# 4. Operating Features

## 4.1 General Operating Features And Functions

### 4.1.1 SERVO ON

After switching ON the power input for the driver, turn on the pin no. 3 of <CN2> to enable SERVO ON of the driver (The driver is shipped with Type A logic enabled). By using a PC utility, it is possible to set the pin no. 3 as a Type B logic. In such a case, if the power supply to the driver is turned ON, the driver will automatically enable the SERVO ON function.

### 4.1.2 Emergency Stop

If the pin no. 2 in CN2 is set ON, the motor shall be brought suddenly to a halt.
Stopping method: The motor decelerates at high speed until it stops completely. However, the driver continues to be in the SERVO ON state.

### 4.1.3 Brake Signal:

★ **Outline:**

This Brake Signal is used to trigger and hence control a brake device or a clamping device for the motor.

★ **Related Parameters:**

The Point Move Operation related parameters are given below:

① At SERVO ON, the delay in executing the "Brake OFF" command is set using the parameter #89 (the default initial value for this is preset as "0").

② At SERVO OFF, the delay in executing the "Brake ON" command is set using the parameter #90 (the default initial value for this is preset as "0").

★ **Operation:**

The brake signal timing is as shown here....
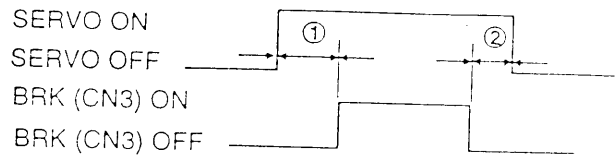


### 4.1.4 M-Function Interface

★ **Outline:**

The M-interface operation is possible upon the completion of the Index Operation, Point Operation or, after reaching a specific location in Program Operation.

★ **Related Parameters:**

The parameters relating to the M-Function Interface are as follows:

① M-Function enabled during the Program Operation    (#100=0 : Disabled; #100=1 : Enabled)
② M-Function enabled during Index or Point Operation    (#101=0 : Disabled; #101=1 : Enabled)
③ Selection of M-Function type of communication interface (#102=0 : PLC; #102=1 : RS232C)

★ **Operation:**

☆ **PLC Mode of operation:**

① The pins <OUT_CODE[0...7]> of the CN2 terminal outputs the M codes and also the <OUT_M_EN> pins are enabled ON.
② After the M codes are completely read, the <IN_M_ANS> pins are enabled in the ON state.
③ After the confirmation of the ON status of <OUT_M_EN> in the CN2, the <IN_M_ANS> is switched OFF.
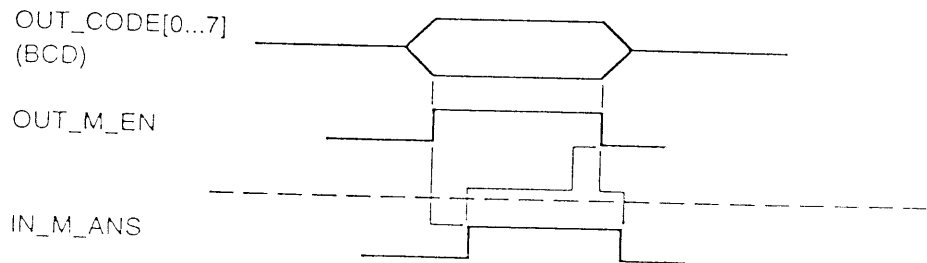


☆ **RS232C Mode of operation:**

M**        (Receive)
@9⏎        (⏎ : CR)

### 4.1.5 Selection Of The Axis Instruction Set:

★ Outline

It is extremely important to set the units of the parameter set before commencing any moves. The choices of selection are from Pulse Inputs, Angular Inputs and Feed Length Input System.
The Axis Operation Unit must be 0.001° during Auto-tuning operation (The default initial value for the Axis Operation Unit is 0.001° ).

⚠ **NOTE**

If you must select an Axis Operation Unit other than 0.001° then, do so only after carrying out the Auto-tuning operation.

★ Method

☆ Set the driver to Machine Set mode
  @55⏎          (⏎ : CR)

☆ Change the value of the parameter (#208) as desired  (Refer to the Parameter list of values)

☆ Reset the driver.

## 4.2 Operation Mode

The various Operation Modes are listed in the table shown below (**Table 4.2**) :

### Table 4.2  Operation Mode List

| Number | Operation Mode | Functions |
|--------|----------------|-----------|
| 0 | Test Mode | The built-in oscillator generates a test signal with a frequency of 3.3 Hz which is used to tune the motor. |
| 1 | Auto-tuning Mode | This mode will oscillate the motor and predict the load inertia and thereby, determine the requisite parameter settings for proper tuning and control of the same. |
| 2 | | |
| 3 | Homing Mode | Returns the motor to the home position (origin return). |
| 4 | Program Mode | To select a desired program and then operate the motor accordingly. |
| 5 | Signal Locate Mode | Use the ORG, OTUP, OTDN signals to move the motor. |
| 6 | | |
| 7 | MDI Mode | Inputting the desired coordinates (position details) for immediate execution. |
| 8 | Index Operation Mode | Moves the motor according to determined indexed points. |
| 9 | Point Move Operation Mode | Moves the motor to a specified point. |
| 10 | Input Value Operation Mode | Moves the motor by a specified value. |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | Mechanical Settings Mode | Enables changing the servo parameters of the motor/ driver system. |

## 4.2.1 Starting And Ending The Operation Mode Using A PLC

❊ This section is applicable only to the Operation Modes under PLC control.

★ **Outline**

The Operation Mode start is enabled by the signal <IN_MODE_START> signal of the CN2.
The Operation Mode end is enabled by the signal <IN_MODE_END> signal of the CN2. However, the Auto-tuning mode, Homing Mode, Signal Locate Mode, Index Operation Mode, Point Move Operation Mode andf Input Value Operation Modes shall end automatically upon completion without any command intervention.

★ **Operation**

Set the <IN_MODE[0...3]> and <IN_CODE[0...3]> of the CN2 and then turn ON the <IN_MODE_START> of the CN2.
Kindly note that it is possible to activate these signals simultaneously provided that the parameter #215 (High Speed Response of the PLC Operation Start Signal) is not activated (disabled). If the parameter #215(High Speed Response of the PLC Operation Start Signal) is activated (enabled), then it is necessary to turn on the <IN_MODE[0...3]> and <IN_CODE[0...3]> signals of the CN2 before setting the <IN_MODE_START> to the ON position.

❊ The response time is in the range of 24 msec to 34 msec if the parameter #215(High Speed Response of the PLC Operation Start Signal) is inactive (Enabled) and in the range of 6 msec to 12 msec if it is active (Disabled).

The <IN_MODE_START> will turn OFF only after the controller turns ON the signal <OUT_MODE_EXE> in the CN2.

⚠ **NOTE:**

Only after the <IN_MODE_START> of the CN2 turns OFF, will the <OUT_MODE_EXE> signal turn OFF.

☆ **Case:** If the Settling parameter (#106) is inactive (disabled), the <OUT_MODE_EXE> signal is output simultaneously with the completion of the position instruction command (the COIN signal is disregarded).



```
IN_MODE [0...3]

IN_CODE [0...7]
(If needed only)

IN_MODE_START

OUT_MODE_EXE

COIN (CN3)
```
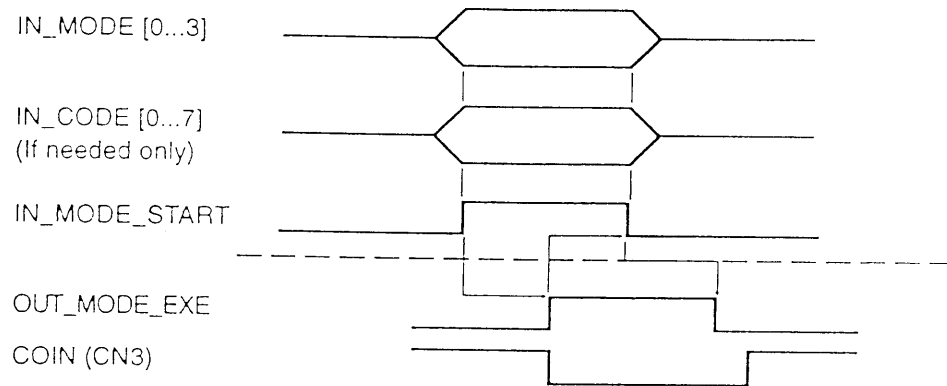
☆ **Case:** If the Settling parameter (#106) is active (enabled), the <OUT_MODE_EXE> signal is output after the completion of the position command and, only when the position complete instruction signal (COIN) turns ON.



```
IN_MODE [0...3]

IN_CODE [0...7]

IN_MODE_START

OUT_MODE_EXE

COIN (CN3)
```
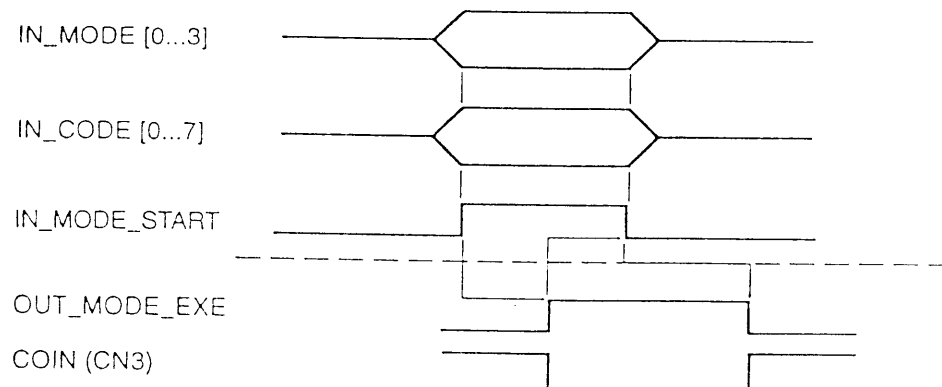
## 4.3 Operation Manual

After the preparations for operation (Installations, Connections & Adjustments) are completed, it is possible to perform the desired operations. The various operation modes are explained in simple point wise detail in this section. Select a desired form of operation and then follow the instructions for that mode of operation.
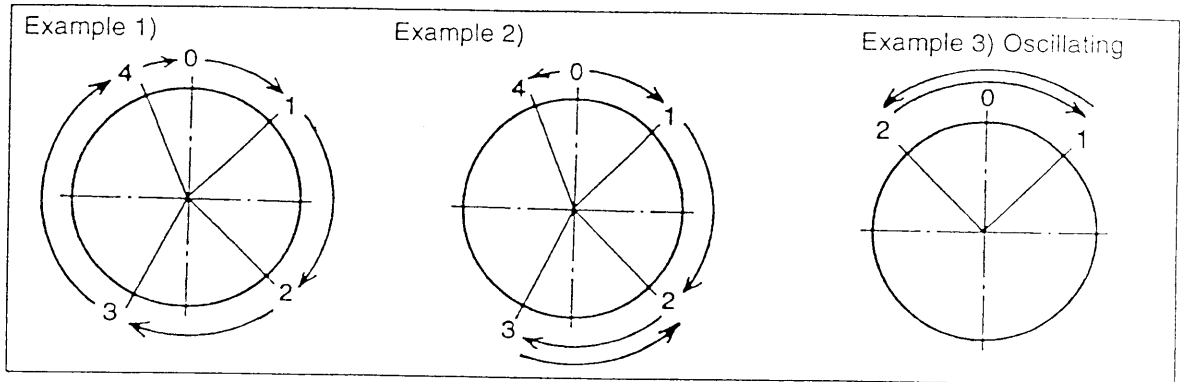
### 4.3.1 Selection Of Operation Modes:

1) Select Index Operations:

✻ Equispaced Index Operations? → Index Operation Mode or Program Operations Mode?

Example: 8 way equispaced indexing    Example: 8 way equispaced indexing (random moves)
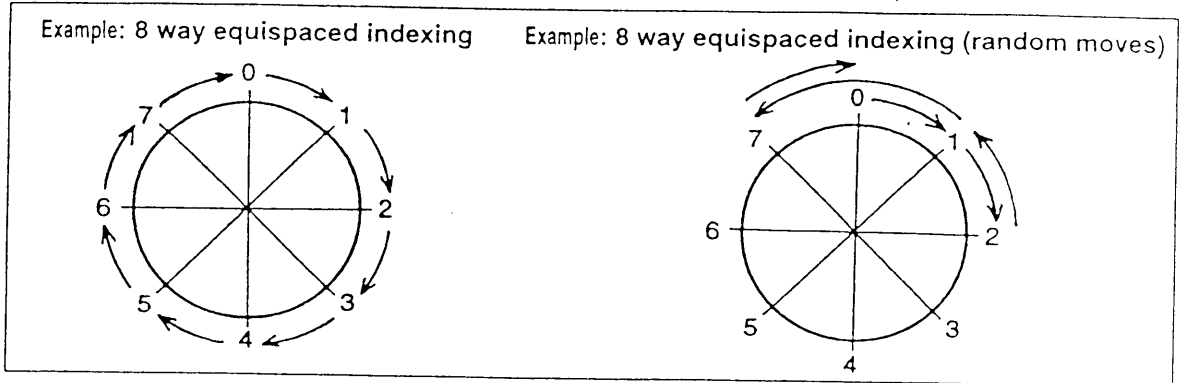


✻ Unequal Index Operations?  → Index Operation Mode or Program Operations Mode?

Example 1)          Example 2)          Example 3) Oscillating



2) Input the move distance directly.

✻ Via serial communications (Use the MDI mode).
✻ Via a PLC (Use the DI/O input settings and feed the Input Value Operation Mode).

### 4.3.2 Points Selection In the Index mode:

1) Index Operation Mode

① Is it in operational readiness?
   Is it in communication readiness?

   (3. Preparation For Operation)
   > 3.4  The Front Panel
   > 6.    The M Drive Utility
   > 7.    How to use the Operation Pendant:

   Is the servo turned ON?
   Is it tuned and adjusted for the load inertia?

   > 3.5  SERVO ON Operation
   > 3.6   Adjustments
   > 6.10 SERVO Tuning Explained

② Setting the parameters of the Index Operation mode?
   Setting the number of Index points:
   Setting the type of motion profile (Trapezoidal, Cam curve)
   Setting the INC/ABS mode of operation

   (4.4.7  Index Operation Mode)

③ Coordination confirmation:
   Homing
   Automatic Homing

   > 4.4.3 Homing Mode
   > Settings for parameter #165

④ M-Function Interface
   Wish to confirm the completion of operation?

   > 4.1.4  M-Function Interface

⑤ Start

   (4.2.1  Mode Start, End)

## 2) Point Move Operation Mode

   ① Is it in operational readiness?
      Is it in communication readiness?

      Is the SERVO turned ON?
      Is it tuned and adjusted for the load inertia?

   ② Setting the parameters of the Point Move Operation mode?
      Setting the number of Points to be moved:
      Settings for each of the Points:
      Setting the type of motion profile (Trapezoidal, Cam curve)
      Setting the INC/ABS mode of operation

   ③ Coordination confirmation:
      Homing
      Automatic Homing

   ④ M-Function Interface
      Wish to confirm the completion of operation?

   ⑤ Start

## 3) Program Operation Mode

   ① Is it in operational readiness?
      Is it in communication readiness?

      Is the SERVO turned ON?
      Is it tuned and adjusted for the load inertia?

   ② Setting the parameters of the Program Operation mode?
      Setting for the related parameters

   ③ Creating a Program
      Creating, Registration and Editing a Program

   ④ Coordination confirmation:
      Homing

   ⑤ M-Function Interface
      Wish to confirm the completion of operation?

   ⑥ Start

## 4.3.3 Points Dealing With Move Distance / Direct input:

### 1) MDI Mode

   ① Is it in operational readiness?
      Is it in communication readiness?

      Is the SERVO turned ON?
      Is it tuned and adjusted for the load inertia?

   ② Setting the parameters of the MDI mode?
      Setting up the MDI mode input
      Setting for the related parameters

   ③ Input a Program

   ④ Ending the MDI mode:

### 2) Input Value Operation Mode

① Is it in operational readiness?
Is it in communication readiness?

Is the SERVO turned ON?
Is it tuned and adjusted for the load inertia?

② Setting the parameters of the Input Value Operation mode?
Setting for the related parameters

③ Start

## 4.4 Operation Modes Explained

In order to properly operate this product, first select the desired mode of operation, then read the explanations on the same and follow the instructions carefully.

### 4.4.1 Test Mode

★ Outline:

This mode enables the tuning of the SERVO motor system. For this purpose, the driver emits a 3.3 Hz Square Wave position command using the built-in oscillator and this is used to move the motor in a reciprocal fashion in very small moves. The response of the motor is also output through the AMON test pin, which may be monitored using an oscilloscope.

★ Related Parameters:

The following parameters are related to this operation and listed below:
① Position control band width          ( #50)
② Position control Integral limit       ( #53)
③ Inertia                              (#155)
④ Velocity control band width          (#159)
⑤ Analog Monitor selection             (#70:1 Motion response from the tested axis)
⑥ Monitor gain for the tested axis movement   ( #72)

☆ Waveform before the tuning:          Motor position

☆ Waveform after the tuning            Motor position

★ Preparations:

☆ Turn the SERVO ON.

★ Operation:

☆ PLC Operation

IN_MODE [0...3] (CN2)
Mode No. 0

IN_MODE_START (CN2)

IN_MODE_END (CN2)

OUT_MODE_EXE (CN2)
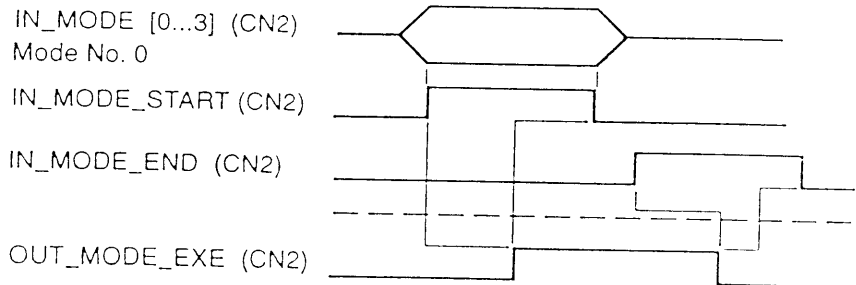
☆ RS232C Operation

◆ Start

@3:0↵ (↵ : CR)
R00 (Receive)

◆ END

@2↵
R00 (Receive)

◆ This operation is carried out in the Servo Adjustements window of the PC Utility.
※ Refer to section 6.10 for the PC Utility's Servo Adjustment explanations.

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### 4.4.2 Auto-tuning Mode

★ Outline:

This mode enables the Auto-tuning of the SERVO motor system. For this purpose, the driver will command the motor to move through some fine oscillations several times and the resultant motion is used to predict the load inertia and the control parameters are set automatically.

★ Related Parameters:

The following parameters are related to this operation of Auto-tuning as listed below:
① SERVO stiffness setting state                                         ( #38)
② Auto-tuning moving range                                             ( #32)
③ Maximum Auto-tuning acceleration/ deceleration                       ( #33)
④ Default value of the Auto-tuning acceleration/deceleration           ( #34)
⑤ Selection of the Axis Instruction                                    (#208=1  This parameter must always be 1)

⁑ Normally, no modifications are required in steps ②,③,④ but it may be needed in the cases shown here:
In case of excessive position error (EPR23)
☆ Set the value of parameters ③,④ to a higher value.
In case of excessive deviation in the differential value of the position instruction (ERR31),
☆ Set the value of parameters ③,④ to a higher value.
In case the move angle is too large.
☆ Change the parameter value to 2 or some appropriate smaller value. Note, however, that a larger move angle usually helps to obtain better tuning.

The following parameters will be set automatically.
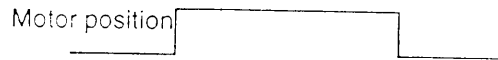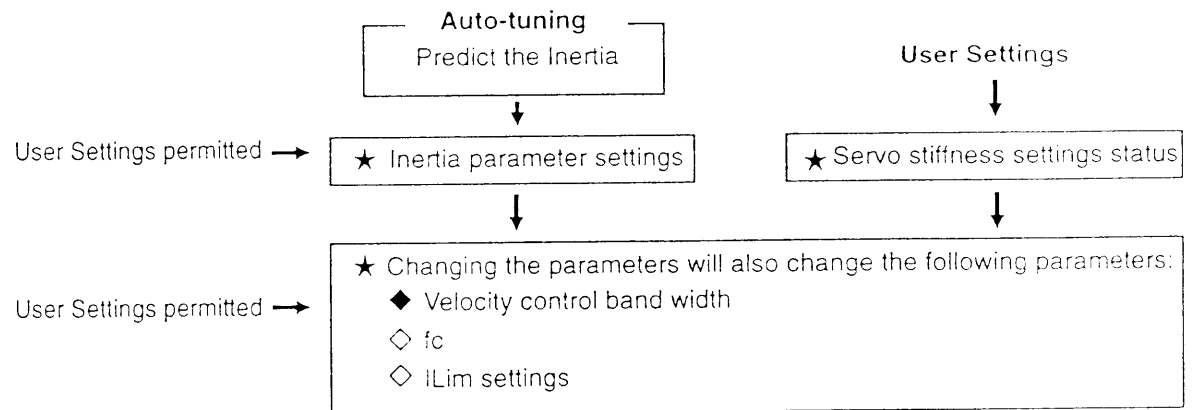① Position control band width                                          ( #50)
② Position control Integral.limit                                      ( #53)
③ Inertia                                                              (#155)
④ Velocity control band width                                         (#159)

☆ The tuning procedure is as follows:
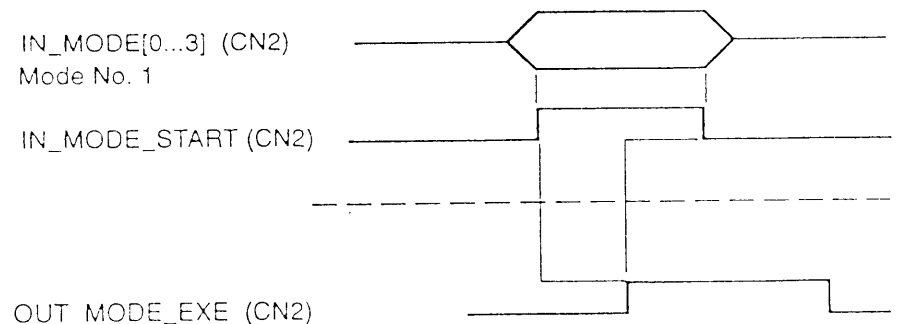
```
              ┌──── Auto-tuning ────┐
              │  Predict the Inertia │                    User Settings
              └──────────────────────┘                         │
                          ↓                                     ↓
User Settings permitted → ┌──────────────────────────┐   ┌──────────────────────────────┐
                          │ ★ Inertia parameter       │   │ ★ Servo stiffness settings status │
                          │    settings               │   └──────────────────────────────┘
                          └──────────────────────────┘
                          ↓                                     ↓
                ┌──────────────────────────────────────────────────────────────┐
                │ ★ Changing the parameters will also change the following parameters: │
User Settings   │    ◆ Velocity control band width                              │
permitted →     │    ◇ fc                                                       │
                │    ◇ ILim settings                                            │
                └──────────────────────────────────────────────────────────────┘
```

★ Preparations:
☆ Turn the SERVO ON.

★ Operation:
☆ PLC Operation

IN_MODE[0...3] (CN2)
Mode No. 1

IN_MODE_START (CN2)

OUT_MODE_EXE (CN2)

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◆ Start

@3:0↵   (↵ : CR)

R00 (Receive)

◆ END

@2↵

R00 (Receive)

◆ This operation is carried out in the Servo Adjustements window of the PC Utility.

※ Refer to section 6.10 for the PC Utility's Servo Adjustment explanations.

⚠ CAUTION:

If the motor starts to resonate, reduce the value of the Servo stiffness settings (#38). If this also does not prove effective in reducing the resonance effect, it may be necessary to change the filter settings. Refer to the section 6.10.3 for making the appropriate filter settings.

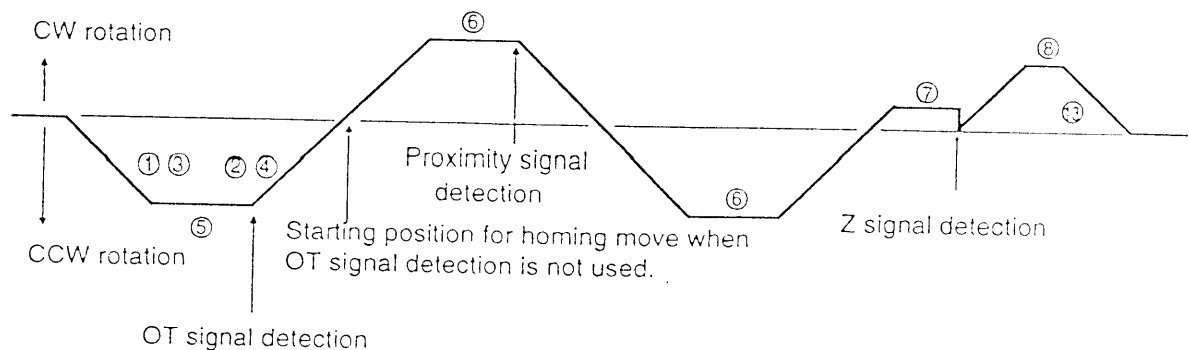### 4.4.3 Homing Mode

★ Outline:

This mode uses the Homing sensor and the motor's Z signal to set the origin position and use this as a home position. The motion profile can use the trapezoidal move only (However, it is possible to set the motor's deceleration type). It is possible to override the velocity settings during homing. For the velocity override settings kindly refer to the section 4.5.2.

★ Related Parameters:

The following parameters are related to this homing procedure are as listed below:

① Selecting the acceleration type                                    (#4=0 : Acceleration; #4=1 : S)
② Selecting the deceleration type                                    (#5=0 : Deceleration; #5=1 : S)
③ Acceleration time under trapezoidal motion                         (#7)
④ Deceleration time under trapezoidal motion                         (#8)

⑤ Velocity during homing for the OT search                           (#11)
⑥ Velocity during homing for the proximity signal search operation   (#12)
⑦ Homing velocity at close to  homing recognition point (1)          (#13)
⑧ Homing velocity for the offset position move                       (#15)

⑨ Homing direction                                                   (#20:0 : -Direction; #20=1 : +Direction)
⑩ Use the OT signal during Homing                                    (#21:0 : Disabled;  #21=1 : Enabled)
⑪ Use the proximity  signal during Homing                            (#22:0 : Disabled;  #22=1 : Enabled)
⑫ Enable the homing flag position upon error                         (#27:0 : Disabled;  #22=1 : Enabled)
⑬ Value of the  homing offset during homing                          (#29)
⑭ The value for Operation instruction after the completion of homing (#30)

The dimensional units for the ⑬ and ⑭ can be set using the parameter (#208).

The default settings are 0.001º.



CW rotation

⑥

⑧

⑦

⑬

Proximity signal detection

① ③   ② ④

⑥

Z signal detection

⑤

CCW rotation

Starting position for homing move when OT signal detection is not used.

OT signal detection

**Setting the homing offset moving distance:**

The amount of offset for the home position can be changed using the parameter #29. However, it can also be changed by following the operation procedure given here.

1) Switch to the RS232C mode of operation (RS232C communications is enabled by setting the DIP switch SW2 on the front panel of the driver to ON position and then either rest the driver or recycle power to the driver).

2) Turn the SERVO ON.

3) Set the value of parameter #29 to 0 (#29=0)

4) Execute the homing operation (@3:3).

5) Use the Jog mode to move to the desired mechanical home position. Alternately, in the Input Value mode of operation [during operation in MDI Mode] (Set parameter #108 to 0 and then perform a homing run). You can also turn the SERVO OFF (Input @8:0 to turn OFF the SERVO) and then manually move the motor to Mechanical home position.

6) Input @10:1⌟  (⌟ : CR) [CW direction during rotational coordinate system or straight line coordinate system]
   Input @10:1⌟  (⌟ : CR) [CCW direction during rotational coordinate system]

By following the above procedure the offset value of the home position shall be registered into the driver.

⚠ CAUTION:

Following the above procedure to set the value of the parameter #29 may result in a calculation error of 1 pulse deviation. Kindly carry out the homing procedure to reconfirm the offset position. Fine tuning the home position will eliminate this error (However, there is no effect on the repeatability of the homing position).
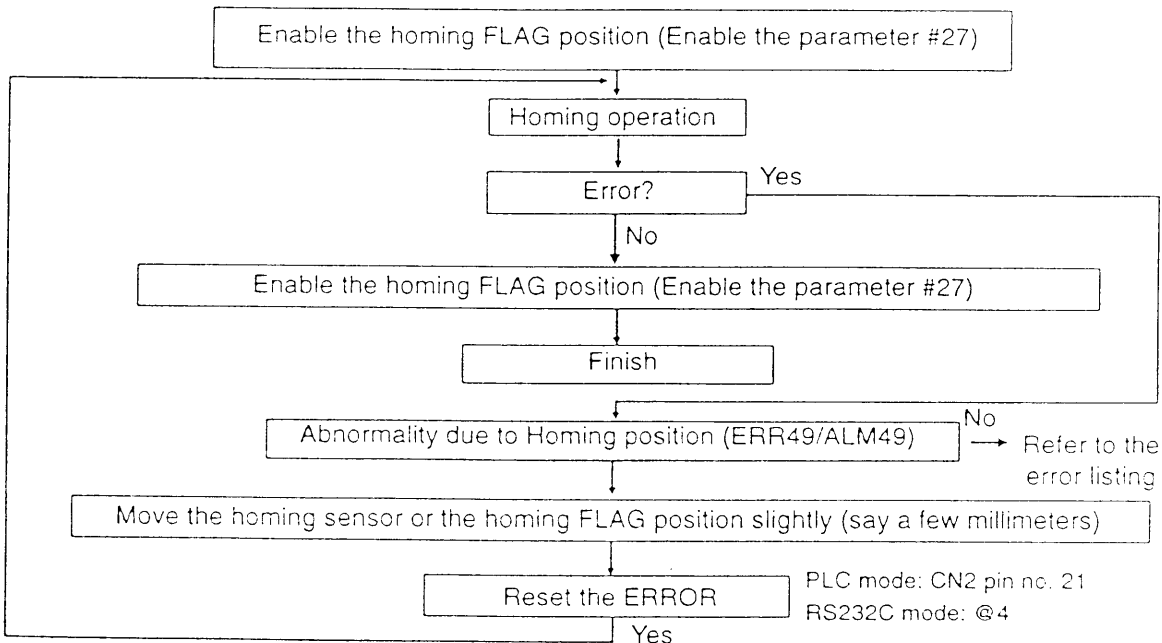
★ Preparations:
  ☆ Turn the SERVO ON.

★ Operation:
  ☆ PLC Operation

IN_MODE [0...3] (CN2)
Mode no. 3

IN_MODE_START (CN2)

OUT_MODE_EXE (CN2)
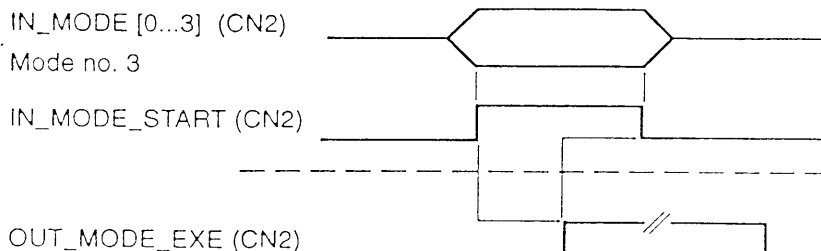
  ☆ RS232C Operation
    @3:0⌟  (⌟ : CR)
    R00 (Receive)

★ WARNING: For the initial homing follow the procedure as given below:

Enable the homing FLAG position (Enable the parameter #27)

Homing operation

Error? ──Yes──

│No

Enable the homing FLAG position (Enable the parameter #27)

Finish

Abnormality due to Homing position (ERR49/ALM49) ──No──→ Refer to the error listing

Move the homing sensor or the homing FLAG position slightly (say a few millimeters)

Reset the ERROR        PLC mode: CN2 pin no. 21
                       RS232C mode: @4
│Yes

☆ NOTE: The homing (proximity) sensors and the OT sensors use the type B logic settings.

#### 4.4.4 Program Operation Mode

★ Outline

This is the mode under which a preregistered program can be run. It is possible to revise the parameters or to make changes to the control parameters in this mode. It is also possible to run another program as a subroutine inside the main program. The program no's from '0' to '89' are user defined program no.s (can be used arbitrarily) The program nos' from '90' to '99' are system recognized program no's (cannot be set by the user). The number of user defined blocks inside a program cannot exceed a total of 1000. Further, the program no. '0' is reserved for special functions (refer to relevant instructions).

★ Related parameters

The parameters related to this mode are as given below:

☆ Common to Index Mode Operation, Point Move Mode Operation & Input Value Mode Operation are:
① Program Step through mode enable     (#82:0 : Disabled; #82=1 : Enabled)
② Absolute Input mode enable     (#83=0: INC ; #83=1 : ABS)
③ Enable the M Functions in Program Mode     (#100=0 :Disabled ; #100=1 : Enabled)
For details regarding the M-function refer to section 4.1.4.

☆ Indexing Operation:
Refer to section 4.4.7 for Index Operation Mode

☆ Point Move Operation:
Refer to section 4.4.8 for Point Move Operation Mode

☆ Input Value Operation Mode:
Refer to section 4.4.9 for Input Value Operation Mode

★ Preparation
☆ Turn the SERVO ON. ·

★ Operation
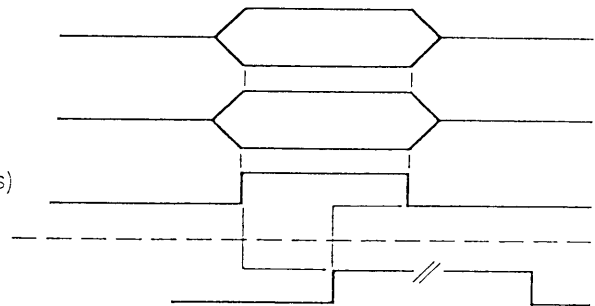☆ PLC Mode

IN_MODE [0...3] (CN2)

Mode no. 4

IN_CODE [0...7] (CN2)

Program no. (BCD 2 characters)
IN_MODE_START (CN2)

OUT_MODE_EXE (CN2)

☆ RS232C Operation
@ 3:4:* ⏎     (*: Program number ; ⏎ : CR)
R00 (Receive)

☆ Operation is made possible by using the PC utility.
⁂ For the explanations on the program menu and the relevant details refer to the section 6.4.

★ Operational precautions

☆ PLC Mode of operation:
The following rules must be observed for setting the IN_CODE[0...7].
For a value excluding 0 to 99:     For a specified program no., it is possible to execute the program for a specified program block number (This may be used for executing just a part of a program, if desired)
For a value of 0 to 99:     For executing a specified program no., in sequence from the beginning of the first block.

☆ RS232C Mode of operation:
@ 3:4: Program number: Block no. ⏎     (Operation mode setting, Start)
    (Program range is 0 to 99; Block numbers are 1 to 1000; ⏎ : CR)
◆ If the program no. and the block no.s are not specified, then an input of @ 3:4 ⏎ will cause the driver to execute the first program from the first block number registered in sequence.
NOTE: If there are no registered programs in the driver, this will lead to an error in operation.

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◆ If the program number is specified and the block number is not, then an input of @3:4: Program number: ↵ will cause the driver to execute the first block in the registered program number and carry on in sequence.

◆ If the program number and the block number are specified, then an input of @3:4: Program number: Block number: will cause the driver to execute the program number from the specified block number and further, continue in sequence.

## ⚠ CAUTION:

When the program number is duly specified and, if there is a nested block inside this program, that block shall be executed in accordance. However, it is not possible to execute change in the parameters or in the axis controlled.

Specifying a block number nested inside a control loop execute the program without changing the control parameters.

## <PROGRAMMING SYNTAX>

★ **General programming caution:**
During programming, avoid using blanks and empty line blocks.

★ **[G]: Preparatory Function**
Description: The preparatory function defined by the G code is used to specify the meaning of the block. It conveys a special meaning to the controller.

☆ **Group 0** (One Shot G code: These types of G codes are effective in the specified blocks alone)
G04   Dwell
Example of usage: G04f****         (****: Dwell time in msec)
G27   Hardware homing
Example of usage: G27X
G28   Software homing
Example of usage: G28X
G92   Coordination system settings
Example of usage: G92X**** (****:programmed coordinate input - user specification)
G92X5       (Type of dimensional units could be Input Value system or Scaling data)
             (In this case, if the units are pulses, the coordinate is set at 5 pulse)
G92X1       (If the dimensional settings are Indexing moves, this will move the motor to the first index point).

☆ **Group 1** (Modal G code: These types of G codes remain effective until another G code in the same group is executed)
G00   Positioning
Example of usage: G00X****         (****: Feeds the axis to the specified position)

☆ **Group 2** (Modal G code: These types of G codes remain effective until another G code in the same group is executed)
G90   Absolute instruction
Example of usage: G90X****         (****: Feeds the axis to the specified position **** from an absolute 0 as a reference)
G91   Incremental instruction
Example of usage: G91X****         (****: Feeds the axis to the specified position which is **** away from the existing position)

★ **[X]: Axis specification**

★ **[F]: Feed velocity**
Example of usage: F****         (****: Move velocity <Depends on dimensional units used for that axis>)

★ **[f]: Feed time**
Example of usage: f****         (****: Feed time <dimensions are in msec>)

★ **[A]: Feed velocity**
Example of usage: A****         (****: Move velocity <Depends on dimensional units used for the X axis>)

★ **[a]: Feed time**
Example of usage: a****         (****: Feed time for the X axis <dimensions are in msec>)

★ **[M]: Signal Code for external devices (2 digit BCD & strobe signal)**
M00   Program stop
Example of usage: M00
M01   Optional stop
Example of usage: M01
M02 to M99 are M outputs from the driver's I/O interface.
Example of usage: M30

★ [P]: Program call
  Example of usage: P3 (Call program no.3)
  NOTE: Nesting of programs are restricted to only 15 routines.

★ [ ' ]: Comments
  Example of usage: ' This will start the homing operation
  NOTE: Maximum comment fields is restricted to 40 characters only.

★ **Input statements**
  User defined parameter values, control strings and data may be set here.
  ☆ Format
  The following 6 modes of input are supported in these type of statements.
  #1=5
  #1=#2
  #1=5+2
  #1=#5+2
  #1=2+#5
  #1=#2+#5

  ☆ Recognized characters
  [+ – * / % ] % has a special meanings which will be explained in later sections.

★ **Control statements**
  ☆ Recognized characters
  <, <=, >, >=, ==, !=]
  NOTE: Nesting of these statements are restricted to a maximum of 15 routines only.

  ☆ IF statements (IF, ELSEIF, ELSE, END)
    ◆ Format
    IF: Numbers: Relationships: Data compared

    ◆ Example of usage:
        IF:#400:>:5
          G90
          X1000
        ELSEIF:#400:>:10
          G91
          X2000
        ELSE
          X3000
        END

  ☆ WHILE statements (WHILE, END)
    ◆ Format
    WHILE: Numbers: Relationships: Data compared

    ◆ Example of usage:
        #400=0
        WHILE:#400:!=:5
          X1000
          M01
          #400=#400+1
        END

  ☆ FOR statements (FOR, END)
    ◆ Format
    FOR: Numbers: Initial values: Relationships: Data compared: No. of steps

    ◆ Example of usage:
        FOR:#400:0:<:7:1   (#400=0; #400<7; #400=#400+1)
          X1000
          M01
        END

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**★ Start-up Program**

If a desired operation sequence is registered as the Program number 0 in the Dynaserv, then upon cycling power to the unit, the driver will automatically select the program number 0 and start executing the same.

**Application example**: This feature may be used to register the homing operation commands (G27X, etc) for user convenience.

**Note**: Kindly remember that the Start-up Program feature is disabled at the time of shipping the driver. However, this feature can be enabled or disabled by using the parameter (#92).

**★** The velocity of either a Trapezoidal or a Cam motion profile; the time duration under a Cam motion profile, are all set by various parameters and this will enable the selection of either a Cam move or a Trapezoidal move.

☆ G00X ＊ ＊ ＊ ＊ F ＊ ＊ ＊ ⎤
   G00X ＊ ＊ ＊ ＊ A ＊ ＊ ＊ ⎦    If defined as such, the 'F' and 'A' will have the following meanings:

For a Trapezoidal move: Setting the velocity of the move       (Change the Feed Velocity parameter)
For a Cam profile move: Setting the velocity (Maximum limit) of the move   (Change the Feed Velocity parameter)

Accordingly, the motion response is identical in the programs ① & ② shown below:

① G00X1000F100
② #9=100             (#9: Feed velocity parameter)
③ G00X1000

☆ G00X ＊ ＊ ＊ ＊ f ＊ ＊ ＊ ⎤
   G00X ＊ ＊ ＊ ＊ a ＊ ＊ ＊ ⎦    If defined as such, the 'f' and 'a' will have the following meanings:

For a Trapezoidal move: Setting the feed time of the move    (Change the parameter for the time duration under a cam profile move)
                                        (The actual move will depend upon the feed velocity parameter)
For a Cam profile move: Setting the feed time of the move    (Change the parameter for the time duration under a cam profile move)

Accordingly, the motion response is identical in the programs ① & ② shown below:

① G00X1000f100
② #79=100           (#79: Parameter for time duration under a cam profile move)
③ G00X1000

**■ Caution Note 1:**

Under a Cam profile move, the choice of using either the feed velocity or Duration of time for the Cam profile move is decided by the status of the Peak Feed Velocity parameter. This parameter is a user set, however, the parameter will change inside a program automatically as shown here:

In a Cam Profile Move,
If a value for 'F' is specified, the motion is according to the Feed Velocity set
(The peak feed velocity is automatically set to enabled).
If a value for 'f' is specified, the motion is according to the duration of time under Cam Profile Move (The peak feed velocity is automatically set to disabled).
If neither 'F' nor 'f' is specified, the motion is according to the existing status of the peak feed velocity parameter.

**■ Caution Note 2:**

If the maximum feed velocity exceeds that of the maximum axis velocity, the value of the maximum axis velocity will become equal to the maximum feed velocity.
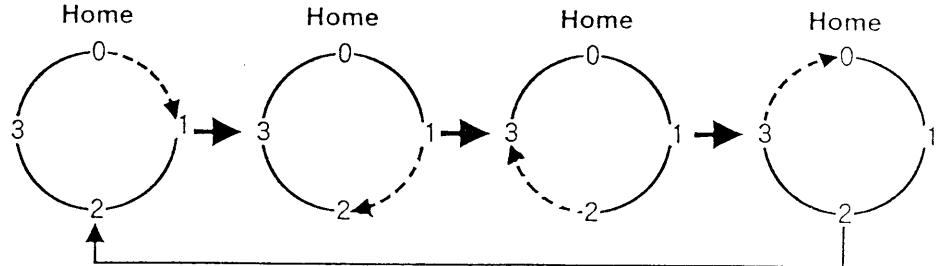
The following table shows the features:

| | F (Maximum axis velocity limit) | f |
|---|---|---|
| Trapezoidal profile | Move as per the set feed velocity | Changes the duration of time under the cam motion profile and moves the motor under feed velocity settings. |
| Cam motion profile | Moves as per the maximum feed velocity. The maximum velocity settings is set to Enabled | Move as per the duration of time under cam motion profile. The maximum velocity settings are disabled. |

| | No settings |
|---|---|
| Trapezoidal move | Move as per the set feed velocity |
| Cam motion prolfile | The value of maximum feed velocity is used. |

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## [Indexing Move Progamming examples]

★ Trapezoidal move:

```
┌──────────── Ex.1 ────────────┐
│ ☆ 4 quadrant Indexing         │
│ ☆ Acceleration type  Acceleration velocity │
│ ☆ Deceleration type  S curve  │
│ ☆ Trapezoidal move acceleration time: 300 msec. │
│ ☆ Trapezoidal move deceleration time: 200 msec │
│ ☆ Feed velocity  360° / sec   │
│ ☆ M-outputs enabled           │
│ ☆ Indexing commands           │
└───────────────────────────────┘
```

◆ Motion sequence:

◆ Preparation:

◇ The following parameters are changed as given below:

- Cam Profile motion selection     (#3=0)
- Acceleration type selection     (#4=0)
- Deceleration type selection     (#5=1)
- Trapezoidal move acceleration time     (#7=300)
- Trapezoidal move deceleration time     (#8=200)
- Feed velocity     (#9=360000)
  During a programmed operation, if an F * * * command is input, will cause the value of #9 to change.
- Enable the M-outputs during programmed operation     (#100=1)
- Optional stop enabled     (#103=0)
- Selection of move dimensions (units)     (#108=1)
- Setting the number of indexing points     (#109=4)
- Command for selection of axis dimensions (units)     (#208=1)

◇ Carry out the homing operation

◆ Coding example No. 1
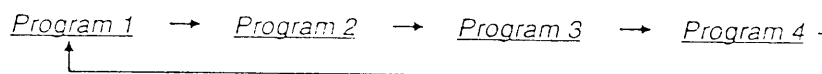
_Program 1_
G90X1
M01

_Program 2_
G90X2
M02

_Program 3_
G90X3
M03

_Program 4_
G90X0
M04

The programs are run in sequence as follows:

_Program 1_ → _Program 2_ → _Program 3_ → _Program 4_

◆ Coding example No. 2

*Program 1*
```
#400=0                    ' Initialize the value
WHILE:#400:<:4
    G91X1
    #400=#400+1
    M#400
END
```

　� M00 should not be used as it will cause the program to terminate.
　✻ M01 (Optional Stop) may however be used if required.

◆ Coding example No. 3　(The program is simplified using Variables and control statements, however this
　　　　　　　　　　　program will loop indefinitely until a Mode Stop command is encountered)

*Program 1*
```
#400=0                    ' Initialize the value
#401=0                    ' Initialize the value
WHILE:#400:==:0
    WHILE:#401:<:4
    G91X1
    #401=#401+1
    M#401
    END
#401=0
END
```

★ Cam profile move

```
────────────────────── Ex.1 ──────────────────────
☆ 4 quadrant Indexing
☆ Time duration under a Cam Profile move
    Time for 1 point  indexing:      400 msec.
    Time for 2 point  indexing:      600 msec.
☆ Cam type:                         Trapecroid
☆ M-outputs enabled
☆ Indexing commands
```
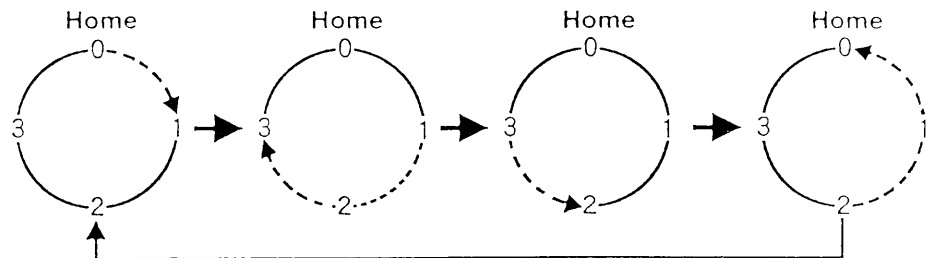
◆ Motion sequence:



◆ Preparation:

　◇ The following parameters are changed as given below:

- Cam Profile motion selection　　　　　　　　　　　　　　　　　(#3=0)
- Cam Profile selection　　　　　　　　　　　　　　　　　　　　(#6=6)
- Duration of time under a Cam profile move　　　　　　　　　　(#79=400)
  During a programmed operation, if an £ ✳ ✳ ✳ command is input, will cause the value of #9 to change.
- Enable the M-outputs during programmed operation　　　　　　(#100=1)
- Optional stop enabled　　　　　　　　　　　　　　　　　　　(#103=0)
- Direction of  rotation Rotational Coordinate Option　　　　　　(#105=0)
- Selection of move dimensions (units)　　　　　　　　　　　　(#108=1)
- Setting the number of index points　　　　　　　　　　　　　(#109=4)
- Command for selection of axis dimensions (units)　　　　　　(#208=1)

　◇ Carry out the homing operation

◆ Coding example No. 1

    *Program 1*
    #105=2                  ' Rotation coordination automatic direction option : +
    G90X1f400
    M01

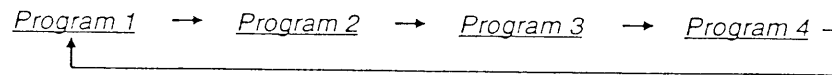    *Program 2*
    #105=2                  ' Rotation coordination automatic direction option : +
    G90X3f600
    M03

    *Program 3*
    #105=3                  ' Rotation coordination automatic direction option : -
    G90X2f400
    M02

    *Program 4*
    #105=3                  ' Rotation coordination automatic direction option : -
    G90X0f600
    M04

The programs are run in sequence as follows:

*Program 1* → *Program 2* → *Program 3* → *Program 4*
(loops back to Program 1)

◆ Coding example No. 3  (Loop continuously until a Mode Stop command is encountered)

    *Program 1*
    #400=0                  ' Initialize the value
    WHILE:#400:==:0
        #105=2              ' Rotation coordination automatic direction option : +
        G90X1f400
        M02
        #105=2              ' Rotation coordination automatic direction option : +
        G90X3f600
        M04
        #105=3              ' Rotation coordination automatic direction option : -
        G90X2f400
        M03
        #105=3              ' Rotation coordination automatic direction option : -
        G90X0f600
        M01
    END

❋ M00 should not be used as it will cause the program to terminate.
❋ M01 (Optional Stop) may however be used if required.


[Point move progamming examples]

★ Trapezoidal move:

```
                          Ex.1
  ☆ 4 quadrant Indexing
  ☆ Acceleration type   Acceleration velocity
  ☆ Deceleration type   Deceleration velocity
  ☆ Trapezoidal move acceleration time: 500 msec.
  ☆ Trapezoidal move deceleration time: 400 msec
  ☆ Feed velocity  360° / sec
  ☆ M-outputs enabled
  ☆ Angular commands (0.001 degree resolution)
```

◆ **Motion sequence:**
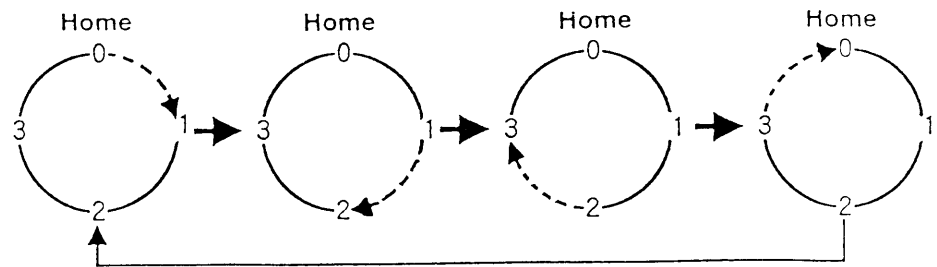


◆ **Preperation:**

◇ The following parameters are changed as given below:

- Cam Profile motion selection                                      (#3=0)
- Acceleration type selection                                       (#4=0)
- Deceleration type selection                                       (#5=0)
- Trapezoidal move acceleration time                               (#7=500)
- Trapezoidal move deceleration time                               (#8=400)
- Feed velocity                                                     (#9=360000)
  During a programmed operation, if an F * * * command is input, will cause the value of #9 to change.
- Enable the M-outputs during programmed operation                 (#100=1)
- Optional stop enabled                                            (#103=0)
- Selection of move dimensions (units)                             (#108=0)
- Number of point move settings                                    (#110=4)
- Command for selection of axis dimensions (units)                 (#208=1)
- Point settings          ··                                        (#600 to #603)
  (It is rather convenient to use the Point Settings in the PC utility; Refer to section 6.7)

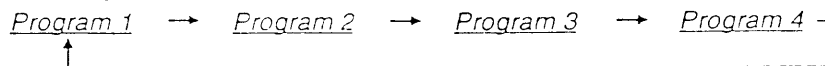◇ Carry out the homing operation

◆ **Coding example No. 1**

*Program 1*
G90X1
M01

*Program 2*
G90X2
M02

*Program 3*
G90X3
M03

*Program 4*
G90X0
M04

The programs are run in sequence as follows:

*Program 1* → *Program 2* → *Program 3* → *Program 4* ⌐
    ↑_____⌐

◆ **Coding example No. 2** (The program is simplified using Variables and Control statments)

*Program 1*
```
#400=0                    ' Initialize the value
WHILE:#400:<:4
    G91X1
    #400=#400+1
    M#400
END
```

※ M00 should not be used as it will cause the program to terminate.
※ M01 (Optional Stop) may however be used if required.

◆ **Coding example No. 3** (The program is simplified using Variables and control statements, however this program will loop indefinitely until a Mode Stop command is encountered)

*Program 1*

```
#400=0                      ' Initialize the value
#401=0                      ' Initialize the value
WHILE:#400:==:0
    WHILE:#401:<:4
    G91X1
    #401=#401+1
    M#401
    END
#401=0
END
```
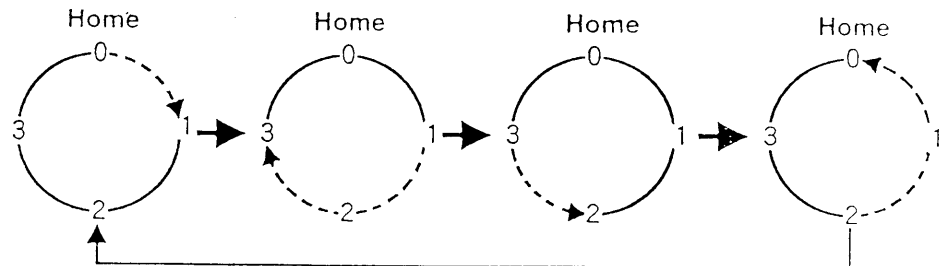
★ **Cam profile move**

```
┌─────────────── Ex.1 ───────────────┐
│  ☆ 4 point division                │
│  ☆ Time duration under a Cam Profile move │
│       Time for 1 point move:     400 msec. │
│       Time for 2 point move:     600 msec. │
│  ☆ Cam type:              Trapecroid │
│  ☆ M-outputs enabled               │
│  ☆ Indexing commands               │
└─────────────────────────────────────┘
```

◆ **Motion sequence:**



◆ **Preparation:**

◇ The following parameters are changed as given below:

| | |
|---|---|
| • Cam Profile motion selection | (#3=1) |
| • Cam Profile selection | (#6=6) |
| • Duration of time under a Cam profile move | (#79=400) |

  During a programmed operation, if an £ * * * command is input, will cause the value of #9 to change.

| | |
|---|---|
| • Enable the M-outputs during programmed operation | (#100=1) |
| • Optional stop enabled | (#103=0) |
| • Direction of rotation Rotational Coordinate Option | (#105=0) |
| • Selection of move dimensions (units) | (#108=2) |
| • Setting the number of point divisions | (#110=4) |
| • Command for selection of axis dimensions (units) | (#208=1) |

◇ Carry out the homing operation

◆ **Coding example No. 1**

*Program 1*

```
#105=2              ' Rotation coordination automatic direction option : +
G90X1f400
M01
```

*Program 2*

```
#105=2              ' Rotation coordination automatic direction option : +
G90X3f600
M03
```
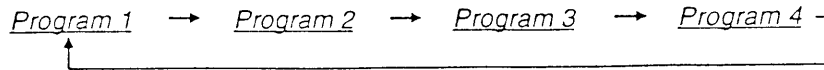
*Program 3*
#105=3      ' Rotation coordination automatic direction option : -
G90X2f400
M02

*Program 4*
#105=3      ' Rotation coordination automatic direction option : -
G90X0f600
M04

The programs are run in sequence as follows:

*Program 1* → *Program 2* → *Program 3* → *Program 4*

◆ **Coding example No. 3** (Loop continuously until a Mode Stop command is encountered)

*Program 1*
#400=0       ' Initialize the value
WHILE:#400:==:0
  #105=2     ' Rotation coordination automatic direction option : +
  G90X1f400
  M02
  #105=2     ' Rotation coordination automatic direction option : +
  G90X3f600
  M04
  #105=3     ' Rotation coordination automatic direction option : -
  G90X2f400
  M03
  #105=3     ' Rotation coordination automatic direction option : -
  G90X0f600
  M01
END

※ M00 should not be used as it will cause the program to terminate.
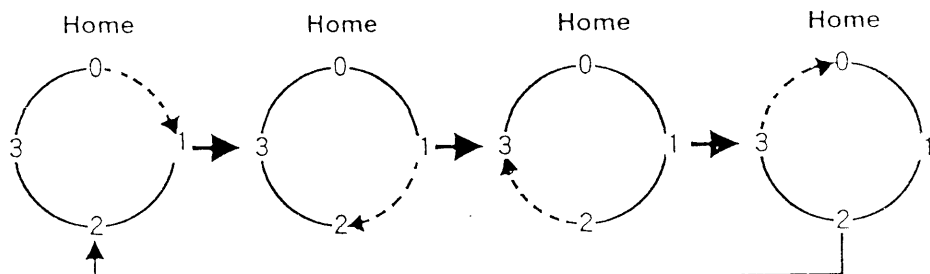※ M01 (Optional Stop) may however be used if required.

[Input value move programming examples]

★ Trapezoidal move:

```
 ───────────────────  Ex.1  ───────────────────
│ ☆ Acceleration type   Other acceleration type.   │
│ ☆ Deceleration type   S pattern                   │
│ ☆ Trapezoidal move acceleration time:  300 msec.  │
│ ☆ Trapezoidal move deceleration time:  200 msec   │
│ ☆ Feed velocity  360° / sec                       │
│ ☆ M-outputs enabled                               │
│ ☆ Angular commands (0.001 degree resolution)      │
 ───────────────────────────────────────────────
```

◆ Motion sequence:



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◆ **Preparation:**

◇ The following parameters are changed as given below:
- Cam Profile motion selection (#3=0)
- Acceleration type selection (#4=0)
- Deceleration type selection (#5=1)
- Trapezoidal move acceleration time (#7=300)
- Trapezoidal move deceleration time (#8=200)
- Feed velocity (#9=360000)
  During a programmed operation, if an F*** command is input, will cause the value of #9 to change.
- Enable the M-outputs during programmed operation (#100=1)
- Optional stop enabled (#103=0)
- Selection of move dimensions (units) (#108=0)
- Command for selection of axis dimensions (units) (#208=1)

◇ Carry out the homing operation

◆ **Coding example No. 1**

*Program 1*
G90X90000
M01
*Program 2*
G90X180000
M02
*Program 3*
G90X270000
M03
*Program 4*
G90X0
M04

◆ **Coding example No. 2** (The program is simplified using Variables and Control statments)

*Program 1*
```
#400=0              ' Initialize the value
WHILE:#400:<:4
    G91X90000
    #400=#400+1
    M#400
END
```

※ M00 should not be used as it will cause the program to terminate.
※ M01 (Optional Stop) may however be used if required.

◆ **Coding example No. 3** (The program is simplified using Variables and control statements, however this program will loop indefinitely until a Mode Stop command is encountered)
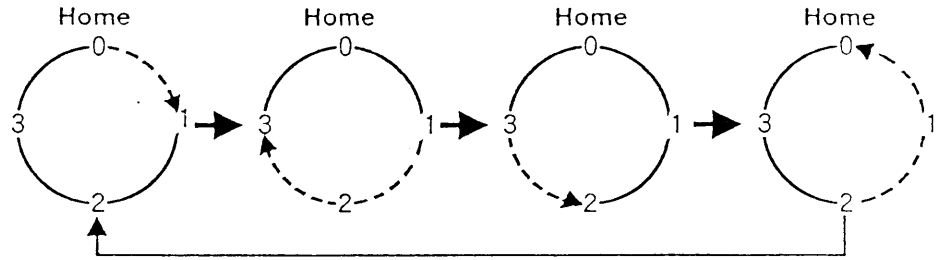
*Program 1*
```
#400=0              ' Initialize the value
#401=0              ' Initialize the value
WHILE:#400:==:0
    WHILE:#401:<:4
    G91X90000
    #401=#401+1
    M#401
    END
#401=0
END
```

★ Cam profile move

┌─────────────── **Ex.1** ───────────────┐
☆ Time duration under a Cam Profile move
   Time for 1 point move:   400 msec.
   Time for 2 point move:   600 msec.
☆ Cam type:   Trapecroid
☆ M-outputs enabled
☆ Indexing commands
└────────────────────────────────────────┘

◆ Motion sequence:



◆ Preparation:

◇ The following parameters are changed as given below:

- Cam Profile motion selection                                              (#3=1)
- Cam Profile selection                                                     (#6=6)
- Duration of time under a Cam profile move                                 (#79=400)
  During a programmed operation, if an f*** command is input, will cause the value of #9 to change.
- Enable the M-outputs during programmed operation                          (#100=1)
- Optional stop enabled                                                     (#103=0)
- Selection of move dimensions (units)                                      (#108=0)
- Command for selection of axis dimensions (units)                         (#208=1)

◇ Carry out the homing operation

◆ Coding example No. 1

*Program 1*
#105=2                          ' Rotation coordination automatic direction option : +
G90X90000f400
M01

*Program 2*
#105=2                          ' Rotation coordination automatic direction option : +
G90X270000f600
M03

*Program 3*
#105=3                          ' Rotation coordination automatic direction option : -
G90X180000f400
M02

*Program 4*
#105=3                          ' Rotation coordination automatic direction option : -
G90X0f600
M04

The programs are run in sequence as follows:

*Program 1* → *Program 2* → *Program 3* → *Program 4*

◆ Coding example No. 3   (Loop continuously until a Mode Stop command is encountered)

*Program 1*
#400=0                          ' Initialize the value
WHILE:#400:==:0
    #105=2                      ' Rotation coordination automatic direction option : +
    G90X90000f400
    M02
    #105=2                      ' Rotation coordination automatic direction option : +
    G90X270000f600
    M04
    #105=3                      ' Rotation coordination automatic direction option : -
    G90X180000f400
    M03
    M01
END                             ※ M00 should not be used as it will cause the program to terminate.
                                ※ M01 (Optional Stop) may however be used if required.

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# [SYSTEM PROGRAMMING]

★ **Outline:**

The DYNASERV driver reserves 10 programs for use by the System itself (Program number 90 to 99). The programs registered in this system area cannot be modified by the user.

★ **Contents:**

Program number 90:     Indexing move demonstration (4 equi-spaced, M-outputs disabled)

Program number 91:     Indexing move demonstration (4 equi-spaced, M-outputs enabled)

Program number 92:     Point settings (The point data are set into parameters #600 to #605. No motion)

Program number 93:     Point move demonstration (6- point, M-outputs disabled)
Before executing this, kindly run program number 92 once.

Program number 94:     Point move demonstration (6- point, M-outputs enabled)
Before executing this, kindly run program number 92 once.

Program number 95:     Input value motion demonstration

Program number 96:     Present position registration
If this program is executed, the present location of the driver is registered (in the parameter #449)
NOTE: Even a power reset will not delete this data as it is battery backed up.

Program number 97:     Deleting the position registration data.
If this program is executed, the registered position data is deleted from memory.
NOTE: The homing operation must run until completion before previous data is deleted.

Program number 98:     Reserved

Program number 99:     Reserved
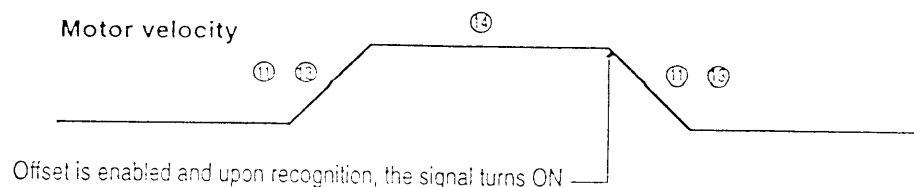
## 4.4.5 Signal Search Mode

★ **Outline:**

This mode moves the motor at a fixed low speed until it detects the switching ON of both the Homing proximity signal, the OT sensor signals. Upon the detection of this signal, the motor will decelerate to a stop. The motion profile during this mode follows Trapezoidal motion (however, it is possible to set a different motion profile for the acceleration parameter). The velocity override function can be used in this mode ( ※ Refer to the section 4.5.3 for the velocity override settings)

★ **Related parameters:**

The parameters related to the Signal search mode are listed as follows:

① Signal search direction                                      (#39)

② Signal search mark sense signal enable             (#41)

③ Signal search homing proximity signal enable     (#42)

④ Signal search + direction OT sensor signal enable    (#43)

⑤ Signal search - direction OT sensor signal enable     (#44)

⑥ Signal search mark sense signal logic switch       (#46)

⑦ Signal search homing proximity signal logic switch    (#47)

⑧ Signal search + direction OT sensor signal logic switch   (#48)

⑨ Signal search - direction OT sensor signal logic switch    (#49)

⑩ Selection of acceleration profile               (#4=0: Selection; #4=1: S curve)

⑪ Selection of deceleration profile              (#5=0: Selection; #5=1: S curve)

⑫ Acceleration time duration under a trapezoid move    (#7)

⑬ Deceleration time duration under a trapezoid move    (#8)

⑭ Feed Velocity                                                (#9)

Motor velocity ⑭

⑪ ⑬                                       ⑪ ⑬

Offset is enabled and upon recognition, the signal turns ON

★ **Preparation:**
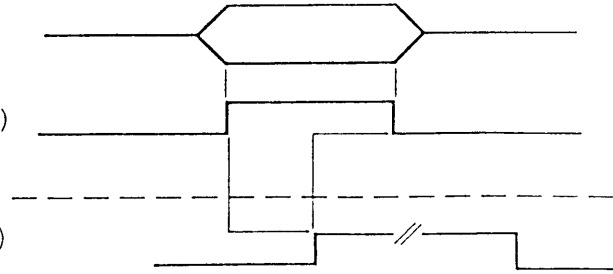
☆ Turn the SERVO ON.

★ Operation
☆ PLC Mode

IN_MODE[0...3] (CN2)
Mode number 5

IN_MODE_START (CN2)

OUT_MODE_EXE (CN2)

☆ RS232C Mode
 @3:5 ⏝ (⏝ : CR)
 R00  (Receive)

## 4.4.6 MDI Mode

★ Outline
Inputting a line of code and then pressing the carriage return will execute the code immediately.
NOTE: Any errors in execution, will automatically leave this mode.

★ Operation:
☆ PLC Mode
It is possible to enable this mode via the PLC interface also. However, as no commands can be input from the PLC, it serves little purpose in doing so.

☆ RS232C Mode
@3:7⏝ (⏝ : CR)
NOTE: As long as the driver continue to be in the MDI mode, there shall be no response from the driver.

@1:⏝ (⏝ : CR) Will abort the commands (This will also cause the driver ot leave the MDI mode)
@2⏝ (⏝ : CR) Mode stop command (The program or commands under execution will first run until completion and after that the driver shall exit from the MDI mode)

⁑ Upon leaving the MDI mode, the driver will output the R00 response.

## 4.4.7 Index Move Mode

★ Outline
This will make the motor move to the index points (It is possible to select either a Trapezoid profile or a Cam Profile motion as desired). The velocity override function may also be used. It is also possible to set the Index compensation feature.
Refer to section 4.5.2 for information and details on the Velocity override functions.
In order to use the Index compensation feature refer to the section 4.5.1 (Adjustments for Index Compensation).

★ Related parameters:
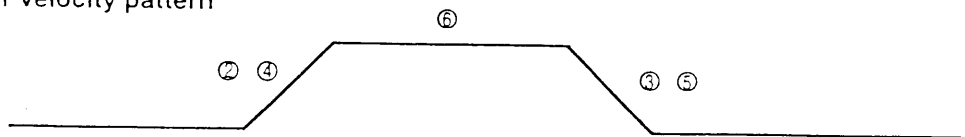The following parameters may be used in the Indexing Move mode:

☆ Trapezoid Profile Motion & Cam Profile Motion

① Indexing points settings (#109)
② Command for selection of axis dimensions (units) (#108=1: Indexing units)
③ Enable wait time for settling (#106=0: Disable; #106=1: Enable)
④ Index / Point move / Input Value move ABS command selection (#104=0: INC; #104=1: ABS)
⑤ Direction of rotation (Rotational Coordinate Option) (#105)
⑥ M outputs enabled during Index / Point move (#101=0: Disable; #101=1: Enable)
⁑ For M-output features refer to the section 4.1.4
⑦ Automatic homing enable (#165=0: Disable; #165=1: Enable)

☆ For the Trapezoidal Motion Profile:

① Cam Profile motion selection       (#3=0: Trapezoidal)
② Acceleration type selection        (#4=0: Normal; #4=1: S type)
③ Deceleration type selection        (#5=0: Normal; #5=1: S type)
④ Trapezoidal move acceleration time    (#7)
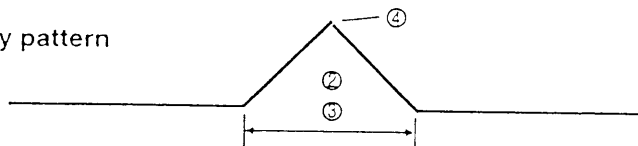⑤ Trapezoidal move deceleration time    (#8)
⑥ Feed velocity             (#9)

**Motor velocity pattern**



☆ For the Cam Profile Motion:

① Cam Profile motion selection       (#3=1: User definable cam profile)
② Cam Profile selection          (#6)
③ Move time under Cam Profile motion    (#79)
④ Enable peak velocity parameter under Cam Profile move (#84)

**Motor velocity pattern**



★ **Preparation**

☆ Turn the SERVO ON

☆ Input the necessary parameters and then carry out the homing procedure and, subsequently confirm the system coordination. However, note that under the following circumstances, the coordination system gets cleared from the driver's memory and it becomes necessary to perform the homing operation again. These cases are: When the homing procedure does not lead to completion; when the motor is brought to an emergency halt; when the Servo is turned OFF and, when the index point settings are changed.

NOTE: If the automatic homing flag is set ON (#165=1), upon receiving a move command, the motor will first carry out the homing procedure automatically and then proceeds further to complete the command instructions and hence, there is no need for the Homing command to be included in the program itself.
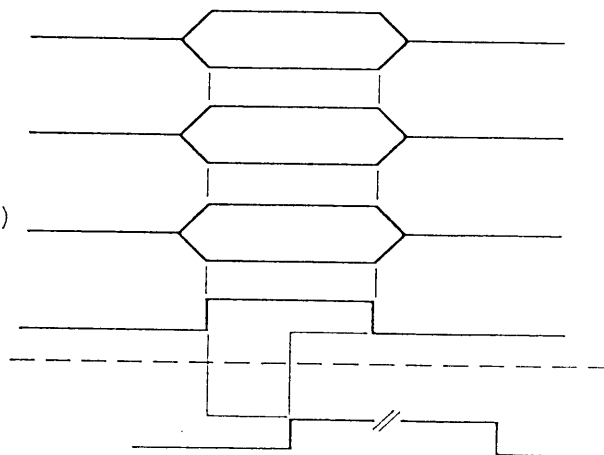
★ **Operation**

☆ PLC Mode

IN_MODE[0...3] (CN2)
Mode number 8

IN_CODE[0...7] (CN2)
Caution note 1 (BCD 2 characters)

IN_SIGN_INDEX_POINT (CN2)
Caution note 2

IN_MODE_START (CN2)

OUT_MODE_EXE (CN2)



Caution note 1: During an INC mode of operation, use the desired index points and in ABS instruction use the absolute index point locations.
Caution note 2: Use IN-CODE[0....7] for inputting the data

☆ RS232C Mode

◆ Turn the SERVO ON

@3:8:*: ↵    (*: Same as inputting data into the IN-CODE[0...7] , ↵ : CR)
R00      (Receive)

## 4.4.8 Points Move Mode

### ★ Outline

This mode will make the motor move to the preset points (It is possible to select either the Trapezoid profile or any user defined Cam Profile motion as desired). It is possible to set a range of points between 0 to 99. The velocity override function may also be used.

✻ Refer to the section **4.5.2** for information and details on the Velocity override functions.

### ★ Related parameters

The parameters related to this point move mode are listed as follows:

☆ Common to Trapezoid motion profile and Cam motion profile

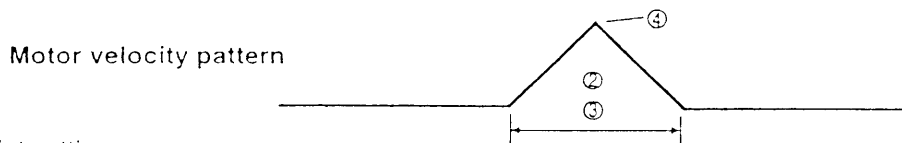| | | |
|---|---|---|
| ① Setting the number of move points | (#110) |
| ② Selection of move dimensions (units) | (#108=2: Point dimensions) |
| ③ Enable wait time for settling | (#106=0: Disable; #106=1: Enable) |
| ④ Index / Point move / Input Value move ABS command selection | (#104=0: INC; #104=1: ABS) |
| ⑤ Direction of rotation (Rotational Coordinate Option) | (#105) |
| ⑥ M outputs enabled during Index / Point move | (#101=0: Disable; #101=1: Enable) |
|    ✻ For M-output features refer to the section **4.1.4** | |
| ⑦ Points range 0 to 99 | (#600 to #699) |
| ⑧ Automatic homing enable | (#165=0: Disable; #165=1: Enable) |

☆ For the Trapezoidal Motion Profile:

| | |
|---|---|
| ① Cam Profile motion selection | (#3=0: Trapezoidal) |
| ② Acceleration type selection | (#4=0: Normal; #4=1: S type) |
| ③ Deceleration type selection | (#5=0: Normal; #5=1: S type) |
| ④ Trapezoidal move acceleration time | (#7) |
| ⑤ Trapezoidal move deceleration time | (#8) |
| ⑥ Feed velocity | (#9) |

**Motor velocity pattern**

☆ For the Cam Profile Motion:

| | |
|---|---|
| ① Cam Profile motion selection | (#3=1: User definable cam profile) |
| ② Cam Profile selection | (#6) |
| ③ Move time under Cam Profile motion | (#79) |
| ④ Enable peak velocity parameter under Cam Profile move | (#84) |

**Motor velocity pattern**

☆ Point settings

The points may be set by using the PC utility software (Use either the "Terminal Menu" or the "Point Settings Menu" for this purpose)

✻ The dimensions depend upon the command for selection of axis dimensions (units) given by #208 (Default settings are 0.001° units).

✻ If you preregister a value in the point 0, then upon homing completion, the home position value shall be set equal to the value set in the point 0. Hence, it is prudent to set the point 0 value to zero, so that upon the completion of homing, the homing offset is also set to zero (value registered in point 0).

### ★ Preparation

☆ Turn the SERVO ON

☆ Input the necessary parameters and then carry out the homing procedure and, subsequently confirm the system coordination. However, note that under the following circumstances, the coordination system gets cleared from the driver's memory and it becomes necessary to perform the homing operation again. These cases are: When the homing procedure does not lead to completion; when the motor is brought to an emergency halt; when the Servo is turned OFF, and also when the index point settings are changed.

    NOTE:    If the automatic homing flag is set ON (#165=1), upon receiving a move command, the motor will first carry out the homing procedure automatically and then proceeds further to complete the command instructions and hence, there is no need for the Homing command to be included in the program itself.
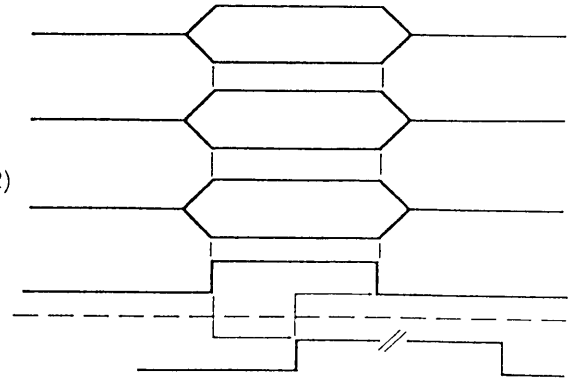
★ Operation

☆ PLC Mode

IN_MODE[0...3] (CN2)
Mode no. 9

IN_CODE[0...7] (CN2)
Caution note 1 (BCD 2 characters)

IN_SIGN_INDEX_POINT (CN2)
Caution note 2

IN_MODE_START (CN2)

OUT_MODE_EXE (CN2)

Caution note 1: During an INC mode of operation, use the desired index points and in ABS instruction use the point locations.
Caution note 2: Use IN-CODE[0....7] for inputting the data

☆ RS232C Mode

◆ Turn the SERVO ON

@3:9:*: ⌐          (*: Same as inputting data into the IN-CODE[0...7] , ⌐ : CR)
R00               (Receive)

## 4.4.9  Direct Input Value Move Mode

★ Outline

This mode will make the motor move by the desired value input (It is possible to select either the Trapezoid profile or any user defined Cam Profile motion as desired). The velocity override function may also be used.

  ⁑Refer to the section 4.5.2 for information and details on the Velocity override functions.

★ Related parameters

The parameters related to this Input value move mode are listed as follows:

☆ Common to Trapezoid motion profile and Cam motion profile

① Selection of move dimensions (units)                (#108=0: direct value input units)
② Enable wait time for settling                     (#106=0: Disable; #106=1: Enable)
③ Index / Point move / Input Value  move ABS command selection  (#104=0: INC; #104=1: ABS)
④ Feeding move settings value                       (#78)
    The units for  ④  depend upon the command for the selection of axis units (#208=1)
    The default settings are 0.001° dimensional units.

☆ For the Trapezoidal Motion Profile:

① Cam Profile motion selection                      (#3=0: Trapezoidal)
② Acceleration type selection                       (#4=0: Normal; #4=1: S type)
③ Deceleration type selection                       (#5=0: Normal; #5=1: S type)
④ Trapezoidal move acceleration time                (#7)
⑤ Trapezoidal move deceleration time                (#8)
⑥ Feed velocity                                     (#9)
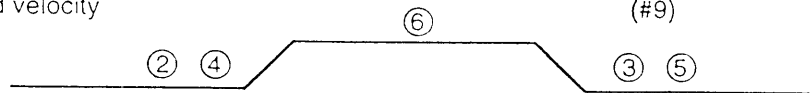
☆ For the Cam Profile Motion:

① Cam Profile motion selection                      (#3=1: User definable cam profile)
② Cam Profile selection                             (#6)
③ Move time under Cam Profile motion                (#79)
④ Enable peak velocity parameter under Cam Profile move  (#84)
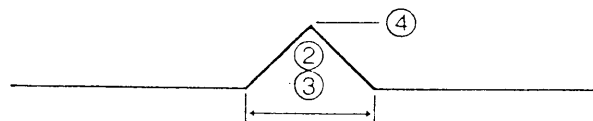
★ Preparation

☆ Turn the SERVO ON

☆ Input the necessary parameters and then carry out the homing procedure and, subsequently confirm the system coordination.
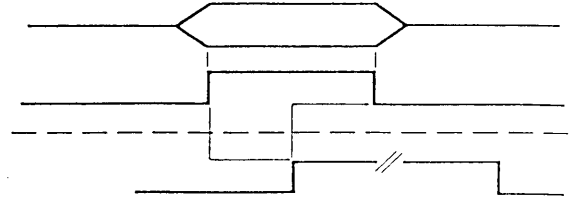
★ Operation

☆ PLC Mode

IN_MODE[0...3] (CN2)
Mode no. 10

IN_MODE_START (CN2)

OUT_MODE_EXE (CN2)

☆ RS232C Mode

◆ Turn the SERVO ON

```
@3:10:*: ⤶          ( ⤶ : CR)
R00                 (Receive)
```

# [Direct input value mode communication specifications]

★ Outline

Set the distance to move and the various parameters between the Dynaserv and the PLC.

★ Operating procedure

① Set the data in IN_BCD[0...7] (CN2) <Character number> and then turn on the IN_DATA_EN (CN2) to ON. (**NOTE:** It is also possible to simultaneously set both variables).
② After the controller outputs the signal OUT_DATA_ACK (CN2), the IN_DATA_EN will be turned OFF.
③ Repeat the steps ① ② as required.
④ If the data is properly terminated, the OUT_DATA_ACK (CN2) shall be output and the data is transferred correctly. If the IN_DATA_EN (CN2) is truned OFF, the OUT_DATA_ACK shall be turned OFF.
If the data input is made incorrectly, the OUT_DATA_ACK shall not output a signal and instead the OUT_ERR (CN2) shall be output. At this point, turn ON the IN_ERR_RESET (CN2) signal and it will turn OFF the OUT_ERR (CN2).

☆ Communications protocol
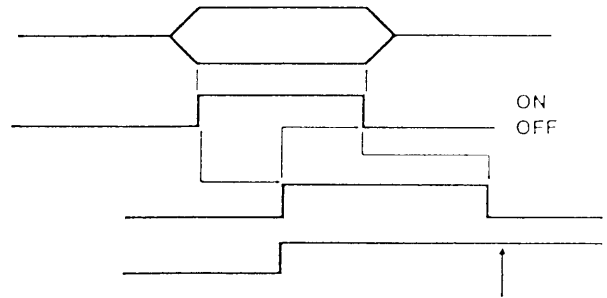
IN_BCD[0...7] (CN2)
Characters

IN_DATA_EN (CN2)
ON
OFF

OUT_DATA_ACK (CN2)
Normal operations

OUT_WARN (CN2)
Under error

Turns OFF based upon the state of IN_ERR_RESET (CN2)

☆ Character specifications (Use binary data for the bottom four bits of the IN_BCD[0...7] signal)

| Numeric data | +: none    -: E |
| --- | --- |
| Change data | 0 to 9 |
| Parameter header | A |
| Data header | B |
| Cancel | C |
| Terminator | F |

◆ **Settings example:**

The change in the distance to be moved may be considered as a special case of the specifications and it is possible to change the data directly. All other parameters shall be headed by A (parameters number) and B (change in data) formats. It is further possible to change the distance to be moved by using the A parameter number and B Data change).

◇ If the distance to be moved is 1234567, then input
1,2,3,4,5,6,7,F (data is input eight times)

◇ If the distance to be moved is -1234567, then input
E,1,2,3,4,5,6,7,F (data is input nine times)

◇ If the velocity is to be set as 1234567, then input
A,\*,\*,\*,B,1,2,3,4,5,6,7,F (data is input thirteen times)

◇ If the velocity is to be set as 1234567 (the fields represented by ### is the acceleration parameter number, then input; A,#,#,#,1,2,3,4,5,6,7,F (the data is input 13 times).

※ For cancelling the data transmission and cancelling the operation, input the characters C, F and immediately transmit them.

## 4.4.10 Jog Move

### ★ Outline

This is the mode to move the motor using a fixed velocity. The velocity profile follows Trapezoidal moves only. It is however possible to select the deceleration pattern. It is also possible to set the velocity override parameters.

※ Refer to the section 4.5.2 for information and details on the Velocity override functions.

### ★ Related parameters
The parameters related to the Signal search mode are listed as follows:

① Jog feed operation: serial communication type selection    (#217):0  PLC operation
  Jog feed operation: serial communication type selection    (#217):1  RS232C operation
  NOTE: First enter the Mechanical coordination mode and then carry out this operation    Use @55 to enter this mode
   Reset the driver to enable this setting.

② Jog feed velocity    (#10)
③ Selection of acceleration profile    (#4=0: Selection; #4=1: S curve)
④ Selection of deceleration profile    (#5=0: Selection; #5=1: S curve)
⑤ Acceleration time duration under a trapezoid move    (#7)
⑥ Deceleration time duration under a trapezoid move    (#8)
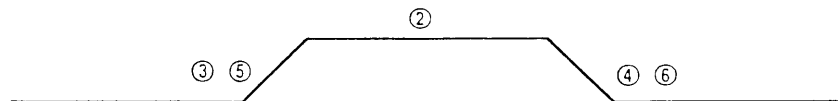


### ★ Operation
#### ☆ PLC Mode

IN_JOG_UP (CN2) ON      CW rotation
IN_JOG_DN (CN2) ON      CCW rotation
**NOTE:** If both the IN_JOG_UP, IN_JOG_DN are turned ON, the motor shall come to a stop!

#### ☆ RS232C Mode

@11:1⏎    ( ⏎ : CR)    CW rotation
@11:-1⏎    ( ⏎ : CR)    CCW rotation
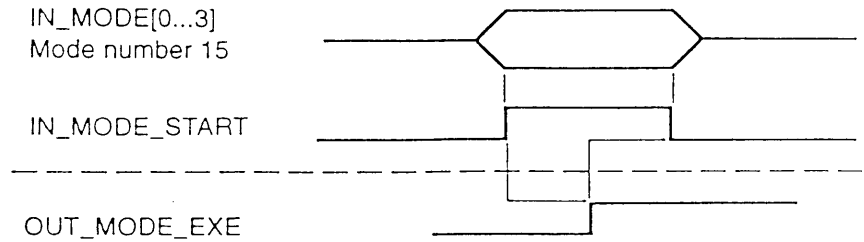@11:0⏎    ( ⏎ : CR)    Stopped
R00    (Receive)

### 4.4.11 Mechanical Settings Mode

★ Outline

This is the mode tochange the parameters #200 to #299. Once the driver is enabled in the Mechancial coordination mode, it is necessary to reset the driver to change modes.

★ Operation

☆PLC Mode

IN_MODE[0...3]
Mode number 15

IN_MODE_START

OUT_MODE_EXE

☆ RS232C Mode

@3:15: ⅃              ( ⅃ : CR)
R00                    (Receive)

☆ Common to both the PLC Mode & RS232C Mode

@55: ⅃               ( ⅃ : CR)
R00                    (Receive)

## 4.5 Miscellaneous Functions

### 4.5.1 Index Compensation

★ Outline

In the Index mode of operation this feature enables the compensation for the various different points.

★ Related parameters

The parameter involved in the Index compensation is

① Index point settings                                    (#109)

★ Preparation

① Carry out a homing operation.
② Using the jog feed, move the motor position to the desired position.
③ Read the commanded position value (parameter #323) and note it carefully.
④ Repeat the steps no. 2 and 3 for various indexed positions.
⑤ Note the difference between the commanded position location value and the actual displacement value from the counter.
⑥ Use the Index compensation menu of the PC utility software to set this index compensation value.

The corrected values can be set into 2 different types (A files and the B file)

Example: A File     4 point indexing

| Index points | Set positions |
|--------------|---------------|
| 0            | 5             |
| 1            | -3            |
| 2            | 0             |
| 3            | 2             |

The dimensions for the value settings depend upon the axis command dimension selections.
(Default value is 0.001°)
(The value may be set in the range of -9999 to 9999)

Example: B File    5 point indexing

| Index points | Set positions |
|---|---|
| 0 | 0 |
| 1 | -27 |
| 2 | 22 |
| 3 | 7 |
| 4 | -4 |

The dimensions for the value settings depend upon the axis command dimension selections.
(Default value is 0.001°)
(The value may be set in the range of -9999 to 9999)

☆    Selection procedure
The Index point settings parameter (#109) may be used to select as given below:

If #109:    -1, A file is selected (4 point indexing and compensation enabled)
If #109:    0, B file is selected (5 point indexing and compensation enabled)
If #109:    1, (Single point indexing and compensation disabled)
If #109:    2, (2 point indexing and compensation disabled)
         :
         :
         :
If #109:    99, (99 point indexing and compensation disabled)

## 4.5.2 Velcocity Override

★ Outline

This feature enables the change to the velocity of the motor in real-time.

★ Related parameters

The following parameters are related to this function of velcoity override as listed herewith:

☆ Common to Trapezoid motion profile and Cam motion profile

① Velocity overide percentage 1                    (#16)
② Velocity overide percentage 2                    (#17)

☆ For the Trapezoidal Motion Profile:

③ Acceleration type selection              (#4=0: Normal; #4=1: S type)
④ Deceleration type selection              (#5=0: Normal; #5=1: S type)
⑤ Trapezoidal move acceleration time       (#7)
⑥ Trapezoidal move deceleration time       (#8)

☆ For the Cam Profile Motion:

⑦ Acceleration time under a cam profile move       (#80)
⑧ Deceleration time under a cam profile move       (#81)
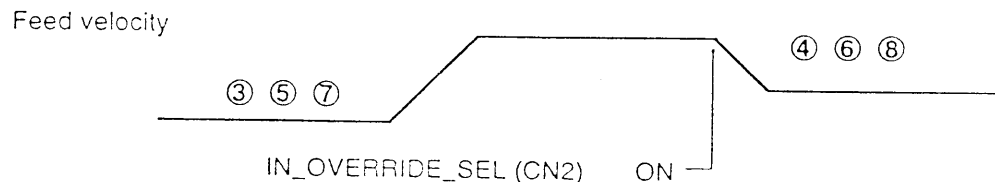
★ Operation

☆ PLC Mode
IN_OVERRIDE_SEL (CN2) OFF:    Use the velocity override percentage 1 for the move.
IN_OVERRIDE_SEL (CN2) ON:     Use the velocity override percentage 2 for the move.

☆ Example of usage

Set the velocity override percentage 1 = 100 (%)
Set the velocity override percentage 2 =  50 (%)

Feed velocity

③ ⑤ ⑦                    ④ ⑥ ⑧

IN_OVERRIDE_SEL (CN2)    ON

## 4.5.3 Interlock Paused

### ★ Outline

This feature permits the temporary stoppage of a motor already in operation. After removing the interlock, starting the motor will move the motor to the commanded position.

### ★ Related parameters

The following parameters are related to the Interlock pause operation:

#### ☆ For the Trapezoidal Motion Profile:

① Acceleration type selection                    (#4=0: Normal; #4=1: S type)
② Deceleration type selection                    (#5=0: Normal; #5=1: S type)
③ Trapezoidal move acceleration time             (#7)
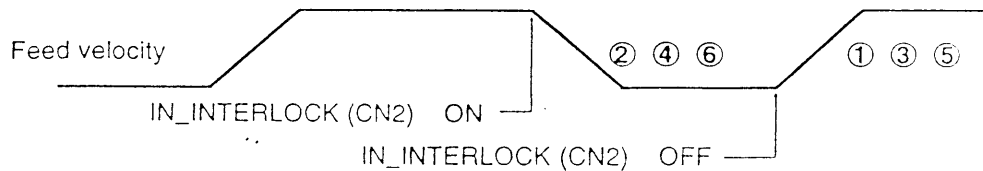④ Trapezoidal move deceleration time             (#8)

#### ☆ For the Cam Profile Motion:

⑤ Acceleration time under a cam profile move     (#80)
⑥ Deceleration time under a cam profile move     (#81)

### ★ Operation

#### ☆ PLC Mode

IN_INTERLOCK (CN2) ON:    Interlock paused



## 4.5.4 Cam Positioner Signal

### ★ Outline

This feature permits the temporary stoppage of a motor already in operation. After removing the interlock, starting the motor will move the motor to the commanded position.

### ★ Related parameters

The following parameters may be used in this cam positioner signal

① Cam positioner 0_ON    (#161)
② Cam positioner 0_OFF   (#162)
③ Cam positioner 1_ON    (#163)
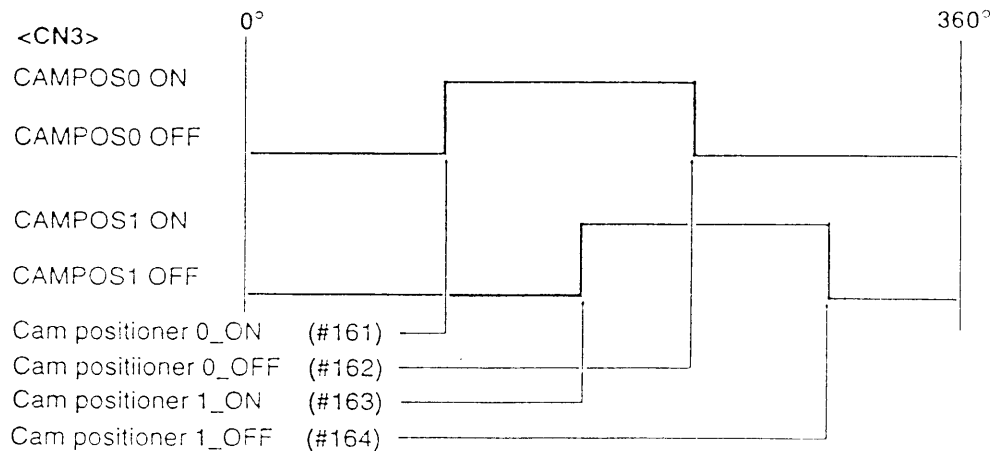④ Cam positioner 1_OFF   (#164)

※ This is enabled by setting the direct coordinate system selection to the rotational coordinates (0).
※ The cam positioner has two channels.
※ There may be a maximum delay of 4 msec. before start up.
※ The dimensional units can be set using the Axis command units selection (#208).
   Initial default value is 0.001°
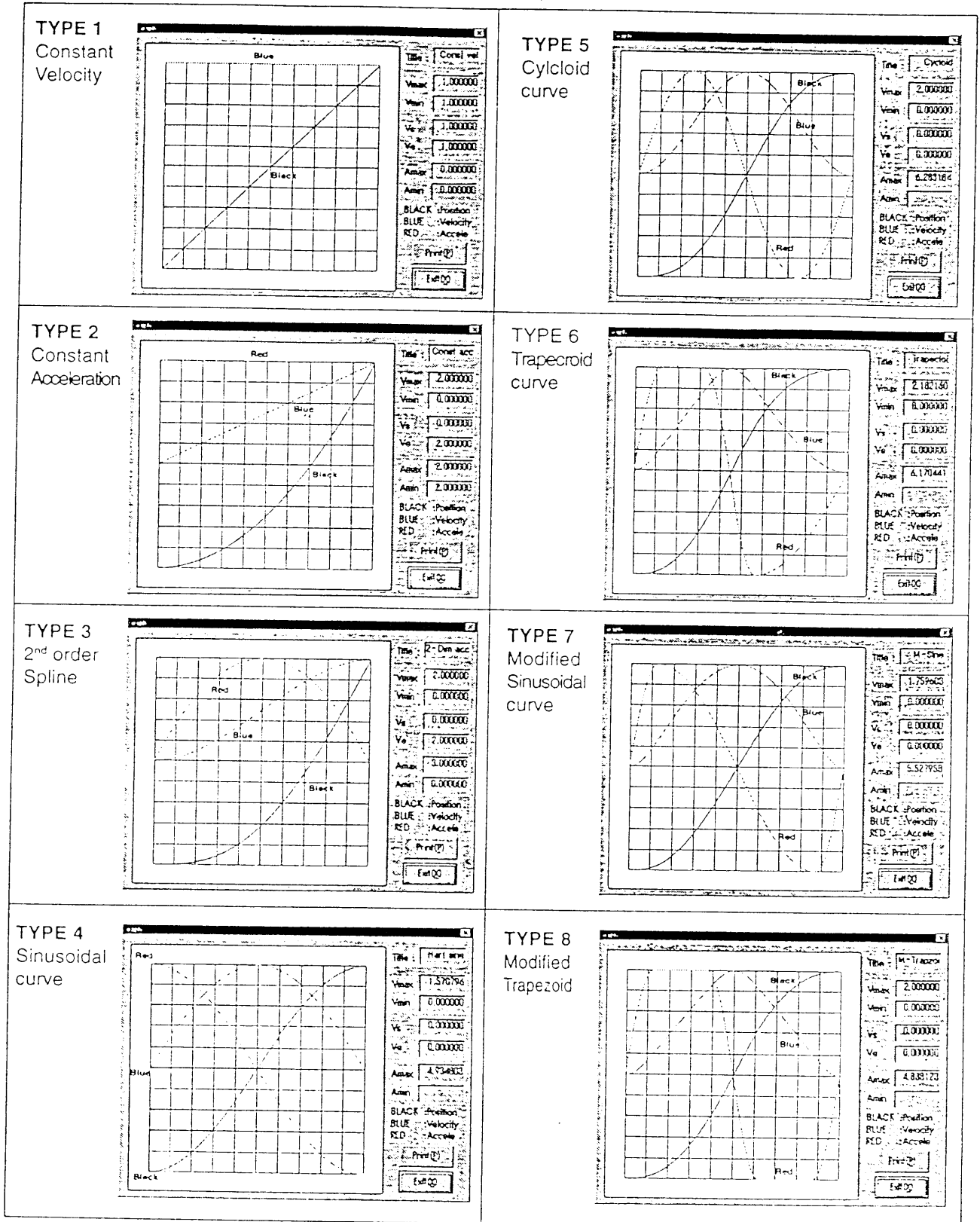


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### 4.5.5 Cam Profiles
Various cam profiles may be selected during different moves using this drive.

1) **Standard cam profiles:**
   There are 8 standard cam profiles registered in this drive which may be selected as required.
   (Use parameter #6 for selection of different cams)

2) **User registered cam profiles:**
   The PC utility for the M type driver may be used to create and register new cam profiles as desired.
   (Refer to the PC utility for M type driver for details)

| | |
|---|---|
| **TYPE 1** Constant Velocity | **TYPE 5** Cylcloid curve |
| **TYPE 2** Constant Acceleration | **TYPE 6** Trapecroid curve |
| **TYPE 3** 2nd order Spline | **TYPE 7** Modified Sinusoidal curve |
| **TYPE 4** Sinusoidal curve | **TYPE 8** Modified Trapezoid |

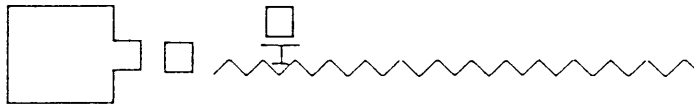### 4.5.6 Direct Coordinate Moves

★ **Outline**

The direct coordinate moves may be used in applications such as the lead screws etc.

★ **Related parameters**

The parameters related to the direct coordinate moves are as follows:

1. Command for selection of axis dimensions (units)     (#208=0 or 3)
2. Axis scaling data (commanded units)     (#209)
3. Axis scaling data (pulse units)     (#210)
4. Command for selection of direct line coordinate moves     (#212=1: Direct line coordinate)
5. Selection of move dimensions (units)     (#108=0: direct value input units)

☆ Settings example:



**DYNASERV**         Lead screw pitch : 5000 μm / rotation

#208=0
#209=5000
#210=655360     (Motor resolution <For standard DMB typer of motor>)

Based on thr above settings, the dimensional units shall be treated as μm.

---

**CAUTION:**

The following restrictions applies for the direct coordinate move:

-214783647 < [Axis command dimension command value (#323) X Axis scaling data in pulse units (#210)] < 2147483648

and

-999999999 < [axis pulse position commnad value (#321)] < 999999999

---