Instruction Manual

DYN⚠SERV
DD Servo Actuator
M Type (Built-in Controller) Driver
Instruction Manual -1
(Installation & Operations Manual)

Introduction

Thank you for purchasing the Direct Drive servo actuator M type driver series.

High torque output and high accuracy are the chief characteristics of the DYNASERV which is an external rotor type of servo actuator. The Dynaserv is used widely in the Semiconductor industry but it also finds numerous applications in the various Factory Automation areas and more.

IMPORTANT: KINDLY READ THE FOLLOWING CAREFULLY BEFORE COMMENCING OPERATIONS.

. Cautionary notes concerning this Instruction Manual

This manual contains the instructions for the proper installation, operation and usage for the Direct Drive servo actuator M-type driver series. You must read the following carefully and comply with the same before proceeding with the installation and the subsequent operation of the equipment.

1. This manual must be handed over to the final user of the equipment.
2. Read the instructions listed in this manual very carefully and after understanding them proceed with the operations.
3. Operating the equipment without following the guidelines listed here may lead to irreparable damage to the equipment. It is not possible to guarantee the safety of operations if the instructions are not adhered to.
4. It is recommended that the user store this manual carefully in an easily accessible location for quick reference.
5. This instruction manual serves as a guide to proper operation of the equipment. It is not to be taken as a guarantee.
6. Copying the whole of this manual or even a part of it by any means is strictly prohibited.
7. The manufacturer reserves the right to change the contents of this manual at it's discretion.
8. While all efforts have been made to ensure accuracy in the contents of this manual, it is possible that errors may have crept in inadvertently. If you find any such discrepancies in the contents, kindly send your comments or suggestions to the manufacturer or it's authorized distributor.

About using this manual:

In order to simplify the reading of this manual, the various features and explanations have been appropriately split into two different parts:

1. Instruction Manual -1 (Installation & Operations Manual)

In this part, the various detailed instructions for handling, installation and connections are explained. The contents index feature the various sub-indices for more details. If this proves insufficient, refer to the section 3.1 Operations Procedure Flow chart, which is a systematic representation of various operating steps.

2. Instruction Manual -2 (Programming Moves & Specific Features)

The part 2 of the instruction manual lists the various programming methods and commands to enable the actuation. The features of each type of motion, the various control settings and the methods of operation are all listed here. For the convenience of our customers, at the end of each subsection explaining a specific feature, simple examples of the programming commands are also detailed, which can be used to actually command motion from the actuation system.

For The Safe Use Of Product

■ For the safe use of this product, the symbol ⚠ and ⚠ WARNING are used on the product concerned and in this manual. Either symbol on the product indicates that the operator must refer to the warnings and instructions in the manual to avoid injury or loss of life. Be sure to follow the warnings. Handling the product in a manner contradictory to the warnings may result in injury or loss of life.

■ Completely understand the following instructions before reading the manual.

■ This sheet and the manual must be kept of hand while the product is being used and must be passed on to those personnel using the products.

⚠ WARNING

KEEP AWAY FROM ROTATING PARTS!

■ The motor rotor rotates at high speed. When coupling a load with it, do NOT allow personnel or objects to come within the sphere of its rotation.

ELECTRICAL SHOCK WARNING!

■ To avoid electrical shock, ensure that you ground the product.
■ Before connecting cables and wires to the driver, make sure that you turn the power off and unplug the power cord.
■ When detaching the driver cord for maintenance or the like, make sure that you turn the power off and unplug the power cord.
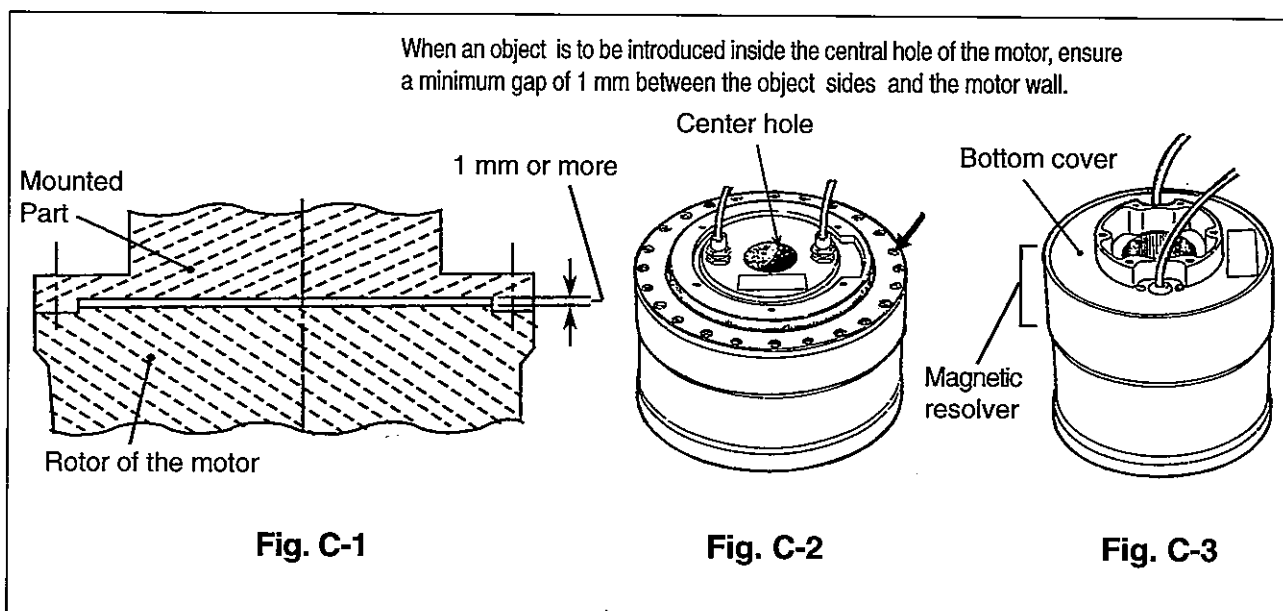
FIRE AND ELECTRICAL SHOCK WARNING!

■ If you notice any abnormal sound, strange odor or smoke emanating from the product, immediately turn off the power and unplug the power cord. Then contact the nearest service representative.
■ If you drop the product or it receives a mechanical shock, immediately stop using it and turn off the power. Then contact the nearest service representative.
■ Do not use the power supply with a voltage exceeding the range specified for the product.
■ Be careful not to let any foreign material such as metal particles, flammable liquids, or moisture enter into the openings on the product (e.g., the gaps around the rotating parts or the vents of the driver). Should this happen, immediately turn off the power and then contact the nearest sales representative.
■ Do not bend, twist, squeeze, or pull the cables from the motor with excessive force or subject them to heat or heavy weights.
■ Users are strictly prohibited from making any modifications or repair to the product.

CONTENTS

Warning On Installation And Operation

1. Never install the motor with the rotor fixed and the stator set free for rotation.

2. Ensure that the mains power is switched off before removing the side panel of the driver for making jumper settings etc. Dangerously high voltages are present inside the driver unit.

3. The motor rotates with high speed at high torque outputs. Beware of the rotating radius of the load when operating the motor with the load installed.

4. Ensure adequate grounding of the driver and motor with a suitable ground connection.

5. When installing a load to the rotor of the motor, allow a space of 1 mm or more between the top surface of the motor and the bottom surface of the load in order to maintain the proper alignment of the surfaces. Never apply any force or press any materials into the cylindrical hole (refer to the figure C-1).

6. **CAUTION** (Applicable to DM Series only): Never touch the bolts (indicated by an arrow in the figure C-2) which fix the bottom part of the rotor of the motor (refer to figure C-2). Loosening or tightening these bolts may change the electrical commutation angle, and may result in faulty rotation.

7. **CAUTION** (Applicable to DR Series only): The DR type of motor incorporates a magnetic resolver in the location shown in the figure C-3 . Hence, avoid subjecting the motor to undue shock, mechanical pressure or strong magnetic fields.

When an object is to be introduced inside the central hole of the motor, ensure a minimum gap of 1 mm between the object sides and the motor wall.

Center hole

1 mm or more

Bottom cover

Mounted Part

Magnetic resolver

Rotor of the motor

Fig. C-1   **Fig. C-2**   **Fig. C-3**

8. **CAUTION** (Applicable to DR Series only): Ensure that the bolts used to fasten the load do not exceed the effective threaded depth of the motor part. The usage of long bolts may cause damage to the motor.

9. The motor emits strong magnetic fields and in case of the DR series, the surface is magnetized partly thus, do not bring any magnetically susceptible materials into the proximity of the motor as it may adversely affect the same.

10. As the motor is not dust protected, watertight or oil proof, ensure that the motor is mounted in suitable locations which will not adversely affect the motor.

11. If the motor is used in an application involving small angle moves (50° or less), then it becomes necessary to carry out a running-in operation with a back-and-forth movement about 10 times at least with each move exceeding an angle of 90° . This running-in operation must be carried out every 10000 times of back-and-forth minute oscillation movements of the motor. This operation is necessary to ensure proper lubrication of the bearings in the motor.

12. The compatibility of the motor with the driver or vice versa is possible only if they are of the same model type. (Example: When the motor type is given by DM □□□□□ 02 and the driver type is designated by SD □□□□□ 02, the numbers within the five squares [□□□□□] must be identical).

Warning On Installation And Operation

13. Do not ever dissemble or modify the motor or the driver. Yokogawa Precision Corporation or it's authorized agency shall accept no responsibility for dissembled or modified motor(s) or driver(s). When such dissembling or modifications are required, customers are required to consult with Yokogawa Precision Corporation or it's authorized distribution agency.

14. **CAUTION** (Applicable to DR Series only): The DR series of motors are shipped with rust protection coatings applied to the load mounting portion of the rotor and also to the stator section meant for mounting the motor. Before installing the moto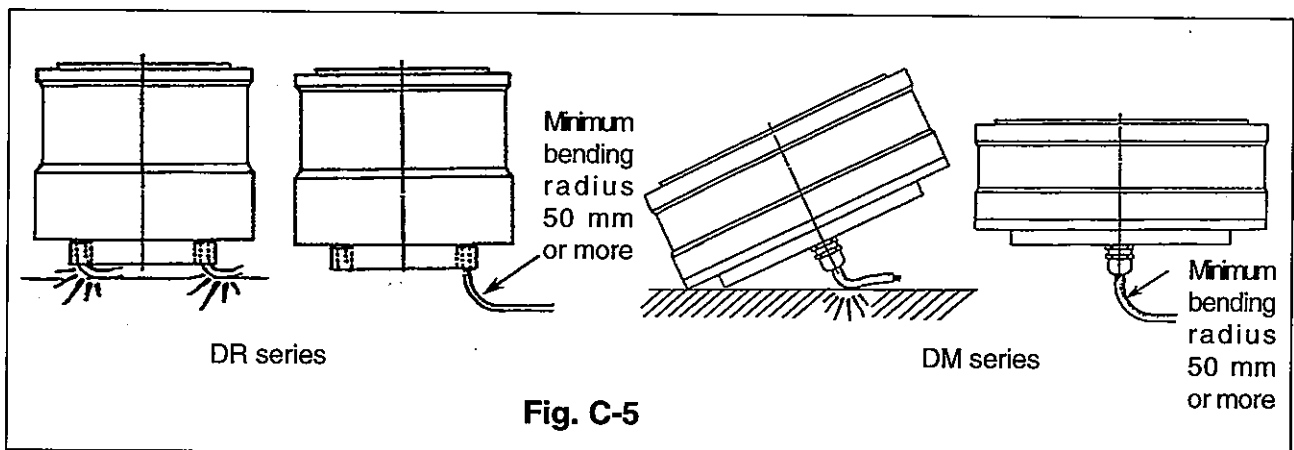r onto the desired location, completely remove this coating using a cloth or paper dipped in suitable petroleum solvent or chlorine based solvent. The presence of the coating may lead to severe mechanical inaccuracies of the assembled system. Refer to the figure C-4 for locations of the rust coatings on the motor.

Rust prevention coating

Fig. C-4
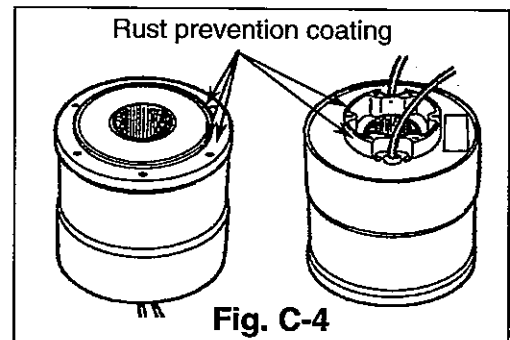
15. During the transportation or during the installation, if the DYNASERV motor is placed on the floor or, other such surfaces as shown in the figure C-5, the cables may get bent by the weight of the motor and this bending may lead to damage to the cables or even cut the conductors inside. Thus when placing the motor, always use a supporting base which protects the cables from being bent. Kindly note that the maximum radius for the cable when bent shall be 50 mm or more when installing the motor. Do not apply undue bending force on the cables when the motor is installed or while it is in operation. The cable specifications do not include applications with a robot.

Minimum bending radius 50 mm or more

DR series

DM series

Minimum bending radius 50 mm or more

Fig. C-5

16. Carry out appropriate centering and alignment when connecting the load to the motor. Very severe damage to the bearings may occur if this centering offset exceeds 10 μm. Refer to Fig. C-6.

Centering offset: 10 μm or less

Fig. C-6
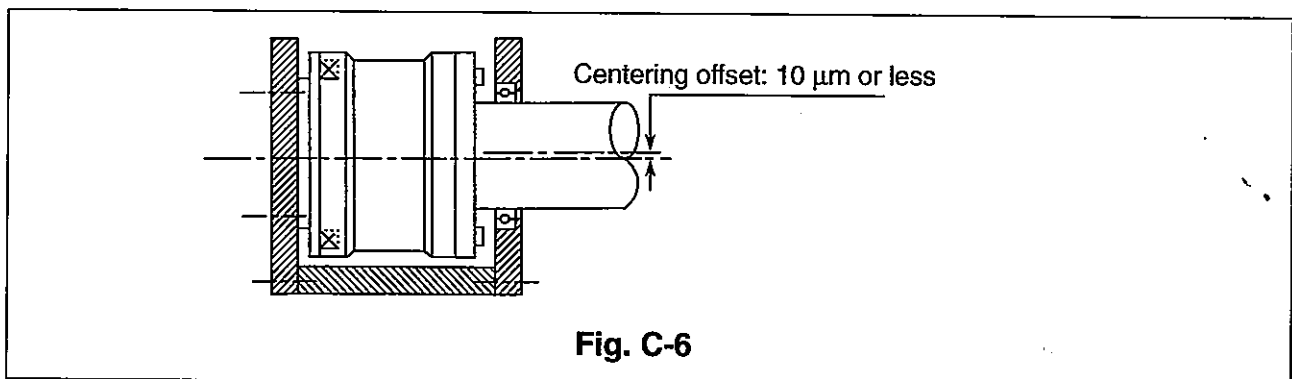
17. Do not carry out withstanding voltage tests on these motors. Withstanding voltage tests may cause accidental damage to the various circuits in the driver and also to the motor. If such tests are deemed necessary, kindly contact Yokogawa Precision Corporation or it's authorized distribution agency.

1. Product Outline

1.1 Product Description

The salient features of the FINESERV single axis motion & position controller has been incorporated into the DYNASERV standard driver, thereby improving it's usability and enhancing the features of the same. This new product is now being marketed as the DYNASERV M-Type Driver model and is an addition to the existing line of products.

This new M-type DYNASERV Driver uses the established I-PD control algorithm for precise motion and position control of the actuator and the addition of the "Auto-tuning" feature enables practically anyone to easily operate this servo actuator.

The M-Type Driver is used with almost all the motor combinations of both the DM/DR type of motors (the exceptions being the DR5000A series, DM1075B and the DM1004B/C type of motors).

Kindly refer to the following page for the configuration of model specifications.

1.2 Standard Product Configuration

The standard product set consists of the following components as specified below in the Table 1.1 . Upon the receipt of the product, ensure that the model numbers tally with the ordered products and also check for the product types and the quantities ordered.

Table 1.1 Standard Products

Part Name	Quantity	Remarks
Motor section	1	
Driver section	1	
Connector (for CN3)	1	Manufactured by Honda Tsushin Kogyo: PCR-S50FS/PCR-S50LA (connector cover)
Connector (for CN2)	1	Manufactured by Honda Tsushin Kogyo: PCR-S20FS/PCR-S20LA (connector cover)
Connector (for CN4)	1	Manufactured by Honda Tsushin Kogyo: MR-16LM (DM series)
		Manufactured by Honda Tsushin Kogyo: MR-8LM (DR series)

Driver Section

Connector CN3

Connector CN2

Connector CN4
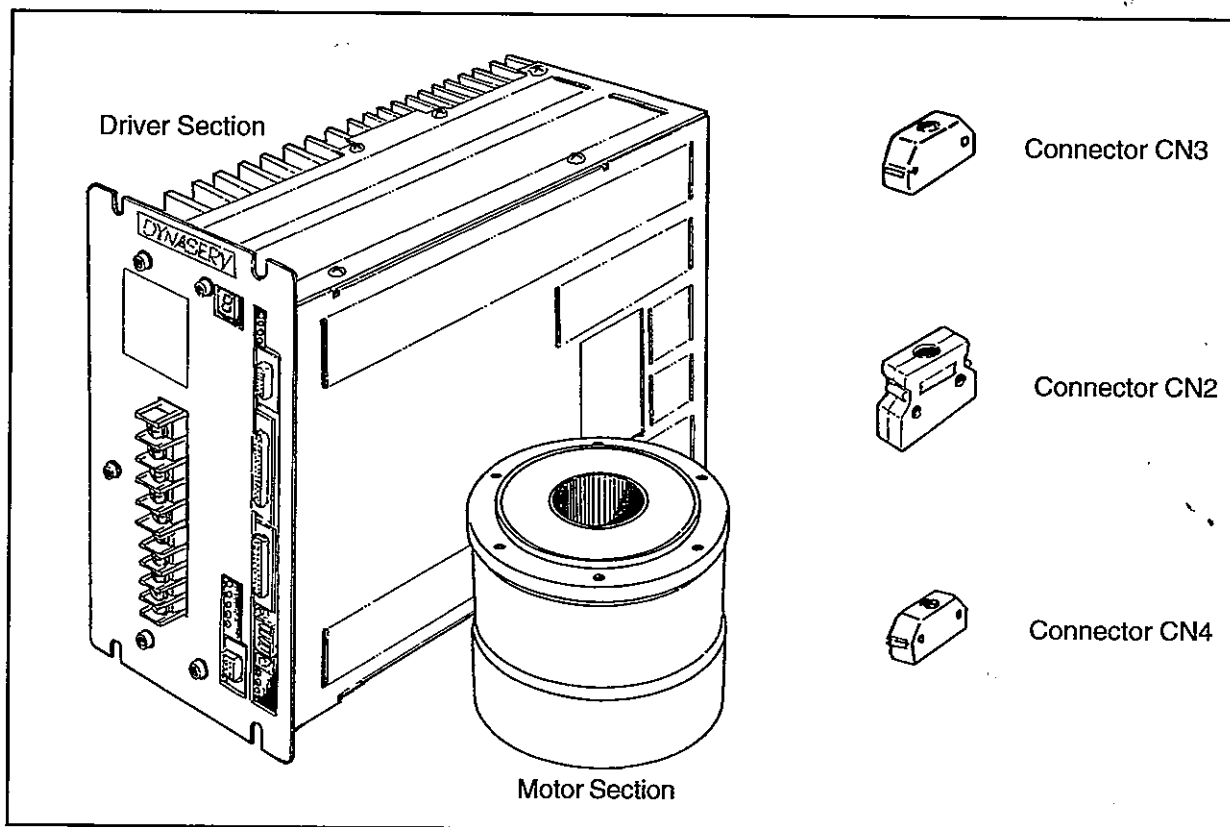
Motor Section

1.3 Model Specification Codes

(1) Motor Section Specification Codes:

☐☐☐☐☐☐☐☐ — ☐ ✳1

- ■ Motor Series Name (DM or DR)
- ■ Design Version (1 : Standard / 5: High Speed)
- ■ Maximum Output Torque (Nm with 3 digits)
- ■ Motor Model No. / Outer Diameter
  (A series: dia. 10"/ E series: dia. 8" / B series: dia. 6")
- ■ Destination (O: Domestic / 5: Overseas)
- ■ Specialized Motor Specifications
  (O: Standard / B: Lightweight / C: With Flange / D: With Mechanical Brake)
- ■ Mechanical Accuracy / Specified only in models requiring this specification, else omitted
  (-1: Mechanical Accuracy of 5 μm or less / -2: Mechanical Accuracy of IO μm or less
  / -3: Mechanical Accuracy of IO μm or less)
- ■ Compatibility function

(2) Driver Section Specification Codes:

☐☐☐☐☐☐☐2 — ☐ M N

- ■ Driver Series Name (SD or SR)
- ■ Design Version (1: Standard / 5: High speed)
- ■ Maximum Output Torque (Nm with 3 digits)
- ■ Motor Model No. / Outer Diameter
  (A series: dia. 10" / E series: dia. 8" / B series: dia. 6")
- ■ Destination (0: Domestic / 5: Overseas)
- ■ Compatibility function
- ■ Input Voltage Specifications
  (1: 100 - 115 V AC / 2: 200 - 230 V AC)
- ■ Built-in Interface Board (M: M Type)
- ■ Mechanical Resonance Filter (N: Notch Filter built-in)

NOTE: The motor and the driver are compatible within the same model type. For compatibility, the upper five digits of the motor specification code (Example: DR ☐☐☐☐☐ 02) and the driver specification code (Example: SR ☐☐☐☐☐ 02) shall be identical.

2. Functional Description

2.1 Motor Section

DM Series

Rotor   Cylindrical hole

Tapped holes on the Rotor for mounting loads

Tapped holes for mounting the stator

Encoder cable

Motor cable

Stator section

Base cover plate

Rating name plate

Top View

Bottom View

DR Series

Tapped holes on the Rotor for mounting loads

Cylindrical hole

Encoder cable

Motor cable

Tapped holes for mounting the stator

Rating nameplate

Base cover plate

Stator section

Rotor

Top View

Bottom View

2.2 Driver Section

Heat sink

<CN1 > Communications connector

Rating nameplate

<CN2> terminal for PLC connection

<CN3> terminal for Homing Sensor

<CN4> terminal for connecting the Encoder cable

7 segment LED ⎫ Driver state
                and alarm
LED Lamp   ⎭ display

DYN⧄SERV

DD SERVO ACTUATOR
S ※※-※※※※※※※
―※※※

YOKOGAWA ◆
Made in Japan

RDY
ERR
BUSY
PLC

CN1

CN2

Controller power
supply terminals

Main power supply
terminals

✻ Power ground terminal

Motor cable A phase terminal

Motor cable B phase terminal

Motor cable C phase terminal

LINE
(CONT)
200-230VAC

LINE
(MN)
200-230VAC

GND

MOTOR   VA
         VB
         VC

GND

TB1

VEL
POSN
AGND
TORQ

CN3

SRV

RESET

AM
VN
TRQFF
FFTN
AGND

CN4

Velocity monitor terminal

Analog ground terminal

Torque monitor terminal

Servo ON Break switch

4-bit DIP switch

Reset switch

Analog monitor terminal

Velocity command
monitoring terminal

Torque feed forward
monitoring terminal

FFT input terminal

Analog ground

✻ Motor cable ground terminal

✻ Both the ground terminals are internally connected to the driver's case

3. Preparation For Operation

3.1 Operations Flow Sequence

For the safe and correct procedure of operation, kindly follow the steps listed herewith. The various subsections dealing with each of the requirements are duly listed here for your convenience.

Explanations & Preliminary considerations   Page No.

Confirmation of the Motor & Driver model and type specifications

Standard configuration, included accessories, ————— 3 - 6
model specification code, product specifications
(The rating nameplates on Motor and the Driver).

Installation of the Motor & Driver

Installation of Motor and the Driver. ——————— 8 - 9

Cable Connections

Regarding cable wiring ——————————————— 10
External wiring connections——————————————— 11

1) Motor & Driver connection

Motor & Driver connections——————————————— 11
(Motor & Encoder cables)

2) PLC & Driver connection

PLC & Driver connections——————————————— 12
(PLC, Controller cables)

3) Sensors & Driver connection

Sensor & Driver connections——————————————— 13
(Sensors, Sensor cables)

Main settings

1) Front panel

Front panel explanations—————————————16 - 18
(Switching between RS232C & PLC controls)

2) SERVO ON

Servo ON——————————————————————— 19
(Ready for operating upon servo ON)

Adjustments

Adjustments —————————————————————— 19
(Auto-tuning/Manual tuning)

This completes the preparation for operation. The mode of programmed operation must now be selected. Refer to the **Instruction Manual -2 (Programming Moves & Specific Features)** for further details.

3.2 Installation Of Motor And Driver

Upon receipt of the product, kindly check the product type and model as well as for the inclusion or the absence of accessories and also for the exact combination of the motor and driver.

3.2.1 Motor Mounting

The motor can be mounted either horizontally or vertically. However, if the product needs to be mounted upside down, consult Yokogawa Precision Corporation or it's authorized distributor. Incorrectly mounting and unsuitable mounting locations may shorten the serviceable life of the motor and lead to problems in operation. Hence it is recommended that the following instructions be adhered to strictly.

(1) Installation location:

This motor is designed for indoor use only. Hence, the installation location must be such that:

■ There are no corrosive gases in the environment.

■ The ambient temperature is between 0° C and 45° C.

■ The dust concentration is low, with adequate air ventilation and low humidity.
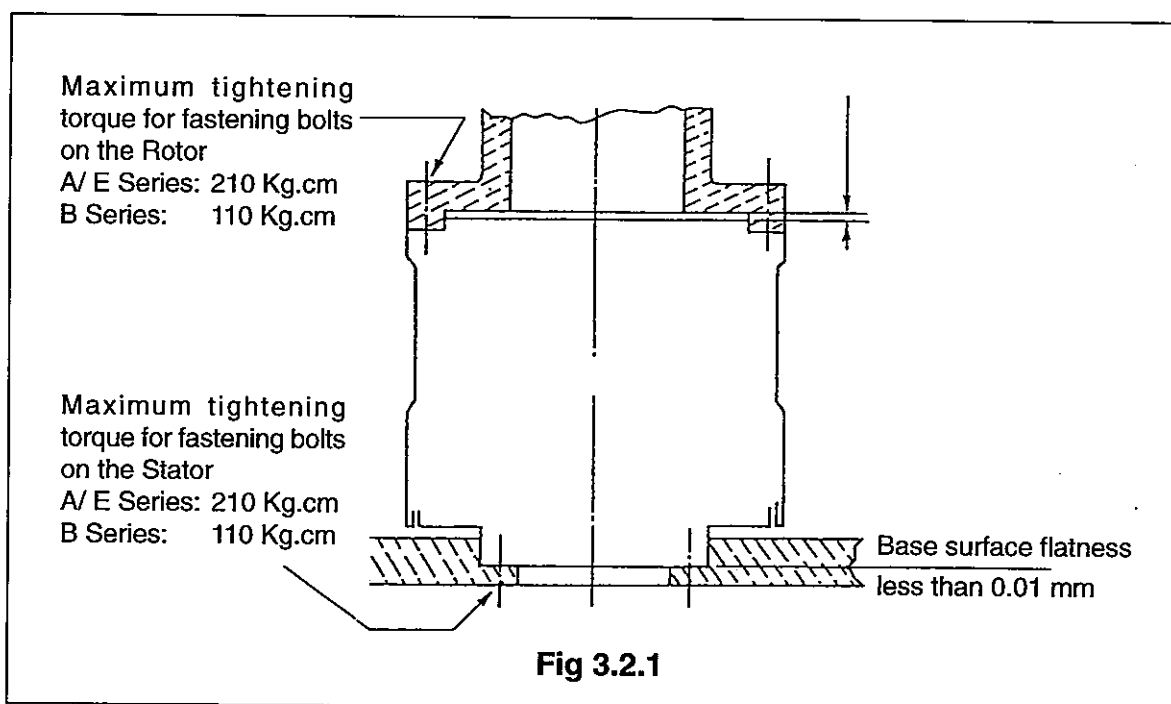
⚠ **NOTE**

The DYNASERV is not moistureproof or oil-proof, so it should be covered by a suitable moistureproof or oil-proof cover when used in such environments.

(2) Mechanical coupling:

■ When coupling a load to the motor's rotor section, ensure that a clearance of l mm or more is present between the motor's upper surface and the load.

■ Secure the motor's rotor and stator by duly tightening the fastening bolts with torques not exceeding the values given in the figure below (Fig 3.2.1)

■ The motor's base must be adjusted such that it maintains a level plane within a maximum permissible deviation of 0.01 mm.

Maximum tightening torque for fastening bolts on the Rotor
A/ E Series: 210 Kg.cm
B Series: 110 Kg.cm

Maximum tightening torque for fastening bolts on the Stator
A/ E Series: 210 Kg.cm
B Series: 110 Kg.cm

Base surface flatness less than 0.01 mm

Fig 3.2.1

⚠ **NOTE**

Kindly use Locktite 601 (or any other equivalent substance) on the bolts after duly fastening them in order to lock them firmly.

3.2.2 Driver Mounting

The standard driver is designed for either rack mounting or wall mounting.

(1) Installation location:

■ If there is a heat generating source close to the installation location, ensure that the temperature does not exceed 50° C in the proximity of the driver by providing an appropriate heat shield or cover etc.

■ If there is a vibration generating source close to the driver, then mount the driver on a rack with appropriate vibration insulators.

■ Further, ensure that the installation is in á location where the humidity is low, and where the surrounding environment is free from high temperatures, dust, metal particles and the presence of corrosive gases.

(2) Mounting procedure:

■ Normally, the driver is rack-mounted (L-shaped angle brackets for wall mounting) on a level plane with it's driver panel facing forward. However, it may also be mounted with the driver panel facing upwards if necessary. Avoid mounting the driver with the panel turned on its side or upside down. Refer to the Fig. 3.2.2 for the correct mounting example.

■ The driver box adopts a natural flow air-cooling system. When mounting it, ensure that there is a clearance of more than 25 mm above and below the box to facilitate proper ventilation.

■ Mount the driver panel onto the rack (use the L-shaped brackets for wall-mounting) and use screws or bolts having a length of 6 mm or more to fasten the driver to the mounting location firmly.
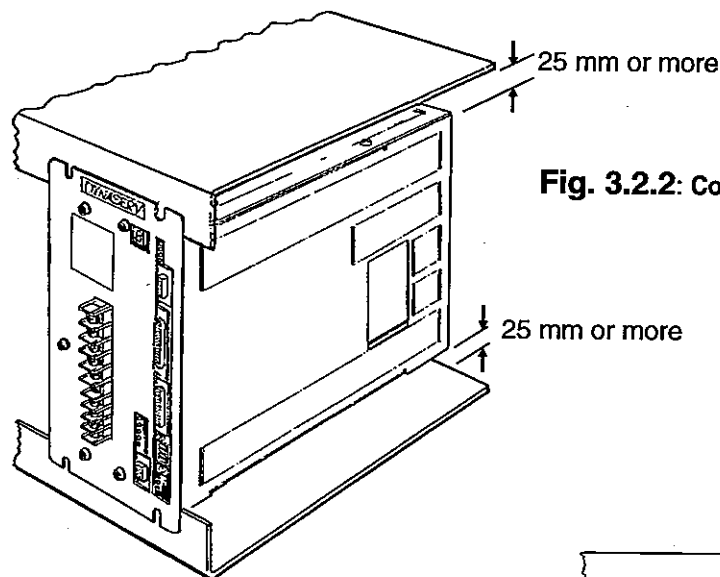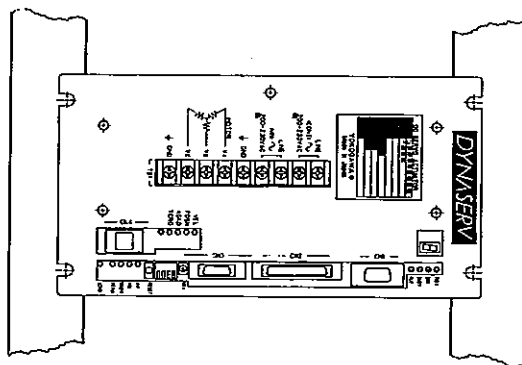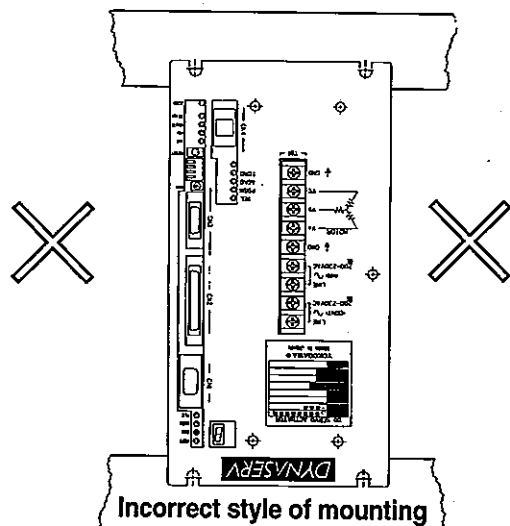

25 mm or more

Fig. 3.2.2: Correct style of mounting

25 mm or more

Incorrect style of mounting

Incorrect style of mounting

3.3 Wiring Cables

3.3.1 Cable Specifications
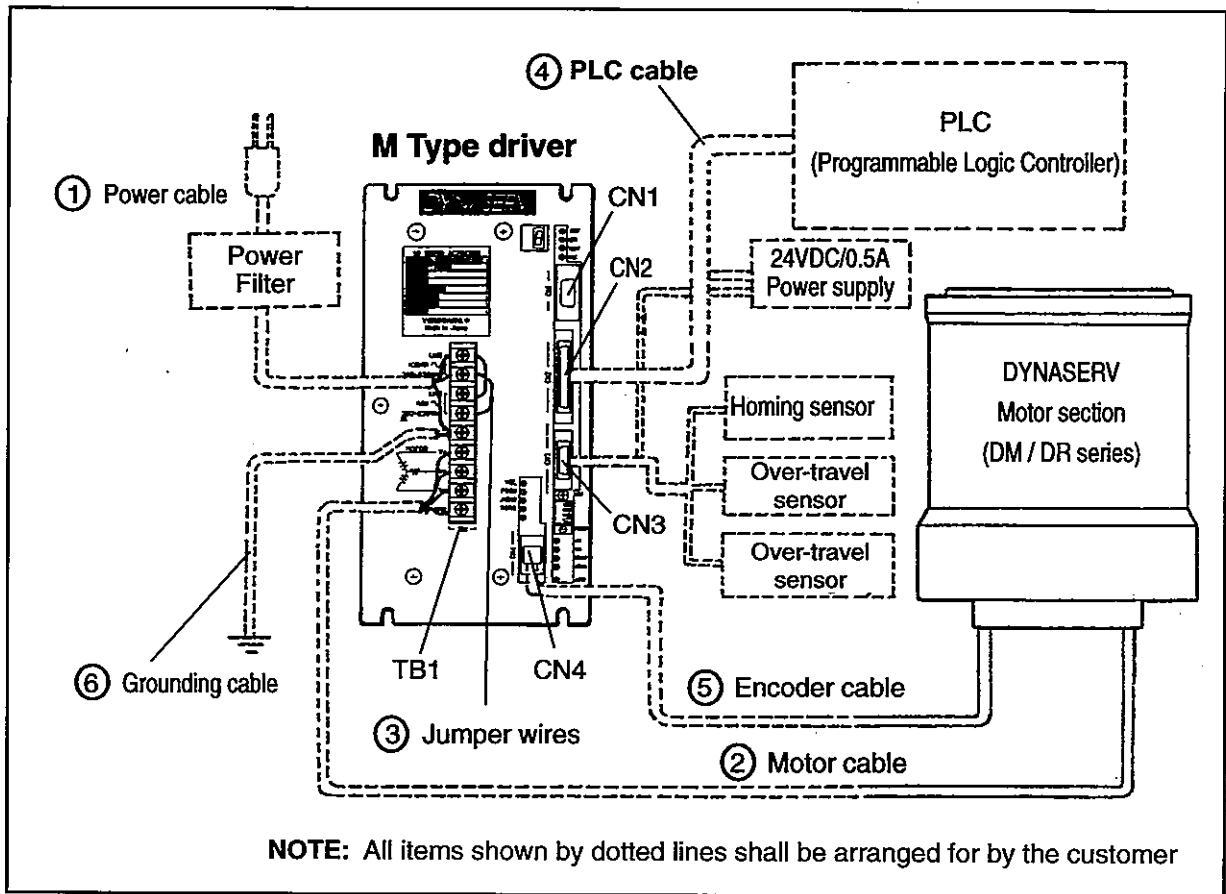
(1) Cable sizes and rated currents:

Table 3.3.1

		A / E series	B series
① AC power supply cable	Current (A)	20	15
	Cable size	HIV 2.0 or greater; Length within 30 m.	
② Motor cable	Current A	20	15
	Cable size	HIV 2.0 or greater; Length within 30 m.	
③ Jumper wires	Current (A)	20	15
	Cable size	HIV 2.0 or greater.	
④ PLC cable	Current (A)	DC 100 mA maximum	
	Cable size	✲ Twisted pair collectively shielded cable; Length within 3 m	
⑤ Encoder cable	Current (A)	DC 150 mA maximum	
	Cable size	✲ Twisted pair collectively shielded cable; Length within 30 m	
⑥ Grounding	Cable size	HIV 2.0 or greater.	

Notes:

1. Current values: r.m.s. of rated currents.

2. Cable size: Cross-sectional area in mm² .

3. Cross sectional area of conductor marked with an ✲ : More than 0.2 mm² tin-plated twisted wire.

4. Outer sizes of the cables used for CN2 is less than dia. 9 mm.

5. The cable size is based upon the conditions that the ambient temperature is 40° C and the rated current flows a cable with three (3) Lead wires bundled together.

6. HIV: Heat resistant polyvinyl chloride insulated wire which maintains insulation resistance up to an operation temperature of 75° C.

7. Use separated shielded wires for connecting to CN2 and CN3.

■ Use the specified multi-core twisted pair cables with collective shielding for the encoder cable. Ensure that the proper end shield connections are made.

■ Use thick grounding cables as far as possible. The DYNASERV must be grounded with a wire resistance of less than 100 Ω.

■ As the motor cable and the AC power cables carry high voltages and large currents, ensure that the proper wiring is carried out while following all the safety precautions.

3.3.2 External connection layout

M Type driver

① Power cable

Power Filter

④ PLC cable

PLC (Programmable Logic Controller)

CN1

CN2

24VDC/0.5A Power supply

Homing sensor

Over-travel sensor

Over-travel sensor

CN3

DYNASERV Motor section (DM / DR series)

⑥ Grounding cable

TB1   CN4

③ Jumper wires

⑤ Encoder cable

② Motor cable

NOTE: All items shown by dotted lines shall be arranged for by the customer

3.3.3 Motor - Driver connection layout

(1) DM/SD Series

Driver section	<TB1>	Motor cable	Motor section
	V_A	Red	M
	V_B	White	o
	V_C	Black	t
	GND	Green	o
			r

<CN2>	Encoder cable	
1	Red	E
2	Black	n
3	Blue	c
4	Blue/White	o
5	Brown	d
6	Brown/White	e
7	Green	r
8	Green/White	
9	Orange	
10	Orange/White	
11		

Twisted-pair shielded wires

(1) DM/SD Series

Driver section	<TB1>	Motor cable	Motor section
	V_A	Red	M
	V_B	White	o
	V_C	Black	t
	GND	Green	o
			r

<CN2>	Encoder cable		
+S0/1		Brown/White	E
+S180/1		Green/White	n
-S0/2		Brown	c
-S180/3		Green	o
+C0/6		Orange/White	d
+C180/6		Blue/White	e
-C0/7		Orange	r
-C180/8		Blue	/
Shield/4			R
FG/5		Black	e
			s
			o
			l
			v
			e
			r

Twisted-pair shielded wires

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3.3.4 PLC - Driver Connection Layout

\<CN2\> Pin assignments

Pin no.	Name of the signal	Functions & Meanings	I/O Type
1	+ 24V	+ 24 V Power supply	In put
2	IN_EMG	Emergency stop	Input
3	IN_SERVO	Servo ON / OFF	Input
4	IN_MODE_START	Mode Start	Input
5	IN_MODE_END	Mode End	Input
6	IN_MODE_0	Operations Mode Change	Input
7	IN_MODE_1	4 bit binary	Input
8	IN_MODE_2		Input
9	IN_MODE_3		Input
10	IN_CODE_0	Code Inputs	Input
11	IN_CODE_1	BCD 2 characters	Input
12	IN_CODE_2	(Index no., Point no., Program no. etc. are input)	Input
13	IN_CODE_3		Input
14	IN_CODE_4		Input
15	IN_CODE_5		Input
16	IN_CODE_6		Input
17	IN_CODE_7		Input
18	IN_PROG_REWI N D	Programmed Auto Rewind ※1	Input
19	IN_INTERLOCK	Interlock (Temporarily Paused)	Input
20	IN ABORT	Abort	In put
21	IN_ERR_RESET	Error reset	Input
22	IN_M_ANS	M answer ※2	Input
23	IN ERRCODE_REQ	Error code request ※ 3	Input
24	IN_DATA_EN	Data enable	Input
25	IN_POS_INH	Position control integration operation stop ※ 5	Input
26	IN_JOG_UP	Jog + command	Input
27	IN_JOG_DN	Jog - command	Input
28	IN_OVERRIDE_SEL	Velocity override selection ※ 6	Input
29	IN_SIGN_INDEX_POINT	(-) code inputs under Indexed/Point operation move	
30			
31			
32			
33			
34	OUT_CRDY	Controller ready	Output
35	OUT_SRDY	Servo ready	Output
36	OUT_MODE_EXE	Under mode operations	Output
37	OUT_ERR	Error state	Output
38	OUT_WARN	Warning state	Output
39	OUT_M_EN	M enable ※2	Output
40	OUT_ERRCODE_OUT	Error code enable ※ 3	Output
41	OUT_DATA_ACK	Data acknowledge ※ 2	Output
42	OUT_CODE_0	Code output	Output
43	OUT_CODE_1	(M code, Error code output)	Output
44	OUT_CODE_2		Output
45	OUT_CODE_3		Output
46	OUT_CODE_4		Output
47	OUT_CODE_5		Output
48	OUT_CODE_6		Output
49	OUT_CODE 7		Output
50	GND	Ground	

※ 1   This will cause the program in execution to repeat continuously.

※ 2   Refer to M interface (see **4.1.4**)

※ 3   Refer to Error code interface (see **9.2.1**)

※ 4   Used to set parameters while under PLC control (see **4.4.9**)

※ 5   This will change the position control algorithm to proportional control.

※ 6   This will enable switching velocity overrides 1 to 2 and also vice versa.

※ 7   The default factory settings for the operations logic is Type A settings.

<CN3> Pin assignments

Pin no.	Signal	Functions & Meanings	I/O Type
1	*ORG –	Home proximity signal –	Input
2	*ORG +	Home proximity signal +	Input
3	*OTDN –	(–) direction over travel hard limit signal – terminal	Input
4	*OTDN +	(–) direction over travel hard limit signal + terminal	Input
5	*OTUP –	(+) direction over travel hard limit signal – terminal	Input
6	*OTUP +	(+) direction over travel hard limit signal + terminal	Input
7	MRK –	Mark signal –	Input
8	MRK +	Mark signal +	Input
9	GND	Ground pin number 50 in CN2 is not connected to round internally	
10	+ 24 V	Power supply +24 V (Pin no.1 in CN2 is not connected internally)	
11	COIN	COIN signal	Output
12			
13	CAMPOS 0	Cam positioner 0	Output
14	CAMPOS 1	Cam positioner 1	Output
15			
16			
17			
18			
19	BRK –	Brake –	Output
20	BRK +	Brake +	Output

⚠ NOTE	1. Those pins marked with an * use Type B logic electrically (Normal close). Normally in the OFF state if the current is flowing. 2. It is not necessary to connect anything to the (+) and the (–) hard limit sensor inputs, if they are unused. 3. The mark sense inputs may also be left unconnected, if not required.

* Input and output circuitry specifications <CN2>, <CN3>

Input Circuitry

CN2: Pin no. 1
CN3: Pin no.2, 4, 6, 8

CN2: Pin no. 29
CN3: Pin no. 1, 3, 5, 7

Normal input voltage sensitivity: 12 - 24 VDC (10.2 - 26.4 VDC)
Input current rating: 8.5 mA / input pin (at 24 VDC)

Output Circuitry

CN2: Pin no. 1
CN3: Pin no. 10

CN2: Pin no. 34 - 49
CN3: Pin no. 11,13,14, 20

CN2: Pin no. 50
CN3: Pin no. 9,19

Rated output voltage :12 - 24 VDC (10.2 - 26.4 VDC)
Maximum load current: 0.1 A / output pin, 0.5A / common
Leak voltage while OFF is less than 0.1 mA

3.3.6 Communication Specifications

A personal computer is used to establish communications with the driver and this is achieved through the <CN1> connector. The various settings and protocols involved are listed herewith.

1) Connector type and manufacturer:

The recommended connector is DELC-J9SAF13L6 (9 pin type) manufactured by JEA.

2) Electrical specifications:

Refer to the pin connection diagram below for details.
The pin numbers 06, 07, 08 are exclusively reserved for use with the Operations Pendant (TBX).

⚠ **NOTE**

When the driver is connected to a personal computer, ensure that these pins are always kept open (unconnected) as they can lead to damage of the driver otherwise.

3) Communication cable (Option)

Contact Yokogawa Precision Corporation or its authorized dealer for obtaining the optional accessories such as the communication cable.
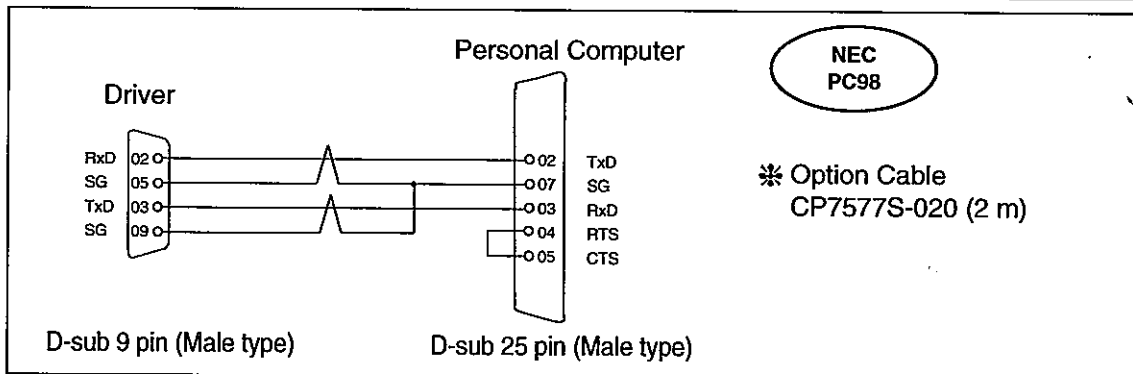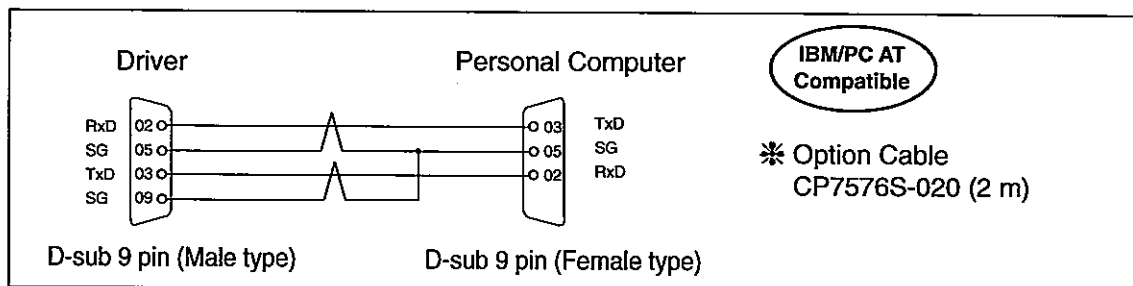
The cables are of two different types, one is meant for the IBM or compatible machines, and the other is for the NEC98 series (for Japan only) of computers. If the cables are made by the customer, kindly note that in the NEC98 version, the RTS and CTS must be shorted for establishing proper communications.

4) The teaching pendant (TBX)

This can be directly connected to the driver. Refer to the section on the Teaching pendant for further details.

<CN1> pin layout

01	FG
02	RXD
03	TXD
04	(NC)
05	SG

06	XTBXON
07	XTBXENG
08	+5V
09	SG

Driver — **Personal Computer** — IBM/PC AT Compatible

```
RxD  02 o----------/\----------o 03  TxD
SG   05 o----------/\----------o 05  SG
TxD  03 o----------/\----------o 02  RxD
SG   09 o
```

D-sub 9 pin (Male type)   D-sub 9 pin (Female type)

※ Option Cable
CP7576S-020 (2 m)

Personal Computer — NEC PC98

Driver

```
RxD  02 o----------/\----------o 02  TxD
SG   05 o----------/\----------o 07  SG
TxD  03 o----------/\----------o 03  RxD
SG   09 o                       o 04  RTS
                                o 05  CTS
```

D-sub 9 pin (Male type)   D-sub 25 pin (Male type)

※ Option Cable
CP7577S-020 (2 m)

※ *For connecting other types of computers or controllers, kindly contact Yokogawa Precision Corporation or its authorized dealer.*
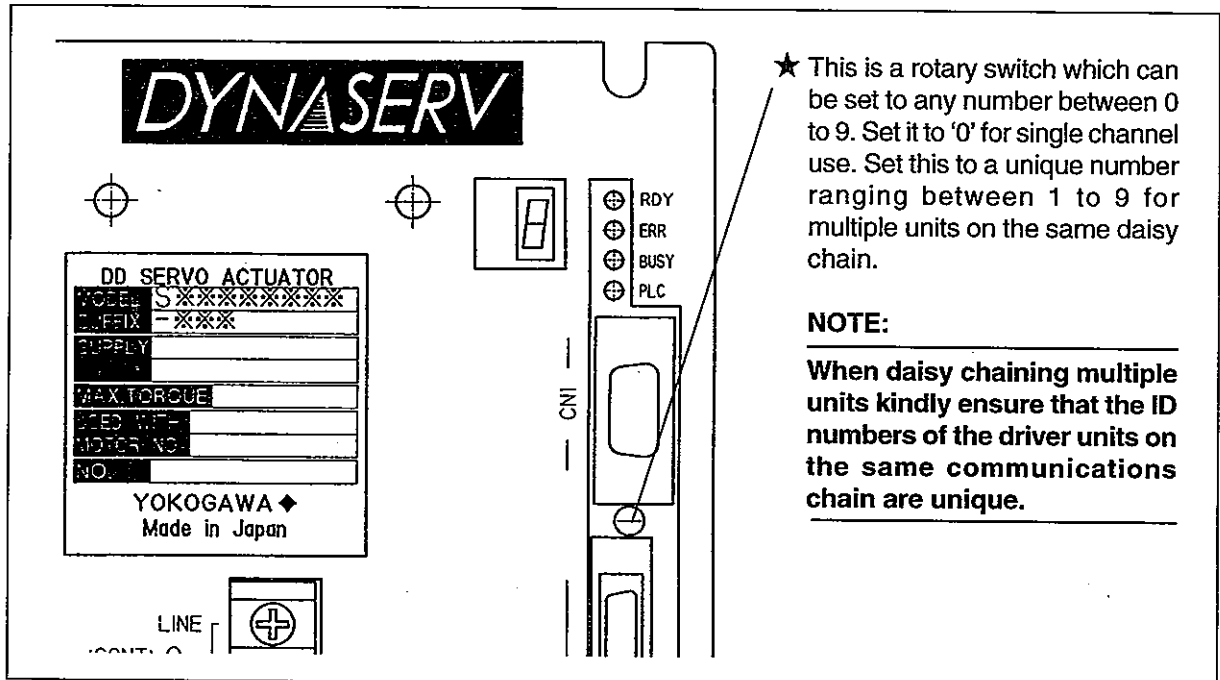
3.3.7 Multi-channel Communications

★ **Outline**

Multi-channel communication refers to the use of multiple units of DYNASERV M-type drivers [limited to nine (9) units per PC] by daisy chaining them and controlling these with a single personal computer.

★ **Operations**

① The figures illustrate the operations as shown below:

★ This is a rotary switch which can be set to any number between 0 to 9. Set it to '0' for single channel use. Set this to a unique number ranging between 1 to 9 for multiple units on the same daisy chain.

NOTE:

When daisy chaining multiple units kindly ensure that the ID numbers of the driver units on the same communications chain are unique.

② For multi-channel use, prepare the cable connections as given below. Refer to **3.3.6** for the pin assignments of the <CN1> connector.

The cable length is restricted to a maximum of 15 m only.
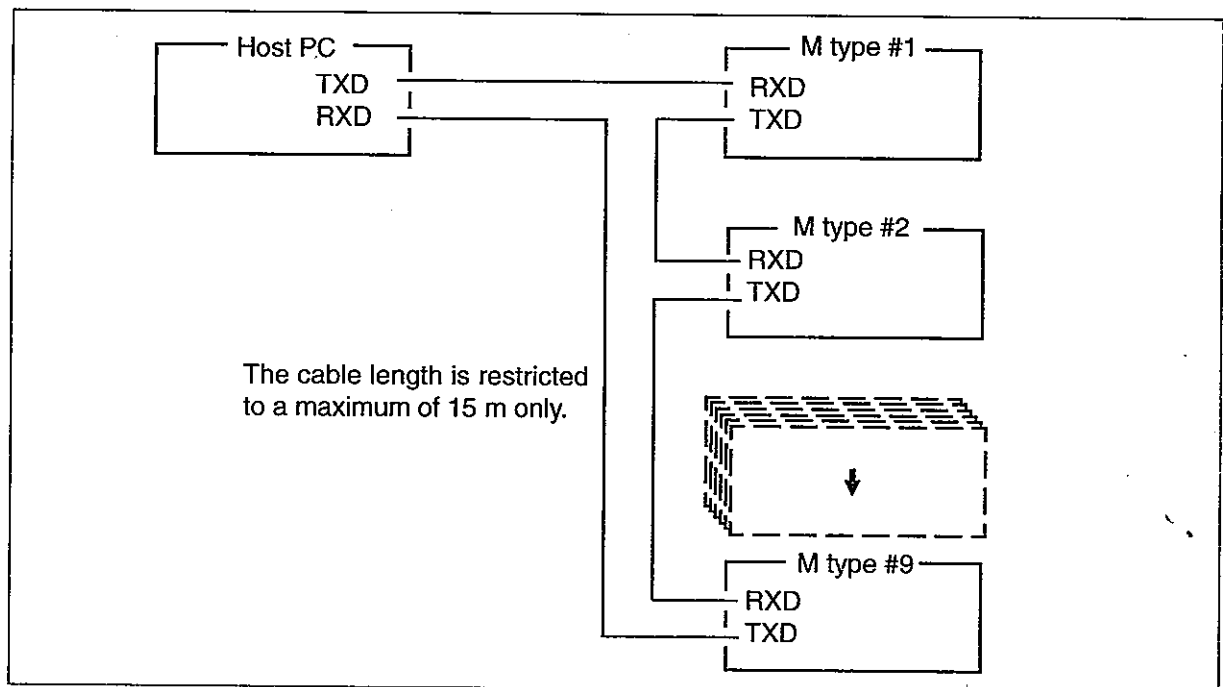
③ When transmitting commands from the controlling PC, each of the commands (intended for a specific driver) shall be duly preceded with the appropriate ID number for each of the M-type driver units. The Tool box utility program's mode settings may be used for this purpose!

< EXAMPLE >

Multi-channel communication

Setting ID=2

Changing rate of #79 to 500

2#79=500 (Transmit)

02R00 ready : 500   (Receive: <Successful>)

02ALM ...   (Receive: <Unsuccessful>)

Reading values of #79

2#79 (Transmit)

02R1D CamMoveTime: 500

* Selection of Velocity override

When 0 (ON)   The value of #16 (velocity override percentage) is used for the move.

When 0 (OFF)   The value of #17 (velocity override percentage) is used for the move.

Note that the above explanation is valid when the Logic Settings are Normal Open.
If the Logic Settings are reversed, then the features get reversed also.

3.4 The Front Panel:

3.4.1 Main Features Of The Front Panel

The LED displays, Switches, and test pins are all accessible directly from the front panel (Fig 3.4.1.1) and the key features are listed here:

1) The LED display (7 segment LED): Displays the state of the driver.
2) SRV (Toggle switch): This helps to turn OFF the SERVO system.
3) 4 pin Dip switch: Enables the various driver settings
4) Test pins: Permits the monitoring of various signals inside the driver.

Fig. 3.4.1.1 Explanations on LED / Switches / Test pins

★ 7 Segment LED:
Whenever the driver is under an error status, the status is displayed as a number. Under normal operation status this will display 0.

★ LED lamps:
<RDY> Green lamp /Displays Controller Ready status (Flashing lamp indicates that the power supply voltage is too low)
<ERR> Red lamp / Error status
<BUSY> Green lamp / Under operation
<PLC> Green lamp / Under PLC operation mode

★ Ten (10) step rotary switch:
Used for multi-channel mode of operation. Set to '0' for single channel operation.

★ Toggle Switch
When this switch is set facig downwards will prevent the driver from turning the SERVO ON.

★ 4-bit dip switch
Refer to the figure 3.4.1.2 for further details. (The upper most pin is bit 1)

★ Push Switch
Pressing this enables the Driver RESET function.

★ LED lamp
<COIN> Green lamp / Displays the positional deviation state

★ Test pin
<AM> Standard anolog monitor terminal
<VIN> Velocity monitorterminal
<TRQFF> Torque Feed FonNard monitor terminal
<FFTVIN> Reserved
<AGND> Analog ground terminal

★ Test pin
<VEL> Velocity detection signal monitor terminal
<POSN> Reserved
<AGND> Analog ground terminal
<TORQ> Torque monitor terminal
<VIN> Reserved

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The 4 pin dip switch is used to set the various modes of operation of the controller as explained below:

Fig 3.4.1.2
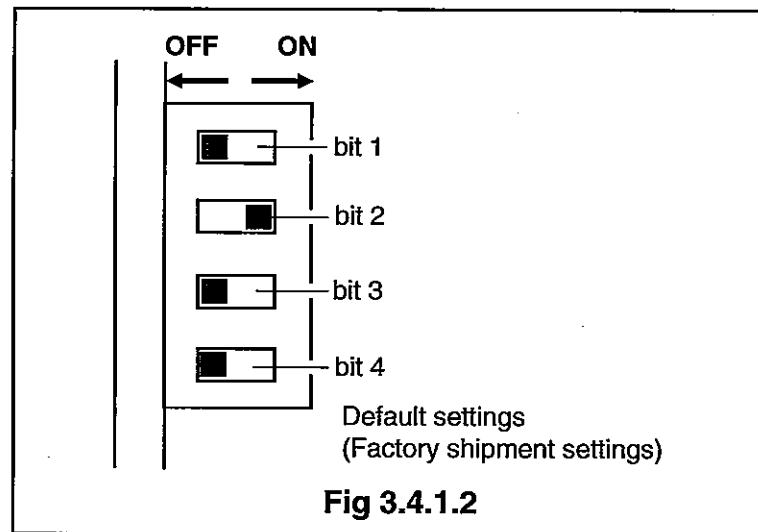
bit 1 : All Reset
If this bit is set to the ON position, upon Power ON, or, upon the recycling the power to the driver, the controller parameters are completely reset and all the settings revert to the default (factory) setting.

bit 2: PLC operation mode / Communications operation mode
If the bit 2 is set in the ON position, then upon Power ON, the driver gets set in the PLC control operation mode.

bit 3: DI emulation
If the bit 3 is set in the ON position, it turns on the DI emulation via the CN2 interface. The control is easily enabled via the Tool box utility software.

bit 4: Flash ROM operations
If the bit 4 is turned ON along with the bit 1, then the set parameters, programs, component backup data etc., are all copied into the flash ROM. Upon the completion of this operation, the "PLC LED" Lamp will start flashing as an indication of completion. (As the flash ROM doesn't require battery backup, it is a safe method to save all the parameters and data settings. Hence, upon the completion of driver settings, it is prudent to carry out this save operation).

If the bit 4 is turned ON along with the bit 2, the entire contents of the flash ROM are read as "Backup" data and used to set the parameters, programs etc. (This operation is usually used to restore settings from the Backup data set). Upon the completion of this operation, the "BUSY LED" will start flashing as an indication of completion.

BACKUP (Save operation process)   RESTORE (Read operation process)
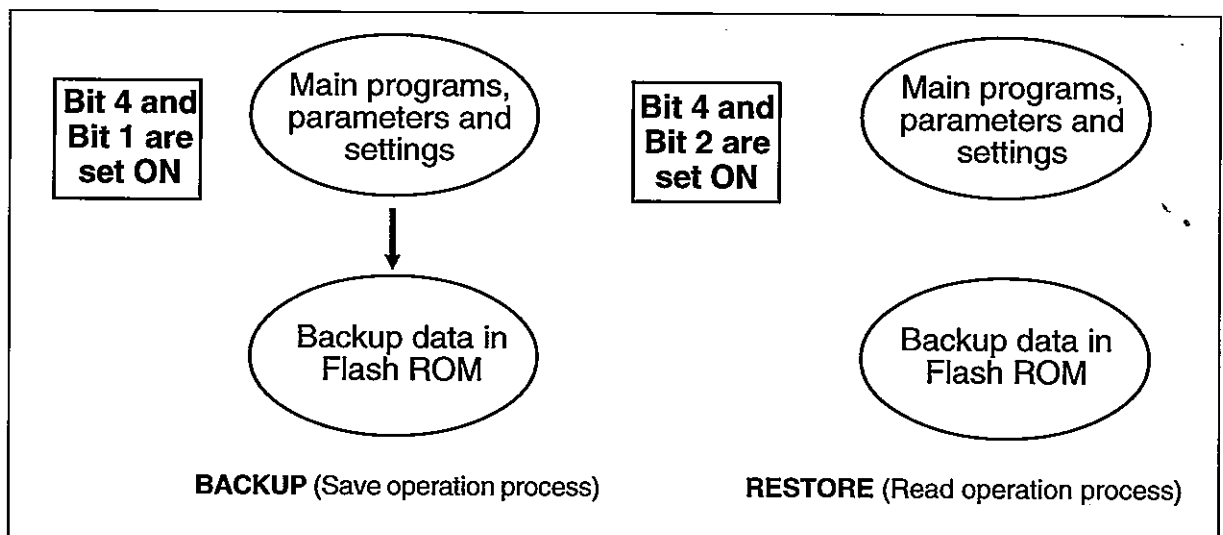
3.4.2 RS232C And PLC Operations Change-over

★ The settings of the 4 pin dip-switch on the front panel will enable the change between the RS232C and PLC modes of operation. However, after changing the settings, it is necessary to cycle power into the driver in order to make the settings valid.

★ 4 pin dip switch

Switch position

→ PLC mode
← RS232C mode

bit 2
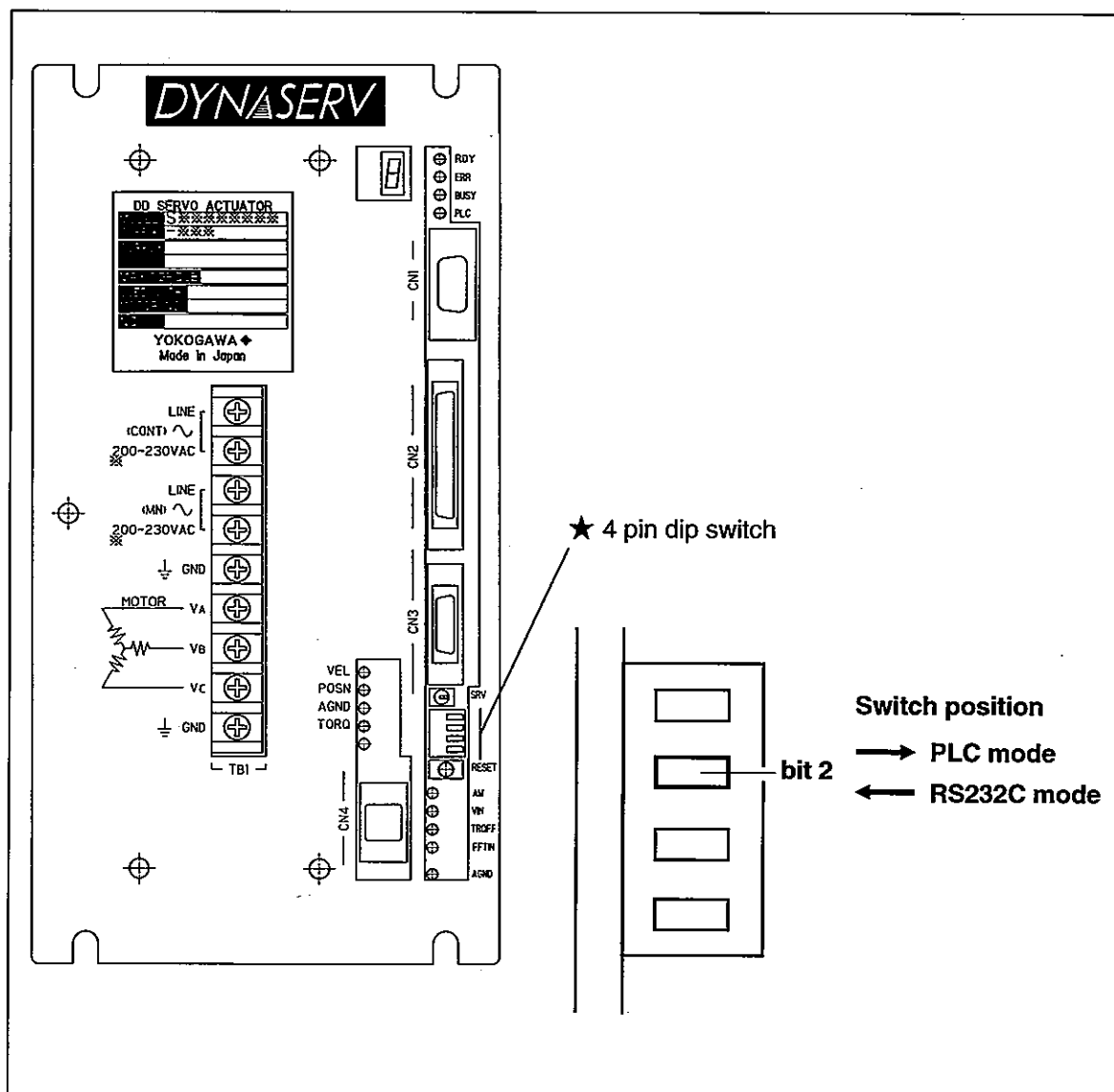
3.4.3 DI Emulation Mode

★ The various PLC operations may be monitored or confirmed using a personal computer connected via the <CN2> connector. It is necessary to use the Tool box utility to carry out this operation. Note that it is essential to change the mode of the 4-pin switch as depicted above.

3.4.4 Variable Definition Analog Monitor

★ It is possible to designate this monitor terminal to be either a velocity or a position monitor etc. (as the case may be) and thus, monitor the different signals. Refer to the Parameter details list (#70,71) for additional information.

Accessible/ Disabled commands under each operation mode of RS232C/PLC

Commands			RS232C Mode			PLC Mode		
Item	RS232C	PLC	RS232C command	TBX command	PLC command	RS232C command	TBX command	PLC command
Emergency stop		IN_EMG	NA	YES	YES	NA	YES	YES
Servo ON	@8		YES	YES	NA	NO	NO	NA
Start Operation	@3	IN_MODE_START	YES	YES	NO	NO	NO	YES
Stop Operation	@2	IN_MODE_ENDE	YES	YES	NO	NO	NO	YES
Program auto rewind		IN_PROG_REWIND	NA	NA	YES	NA	NA	YES
Interlock		IN_INTERLOCK	NA	NA	YES	NA	NA	YES
Abort	@1	IN_ABORT	YES	YES	YES	YES	YES	YES
Error reset	@4	IN_ERR_RESET	YES	YES	YES	YES	YES	YES
M-answer	@9	IN_M_ANS	※1	※1	※1	※1	※1	※1
Error request		IN_ERRCODE_REQ	NA	NA	YES	NA	NA	YES
Data Enable		IN_DATA_EN	NA	NA	NO	NA	NA	YES
Disable integral move execution		IN_POS_INH	NA	NA	YES	NA	NA	YES
Velocity override selection		IN_OVERRIDE_SEL	NA	NA	YES	NA	NA	YES
JOG	@11	IN_JOG_UP	※2	※2	※2	※2	※2	※2
		IN_JOG_DN						
Homing offset	@10		YES	YES	NO	YES	YES	NO

NA	Not Applicable (Invalid)
NO	No (Disabled)
YES	Yes (Enabled)
※1	Based on #102 parameter's value
※2	Based on #217 parameter's value

3.5 SERVO ON Operation

After the completion of installation and mounting, it is necessary to further carry out alignment and fine tuning etc., and for this purpose it is necessary to turn the SERVO ON.

1) Standard method: Connection through the <CN2> connector.
For turning on the SERVO via a PLC, refer to the Figure **3.5** for an example of connections. The logic for the SERVO ON terminal uses the Type A Logic (Factory default setting).

2) Changing the SERVO ON terminal logic to type B connection:
The Tool box utility software can be used to change the logic type of the SERVO ON terminal to Type B Logic. If the logic type is set to Type B, kindly note that upon power on, the system will automatically turn ON the servo status (under PLC mode of operation)

3) Turning the SERVO ON by using a personal computer:
Using the DI emulation function feature of the M type driver, it is possible to turn the SERVO ON (However, this is possible only if the Servo On terminal uses the Type A Logic).
The method uses the following steps of operation:

Refer to the section **3.4** (4-pin Dip-switch settings) for switch positions. Kindly also refer to the section **6.3** (Using the tool box utility software) for operating details.
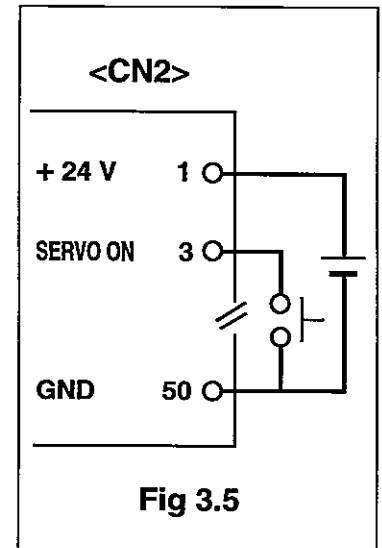
Fig 3.5

⚠ NOTE	When the driver SERVO ON status is enabled, the SERVO RDY (servo ready) signal turns ON also (<CN2> pin no. 35). At this point, it is possible to send the operation commands to the driver/motor.

3.6 Adjustments

It is necessary to fine tune the servo characteristics of the product to properly take advantage of its many features.

3.6.1 Adjustment procedure
This servo driver has an Auto-tuning function as a special feature. This enables easy and exact tuning of the driver based upon the load and, it enables the automatic registration of the various servo parameters.

3.6.2 Auto-tuning:
Auto-tuning feature can be enabled either via the remote communications program using an appropriate utility or even via the <CN2> connector.

⚠ NOTE	This auto-tuning feature will move the DD motor through a range of moves 10° - 45° and based upon the results will set the parameters. As a consequence, ensure that the load mounted on the motor will not interfere with the human personnel or other objects in the vicinity while carrying out this procedure.

1) **Enabling Auto-tuning using communications protocols** (by using a TBX or a personal computer). Transmit the command @3:1 to enable the auto-tuning feature.
2) **Enabling Auto-tuning using a PLC**
This feature can also be enabled by setting the drive mode to 1 (Auto-tuning command) and then carrying out the Mode Start command.

3.6.3 Manual Tuning:

In principle, the auto-tuning feature alone shall be sufficient to tune the motor/load combination. However, further fine tuning of the servo system is also possible. By changing the mode to the Test Mode of operation, it is possible to set the various other servo parameters as well as fine tune the parameters.

1) **Procedure** (The enabling procedure is similar to Auto-tuning feature as explained in the section **3.6.3** above for both the PLC mode and the personal computer mode of operation).
@3:0 command is sent to the driver (enables the test mode).
This command will turn ON the internal oscillator inside the driver at a frequency of 3.3 Hz for the purposes of fine tuning the drive.

2) **Adjustment**
For the list and details of various servo parameters refer to the section **4.3.1** . All the servo parameters can be changed in real-time.
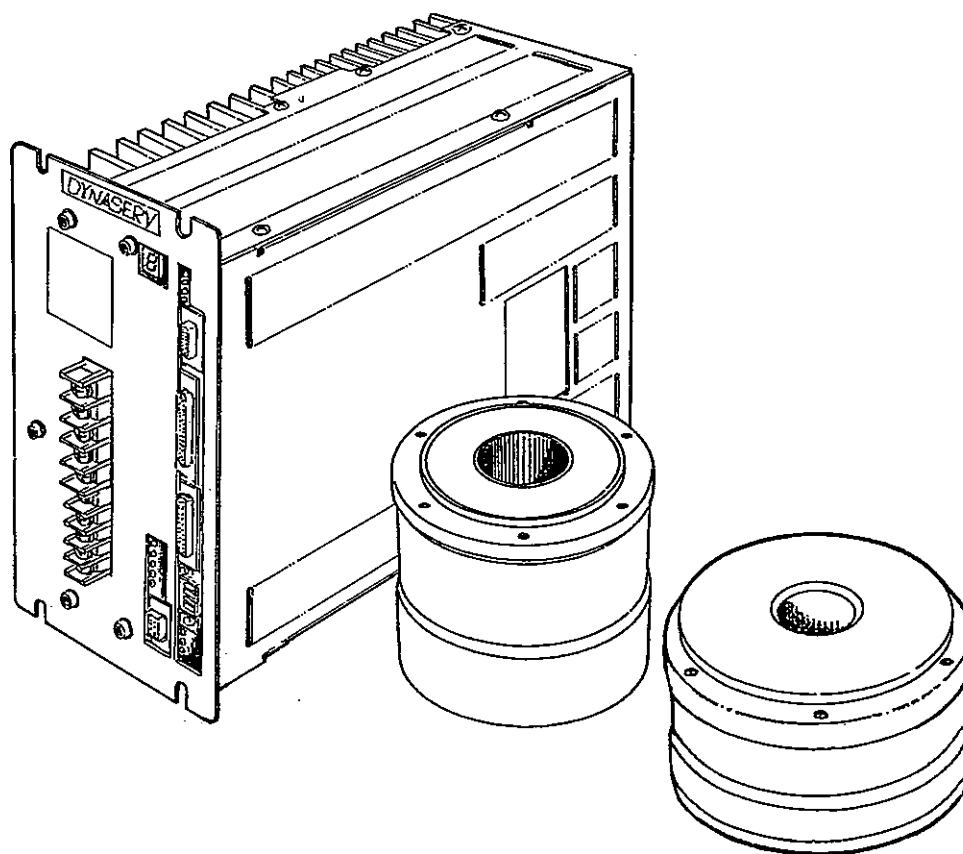
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Instruction Manual

DYN△*SERV*
DD Servo Actuator
M Type (Built-in Controller) Driver
Instruction Manual -2
(Programming Moves & Specific Features)

Introduction

Thank you for purchasing the Direct Drive servo actuator M type driver series.

High torque output and high accuracy are the chief characteristics of the DYNASERV which is an external rotor type of servo actuator. The Dynaserv is used widely in the Semiconductor industry but it also finds numerous applications in the various Factory Automation areas and more.

IMPORTANT: KINDLY READ THE FOLLOWING CAREFULLY BEFORE COMMENCING OPERATIONS.

Cautionary notes concerning this Instruction Manual

This manual contains the instructions for the proper installation, operation and usage for the Direct Drive servo actuator M-type driver series. You must read the following carefully and comply with the same before proceeding with the installation and the subsequent operation of the equipment.

1. This manual must be handed over to the final user of the equipment.
2. Read the instructions listed in this manual very carefully and after understanding them proceed with the operations.
3. Operating the equipment without following the guidelines listed here may lead to irreparable damage to the equipment. It is not possible to guarantee the safety of operations if the instructions are not adhered to.
4. It is recommended that the user store this manual carefully in an easily accessible location for quick reference.
5. This instruction manual serves as a guide to proper operation of the equipment. It is not to be taken as a guarantee.
6. Copying the whole of this manual or even a part of it by any means is strictly prohibited.
7. The manufacturer reserves the right to change the contents of this manual at it's discretion.
8. While all efforts have been made to ensure accuracy in the contents of this manual, it is possible that errors may have crept in inadvertently. If you find any such discrepancies in the contents, kindly send your comments or suggestions to the manufacturer or it's authorized distributor.

About using this manual:

In order to simplify the reading of this manual, the various features and explanations have been appropriately split into two different parts:

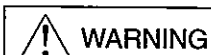### 1. Instruction Manual -1 (Installation & Operations Manual)
In this part, the various detailed instructions for handling, installation and connections are explained. The contents index feature the various sub-indices for more details. If this proves insufficient, refer to the section 3.1 Operations Procedure Flow chart, which is a systematic representation of various operating steps.

2. Instruction Manual -2 (Programming Moves & Specific Features)
The part 2 of the instruction manual lists the various programming methods and commands to enable the actuation. The features of each type of motion, the various control settings and the methods of operation are all listed here. For the convenience of our customers, at the end of each subsection explaining a specific feature, simple examples of the programming commands are also detailed, which can be used to actually command motion from the actuation system.

For The Safe Usage Of This Product

■ For the safe use of this product, the symbol $\triangle$ and $\boxed{\triangle \text{ WARNING}}$ are used on the product concerned and in this manual. Either symbol on the product indicates that the operator must refer to the warnings and instructions in the manual to avoid injury or loss of life. Be sure to follow the warnings. Handling the product in a manner contradictory to the warnings may result in injury or loss of life.

■ Completely understand the following instructions before reading the manual.

■ This sheet and the manual must be kept of hand while the product is being used and must be passed on to those personnel using the products.

$\boxed{\triangle \text{ WARNING}}$

KEEP AWAY FROM ROTATING PARTS!

■ The motor rotor rotates at high speed. When coupling a load with it, do NOT allow personnel or objects to come within the sphere of its rotation.

ELECTRICAL SHOCK WARNING!

■ To avoid electrical shock, ensure that you ground the product.

■ Before connecting cables and wires to the driver, make sure that you turn the power off and unplug the power cord.

■ When detaching the driver cord for maintenance or the like, make sure that you turn the power off and unplug the power cord.

FIRE AND ELECTRICAL SHOCK WARNING!

■ If you notice any abnormal sound, strange odor or smoke emanating from the product, immediately turn off the power and unplug the power cord. Then contact the nearest service representative.

■ If you drop the product or it receives a mechanical shock, immediately stop using it and turn off the power. Then contact the nearest service representative.

■ Do not use the power supply with a voltage exceeding the range specified for the product.

■ Be careful not to let any foreign material such as metal particles, flammable liquids, or moisture enter into the openings on the product (e.g., the gaps around the rotating parts or the vents of the driver). Should this happen, immediately turn off the power and then contact the nearest sales representative.

■ Do not bend, twist, squeeze, or pull the cables from the motor with excessive force or subject them to heat or heavy weights.

■ Users are strictly prohibited from making any modifications or repair to the product.

IMPORTANT : READ THE FOLLOWING

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CONTENTS

> Refer to the Instruction Manual -1 (Installation & Operations Manual)
> for the above mentioned contents.

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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....

SERVO ON
SERVO OFF
BRK (CN3) ON
BRK (CN3) OFF
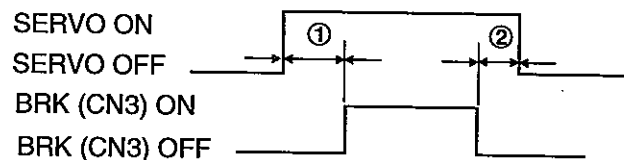
4.1.4 M-Function Interface

★ **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:**

①The 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.

OUT_CODE[0...7]
(BCD)

OUT_M_EN

IN_M_ANS
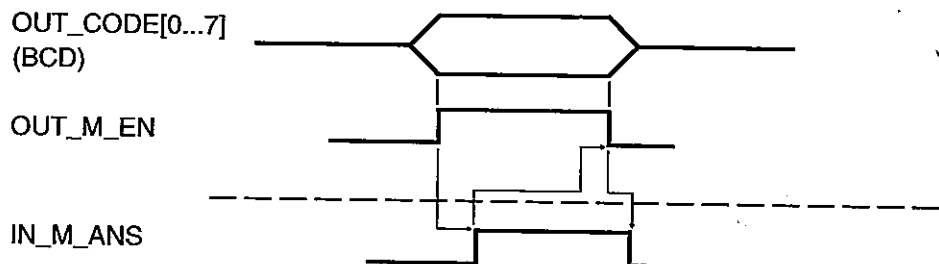
☆ **RS232C Mode of operation:**

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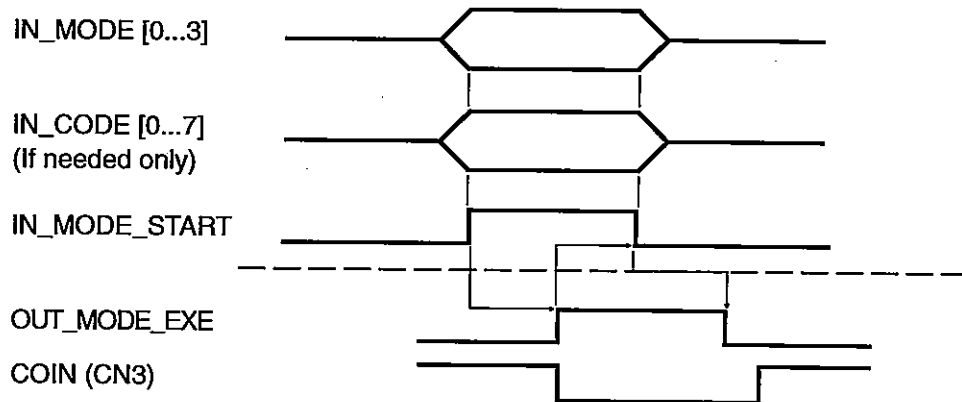
☆ **Case:** If the Settling parameter (#106) is active (enabled), the <OUT_MODE_EXE> signal is output after the completion of the position command and, only when the position complete instruction signal (COIN) turns ON.
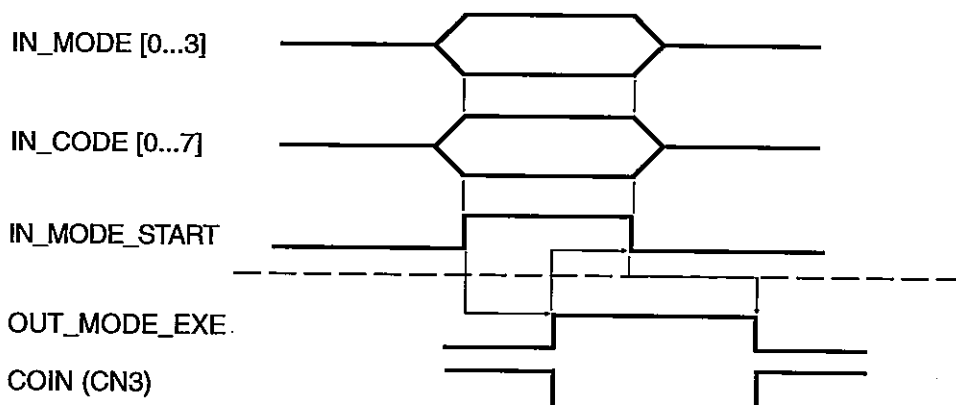
4.3 Operation Manual

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)
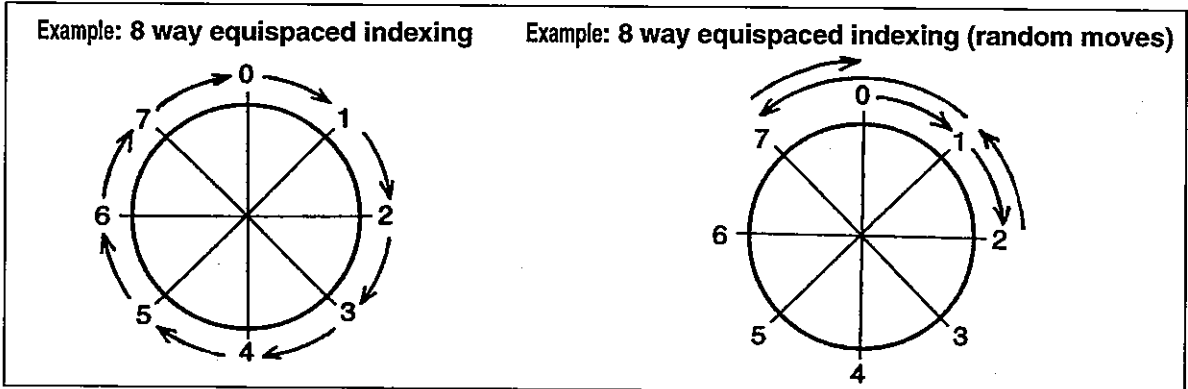
✻ Unequal Index Operations? ➡ Index Operation Mode or Program Operations Mode?

Example 1)   Example 2)   Example 3) Oscillating
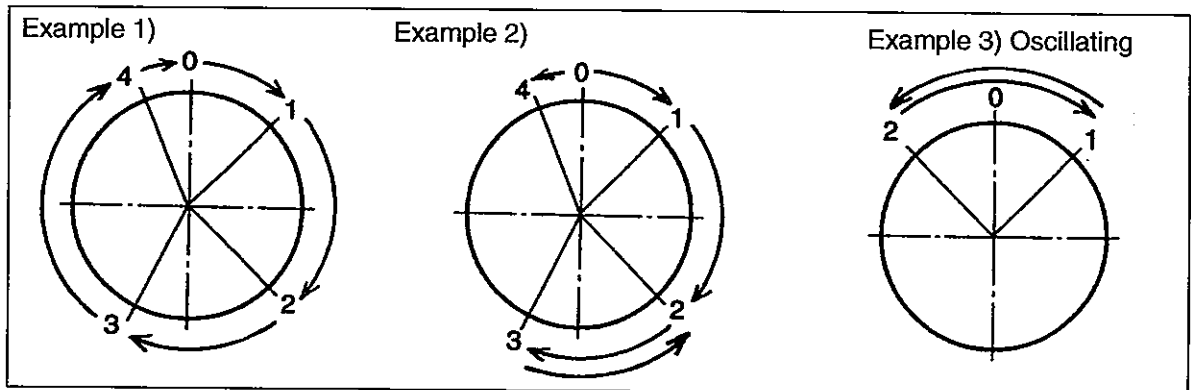
2) Input the move distance directly.

✻ 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. Preparation For Operation)
> 3.4 The Front Panel
> 6. The M Drive Utility
> 7. How to use the Operation Pendant:
> 3.5 SERVO ON Operation
> 3.6 Adjustments
> 6.10 SERVO Tuning Explained

(4.4.8 Point Move Operation Mode)

> 4.4.3 Homing Mode
> Settings for parameter #165

> 4.1.4 M-Function Interface

(4.2.1 Mode Start, End)

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

(3. Preparation For Operation)
> 3.4 The Front Panel
> 6. The M Drive Utility
> 7. How to use the Operation Pendant:
> 3.5 SERVO ON Operation
> 3.6 Adjustments
> 6.10 SERVO Tuning Explained

(4.4.4 Program Operation Mode)
> Refer to Index/ Point Move Operation Mode.

> 6.4 Using Programs

> 4.4.3 Homing Mode

> 4.1.4 M-Function Interface

(4.2.1 Mode Start, End)

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:

(3. Preparation For Operation)
> 3.4 The Front Panel
> 6. The M Drive Utility
> 7. How to use the Operation Pendant:
> 3.5 SERVO ON Operation
> 3.6 Adjustments
> 6.10 SERVO Tuning Explained

(4.4.6 MDI Mode)
> Input the command @3:7 to enable
> Refer to Index/ Point Move Operation Mode.

> 6.3 Using The Terminal Mode
> 4.4.4 Program Operation Mode

> Input the command @1, @2
> to disable and end this mode

2) Input Value 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 Input Value Operation mode? Setting for the related parameters	(4.4.9 Input Value Operation Mode) > Refer to Index/ Point Move Operation Mode > Input Value Operation Mode Specifications
③ Start	(4.2.1 Mode Start, End)

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.
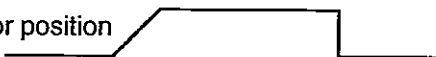
★ **Related Parameters:**

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)
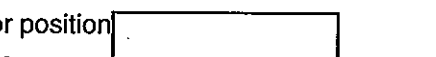
☆ Waveform before the tuning: Motor position

☆ 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)
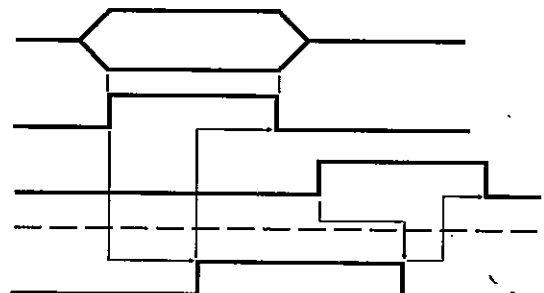
☆ **RS232C Operation**

◆ 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:
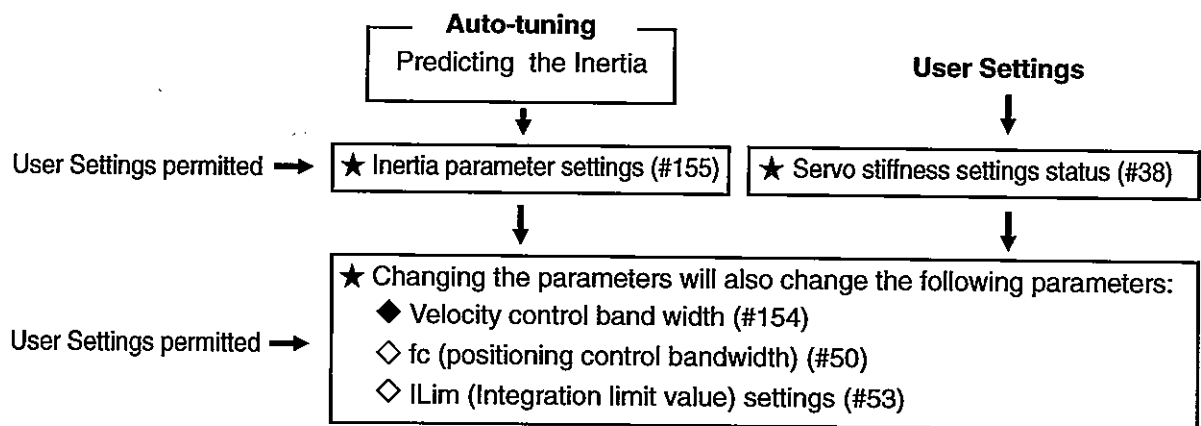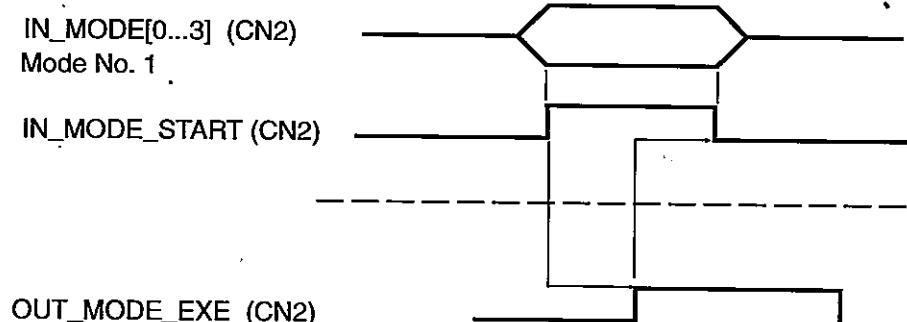
```
                    ┌── Auto-tuning ──┐
                    │ Predicting the Inertia │          User Settings
                    └─────────────────┘
                             ↓                                ↓
User Settings permitted → │ ★ Inertia parameter settings (#155) │  │ ★ Servo stiffness settings status (#38) │
                             ↓                                ↓
                    ┌──────────────────────────────────────────────────────┐
                    │ ★ Changing the parameters will also change the following parameters: │
User Settings permitted → │   ◆ Velocity control band width (#154)              │
                    │   ◇ fc (positioning control bandwidth) (#50)          │
                    │   ◇ ILim (Integration limit value) settings (#53)      │
                    └──────────────────────────────────────────────────────┘
```

★ 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

①③ ②④

Proximity signal
detection

⑥

⑤

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

Z signal detection

CCW rotation

OT signal detection
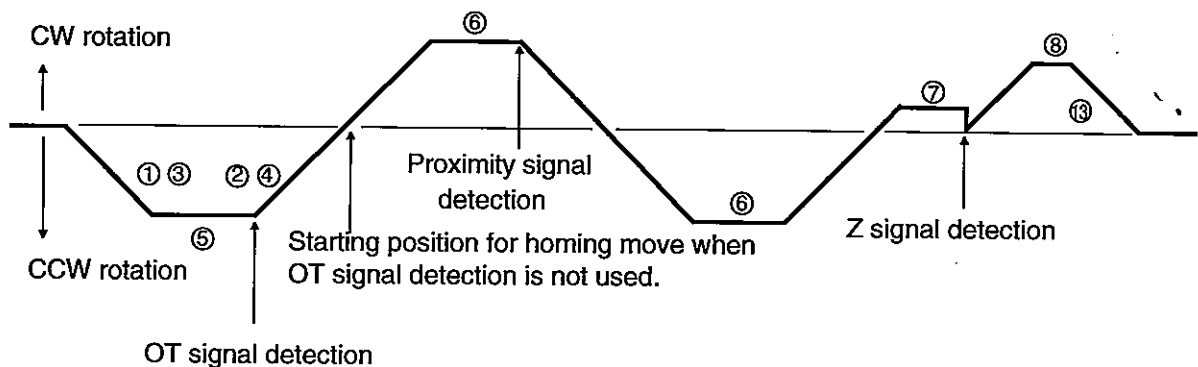
☆ **Setting the homing offset moving distance:**
The amount of offset for the home position can be changed using the parameter #29. However, it can also be changed by following the operation procedure given here.
1) Switch to the RS232C mode of operation (RS232C communications is enabled by setting the DIP switch SW2 on the front panel of the driver to the OFF 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)
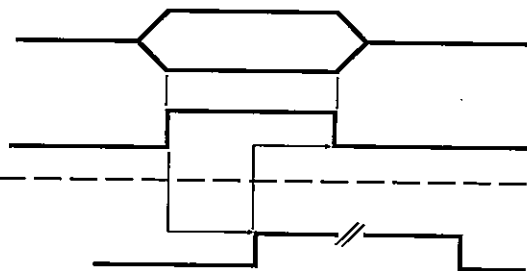
  ☆ **RS232C Operation**
  @3:0⅃ (⅃ : CR)
  R00 (Receive)

★**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.**

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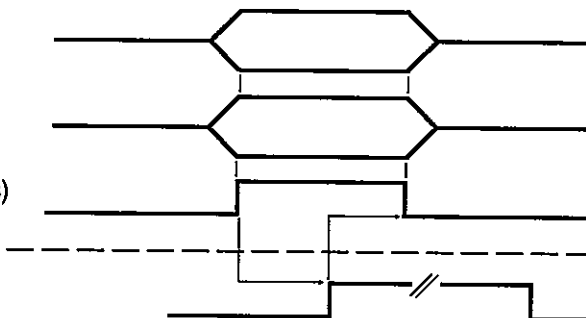
☆ RS232C Operation
 @3:4:* ⏎   (*: Program number ; ⏎ : CR)
 R00 (Receive)

☆ 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.

◆ 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.

★ **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           │
└──────────────────────────────┘
```
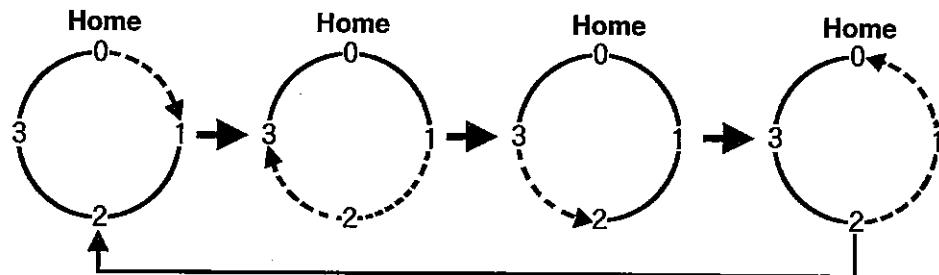
◆ Motion sequence:

◆ 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 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)
- 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

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◆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.

[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:**
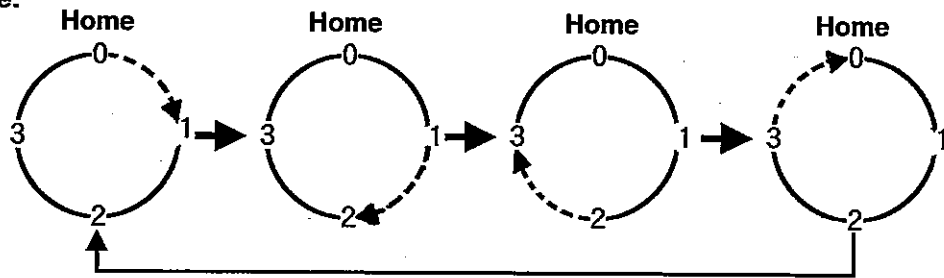
◆ **Preperation:**

◇ 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=2)
• Number of point move settings	(#110=4)
• Command for selection of axis dimensions (units)	(#208=1) ← Enter this value in the Mechanical Settings mode
• Point settings 1	(#600=0)
• Point settings 2	(#601=90000)
• Point settings 3	(#602=180000)
• Point settings 4	(#603=270000)

(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
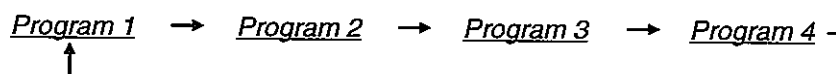
◆ **Coding example No. 1**

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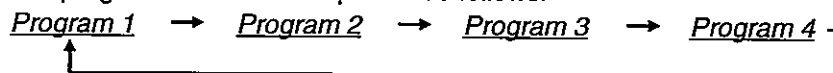
◆ Coding example No. 3   (Loop continuously until a Mode Stop command is encountered)

Program 1
#400=0   ' Initialize the value
WHILE:#400:==:0
    #105=2   ' Rotation coordination automatic direction option : +
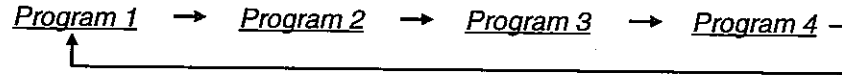   G90X90000f400
    M02
    #105=2   ' Rotation coordination automatic direction option : +
    G90X270000f600
    M04
    #105=3   ' Rotation coordination automatic direction option : -
    G90X180000f400
    M03
    M01
END

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

[SYSTEM PROGRAMMING]
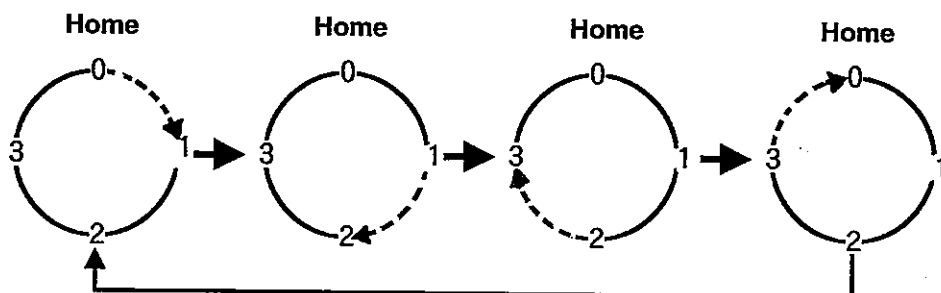
★ **Outline:**

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)

Offset is enabled and upon recognition, the signal turns ON

★ **Preparation:**

☆ Turn the SERVO ON.

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★ Operation

   ☆ PLC Mode

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

IN_MODE_START (CN2)

OUT_MODE_EXE (CN2)
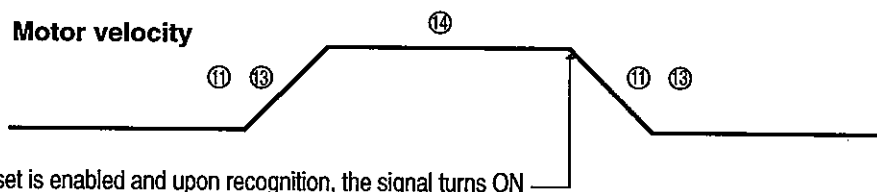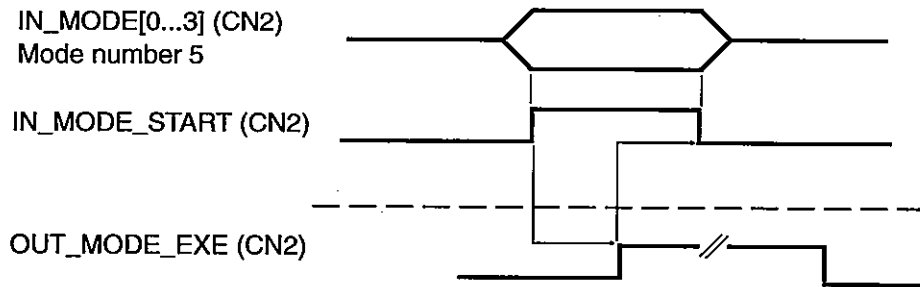
   ☆ RS232C Mode
   @3:5 ⌐   (⌐ : CR)
   R00   (Receive)

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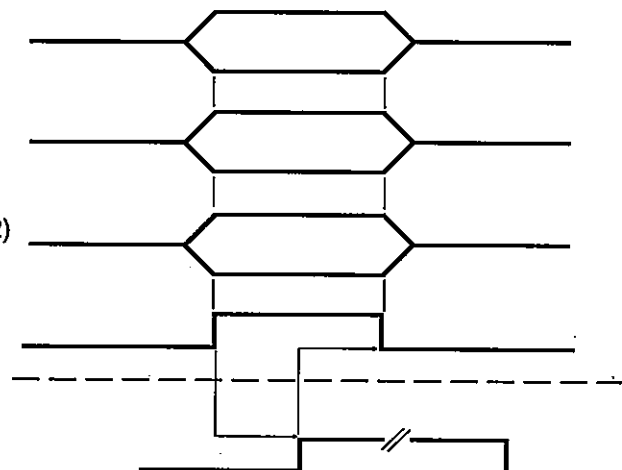
Caution note 1: During an INC mode of operation, use the desired index points and in ABS instruction use the absolute index point locations.
Caution note 2: Use IN-CODE[0....7] for inputting the data

☆ **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   ② ④   ⑥   ③ ⑤

☆ 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   ④   ②   ③

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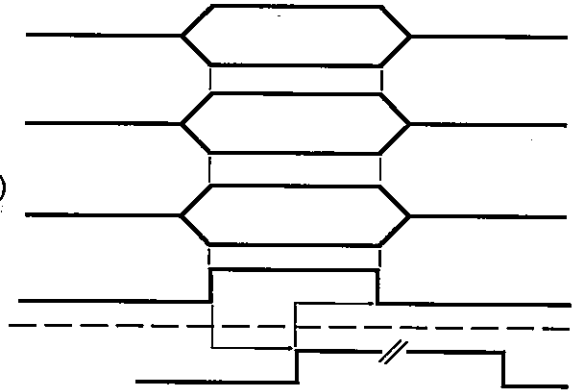
Caution note 1: During an INC mode of operation, use the desired index points and in ABS instruction use the point locations.
Caution note 2: Use IN-CODE[0....7] for inputting the data

☆ 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)
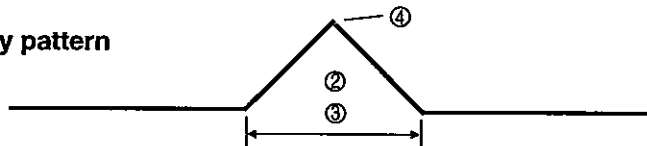⑥ Feed velocity   (#9)
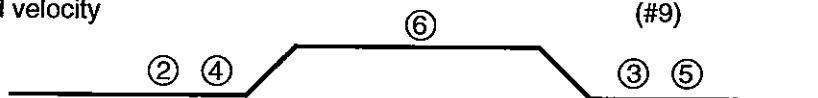
☆ For the Cam Profile Motion:

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)
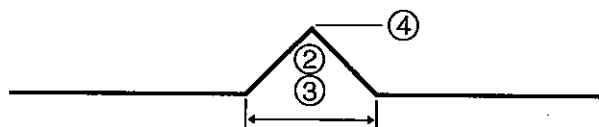
★ Preparation

☆ 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)
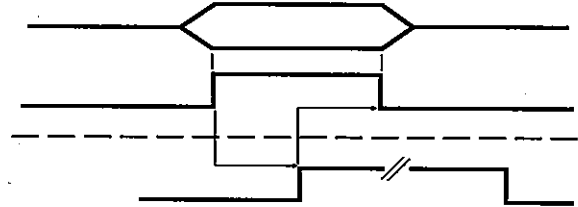
☆ RS232C Mode

◆ 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
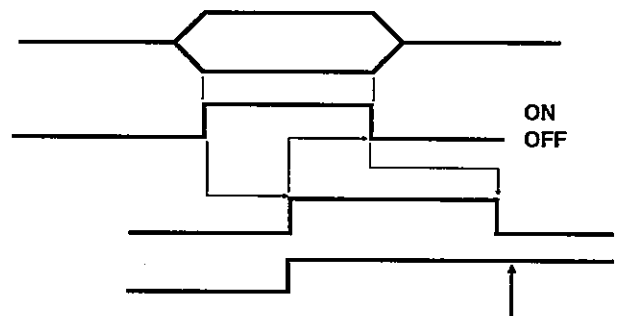
Turns OFF based upon the state of IN_ERR_RESET (CN2)

☆ 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

-27-

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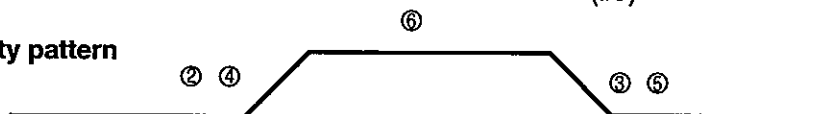The parameters related to the Signal search mode are listed as follows:

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)
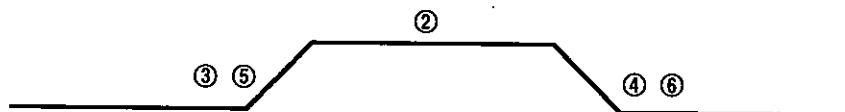
★ Operation
☆ PLC Mode

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
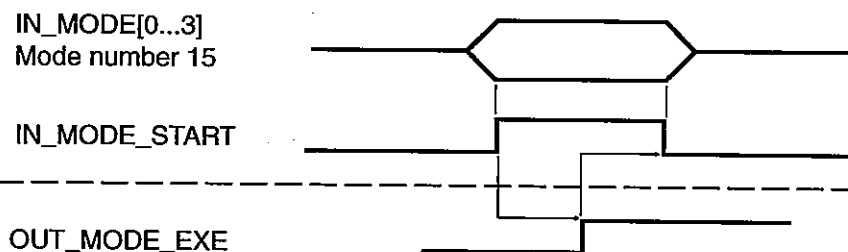
☆ RS232C Mode

@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
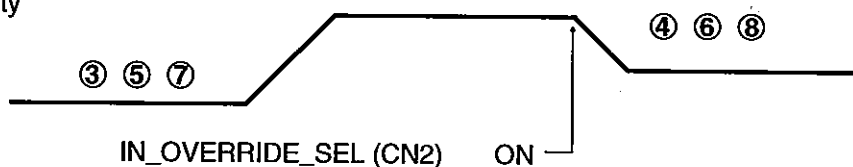
4.5.3 Interlock Paused

★ **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
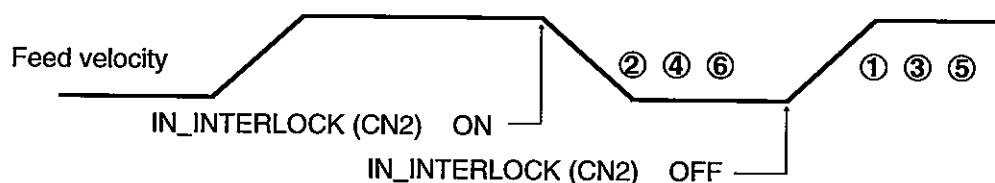
4.5.4 Cam Positioner Signal

★ **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°
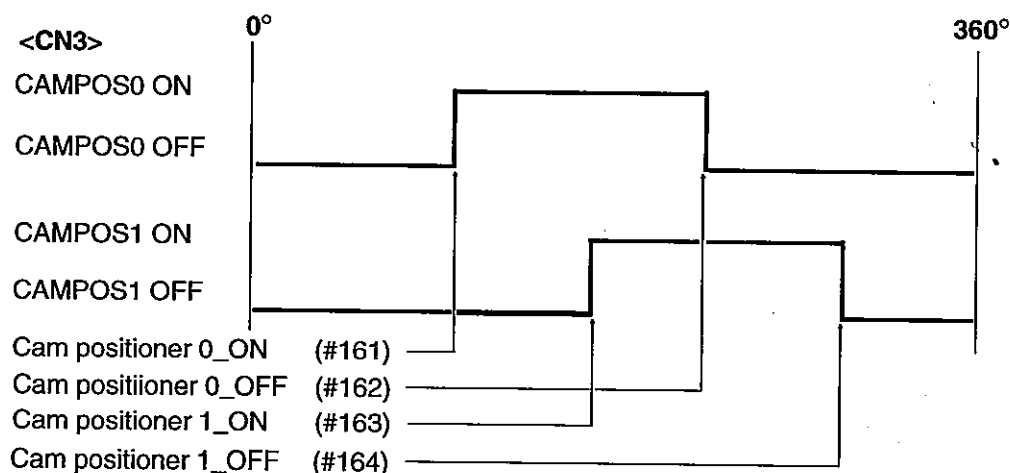
4.5.5 Cam Profiles

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
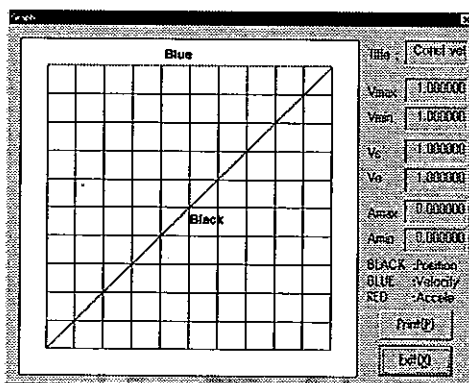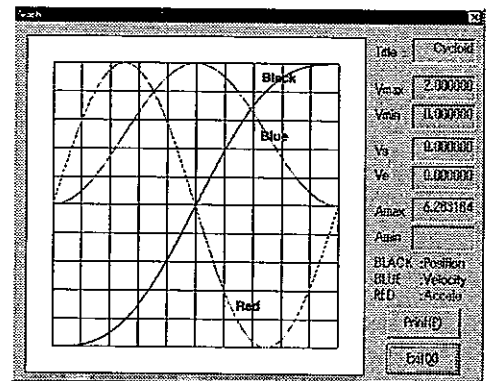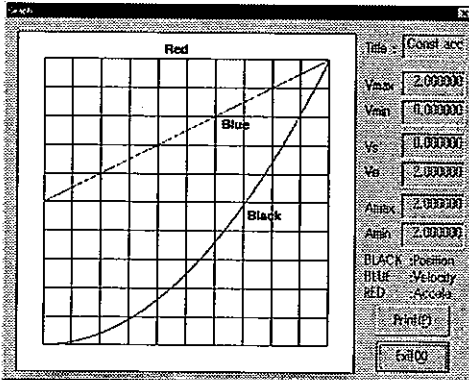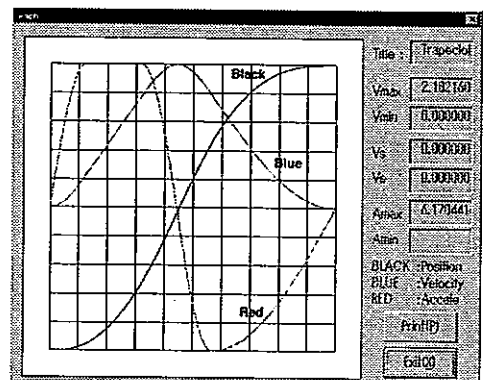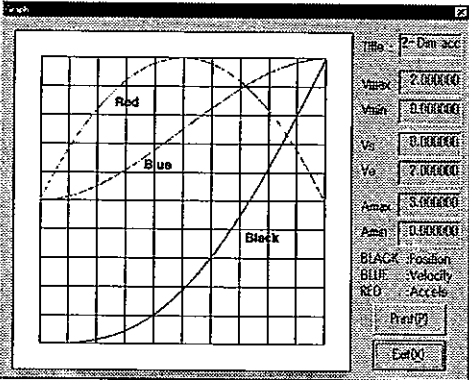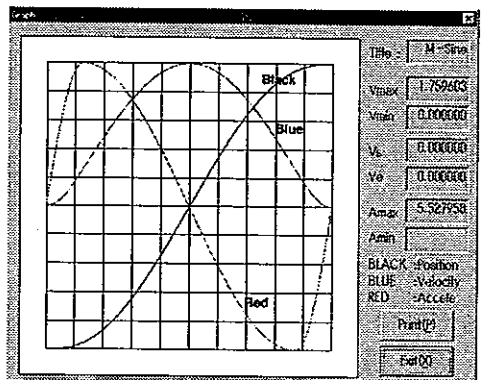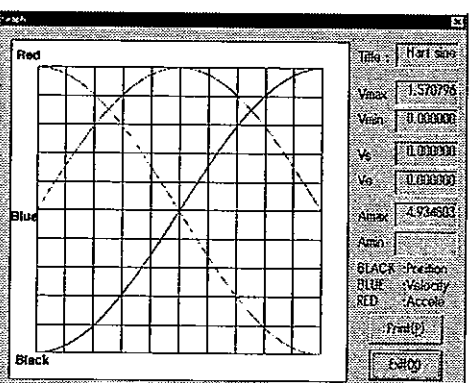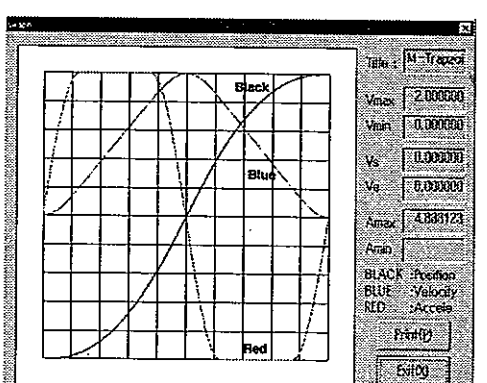
4.5.6 Direct Coordinate Moves

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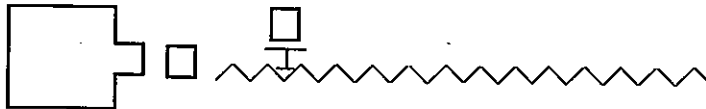
DYNASERV   Lead screw pitch : 5000 μm / rotation

#208=3
#209=5000
#210=655360   (Motor resolution <For standard DMB type 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:

-2^{47} < [Axis command dimension command value (#323) $\times$ Axis scaling data in pulse units (#210)] < $2^{47} - 1$

and

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

---

5. Commands And Parameters (Settings & Confirmation)

5.1 Outline

The following commands enable the DYNASERV to carry out a move:
(1) Command @:   Start & end commands
                  Useful also for Emergency stop command
(2) Parameter (#): For settings the values of distance, velocity, indexing points etc.
                  For reading and confirmation of the values set above.
                  Setting user commands, reading various values of parameters etc. (Programmed mode operation)
                  Settings for the point table and the confirmation of the same (Point mode operation)

5.2 Usage Of @ Commands:

The format for the @ commands are as follows:
@$$: First field: Second field:.......⌐
   ($$:@number; ⌐:CR ; Refer to list below for relevant fields for each of the @ commands)

<Example 1> Start programmed operation (Start program no.5)
   @3:4:5⌐   (⌐:CR)
   Receive R00   (This response is returned if the @ command format was correct)
   ALM**:&&&&&&&&   (When the @ command fields are in error, the driver responds with this message
                              where the ** stands for the alarm number and the &&&&&&&& represents the
                              alarm message display)

<Example 2> Jog move (Clockwise rotation)
   @11:1⌐   (⌐:CR)
   Receive R00   (This response is returned if the @ command format was correct)
   ALM**:&&&&&&&&   (When the @ command fields are in error, the driver responds with this message
                              where the ** stands for the alarm number and the &&&&&&&& represents the
                              alarm message display)

5.3 @ Commands Listing:

Number	Field 1	Field 2	Field 3	Function	Response	Command Execution while the driver is still under operation
@1	No	No	No	Abort	R00	YES
@2	No	No	No	Stop	R00	YES
@3	Move mode number	No	No	Start(Mechanical settings, test, Homing,Signal, search, direct value input	R00	NO
		Program number	Block number	Start (Program mode)	R00	NO
		Index number	No	Start (Index move mode)	R00	NO
		Point numbers	No	Start(Point move mode)	R00	NO
@4	No	No	No	Error reset	R00	NO
@8	0	No	No	Servo ON is paused.	R00	YES
	1	No	No	Change to Servo ON from the paused state.	R00	YES
@9		No	No	M answer	R00	YES
@10	1	No	No	Homing offset settings (CW direction)	R00	NO
	-1	No	No	Homing offset settings (CCW direction)	R00	NO
@11	0			Jog move stop	R00	NO
	1			Jog move (clcokwise)	R00	NO
	-1			Jog move (anti-clockwise)	R00	NO

5.4 Settings And Confirmation Of Parameters (# Command)

<Settings example>   Set the value of the parameter #123 as 1000.
    Use the PC Utility in the terminal mode and input as follows:
    #123=1000: ⅃   (⅃ : CR)
    ReceiveR00 Ready: 123 (If the parameter change was successfully completed)
    ALM**:&&&&&&&&   (When the @ command fields are in error, the driver responds with this
                          message where the ** stands for the alarm number and the &&&&&&&&
                          represents the alarm message display)

<Reading example> Read the value of the parameter #124.
    Use the PC Utility in the terminal mode and input as follows:
    #123 ⅃   (⅃ : CR)
    Receive RID $$$$$$: 234 (If the parameter read is successful then the $$$ represent the comments
                          and the 234 is the value of the parameter #124)
    ALM**:&&&&&&&&   (When the @ command fields are in error, the driver responds with this
                          message where the ** stands for the alarm number and the &&&&&&&&
                          represents the alarm message display)

#Parameter types

Parameter number	Parameter type	Comments
0-199	General parameters	General settings/ Reading the value of these settings
200-299	Mechanical settings parameters	Used in Mechanical settings modes/ Can be used to read the parameter's value.
300-399	Monitor parameters	These parameters are used to read the values only/ Can be used as general parameters also
400-499	Registration parameters	These can be defined by the user in programming or backup for general usage/ Can also be used to read the parameter's value. (Values are backed up until re-initialized)
500-549	Volatile parameters	These can be defined by the user in programming or backup for general usage/ Can also be used to read the parameter's value. (Values are not backed upon recycling power to the driver)
600-699	Point table parameters	Use in the point table mode. General usage/ Can also be used to read the parameter's value.

Refer to separate listings for the descriptions of various types of general parameters, Mechanical mode settings and also the monitor parameters.

NOTE: The settings range for the parameters #400 to #699 are in the range of -999999999 to 999999999

5.5 Parameter Details

1. Enables the over-travel error function in the + direction

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None

The setting of this parameter shall determine the display of error upon the detection of the + direction over-travel sensor signal during the axis move instruction in the + direction.

0: Error signal turned OFF
1: Error signal turned ON

2. Enables the over-travel function in the - direction

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None

The setting of this parameter shall determine the display of error upon the detection of the - direction over-travel sensor signal during the axis move instruction in the - direction.

0: Error signal turned OFF
1: Error signal turned ON

3. Selecting the type of cam profile move

Minimum value: 0
Maximum: 1
Initial: 1
Units: None

Selection of the type of motion profile under the positioning move (It is assumed that the exact amount of distance to be moved is already known).

0: Trapezoidal move
1: Cam profile move

4. Selecting the acceleration type

Minimum value: 0
Maximum vale: 1
Initial value: 0
Units: None

Selects the type of acceleration profile under a Trapezoidal move.

0: Constant velocity
1: S curve

5. Selecting the deceleration type

Minimum value: 0
Maximum value: 1
Initial value: 0
Units None

Selects the type of deceleration profile under a Trapezoidal move.

0: Constant velocity
1: S curve

6. Selection of the cam profile

Minimum value: 1
Maximum value: 16
Initial value: 5
Units: None

Selects the type of cam profile under a cam move

1 - 8: Preset standard cam curves
9 - 16: User defined & registered cam curves

7. Acceleration time during a trapezoidal move

Minimum value: 1
Maximum value: 9999
Initial value: 1000
Units: milliseconds

Selection of the acceleration time required for the change of velocity from zero to the maximum velocity of the specified axis under a trapezoidal move.

8. Deceleration time during a trapezoidal move

Minimum value: 1
Maximum value: 9999
Initial value: 1000
Units: milliseconds

Selection of the deceleration time required for the change of velocity from zero to the maximum axis velocity under the trapezoidal move.

9. Feeding Velocity

Minimum value: 1
Maximum value: 9999999
Initial value: 100000
Units: Axis command unit/ sec

Permits setting a value for the feed velocity.
For trapezoidal moves: Sets the feeding velocity.
For cam profile move: Sets the peak velocity for a cam move.

10. Jog Velocity

Minimum value: 1
Maximum value: 9999999
Initial value: 100000
Units: Axis command unit/sec

Sets the feeding velocity for a move in the jog mode.

11. Over travel search velocity during a homing move

Minimum value: 1
Maximum value: 9999999
Initial value: 100000
Units: Axis command unit/sec

This parameter is used to specify a velocity for the motor when it is searching for the over travel sensor signal in the Homing mode. This parameter value becomes void, if homing is not being carried out.

12. Homing operation: Home sensor proximity signal search velocity

Minimum value: 1
Maximum value: 9999999
Initial value: 50000
Units: Axis command unit/sec

This parameter specifies the velocity of motor under a homing operation when searching for a proximity sensor signal. This parameter value becomes void, if the proximity sensor signal is not used during homing.

13. Home sensing move 1

Minimum value: 1
Maximum value: 9999999
Initial value: 20000
Units: Axis command unit/sec

Under the homing mode, this parameter enables to set the velocity of the initial home sensing run for the motor. Apart from this, the velocity specified here will also be used as the feed velocity in the following cases:
During the second run over the home position;
After detection of the home position, for the over-move of the motor for better home detection;
For the final move to the home position after detection of the home position signal.

Minimum velocity for this operation is limited to 20000 pulses/ sec.

15.	**Homing operation: Origin position offset feed velocity**

Minimum value: 1
Maximum value: 9999999
Initial value: 100000
Unit s: Axis command unit/sec
This parameter enables to set the feed velocity for the home offset position under homing mode.
This parameter becomes void at if the Origin offset is at a distance of 0 from the Origin.

16.	**Velocity override percentage 1**

Minimum value: 0
Maximum value: 200
Initial value: 100
Units: %
Enables to set the velocity override in % for the velocity override percentage 1.
Setting becomes valid only when the <IN_OVERRIDE_SEL> of the CN2 is turned OFF.

17.	**Velocity override percentage 2**

Minimum value: 0
Maximum value: 200
Initial value: 100
Units: %
Enables to set the velocity override in % for the velocity override percentage 2.
Setting becomes valid only when the <IN_OVERRIDE_SEL> of the CN2 is turned ON.

20.	**Homing direction**

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None
Under a Homing mode, this parameter sets the homing direction (The proximity sensor signal search direction).
    0:    -direction
    1:    +direction

21.	**Enable/ Disable the overtravel signal under the homing mode.**

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None
This parameter enables (or disables) the over travel signal during the homing operation.
    0:    Disable the overtravel signal search during homing.
    1:    Enable the over travel signal search during homing.

22.	**Enable/ Disable the proximity signal search during a homing operation**

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None
This parameter enables (or disables) the proximity signal search during the homing operation.
    0:    Disable the proximity sensor signal.
    1:    Enable the proximity sensor signal.

27.	**Enabling the homing flag position error**

Minimum value: 0
Maximum value: 1
Initial value: 1
Units: None
After the completion of the Homing procedure, based upon the relationship between the motor's position locating fixture and the Motor's Z phase, either an **error** or an **alarm** is issued:

[Position of locating fixture - position of the Z phase] > (Z phase interval X 0.95) or
[Position of locating fixture - position of the Z phase] < (Z phase interval X 0.05) leads to an **error!**

[Position of locating fixture - position of the Z phase] > (Z phase interval X 0.90) or
[Position of locating fixture - position of the Z phase] < (Z phase interval X 0.10) prompts a **warning!**

29.	**Offset distance from the Home position**
	Minimum value: -9999999
	Maximum value: 9999999
	Initial value: 0
	Units: Axis command unit
	This parameter enables to set an offset distance from the home position while operating under the homing mode.

30.	**Homing complete operation command value**
	Minimum value: -9999999
	Maximum value: 9999999
	Initial value: 0
	Units: Axis command unit
	This parameter sets the drive command coordinate value for due usage after the completion of the homing.

31.	**Operation width under testing mode**
	Minimum value: 0
	Maximum value: 9999
	Initial value: 1800 (approximate pulse input value)
	Units: Axis command unit
	This parameter sets the operation width under the test mode of operation.

32.	**Operation width under Auto-tuning**
	Minimum value: 5000
	Maximum value: 45000
	Initial value: 20000
	Units: Axis command unit
	This parameter sets the operation width under the Auto-tuning mode.

33.	**Maximum deceleration under Auto-tuning**
	Minimum value: 10
	Maximum value: 1000
	Initial value: 100
	Units: milliseconds
	This parameter sets the time for maximum deceleration while under the Auto-tuning mode of operation. It is the time for Veloctiy change/ Axis Maximum velocity.

34.	**Initializing the First deceleration time while under Auto-tuning.**
	Minimum value: 100
	Maximum value: 2000
	Initial value: 500
	Units: milliseconds
	This parameter sets the time for the deceleration to be used first while under the Auto-tuning mode of operation. It is the time for Velocity change/ Axis Maximum velocity.

38.	**Servo stiffness settings**
	Minimum value: 1
	Maximum value: 5
	Initial value: 3
	Units: None
	This parameter enables to select the type of Servo stiffness desired for a particular operation. (Large values lead to higher stiffness but, it also implies that the motor becomes susceptible to resonance phenomenon)
	1. Velocity control band width 30 Hz Position control band width 7 Hz
	2. Velocity control band width 40 Hz Position control band width 10 Hz
	3. Velocity control band width 50 Hz Position control band width 12 Hz
	4. Velocity control band width 60 Hz Position control band width 15 Hz
	5. Velocity control band width 70 Hz Position control band width 17 Hz

39.   Signal search direction

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: none

Sets the direction of the search move under the signal search mode.

      0:    (-) direction
      1:    (+) direction

---

41.   Enabling the signal search mark signal

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: none

In the signal search mode, this parameter is used to enable/ disable the Mark sense signal.

      0:    Do not seek
      1:    Turn ON the search.

---

42.   Enabling the proximity signal during homing

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: none

In the signal search mode, this parameter is used to enable/ disable the proximity sensor signal.

      0:    Do not seek
      1:    Turn ON the search.

---

43.   Enabling the (+) direction over travel signal during the signal search mode

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: none

In the signal search mode, this parameter is used to enable/ disable the (+) over travel sensor signal.

      0:    Do not seek
      1:    Turn ON the search.

---

44.   Enabling the (-) direction over travel signal during the signal search mode

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: none

In the signal search mode, this parameter is used to enable/ disable the (-) over travel sensor signal.

      0:    Do not seek
      1:    Turn ON the search.

---

46.   Signal search mark signal logic settings

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: none

In the signal search mode, this parameter sets the logic type for the mark signal.
When the mark signal search is not used, this parameter becomes void automatically.

      0:    Mark sense signal OFF
      1:    Mark sense signal ON

47.	**Logic for the proximity signal during homing**
	Minimum value: 0
	Maximum value: 1
	Initial value: 0
	Units: none

This parameter determines the logic of the proximity sensor signal sought under the signal search mode. When the proximity signal search is not used, this parameter becomes void automatically.

      0: Proximity sensor signal OFF
      1: Proximity sensor signal ON

48.	**Logic for the (+) direction over travel signal during the signal search mode**
	Minimum value: 0
	Maximum value: 1
	Initial value: 0
	Units: none

This parameter determines the logic of (+) direction over travel signal sought under the signal search mode. When the (+) direction over travel signal is not used, this parameter becomes void automatically.

      0: (+) direction overtravel signal OFF
      1: (+) direction overtravel signal ON

49.	**Logic for the (-) direction over travel signal during the signal search mode**
	Minimum value: 0
	Maximum value: 1
	Initial value: 0
	Units: none

This parameter determines the logic of (-) direction over travel signal sought under the signal search mode. When the (-) direction over travel signal is not used, this parameter becomes void automatically.

      0: (-) direction overtravel signal OFF
      1: (-) direction overtravel signal ON

50.	**The position control band width**
	Minimum value: 1
	Maximum value: 32
	Initial value: 9
	Units: Hz

This parameter sets the position control band width for the axis position control unit.

53.	**The position integral limiting value**
	Minimum value: 0
	Maximum value: 999999
	Initial value: 10000
	Units: none

This parameter sets the limit value of the position error integrator for the axis position control unit. If the motor exhibits excessive windup error, kindly set this parameter to the minimum value possible.

54.	**The position feed forward percentage**
	Minimum value: 0
	Maximum value: 126
	Initial value: 90
	Units: %

When the driver is set in the I-PD control loop, this parameter sets the amount of position feed forward as a percentage for the controlled axis. However, when the driver is operated under the PI mode of control this parameter's value shall not be used and has no effect on the motor's control.

55.	**Velocity feed forward percentage**	
	Minimum value:	0
	Maximum value:	126
	Initial value:	100
	Units:	%

This parameter sets the amount of velocity feed forward in the control loop as a percentage.

56.	**Acceleration feed forward gain**	
	Minimum value:	0
	Maximum value:	999999
	Initial value:	0
	Units:	None

This parameter sets the amount of gain for the acceleration feed forward.

58.	**Positioning settling width**	
	Minimum value:	0
	Maximum value:	999999
	Initial value:	0
	Units:	None

This parameter sets the settling check and width for an axis position instruction command under position control.

65.	**Value to cause an error detection in the (+) direction or CW direction:**	
	Minimum value:	1
	Maximum value:	32767
	Initial value:	32767
	Units:	Pulse

This parameter sets the maximum value for detected error in the (+) direction.

66.	**Value to cause an error detection in the (-) direction or the CCW direction:**	
	Minimum value:	-32767
	Maximum value:	-1
	Initial value:	-32767
	Units:	Pulse

This parameter sets the maximum value for detected error in the (-) direction.

70.	**Analog monitor selection**	
	Minimum value:	0
	Maximum value:	8
	Initial value:	4
	Units:	None

Selecting the content type for the analog monitor

0:	Axis position variation	[pulse]
1:	Axis test operation response	[pulse]
2:	Axis position command value	[pulse]
3:	Axis position current value	[pulse]
4:	Axis command velocity (based on the position command value)	[pps]
5:	Axis response velocity	[pps]

71. Axis positioning error monitoring gain

Minimum value: 0
Maximum value: 6
Initial value: 2
Units: None

This parameter sets the axis position error monitor gain for use by the analog monitor terminal.

0:	10V / 32768 pulse
1:	10V / 16384 pulse
2:	10V / 8192 pulse
3:	10V / 4096 pulse
4:	10V / 2048 pulse
5:	10V / 1024 pulse
6:	10V / 512 pulse

72. Axis test operation monitoring gain

Minimum value: 0
Maximum value: 6
Initial value: 2
Units: None

During analog monitoring, this parameter sets the gain of the response from the axis under test operation.

0:	10V / 32768 pulse
1:	10V / 16384 pulse
2:	10V / 819 2 pulse
3:	10V / 4096 pulse
4:	10V / 2048 pulse
5:	10V / 1024 pulse
6:	10V / 512 pulse

73. Axis position monitoring gain

Minimum value: 0
Maximum value: 12
Initial value: 2
Units: None

During analog monitoring, this parameter sets the axis position monitor gain.

0:	10V / 4194304 pulse
1:	10V / 2097152 pulse
2:	10V / 1048576 pulse
3:	10V / 5242886 pulse
4:	10V / 262144 pulse
5:	10V / 131072 pulse
6:	10V / 65536 pulse
7:	10V / 32768 pulse
8:	10V / 16384 pulse
9:	10V / 8192 pulse
10:	10V / 4096 pulse
11:	10V / 2048 pulse
12:	10V / 1024 pulse
13:	10V / 512 pulse

74. Axis velocity monitoring gain

Minimum value: 0
Maximum value: 6
Initial value: 2
Units: None

During analog monitoring, this parameter sets the axis velocity monitor gain.

0:	10V / 4096000 pulse
1:	10V / 2048000 pulse
2:	10V / 1024000 pulse
3:	10V / 512000 pulse
4:	10V / 256000 pulse
5:	10V / 128000 pulse
6:	10V / 64000 pulse

78.	**Feeding move set value**	
	Minimum value:	-999999999
	Maximum value:	999999999
	Initial value:	0
	Units:	Axis command unit

This parameter sets the direct input value. Depending on the selection of ABS instruction type in Indexing/ Point move/ Direct input operation will also determine whether this value is an absolute instruction value or an incremental instruction value.

79.	**Move time during a cam profile selection**	
	Minimum value:	1
	Maximum value:	99999
	Initial value:	2000
	Units: ·	Milliseconds

This parameter sets the move time for a cam profile move.

80.	**Acceleration time during a cam profile selection**	
	Minimum value:	1
	Maximum value:	9999
	Initial:	1000
	Units:	Milliseconds

This parameter sets the acceleration time from zero to the maximum of 100% velocity override value.

81.	**Deceleration time during a cam profile selection**	
	Minimum value:	1
	Maximum value:	9999
	Initial value:	1000
	Units:	Milliseconds

This parameter sets the deceleration time from zero to the maximum of 100% velocity override value.

82.	**Enabling the Program step execution**	
	Minimum value:	0
	Maximum value:	1
	Initial value:	0
	Units:	None

This parameter enables the stepping through the program lines automatically.

- 0: Normal execution
- 1: Step execution

83.	**Enabling the Absolute instruction during program execution**	
	Minimum value:	0
	Maximum value:	1
	Initial value:	0
	Units:	None

During the execution of a program, this parameter will determine whether the instructions are of the incremental type or the absolute type.

- 0: Incremental instruction
- 1: Absolute instruction

84.	**Enabling the peak velocity during a cam profile move**	
	Minimum value:	0
	Maximum value:	1
	Initial value:	0
	Units:	None

This parameter will enable the selection of peak velocity during a cam profile move.

- 0: During a cam profile move, this will utilize the time parameter to execute.
- 1: During a cam profile move, this will utilize the maximum velocity to execute.

85.	**Enable the (+) direction soft limit error**
	Minimum value: 0
	Maximum value: 1
	Initial value: 0
	Units: None

When the command instruction exceeds the value of the parameter [#87: (+) direction soft limit], an error is returned depending upon the state.

          0:     Error detection turned OFF
          1:     Error detection turned ON

86.	**Enable the (-) direction soft limit error enable**
	Minimum value: 0
	Maximum value: 1
	Initial value: 0
	Units: None

When the command instruction exceed the value of this parameter [#88: (-) direction soft limit] , an error is returned depending upon the state.

          0:     Error detection turned OFF
          1:     Error detection turned ON

87.	**(+) direction soft limit settings**
	Minimum value: -999999999
	Maximum value: 999999999
	Initial value: 0
	Units: Axis command unit

This parameter is used to set the value of the (+) direction soft limit command.

88.	**(-) direction soft limit settings**
	Minimum value: -999999999
	Maximum value: 999999999
	Initial value: 0
	Units: Axis command unit

This parameter is used to set the value of the (-) direction soft limit command.

89.	**Brake turn OFF delay time upon Servo ON**
	Minimum value: 0
	Maximum value: 2000
	Initial value: 0
	Units: Milliseconds

This parameter will set a value of time which is the delay in turning off the Brake after the Servo is switched ON.

90.	**Advanced Brake turn ON before Servo OFF**
	Minimum value: 0
	Maximum value: 2000
	Initial value: 0
	Units: Milliseconds

This parameter will turn on the Brake by this value of time set here, before turning OFF the Servo.

91.	**TBX_EMG Servo status**
	Minimum value: 0
	Maximum value: 2
	Initial value: 0
	Units: None

This parameter will select the type of operation to be carried when the EMG switch is pressed on the teaching box (TBX).

          0:     After a deceleration stop, the Servo remains ON
          1:     After a deceleration stop, the Servo is turned OFF
          2:     Immediately turn the Servo OFF.

92.	**Start-up program enable**

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None

If a program is registered in the program no. 0, the setting of this parameter will determine if the program no. 0 should be executed or not.

    0:    Do not start-up the program
    1:    Enable the program start-up.

100.	**M function enable in program execution**

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None

This parameter setting will enable or disable the M-function upon program execution.

    0:    Disable the M function
    1:    Enable the M function

101.	**M function enable during index point operation**

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None

This parameter setting will enable or disable the M-function during index point operation.

    0:    Disable the M function
    1:    Enable the M function

102.	**Enabling the selection of type of serial communication for the M function interface**

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None

This parameter will determine the type of outputs from the M-function interface.

    0:    Sets the M-function interface to a PLC type.
    1:    Sets the M-function interface to the serial communications type.

103.	**Optional stop enable**

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None

This parameter will chose the state for the Optional stop function.

    0:    Set the optional stop function to disabled.
    1:    Set the optional stop function to enabled.

104.	**ABS command selection during Index / point / direct input value type of operations**

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None

This parameter may be used to choose between the type of instruction: Absolute or Incremental when the motor is operated under Index / point / direct input value modes of operation.

    0:    Incremental moves
    1:    Absolute moves.

105. Movement direction options while under rotation coordination

Minimum value: 0
Maximum value: 3
Initial value: 0
Units: None

This parameter setting will determine the direction of movement under rotation coordination.

0: In the INC mode, the motor direction will be determined by the prefix on the data; in the ABS mode, the motor will take the direction based upon the shortest distance to location.

1: Move towards the location taking the shortest path.

2: Move always in the (+) direction

3: Move always in the (-) direction

Case: When the command is to move 180°
INC move: Moves in the same direction as that specified by the value set in #202
ABS move: Moves in the same direction as the origin position.

106. Settling wait enable

Minimum value: 0
Maximum value: 1
Initial value: 1
Units: None

This parameter will enable or disable the settling time after the completion of the positioning move. If the motor does not complete the position instruction, irrespective of this parameter's setting, the motor will not wait for settling. In the homing mode, the motor shall go through a settling wait time irrespective of this parameter's setting.

0: Disable settling wait
1: Enable settling wait

108. Operation units selection

Minimum value: 0
Maximum value: 2
Initial value: 1
Units: None

This parameter sets the type of axis operation units. However, the operation unit type switches automatically from Index units in Index operating mode to the Point units in the Point move operations and further, will remain as the default unit after completion of the motion commands.

0: Direct value input units
1: Index units
2: Point units

109. Index divisions setting

Minimum value: -1
Maximum value: 100
Initial value: 4
Units: None

This parameter is used to set the number of divisions in the Indexing mode of operation.

-1: Select the A file
0: Select the B file
1-100: Set the number of divisions desired for indexing.

110. Point divisions setting

Minimum value: 1
Maximum value: 100
Initial value: 10
Units: None

This parameter is used to set the number of divisions in the Points mode of operation. During a Point move operation, when the motor is set for incremental instructions only, shall this parameter be enabled for usage.

150. **Velocity control loop: Proportional gain settings**
Minimum value: 5
Maximum value: 10000
Initial value   80
Units: 0.1 times
This parameter is used to set the proportional gain for the velocity control loop of the Servo system.

152. **First order delay filter: Frequency settings**
Minimum value: 0
Maximum value: 3
Initial value: 0
Units: None
This parameter is used to set the frequency of the first order delay filter used in the driver.
    0:    First order filter disabled
    1:    20 / 80 Hz
    2:    30 / 120 Hz
    3:    40 / 160 Hz

153. **Notch filter: Enable / Disable**
Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None
This parameter is used to enable or disable the notch filter status.
    0:    Notch filter enable
    1:    Notch filter disable

154. **Notch filter: Frequency selection**
Minimum value: 50
Maximum value: 1500
Initial value: 1500
Units: Hz
This parameter is used to set the frequency of the notch filter.

155. **Inertia settings**
Minimum value: 0
Maximum value: 100000
Initial value: 0
Units: $0.001 * Kg.m^2$
This parameter is used to specify the load inertia.

158. **Torque limiter**
Minimum value: 0
Maximum value: 100
Initial value: 0
Units: %
This parameter is used to set the limiting value of torque expressed as a percentage.

159. **Velocity control loop band width**
Minimum value: 1
Maximum value: 100
Initial value: 40
Unit   Hz
his parameter is used to set the band width of the velocity control loop.

161.	**Cam positioner 0_ON**
	Minimum value: 0
	Maximum value: 9999999
	Initial value: 0
	Units: Axis command unit
	This parameter is used to set the ON point for the Cam positioner 0.

162.	**Cam positioner 0_OFF**
	Minimum value: 0
	Maximum value: 9999999
	Initial value: 0
	Units: Axis command unit
	This parameter is used to set the OFF point for the Cam positioner 0.

163.	**Cam positioner 1_ON**
	Minimum value: 0
	Maximum value: 9999999
	Initial value: 0
	Units: Axis command unit
	This parameter is used to set the ON point for the Cam positioner 1.

164.	**Cam positioner 1_OFF**
	Minimum value: 0
	Maximum value: 9999999
	Initial value: 0
	Units: Axis command unit
	This parameter is used to set the OFF point for the Cam positioner 1.

165.	**Auto homing**
	Minimum value: 0
	Maximum value: 1
	Initial value: 0
	Units: None
	This parameter is used to enable the Auto-homing function. During the Index move or the Point move, upon a start command, depending upon the motor position, auto-homing is carried out and then the commands are run in sequence.

In the ABS mode of instruction: If the motor has not performed a homing run, then with auto-homing enabled, the motor shall first carry out a homing operation and then automatically proceed with the programmed instructions.

In the INC mode of instruction: If the motor has not performed a homing run or, if the program performs an illegal operation, then with auto-homing enabled, the motor shall first carry out a homing operation and then automatically proceed with the programmed instructions.

201.	**Selection of English / Japanese language display**
	Minimum value: 0
	Maximum value: 1
	Initial value: 0
	Unit None
	This parameter is used to switch between the English display / Japanese display.
	0: Japanese display
	1: English display

202.	**Axis command (+) direction setting**
	Minimum value: 0
	Maximum value: 1
	Initial value: 1
	Units: None

This parameter is used to set the rotation direction of the motor.

     0:      Sets the motor rotation direction to the (CCW) direction of rotation (when viewed from the direction of the mounted load).

     1:      Sets the motor rotation direction to the (CW) direction of rotation (when viewed from the direction of the mounted load).

204.	**Acceleration feed forward logic**
	Minimum value: 0
	Maximum value: 1
	Initial value: 0
	Units: None

This parameter sets the Acceleration feed forward logic.

     0:      When the motor is accelerating in the direction set by the parameter #202, this will output a negative (–) voltage.

     1:      When the motor is accelerating in the direction set by the parameter #202, this will output a positive (+) voltage.

205.	**Axis encoder resolution settings**
	Minimum value: 1000
	Maximum value: 9999999
	Initial value: 655360
	Units: pulse/rev

This parameter is used to set the resolution of the encoder (4 × encoder pulse count).

206.	**Axis velocity input sensitivity settings**
	Minimum value: 1
	Maximum value: 9999
	Initial value: 2500
	Units: mV / (rev/ sec)

This parameter is used to set the input voltage sensitivity for the velocity command unit of the specified axis Servo driver. For a rotational speed of 1 r.p.s, it is necessary to specify the input sensitivity voltage for this purpose in mV units.

207.	**Z signal interval**
	Minimum value: 1
	Maximum value: 9999999
	Initial value: 10922
	Units: pulse

This parameter is used to set the Z signal's interval for a specified motor axis.

AC/DC   : In this case, set it to the motor resolution (4 × encoder pulse count).

DD   : Refer to the DYNASERV motor's instruction manual for individual motor settings.

208.	**Axis command unit selection**
	Minimum value: 0
	Maximum value: 3
	Initial value: 1
	Units: None

This parameter is set based upon on the type of motor axis:

0: **Pulse**   The axis motor pulse will be the command dimension irrespective of axis scaling data (command unit side) or the axis scaling data (pulse side).

1: **Angle**   360 degree will be set equal to the axis motor pulse which is the axis scaling data (pulse side). The command unit shall be 1/1000 of a degree of rotation,

2: **Angle**   360 degree will be set equal to the axis motor pulse which is the axis scaling data (pulse side). The command unit shall be 1/100 of a degree of rotation.

3. **Scaling**   The value set in #209 is set equal to the value set in the parameter #210. The command pulse units will have the same units as those of #210.

209. Axis scaling data (command unit side)

Minimum value: 1000
Maximum value: 9999999
Initial value: Refer to the various DYNASERV motor specifications for this value.
Units: Axis command unit

This parameter is used as a relational parameter for the axis data after suitable conversion. Set this equal to the value of #210. However, this parameter is used only if the value of parameter #208 is set to scaling. Further, if the selected axis type is the rotational coordination system, the value set in this parameter will be equal to one rotation of the motor axis.

Example: In rotational coordination: Pitch (μm)
In direct line coordination: Screw pitch (μm)

210. Axis scaling data (pulse side)

Minimum value: 1000
Maximum value: 9999999
Initial value: Refer to the various DYNASERV motor specifications for this value.
Units: Pulse

This parameter is used as a relational parameter for the axis data after suitable conversion. Set this equal to the value of #209. However, this parameter is used only if the value of parameter #208 is set to Angle or Scaling only. Further, if the selected axis type is the rotational coordination system, the value set in this parameter will be equal to one rotation of the motor axis.

212. Straight line coordinate selection

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None

This parameter will select the straight line coordination.
0: Rotational coordination
1: Straight line coordination

213. Axis maximum velocity

Minimum value: 1
Maximum value: 9999999
Initial value: Refer to the various DYNASERV motor specifications for this value.
Units: Axis command unit / sec

This parameter will be used to set the maximum allowable velocity for a motor/ driver set. The value of this parameter is used during the servo control of the axis to limit the commanded velocity. Further, in the cases of the jog mode, homing mode, moving mode, signal search mode, using a trapezoidal profile (Constant acceleration / deceleration) for a move operation, this parameter's value shall be used in conjunction with the deceleration time parameter, the feed velocity parameter to calculate the acceleration profile for the move.

215. PLC operation: Start signal processing speed selection

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None

This parameter will determine the scan time for reading the PLC start operations via the PLC interface.
0: Standard settings (10 milliseconds cycle scan, automatic read delay is enabled)
1: High speed settings (2 milliseconds cycle scan, automatic read delay is disabled)

216. Servo ON status upon power up during serial communication operations:

Minimum value: 0
Maximum value: 1
Initial value: 1
Units: None

This parameter will determine the Servo status of the driver upon power up of the driver and with the serial communications enabled.
0: Servo OFF status
1: Servo ON status

217. Jog move operation: Serial communication selection

Minimum value: 0
Maximum value: 1
Initial value: 0
Units: None

This parameter selects the type of serial communication for the Jog move mode.

0: PLC side
1: RS232C Serial communications

218.   Rotor inertia

Minimum value: 5
Maximum value: 5000
Initial value: Refer to the various DYNASERV motor specifications for this value.
Units: $0.001*$ Kg.m^2

This parameter is used to select the motor's rotor inertia.

219.   Maximum torque

Minimum value: 5
Maximum value: 10000
Initial value: Refer to the various DYNASERV motor specifications for this value.
Units: $0.1*$N.m

This parameter is used to select the motor's maximum torque output.

220.   Torque input

Minimum value: 1
Maximum value: 10000
Initial value: Refer to the various DYNASERV motor specifications for this value.
Units: 0.01 N.m/ V

This parameter is used to select the motor's torque signal inputs.

5.6 Monitor parameter details

300 Currently under operation
Units: None
This parameter displays the fact that the motor is under operation.

301 Axis is under operation
Units: None
This parameter displays the fact that the servo axis is under operation.

302 Error status
Units: None
This parameter displays a warning that the servo system is under error status

303 Alarm status
Units: None
This parameter displays a warning status about the servo system requiring attention.

304 Controller ready
Units: None
This parameter displays the fact that the controller function is normal.

305 Servo ready
Units: None
This parameter displays the fact the axis is in the Servo ready status.

306 Drive coordinate status
Units: None
This parameter displays the fact that the coordinate system is ready for operation. If the display reveals that the coordination system is not ready, then it is not possible to move the motor using incremental instruction.

307 M function under operation
Units: None
This parameter displays the fact the M function is under operation.

308 Selection of communication interface for operations
Units: None
This parameter will display the type of communication unit used as the operation unit.
    0: Operations carried out by a PLC
    1: Operations carried out by a RS232C serial communication device.

310 Display of program number under execution (or last executed)
Units: None
This parameter will display the program number currently under execution, or, if the program has completed, will reveal the last programmed number executed.

311 Display of block number under execution in the program
Units: None
This parameter will display the program block number currently under execution, or, if the program block has completed, this parameter shall reveal the last programmed block number executed.

312 Program nesting counter
Units: None
This parameter shall display the program nest counter details during the execution of a program with nested loops.

313 Move dimensions display
Units: None
This parameter displays the drive command dimensions.
  0: Direct count
  1: Index
  2: Point

314 Index resolution current value
Units: None
This parameter displays the current value of index resolution.

315 Velocity override selection status
Units: None
This parameter displays the velocity override selection status.
  0: Velocity override 1
  1: Velocity override 2
  2: Interlock

316 Program auto-rewind enabled status
Units: None
This parameter displays the auto-rewind enabled status under the programmed operation.

317 Completion of homing status display
Units: None
This parameter displays the information about the homing completion after power up of the system.
But if the servo driver is unable to count the position pulses, the system shall return to the power ON status only.

318 Homing operation: The measured value
Units: Pulse
This parameter displays the measured count of pulses between the proximity sensor signal and the origin under the homing operation.

320 Axis pulse position command value
Units: Pulse
This parameter displays the axis pulse position command.

321 Axis pulse position current value
Units: Pulse
This parameter displays the present and current value of axis position in pulses.

322 Axis pulse position deviation
Units: Pulse
This parameter displays the deviation of the axis position in pulses.

323 Axis command unit command value
Units: Pulse
This parameter displays the value of the axis command unit command.

324 Axis scaling data (command unit side)
Units: Axis command unit
This parameter displays the actual axis scaling data (command unit side) being used in operations.

325 Axis scaling data (pulse side)
This parameter displays the actual axis scaling data (pulse unit side) being used in operations.

326 Axis under operation: Command value
Units: Axis running unit
This parameter displays the axis running command count

328 Axis position settling status
Units: none
This parameter displays the fact that the axis position deviation is within the set limits.

329 Axis positioning status
Units: None
This parameter displays the fact that the axis position counter has stopped refreshing the data and further will indicate that the positional deviation is within the set limits.

330 Display brake turned OFF
Units: None
This parameter displays the brake turned OFF status from the brake signal.

331 Cam positioner 0 status
Units: None
This parameter displays the status of the Cam Positioner 0.

332 Cam positioner 1 status
Units: None
This parameter displays the status of the Cam Positioner 1.

6. The M- Drive Utility

6.1 Installing The M - Drive Utility Software

The M - Drive Utility software is designed to operated under the Windows '95 operating system only. Before commencing the installation, ensure that the older versions of this software are not already installed on your system. If any such older versions exist, first delete it and, then perform a fresh installation of this software.

Kindly use the [Add/Remove Programs] icon inside the Windows '95 Control Panel to install this software. Clicking on this icon will bring up the property dialog box for the [Add/Remove Programs]. Then, proceed to click on the [Setup] icon and follow the instructions in the dialog box to run the Setup program for the M Drive Utility software.

Read the instructions carefully and after confirmation of the contents displayed, click on the [Next] button. This will lead to the menu for due selection of the destination for the software installation (refer to the **Fig. 6.1.1**).
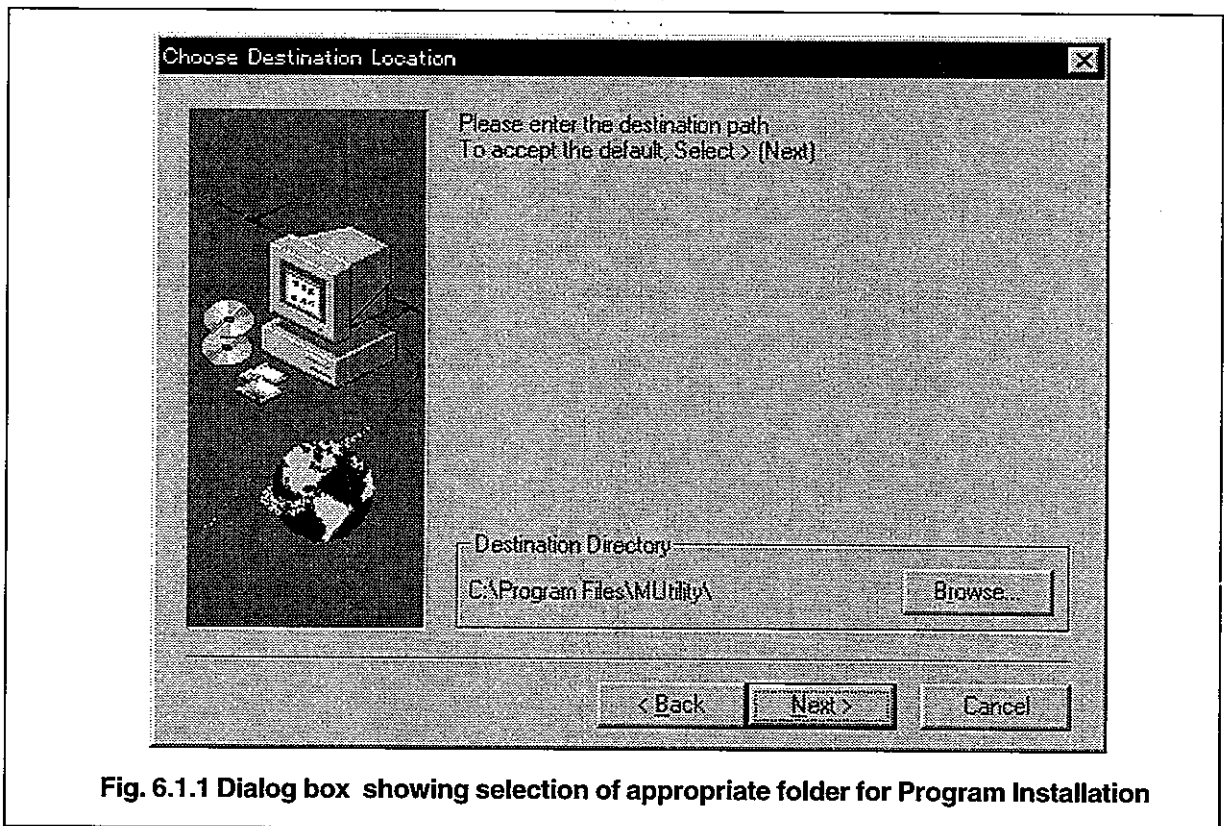
Fig. 6.1.1 Dialog box showing selection of appropriate folder for Program Installation

1. Click on the [Browse] button and the [Directory selection] dialog will appear, and select the drive and the target directory.

2. By default, the program will install the software using the following path: C: Program File\M utility\ You may also click on the [Browse] button to select some other folder as a suitable choice for software installation. If this choice of folder does not exist on the hard disk, the Operating system shall automatically create it.

Then, click on the [Next] button to start the installation.

You may interrupt the installation at anytime by simply clicking on the [Cancel] button.

After copying the contents of the installation Disk#1 to the hard disk, you shall be promted to insert the Disk#2 and follow the instructions on the screen for inserting the installation Disk#2 and, then click on the [OK] button to proceed further with the installation.

The dialog box will pop up indicating the completion of installation and a final click on the [OK] button will end the successful installation of the program.

6.2 How To Use The M - Drive Utility Software:

Clicking on the M Drive Utility software in the "Program" menu of the Windows "Start" button. After the opening screen, the [Main menu] dialog box similar to **Fig. 6.2.1** will be displayed, and then click on the button in accordance to the menu. For a description of the various menu options, refer to the appropriate explanations.

Fig 6.2.1 Main menu
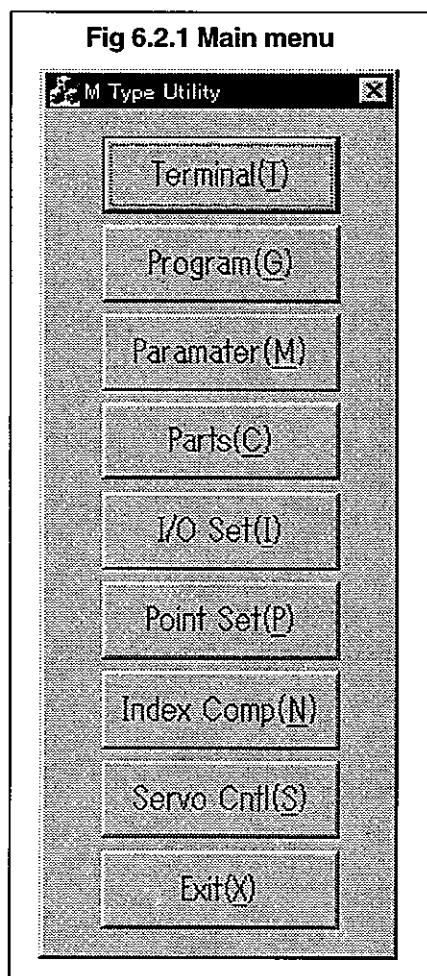
[Terminal Mode]	The terminal mode can be used for directinteraction with the M Driver using the PC and it enables both the parameter inputs as well as the monitoring capability.
[Program Menu]	This sub-menu combines the functionality of uploading and downloading of the various programs from/to the M Driver.
[Parameter Menu]	This sub-menu combines the functionality of uploading and downloading of the parameters from/to the M Driver.
[Cam Curve Menu]	This is used to create, edit, view and download cam curves to the M Driver controller.
[I/O setting menu]	This is used to set the I/O related setting in the Driver
[Point setting menu]	This is used to edit the point setting table.
[Index compensation]	This is used to edit the process for the compensation table and also the index compensation file.
[Servo adjustment]	This is used to adjust the servo parameter of the motor.
[Exit]	Terminating this utility program.

Fig 6.2.2 Communications Example: Dialog Box
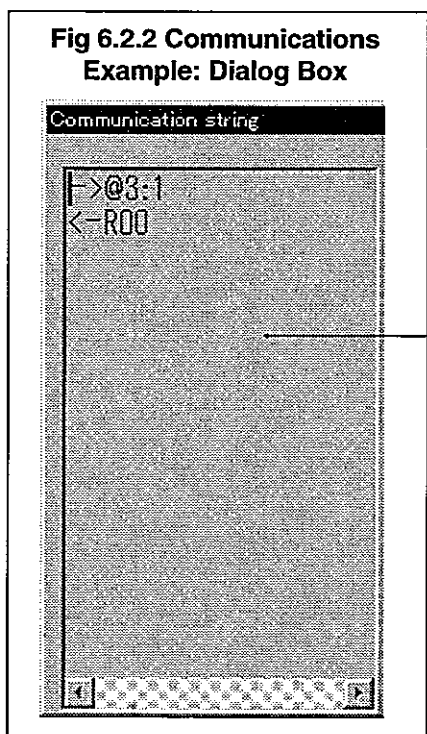
The [Parameter Inputs] dialog box is displayed during the operation of the Utility software(**Fig. 6.2.2**). The commands sent to the driver and the messages (response) received from the driver is displayed regardless of the menu selection.

Alpha-numeric edit tool box.
Headers:

$\longrightarrow$ Characters sent

$\longleftarrow$ Characters received

Fig 6.2.3 Commmunications Example: Dialog Box
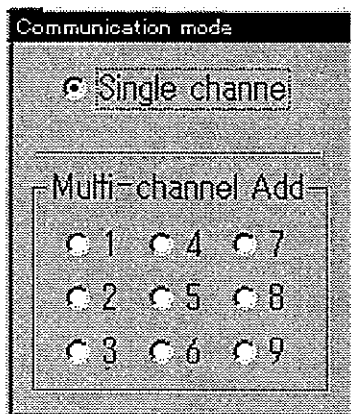
Starting the Utility software will bring up the [Communication mode] dialog box (**Fig. 6.2.3**). For the single axis of operation, select the single axis address and for multiple axis, select the multiple axis address.

6.3 How To Use The Terminal Mode:

Clicking on the [Terminal Mode] button will display the Terminal mode dialog window as shown in the example below. It is possible to monitor the driver status and to display the list of all commands and parameters.

Click on the Terminal mode inside the Main menu to display the "Terminal Mode" dialog box. (Refer to the **Fig. 6.3.1**).
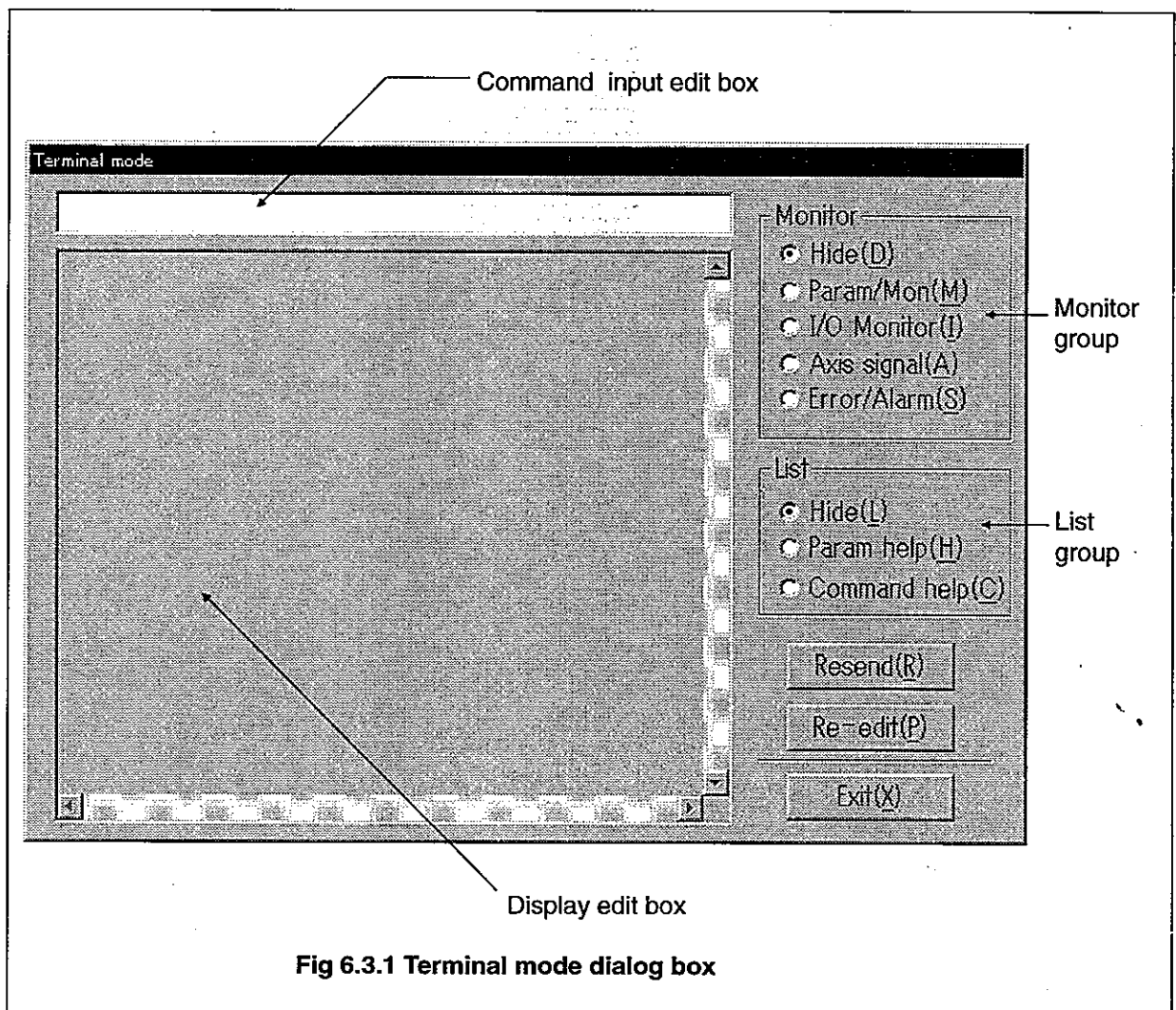
Fig 6.3.1 Terminal mode dialog box

6.3.1 Sending & Receiving Commands

1. Use the keyboard to input the relevant commands in the [Command Input] box and then press the Return key (enter key) to transmit the commands to the M Drive. While these commands are transmitted to the M Drive, the same are also displayed in the [Display edit] box.

2. When the M Drive transmits information to the PC, the same will also be displayed in this [Display edit] box.

3. Clicking on the [Re-Transmit] button will retransmit the last command sent to the M Drive.

4. Clicking on the [Paste] button will paste the last transmitted command in the [Command Input] box. Note: This will not be transmitted unless the Return (enter) key is pressed.

6.3.2 Monitoring The Driver Status

Clicking on any of the items within the [Monitor] group button will display the driver status monitor dialog box. The command transmission can be carried out during the monitoring through this [Terminal Mark]box.

	Description
Parameter I/O Axis signal status Error/Alarm	Monitors up to a maximum of five (5) parameter values from the driver. Monitors the I/O status of the drives. Monitors the Axis DI status. Check for an error or an alarm status and displays it's record.

Parameter Monitor

Clicking on the [Parameter monitor] of the [Terminal mode] will bring up the [Parameter monitor] dialog box (**Fig. 6.3.2**).

When the desired parameter number is input into the parameter number edit box, the contents of the parameter and value shall be displayed. By selection of the Switch check box, the number of parameters intended for monitoring can be changed from 1 to 5.

Fig 6.3.2 [Parameter monitor] dialog box
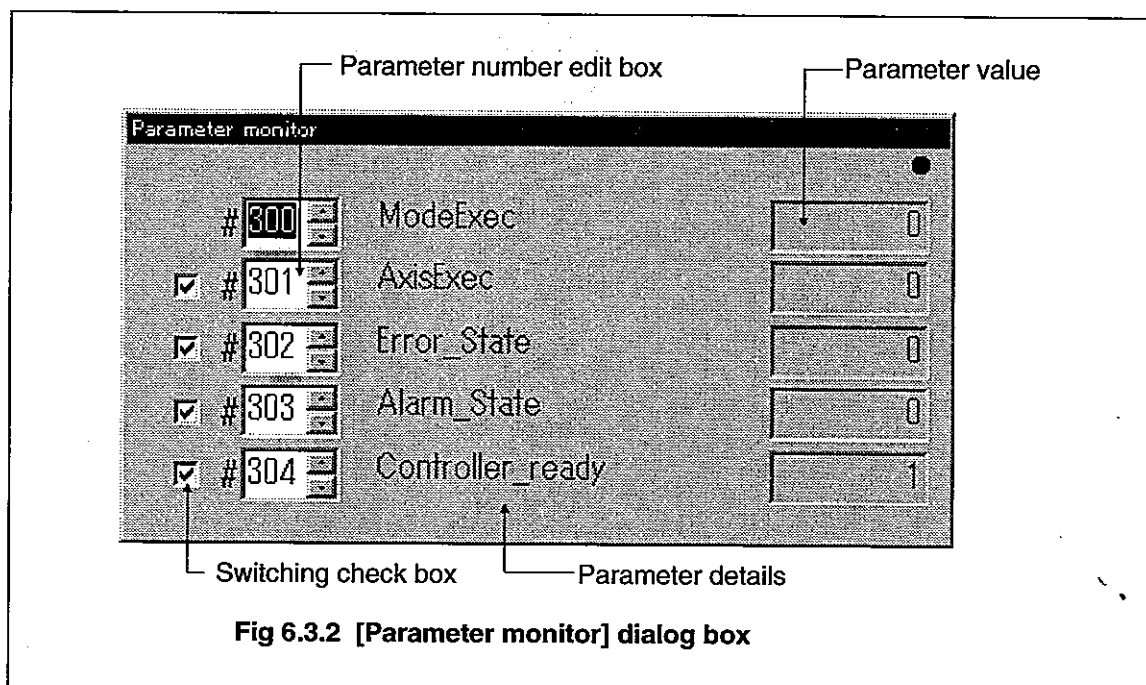
I/O Monitor

Clicking on the [I/O monitor] in the [Terminal mode] will display the [I/O monitor] box (**Fig 6.3.3**).

The status of the DI and DO can be monitored using the [I/O monitor].

In addition, if the drive is powered ON in the DI emulation mode, the DI on the CN2 can be turned either ON/OFF directly by using the button located just below the dialog box.

Fig. 6.3.3 [I/O Monitor] dialog box

DI Status
(CN2)

● ON
● OFF
◉ Unrecognized I/O

DO Status
    0 to 15 CN2 DO
    16 to 24 CN3 DO

Buttons used for DI emulation
    NOTE: When these buttons are used as inputs to the Dynaserv, there is a noticeable delay in transmission of commands.
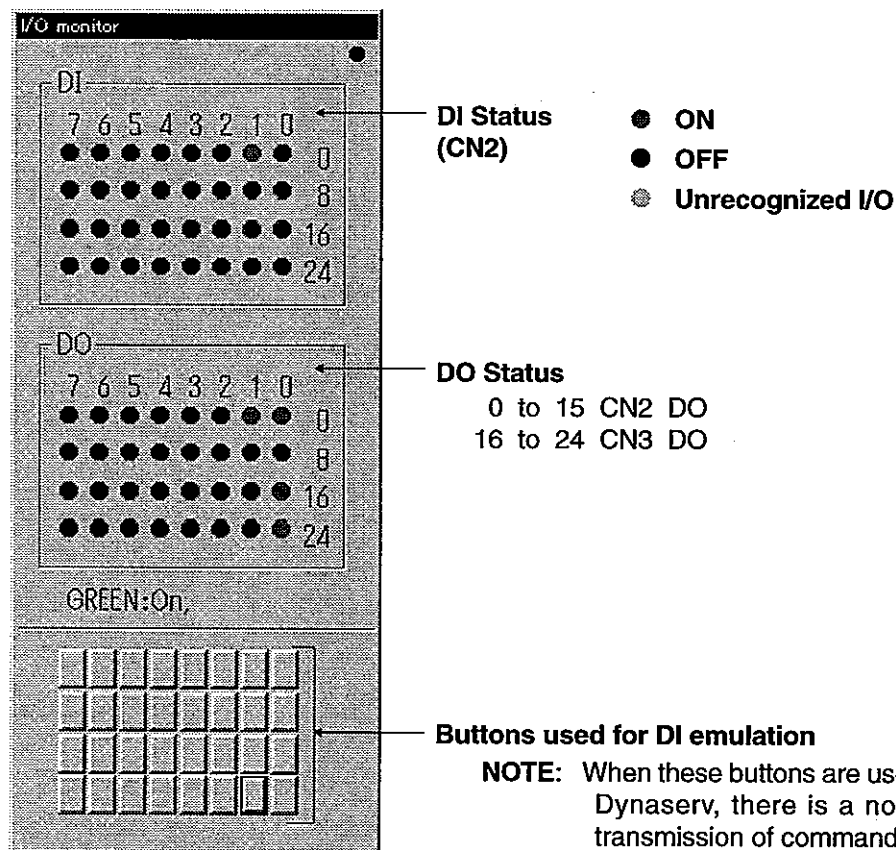
Axis Signal Status

Clicking on the [Axis signal status] button in the [Terminal mode] will display the [Axis signal status] dialog box (**Fig.6.3.4**).

[Axis signal status] can be used to monitor the driver axis DI status.

Fig. 6.3.4 [Axis signal status] dialog box

● ● ON
● ● OFF
◉ ● Unrecognized I/O
RED GREEN

-60-
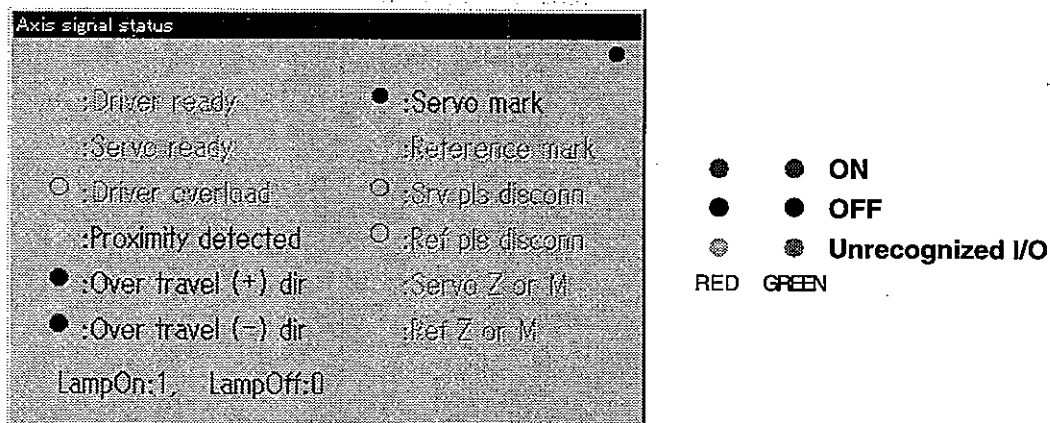
Error / Alarm Monitor

Clicking on the [Error/alarm] button in the [Terminal mode] will display the [Error/alarm] dialog box (**Fig.6.3.5**).

When an error occurs, [Error] warning is displayed and the error messages will be displayed in the display edit box. The same holds true for the alarm warnings. The error/alarm contents are displayed in sequence in the Display edit box but the maximum number of error messages is restricted to 16 only.

Fig.6.3.5 [Error/alarm] dialog box

Error occurence message

Alarm occurence message

Display edit box
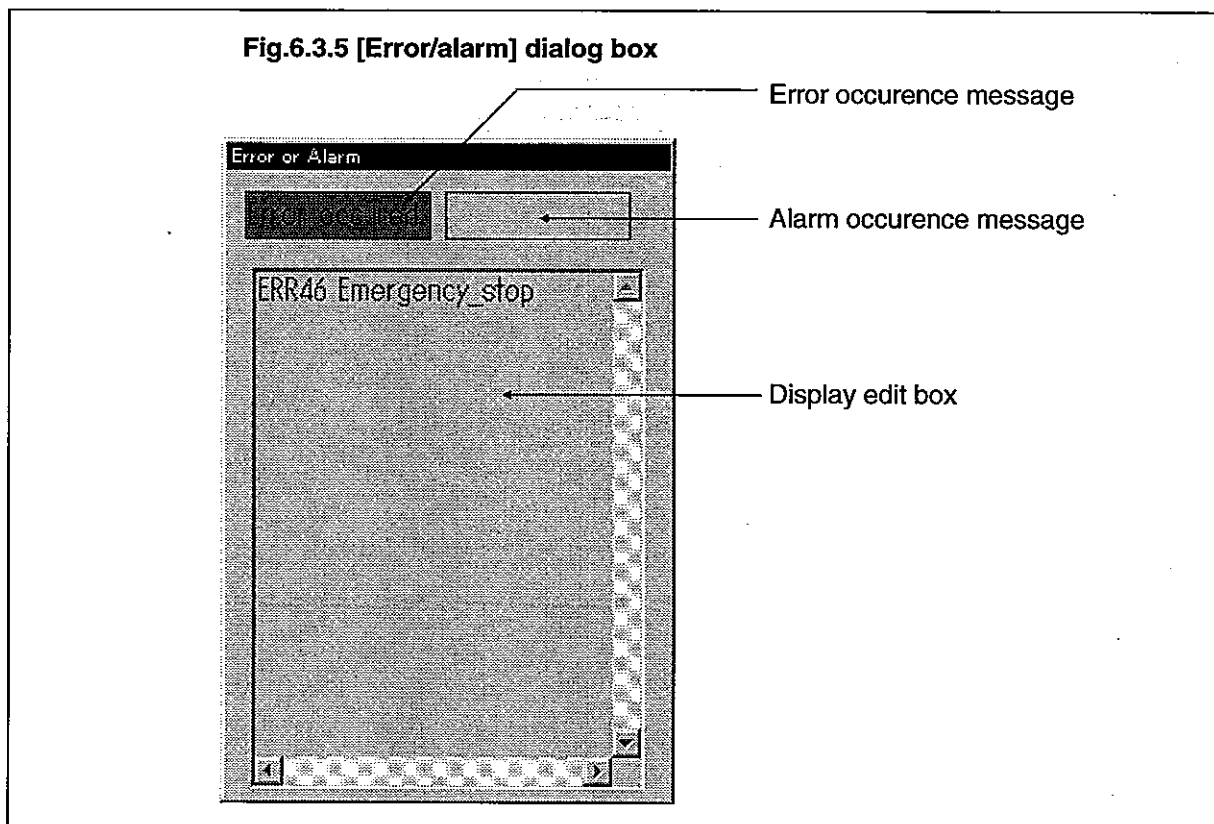
Help List

Clicking on the [List] button of the group in the [Terminal mode] will display the dialog box which displays the driver parameter help or the command help list. **Fig. 6.3.6** shows the [Parameter help] dialog box.

Commands can be sent to the drive using the input edit box in the [Terminal mode] while also displaying the help list. However, commands cannot be sent to the drive while receiving the help messages into the help dialog box.

Fig. 6.3.6 [Parameter Help] dialog box
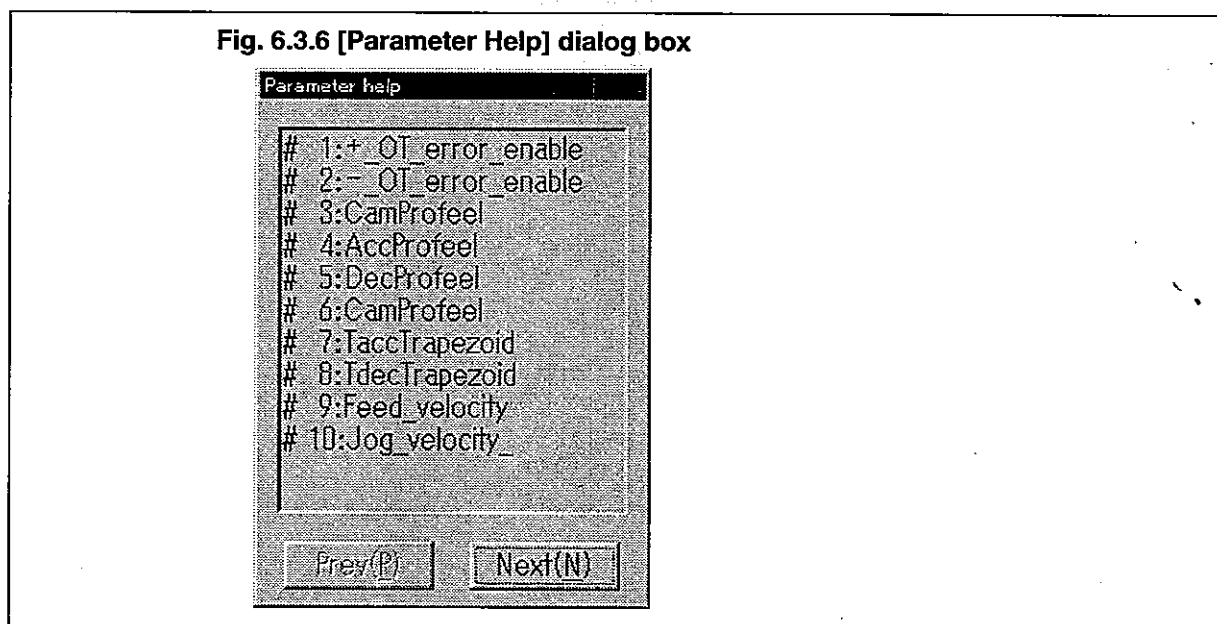
6.4 The Program Manager

The Program manager is used to upload registered files from the drive to the computer, for downloading file contents from the computer to the drive, for editing the file contents and for printing the files for hard copy purposes. Further, inside the program monitor feature it is possible to monitor the program execution and the data.

Clicking on the [Program Manager] button inside the [Main Menu] will display the [Program Manager] dialog box. Refer to **Fig. 6.4.1** for details. Clicking on the individual buttons inside this box will execute various features as required.

Fig. 6.4.1 [Program Manager] dialog box

Program Manager

UpLoad(U)

DownLoad(D)

Edit(E)

Monitor(M)

Com Reset(R)

Exit(X)
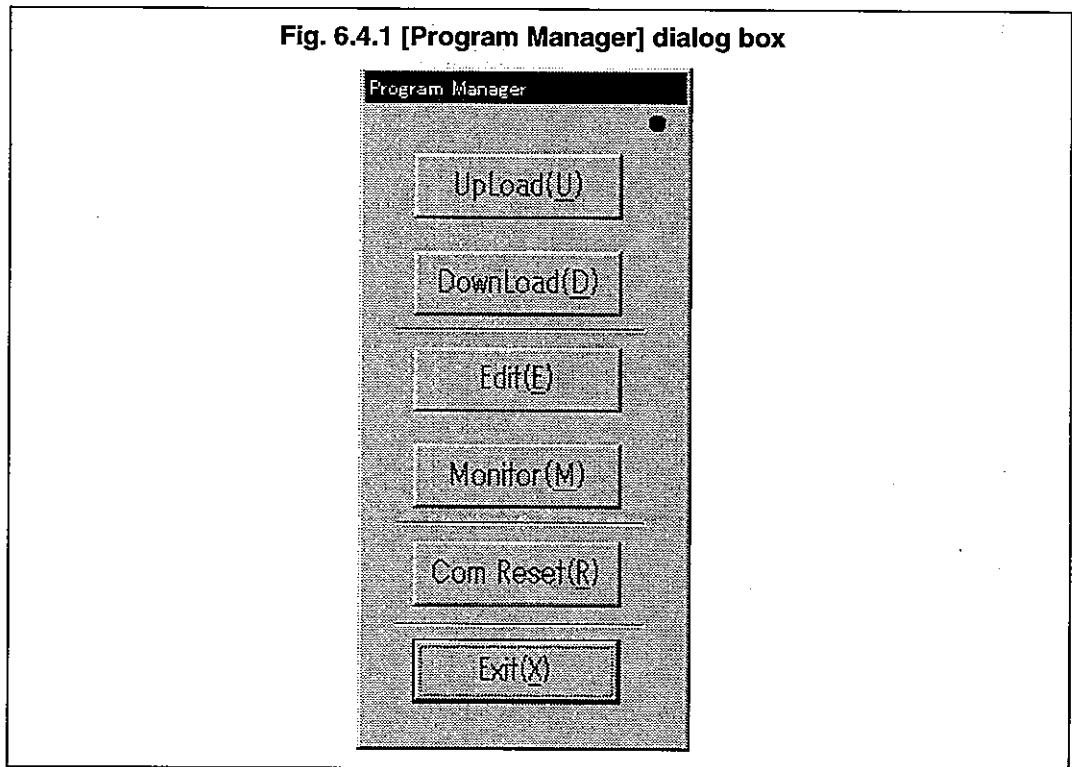
6.4.1 Uploading Programs

Clicking on the[Upload] button inside the [Program Manager] will bring up the [Type Selection] dialog box.

Standard Uploads

1. Click on the [Standard] button inside the [Type Selection] dialog box and then click on the [OK] button.

2. The [Property] dialog box will be displayed and at this point, input the Program number to upload and then click on the [OK] button.

NOTE: **The user definable programs may be stored in program numbers ranging from 0 to 89 and the program numbers 90 to 99 are reserved for the system programs.**

3. Input the name for storing the program file. The file extension (.prg) shall be automatically registered so kindly do not enter any file extensions.

4. Click on the [Save] button and this will commence the upload of information to the computer. You may stop this procedure at any point of time by simply clicking on the [Cancel] button.

Multiple Uploads

All the programs registered in the driver can be uploaded with a single command.

1. Click on the [All] button inside the [Type Selection] dialog box and then click on the [OK] button.

2. Input a program name to retrieve the information into. The file extension (.whp) shall be automatically registered so kindly do not enter any file extensions.

3. Click on the [Save] button to start the upload process. You may stop this procedure at any point of time by simply clicking on the [Cancel] button.

6.4.2 Downloading Programs

Clicking on the [Download] button inside the [Program Manager] (Refer to the **Fig. 6.4.1**), shall bring up the Type Selection] dialog box.

Standard Downloads

1. Click on the [Standard] button inside the [Type Selection] dialog box and then click on the [OK] button.

2. The [Property] dialog box will be displayed and at this point, input the Program number to download and then click on the [OK] button.

NOTE: **The user definable programs may be stored in program numbers ranging from 0 to 89 only (the program numbers 90 to 99 are reserved for the system programs).**

3. Input the program file name for downloading. The file extension (.prg) shall be automatically recognized, so kindly do not enter any file extensions.

4. Click on the [Open] button and this will commence the downloading of information to the drive. You may stop this downloading procedure at any point of time by simply clicking on the [Cancel] button.

Multiple Downloads

Based upon the program numbers specified in the program file, the programs file can be downloaded to the drive with a single command.

1. Click on the [All] button inside the [Type Selection] dialog box and then click on the [OK] button.

2. Input the desired program name into the field specified. The file extension (.whp) shall be automatically recognized, so kindly do not enter any file extensions.

3. Click on the [Open] button to start the download process. You may stop this procedure at any point of time by simply clicking on the [Cancel] button.

6.4.3 Reset Communications

If the driver experiences communication problems, use this feature to reset the communication system between the computer and the drive. In the [Program Manager] (**Fig. 6.4.1**), click on the [Communications Reset] button to reset the communication system and return the drive to normal status.

6.4.4 Editing Programs

The programs registered in the drive or those programs stored in a file on the computer can be easily edited using this feature. In addition, this feature may be used to store the programs on file after editing the same or even to register them on the drive.

In the [Program Manager] (**Fig. 6.4.1**), click on the [Edit] button to display the [Program Edit] display box as shown in **Fig. 6.4.4**:

Fig. 6.4.4 [Program Edit] dialog box
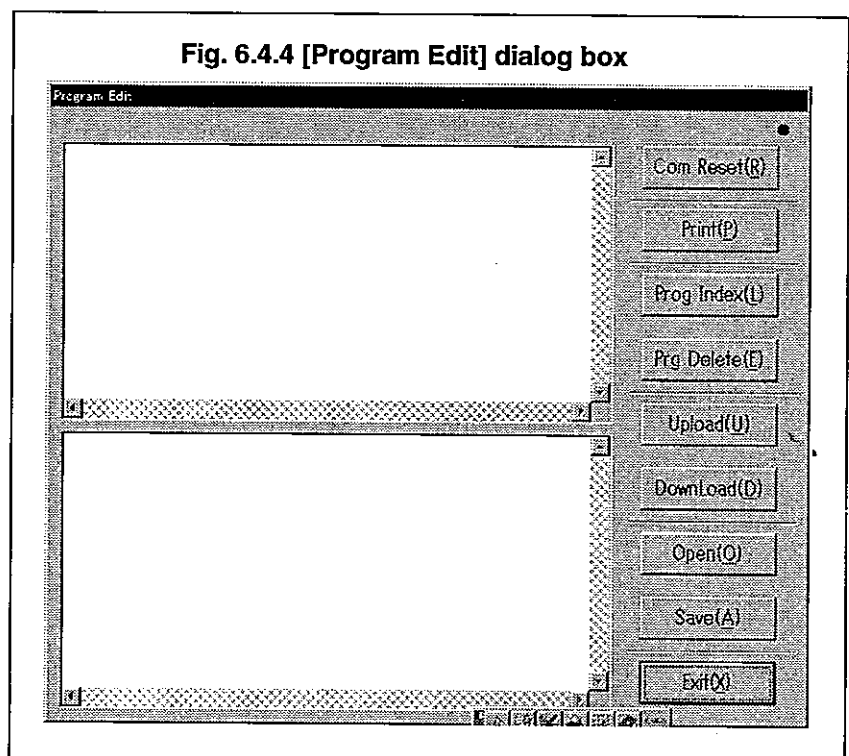
Editing Previously Stored Or Registered Programs

All the programs registered in the drive or, those programs stored on the computer can be edited easily.

Driver Programs

1. Click on the [Upload] button.
2. The [Property] dialog box will be displayed, then select the display window and enter the Program number here.
3. Click on the [OK] button and the Program contents shall be displayed.

Program Files

1. Click on the [Open] button.
2. The [Property] dialog box will be displayed, then select the display window and click on the [OK] button.
3. Enter the program number, click on the [Open] button and the Program contents shall be displayed. As the file extension (.prg) is automatically recognized, do not enter the file extension.

Registration Of Programs Into The Driver

1. Click on the [Download] button and the [Property] dialog box will be displayed.
2. Then select the display window enter the desired program number.
3. Check the required optional parameters and then click on the [Open] button. If the program has any built-in inherent errors, it cannot be downloaded into the driver and the relevant error line in the program shall be highlighted in RED.

   The **optional parameters** during downloading are listed as follows:

	Meanings (When the appropriate box is checked)
Servo ON settings	At the time of downloading, it is necessary that the driver is in Servo ON status, or else the download shall not be carried out.
Motion coordinates compatibility	At the time of downloading, if the coordinate system is incompatible the downloading process cannot be carried out.

Saving Programs In A File

1. Click on the [Save] button and the [Property] dialog box will be displayed.
2. Then select the display window which lists the desired program number and check the required optional parameters and then click on the [OK] button. The optinal parameters for saving are the same as those for downloading programs into the driver (see above).
3. Input the desired program name into the field specified and then click on the [Save] button. The file extension (.whp) shall be automatically registered, so kindly do not enter any file extensions.

Deleting Programs From The Driver

Click on the [Program delete] button and the [Property] dialog box will be displayed. Then enter the program number meant for deletion and click on the [OK] button.

Listing Programs Registered In The Driver

Clicking on the [Program Index] button will bring up a display of the programs registered in the driver along with the details about the programs such as the number of program blocks, loop blocks etc.

Printing The Programs

Clicking on the [Print] button will display the [Property] dialog box. Subsequently, select the display window containing the desired program file and then click on the [OK] button.

Communications Reset

If the driver to computer communications become abnormal due to any reason, use this button to reset the communication channels and thereby restore proper operations.

6.4.5 Program Monitor

When a program is under execution, the program number, the contents of a program, the block number under execution etc. can be monitored. In addition, the display of alarm/ error messages can be viewed too. It is also possible to view the sent and received messages etc.

NOTE: Based upon the operation mode of the driver, the function of the program monitor or the type of the buttons enabled in the program monitor window differ and, hence it is necessary to confirm the operation mode of the driver before carrying out monitoring.

Clicking on the [Program monitor] button inside the [Program Edit] window, will bring up the [Program Monitor Initialization] window (Refer to **Fig. 6.4.5**).

Enter the desired program number, the contents of which you wish to record into the relevant selection box. If you select the [ALL] feature, this will record the entire contents of all the registered programs in the driver. The program contents of a program number which has not been previously registered in the driver shall not be recorded or displayed.

Click on the [OK] button to begin the recording of the program contents. To return to the [Program Edit] window, click on the [Cancel] button.

When the recording of the program contents is complete, the [Program Monitor] dialog box window shall be displayed and another dialog box for the [Optional Settings] shall also be displayed on top of the above window (See **Fig. 6.4.6**).

Fig. 6.4.5 [Initialization Settings] dialog box
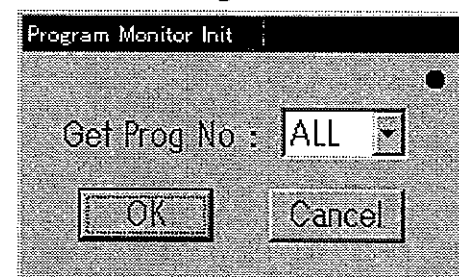
Fig. 6.4.6 [Optional Settings] dialog box
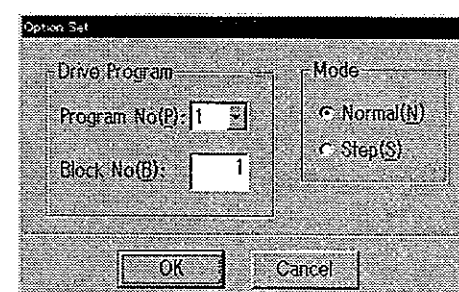
Optional Settings

1. Select the program desired for execution.
2. Input the block number desired for execution.
3. Select the move mode of operation. In the step mode of execution, the program shall stop after each step in the block.
4. Click on the [OK] button to set this selection or click on the [Cancel] button to exit from this mode and then return to the [Program Monitor] window (refer to **Fig. 6.4.7**)

Fig. 6.4.7 [Optional Settings] dailog box

M code edit box

Input edit box

Display edit box

Program contents display edit box

Run Program

Clicking on the [Run] button will commence running the program and the button [Terminate Program Execution] button will be displayed. After completion of all the programs, the system will automatically move to the Stop mode.

If the move operations mode is [Standard], then the system will execute the program number selected in the [Optional Settings] in sequential mode. In order to make changes, click on the [Optional Settings] and make relevant changes. Refer to the section on [Optional Settings] for further information regarding these settings.

While the program is under execution, the program number, block number etc. are displayed in the [Monitor] group. Further, the program statements and contents of the program under execution are displayed in the window in Yellow color.

Program Stop

Clicking on the [Stop] button will wait until the block under execution is complete and then stop the execution. Clicking on the [Abort] button will immediately abort the operation and stop.

Receiving & Sending Alphabetical Characters (Commands)

In the Input edit box, enter the commands or alphabetical characters and then press the Return Key. This will transmit the commands to the driver. After the receipt of these commands into the driver, the driver's response (if any) shall be transmitted to the computer and the responses are displayed in the Display edit box.

M Answer

Set the M function interface communication settings to serial communications. If the M -code outputs are enabled during the program execution, the M code edit box shall be displayed and it will display the M-code display. Clicking on the [M answer] will transmit the M answer to the driver.

Processing Error/ Alarm Warnings

When an error occurs, the [Error] messages are displayed. To reset this error, click on the [Error Reset] button.

In order to view the Error/ Alarm history, click on the [Error or Alarm] button (see **Fig. 6.4.8**). The errors or alarm history is displayed in the Display edit box of the [Error or Alarm] window, but however, the number of errors that can be displayed is restricted to 16 numbers only. Click on the [Update] button to refresh the data on the error/ alarm history details.

Fig. 6.4.8 [Error or Alarm] dialog box

Error or Alarm

ERR30 Servo_not_ready

— Display edit box

Update(F)
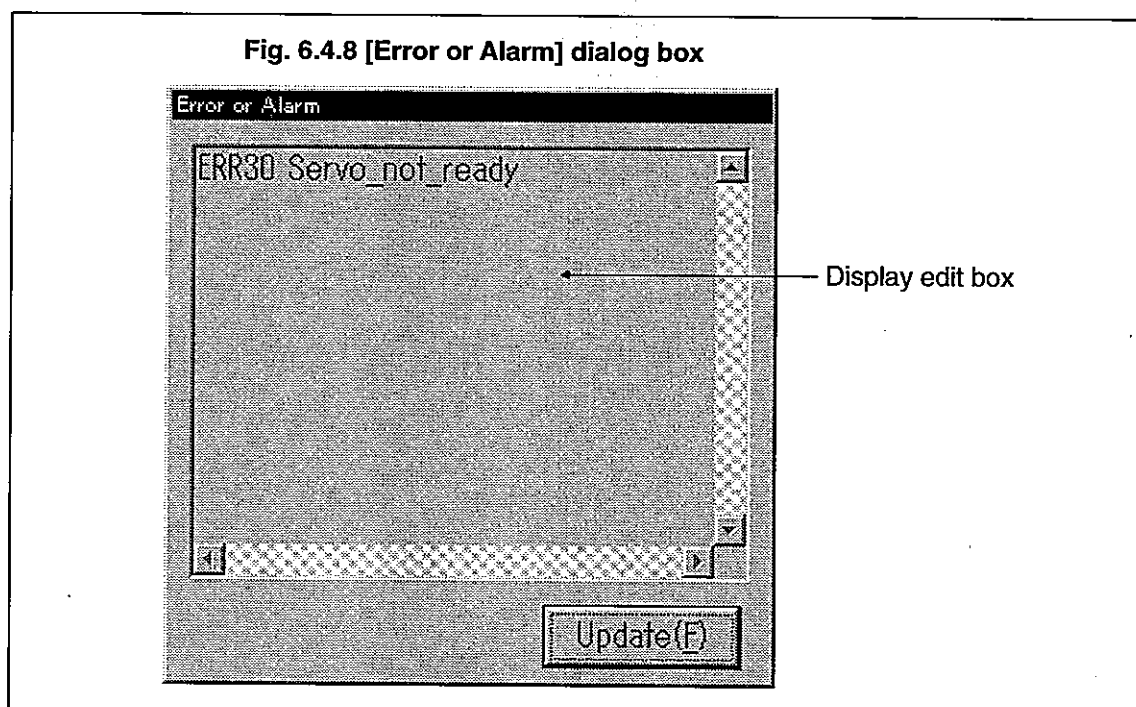
6.5 The Parameter Menu

The parameter menu may be used to upload the parameter values already registered in the drive onto a file on the computer; the contents of the parameters file created on the computer can be downloaded into the driver; the parameter values can be displayed on screen and the contents of the parameter file can also be printed.

Click on the [Parameter Menu] in the [Main menu] to display the [Parameter Menu] dialog box (Refer to **Fig. 6.5.1**). Clicking on the various buttons will execute the various function accordingly.

Fig. 6.5.1 [Parameter Menu] dialog box

Parameter maintenance

Upload(U)

Download(D)

View file(V)

Reset Com(R)

Exit(X)
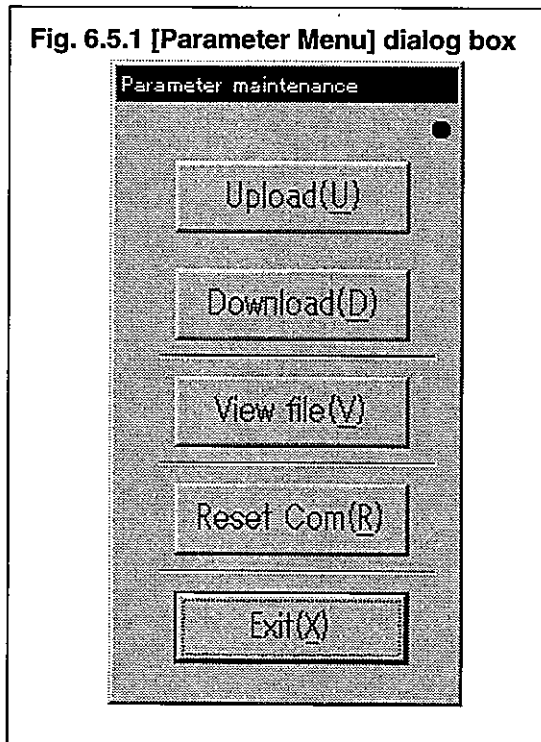
6.5.1 Uploading The Parameters

1. Click on the [Upload] button
2. Input the file name of the parameter to be saved. The file type (.prm) will be added automatically, thus do not add any file extensions.
3. Clicking the [Save] will start the upload. To stop the upload, click on the [Cancel] button.

6.5.2 Downloading The Parameters

1. Click on the [Download] button.
2. Input the file name of the parameter to be downloaded to the driver. The file type (.prm) will be added automatically, thus do not put add any extensions.
3. Clicking the [Save] will commence the download. To stop the downloading process, click on the [Cancel] button.
4. To update the downloaded parameters, reset the driver after completing the download process.

6.5.3 Display The Contents Of The Parameter File

1. Click on the [View] button.
2. Input the name of the parameter file to be viewed. The file type (.prm) will be added automatically, thus do not add any file extensions.
3. Clicking on the [Open] button will display the contents of the file in the [Parameter file display] dialog box.
4. Click on the [File print] button to print the file.

6.5.4 Communications Reset

If communication malfunction occurs during the driver-computer communications, clicking on the [Reset Com] will bring back the driver back to the normal status.

6.6 The Cam Profile Menu

The cam profile menu may be used to create an universal cam profile; upload the cam profile values from the drive into the computer; download the cam profile values already created inside the computer into the drive and further, the cam profile can be displayed on screen and the same can also be printed out.

Click on the [Cam Profile Menu] in the [Main menu] to display the [Cam Profile Menu] dialog box (See **Fig. 6.6.1**). Clicking on the various buttons will execute the various functions accordingly.

6.6.1 Creating An Universal Cam Profile

Clicking on the [Universal Cam] button inside the [Cam Profile Menu] dialog box shall display the [Universal cam profile] dialog box (see **Fig. 6.6.2**).

Fig. 6.6.1 [Cam Profile Menu] dialog box
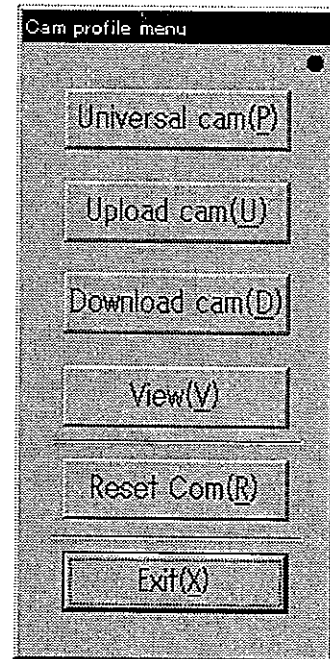
Fig. 6.6.2 [Universal cam profile] dialog box
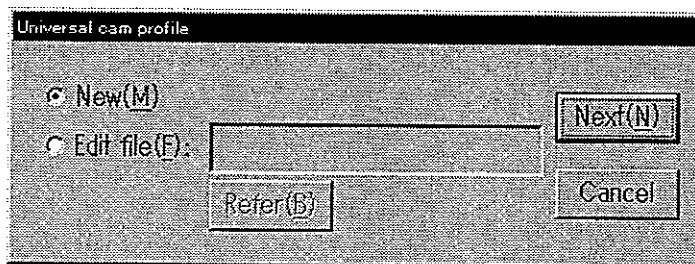
New Universal Cam Profile Creation

1. Click on the [New] button inside rthe [Universal cam] dailog box and then click on the [Next] button to display the [Universal cam profile] dialog box (see the **Fig. 6.6.3**).

2. Enter the dimension less data inputs for the parameters <T1> to <T6>. The valid data range is any value between 0 and 1. Press the carriage return (or the enter key) after making each of the entries so as to register the value correctly.

Note:

Fig. 6.6.3 [Universal camprofile] dialog box
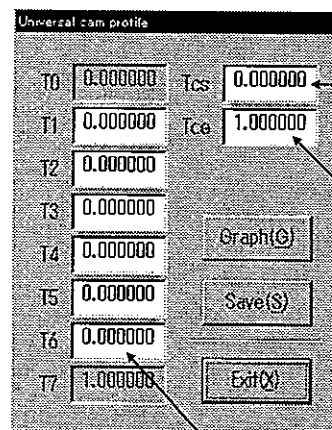
Modifiable 'Start' of Dimensionless cam data: Input edit box

Modifiable 'End' of Dimensionless cam data: Input edit box

Dimensionless data: Input edit box

Click on each of the input areas from <T1> to <T6> and enter any value between 0 & 1 by using the Numeric pad on the computer keyboard and press the return (enter) key to register each of the <T1> to <T6>. Kindly note however, that the values from <T1> to <T6> must be in strict ascending order. For example if a value of 0.3 is entered for <T3> then it is necessary that you must enter a value equal to 0.3 (or greater) for <T4> ; if, however, you do enter a value less than 0.3 for <T4> , the Program will automatically register it as 0.3.

3. After creating the cam curve profile like above, it is possible to select only a part of the curve if necessary. In the above window (**Fig. 6.6.3**), input the values of T_{cs} and T_{ce} and ensure that these values lie in the range of 0 to 1 . Further, remember to enter a carriage return after inputting the values. Note that it is absolutely essential to ensure that the value of T_{cs} does not exceed the value of T_{ce} and also ensure that the value of T_{ce} is not smaller than the value input for T_{cs}.

4. Click on the [Graph] button to immediately view the results of the selection (see **Fig. 6.6.4**). Inorder to print the graph displayed in **Fig. 6.6.4**, click on the [Print] button on the top of the [Graph] dialog box.

Fig. 6.6.4 Graphical depiction of the universal cam profile

Graph depiction

V_{max}: Non-dimensional maximum velocity

V_{min}: Non-dimensional minimum velocity

V_s: Non-dimensional starting velocity

V_e: Non-dimensional terminal velocity

A_{max}: Non-dimensional maximum acceleration

A_{min}: Non-dimensional minimum acceleration

Each of the parameters are depicted in color as given here
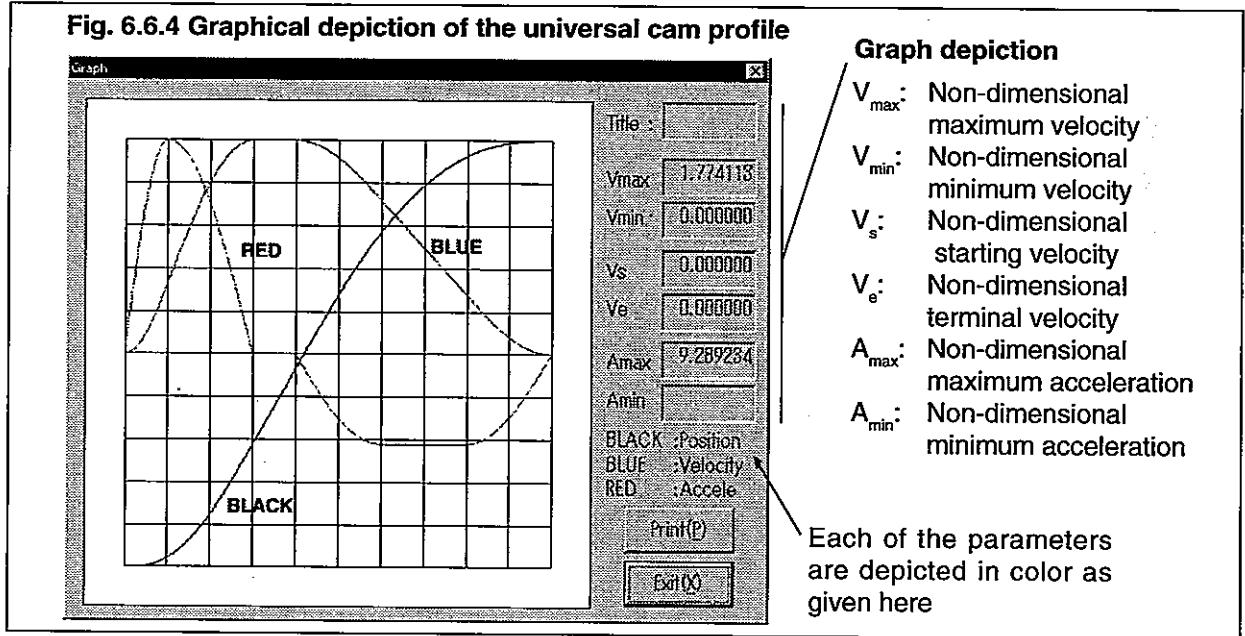
Graph Depiction:

The horizontal and vertical axes depicted on this graph are both non-dimensional. The curve in Black is the non-dimensional Position representation. The Blue curve represents non-dimensional velocity values and the Red curve represents the non-dimensional acceleration values. The left of the horizontal axis has a values of 0 and the right end is taken to be 1.

Similarly, the vertical axis depicting Position starts with a non-dimensional value of 0 at the bottom of the graph on the left and equals 1 at the top right end of the graph. The Velocity curve starts with a value of 0 at origin and ends with a value of 0 and has a maximum non-dimensional value of 1 in the middle. The non-dimensional acceleration curve has a value of 0 in the middle of the graph where it crosses over from a positive value to a negative value. The maximum value of this acceleration in the positive direction is depicted as A_{max} and the minimum value is in the negative direction and referred to as A_{min}.

Saving The 'universal cam profile' In A File

1. Click on the [Save] button in the [Universal cam profile] box.
2. Input a file name to store the universal cam profile. The file type (.unv) will be added automatically, thus do not add any file extensions.
3. Clicking on the [Save] button will store the file. To stop the save process, click on the [Cancel] button.

NOTE: Whenever a universal cam profile is stored in a file, simultaneously yet another file is also created on the computer drive with an identical name but a different file extension (file extension is .cdt).

Close The [Universal cam profile] Dialog Box After Saving The Data In A File

1. Click on the [Exit] button in the [Universal cam profile] box. This will bring the display of a message box which will prompt for saving the data in a file.
2. Click on the [Save] button if you need to save the file. The process is the same as in the section above. Refer to 'Saving the universal cam profile in a file' for more details.
3. Clicking on the [No] button will abort the save process and exit from the menu. To return to the [Universal cam profile] dialog box, click on the [Cancel] button.

Editing The Universal Cam Profile file

1. Click on the [File edit] button in the [Universal cam Menu] dialog box (Refer to **Fig. 6.6.2**).
2. Input the correct file name of the stored universal cam profile in the Input edit box window [the file type (.unv) must be used]. If the file name or the path to the file location is unknown, click on the [Browse] button to seek for it.
3. Clicking on the [Next] button will bring up the [Universal cam profile] dialog box (refer to **Fig. 6.6.3**).
4. Then follow the same procedure as described in 'New Universal Cam Profile Creation'.

6.6.2 Uploading The Cam Profiles

Clicking on the [Cam Profile Upload] button in the [Cam profile menu] dialog box (see **Fig. 6.6.1**), will bring up the display of the [Type selection] dialog box.

Standard Uploads

1. Click on the [Standard] button in the [Type selection] dialog box and then click on the [OK] button.
2. Input the cam profile number to read the universal cam profile data from and then click on the [OK] button.

    The driver has the capability of storing 16 cam profiles. However, the cam profiles numbering 1 to 8 are standard cams and the cam profiles 9 to 16 are available for user defined cams.

3. Input a file name to store the universal cam profile. The file extension (.cdt) will be added automatically, thus do not add any file extensions.
4. Click on the [Save] button to commence uploading of the data. To stop the save process, click on the [Cancel] button.

Multiple Uploads

All the cam profiles stored in the driver can be uploaded with a single command.

1. Click on the [Multiple] button in the [Type selection] dialog box and then click on the [OK] button.
2. Input a file name to store the data from multiple universal cam profiles. The file extension (.whc) will be added automatically, thus do not add any file extensions.
3. Click on the [Save] button to commence uploading of the data. To stop the save process, click on the [Cancel] button.

NOTE: Whenever the multiple universal cam profiles are stored in a single file, simultaneously yet another file is also created on the computer drive with an identical name but a different file extension (file extension is .cdt). The registered cam profile numbers are also appended to the cam profile data file.

6.6.3 Downloading The Cam Profiles

Clicking on the [Cam Profile Download] button in the [Cam profile menu] dialog box (see **Fig. 6.6.1**), will bring up the display of the [Type selection] dialog box.

Standard Downloads

1. Click on the [Standard] button in the [Type selection] dialog box and then click on the [OK] button.
2. Input the cam profile number to download the universal cam profile data to and then click on the [OK] button.

    Note that the cam profiles numbering 9 to 16 are alone available for user downloads.

3. Input a file name with the universal cam profile meant for downloading. The file extension (.cdt) will be added automatically, thus do not add any file extensions.
4. Click on the [Open] button to commence downloading of the data. To stop the downloading process, click on the [Cancel] button.

Multiple Downloads

All the cam profiles stored in single file can be downloaded at once.

1. Click on the [Multiple] button in the [Type selection] dialog box and then click on the [OK] button.
2. Input a file name with the multiple universal cam profiles data. The file extension (.whc) will be added automatically, thus do not add any file extensions.
3. Click on the [Open button to commence the downloading of the data. To stop the downloading process, click on the [Cancel] button.

6.6.4 Viewing The Cam Profiles

The cams registered in the driver or the various cam profiles stored in data files on the computer are easily viewed on screen with graphical representation.

Clicking on the [Cam View] button in the [Cam profile menu] dialog box (see **Fig. 6.6.1**), will bring up the display of the [Cam profile view] dialog box as shown in **Fig. 6.6.5.**

Fig. 6.6.5 [View cam profile] dialog box

File name input edit box
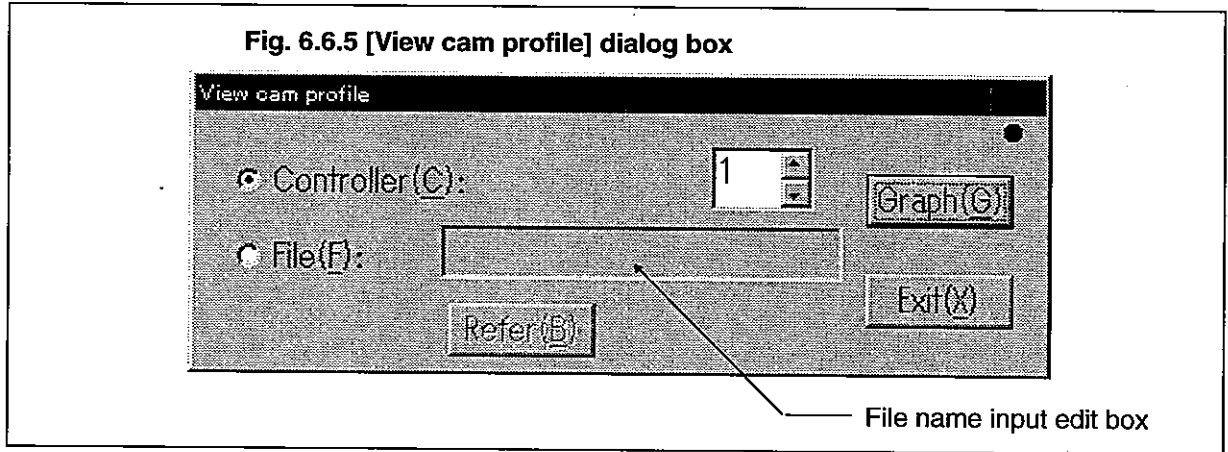
Viewing The Cam Profiles Registered In The Driver

1. Click on the [Controller] button inside the [Cam View] dialog box.
2. Input the desired cam profile number for viewing.
3. Click on the [Graph] button to display the graphical depiction of the cam profile on screen.
4. For details on the graph refer to the section on **New Universal Cam Profile Creation** and also see **Fig. 6.6.4 (Graphical depiction of the universal cam profile)** for explanations.

Viewing The Cam Profiles Stored In Cam Profile Data Files On The Computer

1. Click on the [Filer] button inside the [Cam View] dialog box.
2. Input a file name for the universal cam profiles data in the file name input edit box. The file extension (.cdt) must also be added. If the file name or the path to the file location is unknown, click on the [Browse] button to seek for it.
3. Click on the [Graph] button to display the graphical depiction of the cam profile on screen.
4. For details on the graph refer to the section on **New Universal Cam Profile Creation** and also see **Fig. 6.6.4 (Graphical depiction of the universal cam profile)** for explanations.

6.6.5 Communications Reset

If communication malfunction occurs during the driver-computer communications, clicking on the [Reset Com] button in the [Cam profile menu] dialog box (see **Fig. 6.6.1**) will bring back the driver back to the normal operations status.

6.7 Point Settings

The 'Point setting' menu is used to edit the tables used in point location moves.

Clicking on the [Point setting] in the [Main menu] will display the [Point setting table] dialog box (see the **Fig. 6.7.1**). The coordinates of points specified in the driver will be displayed in the point value display edit box. To change the point coordinate values, use the 'Point n number' parameter in the Terminal mode.

Fig. 6.7.1 [Point Settings Table] dialog box

6.7.1 Point Data Inputs

1. Input the point data into the data input edit box.
2. Pressing the ENTER key (the carriage return key) will confirm the input, and the cursor will automatically move to the next point data input setting.
3. Click on the [All clear] button to initialize all the data fields to default settings (data is reset to 0).

6.7.2 Data Uploads & Downloads

Clicking the [Recall] will read and display the point data registered in the drive.
Clicking the [Register] will register the point data in the display table onto the drive.

6.8 Indexing Compensation

Indexing compensation uses the compensation table during the index moves. It is possible to download the index compensation values registered in the driver onto a file on the computer or to upload a compensation table created on thje computer ont othe driver. Further, this mode also enables the editing of the compensation table values.

Click on the [Index compensation] button in the [Main menu] to bring up the display of the [Index compensation menu] dialog box **(Fig. 6.8.1)**.

Fig. 6.8.1 [Index compensation menu] dialog box
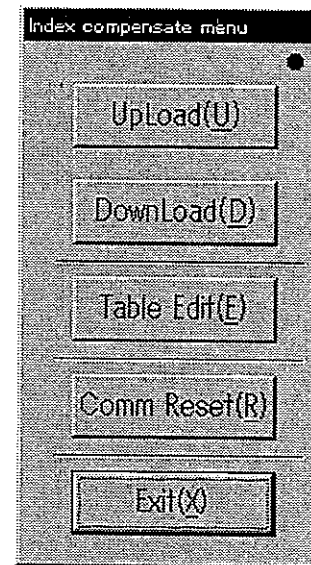
6.8.1 Uploading The Compensation Table

Click on the [Upload] button in the [Index compensation menu] box to display the [Typel selection] dialog box.

Standard Uploads

1. Click on the [Standard] button in the [Model selection] dialog box and then click on the [OK] button.
2. Select the table for uploading and then click on the [OK] button.
   There are two types of indexing compensation tables namely, Table A & Table B.
3. Input the file name for the compensation table to be saved to. The file extension (.idx) will be added automatically, thus do not add any file extensions.
4. Click on the [Save] button to commence the upload process. To stop or abort the upload process, click on the [Cancel] button.

Multiple Uploads

Uploading all the compensation tables registered in the drive.

1. Click on the [All] button in the [Type selection] dialog box and then click on the [OK] button.
2. Input a file name to save the data from all the index compensation tables. The file extension (.whi), will be added automatically, thus do not append a file extension.
3. Click on the [Save] to commence the multiple upload process. To stop or abort the upload, click on the [Cancel] button.

Note: Executing the multiple upload process, will create the single compensdation table file along with the individual compensation table with the extension as (.idx). The registered table number will be also be added to the name of the indexing compensation file.

6.8.2 Downloading The Compensation Table

Click on the [Download] button in the [Index compensation menu] dialog box to bring up the [Type selection] display (see **Fig. 6.8.1**).

Standard Downloads

1. Click on the [Standard] button in the [Type selection] dialog box and then click on the [OK] button.
2. Select a table for downloading and then click on the [OK] button.
3. Input the file name of the Index compensation file for due downloading. The file extension (.idx) will be recognized automatically, thus do not add any file extensions.
4. Click on the [Open] button to commence the download process. To stop or abort the download process, click on the [Cancel] button.

Multiple Downloads

This process enables the download of the compensation tables in accordance with the contents of the Multiple Index Compensation file.

1. Click on the [All] button in the [Type selection]dialog box band then click on the [OK] button.
2. Input the file name of the Multiple Index Compensation file for due downloading. The file extension (.whi) will be appended automatically, thus do not add any file extensions.
3. Click on the [Open] button to commence the multiple download process. To stop or abort the multiple download process, click on the [Cancel] button.

6.8.3 Editing The Compensation Table

It is possible to edit the compensation table registered in the drive or, to edit the table saved as a file on the computer also. Further, it is also possible to register the edited table file into the driver and to save it on a disk file.

Click on the [Table edit] button in the [Index compensation menu] (see **Fig. 6.8.1**) to bring up the display of the [Index compensation table] dialog box (see **Fig. 6.8.2**).

Fig. 6.8.2 [Index compensation table] dialog box

Point value display edit box
Data input edit box
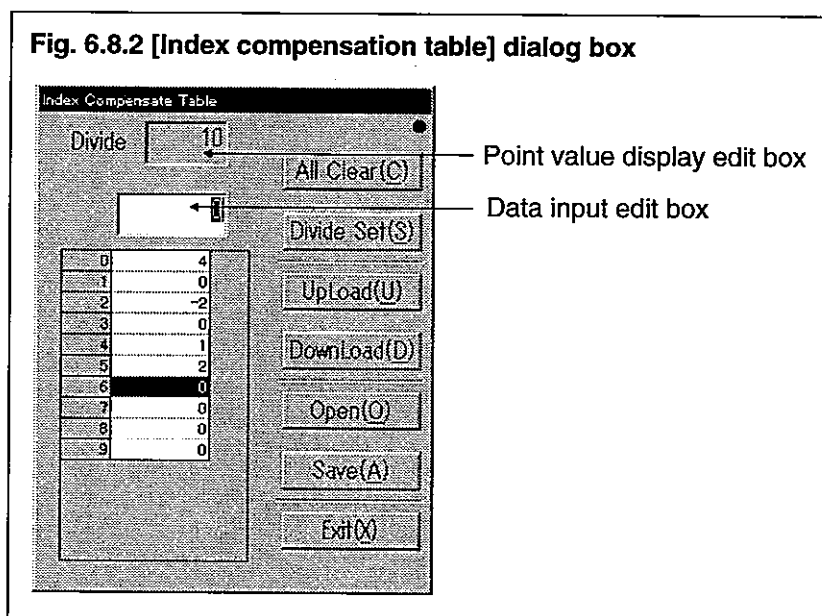
Compensation Data Input

1. Input the compensation data into the data input edit box.
2. Press the Enter key (the carriage return key) to confirm the data input and the cursor will automatically move to the next data field.
3. Click on the [All clear] button to initialize all the data to default values (reset to data 0).

Modifying The Index Table Point Values

Click on the [Change Indexing number] button to change the indexing values. Once the [Change Indexing number] dialog box is displayed, input the indexing values and then click on the [OK] button.

Editing The Existing Index Table Point Values

The table registered in the drive or the index compensation file stored on the computer can easily be edited.

Driver Table

1. Click on the [Call] button.
2. Select the desired table you wish to bring up and then click on the [OK] button.

Index Compensation File

1. Click on the [Open] button..
2. Input the name of the indexing compensation file and then click on the [Open] button.

Registration Of The Table In The Drive

1. Click on the [Register] button.
2. Select the registered table, then click on the [Open] button.

Saving The Table Values In A File

1. Click on the [Save] button.
2. Input the name of the index compensation file to save the data onto and then click on the [Save] button. The file extension (.idx) is appended automatically, thus do not add any file extensions.

6.8.4 Communications Reset

If communication malfunction occurs during the driver-computer communications, clicking on the [Reset Com] button in the [Index compensation menu] dialog box (see **Fig. 6.8.1**) will bring the driver back to the normal operation status.

6.9 I/O Settings

It is possible to make various settings regarding the driver's I/O by using the [I/O settings menu].

Click on the [I/O configuration menu] button in the [Main menu] dialog box to display the [I/O settings menu] dialog box (refer to **Fig. 6.9.1**)

Fig. 6.9.1 [I/O configuration menu] dialog box
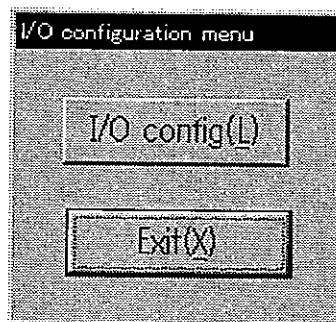
6.9.1 Changing The Operation Logic Settings

The operations logic for the driver's CN2 connection can be changed as desired.

Click on the [Logic settings] button in the [I/O settings menu] to bring up the display of [Logic Settings] dialog box (see **Fig. 6.9.2**).

1. Each of the I/O terminals have a check box designator. Use the computer's mouse to click on the check box to mark them or unmark them as needed.

   The checked box indicates a Type A logic (positive pull up) and the unchecked box indicates the Type B logic (positive sink).

2. Click on the [Configure] button to set the type.

3. These settings shall become valid after resetting the driver once.

NOTE: The setting made here can be copied into the Flash ROM and also restored from there. However, the PC utility software cannot upload these values or download the same either.

Fig. 6.9.2 [Logic setting] dialog box

— DI logic setting

— DO logic setting
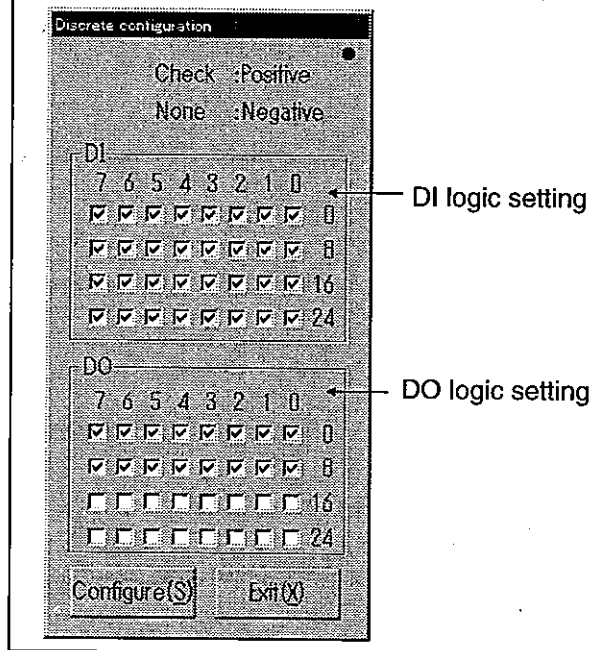
6.10 Servo Settings

The execution of Auto-tuning mode, execution of the test mode, monitoring of the servo parameters etc., can be undertaken in this [Servo settings menu] dialog box. It is also possible to make adjustments to the control loop filter values to avoid mechanical resonance in the Servo system configuration.

Fig. 6.10.1 [Servo settings] dialog box
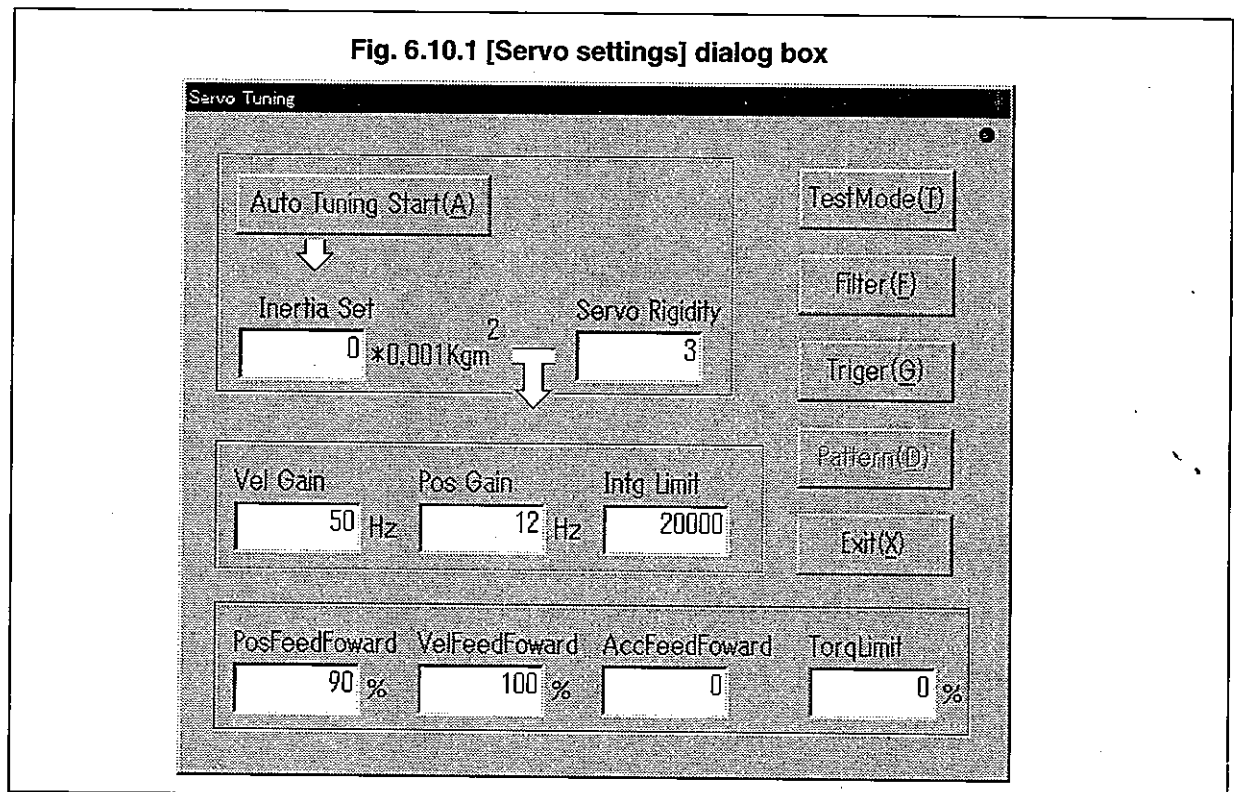
6.10.1 Execute Auto-tuning

The driver carries out the Auto-tuning of the motor and load inertia by making small oscillating movements and estimating the servo parameters and using these for it's servo settings.

NOTE: The motor is subjected to a maximum of 45° rotation back and forth in order to estimate the inertia. However, the maximum rotation angle is subject to change.

Before carrying out the auto-tuning, it is necessary to set the servo stiffness for the system.
The value of servo stiffness range from a low of 1 to a maximum of 5 and the default setting is 3.

After the execution of auto-tuning, the values of velocity control loop bandwidth, the position control loop band width and the position loop integral limiter values change accordingly.

NOTE: It is necessary that the driver be set in the RS232C control mode see <**Section 3.4.2**> for the mode settings or else, clicking on the Auto-tuning feature **will not** have any effect on the driver.

6.10.2 Execute The Test-mode Run

The driver is subject to small oscillating movements and estimating the servo parameters and the response of the driver-motor system is monitored on an oscilloscope and the results are used for setting the various servo parameter settings. (The default value for these oscillations are 1800 pulses).

The test mode is used to set the values of the velocity control loop bandwidth, the position control loop band width and for the position loop integral limiter.

NOTE: If the auto-tuning feature is used for setting the servo parameters and the system behaves in a stable manner, it is not necessary to carry out this test-mode run.

NOTE: It is necessary that the driver be set in the RS232C control mode see <**Section 3.4.2**> for the mode settings or else, clicking on the Auto-tuning feature **will not** have any effect on the driver.

6.10.3 Filter Settings

If the motor shows resonance even after the completion of tuning, it may be necessary to change the filter settings The menu displayed below is used for making changes to the 1st Order delay filter settings. Run through the settings from 40/160, 30/120, 20/80 in that sequence to locate the best response.

If the servo system response does not show satisfactory response despite running through the various filter changes, then it may be necessary to make changes to the control loop by incorporating the Notch filter in it (Optional). To use the notch filter, check the [None] box in the 1st order delay filter dialog box, then select an appropriate cutoff frequency from the notch filter settings and click on the [Set] button. Run through the frequency selections to locate the best settings. (For more details on the notch filter, consult **Yokogawa Precision Corporation** or it's authorized dealers.

Fig. 6.10.2 [Filter settings] dialog box
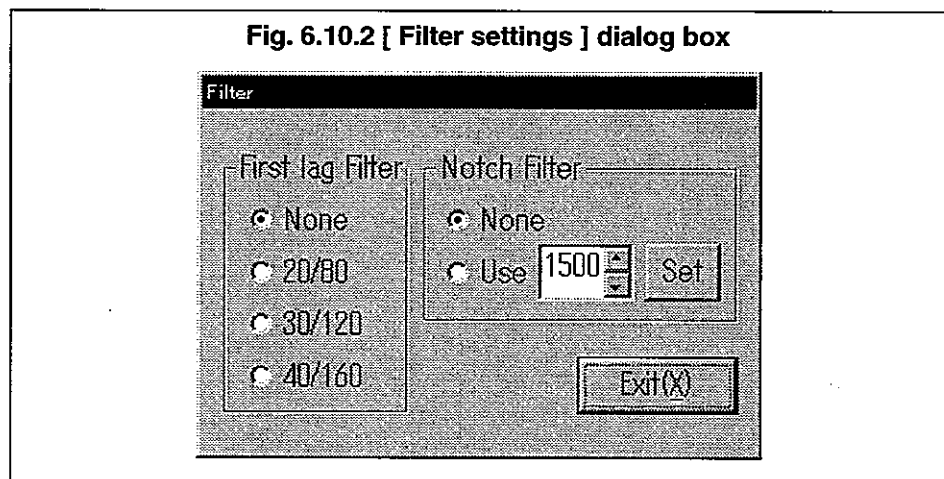
6.10.4 Display The Motor Response Curves

In the absence of an oscilloscope, it is possible to view the position variation, velocity, position error, the COIN signal etc. as a graphical representation on the computer screen itself. The process is described briefly herewith: 2. Start moves (Operate the motor system).

1. Set the Trigger value

Input the Trigger type, time and the trigger point values in the Trigger condition] dialog box and then click on the [Start] button.

Fig. 6.10.3 [Trigger Condition] dialog box
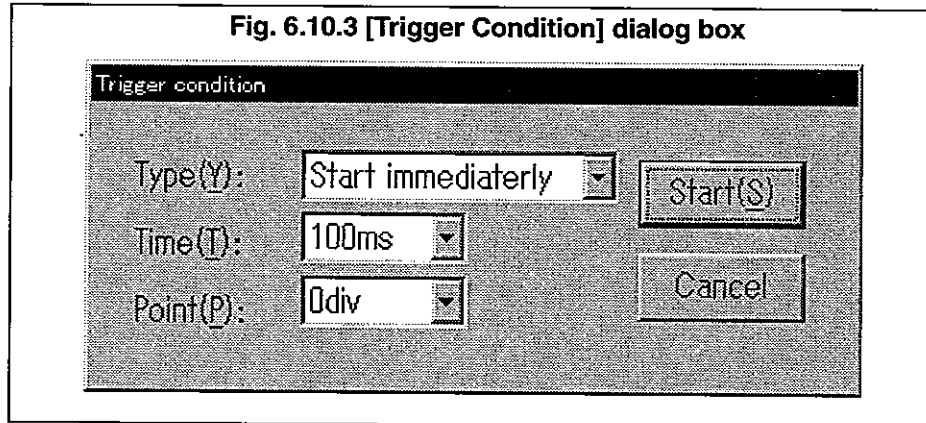
2. Start moves (Operate the motor system).

3. Graphical viewing of the response and command signals.
Click on the [View curves] button. The data shall be displayed on screen. However, the data transmission may not be immediate and it takes a littile time (few seconds) to plot the curves on screen.
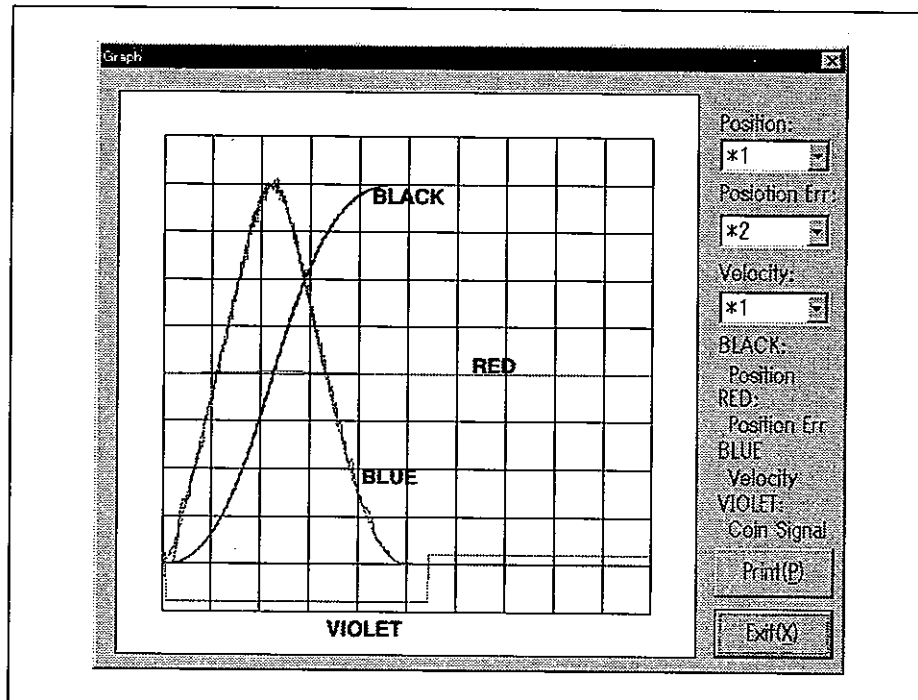
NOTE: It is possible to change the scaling for the display of the position, position error and the velocity of the move as desired for a clear and understandable display. The horizontal axis is the time value and the Vertical axis is automatically adjusted for the dsplay height.

7. Operation Display Pendant (TBX)

7.1 Outline

Connect this teaching pendant to the CN1 connector of the DYNASERV M-type driver.

7.2 Features And Part Descriptions

16 X 2 display

Emergency stop

Use the parameter #91 (TBX_EMG settings) to change the state of the servo system upon the use of the Emergency stop

KEYS (Push type)
Upper level: Direct input keys
Lower level: Press theSHIFT and then push the desired keys.

CR (Carriage return)
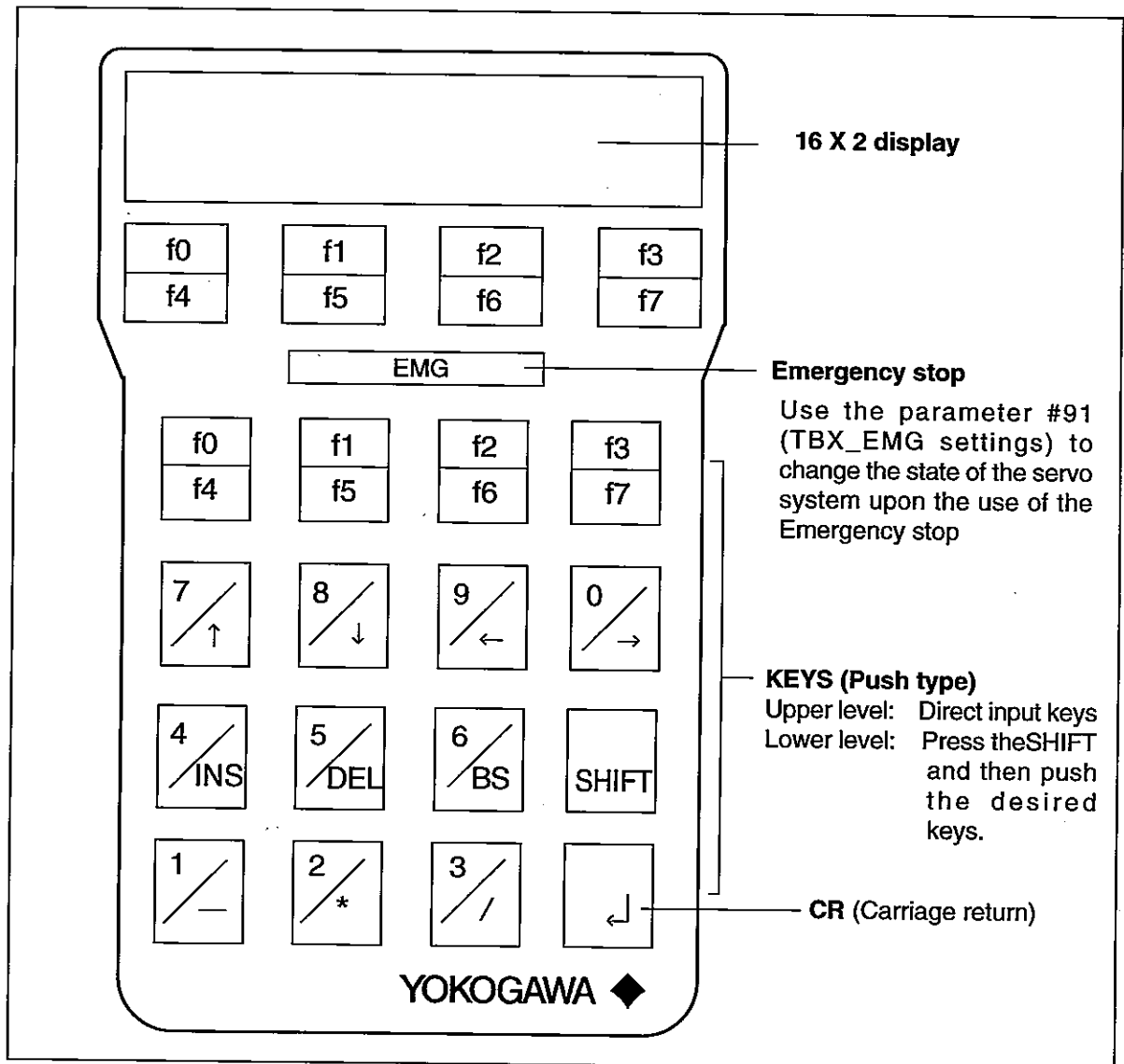
7.3 Connections

Upon the first connection to the CN1 connector in the DYNASERV, the teaching box pendant will display the following and then switch to the terminal mode operations.

YOKOGAWA
DYNASERV
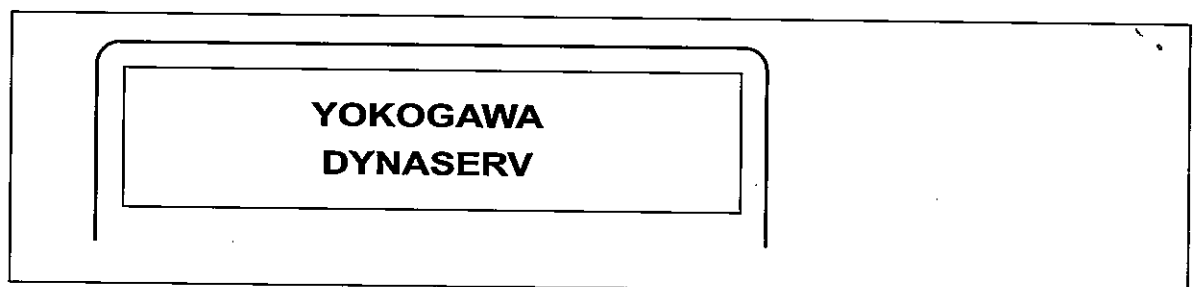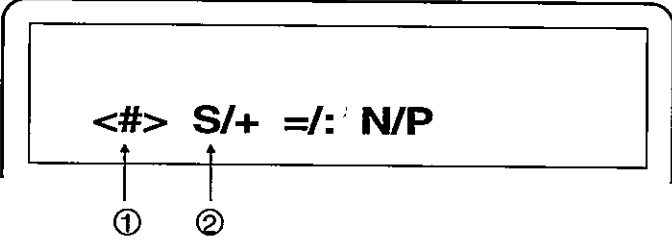
7.4 Switching Displays

Use the f3 key (NEXT) to switch forward between the displays (the default is the terminal mode of display). The f7 key (PREV) may be used to switch backwards between the various menus.

```
          ┌──────────────────────────┐
          │                          │   Terminal
          │   <#>  S/+  =/:  N/P      │   mode
          │                          │   display
          └──────────────────────────┘
                       │
          ┌──────────────────────────┐
          │   #001: +HARD OT_EN       │   Parameter
          │   -MON-      DATA  N/P     │   monitor
          │                          │   display
          └──────────────────────────┘
                       │
          ┌──────────────────────────┐
          │   #001: +HARD OT_EN       │   Parameter
          │   -SET-      DATA  N/P     │   settings
          │                          │   display
          └──────────────────────────┘
                       │
          ┌──────────────────────────┐
          │   PLC DIO: XXXXXXXX        │   DI/O
          │   -I/O-        SEL  N/P    │   monitor
          │                          │   display
          └──────────────────────────┘
                       │
          ┌──────────────────────────┐
          │   CMD: RefErrSts           │   Special
          │   -Spc-        SEL  N/P    │   error
          │                          │   display
          └──────────────────────────┘
                       │
          ┌──────────────────────────┐
          │   Program Menu             │   Program
          │   EDT  DEL  DIR  N/P       │   menu
          │                          │   display
          └──────────────────────────┘
```
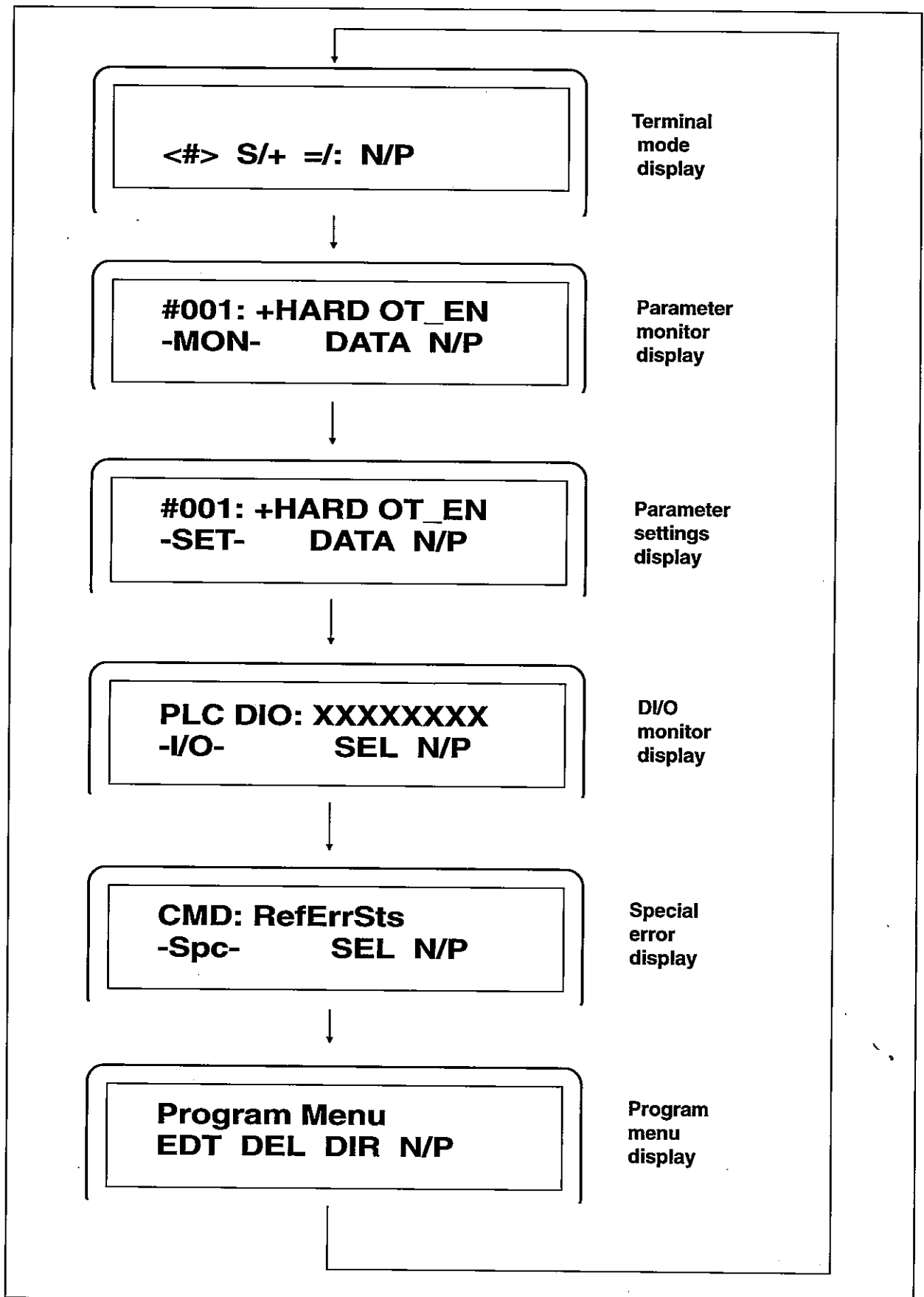
7.5 Menu Displays

7.5.1 Terminal mode display

```
            <#>  S/+  =/:  N/P
             ↑    ↑
             ①    ②
```
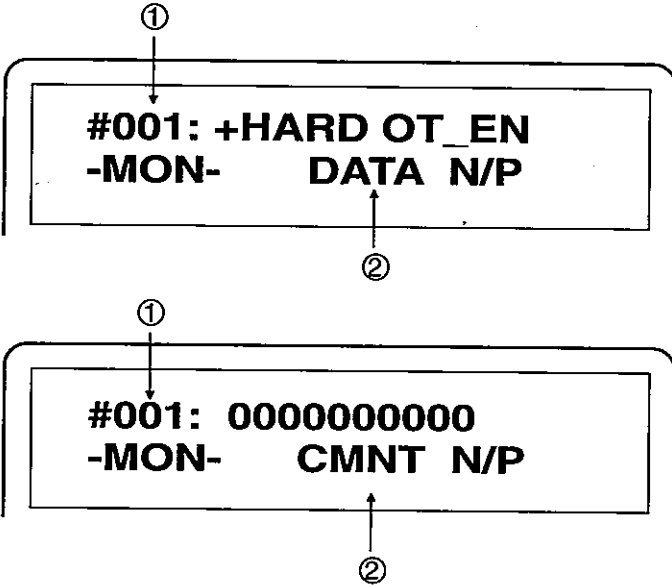
①   Use the f3 key to switch between #/@/G/X/F/f/A/a/M/P
     The f4 key may be used to switch through the above in the reverse order.

②   Use the f1 key to input the character selected in 1 above and it shall be displayed
     Use the f5, f2, f6 keys and the numeric inputs and then press the CR key to enter.

※   Use the ↑ key to scroll upwards between the various lines entered and the relevant line shall be displayed. However, scrolling is permitted up to 16 lines only. Editing the various lines is also permitted.
     The → and the ← keys may be used to move horizontally along the lines and editing is also permitted.

7.5.2 Parameter Monitor Display

```
                  ①
                  ↓
            #001: +HARD OT_EN
            -MON-     DATA  N/P
                        ↑
                        ②


                  ①
                  ↓
            #001: 0000000000
            -MON-     CMNT  N/P
                        ↑
                        ②
```

①   Use the numeric keys to input the parameter numbers.
②   Use the f2 key to switch between the DATA/CMNT fields.

7.5.3 Parameter Settings Display

①

```
#001: +HARD OT_EN
-Set-      DATA N/P
```

②

①   ③

```
#001: 0000000000
-Set-      CMNT N/P
```

②

①   Use the numeric keys to switch between the various parameter numbers.
     Use the → and the← keys to move between the various characters. Further, the ↑ and
     the ↓ keys can be used to change the parameter numbers.
②   Use the f2 key to switch between the DATA/CMNT fields.
③   Input numeric data using the numeric keys and then press the CR (Carriage return) key.
     Use the → and the ← keys to move between the various characters. Further, the ↑ and
     the ↓ keys can be used to change the parameter numbers.

7.5.4 D I/O Monitor Display

②

```
PLC DIO: XXXXXXXX
-I/O-       SEL N/P
```

①

①   Use the f2 key to switch between the DI/ DO/ AXIS DI
②   The IO sub fields may also be switched through.

O indicates ON, X indicates OFF

DI	0	CN2	0 to 7
	1	CN2	8 to 15
	2	CN2	16 to 23
	3	CN2	24 to 31
DO	0	CN2	0 to 7
	1	CN2	8 to 15
	2	CN3	0 to 7
	3	CN3	8 to 15
AXIS DI0	XXXXXXXX		
AXIS DI1	XXXXXXXX		

AXIS DI0: XXXXXXXX
— Homing proximity signal
— + direction over travel hard limit signal } Other signals are not used
— – direction over travel hard limit signal

AXIS DI1: XXXXXXXX
— Mark sense signal } Other signals are not used

7.5.5 Special Error Display

```
┌──────────────────────────────────┐
│   CMD: RefErrSts                 │      Display
│   -Spc-  SEL  N/P                │      error
│                  ↑               │      number
│                  ①              │
├──────────────────────────────────┤
│   CMD: toModel15                 │      Execute
│   -Spc-  SEL  N/P                │      mechanical
│                  ↑               │       settings mode
│                  ①              │
├──────────────────────────────────┤
│   CMD: RefErr                    │      Error
│   -Spc-  SEL  N/P                │      reset
│                  ↑               │
│                  ①              │
└──────────────────────────────────┘
```

①   Use the f3 key to switch between various special menus

◆ **Error Number Display**

```
┌──────────────────────────────────┐
│                                  │
│     CMD: RefErrSts               │
│     -Spc-  SEL  N/P              │
│                  ↑               │
│                  ①              │
└──────────────────────────────────┘
```

Enter the return key to display the errors starting with the very first one.

```
┌──────────────────────────────────┐
│   ERR49  Homing  incomplete      │      Upon the emanation of the
│   -Spc-  SEL  N/P                │      error
│                                  │
└──────────────────────────────────┘
```

```
┌──────────────────────────────────┐
│   No error                       │      When the driver is in the
│   -Spc-  SEL  N/P                │      normal state without errors
│                                  │
└──────────────────────────────────┘
```

②   Use the f3 key to return to the error number display screen.

◆ Mechanical Settings Mode Display

```
┌─────────────────────────────┐
│  CMD: toModel15             │
│  -Spc-  SEL  N/P            │
└─────────────────────────────┘
```

①   Press the return key to enter the Mechanical settings mode display

```
┌─────────────────────────────┐
│  Model15Executing          │
│  -Spc-  SEL  N/P            │
└─────────────────────────────┘
```
Upon
succesful
execution

```
┌─────────────────────────────┐
│  NG! [ALM**]               │
│  -Spc-  SEL  N/P           │
└─────────────────────────────┘
```
Malfunction
or
error status

②   Press the f3 key to retrun to the Mechanical settings mode display.

◆ Error Reset Display

```
┌─────────────────────────────┐
│  CMD: RstErr                │
│  -Spc-  SEL  N/P            │
└─────────────────────────────┘
```

①   Press the return key to reset the error status.

```
┌─────────────────────────────┐
│  OK                         │
│  -Spc-  SEL  N/P            │
└─────────────────────────────┘
```
Upon
succesful
execution

```
┌─────────────────────────────┐
│  NG! [ALM**]               │
│  -Spc-  SEL  N/P           │
└─────────────────────────────┘
```
Malfunction
or
error status

②   Press the f3 key to return to the Error rest display.
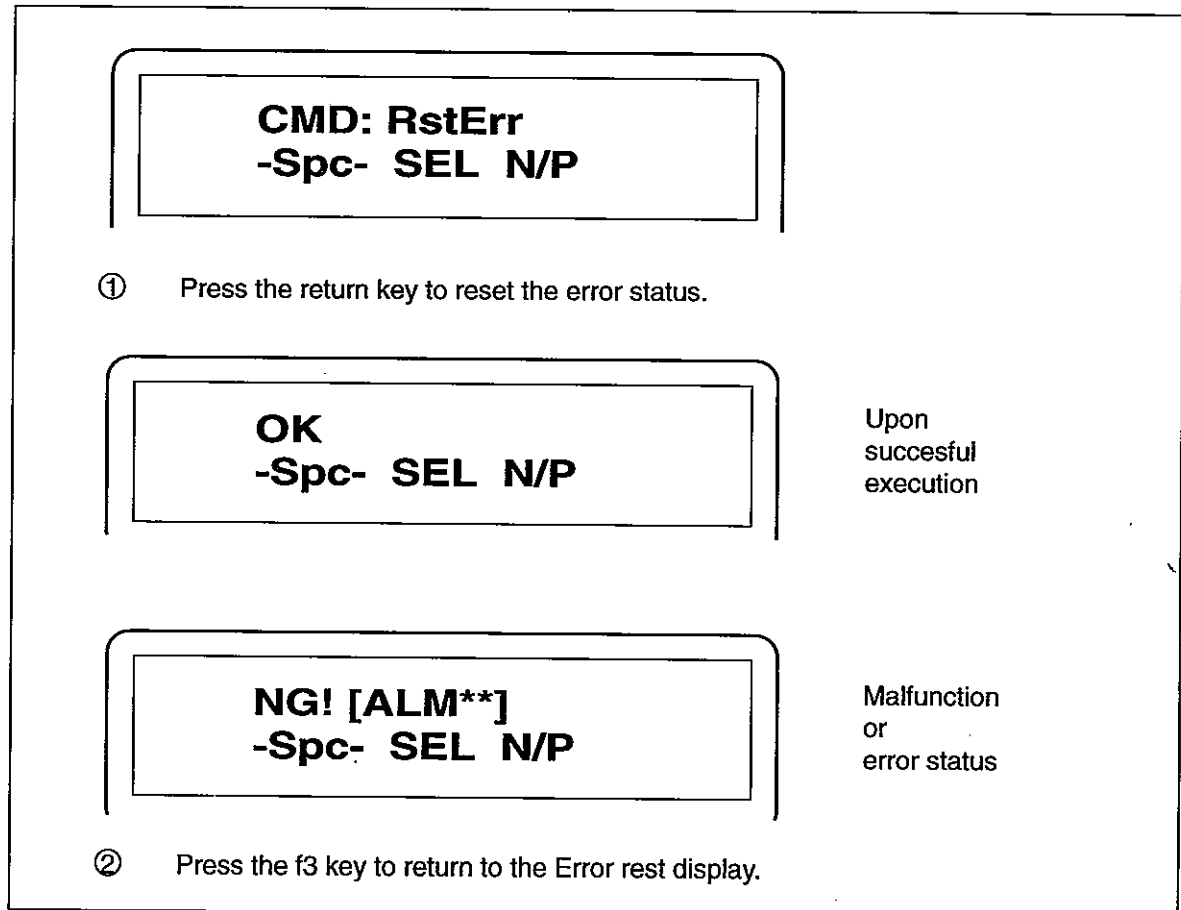
7.5.6 Program Menu Display

The program menu display can be changed using the operation shown below.

<Program menu display>

```
┌─────────────────────────────┐
│  ┌───────────────────────┐  │
│  │  Program Menu         │  │
│  │  Edt   DEL   DIR   N/P │  │
│  │                       │  │
│  └───────────────────────┘  │
└─────────────────────────────┘
```

① Press the EDT key (f0 key) ⟶ Program edit number selection display
② Press the DEL key (f1 key) ⟶ Program delete display
③ Press the DIR key (f2 key) ⟶ Program list display

◆ PROGRAM EDIT NUMBER SELECTION DISPLAY

<Program menu display>

```
┌─────────────────────────────┐
│  ┌───────────────────────┐  │
│  │  Program Menu         │  │
│  │  Edt   DEL   DIR   N/P │  │
│  │        ↑              │  │
│  └───────────────────────┘  │
└─────────────────────────────┘
```
Press

```
┌─────────────────────────────┐
│  ┌───────────────────────┐  │
│  │  Program Menu         │  │
│  │  Edt   DEL   DIR   N/P │  │
│  │                       │  │
│  └───────────────────────┘  │
└─────────────────────────────┘
```
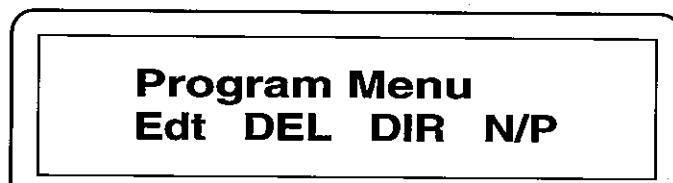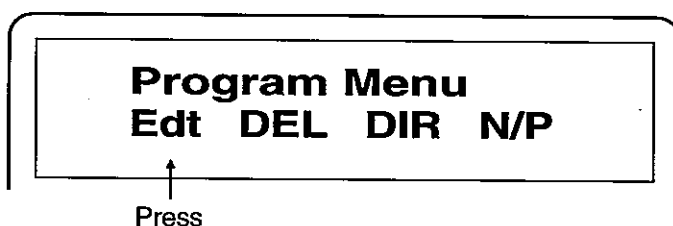
※※ Insert the number you wish to edit, input the CR key.
Move to the programedit display to display the first line.
※ If the program number specified does not exist, the program will be registered as new.
ALM ※※ will be displayed upon making an attempt to set the program other than 0-89, and will not proceed to the Program Edit display.

<Program edit display>

```
┌──────────────────────────────────────────┐
│  ┌────────────────────────────────────┐  │
│  │   %% :                             │  │
│  │   <#  >   S/=    I/D   : /E         │  │
│  │                                    │  │
│  └────────────────────────────────────┘  │
│                                          │
│  %% Block numbers (1-99)                 │
│  Select the characters f0/f4 (#/G/X/F/f/A/a/M/P/WH/FR/IF/ED/</>/!/+) determined by  <*>..<*>S
│  S    ..    Input the symbol inside the <>│
│  =    ..    Input the = sign             │
│  I    ..    Insert (insert 1 block line) │
│  D    ..    Delete (delete 1 block line) │
│  :    ..    Input : sign                 │
│  E    ..    Return to the programdisplay │
└──────────────────────────────────────────┘
```
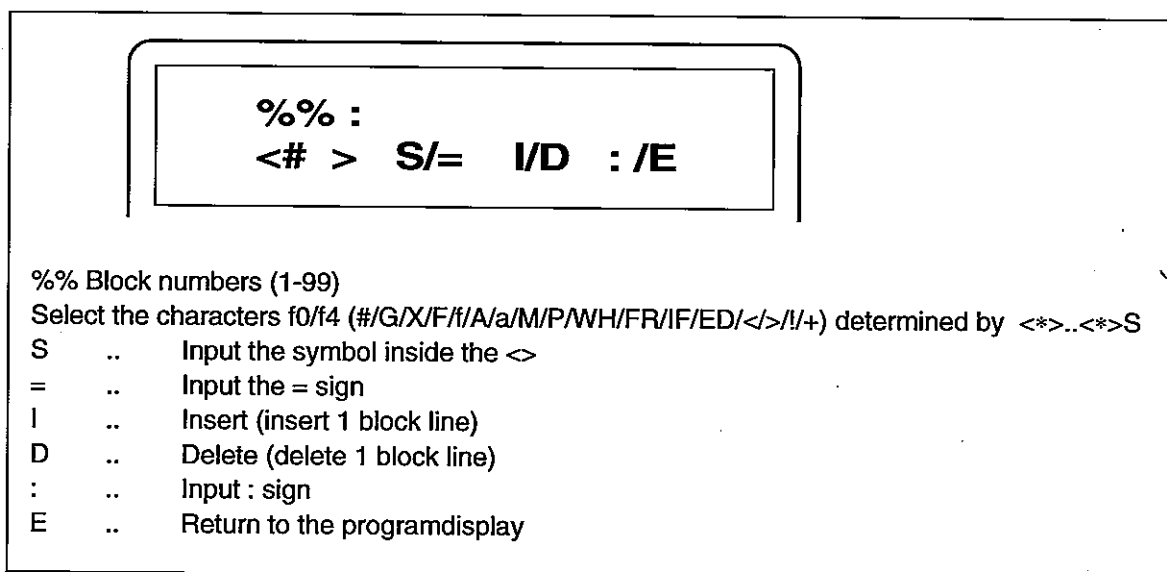
◆ BLOCK EDITING

※ **Restriction note**

● Number of program blocks are restricted to 99 blocks maximum (including comment fields). (When there is program and comment in a line, it must be counted as 2 blocks).

● Do not delete the $ at the end of the block which indicates there is a comment on the same line.

● If an existing program must be deleted to register a new program due to insufficient block space, editing is disabled.

● Registering option (Need for SERVO ON) will be the same as for editing. (No option is for new registration).

Example:

Before editing	After editing
#400=0 →	#400=0
F90X90003f400	F90X89997f400
First line	

```
01:#400=0
<# >  S/=   I/D  :/E
```

① Move to the line you desire to edit using the ↓ key (↑ key)

```
02:G90X90003f400
<# >   S/=   I/D  :/E
```

```
02:G90X89997f400
<# >   S/=   I/D  :/E
```

◆ BLOCK INSERT

Example:

Before editing	After editing
#400=0	#400=0
G90X2	G90X2

① Move to the line you desire to edit using the ↓ key (↑ key)

```
02:G90X2
<# >  S/=   I/D  :/E
```

② Press the I key (f2 key)
   Inserts 1 line and input standby.

```
02:
<# >   S/=   I/D  :/E
```

③ Input the desired number

```
02:#401=1
<# >   S/=   I/D  :/E
```

Note: Press the ↑ key after the last line has been displayed in order to insert a block after the last line.

◆ BLOCK INSERT

Example:

Before editing	After editing
#400=0	#400=0
#401=0	G90X2
G90X2	

① Move to the line you desire to edit using the ↓ key (↑ key)

```
02:#401=0
<# >   S/=   I/D  :/E
```

② Input the D key (f6 key).
   It will delete the line and also display the next line.

```
02:F90X2
<# >   S/=   I/D  :/E
```

◆ PROGRAM REGISTRATION

① Upon completing all editing, transmit using the CR
   Editing is successful, if "Success! Press E" is displayed.
   Press E to return to the Program Display.

Edit is unsuccessful if "ALM" is displayed.
X to abort edit, input E key (f7 key) instead of sending CR.

```
Success! Press E
<#  >  S/=   I/D  :/E
```

EDIT SUCCESSFUL

```
ALM***********
EDIT           END
      ↑              ↑
      ②              ③
```

EDIT UNSUCCESSFUL

Pressing the ② EDIT key while the "ALM" has been displayed will display the grammatical errors. Pressing the ③ END key will abort the edit (returns to the program before the edit). For example: When the 3 rd line is under error, the following is displayed:

```
03:#4001=1
<#  >   S/=   I/D  :/E
```

◆ PROGRAM DELETE

<Program Menu Display>

```
Program Menu
Edt   DEL   DIR   N/P
```

```
Delete Prog No: **
                END
```

① Enter the desired program number to be deleted and then press the CR key. The range is 0 - 89. Any other number outside of this range will cause ALM display to come up.

Successful Delete Complete

```
Delete Complete !
                END
                  ↑
                  ②
```

Delete unsuccessful

```
NG ! [ALM62]
                END
                  ↑
                  ②
```

② Press the **END** key to return to the Program Menu display.

◆ PROGRAM LIST DISPLAY

```
┌─────────────────────────────┐
│  ┌────────────────────────┐  │
│  │  Program Menu          │  │
│  │  Edt  DEL  DIR  N/P    │  │
│  │           ↑            │  │
│  └────────────────────────┘  │
└─────────────────────────────┘
             Press
```

```
┌─────────────────────────────┐
│  ┌────────────────────────┐  │
│  │  Program  No: **       │  │
│  │                END     │  │
│  │                 ↑      │  │
│  └────────────────────────┘  │
└─────────────────────────────┘
                  ②
```
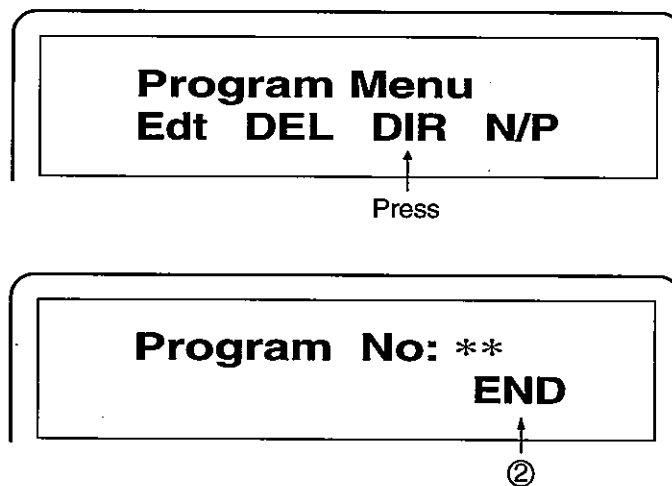
① Program number under the ↓ key will be displayed in the latest order.
   (↑ key will display in the opposite order).

   The number of remaining blocks is displayed in the last line.

② Return to the Program Menu Display using the **END** key.

8. Maintenance And Inspection

8.1 Motor Section

Simple daily checks need be carried out on the motor section. Kindly check the motor for excessive noise or for abnormal amounts of vibration. Do not disassemble the motor. If the operation of the motor is abnormal after 20000 hours of operation or five years after installation (whichever is earlier), you may need to replace the motor and the driver system, if deemed necessary. However, this time period for replacement depends on several factors such as the environmental and operating conditions which the motor is subjected to.

8.2 Driver Section

There is no need for a daily inspection of the driver unit. However, it is prudent to clean the driver unit periodically to protect it from thermal insulation and also to ensure that dust etc. will not enter inside.

8.3 Replacing The Battery For Memory Backups

The driver has a lithium battery inside which is used to backup the data and the various parameters. The life of this lithium battery is approximately about 20000 hours of operation under standard operating conditions. When the life of the battery drains, the driver emits an alarm signal. It is important to change the battery immediately or at the earliest convenience.

The replacement procedure is described herewith:

1   Backup the various parameters, programs and the cam data etc. into the Flash ROM module (built-in) [refer to **section 3.4** for details].

2   Disconnect the mains power supply.

3   Remove the two screws fastening the side plate as shown in the **Fig. 8.1** alongside.

4   Keep the replacement battery alongside and then swap the battery fast (recommended time is within 10 seconds).

5   Confirm all electrical and other connections and then power on the system. If no error messages are displayed, the system is in normal state and ready for operation.

Caution 1:   If the battery alarm display comes on, it is necessary to reset the battery replacement alarm system. In such a case, it may be necessary to input the various parameters once again.

Caution 2:   The replacement battery is identified as **<CR2032> 3V** or it's equivalent type. Remember to note the polarity of the battery at the time of replacement.

Fig. 8.1 [Replacement of the Lithium Battery]
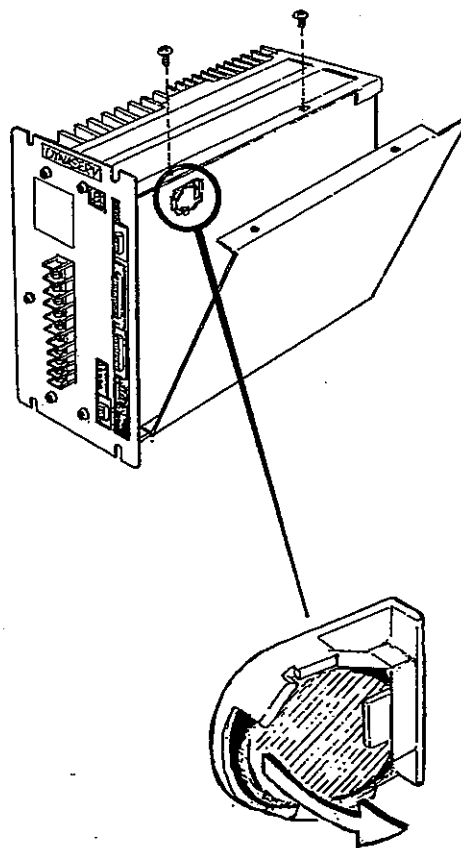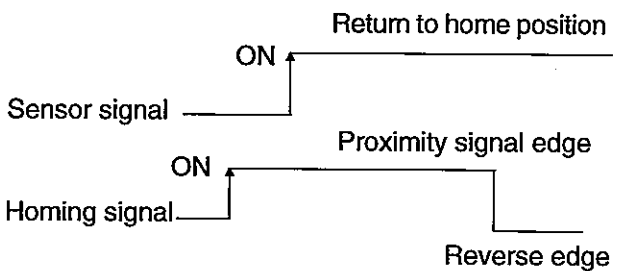
9. Trouble Shooting And Measures

9.1 Motor Problems And Measures

During the operation of this motor if any abnormality occurs, first check the LED display on the front panel of the driver. Most of the causes can be ascertained by the status of the LED display. For the following problems listed below, take appropriate measures as given below. If the driver is still not able to return to normal function despite these efforts, it may be damaged and in such a case cease operations and contact Yokogawa Precision Corporation or it's authorized dealer for remedial action.

Problem	Probable cause	Item(s) to inspect	Measures	Refer to page
Motor does not Servo lock	No AC power is being supplied	Check wiring	Switch ON the power supply	
	The servo ON (SRVON) terminal is set to H	Inspect and confirm	Set to L	
	The Servo parameter values are not set properly	Inspect and confirm	Adjust the values appropriately	
The motor does not start	Overloaded motor	Check to see that the motor operates without any load	Reduce starting load or replace the motor with one of higher torque	
	Incorrect external wiring	Inspect the wiring	Refer to the connection diagram and rewire.	
	The Servo parameter values are not set properly	Inspect and confirm	Adjust the values appropriately	
The motor rotation is unstable	Improper connections	Check the motor connections in phase A,B,C AND GND	Refer to the connection diagram and rewire	
	The motor and the driver combination is not correct	Check the serial numbers on motor and driver combination.	If the combination is incorrect, return them for the correct combination.	
The motor overheats	High ambient temperature	Check if the ambient temperature is above 45° C.	Lower the ambient temperature to below 45° C.	
	Overloaded motor	Check to see that the motor operates without any load	Reduce starting load or replace the motor with one of higher torque	
Abnormal sounds are produced	Incorrect mounting	Loose screws or not fastened properly	Tighten the screws	
	Bearing problems	Check for abnormal sound and vibration from the bearings	Motor replacement (Contact Manufacturer)	
	Mounting base vibration	Check the mounting base	Reinforce the mounting base and tighten screws	
Abnormally small motor torque	Incorrect Motor/ Driver combination	Check combination numbers on rating nameplates	If the combination is incorrect, return them for the correct combination	
	Overloaded motor	Check for OVL error signal	Ascertain proper operation Reduce operating loads.	
	The Servo parameter values are not set properly	Inspect and confirm	Adjust the values appropriately	

9.1 Motor Problems And Measures (continued from page 86)

Problem	Probable cause	Item(s) to inspect	Measures	Refer to page
Motor runs of control	Incorrect motor/driver combination	Check the combination numbers of the motor and driver	If the combination is incorrect, return them for the correct combination.	
	Improper connections	Check the motor/encoder connection	Refer to the connection Diagram and rewire	
The motor does not return to it's home position accurately.	The location of the proximity sensor is not correct	Display the proximity sensor signal and the home signal on an oscilloscope and ensure that these signals do not overlap.		
	Chattering phenomenon	Check to ensure that the homing signal does not "chatter". Increasing the homing velocity will decrease the chattering effect. If even this does not seem feasible, change the position of the proximity sensor and try again. **NOTE:** If the rear portion of this signal appears first, it may lead to confusion with the mark sense edge part. Return to home position ON Sensor signal ON — Proximity signal edge Homing signal Reverse edge		

9.2 LED Display List

A 7 - segment LED is mounted on the front panel of the driver to display the normal/ abnormal status of the motor and the driver. The details of this display are listed as below in the **Fig. 9.2**

Fig. 9.2

LED Display		Status	Comments
Servo OFF	Servo ON		
0	0.	Normal display	
1	1.	Over speed	Change velocity parameters
2		RAM error	Cannot be rectified
3		Encoder error	Check the encoder cable
5		Power supply error	Cannot be rectified
7		ROM error	Cannot be rectified
8		Low voltage (Main power supply)	
9		CPU error	Cannot be rectified
A		Over current	Check the motor cable connections
c	c.	Over load error	
b	b.	Mechanical mode settings are abnormal	Cannot be rectified
E		Over voltage	Check the electrical voltage and the load inertia.

NOTE: Kindly contact Yokogawa Precision Corporation or it's authorized dealer for the errors marked "Cannot be rectified".

9.2.1 Controller Error

★ Outline

Listing the error codes and the error reset procedures.

★ Operation

☆ PLC operation

◆ Reading error codes:

① <OUR_ERR> in the CN2 is output.
② <IN_ERRCODE_REQ> in the CN2 turns ON.
③ When the <OUT_ERRCODE_OUT> in the CN2 is output, simultaneously the <OUT_CODE [0...7]> outputs the error codes.
④ The <IN_ERRCODE_REQ> turns OFF.
⑤ The <OUT_ERRCODE_OUT> and the <OUT_CODE [0...7]> in the CN2 turns OFF.

◆ Error reset procedure:

① Turn ON the <IN_ERR_RESET> in the CN2.
② This will turn OFF the <OUT_ERR> in the CN2.

OUT_ERR

OUT_CODE[0...7]
(BCD 2characters)

OUT_ERRCODE_OUT

IN_ERRCODE_REQ

IN_ERR_RESET
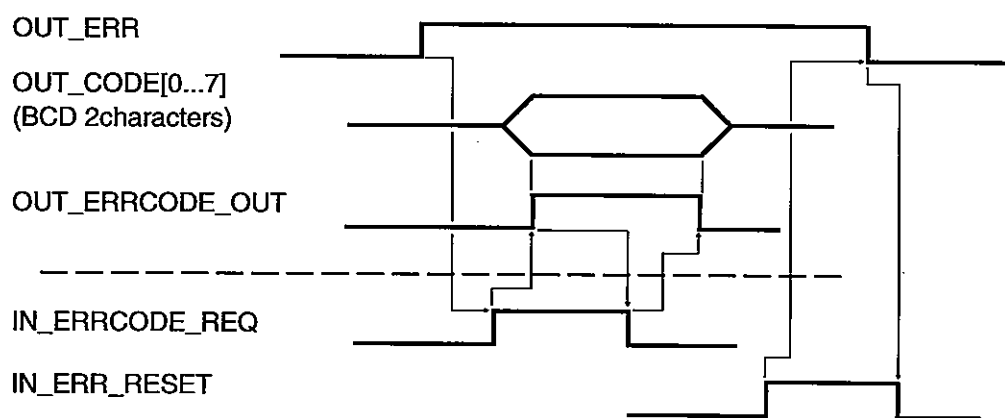
NOTE: The alarm codes are not output

☆ RS232C operation (computer)

◆ Reading the error codes:

The details of the error codes can be read using the PC utility software. Refer to the PC utility menus for more details on the same.

◆ Reading the alarm codes:

The details of the alarm codes can be read using the PC utility software. Refer to the PC utility menus for more details on the same.

◆ Error reset procedure:

@4↵ (↵ : CR)
R00 (receive)

☆ RS232C operation (TBX)

◆ Reading the error codes:

The details of the error codes can be read using the TBX. Refer to the TBX section for more details on the same.

◆ Reading the alarm codes:

The details of the alarm codes cannot be read using the TBX

◆ Error reset procedure:

@4↵ (↵ : CR)
R00 (receive)

9.3 Procedure For Error Correction

(1) Encoder Error
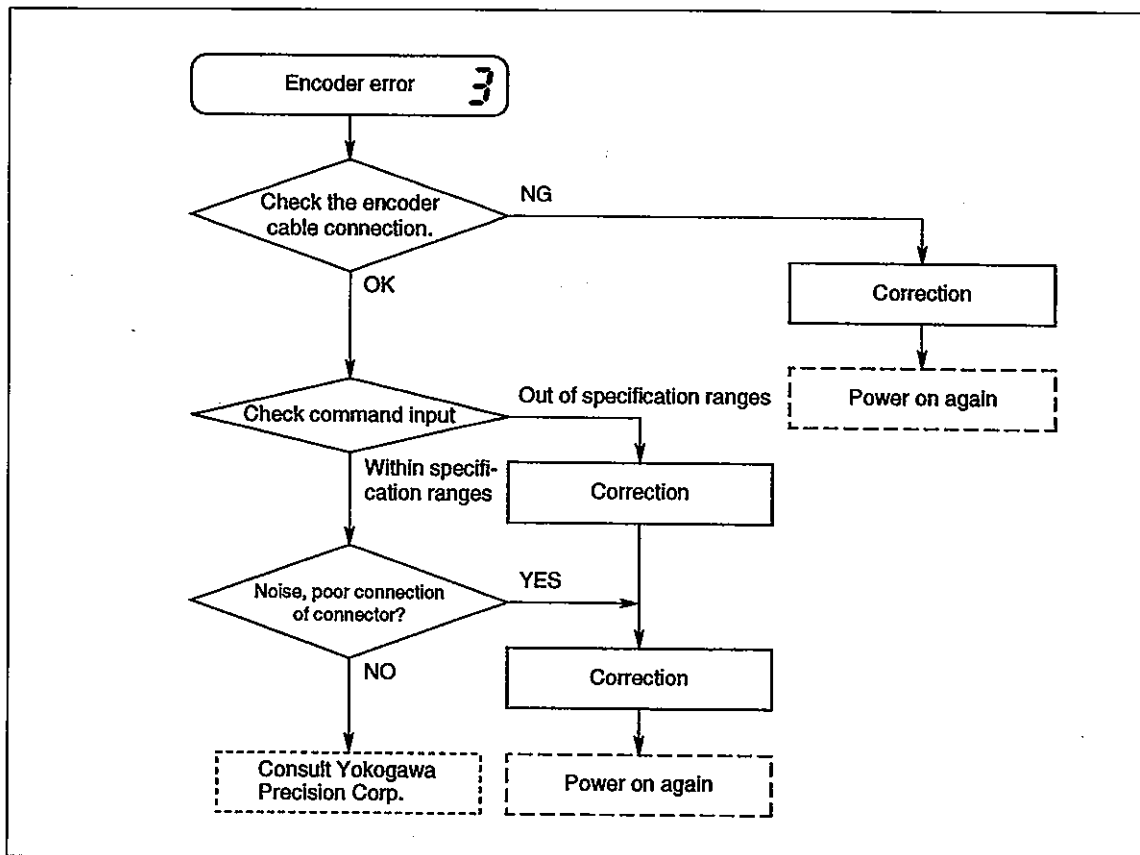
(2) Over Speed Error

(3) Low Voltage Error

```
                    ┌──────────────────────────┐
                    │ Low main power supply  8 │
                    └──────────────────────────┘
                                 │
                                 ▼
                          ╱─────────────╲            Improper
                        ╱  Power cable    ╲──────────────────┐
                        ╲  connections    ╱                  │
                          ╲─────────────╱                    │
                                 │ YES                        │
                                 ▼                            │
                          ╱─────────────╲      YES            │
                        ╱ Power voltage   ╲──────────┐        │
                        ╲ too low?        ╱          │        │
                          ╲─────────────╱            ▼        │
                                 │ NO          ┌──────────────┐│
                                 ▼             │  Correction  │◄┘
                        ┌ ─ ─ ─ ─ ─ ─ ┐        └──────────────┘
                        │Consult Yokogawa│            │
                        │Precision Corp. │     ┌ ─ ─ ─ ▼─ ─ ─ ┐
                        └ ─ ─ ─ ─ ─ ─ ┘        │Power on again│
                                                └ ─ ─ ─ ─ ─ ─ ┘
```

(4) Amplifier Error

-96-
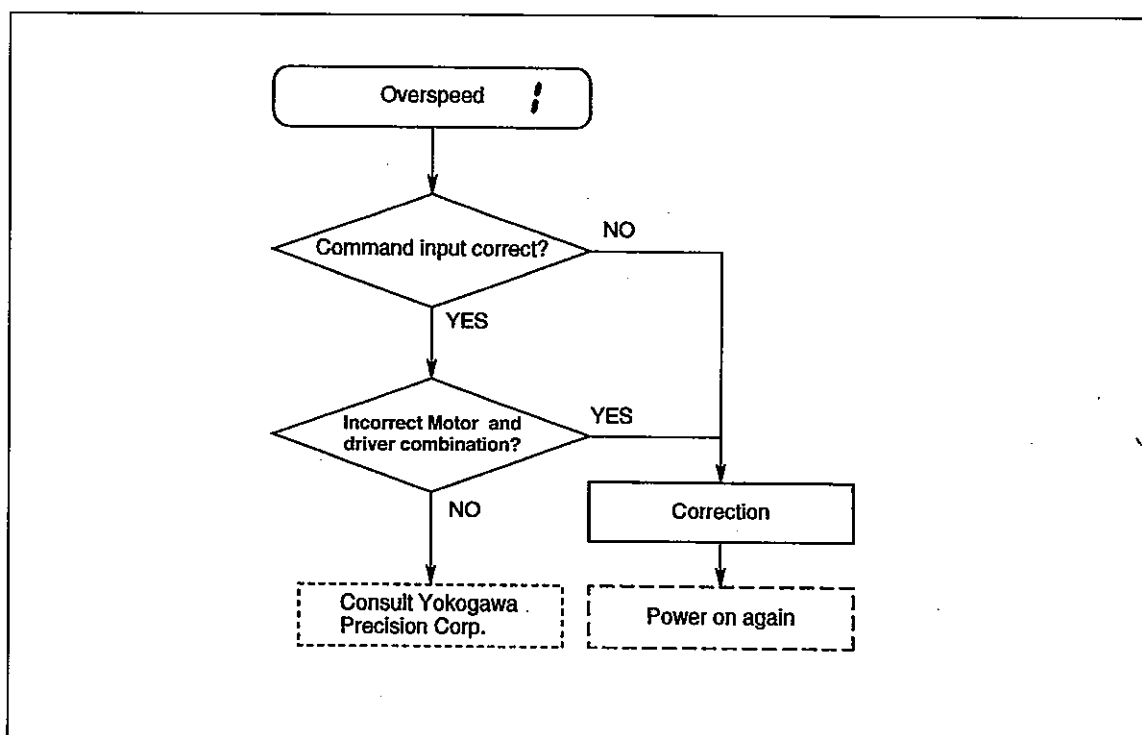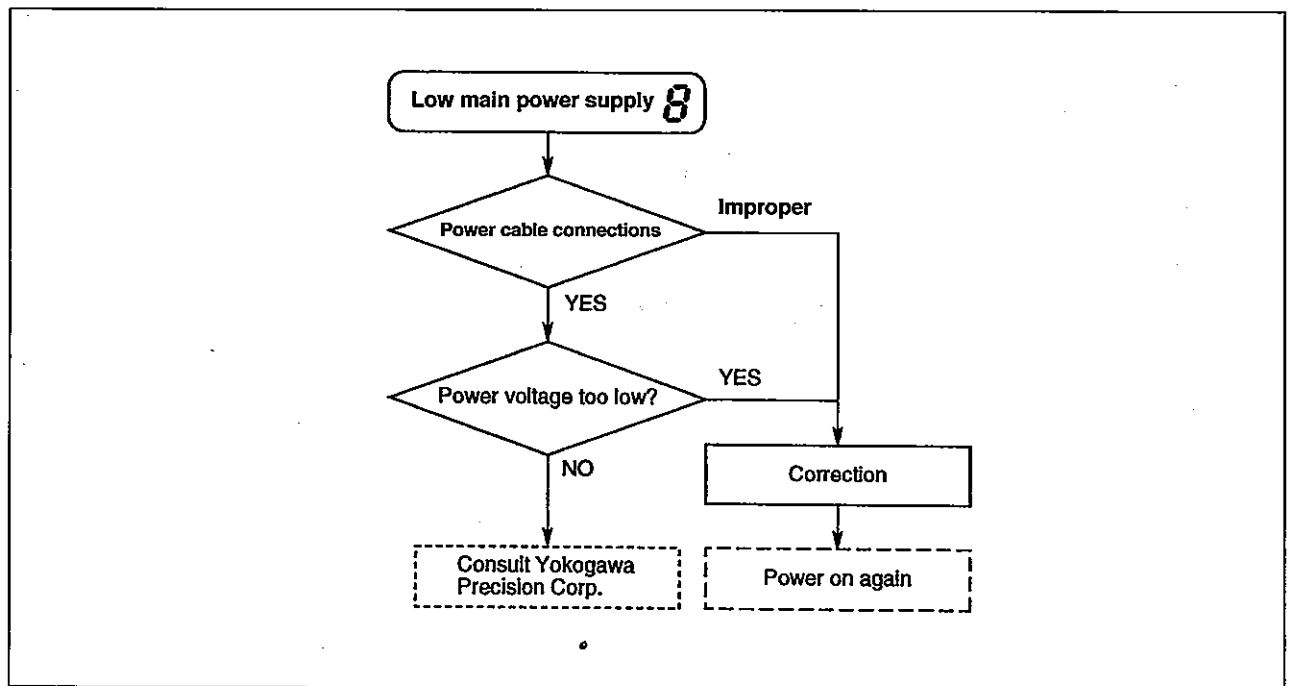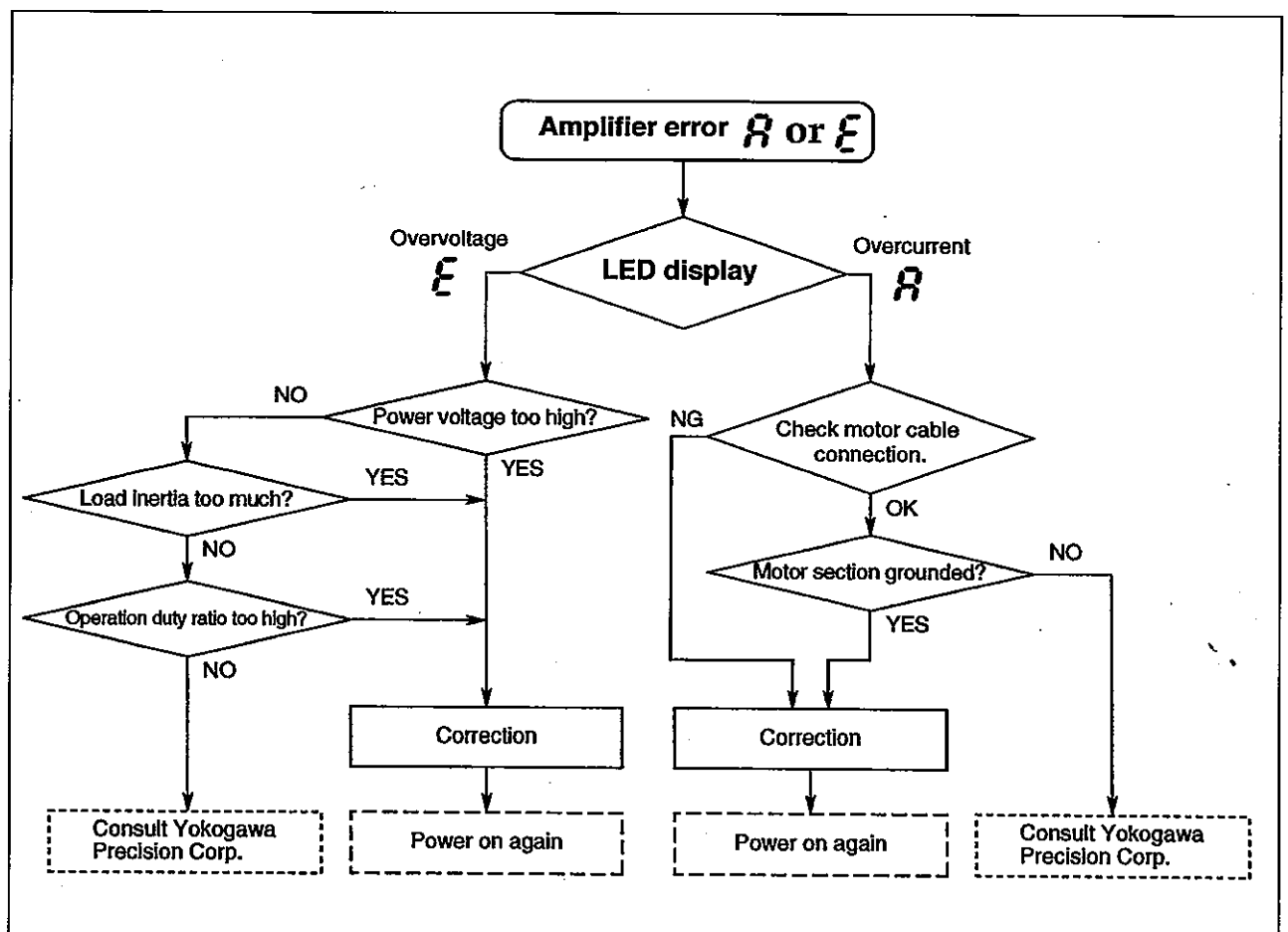
(5) Over Load Error

9.4 Error / Alarm

Error Number: 3		**Battery error**

Error type: [KIND_POR] Start up error
Measures: [TYPE_SYS] Non start up
Main cause: Drained lithium battery used for battery backup
Remedial action: Kindly change the lithium battery after opening the driver's side cover.

Perform a system wide backup by downloading all the relevant parameters, user defined cam data and the programs too as there is a likelihood of losing the data upon a system reset. After a system reset , if it proves necessary kindly upload the data back to the drive.

Error Number: 4		**Watch dog error**

Error type: [KIND_POR] Start up error
Measures: [TYPE_SYS] Non start up
Main cause: Watch timer error has occurred
Remedial action: Contact Yokogawa Precision Corporation or it's authorized dealer.

Error Number: 9		**Servo constants error**

Error type: [KIND_POR] Start up error
Measures: [TYPE_SYS] Non start up
Main cause: Abnormal value for the mechanical settings parameter
(Example: The maximum velocity for the axis is too big a value)
Remedial action: After performing a system reset, kindly input the correct value for the parameter.

Error Number: 10		**Parameter sum error**

Error type: [KIND_POR] Start up error
Measures: [TYPE_SYS] Non start up
Main cause: Parameter value corrupted during upload due to a power shut down or outage etc.
Remedial action: After performing a system reset, kindly input the correct value for the parameter.

Error Number: 11		**Parts sum error**

Error type: [KIND_POR] Start up error
Measures: [TYPE_SYS] Non start up
Main cause: Parts settings corrupted during upload due to a power shut down or outage etc.
Remedial action: After performing a system reset, kindly input the correct value for the parameter.

Error Number: 12		**Program file sum error**

Error type: [KIND_POR] Start up error
Measures: [TYPE_SYS] Non start up
Main cause: Damaged program contents, due to power shut down (outage) while under uploading.
Provision: After performing a system reset, kindly upload the program once again.

Error Number: 13		**Index compensation file sum error**

Error type: [KIND_POR] Start up error
Measures: [TYPE_SYS] Non start up
Main cause: Damaged Index compensation file contents, due to the power shut down (outage) during uploading.
Remedial action: After performing a system reset, kindly upload the Index compensation file once again.

Error number: 14   **System program error**

Error type: [KIND_POR]   Start up error
Measures: [TYPE_SYS]   Non start up
Main cause: System program area was corrupted during program retrieval.
Remedial action: Contact Yokogawa Precision Corporation or it's authorized dealer.

Error number: 19   **Axis operation hand shake error**

Error type: [KIND_ERR]   Error
Measures: [TYPE_EH1]   Emergency abort, Servo OFF status
Main cause: During an axis operation, hand shaking was interrupted.
Remedial action: Contact Yokogawa Precision Corporation or it's authorized dealer.

Error number: 20   **Driver error**

Error type: [KIND_SRV]   Servo Error
Measures: [TYPE_SRV]   Servo OFF
Main cause: Driver operation error.
Remedial action: Kindly carry out the error reset.

Error number: 21   **Driver over load**

Error type: [KIND_SRV]   Servo Error
Measures: [TYPE_SRV]   Servo OFF
Main cause: Driver overload error.
Remedial action: Take action to remove the overload and then carry out an error reset operation.

Error number: 22   **Driver pulse disconnection**

Error type: [KIND_SRV]   Servo Error
Measures: [TYPE_SRV]   Servo OFF
Main cause: Encoder cable has a fault or is disconnected.
Remedial action: Replace cable or connect the cable properly.

Error number: 23   **Position deviation overrun**

Error type: [KIND_SRV]   Servo Error
Measures: [TYPE_SRV]   Servo OFF
Main cause: The position deviation has either exceeded the maximum limit or is under the minimum
                  value defined for the relevant parameter.
Remedial action: ①   Change the relevant parameter's value
                  ②   Reduce the acceleration/deceleration of the motor.

Error number: 25   **Logic I/O error**

Error type: [KIND_POR]   Start up Error
Measures: [TYPE_SYS]   Non start up
Main cause: Error in the Logical I/O.
Remedial action: Contact Yokogawa Precision Corporation or it's authorized dealer.

Error number: 30   **Servo not ready**

Error type: [KIND_ERR]   Error
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: Driver is not in the Servo ON status.
Remedial action: Turn ON the Servo. (Kindly, use the error reset to turn OFF the error status).

Error number: 31   **Position command Servo not ready**

Error type: [KIND_ERR]   Error
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: The position command rate of change is unusually large.
Remedial action: Kindly reduce the motor's acceleration / deceleration values.

Error number: 40   **(+) direction hardware overtravel limit**

Error type: [KIND_ERR]   Error
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: The (+) direction hardware overtravel limit was exceeded.
Remedial action: Reset the error status.

Error number: 41   **(-) direction hardware overtravel limit**

Error type: [KIND_ERR]   Error
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: The (-) direction hardware overtravel limit was exceeded.
Remedial action: Reset the error status.

Error number: 42   **(+) direction software overtravel limit**

Error type: [KIND_ERR]   Error
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: The (+) direction software overtravel limit was exceeded.
Remedial action: Reset the error status.

Error number: 43   **(-) direction software overtravel limit**

Error type: [KIND_ERR]   Error
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: The (-) direction software overtravel limit was exceeded.
Remedial action: Reset the error status.

Error number: 44   **Out of range coordinate values**

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: Command coordinate value exceeded the range for the same.
Remedial action: Reset the error status.

Error number: 45   **Abnormal program coordinates**

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: Program coordinates were corrupted.
Remedial action: First carry out an error reset, then proceed with the homing operation and thus,
                    fix the coordinate system values.

Error number: 46   **Emergency abort enabled**

Error type: [KIND_ERR]   Error
Measures: [TYPE_EL2]   Emergency abort (immediately bring the motor to a stop)
Main cause: System was brought to a stop by means of an emergency abort input.
Remedial action: Remove the emergency abort input and then carry out an error reset.

Error number: 47   **Anomalies in data execution**

Error type: [KIND_ERR]   Error
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: There are anomalies in the data executed.
Remedial action: Reset the error status and then input correct data.

Error number: 48   **Software data overflow**

Error type: [KIND_ERR]   Error
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: System software exceeded arithmetic data limit.
Remedial action: Please bring scaling value to small after reset error

Error number: 49   **Abnormal home position**

Error type: [KIND_ERRALM1] Error/Operation warning
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: The position of home proximity signal and the motor's Z phase are too close to
                  one another.
Remedial action: Shut down the power supply to the system, mechanically relocate the position of
                  the homing sensor and then start up the servo system and carry out the homing
                  operation and then carry out normal operations.

Error number: 50   **Execute mode operation when the motor is under error status.**

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: When motor is stopped and already under error status, commanding a mode change
                  will cause this error to flag up.
Remedial action: Kindly reset the error status.

Error number: 51   **Parts not ready**

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: Command the selection of a part number which is not defined.
Remedial action: Reset the error status and then select the correct part and carry out operations.

Error number: 52   **Program not ready**

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: Command the selection of an undefined program number (not registered).
Remedial action: Reset the error status and then select a registered program number.

Error number: 53   **Index compensation file not ready**

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: Command the selection of an undefined index compensation file number.
Remedial action: Reset the error status and then select a registered index compensation file number.

Error number: 54   **Z phase homing velocity for recognition is abnormal**

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2] Decelerate to a stop and abort operation.
Main cause: During an homing run, the motor's Z phase homing velocity for the first run is below the minimum speed limit specified for this axis.
Remedial action: Carry out an error reset and increase the value of the Z phase homing velocity (parameter #13). Also reduce the value of the parameter #7 (acceleration value under a trapezoidal move), during a trapezoidal move.

Error number: 55   **Execution not permitted while system is still under mode operations.**

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2] Decelerate to a stop and abort operation.
Main cause: A mode change was requested while the motor was executing a mode operation.
Remedial action: Upon error carry out an error reset. However, if an alarm is raised, stop the mode execution and restart the system.

Error number: 56   **Abnormal M interface**

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2] Decelerate to a stop and abort operation.
Main cause: M interface is in abnormal state.
Remedial action: Carry out an error reset.

Error number: 57   **Attempt a mode change while still in mechanical mode setting**

Error type: [KIND_ERRALM] Operation warning
Measures: [TYPE_SYS] Non start up
Main cause: While the motor is still under mechanical setting mode status, Stop or Abort operations was carried out.
Remedial action: Recycle power to the driver or carry out a system reset and then carry out a mode change operation.

Error number: 58   **Program crashed**

Error type: [KIND_ERR] Error
Measures: [TYPE_EL2] Decelerate to a stop and abort operation.
Main cause: The program crashed due to invalid instructions.
Remedial action: Input a valid program once again.

Error number: 59   **Invalid block no**

Error type: [KIND_ERRALM2] Operation warning
Measures: [TYPE_EL2] Non start up
Main cause: Invalid block was specified during the execution of the program.
Remedial action: Upon error carry out an error reset.

Error number: 60   **Invalid command selection**

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2] Decelerate to a stop and abort operation.
Main cause: Invalid command was entered.
Remedial action: Upon error carry out an error reset.

Error number: 61	Abnormal command format

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2] Decelerate to a stop and abort operation.
Main cause: Invalid command was entered.
Remedial action: Upon error carry out an error reset.

Error number: 62	Data out of range

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2] Decelerate to a stop and abort operation.
Main cause: Input data was out of range.
Remedial action: Upon error carry out an error reset.

Error number: 63	Abnormal access timing

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2] Decelerate to a stop and abort operation.
Main cause: Attempt to change the mechanical mode settings parameter while not in the mechanical settings mode.
Remedial action: Change to the mechanical settings mode and then make the appropriate changes.

Error number: 64	Invalid write operation

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2] Decelerate to a stop and abort operation.
Main cause: Attempted to write data while under the monitor parameter mode.
Remedial action: Upon error carry out an error reset.

Error number: 65	Parameter number out of range

Error type: [KIND_ERRALM2] Error/Operation warning
Measures: [TYPE_EL2] Decelerate to a stop and abort operation.
Main cause: The parameter number specified was not within the valid specification range.
Remedial action: Upon error carry out an error reset.

Error number: 66	Invalid device specified

Error type: [KIND_ERRALM] Error/Operation warning
Measures: [TYPE_SYS] Non start up
Main cause: Specified the RS232C communications while still under PLC operation (or vice versa).
Remedial action: Change to the RS232C communications and then carry out operations (or vice versa).

Error number: 67	Application error - 0

Error type: [KIND_ERR] Error
Measures: [TYPE_SRV] Servo off
Main cause: The Servo ON emergency switch on the front panel of the DYNASERV was turned ON.
Remedial action: Turn OFF the Servo ON emergency switch on the front panel of the DYNASERV and then carry out an error reset operation. If you do not wish to turn ON the Servo, simply carry out an error reset only.

Error number: 68	Program nesting overrun

Error type: [KIND_ERR] Error
Measures: [TYPE_EL2] Decelerate to a stop and abort operation.
Main cause: Nesting of programs is limited to 15 only. An error is caused if this number is exceeded.
Remedial action: Review the program statements and then correct the programming.

Error number: 69   **Application error- 1**

Error type: [KIND_ERR]   Error
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: During the auto-tuning mode of operation the motor resonates causing this error. (Inertia settings are initialized to 0)
Remedial action: Carry out manual tuning on the servo system (remember to set the servo stiffness parameter to a low value) or else after setting a low value for the servo stiffness value, carry out auto-tuning operation again.

Error number: 80   **Unrecognized command**

Error type: [KIND_ALM]   Operation warning
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: Command is not recognized.
Remedial action: Enter correct command using the necessary format.

Error number: 82   **Capacity overwhelmed**

Error type: [KIND_ALM]   Operation warning
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: The program data area capacity id filled completely.
Remedial action: Delete unnecessary programs to make space for new programs.

Error number: 83   **Emergency stop during hold on**

Error type: [KIND_ALM]   Operation warning
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: While the system is under hold-on status emergency stop was executed.
Remedial action: Carry out a driver reset or else recycle power to the servo system.

Error number: 84   **Hold failure**

Error type: [KIND_ALM]   Operation warning
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: When the system was not in an idle status, a hold-on command was entered.
Remedial action: Enter the idle status and then carry out this command.

Error number: 85   **Multiple device specified**

Error type: [KIND_ALM]   Operation warning
Measures: [TYPE_SYS]   Non start up
Main cause: The device specification is not recognized.
Remedial action: Select and specify the correct device.

Error number: 89   **Battery alarm**

Error type: [KIND_ELS]   Other
Measures: [TYPE_EL2]   Decelerate to a stop and abort operation.
Main cause: The lithium battery used for backup is low in power.
Remedial action: Open the driver's side panel and then change the lithium battery.

10. Reference

10.1 Standard Specifications

(1) Motor Section

Series			DM B series					DM A series			
Model			DM1015B 00*1	DM1030B 00*1	DM1045B 00*1	DM1060B 00*1	DM1075B 00*1	DM1050A 00*1	DM1100A 00*1	DM1150A 00*1	DM1200A 00*1
Motor & driver coupling	Maximum torque	N·m(kgf·m)	15(1.5)	30(3.0)	45(4.5)	60(6.0)	75(7.5)	50(5.0)	100(10)	150(15)	200(20)
	Maximum velocity	rps	2.4					1.2			
	Rated velocity	rps	2.0[2.0]	2.0[1.5]	2.0[1.0]	1.5[1.0]	2.0[1.0]	1.0[1.0]		1.0[0.5]	
	Rotational positioning — Encoder resolution	p/rev	655.360					1.024.000			
	Positioning accuracy	Sec	±15					±15			
	Repeatability	Sec	±2					±2			
Motor section specifications	Rotor inertia	kg·m²	12×10⁻³	15×10⁻³	19×10⁻³	23×10⁻³	27×10⁻³	96×10⁻³	119×10⁻³	142×10⁻³	167×10⁻³
	Static max load — Axial load C	N (kgf)	3.0×10⁴(3.0×10³)					4.0×10⁴ (4.0×10³)			
	Axial load T		1.0×10⁴(1.0×10³)					2.0×10⁴ (2.0×10³)			
	Overhung load	N·m(kgf·m)	200(20)					400(40)			
	Torsional stiffness — Axial stiffness C	mm/N(mm/kgf)	2.5×10⁻⁶(2.5×10⁻⁵)					2.0×10⁻⁶(2.0×10⁻⁵)			
	Axial stiffness T		3.0×10⁻⁶(3.0×10⁻⁵)					3.0×10⁻⁶(3.0×10⁻⁵)			
	Radial stiffness	rad/N·m (rad/kgf·m)	1.0×10⁻⁶(1.0×10⁻⁵)					4.0×10⁻⁷(4.0×10⁻⁶)			
	Weight	kg	5.5	7.5	9.5	12	14	14.5	19	24	29
	Height (refer to dimensions)	mm	92.5±1	118±1	143±1	168±1	194±1	113±1	138±1	163±1	188±1

C: Compression; T: Tension

Series			DR B series					DR E series						
Model			DR1008B 00*1	DR1015B 00*1	DR1030B 00*1	DR1045B 00*1	DR1060B 00*1	DR1030E 00*1	DR1070E 00*1	DR1100E 00*1	DR1130E 00*1	DE1160E 00*1	DR1220E 00*1	DR1250E 00*1
Motor & driver coupling	Maximum torque	N·m(kgf·m)	8(0.8)	15(1.5)	30(3.0)	45(4.5)	60(6.0)	30(3)	70(7)	100(10)	130(13)	160(16)	220(22)	250(25)
	Maximum velocity	rps	2.4[2.4]			2.4[1.6]	2.4[1.4]	2.4[2.0]	2.4[2.0]	2.4[1.5]	1.2[1.2]	1.2[1.0]	1.2[0.7]	
	Rated velocity	rps	2.0[2.0]			2.0[1.5]	2.0[1.0]	1.5[1.0]	2.0[1.5]	2.0[1.5]	1.5[1.0]		1.0[0.5]	
	Rotational positioning — Encoder resolution	p/rev	507.904					614.400						
	Positioning accuracy	Sec	±45					±45						
	Repeatability	Sec	±5					±5						
Motor section specifications	Rotor inertia	kg·m²	15×10⁻³	21×10⁻³	24×10⁻³	26×10⁻³	33×10⁻³	72×10⁻³	85×10⁻³	100×10⁻³	125×10⁻³	140×10⁻³	170×10⁻³	185×10⁻³
	Static max load — Axial load C	N(kgf)	3.0×10⁴(3.0×10³)					4.0×10⁴(4.0×10³)						
	Axial load T		1.0×10⁴(1.0×10³)					2.0×10⁴(2.0×10³)						
	Overhung load	N·m(kgf·m)	200(20)					400(40)						
	Torsional stiffness — Axial stiffness C	mm/N(mm/kgf)	3.0×10⁻⁶(3.0×10⁻⁵)					2.0×10⁻⁶(2.0×10⁻⁵)						
	Axial stiffness T		4.0×10⁻⁶(4.0×10⁻⁵)					3.0×10⁻⁶(3.0×10⁻⁵)						
	Radial stiffness	rad/N·m (rad/kgf·m)	2.0×10⁻⁶(2.0×10⁻⁵)					4.0×10⁻⁷(4.0×10⁻⁶)						
	Weight	kg	6.0	9.0	11	13	15.5	18	22	26	32	36	44	48
	Height (refer to dimensions)	mm	85±1	123±1	151±1	179±1	207±1	156±1	183±1	210±1	243±1	271±1	327±1	355±1

C: Compression; T: Tension

NOTE: The specifications are for the systems operating under 200 - 230 V AC only. However, the values in the [ ] are for systems operating in the range of 100 - 115 V AC.

Series			DR A series					
Model			DR1050A00*1	DR1100A00*1	DR1150A00*1	DR1200A00*1	DR1300A00*1	DR1400A00*1
Motor & driver coupling	Maximum torque	N·m(kgf·m)	50(5)	100(10)	150(15)	200(20)	300(30)	400(40)
	Maximum velocity	rps	1.8[1.8]	1.2[1.2]	1.2[1.0]	1.2[0.8]	1.0[0.5]	0.8[0.4]
	Rated velocity	rps	1.5[1.5]	1.0[1.0]	1.0[0.5]		0.5[0.25]	
	Rotational positioning Encoder resolution	p/rev	819,200					
	Positioning accuracy	Sec	±30					
	Repeatability	Sec	±5					
Motor section specifications	Rotor inertia	kg·m²	180×10^{-3}	200×10^{-3}	230×10^{-3}	265×10^{-3}	340×10^{-3}	400×10^{-3}
	Static max load Axial load C	N(kgf)	$4.0 \times 10^{4} (4.0 \times 10^{3})$					
	Axial load T		$2.0 \times 10^{4} (2.0 \times 10^{3})$					
	Overhung load	N·m(kgf·m)	400(40)					
	Torsional stiffness Axial stiffness C	mm/N(mm/kgf)	$2.0 \times 10^{-6} (2.0 \times 10^{-5})$					
	Axial stiffness T		$3.0 \times 10^{-6} (3.0 \times 10^{-5})$					
	Radial stiffness	rad/N·m (rad/kgf·m)	$4.0 \times 10^{-7} (4.0 \times 10^{-6})$					
	Weight	kg	26	31	36	45	55	65
	Height (refer to dimensions)	mm	$158^{\pm 1}$	$185^{\pm 1}$	$212^{\pm 1}$	$250^{\pm 1}$	$304^{\pm 1}$	$358^{\pm 1}$

C: Compression; T: Tension

Series			DR B series			DR E series	
Model			DR5030B00*1	DR5050B00*1	DR5070B00*1	DR5070E	DR5100E
Motor & driver coupling	Maximum torque	N·m(kgf·m)	30(3.0)	50(5.0)	70(7.0)	70(7)	100(10)
	Maximum velocity	rps	5.0			4.0	
	Rated velocity	rps	4.0			2.0	
	Rotational positioning Encoder resolution	p/rev	278,528			319,488	
	Positioning accuracy	Sec	±90			±90	
	Repeatability	Sec	±10			±8	
Motor section specifications	Rotor inertia	kg·m²	27×10^{-3}	34×10^{-3}	37×10^{-3}	100×10^{-3}	125×10^{-3}
	Static max load Axial load C	N(kgf)	$3.0 \times 10^{4} (3.0 \times 10^{3})$			$4.0 \times 10^{4} (4.0 \times 10^{3})$	
	Axial load T		$1.0 \times 10^{4} (1.0 \times 10^{3})$			$2.0 \times 10^{4} (2.0 \times 10^{3})$	
	Overhung load	N·m(kgf·m)	200(20)			400(40)	
	Torsional stiffness Axial stiffness C	mm/N(mm/kgf)	$3.0 \times 10^{-6} (3.0 \times 10^{-5})$			$2.0 \times 10^{-6} (2.0 \times 10^{-5})$	
	Axial stiffness T		$4.0 \times 10^{-6} (4.0 \times 10^{-5})$			$3.0 \times 10^{-6} (3.0 \times 10^{-5})$	
	Radial stiffness	rad/N·m (rad/kgf·m)	$2.0 \times 10^{-6} (2.0 \times 10^{-5})$			$4.0 \times 10^{-7} (4.0 \times 10^{-6})$	
	Weight	kg	13.5	16.0	18.0	26	32
	Height (refer to dimensions)	mm	$184^{\pm 1}$	$212^{\pm 1}$	$240^{\pm 1}$	$210^{\pm 1}$	$243^{\pm 1}$

C: Compression; T: Tension

Common specifications:

Insulation class: F type
Insulation withstanding voltage: 1500 VAC for 1 minute
Insulation resistance: Greater than 10MΩ (500V DC)

Motor construction details:

Rotor specification: Outer rotor type
Drive excitation: 3 phase
Colour: Black

NOTE: The specifications are for the systems operating under 200 - 230 V AC only. However, the values in the [ ] are for systems operating in the range of 100 - 115 V AC.
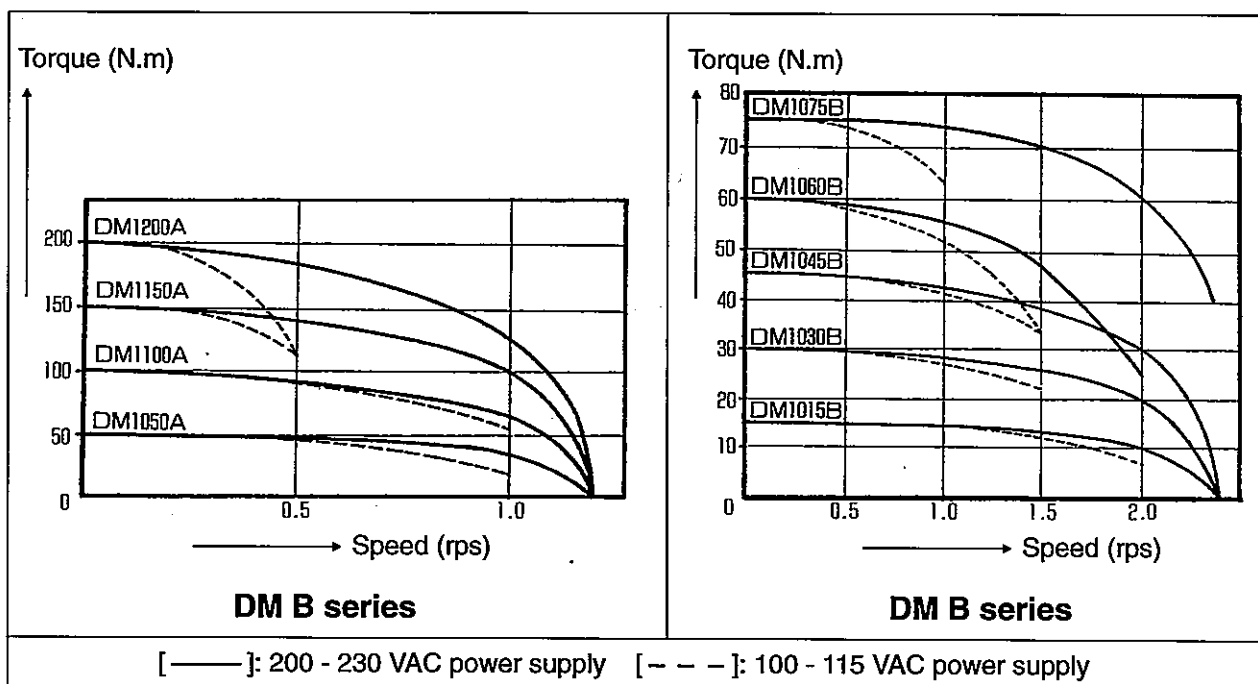
(2) Driver Section (common specifications)

Item		Contents
Communication modes		■ RS232C (Single/Multichannel) communications @9600 bps (maximum 9 channels under multi channel mode) ■ Parallel communications
Connection devices	RS232C	■ IBM PC/AT compatible machine with Windows '95 operating system [Parameter backup, program editing, data backup, terminal mode, I/O Logic type selection, Servo settings, Index compensation and monitoring functions] ■ TBX (Teaching box) [Parameter settings, monitor functions]
Operation modes	Test mode	Use in manual tuning
	Auto-tuning mode	The DC gain, fc and ILim are automatically set.
	Homing mode	The type of homing is changed by parameter settings
	Program mode	Maximum number of programs are 100; maximum program blocks are up to 1000 only.
	Mark signal search mode	Stop on ORT, OTU, OTD, and MRK signals
	MDI mode	Use RS232C to directly carry out remote moves.
	Indexing mode	Indexing points are restricted in the range 1 to 99; INC/ABS; Compensation.
	Point move mode	Points in the range between 1 to 99; INC/ABS.
	Direct value input mode	Pulse, angular coordinates, user defined dimensions
	Mechanical settings mode	Mechanical parameter settings
	Miscellaneous	Jog move, brake signal output, cam positioner signal output, M outputs.
Servo control		I-PD/ P-ID mode of position control, manual/auto-tuning
Acceleration/ Deceleration curve		There are 8 standard cam curves (including trapecroid and modified sinusoidal) and 8 user definable cams.
Monitor outputs		Axis position deviation, axis test move, axis position command value, analog velocity output: ± 6V maximum.
Safety features		High current, High voltage, Low voltage, Over heating, Overload, Abnormal encoder signals, Over travel signals, abnormal CPU
Power supply		100 - 115 VAC / 200 - 230 VAC 50/60 Hz
Backup Battery		Lithium battery (approximate life : 20000 hours of usage)
Weight		6.5 Kg.

(3) Operating Conditions

		Motor section	Driver section	Comments
Ambient operating conditions	Temperature	0° to 45° C	0° to 50° C	
	Humidity	20 to 85% RH	20 to 90% RH	Non condensing
Ambient storage conditions	Temperature	-20° to 85° C	-20° to 85° C	
	Humidity	20 to 85% RH	20 to 90% RH	Non condensing
Operating environment		No corrosive gases, dust-free and no oil mist		

10.2 Torque - Speed Characteristics

(1) DM series

Torque (N.m)

DM1200A
DM1150A
DM1100A
DM1050A

200
150
100
50
0

0.5   1.0

Speed (rps)

DM B series

Torque (N.m)

DM1075B
DM1060B
DM1045B
DM1030B
DM1015B

80
70
60
50
40
30
20
10
0

0.5   1.0   1.5   2.0

Speed (rps)

DM B series

[——]: 200 - 230 VAC power supply   [− − −]: 100 - 115 VAC power supply

(2) DR series

Torque (N.m)

DR1400A
DR1300A
DR1200A
DR1150A
DR1100A
DR1050A

450
400
350
300
250
200
150
100
50
0

0   0.5   1   1.5

Speed (rps)

DR A series

Torque (N.m)

DR1060B
DR1045B
DR1030B
DR1015B
DR1008B

80
70
60
50
40
30
20
10
0

0   0.5   1   1.5   2

Speed (rps)

DR B series

Torque (N.m)

DR1250E
DR1220E
DR1160E
DR1130E
DR1100E
DR1070E
DR1030E

250
200
150
100
50
0

0   0.5   1   1.5   2

Speed (rps)

DR E series

[——]: 200 - 230 VAC power supply   [− − −]: 100 - 115 VAC power supply

Torque - Speed Characteristics *(continued)*

DR 5000 series

[———]: 200 - 230 VAC power supply   [– – –]: 100 - 115 VAC power supply
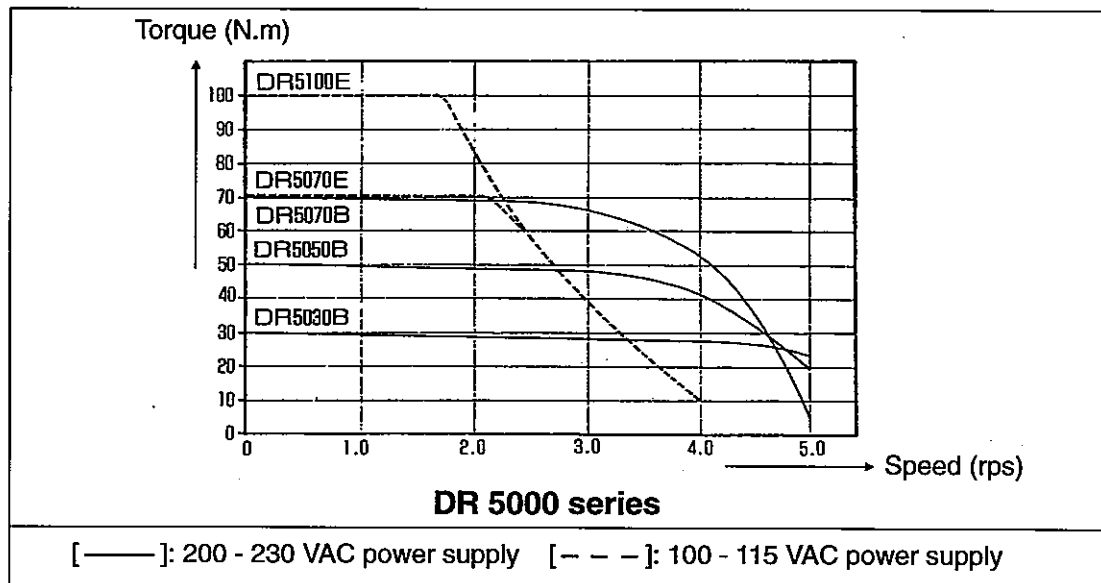
10.3 External Dimensions (Units: mm)

(1) DM series motor

-109-
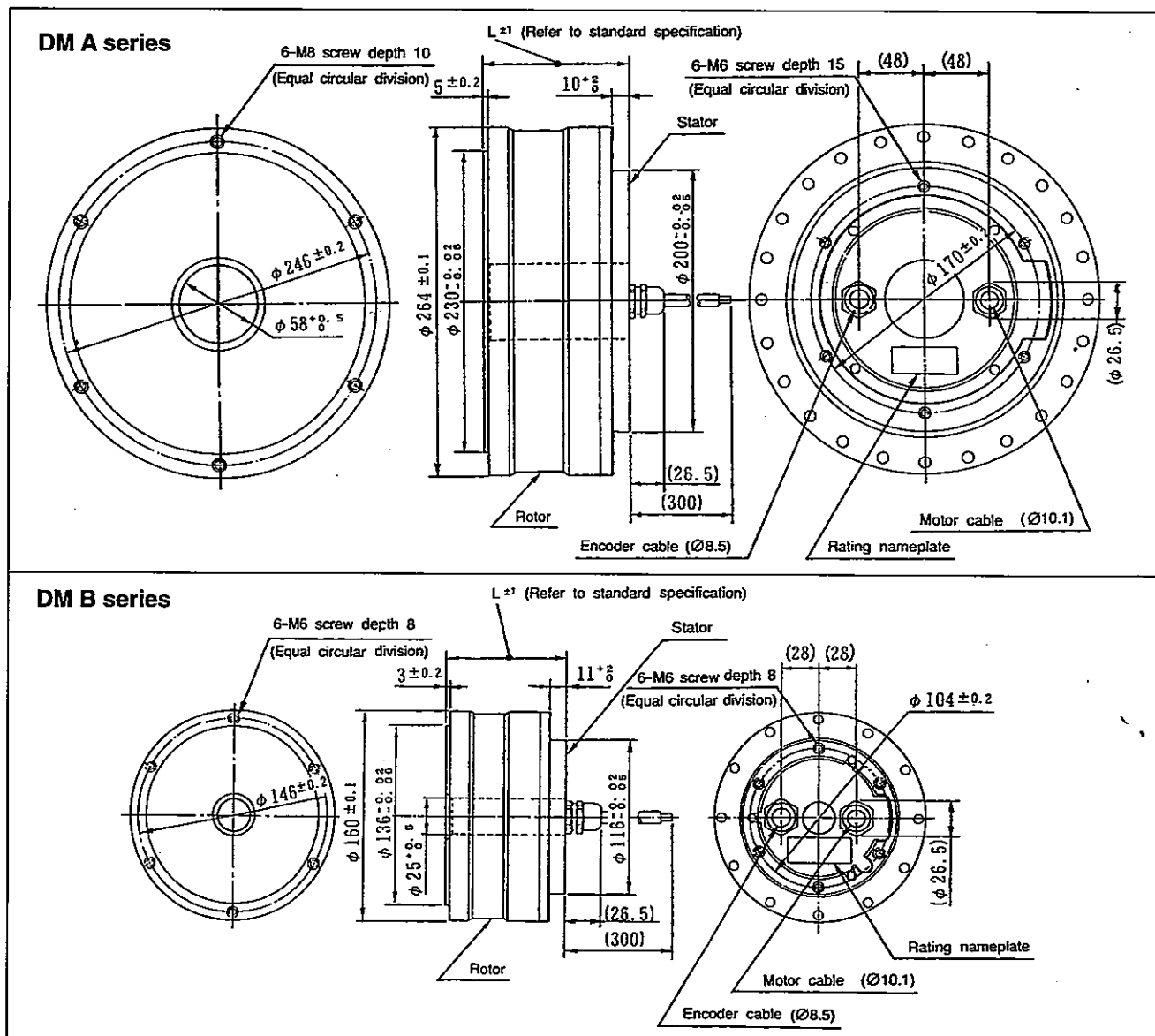
(2) DR series motor

DR A series
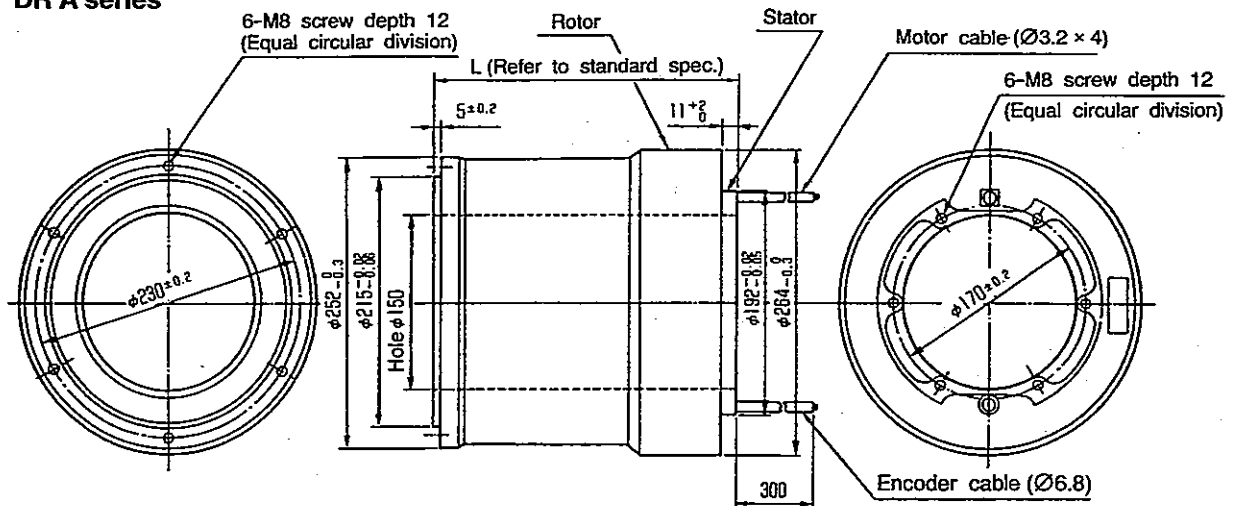
DR B series

DR B series (For DR1008B only)

DR E series

(3) Driver dimensions (common to all series)

10.4 Parameter Listing

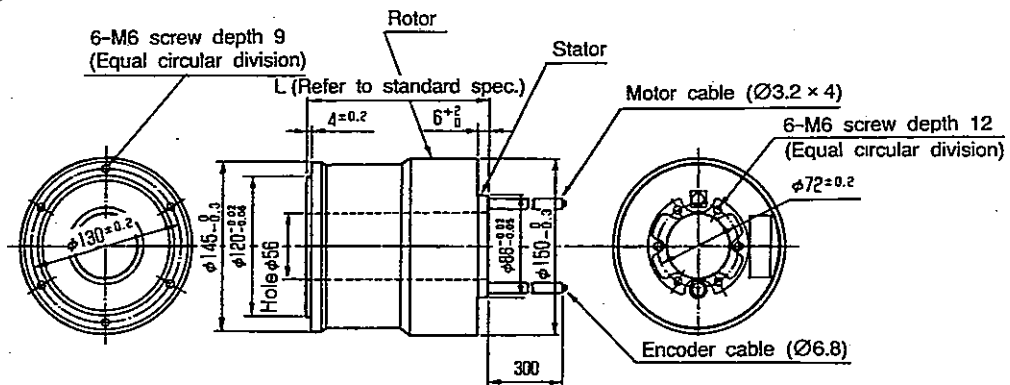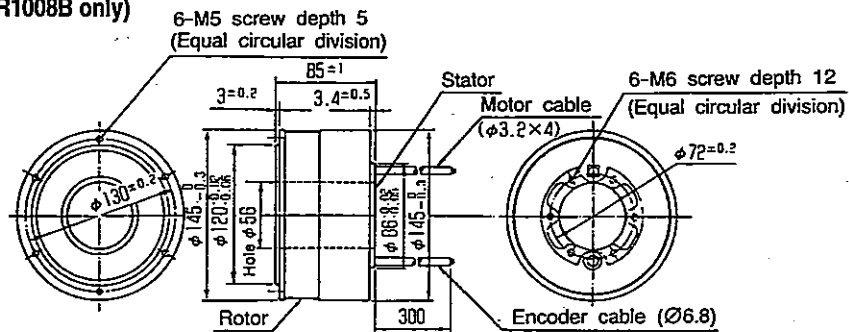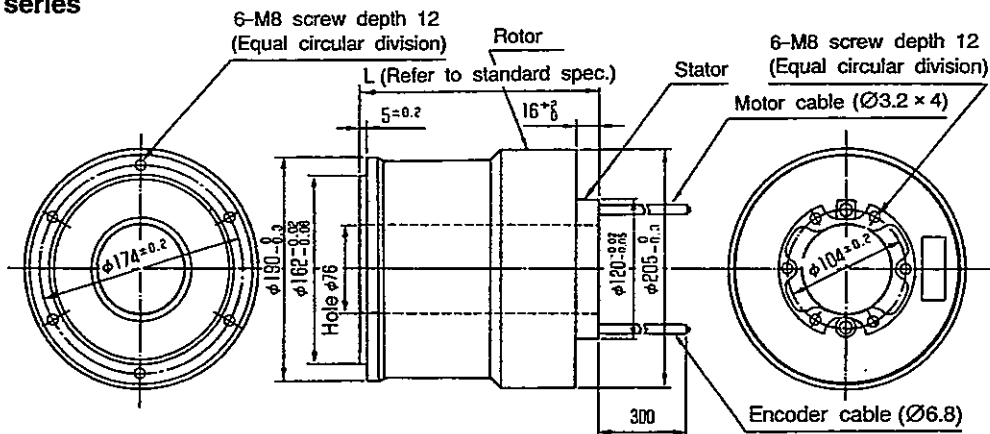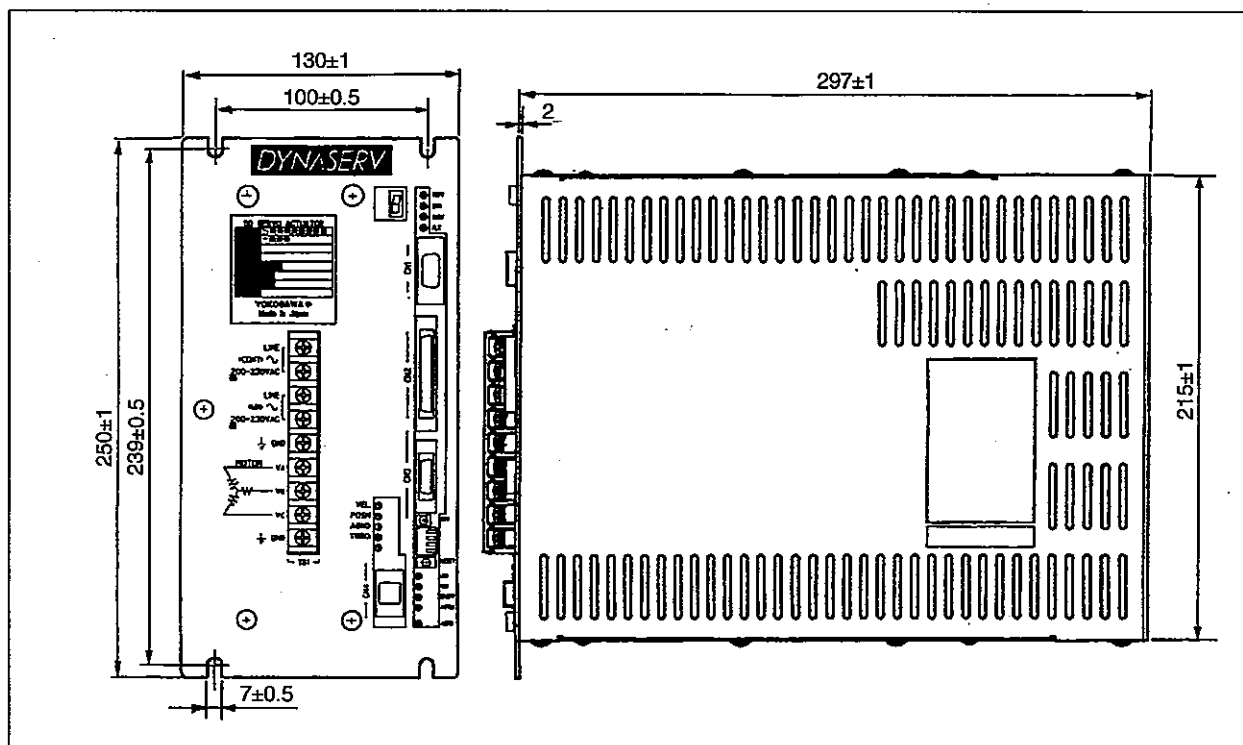| P no.	Parameter Description	Minimum value	Maximum value	Default value	Units
1.	Enables the over-travel error function in the + direction	0	1	0	None
2.	Enables the over-travel error function in the - direction	0	1	0	None
3.	Selecting the type of cam profile move	0	1	1	None
4.	Selecting the acceleration type	0	1	0	None
5.	Selecting the deceleration type	0	1	0	None
6.	Selection of the cam profile	1	16	6	None
7.	Acceleration time during a trapezoidal move	1	9999	1000	msec
8.	Deceleration time during a trapezoidal move	1	9999	1000	msec
9.	Feeding Velocity	1	9999999	100000	Axis command units/msec
10.	Jog Velocity	1	9999999	100000	Axis command units/msec
11.	Over travel search velocity during a homing move	1	9999999	100000	Axis command units/msec
12.	Homing operation: Home sensor proximity signal search velocity	1	9999999	50000	Axis command units/msec
13.	Home sensing move 1	1	9999999	25000 (appr)	Axis command units/msec
15.	Homing operation: Origin position offset feed velocity	1	9999999	100000	Axis command units/msec
16.	Velocity override percentage 1	0	200	100	%
17.	Velocity override percentage 2	0	200	100	%
20.	Homing direction	0	1	0	None
21.	Enable/ Disable the overtravel signal under the homing mode.	0	1	0	None
22.	Enable/ Disable the proximity signal search during a homing operation.	0	1	1	None
27.	Enabling the homing flag position error.	0	1	1	None
29.	Offset distance from the Home position	-9999999	9999999	0	Axis command units
30.	Homing complete operation command value	-9999999	9999999	0	Axis command units
31.	Operation width under testing mode	0	9999	1800 (approx)	Axis command units
32.	Operation width under Auto-tuning	5000	45000	20000	Axis command units
33.	Maximum deceleration under Auto-tuning	10	1000	100	msec
34.	Initializing the deceleration time while under Auto-tuning.	100	2000	500	msec
38.	Servo stiffness settings	1	5	3	None
39.	Signal search direction	0	1	0	None
41.	Enabling the signal search mark signal	0	1	0	None
42.	Enabling the proximity signal during homing	0	1	0	None
43.	Enabling the (+) direction over travel signal during the signal search mode	0	1	0	None
44.	Enabling the (-) direction over travel signal during the signal search mode	0	1	0	None

P no.	Parameter Description	Minimum value	Maximum value	Default value	Units
46.	Signal search mark signal logic settings	0	1	0	None
47.	Logic for the proximity signal during homing	0	1	0	None
48.	Logic for the (+) direction over travel signal during the signal search mode	0	1	0	None
49.	Logic for the (-) direction over travel signal during the signal search mode	0	1	0	None
50.	The position control band width	0	32	12	Hz
53.	The position integral limiting value	0	9999999	10000	Axis command units
54.	The position feed forward percentage	0	126	90	%
55.	Velocity feed forward percentage	0	126	100	%
56.	Acceleration feed forward gain	0	9999999	0	None
58.	Positioning settling width	0	9999	5	Axis command units
65.	Value causing an error detection in the (+) or CW direction:	1	32767	32767	Pulse
66.	Value causing an error detection in the (-) or CCW direction:	-32767	-1	-32767	Pulse
70.	Analog monitor selection	0	8	4	None
71.	Axis positioning error monitoring gain	0	6	2	None
72.	Axis test operation monitoring gain	0	6	2	None
73.	Axis position monitoring gain	0	12	2	None
74.	Axis velocity monitoring gain	0	6	2	None
78.	Feeding move set value	-9999999	9999999	0	Axis command units
79.	Move time during a cam profile selection.	1	9999	2000	msec
80.	Acceleration time during a cam profile selection.	1	9999	1000	msec
81.	Deceleration time during a cam profile selection.	1	9999	1000	msec
82.	Enabling the Program step execution	0	1	0	None
83.	Enabling the Absolute instruction during program execution	0	1	0	None
84.	Enabling the peak velocity during a cam profile move	0	1	0	None
85.	Enable the (+) direction soft limit error	0	1	0	None
86.	Enable the (-) direction soft limit error	0	1	0	None
87.	(+) direction soft limit settings	-9999999	9999999	0	Axis command units
88.	(-) direction soft limit settings	-9999999	9999999	0	Axis command units
89.	Brake turn OFF delay time upon Servo ON	0	2000	0	msec
90.	Advanced Brake turn ON before Servo OFF	0	2000	0	msec
91.	TBX_EMG Servo status	0	2	0	None
92.	Start-up program enable	0	1	0	None
100.	M function enable in program execution	0	1	0	None
101.	M function enable during index point operation	0	1	0	None

P no.	Parameter Description	Minimum value	Maximum value	Default value	Units
102.	Enabling the selection of serial communication type for the M function interface	0	1	0	None
103.	Optional stop enable	0	1	0	None
104.	ABS command selection during Index / point / direct input value type of operations	0	1	0	None
105.	Movement direction options under rotation coordination	0	3	0	None
106.	Settling wait enable	0	1	1	None
108.	Operation units selection	0	2	1	None
109.	Index divisions setting	-1	100	4	None
110.	Point divisions setting	1	100	10	None
150.	Velocity control loop: Proportional gain settings	5	10000	80	0.1 times
152.	First order delay filter: Frequency settings	0	3	0	None
153.	Notch filter: Enable / Disable	0	1	0	None
154.	Notch filter: Frequency selection	50	1500	1500	Hz
155.	Inertia settings	5	200000	0	0.001 Kg.m²
158.	Torque limiter	0	100	0	%
159.	Velocity control loop band width	1	100	50	Hz
161.	Cam positioner 0_ON	0	9999999	0	Axis command units
162.	Cam positioner 0_OFF	0	9999999	0	Axis command units
163.	Cam positioner 1_ON	0	9999999	0	Axis command units
164.	Cam positioner 1_OFF	0	9999999	0	Axis command units
165.	Auto homing	0	1	0	None
201.	Selection of English / Japanese language display	0	1	0	None
202.	Axis command (+)direction setting	0	1	1	None
204.	Acceleration feed forward logic	0	1	0	None
205.	Axis encoder resolution settings	1000	9999999	※	Pulse/rev
206.	Axis velocity input sensitivity settings	1	9999	※	mV/(rev/sec)
207.	Z signal interval	1	9999999	※	Pulse
208.	Axis command unit selection	0	3	1	None
209.	Axis scaling data (command unit side)	1000	9999999	※	Axis command units
210.	Axis scaling data (pulse side)	1000	9999999	※	Pulse
212.	Straight line coordinate selection	0	1	0	None
213.	Axis maximum velocity	1	9999999	※	Axis command units / msec

NOTE: The ※ indicates that this value is dependant on the motor series and type.

P no.	Parameter Description	Minimum value	Maximum value	Default value	Units
215.	PLC operation: Start signal processing speed selection	0	1	0	None
216.	Servo ON status upon power up during serial communication operations	0	1	1	None
217.	Jog move operation: Serial communication selection	0	1	0	None
218.	Rotor inertia	5	5000	※	0.001 Kg.m²
219.	Maximum torque	5	10000	※	0.1 N.m
220.	Torque input	1	10000	※	N.m/V

NOTE: The ※ indicates that this value is dependant on the motor series and type.

10.5 Monitor Parameter Listing

M.No.	Monitoring parameter	Units
300.	Currently under operation	None
301.	Axis is under operation	None
302.	Error status	None
303.	Alarm status	None
304.	Controller ready	None
305.	Servo ready	None
306.	Drive coordinate status	None
307.	M function under operation	None
308.	Selection of communication interface for operations	None
310.	Display of program number under execution (or last executed)	None
311.	Display of block number under execution in the program	None
312.	Program nesting counter	None
313.	Move dimensions display	None
314.	Index resolution current value	None
315.	Velocity override selection status	None
316.	Program auto-rewind enabled status	None
317.	Completion of homing status display	None
318.	Homing operation: The measured value	Pulse
320.	Axis pulse position command value	Pulse
321.	Axis pulse position current value	Pulse
322.	Axis pulse position deviation	Pulse
323.	Axis command unit command value	Pulse
324.	Axis scaling data (command unit side)	Axis command unit
325.	Axis scaling data (pulse side)	Pulse
326.	Axis under operation: Command value	Axis running unit
328.	Axis position settling status	None
329.	Axis positioning status	None
330.	Display brake turned OFF	None
331.	Cam positioner 0 status	None
332.	Cam positioner 1 status	None