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MITSUBISHI

AJ65BT-D75P2-S3 Positioning Module

User's Manual

AJ65BT-D75P2-S3 Positioning Module User's Manual

A

MELSEC

Mitsubishi Programmable Controller

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.

These precautions apply only to Mitsubishi equipment. Refer to the CPU module user's manual for a description of the PC system safety precautions.

These ●SAFETY PRECAUTIONS● classify the safety precautions into two categories: "DANGER" and "CAUTION".

⚠DANGER	**Procedures which may lead to a dangerous condition and cause death or serious injury if not carried out properly.**
⚠CAUTION	**Procedures which may lead to a dangerous condition and cause superficial to medium injury, or physical damage only, if not carried out properly.**

Depending on circumstances, procedures indicated by ⚠**CAUTION** may also be linked to serious results.

In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

[Design Precautions]

⚠DANGER

- Configure a safety circuit outside the PC so that the safety of the overall system is always maintained even if the external power supply or the PC breakdown occurs.
  Accidents may occur due to output error or malfunction.
  (1) For machine damage prevention, configure protective circuits such as an emergency stop circuit and interlocking circuit for positioning upper/lower limit, outside the PC.
  (2) The home position return operation is controlled by two kinds of data: home position return direction and home position return speed, and begins to decelerate when the near-point dog is turned on. Therefore, if the home position direction is set incorrectly, the module will continue to run without decelerating. To measure this, provide a means to prevent damage to the machine.
- When the data link generates a communication error, the action of the faulty station will vary depending on the type of data link used. Configure an interlocking circuit in the sequence program using the communication status information so that safety of the entire system is maintained.
  Refer to the manual for each data link for details on confirmation methods regarding a faulty station and operating status during a communication error.

⚠CAUTION

- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other. They should be installed 100 mm (3.9 in.) or more from each other. Failure to do so may result in noise that would cause malfunction.

[Installation Precautions]

⚠CAUTION

- Use the PC in the environment given in the general specifications of this manual. Using the PC outside the range of the general specifications may result in electric shock, fire or malfunction, or may damage or degrade the module.
- Tighten the module installation screws with the specified torque. If the screws are loose, it may result in short circuits, malfunction or cause the module to fall out.
  If the screws are tightened too much, it may damage the screws and the module may result in short circuits, malfunction or cause the module to fall out.
- Do not directly touch the conducted part of the module or electric parts. This may cause malfunction or breakdowns.
- Make sure connectors for the drive module and peripheral devices are installed securely in the connectors of the module. Make sure the connectors make a clicking sound when attached. Defective contact may cause malfunction or false input/output.
- When the drive module or peripheral devices are not connected to the module, be sure to attach the cover to the connector area. Failure to attach the cover may result in malfunction.

[Wiring Precautions]

⚠CAUTION

- The FG terminal should always be grounded using the class-3 or higher grounding designed specially for PC. Failure to ground the terminal may cause malfunction.
- When wiring the PC, check the rated voltage and terminal layout of the wiring, and make sure the wiring is done correctly. Connecting a power supply that differs from the rated voltage or wiring it incorrectly may cause fire or breakdown.
- Correctly perform wiring to the module after confirming the terminal layout.
- Be careful not to let foreign matter such as filings or wire chips get inside the module. These can cause fire, breakdowns and malfunction.
- Tighten the terminal screws with the specified torque. If the terminal screws are loose, it may result in short circuits, fire or malfunction.
  If the terminal screws are tightened too much, it may damage the screws and the module may result in short circuits, malfunction or cause the module to fall out.
- Before beginning any installation or wiring work, make sure all phases of the power supply have been obstructed from the outside. Failure to completely shut off the power-supply phases may cause electric shock and/or damage to the module.

[Wiring Precautions]

⚠CAUTION

- When turning on the power or operating the module after installation or wiring work, be sure the module's terminal covers are correctly attached. Failure to attach the terminal covers may result in electric shock.
- Correctly perform soldering for connectors for the outside. Incorrect connection may cause short circuits or malfunction.

[Setup and Maintenance Precautions]

⚠CAUTION

- Do not touch the terminals while the power is on. Doing so may cause electric shock or malfunction.
- Never disassemble or modify the module. This may cause breakdowns, malfunction, injury and fire.
- Before cleaning the module or retightening the screws, make sure all phases of the power supply have been obstructed from the outside. Failure to completely shut off the power-supply phases may cause breakdowns and malfunction.
- Before attaching or detaching the module, make sure all phases of the power supply have been obstructed from the outside. Failure to completely shut off the power-supply phases may cause module breakdowns and malfunction.
- When conducting a test operation, set the speed limit parameter at low speed and prepare to stop immediately if any dangerous situation should occur.

[Disposal Precautions]

DANGER

- When disposing of this product, treat it as industrial waste.

Revisions

* The manual number is noted at the lower left of the back cover.

Print date	*Manual number	Revision
Apr. 1998	IB(NA)-66824-A	First printing

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About This Manuals

The following manuals are available regarding this product.
Please order desired manuals using this chart.

Related Manuals

Manual name	Manual No. (Type code)
Control & Communication-Link System Master-Local module type AJ61BT11/A1SJ61BT11 User's Manual This manual describes the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the AJ61BT11 and A1SJ61BT11 (sold separately).	IB (NA) 66721 (13J872)
AJ61QBT11/A1SJ61QBT11 Control & Communication Link System Master/Local Module USER'S MANUAL This manual describes the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the AJ61QBT11 and A1SJ61QBT11 (sold separately).	IB (NA) 66722 (13J873)
Positioning module software package type SW1IVD-AD75P Operating Manual This manual describes how to create data (such as parameters and positioning data) and the operations to transfer data to the module, monitor positioning and conduct tests using the above software package (supplied with each software package product).	IB (NA) 66714 (13J915)

Introduction

Thank you for purchasing the Mitsubishi MELSEC-A-series.

Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of MELSEC-A-series you have purchased, so as to ensure correct use.

Please forward a copy of this manual to the end user.

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Part 1

Function Explanation Volume

Part 1 describes the basic topics relating to the AJ65BT-D75P-S3 positioning module product, as well as the information the user should know when operating the product.

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Chapter 2	System Configuration
Chapter 3	Specification
Chapter 4	Function List
Chapter 5	Home Position Return Function
Chapter 6	Positioning Function
Chapter 7	Other Functions
Chapter 8	Buffer Memory

1. Overview

This users manual describes the specifications, handling and programming method for the AJ65BT-D75P2-S3 positioning module (hereinafter referred to as the D75P2), which can be used as an intelligent device station for the CC-Link system.
An overview of the D75P2's positioning control is shown in Figure 1.1.

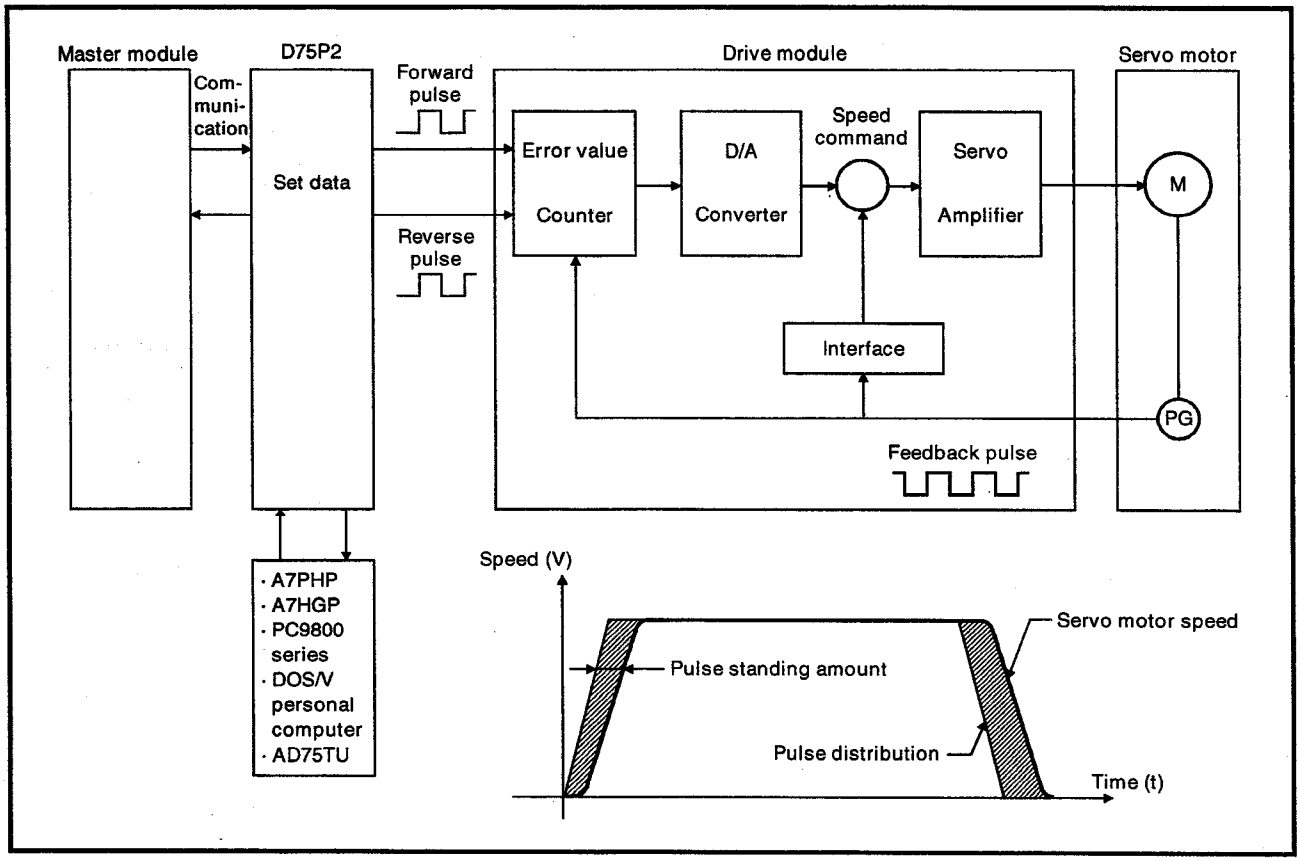


Fig. 1.1 Overview of positioning control

1.1 Features

The features of the D75P2 are listed below.

(1) Compatible with distributed systems

The D75P2 can be placed near a distributedly allocated servo amplifier or stepping motor.

(2) Easily adaptable to an absolute-position detection system

(a) By connecting a servo system that supports absolute positions, the D75P2 can be used with an absolute-position detection system.

(b) Once the location of the home position has been determined, the D75P2 can return to the address prior to power-up using the absolute-position restoration function.

(c) With the absolute-position detection system, the location of the home position can be determined by means of the data-set-type home position return.
Therefore, wiring to items such as a near-point dog is required.

(3) Control via mechanical system input is possible

With external inputs such as external start, stop and speed/position switch, the positioning control can be performed without using a sequence program.

(4) Various positioning control functions are available

(a) Various functions required of a positioning system are included, such as positioning control to any position, fixed-dimension feed control and uniform speed control.
An overview of positioning control functions is provided in Section 1.4.

- A maximum of 600 data items per axis can be set for positioning data, including the positioning address, control method, operation pattern, etc..
- Linear control (two-axis simultaneous execution is allowed) can be performed for the positioning of each axis: independent positioning using one positioning data item, or continuous positioning via the continuous execution of multiple data items.
- Linear interpolation control with two axes, as well as circular interpolation control, can be done for the positioning of multiple axes: independent positioning using one positioning data item, or continuous positioning via the continuous execution of multiple data items.

(b) The control methods specified by positioning data include the position control, speed control and speed/position switch control.

(c) Depending upon the operation pattern set by the user using positioning data, continuous positioning can be performed for multiple axes or each axis using multiple positioning data items.
Continuous positioning can also be performed for multiple blocks, each of which consisting of multiple positioning data items.

(d) The home position return control has been extended.

- Seven types of home position return methods are available: the near-point dog method (one type), stopper stop method (three types), count method (two types) and data-set method (one type).
(However, the data-set method is available only when using an absolute-position system.)
- The home position return retry function is now available in order to realize positioning control from any position relative to the home position of a machine.

(e) Two acceleration/deceleration methods are available: the automatic trapezoid acceleration/deceleration and S-curve acceleration/deceleration. The user can select from the automatic trapezoid acceleration/deceleration or S-curve acceleration/deceleration.

(5) Faster pulse output and longer distance to the drive module

(a) The D75P2 is equipped with pulse-output interfaces for a differential driver and an open collector.

(b) By connecting to the differential driver, higher speed and longer distance can be achieved.

- When connecting to a differential driver : 400 kpps, 10 m (32.8 ft.) maximum.
- When connecting to an open collector : 200 kpps, 2 m (6.6 ft.) maximum.

(6) Easy maintenance

The D75P2 has achieved improved maintainability, as in the following:

(a) Various data such as positioning data and parameters are stored internally in the flash memory of the D75P2.
Therefore, data can be retained without a battery.

(b) Error display and the status of mechanical system input and zero input can be checked on the 17-segment monitor.

(c) Errors are subdivided in order to improve first-time diagnostics.

(d) Confirmation of the contents of errors and warnings is done easier than the way it has been conventionally done, since 16 items each of history data, such as errors and warnings, can be retained.

1.2 Purpose of Positioning

The positioning refers to moving a movable object (processed materials, tools, etc.) at a fixed speed and stopping it accurately at the intended position.
Typical usage examples are shown below.

(1) Fixed-dimension feed

Feed a sheet for a fixed dimension and cut it.

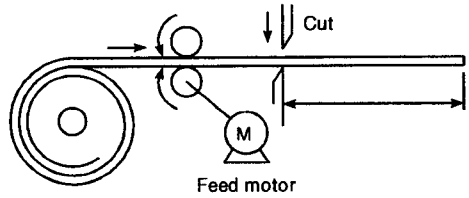


Fig. 1.2 Fixed-dimension feed

(2) Tapping

To perform thread chasing to a fixed depth for processed material, repeat the following steps:

1) Fast forward
2) Process feed (thread chasing)
3) Fast rewind

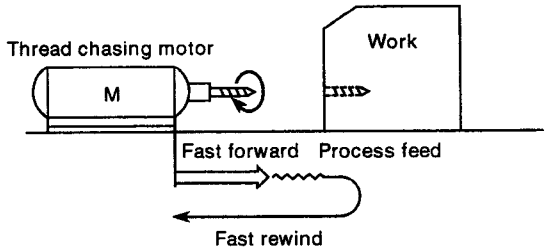


Fig. 1.3 Tapping

(3) Steel-plate drilling (X-Y table movement)

Drill a hole at the fixed position using two motors (one motor each for vertical and horizontal).

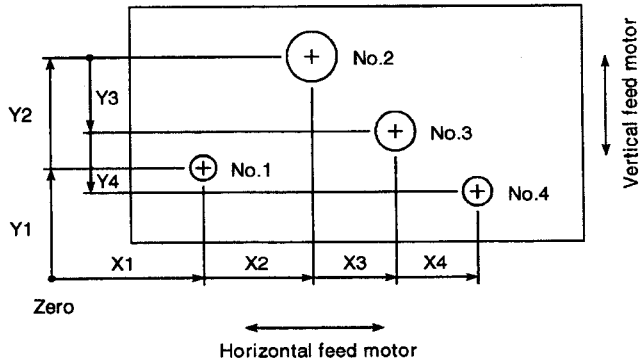


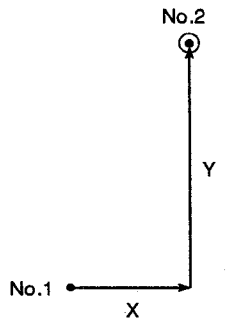
Fig. 1.4 Steel plate drilling

1.3 Types of Positioning

Each of the two axes can be used independently for positioning, or the two axes can be used for the positioning of orthogonal axes.
The following methods as shown in the figures are available when positioning from address number 1 to number 2.

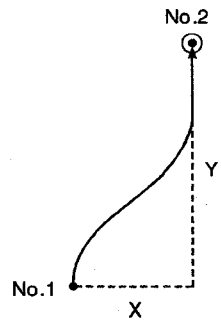
(1) Individual operation

This is a method by which each of the vertical and horizontal directions is positioned individually. First, positioning is performed in the horizontal direction X, then in the vertical direction Y.



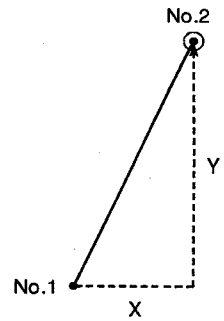
(2) Simultaneous operation

This is a method that designates one of the two motors to perform positioning in the X direction and the other in the Y direction, driving them simultaneously to reach the intended position.
Since each of the acceleration/deceleration time, speed and travel distances for the two motors is independent, this operation moves along a curve.



(3) Linear interpolation operation

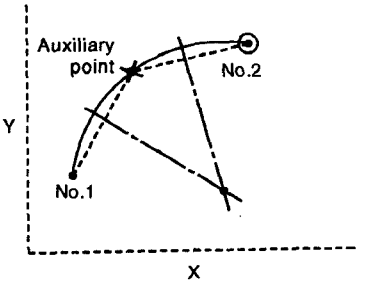
This is a method that operates two motors simultaneously to move along a straight diagonal line. To move along a straight line, calculation is performed via the positioning module equipped with an interpolation function, and the resultant pulse is distributed to the two motors for control, because the acceleration/deceleration times and speeds of the two motors generally vary.



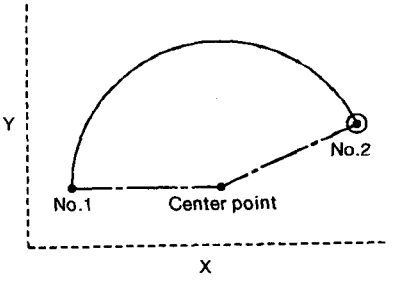
(4) Circular interpolation operation

This is a method that operates two motors simultaneously to execute the interpolation operation for the circular locus.

To move along a circular line, calculation is performed for the positioning module equipped with a circular interpolation function that controls the acceleration/deceleration times and speeds of the two motors, and the resultant pulse is distributed to the two motors for control.



Circular interpolation by specifying an auxiliary point



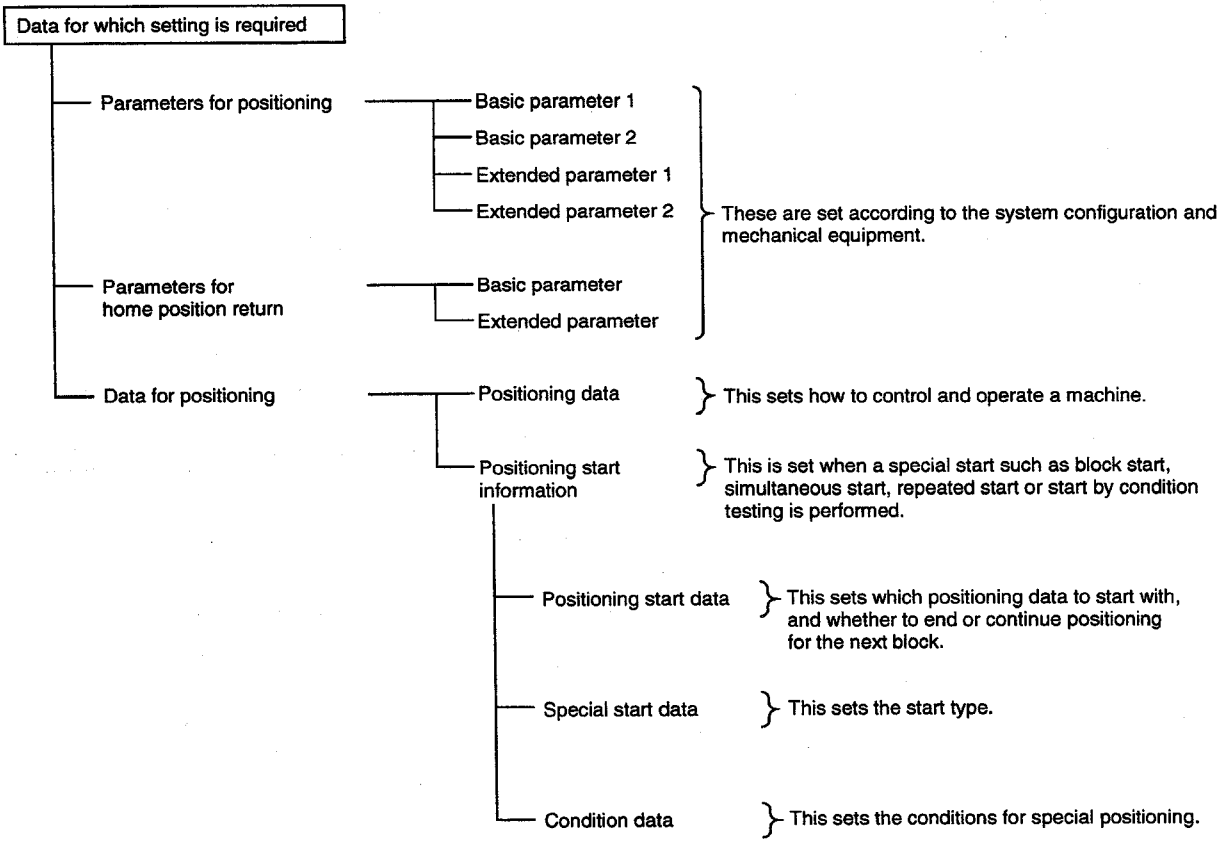
Circular interpolation by specifying the center point

1.4 Overview of Positioning Control

This section describes the data that needs to be set for positioning, along with the types of positioning controls and operation patterns available.

1.4.1 Data setting required for positioning control

In order to perform positioning using the D75P2, several data items listed below must be set.



1.4.2 Positioning control methods

The following positioning functions are available for the D75P2, and they are controlled by control methods *1 of 1) through 8). Use positioning data to set the control method.

* 1) to 6): Control of "positioning" locus and operation
  7) to 8): Control of "positioning" data

Linear positioning function

1) Linear control of single-axis
2) Linear interpolation control of dual-axes

..... This performs positioning along a straight locus from the current stop position toward the specified position.

Fixed-dimension feed-positioning function

3) Fixed-dimension feed control ..... This performs positioning for the specified travel along a straight locus from the current stop position.

Circular positioning function

4) Circular interpolation control ..... This performs positioning along a circular locus from the current stop position towards the specified position.

Speed-control positioning function

5) Speed control ..... This moves at the specified speed from the current stop position toward the specified position. (The operation continues until a stop command is input.)

Speed/position switch positioning function

6) Speed/position switch control ..... This moves at the specified speed from the current stop position toward the specified position, and performs positioning for the specified travel from the moment a speed/position switch signal is input.

Present-value change function

7) Present value change ..... This changes the present feed value to the specified value.

JUMP function

8) JUMP instruction ..... This jumps the control point to the specified positioning data number while in the continuous locus control (operation pattern: 02). (Specification of unconditional or execution condition is made.)

*1: See Section 6.1 for details on control methods.

1.4.3 Specification of positioning address

For positioning control, there are two methods used to designate a position.

(1) Absolute method

This method performs positioning by specifying the position relative to home position (absolute address). This address is used as the positioning address (the starting point can be positioned at any location).

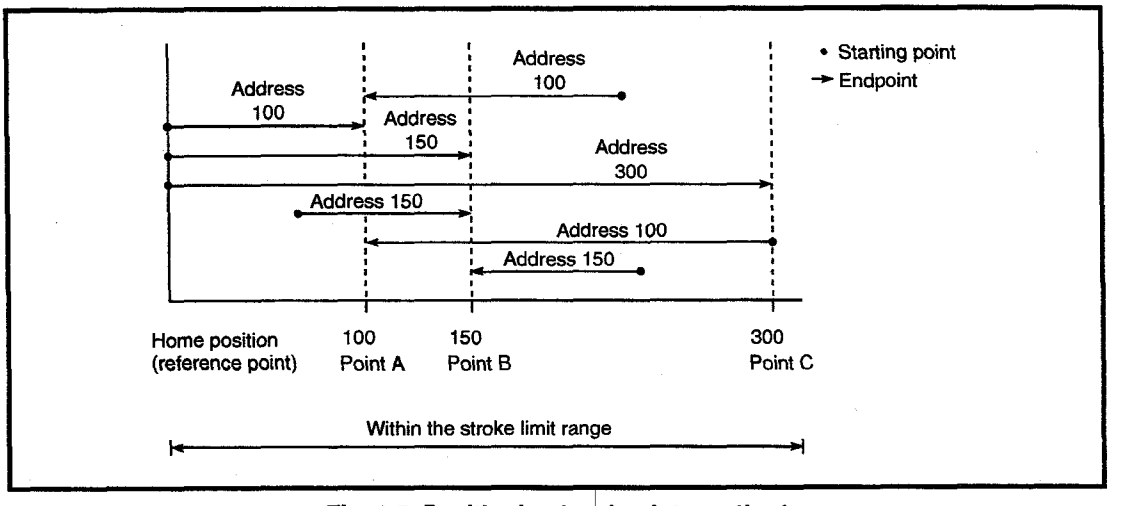


Fig. 1.5 Positioning by absolute method

(2) Increment method

This method performs positioning by specifying the direction and increment of travel using the currently stopped position as the starting point.

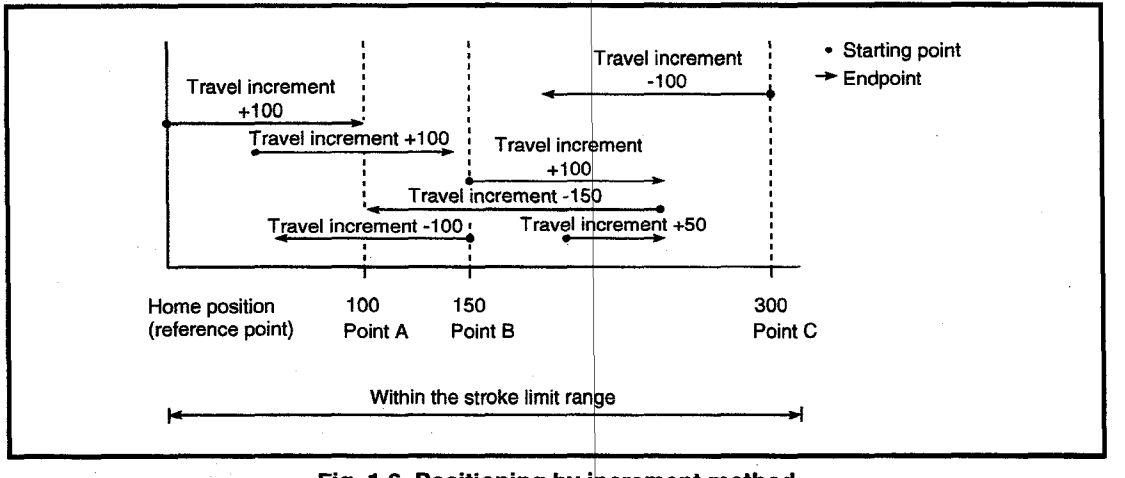


Fig. 1.6 Positioning by increment method

1.4.4 Operation pattern

The following types of operation patterns are available.

- Individual positioning (ends positioning) ——— Individual positioning control (operation pattern: 00)
- Continuous positioning (continues positioning) ——— Continuous positioning control (operation pattern: 01)
  ——— Continuous locus control (operation pattern: 11)

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

The operation is completed with positioning for the specified positioning data alone. The positioning completion of this operation pattern is also used as the operation pattern for the last positioning data of continuous positioning and continuous-locus positioning.

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

The operation stops temporarily upon the completion of positioning for the specified positioning data, then continues with the next positioning data number.
This is specified when performing positioning in which the direction changes because of multiple positioning data items having consecutive positioning data numbers.

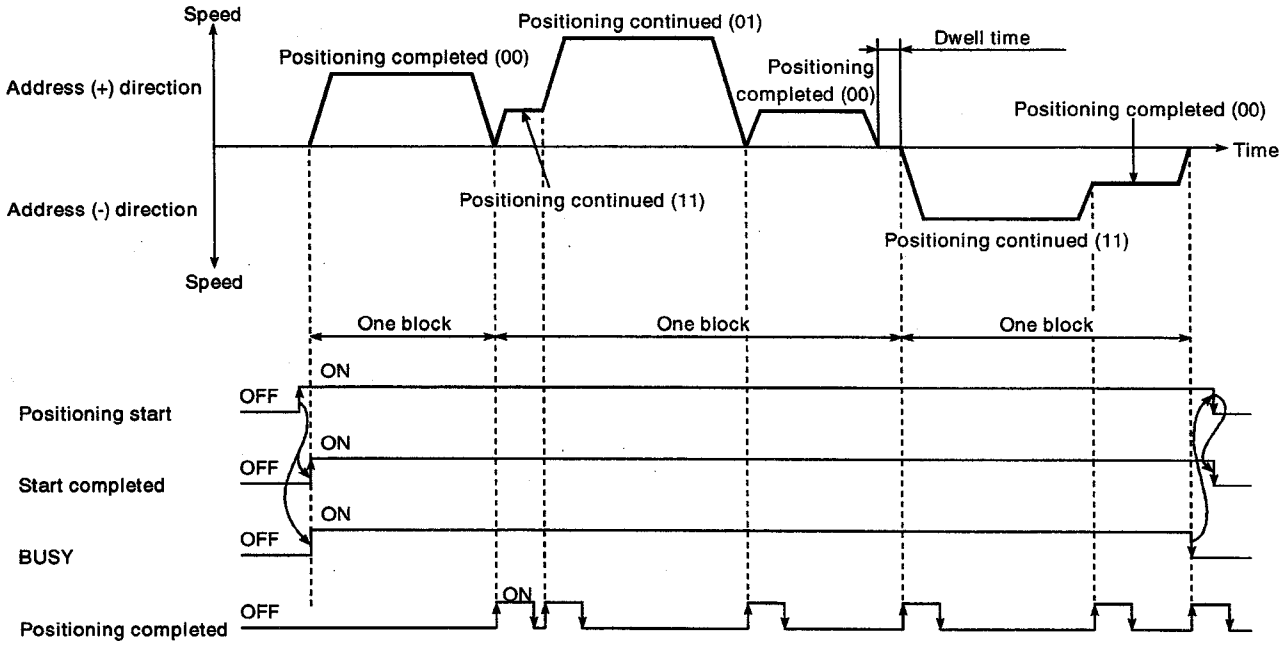
(3) Continuous locus control (operation pattern = 11: continues positioning)

After executing positioning using the specified positioning data, the operation changes its speed to that of the next positioning data number and continues positioning.
This is specified when continuously executing multiple positioning data items having consecutive positioning data numbers at a specified speed.

1.4.5 Block positioning control

Block positioning is a control that continuously executes the positioning of specified blocks. One block is equivalent to a series of positioning data up to the completion of positioning (operation pattern = 00) by individual or continuous positioning control.
A maximum of 50 blocks per axis can be specified.

Using a one-time start command from the PC CPU or external, complex positioning control can be performed.
The block positioning control can be performed by specifying the positioning start number and positioning start information in the buffer memory.



1.4.6 Overview of acceleration/deceleration processing

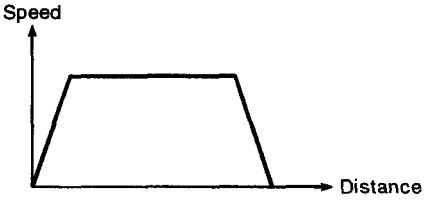
Acceleration/deceleration processing for the positioning operation, manual pulse-generator operation, home position return operation and JOG operation is performed using the user-specified method, acceleration time and deceleration time.

(1) Acceleration/deceleration method

There are two types of acceleration and deceleration processing: the automatic trapezoid acceleration/deceleration method and the S-curve acceleration/deceleration method. An extended parameter is used to set which method is used.
The specified acceleration/deceleration method is applied to all accelerations and decelerations when starting and completing the positioning operation, home position return operation and JOG operation, as well as when changing the speed.

1) Automatic trapezoid acceleration/deceleration method

This method accelerates and decelerates in a linear fashion based on the speed limit value and user-specified acceleration time/deceleration time.



2) S-curve acceleration/deceleration method

This method reduces the load on the motor when starting and stopping.
This method gradually accelerates or decelerates based on the user-specified acceleration time and deceleration time, S-curve ratio (1 % to 100 %) and speed limit value.

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

(a) Four types each of the acceleration time and deceleration time for positioning control can be set using basic parameter 2 and extended parameter 2.
Also, the acceleration time and deceleration time can be selected from 1 to 65535 ms or 1 to 8388608 ms using the acceleration/deceleration time setting size selection in extended parameter 1.
- Acceleration time ····· The time elapses before the speed of 0 reaches the limit value.
- Deceleration time ···· The time elapses before the speed at the limit value reaches 0.

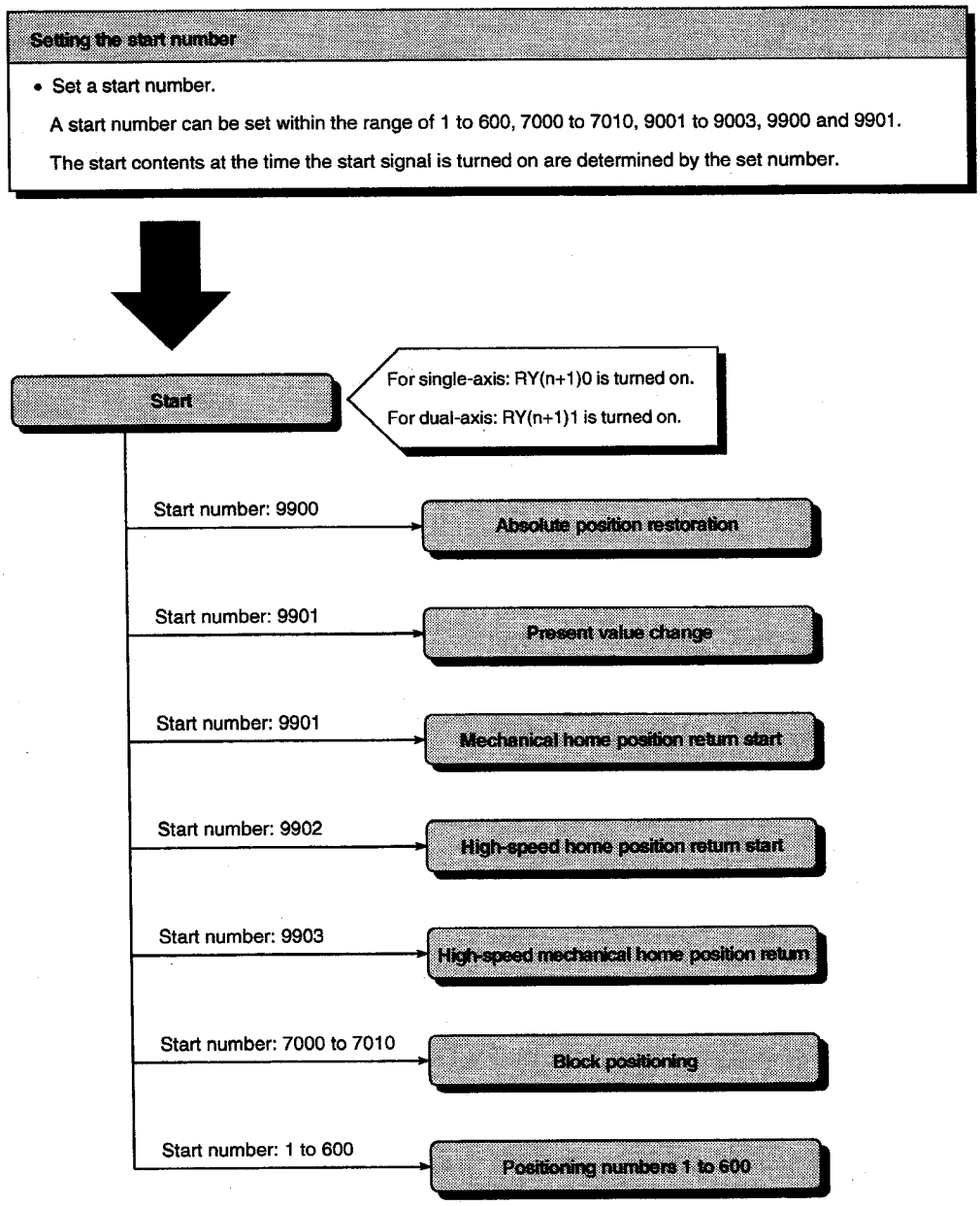
(b) The rapid-stop deceleration time (1 to 65535 ms or 1 to 8388608 ms) is set using the acceleration/deceleration time setting size selection of extended parameter 1.

Remark

The selection of 1 to 65535 ms or 1 to 8388608 ms for the acceleration time, deceleration time and rapid-stop deceleration time is set for each axis.

1.4.7 Overview of start

With the positioning control, operation is started in the following flow after the necessary parameters and data have been set.



1.4.8 Overview of restart

If the operation stops due to the generation of a stop factor during the positioning operation, the positioning of stopped positioning data can be performed to the endpoint using the restart command.

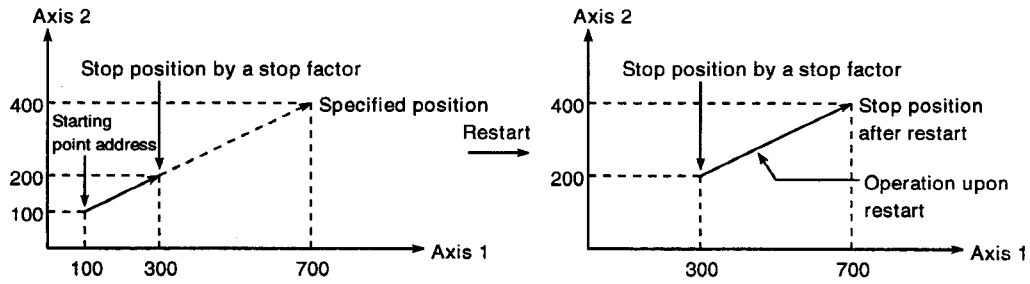
(1) When the remote I/O generates a restart command

1) If the axis operation is in the stop state, positioning from the stopped position to the end of the stopped positioning data is performed regardless of the absolute method or increment method used.

2) If the axis operation is in other than the stop state, a restart disabled warning (warning code 104) occurs and the restart command is ignored.

[For the increment method]

When the travel increment along axis 1 is 600 and that along axis 2 is 300

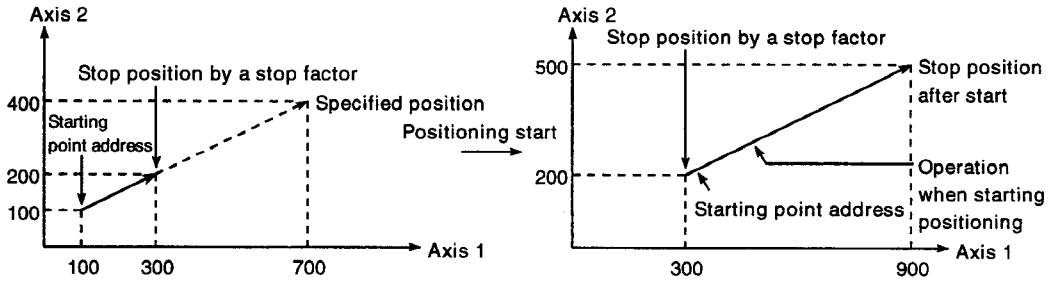


(2) When the positioning start signal or external start signal is turned on

If the axis operation is in standby or the stop state, positioning is performed from the head of the positioning start data regardless of the absolute method or increment method used (as with normal positioning).

[For the increment method]

When the travel increment along axis 1 is 600 and that along axis 2 is 300



1.4.9 Overview of home position return

The home position return is to confirm mechanical home position at power-on or other times.
The following seven types of home position returns are available.

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

This type stops by a zero signal after the near-point dog switches from on to off.

(2) Stopper type (three types)

(a) Stopper (1) (due to the elapse of the dwell timer)

The home position return of this type completes when the dwell time has elapsed after being decelerated by the near-point dog switching on and stopped by a stopper.

(b) Stopper (2) (due to a zero signal when coming in contact with a stopper)

The home position return of this type is completed by a zero signal after decelerated by near-point dog on and stopped by a stopper.

(c) Stopper (3) (no near-point dog method)

The home position return of this type is completed by a zero signal after it has moved at the creep speed and stopped by a stopper.

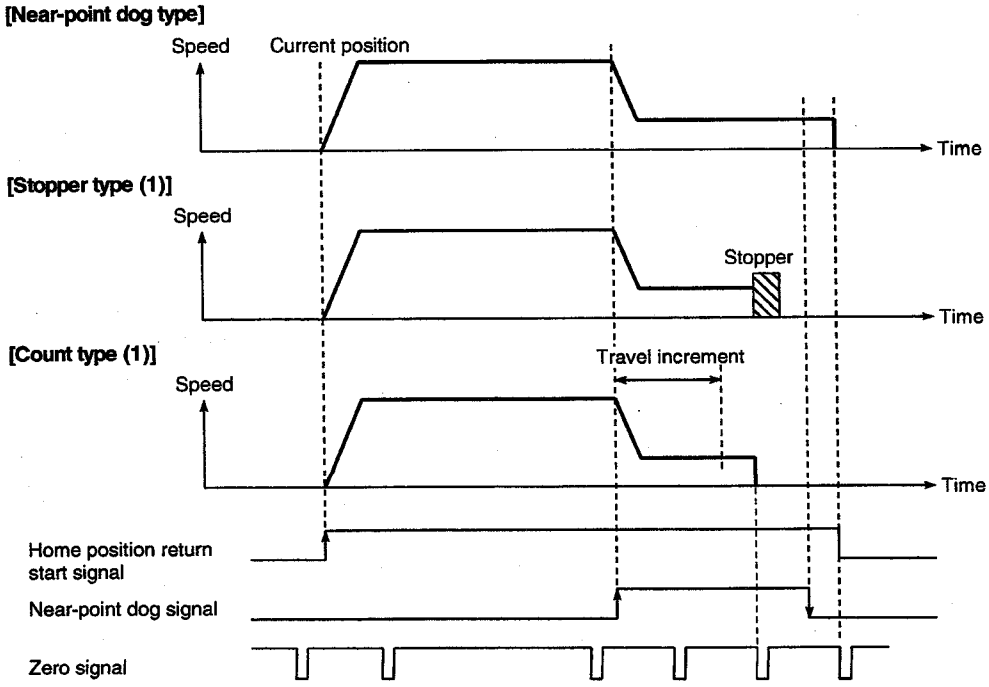
(3) Count type (two types)

(a) Count type (1) (using the zero signal)

The home position return of this type is stopped by the zero signal once after moving for the specified travel increment once the near-point dog has been turned on.

(b) Count type (2) (without using the zero signal)

The home position return of this type is stopped by moving for the specified increment of travel after the near-point dog has been turned on.



(4) Data-set type (one type)

The home position return of this type sets the home position address to the present value during the home position return execution.
This can be used for the absolute-position system.

Remark

1) Home position return can also be performed via the home position return retry function using the high and low limit switches.
2) After the home position has been determined by the home position return operation, the positioning operation can be used until the machine's feed value reaches the home position address, without using the home position detection signal.
(This equates to positioning to the home position position.)

1.5 Overview of Communication

Communication between the D75P2 and a master module uses two types of transmission formats: cyclic transmission and transient transmission.
An overview of communication using the D75P2 is shown in Figure 1.7.

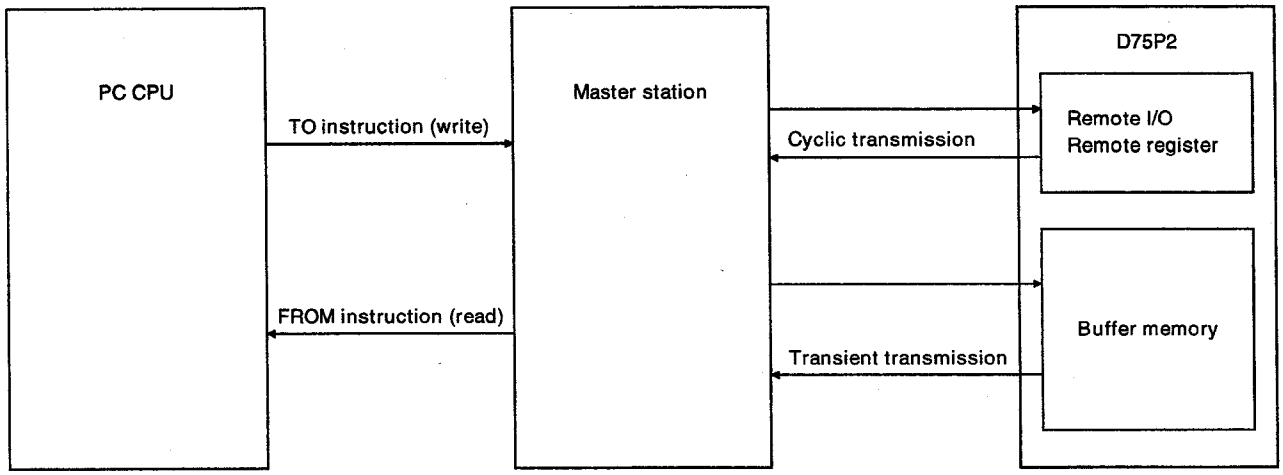


Fig. 1.7 Overview of communication

1.5.1 Cyclic transmission

The following explains the cyclic transmission between the D75P2 and master module.

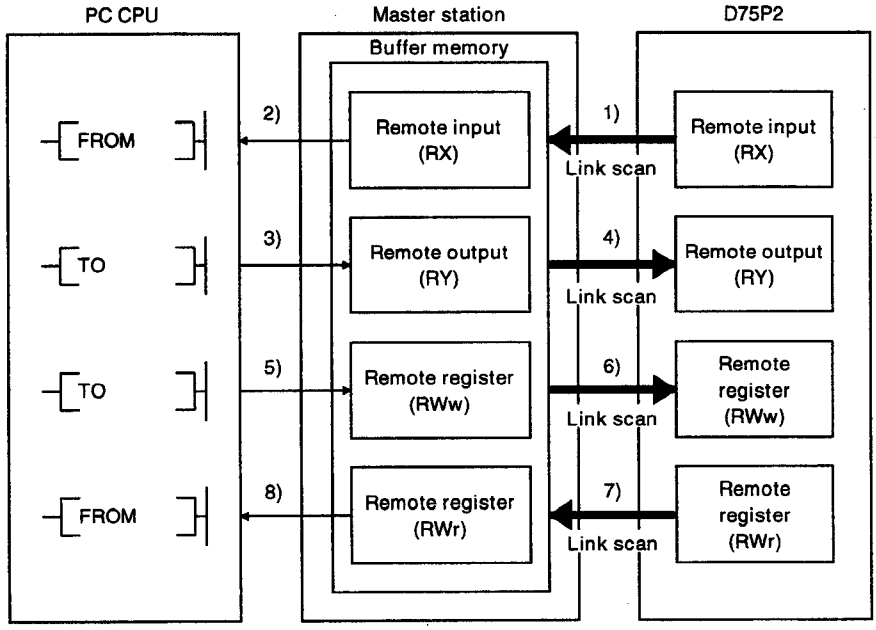


Fig. 1.8 Cyclic transmission

(1) Remote input (RX)

1) The information in the remote input (RX) of the D75P2 is stored in the buffer memory of the master station during each link scan.

2) The input information stored in the master module is captured by the PC CPU using a FROM instruction.

(2) Remote output (RY)

3) The information in the remote output (RY) of the D75P2 is written to the buffer memory of the master station by a TO instruction.

4) The output information stored in the master module is transmitted to the D75P2 during each link scan.

(3) Remote register (RWw)

5) The information in the remote register (RWw) of the D75P2 is written to the buffer memory of the master station by a TO instruction.

6) The transmission data information stored in the master module is transmitted to the D75P2 during each link scan.

(4) Remote register (RWr)

7) The information in the remote register (RWr) of the D75P2 is stored in the buffer memory of the master station during each link scan.

8) The reception data information stored in the master module is captured by the PC CPU using a FROM instruction during each link scan.

1.5.2 Transient transmission

The following explains the transient transmission between the D75P2 and master module.

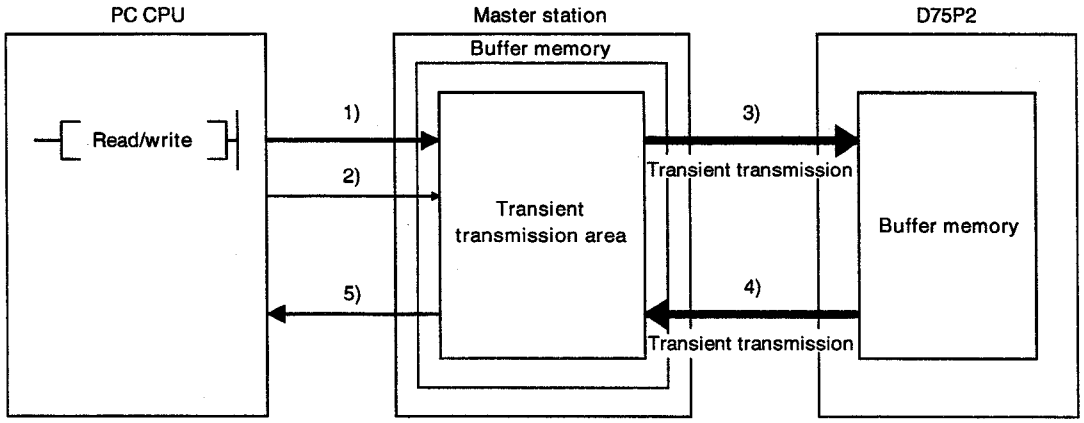
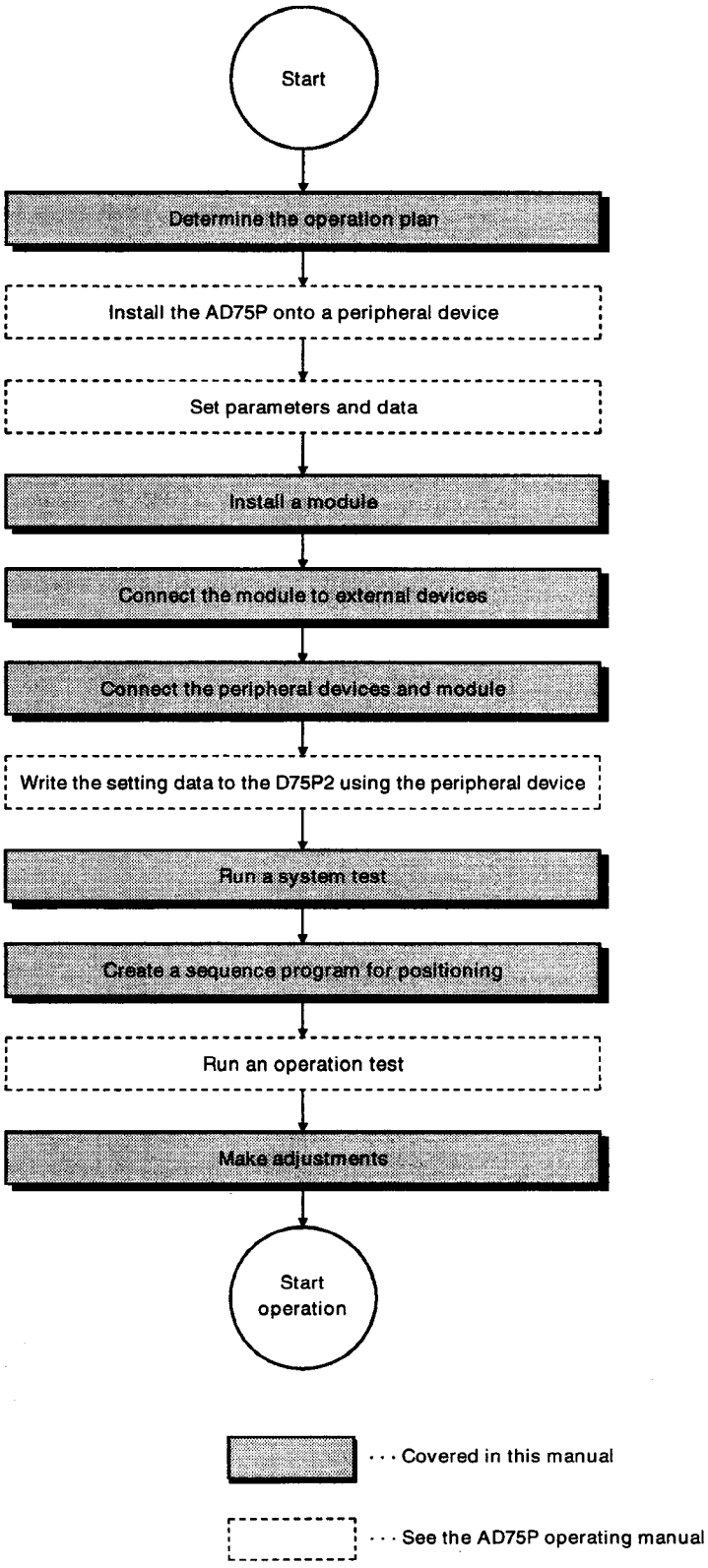


Fig. 1.9 Transient transmission

1) Sets data in the send buffer on the master module.
2) Sets an intelligent device station access request signal.
3) The transient data is transmitted from the master module to the D75P2.
4) A response is returned from the D75P2 to the master module.
5) The intelligent device station access complete signal is turned on.

1.6 General Procedure before Operation

The following shows the general flowchart for positioning using the D75P2.



1.7 Abbreviations, General Names and Terms Used in this Manual

Abbreviations, general names, terms	Description
D75P2	An abbreviation for the AJ65BT-D75P2-S3 positioning module.
CC-Link	An abbreviation for the Control & Communication Link system
Master station	The station that controls remote stations, local stations and intelligent device stations on the CC-Link system.
Remote I/O station	The remote station that handles bit data only. (AJ65BTB□-□□, AJ65BTC□-□□)
Local station	A station having a CPU and the ability to communicate with the master and other local stations.
Intelligent device station	A slave station on the CC-Link system that can perform transient transmission, such as the D75P2.
Master module	The general name for AJ61QBT11, A1SJ61QBT, AJ61BT11 and A1SJ61BT11 when they are used as master stations.
Cyclic transmission	A transmission method that periodically updates the remote I/O and contents of remote registers.
Transient transmission	A function that updates data with respect to the specified station when an access is requested from a PC CPU.
Peripheral device	The general name for the A7PHP, A7HGP, PC9801 and DOS/V personal computers that can execute the AD75P given below. (This is listed separately from the peripheral devices for GPP, as listed below.)
Drive module (Servo amplifier)	An abbreviation for the pulse-input-compatible drive module (servo amplifier).
Manual pulse generator	An abbreviation for the manual pulse generator (supplied by the user).
Data link system	An abbreviation for the MELSECNET (II) or MELSECNET/B data link system.
Network system	An abbreviation for the MELSECNET/10 network system.
AD75P	The general name for the software packages SW□RX-AD75P, SW□NX-AD75P and SW□IVD-AD75P. (□ indicates a numeral greater than 1, which corresponds to the software package function.)
H/W	An abbreviation for hardware.
I/F	An abbreviation for interface.
Peripheral device for GPP	The general name for the A7PHP, A6GPP, PC9801 and DOS/V personal computers and others to which the software package for the GPP function for creating sequence programs, etc., is installed.
S/W	An abbreviation for software package.
17-segment LED	The 17-segment indicator mounted in the upper area of the D75P2.
RX	Remote input
RY	Remote output
RWw	Remote register (read area)
RWr	Remote register (write area)

1.8 Parts Supplied with the Module

When unpacking, check that all of the parts listed below are included. Also, check whether there is any damage to the parts after unpacking.

Description	Quantity
Main module (AJ65BT-D75P2)	1
External wiring connector (10136-3000VE)	2
Connector cover (10336-52F0-008)	2

2. System Configuration

This chapter describes the system configuration using the D75P2.

2.1 System Configuration when Using the D75P2

The Figure below shows the system configuration when using the D75P2.
A maximum of 16 D75P2 modules can be connected to a single master station.

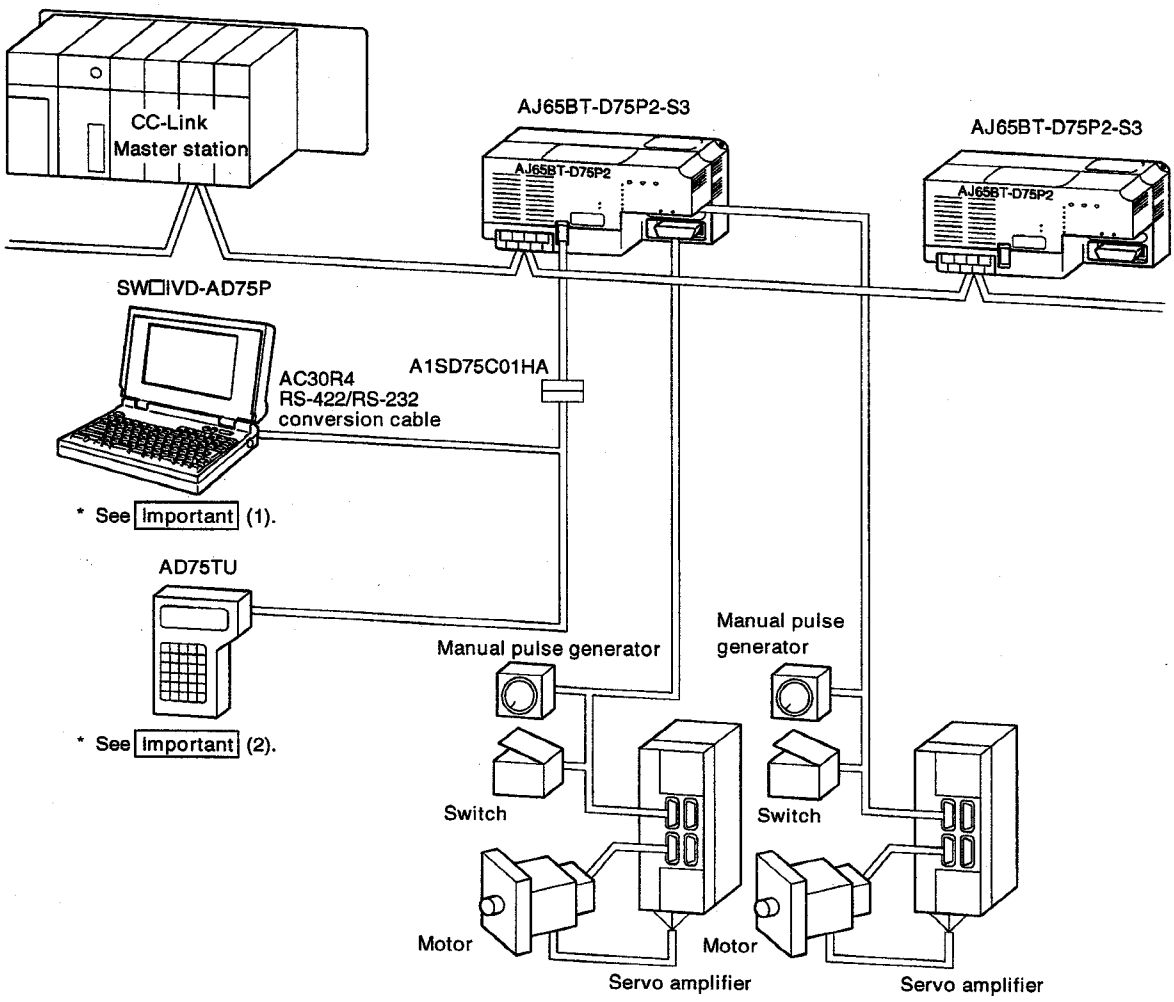


Fig. 2.1 System configuration when using the D75P2

Important

(1) The software packages listed below are required in order to use the D75P2.
- For DOS/V personal computer: SW1IVD-AD75P or later

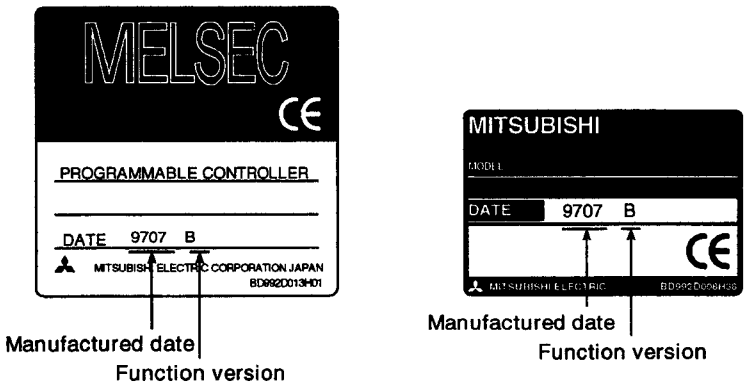
(2) Use software version D or later for the DA75TU.

2.2 Applicable System

This section describes the CC-Link system master module that can be used with the D75P2 and PC CPUs that can be used with CC-Link dedicated instructions.

(1) Master modules that can be used with the D75P2

To use the D75P2, use a module with the following symbol ("9707B" and later) inscribed in the date column of the rated plate.



(2) PC CPUs that can be used with CC-Link dedicated instructions

The PC CPU models listed below can be used with the CC-Link dedicated instructions:

- A1SHCPU
- A1SJHCPU
- A2SHCPU
- Q2ACPU (function version B or later)
- Q2ACPU-S1 (function version B or later)
- Q3ACPU (function version B or later)
- Q4ACPU (function version B or later)
- Q2ASCPU (function version B or later)
- Q2ASCPU-S1 (function version B or later)
- Q2ASHCPU (function version B or later)
- Q2ASHCPU-S1 (function version B or later)

2.3 List of Equipment

Table 2.1 lists the products that can be used for a positioning system using the D75P2.

Table 2.1 List of equipment

Product name		Model name	Contents	
Positioning module		AJ65BT-D75P2-S3		
Software package for AD75		SW1IVD-AD75P or later	Software package for DOS/V personal computer	
Plasma handy graphic programmer		A7PHP-SET	• A7PHP main module • SW□RX-DOS : Basic software package • SW□SRXV-GPPA : GPP function boot floppy disk for A series • SW0S-USER : User floppy disk (2HD) • AC30R4 : RS-422 cable, 3 m (9.8 ft.) in length	
Handy graphic programmer		A7HGP-SET	• A7PHP main module • SW□HX-DOS : Basic software package • SW□HX-GPPA : GPP function boot floppy disk for A series • SW0S-USER : User floppy disk (2HD) • AC30R4 : RS-422 cable, 3 m (9.8 ft.) in length • Shoulder strap	
Peripheral device for AD75P		PC9800 series DOS/V personal computer	(Supplied by the user) Refer to the AD75P operating manual for details.	
Teaching module		AD75TU Ver. D or later	This sets parameters and positioning data, monitors and conducts tests for AD75P2.	
RS-422 cable		AC30R4	Length: 3 m (9.8 ft.)	The cable for connecting the D75P2 and A7PHP or A7HGP.
		AC100R4	Length: 10 m (32.8 ft.)	
		AC300R4	Length: 30 m (98.4 ft.)	
Conversion cable		A1SD75-CO1H	Length: 10 cm (3.94 in.)	The cable for connecting the AC□R4 cable and D75P.
		A1SD75-CO1HA		
Connection cable (converter)		———	The RS-232C cable that connects the AD75 and the PC9801 or DOS/V personal computer, and the RS232C/RS422 converter (supplied by the user). Refer to the appendix for details.	
Drive module		———	(Supplied by the user)	
Manual pulse generator		———	(Supplied by the user) Recommended : MR-HDP01 (manufactured by Mitsubishi Electric)	
Connection cable *	Absolute-position detection function compatible	AD75C20SH	The cable for the connection between the D75P2 and servo amplifier (MR-H-A)	
		AD75C20SJ2	The cable for the connection between the D75P2 and servo amplifier (MR-J2-A)	
	Absolute-position detection function noncompatible	AD75C20SJ	The cable for the connection between the D75P2 and servo amplifier (MR-J-A)	
		AD75C20SC	The cable for the connection between the D75P2 and servo amplifier (MR-C-A)	
Connection cable		———	The cable for connecting the D75P2 to the mechanical system input signal or manual pulse generator (supplied by the user). Refer to the manual for details on the connection device.	

Remark

* : For the connector cover on the D75P2 side, use the one supplied with the product.

2.4 Precautions when Using a Stepping Motor

This section describes the precautions when using a stepping motor.

(1) When setting the stepping motor mode

(a) When using a stepping motor with the D75P2, it is necessary to set the stepping motor mode.

If the stepping motor mode is not set, the stepping motor cannot be controlled normally.

(b) When the stepping motor mode is set, certain restrictions apply to items such as the control method and positioning address.

Use the module after verifying the restrictions that apply to the stepping motor mode in Section 7.15.

(2) Use of bias speed at start

While the stepping motor is used, the motor rotation can be started smoothly by selecting the stepping motor mode and setting the bias speed at start.

(3) The use of S-curve acceleration/deceleration is not allowed

While the stepping motor is used, S-curve acceleration/deceleration cannot be performed.

(4) Circular interpolation control is not allowed

While the stepping motor is used, circular interpolation control cannot be performed.

MEMO

3. Specification

This chapter explains the general specifications, performance specifications and I/O interface with external devices for the D75P2.

3.1 General Specifications

General specifications for the D75P2 are shown in the table below:

Table 3.1 General specification

Item	Specifications					
Ambient operating temperature	0 to 55 °C					
Ambient storage temperature	–20 to 75 °C					
Ambient operating humidity	10 to 90 %RH, Non-condensing					
Ambient storage humidity	10 to 90 %RH, Non-condensing					
Vibration resistance	Conforming to		Frequency	Acceleration	Amplitude	No. of sweeps
	JIS B 3501, IEC 1131-2	Under intermittent vibration	10 to 57 Hz	—	0.075 mm (0.003 in.)	10 times each in X, Y, Z directions (for 80 min.)
			57 to 150 Hz	9.8 m/s² {1G}	—	
		Under continuous vibration	10 to 57 Hz	—	0.035 mm (0.001 in.)	
			57 to 150 Hz	4.9 m/s² {0.5G}	—	
Shock resistance	Conforming to JIS B3501, IEC 1131-2 (147 m/s² {15G}, 3 times in each of 3 directions X Y Z)					
Operating ambience	No corrosive gases					
Operating elevation	2000 m (6562 ft.) max.					
Installation location	Control panel					
Over voltage category *1	II max.					
Pollution level *2	2 max.					

*1: This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within the premises. Category II applies to equipment for which electrical power is supplied from fixed facilities. The surge voltage withstand level for up to the rated voltage of 300 V is 2500 V.

*2: This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used. Pollution level 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensation must be expected occasionally.

3.2 Performance Specifications

Performance specifications for the D75P2 are shown in the table below:

3.2.1 Performance specifications

Table 3.2 Performance specifications (1)

Item		Specification
Number of control axes		2 axes
Interpolation function		Dual-axis linear interpolation, dual-axis circular interpolation (*1)
Control method		PTP (Point to Point) control, locus control (linear and circular settings possible), speed control, speed/position switch control
Control unit		mm, inch, degree, pulse
Positioning data		600 data (positioning-data number: 1 to 600)/axis setting possible
Peripheral devices/software packages		DOS/V personal computer/SW1IVD-AD75P or later (*2)
Teaching module		AD75TU (software version D or later)
Backup		Parameters and positioning data are stored in the flash memory (no battery)
Positioning	Positioning method	PTP control : Increment system/absolute system Speed/position switch control : Increment system Locus control : Increment system/absolute system
	Positioning range (*3)	Absolute system • –214748364.8 to 214748364.7 (μm)/–13421772.8 to 13421772.7 (μm) • –21474.83648 to 21474.83647 (inches)/–1342.17728 to 1342.17727 (inches) • 0 to 359.99999 (degrees)/0 to 359.99999 (degrees) • –2147483648 to 2147483647 (pulses)/–134217728 to 134217727 (pulses) Increment system • –214748364.8 to 214748364.7 (μm)/–13421772.8 to 13421772.7 (μm) • –21474.83648 to 21474.83647 (inches)/–1342.17728 to 1342.17727 (inches) • –21474.83648 to 21474.83647 (degrees)/–1342.17728 to 1342.17727 (degrees) • –2147483648 to 2147483647 (pulses)/–134217728 to 134217727 (pulses) Speed/position switch control • 0 to 214748364.7 (μm)/0 to 13421772.7 (μm) • 0 to 21474.83647 (inches)/0 to 1342.17727 (inches) • 0 to 21474.83647 (degrees)/0 to 1342.17727 (degrees) • 0 to 2147483647 (pulses)/0 to 134217727 (pulses)
	Speed command (*3)	• 0.01 to 6000000.00 (mm/min.)/0.01 to 375000.00 (mm/min.) • 0.001 to 600000.000 (inches/min.)/0.001 to 37500.000 (inches/min.) • 0.001 to 600000.000 (degrees/min.)/0.001 to 37500.000 (degrees/min.) • 1 to 1000000 (pulse/sec.)/1 to 62500 (pulse/sec.)
	Acceleration/deceleration processing	Automatic trapezoid acceleration/deceleration, automatic S-curve acceleration/deceleration (*4)
	Acceleration/deceleration time	Switching between 1 to 65535 (ms) and 1 to 8388608 (ms) is possible 4 patterns of acceleration and deceleration time setting are possible
	Rapid-stop deceleration time	Switching between 1 to 65535 (ms) and 1 to 8388608 (ms) is possible (same range as acceleration/deceleration time)
	Start time	20 ms or less (except link scan time)
Compensation		Electronic gear or backlash compensation available
Home position return method		Near-point dog type (1 type), count types (2 types), stopper types (3 types), data-set type (1 type) (*5)
Absolute-position detection function		Compatible with absolute-position detection systems using MR-H and MR-J2
JOG operation function		Available
Manual pulse-generator operation function		Available
M-code output function		Available (either WITH mode or AFTER mode can be selected)
Error display		17-segment display
I/O display		17-segment display and LED display

*1 Circular interpolation cannot be used while the stepping motor is used.

*2 DOS/V is a registered trademark of IBM Japan.

*3 Indicates the setting ranges of the "standard mode/stepping motor mode."

*4 While the stepping motor is in use, automatic S-curve acceleration/deceleration cannot be used.

*5 Valid only with an absolute-position detection system.

Table 3.2 Performance specifications (2)

Item	Specification
CC-Link station type	Intelligent device station
Number of occupied stations	4 stations (128 points each for RX/RY, 16 points each for RWr/RWw)
External power supply (V)	24 DC (20.4 to 26.4 DC)
Applicable conductor size (mm^2)	0.75 to 2.00
Module installation screws (mm)	M4 × 0.7 × 16 or above Installation with DIN rail is also possible
Applicable DIN rails	TH35-7.5Fe, TH35-7.5Al, TH35-15Fe (complies with JIS-C2B12)
Applicable solderless terminal	RAV1.25 to 3.5, RAV2 to 3.5
24 V DC internal current consumption (A)	0.30
Noise resistance	Noise voltage 500 Vp-p, noise width 1 μs (based on a noise simulator with noise frequency of 25 to 60 Hz)
Dielectric withstand voltage	Power supply/communication system batch - external I/O batch, 500 V AC for 1 minute
Insulation resistance	Power supply/communication system batch - external I/O batch, 10 MΩ or more based on a 500 V DC insulation resistance tester
External dimensions (mm [in.])	63.5 (2.5) (H) × 170 (6.7) (W) × 80 (3.1) (D)
Weight (kg [lb.])	0.50 (1.1)

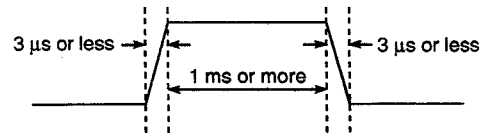
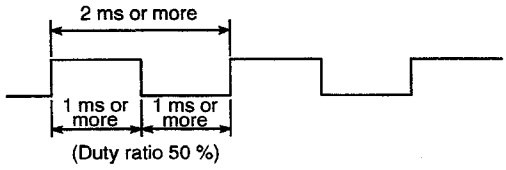
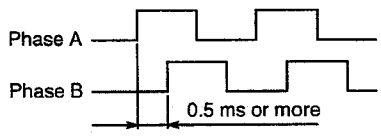
3.2.2 Specifications for I/O interface with external devices

This section explains the I/O interface of the D75P2 with respect to external devices.

(1) Electrical specifications of the D75P2

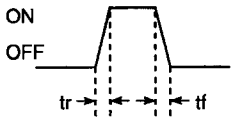
The table below shows the electrical specifications for D75P2 I/O signals with respect to external devices:

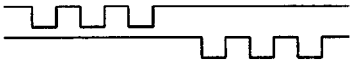
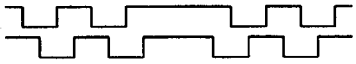
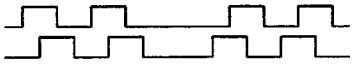
(a) Input specifications

Signal name	Rated input voltage/current	Range of voltage used	ON voltage/ current	OFF voltage/ current	Input resistance	Response time
Drive module ready (READY) In-position signal	24 V DC/5 mA	19.2 to 26.4 V DC	17.5 V DC or more/3.5 mA or more	7 V DC or less/ 1.7 mA or less	Approx. 4.7 kΩ	4 ms or less
Zero signal (PG0)	5 V DC/5 mA	4.5 to 6.1 V DC	2.5 V DC or more/ 2 mA or more	0.5 V DC or less/ 0.5 mA or less	Approx. 0.5 kΩ	0.8 ms or less
	24 V DC/7 mA	12 to 26.4 V DC	10 V DC or more/ 3 mA or more	3 V DC or less/ 0.2 mA or less	Approx. 3.5 kΩ	0.8 ms or less
						
Manual pulse generator phase A (PULSER A) Manual pulse generator phase B (PULSER B)	5 V DC/5 mA	4.5 to 6.1 V DC	2.5 V DC or more/ 3.5 mA or more	1 V DC or less/ 1 mA or less	Approx. 1.5 kΩ	1 ms or less
	1) Pulse width  2) Phase difference  When phase A is ahead of phase B, the positioning address (present value) increases.					
Near-point signal (DOG) Stop signal (STOP) High limit (FLS) Low limit (RLS) External start (STRT) Speed/position switch signal (CHG)	24 V DC/5 mA	19.2 to 26.4 V DC	17.5 V DC or more/3.5 mA or more	7 V DC or less/ 1.7 mA or less	Approx. 4.7 kΩ	4 ms or less
ABS transmission data ready complete ABS data bit 0 ABS data bit 1	24 V DC/5 mA	19.2 to 26.4 V DC	17.5 V DC or more/3.5 mA or more	7 V DC or more/1.7 mA or more	Approx. 4.7 kΩ	4 ms or less

(b) Output specifications

Signal name	Rated load voltage	Range of load voltage used	Maximum load current/ rush current	Maximum voltage drop during on	Leak current during off	Response time
Pulse output (CW/PULSE/phase A) Pulse sign (CCW/SIGN/phase B)	• Am26LS31-equivalent differential driver/open collector • CW/CCW type, PULSE/SIGN type and phase A/B type are selected using the D75P2 and drive module parameters. • The relationships between the pulse output mode set by the parameter and the pulse output based on "positive logic/negative logic selection" are shown below:					
	* In the case of open collector, the rise/fall time and duty ratio are as shown by the figure below.					
	5 to 24 V DC	4.75 to 30 V DC	50 mA/one point/ 200 mA 10 ms or less	0.5 V DC (TYP)	0.1 mA or less	—
Error counter clear (CLEAR)	5 to 24 V DC	4.25 to 30 V DC	0.1 A/one point/ 0.4 A 10 ms or less	1 V DC (TYP) 2.5 V DC (MAX)	0.1 mA or less	2 ms or less (resistive load)
Servo on ABS data transmission mode ABS data request	5 to 24 V DC	4.75 to 30 V DC	0.1 A/one point/ 0.4 A 10 ms or less	1 V DC (TYP) 2.5 V DC (MAX)	0.1 m A or less	2 ms or less (resistive load)



Mode selection	Positive logic		Negative logic	
	Forward rotation	Reverse rotation	Forward rotation	Reverse rotation
CW CCW				
PULSE SIGN				
A ϕ B ϕ				

Pulse rise/fall time (unit tr, tf: μs; duty: %) in the D75P2 ····· when the ambient temperature is normal temperature

Load voltage (V)		26.4						4.75					
Cable length (m [ft.])		1 (3.3)			3 (9.8)			1 (3.3)			3 (9.8)		
Load current (mA)	Pulse speed (kPPS)	tr (rise)	tf (fall)	Duty	tr (rise)	tf (fall)	Duty	tr (rise)	tf (fall)	Duty	tr (rise)	tf (fall)	Duty
2	200	0.04	1.70	30	0.06	2.04	27	0.04	0.63	43	0.04	1.08	38
	100	0.08	3.00	33	0.07	3.49	29	0.06	0.64	47	0.04	1.28	42
	10	0.07	3.20	48	0.08	6.80	46	0.04	0.64	49	0.06	1.30	49
5	200	0.06	1.10	39	0.07	1.83	33	0.04	0.26	48	0.04	0.92	46
	100	0.07	1.24	43	0.08	2.50	36	0.05	0.26	48	0.06	0.44	47
	10	0.07	1.20	49	0.08	2.70	49	0.05	0.30	50	0.06	0.44	50
20	200	0.07	0.42	46	0.08	0.72	43	0.06	0.22	47	0.06	0.22	49
	100	0.07	0.40	48	0.11	0.74	47	0.08	0.24	50	0.06	0.24	50
	10	0.07	0.40	50	0.08	0.79	50	0.06	0.24	50	0.06	0.24	50
50	200	0.08	0.28	48	0.09	0.37	47	0.08	0.20	47	0.10	0.18	50
	100	0.08	0.27	48	0.13	0.37	48	0.08	0.22	49	0.12	0.20	51
	10	0.09	0.27	50	0.09	0.37	50	0.08	0.22	50	0.12	0.20	50

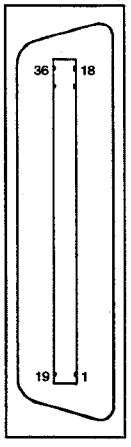
(2) Specifications for I/O interface with external devices

Specifications for I/O interface of the D75P2 with respect to external devices are shown in the table below:

(a) Layout of connector signals

The signal layout of the connector for connecting external devices to the D75P2 (for one axis) is shown below:

(Axis 1 and 2 use the same signal layout for connecting external devices.)

Pin layout	Pin No.	Signal name *		Signal direction AD75 - external	Connection destination
	36	Common 1)	COM	↔	(External device)
	35	Common 1)	COM	↔	(External device)
	34	ABS transmission data ready complete 18)	TLC	←	Drive module
	33	Common (ABS IN) 19)	COM	—	Drive module
	32	Common (ABS OUT) 20)	COM	—	Drive module
	31	ABS request 21)	ABSR	←	Drive module
	30	ABS transfer mode 22)	ABSM	←	Drive module
	29	Servo on 23)	SON	→	Drive module
	28	Manual pulse generator 2)	PULSER B–	←	Manual pulse generator
	27	Manual pulse generator 2)	PULSER A–	←	Manual pulse generator
	26	Common 3)	COM	↔	Drive module
	25	Zero signal common 5)	PG0 COM	←	Drive module
	24	Zero signal (+5 V) 6)	PG0 (5 V)	←	Drive module
	23	Error counter clear common 4)	CLEAR COM	↔	Drive module
	22	Pulse sign (differential –) 7)	PULSE R–	→	Drive module
	21	Pulse output (differential –) 7)	PULSE F–	→	Drive module
	20	Pulse sign common (Open collector) 8)	PULSE COM	↔	Drive module
	19	Pulse output common (Open collector) 8)	PULSE COM	↔	Drive module
	18	ABS data bit 1 24)	ZSP	→	Drive module
	17	ABS data bit 0 24)	D01	→	Drive module
	16	External start 9)	STRT	←	(External device)
	15	Speed/position switch signal 10)	CHG	←	(External device)
	14	Stop signal 11)	STOP	←	(External device)
	13	Low limit 12)	RLS	←	Limit switch
	12	High limit 13)	FLS	←	Limit switch
	11	Near-point signal 14)	DOG	←	Near-point dog
	10	Manual pulse generator 2)	PULSE B+	←	Manual pulse generator
	9	Manual pulse generator 2)	PULSE A+	←	Manual pulse generator
	8	In-position 15)	INPS	←	Drive module
	7	Drive module ready 16)	READY	←	Drive module
	6	Zero signal (+24 V) 6)	PG0 (24 V)	←	Drive module
	5	Error counter clear 17)	CLEAR	→	Drive module
	4	Pulse sign (differential +) 7)	pulse R+	→	Drive module
	3	Pulse output (differential +) 7)	pulse F+	→	Drive module
	2	Pulse sign (open collector) 8)	PULSE R	→	Drive module
	1	Pulse output (open collector) 8)	PULSE F	→	Drive module

* 1) to 24) beside signal names are numbers corresponding to the explanations in "(b) Description of connector signals."

(b) Description of connector signals

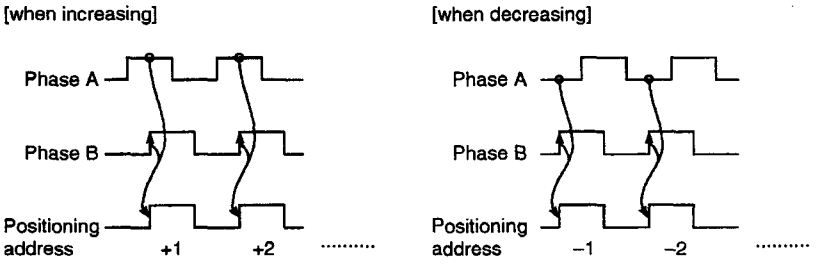
The description of each signal for the connector for connecting external devices to the D75P2 (for one axis) is explained below:

1) Common --- (Pin numbers 36, 35)

- A common for the near-point signal, high/low limit, stop signal, control switch signal, and external start.

2) Manual pulse generator (phase B –), manual pulse generator (phase A –) --- (Pin numbers 28, 27)
Manual pulse generator (phase B +), manual pulse generator (phase A +) --- (Pin numbers 10, 9)

- Inputs the phase A/B pulse signal of the manual pulse generator and rotary encoder.
- When phase A is ahead of phase B, the positioning address increases.
- When phase B is ahead of phase A, the positioning address decreases.



3) Common --- (Pin number 26)

- A common for the drive module ready and in-position.

4) Error counter clear common --- (Pin number 23)

- A common for the error counter clear.

5) Zero signal common --- (Pin number 25)

- A common for the zero signal (+5 V) and zero signal (+24 V).

6) Zero signal (+5 V), zero signal (+24 V) --- (Pin numbers 24, 6)

- Inputs the home position signal at the time of home position return. Generally, the home position grid signal of a pulse encoder is used.
- This signal is also used when the home position return method is "stopper stop" and the home position return complete is input externally.
- The zero point is detected at fall.

7) Pulse sign, pulse output (differential –) --- (Pin numbers 22, 21)
Pulse sign, pulse output (differential +) --- (Pin numbers 4, 3)

- The pulse and pulse sign for positioning are output to the drive module that corresponds to the differential driver.

8) Pulse sign common, pulse output common (open collector) --- (Pin numbers 20, 19)
Pulse sign, pulse output (open collector) --- (Pin numbers 2, 1)

- The pulse and pulse sign for positioning are output to the drive module that corresponds to the open collector.

9) External start --- (Pin number 16)

- Used as an input signal for external positioning start, speed change request or skip request.
- The selection of external start function in extended parameter 2 determines in which function the external start is used.

10) Speed/position switch signal --- (Pin number 15)

- Input control switch signals during speed/position switch control.

11) Stop signal --- (Pin number 14)

- Input when positioning is stopped.
- When this signal turns on, the D75P2 stops the positioning currently executed and turns off the start signal.
  After that, the D75P2 will not start operating even if this signal is switched from on to off.

12) Low limit --- (Pin number 13)

- Input from the limit switch provided at the low limit of stroke.
- When this signal turns off, positioning stops.
- Become the low limit of search for the near-point signal when automatic home position return is enabled.

13) High limit --- (Pin number 12)

- Input from the limit switch provided at the high limit of stroke.
- When this signal turns off, positioning stops.
- Become the high limit of search for the near-point signal when automatic home position return is enabled.

14) Near-point signal --- (Pin number 11)

- Used for near-point dog detection during home position return.
- Detects the change in near-point dog from off → on at rise.
- Detects the change in near-point dog from on → off at fall.

15) In-position --- (Pin number 8)

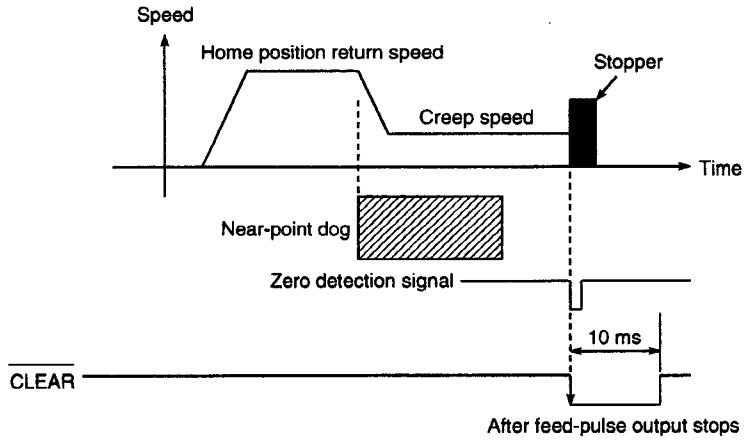
- The in-position signal from the drive module is input.

16) Drive module ready --- (Pin number 7)

- Turn on when the drive module is normal and is in a feed-pulse acknowledge enable state.
- The D75P2 checks the drive module ready signal and outputs a home position return request if it is not in a ready status.
- This signal is turned off when the drive module becomes malfunction, for example, when an error occurs in the control power supply of the drive module.
- If this signal is turned off during positioning, positioning stops. Operation does not start even if the signal is turned on again.
- When this signal turns off, the home position return complete signal also turns off.

17) Error counter clear --- (Pin number 5)

- Turns on after pulse output stops when home position return is performed using the stopper stop method 1) or 2).
  (Example) Home position return using the stopper stop method 2)



- The error counter clear is output for approximately 10 ms.
- As for the drive module, use one that can reset the standing pulse amount for the internal error counter when the D75P2 turns this signal on.

18) ABS transmission data ready complete --- (Pin number 34)

- This signal indicates that preparation of transmission data is complete during the ABS transfer mode.

19) Common (ABS IN) --- (Pin number 33)

- A common for the ABS data bit 0, ABS data bit 1 and ABS transmission data ready complete.

20) Common (ABS OUT) --- (Pin number 32)

- A common for the servo ON, ABS transfer mode and ABS request.

21) ABS request --- (Pin number 31)

- This is the signal for requesting ABS data in the ABS transfer mode.

22) ABS transfer mode --- (Pin number 30)

- Changes the mode to ABS transfer.
- While this is on, the "ABS data bit 0 [D01]," "ABS data bit 1 [ZSP]" and "ABS transmission data ready complete [TLC]" signals become valid.

23) Servo ON --- (Pin number 29)

- This signal turns on power to the servo base circuit and changes the status to operation enable.

24) ABS data bit 0, bit 1 --- (Pin numbers 17, 18)

- ABS data transferred to the D75P2 from the servo during the ABS operation mode. bit 0 indicates the lower bit, while bit 1 indicates the upper bit.

(c) Internal circuits

The internal circuits of interface for connecting external devices to the D75P2 are shown by the schematic diagrams below:

O : Wiring required, Δ : Wire as necessary

I/O classification	External wiring	Pin No.	Internal circuit	Signal name		Description	on/off status: External wiring	on/off status: D75P2	Wiring required/ not required
Input	When the high limit switch is not used When the low limit switch is not used	11		Near-point signal	DOG	• The signal for near-point detection during home position return.		OFF ON	Δ
		12		High limit LS	FLS	• The signal for the limit switch provided at the high limit of stroke. • Also used in the home position return retry function.		ON OFF (stop)	O
		13		Low limit LS	RLS	• The signal for the limit switch provided at the low limit of stroke. • Also used in the home position return retry function.		ON OFF (stop)	O
		14		Stop signal	STOP	• The signal to stop positioning externally. • When stopping positioning, turn this signal on for 4 ms or longer. • Once this signal is turned on, switching it back to off does not resume operation.		ON OFF (stop)	Δ
		15		Speed/ position switch signal	CHG	• The signal that switches speed control to position control during speed/position switch control.		OFF ON	Δ
		16		External start	STRT	• The signal that executes external positioning start, speed change and SKIP request. • To make external start valid, turn this signal on for 4 ms or longer. • Set which function to use via an extended parameter.		OFF ON	Δ
		35		Common	COM	• Input voltage 24 V DC.	—		O
	5-12 V A B 0 V Manual pulse generator (MR-HDP01)	36							
		(+) 9		Manual pulse generator phase A	PULSER A+	• The terminal for connecting the manual pulse generator. • Reference product: MR-HDP01 (Mitsubishi Electric)	—		Δ
		(–) 27			PULSER A–				
		(+) 10		Manual pulse generator phase B	PULSER B+				
		(–)			PULSER B–				
	For MR-J2-□A RD	7		Drive module ready	READY	The signal for identifying whether the drive module is normal or in error. ON : The drive module is normal. Positioning control is possible. OFF : The drive module is in error. Positioning control is not possible.		OFF ON	Δ
	INP VDD	8		In-position signal	INPS	• Inputs the in-position signal from the drive module. • The on/off status can be monitored using the buffer memory.		OFF ON	Δ
	COM	26		Common	COM	• I/O voltage 24 V DC.	—		O
	LZ	6		Zero signal	PG0	• The home position signal at the time of home position return. • The zero-grid signal of an encoder is generally used.	—		Δ
	LZR	24							
		25		Common	PG0 COM	• Input voltage 24/15/5 V DC Pin numbers 6-25: 24/15 V DC Pin numbers 24-25: 5 V DC	—		

○ : Wiring required, △ : Wire as necessary

I/O classification	External wiring	Pin No.	Internal circuit	Signal name		Description	Wiring required/ not required
Output	For MR-J2-□A CR COM SG	5		Error counter clear	CLEAR	• The signal that resets the standing pulse for the error counter on the drive module side. • Output by the OS of the D75P2 upon completion of home position return. (Output by the user is not allowed)	○
		23		Common	LEAR COM	• Load voltage 5 to 24 V DC	
		1		CW Phase A PULSE	PULSE F	Open collector output (5/24 V DC)	○*
		19			PULSE COM		
		2		CCW Phase B SIGN	PULSE R		
		20			PULSE COM		
	PP PG	3 (+)		CW Phase A PULSE	PULSE F+	Differential output (Am26ls31-equivalent differential driver)	○*
		21 (–)			PULSE F–		
	NP NG	4 (+)		CCW Phase B SIGN	PULSE R+		
		22 (–)			PULSE R–		

* Select and use the open collector output or differential output according to the drive module to be used.

* Do the wiring as shown below when building an absolute-position detection system:

I/O classification	External wiring	Pin No.	Internal circuit	Signal name (abbreviation) When ABS transfer mode is on *1	Signal name (abbreviation) When ABS transfer mode is off *2 (Upper row: MR-H, Lower row: MF-J2)	Description (when ABS transfer mode is on)
Input	For MF-J2-□A D01	17		ABS data bit0 [D01]	Positioning complete [PF] Positioning complete [D01]	• The signal that indicates the lower bit of the ABS data 2 bit transmitted to the D75P2 from the servo in the ABS transfer mode.
	ZSP	18		ABS data bit1 [ZSP]	Zero speed [ZSP]	• The signal that indicates the upper bit of the ABS data 2 bit transmitted to the D75P2 from the servo in the ABS transfer mode.
	TLC VCC	34		ABS transmission data ready [TLC]	During torque control [TLC]	• The signal that indicates completion of transmission data preparation in the ABS transfer mode.
	COM	33		Common [COM]	Common [COM]	• I/O voltage 24 V DC. (+24 V side)
Output	SON	29		Servo on [SON]	Servo on [SON]	• The signal for turning on power to the servo base circuit and changing the status to operation enable.
	PC	30		ABS transfer mode [ABSM]	— [D13] Proportional control [PC]	• Changes the mode to ABS transfer. • While on, the "ABS data bit 0 [D01]," "ABS data bit 1 [ZSP]" and "ABS transmission data ready [TLC]" signals become valid.
	TL	31		ABS request [ABSR]	— [D14] During torque limitation [TL]	• The signal to request ABS data in the ABS transfer mode.
	SG	32		Common [COM]	Common [COM]	• I/O voltage 24 V DC (24 G side)

*1 Indicates signals in the ABS transfer mode.

*2 Indicates signals in a normal state (not in the ABS transfer mode).
See the specification and instruction manual for each servo amplifier for details.

3.3 I/O Signals for the Master Module

This section explains the assignment and respective functions of the I/O signals.

3.3.1 List of I/O signals

The D75P2 uses 128 input points and 128 output points for data communication with the master module.
Table 3.3 shows the assignment and name of each I/O signal.
Device RX indicates input signals from the D75P2 to the master module, while device RY indicates output signals from the master module to the D75P2.

Table 3.3 List of I/O signals (1)

Signal direction: D75P2 → master module		Signal direction: master module → D75P2	
Device No.	**Signal name**	**Device No.**	**Signal name**
RXn0	D75P2 ready complete	RYn0	Use prohibited
RXn1	Single-axis start complete		
RXn2	Dual-axes start complete		
RXn3	Use prohibited		
RXn4	Single-axis BUSY		
RXn5	Dual-axis BUSY		
RXn6	Use prohibited		
RXn7	Single-axis positioning complete	to	
RXn8	Dual-axis positioning complete		
RXn9	Use prohibited		
RXnA	Single-axis error detection		
RXnB	Dual-axis error detection		
RXnC	Use prohibited		
RXnD	Single-axis M-code ON		
RXnE	Dual-axis M-code ON		
RXnF	Use prohibited	RYnF	
RX(n+1)0	Single-axis speed limit in-operation flag	RY(n+1)0	Single-axis positioning start
RX(n+1)1	Single-axis speed change processing flag	RY(n+1)1	Dual-axis positioning start
RX(n+1)2	Single-axis drive module ready	RY(n+1)2	Use prohibited
RX(n+1)3	Single-axis zero signal	RY(n+1)3	Single-axis stop
RX(n+1)4	Single-axis in-position signal	RY(n+1)4	Dual-axis stop
RX(n+1)5	Single-axis near-point signal	RY(n+1)5	Use prohibited
RX(n+1)6	Single-axis stop signal	RY(n+1)6	Single-axis forward JOG start
RX(n+1)7	Single-axis high limit	RY(n+1)7	Single-axis reverse JOG start
RX(n+1)8	Single-axis low limit	RY(n+1)8	Dual-axis forward JOG start
RX(n+1)9	Single-axis external start signal	RY(n+1)9	Dual-axis reverse JOG start
RX(n+1)A	Single-axis speed/position switch signal	RY(n+1)A	Use prohibited
RX(n+1)B	Single-axis error counter clear status		
RX(n+1)C	Single-axis speed control in-operation flag	to	
RX(n+1)D	Single-axis speed/position switch latch flag		
RX(n+1)E	Single-axis command in-position signal		
RX(n+1)F	Single-axis home position return request flag	RY(n+1)F	

n: The address assigned to the master module via station number setting.

Table 3.3 List of I/O signals (2)

Signal direction: D75P2 → master module		Signal direction: master module → D75P2	
Device No.	**Signal name**	**Device No.**	**Signal name**
RX(n+2)0	Single-axis home position return complete flag	RY(n+2)0	Single-axis servo ON
RX(n+2)1	Single-axis warning detection	RY(n+2)1	Single-axis ABS transfer mode
RX(n+2)2	Single-axis speed change 0 flag	RY(n+2)2	Single-axis ABS request flag
RX(n+2)3	Single-axis location of the absolute home position overflow flag	RY(n+2)3	Single-axis error counter clear
RX(n+2)4	Single-axis location of the absolute home position underflow flag	RY(n+2)4	Single-axis error reset
RX(n+2)5	Single-axis ABS data bit 0	RY(n+2)5	Single-axis restart command
RX(n+2)6	Single-axis ABS data bit 1	RY(n+2)6	Single-axis M-code OFF request
RX(n+2)7	Single-axis transmission data ready complete flag	RY(n+2)7	Single-axis speed change request
RX(n+2)8	Single-axis restart acknowledge complete flag	RY(n+2)8	Single-axis speed/position switch enable flag
RX(n+2)9	Use prohibited	RY(n+2)9	Single-axis manual pulse generator enable flag
		RY(n+2)A	Single-axis home position return request OFF request
		RY(n+2)B	Single-axis external start valid
to		RY(n+2)C to	Use prohibited
RX(n+3)F		RY(n+3)F	

n: The address assigned to the master module via station number setting.

Table 3.3 List of I/O signals (3)

Signal direction: D75P2 → master module		Signal direction: master module → D75P2	
Device No.	**Signal name**	**Device No.**	**Signal name**
RX(n+4)0	Dual-axis speed limit in-operation flag	RY(n+4)0	Dual-axis servo ON
RX(n+4)1	Dual-axis speed change processing flag	RY(n+4)1	Dual-axis ABS transfer mode
RX(n+4)2	Dual-axis drive module ready	RY(n+4)2	Dual-axis ABS request flag
RX(n+4)3	Dual-axis zero signal	RY(n+4)3	Dual-axis error counter clear
RX(n+4)4	Dual-axis in-position signal	RY(n+4)4	Dual-axis error reset
RX(n+4)5	Dual-axis near-point signal	RY(n+4)5	Dual-axis restart command
RX(n+4)6	Dual-axis stop signal	RY(n+4)6	Dual-axis M-code OFF request
RX(n+4)7	Dual-axis high limit	RY(n+4)7	Dual-axis speed change request
RX(n+4)8	Dual-axis low limit	RY(n+4)8	Dual-axis speed/position switch enable flag
RX(n+4)9	Dual-axis external start signal	RY(n+4)9	Dual-axis manual pulse generator enable flag
RX(n+4)A	Dual-axis speed/position switch signal	RY(n+4)A	Dual-axis home position return request OFF request
RX(n+4)B	Dual-axis error counter clear status	RY(n+4)B	Dual-axis external start valid
RX(n+4)C	Dual-axis speed control in-operation flag	RY(n+4)C	Use prohibited
RX(n+4)D	Dual-axis speed/position switch latch flag		
RX(n+4)E	Dual-axis command in-position signal		
RX(n+4)F	Dual-axis home position return request flag		
RX(n+5)0	Dual-axis home position return complete flag		
RX(n+5)1	Dual-axis warning detection		
RX(n+5)2	Dual-axis speed change 0 flag		
RX(n+5)3	Dual-axis location of the absolute home position overflow flag		
RX(n+5)4	Dual-axis location of the absolute home position underflow flag	to	
RX(n+5)5	Dual-axis ABS data bit 0		
RX(n+5)6	Dual-axis ABS data bit 1		
RX(n+5)7	Dual-axis transmission data ready complete flag		
RX(n+5)8	Dual-axis restart acknowledge complete flag		
RX(n+5)9	Use prohibited		
to			
RX(n+5)F		RY(n+5)F	

n: The address assigned to the master module via station number setting.

Table 3.3 List of I/O signals (4)

Signal direction: D75P2 → master module		Signal direction: master module → D75P2	
Device No.	**Signal name**	**Device No.**	**Signal name**
RX(n+6)0	Use prohibited	RY(n+6)0	Use prohibited
to		to	
RX(n+7)7		RY(n+7)7	
RX(n+7)8	Initial data processing request	RY(n+7)8	Initial data processing complete
RX(n+7)9	Initial data setting complete	RY(n+7)9	Initial data setting request
RX(n+7)A	Use prohibited	RY(n+7)A	Use prohibited
RX(n+7)B	Remote station ready	RY(n+7)B	Use prohibited
RX(n+7)C	Use prohibited	RY(n+7)C	
RX(n+7)D		RY(n+7)D	
RX(n+7)E	Intelligent device station access complete	RY(n+7)E	Intelligent device station access request
RX(n+7)F	Use prohibited	RY(n+7)F	Use prohibited

n: The address assigned to the master module via station number setting.

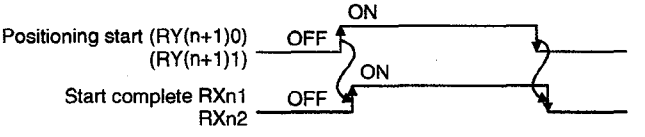
Point

Do not output (turn on) signals whose use is prohibited among the output signals transmitted from the master module to the D75P2.
If signals whose use is prohibited are output, the PC system may malfunction.

3.3.2 Functions of I/O signals

Table 3.4 shows details of each I/O signal for the D75P2.

Table 3.4 Details of I/O signals (1)

Device No.	Signal name	Description
RXn0	D75P2 ready complete	OFF : Ready complete ON : Ready incomplete • When the remote station ready (RX(n+7)B) switches from off → on, the parameter setting range is checked, and if there are no errors the D75P2 ready complete turns off. When the remote station ready turns off, the D75P2 ready complete turns on. • Used in the interlock for the sequence program.
RXn1 RXn2	Single-axis start complete Dual-axis start complete	OFF : Start incomplete ON : Start complete • When the D75P2 starts positioning processing after the positioning start (RY(n+1)0, RY(n+1)1) turns on, the start complete turns on. (The start complete also turns on at the time of home position return operation.) • When the positioning start turns off, the start complete also turns off. 
RXn4 RXn5	Single-axis BUSY Dual-axis BUSY	OFF : Not BUSY ON : BUSY • Turns on at the time of positioning start, home position return start, or JOG start and turns off when the dwell time has elapsed after positioning was stopped. (Remains on while positioning is continued.) • Turns off during stop by step execution. • In the case of manual pulse-generator operation, this signal turns on while the manual pulse generator enable flag (RY(n+2)9, RY(n+4)9) is on. • Turns off by error termination and stop.
RXn7 RXn8	Single-axis positioning complete Dual-axis positioning complete	OFF : Positioning incomplete ON : Positioning complete • Turns on for the period of time set by the parameter for positioning complete output time, starting from the point when positioning for each positioning-data number is completed. (When the parameter for positioning complete output time is set to 0, the signal does not turn on). • When the positioning operation (including home position return), JOG operation or manual pulse-generator operation is started while this signal is on, the psignal turns off. • If speed control or positioning is stopped in the middle, the signal does not turn on.
RXnA RXnB	Single-axis error detection Dual-axis error detection	OFF : Error has not occurred ON : Error has occurred • Turns on when an error occurs, and turns off upon error reset.

n: The address assigned to the master module via station number setting.

Table 3.4 Details of I/O signals (2)

Device No.	Signal name	Description
RXnD RXnE	Single-axis M-code ON Dual-axis M-code ON	OFF : M code set ON : M code not set • *In the WITH mode the signal turns on when positioning starts, while in* the AFTER mode it turns on when positioning is completed. • Turns off when the M-code OFF request (RY(n+2)6, RY (n+4)6) rises. • The signal remains off when there is no M code specification (M code = 0). During operation by continuous locus control, even if the M-code ON signal does not turn off, the M code is set and positioning continues. However, a warning occurs. When the remote station ready signal (RX(n+7)B) turns on, the M-code ON signal turns off. • Starting with the M code ON causes an error.
RX(n+1)0 RX(n+4)0	Single-axis speed limit in-operation flag Dual-axis speed limit in-operation flag	OFF : Speed not limited ON : Speed limited • The signal turns on during operation at the speed limit value after the speed has exceeded the speed limit value due to speed change or positioning operation override. • The signal turns off when the speed becomes within the speed limit value or when the movement along the axis stops. (*1)
RX(n+1)1 RX(n+4)1	Single-axis speed change processing flag Dual-axis speed change processing flag	OFF : Speed change processing complete ON : Speed change processing • The signal turns on during speed change processing. The signal turns off when deceleration starts due to a stop signal during speed change processing or when speed change processing is completed. (*1)
RX(n+1)2 RX(n+4)2	Single-axis drive module ready Dual-axis drive module ready	OFF : Drive module ready signal OFF ON : Drive module ready signal ON • The signal turns on when the drive module is normal and is in a feed-pulse acknowledge enable state. (*1)
RX(n+1)3 RX(n+4)3	Single-axis zero signal Dual-axis zero signal	OFF : Zero signal OFF ON : Zero signal ON • Indicates the home position signal at the time of home position return. Generally, the zero-grid signal from a pulse encoder is used. (*1)
RX(n+1)4 RX(n+4)4	Single-axis in-position signal Dual-axis in-position signal	OFF : In-position signal OFF ON : In-position signal ON • Indicates whether the in-position signal from the drive module is on or off. (*1)
RX(n+1)5 RX(n+4)5	Single-axis near-point signal Dual-axis near-point signal	OFF : Near-point dog signal OFF ON : Near-point dog signal ON • Indicates whether the near-point dog signal is on or off at the time of home position return. (*1)
RX(n+1)6 RX(n+4)6	Single-axis stop signal Dual-axis stop signal	OFF : Stop signal OFF ON : Stop signal ON • Indicates whether the stop signal is on or off. (*1)
RX(n+1)7 RX(n+4)7	Single-axis high limit Dual-axis high limit	OFF : High limit signal OFF ON : High limit signal ON • Indicates whether the high limit signal is on or off. (*1)
RX(n+1)8 RX(n+4)8	Single-axis low limit Dual-axis low limit	OFF : Low limit signal OFF ON : Low limit signal ON • Indicates whether the low limit signal is on or off. (*1)
RX(n+1)9 RX(n+4)9	Single-axis external start signal Dual-axis external start signal	OFF : External start signal OFF ON : External start signal ON • Indicates whether the external start signal is on or off. (*1)
RX(n+1)A RX(n+4)A	Single-axis speed/position switch signal Dual-axis speed/position switch signal	OFF : Speed/position switch signal OFF ON : Speed/position switch signal ON • Indicates whether the speed/position switch signal is on or off. (*1)

n: The address assigned to the master module via station number setting.

*1 Updated every 56.8 ms.

Table 3.4 Details of I/O signals (3)

Device No.	Signal name	Description
RX(n+1)B RX(n+4)B	Single-axis error counter clear status Dual-axis error counter clear status	OFF : Error counter clear signal OFF ON : Error counter clear signal ON • Indicates whether the error counter clear signal is on or off. (*1)
RX(n+1)C RX(n+4)C	Single-axis speed control in-operation flag Dual-axis speed control in-operation flag	OFF : Position control in operation ON : Speed control in operation • This flag turns on during speed control and is used to indicate whether speed control or position control is in operation. During speed/position switch control, the flag remains on until speed control is switched to position control by an external speed/position switch signal. • Turns off at power-on or during position control, JOG operation and manual pulse-generator operation. (*1)
RX(n+1)D RX(n+4)D	Single-axis speed/position switch latch flag Dual-axis speed/position switch latch flag	OFF : Speed/position switch not executed ON : Speed/position switch executed • This flag turns on when speed control is switched to position control during speed/position switch control and is used for the travel-increment change enable interlock during position control. • Turns off upon execution of the next positioning data or during JOG operation and manual pulse-generator operation. (*1)
RX(n+1)E RX(n+4)E	Single-axis command in-position signal Dual-axis command in-position signal	OFF : Out of in-position range ON : Within in-position range • The signal turns on when the remaining distance falls below the "command in-position range" set by the parameter. • Turns off when the axis moves during each operation. • The command in-position check is performed every 56.8 ms during position control. The command in-position check is not performed during speed control, or during speed control of speed/position switch control. (*1)
RX(n+1)F RX(n+4)F	Single-axis home position return request flag Dual-axis home position return request flag	OFF : Home position return complete ON : Home position return being requested • Turns on when any of the following conditions occurs, and turns off when home position return is completed. (*1) (a) The D75P2's power is turned on. (b) When the drive module ready signal turns off. (c) When the remote station ready signal turns on. (d) At the time of home position return start.
RX(n+2)0 RX(n+5)0	Single-axis home position return complete flag Dual-axis home position return complete flag	OFF : Before home position return complete ON : After home position return complete • Turns on after home position return is completed normally. • Turns off at home position return start, positioning operation start, JOG operation start or manual pulse-generator operation start or when the drive module ready turns off. (*1)
RX(n+2)1 RX(n+5)1	Single-axis warning detection Dual-axis warning detection	OFF : No axis warning ON : Axis warning exists • Turns on when an axis warning has occurred. • Turns off upon axis-error reset. (*1)
RX(n+2)2 RX(n+5)2	Single-axis speed change 0 flag Dual-axis speed change 0 flag	OFF : When the new speed value is other than 0 ON : When the new speed value is 0 • Turns on when the new speed value is 0 and the speed change request (RY(n+2)7, RY(n+4)7) is turned on. • Turns off when the new speed value is other than 0 and the speed change request is turned on. (*1)

n: The address assigned to the master module via station number setting.

*1 Updated every 56.8 ms.

Table 3.4 Details of I/O signals (4)

Device No.	Signal name	Description
RX(n+2)3 RX(n+5)3	Single-axis absolute home position position overflow flag Dual-axis absolute home position position overflow flag	OFF : Overflow not occurred ON : Overflow occurred • Turns on when the location of the absolute home position (*2) has overflowed due to a change in the present value. (*1)
RX(n+2)4 RX(n+5)4	Single-axis absolute home position position underflow flag Dual-axis absolute home position position underflow flag	OFF : Underflow not occurred ON : Underflow occurred • Turns on when the location of the absolute home position has underflowed due to a change in the present value. (*1)
RX(n+2)5 RX(n+5)5	Single-axis ABS data bit 0 Dual-axis ABS data bit 0	OFF : Bit OFF ON : Bit ON • Indicates the lower bit of ABS data. (*3)
RX(n+2)6 RX(n+5)6	Single-axis ABS data bit 1 Dual-axis ABS data bit 1	OFF : Bit OFF ON : Bit ON • Indicates the upper bit of ABS data. (*3)
RX(n+2)7 RX(n+5)7	Single-axis transmission data ready complete flag Dual-axis transmission data ready complete flag	OFF : Transmission data in ready ON : Transmission data ready complete • In the ABS transfer mode, this signal indicates the status of transmission data preparation. (*3)
RX(n+2)8 RX(n+5)8	Single-axis restart acknowledge complete flag Dual-axis restart acknowledge complete flag	OFF : No restart acknowledged ON : Restart acknowledged • Indicates the restart acknowledgment status.
RX(n+7)8	Initial data processing request	OFF : Initial data processing not requested ON : Initial data processing being requested • After power-on or hardware reset, the DS75P2 turns on the initial data request in order to request initial data setting. Further, this request turns off when the initial data processing complete (RY(n+7)8) is turned on.
RX(n+7)9	Initial data setting complete	OFF : Initial data setting incomplete ON : Initial data setting complete • When the initial data setting request (RY(n+7)9) is turned on, this signal turns on when initial data setting is completed. Further, when the initial data request (RX(n+7)8) is turned off upon completion of initial data setting, the initial data setting complete also turns off.

n: The address assigned to the master module via station number setting.

*1 Updated every 56.8 ms.

*2 See Section 8.6.2 for the location of the absolute home position.

*3 Used for maintenance of an absolute-position detection system. Cannot be used during normal operation.

Table 3.4 Details of I/O signals (5)

Device No.	Signal name	Description
RX(n+7)B	Remote station ready	OFF : Positioning operation disable ON : Positioning operation enable (a) This signal indicates whether or not the D75P2 is able to perform positioning operation. • Turns on depending on whether the initial data processing complete (RY(n+7)8) and initial data setting request (RY(n+7)9) are on or off. • Turns on when positioning operation, home position return, JOG operation or manual pulse-generator operation is performed in the peripheral device test mode. (b) When changing the positioning parameters, it may be necessary to turn this signal off depending on the item to be changed. (c) When the remote station ready switches from off to on, the following processing is executed: • Checking of parameter ranges. • The D75P2 ready complete signal (RXn0) is turned off. (d) When the remote station ready switches from on to off, the following processing is executed: • The D75P2 ready complete signal (RXn0) is turned on. • The axis currently in operation is stopped. • The M-code ON signal for each axis is turned off, and the M-code storage area is cleared.
RY(n+1)0 RY(n+1)1	Single-axis positioning start Dual-axis positioning start	OFF : No positioning start request ON : Positioning start requested • Starts positioning operation. • The positioning start signal becomes valid at rise. • A "start during operation" warning occurs when the positioning start signal is turned on during BUSY.
RY(n+1)3 RY(n+1)4	Single-axis stop Dual-axis stop	OFF : No axis stop request ON : Axis stop requested • When the axis stop signal is turned on, home position return operation, positioning operation, JOG operation or manual pulse-generator operation stops. • When the axis stop signal is turned on, the M-code ON signal turns off. • Whether the axis undergoes deceleration stop or rapid stop when the axis stop signal turns on can be selected using the parameter for stop signal rapid-stop selection setting. • When using interpolation control during positioning operation, if the axis stop signal for either axis turns on, both axes decelerate and stop.
RY(n+1)6 RY(n+1)8	Single-axis forward JOG start Dual-axis forward JOG start	OFF : JOG not started ON : JOG started • While the forward JOG start signal is on, forward JOG operation is performed at the JOG speed; and when the forward JOG start signal turns off, the axis decelerates and stops.
RY(n+1)7 RY(n+1)9	Single-axis reverse JOG start Dual-axis reverse JOG start	OFF : JOG not started ON : JOG started • While the reverse JOG start signal is on, reverse JOG operation is performed at the JOG speed; and when the reverse JOG start signal turns off, the axis decelerates and stops.
RY(n+2)0 RY(n+4)0	Single-axis servo ON Dual-axis servo ON	OFF : Servo off ON : Servo on • Turns on when the servo is turned on. (*4)
RY(n+2)1 RY(n+4)1	Single-axis ABS transfer mode Dual-axis ABS transfer mode	OFF : Non-ABS transfer mode ON : ABS transfer mode • Turns on when the mode is changed to ABS transfer. (*3)
RY(n+2)2 RY(n+4)2	Single-axis ABS request flag Dual-axis ABS request flag	OFF : ABS data request acknowledge complete ON : ABS data being requested • In the ABS transfer mode, this signal turns on when ABS data is requested. (*3)

n: The address assigned to the master module via station number setting.

*3 Used for maintenance of an absolute-position detection system. Cannot be used during normal operation.

*4 Used when running an absolute-position detection system.

Table 3.4 Details of I/O signals (6)

Device No.	Signal name	Description
RY(n+2)3 RY(n+4)3	Single-axis error counter clear Dual-axis error counter clear	OFF : Error counter clear request acknowledge complete ON : Error counter clear being requested • Turns on when the error counter for the servo amplifier is cleared.(*3)
RY(n+2)4 RY(n+4)4	Single-axis error reset Dual-axis error reset	OFF : No error reset request ON : Error reset requested • Clears the axis error detection, axis error number, axis warning detection and axis warning number. Turns on in the ABS transfer mode when ABS data is requested. • Changes the axis operation status from error to standby. (Nothing happens during starting.) • Error reset is executed at rise. (*5)
RY(n+2)5 RY(n+4)5	Single-axis restart command Dual-axis restart command	OFF : No restart command ON : Restart command issued • If this signal turns on while axis operation is stopped, positioning is performed from the stop position to the endpoint of the stopped positioning data. • Restart is executed at rise. (*5)
RY(n+2)6 RY(n+4)6	Single-axis M-code OFF request Dual-axis M-code OFF request	OFF : No M-code OFF request ON : M-code OFF requested • The M-code OFF request turns off the M-code ON signal (RXnD, RXnE). • M-code OFF is executed at rise. (*5)
RY(n+2)7 RY(n+4)7	Single-axis speed change request Dual-axis speed change request	OFF : No speed change request ON : Speed change requested • When changing the speed during positioning operation, this signal turns on after the new speed value is set. • Speed change is executed at rise.
RY(n+2)8 RY(n+4)8	Single-axis speed/position switch enable flag Dual-axis speed/position switch enable flag	OFF : Speed/position switching disable ON : Speed/position switching enable • When the speed/position switch enable flag turns on, the speed/position switch signals (RX(n+1)A, RX(n+4)A) become valid.
RY(n+2)9 RY(n+4)9	Single-axis manual pulse generator enable flag Dual-axis manual pulse generator enable flag	OFF : Manual pulse-generator operation disable ON : Manual pulse-generator operation enable • Sets whether manual pulse-generator operation is enable or disable.
RY(n+2)A RY(n+4)A	Single-axis home position return request OFF request Dual-axis home position return request OFF request	OFF : No home position return request OFF request ON : Home position return request OFF requested • Turns off the home position return request flags (RX(n+1)F, RX(n+4)F). • The home position return request flag turns off at rise.
RY(n+2)B RY(n+4)B	Single-axis external start valid Dual-axis external start valid	OFF : External start invalid ON : External start valid • When the signal is turned on, external start becomes valid.
RY(n+7)8	Initial data processing complete	OFF : Initial data processing incomplete ON : Initial data processing complete • When initial data setting is performed after power-on or when the initial data setting request (RY(n+7)9) is turned on after hardware reset, this signal turns on after the setting is completed.
RY(n+7)9	Initial data setting request flag	OFF : No initial data setting request ON : Initial data setting requested • Turns on when setting or changing initial data.

n: The address assigned to the master module via station number setting.

*5 Checked by the OS every 56.8 ms.

Figure 3.1 shows the timing of the initial data processing request, initial data processing complete and other I/O signals for the D75P2.

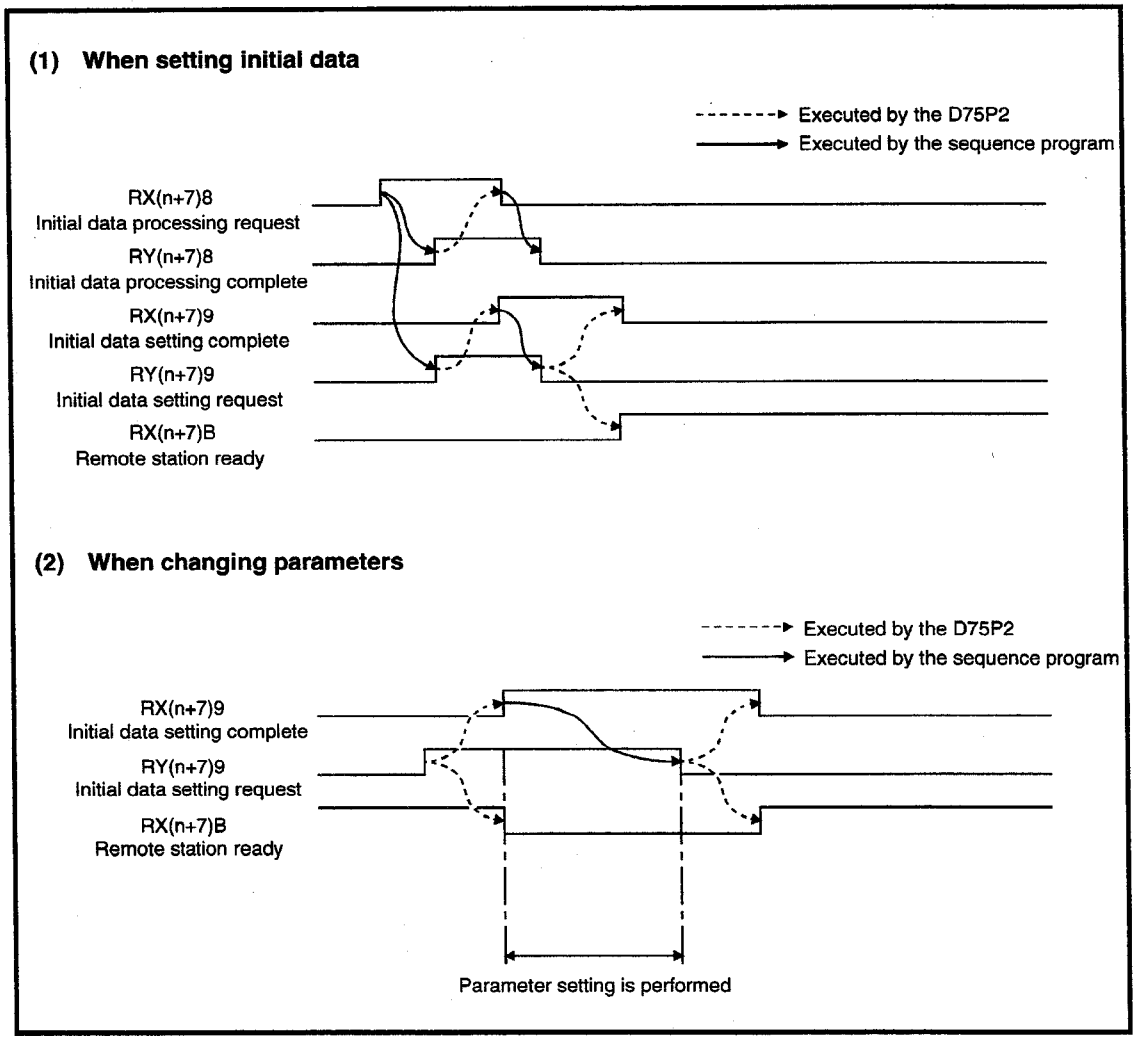


Fig. 3.1 Timing of I/O signals

3.4 Remote Register

The D75P2 has a remote register used for data communication with the master module. This section explains the assignment and data configuration for the remote register.

3.4.1 Remote register assignment

Table 3.5 shows the assignment for the remote register.

Table 3.5 Remote register assignment

Communication direction	Address	Description	Default value	Reference section
Master → remote	RWwm	Single-axis positioning start number	0	Section 3.4.2
	RWwm+1	Single-axis override	100	Section 3.4.3
	RWwm+2	Single-axis new present value	0	Section 3.4.4
	RWwm+3			
	RWwm+4	Single-axis new speed value	0	Section 3.4.5
	RWwm+5			
	RWwm+6	Single-axis JOG speed	0	Section 3.4.6
	RWwm+7			
	RWwm+8	Dual-axis positioning start number	0	Section 3.4.2
	RWwm+9	Dual-axis override	100	Section 3.4.3
	RWwm+10	Dual-axis new present value	0	Section 3.4.4
	RWwm+11			
	RWwm+12	Dual-axis new speed value	0	Section 3.4.5
	RWwm+13			
	RWwm+14	Dual-axis JOG speed	0	Section 3.4.6
	RWwm+15			
Remote → master	RWrn	Single-axis present feed value	0	Section 3.4.7
	RWrn+1			
	RWrn+2	Single-axis feed speed	0	Section 3.4.8
	RWrn+3			
	RWrn+4	Single-axis valid M code	0	Section 3.4.9
	RWrn+5	Single-axis error number	0	Section 3.4.10
	RWrn+6	Single-axis warning number	0	Section 3.4.11
	RWrn+7	Single-axis operation status	0	Section 3.4.12
	RWrn+8	Dual-axis present feed value	0	Section 3.4.7
	RWrn+9			
	RWrn+10	Dual-axis feed speed	0	Section 3.4.8
	RWrn+11			
	RWrn+12	Dual-axis valid M code	0	Section 3.4.9
	RWrn+13	Dual-axis error number	0	Section 3.4.10
	RWrn+14	Dual-axis warning number	0	Section 3.4.11
	RWrn+15	Dual-axis operation status	0	Section 3.4.12

m, n: The address assigned to the master module via station number setting.

3.4.2 Positioning start number

Set the start number used to execute positioning.

- Positioning-data number specification : 1 to 600
- Block start specification : 7000 to 7010
- Indirect specification : 8000 to 8049
- Mechanical home position return specification : 9001
- High-speed home position return specification : 9002
- Present value change : 9003
- Absolute-position restoration : 9900
- Data-set type home position return : 9901

3.4.3 Override

Used when executing override in the speed range of 1 to 300 % (unit: 1 %) relative to the speed of positioning operation (current speed).
When the override value is 100 %, the speed of positioning operation does not change.

3.4.4 New present value

When changing the present feed value using positioning-data number 9003, set the present feed value after change.
No error occurs even if the set value is outside the software stroke limit range.
The setting ranges are shown below:

(1) In the standard mode

–2147483648 to 2147483647 × 10^{-1} μm
–2147483648 to 2147483647 × 10^{-5} inches
0 to 35999999 × 10^{-5} degrees
–2147483648 to 2147483648 pulses

(2) In the stepping motor mode

–134217728 to 134217727 × 10^{-1} μm
–134217728 to 134217727 × 10^{-5} inches
0 to 35999999 × 10^{-5} degrees
–134217728 to 134217727 pulses

3.4.5 New speed value

When changing the speed during positioning operation or JOG operation, set the speed after change.
When 0 is set, the operation stops.
The setting ranges are shown below:

(1) In the standard mode

0 to 600000000 × 10^{-2} mm/min.
0 to 600000000 × 10^{-3} inches/min.
0 to 600000000 × 10^{-3} degrees/min.
0 to 100000000 pulses/sec.

(2) In the stepping motor mode

0 to 37500000 × 10^{-2} mm/min.
0 to 37500000 × 10^{-3} inches/min.
0 to 37500000 × 10^{-3} degrees/min.
0 to 62500 pulses/sec.

3.4.6 JOG speed

Set the speed for JOG operation.
The setting ranges are shown below:

(1) In the standard mode

0 to 600000000 × 10^{-2} mm/min.
0 to 600000000 × 10^{-3} inches/min.
0 to 600000000 × 10^{-3} degrees/min.
0 to 100000000 pulses/sec.

(2) In the stepping motor mode

0 to 37500000 × 10^{-2} mm/min.
0 to 37500000 × 10^{-3} inches/min.
0 to 37500000 × 10^{-3} degrees/min.
0 to 62500 pulses/sec.

3.4.7 Present feed value

The position of positioning currently being executed is stored. (Update timing: 56.8 ms cycle)
The present feed value becomes the coordinate value in the case of absolute positioning.
The home position return address is set when home position return is completed.
The present feed value is changed via the present-value change function.
It is possible to apply software stroke limit using the present feed value via parameter setting.

3.4.8 Feed speed

In all operations, the actual speed at the time of operation is stored.
During interpolation operation, the synthesized speed at the time of operation or reference-axis speed is stored in axis 1 and 0 is stored in axis 2.
If the axis stops, 0 is stored.

3.4.9 Valid M code

An M-code is stored.
0 is stored when the remote station ready signal turns off.

3.4.10 Axis error number

When an axis error occurs, the corresponding error code is stored. If another axis error occurs after an error code has been stored, the old code is overwritten and the new error code is stored.
The axis error number is cleared when the axis error reset is turned on.

3.4.11 Axis warning number

When an axis warning occurs, the corresponding warning code is stored. If another axis warning occurs after a warning code has been stored, the old code is overwritten and the new warning code is stored.
The axis warning number is cleared when the axis error reset is turned on.

3.4.12 Axis operation status

The axis operation statuses shown below are stored:

- 0 : Standby
- 1 : During stop
- 2 : During interpolation
- 3 : During JOG operation
- 4 : During manual pulse-generator operation
- 5 : During analysis
- 6 : Waiting for special start
- 7 : During home position return
- 8 : Position control in operation
- 9 : Speed control in operation
- 10 : Speed control of speed/position switch control in operation
- 11 : Position control of speed/position switch control in operation
- 12 : During absolute-position restoration
- 13 : During data-set type home position return
- –1 : Error
- –2 : Step standby
- –3 : Step stopped
- –4 : Step error has occurred

3.5 Transmission Delay Time

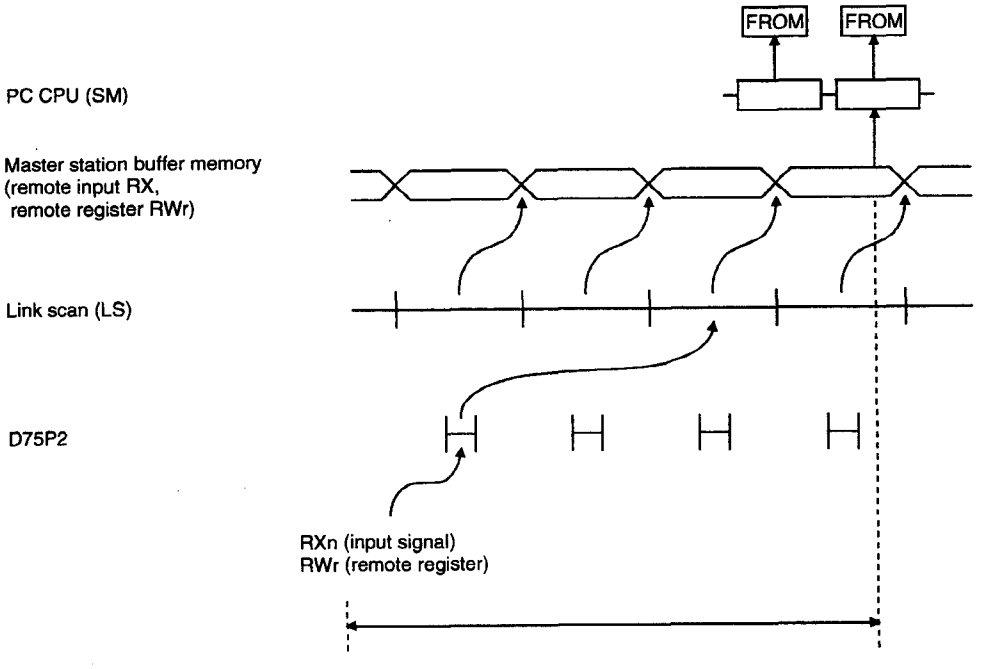
The transmission delay time (time until the data is transmitted) is described below:

(1) Master station (RX/RWr) ← D75P2 (RX/RWr)
[Expression]

SM + LS × 3 + RS [ms]

SM : Scan time of the master station sequence program
LS : Link scan time (See Section 5.2 of the Master Module User's Manual.)
RS : 1.6 [ms]

[Data Flow]

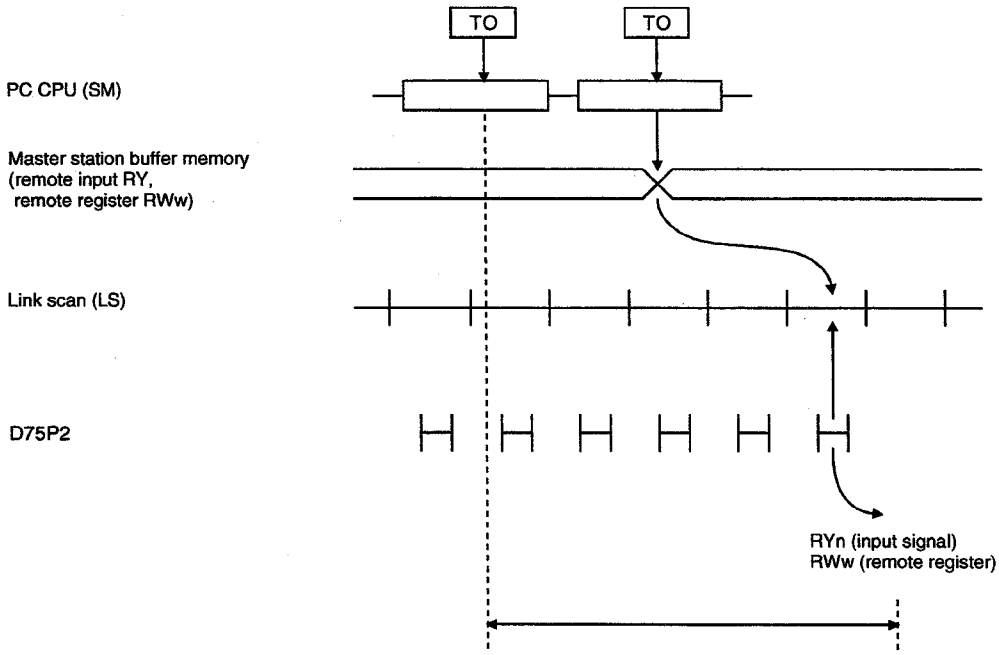


(2) Master station (RY/RWw) → (D75P2 (RY/RWw)
[Expression]

SM + LS × 3 + RS [ms]

SM : Scan time of the master station sequence program
LS : Link scan time (See Section 5.2 of the Master Module User's Manual.)
RS : D75P2 internal processing time (See Section 3.5 (1).)

[Data Flow]



4. Function List

4.1 Function List

Table 4.1 shows the functions of the A1SD75P1-S3/P2-S3/P3-S3 and AD75P1-S3/P2-S3/P3-S3.

Table 4.1 Function list

Function			Description
Positioning functions	Position control mode	Independent positioning	A single, specified positioning is executed → completed, then operation stops.
		Continuous positioning	A single, specified positioning is executed → completed, then operation pauses, after which positioning for the next number is executed continuously. This action is repeated until a positioning with the [positioning complete] operation pattern is executed.
		Continuous locus positioning	A single, specified positioning is executed → completed, and without pausing positioning for the next number is executed continuously. This action is repeated until a positioning with the [positioning complete] operation pattern is executed.
	Interpolation positioning		Two axes are controlled simultaneously, and positioning toward the specified address is executed along a linear or circular locus.
	Block positioning		The next positioning is executed by treating as one block all positioning data up to the one with the [positioning complete] operation pattern. • Positioning for specified multiple blocks is executed continuously. • Positioning for a desired block is repeated until the condition specified by the user is satisfied. • Positioning for a desired block is repeated for the number of times specified by the user.
	Speed control		After acceleration to the specified speed, operation is performed at the same speed until a stop command is input. (Travel increment and address are not specified.)
	Speed/position switch control		Initially, operation is performed at the same specified speed (same status as during speed control), and with input of a speed/position switch stop signal, positioning for the specified travel increment is executed → completed and operation stops.
Manual pulse-generator operation function			Pulses are input from the manual pulse generator, and positioning is executed manually.
JOG operation function			A JOG operation command is input from the PC or peripheral device, and while the command remains on, speed control is executed in the specified direction at the specified speed.
Home position return function			With a home position return command from the PC or peripheral device, positioning to the mechanical home position is performed, and when positioning is complete the present address (present feed value, machine feed value) is corrected to the home position address. (There is a home position return retry function.)
Compensation functions	Electronic gear		Adjusts the travel increment per pulse according to the mechanical system.
	Backlash compensation		During positioning operation, JOG operation, manual pulse-generator operation or home position return operation, extra feed pulses are output for the set backlash compensation amount to adjust the travel increment for the mechanical system.
	Error compensation		When an error (mechanical system error) between the specified travel increment and actual travel increment occurs, the pulse output for the error portion is corrected by adjusting the electronic gear setting.
M-code output function			Calls the number referred to as M-code which is set for each positioning data; confirms the positioning data currently executed; and commands auxiliary operations (clamp, drill rotation, tool replacement, etc.).
Acceleration/deceleration control function			Acceleration/deceleration during positioning (also at the time of speed change during positioning) and JOG operation or at home position return start and finish, is executed as the specified trapezoidal acceleration/deceleration or S-curve acceleration/deceleration.
Software limit function			Any positioning command exceeding the high or low limit of the specified machine movement range is not executed.
Torque control function			The torque generated by the servo motor is limited so that is does not exceed the specified torque control value. The torque is controlled with the changed limit value when the torque control value is changed during positioing.
Present-value change function			The present feed value is changed to the specified value. • Present feed value·····address that can be changed via present value change. • Machine feed value·····address from the mechanical home position based on the home position address.
Override function			The current speed of positioning is changed within a range of 1 to 300 %.
Near path function			When the unit is in degree, positioning is performed in the direction closer to the specified address.
Absolute-position detection function *1			Receives information of the absolute position from the servo amplifier, and changes the present value.
Teaching function			This is a manual operation via JOG operation and manual pulse-generator operation, by which the aligned positioning address is set again as the positioning data for the specified number.
Step function			Stops operation after every positioning action in order to confirm the positioning action.
Skip function			Stops the positioning currently executed and executes the next positioning.

*1: Valid only when MR-H or MR-J2 is used for the servo amplifier.

MEMO

5. Home Position Return Function

5.1 What is the Home Position Return Function?

The home position return function refers to the following two types of functions:

(1) Establishing the mechanical home position at the time power is turned on

This is an operation to set a home position in the coordinates in which the machine operates.

(2) Returning to the home position that has been set

This is an operation to return to the home position set in (1) from the position to which the machine has moved (for example, the stop position after positioning) from the home position.

The following functions are also available in addition to the home position return function described above:

Home position return retry function	Depending on the present value, there are occasions when home position return is not performed correctly. In such a case, this function will automatically perform home position return again. * See Section 5.6.
Home position shift function	This function is used to perform minor adjustments to the location of the home position, by compensating the stop position given by the home position return function. * See Section 5.7.

5.2 Types of Home Position Return

The following types of home position return are available:

(1) Establishing the mechanical home position at the time power is turned on

→ Mechanical home position return start (See Section 5.4.2 for details)

There are seven types of methods to perform mechanical home position return start as shown below:

[Home position return method] (See Section 5.5 for details)

- Near-point dog type
- Count type 1)
- Count type 2)
- Stopper stop type 1)
- Stopper stop type 2)
- Stopper stop type 3)
- Data-set type

* The home position return method is set using the home position return parameter *.

(2) Returning to the home position that has been set

→ High-speed home position return start (See Section 5.4.3 for details)

A home position return is made by calculating the travel increment to the home position from the travel increment stored in the D75P2.

→ High-speed mechanical home position return start (See Section 5.4.4 for details)

Positioning is performed to "the location of the absolute home position" address, which is monitored constantly.

Remark

*: The home position return parameters include "home position return basic parameters" and "home position return extended parameters."

- Home position return basic parameters : See Section 10.3
- Home position return extended parameters : See Section 10.4

5.3 Precautions when Performing Home Position Return

The following explains points to be noted when performing home position return with the D75P2:

(1) When performing home position return, it is necessary to set home position return parameters for each axis.
See Sections 10.3 and 10.4 for home position return parameters.

(2) Home position return cannot be used when the operation pattern is continuous locus control or continuous positioning control.

(3) For home position return, set the acceleration time and deceleration time for the mechanical home position return of positioning-data number 9001 and the high-speed home position return of positioning-data number 9002.

(4) When the location of the home position is not set at the high limit or low limit position of the machine, use the home position return retry function.
When the home position return retry function is used, the point moves in the reverse direction when the high or low limit switch wired to the D75P2 turns off, and home position return is performed once again. (See Section 5.6 for the home position return retry function.)

(5) When using the home position return retry function, an on/off signal from the limit switch in the home position return direction is required.
Provide an external limit switch and wire it to the high/low limit switch of the D75P2.

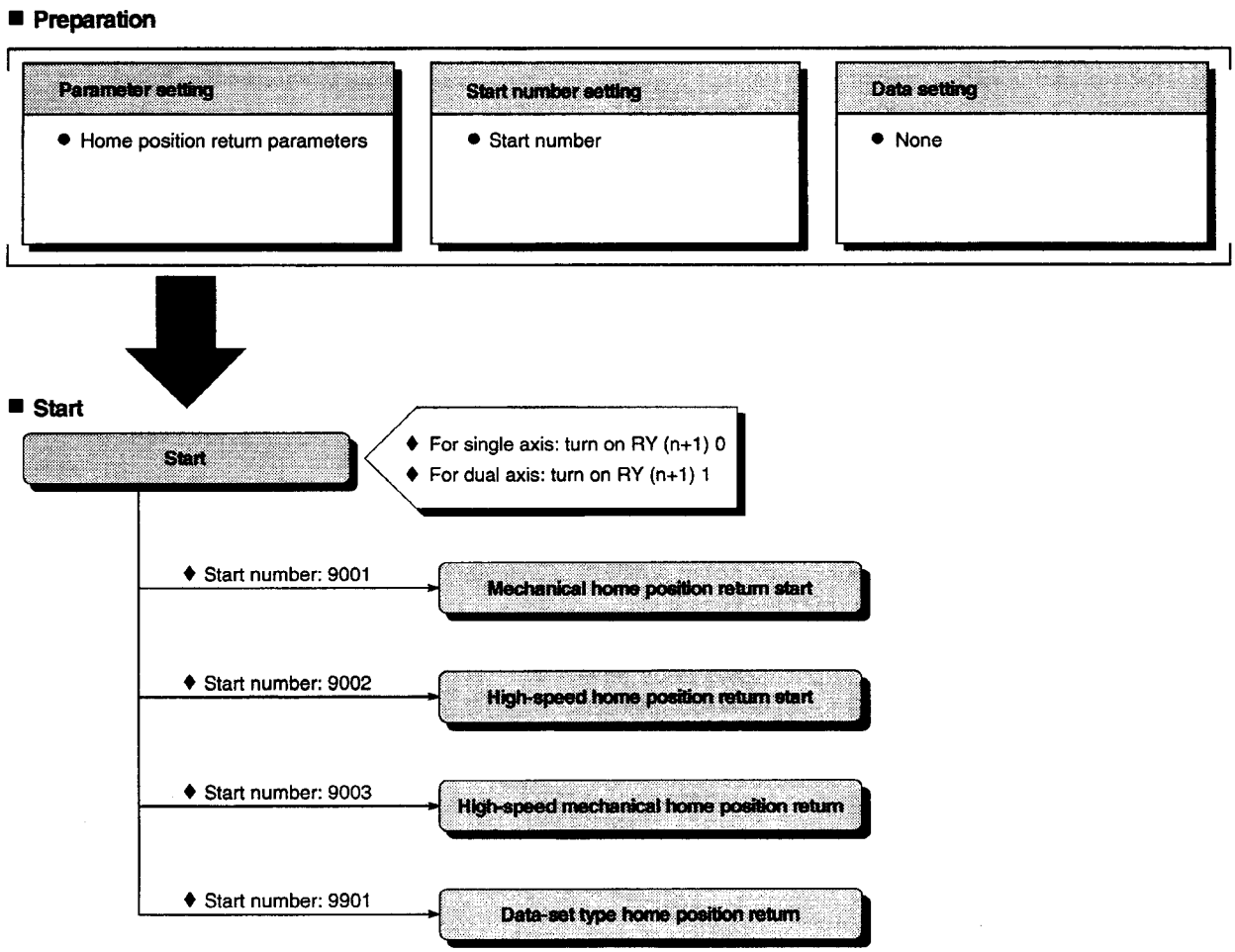
(6) In a system that does not perform home position return, control can be performed even without turning off the home position return request.
However, the home position return parameters for each axis must be set to the default value or a value that will not cause an error.
When any home position return parameter is in error, the ready complete flag will not turn off even when the remote station ready signal is turned on.

5.4 Home Position Return Start Method

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

- Mechanical home position return start
- High-speed home position return start
- High-speed mechanical home position return start
- Data-set type home position return (only when an absolute-position system is used)

5.4.1 Start flow



5.4.2 Mechanical home position return start

(1) What is the mechanical home position return?

1) The mechanical home position return establishes the mechanical home position using the home position return method described in Section 5.5.

2) The mechanical home position return start specifies 9001 in the buffer memory for storing the positioning start number and turns the positioning start signal on.

Point

(1) At the time of mechanical home position return start, the "home position return request flag" turns on *.
When the mechanical home position return completes normally, the "home position return request flag" turns off and the "home position return complete flag" turns on.
Also, depending on the home position return method, a value is stored in the "travel increment after near-point dog ON."

(2) When the mechanical home position return is completed normally, the home position address set by the home position return basic parameter is stored in the present feed value/machine feed value.

(3) During the mechanical home position return, the "axis operation status" of the axis monitor changes to "during home position return."

*: The home position return request flag also turns on in the following cases:
- When power for the D75P2 module is turned on.
- When the drive module ready flag turns off.
- When the remote station ready signal turns on.

5.4.3 High-speed home position return start

(1) What is the high-speed home position return start?

1) This is a function to perform high-speed return to the location of the home position without using a home position detection signal at positioning start, after the location of the home position has been established via mechanical home position return.
Movement to the home position is performed by calculating the amount of travel using the home position return address, which is stored in the D75P2 upon completion of mechanical home position return, and the machine feed value at the time of high-speed home position return start.

2) The high-speed home position return start specifies 9002 in the buffer memory for storing the positioning start number and turns the positioning start signal on.

Remark

The addresses of the buffer memory for data relating to home position return are as follows:

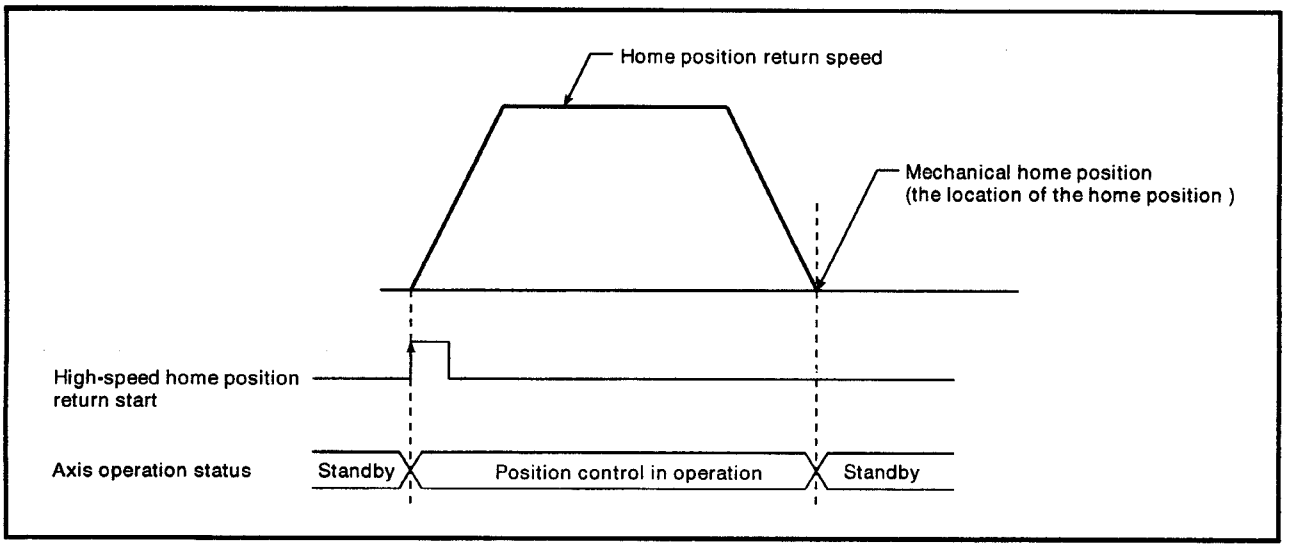
Item	Buffer memory address	
	Axis 1	Axis 2
Home position return request flag	817 bit 3 (b3)	917 bit 3 (b3)
Home position return complete flag	817 bit 4 (b4)	917 bit 4 (b4)
Travel after near-point dog ON	824, 825	924, 925
Present feed value	800, 801	900, 901
Machine feed value	802, 803	902, 903
For storing positioning start number	1150	1200

(2) Action at the time of high-speed home position return

The following actions occur when the high-speed home position return is started:

1) The movement occurs in the direction of mechanical home position at the specified home position return speed.
(The direction of travel varies depending on the machine value used to execute the high-speed home position return start.)

2) The movement decelerates and stops at the position of mechanical home position.



(3) Restrictions

1) If the mechanical home position is not established via mechanical home position return, the high-speed home position return cannot be performed.
Thus, the high-speed home position return cannot be performed while the "home position return request flag" is on.
Perform the high-speed home position return start after confirming that the home position return request flag is off.

2) During the high-speed home position return, the speed set by the parameter becomes the home position return speed.

3) The home position address set value is not stored in the present feed value/machine feed value at the time high-speed return is completed.

4) During home position return, the axis operation status of the axis monitor changes to "position control in operation."

5) In the high-speed home position return, the following data values do not change:
   - Home position return request flag
   - Home position return complete flag
   - Travel increment after near-point dog ON

6) If the machine feed value has overflowed or underflowed even once as a result of infinite-length positioning performed during speed control, an error will occur when the high-speed home position return is executed.
The high-speed home position return cannot be performed unless mechanical home position return is executed and the home position is established.

Remark

The present machine feed value will always be updated whenever there is movement, regardless of the type of operation.
Also, even if the present value is changed, the machine feed value will not change.

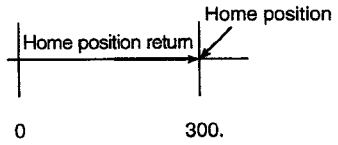
5.4.4 High-speed mechanical home position return

(1) Positioning to "the location of the absolute home position" can be performed by executing a positioning program to the location of the absolute home position using "the location of the absolute home position" value of the buffer memory axis monitor.

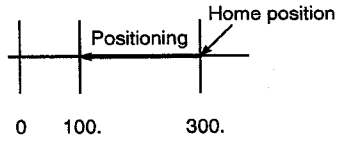
(2) When home position return is complete, "the location of the absolute home position" becomes the home position address value of the parameter.

(3) When the present value is changed, the value of "the location of the absolute home position" is also changed.

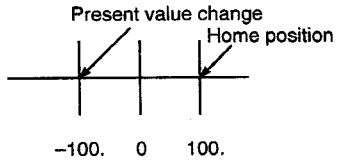
1) When home position return is completed, home position address 300 is stored in "the location of the absolute home position."



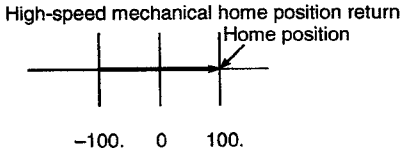
2) Positioning to the position of address 100 is performed.



3) If the present value is changed to –100 at this position, "the location of the absolute home position" becomes 100.



4) From this position, positioning to the location of the home position is performed by using "the location of the absolute home position" value and executing a positioning program to the location of the absolute home position (ABS linear 1).



5) The present value is changed to the home position address if necessary.

6) The home position return request flag OFF request is turned on if necessary.

Fig. 5.1 Positioning to home position and the location of the absolute home position value

Point

When the following control is performed, the value of the location of the absolute home position does not change:

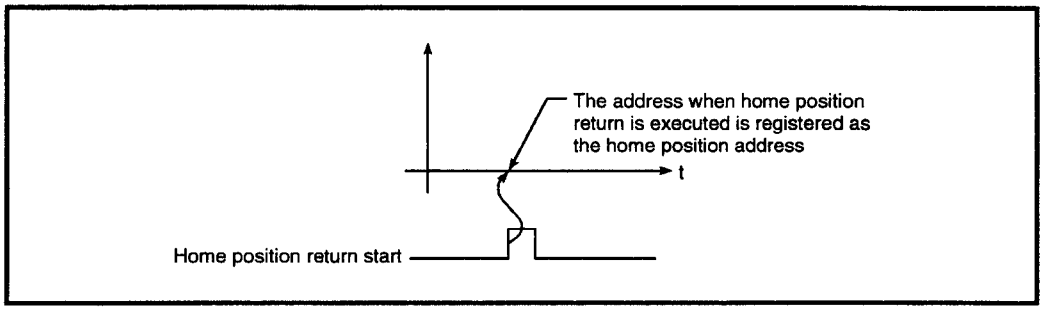
- 0 clear of the present feed value at start of fixed-dimension feed
- Turning off of the present feed value communication request instruction during speed control

Thus, after the above operations are performed, positioning to the home position cannot be performed via the absolute-positioning that uses the location of the absolute home position.

5.4.5 Data-set type home position return

(1) What is the data-set type home position return?

The data-set type is a home position return method that does not use near-point dog. It can be performed when an absolute-position detection system is used.
The present value when home position return is executed becomes the home position address.



(2) Precautions

Items that should be noted when performing the data-set type home position return are given below:

1) If the system is not an absolute-position detection system, when the data-set type home position return is started, the same function as when the present value is changed is obtained.
2) The only home position return data used in the data-set type is the home position address. For home position return data other than the home position address, set desired values within the setting range.

5.5 Home Position Return Method

5.5.1 Near-point dog type home position return

(1) What is the near-point dog type home position return?

The near-point dog type home position return stops using the zero signal after the near-point dog changes from on to off.
The pulse generator (PG) must be of type with the zero signal function.

(2) Actions during the near-point dog type home position return

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

1) The movement occurs in the specified home position return direction at the specified home position return speed.
2) When the near-point dog is turned on, the movement decelerates to the creep speed.
3) The movement stops by the zero signal after the near-point dog changes from on to off. At this time, an "error counter clear output" is output to the drive module.

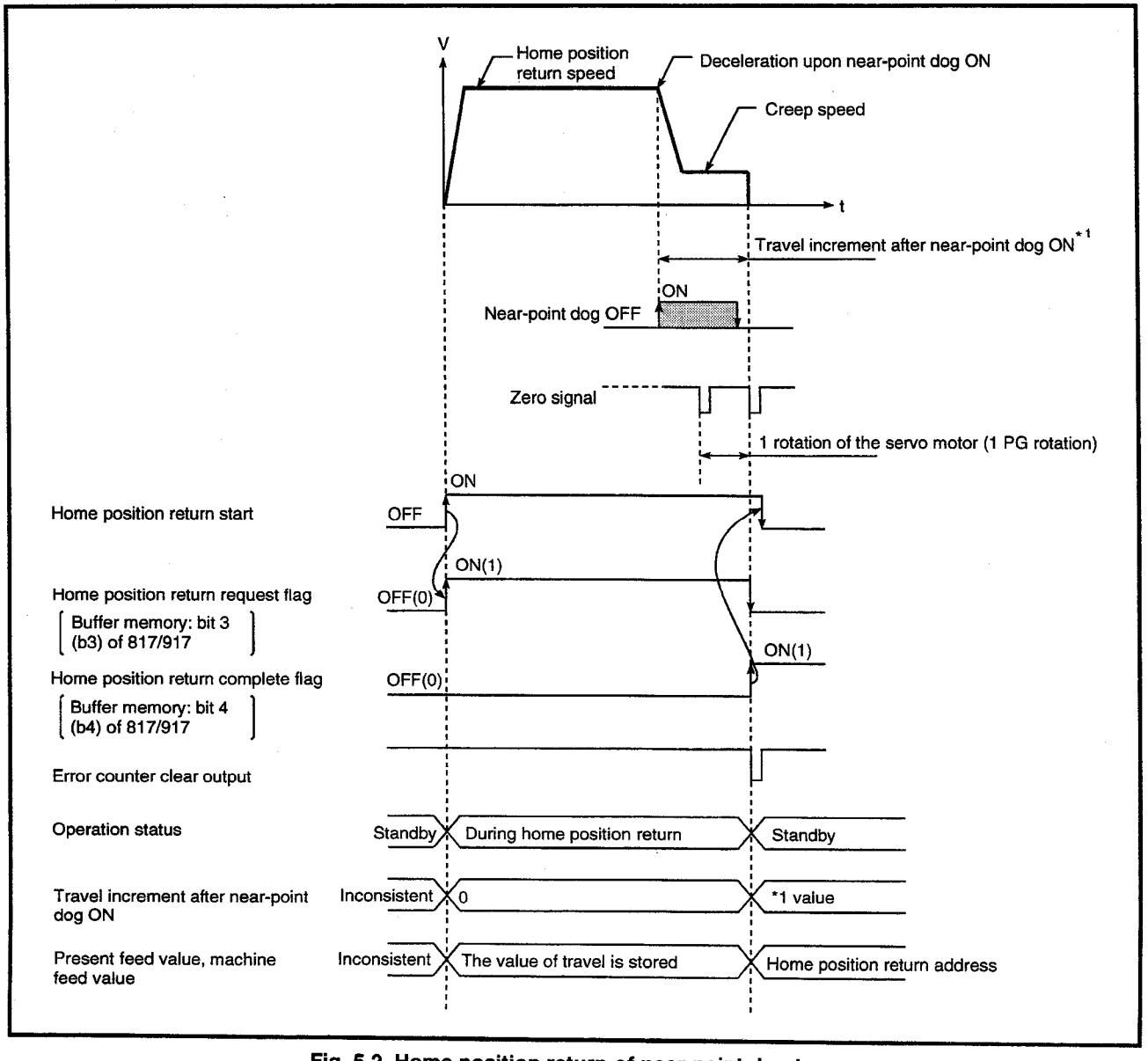


Fig. 5.2 Home position return of near-point dog type

(3) Restrictions

1) Leave the near-point dog on until the speed decelerates to the creep speed from the home position return speed.
If the near-point dog is turned off during deceleration from the home position return speed, deceleration stop occurs.

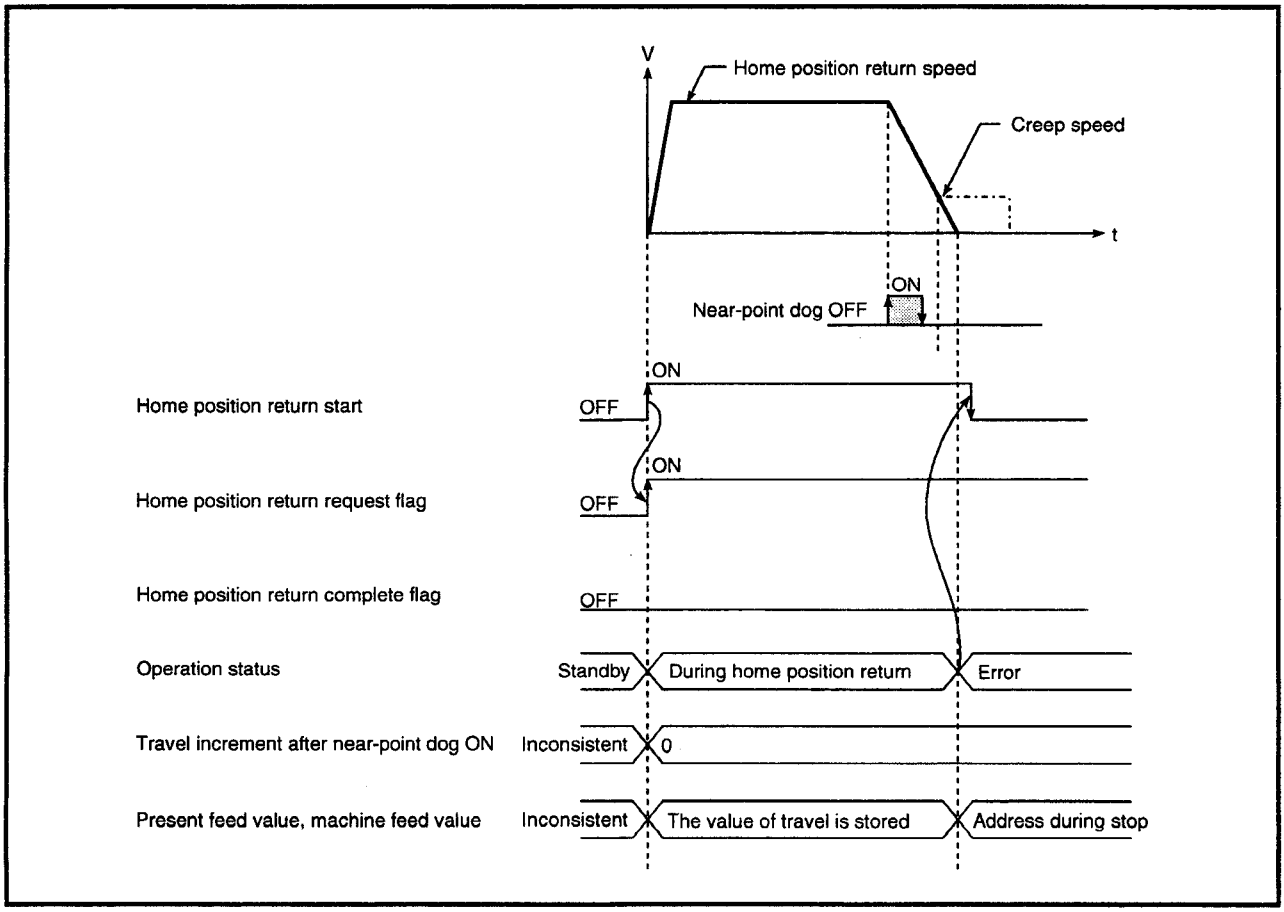


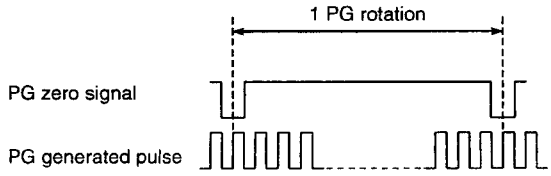
Fig. 5.3 Near-point dog turned off during deceleration from home position return speed

2) When the home position return retry function is disabled and home position return is executed again after a home position return is completed, an error occurs and home position return will not be performed.
In JOG operation, perform home position return after first returning to the position prior to near-point dog ON.

3) Home position return during near-point dog ON starts at the creep speed.

Remark

The zero signal from PG is a signal that generates one pulse per one rotation.



5.5.2 Count-type 1) home position return (using the zero signal)

(1) What is the count-type 1) home position return?

- The count-type 1) home position return is a method that performs stop via the zero signal which is received after the specified distance from near-point dog ON (travel increment after near-point dog).
- The travel increment after near-point dog is set by the home position return parameter.
- The pulse generator (PG) must be of type with the zero signal function.

(2) Actions during the count-type 1) home position return

When the count-type 1) home position return is started, the following actions are performed:

- The movement occurs in the specified home position return direction at the specified home position return speed.
- When the near-point dog is turned on, the movement decelerates to the creep speed.
- The movement stops by the zero signal received after having moved for the specified travel increment from near-point dog ON.
  At this time, an "error counter clear output" is output to the drive module.

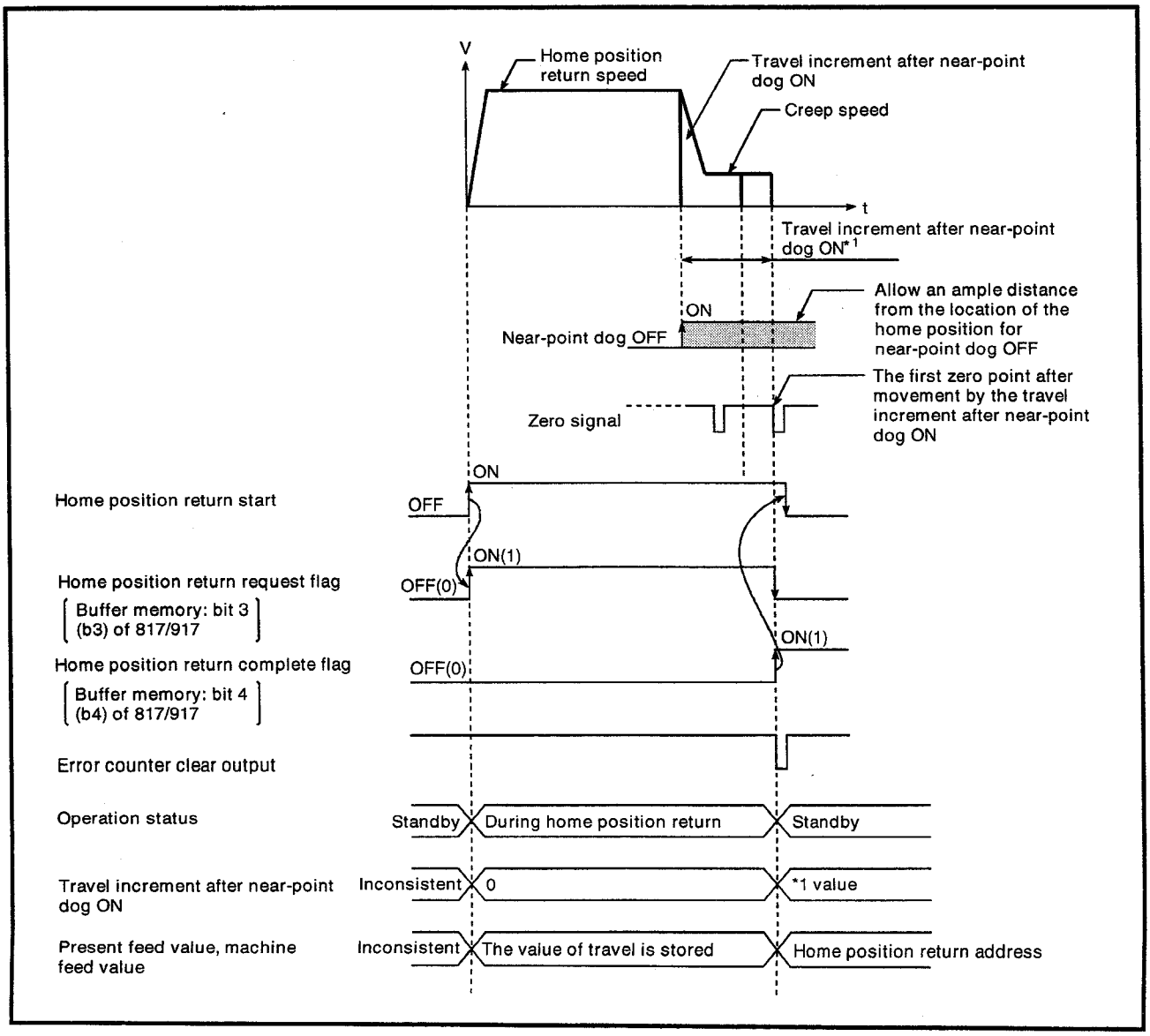
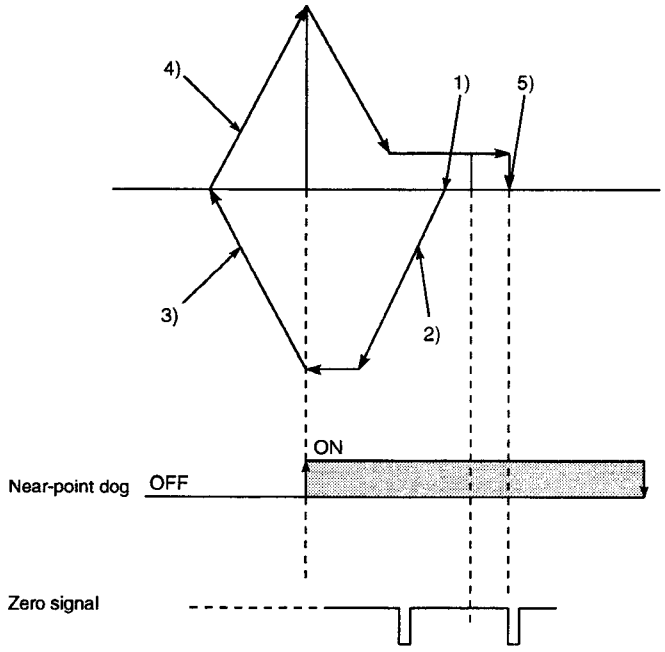


Fig. 5.4 Home position return of count type 1)

(3) Actions at home position return and continuous home position return start along near-point dog ON

With the count-type 1) home position return, home position return during near-point dog ON and continuous home position return start can be performed.
When home position return during near-point dog ON and continuous home position return start are executed, home position return is performed after the axis returns to the position of near-point dog OFF.



[Actions at home position return start along near-point dog ON]

1) Home position return start is executed.
2) The movement occurs at the home position return speed in the direction opposite to the home position return direction.
3) When near-point dog OFF is detected, deceleration processing is executed.
4) After stopping, home position return in the direction of home position return is executed.
5) When the first zero point after movement by the travel increment after near-point dog ON is detected, home position return is complete.

Fig. 5.5 Count-type 1) home position return along the near-point dog

(4) Restrictions

If the travel increment setting after near-point dog is less than the distance of deceleration from the home position return speed, an error occurs and home position return is not performed.
See the example of travel increment setting after near-point dog in the home position return parameters and set a value equal to or greater than the distance of deceleration from the home position return speed.

5.5.3 Count-type 2) home position return (not using the zero signal)

(1) What is the count-type 2) home position return?

- The count-type 2) home position return is a method that uses the point of specified distance after near-point dog ON (travel increment after near-point dog) as the home position.
- The travel increment after near-point dog is set by the home position return parameter. The pulse generator (PG) must be of type with the zero signal function. Unlike other home position return methods, in this method an error of about 1ms, which generates upon near-point dog ON, occurs as a distance error at the home position.

(2) Actions during the count-type 2) home position return

When the count-type 2) home position return is started, the following actions are performed:

- The movement occurs in the specified home position return direction at the specified home position return speed.
- When the near-point dog is turned on, the movement decelerates to the creep speed.
- The movement stops after having moved for the specified travel increment from near-point dog ON.

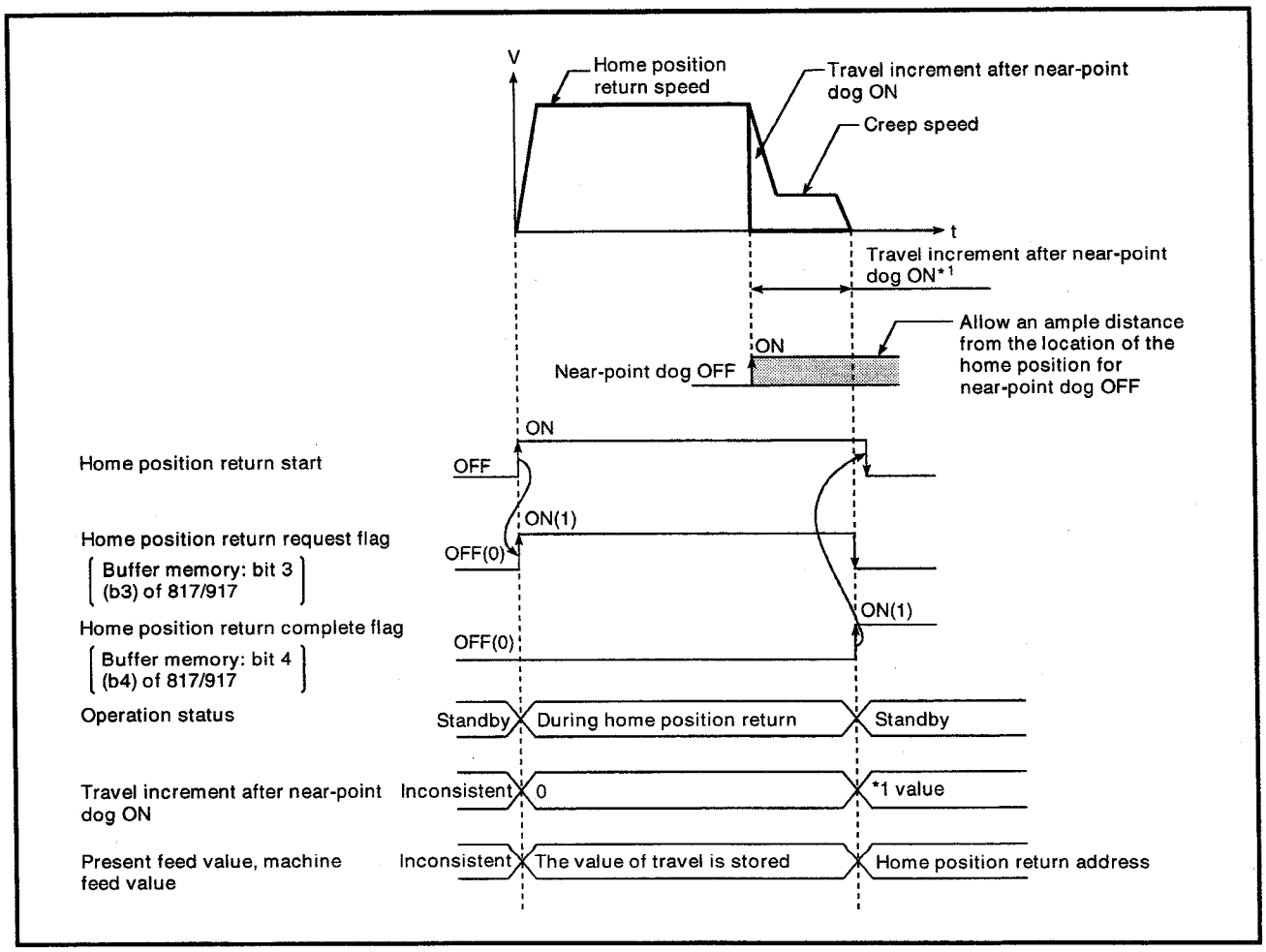
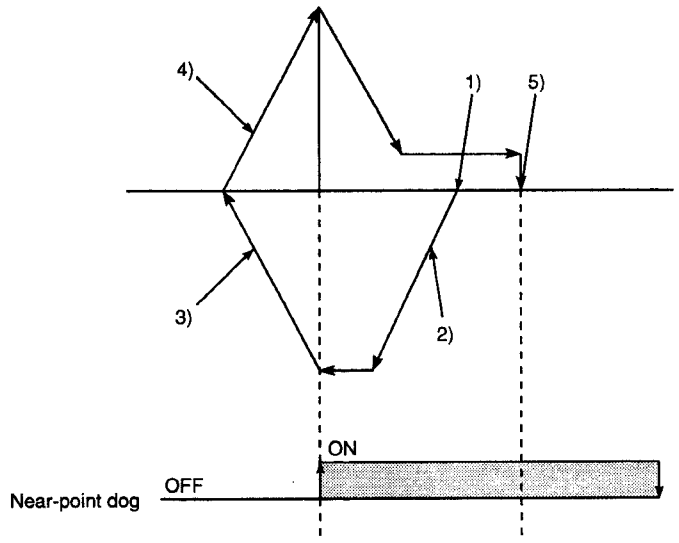


Fig. 5.6 Home position return of count type 2)

(3) Actions at home position return and continuous home position return start along near-point dog ON

With the count-type 2) home position return, home position return during near-point dog ON and continuous home position return start can be performed.
When home position return during near-point dog ON and continuous home position return start are executed, home position return is performed after the axis returns to the position of near-point dog OFF.



[Actions at home position return start along near-point dog ON]

1) Home position return start is executed.
2) The movement occurs at the home position return speed in the direction opposite to the home position return direction.
3) When near-point dog OFF is detected, deceleration processing is executed.
4) After stopping, home position return in the direction of home position return is executed.
5) When the travel increment after near-point dog ON has been moved, home position return is complete.

Fig. 5.7 Count-type 2) home position return along the near-point dog ON

(4) Restrictions

If the travel increment setting after near-point dog ON is less than the distance of deceleration from the home position return speed, an error occurs and home position return is not performed.
See the example of travel increment setting after near-point dog ON in the home position return parameters and set a value equal to or greater than the distance of deceleration from the home position return speed.

Point

Compared to the count-type 1) home position return, the count-type 2) home position return is subject to variations in the stop position at home position return, but it is an effective method in cases where a zero point signal cannot be received by the D75P2.

5.5.4 Stopper stop-type 1) home position return (using time out of dwell time)

(1) What is the stopper stop-type 1) home position return?

After the near-point dog turns ON and the dwell time has elapsed, home position return is complete.
In the stopper stop-type 1), home position return is not completed until the dwell time has elapsed even if the near-point dog turns off in the middle.

(2) Actions during the stopper stop-type 1) home position return

When the stopper stop-type 1) home position return is started, the following actions are performed:

- The movement occurs in the specified home position return direction at the specified home position return speed.
- When the near-point dog is turned on, the movement decelerates to the creep speed.
- The moving point hits the stopper at the creep speed and stops.
- Home position return is completed upon time out of dwell time measured from near-point dog ON.

Important

After the creep speed is reached, it is necessary to perform torque limit to the servo motor.
If torque limit is not performed to the servo motor, there is a risk of damage to the servo motor upon hitting the stopper.

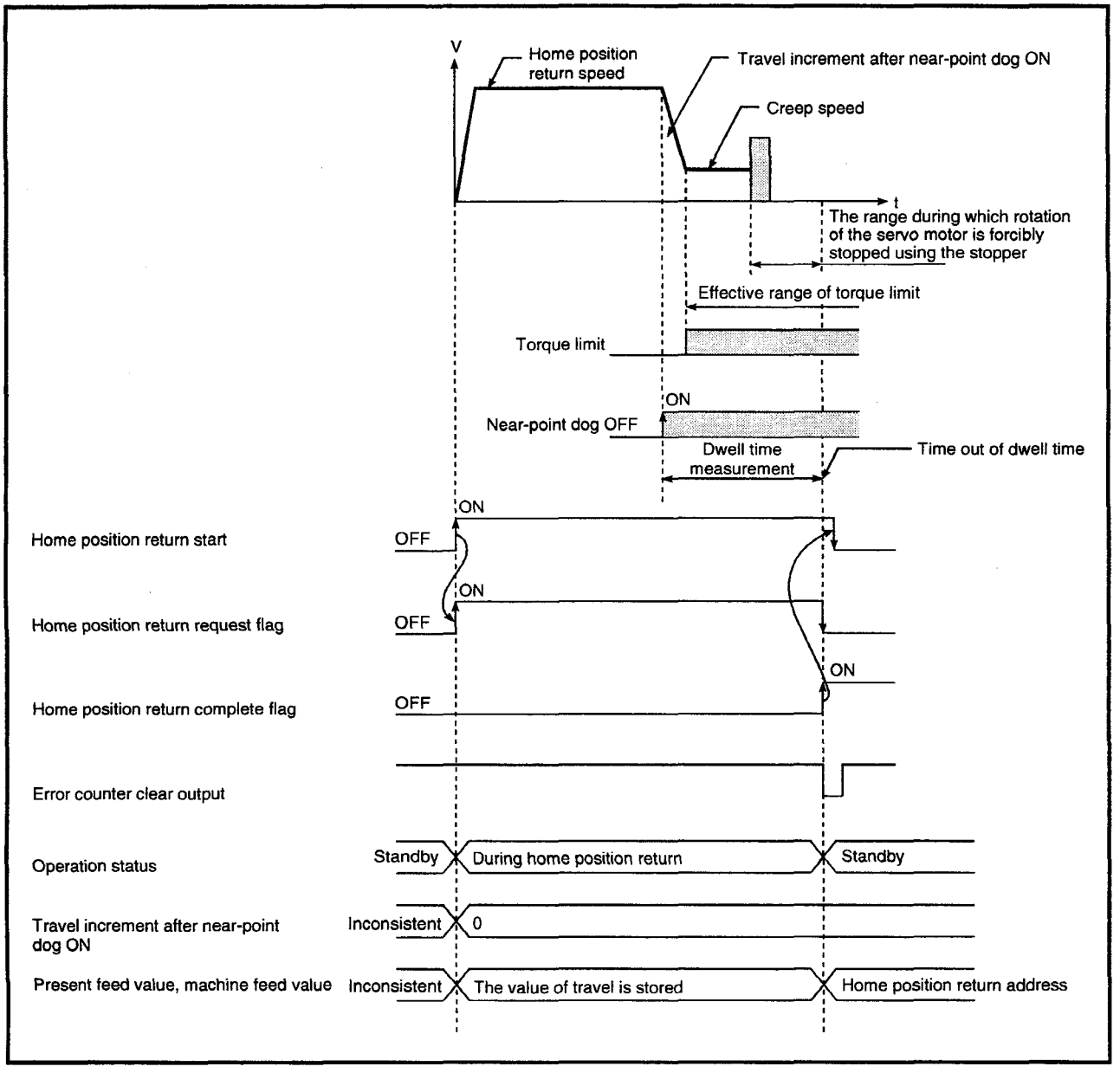


Fig. 5.8 Home position return of stopper stop type 1)

(3) Restrictions

- Set the dwell time equal to or greater than the travel time to the stopper after near-point dog ON. When the dwell time elapses (time out) during decelerating from the home position return speed, deceleration stop occurs.

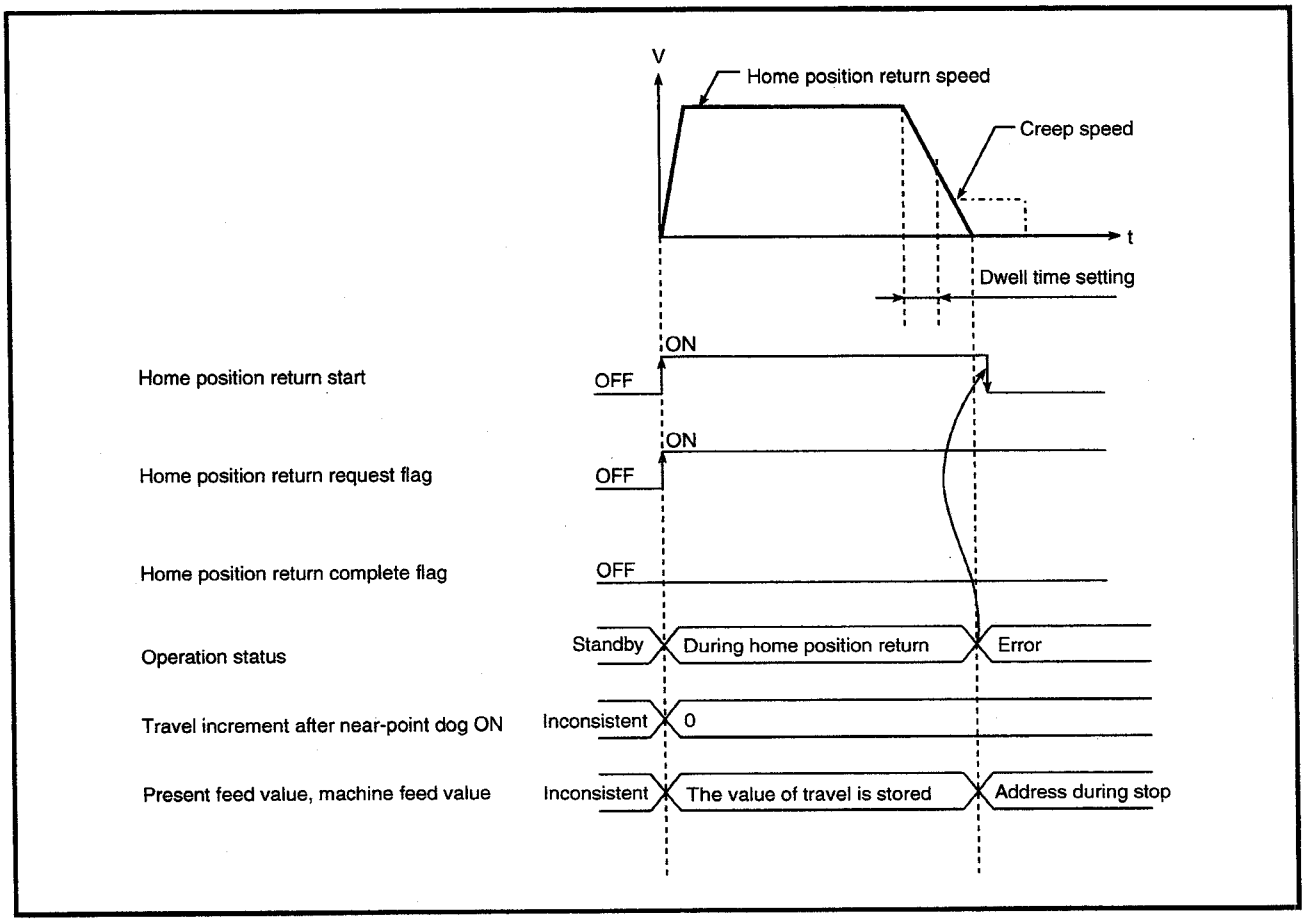


Fig. 5.9 When dwell time elapses during decelerating from home position return speed

- When the dwell time elapses before stopper stop, the movement stops at that moment and the position becomes the home position. Home position return starts at the creep speed during near-point dog ON.

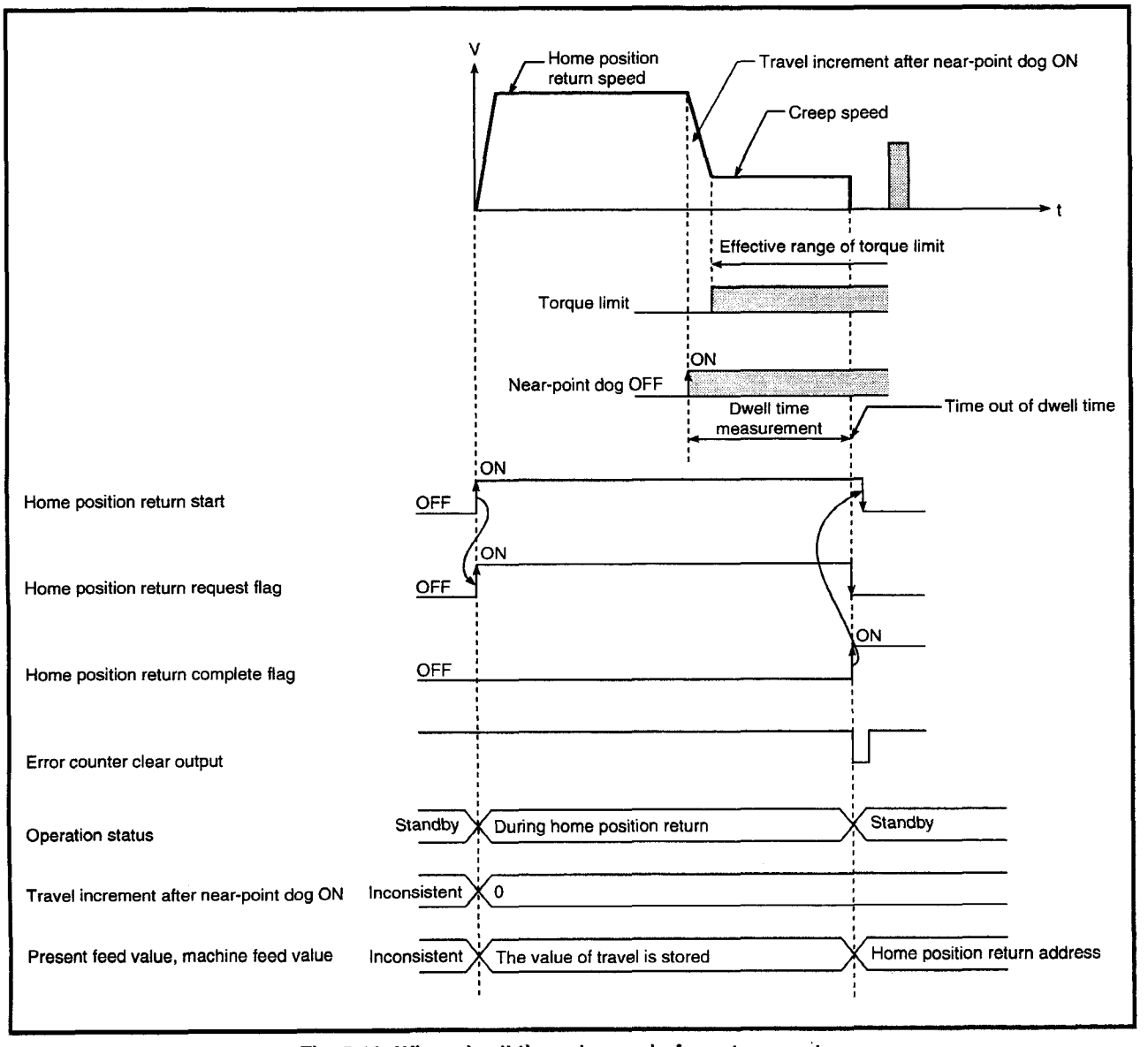


Fig. 5.10 When dwell time elapses before stopper stop

5.5.5 Stopper stop-type 2) home position return (using the zero signal upon hitting the stopper)

(1) What is the stopper stop-type 2) home position return?

In this method, home position return is completed when the zero signal is input to the zero signal terminal using an external switch when the stopper is hit.
When the zero signal is input, it does not matter whether the near-point dog is on or off.

(2) Actions during the stopper stop-type 2) home position return

When the stopper stop-type 2) home position return is started, the following actions are performed:

- The movement occurs in the specified home position return direction at the specified home position return speed.
- When the near-point dog is turned on, the movement decelerates to the creep speed.
- The moving point hits the stopper at the creep speed and stops.
- Home position return is completed when the zero signal is input.

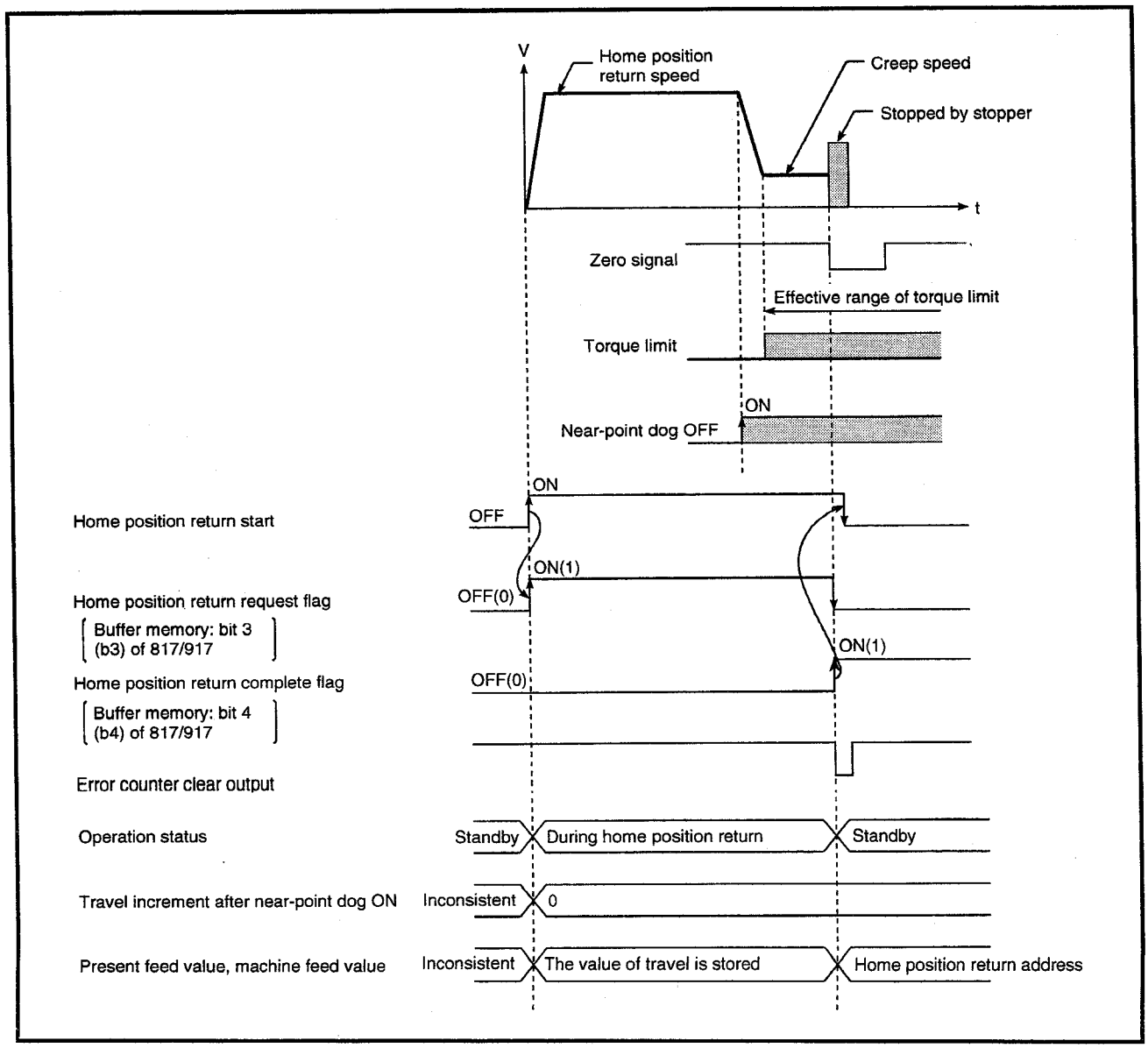


Fig. 5.11 Home position return of stopper stop type 2)

Important

After the creep speed is reached, it is necessary to perform torque limit to the servo motor.
If torque limit is not performed to the servo motor, there is a risk of damage to the servo motor upon hitting the stopper.

(3) Restrictions

- Input the external zero signal after the stopper is hit.
  When the zero signal is input before deceleration to the creep speed is completed, deceleration stop occurs.

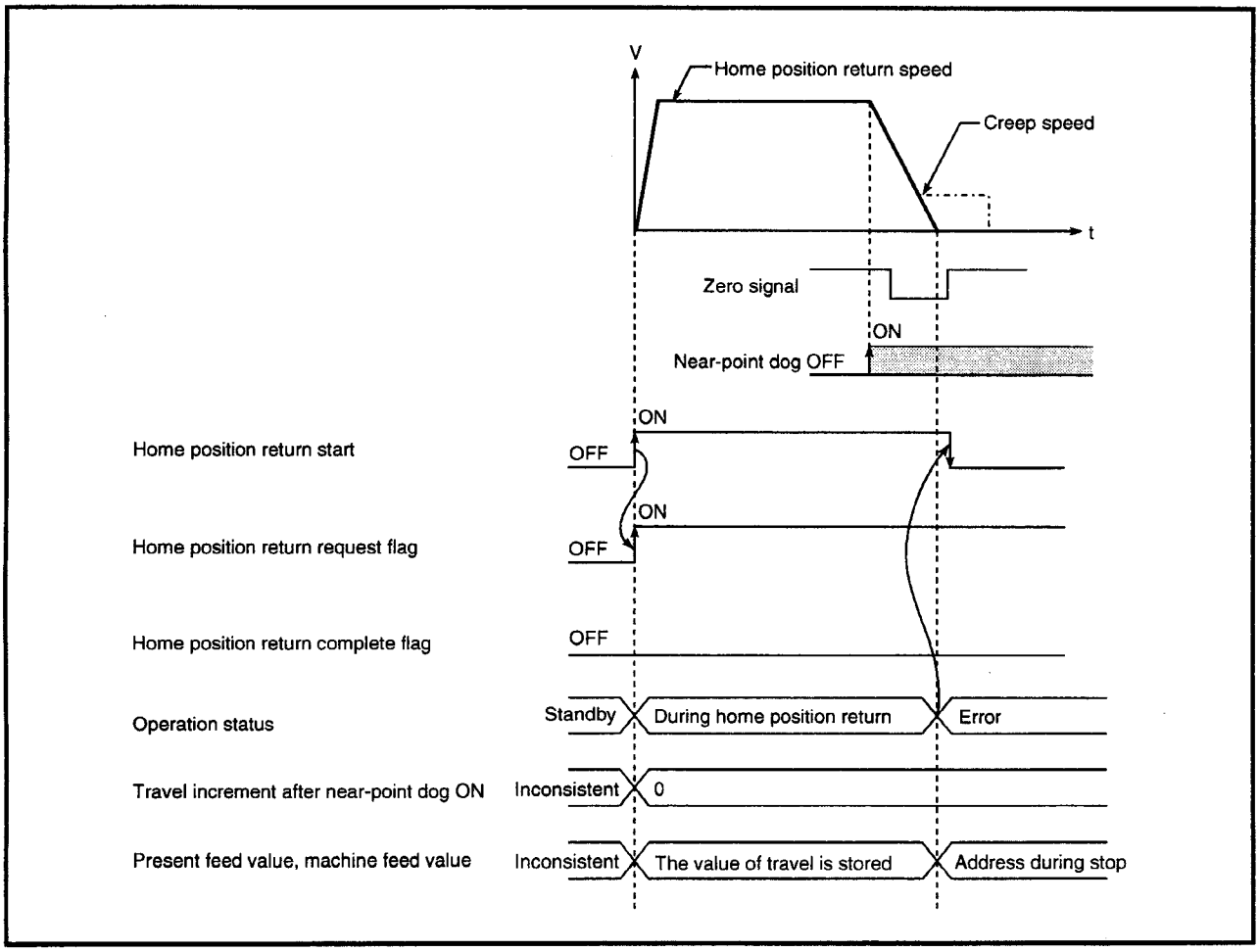


Fig. 5.12 When zero signal is input before creep speed is reached

- When the zero signal is input before stopper stop, the movement stops at that moment and the position becomes the home position. Home position return during near-point dog ON starts at the creep speed.

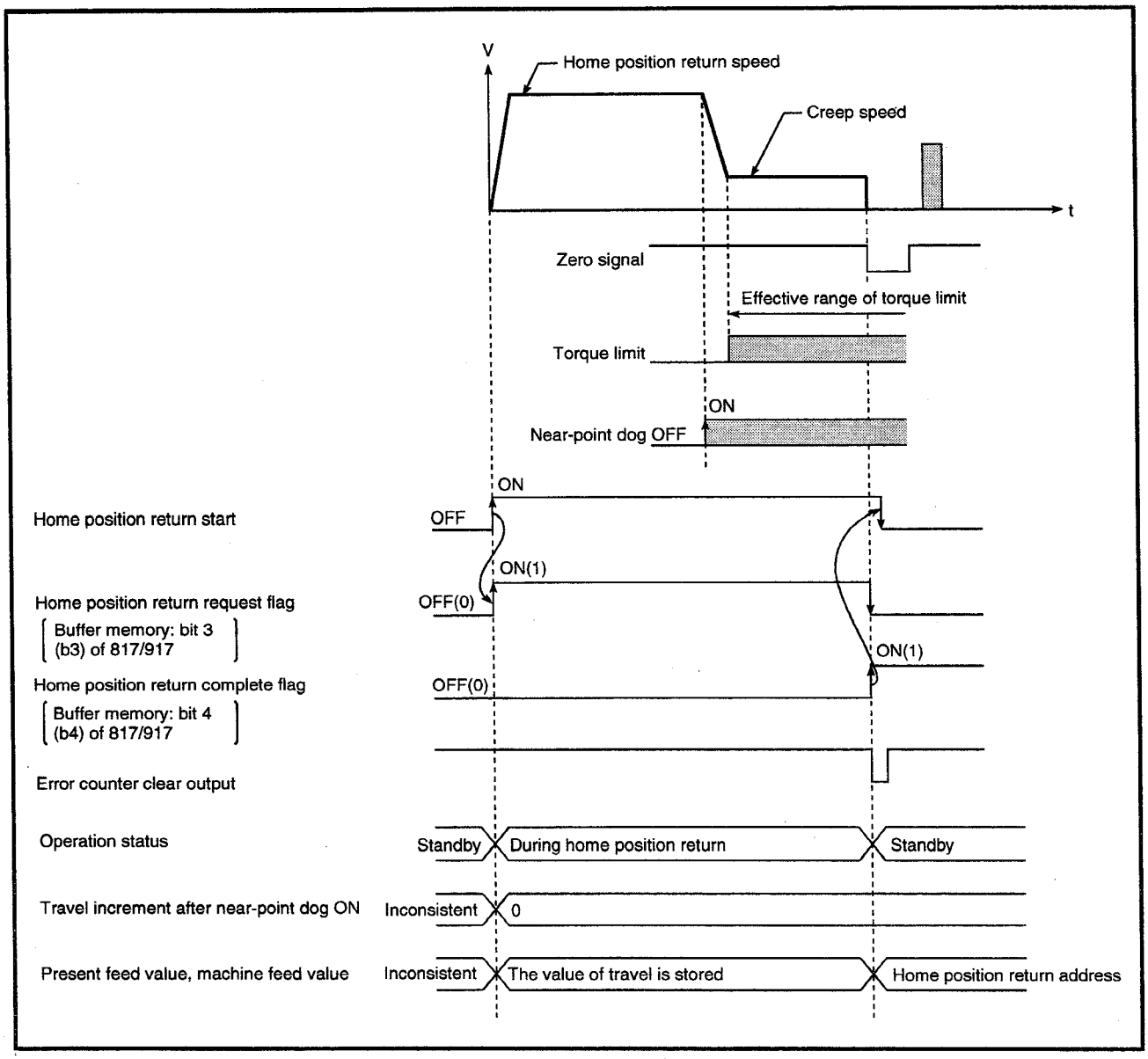


Fig. 5.13 When dwell time elapses before stopper stop

5.5.6 Stopper stop-type 3) home position return (no near-point dog method)

(1) What is the stopper stop-type 3) home position return?

In this method, home position return starts at the creep speed and is completed when the zero signal is input to the zero signal terminal using an external switch when the stopper is hit.

(2) Actions during the stopper stop-type 3) home position return

When the stopper stop-type 3) home position return is started, the following actions are performed:

- The movement occurs in the specified home position return direction at the specified creep speed.
- The moving point hits the stopper at the creep speed and stops.
- Home position return is completed when the zero signal is input.

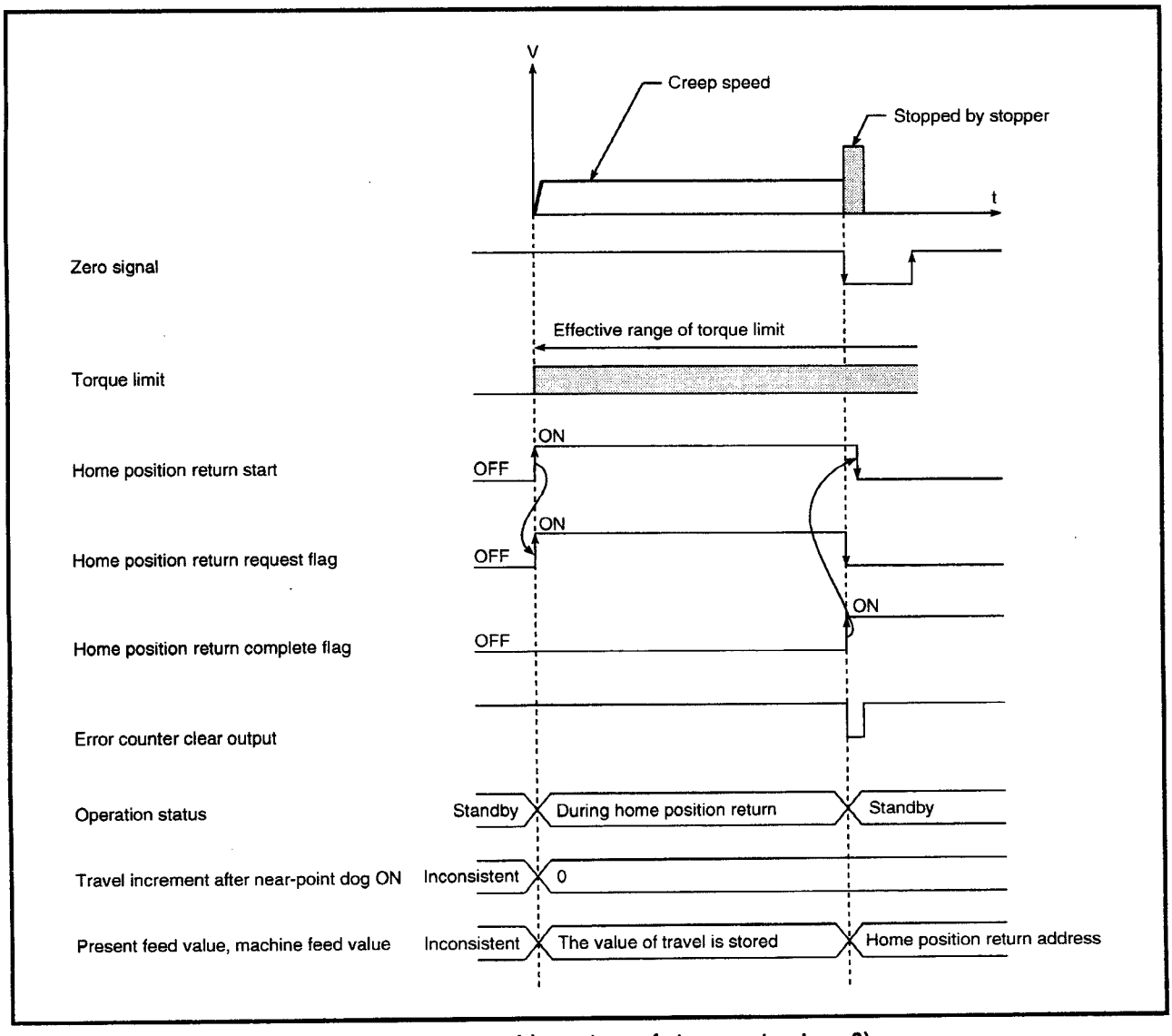


Fig. 5.14 Home position return of stopper stop type 3)

Important

It is necessary to perform torque limit to the servo motor.

If torque limit is not performed to the servo motor, there is a risk of damage to the servo motor upon hitting the stopper.

(3) Restrictions

- When the zero signal is input before stopper stop, the movement stops at that moment and the position becomes the home position.
- With the stopper stop-type 3) home position return, the home position return retry function cannot be used.
- When the limit switch is turned off, deceleration stop occurs.

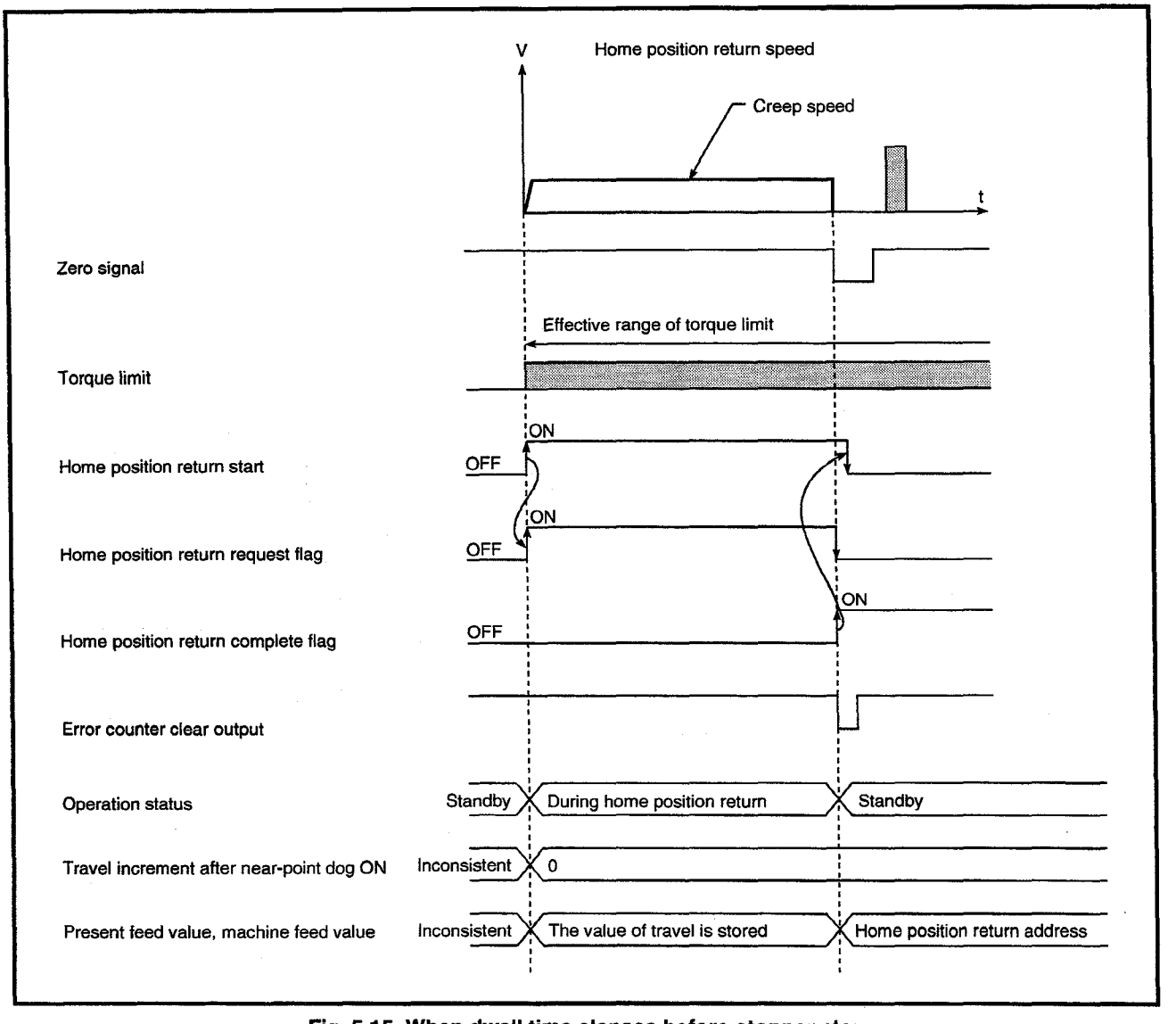


Fig. 5.15 When dwell time elapses before stopper stop

Point

In the stopper stop-type 3) home position return, it takes time to complete home position return because the creep speed is used from the start, but it is an effective method when the near-point dog cannot be used.

5.5.7 Data-set type home position return

The data-set type home position return starts with start number "9901." See Section 5.4.5 for details.

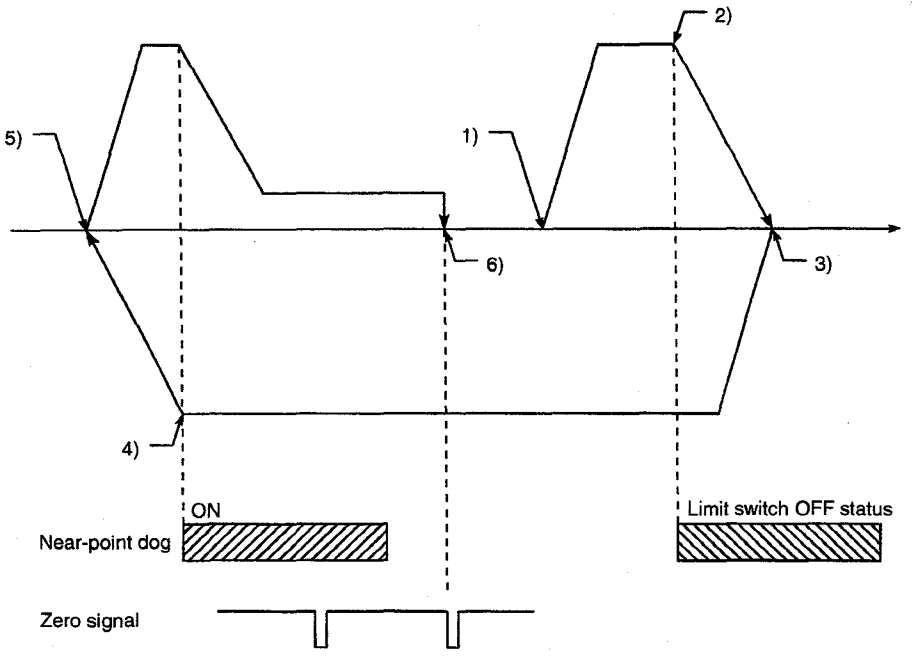
5.6 Home Position Return Retry Function

5.6.1 What is the home position return retry function?

During home position return, this function retries home position return using the high/low limit switch connected to the D75P2.
Home position return is possible during JOG operation, etc., without returning to the position before the near-point dog.

5.6.2 Actions of the home position return retry function

(1) When the home position return retry function is enabled and home position return start is executed, movement in the home position return direction occurs. If the high/low limit switch is turned off before the near-point dog is detected, the movement decelerates to a stop, then resumes in the direction opposite to the home position return direction.
If the near-point dog OFF is detected during movement in the opposite direction, the movement decelerates to a stop and home position return is performed.



[Actions of the home position return retry function]

1) Movement in the home position return direction is started upon home position return start.
2) The movement decelerates upon detection of the limit switch.
3) The movement stops upon limit switch detection, then moves in the direction opposite to the home position return direction at the home position return speed.
4) The movement decelerates when the near-point dog turns off.
5) The movement stops when the near-point dog turns off, and home position return is performed in the home position return direction.

Fig. 5.16 Home position return retry using high/low limit switch

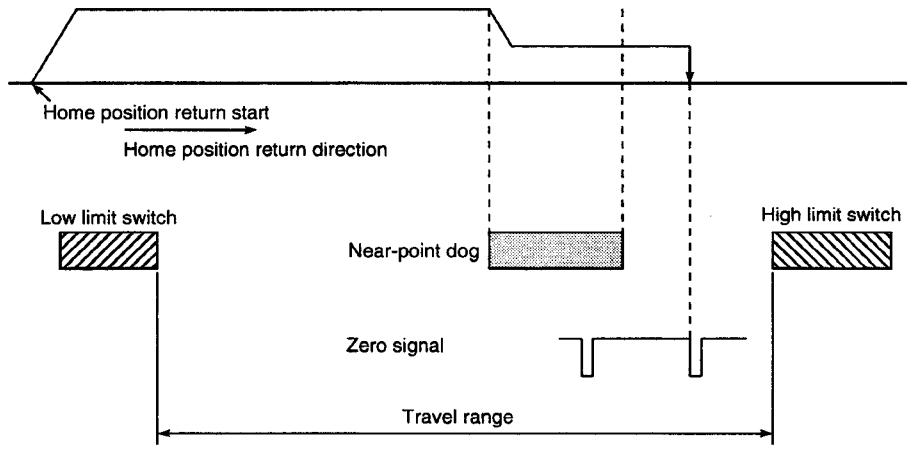
Point

Even if the home position return retry function is disabled, be sure to wire the high/low limit switch for the D75P2.
If the high/low limit switch for the D75P2 is not wired, JOG operation, home position return and positioning control cannot be performed using the D75P2.

(2) Even if the high/low limit switch is in an off status, home position return can be performed as long as the home position return retry function is enabled.

- When the direction into the travel range is same as the home position return direction, normal home position return is performed.
- When the direction into the travel range differs from the home position return direction, home position return is performed in the home position return direction after deceleration stop upon near-point dog OFF.

(1) Action when the direction into the travel range is same as the home position return direction



(2) Action when the direction into the travel range differs from the home position return direction

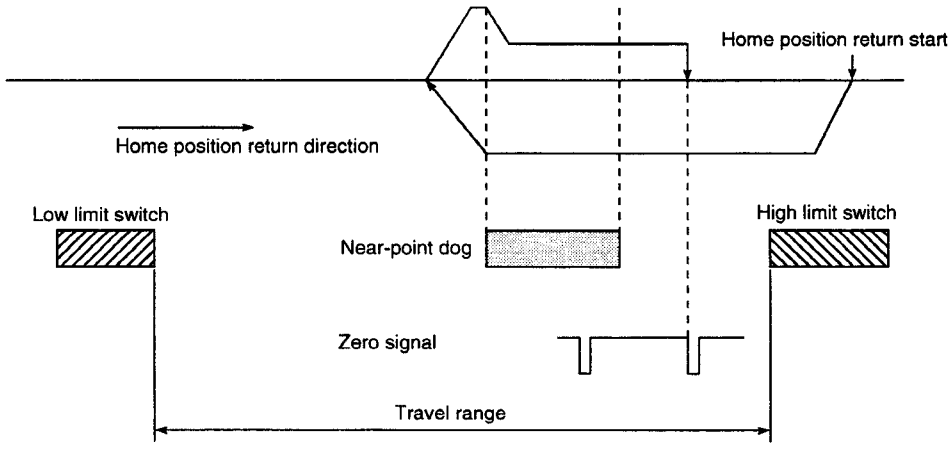


Fig. 5.17 Home position return retry function with high/low limit switch in off status

5.6.3 Home position return methods and execution of the home position return retry function

Home position return method	Execution of the home position return retry function
Near-point dog type	O
Count type 1)	O
Count type 2)	O
Stopper stop 1)	O*
Stopper stop 2)	
Stopper stop 3)	×
Data-set type	×

O : Executable
× : Not executable

* : Home position return retry may not be performed depending on the mechanical stopper.

5.6.4 Conditions when executing the home position return retry function

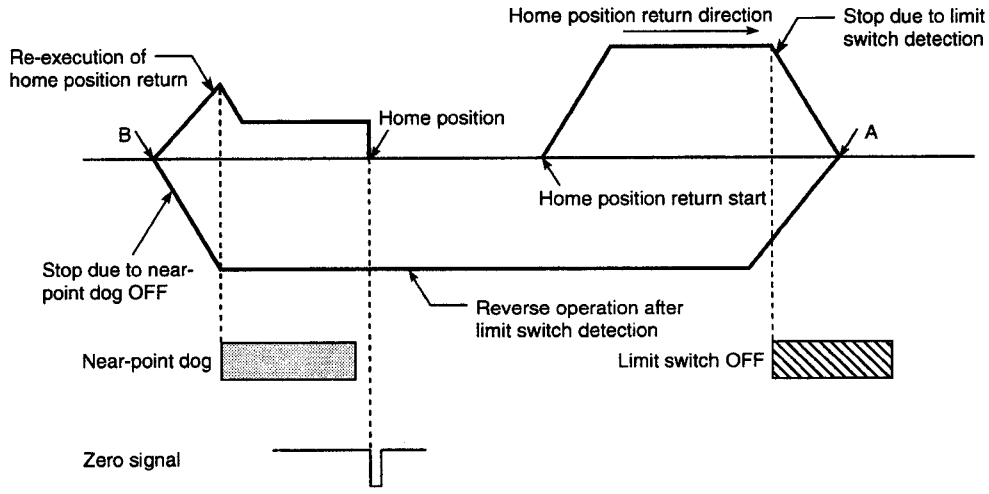
(1) Always install limit switches to be connected to the D75P2 at the high/low limit positions of the machine. When the home position return retry function is enabled and home position return start is executed, either home position return is completed or the motor keeps rotating until a limit switch connected to the D75P2 is detected.

(2) Do not make it impossible to continue the operation by turning off the power for the drive module using the high/low limit switch connected to the D75P2, etc.

5.6.5 Dwell time setting at home position retry

(1) At the time of home position return retry, dwell time can be set for reverse operation due to detection of high/low limit switches and for home position return execution after stop following near-point dog OFF.

(2) The dwell time set at home position retry becomes valid when the movement stops at position "A" or "B" shown in the figure below. (The same value is used for dwell time at positions A and B.)



(3) The dwell time for home position return retry is set in the buffer memory shown below.

(4) The dwell time written to the buffer memory below becomes valid when the remote station ready signal rises (off → on).

Buffer memory		Item	Setting range	Initial value
Axis 1	Axis 2			
89	239	home position return retry dwell time	0 to 65535 ms *	0

Remark

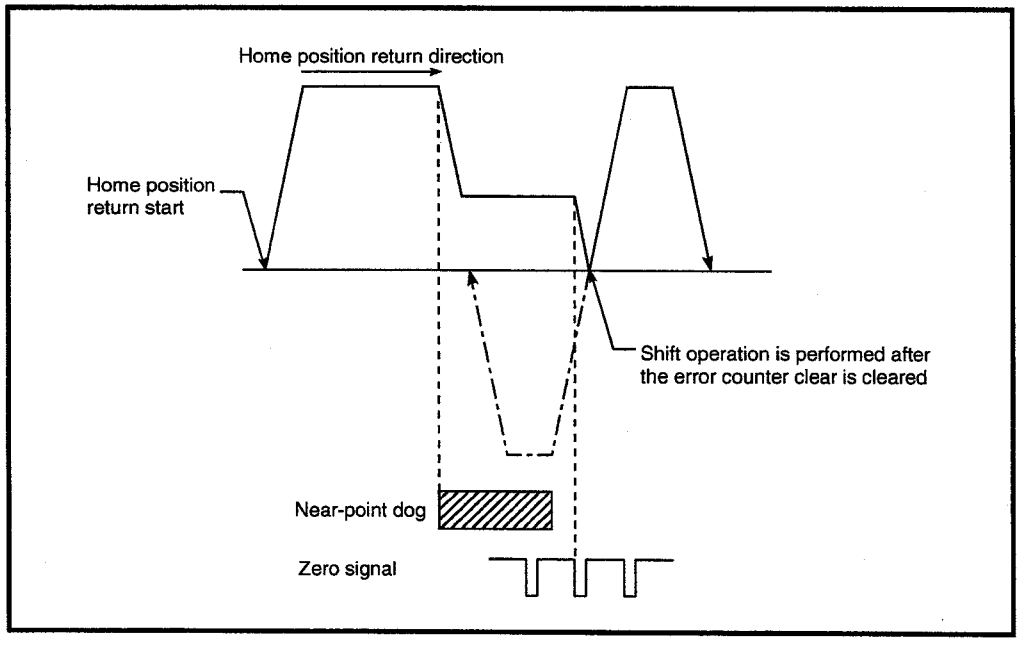
*: For a value of 32768 ms or greater, convert it to a hexadecimal value and set the converted value.
Example) For 32768 and 65534, set the following data:
- 32768: H8000
- 65534: HFFFE

5.7 Home Position Shift Function

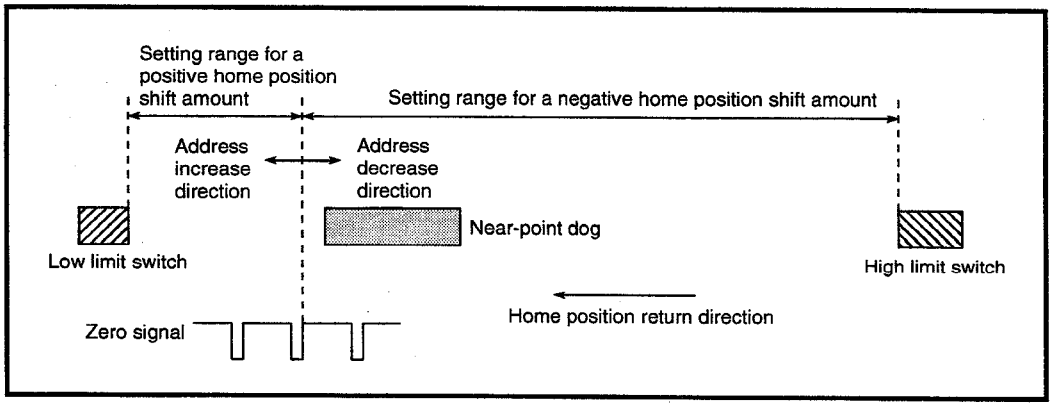
5.7.1 What is the home position shift function?

(1) The home position shift function is used to adjust the location of the home position at which the mechanical home position return has been stopped.
Using the home position shift function, the location of the home position can be shifted between a zero point and a zero point or to a position away from the detected zero point.

- When the home position shift amount is positive : Shift operation is executed in the address increase direction.
- When the home position shift amount is negative : Shift operation is executed in the address decrease direction.



(2) Set the home position shift amount within the range to the high/low limit switches from the detected zero signal.



(3) The following data should be set after shift operation is executed using the home position shift function:
- Home position return request flag
- Home position return complete flag
- Axis operation status
- Travel increment after near-point dog ON
- Present feed value
- Machine feed value

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

(5) With the home position shift function, shift operation is performed at the home position return speed regardless of the home position return method used.

(6) When the present feed value overflows or underflows, positioning to the home position will not be performed correctly even if the high-speed mechanical home position return is executed.

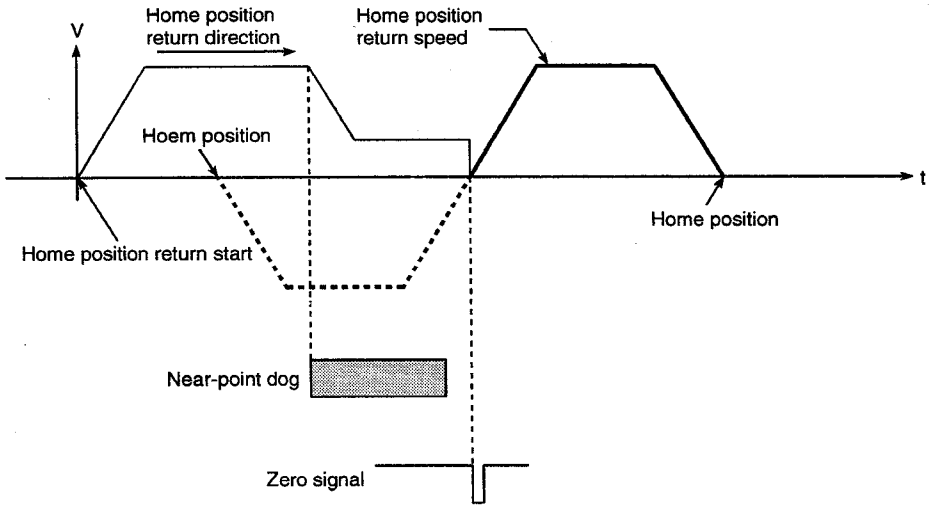
(7) If the location of the absolute home position is in the status of overflow or underflow, positioning to the home position will not be performed correctly even if the high-speed home position return is executed.

5.7.2 Specifying speed during home position shift

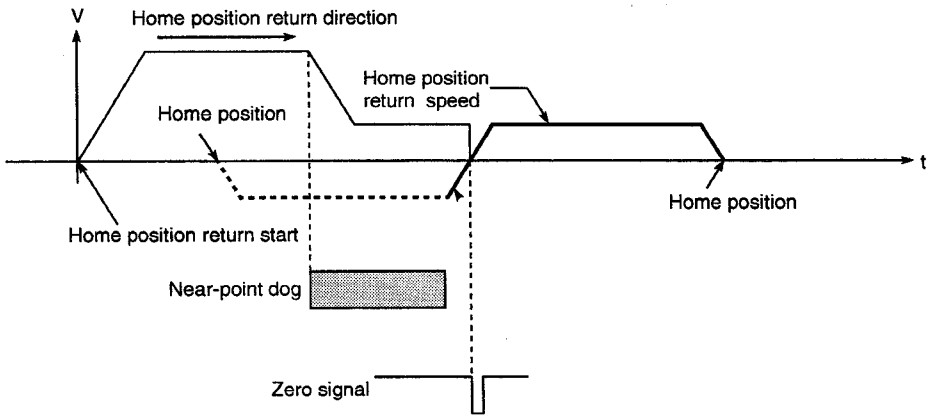
(1) With the D75P2, either "home position return speed" or "creep speed" can be selected as the operation speed during home position shift.

Example The figure below shows the home position shift operation when the near-point dog type home position return is executed.

[Home position shift operation at the home position return speed]



[Home position shift operation at the creep speed]



(2) The speed specification during home position shift is set in the buffer memory shown below.

(3) When using the creep speed as the operation speed during home position shift, write "1: creep speed" in the buffer memory shown below.

(4) The operation speed written to the buffer memory below becomes valid when the remote station ready signal rises (off → on).

Buffer memory		Item	Setting range	Initial value
Axis 1	Axis 2			
88	238	Speed specification during home position shift	Select the home position return speed or creep speed for the operation speed during home position shift. • 0: home position return speed • 1: creep speed	0

5.8 Home Position Return Request Flag OFF Request

The home position return request flag OFF request is a function that forcibly switches the status of home position return request flag on to off in a system that does not require home position return.

5.9 Combining Home Position Return with Other Functions

5.9.1 Home position return start after home position return operation stops

Home position return starts again if a positioning start is input while the movement is stopped due to an external stop signal or axis stop during home position return.
However, when the home position return retry function is not enabled, an error may occur depending on the stop position.
When executing restart after a stop during home position return, execute positioning start after moving the point from the stopped position by enabling the home position return retry function or by using JOG operation or manual pulse-generator operation.

5.9.2 Changing the speed during home position return

The speed cannot be changed once the creep speed has been reached.

6. Positioning Function

This chapter describes the following items in the positioning function, which is the primary function of the D75P2.

Positioning control methods ····· Describes methods of control, interpolation control, etc.
Operation pattern of positioning control ····· Describes the operation pattern.
Starting the positioning control ····· Describes start methods, special starts, etc.
Stopping the positioning control ····· Describes the stop command, stop factors, etc.
Restarting the positioning control ····· Describes the restarting.

* When executing various functions described in this chapter, it may be necessary to write (via transient transmission) to the D75P2 buffer memory. See the master module manual and Section 12.4 for details on the transient method.

6.1 Positioning Control Methods

In order to perform positioning control, data must be set on each axis at the positioning data address (600/axis). The setting items for positioning data include the ones listed below, and the setting is performed via the "edit positioning data" in the "edit mode" of a peripheral device. The "control method" is one of these setting items for positioning data, and specifies what kind of positioning control is executed (read Chapter 11 for the other setting items).

Setting item	(Setting item name on the peripheral device)
Operation pattern	Pattern
Control method	Control method
Acceleration time number	Acceleration
Deceleration time number	Deceleration
Positioning address/travel increment	Address
Circular address	Circular address
Command speed	Command speed
Dwell time	Dwell time
M code	M code

6.1.1 Control method

There are following types of control methods.

Positioning control name	Control method	Control overview	Reference section
1) Single-axis linear control	Single-axis linear control (ABS)	This performs positioning from the current stop position (starting-point address) defined on the specified axis to the specified position (positioning address/travel increment) *1 on the same axis.	[6.1.3]
	Single-axis linear control (INC)		
2) Dual-axis linear interpolation control *2	Dual-axis linear interpolation control (ABS)	This performs interpolation control along linear locus from the current stop position (starting-point address) defined by two axes to the specified position (positioning address/travel increment) *1.	[6.1.4]
	Dual-axis linear interpolation control (INC)		
3) Fixed-dimension feed control	Single-axis fixed-dimension feed control (fixed-dimension feed 1)	This performs positioning for the specified travel increment from the current stop position (starting-point address) defined on the specified axis.	[6.1.5]
	Dual-axis fixed-dimension feed control (fixed-dimension feed 2)	This performs interpolation control along a linear locus for the specified travel increment from the current stop position (starting-point address) defined by two axes.	
4) Circular interpolation control *2	Circular interpolation control with a specified auxiliary point (ABS)	This performs interpolation control from the current stop position (starting-point address) defined by two axes to the specified position (positioning address/travel increment) *1 along a circular locus that passes through the specified point.	[6.1.6]
	Circular interpolation control with a specified auxiliary point (INC)		
	Circular interpolation control with the specified center point (ABS, clockwise)	This performs interpolation control from the current stop position (starting-point address) defined by two axes to the specified position (positioning address/travel increment) *1 along a circular locus whose center point is the specified point.	[6.1.7]
	Circular interpolation control with the specified center point (ABS, counter-clockwise)		
	Circular interpolation control with the specified center point (INC, clockwise)		
	Circular interpolation control with the specified center point (INC, counter-clockwise)		
5) Speed control	Speed control (forward)	This executes the acceleration set toward the specified direction of an axis, and continues running at the set speed until the stop command is input.	[6.1.8]
	Speed control (reverse)		
6) Speed/position switch control	Speed/position switch control (forward)	This performs speed control with respect to the specified axis, and performs positioning for the specified travel increment from the moment a speed/position switch signal is input.	[6.1.9]
	Speed/position switch control (reverse)		
7) Present value change	Present value change	This changes the present feed value to the specified value.	[7.5.2]
8) JUMP instruction	JUMP instruction	This executes a jump to the specified positioning data number during continuous locus control or continuous operation.	[6.1.10]

ABS: Absolute system
INC: Increment system

Remark

*1: For absolute system ····· "Positioning address" is specified.
For increment system ···· "Travel increment" is specified.

*2: Interpolation control ····· This defines each of the two axes as the reference and interpolation axes, and performs positioning while controlling the interpolation axis along with the movement of the reference axis or the set value (see Section 6.1.2).

6.1.2 Interpolation control

(1) Dual-axis are used for interpolation control.
With the D75P2, the dual-axis performing interpolation are classified into the reference axis and the interpolation axis.

Reference axis	Axis 1
Interpolation axis	Axis 2

(2) The control method for interpolation is set in the positioning data for the reference axis.
The start of positioning is executed only on the reference axis side.

(3) For data items such as positioning identifier for interpolation, M code, dwell time, command speed and parameters, the data set on the reference axis is used.
For the positioning address and circular data, however, the data set for the same positioning-data number of each axis is used.

(4) When performing interpolation under continuous positioning control or continuous locus control, interpolate all data starting with the first positioning data number since the beginning of interpolation, until the positioning data number for (operation pattern: 00).
If the positioning data set via block start for each point of the positioning start data is specified as "interpolation," set the points so that all of them are interpolated.
If the above is not true, the D75P2 may malfunction.

(5) There are two types of specification methods (interpolation modes) to specify the interpolation speed: the synthesized speed (default) and the reference-axis speed.
These include ones that can be applicable only to linear interpolation control, or that cannot be specified if the unit groups of the axes are different.
The axis operation status of the interpolation axis becomes "during interpolation" during the interpolation operation, and returns to "standby" when the interpolation operation is completed. If an error occurs during interpolation operation, both of the two axes decelerate and stop, then their statuses become "error."

(a) Unit groups of an axis are classified as follows:

Unit group	Unit
Group 1	mm, inch
Group 2	degree
Group 3	PULS(PLS)

(b) Whether or not the interpolation operation is executable is as follows:

Interpolation	Speed specification	Unit groups match	Unit groups mismatch
Linear interpolation	Synthesized speed	Executable	Not executable
	Reference-axis speed	Executable	Executable
Circular interpolation	Synthesized speed	Executable	Not executable
	Reference-axis speed	Not executable	Not executable

1) mm and inch can be mixed, and are considered the same group.

2) Circular interpolation cannot be performed if the unit is degree.
If the circular interpolation is set as the control method when the unit is degree, a "control method setting error (error code: 524)" is generated and positioning will not start.
If this happens during positioning control, the operation stops immediately.

(c) Speed unit used when the units vary
When performing the interpolation operation in a condition in which mm and inch are mixed, or when performing reference-axis-mode interpolation while the unit groups mismatch, the monitored speed will be as follows:

Monitored speed	Subject axis for display	Speed unit
Synthesized speed (linear interpolation, circular interpolation) (mixture of mm and inch)	Axis 1	Unit set for axis 1
Reference-axis speed (linear interpolation) (mixture of any units)	Axis 1	Unit set for axis 1

Remark

See Section 10.2.9, for the synthesized speed and reference-axis speed.

6.1.3 Single-axis linear control

This performs positioning from the current stop position (starting-point address) defined on the specified axis to another specified position (positioning address/travel increment) on the same axis.

(1) Single-axis linear control (absolute system)

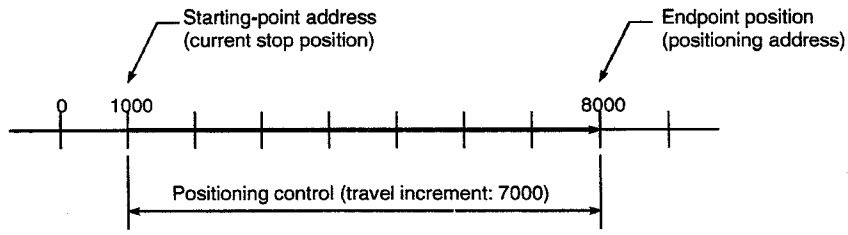
(a) This performs positioning from the starting-point address (current stop position) to the endpoint address (positioning address).
Positioning control is executed based on the address (home position address) specified by home position return.

(b) The starting-point address (current stop position) and the endpoint address (positioning address) determine the direction of travel.

- Starting-point address < endpoint address: positioning in the positive direction
- Starting-point address > endpoint address: positioning in the negative direction

Example

If the starting-point address (current stop position) is 1000 and the endpoint address (positioning address) is 8000, positioning is performed with a travel increment of 7000 (8000 - 1000) in the positive direction.



(c) Setting example of positioning data *1
Positioning data is set for positioning data number 1 of axis 1 under the conditions shown below.

Item		Positioning control	Peripheral device setting data
Positioning identifier	Operation pattern	End of positioning	End
	Control method	ABS line 1	ABS line 1
	Acceleration time selection	Acceleration time 1	1
	Deceleration time selection	Deceleration time 0	0
Positioning address/travel increment *2		80000.0 μm	80000.0
Circular address		Setting not necessary	—
Command speed		6000.00 mm (236.2 in.)/min.	6000.00
Dwell time		500 ms	500
M code		10	10

* "—": No relationship with the control. The initial value or any other value can be used.

Remark

*1: See Section 11.2 for details on the positioning data.
*2: With the absolute system, the positioning address is set.

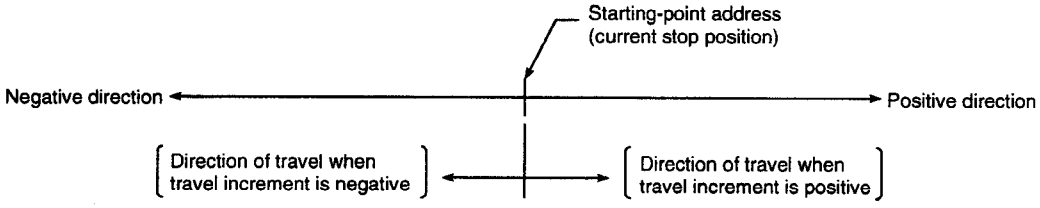
(2) Single-axis linear control (increment system)

(a) This performs positioning for the specified travel increment from the starting-point address (current stop position).

(b) The sign of the travel increment determines the direction of travel.

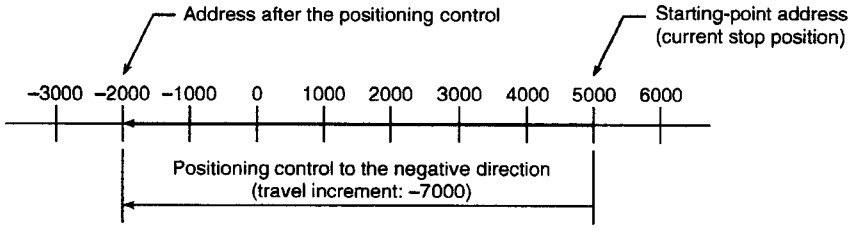
1) For positive travel increment ····· Positioning in the positive direction (direction of address increase)

2) For negative travel increment ····· Positioning in the negative direction (direction of address decrease)



Example

If the starting-point address is 5000 and travel increment is –7000, positioning is performed to the position of –2000.



(c) Setting example of positioning data *1

Positioning data is set for positioning data number 1 of axis 1 under the conditions shown below.

Item		Positioning control	Peripheral device setting data
Positioning identifier	Operation pattern	End of positioning	End
	Control method	INC line 1	INC line 1
	Acceleration time selection	Acceleration time 1	1
	Deceleration time selection	Deceleration time 0	0
Circular address		Setting not necessary	—
Positioning address/travel increment *2		–70000.0 μm	–70000.0
Command speed		6000.00 mm (236.2 in.) /min.	6000.00
Dwell time		500 ms	500
M code		10	10

* "—": No relationship with the control. The initial value or any other value can be used.

Remark

*1: See Section 11.2 for details on the positioning data.
*2: With the increment system, the travel increment is set.

6.1.4 Dual-axis linear interpolation control

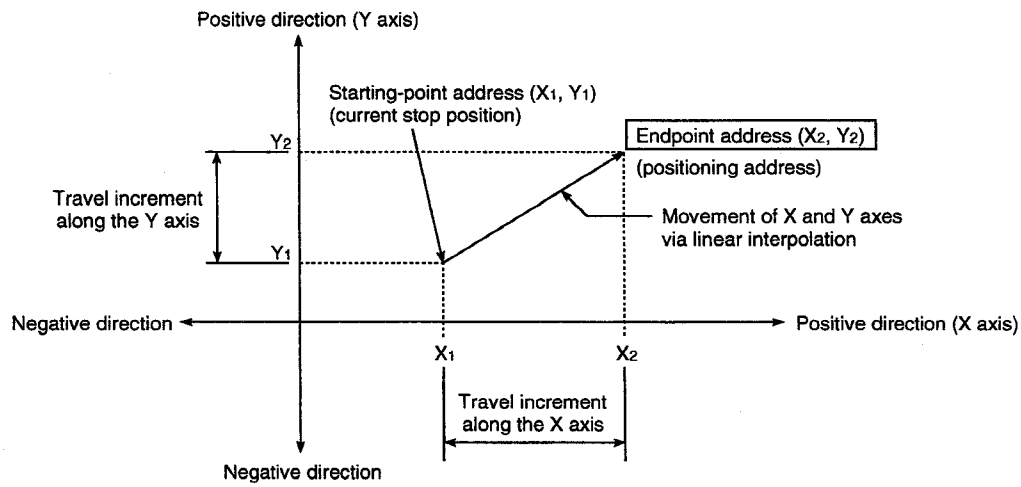
This controls interpolation along a linear locus from the current stop position (starting-point address) defined by two axes, to the specified position (positioning address/travel increment).

(1) Dual-axis linear interpolation control (absolute system)

(a) This performs linear-interpolation positioning using two axis from the starting-point address (current stop position) to the endpoint address (positioning address).
Positioning control is executed based on the address specified by home position return.

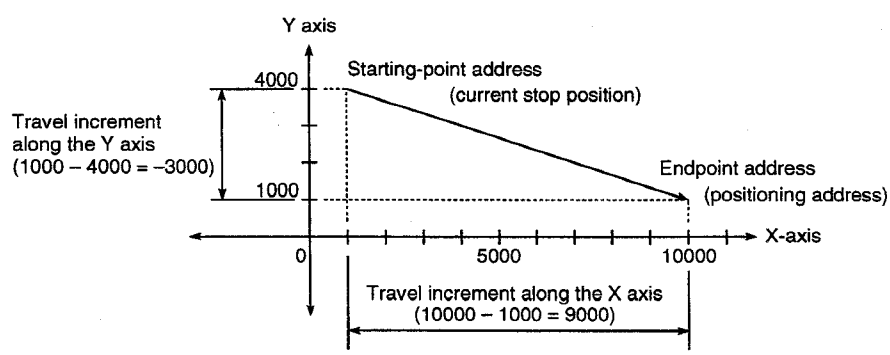
(b) The starting-point address (current stop position) and the endpoint address (positioning address) determine the direction of travel.

- Starting-point address < endpoint address: positioning in the positive direction
- Starting-point address > endpoint address: positioning in the negative direction



Example

The following shows when the starting-point address (current stop position) is (1000, 4000) and endpoint address (positioning address) is (10000, 1000):



(c) The maximum travel increment allowed for linear interpolation control along each axis is 2^{30}.
If the calculated travel increment exceeds the above range, an "out of linear travel-increment range error (error code: 504)" is generated and positioning will not start.

(d) Setting example of positioning data *1

1) Positioning data is set for positioning data number 1 of axes 1 and 2 under the conditions listed below.
For the interpolation between axes 1 and 2, axis 1 serves as the "reference axis" and axis 2 serves as the "interpolation axis."

Axis No.	Item		Positioning control	Peripheral device setting data
Axis 1	Positioning identifier	Operation pattern	End of positioning	End
		Control method	ABS line 2	ABS line 2
		Acceleration time selection	Acceleration time 1	1
		Deceleration time selection	Deceleration time 0	0
	Positioning address/travel increment *2		80000.0 μm	80000.0
	Circular address		Setting not necessary	—
	Command speed		6000.00 mm (236.2 in.)/min.	6000.00
	Dwell time		500 ms	500
	M code		10	10
Axis 2	Positioning identifier	Operation pattern	Setting not necessary	—
		Control method	Setting not necessary	—
		Acceleration time selection	Setting not necessary	—
		Deceleration time selection	Setting not necessary	—
	Positioning address/travel increment *2		60000.0 μm	60000.0
	Circular address		Setting not necessary	—
	Command speed		Setting not necessary	—
	Dwell time		Setting not necessary	—
	M code		Setting not necessary	—

* "—": No relationship with the control. The initial value or any other value can be used.

Remark

1) *1: See Section 11.2 for details on the positioning data.
*2: With the absolute system, the positioning address is set.
2) Start positioning on the reference axis only.
When positioning of the reference axis is started, linear interpolation control is performed using the reference and interpolation axes.

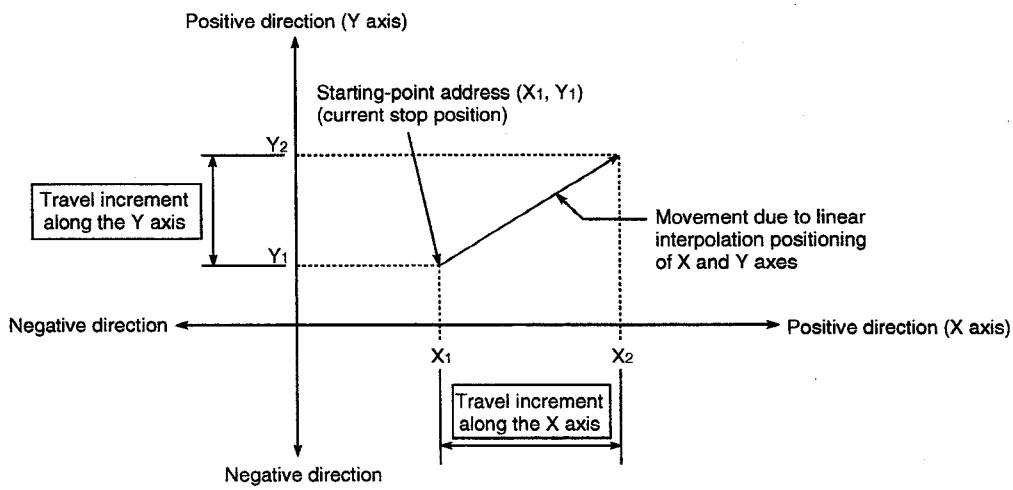
(2) Dual-axis linear interpolation control (increment system)

(a) This performs positioning from the starting-point address (current stop position) to the position determined by synthesizing the direction and increment of travel specified for each axis .

(b) The sign of the travel increment determines the direction of travel.

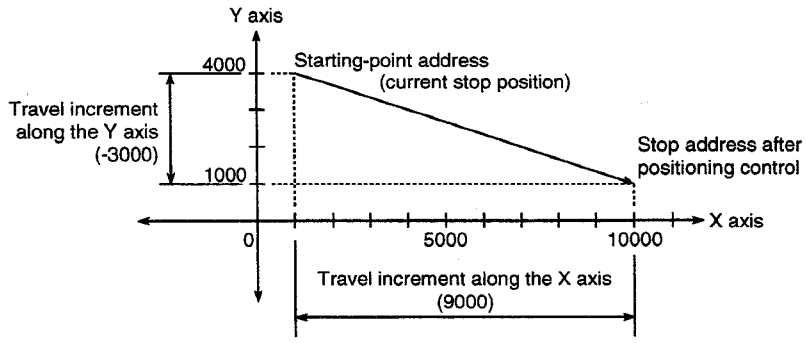
1) For positive travel increment····· Positioning in the positive direction (direction of address increase)

2) For negative travel increment····· Positioning in the negative direction (direction of address decrease)



Example

The following shows the case in which the travel increment along the X axis is 9000 and that along the Y axis is –3000.



(c) The maximum travel increment allowed for linear-interpolation control along each axis is 2^{30}. If the travel increment exceeds the above range, an "out of linear travel-increment range error (error code: 504)" is generated when the positioning starts and positioning will not start.

(d) Setting example of positioning data *1
Positioning data is set for positioning data number 1 of axes 1 and 2 under the conditions listed below.
For the interpolation between axes 1 and 2, axis 1 serves as the "reference axis" and axis 2 serves as the "interpolation axis."

Axis No.	Item		Positioning control	Peripheral device setting data
Axis 1	Positioning identifier	Operation pattern	End of positioning	End
		Control method	INC line 2	INC line 2
		Acceleration time selection	Acceleration time 1	1
		Deceleration time selection	Deceleration time 0	0
	Positioning address/travel increment *2		80000.0 μm	80000.0
	Circular address		Setting not necessary	—
	Command speed		6000.00 mm (236.2 in.)/min.	6000.00
	Dwell time		500 ms	500
	M code		10	10
Axis 2	Positioning identifier	Operation pattern	Setting not necessary	—
		Control method	Setting not necessary	—
		Acceleration time selection	Setting not necessary	—
		Deceleration time selection	Setting not necessary	—
	Positioning address/travel increment *2		60000.0 μm	60000.0
	Circular address		Setting not necessary	—
	Command speed		Setting not necessary	—
	Dwell time		Setting not necessary	—
	M code		Setting not necessary	—

* "—": No relationship with the control. The initial value or any other value can be used.

Remark

1) *1: See Section 11.2 for details on the positioning data.
*2: With the increment system, the travel increment is set.
2) Start positioning on the reference axis only.
When positioning of the reference axis is started, interpolation control is performed using the reference and interpolation axes.

6.1.5 Fixed-dimension feed control

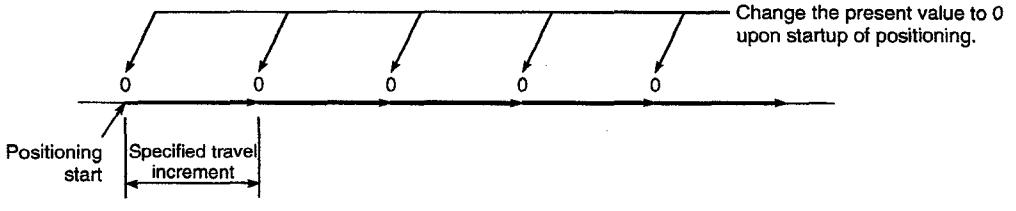
The fixed-dimension feed control performs positioning for the specified increment of travel from the current stop position (starting-point address) defined by the specified axis.
The fixed-dimension feed control includes single-axis fixed-dimension feed and dual-axis fixed-dimension feed.

Point

- The fixed-dimension feed control truncates the remainder below the control precision in order to make the amount of pulse output consistent for the travel increment specified in the positioning data.
  (The remainder below the control precision has no effect on normal control.)
- When the operation pattern of positioning data is the continuous locus control, the fixed-dimension feed control cannot be specified.
  If the fixed-dimension feed control is specified for continuous locus control, an axis error is generated and control will not start.
- Also, when the operation pattern of positioning data is the continuous locus control, the fixed-dimension feed control cannot be specified for the next positioning data.
  If the positioning data immediately following the continuous locus control is the fixed-dimension feed control, an axis error is generated and the speed decelerates automatically.

(1) Single-axis fixed-dimension feed control (fixed-dimension feed 1)

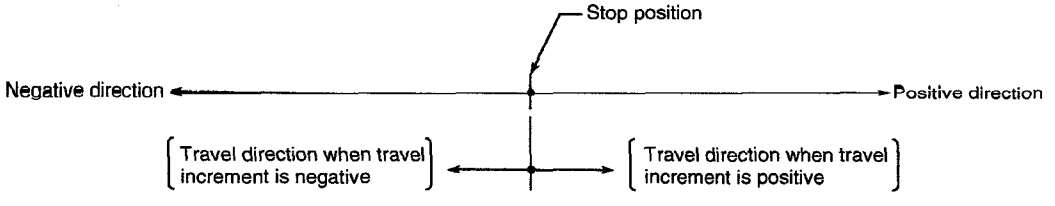
(a) With single-axis fixed-dimension feed control, positioning is performed for the specified increment of travel toward the specified direction after setting the stop address of the axis specified at startup to 0.



(b) The sign of the travel increment determines the direction of travel.

1) For positive travel increment····· Positioning in the positive direction (direction of address increase)

2) For negative travel increment····· Positioning in the negative direction (direction of address decrease)



(c) Setting example of positioning data *1
Positioning data is set for positioning data number 1 of axis 1 under the conditions shown below.

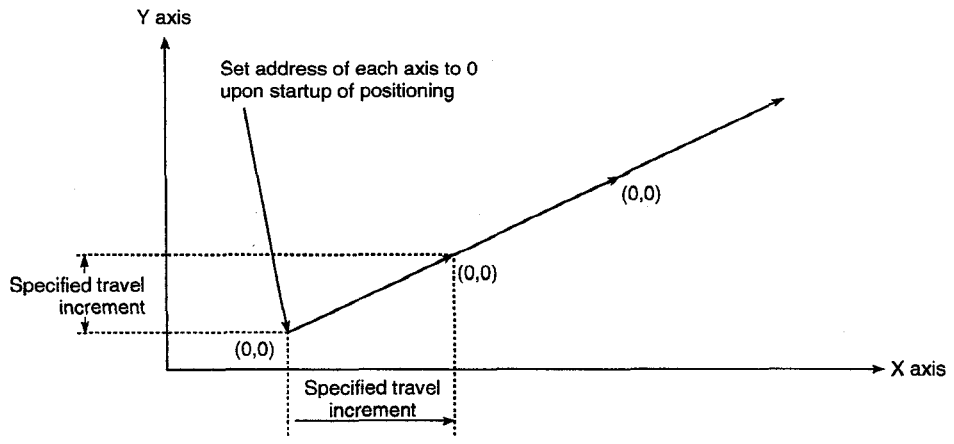
Item		Positioning control	Peripheral device setting data
Positioning identifier	Operation pattern	End of positioning	End
	Control method	Single-axis fixed-dimension feed	Fixed-dimension feed 1
	Acceleration time selection	Acceleration time 1	1
	Deceleration time selection	Deceleration time 0	0
Positioning address/travel increment *2		80000.0 μm	80000.0
Circular address		Setting not necessary	—
Command speed		6000.00 mm (236.2 in.)/min.	6000.00
Dwell time		500 ms	500
M code		10	10

Remark

*1: See Section 11.2 for details on the positioning data.
*2: With fixed-dimension feed control, the travel increment is set.

(2) Dual-axis fixed-dimension feed control (fixed-dimension feed 2)

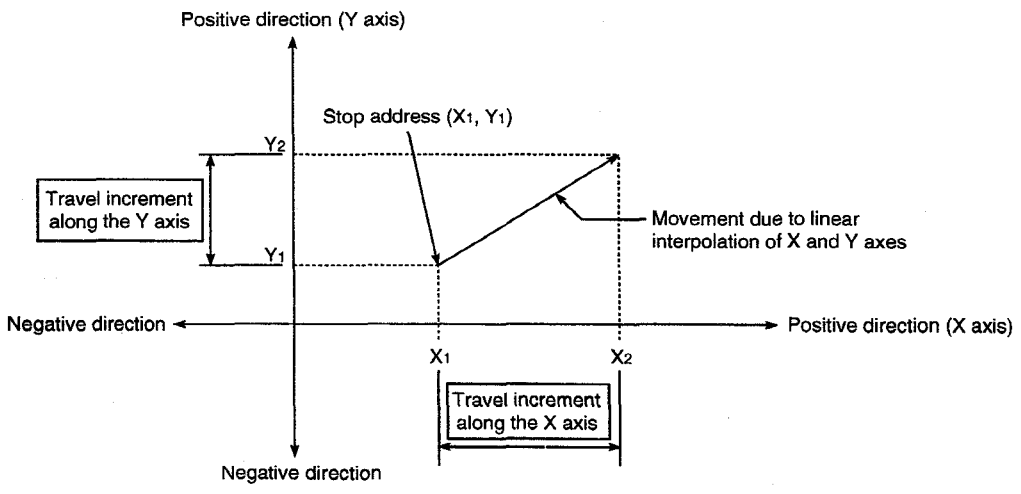
(a) With dual-axis fixed-dimension feed control, the stop addresses of the two axes are set to 0 first, then positioning is performed to the position obtained by synthesizing the travel increment and direction of travel specified for each axis.



(b) The sign of the travel increment of each axis determines the direction of travel along each axis.

1) For positive travel increment ····· Positioning in the positive direction (direction of address increase)

2) For negative travel increment ····· Positioning in the negative direction (direction of address decrease)



(c) The maximum travel increment allowed for fixed-dimension feed along each axis is 2^{30}.
If the travel increment exceeds the above range, an "out of linear travel-increment range error (error code: 504)" is generated when the positioning starts and positioning will not start.

(d) Setting example of positioning data *1
Positioning data is set for positioning data number 1 of axes 1 and 2 under the conditions listed below.
For the interpolation between axes 1 and 2, axis 1 serves as the "reference axis" and axis 2 serves as the "interpolation axis."

Axis No.	Item		Positioning control	Peripheral device setting data
Axis 1	Positioning identifier	Operation pattern	End of positioning	End
		Control method	Dual-axis fixed-dimension feed	Fixed-dimension feed 2
		Acceleration time selection	Acceleration time 1	1
		Deceleration time selection	Deceleration time 0	0
	Positioning address/travel increment *2		80000.0 μm	80000.0
	Circular address		Setting not necessary	—
	Command speed		6000.00 mm (236.2 in.)/min.	6000.00
	Dwell time		500 ms	500
	M code		10	10
Axis 2	Positioning identifier	Operation pattern	Setting not necessary	—
		Control method	Setting not necessary	—
		Acceleration time selection	Setting not necessary	—
		Deceleration time selection	Setting not necessary	—
	Positioning address/travel increment *2		60000.0 μm	60000.0
	Circular address		Setting not necessary	—
	Command speed		Setting not necessary	—
	Dwell time		Setting not necessary	—
	M code		Setting not necessary	—

* "—": No relationship with the control. The initial value or any other value can be used.

Remark

1) *1: See Section 11.2 for details on the positioning data.
*2: With fixed-dimension feed control, the travel increment is set.
2) Start positioning on the reference axis only.
When positioning of the reference axis is started, dual-axis linear interpolation control is performed using the reference and interpolation axes.

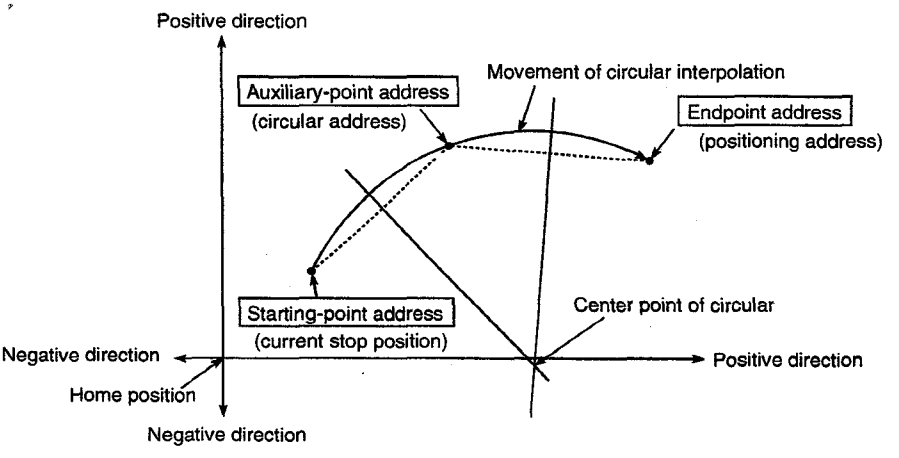
6.1.6 Circular interpolation control with a specified auxiliary point *

This performs interpolation control along a circular locus that passes through the specified auxiliary point, from the current stop position (starting-point address) defined by the two axes to the specified position (positioning address/travel increment).

(1) Circular interpolation control with a specified auxiliary point (absolute system)

(a) Circular interpolation is performed from the starting-point address (current stop position) to the endpoint address (positioning address), passing through the specified auxiliary-point address (circular address).

(b) The center of the circular for the circular interpolation is the intersection of the perpendicular bisectors of the line segments that connect the starting-point address (current stop position) and the auxiliary-point address (circular address), and the auxiliary-point address (circular address) and the endpoint address (positioning address).



(c) The circular interpolation control with a specified auxiliary point can be used even when the operation pattern is the continuous locus control.

(d) If the used unit is degree, circular interpolation control with a specified auxiliary point cannot be used.

(e) The maximum radius allowed for circular interpolation control is 2^{29}.
If the calculated radius exceeds the above range, a "radius setting error (error code: 544)" is generated upon startup of positioning and positioning will not start.
If this occurs during positioning control, the operation stops immediately after the error is detected.

(f) If the calculated center-point address exceeds the range of -2^{31} to $(2^{31} - 1)$, an "auxiliary point setting error (error code: 525)" is generated and positioning will not start.
If this occurs during positioning control, the operation stops immediately after the error is detected.

Remark

*: Circular interpolation with a specified auxiliary point cannot be performed during the stepping motor mode or while using a servo motor in the stepping motor mode.

(g) In the following cases, errors are generated and positioning will not start.
If any one of these cases occurs during positioning control, the operation stops immediately after the error is detected.

1) Starting-point address = Endpoint address
.....Endpoint setting error (error code: 526)

2) Starting-point address = Auxiliary-point address
.....Auxiliary point setting error (error code: 525)

3) Endpoint address = Auxiliary-point address
.....Auxiliary point setting error (error code: 525)

4) When the starting point, auxiliary point and endpoint addresses are on a straight line
.....Auxiliary point setting error (error code: 525)

(h) Setting example of positioning data *1
Positioning data is set for positioning data number 1 of axes 1 and 2 under the conditions listed below.
For the interpolation between axes 1 and 2, axis 1 serves as the "reference axis" and axis 2 serves as the "interpolation axis."

Axis No.	Item		Positioning control	Peripheral device setting data
Axis 1	Positioning identifier	Operation pattern	End of positioning	End
		Control method	Circular interpolation with a specified auxiliary point	ABS circular interpolation
		Acceleration time selection	Acceleration time 1	1
		Deceleration time selection	Deceleration time 0	0
	Positioning address/travel increment *2		80000.0 μm	80000.0
	Circular address		40000.0 μm	40000.0
	Command speed		6000.00 mm (236.2 in.)/min.	6000.00
	Dwell time		500 ms	500
	M code		10	10
Axis 2	Positioning identifier	Operation pattern	Setting not necessary	—
		Control method	Setting not necessary	—
		Acceleration time selection	Setting not necessary	—
		Deceleration time selection	Setting not necessary	—
	Positioning address/travel increment *2		60000.0 μm	60000.0
	Circular address		30000.0 μm	30000.0
	Command speed		Setting not necessary	—
	Dwell time		Setting not necessary	—
	M code		Setting not necessary	—

* "—": No relationship with the control. The initial value or any other value can be used.

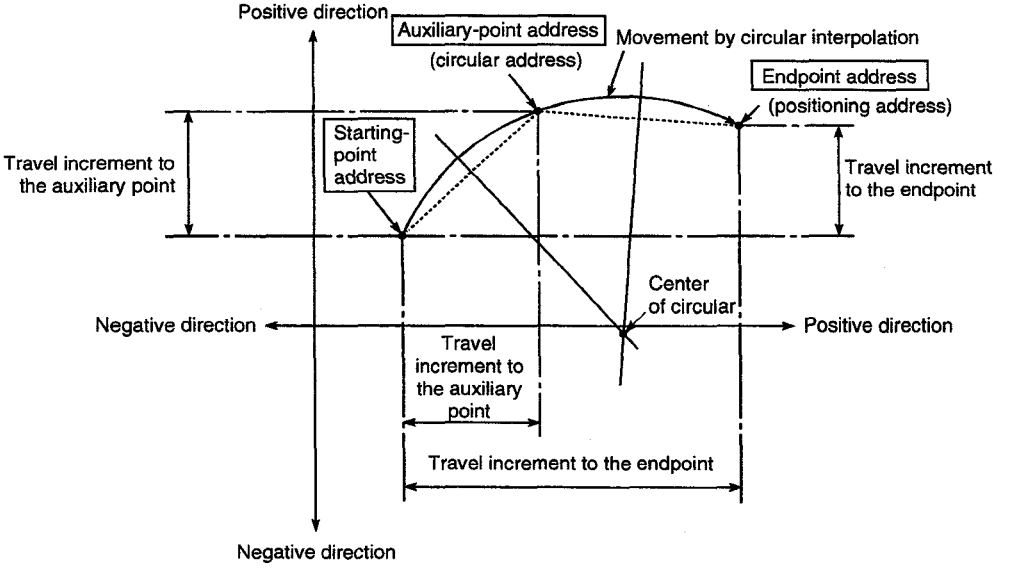
Remark

1) *1: See Section 11.2 for details on the positioning data.
*2: With the absolute system, the positioning address is set.
2) Start positioning on the reference axis only.
When positioning of the reference axis is started, circular interpolation control is performed using the reference and interpolation axes.

(2) Circular interpolation control with a specified auxiliary point (increment system)

(a) Circular interpolation is performed from the starting-point address (current stop position) to the endpoint address (positioning address), passing through the specified auxiliary-point address (circular address).

(b) The center of the circular for the circular interpolation is the intersection of the perpendicular bisectors of the line segments that connect the starting-point address (current stop position) and the auxiliary-point address (circular address) calculated from the travel increment to the auxiliary point, and the auxiliary-point address (circular address) and the endpoint address (positioning address) calculated from the travel increment to the endpoint.



(c) The circular interpolation control with a specified auxiliary point can be used even when the operation pattern is the continuous locus control.

(d) If the used unit is degree, circular interpolation control with a specified auxiliary point cannot be used.

(e) The maximum radius allowed for circular interpolation control is 2^{29}.
If the calculated radius exceeds the above range, a "radius setting error (error code: 544)" is generated upon startup of positioning and positioning will not start.
If this occurs during positioning control, the operation stops immediately after the error is detected.

(f) If the calculated center-point address (circular address) exceeds the range of -2^{31} to (2^{31} – 1), an "auxiliary point setting error (error code: 525)" is generated and positioning will not start.
If this occurs during positioning control, the operation stops immediately after the error is detected.

(g) In the following cases, errors are generated and positioning will not start.
If any one of these cases occurs during positioning control, the operation stops immediately after the error is detected.

1) Starting-point address = Endpoint address
.....Endpoint setting error (error code: 526)

2) Starting-point address = Auxiliary-point address
.....Auxiliary point setting error (error code: 525)

3) Endpoint address = Auxiliary-point address
.....Auxiliary point setting error (error code: 525)

4) When the starting point, auxiliary point and endpoint addresses are on a straight line
.....Auxiliary point setting error (error code: 525)

(h) Setting example of positioning data *1
Positioning data is set for positioning data number 1 of axes 1 and 2 under the conditions listed below.
For the interpolation of axes 1 and 2, axis 1 serves as the "reference axis" and axis 2 serves as the "interpolation axis."

Axis No.	Item		Positioning control	Peripheral device setting data
Axis 1	Positioning identifier	Operation pattern	End of positioning	End
		Control method	Circular interpolation with a specified auxiliary point	INC circular interpolation
		Acceleration time selection	Acceleration time 1	1
		Deceleration time selection	Deceleration time 0	0
	Positioning address/travel increment *2		80000.0 μm	80000.0
	Circular address		40000.0 μm	40000.0
	Command speed		6000.00 mm (236.2 in.)/min.	6000.00
	Dwell time		500 ms	500
	M code		10	10
Axis 2	Positioning identifier	Operation pattern	Setting not necessary	—
		Control method	Setting not necessary	—
		Acceleration time selection	Setting not necessary	—
		Deceleration time selection	Setting not necessary	—
	Positioning address/travel increment *2		60000.0 μm	60000.0
	Circular address		30000.0 μm	30000.0
	Command speed		Setting not necessary	—
	Dwell time		Setting not necessary	—
	M code		Setting not necessary	—

* "—": No relationship with the control. The initial value or any other value can be used.

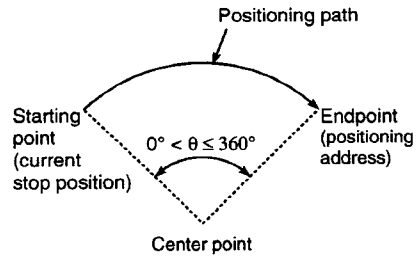
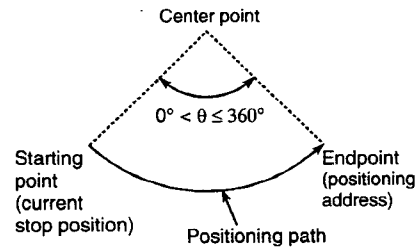
Remark

1) *1: See Section 11.2 for details on the positioning data.
*2: With the increment system, the travel increment is set.
2) Start positioning on the reference axis only.
When positioning of the reference axis is started, circular interpolation control is performed using the reference and interpolation axes.

MEMO

6.1.7 Circular interpolation control with the specified center point *

This performs interpolation control along a circular locus with the specified center point from the current stop position (starting-point address) defined by two axes, to the specified position (positioning address/travel increment).
The direction of rotation, controllable angle of circular and positioning path are shown below.

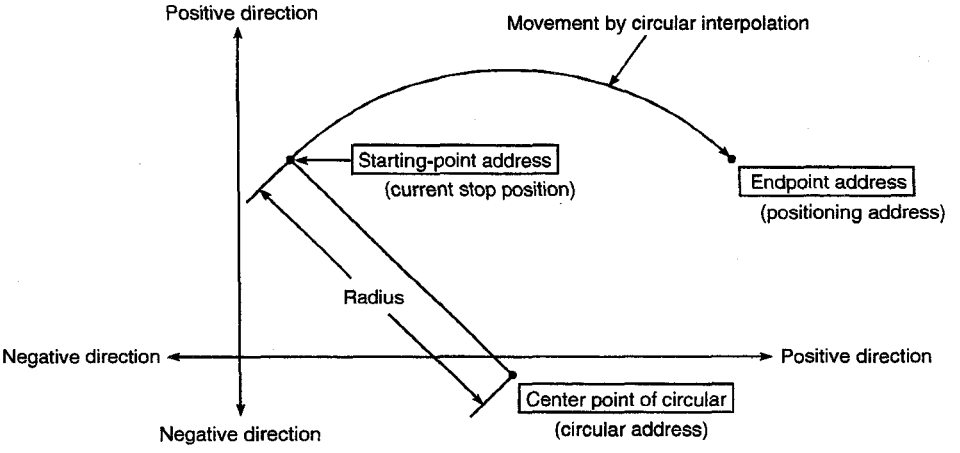
Instruction	Rotation direction	Controllable angle of circular	Positioning path
ABS circular right	Clockwise	0° < θ ≤ 360°	
INC circular right			
ABS circular left	Counter-clockwise		
INC circular left			

Remark

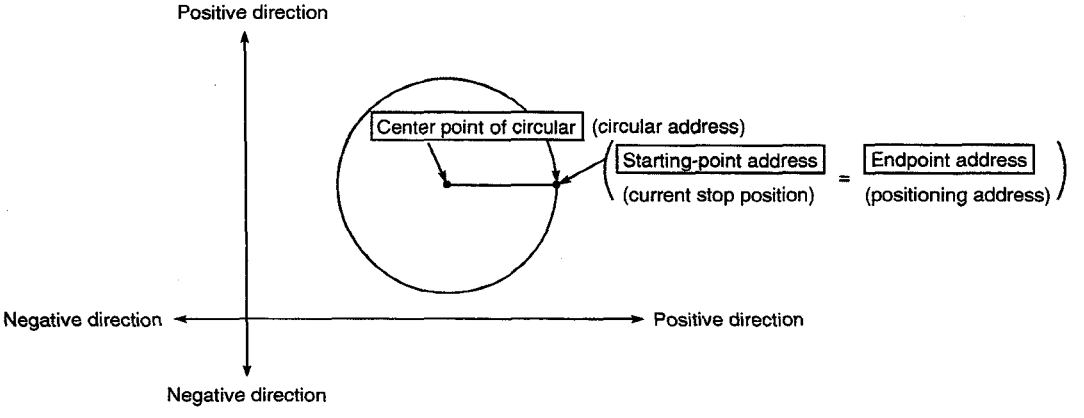
*: Circular interpolation with a specified auxiliary point cannot be performed during the stepping motor mode or while using a servo motor in the stepping motor mode.

(1) Circular interpolation control with the specified center point (absolute system)

(a) Circular interpolation is performed to the endpoint address (positioning address) on the circular whose radius is the distance between the starting-point address (current stop position) and the specified center-point address (circular address).



(b) By making the endpoint address (positioning address) and starting-point address the same, positioning of a complete round whose radius is the distance between the center point of the circular and starting-point address, can be performed.



(c) When performing the circular interpolation control with the specified center point, the positions of the circular locus calculated from the starting-point address (current stop position) and center-point address (circular address), and the set endpoint address (positioning address) may not match.

- If the error of the calculated circular locus against the endpoint address (positioning address) is within the allowable range for circular interpolation errors set by extended parameter 2, circular interpolation is performed to the set endpoint address (positioning address) while performing error compensation via spiral interpolation. *
- If the error of the calculated circular locus against the endpoint address (positioning address) exceeds the allowable range for circular interpolation errors, an "out of allowable circular-interpolation error range error (error code: 506)" is generated upon startup of positioning and positioning will not start.
  If this occurs during positioning control, the operation stops immediately after the error is detected.

Remark

*: See Section 10.2.24 for the spiral interpolation.

(d) Circular interpolation control with the specified center point can be performed even when the operation pattern is continuous locus control.

(e) If the used unit is degree, circular interpolation control with the specified center point cannot be performed.

(f) The maximum radius allowed for circular interpolation control is 2^{29}.
If the calculated radius exceeds the above range, a "radius setting error (error code: 544)" is generated upon startup of positioning and positioning will not start.
If this occurs during positioning control, the operation stops immediately after the error is detected.

(g) In the following cases, a "center point setting error (error code: 527)" is generated upon startup of positioning and positioning will not start.
If this occurs during positioning control, the operation stops immediately after the error is detected.

1) Starting-point address = Center-point address

2) Endpoint address = Center-point address

(h) Setting example of positioning data *1
Positioning data is set for positioning data number 1 of axes 1 and 2 under the conditions listed below.
For the interpolation between axes 1 and 2, axis 1 serves as the "reference axis" and axis 2 serves as the "interpolation axis."

Axis No.	Item		Positioning control	Peripheral device setting data
Axis 1	Positioning identifier	Operation pattern	End of positioning	End
		Control method	Circular interpolation control with the specified center point	ABS circular right
		Acceleration time selection	Acceleration time 1	1
		Deceleration time selection	Deceleration time 0	0
	Positioning address/travel increment *2		80000.0 μm	80000.0
	Circular address		40000.0 μm	40000.0
	Command speed		6000.00 mm (236.2 in.)/min.	6000.00
	Dwell time		500 ms	500
	M code		10	10
Axis 2	Positioning identifier	Operation pattern	Setting not necessary	—
		Control method	Setting not necessary	—
		Acceleration time selection	Setting not necessary	—
		Deceleration time selection	Setting not necessary	—
	Positioning address/travel increment *2		60000.0 μm	60000.0
	Circular address		30000.0 μm	30000.0
	Command speed		Setting not necessary	—
	Dwell time		Setting not necessary	—
	M code		Setting not necessary	—

* "—": No relationship with the control. The initial value or any other value can be used.

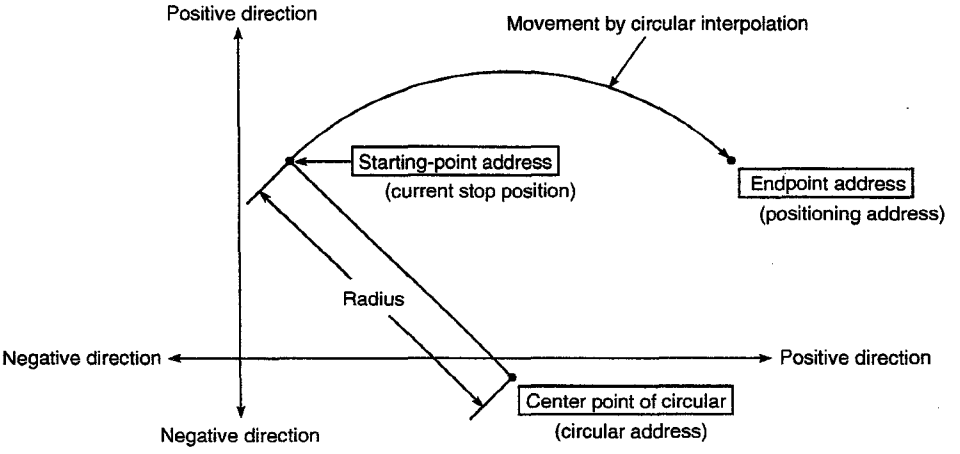
Remark

1) *1: See Section 11.2 for details on the positioning data.
*2: With the absolute system, the positioning address is set.

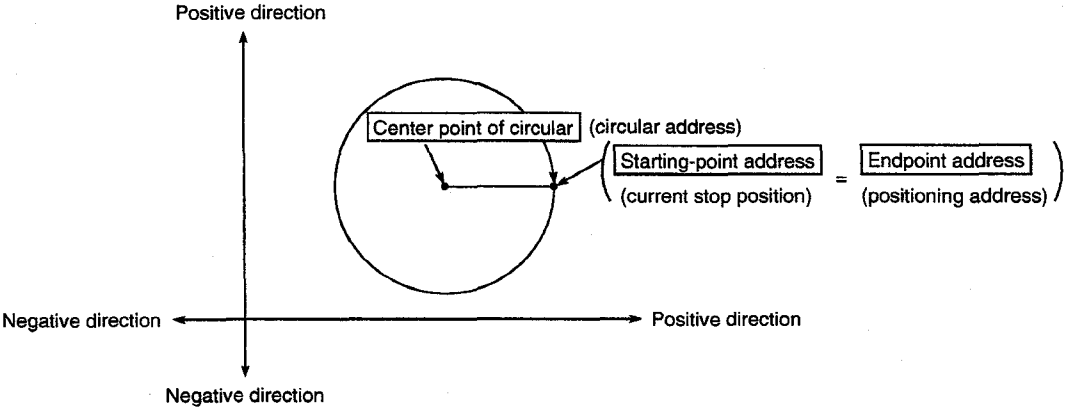
2) Start positioning on the reference axis only.
When positioning of the reference axis is started, circular interpolation control is performed using the reference and interpolation axes.

(2) Circular interpolation control with the specified center point (increment system)

(a) Circular interpolation control is performed on the circular whose radius is the distance between the starting-point address (current stop position) and the specified center-point address (circular address).



(b) By setting the travel increment to 0, positioning of a complete round whose radius is the distance between the center point of the circular and the starting-point address, can be performed.



(c) When performing the circular interpolation control with the specified center point, the positions of the circular locus calculated from the starting-point address (current stop position) and center-point address (circular address), and the set endpoint address (positioning address) may not match.

- If the error of the calculated circular locus against the endpoint address (positioning address) is within the allowable range for circular interpolation errors set by extended parameter 2, circular interpolation is performed to the set endpoint address (positioning address) while performing error compensation via spiral interpolation. *
- If the error of the calculated circular locus against the endpoint address (positioning address) exceeds the allowable range for circular interpolation errors, an "out of allowable circular-interpolation error range error (error code: 506)" is generated upon startup of positioning and positioning will not start.
  If this occurs during positioning control, the operation stops immediately after the error is detected.

Remark

*: See Section 10.2.24 for the spiral interpolation.

(d) Circular interpolation control with the specified center point can be performed even when the operation pattern is continuous locus control.

(e) If the used unit is degree, circular interpolation control with the specified center point cannot be performed.

(f) The maximum radius allowed for circular interpolation control is 2^{29}.
If the calculated radius exceeds the above range, a "radius setting error (error code: 544)" is generated upon startup of positioning and positioning will not start.
If this occurs during positioning control, the operation stops immediately after the error is detected.

(g) If the calculated endpoint address (positioning address) or center-point address (circular address) is outside the range of -2^{31} to $(2^{31} - 1)$, the errors listed below are generated and positioning will not start.
If this occurs during positioning control, the operation stops immediately after the error is detected.

1) For an endpoint address: Endpoint setting error (error code: 526)

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

(h) In the following cases, a "center point setting error (error code: 527)" is generated upon startup of positioning and positioning will not start.
If this occurs during positioning control, the operation stops immediately after the error is detected.

1) Starting-point address = Center-point address

2) Endpoint address = Center-point address

(i) Setting example of positioning data *1
Positioning data is set for positioning data number 1 of axes 1 and 2 under the conditions listed below.
For the interpolation between axes 1 and 2, axis 1 serves as the "reference axis" and axis 2 serves as the "interpolation axis."

Axis No.	Item		Positioning control	Peripheral device setting data
Axis 1	Positioning identifier	Operation pattern	End of positioning	End
		Control method	Circular interpolation control with the specified center point	INC circular right
		Acceleration time selection	Acceleration time 1	1
		Deceleration time selection	Deceleration time 0	0
	Positioning address/travel increment *2		80000.0 μm	80000.0
	Circular address		40000.0 μm	40000.0
	Command speed		6000.00 mm (236.2 in.)/min.	6000.00
	Dwell time		500 ms	500
	M code		10	10
Axis 2	Positioning identifier	Operation pattern	Setting not necessary	—
		Control method	Setting not necessary	—
		Acceleration time selection	Setting not necessary	—
		Deceleration time selection	Setting not necessary	—
	Positioning address/travel increment *2		60000.0 μm	60000.0
	Circular address		30000.0 μm	30000.0
	Command speed		Setting not necessary	—
	Dwell time		Setting not necessary	—
	M code		Setting not necessary	—

* "—": No relationship with the control. The initial value or any other value can be used.

Remarks

1) *1: See Section 11.2 for details on the positioning data.
*2: With the increment system, the travel increment is set.

2) Start positioning on the reference axis only.
When positioning of the reference axis is started, circular interpolation control is performed using the reference and interpolation axes.

6.1.8 Speed control (forward rotation/reverse rotation)

(1) What is speed control?

(a) The speed control executes the acceleration set in the direction of a specified axis, and keeps operating at the set speed until a stop command is input.

(b) The speed control can be started in the direction of either forward rotation or reverse rotation.

(2) Operation timing

The operation timing of speed control is shown in Figure 6.1.

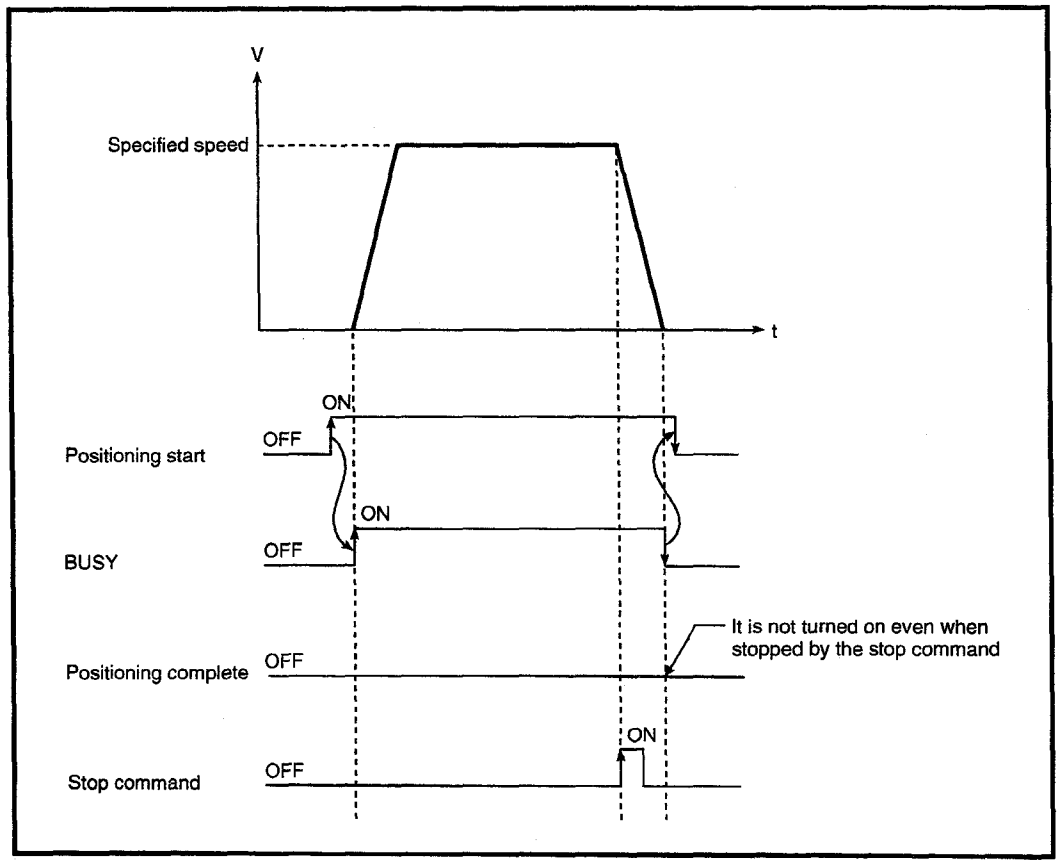


Fig. 6.1 Operation timing of speed control

(3) Updating the present feed value

The present feed value changes as follows depending on the "update request specification of present feed value during speed control" setting in extended parameter 1 (see Section 10.2.10).

(a) When 0 is set (do not update the present feed value) : No change is made in the present feed value before or after speed control execution.

(b) When 1 is set (update the present feed value) : The present feed value is changed during speed control execution.

(c) When 2 is set (clear the present feed value with 0) : The present feed value is cleared with 0 upon speed control startup, and no change is made to the present feed value during speed control execution.

(4) Checks performed during speed control

When the currently operating positioning is performing a speed control, the "speed control in-operation flag" becomes 1. *1

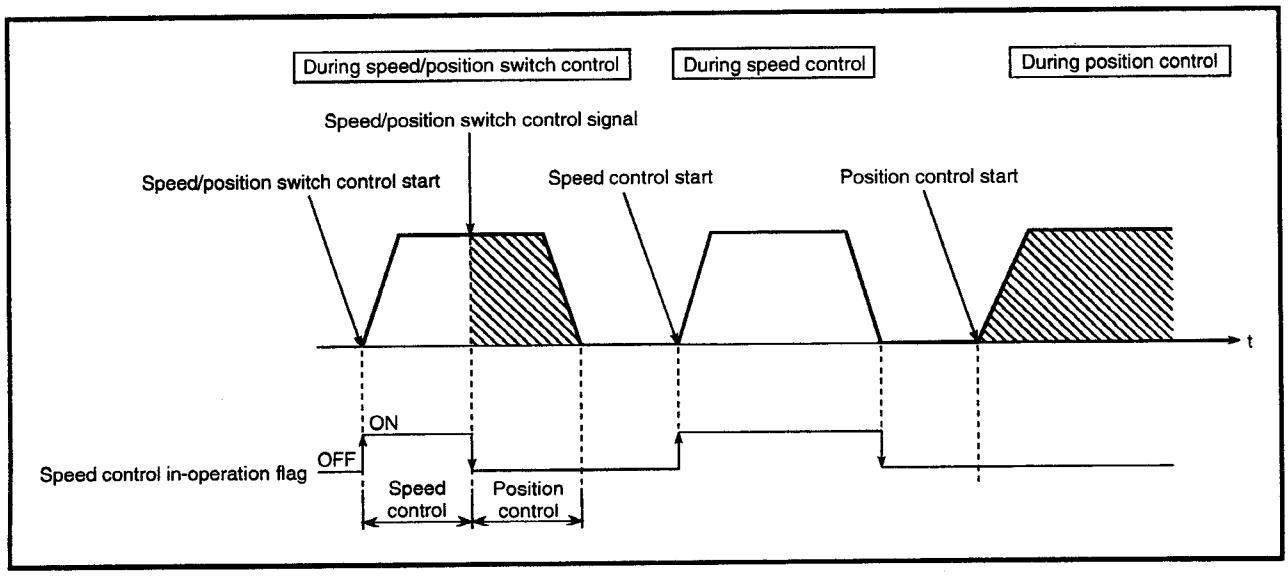


Fig. 6.2 Timing diagram of the "speed control in-operation" flag

(5) Limitations

(a) The speed control cannot be used for the continuous locus control.
If the operation pattern of positioning data is the speed control of continuous locus control, a "continuous locus control disabled error (error code: 516)" is generated and positioning will not start.

(b) The setting for dwell time is ignored.

(c) When using the M code, only the "WITH mode" can be used.
If the AFTER mode is used, the M code is not output nor the M-code on signal is not turned on.

(6) Setting example of positioning data *2

Positioning data is set for positioning data number 1 of axes 1 and 2 under the conditions listed below.

Item		Positioning control	Peripheral device setting data
Positioning identifier	Operation pattern	End of positioning	End
	Control method	Forward rotation speed control	Forward rotation speed control
	Acceleration time selection	Acceleration time 1	1
	Deceleration time selection	Deceleration time 0	0
Positioning address/travel increment		Setting not necessary	0.0
Circular address		Setting not necessary	0.0
Command speed		6000.00 mm (236.2 in.)/min.	6000.0
Dwell time		500 ms	500
M code		10	10

Remark

*1: The speed control in-operation flag is bit 0 of the "status" in the axis monitor of the buffer memory.
See Section 8.6.2 for details.

*2: See Section 11.2 for details on the positioning data.

6.1.9 Speed/position switch control (forward rotation/reverse rotation)

(1) What is speed/position switch control?

(a) This performs speed control along the specified axis, switches from the speed control to position control according to the input speed/position switch signal, and performs positioning for the specified travel increment.

(b) The speed/position switch control can be started in the direction of either forward rotation or reverse rotation.

(2) Switching from speed control to positioning control

(a) Switching from speed control to positioning control is executed using the speed/position switch signal.

(b) The speed/position switch signal is valid only while the speed/position switch permission flag of the axis control data is on (see Section 8.7.2).
If the speed/position switch valid flag turns on after the speed/position switch signal has been turned on, switching from the speed control to position control is not executed, but the speed control continues.

(3) Operation timing

The operation timing of speed/position switch control is shown in Figure 6.3.

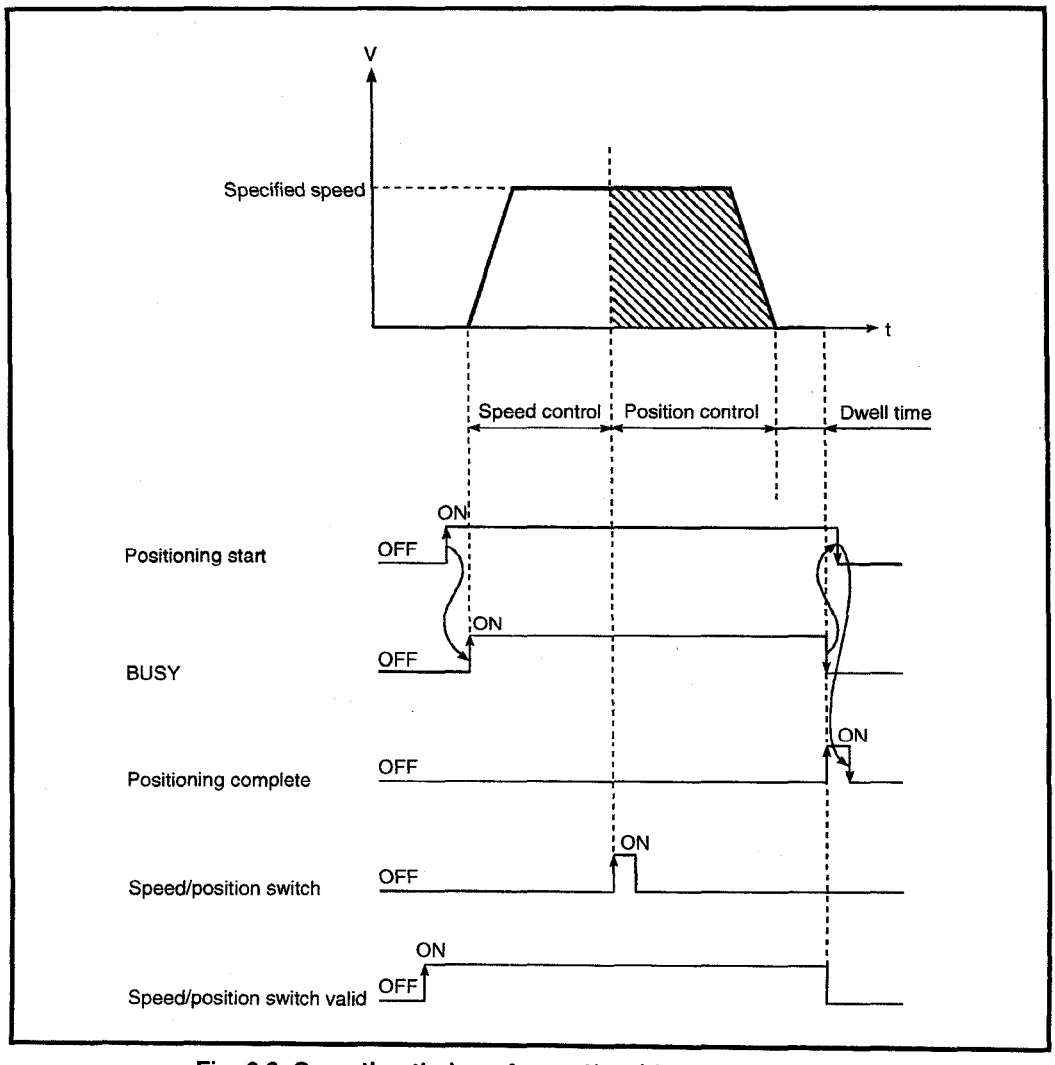


Fig. 6.3 Operation timing of speed/position switch control

(4) Updating the present feed value

The present feed value changes as follows depending on the "update request specification for present feed value during speed control" setting in extended parameter 1 (see Section 10.2.10).

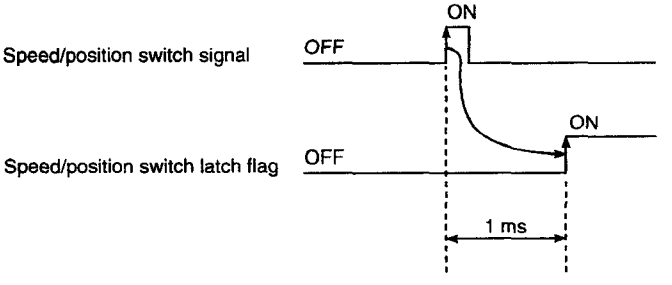
(a) When 0 is set (do not update the present feed value) :
- No change is made in present feed value before or after speed control execution.
- The present feed value is updated as soon as it is switched to the position control.

(b) When 1 is set (update the present feed value) : The present feed value is changed even during speed control execution and position control execution.

(c) When 2 is set (clear the present feed value with 0) : The present feed value is cleared with 0 upon startup of speed/position switch control, and no changes are made during speed control execution.

(5) Switching time from speed control to position control

The time required from the moment the speed/position switch signal turns on until the speed/position switch latch flag turns on, is 1 ms.



(6) Changing the travel increment

(a) The travel increment for the position control can be changed during the speed control of speed/position switch control.
If a request for changing travel increment is made while not in the speed control of speed/position switch control, the request is ignored.

(b) By using a sequence program during the speed control, the travel increment after the change is stored in the travel increment change register for speed/position switch control (see Section 8.7.2).
The content in the travel increment change register for speed/position switch control will become the travel increment for position control when the speed/position switch signal is turned on.

(c) The travel increment after the control has been switched to the position control by the input of an external speed/position switch signal, is stored in the travel increment area after the speed/position switch signal in the axis monitor area has been turned on (see Section 8.6.2).

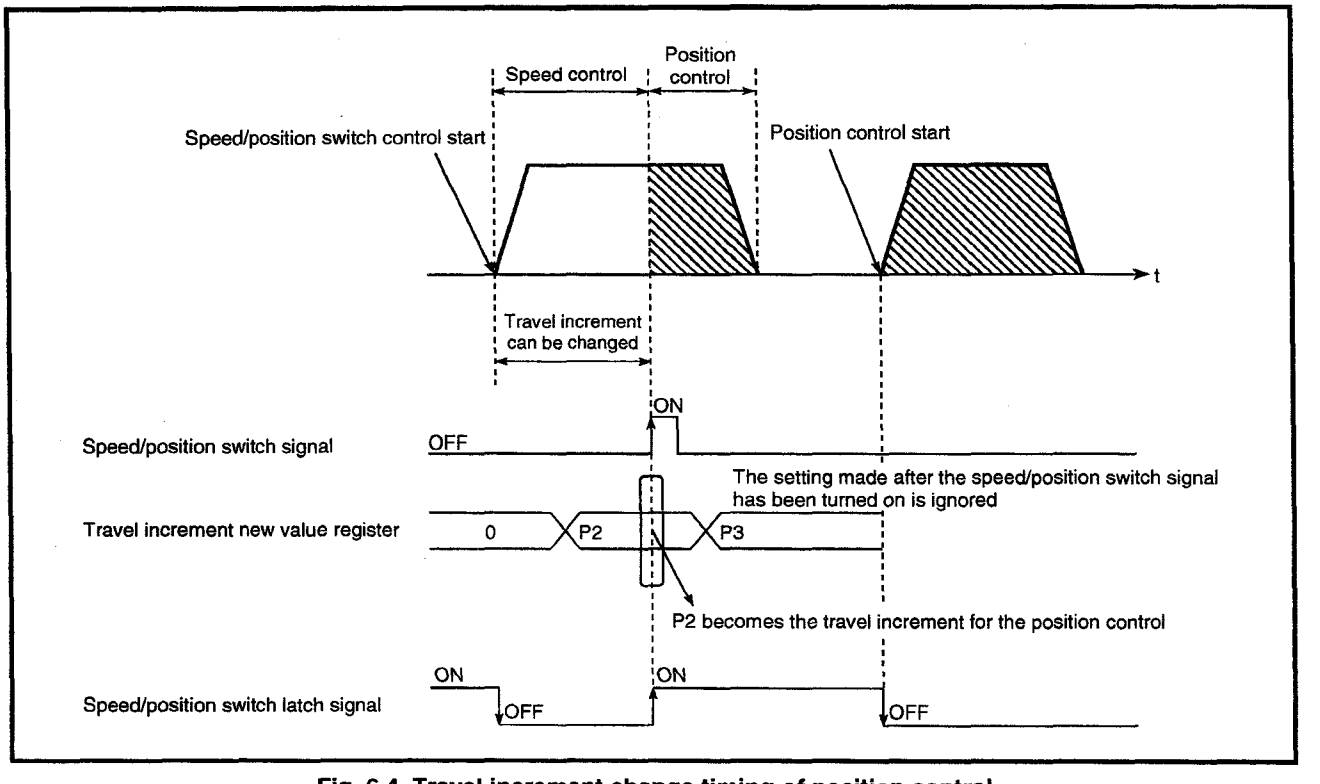


Fig. 6.4 Travel increment change timing of position control

Point

(1) The issuance of a request for changing the travel increment can be notified only by writing data into the travel increment change register using a sequence program.

(2) The changed travel increment is valid until the speed/position switch signal is input by the execution of speed/position switch control.

(3) The "speed/position switch latch flag" in the axis monitor area can be used as the interlock for enabling and disabling of travel increment changes during position control (see Section 8.6.2).

(7) Limitations

(a) When using a pulse chain output motor, turn on the speed/position switch signal within the speed stabilized range (constant speed state).
Turning on this signal while accelerating produces a warning since the variation of the standing pulse amount is too large.

(b) The speed/position switch control cannot be used in the continuous locus control.

1) If the operation pattern of positioning data is the speed/position switch control of the continuous locus control, an axis error is generated and positioning will not start.

2) Also, when the operation pattern of positioning data is continuous locus control, the speed/position switch control cannot be specified for the next positioning data.
If the positioning data immediately following the continuous locus control is the speed/position switch control, an axis error is generated and the speed decelerates, then stops.

(c) If both the speed/position switch valid signal and speed/position switch signal are on upon startup, only the position control is executed.

(d) If the travel increment by position control is less than the deceleration distance at the speed being in control, deceleration processing is performed as soon as the speed/position switch signal is input.

(e) The software stroke limit check performs checking of the software stroke limit range upon startup, only if the "present feed value update request" during speed control is set to 1.

(8) Setting example of positioning data *1

Positioning data is set for positioning data number 1 of axis 1 under the conditions shown below.

Item		Positioning control	Peripheral device setting data
Positioning identifier	Operation pattern	End of positioning	End
	Control method	Forward-rotation speed/position switch control	Forward rotation speed/position
	Acceleration time selection	Acceleration time 1	1
	Deceleration time selection	Deceleration time 0	0
Positioning address/travel increment *2		10000.0 μm	10000.0
Circular address		Setting not necessary	—
Command speed		6000.00 mm (236.2 in.)/min.	6000.00
Dwell time		500 ms	500
M code		10	10

* "—": No relationship with the control. The initial value or any other value can be used.

Remark

*1: See Section 11.2 for details on the positioning data.
*2: With the speed/position switch control, the travel increment is set.

6.1.10 JUMP instruction

(1) What is JUMP instruction?

The JUMP instruction performs "unconditional JUMP" or "conditional JUMP" to the specified positioning data number during continuous locus control or continuous operation.

- Unconditional JUMP : executed when no condition is set for the JUMP instruction.
- Conditional JUMP : executed when a condition is set for the JUMP instruction.
  The condition data for a block start is used as the conditions for the JUMP instruction execution.

With the JUMP instruction, tasks such as repeating the same positioning control and selecting the positioning data number by specifying conditions can be performed during the continuous locus control or continuous operation.

(2) Action of the JUMP instruction

(a) For unconditional JUMP
The JUMP instruction is executed unconditionally, and jumps to the specified positioning data number.

(b) For conditional JUMP
If the execution condition specified by the JUMP instruction is satisfied, the JUMP instruction is executed and jumps to the specified positioning data number.
If the execution condition specified by the JUMP instruction is not satisfied, the positioning data number following the JUMP instruction is executed.

(3) Limitations

(a) During continuous locus control or continuous operation, calculation is performed with respect to the positioning data of the fourth positioning data number after the current positioning data number.
When using a conditional JUMP instruction, be sure the execution condition of the JUMP instruction is satisfied before executing the fourth positioning data number before the positioning data number of the JUMP instruction. If the execution condition of the JUMP instruction has not been satisfied prior to performing the fourth positioning control before the JUMP instruction, the execution is processed as if the execution condition of JUMP instruction is not satisfied.

(b) Set the JUMP instruction in the positioning data number whose operation pattern is either "continuous operation" or "continuous locus."
It cannot be set in the positioning data number whose operation pattern is "complete."
Even when setting it at the end of continuous locus control or continuous operation, set to "continuous operation" or "continuous locus."

(c) When setting a JUMP instruction at the end of continuous locus control or continuous operation, use an unconditional JUMP instruction.
If a conditional JUMP instruction is set at the end of continuous locus control or continuous operation, positioning of the next positioning data number is executed when the execution condition is not satisfied.

(d) It is not allowed to use a positioning control that enters a loop and the loop can only be escaped by a conditional JUMP instruction alone when the condition is satisfied.

(4) Jump destination positioning data number and execution condition

The "jump destination positioning data number" and "execution condition" of the JUMP instruction are set in the dwell time and M code.

(a) Jump destination positioning data number
With the JUMP instruction, the dwell time area is used for setting jump destination positioning data numbers 1 through 600.
The jump destination positioning data number can be used to set the positioning data number of other than itself.
For example, if a JUMP instruction is set in positioning data number 5, positioning data numbers other than 5 can be set.

(b) Execution conditions

1) With JUMP instructions, the M code area is set as the condition data numbers for which execution conditions are set.
   - 0 is the setting for an unconditional JUMP.
   - 1 to 10 are the setting for condition data numbers.

2) The condition data of the JUMP instruction uses the condition data of the block start. Set the condition data of the JUMP instruction for the condition data of the block start, and specify the set condition data number using the JUMP instruction.

3) Among the condition data of block start, "simultaneous start" cannot be set as the execution condition of the JUMP instruction.

(5) Setting example of positioning data *1

Positioning data is set for positioning data number 1 of axis 1 under the conditions listed below.

Item		Positioning control	Peripheral device setting data
Positioning identifier	Operation pattern	Continuous locus	Continuous locus
	Control method	JUMP instruction	JUMP instruction
	Acceleration time selection	Setting not necessary	—
	Deceleration time selection	Setting not necessary	—
Positioning address/travel increment		Setting not necessary	—
Circular address		Setting not necessary	—
Command speed		Setting not necessary	—
Dwell time (JUMP destination positioning data number) *2		500	500
M code (execution condition) *2		1	1

* "—": No relationship with the control. The initial value or any other value can be used.

Remark

*1: See Section 11.2 for details on the positioning data.
*2: The value inside ( ) indicates the data when the JUMP instruction is executed.

6.2 Operation Pattern of Positioning Control

The operation pattern is used to control the type of operation to be performed among the plural positioning data.

The operation pattern includes the following types:

- Individual positioning (positioning completes) — Individual positioning control (operation pattern: 00)
- Continuous positioning (positioning continues) — Continuous positioning control (operation pattern: 01)
  - Continuous locus control (operation pattern: 11)

(By using the "continuous locus control" operation pattern, the function almost equivalent to the uniform speed control can be realized.)

6.2.1 Individual positioning control (operation pattern: 00)

This is set when executing positioning of a single data item only. If the dwell time is specified, positioning is completed after the specified time has elapsed.

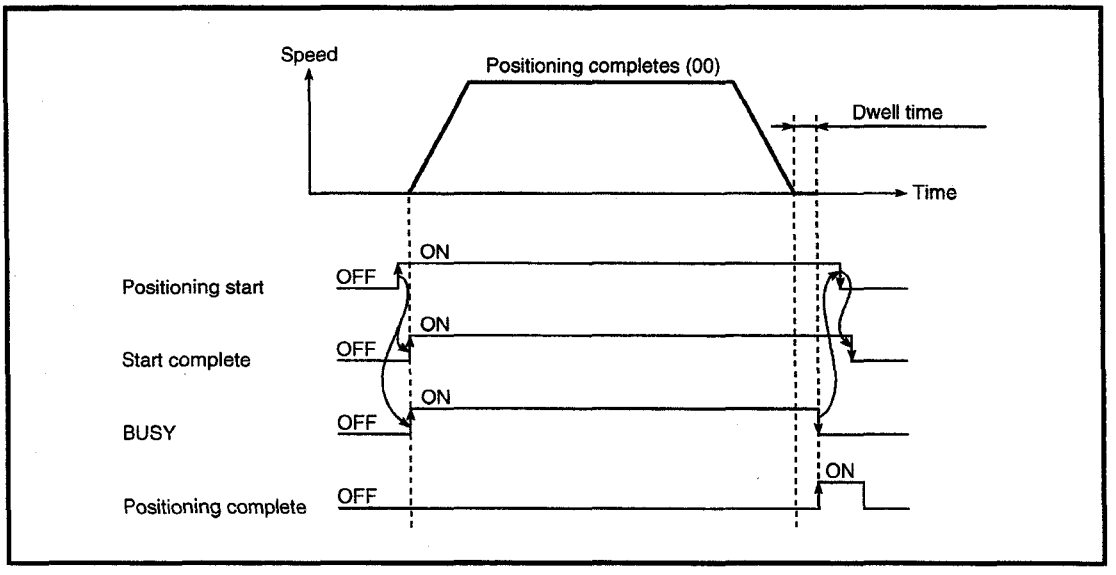


Fig. 6.5 Operation during individual positioning control

For block positioning, this data is the last data of a block (the operation stops after this data is processed).

6.2.2 Continuous positioning control (operation pattern: 01)

(1) The operation always decelerates each time positioning of one positioning data is completed, and begins to accelerate for processing the next positioning data after the command speed of the D75P2 reaches 0.
If a dwell time is specified, acceleration is performed after the specified time has elapsed.

(2) With the operation by continuous positioning control (01), positioning of the next number is automatically executed. Be sure to set the operation pattern "00" for the last positioning data to complete positioning.
If the operation pattern is "positioning continues" (01 or 11), the operation continues until the operation pattern 00 is found.
Therefore, if the operation pattern 00 is not found, the operation can be executed up to data number 600.

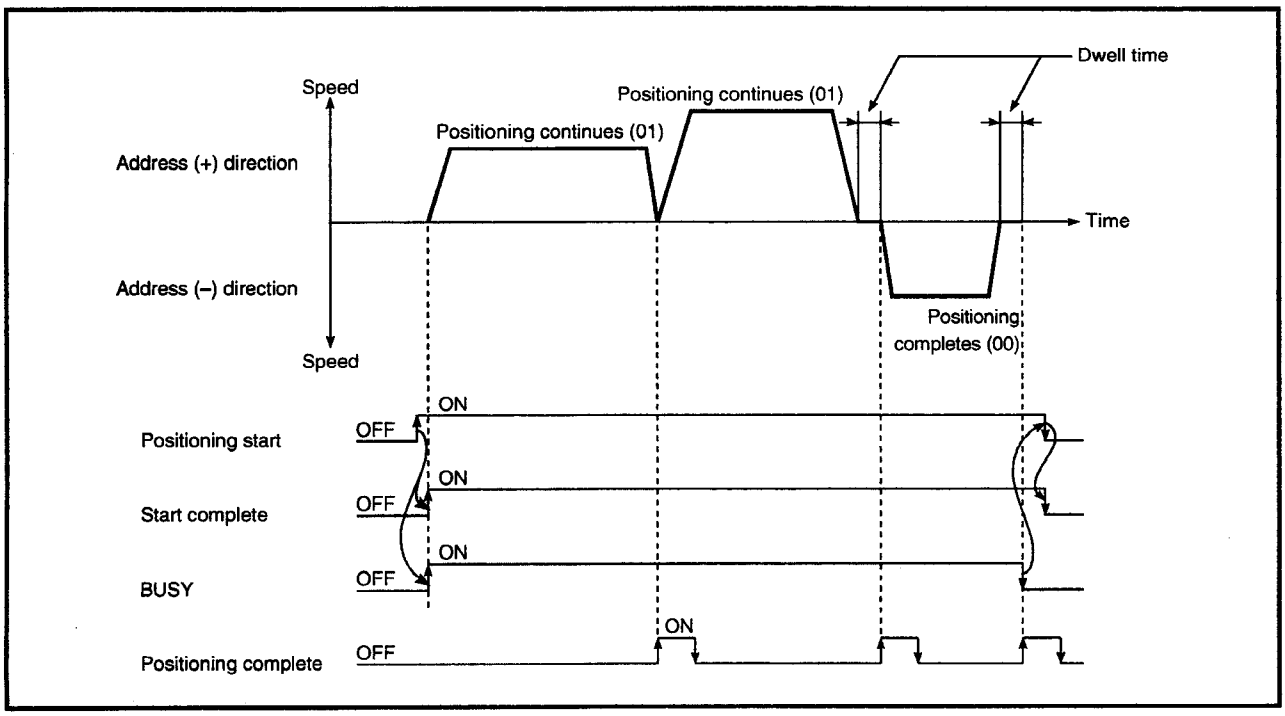


Fig. 6.6 Operation during continuous positioning control

6.2.3 Continuous locus control (operation pattern: 11)

(1) Continuous locus control

(a) Speed is changed between the speed of positioning data currently being positioned and that of positioning data to be positioned next.
The speed is not changed if the current speed and next speed are equal.

(b) When the command speed setting is –1, the speed used in the previous positioning operation is used.

(c) The dwell time is ignored even if it is set.

(d) With the operation by continuous locus control (01), positioning of the next number is automatically executed. Be sure to set the operation pattern "00" for the last positioning data to complete positioning.
If the operation pattern is "positioning continues" (01 or 11), the operation continues until the operation pattern "00" is found.
Therefore, if the operation pattern 00 is not found, the operation can be executed up to data number 600.

(e) The patterns for speed switching include the "early speed switch pattern" in which speed is changed at the end of the current positioning, and the "standard speed switch pattern" in which speed is changed at the beginning of the next positioning.

Continuous locus control ─┬─ Standard speed switch mode
└─ Early speed switch mode

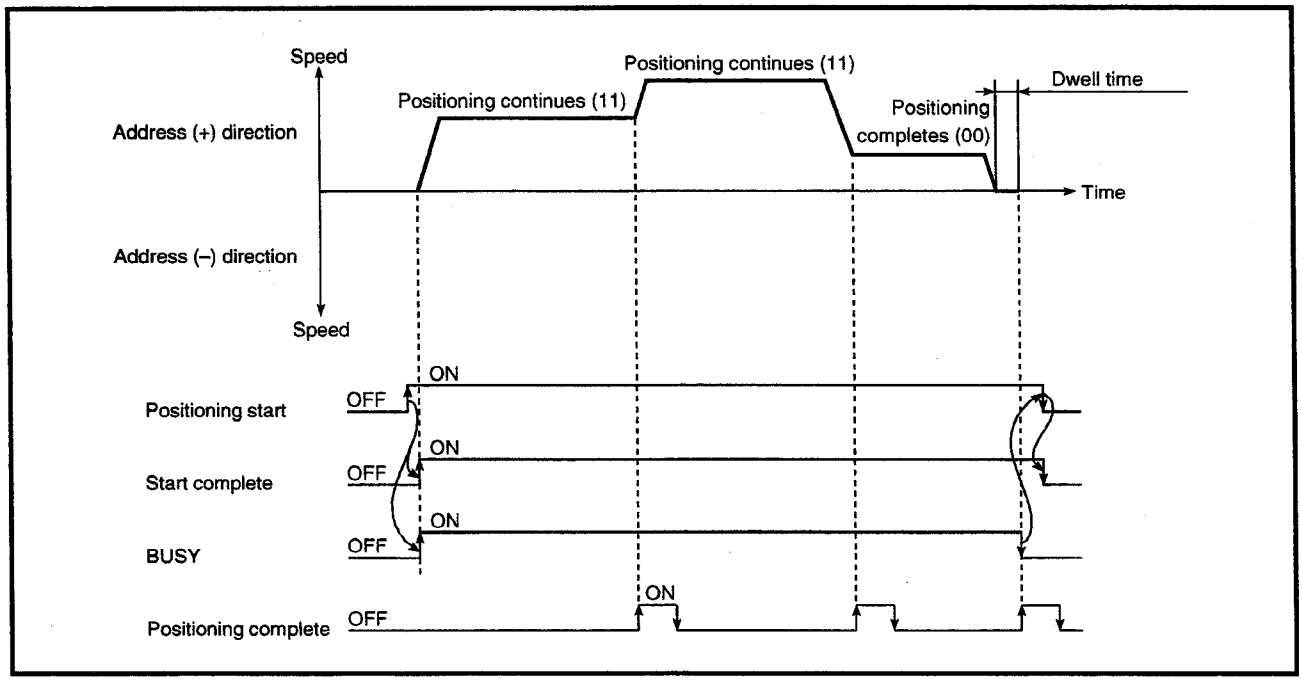


Fig. 6.7 Operation during continuous locus control

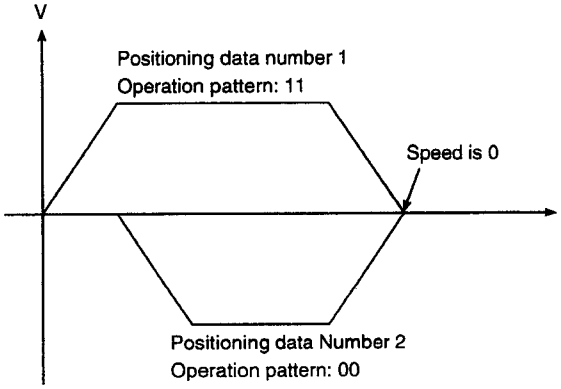
Point

With the D75P2, speed variation can be eliminated by setting to the adjacent passing mode(see Section 6.2.3 (5)).

(2) Conditions of stopping after decelerating during continuous locus control

The continuous locus control normally does not decelerate to stop. However, it does decelerate before stopping and the speed once reaches 0 in the following cases:

(a) When the operation pattern of the positioning data currently being executed is "continuous locus control: 11" and the travel directions of the positioning data currently being executed and that of the next positioning data are different (see Points).



(b) When the operation pattern of the positioning data currently being executed is "continuous locus control: 11" and the travel increment of the next positioning data is "0."

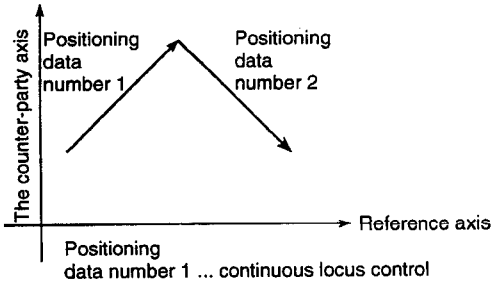
(c) When step operation is being executed (see Section 7.11).

(d) When there is an error in the positioning data to be operated next.

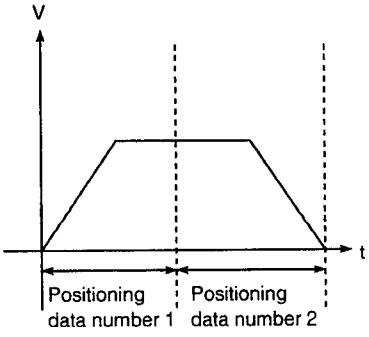
Point

(1) Checks are performed only in the direction of travel along the reference axis during interpolation operation. Therefore, automatic deceleration is not performed when there has been no change in the direction of travel along the reference axis.
This may cause the counter-party axis of interpolation to reverse abruptly.
To prevent the counter-party axis of interpolation from reversing the rotation abruptly, do not set the passing point to "continuous locus control (11)," but to "continuous positioning control (01)."

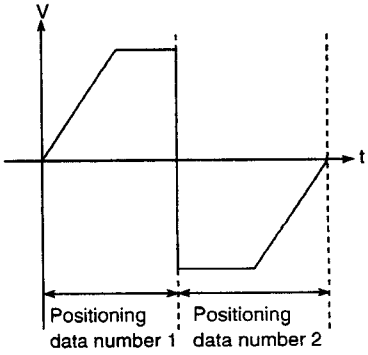
[Positioning by interpolation]



[Operation of reference axis]



[Operation of the counter-party axis of interpolation]



(2) If either the travel direction of the positioning data number currently being operated or that of the next positioning data number is undergoing the circular interpolation control, automatic deceleration is not performed.

(3) Handling the speed

(a) Use each positioning data to set the command speed for continuous locus control.
With the D75P2, positioning is performed at the speed specified by each positioning data.

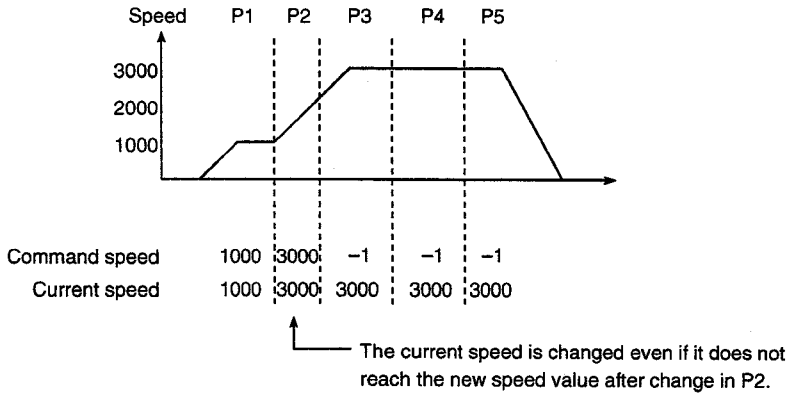
(b) "–1" can be set for the command speed of continuous locus control.
By setting "–1" for the command speed, control is performed at the speed used for the previous positioning data number.
(When the positioning data is set via a peripheral device, "–1" is displayed for the command speed.)

1) By setting the command speed to "–1" when performing uniform speed control, it is no longer necessary to set speed for each positioning data.

2) When "–1" is set as the command speed, if the speed is changed while the previous positioning data number is processed, the control can be continued at the speed that was set during the speed change.

3) When –1 is set for the command speed of the first positioning data at start, a "no command speed error (error code: 503)" is generated and positioning will not start.

[Relationship between command speed and current speed]



Point

With the D75P2, speed variation can be eliminated by setting to the adjacent passing mode(see Section 6.2.3 (5)).

Remark

1) With the D75P2, the latest value of the command speed set by the positioning data number and that of the speed set by a speed change request are retained as the current speed, and the current speed is used for control when –1 (current speed) is set as the command speed.
2) Depending on the relationship between travel increment and change speed, the feed speed may not reach the new speed value. Even in such a case, the current speed is updated.

(4) Switching the speed

(a) Standard speed switch mode

1) If command speeds of the positioning data number currently being operated and the positioning data number to be operated next are different, first the positioning point of the previous operation is reached, then the speed is switched to the specified speed by performing acceleration or deceleration.

2) When acceleration or deceleration is performed to reach the command speed specified by the positioning data to be operated next, the parameter of the positioning data number that executes acceleration/deceleration is used.
Note that the speed is not switched if command speeds are the same.

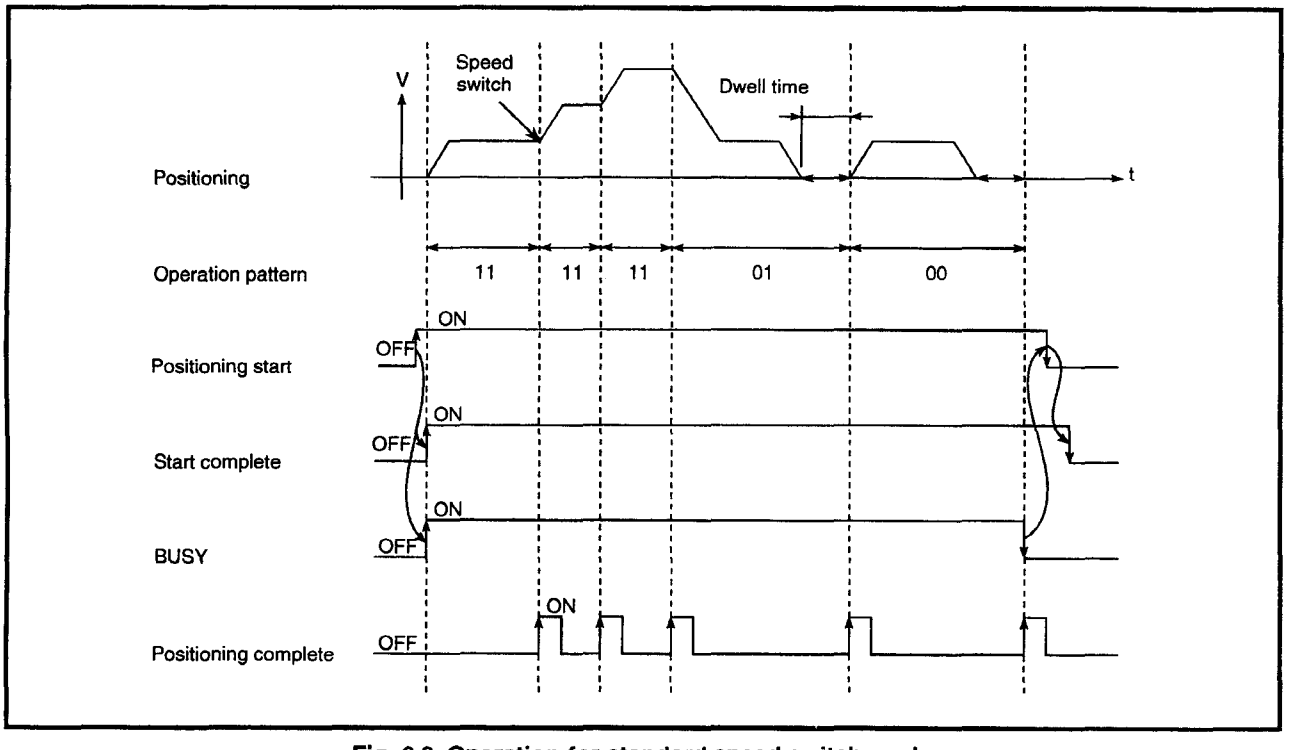
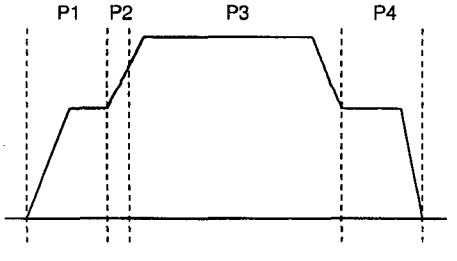


Fig. 6.8 Operation for standard speed switch mode

3) Speed switch condition
When travel increment is less than required for the set speed and the set speed is not reached even if acceleration or deceleration is performed, acceleration or deceleration is performed so that the speed approaches the set speed value.
Also, if the speed exceeds the travel increment when automatic deceleration is necessary (for example, when the operation pattern is 00 or 01), the operation immediately stops at the positioning address and a "travel distance shortage warning (warning code: 513)" is generated.

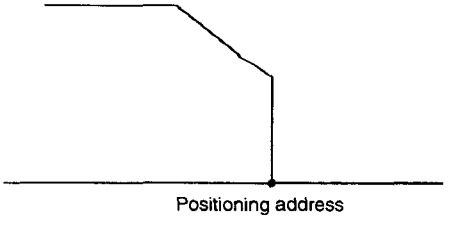
[When speed cannot be switched in P2]

When the relationships among the speeds are P1 = P4, P2 = P3, P1 < P2:



[When travel increment is small during automatic deceleration]

Since the increment of travel necessary for automatic deceleration cannot be secured, the operation immediately stops when the speed ≠ 0.



(b) Early speed switch mode

1) If the command speeds of the positioning data number currently being operated and the positioning data number to be operated next are different, speed is changed at the end of current positioning, to the speed specified by the next positioning data number.

2) When acceleration or deceleration is performed to reach the command speed specified by the positioning data number to be operated next, the parameter of the positioning data number following the positioning data number that executes acceleration/deceleration is used.
Note that the speed is not switched if command speeds are the same.

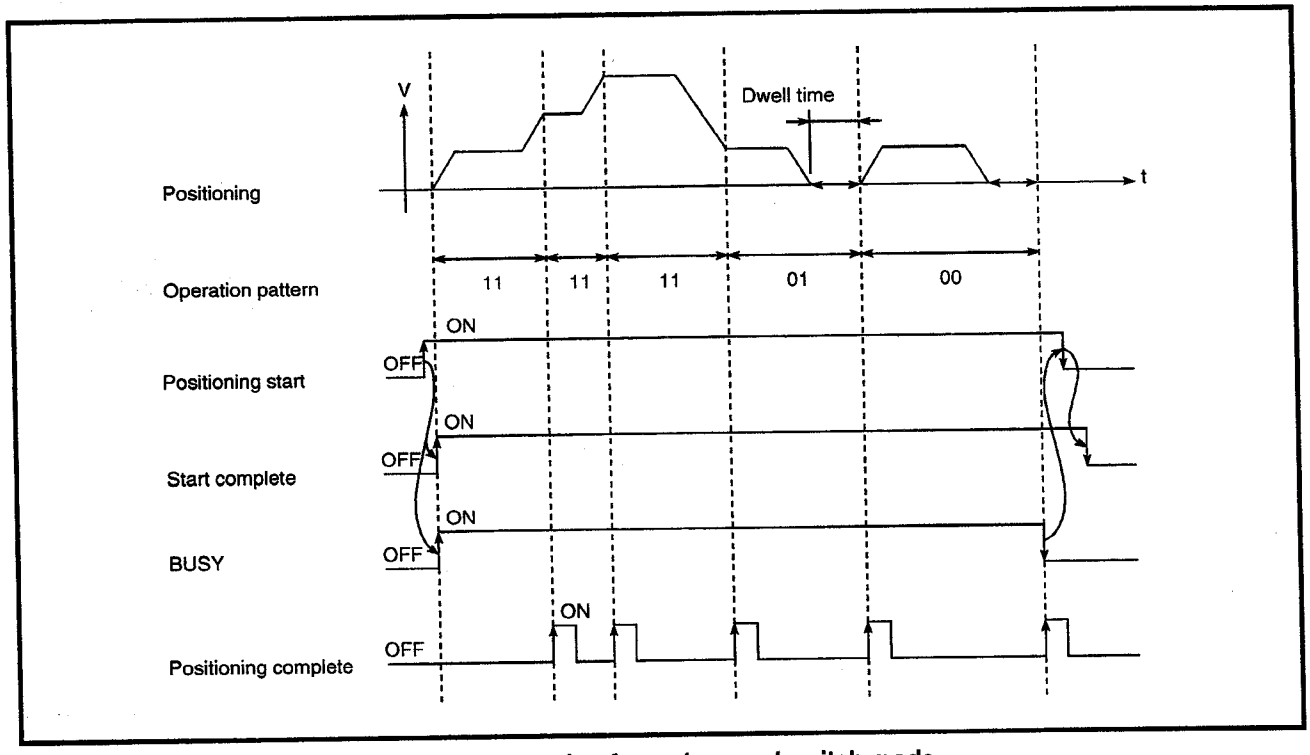
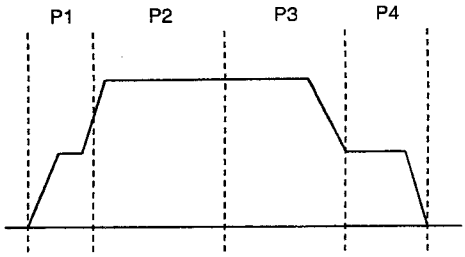


Fig. 6.9 Operation for early speed switch mode

3) Speed switch condition
When travel increment is less than required for the set speed and the set speed is not reached even if acceleration or deceleration is performed, acceleration or deceleration is performed so that the speed approaches the set speed value.
Also, if the speed exceeds the travel increment when automatic deceleration is necessary (for example, when the operation pattern is 00 or 01), the operation immediately stops at the positioning address and a "travel distance shortage warning (warning code: 513)" is generated.

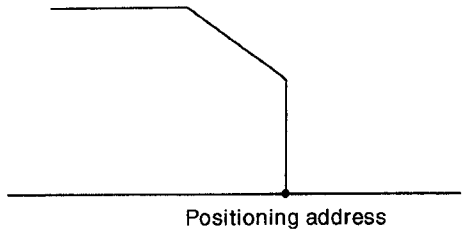
[When speed cannot be switched to the P2 speed in P1]

When the relationships among the speeds are P1 = P4, P2 = P3, P1 < P2:



[When travel increment is small during automatic deceleration]

Since the increment of travel necessary for automatic deceleration cannot be secured, the operation immediately stops when the speed ≠ 0.



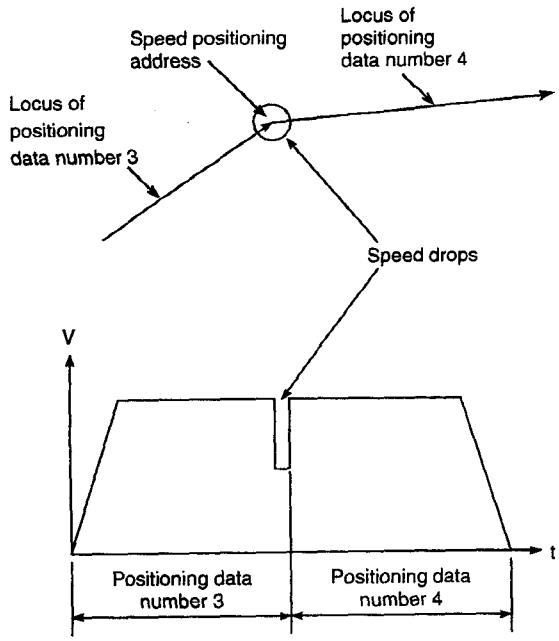
(5) Adjacent passing mode of interpolation operation during locus control

(a) Positioning-address passing mode and adjacent passing mode

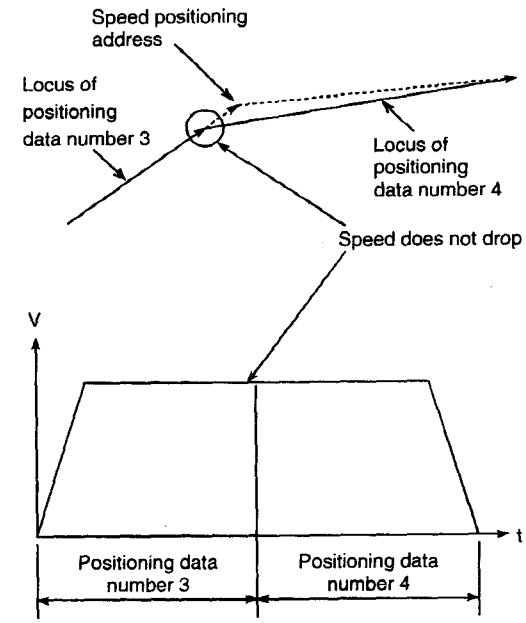
1) Positioning-address passing mode (default)
The positioning-address passing mode performs control so that the specified positioning address is always passed through when completing each positioning data. Therefore, the output speed may drop during each positioning-address passing, and this may cause a problem for the control.

2) Adjacent passing mode (set "1" in the buffer memory at 66 and 216)
The adjacent passing mode carries over the remainder of travel increment produced at the end of each positioning data to the next positioning data so that position adjustment is not executed, which prevents output speed drops and mechanical vibrations due to speed changes.
However, because it carries over the remainder of travel increment produced at the end of each positioning data to the next positioning data, the locus passes the area adjacent to the specified positioning address.

[Locus of positioning-address passing mode]



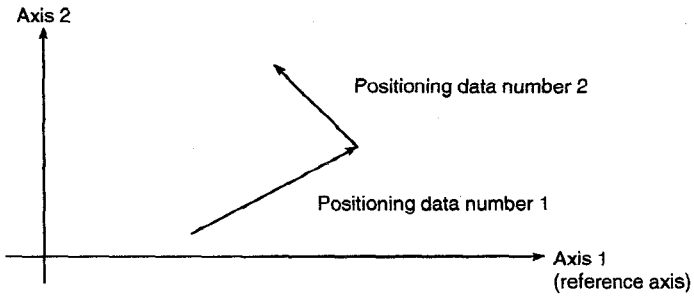
[Locus of adjacent passing mode]



(b) Precautions

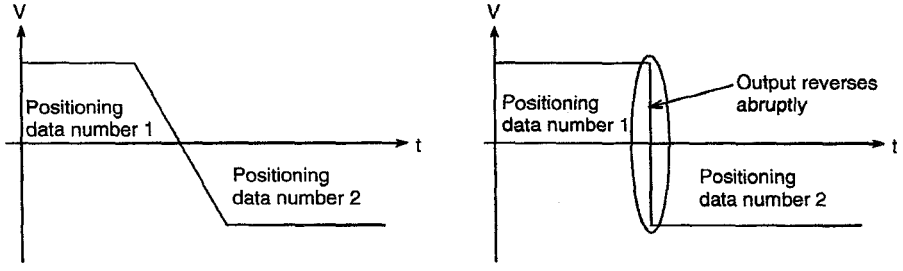
1) When performing continuous locus control in the adjacent passing mode, output abruptly reverses if the travel direction of the reference axis changes when processing moves on to the next positioning data number from the current positioning data number. If the sudden reversal of output affects the mechanical system, perform control using the continuous positioning control.
(In the case of the positioning-address passing mode, a change in the travel direction of reference axis triggers an automatic deceleration.)

[Locus of continuous locus control]



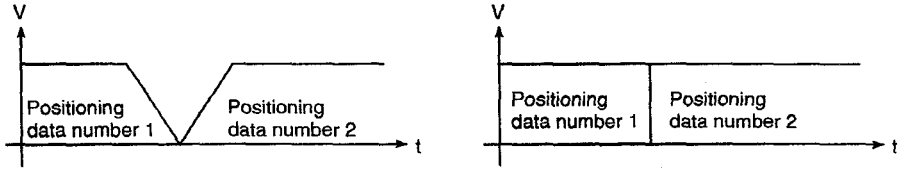
[Output speed of axis 1]

(a) Positioning-address passing mode (b) Adjacent passing mode

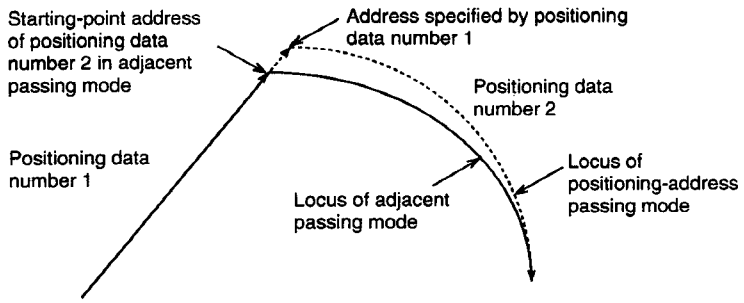


[Output speed of axis 2]

(a) Positioning-address passing mode (b) Adjacent passing mode

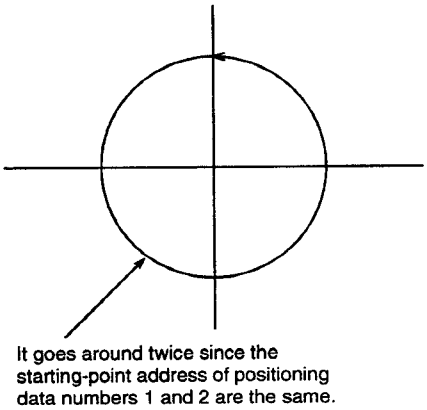


2) During the continuous locus control of circular interpolation in the adjacent passing mode, the positioning address number currently being executed minus the remainder of travel increment replaces the starting-point address of the next positioning data number.
Therefore, circular interpolation control cannot be performed using the increment system.
Also, because the starting-point address is replaced, a "large circular error gap (error code: 506)" may occur.
In this case, adjust the "allowable circular error range setting."

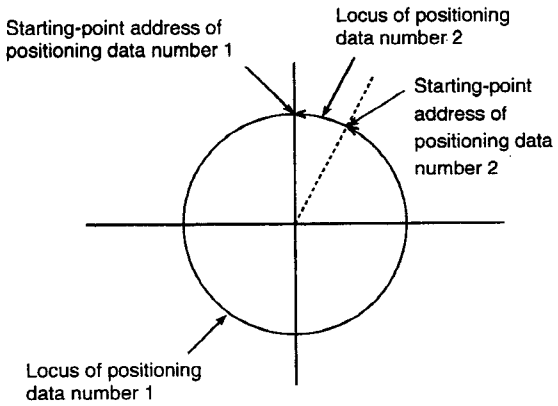


3) In the adjacent passing mode, if the circular interpolation control with the specified center point is performed by specifying continuous locus and if the starting-point and positioning addresses are set at the same position, two data numbers form a round. This is because the starting-point address of the second data is shifted for the remainder of travel increment produced by the first data.

[Positioning-address passing mode]



[Adjacent passing mode]



4) If the travel increment specified by a positioning data number is small when performing continuous locus control in the adjacent passing mode, output speed may not reach the command speed.

6.3 Starting Positioning Control

This section describes the start method of positioning control and the start input.

6.3.1 Overview of start

The start methods of positioning control include the individual data (one block) start and block start. With block start, "start from the first point" or "start from the nth point" can be selected.

(1) Individual data (one block) start

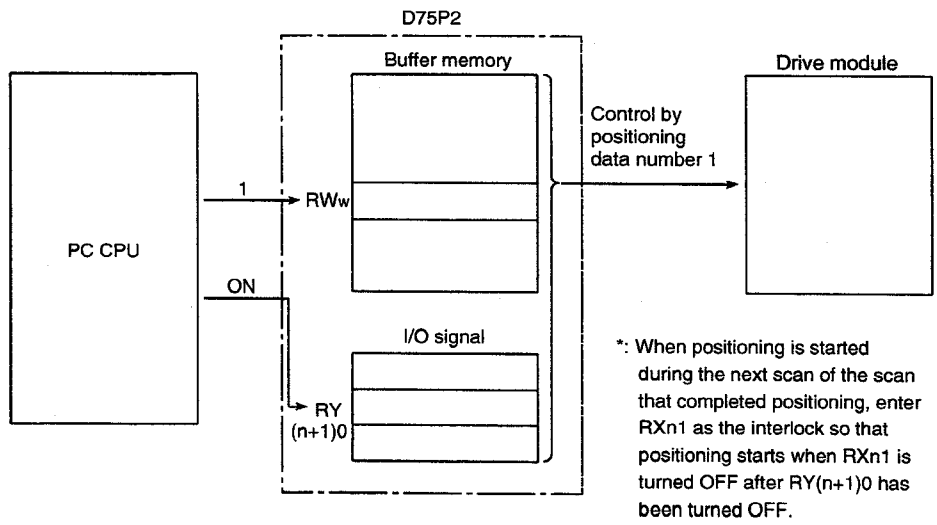
(a) This performs positioning from the positioning data number at which positioning was started, to the positioning data number whose positioning pattern is set to "positioning completes (00)."

(b) When performing individual data start, set the positioning data number to be started in the buffer memory for setting positioning start number as shown below, then start positioning.

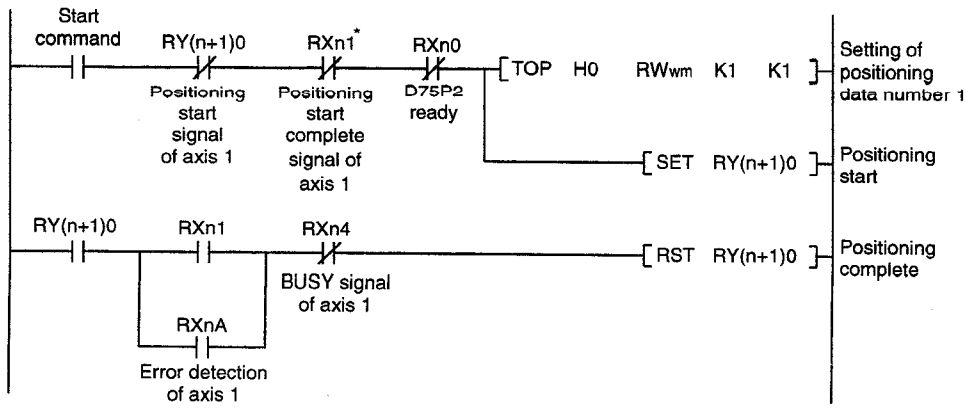
Axis number	Buffer memory
Axis 1	RWwm
Axis 2	RWwm + 8

Example

The following shows the program when starting positioning data number 1 of axis 1.



[Sequence program]



(2) Block start

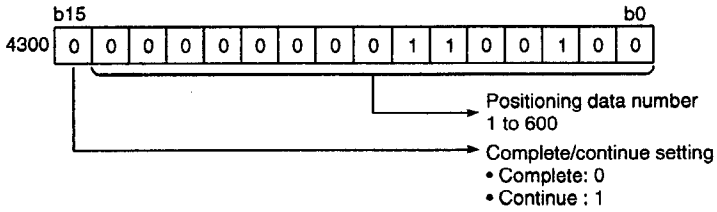
(a) With block start, multiple consecutive blocks are automatically started at one time.

(b) Block start method

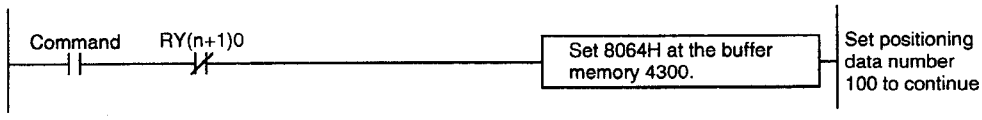
1) When performing block start, set "7000" or "7001 to 7010" in the buffer memory for setting the positioning start number, then start positioning.
If "7000" or "7001 to 7010" is set in the buffer memory for setting the positioning start number, operation starts using the positioning data number set in the buffer memory for block start.

Axis number	Buffer memory address for block start
Axis 1	4300 to 4349
Axis 2	4550 to 4599

2) Set the complete/continue setting and the positioning data number for start in the buffer memory for block start.



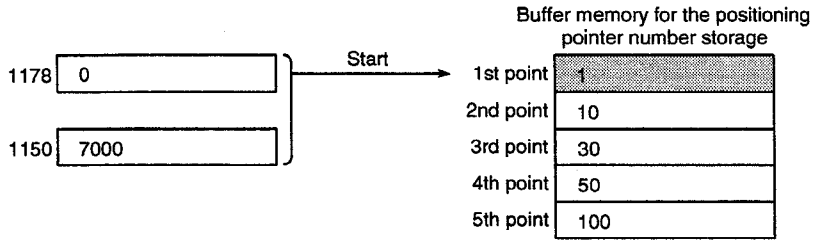
- When setting the complete/continue and the positioning data number for start in the buffer memory for block start, use hexadecimal values.
Positioning data number 100 is converted to "64H" in hexadecimal. Set to H64 when setting to complete and H8064 to continue.



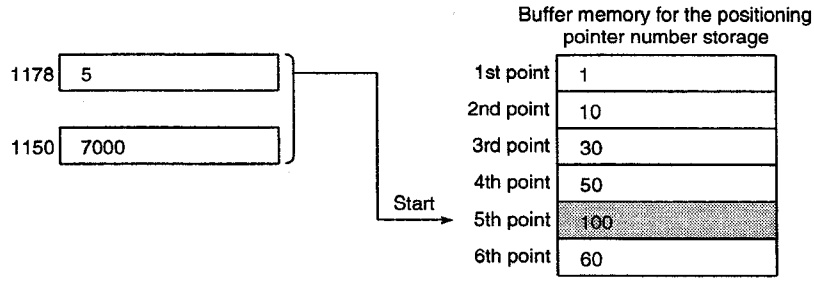
(c) With block start, "start from the first point" or "start from the nth point" can be selected.
To select "start from the first point" or "start from the nth point," use the buffer memory for storing positioning pointer number as shown below.

Axis number	Buffer memory address for the positioning pointer number storage	Setting range
Axis 1	1178	• 1 to 50: Start from the specified point
Axis 2	1228	• Other than the above: Start from the first point

1) If start is executed without setting the pointer number that performs start in the buffer memory for the positioning pointer number storage, positioning from the first point can be performed.

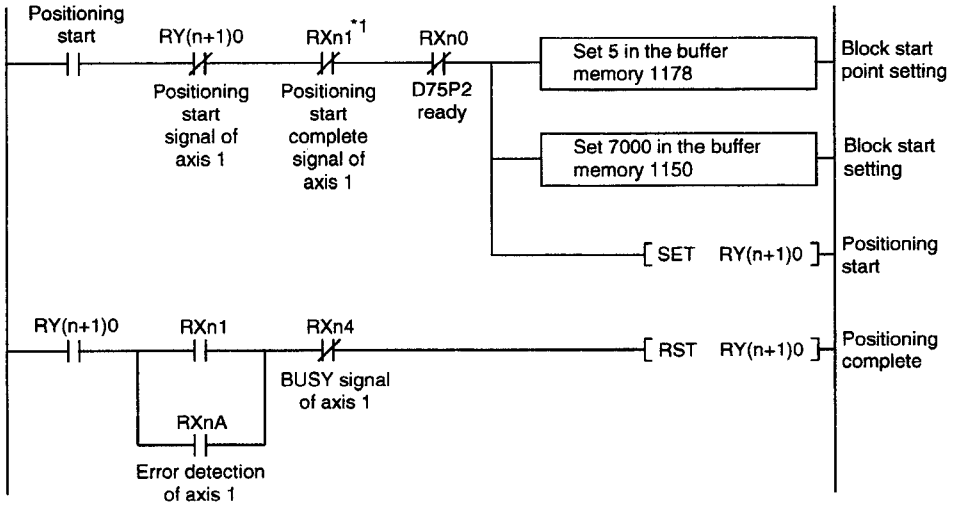


2) Positioning can be started with any point number by setting the desired pointer number in the buffer memory for the positioning pointer number storage prior to starting.
A maximum of 50 points of positioning data numbers can be preset for block start, and positioning can be performed by switching the point number.



Example

The following shows a program that performs block start of the 5th point of axis 1



(d) Block positioning operation

1) When the positioning start signal is turned on, positioning starts with the positioning data number set in the first point of the buffer memory for setting positioning start data in the following conditions:
Buffer memory for positioning start number storage: 7000 to 7010 *2
Buffer memory for setting positioning point number: Other than 1 to 50

2) When the operation pattern of the positioning data is "positioning continues," operation with respect to the current positioning data is performed first, followed by the operation with respect to the next positioning data number. The next positioning data number of the positioning data previously operated will be processed next.
For example, if the data number operated previously is 10, positioning data number 11 will be processed next.

3) When the operation pattern of the positioning data is "positioning completes," the operation with respect to the positioning data is performed first, then the processing of the first point is performed.
If the complete/continue setting of the first point is set to "complete" at this time, the operation is terminated (BUSY signal turns off).
If the operation pattern of the first point is "continue," the points are updated and operation starts with the second point.

Remark

*1: When positioning is started during the next scan of the scan that completed positioning, enter RXn1 as the interlock so that positioning starts when RXn1 is turned off after RY(n+1)0 has been turned off.

*2: When using 7001 to 7010, the positioning start data, positioning special start data and condition data can only be set using a peripheral device (SW1IVD-AD75P).

4) Points are updated until "complete" appears.
However, the point can be updated until it reaches 50.
When the point exceeds 50, operation is terminated and a "no operation complete setting warning (warning code: 505)" is generated.

[Positioning start data setting]

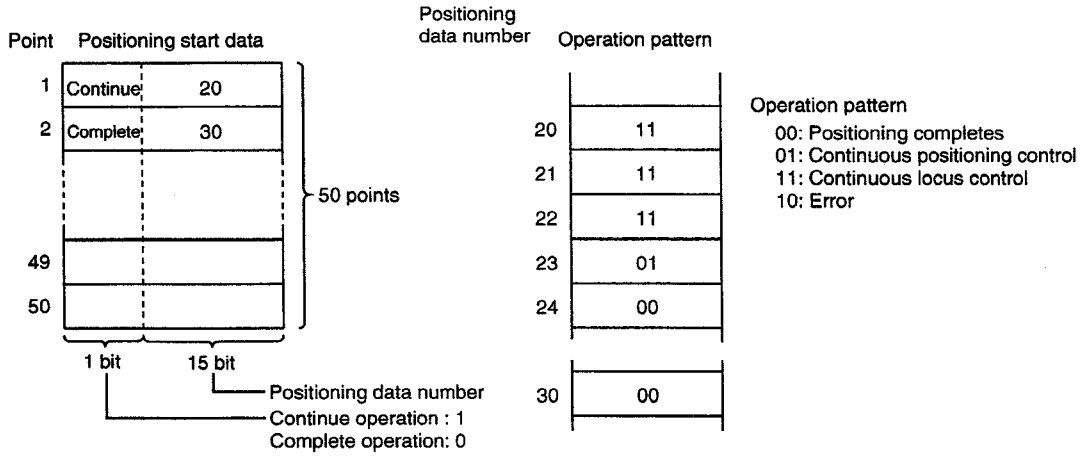


Fig. 6.10 Block positioning process (1)

[Process sequence]

For the above settings, the sequence of processed positioning data number is as follows:

- 20 → 21 → 22 → 23 → 24 → 30 → (Operation complete)

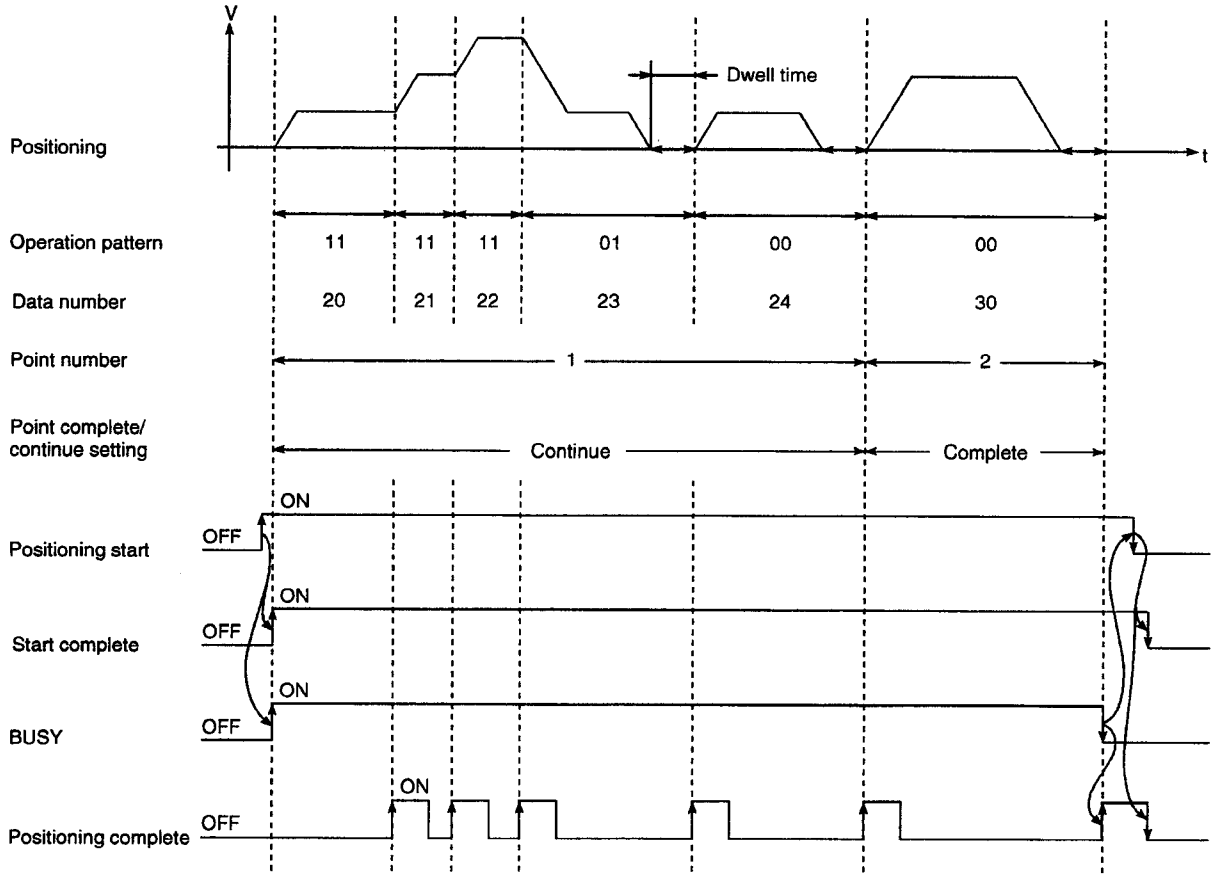


Fig. 6.10 Block positioning process (2)

6.3.2 Start method

This section describes the start method for positioning.
Start positioning for interpolation control on the reference axis only.
By starting positioning of the reference axis, interpolation control is performed using the reference and auxiliary axes.
If positioning is started on both the reference axis and interpolation axis, the errors listed below occur and positioning will not start:

- Reference axis : BUSY interpolation on the counter-party axis (error code: 519)
- Interpolation axis : Control method setting error (error code: 524)
  Started during operation (warning code: 100)

(1) Start by positioning start signals

(a) Upon positioning start signal becoming on, the start complete signal and BUSY signal are turned on, then positioning operation is started.
The BUSY signal being turned on tells that the axis is in operation.

(b) When the positioning start signal turns off, the start complete signal also turns off.
If the positioning start signal is on even after positioning has been terminated, the start complete signal also remains on.

(c) If the positioning start signal is turned on again while the BUSY signal is on, a "started during operation warning (warning code: 100)" is generated.

(d) When the axis operation reaches the final phase of positioning, the processing varies depending on whether or not the next positioning is required.

1) When the next positioning is not required

- If a dwell time has been set, positioning is completed after the set wait time has elapsed.
- Upon completion of positioning, the BUSY signal turns off, then the positioning complete signal turns on. However, it does not turn on during speed control or when the positioning complete signal ON time is set to "0."
- When the positioning complete signal ON time elapses, the positioning complete signal is turned off.

2) When the next positioning is required

- If a dwell time has been set, it waits until the set wait time has elapsed.
- When the set dwell time has elapsed, the next positioning starts.

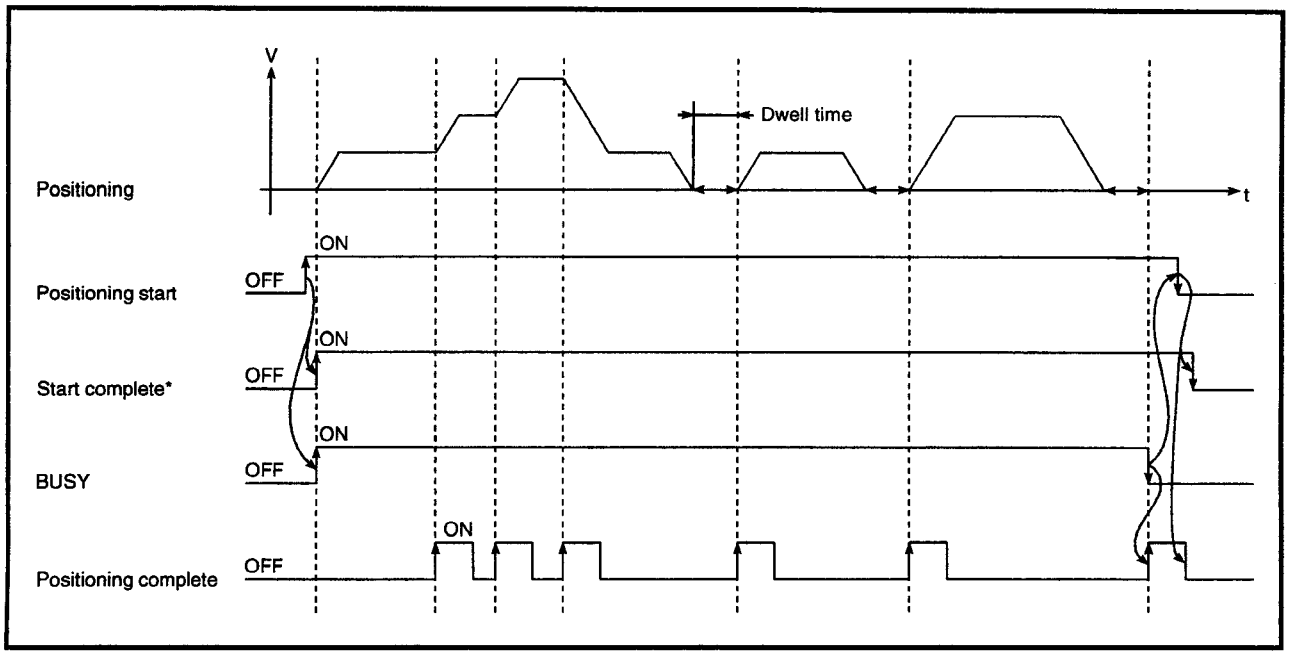


Fig. 6.11 ON/OFF timing of each signal upon startup of positioning

Remark

*: It does not turn ON when started by an external start signal.

(2) External positioning operation start

(a) Positioning operation can be started by turning ON the external start signal.
(The same processing as the positioning operation start by the positioning start signal can be performed. See (1) in Section 6.3.2.)

(b) When performing positioning operation by an external start signal, the following settings are required:

1) External start function selection : External positioning start (0)

2) External start valid setting : Set to enable external start (1). The operation cannot be started by the external start signal with the initial set value (0: disable external start).

(c) Start complete signal does not turn ON when started by an external start signal.

Point

When using external positioning operation start, write the start data number beforehand using a sequence program, then start the operation via an external input.
Therefore, since an external input starts the operation when the external positioning operation start is used, variation in start times due to the PC's scan time can be eliminated.

Remark

The buffer memory addresses for selecting external start function and enabling external start are listed below.

Axis number	Buffer memory	
	External start function selection	External start valid setting
Axis 1	62	1171
Axis 2	212	1221

6.3.3 Special start

(1) Special start

The following controls are feasible when using the special start:

- Initiate positioning control after positioning has been started when the specified condition is satisfied.
- Repeat processing for the specified point by a single start
- Simultaneous start (maximum 2 axes)

(2) Setting the special start

(a) Use "positioning special-start data area" and "condition data area" of the buffer memory to set special start conditions.
The positioning special-start data area and condition data area have the areas that correspond to the 1st to 50th points of the positioning start data area for block start.
(The special start data and condition data can be set in the edit mode of a peripheral device.)

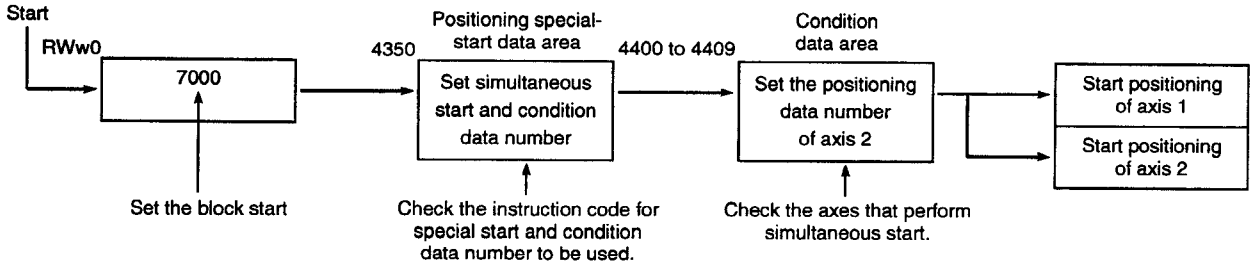
	Positioning start data area		Positioning special-start data area		Condition data
4300	1st point	4350	1st point	4400 to 4409	1st point
4301	2nd point	4351	2nd point	4410 to 4419	2nd point
4302	3rd point	4352	3rd point	4420 to 4429	3rd point
4348	49th point	4398	49th point	4480 to 4489	9th point
4349	50th point	4399	50th point	4490 to 4499	10th point

* The above indicates the addresses of axis 1.

(b) If the instruction code for special start is set in the positioning special-start data area in the buffer memory at the time of block start, positioning starts using the conditions set in the condition data area.
If the instruction code is not set in the positioning special-start data area in the buffer memory, a normal start is performed (control is initiated when positioning starts).

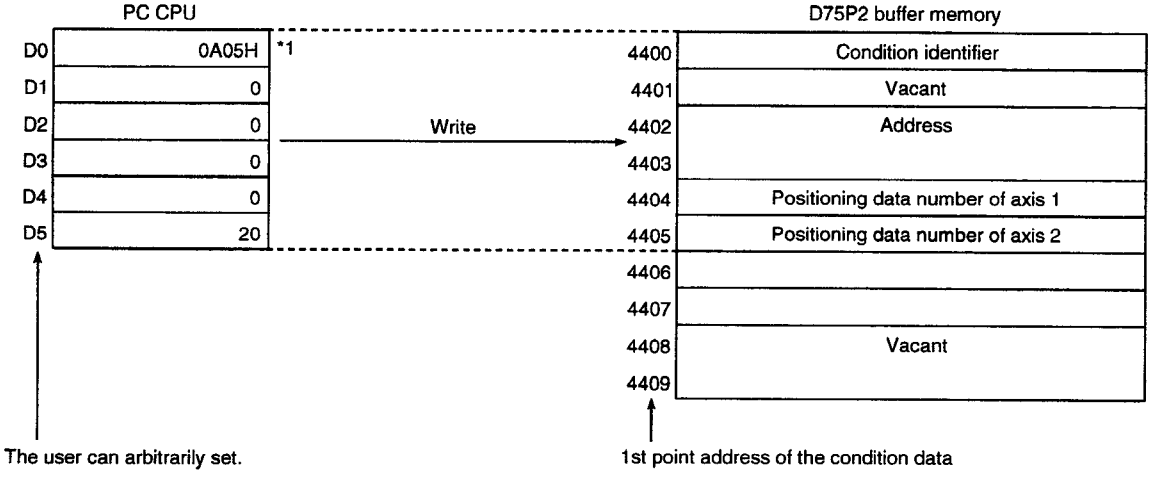
(c) When axis 1 is started, the simultaneous start of axes 1 and 2 is performed in the following flow.

1) Outline of operation

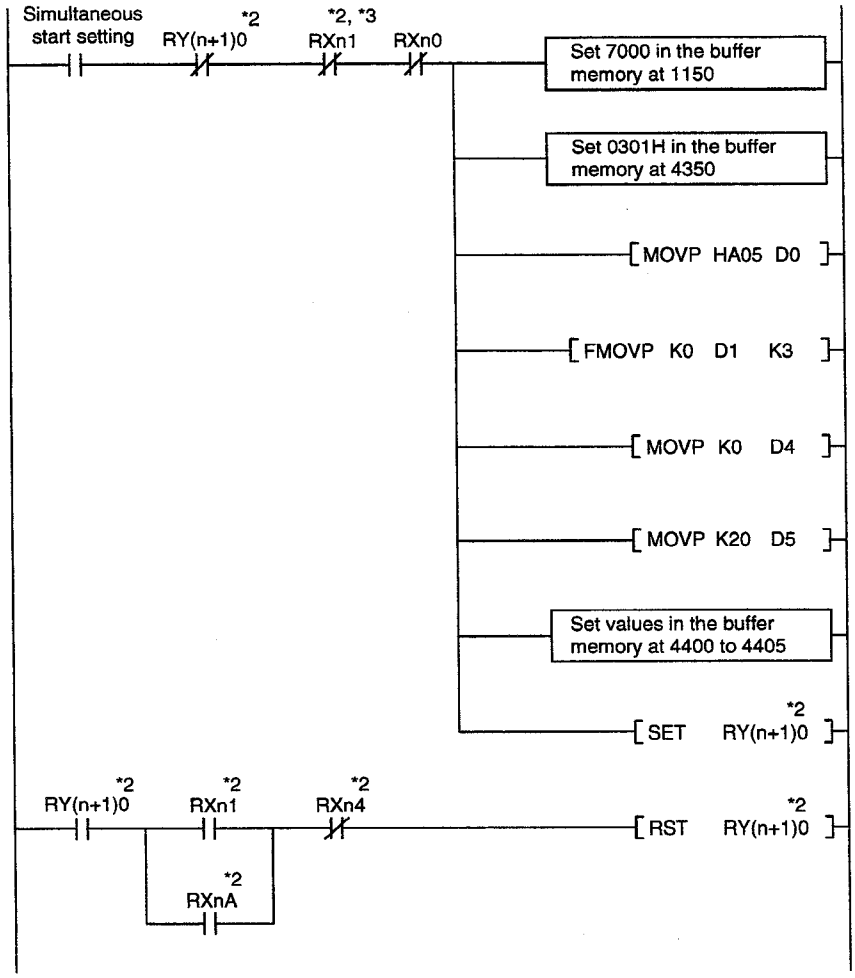


2) Sequence program setting

- The set data and the D75P2 buffer memory



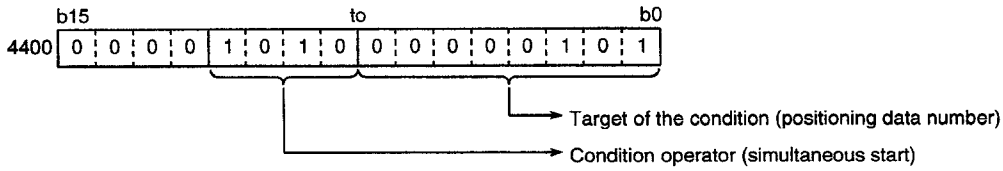
- Sequence program



(d) See Sections 11.3, 11.4 and 8.9 for the instruction codes and condition data for special start.

Remark

*1: Setting contents of condition identifier



*2: Set this so that it matches the I/O number of the D75P2 loading position.

*3: When positioning is started during the scan immediately following the scan that completed positioning, enter RXn1 as the interlock so that positioning starts when RXn1 is turned off after Remote station ready signal has been turned off.

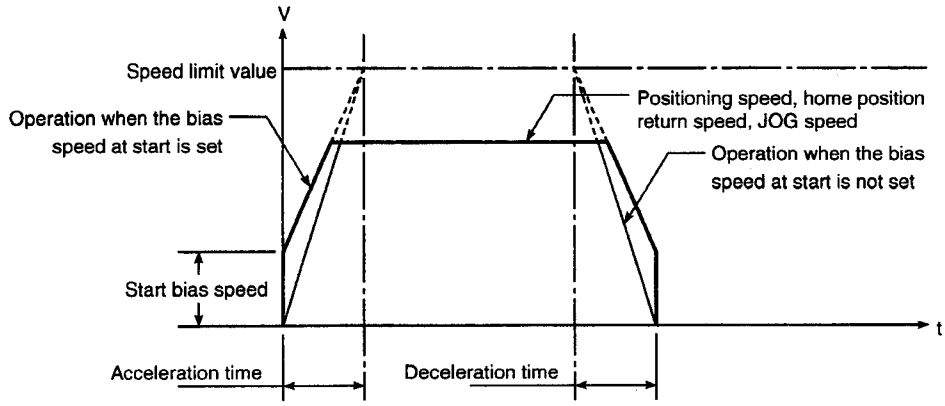
6.3.4 Setting the bias speed at start

(1) Bias speed at start

(a) The bias speed at start is the minimum start speed, which can be used to start motor rotation smoothly when using stepping motors, etc.

(b) With the D75P2, the bias speed at start can be set in the buffer memory.

(c) The set bias speed at start is valid for positioning, home position return and JOG operation.



(2) Setting method

(a) The bias speed at start is set in the buffer memory listed below.

(b) When using bias speed at start, write the bias speed at start into the buffer memory listed below.
When not using bias speed at start, set the buffer memory listed below to "0."

(c) The data for bias speed at start that has been written to the buffer memory listed below becomes valid at the rise of the remote station ready signal (off to on).

Buffer memory		Item	Setting range				Initial value
Axis 1	Axis 2		mm	inch	degree	pulse	
12 13	162 163	Bias speed at start	1 to 37500000 × 10^{-2} mm/min.	1 to 37500000 × 10^{-3} inches/min.	1 to 37500000 × 10^{-3} degrees/min.	1 to 62500 pulse/sec.	0

6.4 Stop of Positioning Control

This section describes possible factors that stop an axis during positioning.

6.4.1 Stop command and stop factors

(1) The stop command and stop factors are listed in Table 6.1. They are classified into "stop of individual axis" and "simultaneous stop of all axes."

(a) For the stop command and stop factors for individual axis, only the axis whose stop command is turned on or for which a stop factor occurs stops.
However, if a stop command or stop factor arises for either one of the axes undergoing an interpolation control execution, both of the axes performing the interpolation control stop.

(b) For the simultaneous stop command and stop factors with respect to all axes, all axes stop when the stop command turns on or when the stop factor occurs.

(2) The stop commands and stop factors for which stop after deceleration or rapid stop can be selected, are classified into stop groups 1 to 3.
Use an extended parameter to set stop after deceleration or rapid stop for each stop group.

(a) Stop group 1: Fatal stop factors

(b) Stop group 2: Emergency or equivalent

(c) Stop group 3: Intentional stops and relatively safe errors

Table 6.1 A list of stop processing by stop factors and operation status

Stop factor		Positioning *4	Home position return *5	JOG operation	Manual pulse generator operation	Stop axis	Axis operation status after stop	M-code on signal status
—	Drive module ready off *1 (servo ready off)	Immediate stop			Immediate stop	Individual axis	Error	No change
	Error occurrence during continuous locus operation *2							
Stop group 1	External high-limit switch on	Stop after deceleration/rapid stop			Immediate stop	Individual axis	Error	No change
	External Low-limit switch on							
Stop group 2	Software stroke limit out of range	Stop after deceleration/rapid stop			Immediate stop	Individual axis	Error	No change
	"Stop" key input from peripheral device *3					All axes		
	Remote station ready signal off							Turns off
Stop group 3	External stop signal ON *6	Stop after deceleration/rapid stop			Immediate stop	Individual axis	Stopped/standby	No change
	Axis stop signal ON *6							
	Axis error occurrence (other than stop group 1 and 2)						Error	
	Test mode error							

Remark

*1: This is a hardware stop processing of the drive module.

*2: For the software stroke limit valid/invalid at JOG operation and manual pulse generator operation, select using "software stroke limit valid/invalid at JOG operation and manual pulse generator operation" of the axis control data in the buffer memory.

*3: Operation is normally performed up to the positioning data immediately preceding the positioning data in which the following errors occur, then stops immediately.

- Out of linear travel increment range (error code: 504)
- Large circular error gap (error code: 506)
- Travel outside stroke limit (+) (error code: 511)
- Travel outside stroke limit (–) (error code: 512)
- Auxiliary point setting error (error code: 525)
- Endpoint setting error (error code: 526)
- Center point setting error (error code: 527)
- Radius out of range (error code: 544)

*4: Indicates positioning during positioning control using positioning data, speed control or speed/position switch control.

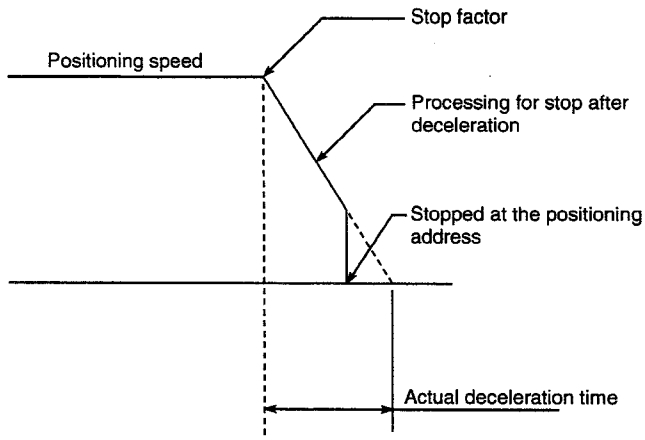
*5: Indicates home position return that is travelling at the home position return speed or creep speed.

Point

*6: Even if an external stop signal or axis stop signal is turned off while the start signal is on, it will not start abruptly (the start signal is valid only when it rises (off to on)).

Point

The operation stops as soon as the set positioning address is reached while decelerating to stop.



6.4.2 Stop processing and priority

(1) Stop processing

There are three types of stops during operation: stop after deceleration, rapid stop and immediate stop.

(a) Stop after deceleration *1
This is the stop by "deceleration times 1 to 4" of the base and extended parameters.
Use the positioning data to set which of the deceleration times 1 to 4 is to be used.

(b) Rapid stop *1
This is the stop by the "rapid-stop deceleration time" of the extended parameter.

(c) Immediate stop
This is the stop that does not perform deceleration processing.
The D75P2 immediately stops pulse output, but it does not completely stop until the processing for the pulse standing in the drive module error counter is finished.

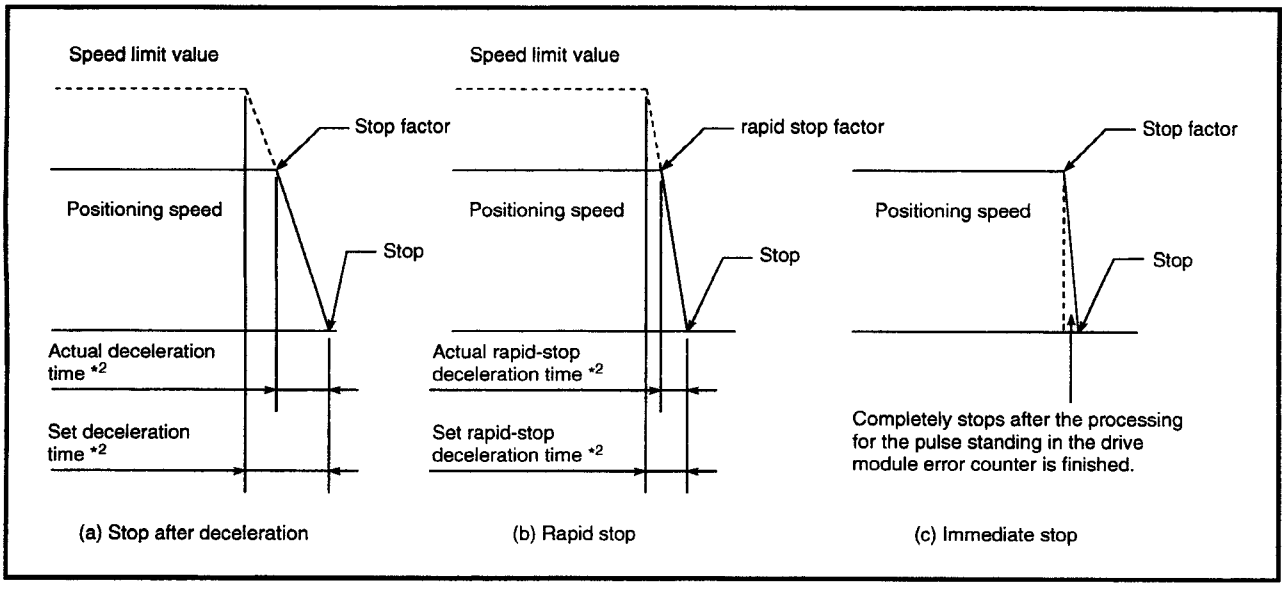


Fig. 6.12 Outline of stop processing

Remark

*1: To select stop after deceleration or rapid stop, use the "rapid stop selection for stop groups 1 to 3" of the extended parameter (the default setting is stop after deceleration).
*2: See Section 7.9.1 for the actual deceleration time, set deceleration time, actual rapid-stop deceleration time and set rapid-stop deceleration time.

(2) Stop processing priority

The following shows the stop processing priority of the D75P2.

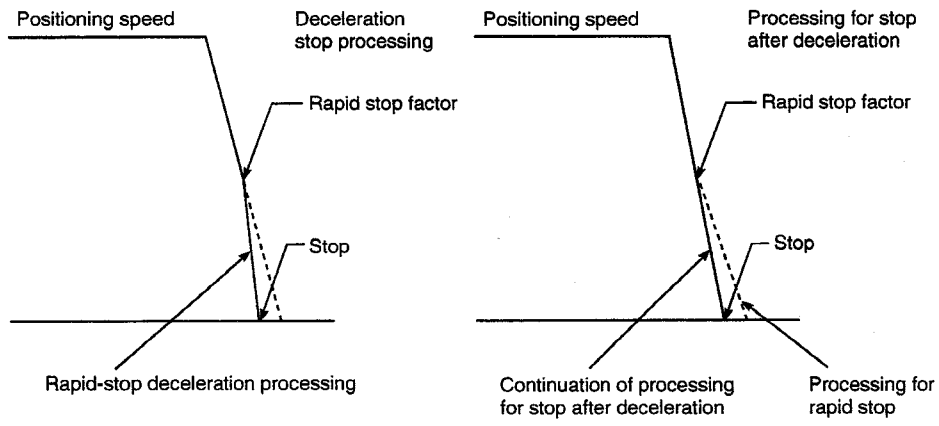
(Stop after deceleration) < (Rapid stop) < (Immediate stop)

(a) While in deceleration (including automatic deceleration), the operation will stop from the deceleration speed even if the deceleration stop command becomes on or there is a deceleration stop factor.

(b) When the stop signal specified for a rapid stop is turned on or there is a rapid stop factor while in deceleration, the rapid stop processing is executed from that point on.
However, if the rapid-stop deceleration time is longer than the deceleration time, the deceleration stop processing continues even if a rapid stop factor is encountered while in the deceleration stop processing.

Example

The processing when a rapid stop factor is encountered while in the deceleration stop processing is as follows.



1) When stop after deceleration time > rapid-stop deceleration time

2) When stop after deceleration time > rapid-stop deceleration time

6.4.3 Stop processing during deceleration

(1) During deceleration (including automatic deceleration), the operation stops from the deceleration speed even if a stop is input.

(2) When a stop is input while decelerating for home position return, the operation stops from the deceleration speed. The operation stops immediately in the case of the creep speed.

(3) If a stop factor that is specified as a rapid stop factor occurs while decelerating, the rapid stop processing is executed from that point on.
The rapid stop processing during deceleration is executed only when the rapid stop time is shorter than the stop time.

6.4.4 Stop processing during interpolation operation

(1) While in the interpolation operation, a stop signal to either of the axes in use stops the both axes.

(2) When a restart is performed while the operation is stopped, if positioning is being executed (i.e., the operating status of the axis is "stopped"), the operation resumes continuing the positioning. *
If it was waiting for a condition to be satisfied, it will wait again.

Remark

*: See Section 6.5 for restart.

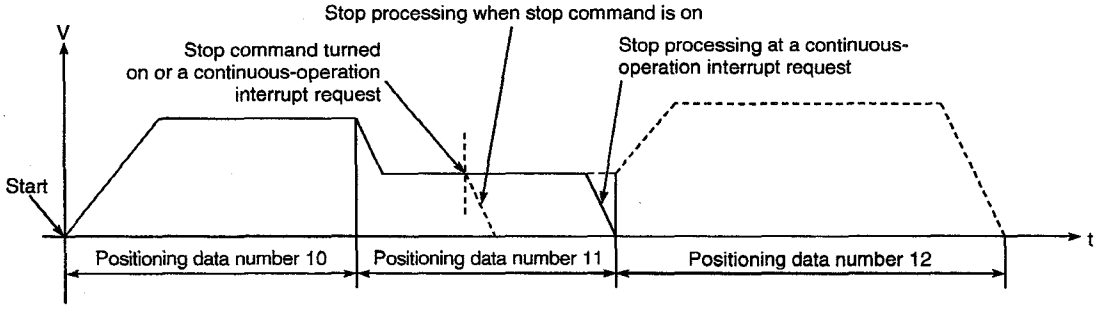
6.4.5 Continuous-operation interrupt function

(1) Continuous-operation interrupt function

(a) If a stop command is turned on while executing continuous operation or continuous locus control, immediate stop processing is executed.
The continuous-operation interrupt function is the function that terminates operation at the positioning data number being executed.
When a continuous-operation interrupt request is made, the operation is terminated at the point the processing for the positioning data number being executed is terminated.

(b) The status for each signal is as follows when the operation is stopped by the continuous-operation interrupt function:

- Positioning complete signal : OFF
- BUSY signal : OFF
- M-code on signal : ON (if M code has been set)
  OFF (if M code has not been set)
- Error detection : OFF

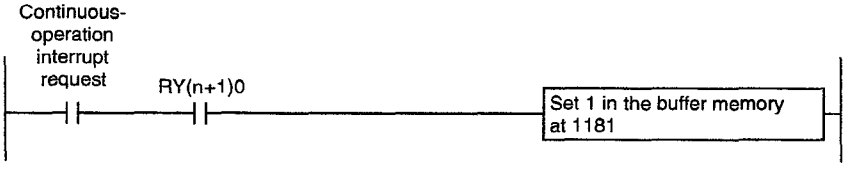


(2) Continuous-operation interrupt request

(a) The following buffer memory is used to set a continuous-operation interrupt request.

Buffer memory		Setting range	Initial value
Axis 1	1181	0: Continuous-operation interrupt request acknowledgment complete (set by the OS)	0
Axis 2	1231	1: Continuous-operation interrupt request (set by a sequence program)	

(b) Use the following program to issue a continuous-operation interrupt request.

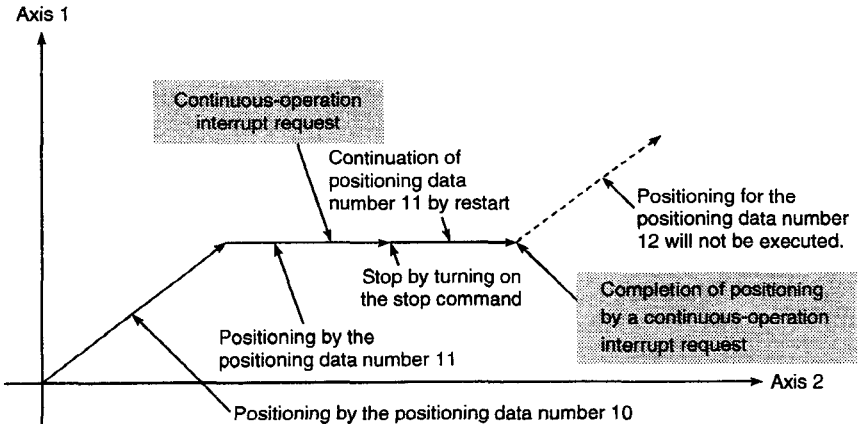


(c) When a continuous-operation interrupt request is made, the D75P2 turns off the continuous-operation interrupt request upon completion of acknowledgment.
(Set 0 in the buffer memory at 1181 for axis 1).

(3) Precautions

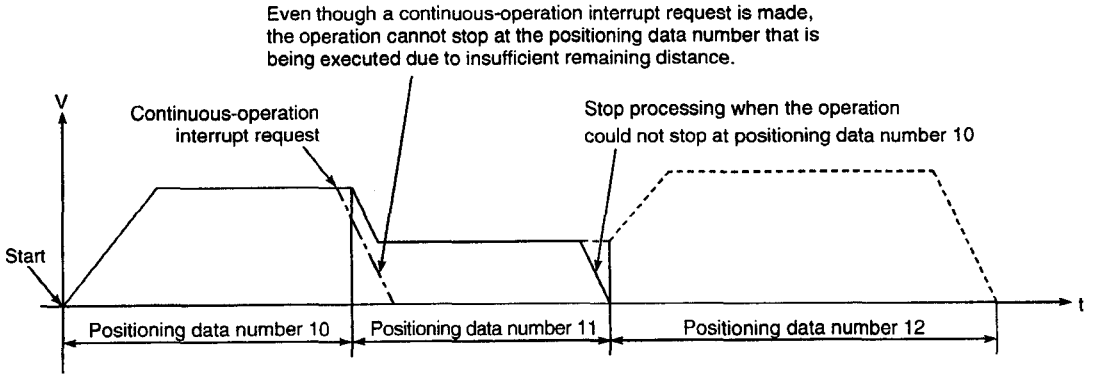
(a) When a continuous-operation interrupt request is made, the positioning is completed. Therefore, positioning cannot be restarted once it is stopped.
If a restart request is made, it generates a warning (warning code 104: restart disabled).

(b) Even if the stop command is turned on after a continuous-operation interrupt request has been made, the continuous-operation interrupt request will not be canceled.
Therefore, if positioning is restarted after it has been stopped by turning on the stop command, the operation stops upon completion of the positioning data number to which a continuous-operation interrupt request is made.



(c) If stop after deceleration cannot be performed due to insufficient remaining distance when a continuous-operation interrupt request is made during continuous locus control, the interruption to the continuous operation is deferred until the positioning data indicated below is processed:

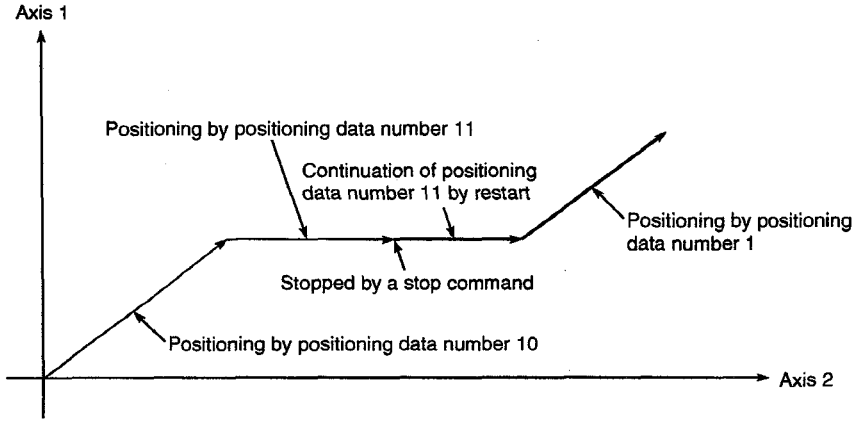
- Positioning data number that can secure a remaining distance
- Positioning data number with "positioning completes" (pattern: 00)
- Positioning data number with "continuous positioning control" (pattern: 01)



6.5 Restarting Positioning Control

6.5.1 What is restart after a stop?

(1) Restart after a stop is the function that once stops the operation by turning on a stop signal, then resumes positioning from the position it was stopped.



(2) Using restart after a stop enables continuous operation from the position where the operation was stopped by a stop command, even if the following controls are being performed:
- Positioning control by the increment system
- Continuous operation control
- Continuous locus control
- Block start

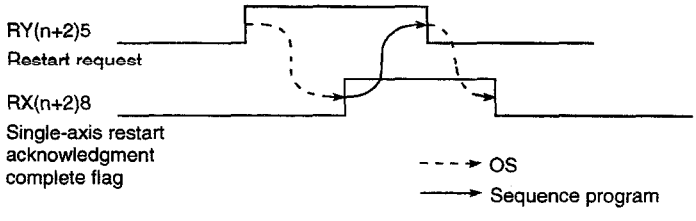
6.5.2 Specifying the restart after a stop

(1) Use the following remote I/O to specify a restart.

Remote I/O		Setting range	Initial value
Axis 1	RY(n+2)5	0: No restart	0
Axis 2	RY(n+4)5	1: Restart request (set by a sequence program)	

(2) After a restart, confirm the restart acknowledgment complete flag and reset RY(n+2)5 and RY(n+4)5.

(Example) For one axis



6.5.3 Precautions

(1) Restart can only be executed while the operating status of the axis is "STOP."
Restart cannot be executed when the operation status of the axis is other than "STOP."

(2) Do not restart while a stop command is on.
If restart is executed while stopped, an error (error code 106: Started during stop command on) is generated, and the operating status of the axis becomes "ERR."
Therefore, restart cannot be performed even if the error is reset.

(3) Restart can also be executed while the positioning start signal is on.
However, do not set the positioning start signal from off to on while stopped.
If the positioning start signal switches on from off, positioning is performed from the positioning data number set in the buffer memory at 1150 or from the positioning data number of the specified point.

(4) If positioning is terminated by a continuous-operation interrupt request, restart cannot be performed.
If a restart request is made, a warning (warning code 104: Restart disabled) is generated.

7. Other Functions

7.1 Manual Operation

The manual operations of D75P2 include "JOG operation" and "manual pulse generator operation."

7.1.1 JOG operation

(1) What is JOG operation?

(a) The JOG operation is to perform positioning control with a JOG start signal.
The JOG operation is performed at the JOG speed of an axis control data when the JOG start signal turns on, while the operation decelerates to stop when the JOG start signal turns off.

(b) When using a peripheral device, the JOG operation can be performed in test mode.

(2) Acceleration/deceleration processing and JOG speed

(a) Acceleration/deceleration processing is controlled based on the JOG operation acceleration/deceleration-time selection setting of an extended parameter, and the JOG speed limit value of an extended parameter.

(b) When performing the JOG operation, set the JOG speed in the remote register for JOG speed setting.

(c) If the JOG speed is out of the setting range or 0 at the start of JOG operation, an axis error will occur and thus the operation will not start.

(d) When the JOG speed exceeds the limit value of JOG speed, an axis warning will be generated and the JOG operation is performed at the limit value of JOG speed.
At this time, the during-speed-limit flag turns on.

Point

(1) The JOG speed is in the unit set by the basic parameter 1.
(2) Write the JOG speed in two-word units.
(3) The remote register for JOG speed setting is not backed up.
When the power of a PC is turned off, or a PC CPU is reset, set the speed again.

Remark

1) A JOG start signal is established for each axis.

Axis number	Axis 1	Axis 2
Forward JOG start	RY(n+1)6	RY(n+1)8
Reverse JOG start	RY(n+1)7	RY(n+1)9

2) The JOG speed during the JOG operation is set in the remote register for JOG speed setting listed below.

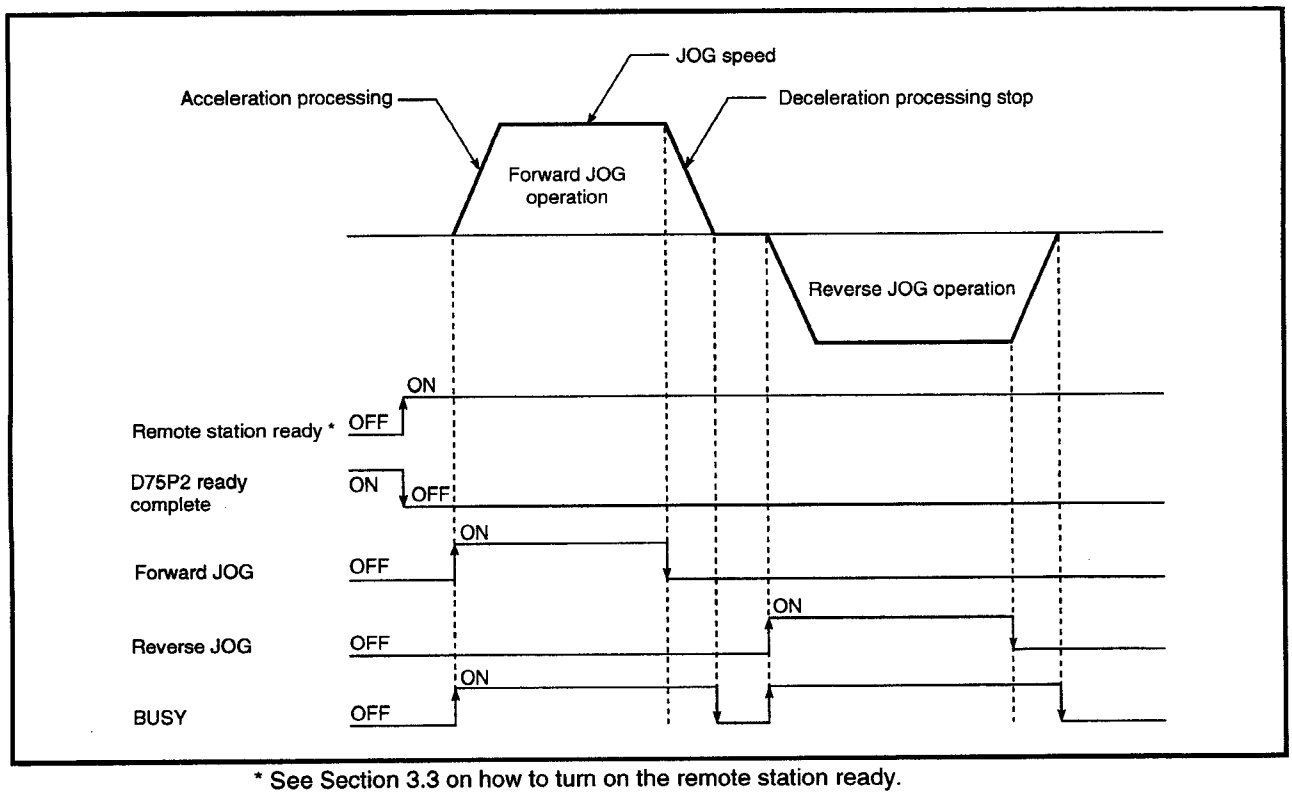
Axis number	Axis 1	Axis 2
Remote register address	RWwm+6, RWwm+7	RWwm+14, RWwm+15

(3) Actions during JOG operation

When starting the JOG operation, the following actions will take place.

(a) When the forward/reverse rotation JOG start signal turns on, the acceleration processing is performed in the specified direction at a specified JOG speed.

(b) When the JOG start signal turns off, the operation decelerates to stop.



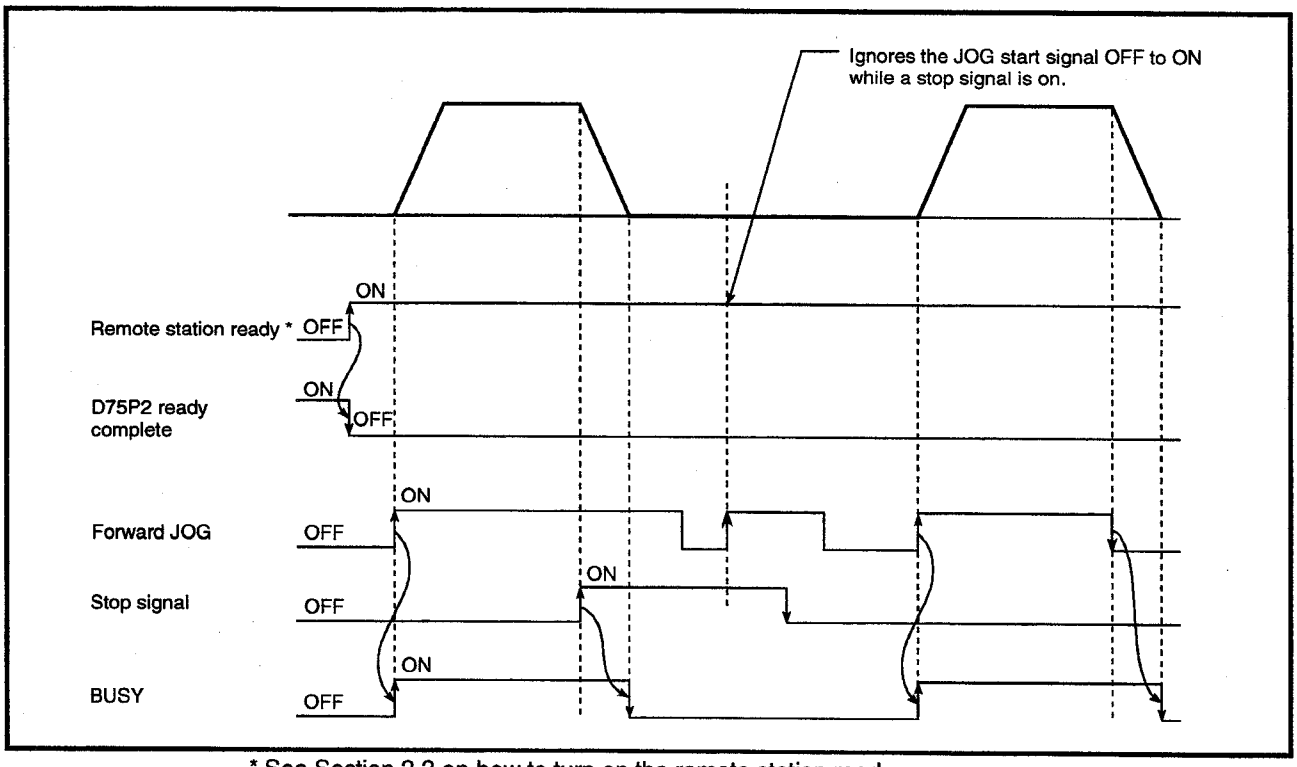
* See Section 3.3 on how to turn on the remote station ready.

(4) Actions during stop signal ON (input)

(a) When a stop signal turns on during JOG start, the operation decelerates to stop.

(b) The JOG start signal is ignored while a stop signal is on.

(c) By turning a stop signal off and a JOG start signal from OFF to ON, the operation can be restarted.

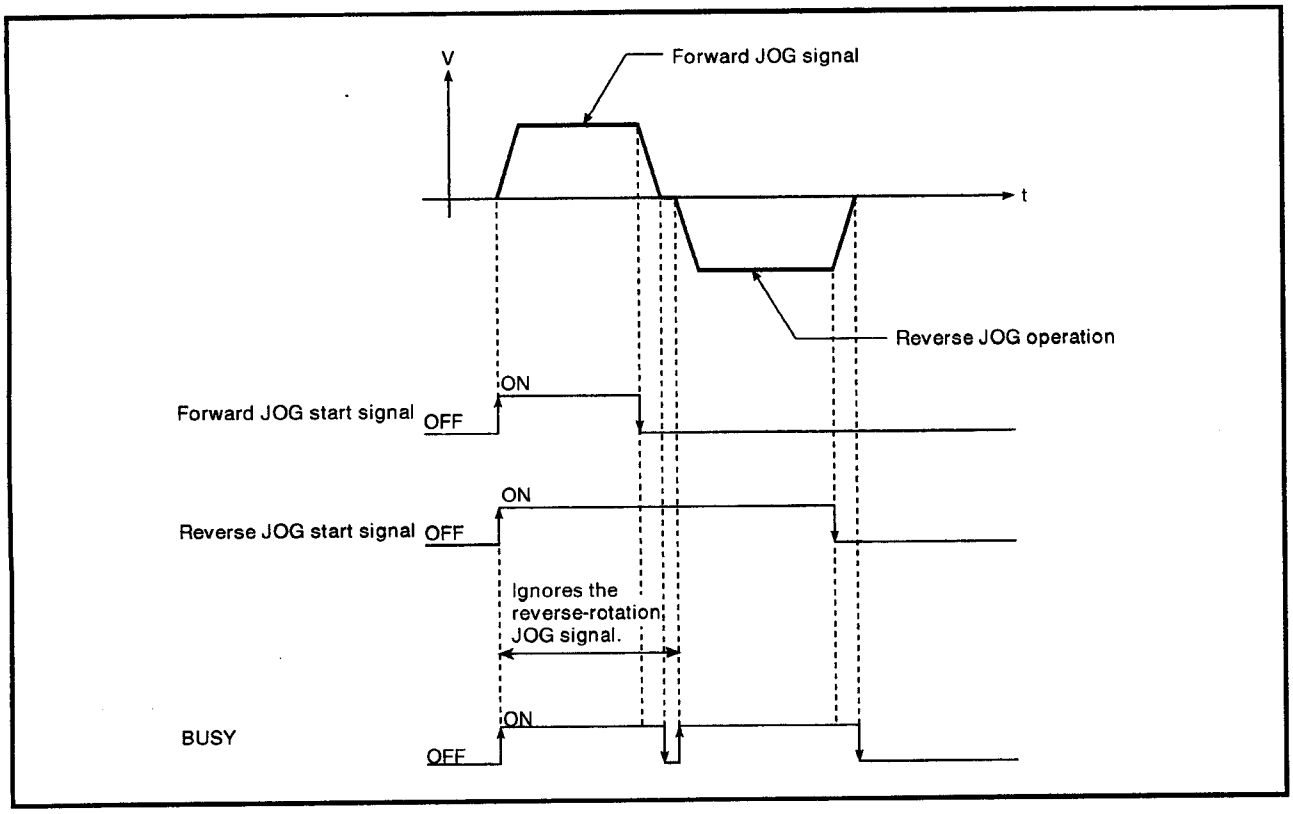


* See Section 3.3 on how to turn on the remote station ready.

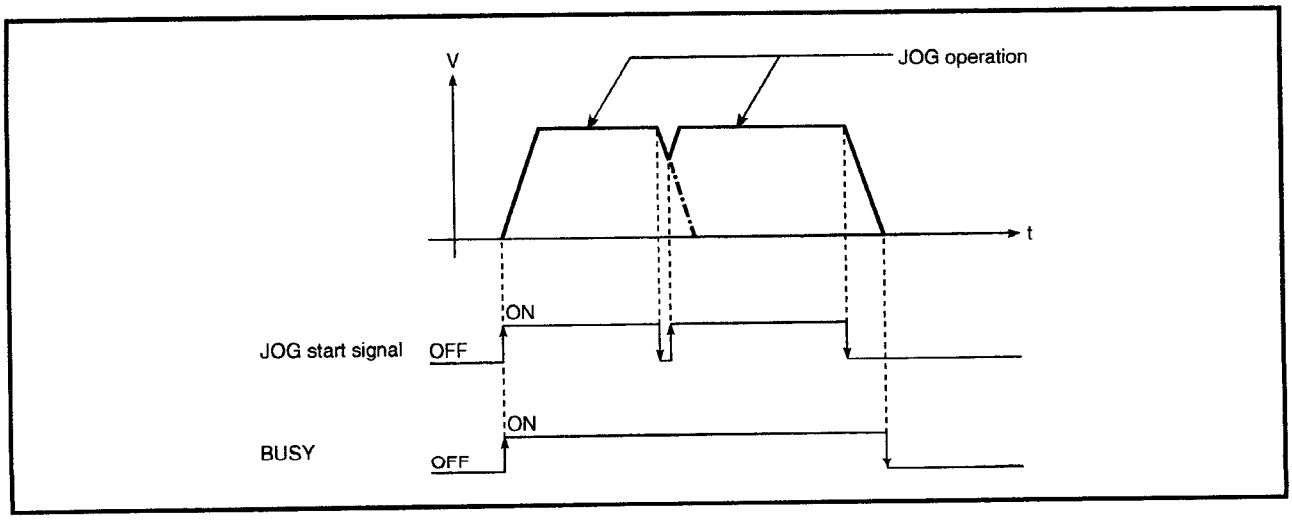
(5) Restrictions in JOG operation

(a) If, on one axis, both the forward-rotation JOG signal and the reverse-rotation JOG signal turn on simultaneously, the forward-rotation JOG operation is performed.

If the forward-rotation JOG signal turns off and the operation stops, the reverse-rotation JOG operation is performed when the reverse-rotation JOG signal is on.
(The reverse-rotation signal is validated when the BUSY signal turns off.)

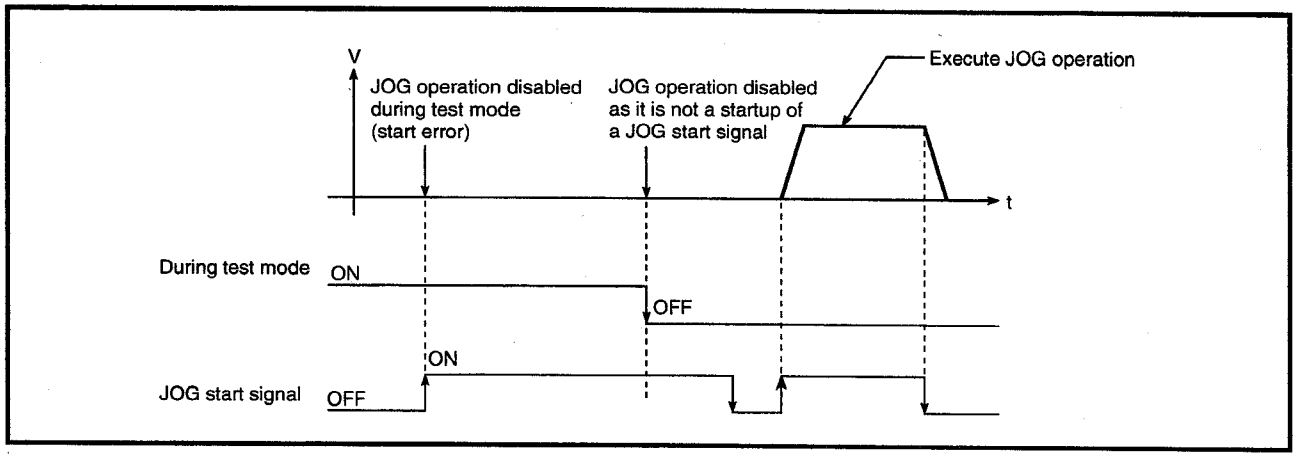


(b) During deceleration triggered by the JOG start signal OFF, if an identical JOG start signal is turned on again, the JOG operation is performed at the moment the signal turns on.

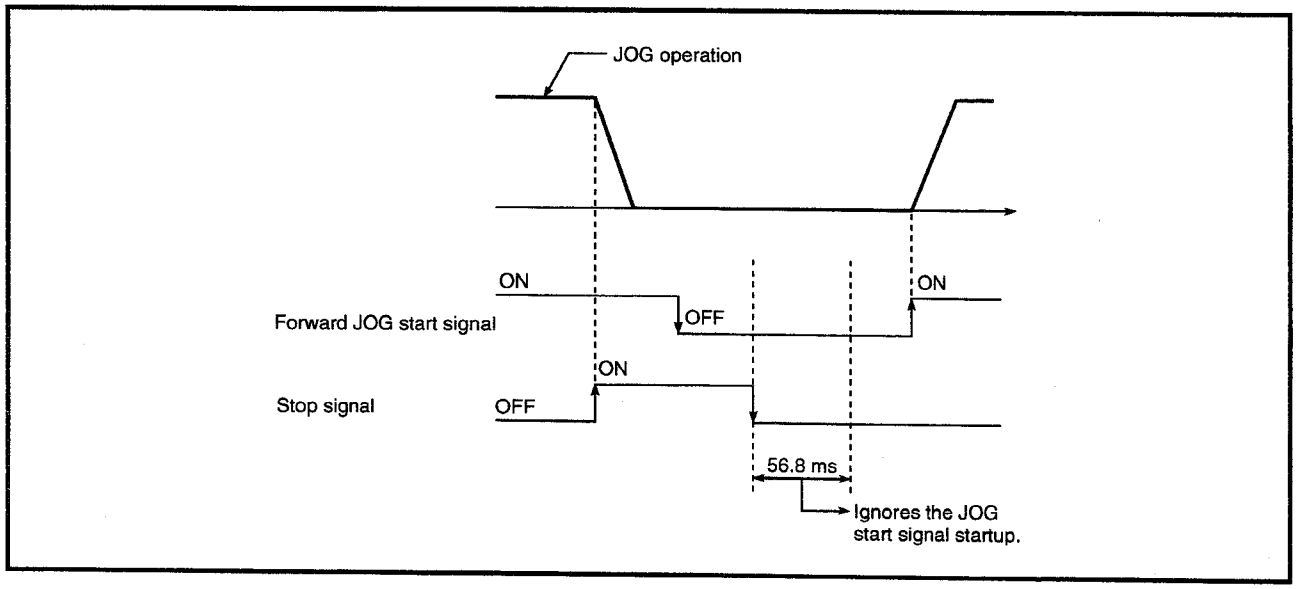


(c) The JOG operation via the JOG start signal is not performed during a test mode caused by a peripheral device.

Once the test mode of a peripheral device is canceled, the JOG operation is performed at the startup (OFF to ON) of a JOG start signal.



(d) Ignores the JOG signal OFF to ON for 56.8 ms + the link scan time after a stop signal turns off.



(6) Changing the JOG speed

(a) During the JOG operation, the JOG speed can be changed within the setting range of the "*JOG speed limit value*" of the basic parameter 2.

(b) When changing the JOG speed, turn on the request for positioning-operation speed change of an axis control data, or the external speed change of an external signal.

The "during-speed-change-processing flag" of an axis monitor turns on during the speed change processing.

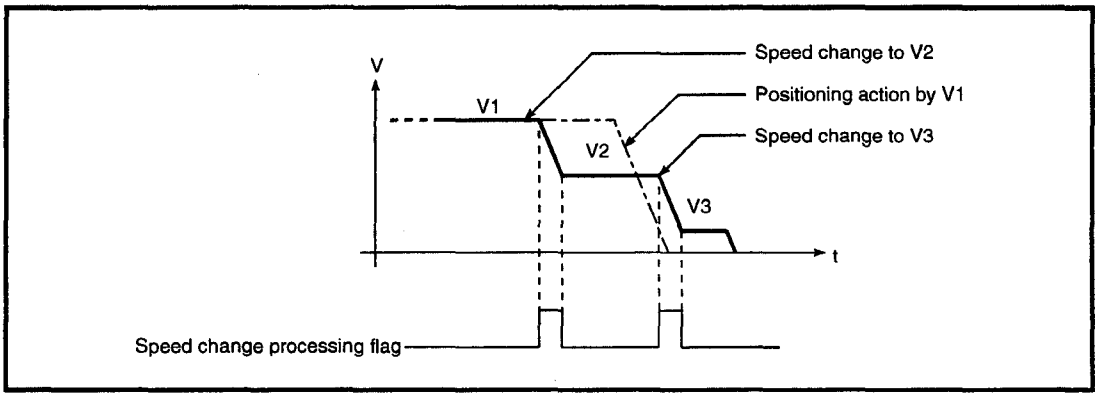


Fig. 7.1 Operation timing of the during-speed-change-processing flag

(c) The JOG speed can be changed even while the during-speed-change-processing flag is on.

(d) Even if the speed is changed during deceleration caused by the JOG start signal OFF, the deceleration processing continues. A warning is generated at this time.

(e) When the speed change value exceeds the JOG speed limit value, an axis warning will be generated and the JOG operation is performed at the JOG speed limit value.

At this time, the during-speed-limit flag turns on.

Remark

1) To change the JOG speed, use the remote register and device listed below.

Axis number		Axis 1	Axis 2
Remote register address	Speed change value	RWwm+4, RWwm+5	RWwm+12, RWwm+13
Device number	Speed change request	RY(n+2)7	RY(n+4)7

2) The during-speed-change-processing flag is set in the device listed below.

Axis number	Axis 1	Axis 2
Device number	RX(n+1)1	RX(n+4)1

7.1.2 Manual pulse generator operation

(1) What is the manual pulse generator operation?

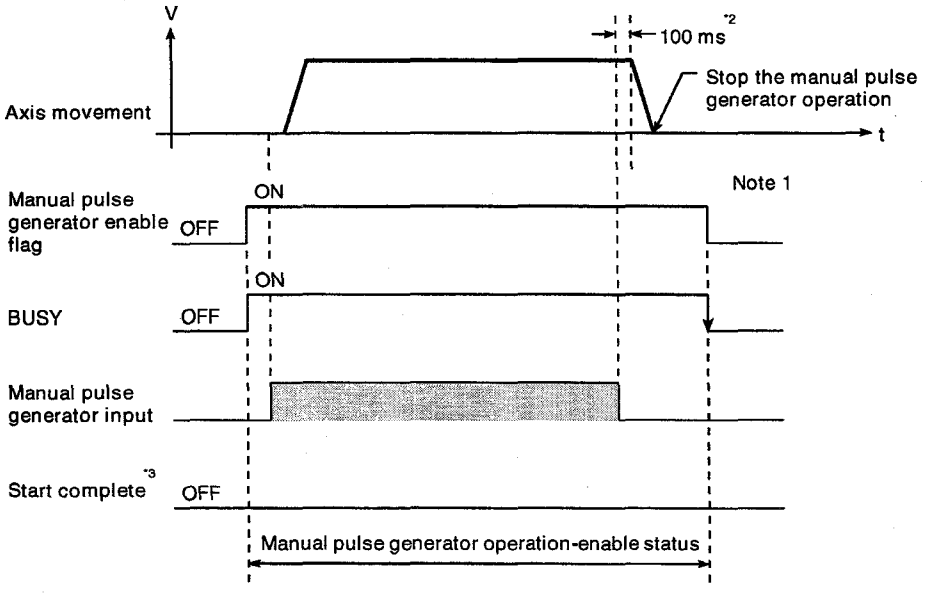
(a) This operation is to perform positioning control using pulses entered from the manual pulse generator. This is used to perform precise positioning manually.

(b) A maximum of three manual pulse generators can be connected to the D75P2.
A single manual pulse generator can operate a couple of axes simultaneously.

(2) Executing the operation of a manual pulse generator

(a) Setting the manual pulse generator operation-enable flag to "1 (enable) " will turn on the BUSY signal, entering the state of manual pulse generator operation enable. *1
The positioning control can be performed using pulses entered from the manual pulse generator.

(b) Setting the manual pulse generator enable flag to "0 (disable) " will turn off the BUSY signal, returning to the state of manual pulse generator operation disable.



Note

*2 : When there is no more input from the manual pulse generator, the last pulse is output from the D75P2 one control cycle time (100 ms) behind.

*3 : During the manual pulse generator operation, the start complete signal will not turn on.

Remark

*1) Use the device listed below to set the manual pulse generator enable flag.

Axis number	Axis 1	Axis 2
Device number	RY(n+2)9	RY(n+4)9

(3) Control contents

(a) The travel increment and output speed of the positioning control via the manual pulse generator operation are as follows:

- Use the following expression to calculate the travel increment by the pulses inputted from the manual pulse generator.

$$[\text{Travel increment}] = \begin{bmatrix}\text{Number of}\\ \text{input pulses}\end{bmatrix} \times \begin{bmatrix}\text{Manual pulse generator's}\\ \text{one-pulse input-scale setting}\end{bmatrix} \times [\text{Travel increment per one pulse}]$$

- With the manual pulse generator operation, positioning is performed at the speed that corresponds to the number of input pulses per unit time.
  The speed during the manual pulse generator operation is not limited by the speed limit value.

$$[\text{Output speed}] = \begin{bmatrix}\text{Input pulse per one}\\ \text{control cycle time}\end{bmatrix} \times \begin{bmatrix}\text{Manual pulse generator's}\\ \text{one-pulse input-scale setting}\end{bmatrix} \times \begin{bmatrix}\text{Travel increment}\\ \text{per one pulse}\end{bmatrix}$$

(4) Note

(a) When the manual pulse generator operation is terminated, be sure to set the manual pulse generator's enable flag to "0 (disable). "
If the manual pulse generator is operated while the flag is set to "1 (enable)," an erroneous positioning may be performed.

(b) If the manual pulse generator's enable flag turns on during the BUSY state caused by the positioning control, home position return or JOG operation, the "during-operation start warning" occurs.

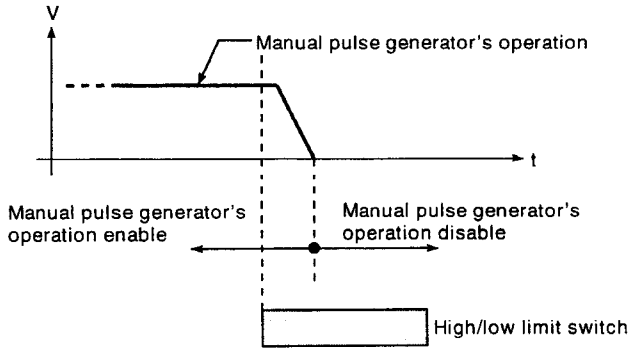
(c) During the manual pulse generator operation, the torque limit value is controlled by the parameter's setting value or a new torque value.

(d) The manual pulse generator's one-pulse input-scale is operated, using the value of a corresponding axis. Use the following values if it is out of the setting range.

- Operate at 100 when the manual pulse generator's one-pulse input-scale is 101 or more.
- Operate at 1 when the manual pulse generator's one-pulse input-scale is 0 or less.

(e) When the manual pulse generator operation is interrupted by a stop factor, the status of axis operation after the stop enters "during stop" or "during an error, " thus turning off the BUSY signal.
If the manual pulse generator's enable flag is changed from "0" to "1" after turning off the stop factor, the manual pulse generator's operation-enable status begins.

(f) When the high/low limit switch turns off, the operation decelerates to stop.
After the stop, the pulse input in the direction of the high/low limit switch OFF is ignored.
The manual pulse generator can be operated by the pulse input in the direction of high/low limit switch ON.



7.2 Speed Change Function during the Positioning Operation

(1) What is the speed change function?

(a) The speed change function changes the speed to a specified speed at an arbitrary timing during the following positioning operations:

- Positioning control
- Speed control
- Speed/positioning switch control
- JOG operations

(b) The speed changes during the positioning operation include the "speed change via the remote register for speed change" and the "speed change via the override function. "

7.2.1 Speed change via the remote register for speed change

(1) Speed change via the remote register for speed change

The speed can be changed by setting the speed after a change in the remote register for speed change and making a speed change request.

(a) The addresses of the remote register for speed change are as follows:

Axis number	Axis 1	Axis 2
Remote register address for speed change	RWwm+4, RWwm+5	RWwm+12, RWwm+13

(b) The speed change can be requested by either writing "1" to the device for speed change request, or turning on the external speed change request * of an external signal.

Axis number	Axis 1	Axis 2
Device number for speed change	RY(n+2)7	RY(n+4)7

Remark

* : When using an external speed change request, it is necessary to set the "external start-function selection" of extended parameter 2 to the "external speed-change request (1)."

Also, it is necessary to set "valid (1)" for the "external start valid" of an axis control data in the device used to set the external start valid listed below.

Axis number	Axis 1	Axis 2
Device number for setting the external start valid	RY(n+2)B	RY(n+4)B

(2) Control contents

(a) In the following cases, a warning will occur and the speed cannot be changed.

- During deceleration due to a stop command
- During automatic deceleration by position control

(b) If the value set in the remote register for speed change exceeds the speed limit value, a warning occurs and the speed limit value is used.

(c) When changing the speed during position control and the position control of the speed/position switch control, if the remaining distance is not sufficient to change the speed, control is performed so that the feed speed during the next control approximates to the new speed value.

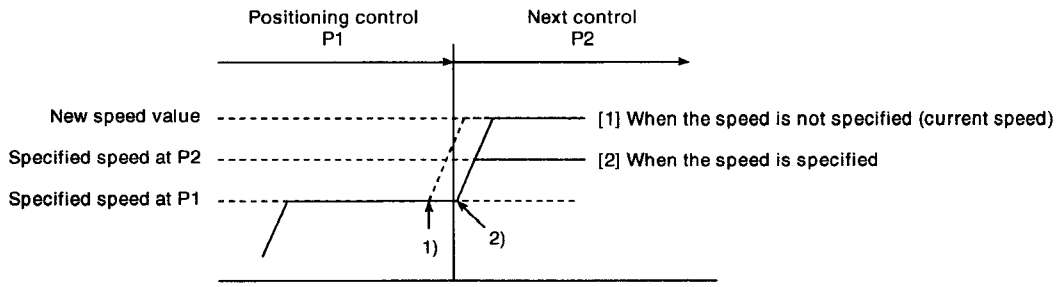
[1] When the speed is not specified for the next control data (current speed)

→ The feed speed becomes the new speed value.

[2] When the speed is set for the next control data

→ The speed change is canceled, and the operation is performed at the set speed.

< Control when a sufficient remaining distance cannot be secured to change the speed >



The speed change request at the timing of 1) is temporarily suspended due to insufficient remaining distance. The request is processed at the timing of 2).

(d) During the interpolation control, use the device for speed change request setting and the remote register for speed change of the axis (reference axis) indicated below.

Interpolation axis	Reference axis	Remote register address for speed change	Device number for the setting of a speed change request
During interpolation control by axes 1 and 2	Axis 1	RWwm+4, RWwm+5	RY(n+2)7

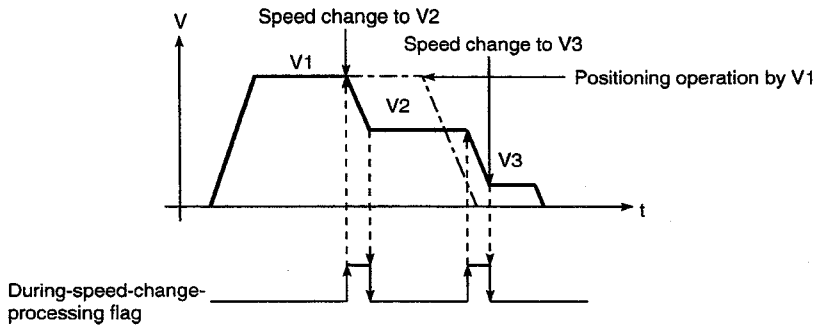
(e) The unit of reference axis is used for the unit of speed change when the control units vary during interpolation (See (d) above).

(f) During the speed-change processing, 1 is stored in the during-speed-change flag (the device below). Upon completion of the speed-change processing, the flag becomes 0.

Axis number	Device number
Axis 1	RX(n+1)1
Axis 2	RX(n+4)1

(g) Even when the operation pattern is continuous locus control (11), the operation speed can be changed as soon as the speed change request is made.
However, the speed will not be changed if a distance required to change the speed to the specified speed cannot be secured.

<Operation timing during the processing of positioning-operation speed change>



(3) Speed change request with the new speed value at "0"

(a) When a speed change request is made with the new speed value at "0" during operation (excluding the manual pulse generator operation), the operation decelerates to stop and the device's speed change 0 flag is turned on.

(b) During the interpolation control, the speed change 0 flag (the device below) of the axis (reference axis) indicated blow turns on.

Interpolation axis	Reference axis	Device number
During the interpolation control by axes 1 and 2	Axis 1	RX(n+2)2

(c) Setting the new speed value to a value other than 0 changes the speed change 0 flag to 0, thus continuing the operation.

(d) When requesting the speed change to the new speed value 0, even if the speed becomes 0, the BUSY signal will remain on.

At this time, the axis stops. However, there are no changes in the axis operation status.

(e) Inputting a stop signal turns off the BUSY signal, switching the axis operation status to "during stop."

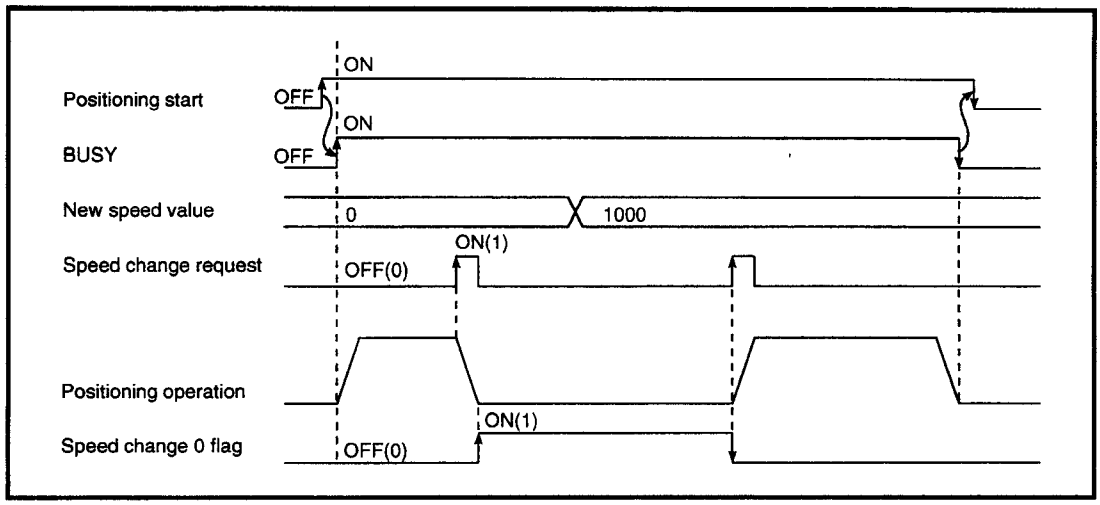


Fig. 7.2 Timing of speed change 0

7.2.2 Speed change by the override function

(1) What is the override function?

(a) This is the function used to change the speed (command speed) during positioning control within the range of 1 to 300 %.

(b) When using the override function, write an override value (1 to 300 %) in the remote register for positioning-speed override setting.

(2) Control contents

(a) When the speed is changed, the override function is enabled for the changed speed, as well.

(b) When the override value is 100 %, the current speed will not change.

(c) The override function does not work during acceleration/deceleration.
The override function is enabled after a deceleration stop.

(d) If the speed specified by an override value exceeds the speed limit value, the speed limit value is used.
A warning (warning number: 501) occurs at this time, and the during-speed-limit flag of the axis monitor turns on.

(e) If, during positioning control, a sufficient distance cannot be secured to change the speed to that specified by an override value, the operation is performed at an available speed.
However, when the operation pattern is 11 (continuous locus control), the speed will not change.

(f) During interpolation, use the remote register (the address below) for setting the positioning operation speed override of the reference axis.

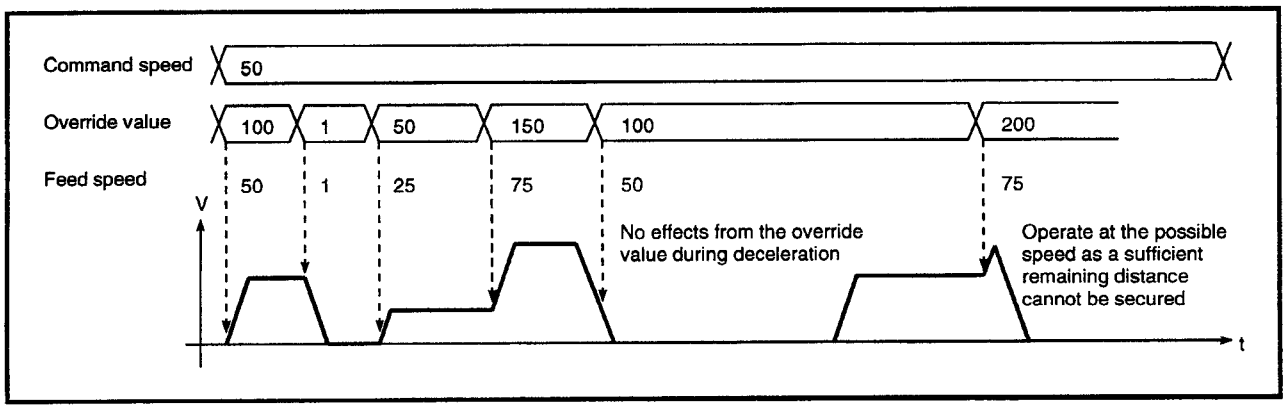
Interpolation axis	Reference axis	Remote register address
During the interpolation control by axes1 and 2	Axis 1	RWwm+1

(g) The value of the remote register for storing the feed speed of an axis monitor changes depending on the override value.

(h) When setting the override at 100 % or below, if the feed speed is 1 or less, the operation is performed at 1 in the speed unit used at that time.

(i) When the set override value is out of the setting range, the operation is performed at the values listed blow.

- When 0 % : Operation at 100 %
- When 301 % : Operation at 300 %

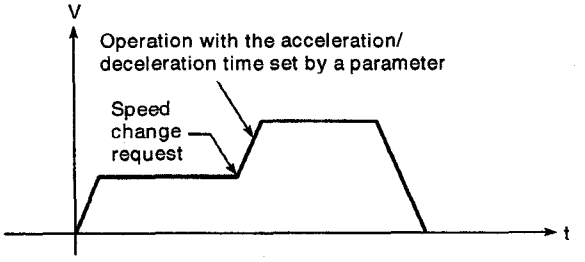


7.2.3 Acceleration/deceleration-time setting for speed change

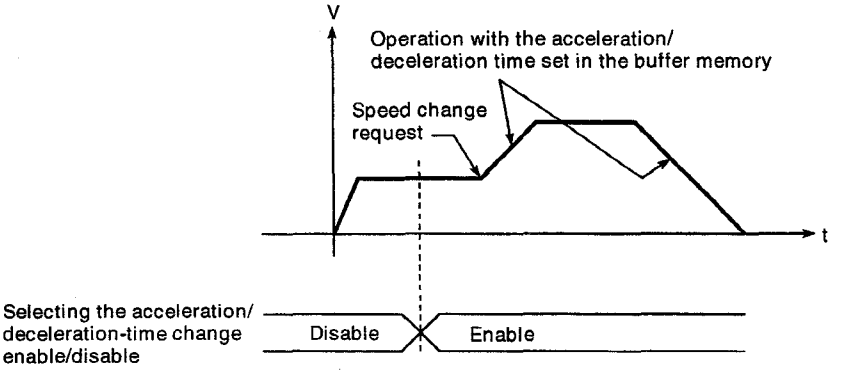
(1) Acceleration/deceleration-time setting for speed change

- The acceleration/deceleration during positioning operation is performed according to the acceleration/deceleration time set by the basic parameter 2/extended parameter 2.

[When the acceleration/deceleration-time change disable is set]



[When the acceleration/deceleration-time change enable is set]



(2) Setting method

- When changing the speed, set the acceleration/deceleration time in the AD75P.
- The written data becomes valid when the speed is changed.
  When changing the acceleration/deceleration time while changing the speed, set the new acceleration-time value and deceleration-time value before the speed change, then enable the acceleration/deceleration time change.

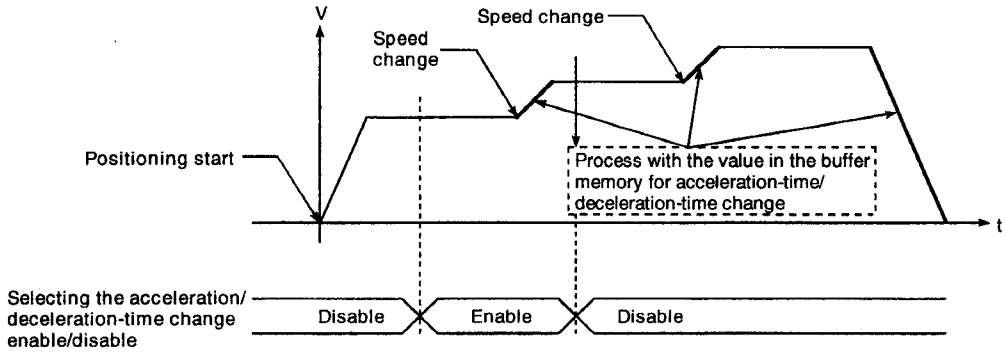
Item	Setting range	Initial value
For changing acceleration speed	• 0 to 65535 ms/0 to 8388608 ms	0
For changing deceleration speed	• 0 to 65535 ms/0 to 8388608 ms	0
Selecting the acceleration/deceleration-time change enable/disable during speed change	• 1 : Acceleration/deceleration-time change enable • Other than 1 : Acceleration/deceleration-time change disable	0

(3) Note

(a) If the acceleration/deceleration-time change enable is set, the values in the buffer memory for changing the acceleration time and the buffer memory for changing the deceleration time become valid when the speed is changed.

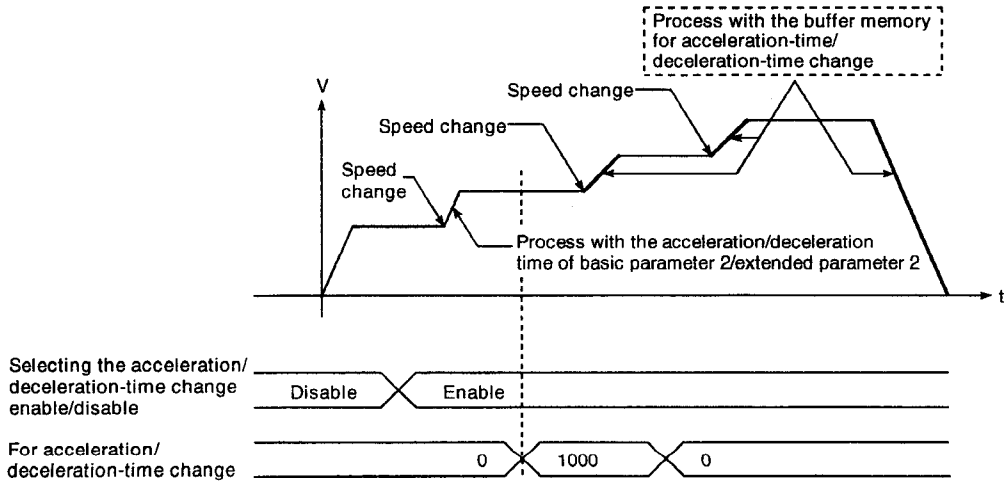
(b) If the speed is changed by the acceleration/deceleration-time change enable, the acceleration/deceleration processing of the positioning data number for which the speed is changed is performed using the value in the buffer memory used to change the acceleration/deceleration time.
The automatic deceleration processing upon completion of the positioning is also performed using the value in the buffer memory used to change the deceleration time.

(c) Even if the acceleration/deceleration-time change is set to disable after changing the speed, the acceleration/deceleration processing of the positioning data number for which the speed is changed is performed using the value in the buffer memory used to change the acceleration/decelerations time.
However, when executing the next positioning data number, control is performed with the acceleration/deceleration-time setting of the basic parameter 2/extended parameter 2.



(d) For a speed change after the positioning start, if the value in the buffer memory for acceleration-time/deceleration-time change is 0, processing is performed with the acceleration/deceleration time set in the basic parameter 2/extended parameter 2.

(e) When the speed is changed by setting 0 for the value in the buffer memory for acceleration-time/deceleration-time change after the speed has been changed with the value in the buffer memory for acceleration/deceleration-time change, the same acceleration/deceleration processing as that of the previous speed change is performed.



(f) During continuous operation/continuous locus operation, even if the speed is changed with a value in the buffer memory for acceleration/deceleration-time change, the processing is performed with the acceleration/deceleration time of the basic parameter 2/extended parameter 2 upon switching to the next positioning data number.

7.3 Torque Limit Function

The torque limit functions of D75P2 include the "torque limit function" and "torque change function. "

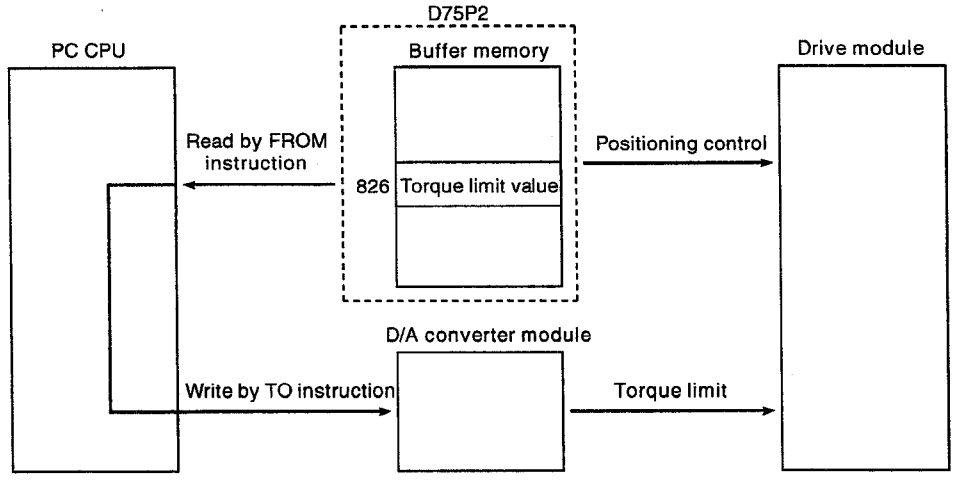
Point

Notes when performing torque limit with the D75P2.

(a) When performing torque limit with the D75P2, wiring between the D/A converter module and the drive module as well as D/A converter module is required.

(b) A drive module that can accept the torque limit command by the analog voltage is required.

(c) Since the set torque limit setting value is set to the "torque limit storage value" of an axis monitor, transfer the "torque limit storage value" to the D/A converter module using the sequence program.



7.3.1 Torque limit function

(1) What is the torque limit function?

(a) The torque limit function limits the torque generated by a servo motor within the setting range.

(b) If the torque required for control exceeds the torque limit value, control is performed with the set torque limit value.

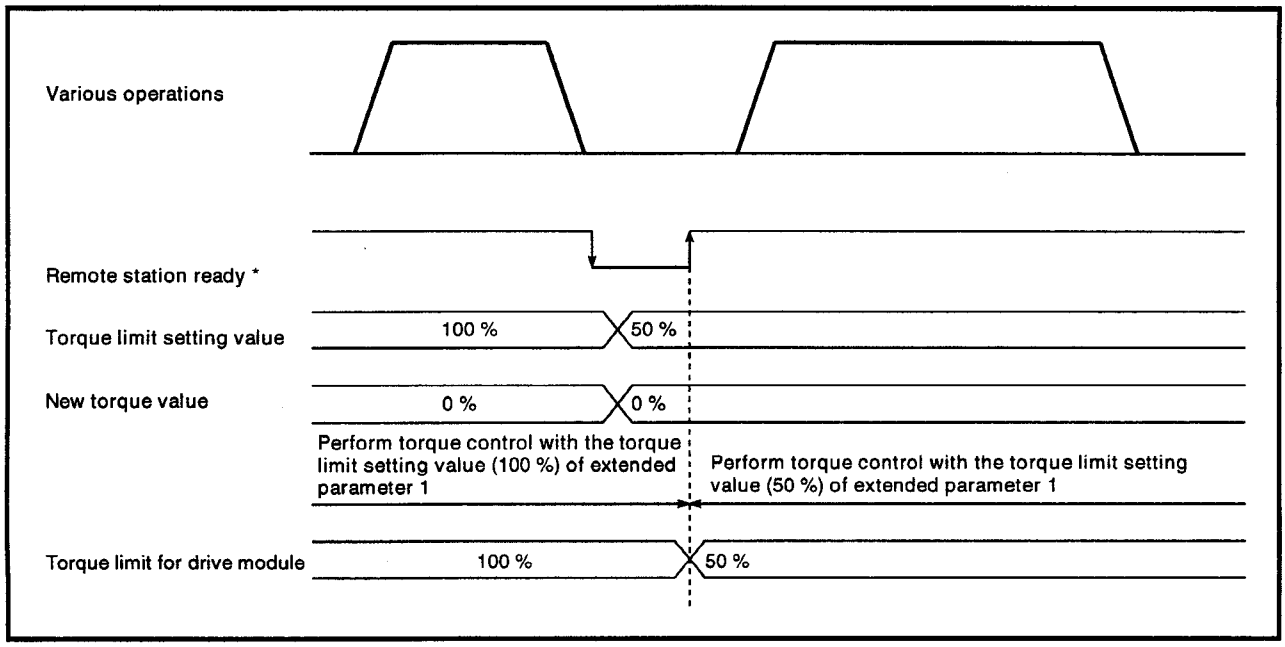
(2) Operation overview during torque limit

(a) The torque limit setting value of extended parameter 1 is used for the torque limit value. When controlling using a torque limit setting value of extended parameter 1, set the new torque value of the axis control data to 0.

When a value other than 0 is set for the new toque value, control is performed with the new torque value.
See Torque Change Function on the new torque value.

(b) The torque limit value of extended parameter 1 can be changed while the remote station ready signal is off.

The torque limit value after a change becomes valid when the remote station ready signal turns on.



* See Section 3.3 on how to turn on the remote station ready.

(c) The relationship between operations and torque limit values is shown below.

Operation status	Torque limit value
During positioning operation	• Controlled with a new torque value or the torque limit setting value of extended parameter 1.
During home position return	• Controlled with a new torque value or the torque limit setting value of extended parameter 1. However, it is controlled with the torque limit value of a home position return parameter after reaching the creep speed.
During JOG operation	• Controlled with a new torque value or the torque limit setting value of extended parameter 1.
During manual pulse generator operation	• Controlled with a new torque value or the torque limit setting value of extended parameter 1.

7.3.2 Torque change function

(1) What is the torque change function?

(a) This function changes the torque limit value during the positioning operation, JOG operation and manual pulse generator operation.
By setting a torque limit value to be changed to the "new torque value" of an axis control data, the torque generated by a servo motor can be limited to the new torque value specified.

(b) The torque change is performed by writing to the buffer memory using the sequence program.

(2) Control contents

(a) Operation overview of torque change

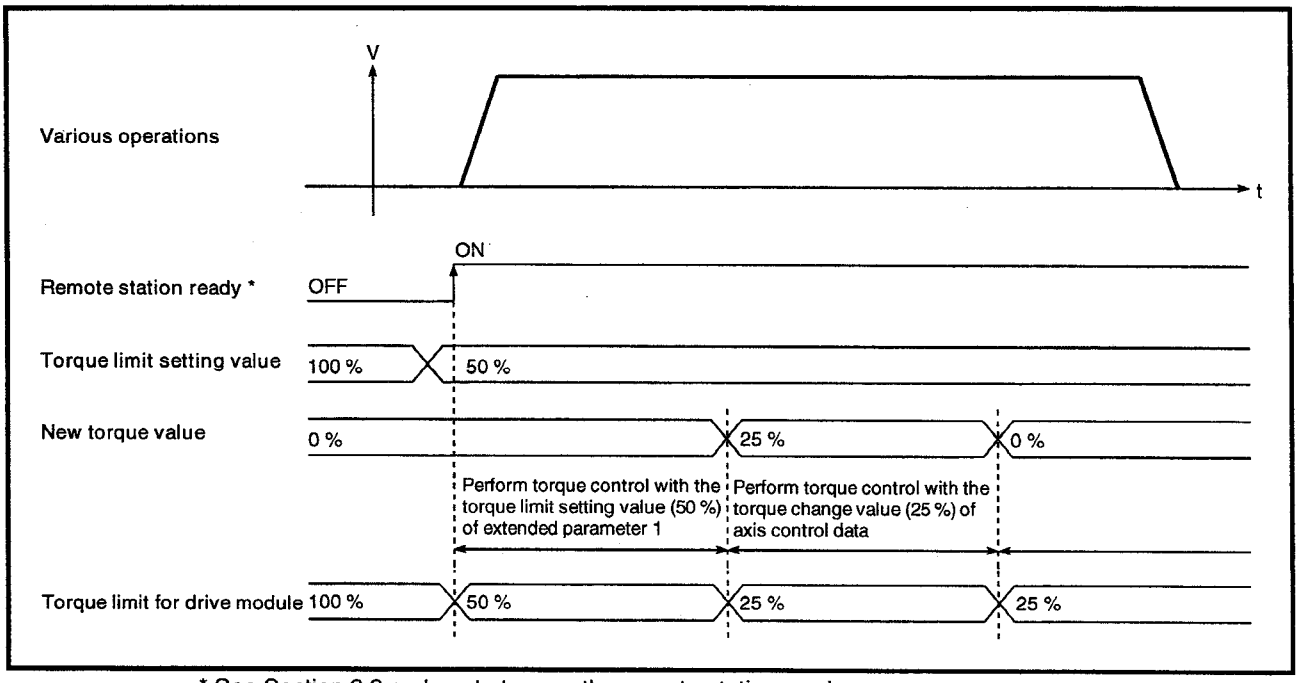
1) The new torque value of axis control data is always changeable.
The torque limit is performed with the new value upon writing the new torque value.

2) The setting range is 0 to (the torque limit setting value of extended parameter 1).

- When controlling with the torque limit setting value of extended parameter 1, set 0 as a new torque value.
- When the new torque value is other than 0, the control is performed with the new torque value set.

3) Torque control is performed with the torque limit setting value of extended parameter 1 at the start of positioning operation, JOG operation and manual pulse generator operation.

(b) When a new torque value is out of the setting range, an axis warning occurs.



* See Section 3.3 on how to turn on the remote station ready.

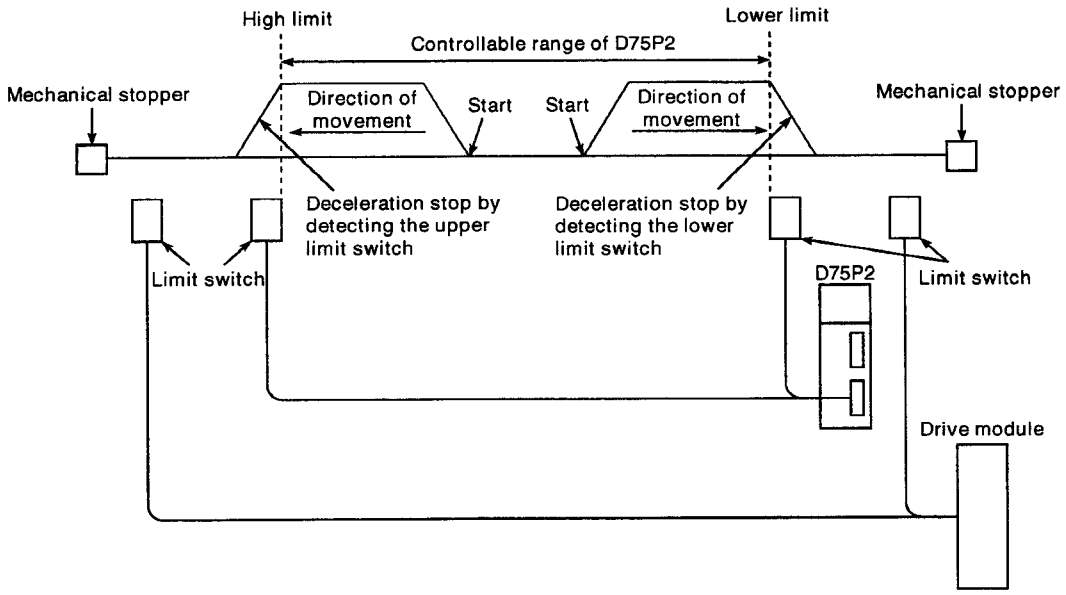
7.4 Stroke Limit Function

The D75P2 includes the "stroke limit function via external input" and "software stroke limit function."

7.4.1 Stroke limit function via external input

(1) With the stroke limit function via external input, by placing the stroke limit of D75P2 inside the stroke limit/stroke end on the drive module side, the D75P2 decelerates to stop before reaching the stroke limit/stroke end of the drive module.

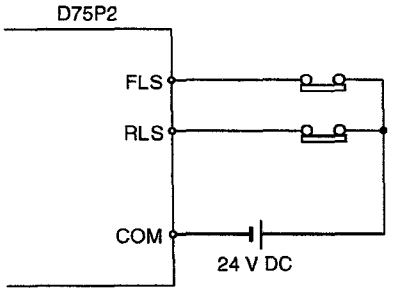
(2) The stroke limits via external input include the "upper stroke limit" and "lower stroke limit" for the mechanical system input of D75P2's external input connectors.



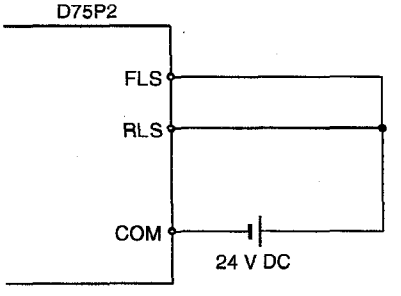
(3) If the D75P2 has stopped outside its controllable range, positioning cannot be started.
If it has stopped by detecting a stroke limit by external input, move it to a position within the D75P2 controllable range using the JOG operation.

(4) The stroke limit via external input can also be used by the "home position return retry function."
See Section 5.6 for the Home Position Return Retry Function.

(5) Wire the stroke limit via external input as shown in the figure (a) below.
If the stroke limit via external input is not used, wire the high/low stroke limit terminals of D75P2 as shown in the figure (b) below.



(a) Wiring the stroke limit



(b) Wiring when the stroke limit is not used

Point

If it is open between FLS and COM as well as RLS and COM (including when not wired), the high/low stroke limit of D75P2 turns off and positioning cannot be started. When not using the high limit switch/low limit switch, wire as shown above.

Remark

FLS and RLS indicates the high limit switch and the low limit switch, respectively.

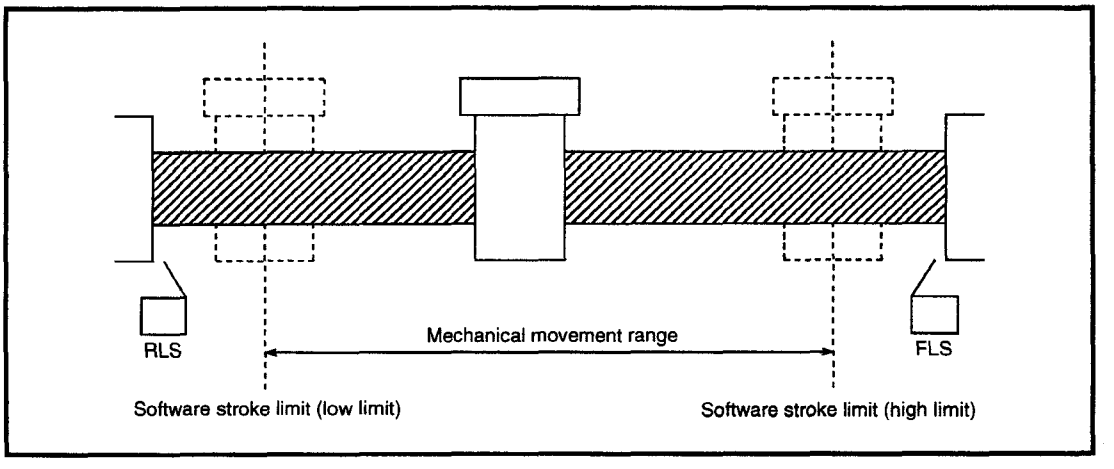
7.4.2 Software stroke limit function

(1) What is the software stroke limit function?

(a) The software stroke limit function disables the positioning in response to a command given to outside the setting range of the set high/low stroke limit.

(b) Using a parameter, whether the limit is placed on the present feed value or machine feed value is selected.
However, when the unit setting is in "degree, " do not select the machine feed value.

(c) The range check of a software stroke limit is performed at operation start.

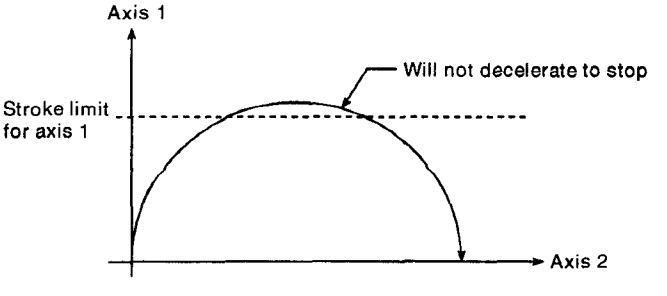


Point

During the circular interpolation control, the software stroke limit check is performed on the starting-point, end-point and circular addresses.

Therefore, the software stroke limit may be exceeded in the middle of control.

In this case, deceleration stop will not be performed. Therefore, set up an external limit switch when the software stroke limit may possibly be exceeded.



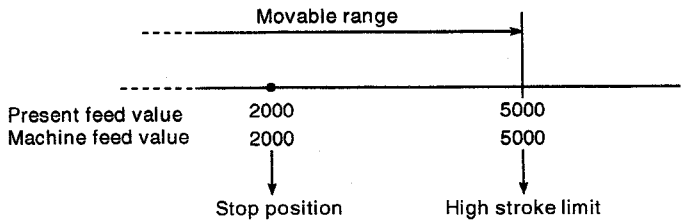
(2) Control contents

(a) Difference between the travel enable range of the present feed value and machine feed value

When the limit is posed on the machine feed value, the stroke is absolute. *
When the limit is posed on the present feed value, the value is relative to the present feed value at that time.

[Condition]

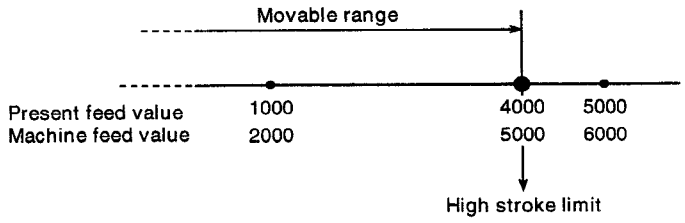
Assume that the current stop position is 2000 and the high stroke limit is set to 5000.



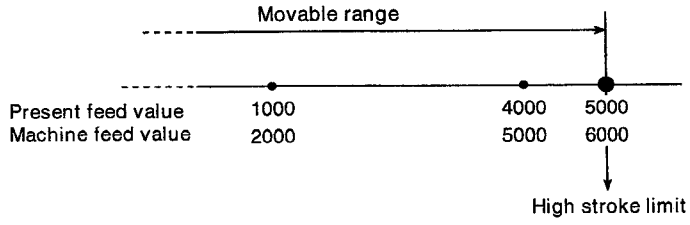
[Changing the present value]

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

1) When the machine feed value is set to the limit.
The machine feed value 5000 (present feed value: 4000) becomes the high stroke limit.



2) When the present feed value is set to the limit.
The present feed value 5000 (machine feed value: 6000) becomes the high stroke limit.



Remark

* : Upon home position return completion, the home position address of a home position return parameter is set for the present feed value and machine feed value.

- If positioning control, etc. is performed after home position return completion, both the present feed value and machine feed value change.
- When the present value is changed, only the present feed value is changed.
- The machine feed value always indicates a value from the location of the home position.

(b) Software stroke-limit range check at operation start

1) At the operation start, the following software stroke-limit range checks are performed:
   - Operation start from outside the software stroke-limit range
   - Operation start when the positioning address is set outside the software stroke-limit range

2) During the interpolation control of positioning operation, if one of the axes is outside the software stroke-limit range, an axis error occurs, and the operation will not be started.

3) With the simultaneous start of positioning operation, if the operation cannot be started because either of the axes is outside the software stroke-limit range, an axis error occurs, and the operation will not be started on either axis.

Table 7.1 List of software stroke-limit range check at the start of each operation

		Condition			Remarks
Positioning control	Position control	N/A			1) When the present feed value and machine feed value are outside the software stroke-limit range at the start of positioning control, an error occurs and positioning control will not start. 2) When the positioning address is the positioning control outside the software stroke-limit range, the operation will not start. 3) During the circular interpolation control, the circular address is also checked.
	Speed control *1	When the limit of machine feed value is set	Present value change unexecuted		1) Software stroke-limit range check is not performed.
			Present value change executed		1) When the present feed value is outside the software stroke-limit range at the start of speed control, an error occurs and the speed control will not start.
		When the limit of a machine feed value is set			1) When the machine feed value is outside the software stroke-limit range at the start of speed control, an error occurs and the speed control will not start.
	Speed and position control *1	When the limit of a present feed value is set	Present value change unexecuted		1) Software stroke-limit range check is not performed.
			Present value change executed		1) When the present feed value is outside the software stroke-limit range at the start of speed/position control, an error occurs and the speed/position control will not start.
		At the limit of the machine feed value			1) When the machine feed value is outside the software stroke-limit range at the start of speed/position control, an error occurs and the speed control will not start.
	Home position return	N/A			1) Software stroke-limit range check is not performed.
Manual operation *2	JOG operation	Software stroke-limit of JOG operation/manual pulse generator operation		When invalid	1) Software stroke-limit range check is not performed.
				When valid	1) When the present feed value is outside the software stroke-limit range at the start of JOG operation, the JOG operation starts in the direction within the software stroke-limit range.
	Manual pulse generator operation	Software stroke-limit of JOG operation/manual pulse generator operation		When invalid	1) Software stroke-limit range check is not performed.
				When valid	1) When the present feed value is outside the software stroke-limit range at the start of manual pulse generator operation, the manual pulse generator operation starts in the direction within the software stroke-limit range.

*1 : Set whether or not to update the present feed value during speed control by using the parameter's "update request command of present feed value during speed control. "

*2 : When the unit is in degrees, the software stroke-limit check is not performed even if the software stroke-limit of JOG operation and manual pulse generator operation is valid.

(c) Software stroke-limit range check during operation

1) An error occurs when the positioning address of positioning data is out of range.

2) During interpolation operation, an axis error occurs whichever axis is outside the software stroke-limit range.

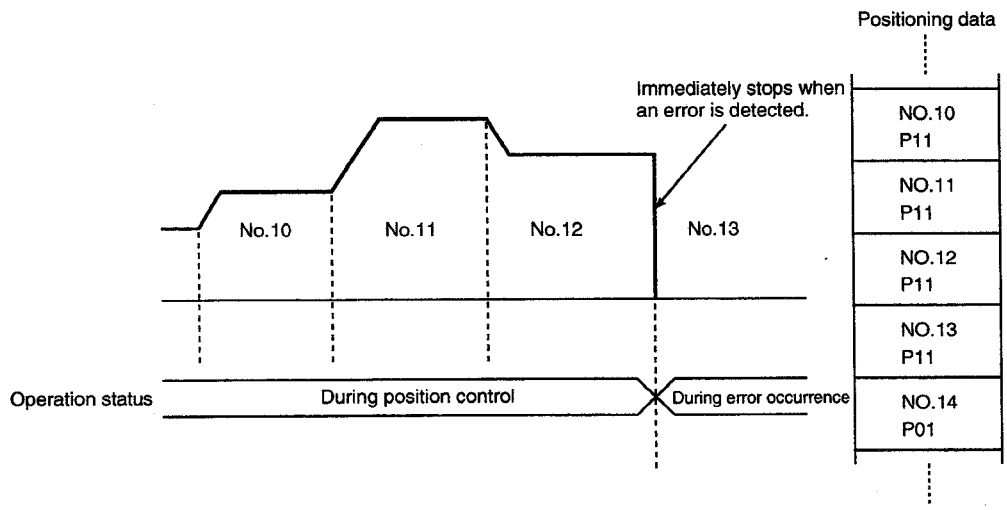
3) When the operation pattern is continuos locus control, the positioning data number whose positioning address is out of range will not be executed. Instead, the operation will instantly stop at the positioning address immediately before.

4) The JOG operation or manual pulse generator operation decelerates to stop upon exceeding the software stroke-limit range.

After the stop, the JOG operation or manual pulse generator operation can be performed in the direction within the software stroke-limit range.
The JOG operation input in the direction outside the software stroke-limit range and input pulses from the manual pulse generator are ignored.

Example

- When the positioning address of positioning data number 13 is outside the software stroke-limit range, the operation decelerates to stop upon completion of positioning data number 12 execution.



(d) To cancel the software stroke limit
To cancel the software stroke limit, set as the "(low software stroke limit value) = (high software stroke limit value)."
Control can be performed regardless of the software stroke limit setting.

(e) The software stroke limit valid/invalid at JOG operation and manual pulse generator operation can be selected by setting the "software limit valid selection of JOG operation and manual pulse generator operation" of the software stroke limit valid/invalid selection parameter of JOG operation and manual pulse generator.
However, even if the JOG operation and manual pulse generator operation software stroke limit valid/invalid selection are set to "valid," the software stroke limit check will not be performed when the unit is in "degree."

(f) Present value change and software stroke-limit range check
When the present value is changed, even if the address after a change is outside the software stroke-limit range, no error occurs.
An "operation start from outside the software stroke-limit range" error occurs at the operation start.

7.5 Confirmation and Change of Present Value

This section describes the confirmation of a present value of D75P2 as well as the change method of a present value.

7.5.1 Confirmation of present value

(1) Present value of D75P2

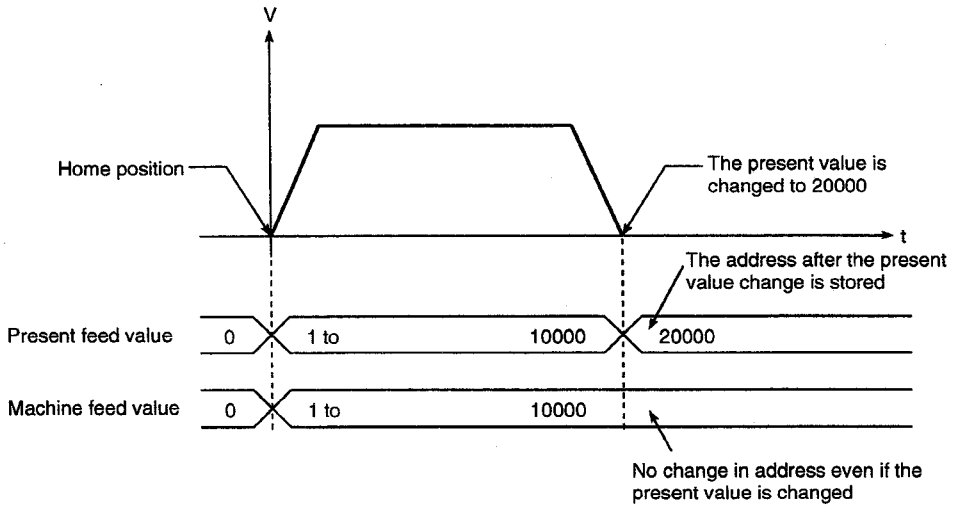
The D75P2 includes two types of present values: "present feed value" and "machine feed value."

(a) What is the present feed value?

The present feed value is an address based on the home position address that is established by the machine home position return.
However, if the present value is changed, this address is replaced by the address after a change.

(b) What is the machine feed value?

The machine feed value is an address based on the home position address that is established by the machine home position return.
Changing the present value will not change the address of machine feed value.



Remark

1) See Chapter 5 for the machine feed home position return.
2) Use extended parameter 1 to select whether to set the software stroke limit to the "present feed value" or "machine feed value" (See Section 10.2.3).

(2) Confirmation of the present value

(a) The present feed value and machine feed value are stored in the remote register and buffer memory listed below.

	Axis 1	Axis 2
Present feed value (remote register address)	RWm, RWm+1	RWm+8, RWm+9
Machine feed value (buffer memory address)	802, 803	902, 903

(b) The remote register for present feed value and the buffer memory for machine feed value use two-word (32 bits) configuration.
Therefore, the present feed value and machine feed value can be read into a PC CPU using the DFRO(P) instruction from the PC CPU.

(c) When the electronic gear setting is not "1," the present feed value and machine feed value may not be the specified address/travel increment.
Therefore, it is recommended to set "1" for the electronic gear.

(3) Update of the present value

(a) With D75P2, the present value is updated every 56.8 ms.
The present feed value and machine feed value that are stored in the remote register and buffer memory are updated every 56.8 ms.

(b) Use the present feed value and machine feed value of D75P2 as monitors to display a present value and such.
When using the present feed value and machine feed value that are stored in the remote register and buffer memory for control, an error in the update timing (56.8 ms) of a present value occurs.

7.5.2 Present value change

(1) What is the present value change?

(a) This is to change the present feed value of an axis, which is not used for the movement, to a specified address.
However, the machine feed value will not be changed.
To change the present value, it is necessary to set the positioning start number and turn on the positioning start signal.

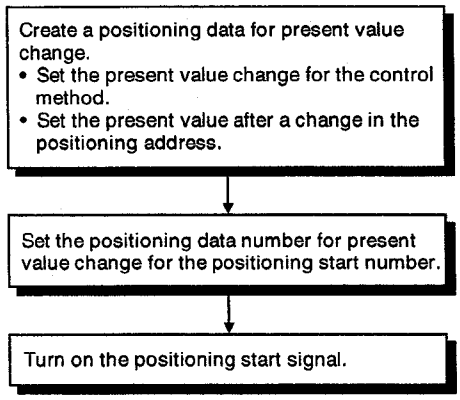
(b) The present value changing methods include two types: a method using the positioning data, and that using the remote register for present value change.

1) The present value change via the positioning data uses the "present value change" of the positioning data control method.

2) The present value change using the remote register for present value change sets the address after a change in the remote register that is allocated for present value change. "9003" is used for the positioning start number.

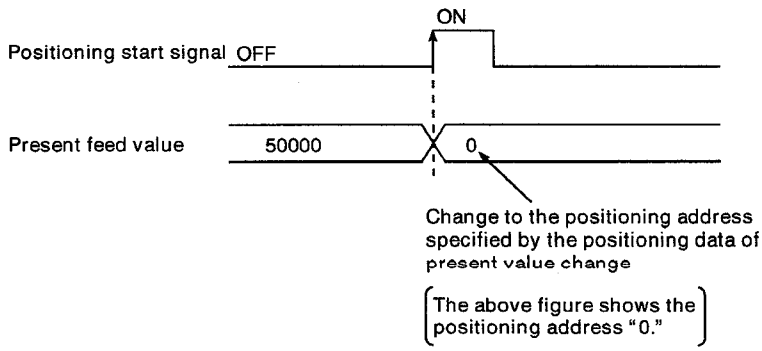
(2) Present value change via the positioning data

(a) The present value change via the positioning data is performed in the following steps:



(b) Change timing

Tuning on the positioning start number changes the present feed value to a specified value.



Remark

The addresses of remote registers for positioning start are as follows.

Axis number	Axis 1	Axis 2
Remote register for the positioning start	RWwm	RWwm+8
Remote register for the present value change	RWwn+2, RWwm+3	RWwn+10, RWwm+11

(c) Error detection

1) If the value specified in degree units is outside the setting range, an axis error occurs.

2) Even if the specified value is outside the software stroke-limit range, no error occurs. However, an "operation start from outside the software stroke-limit range" error occurs at the positioning start.

3) When the positioning data subsequent to the positioning data of continuous locus control is present value change, an axis error occurs.
Also, even when the operation pattern of the positioning data describing the present value change is continuous locus control, an axis error occurs.

(d) Setting example of positioning data * and present-value change program
Use the conditions below to set positioning data at the positioning data number 1 of axis 1.

Item		Positioning control	Set data of peripheral device
Positioning identifier	Operation pattern	End of positioning	End
	Control method	Present value change	Present value change
	Acceleration time selection	Setting not necessary	—
	Deceleration time selection	Setting not necessary	—
Positioning address/travel increment		10000.0 μ m	10000.0
Circular address		Setting not necessary	—
Command speed		Setting not necessary	—
Dwell time		Setting not necessary	—
M code		Setting not necessary	—

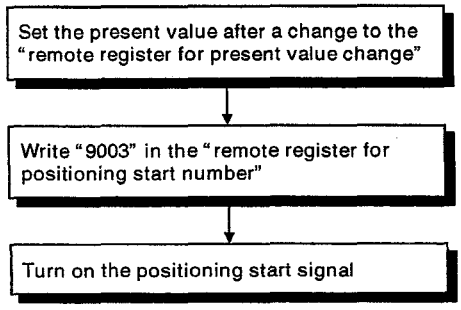
* "–" : This value is irrelevant to control. An initial value or any other value may be used.

Remark

* : See Section 11.2 for details on positioning data.

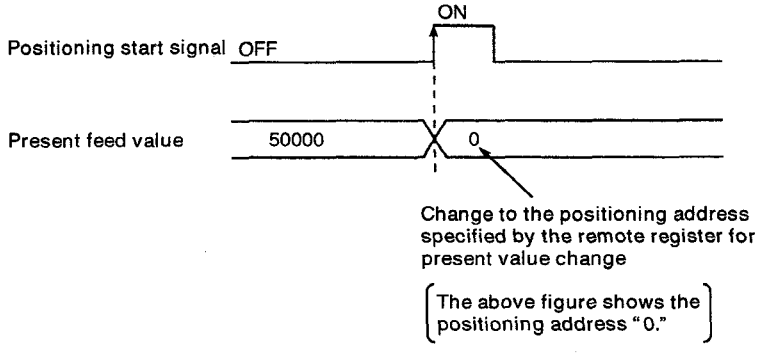
(3) Present value change using the remote register for present value change

(a) The present value change using the remote register for present value change is performed as follows:



(b) Change timing

Tuning on the positioning start signal changes the present feed value to a specified value.



(c) Error detection

1) If the value specified in degree units is outside the setting range, an axis error occurs.

2) Even if the specified value is outside the software stroke-limit range, no error occurs.

However, an "operation start from outside the software stroke-limit range" error occurs at the positioning start.

Remark

The addresses of the remote register for present value change and the one for the positioning start are as follows :

Axis number	Axis 1	Axis 2
Remote register address for present value change	RWwm+2, RWwm+3	RWwm+10, RWwm+11
Remote register address for the positioning start	RWwm	RWwm+8

7.6 Electronic Gear

(1) What is the electronic gear?

(a) The electronic gear freely changes the machine travel increment per command pulse by setting the "travel increment per pulse."

(b) Set the travel increment per pulse by selecting from the "number of pulses per rotation" of the basic parameter 1, "travel increment per rotation" and "unit multiplier."

(c) By setting the travel increment per pulse, positioning can be performed flexibly since it is no longer necessary to select a detector (encoder) or servo motor depending on the mechanical system.

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

(2) Electronic gear processing

(a) The electronic gear function accumulates values, that are smaller than the "travel increment per pulse" that was not output by pulse during mechanical movement, inside the D75P2. When the amount of these accumulated values reaches the "travel increment per pulse," they are output by pulse.

(b) The "accumulated values smaller than the travel increment per pulse" is cleared to 0 when the fixed-dimension feed execution is completed.
Therefore, even if the fixed-dimension feed is performed repeatedly, the mechanical movement will be the same for each feed.

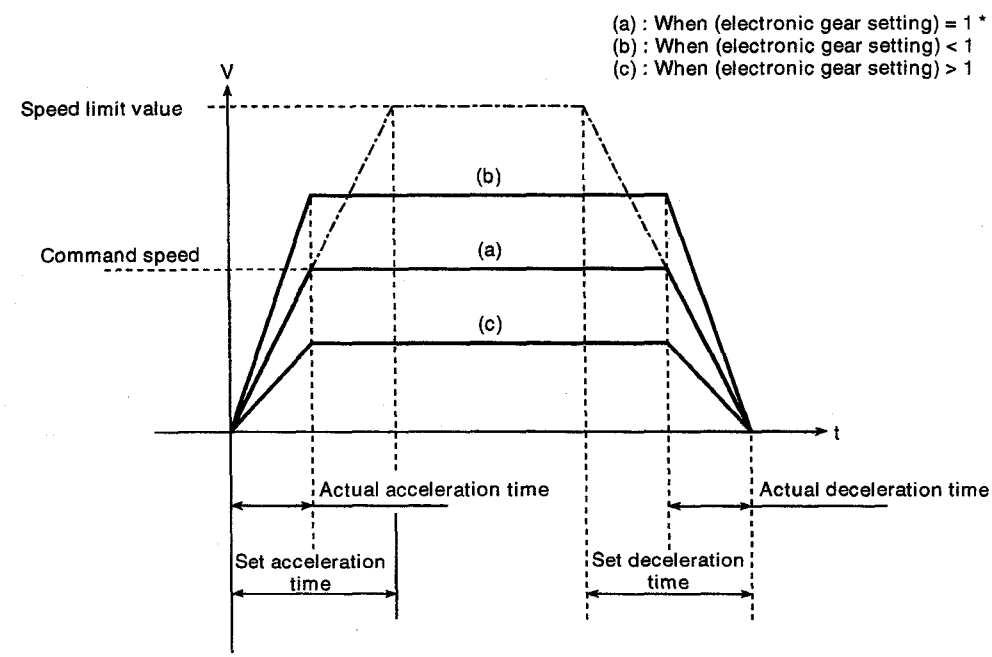
(3) Relationship between the command speed and actual speed

When the electronic gear is set, the relationship between the command speed (the command speed set by positioning data) and actual speed (actual feed speed) will be as follows:

(a) When (electronic gear setting) = 1, (command speed) = (actual speed)

(b) When (electronic gear setting) < 1, (command speed) < (actual speed)

(c) When (electronic gear setting) > 1, (command speed) > (actual speed)



* The speed limit value, acceleration time and deceleration time will be the data specified by the basic parameter 2.

Fig. 7.3 Relationship between the command speed and actual speed

(4) Note

(a) Please be reminded that if the electronic gear setting is small, the actual speed may exceed the speed limit value, thus overspending the servo motor.

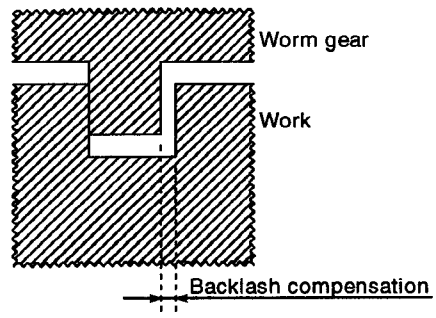
(b) If the electronic gear value is large, vibration may occur.
Therefore, use a smaller value for the electronic gear.
It is recommended that 1 is used for the value of electronic gear.

(c) When setting the electronic gear, set a value so that the frequency of pulse output to the drive module is 400 kpps or less.
If the electronic gear is set so that the frequency of pulse output to the drive module exceeds 400 kpps, misoperation may occur.

7.7 Backlash Compensation Function

(1) What is the backlash compensation function?

(a) When the backlash compensation is set, the backlash compensation function outputs an extra feed pulse for the set amount of backlash each time the travel direction changes during positioning control, JOG operation, manual pulse generator operation, or home position return.



(b) The backlash compensation is to perform compensation for the mechanical system's backlash (play) amount.

(c) The backlash compensation is performed with a value obtained by dividing the set backlash compensation by the travel increment per pulse.

The setting range of backlash compensation is 0 to 65535. Set the backlash compensation so that the value obtained by dividing the set backlash compensation by the travel increment per pulse is 255 or less.
If it exceeds 255, a setting error occurs.
Also, decimals are omitted.

$$0 \leqq \frac{\text{Backlash compensation}}{\text{Travel increment per pulse}} \leqq 255$$

(Decimals are omitted)

(2) Note

(a) The feed pulse of backlash compensation will not be added to the present/machine feed values.

(b) When performing backlash compensation, be sure to perform home position return.
If home position return is not performed, the backlash compensation cannot be performed properly for the mechanical system.

(c) The backlash compensation can be changed when the remote station ready signal is off. However, when the backlash compensation is changed, home position return must be performed.

[If backlash compensation is changed after the remote station ready signal turns on, the "home position return request" of an axis monitor will turn on.]

(d) When the travel direction is changed, the backlash compensation outputs the amount of travel increment as well as backlash compensation.

7.8 M-code Function

(1) What is the M-code function?

(a) A number between 0 and 32767 can be set for each positioning control.

(b) By reading the M code via the sequence program, the data number currently being executed can be confirmed and a supplementary work (for example, cramp, drill rotation, tool exchange, etc.) can be commanded.

(2) Control contents

(a) If the M code is set to 0, the M code is not output and the previously output M code is retained.
The M-code ON signal will not turn on.

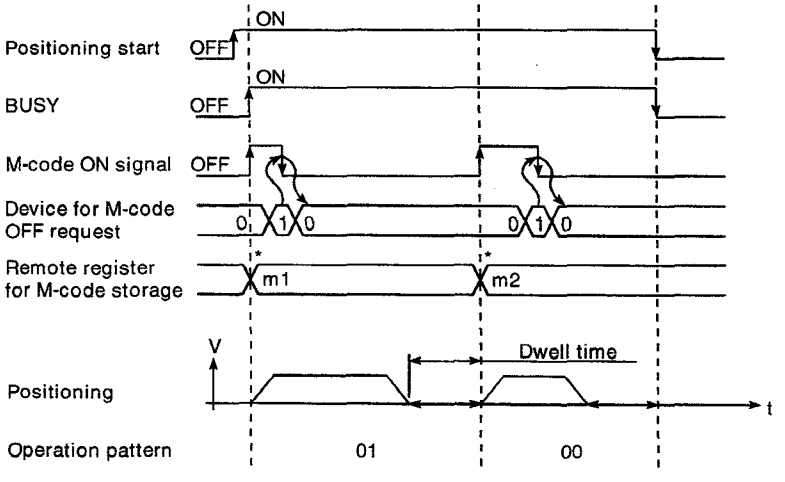
(b) The M-code ON signal (the device number below) of the reference axis turns on during interpolation operation.

Interpolation axis	Reference axis	Device number
During interpolation by axes 1 and 2	Axis 1	RXnD

(3) Output timing of M-code ON signal

(a) The output timings of an M code and M-code ON signal include WITH mode and AFTER mode.

- WITH mode ····· M-code ON signal is turned on at the start of positioning.



* : m1, m2 indicate the set M codes.

Fig. 7.4 M-code ON/OFF timing (WITH mode)

Remark

The addresses for the setting of M-code output timing, M-code OFF request, and buffer memory for M-code storage are as follows:

Axis number	M-code output timing setting	Device number for M-code OFF request	Resister address for M-code storage
Axis 1	25	RY(n+2)6	RWrn+4
Axis 2	175	RY(n+4)6	RWrn+12

- AFTER mode ····· The M-code ON signal is turned on upon positioning complete. However, the M code is stored in the remote register for M-code storage as soon as the M-code ON signal turns on. Read an M code using the during-ON execution instruction instead of the startup instruction.

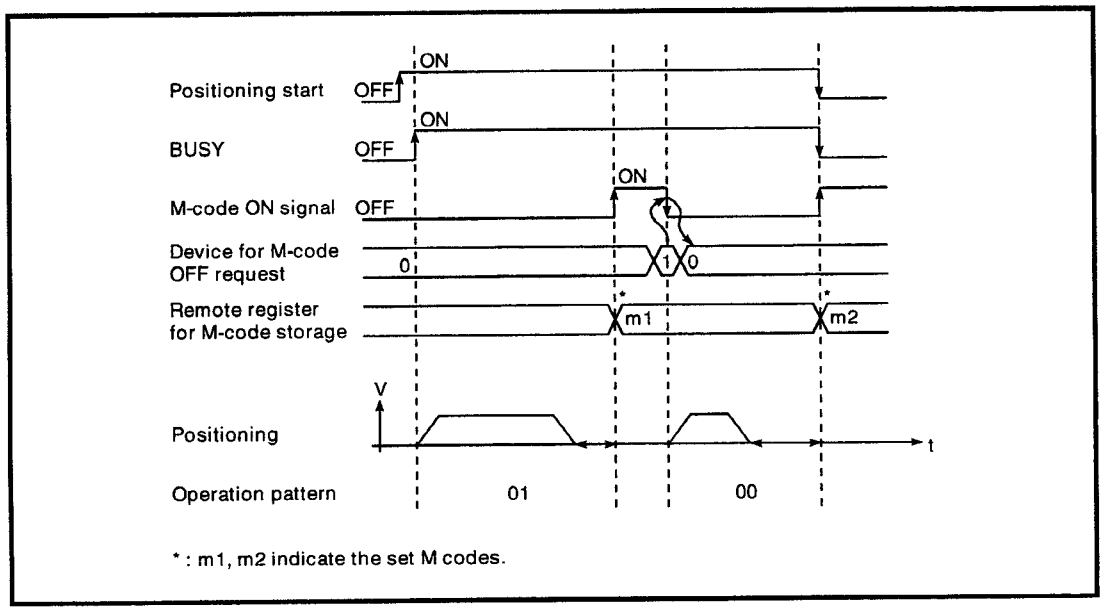


Fig. 7.5 M-code ON/OFF timing (AFTER mode)

(b) When in AFTER mode during speed control, the M-code ON signal will not be turned on. The M-code ON signal will not be stored in the remote register for M-code storage.

(c) When the M-code ON signal is on, if the M-code OFF request of the Y contact is turned on, the M-code ON signal will be turned off.
If the M-code ON signal is not turned off, the processing will be as follows, depending on the operation pattern.

1) When the operation pattern is either positioning complete (00) or continuous positioning control (01), the next positioning will not be performed until the M-code ON signal is turned off.

2) When the operation pattern is continuous locus control (11)

- The next positioning is performed. However, a warning (warning code: 503) occurs.
- If the M-code ON signal is on at the positioning start, an error (error code: 536) occurs and the operation is not started.
- If the remote station ready signal turns off, the M-code ON signal is turned off and 0 is output to the M code.
- In continuous locus control (11), a warning (warning code: 503) may occur when the positioning operation time is short.
- If a sufficient time cannot be secured to turn off the M-code ON signal, 0 is set to M code for that section only.

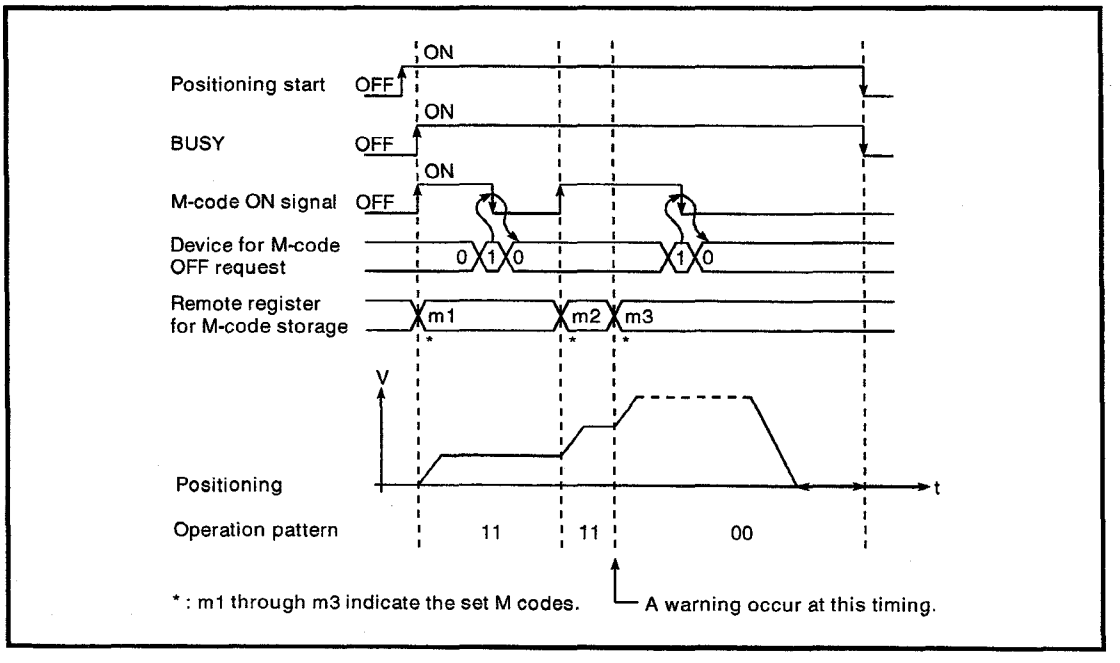


Fig. 7.6 When a warning occurs in WITH mode

7.9 Acceleration/Deceleration Processing

(1) What is the acceleration/deceleration processing?

(a) The acceleration/deceleration processing refers to the acceleration processing and deceleration processing performed when starting the positioning operation, JOG operation and home position return operation as well as when changing the speed.

(b) Setting ranges of acceleration and deceleration times
Use extended parameter 1 to select the setting range of acceleration time and deceleration time from 1 to 65535 ms or 1 to 8388608 ms.

(c) Selecting the acceleration time and deceleration time

1) Four patterns can be set for both the acceleration time and the deceleration time for positioning operation.

2) With home position return /JOG operation, use the extended parameter for home position return /extended parameter 2 to specify the acceleration time/deceleration time to be used.

Point

Four patterns can be used by selecting for both the acceleration time and deceleration time.

If four or more patterns of acceleration/deceleration time are needed, rewrite the time for the acceleration time 0 to 3 and deceleration time 0 to 3 of the buffer memory listed below from a PC CPU before turning on the positioning start signal.

	Buffer memory address			Buffer memory address	
	Axis 1	Axis 2		Axis 1	Axis 2
Acceleration time 0	8, 9	158, 159	Deceleration time 0	10, 11	160, 161
Acceleration time 1	36, 37	186, 187	Deceleration time 1	42, 43	192, 193
Acceleration time 2	38, 39	188, 189	Deceleration time 2	44, 45	194, 195
Acceleration time 3	40, 41	190, 191	Deceleration time 3	46, 47	196, 197

7.9.1 Relationship among speed limit value, JOG speed limit value, acceleration time, deceleration time and rapid stop deceleration time

(1) The following describes the speed limit value, JOG speed limit value, acceleration time, deceleration time and rapid stop deceleration time.

(a) The speed limit value is the highest speed during the positioning operation, manual pulse generator operation and home position return operation.

(b) The JOG speed limit value is the highest speed during the JOG operation.
Set the JOG speed limit value at or below the speed limit value.

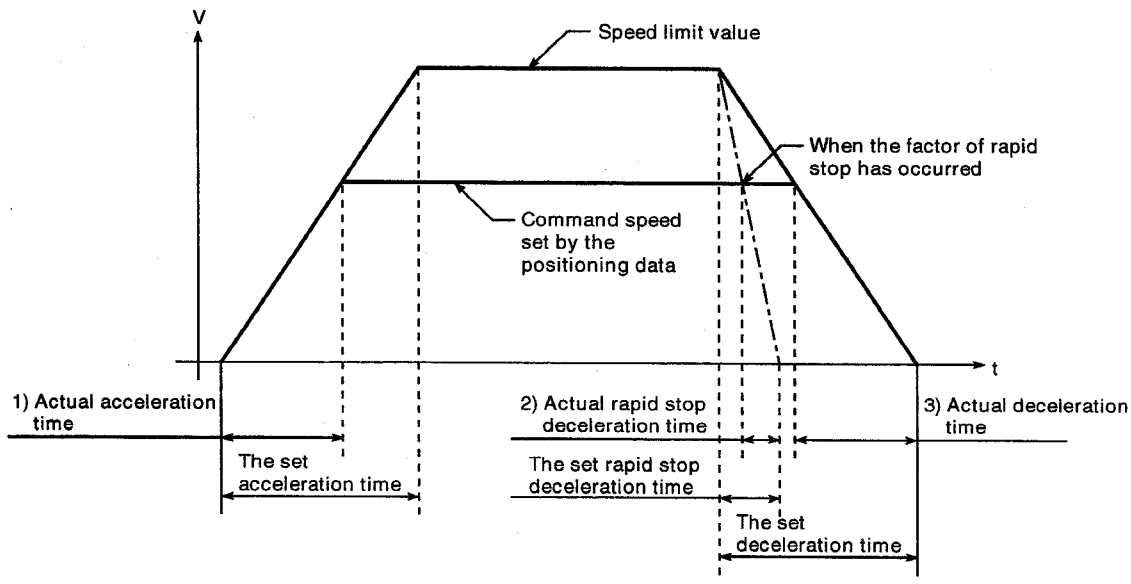
(c) The acceleration time is the time required to reach the set speed limit value from speed 0.

(d) The deceleration time and rapid stop deceleration time are the times required to reach speed 0 from the set speed limit value.

(2) When the command speed setting is lower than the speed limit value of a parameter, the acceleration/deceleration time shortens accordingly.
Therefore, the maximum value of a command speed should be equal or close to the speed limit value of a parameter.

(3) Parameters are used to set the speed limit value, acceleration time, deceleration time and rapid stop deceleration time.

(4) Parameters for the axis indicated below are used during interpolation control.
- During interpolation of axes 1 and 2: Parameter of axis 1



1) Actual acceleration time : Time required to reach the command speed set by the positioning data

2) Actual rapid stop deceleration time : Time required to stop rapidly from the command speed set by the positioning data

3) Actual deceleration time : Time required to stop from the command speed set by the positioning data

Fig. 7.7 Relationship among speed limit value, acceleration time, celeration time and rapid stop deceleration time

7.9.2 Acceleration/deceleration processing

(1) The acceleration/deceleration processings include two types: "trapezoid acceleration/deceleration processing" and "S-curve acceleration/deceleration processing."

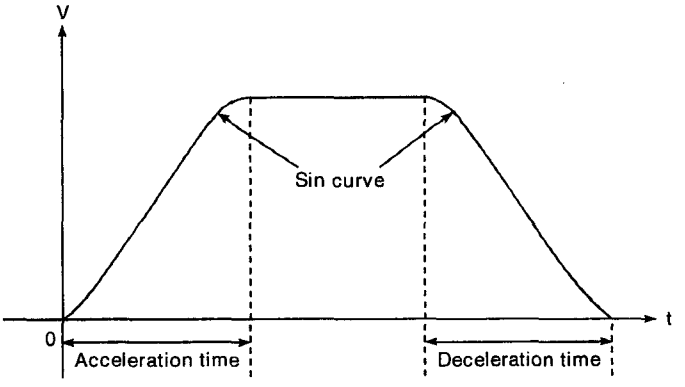


Fig. 7.8 S-curve acceleration and deceleration processing

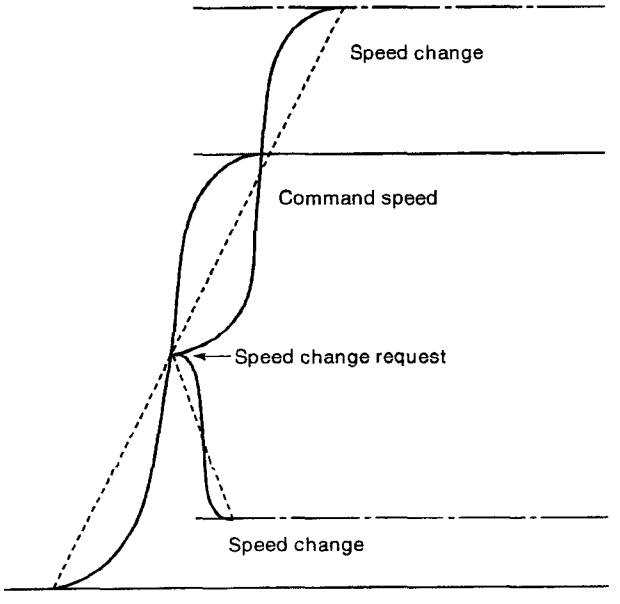
Point

(1) The S-curve acceleration/deceleration processing cannot be used in the stepping motor mode.

(2) When performing the S-curve acceleration/deceleration processing, set the acceleration/deceleration processing selection to S-curve acceleration/deceleration processing with extended parameter 2, and set the S-curve ratio.

(2) When the S-curve acceleration/deceleration processing is selected, set the S-curve ratio (See Section 10.2.20 on the S-curve ratio).
The S-curve acceleration/deceleration processing is performed for each acceleration/deceleration when starting or completing the positioning operation, JOG operation, and home position return operation, or changing the speed.

(3) The speed change during S-curve acceleration/deceleration, the S-curve acceleration/deceleration is performed from the moment the speed change request is made.



7.10 Skip Function

(1) What is the skip function?

When the skip signal is input, this function ignores the remaining travel increment of the positioning currently being executed to decelerate the operation to stop and perform the next positioning.

(2) Skip signal

(a) The skip signal is input from a skip command of the axis control data in the buffer memory, or an external start signal.

(3) Processing when the skip signal is input

(a) When the skip signal is turned on, an automatic deceleration occurs and the next positioning is performed. If the skip signal is turned on at the end of an operation, the operation is terminated.

(b) When the positioning currently executed is skipped, the positioning complete signal via the positioning data number unit or automatic deceleration unit is not turned on (the same applies when the skip signal is turned on during automatic deceleration).

(c) A skip during dwell ignores the remaining dwell time and performs the next positioning.

(d) The following will occur during interpolation operation.
If the skip signal to axis 1 is turned on, the movement decelerates to stop along both axes and the next positioning for axis 1 (reference axis: axis 1) starts.

(e) When the M-code output is in AFTER mode, the M-code ON signal will not turn on. The M code will not be stored in the buffer memory for M-code storage.

(f) A skip signal during home position return operation is ignored.

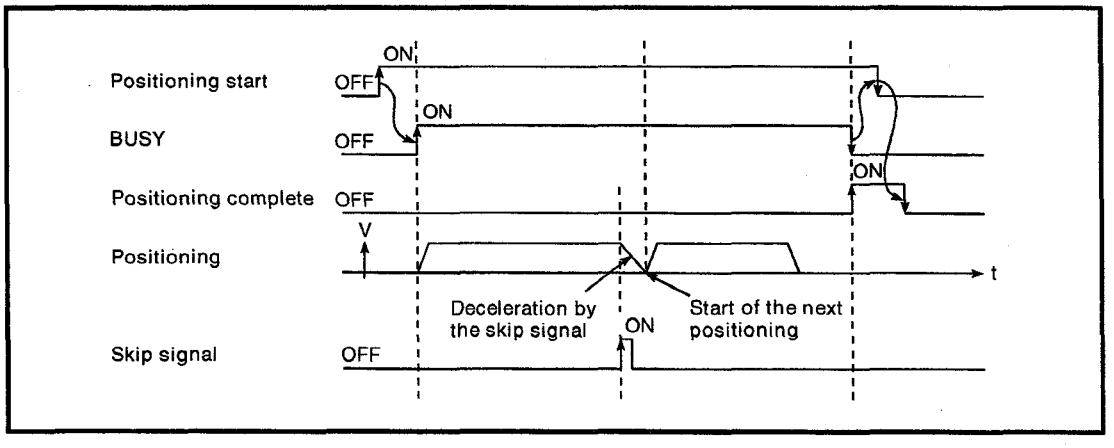


Fig. 7.9 Processing when the skip signal is input during positioning control

Remark

1) As the external start signal is used for the following applications, it is necessary to set the function selection of external start input to the skip function when using the skip function. Use the AD75P to set the function selection of external start input.
   - External positioning start
   - External speed change request
   - Skip request input signal

   Also, when using the external start signal, it is necessary to set the external start valid.

2) Use the buffer memory addresses and remote register addresses listed below for setting skip commands and external start valid.

Axis No.	Buffer memory address for skip command	Remote register address for setting external start valid
Axis 1	1175	RY(n+2)B
Axis 2	1225	RY(n+4)B

7.11 Step Function

(1) What is the step function?

This is used to check each individual action in the positioning operation.

(2) Step execution

(a) After setting the step valid flag to ON in advance, a positioning start signal is turned on.

(b) When one step of the positioning completes normally, the status of the axis operation becomes "during step standby."

(c) When the stop signal stops the step operation, the status becomes "during step stop."

(d) If an error occurs during the step operation and decelerates the operation to stop, the status becomes "during step error occurrence."

(e) If 01H is set for the step start information while the status of an axis operation is during step standby, the step execution of the next positioning is performed.

(f) If 01H or 02H is set for the step start information while the status of an axis operation is during step stop, the halted positioning data is restarted.

Even if 02H is set for the step start information while the status of an axis operation is other than during step stop, no positioning is performed.

(g) If the status of an axis operation is not appropriate when setting the step start information, the warnings listed in the table below occur.

(Warnings are output only when the step valid flag is ON.)

Axis operation status	Start information	
	Set to 01	Set to 02
Standby	—	—
Stopped	—	—
During Interpolation	×	×
During JOG operation	×	×
During manual pulse generator operation	×	×
Analyzing	×	×
Waiting for special start	×	×
During home position return	×	×
During position control	×	×
During speed control	×	×
During speed control of the speed/position switch control	×	×
During position control of the speed/position switch control	×	×
During step standby	O	—
During step stop	O	O
During step error occurrence	—	—
During error occurrence	—	—

(× : During-operation start warning
O : Normal processing
— : Step start information invalid warning)

(h) If the positioning start signal is turned on again during step standby while the step valid signal is on, during step stop, or during step error occurrence, the positioning step execution of the positioning start data number specified by the positioning start number is performed.

(3) Step mode

(a) The step functions include two types: "deceleration unit step" and "data number unit step."

1) Deceleration unit step

The normal operation will be performed until the positioning data number that requires an automatic deceleration is found. When a positioning data number requiring an automatic deceleration is found, the operation automatically decelerates to stop after executing the positioning data.

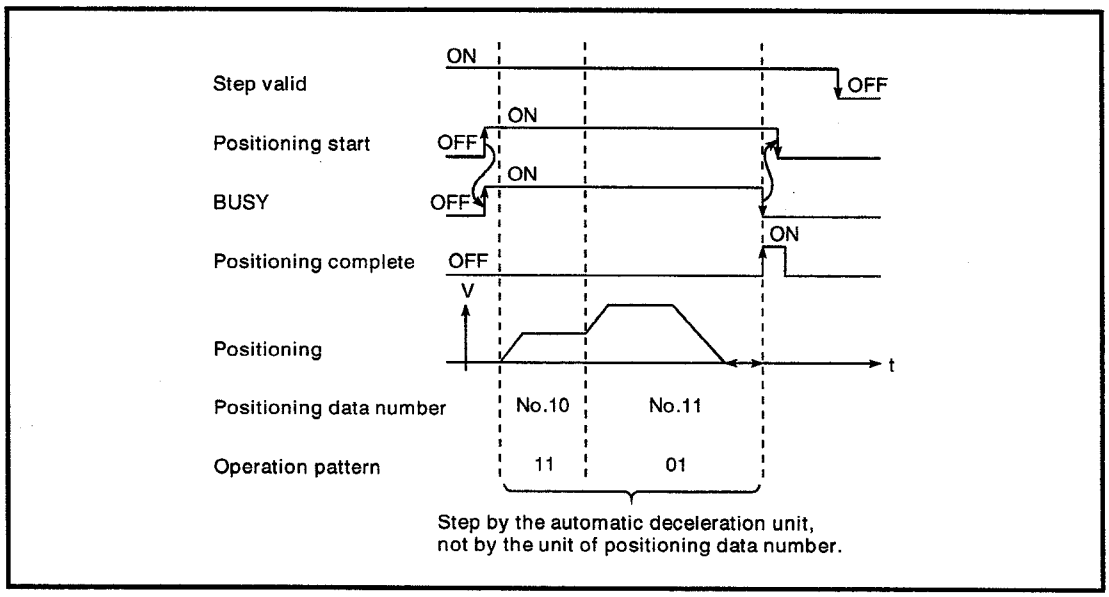


Fig. 7.10 Operation during step execution with the deceleration unit step

2) Data number unit step

Regardless of whether or not the automatic deceleration is necessary, the operation automatically decelerates to stop after executing the specified positioning data.
Even when the operation pattern is continuous locus control (11), the operation forcefully and automatically decelerates to stop (the operation is the same as continuous positioning control (01)).
Therefore, if the positioning data consists of the operation patterns 00 and 01 when performing continuous operation, the operation will be the same as that of data number unit step even if the deceleration unit step is performed.

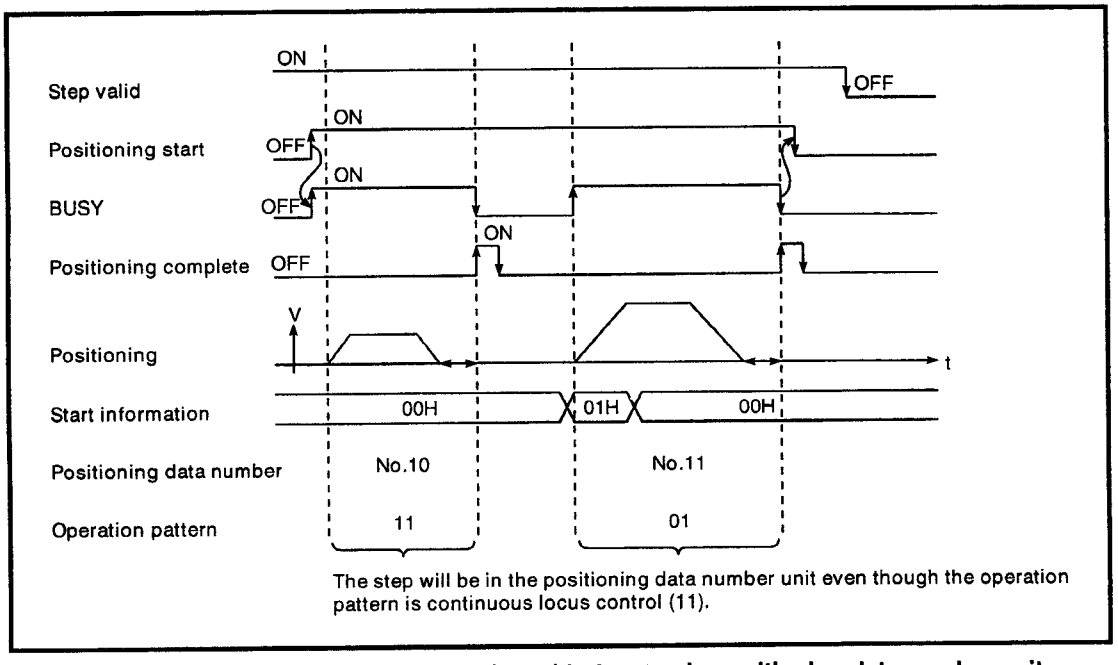


Fig. 7.11 Operation during step execution with the step in positioning data number units

(b) During interpolation of the axes 1 and 2, the step is performed in the axis 1's step mode.

(4) Steps during the operation of continuous locus control (11)

When performing the positioning data number unit step during continuous locus control (11), the operation will be pattern 01.
The axis operation status at this time becomes during step standby.
If 01 is set for the step start information, the step operation is continued from the data following the positioning data for which an error has occurred.

7.12 Command In-position Function

(1) What is the command in-position function?

(a) This function checks upon each automatic deceleration whether the remaining distance of D75P2 is equal to or less than the value set in the buffer memory for storing command in-position range, and stores "1 (ON)" in the remote register for storing command in-position flag if it is equal to or less than the set value.

(b) When the command in-position range is checked, "1(ON)" is stored in the remote register for storing command in-position flag if the relationship, (remaining distance) ≦ (command in-position range), is satisfied.

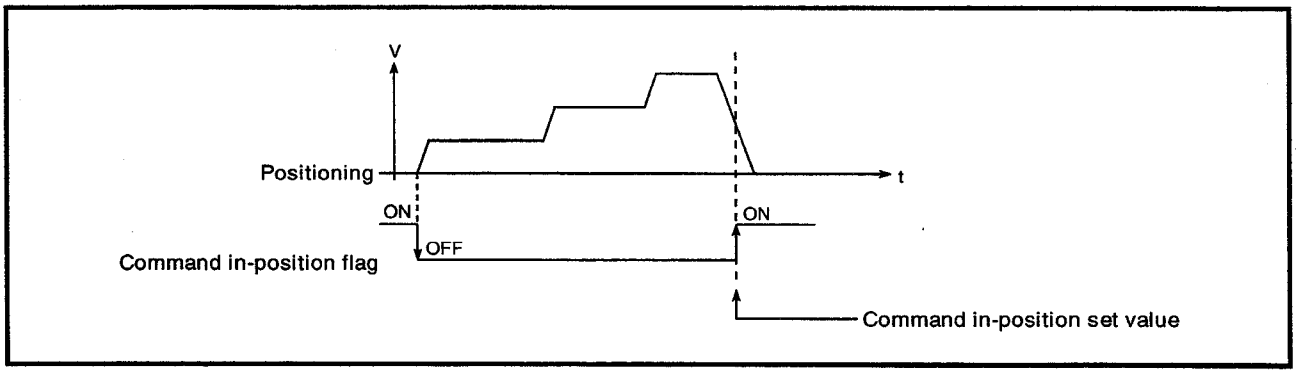


Fig. 7.12 ON and OFF timing of command in-position flag

(2) Control contents

(a) The range check for command in-position is performed at the timing of 56.8 ms during position control and deceleration stop via the step function.
However, the range check for command in-position is not performed in the following cases:

- Upon deceleration stop via the stop command or rapid stop command.
- Upon deceleration stop during the speed control, and the speed control of speed/position switch control.

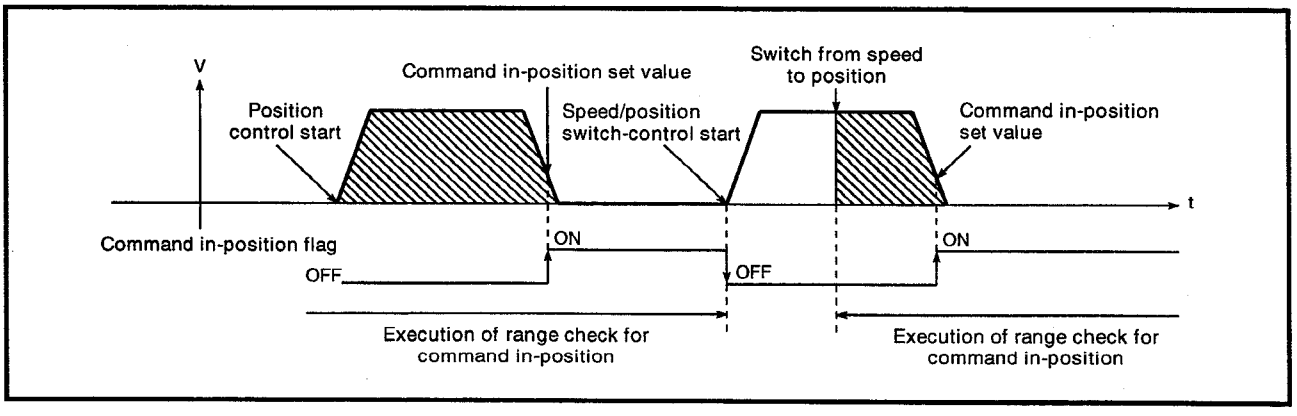


Fig. 7.13 Range check for command in-position

(b) "0(OFF)" is stored in the remote register for storing command in-position flag in the following cases:

- At the start of positioning control
- At the start of home position return
- At the start of speed control
- At the start of JOG operation
- When the manual pulse generator operation is enabled

(c) During interpolation control, the remote register for storing command in-position flag of the axis (reference axis) indicated below is used. Use the AD75P to set the command in-position range.

Interpolation axis	Reference axis	Remote register for storing command in-position flag
During interpolation control of axes 1 and 2	Axis 1	RX(n+1)E

7.13 Teaching Function

(1) What is the teaching function?

(a) This function changes the positioning address of the positioning data number specified to the address positioned by the manual operation (JOG operation, manual pulse generator operation).

(b) For the circular interpolation of auxiliary point specification, the circular auxiliary point address and positioning address can be changed.

For the circular interpolation of center point specification, the positioning address can be changed.

(2) Positioning address

(a) The positioning address and circular auxiliary point address to write are absolute addresses based on the home position address.

(b) The travel increment of the positioning using the increment method cannot be set.

(3) Axes subject to teaching

Teaching may be performed for each axis or for interpolation axis. The subject of teaching is set according to the table below.

Axis number	Axis 1	Axis 2	Interpolation for axes 1 and 2
Setting	1	2	4

(4) Restrictions

(a) The teaching function is performed on the stopped axes using the sequence program. Even when the error warning occurs during the manual operation, teaching can be performed unless the axis is in BUSY status.

Point

(1) When executing teaching, the positioning identifier, M code, dwell time and command speed can also be changed. *

(2) When performing teaching, use the control data area of a buffer memory. In the control data area, set the data listed below.

Setting data	Buffer memory address
Subject axis	1103
Positioning data number	1104
Write pattern	1105
Write request	1106
Write positioning data	1108 to 1127
Flash memory write request	1138

See Section 8.7 for details on the control data area.

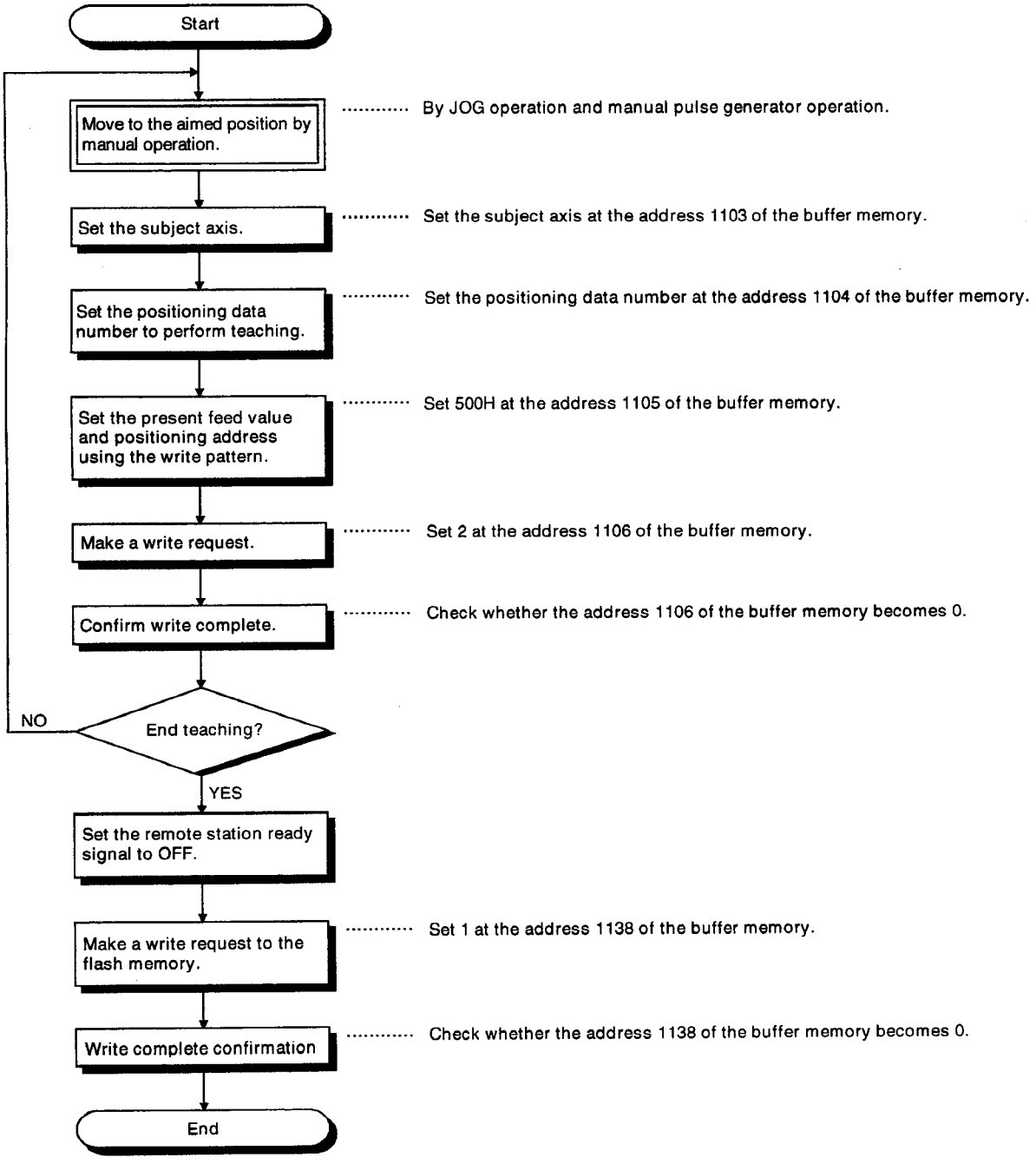
Remark

* : The positioning identifier is the general term for positioning operation pattern, acceleration time number, deceleration time number and control method.

(5) Teaching procedure

The following shows the procedure for performing teaching by using a sequence program.

(a) When controlling each axis independently and during interpolation (excluding circular interpolation of auxiliary point specification), positioning addresses can be changed for independent control of each axis and interpolation control (excluding circular interpolation of auxiliary point specification).



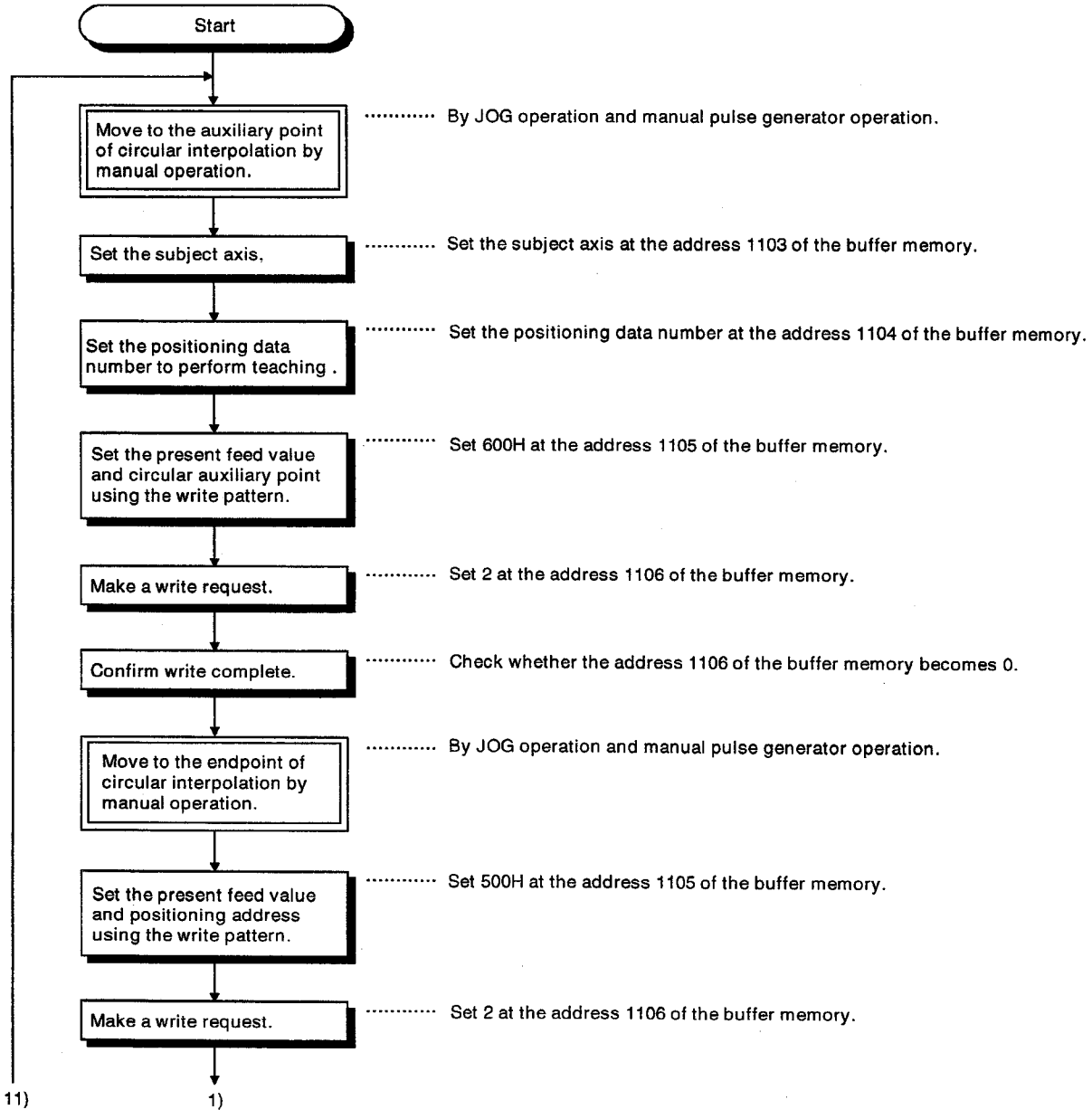
Point

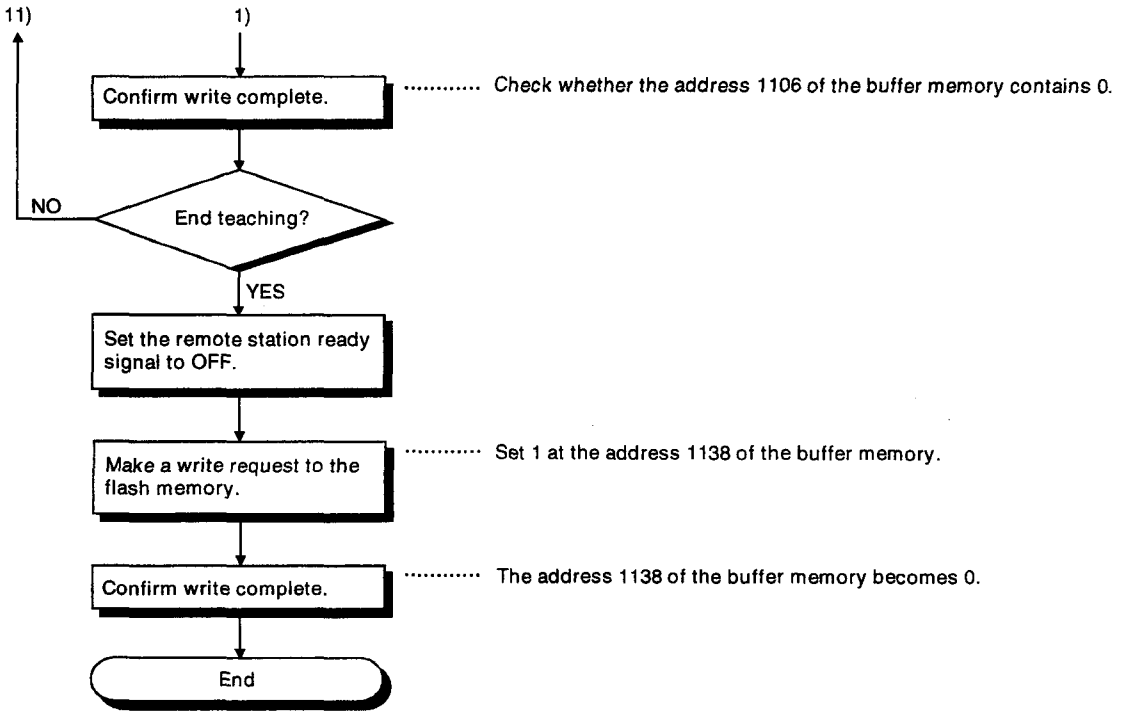
* : Write to the flash memory is allowed up to 100,000 times.
When the number of write to the flash memory exceeds 100,000, write to the flash memory may no longer be performed normally.

(b) For circular interpolation control of auxiliary point specification

With circular interpolation control of auxiliary point specification, the auxiliary point address and the last address can be changed.

[For circular interpolation control of center point specification, the endpoint address can be changed. See (a) for the teaching procedure.]





Point

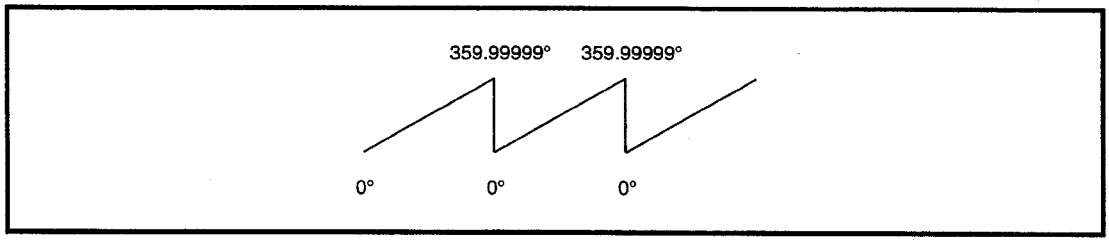
* : Write to the flash memory is allowed up to 100,000 times.
When the number of write to the flash memory exceeds 100,000, write to the flash memory may no longer be performed normally.

7.14 Handling when the Control Unit is in "Degree"

When the control unit is in "degree," the items below are different from other control units.

7.14.1 Address of present feed value and machine feed value

The addresses of present feed values and machine feed values are ring addresses between 0 and 359.99999°.

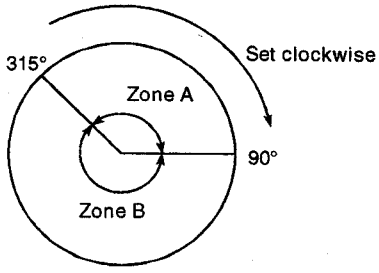


7.14.2 Setting valid/invalid of software stroke limit

The high limit/low limit values of a software stroke limit are between 0 and 359.99999°.

(1) Setting the software stroke limit to valid

To set the software stroke limit to valid, set the low limit value and high limit value of the software stroke limit in the clockwise direction.



(a) Set the travel range of zone A as follows:

- Low limit value of software stroke limit ····· 315.00000°
- High limit value of software stroke limit ····· 90.00000°

(b) Set the travel range of zone B as follows:

- Low limit value of software stroke limit ····· 90.00000°
- High limit value of software stroke limit ····· 315.00000°

(2) Setting the software stroke limit to invalid

Set the software stroke limit to invalid as follows:

(Low limit value of software stroke limit) = (High limit value of software stroke limit)

Control can be performed regardless of the software stroke limit setting.

7.14.3 Positioning control

This section describes the positioning control method when the control unit is in degrees.

(1) Absolute method

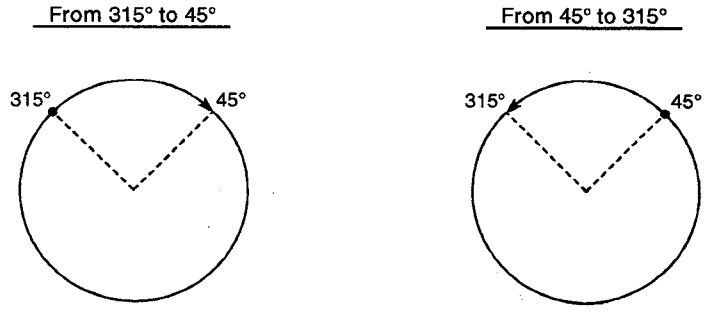
(a) When the stroke limit is invalid

Positioning is performed in the direction closer to the specified address based on the present value (shortcut control).

Example

(1) When moving from the present value at the position of 315° to the position of 45°, positioning is performed in the clockwise direction.

(2) When moving from the present value at the position of 45° to the position of 315°, positioning is performed in the counterclockwise direction.

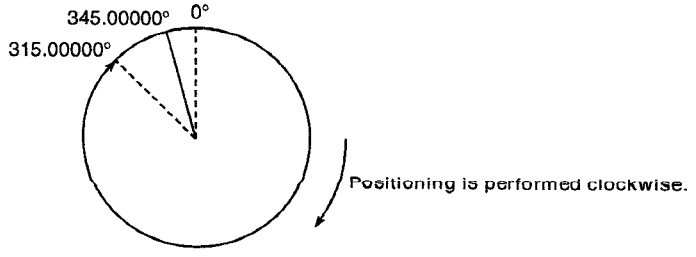


(b) When the stroke limit is valid

The positioning direction -- clockwise or counterclockwise -- is determined by the setting method of software stroke limit range.
Therefore, positioning via the shortcut control may not be allowed.

Example

When moving from the present value at the position of 0° to the position of 315°, positioning is performed in the clockwise direction if the low limit value of software stroke limit is 0° and its high limit value is 345°.



Point

The positioning address should be within the range of 0° to 359.99999°.
Use the increment method to perform positioning of one rotation or more.

(2) Increment method

When using the increment method, positioning is performed for a specified travel increment in the specified direction. The sign of travel increment determines the travel direction.

- When the travel direction is positive ····· Clockwise
- When the travel direction is negative ··· Counterclockwise

Point

With the increment method, positioning of 360° or more can be performed.
To do this, set (low limit value of software stroke limit) = (high limit value of software stroke limit), and set the software stroke limit to invalid.

7.15 Setting the Stepping Motor Mode

(1) What is the stepping motor mode?

(a) The stepping motor mode performs "prevention of out-of-step acceleration/deceleration" and "reduction of machine vibration due to decreased frequency variation" when using the stepping motor with D75P2.

(b) By selecting the stepping motor mode, the stepping motor can be used without getting out of step.

Also, machine vibration due to frequency variation during operation can be reduced.

* When using the stepping motor, the rotation of a motor can be started smoothly by selecting the stepping motor mode and setting the bias speed at start.

(2) Setting method

(a) Use basic parameter 2 to set the stepping motor mode.

(b) When setting the stepping motor mode, set "1: stepping motor mode" in basic parameter 2.

(c) The stepping motor mode 1 becomes valid at the startup of remote station ready signal (OFF to ON).

Remark

When setting the stepping motor mode in the peripheral device, use the software packages listed below.

- DOS/V personal computers : SW1IVD-AD75P and later

(3) Restrictions

The stepping motor can be controlled normally in the stepping motor mode, except for the following restrictions.
Control the axes set in the stepping motor mode in consideration of the following restrictions.

(a) Restriction on a positioning command range and speed command range
In the stepping motor mode, the position command range and speed command range are 1/16 of those in the standard mode.
When using the stepping motor mode, control should be performed within the range indicated in Table 7.2.

(b) Circular interpolation control not used
The circular interpolation control cannot be specified in the stepping motor mode (the circular interpolation control cannot be performed when using a servo motor in the stepping motor mode).
If the circular interpolation is started when the stepping motor mode is set, the control method setting error (error code: 524) occurs.

(c) Restriction on linear interpolation control
Use the linear interpolation control when both axes are set in the standard mode or stepping motor mode.
When the standard mode is used together with stepping motor mode for linear interpolation control, control cannot be performed at the command speed.
When performing linear interpolation control for the stepping motor and servo motor, set both axes to the stepping motor mode.

(d) Restriction on continuous locus control
- The continuous locus control can only be used for a single axis.
  The continuous locus control cannot be used for double-axis interpolation control.
  Performing continuous locus control with the double-axis interpolation control may result in a positional dislocation.
- The continuous locus control can only be used for controls in the same direction.
  Using locus control for controls whose direction reverses may result in a positional dislocation.
  When performing controls whose direction reverses in the stepping motor mode, use the continuous operation.

(e) Restriction on the INC instruction
After stopping the JOG operation or positioning, do not perform positioning in the opposite direction by the INC instruction.
If positioning is performed in the opposite direction by the INC instruction after stopping the JOG operation or positioning, positioning may be one pulse more than the command pulse.

(f) Restriction on electronic gear
If the value of electronic gear is large in the stepping motor mode, it may cause vibration.
Therefore, use a smaller value for the electronic gear.
It is recommended that 1/1 is used for the electronic gear value in the stepping motor mode.

(g) Switching control of standard mode and stepping motor mode not used
The position command range and speed command range differ between the stepping motor mode and standard mode.
Therefore, the stepping motor mode and standard mode cannot be switched for use.
If the stepping motor mode and standard mode are switched for use, normal controls can no longer be performed.

(h) Restriction on speed
When using the stepping motor mode, control may be performed 10 pulse/s lower than the set positioning speed.

Table 7.2 Setting ranges for the stepping motor mode

		Setting unit			
		mm		inches	
		Standard mode	Stepping motor mode	Standard mode	Stepping motor mode
Positioning address	ABS	– 214748364.8 to 214748364.7 μm	– 13421772.8 to 13421772.7 μm	– 21474.83648 to 21474.83647 inches	– 1342.17728 to 1342.17727 inches
	INC	– 214748364.8 to 214748364.7 μm	– 13421772.8 to 13421772.7 μm	– 21474.83648 to 21474.83647 inches	– 1342.17728 to 1342.17727 inches
	Speed/position switch control	0 to 214748364.7 μm	0 to 13421772.7 μm	0 to 21474.83647 inches	0 to 1342.17727 inches
Speed limit value		0.01 to 6000000.00 mm/min.	0.01 to 375000.00 mm/min.	0.001 to 600000.000 inches/min.	0.001 to 37500.000 inches/min.
Positioning speed		0.01 to 6000000.00 mm/min.	0.01 to 375000.00 mm/min.	0.001 to 600000.000 inches/min.	0.001 to 37500.000 inches/min.
Bias speed upon start		—	0.01 to 375000.00 mm/min.	—	0.001 to 37500.000 inches/min.
Backlash compensation		0 to 6553.5 μm	0 to 409.5 μm	0 to 0.65535 inches	0 to 0.04095 inches
Stroke high limit		– 214748364.8 to 214748364.7 μm	– 13421772.8 to 3421772.7 μm	– 21474.83648 to 21474.83647 inches	– 1342.17728 to 1342.17727 inches
Stroke low limit		– 214748364.8 to 214748364.7 μm	– 13421772.8 to 13421772.7 μm	– 21474.83648 to 21474.83647 inches	– 1342.17728 to 1342.17727 inches
Command in-position		0.1 to 3276700.0 μm	0.1 to 204793.7 μm	0.00001 to 327.67000 inches	0.00001 to 20.47937 inches
JOG speed limit value		0.01 to 6000000.00 mm/min.	0.01 to 375000.00 mm/min.	0.001 to 600000.000 inches/min.	0.001 to 37500.000 inches/min.
Circular interpolation error allowable range		0 to 10000.0 μm	0.1 to 625.0 μm	0 to 1.00000 inch	0.00001 to 0.06250 inch
Home position address		– 214748364.8 to 214748364.7 μm	– 13421772.8 to 134211772.7 μm	– 21474.83648 to 21474.83647 inches	– 1342.17728 to 1342.17727 inches
Home position return speed		0.01 to 6000000.00 mm/min.	0.01 to 375000.00 mm/min.	0.001 to 600000.000 inches/min.	0.001 to 37500.000 inches/min.
Creep speed		0.01 to 6000000.00 mm/min.	0.01 to 375000.00 mm/min.	0.001 to 600000.000 inches/min.	0.001 to 37500.000 inches/min.
Travel increment after near-point dog ON		0.0 to 214748364.7 μm	0 to 13421772.7 μm	0 to 21474.83647 inches	0 to 1342.17727 inches
Home position shift amount		– 214748364.8 to 214748364.7 μm	– 13421772.8 to 13421772.7 μm	– 21474.83648 to 21474.83647 inches	– 1342.17728 to 1342.17727 inches
Present value change amount		– 214748364.8 to 214748364.7 μm	– 13421772.8 to 13421772.7 μm	– 21474.83648 to 21474.83647 inches	– 1342.17728 to 1342.17727 inches
Speed change value		0.01 to 6000000.00 mm/min.	0 to 375000.00 mm/min.	0.001 to 600000.000 inches/min.	0 to 37500.000 inches/min.
JOG speed		0.01 to 6000000.00 mm/min.	0.01 to 375000.00 mm/min.	0.001 to 600000.000 inches/min.	0.001 to 37500.000 inches/min.
Speed/position switch-control travel-increment register		0 to 214748364.7 μm	0.1 to 13421772.7 μm	0.00001 to 21474.83647 inches	0.00001 to 1342.17727 inches

	Degree		Pulse	
	Standard mode	Stepping motor mode	Standard mode	Stepping motor mode
	– 21474.83648 to 21474.83647 degrees	0 to 359.99999 degrees	– 2147483648 to 2147483647 pulses	– 134217728 to 134217727 pulses
	– 21474.83648 to 21474.83647 degrees	– 1342.17728 to 1342.17727 degrees	– 2147483648 to 2147483647 pulses	– 134217728 to 134217727 pulses
	0 to 21474.83647 degrees	0 to 1342.17727 degrees	0 to 2147483647 pulses	0 to 134217727 pulses
	0.001 to 600000.000 degrees/min.	0.001 to 37500.000 degrees/min.	1 to 1000000 pulses/sec.	1 to 62500 pulses/sec.
	0.001 to 600000.000 degrees/min.	0.001 to 37500.000 degrees/min.	1 to 1000000 pulses/sec.	1 to 62500 pulses/sec.
	——	0.001 to 37500.000 degrees/min.	——	1 to 62500 pulses/sec.
	0 to 0.65535 degrees	0 to 0.04095 degrees	0 to 65535 pulses	0 to 4095 pulses
	0 to 359.99999 degrees	0 to 359.99999 degrees	– 2147483648 to 2147483647 pulses	– 134217728 to 134217727 pulses
	0 to 359.99999 degrees	0 to 359.99999 degrees	– 2147483648 to 2147483647 pulses	– 134217728 to 134217727 pulses
	0.00001 to 327.67000 degrees	0 to 327.67000 degrees	1 to 32767 pulses	1 to 2047 pulses
	0.001 to 600000.000 degrees/min.	0.001 to 37500.000 degrees/min.	1 to 1000000 pulses/sec.	1 to 62500 pulses/sec.
	0 to 1.00000 degrees	0.00001 to 0.06250 degrees	0 to 100000 pulses	1 to 6250 pulses
	0 to 359.99999 degrees	0 to 359.99999 degrees	– 2147483648 to 2147483647 pulses	– 134217728 to 134217727 pulses
	0.001 to 600000.000 degrees/min.	0.001 to 37500.000 degrees/min.	1 to 1000000 pulses/sec.	1 to 62500 pulses/sec.
	0.001 to 600000.000 degrees/min.	0.001 to 37500.000 degrees/min.	1 to 1000000 pulses/sec.	1 to 62500 pulses/sec.
	0 to 21474.83647 degrees	0 to 1342.17727 degrees	0 to to 2147483647 pulses	0 to 134217727 pulses
	– 21474.83648 to 21474.83647 degrees	– 1342.17728 to 1342.17727 degrees	– 2147483648 to 2147483647 pulses	– 134217728 to 134217727 pulses
	0 to 359.99999 degrees	0 to 359.99999 degrees	– 2147483648 to 2147483647 pulses	– 134217728 to 134217727 pulses
	0.001 to 600000.000 degrees/min.	0.001 to 37500.000 degrees/min.	1 to 1000000 pulses/sec.	0 to 62500 pulses/sec.
	0.001 to 600000.000 degrees/min.	0.001 to 37500.000 degrees/min.	1 to 1000000 pulses/sec.	1 to 62500 pulses/sec.
	0.00001 to 359.99999 degrees	0.00001 to 359.99999 degrees	1 to 2147483647 pulses	1 to 134217727 pulses

7.16 Present Feed Value Clear Function at the Start of Speed Control and Speed/Position Switch Control

(1) Present feed value clear function at the start of speed control and speed/position switch control

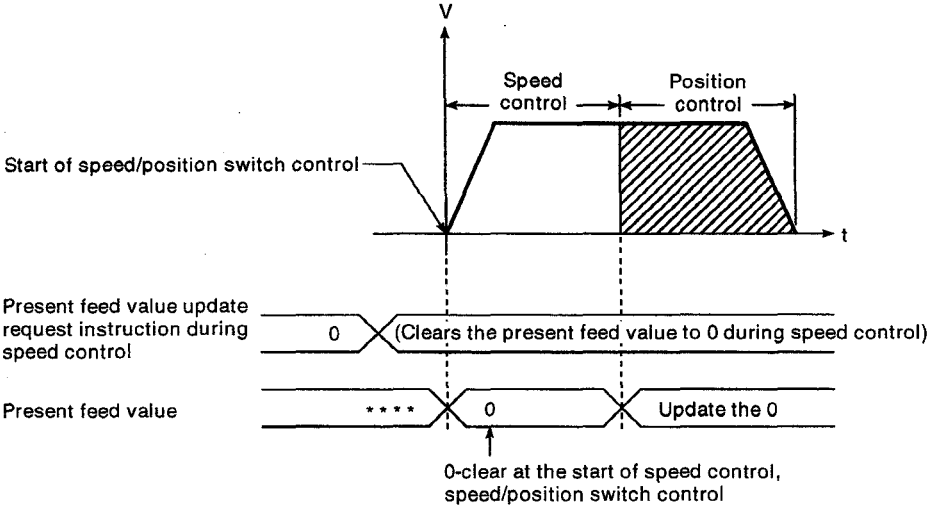
(a) Whether or not to update the present feed value at the start of speed control and speed/position switch control can be set.
Also, the present feed value can be cleared to 0 at the start of speed control and speed/position switch control, using the "present feed value update request instruction during speed control" of extended parameter 1.

(b) If "Clear the present feed value during speed control" is selected, the present feed value in the buffer memory will be as follows:

1) For speed control, the present feed value remains 0.

2) For speed/position switch control, the present feed value during speed control remains 0.
Upon switching to position control, the present feed value is updated from 0.
If positioning is started with the position control as the speed position switch signal is on at the start of positioning, the present feed value is not cleared but updated from the present value at stop.

(c) Even if "Clear the present feed value during speed control" is selected, the machine feed value will not be cleared to 0.



(2) Setting method

To clear the present feed value at the start of speed control and speed/position switch control, set "2: Clear the present feed value to 0 during speed control" in the buffer memory for "present feed value update request instruction during speed control" of extended parameter 1.

Buffer memory		Item	Setting range	Initial value
Axis 1	Axis 2			
28	178	present feed value update request instruction during speed control	• 0 : Does not update the present feed value during speed control • 1 : Updates the present feed value during speed control • 2 : Clears the present feed value to 0 during speed control	0

7.17 Write to the Flash Memory

This section describes how the D75P2 parameters and positioning data are written into the flash memory.

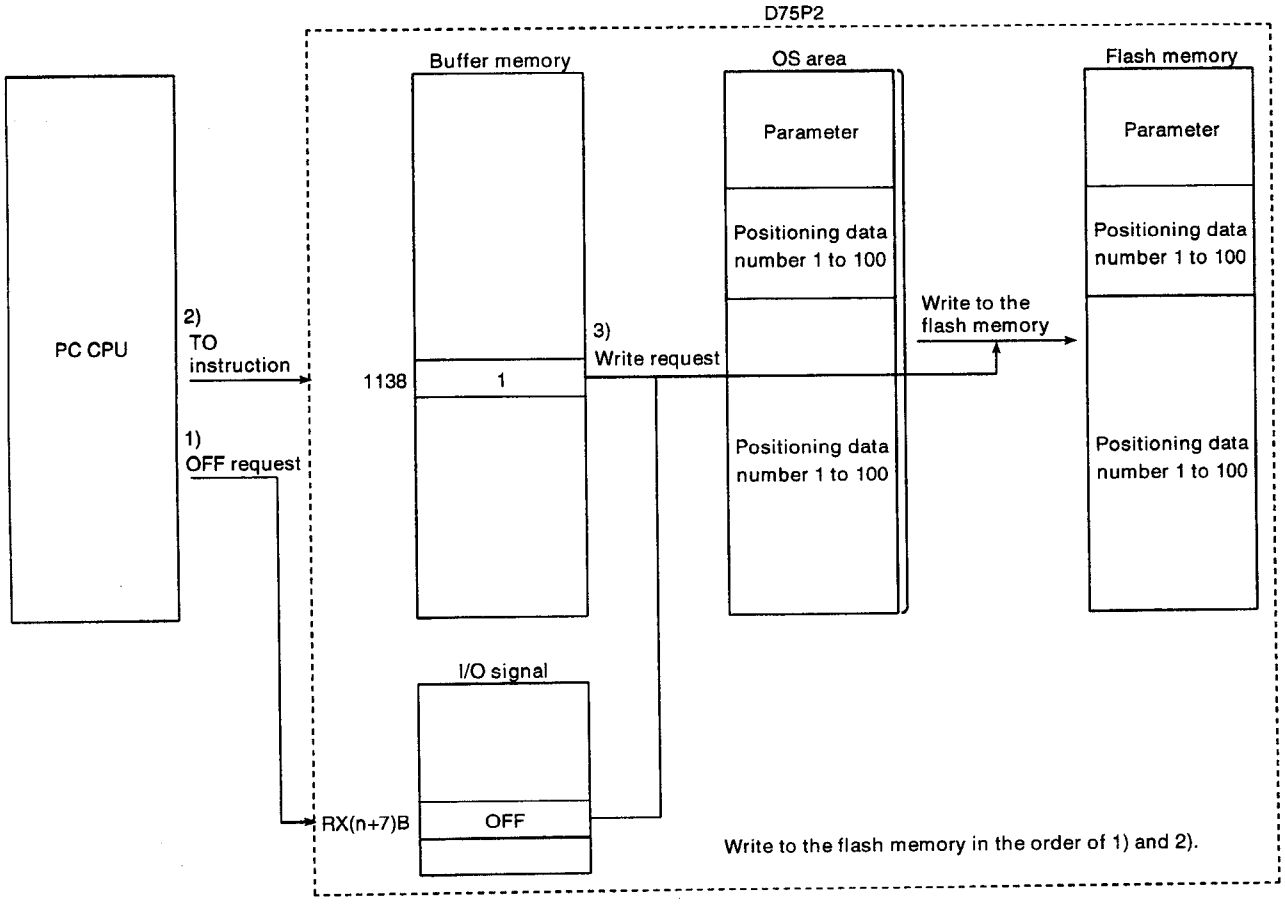
(1) Method using the peripheral device

(a) The peripheral device for which "Automatic write to the flash memory" is set writes to the flash memory while writing to the D75P2.

(b) If a peripheral device makes a flash memory write request, the D75P2 parameters and positioning data are written to the flash memory.

(2) Method using the PC CPU

The PC CPU writes the D75P2 parameters and positioning data to the flash memory by writing "1" to "1138" of the buffer memory.
Upon completion of write to the flash memory, the buffer memory "1138" becomes "0. "
However, the D75P2 parameters and positioning data can be written to the flash memory only when the remote station ready signal is off.



Important

- When writing to the flash memory consecutively, be sure to take a 10 or more second interval. Do not perform a transient transmission immediately after writing to the flash memory.
  * This may make the link status of CC-link unstable, or shorten the life of a module.

7.18 Pulse Output Logic Switch

(1) Pulse output logic of D75P2

The positive logic is set as D75P2's default.
When connecting to a negative logic drive module, set the pulse output logic to negative logic.

(2) Pulse output logic switch

(a) Use the AD75P to set the pulse output of D75P2.

Setting range	Initial value
0 : Positive logic 1 : Negative logic	0

(3) Note

(a) The pulse output logic switch becomes valid at the startup (OFF to ON) of the remote station ready signal.

Set this before setting the remote station ready signal to ON.

7.19 Parameter Initialization Function

(1) What is the parameter initialization function?

(a) The parameter initialization function restores the parameters set in the D75P2 to the factory-set default values (initial values).

1) The parameter initialization function initializes the following parameters:

- Basic parameters 1 and 2
- Extended parameters 1 and 2
- Home position return basic parameter
- Home position return extended parameter

2) The parameter initialization function does not initialize the positioning data, start block information, or condition data.

(b) If parameter errors occur frequently and the D75P2 will not start up, initialize parameters using this function to reset them.

[If the set parameters are found abnormal when the initial data setting request flag is set from On to OFF, the D75P2 will not be able to perform positioning control because the remote station ready signal will not turn on.]

(2) Parameter initialization setting

(a) Parameter initialization can be performed when the remote station ready signal is off.

[When the remote station ready signal is on, the warning 111 occurs and parameter initialization cannot be performed.]

(b) To initialize parameters, write "1" to the buffer memory address 1139.
Upon completing parameter initialization, OS sets the buffer memory address 1139 to 0.

[It takes approximately 10 seconds to complete initializing the parameters as the parameter area is written to the flash memory.]

(3) Note

(a) Parameter initialization is performed for the OS area of D75P2 and flash memory.

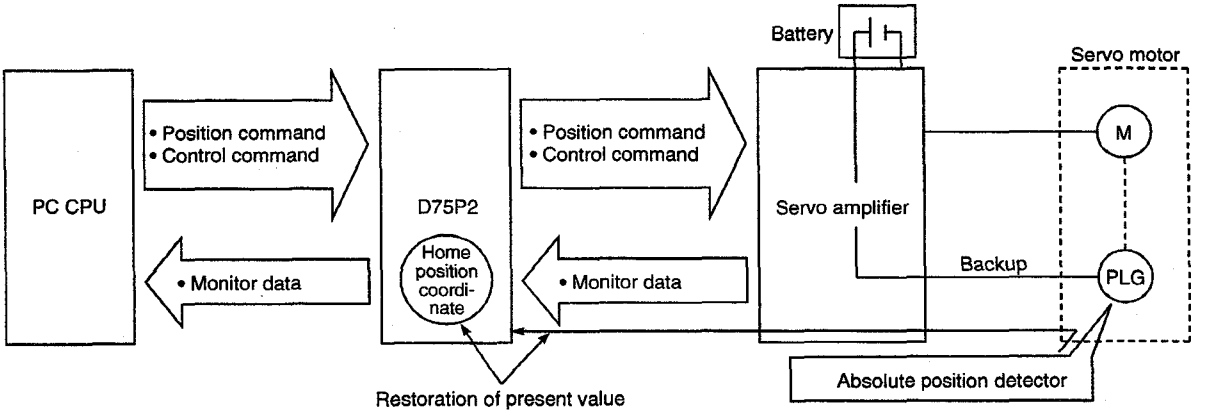
Data in the buffer memory of D75P2 will not be initialized.
Therefore, data in the buffer memory does not match the data in the OS area of D75P2/flash memory upon completion of parameter initialization.

(b) When parameter initialization is performed, reset the CPU or restart the power to the PC CPU.

If the CPU is reset or the power to the PC CPU is restarted, the contents of flash memory are transferred to the OS area and buffer memory, thus initialization of the data in the buffer memory is performed.

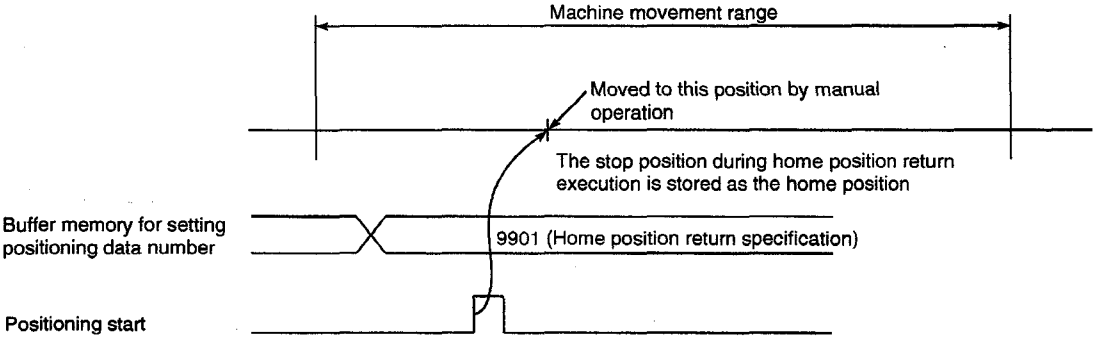
7.20 When Constructing the Absolute Position Detection System Using the D75P2

The D75P2 can construct the absolute position detection system by installing the absolute position detection system.
The following describes precautions when constructing the absolute position detection system.



(1) Home position return

The absolute position detection system can establish the location of the home position, using the data-set type home position return.
In the data-set type home position return system, the location to which the location of the home position is moved by manual operation (JOG operation/manual pulse generator operation) is treated as the home position.



(2) Precautions during the absolute position detection system

When constructing the absolute position detection system, there are restrictions on the positioning address and the high limit/low limit values of software stroke limit that can be used.

(a) Positioning address

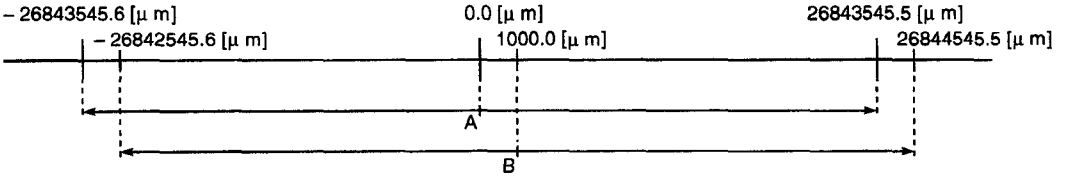
The positioning addresses that can be used in the absolute position detection system vary depending on the feedback pulse of the servo motor to be used.

Unit	Setting range	
	Feedback pulses = 8192	Feedback pulses = 16384
μ m	– 26843545.6 to 26843545.5	– 53687091.2 to 53687091.1
Inches	– 2684.35456 to 2684.35455	– 5368.70912 to 5368.70911
Degrees	0 to 359.99999	0 to 359.99999
Pulses	– 268435456 to 268435455	– 536870912 to 536870911

(b) When the home position address is set to "other than 0. "

1) The positioning address can be set within the range of values obtained by adding the home position address to the values listed in the previous section (a).

For example, if the home position address is set at 1000.0 [μ m], the positioning address will be in the range of -26842545.6 [μ m] (– 26843545.6 + 1000.0) to 26844545.5 [μ m] (26843545.5 + 1000.0).
However, when the unit is in degrees, it remains within 0 to 359.99999.

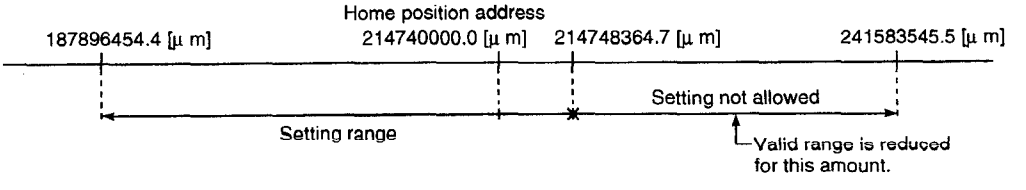


A : Home position address = Setting range at 0.0 [μ m]
B : Home position address = Setting range at 1000.0 [μ m]

2) If the value obtained by adding the home position address to the value listed in (a) exceeds the valid range indicated below, the range is reduced for the excess amount.

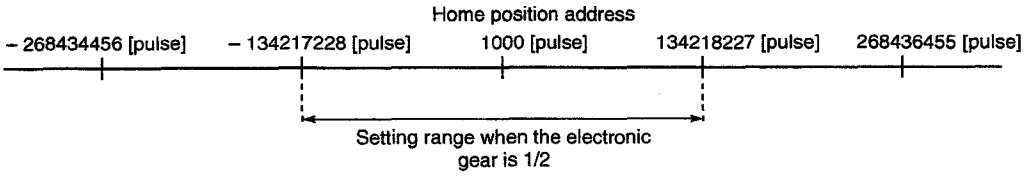
Unit	Setting valid range
mm	– 214748364.8 to 214748364.7
Inches	– 21474.83648 to 21474.83647
Pulses	– 2147483648 to 2147483647

For example, if the home position address is set at 214740000.0 [μ m], the valid range is from 187896454.4 [μ m] (– 26843545.6 + 21474000.0) to 241583545.5 [μ m] (214740000.0 + 26843545.5). However, the actual range will be from 187896454.4 [μ m] to 214748364.7 [μ m].



(c) When (electronic gear) <1

When the electronic gear is set to [electronic gear (travel increment per pulse) < 1], the movable distance centering around the home position becomes 1/electronic gear.
For example, if electronic gear = 1/2 and home position address = 1000 [pulse], the range will be – 134217228 [pulse] ((– 268435456 + 1000)/2) to 134218227 [pulse] ((268435455 + 1000)/2).
However, if (electronic gear) > 1, it will be within the range of (a) and (b).



(d) During positioning in the same direction

Perform positioning in the same direction so that the present value is within the range of positioning addresses indicated in (a) to (c).
If the value exceeds the range of (a) to (c), the present value cannot be restored properly when the power is turned on.

7.21 Servo ON/OFF

This sets ON/OFF the servo amplifier connected to the D75P2, using the D75P2.
By setting the servo to ON, the servo becomes operable.

(1) Servo ON

The servo becomes operable.
Single-axis servo ON : RY(n+2)0
Double-axis servo ON : RY(n+4)0

(2) Servo OFF

The servo becomes inoperable.

Point

(1) If the servo motor is turned on due to an external force when the servo is off, perform absolute position restoration.
(2) Set the servo to ON/OFF while the motor is stopped.
A servo OFF request during positioning will be ignored.

MEMO

8. Buffer Memory

8.1 Outline of Buffer Memory

The D75P2 contains a PC CPU and the buffer memory for data communication.
Various data, such as those listed below, are stored in the buffer memory, and the D75P2 uses this data to perform positioning control.

- Parameter area to set parameters for the D75P2.
- Monitor area to check the control status of the D75P2.
- Control data area to set the control status of the D75P2.
- Positioning data area to set positioning data.
- Positioning start information area to set positioning start information.
- PC CPU memory area to be used for condition data for block start.

8.2 Classification of Buffer Memory Areas

(1) Parameter area

- Basic parameter ..... This is the area to set parameters used as bases of positioning control, such as command unit, travel increment per pulse, pulse output mode, and rotation direction.
- Extended parameter ..... This is the area to set detailed contents required for positioning control, such as backslash compensation, stroke limit, M-code output timing, acceleration/deceleration time, and rapid stop selection.
- Home position return basic parameter ..... This is the area to set parameters used as bases of home position return, such as home position return method, direction, address, and speed.
- Home position return extended parameter ..... This is the area to set detailed contents required for home position return, such as home position return dwell time, and home position return acceleration/deceleration time.

(2) Monitor area

- System monitor ..... This is the area in which information related to the control status that is common within the system is stored.
- Axis monitor ..... This is the area in which information related the control status of each axis is stored.

(3) Control data area

- System control data ..... This is the area to read and write the clock data and positioning data.
- Axis-control data ..... This is the area to set the control status of each axis.

(4) Positioning data

This is the positioning data area to set positioning data.

(5) Positioning start information area

- Positioning start data ····· This is the area to set the positioning-data number.
- Positioning special start data ····· This area is set when adding special operations, such as condition judgment, simultaneous start, stop and repeat, to the normal positioning operation.
- Condition data ····· This area is set when performing condition judgment using an instruction that performs the special operation being set with positioning special start data.
- Indirect specification ····· This is the area to specify positioning-data number indirectly.

(6) PC CPU memory

This is the area to control positioning start by setting values for condition judgment and wait judgment.

(7) Area for block transfer

This is the area to set positioning data by block transfer.

8.3 Reading and Writing Data in the Buffer Memory

The following indicates the methods to read and write each data in the buffer memory:

(1) Read

- Method using a peripheral device ···· Read can be performed in accordance with each data mode of the peripheral device.
- Method using a sequence program ·· Read can be performed in units of 1 word (16 bits) or 2 words by specifying an address of the buffer memory and using transient transmission *.

(2) Write

- Method using a peripheral device ···· Write is performed by storing data in the peripheral device, then using block transfer to write the data to the buffer memory inside the D75P2 from the peripheral device.
- Method using a sequence program ·· Read can be performed in units of 1 word (16 bits) or 2 words by specifying an address of the buffer memory and using transient transmission *.

< Contents of buffer memory and write conditions >

Contents		Write condition
Parameter area		Write allowed at any time However, depending on the type of parameter, change may or may not be reflected immediately.
Monitor area		(Read only)
Control data area		Write allowed at any time
Positioning data area		Write allowed at any time However, write must be performed before turning on the positioning start for the corresponding axis.
Positioning start information	Positioning start data	
	Positioning special start data	
	Condition data	
	Indirect specification	
PC CPU memo area		Write allowed at any time
Transfer I/F area between PC CPU and D75P2		Write allowed at any time

Important

Do not write to missing-number addresses and the areas that are indicated as "write prohibited" in the buffer memory lists shown in Section 8.4 and later.
This may cause malfunction.

Remark

* : The dedicated instruction-compliant models can read and write using CC-Link dedicated instructions. Use FROM/TO instructions to perform read and write for models not compliant with dedicated instructions.

Point

Data in the buffer memory is not backed up using batteries.
At power-on, the D75P2 performs the following processing to the buffer memory:

- Parameter area ····· Transfers parameter values in the flash memory.
- Monitor area, control data area ···· Performs initialization.
- Positioning data area ····· Transfers data in the flash memory.
- PC CPU memory area ····· Performs initialization.

8.4 Configuration of Buffer Memory

The overall configuration of the buffer memory is shown below:

Address				
0 to 14	Basic parameter	For axis 1	For axis 2	Parameter area
15 to 66	Extended parameter	For axis 1	For axis 2	Parameter area
67 to 69	Vacant (use prohibited)	For axis 1	For axis 2	Parameter area
70 to 89	Home position return parameter	For axis 1	For axis 2	Parameter area
90 to 149	Vacant (use prohibited)	For axis 1	For axis 2	Parameter area
150 to 164	Basic parameter	For axis 2	For axis 2	Parameter area
165 to 216	Extended parameter	For axis 2	For axis 2	Parameter area
217 to 219	Vacant (use prohibited)	For axis 2	For axis 2	Parameter area
220 to 239	Home position return parameter	For axis 2	For axis 2	Parameter area
240 to 299	Vacant (use prohibited)	For axis 2	For axis 2	Parameter area
300 to 449	Vacant (use prohibited)			Parameter area
450 to 799	System monitor		System monitor area	Monitor area
800 to 899	Axis monitor for axis 1		Axis monitor area	Monitor area
900 to 999	Axis monitor for axis 2		Axis monitor area	Monitor area
1000 to 1099	Vacant (use prohibited)		Axis monitor area	Monitor area
1100 to 1149	System-control data		System-control data area	Control data area
1150 to 1199	Axis-control data for axis 1		Axis-control data area	Control data area
1200 to 1249	Axis-control data for axis 2		Axis-control data area	Control data area
1250 to 1299	Vacant (use prohibited)		Axis-control data area	Control data area
1300 to 2299	Buffer memory positioning data for axis 1			Buffer memory positioning data area
2300 to 3299	Buffer memory positioning data for axis 2			Buffer memory positioning data area
3300 to 4299	Vacant (use prohibited)			Buffer memory positioning data area
4300 to 4499	Start block for axis 1			Buffer memory positioning data area
4500 to 4549	Indirect specification 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 specification for axis 2			Buffer memory positioning data area
4800 to 4999	Vacant (use prohibited)			Buffer memory positioning data area
5000 to 5049	Vacant (use prohibited)			Buffer memory positioning data area
5050 to 5099	PC CPU memory area			PC CPU memory area
5100 to 6109	Block transfer area			Block transfer area
6110 to 7167	Reserved			Reserved

8.5 Parameter Area

This section explains the parameter area of the buffer memory.

In this section, the buffer memory addresses and setting ranges of the parameters for axis 1 and axis 2 are described.
See Sections 10.1 and 10.2 for details of the setting contents.

8.5.1 Basic parameter 1

Buffer memory address		Item		Setting range				Initial value	Write*1
Axis 1	Axis 2								
0	150	Unit setting		0: mm 1: inch 2: degree 3: pulse				3	1)
1	151	Travel increment per pulse	Number of pulses per rotation (Ap)	1 to 65535 pulses				20000	
2	152		Travel increment per rotation (Al)	1 to 65535 $\times 10^{-1}$ μm	1 to 65535 $\times 10^{-5}$ inches	1 to 65535 $\times 10^{-5}$ degrees	1 to 65535 pulses	20000	
3	153		Unit multiplier (Am)	1: ×1; 10: ×10; 100: ×100; 1000: ×1000				1	
4	154	Pulse output mode		0 : PLS/SIGN mode 1 : CW/CCW mode 2 : Phase A/B mode (multiplication by 4) 3 : Phase A/B mode (multiplication by 1)				1	
5	155	Rotation direction setting		0 : Present-value increase by forward pulse output 1 : Present-value increase by reverse pulse output				0	

8.5.2 Basic parameter 2

Buffer memory address		Item	Setting range				Initial value	Write*1
Axis 1	Axis 2							
6 7	156 157	Speed control value	1 to 600000000 $\times 10^{-2}$ mm/min.	1 to 600000000 $\times 10^{-3}$ inches/min.	1 to 600000000 $\times 10^{-3}$ degrees/min.	1 to 1000000 pulses/sec.	200000	2)
			1 to 37500000 $\times 10^{-2}$ mm/min.	1 to 37500000 $\times 10^{-3}$ inches/min.	1 to 37500000 $\times 10^{-3}$ degrees/min.	1 to 62500 pulses/sec.		
8 9	158 159	Acceleration time 0	1 to 65535 ms/1 to 8388608 ms				1000	
10 11	160 161	Deceleration time 0	1 to 65535 ms/1 to 8388608 ms				1000	
12 13	162 163	Bias speed at start	1 to 600000000 $\times 10^{-2}$ mm/min.	1 to 600000000 $\times 10^{-3}$ inches/min.	1 to 600000000 $\times 10^{-3}$ degrees/min.	1 to 1000000 pulses/sec.	0	1)
			1 to 37500000 $\times 10^{-2}$ mm/min.	1 to 37500000 $\times 10^{-3}$ inches/min.	1 to 37500000 $\times 10^{-3}$ degrees/min.	1 to 62500 pulses/sec.		
14	164	Stepping motor mode selection	0 : Standard mode 1 : Stepping motor mode				0	

Point

(1) The basic parameter 2 is used to determine the inclination of acceleration/deceleration processing.
Set the most appropriate values according to the system (Operation can be performed using the initial values).

(2) *1 : "Write" indicates writing data from the PC CPU of the D75P2 to the buffer memory.

- 1) : The data written from the PC CPU becomes valid when the remote station ready signal rises (OFF → ON).
  If setting contents are rewritten while the remote station ready signal is on, switch the signal off, then on again.
- 2) : The data becomes valid at the point when it is written from the PC CPU.
  However, data change will be delayed by three data at most from the positioning-data number that is being executed when data is written.
  Also, during JOG operation or manual pulse-generator operation, the written data will not be reflected.
  Therefore, perform write when positioning control is not in operation.

8.5.3 Extended parameter 1

Buffer memory address		Item	Setting range				Initial value	Write *
Axis 1	Axis 2							
15	165	Backlash compensation	0 to 65535 $\times 10^{-1}$ μm	0 to 65535 $\times 10^{-5}$ inches	0 to 65535 $\times 10^{-5}$ degrees	0 to 65535 pulses	0	O *1
16 17	166 167	Software stroke high limit value *2	−2147483648 to +2147483647 $\times 10^{-1}$ μm	−2147483648 to +2147483647 $\times 10^{-5}$ inches	0 to 35999999 $\times 10^{-5}$ degrees	−2147483648 to +2147483647 pulses	+2147483647	
			−134217728 to 134217727 $\times 10^{-1}$ μm	−134217728 to 134217727 $\times 10^{-5}$ inches	0 to 35999999 $\times 10^{-5}$ degrees	−134217728 to 134217727 pulses		
18 19	168 169	Software stroke low limit value *2	−2147483648 to +2147483647 $\times 10^{-1}$ μm	−2147483648 to +2147483647 $\times 10^{-5}$ inches	0 to 35999999 $\times 10^{-5}$ degrees	−2147483648 to +2147483647 pulses	+2147483648	
			−134217728 to 134217727 $\times 10^{-1}$ μm	−134217728 to 134217727 $\times 10^{-5}$ inches	0 to 35999999 $\times 10^{-5}$ degrees	−134217728 to 134217727 pulses		
20	170	Software stroke limit selection	0 : Applies software stroke limit to the present feed value. 1 : Applies software stroke limit to the machine feed value.				0	
21	171	Software stroke limit valid for JOG operation and manual pulse-generator operation	0 : Software stroke limit invalid during JOG operation and manual pulse-generator operation 1 : Software stroke limit valid during JOG operation and manual pulse-generator operation				0	
22 23	172 173	Command in-position range *2	1 to 32767000 $\times 10^{-1}$ μm	1 to 32767000 $\times 10^{-5}$ inches	1 to 32767000 $\times 10^{-5}$ degrees	1 to 32767 pulses	100	
			1 to 2047937 $\times 10^{-1}$ μm	1 to 2047937 $\times 10^{-5}$ inches	1 to 2047937 $\times 10^{-5}$ degrees	1 to 2047 pulses		
24	174	Torque limit set value	1 to 500 %				300	
25	175	M-code on signal output timing	0 : WITH mode 1 : AFTER mode					
26	176	Speed switch mode, speed change type	0 : Standard speed switch mode 1 : Early speed switch mode				0	
27	177	Interpolation-speed specification method (interpolation mode)	0 : Synthesized speed 1 : Reference-axis speed				0	
28	178	Present value update request command during speed control	0 : Does not update the present feed value during speed control 1 : Updates the present feed value during speed control 2 : Performs 0 clear on the present feed value during speed control				0	
29	179	Manual pulse generator selection	0 : Ignores manual pulse-generator operation 1 : Uses manual pulse generator 1 2 : Uses manual pulse generator 2 3 : Uses manual pulse generator 3				Axis 1 = 1 Axis 2 = 2	
30	180	Selection for pulse output logic to drive module	0 : Positive logic 1 : Negative logic				0	
31	181	Acceleration/deceleration time size selection	0 : 1 word type (1 to 65535 ms) 1 : 2 word type (1 to 8388608 ms)				0	

*: O ····· Write allowed.
× ····· Write prohibited.

Point

*1 : The contents set by the extended parameter 1 become valid when the remote station ready signal switches from off to on.
If setting contents in the extended parameter 1 are rewritten while the remote station ready signal is on, switch the signal off, then on again.

*2 : The upper row indicates setting ranges in the standard mode, while the lower row indicates those in the stepping motor mode.

8.5.4 Extended parameter 2

Buffer memory address Axis 1	Buffer memory address Axis 2	Item	Setting range				Initial value	Write *
36 37	186 187	Acceleration time 1	1 to 65535 ms/1 to 8388608 ms				1000	
38 39	188 189	Acceleration time 2						
40 41	190 191	Acceleration time 3						
42 43	192 193	Deceleration time 1	1 to 65535 ms/1 to 8388608 ms				1000	
44 45	194 195	Deceleration time 2						
46 47	196 197	Deceleration time 3						
48 49	198 199	JOG speed control value	1 to 600000000 $\times 10^{-2}$ mm/min.	1 to 600000000 $\times 10^{-3}$ inches/min.	1 to 600000000 $\times 10^{-3}$ degrees/min.	1 to 1000000 pulses/sec.	20000	
			1 to 37500000 $\times 10^{-2}$ mm/min.	1 to 37500000 $\times 10^{-3}$ inches/min.	1 to 37500000 $\times 10^{-3}$ degrees/min.	1 to 62500 pulses/sec.		
50	200	JOG operation Acceleration time selection	0 to 3				0	
51	201	JOG operation Deceleration time selection	0 to3				0	
52	202	Acceleration/deceleration processing selection	0 : Trapezoid acceleration/deceleration processing 1 : S-curve acceleration/ deceleration processing				0	
53	203	S-curve ratio	1 to 100 %				100	O *1
54 55	204 205	Rapid-stop deceleration time	1 to 65535 ms/1 to 8388608 ms				1000	
56	206	Stop group 1 rapid stop selection	0 : Normal deceleration stop 1 : Rapid stop				0	
57	207	Stop group 2 rapid stop selection	0 : Normal deceleration stop 1 : Rapid stop				0	
58	208	Stop group 3 rapid stop selection	0 : Normal deceleration stop 1 : Rapid stop				0	
59	209	Positioning-complete signal output time	0 to 65535 ms				300	
60 61	210 211	Allowable circular-interpolation error range	0 to 100000 $\times 10^{-1}$ μm	0 to 100000 $\times 10^{-5}$ inches	0 to 100000 $\times 10^{-5}$ degrees	0 to 100000 pulses	100	
			0 to 6250 $\times 10^{-1}$ μm	0 to 6250 $\times 10^{-5}$ inches	0 to 6250 $\times 10^{-5}$ degrees	0 to 6250 pulses		
62	212	External start function selection	0 : External positioning start 1 : External speed change request 2 : Skip request				0	
66	216	Locus control adjacent passing mode selection	0 : Positioning address passing mode 1 : Adjacent passing mode				0	O *3

* : O ····· Write allowed.
× ····· Write prohibited.

Point

*1 : The data becomes valid at the point when it is written from the PC CPU.
However, data change will be delayed by three data at most from the positioning-data number that is being executed when data is written.
Also, during JOG operation or manual pulse-generator operation, the written data will not be reflected. Therefore, perform write when positioning control is not in operation.

*2 : The upper row indicates setting ranges in the standard mode, while the lower row indicates those in the stepping motor mode.

*3 : The data becomes valid when the remote station ready signal is switched from off to on.
If setting contents are rewritten while the remote station ready signal is on, switch the signal off, then on again.

8.5.5 Home position return basic parameters

Buffer memory address		Item	Setting range				Initial value	Write *
Axis 1	Axis 2							
70	220	Home position return type	0 : Near-point dog type 1 : Stopper stop 1) (by time out from the dwell timer) 2 : Stopper stop 2) (by zero signal at the time of contacting the stopper) 3 : Stopper stop 3) (no near-point dog method) 4 : Count type 1) (use zero signal) 5 : Count type 2) (does not use zero signal)				0	
71	221	Home position return direction	0 : Positive direction (direction of address increase) 1 : Negative direction (direction of address decrease)				0	
72 73	222 223	Home position address *2	–2147483648 to +2147483647 $\times 10^{-1}$ μm	–2147483648 to +2147483647 $\times 10^{-5}$ inches	0 to 35999999 $\times 10^{-5}$ degrees	–2147483648 to +2147483647 pulses	0	
			–134217728 to 134217727 $\times 10^{-1}$ μm	–134217728 to 134217727 $\times 10^{-5}$ inches	0 to 35999999 $\times 10^{-5}$ degrees	–134217728 to 134217727 pulses		○ *1
74 75	224 225	Home position return speed *2	1 to 600000000 $\times 10^{-2}$ mm/min.	1 to 600000000 $\times 10^{-3}$ inches/min.	1 to 600000000 $\times 10^{-3}$ degrees/min.	1 to 1000000 pulses/sec.	1	
			1 to 37500000 $\times 10^{-2}$ mm/min.	1 to 37500000 $\times 10^{-3}$ inches/min.	1 to 37500000 $\times 10^{-3}$ degrees/min.	1 to 62500 pulses/sec.		
76 77	226 227	Creep speed *2	1 to 600000000 $\times 10^{-2}$ mm/min.	1 to 600000000 $\times 10^{-3}$ inches/min.	1 to 600000000 $\times 10^{-3}$ degrees/min.	1 to 1000000 pulses/sec.	1	
			1 to 37500000 $\times 10^{-2}$ mm/min.	1 to 37500000 $\times 10^{-3}$ inches/min.	1 to 37500000 $\times 10^{-3}$ degrees/min.	1 to 62500 pulses/sec.		
78	228	Home position return retry	0: Does not retry home position return using the high/low limit switch. 1: Retries home position return using the high/low limit switch.				0	

* : ○ ····· Write allowed.
× ····· Write prohibited.

8.5.6 Home position return extended parameters

Buffer memory address		Item	Setting range				Initial value	Write *
Axis 1	Axis 2							
79	229	Home position return dwell time	0 to 65536 ms				0	
80 81	230 231	Travel setting after near-point dog ON *2	0 to 2147483647 $\times 10^{-1}$ μ m	0 to 2147483647 $\times 10^{-5}$ inches	0 to 2147483647 $\times 10^{-5}$ degrees	0 to 2147483647 pulses	0	
			0 to 134217727 $\times 10^{-1}$ μ m	0 to 134217727 $\times 10^{-5}$ inches	0 to 134217727 $\times 10^{-5}$ degrees	0 to 134217727 pulses		
82	232	Home position return acceleration time selection	0 to 3				0	
83	233	Home position return deceleration time selection	0 to 3				0	
84 85	234 235	Home position shift amount *2	−2147483648 to +2147483647 $\times 10^{-1}$ μ m	−2147483648 to +2147483647 $\times 10^{-5}$ inches	−2147483648 to +2147483647 $\times 10^{-5}$ degrees	−2147483648 to +2147483647 pulses	0	○ *1
			−134217728 to 1342117727 $\times 10^{-1}$ μ m	−134217728 to 1342117727 $\times 10^{-5}$ inches	−134217728 to 1342117727 $\times 10^{-5}$ degrees	−134217728 to 1342117727 pulses		
86	236	Home position return torque limit value	1 to 300 (%)				300	
88	238	Home position shift speed specification	0 : Home position return speed 1 : Creep speed				0	
89	239	Dwell time setting at home position return retry	0 to 65535 ms				0	

* : ○ ····· Write allowed.
× ····· Write prohibited.

Point

1) *1 : The contents set using home position return basic parameters and home position return extended parameters become valid when the remote station ready signal switches from off to on.

   If the setting contents of home position return basic parameters and home position return extended parameters are rewritten while the remote station ready signal is on, turn the signal off, then on again.

   *2 : The upper row indicates setting ranges in the standard mode, while the lower row indicates those in the stepping motor mode.

2) For data-set type home position return, there is no need to set home position return basic parameters or home position return extended parameters.

8.6 Monitor Area

The initial values are stored in the monitor area at power-on.

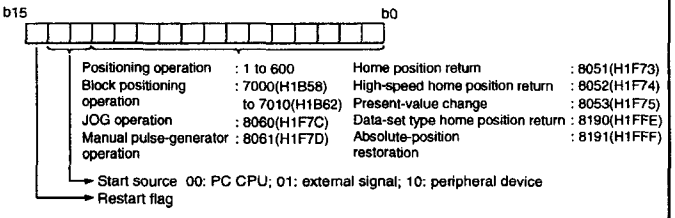
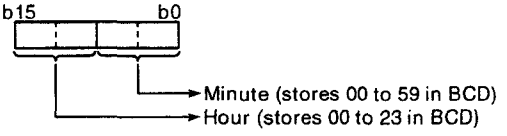
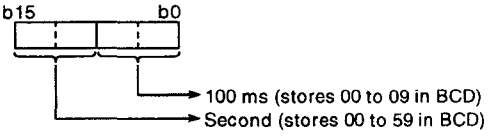
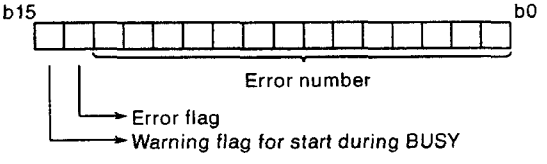
8.6.1 System monitor area

The system monitor data can be monitored using the monitor function of a peripheral device.

Buffer memory address (common to axis 1 and axis 2)	Item	Remarks/setting range	Initial value	Write *
450	Test mode flag	• The flag to judge whether or not the system is in the test mode from a peripheral device. • Turns on during the test mode from a peripheral device, and turns off when the system becomes no longer in the test mode. 0 : Not in the test mode 1 : In the test mode	0	
451	Module model name	• Stores the module model name of the D75P2 main module at power-on or when a remote station ready signal is turned on. 0 : AD75P1-S3/ A1SD75P1-S3 1 : AD75P2-S3/ A1SD75P2-S3/ AJ65BT-D75P2-S3 2 : AD75P3-S3/ A1SD75P3-S3	Module model name is stored.	
452 453 454 455	OS type	• Stores the OS type of the D75P2 main module at power-on or when a remote station ready signal is turned on. • The data is stored using 8 characters in ASCII code.	OS type is stored.	
456 457	OS version	• Stores the OS version of the D75P2 main module at power-on or when a remote station ready signal is turned on. • The data is stored using 4 characters in ASCII code.	OS version	
460	Clock data (hour: minute)	The software clock data that keeps time by periodic interruptions of the system inside the D75P2. • Used to store the occurrence time of errors (warnings) in the error (warning) history. • The clock data needs to be set from the PC CPU at power-on. Use the control data area (1100 to 1102 of the buffer memory) for setting. [The clocks of the PC CPU and D75P2 do not necessarily agree. If agreement is required, reset time periodically from the PC CPU.] b15 b0 → Minute (stores 00 to 59 in BCD) → Hour (stores 00 to 23 in BCD)	0	×
461	Clock data (second: 100msec)	Same as above. b15 b0 → 100 ms (stores 00 to 09 in BCD) → Second (stores 00 to 59 in BCD)	0	

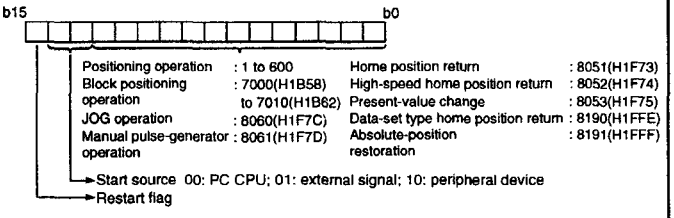
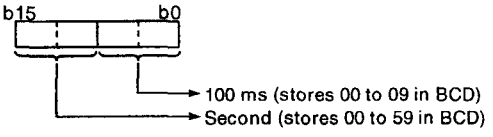
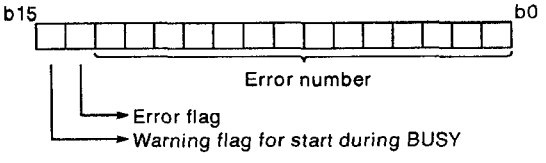
* : O ····· Write allowed.
× ····· Write prohibited.

Buffer memory address (common to axis 1 and axis 2)																
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	Remarks/setting range	Initial value	Write *
	Start history Start axis	• The axis number of start execution is stored. 1, 2	0	
	Start history Operation type	• Stores the positioning-data number of the axis for which JOG operation, manual pulse-generator operation or positioning operation was started. • Whether the start was initiated from the PC CPU, external start signal or peripheral device, is stored at the start source. • The restart flag is turned on upon restart during stop. 	0	
	Start history Start hour : minute	• The hour and minute of start execution are stored as shown below: 	0	
	Start history Start second : 100 ms	• The second and 100 ms-unit value of start execution are stored as shown below: 	0	×
	Start history Error judgment	• The error judgment result at start is stored. • If start could not be made because an error occurred at start, the error flag is turned on and an error number is stored. • For start during operation (while the BUSY signal is on), the BUSY warning flag is turned on. 	0	
	Start history Pointer	• Specifies the next pointer to the latest axis error using a value between 0 and 15. • Becomes 0 at power-on.	0	

* : O ····· Write allowed.
× ····· Write prohibited.

Buffer memory address (common to axis 1 and axis 2)																
Error start history																
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	Remarks/setting range	Initial value	Write *
	Error start history Start axis	• The axis number that detected an error at start is stored. 1,2	0	
	Error start history Operation type	• Stores the positioning-data number of the axis for which JOG operation, manual pulse-generator operation or positioning operation was started. • Whether the start was initiated from the PC CPU, external start signal or peripheral device, is stored at the start source. • *The restart flag is turned on upon restart during stop.* 	0	
	Error start history Start hour : minute	• The hour and minute of error detection are stored as shown below: 	0	
	Error start history Start second : 100 ms	• The second and 100 ms-unit value of error detection are stored as shown below: 	0	×
	Error start history *Error judgment*	• The error judgment result at start is stored. • *If start could not be made because an error occurred at start, the error flag is* turned on and an error number is stored. • For start during operation (while the BUSY signal is on), the BUSY warning flag is turned on. 	0	
	Error start history Pointer	• Specifies the next pointer to the latest axis warning using a value between 0 and 15. • Becomes 0 at power-on.	0	

*: ○ ····· Write allowed.
× ····· Write prohibited.

Buffer memory address (common to axis 1 and axis 2)															
Error start 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	Remarks/setting range	Initial value	Write *
	Error history Error occurrence axis	• The error occurrence axis is stored. 1,2	0	
	Error history axis Error number	• The axis-error number is stored.	0	
	Error history Axis-error occurrence hour: minute	• The hour and minute of axis-error detection are stored as shown below: b15 b0 → Minute (stores 00 to 59 in BCD) → Hour (stores 00 to 23 in BCD)	0	
	Error history Axis-error occurrence second: 100 ms	• The second and 100 ms-unit value of axis-error detection are stored as shown below: b15 b0 → 100 ms (stores 00 to 09 in BCD) → Hour (stores 00 to 59 in BCD)	0	
	Error history pointer	• Specifies the next pointer to the latest axis error using a value between 0 and 15. • Becomes 0 at power-on.	0	
	Warning history Warning occurrence axis	• The warning occurrence axis is stored. 1,2	0	×
	Warning history Axis-warning number	• The axis-warning number is stored.	0	
	Warning history Warning occurrence axis hour: time	• The hour and minute of axis-warning detection are stored as shown below: b15 b0 → Minute (stores 00 to 59 in BCD) → Hour (stores 00 to 23 in BCD)	0	
	Warning history Axis-warning occurrence second: 100 ms	• The second and 100 ms-unit value of axis-warning detection are stored as shown below: b15 b0 → 100 ms (stores 00 to 09 in BCD) → Hour (stores 00 to 59 in BCD)	0	
	Warning history Pointer	• Specifies the next pointer to the latest axis warning using a value between 0 and 15. • Becomes 0 at power-on.	0	

* : O ····· Write allowed.
× ····· Write prohibited.

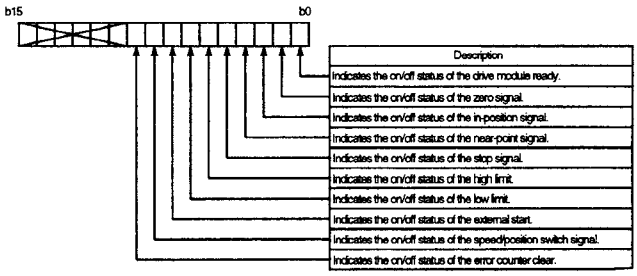
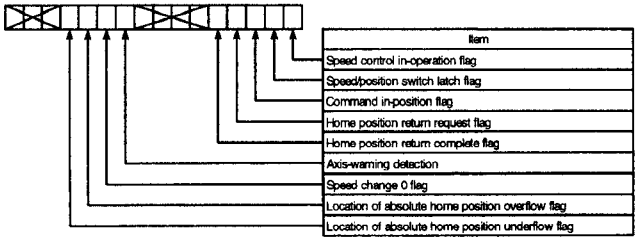
8.6.2 Axis monitor area

Buffer memory address		Item	Setting range	Initial value	Write *
Axis 1	Axis 2				
800 801	900 901	Present feed value *1	• The position currently executed is stored. (Update timing: 56.8 ms cycle) • The present feed value becomes the coordinates value if the positioning method is "absolute." • The home position return address is set at home position return completion. • The present feed value is changed using the present-value change function. • Software stroke limit can be applied using the present feed value via parameter setting.	0	
802 803	902 903	Machine feed value	• The present position where home position is a specific position defined by the machine (machine coordinate) is stored. (Update timing : 56.8 ms cycle) • The home position return address is set at home position return completion. • The machine value cannot be changed using the present-value change function. • Software stroke limit can be applied using the machine value via parameter setting.	0	
804 805	904 905	Feed speed *1	• For all operations, the actual speed of operation at the time is stored. • In the case of axis 1 and axis 2 interpolation, the synthesized speed or reference-axis speed at the time is stored, and 0 is stored at the interpolation axes. • 0 is stored when the axis stops.	0	
806	906	Valid M code *1	• An M code is stored. • 0 is stored when the remote ready signal turns off.	0	
807	907	Axis-error number *1	• The corresponding error code is stored at occurrence of an axis error. If another axis error occurs after an error code has been stored, the stored code is overwritten with the new error code • The axis-error number is cleared when the axis-error reset is turned on.		
808	908	Axis-warning number *1	• The corresponding warning code is stored at occurrence of an axis warning. If another axis warning occurs after a warning code has been stored, the stored code is overwritten with the new warning code. • The axis-warning number becomes 0 when the axis-error reset is turned on.	0	×
809	909	Axis operation status *1	• The operation status of an axis is stored. 0: Standby 1 : During stop 2 : During interpolation 3 : During JOG operation 4 : During manual pulse-generator operation 5 : During analysis 6 : Special standby 7 : During home position return 8 : Position control in operation 9 : Speed control in operation 10 : Speed control of speed/position control in operation 11 : Position control of speed/position control in operation 12 : During absolute-position restoration 13 : During data-set type home position return −1 : Error −2 : Step standby −3 : Step stop −4 : Step error	0	
810	910	Current speed	• The command speed specified by positioning data becomes the current speed during operation using positioning data. • When the command speed is omitted, the previous current speed is retained. Also, if the speed is changed, the new speed becomes the current speed. • In the case of axis 1 and axis 2 interpolation, the synthesized speed or reference-axis speed at the time is stored, and 0 is stored at the interpolation axes. • Becomes 0 upon termination of positioning-data operation. • The current speed before stop is retained during stop by a stop command. • 0 is stored during JOG operation and manual pulse-generator operation.	0	
812 813	912 913	Axis feed speed	• The actual speed of each axis at the time is stored. • 0 is stored when the axis stops.	0	
814 815	914 915	Travel increment after switching on the speed/position switch control	• The travel increment until positioning is completed after the speed/position switch signal is turned on during speed control of speed/position switch control and position control is switched on, is stored.	0	

* : O ····· Write allowed.
× ····· Write prohibited.

Remark

*1 : The same value is stored in the remote register (RWr).
During monitoring, the same result can be obtained even if the remote register (RWr) is used.

Buffer memory address		Item	Setting range	Initial value	Write *
Axis 1	Axis 2				
816	916	External I/O signal *1	• Indicates on/off statuses of external I/O signals.  	0	×
817	917	Status *1	• Indicates on/off statuses of various flags.  	0	
			Item / **Description**		
			Speed control in-operation flag • A flag that turns on during speed control, and is used to judge whether speed control or position control is in operation. During speed/position switch control, the flag remains on until a speed → position switch is executed via an external speed/position switch signal. • Turns off at power-on as well as during positioning control, JOG operation and manual pulse-generator operation.	0	
			Speed/position switch latch flag • A flag that turns on when control is switched to position control during speed/position control, and is used for the travel-increment change enable/disable interlock for position control. • Turns off at execution of the next positioning data or start of JOG operation or manual pulse-generator operation.	0	
			Command in-position flag • Turns on when the remaining distance decreases to or below the "command in-position range" set by a parameter. • Turns off when the axis moves during each operation. • A command in-position check is performed every 56.8 ms during position control. No command in-position check is performed during speed control or during speed control of speed/position control.	0	
			Home position return request flag • Turns on when any one of the conditions listed below occurs, and turns off at home position return completion. • At power-on of the D75P2 module. • When the drive module ready signal turns off. • When a remote ready flag turns on. • At home position return start	0	

* : ○ ····· Write allowed.
× ····· Write prohibited.

Remark

*1 : The same value is stored in the remote input signal (RX).
During monitoring, the same result can be obtained even if the remote input signal (RX) is used.

Buffer memory address		Item	Setting range		Initial value	Write *
Axis 1	Axis 2		Item	Description		
817	917	Status *1	Home position return complete flag	• Turns on when home position return completes normally. • Turns off at home position return start, positioning operation start, JOG operation start or manual pulse-generator operation start, and when the drive module ready signal turns off.	0	×
			Axis-warning detection	• Turns on when an axis warning occurs. • Turns off by axis-error reset ON.	0	
			Speed change 0 flag	• Turns on when a speed change request is made with the new speed value being 0. • Turns off when a speed change request is made with the new speed value being other than 0.	0	
			Location of absolute home position overflow flag	• Turns on when the location of the absolute home position overflows due to present-value change.	0	
			Location of absolute home position underflow flag	• Turns on when the location of the absolute home position underflows due to present-value change.	0	
818 819	918 919	Set value	• The following set values are stored in connection with positioning operation: • During position control, a set value is stored based on the specified positioning address/travel increment. The above set value is stored at start of position control. 0 is stored at completion of positioning in position control. • 0 is stored during speed control and at home position return. • As for speed/position control switching, 0 is stored at start, and the travel increment is stored as the set value upon switching to position control. • 0 is stored at the JOG operation, manual pulse-generator operation and home position return operation start.		0	
820 821	920 921	Set speed	• During operation using positioning data, the actual set speed which is the current speed that takes into consideration override and the speed limit value, is input. Becomes 0 as each movement completes. • In the case of axis 1 and axis 2 interpolation, the set synthesized speed or reference-axis speed is stored, and 0 is stored at the interpolation axes. • For JOG operation, the actual set speed which is the JOG speed that takes into consideration the JOG speed limit value, is stored. 0 is stored when JOG operation is stopped. • 0 is stored for manual pulse-generator operation.		0	
822 823	922 923	Location of absolute home position	• The location of the absolute home position used at positioning to the location of the home position is stored. • The value stored at power-on is inconsistent. • The home position address value of home position return basic parameters is stored for "the location of the absolute home position" at completion of home position return. • When the present value changes, the value of "the location of the absolute home position" also changes.		0	
824 825	924 925	Travel increment after near-point dog ON	• 0 is stored at start of home position return. • After completion of home position return, the travel increment (no sign) from near-point dog ON to completion of home position return is stored. However, the value remains 0 in the case of stopper-stop home position return with no near-point dog.		0	
826	926	Torque limit storage value	• The torque limit setting value or a new torque value is stored. • The torque limit value is stored at positioning start, JOG start and manual pulse-generator operation start. • If a value other than 0 is set in the buffer memory (1176, 1226) for storing new torque value during operation, the torque value after change is stored. • When performing torque limiting of a drive module, the torque limit storage value is output to the drive module via a D/A converter.		0	

*: O ····· Write allowed.
× ····· Write prohibited.

Remark

*1 : The same value is stored in the remote input signal (RX).
During monitoring, the same result can be obtained even if the remote input signal (RX) is used.

Buffer memory address		Item	Setting range	Initial value	Write *
Axis 1	Axis 2				
827	927	Special start data instruction code set value	• The special start data instruction code specified by the start data pointer being executed is stored. • The content is retained until the start data pointer is updated.	0	×
828	928	Special start data instruction parameter set value	• The special start data instruction parameter specified by the start data pointer being executed is stored. • The content is retained until the start data pointer is updated.	0	
829	929	Start positioning-data number set value	• The positioning-data number specified by the start data pointer being executed is stored. • The indirect specification number is stored in the case of indirect specification. • The content is retained until the start data pointer is updated.	0	
830	930	Speed control in-operation flag *1	• Turns on when operation is controlled by the speed limit value, after the new speed has exceeded the speed limit value by speed change or positioning operation override. • Turns off when the above condition no longer exists, or when the axis stops. 0 : Speed control not in operation 1 : Speed control in operation	0	
831	931	Speed change processing flag *1	• Turns on during speed change where the speed is changed. • Turns off at deceleration start by a stop signal during speed change processing, or upon completion of speed change processing. 0 : Speed change processing complete 1 : Speed change processing	0	
832	932	Start data pointer in execution	• Specifies the point of start data currently executed. • The pointer value becomes 1 at positioning start (if it is not a restart). • The pointer value becomes 0 when positioning terminates.	0	
833	933	Last executed positioning-data number	• The positioning-data number executed last is stored. • The value is retained until the next positioning data is executed.	0	
834	934	Repeat counter	• The remaining number of repetitions is stored. • The value decreases (by 1) at the end of repeat loop. • The loop is terminated when 0 is reached. • 0 is stored from the beginning in the case of an infinite loop.	0	
835	935	Positioning-data number in execution	• The positioning-data number currently executed is stored. • For the positioning-data number specified indirectly, a data number changed to 1 to 600 is stored.	0	
836	936	Block number in execution	• The block positioning number is stored.	0	
838 847	938 947	Positioning data in execution	• The positioning data currently executed is stored. Axis 1 / Axis 2 838 938 Positioning identifier 839 939 M code 840 940 Dwell time 841 941 Reserved 842 942 / 843 943 Command speed 844 944 / 845 945 Positioning address 846 946 / 847 947 Circular data	0	

*: ○ ····· Write allowed.
× ····· Write prohibited.

Remark

*1 : The same value is stored in the remote input signal (RX).
During monitoring, the same result can be obtained even if the remote input signal (RX) is used.

8.7 Control Data Area

This section explains the control data area of the buffer memory.
The initial values are stored in the control data area at power-on.
The control data area is divided into the following two areas:

- System-control data area
- Axis-control data area

8.7.1 System-control data area

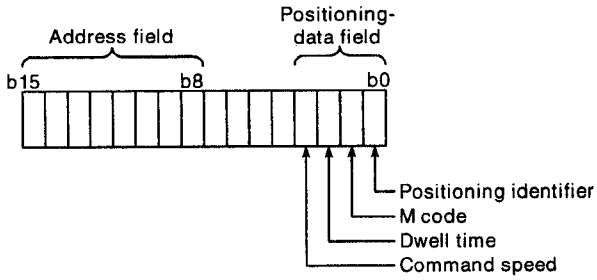
Buffer memory address (common to axis 1 and axis 2)	Item	Remarks/setting range	Initial value	Write *
1100	Clock data setting (hour)	• Sets clock data inside the D75P2 from a PC CPU after the D75P2 is powered on. • The hour setting is as follows: b15 b0 → Hour (stores 00 to 23 in BCD) → Date data is ignored even when set.	0	○
1101	Clock data setting (minute, second)	• The minute and second settings are as follows: b15 b0 → Second (stores 00 to 59 in BCD) → Minute (stores 00 to 23 in BCD)	0	
1102	Clock data write	• Turned on when writing to the D75P2 after clock data has been set. 0 : Clock data write acknowledge complete (set by the OS). 1 : Clock data write request (set using a sequence program).	0	
1103	Target axis	• Sets the axis to perform read and write for. 1: Axis 1; 2: Axis 2; 4: Axes 1 and 2 interpolation	0	
1104	Positioning-data number	• Sets the data number to perform read and write for. 1 to 600	0	

* : ○ ····· Write allowed.
× ····· Write prohibited.

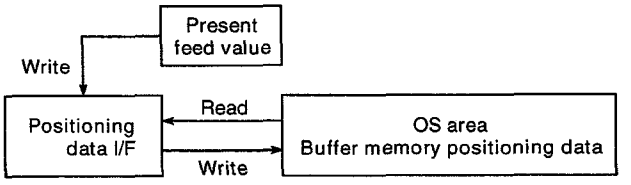
Point

(1) Clock data is set in the start history/ error start history/ error history/ warning history inside the system monitor.
Times set in the start history and error history can be referenced when obtaining a tact time summary or determining the cause of failure upon error occurrence.

(2) When clock data is not set, the clock count starts from 0 00:00:00 as the time of D75P2 power-on. At power-on to the D75P2, synchronize its clock data with the clock data of the PC CPU.

Buffer memory address (common to axis 1 and axis 2)	Item	Remarks/setting range	Initial value	Write *
1105	Write pattern (Read is performed unconditionally.)	• Sets the type of data to read/write.  1) In the address field, specify address data to be used when setting the positioning address/arc auxiliary point. The specification values in the address field (8 bits) and their descriptions are as follows: 0 : Sets the positioning address/arc auxiliary point value of positioning data. 1 : Sets the positioning address value of positioning data. 2 : Sets the arc auxiliary point value of positioning data. 5 : Sets the present feed value as the positioning address. 6 : Sets the present feed value as the arc auxiliary point. 7 : Sets neither positioning address nor arc auxiliary point. 2) In the positioning data field, specify which positioning data is set among those written to the positioning data I/F area (1108 to 1137) for read/write, other than the positioning address and arc auxiliary point. 0 : Sets applicable data for the bit (written). 1 : Sets no applicable data for the bit (not written).	0	○

* : ○ ····· Write allowed.
× ····· Write prohibited.

Buffer memory address (common to axis 1 and axis 2)	Item	Remarks/setting range	Initial value	Write *
1106	Read/write request	• Performs write or read of positioning data. • Performs read and write simultaneously for interpolation axes. • Data flow with read and write is as follows.  • A read or write request is performed when the remote ready signal is off. • When the "present feed value" is set in the write pattern address field, the "present feed value" is stored in the positioning data I/F via write, then set in the OS area in buffer memory positioning data (positioning-data number 1 to 100). 0 : Write/read complete (set by the OS). 1 : Read request (set via a sequence program). 2 : Write request (set via a sequence program).	0	
1108 to 1137	Positioning data I/F for write/read	Axis 1: 1108 Positioning identifier; 1109 M code; 1110 Dwell time; 1111 Reserved; 1112–1113 Command speed; 1114–1115 Positioning address; 1116–1117 Circular data Axis 2: 1118 Positioning identifier; 1119 M code; 1120 Dwell time; 1121 Reserved; 1122–1123 Command speed; 1124–1125 Positioning address; 1126–1127 Circular data	0	○
1138	Flash memory write request	• The contents in the OS area are written to the flash memory. 0 : Flash memory write complete (set by the OS) 1 : Flash memory write request (set via a sequence program).	0	
1139	Parameter initialization request	0 : Parameter initialization non-executed or parameter initialization complete 1 : Parameter initialization request	0	

* : ○ ····· Write allowed.
× ····· Write prohibited.

Point

(1) The positioning data I/F enables use of the teaching function in combining with manual operation.

(2) Since writing to the flash memory is somewhat restricted, do not write to the flash memory if data is being set via a sequence program every time.

8.7.2 Axis-control data area

Buffer memory address		Item	Setting range	Initial value	Write *
Axis 1	Axis 2				
1150	1200	System use area	Use prohibited		×
1151	1201				
1152	1202				
1153	1203				
1154 1155	1204 1205				
1156 1157	1206 1207				
1158	1208				
1159	1209				
1160 1161	1210 1211				
1163	1213				
1164 1165	1214 1215	Speed/position switch control travel-increment change register	• Used when changing the travel-increment of position control in speed/position switch control. • Sets the new travel increment during speed control in speed/position switch control. • The content in the speed/position switch control travel-increment register becomes the travel increment of position control when the speed/position switch control signal turns on. • Sets the travel increment set by positioning data at start of the next speed/position switch control. 1 to 2147483647 $\times 10^{-1}$ μm / 1 to 2147483647 $\times 10^{-5}$ inches / 1 to 2147483647 $\times 10^{-5}$ degrees / 1 to 2147483647 pulses 1 to 134217727 $\times 10^{-1}$ μm / 1 to 134217727 $\times 10^{-5}$ inches / 1 to 134217727 $\times 10^{-5}$ degrees / 1 to 134217727 pulses	0	○
1167	1217	System use area	Use prohibited		×
1168 1169	1218 1219	Pulse input scale for manual pulse generator 1	• Sets the scale per pulse for the number of input pulses from a manual pulse generator during manual pulse-generator operation. 1 to 100	1	○
1170	1220	System use area	Use prohibited		×
1171	1221				
1172	1222	Step valid flag	• Used to confirm each action during positioning operation. 0 : Performs step operation. 1 : Does not perform step operation.	0	○
1173	1223	Step mode	• Sets in which positioning unit the step is performed. 0 : Deceleration unit step 1 : Data number unit step	0	
1174	1224	Step start information	• Used to perform continuation or restart of step operation. 00H : Step start request acknowledge complete 01H : Step continue 02H : Restart	0	

* : ○ ····· Write allowed.
× ····· Write prohibited.

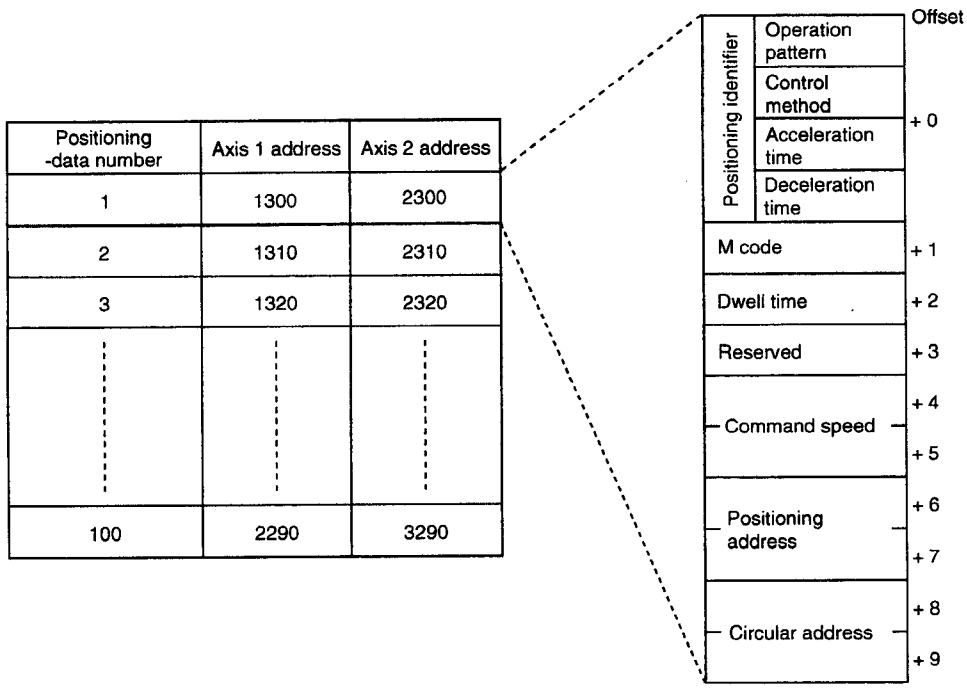
Buffer memory address		Item	Setting range	Initial value	Write *
Axis 1	Axis 2				
1175	1225	Skip command	• Performs the next positioning upon automatic deceleration stop when the step command is turned on during positioning operation. 0 : Skip start request acknowledge complete (set by the OS) 1 : Skip request (set via a sequence program)	0	O
1176	1226	Torque change value	• Sets a new torque value. 0 to torque limit value set value by a parameter	0	
1178	1228	Positioning start point number	• Sets the start point number at the time of positioning execution (block start). 1 to 50 : Start from the specified point number Other than the above : Start from the first point	0	
1181	1231	Continuous operation stop request	• Issues a stop request for continuous operation and continuous locus control. (See Section 8.4.5.) 0 : Continuous operation stop request acknowledge complete (set by the OS). 1 : Continuous operation stop request (set via a sequence program)	0	
1184 1185	1234 1235	For changing acceleration time	• 0 to 65535ms/0 to 8388608 ms	0	
1186 1187	1236 1237	For changing deceleration time	• 0 to 65535ms/0 to 8388608 ms	0	
1188	1238	Acceleration/deceleration time change enable/disable selection at speed change	• 1 : Acceleration/deceleration time change enable • Other than 1 : Acceleration/deceleration time change disable	0	

* : O ····· Write allowed.
× ····· Write prohibited.

8.8 Positioning Data Area

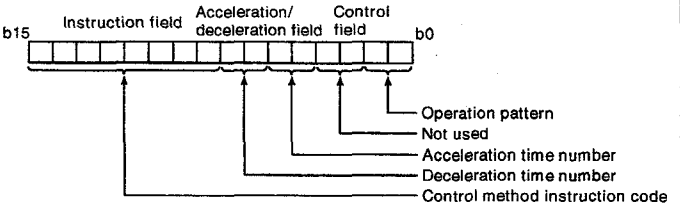
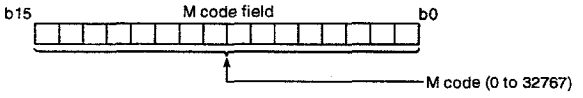
This section explains the positioning data area of the buffer memory.
In this section, the buffer memory addresses and setting ranges of the parameters for axis 1 and axis 2 are described.
See Section 11.2 for details of the setting contents.

< Details of the positioning data area of the buffer memory >



Remark

See Appendix 3 for details of the buffer memory address of the positioning-data numbers 1 to 100.

Buffer memory address		Item		Setting range				Initial value
Axis 1	Axis 2							
1300	2300	Positioning identifier	Operation pattern Control method Acceleration time Deceleration time					0
1301	2301	M code						0
1302	2302	Dwell time		0 to 65535ms				0
1303	2303	Not used		—				
1304 1305	2304 2305	Command speed		–1 : omits the command speed setting				0
				1 to 600000000 $\times 10^{-2}$ mm/min.	1 to 600000000 $\times 10^{-3}$ inches/min.	1 to 60000000.000/min.	1 to 1000000 pulses/sec.	
1306 1307	2306 2307	Positioning address	ABS	-2147483648 to +2147483647 $\times 10^{-1}$ μm	–2147483648 to +2147483647 $\times 10^{-5}$ inches	0 to 35999999 $\times 10^{-5}$ degrees	–2147483648 to +2147483647 pulses	0
			INC	Other than speed/position switch control				0
				–2147483648 to +2147483647 $\times 10^{-1}$ μm	–2147483648 to +2147483647 $\times 10^{-5}$ inches	–2147483647 to +2147483648 $\times 10^{-5}$ degrees	–2147483648 to +2147483647 pulses	
				Speed/position switch control				0
				0 to 214748364 $\times 10^{-1}$ μm	0 to 2147483647 $\times 10^{-5}$ inches	0 to 2147483647 $\times 10^{-5}$ degrees	0 to 2147483647 pulses	
1308 1309	2308 2309	Circular address	ABS	–2147483648 to +2147483647 $\times 10^{-1}$ μm	–2147483648 to +2147483647 $\times 10^{-5}$ inches	0 to 35999999 $\times 10^{-5}$ degrees	–2147483648 to +2147483647 pulses	0
			INC			–2147483647 to +2147483648 $\times 10^{-5}$ degrees		

8.9 Positioning Start Information Area

This section explains the positioning start information area of the buffer memory.

In this section, the buffer memory for axis 1 and axis 2 are described.
See Section 11.3 for details of the setting contents.

Positioning start information		Axis 1 address	Axis 2 address
Positioning start data	1st point	4300	4550
	2nd point	4301	4551
	3rd point	4302	4552
	⋮	⋮	⋮
	50th point	4349	4599
Special start data	1st point	4350	4600
	2nd point	4351	4601
	3rd point	4352	4602
	⋮		
	50th point	4399	4649
Condition data	1st item	4400	4650
	⋮		
	10th item	4490	4740
Indirect specification	8001	4500	4750
	8002	4501	4751
	⋮		
	8050	4549	4799

	Offset
Condition identifier	+ 0
Vacant	+ 1
Address	+ 2
Vacant	+ 3
Parameter 1	+ 4
	+ 5
Parameter 2	+ 6
	+ 7
Vacant	+ 8
	+ 9

8.9.1 Positioning start data area

(1) The positioning start data area is used when performing block positioning. The positioning start data area includes areas corresponding to the first through 50th points.

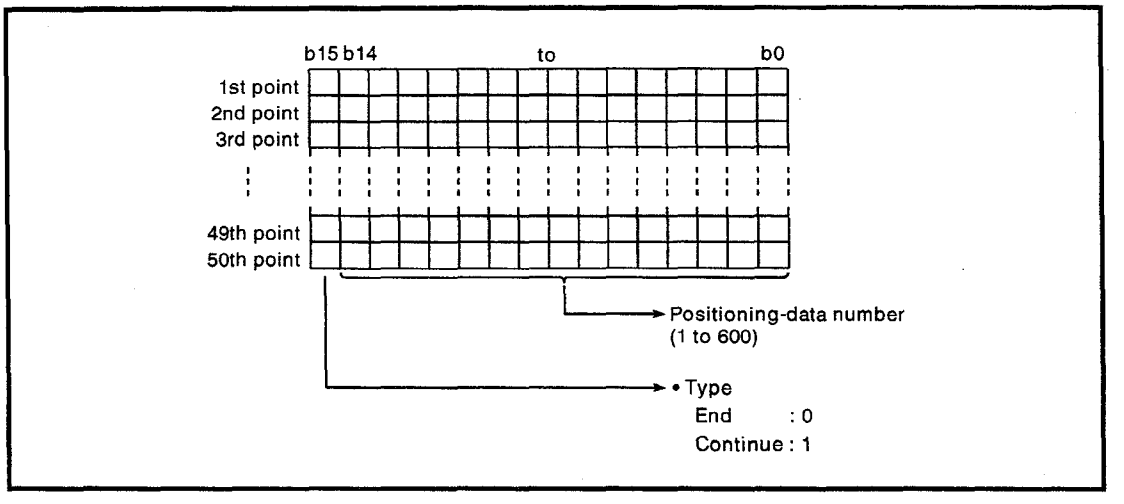
(2) Use the buffer memory for setting the positioning start point number to specify at which point in the positioning start data area the positioning is started.

	Buffer memory address
Axis 1	1178
Axis 2	1228

If start is performed without setting anything in the buffer memory for setting the positioning start point number, the positioning will be started from the first point.

(3) Set the "type" and "positioning-data number" as positioning start data.*
(See Section 11.3 for the type and positioning-data number.)
(a) Set either "End: 0" or "Continue: 1" for the type.
(b) Set a positioning-data number between 1 and 600 for the positioning-data number.

(4) The positioning start data area has the configuration as shown below:

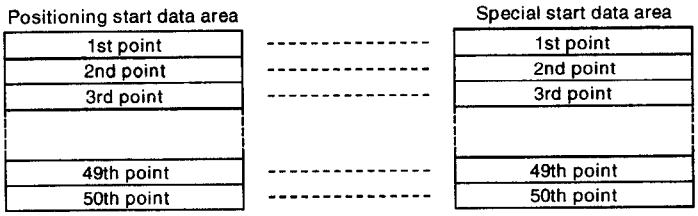


Remark

* : For the positioning-data number, set the data number to perform positioning control.

8.9.2 Special start data area

(1) The special start data area is used to set special start for the D75P2.
The special start area corresponds to the positioning start data area point by point.



(2) Set the "instruction code for special start" and "parameter" in the special start data area.
(See Section 11.3 for the instruction code for special start and parameter.)

(a) For the instruction code for special start, set an instruction code for the start condition of the special start (00H to 07H).

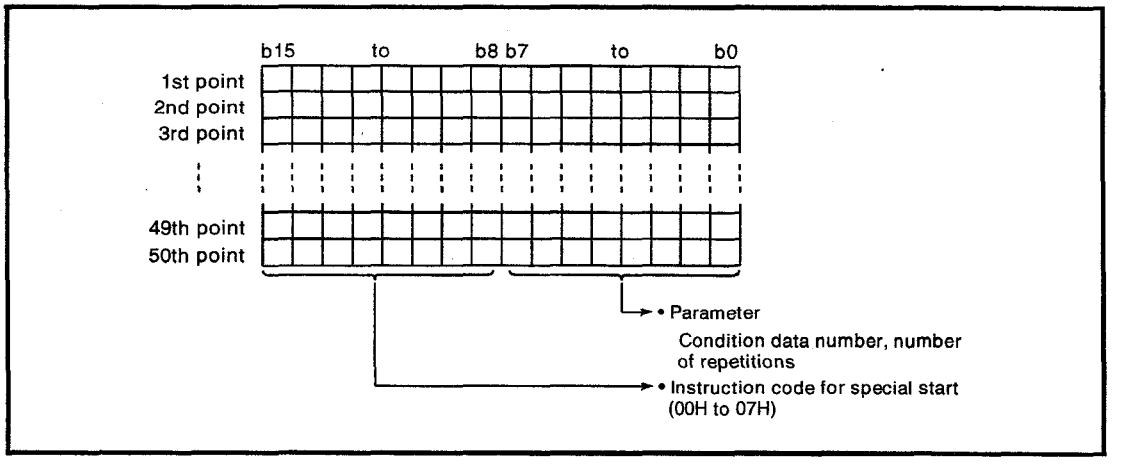
(b) For the parameter, set a condition data number or number of repetitions.

Special start	Instruction code	Set parameter
Normal start	00H	—
Conditional start	01H	Condition data number 1 to 10 *
Wait start	02H	
Simultaneous start	03H	
Stop start	04H	—
FOR loop	05H	Number of repetitions (0 to 255)
FOR condition	06H	Condition data number 1 to 10 *
NEXT	07H	—

Remark

* : For the condition data number, set which of the condition data in (3) is used.

(4) The positioning special start data area has the configuration as shown below:



8.9.3 Condition data area

(1) The condition data area is used to set conditions that are specified by the parameters in the positioning special start data area.
The condition data area includes areas for 1 to 10 items.

(2) Configuration of condition data

(Condition data for axis 1)

Address		
4400	Condition identifier	1st item
4401	Vacant	
4402	Address	
4403		
4404	Parameter 1	
4405		
4406	Parameter 2	
4407		
4408	Vacant	
4409		
4410	Condition identifier	2nd item
4411	Vacant	
4412	Address	
4413		
4414	Parameter 1	
4415		
4416	Parameter 2	
4417		
4418	Vacant	
4419		
4420		
4489		
4490	Condition identifier	10th item
4491	Vacant	
4492	Address	
4493		
4494	Parameter 1	
4495		
4496	Parameter 2	
4497		
4498	Vacant	
4499		

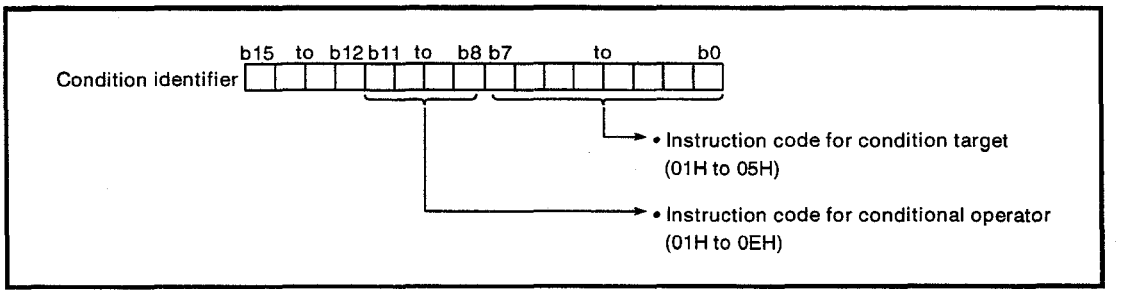
(Condition data for axis 2)

Address		
4650	Condition identifier	1st item
4651	Vacant	
4652	Address	
4653		
4654	Parameter 1	
4655		
4656	Parameter 2	
4657		
4658	Vacant	
4659		
4660	Condition identifier	2nd item
4661	Vacant	
4662	Address	
4663		
4664	Parameter 1	
4665		
4666	Parameter 2	
4667		
4668	Vacant	
4669		
4670		
4739		
4740	Condition identifier	10th item
4741	Vacant	
4742	Address	
4743		
4744	Parameter 1	
4745		
4746	Parameter 2	
4747		
4748	Vacant	
4749		

(3) Set the data described below for each item in the condition data area:

(a) For the condition identifier, set an "instruction code for condition target" and "instruction code for conditional operator."

(See 11.4.1 for the instruction code for condition target and the instruction code for conditional operator.)



(b) See Sections 11.4.2 through 11.4.5 for the address, parameter 1, and parameter 2.

8.10 Indirect Specification Area

This area is used to perform indirect specification of positioning start data.

(a) Set the positioning-data number used to perform positioning start in the buffer memory for indirect specification (4500 to 4549, 4750 to 4799).

(b) Setting 8001 to 8050 in the buffer memory for setting the positioning start number (1150, 1120), enables starting of the positioning-data number set in the corresponding buffer memory for indirect specification.

8.11 PC CPU Memory Area

The PC CPU memory area is an area where read and write can be performed freely.
Since this area is used as condition targets of the condition data for positioning start information, positioning start can be controlled by setting condition judgment values used at wait judgment.

The values written to the PC CPU memory area erased when the D75P2 is powered off, and the area is cleared to 0 at power-on.

Address	
5050	
5051	
5052	
to	
5097	
5098	
5099	

8.12 Area for Block Transfer

This area is used for batch read/write (up to 100 data items), when positioning data written from the PC CPU exceeds 100 data items per axis.

Buffer memory address (common to axis 1 and axis 2)	Item	Remarks/setting range	Initial value	Write *
5100	Target axis	• Sets the axis to perform read/write for. 1: Axis 1 2: Axis 2	0	
5101	Head positioning block number	• Sets the head data number to perform read/write from. 1 to 600	0	
5102	Number of read/write data items	• Sets the number of read/write data items. 1 to 100	0	
5103	Read/write request	• Sets read or write of the positioning block. • Data flow of read/write Positioning-data block transfer area ← Read / → Write OS area 0 : Read/write complete (set by the OS) 1 : Read request (set via a sequence program.) 2 : Write request (set via a sequence program.)	0	O
5110 to 6109	Read/write block	• Each positioning data item that is read/written has a 10-word configuration as shown in the figure below: • See Section 8.5 for the setting range of each data. Positioning identifier +0 M code +1 Dwell time +2 Reserved +3 Command speed +4 +5 Positioning address for the first axis +6 +7 Circular data for the first axis +8 +9	0	

*: O ····· Write allowed.
× ····· Write prohibited.

Part 2

Setup Volume

Part 2 describes information relating to setup, which is performed prior to using this product, such as identification nomenclature and handling of parts, installation of the main module and wiring.

<Overview of contents>

Chapter 9 Setup

9.1 Name of Each Part

9.2 Handling Precautions

9.3 Module Installation

9.4 Wiring/Connections

9.5 Setting the Main Module

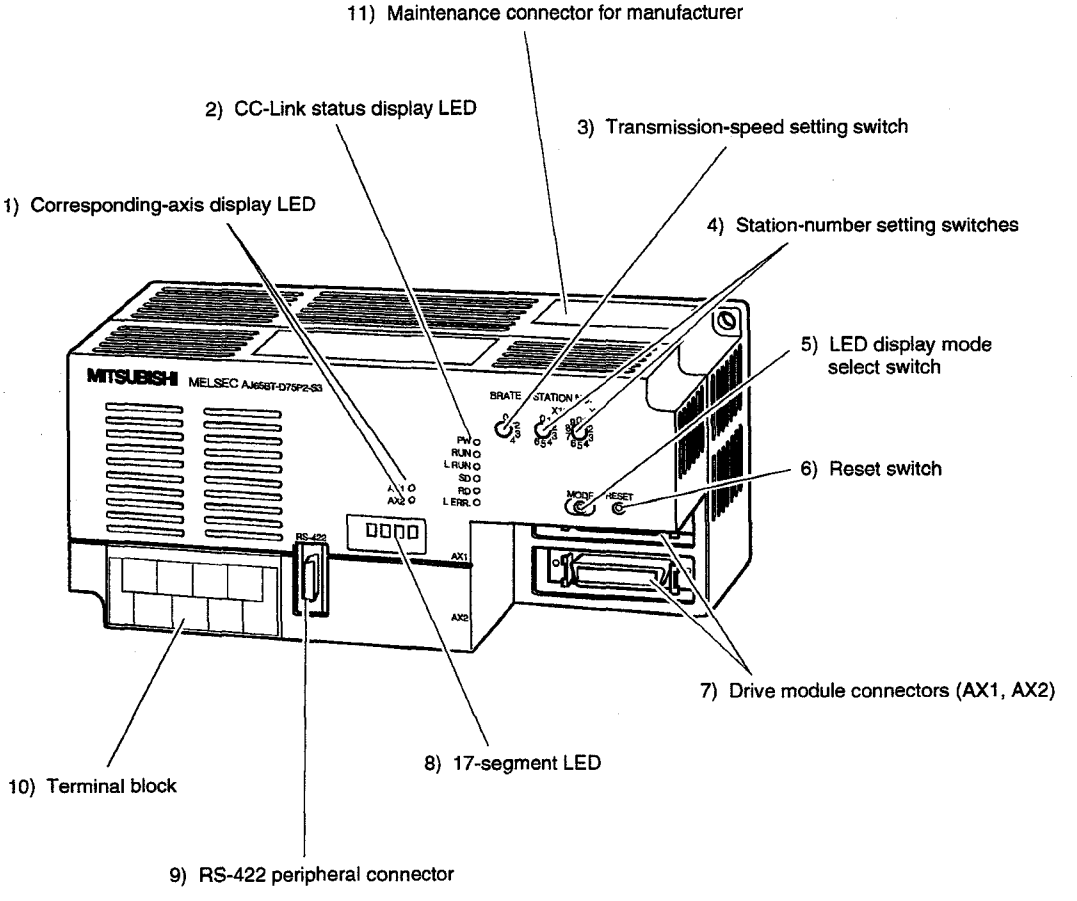
9.6 Display Viewpoint

9.7 System Test

9. Setup

9.1 Name of Each Part

This section describes name of each part of the D75P2.



1) Corresponding-axis display LED

Indicates the axis for the "8) 17-segment LED" message.

2) CC-Link status display LED

Shows the power supply and data communication conditions.

3) Transmission-speed setting switch

Sets the data communication speed.

4) Station-number setting switch

Sets the D75P2 station number.

5) LED display mode select switch

Information displayed by "1) corresponding-axis display LED" and "8) 17-segment LED" is switched each time the switch is pressed.

6) Reset switch

When pressed, it initializes input signals, remote registers and operation processing.

7) Drive module connectors (AX1, AX2)

For connection to the drive module, machine system input and manual pulse generator.

8) 17-segment LED

Displays messages indicating the operation status according to the mode.

9) RS-422 peripheral connector

For connection to peripheral devices.

10) Terminal block

For connection to the master module. (See Section 9.4.3 for the terminal layout.)

11) Maintenance connector for manufacturer

A connector for loading programs to the D75P2.

* This connector is for manufacturer use only. Do not open the cover.

9.2 Handling Precautions

This section describes handling of the D75P2 and cables. Always take the following cautions when handling the product.

[Precautionary items regarding the main module]

⚠CAUTION

- Use the PC in the environment given in the general specifications of this manual. Using the PC outside the range of the general specifications may result in electric shook, fire or malfunction, or may damage or degrade the product.
- Do not directly touch the conducted part of the module or electronic parts. This may cause malfunction or breakdown of the module.
- Be sure to attach the cover for the connectors when the drive module and peripheral devices are not connected. Failing to do so may cause malfunction.
- Be careful not to let foreign matter such as filings or wire chips get inside the module. These can cause fire, breakdowns and malfunction.
- Do not disassemble or modify the module. This may cause breakdowns, malfunction, injury and fire.

[Other precautionary items]

Main module

- The main module case is made of plastic. Do not drop or apply strong shock to it.

Cable

- Do not apply pressure to the cable with sharp objects.
- Do not unduly twist the cable.
- Do not unduly pull on the cable.
- Do not step on the cable.
- Do not place objects on the cable.
- Do not cut or pierce the cover of the cable.

Setting environment

Avoid the following conditions for the installation location of the module:

- Location where the ambient temperature exceeds the range of 0 to 55 °C.
- Location where the ambient humidity exceeds the range of 10 to 90 %RH.
- Location where condensation occurs due to a sudden temperature change.
- Location where corrosive gas or flammable gas exists.
- Location where a lot of conductive powdery substance such as dust and iron filing, oil mist, salt, or organic solvent exists.
- Location exposed to direct sunlight.
- Location where strong electric fields or magnetic fields form.
- Location where vibration or impact is directly applied to the main module.

9.3 Module Installation

This section describes installation of the D75P2.
There are two types of installation of the D75P2 as described below:

- DIN rail installation
- Control panel installation

During installation, attend to the following points as well as the "handling precautions."

[Precautions when installing the module]

⚠CAUTION

- Use the PC in the environment given in the general specifications of this manual. Using the PC outside the range of the general specifications may result in electric shook, fire or malfunction, or may damage or degrade the product.
- Tighten the module installation screws with the specified torque.
  If module installation screws are loose, it may cause short-circuits, fire, or malfunction.
  If module installation screws are tightened too much, it may cause dropping of the screws and module, short-circuits or malfunction.

Screw location	Tightening torque range
Module installation screws (M4 screws)	78 to 118 N · cm {8 to 12 kg · cm}

- Do not directly touch the conducted part of the module or electronic parts.
  This may cause malfunction or breakdown of the module.
- Confirm that drive module and peripheral device connectors are installed firmly on the module's connectors until a click sound is heard.
  If connectors are not installed properly, it may cause mis-input and mis-output due to contact failure.
- Be sure to replace the cover for the connectors when the drive module and peripheral devices are not connected.
  This may cause malfunction.

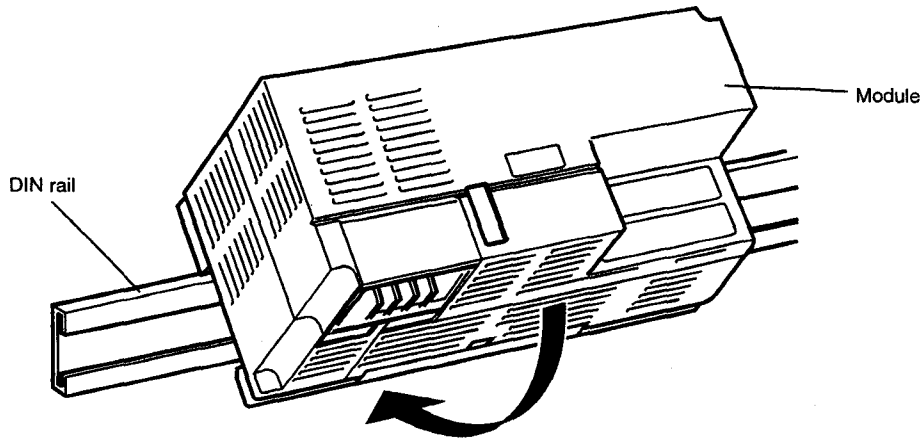
9.3.1 DIN rail installation (removal)

[Installation procedure]

(1) Confirm the external power supply for the D75P2 main module is disconnected at all phases.
* If it is not disconnected, disconnect it externally at all phases.

(2) Contact the DIN rail groove on the module base to the upper side of the DIN rail.

(3) Press the module against the DIN rail to fix it.



How to install the module

(4) Confirm the module is fixed to the DIN rail.

[Post-installation confirmation]

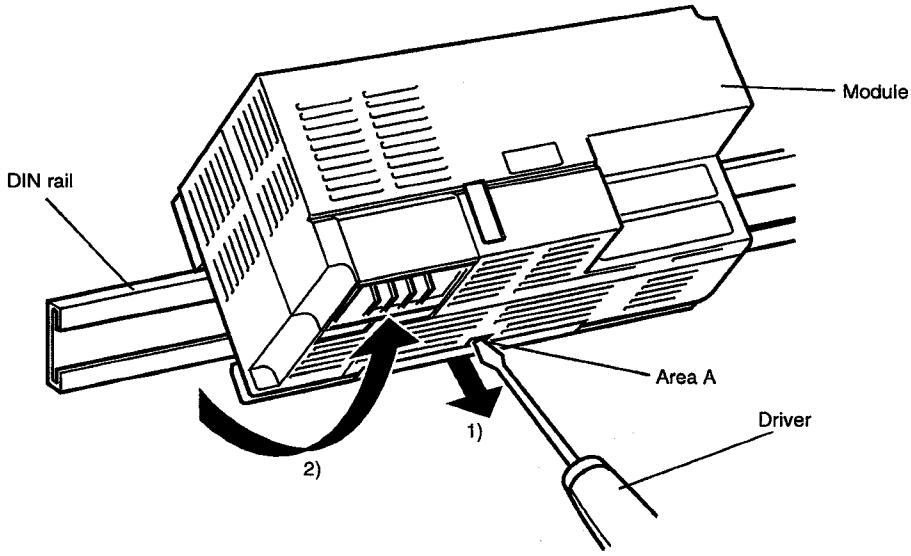
Confirm the following after installation:

- ☐ The module is securely fixed and has no play.
- ☐ The DIN rail is securely fixed and has no play.

[Removal procedure]

(1) Confirm the external power supply for the D75P2 main module is disconnected at all phases.
* If it is not disconnected, disconnect it externally at all phases.

(2) Insert a plain screwdriver (–) into area A, lever it outward slightly (1)) and remove the module (2)).



How to remove the module

9.3.2 Installation to (removal from) the panel

[Installation procedure]

(1) Confirm the external power supply for the D75P2 main module is disconnected at all phases.
* If it is not disconnected, disconnect it externally at all phases.

(2) Fix the module to the panel with screws.
* Torque the module installation screws to 78 to 118 N · cm {8 to 12 kg · cm}.

[Post-installation confirmation]

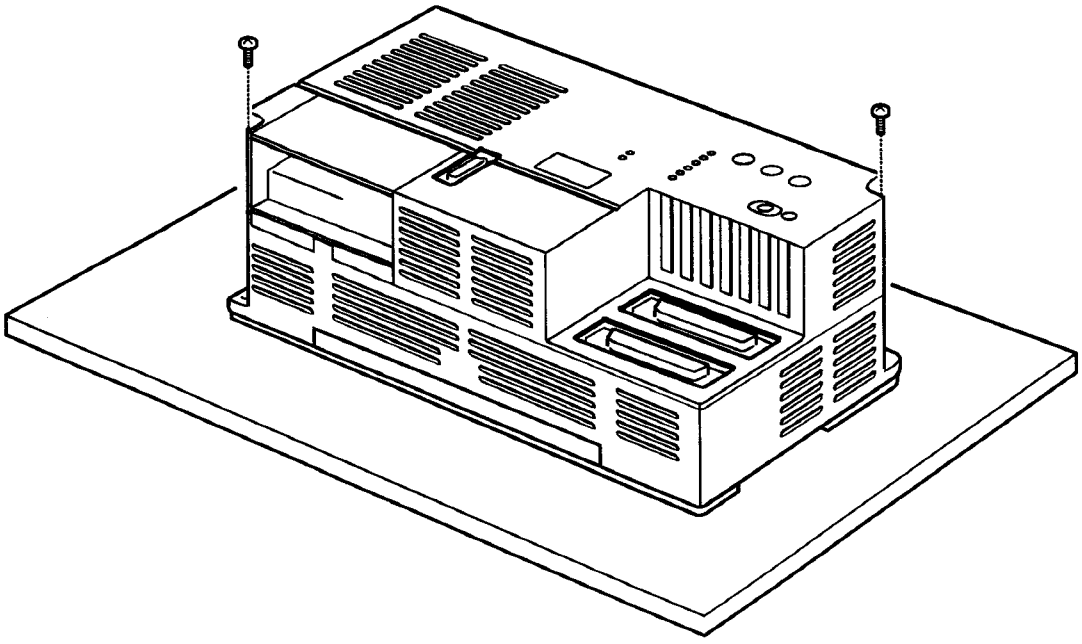
Confirm the following after installation:

☐ The module is securely fixed and has no play.

[Removal procedure]

(1) Confirm the external power supply for the D75P2 main module is disconnected at all phases.
* If it is not disconnected, disconnect it externally at all phases.

(2) Loosen the screws to remove the module.



9.4 Wiring/Connections

This section describes wiring and connections for the D75P2.
To operate the D75P2 to its full potential and with high reliability, the external wiring must be highly resistant to noise interference, and must be properly connected. To avoid malfunctions caused by noise as well as errors and accidents due to false connections, attend to the following items as well as the "handling precautions" when performing external wiring and connections for the D75P2.
There are three ways to wire the D75P2:

- Pin connection to the drive module connector
- Connector connection (removal)
- Twisted cable connection

[Precautionary items on wiring/connection]

⚠CAUTION

- The FG terminals should always be grounded using the class-3 or higher grounding designed specially for the PC.
  Failure to ground these terminals may cause malfunction.
- When wiring the PC, check the rated voltage and terminal layout of the product, and make sure the wiring is done correctly.
  Connecting a power supply that differs from the rated voltage or wiring it incorrectly may cause fire or breakdown.
- Verify the terminal layout and correctly wire to the module.
- Be careful not to let foreign matter such as filings or wire chips get inside the module. These can cause fire, breakdowns and malfunction.
- When turning on the power or operating the module after installation or wiring work, be sure the module's terminal covers are correctly attached.
  Failure to attach the terminal covers may result in electric shock.
- Tighten the terminal screws with the specified torque.
  If the terminal screws are loose, it may cause short-circuits, fire or malfunction.
  If the terminal screws are tightened too much, it may cause dropping of the screws and module, short-circuits or malfunction.

Screw location	Tightening torque range
Terminal block terminal screws (M3.5 screws)	59 to 88 N · cm {6 to 9 kg · cm}
Terminal block installation screws (M4 screws)	78 to 118 N · cm {8 to 12 kg · cm}

- Before beginning any installation or wiring work, make sure all phases of the power supply have been disconnected externally.
  Failure to completely disconnect the power-supply phases may cause electric shock and/or damage to the product.
- Properly solder the external connectors.
  Incorrect connection may cause short circuits or malfunction.

[Other precautionary items]

- Use separate cables for AC and D75P2 external input signals to eliminate the effects of AC surges and induction.
- Do not bundle or put in the same vicinity as the main circuit line, high voltage cables or load-carrying wires leading to other than the programmable controller (PC), since the module will become susceptible to noise, surge and induction.
- Ground the tube firmly after pipe wiring.
- If placing AC and D75P2 external input signals in the same vicinity is unavoidable, separate the duct or perform pipe wiring.
- If bundling AC and D75P2 external input signals is unavoidable, use the batch shield cable and ground on the PC side.
- The maximum length of a connection cable between the D75P2 and the drive module is as shown below, depending on the interface of the drive module:

  Open connector method : Maximum 2 m (6.6 ft.)
  Differential driver method : Maximum 10 m (32.8 ft.)
- When wiring between the D75P2 and the servo amplifier, in a noisy environment use a twisted pair shield cable differed from the other shield cable wiring to wire from a pulse chain output pin of the D75P2.

9.4.1 Pin connection to the drive module connector

The pin connection to the drive module connector is performed in the steps shown below:

Disassemble the connector area ····· Disassemble the connector area, and remove the connector.

↓

Connect the connector and cable ····· Solder the cable onto the connector pins.

↓

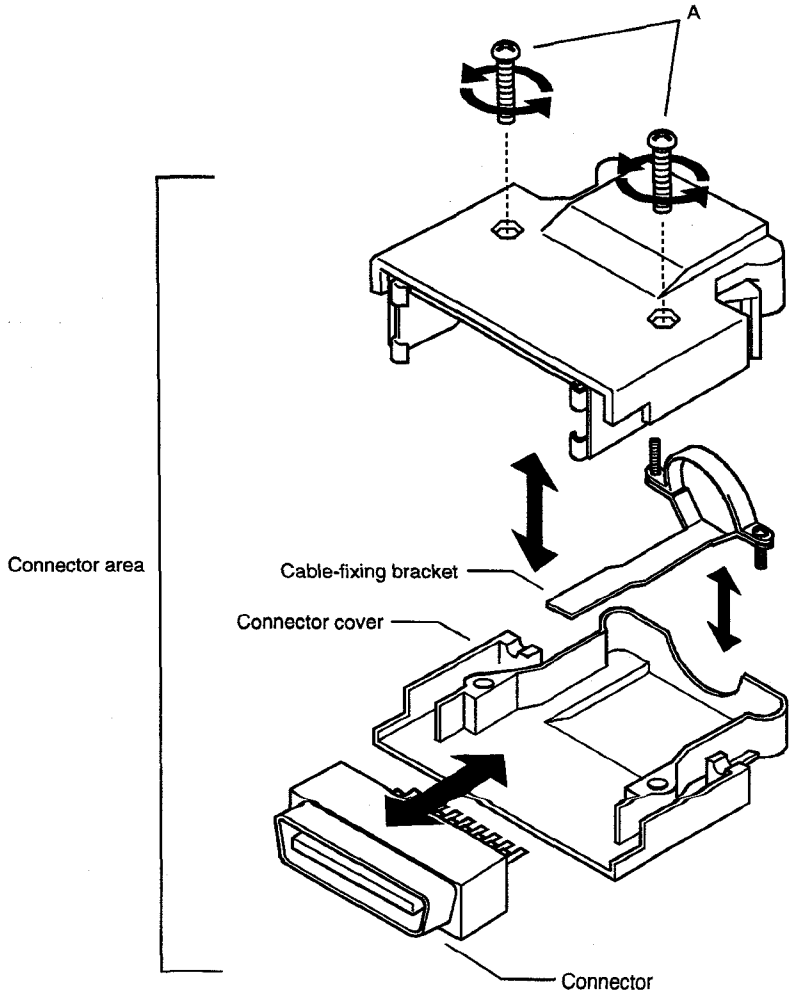
Assemble the connector area ····· Assemble the connector area.

[Disassembling the connector area]

(1) Loosen and pull out the A screws.
(Be careful not to lose screws and nuts.)

(2) Open the connector cover from the connector side.

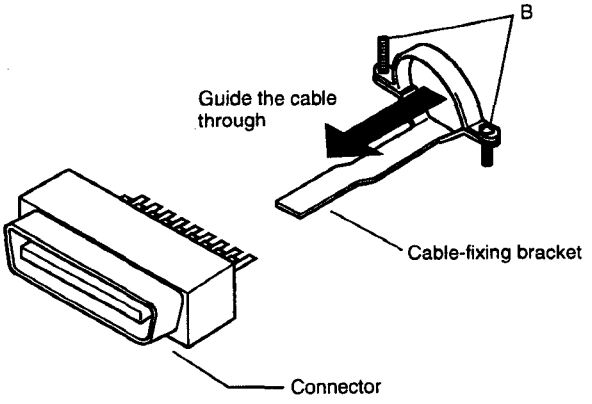
(3) Remove the connector and cable-fixing bracket.



[Connect the connector and cable]

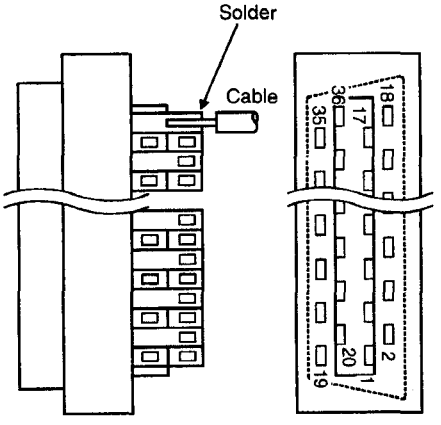
* Follow the instructions in I/O interface (Section 3.2.2) when connecting.

(1) Loosen the B screws on the cable-fixing bracket, guide the cable through and tighten the B screws.
(The B screws can be removed and tightened back again after guiding the cable through.)
(Be careful not to lose screws and nuts.)



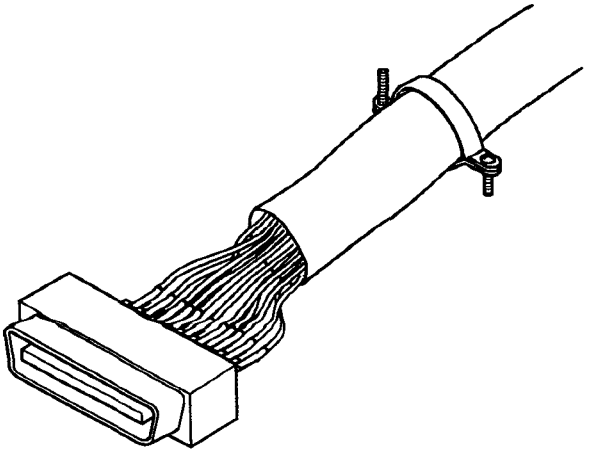
(2) Solder the connector and cable.

Pin connection



* The applicable size of cables to be connected is "AWG#24 to #30 (approximately .2 to 0.05SQ)."

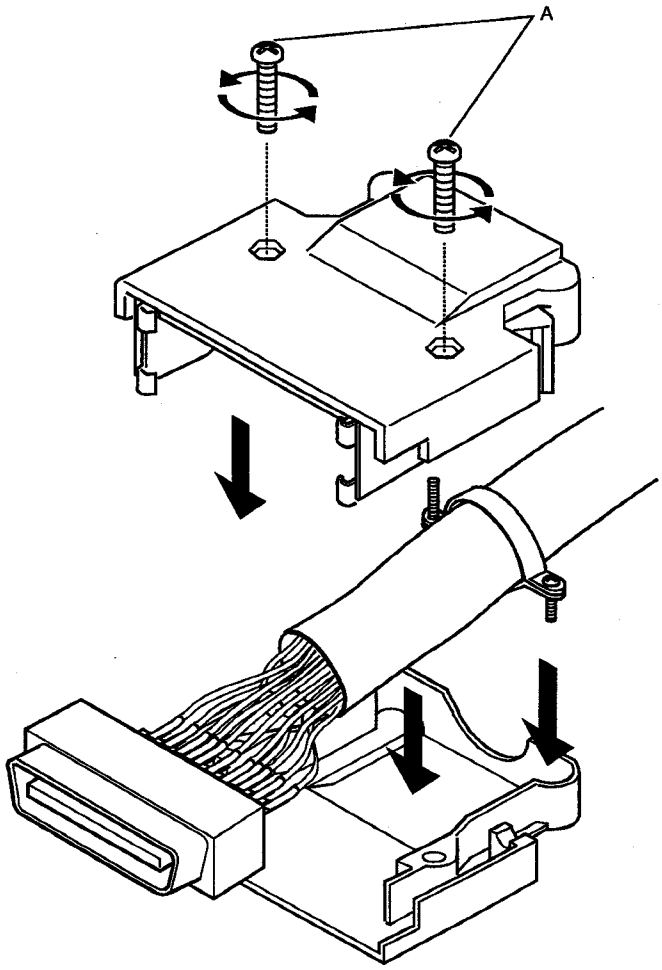
(3) The illustration below shows how the area looks like after connection.



[Assemble the connector area]

(1) Place the soldered connector and cable-fixing bracket inside the connector cover.
* The cable-fixing bracket is used as a stopper to protect the connected section of signal cables when the cables are pulled. If the cable is not securely held by the cable-fixing bracket, use insulation tape to adjust the tightness.

(2) Sandwich the cable between the connector covers, and tighten the A screws.



9.4.2 Connector connection (removal)

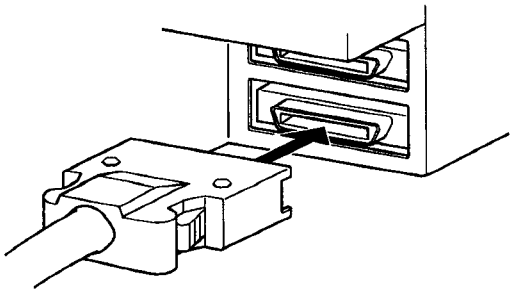
The D75P2 is connected via connectors to the drive module and peripheral devices. The connection procedure is as shown below:

[Connection procedure]

(1) Confirm the external power supply for the D75P2 main module is disconnected at all phases.
* If it is not disconnected, disconnect it externally at all phases.

(2) Confirm the shapes of the module's connector area and the connector for proper orientation.

(3) Insert the connector horizontally into the module until a click sound is heard.



[Work confirmation]

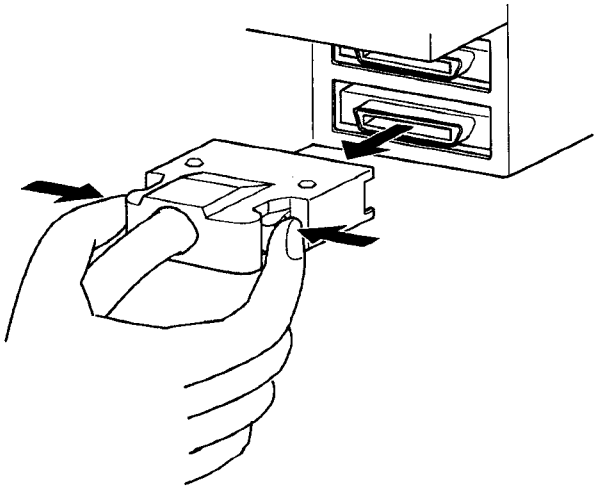
Confirm the following after cable connection:

☐ The connector is securely fixed and has no play.

[Removal procedure]

(1) Confirm the external power supply for the D75P2 main module is disconnected at all phases.
* If it is not disconnected, disconnect it externally at all phases.

(2) While pressing together both sides of the connector in the indicated position, remove it by pulling straight back.



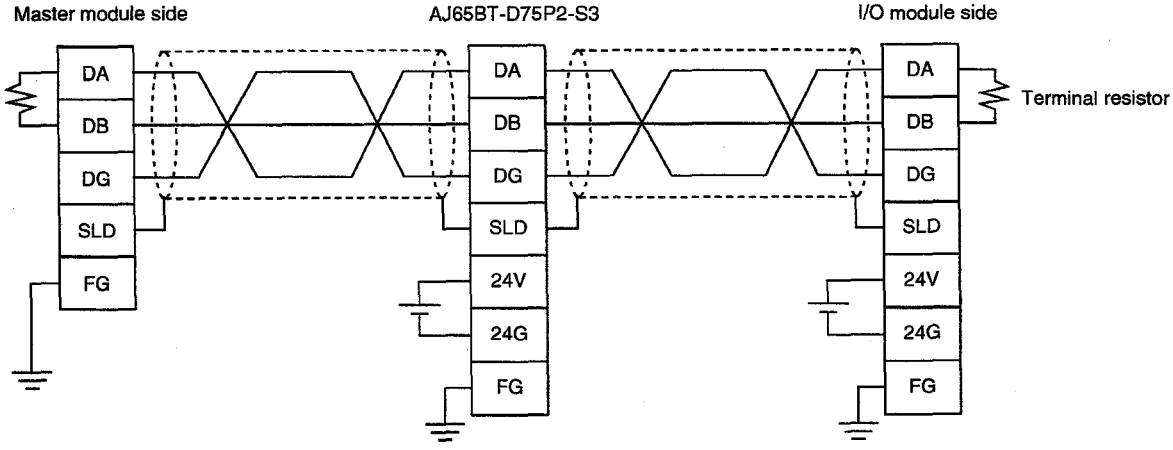
9.4.3 Twisted cable connection

The D75P2 is connected to the master module via a "twisted cable." The connection procedure is as shown below:

[Connection procedure]

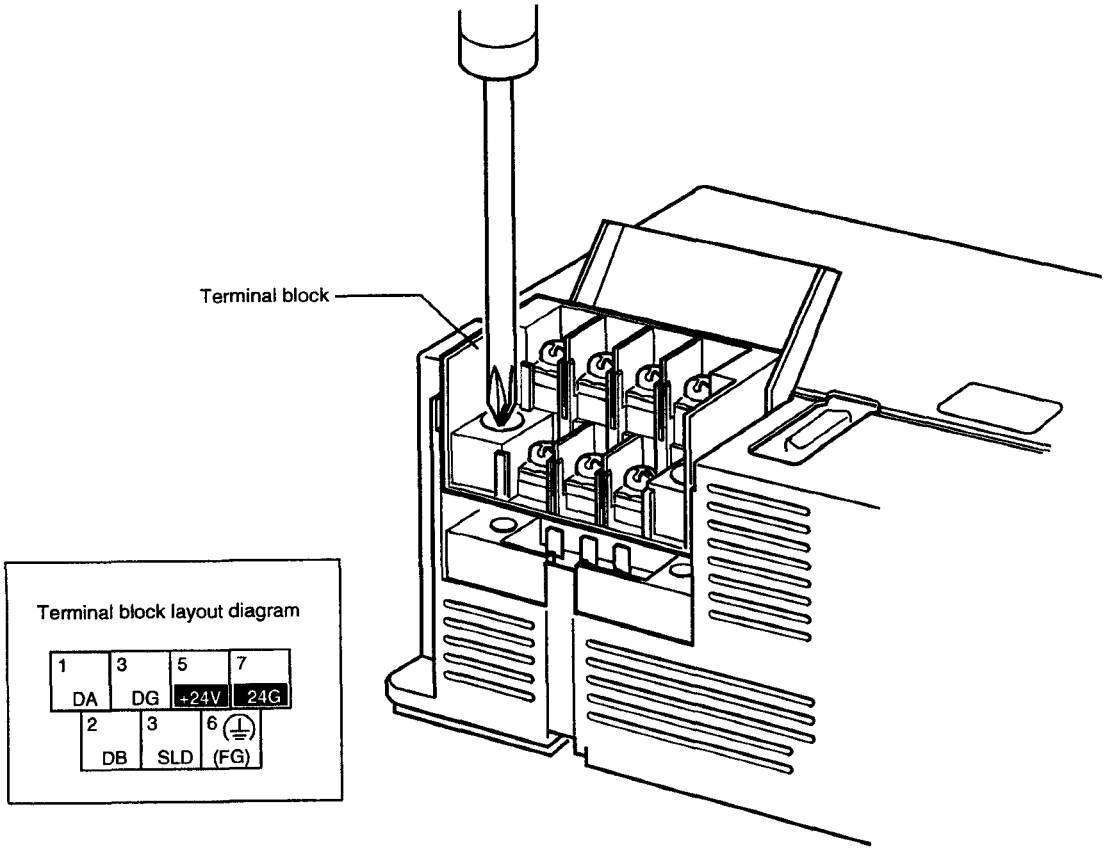
(1) Confirm that power of the master module and peripheral devices is externally disconnected at all phases.
* If it is not disconnected, disconnect it externally at all phases.

(2) Connect the D75P2 and the master module as shown below:



[Tip]

The terminal block can be removed from the module. If connection can be made easier without the terminal block, remove it from the module by loosening the screw to connect the cables as shown below:



[Work confirmation]

Confirm the following after cable connection:

- ☐ The cable is securely fixed and has no play (part that may become loose).
- ☐ Terminal layout and connection are correct.

9.5 Setting the Main Module

This section describes the settings for the D75P2. Some settings are necessary on the D75P2 for the connected servo motor.
Settings are required in the following cases:

(A) Station number of the main module setting area (mandatory)

→ See Section 9.5.1, "Setting the station number of the main module."

(B) Main module transmission-speed setting area (mandatory)

→ See Section 9.5.2, "Setting the transmission speed of the main module."

(C) When the servo motor uses the "negative logic" pulse output

* The default setting is "positive logic".

→ "Switching of positive logic/negative logic pulse output" must be performed. (See Section 7.18.)

(D) When the stepping motor is used

* The default setting is "standard mode."

→ "Setting of the stepping motor mode" must be performed. (See Section 7.15.)

9.5.1 Setting the station number of the main module

Set the D75P2's station number.

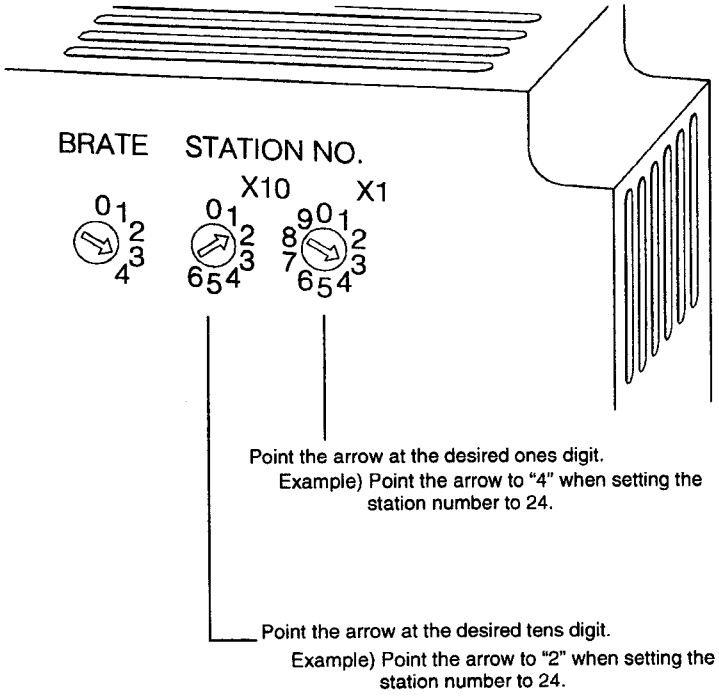
* The default station number setting (factory set value) is "01".

[Setting standards]

1) The setting number should be between "01 and 61."
   (The D75P2 occupies four stations after the setting number.)
2) The setting number should be "any number that is successive from but is not overlapping with other station numbers."
   * The station number can be set regardless of the order of device connection.
   * If "62" or a higher number is set, the "CC-Link status display LED" will show "L ERR" during data communication.

[Setting method]

Insert a plain screwdriver (–) into the arrow-shaped groove and turn the arrow to the desired number.



9.5.2 Setting the transmission speed of the main module

Set the D75P2's transmission speed.
* The default setting (factory set value) is "0."

[Setting standards]

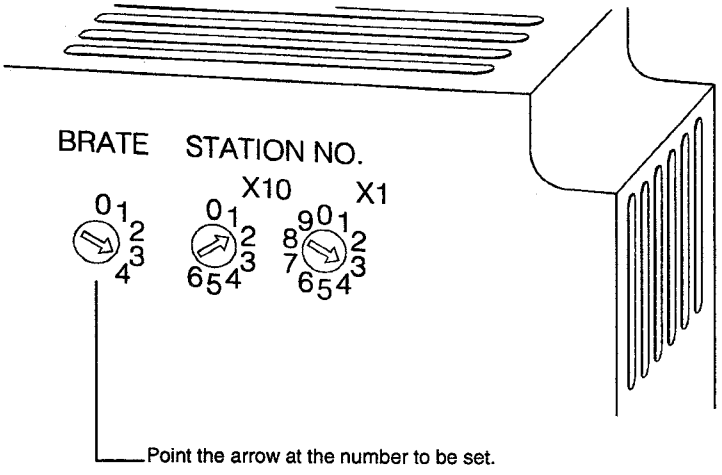
1) The setting number should be between "0 and 4."
2) Set a number according to the following table:

Communication speed to be set	Setting number
156 [kbps]	0
625 [kbps]	1
2.5 [Mbps]	2
5 [Mbps]	3
10 [Mbps]	4

* Setting numbers "5 to 9" cannot be used. If a number in the range "5 to 9" is set, the "CC-Link status display LED" will show "L ERR" during data communication.

[Setting method]

Insert a plain screwdriver (–) into the arrow-shaped groove and turn the arrow to the desired number.



Point the arrow at the number to be set.
Example) When the communication speed is 5 Mbps, the setting value is "3."

9.6 Display Viewpoint

9.6.1 17-segment/corresponding-axis display LEDs

In the LED display area, the type of OS is displayed for one second when the power of the PC is turned on, then the display changes to "operation monitor 1" in the table below. Further, when the mode switch is pressed, the display shows the specified mode message and status.

Mode	17-segment LED	Axis-display LED
Operation monitor 1	When no error exists	
	One of the following is displayed: RUN (during operation) →	→ The axis in operation is lit
	TEST (in the test mode) →	→ All axes are lit
	IDLE (standby) →	→ Off
	When error exists	
	The following is displayed: Display: ERR	The LED of the axis in which the error has occurred flashes.
Operation monitor 2	Indicates the operation status of the axis whose axis-display LED is turned on (see 9.6.2).	The AXn indicator light changes every 0.5 second.
Internal information 1	The OS type information is displayed. Display: S003	Off
Internal information 2	The OS version is displayed. Display : V***	Off
I/O information "n"	Displays the signal name switched using the mode switch (see 9.6.3).	The selected signal indicator is lit when in the on status.
Stepping motor mode	Displays STMM.	The indicator for the stepping motor mode axis is lit.

9.6.2 Message descriptions for operation monitor 2

<Message>	<Description>
IDLE	Standby (starts from the initial state, if start is input)
STOP	During stop (restarts, if start is input)
JOG	During JOG operation
MANP	During manual pulse-generator operation
OPR	During home position return
POSI	During position control
VELO	During speed control
V-P	During speed control of the speed/position control
V-P	During position control of the speed/position control
BUSY	Waiting for a condition, etc.
E***	Error occurrence

Error number display

When an error has occurred at an axis, the error number occurring at the axis is displayed for 0.5 second, then the display changes to the next axis.

9.6.3 Signal names of I/O information "n"

The message switches in the following order each time the mode switch is pressed:

<Message>	<Description>
SVON	Servo ON
↓	
Z-ON	Zero point signal
↓	
ULMT	High limit signal
↓	
LLMT	Low limit signal
↓	
V-P	Speed/position switch signal
↓	
DOG	Near-point dog ON

9.6.4 Descriptions of other messages

The following error messages are displayed on the 17-segment LED regardless of the mode:

<Message>	<Description>
FALT	When exceptions such as zero division, invalid instruction or watch dog occur, the display shows the message occurred, cause and the IP address at which it occurred.

9.7 System Test

This section describes the method to check, on the D75P2 main module, whether or not the D75P2 is operating normally.
The test can be executed even when no sequence program or data is stored in the ACPU or D75P2, or when the D75P2 is in operation.
Operate the system after completing the connections between the D75P2, drive module, motor and external devices. The "mode switch," "17-segment LED" and "axis-display LED" being described here indicate the D75P2's switch/LEDs.

[Procedure]

(1) Power-on

1) Set the ACPU to STOP status.
(Set the master station to STOP status when the D75P2 is installed at a remote station.)
2) Power-on the ACPU (the installed station and master station when the D75P2 is installed at a remote station) and the drive module and motor connected to the D75P2.
3) The OS type of the D75P2 ("S003" is the same as the display of (4)) is displayed on the 17-segment LED for one second.
4) After one second has elapsed, the display changes to the status of operation monitor 1 described in (2).

(2) Operation monitor 1

1) Depending on the status of the D75P2, one of the following is displayed on the 17-segment LED and axis-display LED.
Confirm whether the display matches the D75P2 status.

D75P2 status	17-segment LED	Axis-display LED for each axis
During operation	RUN	Displays BUSY signal status of the corresponding axis
In the test mode	TEST	Light on : BUSY signal is on
Standby	IDL	Light off : BUSY signal is off
Error in occurrence	ERR	LED of the axis of error in occurrence is lit.

2) Pressing the mode switch changes the display to the status of operation monitor 2 described in (3).

(3) Operation monitor 2

1) The axis-display LED of each axis lights up in sequence in approximately 0.5 second intervals.
Also, the status of the axis, whose axis-display LED is lit, is displayed on the 17-segment LED as one of the following.
Confirm whether the display matches the D75P2 status.

Axis status	17-segment LED	Remarks
Standby	IDLE	• Status at power-on/operation end
During stop	STOP	• Pause status during positioning operation
During JOG operation	JOG	———
During manual pulse-generator operation	MANP	
During home position return	OPR	
During position control	POSI	
During speed control	VELO	
During speed control of the speed/positioning switch control	V-P	
During position control of the speed/positioning switch control	V-P	
Wait status	BUSY	• Waiting for an execution by condition specification
Error occurrence *	E***	• Displays an error code in the *** area. See Chapter 13 for the error code.

2) Pressing the mode switch changes the display to the status of monitor of internal information 1 described in (4).

(4) Monitor of internal information 1

1) The OS type ("S003") of the D75P2 is displayed on the 17-segment LED.
Use this information as reference.
2) The axis-display LED of each axis is turned off.
3) Pressing the mode switch changes the display to the status of monitor of internal information 2 described in (5).

(5) Monitor of internal information 2

1) The OS version of the D75P2 is displayed on the 17-segment LED.
Use this information as reference.

"V000"
→ Version

2) The axis-display LED of each axis is turned off.
3) Pressing the mode switch changes the display to the status of monitor of I/O information n described in (6).

Point

*: No error code is displayed on the 17-segment LED even if there is a parameter error when a remote station ready signal is turned on.
If no error code is displayed on the 17-segment LED, verify the error code in the buffer memory for storing the error code of the D75P2 or peripheral device.

(6) Monitor of I/O information n

1) Each time the mode switch is pressed, the following I/O signal names are displayed on the 17-segment LED in sequence.

2) The signal status of each axis indicated by the 17-segment LED is displayed on the axis-display LED of each axis.
Verify whether the display matches each signal status.

- When the signal is on ·····the axis-display LED is on
- When the signal is off ·····the axis-display LED is off

17-segment LED	Applicable I/O signal name	Remarks
"SVON"	Drive module ready signal (servo ON signal)	Switches in sequence as the mode switch is pressed.
"Z-ON"	Zero point signal	
"ULMT"	High limit signal	
"LLMT"	Low limit signal	
"V-P"	Speed/position switch signal	
"DOG"	Near-point signal	

(7) Monitor of stepping motor mode

1) "STMM" is displayed on the 17-segment LED.

2) As for the axis-display LED of each axis, the axis that is set to the stepping motor mode is lit.

3) Pressing the mode switch changes the display to the status of monitor of stepping motor mode described in (7).

(8) Change to operation monitor 1/termination of operation monitor

1) Pressing the mode switch returns the status to the operation monitor 1 described in (2).
Each time the mode switch is pressed, the operation monitor status repeats changing from (2) through (7).

2) When terminating the operation monitor, leave it in any monitor status between (2) and (7) as required by the user.

Point

(1) The operation monitor described in this section is a function used to verify the D75P2 status, control status of each axis and I/O signal status, and it can be operated at any time.

(2) Perform the operation monitor as necessary, such as when the D75P2 does not operate continually.

(3) Other than those listed above, "FALT" is displayed on the 17-segment LED when a watchdog timer error occurs on the D75P2.
When a watchdog timer error occurs on the D75P2, ACPU reset operation is needed.
If the watchdog timer error persists on the D75P2 even after the ACPU has been reset, the D75P2 module needs to be replaced.
Contact the nearest representative or branch.

MEMO

Part 3

Setting Volume

Part 3 describes setting information necessary when using this product, how to create a system and programs, and actions to be taken when troubles occur.

<Overview of contents>

Chapter 10 Setting Positioning Parameters

Chapter 11 Setting Positioning Data

Chapter 12 Building a System

Chapter 13 Troubleshooting

10. Setting Positioning Parameters

(1) The positioning parameters set on the D75P2 include four types as listed below:
- Basic parameters
- Extended parameters
- Basic parameters for home position return
- Extended parameters for home position return

(2) The positioning parameters of the D75P2 are set for each axis.

(3) The initial values (default values) of the D75P2's positioning parameters are already determined and set at the time of shipment.
When all clear is performed on the memory from a peripheral device, initial values are set to the parameters.
Also, the parameters can be initialized by performing "parameter initialization setting" using a sequence program.

(4) The methods to set positioning parameters include the following:
- Setting in the peripheral device edit mode ····· See the AD75P Operating Manual for the setting method.

10.1 Basic Parameters

The basic parameters include those in the basic parameter 1 and the basic parameter 2.

Basic parameters

Basic parameter 1

- In the basic parameter 1, control unit, travel increment per pulse, pulse output mode, and rotation direction, which are necessary for the D75P2 to perform control, are set.
  Set the parameters at system start-up in accordance with the mechanical system and applicable motor.
- Not setting the basic parameter 1 correctly may cause the rotation direction to reverse, or the D75P2 to stop operating completely.
  Therefore, be sure to set the basic parameter 1 according to the system that uses the D75P2.
- The values can be changed from the PC CPU regardless of the remote station ready signal being on or off. However, the changed data can only become valid when the remote station ready signal rises (OFF → ON).
  If the setting contents are rewritten while the remote station ready signal is on, turn the remote station ready signal on again after turning it off first.

Basic parameter 2

- In the basic parameter 2, speed limit value, inclination at acceleration/ deceleration, and drive module used are set.
  Set the most appropriate values at system start-up.
- Operation is possible without changing the initial values set in the extended parameter 2.
- The values can be changed from the PC CPU regardless of the remote station ready signal being on or off, and become valid immediately after the change.

Table 10.1 List of basic parameters

Basic parameter number	Item		Initial value	Setting range				
				Standard mode				
				mm	inch	degree	pulse	
1	Unit setting		3	0: mm	1: inch	2: degree	3: pulse	
	Travel increment per pulse (A)	Number of pulses per rotation (Ap)	20000	• 1 to 65535 (pulses)				
		Travel increment per rotation (Al)	20000	0.1 to 6553.5 (μm)	0.00001 to 0.65535 (inch)	0.00001 to 0.65535 (degree)	1 to 65535 (pulses)	
		Unit multiplier (Am)	1	• × 1 • × 10 • × 100 • × 1000				
	Pulse output mode		0	• 0: PLS/SIGN mode • 1: CW/CCW mode • 2: Phase A/B mode (multiplication by 4) • 3: Phase A/B mode (multiplication by 1)				
	Rotation method		0	• 0: Present-value increase by forward pulse output • 1: Present-value increase by reverse pulse output				
2	Speed limit		200000	0.01 to 6000000.00 (mm/min.)	0.001 to 600000.000 (inches/min.)	0.001 to 600000.000 (degrees/min.)	1 to 1000000 (pulses/sec.)	
	Acceleration time 0		1000	• 1 to 65535(ms)/1 to 8388608(ms)*				
	Deceleration time 0		1000	• 1 to 65535(ms)/1 to 8388608(ms)*				
	Bias speed at start		0	0.01 to 6000000.00 (mm/min.)	0.001 to 600000.00 (inches/min.)	0.001 to 6000000.000 (degrees/min.)	1 to 1000000 (pulses/sec.)	
	Stepping motor mode selection		0	• 0: Standard mode				

See Sections 8.5.1 and 8.5.2 for the buffer memory address and setting range of the basic parameter 1 and basic parameter 2.

Remark

* : Use the extended parameter 1 to select 1 to 65535 (ms) and 1 to 8388608 (ms) for the acceleration time 0, and deceleration time 0.
See Section 10.2 for setting.

					Remarks
	Stepping motor mode				
	mm	inch	degree	pulse	
	0: mm	1: inch	2: degree	3: pulse	
	0.1 to 6553.5 (μm)	0.00001 to 0.65535 (inch)	0.00001 to 0.65535 (degree)	1 to 65535 (pulses)	
	0.01 to 375000.00 (mm/min.)	0.001 to 37500.000 (inches/min.)	0.001 to 37500.000 (degrees/min.)	1 to 62500 (pulses/sec.)	
	0.01 to 375000.00 (mm/min.)	0.001 to 37500.000 (inches/min.)	0.001 to 37500.000 (degrees/min.)	1 to 62500 (pulses)	
	• 1: Stepping motor mode				

10.1.1 Unit setting

(1) The command unit during positioning control is set.
(2) Changing the unit setting does not change the values of the currently set parameters and positioning data.
When the unit setting is changed, set the currently set parameters and positioning data again.
The D75P2 generates an error when data outside the setting range is detected.

10.1.2 Travel increment per pulse

The travel increment per pulse is a value indicating the amount of travel increment by the mechanical system that the D75P2 uses to perform positioning control.
It is set by the number of pulses per one motor rotation, travel increment per one motor rotation and multiplier for travel increment per pulse of the mechanical system used.

(1) Calculating the travel increment per pulse

(a) Specifications of the mechanical system

The items necessary to calculate the travel increment per pulse are assumed as follows:

1) Worm gear pitch ····· P_B (mm/rev.)
2) Number of motor axis gear teeth ····· Z1
3) Number of worm gear axis gear teeth ····· Z2

Deceleration ratio $\frac{Z1}{Z2} = \frac{1}{n}$ (gear ratio)

4) Number of pulses per rotation ··· Pf (pulse/rev.)

(b) In the case of the above mechanical system specifications, the number of pulses per rotation, travel increment per rotation, and unit multiplier are as follows:

1) Number of pulses per rotation = P_f
2) Travel increment per rotation = $P_B \times (1/n) \times 10^3$
3) Unit multiplier = M

(c) The D75P2 uses the following expression to calculate the travel increment per pulse:

$$A = \frac{\text{Travel increment per rotation}}{\text{Number of pulses per rotation}} \times \text{Unit multiplier}$$

$$= \frac{P_B \times (1/n) \times 10^3}{Pf} \times M \ (\mu m/pulse)$$

Calculation example

[Condition]
- PB = 5 (mm/rev)
- $\frac{1}{n} = \frac{1}{1}$
- Pf = 12000 (pulse/rev)
- M = 1

[Expression]

$$A = \frac{5 \times (1/1) \times 10^3}{1200}$$

$$= 0.4167 \ (\mu m/pulse)$$

(2) Error compensation

When positioning is performed using the set "travel increment per pulse," a difference (mechanical system error) may occur between the command travel increment and the actual travel increment.

Using the D75P2, this error can be compensated by changing the values of number of pulses per rotation, travel increment per rotation, and unit multiplier.

The error compensation method on the D75P2 is shown below:

(a) Set the command travel increment L (mm), and perform positioning.

(b) After positioning, measure the actual travel increment L' (mm).

(c) From the command travel increment and actual travel increment, calculate the number of pulses per rotation and travel increment per rotation to be compensated using the expression below:

1) Travel increment per pulse A (mm/pulse) to command travel increment L (mm)

$$A = \frac{\text{Travel increment per rotation } (A_L)}{\text{Number of pulses per rotation } (A_P)} \times \text{Unit multiplier } (A_M)$$

2) Number of pulses needed P (pulse) is

$$P = \frac{L}{A} \text{ (pulse)}$$

3) Superficial travel increment per pulse A' to actual travel increment L' (mm)

$$A' = \frac{L'}{P} \text{ (mm/pulse)}$$

$$\therefore P = \frac{L'}{A'}$$

$$\therefore A' = A\frac{L'}{L}$$

$$= \frac{\text{Travel increment per rotation } (A_L) \times \text{Unit multiplier } (A_M)}{\text{Number of pulses per rotation } (A_P)} \times \frac{\text{Actual travel increment } (L')}{\text{Command travel increment } (L)}$$

$$= \frac{\text{Travel increment per rotation for compensation } (A_L' = A_L \times L')}{\text{Number of pulses per rotation for compensation } (A_P' = A_P \times L)} \times \text{Unit multiplier } (A_M)$$

Calculate A_L'/A_P' as a reduced fraction using the above expression, and rewrite to this value.

Calculation example

[Condition]	Travel increment per rotation ..... 5000 (μm/rev) Number of pulses per rotation ..... 12000 (pulse/rev) Unit multiplier 1
[Positioning result]	Command travel increment ..... 100mm Actual travel increment 101mm
[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 increment per rotation is 101 (μm/rev) Number of pulses per rotation is 240 (pulse/rev)

10.1.3 Pulse output mode

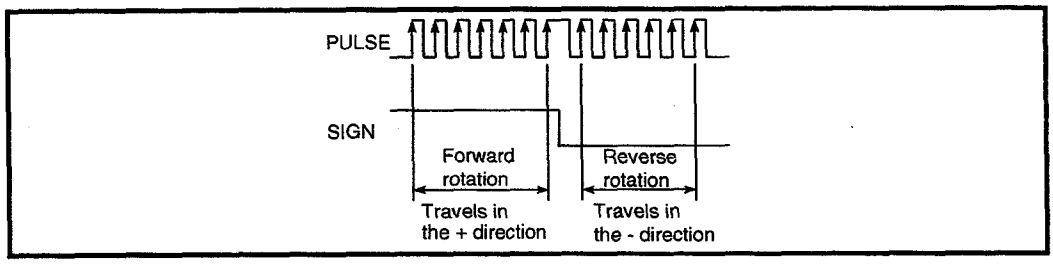
The pulse output mode that is appropriate for the drive module used is set.

(1) When the pulse output logic is a positive logic

(a) PLS/SIGN mode

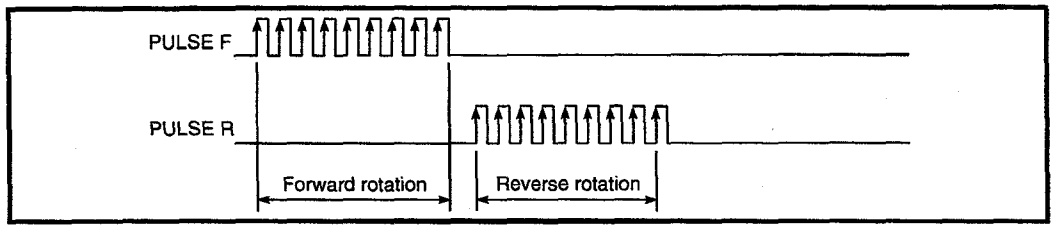
Control of forward rotation/reverse rotation is performed using on/off of the direction sign (SIGN).

- When the direction sign is LOW : Reverse rotation
- When the direction sign is HIGH : Forward rotation



(b) CW/CCW mode

A forward rotation field pulse (PULSE F) is output during forward rotation.
Similarly, a reverse rotation field pulse (PULSE R) is output during reverse rotation.

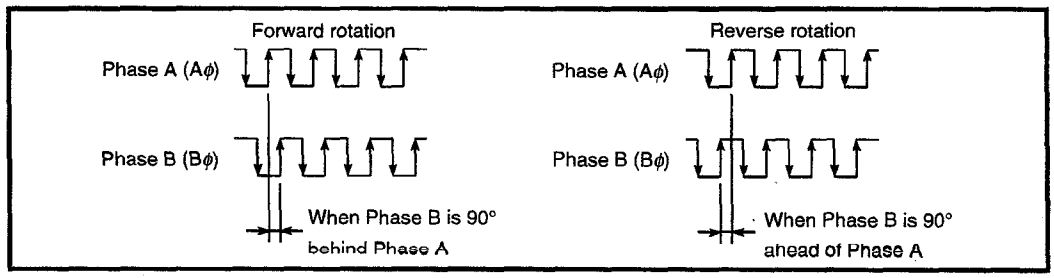


(c) Phase A/B mode

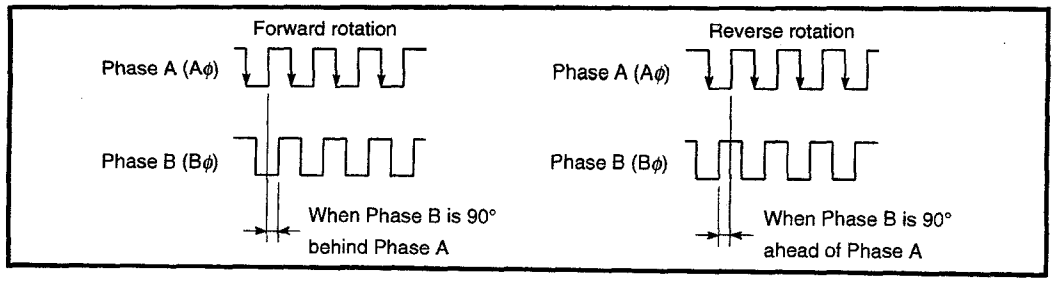
Control of forward rotation/reverse rotation is performed using a phase difference between Phase A (Aϕ) and Phase B (Bϕ).

- When Phase B is 90° behind Phase A : Forward rotation
- When Phase B is 90° ahead of Phase A : Reverse rotation

1) Set at multiplication by 4



2) Set at multiplication by 1

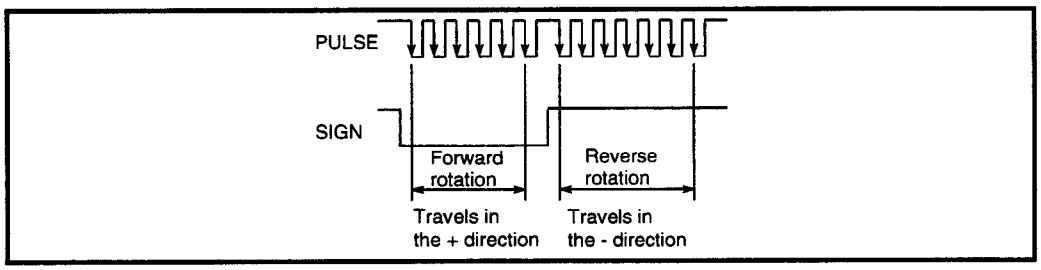


(2) When the pulse output logic is a negative logic

(a) PLS/SIGN mode

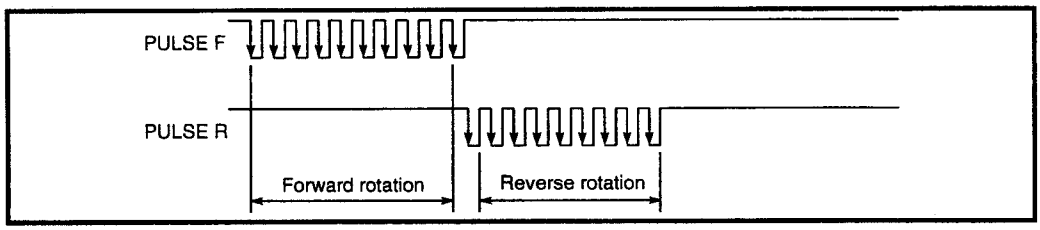
Control of forward rotation/reverse rotation is performed using on/off of the direction sign (SIGN).

- When the direction sign is LOW : Forward rotation
- When the direction sign is HIGH : Reverse rotation



(b) CW/CCW mode

A forward rotation field pulse (PULSE F) is output during forward rotation.
Similarly, a reverse rotation field pulse (PULSE R) is output during reverse rotation.

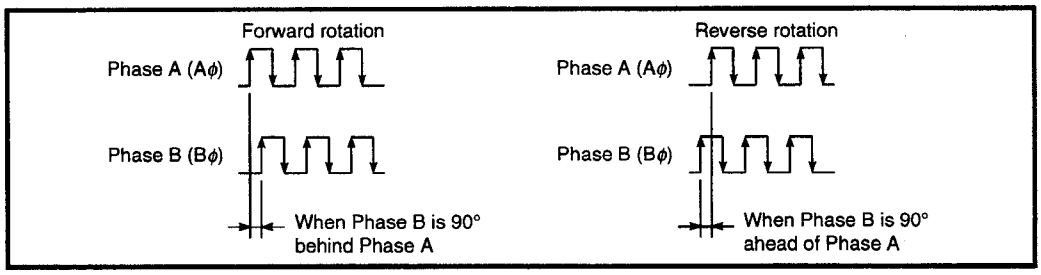


(c) Phase A/B mode

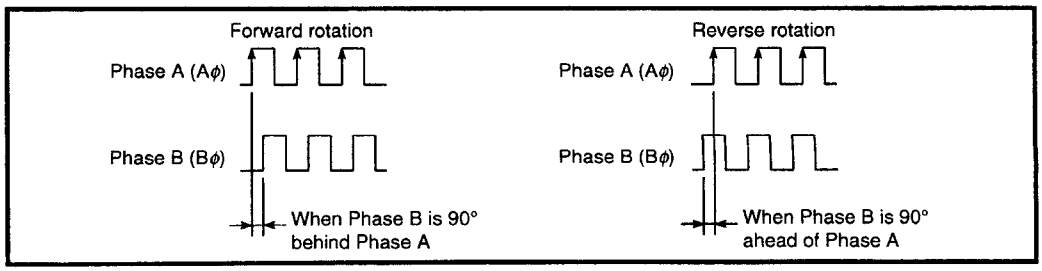
Control of forward rotation/reverse rotation is performed using a phase difference between Phase A (Aϕ) and Phase B (Bϕ).

- When Phase B is 90° behind Phase A : Forward rotation
- When Phase B is 90° ahead of Phase A : Reverse rotation

1) Set at multiplication by 4

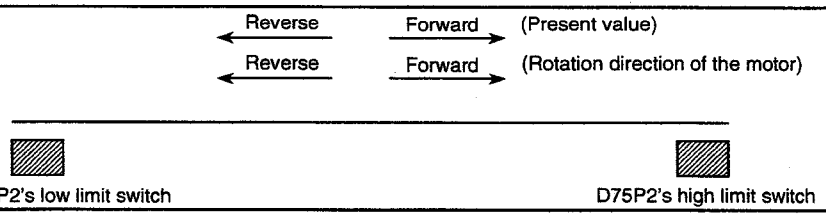
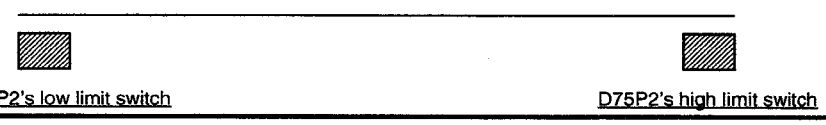


2) Set at multiplication by 1



10.1.4 Rotation direction setting

The rotation direction of a motor (forward rotation/reverse rotation) at the present-value increase is set.
The D75P2 uses the limit of present value in increase direction as the high limit and the limit in decrease direction as the low limit to perform an on/off check of the limit switch.
Therefore, the relationships of the motor's actual rotation directions and the locations of high/low limit switches are as shown in the figure below:

(Rotation direction setting)	Motor rotations and locations of external hardware stroke limits
Forward rotation	
Reverse rotation	

10.1.5 Speed limit value

(1) The maximum speeds of positioning operation (including home position return) and of manual pulse-generator operation are set.
(2) Even if the command speed and home position return speed in positioning operation are set to larger values than the speed limit value, the operation is still limited at the set speed limit value.
(3) Even if a speed change or override during positioning operation causes the set speed to be larger than the speed limit value, the operation is still limited at the set speed limit value.
The "speed control in-operation flag" of the axis monitor is turned on while the speed is limited by the speed limit value.
(4) At the point when the speed is limited, a "speed limit value exceeded" warning occurs.
(5) The speed during manual pulse-generator operation is not limited by the speed limit value.
(6) The speed limit value of the reference axis is used to limit the speed during linear-interpolation or circular-interpolation operation.
* During interpolation of axis 1 and axis 2, the speed is limited at the speed limit value of axis 1.

10.1.6 Acceleration time 0

For positioning operation, the time that takes to reach the speed limit value from speed 0 is set.

10.1.7 Deceleration time 0

For positioning operation, the time it takes to reach speed 0 from the speed limit value is set.

* See Section 7.9.1 for the relationships among the speed limit value, acceleration time and deceleration time.

10.1.8 Bias speed at start

This is to set the minimum start speed needed to start the rotation of the motor smoothly when using a stepping motor, etc..

* See Section 6.3.4 for the bias speed at start.

10.1.9 Stepping motor mode selection

The stepping motor mode is selected when controlling a stepping motor with the D75P2.
Also, this mode is selected for both of the two axes when performing interpolation control using a stepping motor and a servo motor.

* See Section 7.15 for restrictions when the stepping motor mode has been selected.

10.2 Extended Parameters

The extended parameters include those in the extended parameter 1 and the extended parameter 2.

Extended parameters

- Extended parameter 1
  - In the extended parameter 1, data such as backlash compensation and software stroke limit are set.
    Set the parameters at system start-up according to the system that uses the D75P2.
  - The values can be changed from the PC CPU regardless of the remote station ready signal being on or off. However, the changed data can only become valid when the remote station ready signal rises (OFF → ON).
    If the setting contents are rewritten while the remote station ready signal is on, turn the remote station ready signal on again after turning it off first.
- Extended parameter 2
  - In the extended parameter 2, data needed to make full use of the D75P2's functions are set.
    Set the parameters as necessary.
  - Operation is possible without changing the initial values set in the extended parameter 2.
  - The values can be changed from the PC CPU regardless of the remote station ready signal being on or off, and become valid immediately after the change.

Table 10.2 List of extended parameters

Extended parameter number	Item / Unit	Initial value	Setting range: Standard mode: mm	Setting range: Standard mode: inch	Setting range: Standard mode: degree	Setting range: Standard mode: pulse	
1	Backlash compensation	0	0 to 6553.5 µm	0 to 0.65535 inch	0 to 0.65535 degree	0 to 65535 pulses	
	Software stroke high limit value*	2147483647	-214748364.8 to 214748364.7 µm	-21474.83648 to 21474.83647 inches	0 to 359.99999 degrees	-2147483648 to 2147483647 pulses	
	Software stroke low limit value*	-2147483648	-214748364.8 to 214748364.7 µm	-21474.83648 to 21474.83647 inches	0 to 359.99999 degrees	-2147483648 to 2147483647 pulses	
	Software stroke limit selection	0	• 0: Applies software stroke limit to the present feed value • 1: Applies software stroke limit to the machine feed value				
	Software stroke limit valid/invalid setting for manual pulse-generator operation	0	• 0: Software stroke limit invalid during JOG operation and manual pulse-generator operation • 1: Software stroke limit valid during JOG operation and manual pulse-generator operation				
	Command in-position	100	0.1 to 3276700.0 µm	0.00001 to 327.67000 inches	0.00001 to 327.67000 degrees	1 to 32767 pulses	
	Torque limit setting value	300	1 to 500 %				
	M-code ON signal output timing	0	• 0: WITH mode • 1: AFTER mode				
	Speed change type	0	• 0: Standard speed switch mode • 1: Early speed switch mode				
	Interpolation speed specification	0	• 0: Synthesized speed • 1: Reference-axis speed				
	Present feed value update request specification during speed control	0	• 0: Does not update the present feed value during speed control • 1: Updates the present feed value during speed control • 2: Performs 0 clear on the present feed value during speed control				
	Manual pulse-generator selection	Axis 1: 1 Axis 2: 2	• 0: Manual pulse-generator operation disabled • 1: Uses manual pulse generator 2				
	Selection for pulse output logic to drive module	0	• 0: Positive logic • 1: Negative logic				
	Acceleration/deceleration time setting size selection	0	• 0: 1 word type (1 to 65535 ms) • 1: 2 word type (1 to 8388608 ms)				
2	Acceleration time 1 to 3	1000	1 to 65535 ms				
	Deceleration time 1 to 3	1000	1 to 65535 msec.				
	JOG speed limit value	20000	0.01 to 6000000.00 mm/min.	0.001 to 600000.000 inches/min.	0.001 to 600000.000 degrees/min.	1 to 1000000 pulses/sec.	
	JOG operation acceleration time select	0	0 to 3				
	JOG operation deceleration time select	0	0 to 3				
	Acceleration/deceleration processing selection	0	• 0: Trapezoid acceleration/deceleration processing • 1: S-curve acceleration/deceleration processing				
	S-curve ratio	100	1 to 100 %				
	Rapid-stop deceleration time	1000	1 to 65535 ms				
	Stop groups 1 to 3 rapid-stop selection	0	• 0: Normal deceleration stop • 1: Rapid stop				
	Positioning-complete signal output time	300	0 to 65535 ms				
	Allowable circular-interpolation error range	100	0 to 10000.0 µm	0 to 1.00000 inch	0 to 1.00000 degree	0 to 100000 pulses	
	External-positioning start selection	0	• 0: External-positioning start • 1: External-speed change request • 2: Skip request				

See Sections 8.5.3 and 8.5.4 for the buffer memory address and setting range of the extended parameter 1 and extended parameter 2.

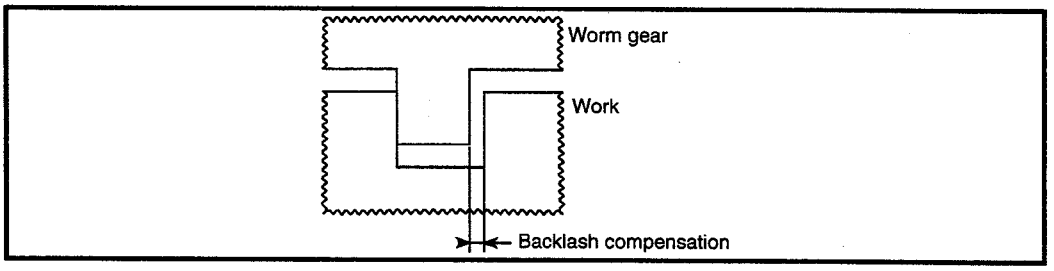
Remark

* : Control using initial values is not possible when the stepping motor mode is set.
Change the values to those within the stepping motor mode setting range.

					Remarks
	Stepping motor mode				
	mm	inch	degree	pulse	
	0 to 409.5 µm	0 to 0.4095 inch	0 to 0.04095 degrees	0 to 4095 pulses	
	-13421772.8 to 13421772.7 µm	-1342.17728 to 1342.17727 inches	0 to 359.99999 degrees	-134217728 to 134217727 pulses	
	-13421772.8 to 13421772.7 µm	-1342.17728 to 1342.17727 inches	0~359.99999 degrees	-134217728 to 134217727 pulses	
	0.1 to 204793.7 µm	0.0001 to 20.47937 inches	0.00001 to 20.47937 degrees	1 to 2047 pulses	
	0.01 to 375000.00 mm/min.	0.001 to 37500.000 inches/min.	0.001 to 37500.000 degrees/min.	1 to 62500 pulses/sec.	
	0 to 625.0 µm	0 to 0.06250 inch	0 to 0.06250 degree	0 to 6250 pulses	

10.2.1 Backlash compensation

(1) This sets the backlash amount (play) of the machine.



(2) Set the backlash compensation within the range of the following expression:

$$0 \leqq \frac{\text{Backlash compensation}}{\text{Travel increment per pulse}} \leqq 255 \text{ (rounded down below the decimal point)}$$

(3) If the backlash compensation is set, backlash compensation by the set amount is performed every time the positioning direction changes at positioning start.

10.2.2 Software stroke limit *

(1) The software stroke limit is the limit value of the machine's travel range set on the software.
  (a) Software stroke high limit value : High limit value of machine's travel range
  (b) Software stroke low limit value : Low limit value of machine's travel range
(2) When a command that exceeds the software stroke limit setting range is issued, positioning will not be performed in response to the command.
(3) Control using initial values is not possible when the stepping motor mode is set.
  Change the values to those within the stepping motor mode setting range.
(4) To disable the software stroke limit, set as "(software stroke high limit value) = (software stroke low limit value)."

10.2.3 Software stroke limit selection

Whether to apply the software stroke limit to the present feed value or machine feed value is set.

10.2.4 Software stroke limit valid/invalid setting

Whether the software stroke limit becomes valid or invalid during JOG operation and manual pulse-generator operation is set.

* See Section 7.4.2 for the software stroke limit.

10.2.5 Command in-position range

The position [(positioning address) - (present value)] at which the command in-position signal is turned on is set.

10.2.6 Torque limit

The torque limit value is set.

10.2.7 M-code ON signal output timing

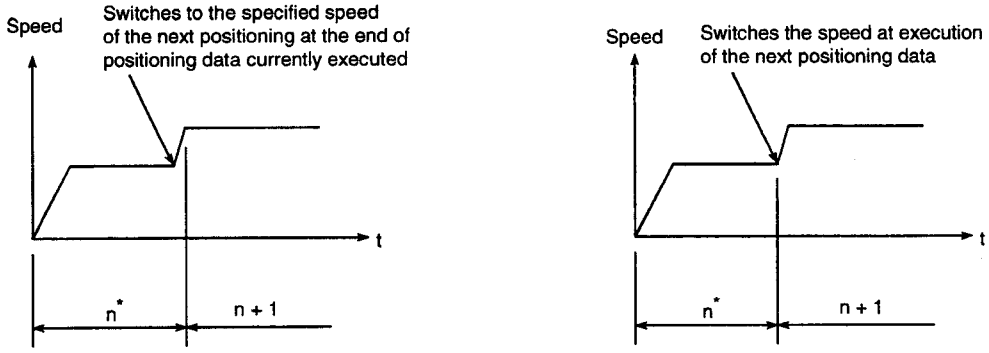
Whether to output the M-code ON signal in the WITH mode or AFTER mode is set.

- WITH mode : Sets the M code at positioning start, then turns on the M-code ON signal.
- AFTER mode : Sets the M code at positioning complete, then turns on the M-code ON signal.

10.2.8 Speed switch type

(1) Whether to perform a speed switch in the speed switch mode using the standard switch or early switch is set.
- Early switch : Switches the speed at the end of positioning data currently executed.
- Standard switch : Switches the speed at execution of the next positioning data.

(2) The speed switch at execution of positioning-data number n is shown below:



(a) Early switch (b) Standard switch

* See Section 6.2.3 for the speed switch parameters used at acceleration/deceleration.

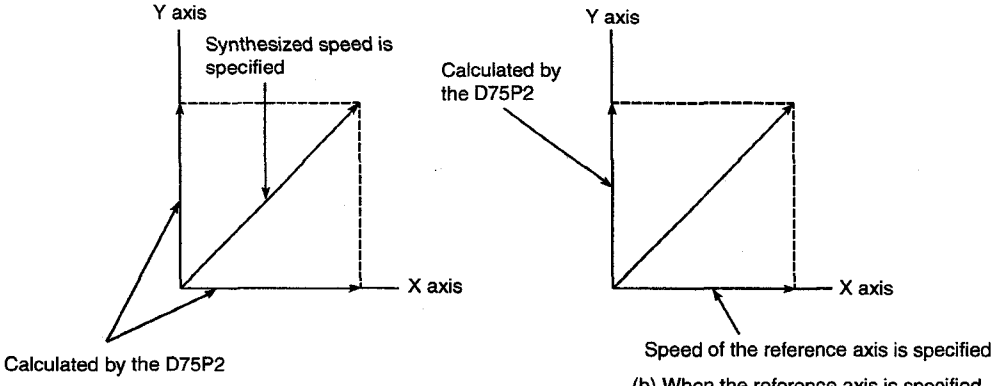
Remark

* : n indicates a positioning-data number.

10.2.9 Interpolation speed specification

(1) When performing linear interpolation/circular interpolation control, whether to specify the synthesized speed or reference-axis speed is set.

- Synthesized speed : Specifies the travel speed of the controlled system. The D75P2 calculates the speed of each axis.
- Reference-axis speed : Specifies the speed of the axis being set as a reference axis. The D75P2 calculates the speed of the other axis used for interpolation.



(a) When the synthesized speed is specified

(b) When the reference axis is specified (When X axis is the reference axis)

(2) In circular-interpolation operation, an error occurs when specified unit groups do not match, and positioning using the specified positioning data will not be performed.

Interpolation control	Speed specification	Execution of positioning	
		Unit groups match	Unit groups mismatch
Linear interpolation control	Synthesized speed specification	Allowed	Not allowed
	Reference-axis speed specification	Allowed	Not allowed
Circular-interpolation control	Synthesized speed specification	Allowed	Allowed
	Reference-axis speed specification	Not allowed	Not allowed

Point

When the speed calculated by the D75P2 exceeds the speed limit value during interpolation control, control is performed ignoring the speed limit value.

Therefore, when specifying an interpolation speed, pay attention to the items described below:

- When specifying the synthesized speed, specify the speed of each axis not to exceed the speed limit value.
- When specifying the reference-axis speed, set the longer axis as the reference axis. If the shorter axis is set as the reference axis, the speed of the longer axis may exceed the speed limit value.

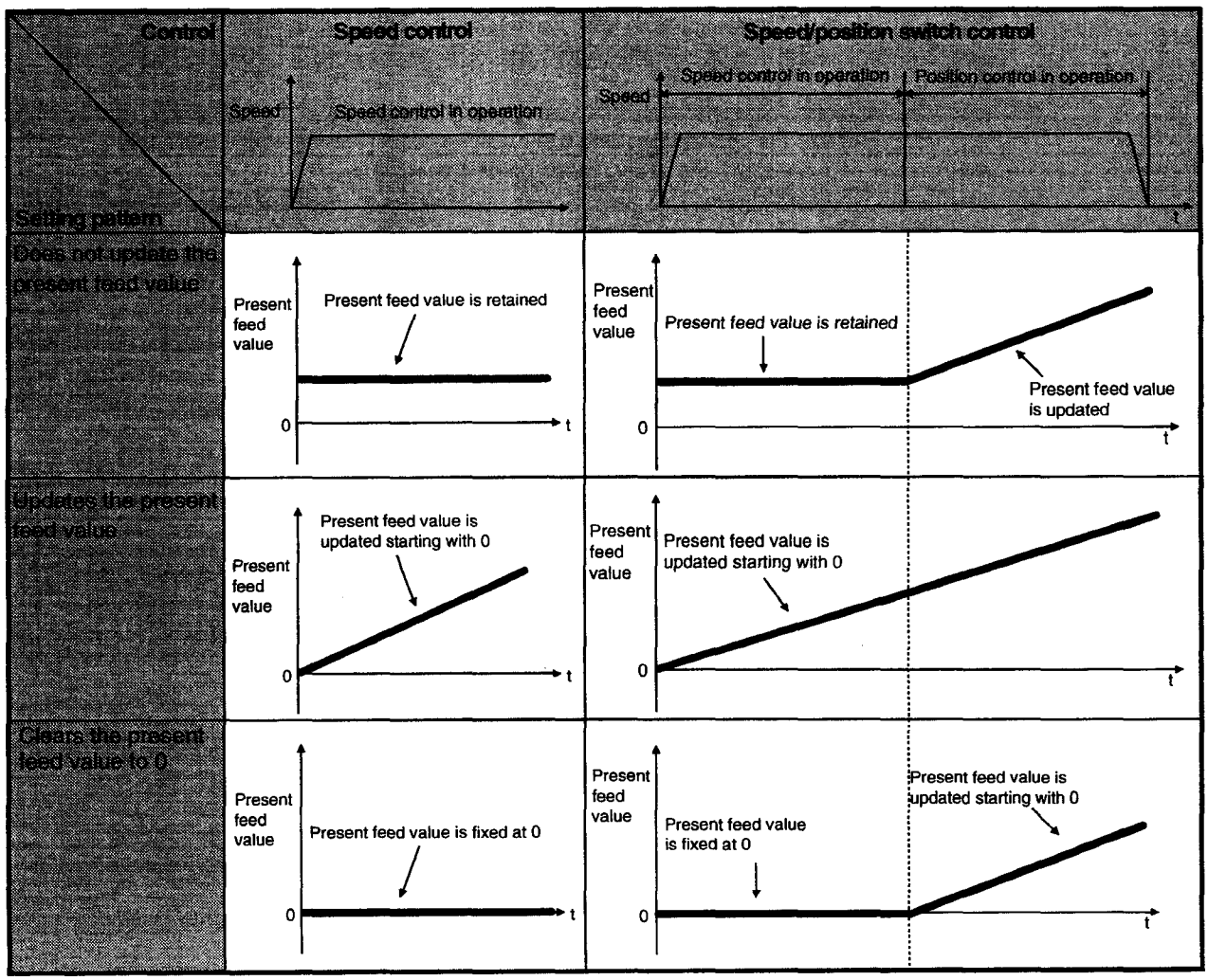
Remark

The unit groups are as follows.

- Group 1 : mm, inch
- Group 2 : degree
- Group 3 : pulse

10.2.10 Present feed value during speed control

The update pattern of the present feed value at execution of speed control and speed/position switch control is set.



10.2.11 Manual pulse-generator selection

Which one of the manual pulse generators connected to axis 1 and axis 2 is used for control is set.

- Manual pulse generator of axis 1 : Manual pulse generator 1
- Manual pulse generator of axis 2 : Manual pulse generator 2

10.2.12 Selection for pulse output logic to drive module

The logic that is appropriate for the pulse input logic of the drive module connected to the D75P2 is set.

10.2.13 Acceleration/deceleration time setting size selection

(1) Whether to use the 1-word type or 2-word type for the acceleration/deceleration time is set.
- 1-word type : Acceleration/deceleration time 1 to 65535 ms
- 2-word type : Acceleration/deceleration time 1 to 8388608 ms

(2) Setting the acceleration/deceleration time size causes the acceleration time 0 to 3, deceleration time 0 to 3 and rapid-stop deceleration time to be same as the acceleration/deceleration time size.

(3) When the acceleration/deceleration time setting size is changed from the 2-word type to 1-word type, verify whether the acceleration time 0 to 3, deceleration time 0 to 3 and rapid-stop deceleration time are within the setting range of the 1-word type.

(4) Use the 2-word type only when a sufficient travel increment can be provided and constant-speed travel is possible.
Do not use this type if the travel increment is extremely small, or when the speed is slow.

10.2.14 Acceleration time 1 to 3

The time that takes to reach the speed limit value from speed 0 during positioning operation is set. The operation at acceleration time 1 to 3 is the same as that at acceleration time 0 in the basic parameter 2.

* See Section 10.1.6 for the acceleration time 0.

10.2.15 Deceleration time 1 to 3

The time that takes to reach speed 0 from the speed limit value during positioning operation is set. The operation at deceleration time 1 to 3 is the same as that at deceleration time 0 in the basic parameter 2.

* See Section 10.1.7 for the deceleration time 0.

10.2.16 JOG speed limit value

(1) The maximum speed during JOG operation is set.

(2) Set a JOG speed limit value equal to or lower than the speed limit value.
If the JOG speed limit value exceeds the speed limit value, a setting range error occurs.

(3) If a value larger than the JOG speed limit value is set for JOG speed, the speed is limited by the JOG speed limit value.
- The "speed control in-operation flag" of the axis monitor is turned on while the speed is limited by the JOG speed limit value.
- At the point when the JOG speed is limited, a "JOG speed limit exceeded" warning occurs.

10.2.17 JOG operation acceleration/deceleration time selection

Which acceleration time between 0 and 3 is used for the acceleration time during JOG operation is set.

- Acceleration time 0 : Set by a basic parameter [See Section 10.1.6]
- Acceleration time 1 to 3 : Set by an extended parameter [See Section 10.2.14]

10.2.18 JOG operation deceleration time selection

Which deceleration time between 0 and 3 is used for the deceleration time during JOG operation is set.

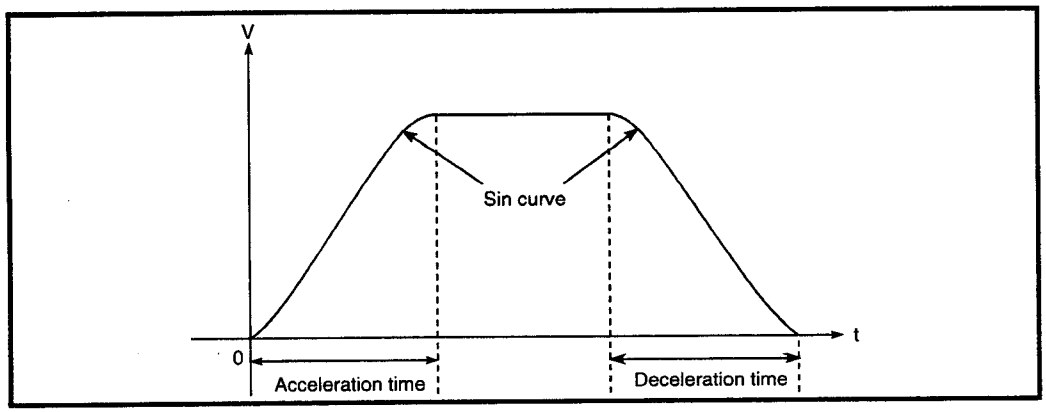
- Deceleration time 0 : Set by a basic parameter [See Section 10.1.7]
- Deceleration time 1 to 3 : Set by an extended parameter [See Section 10.2.15]

10.2.19 Acceleration/deceleration processing selection

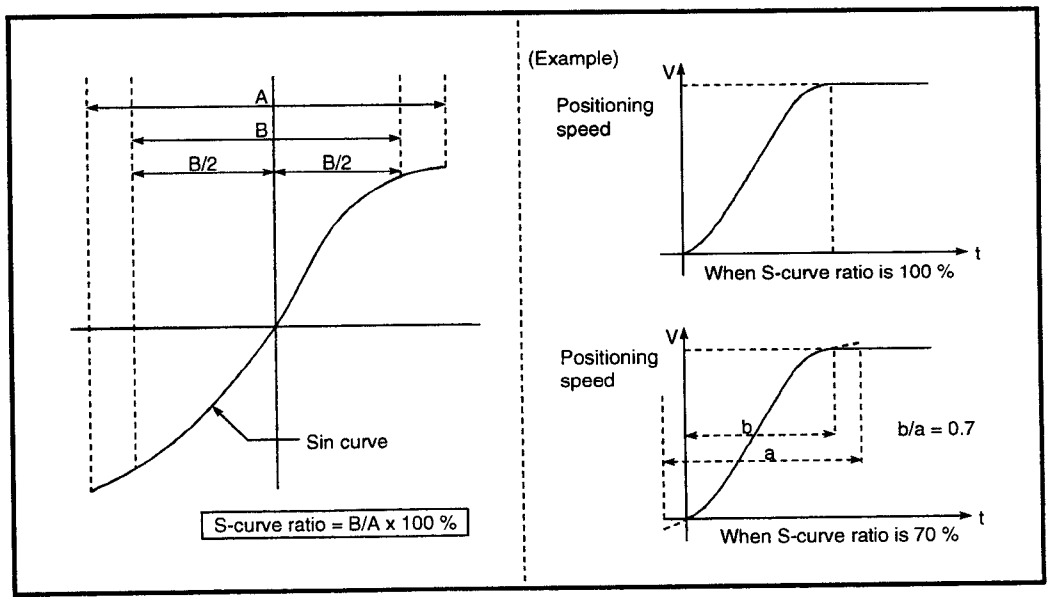
For acceleration/deceleration processing, whether to use trapezoid acceleration/deceleration processing or S-curve acceleration/deceleration processing is set.

10.2.20 S-curve ratio

The S-curve ratio used to perform S-curve acceleration/deceleration processing is set.
Setting the S-curve ratio makes the acceleration/deceleration processing gradual.
Setting a small S-curve ratio makes the curve closer to a straight line.
The S-curve acceleration/deceleration graph forms a Sin curve, as shown in the figure below:



The S-curve ratio sets which part of the Sin curve is used to draw an acceleration/deceleration curve, as shown in the figure below:



10.2.21 Rapid-stop deceleration time

(1) The time that takes to reach speed 0 from the speed limit value at rapid stop is set.
(2) Selecting an acceleration/deceleration time setting size determines whether the setting range is 1-word type (1 to 65535 ms) or 2-word type (1 to 8388608 ms).

10.2.22 Rapid-stop selection (Stop groups 1 to 3)

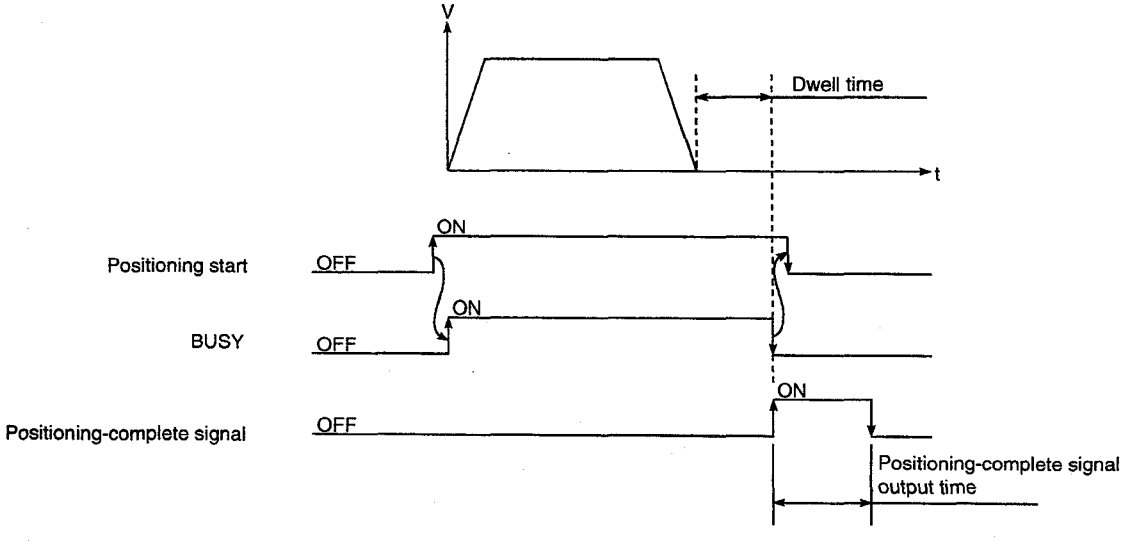
(1) Whether to perform normal deceleration stop or rapid stop is selected when a stop factor occurs. This setting is valid during positioning operation, home position return and JOG operation.

(2) Selecting the rapid stop performs rapid-stop deceleration when stop signals of stop groups 1 to 3 that correspond to the stop factors listed below is input:
- Stop group 1 : Stop due to the hardware stroke limit
- Stop group 2 : Stop due to the software stroke limit
  Stop due to a peripheral device
  Stop due to a remote ready signal being turned off
- Stop group 3 : Stop due to an external stop signal
  Stop due to a stop signal from the PC
  Stop due to an error (other than stop groups 1 and 2)

(3) Even if the "rapid-stop selection" setting is changed during rapid stop or deceleration, the rapid stop/deceleration stop is continued using the setting at the time of stop signal input.
(4) During linear interpolation/circular interpolation, stop or rapid stop is performed according to the rapid-stop selection setting of the axis at which a stop factor has occurred.

10.2.23 Positioning-complete signal output time

The output time of a "positioning-complete signal" that is output from the D75P2 is set.

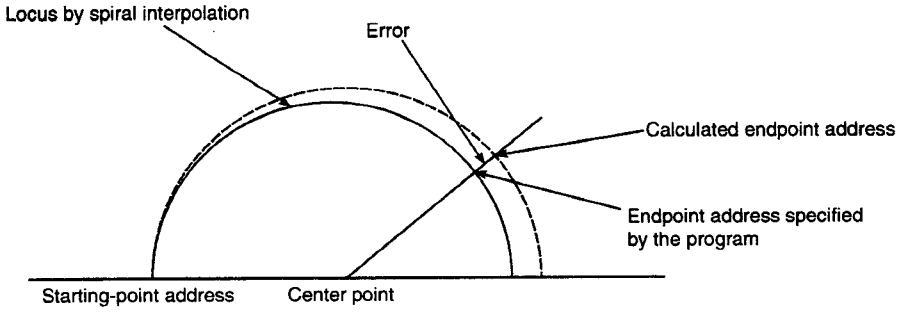


10.2.24 Allowable circular-interpolation error range

(1) In circular interpolation control by center specification, the locus of circular calculated from the starting-point address (current stop position) and center point (circular address) may be different from the endpoint address (positioning address).

(2) For the allowable circular-interpolation range, an allowable range for error between the calculated circular locus and endpoint address (positioning address) is set.
When the error between the calculated circular and endpoint address (positioning address) is within the setting range, circular interpolation to the set endpoint address (positioning address) is performed by error compensation using spiral interpolation.

(3) Set the allowable circular-interpolation range in axis 1's extended parameter 2.



10.2.25 External start function selection

With which function an external start signal is used is set.

(a) At external positioning start setting
- Positioning operation is started when an external start signal is input.

(b) At external speed change request setting
- The speed of the positioning operation currently executed is changed when an external start signal is input.
- When performing an external speed change, set a new speed value in the "new speed value" of axis control data.

(c) At skip request setting
- Skip operation for the positioning operation currently executed is performed when an external start signal is input.

10.3 Home Position Return Basic Parameters

Table 10.3 Home position return basic parameters

Item \ Unit	Initial value	Setting range				
		Standard mode				
		mm	inch	degree	pulse	
Home position return method	0	• 0: Near-point dog type • 1: Stopper stop 1) (by time out from the dwell timer) • 2: Stopper stop 2) (by zero signal at the time of contacting the stopper) • 3: Stopper stop 3) (no near-point dog method) • 4: Count type 1) (uses zero signal) • 5: Count type 2) (does not use zero signal)				
Home position return direction	0	• 0: Positive direction (address increase direction) • 1: Negative direction (address decrease direction)				
Home position address	0	-214748364.8 to 214748364.7 μm	-21474.83648 to 21474.83647 inches	0 to 359.99999 degrees	-2147483648 to 2147483647 pulses	
Home position return speed	1	0.01 to 6000000.00 mm/min.	0.001 to 600000.000 inches/min.	0.001 to 600000.000 degrees/min.	1 to 1000000 pulses/sec.	
Creep speed	1	0.01 to 6000000.00 mm/min.	0.001 to 600000.000 inches/min.	0.001 to 600000.000 degrees/min.	1 to 1000000 pulses/sec.	
Home position return retry	0	• 0: Does not perform home position return retry using the high/low limit switch • 1: Performs home position return retry using the high/low limit switch				

* When performing data-set type home position return on the absolute-position detection system, there is no need to change the initial values of the home position return parameters (as long as they are within the setting range).

* See Section 8.5.5 for the buffer memory address and setting range of the home position return basic parameters.

10.3.1 Home position return method

This parameter sets the home position return method used when performing home position return.
(See Section 5.5 for details on the home position return method.)

10.3.2 Home position return direction

This parameter sets the direction in which home position return is performed.
When home position return start is performed, the machine moves in the specified direction.

Important

(1) Home position return operation is controlled by two data, home position return direction and home position return speed, and deceleration is initiated when the near-point dog is turned on.
Therefore, be careful when setting the home position return direction since a wrong direction causes malfunction.

(2) When the home position return direction is not consistent every time, use the home position return retry function.
See Section 5.6 for details on the home position return retry function.

					Remarks
	Stepping motor mode				
	mm	inch	degree	pulse	
	-13421772.8 to 13421772.7 µm	-1342.17728 to 1342.17727 inches	0 to 359.99999 degrees	-134217728 to 134217727 pulses	
	0.001 to 37500.000 inches/min.	0.001 to 37500.000 degrees/min.	0.001 to37500.000 degrees/min.	1 to 62500 pulses/sec.	
	0.01 to 375000.00 mm/min.	0.001 to 37500.000 inches/min.	0.001 to 37500.000 degrees/min.	1 to 62500 pulses/sec.	

10.3.3 Home position address

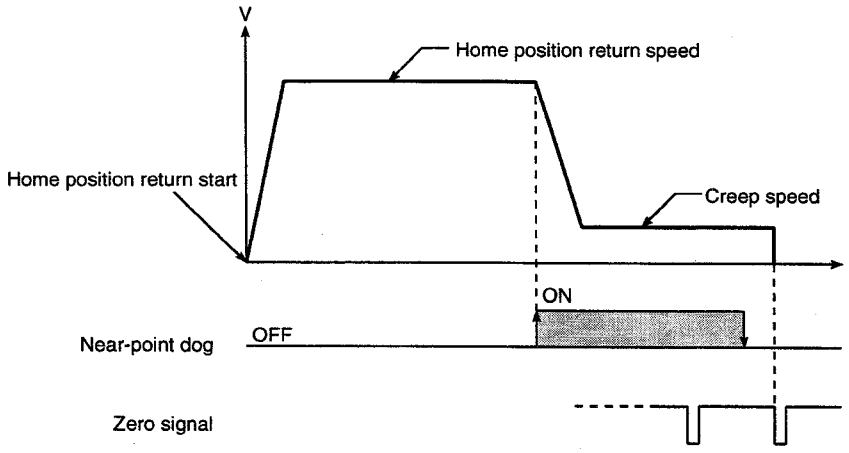
(1) This address sets the present value of home position when home position return is completed.
(2) The home position addresses set at the present feed value and machine feed value are stored when home position return is completed successfully.
(3) Even if the set home position address value is outside the software stroke limit range, no setting error/warning will occur.
For the home position address, verify the setting of the software stroke limit in the extended parameter 1, and set a value within the software stroke limit range.

10.3.4 Home position return speed

(1) This parameter sets the speed at home position return.
(2) Set a value equal to or lower than the speed limit value specified in the basic parameter 2.

10.3.5 Creep speed

(1) This parameter sets the creep speed (low speed immediately before the decelerated stop from the home position return speed) after the near-point dog is turned on.



(2) Set a value equal to or lower than the home position return speed.

(3) The creep speed is related to the detection error in the home position return method using zero signal, and the size of impact in the home position return method using stopper stop. Therefore, set the creep speed in consideration of the error range or size of impact.

10.3.6 Home position return retry

(1) This parameter sets whether or not to perform home position return retry using the high/low limit switch.

(2) If the home position return retry function is used, home position return can be initiated regardless of the machine position.

* See Section 5.6 for details on the home position return retry function.

Remark

To use the home position return retry function, an input to the D75P2 from the high/low limit switch is required.

10.4 Home Position Return Extended Parameters

Table 10.4 Home position return extended parameters

Item \ Unit	Initial value	Setting range				
		Standard mode				
		mm	inch	degree	pulse	
Home position return dwell time	0	0 to 65535 (ms)				
Travel increment setting after near-point dog ON	0	0 to 214748364.7 μm	0 to 21474.83647 inches	0 to 21474.83647 degrees	0 to 2147483647 pulses	
Home position return acceleration time selection	0	0 to 3				
Home position return deceleration time selection	0	0 to 3				
Home position shift amount	0	-214748364.8 to 214748364.7 μm	-21474.83648 to 21474.8364.7 inches	0 to 359.99999 degrees	-2147483648 to 2147483647 pulses	
Home position return torque limit value	300	1 to 300 (%)				
Home position shift speed specification	0	• 0: Home position return speed • 1: Creep speed				
Dwell time setting at home position return retry	0	0 to 65535 (ms)				

10.4.1 Home position return dwell time

(1) This parameter sets the time after the near-point dog is turned on until home position return is completed, when home position return by stopper stop 1) is used. Set a value equal to or longer than the time of travel from near-point dog ON to stopper stop.

(2) When setting other than stopper stop 1) is used, setting different values does not make any difference as long as they are within the setting range.

10.4.2 Travel increment setting after near-point dog ON

(1) This parameter sets the travel increment till home position after the near-point dog is turned on, when count-type home position return is set.

(2) After the near-point dog is turned on, the first zero point after travel increment by the set travel increment becomes the location of the home position.

(3) For the travel increment after near-point dog ON, set a value equal to or more than the distance of deceleration from the home position return speed to the creep speed.

10.4.3 Home position return acceleration time selection

This parameter sets which of the set acceleration time 0 to 3 is used as the acceleration time at home position return.

- Acceleration time 0 : Set by a basic parameter [See Section 10.1.6 for details.]
- Acceleration time 1 to 3 : Set by an extended parameter [See Section 10.2.14.]

10.4.4 Home position return deceleration time selection

This parameter sets which of the set deceleration time 0 to 3 is used as the deceleration time at home position return.

- Deceleration time 0 : Set by a basic parameter [See Section 10.1.7 for details.]
- Acceleration time 1 to 3 : Set by an extended parameter [See Section 10.2.15.]

10.4.5 Home position shift amount

This parameter sets the amount of shift from the detected zero signal to the location of the home position.

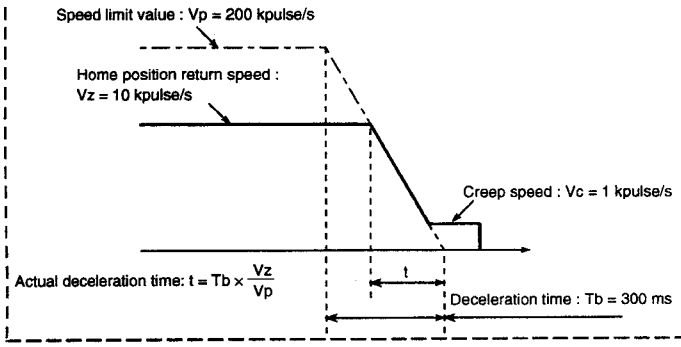
* See Section 5.7 for details on the home position shift function.

	Stepping motor mode				Remarks
	mm	inch	degree	pulse	
	0 to 13421772.7 μm	0 to 1342.17727 inches	0 to 1342.17727 degrees	0 to 134217727 pulses	
	-13421772.8 to 13421772.7 μm	-1342.17728 to 1342.17727 inches	0 to 359.99999 degrees	-134217728 to 134217727 pulses	

Example

When the speed limit value is set at 200 kpulses/s, home position return speed at 10 kpulses/s, creep speed at 1 kpulse/s and deceleration time at 300 ms, the travel increment after near-point dog is calculated as shown below:

[Home position return operation]



[Deceleration distance] $= \frac{1}{2} \times \frac{Vz}{1000} \times t$

..... Converted to the speed per 1 msec

$= \frac{Vz}{2000} \times \frac{Tb \times Vz}{VP}$

$= \frac{10 \times 10^3}{2000} \times \frac{3000 \times 10 \times 10^3}{2000 \times 10^3}$

$= 75$

↓

* Set 75 or a higher value for the travel increment after near-point dog ON.

10.4.6 Home position return torque limit value

(1) This parameter sets the value used to limit the torque of the servo motor at home position return after the creep speed is reached.
(2) For all home position return methods, torque control is performed using the set home position return torque limit value after the creep speed is reached.

Point

(1) A D/A converter module is required to perform torque control.
(2) When performing home position return by stopper stop 1), 2) or 3), be sure to set the home position return torque limit value.
(3) When torque control is not performed, setting different values does not make any difference as long as they are within the setting range.

10.4.7 Home position shift speed specification

This parameter selects whether the home position return speed or creep speed is used as the operation speed at home position shift.

- Home position return speed : Set by the home position return basic parameter [See Section 10.3]
- Creep speed : Set by the home position return basic parameter [See Section 10.3]

10.4.8 Dwell time at home position return retry

This parameter sets the dwell time at stop by high/low limit detection using the home position return retry function and stop by near-point dog OFF after reverse operation. (See Section 5.6)

11. Setting Positioning Data

11.1 What is Positioning Data?

The positioning data (data necessary to perform positioning control) includes the following:

- Data for positioning
  - Positioning data [See Section 11.2]
  - Positioning start information
    - Positioning start data [See Section 11.3.1]
    - Special start data [See Section 11.3.2]
    - Condition data [See Section 11.4]

(1) What is positioning data?

The positioning data is used to set the contents of individual positioning operations, such as the operation pattern or operation locus of positioning operation. Up to 600 items of positioning data can be set per axis.

* See Section 11.2, Positioning data.

(2) What is positioning start information?

The positioning start information is used to set the start order of block positioning, special starts such as conditional start, simultaneous start and repeat, as well as conditions for these settings.

* See Section 11.3, Positioning start information.

11.2 Positioning Data

(1) The positioning data is used inside the D75P2 when it performs positioning operation (excluding home position return, JOG operation, and manual pulse-generator operation).

(2) The positioning data includes positioning identifier, M code, dwell time, command speed, positioning address and circular address.
The positioning data is set for each axis.

(3) The range check of each set value of positioning data is performed at execution of each positioning. When the value is out of the range, an error occurs and positioning will not be executed.

Remark

See Section 6.1 for positioning data settings by positioning control method.

Table 11.1 Positioning data

Item	Unit	Initial value	Setting range: Standard mode: mm	inch	degree	pulse
Positioning identifier	Operation pattern	00	00: Positioning complete 01: Continuous positioning control 11: Continuous locus control			
	Control method	0	(see table below)			
	Acceleration time number	0	0 to 3			
	Deceleration time number	0	0 to 3			
Positioning address/ travel increment	Absolute	0	–214748364.8 to 214748364.7 (μm)	–21474.83648 to 21474.83647 (inches)	0 to 359.99999 (degrees)	–2147483648 to 2147483647 (pulses)
	Increment (other than speed/position switch control)	0	–214748364.8 to 214748364.7 (μm)	–21474.83648 to 21474.83647 (inches)	–21474.83648 to 21474.83647 (degrees)	–2147483648 to 2147483647 (pulses)
	Speed/position switch control	0	0 to 214748364.7 (μm)	0 to 21474.83647 (inches)	0 to 21474.83647 (degrees)	0 to 2147483647 (pulses)
Circular address	Absolute	0	–214748364.8 to 214748364.7 (μm)	–21474.83648 to 21474.83647 (inches)	0 to 359.99999 (degrees)	–2147483648 to 2147483647 (pulses)
	Increment				–21474.83648 to 21474.83647 (degrees)	
Command speed		0	0.01 to 600000.00 (mm/min.)	0.001 to 600000.00 (inches/min.)	0.001 to 600000.000 (degrees/min.)	1 to 1000000 (pulses/sec.)
			–1 (Current speed: The same speed as the immediately preceding positioning-data number)			
Dwell time	Dwell time	0	0 to 65535 (ms)			
	Jump destination data number *		1 to 600			
M code	M code	0	0 to 32767			
	Condition data number *		0 to 10			

Display on peripheral device	Set data	Instruction code
ABS line 1	• Single-axis linear control (absolute method)	01H
INC line 1	• Single-axis linear control (increment method)	02H
Fixed-dimension feed 1	• Single-axis fixed-dimension feed control	03H
ABS line 2	• Dual-axis linear interpolation control (absolute method)	04H
INC line 2	• Dual-axis linear interpolation control (increment method)	05H
Fixed-dimension feed 2	• Fixed-dimension feed control by dual-axis linear interpolation	06H
ABS circular interpolation	• Circular interpolation control by auxiliary-point specification (absolute method)	07H
INC circular interpolation	• Circular interpolation control by auxiliary-point specification (increment method)	08H
ABS circular clockwise	• Circular interpolation control by center-point specification (absolute method, clockwise)	09H
ABS circular counterclockwise	• Circular interpolation control by center-point specification (absolute method, counterclockwise)	0AH
INC circular clockwise	• Circular interpolation control by center-point specification (increment method, clockwise)	0BH
INC circular counterclockwise	• Circular interpolation control by center-point specification (increment method, counterclockwise)	0CH
Forward rotation speed control	• Speed control (forward rotation)	0DH
Reverse rotation speed control	• Speed control (reverse rotation)	0EH
Forward rotation speed/position	• Speed/position switch control (forward rotation)	0FH
Reverse rotation speed/position	• Speed/position switch control (reverse rotation)	10H
Present-value change	• Present value change	11H
JUMP instruction	• JUMP instruction	20H

* : Shows the setting data for the JUMP instruction.

	Stepping motor mode				Remarks
	mm	inch	degree	pulse	

11.2.1 Operation pattern

Set the pattern of positioning operation.

- Positioning complete (individual positioning) : After positioning using the specified positioning data is executed → completed, operation stops.
- Continuous positioning : After positioning using the specified positioning data is executed → completed, operation is paused, then positioning is continued using the next positioning-data number.
- Continuous locus control : After positioning using the specified positioning data is executed → completed, positioning is continued without pause using the next positioning-data number.

* See Section 6.2 for details on operation patterns.

11.2.2 Control method

Set the control method used when performing positioning control.

* See Section 6.1 for details on each control method.

11.2.3 Acceleration time number

Set which of the acceleration time 0 to 3 set by a basic parameter or extended parameter is used as the acceleration time.

- Acceleration time 0 : Set by a basic parameter (See Section 10.1.6)
- Acceleration time 1 to 3 : Set by an extended parameter (See Section 10.2.14)

11.2.4 Deceleration time number

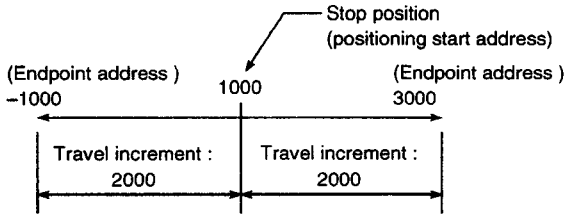
Set which of the deceleration time 0 to 3 set by a basic parameter or extended parameter is used as the deceleration time.

- Deceleration time 0 : Set by a basic parameter (See Section 10.1.7)
- Deceleration time 1 to 3 : Set by an extended parameter (See Section 10.2.15)

11.2.5 Positioning address/travel increment

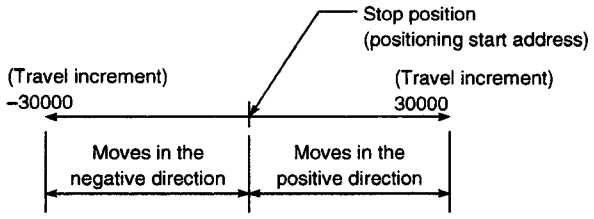
(1) Absolute (ABS) method

- Set the positioning address (endpoint address) for the ABS method using the absolute address (address from home position).



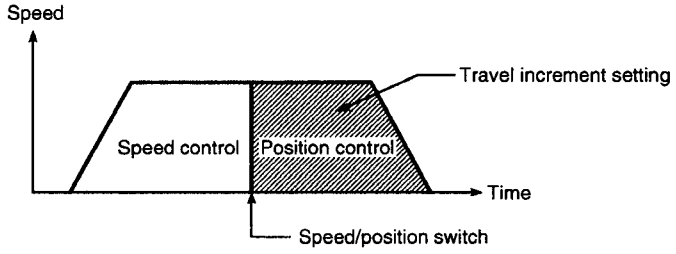
(2) Increment (INC) method

- Set the travel increment for the INC method.
- The travel direction is specified using a sign.
  When the travel increment is positive : Positive direction (address increase direction)
  When the travel increment is negative : Negative direction (address decrease direction)



(3) Speed/position switch control

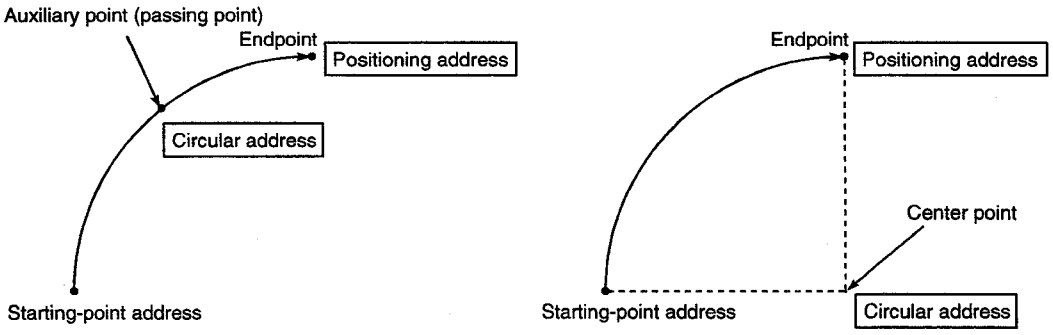
- Set the travel increment applied after switching from speed control to position control.



11.2.6 Circular address

The circular address is data needed only when circular interpolation control is performed.

- Auxiliary-point specification: Set the auxiliary point (passing point) for circular interpolation.
- Center-point specification: Set the center point of the circular for circular interpolation.



(a) Circular interpolation by auxiliary-point specification (b) Circular interpolation by center-point specification

11.2.7 Command speed

(1) Set the command speed at execution of positioning.

(2) If the set command speed exceeds the speed limit value, positioning is performed using the speed limit value.

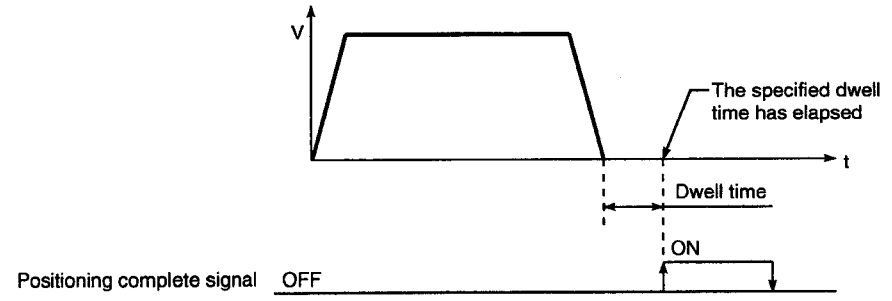
(3) If "–1" is set for the command speed, positioning control is performed using the current speed (same speed as the immediately preceding positioning speed). *
However, if, at positioning start, speed "–1" is set for the first positioning data subject to positioning control, no speed setting error occurs and positioning will not start.

Remark

* : The current speed is used when uniform-speed control is performed.
When the current speed is specified for uniform-speed control, if the speed of the positioning-data number specified at positioning start is changed, any positioning-data number being specified to the current speed can be controlled at the specified speed.

11.2.8 Dwell time

(1) When the operation pattern is positioning complete, set the delay time until a positioning complete signal is output.



(2) When the operation pattern is continuous positioning, set the delay time until the next positioning control is performed, after positioning is completed.

(3) When the operation pattern is continuous locus control, control is performed using 0 (ms) even if a dwell time is set.

11.2.9 Jump destination data number

(1) Set the jump destination positioning-data number used when executing a JUMP instruction.

(2) As the jump destination data number, set a positioning-data number other than itself.
For example, when setting a JUMP instruction at positioning-data number 6, any number other than positioning-data number 6 can be specified as the jump destination data number.

11.2.10 M code

(1) Set the M code to be stored in the buffer memory for storing M code during positioning control. During interpolation operation, the M code is stored only in the reference axis.

(2) Set "0" if outputting no M code.

(3) To set the M-code output timing, use the extended parameter "M-code ON signal output timing."
* See Section 10.2.7 for M-code ON signal output timing.

11.2.11 Condition data number

(1) Set conditions to execute a JUMP instruction.
- 0 specifies an unconditional JUMP instruction.
- 1 to 10 indicates the condition data number to be used for block start.

(2) For JUMP instructions, all but "simultaneous start" can be specified among the condition data that can be specified with block start. (See Section 11.4)

11.3 Positioning Start Information

As positioning start information, positioning start data, special start data and parameters are specified. Up to 50 points (1 to 50) of positioning start information can be set for each axis.

Table 11.2 List of positioning start information

Item		Setting range	Initial value
Positioning start data	Type	• 0: End • 1: Continue	End
	Data number	1 to 600	0
Special start data	Start pattern		Normal start
	Parameter		0

Start pattern	Setting parameter
0: Normal start	—
1: Conditional start 2: Wait start 3: Simultaneous start	Condition data number : 1 to 10
4: Stop start	—
5: FOR loop	Number of repetitions : 0 to 255
6: FOR condition	Condition data number : 1 to 10
7: NEXT start	—

11.3.1 Positioning start data

(1) Type

Set whether to terminate positioning start control at a specified point, or to perform positioning start for the next pointer. Any data number that is set after the point for which termination is set will not be executed.

End : Positioning ends when the execution of positioning control for the specified point is completed.

Continue : Positioning control for the next point is performed when the execution of positioning control for the specified point is completed.

(2) Data number (positioning-data number)

Set the data number used to perform positioning control.

When data numbers are set at multiple points, positioning control is performed in the order the points have been specified in the buffer memory used for setting "positioning start point numbers." *

Remark

*: The addresses of the buffer memories for setting positioning start point numbers are as follows:

Axis number	Axis 1	Axis 2
Buffer memory for setting positioning start point number	1178	1228

11.3.2 Special start data

(1) Start pattern

Set the start pattern used at positioning start.
The start pattern is selected from the eight patterns of (a) through (h) listed below:

Start pattern	Overview of start
(a) Normal start	• Executes the positioning-data number of the same point.
(b) Conditional start	1) Performs condition judgment for the specified condition data number, and executes start only when the condition is satisfied. • When the condition is satisfied : Starts the start data number of the same point. • When the condition is not satisfied : Performs condition judgment for the next point. 2) When the condition data number setting is out of range, an error occurs at execution of the positioning-data number, and positioning control will not be performed.
(c) Wait start	1) Performs condition judgment for the specified condition data number, and will not start the start data number of the same point until the condition is satisfied. 2) When the condition is satisfied, the start data number of the same point is started. 3) When the condition data number setting is out of range, an error occurs at execution of the positioning-data number, and positioning control will not be performed.
(d) Simultaneous start	1) Simultaneous start of 2 axes is performed at a pulse output level. (The axes to perform simultaneous start for are set in the condition data number specified by a parameter.) 2) At simultaneous start, an error occurs and the positioning-data number will not be executed if any of the following cases exists: • The counter-party axis is busy (BUSY). • The same axis is set in a parameter. • No counter-party axis is set in a parameter.
(e) Stop start	1) Stops positioning operation. 2) Restarting executes the positioning-data number of the same point.
(f) FOR loop	1) A FOR to NEXT loop is repeated for the number of repetitions set by a parameter. The start data number of the same point is started at the beginning of repeat processing. 2) When 0 is set for the number of repetitions, an infinite loop will be created. 3) If there is no NEXT after FOR, repeat processing will not be performed although no error occurs.
(g) FOR condition	1) Performs condition judgment for the condition data number specified by a parameter, and repeatedly executes FOR to NEXT until the condition is satisfied. 2) If there is no NEXT after FOR, repeat processing will not be performed although no error occurs.
NEXT	1) Represents the end of repetition. 2) Returns to the beginning of the FOR to NEXT loop. 3) In the case of FOR (count), the number of repetitions is reduced at a decrement, and when the count becomes 0, the loop is terminated after positioning of the same point has been executed. 4) If NEXT is executed before FOR is executed, the same processing as normal start is performed.

* The range check of start conditions set for special start and of each parameter are performed when the specified data number is executed.
If any start condition or parameter is out of its setting range, positioning control will not be performed.

(2) Parameter

The start condition parameter is set when setting "conditional start," "wait start," "simultaneous start," "FOR loop," and "FOR condition" as the start pattern for special start. [See Section 11.3.2]

Start pattern	Setting parameter
0: Normal start	—
1: Conditional start 2: Wait start 3: Simultaneous start	Condition data number : 1 to 10
4: Stop start	—
5: FOR loop	Number of repetitions : 0 to 255
6: FOR condition	Condition data number : 1 to 10
7: NEXT start	—

(a) Condition data number : Specify the condition data number with which the condition data used by conditional start, wait start, simultaneous start, or FOR condition was set.
(See Section 11.4 for the condition data.)

(b) Number of repetitions : Set the number of repetitions of the FOR loop to NEXT instruction.

Point

FOR to NEXT loop processing

Nesting is not allowed in a FOR to NEXT loop.
If nesting is performed in a FOR to NEXT loop, a warning occurs.

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 NEXT specified by points 7 and 9 is FOR at point 4.
When NEXT specified by point 9 is executed, a warning will occur.

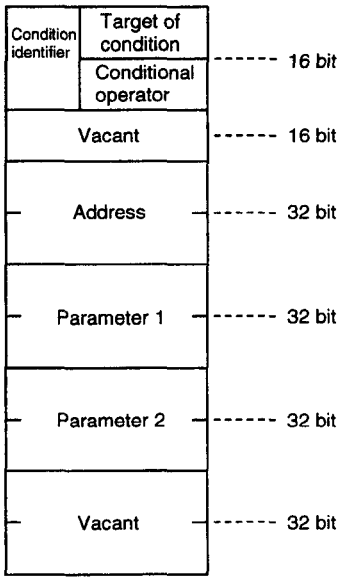
11.4 Condition Data

(1) The condition data includes the following applications:
- Condition judgment when performing a special start of block start
- Condition judgment of a JUMP instruction execution

(2) Using condition data, ten items of data, corresponding to condition data numbers 1 to 10, can be created in the buffer memory.
- Axis 1: Buffer memory address 4400 to 4499
- Axis 2: Buffer memory address 4650 to 4749

(3) One condition data is comprised of a condition identifier and three parameters (address, parameter 1, and parameter 2).

Configuration of condition data



(4) The range check for each parameter of condition data is performed at execution of the positioning-data number.
When any parameter setting of condition data is out of range, an error occurs and positioning will not be executed.

11.4.1 Condition identifier

The condition identifier includes a condition target and a conditional operator used to perform condition judgment.

(1) Condition target

The target to perform condition judgment is set in the condition target.
The condition targets include five types listed below:

	Instruction code
Device RX (RXn0 to RX(n+7)E)*	01H
Device RY (RY(n+1)0 to RY(n+7)E)*	02H
Buffer memory (16 bit)	03H
Buffer memory (32 bit)	04H
Positioning-data number	05H

Point

*: Device RX/RY uses remote I/O signals of the D75P2 (excluding the use-prohibited area). Any remote I/O signals not belonging to the D75P2 cannot be used.

(2) Conditional operator

The operation method by the condition target is set in the conditional operator.
The conditional operators include 14 types listed below:

Conditional operator		Relationship between condition target and parameter	Instruction code	Possible condition target
Normal operator	=	n = (parameter 1)	01H	Buffer memory (16/32 bit)
	≠	n ≠ (parameter 1)	02H	
	≤	n ≤ (parameter 1)	03H	
	≥	n ≥ (parameter 1)	04H	
Range operator	Range specification 1	(parameter 1) ≤ n ≤ (parameter 2) *1	05H	Buffer memory (16/32 bit)
	Range specification 2	n ≥ (parameter 1), n ≥ (parameter 2)	06H	
Bit operator	ON	Parameter 1 ON	07H	Device RX
	OFF	Parameter 1 OFF	08H	Device RY
Simultaneous start	Axis specification	Axis 1 specification	09H	Positioning-data number
		Axis 2 specification	0AH	
		Axes 1 and 2 specification	0BH	

Remark

*1: With range specification 1, an error occurs when (parameter 1) > (parameter 2).

11.4.2 Address

(1) The address specifies the buffer memory address used when the conditional operator is a "normal operator" or "range operator."
Condition judgment uses the value in the buffer memory specified by the address, and values of parameter 1 and parameter 2.

(2) The address is not used when the condition target is "device RX," "device RY," or "positioning-data number."

11.4.3 Parameter 1

(1) Parameter 1 is data which is set when the conditional operator is a "normal operator," "range operator," "bit operator," or "positioning-data number."

(2) The data to be set varies depending on the operator used.

Condition target	Normal operator/range operator	Bit operator
Device RX	—	Bit number
Device RY	—	Bit number
Buffer memory (16 bit)	Numeric value	—
Buffer memory (32 bit)	Numeric value	—

When the conditional operator is for "simultaneous start," the positioning-data number of the counter-party axis that performs simultaneous start is set. [See Section 11.4.5]

11.4.4 Parameter 2

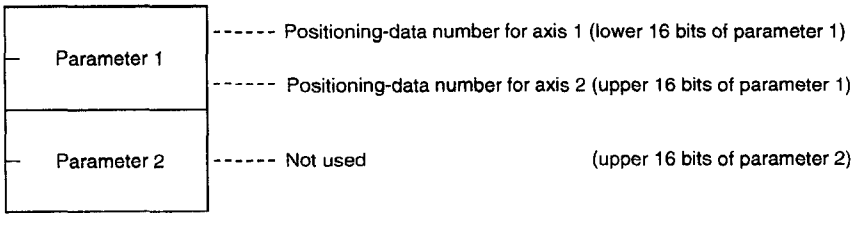
(1) Parameter 2 is used to set data necessary for the conditional operator.

(2) Only numeric value data can be set in the parameter 2.
When the conditional operator is for "simultaneous start," the positioning-data number of the counter-party axis that performs simultaneous start is set. [See Section 11.4.5]

11.4.5 Parameter 1 and parameter 2 settings for simultaneous start

(1) When the conditional operator is for simultaneous start, the positioning-data number of the axis that performs simultaneous start is set, using parameter 1 and parameter 2.

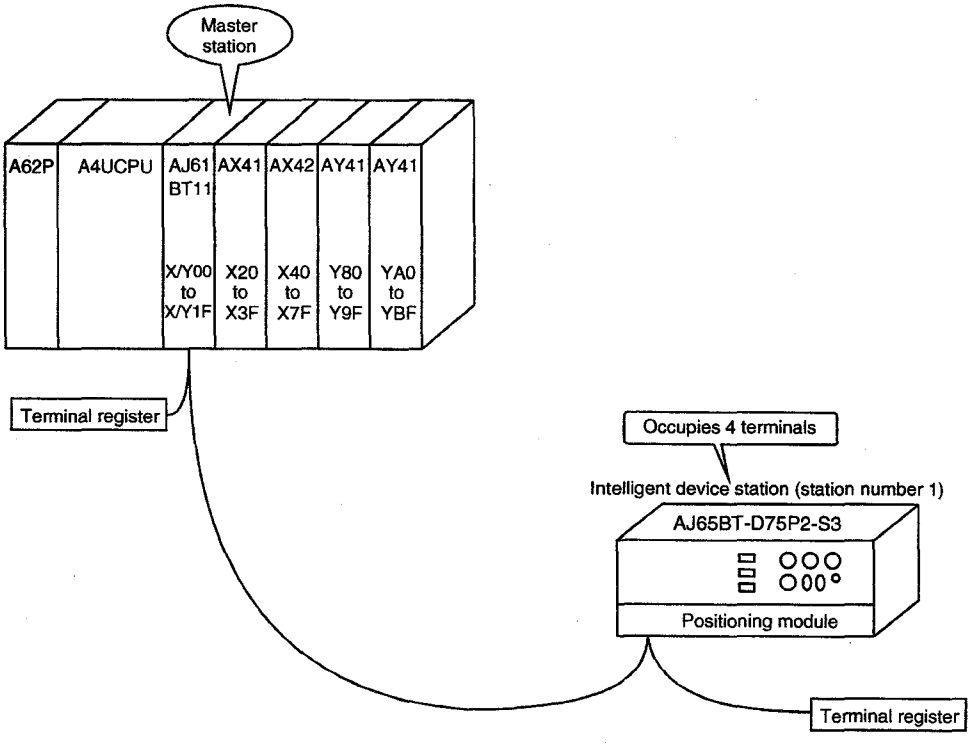
(2) Set positioning-data numbers for axis 1 and axis 2 as shown below:
(The area used by axis 1 and axis 2 are fixed.)



12. Building a System

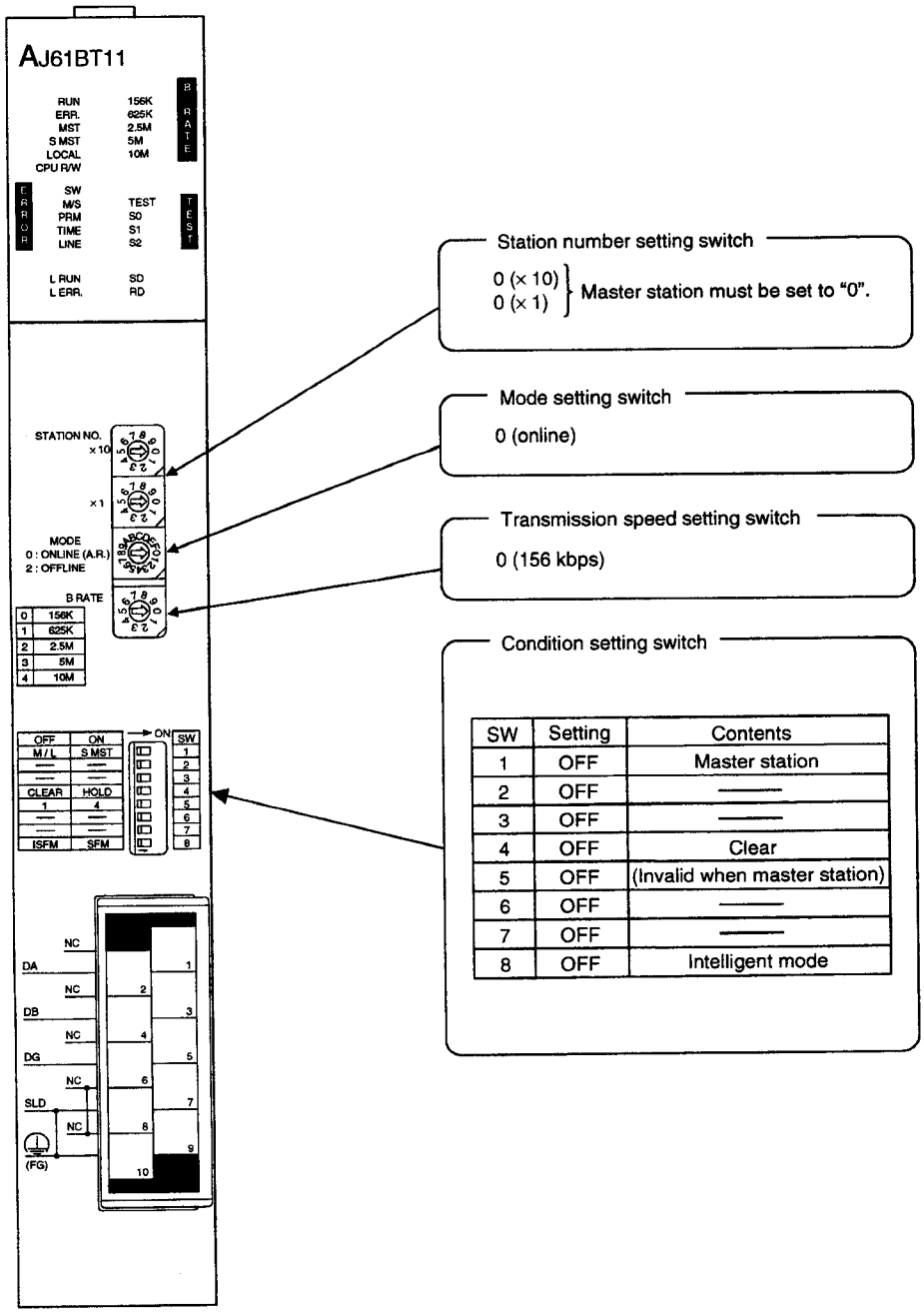
12.1 Overview

Assume a system consisting of a master station and the D75P2 being connected.



12.2 Master Station Settings

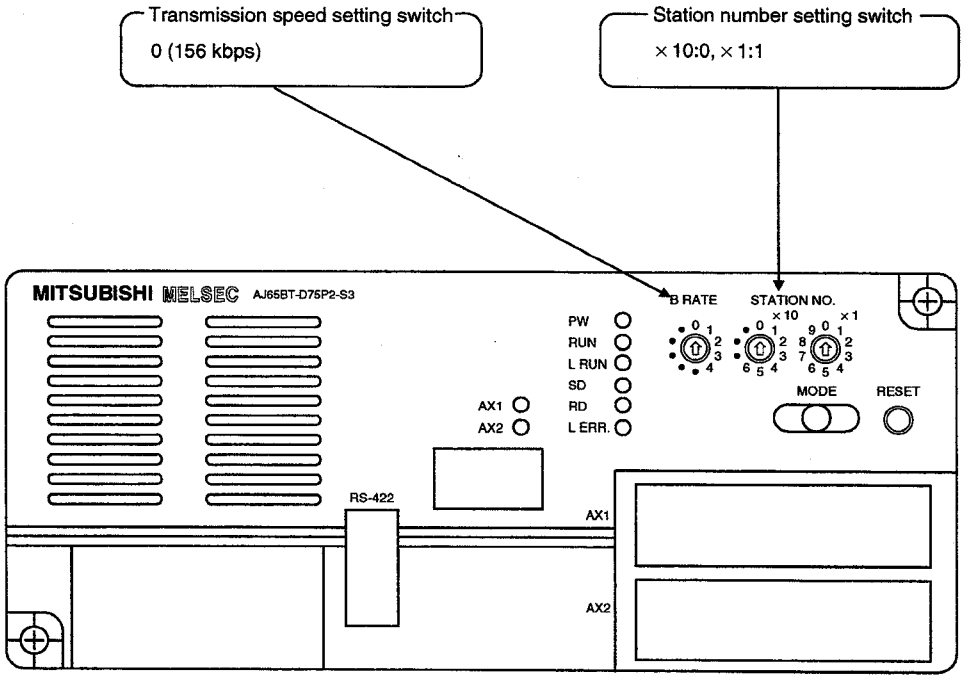
Settings of master station switches are shown below:



SW	Setting	Contents
1	OFF	Master station
2	OFF	———
3	OFF	———
4	OFF	Clear
5	OFF	(Invalid when master station)
6	OFF	———
7	OFF	———
8	OFF	Intelligent mode

12.3 D75P2 Settings

Settings of D75P2 switches are shown below:



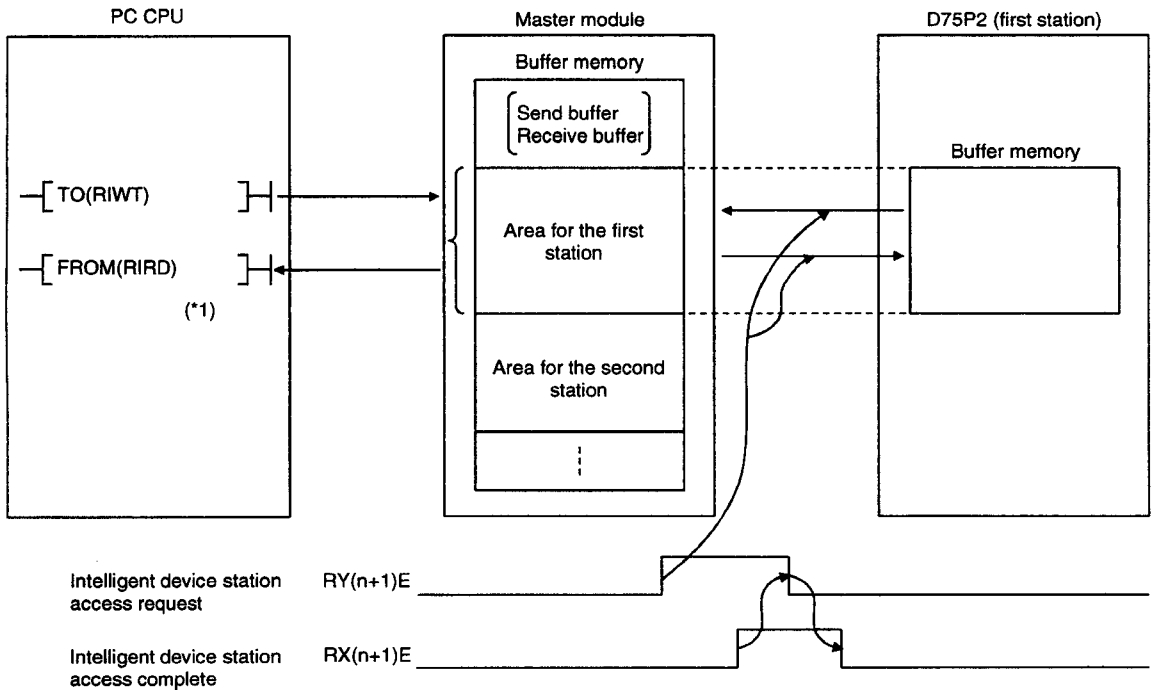
12.4 Concept of Transient Transmission

This section explains reading/writing to the buffer memory of the D75P2 using transient transmission.

12.4.1 Read/write of the buffer memory

Read/write of the D75P2 buffer memory is performed from the PC CPU using the following buffer memory and RX/RY signals.

- The send buffer and receive buffer of the buffer memory of the master module
- RX/RY signals (RX(n+1)E/RY(n+1)E) between the D75P2 and the master module



*1 When performing read/write of the send buffer/receive buffer of the master module from the PC CPU, it is necessary to switch the bank (bank 1) of the buffer memory of the master module. However, when using dedicated instructions RIWT/RIRD, bank switching is performed automatically via the dedicated instruction.
For details on dedicated instructions, see the AnSHCPU/AnACPU/AnUCPU Programming Manual (Dedicated Instruction Volume) or the QnACPU Programming Manual (Special Function Module Volume).

Before starting data link, it is possible to read from or write to the buffer memory of the D75P2 by assigning a send buffer or receive buffer to the buffer memory of the master module.
See Section 12.4.3 for details on buffer memory assignment.
There are no assignments for the D75P2 side.

Data is read and written using the send and receive buffers in the following manner:

- When writing data to the D75P2 buffer memory
  The control data for write request and data to be written to the buffer memory of the D75P2 are specified from the PC CPU to the send/receive area of the master module.
  By turning on the intelligent device station access request signal (RY(n+1)E), the data is written to the specified buffer memory of the corresponding intelligent device station.
  When write is complete, the intelligent device station access complete signal (RX(n+1)E) will turn on.
- When reading data from the D75P2 buffer memory
  The control data for read request is specified from the PC CPU to the send/receive area of the master module.
  By turning on the intelligent device station access request signal (RY(n+1)E), the data is read to the send/receive area of the buffer memory of the master module from the specified buffer memory of the corresponding intelligent device station.
  When read is complete, the intelligent device station access complete signal (RX(n+1)E) will turn on.

12.4.2 Transient transmission

The initial setting procedure for the D75P2 when performing transient transmission is shown below. Perform the following settings before data link is started.

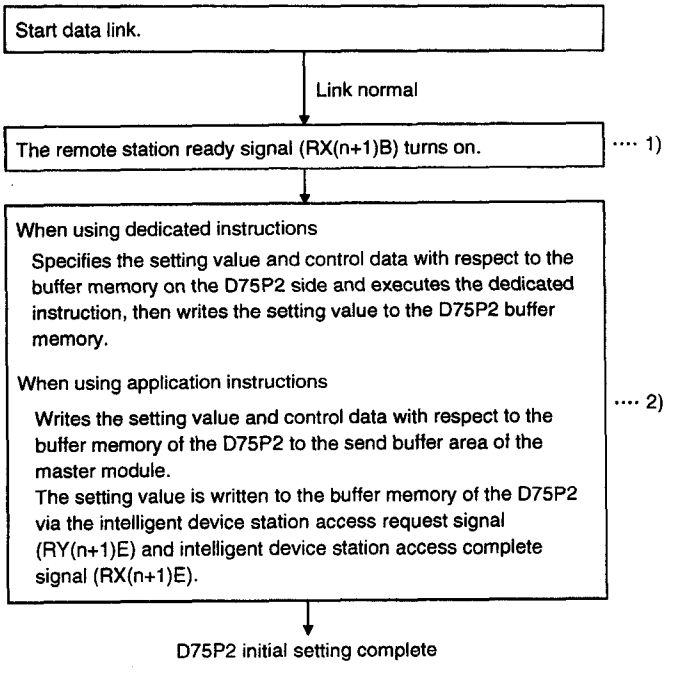
(1) Master module side

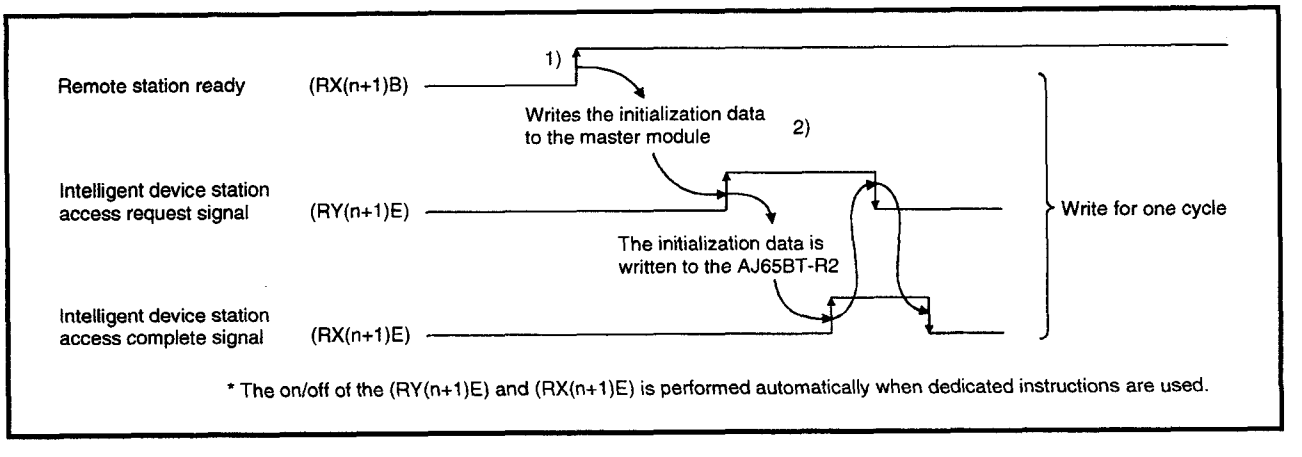
Reserve enough send buffer area and receive buffer area in the master module buffer memory for the data to be used for read/write instructions with respect to the D75P2 buffer memory area (control data, send data, etc.).

(2) D75P2 side

There are no settings.

(Procedure)





12.4.3 Control data/send data setting procedures

This section explains the procedures for setting control data and send data when reading/writing the D75P2 buffer memory.

Point

(1) This example illustrates reading from and write to the CPU with respect to a certain portion of the D75P2 buffer memory.

(2) Change the applicable address when performing read and write with respect to the buffer memory area other than those specified in this section.

(3) The buffer memory of the master module (AJ61BT11/A1SJ61BT11) is divided into three banks, each starting from address 0.

- Bank 0 : Parameter information area to link special register (SW)
- Bank 1 : Area used for reading or writing of the buffer memory of the intelligent device station using the send buffer/receive buffer.
- Bank 2 : Use prohibited with the D75P2.

Switch to the applicable bank using the output signals (Y1C, Y1D) before read/write of the buffer memory is performed.
For details, see the master module user's manual. Bank switching is not necessary for the master module (AJ61QBT11/A1SJ61QBT11), since there is only one area.

The following are assumed in the explanations:

- The send buffer and receive buffer assignments are 64 words (40H) each.
- The send buffer and receive buffer on the master module side for reading/writing to the D75P2 buffer memory are in the following range:

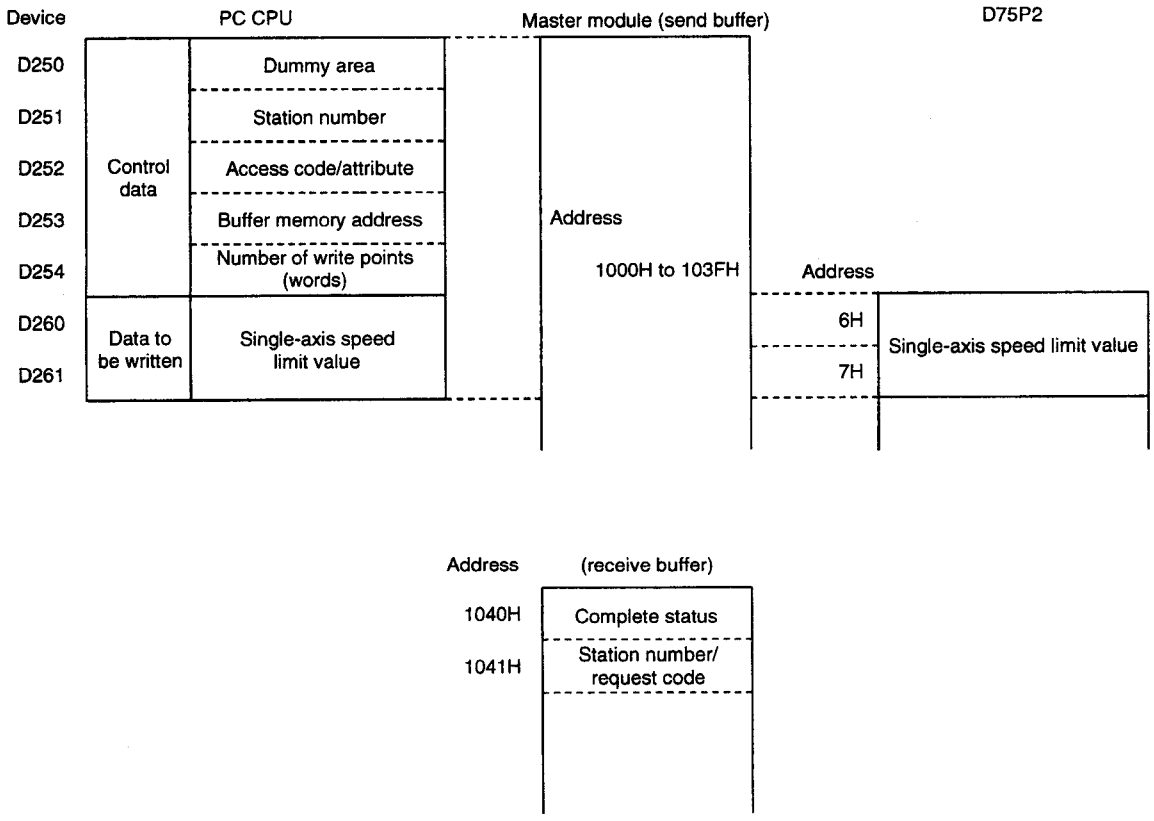
  Send buffer address : 00H to 3FH of bank 1 (for 64 words (40H))
  Receive buffer address : 40H to 7FH of bank 1 (for 64 words (40H))

(1) Writing to the buffer memory

Data is written using dedicated instruction (RIWT) or application instruction (T0).

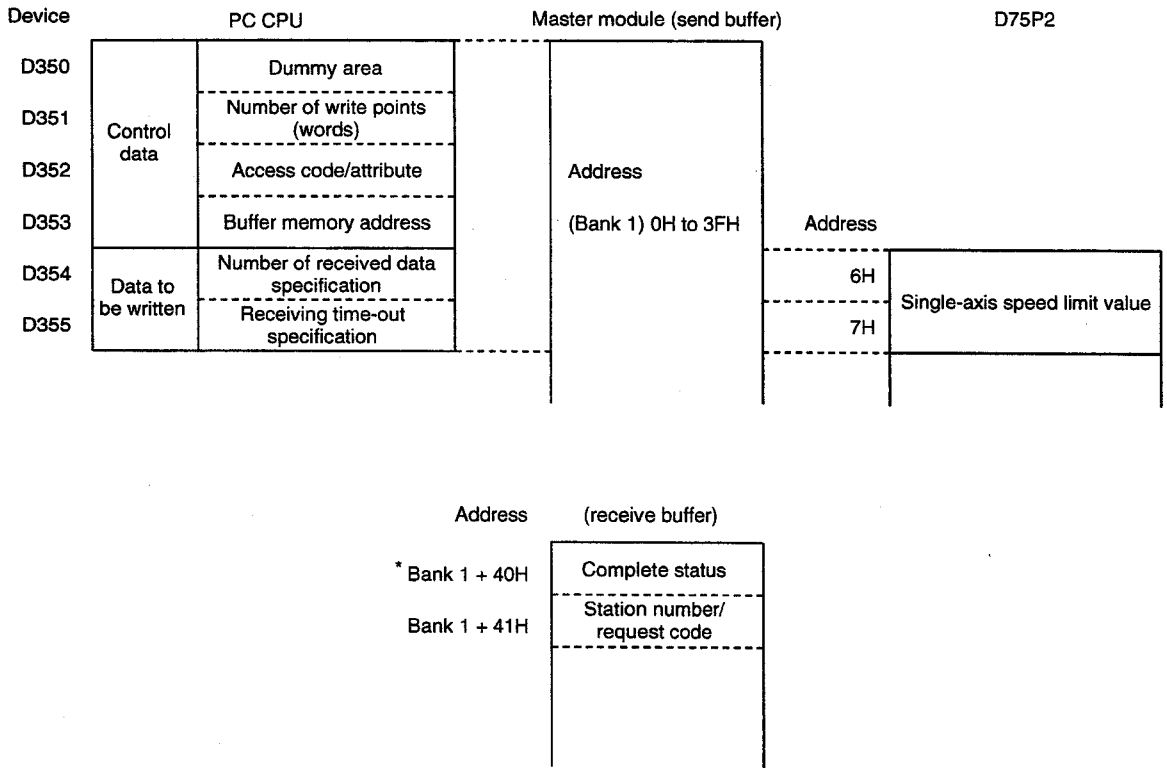
(a) When using the RIWT instruction (QnA dedicated instruction)
This is used when only writing to the specified buffer memory of the D75P2.
When using the RIWT instruction, the send buffer (buffer memory of the master module) area corresponding to the control data and data to be written to the buffer memory of the D75P2 will be used. The receive buffer stores the control data.

(Example) Writing the single-axis speed limit value of the D75P2



(b) When using the RIWT instruction (AnSH dedicated instruction)
This is used when only writing to the specified buffer memory of the D75P2.
When using the RIWT instruction, the send buffer (buffer memory of the master module) area corresponding to the control data and data to be written to the buffer memory of the D75P2 will be used. The receive buffer stores the control data.

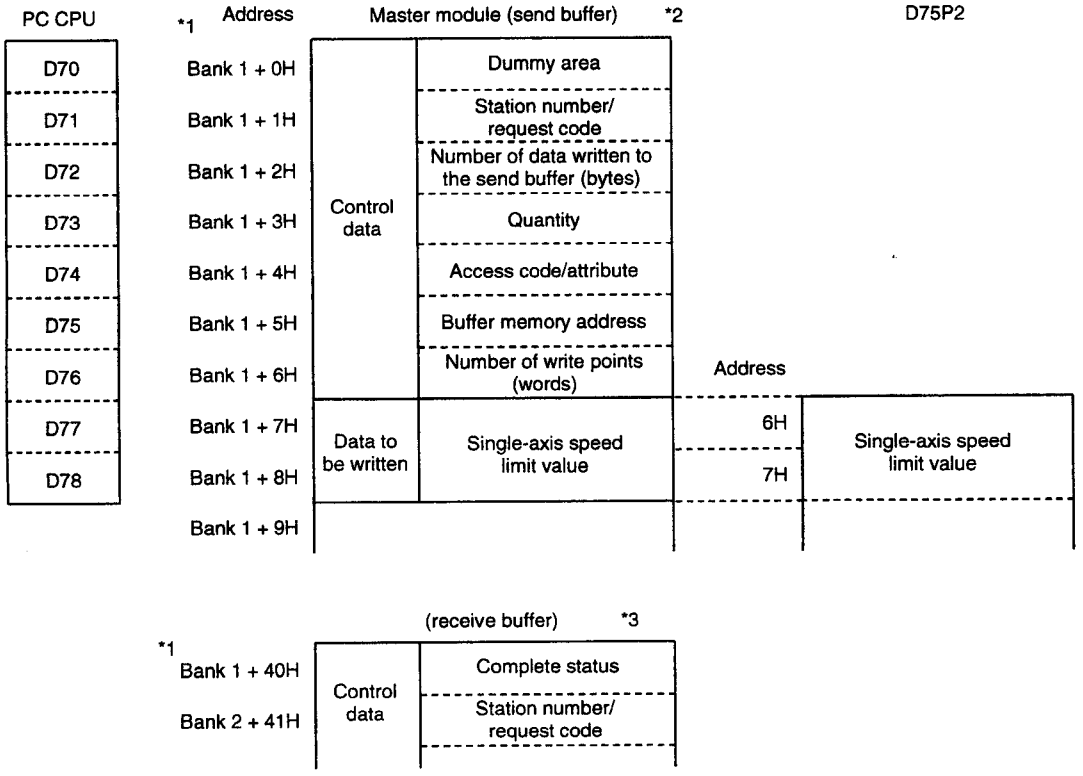
(Example) Writing the single-axis speed limit value of the D75P2

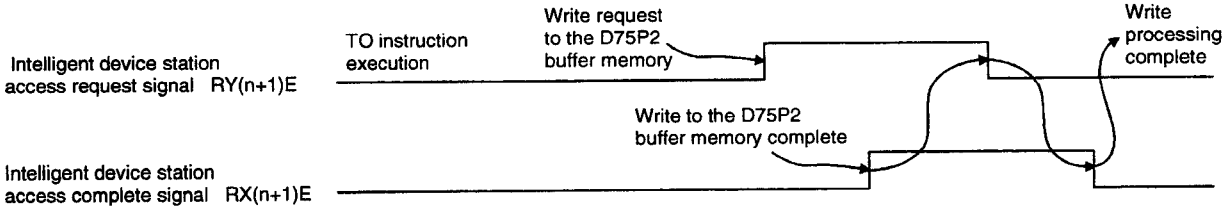


* Bank switching is performed automatically by the system.

(c) When using the TO instruction (application instruction)
This is used when only writing to the specified buffer memory of the D75P2.
When using the TO instruction, the send buffer (buffer memory of the master module) area corresponding to the control data and data to be written to the buffer memory of the D75P2 will be used. The receive buffer stores the control data.
The data specified by the send buffer is written to the D75P2 buffer memory via the intelligent device station access request signal and complete signal (RY(n+1)E, RX(n+1)E).

(Example) Writing the single-axis speed limit value of the D75P2





*1 See Points in Section 12.4.3 for details on bank switching.

*2 When writing data to the buffer memory of the D75P2 using the TO instruction, set the following control data and data to be written in the send buffer of the corresponding station of the master module:

Specified data	Item	Contents	Setting range	Setting side
Control data	Dummy area	(Fixed value)	0	User
	Station number/request code	Station number (specified by the upper bytes (bits 8 to 15)) Specifies the station number of the intelligent device station that is the access destination.	1 to 64	User
		Request code (specified by the lower bytes (bits 0 to 7)) Specifies the write request code.	12H	User
	Number of data written to the send buffer (bytes)	Specifies the total bytes of the specified data after the quantity item described below. • Control data : Quantity to number of write points • Data to be written : Data to be written to the D75P2 buffer memory	8 + Number of write points × 2	User
	Quantity	(Fixed value)	1	User
	Access code/attribute	(Fixed value)	0004H	User
	Buffer memory address	Specifies the buffer memory head address (0H and above)	0H to 17D4H	User
	Number of write points (words)	Specifies the number (number of words) of the data to be written, as described below, in a manner not to exceed the buffer memory address 17DDH of the D75P2.	1 to 480	User
Data to be written	Specifies the data written to the D75P2 buffer memory, which is specified via the buffer memory address item and the number of write points item of control data, for the number of write points of control data.			User

* Among the data mentioned above, the contents of the following data are same as when using the RIWT instruction (dedicated instruction):

1) Control data
   - Complete status
   - Station number
   - Access code/attribute
   - Buffer memory address
   - Number of write points (words)
2) Data to be written

*3 The receive buffer of the master module stores the control data shown below:

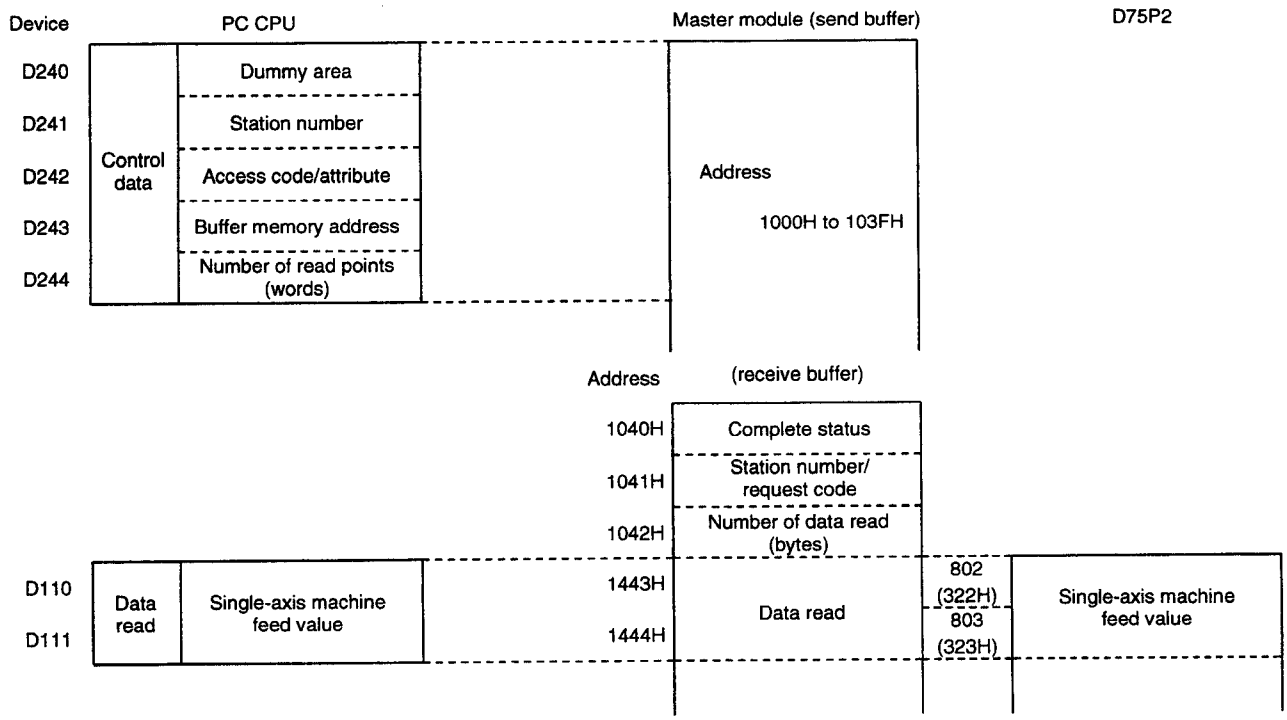
Specified data	Contents	Setting side
Complete status	The status when the instruction is completed is stored. 0 : Completion Other than 0 : Error (error code) See the master module user's manual (Detail Volume).	System
Station number/request code	Station number (specified by the upper bytes (bits 8 to 15)) The station number of the intelligent device station that is the access destination, is stored.	System
	Request code (specified by the lower bytes (bits 0 to 7)) The code for a write request (12H) is stored.	System

(2) Reading the buffer memory

Perform read using the dedicated instruction (RIRD) or application instruction (FROM).

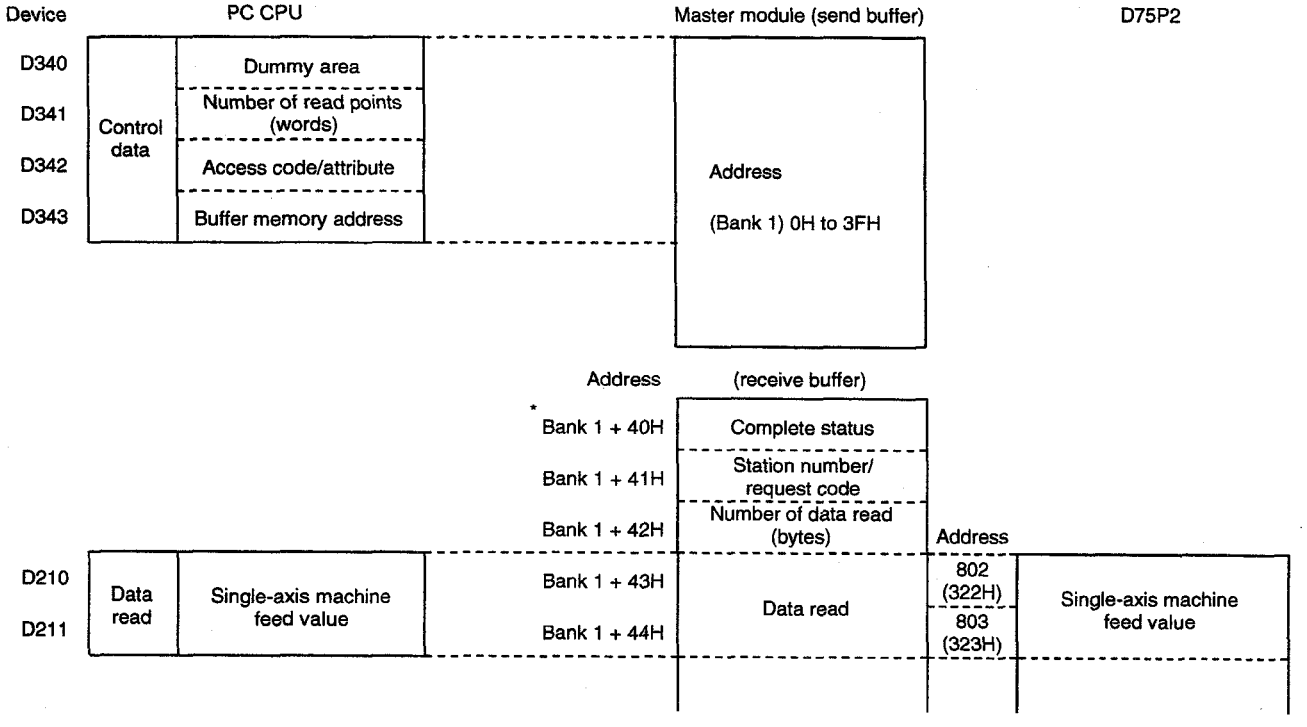
(a) When using the RIRD instruction (QnA dedicated instruction)
This is used when only reading from the specified buffer memory of the D75P2.
When using the RIRD instruction, the send buffer (buffer memory of the master module) area corresponding to the control data and the receive buffer (buffer memory of the master module) area corresponding to the control data and number of data read will be used.

(Example) Reading the single-axis machine feed value of the D75P2



(b) When using the RIRD instruction (AnSH dedicated instruction)
This is used when only reading from the specified buffer memory of the D75P2.
When using the RIRD instruction, the send buffer (buffer memory of the master module) area corresponding to the control data and the receive buffer (buffer memory of the master module) area corresponding to the control data and number of data read will be used.

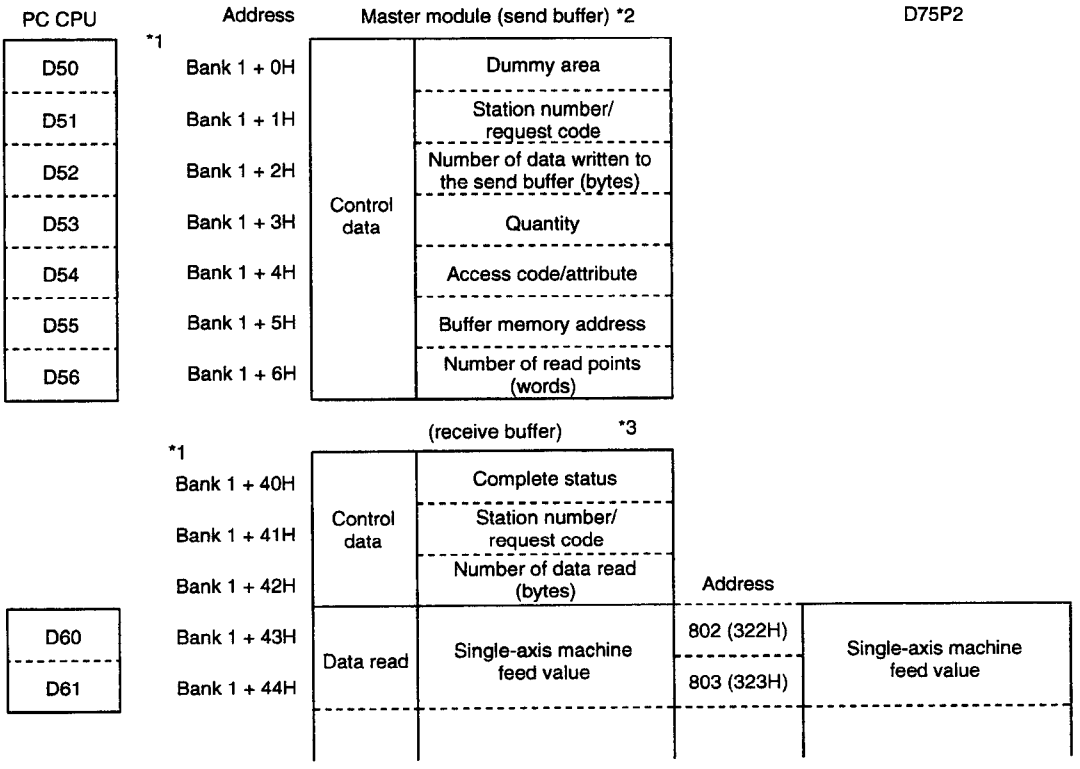
(Example) Reading the single-axis machine feed value of the D75P2

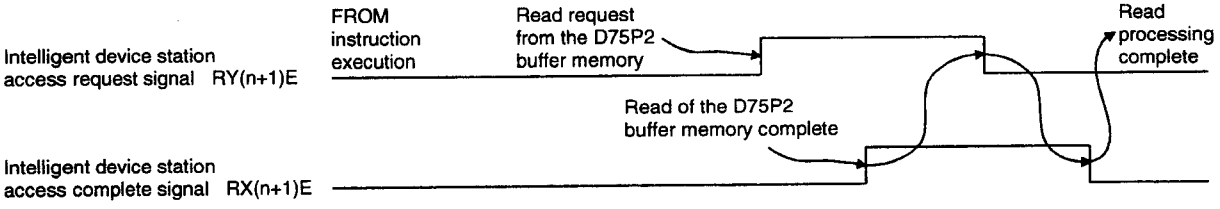


* Bank switching is performed automatically by the system.

(c) When using the FROM instruction (application instruction)
This is used when only reading from the specified buffer memory of the D75P2.
When using the FROM instruction, the send buffer (buffer memory of the master module) area corresponding to the control data and the receive buffer (buffer memory of the master module) area corresponding to the control data and number of data read will be used.
The data specified by the send buffer is read from the D75P2 buffer memory via the intelligent device station access request signal and complete signal (RY(n+1)E, RX(n+1)E).

(Example) Reading the single-axis machine feed value of the D75P2





*1 See Points in Section 12.4.3 for details on bank switching.

*2 When reading data from the buffer memory of the D75P2 using the FROM instruction, set the control data in the send buffer of the corresponding station of the master module in the following manner:

Specified data	Item	Contents	Setting range	Setting side
Control data	Dummy area	(Fixed value)	0	User
	Station number/request code	Station number (specified by the upper bytes (bit 8 to 15)) Specifies the station number of the intelligent device station that is the access destination.	1 to 64	User
		Request code (specified by the lower bytes (bits 0 to 7)) Specifies the read request code.	10H	User
	Number of data written to the send buffer (bytes)	(Fixed value)	8	User
	Quantity	(Fixed value)	1	User
	Access code/attribute	(Fixed value)	0004H	User
	Buffer memory address	Specifies the buffer memory head address (0H and above).	0H to 17D4H	User
	Number of read points (words)	Specifies the number (number of words) of data to be read in a manner not to exceed the buffer memory address 17DDH of the D75P2.	1 to 480	User

* Among the data mentioned above, the contents of the following data are same as when using the RIRD instruction (dedicated instruction):

- Complete status
- Station number
- Access code/attribute
- Buffer memory address
- Number of read points (words)

*3 The receive buffer of the master module stores the control data shown below:

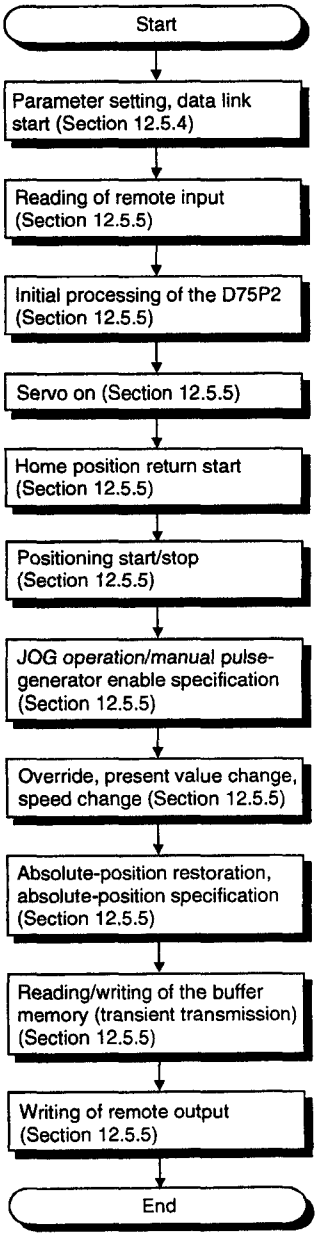
Specified data	Contents	Setting side
Complete status	The status when the instruction is completed is stored. 0 : completion Other than 0 : error (error code)	System
Station number/request code	Station number (specified by the upper bytes (bits 8 to 15)) The station number of the intelligent device station that is the access destination, is stored.	System
	Request code (specified by the lower bytes (bits 0 to 7)) The code for write request (10H) is stored.	System
Number of data read (bytes)	The total amount of data read in bytes is stored.	System
Data read	The data in the D75P2 buffer memory, specified via the buffer memory address item and the number of read points item of control data, is stored.	System

12.5 Programming

This section explains the programming procedure, notes on programming as well as program creation.

12.5.1 Programming procedure

Create a program to execute positioning using the master station and D75P2, following the procedure below:



12.5.2 Notes on creating programs

The following must be noted when creating programs:

Set the parameters and positioning data beforehand using the AD75P. The communication time may be delayed or the sequence program may get complicated if the buffer memory is read or written using the sequence program.

12.5.3 Creating programs

Tables 12.1 and 12.2 show lists of devices and buffer memories used in the programs explained in Section 12.5.4 and thereinafter.

Table 12.1 Devices used in the program examples (1)

Device number	Application
X000	Module error
X001	Local data link status
X006	Normal completion of data link start by the buffer memory parameter
X007	Abnormal completion of data link start by the buffer memory parameter
X00F	Module ready
X040	Transient read command
X041	Transient write command
X050	Single-axis positioning start request signal
X051	Dual-axis positioning start request signal
X053	Single-axis stop command
X054	Dual-axis stop command
X056	Single-axis forward JOG command
X057	Single-axis reverse JOG command
X058	Dual-axis forward JOG command
X059	Dual-axis reverse JOG command
X05D	Parameter change request signal
X069	Manual pulse generator enable command
X06E	Single-axis home position return start request signal
X06F	Dual-axis home position return start request signal
X070	Single-axis override command
X071	Dual-axis override command
X072	Single-axis present-value change command
X073	Dual-axis present-value change command
X074	Single-axis speed change command
X075	Dual-axis speed change command
X07B	JOG speed setting command
X07C	Single-axis absolute-position restoration command
X07D	Dual-axis absolute-position restoration command
X07E	Single-axis absolute-position specification command
X07F	Dual-axis absolute-position specification command
Y000	Refresh specification
Y006	Data link start request by the buffer memory parameter
Y01C	Buffer memory bank switch command
Y01D	Buffer memory bank switch command
Y080	Intelligent device station access abnormal-completion signal (read)
Y081	Intelligent device station access normal-completion signal (write)
Y082	Intelligent device station access abnormal-completion signal (write)
Y08F	D75P2 data link error

Table 12.1 Devices used in the program examples (2)

Device number	Application
M000	Module ready complete flag
M001	Parameter setting flag
M002	Data link start flag
M004 to M007	D75P2 data link status flag
M020	Single-axis positioning start request flag
M021	Dual-axis positioning start request flag
M022	Single-axis home position return start request flag
M023	Dual-axis home position return start request flag
M024	Servo on command flag
M025	Single-axis present-value change command flag
M026	Dual-axis present-value change command flag
M027	Single-axis speed change command flag
M028	Dual-axis speed change command flag
M030	Transient read flag
M031	Transient write flag
M032	Bank 0 switch flag
M040	Single-axis absolute-position restoration command flag
M041	Dual-axis absolute-position restoration command flag
M042	Single-axis absolute-position specification command flag
M043	Dual-axis absolute-position specification command flag
M100	D75P2 ready complete (RX0)
M100 to M147	Input signal storage device (RX00 to RX2F)
M101	Single-axis start complete (RX1)
M102	Dual-axis start complete (RX2)
M104	Single-axis BUSY (RX4)
M105	Dual-axis BUSY (RX5)
M110	Single-axis error detection (RXA)
M111	Dual-axis error detection (RXB)
M117	Single-axis speed change processing flag (RX11)
M148 to M179	Input signal storage device (RX40 to RX5F)
M149	Dual-axis speed change processing flag (RX41)
M180 to M195	Input signal storage device (RX70 to RX7F)
M188	Initial data processing request (RX78)
M191	Remote station ready (RX7B)
M194	Intelligent device station access complete (RX7E)
M200	Single-axis positioning start (RY10)
M200 to M231	Output signal storage device (RY10 to RY2F)
M201	Dual-axis positioning start (RY11)
M203	Single-axis stop (RY13)
M204	Dual-axis stop (RY14)
M206	Single-axis forward JOG start (RY16)
M207	Single-axis reverse JOG start (RY17)
M208	Dual-axis forward JOG start (RY18)
M209	Dual-axis reverse JOG start (RY19)
M216	Single-axis servo on (RY20)
M223	Single-axis speed change request (RY27)
M225	Single-axis manual pulse-generator enable flag (RY29)
M232	Dual-axis servo on (RY40)
M232 to M247	Output signal storage device (RY40 to RY4F)
M239	Dual-axis speed change request (RY47)
M241	Dual-axis manual pulse-generator enable flag (RY49)
M248 to M263	Output signal storage device (RY70 to RY7F)

Table 12.1 Devices used in the program examples (3)

Device number	Application
M256	Initial data processing complete (RY78)
M257	Initial data setting request (RY79)
M262	Intelligent device station access request (RY7E)
M9036	Always on
M9038	1 scan on after RUN
M9052	Partial refresh specification
D000	Register for setting the number of module connected
D001	Register for setting the number of retries setting
D002	Register for setting the number of automatic-return modules
D003	Register for specifying operation when CPU is down
D004	Register for setting station information
D005	Register for setting the send buffer size
D006	Register for setting the receive buffer size
D007	Register for setting the automatic communication buffer size
D010	Register for storing the parameter setting status
D050	Register for storing the dummy area (read)
D051	Register for storing the station number/request code (read)
D052	Register for storing the number of data written (read)
D053	Register for storing the quantity (read)
D054	Register for storing the access code/attribute (read)
D055	Register for storing the buffer memory head address (read)
D056	Register for storing the number of read points
D057	Register for storing the complete status (read)
D060, D061	Register for reading the machine feed value
D070	Register for storing the dummy area (write)
D071	Register for storing the station number/request code (write)
D072	Register for storing the number of data written (write)
D073	Register for storing the quantity (write)
D074	Register for storing the access code/attribute (write)
D075	Register for storing the buffer memory head address (write)
D076	Register for storing the number of write points
D077, D078	Register for storing the speed limit value
D079	Register for storing the complete status (write)
P10	Pointer for D75P2 program execution

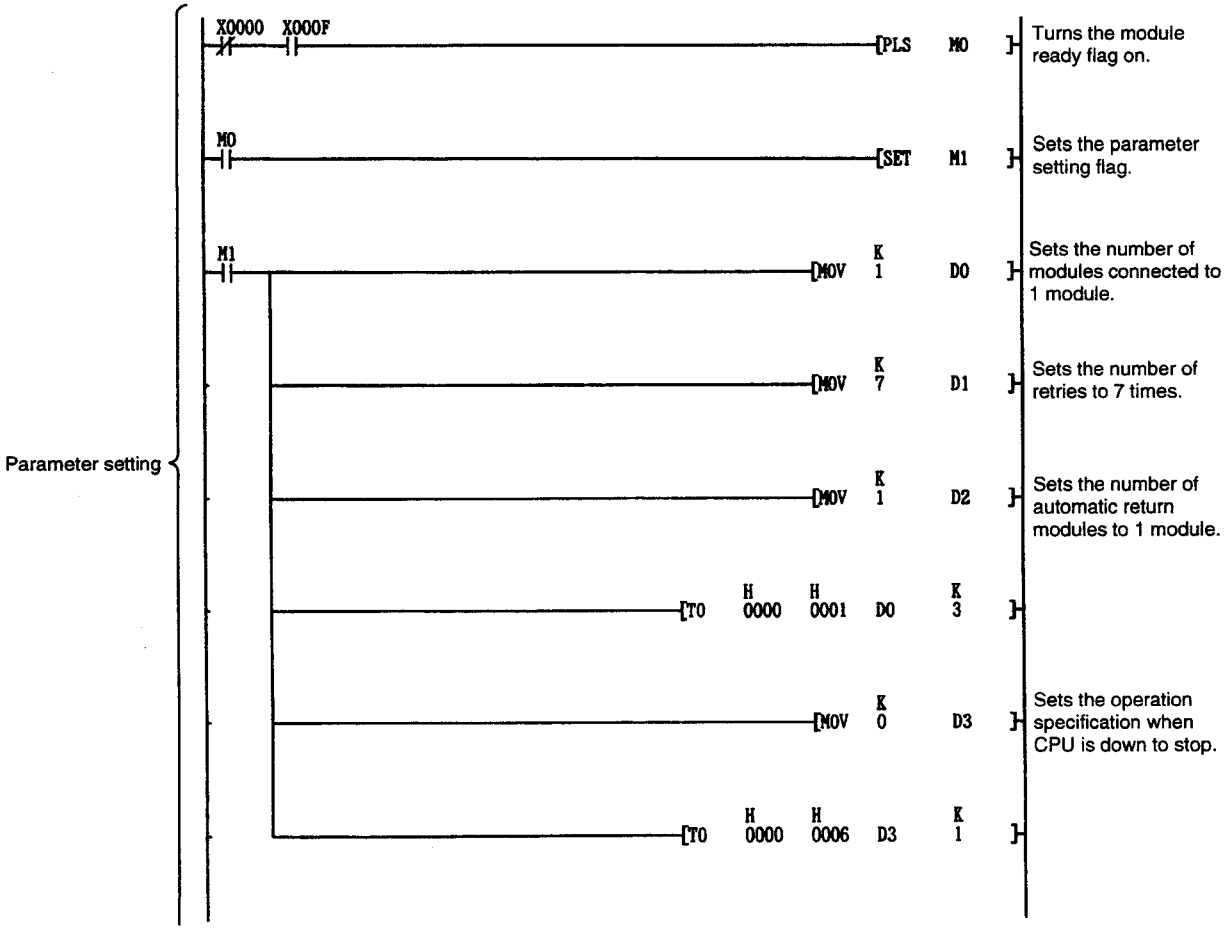
Table 12.2 Buffer memories used in the program examples

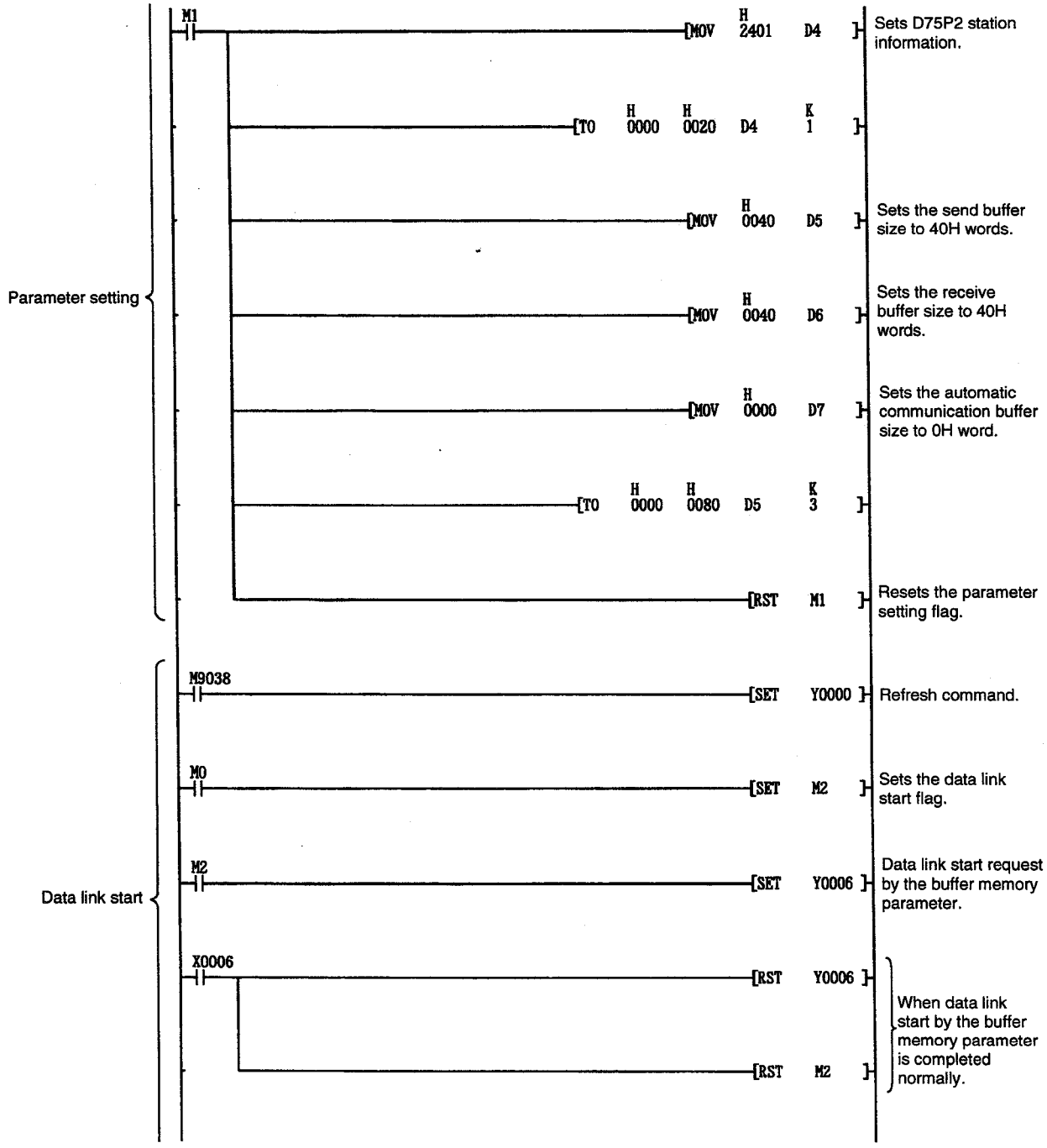
Buffer address (Hexadecimal)	Application
001H	For setting the number of modules connected
002H	For setting the number of retries
003H	For setting the number of automatic return modules
006H	For specifying operation when CPU is down
020H	For setting the station information
080H	For setting the send buffer size
081H	For setting the receive buffer size
082H	For setting the automatic communication buffer size
0E0H to 0E2H	For storing the input signal (RX00 to RX2F)
0E4H to 0E5H	For storing the input signal (RX40 to RX5F)
0E7H	For storing the input signal (RX70 to RX7F)
161H to 162H	For storing the output signal (RY10 to RY2F)
164H	For storing the output signal (RY40 to RY4F)
167H	For storing the output signal (RY70 to RY7F)
1E0H	For setting the single-axis positioning start number
1E1H	For setting the single-axis override value
1E2H	For setting the single-axis new present value
1E4H	For setting the single-axis new speed value
1E6H	For setting the single-axis JOG speed
1E8H	For setting the dual-axis positioning start number
1E9H	For setting the dual-axis override value
1EAH	For setting the dual-axis new present value
1ECH	For setting the dual-axis new speed value
1EEH	For setting the dual-axis JOG speed
668H	For storing the parameter setting status
680H	For storing the D75P2 data link status
000H (bank 1)	For storing the dummy area
001H (bank 1)	For storing the station number/request code
002H (bank 1)	For storing the number of data written
003H (bank 1)	For storing the quantity
004H (bank 1)	For storing the access code/attribute
005H (bank 1)	For storing the buffer memory head address
006H (bank 1)	For storing the number of read/written points
400H (bank 1)	For storing the complete status
403H, 404H (bank 1)	For storing the machine feed value

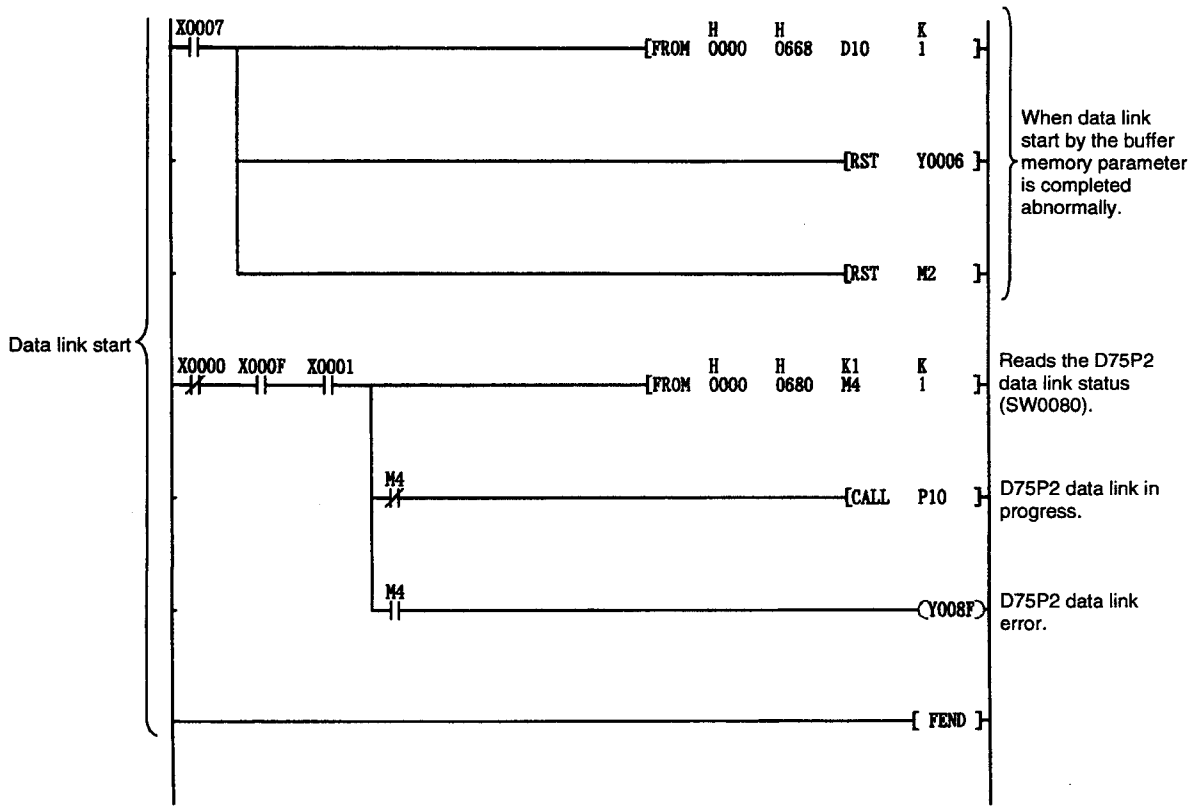
* See Points in Section 12.4.3 for bank switching.

12.5.4 Parameter setting/data link start program

This section shows a program for setting CC-Link parameters and start data link.

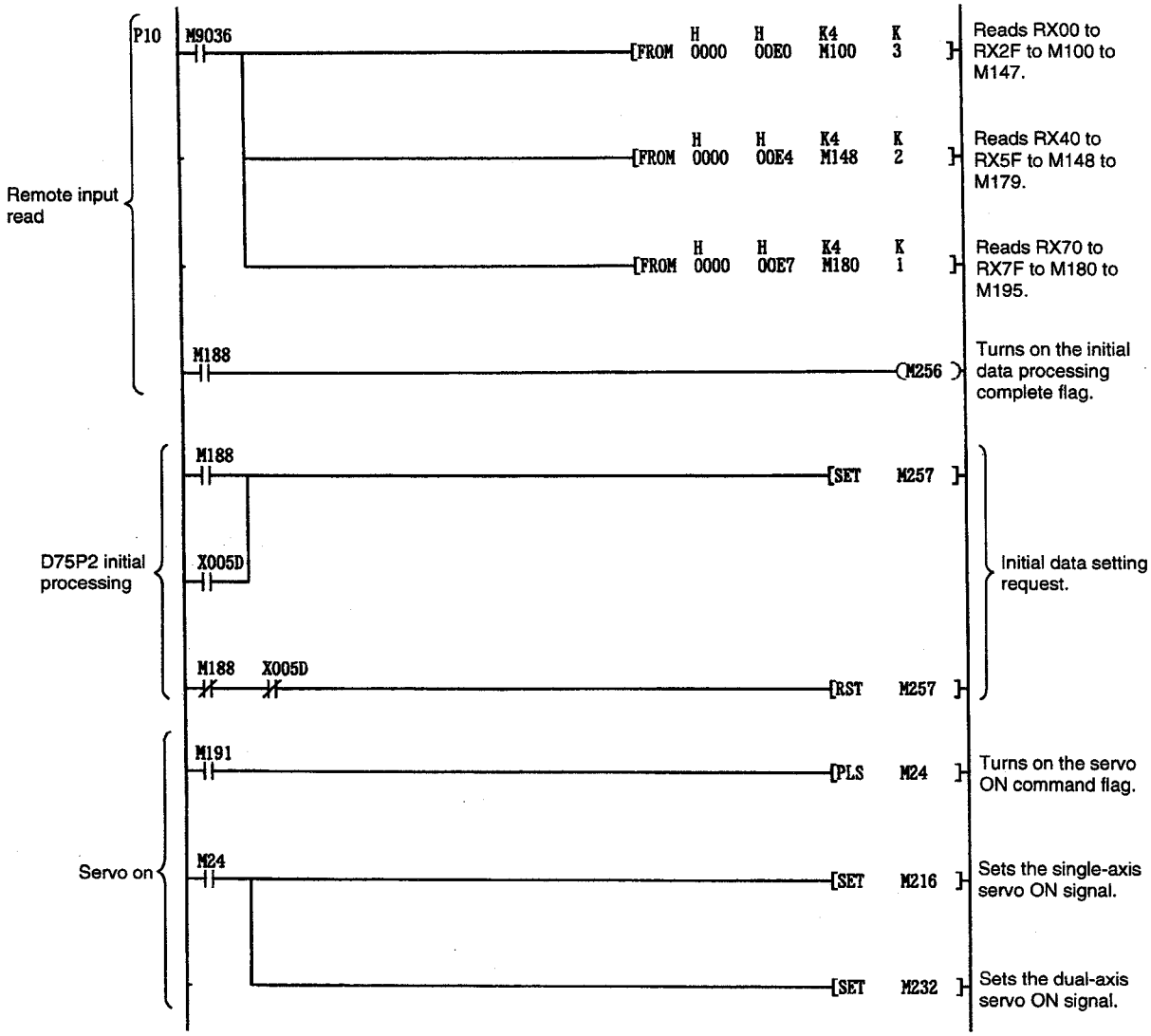


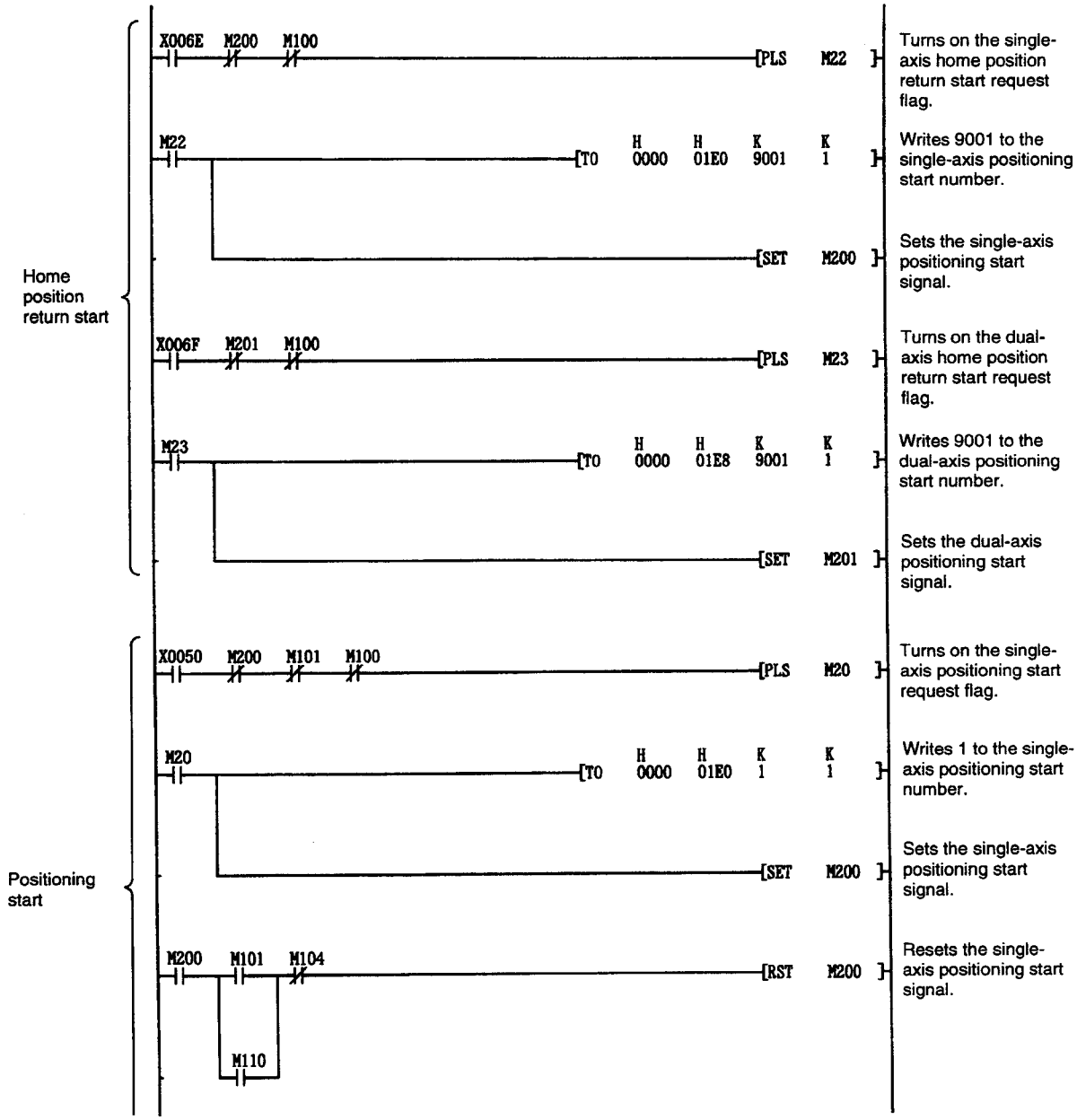

Parameter setting
M1
MOV H 2401 D4
Sets D75P2 station information.
TO H 0000 H 0020 D4 K 1
MOV H 0040 D5
Sets the send buffer size to 40H words.
MOV H 0040 D6
Sets the receive buffer size to 40H words.
MOV H 0000 D7
Sets the automatic communication buffer size to 0H word.
TO H 0000 H 0080 D5 K 3
RST M1
Resets the parameter setting flag.
Data link start
M9038
SET Y0000
Refresh command.
M0
SET M2
Sets the data link start flag.
M2
SET Y0006
Data link start request by the buffer memory parameter.
X0006
RST Y0006
RST M2
When data link start by the buffer memory parameter is completed normally.

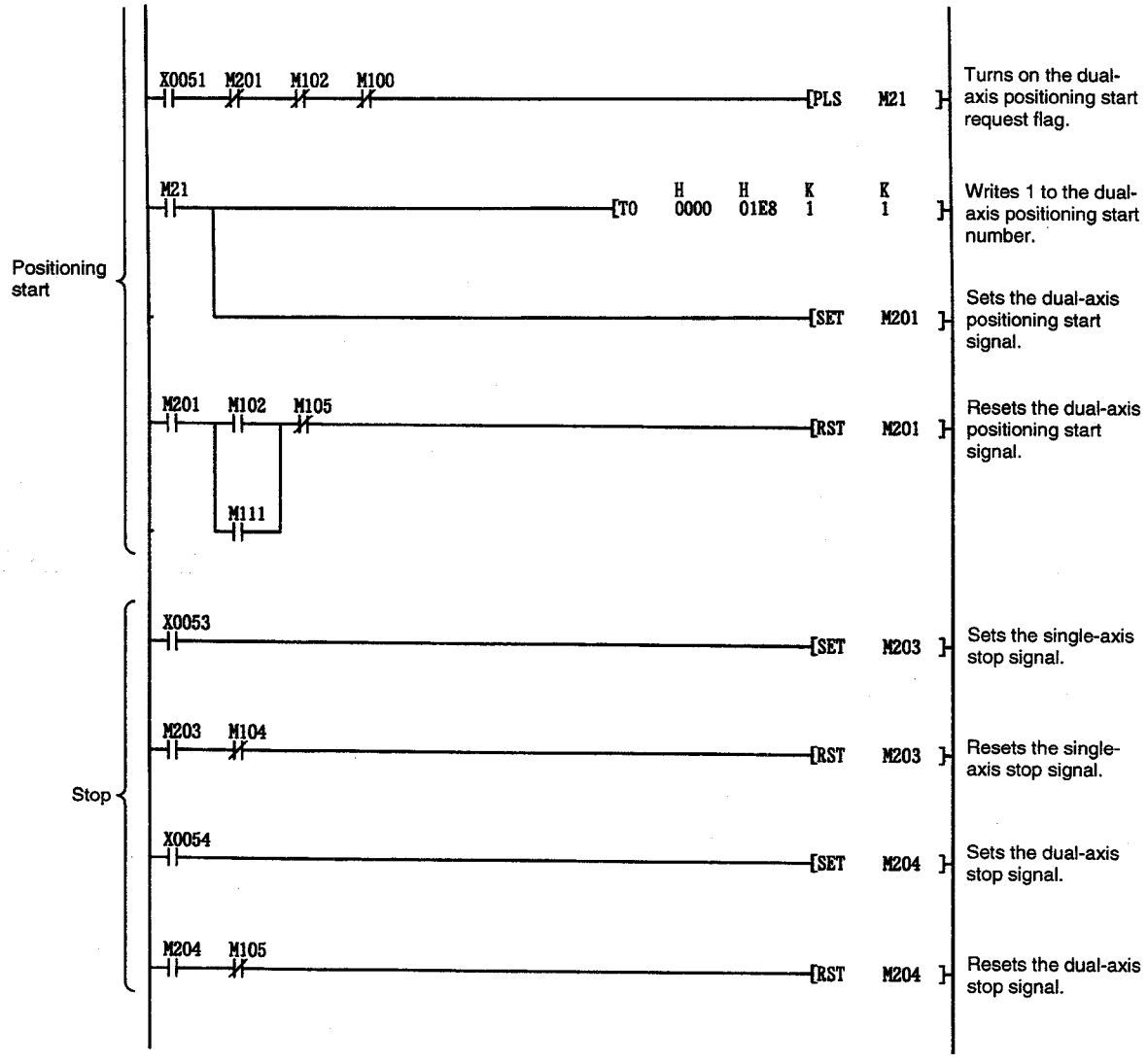

Data link start
X0007
FROM H 0000 H 0668 D10 K 1
RST Y0006
RST M2
When data link start by the buffer memory parameter is completed abnormally.
X0000 X000F X0001
FROM H 0000 H 0680 K1 M4 K 1
Reads the D75P2 data link status (SW0080).
M4
CALL P10
D75P2 data link in progress.
M4
Y008F
D75P2 data link error.
FEND

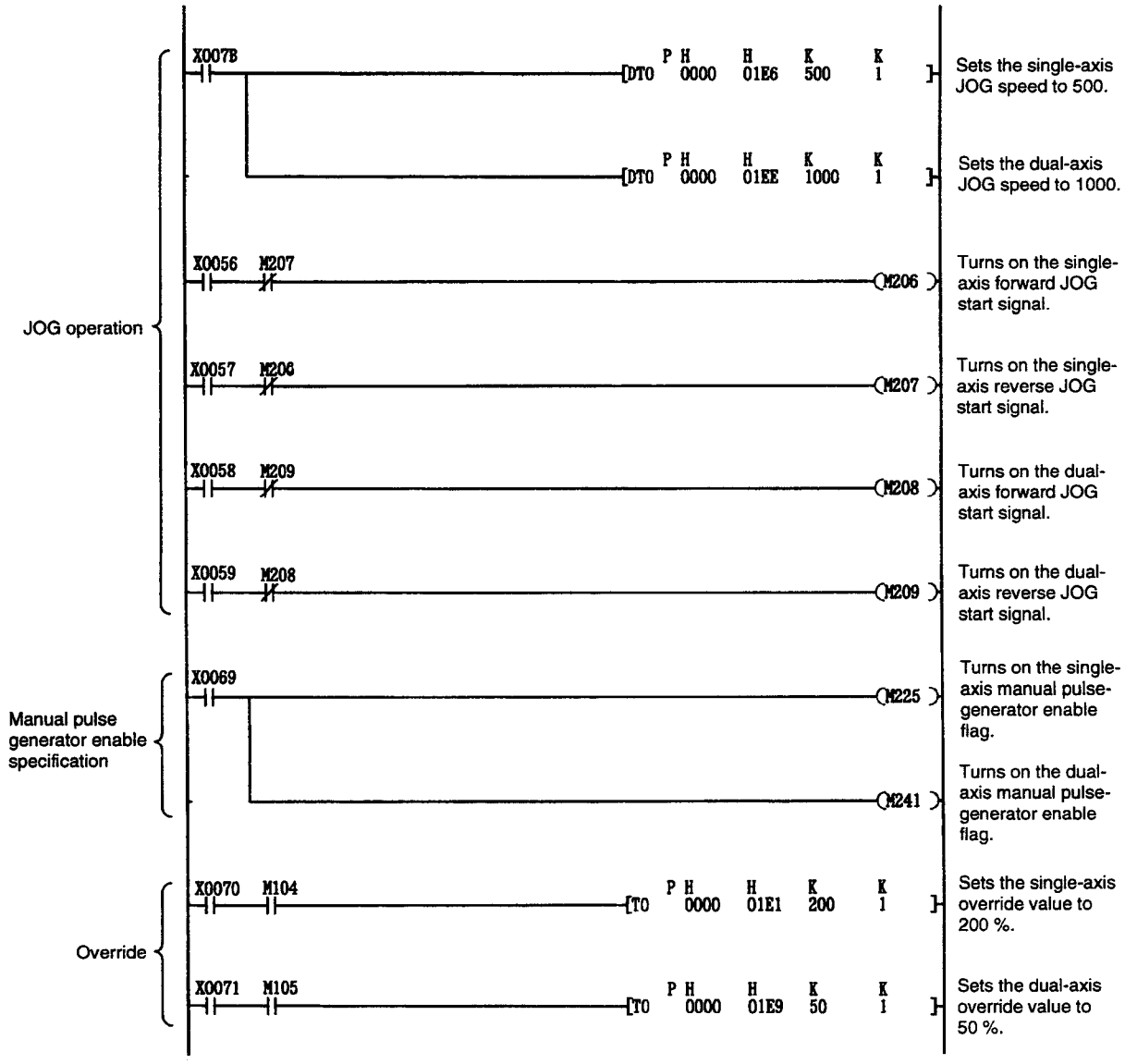
12.5.5 Communication/positioning programs

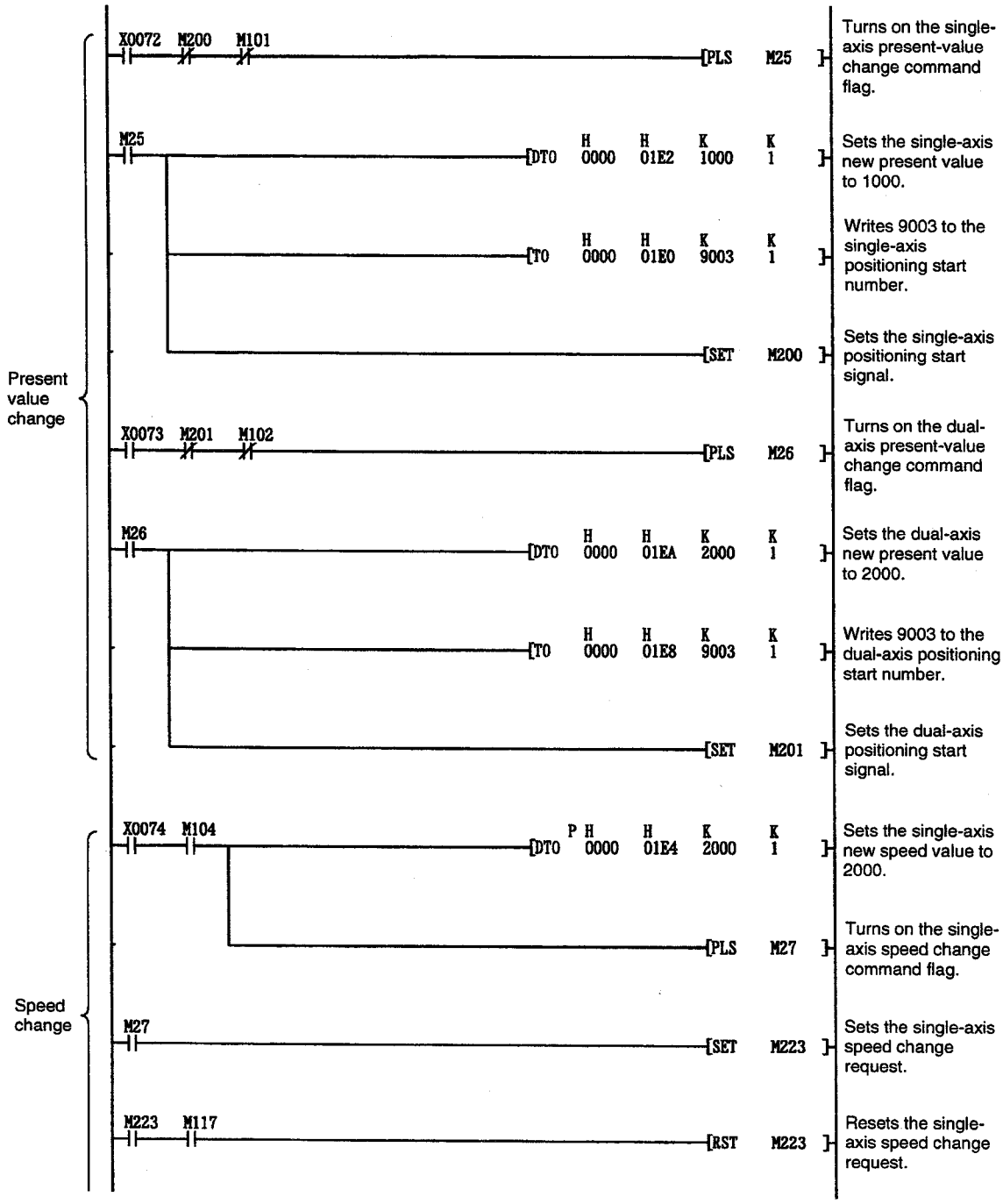
This section shows programs for remote I/O read/write communication as well as for positioning, such as home position return start and positioning start.

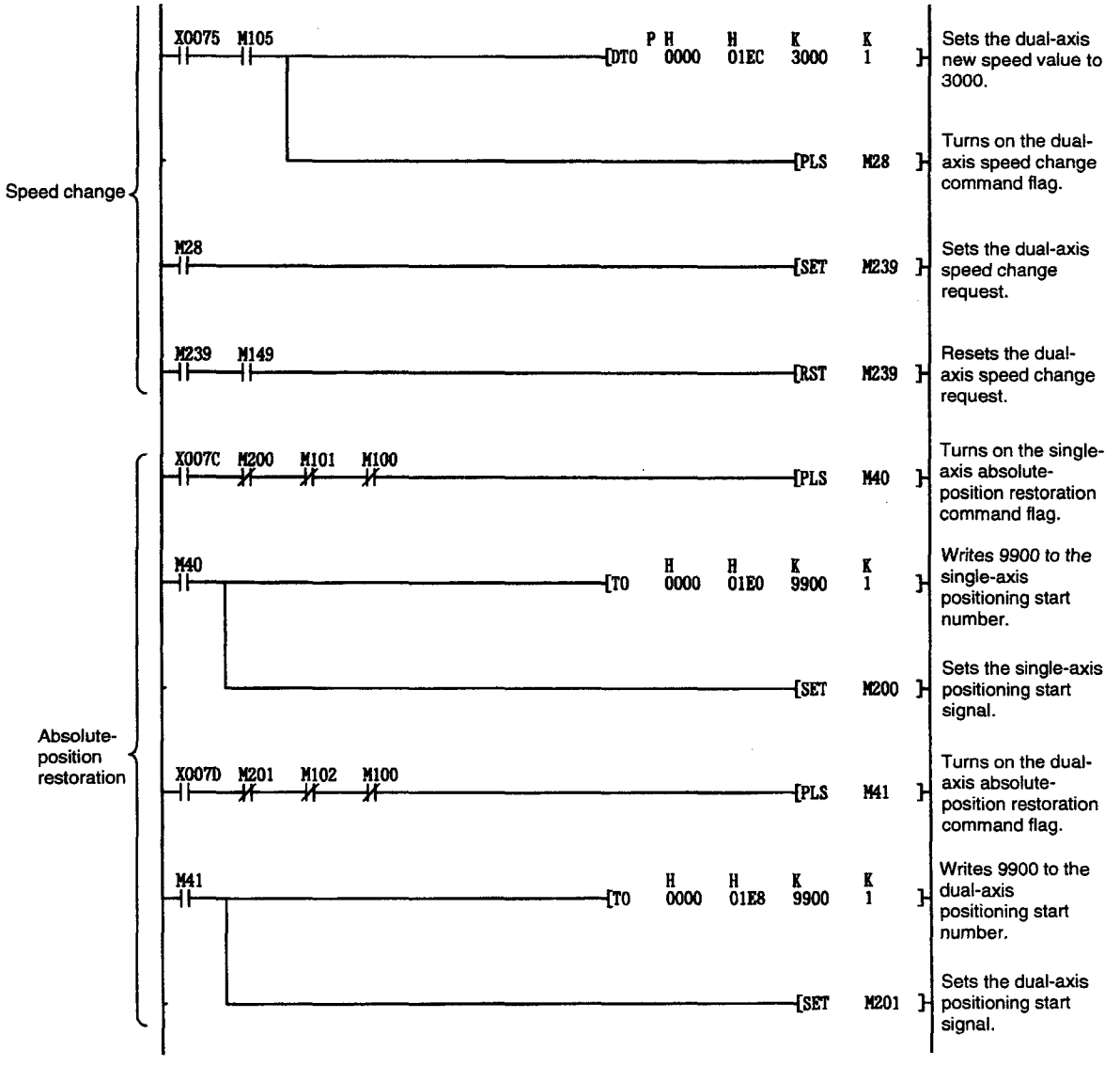


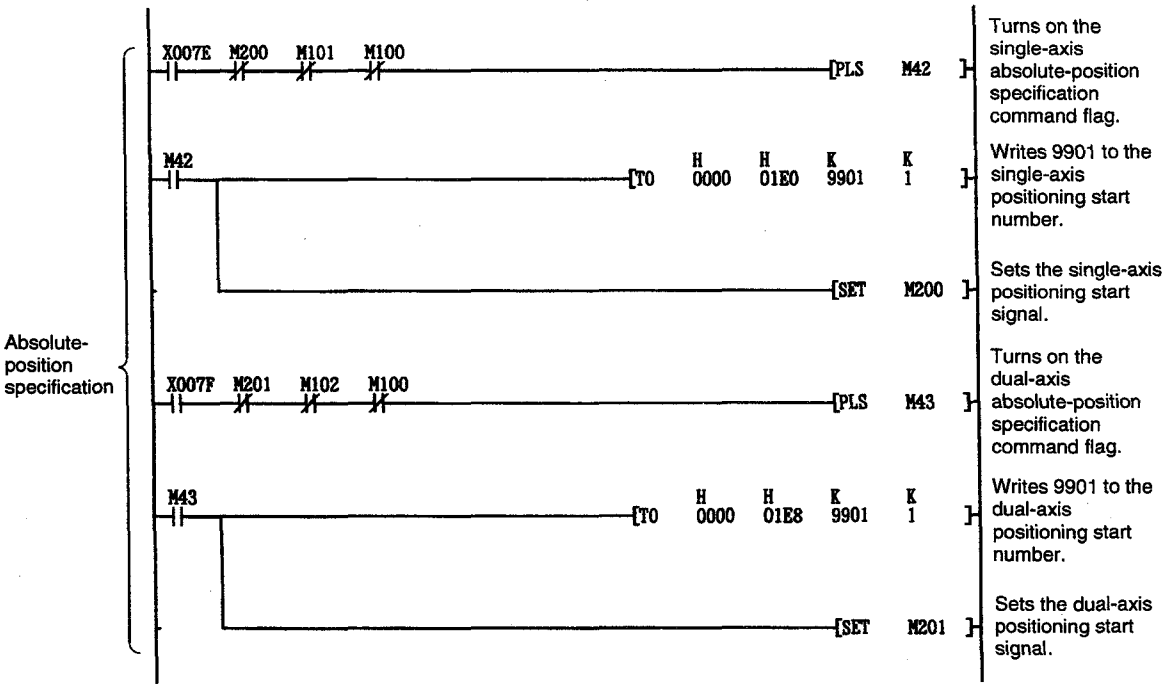

Home position return start
X006E M200 M100 [PLS M22]
Turns on the single-axis home position return start request flag.
M22 [TO H 0000 H 01E0 K 9001 K 1]
Writes 9001 to the single-axis positioning start number.
[SET M200]
Sets the single-axis positioning start signal.
X006F M201 M100 [PLS M23]
Turns on the dual-axis home position return start request flag.
M23 [TO H 0000 H 01E8 K 9001 K 1]
Writes 9001 to the dual-axis positioning start number.
[SET M201]
Sets the dual-axis positioning start signal.
Positioning start
X0050 M200 M101 M100 [PLS M20]
Turns on the single-axis positioning start request flag.
M20 [TO H 0000 H 01E0 K 1 K 1]
Writes 1 to the single-axis positioning start number.
[SET M200]
Sets the single-axis positioning start signal.
M200 M101 M104 [RST M200]
M110
Resets the single-axis positioning start signal.

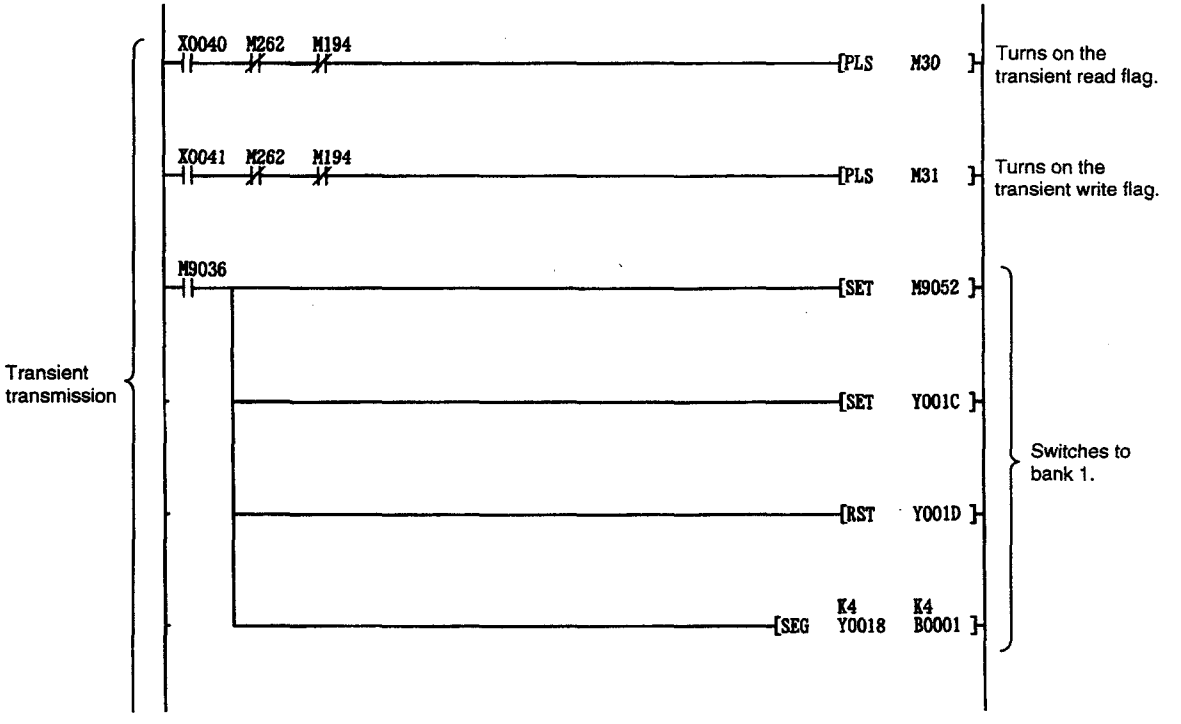

Positioning start
X0051 M201 M102 M100
PLS M21
Turns on the dual-axis positioning start request flag.
M21
TO H 0000 H 01E8 K 1 K 1
Writes 1 to the dual-axis positioning start number.
SET M201
Sets the dual-axis positioning start signal.
M201 M102 M105
M111
RST M201
Resets the dual-axis positioning start signal.
Stop
X0053
SET M203
Sets the single-axis stop signal.
M203 M104
RST M203
Resets the single-axis stop signal.
X0054
SET M204
Sets the dual-axis stop signal.
M204 M105
RST M204
Resets the dual-axis stop signal.

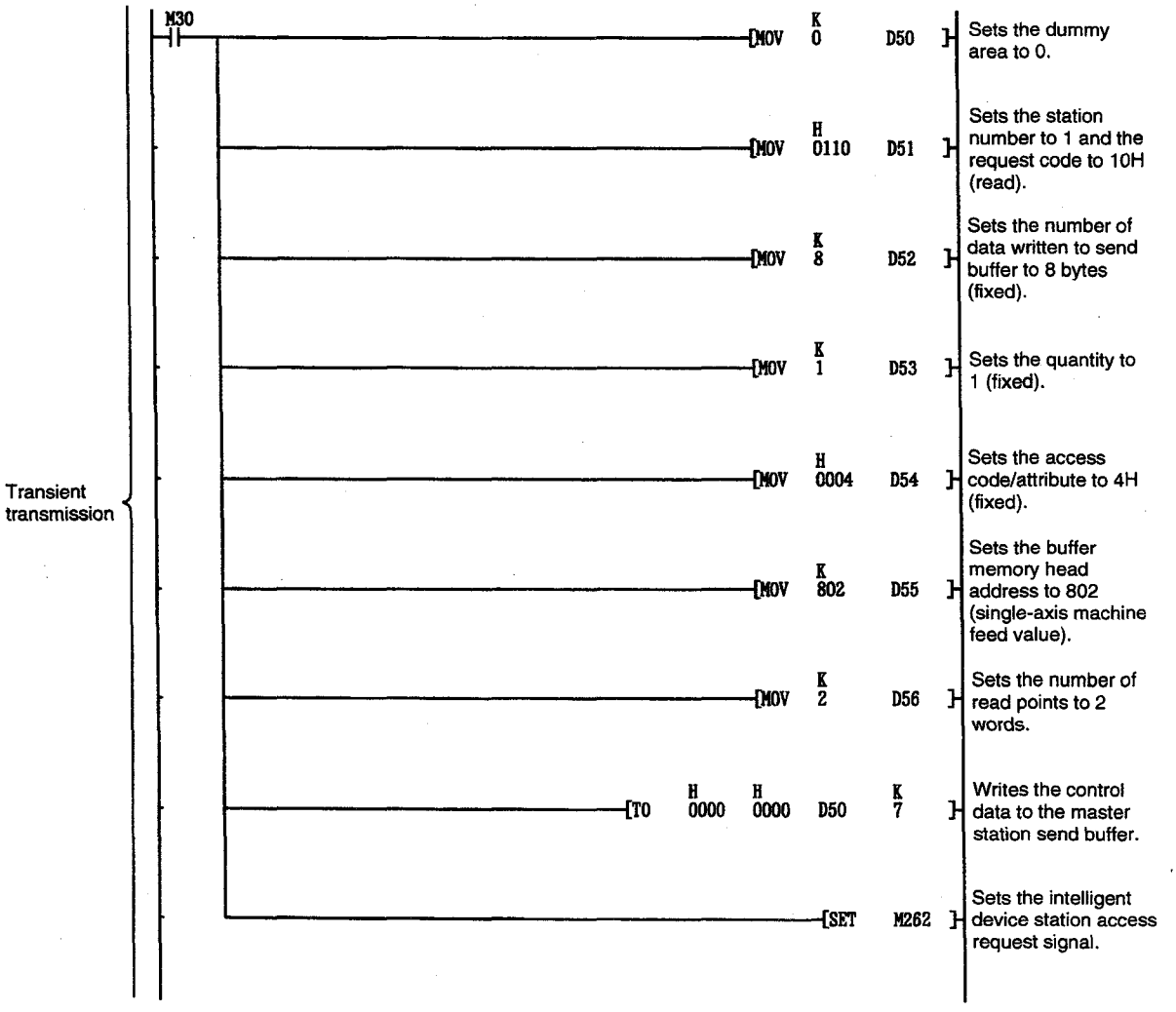

JOG operation
X007B
DTO P H 0000 H 01E6 K 500 K 1
Sets the single-axis JOG speed to 500.
DTO P H 0000 H 01EE K 1000 K 1
Sets the dual-axis JOG speed to 1000.
X0056 M207 M206
Turns on the single-axis forward JOG start signal.
X0057 M206 M207
Turns on the single-axis reverse JOG start signal.
X0058 M209 M208
Turns on the dual-axis forward JOG start signal.
X0059 M208 M209
Turns on the dual-axis reverse JOG start signal.
Manual pulse generator enable specification
X0069 M225
Turns on the single-axis manual pulse-generator enable flag.
M241
Turns on the dual-axis manual pulse-generator enable flag.
Override
X0070 M104
TO P H 0000 H 01E1 K 200 K 1
Sets the single-axis override value to 200 %.
X0071 M105
TO P H 0000 H 01E9 K 50 K 1
Sets the dual-axis override value to 50 %.

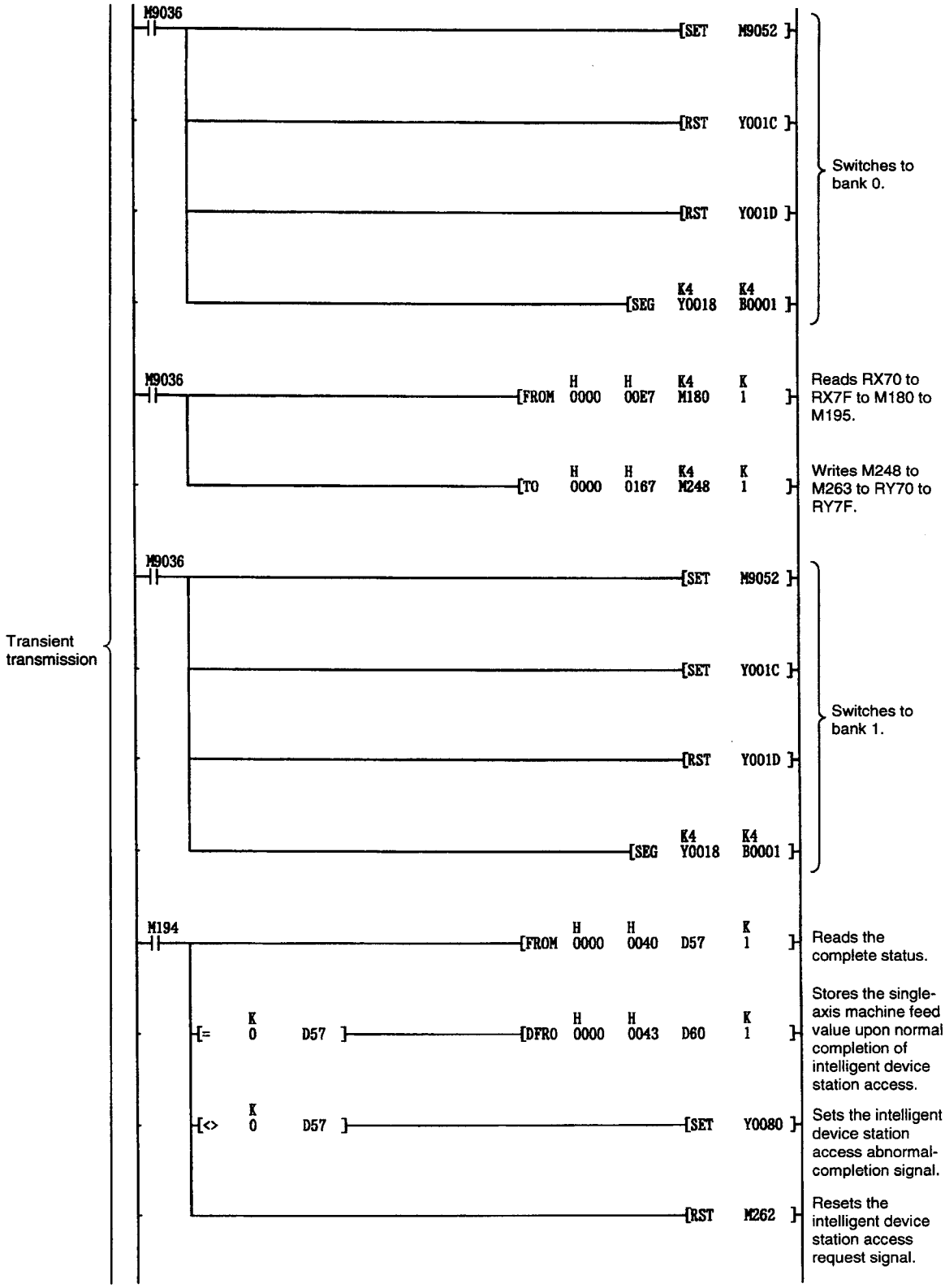

Present value change
X0072 M200 M101 [PLS M25]
Turns on the single-axis present-value change command flag.
M25 [DTO H 0000 H 01E2 K 1000 K 1]
Sets the single-axis new present value to 1000.
[TO H 0000 H 01E0 K 9003 K 1]
Writes 9003 to the single-axis positioning start number.
[SET M200]
Sets the single-axis positioning start signal.
X0073 M201 M102 [PLS M26]
Turns on the dual-axis present-value change command flag.
M26 [DTO H 0000 H 01EA K 2000 K 1]
Sets the dual-axis new present value to 2000.
[TO H 0000 H 01E8 K 9003 K 1]
Writes 9003 to the dual-axis positioning start number.
[SET M201]
Sets the dual-axis positioning start signal.
Speed change
X0074 M104 [DTO P H 0000 H 01E4 K 2000 K 1]
Sets the single-axis new speed value to 2000.
[PLS M27]
Turns on the single-axis speed change command flag.
M27 [SET M223]
Sets the single-axis speed change request.
M223 M117 [RST M223]
Resets the single-axis speed change request.

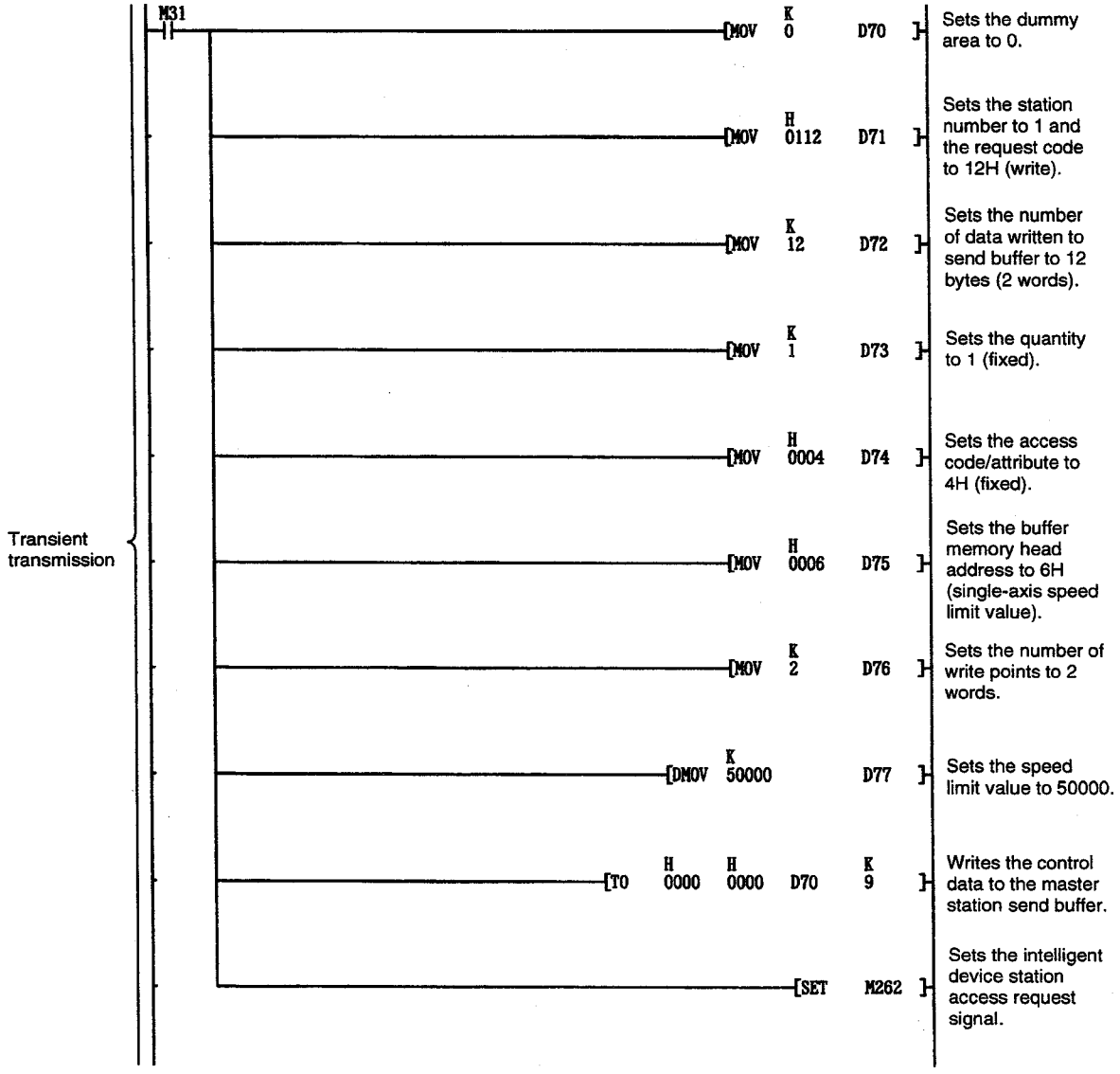

Speed change
X0075 M105
P H 0000 H 01EC K 3000 K 1
DTO
Sets the dual-axis new speed value to 3000.
PLS M28
Turns on the dual-axis speed change command flag.
M28
SET M239
Sets the dual-axis speed change request.
M239 M149
RST M239
Resets the dual-axis speed change request.
Absolute-position restoration
X007C M200 M101 M100
PLS M40
Turns on the single-axis absolute-position restoration command flag.
M40
TO H 0000 H 01E0 K 9900 K 1
Writes 9900 to the single-axis positioning start number.
SET M200
Sets the single-axis positioning start signal.
X007D M201 M102 M100
PLS M41
Turns on the dual-axis absolute-position restoration command flag.
M41
TO H 0000 H 01E8 K 9900 K 1
Writes 9900 to the dual-axis positioning start number.
SET M201
Sets the dual-axis positioning start signal.

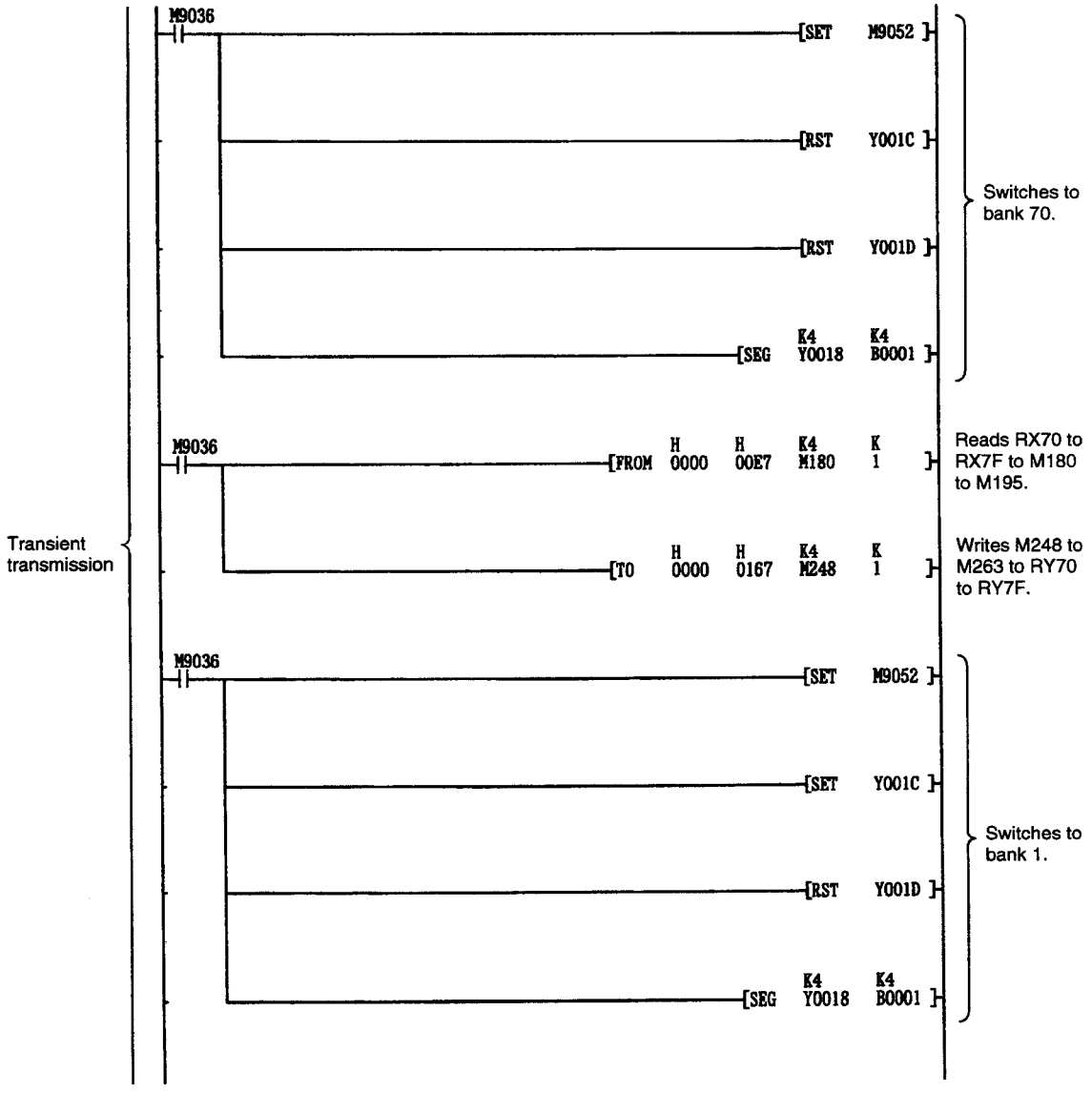

Absolute-position specification
X007E M200 M101 M100
PLS M42
Turns on the single-axis absolute-position specification command flag.
M42
TO H 0000 H 01E0 K 9901 K 1
Writes 9901 to the single-axis positioning start number.
SET M200
Sets the single-axis positioning start signal.
X007F M201 M102 M100
PLS M43
Turns on the dual-axis absolute-position specification command flag.
M43
TO H 0000 H 01E8 K 9901 K 1
Writes 9901 to the dual-axis positioning start number.
SET M201
Sets the dual-axis positioning start signal.

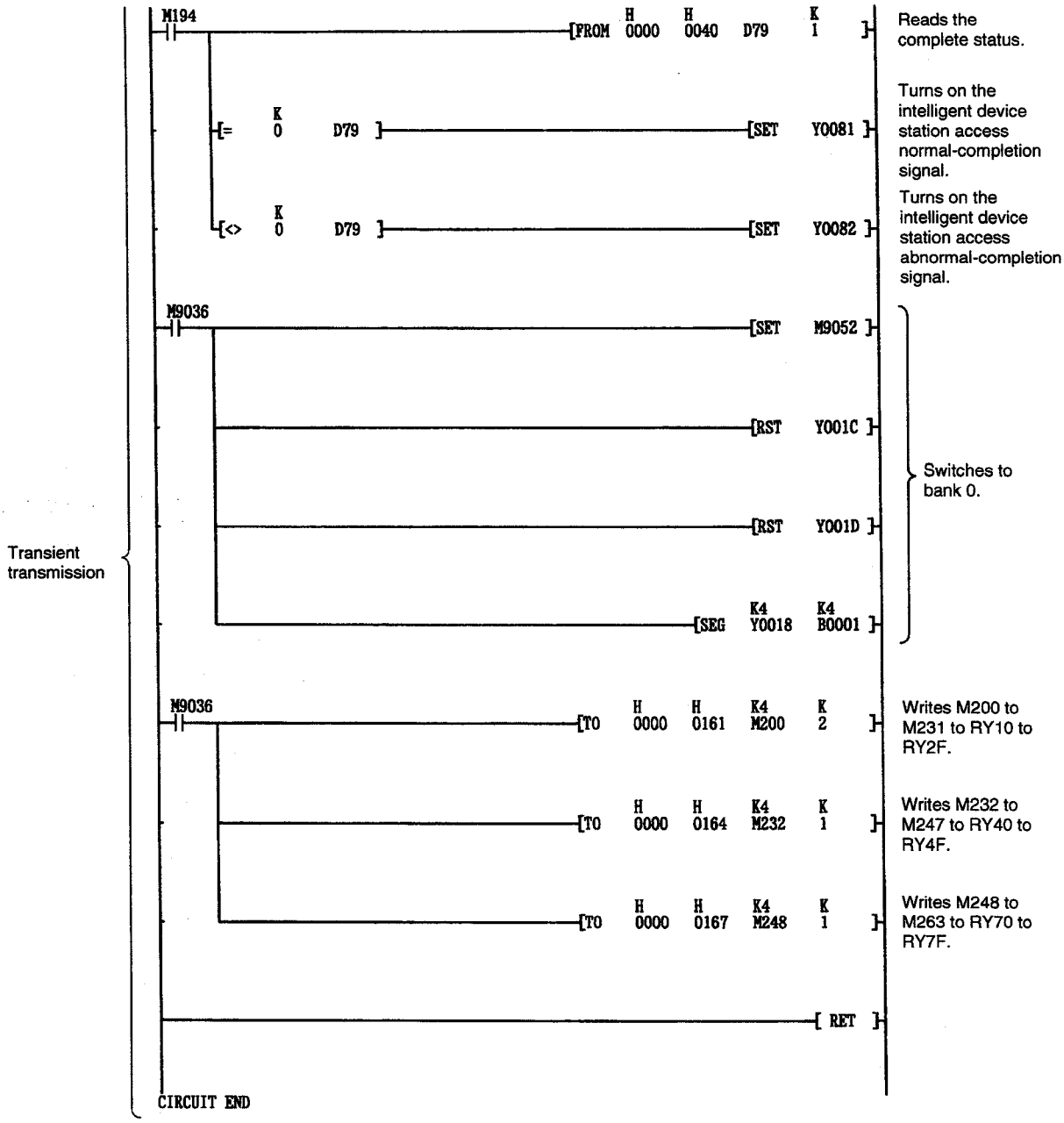

Transient transmission
X0040 M262 M194
[PLS M30]
Turns on the transient read flag.
X0041 M262 M194
[PLS M31]
Turns on the transient write flag.
M9036
[SET M9052]
[SET Y001C]
[RST Y001D]
[SEG K4 Y0018 K4 B0001]
Switches to bank 1.


Transient transmission
M30
[MOV K0 D50]
Sets the dummy area to 0.
[MOV H0110 D51]
Sets the station number to 1 and the request code to 10H (read).
[MOV K8 D52]
Sets the number of data written to send buffer to 8 bytes (fixed).
[MOV K1 D53]
Sets the quantity to 1 (fixed).
[MOV H0004 D54]
Sets the access code/attribute to 4H (fixed).
[MOV K802 D55]
Sets the buffer memory head address to 802 (single-axis machine feed value).
[MOV K2 D56]
Sets the number of read points to 2 words.
[TO H0000 H0000 D50 K7]
Writes the control data to the master station send buffer.
[SET M262]
Sets the intelligent device station access request signal.


Transient transmission
M9036
[SET M9052]
[RST Y001C]
[RST Y001D]
[SEG K4 Y0018 K4 B0001]
Switches to bank 0.
M9036
[FROM H 0000 H 00E7 K4 M180 K 1]
Reads RX70 to RX7F to M180 to M195.
[TO H 0000 H 0167 K4 M248 K 1]
Writes M248 to M263 to RY70 to RY7F.
M9036
[SET M9052]
[SET Y001C]
[RST Y001D]
[SEG K4 Y0018 K4 B0001]
Switches to bank 1.
M194
[FROM H 0000 H 0040 D57 K 1]
Reads the complete status.
[= K 0 D57]
[DFRO H 0000 H 0043 D60 K 1]
Stores the single-axis machine feed value upon normal completion of intelligent device station access.
[<> K 0 D57]
[SET Y0080]
Sets the intelligent device station access abnormal-completion signal.
[RST M262]
Resets the intelligent device station access request signal.


Transient transmission
M31
MOV K 0 D70
Sets the dummy area to 0.
MOV H 0112 D71
Sets the station number to 1 and the request code to 12H (write).
MOV K 12 D72
Sets the number of data written to send buffer to 12 bytes (2 words).
MOV K 1 D73
Sets the quantity to 1 (fixed).
MOV H 0004 D74
Sets the access code/attribute to 4H (fixed).
MOV H 0006 D75
Sets the buffer memory head address to 6H (single-axis speed limit value).
MOV K 2 D76
Sets the number of write points to 2 words.
DMOV K 50000 D77
Sets the speed limit value to 50000.
TO H 0000 H 0000 D70 K 9
Writes the control data to the master station send buffer.
SET M262
Sets the intelligent device station access request signal.

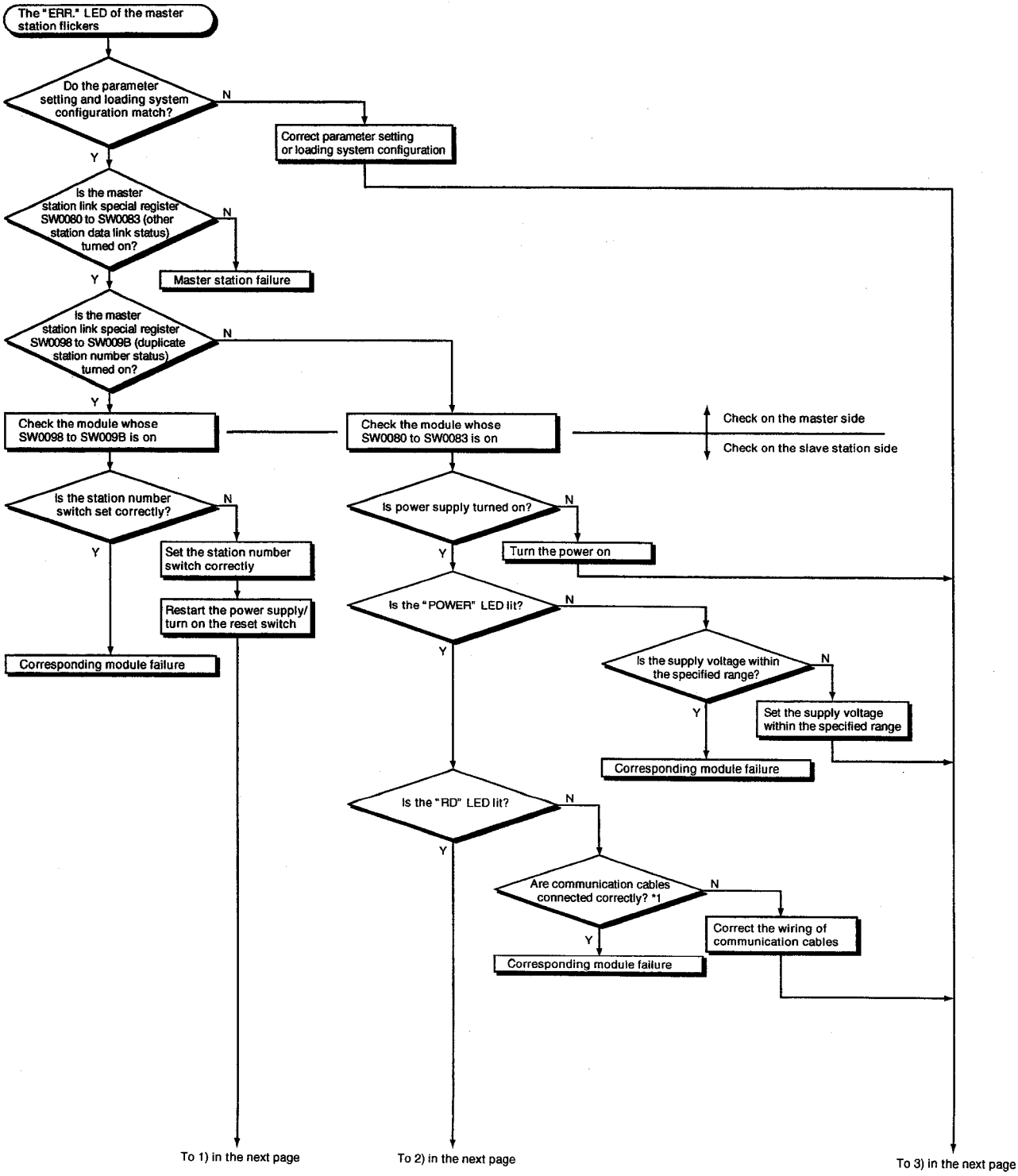

Transient transmission
M9036
[SET M9052]
[RST Y001C]
[RST Y001D]
[SEG K4 Y0018 K4 B0001]
Switches to bank 70.
M9036
[FROM H 0000 H 00E7 K4 M180 K 1]
Reads RX70 to RX7F to M180 to M195.
[TO H 0000 H 0167 K4 M248 K 1]
Writes M248 to M263 to RY70 to RY7F.
M9036
[SET M9052]
[SET Y001C]
[RST Y001D]
[SEG K4 Y0018 K4 B0001]
Switches to bank 1.

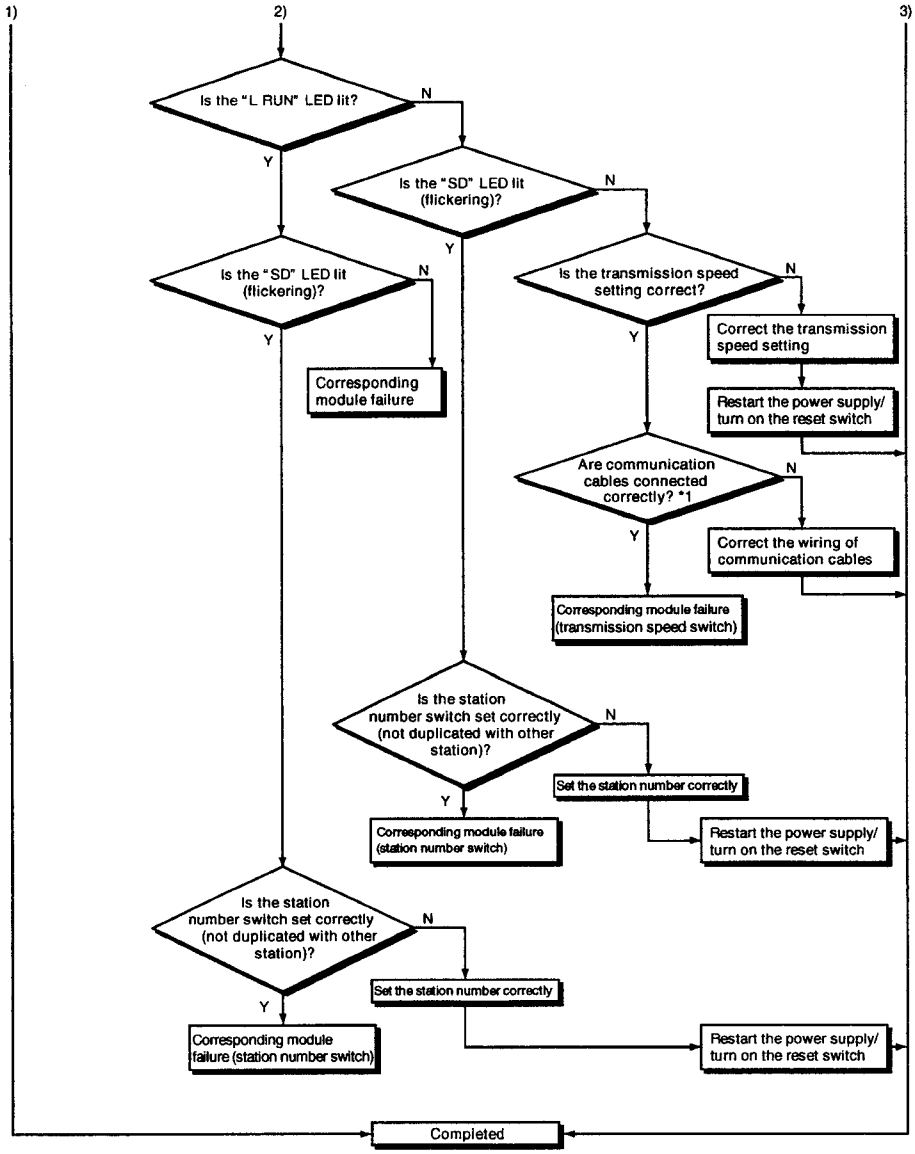

Transient transmission
M194
FROM H 0000 H 0040 D79 K 1
Reads the complete status.
= K 0 D79
SET Y0081
Turns on the intelligent device station access normal-completion signal.
<> K 0 D79
SET Y0082
Turns on the intelligent device station access abnormal-completion signal.
M9036
SET M9052
RST Y001C
RST Y001D
SEG K4 Y0018 K4 B0001
Switches to bank 0.
M9036
TO H 0000 H 0161 K4 M200 K 2
Writes M200 to M231 to RY10 to RY2F.
TO H 0000 H 0164 K4 M232 K 1
Writes M232 to M247 to RY40 to RY4F.
TO H 0000 H 0167 K4 M248 K 1
Writes M248 to M263 to RY70 to RY7F.
RET
CIRCUIT END

MEMO

13. Troubleshooting

13.1 Troubleshooting Flow when "ERR" LED of Master Station is Flickering





*1 Check for short-circuits, reversed connection, wire breakage, terminal resistor, FC connection, overall distance and station-to-station distance.

13.2 Errors/Warnings of D75P2

This section explains the contents of and corrective actions for the various errors and warnings generated when using the D75P2.

- Errors
  - Parameter setting range errors
  - Errors at operation start or during operation
- Warnings
  - System warnings
  - Axis warnings

13.2.1 Errors

(1) Overview of errors

(a) There are two types of error detected by the D75P2: parameter setting range errors and errors at operation start or during operation.

1) Parameter setting range errors
Parameter checking is conducted when power is turned on or when the remote station ready signal rises (off → on). When any of the parameter setting contents is incorrect, an error is generated.
When this error is generated, the D75P2 ready complete signal will not turn off.
To cancel this error, correct the value of the incorrectly set parameter, then turn on the remote station ready signal.

2) Errors at operation start/during operation
These errors are generated when starting or during positioning control, JOG operation, manual pulse-generator operation, etc.
When an axis error is generated during interpolation operation, the error number will be stored both in the reference axis and the counter-party axis of interpolation.
However, if either of the following conditions exists during analysis of the positioning data set for each point on the positioning start data table, then the axis error number is stored only in the reference axis:

- The other-party axis is BUSY, or
- When an error is generated in data not related to interpolation among positioning data and parameters.

When an error is generated at the simultaneous start of positioning operation, the storage contents of the axis error will differ depending on when the error was generated: before or after the simultaneous start.

- When the error is generated before the simultaneous start (axis number invalid, other axis BUSY, etc.), the "pre-simultaneous start error" will be stored in the start axis.
- When the error is generated after the simultaneous start (positioning data error, software stroke limit error, etc.), the corresponding error code will be stored in the axis that generated the error.
  As a result, the simultaneous start will not be completed, and all axes that do not have any error will store the "simultaneous start not possible error."

The operation status of the axis that generated the error will change to "error". When an error is generated during operation, the movement along the traveling axis will decelerate to a stop and the axis operation status becomes "error".
During interpolation operation, both axes will decelerate to a stop when one of the axes generates an error.

(2) Processing when error is generated

When error is generated, the error detection input will turn on and the corresponding error code will be stored in the buffer memory address for storing the axis error number, as shown below. However, there is a maximum delay of 56.8 ms until storing of the error code is completed after the error detection input turns on.

Axis number	Error detection input	Buffer memory address
1	XA	807
2	XB	907

The most recent error code will be stored in the buffer memory address for storing the axis error every time an error is generated.

(3) Error code classification

Error codes are generally classified into the following categories:

Error code	Error classification
001 to 009	Fatal error
010 to 099	Error at system startup
100 to 199	Common 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	Error during range checking of parameter settings

13.2.2 Warnings

(1) Overview of warnings

(a) There are two types of warnings detected: system warnings and axis warnings.

1) System warnings include the following:

- System control data setting error ····· Axis 1 will generate an axis warning.
- Positioning data setting error ····· Each axis will generate an axis warning. However, when it is an interpolation specification or axis setting error, the following axis will generate a warning:
  - During interpolation control of axes 1 and 2 : axis 1

2) Axis warnings are generated during operation such as positioning operation, JOG operation, manual pulse-generator operation and home position return operation, or by setting warnings due to system errors, and may be reset by turning on the axis error reset.
However, there are warnings that may not be canceled until the warning factor is removed.
The axis operation status will not change even when axis warnings are generated.

(2) Processing when warnings are generated

(a) When an axis warning is generated, the warning code corresponding to the content of the warning will be stored in the buffer memory address for storing the axis warning number, as shown below:

Axis number	Buffer memory address
1	808
2	908

The most recent warning code will be stored in buffer memory address for string the axis warning number every time an axis warning is generated.

(b) When an axis warning is generated during positioning operation, bit 10 (b10) in the buffer memory address for storing the status will be set to "1", as shown below.

Axis number	Buffer memory address
1	817
2	917

(3) Warning code classification

Warning codes are generally classified into the following categories:

Warning code	Warning classification
100 to 199	Common 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	Warning during range checking of system control data

13.2.3 Resetting the error

The error status is canceled when the buffer memory addresses for axis error reset, 1151 (for axis 1) and 1201 (for axis 2), are set to "1", after the following actions take place:

- The axis error detection signal is turned off
- The axis error number is cleared
- The axis warning detection signal is turned off
- The axis warning number is cleared
- The operation status is changed from "error" to "standby"
- The operation status is changed from "step error" to "standby"

13.2.4 Invalid operations

When the following operations are performed, the setting contents will become invalid and no error/warning will be generated:

- Speed change during home position return
- Speed change when operation is not in progress
- Axis stop when the axis is stopped
- Rapid axis stop when the axis is stopped
- Axis stop when the axis is not operating
- Rapid axis stop when the axis is not operating
- Writing to the buffer memory monitor area

13.3 Corrective Actions for Errors

This section explains the contents of errors as well as corrective actions to be taken when they are generated.

Error code	Error name	Detection timing	Operation status when error is generated	Corrective action
000	Normal status	—	—	—
001 003 004 005	<Fatal error> Fault Zero divide Overflow Underflow	H/W error	System stops	• Check for interference such as noise. • Check for hardware error.
51	Position command range exceeded	When the remote station ready signal is switched from off → on	The D75P2 ready complete flag does not turn off	Correct the positioning address so that it is within the range of performance specifications.
		At the start of positioning	Positioning does not start	
52	Speed command range exceeded	When the remote station ready signal is switched from off → on	The D75P2 ready flag does not turn off	Correct the command speed so that it is within the range of performance specifications.
		At the start of positioning	Positioning does not start	
100	<Common> Peripheral devices stop during operation	When the "stop" key is input from a peripheral device during operation	Operation decelerates to stop or abruptly stops	Cancel the error using axis error reset.
101	Remote station ready OFF during operation	When the remote station ready signal turns off during operation	Operation decelerates to stop or abruptly stops	Cancel the error using axis error reset.
102	Drive module ready OFF	When the drive module ready signal turns off during operation	Operation stops immediately	Cancel the error using axis error reset.
103	Test mode error during operation	In the test mode	Operation decelerates to stop	Investigate the cause and turn off the power for the D75P2 main module and peripheral devices, then turn it back on.
104	H/W stroke limit +	At the start of operation	Operation does not start	After canceling the error, start JOG operation or manual pulse-generator operation in the opposite direction to the limit switch.
		During operation	Operation decelerates to stop	
105	H/W stroke limit -	At the start of operation	Operation does not start	After canceling the error, start JOG operation or manual pulse-generator operation in the opposite direction to the limit switch.
		During operation	Operation decelerates to stop	
106	Stop signal ON at start	At the start of operation	Operation does not start	Cancel the error using axis error reset.
107	Ready off → on while BUSY	When the remote station ready signal rises	The D75P2 ready complete signal turns on The next operation does not start	Turn the remote station ready signal off → on.
108	Start not possible	At the start of operation	Operation does not start	Verify the axis operation status (buffer memory: 808, 908) and avoid issuing a start request during the status listed below: • Standby • During stop • Step standby • During step stop
201	Home position start	At the start of home position return	Home position return is not performed	• Enable the home position return retry function. • Perform home position return after moving the position from the present position using JOG operation or manual pulse-generator operation.
203	Dog detection timing error	During deceleration from the home position return speed	Operation decelerates to stop	• Correct the home position return speed.
204	Zero detection timing error			• Correct the home position return speed. • Input the external zero signal during movement at the creep speed.
205	Dwell time error			• Correct the home position return speed. • Extend the dwell time.
206	Count-type travel increment error	At the start of count-type home position return	Home position return is not performed	• Calculate the travel distance with the speed limit value, home position return speed and deceleration time, and set the travel increment after near-point dog at a value equal to or greater than the deceleration distance. • Reduce the home position return speed. • Adjust the near-point dog position so that the travel increment after near-point dog becomes longer.
207	Home position return request ON	At the start of high-speed home position return	Home position return is not performed	Execute the home position return.
208	Out of creep speed range	At the start of home position return		Set a creep speed within the home position return speed.

Error code	Error name	Detection timing	Operation status when error is generated	Corrective action
209	Home position return restart not possible	When requesting restart after home position return stops	Home position return does not restart	Restart the home position return.
213	ABS transfer time-out	During absolute-position restoration	Absolute-position restoration is not performed	Check the cable.
214	ABS transfer checksum			Check the wiring.
300	<JOG> Out of JOG speed range	At the start of JOG operation	JOG operation is not performed if the setting value is 0 or out of the setting range at the start of JOG operation	Set a value within the setting range. (However, except 0)
500	<Positioning operation> Condition data number invalid	During analysis of special start data	Operation is terminated	Correct the special start data.
501	Pre-simultaneous start error			
502	Start data number invalid	During analysis of positioning data	Positioning data is not executed	Correct the positioning data.
503	No command speed	During analysis of the first positioning data at start	Operation is not started	
504	Out of linear travel increment range	During analysis of positioning data		Review the positioning address.
506	Large circular error	When calculating the locus of circular-interpolation control by center-point specification	Circular-interpolation control by center-point specification is not performed	• Correct the center-point address/endpoint address. • Correct the values of the allowable circular-interpolation error range.
507	Start outside of stroke limit +	At the start of operation	Operation is not started	Change the present feed value to within the software stroke limit range using JOG operation or manual pulse-generator operation.
508	Start outside of stroke limit –			
509	Travel outside of stroke limit +			• In the case of positioning operation, change the positioning address to within the software stroke limit setting range. • In the case of starting JOG operation or manual pulse-generator operation, perform operation so that the value becomes within the software stroke limit setting range.
510	Travel outside of stroke limit –			
511	Travel outside of stroke limit +	During operation	Operation abruptly stops at positioning data immediately prior to the positioning data number at which the stroke limit is exceeded	Correct the positioning data.
512	Travel outside of stroke limit –			
514	Out of present-value change range	During analysis of the present value change	The present value is not changed	Change the new present value to within the setting range.
515	Present value change not possible			Do not specify present value change for the next positioning data in continuous locus control.
516	Continuous locus control not possible	During analysis of positioning data	Operation is not started	• Do not specify fixed-dimension feed for the next positioning data in continuous locus control. • Do not perform fixed-dimension feed, speed control or speed/position control while in the operation pattern of continuous locus control.
518	Out of operation pattern range	During analysis of positioning data	Operation is not started Operation decelerates to stop	Correct the operation pattern.
519	Interpolation with counter-party axis BUSY		Operation is not started Operation stops	Correct the control method.
520	Unit group mismatch	During analysis of positioning data	Operation is not started Operation decelerates to stop	• Correct the positioning data or change the parameter.
521	Interpolation description instruction invalid			Correct the control method.
522	Command speed setting error			Correct the command speed.
524	Control method setting error			Correct the control method or parameter.
525	Auxiliary point setting error		Operation is not started Operation stops immediately	Correct the circular address.
526	Endpoint setting error			Correct the positioning address.
527	Center point setting error			Correct the circular address.
530	Out of address range		Operation is not started Operation decelerates to stop	Correct the positioning address.
532	Simultaneous start not possible	At simultaneous start	Operation is terminated	Correct the special start data or positioning data.
533	Condition data error	During analysis of special start data		Set the special start data again.
534	Special start instruction error			

Error code	Error name	Detection timing	Operation status when error is generated	Corrective action
536	M-code ON signal ON start	At the start of positioning	Operation is not started	Perform start after the M-code ON signal is turned off.
537	Remote station ready OFF start			Perform start after the remote station ready signal is turned on.
538	Ready complete ON start			Perform start after D75P2 ready complete OFF is confirmed.
543	Out of start number range			Set the positioning start numbers again.
544	Out of radius range	During analysis of positioning data	Operation is not started Operation stops immediately	Correct the positioning data.
900	<Error history> (Basic parameter 1) Out of unit setting range	At power-on or when the remote station ready signal switches from off → on	The D75P2 ready complete flag does not turn off	Set a value within the setting range.
901	Number of pulses per rotation setting error			
902	Travel increment per rotation setting error			
903	Unit multiplier setting error			
904	Pulse output mode error			
905	Rotation direction setting error			
910	<Error history> (Basic parameter 2) Out of speed limit value range	At power-on or when the remote station ready signal switches from off → on At the start of operation	The D75P2 ready complete flag does not turn off at power-on or when the remote station ready signal switches from off → on When starting operation, operation is not started	Set a value within the setting range.
911	Out of acceleration time range			
912	Our of deceleration time range			
913	Out of bias speed range			
921	<Error history> (Extended parameter 1) S/W stroke high limit	When the remote station ready signal switches from off → on	The D75P2 ready complete does not turn off	Set a value within the setting range.
922	S/W stroke low limit			
923	S/W stroke limit selection			
924	S/W stroke limit valid			
925	Torque limit setting value invalid			
926	Command in-position range			
927	M-code ON timing error			
928	Speed switch mode error			
929	Interpolation speed specification method			
930	Present value update request error	When the remote station ready signal switches from off → on	The D75P2 ready complete does not turn off	Set a value within the setting range.
931	Manual pulse-generator selection error			
932	Pulse logic selection error			
933	Acceleration/deceleration time size error			

When a reserved error code is displayed, it means that an unnecessary data is stored in a buffer memory not listed in the manual.
When a reserved error is generated, write the following data to the specified buffer memory:

Error code	Setting data	Related buffer memory	
		Axis 1	Axis 2
934	0	32	182
935	1	33	183
936	3	34	184
937	0	35	185
996	1	87	237
970	0	64, 65	214, 215

Error code	Error name	Detection timing	Operation status when error is generated	Corrective action
934	(Reserved)	—	—	—
935	(Reserved)			
936	(Reserved)			
937	(Reserved)			
938	Backlash compensation error 2	When the remote station ready signal switches from off → on	The D75P2 ready complete does not turn off	Set a value within the setting range.
950	<Error history> (Extended parameter 2) Acceleration time 1 setting error	During data analysis	At start : Operation does not start During : Operation decelerates to 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 limit value 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			
962	Rapid-stop deceleration time invalid	During data analysis	At start : Operation does not start During : Operation decelerates to stop	Set a 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 circular error range			
967	External start selection error			
971	Locus control mode error	When the remote station ready signal switches from off → on	The D75P2 ready complete does not turn off	Set a value within the setting range.
980	<Error history> (Home position return basic parameter) 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 extended parameter) Home position return torque limit value			
992	Near-point dog travel increment error			
993	Home position acceleration selection error			
994	Home position deceleration selection error			
997	Speed selection error during home position shift			
999	Flash memory sum check error	When writing to the flash memory	The D75P2 ready complete does not turn off	Write to the flash memory again. If the same error occurs again, replace the module with a new one.

13.4 Corrective Actions for Warnings

This section explains the contents of warnings as well as corrective actions to be taken when they are generated.

Error code	Error name	Detection timing	Operation status when error is generated	Corrective action
000	Normal status	—	—	—
51	Travel-increment change invalid during speed/position switch control	When the speed → position switch signal is input	Operates using the positioning address (travel increment) of the positioning data.	Change the setting value of the register for changing speed/position switch control travel increment to within the setting range.
52	New speed value invalid	When speed change during JOG operation	Cramps at the maximum value of the setting range.	Change the new speed value to within the setting range.
100	<Common> Start during operation	When the start request is on	Operation continues	Correct the start request ON timing.
101	Present value change during BUSY	When present-value change request (Test mode)	The present-value change request is ignored	The present value is not changed during axis operation.
102	Error counter clear request	When error counter clear request	The error counter request is ignored	The error counter is not cleared during axis operation.
104	Restart not possible	When restart command request	Operation continues	Correct the start request ON timing.
105	Applicable axis invalid	When read/write request	The reference axis generates a warning.	Set the correct value, then perform read/write request again.
106	Positioning-data number invalid		The applicable axis generates a warning.	
107	Write pattern invalid			
108	Flash write invalid	When read/write request	Axis 1 generates a warning.	No processing
109	Write during BUSY	When write request	The applicable axis generates a warning.	Perform read/write request when the axis is not BUSY.
111	Remote station ready in progress	When writing to the flash memory	Axis 1 generates a warning.	Turn the remote station ready signal on → off.
112	Override value invalid	During analysis	• When the setting value is 0, control at 100. • When the setting value is 301 or more, control at 300.	Set a value within the setting range.
113	Out of torque change value range	During operation	Torque change is not performed	
114	Under bias speed	During analysis	Operation is performed at the bias speed	Set the command speed/bias speed again so that (command speed) ≧ (bias speed) is satisfied.
115	Number of read/write data invalid	When read/write	The applicable axis generates a warning.	Write the correct setting value, then perform read/write request again.
300	<JOG> Speed change during deceleration	When change of the JOG operation speed	Speed change is not performed	Do not change the JOG speed during deceleration due to JOG start signal off.
301	JOG speed limit value	When change of the JOG operation speed	• Perform JOG operation at the JOG speed limit value when the JOG speed limit value is exceeded. • The "speed control in-operation flag" will turn on while speed is being limited by the JOG speed limit.	Change the setting value to within the setting range.
401	<Manual pulse generator> Out of manual pulse-generator input scale range	When the manual pulse-generator input scale is changed	If the input scale is set to 101 or above, the value is cramped to 100. When 0 is set, it is considered that the scale is set to 1.	Change the pulse input scale for the manual pulse generator 1 to within the setting range.
402	Manual pulse generator selection setting 0	When the start of operation	Operation does not start	• Turn off the manual pulse-generator enable flag • Set the setting value for manual pulse-generator selection to 1 to 3. • Turn the remote station ready signal off → on.
500	<Positioning operation> Deceleration/stop speed change	When speed change	Speed change is not performed	Do not change speed during deceleration or stop due to a stop command, or during automatic deceleration in positioning control.

Error code	Error name	Detection timing	Operation status when error is generated	Corrective action
501	Speed limit value exceeded	When speed is changed	The speed cramps to the "speed limit value"	Set the speed after change within the range of 0 to speed control value.
502	Remainder dispersion speed drop	When in the remainder dispersion mode during position control	The applicable axis generates a warning	No processing
503	M-code ON signal ON	When execution of positioning data	Execution of positioning data is continued	Correct the on/off timing of the M code OFF signal.
505	No operation complete setting	When the 50th point is updated	Operation is terminated	Set operation completion at the 50th point.
506	FOR to NEXT nest structure	During analysis of the FOR instruction	Operation continues	Limit the FOR to NEXT nesting structures to 1.
508	VP switch ON during acceleration	When the speed/position switch signal turns on	Operation continues	Do not turn on the speed/position switch signal during acceleration
509	Remaining distance insufficient	When speed is changed	Speed change is performed (with the exception of operation pattern 11)	Change the speed so that the feed speed gets closer to the new speed value.
512	External start function invalid	When the external start signal turns on	No action in response to external start signal ON	Change the parameters to within the setting range.
513	Insufficient travel increment	During positioning operation	Operation stops immediately after the positioning address is reached	Correct the positioning data and parameter.
	Out of speed/position control travel-increment change register range	When the speed/position switch signal turns on	Position control is performed without using the change register	Set a travel increment within the setting range.
514	Out of command speed range	During analysis	The command speed is cramped at the speed limit value	Set a command speed within the setting range.
900	<System control data> Clock data setting invalid	When the clock data is set		Perform setting again using the correct clock data.

13.5 Error Start History

When an error is generated at start, the entire contents of the start history area in the buffer memory (address: 462 to 541) are copied to the error start history area (address: 543 to 622).

The contents stored in the error start history area will be erased when the power of the D75P2 is turned off. (When the D75P2 is powered on, "0" is stored in the error start history area.)

The error start history area stores a maximum of 16 errors occurred after the D75P2 was powered on.

The error start history may be monitored using peripheral devices.
See the following manual for operation using peripheral devices:

- SW □ RX/NX/IVD-AD75P-type positioning module software package, operation manual [IB(NA) · 68709]

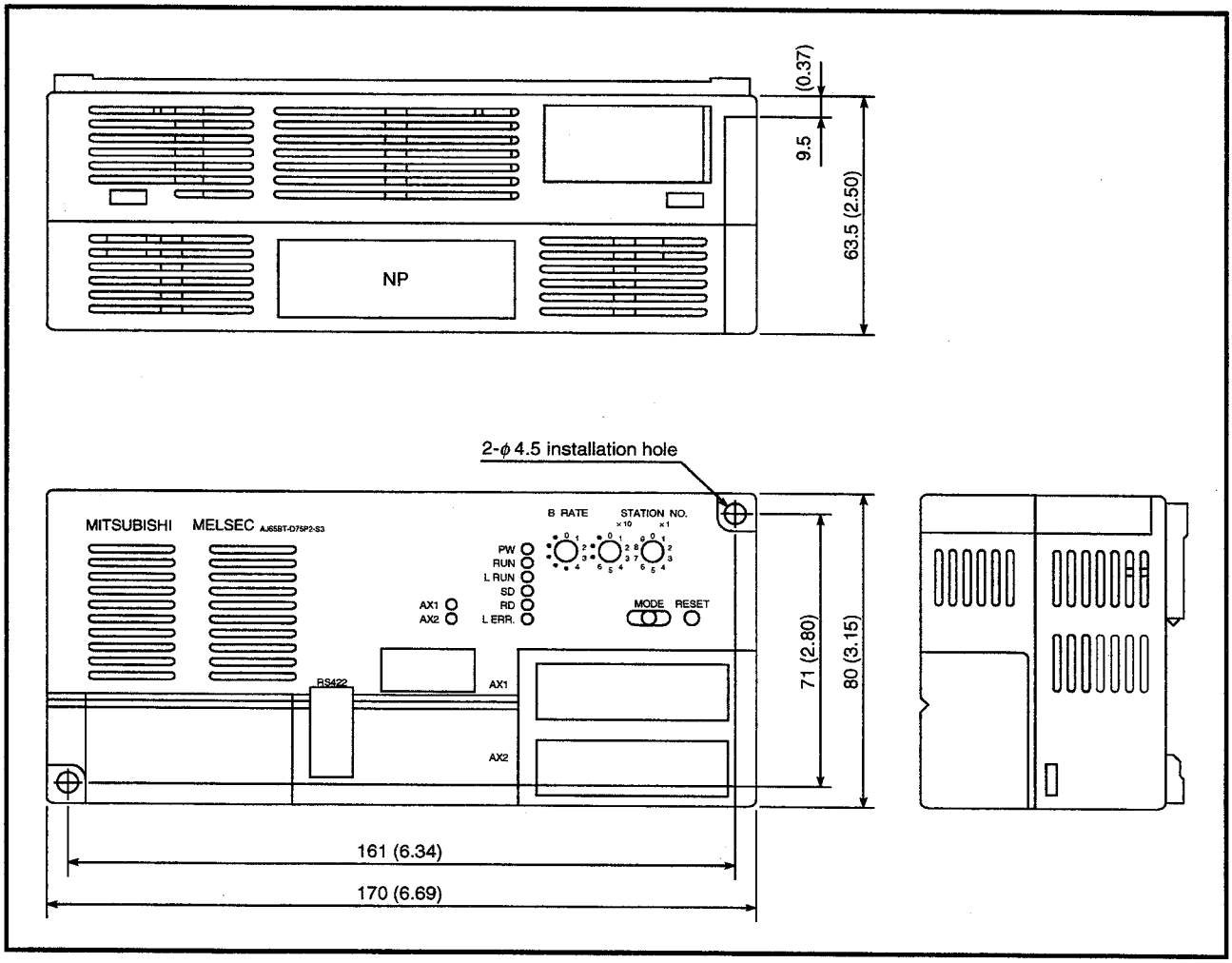
<Display example on a peripheral device>

N0.	Axis	Start	Type	Time	Judgment
1	1	External	100	21:34:56.7	OK
2	2	PC	Manual pulse generator	21:43:12.3	OK
3	2	PC	JOG	21:43:34.4	201
4	1	External	Restart 100	21:43:54.8	OK
5	3	Peripheral	101	10:18:03.7	201

Appendix

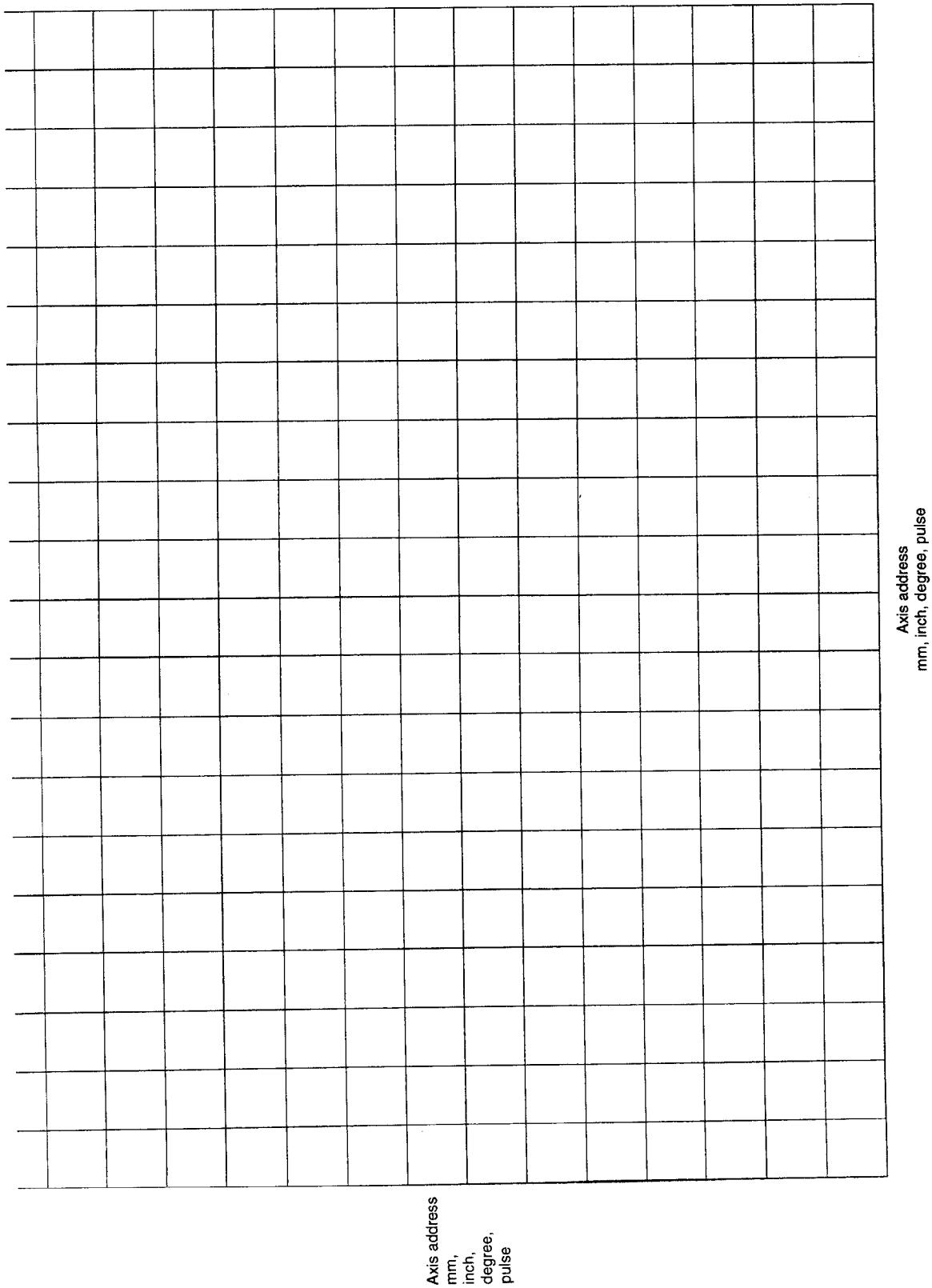
Appendix 1 External Dimensions Diagram

(1) AJ65BT-D75P2-S3



Appendix 2 Format Sheet

Appendix 2.1 Positioning module operation diagram



Appendix 2.2 Parameters, 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 rotation	1 to 65535 pulse			
	Travel increment per rotation	1 to 65535 $\times 10^{-1}$ μ m	1 to 65535 $\times 10^{-5}$ inch	1 to 65535 $\times 10^{-5}$ degree	1 to 65535 pulse
	Multiple of travel increment per pulse	1: ×1, 10: ×10, 100: ×100, 1000: ×1000			
	Output mode	0 : PLS/SIG mode 2 : Phase A/B mode (multiplication by 4)		1 : CW/CCW mode, 3 : Phase A/B mode (multiplication by 1)	
	Rotation direction setting	0 : The present value increases by forward pulse output 1 : The present value increases by reverse pulse output			
Basic parameter 2	Speed limit value	1 to 600000000 $\times 10^{-2}$ mm/min	1 to 600000000 $\times 10^{-3}$ inch/min	1 to 600000000 $\times 10^{-3}$ degree/min	1 to 1000000 pulse/s
	Acceleration time	1 to 65535 ms / 1 to 8388608 ms			
	Deceleration time				
	Start bias speed	1 to 600000000 $\times 10^{-2}$ mm/min	1 to 600000000 $\times 10^{-3}$ inch/min	1 to 600000000 $\times 10^{-3}$ degree/min	1 to 1000000 pulse/s
	Stepping motor mode selection	0 : Standard mode		1 : Stepping motor mode	
Extended parameter 1	Backlash compensation	1 to 65535 $\times 10^{-1}$ μ m	1 to 65535 $\times 10^{-5}$ inch	1 to 65535 $\times 10^{-5}$ degree	1 to 65535 pulse
	Software stroke high limit	–2147483648 to 2147483647 $\times 10^{-1}$ μ m	–2147483648 to 2147483647 $\times 10^{-5}$ inch	0 to 35999999 $\times 10^{-5}$ degree	–2147483648 to 2147483647 pulse
	Software stroke low limit				
	Software stroke limit selection	0 : Applies software stroke limit to the present feed value 1 : Applies software stroke limit to the machine feed value			
	Software stroke limit validity during JOG operation/manual pulse-generator operation	0 : Software stroke limit invalid during JOG operation/manual pulse-generator operation 1 : Software stroke limit valid during JOG operation/manual pulse-generator operation			
	Command in-position range	1 to 32767000 $\times 10^{-1}$ μ m	1 to 32767000 $\times 10^{-5}$ inch	1 to 32767000 $\times 10^{-5}$ degree	1 to 32767 pulse
	Torque limit setting value	1 to 500 %			
	M-code ON signal output timing	0 : WITH mode		1 : AFTER mode	
	Speed change type in speed switching mode	0 : Standard speed switch mode		1 : Early speed switch mode	
	Interpolation speed specification method (interpolation mode)	0 : Composite speed		1 : Reference-axis speed	
	Present feed value update request instruction during speed control	0 : Does not update the present feed value during speed control 1 : Updates the present feed value during speed control 2 : Clears the present feed value with 0 during speed control			
	Manual pulse-generator selection	0 : Ignores manual-pulse generator operation 2 : Uses manual pulse generator 2		1 : Uses manual pulse generator 1 3 : Uses manual pulse generator 3	
	Pulse output logic selection to drive module	0 : Positive logic 1 : Negative logic			
	Selection of the acceleration/deceleration time setting size	0 : 1-word type (0 to 65535 ms) 1 : 2-word type (0 to 8388608 ms)			
Extended parameter 2	Acceleration time 1	1 to 65535 ms / 1 to 8388608 ms			
	Acceleration time 2				
	Acceleration time 3				
	Deceleration time 1				
	Deceleration time 2				
	Deceleration time 3				
	JOG speed limit value	1 to 600000000 $\times 10^{-2}$ mm/min	1 to 600000000 $\times 10^{-3}$ inch/min	1 to 600000000 $\times 10^{-3}$ degree/min	1 to 1000000 pulse/s
	Selection of the JOG operation acceleration time	0 to 3			
	Selection of the JOG operation deceleration time				
	Selection of the acceleration/deceleration processing	0 : Trapezoidal acceleration/deceleration processing 1 : S-pattern acceleration/deceleration processing			

	Initial value	Axis 1	Axis 2	Remarks
	3			
	20000			
	20000			
	1			
	1			
	0			
	20000			
	1000			
	1000			
	0			
	0			
	0			
	2147483647 –2147483648			
	0			
	0			
	100			
	300			
	0			
	0			
	0			
	0			
	Axis1: 1, Axis2: 2, Axis3: 3			
	0			
	0			
	1000			
	1000			
	1000			
	1000			
	1000			
	1000			
	20000			
	0			
	0			
	0			

Item		Setting range				
		mm	inch	degree	pulse	
Extended parameter 2	S-curve ratio	1 to 100 %				
	Rapid-stop deceleration time	1 to 65535 ms / 1 to 8388608 ms				
	Stop group 1 rapid stop selection	0 : Normal deceleration stop 1 : Rapid stop				
	Stop group 2 rapid stop selection					
	Stop group 3 rapid stop selection					
	Positioning completion signal output time	0 to 65535 ms				
	Allowable circular-interpolation error range	0 to 100000 $\times 10^{-1}$ μ m	0 to 100000 $\times 10^{-5}$ inch	0 to 100000 $\times 10^{-5}$ degree	0 to 100000 pulse	
	External start function selection	0 : External positioning start 1 : External speed change request 2 : Skip request				
	Adjacent passing mode selection in locus control	0 : Positioning-address passing mode 1 : Adjacent passing mode				

(2) Home position return data

Item		Setting range				
		mm	inch	degree	pulse	
Home position return basic parameter	Home position return method	0 : Near-point dog type 1 : Stopper stop 1) (by time-out from the dwell timer) 2 : Stopper stop 2) (by home position signal at the time of contacting the stopper) 3 : Stopper stop 3) (no near-point dog method) 4 : Count type 1) (uses home position signal) 5 : Count type 2) (does not use home position signal)				
	Home position return direction	0 : Positive direction (address-increase direction) 1 : Negative direction (address-decrease direction)				
	Home position address	–2147483648 to 2147483647 $\times 10^{-1}$ μ m	–2147483648 to 2147483647 $\times 10^{-5}$ inch	0 to 35999999 $\times 10^{-5}$ degree	–2147483648 to 2147483647 pulse	
	Home position return speed	1 to 600000000 $\times 10^{-2}$ mm/min	1 to 600000000 $\times 10^{-3}$ inch/min	1 to 600000000 $\times 10^{-3}$ degree/min	1 to 1000000 pulse/s	
	Creep speed					
	Home position return retry	0 : Does not perform home position return retry using the high/low limit switch. 1 : Perform home position return retry using the high/low limit switch.				
Home position return extended parameter	Home position return dwell time	0 to 65535 ms				
	Travel increment after near-point dog setting	0 to 2147483647 $\times 10^{-1}$ μ m	0 to 2147483647 $\times 10^{-5}$ inch	0 to 2147483647 $\times 10^{-5}$ degree	0 to 2147483647 pulse	
	Home position return acceleration time selection	0 to 3				
	Home position return deceleration time selection					
	Home position shift amount	–2147483648 to 2147483647 $\times 10^{-1}$ μ m	–2147483648 to 2147483647 $\times 10^{-5}$ inch	0 to 35999999 to $\times 10^{-5}$ degree	–2147483648 to 2147483647 pulse	
	Home position return torque limit value	0 to 300 %				
	Speed at home position shift specification	0 : Home position return speed 1 : Creep speed				
	Dwell time at retry	0 to 65535 ms				

	Initial value	Axis 1	Axis 2	Remarks
	100			
	1000			
	0			
	0			
	0			
	300			
	100			
	0			

	Initial value	Axis 1	Axis 2	Remarks
	0			
	0			
	0			
	1			
	1			
	0			
	0			
	0			
	0			
	0			
	0			
	300			
	0			
	0			

Appendix 2.3 Positioning data (data number to)

Axis							
Data number	Pattern	Control method	Direction	Speed	Address	Dwell	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 Positioning Data Number and Buffer Memory Address Conversion Table

(1) For axis 1

Data number	Positioning identifier	M code	Dwell time	Command speed		Positioning address		Circular data	
				Lower level	Upper level	Lower level	Upper level	Lower level	Upper level
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	1435	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	15147	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	1721	1712	1714	1715	1716	1717	1718	1719
43	1720	1731	1722	1724	1725	1726	1727	1728	1729
44	1730	1741	1732	1734	1735	1736	1737	1738	1739
45	1740	1751	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

Data number	Positioning identifier	M code	Dwell time	Command speed		Positioning address		Circular data	
				Lower level	Upper level	Lower level	Upper level	Lower level	Upper level
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	2090	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

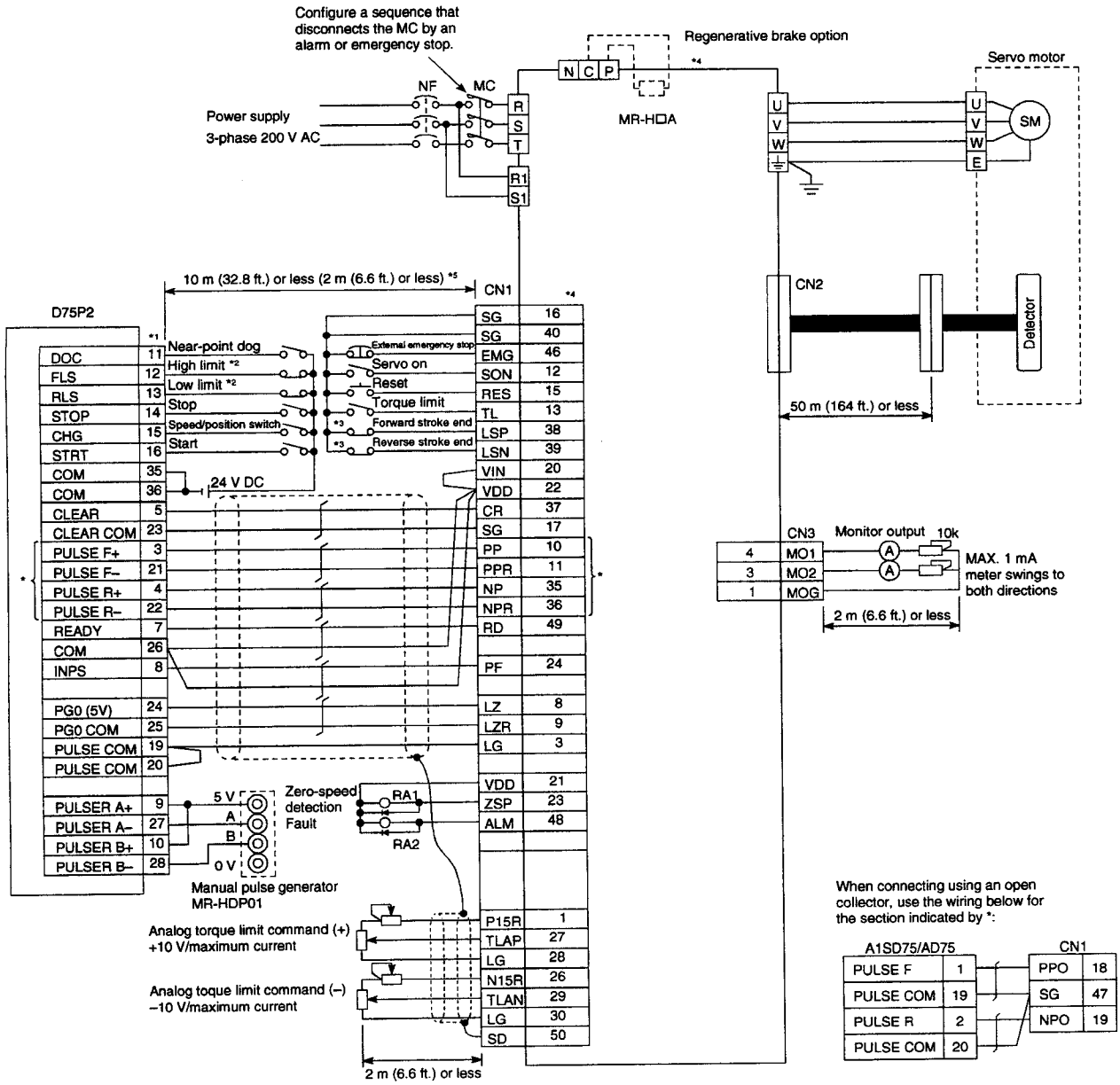
(2) For axis 2

Data number	Positioning identifier	M code	Dwell time	Command speed		Positioning address		Circular data	
				Lower level	Upper level	Lower level	Upper level	Lower level	Upper level
1	2300	2301	2302	2304	2305	2306	2307	2308	2309
2	2310	2311	2312	2314	2315	2316	2317	2318	2319
3	2320	2321	2322	2324	2325	2326	2327	2328	2329
4	2330	2331	2332	2334	2335	2336	2337	2338	2339
5	2340	2341	2342	2344	2345	2346	2347	2348	2349
6	2350	2351	2352	2354	2355	2356	2357	2358	2359
7	2360	2361	2362	2364	2365	2366	2367	2368	2369
8	2370	2371	2372	2374	2375	2376	2377	2378	2379
9	2380	2381	2382	2384	2385	2386	2387	2388	2389
10	2390	2391	2392	2394	2395	2396	2397	2398	2399
11	2400	2401	2402	2404	2405	2406	2407	2408	2409
12	2410	2411	2412	2414	2415	2416	2417	2418	2419
13	2420	2421	2422	2424	2425	2426	2427	2428	2429
14	2430	2431	2432	2434	2435	2436	2437	2438	2439
15	2440	2441	2442	2444	2445	2446	2447	2448	2449
16	2450	2451	2452	2454	2455	2456	2457	2458	2459
17	2460	2461	2462	2464	2465	2466	2467	2468	2469
18	2470	2471	2472	2474	2475	2476	2477	2478	2479
19	2480	2481	2482	2484	2485	2486	2487	2488	2489
20	2490	2491	2492	2494	2495	2496	2497	2498	2499
21	2500	2501	2502	2504	2505	2506	2507	2508	2509
22	2510	2511	2512	2514	2515	2516	2517	2518	2519
23	2520	2521	2522	2524	2525	2526	2527	2528	2529
24	2530	2531	2532	2534	2535	2536	2537	2538	2539
25	2540	2541	2542	2544	2545	2546	2547	2548	2549
26	2550	2551	2552	2554	2555	2556	2557	2558	2559
27	2560	2561	2562	2564	2565	2566	2567	2568	2569
28	2570	2571	2572	2574	2575	2576	2577	2578	2579
29	2580	2581	2582	2584	2585	2586	2587	2588	2589
30	2590	2591	2592	2594	2595	2596	2597	2598	2599
31	2600	2601	2602	2604	2605	2606	2607	2608	2609
32	2610	2611	2612	2614	2615	2616	2617	2618	2619
33	2620	2621	2622	2624	2625	2626	2627	2628	2629
34	2630	2631	2632	2634	2635	2636	2637	2638	2639
35	2640	2641	2642	2644	2645	2646	2647	2648	2649
36	2650	2651	2652	2654	2655	2656	2657	2658	2659
37	2660	2661	2662	2664	2665	2666	2667	2668	2669
38	2670	2671	2672	2674	2675	2676	2677	2678	2679
39	2680	2681	2682	2684	2685	2686	2687	2688	2689
40	2690	2691	2692	2694	2695	2696	2697	2698	2699
41	2700	2701	2702	2704	2705	2706	2707	2708	2709
42	2710	271v	2712	2714	2715	2716	2717	2718	2719
43	2720	2721	2722	2724	2725	2726	2727	2728	2729
44	2730	2731	2732	2734	2735	2736	2737	2738	2739
45	2740	2741	2742	2744	2745	2746	2747	2748	2749
46	2750	2751	2752	2754	2755	2756	2757	2758	2759
47	2760	2761	2762	2764	2765	2766	2767	2768	2769
48	2770	2771	2772	2774	2775	2776	2777	2778	2779
49	2780	2781	2782	2784	2785	2786	2787	2788	2789
50	2790	2791	2792	2794	2795	2796	2797	2798	2799

Data number	Positioning identifier	M code	Dwell time	Command speed		Positioning address		Circular data	
				Lower level	Upper level	Lower level	Upper level	Lower level	Upper level
51	2800	2801	2802	2804	2805	2806	2807	2808	2809
52	2810	2811	2812	2814	2815	2816	2817	2818	2819
53	2820	2821	2822	2824	2825	2826	2827	2828	2829
54	2830	2831	2832	2834	2835	2836	2837	2838	2839
55	2840	2841	2842	2844	2845	2846	2847	2848	2849
56	2850	2851	2852	2854	2855	2856	2857	2858	2859
57	2860	2861	2862	2864	2865	2866	2867	2868	2869
58	2870	2871	2872	2874	2875	2876	2877	2878	2879
59	2880	2881	2882	2884	2885	2886	2887	2888	2889
60	2890	2891	2892	2894	2895	2896	2897	2898	2899
61	2900	2901	2902	2904	2905	2906	2907	2908	2909
62	2910	2911	2912	2914	2915	2916	2917	2918	2919
63	2920	2921	2922	2924	2925	2926	2927	2928	2929
64	2930	2931	2932	2934	2935	2936	2937	2938	2939
65	2940	2941	2942	2944	2945	2946	2947	2948	2949
66	2950	2951	2952	2954	2955	2956	2957	2958	2959
67	2960	2961	2962	2964	2965	2966	2967	2968	2969
68	2970	2971	2972	2974	2975	2976	2977	2978	2979
69	2980	2981	2982	2984	2985	2986	2987	2988	2989
70	2990	2991	2992	2994	2995	2996	2997	2998	2999
71	3000	3001	3002	3004	3005	3006	3007	3008	3009
72	3010	3011	3012	3014	3015	3016	3017	3018	3019
73	3020	3021	3022	3024	3025	3026	3027	3028	3029
74	3030	3031	3032	3034	3035	3036	3037	3038	3039
75	3040	3041	3042	3044	3045	3046	3047	3048	3049
76	3050	3051	3052	3054	3055	3056	3057	3058	3059
77	3060	3061	3062	3064	3065	3066	3067	3068	3069
78	3070	3071	3072	3074	3075	3076	3077	3078	3079
79	3080	3081	3082	3084	3085	3086	3087	3088	3089
80	3090	3091	3092	3094	3095	3096	3097	3098	3099
81	3100	3101	3102	3104	3105	3106	3107	3108	3109
82	3110	3111	3112	3114	3115	3116	3117	3118	3119
83	3120	3121	3122	3124	3125	3126	3127	3128	3129
84	3130	3131	3132	3134	3135	3136	3137	3138	3139
85	3140	3141	3142	3144	3145	3146	3147	3148	3149
86	3150	3151	3152	3154	3155	3156	3157	3158	3159
87	3160	3161	3162	3164	3165	3166	3167	3168	3169
88	3170	3171	3172	3174	3175	3176	3177	3178	3179
89	3180	3181	3182	3184	3185	3186	3187	3188	3189
90	3190	3191	3192	3194	3195	3196	3197	3198	3199
91	3200	3201	3202	3204	3205	3206	3207	3208	3209
92	3210	3211	3212	3214	3215	3216	3217	3218	3219
93	3220	3221	3222	3224	3225	3226	3227	3228	3229
94	3230	3231	3232	3234	3235	3236	3237	3238	3239
95	3240	3241	3242	3244	3245	3246	3247	3248	3249
96	3250	3251	3252	3254	3255	3256	3257	3258	3259
97	3260	3261	3262	3264	3265	3266	3267	3268	3269
98	3270	3271	3272	3274	3275	3276	3277	3278	3279
99	3280	3281	3282	3284	3285	3286	3287	3288	3289
100	3290	3291	3292	3294	3295	3296	3297	3298	3299

Appendix 4 Connection Examples of D75P2 and Servo Amplifier

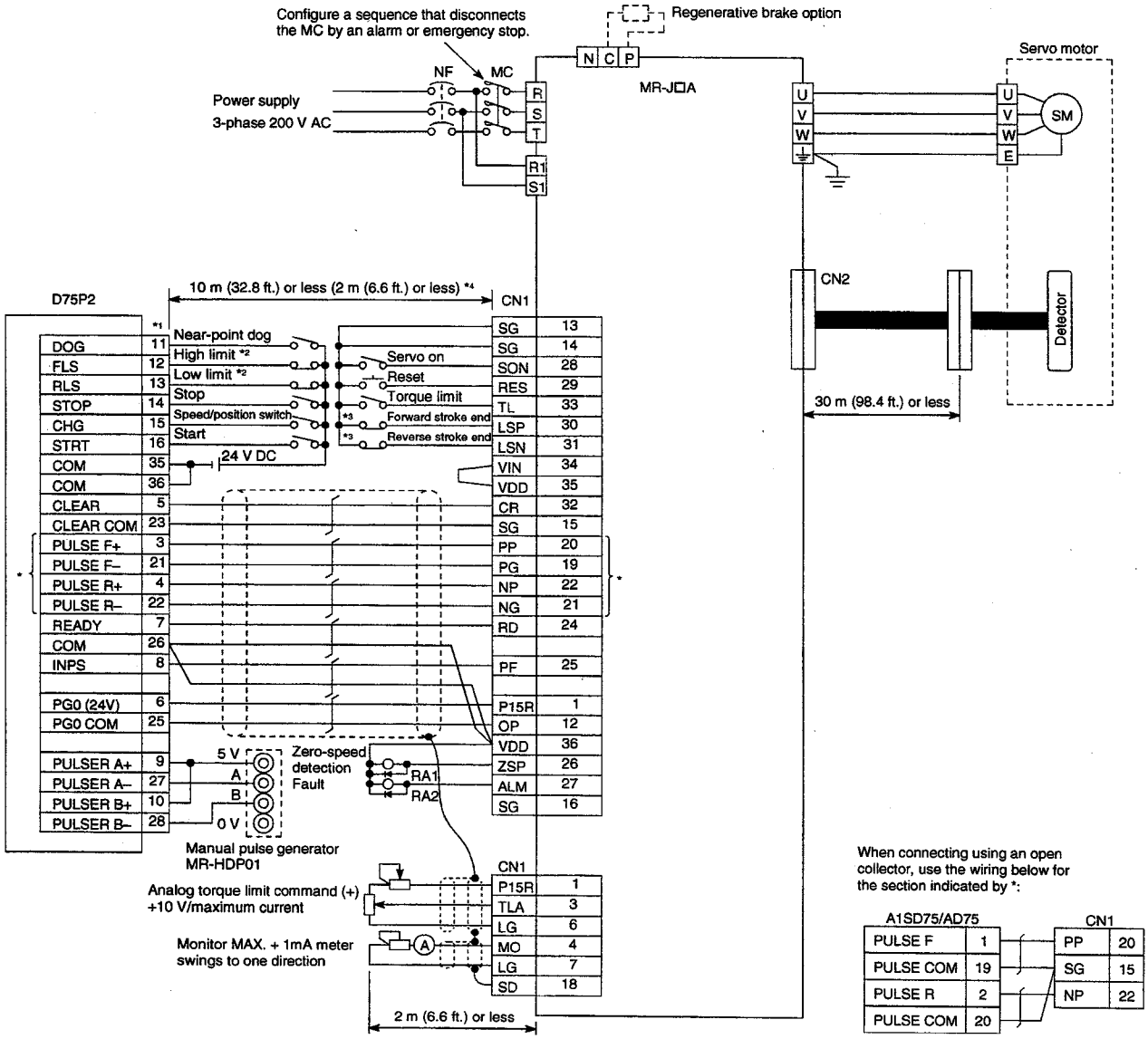
Appendix 4.1 Connection example of D75P2 and MR-H □ A (differential driver (open collector), negative logic *6)



Remark

1) *1 : The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) *2 : The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function. Set them inside the servo limit switches.
3) *3 : Limit switches for the servo (for stopping).
4) *4 : For details on connection, see the specification and instruction manual for the MR-H servo amplifier.
5) *5 : Indicates the distance between the controller and amplifier. The distance is 2 m (6.6 ft.) or less when an open collector is used.
6) *6 : For the D75P2, set the pulse output logic selection to drive module in the extended parameter 1 to "negative logic."

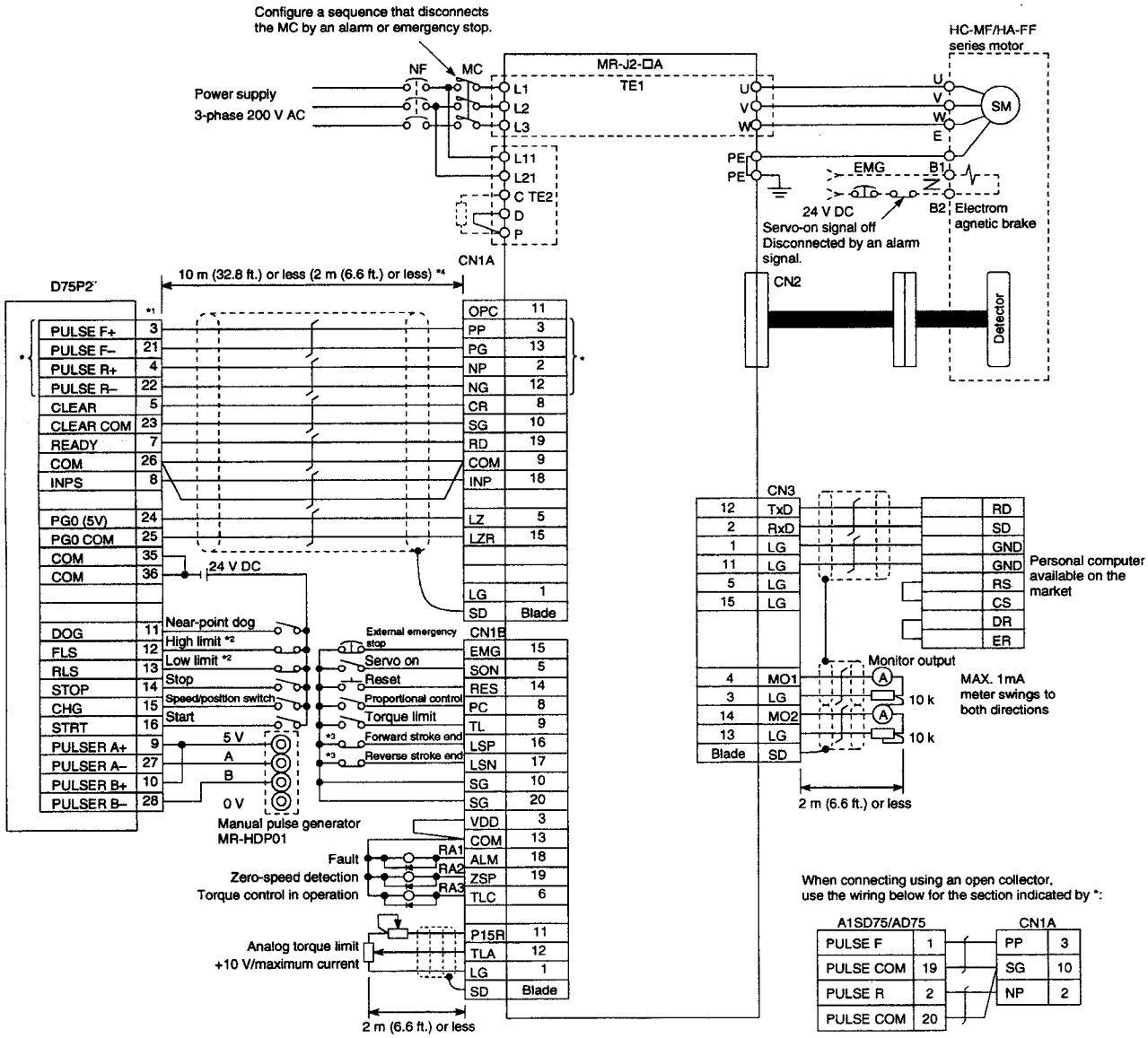
Appendix 4.2 Connection example of D75P2 and MR-J □ A (differential driver (open collector), negative logic *5)



Remark

1) *1 : The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) *2 : The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function. Set them inside the servo limit switches.
3) *3 : Limit switches for the servo (for stopping).
4) *4 : Indicates the distance between the controller and amplifier. The distance is 2 m (6.6 ft.) or less when an open collector is used.
5) *5 : For the D75P2, set the pulse output logic selection to drive module in the extended parameter 1 to "negative logic."

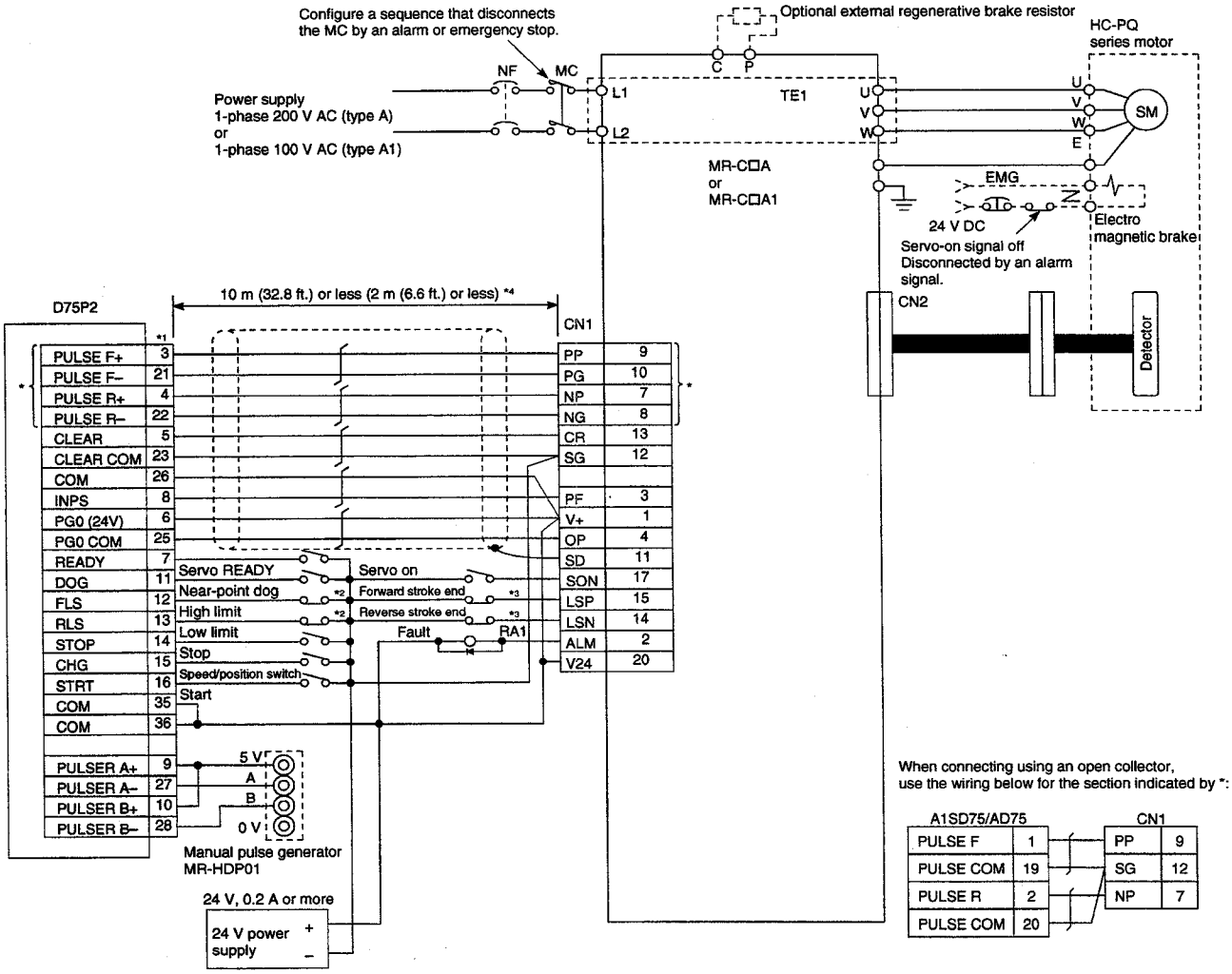
Appendix 4.3 Connection example of D75P2 and MR-J2- □ A (differential driver (open collector), negative logic *5)



Remark

1) *1 : The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) *2 : The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function. Set them inside the servo limit switches.
3) *3 : Limit switches for the servo (for stopping).
4) *4 : Indicates the distance between the controller and amplifier.
   The distance is 2 m (6.6 ft.) or less when an open collector is used.
5) *5 : For the D75P2, set the pulse output logic selection to drive module in the extended parameter 1 to "negative logic."

Appendix 4.4 Connection example of D75P2 and MR-C □ A (differential driver (open collector), negative logic *5)

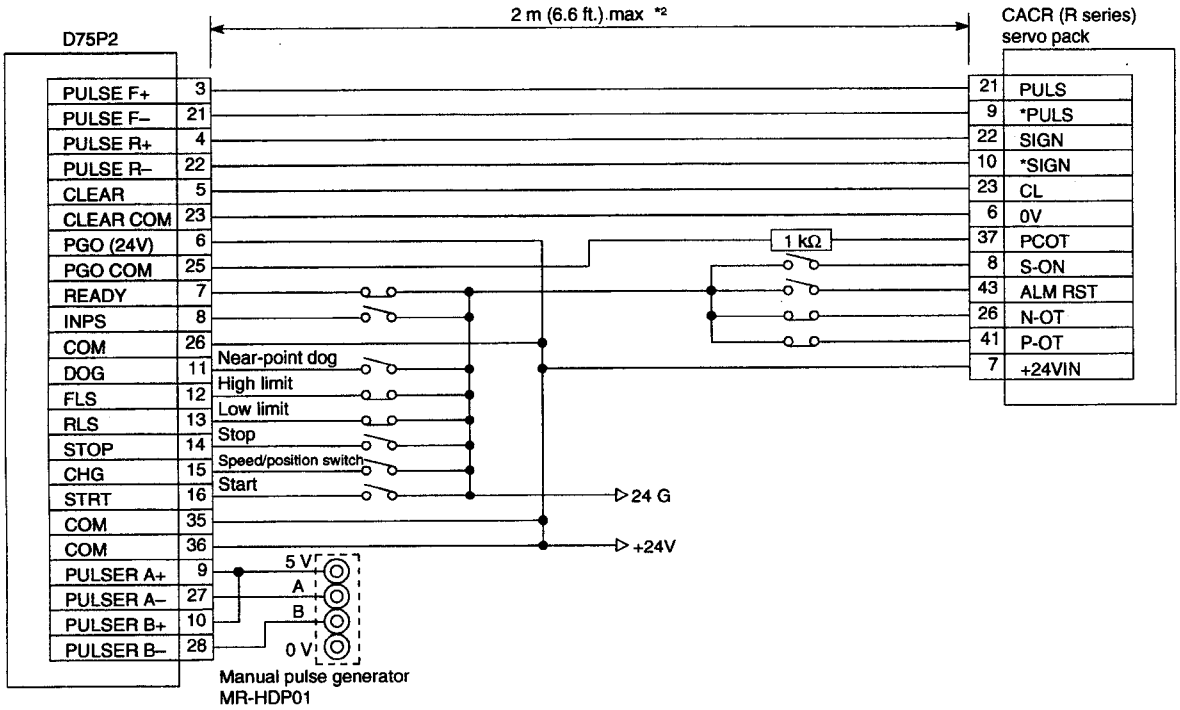


Remark

1) *1 : The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) *2 : The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function. Set them inside the servo limit switches.
3) *3 : Limit switches for the servo (for stopping).
4) *4 : Indicates the distance between the controller and amplifier.
   The distance is 2 m (6.6 ft.) or less when an open collector is used.
5) *5 : For the D75P2, set the pulse output logic selection to drive module in the extended parameter 1 to "negative logic."

Appendix 5 Connection Example with Servo Amplifier by Yasukawa

Appendix 5.1 Connection example of D75P2 and CACR (R series) (differential driver, negative logic *1)

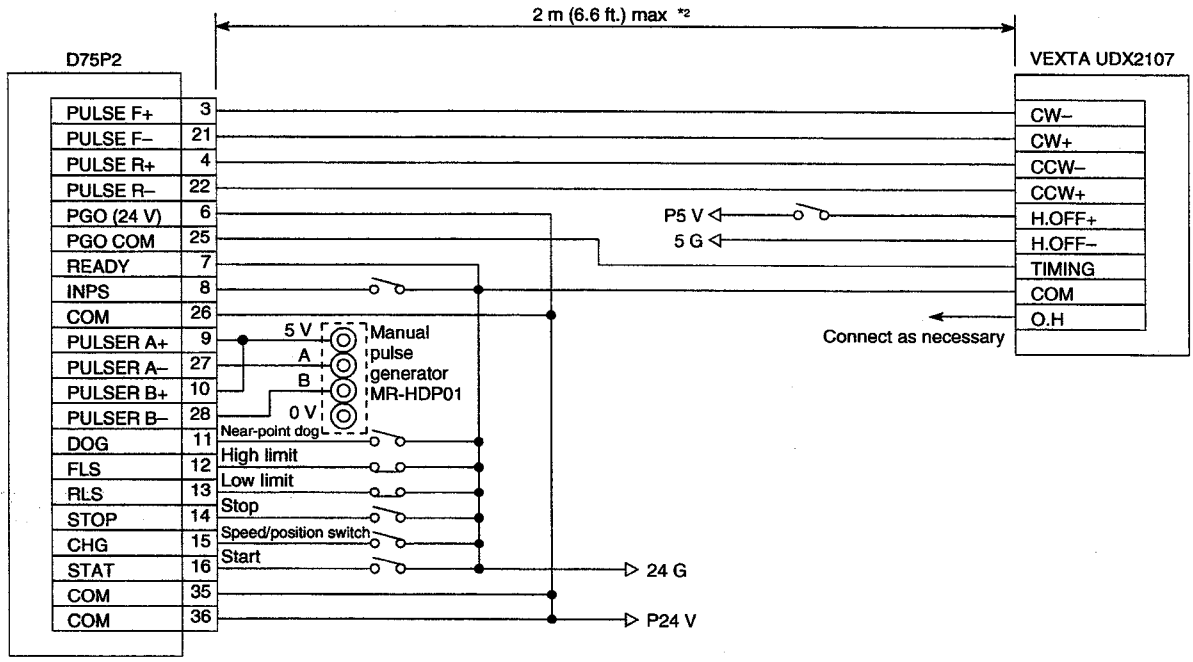


Remark

1) The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function. Set them inside the servo limit switches.
3) For wiring on the servo amplifier side other than above and shielding of respective signal lines, see the manual for the servo amplifier.
4) *1 : For the D75P2, set the pulse output logic selection to drive module in the extended parameter 1 to "negative logic."
5) *2 : Indicates the distance between the D75P2 and CACR (R series) servo pack.

Appendix 6 Connection Examples with Stepping Motors by Oriental

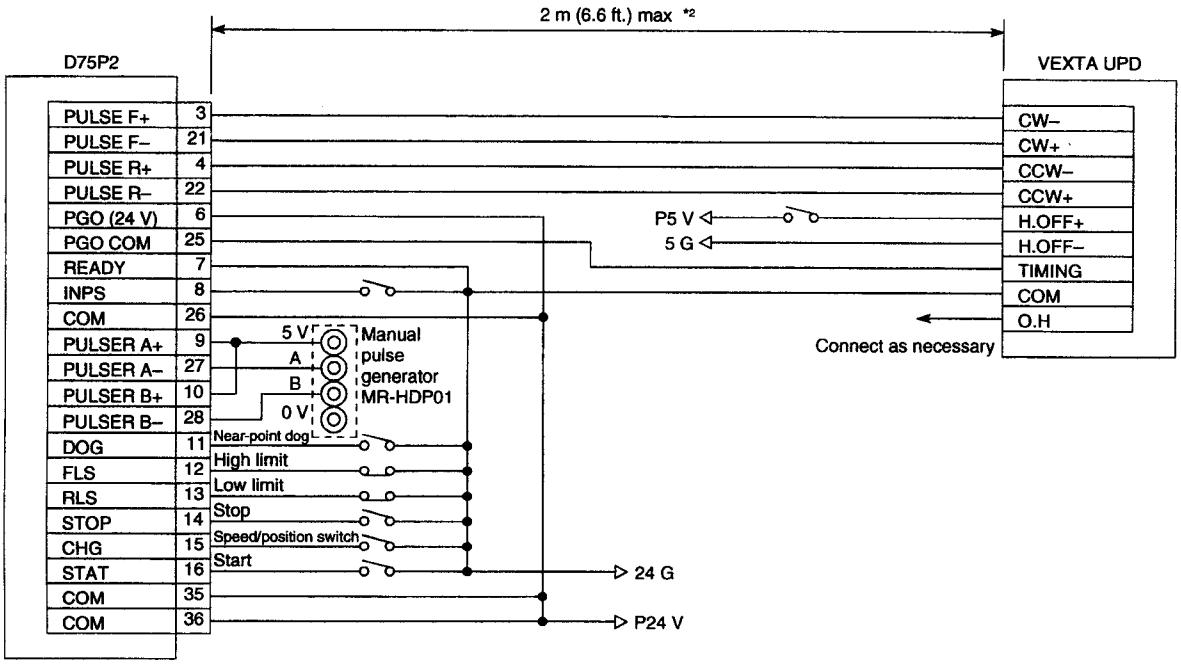
Appendix 6.1 Connection example of D75P2 and VEXTA UDX2107 (differential driver, positive logic *1)



Remark

1) The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function.
3) For wiring on the stepping motor drive side other than above and shielding of respective signal lines, see the manual for the stepping motor drive.
4) *1 : The default pulse-output logic to the D75P2 drive module is "positive logic."
5) *2 : Indicates the distance between the D75P2 and VEXTA UDX2107.

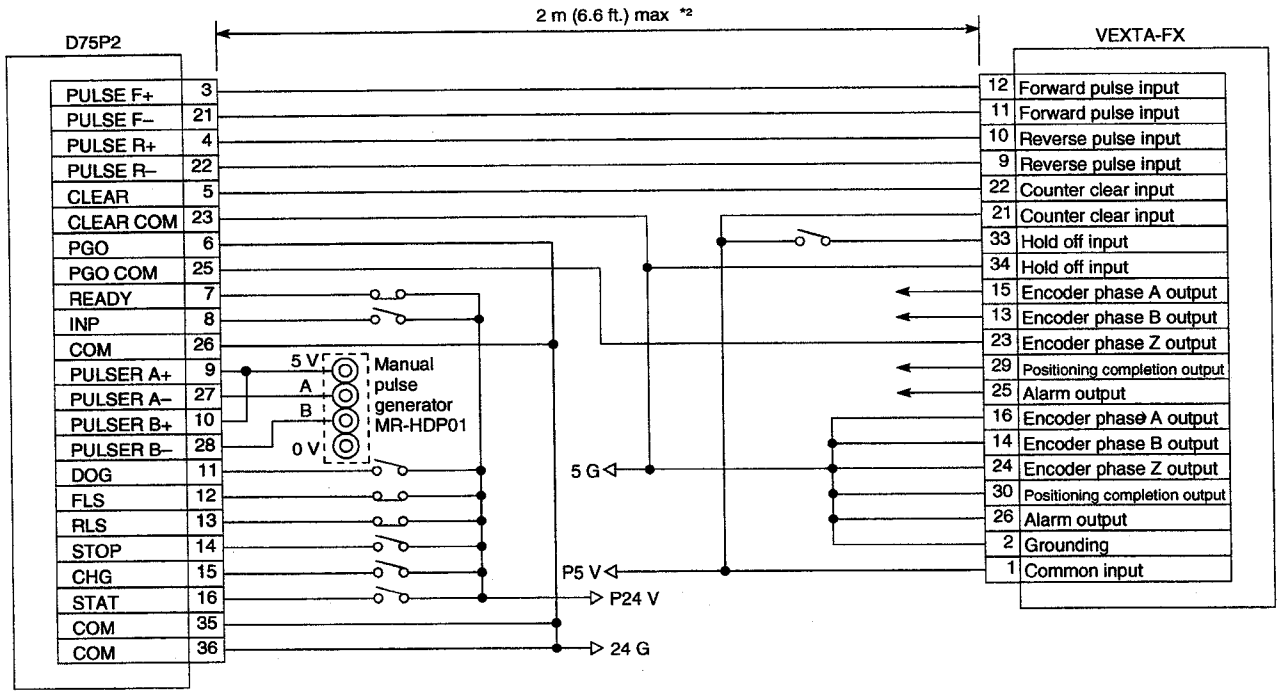
Appendix 6.2 Connection example of D75P2 and VEXTA UPD (differential driver, positive logic *1)



Remark

1) The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function.
3) For wiring on the stepping motor drive side other than above and shielding of respective signal lines, see the manual for the stepping motor drive.
4) *1 : The default pulse-output logic to the D75P2 drive module is "positive logic."
5) *2 : Indicates the distance between the D75P2 and VEXTA UPD.

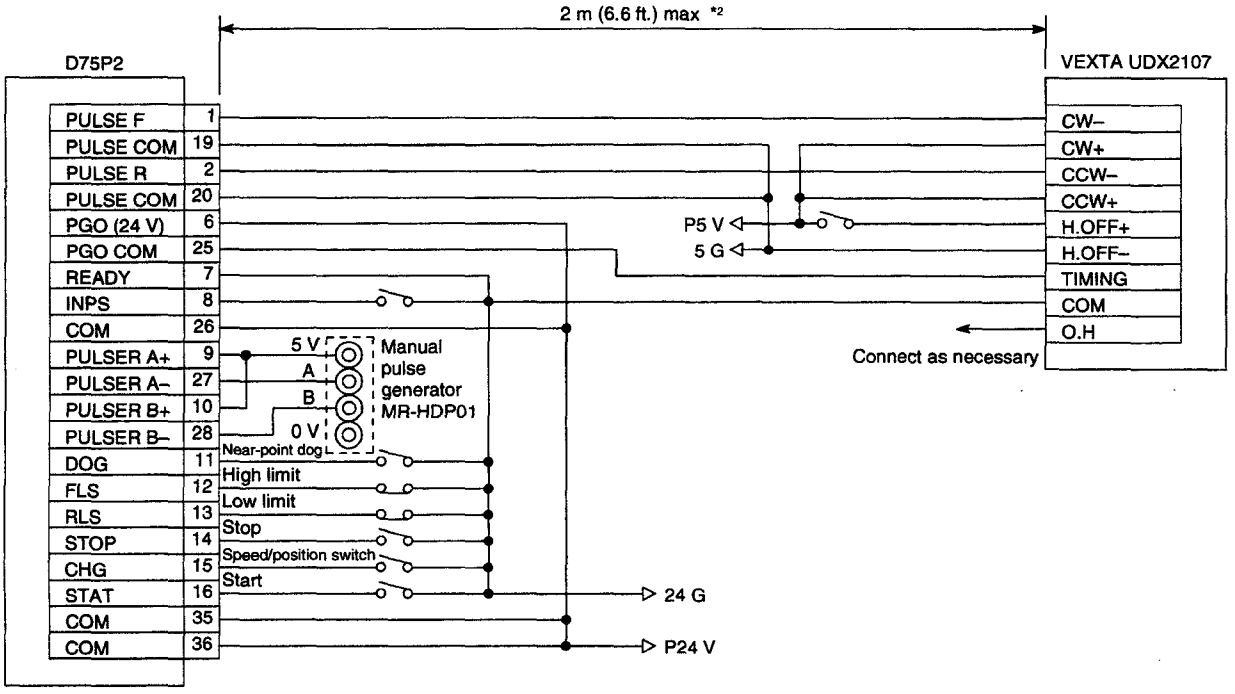
Appendix 6.3 Connection example of D75P2 and VEXTA-FX (differential driver, positive logic *1)



Remark

1) The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function.
3) For wiring on the stepping motor drive side other than above and shielding of respective signal lines, see the manual for the stepping motor drive.
4) *1 : The default pulse-output logic to the D75P2 drive module is "positive logic."
5) *2 : Indicates the distance between the D75P2 and VEXTA FX.

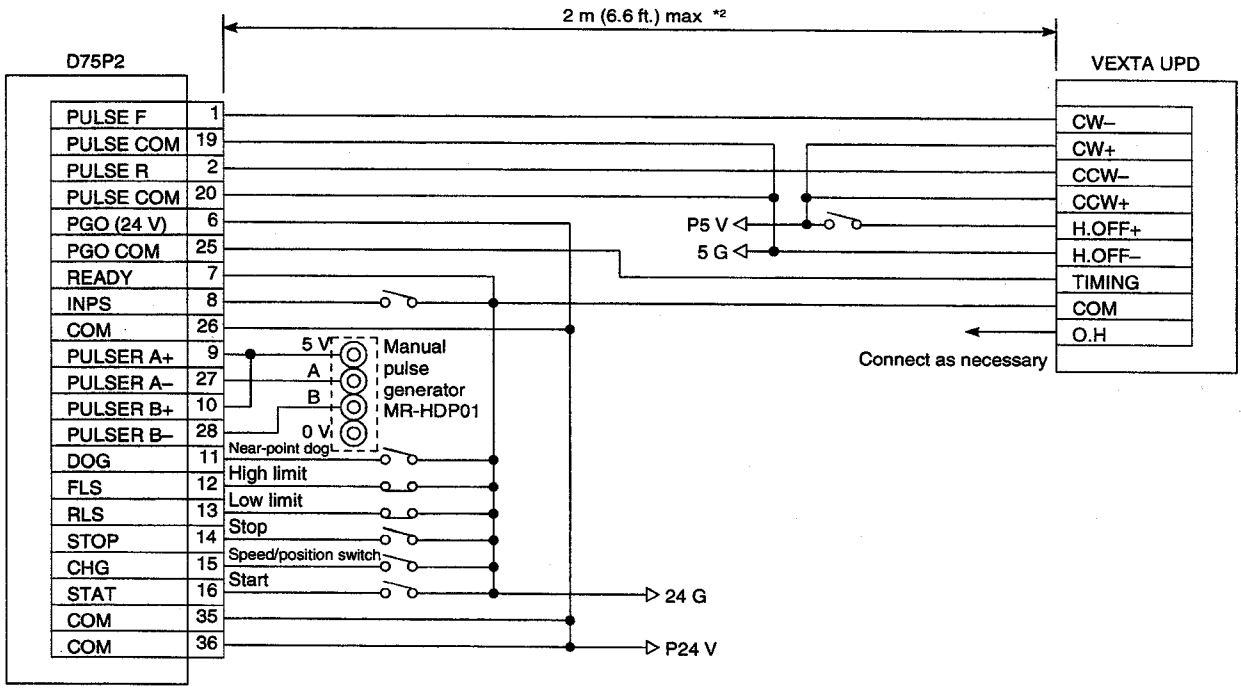
Appendix 6.4 Connection example of D75P2 and VEXTA UDX2107 (open collector method, negative logic *1)



Remark

1) The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function.
3) For wiring on the stepping motor drive side other than above and shielding of respective signal lines, see the manual for the stepping motor drive.
4) *1 : For the D75P2, set the pulse output logic selection to drive module in the extended parameter 1 to "negative logic."
5) *2 : Indicates the distance between the D75P2 and VEXTA UDX2107.

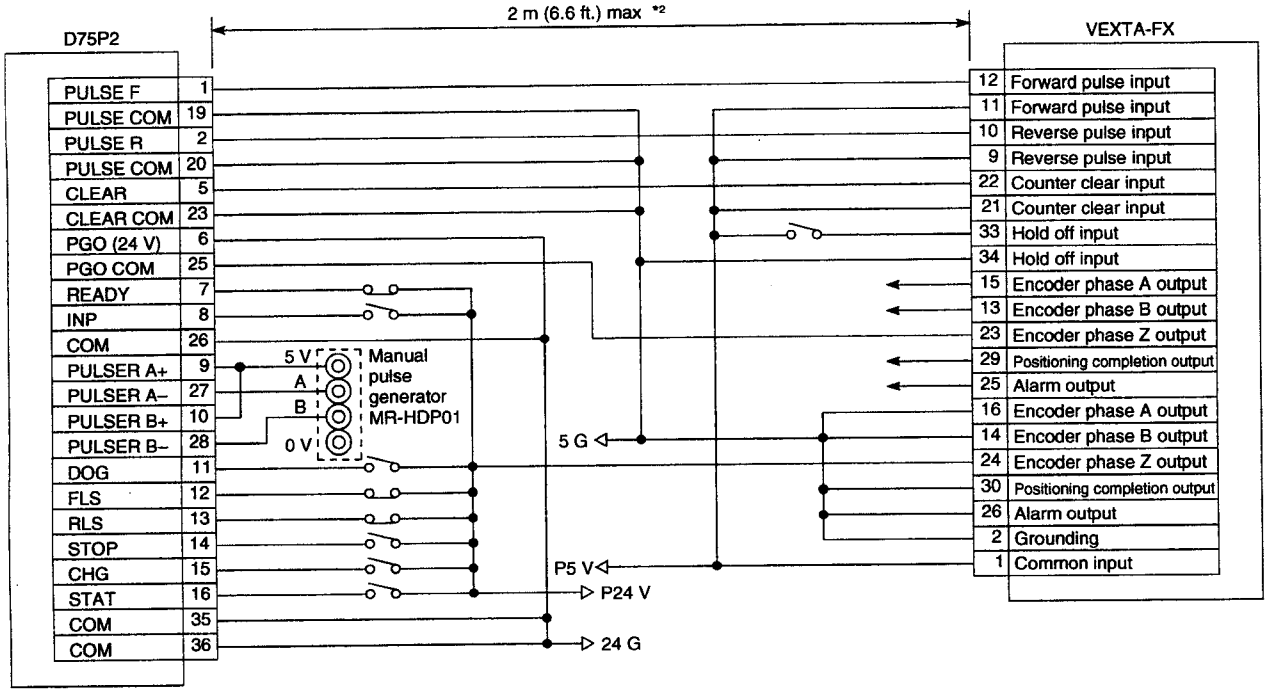
Appendix 6.5 Connection example of D75P2 and VEXTA UPD (open collector method, negative logic *1)



Remark

1) The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function.
3) For wiring on the stepping motor drive side other than above and shielding of respective signal lines, see the manual for the stepping motor drive.
4) *1 : For the D75P2, set the pulse output logic selection to drive module in the extended parameter 1 to "negative logic."
5) *2 : Indicates the distance between the D75P2 and VEXTA UPD.

Appendix 6.6 Connection example of D75P2 and VEXTA-FX (open collector method, negative logic *1)

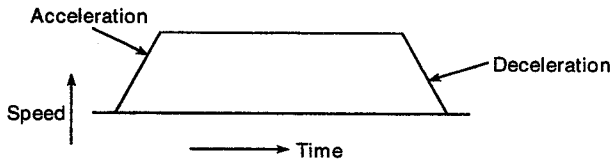


Remark

1) The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function.
3) For wiring on the stepping motor drive side other than above and shielding of respective signal lines, see the manual for the stepping motor drive.
4) *1 : For the D75P2, set the pulse output logic selection to drive module in the extended parameter 1 to "negative logic."
5) *2 : Indicates the distance between the D75P2 and VEXTA FX.

Automatic trapezoid acceleration/deceleration

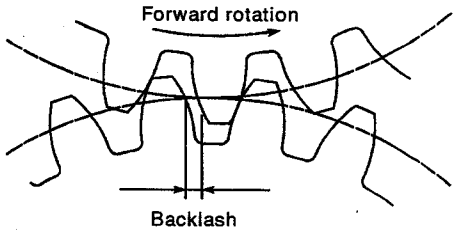
An operation whose diagram of time and speed forms a trapezoid.

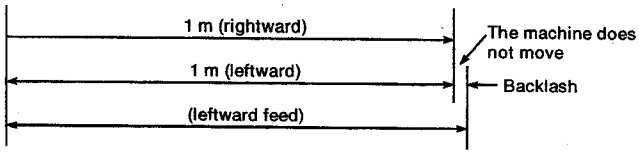


B

Backlash compensation

When the rotation direction is changed from forward to reverse, a play (backlash) may be created between the engaged gears. The same goes with screws. In positioning, a leftward feed by 1 m is not sufficient to return to the original position following a rightward feed by 1 m, but returning to the original position requires an extra feed corresponding to the amount of play. This play is compensated.



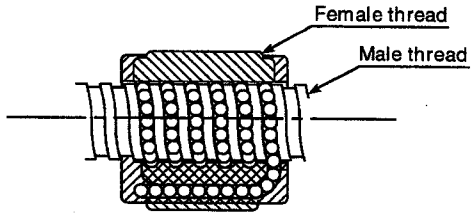


Backup function

1) The function to retain sequence programs and device statuses stored in the RAM memory of the PC CPU even during power failure.
2) The function of an absolute-position system to retain the present value even during power failure.
3) Data in the CPU (sequence programs, parameters, positioning data, etc.) are read via a peripheral device when changing the CPU module, and loaded after the change has been completed.

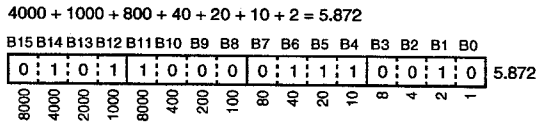
Ball screw

A type of screw that has balls lined up in the engaging section just like a ball bearing. Produces no backlash and can be rotated with a small force.

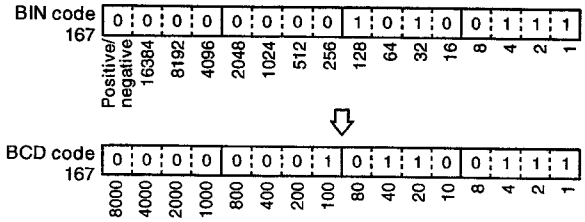


BCD (Binary Coded Decimal)

1) An abbreviation for "binary coded decimal," or BCD code to be precise. BCD codes are binary numbers representing decimal numbers, since binary numbers such as on (1) and off (0) used by calculators and PC's are difficult to understand for people. Digital switches and displays operated by people often use BCD codes. The figure below shows the significance of bits. A 16-bit code and 32-bit code can represent a number between 0 and 9,999, and 0 and 99,999,999, respectively.

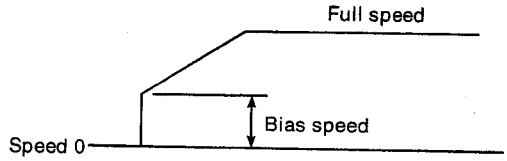


2) The BCD instruction converts a binary number (BIN) to a binary coded decimal (BCD).
It is used to display the data output from the PC on a digital display.
The figure below shows an example of 16-bit conversion:



Bias speed at start

Although a large torque is required when the machine starts operating, torque is often unstable at speed 0 when a stepping motor is used. Starting can be smoothly done if it is made at a specific speed from the beginning. This is the speed set when making such start.



BIN Binary

1) Binary number, or binary code to be precise.
PC's and similar devices indicate electrical on and off using binary numbers of 1 and 0, respectively. The figure below shows the significance of bits.
Since MELSEC uses the most significant bit (B15) to distinguish a positive number (0) from negative number (1), 15 bits up to B14 are valid.

128 + 32 + 4 + 2 + 1 = 167

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0	
0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	1	167
2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	
32768 =	16384 =	8192 =	4096 =	2048 =	1024 =	512 =	256 =	128 =	64 =	32 =	16 =	8 =	4 =	2 =	1 =	

2) The BIN instruction converts a binary coded decimal (BCD) code to a BIN code.
It is used to input to the PC the data indicated by digital switches. The figure below shows an example of 16-bit conversion:

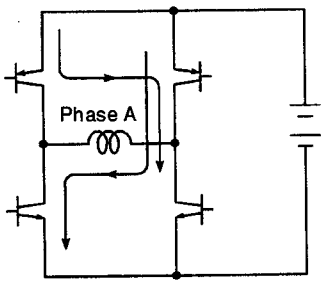
BCD code 167	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	1
	8000	4000	2000	1000	800	400	200	100	80	40	20	10	8	4	2	1

⇩

BIN code 167	0	0	0	0	0	0	0	1	0	1	1	0	0	1	1	1
	Positive/ negative	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

Bipolar drive constant-current system

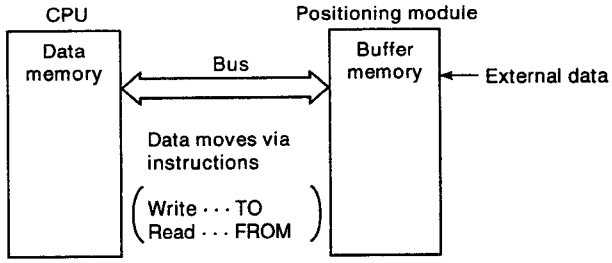
A stepping motor drive system. In this system, the direction of excitation current applied to the stator coils is reversed between two directions of positive and negative. The motor coils are used effectively so that a large output torque can be obtained at low speed.



Basic bipolar drive circuit (bridge system)

Buffer memory

A memory in which data is stored temporarily. External data is stored here temporarily and used for program operation before being input to the CPU's data memory. Since the buffer memory enables write and read of the latest data, it is used by positioning modules.



BUSY

Operation is in progress. Busy. During positioning operation or dwell time.

C

CCW (Counter-Clockwise)

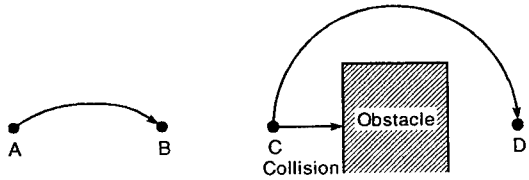
Rotations in the counter-clockwise direction. The rotation direction of a motor is determined as seen from the shaft end. See also "CW."

CHANGE signal

The change signal is an external signal used to start position control when speed control of speed/position control is currently performed.

Circular interpolation

An automatic operation as if to draw a circular during positioning in which two motors that respectively perform horizontal feed and vertical feed are operated simultaneously.
Usually, circular interpolation is performed in units of 90 degrees, being used to create a circle or avoid an obstacle along the way.
See "Interpolation operation" and "Linear interpolation" in the glossary.



Command pulse

See "Feed pulse" in the glossary.

Control unit

A basic data item used for positioning. Specify either mm, inch, degree or pulse.

COPY

To copy means to transfer a section of the editorial screen to another location.

CP (Continuous Pass) control

The continuous pass is a type of control in which operation follows an uninterrupted path, such as uniform speed control.

Creep speed

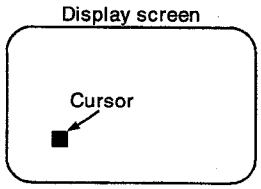
A very slow speed of movement.
Since it is difficult for the machine to move at high speed then come to a complete stop very quickly, the speed must be switched to creep speed first.
See "Near-point dog" in the glossary.

Current loop mode

A servo control mode used in positioning. This mode is used to control torque using current. Also called "torque loop mode."
See "Position loop mode."

Cursor

A point on the display screen of a peripheral device or CRT used to attract attention of the user.



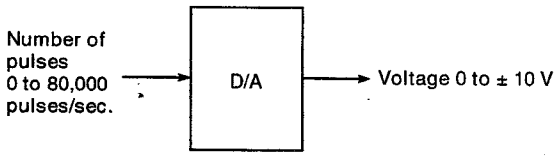
CW (Clockwise)

The same rotation direction as the hands of a clock. The clockwise rotation seen from the end of the motor shaft.

D

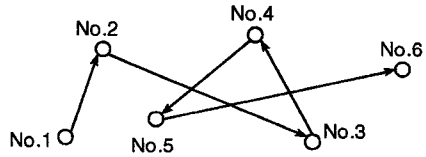
D/A (Digital-to-Analog) converter

A device capable of converting the number of pulses, which is a digital value, to an analog voltage (or current) value.



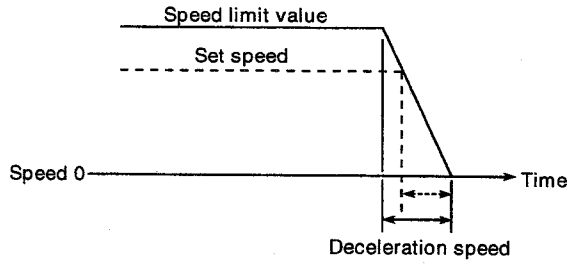
Data number

When positioning involves two or more points, respective positions are specified as number 1, number 2, number 3 and so on, and positioning is performed in order of the number. Up to number 600 can be specified with the D75P2.



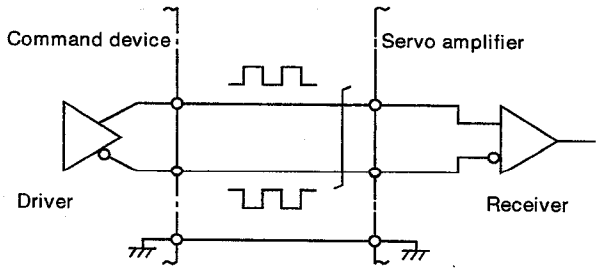
Deceleration time

The deceleration parameter is the time identical to the acceleration time.
Since it refers to the time needed to stop the movement from the speed limit value, the deceleration time decreases proportionally as the set speed is lowered.



Differential output type

A type of feedback pulse output from an encoder. Instead of outputting only one signal, a pair of signals, namely the target signal and another signal having the opposite polarity, are output simultaneously. This type is used for high-speed signal transmission including I/O of pulse chains, since it provides such advantages as high-frequency transmission and noise resistance. Generally, the transmitting side is called the "driver" while the receiving side is called the "receiver." A dedicated IC is used.



Digital bus connection

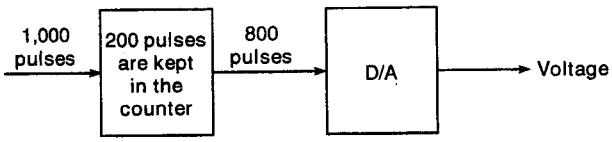
Generally, pulse chains are used for commands that are output from the positioning module to servo amplifier. In recent years, however, digitization of various devices has given rise to a method in which bus lines of CPUs of the positioning module and servo amplifier are connected. Using this method, a highly accurate system can now be configured.
The MELSEC AD70D, AD774M, A171SCPU and A273UCPU modules use this digital bus connection.

Dog signal

The near-point dog used in home position return.

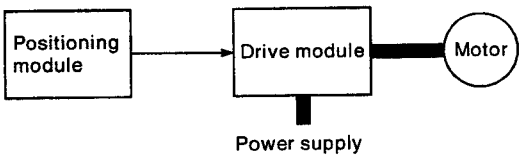
Droop pulse

Since the machine has inertia (GD^2), it is subject to delays and cannot follow a speed command if the command is transmitted directly from the positioning module.
Thus, when using a servo motor, speed command pulses are kept in the deviation counter so that their transmission is delayed.
Droop pulses refer to the pulses kept in the counter.
When stopping, the error counter releases all pulses and the count becomes 0.



Drive module

Commands (such as pulses) issued from the positioning module are low in voltage and current, and thus lacking the level of energy needed to drive the motor.
This device is used to increase the (pulse) width so that the motor can be driven. An auxiliary component of the servo motor or stepping motor. Also called "servo amplifier."



Drive module ready

A signal indicating that the motor drive module is in a ready complete status.
It remains off while the drive module power is off or during fault.

Dwell time

The time required to clear droop pulses in the error counter immediately upon completion of positioning. If the dwell time is too short, the position becomes inaccurate.

Dynamic brake

Used to stop the motor rapidly without causing it to run freely when a protection circuit such as for the power failure or emergency stop (EMG signal) is activated, by inducing a short-circuit between servo motor terminals via a resistor and consuming the rotational energy as heat.
Since braking power is generated only while a motor that generates a large brake torque by the use of an electromagnetic brake is rotating and there is no retaining power during stopping, use a mechanical brake in conjunction with the dynamic brake to prevent the upper and lower axes from falling down.

E

Electromagnetic brake

Equipped in motors with electromagnetic brake, it is used to prevent slipping due to power failure or fault that may occur while axes are driven up and down, or for protection in the stopped state.
Non-excitation operation brake.

Electronic gear

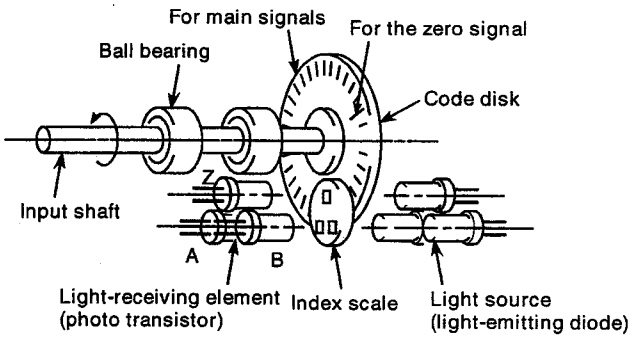
A function to electronically reduce or increase command pulses sent from the pulse command module, by multiplying them by an integer or inverse number (1/50 to 50). Therefore, the speed and travel increment of positioning can be controlled using the electronic gear ratio.

Emergency stop

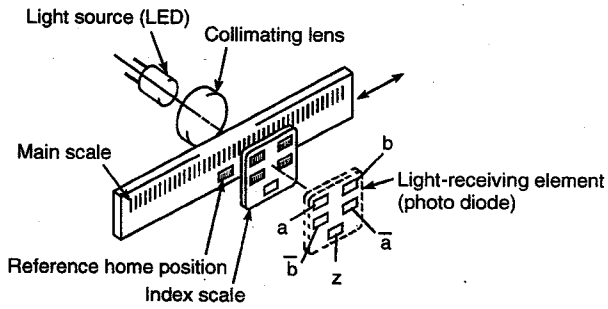
Since the D75P2 does not have this capability, considerations are necessary such as turning off the servo power from outside the PC.

Encoder

A device that converts input data to binary signals of on and off. A type of pulse generator. An encoding device.



Rotary encoder



Linear encoder

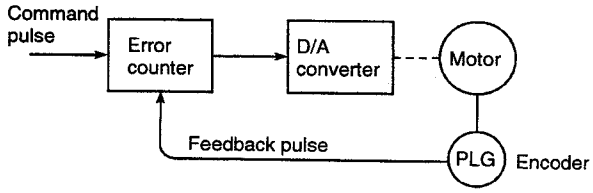
Error correction

When the machine has a dimensional error and sending a command of 1 m from the D75P2 has resulted in an actual dimension being shorter or longer than 1 m, the error is compensated. For example, if the actual dimension is smaller than 1 m, an extra dimension corresponding to the difference is fed so that positioning is performed correctly for 1 m.

Error counter

Provides two functions shown below:

1) Counts command pulses sent from the D75P2 and sends their count value to the D/A converter.
2) Subtracts feedback pulses from command pulses, and drives the motor using the error of command pulses from feedback pulses (droop pulses). The motor is operated until the number of command pulses becomes 0.



Error reset

Resets all errors concerning both axes. If the cause of any error has not been removed upon reset, an error occurs again.

External regenerative brake resistor

Called "regenerative brake."
When a machine is driven by a motor, power is normally supplied to the motor from the amplifier. However, the rotational energy of the motor and machine flows back to the amplifier (regenerates) when the motor decelerates or decreasing load is applied.
The external regenerative brake resistor is used to provide a regenerative braking ability at stopping by consuming the regenerative energy via a resistor and producing regenerative brake torque.
Used when acceleration/deceleration is performed at high frequencies.

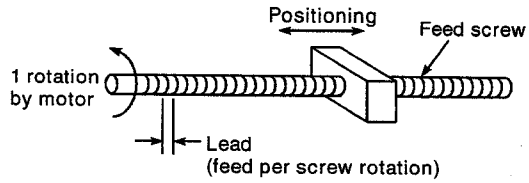
F

Feed pulse

The pulses given from the positioning module to the servo motor or stepping motor. Also called "command pulse."

Feed screw

The base screw used in a mechanism that performs positioning by rotating a screw. In many cases a ball screw is used to minimize backlash and dimensional errors.



Feedback pulse

A method to confirm by returning the pulse chain whether or not action took place according to the command issued during automatic control. If the action differs from the command, a correction command is issued. When 10,000 pulses are output as commands and 10,000 pulses are returned, the difference is 0. Also called "return pulse."
See "Error counter."

FD

Abbreviation for "floppy disk."
See "Floppy disk."

FDD

Abbreviation for "floppy disk drive module."
See "Floppy disk drive module."

Fixed-dimension feed

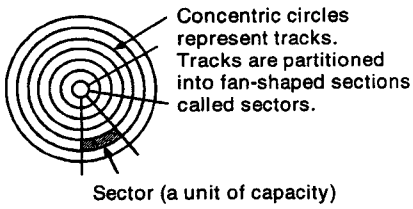
To feed fixed dimensions in order to cut sheets, bars, etc., to the specified dimensions. Often performed using the increment system. The present value will not be accumulated even when feed actions are repeated.

Flash memory

Stores parameters and positioning data, and backs them up without using batteries.
Since no battery is used, battery maintenance is not required.

Floppy disk

A disk-shaped magnetic storage device. A flexible disk. Depending on the size, 5-inch and 3.5-inch disks are available. Information is stored along concentric circles. Used commonly, since the memory capacity is large and the write/read time is short. Abbreviated as FD.



Floppy disk drive module

A device that reads and writes the contents of a floppy disk.
Read/write is performed by rotating a floppy disk using a motor. Abbreviated as FDD.

FLS (Forward Limit Switch) signal

Input signal XnB, which indicates that the high limit switch (having a contact-b configuration and carrying current in a normal status) located outside the movement range of positioning control was activated. Positioning operation stops when the external FLS signal (contact b) is turned off (becomes non-conductive).

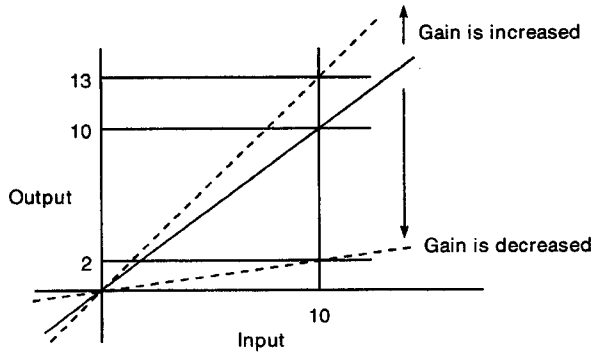
Formatting

To initialize a disk.
An operation to write rules and indexes to a disk. Thus, the memory capacity of the disk is reduced by the amount required for the rules and indexes.

G

Gain

To change the ratio of two values that are in direct proportion to each other; in a graph, to change the slope of characteristic.



When 10 is output for the input of 10, the output can be changed to 12 or 5 by changing the gain.

G code

A coded 2-digit numeric value (00 to 99) used to specify the control function for the axis of an NC device. Also called "G function."

Examples
- G01 Linear interpolation
- G02 Circular interpolation CW (clockwise)
- G04 Dwell
- G28 Home position return
- G50 Master-axis maximum rotation setting

GD^2

Inertial moment. The total sum of the mass dm of each very small section constituting an object, being multiplied by the square of distance r between the section and a fixed straight line. $I = \int r^2 dm$
The relationship with GD^2 is given as 4gI, where g is gravitational acceleration.

Guidance

An explanatory text.

H

Hard disk memory

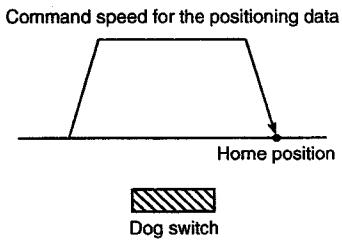
A disk-shaped magnetic storage device. While the floppy disk is soft and flexible, this disk is hard, thus called the "hard disk." Available sizes include 5-inch, 3.5-inch and 2.5-inch. Hard disks have larger memory capacities and are more expensive than floppy disks. Read/write is performed by rotating the disk. Although it is in many cases impossible to change hard disks as can be done for floppy disks, hard disks comprise a stack of many disks, each with a head.

HD

Abbreviation for "hard disk."
See "Hard disk memory."

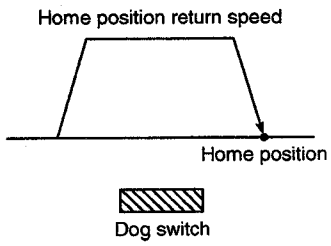
High-speed mechanical home position return

Positioning to home position is performed at a specified high speed by executing the positioning data after replacing the mechanical home position address with positioning-data address, without detecting the near-point dog.
(Valid after home position return using the near-point dog has been performed at least once.)



High-speed home position return

Returns to mechanical home position at the home position return speed without detecting the near-point dog.
(Valid after home position return using the near-point dog has been performed at least once.)

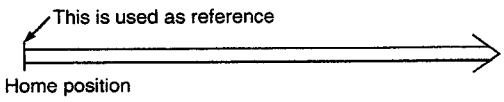


HOLD

For the AD71, this is a status where the module itself is in error.
Holding.

Home position

A position used as the reference of positioning.
Positioning cannot be started unless a reference point is set.
Usually, home position is set at the low or high stroke limit.



Home position return data

Data necessary to return the current position to home position. Determined during the designing stage of a machine, and changing this data later requires a design change for the machine.
Since home position is the reference point of positioning, it is better to perform home position return following the power failure occurred during positioning or when the position has been moved manually by switching off the power, since the present value of the positioning module is not correct. When home position return is performed, movement occurs in search of the near-point dog regardless of the present value, and stops at home position. At this time, the present value is rewritten by the home position address. Data cannot be written during positioning. For the D75P2, data must be written for both axes.
See "Near-point dog" in the glossary.

Home position return method

The following home position return methods are available depending on the structure and stopping accuracy of the machine.
Home position return can be performed by writing the parameters and home position return data.

1) The method that uses the zero signal
2) The method to stop the movement using a stopper and the motor based on dwell time
3) The method to stop the movement using a stopper and the motor by limiting the torque
4) The method to stop the movement based on the travel increment after near-point dog turned on

Home position return request

A signal that turns on when abnormality affecting the D75P2 is detected. This signal turns on under the following conditions:

1) At power-on
2) When a stop command is issued during positioning
3) When the PC ready is turned off
4) When a parameter or home position return data is changed
5) When test operation for the following is selected from a peripheral device:
   Home position return
   Positioning
   JOG
   Manual pulse generator
6) At home position return start
   It is up to the user's choice whether or not to perform home position return in these cases.

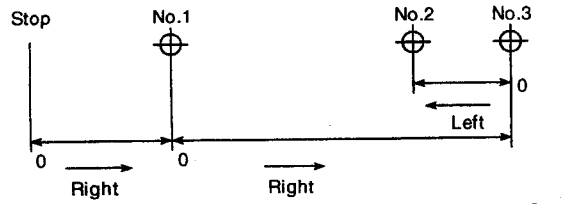
Home position shift function

The position of home position can be shifted in the positive or negative direction after executing home position return, by specifying a shift amount from the home position position.
A position other than the zero position or outside the dog switch range can be set as home position.

I

Increment system

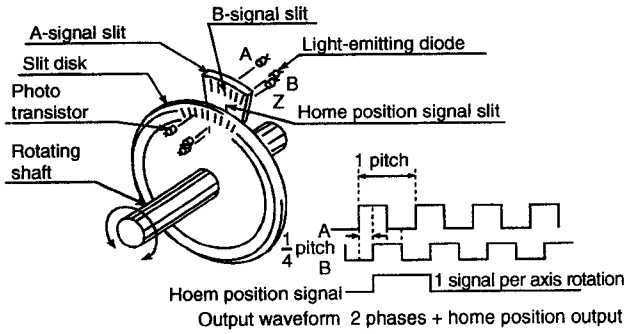
A system in which positions are indicated by the specified direction and travel distance by assuming the present value as 0. Relative address system. Used for fixed-dimension feed, etc. C.f., absolute system.



Number 2 is positioned at O mm to the right of number 1.

Incremental encoder

A device that simply outputs on/off pulses according to axis rotations. The 1-phase type uses A pulses only, and the axis rotation direction cannot be determined. The 2-pulse type uses two pulse chains of A and B, and the rotation direction is determined forward if B turns on while A is on, and reverse if A turns on while B is on. A type that uses the home position signal is also available. Incremental encoders can output 100 to 100,000 pulses per axis rotation and are a type of encoder most commonly used.



Output waveform 2 phases + home position output

Inertia

A characteristic of an object to try to retain the current status unless external forces are applied. Inertial moment.

Input terminal

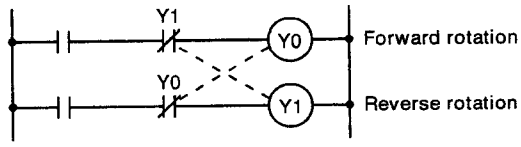
An external input to the D75P2 provided in the form of pin connector wired by the user.
Connected to the motor drive module or machine.

- Drive module ready signal
- Stop signal

Since input terminals have no direct relation to the program, input number Xn is not used.

Interlock

A condition that blocks the next action until the action currently in progress is completed. Used to prevent damage to or malfunction of the device.



Interpolation operation

To operate two motors simultaneously to produce synthesized movement. The positioning distance, acceleration/deceleration time and speed can be set freely for the two motors, and these settings are synthesized to draw lines and circles. Types of interpolation operation include linear interpolation and circular interpolation.

Inverter

A device that converts direct current to alternating current. In reality, it refers to an entity that controls the motor rotation speed by converting the commercial frequency of 50 Hz or 60 Hz to a direct current, then to an alternating current of 5 to 120 Hz, thereby changing the number of motor rotations.

J

JOG

Jogging. Stop-and-go movements at small increments. Inching.
Parameter setting is necessary to perform JOG operation. However, if the operation remains on for a long duration of time, it is turned off at the stroke high limit.

K

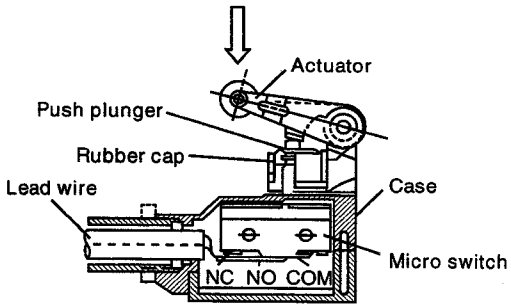
kPPS

Abbreviation for "kilopulses per second."
The number of pulses per second. 80 kPPS corresponds to 80,000 pulses per second.

L

Limit switch

A switch provided for safety reasons at both ends of a movement device to stop the moving object.
A circuit is created that forcibly turns off the power when the contact is activated by the moving object itself as it pushes the switch. When the actuator shown in the figure is pushed, the micro switch located inside is activated. Various other types are available.

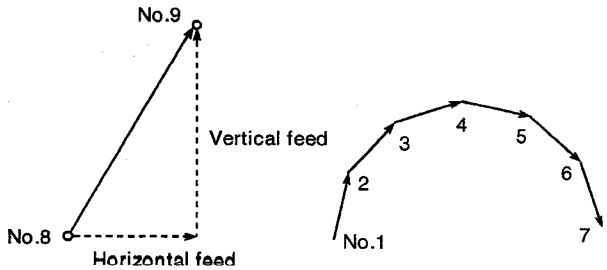


Limit switch output

An external limit switch is made unnecessary by outputting the same signal as the on/off of the limit switch. Based on the data set in advance for each axis, the on/off signal of the limit switch data corresponding to the actual current value address of each axis is output externally.

Linear interpolation

An automatic operation to obtain diagonal, linear movement during positioning in which two motors that respectively perform horizontal feed (X) and vertical feed (Y) are used simultaneously.
With the D75P2, interpolation combining axes 1 and 2 is possible, but the same positioning number must always be used. See "Interpolation operation" in the glossary.



Load inertia ratio

GD_L^2/DG_M^2
See "GD^2."

Low-inertia motor

Used when acceleration/deceleration needs to be repeated frequently.
The rotor diameter is reduced so that the inertial moment drops to around one third of that of a standard motor, while the dimension in longitudinal direction is extended to make up for the torque.
The load inertia ration should ideally be 1 or less.

M

M (Machine) code

An auxiliary function to perform drill change, clamping, loosening, raising/lowering of the welding electrode and various displays such as ganged operation during positioning.
Two modes -- AFTER and WITH -- used depending on when the code is turned on.
While the M code remains turned on, the next positioning is not started. The code is turned off using a sequence program.
When using the M code, the user assigns a code number between 1 and 255 (1, clamping; 2, loosening, etc.). Comments can be attached to 19 M codes to be monitored by a peripheral device or displayed externally.
See "AFTER mode."
See "WITH mode."

Machine feed value

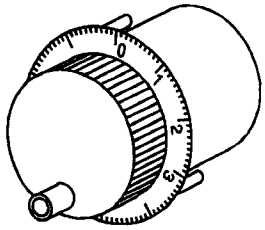
Stores the home position address upon completion of home position return.
Stores the current position in machine coordinates specified by the machine, based on the home position return address.
Does not change even when the present value is changed.

Machine name

A code of up to eight characters in the file name that the user can freely specify. Alphabetical characters (capital letters), numbers and a - sign can be used. The first character must be from the alphabet.
As long as identifiers are different, the same machine name can be assigned to multiple items on the same floppy disk. For example, the sequence program and positioning data may have the same machine name.
See "File name."

Manual pulse generator

A device that is turned manually to generate pulses. Used when performing precise positioning manually.



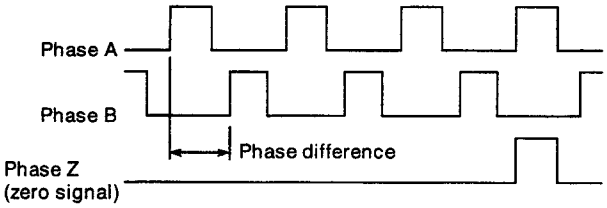
Model by Mitsubishi Electric
(model name: HD52B)

Master axis

The side whose positioning data is given priority for execution during interpolation operation. For example, either the X or Y axis, whichever has the longer travel distance, becomes the master axis during positioning, and the speed of the master axis is used while that of the slave axis is ignored.

Multi-pulse phase

A combination of two or more pulses of different phases. Examples include a 2-phase pulse.



Multiplying rate setting

Same as "P rate."
See "P rate" in the glossary.

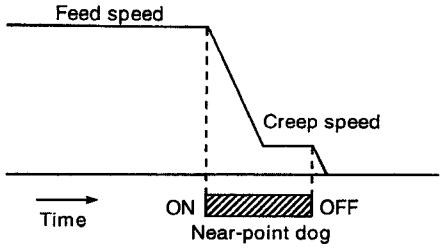
N

NC (Numerical Control) language

The code punched on paper tape to give processing instructions to an NC device.
NC languages include EIA code (EIA language), ISO code (ISO standard) and JIS code (JIS standard).

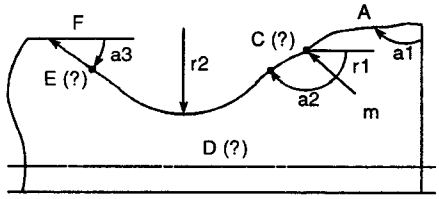
Near-point dog

A limit switch placed before home position. When this turns on, the feed speed is switched to creep speed. Thus, the duration of time during which the switch remains on must be longer than the time needed for the feed speed to decelerate to the creep speed.



Numerical control

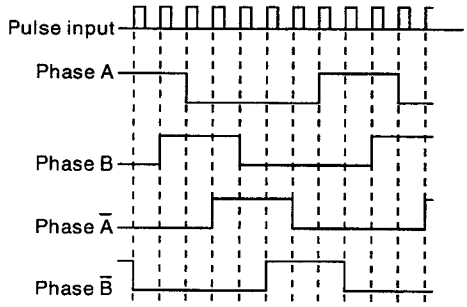
A device that performs positioning of a higher level. Three axes or more can be controlled with high accuracy at high speed. Complex curved lines and planes can be controlled.



O

1-2 phase excitation system

A method to excite stepping motor coils in a fixed order. In this system, the first phase and second phase are excited alternatively.



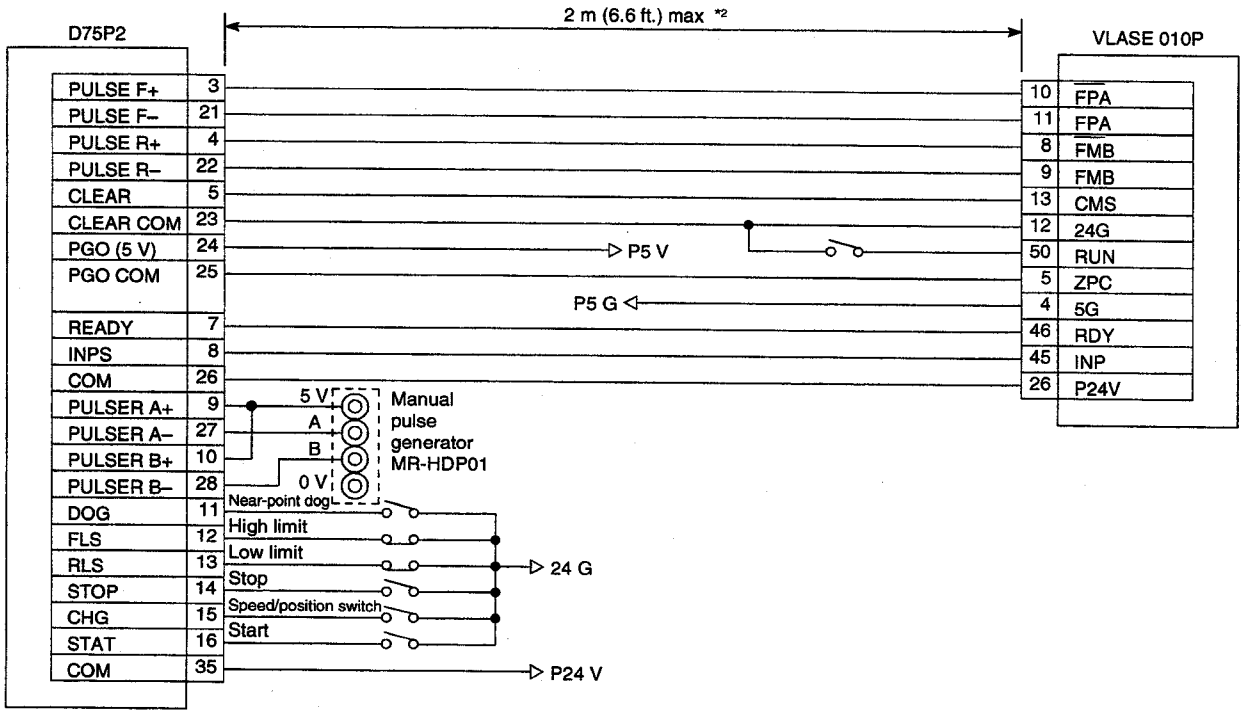
Operation pattern

Determines the action to take place following the execution of positioning data.

1) If "end" is selected, movement stops upon completion of positioning.
2) If "continue" is selected, the next data number is executed automatically upon completion of current positioning.
3) If "locus" is selected, the next data number is executed automatically by changing the speed but without completing current positioning.

Appendix 7 Connection Example with Servo Amplifier by Toei Electric

Appendix 7.1 Connection example of D75P2 and VLASE 010P (differential driver, positive logic *1)

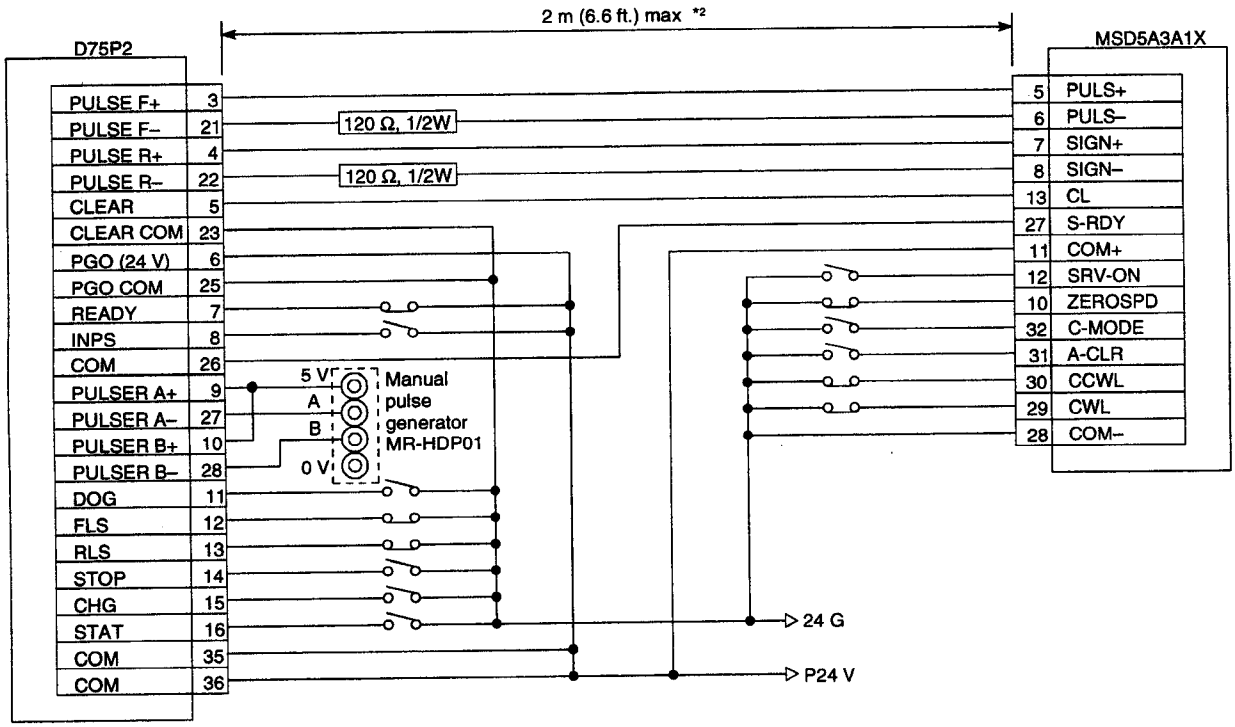


Remark

1) The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function. Set them inside the servo limit switches.
3) For wiring on the servo amplifier side other than above and shielding of respective signal lines, see the manual for the servo amplifier.
4) *1 : The default pulse-output logic to the D75P2 drive module is "positive logic."
5) *2 : Indicates the distance between the D75P2 and VLASE 010P.

Appendix 8 Connection Example with Servo Amplifier by Matsushita Electric Industries

Appendix 8.1 Connection example of D75P2 and MSD5A3A1X (differential driver, positive logic *1)



Remark

1) The connector pin numbers of the D75P2 indicate the same applications for axes 1 and 2.
2) The high limit (FLS) and low limit (RLS) of the D75P2 are used in the home position return retry function. Set them inside the servo limit switches.
3) For wiring on the servo amplifier side other than above and shielding of respective signal lines, see the manual for the servo amplifier.
4) *1 : The default pulse-output logic to the D75P2 drive module is "positive logic."
5) *2 : Indicates the distance between the D75P2 and MSD5A3A1X.

Appendix 9 Station Numbers - Remote I/O and Remote Register Conversion Table

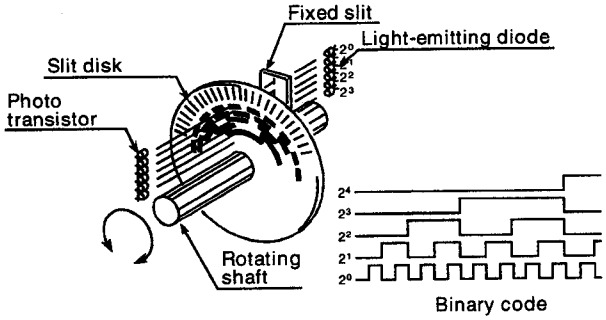
Station number	RX, RY		RWw, RWr	Refreshing device			
	Hexadecimal	Decimal	Decimal	RX	RY	RWw	RWr
1	0 to 1F	0 to 31	0 to 3				
2	20 to 3F	32 to 63	4 to 7				
3	40 to 5F	64 to 95	8 to 11				
4	60 to 7F	96 to 127	12 to 15				
5	80 to 9F	128 to 159	16 to 19				
6	A0 to BF	160 to 191	20 to 23				
7	C0 to DF	192 to 223	24 to 27				
8	E0 to FF	224 to 255	28 to 31				
9	100 to 11F	256 to 287	32 to 35				
10	120 to 13F	288 to 319	36 to 39				
11	140 to 15F	320 to 351	40 to 43				
12	160 to 17F	352 to 383	44 to 47				
13	180 to 19F	384 to 415	48 to 51				
14	1A0 to 1BF	416 to 447	52 to 55				
15	1C0 to 1DF	448 to 479	56 to 59				
16	1E0 to 1FF	480 to 511	60 to 63				
17	200 to 21F	512 to 543	64 to 67				
18	220 to 23F	544 to 575	68 to 71				
19	240 to 25F	576 to 607	72 to 75				
20	260 to 27F	608 to 639	76 to 79				
21	280 to 29F	640 to 671	80 to 83				
22	2A0 to 2BF	672 to 703	84 to 87				
23	2C0 to 2DF	704 to 735	88 to 91				
24	2E0 to 2FF	736 to 767	92 to 95				
25	300 to 31F	768 to 799	96 to 99				
26	320 to 33F	800 to 831	100 to 103				
27	340 to 35F	832 to 863	104 to 107				
28	360 to 37F	864 to 895	108 to 111				
29	380 to 39F	896 to 927	112 to 115				
30	3A0 to 3BF	928 to 959	116 to 119				
31	3C0 to 3DF	960 to 991	120 to 123				
32	3E0 to 3FF	992 to 1023	124 to 127				
33	400 to 41F	1024 to 1055	128 to 131				
34	420 to 43F	1056 to 1087	132 to 135				
35	440 to 45F	1088 to 1119	136 to139				
36	460 to 47F	1120 to 1151	140 to 143				
37	480 to 49F	1152 to 1183	144 to 147				
38	4A0 to 4BF	1184 to 1215	148 to 151				
39	4C0 to 4DF	1216 to 1247	152 to 155				
40	4E0 to 4FF	1248 to 1279	156 to 159				
41	500 to 51F	1280 to 1311	160 to 163				
42	520 to 53F	1312 to 1343	164 to 167				
43	540 to 55F	1344 to 1375	168 to 171				
44	560 to 57F	1376 to 1407	172 to 175				
45	580 to 59F	1408 to 1439	176 to 179				
46	5A0 to 5BF	1440 to 1471	180 to 183				
47	5C0 to 5DF	1472 to 1503	184 to 187				
48	5E0 to 5FF	1504 to 1535	188 to 191				
49	600 to 61F	1536 to 1567	192 to 195				
50	620 to 63F	1568 to 1599	196 to 199				
51	640 to 65F	1600 to 1631	200 to 203				
52	660 to 67F	1632 to 1663	204 to 207				
53	680 to 69F	1664 to 1695	208 to 211				
54	6A0 to 6BF	1696 to 1727	212 to 215				
55	6C0 to 6DF	1728 to 1759	216 to 219				
56	6E0 to 6FF	1760 to 1791	220 to 223				
57	700 to 71F	1792 to 1823	224 to 227				
58	720 to 73F	1824 to 1855	228 to 231				
59	740 to 75F	1856 to 1887	232 to 235				
60	760 to 77F	1888 to 1919	236 to 239				
61	780 to 79F	1920 to 1951	240 to 243				
62	7A0 to 7BF	1952 to 1983	244 to 247				
63	7C0 to 7DF	1984 to 2015	248 to 251				
64	7E0 to 7FF	2016 to 2047	252 to 255				

Appendix 10 MELSEC Glossary of Positioning Terms

A

Absolute encoder

A detector that can externally output angle data within one motor rotation, and generally retrieves 360 degrees in 8 to 12 bits.
While incremental encoders have a drawback that the axis position is lost upon power failure, absolute encoders retain the axis position even when power failure occurs.
Absolute encoders are classified into various types depending on output, such as binary-code and BCD-code types. These encoders are more expensive, more accurate and larger than the incremental type. See "Encoder."

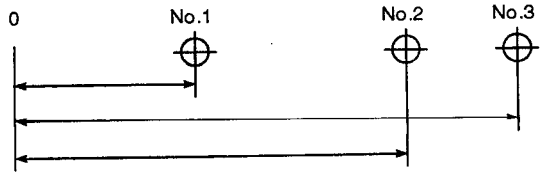


Absolute-position system

A system that retains the current position even when the power is turned off, since the machine position is stored in the positioning module as long as home position return was performed once when the device was started up. Mechanical errors, if any, will be compensated. Thus, there is no need to perform home position return after power restart. A motor with absolute-position detector, a servo amplifier supporting absolute-position systems and a positioning module are required to configure this system.

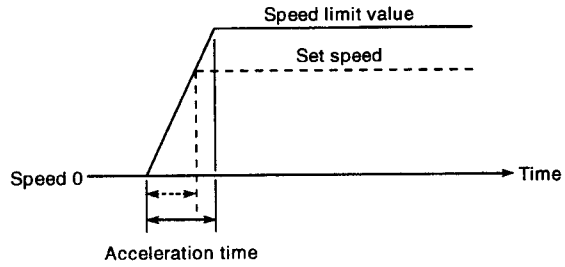
Absolute system

A method to indicate the positioning address.
The absolute address system.
A system in which distances are indicated relative to 0. The direction is automatically determined and need not be specified. C.f., increment system.



Acceleration time

The acceleration time parameter refers to the time needed for the speed to reach the speed limit value from home position(stopped status). Thus, the acceleration time decreases proportionally as the set speed is lowered. Determined by machine inertia, motor torque and load resistance torque.

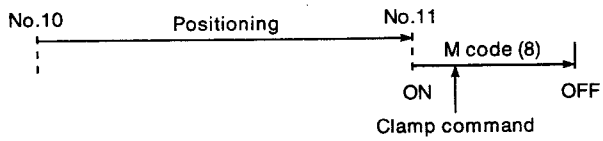


Address

1) A numeric value used to indicate a position in positioning. Specified in mm, inches, degrees or pulses.
2) A memory address. The memory has many addresses, and write/read is performed by first specifying some of these addresses.

AFTER mode

A mode in which the M code is output after positioning is completed (stopped). For example, clamping or drill-dimension selection is possible in this mode.



Auto tuning

The responsiveness and stability of machines driven by a servo motor are influenced by changes in inertial moment and rigidity that occur as a result of changes in machine load.
This function automatically adjusts the speed loop gain and position loop gain in accordance with the machine condition to retain optimum machine characteristics.
It is desirable that a real-time auto tuning function is provided for machines subject to significant load changes.

Output terminal

An external output from the D75P2 provided in the form of pin connector. Connected to the motor drive module.

- Feed pulses for forward and reverse rotations
- Start
- Error counter clear

Terminal numbers are determined for each axis. Since output terminals have no direct relation to the program, output number Yn is not used.

Override function

Function to change the speed (current speed) during positioning operation within the range of 1 to 300 %. The same variable ratio is applied to continuous positioning operations for which different speeds are specified.

P

P (Pulse) rate

A factor to double or triple the number of feedback pulses per motor axis rotation or reduce it to a half or one third.
The ratio of feed pulses and feedback pulses.
For example, when there are 2,400 pulses per rotation, the P rate setting of 2 corresponds to 1,200 pulses. While the axis rotation per pulse is 0.15° at 2,400 pulses, it becomes 0.3° at 1,200 pulses. Positioning accuracy drops as the P rate increases.

Pancake motor

Compared to the standard type, the dimension in axial direction is shorter by around 100 mm. Used when only a small installation space is available for the servo motor.

Parameter

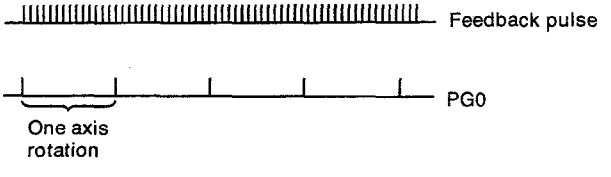
A basic data item used in positioning. Determined during the design stage of a machine, and changing it later requires a design change for the machine.
Data cannot be written during positioning.
Parameters are set to their initial values by the manufacturer.

Pattern

See "Positioning pattern" in the glossary.

PG0 (Pulse Generator Zero)

See "Home position signal."

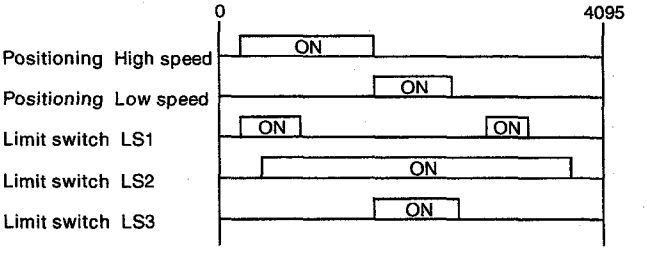


Position control

A type of control with main focus on positions and dimensions, such as fixed-dimension control, positioning control and numerical control. This control always uses feed pulses.
C.f., speed control.
In some cases position control uses the same motor but a different drive module.

Position detection module

Performs a simple version of positioning. The modules available from MELSEC include the A61LS and A62LS. The positioning function and limit switch function are provided, and a total of 16 channels can be used. The figure below shows an example of a 5-channel module. A resolver is used to detect positions.



Position loop gain

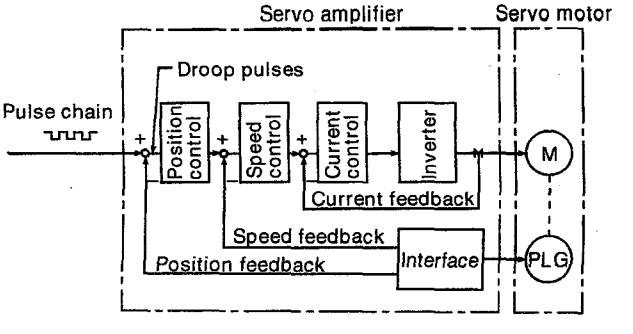
A ratio of the command pulse frequency to the droop pulses in the error counter.

$$\text{Position loop gain} = \frac{\text{Command pulse frequency}}{\text{Droop pulses}} \ (\text{sec}^{-1})$$

Can be set with the drive module. Stopping accuracy can be improved by increasing the gain, but increasing it too much can cause instability due to overshooting (exceeding the allowable range). If the gain is lowered too much, stopping becomes smooth while the stop error increases.

Position loop mode

A servo control mode used in positioning. This mode is used for position control. Other servo control modes include the speed loop mode used for speed control and the torque loop mode used for torque control (current control).

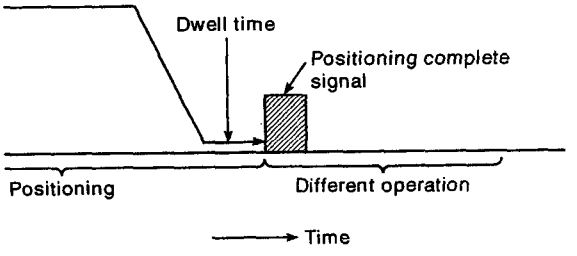


Positioning

To move an object in a precise manner from a given point to a scheduled point.
To accomplish this, the distance, direction and speed of movement are specified.
Examples include cutting of sheets, drilling of plates, installation of parts to printed wiring boards and welding.
Robots also perform positioning.

Positioning complete signal

A signal generated when positioning has ended. The set timer is started at this point, and operation is stopped until the time elapses.
The purpose of this signal is to start different operation after positioning.
The next positioning is not started while the complete signal remains on.



Positioning completion

See "Positioning pattern" in the glossary.

Positioning continued

See "Positioning pattern" in the glossary.

Positioning data

Data used by the user to perform positioning. Specified for the number of points (number of addresses) used for positioning. Up to 600 points can be specified with the D75P2. As a rule, positioning is executed in order of the data number.

Positioning parameter

Data used as a basis of positioning control. Positioning parameters indicate various data including control unit, travel increment per pulse, speed limit value, stroke high/low limit values, acceleration/deceleration time and positioning method.
Since parameters are set to their initial values, change these values according to the control condition.

Positioning start

To start positioning by specifying a target data number. Action to take place after positioning to the data number is completed is determined by the positioning pattern of the data number.

Present feed value

Stores the home position address upon completion of home position return.
Stores the position currently executed.
Changed when the present value is changed.

Present value

The current address (position) at which the movement is stopped or positioning is performed.

Present value change, present value rewrite

When a machine is assembled and connected to the positioning module, a dummy approximate value is taught to the D75P2 since it has no way of knowing the present value. In addition, this function allows writing of a dummy present value when the present value is lost due to an accident, etc. If home position return is performed subsequently, the positioning module recognizes the home position.
To set the accumulated value not to hit the stroke high limit during fixed-dimension feed, etc., rewrite the present value to 0 upon completion of fixed-dimension feed. The present value can be changed while positioning is stopped.

PTP (Point-to-Point) control

Synonymous with positioning control.
A type of control in which the specified passing points along the path are scattered and non-continuous.
The only requirement is to reach the given target position, and control along the traveling path from a given position to the next value is not necessary.

PU (Programming Unit)

Abbreviation for "programming unit."

Pulse

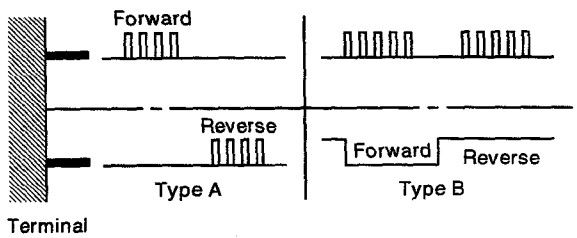
To turn on or off current (voltage) for a short period of time.
A pulse chain is a series of pulses.
The D75P2 is a module that generates pulses.

Pulse generator

A device that generates pulses. For example, a pulse generator is installed to the motor axis and generates pulses using axis rotations. A digital device. The 1-phase type has one pulse chain, while the 2-phase type outputs two pulse chains with a phase difference. The number of pulses per axis rotation varies from 600 to one million. The type with zero signal is capable of outputting one pulse or two pulses per axis rotation.
Referred to as "PLG."
See "Encoder" in the glossary.

Pulse output mode

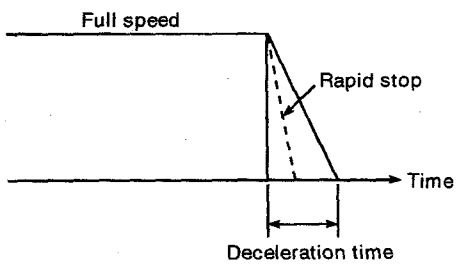
Two types of methods are available to specify forward or reverse rotation when issuing a command to the servo motor, and which method is used depends on individual manufacturers. Type A outputs the forward and reverse pulses from separate terminals. In type B, the forward and reverse pulses are output from the same terminal, and a signal to identify forward/reverse rotation is output from another terminal.



R

Rapid stop

To bring movement to a stop in a time shorter than the deceleration time set by a parameter.



READY

Preparation being complete. Ready.

Real-time auto tuning

See "Auto tuning."

Reduction ratio

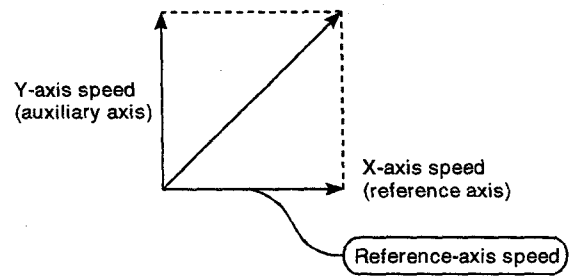
The ratio of deceleration when gears are used. It is always a number larger than 1.

$$\text{Reduction ratio} = \frac{\text{Number of input gear rotations}}{\text{Number of output gear rotations}}$$

The speed transmission ratio.

Reference axis speed

The speed of an axis used as reference during interpolation operation.

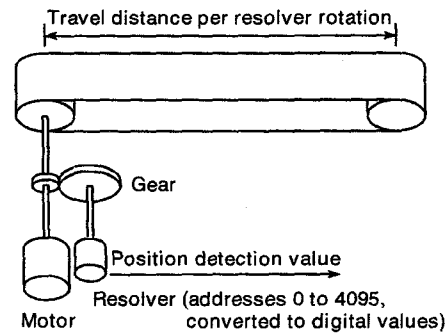


Regenerative brake option

An optional product used when acceleration/deceleration is performed at high frequencies.
See "External regenerative brake resistor."

Resolver

A device that detects an angle by dividing input into two analog voltages. Also called "2-phase synchronizer," since the axis rotation angle of a 1-phase voltage input is converted to a 2-phase voltage (analog voltage) and output.



Return pulse

See "Feedback pulse" in the glossary.

RLS (Reverse Limit Switch) signal

Input signal XnC, which indicates that the low limit switch (having a contact-b configuration and carrying current in a normal state) located outside the movement range of positioning control was activated.
Positioning operation stops when the external RLS signal (contact b) is turned off (becomes non-conductive).

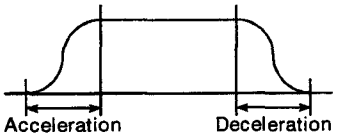
Rotary table

A round table that carries work placed on it, rotating within the range of 360 degrees to perform positioning control.

S

S-curve acceleration/deceleration

Smooth acceleration and deceleration movements along a sine curve are obtained.
The S-curve ratio can be set between 1 and 100 %.



Scroll monitor

When positioning operation is monitored with the GPP, this monitor displays the address and error of the data number currently executed for positioning, as well as the most recent five data numbers.

Sequence control

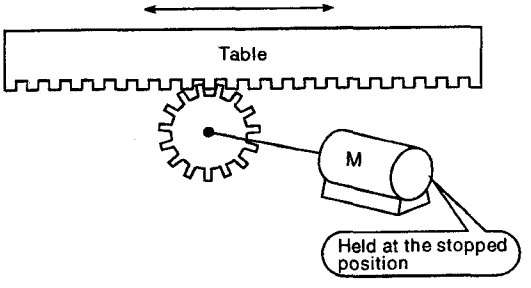
A type of movement control that performs actions in sequence by detecting the end of an action via a switch and starting the next action using that signal, etc.
Synonymous with "sequence program."

Servo amplifier

See "Drive module" in the glossary.

Servo lock

During positioning using a servo motor or stepping motor, it is necessary to apply a force by which to retain the stopped position.
(The position becomes incorrect if a shift is caused by external forces.)
The status under such force is called "servo lock" or "servo lock torque."

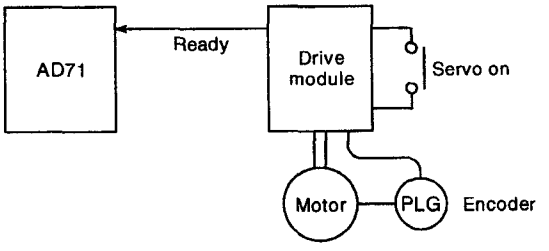


Servo motor

A motor that rotates faithfully, as specified by the command.
Highly responsive and able to perform starts and stops frequently at high speed and high accuracy.
There are DC and AC types as well as those designed to handle large capacities. They are equipped with a pulse generator that detects the number of rotations, often used for feedback control.

Servo on

The servo module does not operate unless the drive module is functioning normally and this servo on is turned on.

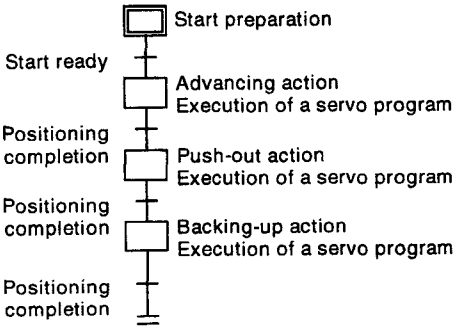


Setting unit

A setting item among the positioning basic parameters.
Specify either mm, inch, degree or pulse.

SFC (Sequential Function Chart)

The sequential function chart is the most ideal structured programming method for performing automatic control operation of a machine in sequence using a PC.



Skip function

A function to stop the positioning currently executed, decelerate to a stop, then perform the next positioning, when a skip signal is input.

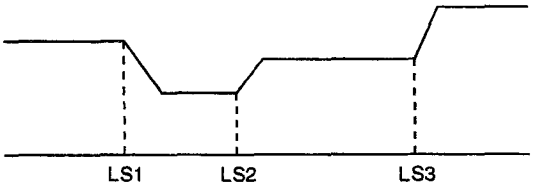
Slave axis

The side whose positioning data is partially ignored during interpolation operation. Moves according to the data of the master axis.

Speed change

The positioning speed can be changed between low and high speeds.

1) Pattern specification is allowed for up to nine successive points, and the feed direction must be same.
2) The speed can be changed using an external signal, and there is no limitation as to the number of changes performed.



Speed change using a limit switch (external signal)

Speed control

A type of speed control performed mainly by the servo motor. Sample applications include grinding wheel rotation, welding speed and feed speed. Unlike position control, the present value (address) is not controlled. In some cases, a different drive module may be used for the same motor.

Speed integral compensation

The first item of servo parameters relating to positioning data, and is used to improve the frequency response and transient characteristic during speed control. Increasing this value is effective when overshooting during acceleration/deceleration cannot be reduced by adjusting the speed loop gain.
Unit is ms.

Speed limit value

The maximum speed of positioning. When this value is set by a parameter, any higher speed mistakenly set to other data will revert to the speed limit value. The acceleration/deceleration time refers to a time to/from the speed limit value.

Speed loop gain

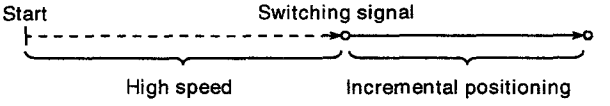
The first item of the servo parameters relating to positioning data, it indicates the speed of control response during speed control.
When the load inertial moment ratio increases and the speed response of the control system drops, the declining stability of operation can be improved by increasing the set value.
If the value is increased too much, however, overshooting during acceleration will increase and motor vibration noise will be generated during operation or when operation stops.

Speed loop mode

A servo control mode used in positioning. This mode is used to perform speed control. See "Position loop mode."

Speed/position control switching mode

A method used in positioning. This mode can be used, for example, for high-speed movement to a certain point, which has nothing to do with positioning, followed by a movement by a fixed dimension from the action point of the limit switch.



Speed switching control

During positioning control, positioning to the endpoint of travel increment is performed while the speed is changed at speed switching points.

Start complete

The reply signal issued by the D75P2 immediately after receiving a start command to indicate that the module is functioning normally and ready to begin positioning. It is different from positioning complete.

Starting axis

Specify axis 1 or axis 2 of the two axis systems of the D75P2, or the reference axis of interpolation operation.

Status

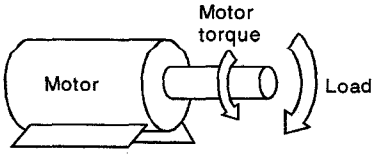
Data indicating a status. A collective name for signals that turn on when the battery voltage is low, home position return is requested, during dwell time, etc.

Step function

Test operations can be performed for each data item when continuous operation is enabled for multiple positioning-data numbers.

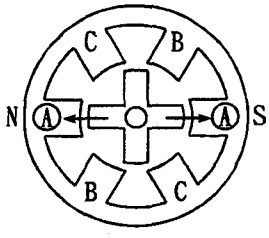
Step out

The stepping motor rotates in proportion to the number of pulses (frequency), but the rotation timing may become out of sync if load applied to the motor is too large. This is called "step out," and it is necessary to increase motor torque to prevent step out. Step out increases the positioning error.

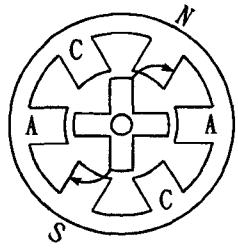


Stepping motor

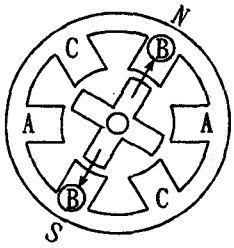
A motor that rotates by certain degrees (e.g.: 0.15°) when a pulse is given.
Thus, rotations proportional to the number of pulses can be obtained. 2-phase through 5-phase types are available, and in the 3-phase type the rotor rotates when voltage is applied to A, B and C in this order. Often found in small motors, and able to provide accurate rotations without feedback. Be careful of step out during overload.



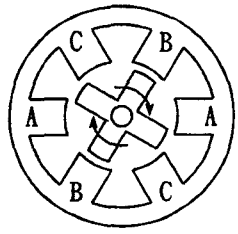
1) Phase A is excited by the pulse.



2) Next, a force is applied in the direction of arrow when phase B is excited.



3) The gear closest to phase B is attracted and stopped.



4) The rotor rotates clockwise as the excitation phase is changed successively.

Stop setting time

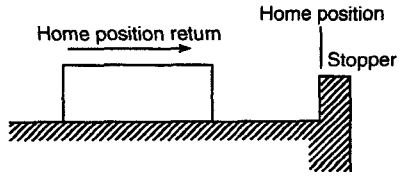
See "Dwell time" in the glossary.

STOP signal

Input signal X which externally and directly stops the action during positioning control.
Action stops when the external STOP signal (contact a) turns on (conductive), and X is turned on.

Stopper stop

A method of home position return by which a stopper is provided at home position and movement is stopped by contact with the stopper.
The motor may deteriorate or get damaged if no cautionary measures are taken. The available methods include providing a timer to turn off the motor after a specified time and stopping the motor by suppressing a sudden increase in motor torque upon contact with the stopper.

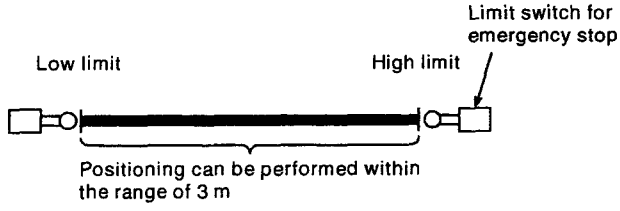


Stroke

The distance traveled after operation is started from the stopped status until it stops again. The amount of change in operation.

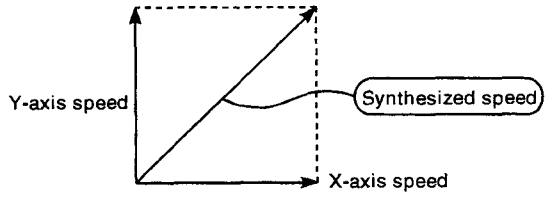
Stroke limit

A range within which positioning operation can be performed, or outside which the machine will be damaged. (During JOG operation, movement beyond this range is possible.) When a feed screw is used, this range is determined by the length of the screw. In fixed-dimension feed, it is the maximum cutting dimension. Although high and low limits are set using parameters, it is recommended to create an emergency stop circuit outside the PC by providing a separate limit switch. See "Limit switch" in the glossary.



Synthesized speed

The moving speed of the controlled system during interpolation.



T

Teaching

A function to manually find and teach a position to the module when the positioning address is not clear or alignment need to be done using an actual object. For example, complicated addresses of graphics are taught by tracing the model so that positioning operation can be repeated.

Teaching module

A device that performs writing/reading of data, operation and monitoring. Must be connecting to the D75P2 before it can be used. Model name AD75TU. A simplified version of the GPP.

Torque control

A limit is set to the resistance torque applied to the positioning motor so that the power is turned off when the applied torque reaches or exceeds the limit. When excess torque is applied to the motor, current increases suddenly, causing the motor to deteriorate or shortening its service life as a result of stress received. At the time of home position return, this sudden increase in torque is used as a motor stop command.

Torque loop mode

Also called "current loop mode."
See "Position loop mode."

Torque ripple

A range of changes in torque. Variation.

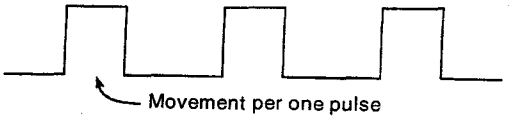
Tracking function

A function to perform positioning at a speed relative to the moving target, by inputting a travel increment from an external encoder and adding the travel increment to the servo command value.

Travel increment per pulse

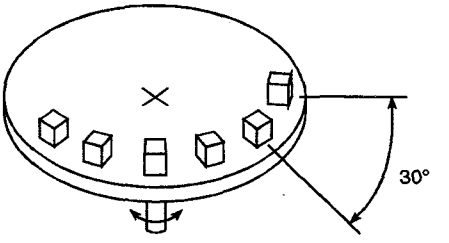
Data in mm, inches or angles calculated by the machine to indicate how much the motor axis travels per pulse. Corresponds to the position detection unit. Positioning accuracy cannot be higher than this value.
Since the motor is usually designed based on the travel increment per axis rotation, the following expression can be established:
Travel increment per pulse =

$$\frac{\text{P rate}}{\text{Number of pulses per encoder rotation}} \times \text{Travel increment per rotation}$$



Turntable

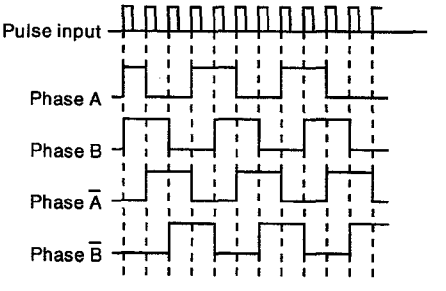
A plate that turns. Turned by power, and used in operations in which one rotation, or 360 degrees, is divided at necessary points
The control unit of positioning should be "degree."



Turned by the motor

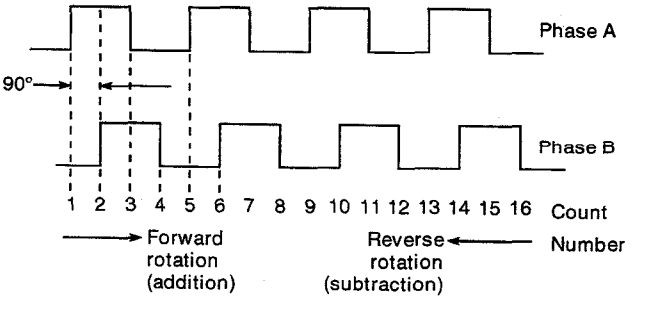
2-phase excitation system

A system in which the stepping motor coils are excited in a fixed order. In this system, current flows constantly into two phases to perform step feed.



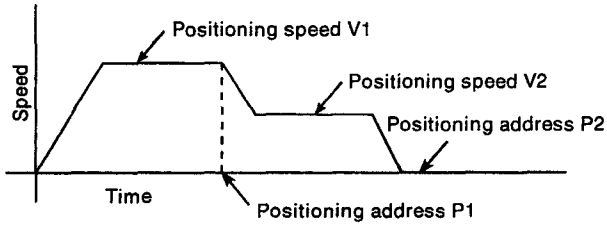
2-phase pulse

Dual-chain pulses of phase A and phase B. Using a phase difference between the two phases, addition and subtraction can be performed automatically. A standard phase difference is 90 degrees in electric angle.
If phase B delays from phase A during forward rotation (phase B turns on after phase A has turned on), phase A delays from phase B during reverse rotation (phase A turns on after phase B has turned on). Using this, forward/reverse rotations (addition/subtraction) can be performed automatically.



2-speed trapezoid control

A type of positioning control in which the positioning pattern, positioning addresses (P1, P2) and positioning speeds (V1, V2) are set using a sequence program, and after the first positioning start command is issued and address P1 is reached, the positioning speed is automatically changed to V2 and positioning is performed.



U

Unit setting

To set the unit of the actual address or travel increment used for positioning.
The units of mm, inch, degree and pulse can be set.
The parameter's initial value is pulse.

W

Warning

A warning code is issued when a minor error is detected that does not require positioning operation to be paused or stopped, and is differentiated from an error code.

WDT (Watchdog Timer) error

Stands for "watch dog timer error," and indicates a malfunction of the PCPU.

Window

A selection menu displayed on the screen when the AD75P is started up.

- Menu selection window
- Mode function selection window
- Sub-function selection window
- Execution/setting selection window

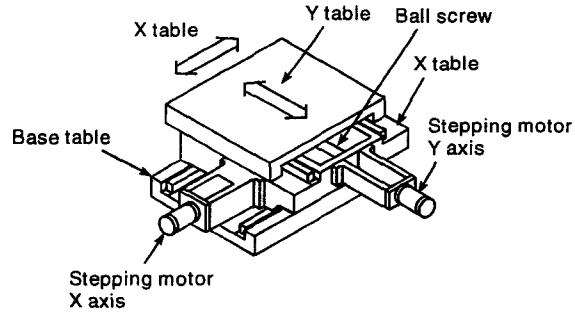
WITH mode

A mode in which the M code is output at the start of positioning. Since the code tuns on upon start, voltage can be applied to the welding electrode or the positioning speed can be displayed.
See "AFTER mode in the glossary."

X

XY table

A device that moves a table in two directions of X (horizontal) and Y (vertical) to facilitate positioning. Commercial products are also available.



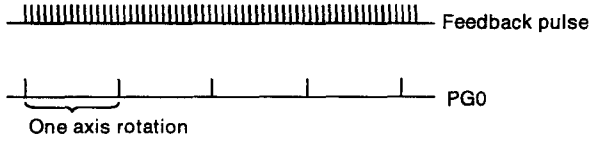
Z

Z phase

Also called "PG zero."
See "Home position signal."

Zero signal

The pulse that generates by one unit (or two units) per rotation of the pulse generator's axis.
Used for zeroing in positioning. Also called "Z signal" or "PG0."



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AJ65BT-D75P2-S3 Positioning Module

User's Manual

MODEL	AJ65BT-D75P2-U-E
MODEL CODE	13JL46
IB(NA)66824-A(9804)MEE	

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : MITSUBISHI DENKI BLDG MARUNOUCHI TOKYO 100-0005 TELEX : J24532 CABLE MELCO TOKYO
NAGOYA WORKS : 1-14 , YADA-MINAMI 5 , HIGASHI-KU, NAGOYA , JAPAN

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