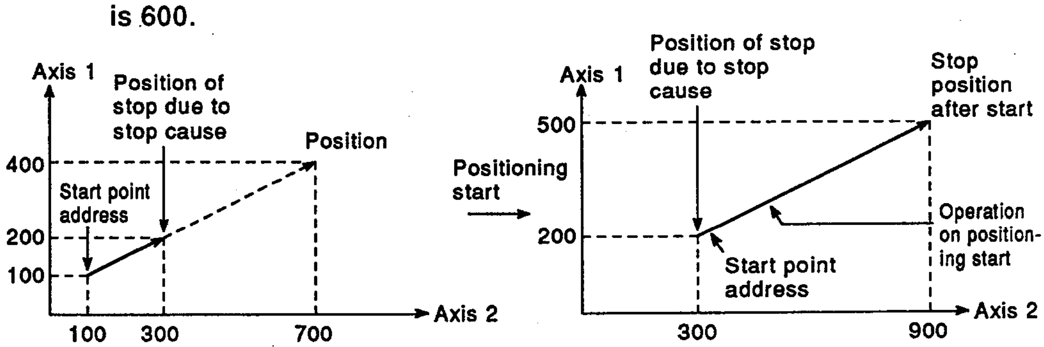
[Incremental method]
Operation when the axis 1 travel vale is 300 and the axis 2 travel value is 600.




(2) When a positioning start signal (Y10 to Y12) or external start signal is turned ON

When the axis is on standby or at a stop, positioning restarts from the beginning of the positioning start data regardless of whether the absolute data method or incremental method is selected (same as regular positioning).

[Incremental method]
Operation when the axis 1 travel value is 300 and the axis 2 travel value is 600.



### 1.2.6 Home position return

The home position return function is used to confirm that the machine is at the home position when the power is switched on, etc.

There are six home position return methods.

(1) Near-zero point dog method (one type)

This method stops axis motion in response to a zero-point signal after the near-zero point dog has gone OFF.

(2) Stopper method (three types)

(a) Stopper (1) (on lapse of dwell time)

In this method home position return is completed on elapse of the dwell time after axis motion has been decelerated by turning ON the near-zero point dog, then stopped by the stopper.

(b) Stopper (2) (by zero-point signal issued when the machine contacts the stopper)

In this method home position return is completed on receipt of the zero-point signal after axis motion has been decelerated by turning ON the near-zero point dog, then stopped by the stopper.

(c) Stopper (3) (method without a near-zero point dog)

In this method home position return is completed on receipt of the zero-point signal after travel at the creep speed and stopping of axis motion by the stopper.

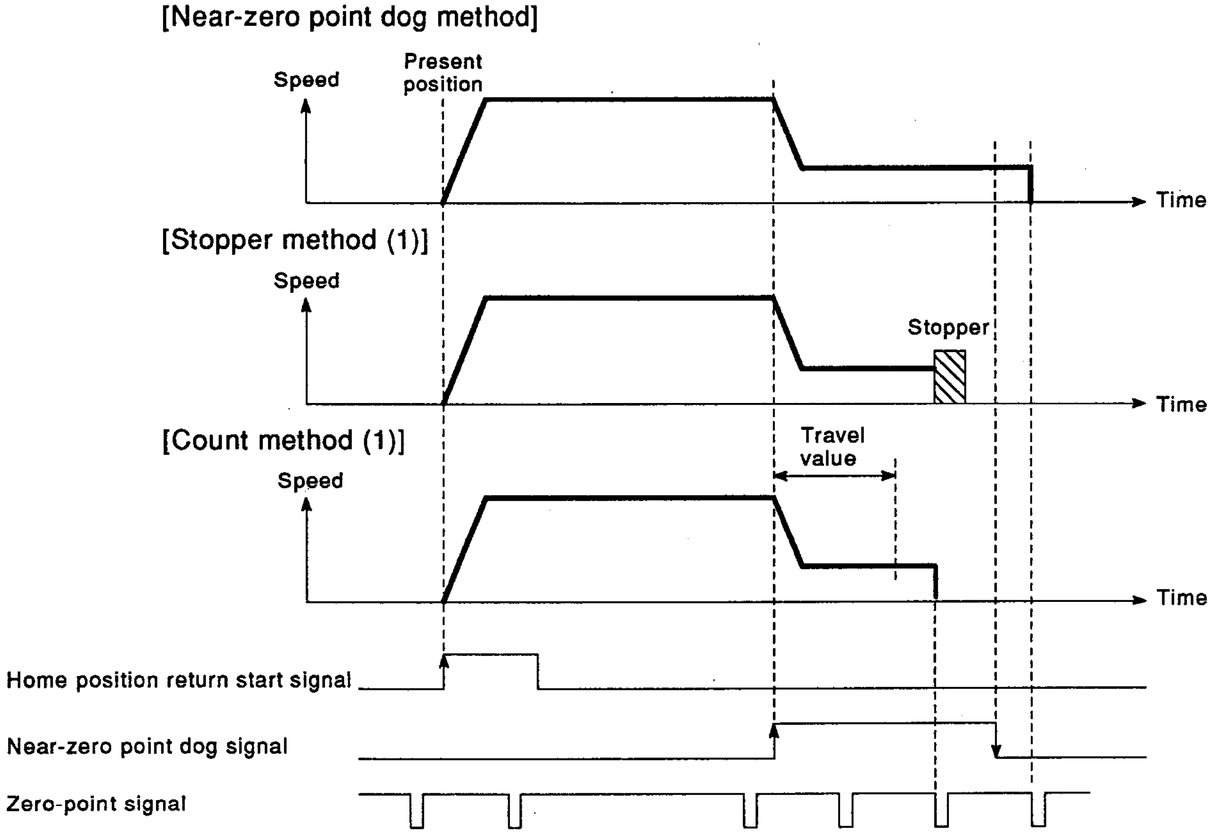
(3) Count method (two types)

(a) Count method (1) (using a zero-point signal)

In this method, axis motion is stopped by a zero-point signal which is issued after travelling for the specified travel value after the near-zero point dog has come ON.

(b) Count method (2) (not using a zero-point signal)

In this method, axis motion is stopped as soon as the machine has traveled for the specified travel value after the near-zero point dog has come ON.




**REMARKS**

1) Home position return can be performed by the home position return retry function using upper and lower limit switches.

2) After the home position has been established by using the home position return function, it is possible to travel until the machine feed value is equal to the home position address. (This process is the same as positioning to the home position.)

## 1.3 Comparison with Conventional Positioning Modules

Table 1.1 shows a comparison of specifications between the AD75 and the conventional positioning modules AD71(S1), AD71S2 and A1SD71S2.

**Table 1.1 Comparison between AD75 and Conventional Positioning Modules**

| Specification \ Type | | A1SD75P1 AD75P1 | A1SD75P2 AD75P2 | A1SD75P3 AD75P3 | AD71(S1) | A1SD71S2 AD71S2 |
|---|---|---|---|---|---|---|
| Number of controlled axes | | 1 axis | 2 axes | 3 axes | 2 axes | |
| Number of sets of positioning data | | 600/axis *1 | | | 400/axis | |
| Interpolation function | | —— | | | —— | |
| | 2-axis linear interpolation | O | | | O | |
| | 2-axis circular interpolation | O | | | X | |
| Positioning method | | —— | | | —— | —— |
| | Position control | O | | | O | O |
| | Speed control | O | | | X | O |
| | Speed-position switching control | O | | | X | O |
| Home position return function | | O (6 ways) | | | O | |
| JOG operation function | | O | | | O | |
| Manual pulse generator operation | | O | | | O | X |
| Acceleration/Deceleration processing | | —— | | | —— | |
| | Automatic trapezoidal acceleration/deceleration | O | | | O | |
| | Automatic S-pattern acceleration/deceleration | O | | | X | |
| Acceleration/Deceleration time | | Acceleration and deceleration times can be set (four patterns each). | | | The acceleration and deceleration times are the same. | |
| Compensation | | Electronic gear, backlash compensation | | | Backlash compensation | |
| Error display | | 17-segment display | | | Error LED | |
| Past data storage (starts, errors, warnings) | | Possible (4 types * 16/axis) | | | Impossible | |
| Data storage memory | | Flash ROM (backup without battery) | | | Buffer memory (battery backup) | |
| Number of I/O points | | 32 | | | 32 | 32 (48) *2 |
| Number of points occupied by module | | 1 | | | 1 | 1 (2) *3 |
| Peripheral device (data setting, etc.) | | —— | | | —— | |
| | AD71TU | X | | | O | |
| | A6GPP, A6PHP | X | | | O | |
| | IBM PC/AT | X | | | X | |

O: Enable X: Disable

**REMARKS**

1) *1: The positioning data that can be set using the AD75 buffer memory is positioning data 1 to 100 (i.e. 100 data items) for each axis.
Note that the positioning data in the buffer memory is not backed up.
2) *2: The number of I/O points for an A1SD71S2 is 48.
3) *3: An A1SD71S2 occupies two slots.

## 1.4 Generic Names, Abbreviations and Terms Used in This Manual

| Generic Name/Abbreviation/Term | Description |
|---|---|
| • Peripheral device | Generic name for IBM PC/ATs which can run the AD75Ps indicated below (differentiated from the "peripheral device for GPP" described below). |
| • Drive unit (servo amplifier) | Common name of a pulse input processing drive unit (servo amplifier). |
| • Manual pulse generator | Common name of a manual pulse generator (prepared by the user). |
| • Data link system | Common name of the MELSECNET (II) or MELSECNET/B data link system. |
| • Network system | Common name of the MELSECNET/10 network system. |
| • ACPU | Generic name of an A series PC CPU in which an AD75 can be loaded. |
| • AD75 | Generic name for the AD75P1, AD75P2, AD75P3, A1SD75P1, A1SD75P2 and A1SD75P3 positioning modules. The individual model name is used when referring to a specific module type. |
| • AD75P | Generic name for SW[ ]IVD-AD75P software packages (the number corresponding to the software package function is indicated in the square brackets [ ]). |
| • H/W | Abbreviation for hardware. |
| • I/F | Abbreviation for interface. |
| • GPP function peripheral device | Generic name of an A6GPP, IBM PC/AT, etc. in which a GPP function software package has been installed (differentiated from "peripheral device" above). |
| • S/W | Abbreviation for software package. |
| • 17-segment LED | A 17-segment display on the upper part of the front of the AD75. |

### 1.5 Packed Components

The following table shows the components packed with the AD75.

When unpacking, confirm that all of the following are contained in the package.

| Component | Quantity | | | | | |
|---|---|---|---|---|---|---|
| AD75P1 type positioning module | 1 | | | | | |
| AD75P2 type positioning module | | 1 | | | | |
| AD75P3 type positioning module | | | 1 | | | |
| A1SD75P1 type positioning module | | | | 1 | | |
| A1SD75P2 type positioning module | | | | | 1 | |
| A1SD75P3 type positioning module | | | | | | 1 |
| External wiring connector (made by Sumitomo 3M) | — | — | — | — | — | — |
| Connector (10136-300VE) | 1 | 2 | 3 | 1 | 2 | 3 |
| Connector cover (10336-56F0-008) | 1 | 2 | 3 | 1 | 2 | 3 |

# MEMO

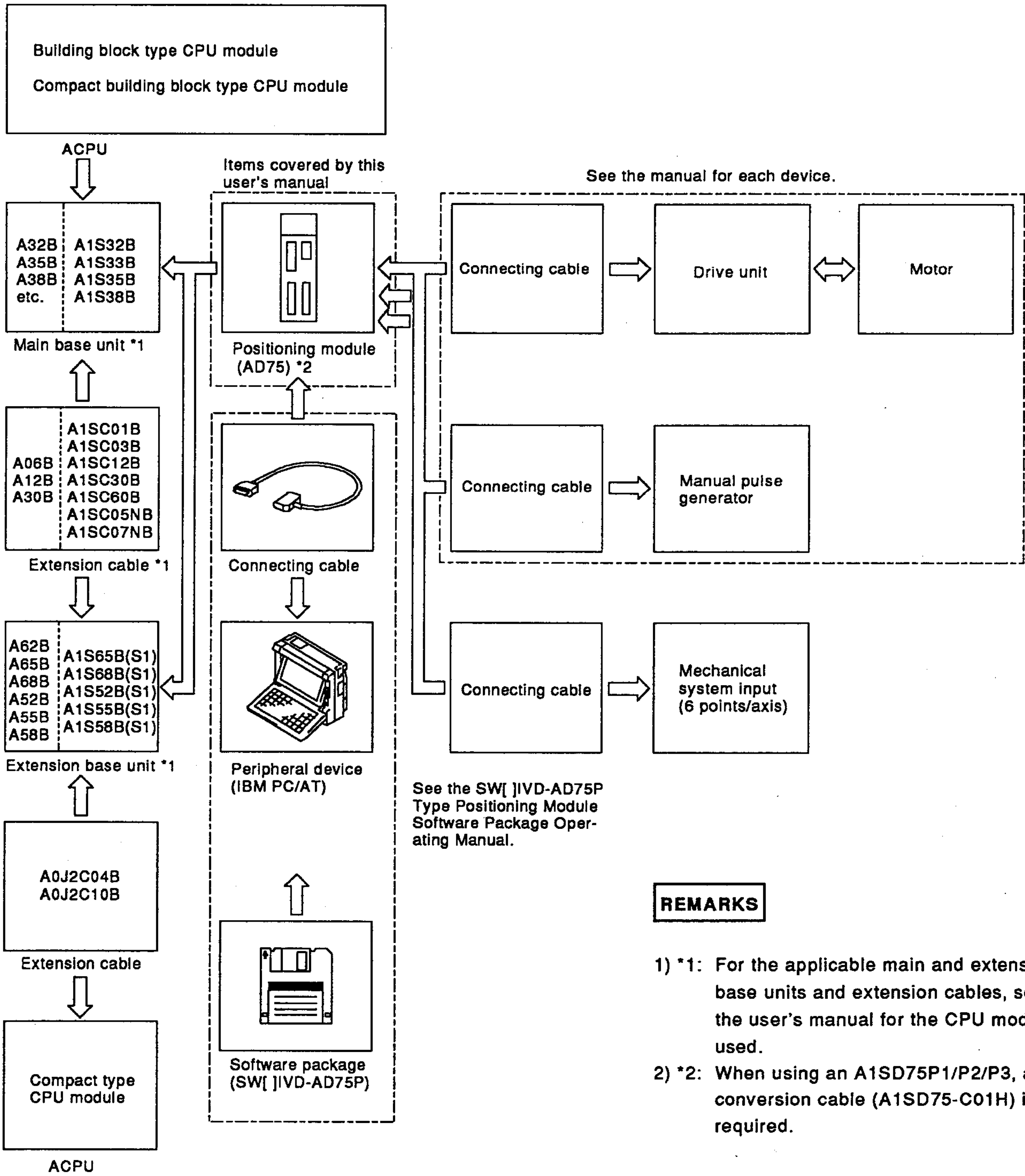
# 2. SYSTEM CONFIGURATION

This chapter describes the system configuration and system components required for positioning by the AD75.

For details of system configuration using an AD75, see the SW[ ]IVD-AD75P Positioning Module Software Package Operating Manual.

## 2.1 Overall Configuration

The following figure shows the overall configuration, including an AD75, a PC CPU module and peripheral devices.




**REMARKS**

1) *1: For the applicable main and extension base units and extension cables, see the user's manual for the CPU module used.
2) *2: When using an A1SD75P1/P2/P3, a conversion cable (A1SD75-C01H) is required.

## 2.2 Applicable Systems

This section describes PC systems compatible with the AD75, and precautions on system configuration.

(1) PC CPUs

(a) AD75P1(P2/P3)

The AD75P1(P2/P3) type positioning module can be used with the following PC CPUs (including those with a link function):

| | | | | |
|---|---|---|---|---|
| • A0J2CPU | • A0J2HCPU | • A1CPU | • A2(S1)CPU | • A3CPU |
| • A1NCPU | • A2N(S1)CPU | • A3NCPU | • A3MCPU | • A3HCPU |
| • A2A(S1)CPU | • A3ACPU | • A2U(S1)CPU | • A3UCPU | • A4UCPU |
| • A73(S3)CPU | • A81CPU | • A52GCPU | | |
| • A1SCPU(S1) | • A1SJCPU | • A2SCPU(S1) | • A2AS(S1/S30)CPU | |
| • Q2A(S1)CPU | • Q3ACPU | • Q4ACPU | | |

* The A73(S3)CPU and A373CPU can be mounted on an extension base unit.

(b) A1SD75P1(P2/P3)

The A1SD75P1(P2/P3) type positioning module can be used with the following PC CPUs (including those with a link function):

• A1SCPU(S1) • A1SJCPU • A2SCPU(S1) • A2AS(S1/S30)CPU • A52GCPU

(2) Remote I/O station (MELSECNET/10, MELSECNET (II), MELSECNET/B)

The AD75P1(P2/P3) and A1SD75P1(P2/P3) type positioning modules can be used at remote I/O stations of data link systems or network systems, except for the A0J2P25/R25 (remote I/O station).

**POINT**

One AD75 requires one slot of the base unit, and occupies 32 I/O points of the PC CPU.
Any number of AD75s can be loaded unless the number of occupied I/O points exceeds that of the PC CPU.

## 2.3 Precautions on System Configuration

The AD75 can be loaded in any slot of a main or extension base unit, but note the following points:

(1) When mounting the AD75 to an extension base unit without a power supply, give careful consideration to the power supply capacity and voltage drop.

(2) The AD75P1(P2/P3) cannot be loaded in the final slot of the seventh extension stage of the A3CPU.

(3) The AD75P1(P2/P3) cannot be mounted on the main base unit of an A73(S3)CPU. Note also that simultaneous starting or interpolation operation with axes controlled by the A73(S3)CPU is not possible.

(4) The A1SD75P1/P2/P3 cannot be mounted next to the extension power supply module of an extension base unit.

(5) The AD75 cannot be mounted at an A0J2P25/R25 (remote I/O station).

(6) For details on mounting the AD75 on a PC CPU or base unit, see the user's manual for the PC CPU used.

## 2.4 Precautions on Using a Stepping Motor

The following functions of the AD75 are not available when a stepping motor is used:

- S-pattern deceleration processing
- Circular interpolation control

## 2.5 List of System Components

Table 2.1 shows the components that can be used in a positioning system using an AD75.

**Table 2.1 System Components**

| Component Name | Type | Remarks | |
|---|---|---|---|
| Positioning module | AD75P1<br>AD75P2<br>AD75P3<br>A1SD75P1<br>A1SD75P2<br>A1SD75P3 | A[ ]D75P[ ]<br>Number of controllable axes | |
| Software package for AD75 | SW[ ]IVD-AD75P | Software package for IBM PC/AT | |
| Peripheral device for AD75P | IBM PC/AT | (Prepared by user)<br>For details, see the AD75P Operating Manual. | |
| Conversion cable | A1SD75-C01H | Length 10 cm | Cable to connect an RS-422 cable and A1SD75P [ ]. |
| Connecting cable (converter) | — | The RS-232C cable and RS-232C/RS-422 converter connected between the AD75 and the IBM PC/AT (prepared by the user).<br>For details, see the AD75P Operating Manual. | |
| Drive unit | — | (Prepared by user) | |
| Manual pulse generator | — | (Prepared by user)<br>Recommendation: MR-HDP01 | |
| Connecting cable | — | The cable to connect the AD75 and the drive unit or manual pulse generator. (Prepared by the user)<br>For details, see the manual for the device to be connected. | |
| Connecting cable | — | The connecting cable for mechanical system input signals to the AD75. (Prepared by the user)<br>For details, see the manual for the device to be connected. | |
| User's floppy disk | SW0S-USER | 2HD type | For storing user programs and set data (3.5-inch fomatted) |

# 3. SPECIFICATIONS

This chapter describes the AD75's specifications, functions, set data, buffer memory, I/O signals and I/O interface with an external device.

## 3.1 General Specifications

The following table shows the general specifications of the AD75.

**Table 3.1 General Specifications**

<table>
<tr><th>Item</th><th colspan="5">Specification</th></tr>
<tr><td>Operating ambient temperature</td><td colspan="5">0 to 55 °C</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="5">-20 to 75 °C</td></tr>
<tr><td>Operating ambient humidity</td><td colspan="5">10 to 90 % RH, no dewing</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="5">10 to 90 % RH, no dewing</td></tr>
<tr><td rowspan="8">Vibration resistance</td><td rowspan="8">Conforms to JIS B 3501 and IEC 1131-2. *1</td><td colspan="4">In case of intermittent vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep count</td></tr>
<tr><td>10 to 57Hz</td><td>—</td><td>0.075 mm (0.003 inch)</td><td rowspan="6">10 times in each of X, Y and Z directions (for 80 minutes)</td></tr>
<tr><td>57 to 150Hz</td><td>9.8 m/s$^2$ (1G)</td><td>—</td></tr>
<tr><td colspan="3">In case of continuous vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td></tr>
<tr><td>10 to 57Hz</td><td>—</td><td>0.035 mm (0.0014 inch)</td></tr>
<tr><td>57 to 150Hz</td><td>4.9 m/s$^2$ (0.5G)</td><td>—</td></tr>
<tr><td>Shock resistance</td><td colspan="5">Conforms to JIS B 3501 and IEC 1131-2. (147 m/s$^2$ (15 G), 3 times in each of 3 directions)</td></tr>
<tr><td>Operating atmosphere</td><td colspan="5">The operating atmosphere shall not contain corrosive gas.</td></tr>
<tr><td>Operating altitude</td><td colspan="5">2000 m or lower</td></tr>
<tr><td>Installation site</td><td colspan="5">Inside control panel</td></tr>
<tr><td>Overvoltage category *2</td><td colspan="5">II or lower</td></tr>
<tr><td>Contamination level *3</td><td colspan="5">2 or lower</td></tr>
</table>

*1 JIS: Japanese Industrial Standard

*2 The value indicates the power distribution unit between the public distribution network and the in-plant machinery to which the device is assumed to be connected.
Category II applies to devices powered by fixed equipment.
The surge voltage withstand capability of devices whose rated voltage is 300 V or lower is 2500 V.

*3 This is an index which gives a measure of the incidence of conductive materials in the environment in which the device is used.
A contamination level of "2" indicates an environment in which there is only contamination by non-conducting materials, but, due to occasional condensation, conductivity may occur.

## 3.2 Performance Specifications

The following table shows the performance specifications of the AD75.

### 3.2.1 Performance specifications

**Table 3.2 Performance Specifications**

| Item | | A1SD75P1<br>AD75P1 | A1SD75P2<br>AD75P2 | A1SD75P3<br>AD75P3 |
|---|---|---|---|---|
| Number of controllable axes | | Axis 1 | Axis 2 | Axis 3 |
| Interpolation function | | Not available | 2-axis linear interpolation<br>2-axis circular interpolation | 2-axis linear interpolation<br>2-axis circular interpolation |
| Control method | | PTP (Point To Point) control, locus control (both linear and circular modes can be set), speed control, speed/position switching control | | |
| Control unit | | mm, inch, degree, pulse | | |
| Positioning data | | Peripheral device : 600 data (positioning data No.: 1 to 600)/axis<br>PC program : 100 data (positioning data No.: 1 to 100)/axis only | | |
| Peripheral device | | IBM PC/AT: SW0IVD-AD75P | | |
| Backup | | Parameters and positioning data are stored in a flash ROM (without a battery). | | |
| Positioning | Positioning method | PTP control : Incremental method/Absolute data method<br>Speed/position switching control : Incremental method<br>Locus control : Incremental method/Absolute data method | | |
| | Positioning range | In absolute data method<br>• -214748364.8 to 214748364.7 (µm)<br>• -21474.83648 to 21474.83647 (inch)<br>• 0 to 359.99999 (degree)<br>• -2147483648 to 2147483647 (pulse)<br>Incremental method<br>• -214748364.8 to 214748364.7 (µm)<br>• -21474.83648 to 21474.83647 (inch)<br>• -21474.83648 to 21474.83647 (degree)<br>• -2147483648 to 2147483647 (pulse)<br>Speed-position switching control<br>• 0 to 214748364.7 (µm)<br>• 0 to 21474.83647 (inch)<br>• 0 to 21474.83647 (degree)<br>• 0 to 2147483647 (pulse) | | |
| | Speed command | 0.01 to 6000000.00 (mm/min)<br>0.001 to 600000.000 (inch/min)<br>0.001 to 600000.000 (degree/min)<br>1 to 400000 (pulse/s) | | |
| | Output variation | 1 pulse/3.5 ms | | |
| | Acceleration/Deceleration processing | Automatic trapezoidal acceleration/deceleration, automatic S-pattern acceleration/deceleration | | |
| | Acceleration/Deceleration time | 1 to 65535 (ms)<br>Four patterns each can be set for acceleration time and deceleration time. | | |
| | Rapid stop deceleration time | 1 to 65535 (ms) | | |
| Compensation | | With electronic gear and backlash compensation | | |
| Home position return method | | Near-zero point dog method, count method, stopper method | | |
| JOG operation function | | Equipped | | |
| Manual pulse generator operation function | | Available | | |
| M code output function | | Equipped (Either WITH or AFTER mode can be selected.) | | |
| Error display | | Indicated by the 17-segment display. | | |
| I/O display | | Indicated by the 17-segment display and LED indicators. | | |
| Internal current consumption (5 VDC) | | A1SD75P[ ] : 0.7 A or lower<br>AD75P[ ] : 0.7 A or lower | | |
| Number of occupied I/O points | | 32 points (In I/O allocation: Special function module 32 points) | | |
| Size mm [inch] | | A1SD75P[ ] : 130 [5] (H) *34.5 [1.3] (W) *93.6 [3.7] (D)<br>AD75P[ ] : 250 [9.7] (H) *37.5 [1.5] (W) *106 [4.1] (D) | | |
| Weight kg [lb] | | A1SD5P[ ] : 0.35 [0.77]<br>AD75P[ ] : 0.45 [0.99] | | |

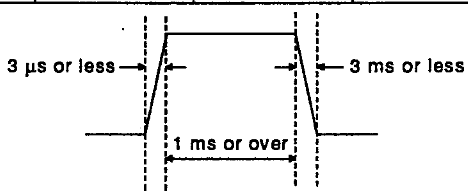
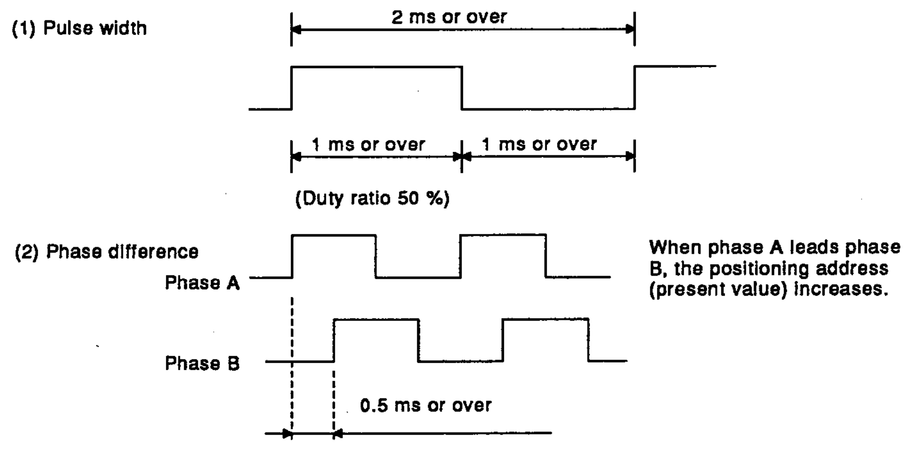
### 3.2.2 Specifications of I/O interface with external device

This section describes the I/O interface of the AD75 with an external device.

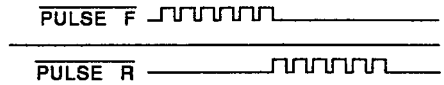
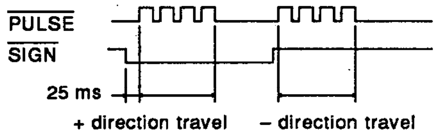
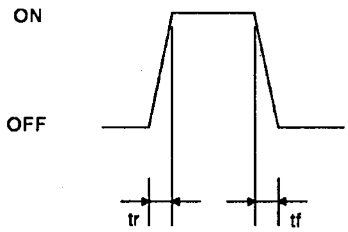
(1) Electrical specifications of the AD75

The following table shows the electrical specifications of I/O signals from/to an external device.

(a) Input specifications

| Signal Name | Rated Input Voltage/ Current | Operating Voltage Range | ON Voltage/ Current | OFF Voltage/ Current | Input Resistance | Response Time |
|---|---|---|---|---|---|---|
| Drive unit ready (READY) in-position signal | 24 VDC/5 mA | 19.2 to 26.4 VDC | 17.5 VDC or over/3.5 mA or over | 7 VDC or lower/1.7 mA or lower | Approx. 4.7 kΩ | 4 ms or less |
| Zero point signal (PGO) | 5 VDC/5 mA | 4.5 to 6.1 VDC | 2.5 VDC or over/2 mA or over | 0.5 VDC or lower/0.5 mA or lower | Approx. 0.5 kΩ | 1 ms or less |
| | 24 VDC/5 mA | 19.2 to 26.4 VDC | 17.5 VDC or over/2 mA or over | 7 VDC or lower/0.5 mA or lower | Approx. 8.5 kΩ | 1 ms or less |
| |   | | | | | |
| Manual pulse generator phase A (PULSER A)<br>Manual pulse generator phase B (PULSER B) | 5 VDC/5 mA | 4.5 to 6.1 VDC | 2.5 VDC or over/3.5 mA or over | 1 VDC or lower/1 mA or lower | Approx. 1.5 kΩ | 1 ms or less |
| |   | | | | | |
| Near-zero point signal (DOG)<br>Stop signal (STOP)<br>Upper limit (FLS)<br>Lower limit (RLS)<br>External start<br>Speed-position switching signal | 24 VDC/5 mA | 19.2 to 26.4 VDC | 17.5 VDC or over/3.5 mA or over | 7 VDC or lower/1.7 mA or lower | Approx. 4.7 kΩ | 4 ms or less |

(b) Output specifications

| Signal Name | Rated Load Voltage | Operating Load Voltage Range | Maximum Load Current/Rush Current | Maximum Voltage Drop at ON | Leak Current at OFF | Response Time |
|---|---|---|---|---|---|---|
| Pulse output (CW/PULSE/PHASE A)<br>Pulse sign (CCW/SIGN/PHASE B) | Am26LS31 or equivalent differential driver/open collector | | | | | |
| | CW/CCW type | PULSE/SIGN type | PHASE A/ PHASE B type | Select the CW/CCW, PULSE/SIGN or PHASE A/ PHASE B type when setting driver unit parameters. | | |
| | Forward feed pulse<br>$\overline{\text{PULSE F}}$ | Feed pulse<br>$\overline{\text{PULSE}}$ | Phase A<br>$\overline{A\phi}$ | • CW/CCW type<br>  | | |
| | Reverse feed pulse<br>$\overline{\text{PULSE R}}$ | Direction sign<br>$\overline{\text{SIGN}}$ | Phase B<br>$\overline{B\phi}$ | • PULSE/SIGN type<br>Forward/Reverse feed pulse<br>The operating direction can be identified from the direction sign (SIGN).<br> <br>• PHASE A/PHASE B type<br>When phase A leads phase B, the positioning address increases.<br>When phase B leads phase A, the positioning address decreases. | | |
| | *The rise time/fall time and duty ratio for the open collector system are shown in the table below.<br>  | | | | | |
| | 5 to 24 VDC | 4.75 to 30 V | 50 mA/point /200 mA and 10 ms or less | 0.5 VDC (TYP) | 0.1 mA or lower | —— |
| Deviation counter clear ($\overline{\text{CLEAR}}$) | 5 to 24 VDC | 4.25 to 30 V | 0.1 A/point /0.4 A and 10 ms or less | 1 VDC (TYP)<br>2.5 VDC (MAX) | 0.1 mA or lower | 2 ms or lower (resistance load) |

Pulse rise time/fall time of the AD75 (Unit: tr, tf: µs Duty: %)
....At room temperature

1) When the load voltage is 26.4 V

| Cable Length (m) | | 1 | | | 3 | | |
|---|---|---|---|---|---|---|---|
| Load Current (mA) | Pulse Speed (kpuls/s) | tf (Rise) | tr (Fall) | Duty | tf (Rise) | tr (Fall) | Duty |
| 2 | 200 | 0.04 | 1.70 | 30 | 0.06 | 2.04 | 27 |
| | 100 | 0.08 | 3.00 | 33 | 0.07 | 3.49 | 29 |
| | 10 | 0.07 | 3.20 | 48 | 0.08 | 6.80 | 46 |
| 5 | 200 | 0.06 | 1.10 | 39 | 0.07 | 1.83 | 33 |
| | 100 | 0.07 | 1.24 | 43 | 0.08 | 2.50 | 36 |
| | 10 | 0.07 | 1.20 | 49 | 0.08 | 2.70 | 49 |
| 20 | 200 | 0.07 | 0.42 | 46 | 0.08 | 0.72 | 43 |
| | 100 | 0.07 | 0.40 | 48 | 0.11 | 0.74 | 47 |
| | 10 | 0.07 | 0.40 | 50 | 0.08 | 0.79 | 50 |
| 50 | 200 | 0.08 | 0.28 | 48 | 0.09 | 0.37 | 47 |
| | 100 | 0.08 | 0.27 | 48 | 0.13 | 0.37 | 48 |
| | 10 | 0.09 | 0.27 | 50 | 0.09 | 0.37 | 50 |

2) When the load voltage is 4.75 V

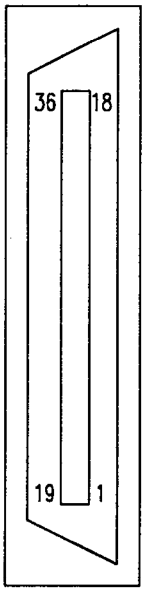
| Cable Length (m) | | 1 | | | 3 | | |
|---|---|---|---|---|---|---|---|
| Load Current (mA) | Pulse Speed (kpuls/s) | tf (Rise) | tr (Fall) | Duty | tf (Rise) | tr (Fall) | Duty |
| 2 | 200 | 0.04 | 0.63 | 43 | 0.04 | 1.08 | 38 |
| | 100 | 0.06 | 0.64 | 47 | 0.04 | 1.28 | 42 |
| | 10 | 0.04 | 0.64 | 49 | 0.06 | 1.30 | 49 |
| 5 | 200 | 0.04 | 1.26 | 48 | 0.04 | 0.92 | 46 |
| | 100 | 0.05 | 1.26 | 48 | 0.06 | 0.44 | 47 |
| | 10 | 0.05 | 1.30 | 50 | 0.06 | 0.44 | 50 |
| 20 | 200 | 0.06 | 0.22 | 47 | 0.06 | 0.22 | 49 |
| | 100 | 0.08 | 0.24 | 50 | 0.06 | 0.24 | 50 |
| | 10 | 0.06 | 0.24 | 50 | 0.06 | 0.24 | 50 |
| 50 | 200 | 0.08 | 0.20 | 47 | 0.10 | 0.18 | 50 |
| | 100 | 0.08 | 0.22 | 49 | 0.12 | 0.20 | 51 |
| | 10 | 0.08 | 0.22 | 50 | 0.12 | 0.20 | 50 |

(2) Specifications of I/O interface with external device

This section describes the specifications of the AD75's I/O interface with an external device.

(a) Connector signal pin layout

The following table shows the signal pin layout of the AD75's connector for external device (for one axis).
(The signal pin layout of the connector for connection to external devices is the same for axes 1 to 3.)




| Pin Layout | Pin No. | Signal Name | | Signal Direction AD75 - External Device | Connecting Device |
|---|---|---|---|---|---|
| | 36 | Common | COM | <----> | Drive unit |
| | 35 | Common | COM | <----> | Drive unit |
| | 34 | Unused | | | |
| | 33 | Unused | | | |
| | 32 | Unused | | | |
| | 31 | Unused | | | |
| | 30 | Unused | | | |
| | 29 | Unused | | | |
| | 28 | Manual pulse generator | Phase B– | <----- | Manual pulse generator |
| | 27 | Manual pulse generator | Phase A– | <----- | Manual pulse generator |
| | 26 | Common | COM | <----> | Drive unit |
| | 25 | Zero point signal common | COM | <----- | Drive unit |
| | 24 | Zero point signal | +5 V | <----- | Drive unit |
| | 23 | Deviation counter clear common | COM | <----> | Drive unit |
| | 22 | Pulse sign (differential-) | CCW/SIGN/B$\phi$ | -----> | Drive unit |
| | 21 | Pulse output (differential-) | CW/PULSE/A$\phi$ | -----> | Drive unit |
| | 20 | Pulse sign common (open collector) | CCW/SIGN/B$\phi$ | <----> | Drive unit |
| | 19 | Pulse output common (open collector) | CW/PULSE/A$\phi$ | <----> | Drive unit |
| | 18 | Unused | | | |
| | 17 | Unused | | | |
| | 16 | External start (*1) | START | <----- | (External device) |
| | 15 | Speed-position switching signal | | <----- | (External device) |
| | 14 | Stop signal | STOP | <----- | (External device) |
| | 13 | Lower limit | RLS | <----- | Limit switch |
| | 12 | Upper limit | FLG | <----- | Limit switch |
| | 11 | Near-zero point signal | DOG | <----- | Near-zero point dog |
| | 10 | Manual pulse generator | Phase B+ | <----- | Manual pulse generator |
| | 9 | Manual pulse generator | Phase A+ | <----- | Manual pulse generator |
| | 8 | In-position | INPOS | <----- | Drive unit |
| | 7 | Drive unit ready | READY | <----- | Drive unit |
| | 6 | Zero point signal | +24 V | <----- | Drive unit |
| | 5 | Deviation counter clear | CLEAR | -----> | Drive unit |
| | 4 | Pulse sign (differential+) | CCW/SIGN/B$\phi$ | -----> | Drive unit |
| | 3 | Pulse output (differential+) | CW/PULSE/A$\phi$ | -----> | Drive unit |
| | 2 | Pulse sign (open collector) | CCW/SIGN/B$\phi$ | -----> | Drive unit |
| | 1 | Pulse output (open collector) | CW/PULSE/A$\phi$ | -----> | Drive unit |

**REMARK**

*1: The signal application depends on the selection of the external start function of extended parameters #2.

(b) Description of connector signals

Details of the signals exchanged through the AD75's connector for external device (for one axis) are given below.

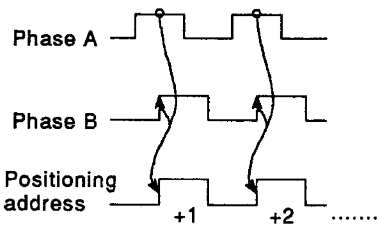
1) Common ... (Pin Nos. 36 and 35)

- Common for near-zero point signal, lower and upper limits, stop signal, control switching signal and external start.

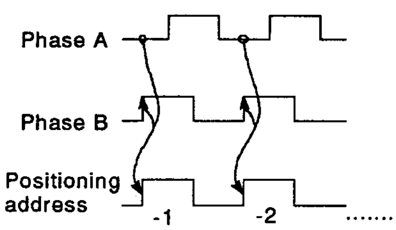
2) Manual pulse generator (phase B–), manual pulse generator (phase A–) ... (Pin Nos. 28 and 27)
Manual pulse generator (phase B+), manual pulse generator (phase A+) ... (Pin Nos. 10 and 9)

- Phase A and phase B signals of the manual pulse generator or rotary encoder are inputted.
- When phase A leads phase B, the positioning address increases.
- When phase B leads phase A, the positioning address decreases.

[Address increase]




[Address decrease]




3) Common ... (Pin No. 26)

- Common for drive unit ready and in-position.

4) Common ... (Pin No. 25)

- Common for deviation counter clear.

5) Zero point signal common ... (Pin No. 25)

- Common for zero point signals (+5 V and +24 V)

6) Zero point signal (+5 V), zero point signal (+24 V) ... (Pin Nos. 24 and 6)

- The home position signal is input in home position return. The zero point grid signal from a general pulse encoder is used.
- These signals are also used when the stopper stop method is selected for home position return and a home position return completed signal is input from the external device.
- The home position is detected at the trailing edge of the pulse.

7) Pulse sign, pulse output (differential–) ... (Pin Nos. 22 and 21)
Pulse sign, pulse output (differential+) ... (Pin Nos. 4 and 3)

- A positioning pulse and a pulse sign are output to the drive unit for the differential driver.

8) Pulse sign common, pulse output common (open collector) ... (Pin Nos. 20 and 19)
Pulse sign, pulse output (open collector) ... (Pin Nos. 2 and 1)

- A positioning pulse and a pulse sign are output to the drive unit for the open collector.

9) External start ... (Pin No. 16)

- This signal is used as an external input signal for positioning start, speed change request or skip request.
- The function which will perform an external start depends on the external start function selection of detailed parameter 2.

10) Speed-position switching signal ... (Pin No. 15)

- A control switching signal is input in speed/position switching control.

11) Stop signal ... (Pin No. 14)

- This signal is input to discontinue positioning.
- As soon as this signal is turned ON, the AD75 discontinues the ongoing positioning, and turns OFF the start signal. Thereafter, axis motion will not start even if this signal is turned OFF.

12) Lower limit ... (Pin No. 13)

- The limit switch mounted at the lower stroke end issues this signal.
- Turning OFF this signal discontinues positioning.
- This signal indicates the lower limit for detecting a near-zero point signal when home position return is performed.

13) Upper limit ... (Pin No. 12)

- The limit switch mounted at the upper stroke end issues this signal.
- Turning OFF this signal discontinues positioning.
- This signal indicates the upper limit for detecting a near-zero point signal when home position return is performed.

14) Near-zero point signal ... (Pin No. 11)

- This signal is used to detect the near-zero point dog in home position return.
- The near-zero point dog status switching from OFF to ON is detected at the leading edge of the pulse.
- The near-zero point dog status switching from ON to OFF is detected at the trailing edge of the pulse.

15) In-position ... (Pin No. 8)

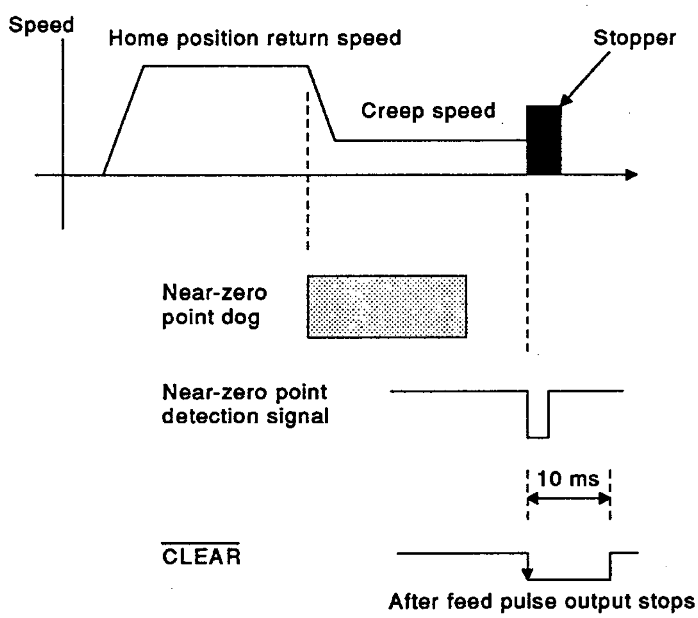
- The drive unit inputs an in-position signal.

16) Drive unit ready ... (Pin No. 7)

- This signal is turned ON when the drive unit is operating normally and is ready to receive feed pulses.
- The AD75 checks the drive unit ready signal, and issues a home position return request if the drive unit is not ready for operation.
- This signal is turned OFF when the drive unit is malfunctioning because of a drive unit control power supply failure.
- If this signal is turned OFF during positioning, axis motion stops. It will not restart even if the signal is turned back ON.
- Turning OFF this signal turns OFF the home position return signal.

17) Deviation counter clear ... (Pin No. 5)

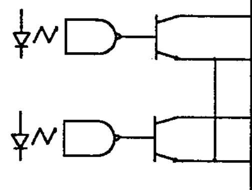
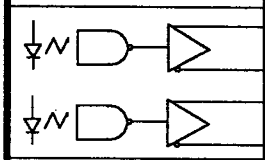
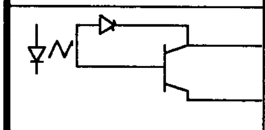
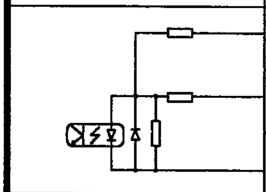
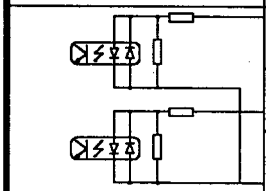
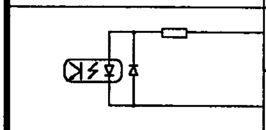
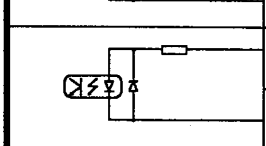
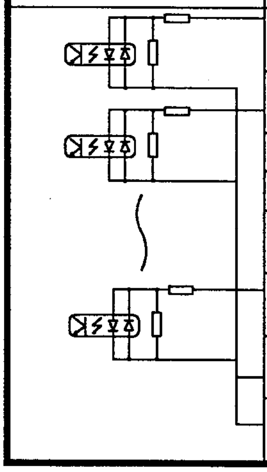
- When performing home position return by stopper stop method (1) or (2), this signal is turned ON after the pulse output has stopped.
  (Example)
  In the case of home position return by stopper stop method (2)




- A deviation counter clear signal is issued for about 10 ms.
- Use a drive unit capable of resetting the number of droop pulses of the internal deviation counter when the AD75 turns ON this signal.

(c) Internal Circuit

The following table shows the schematic circuit diagrams of the internal circuits of the AD75's interface for external devices.

| Internal Circuit | Pin No. | Signal Name | Remarks |
|---|---|---|---|
|  | 1 | Pulse output (open collector) | CW/PULSE/Aϕ |
| | 19 | Pulse output common (open collector) | |
| | 2 | Pulse sign (open collector) | CW/SIGN/Bϕ |
| | 20 | Pulse sign common (open collector) | |
|  | 3 | Pulse output (differential+) | CW/PULSE/Aϕ |
| | 21 | Pulse output (differential–) | |
| | 4 | Pulse sign (differential+) | CCW/SIGN/Bϕ |
| | 22 | Pulse sign (differential–) | |
|  | 5 | Deviation counter clear | — |
| | 23 | Common | |
|  | 6 | Zero point signal (+24 V) | |
| | 24 | Zero point signal (+5 V) | |
| | 25 | Zero point signal common | |
|  | 7 | Drive unit ready | |
| | 8 | In-position | |
| | 26 | Common | |
|  | 9 | Manual pulse generator (phase A+) | |
| | 27 | Manual pulse generator (phase A–) | |
|  | 10 | Manual pulse generator (phase B+) | |
| | 28 | Manual pulse generator (phase B–) | |
|  | 11 | Near-zero point signal | |
| | 12 | Upper limit | |
| | 13 | Lower limit | |
| | 14 | Stop signal | |
| | 15 | Speed-position switching signal | |
| | 16 | External start | |
| | 35 | Common | |
| | 36 | Common | |

(3) Connector specifications

The following tables show the specifications of the AD75's connector for external devices.

(a) AD75 connector

| AD Connector (Receptacle) | Lock Type |
|---|---|
| 10236–52A2JL | One-touch lock type |

(b) Communicating device connector*

<table>
<tr><th>Plug</th><th>Applicable Wire Size</th><th>Connection Method</th><th>Cover</th><th>Manufac-turer</th></tr>
<tr><td>10136–6000EL</td><td>AWG#28 (approx. 0.08 sq.)</td><td>Pressure displacement</td><td rowspan="2">10336-56F0-008 (right angle plastic cover)</td><td rowspan="2">3M</td></tr>
<tr><td>10136–3000VE</td><td>AWG#24 to #30 (approx. 0.05 to 0.2 sq.)</td><td>Soldering</td></tr>
</table>

**REMARK**

* The 10136-3000VE (plug) and the 10336-56F0-008 (right angle plastic cover) are packed with the AD75.

## 3.3 Functions

Table 3.3 shows the functions of the A1SD75P1/P2/P3 and AD75P1/P2/P3.

**Table 3.3 Functions of A1SD75P1/P2/P3 and AD75P1/P2/P3**

| Function Name | | | Description | Positioning Module AD75P1 A1SD75P1 | Positioning Module AD75P2 A1SD75P2 | Positioning Module AD75P3 A1SD75P3 |
|---|---|---|---|---|---|---|
| Positioning function | Position control | Individual positioning | • This function performs positioning with one start signal according to a single designated positioning data. | | | |
| | | Continuous positioning | • This function performs and completes positioning according to a designated positioning data, then restarts positioning in response to the positioning data of the following data number.<br>• Positioning continues with one start signal until the positioning data containing positioning end as the operation pattern is detected. | | | |
| | | Continuous locus positioning | After performing and completing positioning according to the designated data, this function continues positioning using the positioning data of the following data number.<br>Positioning is repeated with one start signal until the positioning data containing positioning end as the operation pattern is detected. | | | |
| | Speed control | | This function starts positioning with one start signal according to single designated positioning data, and completes it on input of a stop signal. | o | o | o |
| | Speed/position switching control | | This function starts positioning with one start signal according to single designated positioning data, and completes positioning of the designated addresses on input of a speed-position switching stop signal. | | | |
| | Block positioning | | This function performs positioning on the basis of one "block" of positioning data, which ends with the operation pattern of positioning complete, after which the subsequent positioning takes place.<br>• This positioning is performed with two or more designated blocks.<br>Positioning continues between blocks only when user-designated conditions are fulfilled.<br>• Positioning is repeated in accordance with only one of the plural blocks until user-designated conditions are met.<br>• Positioning in accordance with plural selected blocks is repeated the number of times the user specifies. | | | |
| | Interpolation positioning (2-axis linear/circular) | | This function performs linear or circular interpolation positioning using one or two of three axes. | x | o | o |
| Manual pulse generator operation function | | | This function performs positioning in response to the number of input pulses from the manual pulse generator. | | | |
| JOG operation function | | | This function performs positioning while the JOG operation command from the ACPU or peripheral device remains ON. | | | |
| Home position return function | | | The axis returns to the home position on receipt of a home position return command from the ACPU or peripheral device, and this function corrects the present address (feed present value, machine feed value) to the home position address.<br>Home position return is executed by one of the six methods - one near-zero point dog method, two count methods and three stopper stop methods.<br>When the home position return retry function is set, the axis travel direction changes in accordance with the limit switches and near-zero point dog during return to the home position. | o | o | o |

Symbols in table o: Function equipped x: Function not equipped

### Table 3.3 Functions of A1SD75P1/P2/P3 and AD75P1/P2/P3 (Continued)

| Function Name | | Description | Positioning Module | | |
|---|---|---|---|---|---|
| | | | AD75P1<br>A1SD75P1 | AD75P2<br>A1SD75P2 | AD75P3<br>A1SD75P3 |
| Compensation function | Electronic gear | Based on the travel value per pulse, the AD75 outputs the number of pulses corresponding to the designated unit magnification (1/10/100/1000 times) to control the travel value and speed. | o | o | o |
| | Backlash compensation | During positioning, JOG operation, manual pulse generator operation or home position return, additional feed pulses are output each time the travel direction changes to compensate for the set machine backlash. | o | o | o |
| Error compensation function | | If there is a difference (mechanical system error) between the designated and actual travel values, additional pulses are output to compensate for the difference. | o | o | o |
| M code output function | | When positioning using the current positioning data starts (WITH mode) or ends (AFTER mode), this function stores the set M code to the buffer memory, and turns ON the M code ON signal to the ACPU.<br>M code output takes place during individual or continuous positioning. | o | o | o |
| Acceleration/deceleration control function | | This function performs acceleration and deceleration by the designated acceleration/deceleration method, automatic trapezoidal or automatic S-pattern, in positioning (including speed change during positioning), JOG operation or at the start and end of home position return. | o | o | o |
| Software stroke limit function | | This function does not execute a positioning command which exceeds the upper or lower limit of the set machine travel range.<br>The user must select a feed present value or machine feed value as the limit. | o | o | o |
| Torque control function | | This function controls the torque generated by the servomotor so that it will not exceed the set torque limit value.<br>When the torque limit value is changed in the middle of positioning, the new value becomes valid. | o | o | o |
| Present value change function | | When the present value is changed, this function changes the feed present value to the designated value.<br>The AD75 controls the position (address) with the feed present value and the machine feed value during positioning; when a present value change is executed, the feed present value and machine feed value become different values.<br>• Present feed value...... Becomes the address to which the change was made by the present value change.<br>• Machine feed value..... Address with respect to the machine home position and based on the home position address: not changed by a presant value change. | o | o | o |
| Teaching function | | This function writes the positioning address where positioning was completed manually by JOG operation or manual pulse generator operation to the buffer memory as the positioning data of the ACPU-designated data number. | o | o | o |
| Override function | | This function adjusts the speed during positioning between 1 % and 300 %. | o | o | o |
| Shorter path selection function | | When "degrees" is selected as the unit, this function performs positioning in the closer direction to the designated address. | o | o | o |

Symbols in table o: Function equipped x: Function not equipped

### 3.3.1 Control method

(1) Description of the control method

(a) The control method means the mode (type) of positioning control.

(b) There are 17 control methods as shown below:

1) 1-axis linear control (See Section 3.3.1 (2).)
   - Absolute data method
   - Incremental method

2) 2-axis linear interpolation (See Section 3.3.1 (3).)
   - Absolute data method
   - Incremental method

3) Fixed-pitch feed (See Section 3.3.1 (4).)
   - 1-axis fixed-pitch feed
   - 2-axis fixed-pitch feed

4) Circular interpolation: Cannot be used with a stepping motor (See Section 3.3.1 (5) and (6).)
   - Circular interpolation by designating an auxiliary point (absolute)
   - Circular interpolation by designating an auxiliary point (incremental)
   - Circular interpolation by designating a center point (absolute, clockwise)
   - Circular interpolation by designating a center point (absolute, counterclockwise)
   - Circular interpolation by designating a center point (incremental, clockwise)
   - Circular interpolation by designating a center point (incremental, counterclockwise)

5) Speed control (See Section 3.3.4.)
   - Forward
   - Reverse

6) Speed/position switching control (See Section 3.3.5.)
   - Forward
   - Reverse

7) Present value change (See Section 3.3.18.)

(c) Specify a control method of the positioning data.

Positioning data can be set using the peripheral device or sequence program.
For details of positioning data, see Section 3.4.5.

- Peripheral device: Set positioning data when editing positioning data in the edit mode. For operation of the peripheral device, see the SW0IVD-AD75P Operating Manual.
- Sequence program: Write TO/DTO instructions to the designated buffer memory area. For details of the buffer memory, see Section 3.6.5.

**REMARK**

*: Positioning data setting using a peripheral device, and writing of positioning data to the buffer memory using the sequence program use different data numbers.

(1) Peripheral device: Positioning data Nos. 1 to 600 (600 data)

(2) Sequence program: Positioning data Nos. 1 to 100 (100 data)

(2) 1-axis linear positioning control

This function controls positioning of the designated axis from the start point address (present stop position) to the designated position (travel value).

Control by absolute data method (ABS linear 1)

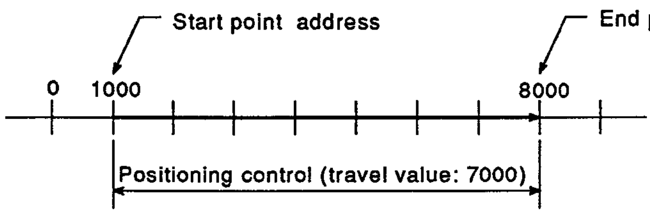
(a) This method controls positioning from the start point address to the end point address (address designated in the positioning data). Positioning control is performed based on the address (home position address) designated for home position return.

(b) The travel direction depends on the start and end addresses.

- Start point address < End point address: Positioning in forward direction
- Start point address > End point address: Positioning in reverse direction

Example

When the start point address is 1000 and the end point address is 8000, the axis travels 7000 (8000 to 1000) in the forward direction.



(c) Designating positioning data *1

The following positioning data can be set with the peripheral device or sequence program:

| Data | Necessity of Setting *2 |
|---|---|
| Operation pattern | o |
| Control method | Select "ABS linear 1". |
| Acceleration time | o |
| Deceleration time | o |
| Positioning address/Travel value | o |
| Circular interpolation address | — |
| Commanded speed | o |
| Dwell time | Δ |
| M code | Δ |

**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.

2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

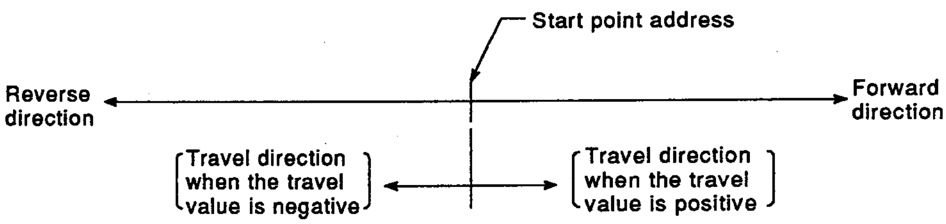
**Control by incremental method (INC linear 1)**

(a) This method controls positioning for the designated travel value from the start point address.

(b) The travel direction depends on the travel value sign.

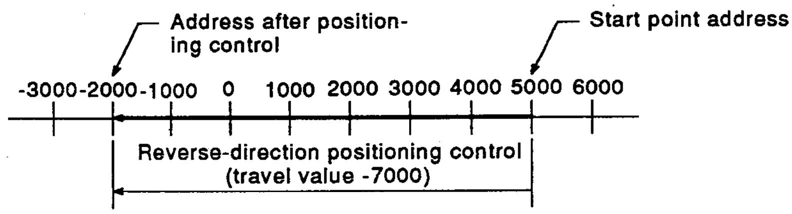
1) + direction..... Positioning in forward direction (address incremental direction)

2) - direction..... Positioning in reverse direction (address decremental direction)



Example

When the start point address is 5000 and the travel value is -7000, the axis travels to the position of -2000.




(c) Designating positioning data *1

The following positioning data can be set with the peripheral device or sequence program:

| Data | Necessity of Setting *2 |
|---|---|
| Operation pattern | o |
| Control method | Select "INC linear 1". |
| Acceleration time | o |
| Deceleration time | o |
| Positioning address/Travel value | o |
| Circular interpolation address | — |
| Commanded speed | o |
| Dwell time | Δ |
| M code | Δ |

**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.

2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

(3) 2-axis linear interpolation control

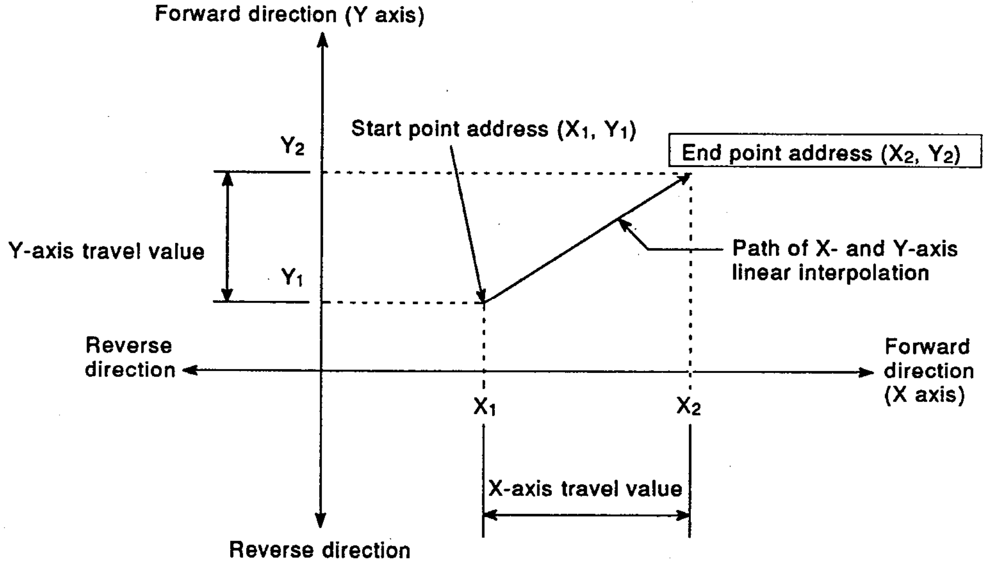
This function performs linear interpolation control from the start point address (present stop position) using two designated axes.

Control by absolute data method (ABS linear 2)

(a) This method performs 2-axis linear interpolation from the start point address to the end point address (address designated in the positioning data).
Positioning control is performed based on the address designated for home position return.

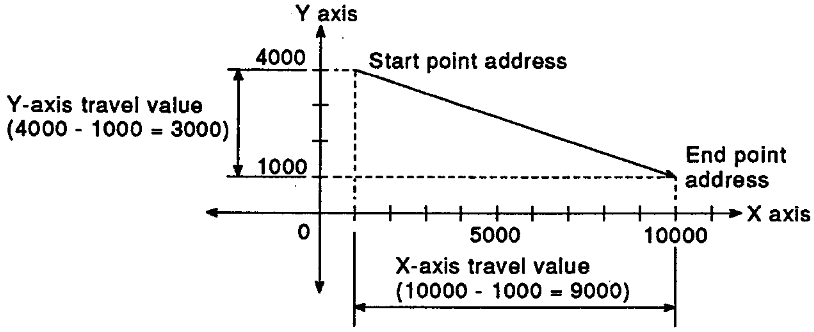
(b) The travel value depends on the start point and designated addresses of each axis.

- Stop point address < End point address:
  Positioning in forward direction
- Stop point address > End point address:
  Positioning in reverse direction




Example

When the start point address is (1000, 4000) and the end point address is (10000, 1000), positioning is performed as shown below:



(c) Travel values of up to $2^{30}$ are possible for each axis in linear interpolation control.
If the calculated travel value exceeds the range indicated above, an "out of linear travel value range error message (error code 504)" will occur at the start of positioning, and positioning will not begin.

(d) Designating positioning data *1

1) Set the positioning data control method for the reference axis.

2) The following positioning data can be set with the peripheral device or sequence program:

| Data | Necessity of Setting *2 | |
|---|---|---|
| | Reference Axis | Auxiliary Axis |
| Operation pattern | o | — |
| Control method | Select "ABS linear 2". | — |
| Acceleration time | o | — |
| Deceleration time | o | — |
| Positioning address/Travel value | o | o |
| Circular interpolation address | — | — |
| Commanded speed | o | — |
| Dwell time | Δ | — |
| M code | Δ | — |

**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.

2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

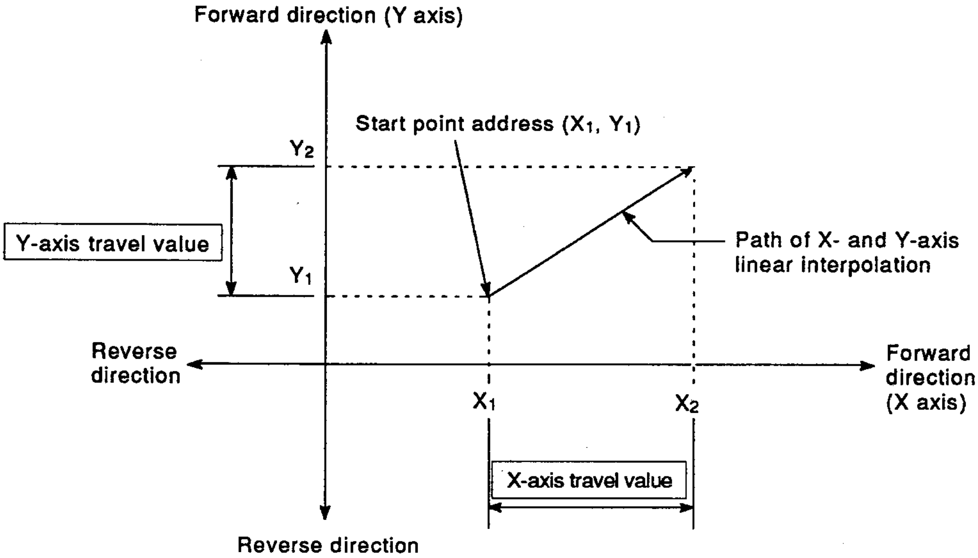
Control by incremental method (INC linear 2)

(a) This method controls positioning from the start point address to the resultant position obtained from the travel direction and distance designated for each axis.

(b) The travel direction of each axis depends on the travel value sign.

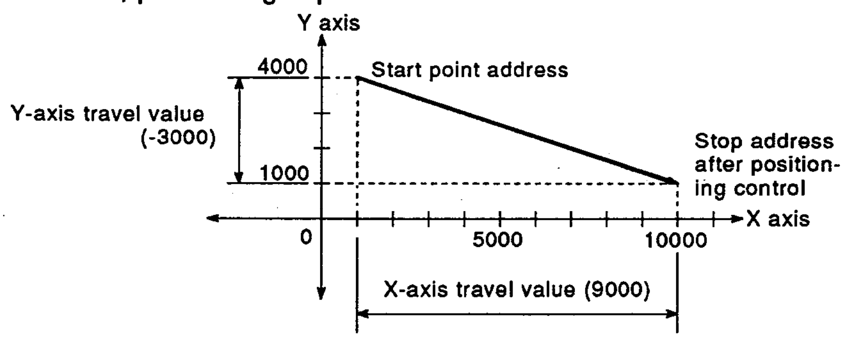
1) + travel value ... Positioning in forward direction (address incremental direction)

2) - travel value ... Positioning in reverse direction (address decremental direction)




Example

When the X-axis travel value is 9000 and the Y-axis travel value is -3000, positioning is performed as shown below:




(c) Travel values of up to $2^{30}$ are possible for each axis in linear interpolation control.
If the calculated travel value exceeds the range indicated above, an "out of linear travel value range error message (error code 504)" will occur at the start of positioning, and positioning will not begin.

(d) Designating positioning data *1

1) Set the positioning data control method for the reference axis.

2) The following positioning data can be set with the peripheral device or sequence program:

| Data | Necessity of Setting *2 | |
|---|---|---|
| | Reference Axis | Auxiliary Axis |
| Operation pattern | o | — |
| Control method | Select "INC linear 2". | — |
| Acceleration time | o | — |
| Deceleration time | o | — |
| Positioning address/Travel value | o | o |
| Circular interpolation address | — | — |
| Commanded speed | o | — |
| Dwell time | Δ | — |
| M code | Δ | — |

**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.

2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

(4) Fixed-pitch feed control

This function controls positioning of a designated axis for a designated travel value from the stop position.
One-axis fixed-pitch feed and 2-axis fixed-pitch feed are available.

**POINTS**

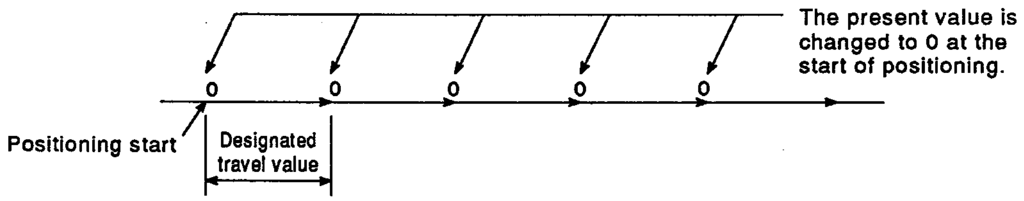
(a) Since fixed-pitch feed matches the number of pulse outputs with the travel value designated in the positioning data, fractions lower than the last digit of the control accuracy are truncated.
(This truncation does not affect the accuracy of regular control.)
When the fraction is truncated, the machine feed value may be compensated.

(b) When continuous locus control is selected as the operation pattern of the positioning data, fixed-pitch feed control cannot be designated.
If continuous locus control and fixed-pitch feed are designated simultaneously, an axis error will occur, and the axis travel will not start.

(c) Fixed-pitch feed control cannot be designated for the next positioning data after a positioning data for which continuous locus control is set as the operation pattern either.
If fixed-pitch feed is designated, an axis error will occur and automatic deceleration will begin.

Control by 1-axis fixed-pitch feed (fixed-pitch feed 1)

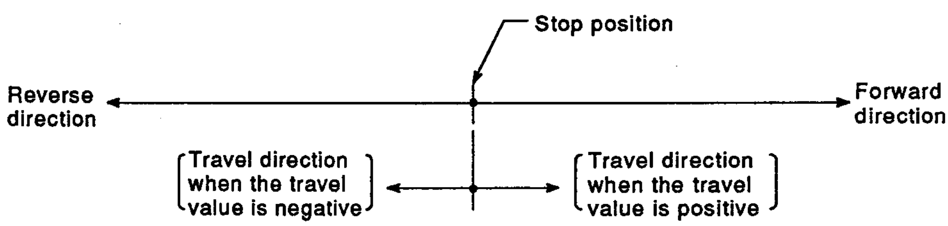
(a) One-axis fixed-pitch feed changes the stop address of the axis designated at the start of positioning to 0, then controls positioning for the designated travel value in the designated direction.




(b) The travel direction depends on the travel value sign.

1) + travel value ... Positioning in forward direction (address incremental direction)

2) - travel value ... Positioning in reverse direction (address decremental direction)



(c) Designating positioning data *1

The following positioning data can be set with the peripheral device or sequence program:

| Data | Necessity of Setting *2 |
|---|---|
| Operation pattern | o |
| Control method | Select "fixed-pitch feed 1". |
| Acceleration time | o |
| Deceleration time | o |
| Positioning address/Travel value | o |
| Circular interpolation address | — |
| Commanded speed | o |
| Dwell time | Δ |
| M code | Δ |

**REMARKS**

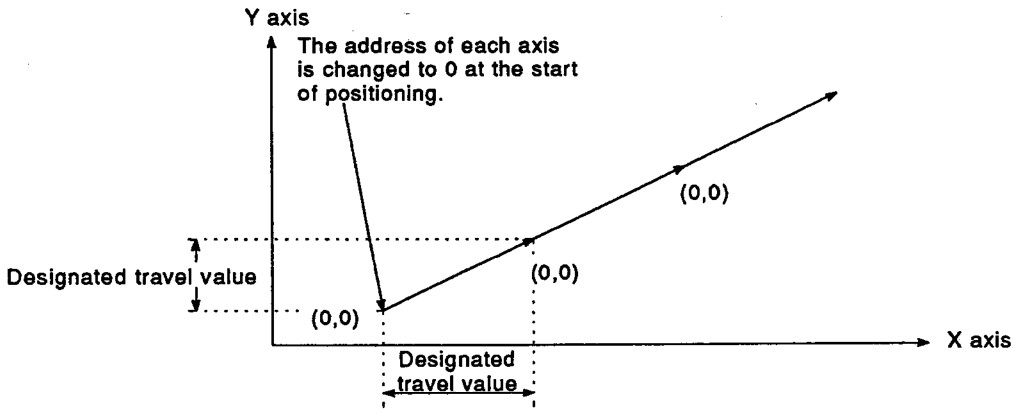
1) *1: For details of positioning data, see Section 3.4.5.

2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

Control by 2-axis fixed-pitch feed (fixed-pitch feed 2)

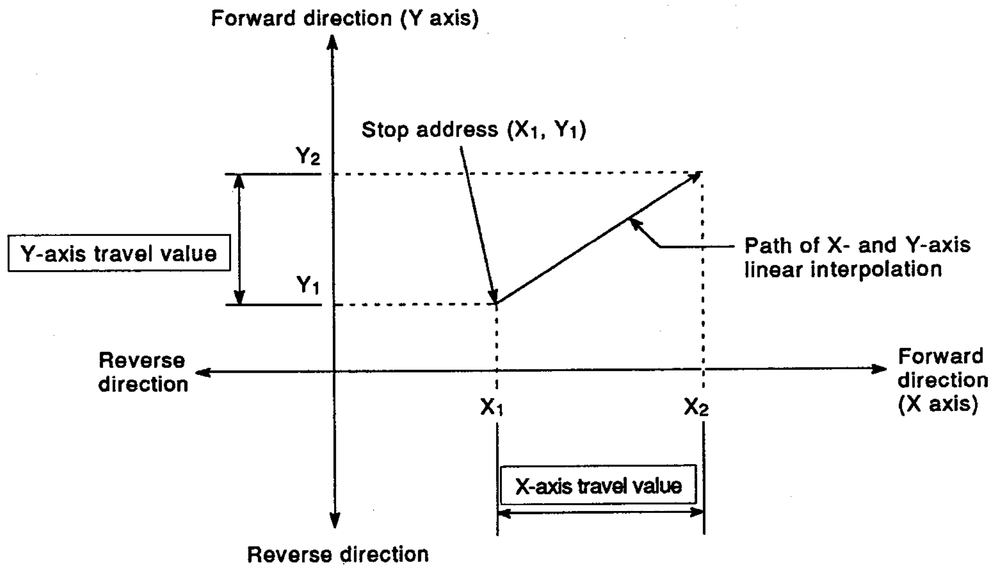
(a) Two-axis fixed-pitch feed changes the stop address of the two axes designated at the start of positioning to 0, then controls positioning to the resultant position of the travel direction and distance designated for each address.




(b) The travel direction of each axis depends on the travel value sign.

1) + travel value ... Positioning in forward direction (address incremental direction)

2) - travel value ... Positioning in reverse direction (address decremental direction)




(c) Travel values of up to $2^{30}$ are possible for each axis in linear interpolation control.
If the calculated travel value exceeds the range indicated above, an "out of linear travel value range error message (error code 504)" will occur at the start of positioning, and positioning will not begin.

(d) Designating positioning data *1

1) Set the positioning data control method for the reference axis.

2) The following positioning data can be set with the peripheral device or sequence program.

| Data | Necessity of Setting *2 | |
|---|---|---|
| | Reference Axis | Auxiliary Axis |
| Operation pattern | o | — |
| Control method | Select "fixed-pitch feed 2". | — |
| Acceleration time | o | — |
| Deceleration time | o | — |
| Positioning address/Travel value | o | o |
| Circular interpolation address | — | — |
| Commanded speed | o | — |
| Dwell time | Δ | — |
| M code | Δ | — |

**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.

2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

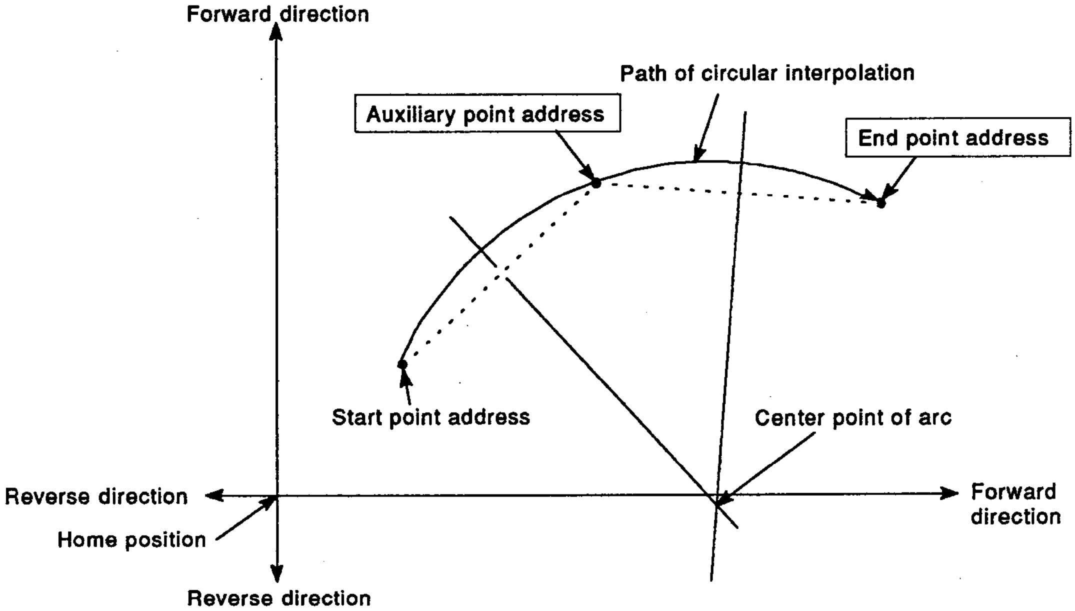
(5) Circular interpolation control by designating an auxiliary point (cannot be used with stepping motors)

This function performs circular interpolation control after designation of an end point and an auxiliary point (passing point).

Control by absolute data method

(a) This method performs circular interpolation from the start point address to the end point address via the designated auxiliary point address.

(b) The center point of the arc is located at the point of intersection of the vertical bisector from the line connecting the start point address and the auxiliary point address and the vertical bisector from the line between the auxiliary point address and the end point address.




(c) Circular interpolation control by designating an auxiliary point can be used even when the operation pattern is continuous locus control.

(d) Circular interpolation control by designating an auxiliary point cannot be used when "degrees" is selected as the unit.

(e) The maximum radius for which circular interpolation control is possible is $2^{29}$.
If the calculated radius exceeds the above range, a "radius setting error (error code: 544)" will occur at the start of positioning, and positioning will not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

(f) If the calculated center point address is outside the range $-2^{31}$ to $(2^{31} - 1)$, an "auxiliary point setting error (error code: 525)" will occur, and positioning will not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

(g) In the following cases an error will occur and positioning will not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

1) Start point address = end point address
... End point setting error (error code: 526)
2) Start point address = auxiliary point address
... Auxiliary point setting error (error code: 525)
3) End point address = auxiliary point address
... Auxiliary point setting error (error code: 525)
4) Start point address, auxiliary point address, and end point address lie on a straight line.
... Auxiliary point setting error (error code: 525)

(h) Designating positioning data *1

1) Set the positioning data control method for the reference axis.

2) The following positioning data can be set with the peripheral device or sequence program.

| Data | Necessity of Setting *2 | |
|---|---|---|
| | Reference Axis | Auxiliary Axis |
| Operation pattern | o | — |
| Control method | Select "ABS circular interpolation". | — |
| Acceleration time | o | — |
| Deceleration time | o | — |
| Positioning address/Travel value | o | o |
| Circular interpolation address | o (Set the auxiliary point address.) | o (Set the auxiliary point address.) |
| Commanded speed | o | — |
| Dwell time | Δ | — |
| M code | Δ | — |

**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.

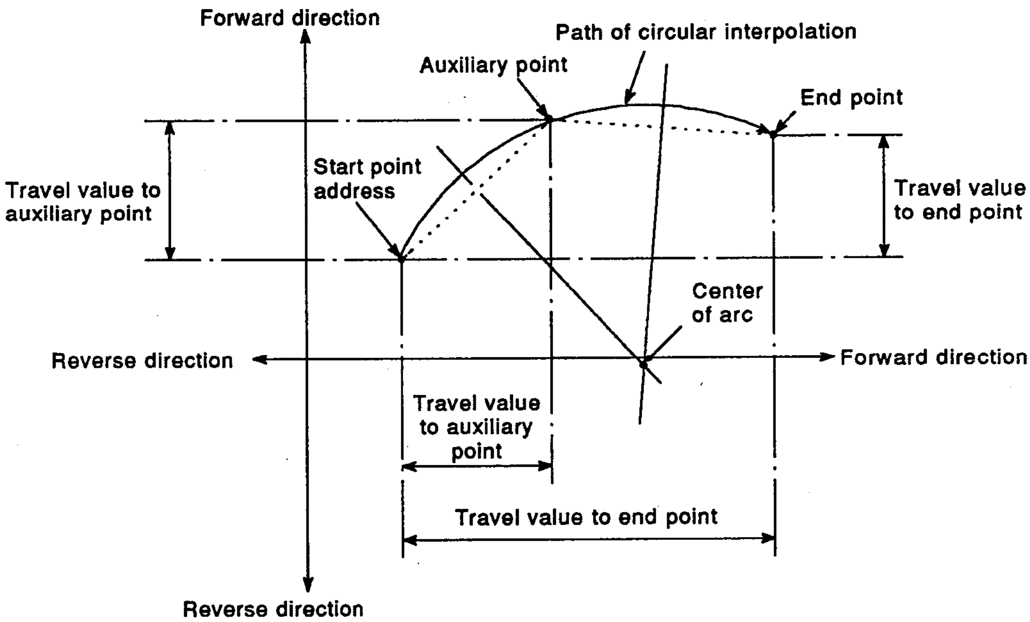
2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

Control by incremental method

(a) This method performs circular interpolation from the start point address to the end point address via the designated auxiliary point address.

(b) The center point of the arc is located at the point of intersection of the vertical bisector of the auxiliary point address calculated from the travel value from the start point address to the auxiliary point, and the vertical bisector of the end point address calculated from the travel value from the auxiliary point address to the end point.




(c) Circular interpolation control by designating an auxiliary point is available even when the operation pattern is continuous locus control.

(d) Circular interpolation control by designating an auxiliary point cannot be used when "degrees" is selected as the unit.

(e) The maximum radius for which circular interpolation control is possible is $2^{29}$.
If the calculated radius exceeds the above range, a "radius setting error (error code: 544)" will occur at the start of positioning, and positioning will not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

(f) If the calculated center point address is outside the range $-2^{31}$ to $(2^{31} - 1)$, an "auxiliary point setting error (error code: 525)" will occur, and positioning will not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

(g) In the following cases an error will occur and positioning will not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

1) Start point address = end point address
... End point setting error (error code: 526)
2) Start point address = auxiliary point address
... Auxiliary point setting error (error code: 525)
3) End point address = auxiliary point address
... Auxiliary point setting error (error code: 525)
4) Start point address, auxiliary point address, and end point address lie on a straight line.
... Auxiliary point setting error (error code: 525)

(h) Designating positioning data *1

1) Set the positioning data control method for the reference axis.

2) The following positioning data can be set with the peripheral device or sequence program.

| Data | Necessity of Setting *2 | |
|---|---|---|
| | Reference Axis | Auxiliary Axis |
| Operation pattern | o | — |
| Control method | Select "INC circular interpolation". | — |
| Acceleration time | o | — |
| Deceleration time | o | — |
| Positioning address/Travel value | o | o |
| Circular interpolation address | o (Set the travel value to the auxiliary point.) | o (Set the travel value to the auxiliary point.) |
| Commanded speed | o | — |
| Dwell time | Δ | — |
| M code | Δ | — |

**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.

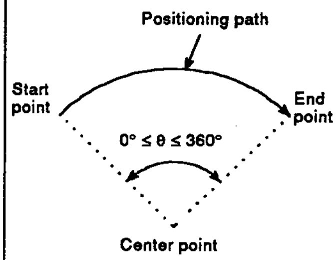
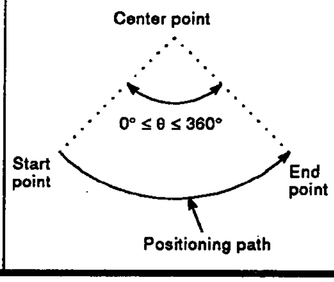
2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

(6) Circular interpolation control by designating a center point (cannot be used with stepping motors)

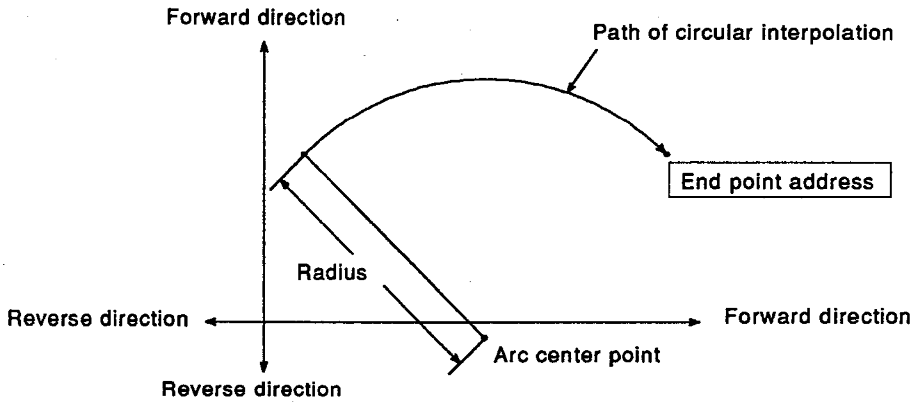
This function performs circular interpolation control after designation of the end point of circular interpolation and the center point of an arc.

The following table shows servomotor directions of rotation, controllable arc center angles and positioning paths.

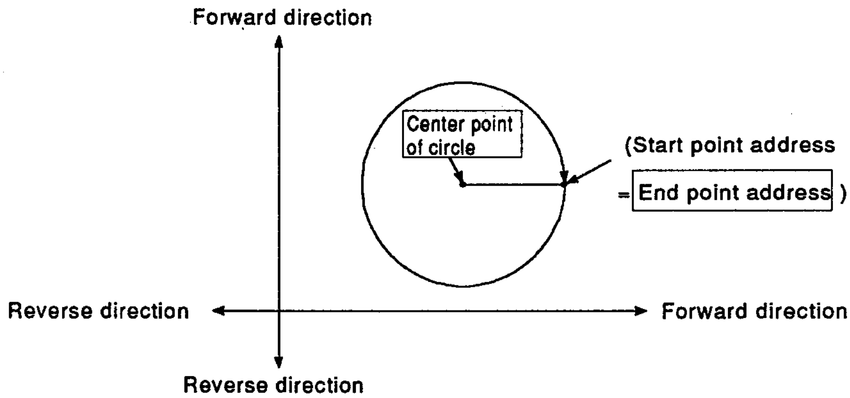
| Command | Direction of Rotation | Controllable Arc Center Angle | Positioning Path |
|---|---|---|---|
| ABS circular clockwise | Clockwise | $0° \leq \theta \leq 360°$ |   |
| INC circular clockwise | | | |
| ABS circular counterclockwise | Counterclockwise | |   |
| INC circular counterclockwise | | | |

Control by absolute data method

(a) This method performs circular interpolation from the start point address to the end point address along the arc of the circle whose radius is equivalent to the length from the start point address to the designated center point address.




(b) When the end point address and the start point address are the same, positioning can be performed on a circle which takes the length of the line joining the start point address to the center point of the circle as the radius.




(c) In circular interpolation control by designating a center point, the locus of the arc calculated from the start point address and the center point address may not coincide with the set end point address.

- When the error between the calculated locus of the arc and the end point address is within the allowable error range for circular interpolation set in extended parameters #2, circular interpolation is performed based on the set end point address while the error is compensated for by spiral interpolation.*

- When the error between the calculated locus of the arc and the end point address is outside the allowable error range for circular interpolation, an "out of allowable circular interpolation error range error (error code: 506)" will occur, and positioning will not begin.
  If positioning control is in progress, an immediate stop will occur on detection of the error.

REMARK

*: For spiral interpolation, see Section 3.4.2 (22).

(d) Circular interpolation control by designating a center point is available even when the operation pattern is continuous locus control.

(e) Circular interpolation control by designating a center point cannot be used when degree is selected as the unit.

(f) The maximum radius for which circular interpolation control is possible is $2^{29}$.
If the calculated radius exceeds the above range, a "radius setting error (error code: 544)" will occur at the start of positioning, and positioning will not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

(g) In the cases shown below, a "center point setting error (error code: 527)" occurs and positioning does not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

1) Start point address = center point address

2) End point address = center point address

(h) Designating positioning data *1

1) Set the positioning data control method for the reference axis.

2) The following positioning data can be set with the peripheral device or sequence program.

| Data | Necessity of Setting *2 | |
|---|---|---|
| | Reference Axis | Auxiliary Axis |
| Operation pattern | o | — |
| Control method *3 | Select "ABS circular clockwise" or "ABS circular counterclockwise". | — |
| Acceleration time | o | — |
| Deceleration time | o | — |
| Positioning address/Travel value | o | o |
| Circular interpolation address | o (Set the center point address.) | o (Set the center point address.) |
| Commanded speed | o | — |
| Dwell time | Δ | — |
| M code | Δ | — |

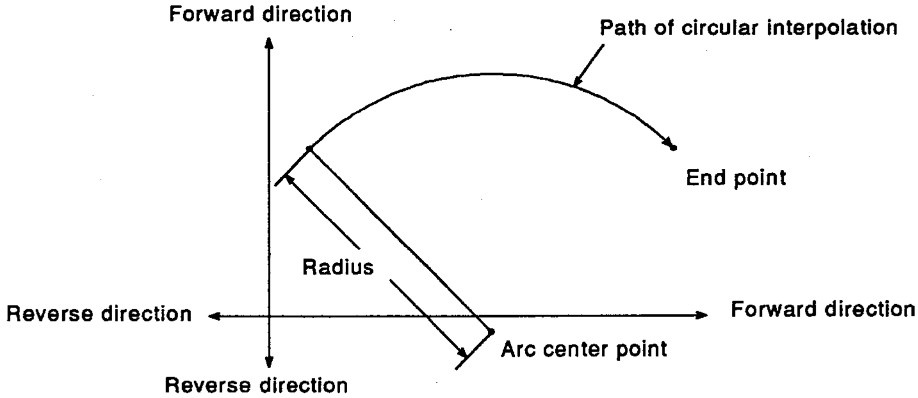
**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.
2) *2: Whether or not setting is necessary is indicated by one of the following symbols:
- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

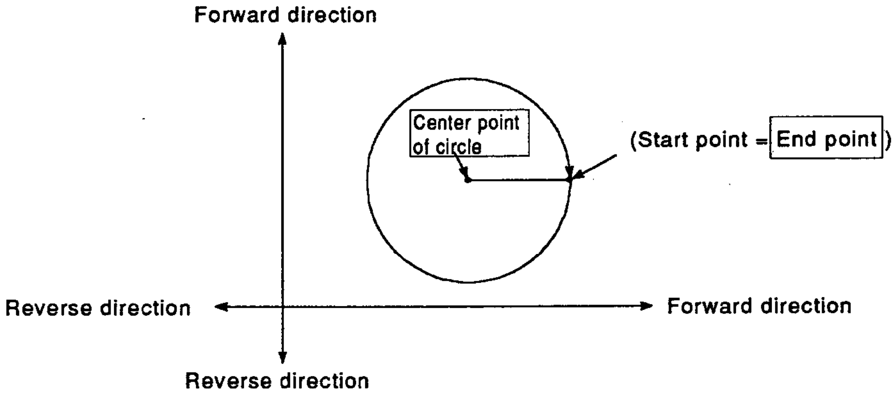
3) *3: With regard to the control method, select either "ABS circular clockwise" or "ABS circular counterclockwise" according to the direction of rotation of the servomotor.

Control by incremental method

(a) This method performs circular interpolation from the start point address to the end point along the arc of the circle whose radius is equivalent to the length from the start point address to the designated center point address..




(b) By setting the travel value to 0, positioning can be performed on a circle which takes the length of the line joining the start point address to the center point of the circle as the radius.




(c) In circular interpolation control by designating a center point, the locus of the arc calculated from the start point address and the center point address may not coincide with the set end point address.

- When the error between the calculated locus of the arc and the end point address is within the allowable error range for circular interpolation set in extended parameters #2, circular interpolation is performed based on the set end point address while the error is compensated for by spiral interpolation.*
- When the error between the calculated locus of the arc and the end point address is outside the allowable error range for circular interpolation, an "out of allowable circular interpolation error range error (error code: 506)" will occur, and positioning will not begin.
  If positioning control is in progress, an immediate stop will occur on detection of the error.

**REMARK**

*: For details on spiral interpolation, see Section 3.4.2 (22).

(d) Circular interpolation control by designating a center point is possible even when the operation pattern is continuous locus control.

(e) Circular interpolation control by designating a center point cannot be used when "degrees" is selected as the unit.

(f) The maximum radius for which circular interpolation control is possible is $2^{29}$.
If the calculated radius exceeds the above range, a "radius setting error (error code: 544)" will occur at the start of positioning, and positioning will not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

(g) If the calculated end point address or center point address is outside the range $-2^{31}$ to $(2^{31}-1)$, the following errors occur and positioning does not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

1) For end point address: End point setting error (error code: 526)

2) For center point address:
Center point setting error (error code: 527)

(h) In the cases shown below, a "center point setting error (error code: 527)" occurs and positioning does not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

1) Start point address = center point address

2) End point address = center point address

(i) designating positioning data *1

1) Set the positioning data control method for the reference axis.

2) The following positioning data can be set with the peripheral device or sequence program.

| Data | Necessity of Setting *2 | |
|---|---|---|
| | Reference Axis | Auxiliary Axis |
| Operation pattern | o | — |
| Control method *3 | Select "INC circular clockwise" or "INC circular counterclockwise" | — |
| Acceleration time | o | — |
| Deceleration time | o | — |
| Positioning address/Travel value | o | o |
| Circular interpolation address | o (Set the center point address.) | o (Set the center point address.) |
| Commanded speed | o | — |
| Dwell time | Δ | — |
| M code | Δ | — |

**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.

2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

3) *3: With regard to the control method, select either "INC circular clockwise" or "INC circular counterclockwise" according to the direction of rotation of the servomotor.

### 3.3.2 Positioning method

There are four positioning methods as shown below:

Positioning method
- Individual positioning
- Continuous locus
- Continuous positioning
- Block positioning

- Individual positioning
  The individual positioning method performs one-time positioning according to the positioning data.

- Continuous locus positioning
  The continuous locus method performs continuous locus operation in response to one start signal according to the operation pattern set in the positioning data.

- Continuous positioning
  The continuous positioning method performs continuous positioning until a set end pattern in response to one start signal according to the operation pattern set in the positioning data.
  Continuous locus positioning and continuous positioning can be used in combination.

- Block positioning
  The block positioning method can perform the most complicated operation in response to a single start signal, and execute the operation indicated in the positioning information.

(1) Positioning start

This section describes processing started by inputting a positioning start signal.

(a) Start with a positioning start signal

1) As soon as the positioning signal is turned ON, the start completed signal and the BUSY signal are also turned ON to start positioning.
The ON status of the BUSY signal indicates that the axis is in operation.

2) The start completed signal is turned OFF whenever the positioning start signal goes OFF.
When the positioning start signal is ON even after positioning has been completed, the start complete signal remains ON.

3) If the positioning start signal is turned ON again while the BUSY signal is ON, an "in-operation start warning (warning code: 100)" will be issued.

4) The processing after the axis has completed operation depends on whether subsequent positioning must be performed.

i) When subsequent positioning need not be performed

- If a dwell time is set, positioning is delayed until the set time has elapsed.
- When positioning is completed, the BUSY signal goes OFF and the positioning complete signal comes ON. However, the positioning completed signal will not be turned ON during speed control, or when the positioning completed signal ON time is "0".
- The lapse of the positioning completed signal ON time turns OFF the positioning completed signal.

ii) When subsequent positioning must be performed

- When the dwell time is set, the axis waits until the set time elapses.
- The subsequent positioning will begin on elapse of the set dwell time.

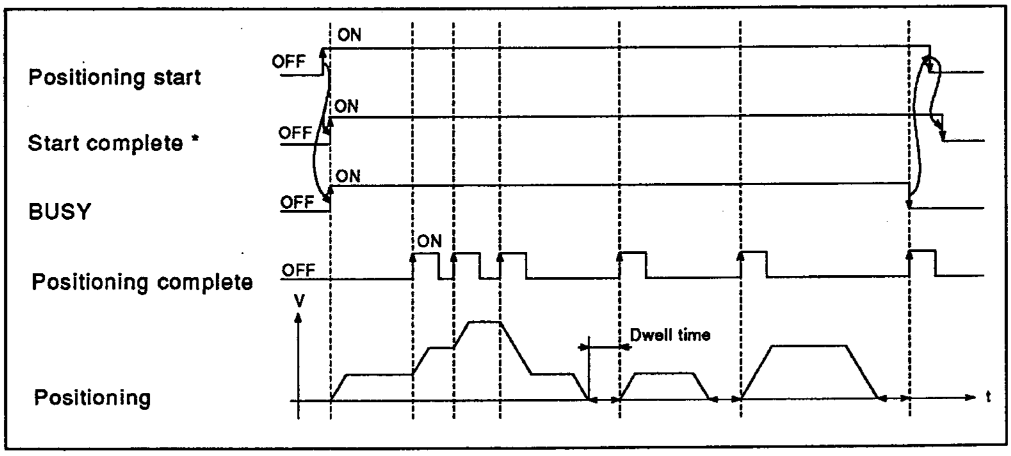



**Fig. 3.1 ON/OFF Timing of Signals at Positioning Start**

**REMARK**

* : Does not come ON in the case of a start caused by an external start signal.

(b) External positioning start

1) Positioning can be started by turning ON an external start signal. [The same processing as positioning start with a positioning start signal can be performed. See (1)(a).]

2) To perform positioning with an external start signal, "external positioning start (0)" must be set in the "external start function selection" buffer memory area.

3) To start positioning by external start, "external start enabled (1)" must be set in the "external start valid setting" buffer memory area.
Positioning does not begin if the setting in the external start valid setting buffer memory area is "external start disabled (initial value: 0)".

4) The start complete signal does not come ON in the case of a start caused by an external start signal.

**POINT**

An external positioning start will be executed in response to an input from an external source provided the start data number has been written by the sequence program in advance.
Because the external input starts positioning by selecting external positioning start, lead time fluctuation due to the sequence scan time can be eliminated by using this method.

**REMARK**

The buffer memory addresses for the external start function selection area and the external start enable setting area are shown below:

| Axis No. | Buffer Memory | |
|---|---|---|
| | External Start Function Selection | External Start Valid Setting |
| Axis 1 | 62 | 1171 |
| Axis 2 | 212 | 1221 |
| Axis 3 | 362 | 1271 |

(c) Block positioning

1) When the positioning start signal is turned ON, block positioning starts with the positioning data number of the first point set in the positioning start data.

2) When the operation pattern of the positioning data is positioning continued, the next positioning data will be executed after positioning according to the first point of positioning data.
The "next positioning data" means the positioning data number subsequent to the positioning data number on the basis of which positioning was performed last time. For example, when the previously executed data number is 10, positioning will be executed in accordance with positioning data No. 11.

3) When the operation pattern of the positioning data is "positioning end", positioning stops after the first positioning data has been executed.
Positioning will be terminated when the "positioning end/continued" setting for the first point is "positioning end". (The BUSY signal will be turned OFF.)
When "positioning continued" is selected as the operation pattern for the first point, the point will be updated, and the second point positioning data will be executed.

4) Point updating continues until the positioning data proceeds to the end command.
However, note that updating can be continued for a maximum of 50 points.
If this limit of 50 points is exceeded, positioning is discontinued and the warning "no operation end setting (warning code: 505)" is issued.

[Positioning start data setting]

| Point | Positioning start data | |
|---|---|---|
| 1 | Con-tinued | 20 |
| 2 | End | 30 |
| ⋮ | | |
| 49 | | |
| 50 | | |

50 points

| Positioning data No. | Operation pattern |
|---|---|
| 20 | 11 |
| 21 | 11 |
| 22 | 11 |
| 23 | 01 |
| 24 | 00 |
| 30 | 00 |

Operation pattern
00: Positioning end
01: Continuous positioning control
11: Continuous locus control
10: Error

[Processing sequence]

In the case of the above setting, the positioning data is processed in the following sequence:

- 20 → 21 → 22 → 23 → 24 → 30 → (Positioning end)

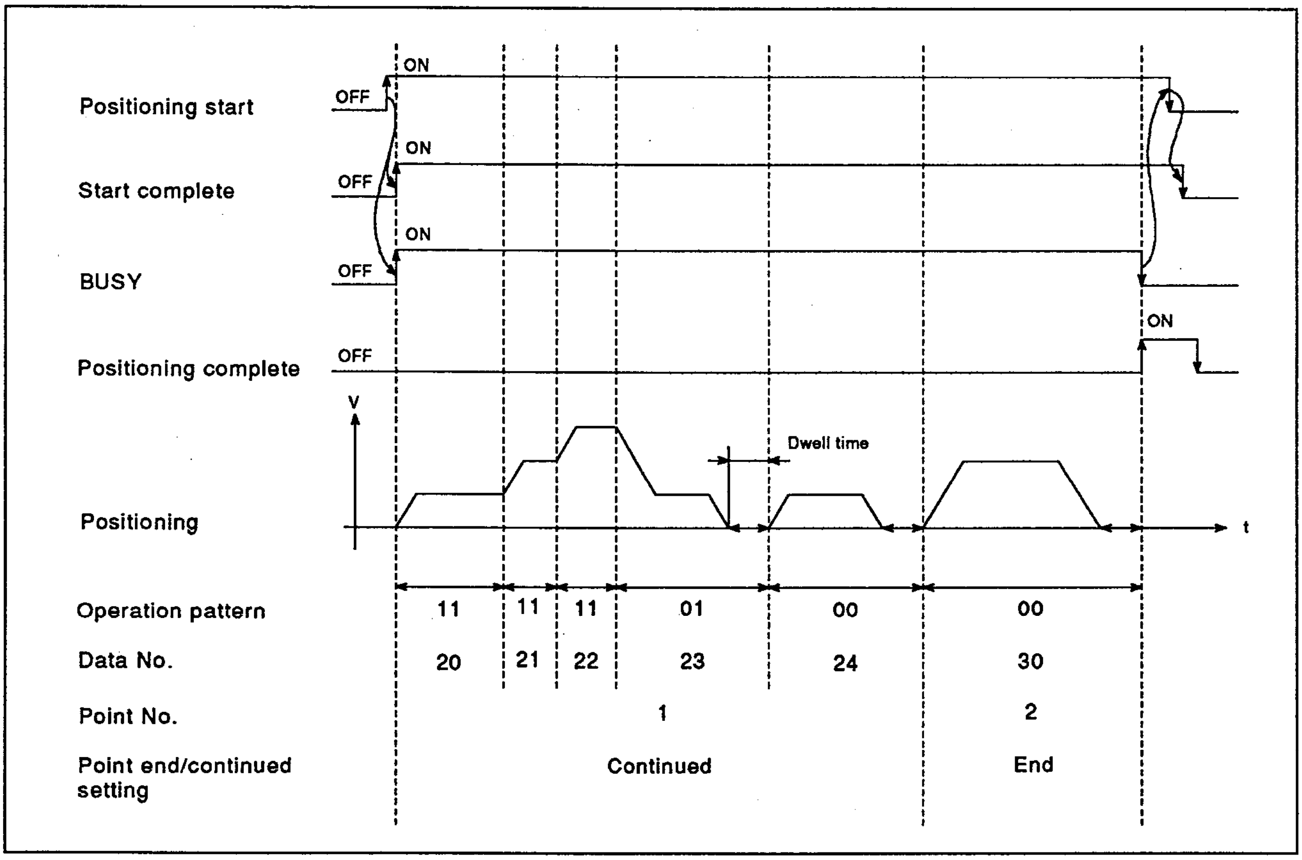



Fig. 3.2 Block Positioning Processing

### 3.3.3 Positioning stop

This section describes the causes for which axes may be stopped during positioning.

(1) Stop processing and order of priority

(a) Stop processing

There are three types of stop during positioning: deceleration stop, rapid stop, and immediate stop.

1) Deceleration stop *1

This is a stop made in accordance with deceleration times 1 to 4 in the basic parameters and extended parameters.
Which of deceleration times 1 to 4 is used is determined by the positioning data settings.

2) Rapid stop *1

This is a stop in accordance with the "rapid stop deceleration time" set in the extended parameters.

3) Immediate stop

This is a stop without deceleration processing.
The AD75 stops pulse output immediately but coasts by the amount of droop pulses in the drive unit's deviation counter.

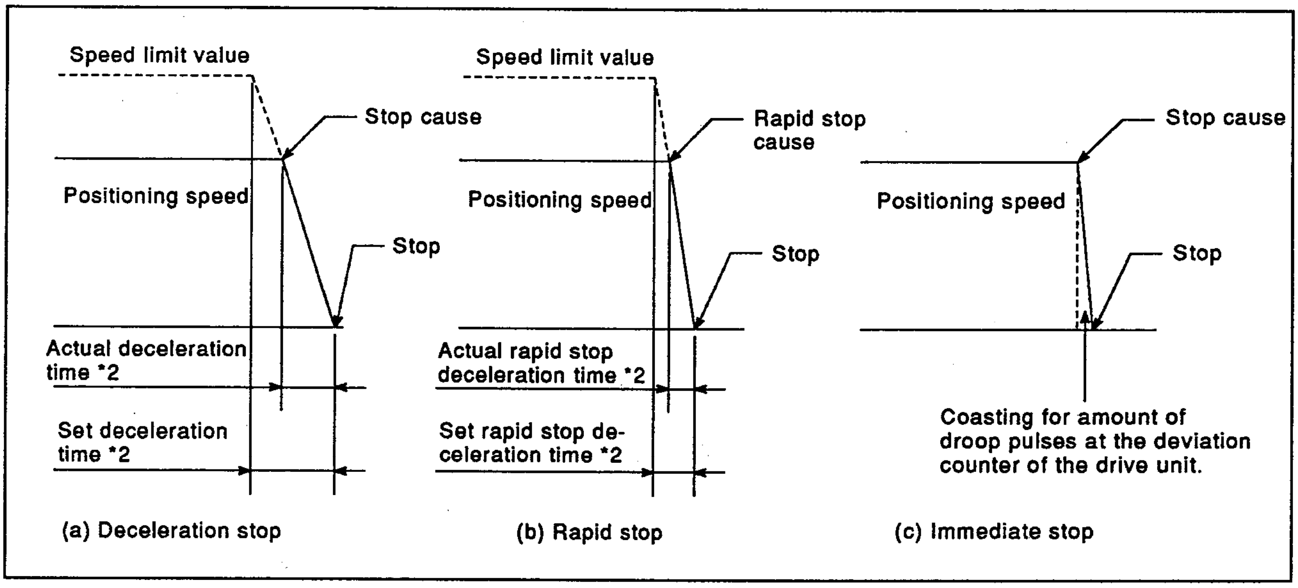



**Fig. 3.3 Outline of Stop Processing**

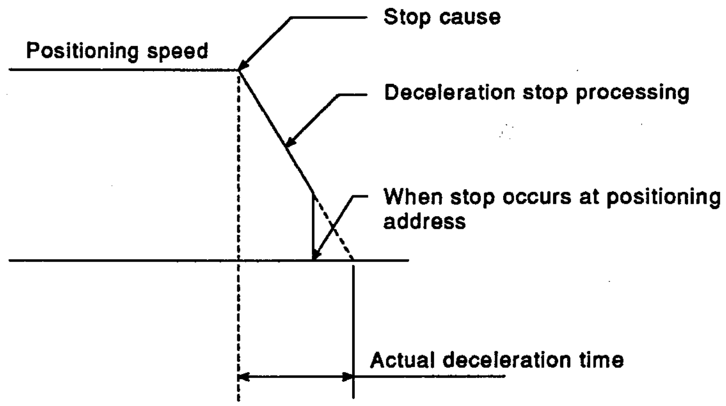
**REMARKS**

1) *1: Deceleration stop and rapid deceleration stop are selected in the "stop group 1 to 3 rapid stop selections" of the extended parameters. (The default is "normal deceleration stop".)

2) *2: For details on the actual deceleration time, set deceleration time, actual rapid stop deceleration time, and set rapid stop deceleration time, See Section 3.3.15.

**POINT**

An immediate stop occurs on reaching the set positioning address during a deceleration stop in position control.




(b) Order of priority for stop processing

The order of priority for AD75 stop processing is as follows.

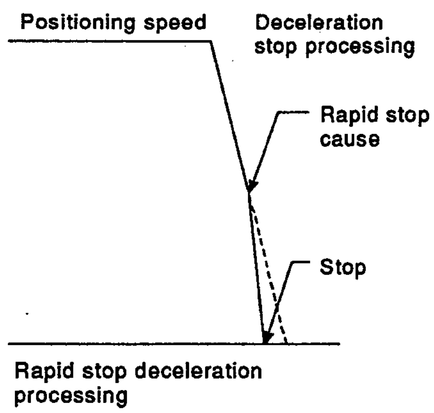
| |
|---|
| (deceleration stop) < (rapid stop) < (immediate stop) |

1) Even if the deceleration stop command comes ON or a deceleration stop cause occurs during deceleration (including automatic deceleration), the current deceleration will remain in effect until the stop.

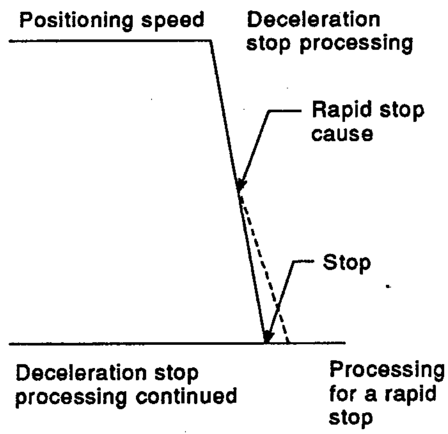
2) If a stop signal for which rapid stop is designated comes ON - or a stop cause occurs - during deceleration, rapid stop processing commences from that point.
However, if the rapid stop deceleration time is longer than the remaining deceleration time, the current deceleration stop processing will continue even if a rapid stop cause occurs during deceleration stop processing.

Example

The processing when a rapid stop cause occurs during deceleration processing is indicated below.




(a) When deceleration stop time > rapid stop deceleration time




(b) When deceleration stop time < rapid stop deceleration time

(2) Stop commands, stop causes

(a) The types of stop command and stop cause are shown in Table 3.4: they are classified into "individual axis stop" and "all-axis simultaneous stop".

1) In the case of a stop command or stop cause for an individual axis, only the axis for which the stop command came ON or the stop caused occurred stops.
However, if during interpolation control, one of the axes is stopped by a stop command or the occurrence of a stop cause, both axes involved in the interpolation control are stopped.

2) In the case of an all-axis simultaneous stop command or stop cause, all axes are stopped when the stop command comes ON or the stop cause occurs.

(b) The stop commands and stop causes that can be selected for deceleration stops and rapid stops are classified into stop groups 1 to 3.
"Deceleration stop" or "rapid stop" can be set for each stop group by using the extended parameters.

1) Stop group 1: Critical stop cause

2) Stop group 2: Emergencies

3) Stop group 3: Intentional stop and relatively minor errors

### Table 3.4 Stop Processing According to Stop Cause and Operating Status

<table>
<tr><th colspan="2">Stop Cause</th><th>Positio-ning *4</th><th>Home Position Return *5</th><th>JOG Operation</th><th>Manual Pulse Generator Operation</th><th>Stop Axis</th><th>Axis Operating Status After Stop</th><th>M code ON Signal Status</th></tr>
<tr><td rowspan="2">—</td><td>Drive unit ready OFF *1 (Servo ready OFF)</td><td colspan="3" rowspan="2">Immediate stop</td><td rowspan="2">Immediate stop</td><td rowspan="2">Individual axes</td><td rowspan="2">Error</td><td rowspan="2">No change</td></tr>
<tr><td>When an error occurs in continuous locus positioning *2</td></tr>
<tr><td rowspan="2">Stop group 1</td><td>External upper limit switch ON</td><td colspan="3" rowspan="2">Deceleration stop/rapid stop</td><td rowspan="2">Immediate stop</td><td rowspan="2">Individual axes</td><td rowspan="2">Error</td><td rowspan="2">No change</td></tr>
<tr><td>External lower limit switch ON</td></tr>
<tr><td rowspan="3">Stop group 2</td><td>Outside software stroke limit</td><td colspan="3" rowspan="3">Deceleration stop/rapid stop</td><td rowspan="3">Immediate stop</td><td>Individual axes</td><td rowspan="3">Error</td><td rowspan="2">No change</td></tr>
<tr><td>[Stop] key input from peripheral device</td><td rowspan="2">All axes</td></tr>
<tr><td>Sequence ready OFF</td><td>Turned OFF</td></tr>
<tr><td rowspan="4">Stop group 3</td><td>External stop signal ON *6</td><td colspan="3" rowspan="4">Deceleration stop/rapid stop</td><td rowspan="4">Immediate stop</td><td rowspan="4">Individual axes</td><td rowspan="2">Stopped/ Standby</td><td rowspan="4">No change</td></tr>
<tr><td>Axis stop signal (Yn) ON *6</td></tr>
<tr><td>Axis error occurrence (other than stop groups 1, 2)</td><td rowspan="2">Error</td></tr>
<tr><td>Test mode error</td></tr>
</table>

**REMARKS**

1) *1: This is stop processing by drive unit hardware processing.

2) *2: Whether or not the software stroke limit is effective for JOG operation and manual pulse generator operation can be selected using validating/invalidating the software stroke limit during JOG operation/manual pulse generator operation in the axis control data.

3) *3: Normal operation proceeds up to the positioning data immediately preceding the positioning data at which any of the following errors occurred, then an immediate stop is executed.
Out of linear travel value range(error code: 504)
Excessive arc error(error code: 506)
Travel outside stroke limit +(error code: 511)
Travel outside stroke limit -(error code: 512)
Auxiliary point setting error(error code: 525)
End point setting error(error code: 526)
Center point setting error(error code: 527)
Out of radius range(error code: 544)

4) *4: "Positioning" here means position control, speed control, or speed/position switching control, in accordance with positioning data.

5) *5: Indicates travel at the home position return speed or creep speed during a home position return.

**POINT**

*6: Positioning will not start even if the external stop signal or axis stop signal (Yn) goes OFF while the start signal is ON.
(The start signal is effective at its leading edge (OFF → ON)).

(3) Stop signal input during deceleration

(a) If a stop signal is input during deceleration (including automatic deceleration), the deceleration continues unaltered before axis motion stops.

(b) When a stop signal is input during deceleration in a home position return, the deceleration continues unaltered before axis motion stops. However, axis motion stops immediately during axis motion at the creep speed.

(c) Rapid stop processing is performed as soon as a stop cause requiring a rapid stop occurs during deceleration, provided that the rapid stop time is shorter than the stop time.

(4) Stop processing during interpolation

(a) During interpolation, both operating axes are stopped by stop signals issued to both axes.

(b) On restarting interrupted positioning (starting when axis motion is stopped), positioning begins from where the axes stopped.
On restarting after positioning operation has been stopped while the system was waiting for conditions to be fulfilled, the waiting for condition fulfillment status is re-established.

(5) M code

When the PC READY signal is turned OFF, a "0" M code is issued.

### 3.3.4 Operation pattern

Operation patterns represent control patterns for various factors, such as how the positioning data corresponding to two or more data numbers will be executed, or the nature of the acceleration/deceleration between positioning data.

There are three operation patterns - positioning end, continuous positioning control and continuous locus control.

Of these three operation patterns, continuous locus control executes almost the same function as constant speed control.

The categories of operation pattern are shown below:

- Operation pattern
  - Positioning end (00)
  - Positioning continued
    - Continuous positioning control (01)
    - Continuous locus control (11)

(1) Positioning end

Set this operation pattern to execute positioning to the designated address and complete the positioning of the current point. If a dwell time has been designated, positioning is completed after elapse of the designated time.

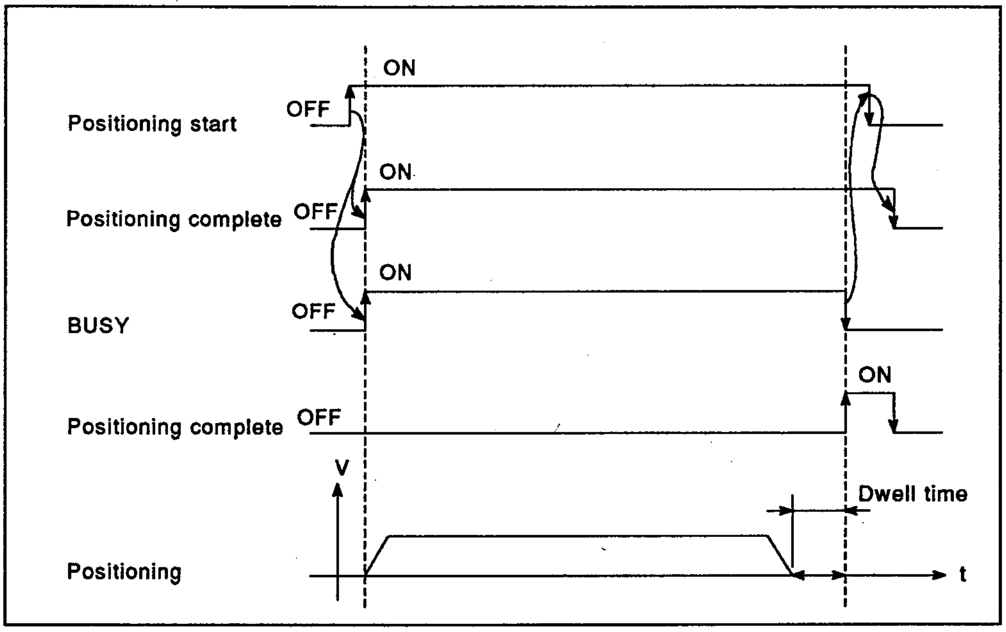



**Fig. 3.4 Operation for "Positioning End"**

(2) Continuous positioning control

(a) Each time positioning is completed in accordance with a single positioning data, the axis is automatically decelerated to 0, then it is accelerated again to perform positioning based on the next positioning data.

(b) Set operation pattern "00" at the end of positioning by continuous positioning control (01) to terminate positioning.
When "positioning continued" is set as the operation pattern, positioning continues until operation pattern 00 is detected.
If operation pattern 00 is not identified, positioning may proceed to positioning data No. 600.

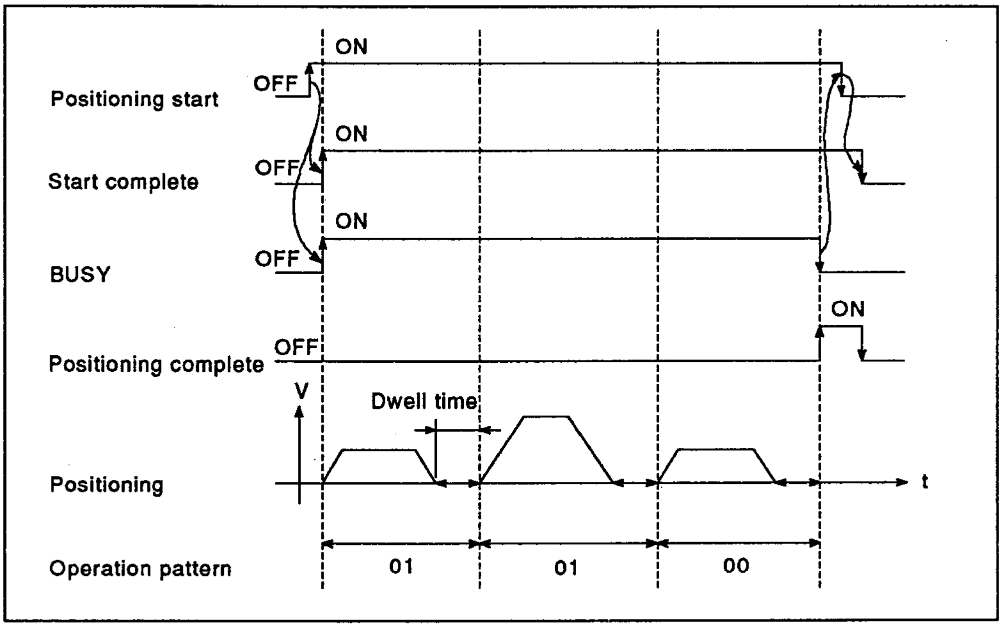



**Fig. 3.5 Operation for Continuous Positioning Control**

(3) Continuous locus control

(a) The speed of positioning according to the ongoing positioning data is changed to the speed of the positioning data for the next positioning.
The speed will not be changed if the current speed and the speed of the next positioning are the same.

(b) When the set commanded speed is -1, the speed of the previous positioning is valid.

(c) If a dwell time is set, it is ignored.

(d) Set operation pattern "00" at the end of positioning by continuous locus control (11) to terminate positioning.
When positioning continued is set as the operation pattern, positioning continues until operation pattern 00 is detected.
If operation pattern 00 is not identified, positioning may proceed to positioning data No. 600.

(e) As the speed switching pattern, the "advance speed change pattern" which changes the speed at the end of the ongoing positioning, or the "standard speed change pattern" which changes the speed at the start of the next positioning, can be selected.

Continuous locus control ┬ Standard speed change mode
└ Advance speed change mode

**Automatic deceleration conditions**

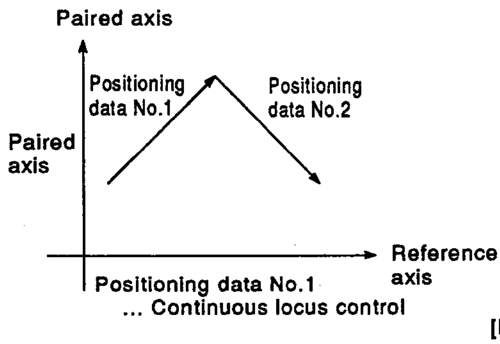
As a rule, automatic deceleration is not executed in continuous locus control. However, under any of the conditions mentioned below, axis motion is decelerated to zero by automatic deceleration:

- When the operation pattern of the current positioning data is "11", and there are different travel values in the current data and the next data. (See POINTS.)
- During step operation (See Section 3.3.21)
- When there is an error in the positioning data to be executed next

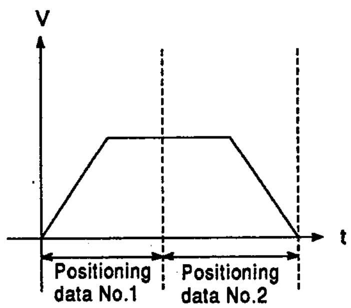
**POINTS**

(1) In interpolation control, only the travel direction of the reference axis is checked. Therefore, automatic deceleration is not performed as long as the travel direction on the reference axis remains unchanged.This may result in sudden direction reversal on the other interpolation axis.
To avoid a sudden direction reversal on the other interpolation axis, program the pass point in continuous positioning control (01) rather than continuous locus control (11).

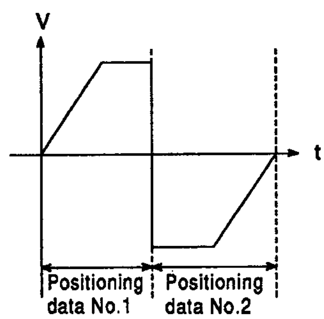
[Positioning by interpolation]




[Motion of reference axis]




[Motion of paired interpolation axis]




(2) Automatic deceleration is not performed when circular interpolation control is set for either the current positioning data number or the next data number.

Speed processing

- The commanded speed is set in the setting positioning data, but it may be omitted.
  In such a case, the speed used in the previous positioning remains effective.
- To omit the commanded speed, set "-1" as the commanded speed. The peripheral device displays "-1".
- The AD75 retains the commanded speed set in the positioning data number, and the latest speed set in response to a speed change request as the current speed. When -1 (current speed) is set as the commanded speed, control is performed at the current speed.
- The feed speed may fail to reach the speed change value because of the relationship between the travel value and the change speed. However, the current speed is updated even in such a case.
- If "-1" is set for the commanded speed of the first positioning data on starting, a "No commanded speed error (error code: 503)" occurs and positioning does not begin.

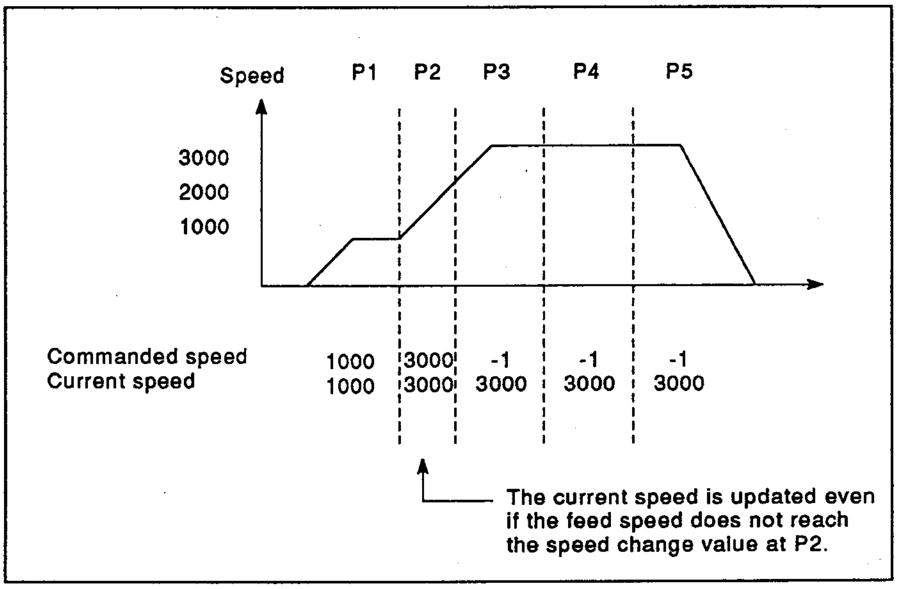



**Fig. 3.6 Relationship Between Commanded Speed and Current Speed**

Standard speed change mode

- When the commanded speed of the ongoing positioning data number and that of the next data number are different, the currently valid speed is accelerated or decelerated to the designated value of the next data number after the axis has reached the positioning end point.

- For acceleration or deceleration, the parameters of the positioning data number executing acceleration or deceleration are used. A speed change does not take place when the commanded speed is the same.

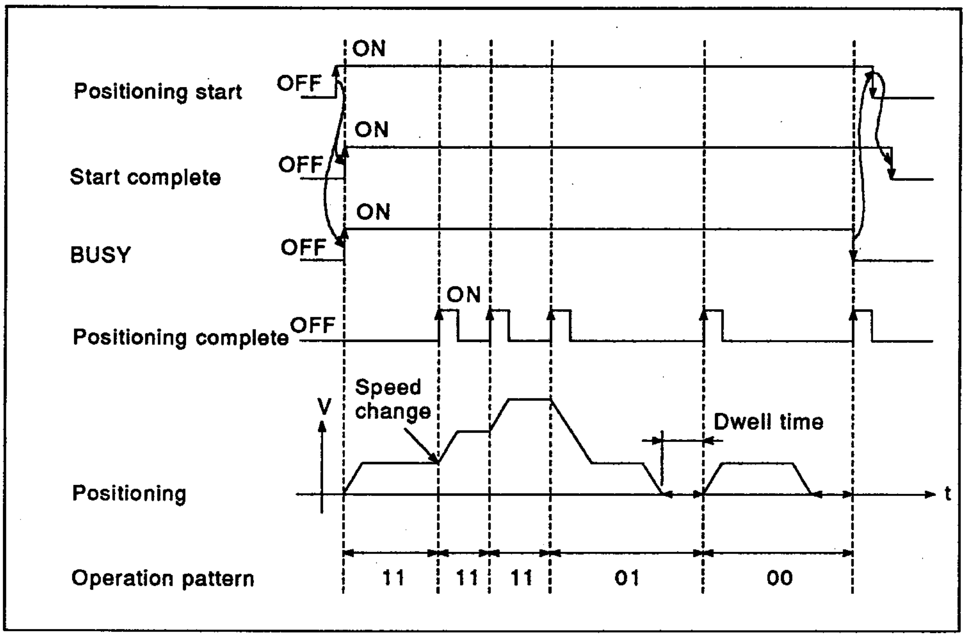
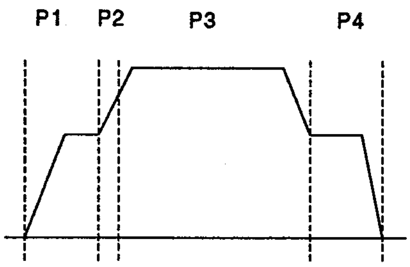



**Fig. 3.7 Operation in Standard Speed Change Mode**

- Speed change conditions
  When the travel value is too short for the target speed and consequently the actual speed does not reach the target speed in acceleration and deceleration, the actual speed is accelerated or decelerated to as close a speed as possible to the target.
  If the axis overruns the travel value when automatic deceleration is required (for example, when the operation pattern is 00 or 01), the axis will stop at the positioning address immediately, and "insufficient travel value warning (warning code: 513)" will be issued.

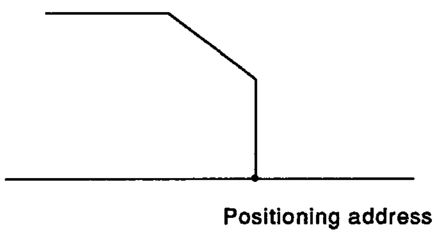
[When the speed cannot be changed at P2]

Speed relationship: P1 = P4, P2 = P3, P1 < P2




[When the travel value is short in automatic deceleration]

Since the travel value required for automatic deceleration cannot be assured, the axis stops immediately at any speed higher than 0.



Advance speed change mode

- When the commanded speed of the ongoing positioning data number and that of the next data number are different, the currently valid speed is changed to the designated value of the next data number at the end of the current positioning.
- For acceleration or deceleration, the parameters of the positioning data number executing the acceleration or deceleration are used. A speed change does not take place when the commanded speed is the same.

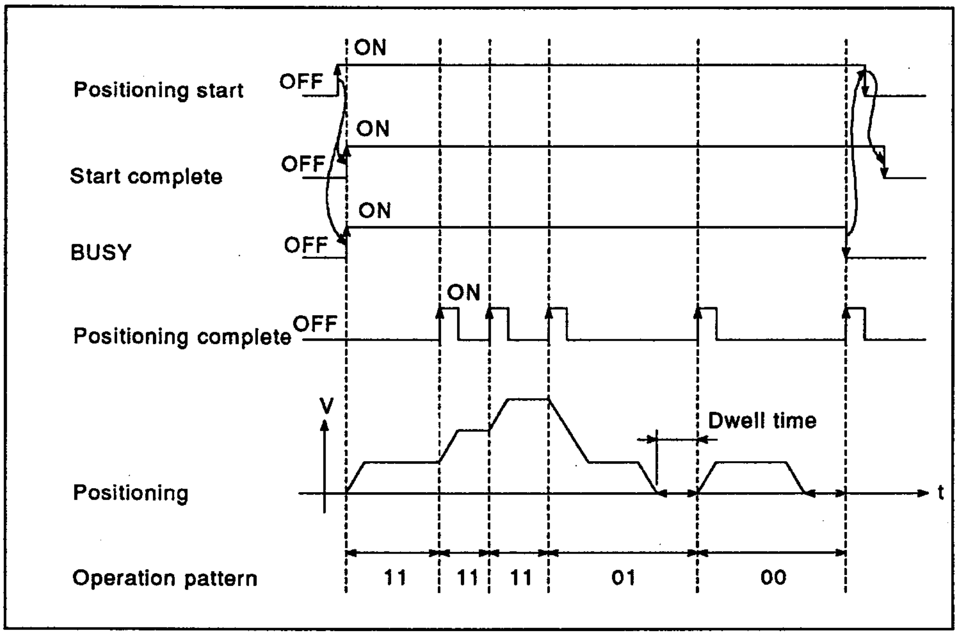
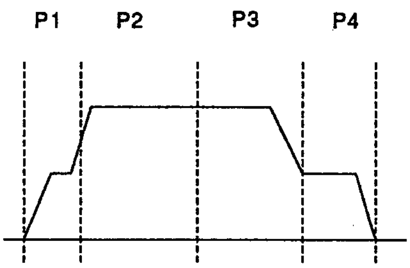



**Fig. 3.8 Operation in Advance Speed Change Mode**

- Speed change conditions
  When the travel value is too short for the target speed and consequently the actual speed does not reach the target speed in acceleration and deceleration, the actual speed is accelerated or decelerated to as close a speed as possible to the target.
  If the axis overruns the travel value when automatic deceleration is required (for example, when the operation pattern is 00 or 01), the axis will stop at the positioning address immediately, and "insufficient travel value warning (warning code: 513)" will be issued.

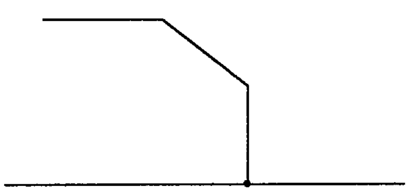
[When the speed cannot be changed to P2 at P1]

Speed relationship: P1 = P4, P2 = P3, P1 < P2




[When the travel value is short in automatic deceleration]

Since the travel value required for automatic deceleration cannot be assured, the axis stops immediately at any speed higher than 0.



### 3.3.5 Interpolation

(1) Interpolation uses two axes.

(2) Write the control method to: the positioning data for axis 1 for interpolation by axis 1 and axis 2; the positioning data for axis 2 for interpolation by axis 2 and axis 3; or the positioning data for axis 3 for interpolation by axis 3 and axis 1.

(3) The positioning identifier, M code, dwell time, commanded speed and other parameters for axis 1 are used for interpolation by axis 1 and axis 2, those for axis 2 for interpolation by axis 2 and axis 3, or those for axis 3 for interpolation by axis 3 and axis 1.
However, the positioning address and arc data used must be those set for the same positioning data number of each axis.

(4) When interpolation is executed using continuous positioning control or continuous locus control, include everything from the first positioning data No. started to the operation pattern 00 positioning data No. in the interpolation.
If the positioning data set for each point of the positioning start data in a block start is interpolation data, make all these points subject to interpolation.
Failure to do this may cause the AD75 to malfunction.

(5) There are two interpolation speed specification methods (interpolation modes), resultant speed (default) and reference axis speed.
The reference axis speed mode is, however, applicable only to linear interpolation control, and it may not be possible to designate either mode if there is an axis unit G (group) mismatch.
During interpolation, the paired axis (second axis) remains in the interpolation state, and returns to standby on completion of interpolation.
If an error occurs during interpolation, both axes decelerate to a stop and go into an error status.

(a) Axis unit G (groups) are classified as follows.

| Unit G (Group) | Unit |
|---|---|
| Group 1 | mm, inch |
| Group 2 | degree |
| Group 3 | PULS (PLS) |

(b) Whether or not interpolation is possible is determined as follows.

| Interpolation | Speed Designation | Unit G Matched | Unit G Mismatched |
|---|---|---|---|
| Linear interpolation | Resultant speed | Applicable | Inapplicable |
| | Reference axis speed | Applicable | Applicable |
| Circular interpolation | Resultant speed | Applicable | Inapplicable |
| | Reference axis speed | Inapplicable | Inapplicable |

1) The units "mm" and "inch" can be used together and they belong to the same group.

2) Circular interpolation cannot be performed when "degrees" is selected as the unit.
Selecting circular interpolation as the control method with degree units causes a "Control method setting error (error code: 524)" and positioning does not begin.
If positioning control is in progress, an immediate stop will occur on detection of the error.

(c) Speed unit when different units are used

Linear or circular interpolation in the resultant speed mode is possible whether unit group is matched or mm and inch units are both used.
Linear interpolation can be executed in the reference axis mode even when the unit G is mismatched.
The following table shows the applicable speed units in such cases.

| Speed Designation | Interpolation Axes | Applicable Speed | Speed Unit |
|---|---|---|---|
| Resultant speed (linear interpolation, circular interpolation) (mm and inch are used together.) | Axis 1 and axis 2 | Speed of axis 1 | Unit of axis 1. The unit is always the same. |
| | Axis 2 and axis 3 | Speed of axis 2 | Unit of axis 2. The unit is always the same. |
| | Axis 3 and axis 1 | Speed of axis 3 | Unit of axis 3. The unit is always the same. |
| Reference axis speed (linear interpolation) (Various units are used together.) | Axis 1 and axis 2 | Speed of axis 1 | Unit of axis 1. The unit is always the same. |
| | Axis 2 and axis 3 | Speed of axis 2 | Unit of axis 2. The unit is always the same. |
| | Axis 3 and axis 1 | Speed of axis 3 | Unit of axis 3. The unit is always the same. |

**REMARK**

For details on the resultant speed and reference axis speed, see Section3.4.2 (9).

### 3.3.6 Speed control (VF, VR)

(1) Description of speed control

(a) The designated axis of the positioning start data is controlled at the commanded speed until a stop command is input.

(b) The VF or VR speed control mode can be selected according to the direction of rotation.

- VF ....... Start in forward direction
- VR ....... Start in reverse direction

(2) Operation timing

Fig. 3.9 shows the speed control operation timing.

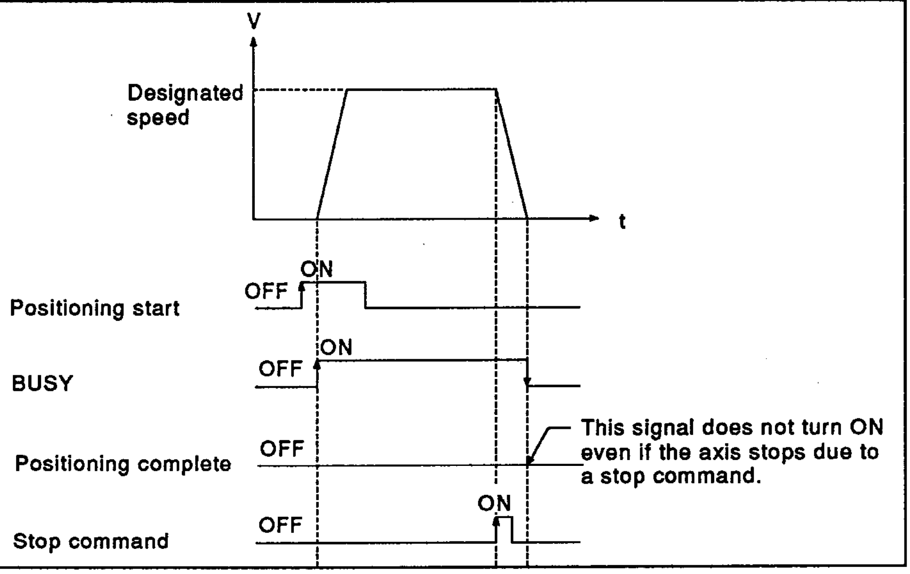



**Fig. 3.9 Speed Control Operation Timing**

(3) Feed present value updating

As shown below, the processing of the feed present value differs depending on the setting of "feed present value update request designation during speed control" of extended parameters #1. (See Section 3.4.2 (10).)

(a) When 0 (feed present value update disabled) is set:
The feed present value remains unchanged before and after execution of speed control.

(b) When 1 (feed present value update enabled) is set:
The feed present value is updated during speed control.

**POINT**

When positioning is commenced with the feed present value update request designation setting "1", do not change it until positioning control is completed.
If the setting is changed to "0" in the middle of positioning control, the feed present value cannot be maintained.

(4) Confirmation during speed control

The speed control in progress flag is changed to 1 during speed control. *

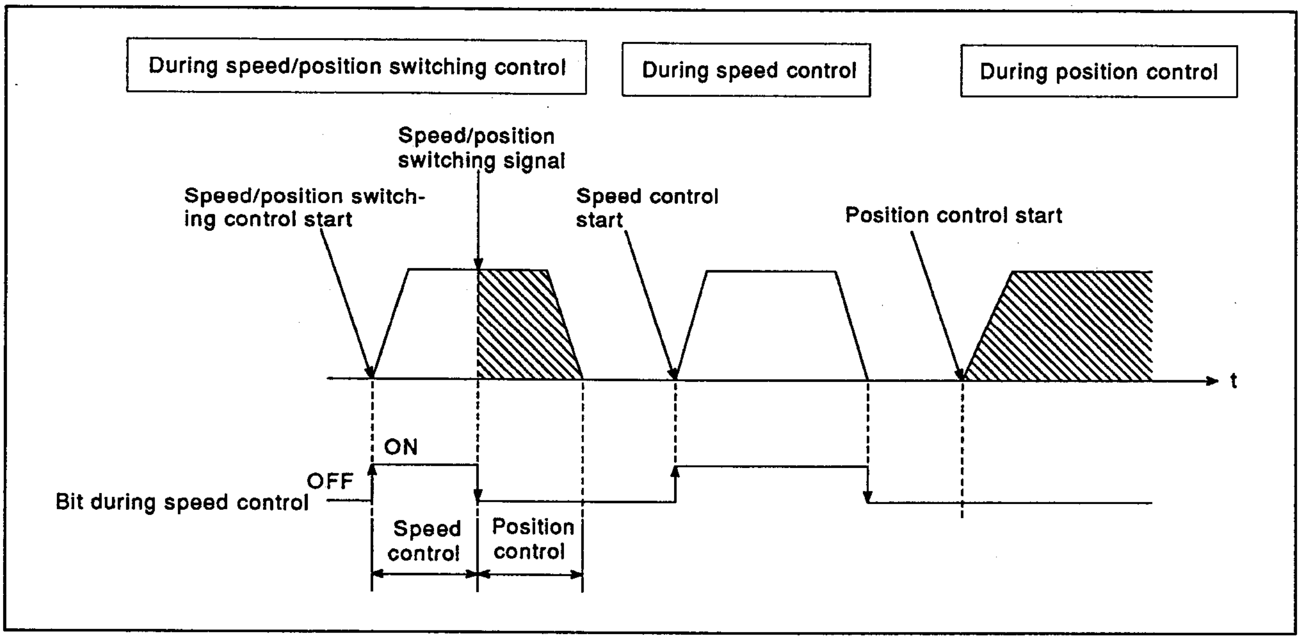



**Fig. 3.10 Speed Control In Progress Flag Timing Chart**

(5) Constraints

(a) Speed control cannot be used for continuous locus control.

If speed control is designated when the operation pattern of the positioning data is continuous locus control, "continuous locus control not possible error (error code: 516)" will result, and positioning will not begin.

(b) The dwell time setting is ignored.

(c) The M code can be used only in the "WITH mode".
When the AFTER mode is selected, no M codes will be output, and the M code ON signal will not be turned ON.

**REMARK**

*: The speed control in progress flag is set at bit 0 of the "status" area in the axis monitor area of the buffer memory. For details, See Section 3.6.3 (2).

(6) Designating positioning data *1

The following positioning data can be set with the peripheral device or sequence program:

| Data | Necessity of Setting *2 |
|---|---|
| Operation pattern | o |
| Control method *3 | Select "forward speed control" or "reverse speed control". |
| Acceleration time | o |
| Deceleration time | o |
| Positioning address/Travel value | — |
| Circular interpolation address | — |
| Commanded speed | o |
| Dwell time | Δ |
| M code | Δ |

**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.

2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

3) *3: Make the selection of "forward speed control" or "reverse speed control" for the control method based on the direction of rotation of the motor.

### 3.3.7 Speed/position switching control (VPF, VPR)

(1) Description of speed/position switching control

(a) Speed control is executed for the designated axis of the positioning start data until receipt of the speed/position switching signal, whereupon the control mode switches from speed control to position control and positioning is performed for the designated travel value.

(b) The VPF or VPR speed/position switching control mode can be selected according to the direction of rotation.

- VPF...... Start in forward direction (address incremental direction)
- VPR ..... Start in reverse direction (address decremental direction)

(2) Switching from speed control to position control

(a) A speed/position switching signal switches the control mode from speed control to position control.

(b) The speed/position switching signal is valid only when the speed/position switching enabled flag in the axis control data is ON. (See Section 3.6.4 (2).)
If the speed/position switching enable flag is turned ON after the speed/position switching signal, the control mode cannot switch from speed control to position control, which means that speed control remains in effect.

(3) Operation timing

Fig. 3.11 shows the operation timing of speed/position switching control.

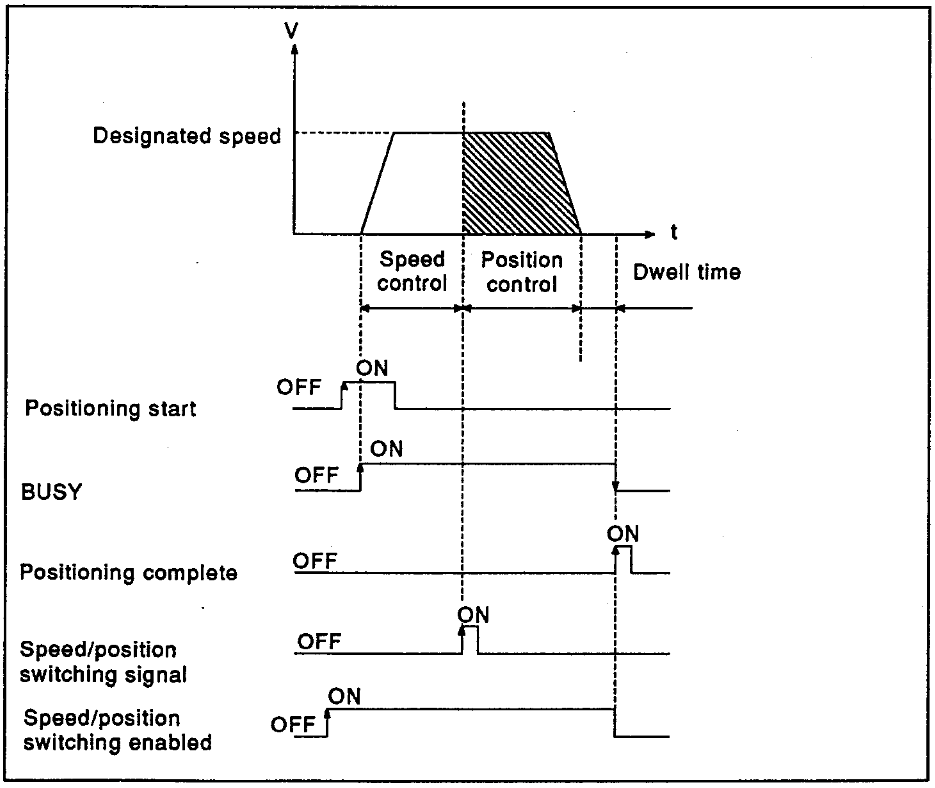



**Fig. 3.11 Speed/Position Switching Control Operation Timing**

(4) Feed present value updating

As described below, the processing of the feed present value is different depending on the setting of "feed present value update request designation during speed control" of extended parameters #1. (See Section 3.4.2 (10).)

(a) When 0 (feed present value update disabled) is set:

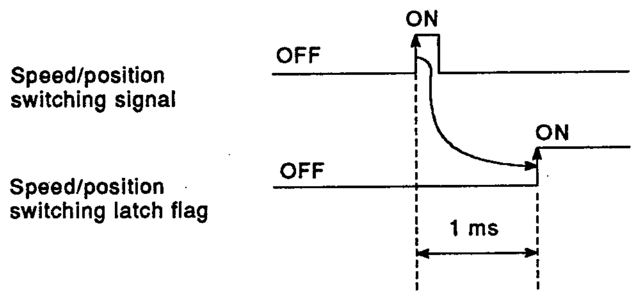
- The feed present value remains is the same during speed control as before speed control started.
- Feed present value updating begins on switching of the control mode to position control.

(b) When 1 (feed present value update enabled) is set:

- The feed present value is updated during speed control.

(5) Switching time from speed control to position control

The time from speed/position control switching signal ON to speed/position switching latch flag ON is 1 ms.




**POINT**

When positioning is commenced with a feed present value update request designation setting of "1", do not change it until positioning control is completed.
If the setting is changed to "0" in the middle of positioning control, the feed present value cannot be maintained.

(6) Travel value change

(a) Travel values can be changed by position control in the speed control mode of speed/position switching control.
Any requests for travel value changes will be ignored in the position control mode of speed/position switching control.

(b) Travel values changed during speed control are stored to the speed/position switching control travel value change register using the sequence program. (See Section 3.6.4 (2).)
The data stored in the speed/position switching control travel value change register will become the travel value when the speed/position switching signal is turned ON.

(c) The travel value from the point when a switch to position control is made due to input of a speed/position switching signal from an external source is stored in the "travel value after speed/position switching signal ON" area in the axis monitor area. (See Section 3.6.3 (2))

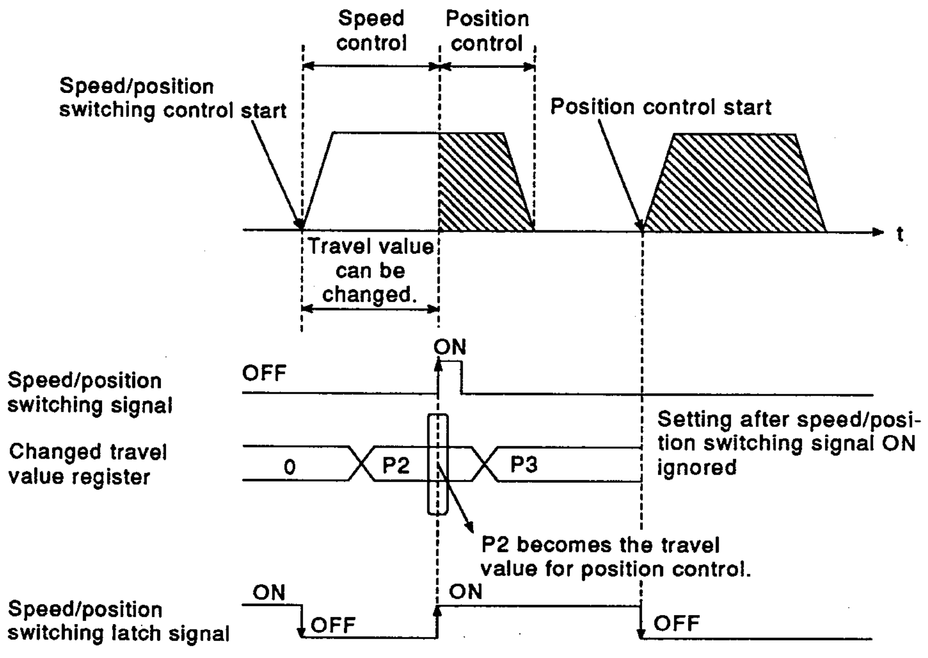



**Fig. 3.12 Travel Value Change Timing in Position Control**

**POINTS**

(1) Requests for travel value changes can be identified simply by writing changed travel values to the changed travel value register using the sequence program.

(2) The travel value after the change can become valid at any time up to input of the speed/position switching signal during speed/position switching control.

(3) The "speed/position switching latch flag" in the axis monitor area can be used as a travel value change enable/disable interlock in position control. (See Section 3.6.3 (2))

(7) Constraints

(a) To use a pulse train output motor, turn ON the speed/position switching signal within the stable speed range (stable speed state). A warning will be issued if the signal is turned ON during acceleration because of a large fluctuation in the number of droop pulses.

(b) Speed/position switching control cannot be used for continuous locus control.
If speed/position switching control is designated when the operation pattern of the positioning data is continuous locus control, an axis error will result, and positioning will not begin.

(c) Only position control is performed when both speed/position switching enabled and speed/position switching signals are turned ON at the start of positioning.

(d) If the travel value in position control is shorter than the deceleration distance at the control speed, deceleration begins on input of a speed/position switching signal.

(e) A software stroke limit range check is executed only when the "feed present value update request" is ON during speed control.

(8) Designating positioning data *1

The following positioning data can be set with the peripheral device or sequence program:

| Data | Necessity of Setting *2 |
|---|---|
| Operation pattern | o |
| Control method *3 | Select "forward speed/position control" or "reverse speed/position control". |
| Acceleration time | o |
| Deceleration time | o |
| Positioning address/Travel value | — |
| Circular interpolation address | — |
| Commanded speed | o |
| Dwell time | Δ |
| M code | Δ |

**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.

2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

3) *3: Make the selection of "forward speed/position control" or "reverse speed/position control" for the control method based on the direction of rotation of the motor.

### 3.3.8 Home position return function

(1) Description of home position return

(a) Home position return means moving the axes to the machine home position, for example when the power is switched on.

(b) The AD75 provides the following six types of home position return:

- Near-zero point dog method
- Stopper stop (1) (on elapse of dwell time)
- Stopper stop (2) (by zero point signal issued when the axis contacts the stopper)
- Stopper stop (3) (method without a near-zero point dog)
- Count method (1) (using a zero point signal)
- Count method (2) (using no zero point signal)

Specify the home position return method with the home position return parameter.

(2) Precautions

(a) The home position return parameter must be set for each axis to perform home position return.

(b) The home position return function is not available when the operation pattern is continuous locus control or continuous positioning control.

(c) Acceleration/Deceleration time selection for home position return
For home position return, set an acceleration time and a deceleration in the parameters for home position return of positioning data No. 9001 and high-speed home position return of positioning data No. 9002, respectively.

**REMARK**

The home position return parameters comprise the "basic parameters for home position return" and the "extended parameters for home position return".

- Basic parameters for home position return: Section 3.4.3
- Extended parameters for home position return: Section 3.4.4

(3) Home position return methods

Near-zero point dog home position return

(a) Description of near-zero point home position return

Near-zero point dog home position return stops axis motion with in response to a zero point signal after the near-zero point dog has been turned OFF.
A pulse generator (PG) capable of generating a zero point signal is required.

(b) Operations in near-zero point dog home position return

When near-zero point dog home position return is started, the following operations are performed:

1) Axis travel occurs in the designated home position return direction at the designated home position return speed.

2) The speed decreases to the creep speed when the near-zero point dog comes ON.

3) The axis stops in response to the zero point signal after the near-zero point dog has been turned OFF.
A "deviation counter clear output" is issued to the drive unit.

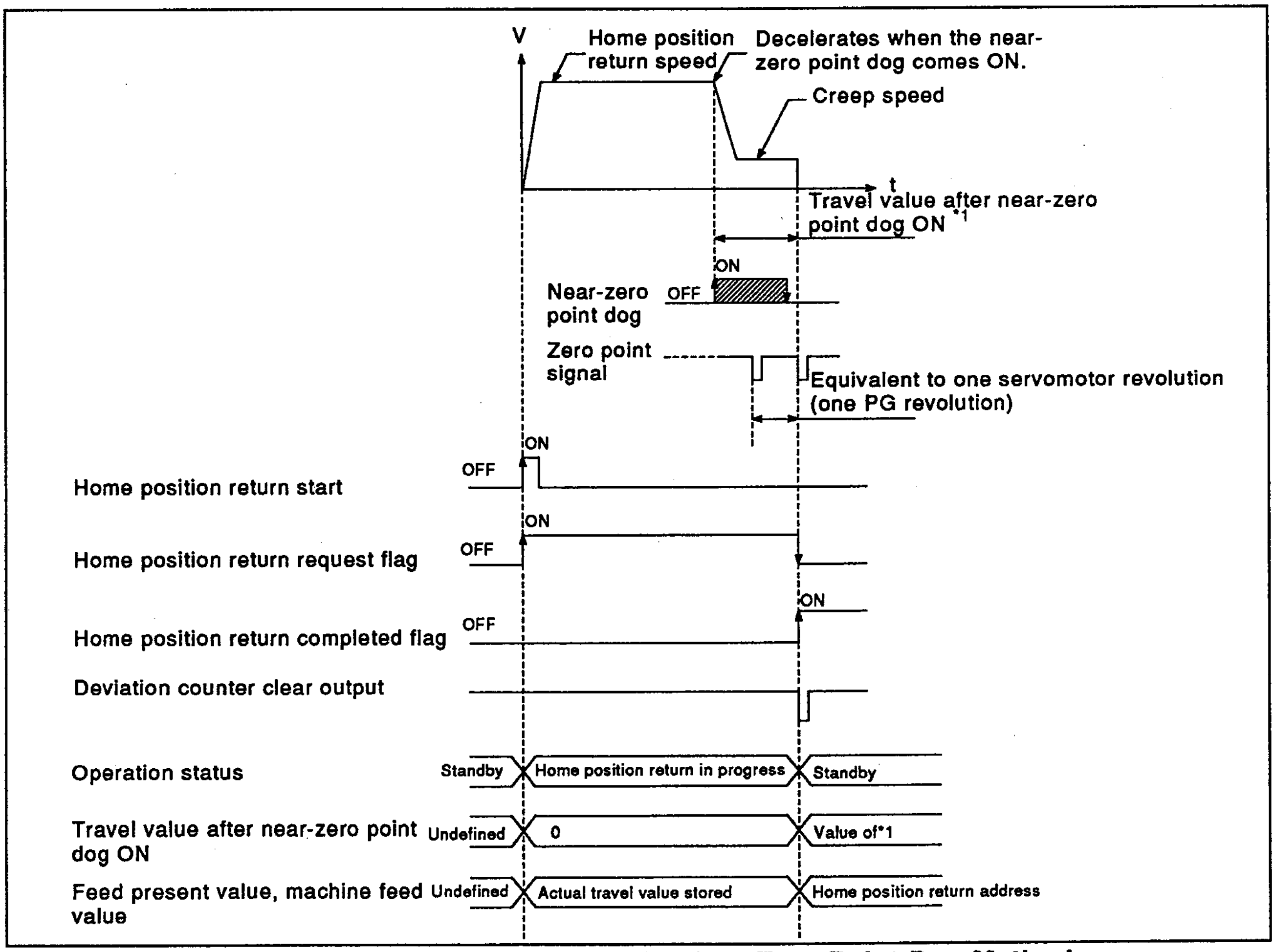
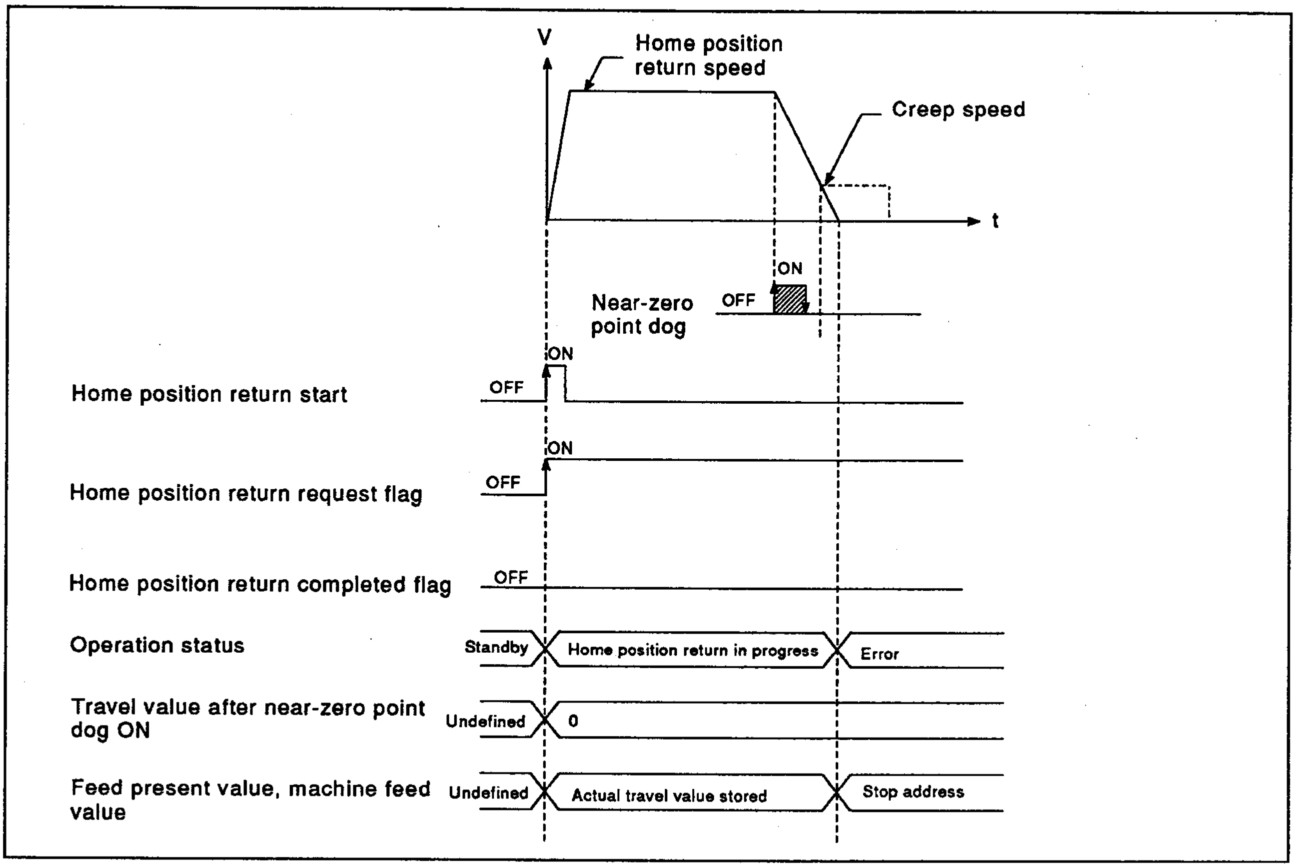



Fig. 3.13 Home Position Return by Near-Zero Point Dog Method

(c) Constraints

1) Keep the near-zero point dog ON until deceleration from the home position return speed to the creep speed begins.
If the dog is turned OFF during deceleration from the home position return speed, axis motion will decelerate to a stop.

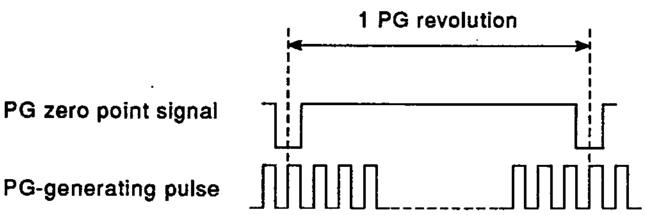



2) An error will occur if an attempt is made to perform another home position return after completion of one home position return operation with the home position return retry function disabled.
In such a case, return the axis by JOG operation to a position before where the near-zero point dog turns ON, then perform home position return.

3) Home position return when the near-zero point dog comes ON begins at the creep speed.

**REMARK**

The zero point signal issued from the PG is generated as a single pulse per PG revolution.



Count method (1) (using a zero point signal)

(a) Description of count method (1) home position return

1) Count method (1) home position return stops axis motion in response to a zero point signal as soon as the designated distance after the near-zero point dog was turned ON (travel value after near-zero point dog ON) has been traveled.

2) Set the travel value after near-zero point dog ON in the home position return parameters.

3) A pulse generator (PG) capable of generating a zero point signal is required.

(b) Operations in count method (1) home position return
When count method (1) home position return is started, the following operations are performed:

1) Axis travel occurs in the designated home position return direction at the designated home position return speed.

2) The speed decelerates to the creep speed with the near-zero point dog ON.

3) The axis stops with a zero point signal after the near-zero point dog has been turned ON.
A "deviation counter clear output" is issued to the drive unit.

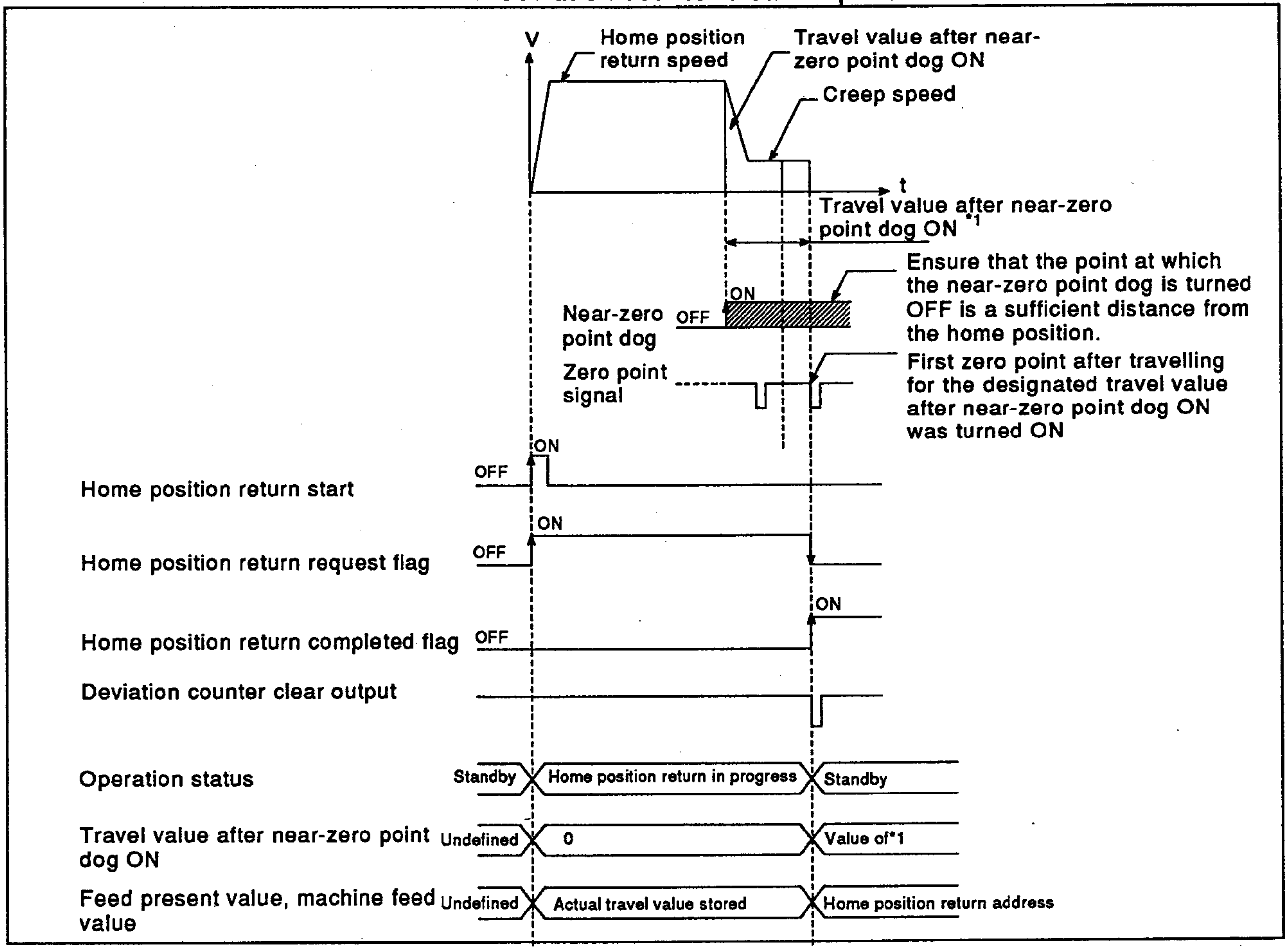
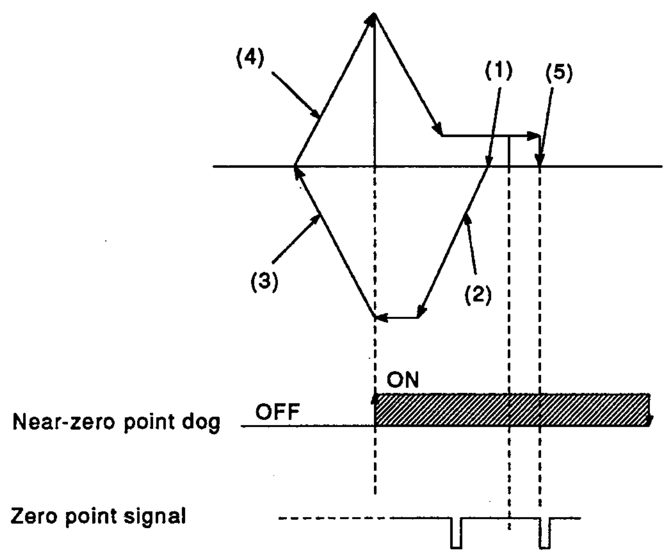



Fig. 3.14 Home Position Return by Count Method (1)

(c) Operations on home position return when the near-zero point dog comes ON and continuous starting of home position return

In count method (1) home position return, home position return can be performed when the near-zero point dog comes ON, and continuous starting of home position return is possible.
When home position return when the near-zero point dog comes ON or continuous starting of home position return is executed, the axis returns to a position where the near-zero point dog is OFF before home position return is started.




[Operations at the start of home position return when the near-zero point dog comes ON]

(1) Home position return begins.

(2) Axis travel occurs in the reverse direction to the home position return direction.

(3) Deceleration begins as soon as the near-zero point dog is detected in the OFF status.

(4) After the axis has stopped, it returns to the home position.

(5) Home position return is completed on detection of the first zero point subsequent to travelling for the travel value after near-zero point dog ON was turned ON.

**Fig. 3.15 Count Method (1) Home Position Return at Near-zero Dog ON**

(d) Constraint

1) If the set travel value after near-zero point dog ON is shorter than the distance required for deceleration from the home position speed, an error will result, and home position return will not be performed.
Refer to the setting example for the travel value after near-zero point dog ON in the home position parameters, and set a travel value longer than the distance for deceleration from the home position return speed.

Count method (2) (no zero point signal used)

(a) Description of count method (2) home position return

1) Count method (2) home position return uses the designated distance after the near-zero point dog has been turned ON (travel value after near-zero point dog ON) to define the home position.

2) Set the travel value after near-zero point dog ON in the home position return parameters.
Compared with the other home position return methods, this method causes an error of about 1 ms.

(b) Operations in count method (2) home position return
When count method (2) home position return is started, the following operations are performed:

1) Axis travel occurs in the designated home position return direction at the designated home position return speed.

2) The speed decreases to the creep speed when the near-zero point dog comes ON.

3) Axis motion stops after travelling for the designated travel value after the near-zero point dog has been turned ON.

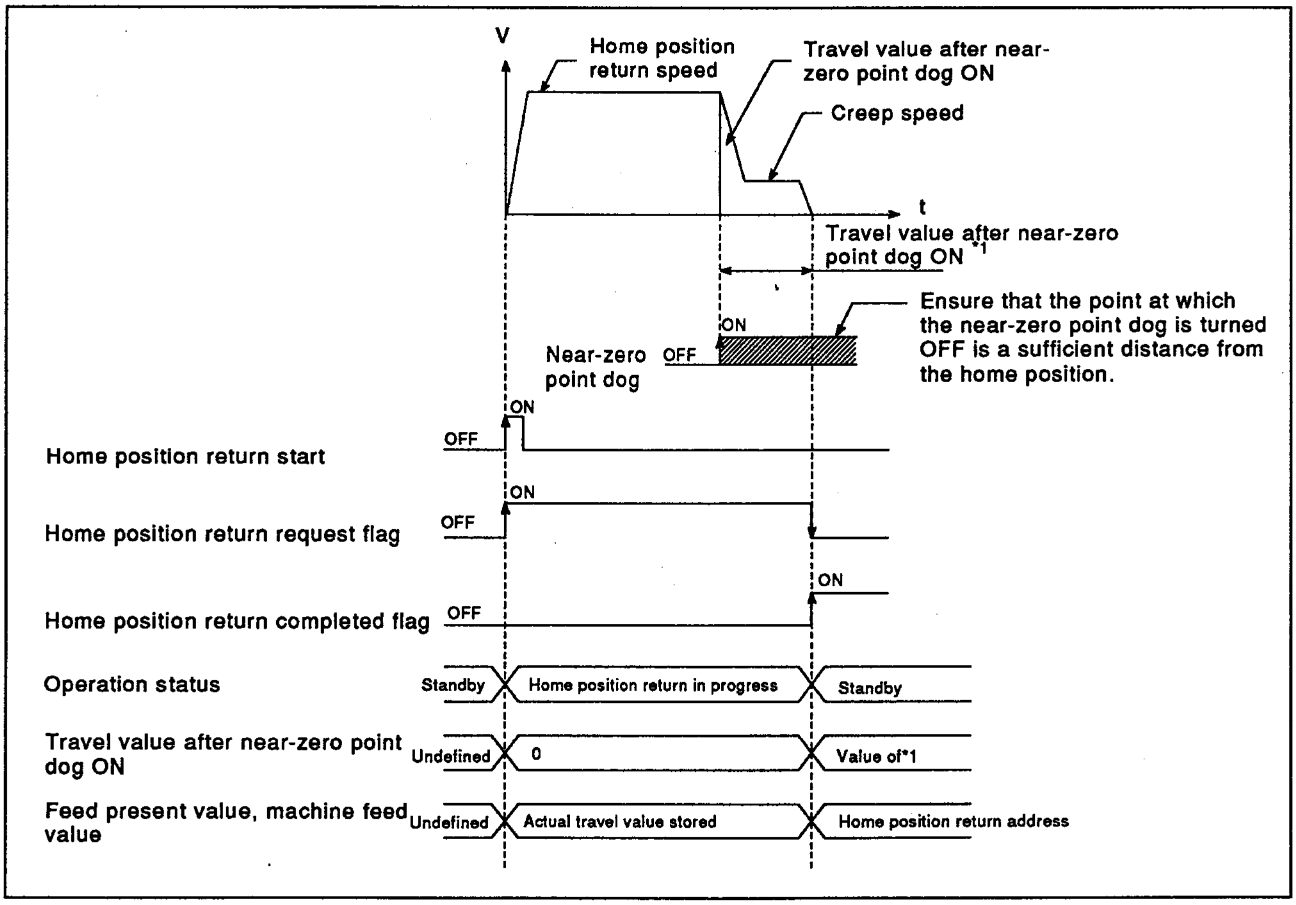
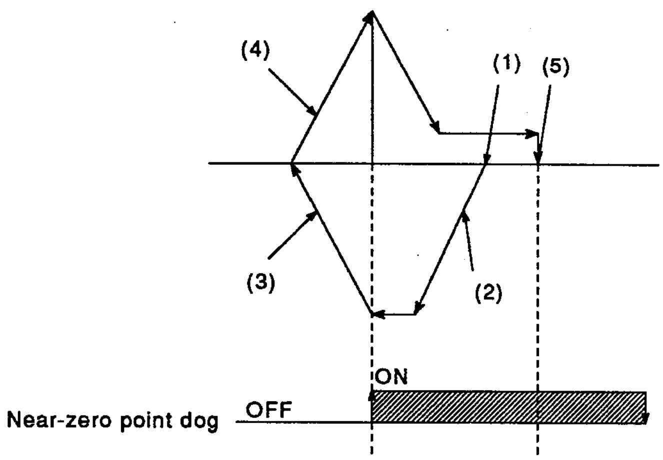



Fig. 3.16 Home Position Return by Count Method (2)

(c) Operations on home position return when the near-zero point dog comes ON and continuous starting of home position return
In count method (2) home position return, home position return can be performed when the near-zero point dog comes ON, and continuous starting of home position return is possible.
When home position return when the near-zero point dog comes ON or continuous starting of home position return is executed, the axis returns to a position where the near-zero point dog is OFF before home position return is started.




[Operations at the start of home position return when the near-zero point dog comes ON]

(1) Home position return begins.

(2) Axis travel occurs in the reverse direction to the home position return direction.

(3) Deceleration begins as soon as the near-zero point dog is detected in the OFF status.

(4) After the axis has stopped, it returns to the home position.

(5) Home position return is completed on completion of travelling for the travel value after near-zero point dog ON was turned ON.

**Fig. 3.17 Count Method (2) Home Position Return at Near-zero Dog ON**

(d) Constraint

1) If the set travel value after near-zero point dog ON is shorter than the distance required for deceleration from the home position speed, an error will result, and home position return will not be performed.
Refer to the setting example for travel value after near-zero point dog ON in the home position parameters, and set a travel value longer than the distance for deceleration from the home position return speed.

**POINT**

Compared with count method (1) home position return, count method (2) home position return is inferior in the accuracy of the stop position in home position return. However, this method is helpful when the AD75 cannot receive a zero point signal.

**Stopper stop (1) (on elapse of dwell time)**

(a) Description of stopper stop (1) home position return

1) Home position return is completed on elapse of the dwell time after the near-zero point dog has been turned ON.
In stopper stop (1), home position return is not completed until the dwell time elapses even if the near-zero point dog is turned OFF in the middle of home position return.

2) After the home position return speed has decreased to the creep speed, it is necessary to limit the servomotor torque, otherwise the servomotor will malfunction when contact is made with the stopper.

(b) Operations in stopper stop (1) home position return

When stopper stop (1) home position return is started, the following operations are performed:

1) Axis travel occurs in the designated home position return direction at the designated home position return speed.

2) The speed decreases to the creep speed when the near-zero point dog comes ON.

3) During travel at the creep speed the stopper is contacted and axis motion stops.

4) On elapse of the dwell time measured from the point when the near-zero point dog comes ON, home position return is completed.

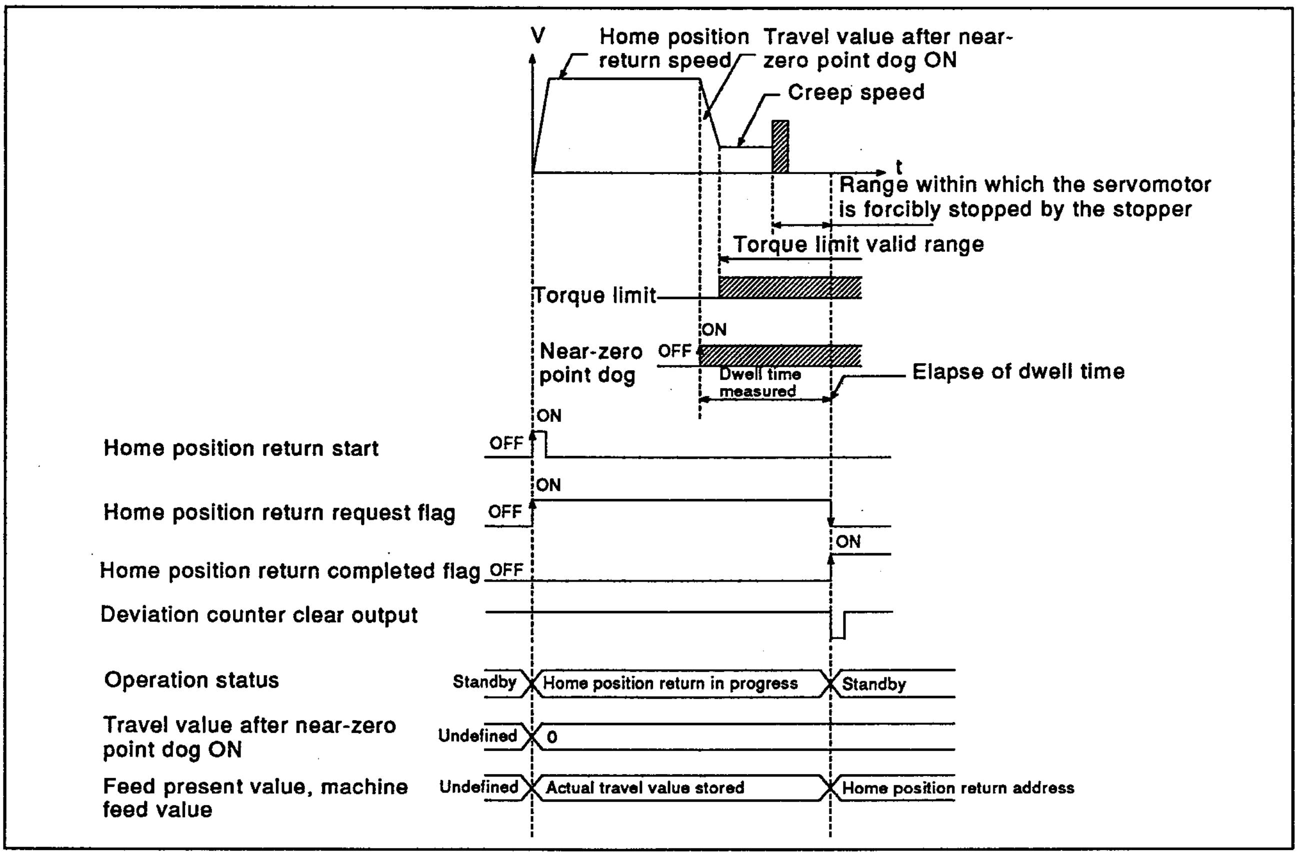
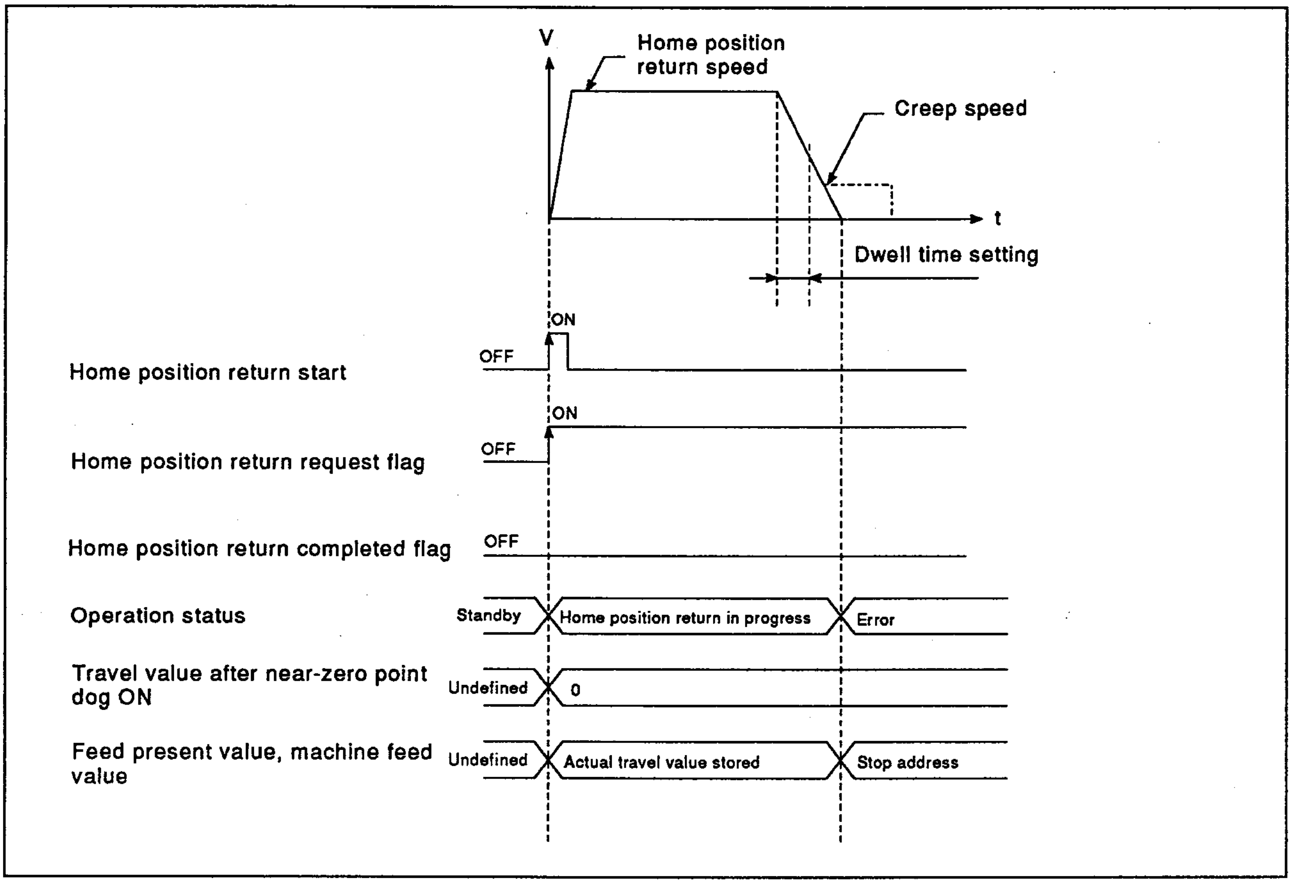



**Fig. 3.18 Home Position Return by Stopper Stop (1)**

(c) Constraints

1) Set a longer dwell time than the time required for axis motion to reach the stopper after the near-zero point dog has been turned ON.

- If the dwell time elapses during deceleration from the home position return speed, axis motion decelerates to a stop.



2) If the dwell time elapses before axis motion reaches the stopper, motion stops at that point and this position is set as the home position.

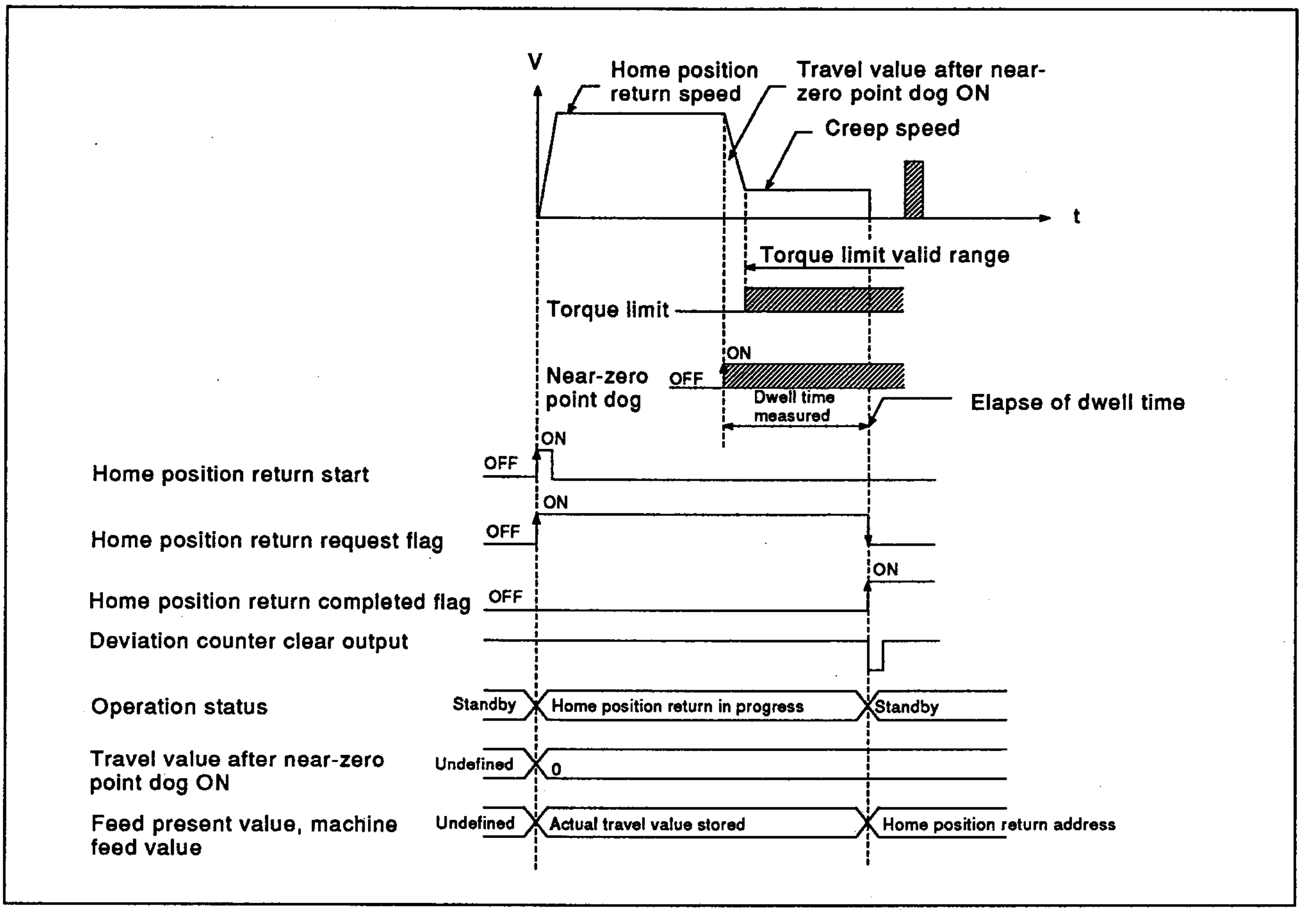



**Fig. 3.19 When Dwell Time Elapses Before Axis Reaches Stopper**

3) Home position return when the near-zero point dog comes ON begins at the creep speed.

**Stopper stop (2) (by zero point signal issued on contacting the stopper)**

(a) Description of stopper stop (2) home position return

1) This method completes home position return in response to a zero point signal input from an external switch to the zero point signal terminal on contacting the stopper.
The zero point signal is input whether the near-zero point dog is turned ON or OFF.

2) After the home position return speed has reached the creep speed, it is necessary to limit the servomotor torque, otherwise the servomotor will malfunction when contact is made with the stopper.

(b) Operations in stopper stop (2) home position return

When stopper stop (2) home position return is started, the following operations are performed:

1) Axis travel occurs in the specified home position return direction at the specified home position return speed.

2) The speed decreases to the creep speed when the near-zero point dog comes ON.

3) During travel at the creep speed the stopper is contacted and axis motion stops.

4) On input of a zero point signal, home position return is completed.

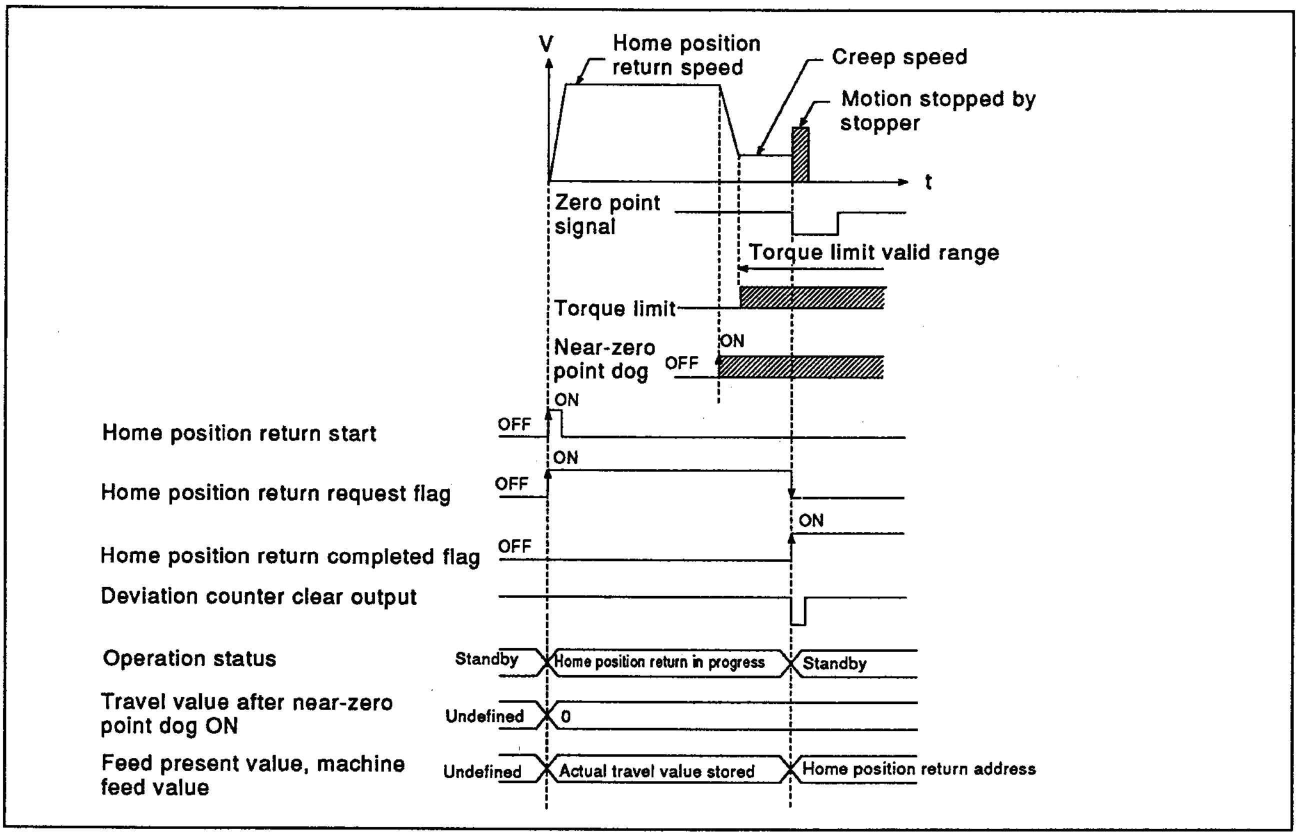



**Fig. 3.20 Home Position Return by Stopper Stop (2)**

(c) Constraints

1) Input an external zero point signal after contact is made with the stopper.
A zero point signal input before deceleration to the creep speed causes axis motion to decelerate to a stop.

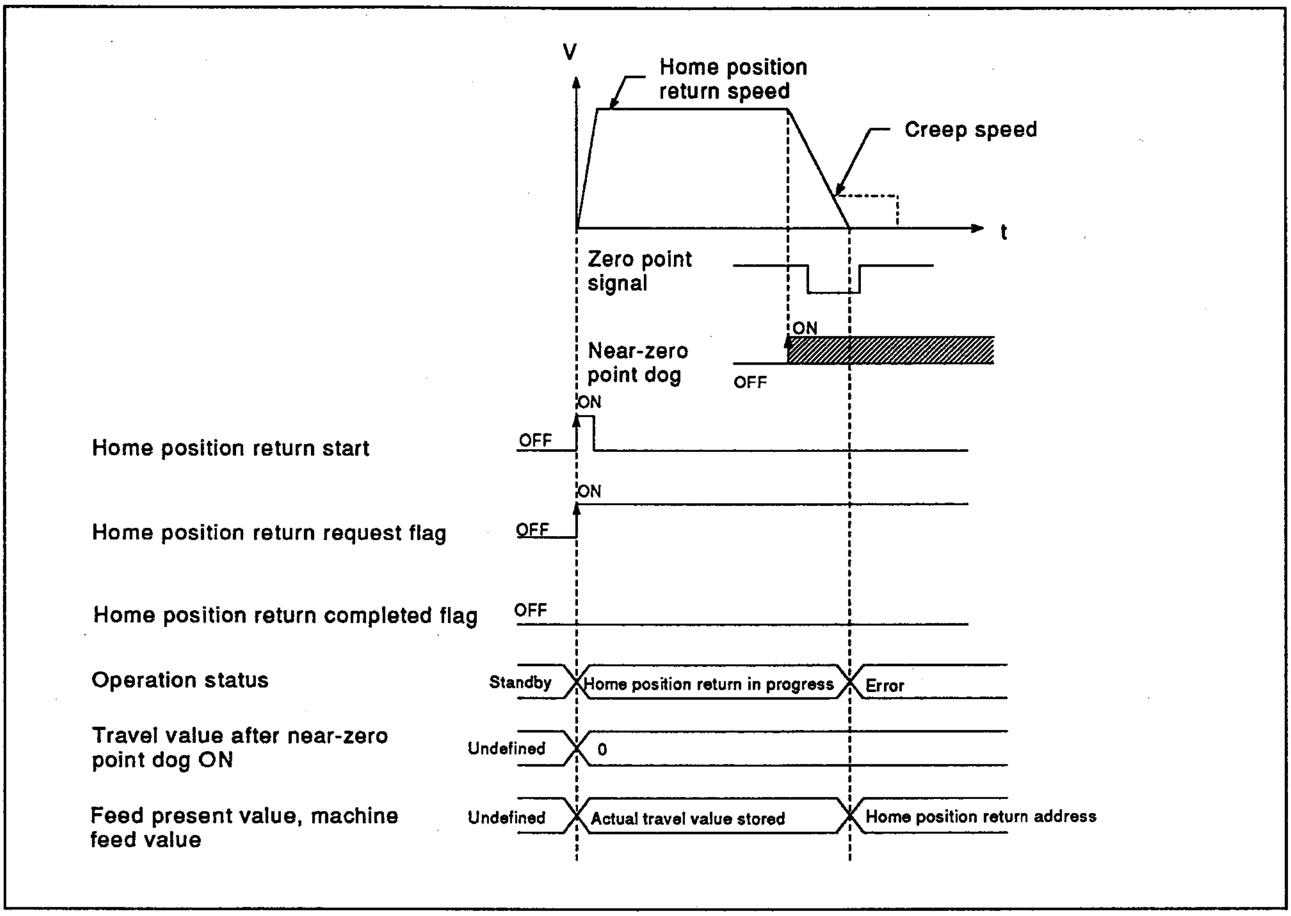



**Fig. 3.21 Operation When Zero Point Signal Input Before Creep Speed Reached**

2) If a zero point signal is input before axis motion reaches the stopper, motion stops at that point and this position is set as the home position.

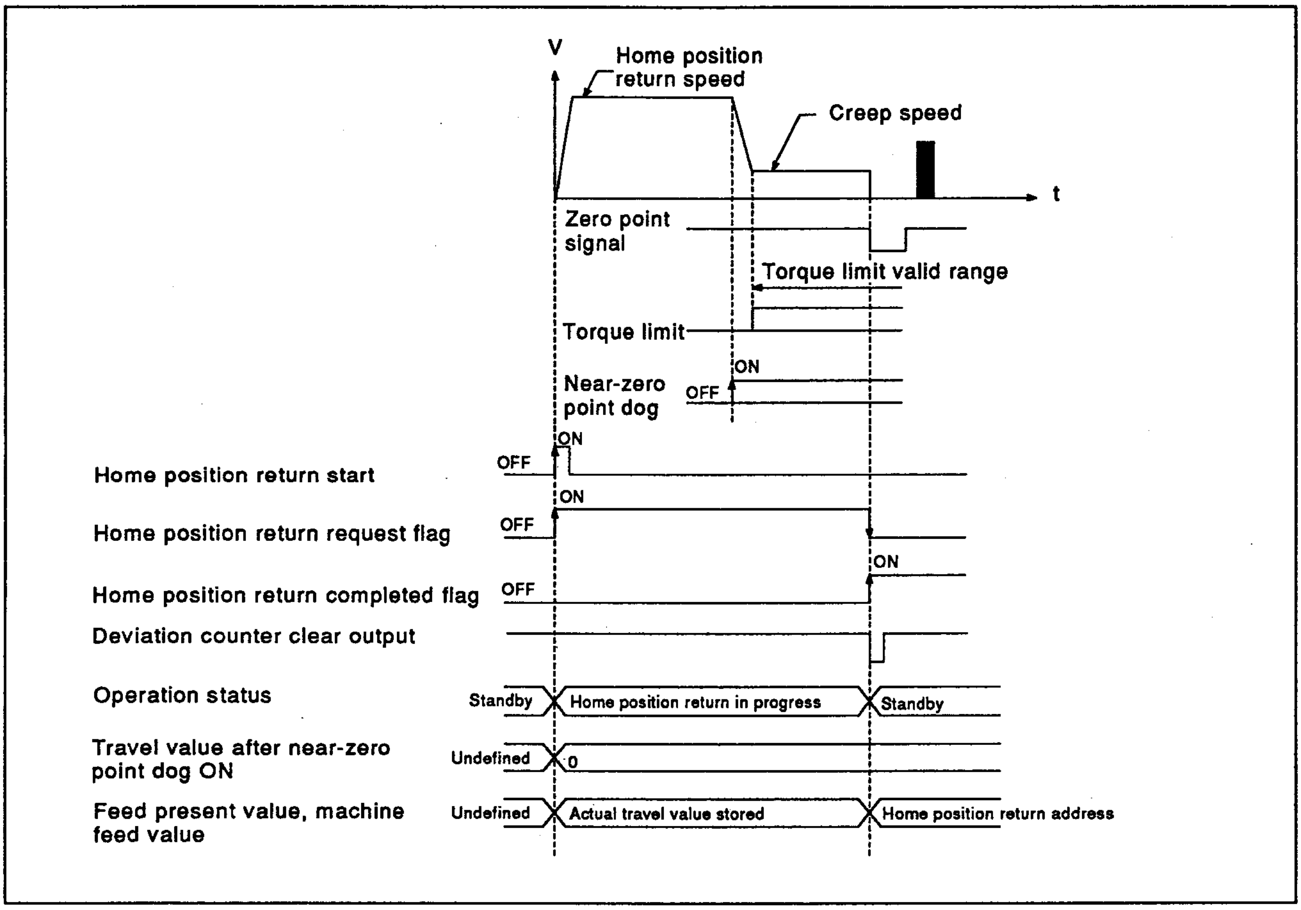



**Fig. 3.22 Operation when Dwell Time Elapses before Stopping by the Stopper**

3) Home position return at near-zero dog ON begins at the creep speed.

Stopper stop (3) (method without a near-zero point dog)

(a) Description of stopper stop (3) home position return

1) This method starts home position return at the creep speed, and completes it with a zero point signal input from an external switch to the zero point signal terminal when the axis contacts the stopper.

2) It is necessary to limit the servomotor torque.

Otherwise, the servomotor will malfunction when contact is made with the stopper.

(b) Operations in stopper stop (3) home position return

When stopper stop (3) home position return is started, the following operations are performed:

1) Axis travel occurs in the specified home position return direction at the specified home position return speed.

2) During travel at the creep speed the stopper is contacted and axis motion stops.

3) On input of a zero point signal, home position return is completed.

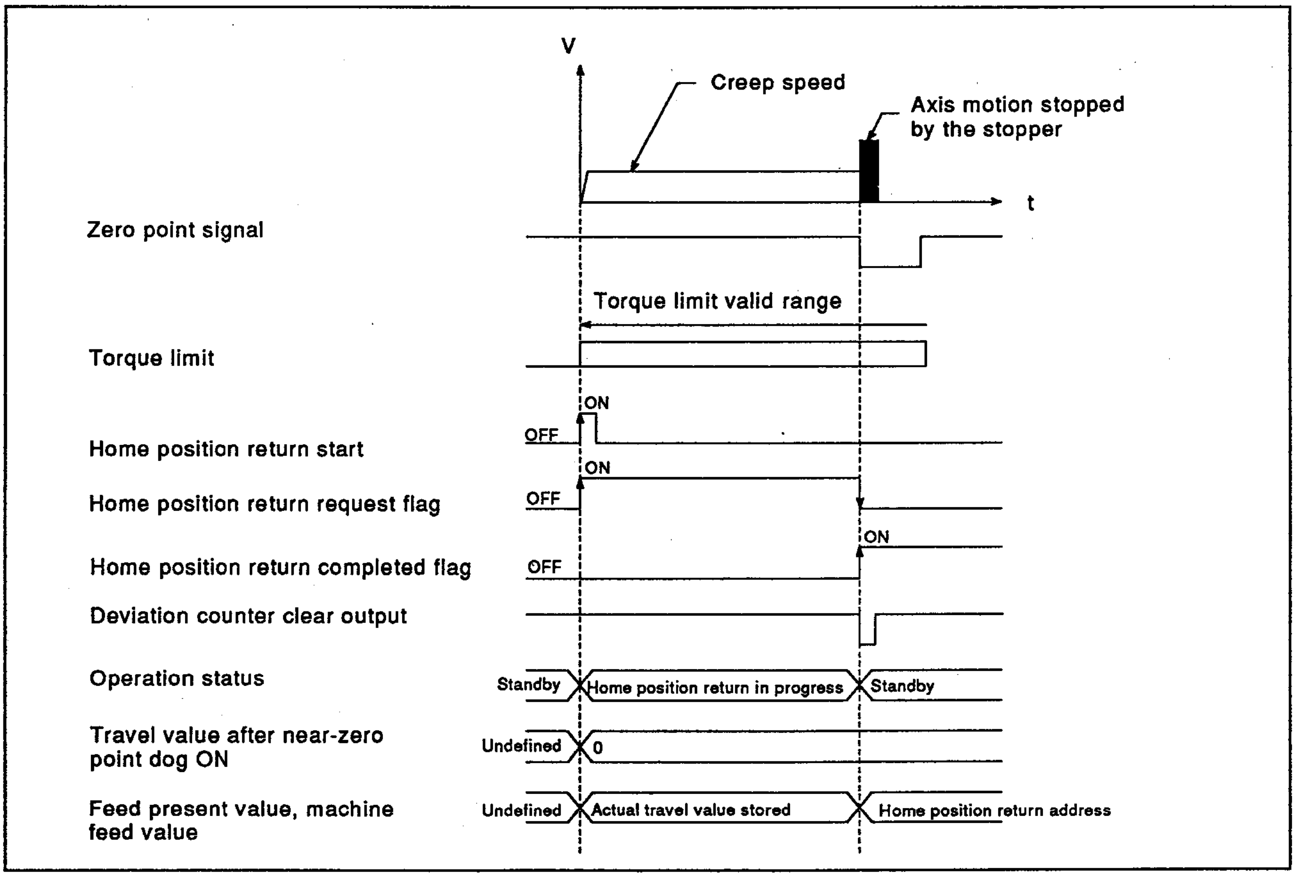



Fig. 3.23 Home Position Return by Stopper Stop (3)

(c) Constraints

1) If a zero point signal is input before axis motion reaches the stopper, motion stops at that point and this position is set as the home position.

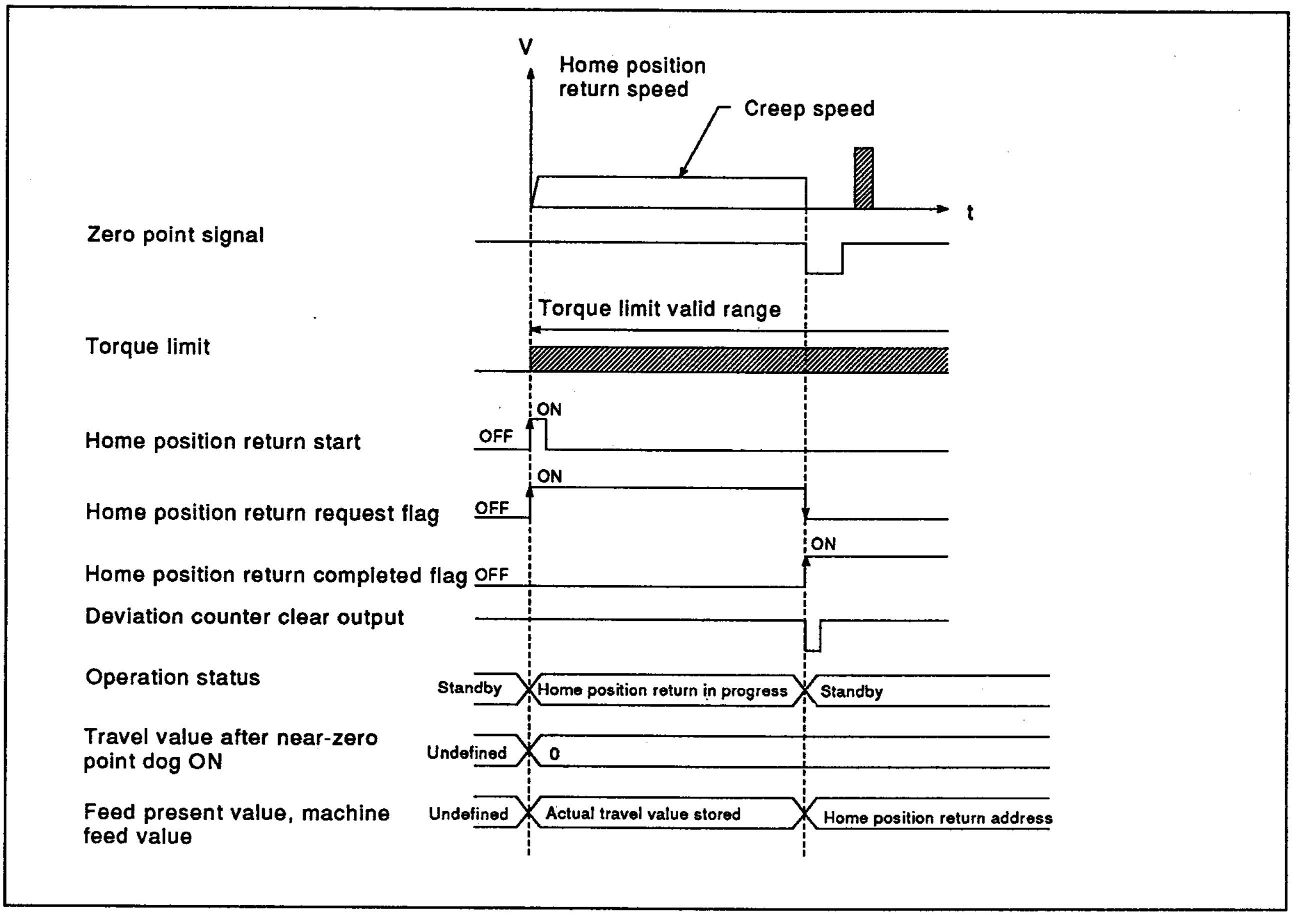



**Fig. 3.24 When a Zero Point Signal is Input Before Reaching Stopper**

2) If there is an external zero point signal input at the start of home position return, an error will result, and home position return will not be performed.

3) Stopper stop (3) home position return cannot execute the home position return retry function.

4) When the limit switch is turned OFF, axis motion decelerates to a stop.

**POINT**

Although stopper stop (3) home position return takes time to complete home position return because it is performed at the creep speed from the beginning, it is helpful when a near-zero point dog cannot be installed.

(4) Home position return start methods

There are three home position return start methods, as shown below:

- Machine home position return start
- High-speed home position return start
- High-speed machine home position return start

POINTS

(1) The "home position return request flag" is turned ON at the start of machine home position return.
As soon as machine home position return is completed properly, the "home position return request flag" is turned OFF, and the "home position return completed flag" is turned ON.
Depending on the home position return method, the actual travel value may be stored to the "travel value after near-zero point dog ON" area.

(2) After machine home position return has been completed normally, the set home position address is stored to the feed present value/machine value area.

(3) During machine home position return, the "axis operation status" in the axis monitor area remains "home position return in progress".

Machine home position return start

(a) Description of machine home position return

1) Machine home position return start establishes the machine home position by the home position return methods described in Section 3.3.8 (3).

2) Designate positioning start data No. 9001 to start machine home position return.

High-speed home position return start

(a) Description of high-speed home position return start

1) After the machine home position has been established by a machine home position return, high-speed home position return start can be used to travel to the home position at a high speed at the start of positioning without using a home position detection signal.
The travel value is calculated from the home position return address stored in the AD75's internal buffer memory when machine home position return is completed, and the present machine value at high-speed home position return start, and the axis travels to the home position according to this value.

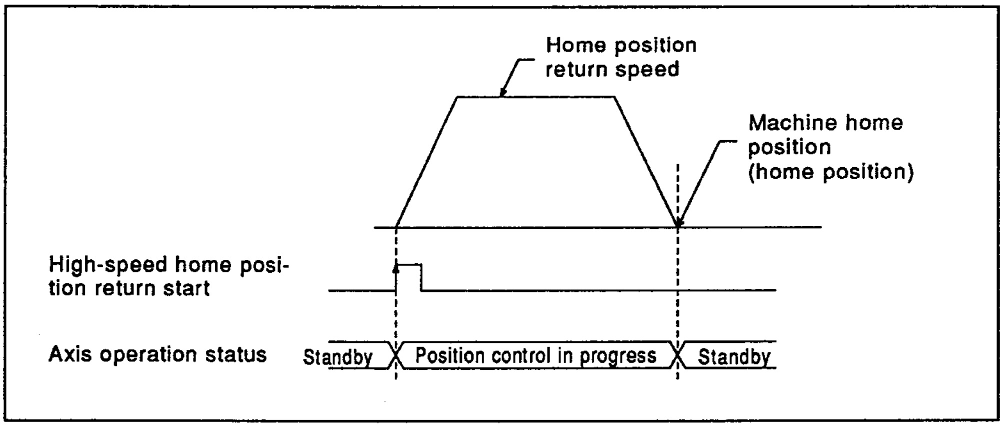
2) Designate positioning start data No. 9002 to start high-speed home position return.

(b) Operations in high-speed home position return

When high-speed home position return is started, the following operations are performed:

1) Axis travel occurs in the machine home position direction at the specified home position return speed. (The travel direction depends on the present machine value when the high-speed home position return start was performed.)

2) Axis motion decelerates to a stop at the home position.



(c) Constraints

1) High-speed home position return cannot be performed until the machine home position has been established by executing a machine home position return.
High-speed home position return cannot be executed while the "home position return request flag" is ON.

2) High-speed home position return is performed at the home position return speed set in the parameters.

3) The set home position address is not stored to the feed present value/machine feed value area when high-speed home position return is completed.

4) During home position return, the axis operation status of the axis is "position control in progress".

5) The following data values do not change in high-speed home position return:

- Home position return request flag
- Home position return completed flag
- Travel value after near-zero point dog ON

6) If the present machine value exceeds the lower or upper limit even once during positioning over an indefinite distance in speed control, an error will occur when high-speed home position return is performed.
High-speed home position return cannot take place until the machine home position has been established by executing a machine home position return.

**REMARK**

The present machine value is always updated, regardless of the operation pattern. It remains unchanged when the present value is changed.

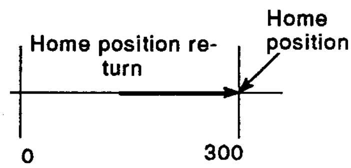
High-speed machine home position return

(a) By executing the positioning program for absolute home position using the "absolute original point" value in the buffer memory axis monitor area, positioning to the absolute original point can be performed.

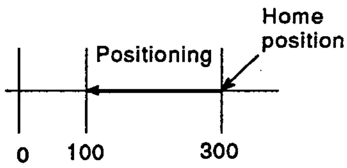
(b) The "absolute original point" matches the home position address parameter when home position return is completed.

(c) The "absolute original point" value changes when the present value changes.

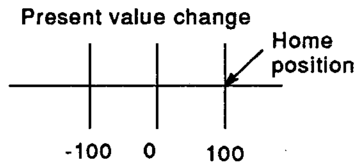
1) When home position return is completed, home position address 300 is stored to the "absolute original point" area.




2) The axis is positioned to address 100.




3) If the present value is changed to -100 at this position, the "absolute original point" is changed to 100.




4) By executing the program for positioning to absolute original point (ABS linear 1) using the "absolute original point" value at this position, positioning to the home position is performed.

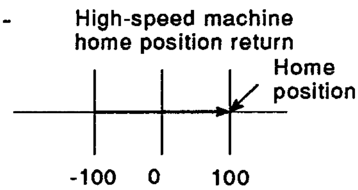



**Fig. 3.25 Absolute Original Point Value and Positioning to Home Position**

**POINT**

The absolute original point is not changed after any of the following control operations is performed:

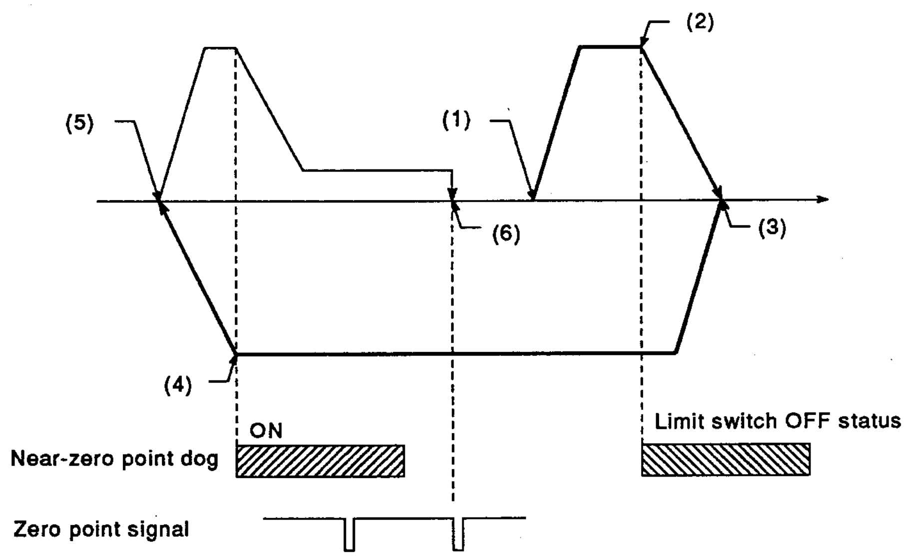
- Present feed value 0 clear at the start of fixed-pitch feed
- Present feed value update request command OFF during speed control

Consequently, positioning to the home position cannot be executed by absolute positioning using the absolute original point after the above operations.

(5) Home position return retry function

(a) This function retries home position return using the upper and lower limit switches.
It can perform home position return without moving the axis back past the near-zero point dog by using JOG operation or other operation modes.

(b) When a home position return start is executed with the home position return retry function enabled, axis travel occurs in the home position return direction. However, if the upper or lower limit switch is turned OFF before the near-zero point dog status is detected, the axis decelerates to a stop, then travels in the reverse direction to the home position return direction.
When the near-zero point dog is detected in the OFF status, the axis decelerates to a stop, and home position return is reattempted.




[Operation of home position return retry function]

(1) Axis motion starts in the home position return direction on receipt of a home position return start signal.

(2) Axis motion decelerates to a stop as soon as the limit switch is turned OFF.

(3) After axis motion has stopped in response to the detection of the limit switch OFF status, it starts in the reverse direction to the home position return direction at the home position return speed.

(4) Axis motion decelerates to a stop when the near-zero point dog goes OFF.

(5) After it has stopped after near-zero point dog OFF, the axis returns to the home position.

**Fig. 3.26 Home Position Return Retry Using Upper/Lower Limit Switches**

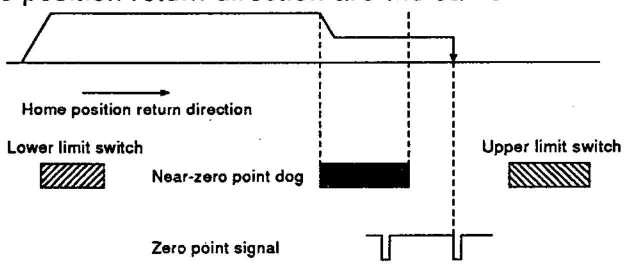
**POINT**

Set upper and lower limit switches whenever the home position return retry function is disabled.

(c) Even if the upper and lower limit switches are turned OFF, home position return can be performed when the home position return retry function is enabled.

- When the direction of travel into the travel range and the home position return direction are the same, normal home position return takes place.
- When the direction of travel into the travel range is different from the home position return direction, axis motion decelerates to a stop when the near-zero point dog goes OFF, then returns to the home position.

1) Operation when the direction of travel into the travel range and the home position return direction are the same




2) Operation when the direction of travel into the travel range is different from the home position return direction

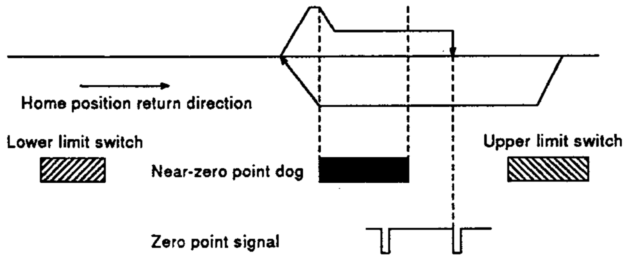



**Fig. 3.27 Home Position Return Retry Operation with Upper/Lower Limit Switches OFF**

(d) Relationship between home position return method and home position return retry function

| Home Position Return Method | Home Position Return Retry Function Disabled | Home Position Return Retry Function Enabled |
|---|---|---|
| Near-zero point dog method | x | o |
| Count method (1) | x | o |
| Count method (2) | x | o |
| Stopper stop (1) | x | Δ* |
| Stopper stop (2) | x | |
| Stopper stop (3) | x | x |

*: In some cases, home position return retry may not be possible due to a mechanical stopper.

(e) Conditions for executing the home position return retry function

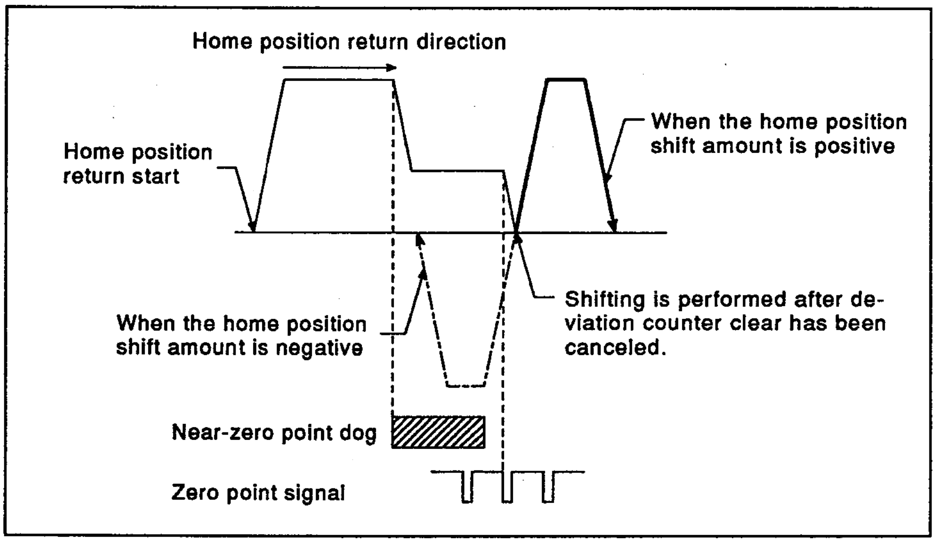
- Limit switches must be installed at the upper and lower stroke ends of the machine.
  The motor will keep running until either limit switch is actuated.
- Do not make it impossible to continue operation (for example by turning OFF the power to the drive unit) by using the upper and lower limit switches.

(6) Home position shift function

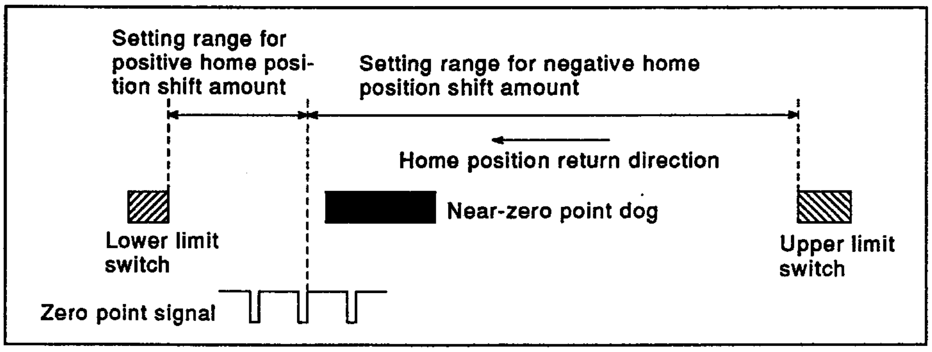
(a) Description of home position shift function

This function discontinues home position return to correct the home position.
It can shift the home position to a position between zero points or to a position away from the zero point.

- When the home position shift amount is positive:
  The home position is shifted in the specified home position return direction.
- When the home position shift amount is negative:
  The home position is shifted in the reverse direction of the specified home position return direction.




(b) Set the home position shift amount within the range from the position at which the zero point signal is detected to the upper and lower limit switches.



(c) Set the following data after shifting with the home position shift function:

- Home position return request flag
- Home position return completed flag
- Axis operation status
- Travel value after near-zero point dog ON
- Feed present value
- Machine feed value

(d) The set home position shift amount is not added to the travel value after near-zero point dog ON.

(e) The home position shift function perform shifting at the home position return speed, irrespective of the home position return method.

(7) Home position return request flag OFF request

(a) Description of home position return request flag OFF request

This function forcibly turns OFF the ON home position return request flag in a system which does not require home position return.

(8) Combinations of home position return and other functions

(a) Home position return start after home position return stop

Home position return interrupted by an external stop signal or axis stop can be restarted by inputting a positioning start signal.
However, when the home position return retry function is disabled an error may occur, depending on the stop position.
Before restarting positioning suspended in the middle of home position return, enable the home position return retry function, or move the axis from the stop position by JOG operation or manual pulse generator operation.

(b) Speed change during home position return

Speed changes are not possible after entering the creep speed.

### 3.3.9 Manual pulse generator operation

(1) Description of manual pulse generator operation

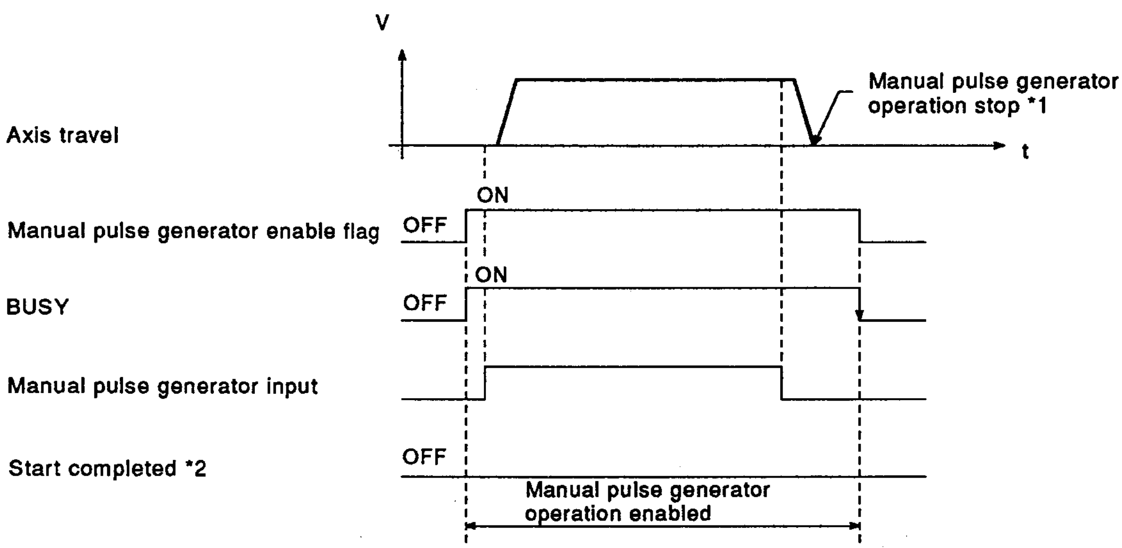
(a) Manual pulse generator operation means positioning control using input pulses from a manual pulse generator. *1
This function is used to perform accurate positioning manually.

(b) Up to three manual pulse generators can be connected to one AD75. One manual pulse generator can control one to three axes simultaneously.

(2) Execution of manual pulse generator operation

(a) Setting the manual pulse generator enable flag to "1 (enabled)" turns ON the BUSY signal, enabling manual pulse generator operation. *2
Positioning control can be performed with input pulses from the manual pulse generator.

(b) Setting the manual pulse generator enable flag to "0 (disabled)" turns OFF the BUSY signal, disabling manual pulse generator operation.




[Notes]

1) *1: One control cycle time (100 ms) after the manual pulse generator has stopped input, the AD75 outputs the last pulse.

2) *2: In manual pulse generator operation, the start completed signal remains OFF.

**REMARKS**

1) Select and set the manual pulse generator to be used at the following buffer memory addresses:

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Buffer memory address | 29 | 179 | 329 |

2) Set the manual pulse generator enable flag at the following buffer memory addresses:

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Buffer memory address | 1167 | 1217 | 1267 |

(3) Description of control

(a) The travel value and output speed in positioning control by manual pulse generator operation are shown below.

- The travel value according to input pulses from the manual pulse generator is calculated from the following expression:

$$\left[\begin{array}{c}\text{Travel}\\\text{value}\end{array}\right] = \left[\begin{array}{c}\text{Number of}\\\text{input pulses}\end{array}\right] \times \left[\begin{array}{c}\text{Set manual pulse}\\\text{generator 1 pulse}\\\text{input magnification}\end{array}\right] \times \left[\begin{array}{c}\text{Travel value}\\\text{per pulse}\end{array}\right]$$

- In manual pulse generator operation, positioning is performed at a speed corresponding to the number of input pulses per unit time.

$$\left[\begin{array}{c}\text{Output}\\\text{speed}\end{array}\right] = \left[\begin{array}{c}\text{Number of input}\\\text{pulses per con-}\\\text{trol cycle time}\end{array}\right] \times \left[\begin{array}{c}\text{Set manual pulse}\\\text{generator 1 pulse}\\\text{input magnification}\end{array}\right] \times \left[\begin{array}{c}\text{Travel}\\\text{value}\\\text{per pulse}\end{array}\right]$$

(4) Precautions

(a) After manual pulse generator operation, set the manual pulse generator enable flag to "0 (disabled)".
If this flag is left at the "1" (enabled) setting, unintended positioning could be started by inadvertent operation at the manual pulse generator.

(b) If the manual pulse generator enable flag is turned on when the BUSY signal is ON in positioning control, home position return or JOG operation, a "in-operation start warning" will be issued.

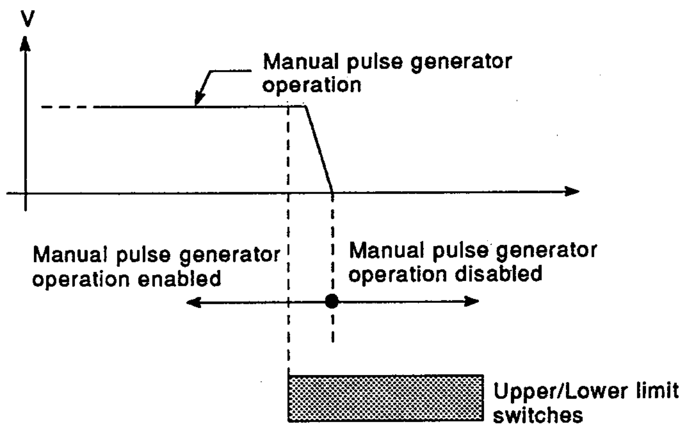
(c) During manual pulse generator operation, the torque limit value is controlled to the value set in the parameters or by a torque value change.

(d) For the manual pulse generator 1 pulse input magnification, set the value for the relevant axis.
If the magnification is outside the setting range, operation is performed using the following values.

- If the manual pulse generator 1 pulse input magnification is set higher than "100", the value used is "100".
- If the manual pulse generator 1 pulse input magnification is set lower than "1", the value used is "1".

(e) If a stop cause occurs during manual pulse generator operation, the axis will stop, and go into the "stopped" or "error" status. The BUSY signal will be turned OFF at the same time.
After eliminating the stop cause, set the manual pulse generator enable flag from "0" to "1". Manual pulse generator operation will be enabled.

(f) Axis motion decelerates to a stop when the upper or lower limit switch is turned OFF.
Input pulses to the upper or lower limit switch in the OFF status are ignored after the axis has stopped.
However, manual pulse generator operation can be continued with input pulses to the limit switch in the ON status.



### 3.3.10 JOG operation

(1) Description of JOG operation

(a) JOG operation refers to positioning control in response to a JOG start signal.
While the JOG start signal remains ON, JOG operation is performed at the JOG speed set in the control data. Axis motion decelerates to a stop as soon as the JOG start signal is turned OFF.

(b) JOG operation can be executed in the test mode when a peripheral device is used.

(2) Acceleration/Deceleration processing and JOG speed

(a) Acceleration/Deceleration processing is controlled by the acceleration time and deceleration time set in the JOG operation acceleration/deceleration selection of the extended parameters, as well as the JOG speed limit parameter.

(b) If the JOG speed is outside the setting range at the start of JOG operation, an axis error will occur, and JOG operation will not begin.

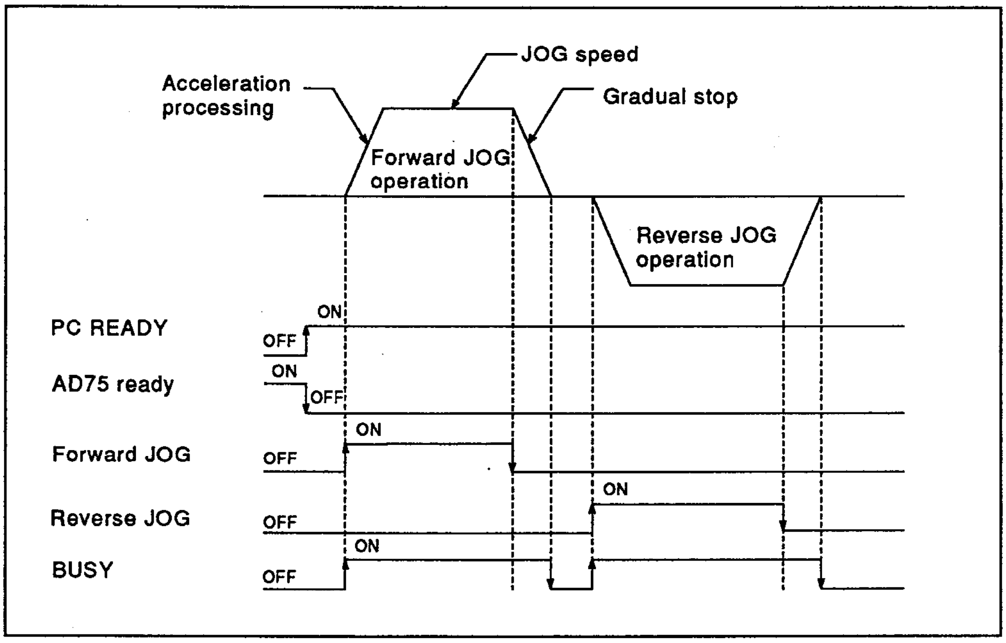
(c) If the JOG speed exceeds the JOG speed limit, an axis warning will be issued, and JOG operation will be performed according to the JOG speed limit.
In such a case, the speed limit flag will be turned ON.

(3) Operations in JOG operation

When JOG operation is started, the following operations are performed:

(a) As soon as the forward/reverse JOG start signal is turned ON, axis motion starts in the specified direction at the specified JOG speed.

(b) Axis motion decelerates to a stop when the JOG start signal goes OFF.



**REMARKS**

1) A specific JOG start signal is assigned to each axis.

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Forward JOG start | Y16 | Y18 | Y1A |
| Reverse JOG start | Y17 | Y19 | Y1B |

2) The JOG speed during JOG operation can be checked in the buffer memory.

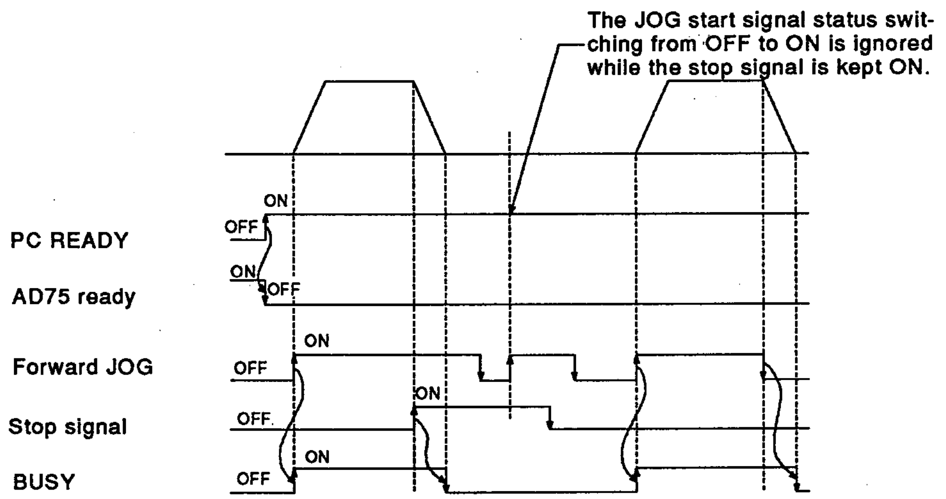
| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Buffer memory address | 1161,1160 | 1211,1210 | 1261,1260 |

(4) Operations when the stop signal is ON (input)

(a) When the stop signal is turned ON during JOG start, axis motion decelerates to a stop.

(b) While the stop signal remains ON, the JOG start signal is ignored.

(c) JOG operation can be restarted by turning OFF the stop signal and turning ON the JOG start signal.




**POINTS**

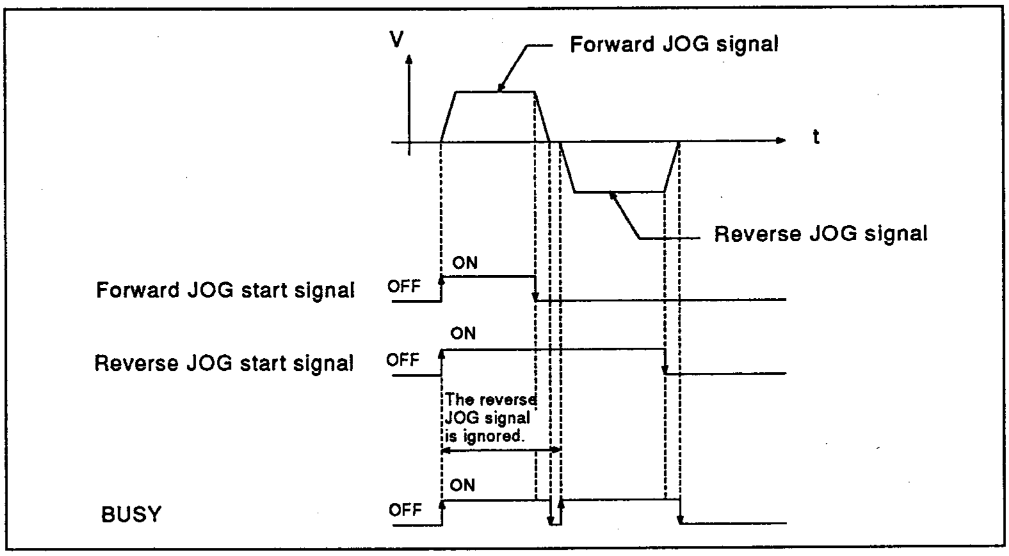
(1) When setting the JOG speed using the sequence program, write the value of the actual JOG speed multiplied by 100 or 1000 to the JOG speed area of the buffer memory.
For example, to set a JOG speed of 10000.00 mm/min., store "1000000" as the speed change value.

(2) The JOG speed is set in the units specified in basic parameters #1.

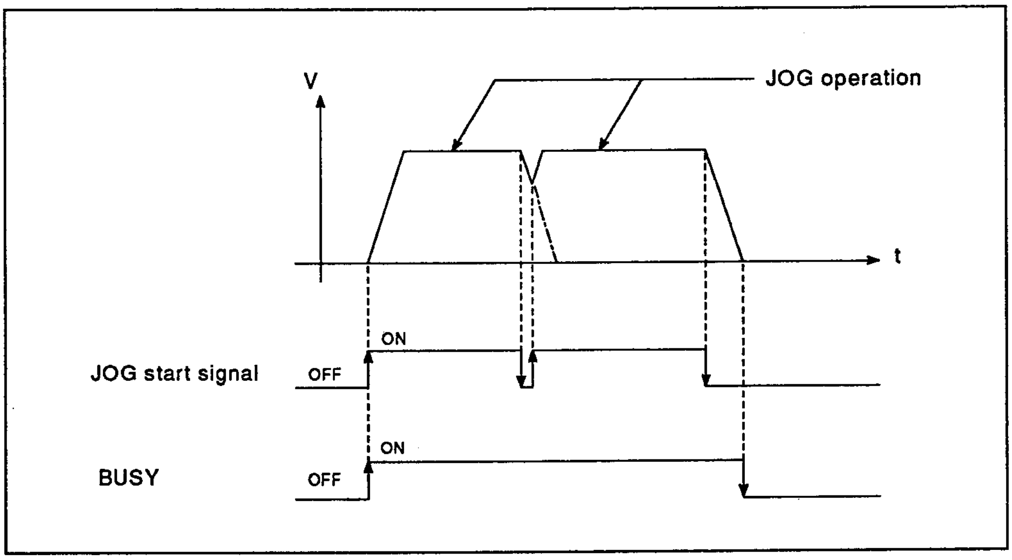
(3) Write the JOG operation speed in units of two words.

(5) Limitations on JOG operation

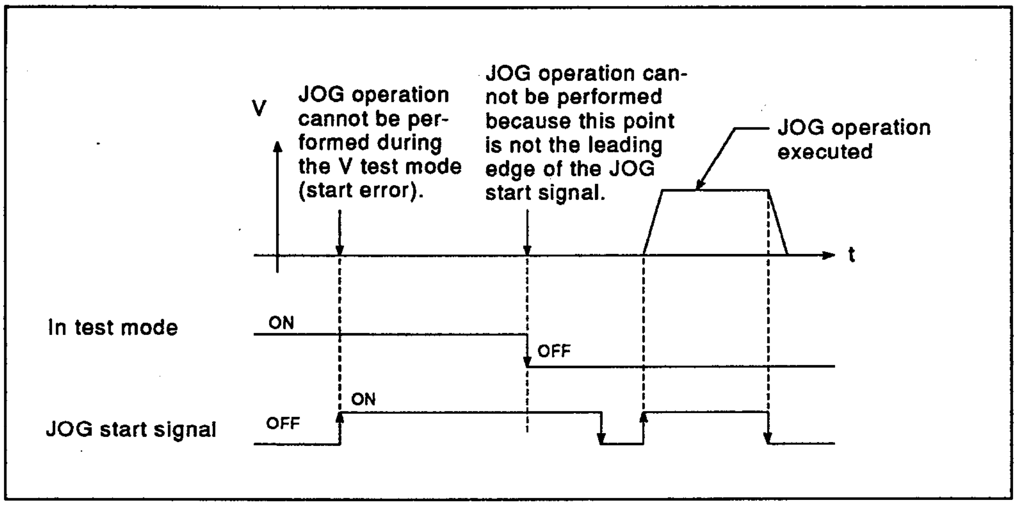
(a) When both forward and reverse JOG signals are turned ON simultaneously for one axis, forward JOG operation will be performed.
If the reverse JOG signal is ON when the forward JOG is turned OFF, JOG operation will stop and then reverse JOG operation will begin. (The reverse JOG signal becomes valid when the BUSY signal is turned OFF.)



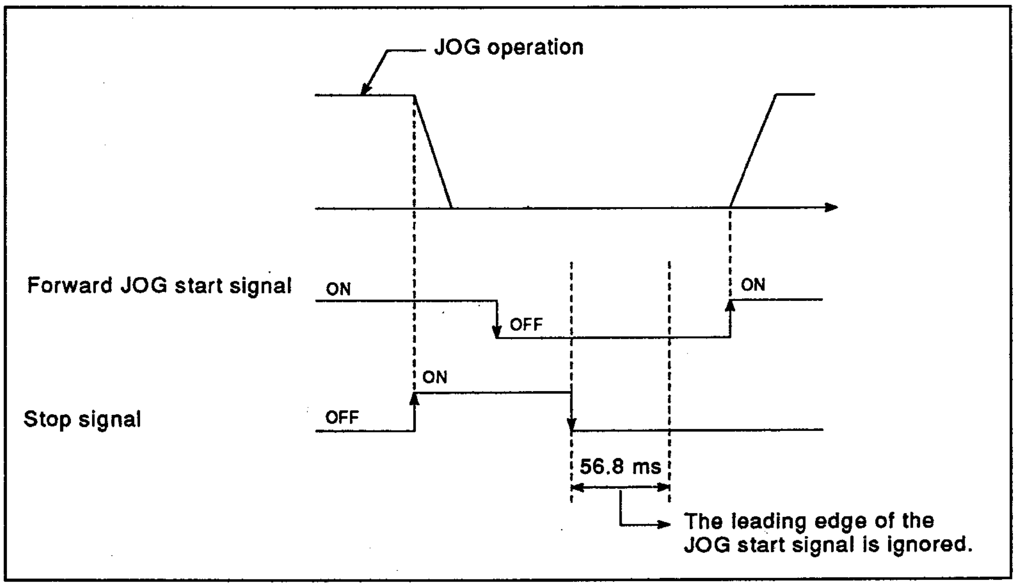

(b) If the JOG start signal is turned back ON during deceleration initiated by turning it OFF, JOG operation will restart from where the signal is turned ON.



(c) In the test mode at a peripheral device, JOG operation cannot be performed with a JOG start signal.
JOG operation will begin at the leading edge (OFF → ON) of the JOG start signal after the test mode of the peripheral device has been cancelled.




(d) The JOG signal status switching from OFF to ON, which takes place within 56.8 ms after the stop signal has been turned OFF, is ignored.



(6) JOG speed change

(a) The jog speed can be changed within the "JOG speed limit" setting range of basic parameters #2 during JOG operation.

(b) To change the JOG speed, turn ON the positioning speed change request of the axis control data, or an external speed change request.
The "speed change processing in progress flag" in the axis monitor area remains ON during speed change processing.

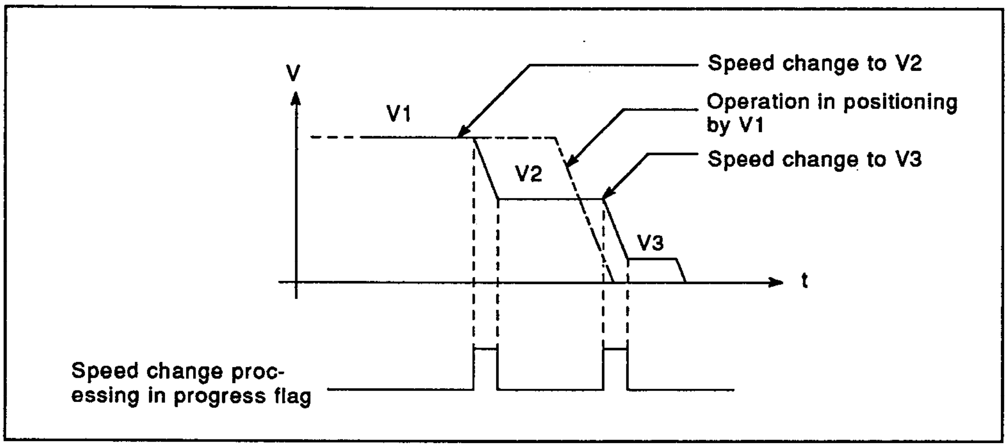



**Fig. 3.28 Speed Change Processing Flag Operation Timing**

(c) Even if the speed change processing flag is turned ON, the JOG speed can be changed.

(d) Deceleration processing can be continued even if the JOG speed is changed during deceleration with the JOG start signal OFF. However, a warning will be issued.

(e) A speed change value beyond the JOG speed limit results in an axis warning, and JOG operation is executed at the limit JOG speed.
The speed limit flag is kept ON during this JOG operation.

**REMARKS**

1) The JOG speed can be changed at the following buffer memory address:

| Axis No. | | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|---|
| Buffer memory address | Changed speed value | 1157, 1156 | 1207, 1206 | 1257, 1256 |
| | Speed change request | 1158 | 1208 | 1258 |

2) The speed change flags are set at the following buffer memory addresses:

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Buffer memory address | 831 | 931 | 1031 |

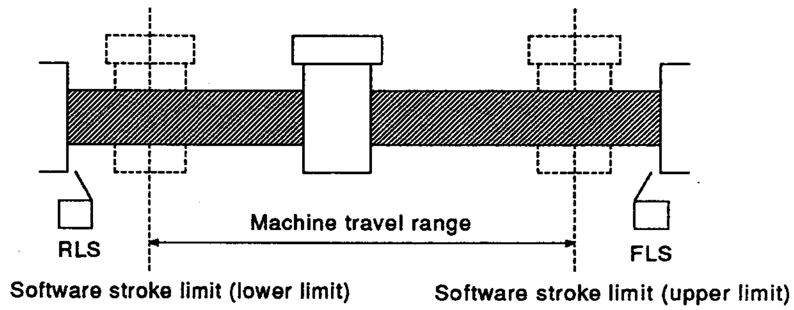
### 3.3.11 Software stroke limit function

(1) Description of software stroke limit function

(a) The software stroke limit function prevents positioning requested by a command which is outside the upper/lower stroke limit setting range.

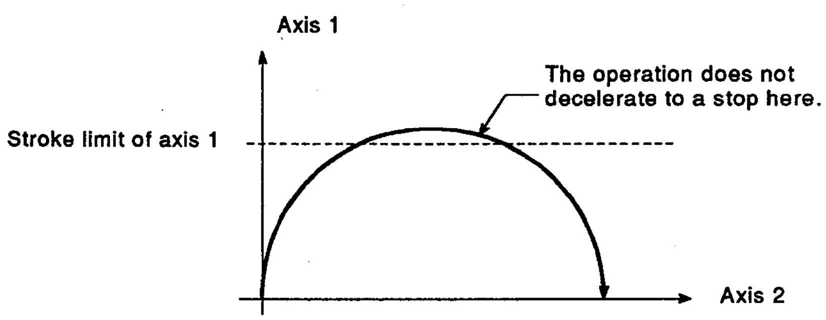
(b) Select a feed present value or machine feed value as the limit in the parameters.

(c) The software stroke limit range is checked at the start of and during operation.




**POINT**

In circular interpolation control, a software stroke limit check is performed at the start point, end point and arc addresses.
Thus, the path of the axis may overrun the software stroke limit in the middle of control.
However, the operation does not decelerate to a stop in such a case.
Install an external limit switch if there is a possibility of overrun.

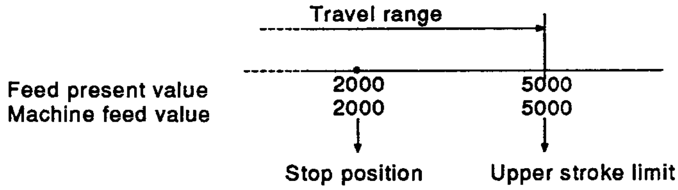


(2) Description of the control

(a) Difference in travel range between the feed present value and the machine feed value
The stroke limit set for the machine feed value is an absolute value with respect to the home return position.*
The stroke limit set for the feed present value is relative to the feed present value.*

[Conditions]

If the current stop position is 2000 and the upper stroke limit is set to 5000;

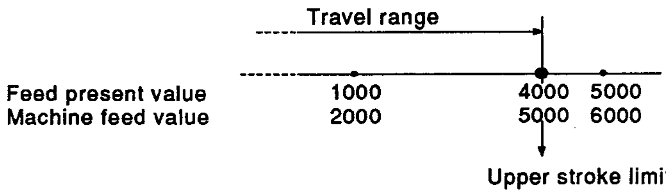



[Present value change]

If the present value is changed from 2000 to 1000, the feed present value is changed to 1000 while the machine feed value remains unchanged.

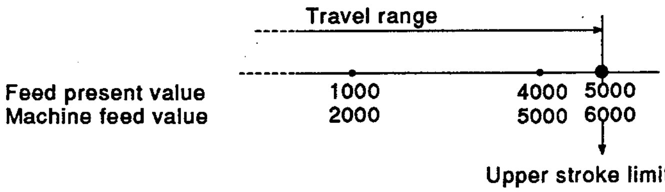
1) If the above upper stroke limit is set for the machine feed value:

Machine feed value 5000 will be the upper stroke limit, which equals the feed present value 4000.




2) If the above upper stroke limit is set to the feed present value:

Feed present value 5000 will be the upper stroke limit, which equals machine feed value 6000.



**REMARK**

Upon completion of home position return, the feed present value and the machine feed value are set to the home position address of the home position return parameter.

- If positioning control is performed upon completion of the home position return, both the feed present value and the machine feed value will be changed.
- If present value change is performed, only the feed present value will be changed.
- The machine feed value always represents the value with respect to the home position.

(b) Software stroke limit range check performed at the start of operation

1) The following software stroke limit range check is performed on each axis at operation start to determine;

   - Whether or not the operation start point is outside the software stroke limit range.
   - Whether or not the operation would overrun the software stroke limit range.

2) Any axis that has failed to pass either of the above check points, thus causing an axis error, will not be operated.

3) During interpolation control in positioning operation, even if only one axis is out of the software stroke limit range or would overrun the range, an axis error will occur. Consequently, neither axis will be operated.

4) Even if only one axis is out of the software stroke limit range or would overrun the range, thus preventing both axes from being operated at the same time at the start of simultaneous axis positioning, an axis error will occur. Consequently, neither axis will be operated.

**Table 3.5 List of Software Stroke Limit Range Checks Performed at Operation Start**

<table>
<tr><th colspan="2"></th><th colspan="2">Condition</th><th>Remarks</th></tr>
<tr><td rowspan="8">Positioning control</td><td>Position control</td><td colspan="2">None</td><td>(1) If the feed present value or the machine feed value is outside the software stroke limit range at the start of position control, an error will occur. Consequently, no position control will be performed.<br>(2) If the positioning address is outside the software stroke limit range, no position control will be performed.<br>(3) During circular interpolation control, the software stroke limit range check will also be performed on arc addresses.</td></tr>
<tr><td rowspan="3">Speed control</td><td rowspan="2">When a limit is set to the feed present value</td><td>Present value change not performed</td><td>(1) Software stroke limit range check not performed.</td></tr>
<tr><td>Present value change performed</td><td>(1) If the feed present value is outside the software stroke limit range at the start of speed control, an error will occur. Consequently, no speed control will be performed.</td></tr>
<tr><td colspan="2">When a limit is set to the machine feed value</td><td>(1) If the machine feed value is outside the software stroke limit range at the start of speed control, an error will occur. Consequently, no speed control will be performed.</td></tr>
<tr><td rowspan="3">Speed/ position switching control</td><td rowspan="2">When a limit is set for the feed present value</td><td>Present value change not performed</td><td>(1) Software stroke limit range check not performed.</td></tr>
<tr><td>Present value change performed</td><td>(1) If the feed present value is outside the software stroke limit range at the start of speed/position switching control, an error will occur. Consequently, no speed/position switching control will be performed.</td></tr>
<tr><td colspan="2">When a limit is set to the machine feed value</td><td>(1) If the machine feed value is outside the software stroke limit range at the start of speed/position switching control, an error will occur. Consequently, no speed control will be performed.</td></tr>
<tr><td>Home position return</td><td colspan="2">None</td><td>(1) Software stroke limit range check not performed.</td></tr>
<tr><td rowspan="4">Manual operation</td><td rowspan="2">JOG operation</td><td rowspan="2">Software stroke limit of JOG operation/manual pulse generator operation</td><td>Invalid</td><td>(1) Software stroke limit range check not performed.</td></tr>
<tr><td>Valid</td><td>(1) If the feed present value is outside the software stroke limit range at the start of JOG operation, JOG operation will be started if its direction is toward the software stroke limit range.</td></tr>
<tr><td rowspan="2">Manual pulse generator operation</td><td rowspan="2">Software stroke limit of JOG operation/manual pulse generator operation</td><td>Invalid</td><td>(1) Software stroke limit range check not performed.</td></tr>
<tr><td>Valid</td><td>(1) If the feed present value is outside the software stroke limit range at the start of manual pulse generator operation, manual pulse generator operation will be started only if its direction is toward the software stroke limit range.</td></tr>
</table>

*1: The parameter for "feed present value update request command during speed control" determines whether or not to update the feed present value during speed control.

(c) Software stroke limit range check during operation

1) A software stroke limit range check is performed for position control only.

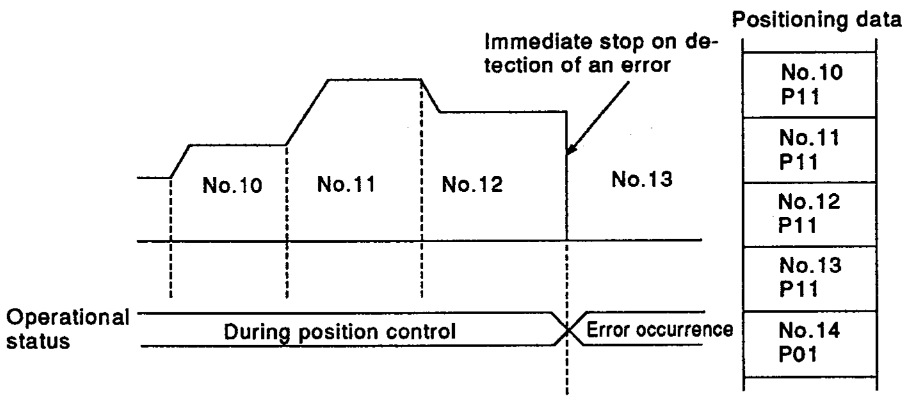
2) If the positioning address of the positioning data is outside the range, an error will occur.

3) During interpolation control, even if one axis is out of the software stroke limit range, an axis error will occur.

4) If the operation pattern is P11 and the next positioning data is position control data, the software stroke limit range check is also run on the next data.
If the next positioning data is found to be outside the software stroke limit range by the check, the current positioning data will be subjected to the same positioning control as P01.
When the next data comes up for processing, an error occurs.

Example

- If the positioning address of positioning data No.13 is outside the software stroke limit range, the axis will decelerate and stop upon execution of positioning data No.12.




(d) Invalidating the software stroke limit range check

To invalidate software stroke limit range check, make the "lower software stroke limit value" equal to the "upper software stroke limit value".
This will allow control regardless of the software stroke limit setting.

(e) Choosing to validate or invalidate the software stroke limit during JOG operation/manual pulse generator operation

The software stroke limit during JOG operation/manual pulse generator operation can be validated or invalidated by setting the parameter for "invalidating the software limit during JOG operation/manual pulse generator operation".

(f) Present value change and software stroke limit range check

Even if an address is put outside the software stroke limit range by a present value change, no error will occur during the change. However, an error will occur at the start of operation due to "attempting to start operation outside the software stroke limit range".

**REMARK**

To set a stroke limit, or to validate or invalidate a stroke limit with a sequence program, enter data in the following buffer memory areas.

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Upper stroke limit | 16, 17 | 166, 167 | 316, 317 |
| Lower stroke limit | 18, 19 | 168, 169 | 318, 319 |
| Software limit selection | 20 | 170 | 320 |
| Invalidating the software limit during JOG operation and manual pulse generator operation | 21 | 171 | 321 |

### 3.3.12 Electronic gear

(1) Electronic gear

(a) Allows the machine travel value per command pulse to be changed as required by setting a travel value per pulse.

(b) Set the travel value per pulse by specifying the "Number of pulses per revolution", "Travel value per revolution", and "Unit magnification" of basic parameters #1.

(c) Setting the travel value per pulse makes it unnecessary to select a servomotor or a detector (encoder) that conforms to the mechanical system, allowing flexible positioning.

(d) The electronic gear function is effective for positioning control, JOG operation, manual pulse generator operation, and home position return.

(2) Electronic gear processing

(a) The electronic gear function accumulates in the AD75 the values less than the travel value per pulse that could not be output as pulses during machine travel. When the cumulative value reaches the travel value per pulse, it is output as a pulse.

(b) Upon completion of fixed-pitch feed, a cumulative value less than the travel value per pulse is cleared to zero.
Accordingly, even when fixed-pitch feed is executed consecutively, the same machine travel value is obtained each time.

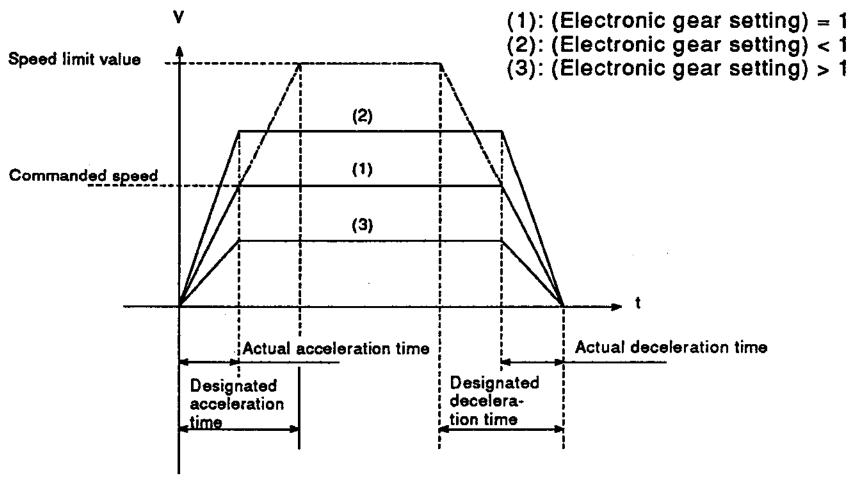
(3) Relationship between the commanded speed and the actual speed

The relationship between the commanded speed (the commanded speed set by the positioning data) and the actual speed varies as follows, depending on the electronic gear setting:

(a) When electronic gear setting = 1: commanded speed = actual speed.

(b) When electronic gear setting < 1: commanded speed < actual speed.

(c) When electronic gear setting > 1: commanded speed > actual speed.




* The speed limit value and the acceleration and the deceleration times will be determined by designated parameters.

**Fig. 3.29 Relationship between commanded speed and actual speed**

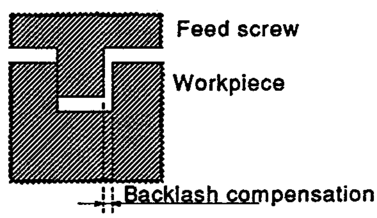
(4) Caution

(a) Note that if the electronic gear setting is low, the actual speed could exceed the speed limit value, causing the servo motor to operate at too high a speed.

### 3.3.13 Backlash compensation

(1) Backlash compensation

(a) Allows compensation for mechanical backlash to achieve accurate positioning.



(b) When a backlash compensation amount is set, every time the travel direction changes during positioning control, JOG operation, manual pulse generator operation, and home position return, extra feed pulses corresponding to the set backlash compensation amount are generated.

(c) Backlash compensation is performed based on the result of dividing the set backlash compensation amount by the travel value per pulse. The backlash compensation amount can be set in the range from 0 to 65535. Make sure that the backlash compensation amount will be no more than 255 when divided by the travel amount per pulse.
A setting error will occur if 255 is exceeded.
Round off decimals in this calculation.

$$0 \leq \frac{\text{Backlash compensation amount}}{\text{Travel amount per pulse}} \leq 255$$

(Round off decimals)

(2) Caution

(a) The feed pulses for a backlash compensation amount are not added to the feed present value/machine present value.

(b) Be sure to perform home position return before backlash compensation. Otherwise, accurate backlash compensation for the mechanical system is not possible.

(c) The backlash compensation amount can be changed when the PC READY status is OFF.
After the backlash compensation amount is changed, perform home position return.
(When the PC READY status is turned ON, the "home position return request" of the axis monitor will be ON if the backlash compensation amount has been changed.)

(d) When the travel direction changes, feed pulses representing both the travel value and the backlash compensation amount are generated.

**REMARK**

To change the backlash compensation amount, enter data in the following buffer memory addresses.

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Buffer memory address | 15 | 165 | 315 |

### 3.3.14 M code function

(1) M codes

(a) M codes are code numbers (0 to 32767) assigned by the user for each type of positioning control.

(b) M codes can be read by a sequence program to control auxiliary functions (such as clamp, drill rotation, stop, and tool change commands).

(2) Description of M code control

(a) When M = 0, no M code is generated, with the previously issued M code remains valid.
Also, in this case, no M code ON signal is generated.

(b) The M code ON signal for the reference axis is generated during interpolation operation as follows.

| Interpolation Axis | Reference Axis | M code ON Signal |
|---|---|---|
| During interpolation with axis 1 and axis 2 | Axis 1 | XD |
| During interpolation between with 2 and axis 3 | Axis 2 | XE |
| During interpolation with axis 3 and axis 1 | Axis 3 | XF |

(3) Output timing of "M code" ON signal

(a) The M code ON signal can be output in two timing modes:
WITH and AFTER

- In the WITH mode, the M code is generated at approximately the same time as the positioning operation starts, thus turning ON the M code ON signal.

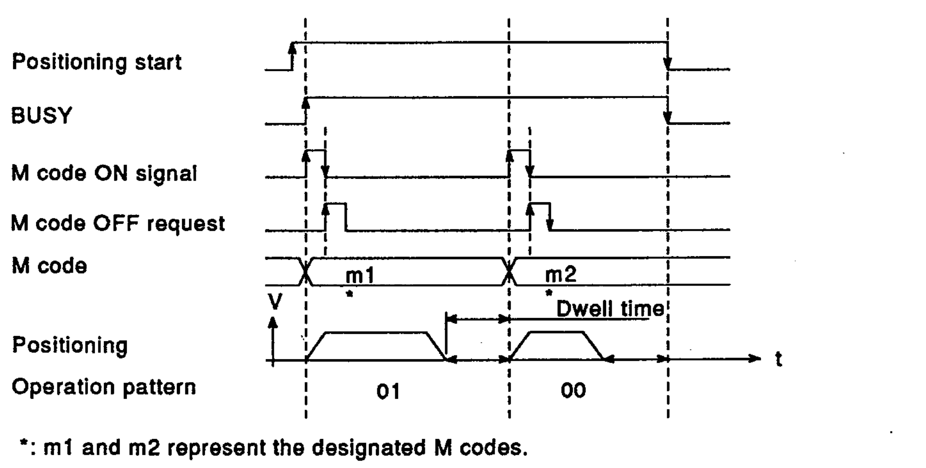


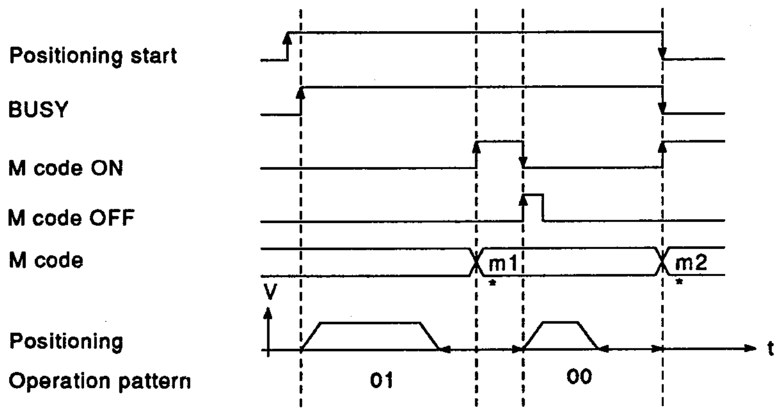

Fig. 3.30 M Code ON/OFF Timig (WITH mode)

**REMARK**

To set the M code ON signal output timing and request an M code OFF signal, enter data at the following buffer memory address.

| Axis No. | Output Timing of M code ON Signal | M code OFF Signal Request |
|---|---|---|
| Axis 1 | 25 | 1153 |
| Axis 2 | 175 | 1203 |
| Axis 3 | 325 | 1253 |

- In the AFTER mode, the M code is output upon completion of the positioning operation, thus turning ON the M code ON signal.




*: m1 and m2 represent the designated M codes.

**Fig. 3.31 M Code ON/OFF Timing (AFTER mode)**

(b) In speed control in the AFTER mode, no M code is output at the completion of the positioning operation during speed control, and the M code ON signal does not come ON.

(c) If the M code ON signal has been turned ON, it must be turned OFF by turning the M code OFF request signal ON with the sequence program.
If the M code ON signal is not turned OFF, one of the following will happen, depending on the operation pattern.

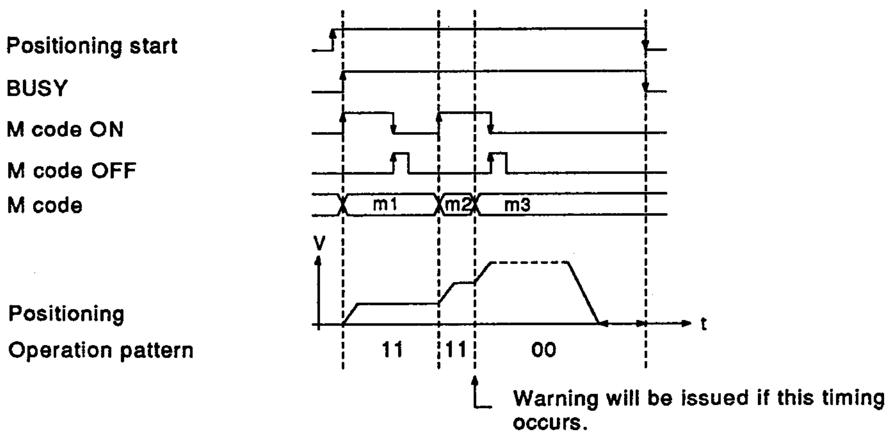
1) If the operation pattern is either positioning complete (00) or continuous positioning control (01):

- The next positioning will not be carried out.

- The system will stand by until the M code ON signal is turned OFF.

2) If the operation pattern is continuous locus control (11):

- The next positioning will be performed, but a warning will be issued.
- If the M code ON signal is ON at the start of positioning control, an error will occur, and the positioning operation will not start.
- If the PC READY signal is turned OFF, the M code ON signal is turned OFF, and "0" will be output as the M code.
- In continuous locus control (11), a warning may be issued if the positioning operation time is too short.
- If there is not enough time to turn OFF the M code ON signal, set 0 for the M code number instead.




*: m1 to m3 represent the designated M codes.

Fig. 3.32 When a Warning Occurs in the WITH Mode

### 3.3.15 Acceleration/deceleration processing

(1) What is acceleration/deceleration processing?

(a) It is the acceleration processing and deceleration processing at the start of positioning operation, JOG operation, home position return operation, and speed changes.

(2) Relationship between the speed control limit, JOG speed control limit, acceleration time, deceleration time, and rapid stop deceleration time

(a) The speed control limit, JOG speed control limit, acceleration time, deceleration time, and rapid stop deceleration time are defined as follows:

1) The speed control limit is the maximum speed during positioning operation, manual pulse generator operation, and home position return operation.

2) The JOG speed control limit is the maximum speed during JOG operation.
Set the JOG speed control limit to, or lower than, the speed control limit.

3) The acceleration time is the time it takes to reach the designated speed control limit from speed 0.

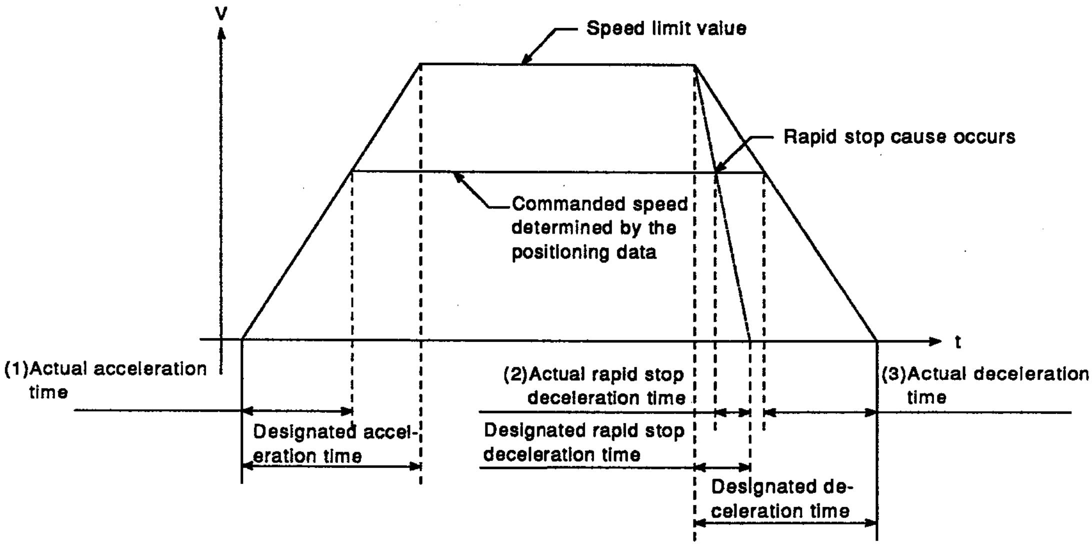
4) The deceleration time and rapid stop deceleration time are times taken to reach speed 0 from the designated speed control limit.

(b) If the commanded speed is designated lower than the parameter speed control limit, the acceleration/deceleration time will be relatively shorter.
Accordingly, set the maximum commanded speed to the same value as, or a similar value to, the parameter speed control limit.

(c) Set the speed control limit, acceleration time, deceleration time, and rapid stop deceleration time by specifying their respective parameters.

(d) During interpolation control with two axes, set the parameters for one of the axes as follows:

- Interpolation control with axis 1 and 2: parameter for axis 1
- Interpolation control with axis 2 and 3: parameter for axis 2
- Interpolation control with axis 3 and 4: parameter for axis 3




(1)Actual acceleration time : Actual acceleration time: The time taken to reach the commanded speed in the positioning data
(2)Actual rapid stop deceleration time : Actual rapid stop deceleration time: The time to reach a complete sudden stop from the commanded speed in the positioning data
(3)Actual deceleration time : Actual deceleration time: The time taken to reach a complete stop from the commanded speed in the positioning data.

**Fig. 3.33 Relationships Among Speed Control Limit, Acceleration Time, Deceleration Time, and Rapid Stop Deceleration Time**

(e) Setting ranges for acceleration/deceleration time

The setting range for both acceleration and deceleration time is 1 to 65535 ms.

(f) Selection of an acceleration/deceleration time pattern

1) Four patterns each for acceleration time and deceleration time are available for positioning operation.

2) Specify which acceleration and deceleration pattern is to be used for home position return and JOG operation by parameter setting.

**POINT**

There are four patterns each of acceleration time and deceleration time to choose from.
If more than four patterns are required, rewrite acceleration times 0 to 3 and deceleration times 0 to 3 using the programmable controller before turning ON positioning start signal (Y10 to 12).

(3) Acceleration/deceleration processing

(a) There are two acceleration/deceleration methods: "trapezoidal acceleration/deceleration" and "S-pattern acceleration/deceleration".

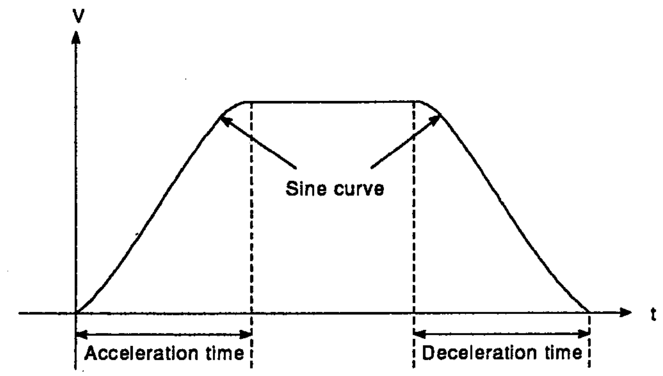



**Fig. 3.34 S Pattern Acceleration/Deceleration Processing**

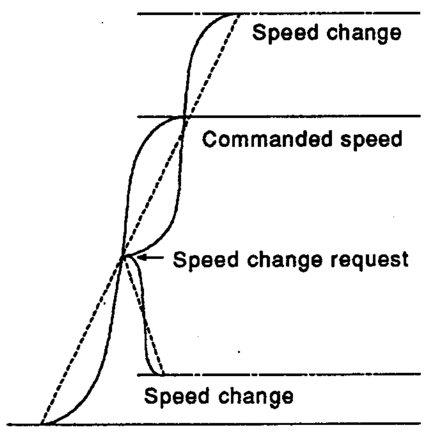
**POINTS**

(1) S pattern acceleration/deceleration processing cannot be used with stepping motors.

(2) To use S pattern acceleration/deceleration processing, set "S pattern acceleration/deceleration processing" for the acceleration/deceleration processing selection, and set an S curve ratio, in extended parameters #2.

(b) When S curve acceleration/deceleration processing is selected, an S curve ratio must be set. (For details on the S curve ratio, see Section 3.4.2 (18).)
S pattern acceleration/deceleration processing is performed for all acceleration and deceleration at the start and end of positioning, JOG, and home position return operations, and at speed changes.

(c) When a speed change is executed during S pattern acceleration/deceleration, S curve acceleration/deceleration is executed from when the speed change request is received.



### 3.3.16 Torque limit function

(1) Torque limit function

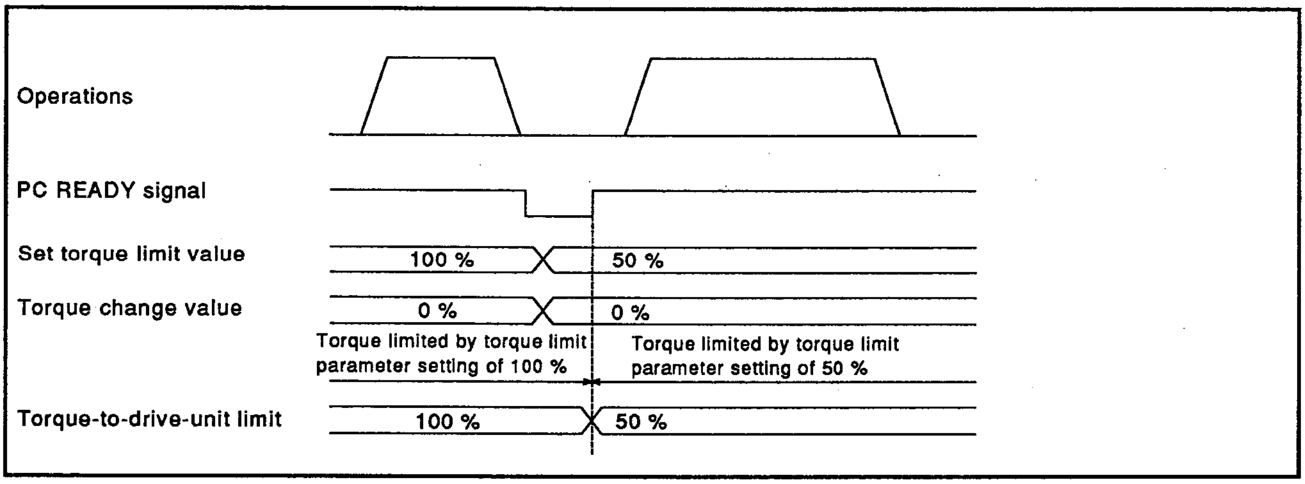
(a) Limits the torque generated by the servomotor within a setting range.

(b) It also maintains the torque within the setting range if the torque required for control exceeds the torque limit value.

(2) Description of the operation under torque limit control

(a) The torque limit value set in the parameters is used as the torque limit setting.
To perform torque limit control based on the set torque limit parameter value, set the torque change value of the axis control data to "0".
If the torque change value is set to any value other than "0", torque limit control will be performed based on the torque change value.
See Section 3.3.17 "Torque change function" for further details.

(b) The torque limit parameter value can be changed when the PC READY signal is OFF.
The torque limit parameter value after such a change will be effective after the PC READY signal is turned ON.




(c) The following table describes the operation status and the applicable torque limit value.

| Operation Status | Applicable Torque Limit Value(s) |
|---|---|
| Positioning operation | The torque limit setting in the parameters or the torque change value is used. |
| Home position return | The torque limit setting in the parameters or the torque change value is used.<br>However, the torque limit value of the home position return parameter is used after the creep speed is reached. |
| JOG operation | The torque limit setting in the parameters or the torque change value is used. |
| Manual pulse generator operation | The torque limit setting in the parameters or the torque change value is used. |

**POINTS**

(1) Requirements for using a pulse-train output type

(a) Wiring is required between the D/A conversion module and the drive unit.

(b) A drive unit capable of issuing torque limit commands based on analog voltage is required.

(c) The set torque limit setting is set in the "torque limit storage area" of the axis monitor. Transmit the "torque limit storage value" to the D/A conversion module using a sequence program.

**REMARKS**

1) To set the torque limit value using a sequence program, enter data in the following buffer memory addresses.

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Torque limit value | 24 | 174 | 324 |

2) The following are the buffer memory area addresses of the axis monitor for storing the torque limit value.

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| For storing the torque limit value | 826 | 926 | 1026 |

### 3.3.17 Torque change function

(1) What is the torque change function?

(a) It is a function for changing the torque limit value during positioning control, JOG operation, and manual pulse generator operation. To change the torque limit value, set the "torque change value" of the axis control data to the required value. The torque generated by the servomotor will be limited to the changed value.

(b) To perform this change, data has to be written to the buffer memory area using a sequence program.

(2) Description of the torque change function

(a) Details of the torque change function

1) The "torque change value" of the axis control data can be changed at any time.
The torque change value takes effect the moment it is written.

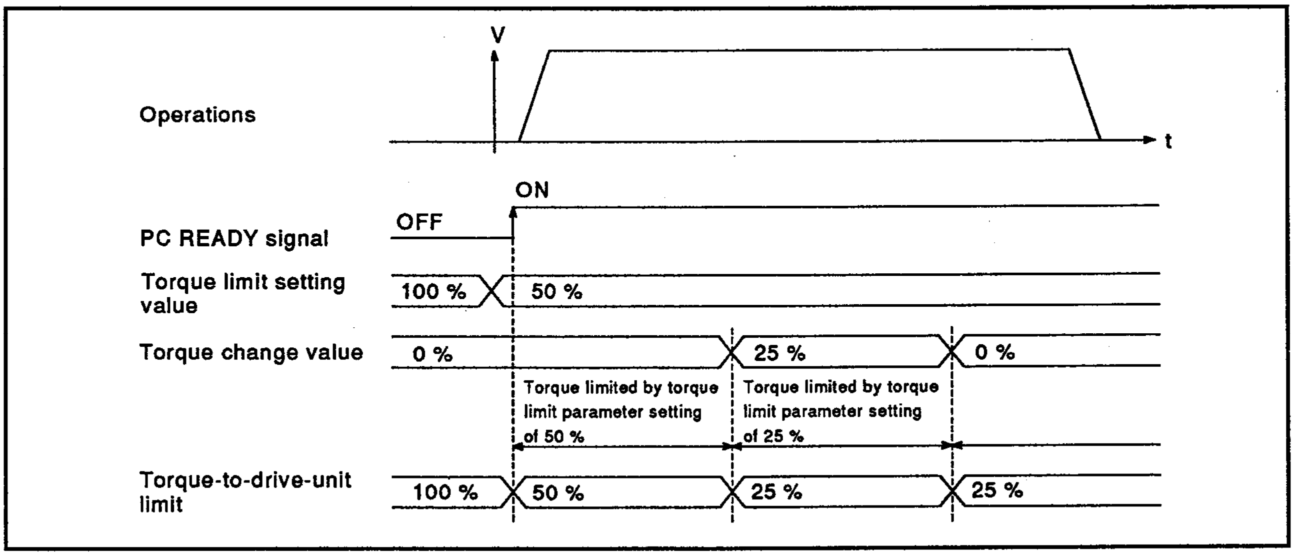
2) The setting range is from 0 (zero) to the torque limit setting in the parameters.

- To perform torque limit control based on the torque limit setting in the parameters, set the torque change value of the axis control data to "0".

- If the torque change value is set to any value other than "0", torque limit control will be performed based on the torque change value.

3) At the start of positioning control, JOG operation, and manual pulse generator operation, torque limit control will be performed based on the torque limit setting in the parameters.

(b) If the torque change value is out of the setting range, an axis warning will occur.



**REMARK**

Set the torque change value in the following buffer memory areas.

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Torque change | 1176 | 1226 | 1276 |

### 3.3.18 Present value change

(1) What is present value change?

(a) This function changes the feed present value of an axis that has not been moved to a designated address.
Present value change does not change the machine feed value.

(b) There are two present value change methods: the method using the positioning data, and the method using the present value change buffer memory.

1) For present value change using the positioning data, use the "present value change" setting for the control method in the positioning data.

2) For present value change using the present value change buffer memory, set the address after the change in the buffer memory allocated for present value change use.
Use the positioning start number "9003".

(2) Present value change using positioning data

(a) A present value change using the positioning data is performed according to the procedure below.

| Create positioning data with "present value change" set as the control method. |
|---|

↓

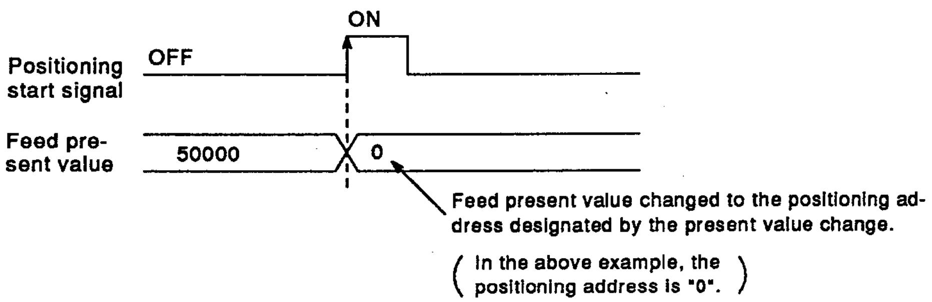
| Set the present value change positioning data number as the positioning start number. |
|---|

↓

| Turn the positioning start signal ON. |
|---|

(b) Timing of change

When the positioning start signal is turned ON, the feed present value is changed to the newly designated value .




**REMARK**

The following are the buffer memory addresses for positioning start.

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Buffer memory address for positioning start | 1150 | 1200 | 1250 |

(c) Error detection

1) An axis error will occur if a value designated in degree units is outside the setting range.

2) An error will not occur even if the set value is outside the stroke limit range.
At the start of positioning control, however, an error will occur due to an operation start from outside the software stroke limit range.

3) An error will occur if the positioning data following the positioning data for continuous locus control is present value change data.
An error will also occur if the operation pattern of the positioning data designating present value change is continuous locus control.

(d) Designating positioning data *1

The following positioning data can be set with the peripheral device or sequence program:

| Data | Necessity of Setting *2 |
|---|---|
| Operation pattern | Select "positioning end". |
| Control method | Select "present value change". |
| Acceleration time | — |
| Deceleration time | — |
| Positioning address/Travel value | o *3 |
| Circular interpolation address | — |
| Commanded speed | — |
| Dwell time | — |
| M code | — |

**REMARKS**

1) *1: For details of positioning data, see Section 3.4.5.

2) *2: Whether or not setting is necessary is indicated by one of the following symbols:

- o : Must be set.
- Δ : May be set as required.
- — : Need not be set.

3) *3: Set the address after the change.

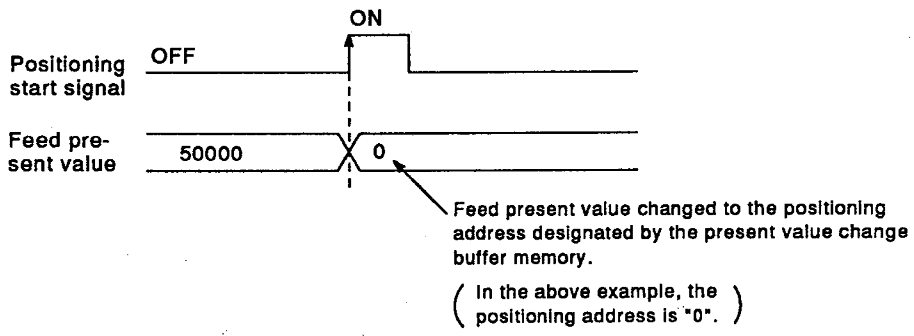
(3) Present value change using the present value change buffer memory

(a) A present value change using the present value change buffer memory is performed according to the procedure below.

| |
|---|
| Write the new present value in the "buffer memory area for changing the present value". |
| ↓ |
| Write "9003" in the "buffer memory area for the positioning start number". |
| ↓ |
| Turn ON the positioning start signal. |

(b) Timing of change

When the positioning start signal is turned ON, the feed present value is changed to the newly designated value .




(c) Error detection

1) An axis error will occur if a value designated in degree units is outside the setting range.

2) An error will not occur even if the set value is outside the stroke limit range.
At the start of positioning control, however, an error will occur due to an operation start from outside the software stroke limit range.

**REMARK**

The following are the buffer memory addresses forpresent value change and positioning start.

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Buffer memory address for present value change | 1154, 1155 | 1204, 1205 | 1254, 1255 |
| Buffer memory address for positioning start | 1150 | 1200 | 1250 |

### 3.3.19 Speed change

(1) What is speed change?

(a) This function changes the present speed to a designated speed during the following positioning.

- Position control
- Speed control
- Speed/position switching control
- JOG operation

(b) A new speed can be written by using a sequence program or the test mode of a peripheral device.

(c) A speed change can be executed at any required position either by turning ON a speed change request in the axis control data, or by turning ON an external speed change request* (external signal).

**POINTS**

(1) To change the present speed with a sequence program, first multiply the new value by 100 or 1000 and then enter the product of the multiplication as the speed change value.

Example

If the current speed is to be changed to 10000.00 mm/min, enter 1000000 for the changed speed value.

(2) When making consecutive speed changes, set at least 100 ms intervals between successive speed changes.

**REMARK**

* : To use an external speed change request, "1: external speed change request" must be set for "external positioning start selection" in extended parameters #2. Also, "external start valid" of the buffer memory axis control data must be set to "valid" (1).

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Buffer memory for external start valid setting | 1171 | 1221 | 1271 |

(2) Description of the operation

(a) A warning will occur in the following cases.

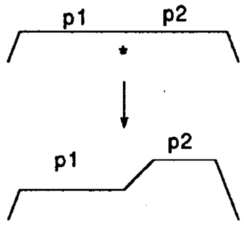
- During deceleration due to a stop command
- During automatic deceleration under positioning control

(b) To change to a new value, set the positioning operation speed change value of the axis control data to the new value.
If the positioning operation speed change value exceeds the speed limit value, a warning will occur and the change value will be set at the limit value.

(c) When the remaining distance is insufficient to complete the change during position control, or during position control in speed/position switching control, the feed speed is controlled to approach the speed change value as closely as possible.

<When the remaining distance is insufficient>

If a speed is designated for P1 while the current speed is designated for P2:




If speed change occurs at "*" where the remaining distance is insufficient to complete the speed change, it is completed in P2, and the current speed is set to the changed speed.

* If a commanded speed is designated for P2, operation is performed at the commanded speed, and the current speed is set to the commanded speed.

However, since the current speed is changed, if the current speed is used as the next positioning speed during continuous positioning, the new change speed value is achieved during the next positioning. On the other hand, if a speed is designated in the next positioning data, the operation is performed at the designated speed.

(d) During interpolation control, speed change is performed based on the speed change value and the speed change request stored in the buffer memory area for the reference axis.

| Interpolation Axis | Reference Axis | Buffer Memory | |
|---|---|---|---|
| | | Speed Change Value | Speed Change Request |
| During interpolation with axis 1 and axis 2 | Axis 1 | 1156,1157 | 1158 |
| During interpolation with axis 2 and axis 3 | Axis 2 | 1206,1207 | 1208 |
| During interpolation with axis 3 and axis 1 | Axis 3 | 1256,1257 | 1258 |

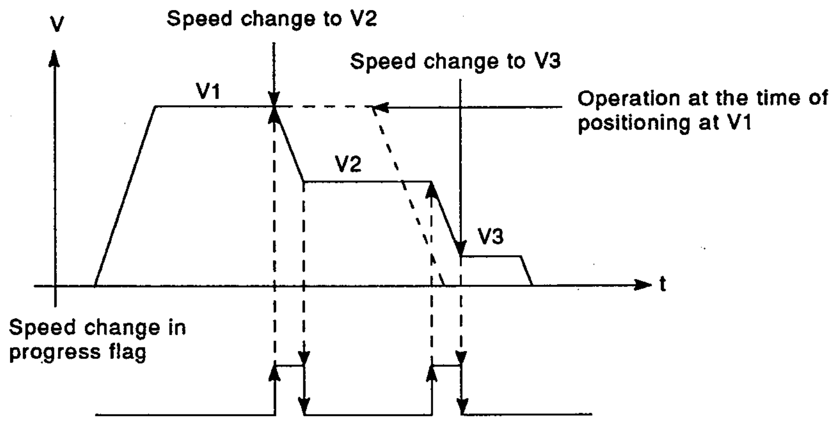
(e) If the control units of the reference axis and other axis differ from each other, the unit of the reference axis will be the unit for the speed change. (See (d) above.)

(f) During speed control, "1" is stored in the applicable buffer memory for the speed change in progress flag (flag ON). Upon completion of the speed change, "0" replaces "1" (flag OFF). (See the table below.)

| Axes No. | Speed Change Flag |
|---|---|
| Axis 1 | 831 |
| Axis 2 | 931 |
| Axis 3 | 1031 |

(g) Even when the operation pattern is set to continuous locus control (11), an immediate speed change can be executed upon receiving a speed change request.
However, if the distance required to change to the designated speed cannot be secured, no speed change is executed.

<Opeation timing during positioning operation speed change processing>




(3) Speed change request with speed change value of "0"

(a) If a speed change request is made with a speed change value of "0" during positioning control, the axis will decelerate to a stop and the speed change 0 flag of the buffer memory axis monitor will be turned ON.

(b) During interpolation control, "1" is stored in the buffer memory area for the speed change 0 flag for the applicable reference axis.

| Interpolation Axes | Reference Axis | Speed Change 0 Flag |
|---|---|---|
| During interpolation with axis 1 and axis 2 | Axis 1 | 817 |
| During interpolation with axis 2 and axis 3 | Axis 2 | 917 |
| During interpolation with axis 3 and axis 1 | Axis 3 | 1017 |

(c) If the speed change value is set to any value other than "0", the speed change "0" flag will be turned OFF, continuing the operation.

(d) When the speed becomes "0" after making a speed change to "0", the BUSY signal will remain ON.
In this case, the axis is stopped but maintains its operation status.

(e) Upon receiving a stop signal, the BUSY signal will be turned OFF, with the operation status of the axis changed to "stopped".

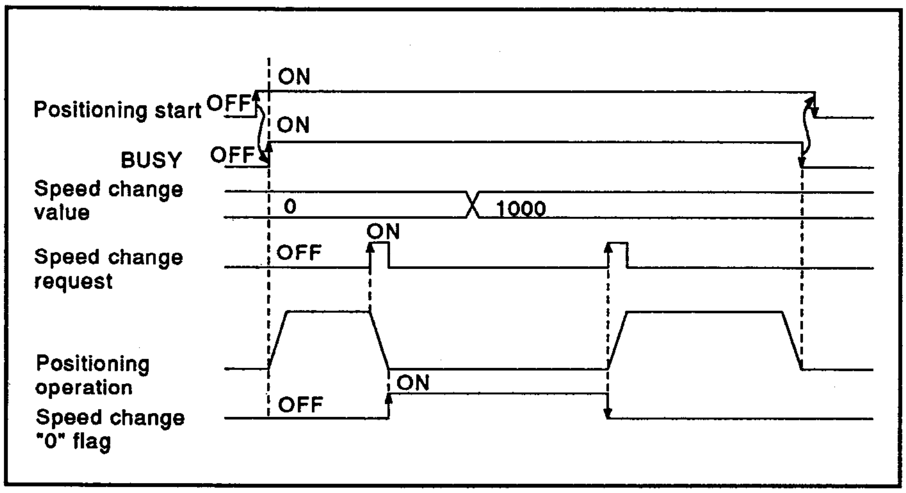



Fig. 3.35 Speed Change "0" Timing

### 3.3.20 Skip function

(1) What is the skip function?

Upon receipt of a skip signal, this function decelerates axis motion to a stop without processing the remaining travel value, and executes the next positioning.

(2) Skip signal

(a) The skip signal is turned ON when the skip command of the axis control data or the external start signal comes ON.

(b) When the skip signal is turned ON, the axis automatically decelerates and performs the next positioning.
If the skip signal is turned ON in a final positioning operation, operation is terminated.

(c) When the positioning being executed is skipped, the positioning completed signal for positioning in data No. units or automatic acceleration and deceleration units is not turnd ON.

(d) When skip is executed during a dwell time, the dwell time is terminated and the next positioning is started.

(e) The following describes the operation after the skip signal is turned ON during interpolation.

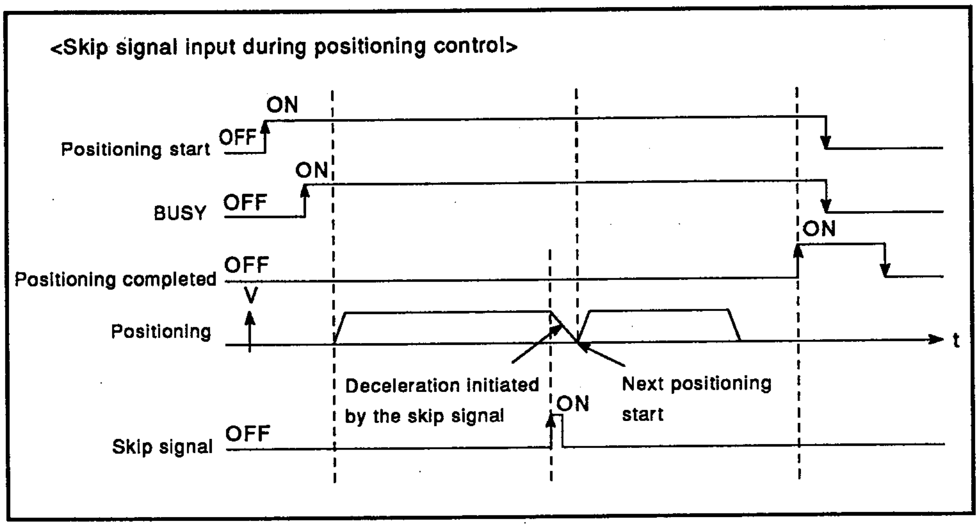
1) During interpolation with axis 1 and axis 2
(reference axis: axis 1)
When the skip signal of axis 1 is turned ON, both axes decelerate to a stop and axis 1 performs the next positioning.

2) During interpolation with axis 2 and axis 3
(reference axis: axis 2)
When the skip signal of axis 2 is turned ON, both axes decelerate to a stop and axis 2 performs the next positioning.

3) During interpolation with axis 3 and axis 1
(reference axis: axis 3)
When the skip signal of axis 3 is turned ON, both axes decelerate to a stop and axis 3 performs the next positioning.

(f) If the M code output is in the AFTER mode, no M code is output and the M code ON signal does not come ON.

(g) A skip signal received during home position return is ignored.




**REMARKS**

1) *: Since the external start signal is used for the following purposes, the skip function must be set in advance if it used to be used for the skip function.

- External positioning start
- External speed change request
- Skip request input signal

External start enable setting is also necessary to use the external start signal.

2) Enter data in the following buffer memory addresses to turn ON the skip command, select the external start input function, and perform the external start enable setting.

| Axis No. | Skip Command | External Start Input Selection | External Start Enable Setting |
|---|---|---|---|
| Axis 1 | 1175 | 62 | 1171 |
| Axis 2 | 1225 | 212 | 1221 |
| Axis 3 | 1275 | 362 | 1271 |

### 3.3.21 Step function

(1) What is the step function?

The step function enables the user to confirm each positioning step.

(2) Executing the step function

(a) After turning the step enabled flag ON in advance, turn the positioning start signal ON.

(b) When one positioning step is completed normally, the axis operation status will become step standby.

(c) If operation is stopped by the stop signal during step operation, the axis operation status will become step-stopped.

(d) If an error occurs which causes deceleration to a stop during step operation, a step error condition will occur.

(e) The next positioning step is performed if the step start data is set to 01H when the axis operation status is step standby.

(f) The stopped processing of positioning data restarts if the step start data is set to 01H or 02H when the axis operation status is step-stopped.
Positioning will not be performed even if the step start data is set to 02H when the axis operation status is other than step-stopped.

(g) If the axis operation status is inappropriate when setting the step start data, a warning will occur, as shown in the following table.
(A warning is output only when the step enable flag is turned ON.)

| Axis Operation Status | Start Data | |
|---|---|---|
| | Set to 01 | Set to 02 |
| Standby | — | — |
| Stopped | — | — |
| Interpolation | X | X |
| JOG operation | X | X |
| Manual pulse generator operation | X | X |
| Analyzing | X | X |
| Special start standby | X | X |
| Home position return | X | X |
| Positioning control | X | X |
| Speed control | X | X |
| Speed/position switching: speed control | X | X |
| Speed/position switching: position control | X | X |
| Step standby | O | — |
| Step-stopped | O | O |
| Step error | — | — |
| Error | — | — |

(X: Warning for starting during operation
O: Normal operation
—: Warning for invalid step start data)

(h) When the axis operation status is step standby, step-stopped, or step error with the step effective signal ON, the first-point positioning step will be performed upon turning ON the positioning start signal again.

(3) Step function modes

(a) Two step function are available: "the deceleration unit step mode"; and "the data No. unit step mode".

1) Deceleration unit step mode

Normal operation is performed until positioning data that calls for automatic deceleration is encountered. Upon such an encounter, axis motion is automatically decelerated and positioning stopped after the positioning data is executed.

2) Data No. unit step mode

After executing the positioning data, automatic deceleration to a stop is performed regardless of whether automatic deceleration is necessary or not.
Automatic deceleration is executed forcibly even if the operation pattern is continuous locus control (11).
(The operation is the same as continuous positioning control (01).)
Therefore, when performing continuous operation in which the positioning data has the operation patterns 00 and 01 only, positioning in the deceleration unit step mode operates in the same manner as in the data No. unit step mode.

(b) During interpolation with axis 1 and axis 2, positioning is performed in the step mode of axis 1; during interpolation with axis 1 and axis 2, the step mode of axis 2; and during interpolation with axis 3 and 1, the step mode of axis 3.

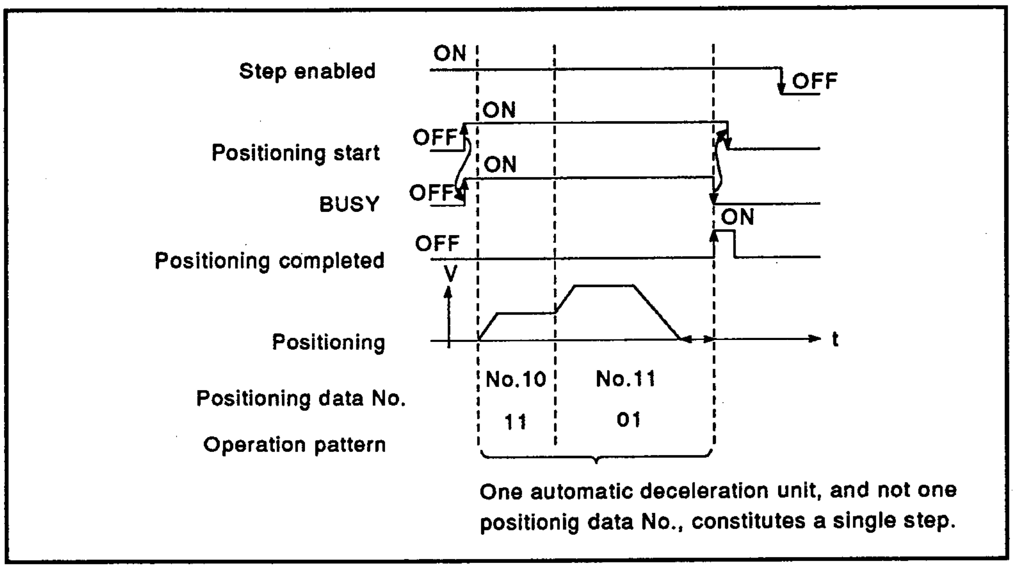



**Fig. 3.36 Operation for Deceleration-Unit Step Execution**

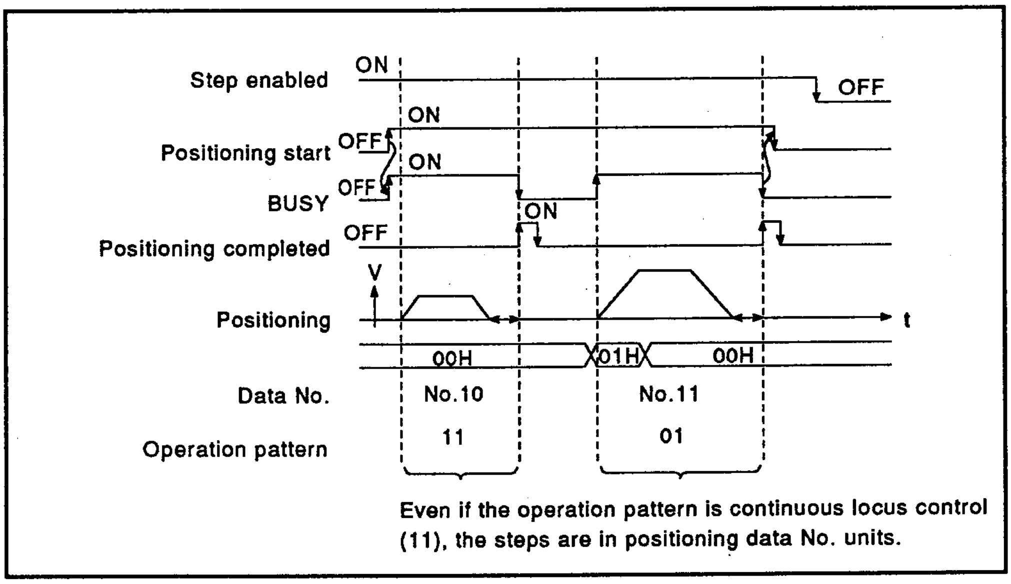



**Fig. 3.37 Operation for Positioning Data No.-Unit Step Execution**

(4) Step function in continuous locus control (11)
If positioning is performed in the data No. unit step mode when the operation pattern is continuous locus control (11), the AD75 performs operation according to pattern 11 to check the positioning operation for abnormality.
However, since the axis is actually operated in the data No. unit step mode, the operation is carried out in accordance with operation pattern 01.
The axis operation status becomes "step error" at this time.
If "01" is set in the step start data, step operation will resume at the data following the positioning data which has caused the error.

### 3.3.22 Command in-position

(1) What is command in-position?

(a) For each occurrence of automatic deceleration during positioning control, this function turns ON the command in-position flag when the remaining positioning distance is within the "command in-position range".
The command in-position flag is set when the command in-position range check determines the remaining positioning distance is within the "command in-position range".

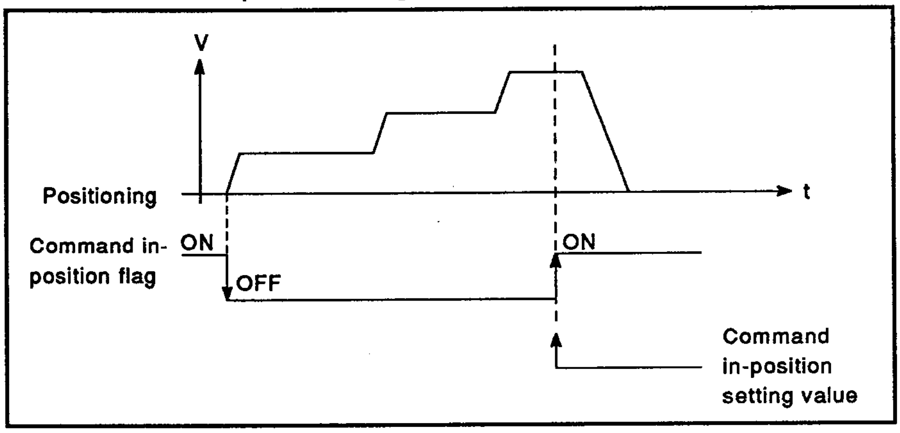



**Fig. 3.38 ON/OFF Timing of the Command In-Position Flag**

(2) Description of the operation

(a) The command in-position range check is run all the time during positioning control and deceleration to a stop by the step function, except in the following conditions:

- During deceleration to a stop due to a stop command/rapid stop command
- During speed control or during speed control in speed/position switching control

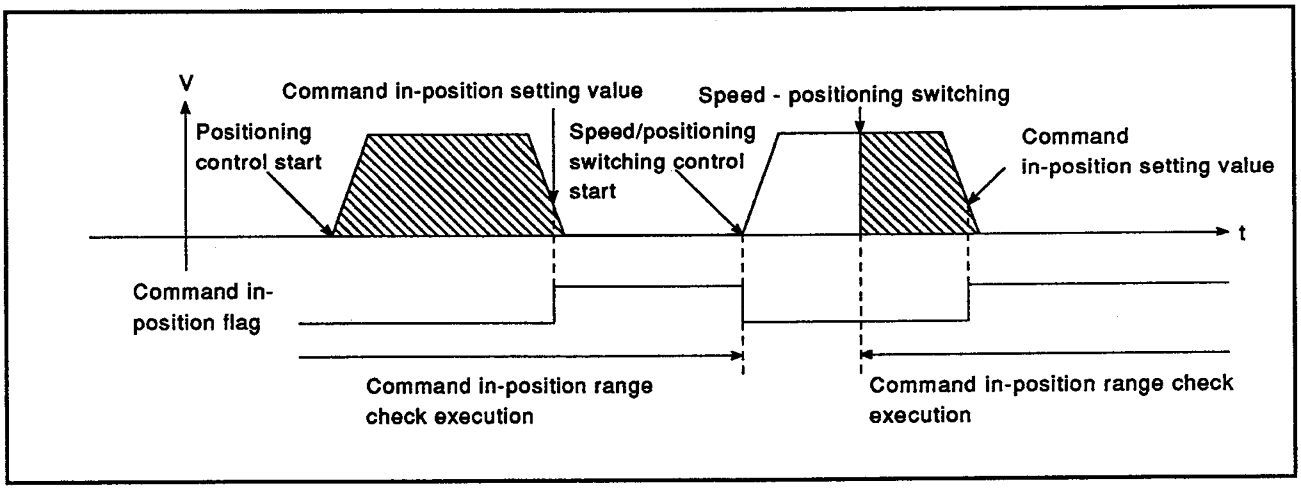



**Fig. 3.39 Command In-Position Range Check**

(b) The command in-position flag is turned OFF in the following situations:

- At the start of positioning
- During home position return
- During speed control
- During JOG control
- During manual pulse generator operation

(c) During interpolation control, the command in-position function is executed based on the data stored in the buffer memory areas for the command in-position range and the command in-position flag for the reference axis.

| Interpolation Axes | Reference Axis | Buffer Memory | |
|---|---|---|---|
| | | Command In-position Range | Command In-position Flag |
| During interpolation with axis 1 and axis 2 | Axis 1 | 22,23 | 817 |
| During interpolation with axis 2 and axis 3 | Axis 2 | 172,173 | 917 |
| During interpolation with axis 3 and axis 1 | Axis 3 | 322,323 | 1017 |

### 3.3.23 Teaching function

(1) What is the teaching function?

(a) This function changes a positioning address reached by manual operation (JOG operation or manual pulse generator operation) to the positioning address of a designated positioning data No.

(b) In the case of circular interpolation with a designated auxiliary point, The teaching function can change the circular interpolation auxiliary point address and the positioning address.
In the case of circular interpolation with a designated center point the teaching function can change the positioning address.

(2) Positioning address

The written positioning address or auxiliary point address for circular interpolation is an absolute address with respect to the home position.

(3) Axes subject to teaching

Teaching can be performed for each axis individually or for designated interpolation axes.

- Individual axis teaching: designate one target axis at a time.
- Interpolation axes teaching:designate a pair of target axes at a time.

(4) Constraints

(a) The teaching function is performed for stopped axes with a sequence program.
Even if an error or warning occurs during manual operation, this function is effective unless the axis is in the BUSY status.

**POINTS**

(1) Positioning identifiers, M codes, dwell time, and commanded speed can also be changed during teaching operation.

(2) The teaching function uses the control data addresses of the buffer memory.
Set the following data in the control data addresses.

| Setting Data | Buffer Memory Address(es) |
|---|---|
| Target axis | 1103 |
| Positioning data No. | 1104 |
| Write pattern | 1105 |
| Write request | 1106 |
| Write positioning data | 1108 to 1137 |
| Flash ROM write request | 1138 |

For details of the control data addresses, see Section 3.6.4.

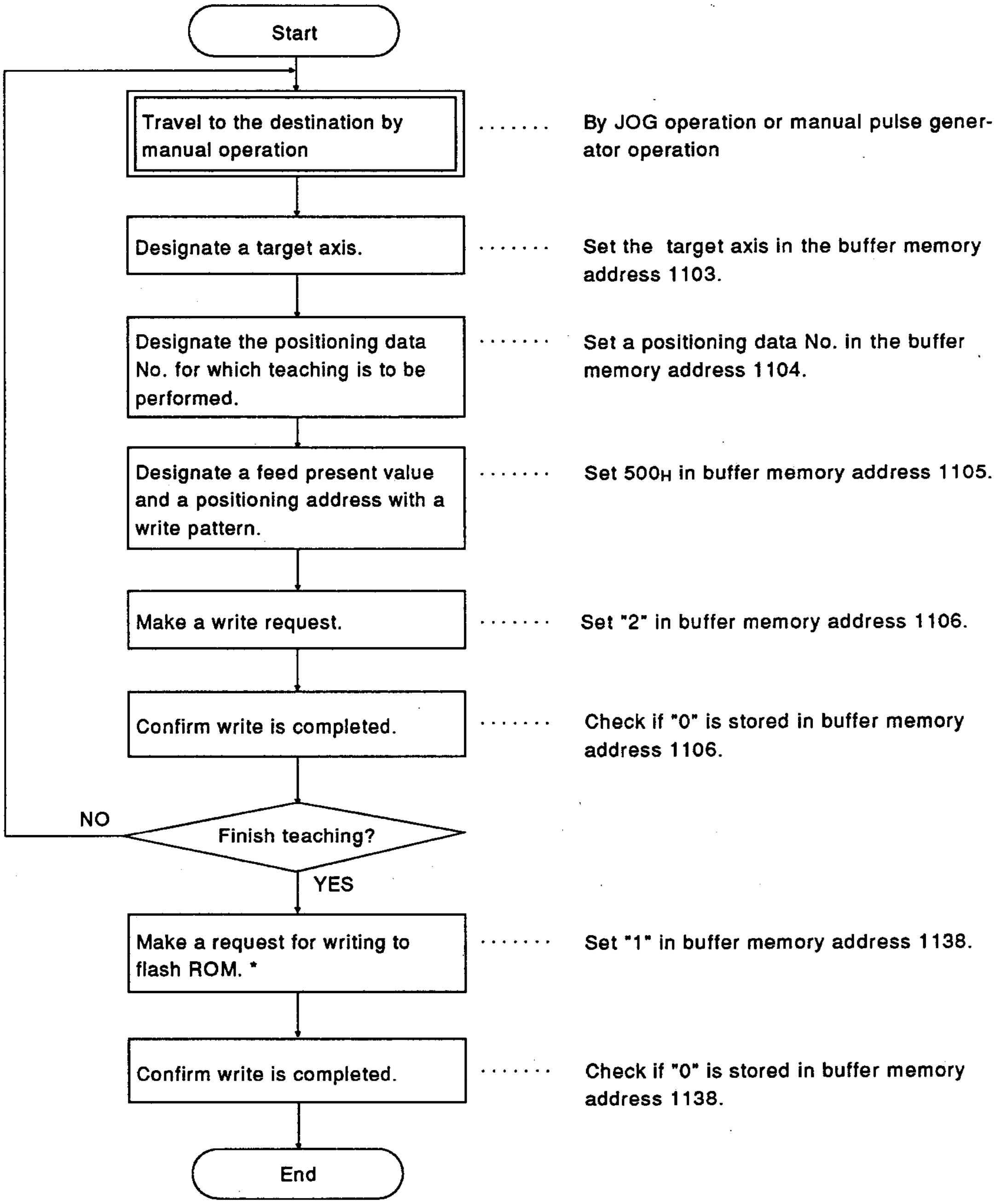
**REMARK**

*: "Positioning identifier" is a generic term that covers the positioning pattern, acceleration time No., deceleration time No., and control method.

(5) Teaching procedure

The following flowcharts describes the teaching procedure with a sequence program.

(a) When controlling each axis independently, and when performing interpolation (except for circular interpolation with a designated auxiliary point), the teaching function can be used to change the positioning address in the individual axis control or interpolation control (except circular interpolation with a designated auxiliary point).




**POINT**

*: Writing to the flash ROM is possible up to 100,000 times.
Once the flash ROM has been writen to 100,000 times, writing to the flash ROM will no langer be possible.

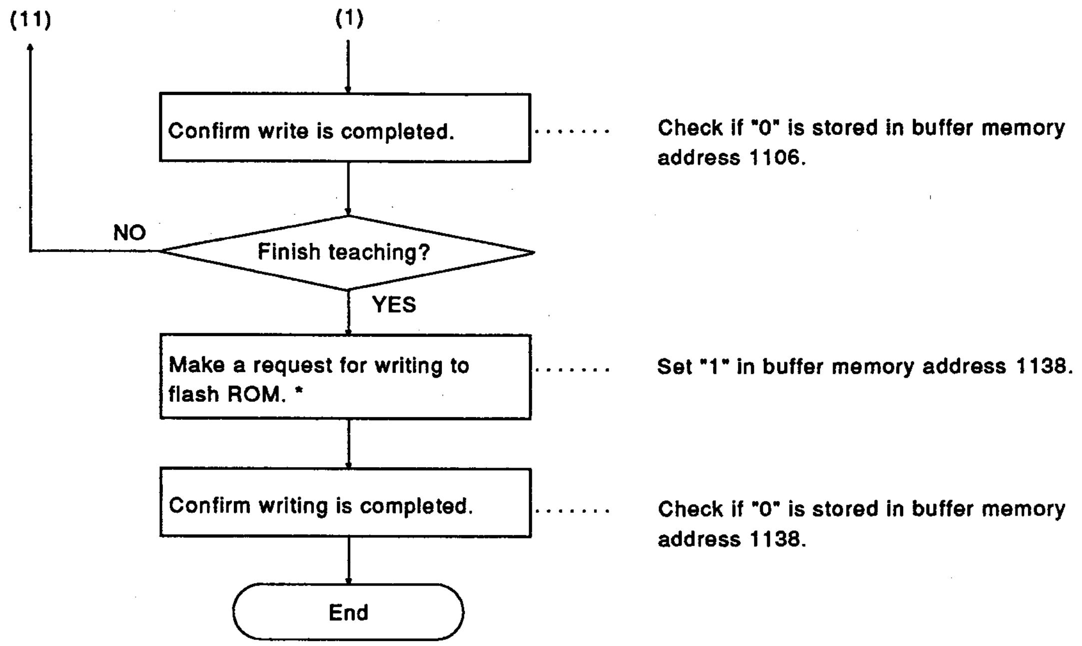
(b) Procedure for controlling circular interpolation with a designated auxiliary point

In the case of circular interpolation with a designated auxiliary point, the teaching function enables the auxiliary point and the final address to be changed.

( In the case of circular interpolation with a designated center point, the teaching function enables the final address to be changed. See (a) for details about the teaching procedure. )

| | |
|---|---|
| Start | |
| Travel to the auxiliary point for circular interpolation by manual operation | By JOG operation or manual pulse generator operation |
| Designate a target axis. | Set a target axis in the buffer memory address 1103. |
| Designate the positioning data No. where teaching is performed. | Set a positioning data No. in the buffer memory address 1104. |
| Designate the feed present value and the auxiliary point of circular interpolation with the write pattern. | Set $600_H$ in the buffer memory address 1105. |
| Make a write request. | Set "2" in the buffer memory address 1106. |
| Confirm write is completed. | Check if "0" is stored in the buffer memory address 1106. |
| Travel to the terminal point of circular interpolation by manual operation | By JOG operation or manual pulse generator operation |
| Designate the feed present value and the positioning address with the write pattern. | Set $500_H$ in buffer memory address 1105. |
| Make a write request. | Set "2" in buffer memory address 1106. |

(11) (1)




**POINT**

*: Writing to the flash ROM is possible up to 100,000 times.
Once the flash ROM has been writen to 100,000 times, writing to the flash ROM will no longer be possible.

### 3.3.24 Override function

(1) Override function

(a) Changes the positioning speed (current speed) to 1 to 300 % of the commanded speed.

(b) This is accomplished by writing the required override value (1 to 300 %) in the buffer memory area for the positioning speed override setting.

(2) Description of the operation

(a) The override function continues to be effective for the current speed even after a speed change is executed.

(b) The current speed remains unchanged when the override value is set to 100 %.

(c) The override function is ineffective for the speed during deceleration due to a stop command, or for automatic deceleration during position control.
The override function will take effect again after deceleration to a stop.

(d) Any value set for this function is invalid if it exceeds the speed control limit; the positioning will be performed at the speed control limit.
In this case, a warning (warning No. 501) occurs, turning the speed control flag ON.

(e) If it is not possible to secure a sufficient distance for this function to change the current speed to the designated override speed, the current speed is changed to the highest possible speed within the given distance.
However, no speed change occurs if the operation pattern is "11" (continuous locus control).

(f) During interpolation control, the override function uses the buffer memory area for the positioning speed override setting for the reference axis as shown below.

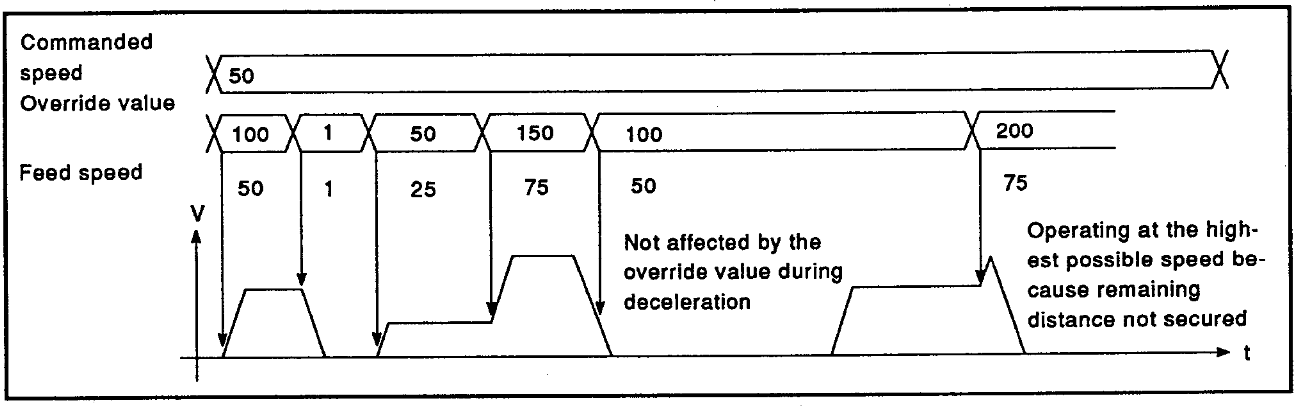
| Interpolation Axis | Reference Axis | Buffer Memory for Positioning Speed Override Setting |
|---|---|---|
| During interpolation with axis 1 and axis 2 | Axis 1 | 1159 |
| During interpolation with axis 2 and axis 3 | Axis 2 | 1209 |
| During interpolation with axis 3 and axis 1 | Axis 3 | 1259 |

(g) The value in the feed speed storing buffer memory in the axis monitor area changes according to the override value.

(h) If a feed speed of 1 or less results from setting an override value of 100 % or less, feed is performed at the speed of "1" in the current speed units.

(i) If the set override value is outside the setting range, operation is performed using the value indicated below.

- For 0 % : Operation at 100 %
- For 301 % : Operation at 300 %

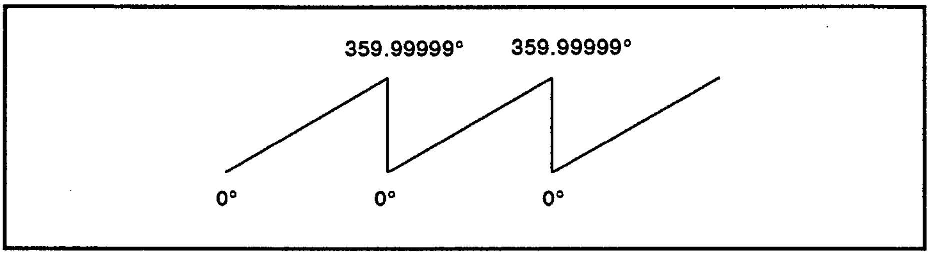


### 3.3.25 Control unit "degrees"

The control unit "degrees" differs from other control units as described below.

(1) Addresses of the feed present value and machine feed value

Ring addresses of 0° to 359.99999° are assigned to feed present values and machine feed values.

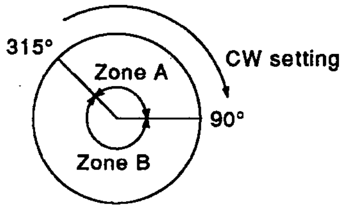



(2) Validating/invalidating software stroke limits

The software stroke limit value range is from 0° to 359.9999°.

(a) How to validate software stroke limits

To validate software stroke limits, set the lower limit value first and then the upper limit value clockwise.




1) To define travel range A, perform the following setting:

- Set the lower limit value to 315.00000°
- Set the upper limit value to 90.00000°

2) To define travel range B, perform the following setting:

- Set the lower limit value to 90.00000°
- Set the upper limit value to 315.00000°

(b) How to invalidate software stroke limits

To invalidate software stroke limits, define the lower software stroke limit value and the upper software stroke limit value as follows:

| (Lower software stroke limit value) = (Upper software stroke limitvalue) |
|---|

This stops software stroke limit settings from affecting the operation.

(3) Positioning control

This section describes the positioning control when the control unit is degrees.

(a) In the absolute data method:

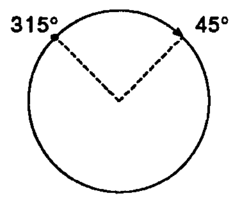
1) When the stroke limit is invalid

Positioning is performed taking the shortcut from the present value. (Shortcut positioning control)

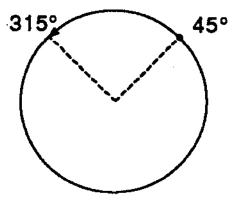
Example

(1) Move clockwise to go from the present value of 315° to 45°.
(2) Move counterclockwise to go from the present value of 45° to 315°.

From 315° to 45°




From 45° to 315°

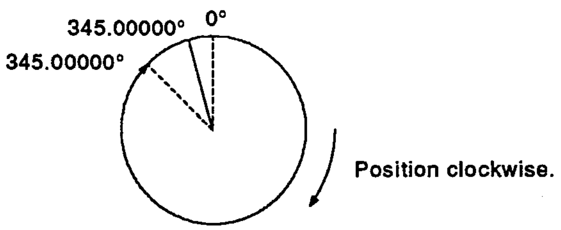



2) When the stroke limit is valid

The positioning direction (clockwise or counterclockwise) is determined by the software stroke limit settings.
Accordingly, shorter path selection may be impossible, depending on the settings.

Example

Move clockwise to go from the present value of 0° to 315° when the software stroke upper limit is 0° and the upper limit is 345°.




**POINT**

The positioning address range is from 0° to 359.99999°.
To perform positioning that completes a full revolution or more, use the incremental method.

(b) In the incremental method:

Positioning of a designated travel value is performed in a designated direction.

The plus or minus sign placed before each travel value determines the travel direction.

- Minus sign .. Clockwise
- Plus sign ... Counterclockwise

**POINT**

The incremental method allows positioning of over 360°.
In order to do this, it is necessary to invalidate the software stroke limits by setting the lower and upper software stroke limit values to the same value (lower software stroke limit value = upper software stroke limit value).

## 3.4 Parameters

This section describes the parameters of the AD75.

The parameters of the AD75 are set for each axis.

Each parameter is set to its initial value (default) on shipment from the factory.
When memory "all clear" is executed, all parameters are set to defaults.

### 3.4.1 Basic parameters

The basic parameters are divided into basic parameters #1 and #2.

Basic parameters

- Basic parameters #1
  - Basic parameters #1 includes the control unit parameter, the travel value per pulse parameter, the pulse output mode parameter, and the direction of rotation parameter.
    Set these parameters to suit the mechanical system or applicable motor when booting the system.
  - Note that if basic parameters #1 is set inappropriately, rotation may be reversed or no operation may be performed.
    Be sure to set the parameters to suit the system.
  - Parameters can be changed only when the PC READY flag (Y1D) is OFF.
    Make sure the PC READY flag (Y1D) is OFF before changing Basic parameters #1.
- Basic parameters #2
  - Basic parameters #2 are the speed control parameter and the acceleration/deceleration curve parameters.
    Set these parameters when starting up the system.
  - The system will operate even if basic parameters #2 are set to the initial values.
  - These parameters can be changed regardless of the ON/OFF status of the PC READY flag.

The basic parameters can be set in the following two ways:

- With a peripheral device in the edit mode
- With a sequence program

Table 3.6 List of Basic Parameters

| Basic Parameter Group No. | Item | | mm | inch | degree | pulse | Initial Value |
|---|---|---|---|---|---|---|---|
| | | | Setting Ranges | | | | |
| 1 | Unit setting | | 0: mm | 1: inch | 2: degree | 3: pulse | 3 |
| | Travel value per pulse (A) | Number of pulses per revolution (Ap) | 1 to 65535 (pulse) | | | | 20000 |
| | | Travel value per revolution (Al) | 0.1 to 6553.5 (μm) | 0.00001 to 0.65535 (inch) | 0.00001 to 0.65535 (degree) | 1 to 65535 (pulse) | 20000 |
| | | Unit magnification (Am) | • 1 • 10 • 100 • 1000 | | | | 1 |
| | Pulse output mode | | • 0: PLS/SIGN mode • 1: CW/CCW mode • 2: A-phase/B-phase mode | | | | 0 |
| | Direction of rotation | | • 0: Present value increases when forward pulse is output • 1: Present value increases when reverse pulse is output | | | | 0 |
| 2 | Speed control | | 0.01 to 6000000.00 (mm/min) | 0.001 to 600000.00 (inch/min) | 0.001 to 600000.000 (degree/min) | 1 to 1000000 (pulse/s) | 200000 |
| | Acceleration time | | 1 to 65535 (ms) | | | | 1000 |
| | Deceleration time | | 1 to 65535 (ms) | | | | 1000 |

**REMARK**

For details on the buffer memory address and setting range when setting basic parameters #1 and #2 with a sequence program. See Sections 3.6.2(1) and (2).

(1) Unit setting

(a) Sets the command unit for positioning control.

(b) Changing the command unit does not affect the parameters and the positioning data.
After changing the command unit, check if the parameters and the positioning data are within the setting ranges.
The AD75 will go into an error status upon detecting any data outside the setting range.

(2) Travel value per pulse

The travel value per pulse is the mechanical system value used for positioning control by the AD75. It sets the number of pulses for one revolution of the mechanical system motor, the travel value for one revolution of the motor, and the magnification of the travel value per pulse.

(a) Calculation of the travel value per pulse

1) Mechanical system specification

The following data are required for calculation of the travel value per pulse:

i) Feed screw pitch ...... $P_B$(mm/rev)

ii) Number of gear teeth of motor shaft ......... $Z_1$

iii) Number of gear teeth of feed screw shaft..... $Z_2$

Reduction ratio $\frac{Z_1}{Z_2} = \frac{1}{n}$ (Gear ratio)

iv) Number of pulses per revolution ..... $P_f$ (pulse/rev)

2) For the above mechanical system specification, the number of pulses per revolution, the travel value per revolution, and the unit magnification are as follows:

i) Number of pulses per revolution = $P_f$

ii) Travel value per revolution = $P_B \times (1/n) \times 10^3$

iii) Unit magnification = M

3) The travel value per pulse is calculated using the following

$$A = \frac{\text{Travel value per revolution}}{\text{Number of pulses per revolution}} \times \text{Unit magnification}$$

$$= \frac{P_B \times (1/n) \times 10^3}{P_f} \times M(\mu m/\text{pulse})$$

Calculation example

[Condition]

- PB = 5(mm/rev)
- $\frac{1}{n} = \frac{1}{1}$
- Pf = 12000(pulse/rev)
- M = 1

[Equation]

$$A = \frac{5 \times (1/1) \times 10^3}{12000}$$

$= 0.4167(\mu m/\text{pulse})$

(b) Error compensation

A mechanical error may occur between the command travel value and the actual travel value when positioning is performed based on a travel value per pulse.
With the AD75, this error can be compensated for by changing the number of pulses per revolution, the travel value per revolution, and the unit magnification.
The following explains how to perform this error compensation.

1) Set command travel value L (mm) and perform positioning.

2) Measure actual travel value L' (mm) after positioning.

3) The number of pulses per revolution and the travel value per revolution for compensation are given by the following expressions based on the above command travel value and actual travel value as follows.

i) Travel value per pulse (mm/pulse) A for command travel value L (mm)

$$A = \frac{\text{Travel value per revolution } (A_L)}{\text{Number of pulses per revolution } (A_P)} \times \text{Unit magnification } (A_M)$$

ii) Required number of pulses P (pulse)

$$P = \frac{L}{A} \text{ (pulse)}$$

iii) Apparent travel value per pulse A' for actual travel value L' (mm)

$$A' = \frac{L'}{P} \text{ (mm/pulse)}$$

$$\therefore P = \frac{L'}{A'}$$

$$\therefore A' = A\frac{L'}{L}$$

$$= \frac{\text{Travel value per revolution } (A_L) \times \text{ Unit magnification } (A_M)}{\text{Number of pulses per revolution } (A_P)} \times \frac{\text{Actual travel value } (L')}{\text{Command travel value } (L)}$$

$$= \frac{\text{Travel value per revolution } (A_L) \text{ for compensation } (A_L' = A_L \times L')}{\text{Number of pulses per revolution for compensation } (A_P' = A_P \times L)} \times \text{Unit magnification } (A_M)$$

Reduce the fraction $A_L'/A_P'$ to obtain the desired compensation values.

Example

[Condition]
Travel value per revolution ........ 5000 (μm/rev)
Number of pulses per revolution ... 12000 (pulse/rev)
Unit magnification................ 1

[Result of positioning]
Command travel value............ 100 mm
Actual travel value ............... 101 mm

[Compensation value]

$$\frac{A_L'}{A_P'} = \frac{5 \times 10^3}{12000} \times \frac{101 \times 10^3}{100 \times 10^3} = \frac{5050}{12000} = \frac{101}{240}$$

Travel value per revolution: 101 (μm/rev)
Number of pulses per revolution: 240 (pulse/rev)

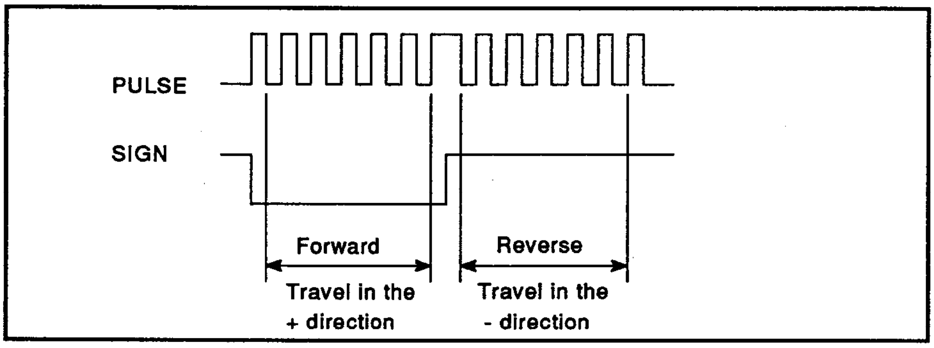
(3) Pulse output mode

This sets the pulse output mode compatible with the servo amplifier to be used.

(a) PLS/SIGN mode

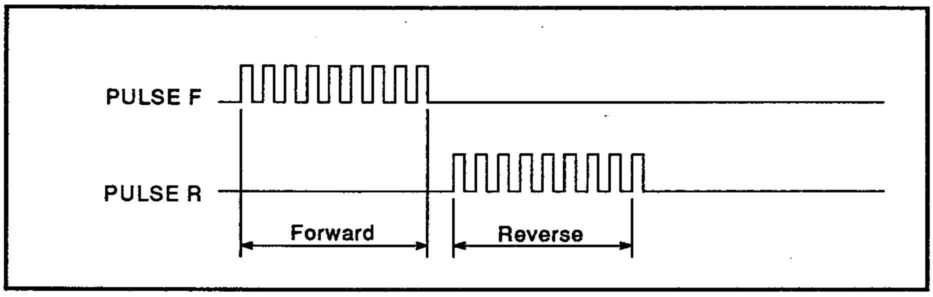
Controls forward/reverse rotation by turning on/off the direction sign (SIGN).

- When the direction sign is LOW: Forward rotation
- When the direction sign is HIGH: Reverse rotation




(b) CW/CCW mode

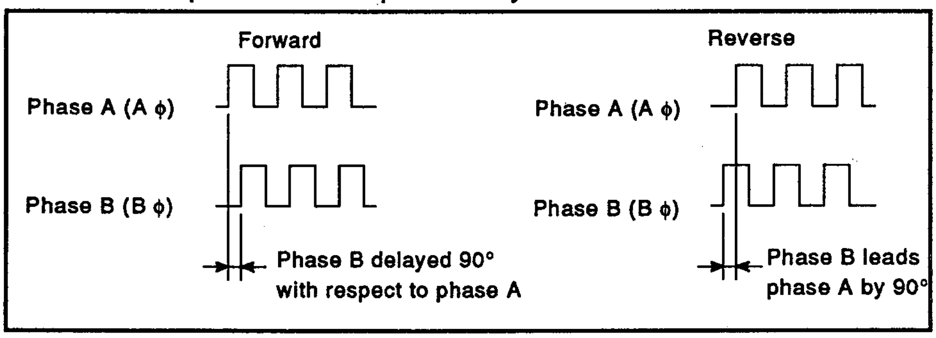
Outputs forward field pulses (PULSE F) in forward rotation.
Outputs reverse field pulses (PULSE R) in reverse rotation.




(c) A/B phase mode

Controls forward/reverse rotation according to the phase difference between phase A (A ϕ) and phase B (B ϕ).

- When phase B is behind phase A by 90° : Forward rotation
- When phase B leads phase A by 90° : Reverse rotation



(4) Direction of rotation setting

This sets the direction of rotation (forward/reverse) when the present value is increasing.
With the AD75, a limit switch ON/OFF check is performed with the upper limit in the direction of increase of the present value and the lower limit in the direction of decrease.
Because of this the relationship between the actual direction of rotation of the motor and arrangement of the upper and lower limit switches is as shown below.

| Direction of Rotation Setting | Motor Rotation and Arrangement of External Hardware Stroke Limit Switches |
|---|---|
| Forward | ← Reverse / Forward → (present value)<br>← Reverse / Forward → (direction of motor rotation)<br>AD75 lower limit switch / AD75 upper limit switch |
| Reverse | ← Reverse / Forward → (present value)<br>← Forward / Reverse → (direction of motor rotation)<br>AD75 lower limit switch / AD75 upper limit switch |

(5) Speed limit value

(a) This sets the maximum speed for positioning operation (including home position return) and manual pulse generator operation.

(b) If the commanded speed and home position return speed in positioning operation are set greater than the speed limit value, they are restrained within the designated speed limit value.

(c) In manual pulse generator operation, if the speed expressed as the number of input pulses for the designated time exceeds the speed limit value, it is restrained within the speed limit value.
The input pulses exceeding the speed limit value are discarded, and the travel value is therefore reduced by the corresponding amount.

(d) If the target speed is greater than the speed limit value due to speed change or override in positioning operation, it is restrained within the speed limit value.
"Speed control flag" of the axis monitor is turned on while the speed is restrained within the speed limit value.

(e) When the speed is being restrained, the warning "over the speed limit value" is given.

(f) For linear interpolation and circular interpolation operation, the speed is restrained within the speed limit value of the reference axis.

1) For interpolation with axis 1 and axis 2, the speed is restrained within the speed limit value of axis 1.

2) For interpolation with axis 2 and axis 3, the speed is restrained within the speed limit value of axis 2.

3) For interpolation with axis 3 and axis 1, the speed is restrained within the speed limit value of axis 3.

(6) Acceleration time 0

(a) This sets the time taken to reach the speed limit value from speed 0 in positioning operation.

(7) Deceleration time 0

(a) This sets the time taken to reach speed 0 from the speed limit value in positioning operation.

**REMARK**

For the relationship between the speed limit value, acceleration time, and deceleration time. See Section 3.3.15.

### 3.4.2 Extended parameters

The extended parameters consist of extended parameters #1 and extended parameters #2.

Extended parameters

Extended parameters #1

- Extended parameters #1 are data such as the backlash compensation amount and software stroke limit.
  Set these parameters at system start-up using the AD75.
- These parameters can be reset only when the PC READY flag (Y1D) is OFF.
  Check that the PC READY flag is OFF before resetting extended parameters #1.

Extended parameters #2

- Extended parameters #2 are data allowing full use of the functions of the AD75.
  Set these parameters as required.
- Extended parameters# 2 can be used at their initial values.
- These parameters can be reset regardless of whether the PC READY flag is ON or OFF.

The following methods are used for setting the detailed parameters.

- Setting in the edit mode of a peripheral device
- Setting with a sequence program

**Table 3.7 Extended Parameter List**

| Extended Parameter No. | Item \ Unit | Setting Ranges: mm | Setting Ranges: inch | Setting Ranges: degree | Setting Ranges: pulse | Initial Value |
|---|---|---|---|---|---|---|
| 1 | Backlash compensation amount | 0 to 6553.5 μm | 0 to 0.65535 inch | 0 to 0.65535 degree | 0 to 65535 pulse | 0 |
| | Software upper stroke limit | -214748364.8 to 214748364.7 μm | -21474.83648 to 21474.83647 inch | 0 to 359.99999 degree | -2147483648 to 2147483647 pulse | 2147483647 |
| | Software lower stroke limit | -214748364.8 to 214748364.7 μm | -21474.83648 to 21474.83647 inch | 0 to 359.99999 degree | -2147483648 to 2147483647 pulse | -2147483648 |
| | Software stroke limit selection | • 0: Multiply the feed present value by the software stroke limit.<br>• 1: Multiply the machine feed value by the software stroke limit. | | | | 0 |
| | Software stroke limit valid/invalid setting in manual pulse generator operation | • 0: The software stroke limit is invalid in JOG operation and manual pulse generator operation.<br>• 1: The software stroke limit is valid in JOG operation and manual pulse generator operation. | | | | 0 |
| | Command in-position | 0.1 to 3276700.0 μm | 0.00001 to 327.67000 inch | 0.00001 to 327.67000 degree | 1 to 32767 pulse | 100 |
| | Torque limit value setting | • 1 to 500 % | | | | 300 |
| | M code ON signal output timing | • 0: WITH mode<br>• 1: AFTER mode | | | | 0 |
| | Speed change type | • 0: Standard speed switching mode<br>• 1: Advance speed switching mode | | | | 0 |
| | Interpolation speed designation | • 0: Resultant speed<br>• 1: Reference axis speed | | | | 0 |
| | Feed present value update request during speed control | • 0: Feed present value is not updated during speed control.<br>• 1: Feed present value is updated during speed control. | | | | 0 |
| | Manual pulse generator selection | • 0: Manual pulse generator operation not allowed.<br>• 1: Manual pulse generator 1 used.<br>• 2: Manual pulse generator 2 used.<br>• 3: Manual pulse generator 3 used. | | | | Axis 1: 1<br>Axis 2: 2<br>Axis 3: 3 |

### Table 3.7 Extended Parameter List (continued)

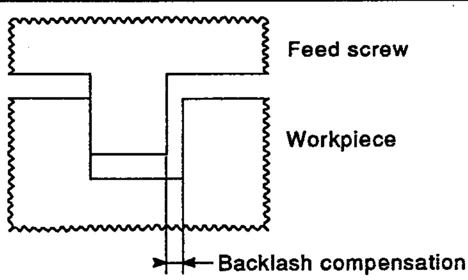
| Extended Parameter No. | Item \ Unit | Setting Ranges | | | | Initial Value |
|---|---|---|---|---|---|---|
| | | mm | inch | degree | pulse | |
| 2 | Acceleration time 1 to 3 | 1 to 65535 ms | | | | 1000 |
| | Deceleration time 1 to 3 | 1 to 65535 ms | | | | 1000 |
| | JOG speed limit value | 0.01 to6000000.00 mm/min | 0.001 to 600000.000 inch/min | 0.001 to 600000.000 degree/min | 1 to 1000000 pulse/s | 20000 |
| | JOG operation acceleration time selection | 0 to 3 | | | | 0 |
| | JOG operation deceleration time selection | 0 to 3 | | | | 0 |
| | Acceleration/deceleration processing selection | • 0: Trapezoidal acceleration/deceleration processing<br>• 1: S pattern acceleration/deceleration processing | | | | 0 |
| | S curve ratio | 1 to 100 % | | | | 100 |
| | Rapid stop deceleration time | 1 to 65535 ms | | | | 1000 |
| | Stop group 1 to 3 Rapid stop selection | • 0: Normal deceleration stop<br>• 1: Rapid stop | | | | 0 |
| | Positioning completed signal output time | 0 to 65535 ms | | | | 300 |
| | Allowable error range for circular interpolation | 0 to 10000.0 µm | 0 to 1.00000 inch | 0 to 1.00000 degree | 0 to 100000 pulse | 100 |
| | External positioning start selection | • 0: External positioning start<br>• 1: External speed change request<br>• 2: Skip request | | | | 0 |

**REMARK**

For details on the buffer memory address and setting range when setting extended parameters #1 and #2 with a sequence program, see Sections 3.6.2(3) and (4).

(1) Backlash compensation amount

(a) This sets the backlash amount (play) of the machine.




(b) Set the backlash compensation amount within the following range:

$$0 \le \frac{\text{Backlash compensation amount}}{\text{Travel value per pulse}} \le 255 \text{ (Decimal point fractions are rounded off.)}$$

(c) When the backlash compensation amount is set, compensation by the backlash compensation amount is executed for each change of positioning direction at the start of positioning.

(2) Software stroke limit *1

(a) The software stroke limits are the upper/lower limit values for machine travel.

1) Upper software stroke limit: upper limit value of machine travel

2) Lower software stroke limit: lower limit value of machine travel

(b) If a command exceeding the setting range of the software stroke limits is given, the positioning corresponding to the command is not carried out.

(3) Software stroke limit selection

(a) This sets whether the software stroke limit is multiplied by the feed present value or the machine present value.

(4) Software stroke limit valid/invalid setting

(a) This sets whether the software stroke limits are valid or invalid in JOG or manual pulse generator operation.

(5) Command in-position range

(a) This sets the ON position [(positioning address) - (present value)] for the command in-position signal.

(6) Torque limit

(a) This sets the torque limit value.

(7) "M code ON" signal output timing

(a) This sets "M code ON" signal output to WITH mode or AFTER mode.

- WITH mode: Sets the M code and turns on the "M code ON" signal when positioning operation starts.
- AFTER mode: Sets the M code and turns on the "M code ON" signal when positioning operation ends.

**REMARK**

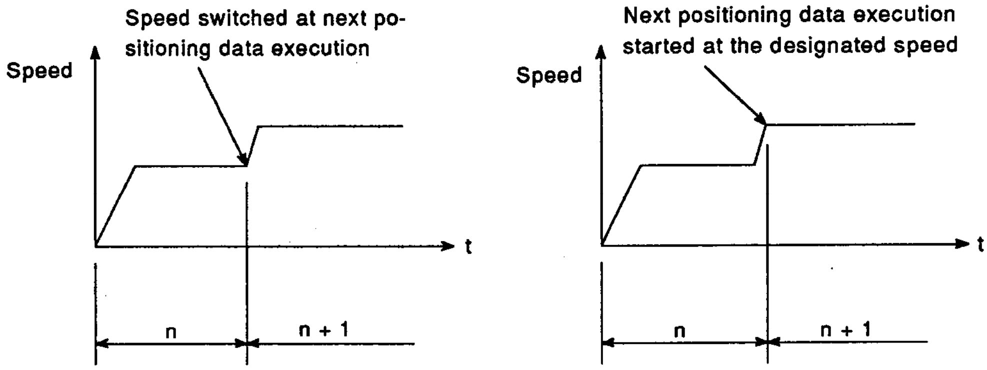
*1: For details on software stroke limits, see Section 3.3.11.

(8) Speed switching type

(a) This sets the speed switching mode to standard switching or advance switching.

- Advance switching: The speed is switched at the end of current positioning data.
- Standard switching: The speed is switched when next positioning data is executed.

(b) When positioning data No. n is executed, the speed is switched as follows:

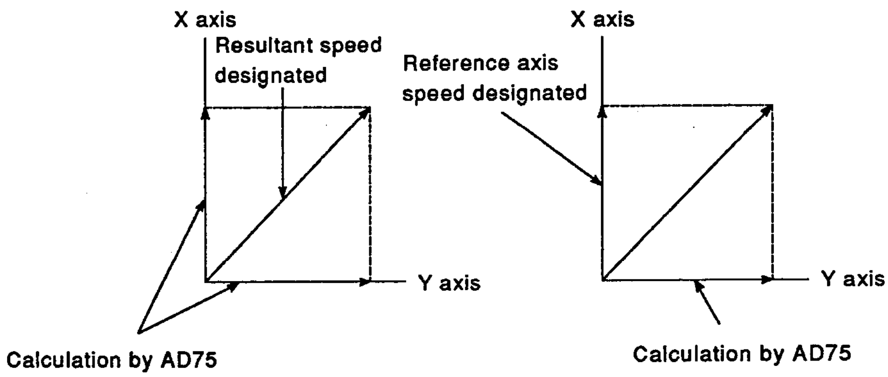



(a) Standard switching (b) Advanced switching

(9) Interpolation speed designation

(a) When the linear/circular interpolation is carried out, either the resultant speed or the reference axis speed is set.

- Resultant speed: Designates the travel speed for control. The speed of each axis is calculated by the AD75.
- Reference axis speed: Designates the axis speed set for the reference axis. The speed of the other axis used for interpolation is calculated by the AD75.




(a) Resultant speed designation (b) Reference axis designation (when X axis is the reference)

(b) In circular interpolation, or if different unit groups are designated for the interpolation axes, an error may occur and positioning according to the designated positioning data may not be carried out.

| Interpolation Control | Speed Designation | Execution of Positioning | |
|---|---|---|---|
| | | Matching of Unit Groups | Mismatching of Unit Groups |
| Linear interpolation | Resultant speed designation | Executed | Not executed |
| | Reference axis speed designation | Executed | Executed |
| Circular interpolation | Resultant speed designation | Executed | Not executed |
| | Reference axis speed designation | Not executed | Not executed |

**POINT**

When the speed calculated by the AD75 exceeds the speed limit value during interpolation control, control is carried out without acknowledging the speed limit value.
When designating the interpolation speed, pay attention to the following:

- For the resultant speed, designate the value so that the speed of each axis does not exceed the speed limit value.
- For the reference axis speed, set the long axis as the reference axis. If the reference axis is set to the short axis, the speed on the long axis may exceed the speed limit value.

**REMARK**

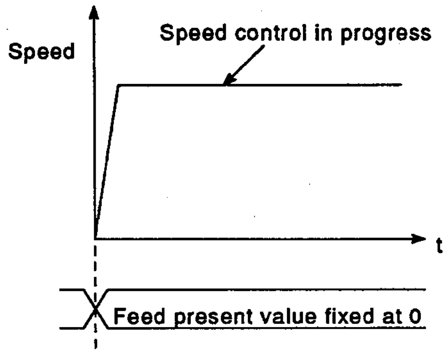
Unit groups are as follows:

- Group 1: mm, inches
- Group 2: degrees
- Group 3: pulses

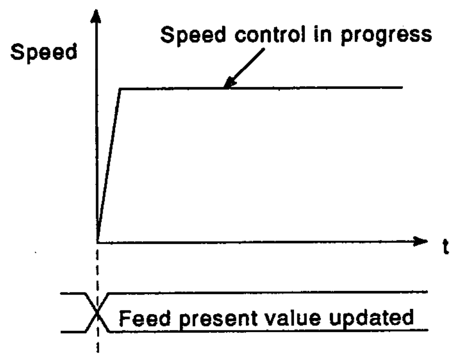
(10) Feed present value during speed control

(a) This parameter sets whether the feed present value is updated or not during speed control, and during speed control in speed/position switching control.

- When the feed present value is not updated:
  During speed control, the feed present value remains at 0.
  During speed/position switching control, the feed present value is updated on switching to position control.
- When the feed present value is updated:
  During speed control, the feed present value is updated from 0.




(a) Feed present value not updated




(b) Feed present value updated

(11) Manual pulse generator selection

(a) This sets which of the manual pulse generators connected to axes 1 to 3 is used for the control.

- For the manual pulse generator of axis 1:
  Manual pulse generator 1
- For the manual pulse generator of axis 2:
  Manual pulse generator 2
- For the manual pulse generator of axis 3:
  Manual pulse generator 3

(12) Acceleration times 1 to 3

(a) These set the time from speed 0 to the speed limit value for positioning operations.
Acceleration times 1 to 3 operate in the same way as acceleration time 0 of the basic parameters #2.
(For details of acceleration time 0, see Section 3.4.1.)

(13) Deceleration times 1 to 3

(a) These set the time from the speed limit value to speed 0 for positioning operations.
Deceleration times 1 to 3 operate in the same way as deceleration time 0 of the basic parameters #2.
(For details of deceleration time 0, see Section 3.4.1.)

(14) JOG speed limit value

(a) This sets the maximum speed in JOG operation.

(b) Set the JOG speed limit value to the speed limit value or lower.
If the JOG speed limit value exceeds the speed limit value, a setting range error occurs.

(c) When the JOG speed value is greater than the JOG speed limit, the actual speed is restrained within the JOG speed limit value.

- The "speed limit flag" of the axis monitor is turned ON while the speed is restrained within the JOG speed limit value.
- When the speed is being restrained, the warning "over JOG speed limit" is issued

(15) JOG operation acceleration time selection

(a) This sets which of the acceleration times 0 to 3 is used for the acceleration time in JOG operation.

- Acceleration time 0: Set in the basic parameters [See Section 3.4.1.]
- Acceleration time 1 to 3: Set in the extended parameters [See item (12).]

(16) JOG operation deceleration time selection

(a) This sets which of the deceleration times 0 to 3 is used for the deceleration time in JOG operation.

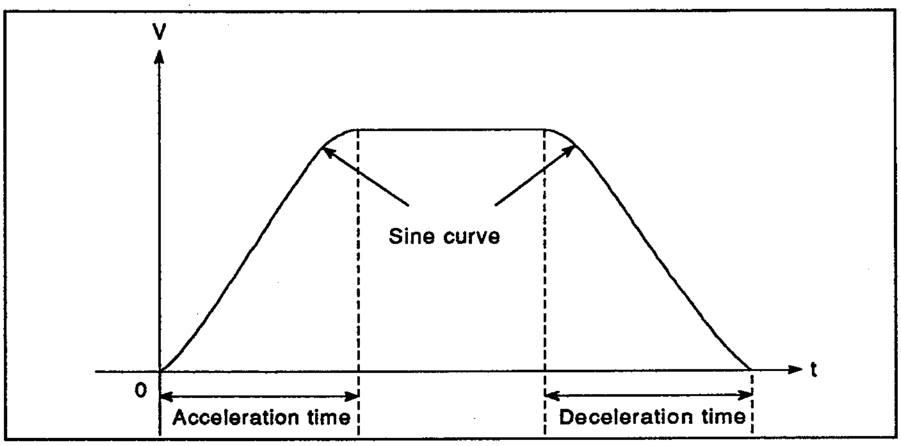
- Deceleration time 0: Set in the basic parameters [See Section 3.4.1.]
- Deceleration time 1 to 3: Set in the detailed parameters [See item (13).]

(17) Acceleration/deceleration processing selection

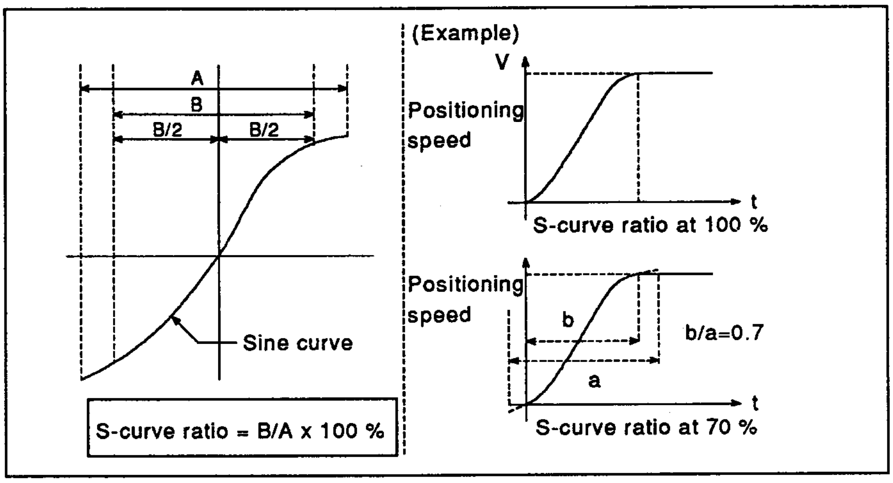
(a) This sets the acceleration/deceleration processing to trapezoidal processing or S pattern processing.

(18) S curve ratio

(a) This sets the S curve ratio when the S pattern acceleration/deceleration processing is carried out.
When an S curve ratio is set, the acceleration/deceleration processing is carried out smoothly.
The smaller the value of the S curve ratio, the closer the processing curve becomes to a straight line.
The S pattern acceleration/deceleration graph takes the form of a sine curve, as follows:



The S curve ratio sets which part of the sine curve is used to describe the acceleration/deceleration curve, as shown below.




(19) Rapid stop deceleration time

(a) This sets the time taken to reach speed 0 from the speed limit value when a rapid stop is executed.

(20) Rapid stop selection (Stop group 1 to 3)

(a) This selects whether a normal deceleration stop or rapid stop is executed when a stop cause occurs.
The setting is valid for positioning operation, home position return, and JOG operation.

(b) Once rapid stop has been selected, rapid stop deceleration is carried out when the stop signal of stop groups 1 to 3, corresponding to the following stop causes, is input.

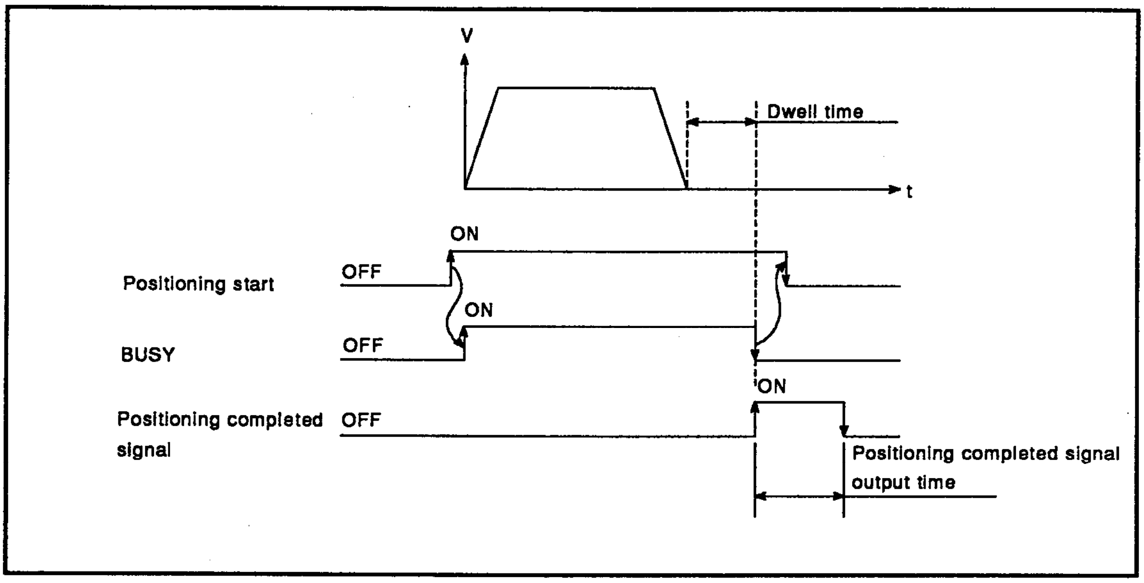
- Stop group 1: Stop due to hardware stroke limit
- Stop group 2: Stop due to software stroke limit
  Stopped by a peripheral device
  Stop due to PC READY OFF
- Stop group 3: Stop due to the external stop signal
  Stop due to stop signal from the programmable controller.
  Stop due to error occurrence
  (other than stop group 1 or 2)

(c) If the "rapid stop selection" setting is changed during rapid stop or deceleration, rapid /deceleration stop continues using the setting when the stop signal was input.

(d) In case of linear/circular interpolation, stop or rapid stop is carried out according to the rapid stop setting of the axis where the stop cause has occurred.

(21) Positioning completed signal output time

(a) This sets the time of output of the "positioning completed signal" from the AD75.



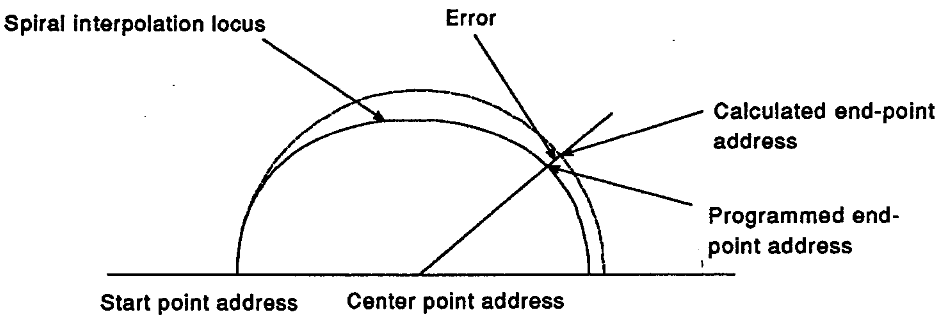

(22) Allowable error range for circular interpolation

(a) When the circular interpolation control is executed by center point designation, the circular locus calculated from the start address and center point address may deviate from the end address.

(b) The allowable error range for circular interpolation is set as the tolerance between the calculated circular locus and the end address. When the calculated circular arc error and the end address error are within the set allowable error range, circular interpolation is carried out at the end address while compensating for the error by spiral interpolation.

(c) The allowable error range for circular interpolation tolerance is set in the extended parameters #2 for the following axes:

- In case of circular interpolation with axes 1 and 2: Axis 1
- In case of circular interpolation with axes 2 and 3: Axis 2
- In case of circular interpolation with axes 3 and 1: Axis 3



(23) External start function selection

(a) This sets what function applies to the external start signal.

1) External positioning start setting

- The positioning operation is started by the external start signal input.

2) External speed change request setting

- The current positioning operation speed is changed by external start signal input.
- When the external speed is to be changed, set the speed change value as the "positioning operation speed change value" of the axis control data.

3) Skip request setting

- The current positioning operation is skipped by the external start signal input.

### 3.4.3 Basic parameters for home position return

**Table 3.8 Basic Parameters for Home Position Return**

| Item \ Unit | Setting Ranges: mm | inch | degree | pulse | Initial Value |
|---|---|---|---|---|---|
| Home position return method | • 0:Near-zero point dog metho<br>• 1:Stopper stop (1) (caused by time-out of the dwell timer)<br>• 2:Stopper stop (2) (caused by the zero point signal when in contact with the stopper)<br>• 3:Stopper stop (3) (method without near-zero point dog)<br>• 4:Count method (1) (zero point signal is used)<br>• 5:Count method (2) (zero point signal is not used) | | | | 0 |
| Home position return direction | • 0:Forward direction (address increases)<br>• 1:Reverse direction (address decreases) | | | | 0 |
| Zero position address | -214748364.8 to 214748364.7 µm | -21474.83648 to 21474.83647 inch | 0 to 359.99999 degree | 2147483648 to 2147483647 pulse | 0 |
| Home position return speed | 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 | 1 |
| Creep speed | 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 | 1 |
| Home position return retry | • 0:home position return is not retried in accordance with the upper/lower limit switch.<br>• 1:home position return is retried in accordance with the upper/lower limit switch. | | | | 0 |

(1) Home position return method

(a) Designates the home position return method when home position return is carried out.
(For details of the home position return method, see Section 3.3.8.)

(2) Home position return direction

(a) Designates the direction for home position return.
Allows travel in the designated direction on home position return start.

**IMPORTANT**

(1) Home position return is controlled according to the home position return direction and speed. When the near-zero point dog is turned ON, deceleration is started.
Caution: incorrect setting of the home position return direction may cause the drive system to overrun.

(2) If the home position return direction is not the same every time, use the home position return retry function.
For details of the home position return retry function, see Section 3.3.8.

**REMARK**

For details on the buffer memory address and setting range when setting home position return basic parameters with a sequence program, see Section 3.6.2 (5).

(3) Home position return address

(a) This address sets the present value of the home position upon completion of home position return.

(b) Upon normal completion of home position return, the home position return address set as the feed present value and machine feed value is stored.

(c) It is recommended the home position return address be set to either the upper or lower software stroke limit value.

(d) Even if the set value of the home position return address falls outside the software stroke limits, no setting error warning is given. Check the value set for the software stroke limit in detailed parameters 1 and set the home position return address to a value within the software stroke limit.

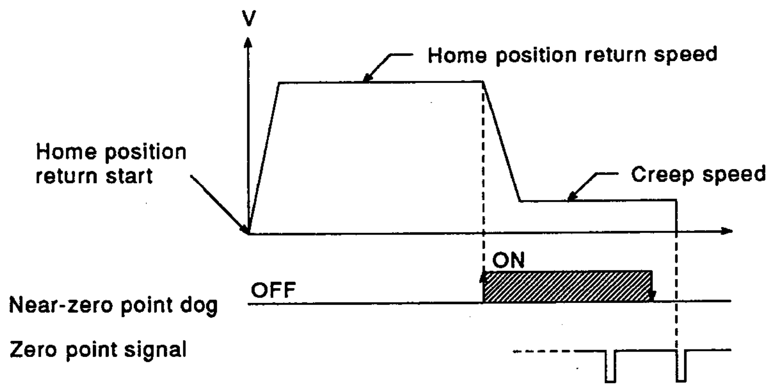
(4) Home position return speed

(a) This sets the home position return speed.

(b) Set a value within the speed limit value designated by basic parameter 2.

(5) Creep speed

(a) This sets the creep speed (low speed up until stopping after decelerating from the home position return speed) after near-zero point dog ON.




(b) Set a value within the home position return speed.

(c) The creep speed is related to the detection error in the case of home position return by a zero phase signal and to the size of the impact with the stopper in the case of home position return by stopper. Therefore, take the error range and the size of impact into consideration when setting the creep speed.

(6) Home position return retry

(a) This sets whether or not a home position return is retried in accordance with the upper/lower limit switch

(b) Using the home position return retry function, the home position return operation can start wherever the machine position is designated.
For details of the home position return retry function, see Section 3.3.8.

**REMARK**

In order to use the home position return retry function, input from the upper/lower limit switches to the AD75 is required.

## CONTENTS

### 3.4.4 Extended parameters for home position return

**Table 3.9 Extended Parameters for Home Position Return**

| Item \ Unit | Setting Ranges: mm | inch | degree | pulse | Initial Value |
|---|---|---|---|---|---|
| Home position return dwell time | • 0 to 65535(ms) | | | | 0 |
| Travel value setting after near-zero point dog ON | 0 to 214748364.7 µm | 0 to 21474.83647 inch | 0 to 21474.83647 degree | 0 to 2147483647 pulse | 0 |
| Home position return acceleration time selection | • 0 to 3 | | | | 0 |
| Home position return deceleration time selection | • 0 to 3 | | | | 0 |
| Home position shift amount | -214748364.8 to 214748364.7 µm | -21474.83648 to 21474.83647 inch | 0 to 359.99999 degree | -2147483648 to 2147483647 pulse | 0 |
| Home position return torque limit | • 1 to 300 (%) | | | | 300 |

(1) Home position return dwell time

(a) The home position return dwell time is the time until home position return is completed after the near-zero point dog comes ON during home position return by the stopper stop (1) method.
Set a travel time equal to or greater than the time from the near-zero point dog ON to the stopper stop.

(b) Any value in the setting range can be input at a time other than when executing stopper stop (1).

(2) Setting for travel value after near-zero point dog ON

(a) When count type home position return is set, this sets the travel value from near-zero point dog ON to the home position.

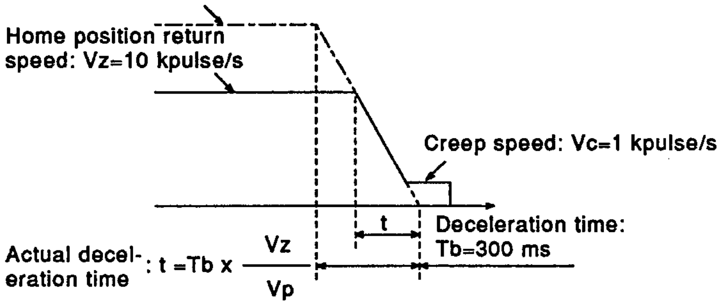
(b) After the near-zero point dog comes ON, the first zero point encountered after traveling the set travel value is the home position.

(c) Set the travel value after the near-zero point dog ON to the distance for decelerating from the home position return speed to the creep speed or greater.

Example

(1) When the speed limit value is set to 200 kpulse/s, the zero return speed to 10 kpulse/s, the creep speed to 1 kpulse/s, and deceleration time to 300 ms, the travel value after near-point dog ON is calculated as follows:

[Home position return motion]




$$[\text{Deceleration distance}] = \frac{1}{2} \times \frac{Vz}{1000} \times t$$

1000··· Converted to speed per millisecond

$$= \frac{Vz}{2000} \times \frac{Tb \times Vz}{Vp}$$

$$= \frac{10 \times 10^3}{2000} \times \frac{3000 \times 10 \times 10^3}{2000}$$

$$= 75$$

*Set the travel value after the near-zero point dog ON to 75 or more.

(3) Home position return acceleration time selection

(a) This sets which of the set acceleration times 0 to 3 is used for the acceleration time in home position return.

- Acceleration time 0: Set by the basic parameters [See Section 3.4.1.]
- Acceleration times 1 to 3: Set by the extended parameters [Refer to Section 3.4.2.]

(4) Home position return deceleration time selection

(a) This sets which of the set deceleration times 0 to 3 is used for the deceleration time in home position return.

- Deceleration time 0: Set by the basic parameters [See Section 3.4.1.]
- Deceleration time 1 to 3: Set by the extended parameters [Refer to item 3.4.2.]

(5) Home position shift amount

(a) This sets the shift amount from the detected zero phase signal to the home position.
For details of the home position shift function, see Section 3.3.8(6).

(6) Home position return torque limit

(a) This is the set value limiting servo motor torque after reaching the creep speed in home position return.

(b) After reaching the creep speed in each home position return method, the torque is limited by the set home position return torque limit.

**POINTS**

(1) D-A converter is necessary to set the torque limit.

(2) Be sure to set the home position return torque limit when carrying out home position return by stopper stop method (1), (2), or (3).

(3) Any value in the setting range can be input when the torque is not limited.

**REMARK**

For details on the buffer memory address and setting range when setting home position return extended parameters with a sequence program, see Section 3.6.2(6).

### 3.4.5 Positioning data

Positioning data are used in the AD75 to execute positioning control (i.e. control other than home position return, JOG operation and manual operation).

Positioning data consists of a positioning identifier, M code, dwell time, commanded speed, positioning address, and arc data.
Set the positioning data for each axis.

The value ranges of each of the positioning data are checked when positioning is executed.
If the set value is outside the range, positioning is not executed.

**Table 3.10 Positioning Data**

<table>
<tr><th rowspan="2" colspan="2">Item / Unit</th><th colspan="4">Setting Ranges</th><th rowspan="2">Initial Value</th></tr>
<tr><th>mm</th><th>inch</th><th>degree</th><th>pulse</th></tr>
<tr><td colspan="2">Operation pattern</td><td colspan="4">00: Positioning end<br>01: Continuous positioning control<br>11: Continuous locus control</td><td>00</td></tr>
<tr><td colspan="2">Control method</td><td colspan="4">
<table>
<tr><th>Notation of peripheral device</th><th>Description of setting</th><th>Instruction code</th></tr>
<tr><td>ABS linear 1</td><td>• Linear control of axis 1 (ABS)</td><td>01H</td></tr>
<tr><td>INC linear 1</td><td>• Linear control of axis 2 (INC)</td><td>02H</td></tr>
<tr><td>Fixed-pitch feed 1</td><td>• Fixed-pitch feed of axis 1</td><td>03H</td></tr>
<tr><td>ABS linear 2</td><td>• Linear interpolation control of axis 2 (ABS)</td><td>04H</td></tr>
<tr><td>INC linear 2</td><td>• Linear interpolation control of axis 2 (INC)</td><td>05H</td></tr>
<tr><td>Fixed-pitch feed 2</td><td>• Fixed-pitch feed control by linear interpolation of axis 2</td><td>06H</td></tr>
<tr><td>ABS circular interpolation</td><td>• Circular interpolation control by auxiliary point designation(ABS)</td><td>07H</td></tr>
<tr><td>INC circular interpolation</td><td>• Circular interpolation control by auxiliary point designation(INC)</td><td>08H</td></tr>
<tr><td>ABS circular right</td><td>• Circular interpolation control by center point designation(ABS, CW)</td><td>09H</td></tr>
<tr><td>ABS circular left</td><td>• Circular interpolation control by center point designation(ABS, CCW)</td><td>0AH</td></tr>
<tr><td>INC circular right</td><td>• Circular interpolation control by center point designation(INC, CW)</td><td>0BH</td></tr>
<tr><td>INC circular left</td><td>• Circular interpolation control by center point designation(INC, CCW)</td><td>0CH</td></tr>
<tr><td>Forward speed control</td><td>• Speed control (forward)</td><td>0DH</td></tr>
<tr><td>Reverse speed control</td><td>• Speed control (reverse)</td><td>0EH</td></tr>
<tr><td>Forward speed/position</td><td>• Speed/position switching control (forward)</td><td>0FH</td></tr>
<tr><td>Reverse speed/position</td><td>• Speed/position switching control (reverse)</td><td>10H</td></tr>
<tr><td>Present value change</td><td>• Present value change</td><td>11H</td></tr>
</table>
</td><td>0</td></tr>
<tr><td colspan="2">Acceleration time No.</td><td colspan="4">• 0 to 3</td><td>0</td></tr>
<tr><td colspan="2">Deceleration time No.</td><td colspan="4">• 0 to 3</td><td>0</td></tr>
<tr><td rowspan="3">Positioning adress/ Travel value</td><td>Absolute</td><td>-214748364.8 to 214748364.7 (μm)</td><td>-21474.83648 to 21474.83647 (inch)</td><td>0 to 359.99999 (degree)</td><td>-2147483648 to 2147483647 (pulse)</td><td>0</td></tr>
<tr><td>Incremental (other than speed/position switching control)</td><td>-214748364.8 to 214748364.7 (μm)</td><td>-21474.83648 to 21474.83647 (inch)</td><td>-21474.83648 to 21474.83647 (degree)</td><td>-2147483648 to 2147483647 (pulse)</td><td>0</td></tr>
<tr><td>Speed/position switching control</td><td>0 to 214748364.7 (μm)</td><td>0 to 21474.83647 (inch)</td><td>0 to 21474.83647 (degree)</td><td>0 to 2147483647 (pulse)</td><td>0</td></tr>
</table>

| Item \ Unit | | Setting Ranges: mm | inch | degree | pulse | Initial Value |
|---|---|---|---|---|---|---|
| Arc address | Absolute | -214748364.8 to 214748364.7 (μm) | -21474.83648 to 21474.83647 (inch) | 0 to 359.99999 (degree) | -2147483648 to 2147483647 (pulse) | 0 |
| | Incremental | | | -21474.83648 to 21474.83647 (degree) | | |
| Commanded speed | | 0.01 to 600000.00 (mm/min) | 0.001 to 600000.000 (inch/min) | 0.001 to 600000.000 (degree/min) | 1 to 1000000 (pulse/s) | 0 |
| | | -1 (Current speed: the same speed as the previous positioning data No.) | | | | |
| Dwell time | | 0 to 65535(ms) | | | | 0 |
| M code | | 0 to 32767 | | | | 0 |

(1) Operation pattern

(a) Set the operation pattern for completion of positioning.

- Positioning end: Positioning is completed in accordance with the designated positioning data.
- Continuous positioning: Positioning stops when positioning is completed in accordance with the designated positioning data, and then positioning is continued in accordance with the next positioning data.
- Continuous locus control: After positioning is completed in accordance with the designated positioning data, positioning is continued in accordance with the next positioning data.

(2) Control method

(a) This sets the control methods when executing positioning control.

(3) Acceleration time No.

(a) This sets which of the acceleration times 0 to 3 (set by the basic and detailed parameters) is used for the acceleration time.

- Acceleration time 0: Refer to the basic parameters (Section 3.4.1.)
- Acceleration times 1 to 3: Refer to the extended parameters (Section 3.4.2.)

(4) Deceleration time No.

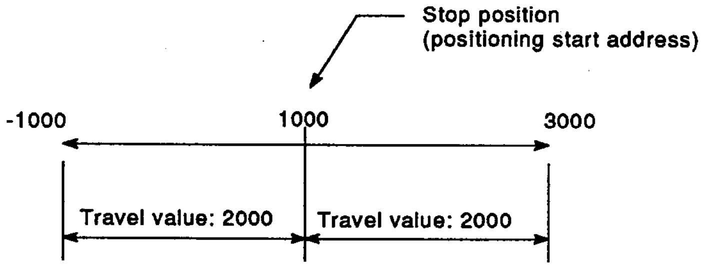
(a) This sets which of the deceleration times 0 to 3 (set by the basic and extended parameters) is used for the deceleration time.

- Deceleration time 0: Refer to the basic parameters (Section 3.4.1.)
- Deceleration times 1 to 3: Refer to the extended parameter (Section 3.4.2.)

(5) Positioning address

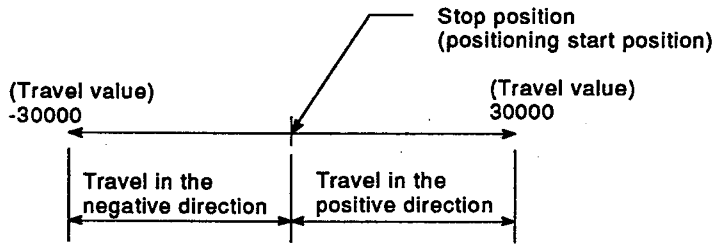
(a) Absolute (ABS) mode

- Set the positioning address (end address) in ABS mode to the absolute address (address from the home position).



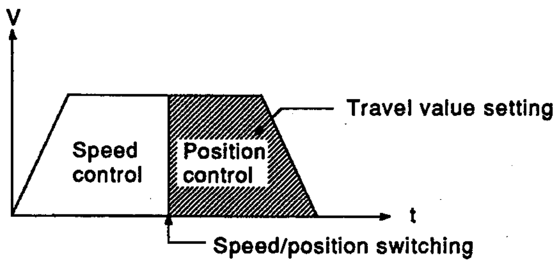

(b) Incremental (INC) mode

- This sets the travel value in the incremental mode.
- The travel direction is designated using signs.
  When the travel value is positive: positive direction (address incremental direction)
- When the travel value is negative: negative direction (address decremental direction)




(c) Speed/position switching control

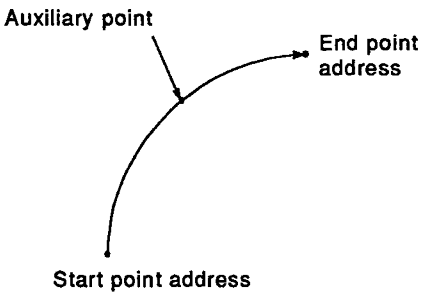
- This sets the travel value after the speed control mode is switched to position control mode.



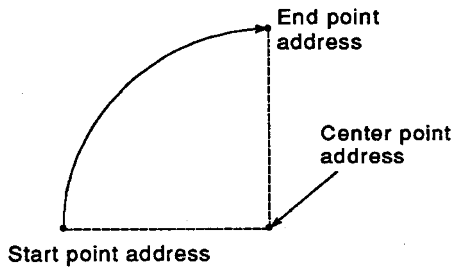
(6) Arc address

(a) Arc address data is necessary only for circular interpolation control.

- When an auxiliary point is designated: Set the address of the pass point for circular interpolation.
- When a center point is designated: Set the address of center point of the arc for circular interpolation.




(a) Circular interpolation by auxiliary point designation




(b) Circular interpolation by center point designation

(7) Commanded speed

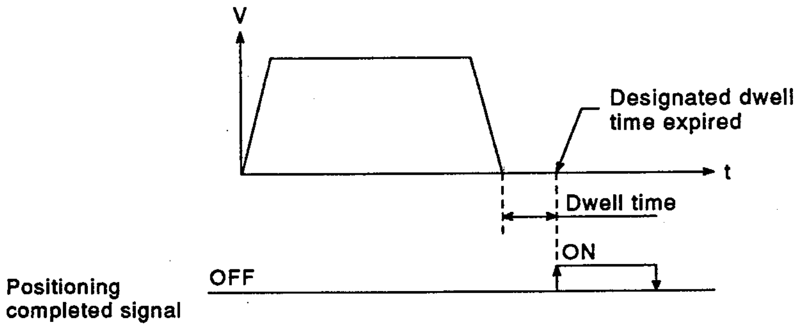
(a) This sets the commanded speed during positioning.

(b) When the set commanded speed exceeds the speed limit value, positioning is carried out within the speed limit value.

(c) If the commanded speed is set to "-1", positioning is controlled using the current speed (the same speed as the previous positioning speed).*
When starting positioning, if the initial positioning data for positioning control is set to "-1", the "no speed setting" error occurs and positioning does not start.

(8) Dwell time

(a) This sets the delay after positioning completion before the next positioning control begins.
When positioning operation is completed, it sets the delay time before the "positioning completed" signal is output.




(b) When the operation pattern is continuous locus control, control is executed with a dwell time of 0 (ms) even if a dwell time is set.

(9) M code

(a) This sets M code output in positioning control.
An M code is output only on axis 1 in interpolation operation.

(b) If no M code is to be output, set "0".

(c) This sets the M code output timing with the "M code ON signal output timing" setting of the extended parameters. (For the M code ON signal output timing, see Section 3.3.2.)

**REMARK**

*: The current speed is used for constant speed control.
When the current speed is designated during the constant speed control and the positioning data No. speed designated by positioning start is replaced, all positioning data Nos. for which the current speed is designated can be controlled at the designated speed.

### 3.4.6 Start block information

Pattern, data No. special start, and parameter are set for start block information.
Start block information can be set up to 50 points (1 to 50) for each axis.

**Table 3.11 Start Block Information List**

<table>
<tr><th>Item</th><th>Setting Ranges</th><th>Initial Value</th></tr>
<tr><td>Pattern</td><td>• 0: End<br>• 1: Continued</td><td>End</td></tr>
<tr><td>Data No.</td><td>• 1 to 600</td><td>0</td></tr>
<tr><td>Special start</td><td><table>
<tr><th>Special start</th><th>Setting parameter</th></tr>
<tr><td>0: Normal start</td><td>—</td></tr>
<tr><td>1: Conditional start<br>2: Wait start<br>3: Simultaneous start</td><td>Condition data No.</td></tr>
<tr><td>4: Stop start</td><td>Repeat count</td></tr>
<tr><td>5: FOR loop</td><td>Condition data No.</td></tr>
<tr><td>6: FOR condition</td><td>—</td></tr>
<tr><td>7: NEXT start</td><td>—</td></tr>
</table></td><td>Normal start</td></tr>
<tr><td>Parameter</td><td>• Condition data No.: 1 to 10<br>• Repeat count: 0 to 255</td><td>0</td></tr>
</table>

(1) Pattern

(a) This sets whether to end positioning control at the designated point or to start the positioning at the next pointer.

1) End: When positioning control of the designated point is completed, positioning ends.

2) Continued: When positioning control of the designated point is completed, positioning control of the next point starts.

3) The data No. set after the end point is not to be executed.

(2) Data No. (Positioning data No.)

(a) This sets the data No. for positioning control.
If data numbers are set at multiple points, positioning control is performed in order starting from the point designated in the buffer memory for setting the "positioning start point number".*

(3) Special start

(a) This sets the start requirements when starting positioning.

**REMARK**

* : The positioning start point number setting memory is located at the following addresses:

| Axis number | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Positioning start point number setting buffer memory | 1178 | 1228 | 1278 |

(b) The possible start requirements include condition judgment, simultaneous start, stop, and repeat processing.

1) Normal start

- Execute the positioning data No. for the same point.

2) Conditional start

- A condition judgment is made for the designated condition data No. and operation is started only if the condition is satisfied.
  When the condition is satisfied: The start data No. of the point for which the condition is satisfied is started.
  When the condtion is not satisfied: The condition for the next point is judged.

- When the condition data No. setting is outside range, an error occurs when the positioning data No. is executed, and positioning control is not executed.

3) Wait start

- A condition judgment is made for the designated condition data No. and operation is started only if the condition is satisfied.

- If the condition is satisfied, the start data No. of the point for which the condition is satisfied is started.

- If the condition data No. setting is out of the range, an error occurs when the positioning data No. is executed, and positioning control is not executed.

4) Simultaneous start

- Simultaneous start is carried out with the pulse output level for the designated axis (or axes).

- Simultaneous start is possible for a maximum of three axes. (The axes for which a simultaneous start is to be executed are set for the condition data No. designated by parameter.)

- In simultaneous starting, an error occurs and the positioning data No. is not executed in the following cases:
  The other axis (axes) is BUSY.
  The principal axis is set in the parameter setting.
  The other axis (axes) is not set in the parameter setting.

5) Stop

- Stops the positioning operation.

- When restarting, the positioning data No. of the same point is executed.

6) FOR loop (count)

- Repeats and executes FOR to NEXT loop for the repeat count set in the parameter setting.
  At the beginning of repeat processing, the start data No. of the same point is executed.

- When the repeat count is set to "0", the loop is endless.

- If there is no NEXT after the FOR, no error occurs, but repeat processing is not carried out.

7) FOR condition

- The condition of the condition data No. designated by parameter is judged, and the steps between FOR and NEXT are repeated until this condition is satisfied.

- If there is no NEXT after the FOR, no error occurs, but repeat processing is not carried out.

8) NEXT

- Indicates the repeat end.

- Returns to the top of FOR to NEXT loop.

- In the case of FOR (count), the repeat count is decremented and, on reaching 0, the loop is ended after executing the positioning of the start data No. of the same point.

- If NEXT is executed before FOR, the same processing as for normal start is carried out.

(c) When the designated data No. is executed, the start conditions set for special start and each of the parameter ranges are checked.
If the start conditions and parameters are outside the setting range, positioning control is not carried out.

(4) Parameters

(a) When "conditional start", "wait start", "simultaneous start", "FOR loop", and "FOR condition" are set by the special start [see item (3)], these settings set the start conditions.

Condition data No.: Designate the condition data No. for which the condition data used with the conditional start, wait start, simultaneous start, or FOR condition, is set.(For details on condition data, see Section 3.4.7.)

Repeat count: Sets the repeat count for the FOR to NEXT loop instruction.

**POINT**

Processing for FOR to NEXT loop
Nesting of FOR to NEXT loops is not possible.
If nesting is attempted, a warning is issued.

| Point | Special start setting |
|---|---|
| 1 | Normal start |
| 2 | FOR |
| 3 | Normal start |
| 4 | FOR |
| 5 | Normal start |
| 6 | Normal start |
| 7 | NEXT |
| 8 | Normal start |
| 9 | NEXT |

The jump destination of the NEXT designated for points 7 and 9 is the FOR at point 4. If the designated NEXT is executed at point 9, an error occurs.

### 3.4.7 Condition data

The condition data serve to make condition judgments when a conditional start, wait start, or simultaneous start is executed.
Up to ten condition data (Nos. 1 to 10) can be created in buffer memory.

- Axis 1 :Buffer memory addresses 4400 to 4499
- Axis 2 :Buffer memory addresses 4650 to 4749
- Axis 3 :Buffer memory addresses 4900 to 4999

One condition data comprises a condition identifier and three parameters (address, parameter 1, parameter 2).

Configuration of condition data

| | |
|---|---|
| Condition identifier | .. 16 bits |
| Vacant | .. 16 bits |
| Address | .. 32 bits |
| Parameter 1 | .. 32 bits |
| Parameter 2 | .. 32 bits |
| Vacant | .. 32 bits |

The range check for each of the parameters in the condition data is performed when the positioning data No. is executed.
If any of the condition data parameter setting is out of range, an error occurs and positioning is not performed.

(1) Condition identifier

There are the following types of condition identifier: "condition objects" on which the condition judgment is to be performed, and "comparison condition".

(a) Condition object

The condition object sets the object of the condition judgment.
There are the five types of condition judgment shown below.

| | Instruction Code |
|---|---|
| Device X | $01_H$ |
| Device Y | $02_H$ |
| Buffer memory (16 bits) | $03_H$ |
| Buffer memory (32 bits) | $04_H$ |
| Positioning data No. | $05_H$ |

(b) Comparison condition

The comparison condition sets the operation method in accordance with the condition object.
There are the following 14 types of comparison condition.

| Comparison Condition | | Relationship Between Condition Object and Parameters | Instruction Code | Condition Objects that can be Designated |
|---|---|---|---|---|
| Normal operators | = | n = (parameter 1) | 01H | Buffer memory (16/32 bit) |
| | ≠ | n ≠ (parameter 1) | 02H | |
| | ≤ | n ≤ (parameter 1) | 03H | |
| | ≥ | n ≥ (parameter 1) | 04H | |
| Range operators | Range designation 1 | (parameter 1) ≤ n ≤ (parameter 2) * | 05H | Buffer memory (16/32 bit) |
| | Range designation 2 | n ≥ (parameter 1), n ≥ (parameter 2) | 06H | |
| Bit operator | ON | Parameter 1 ON | 07H | Device X |
| | OFF | Parameter 1 OFF | 08H | Device Y |
| Simultaneous start | Axis designation | Axis 1 designated | 09H | Positioning data No. |
| | | Axis 2 designated | 0AH | |
| | | Axes 1 and 2 designated | 0BH | |
| | | Axis 3 designated | 0CH | |
| | | Axes 1 and 3 designated | 0DH | |
| | | Axes 2 and 3 designated | 0EH | |

REMARK

*:With range designation 1, an error occurs if (parameter 1) > (parameter 2).

(2) Address

(a) The address serves to designate a buffer memory address which is used when the comparison condition is a "normal operator" or "range operator".
The condition judgment is made on the basis of the value in the buffer memory designated by the address and the parameter 1 and parameter 2 values.

(b) No address is used if the condition object is "device X", "device Y", or "positioning data No.".

(3) Parameter 1

(a) Parameter 1 is the data set when the comparison condition is a "normal operator", "range operator", "bit operator", or "positioning data No.".

(b) The data to be set differs according to the operator used.

| Condition Object | Normal Operator/ Range Operator | Bit Operator |
|---|---|---|
| Device X | — | Bit No. |
| Device Y | — | Bit No. |
| Buffer memory (16 bit) | Numerical value | — |
| Buffer memory (32 bit) | Numerical value | — |

If the comparison condition is "simultaneous start", set the positioning data No. of the other axis involved in the simultaneous start. (See (5) below.)

(4) Parameter 2

(a) Parameter 2 is the data set when the comparison condition is a range operator.

(b) Only numerical data can be set for parameter 2.
If the comparison condition is "simultaneous start", set the positioning data No. of the other axis involved in the simultaneous start. (See (5) below.)

(5) Setting parameter 1 and parameter 2 for simultaneous start

(a) If the comparison condition is "simultaneous start", set the positioning data numbers of the axes involved in the simultaneous start by using parameter 1 and parameter 2.

(b) Set the positioning data numbers for axes 1 to 3 as shown below. (The area used for axes 1 to 3 is fixed.)

| | | |
|---|---|---|
| Parameter 1 | ... Positioning data No. for axis 1 | (lower 16 bits of parameter 1) |
| | ... Positioning data No. for axis 2 | (upper 16 bits of parameter 1) |
| Parameter 2 | ... Positioning data No. for axis 3 | (lower 16 bits of parameter 2) |
| | ... Not used | (upper 16 bits of parameter 2) |

## 3.5 I/O Signals

### 3.5.1 I/O signal list

The AD75 uses 16 inputs and 16 outputs for data communication with the PC CPU.
Table 3.12 shows the I/O signals when the AD75 is loaded in slot No.0 of the main base unit.

X devices represent input signals from the AD75 to the PC CPU.
Y devices represent output signals from the PC CPU to the AD75.

**Table 3.12 I/O Signal List**

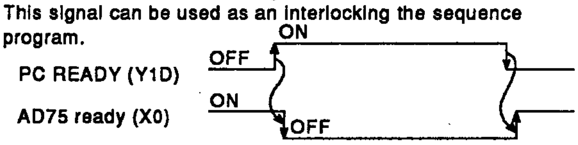
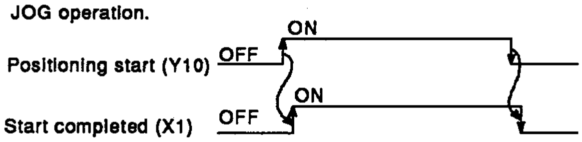
| Signal Direction: AD75 to PC CPU | | | Signal Direction: PC CPU to AD75 | | |
|---|---|---|---|---|---|
| **Device Number** | **Signal** | | **Device Number** | **Signal** | |
| X0 | AD75 ready | | Y10 | Axis 1 | Positioning start |
| X1 | Axis 1 | Start completed | Y11 | Axis 2 | |
| X2 | Axis 2 | | Y12 | Axis 3 | |
| X3 | Axis 3 | | Y13 | Axis 1 | Axis stop |
| X4 | Axis 1 | BUSY | Y14 | Axis 2 | |
| X5 | Axis 2 | | Y15 | Not used | |
| X6 | Axis 3 | | Y16 | Axis 1 | Forward JOG start |
| X7 | Axis 1 | Positioning completed | Y17 | Axis 1 | Reverse JOG start |
| X8 | Axis 2 | | Y18 | Axis 2 | Forward JOG start |
| X9 | Axis 3 | | Y19 | Axis 2 | Reverse JOG start |
| XA | Axis 1 | Error detection | Y1A | Axis 3 | Forward JOG start |
| XB | Axis 2 | | Y1B | Axis 3 | Reverse JOG start |
| XC | Axis 3 | | Y1C | Axis 3 | Axis stop |
| XD | Axis 1 | M code ON | Y1D | PC READY | |
| XE | Axis 2 | | Y1E | Used by system. Not usable by the user. | |
| XF | Axis 3 | | Y1F | | |

**IMPORTANT**

Y1E and Y1F, and Y0 to YF are reserved for use by the system, and cannot be used by the user.
If these devices are used, normal operation of the AD75 cannot be guaranteed.
(However, YD to YF must be turned OFF by a user program in one case only: when the AD75 is installed at a remote I/O station.)

(1) Detailed descriptions of input signals

Following table shows the ON/OFF timing and conditions for the input signals.

| Device No. | Signal Name | | | Description |
|---|---|---|---|---|
| X0 | AD75 ready | | OFF: Ready<br>ON: Not ready/WDT error | • When the PC READY signal (Y1D) changes from OFF to ON, the setting range of the parameter is checked; if no error is found, this signal is turned OFF.<br>• When the PC READY signal (Y1D) is turned OFF, this signal is turned ON.<br>• If a WDT error occurs, this signal is turned ON.<br>• This signal can be used as an interlocking the sequence program.<br> |
| X1<br>X2<br>X3 | Axis 1<br>Axis 2<br>Axis 3 | Start completed | OFF: Start not completed<br>ON: Start completed | • When the positioning start signal is turned ON, this signal is turned ON after the start of AD75 positioning processing. (The start completed signal is also turned ON in home position return operation.)<br>• When the start signal is turned OFF, this signal is turned OFF. This signal also goes OFF if a stop signal is received during JOG operation.<br> |
| X4<br>X5<br>X6 | Axis 1<br>Axis 2<br>Axis 3 | BUSY | OFF: Not BUSY<br>ON: BUSY | • When positioning, home position return or JOG is started, this signal is turned ON. It is turned OFF when the dwell time elapses after positioning stop. (It remains ON during positioning operation.)<br>It is off during a stop in step execution.<br>• In manual pulse generator operation, it is ON while the manual pulse generator enabled flag is ON.<br>• It is turned off when operation is ended by an error and when operation is stopped. |
| X7<br>X8<br>X9 | Axis 1<br>Axis 2<br>Axis 3 | Positioning completed | OFF: Positioning not complete<br>ON: Positioning complete | • This signal is turned ON for the time set in the positioning completion output time parameter after each data No. positioning is complete.<br>(It is not turned ON when the positioning completion output time parameter is 0.)<br>• When positioning operation (including home position return), JOG operation or manual pulse generator operation is started while this signal is ON, it is turned OFF .<br>• It is not turned ON when speed control or positioning are canceled. |
| XA<br>XB<br>XC | Axis 1<br>Axis 2<br>Axis 3 | Error detection | OFF: No error<br>ON: Error | • This signal is turned ON on occurrence of the errors in Section 12. After the error is reset, the signal is turned OFF. |
| XD<br>XE<br>XF | Axis 1<br>Axis 2<br>Axis 3 | M code ON | OFF: Without M code setting<br>ON: With M code setting | • In the WITH mode, this signal is turned ON at positioning data start. In the AFTER mode, it is turned ON at positioning data completion.<br>• This signal is turned OFF when an M code OFF request is issued.<br>If no M code is designated (M code = 0), this signal remains OFF.<br>• When the positioning operation is continuous locus control, an M code is set even if this signal is not turned OFF, and positioning is continued. However, a warning is issued.<br>• When the PC READY signal is turned OFF, the "M code ON" signal is also turned OFF.<br>• If a start is executed out in the M code ON status, an error occurs. |

(2) Detailed descriptions of output signals

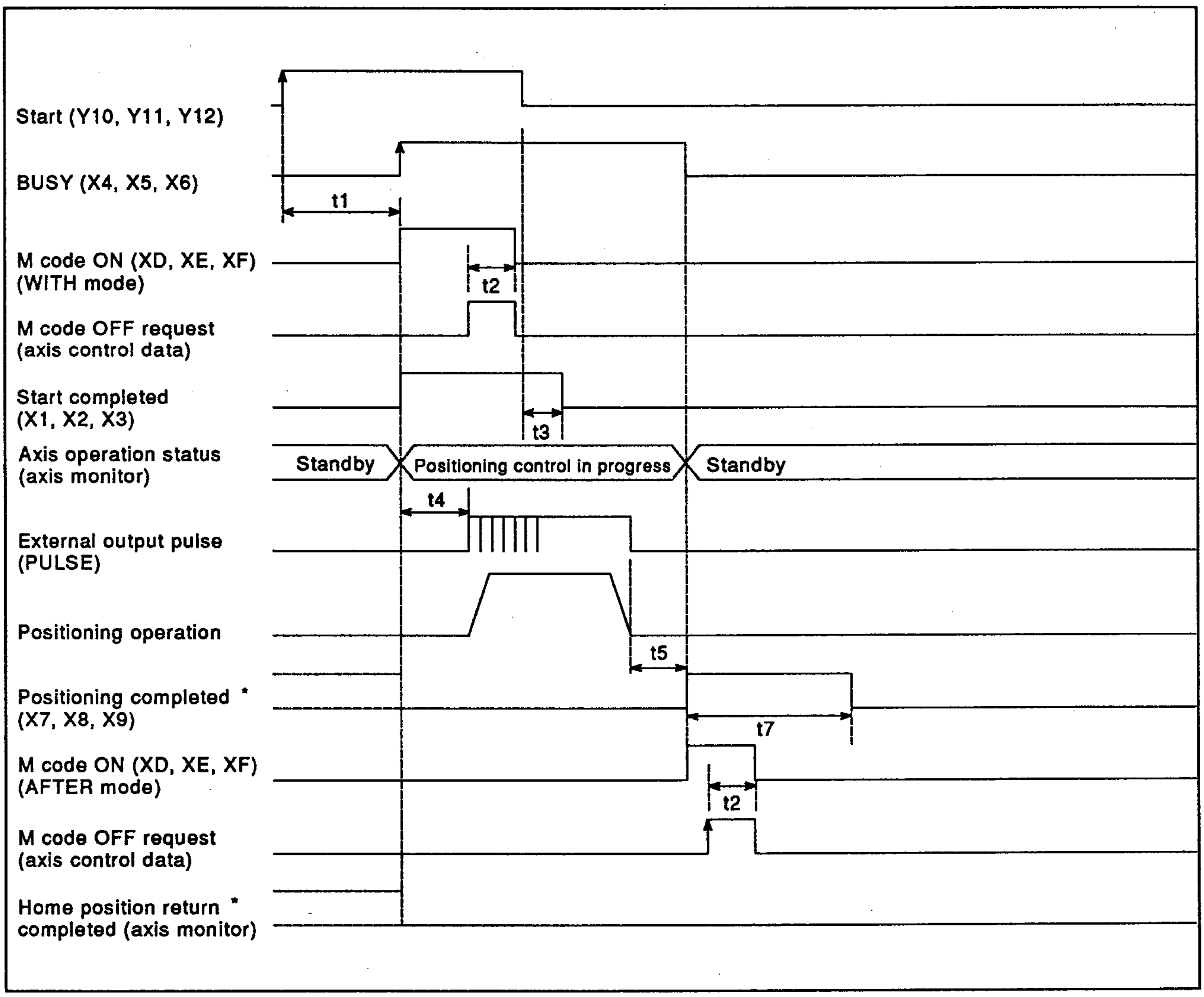
Following table shows the ON/OFF timing and conditions for the output signals.

| Device No. | Signal Name | | | Description |
|---|---|---|---|---|
| Y10<br>Y11<br>Y12 | Axis 1<br>Axis 2<br>Axis 3 | Positioning start | OFF:No positioning start request issued<br>ON: Positioning start request issued | • Start the positioning operation.<br>• The positioning start signal takes effect at its leading edge, whereupon the start is executed.<br>• If the positioning start signal comes ON during the BUSY status, a "start during operation" warning is issued. |
| Y13<br>Y14<br>Y1C | Axis 1<br>Axis 2<br>Axis 3 | Axis stop | OFF:No axis stop request issued<br>ON: Axis stop request issued | • When this signal is turned ON, home position return operation, positioning operation, JOG operation and manual pulse generator operation are stopped.<br>• When the axis stop signal is turned ON, the "M code ON signal" is turned OFF.<br>• When the axis stop signal is turned ON in positioning operation, the positioning operation goes into the "stopped" status.<br>• Deceleration stop or rapid stop can be selected with the "stop signal rapid stop selection" parameter.<br>• If axis stop signal is turned ON for one axis during interpolation control, a deceleration stop occurs on both axes in the positioning operation. |
| Y15 | Unused | — | — | — |
| Y16<br>Y17<br>Y18<br>Y19<br>Y1A<br>Y1B | Axis 1<br>Axis 1<br>Axis 2<br>Axis 2<br>Axis 3<br>Axis 3 | Forward JOG start<br>Reverse JOG start<br>Forward JOG start<br>Reverse JOG start<br>Forward JOG start<br>Reverse JOG start | OFF: JOG not started<br>ON: JOG started | • While the JOG signal is ON, JOG operation proceeds at the "JOG speed" set in the axis control data. When the JOG start signal is turned OFF, a deceleration stop occurs. |
| Y1D | PC READY | | OFF: PC READY OFF<br>ON: PC READY ON | (a) Signal to notify the AD75 that the PC CPU is normal.<br>• It is turned ON/OFF by the sequence program.<br>• In positioning operation, home position return operation, JOG operation or manual pulse generator operation, PC READY is ON except when the test mode of a peripheral device is in effect.<br>(b) PC READY may be turned OFF when a parameter change is made. (For details, see Section 3.4.)<br>(c) When PC READY is turned from OFF to ON, the following processing must be executed.<br>• Check the parameter setting range.<br>• Turn OFF the AD75 ready signal.<br>(d) When the PC READY is turned from ON to OFF, the following processing must be executed.<br>• Turn ON the AD75 ready signal.<br>• Stop the axis or axes in operation.<br>• Turn off the M code ON signal of each axis and clear the M code storage area. |

### 3.5.2 I/O signal timing

The following shows the I/O signal timing for positioning operation, JOG operation and manual pulse generator operation.

(1) Position control I/O signal input timing



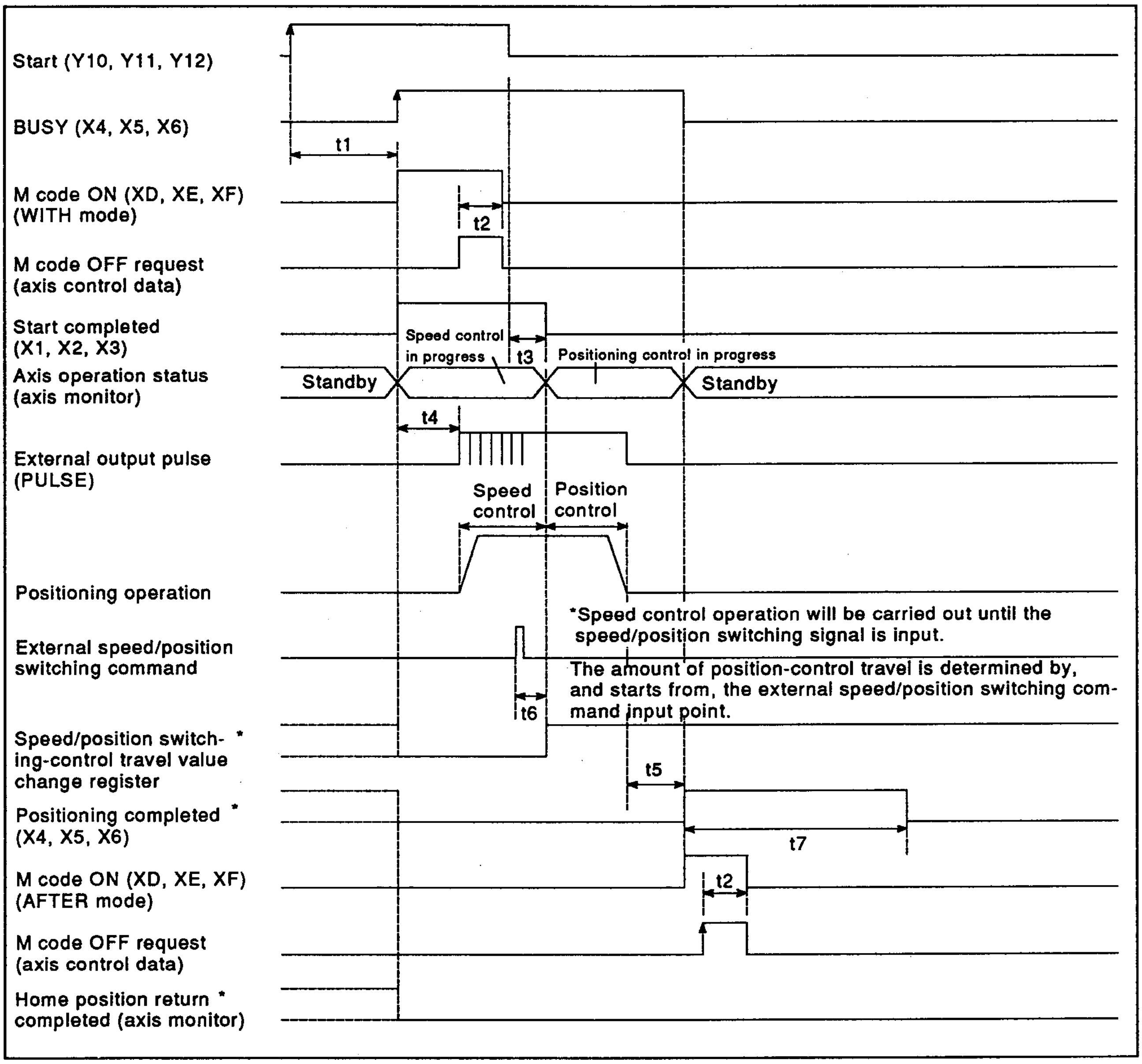

* If one of the signals marked * is ON before the positioning start signal is turned ON, it is turned off when the positioning signal is turned ON.

Normal timing — Unit: ms

| t1 | t2 | t3 | t4 | t5 | t7 |
|---|---|---|---|---|---|
| 5 to 15 | 0 to 3.5 | | | | Determined by parameter |

- Some delays may occur in t1 timing due to the following:
  - (a) Execution of FROM/TO instruction for start operation
  - (b) Operation status of other axis
  - (c) Interruption from peripheral device during start processing
  - (d) Nature of the positioning data for the start

(2) Speed/position switching control I/O signal input timing



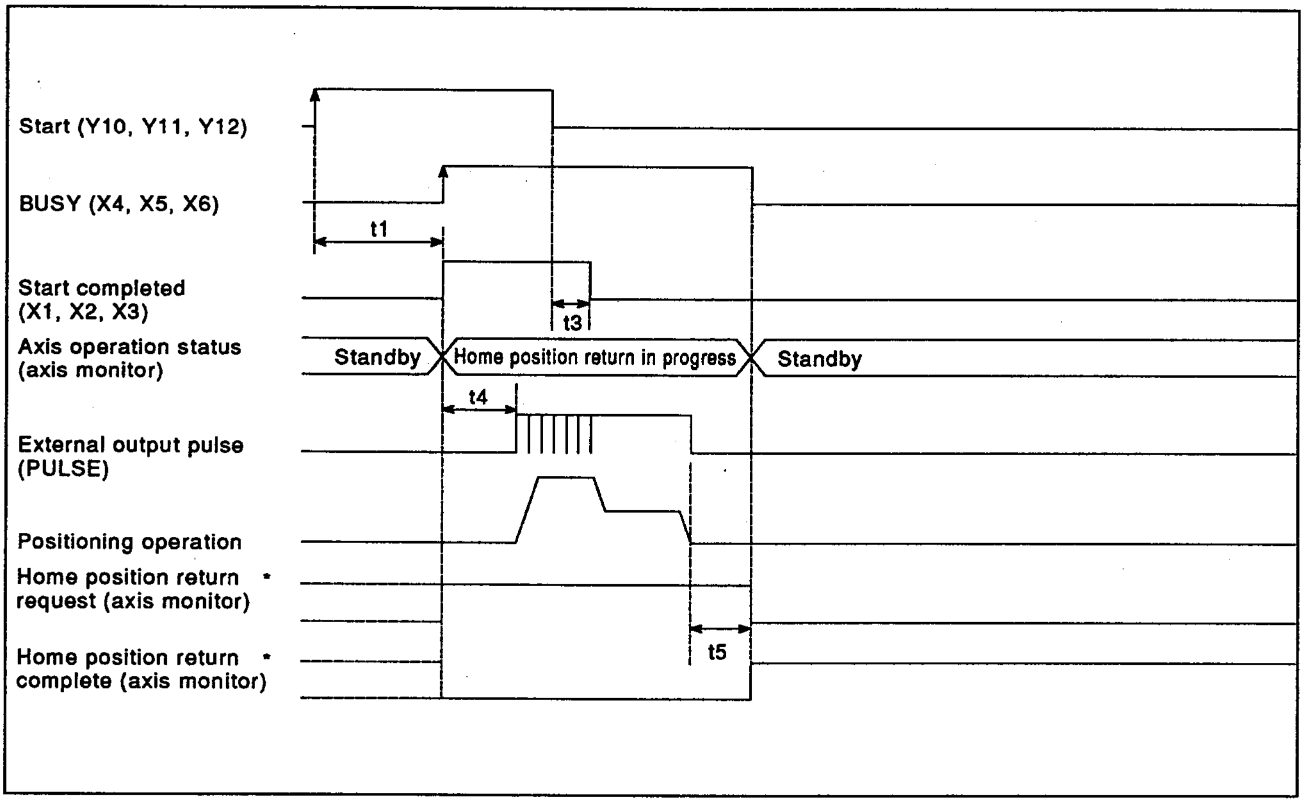

* If one of the signals marked * is ON before the positioning start signal is turned ON, it is turned off when the positioning signal is turned ON.

Normal timing　　Unit: ms

| t1 | t2 | t3 | t4 | t5 | t6 | t7 |
|---|---|---|---|---|---|---|
| 5 to 15 | 0 to 3.5 | | | | 1 | Determined by parameter |

- Some delays may occur in t1 timing due to the following:
  (a) Execution of FROM/TO instruction for start operation
  (b) Operation status of other axis
  (c) Interruption from peripheral device during start processing
  (d) Nature of the positioning data for the start

(3) I/O signal input timing during home position return



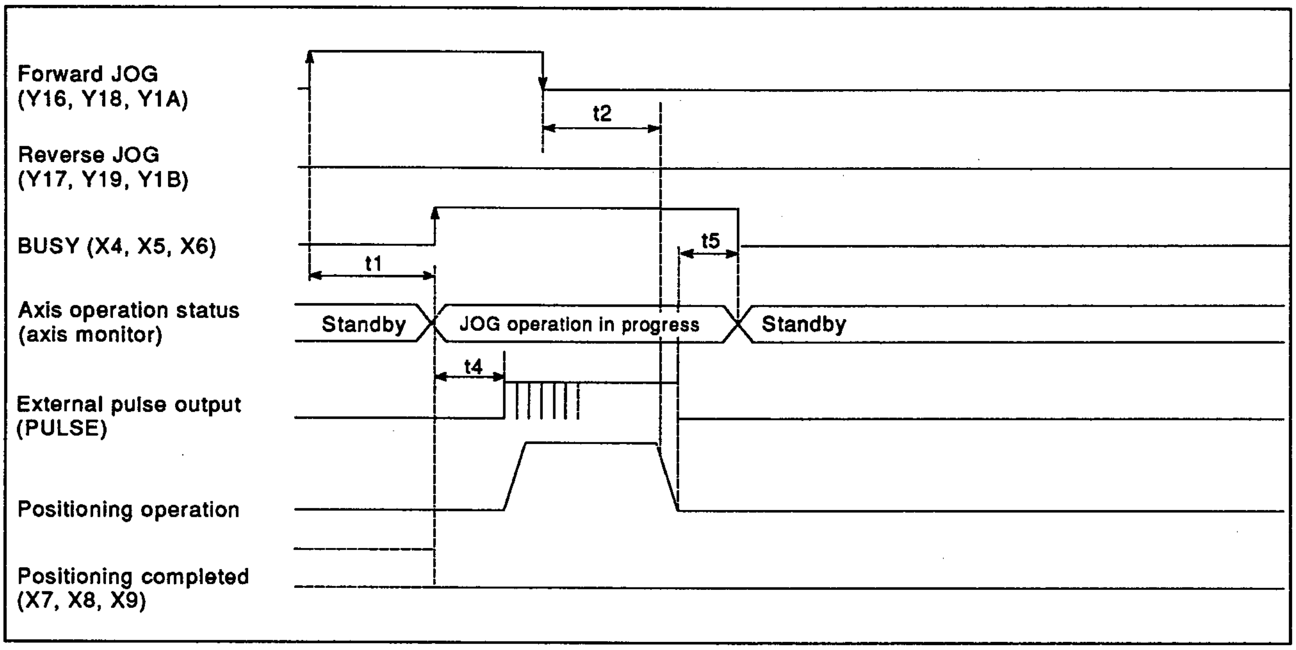

* If one of the signals marked * is ON before the positioning start signal is turned ON, it is turned off when the positioning signal is turned ON.

Normal timing Unit: ms

| t1 | t2 | t3 | t4 | t5 |
|---|---|---|---|---|
| 5 to 15 | 0 to 3.5 | | | |

- Some delays may occur in t1 timing due to the following:
  (a) Execution of FROM/TO instruction for start operation
  (b) Operation status of other axis
  (c) Interruption from peripheral device during start processing
  (d) Nature of the positioning data for the start

(4) I/O signal input timing during JOG operation



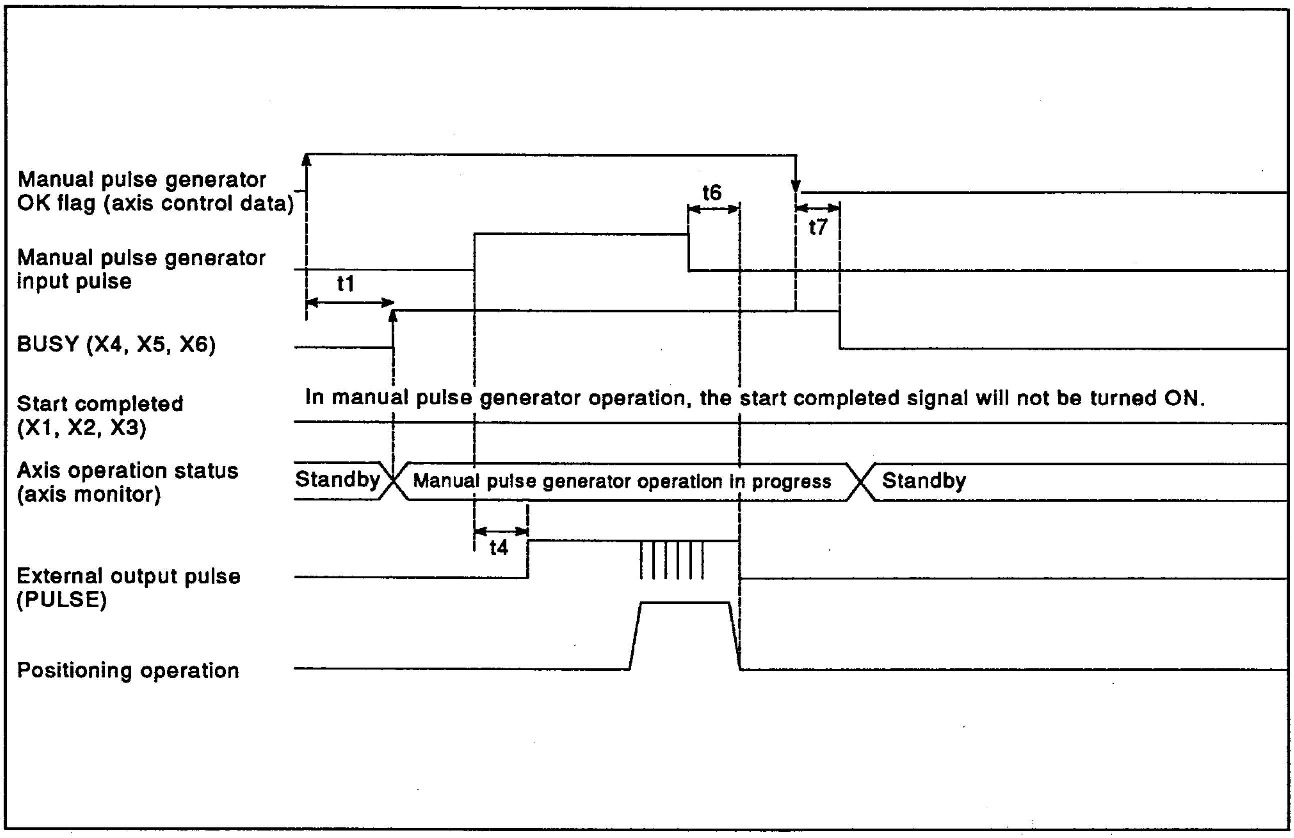

* If one of the signals marked * is ON before the positioning start signal is turned ON, it is turned off when the positioning signal is turned ON.

Normal timing — Unit: ms

| t1 | t2 | t4 | t5 |
|---|---|---|---|
| 1 to 60 | 0 to 3.5 | 6.5 to 10 | 0 to 3.5 |

- Some delays may occur in t1 timing due to the following:
  (a) Execution of FROM/TO instruction for start operation
  (b) Operation status of other axis
  (c) Interruption from peripheral device during start processing
  (d) Nature of the positioning data for the start

(5) Output signals input timing during manual pulse generator operation




* If one of the signals marked * is ON before the positioning start signal is turned ON, it is turned off when the positioning signal is turned ON.

Normal timing Unit: ms

| t1 | t4 | t6 | t7 |
|---|---|---|---|
| 1 to 60 | 0 to 3.5 | 60 | 1 to 60 |

- Some delays may occur in t1 timing due to the following:
  (a) Execution of FROM/TO instruction for start operation
  (b) Operation status of other axis
  (c) Interruption from peripheral device during start processing
  (d) Nature of the positioning data for the start

## 3.6 Buffer Memory List

The AD75 has a buffer memory for data communication with the PC CPU. The following data are stored in the buffer memory. The AD75 carries out positioning control using these data.

- Parameter area for setting the AD75 parameters.
- Monitor area for checking the control status of the AD75.
- Control data area for setting the control status of the AD75.
- Buffer memory positioning data area for setting positioning data by sequence program.
- Positioning start information area for setting positioning start information by sequence program.
- PC CPU memory area for block start condition data.

(1) Buffer memory area

(a) Parameter area

- Basic parameters ........ Area for setting basic parameters for positioning control such as command unit, travel value per pulse, pulse output mode and direction of rotation
- Detailed parameters...... Area for setting detailed information for positioning control such as backlash compensation, stroke limits, M code output timing, acceleration/deceleration time and selection of rapid stop.
- Home position return basic parameters .... Area for setting the basic parameters for home position return such as the home position return method, direction, address and speed
- Home position return extended parameters .... Area for setting the required information for home position return such as home position return dwell time and home position return acceleration/deceleration time.

(b) Monitor area

- System monitor.......... Area which stores information on the control status common to the system.
- Axis monitor ............ Area which stores information on the control status for each axis.

(c) Control data area

- System control data...... Area for reading/writing the clock data and positioning data.
- Axis control data......... Area for setting the control status for each axis.

(d) Buffer memory positioning data area

Data area for setting positioning data using the sequence program.

(e) Positioning start information area

- Positioning start data..... Area for setting the positioning data No.
- Positioning special start data ...... Area for setting special operations in normal positioning operation, such as condition judgment, simultaneous start, stop or repeat.
- Condition data........... Area for setting condition judgment for the special operation instruction set in the positioning special start data.
- Indirect designation ...... Area for setting the positioning data No. indirectly.

(f) PC CPU memory area

Area for controlling positioning start from the sequence program by setting the condition judgment value for the condition judgment and wait judgment from the sequence program.

**POINT**

Sections 3.6.2 to 3.6.7 explain each area of the buffer memory. Buffer memory address that are not described (missing address numbers) are not available to the user.
If the user writes to the missing addresses, an error may occur.

(2) Data reading/writing in the buffer memory

Reading and writing method in the buffer memory are shown as follows:

(a) Reading

- Using the sequence program ..... The buffer memory address is designated by the buffer memory access instruction. Data can be read directly in 1 word (16-bit) or 2 word units.
- Using a peripheral device ....... Data applicable to each mode of a peripheral device can be read.

(b) Writing

- Using the sequence program ..... The buffer memory address is designated by the buffer memory access instruction. Data can be written directly in 1 word (16-bit) or 2 word units.
- Using a peripheral device ....... Data is stored in the peripheral device and the data is written into the AD75 buffer memory by block transfer from the peripheral device.

<Buffer memory contents and writing conditions>

<table>
<tr><th colspan="2">Contents</th><th>Writing Condition</th></tr>
<tr><td colspan="2">Parameter area</td><td>Write enabled at all times<br>Some changes may not take effect immediately; this depends on the parameter type.</td></tr>
<tr><td colspan="2">Monitor area</td><td>Read only</td></tr>
<tr><td colspan="2">Control data area</td><td>Write enabled at all times</td></tr>
<tr><td colspan="2">Buffer memory positioning data area</td><td rowspan="5">Write enabled<br>Write before positioning start (Y10 to Y12) for the applicable axis is turned ON.</td></tr>
<tr><td rowspan="4">Positioning start information</td><td>Positioning start data</td></tr>
<tr><td>Positioning special start data</td></tr>
<tr><td>Condition data</td></tr>
<tr><td>Indirect designation</td></tr>
<tr><td colspan="2">PC CPU memory area</td><td>Write enabled at all times</td></tr>
<tr><td colspan="2">Transmission interface area between the PC CPU and AD75</td><td>Write enabled at all times</td></tr>
</table>

**POINT**

The buffer memory does not back up data by battery.
When the power is turned on, the AD75 carries out the following processing with respect to the buffer memory.

- Parameter area .................... Transmits the parameter value
- Monitor area, control data area ....... Initialized.
- Buffer memory positioning data area .. Transmits the data in the flash
- PC CPU memory area.............. Initialized.

### 3.6.1 Buffer memory configuration

The buffer memory configuration is shown below:

| Address | | | | |
|---|---|---|---|---|
| 0 to 13 | Basic parameters | For axis 1 | | Parameter area |
| 14 | Not used (unavailable) | For axis 1 | | Parameter area |
| 15 to 62 | Extended parameters | For axis 1 | | Parameter area |
| 63 to 69 | Not used (unavailable) | For axis 1 | | Parameter area |
| 70 to 87 | Home position return parameters | For axis 1 | | Parameter area |
| 88 to 149 | Not used (unavailable) | For axis 1 | | Parameter area |
| 150 to 163 | Basic parameters | For axis 2 | | Parameter area |
| 164 | Not used (unavailable) | For axis 2 | | Parameter area |
| 165 to 212 | Extended parameters | For axis 2 | | Parameter area |
| 213 to 219 | Not used (unavailable) | For axis 2 | | Parameter area |
| 220 to 237 | Home position return parameters | For axis 2 | | Parameter area |
| 238 to 299 | Not used (unavailable) | For axis 2 | | Parameter area |
| 300 to 313 | Basic parameters | For axis 3 | | Parameter area |
| 314 | Not used (unavailable) | For axis 3 | | Parameter area |
| 315 to 362 | Extended parameters | For axis 3 | | Parameter area |
| 363 to 369 | Not used (unavailable) | For axis 3 | | Parameter area |
| 370 to 387 | Home position return parameters | For axis 3 | | Parameter area |
| 388 to 449 | Not used (unavailable) | For axis 3 | | Parameter area |
| 450 to 799 | System monitor | | System monitor area | Monitor area |
| 800 to 899 | Axis monitor for axis 1 | | Axis control data area | Monitor area |
| 900 to 999 | Axis monitor for axis 2 | | Axis control data area | Monitor area |
| 1000 to 1099 | Axis monitor for axis 3 | | Axis control data area | Monitor area |
| 1100 to 1149 | System control data | | Axis monitor area | Control data area |
| 1150 to 1199 | Axis control data for axis 1 | | System control data area | Control data area |
| 1200 to 1249 | Axis control data for axis 2 | | System control data area | Control data area |
| 1250 to 1299 | Axis control data for axis 3 | | System control data area | Control data area |
| 1300 to 2299 | Buffer memory positioning data for axis 1 | | | Buffer memory positioning data area |
| 2300 to 3229 | Buffer memory positioning data for axis 2 | | | Buffer memory positioning data area |
| 3300 to 4299 | Buffer memory positioning data for axis 3 | | | Buffer memory positioning data area |
| 4300 to 4499 | Start block for axis 1 | | | Buffer memory positioning data area |
| 4500 to 4549 | Indirect designation for axis 1 | | | Buffer memory positioning data area |
| 4550 to 4749 | Start block for axis 2 | | | Buffer memory positioning data area |
| 4750 to 4799 | Indirect designation for axis 2 | | | Buffer memory positioning data area |
| 4800 to 4999 | Start block for axis 3 | | | Buffer memory positioning data area |
| 5000 to 5049 | Indirect designation for axis 3 | | | Buffer memory positioning data area |
| 5050 to 5099 | PC CPU memory area | | | PC CPU memory area |
| 5100 to 7167 | Spare | | | |

### 3.6.2 Parameter area

The parameter area of the buffer memory is described here.

This section describes the buffer memory address and setting range for axis 1, axis 2 and axis 3.
For details on setting, refer to Sections 3.4.1 and 3.4.2.

(1) Basic parameters #1

| Buffer Memory Address | | | Item | | Setting Range | | | | Initial Value |
|---|---|---|---|---|---|---|---|---|---|
| Axis 1 | Axis 2 | Axis 3 | | | | | | | |
| 0 | 150 | 300 | Unit setting | | 0: mm 1: inch 2: degree 3: pulse | | | | 3 |
| 1 | 151 | 301 | Travel value per pulse | Number of pulses per revolution | 1 to 65535 pulse | | | | 20000 |
| 2 | 152 | 302 | | Travel value per revolution | 1 to 65535 x $10^{-1}$ µm | 1 to 65535 x $10^{-5}$ inch | 1 to 65535 x 10-5 degree | 1 to 65535 pulse | 20000 |
| 3 | 153 | 303 | | Unit magnification | 1: x1 times, 10: x10 times, 100: x100 times, 1000: x1000 times | | | | 1 |
| 4 | 154 | 304 | Pulse output mode | | 0: PLS/SIGN mode 1: CW/CCW mode 2: A phase/B phase mode | | | | 1 |
| 5 | 155 | 305 | Rotation direction setting | | bit0 0: Increase of present value on forward rotation pulse output<br>1: Increase of present value on reverse rotation pulse output | | | | 0 |

(2) Basic parameters #2

| Buffer Memory Address | | | Item | Setting Range | | | | Initial Value |
|---|---|---|---|---|---|---|---|---|
| Axis 1 | Axis 2 | Axis 3 | | | | | | |
| 6<br>7 | 156<br>157 | 306<br>307 | Speed limit value | 1 to 600000000 x $10^{-2}$ mm/min | 1 to 600000000 x $10^{-3}$ inch/min | 1 to 600000000 x 10-5 degree/min | 1 to 1000000 pulse/s | 200000 |
| 8<br>9 | 158<br>159 | 308<br>309 | Acceleration time 0 | 1 to 65535 ms | | | | 1000 |
| 10<br>11 | 160<br>161 | 310<br>311 | Deceleration time 0 | 1 to 65535 ms | | | | 1000 |

**POINTS**

(1) Basic parameters #2 determine the slope of acceleration and deceleration.
Sets the optimum values according to the system. (Operation using the initial values is also possible.)

(2) Basic parameters #1 can only be set while the sequence ready signal (Y1D) is OFF.

(3) Basic parameters #2 can be set provided the BUSY status is not effective.

(3) Extended parameters #1

| Buffer Memory Address | | | Item | Setting Range | | | | Initial Value |
|---|---|---|---|---|---|---|---|---|
| Axis 1 | Axis 2 | Axis 3 | | | | | | |
| 15 | 165 | 315 | Backlash compensation | 0 to 65535 x $10^{-1}$ µm | 0 to 65535 x $10^{-5}$ inch | 0 to 65535 x $10^{-5}$ degree | 0 to 65535 pulse | 0 |
| 16<br>17 | 166<br>167 | 316<br>317 | Software stroke limit<br>Upper limit | -2147483648 to +2147483647 x $10^{-1}$ µm | -2147483648 to +2147483647 x $10^{-5}$ inch | 0 to 35999999 x 10-5 degree | -2147483648 to +2147483647 pulse | +2147483647 |
| 18<br>19 | 168<br>169 | 318<br>319 | Software stroke limit<br>Lower limit | -2147483648 to +2147483647 x $10^{-1}$ µm | -2147483648 to +2147483647 x $10^{-5}$ inch | 0 to 35999999 x 10-5 degree | -2147483648 to +2147483647 pulse | -2147483648 |
| 20 | 170 | 320 | Software stroke limit<br>Selection | bit0 0: The software stroke limit is applied to the feed present value.<br>1: The software stroke limit is applied to the machine feed value. | | | | 0 |
| 21 | 171 | 321 | Valid software stroke limit of JOG operation and manual pulse generator operation | bit0 0: The software stroke limit is valid in JOG operation and manual pulse generator operation.<br>1: The software stroke limit is invalid in JOG operation and manual pulse generator operation. | | | | 0 |
| 22<br>23 | 172<br>173 | 322<br>323 | Command in-position range | 1 to 32767000 x $10^{-1}$ µm | 1 to 32767000 x $10^{-5}$ inch | 1 to 32767000 x $10^{-5}$ degree | 1 to 32767 pulse | 100 |
| 24 | 174 | 324 | Torque limit setting value | 1 to 500 % | | | | 300 |
| 25 | 175 | 325 | M code ON signal output timing | bit0 0: WITH mode<br>1: AFTER mode | | | | |
| 26 | 176 | 326 | Speed change mode speed change type | bit0 0: WITH mode<br>1: AFTER mode | | | | 0 |
| 27 | 177 | 327 | Interpolation method designation method (interpolation mode) | bit0 0: Resultant speed<br>1: Long axis speed | | | | 0 |
| 28 | 178 | 328 | Feed present value update request command during speed control | bit0 0: Feed present value is not updated during speed control.<br>1: Feed present value is updated during speed control. | | | | 0 |
| 29 | 179 | 329 | Manual pulse generator selection | 0: Manual pulse generator operation is not acknowledged.<br>1: Manual pulse generator 1 used<br>2: Manual pulse generator 2 used<br>3: Manual pulse generator 3 used | | | | Axis 1 = 1<br>Axis 2 = 2<br>Axis 3 = 3 |

**POINT**

The settings for extended parameters #1 are valid when the PC READY signal is turned from OFF to ON. After the detailed parameters 1 settings have been rewritten while the PC READY signal is ON, turn the PC READY signal OFF and then back ON.

(4) Extended parameters #2

| Buffer Memory Address Axis 1 | Axis 2 | Axis 3 | Item | Setting Range | | | | Initial Value |
|---|---|---|---|---|---|---|---|---|
| 36<br>37 | 186<br>187 | 336<br>337 | Acceleration time 1 | 1 to 65535 ms | | | | 1000 |
| 38<br>39 | 188<br>189 | 338<br>339 | Acceleration time 2 | | | | | |
| 40<br>41 | 190<br>191 | 340<br>341 | Acceleration time 3 | | | | | |
| 42<br>43 | 192<br>193 | 342<br>343 | Deceleration time 1 | 1 to 65535 ms | | | | 1000 |
| 44<br>45 | 194<br>195 | 344<br>345 | Deceleration time 2 | | | | | |
| 46<br>47 | 196<br>197 | 346<br>347 | Deceleration time 3 | | | | | |
| 48<br>49 | 198<br>199 | 348<br>349 | JOG speed limit value | 1 to 600000000<br>x $10^{-2}$ μm/min | 1 to 600000000<br>x $10^{-3}$ inch/min | 1 to 600000000<br>x 10-3<br>degree/min | 1 to 1000000<br>pulse/s | 20000 |
| 50 | 200 | 350 | JOG operation acceleration time selection | 0 to 3 | | | | 0 |
| 51 | 201 | 351 | JOG operation deceleration time selection | 0 to 3 | | | | 0 |
| 52 | 202 | 352 | Acceleration/deceleration processing selection | bito 0: Trapezoidal acceleration/deceleration process<br>1: S pattern acceleration/deceleration processing | | | | 0 |
| 53 | 203 | 353 | S curve ratio | 1 to 100 % | | | | 100 |
| 54<br>55 | 204<br>205 | 354<br>355 | Rapid stop deceleration time | 1 to 65535 ms | | | | 1000 |
| 56 | 206 | 356 | Stop group 1 rapid stop selection | bit0 0: Normal deceleration stop<br>1: Rapid stop | | | | 0 |
| 57 | 207 | 357 | Stop group 2 rapid stop selection | bit0 0: Normal deceleration stop<br>1: Rapid stop | | | | 0 |
| 58 | 208 | 358 | Stop group 3 rapid stop selection | bit0 0: Normal deceleration stop<br>1: Rapid stop | | | | 0 |
| 59 | 209 | 359 | Positioning completed signal output time | 0 to 65535 ms | | | | 300 |
| 60<br>61 | 210<br>211 | 360<br>361 | Circular interpolation tolerance | 0 to 100000<br>x $10^{-1}$ μm | 0 to 100000<br>x $10^{-5}$ inch | 0 to 100000<br>x $10^{-5}$ degree | 0 to 100000<br>pulse | 100 |
| 62 | 212 | 362 | External start function selection | 0: External positioning start<br>1: External speed change request<br>2: Skip request | | | | 0 |

(5) Home position return basic parameters

| Buffer Memory Address Axis 1 | Axis 2 | Axis 3 | Item | Setting Range | | | | Initial Value |
|---|---|---|---|---|---|---|---|---|
| 70 | 220 | 370 | Home position return type | Near-zero point dog<br>1: Stopper stop 1 (by time-out of the dwell timer)<br>2: Stopper stop 2 (by zero point signal when stopper is contacted)<br>3: Stopper stop 3 (without near-zero point type)<br>4: Count type 1 (zero point signal used)<br>5: Count type 2 (zero point signal not used) | | | | 0 |
| 71 | 221 | 371 | Home position return direction | bit0 0: Positive direction (address incremental direction)<br>1: Negative direction (address decrease direction) | | | | 0 |
| 72<br>73 | 222<br>223 | 372<br>373 | Home position address | -2147483648 to +2147483647 x $10^{-1}$ μm | -2147483648 to +2147483647 x $10^{-5}$ inch | 0 to 35999999 x $10^{-5}$ degree | -2147483648 to +2147483647 pulse | 0 |
| 74<br>75 | 224<br>225 | 374<br>375 | Home position return speed | 1 to 600000000 x $10^{-2}$ mm/min | 1 to 600000000 x $10^{-3}$ inch/min | 1 to 600000000 x $10^{-3}$ degree/min | 1 to 1000000 pulse/s | 1 |
| 76<br>77 | 226<br>227 | 376<br>377 | Creep speed | 1 to 600000000 x $10^{-2}$ mm/min | 1 to 600000000 x $10^{-3}$ inch/min | 1 to 600000000 x $10^{-3}$ degree/min | 1 to 1000000 pulse/s | 1 |
| 78 | 228 | 378 | Home position return retry | bit0 0: Home position return retry is not performed using upper/lower limit switch.<br>1: Home position return retry is performed using upper/lower limit switch. | | | | 0 |

(6) Home position return extended parameters

| Buffer Memory Address Axis 1 | Axis 2 | Axis 3 | Item | Setting Range | | | | Initial Value |
|---|---|---|---|---|---|---|---|---|
| 79 | 229 | 379 | Home position return dwell time | 0 to 65535 ms | | | | 0 |
| 80<br>81 | 230<br>231 | 380<br>381 | Travel value after near-zero point dog setting | 0 to 2147483647 x $10^{-1}$ μm | 0 to 2147483647 x $10^{-5}$ inch | 0 to 2147483647 x $10^{-5}$ degree | 0 to 2147483647 pulse | 0 |
| 82 | 232 | 382 | Home position return acceleration time selection | 0 to 3 | | | | 0 |
| 83 | 233 | 383 | Home position return deceleration time selection | 0 to 3 | | | | 0 |
| 84<br>85 | 234<br>235 | 384<br>385 | Home position return shift amount | -2147483648 to +2147483647 x $10^{-1}$ μm | -2147483648 to +2147483647 x $10^{-5}$ inch | -2147483648 to +2147483647 x $10^{-5}$ degree | -2147483648 to +2147483647 pulse | 0 |
| 86 | 236 | 386 | Home position return torque limit value | 1 to 300 (%) | | | | 300 |

**POINT**

The home position return basic parameter and home position return extended parameter settings become valid when the PC READY signal is turned from OFF to ON. If you change a home position return basic parameter or home position return extended parameter setting while the PC READY signal is ON, turn the PC READY signal OFF and then back ON afterwards.

### 3.6.3 Monitor area

The monitor area of the buffer memory is described here.

Writing data to the monitor area does not cause an error; the data is stored in the monitor area as it is.
When the PC CPU reads the data, the AD75 sets new information automatically, which means that writing data to the monitor area does not cause a problem.

When the power is turned on, the initial values are stored in the monitor area.

(1) System monitor area

The system monitor area can be monitored using the monitor function of peripheral devices.

| Buffer Memory Address (Common to Axis 1, Axis 2 and Axis 3) | Item | Remark/Setting Range | Initial Value |
|---|---|---|---|
| 450 | Test mode flag | • Flag for determining whether the test mode of the peripheral device is currently effective or not.<br>• The device is turned ON when the peripheral device is in the test mode and turned OFF when it is not in the test mode.<br>bit0 0: Not in test mode<br>1: In test mode | 0 |
| 451 | Unit type name | When the power is turned ON or the PC READY signal is ON, the AD75 unit type name is stored.<br>0: AD75P1<br>1: AD75P2<br>2: AD75P3 | Module model name is stored. |
| 452<br>453<br>454<br>455 | OS type | • When the power is turned ON or the PC READY signal is ON, the AD75 type is stored.<br>• It is stored in 8 letters of ASCII code. | OS type is stored. |
| 456<br>457 | OS version | • When the power is turned ON or the PC READY signal is ON, the AD75 version is stored.<br>• It is stored in 4 letters of ASCII code. | OS version |
| 460 | Clock data (hour:minute) | Software type clock data that counts time by cyclic interruption in the AD75 system.<br>• Used for recording the times at which errors (warnings) occur in the error (warning) history.<br>• When the power is turned on, the clock data must be set in the PC CPU.<br>[ The clock of the PC CPU does not always conform to that of the AD75. If time conformity is required, rese the PC CPU periodically. ]<br>b15 b0<br>Minute (00 to 59 is stored in BCD.)<br>Hour (00 to 23 is stored in BCD.) | 0 |
| 461 | Clock data (second, 100 ms) | Ditto<br>b15 b0<br>100 ms (00 to 09 is stored in BCD.)<br>Second (00 to 59 is stored in BCD.) | 0 |

| Buffer Memory Address (Common to Axis 1, Axis 2 and Axis 3) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start History | | | | | | | | | | | | | | | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 462 | 467 | 472 | 477 | 482 | 487 | 492 | 497 | 502 | 507 | 512 | 517 | 522 | 527 | 532 | 537 |
| 463 | 468 | 473 | 478 | 483 | 488 | 493 | 498 | 503 | 508 | 513 | 518 | 523 | 528 | 533 | 538 |
| 464 | 469 | 474 | 479 | 484 | 489 | 494 | 499 | 504 | 509 | 514 | 519 | 524 | 529 | 534 | 539 |
| 465 | 470 | 475 | 480 | 485 | 490 | 495 | 500 | 505 | 510 | 515 | 520 | 525 | 530 | 535 | 540 |
| 466 | 471 | 476 | 481 | 486 | 491 | 496 | 501 | 506 | 511 | 516 | 521 | 526 | 531 | 536 | 541 |
| 542 | | | | | | | | | | | | | | | |

| Item | Remark/Setting Range | Initial Value |
|---|---|---|
| Start history Start axis | •The axis No. of the started axis is stored here.<br>1 to 3 | 0 |
| Start history Operation type | • The axis positioning data No. for JOG operation, manual pulse generator operation or positioning operation is stored here.<br>• PC CPU, external start or peripheral device is stored as the start source.<br>• Restart flag is turned ON when restarting from stopped state.<br>b15 … b0<br>Positioning operation :1 to 600<br>Block positioning operation :7000 (H1B58)<br>JOG operation :8060 (H1F7C)<br>Manual pulse generator operation :8061 (H1F7D)<br>Home position return :8051 (H1F73)<br>High-speed home position return :8052 (H1F74)<br>Present value change :8053 (H1F75)<br>→ Start source 00: PC CPU 01: External signal 10: Peripheral device<br>→ Restart flag | 0 |
| Start history Start hour: minute | • The hour and minute when the start was executed are recorded as follows.<br>b15 b0<br>→ Minute (00 to 59 is stored in BCD.)<br>→ Hour (00 to 23 is stored in BCD.) | 0 |
| Start history Start second: 100 ms | • The second and 100 ms unit when the start was executed are recorded as follows.<br>b15 b0<br>→ 100 ms (00 to 09 is stored in BCD.)<br>→ Second (00 to 59 is stored in BCD.) | 0 |
| Start history Error judgment | • Error judgment result is stored at the start time.<br>• If an error occurs at the start time and the start operation is not carried out, the error flag is turned ON and the error No. is stored.<br>• If the start is executed during operation (while BUSY signal is ON), the BUSY warning flag is turned ON.<br>b15 … b0<br>Error No.<br>→ Error flag<br>→ BUSY start warning flag | 0 |
| Start history Pointer | • The next pointer of the latest axis error is designated by a value from 0 to 15.<br>• It is 0 when the power is turned on. | 0 |

| Buffer Memory Address (Common to Axis 1, Axis 2 and Axis 3) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start History in the Event of an Error | | | | | | | | | | | | | | | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 543 | 548 | 553 | 558 | 563 | 568 | 573 | 578 | 583 | 588 | 593 | 598 | 603 | 608 | 613 | 618 |
| 544 | 549 | 554 | 559 | 564 | 569 | 574 | 579 | 584 | 589 | 594 | 599 | 604 | 609 | 614 | 619 |
| 545 | 550 | 555 | 560 | 565 | 570 | 575 | 580 | 585 | 590 | 595 | 600 | 605 | 610 | 615 | 620 |
| 546 | 551 | 556 | 561 | 566 | 571 | 576 | 581 | 586 | 591 | 596 | 601 | 606 | 611 | 616 | 621 |
| 547 | 552 | 557 | 562 | 567 | 572 | 577 | 582 | 587 | 592 | 597 | 602 | 607 | 612 | 617 | 622 |
| 623 | | | | | | | | | | | | | | | |

| Item | Remark/Setting Range | Initial Value |
|---|---|---|
| Start history in the event of an error Start axis | • The axis No. of the axis where an error occurred on starting is stored here.<br>1 to 3 | 0 |
| Start history in the event of an error Operation type | • The axis positioning data No. for JOG operation, manual pulse generator operation and positioning operation are stored.<br>• PC CPU, external start or peripheral device is stored as the start source.<br>• Restart flag is turned ON when restarting from stopping.<br>b15 … b0<br>Positioning operation : 1 to 600<br>Block positioning operation : 7000 (H1B58)<br>JOG operation : 8060 (H1F7C)<br>Manual pulse generator operation : 8061 (H1F7D)<br>Home position return : 8051 (H1F73)<br>High-speed home position return : 8052 (H1F74)<br>Present value change : 8053 (H1F75)<br>→ Start source 00: PC CPU 01: External signal 10: Peripheral device<br>→ Restart flag | 0 |
| Start history in the event of an error Start hour: minute | • The hour and minute when the error was detected are recorded as follows.<br>b15 … b0<br>→ Minute (00 to 59 is stored in BCD.)<br>→ Hour (00 to 23 is stored in BCD.) | 0 |
| Start history in the event of an error Start second: 100 ms | • The second and 100 ms unit when the error was detected are recorded as follows.<br>b15 … b0<br>→ 100 ms (00 to 09 is stored in BCD.)<br>→ Second (00 to 59 is stored in BCD.) | 0 |
| Start history in the event of an error Error judgment | • The error judgment result is stored at the start time.<br>• If an error occurs at the start time and the start operation is not carried out, the error flag is turned ON and the error No. is stored.<br>• If the start is executed during operation (while BUSY signal is ON), the BUSY warning flag is turned ON.<br>b15 … b0<br>Error No.<br>→ Error flag<br>→ BUSY start warning flag | 0 |
| Start history Pointer | • The next pointer after the latest axis error is indicated by a value from 0 to 15.<br>• It is 0 when the power is turned on. | 0 |

| Buffer Memory Address (Common to Axis 1, Axis 2 and Axis 3) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Error History/Warning History | | | | | | | | | | | | | | | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 624 | 628 | 632 | 636 | 640 | 644 | 648 | 652 | 656 | 660 | 664 | 668 | 672 | 676 | 680 | 684 |
| 625 | 629 | 633 | 637 | 641 | 645 | 649 | 653 | 657 | 661 | 665 | 669 | 673 | 677 | 681 | 685 |
| 626 | 630 | 634 | 638 | 642 | 646 | 650 | 654 | 658 | 662 | 666 | 670 | 674 | 678 | 682 | 686 |
| 627 | 631 | 635 | 639 | 643 | 647 | 651 | 655 | 659 | 663 | 667 | 671 | 675 | 679 | 683 | 687 |
| 688 | | | | | | | | | | | | | | | |
| 689 | 693 | 697 | 701 | 705 | 709 | 713 | 717 | 721 | 725 | 729 | 733 | 737 | 741 | 745 | 749 |
| 690 | 694 | 698 | 702 | 706 | 710 | 714 | 718 | 722 | 726 | 730 | 734 | 738 | 742 | 746 | 750 |
| 691 | 695 | 699 | 703 | 707 | 711 | 715 | 719 | 723 | 727 | 731 | 735 | 739 | 743 | 747 | 751 |
| 692 | 696 | 700 | 704 | 708 | 712 | 716 | 720 | 724 | 728 | 732 | 736 | 740 | 744 | 748 | 752 |
| 753 | | | | | | | | | | | | | | | |

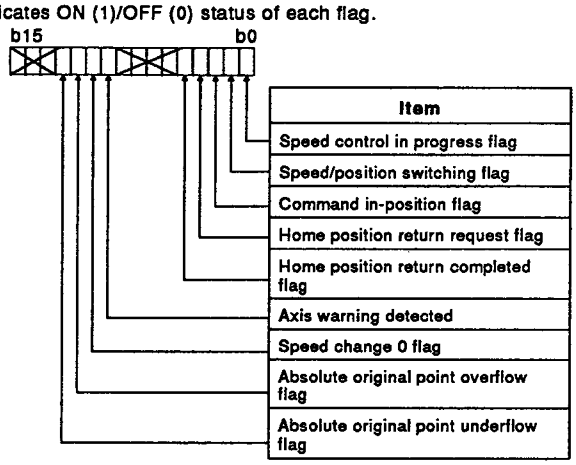
| Item | Remark/Setting Range | Initial Value |
|---|---|---|
| Error history Error occurrence axis | • The error occurrence axis is stored.<br>1 to 3 | 0 |
| Error history Axis error No. | • The axis error No. is stored. | 0 |
| Error history Axis error hour: minute of occurrence | • The hour and minute when the axis error was detected are recorded as follows.<br>b15 b0<br>Minute (00 to 59 is stored in BCD.)<br>Hour (00 to 23 is stored in BCD.) | 0 |
| Error history Axis error second, 100 ms division, of occurrence | • The second and 100 ms unit when the axis error was detected are recorded as follows.<br>b15 b0<br>100 ms (00 to 09 is stored in BCD.)<br>Second (00 to 59 is stored in BCD.) | 0 |
| Error history Pointer | • The next pointer after the latest axis error is designated by a value from 0 to 15.<br>• It is 0 when the power is turned on. | 0 |
| Warning history Warning occurrence axis | • The warning occurrence axis is stored.<br>1 to 3 | 0 |
| Warning history Axis warning No. | • The axis warning No. is stored. | 0 |
| Warning history Axis warning occurrence hour:minute | • The hour and minute when the axis warning was detected are recorded as follows.<br>b15 b0<br>Minute (00 to 59 is stored in BCD.)<br>Hour (00 to 23 is stored in BCD.) | 0 |
| Warning history Axis error occurrence second, 100 ms division | • The second and 100 ms unit when the axis warning was detected are recorded as follows.<br>b15 b0<br>100 ms (00 to 09 is stored in BCD.)<br>Second (00 to 59 is stored in BCD.) | 0 |
| Warning history Pointer | • The next pointer after the latest axis warning is designated by a value from 0 to 15.<br>• It is 0 when the power is turned on. | |

(2) Axis monitor area

| Buffer Memory Address | | | Item | Remark/Setting Range | Initial Value |
|---|---|---|---|---|---|
| Axis 1 | Axis 2 | Axis 3 | | | |
| 800<br>801 | 900<br>901 | 1000<br>1001 | Feed present value | • The present execution position is stored.<br>• When the positioning type is absolute, the feed present value becomes a coordinate value.<br>• When home position return is completed, the home position return address is set.<br>• The feed present value is changed by the present value change function.<br>• The software stroke limit can be applied at the feed present value by parameter setting. | 0 |
| 802<br>803 | 902<br>903 | 1002<br>1003 | Machine feed value | • The present position in the machine coordinate system, which takes a particular position determined by the machine as its home position, is stored.<br>• The home position return address is set when home position return is completed.<br>• The machine value is not changed by the present value change function.<br>• The software stroke limit can be applied at the machine value by parameter setting. | 0 |
| 804<br>805 | 904<br>905 | 1004<br>1005 | Feed speed | • In all operations, the actual speed at the time is stored.<br>• During interpolation, the actual resultant speed or reference axis speed at that time is set for axis 1 in axis 1/2 interpolation, axis 2 in axis 2/3 interpolation, and axis 3 in axis 3/1 interpolation. For other interpolation axes, zero is entered.<br>• When an axis stops, zero is stored. | 0 |
| 806 | 906 | 1006 | Valid M code | • M code is stored.<br>• When the PC READY signal is turned OFF, zero is entered. | 0 |
| 807 | 907 | 1007 | Axis error No. | • If an axis error occurs, the applicable error code is stored. If another axis error occurs after an error code has been stored, the current error code is overwritten by the new error code.<br>• The axis error No. is cleared by axis error reset ON. | 0 |
| 808 | 908 | 1008 | Axis warning No. | • If an axis warning occurs, the applicable warning code is stored.<br>If another axis warning occurs after a warning code has been stored, the current warning code is overwritten by the new warning code.<br>• The axis warning No. becomes zero at axis error reset ON. | 0 |
| 809 | 909 | 1009 | Axis operation status | • The axis operation status is stored.<br><br>0: Standby<br>1: Stopped<br>2: Interpolation in progress<br>3: JOG operation in progress<br>4: Manual pulse generator operation in progress<br>5: Analysis in progress<br>6: Special start wait in progress<br>7: Home position return in progress<br>8: Position control in progress<br>9: Speed control in progress<br>10: Speed control in progress in speed/position switching control<br>11: Position control in progress in speed/position switching control<br>-1: Error<br>-2: Step standby<br>-3: Step-stopped<br>-4: Step error | 0 |
| 810 | 910 | 1010 | Current speed | • In operation based on positioning data, the commanded speed designated in the positioning data becomes the current speed. If the commanded speed is omitted, the previous current speed is maintained.<br>• During interpolation, the actual resultant speed or reference axis speed at that time is set for axis 1 in axis 1/2 interpolation, axis 2 in axis 2/3 interpolation, and axis 3 in axis 3/1 interpolation. For other interpolation axes, zero is entered.<br>• When the positioning data operation is completed, the value becomes zero.<br>• In the stopped status caused by a stop command, the current speed before the stop is held.<br>• In JOG or manual pulse generator operation, zero is stored. | 0 |
| 812<br>813 | 912<br>913 | 1012<br>1013 | Axis feed speed | • The actual speed of each axis is stored.<br>• When the axis stops, zero is stored. | 0 |

| Buffer Memory Address | | | Item | Remark/Setting Range | Initial Value |
|---|---|---|---|---|---|
| Axis 1 | Axis 2 | Axis 3 | | | |
| 814<br>815 | 914<br>915 | 1014<br>1015 | Speed/position switching control Travel value after switching the control | • During speed control by the speed/position switch control, the speed/position switch signal is turned ON. The travel value from the point at which switching to position control occurs to positioning completion is stored here. | 0 |
| 816 | 916 | 1016 | External I/O signal | • Indicates ON/OFF status of external I/O signal.<br>b15 b0<br>**Description**<br>Indicates ON/OFF status of drive unit ready.<br>Indicates ON/OFF status of zero point signal.<br>Indicates ON/OFF status of in-position signal.<br>Indicates ON/OFF status of near-zero point signal.<br>Indicates ON/OFF status of stop signal.<br>Indicates ON/OFF status of upper limit.<br>Indicates ON/OFF status of lower limit.<br>Indicates ON/OFF status of external start.<br>Indicates ON/OFF status of speed-position switching signal.<br>Indicates ON/OFF status of deviation counter clear. | 0 |

| Buffer Memory Address Axis 1 | Axis 2 | Axis 3 | Item | Remark/Setting Range | Initial Value |
|---|---|---|---|---|---|
| 817 | 917 | 1017 | Status | Indicates ON (1)/OFF (0) status of each flag. | 0 |




| Item | Description | Initial Value |
|---|---|---|
| Speed control in progress flag | • This is used to determine whether speed control or position control is in progress: it is turned ON during speed control.<br>In speed/position switching control, it is turned ON on switching from speed to position control by the external speed- position switching signal.<br>• It is turned OFF during position control, JOG operation and manual pulse generator operation, and when the power is turned on. | 0 |
| Speed/ position switching latch flag | • This is flag is turned ON on switching to position control during speed/position switching control. It is used for travel value change interlock in position control.<br>• It is turned OFF when the next positioning data, JOG operation or manual pulse generator operation is executed. | 0 |
| Com- mand in- position flag | • This flag is turned ON when the remaining distance is less than the designated "command in-position range".<br>• It is turned OFF when the axis travels in each operation.<br>• The command in-position check is always carried out during position control.<br>The command in-position check is not carried out during speed control, or during the speed control part of speed/position switching control. | 0 |
| Home position return request flag | • This flag is turned ON when any of the following occurs, and turned OFF on completion of home position return.<br>• When the power to the AD75 module is turned on.<br>• When the drive unit ready signal is turned OFF.<br>• When the PC READY flag is turned ON.<br>• When home position return is started. | 1 |
| Home position return com- pleted flag | • This flag is turned ON when home position return is completed normally.<br>• It is turned OFF in the event of home position return start, positioning operation start, JOG operation start or manual pulse generator operation start, and when the drive unit ready signal is turned OFF. | 0 |
| Axis warning detected | • This signal is turned ON when an axis warning occurs.<br>• It is turned OFF when the axis error reset is ON. | 0 |
| Speed change 0 flag | • This flag is turned ON when the speed change value is 0 and a speed change is requested.<br>• It is turned OFF when the speed change value is not 0 and a speed change is requested. | 0 |
| Absolute original point overflow flag/ underflow flag | • It is turned ON when shifting of the absolute original point caused by a present value change leads to an underflow or overflow. | 0 |

| Buffer Memory Address | | | Item | Remark/Setting Range | Initial Value |
|---|---|---|---|---|---|
| Axis 1 | Axis 2 | Axis 3 | | | |
| 818<br>819 | 918<br>919 | 1018<br>1019 | Target value | • The target value is stored in positioning operation as follows:<br>• In position control, the target value is stored based on the designated positioning address/travel value.<br>This target value is stored when positioning control is started. When positioning by position control is completed, zero is stored.<br>• Zero is stored when speed control and home position return are executed.<br>• Zero is stored when speed/position switching control is started. When positioning control is switched, the travel value is stored as the target value.<br>• Zero is stored when JOG operation, manual pulse generator operation, and home position return operation starts are executed. | 0 |
| 820<br>821 | 920<br>921 | 1020<br>1021 | Target speed | • In positioning data operation, the actual target speed considering the override and speed control limit is stored as the current speed.<br>When travel is completed, the speed is zero.<br>• During interpolation, the target speed for the resultant speed or reference axis speed is set for axis 1 in axis 1/2 interpolation, axis 2 in axis 2/3 interpolation, and axis 3 in axis 3/1 interpolation. For other interpolation axes, zero is entered.<br>• For JOG operation, the actual target speed, taking into account the JOG speed and the JOG speed limit value, is stored.<br>If JOG operation is discontinued, zero is stored.<br>• In manual pulse generator operation, zero is stored. | 0 |
| 822<br>823 | 922<br>923 | 1022<br>1023 | Absolute original point | • The "absolute original point" used when positioning to the home position is stored.<br>• When the power is switched on, the stored value is not defined.<br>• On completing a home position return, the home position address value in the basic parameters for home position return is set as the "absolute original point".<br>• When the present value is changed, the "absolute original point" is changed. | 0 |
| 824<br>825 | 924<br>925 | 1024<br>1025 | Travel value after near-zero point dog ON | • Zero is stored when home position return is started.<br>• When home position return is completed, the travel value (without sign) from near-zero point dog ON to home position return completed is stored.<br>It remains zero when home position return with no near-zero point dog and stopper stop type home position return are executed. | 0 |
| 826 | 926 | 1026 | Torque limit stored value | • The torque limit set value or torque change value is stored.<br>• The torque limit set value is stored in the event of positioning start, JOG start, and manual pulse generator operation start.<br>• If a value other than zero is set in the torque change value storage buffer memory (1176, 1226, 1276) during operation, the torque value after the change is stored. | 0 |
| 827 | 927 | 1027 | Special start data instruction code set value | • The special start data instruction code designated by the start data pointer during execution is stored.<br>• The value is maintained until the start data pointer is updated. | 0 |
| 828 | 928 | 1028 | Special start data instruction parameter set value | • The special start data instruction parameter designated by the start data pointer during execution is stored.<br>• This value is maintained until the start data pointer is updated. | 0 |
| 829 | 929 | 1029 | Start positioning data No. set value | • The positioning data No. designated by the start data pointer during execution is stored.<br>• If the designation is indirect, the indirect designation No. is stored.<br>• The value is maintained until the start data pointer is updated. | 0 |
| 830 | 930 | 1030 | Speed control in progress flag | • If the speed value to be changed to exceeds the speed control limit as a result of speed change or positioning operation override, this flag is ON when operating at the speed limit value.<br>• It is turned OFF when the above status is canceled or an axis stop occurs.<br>bit0 0: Speed control in progress<br>1: Speed control not in progress | 0 |
| 831 | 931 | 1031 | Speed change processing in progress flag | • This flag is turned ON during speed change processing .<br>• It is turned OFF in the event of deceleration start caused by the stop signal during speed change processing, and after completion of speed change processing.<br>bit0 0: Speed change processing completed<br>1: Speed change processing in progress | 0 |

| Buffer Memory Address | | | Item | Remark/Setting Range | Initial Value |
|---|---|---|---|---|---|
| Axis 1 | Axis 2 | Axis 3 | | | |
| 832 | 932 | 1032 | Execution start data pointer | • This pointer shows the start data point currently being executed.<br>• The pointer value becomes 1 in the event of positioning start (not restart).<br>• The pointer value becomes 0 when positioning is completed. | 0 |
| 833 | 933 | 1033 | Last execution positioning data No. | • The positioning data No. which was executed last is stored.<br>• This value is maintained until the next positioning data is executed. | 0 |
| 834 | 934 | 1034 | Repeat counter | • The remaining number of repeats is stored.<br>• The count is decremented (-1) at the end of a repeat loop.<br>• The loop ends when the count is 0.<br>• 0 is stored from the top of the loop when it is an infinite loop. | 0 |
| 835 | 935 | 1035 | Execution positioning data No. | • The positioning data No. currently being executed is stored.<br>• For an indirectly designated positioning data No., the data No. converted to 1-600 is stored. | 0 |
| 836 | 936 | 1036 | Block No. being executed | • The block positioning No. is stored. | |
| 838 to 847 | 938 to 947 | 1038 to 1047 | Positioning data being executed | • The positioning data currently being executed is stored. (See Section 3.4.5)<br>Axis 1 / Axis 2 / Axis 3<br>838 / 938 / 1038: Positioning identifier<br>839 / 939 / 1039: M code<br>840 / 940 / 1040: Dwell time<br>841 / 941 / 1041: Spare<br>842 / 942 / 1042, 843 / 943 / 1043: Commanded speed<br>844 / 944 / 1044, 845 / 945 / 1045: Axis 1 Positioning address<br>846 / 946 / 1046, 847 / 947 / 1047: Axis 1 Arc data | 0 |

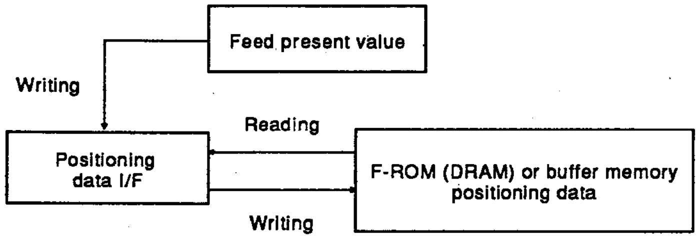
### 3.6.4 Control data area

This section describes the control data area in the buffer memory.

The initial values are stored in the control data area when the power is turned on.

(1) System control data area

| Buffer Memory Address (Common for Axis 1, Axis 2 and Axis 3) | Item | Remark/Setting Range | Initial Value |
|---|---|---|---|
| 1100 | Clock data setting (hour) | • After turning on the AD75, set the clock data in the AD75 from the PC CPU.<br>• The hour is set as follows:<br>b15 b0<br>→Hour (00 to 23 is stored in BCD.)<br>→Day data is not acknowledged if set. | 0 |
| 1101 | Clock data setting (minute, second) | • The minute and second are set as follows:<br>b15 b0<br>→Second (00 to 59 is stored in BCD.)<br>→Minute (00 to 59 is stored in BCD.) | 0 |
| 1102 | Clock data write | • Turned ON when the clock data is set and written in the AD75.<br>bit0 0: Clock data write accepted (set by OS)<br>1: Clock data write request (set by sequence program) | 0 |
| 1103 | Applicable axis | • Axis for which write/read is executed is set.<br>1: Axis 1 2: Axis 2 3: Axis 3 4: Interpolation, axes 1/2<br>5: Interpolation, axes 2/3 6: Interpolation, axes 3/1 | 0 |
| 1104 | Positioning data No. | • Data No. for writing and reading is set.<br>1 to 600 | 0 |
| 1105 | Writing pattern (Reading is executed unconditionally.) | • Data type for reading is set.<br>Address field Positioning data field<br>b15 b8 b0<br>Positioning identifier<br>M code<br>Dwell time<br>Commanded speed<br>1) The address data used when setting the positioning address/arc auxiliary point is set in the address field.<br>The values designated in the address field (8 bits) and their descriptions are as follows:<br>0: Sets the values of the positioning address and arc auxiliary point in the positioning data.<br>1: Sets the value of the positioning address in the positioning data.<br>2: Sets the value of the arc auxiliary point in the positioning data.<br>5: Sets the feed present value as the positioning address.<br>6: Sets the feed present value as the arc auxiliary point.<br>7: The positioning address and arc auxiliary point are not set.<br>2) Apart from the positioning address/arc auxiliary point settings, the setting for which of the data written into the read/write positioning data interface area (1108 to 1137) is to be set is designated in the positioning data field.<br>0: Data corresponding to the bit is set (written).<br>1: Data corresponding to the bit is not set (not written). | 0 |

| Buffer Memory Address (Common for Axis 1, Axis 2 and Axis 3) | Item | Remark/Setting Range | Initial Value |
|---|---|---|---|
| 1106 | Write/read request | • Positioning data is read or written.<br>• Simultaneous reading/writing is carried out for interpolation axes.<br>• Data flow in reading/writing is as follows:<br><br><br>* When the "feed present value" is set in the writing pattern address field, when writing is executed the "feed present value" is set in the positioning data interface and then set in the positioning data of the F-ROM or buffer memory.<br>0: Writing/reading completed (set by OS)<br>1: Read request (set by sequence program)<br>2: Write request (set by sequence program) | 0 |
| 1108 to 1137 | Read/write positioning data interface | Axis 1:<br>1108 Positioning identifier<br>1109 M code<br>1110 Dwell time<br>1111 Spare<br>1112, 1113 Commanded speed<br>1114, 1115 Positioning address<br>1116, 1117 Arc data<br>Axis 2:<br>1118 Positioning identifier<br>1119 M code<br>1120 Dwell time<br>1121 Spare<br>1122, 1123 Commanded speed<br>1124, 1125 Positioning address<br>1126, 1127 Arc data<br>Axis 3:<br>1128 Positioning identifier<br>1129 M code<br>1130 Dwell time<br>1131 Spare<br>1132, 1133 Commanded speed<br>1134, 1135 Positioning address<br>1136, 1137 Arc data | 0 |
| 1138 | F-ROM writing request | • Write the parameters and positioning data of the OS area to the F-ROM.<br>bit0 0: F-ROM writing completed (set by OS)<br>1: F-ROM write request (set by sequence program) | 0 |

**POINTS**

(1) Clock data is set for the start history, error start history, error history and warning history in the system monitor. The times set in the start history and error history can be used as a reference for determining the approximate cycle time and tracing the failure cause when an error occurs.

(2) If the clock data is not set, the clock count starts from day: 0 hour:0 minute: 00 second: 00 when the power to the AD75 is turned ON. When the power to the AD75 is turned ON, synchronize the data with the clock data of the PC CPU.

(3) When the positioning data interface is used, the teaching function can be realized in combination with manual operation.

| Buffer Memory Address | | | Item | Remark/Setting Range | | | | Initial Value |
|---|---|---|---|---|---|---|---|---|
| Axis 1 | Axis 2 | Axis 3 | | | | | | |
| 1150 | 1200 | 1250 | Positioning start No. | • Start No. for executing positioning is set. | | | | 0 |
| 1151 | 1201 | 1251 | Axis error reset | • Axis error detection, axis error No., axis warning detection and axis warning No. are cleared.<br>• Change the axis operation status from "error" to "standby" (start from the beginning if start is included). | | | | 0 |
| | | | | bit0 0: Axis error reset request accepted (set by OS)<br>1: Axis error reset request (set by sequence program) | | | | |
| 1152 | 1202 | 1252 | Restart command | • When "1" is set while the axis operation status is "stopped", positioning based on the positioning data at the stop is executed from the stop position to the end point. | | | | 0 |
| | | | | bit0 0: Restart command accepted (set by OS)<br>1: Restart command request (set by sequence program) | | | | |
| 1153 | 1203 | 1253 | M code OFF request | • M code ON signal is turned OFF by the M code OFF request. | | | | 0 |
| | | | | bit0 0: M code OFF request accepted (set by OS)<br>1: M code OFF request (set by sequence program) | | | | |
| 1154<br>1155 | 1204<br>1205 | 1254<br>1255 | Present value change value | • When the feed present value is changed using positioning data No. 9003, the feed present value after the change is stored.<br>• Even if the set value is outside the software stroke limit, no error occurs. | | | | 0 |
| | | | | -2147483648 to +2147483648 x $10^{-1}$ µm | -2147483648 to +2147483648 x $10^{-5}$ inch | 0 to 35999999 x $10^{-5}$ degree | -2147483648 to +2147483648 pulse | |
| 1156<br>1157 | 1206<br>1207 | 1256<br>1257 | Speed change value | • In positioning operation, the speed after the change is stored when a speed change is carried out in JOG operation. | | | | 0 |
| | | | | 0 to 600000000 x $10^{-2}$ µm/min | 0 to 600000000 x $10^{-3}$ inch/min | 0 to 600000000 x $10^{-3}$ degree/min | 0 to 1000000 pulse/s | 0 |
| 1158 | 1208 | 1258 | Speed change request | • In positioning operation, this signal is turned ON(1) after the speed change value is set when a speed change is carried out in JOG operation. | | | | 0 |
| | | | | bit0 0: Speed change request accepted (set by OS)<br>1: Speed change request (set by sequence program) | | | | |
| 1159 | 1209 | 1259 | Positioning operation speed override | • Used to set an override in the range 1 to 300 % (in 1 % units) with respect to the speed in positioning operation (current speed).<br>• When the override value is 100 %, the positioning operation speed does not change. | | | | 100 |
| | | | | 1 to 300 % | | | | |
| 1160<br>1161 | 1210<br>1211 | 1260<br>1261 | JOG speed | • JOG speed during JOG operation is stored.<br>• When the speed during JOG operation is changed, the speed after the change is stored. | | | | 0 |
| | | | | 0 to 600000000 x $10^{-2}$ µm/min | 0 to 600000000 x $10^{-3}$ inch/min | 0 to 600000000 x $10^{-3}$ degree/min | 0 to 1000000 pulse/s | 0 |
| 1163 | 1213 | 1263 | Speed-position switching enable flag | Makes the control switch signal (speed to position switching signal) valid. | | | | 0 |
| | | | | bit0 0: Even if the speed-position switching signal is turned ON, speed control is not switched to position control.<br>1: When the speed/position switch signal is turned ON, speed control is switched to position control. | | | | |
| 1164<br>1165 | 1214<br>1215 | 1264<br>1265 | Speed/position switching control travel value change register | • This register is used for changing the travel value of position control in speed/position switching control.<br>• The change travel value is set during speed control in speed/position switching control.<br>• When the speed-position switching signal is turned ON, the speed/position switching control travel value register is the travel value of position control.<br>• The travel value set in the positioning data is set at the next speed/position switching control start. | | | | 0 |
| | | | | 1 to 2147483647 x $10^{-1}$ µm | 1 to 2147483647 x $10^{-5}$ inch | 1 to 2147483647 x $10^{-5}$ degree | 1 to 2147483647 pulse | |
| 1167 | 1217 | 1267 | Manual pulse generator enable flag | • Used to enable/disable manual pulse generator operation. | | | | 0 |
| | | | | bit0 0: Manual pulse generator operation is enabled.<br>1: Manual pulse generator operation is disabled. | | | | |
| 1168<br>1169 | 1218<br>1219 | 1268<br>1269 | Manual pulse generator 1 pulse input magnification | • Sets the magnification per pulse for the number of pulses input from the manual pulse generator in manual pulse generator operation. | | | | 1 |
| | | | | 1 to 100 | | | | |

| Buffer Memory Address | | | Item | Remark/Setting Range | Initial Value |
|---|---|---|---|---|---|
| Axis 1 | Axis 2 | Axis 3 | | | |
| 1170 | 1220 | 1270 | Home position return request Flag OFF request | • Status of the home position return request flag is turned from ON to OFF.<br>bit0 0: Home position return request flag OFF request accepted (set by OS)<br>1: Home position return request flag OFF request (set by sequence program) | 0 |
| 1171 | 1221 | 1271 | External start valid | • External start is valid.<br>bit0 0: Makes external start invalid.<br>1: Makes external start valid. | 0 |
| 1172 | 1222 | 1272 | Step valid flag | • This flag is used to check each operation in positioning operation.<br>bit0 0: Step operation is not carried out.<br>1: Step operation is carried out. | 0 |
| 1173 | 1223 | 1273 | Step mode | • Sets the positioning unit to be used for step operation.<br>bit0 0: Steps in deceleration units<br>1: Steps in data No. units | 0 |
| 1174 | 1224 | 1274 | Step start information | • This is used for continuation or restart of step operation.<br>bit0 00H: Step start request accepted<br>01H: Step continuation<br>02H: Restart | 0 |
| 1175 | 1225 | 1275 | Skip command | • When the skip command is turned ON during positioning operation, an automatic deceleration stop occurs and the next positioning is carried out.<br>bit0 0: Skip request accepted (set by OS)<br>1: Skip request (set by sequence program) | 0 |
| 1176 | 1226 | 1276 | Torque change value | • Sets the torque change value.<br>Setting range: 0 to torque control limit value set by parameter | 0 |
| 1178 | 1228 | 1278 | Position start point No. | • Set the start point No. for executing positioning (block start).<br>1 to 50 : Start from the designated point No.<br>Other than above : Start from the first point | 0 |

### 3.6.5 Positioning data area

This section describes the positioning data area in the buffer memory.
The buffer memory address and setting range for axis 1, 2 and 3 are described.
For details of setting, see Section 3.4.5.

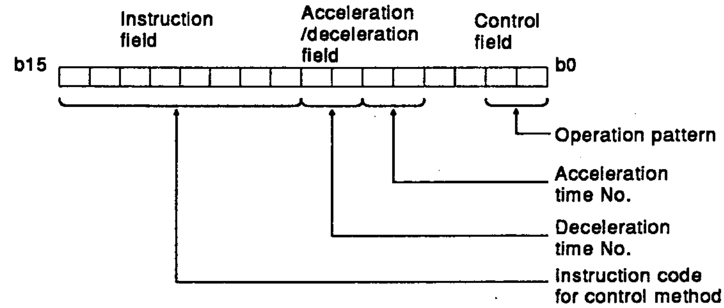
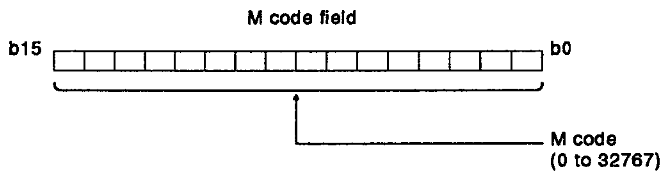
[Buffer memory positioning data areas configuration]

| Positioning data No. | Axis 1 address | Axis 2 address | Axis 3 address |
|---|---|---|---|
| 1 | 1300 | 2300 | 3300 |
| 2 | 1310 | 2310 | 3310 |
| 3 | 1320 | 2320 | 3320 |
| to | to | to | to |
| 100 | 2290 | 3290 | 4290 |

| | Offset |
|---|---|
| Positioning identifier | +0 |
| M code | +1 |
| Dwell time | +2 |
| Spare | +3 |
| Commanded speed | +4 |
| | +5 |
| Positioning address | +6 |
| | +7 |
| Arc address | +8 |
| | +9 |

**REMARK**

For details on the buffer memory addresses for positioning data numbers 1 to 100, see APPENDIX 3.

| Buffer Memory Address Axis 1 | Buffer Memory Address Axis 2 | Buffer Memory Address Axis 3 | Item | | Remark/Setting Range | | | | Initial Value |
|---|---|---|---|---|---|---|---|---|---|
| 1300 | 2300 | 3300 | Positioning identifier | |  | | | | 0 |
| 1301 | 2301 | 3301 | M code | |  | | | | 0 |
| 1302 | 2302 | 3302 | Dwell time | | 0 to 65535 ms | | | | 0 |
| 1303 | 2303 | 3303 | Not used | | — | | | | |
| 1304<br>1305 | 2304<br>2305 | 3304<br>3305 | Commanded speed | | -1: Setting of the commanded speed is omitted. | | | | 0 |
| | | | | | 1 to 600000000 x $10^{-2}$ μm/min | 1 to 600000000 x $10^{-3}$ inch/min | 1 to 600000.000 /min | 1 to 1000000 pulse/s | |
| 1306<br>1307 | 2306<br>2307 | 3306<br>3307 | Positioning address | ABS | -2147483648 to +2147483647 x $10^{-1}$ μm | -2147483648 to +2147483647 x $10^{-5}$ inch | 0 to 35999999 x $10^{-5}$ degree | -2147483648 to +2147483647 pulse | 0 |
| | | | | INC | Other than speed/position switching control | | | | |
| | | | | | -2147483648 to +2147483647 x $10^{-1}$ μm | -2147483648 to +2147483647 x $10^{-5}$ inch | -2147483648 to +2147483647 x $10^{-5}$ degree | -2147483648 to +2147483647 pulse | 0 |
| | | | | | Speed/position switching control | | | | |
| | | | | | 0 to 2147483647 x $10^{-1}$ μm | 0 to 2147483647 x $10^{-5}$ inch | 0 to 2147483647 x $10^{-5}$ degree | 0 to 2147483647 pulse | 0 |
| 1308<br>1309 | 2308<br>2309 | 3308<br>3309 | Arc address | ABS | -2147483648 to +2147483647 x $10^{-1}$ μm | -2147483648 to +2147483647 x $10^{-5}$ inch | 0 to 35999999 x $10^{-5}$ degree | -2147483648 to +2147483647 pulse | 0 |
| | | | | INC | | | -2147483648 to +2147483647 x $10^{-5}$ degree | | |

### 3.6.6 Positioning start information area

This section describes the positioning start information area in the buffer memory.

The buffer memory for axis 1, 2 and 3 is described.
For details of setting, see Section 3.4.6 to 3.4.7.

| Positioning Start Information | | Address for Axis 1 | Address for Axis 2 | Address for Axis 3 |
|---|---|---|---|---|
| Positioning start data | 1st point | 4300 | 4550 | 4800 |
| | 2nd point | 4301 | 4551 | 4801 |
| | 3rd point | 4302 | 4552 | 4802 |
| | to | to | to | to |
| | 50th point | 4349 | 4599 | 4849 |
| Positioning special start data | 1st point | 4350 | 4600 | 4850 |
| | 2nd point | 4351 | 4601 | 4851 |
| | 3rd point | 4352 | 4602 | 4852 |
| | to | to | to | to |
| | 50th point | 4399 | 4649 | 4899 |
| Condition data | 1st data | 4400 | 4650 | 4900 |
| | to | to | to | to |
| | 10th data | 4490 | 4740 | 4990 |
| Indirect designation | 8001 | 4500 | 4750 | 5000 |
| | 8002 | 4501 | 4751 | 5001 |
| | to | to | to | to |
| | 8050 | 4549 | 4799 | 5049 |

| | Offset |
|---|---|
| Condition identifier | +0 |
| Unused | +1 |
| Address | +2 |
| Unused | +3 |
| Parameter 1 | +4 |
| | +5 |
| Parameter 2 | +6 |
| | +7 |
| Unused | +8 |
| | +9 |

(1) Positioning start data area

(a) The positioning start data area is the area used when performing block positioning.
It is an area for 1 to 50 points.

(b) Which of the points of the positioning start data area is to be started is designated using the buffer memory for positioning start point No. setting.

| | Buffer Memory Address |
|---|---|
| Axis 1 | 1178 |
| Axis 2 | 1228 |
| Axis 3 | 1278 |

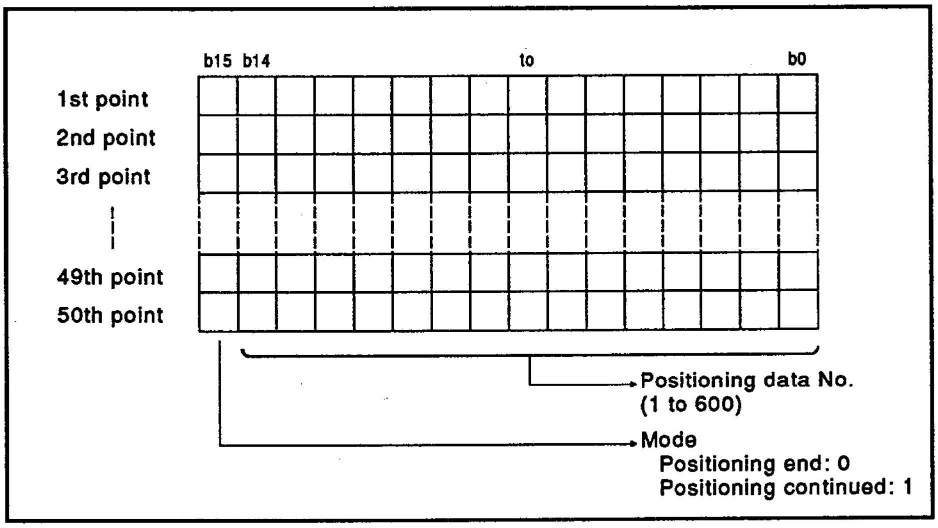
If operation is started without making a setting in the buffer memory for setting the positioning start point number, operation is started from the first point.

(c) Set the "mode" and "positioning data No." in the positioning start data.*
(For details on the mode and positioning data No., see Section 3.4.6.)

1) Set "positioning end: 0" or "positioning continued: 1" for the mode.

2) Set a positioning data No. within the range 1 to 600.

(d) The positioning data area has the configuration shown below.




**REMARK**

* : Set the data No. for which positioning control is executed as the positioning data No.

(2) Positioning special start data area

(a) The positioning special start data area is the area in which AD75 special starts are set.
The positioning special start data area has a 1 to 1 correspondence with the positioning start data area.

| Positioning start data area | | Positioning special start data area |
|---|---|---|
| 1st point | --------------- | 1st point |
| 2nd point | --------------- | 2nd point |
| 3rd point | --------------- | 3rd point |
| | | |
| 49th point | --------------- | 49th point |
| 50th point | --------------- | 50th point |

(b) Set the "special start instruction code" and "parameter" in the positioning special start data area.
(For details on the special start instruction code and parameter, see Section 3.4.6.)

1) For the special start instruction code, set the instruction code for a special start start condition ($00_H$ to $07_H$).

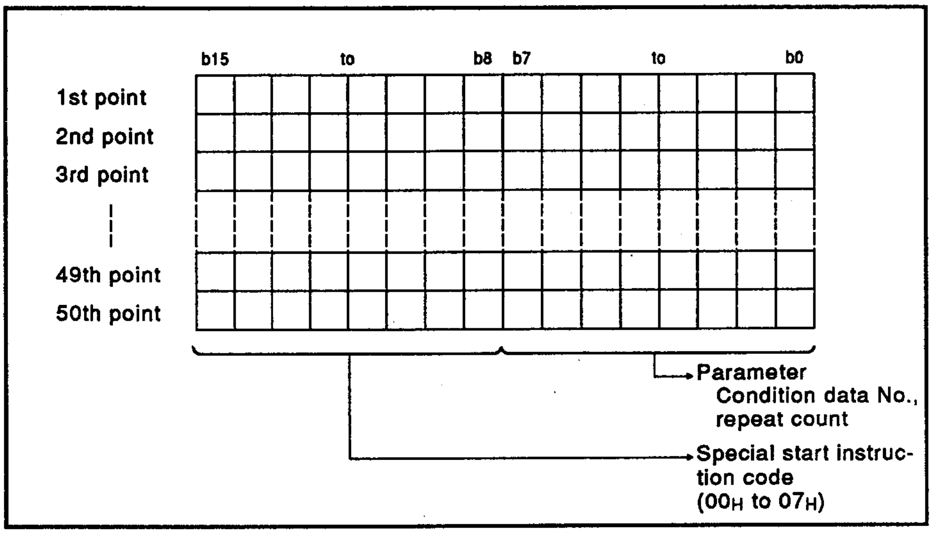
2) For the parameter, set a condition data number or repeat count.

| Special Start | Instruction Code | Setting Parameter |
|---|---|---|
| Normal start | $00_H$ | — |
| Conditional start<br>Wait start<br>Simultaneous start | $01_H$<br>$02_H$<br>$03_H$ | Condition data No. 1 to 10* |
| Stop start | $04_H$ | — |
| FOR loop | $05_H$ | Repeat count (0 to 255) |
| FOR condition | $06_H$ | Condition data No. 1 to 10* |
| NEXT | $07_H$ | — |

**REMARK**

* : For the condition data No., set which of the condition data in (3) is to be used.

(c) The positioning data area has the configuration shown below.




(3) Condition data area

(a) In the condition data area, set the condition designated by the parameter in the positioning special start data.
There can be from 1 to 10 condition data areas.

(b) Configuration of condition data

**Axis 1 condition data**

| Address | Content | |
|---|---|---|
| 4400 | Condition identifier | 1st data |
| 4401 | Unused | |
| 4402 | Address | |
| 4403 | | |
| 4404 | Parameter 1 | |
| 4405 | | |
| 4406 | Parameter 2 | |
| 4407 | | |
| 4408 | Unused | |
| 4409 | | |
| 4410 | Condition identifier | 2nd data |
| 4411 | Unused | |
| 4412 | Address | |
| 4413 | | |
| 4414 | Parameter 1 | |
| 4415 | | |
| 4416 | Parameter 2 | |
| 4417 | | |
| 4418 | Unused | |
| 4419 | | |
| 4420 | to | |
| 4489 | | |
| 4490 | Condition identifier | 10th data |
| 4491 | Unused | |
| 4492 | Address | |
| 4493 | | |
| 4494 | Parameter 1 | |
| 4495 | | |
| 4496 | Parameter 2 | |
| 4497 | | |
| 4498 | Unused | |
| 4499 | | |

**Axis 2 condition data**

| Address | Content | |
|---|---|---|
| 4650 | Condition identifier | 1st data |
| 4651 | Unused | |
| 4652 | Address | |
| 4653 | | |
| 4654 | Parameter 1 | |
| 4655 | | |
| 4656 | Parameter 2 | |
| 4657 | | |
| 4658 | Unused | |
| 4659 | | |
| 4660 | Condition identifier | 2nd data |
| 4661 | Unused | |
| 4662 | Address | |
| 4663 | | |
| 4664 | Parameter 1 | |
| 4665 | | |
| 4666 | Parameter 2 | |
| 4667 | | |
| 4668 | Unused | |
| 4669 | | |
| 4670 | to | |
| 4739 | | |
| 4740 | Condition identifier | 10th data |
| 4741 | Unused | |
| 4742 | Address | |
| 4743 | | |
| 4744 | Parameter 1 | |
| 4745 | | |
| 4746 | Parameter 2 | |
| 4747 | | |
| 4748 | Unused | |
| 4749 | | |

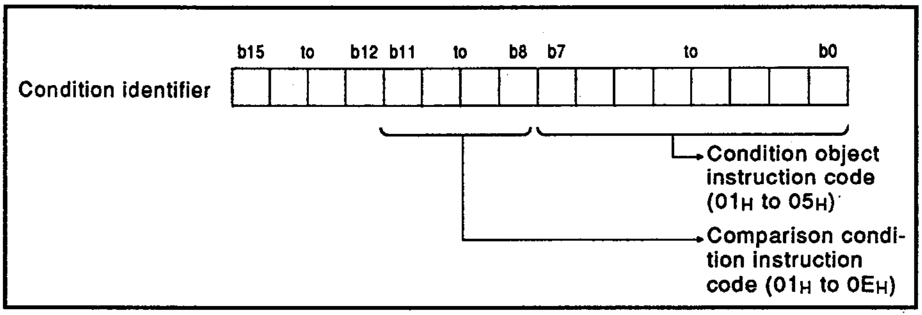
**Axis 3 condition data**

| Address | Content | |
|---|---|---|
| 4900 | Condition identifier | 1st data |
| 4901 | Unused | |
| 4902 | Address | |
| 4903 | | |
| 4904 | Parameter 1 | |
| 4905 | | |
| 4906 | Parameter 2 | |
| 4907 | | |
| 4908 | Unused | |
| 4909 | | |
| 4910 | Condition identifier | 2nd data |
| 4911 | Unused | |
| 4912 | Address | |
| | | |
| 4914 | Parameter 1 | |
| 4915 | | |
| 4916 | Parameter 2 | |
| 4917 | | |
| 4918 | Unused | |
| 4919 | | |
| 4920 | to | |
| 4989 | | |
| 4990 | Condition identifier | 10th data |
| 4991 | Unused | |
| 4992 | Address | |
| 4993 | | |
| 4994 | Parameter 1 | |
| 4995 | | |
| 4996 | Parameter 2 | |
| 4997 | | |
| 4998 | Unused | |
| 4999 | | |

(c) Set the data shown below for the items in the condition data area.

1) For the condition identifier, set the "condition object instruction code" and the "comparison condition instruction code".

[For details on the condition object instruction code and comparison condition instruction code, see Section 3.4.7 (1).]



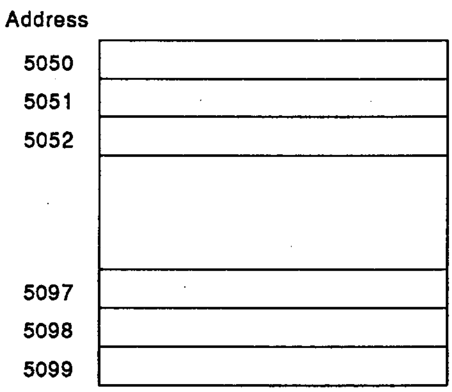

2) For details on the address, parameter 1, and parameter 2, see Section 3.4.7 (2) to (5).

### 3.6.7 PC CPU memory area

The PC CPU memory area is an area which can be read from and written to without restriction by the sequence program.
This area is also used for the conditions relating to positioning start information condition data. Positioning starts can be controlled by the sequence program by setting values for condition judgments and wait judgments in this area.

When the AD75 is turned OFF, the values written in the PC CPU memory area are deleted. When the power is turned on, the values are cleared to zero.

[PC CPU memory area of buffer memory]



# MEMO

# 4. OPERATING PROCEDURE AND SETTING

This chapter describes the start-up and positioning procedure, part names, wiring, and connection with an external device.

## 4.1 Outline of Procedure

The outline of the procedure for positioning operation using the AD75 is as follows:

Start

↓

Decide positioning operation method
- Decide the home position return method, positioning method, and operation pattern for positioning operation. (See Sections 1.2 and 3.3.)

↓

Installation of AD75P at the peripheral device

↓

Setting of various data for positioning using the AD75P
- Basic parameters 1 and basic parameters 2
- Detailed parameters 1 and detailed parameters 2
- Basic parameters and detail parameters for home position return
- Positioning data

- Setting using the edit mode (See Section 3.4.)

↓

Installation of the AD75 in the base unit
- See Section 4.3.

↓

Connection of the AD75, drive module, motor, and external devices

↓

Connection of the AD75 to the peripheral device

↓

Power to the ACPU ON
- Start up the ACPU in the STOP status.

↓

System test of the AD75 (operation monitor)
- Monitoring with the 17-segment LED and axis indicator LED of the AD75. (See Section 4.6.)

↓

Writing of setting data from the peripheral device to the AD75

↓

(1)

(1)

↓

Positioning test operation by the AD75P and setting/changing/monitoring of various data
- Home position return address settings
- Positioning data (address, etc.) setting using teaching function/JOG operation/manual pulse generator operation.

- Operation in the test mode/monitor mode
  Setting/changing of data which was not set to the correct value in the edit mode.

↓

Data setting for block positioning with the AD75P

- Setting of positioning start data

↓

Creation of sequence program for positioning

- See Chapter 5.

↓

Positioning operation using the ACPU and AD75.

↓

End

**REMARK**

For □ refer to the operating manual for the AD75P.

### 4.2 Handling Precautions

The precautions for handling the AD75 are described below.

(1) The case of the AD75 is made of plastic: do not drop it or subject it to strong impact.

(2) Do not remove the printed circuit board from the case. This could cause failure.

| CAUTION |
| --- |
| (3) Turn the PC CPU power supply OFF before mounting the AD75 in a base unit or removing it from a base unit.<br>Mounting or removal with the power on may result in failure or malfunction of the module.<br><br>(4) Make sure that no wire offcuts or other debris enters the top of the AD75 during wiring, since this could cause fire, failure or malfunction.<br>If anything does enter the module, remove it. |

(5) Tighten the module fixing screws within the range described in Section 4.3.3.
For installation/removal of the AD75 to/from the base unit, see Section 4.3.3.

(6) Turn the PC CPU and drive unit power supply OFF before connecting or disconnecting the drive unit connector.
After confirming the correct orientation for insertion, insert the connector directly from the front. Then secure it with the two fixing screws.
Incorrect insertion may result in incorrect input or output due to defective contact.

| DANGER |
| --- |
| (7) When the drive unit is not connected, be sure to attach the cover to the connector area of the AD75 interface.<br>Otherwise, malfunction may occur. |

(8) After confirming the correct orientation for insertion, insert the connector directly from the front. Then secure it with the two fixing screws.
If no peripheral device is connected, attach the cover to the RS-422 connector area.

| CAUTION |
| --- |
| (9) Never disassemble or modify the module.<br>This could cause failure, malfunction, injury or fire.<br>Otherwise, malfunction may occur. |

## 4.3 Loading and Installation

This section explains the methods for loading and installation and the precautions to take to increase system reliability and to use the functions most efficiently.

| DANGER |
|---|
| Use the programmable controller in an environment that complies with the general specifications stated in this manual.<br>Using it in an environment that does not comply with the specifications could result in electric shock, fire, malfunction, personal injury or deterioration. |

### 4.3.1 Installation environment

Do not install the A series programmable controller at locations subject to any of the following environmental conditions:

(1) Ambient temperatures outside the range 0 to 55 °C.

(2) Ambient humidities outside the range 10 to 90 %RH.

(3) Condensation due to sudden temperature changes.

(4) Corrosive or inflammable gases.

(5) Excessive airborne dust, conductive particles such as iron powder, oil mist, salt, or organic solvents.

(6) Direct sunlight.

(7) Strong electric or magnetic fields.

(8) Direct vibrations or impacts.

### 4.3.2 Loading precautions

Pay attention to the following points when loading the AD75 to the base unit (main base unit or extension base unit):

(1) Do not load the AD75 to an extension base without a power supply module (A5[ ]B/A1S5[ ]B(S1)). When connecting it, consider the power supply capacity, voltage drop in the extension cable, etc.

(2) If the board temperature exceeds 55 °C, consider forced ventilation of the PC CPU board.

### 4.3.3 Mounting/removing the module

This section explains how to mount the AD75 in the base unit, and how to remove it.

(1) Mounting/removing the AD75P[ ].

(a) Mounting the module

The procedure for mounting the module is as follows:

| ⚠ CAUTION |
|---|
| (1) To mount the module in a base unit, first insert the module fixing projections into the module fixing hole.<br>Incorrect insertion of the module may result in malfunction, failure, or the module falling out. |
| (2) Turn the power supply OFF before mounting the module.<br>Installation with the power on could result in failure or malfunction of the module. |

Insert the two module fixing projections into module fixing hole (B) of the base unit.

↓

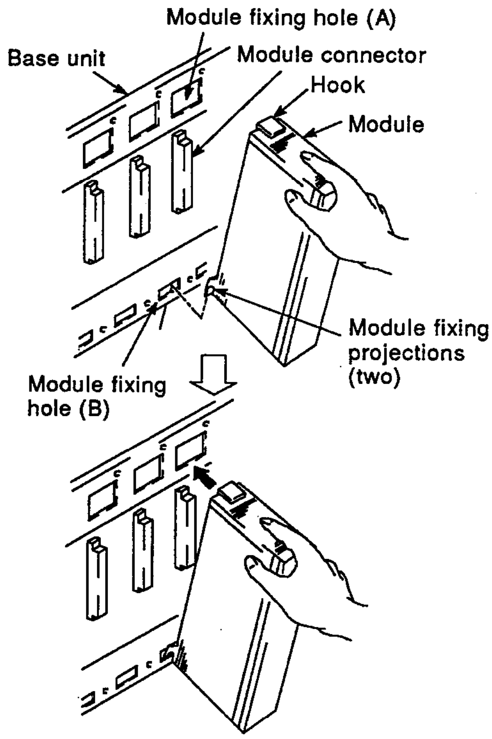
Push the module in the direction indicated by the arrow to load it in the base unit.

↓

Confirm that the module hook is inserted in module fixing hole (A) of the base unit.

↓

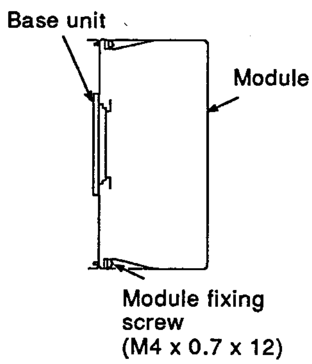
End




**POINTS**

(1) Forcibly installing the module without inserting the module fixing projections into module fixing hole (B) may bend the module connector pins or damage the module.

(2) If the module is used in a location subject to a lot of vibration, secure the module to the base with screws.
The user must prepare the screws (M4 x 0.7 x 12).
(Tightening torque range: 78 to 118 N·cm
(8 to 12 kg·cm):[6.9 to 10.4b·inch])
The mounting method is shown on the right.



(b) Removing the module

The procedure for removing the module is as follows:

**⚠ CAUTION**

Turn off power before removing the module.
Removal with the power on may result in failure or malfunction of the module.

Hold the module with both hands and push the hook at the top of the module with your finger as far as it will go.

↓

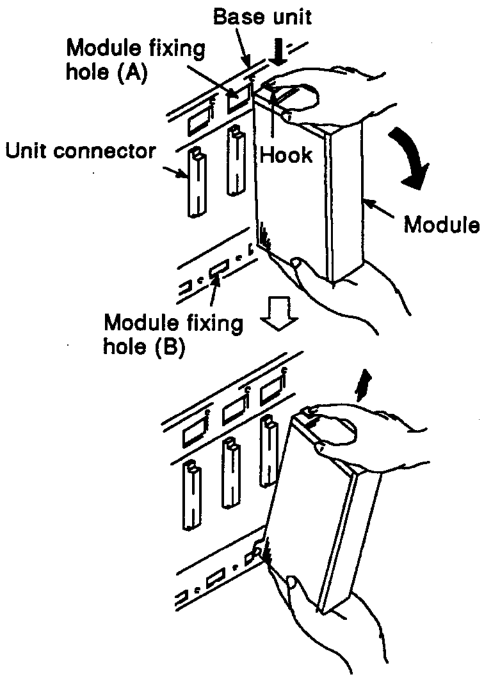
Pull the module toward you, using the bottom of the module as a support point, while holding the hook in the same position.

↓

Lift the module upward to remove the module fixing projections from module fixing hole (B).

↓

End




**POINT**

Remove the hook from module fixing hole (A), then remove the module fixing projections from module fixing hole (B).
Forced removal of the module may damage the hook or module fixing projections.

(2) Mounting/removing the AISD75P[ ].

(a) Mounting the module

The procedure for mounting the module is as follows:

**⚠ CAUTION**

(1) To mount the module in a base unit, first insert the module fixing projections into the module fixing hole.
Incorrect insertion of the module may result in malfunction, failure, or the module falling out.

(2) Turn the power supply OFF before mounting the module.
Installation with the power on could result in failure or malfunction of the module.

Insert the module fixing projections into the module fixing hole of the base unit.

↓

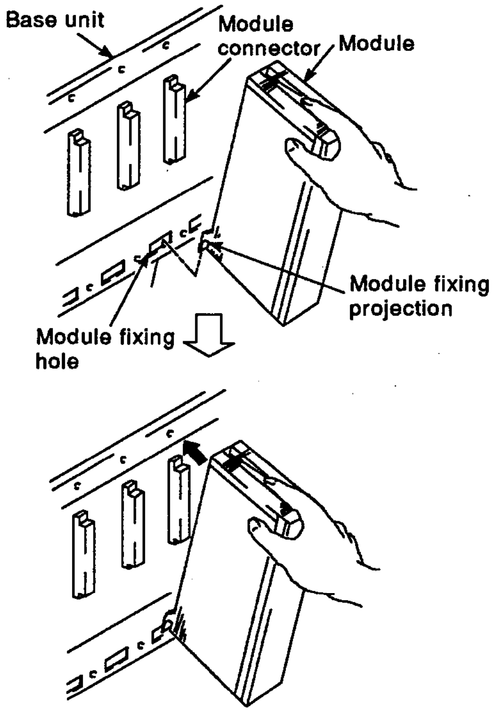
Push the module in the direction indicated by the arrow to load it in the base unit.

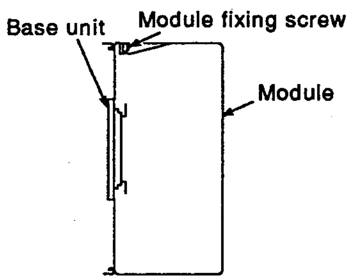
↓

Confirm that the module is correctly inserted in the base unit, then secure it with the module fixing screw.

↓

End




**POINT**

Attempting to mount the module without inserting the fixing projections into module fixing hole (B) may damage the module connector and module.

(b) Removing the module

The procedure for removing the module is as follows:

| ⚠ CAUTION |
|---|
| Turn off power before removing the module.<br>Removal with the power on may result in failure or malfunction of the module. |

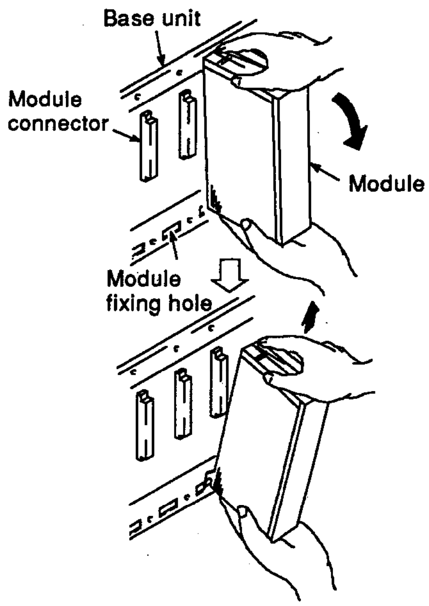
Remove the module fixing screw and pull the top of the module toward you, using the bottom of the module as a support point.

↓

Lift the module upward to remove the module fixing projections from module fixing hole.

↓

End

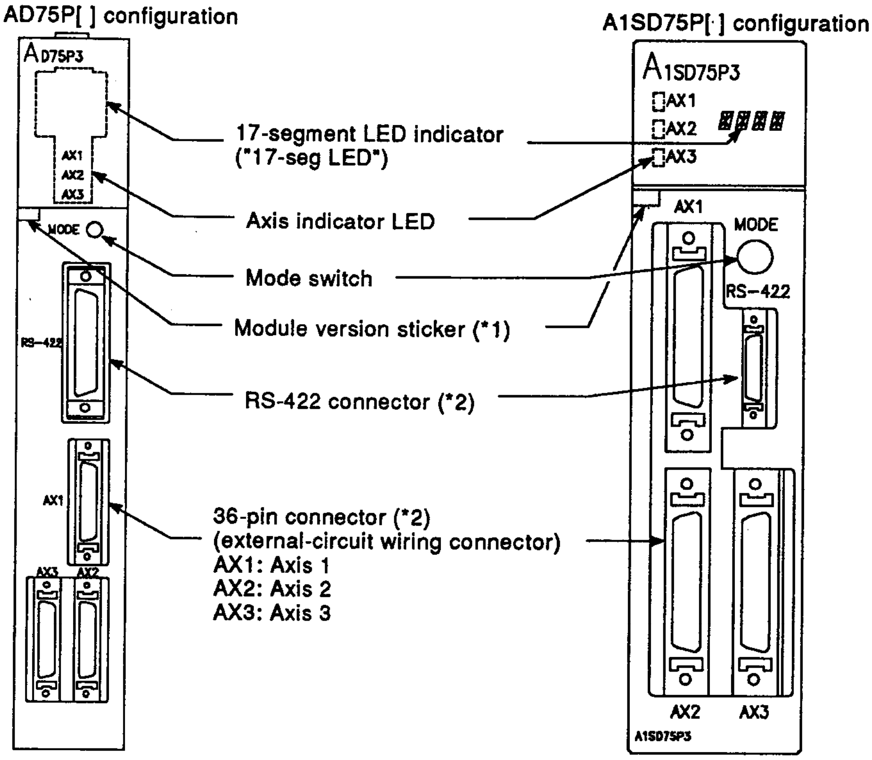



**POINT**

Remove the module fixing screw from the module, then remove the module fixing projections from the module fixing hole.
Forced removal of the module may damage the module fixing projections.

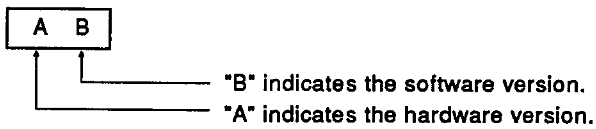
## 4.4 Part Names

The names of each part of the AD75 are indicated below:

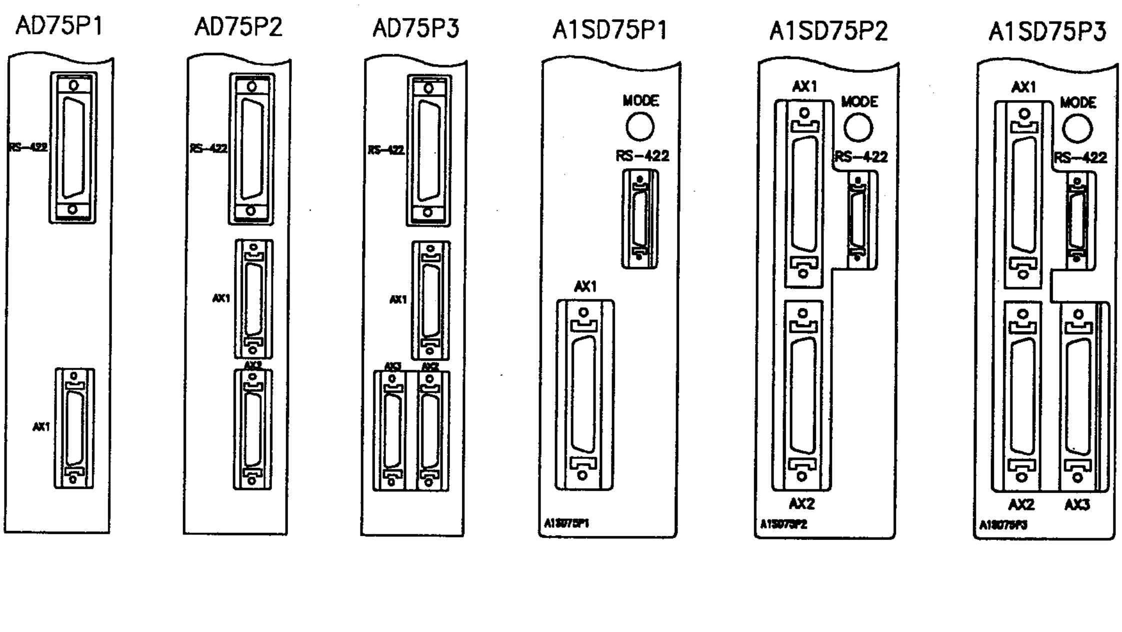



**REMARKS**

1) *1: Stickers for hardware version and software version of the module.
(Example)




2) *2: The interfaces of each AD75 are indicated below:



## 4.5 Wiring

This section describes the precautions when connecting wiring between the AD75 and external devices (including a drive unit), and how to use the external wiring connector.

### 4.5.1 Wiring precautions

The precautions when connecting wiring between the AD75 and external devices (including a drive unit) are described below.

(1) Length of connecting cable between the AD75 and drive unit

(a) The length of the connection cable between the AD75 and drive unit is 1 to 3 meters if using an open collector.
However, the distance depends on the drive unit specifications. Confirm the correct specifications of the drive unit.

(b) The length is a maximum of 30 meters if using a differential driver. If the AD75 and drive unit area long distance apart, use a differential driver.

(2) I/O signal wiring

(a) Do not bundle I/O signal wires with, or lay them close to, power lines or main circuit lines.

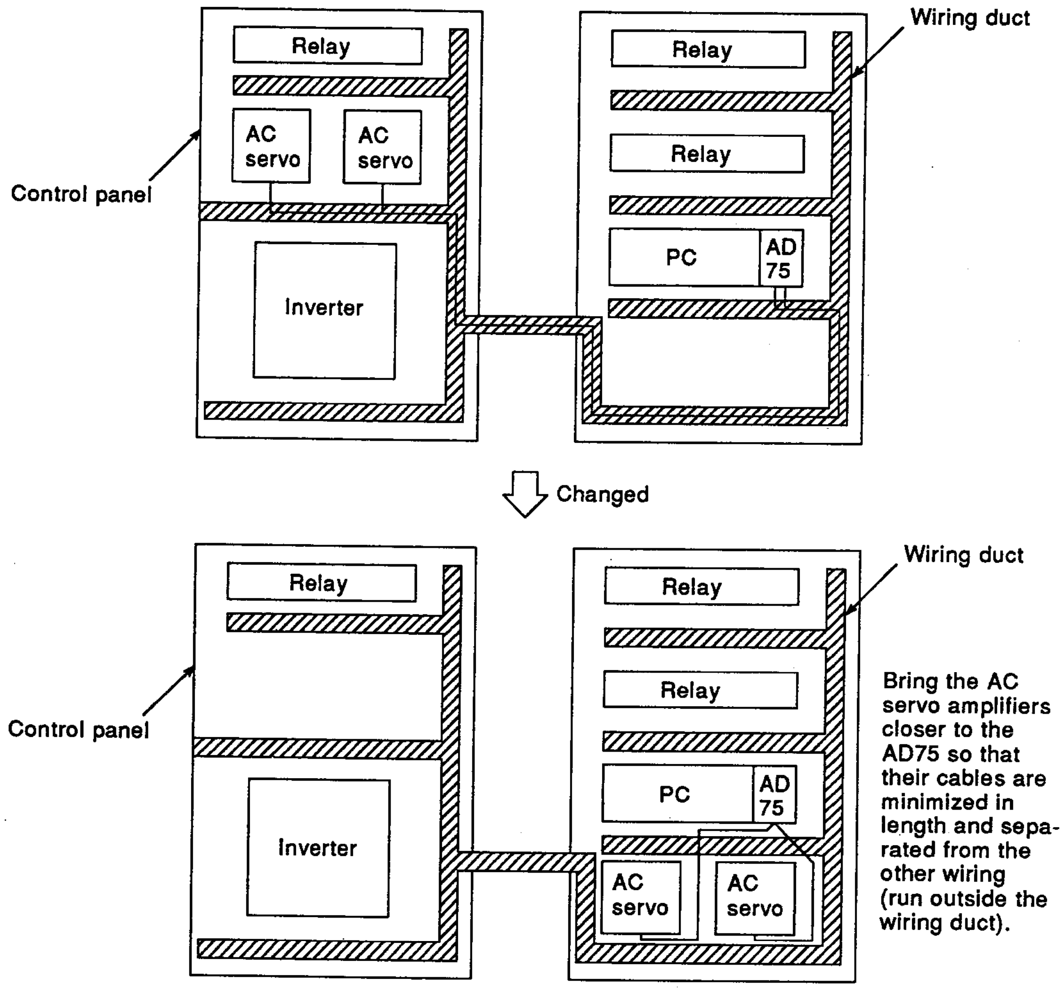
(b) If I/O signal wires have to be laid close to these lines, either use a partitioned duct or separate conduits.

(c) If there is no alternative but to bundle the cables together, use a shielded cable and ground its shielding at the PC CPU side.

(d) If conduits are used for wiring, ground the conduits.

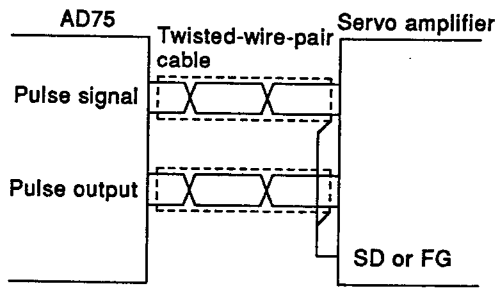
(e) If the connecting cable is too long, or is too close to a main circuit line, malfunctions could occur due to noise.

Examples (bad example at the top, good example at the bottom)




**REMARK**

In environments where noise is likely to cause a problem in the wiring between the AD75 and servo amplifier, use shielded twisted-wire-pair cable that is separate from other shielded cables for the wiring from the AD75 pulse train output terminals.



### 4.5.2 External wiring connector disassembly/assembly procedure

For the external wiring connectors have the interface components for external connection of the module packaged with them.
When connecting signal lines, disassemble the connector as shown below.
The disassembly and assembly procedures are as follows:

(1) Loosen the two screws, and remove them.
(Be sure that screws and nuts do not get lost.)

(2) Open the connector cover from the connector side, and remove it by pulling backward.

(3) Take out the cable clamp and loosen the screw.

(4) Pass the signal cable through the cable clamp.

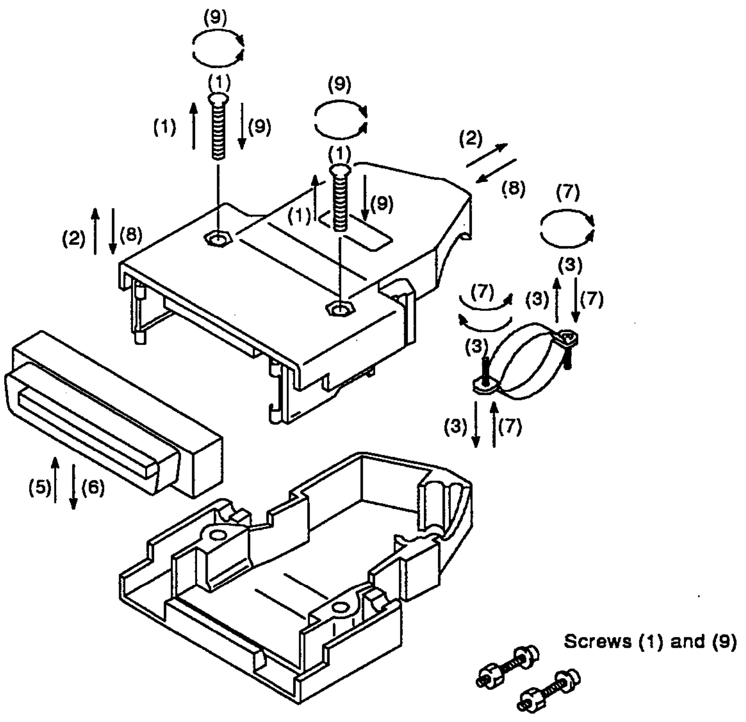
(5) Take out the part to which the connections are made and connect each wire of the signal cable. (For the connecting procedure, see Section 4.5.3.)

(6) Put the part to which connections are made back inside one half of the connector cover.

(7) Fasten the screws of the cable clamp and replace it at the position in the connector cover (the same half as in (6) above) from which it was removed.
If the presser of the cable clamp does not contact the cable properly, wrap the cable with insulating tape so that it can be clamped better.

(8) Replace the half of the cover that was removed by pulling it back-end first onto the other half.

(9) Replace and tighten the screws.



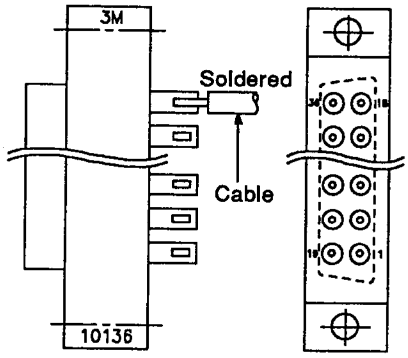
### 4.5.3 Connecting signal wires

The connector pin wiring is shown below. Connect in accordance with the I/O arrangement and numbers (see Section 3.2.2).

(1) Use AWG#24 to #30 wires (approx. 0.2 to 0.05 SQ).

(2) Solder the wires to the pins. Remove the wire insulation carefully. Be careful not to cause a short circuit due to a wire strand or solder whisker.

(3) Secure the electric wire in the cable clamp, making sure that no tension is applied to the wire connections.
If the presser of the cable clamp does not contact the cable properly, wrap the cable with insulating tape so that it can be clamped better.




Pin arrangement viewed from the above.
The connector pin numbers in the figure to the left are as follows:
- Right ... 1 to 18 from the bottom
- Left ..... 19 to 36 from the bottom

## 4.6 System Test (Operation Monitor)

This section explains how to check whether the AD75 is operating normally or not at the AD75 itself.
This test can be executed even when no sequence program is stored in the ACPU, or no data is stored in the AD75, or when the AD75 is operating.

Connect the AD75, drive unit, motor and external device before starting the test.

"Mode switch", "17-segment LED" and "axis indicator LED" in the test description are references to the switches/LEDs of the AD75.

Step 1: Power ON

(1) Set the ACPU to STOP.
(If the AD75 is installed at a remote station, set the master station to STOP.)

(2) Turn on the power of the ACPU (or the station at which the AD75 is installed and the master station if the AD75 is installed at a remote station), the drive unit connected to the AD75, and the motor.

(3) The OS type of the AD75 ["S000" is the same as the display in step 4] is displayed in the 17-segment LED for one second.

(4) After one second, the display is switched to operation monitor 1 described in Step 2.

Step 2: Operation monitor 1

(1) One of the following items is displayed in the 17-segment LED and axis indicator LED according to the AD75 conditions.

| AD75 Status | 17-segment LED | Axis Indicator LED for Each Axis |
|---|---|---|
| Operation in progress | RUN | Displays the BUSY signal status of the relevant axis. |
| Test mode effective | TEST | Light ON: BUSY signal is turned ON. |
| Stand-by | IDL | Light OFF: BUSY signal is turned OFF. |
| Error | ERR | LED of axis subject to error comes ON. |

(2) When mode switch is pressed, the display is switched to operation monitor 2 described in step 3.

Step 3: Operation monitor 2

(1) The axis indicator LEDs for each axis are turned ON at approximately 0.5-second intervals in the following order.
In addition, the status of the axis for which the axis indicator LED is ON is indicated on the 17-segment LED.

| Axis Conditions | 17-segment LED | Remarks |
|---|---|---|
| Stand-by | IDLE | • Status when power is turned on/off. |
| Stopped | STOP | • Temporary stop status of positioning operation. |
| JOG operation in progress | JOG | —— |
| Manual pulse generator operation in progress | MANP | |
| Home position return in progress | OPR | |
| Position control in progress | POSI | |
| Speed control in progress | VELO | |
| Speed control part of speed/position switching control in progress | V-P | |
| Position control part of speed/position switching control in progress | V-P | |
| Wait status | BUSY | • Wait status of execution by condition designation |
| Error | E*** | • The error code is displayed at the part indicated here by ***. For details on error codes, see Chapter 13. |

(2) When the mode switch is pressed, the condition is switched to internal information monitor 1, which is described in step 4.

Step 4: Internal information 1 monitor

(1) The OS type of the AD75 ("S000") is displayed in the 17-segment LED. Use this as a reference.

(2) The axis indicator LEDs for each axis are turned off.

(3) When the mode switch is pressed, the condition monitor is switched to internal information 2, which is described in step 5.

Step 5: Internal information 2 monitor

(1) The OS version of the AD75 is displayed in the 17-segment LED. Use this as a reference.

"V000"
Version

(2) The axis indicator LED for each axis is turned off.

(3) When the mode switch is pressed, the condition is switched to the input/output information monitor n, which is described in step 6.

Step 6: Input/output information n monitor

(1) Repeatedly pressing the mode switch displays the following I/O signal names in the 17-segment LED in the order indicated below.

(2) The signal status of each axis indicated on the 17-segment LED is displayed by the axis indicator LED for each axis.

- When the signal is ON ... The axis indicator LED is turned on.
- When the signal is OFF .. The axis indicator LED is turned off.

| 17-segment LED | I/O Signal Name | Remark |
|---|---|---|
| "SVON" | Drive unit READY signal (servo ON signal) | Every time the mode switch is pressed, the next signal in the series is indicated. |
| "Z-ON" | Zero point signal | |
| "ULMT" | Upper limit signal | |
| "LLMT" | Lower limit signal | |
| "V-P" | Speed/position switching signal | |
| "DOG" | Near-zero point signal | |

Step 7: Switching to operation monitor 1/end of operation monitoring

(1) When the mode switch is pressed, the status returns to operation monitor 1 of step 2.
The operation monitoring from step 2 to step 6 can be repeated by successively pressing the mode switch.

(2) To end operation monitoring, set any required monitor status from step 2 to step 6.

**POINTS**

(1) The operation monitor function described in this section can be used at any time to check the AD75 status, control status of each axis, and I/O signal status.

(2) Use the operation monitor function when the AD75 is not operating normally, and whenever else it becomes necessary.

(3) In addition to the 17-segment LED displays indicated above, the "FALT" will be displayed if a watchdog timer error occurs at the AD75.
If a watchdog timer error occurs at the AD75, the ACPU must be reset.
If a watchdog timer error still occurs on the AD75 after the ACPU has been reset, the AD75 module must be replaced.
In this case, please contact your nearest Mitsubishi representative.

# 5. CONFIGURATION OF POSITIONING PROGRAMS

This chapter describes the program configuration when creating an AD75 positioning program, and the programs required to execute positioning from the ACPU.

## 5.1 Program Configuration

The program configuration that can be used when writing the AD75 positioning program is covered here. Compose the program using the required program parts by referring to the relevant reference sections.
Table 5.1 shows the applications of the I/O signals (X,Y), internal relays (M) and data registers (D) which appear in the program examples.

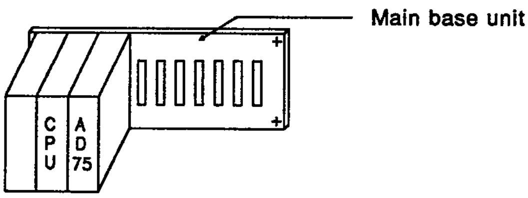
**Table 5.1. Devices Used in Program Examples**

| Device Name | Device | | | Application | Bit Device: Status when ON<br>Data Register: Stored Data |
|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | |
| Inputs | X0 | | | AD75 READY | Not ready/WDT error |
| | X4 | X5 | X6 | BUSY | BUSY (operation in progress) |
| | XA | XB | XC | Error detection | Error detected |
| Outputs | Y10 | Y11 | Y12 | Positioning start | Start being requested |
| | Y13 | Y14 | Y1C | Axis stop | Stop being requested |
| | Y16 | Y18 | Y1A | Forward JOG start | Forward start in progress |
| | Y17 | Y19 | Y1B | Reverse JOG start | Reverse start in progress |
| | Y1D | | | PC READY | PC CPU normal |
| Internal relays | M0 | | | Parameter setting completed flag | Setting complete |
| | M1 | | | Flash ROM register processing in progress flag | Processing in progress |
| | M2 | M3 | M4 | Axis error reset request in progress flag | Request being made |
| | M101 | | | Initial error reset completed flag | Error reset completed |
| | M102 | | | All BUSY signal OFF flag | All BUSY signals OFF |
| | M103 | | | AD75 operation enabled flag | Operation possible |
| Data registers | D100 | | | Flash ROM registration result | Registered result |
| | D101 | D102 | D103 | Axis error code | Error code |
| | D104 | D105 | D106 | Axis warning code | Warning code |
| | D107 | D108 | D109 | Axis error reset result. | Axis error reset result |

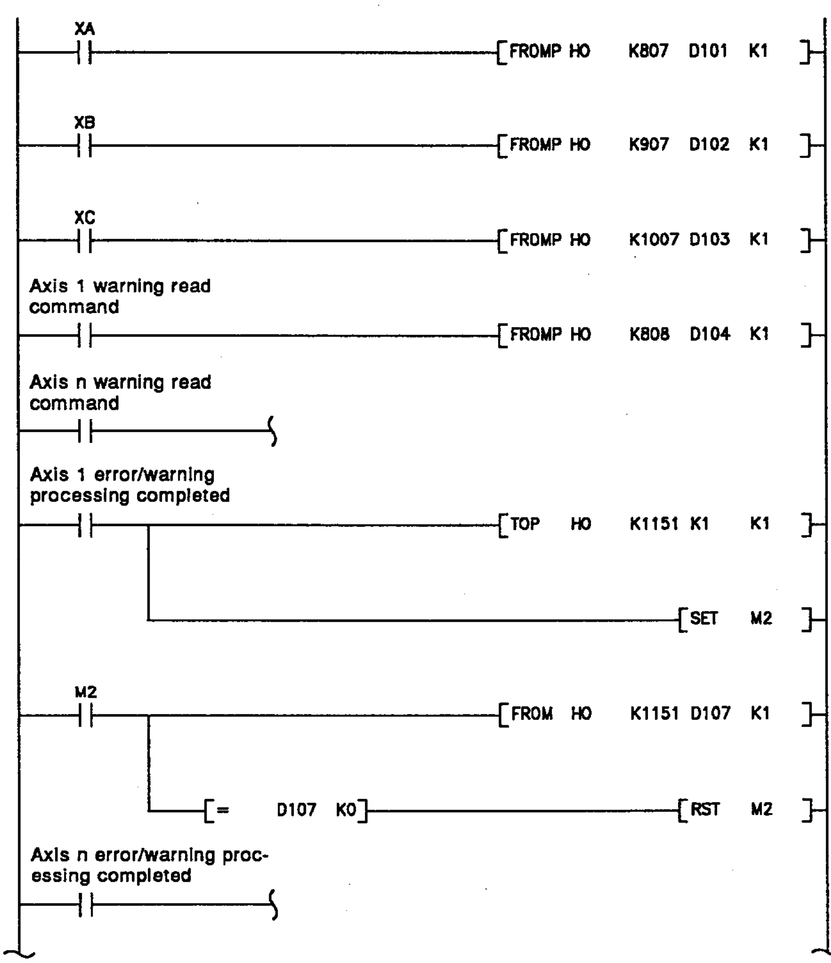
**REMARK**

Unless otherwise specified, the sequence programs in this section comply with the following conditions.

- CPU module : A3UCPU
- I/O signals of the AD75: X/Y00$_H$ to X/Y1F$_H$ (when the AD75 is set in slot 0 of the main base unit.)



[Program examples]




Read axis error codes for axes where errors occur, and process the errors (See Chapter 13).

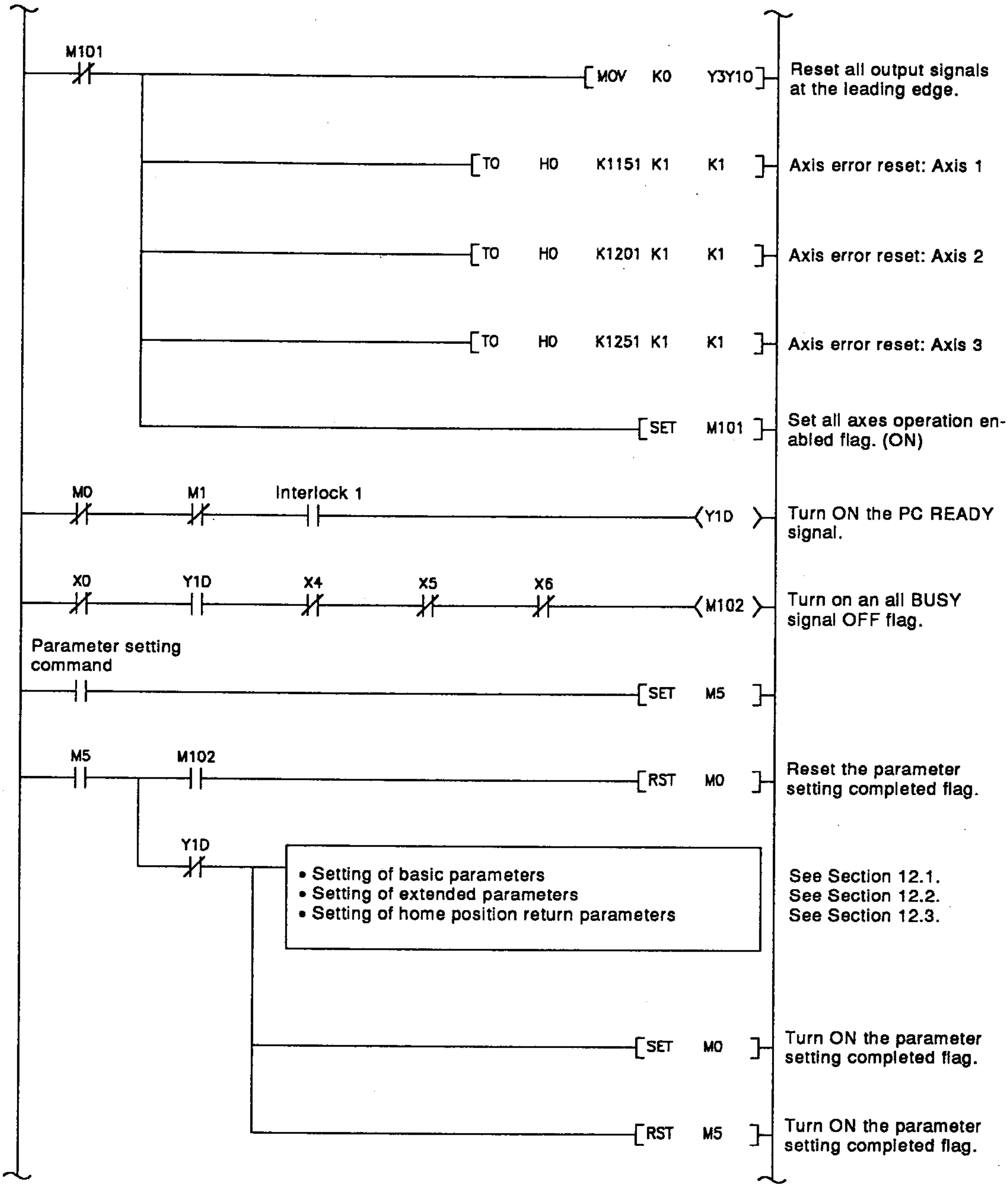
Read the axis warning code of Axis 1, and execute processing when a warning occurs. (See Chapter 13)

The same processing as above is performed for axis 2 and axis 3.

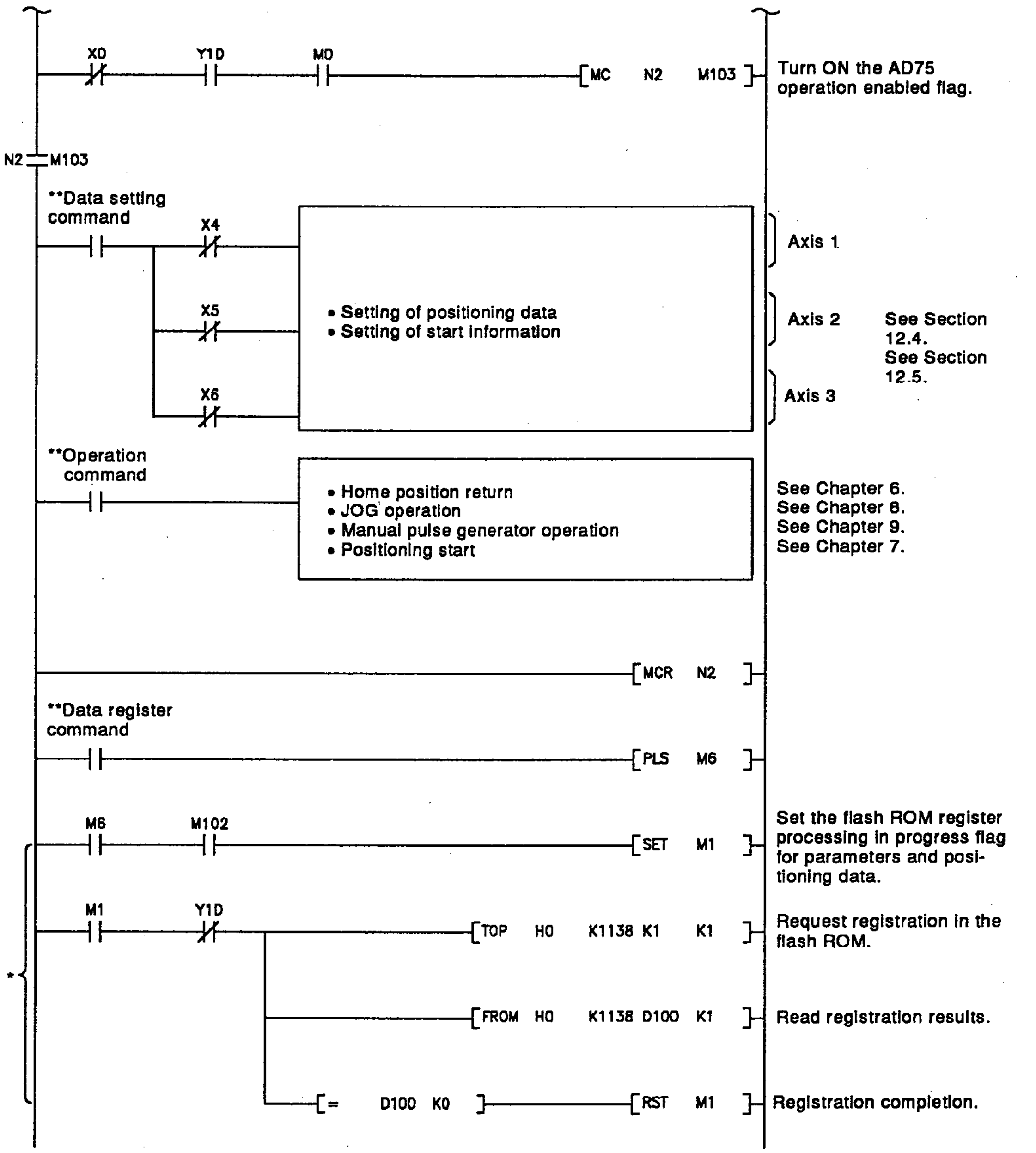
Request an axis error reset for Axis 1. (error code, warning code reset)

Confirm that acceptance of axis error reset request is completed.

The same processing as above is performed for axis 2 and axis 3.



M101
[MOV K0 Y3Y10]
Reset all output signals at the leading edge.
[TO H0 K1151 K1 K1]
Axis error reset: Axis 1
[TO H0 K1201 K1 K1]
Axis error reset: Axis 2
[TO H0 K1251 K1 K1]
Axis error reset: Axis 3
[SET M101]
Set all axes operation enabled flag. (ON)
M0
M1
Interlock 1
(Y1D)
Turn ON the PC READY signal.
X0
Y1D
X4
X5
X6
(M102)
Turn on an all BUSY signal OFF flag.
Parameter setting command
[SET M5]
M5
M102
[RST M0]
Reset the parameter setting completed flag.
Y1D
• Setting of basic parameters
• Setting of extended parameters
• Setting of home position return parameters
See Section 12.1.
See Section 12.2.
See Section 12.3.
[SET M0]
Turn ON the parameter setting completed flag.
[RST M5]
Turn ON the parameter setting completed flag.




**REMARK**

* : This is a program for storing data set at the programmable controller-such as the basic parameters, extended parameters, home position return parameters, positioning data, etc. -to the flash ROM.
This program is not necessary if the above data is written to the AD75 by a sequence program when the programmable controller power comes ON.

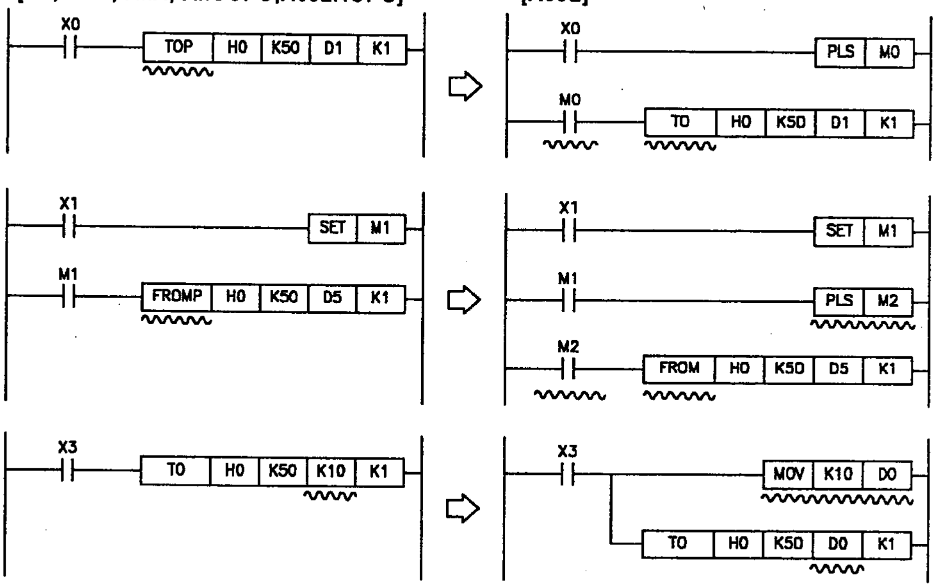
## 5.2 Notes on Writing Programs

Some general notes on writing data from the ACPU to the AD75 buffer memory are presented below.

(1) With regard to the data setting described in this section, Mitsubishi recommends that the various parameters, positioning data and positioning start information should, as far as possible, be set at the AD75P.
If these data are set in a sequence program, the program will be large and many devices will be used, making programming complicated and increasing scan time.

(2) Programming with A0J2CPU
There are some commands which cannot be used, for example TOP/FROMP, if the AD75 is used with A0J2CPU.
If using A0J2CPU, make the following changes:

[An, AnN, AnA, AnUCPU,A0J2HCPU] [A0J2]




(3) Restriction on the number of FROM/TO command executions

(a) The number of FROM/TO command executions possible for axes subject to positioning control by the AD75 is limited to one execution (32-bit data) per scan per axis.
Communications between the ACPU and the AD75 should be performed by using one FROM/TO command per scan per axis.

(b) Restriction relating to speed change execution intervals
An interval of at least 100 ms is recommended between speed changes executed at the AD75.

# MEMO

# 6. HOME POSITION RETURN PROGRAMS

Home position return is the positioning control performed when the machine home position needs to be confirmed, for example when the power is turned ON. It can be executed from the ACPU or the AD75P.

Set home position return parameters including the home position return method for each axis, home position return directions and home position return addresses, and execute home position return using whichever of the following two start methods is suitable for the positioning system configuration:

- Machine home position return start ..... Start positioning data No.9001 in the positioning operation to execute a home position return using the set control method.
- High-speed home position return start... Start positioning data No.9002 in the positioning operation to start axis motion that continues until the machine feed value coincides with the home position address, without using a home position detection signal.

This section describes the method for executing home position return from the ACPU using a sequence program. For details on home position return executed from the AD75P, refer to the Operating Manual for the AD75P.

**POINT**

The high-speed home position return start is the same as a positioning operation to the home position. High-speed home position return is only possible after the home position has been established by a machine home position return.

## 6.1 Parameter Settings Required For Home Position Return

Home position return is performed by using one of the six methods described in Section 3.3.8. This section describes the parameters that must be set in order to execute home position return.

**POINTS**

(1) Home position return parameters, basic parameters, and detailed parameters must be set for the AD75 so that home position return can be executed. Check that the home position return parameters, basic parameters and detailed parameters indicated in this section have been set at the AD75 before attempting to execute home position return.

(2) For details on setting parameters at the AD75P, refer to the AD75P Operating Manual.

**Table 6.1 Home Position Return Parameters (Basic and Extended)**

| Items to be Set | Buffer Memory | | | Description of Setting Items | References | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Details of Settings | Setting Values | | Sequence Program Setting Method |
| | Axis 1 | Axis 2 | Axis 3 | | | Sequence Program | AD75P | |
| Home position return method | 70 | 220 | 370 | Sets the home position return method. | Section 3.3.8. Section 3.4.3. | Section 3.6.2 (5). | Section 3.4.3. | Section 12.4. |
| Home position return direction | 71 | 221 | 371 | Sets the home position return direction. | | | | |
| Home position return address | 72<br>73 | 222<br>223 | 372<br>373 | Sets the present value of the home position when home position return is finished. | | | | |
| Home position return speed | 74<br>75 | 224<br>225 | 374<br>375 | Sets the speed for home position return. | | | | |
| Creep speed | 76<br>77 | 226<br>227 | 376<br>377 | Sets the creep speed after the near-zero point dog is turned ON. | | | | |
| Home position return retry | 78 | 228 | 378 | Sets whether home position return retry is to be executed or not using the upper/lower limit switches. | | | | |
| Home position return dwell time | 79 | 229 | 379 | Set the time between turning ON of the near-zero point dog and completion of home position return. | | | | |
| Travel value after near-zero point dog setting | 80<br>81 | 230<br>231 | 380<br>381 | Sets the travel value after the near-zero point dog is turned ON. | | | | |
| Selection of home position return acceleration time | 82 | 232 | 382 | Set which acceleration time (of 0 to 3) set in the basic parameters and detailed parameters, is to be used for home position return. | | | | |
| Selection of home position return deceleration time | 83 | 233 | 383 | Set which acceleration time (of 0 to 3) set in the basic parameters and detailed parameters, is to be used for home position return. | | | | |
| Home position shift amount | 84<br>85 | 234<br>235 | 384<br>385 | Set the shift amount from detection of the zero-point signal to the home position. | | | | |
| Home position return torque limit value | 86 | 236 | 386 | Set a value to limit the torque of the servomotor after it reaches creep speed. | | | | |

## 6.2 Buffer Memory for Monitoring Home Position Return

The monitored items whose status is stored in the buffer memory on execution of a home position return are shown here. Whenever necessary, check these statuses by reading them from the buffer memory.

**Table 6.2 Buffer Memory for Monitor List**

| Monitored Items | Buffer Memory Address | | | Description of Monitored Items | References |
|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | |
| External I/O signal | 816 | 916 | 1016 | Stores ON/OFF status of external I/O signals. | Section 3.6.3 (2). |
| Status | 817 | 917 | 1017 | Stores ON/OFF status of the flags that the AD75 handles. | |
| Absolute original point | 822<br>823 | 922<br>923 | 1022<br>1023 | Stores the parameter home position address value when home position return is completed. | |
| Travel value after the near-zero point dog is turned ON | 824<br>825 | 924<br>925 | 1024<br>1025 | Stores 0 when the home position return is started.<br>Stores the travel value between the turning ON of the near-zero point dog and completion of home position return. | |

## 6.3 Programming

Sequence programming for executing a home position return from the ACPU is described here.

### 6.3.1 Home Position Return Start Programs

An example of a program for starting a home position return in response to a machine home position return request from the ACPU is presented below.

(1) Conditions

- Set the basic parameters, detailed parameters and parameters for home position return in advance.
- If necessary, set clock data in advance.
- Start the program when the home position return completed flag and the positioning start signal are OFF.

(2) Program example

- The program in this example requests a home position return start for axis 1.

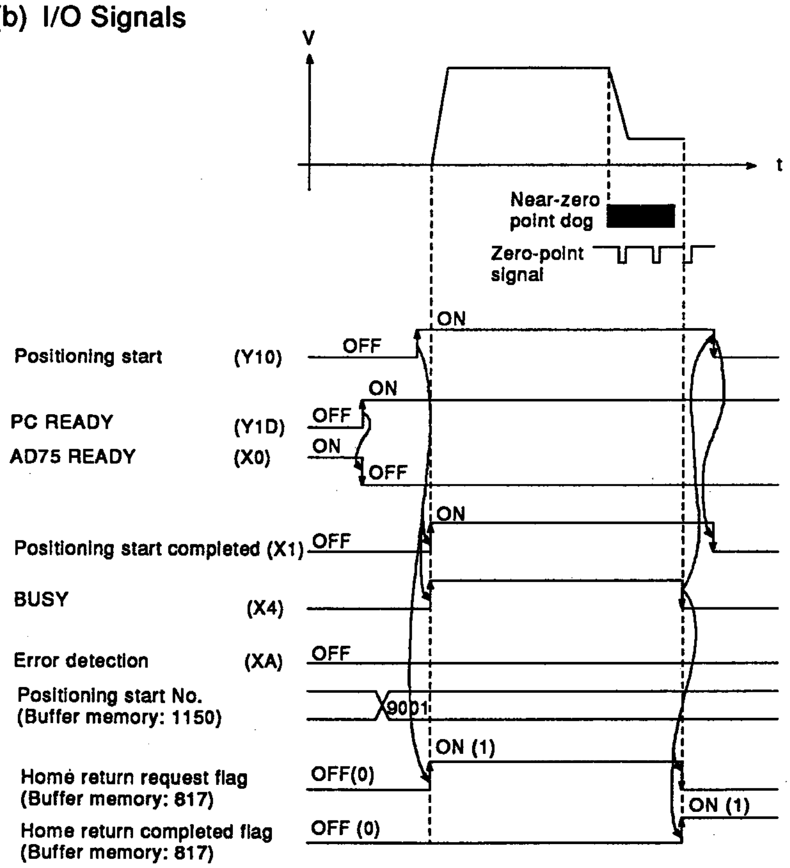
(a) Data transfer

AD75 buffer memory

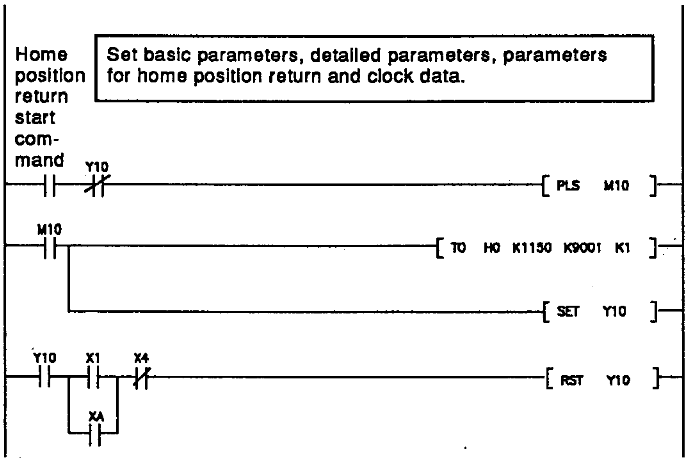
9001 (machine home position return start) ——→ Address 1150 | Positioning start number |

(For details on start numbers, see Section 3.3.8)

(b) I/O Signals



(c) Program




See Section 12.

Convert the home position return command to a pulse.

Write positioning data No.9001 for home position return start.

Turn ON the positioning start signal.

Turn OFF the start signal when home position return is completed.

**POINTS**

(1) The only difference between a home position return sequence program and a positioning start sequence program is the data No. at the start; otherwise they are the same.

Home position return start data No. : 9001

Positioning start data Nos. : 1 to 600, 8001 to 8050 (for indirect designation)

(2) Before executing home position return, check the home position return operation, and restrictions that apply, for the method set in the home position return parameters, and the home position start method, by referring to Section 3.3.8.

(3) After confirming that home position return is executed and completed normally, you are recommended to register the home position return parameters including the home position address in the AD75 flash ROM.

### 6.3.2 High-speed home position return start program

An example of a start program for executing a high-speed home position return from the ACPU is presented below.

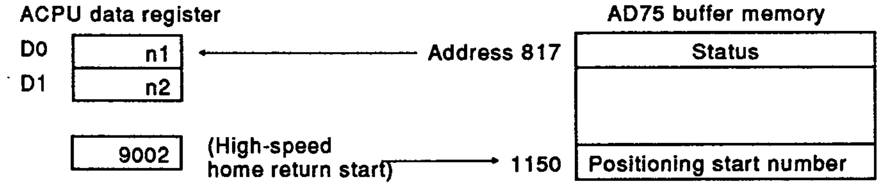
(1) Conditions

- Establish the home position by executing a home position return. In a situation just after a machine present value underflow or overflow has occurred during speed control, execute another machine home position return before executing high-speed home position return.
- Be sure to start the program when the home position return request flag and positioning start signal are turned OFF.

(2) Program example

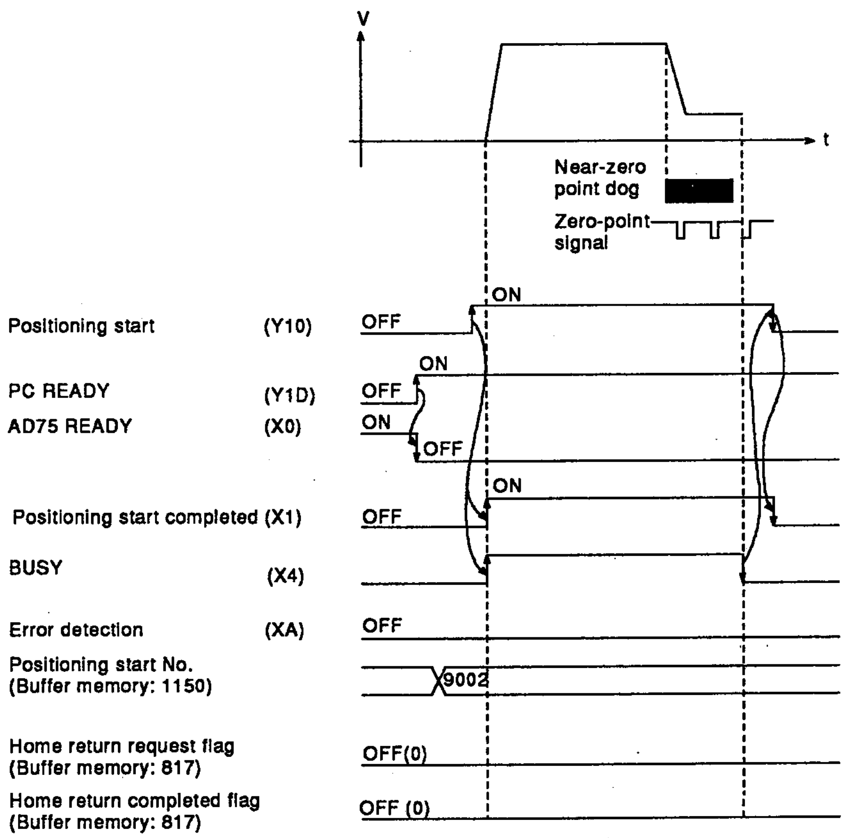
- The program in this example requests a high-speed home position return start for the first axis.

(a) Data transfer

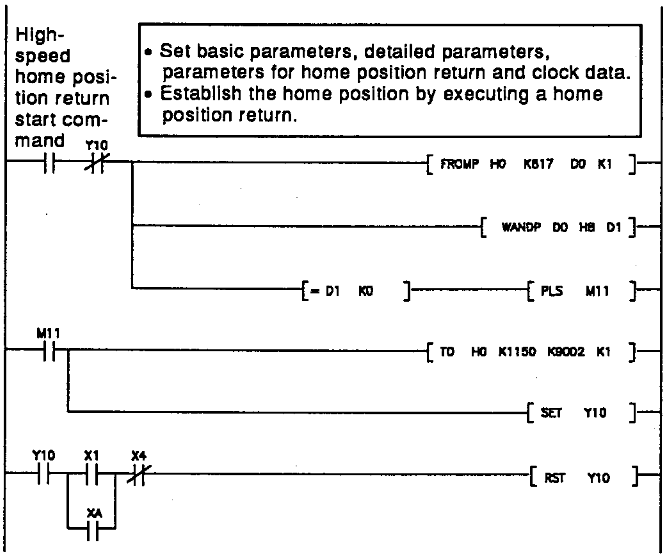



(For the start number, see Section 3.3.8.)

(b) I/O signals



(c) Program




See Chapter 12.

See Sections 3.3.8 and 6.3.1.

Reads the status of axis 1.

Checks if the home position return request flag

Writes positioning data No.9002 for high-speed home position start.

Turns on the positioning start signal.

Turns off the start signal when the BUSY signal is turned OFF.

**POINTS**

(1) The only difference between a high-speed home position return sequence program and a positioning start sequence program is the data No. at the start; otherwise they are the same.

- High-speed home position return start data No. : 9002
- Positioning start data Nos. : 1 to 600, 8001 to 8050 (for indirect designation)

(2) High-speed home position return start is the positioning for traveling to the home position at high speed without using a home position detection signal, and it is executed by using the machine present value.
It is possible to start a high-speed home position return after the home position has been established by executing a machine home position return.

(3) Before executing high-speed home position return, check the high-speed home position return operation and restrictions that apply to it, and the high-speed home position start method, by referring to Section 3.3.8.

### 6.3.3 High-speed machine home position return program

An example of a program for executing a high-speed machine home position return from the ACPU is presented below.

(1) Conditions

- Set basic parameters, detailed parameters and parameters for home position return in advance.
- If necessary, set the clock data in advance.
- At the positioning data No. designated by the high-speed machine home position return request, register data other than positioning addresses in the AD75 flash ROM.

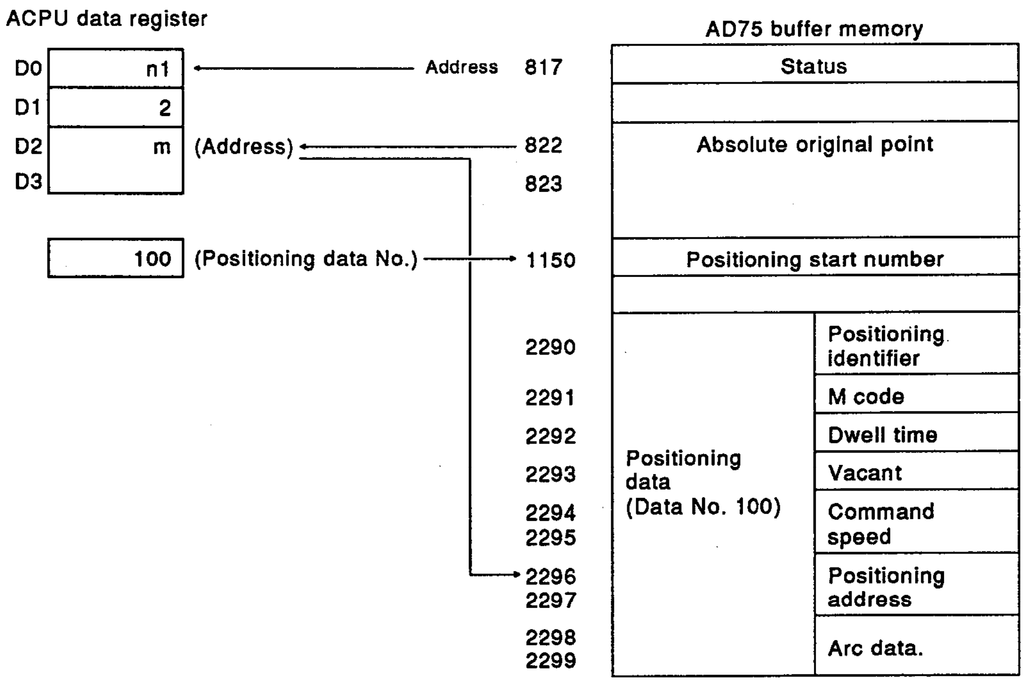
  Data No. 1 to 100 : Registered at the ACPU or the AD75P.
  Data No. 101 to 600 : Registered at the AD75P.

- Only start the program when the absolute home position overflow flag and underflow flag are OFF.

(2) Program example

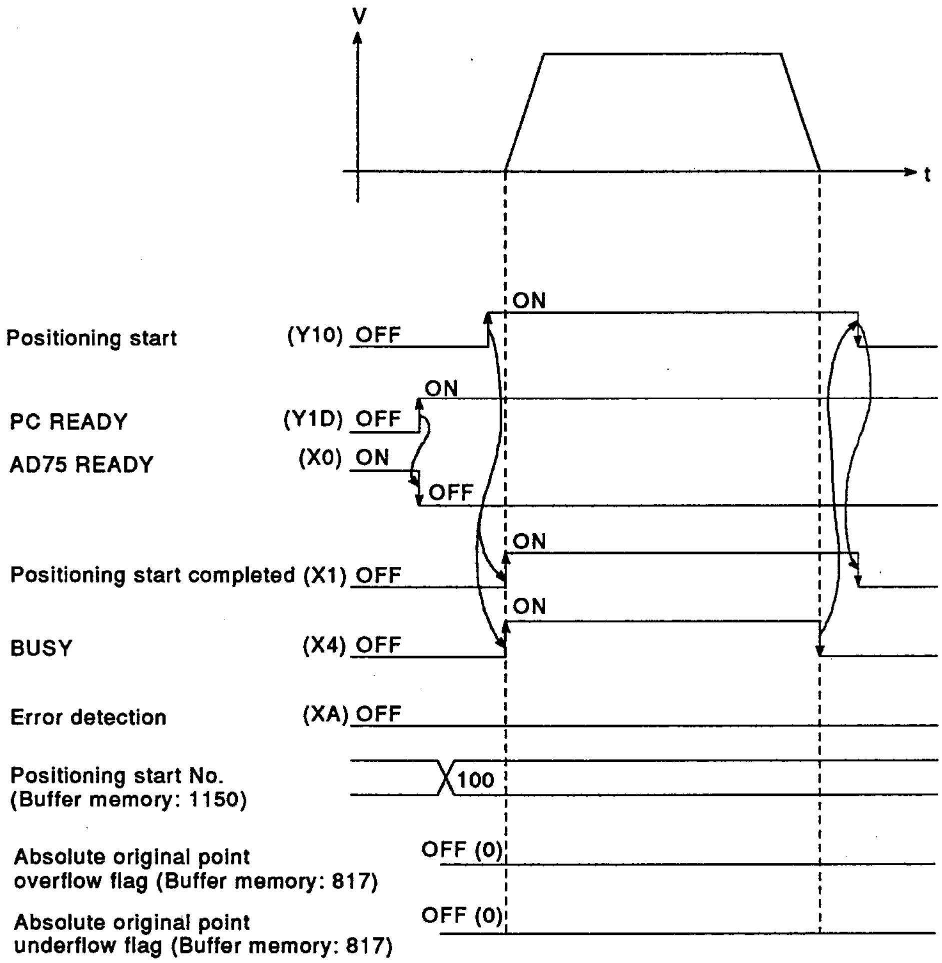
- The program in this example requests a high-speed machine home position return for axis 1 using data No.100.
  The value in the absolute home position storage area of the buffer memory is used for the positioning address of positioning data No. 100.

(a) Data transfer

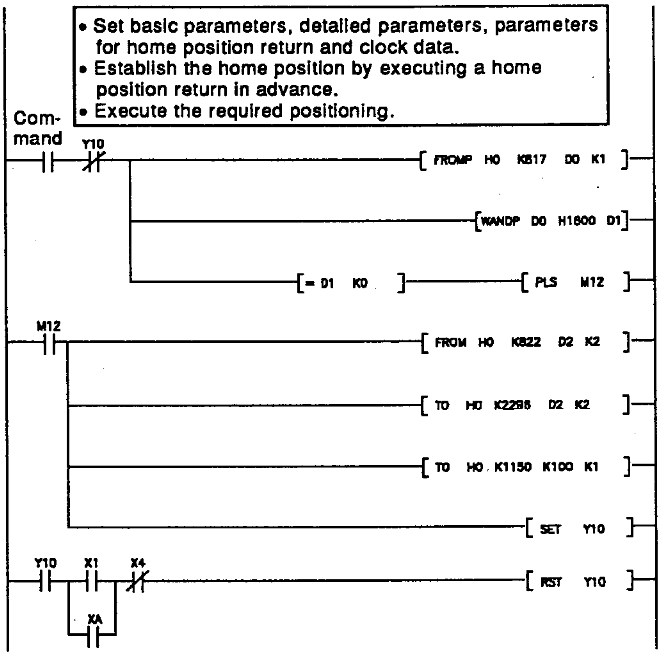



(For details on setting the positioning data, see Section 12.6)

(b) I/O signals


V
t
ON
Positioning start (Y10) OFF
ON
PC READY (Y1D) OFF
AD75 READY (X0) ON
OFF
ON
Positioning start completed (X1) OFF
ON
BUSY (X4) OFF
Error detection (XA) OFF
Positioning start No.
(Buffer memory: 1150)
100
Absolute original point
overflow flag (Buffer memory: 817)
OFF (0)
Absolute original point
underflow flag (Buffer memory: 817)
OFF (0)

(c) Program




See Chapter 12.
See Sections 3.3.8 and 6.3.1.
See Chapter 7.

Read status of axis 1.

Check if the over flag or the under flag is turned OFF.

Read the absolute original position of axis 1.

Write a positioning address to the data No.100 area.

Write the positioning data No.

Turn ON the positioning start signal.

Turn OFF the start signal when the BUSY signal is turned OFF.

**POINTS**

(1) High-speed machine home position return is a type of absolute positioning control that makes the value of the "absolute home position" of the buffer memory axis monitor the positioning address of the positioning data. Execution of a positioning program (ABS-1), by designating the positioning data No. which makes the value of the "absolute home position" the positioning address enables positioning to the absolute home position.

(2) On completion of positioning, the "absolute home position" becomes the home position address value in the parameters.

(3) Before executing high-speed home position return, check the high-speed home position return operation and restrictions that apply to it by referring to Section 3.3.8.

### 6.3.4 Home position return request flag OFF requesting program

An example of a program for forcing the home position return request flag (bit 3) of the status area (address:817, 917, 1017) of the AD75 buffer memory from ON to OFF from the ACPU is shown below.

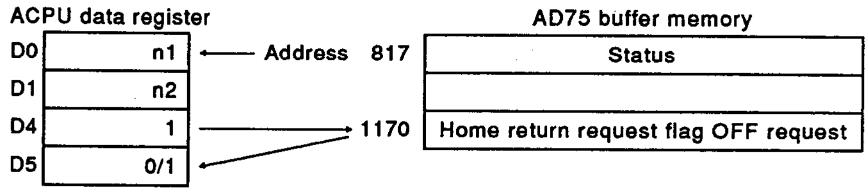
(1) Conditions

- Execute the program each time the home position return request flag (bit 3) is turned ON.

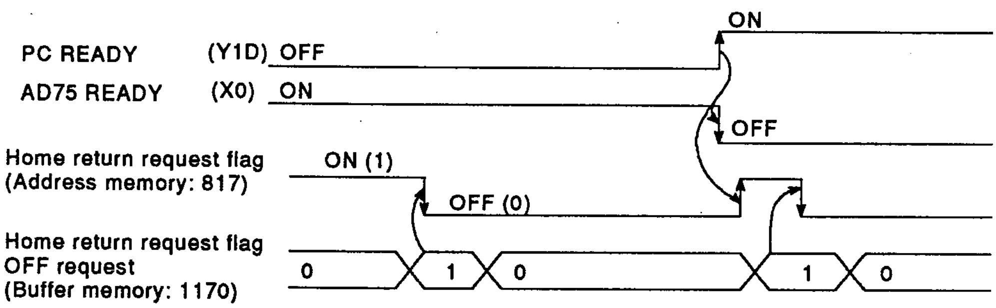
(2) Program example

- The program in this example forces the home position return request flag for axis 1 OFF.

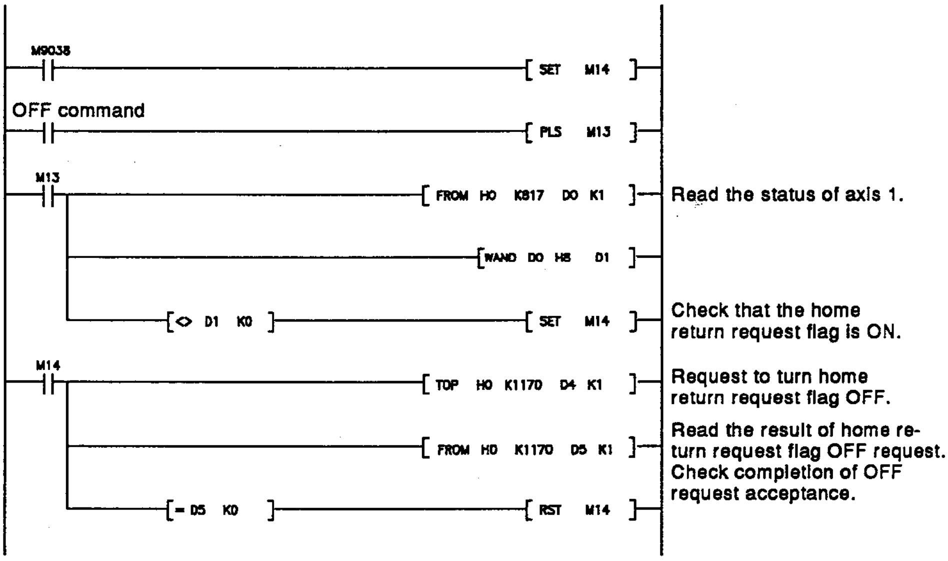
(a) Data transfer




(b) I/O signals



(c) Program




**POINT**

In a system which does not require home position return, execute the processing described in this section only to forcibly turn a home position return request flag from ON to OFF.
In a system which requires home position return, execute home position return when the home position return request flag is ON.

# 7. POSITIONING START

Positioning start is the start processing which positions the machine at the designated position in accordance with various parameters, positioning data and positioning start information pre-set in the AD75 by the user. The start can be executed from the ACPU or an external device.
Set the basic parameters, extended parameters, positioning data, and positioning start information for each axis according to the positioning system configuration. Then, designate the user-set positioning data No. for the positioning start, and execute the start.

This chapter describes the method for executing a positioning start using the basic parameters and extended parameters set in the AD75, positioning data, and positioning start information.

**POINTS**

(1) Positioning start is not possible when the AD75 is in the following statuses.
- Sequence ready signal (Y1D): OFF.
  (If a positioning start is executed from a peripheral device while the peripheral device is in the test mode, positioning start is possible regardless of whether the sequence ready signal is ON or OFF.)
- AD75 ready flag (X0): ON
- M code: ON

(2) If the relevant axis is BUSY when the positioning start is executed, the following happens:
- Currently operating axes continue operation.
- A "start during operation" warning (warning code: 100) is issued for the relevant axis.

**REMARK**

The difference between the positioning start methods when starting from the ACPU and starting from an external device is the method of input of the start signal to the AD75. The necessary parameters, positioning data and positioning start information are the same.

1) Starting from the ACPU:
- Turn ON the positioning start signal (Y10, Y11, and Y12).

2) Starting from an external device:
- Input the start signal via the external interface of the AD75.
- Set "External positioning start" for external start function selection (buffer memory address: 62, 212, and 362) in extended parameter #2.
- Set the external start valid setting (buffer memory address: 1171, 1221, and 1271) before starting.

## 7.1 Parameter, Positioning Data, and Start Information Settings Required for Positioning

Positioning is carried out using one of the three control methods described in Sections 3.3.1 through 3.3.5.

This section describes the settings of the basic parameters, extended parameters, positioning data and positioning start information required for positioning.

**POINTS**

(1) The basic parameters, extended parameters, and positioning data must be set to carry out positioning.
Carry out the positioning operation after checking the details of the parameters and positioning data described in this section and setting the AD75.

(2) For details on the method for setting parameters, positioning data, and positioning start information when using the AD75P, refer to the operating manual of the AD75P.

(1) Basic parameter

The table below shows the basic parameters to be set in the AD75 buffer memory.

| Items to be Set | Buffer Memory Address | | | Description of Setting Items | References | | | |
|---|---|---|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | Details of Settings | Setting Values | | Sequence Program Setting Method |
| | | | | | | Sequence Program | AD75P | |
| Unit setting | 0 | 150 | 300 | Set the command unit for positioning control. | Section 3.4.1. | Section 3.6.2 (1) and (2) | Section 3.4.1. | Section 12.2. |
| Number of pulses per revolution (Ap) | 1 | 151 | 301 | Set the number of pulses per revolution of the motor, which is determined by the mechanical system. | | | | |
| Travel value per revolution (Al) | 2 | 152 | 302 | Set the travel value per revolution of the motor, which is determined by the mechanical system. | | | | |
| Unit magnification (Am) | 3 | 153 | 303 | Set the magnification of the travel value per pulse. | | | | |
| Pulse output mode | 4 | 154 | 304 | Set in accordance with the drive unit. (PLS/SIGN, CW/CCW, phase A/B) | | | | |
| Rotational direction setting | 5 | 155 | 305 | Set the direction of rotation when the present value is increased. | | | | |
| Speed control limit | 6<br>7 | 156<br>157 | 306<br>307 | Set the maximum speed of positioning operation (including home position return) and manual pulse generator operation. | | | | |
| Acceleration time 0 | 8<br>9 | 158<br>159 | 308<br>309 | Set the time taken to reach the speed control limit from speed 0. | | | | |
| Deceleration time 0 | 10<br>11 | 160<br>161 | 310<br>311 | Set the time taken to reach speed 0 from the speed control limit. | | | | |

(2) Extended parameters

The table below shows the extended parameters to be set in the AD75 buffer memory.

| Items to be Set | Buffer Memory Address | | | Description of Setting Items | References | | | |
|---|---|---|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | Details of Settings | Setting Values: Sequence Program | Setting Values: AD75P | Sequence Program Setting Method |
| Backlash compensation amount | 15 | 165 | 315 | Set the machine backlash compensation amount for changes in positioning direction. | Section 3.4.2. | Section 3.6.2 (3) and (4) | Section 3.4.2. | Section 12.3. |
| Software upper stroke limit | 16<br>17 | 166<br>167 | 316<br>317 | Set the upper limit of the machine travel range. | | | | |
| Software lower stroke limit | 18<br>19 | 168<br>169 | 318<br>319 | Set the lower limit of the machine travel range. | | | | |
| Software stroke limit selection | 20 | 170 | 320 | Set the software stroke limit for either the feed present value or machine present value. | | | | |
| Command in-position range | 22<br>23 | 172<br>173 | 322<br>323 | Set the position [(positioning address) - (present value)] at which the command in-position signal is turned ON. | | | | |
| Torque limit setting value | 24 | 174 | 324 | Set the torque limit value. | | | | |
| M code ON signal output timing | 25 | 175 | 325 | Set the timing in accordance with which the M code ON signal is turned ON. | | | | |
| Speed change type in speed switching mode | 26 | 176 | 326 | Set the speed switching type in the speed switching mode. (Standard or advance). | | | | |
| Interpolation speed designation method | 27 | 177 | 327 | Set the designation method of the speed for interpolation. (Resultant speed or reference axis). | | | | |
| Feed present value update request command in speed control | 28 | 178 | 328 | Set whether the feed present value is updated or not updated during speed control or the speed control part of speed/position switching control. | | | | |
| Acceleration time 1 to 3 | 36 to | 186 to | 336 to | Set the time taken to reach the speed control limit from speed 0. | | | | |
| Deceleration time 1 to 3 | 42 to | 192 to | 342 to | Set the time from the speed control limit to speed 0. | | | | |
| Acceleration/deceleration process selection | 52 | 202 | 352 | Set the processing for acceleration/deceleration. (Trapezoidal or S pattern) | | | | |
| S curve ratio | 53 | 203 | 353 | Set the S curve ratio in S pattern acceleration/deceleration processing | | | | |
| Rapid stop deceleration time | 54<br>55 | 204<br>205 | 354<br>355 | Set the time taken to reach speed 0 from the speed control limit when a rapid stop is executed. | | | | |
| Stop group 1 to 3 rapid stop selection | 56<br>57<br>58 | 206<br>207<br>208 | 356<br>357<br>358 | Select the normal deceleration stop or rapid stop when a stop is executed. * | | | | |
| Positioning completion signal output time | 59 | 209 | 359 | Set the output time of "positioning completed signal" output from the AD75. | | | | |
| Allowable error range for circular interpolation. | 60<br>61 | 210<br>211 | 360<br>361 | Set the allowable range for error between the circular locus and end point coordinates in circular interpolation. | | | | |
| External start function selection | 62 | 212 | 362 | Set positioning start by input of an external start signal. | | | | |

**REMARK**

*: Stop causes for each group

- Stop group 1: H/W stroke limit
- Stop group 2: S/W stroke limit, peripheral stop, and PC READY OFF
- Stop group 3: Stop by stop signal in the event of error (other than stop groups 1 and 2)

(3) Positioning data

The table below shows the positioning data settings to be made in the AD75 buffer memory.
Positioning data Nos. 1 to 100 can be set in the buffer memory.

| Items to be Set | Buffer Memory Address | | | Description of Setting Items | References | | | |
|---|---|---|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | Details of Settings | Setting Values: Sequence Program | Setting Values: AD75P | Sequence Program Setting Method |
| Positioning identifier | 1300<br>1310<br>to<br>2290 | 2300<br>2310<br>to<br>3290 | 3300<br>3310<br>to<br>4290 | Set the following data of the applicable positioning data in the fields for instruction, acceleration/deceleration, and control.<br>• Operation pattern (00, 01, 11)<br>• Setting No. for acceleration time (0 to 3)<br>• Setting No. for deceleration time (0 to 3)<br>• Control method (01H to 11H) | | | | |
| M code | 1301<br>1311<br>to<br>2291 | 2301<br>2311<br>to<br>3291 | 3301<br>3311<br>to<br>4291 | Set the M code of the applicable positioning data. | | | | |
| Dwell time | 1302<br>1312<br>to<br>2292 | 2302<br>2312<br>to<br>3292 | 3302<br>3312<br>to<br>4292 | Set the dwell time of the applicable positioning data. | | | | |
| Commanded speed | 1304<br>1305<br>1314<br>1315<br>to<br>2294<br>2295 | 2304<br>2305<br>2314<br>2315<br>to<br>3294<br>3295 | 3304<br>2205<br>3314<br>3315<br>to<br>4294<br>4295 | Set the speed for positioning using the applicable positioning data. | Section 3.4.4. | Section 3.6.5. | Section 3.4.4. | Section 12.5. |
| Positioning address | 1306<br>1307<br>1316<br>1317<br>to<br>2296<br>2297 | 2306<br>2307<br>2316<br>2317<br>to<br>2396<br>3297 | 3306<br>3307<br>3316<br>3317<br>to<br>4296<br>4297 | Set the type of positioning address for the applicable positioning data.<br>• If absolute (ABS): Absolute address<br>• If incremental (INC): Travel value | | | | |
| Arc address | 1308<br>1309<br>1318<br>1319<br>to<br>2298<br>2299 | 2308<br>2309<br>2318<br>2319<br>to<br>3298<br>3299 | 3308<br>3309<br>3318<br>3319<br>to<br>4298<br>4299 | When executing circular interpolation control, set the following items as absolute addresses in an absolute (ABS) system, or as the travel value in an incremental (INC) system:<br>• Auxiliary point designation<br>Set the address of the pass point on the arc.<br>• Center point designation<br>Set the address of the arc center point. | | | | |

**REMARK**

Set positioning data No. 101 to 600 for the AD75 by using the AD75P whenever possible.
When setting data in the AD75 from the ACPU, refer to the program example in Section 12.7.

(4) Positioning start number

The table below shows the positioning start number settings to be made in the AD75 buffer memory.

| Items to be Set | Buffer Memory Address | | | Description of Setting Items | References | | | |
|---|---|---|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | Details of Settings | Setting Values | | Sequence Program Setting Method |
| | | | | | | Sequence Program | AD75P | |
| Positioning start No. | 1150 | 1200 | 1250 | Set the positioning data No. for starting the positioning operation. (*)<br>1 to 600:<br>For positioning for one block ending with operation pattern "00"<br>7000:<br>For positioning in accordance with the positioning start information<br>8001 to 8050:<br>For positioning with indirect designation area (set the address between 4500 and 4549 for axis 1.) | Sections 3.4.5 and 7.3. | Section 7.3. | | Section 7.3. |
| Positioning start point No. | 1178 | 1228 | 1278 | When the positioning start No. is set as 7000, set the point in the positioning start data of the positioning start information from which the positioning operation is to start. | | | | |

**REMARK**

*: When executing a home position return start, high speed home position return start, or present value change, set the appropriate data No. for the function at this setting item:

- Data No. 9001: Home position return start ........................ See Section 6.3.1.
- Data No. 9002: High speed home position return start ....... See Section 6.3.2.
- Data No. 9003: Present value change .............................. See Chapter 11.

(5) Positioning start information

When positioning is executed with multiple blocks, where one block is an operation ending with operation pattern "00", the following positioning start information settings should be made in the AD75 buffer memory.

| Items to be Set | Buffer Memory Address | | | Description of Setting Items | References | | | |
|---|---|---|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | Details of Settings | Setting Values | | Sequence Program Setting Method |
| | | | | | | Sequence Program | AD75P | |
| Positioning start data (1 to 50 points) | 4300<br>4301<br>to<br>4349 | 4550<br>4551<br>to<br>4599 | 4800<br>4801<br>to<br>4849 | Set the data for one block as one point and set a maximum of 50 points in the order of positioning.<br>Designate at bit No.15 whether positioning is continued from the designated data No. to the next point. | Section 3.4.6. | Section 3.4.6. | | Section 12.6. |
| Positioning special start data (1 to 50 points) | 4350<br>4351<br>to<br>4399 | 4600<br>4611<br>to<br>4649 | 4850<br>4851<br>to<br>4899 | If a special operation (condition judgment, simultaneous start, stop, or repeat processing) is to be added to the normal positioning operation, set the appropriate data at this item. | | | | —— |
| Condition data (maximum 10 items) | 4400<br>to<br>4499 | 4650<br>to<br>4749 | 4900<br>to<br>4999 | When the condition data No. is designated by the parameter setting of the positioning special start data, set the condition data (*1) for the condition data No. | | | | |

**REMARK**

*1: When the condition data No. is designated by the positioning special start data in the positioning start information, the condition data settings to be made in the AD75 buffer memory are as indicated below.
The condition data is the data for the condition judgment and wait judgment carried out by the AD75 when the positioning for each block is started. The following information is set for one set of condition data.

| Items to be Set | Buffer Memory Address | | | Description of Setting Items | References | | | |
|---|---|---|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | Details of Settings | Setting Values | | Sequence Program Setting Method |
| | | | | | | Sequence Program | AD75P | |
| Condition identifier | 4400<br>4410<br>to<br>4490 | 4650<br>4660<br>to<br>4740 | 4900<br>4910<br>to<br>4990 | Set the condition object and condition operator for condition judgment by the AD75. | Section 3.4.6. | Section 3.4.6. | | —— |
| Address | 4402<br>4403<br>4412<br>4413<br>to<br>4493 | 4652<br>4653<br>4662<br>4663<br>to<br>4743 | 4902<br>4903<br>4912<br>4913<br>to<br>4993 | When the condition object is the buffer memory, set the AD75 buffer memory addresses at which the designated values of parameters #1 and #2 and the condition judgment values are stored. | | | | |
| Parameter 1<br>Parameter 2 | 4404<br>to<br>4414<br>to<br>4494<br>to | 4654<br>to<br>4664<br>to<br>4744<br>to | 4904<br>to<br>4914<br>to<br>4994<br>to | Set the values for condition judgment, bit No. or positioning data No. corresponding to the condition object. (*2) | | | | |

**REMARK**

*2: When the condition object is a positioning data No. (simultaneous start), the positioning data No. for the simultaneous start is set in parameter #1 and parameter #2 (both two-word areas) as shown below.
The address shows the condition data No. 1 for axis 1.

| Address | Buffer memory | |
|---|---|---|
| 4404 | Parameter #1 (lower bits) | ........... Positioning data No. (for axis 1 start) |
| 4405 | Parameter #1 (upper bits) | ........... Positioning data No. (for axis 2 start) |
| 4406 | Parameter #2 (lower bits) | ........... Positioning data No. (for axis 3 start) |
| 4407 | Parameter #2 (upper bits) | ........... Not used |

(Setting example)

This example is for setting the positioning special start data required to set the following conditions.
(The address is for condition data No. 1 for the first axis.)

1) I/O signal X4 (BUSY signal for axis 1) to/from the ACPU is set to OFF
2) The value in the PC CPU memory area (address: 5050) in the buffer memory is set to "1000" to "1999".
3) Simultaneous start with the positioning data No. for axis 1 and data No. 100 for axis 3.

| Address | Buffer memory | Setting value of 1) | Setting value of 2) | Setting value of 3) |
|---|---|---|---|---|
| 4400 | Condition identifier | 0801H | 0503H | 0D05H |
| 4401 | (Blank) | 0H | 0H | 0H |
| 4402 | Address | 0H | 136AH (5050) | 0H |
| 4403 | | 0H | 0H | 0H |
| 4404 | Parameter 1 | 4H | 03E8H (1000) | 1H |
| 4405 | | 0H | 0H | 0H |
| 4406 | Parameter 2 | 0H | 07CFH (1999) | 64H |
| 4407 | | 0H | 0H | 0H |
| 4408 | (Not used) | 0H | 0H | 0H |
| 4409 | (Not used) | 0H | 0H | 0H |

## 7.2 Buffer Memory for Positioning Monitor

The following statuses are stored in a buffer memory when positioning is executed and can be monitored as required by reading the buffer memory.

### 7.2.1 System monitor area

| Monitor Item | | Buffer Memory Address (Axis 1, Axis 2, Axis 3) | Description of Monitor Item | References |
|---|---|---|---|---|
| Start history 0 to 15 | Start axis | 462, 467, ... 537 | The No. (1 to 3) of the start axis is stored. | Section 3.6.3 (1). |
| | Operation type | 463, 468, ... 538 | The positioning operation type, start source, and restart/no restart status are stored. | |
| | Start hour:min | 464, 469, ... 539 | The hour and minute of the start time are stored in BCD code. | |
| | Start second:100 ms | 465, 470, ... 540 | The second and 100 msec division of the start time are stored in BCD code. | |
| | Error judgment | 466, 471, ... 541 | The error judgment results (error, warning) and error code at the start are stored. | |
| Start history pointer | | 542 | The area No. (0 to 15) following the area which stores the latest start history information (see above) is stored. | |
| Error start history 0 to 15 | Start axis | 543, 548, ...618 | The No. (1 to 3) of the started axis for which the error occurred is stored. | |
| | Operation type | 544, 549, ... 619 | The type of positioning operation in which the error occurred, the start source, and the restart/no restart status are stored. | |
| | Start hour:min | 545, 550, ... 620 | The hour and minute of the time of the start with error are stored in BCD code. | |
| | Start second:100 ms | 546, 551, ... 621 | The second and 100 msec division of the time of the start with error are stored in BCD code. | |
| | Error judgment | 547, 552, ... 622 | The error judgment result (error, warning) and error code in the event of a start with error are stored. | |
| Error start history pointer | | 623 | The area No. (0 to 15) following the area which stores the latest error start history information (see above) is stored. | |
| Error history 0 to 15 | Axis where error occurred | 624, 628, ... 684 | The No. (1 to 3) of the axis for which the error occurred is stored. | |
| | Axis error code | 625, 629, ... 685 | The axis error code is stored. (See Chapter 13.) | |
| | Axis error occurrence hour:min | 626, 630, ... 686 | The hour and minute of the axis error occurrence is stored in BCD code. | |
| | Axis error occurrence sec:100 ms | 627, 631, ... 687 | The second and 100 msec division of the axis error occurrence is stored in BCD code. | |
| Error history pointer | | 688 | The area No. (0 to 15) following the area which stores the latest error history information is stored. | |
| Warning history 0 to 15 | Axis where warning occurred | 689, 693, ... 749 | The No. (1 to 3) of the axis for which the warning occurred is stored. | |
| | Axis warning code | 690, 694, ... 750 | The axis warning code is stored. (See Chapter 13.) | |
| | Axis warning occurrence hour:min | 691, 695, ... 751 | The hour and minute of the axis warning occurrence is stored in BCD code. | |
| | Axis warning occurrence sec:100 ms | 692, 696, ... 752 | The second and millisecond of the axis warning occurrence is stored in BCD code. | |
| Warning history pointer | | 753 | The area No. (0 to 15) following the area which stores the latest warning history information (see above) is stored. | |

### 7.2.2 Axis monitor area

| Monitor Item | Buffer Memory Address Axis 1 | Axis 2 | Axis 3 | Description of Monitor Item | References |
|---|---|---|---|---|---|
| Feed present value | 800<br>801 | 900<br>901 | 1000<br>1001 | The present position is stored.<br>The home position address is stored on completion of home position return. | |
| Machine feed value | 802<br>803 | 902<br>903 | 1002<br>1003 | The present position in reference to a home position determined by the characteristics of the machine (in the machine coordinate system) is stored. The home position address is stored on completion of home position return. | |
| Feed speed | 804<br>805 | 904<br>905 | 1004<br>1005 | Stores the present speed. ("0" for stop)<br>For interpolation, the present resultant speed or reference axis speed is stored for the reference axis, and "0" is stored for the other interpolation axis. | |
| Effective M code | 806 | 906 | 1006 | Effective M code is stored. "0" is stored when the PC READY signal is OFF. | |
| Axis error code | 807 | 907 | 1007 | The latest axis error code is stored. When an axis error is reset, "0" is stored.<br>(For the first axis, reset is requested using the buffer memory address "1151".) | |
| Axis warning code | 808 | 908 | 1008 | The latest axis warning code is stored. When an axis error is reset, "0" is stored.<br>(For axis 1, reset is requested using the buffer memory address "1151".) | |
| Axis operation status | 809 | 909 | 1009 | The axis operation status (error, stand-by, or positioning control in progress) is stored. | |
| Present speed | 810<br>811 | 910<br>911 | 1010<br>1011 | The speed set by the positioning data is stored.<br>For interpolation, the present resultant speed or reference axis speed is stored for the reference axis, and "0" is stored for the other interpolation axis. | |
| Axis feed speed | 812<br>813 | 912<br>913 | 1012<br>1013 | The present speed is stored. ("0" for stop) | |
| Speed/position switching control | 814<br>815 | 914<br>915 | 1014<br>1015 | The travel value between switching to position control and positioning completion is stored. | Section 3.6.3 (2). |
| External I/O signal | 816 | 916 | 1016 | The ON/OFF status of the I/O signals to/from external devices is stored. | |
| Status | 817 | 917 | 1017 | The ON/OFF status of various flags used by the AD75 is stored. | |
| Target value | 818<br>819 | 918<br>919 | 1018<br>1019 | The target value for positioning operation is stored as follows:<br>• For positioning control, the target value based on the designated positioning address/travel value. The target value is "0" on completion of positioning.<br>• "0" during speed control and home position return.<br>• For speed/position switching control, "0" at the start, and the travel value after the switch to position control. | |
| Target speed | 820<br>821 | 920<br>921 | 1020<br>1021 | The present speed is overwritten. The actual target speed, taking into account the current speed, override and speed limit value, is stored. ("0" is stored at every travel completion.)<br>For interpolation, the present resultant speed or reference axis speed is stored for the reference axis, and "0" is stored for the other interpolation axis. | |
| Torque control value | 826 | 926 | 1026 | The torque limit value/torque change value are stored. | |
| Special start data instruction code setting value | 827 | 927 | 1027 | Stores the instruction code of the special start instruction in the positioning special start data which is indicated by the pointer of the positioning start data currently being executed, which is included in the positioning start information.<br>(Retained until the start data pointer is updated.) | |
| Special start data instruction parameter setting value | 828 | 928 | 1028 | Stores the parameter of the special start instruction in the positioning special start data which is indicated by the pointer of the positioning start data currently being executed, which is included in the positioning start information.<br>(Retained until the start data pointer is updated.) | |
| Positioning data No. setting value | 829 | 929 | 1029 | Stores the positioning start data No. which is indicated by the pointer of the positioning start data currently being executed, which is included in the positioning start information.<br>(Retained until the start data pointer is updated.) | |

| Monitor Item | Buffer Memory Address | | | Description of Monitor Item | References |
|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | |
| Speed control limit in progress flag | 830 | 930 | 1030 | Whether the speed limit is controlled or not in the event of a speed change or positioning operation override is stored. | |
| Speed change processing in progress flag | 831 | 931 | 1031 | Whether a speed change process is in progress or not is stored. | |
| Currently executed start data pointer | 832 | 932 | 1032 | Stores the pointer of the positioning start data currently being executed, which is included in the positioning start information.<br>1 is stored for positioning start (not restart) and 0 is stored for positioning completion. | |
| Last executed positioning data No. | 833 | 933 | 1033 | The positioning data No. executed last is stored.<br>(Retained until the next positioning data is executed.) | Section 3.6.3 (2) |
| Repeat counter | 834 | 934 | 1034 | When the number of repetitions is set by the currently executed positioning special start data in the positioning start information, the remaining number of repetitions is stored.<br>If the loop is infinite, 0 is stored from the beginning of the loop. | |
| Currently executed positioning data No. | 835 | 935 | 1035 | The positioning data No. which is currently being executed is stored.<br>For indirect designation, the data No. actually being executed is stored. | |
| Currently executed block No. | 836 | 936 | 1036 | When data No. 7000 is set for the positioning start No. and positioning is carried out in accordance with the positioning start information, the set data No. 7000 is stored. (0 is stored in other cases.) | |
| Currently executed positioning data | | | | The settings of the currently executed positioning data are stored. | Section 3.6.3 (2)<br>Section 3.6.5 |
| | 838 | 938 | 1038 | Positioning identifier | |
| | 839 | 939 | 1039 | M code | |
| | 840 | 940 | 1040 | Dwell time | |
| | 841 | 941 | 1041 | Not used | |
| | 842<br>843 | 942<br>943 | 1042<br>1043 | Commanded speed | |
| | 844<br>845 | 944<br>945 | 1044<br>1045 | Positioning address | |
| | 846<br>847 | 946<br>947 | 1046<br>1047 | Arc data | |

## 7.3 Programming

This section describes a sequence programs in which the ACPU requests the AD75 to start positioning operation.

**REMARK**

Unless otherwise specified, this section shows the sequence program when the ACPU at the station where the AD75 is installed is an A3UCPU and the I/O signal of the AD75 as seen from the A3UCPU are 00H to 1FH.

### 7.3.1 Positioning start program

An example of a positioning start program in which the ACPU requests the AD75 to start positioning operation is shown here.

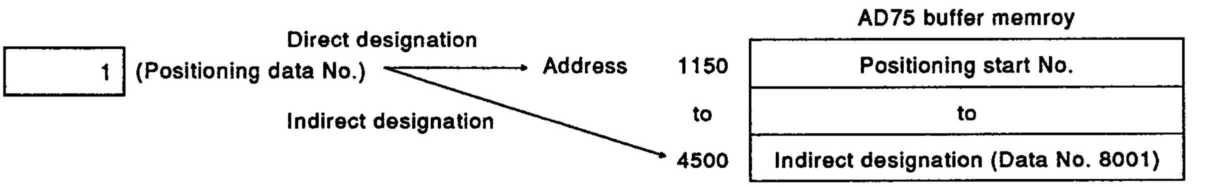
(1) Conditions

- Set the basic parameters, extended parameters and positioning data.
- Set the clock data as required.
- Start the operation when the positioning start signal is OFF.

(2) Program example

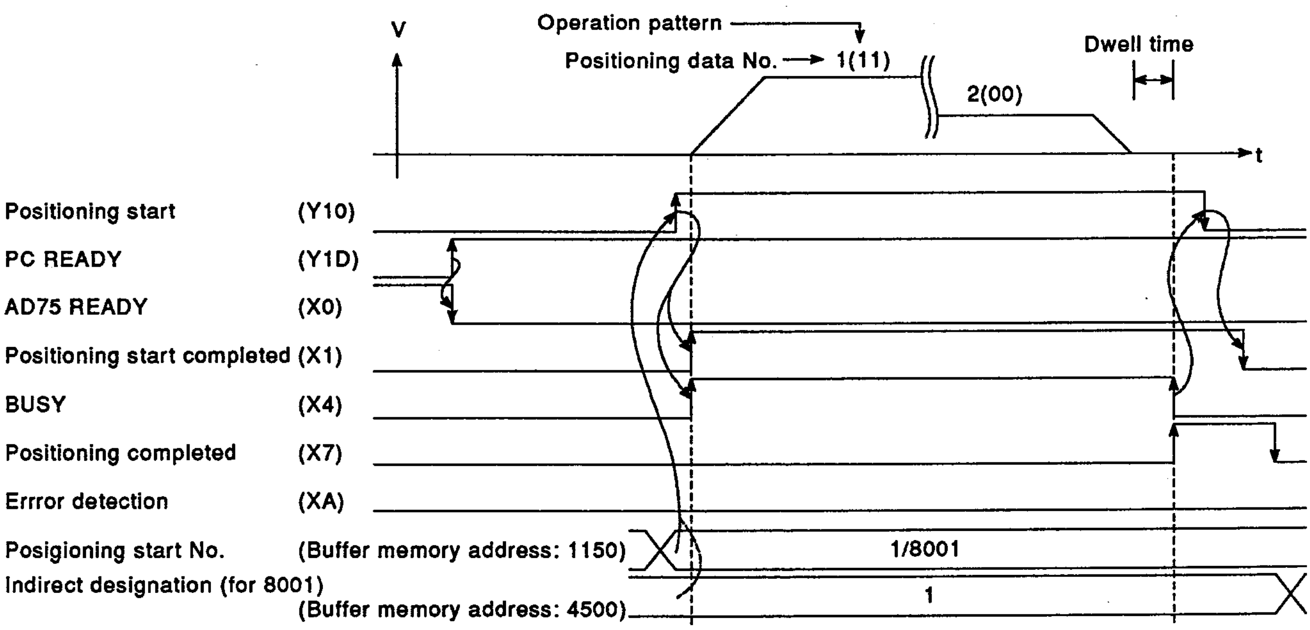
- The program shown here sets positioning data No. 1 and starts positioning on the axis 1.

(a) Data transfer



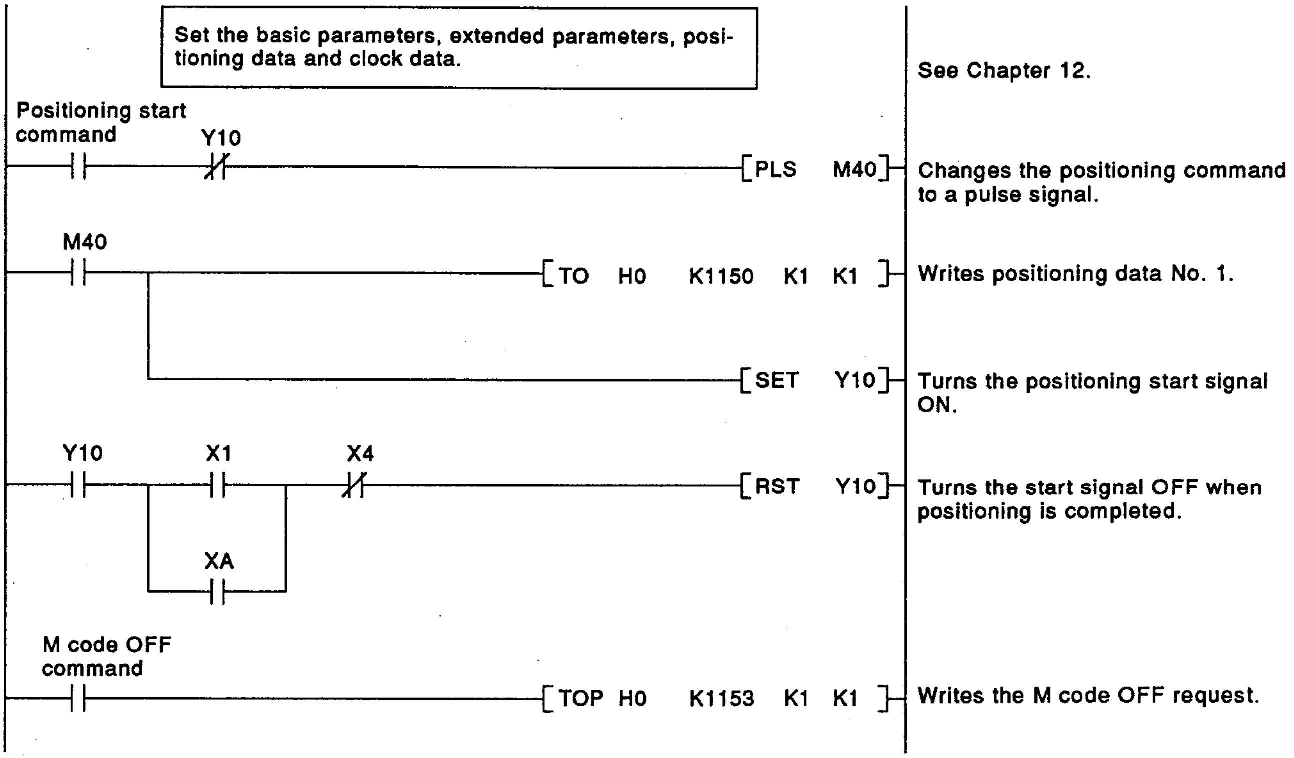

(For details on start numbers, see Section 3.4.5)

(b) I/O signals



(c) Program

1) When the positioning data No. is designated directly




**POINTS**

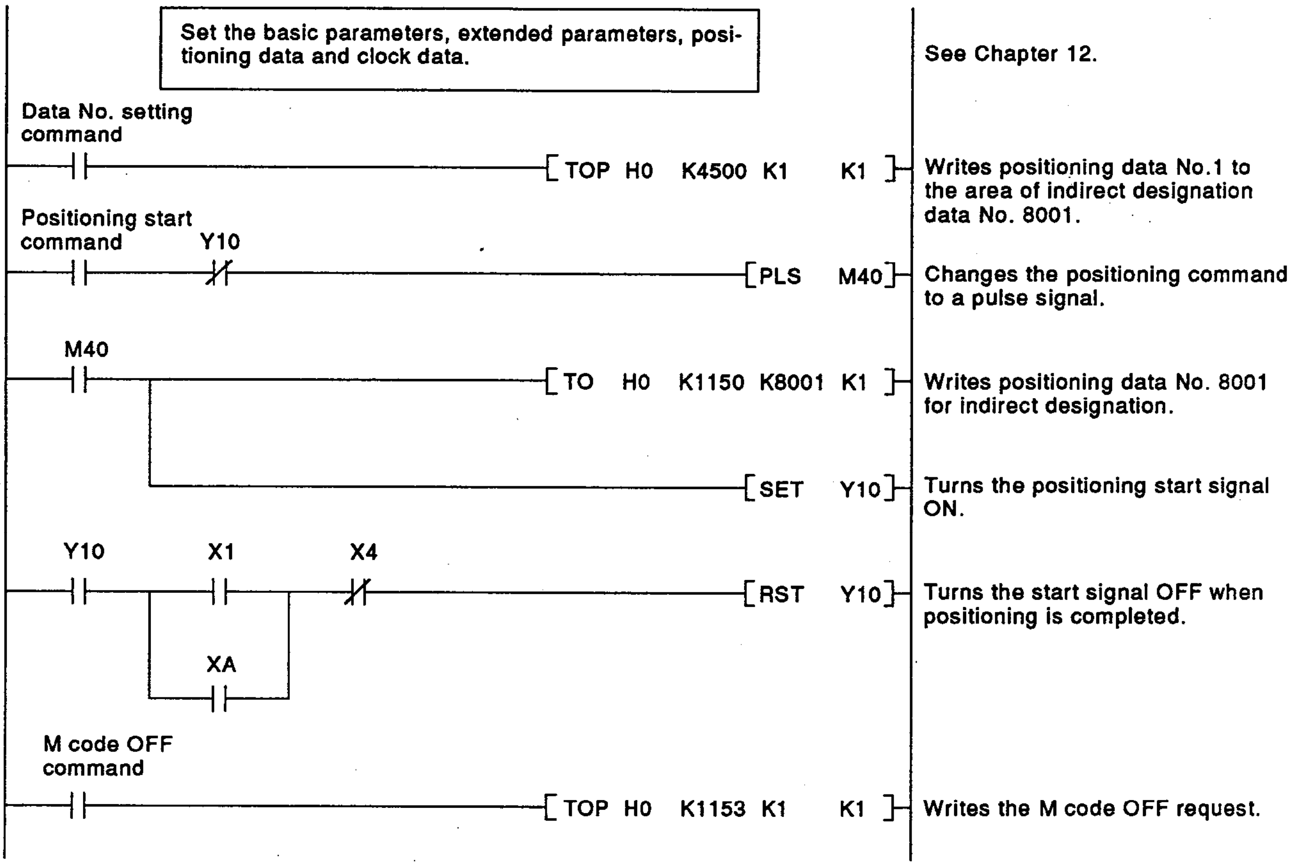
(1) Before carrying out positioning, check the positioning operation and restrictions on setting positioning data by referring to Sections 3.3.1 to 3.3.7.

(2) When designating the positioning data No. directly, set the data No. of the positioning data used for positioning at the start No. area in the buffer memory, and turn ON the start signal.
After the start signal is turned ON, positioning operation is carried out from the positioning data of the designated No. to the positioning data of operation pattern "00".

(3) For interpolation operation, turn on the positioning start signal of the reference axis to start the operation.

(4) When positioning is completed normally, it is recommended that the positioning data be registered in the flash ROM of the AD75.

2) When the positioning data No. is indirectly designated




**POINTS**

(1) Before carrying out positioning, check the positioning operation and restrictions on setting positioning data by referring to Sections 3.3.1 to 3.3.7.

(2) When designating the positioning data No. indirectly, set the data No. of the positioning data used for positioning in the indirect designation area in the buffer memory in advance.
(It is written to the area of the data Nos. used for indirect designation (8001 to 8050)).
At positioning start, set the positioning data No. 8001 to 8050 for the above indirect designation at the start No. area in the buffer memory, and turn ON the start signal.
After the start signal is turned ON, positioning operation is carried out from the positioning data of the No. designated in the indirect designation area to the positioning data for operation pattern "00".

(3) For interpolation operation, turn on the positioning start signal of the reference axis to start operation.

(4) When positioning is completed normally, it is recommended that the positioning data be registered in the flash ROM of the AD75.

### 7.3.2 Positioning start program using positioning start information

An example of a positioning start program in which the ACPU requests the AD75 to start positioning operation is shown here.

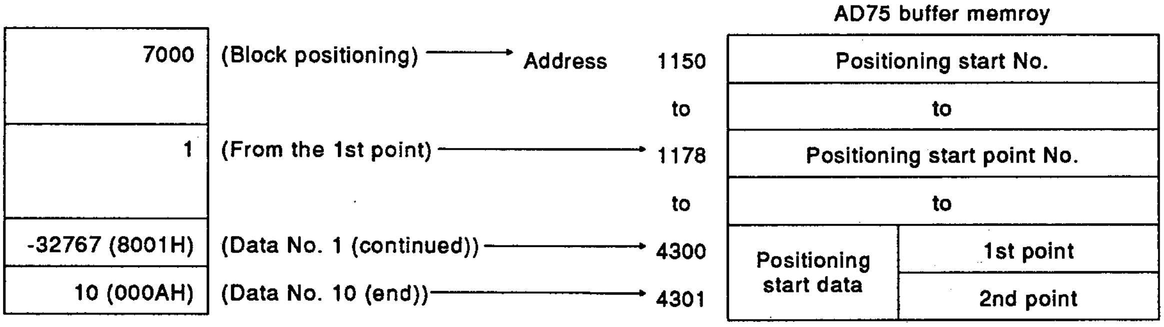
(1) Conditions

- Set the basic parameters, extended parameters and positioning data.
- Set the clock data as required.
- Start the operation when the positioning start signal is OFF.

(2) Program example

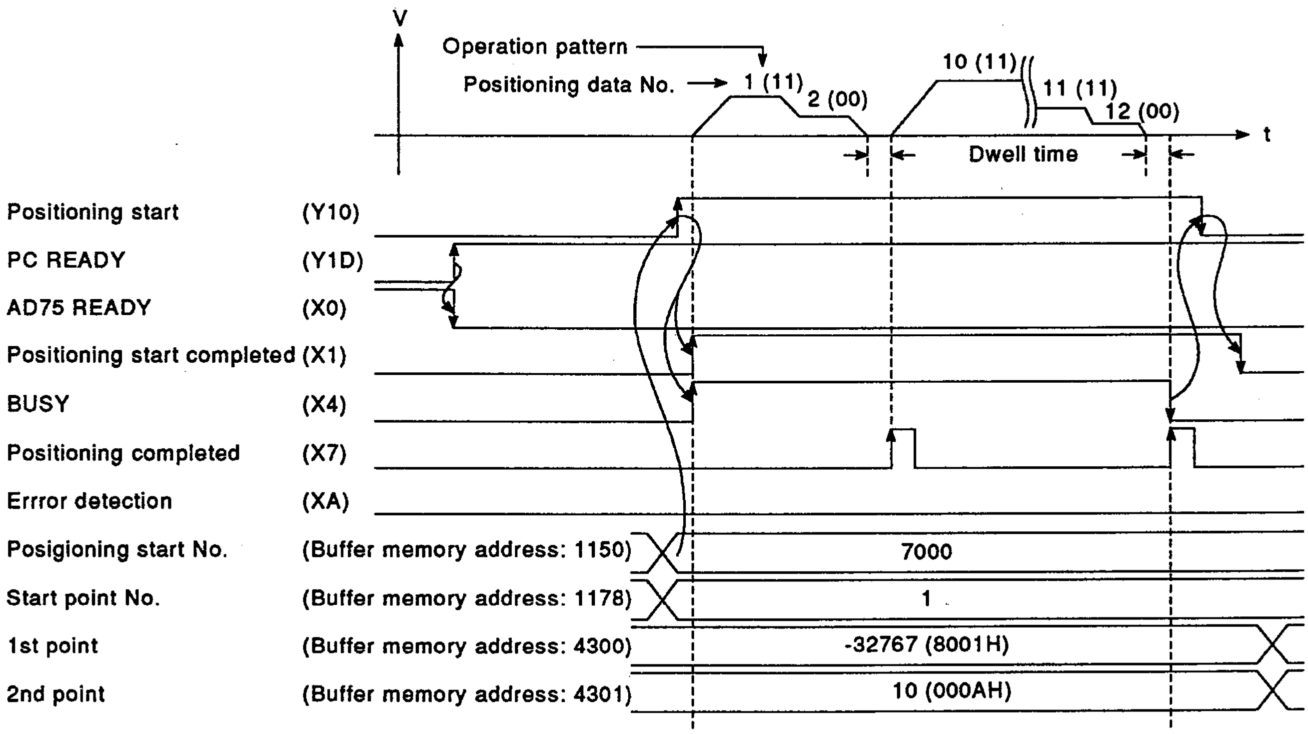
- The program shown here sets the positioning data Nos. for two points in the positioning start data of the positioning start information for the first axis 1, and starts positioning.

(a) Data transfer

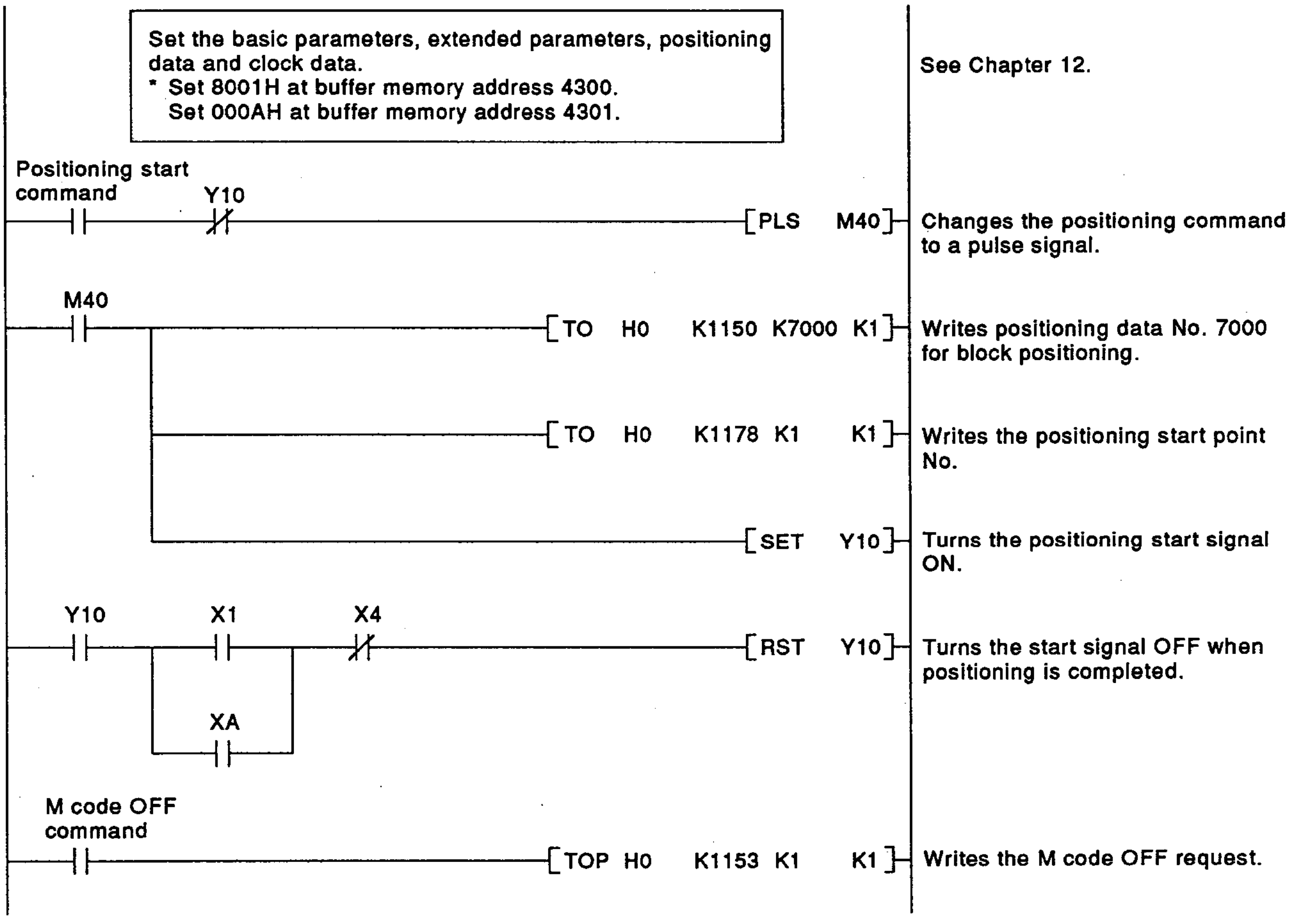



(For details on start numbers, see Section 3.4.5)
Dwell time

(b) I/O signals



(c) Program




**POINTS**

(1) Before carrying out positioning, check the positioning operation and restrictions on setting positioning data and positioning start information (for block positioning) by referring to Sections 3.3.1 to 3.3.7.

(2) When carrying out positioning using the positioning start information, set data in the following areas in the buffer memory in advance.
  1) Positioning start point No.
  2) Positioning start information area
    * Set the positioning special start data and condition data as required.

  Block positioning can be performed with positioning start data only. At the positioning start, set positioning data No. 7000 for block positioning start in the positioning start No. area in the buffer memory, then turn ON the start signal.
  When the start signal is turned ON, the positioning operation is carried out in sequence, starting from the positioning data whose No. is designated at the position designated by the positioning start point number.

(3) For interpolation operation, turn on the positioning start signal of the reference axis to start operation.

(4) When positioning is completed normally, it is recommended that the positioning data be registered in the flash ROM of the AD75.

### 7.3.3 Speed/position switching control operation program

An example of a positioning program where positioning operation is carried out by speed/position switching control is shown here.

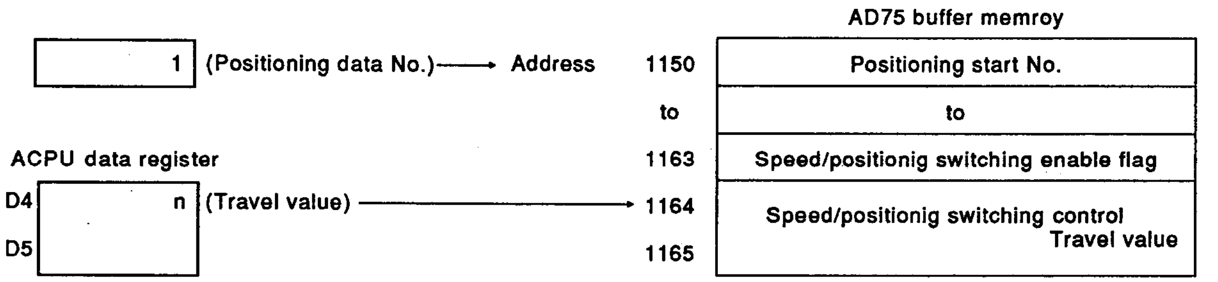
(1) Conditions

- Set the basic parameters, extended parameters and positioning data.
- Set clock data as required.
- Start the operation when the positioning start signal is OFF.
- If the travel value is to be changed during positioning, change it during speed control.
- Enable switching before the control switching signal is input from the external source.

(2) Program example

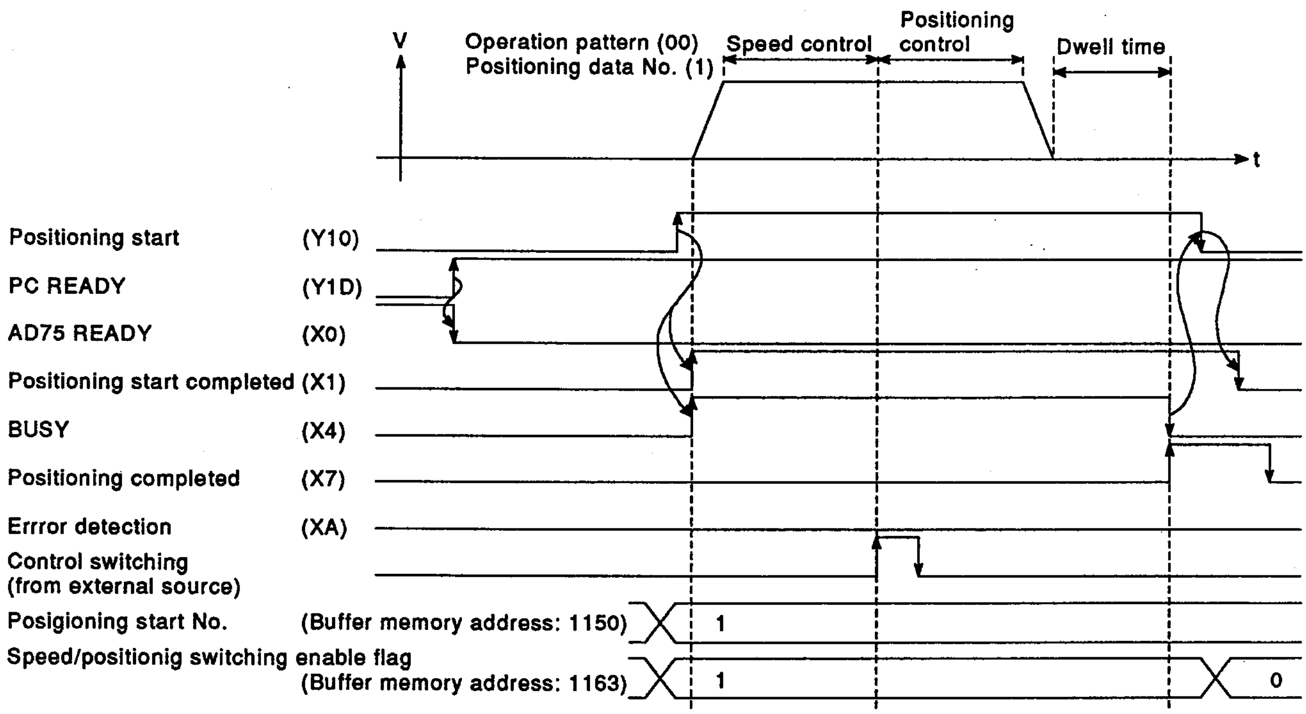
- The program shown here sets positioning data No. 1 and starts positioning for the first axis 1.

(a) Data transfer

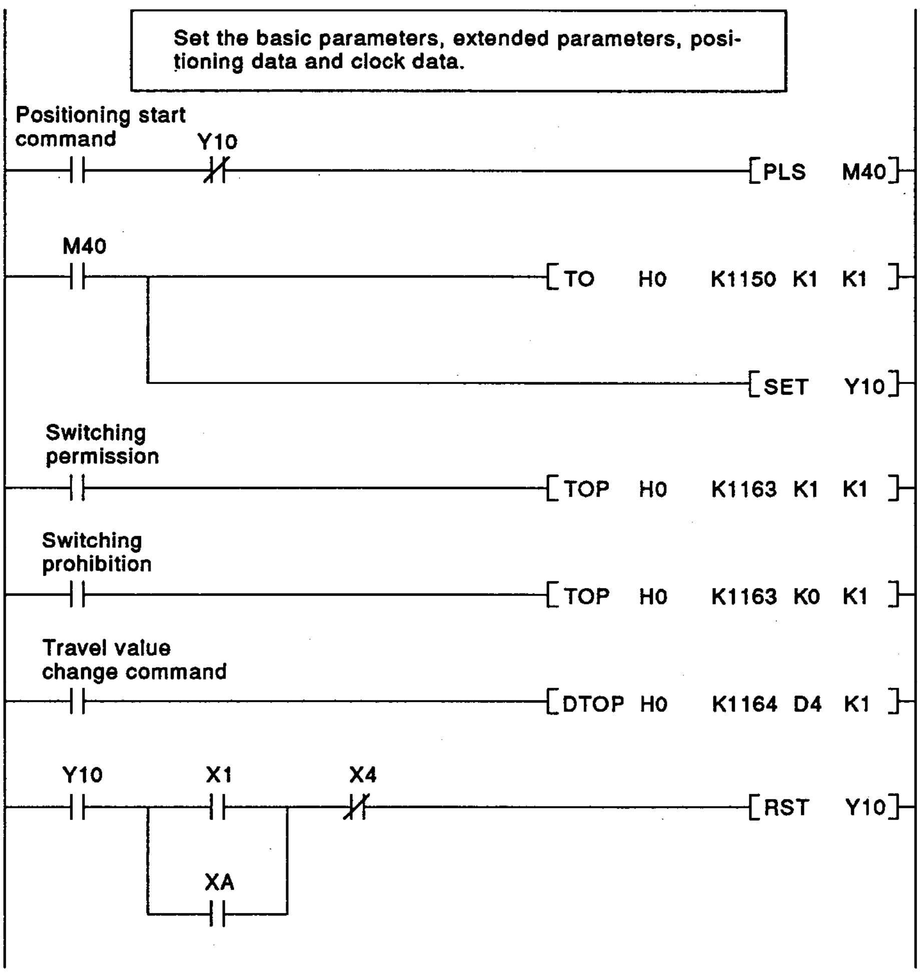



(For details on start numbers, see Section 3.4.5)

(b) I/O signals



(c) Program




See Chapter 12.

Changes the positioning command to a pulse signal.

Writes positioning data No. 1.

Turns the positioning start signal ON.

Sets "enabled" status at all times unless in the disabled range.

Executed before input of the control switching signal.
Writes the travel value stored in D4/D5.

Turns the start signal OFF when positioning is completed.

**POINTS**

(1) Before carrying out positioning, check the positioning operation and restrictions on setting positioning data by referring to Sections 3.3.1 to 3.3.7.

(2) When positioning is completed normally, it is recommended that the positioning data be registered in the flash ROM of the AD75.

### 7.3.4 Program for restarting after a stop

An example of a restart program when the ACPU requests the AD75 to start positioning operation after a stop signal has been input from the ACPU or an external source during positioning operation and the AD75 is in the stopped status, is shown here.
Even an axis which has been set to the stopped status in block positioning based on positioning start information (by execution of the "stop" special start instruction) can be started with this program.

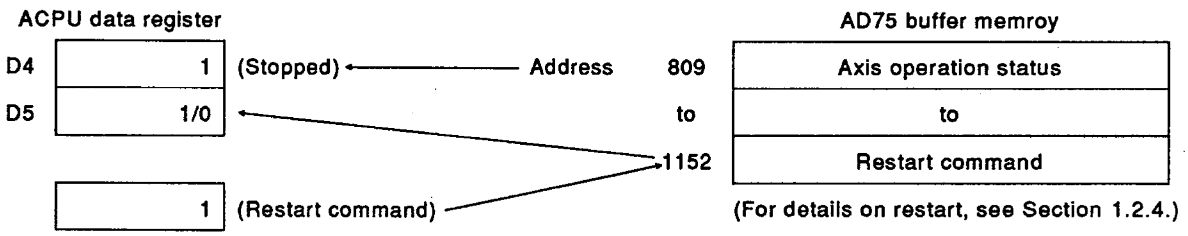
(1) Conditions

- Start operation for the following conditions.
  1) The positioning data is for position control and the axis operation status is "stopped".
  2) The BUSY signal, positioning start signal and positioning completed signal are OFF.

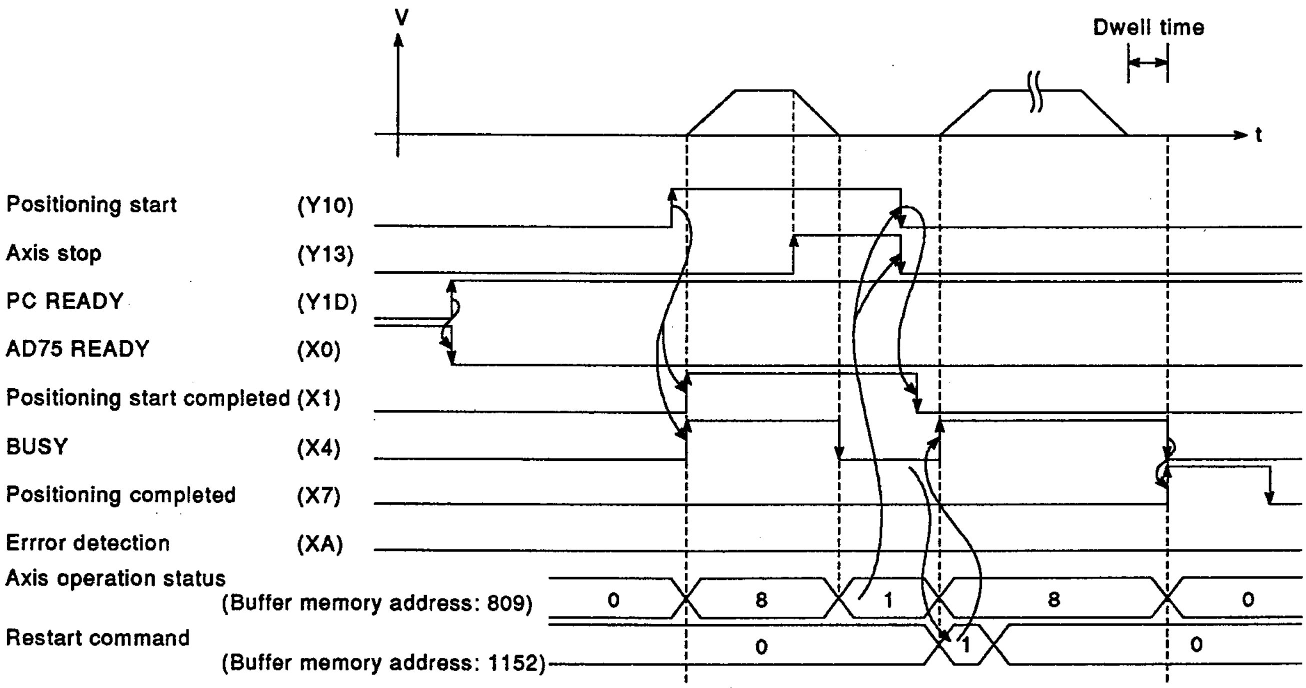
(2) Program example

- The program shown here restarts positioning for the axis 1, which is in the stopped status.

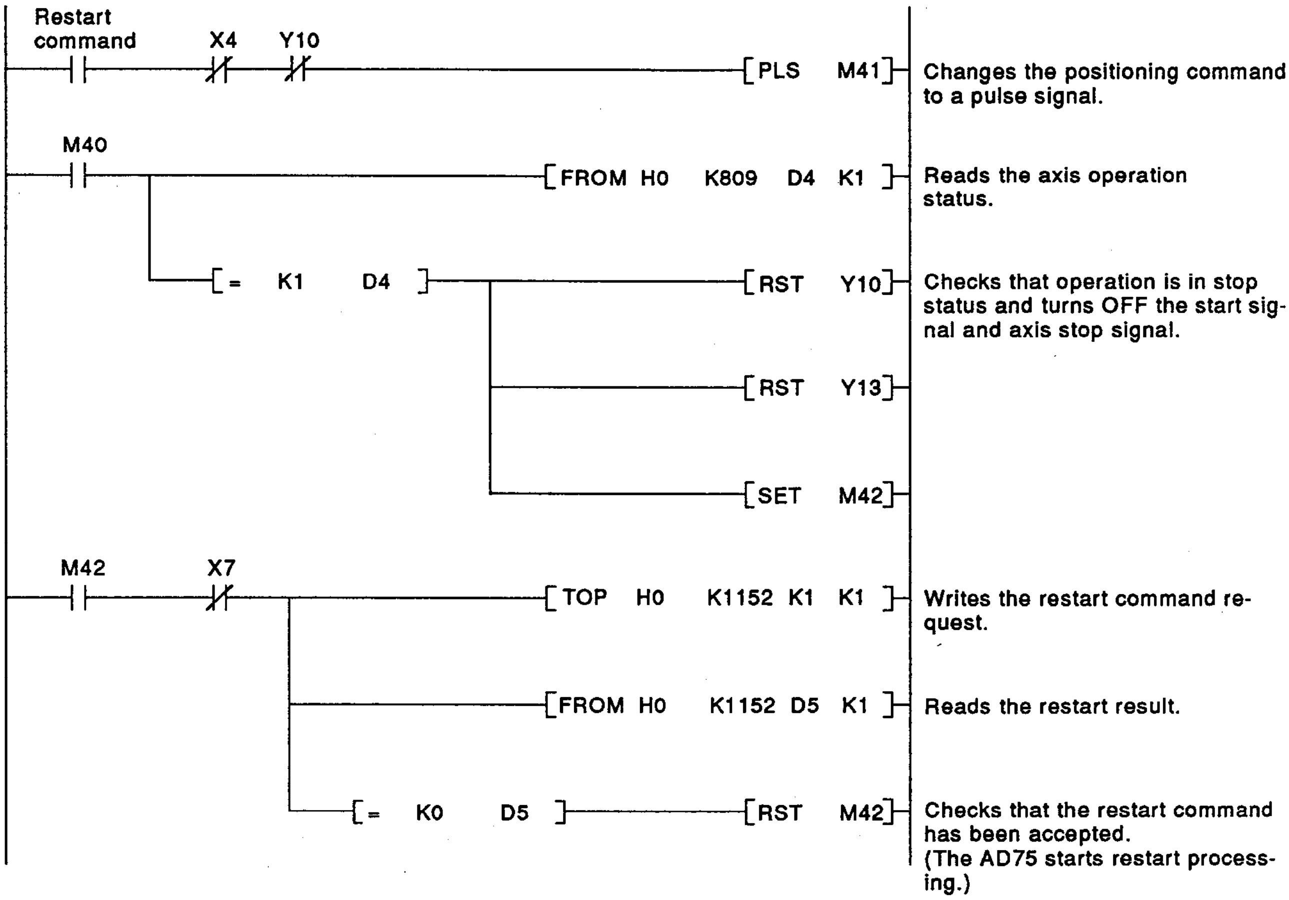
(a) Data transfer




(b) I/O signals



(c) Program




**POINTS**

(1) If a restart command request is issued when axis operation is in the stopped status and the positioning data is for position control, positioning control is carried out from the stop position to the end of the stopped positioning data, regardless of whether the AD75 is an absolute data type or incremental type.
When a restart is executed while axis operation is in the stopped status during block positioning based on the positioning start information, positioning control is carried out from the stop position to the final positioning data of the point, then control continues to the positioning in the next point.

(2) When an interpolation operation is in the stopped status, write the restart request to the restart area of the reference axis to execute restart.

(3) If axis operation is not in the stopped status when a restart is attempted, a multiple start warning occurs, and the current processing is continued.
If this happens, change the value written in the restart command area from 1 to 0.

(4) Before restarting the operation, check the restart procedure by referring to Section 1.2.4.

### 7.3.5 Program for handling an external start signal

The following functions can be executed in accordance with the external start function selection (buffer memory address: 62/112/362) by inputting an external start signal.

- When external positioning start is selected
  Positioning start can be carried out in accordance with the pre-set positioning start No.
- When external speed change is selected
  Speed during positioning can be changed to a pre-set speed.
- When skip request is selected
  Positioning operation using the present data No. can be stopped (by deceleration stop) and operation continued from the next positioning operation.

This section shows an example of an external positioning start program in which external positioning is started from an external source by external positioning start selection.

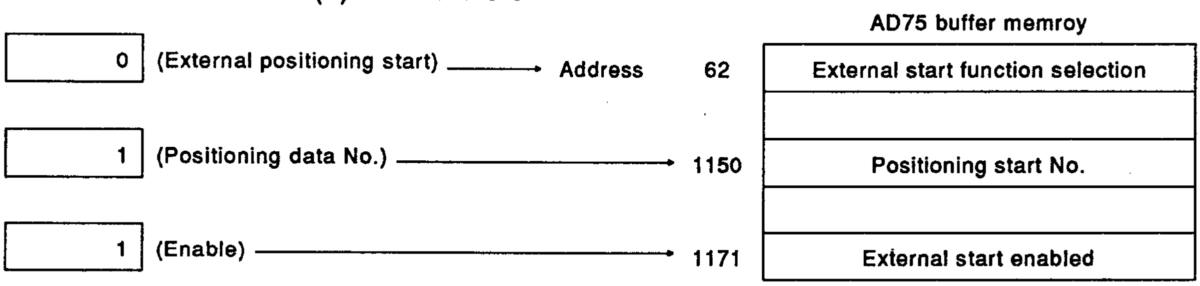
(1) Conditions

- Select external positioning start using the external positioning function selection.
- Carry out the following setting before inputting the external start signal.
  1) Set external start "valid".
  2) Set the positioning start No.

(2) Program example

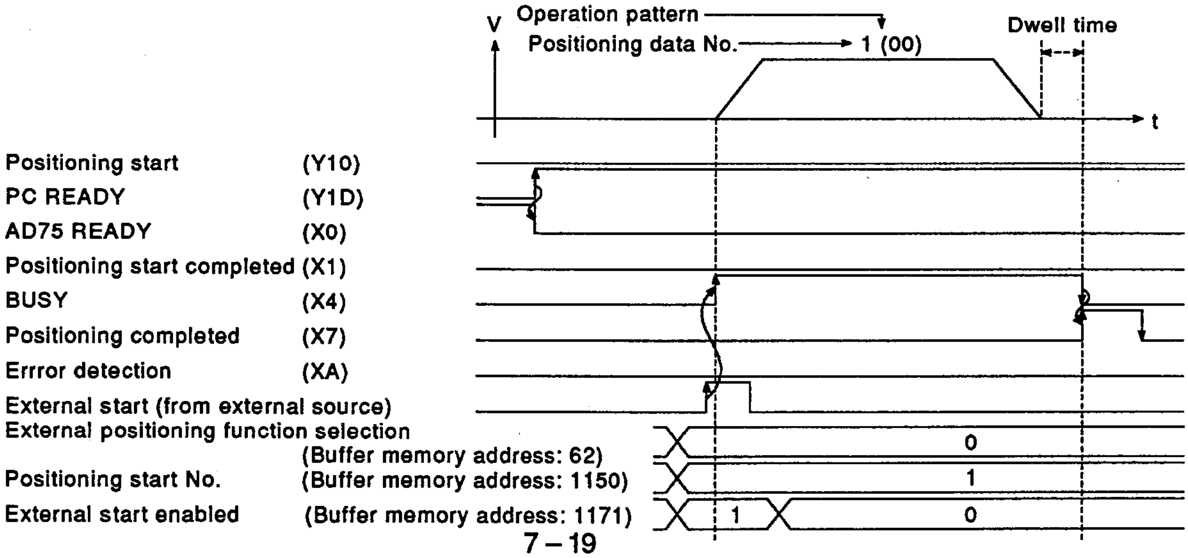
- The program shown here executes an external positioning start for the axis 1, which is in the stand-by status.

(a) Data transfer




(For details on the set values refer to the sections for respective areas.)

(b) I/O signals



(c) Program

| Contacts | Instruction | Comment |
|---|---|---|
| Function selection command | [TOP H0 K62 K0 K1] | Set external positioning start by external start function selection in extended parameter #2. |
| Data No. setting command | [FROM H0 K1150 K1 K1] | Set positioning data No. 1 for positioning start. |
| External start valid command, Y10 | [TOP H0 K1171 K1 K1] | Set external start signal input to "valid". |

**POINTS**

(1) When "External speed change request" is selected using external start function selection, set the speed change value (address: 1156 to/1206 to/1256 to) before inputting the external start signal.
When "Skip request" is selected, no settings have to be made.
Whichever function is selected, the timing for external start function selection and external start "Valid" setting is the same as when "External positioning start" is selected.

(2) External start is a function whereby the command is input directly into the AD75.
Use of an external start signal eliminates the effects of variation in ACPU scan time.
This is useful when an earlier start by command input or reduction of variation is desired.

(3) The external start valid setting prevents actuation of the selected function by incorrect input.
In order to stop the selected function being actuated by input of the external start signal, it is recommended that "Invalid" be set.

(4) Before using any of the functions, check the operation and applicable restrictions by referring to the following sections on the functions that can be selected by external start function selection.

- External positioning start : See Sections 3.3.1 to 3.3.7 and Section 7.3.1.
- External speed change request : See Section 3.3.19, Section 10.
- Skip request : See Section 3.3.20.

# 8. JOG OPERATION

JOG operation is a positioning operation used to determine the positioning address of the positioning data for an axis, or to move an axis in the reverse direction for home position return. JOG operation can be carried out from the ACPU or the AD75P.

The basic parameters and extended parameters are set for each axis according to the positioning system configuration, then JOG operation is carried out by turning the output signal for the JOG operation ON and OFF.

This chapter describes a JOG operation from the ACPU executed in accordance with the basic parameters and extended parameters set in the AD75. For details on JOG operation from the AD75P, refer to the operating manual of the AD75P.

**POINT**

When using JOG operation to determine a positioning address, you are recommended to use a slow JOG speed.
(Set the JOG speed in the axis control data area in the buffer memory. For axis 1, set the JOG speed in buffer memory address 1160.)

## 8.1 Parameter Settings Required for JOG Operation

JOG operation is carried out by turning the forward/reverse output signal for each axis ON and OFF from the ACPU.
This section describes the basic parameter and extended parameter settings required for JOG operation.

**POINTS**

(1) To carry out a JOG operation, the basic parameters and extended parameters for the AD75 must be set.

(2) For details on the method for setting the parameters with the AD75P, refer to the operating manual of the AD75P.

(1) Basic parameters

The basic parameter settings (set at addresses 0 to 11 for the axis 1) to be made in the buffer memory of the AD75 are the same as those for positioning.
Check the settings by referring to Section 7.1 (1). (When checking, switch positioning operation to JOG operation.)

(2) Extended parameters

The table below shows the extended parameter settings to be made in the buffer memory of the AD75.

<table>
<tr><th rowspan="3">Items to be Set</th><th colspan="3">Buffer Memory Address</th><th rowspan="3">Description of Setting Items</th><th colspan="4">References</th></tr>
<tr><th rowspan="2">Axis 1</th><th rowspan="2">Axis 2</th><th rowspan="2">Axis 3</th><th rowspan="2">Details of Settings</th><th colspan="2">Setting Values</th><th rowspan="2">Sequence Program Setting Method</th></tr>
<tr><th>Sequence Program</th><th>AD75P</th></tr>
<tr><td>Backlash compensation amount</td><td>15</td><td>165</td><td>315</td><td>Set the machine backlash compensation amount for changes in positioning direction.</td><td rowspan="9">Section 3.4.2</td><td rowspan="9">Section 3.6.2 (3) (4)</td><td rowspan="9">Section 3.4.2</td><td rowspan="9">Section 12.3</td></tr>
<tr><td>Software upper stroke limit</td><td>16<br>17</td><td>166<br>167</td><td>316<br>317</td><td>Set the upper limit of the machine travel range.</td></tr>
<tr><td>Software lower stroke limit</td><td>18<br>19</td><td>168<br>169</td><td>318<br>319</td><td>Set the lower limit of the machine travel range.</td></tr>
<tr><td>Software stroke limit selection</td><td>20</td><td>170</td><td>320</td><td>Set the software stroke limit for either the feed present value or machine present value.</td></tr>
<tr><td>Software stroke limit validity in JOG operation, manual pulse generator operation</td><td>21</td><td>171</td><td>321</td><td>Set whether or not the software stroke limit is valid in JOG operation.</td></tr>
<tr><td>Torque limit setting value</td><td>24</td><td>174</td><td>324</td><td>Set the torque limit value.</td></tr>
<tr><td>Acceleration time 1 to 3</td><td>36 to</td><td>186<br>to</td><td>336<br>to</td><td>Set the time taken to reach the speed control limit from speed 0.</td></tr>
<tr><td>Deceleration time 1 to 3</td><td>42 to</td><td>192<br>to</td><td>342<br>to</td><td>Set the time from the speed control limit to speed 0.</td></tr>
<tr><td>JOG speed limit value</td><td>48<br>49</td><td>198<br>199</td><td>348<br>349</td><td>Set the maximum speed for JOG operation to a value lower than the speed limit value in the basic parameters.</td></tr>
</table>

| Items to be Set | Buffer Memory Address | | | Description of Setting Items | References | | | |
|---|---|---|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | Details of Settings | Setting Values: Sequence Program | Setting Values: AD75P | Sequence Program Setting Method |
| JOG operation acceleration time selection | 50 | 200 | 350 | Sets which of acceleration times 0, 1 ,2 and 3 set in the basic parameters and extended parameters during JOG operation. | Section 3.4.2 | Section 3.6.2 (3) (4) | Section 3.4.2 | Section 12.3 |
| JOG operation deceleration time selection | 51 | 201 | 351 | Sets which of deceleration times 0, 1, 2 and 3 set in the basic parameters and extended parameters is used during JOG operation. | | | | |
| Acceleration/deceleration processing selection | 52 | 202 | 352 | Set the processing for acceleration/deceleration. (Trapezoidal or S pattern) | | | | |
| S curve ratio | 53 | 203 | 353 | Set the S curve ratio in S pattern acceleration/deceleration processing | | | | |
| Rapid stop deceleration time | 54<br>55 | 204<br>205 | 354<br>355 | Set the time taken to reach speed 0 from the speed control limit when a rapid stop is executed. | | | | |
| Stop group 1 to 3 Rapid stop selection | 56<br>57 | 206<br>207 | 356<br>357 | Select the normal deceleration stop or rapid stop for each group.*1 | | | | |
| External start function selection | 58<br>62 | 208<br>212 | 358<br>362 | External speed change request is set with the input of external start signal. *2 | | | | |

*1 Stop causes for each group

- Stop group 1: H/W stroke limit
- Stop group 2: Software stroke limit, peripheral device stop, PC READY OFF
- Stop group 3: Stop with stop signal, occurrence of error (other than stop groups 1 and 2)

*2 When the JOG speed change command is input from an external source using an external start signal, carry out the following setting.

- Set an external speed change request using the external start function selection of extended parameter #2.
- Set the external start valid setting (buffer memory address: 1171, 1221, and 1271) before starting.

## 8.2 Buffer Memory for JOG Operation Monitor

The following statuses are stored in a buffer memory when JOG operation is executed and can be monitored as required by reading the buffer memory.

(1) System monitor area

The monitor item of the system monitor area for monitoring the buffer memory of the AD75 is the same as for positioning.
Check this according to Section 7.2.1.

(2) Axis monitor area

| Items to be Set | Buffer Memory Address | | | Description of Monitor Items | References |
|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | |
| Feed present value | 800<br>801 | 900<br>901 | 1000<br>1001 | The present position is stored.<br>The home position address is stored on completion of home position return. | Section 3.6.3 (2) |
| Machine feed value | 802<br>803 | 902<br>903 | 1002<br>1003 | The present position in reference to a home position determined by the characteristics of the machine (in the machine coordinate system) is stored. The home position address is stored on completion of home position return. | |
| Feed speed | 804<br>805 | 904<br>905 | 1004<br>1005 | Stores the present speed. ("0" for stop) | |
| Axis error code | 807 | 907 | 1007 | The latest axis error code is stored. When an axis error is reset, "0" is stored.<br>(For the axis 1, reset is requested using the buffer memory address "1151".) | |
| Axis warning code | 808 | 908 | 1008 | The latest axis warning code is stored. When an axis error is reset, "0" is stored.<br>(For axis 1, reset is requested using the buffer memory address "1151".) | |
| Axis operation status | 809 | 909 | 1009 | The axis operation status (error, stand-by, or positioning control in progress) is stored. | |
| Axis feed speed | 812<br>813 | 912<br>913 | 1012<br>1013 | The present speed is stored. ("0" for stop) | |
| External I/O signal | 816 | 916 | 1016 | The ON/OFF status of the I/O signal to/from external devices is stored. | |
| Status | 817 | 917 | 1017 | The ON/OFF status of various flags used by the AD75 is stored. | |
| Target speed | 820<br>821 | 920<br>921 | 1020<br>1021 | The actual target speed taking into account the JOG speed control limit is stored. (0 is stored when the machine is not operating.) | |
| Absolute original point | 822<br>823 | 922<br>923 | 1022<br>1023 | The address home position return is stored.<br>The position is not established when the power is turned on. | |
| Torque control value | 826 | 926 | 1026 | The torque limit value/torque change value are stored. | |
| Speed control limit in progress flag | 830 | 930 | 1030 | Whether the speed limit is controlled or not in the event of a speed change or positioning operation override is stored. | |
| Speed change processing in progress flag | 831 | 931 | 1031 | Whether speed change processing is in progress or not is stored. | |

## 8.3 Programming

This section describes the sequence program used at the ACPU to request the AD75 to perform JOG operation.

**REMARK**

Unless otherwise specified, this section shows the sequence program when the ACPU at the station where the AD75 is installed is an A3UCPU and the I/O signals of the AD75 as seen from the A3UCPU are 00H to 1FH.

### 8.3.1 JOG operation program

A program example in which the ACPU requests the AD75 to start JOG operation is shown here.

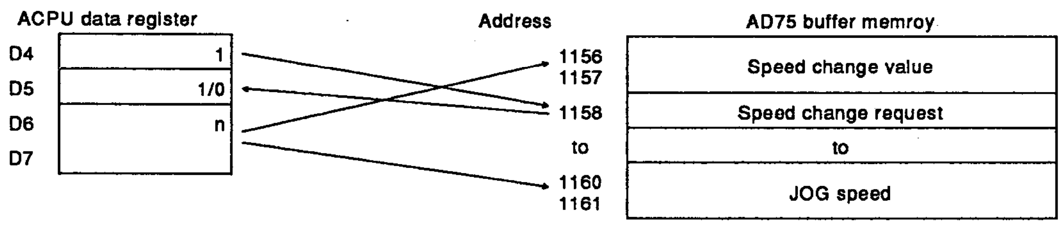
(1) Conditions

- Set the basic parameters, extended parameters and positioning data.
- Set the clock data as required.
- Start operation when the BUSY signal is OFF.

(2) Program example

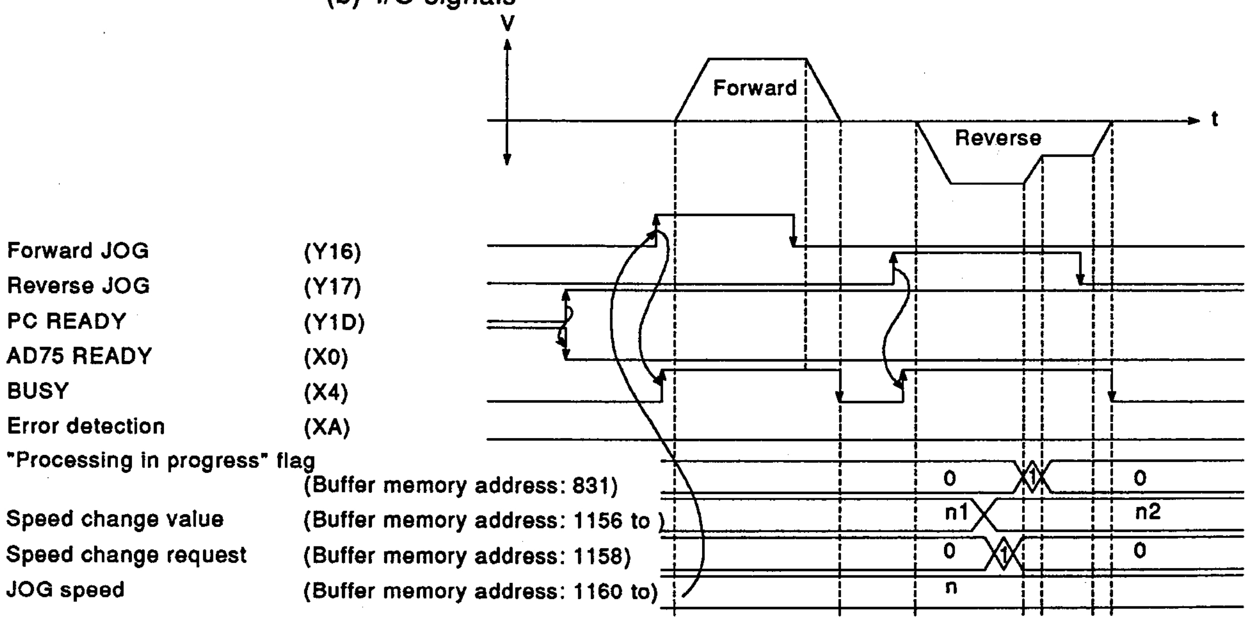
- A JOG operation request for the axis 1 is shown.

(a) Data transfer



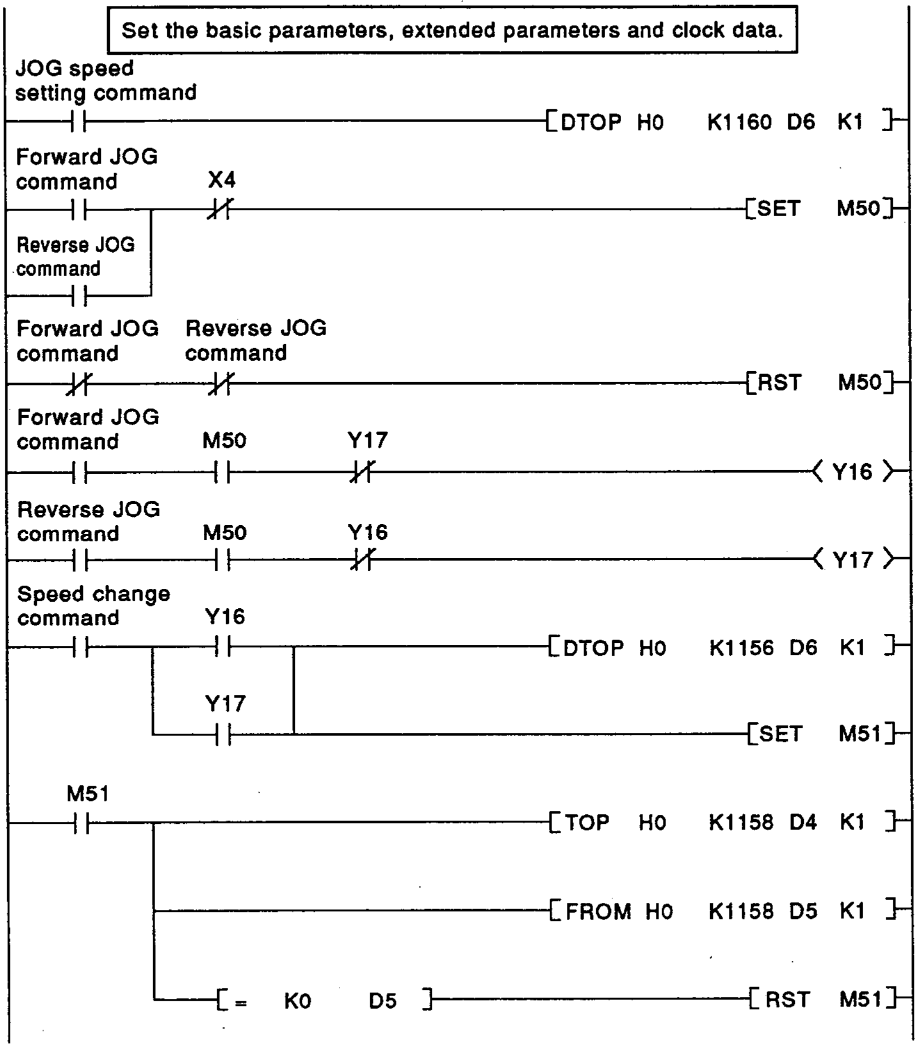

(See Section 3.6.4 for details on JOG speed.)

(b) I/O signals




* If a stop signal is input during JOG operation, restart will not be possible without turning the JOG start signal ON again.

(c) Program




See Chapter 12.

Sets the 2 word JOG speed to 1 degree.
Set the speed considering the units of the set value and the actual speed.

Sets the JOG operation enable flag.

Resets the JOG operation enable flag.

Starts forward JOG motion.
While the JOG start signal is ON, JOG operation is carried out at the JOG speed in the axis control data.

Starts reverse JOG motion.

The following is the processing for a speed change.

Sets the speed change request flag.

Writes the speed change request.

Reads the result of the speed change request.

Checks that request has been accepted.
(The AD75 starts the speed change processing.)

**POINTS**

(1) When JOG operation is used to determine a positioning data address, "the feed present value" (buffer memory address 800 and 801 for the axis 1) stored in the buffer memory is used on completing motion to the desired position.

(2) When the forward JOG signal and reverse JOG signal of the same axis are turned ON simultaneously, forward JOG operation is carried out.
When the forward JOG signal is turned off, causing deceleration to a stop, reverse JOG operation is carried out if the reverse JOG signal is ON.

(3) JOG operation is not carried out during operation from a peripheral device in the test mode.

(4) A JOG signal status change from OFF to ON is not acknowledged within 56.8 ms after the stop signal is turned OFF.

(5) Before carrying out JOG operation, check the details of JOG operation and applicable restrictions by referring to Section 3.3.10.

# 9. MANUAL PULSE GENERATOR OPERATION

Manual pulse generator operation is a positioning operation in which pulses are input from a manual pulse generator to the AD75 to move the applicable axis by a distance commensurate with the number of input pulses.

Manual pulse generator operation is used for precise manual positioning.

Set the basic parameters and extended parameters in accordance with the positioning system configuration, carry out manual pulse generator selection, and enable manual pulse generator operation, before starting manual pulse generator operation.

This chapter describes the pre-processing and post-processing at the ACPU when manual pulse generator operation is executed on the basis of the basic parameters and extended parameters set at the AD75.

## 9.1 Parameter Setting for Manual Pulse Generator Operation

Manual pulse generator operation is carried out from the pulse input of the manual pulse generator.

This section describes the setting of basic parameters and extended parameters required for manual pulse generator operation.

**POINTS**

(1) Setting of basic parameters and extended parameters in the AD75 is required for manual pulse generator operation.
Check the details on parameters in this section and carry out setting at the AD75 before starting manual pulse generator operation.

(2) For parameter setting in the AD75P, refer to the operating manual of the AD75P.

(1) Basic parameters

The basic parameters that must be set at the AD75 are the same as those for positioning.
Check these settings by referring to Section 7.1.2 (1).

(2) Extended parameters

The extended parameters that must be set at the AD75 are tabled below.

| Items to be Set | Buffer Memory | | | Description of Setting Items | References | | | |
|---|---|---|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | Details of Settings | Setting Values: Sequence Program | Setting Values: AD75P | Sequence Program Setting Method |
| Backlash compensation amount | 15 | 165 | 315 | Set the machine backlash compensation amount for changes in positioning direction. | Section 3.4.2 | Section 3.6.2 (3) (4) | Section 3.4.2 | Section 12.3 |
| Software upper stroke limit | 16<br>17 | 166<br>167 | 316<br>317 | Set the upper limit of the machine travel range. | | | | |
| Software lower stroke limit | 18<br>19 | 168<br>169 | 318<br>319 | Set the lower limit of the machine travel range. | | | | |
| Software stroke limit selection | 20 | 170 | 320 | Set the software stroke limit for either the feed present value or machine present value. | | | | |
| Software stroke limit validity in JOG operation, manual pulse generator operation | 21 | 171 | 321 | Set whether or not the software stroke limit is valid in manual pulse generator operation. | | | | |
| Torque limit setting value | 24 | 174 | 324 | Set the torque limit value. | | | | |
| Manual pulse generator selection | 29 | 179 | 329 | Set the manual pulse generator to be used. (Setting value n (1 to 3) corresponds to axis No. 1 to 3.) | | | | |

## 9.2 Buffer Memory for Manual Pulse Generator Monitor

The following statuses are stored in a buffer memory when manual pulse generator operation is executed and can be monitored as required by reading the buffer memory.

(1) System monitor area

The items monitored in the system monitor area for monitoring the buffer memory in the AD75 are the same as for positioning.

(2) Axis monitor area
Check these by referring to Section 7.2.1.

| Monitor Item | Buffer Memory | | | Description of Monitor Item | References |
|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | |
| Feed present value | 800<br>801 | 900<br>901 | 1000<br>1001 | The present position is stored.<br>The home position address is stored on completion of home position return. | Section 3.6.3 (2) |
| Machine feed value | 802<br>803 | 902<br>903 | 1002<br>1003 | The present position in reference to a home position determined by the characteristics of the machine (in the machine coordinate system) is stored. The home position address is stored on completion of home position return. | |
| Feed speed | 804<br>805 | 904<br>905 | 1004<br>1005 | Stores the present speed. ("0" for stop) | |
| Axis error code | 807 | 907 | 1007 | The latest axis error code is stored. When an axis error is reset, "0" is stored.<br>(For the axis 1, reset is requested using the buffer memory address "1151".) | |
| Axis warning code | 808 | 908 | 1008 | The latest axis warning code is stored. When an axis error is reset, "0" is stored.<br>(For axis 1, reset is requested using the buffer memory address "1151".) | |
| Axis operation status | 809 | 909 | 1009 | The axis operation status (error, stand-by, or positioning control in progress) is stored. | |
| Axis feed speed | 812<br>813 | 912<br>913 | 1012<br>1013 | The present speed is stored. ("0" for stop) | |
| External I/O signal | 816 | 916 | 1016 | The ON/OFF status of the I/O signal to/from external devices is stored. | |
| Status | 817 | 917 | 1017 | The ON/OFF status of various flags used by the AD75 is stored. | |
| Absolute original point | 822<br>823 | 922<br>923 | 1022<br>1023 | The address home position return is stored.<br>The position is not established when the power is turned on. | |
| Torque control value | 826 | 926 | 1026 | The torque limit value/torque change value are stored. | |

## 9.3 Programming

This section describes a sequence program for the pre/post-processing by the ACPU to carry out a manual pulse generator operation.

### 9.3.1 Manual pulse generator operation program

An example of pre/post-processing program for a manual pulse generator operation is shown here.

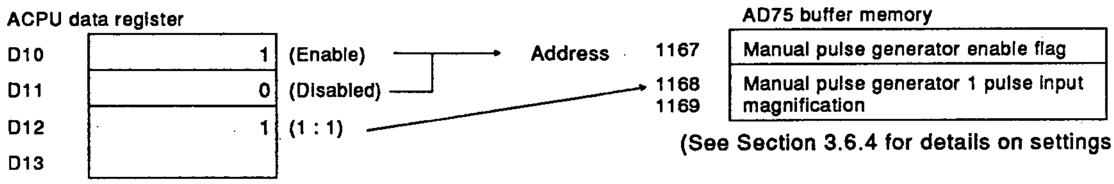
(1) Conditions

- Set the basic parameters and extended parameters.
- Set the clock data as required.
- Carry out the pre-processing when the BUSY signal is OFF.

(2) Program example

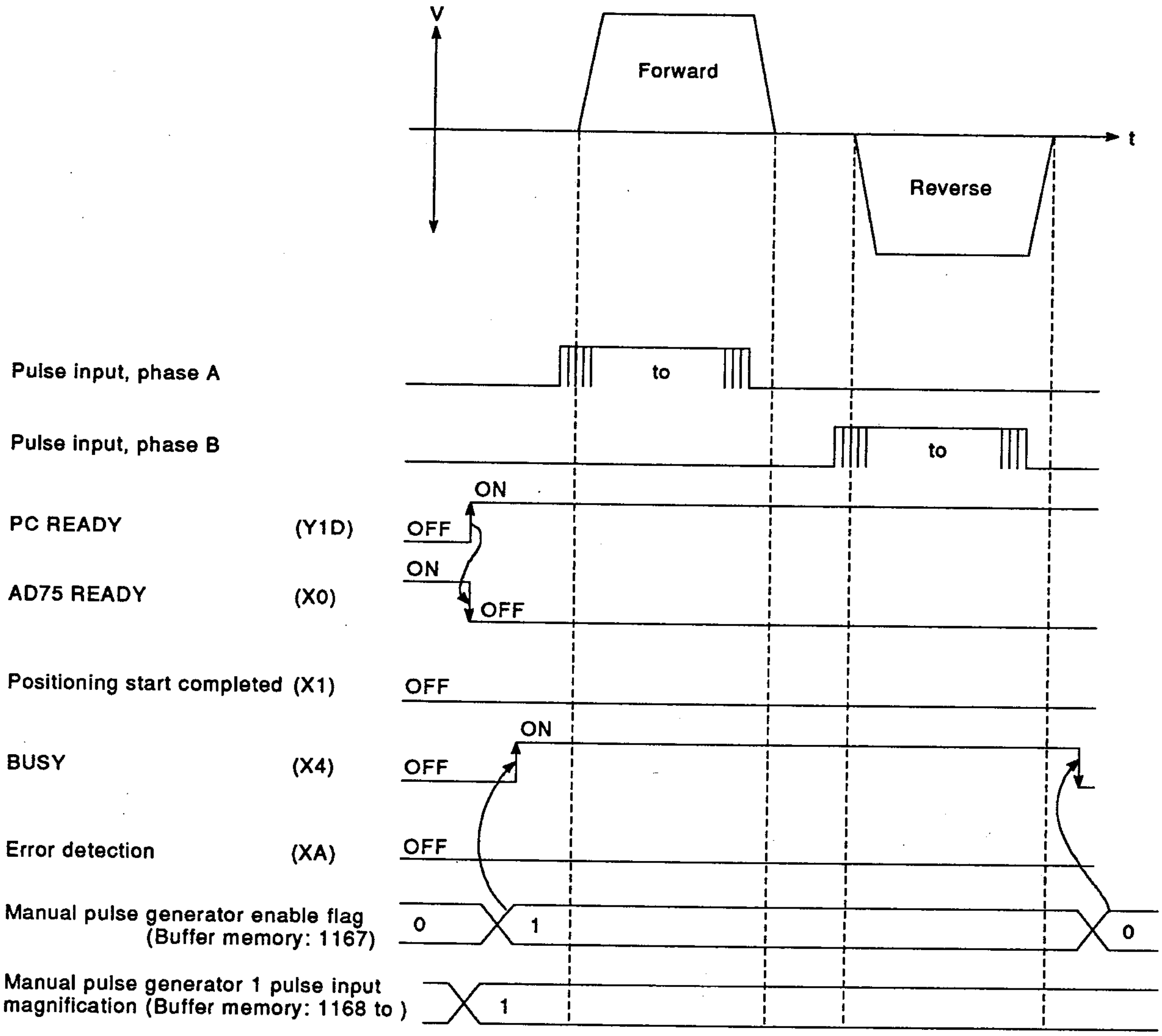
- The program shown below executes the pre/post-processing for a manual pulse generator operation at axis 1.

(a) Data transfer




(See Section 3.6.4 for details on settings.)

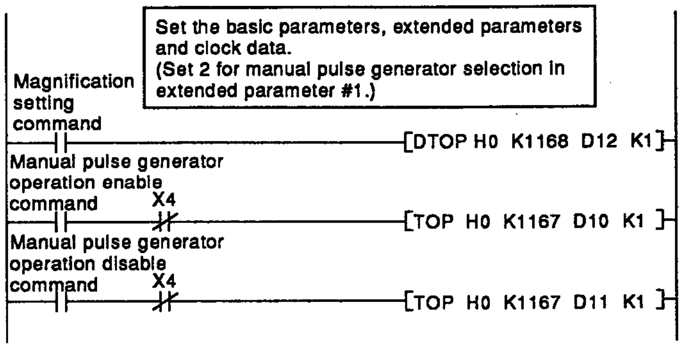
(b) I/O signals




**REMARK**

When a stop signal is input during a manual pulse generator operation, the BUSY signal is turned OFF.
Before reattempting manual pulse generator operation, set the manual pulse generator enable flag from 0 to 1.

(c) Program




See Chapter 12.
(This setting is not required when setting is done at a peripheral device.

[Pre-processing]
Sets the input magnification to 1 x

[Pre-processing]
Enables manual pulse generator operation.
Manual pulse generator operation will be possible until it is disabled.

Disables manual pulse generator operation.

**POINTS**

(1) Positioning control is carried out based on the parameter settings and the number of pulses input from the manual pulse generator, as follows.

[Travel value] = (Number of input pulses) x (Manual pulse generator 1 pulse input magnification setting) x (Travel value per pulse)

[Output speed] = (Number of input pulses per control cycle time) x (Manual pulse generator 1 input magnification setting) x (Travel value per pulse)

(2) The last pulse is output with a delay of 1 control cycle time (about 100 ms).

(3) The torque limit during manual pulse generator operation is controlled in accordance with the parameter setting value or torque change value.

(4) After the upper/lower limit switch signal has been turned OFF during manual pulse generator operation, causing deceleration to a stop, input pulses for travel in the direction that caused the limit switch signal to go OFF are not acknowledged.
Input pulses in the direction that cause the limit switch signal to come ON are acknowledged.

(5) When the manual pulse generator operation is completed, the manual pulse generator enable flag must be set to 0.
If it is left set at "1" (enabled), inadvertent operation at the manual pulse generator will cause incorrect positioning operation.

(6) When manual pulse generator operation is used to determine a positioning data address, the "feed present value" stored in the buffer memory (axis 1: 800, 801) is used when travelling to the target position is completed.

(7) Before carrying out manual pulse generator operation, check the details of manual pulse generator operation and applicable restrictions by referring to Section 3.3.9.

# 10. SPEED CHANGE AND OVERRIDE

Speed changes and overrides can be executed at any time from the ACPU, an external device or the AD75P, by changing the positioning speed within the speed control limit range.

This chapter describes the use of the speed change and override functions in programming to change the positioning speed from the ACPU or an external device.
For speed changes from the AD75P in the test mode, see the AD75P Operating Manual.

**REMARK**

Unless otherwise specified, this section shows the sequence program when the ACPU at the station where the AD75 is installed is an A3UCPU and the I/O signals of the AD75 as seen from the A3UCPU are 00H to 1FH.

## 10.1 Speed Change Programs

This section shows program examples for changing the present positioning speed using the speed change function.

### 10.1.1 Program to change the speed from the ACPU

Shown below is a program example for changing the speed from the ACPU in response to a positioning speed change request in the axis control data.

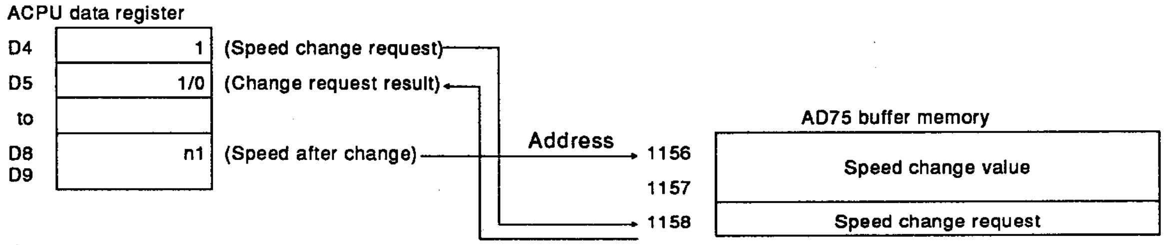
(1) Conditions

- Set a speed change value before issuing a speed change request.

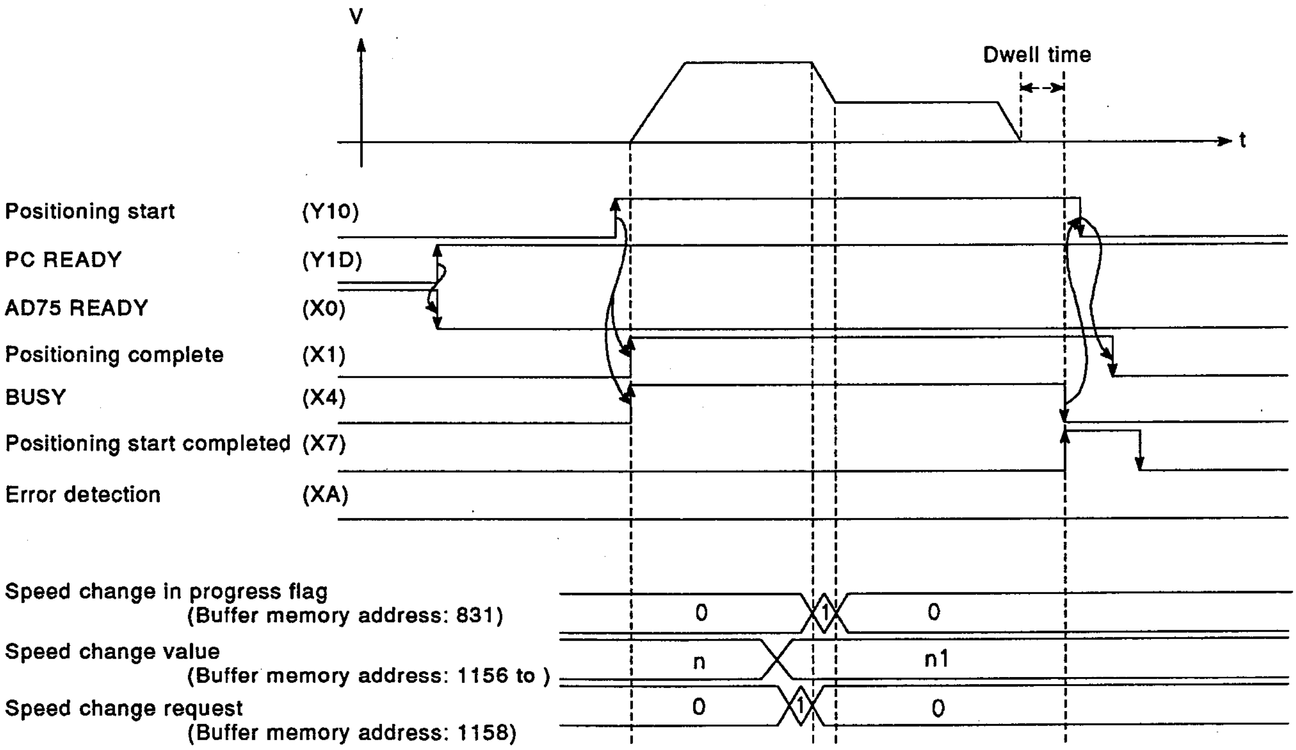
(2) Program example

- The program shown here issues a speed change request for axis 1.

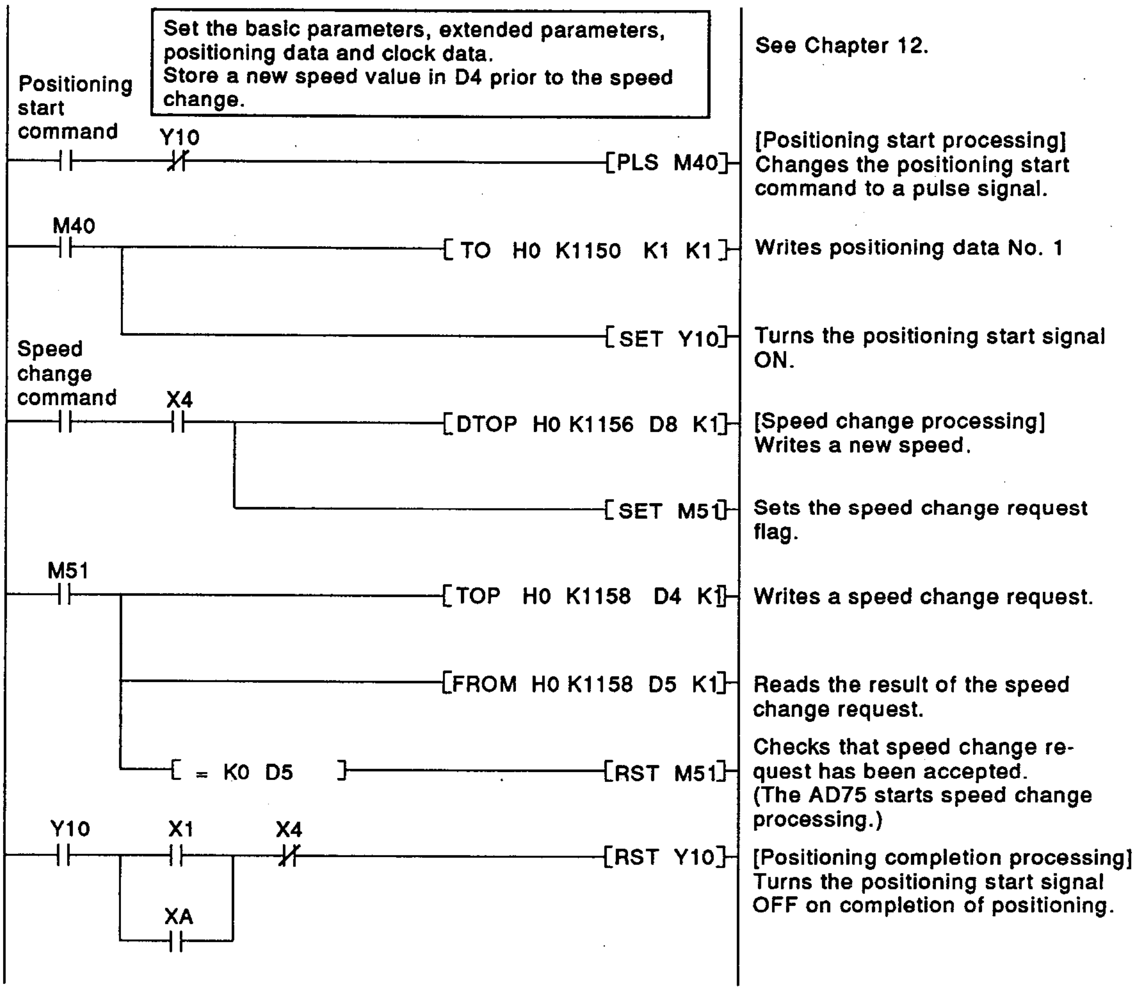
(a) Data transfer




(b) I/O signals



(c) Program




**POINTS**

(1) Before performing a speed change, check the speed change operation and applicable restrictions by referring to Section 3.3.19.

(2) For interpolation operation, use the speed change value and speed change request for the reference axis.

### 10.1.2 Program to change the speed from an external device

This section shows an example of a program in which the speed is changed from an external source during positioning operation by selecting "external speed change request" in external positioning start selection.

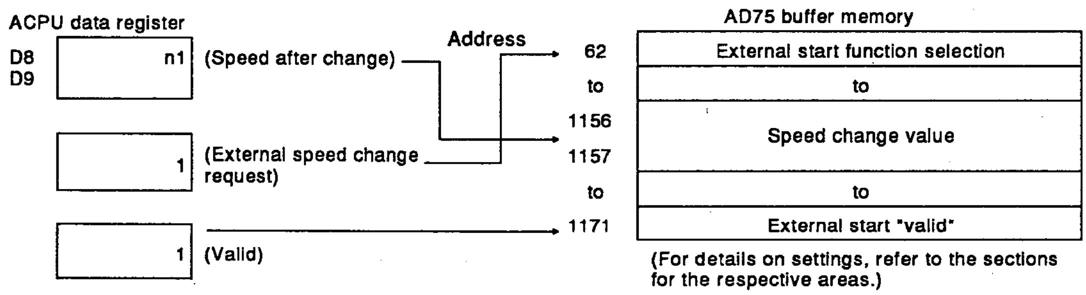
(1) Conditions

- Select external speed change request using the external positioning function selection.
- Carry out the following setting before inputting the external start signal.
  1) Set external start "valid".
  2) Set the speed change value.

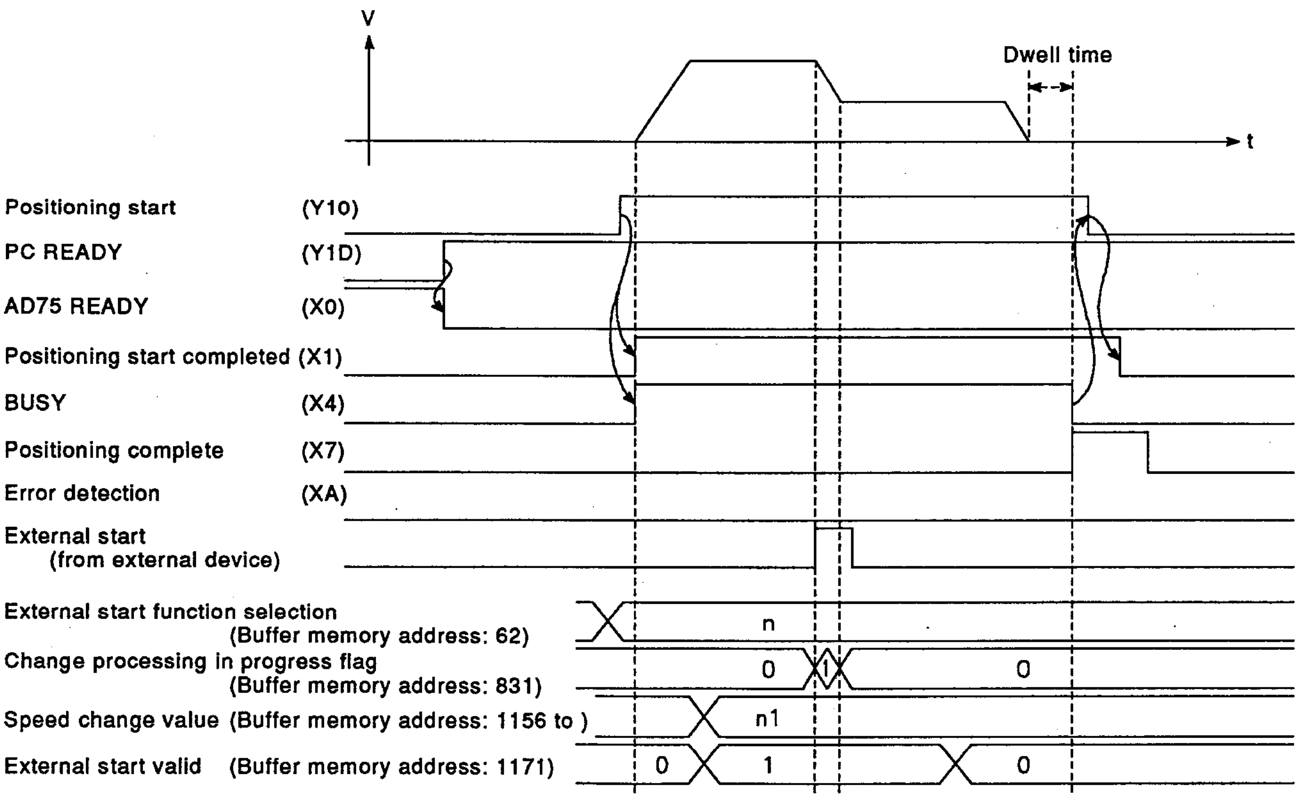
(2) Program example

- The program shown here issues a speed change request from an external device to axis 1.

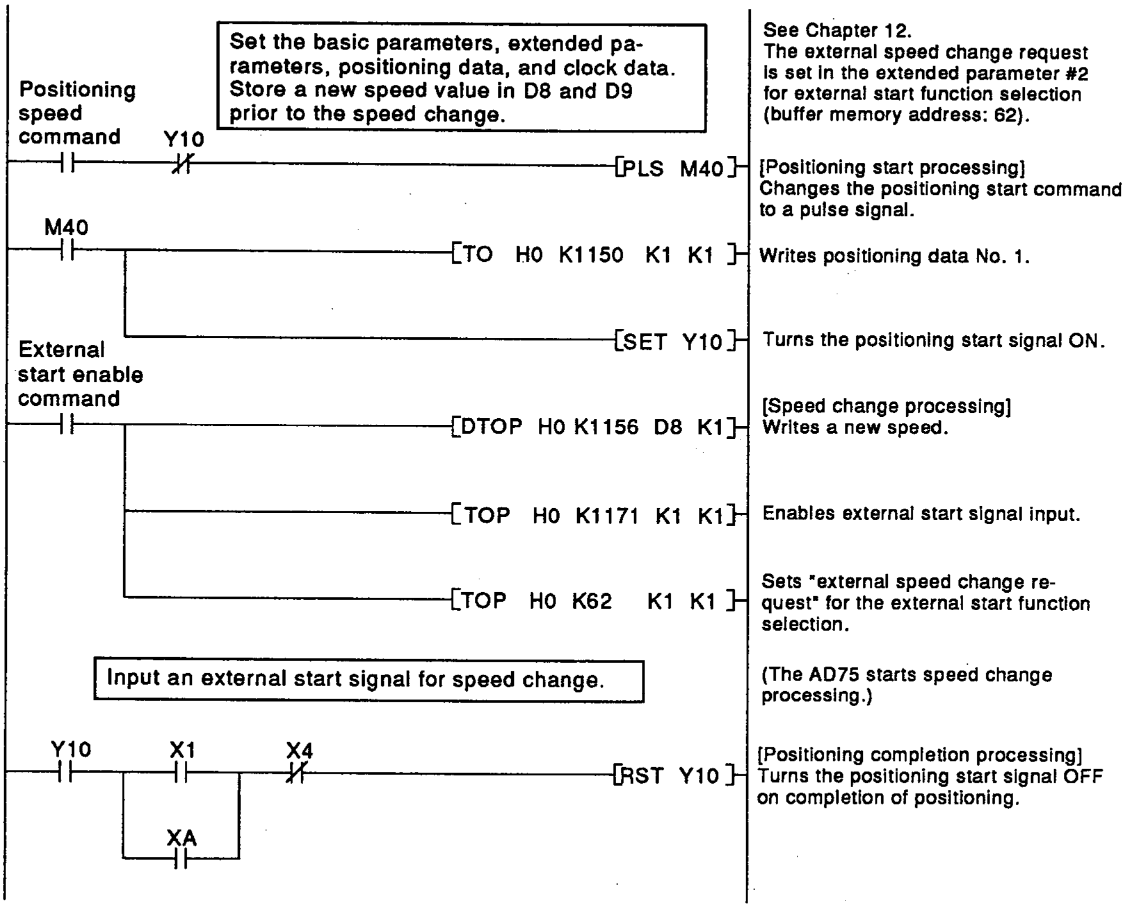
(a) Data transfer




(b) I/O signals



(c) Program




**POINTS**

(1) When "external speed change request" is selected using external start function selection, set the speed change value (address: 1156/1206/1256) before inputting the external start signal.
When "skip request" is selected, no settings have to be made.
Whichever function is selected, the timing for external start function selection and external start "valid" setting is the same as when "external positioning start" is selected.

(2) External start is a function whereby the command is input directly into the AD75.
Use of an external start signal can eliminate timing variations of up to one ACPU scan time.
This is useful when an earlier start by command input or reduction of variation is desired.

(3) The external start valid setting prevents actuation of the selected function by incorrect input.
In order to stop the selected function being actuated by input of the external start signal, it is recommended that "invalid" be set.

(4) Before using any of the functions, check the operation and applicable restrictions by referring to the following sections on the functions that can be selected by external start function selection.
- External positioning start : See Sections 3.3.1 to 3.3.7 and Section 7.3.1.
- External speed change request : See Section 3.3.19, Section 10.
- Skip request : See Section 3.3.20.

(5) For interpolation operation, use the speed change value and external start signal for the reference axis.

## 10.2 Override Programs

The positioning speed (current speed) can be overridden within the range of 1 to 300 % in 1 % increments to change the speed.
When a speed change is performed during positioning, the changed positioning speed is also overridden.

This section shows program examples for changing the present positioning speed using the override function.

(1) Conditions

- Set a positioning speed override value during positioning.

(2) Program example

- The program shown here changes the positioning speed of axis 1.

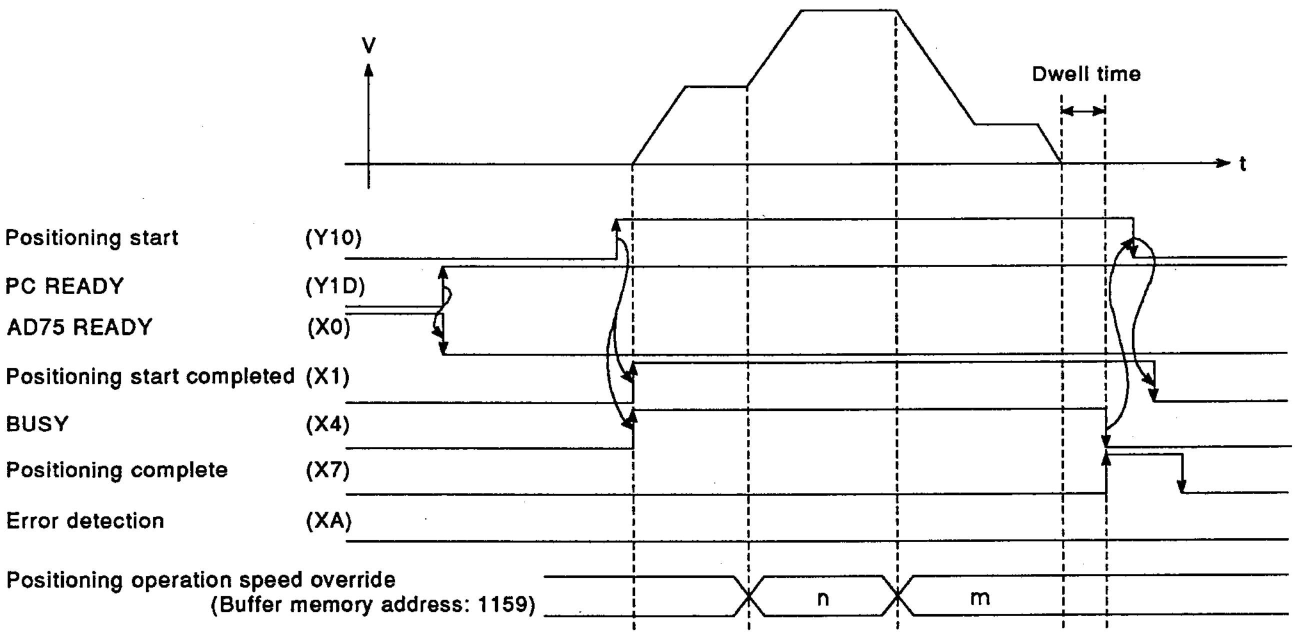
(a) Data transfer

ACPU data register — AD75 buffer memory

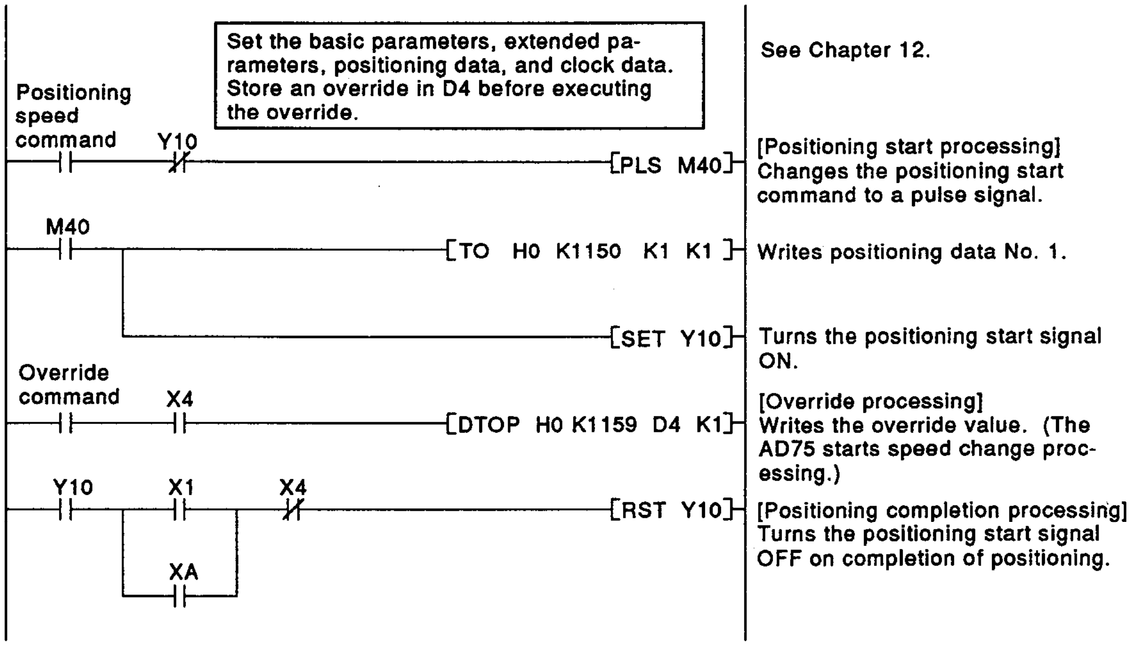
D4 [ n/m % ] (Override value) ⟶ Address 1159 [ Positioning operation speed override ]

(For details on settings, see Section 3.6.4.)

(b) I/O signals



(c) Program




**POINTS**

(1) Before executing a speed change, check the override operation and applicable restrictions by referring to Section 3.3.24.

(2) For interpolation operation, use the set positioning operation speed override value for the reference axis.

(3) When the override value is 100 %, the current speed remains unchanged.

(4) If the override value for the deceleration speed is changed during deceleration in response to a stop command, or during automatic deceleration during position control, the new value will not become effective until motion has stopped after deceleration.

(5) If the override speed exceeds the speed control limit, the limit is used as the positioning speed.

(6) If the remaining distance is not long enough to increase the speed to the override value during position control, positioning is performed at the highest possible speed.

# MEMO

# 11. PRESENT VALUE CHANGE

Present value change means changing the feed present value of an axis at rest. (For details of present value change, see Section 3.3.18.)

Present value change can be executed in the following two ways:

- Using positioning data No. 9003 .......... See Section 11.1.
- Using the present value change as the control method ...................................... See Section 11.2.

This chapter describes programming for changing the feed present value of an axis from the ACPU using the above approaches.

**POINTS**

(1) Present value change using positioning data No. 9003
Write data No. 9003 to the positioning start number area in the buffer memory and turn ON the positioning start signal. *1

(2) Present value change using "present value change" as the control method
(a) Write the positioning data number for which present value change is designated to the positioning start number area in the buffer memory and turn ON the positioning start signal.
(b) A positioning data number for which present value change is designated as the control method can be set after the positioning data number set in the positioning start data block in the start information area. *2
This data is used to perform present value change during continuous positioning of two or more data blocks according to the start information.

**REMARKS**

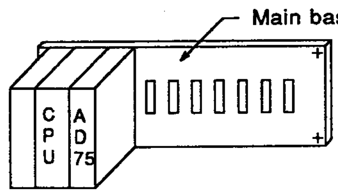
1) *1: The positioning start number area is located at the following buffer memory addresses. (See Section 3.6.4.)

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Positioning start number area | 1150 | 1200 | 1250 |

2) *2: The positioning start area is located at the following buffer memory addresses. (See Section 3.6.6.)

| Axis No. | Axis 1 | Axis 2 | Axis 3 |
|---|---|---|---|
| Positioning start data area | 4300 to 4349 | 4550 to 4599 | 4800 to 4849 |

3) Unless otherwise stated, this section shows sequence programs to be used under the following conditions:
- CPU*: A3UCPU
- AD75 I/O signals: X/Y00H to X/Y1FH
(when the AD75 is loaded at slot 0 of the main base unit)



### 11.1 Present Value Change Program Using Positioning Data No. 9003

This section describes an example of a program for changing the feed present value by starting positioning data No. 9003.

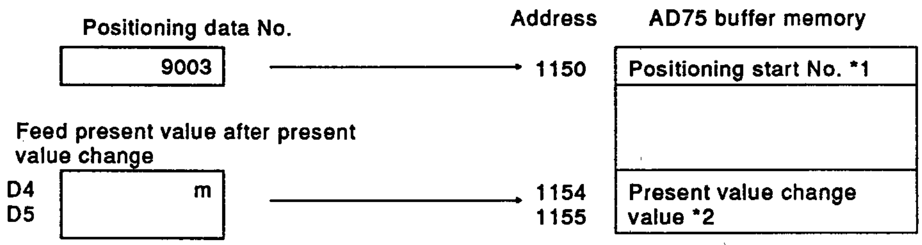
(1) Condition

- Set a new present value in the present value change value area prior to present value change.

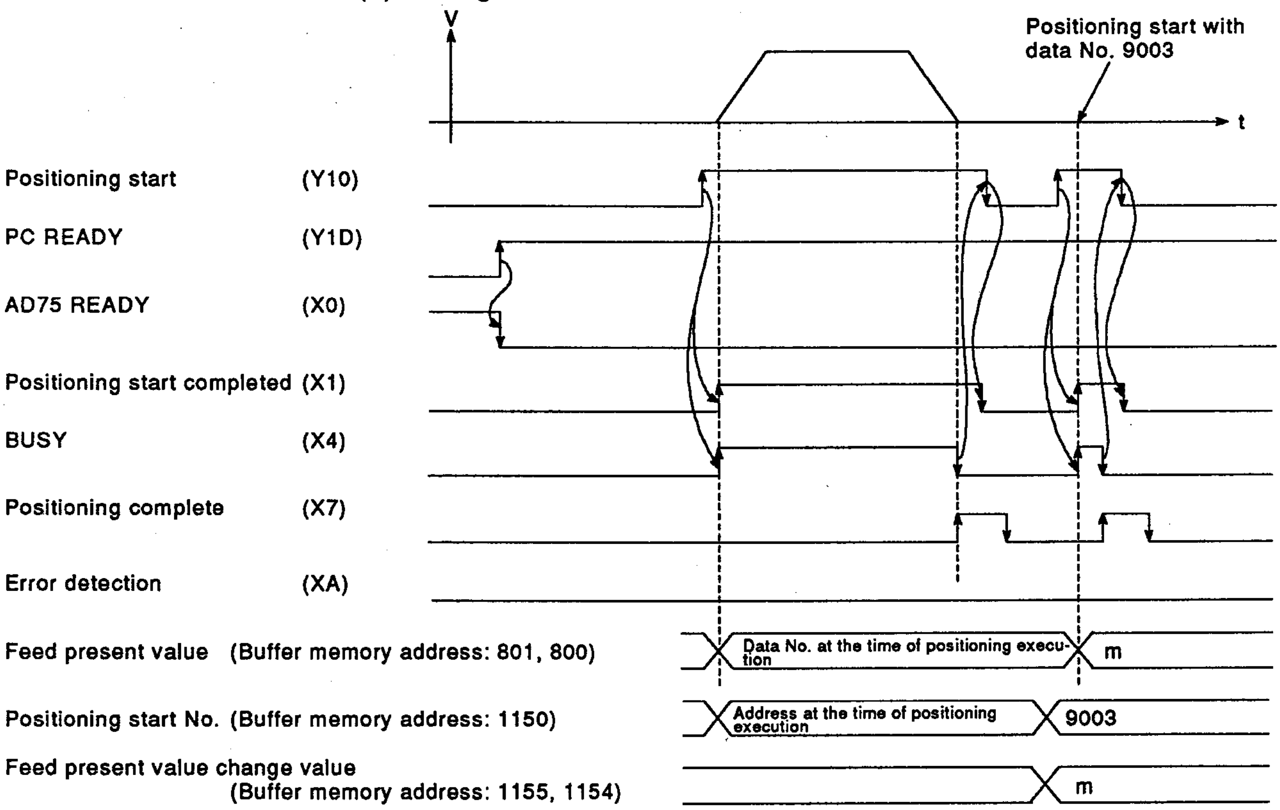
(2) Program example

- The program shown here changes the present value of axis 1.

(a) Data transfer



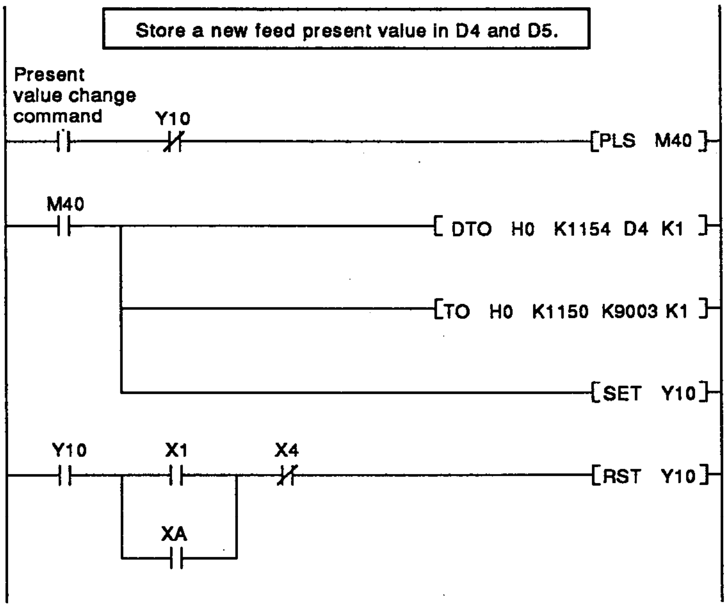

(b) I/O signals




**REMARKS**

1) *1: For details on positioning start numbers, see Section 3.4.5.
2) *2: For details on the present value change value area in the buffer memory, see Section 3.6.4.

(c) Program example




[Positioning start processing]
Changes the present value change command to a pulse signal.

Writes the new feed present value after the present value change.

Writes positioning data No. 9003.
(Data number for present value change)

Turns the positioning start signal ON.

[Positioning completion processing]*
Turns the positioning start signal OFF on completion of positioning. The feed present value is changed to the setting stored in D4 and D5.

**POINTS**

(1) Before performing a present value change, check the present value change operation and applicable restrictions by referring to Section 3.3.18.

(2) The present value change program and the positioning start program are the same, except that the data number for positioning is 9003.
Thus, the present value cannot be changed while the "stop command" and the "M code ON flag" remain ON.

(3) *: The positioning completion processing is the same as that executed by the positioning start program.
The positioning start signal can be turned OFF in the start completion processing of a positioning start program even if the program is not for a present value change.

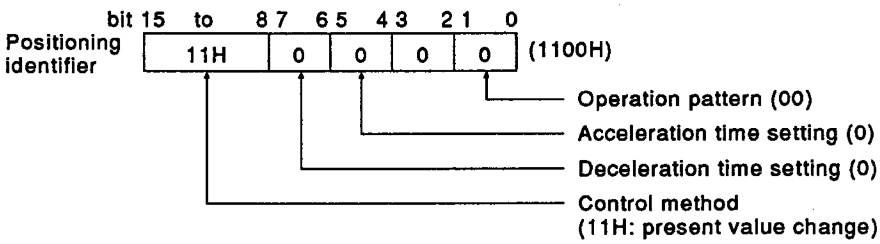
(4) A new present value outside the stroke limit range does not cause an error.
However, an "operation start outside software stroke limit range" error will occur at the beginning of the following positioning.

## 11.2 Present Value Change Program Using Present Value Change as the Control Method

This section describes a program example for changing the feed present value by executing the positioning data number specified for the present value change command.

(1) Conditions

- Set positioning data for which $1100_H$ (present value change) is set as the control method of the positioning identifier.

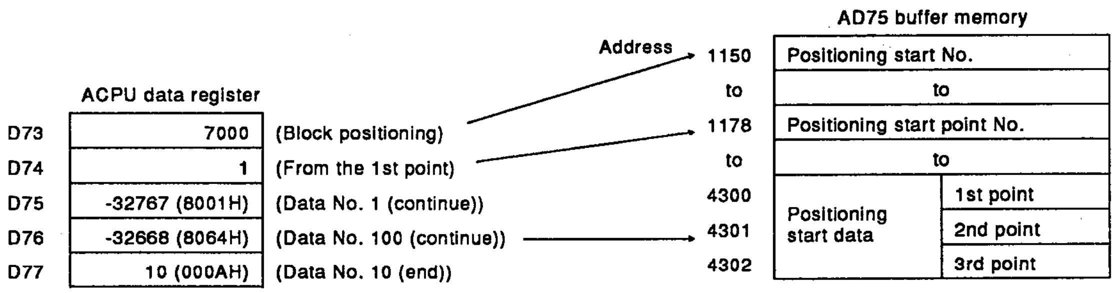



- Set a new present value for the positioning address.

(2) Program example

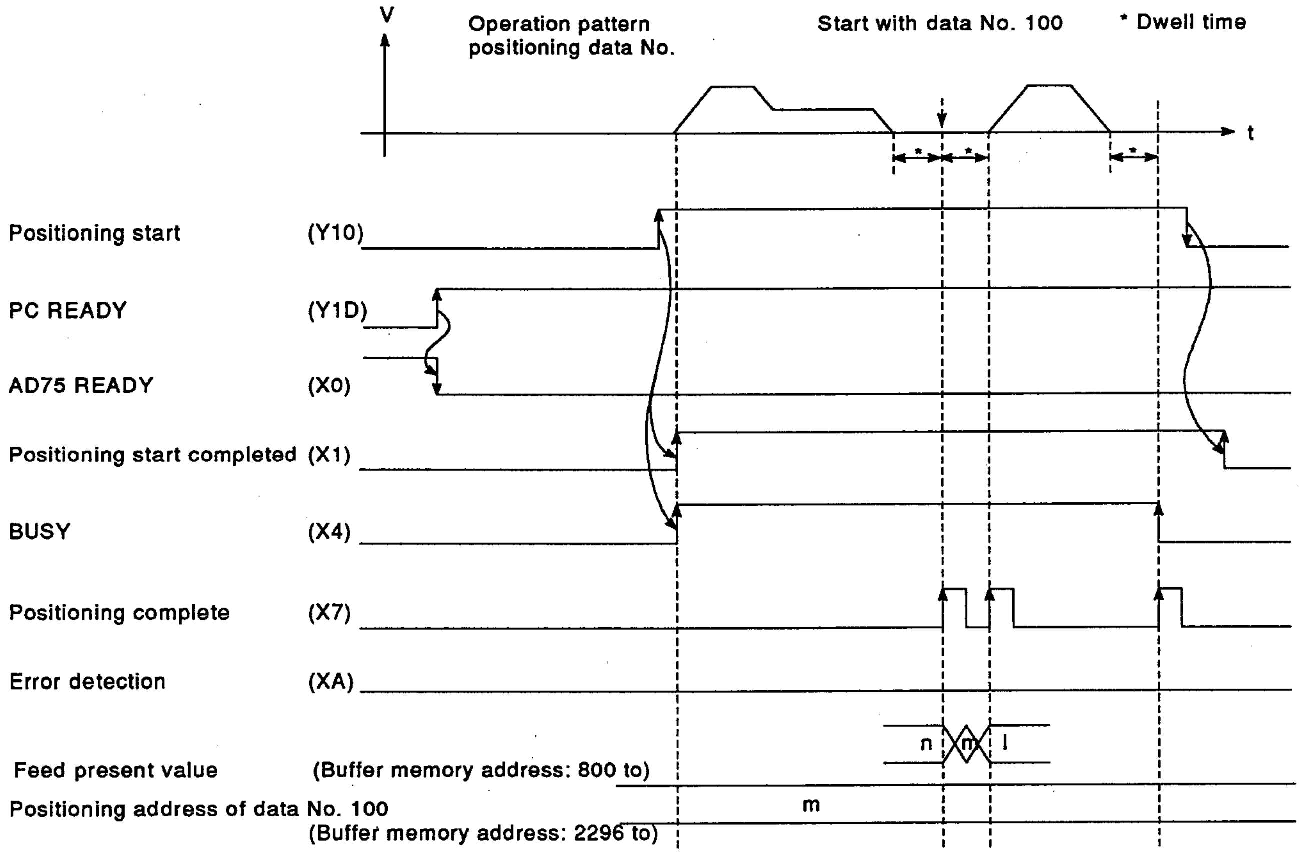
- The program shown here changes the present value of axis 1 using positioning data No. 100.

(a) Data transfer

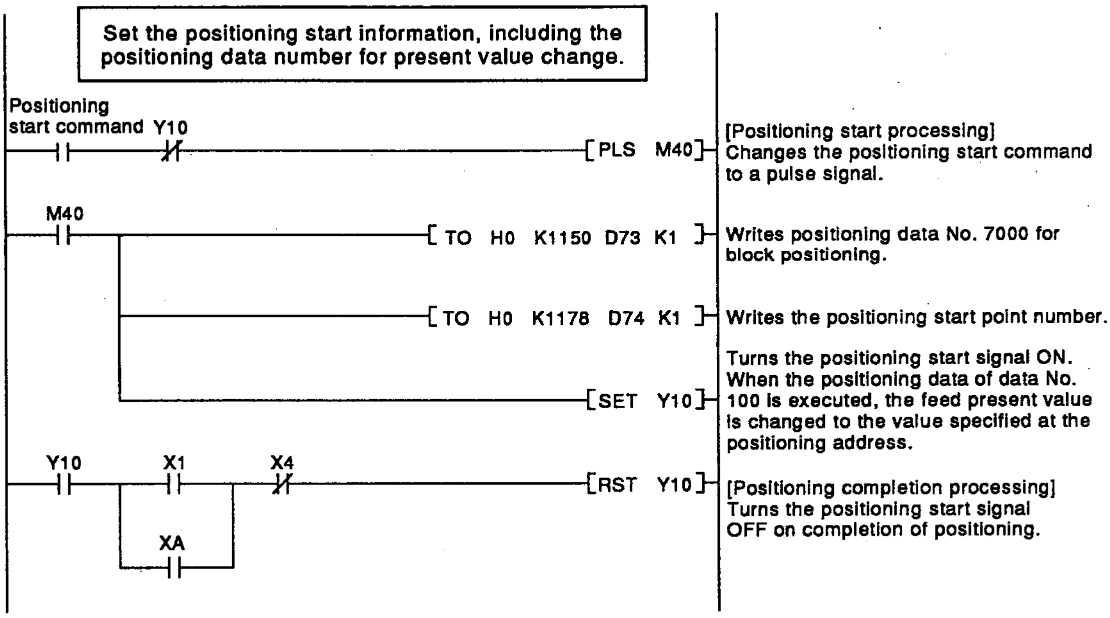



(For details on start numbers, see Section 3.4.5.
For details on the present value change value, see Section 3.6.4.)

(b) I/O signals


V
Operation pattern
positioning data No.
Start with data No. 100
* Dwell time
t
Positioning start (Y10)
PC READY (Y1D)
AD75 READY (X0)
Positioning start completed (X1)
BUSY (X4)
Positioning complete (X7)
Error detection (XA)
n
m
l
Feed present value (Buffer memory address: 800 to)
Positioning address of data No. 100
(Buffer memory address: 2296 to)
m

(c) Program




**POINTS**

(1) Before performing a present value change, check the present value change operation and applicable restrictions by referring to Section 3.3.18.

(2) Positioning data in which a present value change instruction is designated can beexecuted just after the positioning data of operation pattern "01" or "00" to perform a present value change.

(3) A present value change value outside the stroke limit range does not cause an error.
However, an "operation start outside software stroke limit range" error will occur at the begining of the following positioning.

# 12. DATA SETTING USING A SEQUENCE PROGRAM

This chapter describes sequence programs to set clock data (system control data), parameters, positioning data and positioning start information in the AD75's buffer memory from the ACPU.

The following table shows the applications of the I/O signals (X, Y), internal relays (M) and data registers (D) used in the program examples, including the devices used in the programs cited in sections 5 to 11.

| Device Name | Device Axis 1 | Device Axis 2 | Device Axis 3 | Use | ON Status or the Stored Value Indicates: |
|---|---|---|---|---|---|
| Input | X0 | | | AD75 READY | Not ready/WDT error |
| | X1 | X2 | X3 | Start completed | Start completed |
| | X4 | X5 | X6 | Busy | Busy (operation in progress) |
| | X7 | X8 | X9 | Positioning completed | Positioning completed |
| | XA | XB | XC | Error detection | Error detection |
| | XD | XE | XF | M code ON | M code being output |
| Output | Y10 | Y11 | Y12 | Positioning start | Requesting start |
| | Y13 | Y14 | Y1C | Axis stop | Requesting stop |
| | Y16 | Y18 | Y1A | Forward JOG start | Forward start in progress |
| | Y17 | Y19 | Y1B | Reverse JOG start | Reverse operation starting |
| | Y1D | | | PC READY | Ready |
| Internal relay | M0 | | | Parameter setting completed flag | Setting completed |
| | M1 | | | Flash ROM registration processing in progress flag | Processing |
| | M2 | M3 | M4 | Axis error reset request in progress flag | Request issued |
| | M10 | —— | —— | Machine home position return start flag | Home position return enabled |
| | M11 | —— | —— | High-speed home position return start flag | Home position return enabled |
| | M12 | —— | —— | High-speed machine home position return flag | Home position return enabled |
| | M13 | —— | —— | Home position return request flag OFF request | Flag OFF request |
| | M14 | —— | —— | | Flag OFF request |
| | M40 | —— | —— | Positioning command flag | Command exists |
| | M41 | —— | —— | Restart command flag | Command exists |
| | M42 | —— | —— | Restart request flag | Request issued |
| | M50 | —— | —— | JOG operation enable flag | Operation enabled |
| | M51 | —— | —— | Speed change request flag | Requesting change |
| | M52 | —— | —— | Positioning data write/read request flag | Request issued |
| | M53 | —— | —— | | |
| | M100 | | | "AD75 normal" flag | Normal |
| | M101 | | | Initial error reset complete flag | Error reset complete |
| | M102 | | | All BUSY signals OFF flag | All OFF |
| | M103 | | | AD75 operation enable flag | Operation enabled |
| | M104 | | | Clock setting command flag | Command exists |
| | M105 | | | Clock setting command flag | Command exists |
| | M106 | | | Clock data write request flag | Request issued |
| | M9028 | | | Clock data read request | Request issued |

| Device Name | Device | | | Use | ON Status or the Stored Value Indicates: |
|---|---|---|---|---|---|
| | Axis 1 | Axis 2 | Axis 3 | | |
| Data register | D0 | ——— | | Status | Flag statuses |
| | D1 | | | Status (for specific flag) | Specific flag status |
| | D2 | | | Absolute original point | Home position address, etc. |
| | D3 | | | | |
| | D4 | | | General-purpose | ——— |
| | D5 | | | General-purpose | |
| | D6 | | | Speed command value | Speed |
| | D7 | | | | |
| | D8 | | | Speed change command value | Target speed |
| | D9 | | | | |
| | D10 | | | Manual pulse generator operation enabled | "Enable" value |
| | D11 | | | Manual pulse generator operation disabled | "Disabled" value |
| | D12 | | | Manual pulse generator 1 pulse input magnification | Magnification value |
| | D13 | | | | |
| | D30 | | | Parameter settings | Applicable set value |
| | to | | | | |
| | D72 | | | | |
| | D73 | | | General-purpose | ——— |
| | D74 | | | General-purpose | |
| | D75 | | | Positioning data set value or positioning start data setting | Applicable set value |
| | | | | | |
| | D84 | | | | |
| | D85 | | | Positioning data interface | Teaching set value or read value |
| | | | | | |
| | D99 | | | | |
| | D100 | | | Flash ROM registration result | Result value |
| | D101 | D102 | D103 | Axis error code | Error code |
| | D104 | D105 | D106 | Axis warning code | Warning code |
| | D107 | D108 | D109 | Axis error reset result | Result value |
| | D110 | | | Clock data setting (hour) | Clock data |
| | D111 | | | Clock data setting (min./sec.) | |
| | D112 | | | Clock data set request | Set request data |
| | D113 | | | Clock data write result | Result value |

## 12.1 Program for Setting Clock Data (System Control Data)

This section shows an example of a sequence program for setting AD75 clock data (one of the system control data) from the ACPU.

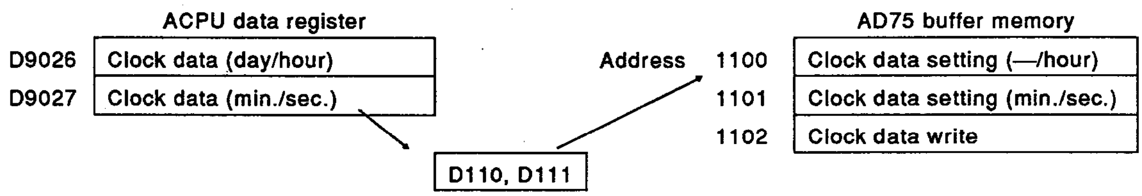
(1) Setting conditions

- There are no particular conditions to be set.

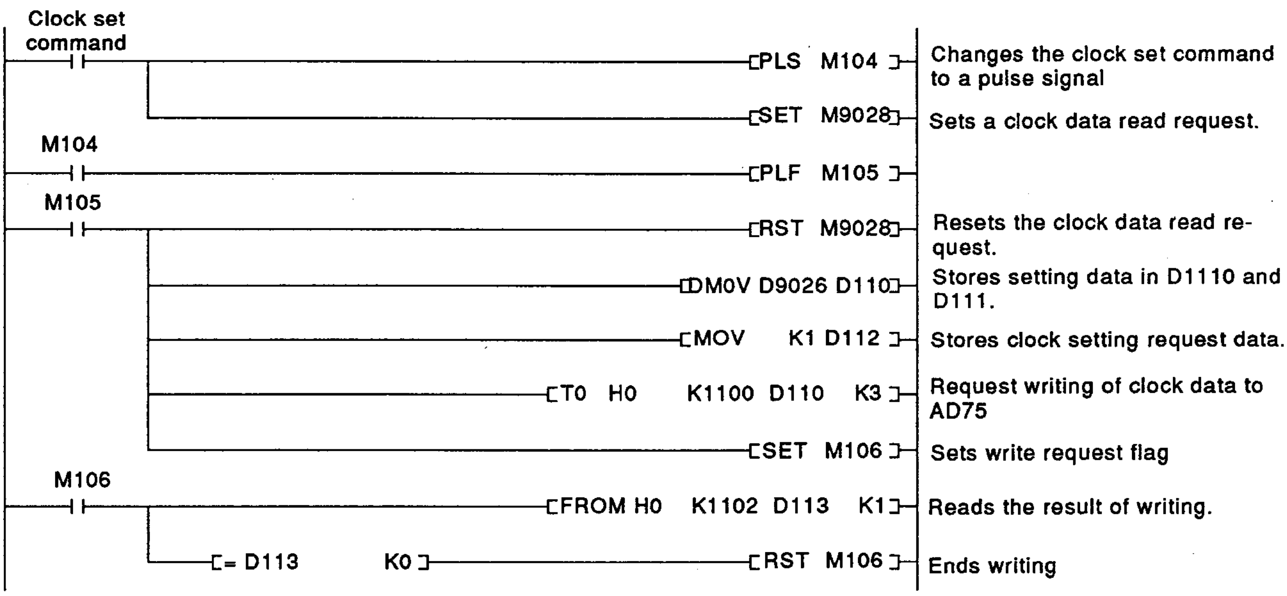
(2) Program example

- The program shown here reads clock data from the ACPU to the AD75.

(a) Data transfer




(b) (Program)




**POINTS**

(1) Set clock data in the AD75 each time the ACPU is turned ON. Otherwise, the clock data count will start from the AD75 start-up time of 00 day/00 hour/00 minute/00 second.

(2) The set clock data will be used as history data.

(3) The first eight bits of the data set at address 1100 (in the control data area) in the AD75's buffer memory will be ignored.

(4) The AD75 controls the clock data to an accuracy of 0.1 second to facilitate measurement of tact time and other data in start history recording by the user.

(5) Since the clock data in the AD75 is less accurate than that in the ACPU, match it with the ACPU clock data at least once a day.

### 12.2 Program for Setting Basic Parameters

This section shows an example of a sequence program for setting basic parameters in the AD75 from the ACPU.

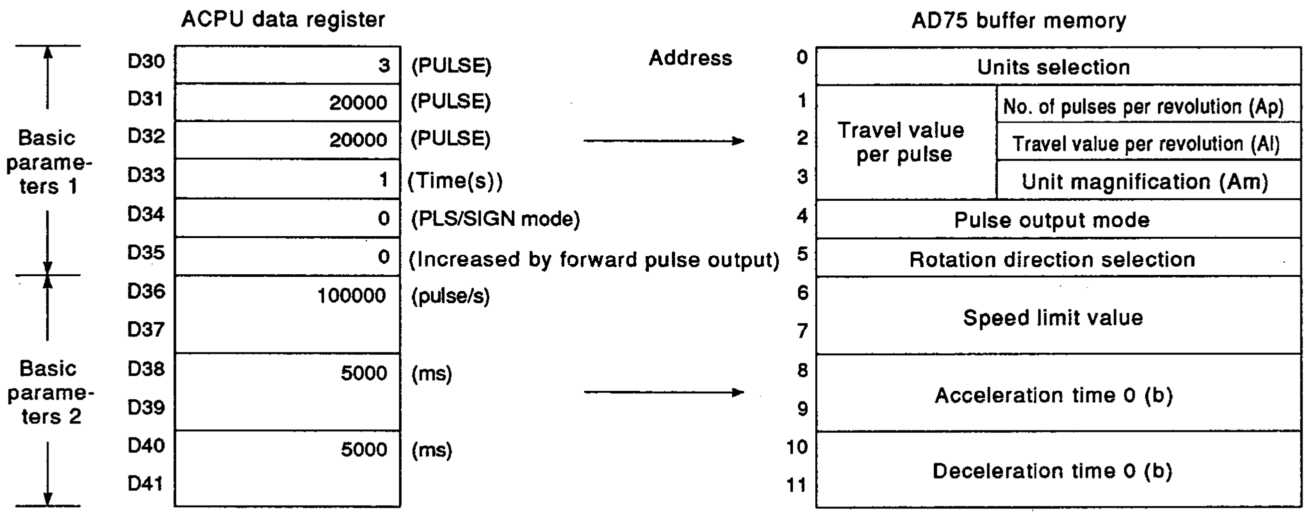
(1) Setting conditions

- Write basic parameters #1 when the PC READY signal (Y1D) is turned OFF.
- Write basic parameters #2 when positioning is not executed.

(2) Program example

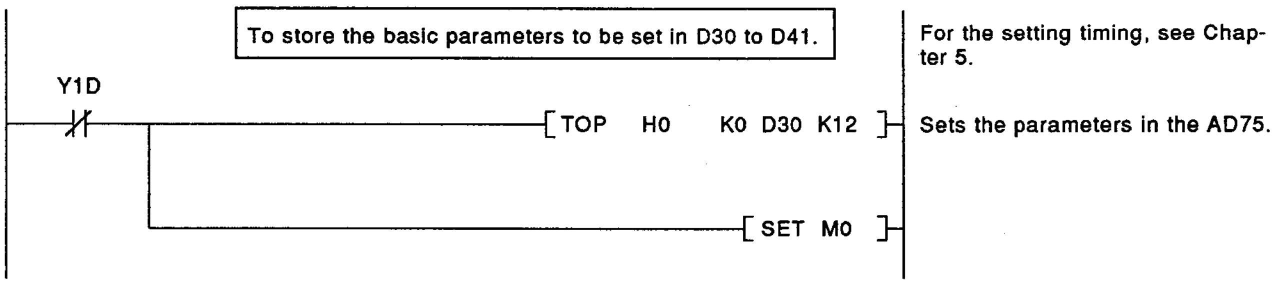
- The program shown here sets the basic parameter settings for axis 1, stored in D30 to D41, in the AD75.

(a) Data transfer




(For details on parameters and set values, see Section 3.4.1.)

(b) Program



**POINTS**

(1) The basic parameters are data to be set in accordance with the mechanical system or applicable motor.
An improper parameter value can reverse the forward/reverse directions of rotation of the motor, or make it completely inoperable.
Set the correct parameters for the system.

(2) A parameter setting range check takes place in the following cases.
If the AD75 detects an error in the parameter setting range check, it turns ON the error detection signal (XA/XB/XC) for the faulty axis, and stores the error code in the buffer memory (addresses: 807/907/1007). (The AD75 READY signal (X0) does not turn OFF.)

- At start-up of the AD75.
- When the PC READY signal (Y1D) status is switched from OFF to ON.
- When the parameters are set in the AD75.

(3) Basic parameters #1 are the basic data for positioning, including home position return, whereas basic parameters #2 are the data to set the acceleration/deceleration gradients in positioning.

(4) The parameter values held in the flash ROM are stored in the buffer memory at start-up of the AD75.
After changing a parameter, it is advisable to confirm that the AD75 operates properly with the changed parameter before registering it in the flash ROM and using it as the set value at start-up of the AD75.

(5) Basic parameters #1 can be changed when the PC READY signal (Y1D) is turned OFF.
When changing the basic parameters #1 after positioning, first turn OFF the PC READY signal after completion of positioning.
After the parameters have been changed, turn ON the PC READY signal, and resume positioning.

(6) Basic parameters #2 can be changed whether the PC READY signal (Y1D) is turned ON or OFF, and become valid as soon as they are changed.
Positioning by changing the acceleration time, etc. on a case-by-case basis must, therefore, be started after changing the parameters.

### 12.3 Program for Setting Extended Parameters

This section shows examples of sequence programs for setting extended parameters in the AD75 from the ACPU.

(1) Setting conditions

- Write extended parameters #1 when the PC READY signal (Y1D) is turned OFF.
- Write extended parameters #2 when positioning is not executed.

(2) Program example

- The program shown here sets the extended parameter settings for axis 1, stored in D30 to D72, in the AD75.

(a) Data transfer

| | ACPU data register | | | Address | AD75 buffer memory |
|---|---|---|---|---|---|
| Extended parameters 1 | D30 | 10 | (pulse) | 15 | Backlash compensation |
| | D31 | 1000000000 | (pulse) | 16 | Upper software stroke limit |
| | D32 | | | 17 | |
| | D33 | 0 | (pulse) | 18 | Lower software stroke limit |
| | D34 | | | 19 | |
| | D35 | 1 | (Machine feed value designation) | 20 | Software stroke limit selection |
| | D36 | 1 | (Valid) | 21 | Software stroke limit valid for JOG operations, etc. |
| | D37 | 20000 | (pulse) | 22 | Command in-position range |
| | D38 | | | 23 | |
| | D39 | 300 | (%) | 24 | Torque limit set value |
| | D40 | 1 | (AFTER mode) | 25 | M code ON signal output timing |
| | D41 | 0 | (Standard speed switching) | 26 | Speed switching mode Speed change type |
| | D42 | 1 | (Reference axis speed) | 27 | Interpolation speed designation method (interpolation mode) |
| | D43 | 0 | (No update) | 28 | Feed present value update command in speed control |
| | D44 | 0 | (No manual pulse generator operation) | 29 | Manual pulse generator selection |
| | | | | 30 | |
| | | | | to | |
| Extended parameters 2 | D46 | 1000 | (ms) | 36 | Acceleration time 1 (b) |
| | D47 | | | 37 | |
| | to | | | to | |
| | D56 | 1000 | (ms) | 46 | Deceleration time 3 (b) |
| | D57 | 100000 | | 47 | |
| | D58 | | (pulse/s) | 48 | JOG speed limit value |
| | D59 | | | 49 | |
| | D60 | 0 | (Select acceleration time 0) | 50 | JOG operation acceleration time selection |
| | D61 | 0 | (Select deceleration time 0) | 51 | JOG operation deceleration time selection |
| | D62 | 0 | (Trapezoidal acceleration/deceleration) | 52 | Acceleration/deceleration process selection |
| | D63 | 100 | (%) | 53 | S-curve ratio |
| | D64 | 1000 | (ms) | 54 | Rapid stop deceleration time |
| | D65 | | | 55 | |
| | D66 | 1 | (Rapid stop) | 56 | Stop group 1 rapid stop selection |
| | to | | | to | |
| | D70 | 100 | (pulse) | 60 | Allowable error range for circular interpolation |
| | D71 | | | 61 | |
| | D72 | 0 | (External start) | 62 | External start function selection |

(For details on parameters and set values, see Section 3.4.2.)

(b) Program

```
         To store the extended parameters to be set in D30 to D72.   For the setting timing, see Chap-
 Y1D                                                                 ter 5.
--|/|--+-------------------[ TOP   H0   K15  D30  K15 ]-   Sets the parameters in the AD75.
       |
       +-------------------[ TOP   H0   K36  D46  K27 ]-
       |
       +----------------------------------[ SET  M0   ]-
```

**POINTS**

(1) A parameter setting range check takes place in the following cases. If the AD75 detects an error in the parameter setting range check, it turns ON the error detection signal (XA/XB/XC) for the faulty axis, and stores the error code in the buffer memory (addresses: 807/907/1007). (The AD75 READY signal (X0) does not turn OFF.)

- At start-up of the AD75.
- When the PC READY signal (Y1D) status is switched from OFF to ON.
- When the parameters are set in the AD75.

(2) Extended parameters #1 are data which seldom require changes once set at system start-up.
Extended parameters #2 are data to be set to make the best use of the AD75's functions.
Change the parameters according to the system as appropriate.

(3) The parameter values held in the flash ROM are stored in the buffer memory at start-up of the AD75.
After changing a parameter, it is advisable to confirm that the AD75 operates properly with the changed parameter before registering it in the flash ROM and using it as the set value at start-up of the AD75.

(4) Extended parameters #1 can be changed when the PC READY signal (Y1D) is turned OFF.
When changing extended parameters #1 after positioning, first turn OFF the PC READY signal after completion of positioning.
After the parameters have been changed, turn ON the PC READY signal, and resume positioning.

(5) Extended parameters #2 can be changed whether the PC READY signal (Y1D) is turned ON or OFF, and become valid as soon as they are changed.
Positioning by changing the acceleration time, etc. on a case-by-case basis must, therefore, be started after changing the parameters.

(6) External start function selection (buffer memory addresses: 62/112/362) requires control of the external start enable setting area (addresses: 1171/1221/1271) and the following setting to the buffer memory:

- When external positioning start is selected: Positioning start signal number (addresses: 1150/1200/1250)
- When external speed change request is selected: Speed change value (addresses: 1156 to/1206 to/1256 to)
- When skip request is selected: No setting required.

## 12.4 Program for Setting Home Position Return Parameters

This section shows an example sequence program for setting home position return parameters in the AD75 from the ACPU.

(1) Setting condition

- Write parameters when the PC READY signal (Y1D) is turned OFF.

(2) Program example

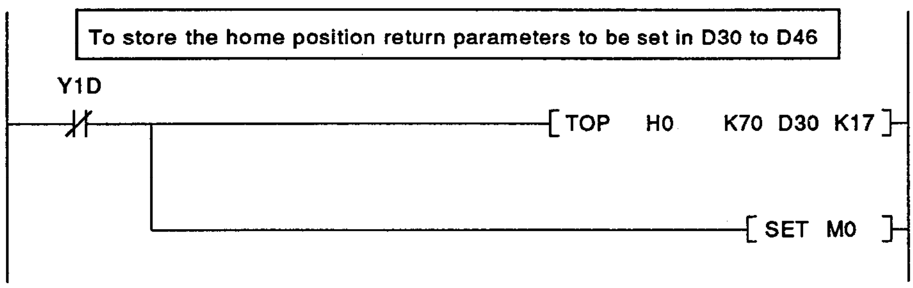
- The program shown here sets the home position return settings for axis 1, stored in D30 to D46, in the AD75.

(a) Data transfer

| Group | ACPU data register | Value | Unit / meaning | Address | AD75 buffer memory |
|---|---|---|---|---|---|
| Home position return basic parameters | D30 | 0 | (Near-zero point dog method) | 70 | Home position return method |
| | D31 | 1 | (Negative direction) | 71 | Home position return direction |
| | D32 | 0 | (pulse) | 72 | Home position address |
| | D33 | | | 73 | |
| | D34 | 50000 | (pulse/s) | 74 | Home position return speed |
| | D35 | | | 75 | |
| | D36 | 100 | (pulse/s) | 76 | Creep speed |
| | D37 | | | 77 | |
| Home position return extended parameters | D38 | 1 | (Execute) | 78 | Home position return retry |
| | D39 | 1000 | (ms) | 79 | Home position return dwell time |
| | D40 | 0 | (pulse) | 80 | Travel after near-zero point value designation |
| | D41 | | | 81 | |
| | D42 | 0 | (Select acceleration time 0) | 82 | Home position return acceleration time selection |
| | D43 | 0 | (Select deceleration time 0) | 83 | Home position return deceleration time selection |
| | D44 | 0 | (pulse) | 84 | Home position shift |
| | D45 | | | 85 | |
| | D46 | 300 | (%) | 86 | Home position return torque limit value |

(For details on parameters and set values, see Section 3.4.3.)

(b) Program




For the setting timing, see Chapter 5.

Sets the parameters in the AD75.

**POINTS**

(1) A parameter setting range check takes place in the following cases. If the AD75 detects an error in the parameter setting range check, it turns ON the error detection signal (XA/XB/XC) for the faulty axis, and stores the error code in the buffer memory (addresses: 807/907/1007). (The AD75 READY signal (X0) does not turn OFF.)

- At start-up of the AD75.
- When the PC READY signal (Y1D) status is switched from OFF to ON.
- When the parameters are set in the AD75.

(2) To perform home position return, set the following parameters in accordance with the system configuration:

- Set all the basic parameters for home position return.
- Set only the necessary home position return extended parameters.

(3) The parameter values held in the flash ROM are stored in the buffer memory at start-up of the AD75.
After changing a parameter, it is advisable to confirm that the AD75 operates properly with the changed parameter before registering it in the flash ROM and using it as the set value at start-up of the AD75.

(4) The home position return parameters can be changed when the PC READY signal (Y1D) is turned OFF.
When changing the home position return parameters after positioning, first turn OFF the PC READY signal after completion of positioning.
After the parameters have been changed, turn ON the PC READY signal, and resume positioning.

## 12.5 Program for Setting Positioning Data

This section shows an example of a sequence program for setting AD75 positioning data from the ACPU.

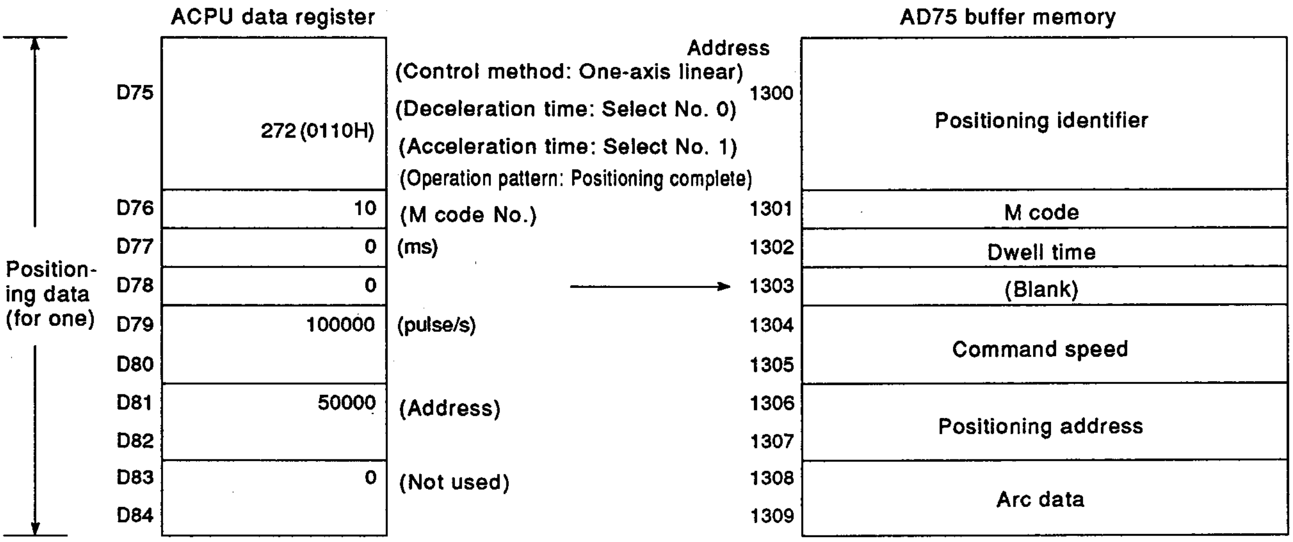
(1) Setting condition

- Write parameters when the relevant axis is not in operation.

(2) Program example

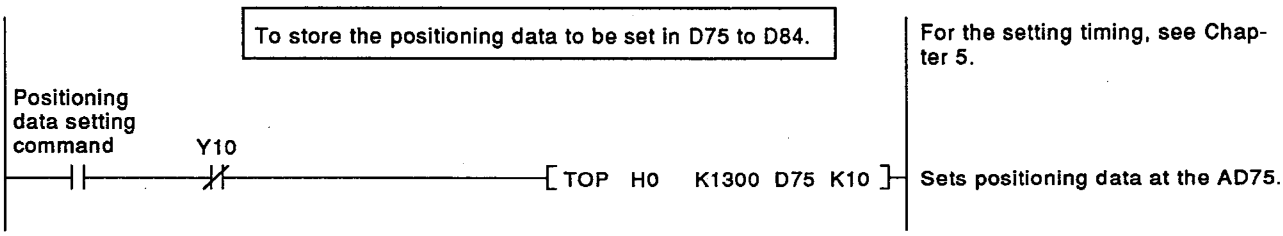
- The program shown here sets the positioning data for axis 1, stored in D0 to D9, in the AD75 using positioning data No. 1.

(a) Data transfer




(For details on positioning data and set values, see Section 3.4.4.)

(b) Program



**POINTS**

(1) A positioning data range check is performed when positioning is executed on the basis of that positioning data. If the AD75 detects an error in the range check, positioning cannot be performed according to the positioning data.
The AD75 turns ON the error detection signal (XA/XB/XC) for the faulty axis, and stores the error code in the buffer memory (addresses: 807/907/1007).

(2) The positioning data the AD75 handles is stored in the flash ROM. At start-up of the AD75, the positioning data in the flash ROM is stored in the internal memory and buffer memory of the AD75, and is used for positioning.

- Positioning data of data No. 1 to No. 100:
  Stored in the internal memory and buffer memory.
- Positioning data of data No. 101 to No. 600:
  Stored in the internal memory.

(3) From the ACPU, only the positioning data of data No. 1 to No. 100 can be set in the buffer memory, and the data becomes valid as soon as it is written to the buffer memory (only data requiring change can be written and become valid). From the AD75, the positioning data of data No. 1 to No. 600 can be set.

(4) After the positioning data has been set, it is advisable to confirm that positioning can be performed correctly according to the set data before registering it in the flash ROM.

(5) Set the positioning data when the relevant axis is not in operation, then start positioning.

## 12.6 Program for Setting Positioning Start Information

This section shows an example of a sequence program for setting positioning start information for block positioning from the ACPU to the AD75.

(1) Setting condition

- Write positioning start information when the relevant axis is not in operation.

(2) Program example

- The program shown here sets the positioning start data (5 points) for axis 1, stored in D75 to D79, in the AD75.
- In this example, no special positioning start or condition data corresponding to the positioning start data are set.

(a) Data transfer

ACPU data register

| | Register | Value | |
|---|---|---|---|
| Positioning start data | D75 | -32767(8001H) | (Continue, data No. 1) |
| | D76 | -32766(8002H) | (Continue, data No. 2) |
| | D77 | -32763(8005H) | (Continue, data No. 5) |
| | D78 | -32758(800AH) | (Continue, data No. 10) |
| | D79 | 15(000FH) | (End, data No. 15) |
| Special positioning start data | | | No setting |
| Condition data | | | No setting |

AD75 buffer memory

| Address | AD75 buffer memory |
|---|---|
| 4300 | 1st point |
| 4301 | 2nd point |
| 4302 | 3rd point |
| 4303 | 4th point |
| 4304 | 5th point |
| 4305 | 6th point |
| to | to |
| 4349 | 50th point |
| 4350 | 1st point |
| to | to |
| 4399 | 50th point |
| 4400 | 1st data |
| to | to |
| 4499 | 10th data |

(For details on positioning start data and set values, see Section 3.4.6.)

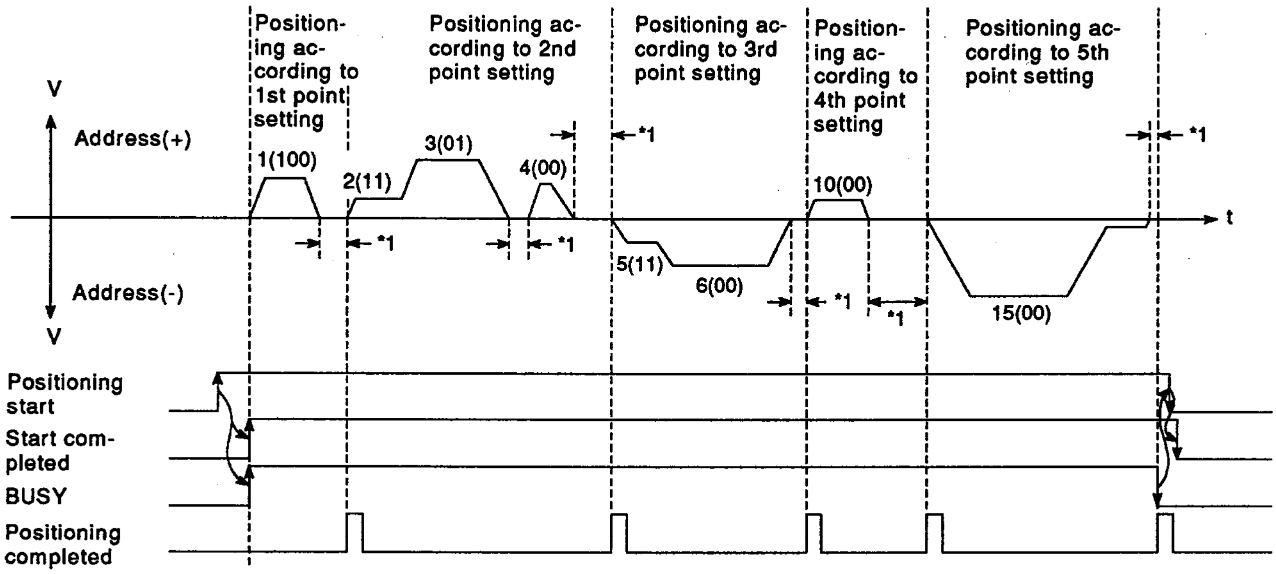
(b) Program

To set the positioning data specified for block positioning, and store the positioning start information to be set in D75 to D79. — See Section 12.5. For the setting timing, see Chapter 5.

```
Positioning
start informa-
tion setting
command        Y10
----| |--------|/|--------------------[ TOP  H0   K4300  D75  K5 ]-
```

Sets the positioning start information for five points of positioning start data in the AD75.

The figure below illustrates positioning by normal start when block positioning is performed according to the data numbers shown in the program example.
In the figure, the numbers not in parentheses represent the positioning data numbers and those in parentheses represent the operation pattern.




*1: Dwell time by the respective positioning data

**POINTS**

(1) A block positioning data No. range check takes place in the following cases. If the AD75 detects an out-of-range error in the range check, positioning is not performed according to the positioning data.
The AD75 turns ON the error detection signal (XA/XB/XC) for the faulty axis, and stores the error code in the buffer memory (addresses: 807/907/1007).

(2) The available numbers for positioning start data are 1 to 600 (positioning data numbers).

(3) Block positioning can be executed without including special positioning start and condition data in the positioning start information. Set special positioning start data or condition data as required when specifying the positioning start conditions for each block or conditions for repeating blocks alternately.

(4) For debugging during positioning, it is advisable to confirm the positioning of each block or data number using the step function described in Section 3.3.21.

(5) The positioning start information handled by the AD75 is not stored in the flash ROM.
Set positioning start information when the relevant axis is not in operation whenever positioning is to be performed, then start block positioning.

## 12.7 Program for Setting and Reading Positioning Data Through the Positioning Data Interface

This section shows examples of sequence programs for setting (writing) positioning data, such as positioning addresses obtained by the teaching function in manual operation (JOG operation, manual pulse generator operation) to the AD75 and for reading positioning data from the AD75.

### 12.7.1 Program for setting positioning data through the positioning data interface

This section shows an example of a sequence program for setting (writing) positioning data obtained by the teaching function.

(1) Setting condition

- To set the feed present value as the positioning address or auxiliary point for circular interpolation, write positioning data when the BUSY signal is turned OFF.

(2) Program example 1

- The program shown here writes the feed present value as the positioning address, and the other positioning data stored in D90 to D95, to data No. 101 for axis 1 (for individual control of each axis or for interpolation (except for circular interpolation by designating an auxiliary point)).

(a) Data transfer

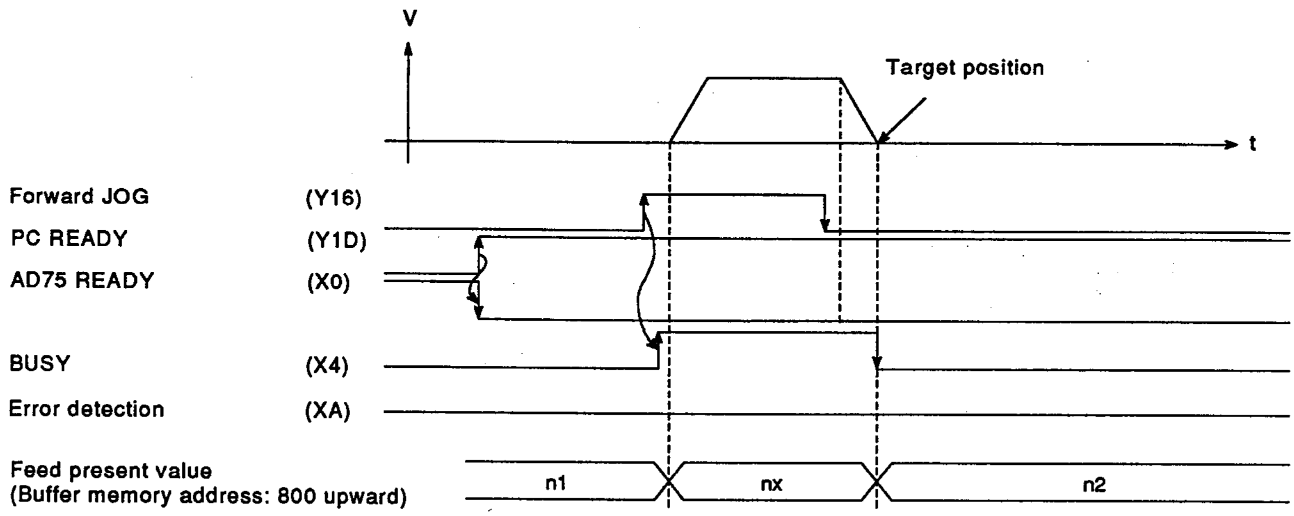
ACPU data register

| | | | |
|---|---|---|---|
| | D85 | 1 | (Axis 1) |
| | D86 | 101 | (Data No. 101) |
| | D87 | 1280(0500H) | (The feed present value is the address.) (Write data other than the address, too.) |
| | D88 | 2 | (Write request) |
| | D89 | 0 | |
| Positioning data (one complete set) | D90 | 272 (0110H) | (Control method: Axis 1 linear ABS) (Deceleration time: Select No. 0.) (Acceleration time: Select No. 1.) (Operation pattern: Positioning complete) |
| | D91 | 10 | (M code No.) |
| | D92 | 1000 | (ms) |
| | D93 | 0 | |
| | D94, D95 | 100000 | (pulse/s) |
| | D96, D97 | 0 | (Address) |
| | D98, D99 | 0 | (Not used) |

AD75 buffer memory

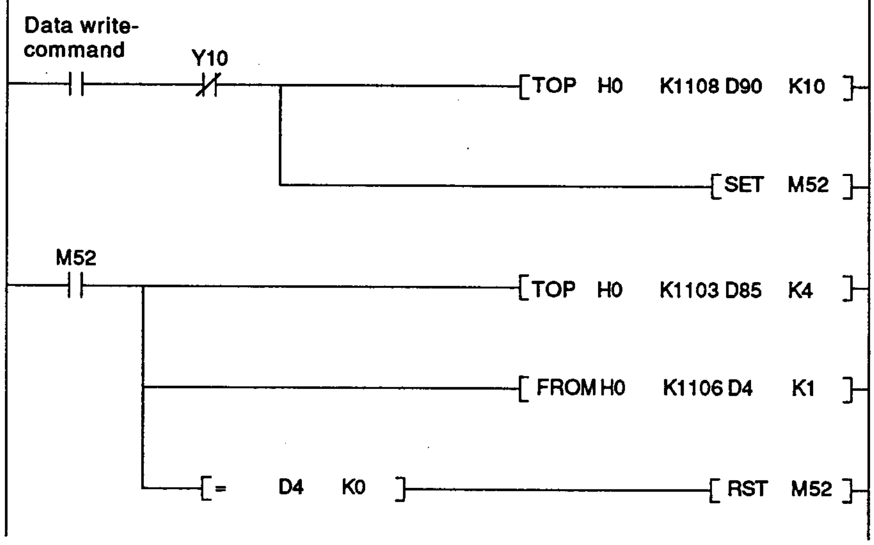
| Address | |
|---|---|
| 800, 801 | Feed present value |
| to | to |
| 1103 | Subject axis |
| 1104 | Positioning data No. |
| 1105 | Write pattern |
| 1106 | Write/read request |
| 1107 | (Blank) |
| 1108 | Positioning identifier |
| 1109 | M code |
| 1110 | Dwell time |
| 1111 | (Blank) |
| 1112, 1113 | Commanded speed |
| 1114, 1115 | Positioning address |
| 1116, 1117 | Arc data |

For details on positioning data and set values, see Section 3.4.4.
For details on the positioning data interface system control data areas shown above, see Section 3.6.4 (1).




(b) Program

- Set the basic parameters, extended parameters, and clock data. — See Section 12.
- Perform positioning to the destination position by manual operation. — See Sections 3.3.9 and 3.3.10 and Chapters 8 and 9.
- Store the positioning data in D85 to D99, except data for the positioning data interface and the positioning address. — See Sections 3.4.4 and 3.6.4 (1).




Writes the positioning data.
Sets a write request flag.
Sets the data for the positioning data interface.
Reads the write result.
Write completion is confirmed.

**POINTS**

(1) Use addresses No. 1103 to No. 1137 in the system control data area as the buffer memory area for the positioning data interface.

(2) Before setting the positioning data, check the teaching function and teaching procedure described in Section 3.3.23.

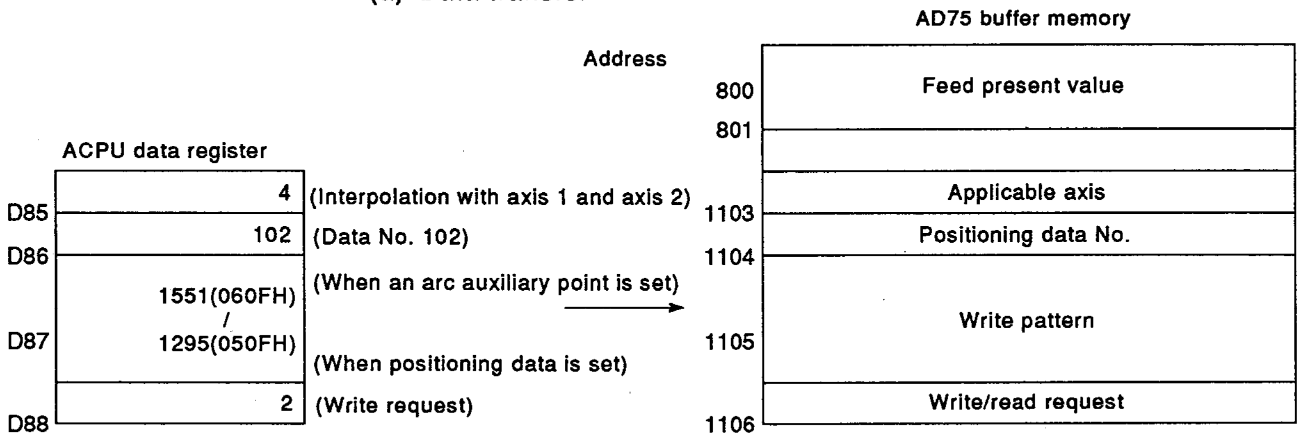
(3) The positioning address to be written is the absolute address (ABS) value.

(4) It is advisable to register the written positioning data in the AD75's flash ROM after confirming that positioning using the data has been performed and completed correctly.

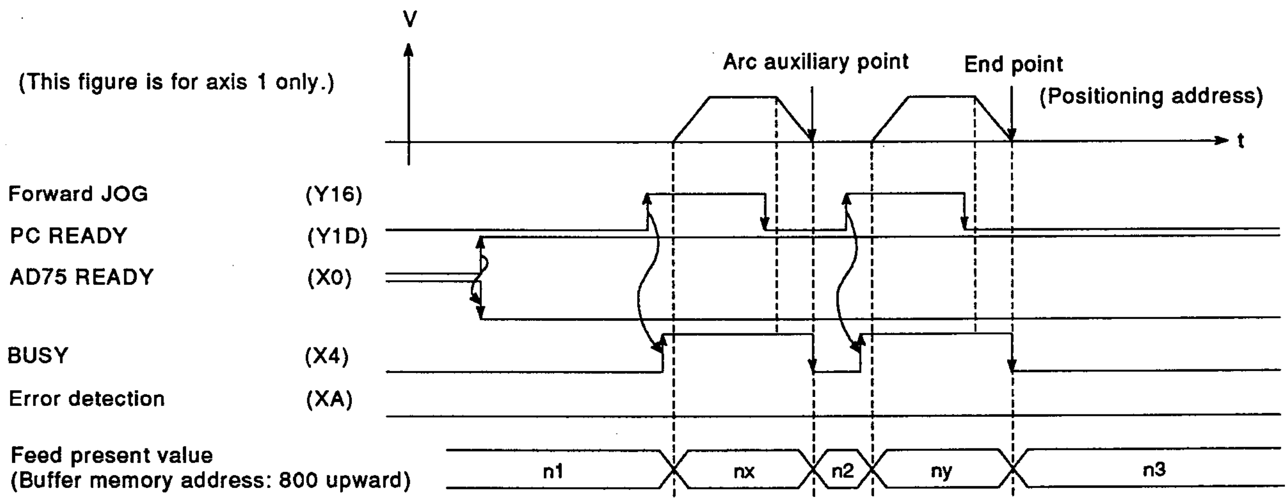
(3) Program example 2

- The program shown here writes only the positioning address and the circular interpolation data (auxiliary point for circular interpolation) as the positioning data for circular interpolation control using the feed present value to data No. 102 for axes 1 and 2 (for circular interpolation control by designation of an auxiliary point).

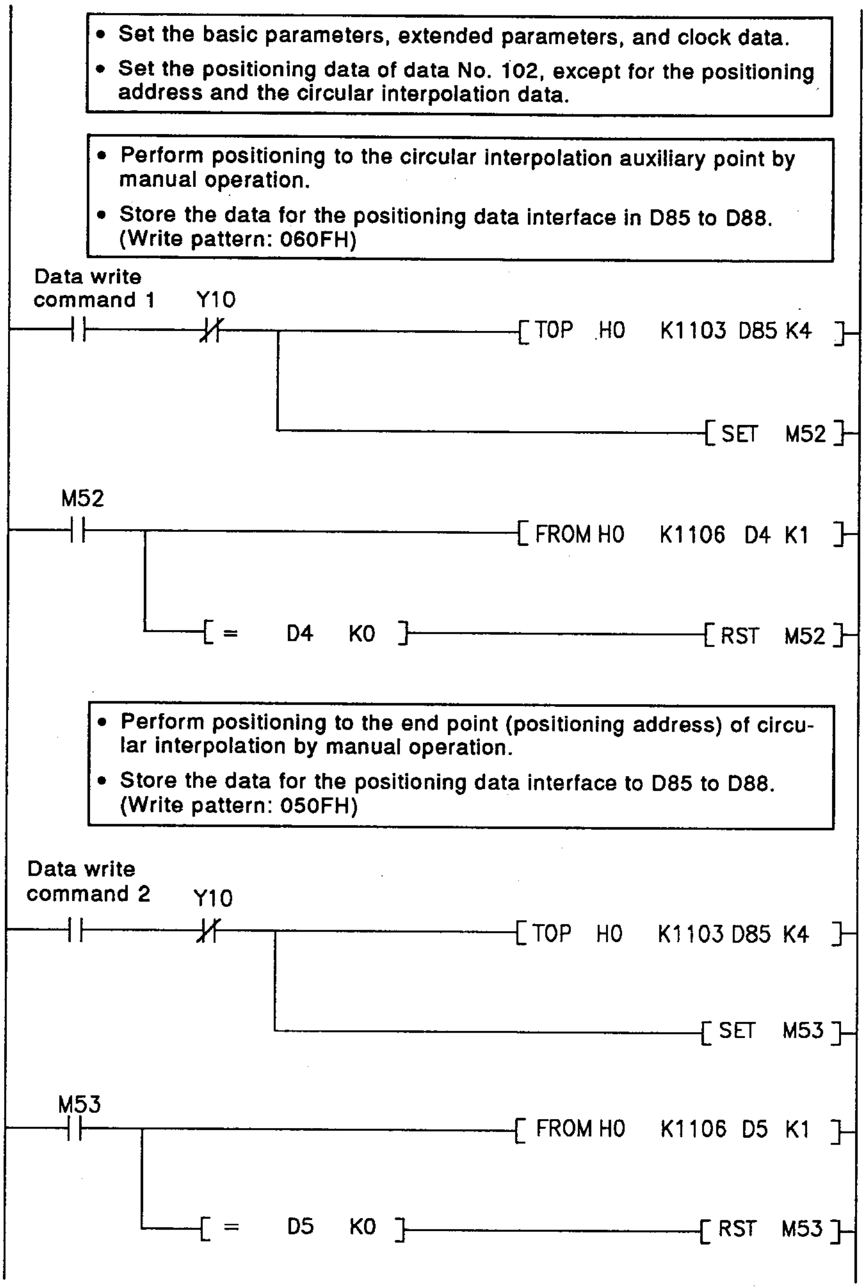
(a) Data transfer




For details on the positioning data interface system control data areas, see Section 3.6.4 (1).



(b) Program




See Chapter 12, Sections 3.4.4 and 3.4.6 (1) and [Program example 1].

See Sections 3.3.9 and 3.3.10, Chapters 8 and 9 and Section 3.6.4 (1).

Sets the data for the positioning data interface.

Sets the write request flag.

Reads the write result.

Confirms write completion.

See Sections 3.3.9 and 3.3.10, Chapters 8 and 9 and Section 3.6.4 (1).

Sets the data for the positioning data interface.

Sets the write request flag.

Reads the write result.

Confirms completion of writing.

**POINTS**

(1) Use addresses No. 1103 - No. 1137 in the system control data area as the buffer memory area for the positioning data interface.

(2) Before setting the positioning data, check the teaching function and teaching procedure described in Section 3.3.23.

(3) The positioning address to be written is the absolute address (ABS) value.

(4) It is advisable to register the written positioning data to the AD75's flash ROM after confirming that positioning using the data has been performed and completed correctly.

### 12.7.2 Program for reading positioning data through the positioning data interface

This section shows an example of a sequence program for reading the positioning data from the AD75.

(1) Setting conditions

- There are no particular conditions to be set.

(2) Program example

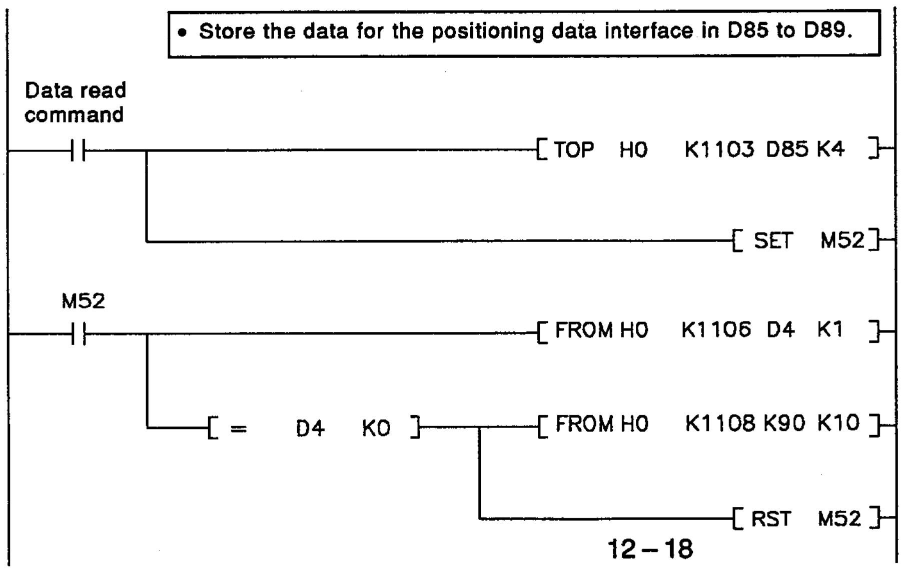
- The program shown here reads the positioning data of data No. 101 for axis 1 into D90 to D99.

(a) Data transfer

| | ACPU data register | Value | | Address (AD75 buffer memory) | AD75 buffer memory |
|---|---|---|---|---|---|
| | D85 | 1 | (Axis 1) | 1103 | Subject axis |
| | D86 | 101 | (Data No. 101) | 1104 | Positioning data No. |
| | D87 | 0 | (Meaningless data) → | 1105 | Write pattern |
| | D88 | 1 | (Read request) | 1106 | Write/read request |
| | D89 | 0 | | 1107 | (Blank) |
| Positioning data (one complete set) | D90 | 272 (0110H) | (Control method: axis 1 linear ABS) (Deceleration time: Select No. 0.) (Acceleration time: Select No. 1.) (Operation pattern: Positioning complete) | 1108 | Positioning identifier |
| | D91 | 10 | (M code No.) | 1109 | M code |
| | D92 | 1000 | (ms) ← | 1110 | Dwell time |
| | D93 | 0 | | 1111 | (Blank) |
| | D94, D95 | 100000 | (pulse/s) | 1112, 1113 | Commanded speed |
| | D96, D97 | 1234567890 | (Address) | 1114, 1115 | Positioning address |
| | D98, D99 | 0 | (Address) | 1116, 1117 | Arc data |

(For positioning data details and set values, refer to Section 3.4.4. For the positioning data-interface system control data areas shown above, refer to Section 3.6.4 (1).)

(b) Program




See Section 3.6.4 (1).

Sets the data for the positioning data interface.

Sets the read request flag.

Reads the read result.

Reads the specified positioning data to D90 to D99 on completion of reading.

# 13. TROUBLESHOOTING

This chapter describes the various errors and warnings that may occur when using the AD75, and the corrective action to take if they occur.

(1) Error detection

(a) The errors detected by the AD75 consist of parameter setting range errors and errors that occur at operation start or while operation is in progress.

1) Parameter setting range errors

A parameter check is performed at power ON and at the leading edge (OFF → ON) of the PC READY signal: if the parameter settings are found to be incorrect in the checking, an error occurs.
If an error occurs, the AD75 READY signal is not turned OFF.
To reset an error, change the erroneous parameter setting to a correct value, then turn on the PC READY signal.

2) Errors at operation start/during operation

These are the errors that may occur at the start of, or during, positioning control, JOG operation, and manual pulse generator operation.
If an axis error occurs during interpolation operation, the error number is stored for both the reference axis and the other interpolation axis.
However, when the positioning data for each point of the positioning start data table is analyzed, the axis error number is stored only for the reference axis in the following cases:

- When the other interpolation axis is BUSY or,
- When an error occurs for the data not related to interpolation of the positioning data or parameters.

If an error occurs at the simultaneous start of positioning operations, the stored axis error contents differ depending on whether the error exists before or after the simultaneous start:

- Before simultaneous start (when the axis number is incorrect or the other axis is BUSY), an "error before simultaneous start" occurs.
- After simultaneous start (positioning error, software stroke limit error, etc.), the error code for the axis on which the error occurred is stored.
  Since simultaneous start cannot be carried out, a "simultaneous start not possible error" error code is stored for all error-free axes.

For the axis on which the error occurred, the axis operation status is "error".
If an error occurs during operation, the travelling axis is decelerated to a stop, and the axis operation status is "error".
Even if an error occurs at one axis during interpolation operation, both axes decelerate to a stop.

(b) If an error occurs, the error detection input signal is turned ON, and the error code corresponding to the error content is stored at the following buffer memory address for axis error number storage.

| Axis No. | Error Detection Signal Input | Buffer Memory Address |
|---|---|---|
| 1 | XA | 807 |
| 2 | XB | 907 |
| 3 | XC | 1007 |

Every time an error occurs, the latest error code is stored in the buffer memory address for axis error storage.

(c) Error codes are classified into the following main groups:

| Error Code | Error Classification |
|---|---|
| 001 to 009 | Critical error |
| 010 to 099 | Error at system start |
| 100 to 199 | General error |
| 200 to 299 | Error during home position return |
| 300 to 399 | Error during JOG operation |
| 400 to 499 | Error during manual pulse generator operation |
| 500 to 599 | Error during positioning operation |
| 900 to 999 | Parameter setting range check error |

(2) Warning detection

(a) The warnings detected are classified into system warnings and axis warnings.

1) The system warnings are as follows:
- System control data setting error
  The axis warning is issued for axis 1.
- Positioning data setting error
  The axis warning is issued for all axes.
  If an interpolation designation or axis setting error occurs, the warning is issued for the following axes.
  * In interpolation control for axis 1 and axis 2: axis 1
  * In interpolation control for axis 2 and axis 3: axis 2
  * In interpolation control for axis 3 and axis 1: axis 3

2) The axis warnings are issued in response to incorrect setting for positioning operation, JOG operation, manual pulse generator operation, or home position return operation, or system error. To reset an axis warning, turn on the axis error reset signal.
Warnings cannot be reset without eliminating their cause.
When an axis warning occurs, the axis operation status is not changed.

(b) If an axis warning occurs, the warning code corresponding to the warning content is stored at the following buffer memory address for the axis warning No. storage.

| Axis No. | Buffer Memory Address |
|---|---|
| 1 | 808 |
| 2 | 908 |
| 3 | 1008 |

Every a warning is issued, the latest warning code is stored in the buffer memory address for axis warning No. storage.

(c) If an axis warning is issued for positioning operation, "1" is set at bit 10 (b10) of the following buffer memory address for status storage.

| Axis No. | Buffer Memory Address |
|---|---|
| 1 | 817 |
| 2 | 917 |
| 3 | 1017 |

(d) Warning codes are classified into the following main groups.

| Warning Code | Error Classification |
|---|---|
| 100 to 199 | General warning |
| 200 to 299 | Warning during home position return |
| 300 to 399 | Warning during JOG operation |
| 400 to 499 | Warning during manual pulse generator operation |
| 500 to 599 | Warning during positioning operation |
| 900 to 999 | System control data range check warning |

(3) Axis error reset

Set "1" at the relevant buffer memory address for axis error reset - 1151 (for axis 1), 1201 (for axis 2) and 1251 (for axis 3) - then carry out the following processing to reset the error status.

- Turn OFF the axis error detection signal.
- Clear the axis error No.
- Turn OFF the axis warning detection signal.
- Clear the axis warning No.
- Switch the operation status from "error" to "standby".
- Switch the operation status from "step error" to "standby".

(4) Invalidation of settings

If any of the following operations are attempted, the settings are considered invalid and no errors/warning occurs.

- Speed change during home position return
- Speed change while no operation is in progress
- Axis stop when axis is stopped
- Axis rapid stop when axis stopped
- Axis stop while no axis operation is in progress
- Axis rapid stop while no axis operation is in progress
- Writing to the buffer memory monitor area

## 13.1 Error List

The following tables give the descriptions of errors and the corrective actions to take against them.

| Error Code | Error Name | Detection Timing | Operation Status when Error Occurs | Corrective Action |
|---|---|---|---|---|
| 000 | Normal status | —— | —— | —— |
| 001<br>003<br>004<br>005 | <Critical error><br>Fault<br>Below zero<br>Overflow<br>Underflow | H/W fault | The system stops | • Check for noise.<br>• Check for hardware faults. |
| 100 | <General><br>Peripheral device stop during operation | "Stop" key input from the peripheral device during operation. | Deceleration stop or rapid stop | Reset the error by axis error reset. |
| 101 | PC READY OFF during operation | When PC READY goes OFF during operation | Deceleration stop or rapid stop | Reset the error by axis error reset. |
| 102 | Drive module ready OFF | When drive module ready signal goes OFF during operation | Immediate stop | Reset the error by axis error reset. |
| 103 | Test mode error during operation | During test mode | Deceleration stop | After determining the cause, turn the power of the AD75 and peripheral devices OFF and back ON. |
| 104 | H/W stroke limit + | At the start of operation | Operation is not started. | fter resetting the error, start the JOG operation and manual pulse generator operation in the reverse direction of the limit switch. |
| | | During operation | Deceleration stop | |
| 105 | H/W stroke limit - | At the start of operation | Operation is not started. | fter resetting the error, start JOG operation or manual pulse generator operation in the reverse direction to the direction when the limit switch was struck. |
| | | During operation | Deceleration stop | |
| 106 | Stop signal ON at start | At the start of operation | Operation is not started. | Reset the error by axis error reset. |
| 107 | Ready OFF to ON during BUSY | When PC READY signal (Y1D) comes ON | The AD75 READY signal (X0) is turned ON.<br>Next operation is not started. | Turn the PC READY signal (Y1D) from OFF to ON. |
| 201 | Start at home position | At the start of home position return | Home position return fault | • Enable the home position return retry function.<br>• Use JOG operation or manual pulse generator operation to move from the present position to carry out home position return. |
| | | At the start of home position return by stopper stop (3) (method without near-zero point dog) or external signal home position return without near-zero point dog | | • Move the present position by JOG operation or manual pulse generator operation to carry out home position return. |
| 203 | Dog detection timing error | Deceleration from home position return speed in progress | Deceleration stop | • Correct the home position return speed. |
| 204 | Zero-point detection timing error | | | • Correct the home position return speed.<br>• Zero-point signal from external source is input while travelling at the creep speed. |
| 205 | Dwell time error | | | • Correct the home position return speed.<br>• Extend the dwell time. |

| Error Code | Error Name | Detection Timing | Operation Status when Error Occurs | Corrective Action |
|---|---|---|---|---|
| 206 | Count type travel value error | At count type home position return start | Home position return fault | • Calculate the travel distance from the speed limit, home position return speed, deceleration speed. Set the travel value after the near-zero point dog equal to or greater than the deceleration distance.<br>• Decrease the home position return speed.<br>• Adjust the near-zero point dog position ti extend the travel value after the near-zero point dog. |
| 207 | Home position return request ON | At high speed home position return start | | Execute the home position return. |
| 208 | Out of creep speed range | At home position return start | | Set the creep speed to a speed within the home position return speed. |
| 209 | Home position return restart not possible | At restart request after home position return stop | No restart | Restart home position return. |
| 300 | <JOG><br>Out of JOG speed range | At JOG operation start | JOG operation is not carried out when the set value is "0" or out of the setting range. | Set a value within the setting range (except "0"). |
| 500 | <Positioning operation><br>Start data No. incorrect | On analysis of special start data | Operation is ended. | Correct the special start data. |
| 501 | Error before simultaneous start | | | |
| 502 | Start data No. incorrect | On analysis of positioning data | The positioning data is not executed. | Correct the positioning data. |
| 503 | No commanded speed | On analysis of initial positioning data at the start | At start:<br>No operation | |
| 504 | Out of linear travel value range | On analysis of positioning data | | Review the positioning address. |
| 506 | Excessive arc error | At calculation of locus for circular interpolation control by center point designation | The circular interpolation control by center point designation is not executed. | • Correct the center point address and end point address.<br>• Correct the value for the allowable error range for circular interpolation. |
| 507 | Start outside stroke limit + | At operation start | At start:<br>No operation | Set the feed present value within the software stroke limit setting range by JOG operation or manual pulse generator operation. |
| 508 | Start outside stroke limit - | | | |
| 509 | Travel outside stroke limit + | | | • In case of positioning operation, set the positioning address within the software stroke limit setting range.<br>• For JOG operation and manual pulse generator operation start, carry out operation within the software stroke limit range. |
| 510 | Travel outside stroke limit - | | | |
| 511 | Travel outside stroke limit + | During operation | Immediate stop at positioning data No. immediately preceding the positioning data No. at which the stroke limit was exceeded. | Correct the positioning data. |
| 512 | Travel outside stroke limit - | | | |
| 514 | Out of range for present value change | On analysis of present value change | Present value is not changed. | Set the present value after the change within the setting range. |
| 515 | Present value change not possible | | | Do not designate present value change in the next positioning data of continuous locus control. |
| 516 | Continuous locus control not possible | On analysis of positioning data | At start:<br>No operation | • Do not designate fixed pitch feed in the next positioning data of continuous locus control.<br>• Do not carry out fixed pitch feed, speed control or speed/position control with the continuous locus control operation pattern. |

| Error Code | Error Name | Detection Timing | Operation Status when Error Occurs | Corrective Action |
|---|---|---|---|---|
| 518 | Out of operation pattern range | On analysis of positioning data | At start: No operation<br>During operation: Deceleration stop | Correct the operation pattern. |
| 519 | Other interpolation axis BUSY | On analysis of positioning data | At start: No operation<br>During operation: Deceleration stop | Correct the control method. |
| 520 | Unit group mismatch | On analysis of positioning data | At start: No operation<br>During operation: Deceleration stop | • Correct the positioning data or change the parameters. |
| 521 | Interpolation description command incorrect | On analysis of positioning data | At start: No operation<br>During operation: Deceleration stop | Correct the control method. |
| 522 | Commanded speed setting error | On analysis of positioning data | At start: No operation<br>During operation: Deceleration stop | Correct the commanded speed. |
| 524 | Control method setting error | On analysis of positioning data | At start: No operation<br>During operation: Deceleration stop | Correct the control method or parameter. |
| 525 | Auxiliary point setting error | On analysis of positioning data | At start: No operation<br>During operation: Deceleration stop | Correct the arc address. |
| 526 | End point setting error | On analysis of positioning data | At start: No operation<br>During operation: Deceleration stop | Correct the positioning address. |
| 527 | Center point setting error | On analysis of positioning data | At start: No operation<br>During operation: Deceleration stop | Correct the arc address. |
| 530 | Address out of range | On analysis of positioning data | At start: No operation<br>During operation: Deceleration stop | Correct the positioning address. |
| 532 | Simultaneous start not possible | At simultaneous start | Operation is finished. | Correct the special start data and positioning data. |
| 533 | Condition data error | On analysis of special start data | Operation is finished. | Reset the special start data. |
| 534 | Special start command error | On analysis of special start data | Operation is finished. | Reset the special start data. |
| 536 | M code ON signal ON start | At positioning start | At start: No operation | Start operation after M code ON signal is turned OFF. |
| 537 | PC READY OFF start | At positioning start | At start: No operation | Start operation after PC READY ON. |
| 538 | READY OFF start | At positioning start | At start: No operation | Start operation after checking the AD75 READY is ON. |
| 543 | Out of start No. range | At positioning start | At start: No operation | Reset the positioning start No. |
| 544 | Out of radius range | On analysis of positioning data | At start: No operation<br>During operation: Immediate stop | Correct the positioning data. |
| 900 | <Error history><br>(Basic parameter #1)<br>Out of unit setting range | At power ON or when PC READY is switched from OFF to ON | The AD75 READY flag (X0) is not turned OFF. | Set the value within the setting range. |
| 901 | Number of pulses per revolution setting error | At power ON or when PC READY is switched from OFF to ON | The AD75 READY flag (X0) is not turned OFF. | Set the value within the setting range. |
| 902 | Travel value per revolution setting error | At power ON or when PC READY is switched from OFF to ON | The AD75 READY flag (X0) is not turned OFF. | Set the value within the setting range. |
| 903 | Unit magnification setting error | At power ON or when PC READY is switched from OFF to ON | The AD75 READY flag (X0) is not turned OFF. | Set the value within the setting range. |
| 904 | Pulse output mode error | At power ON or when PC READY is switched from OFF to ON | The AD75 READY flag (X0) is not turned OFF. | Set the value within the setting range. |
| 905 | Direction of rotation setting error | At power ON or when PC READY is switched from OFF to ON | The AD75 READY flag (X0) is not turned OFF. | Set the value within the setting range. |
| 910 | <Error history><br>(Basic parameter #2)<br>Out of speed limit range | At power ON or when PC READY is switched from OFF to ON<br>At the start of operation | At power ON or when PC READY is switched from OFF to ON, the AD75 READY flag (X0) is not turned OFF.<br>At start: No operation. | Set the value within the setting range. |
| 911 | Out of acceleration time range | At power ON or when PC READY is switched from OFF to ON<br>At the start of operation | At power ON or when PC READY is switched from OFF to ON, the AD75 READY flag (X0) is not turned OFF.<br>At start: No operation. | Set the value within the setting range. |
| 912 | Out of deceleration time range | At power ON or when PC READY is switched from OFF to ON<br>At the start of operation | At power ON or when PC READY is switched from OFF to ON, the AD75 READY flag (X0) is not turned OFF.<br>At start: No operation. | Set the value within the setting range. |

| Error Code | Error Name | Detection Timing | Operation Status when Error Occurs | Corrective Action |
|---|---|---|---|---|
| 921 | <Error history> (Extended parameter #1) S/W stroke upper limit | When PC READY is switched from OFF to ON | The AD75 READY (X0) is not turned OFF. | Set the value within the setting range. |
| 922 | S/W stroke lower limit | | | |
| 923 | S/W stroke limit selection | | | |
| 924 | S/W stroke limit valid | | | |
| 925 | Torque limit setting value incorrect | | | |
| 926 | Command in-position range | | | |
| 927 | M code ON timing error | | | |
| 928 | Speed switching mode error | | | |
| 929 | Interpolation speed designation method | | | |
| 930 | Present value update request error | | | |
| 931 | Manual pulse generator selection error | | | |
| 933 | (Spare) | —— | —— | —— |
| 934 | (Spare) | | | |
| 935 | (Spare) | —— | —— | —— |
| 936 | (Spare) | | | |
| 937 | (Spare) | | | |
| 938 | Backlash compensation amount error 2 | When PC READY is switched from OFF to ON | The AD75 READY (X0) is not turned OFF. | Set the value within the setting range. |
| 950 | <Error history> (Extended parameter #2) Acceleration time 1 setting error | At data analysis | At the start: Operation does not start<br>During operation: Deceleration stop | Set a value within the setting range. |
| 951 | Acceleration time 2 setting error | | | |
| 952 | Acceleration time 3 setting error | | | |
| 953 | Deceleration time 1 setting error | | | |
| 954 | Deceleration time 2 setting error | | | |
| 955 | Deceleration time 3 setting error | | | |
| 956 | JOG speed control limit error | | | |
| 957 | JOG acceleration selection setting error | | | |
| 958 | JOG deceleration selection setting error | | | |
| 959 | Acceleration/deceleration selection setting error | | | |
| 960 | S curve ratio setting error | | | |

| Error Code | Error Name | Detection Timing | Operation Status when Error Occurs | Corrective Action |
|---|---|---|---|---|
| 962 | Rapid stop deceleration time incorrect | At data analysis | At the start: Operation does not start<br>During operation: Deceleration stop | Set the value within the setting range. |
| 963 | Stop group 1 selection error | | | |
| 964 | Stop group 2 selection error | | | |
| 965 | Stop group 3 selection error | | | |
| 966 | Out of allowable range for circular interpolation | | | |
| 967 | External start selection error | | | |
| 980 | <Error history> (Home position return basic parameters) Home position return method error | | | |
| 981 | Home position return direction error | | | |
| 982 | Home position address setting error | | | |
| 983 | Home position return speed error | | | |
| 984 | Creep speed error | | | |
| 985 | Home position return retry error | | | |
| 991 | <Error history> (Home position return detail parameter) Home position return torque control limit | When PC READY is switched from OFF to ON | The AD75 READY (X0) is not turned OFF. | Set the value within the setting range. |
| 992 | Near-zero point dog travel value error | | | |
| 993 | Home position acceleration selection error | | | |
| 994 | Home position deceleration selection error | | | |
| 999 | Flash ROM sum check error | On writing to flash ROM | The AD75 READY (X0) is not turned OFF. | Write to flash ROM again.<br>If the same error occurs again, replace the module. |

## 13.2 Warning List

The following shows the description and corrective action for warning.

| Error Code | Error Name | Detection Timing | Operation Status when Error Occurs | Corrective Action |
|---|---|---|---|---|
| 000 | Normal status | ——— | ——— | ——— |
| 100 | <General> Start during operation | When start request is turned ON | Operation continues. | Correct the start request ON timing. |
| 101 | Present value change when BUSY | When present value change request issued (test mode) | The present value change request is not acknowledged. | Do not change the present value while the axis is in operation. |
| 102 | Deviation counter clear request | When deviation counter clear request issued | Deviation counter clear request is ignored | Do not clear the deviation counter while the axis is in motion. |
| 104 | Restart disabled | When restart command request issued | Operation continues. | Correct the start request ON timing. |
| 105 | Applicable axis incorrect | At writing/reading | Reference axis warning | Set a correct value and issue the writing/reading request again. |
| 106 | Positioning data No. incorrect | | Applicable axis warning | |
| 107 | Writing pattern incorrect | | | |
| 108 | Flash writing incorrect | At writing/reading | Warning for axis 1 | No processing |
| 109 | Write during BUSY | When writing request issued | Warning for applicable axis | Issue the writing/reading request while the axis is not BUSY. |
| 111 | PC READY is ON | When F-ROM writing executed | Warning for axis 1 | None (response is made to the request when Y1D is turned OFF.) |
| 112 | Override value incorrect | On analysis | • If the set value is 0, 100 is used for control.<br>• If the set value is 301 or more, 300 is used for control. | Set a value within the setting range. |
| 113 | Torque change value out of range | During operation | Torque change is not carried out. | |
| 300 | <JOG> Speed change during deceleration | At JOG operation speed change | Speed change is not carried out. | Do not change the JOG operation speed during deceleration by turning off the JOG start signal. |
| 301 | JOG speed limit value | At JOG operation speed change | • JOG operation is carried out at the JOG speed limit value if the limit value is exceeded.<br>• The speed limit in progress flag is ON while the speed is limited by the JOG speed limit value. | Set a value within the setting range. |
| 401 | <Manual pulse generator> Out of manual pulse generator input magnification range | At manual pulse generator input magnification change | If the set input magnification is 101 or more, the value actually used is set as 100 by clamping. When the set value is "0", the value actually used is set as "1" by clamping. | Set the manual pulse generator 1 pulse input magnification within the setting range. |
| 402 | Manual pulse generator selection setting 0 | At operation start | Operation does not start | • Turn off the manual pulse generator operation enable flag.<br>• Set the manual pulse generator selection value to 1, 2, or 3.<br>• Turn the PC READY signal from OFF to ON. |
| 500 | <Positioning operation> Deceleration/stop speed change | At speed change | Speed change is not carried out. | Do not execute a speed change during deceleration due to a stop command, while operation is stopped, or during automatic deceleration in positioning. |

| Error Code | Error Name | Detection Timing | Operation Status when Error Occurs | Corrective Action |
|---|---|---|---|---|
| 502 | Low remaining decentralized speed | In remaining decentralized mode for positioning control | Warning for applicable axis | No processing |
| 503 | M code ON signal ON | When positioning data executed | Execution of positioning data continues. | Correct the ON/OFF timing of the M code OFF signal. |
| 505 | No operation end setting | When the 50th point is updated | Operation ends. | Set the operation end at the 50th point. |
| 506 | FOR to NEXT nesting | At FOR command analysis | Operation continues. | Create a configuration with only one level of FOR to NEXT nesting. |
| 508 | Speed-position switch during acceleration | When speed-position switching signal turned ON | | Do not turn ON the speed-position switching signal during acceleration. |
| 509 | Insufficient remaining distance | At speed change | Speed change is carried out. (Except for operation pattern 11) | Carry out the speed change with a feed speed close to the speed change value. |
| 512 | External start function incorrect | When external signal turned ON | Nothing happens when the external start signal comes ON. | Set the parameter within the setting range. |
| 513 | Insufficient travel value | In positioning operation | After reaching the positioning address, the machine stops. | Correct the positioning data and parameter. |
| | Travel value change register in speed/positioning control out of range | When speed-position switching signal turned ON | Positioning control is carried without using the change register. | Set the travel value within the setting range. |
| 514 | Commanded speed out of range | On analysis | The commanded speed is clamped at the speed limit value. | Set a commanded speed within the setting range. |
| 900 | <System control data> Clock data setting incorrect | At clock data setting | | Reset with the correct clock data. |

### 13.3 Error Start History

If an error occurs at operation start, the contents of the start history area (address:541) in the buffer memory are copied to the error start history area (address: 543 to 622).

The contents of the error start history area are deleted when the AD75 power is turned OFF. ("0" is stored in the error start history when the AD75 power is turned ON.)

A maximum of 16 records can be stored in the error start history area when the AD75 power is turned ON.

The error start history can be monitored at a peripheral device.

For details on operation of the peripheral device, refer to the following manual:

- SW0IVD-AD75P Type Positioning Module Software Package Operating Manual (IB-66596)

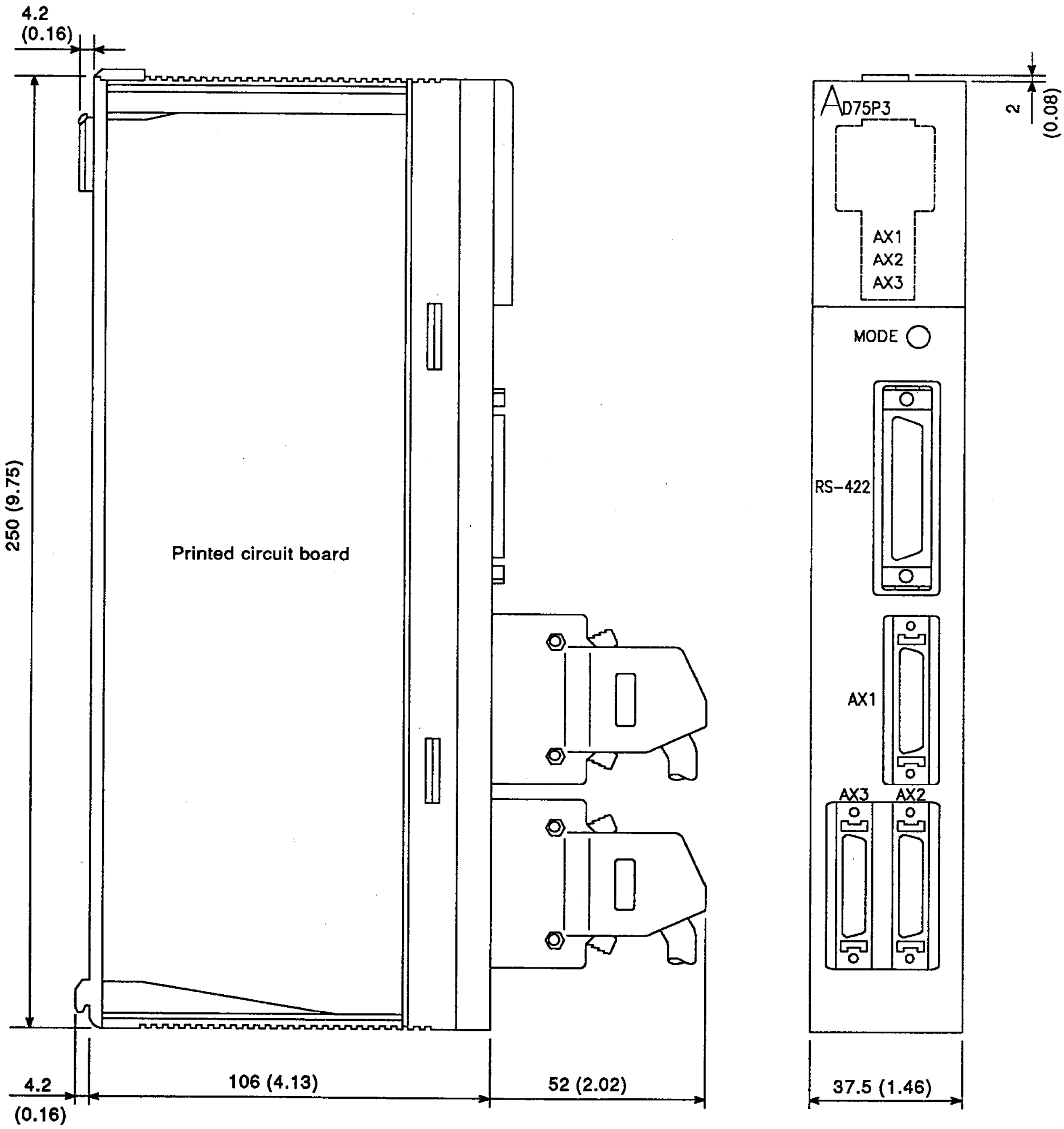
<Example of Display at Peripheral Device>

| No. | Ax. | Start | Mode | Time | Res. |
|---|---|---|---|---|---|
| 1 | 1 | Ext. | 100 | 21:34:56.7 | OK |
| 2 | 2 | PC | M/P | 21:43:12.3 | OK |
| 3 | 2 | PC | JOG | 21:43:34.4 | 201 |
| 4 | 1 | Ext. | Re100 | 21:43:54.8 | OK |
| 5 | 3 | Prog | 101 | 10:18:03.7 | 201 |

# APPENDICES

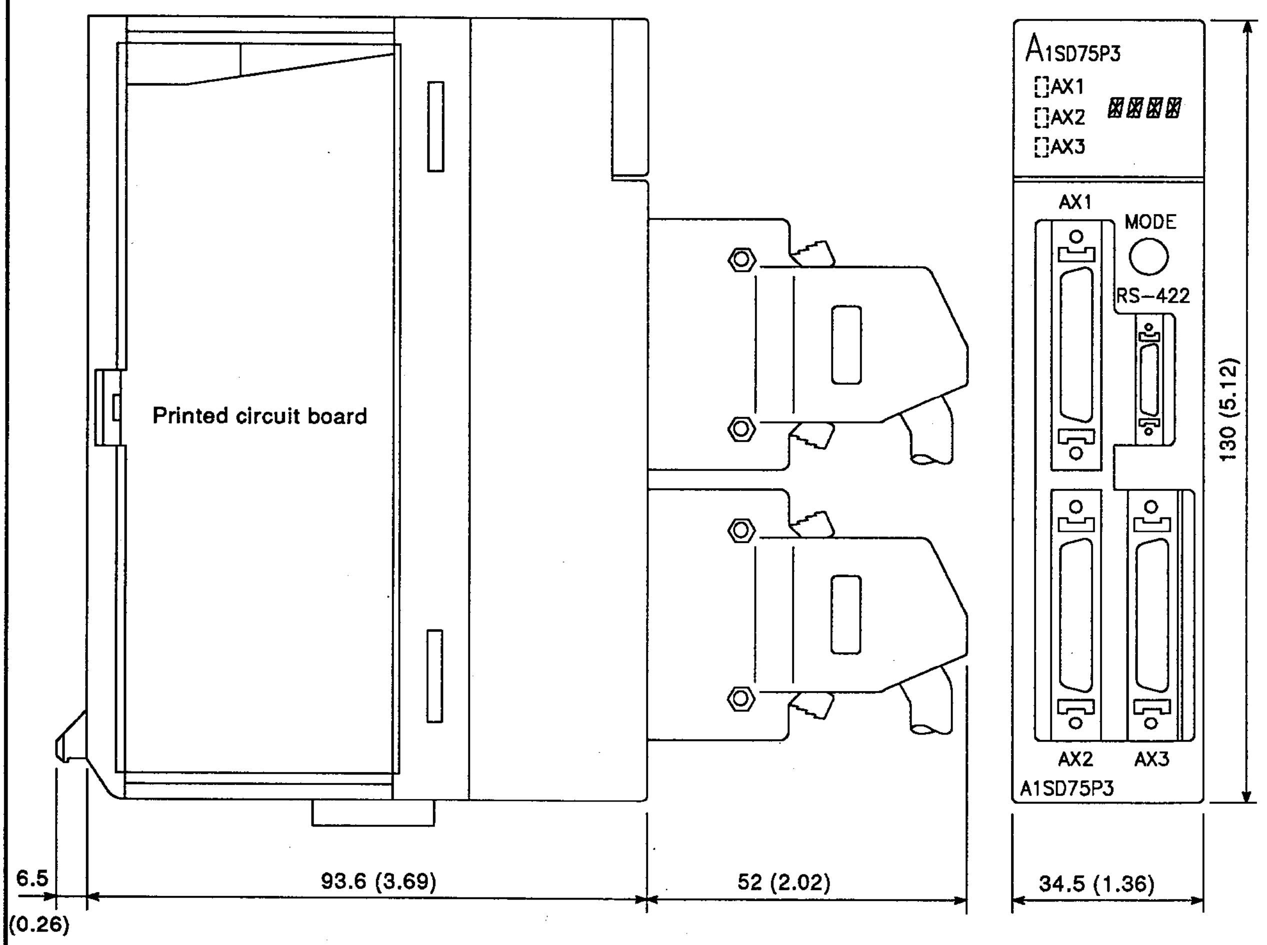
## APPENDIX 1 EXTERNAL DIMENSIONS

(1) AD75P1/P2/P3




Unit: mm (inch)

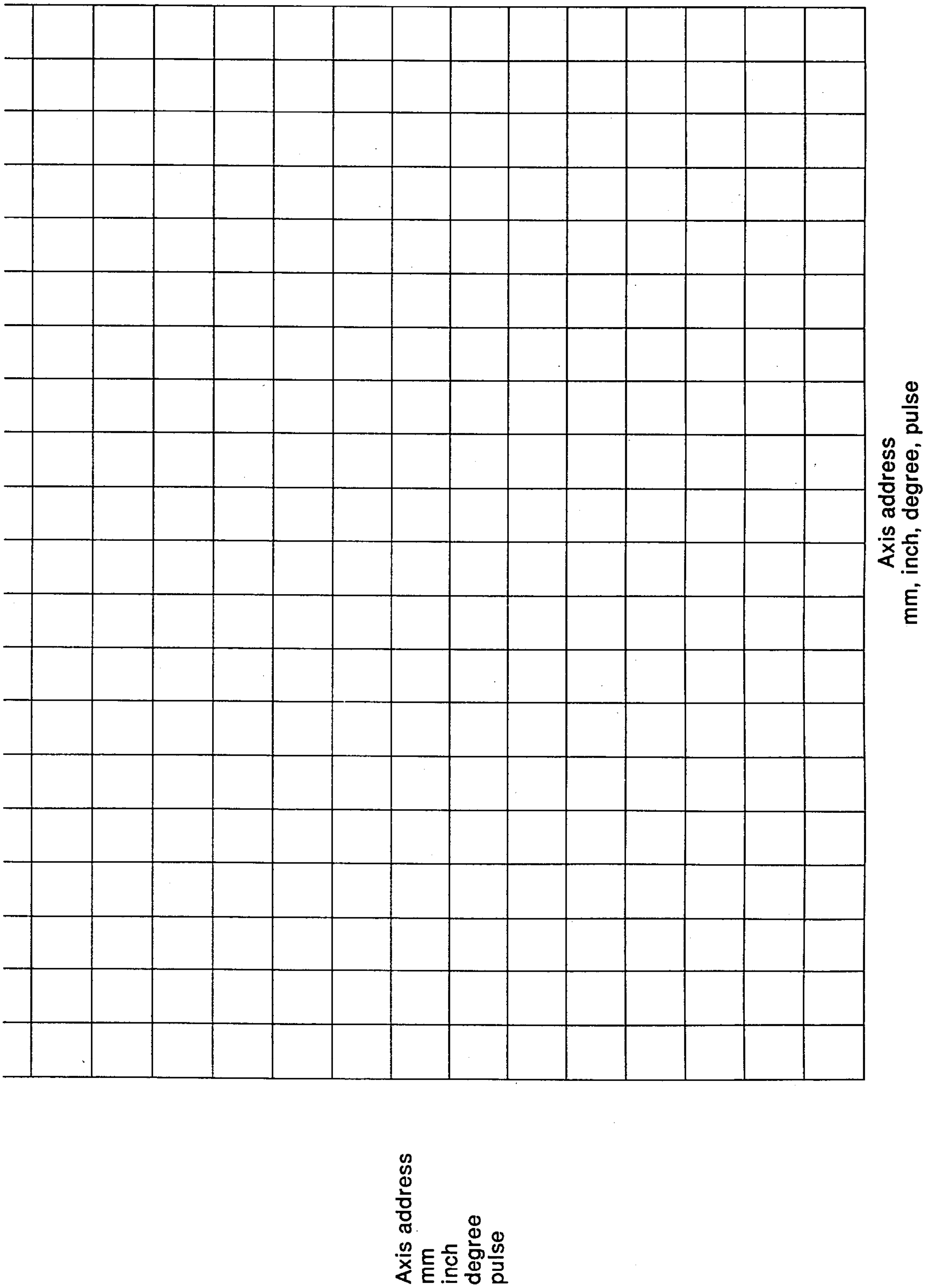
(2) AISD75P1/P2/P3




Unit: mm (inch)

## APPENDIX 2 FORMAT CHART

### 2.1 Positioning Module Operation Chart



## 2.2 Parameter and Home Position Return Data

(1) Parameters

| Item | | Setting Range | | | |
|---|---|---|---|---|---|
| | | mm | inch | degree | pulse |
| Basic parameter #1 | Unit setting | 0 | 1 | 2 | 3 |
| | Number of pulses per revolution | 1 to 65535 pulse | | | |
| | Travel value per revolution | 1 to 65535 x $10^{-1}$ µm | 1 to 65535 x $10^{-1}$ inch | 1 to 65535 x $10^{-1}$ degree | 1 to 65535 pulse |
| | Travel value magnification per pulse | 1: x 1  10 : x 10  100: x 100  1000: x 1000 | | | |
| | 1 pulse output mode | 0: PLS/SIG mode  1: CW/CCW mode  2: Phase A/phase B mode | | | |
| | Direction of rotation setting | 0: Increase of present value by forward pulse output<br>1: Increase of present value by reverse pulse output | | | |
| Basic parameter #2 | Speed limit value | 1 to 600000000 x $10^{-2}$ mm/min | 1 to 600000000 x $10^{-3}$ inch/min | 1 to 600000000 x $10^{-3}$ degree/min | 1 to 1000000 pulse/s |
| | Acceleration time | 1 to 65535 ms | | | |
| | Deceleration time | | | | |
| Extended parameter #1 | Backlash compensation amount | 0 to 65535 x $10^{-1}$ µm | 0 to 65535 x $10^{-5}$ inch | 0 to 65535 x $10^{-5}$ degree | 0 to 65535 pulse |
| | Software stroke upper limit | -2147483648 to 2147483647 x $10^{-1}$ µm | -2147483648 to 2147483647 x $10^{-5}$ inch | 0 to 35999999 x $10^{-5}$ degree | -2147483648 to 2147483647 pulse |
| | Software stroke lower limit | | | | |
| | Software stroke limit selection | 0: Software stroke limit is applied to the feed present value.<br>1: Software stroke limit is applied to the feed machine value. | | | |
| | Valid software stroke limit in JOG operation and manual pulse generator operation | 0: Software stroke limit is invalid in JOG operation and manual pulse generator operation.<br>1: Software stroke limit is valid in JOG operation and manual pulse generator operation. | | | |
| | Command in-position range | 1 to 32767000 x $10^{-1}$ µm | 1 to 32767000 x $10^{-5}$ inch | 1 to 32767000 x $10^{-5}$ degree | 1 to 32767 pulse |
| | Torque limit value | 1 to 500 % | | | |
| | M code ON signal output timing | 0: WITH mode  1: AFTER mode | | | |
| | Speed switching mode speed change type | 0: Standard speed switching mode 1: Advance speed switching mode | | | |
| | Interpolation speed designation method (interpolation mode) | 0: Resultant speed  1: Reference axis speed | | | |
| | Feed present value update request command in speed control | 0: Feed present value is not updated during speed control.<br>1: Feed present value is updated during speed control. | | | |
| | Manual pulse generator selection | 0: Manual pulse generator operation is not acknowledged.<br>1: Manual pulse generator 1 is used.<br>2: Manual pulse generator 2 is used.<br>3: Manual pulse generator 3 is used. | | | |
| Extended parameter #2 | Acceleration time 1 | 1 to 65535 ms | | | |
| | Acceleration time 2 | | | | |
| | Acceleration time 3 | | | | |
| | Deceleration time 1 | | | | |
| | Deceleration time 2 | | | | |
| | Deceleration time 3 | | | | |
| | JOG speed limit value | 1 to 600000000 x $10^{-2}$ mm/min | 1 to 600000000 x $10^{-3}$ inch/min | 1 to 600000000 x $10^{-1}$ degree/min | 1 to 1000000 pulse/s |
| | JOG operation acceleration time selection | 0 to 3 | | | |
| | JOG operation deceleration time selection | | | | |
| | Acceleration/deceleration processing selection | 0: Trapezoidal acceleration/deceleration processing<br>1: S pattern acceleration/deceleration processing | | | |
| | S curve ratio | 1 to 100 % | | | |
| | Rapid stop deceleration time | 1 to 65535 ms | | | |
| | Stop group 1 rapid stop selection | 0: Normal deceleration stop<br>1: Rapid stop | | | |
| | Stop group 2 rapid stop selection | | | | |
| | Stop group 3 rapid stop selection | | | | |
| | Positioning completed signal output time | 0 to 65535 ms | | | |
| | Allowable error range for circular interpolation | 0 to 100000 x $10^{-1}$ µm | 0 to 100000 x $10^{-5}$ inch | 0 to 100000 x $10^{-5}$ degree | 0 to 100000 pulse |
| | External start function selection | 0: External start 1: External speed change<br>2: Skip request | | | |

| | Initial Value | Axis 1 | Axis 2 | Axis 3 | Remark |
|---|---|---|---|---|---|
| | 3 | | | | |
| | 20000 | | | | |
| | 20000 | | | | |
| | 1 | | | | |
| | 1 | | | | |
| | 0 | | | | |
| | 20000 | | | | |
| | 1000 | | | | |
| | 1000 | | | | |
| | 0 | | | | |
| | 2147483647 | | | | |
| | -214783648 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 100 | | | | |
| | 300 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | Axis 1: 1<br>Axis 2: 2<br>Axis 3: 3 | | | | |
| | 1000 | | | | |
| | 1000 | | | | |
| | 1000 | | | | |
| | 1000 | | | | |
| | 1000 | | | | |
| | 1000 | | | | |
| | 20000 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 100 | | | | |
| | 1000 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 300 | | | | |
| | 100 | | | | |
| | 0 | | | | |

(2) Home position return data

<table>
<tr><th colspan="2" rowspan="2">Item</th><th colspan="4">Setting Range</th></tr>
<tr><th>mm</th><th>inch</th><th>degree</th><th>pulse</th></tr>
<tr><td rowspan="6">Home position return basic parameters</td><td>Home position return method</td><td colspan="4">0: Near-zero point dog method<br>1: Stopper stop (1) (according to dwell timer time-out)<br>2: Stopper stop (2) (by zero point signal when the stopper is struck)<br>3: Stopper stop (3) (method without near-zero point dog)<br>4: Count method (1) (zero point signal used)<br>5: Count method (1) (zero point signal not used)</td></tr>
<tr><td>Home position return direction</td><td colspan="4">0: Positive direction (direction in which address increases)<br>1: Negative direction (direction in which address decreases)</td></tr>
<tr><td>Home position address</td><td>-2147483648 to 2147483647 x $10^{-1}$ µm</td><td>-2147483648 to 2147483647 x $10^{-5}$ inch</td><td>0 to 35999999 x $10^{-5}$ degree</td><td>-2147483648 to 2147483647 pulse</td></tr>
<tr><td>Home position return speed</td><td rowspan="2">1 to 600000000 x $10^{-2}$ mm/min</td><td rowspan="2">1 to 600000000 x $10^{-3}$ inch/min</td><td rowspan="2">1 to 600000000 x $10^{-3}$ degree/min</td><td rowspan="2">1 to 1000000 pulse/s</td></tr>
<tr><td>Creep speed</td></tr>
<tr><td>Home position return retry</td><td colspan="4">0: Home position return retry is not carried out by upper/lower limit switch.<br>1: Home position return retry is carried out by upper/lower limit switch.</td></tr>
<tr><td rowspan="6">Home position return extended parameters</td><td>Home position return dwell time</td><td colspan="4">0 to 65535 ms</td></tr>
<tr><td>Travel value after near-zero point dog</td><td>0 to 2147483647 x $10^{-1}$ µm</td><td>0 to 2147483647 x $10^{-5}$ inch</td><td>0 to 2147483647 x $10^{-5}$ degree</td><td>0 to 2147483647 pulse</td></tr>
<tr><td>Home position return acceleration time selection</td><td colspan="4" rowspan="2">0 to 3</td></tr>
<tr><td>Home position return deceleration time selection</td></tr>
<tr><td>Home position shift amount</td><td>-2147483648 to 2147483647 x $10^{-1}$ µm</td><td>-2147483648 to 2147483647 x $10^{-5}$ inch</td><td>0 to 35999999 x $10^{-5}$ degree</td><td>-2147483648 to 2147483647 pulse</td></tr>
<tr><td>Home position return torque limit value</td><td colspan="4">0 to 300 %</td></tr>
</table>

| | Initial Value | Axis 1 | Axis 2 | Axis 3 | Remark |
|---|---|---|---|---|---|
| | 0 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 1 | | | | |
| | 1 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 0 | | | | |
| | 300 | | | | |

### 2.3 Positioning Data [ Data No. to ]

| | | | | Axis | | | |
|---|---|---|---|---|---|---|---|
| Data No. | Pattern | Control Method | Direction | Speed | Address | Dwell Time | M-Code |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 0 | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 0 | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 0 | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 0 | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 0 | | | | | | | |

## APPENDIX 3 CONVERSION TABLE OF POSITIONING DATA NO. AND BUFFER MEMORY ADDRESS

| Data No. | Positioning Identifier | M-Code | Dwell Time | Commanded Speed | | Positioning Address | | Arc Data | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Lower | Upper | Lower | Upper | Lower | Upper |
| 1 | 1300 | 1301 | 1302 | 1304 | 1305 | 1306 | 1307 | 1308 | 1309 |
| 2 | 1310 | 1311 | 1312 | 1314 | 1315 | 1316 | 1317 | 1318 | 1319 |
| 3 | 1320 | 1321 | 1322 | 1324 | 1325 | 1326 | 1327 | 1328 | 1329 |
| 4 | 1330 | 1331 | 1332 | 1334 | 1335 | 1336 | 1337 | 1338 | 1339 |
| 5 | 1340 | 1341 | 1342 | 1344 | 1345 | 1346 | 1347 | 1348 | 1349 |
| 6 | 1350 | 1351 | 1352 | 1354 | 1355 | 1356 | 1357 | 1358 | 1359 |
| 7 | 1360 | 1361 | 1362 | 1364 | 1365 | 1366 | 1367 | 1368 | 1369 |
| 8 | 1370 | 1371 | 1372 | 1374 | 1375 | 1376 | 1377 | 1378 | 1379 |
| 9 | 1380 | 1381 | 1382 | 1384 | 1385 | 1386 | 1387 | 1388 | 1389 |
| 10 | 1390 | 1391 | 1392 | 1394 | 1395 | 1396 | 1397 | 1398 | 1399 |
| 11 | 1400 | 1401 | 1402 | 1404 | 1405 | 1406 | 1407 | 1408 | 1409 |
| 12 | 1410 | 1411 | 1412 | 1414 | 1415 | 1416 | 1417 | 1418 | 1419 |
| 13 | 1420 | 1421 | 1422 | 1424 | 1425 | 1426 | 1427 | 1428 | 1429 |
| 14 | 1430 | 1431 | 1432 | 1434 | 1535 | 1436 | 1437 | 1438 | 1439 |
| 15 | 1440 | 1441 | 1442 | 1444 | 1445 | 1446 | 1447 | 1448 | 1449 |
| 16 | 1450 | 1451 | 1452 | 1454 | 1455 | 1456 | 1457 | 1458 | 1459 |
| 17 | 1460 | 1461 | 1462 | 1464 | 1465 | 1466 | 1467 | 1468 | 1469 |
| 18 | 1470 | 1471 | 1472 | 1474 | 1475 | 1476 | 1477 | 1478 | 1479 |
| 19 | 1480 | 1481 | 1482 | 1484 | 1485 | 1486 | 1487 | 1488 | 1489 |
| 20 | 1490 | 1491 | 1492 | 1494 | 1495 | 1496 | 1497 | 1498 | 1499 |
| 21 | 1500 | 1501 | 1502 | 1504 | 1505 | 1506 | 1507 | 1508 | 1509 |
| 22 | 1510 | 1511 | 1512 | 1514 | 1515 | 1516 | 1517 | 1518 | 1519 |
| 23 | 1520 | 1521 | 1522 | 1524 | 1525 | 1526 | 1527 | 1528 | 1529 |
| 24 | 1530 | 1531 | 1532 | 1534 | 1535 | 1536 | 1537 | 1538 | 1539 |
| 25 | 1540 | 1541 | 1542 | 1544 | 1545 | 1546 | 1547 | 1548 | 1549 |
| 26 | 1550 | 1551 | 1552 | 1554 | 1555 | 1556 | 1557 | 1558 | 1559 |
| 27 | 1560 | 1561 | 1562 | 1564 | 1565 | 1566 | 1567 | 1568 | 1569 |
| 28 | 1570 | 1571 | 1572 | 1574 | 1575 | 1576 | 1577 | 1578 | 1579 |
| 29 | 1580 | 1581 | 1582 | 1584 | 1585 | 1586 | 1587 | 1588 | 1589 |
| 30 | 1590 | 1591 | 1592 | 1594 | 1595 | 1596 | 1597 | 1598 | 1599 |
| 31 | 1600 | 1601 | 1602 | 1604 | 1605 | 1606 | 1607 | 1608 | 1609 |
| 32 | 1610 | 1611 | 1612 | 1614 | 1615 | 1616 | 1617 | 1618 | 1619 |
| 33 | 1620 | 1621 | 1622 | 1624 | 1625 | 1626 | 1627 | 1628 | 1629 |
| 34 | 1630 | 1631 | 1632 | 1634 | 1635 | 1636 | 1637 | 1638 | 1639 |
| 35 | 1640 | 1641 | 1642 | 1644 | 1645 | 1646 | 1647 | 1648 | 1649 |
| 36 | 1650 | 1651 | 1652 | 1654 | 1655 | 1656 | 1657 | 1658 | 1659 |
| 37 | 1660 | 1661 | 1662 | 1664 | 1665 | 1666 | 1667 | 1668 | 1669 |
| 38 | 1670 | 1671 | 1672 | 1674 | 1675 | 1676 | 1677 | 1678 | 1679 |
| 39 | 1680 | 1681 | 1682 | 1684 | 1685 | 1686 | 1687 | 1688 | 1689 |
| 40 | 1690 | 1691 | 1692 | 1694 | 1695 | 1696 | 1697 | 1698 | 1699 |
| 41 | 1700 | 1701 | 1702 | 1704 | 1705 | 1706 | 1707 | 1708 | 1709 |
| 42 | 1710 | 1711 | 1712 | 1714 | 1715 | 1716 | 1717 | 1718 | 1719 |
| 43 | 1720 | 1721 | 1722 | 1724 | 1725 | 1726 | 1727 | 1728 | 1729 |
| 44 | 1730 | 1731 | 1732 | 1734 | 1735 | 1736 | 1737 | 1738 | 1739 |
| 45 | 1740 | 1741 | 1742 | 1744 | 1745 | 1746 | 1747 | 1748 | 1749 |
| 46 | 1750 | 1751 | 1752 | 1754 | 1755 | 1756 | 1757 | 1758 | 1759 |
| 47 | 1760 | 1761 | 1762 | 1764 | 1765 | 1766 | 1767 | 1768 | 1769 |
| 48 | 1770 | 1771 | 1772 | 1774 | 1775 | 1776 | 1777 | 1778 | 1779 |
| 49 | 1780 | 1781 | 1782 | 1784 | 1785 | 1786 | 1787 | 1788 | 1789 |
| 50 | 1790 | 1791 | 1792 | 1794 | 1795 | 1796 | 1797 | 1798 | 1799 |
| 51 | 1800 | 1801 | 1802 | 1804 | 1805 | 1806 | 1807 | 1808 | 1809 |
| 52 | 1810 | 1811 | 1812 | 1814 | 1815 | 1816 | 1817 | 1818 | 1819 |
| 53 | 1820 | 1821 | 1822 | 1824 | 1825 | 1826 | 1827 | 1828 | 1829 |
| 54 | 1830 | 1831 | 1832 | 1834 | 1835 | 1836 | 1837 | 1838 | 1839 |
| 55 | 1840 | 1841 | 1842 | 1844 | 1845 | 1846 | 1847 | 1848 | 1849 |
| 56 | 1850 | 1851 | 1852 | 1854 | 1855 | 1856 | 1857 | 1858 | 1859 |
| 57 | 1860 | 1861 | 1862 | 1864 | 1865 | 1866 | 1867 | 1868 | 1869 |
| 58 | 1870 | 1871 | 1872 | 1874 | 1875 | 1876 | 1877 | 1878 | 1879 |
| 59 | 1880 | 1881 | 1882 | 1884 | 1885 | 1886 | 1887 | 1888 | 1889 |
| 60 | 1890 | 1891 | 1892 | 1894 | 1895 | 1896 | 1897 | 1898 | 1899 |
| 61 | 1900 | 1901 | 1902 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 |
| 62 | 1910 | 1911 | 1912 | 1914 | 1915 | 1916 | 1917 | 1918 | 1919 |
| 63 | 1920 | 1921 | 1922 | 1924 | 1925 | 1926 | 1927 | 1928 | 1929 |
| 64 | 1930 | 1931 | 1932 | 1934 | 1935 | 1936 | 1937 | 1938 | 1939 |
| 65 | 1940 | 1941 | 1942 | 1944 | 1945 | 1946 | 1947 | 1948 | 1949 |
| 66 | 1950 | 1951 | 1952 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 |
| 67 | 1960 | 1961 | 1962 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 |
| 68 | 1970 | 1971 | 1972 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
| 69 | 1980 | 1981 | 1982 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
| 70 | 1990 | 1991 | 1992 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
| 71 | 2000 | 2001 | 2002 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
| 72 | 2010 | 2011 | 2012 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
| 73 | 2020 | 2021 | 2022 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
| 74 | 2030 | 2031 | 2032 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 |
| 75 | 2040 | 2041 | 2042 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 |
| 76 | 2050 | 2051 | 2052 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 |
| 77 | 2060 | 2061 | 2062 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 |
| 78 | 2070 | 2071 | 2072 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 |
| 79 | 2080 | 2081 | 2082 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 |
| 80 | 2090 | 2091 | 2092 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 |
| 81 | 2100 | 2101 | 2102 | 2104 | 2105 | 2106 | 2107 | 2108 | 2109 |
| 82 | 2110 | 2111 | 2112 | 2114 | 2115 | 2116 | 2117 | 2118 | 2119 |
| 83 | 2120 | 2121 | 2122 | 2124 | 2125 | 2126 | 2127 | 2128 | 2129 |
| 84 | 2130 | 2131 | 2132 | 2134 | 2135 | 2136 | 2137 | 2138 | 2139 |
| 85 | 2140 | 2141 | 2142 | 2144 | 2145 | 2146 | 2147 | 2148 | 2149 |
| 86 | 2150 | 2151 | 2152 | 2154 | 2155 | 2156 | 2157 | 2158 | 2159 |
| 87 | 2160 | 2161 | 2162 | 2164 | 2165 | 2166 | 2167 | 2168 | 2169 |
| 88 | 2170 | 2171 | 2172 | 2174 | 2175 | 2176 | 2177 | 2178 | 2179 |
| 89 | 2180 | 2181 | 2182 | 2184 | 2185 | 2186 | 2187 | 2188 | 2189 |
| 90 | 2190 | 2191 | 2192 | 2194 | 2195 | 2196 | 2197 | 2198 | 2199 |
| 91 | 2200 | 2201 | 2202 | 2204 | 2205 | 2206 | 2207 | 2208 | 2209 |
| 92 | 2210 | 2211 | 2212 | 2214 | 2215 | 2216 | 2217 | 2218 | 2219 |
| 93 | 2220 | 2221 | 2222 | 2224 | 2225 | 2226 | 2227 | 2228 | 2229 |
| 94 | 2230 | 2231 | 2232 | 2234 | 2235 | 2236 | 2237 | 2238 | 2239 |
| 95 | 2240 | 2241 | 2242 | 2244 | 2245 | 2246 | 2247 | 2248 | 2249 |
| 96 | 2250 | 2251 | 2252 | 2254 | 2255 | 2256 | 2257 | 2258 | 2259 |
| 97 | 2260 | 2261 | 2262 | 2264 | 2265 | 2266 | 2267 | 2268 | 2269 |
| 98 | 2270 | 2271 | 2272 | 2274 | 2275 | 2276 | 2277 | 2278 | 2279 |
| 99 | 2280 | 2281 | 2282 | 2284 | 2285 | 2286 | 2287 | 2288 | 2289 |
| 100 | 2290 | 2291 | 2292 | 2294 | 2295 | 2296 | 2297 | 2298 | 2299 |

## APPENDIX 4 POINTS TO NOTE WHEN REPLACING A1SD71/AD71 WITH A1SD75P[ ]/AD75P[ ]

The points to note when replacing A1SD71/AD71 with A1SD75P[ ]/AD75P[ ] are explained here.
(For a functional comparison between A1SD75P[ ]/AD75P[ ] and A1S71/AD71, see Section 1.3.)

(1) The pulse output logic and connector pin layout are different for the A1SD75P[ ]/AD75P[ ].
For details on the pulse output logic, see APPENDIX 5.

| Item | A1SD75P[ ]/AD75P[ ] | A1SD71/AD71 |
|---|---|---|
| Connector used | Connector: 10136-3000VE<br>Cover: 10336-56F0-008 | Connector: FCN-361J040-AU<br>Cover: FCN-360C040-B |
| Number of connectors | One per axis<br>(Accessories for number of units corresponding to the number of axes) | One per unit |
| Connector pin layout | Pin numbers have the same application for each axis. | X-axis and Y-axis designated for pin numbers. |
| Zero point signal specification | Corresponds to 5 VDC/24 VDC<br>[When using MR-H/MR-J, 24 VDC power is used. (See connection example.)] | Corresponds to 5 VDC/24 VDC |
| Manual pulse generator model name | MR-HDP01 | OSM-01-2(C) |

(2) In order to connect an A1SD75P[ ] and a peripheral device, a conversion cable (A1D75-C01H) is required.

## APPENDIX 5 CONNECTION TO DRIVE UNITS

### 5.1 AD75 Pulse Output Specification

(1) With the AD75, positioning control is performed by outputting a pulse train to the drive unit.

(2) The AD75 has three types of pulse output: "SING pulse output", "CW/CCW pulse output", and "A phase/B phase pulse output": the type of pulse output used must be set in the basic parameters #1 of the AD75.

(3) The pulse output of the AD75 is shown in Table 5.1.

**Table 5.1 AD75 Pulse Output**

| | | Forward | Reverse |
|---|---|---|---|
| SING pulse output | PULSE | High<br>Low | |
| | SING | High<br>Low | |
| CW/CCW pulse output | PULSE F | High<br>Low | |
| | PULSE R | High<br>Low | |
| A phase/B phase pulse output | A phase | High<br>Low | |
| | B phase | High<br>Low | |

**REMARK**

With the AD75 open collector system (transistor output), "High" and "Low" represent the following statuses.

- High: AD75 pulse output transistor OFF
- Low: AD75 pulse output transistor ON

## 5.2 Recommended Connection

(1) The AD75 has two systems of pulse train output: open collector system and differential driver system.

(2) In general, since the differential driver system is more resistant to noise than the open collector system, it is recommended to connect the AD75 to the drive unit using the differential driver system.
However, since the load current of the AD75 differential driver is 20 mA, the differential driver must be used within the range of the specification in 5.1.

## 5.3 Method for Connection to Drive Unit

(1) Generally, the command pulse input section of the drive unit (servo amplifier, stepping motor driver) is open collector input with isolation by photocoupler.
Connection to a drive unit with open collector input is explained here.

(2) You are recommended to use the differential driver system for connection between the AD75 and drive unit in order to increase the noise margin. (See Figure 5.1.)

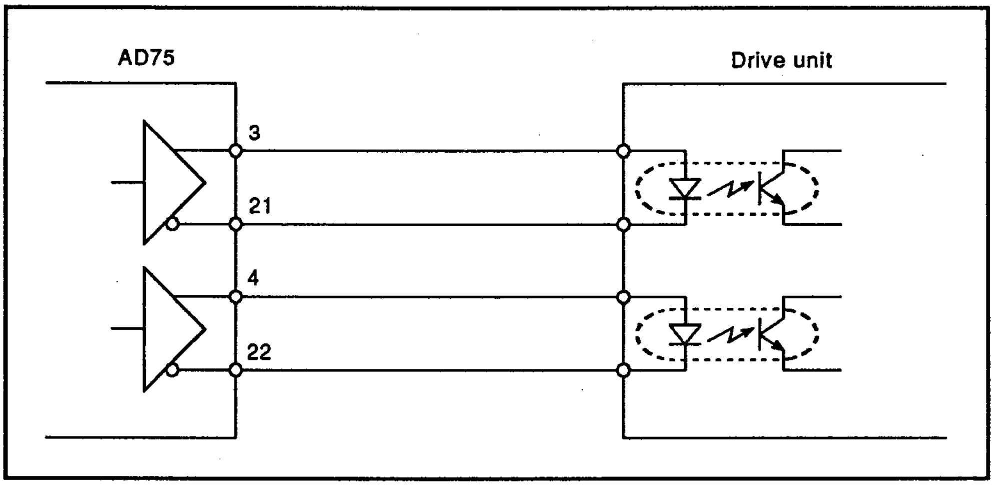



**Fig. 5.1 Example Connection Using AD75 Differential Driver**

(3) When connecting an AD75 and drive unit using the open collector system, wire as shown in Figure 5.2.

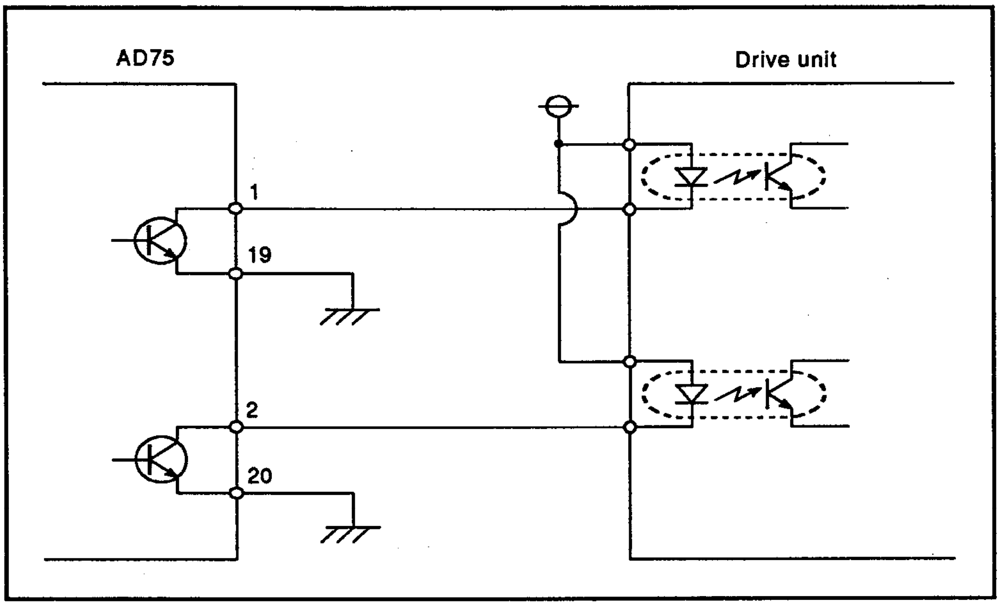



**Fig. 5.2 Example Connection Using AD75 Open Collector**

### 5.4 AD75 Command Pulse Logic

(1) It may not be possible to receive command pulses from some models of servo amplifier and stepping motor driver whose command pulse logic does not match that of the AD75.

(2) If the AD75 and servo amplifier/stepping motor driver have different logics, use differential driver output and cross the wiring as shown in Figure 5.3.
In this case the open collector system cannot be used.

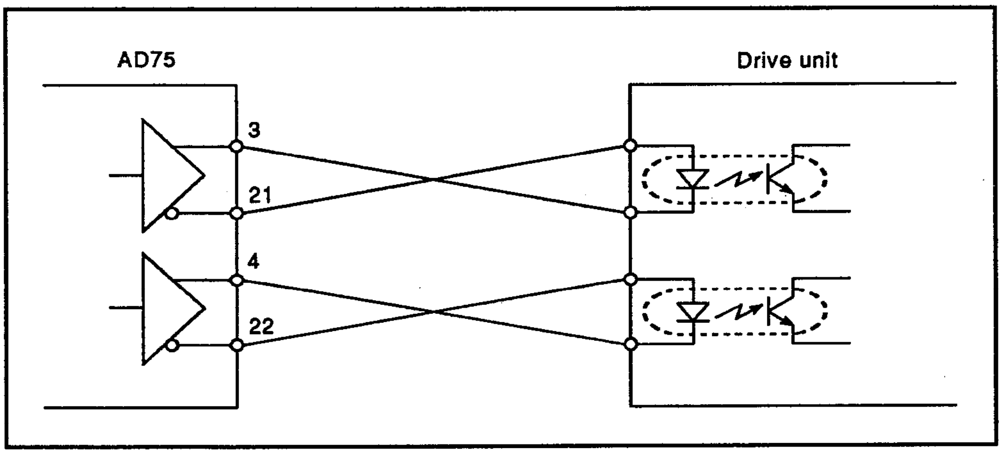


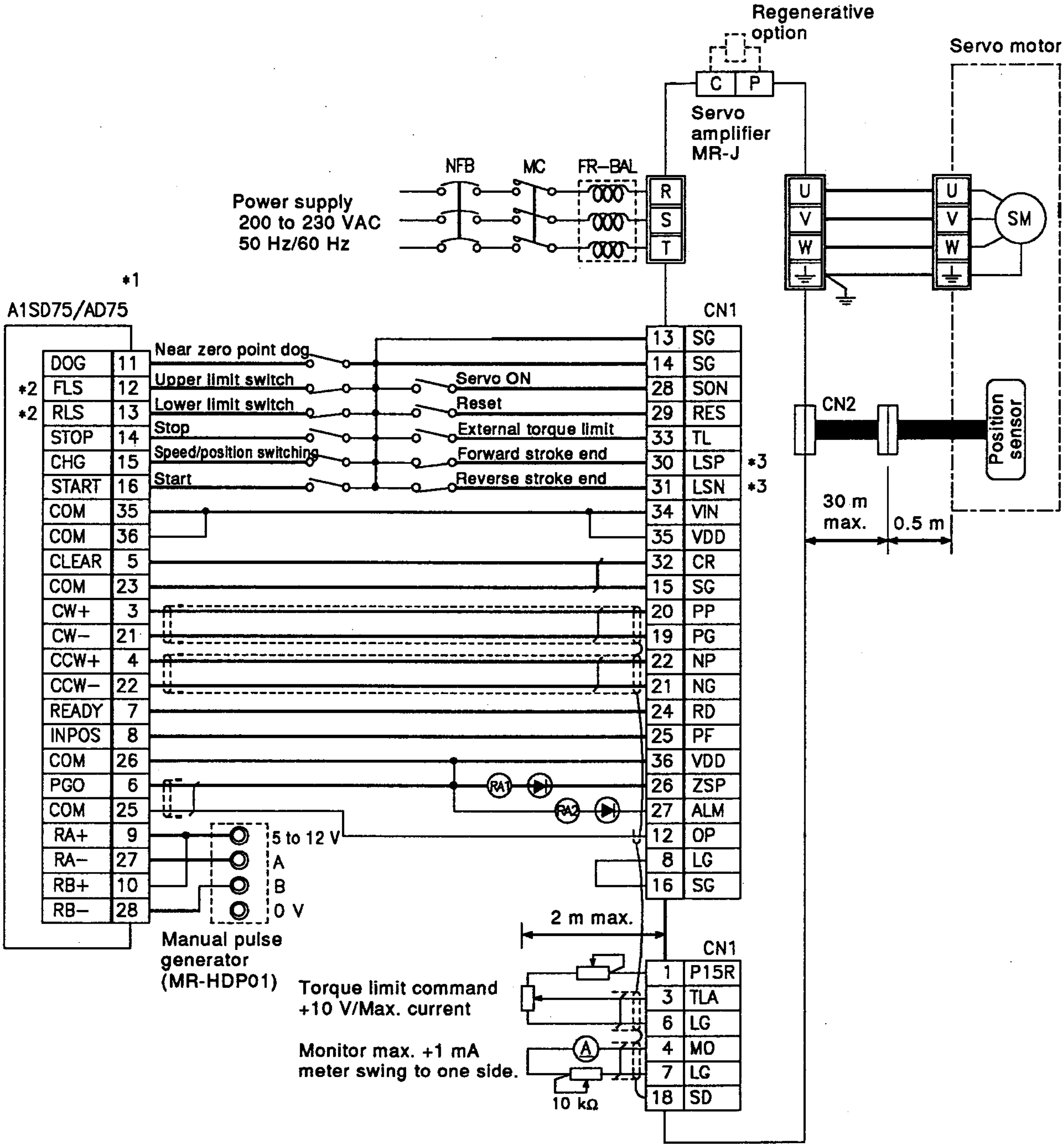

**Fig. 5.3 Example of Wiring When the Command Pulse Logic Does Not Match**

(3) When the AD75 is connected to an MR-J/MRH servo amplifier (made by Mitsubishi), the logic can be changed by changing the servo amplifier parameter settings, which means that the normal wiring shown in Figures 5.1 and 5.2 can be used.

## APPENDIX 6 EXAMPLE CONNECTION TO SERVO AMPLIFIER

### 6.1 Example of Connection Between A1SD75/AD75 and MR-J

(1) When differential driver is used



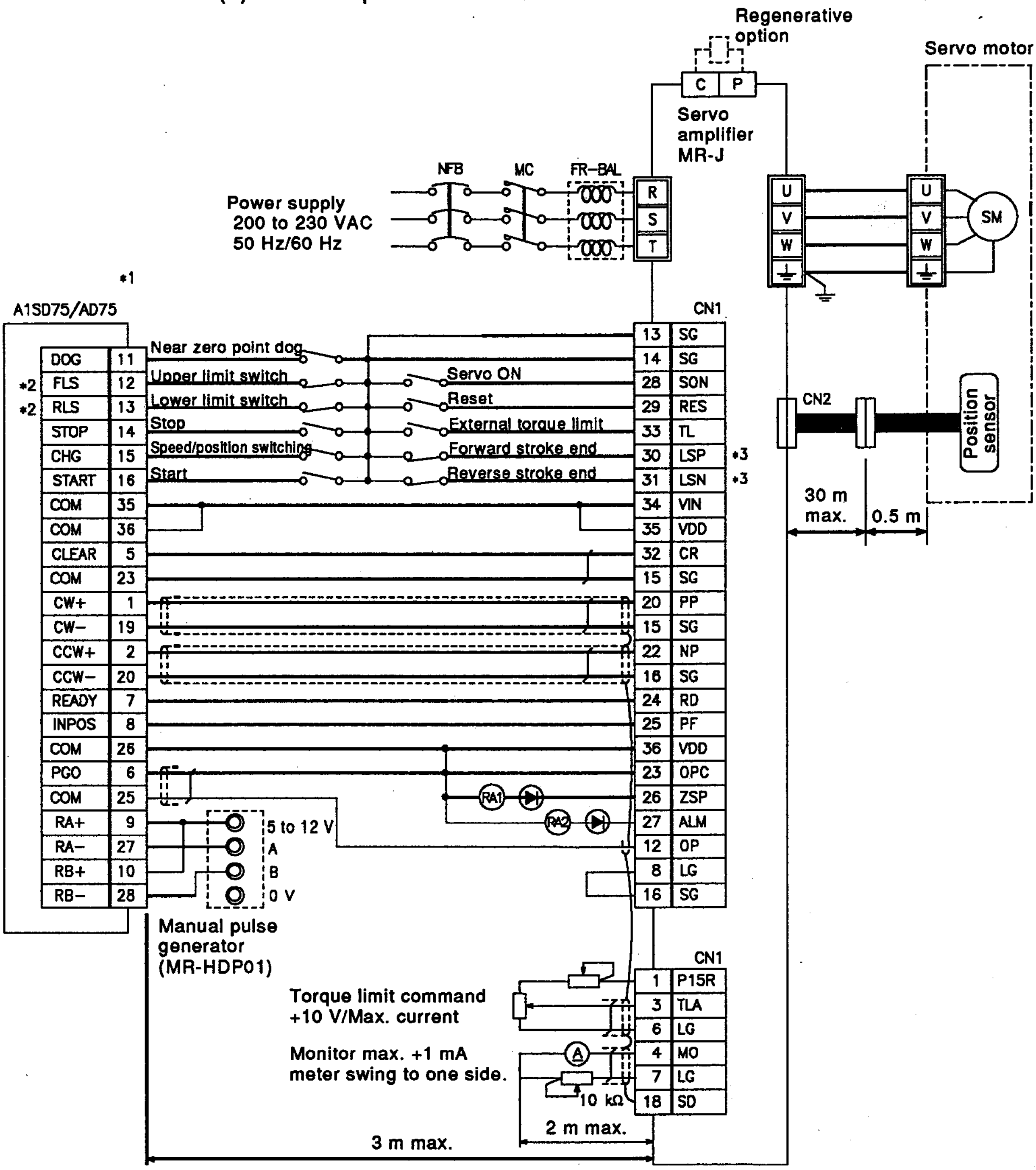

**REMARKS**

1) *1: The applications of the A1SD75/AD75 connector pin numbers are the same for axes 1 through 3.

2) *2: The A1SD75/AD75 upper limit switch (FLS) and lower limit switch (RLS) are used with the retry function during home position return. Set the limits inside those for the servo limit switches.

3) *3: These are the servo limit switches (for stopping).

(2) When open collector is used




**REMARKS**

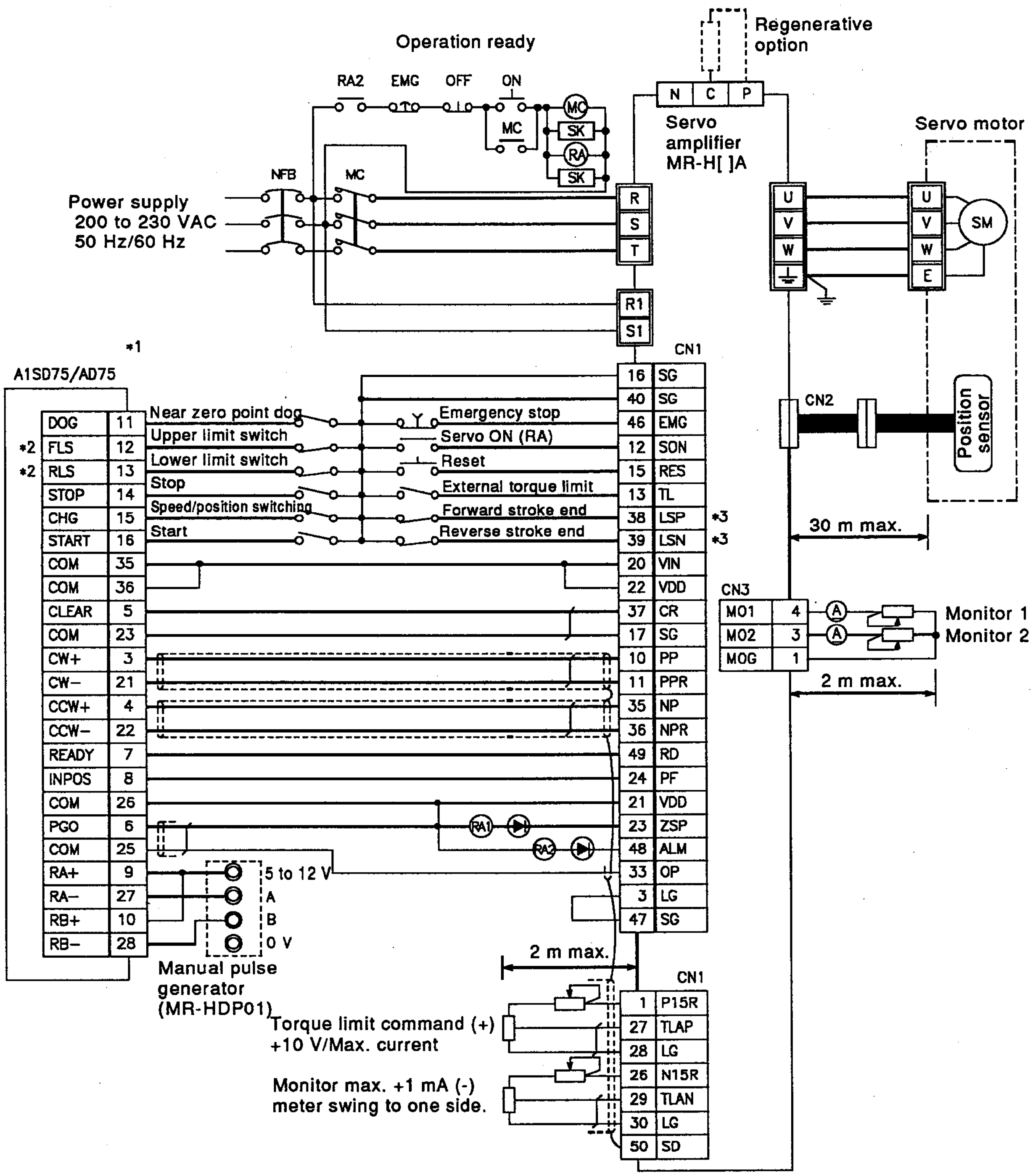
1) *1: The applications of the A1SD75/AD75 connector pin numbers are the same for axes 1 through 3.

2) *2: The A1SD75/AD75 upper limit switch (FLS) and lower limit switch (RLS) are used with the retry function during home position return. Set the limits inside those for the servo limit switches.

3) *3: These are the servo limit switches (for stopping).

## 6.2 Example of Connection Between A1SD75/AD75 and MR-H

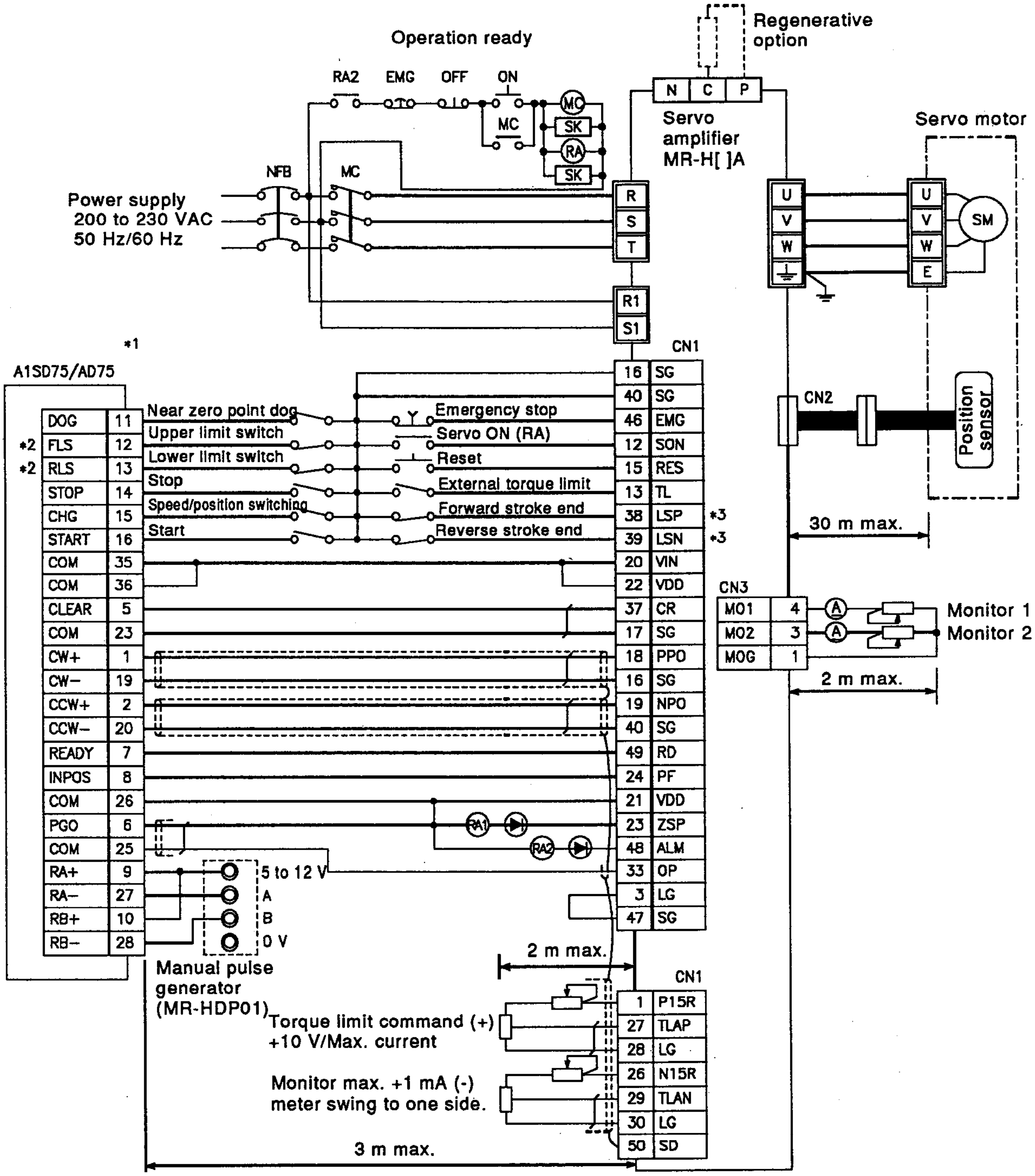
(1) When differential driver is used




**REMARKS**

1) *1: The applications of the A1SD75/AD75 connector pin numbers are the same for axes 1 through 3.
2) *2: The A1SD75/AD75 upper limit switch (FLS) and lower limit switch (RLS) are used with the retry function during home position return. Set the limits inside those for the servo limit switches.
3) *3: These are the servo limit switches (for stopping).

(2) When open collector is used




**REMARKS**

1) *1: The applications of the A1SD75/AD75 connector pin numbers are the same for axes 1 through 3.

2) *2: The A1SD75/AD75 upper limit switch (FLS) and lower limit switch (RLS) are used with the retry function during home position return. Set the limits inside those for the servo limit switches.

3) *3: These are the servo limit switches (for stopping).

**IMPORTANT**

(1) Design the configuration of a system to provide an external protective or safety inter locking 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 your body and the work bench.

(b) Do not touch the conductive areas of the printed circuit board and its electrical parts with non-grounded tools, etc.

Positioning Module
type A1SD75P1/P2/P3, AD75P1/P2/P3

# User's Manual

| | |
|---|---|
| MODEL | A1SD75/AD75-U-E |
| MODEL CODE | 13J812 |
| IB(NA)66589-B(9606)MEE | |


MITSUBISHI ELECTRIC CORPORATION

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