Parker
Automation

p/n 88-018108-01 A

Dynaserv M-Type Controller/Drive User Guide

Effective: July 2, 1999

IMPORTANT

User Information

WARNING

Dynaserv Series products are used to control electrical and mechanical components of motion control systems. You should test your motion system for safety under all potential conditions. Failure to do so can result in damage to equipment and/or serious injury to personnel.

Technical Assistance ⇨ *Contact your local automation technology center (ATC) or distributor, or ...*

North America and Asia:
Compumotor Division of Parker Hannifin
5500 Business Park Drive
Rohnert Park, CA 94928
Telephone: (800) 358-9070 or (707) 584-7558
Fax: (707) 584-3793
FaxBack: (800) 936-6939 or (707) 586-8586
e-mail: tech_help@cmotor.com
Internet: http://www.compumotor.com

Europe *(non-German speaking)*:
Parker Digiplan
21 Balena Close
Poole, Dorset
England BH17 7DX
Telephone: +44 (0)1202 69 9000
Fax: +44 (0)1202 69 5750

Germany, Austria, Switzerland:
HAUSER Elektronik GmbH
Postfach: 77607-1720
Robert-Bosch-Str. 22
D-77656 Offenburg
Telephone: +49 (0)781 509-0
Fax: +49 (0)781 509-176

Parker
Automation

Technical Support Email
tech_help@cmotor.com

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

CONTENTS

CONTENTS

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.

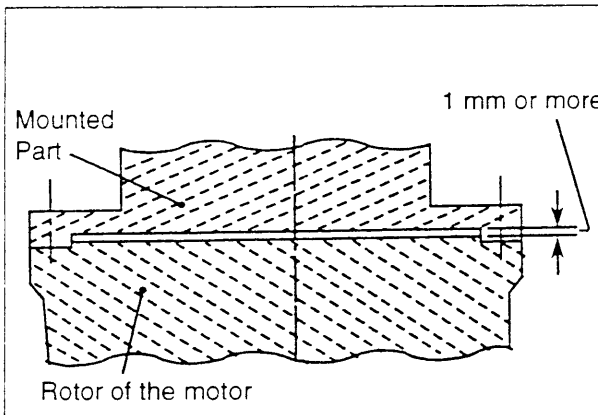


Fig. C-1

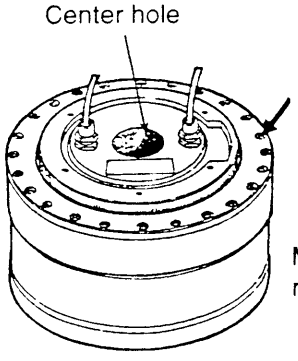


Fig. C-2

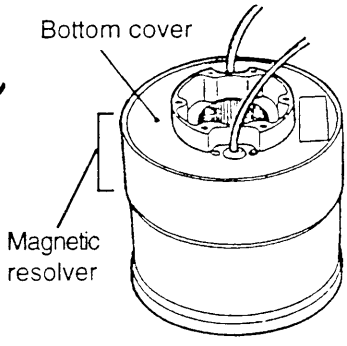


Fig. C-3

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 motor 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.

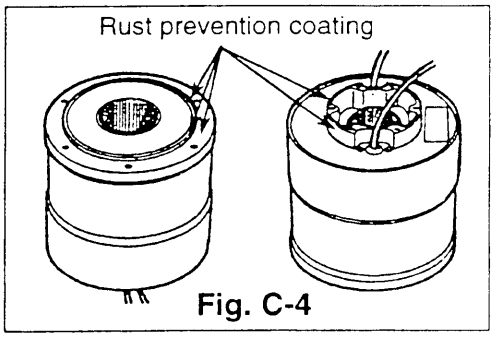


Fig. C-4

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.

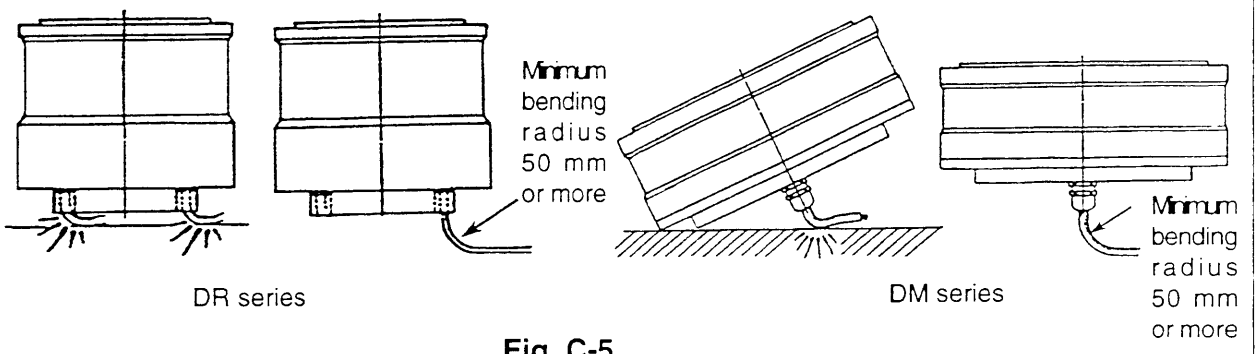


Fig. C-5

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.

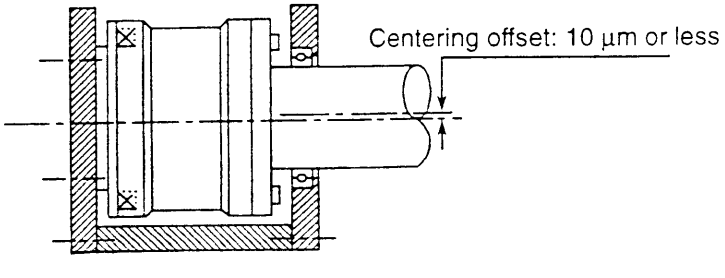


Fig. C-6

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).

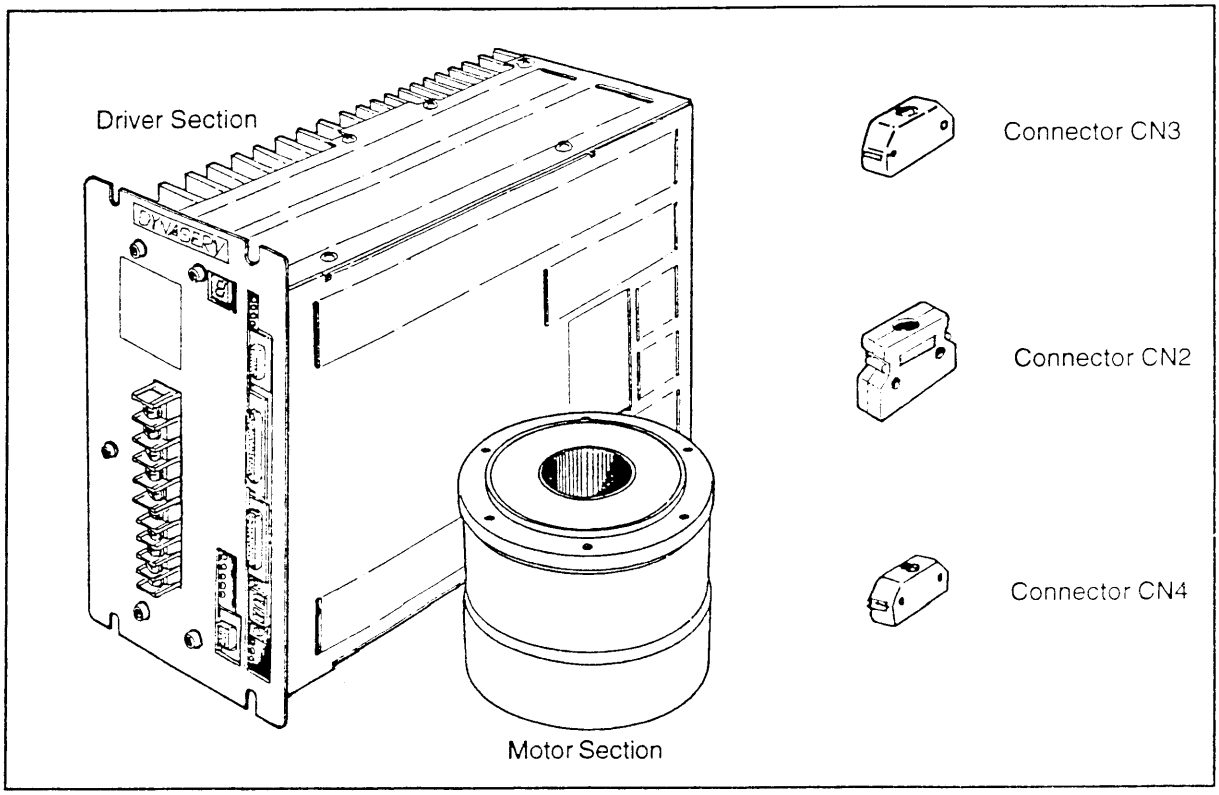
Kindly refer to the following page for the configuration of model specifications.

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.

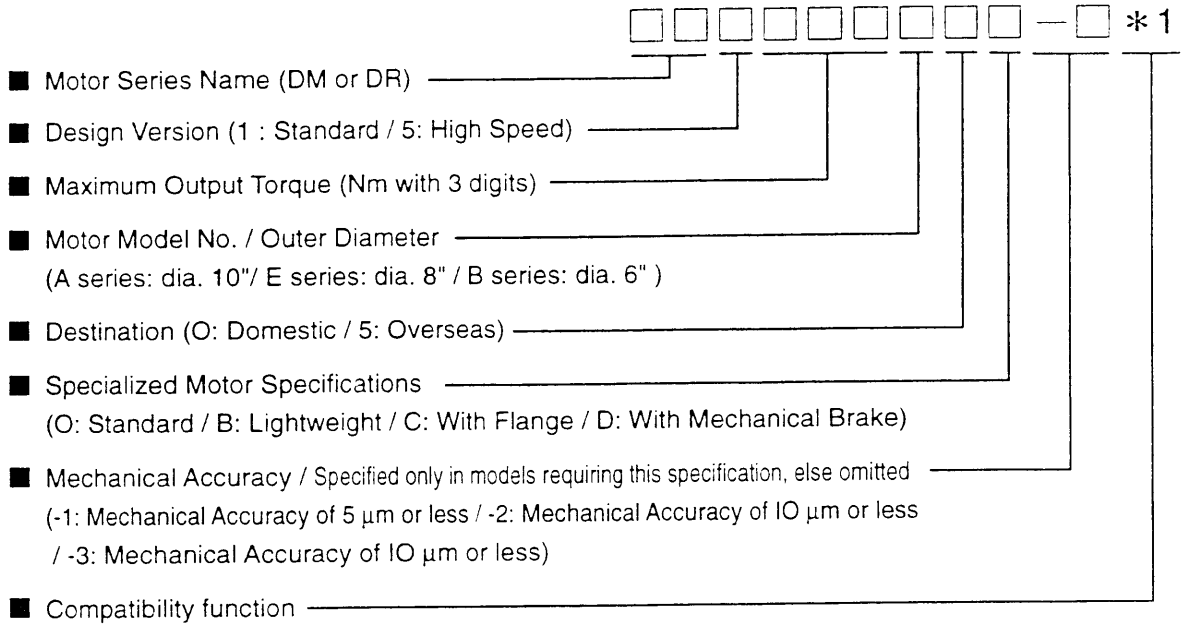
Table 1.1 Standard Products

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)

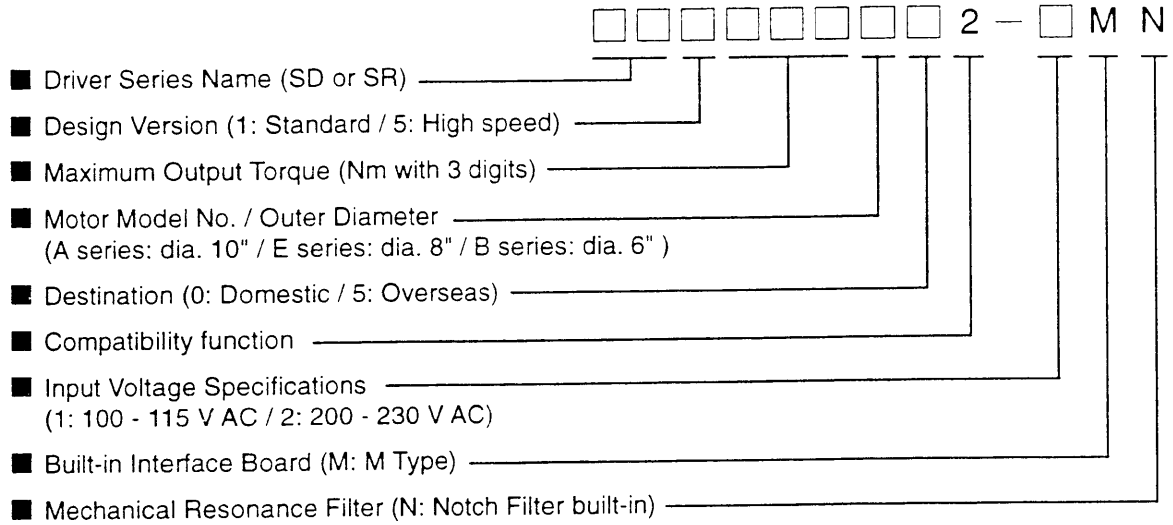


1.3 Model Specification Codes

(1) Motor Section Specification Codes:



(2) Driver Section Specification Codes:

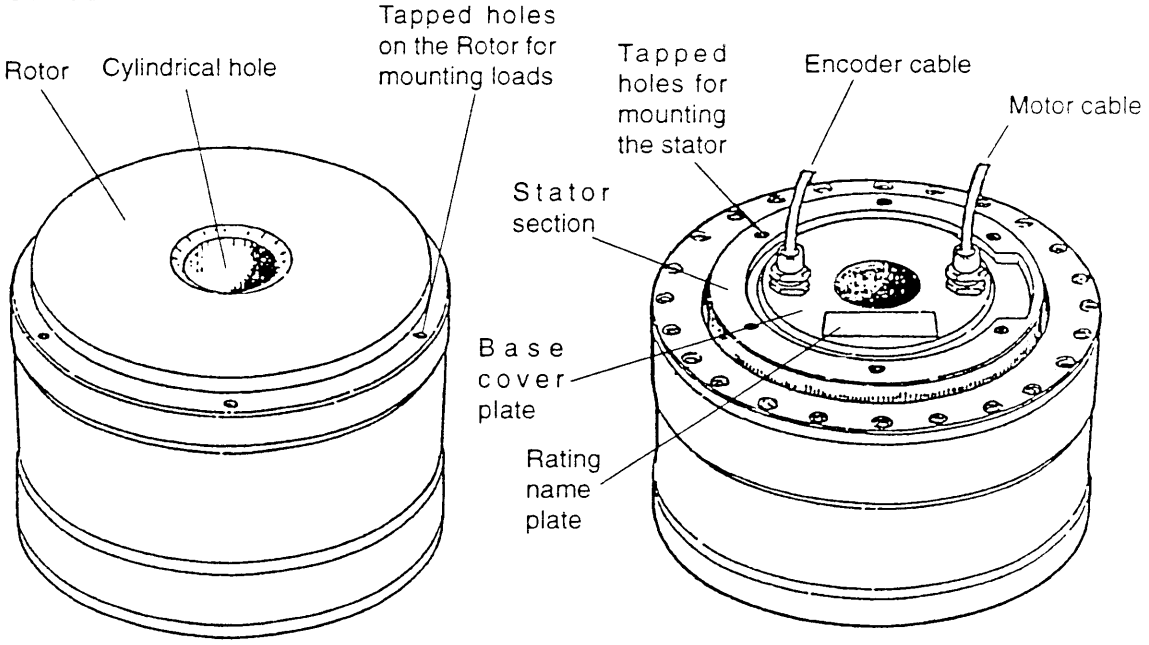


NOTE: The motor and the driver are compatible within the same model type. For compatibility, the upper five digits of the motor specification code (Example: DR □□□□□ 02) and the driver specification code (Example: SR □□□□□ 02) shall be identical.

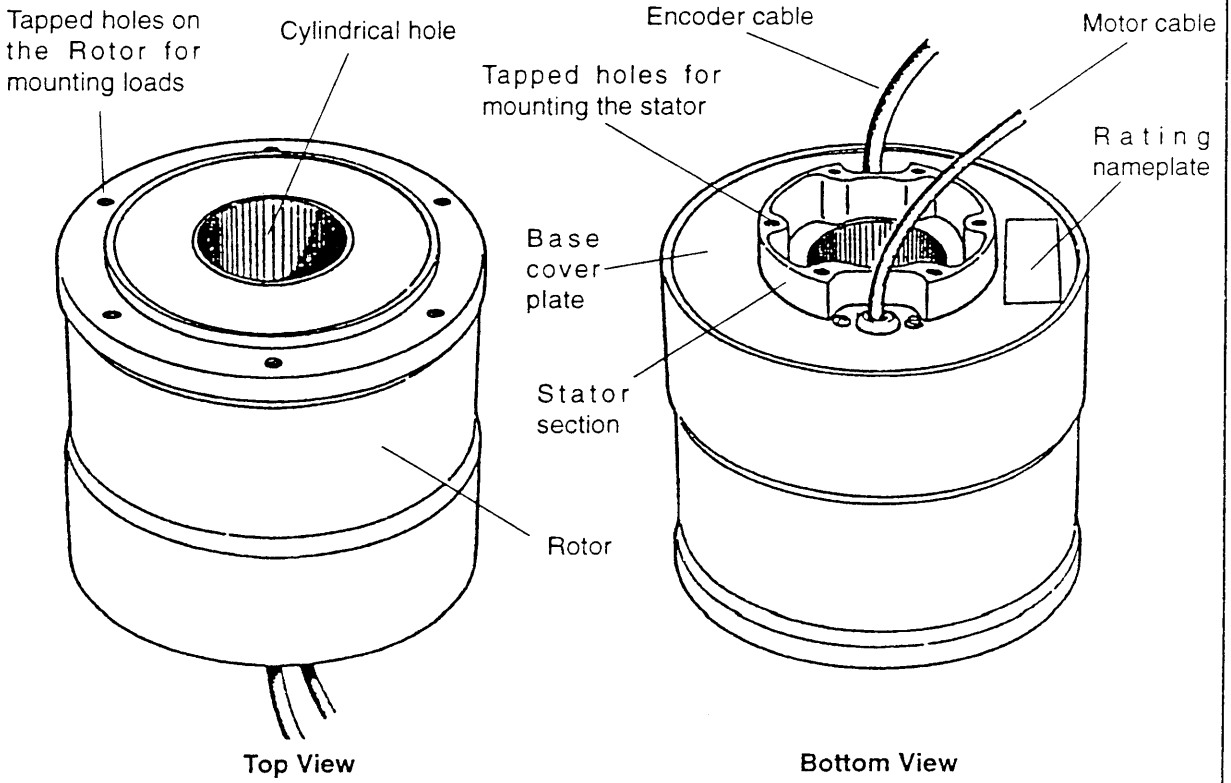
2. Functional Description

2.1 Motor Section

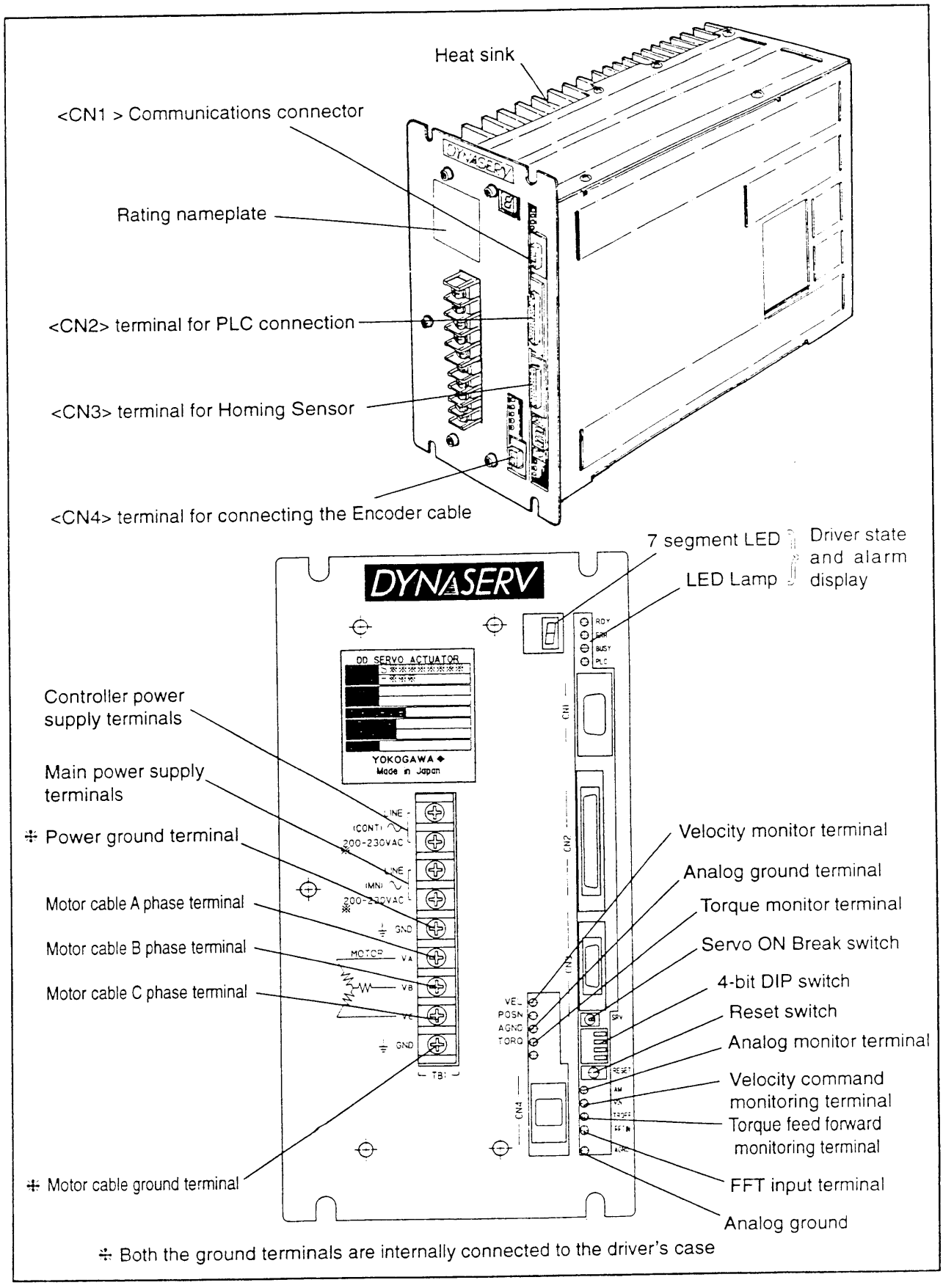
DM Series



DR Series



2.2 Driver Section

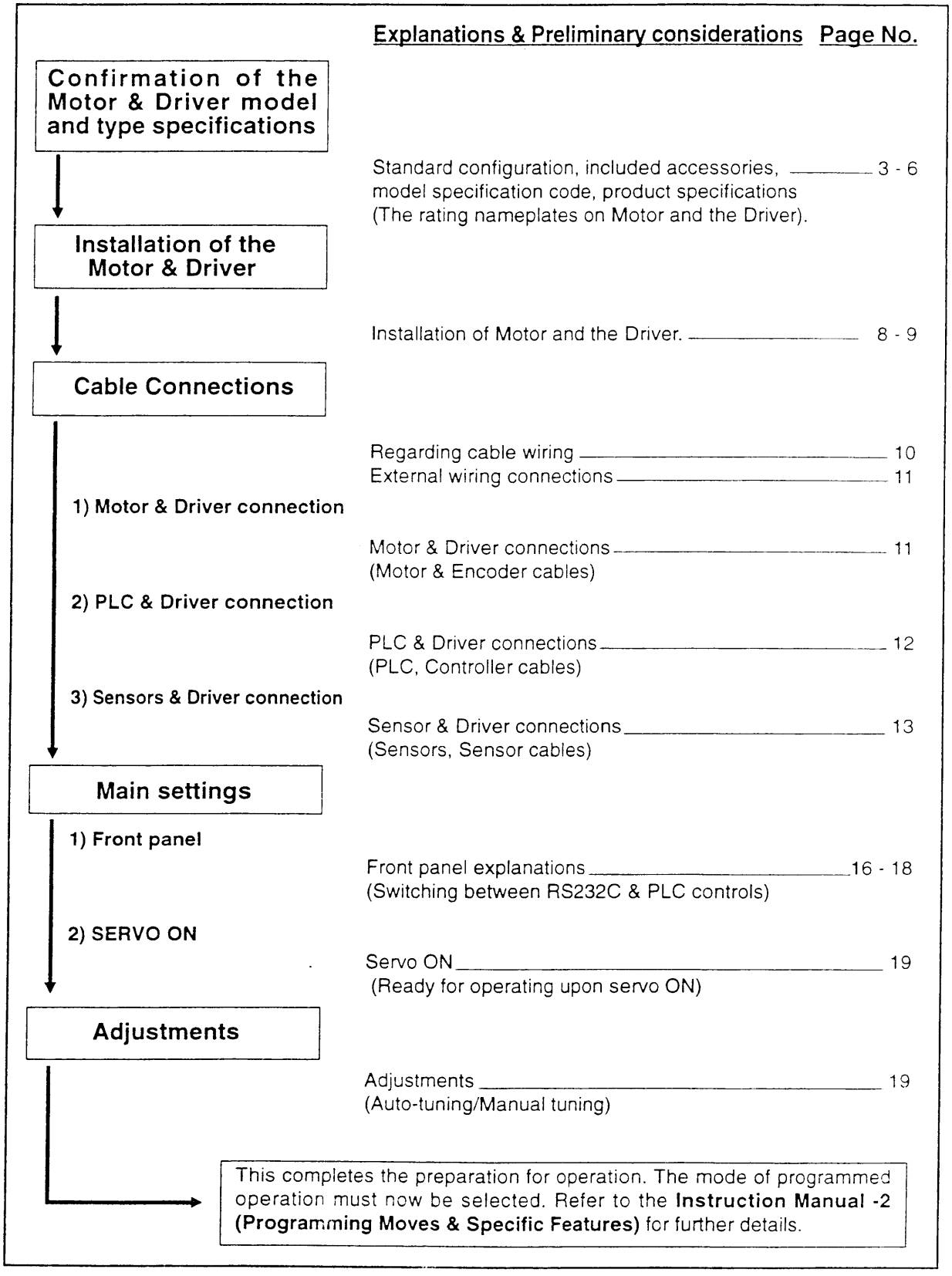


Both the ground terminals are internally connected to the driver's case

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.



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 1 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.

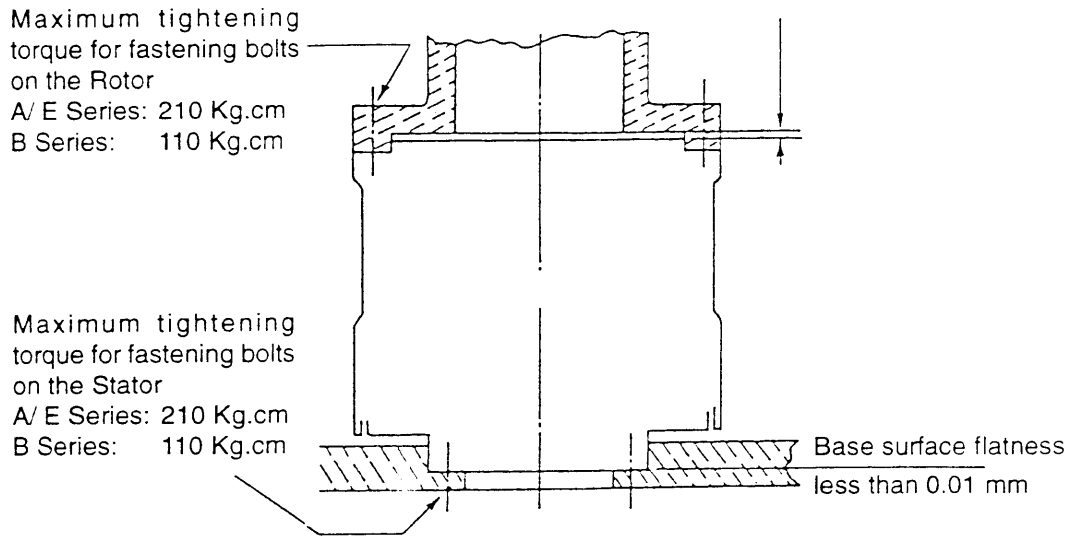


Fig 3.2.1

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 a 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.

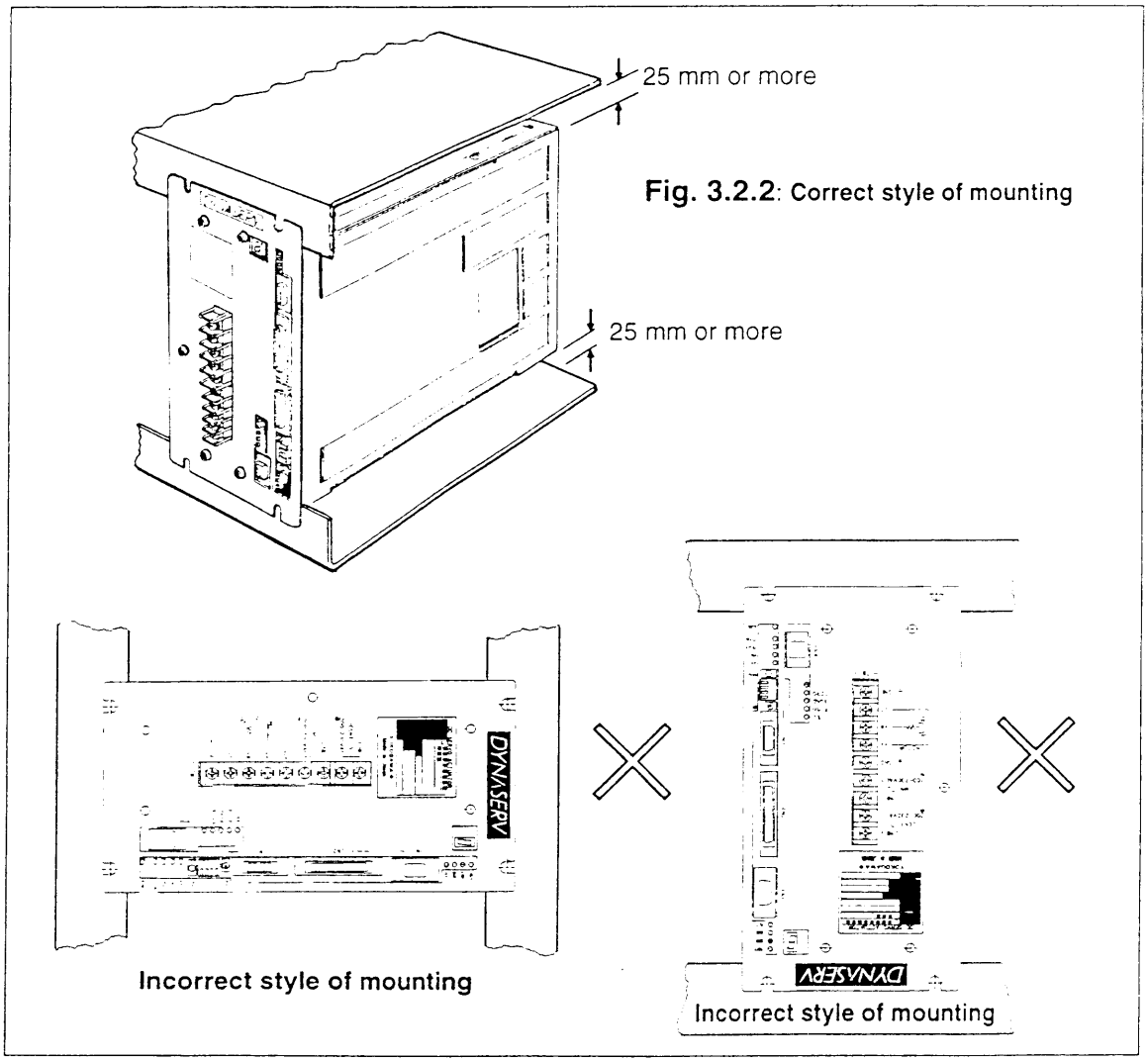


Fig. 3.2.2: Correct style of mounting

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 Interface 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.	

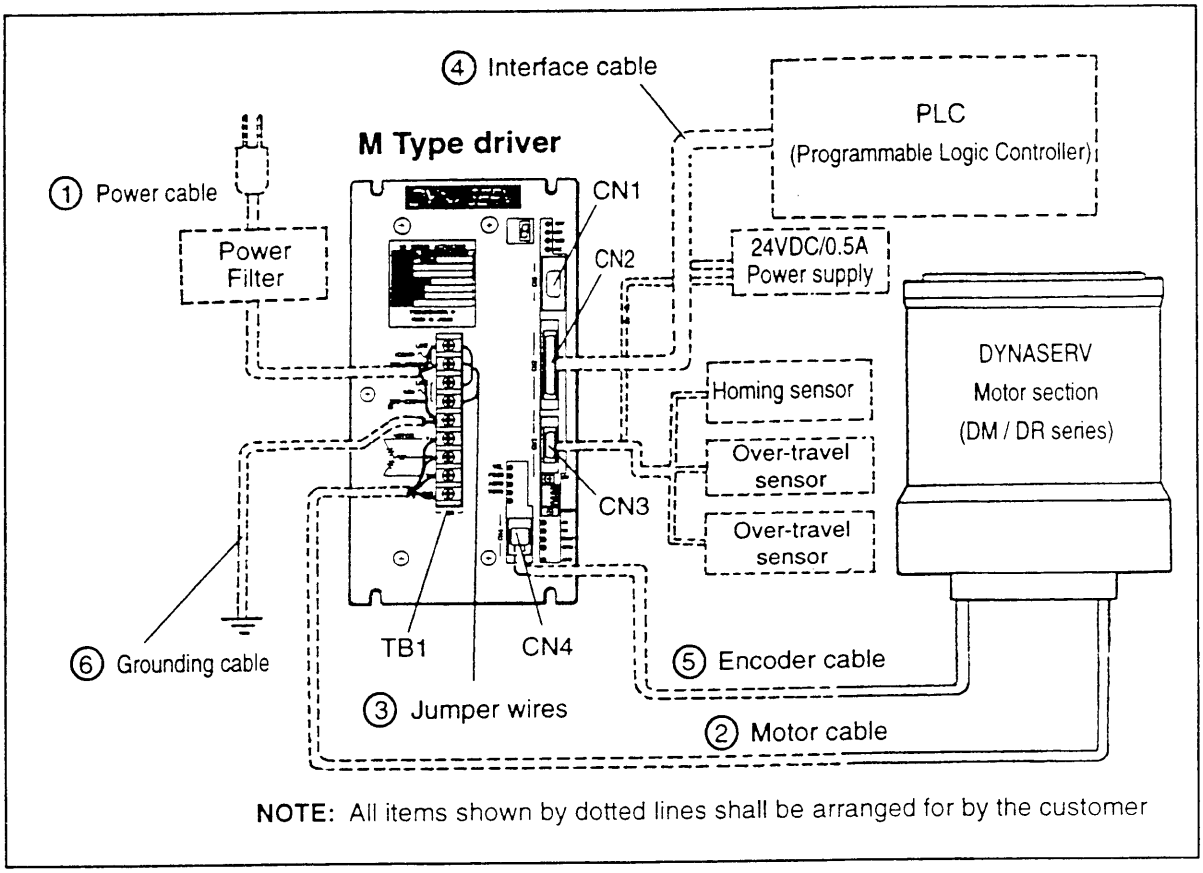
Notes:

1. Current values: r.m.s. of rated currents.
2. Cable size: Cross-sectional area in mm^2 .
3. Cross sectional area of conductor marked with an ✣ : More than 0.2 mm^2 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.

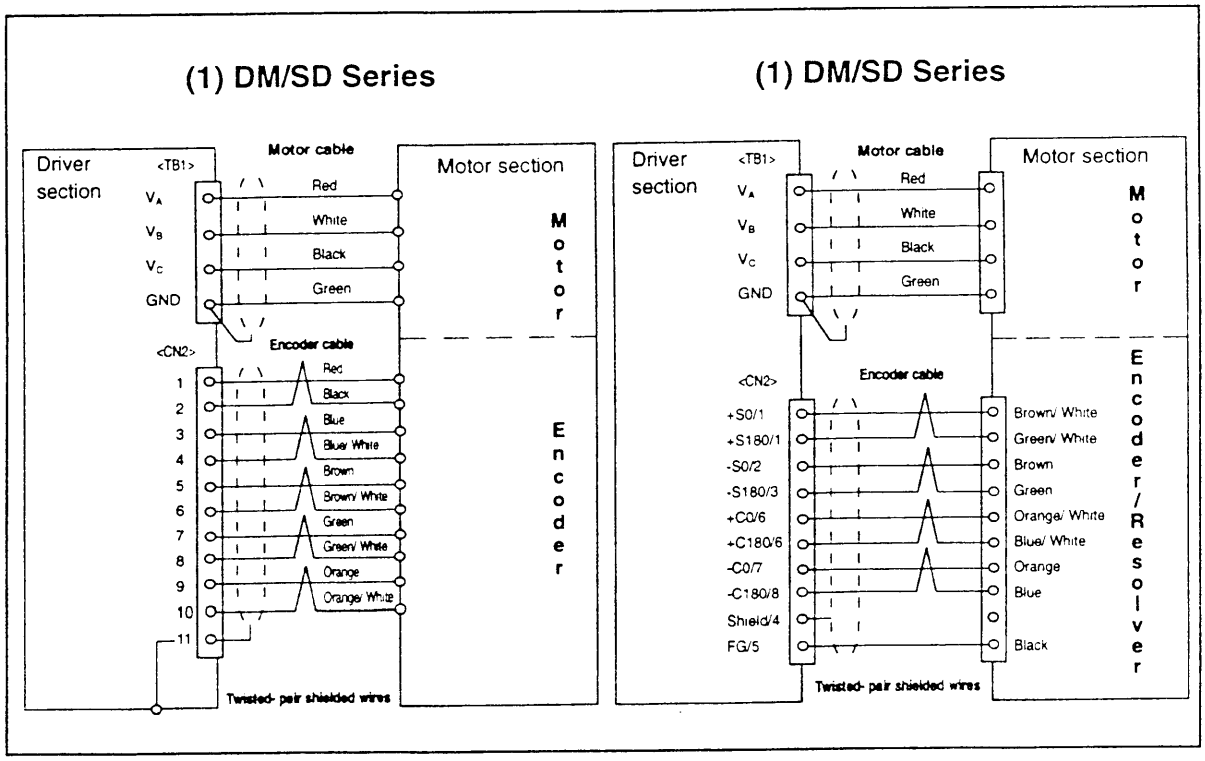
(2)Wiringcautions:

- Usethespecifiedmulti-coretwistedpaircableswithcollectiveshieldingfortheencodercable. Ensurethattheproperendshieldconnectionsaremade.
- Usethickconductorsasgroundingcablesasfaraspossible.TheDYNASERVmustbegrounded withawireresistanceoflessthan100Ω.
- AsthemotorcableandtheACpowercablescarryhighvoltagesandlargecurrents,ensurethatthe properwiringiscarriedoutwhilefollowingallthesafetyprecautions.

3.3.2 External connection layout



3.3.3 Motor - Driver connection layout



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 ÷ 4	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 Use this to switch between velocity over ride 1 and 2.

÷ 7 The default factory settings for the operations logic is normal open settings.

<CN3> Pin assignments

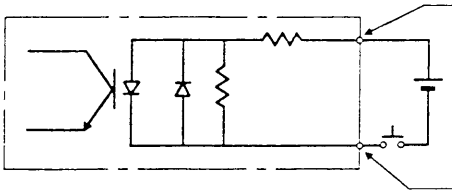
Pin no.	Signal	Functions & Meanings	I/O Type
1	*ORG -	Home proximity signal -	Input
2	*ORG +	Home proximity signal +	Input
3	*OTUP -	CW direction hard limit signal -	Input
4	*OTUP +	CW direction hard limit signal +	Input
5	*OTDN -	CCW direction hard limit signal -	Input
6	*OTDN +	CCW direction hard limit signal+	Input
7	MRK -	Mark signal -	Input
8	MRK +	Mark signal +	Input
9	GND	Ground(Note: pin number 50 in CN2 is not connected to this 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 * uses normal close logic electrically.
2. It is not necessary to connect anything to the CW and CCW 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

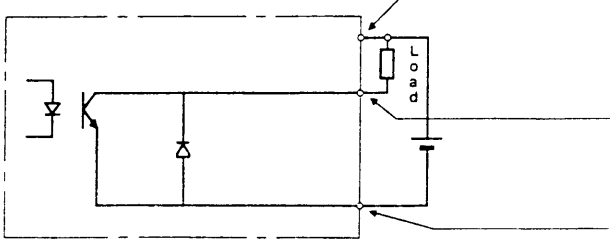


CN2: Pin no. 1
CN3: Pin no. 2, 4, 6, 8

CN2: Pin no. 2-29
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 voitage 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.

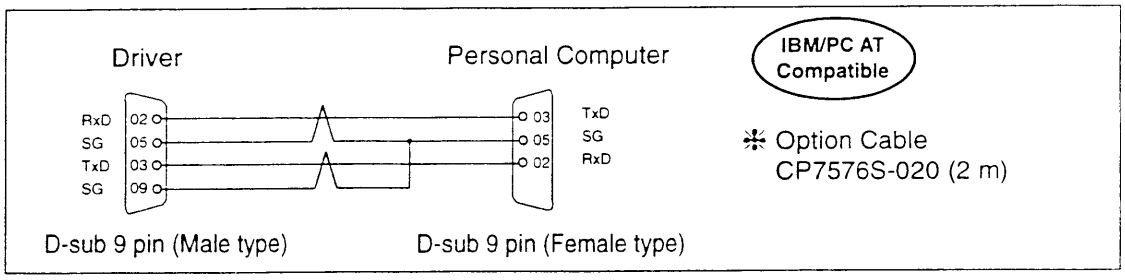
   The cables are of two different types, one is meant for the IBM or compatible machines, and the other is for the NEC98 series (for Japan only) of computers. If the cables are made by the customer, kindly note that in the NEC98 version, the RTS and CTS must be shorted for establishing proper communications.

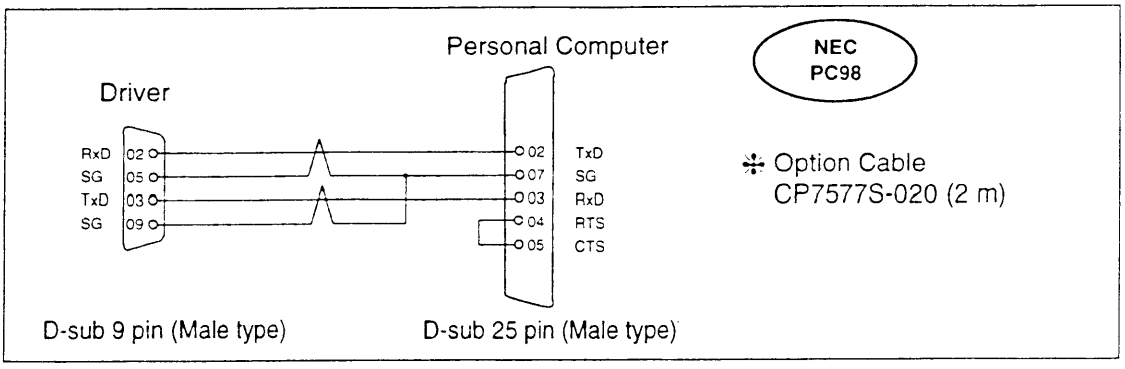
4) The teaching pendant (TBX)

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

<CN1> pin layout

01	FG	06	XTBXON
02	RXD	07	XTBXENG
03	TXD	08	+5V
04	(NC)	09	SG
05	SG		





For connecting other types of computers or controllers, kindly contact Yokogawa Precision Corporation or its authorized dealer.

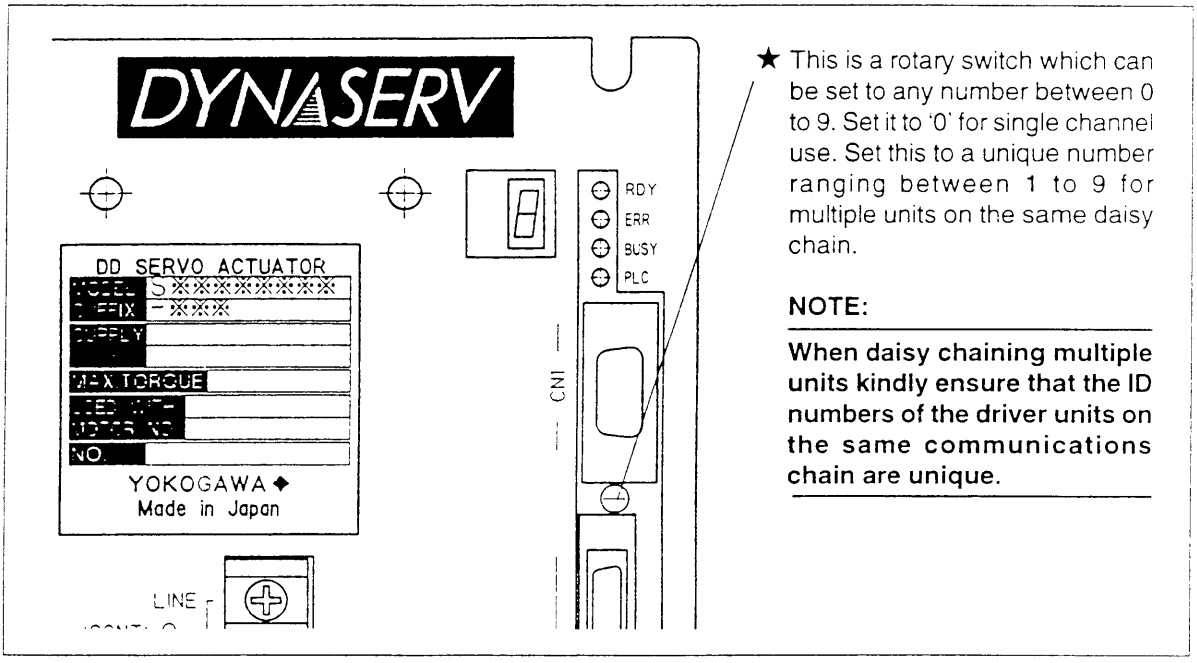
3.3.7 Multi-channel Communications

★ **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:

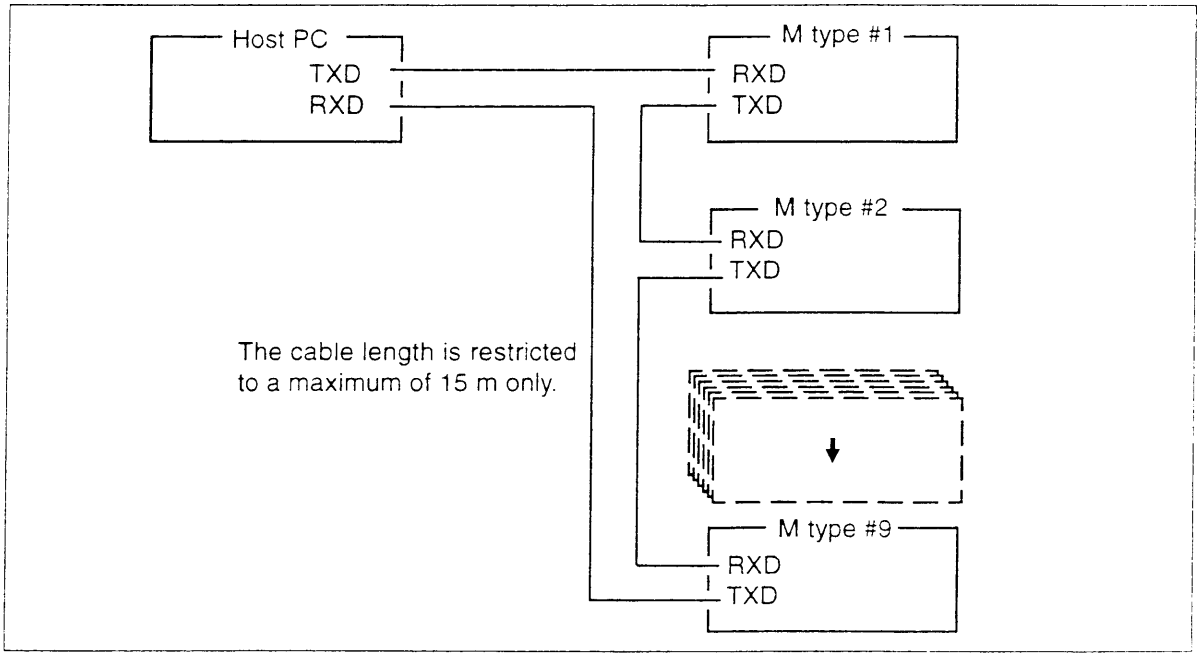


★ This is a rotary switch which can be set to any number between 0 to 9. Set it to '0' for single channel use. Set this to a unique number ranging between 1 to 9 for multiple units on the same daisy chain.

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.



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 1 (OFF) The value of #17 (velocity override percentage) is used for the move
Note that the above explanations are valid when the logic settings are Normal Open. If the logic settings are reversed, the features are reversed too.

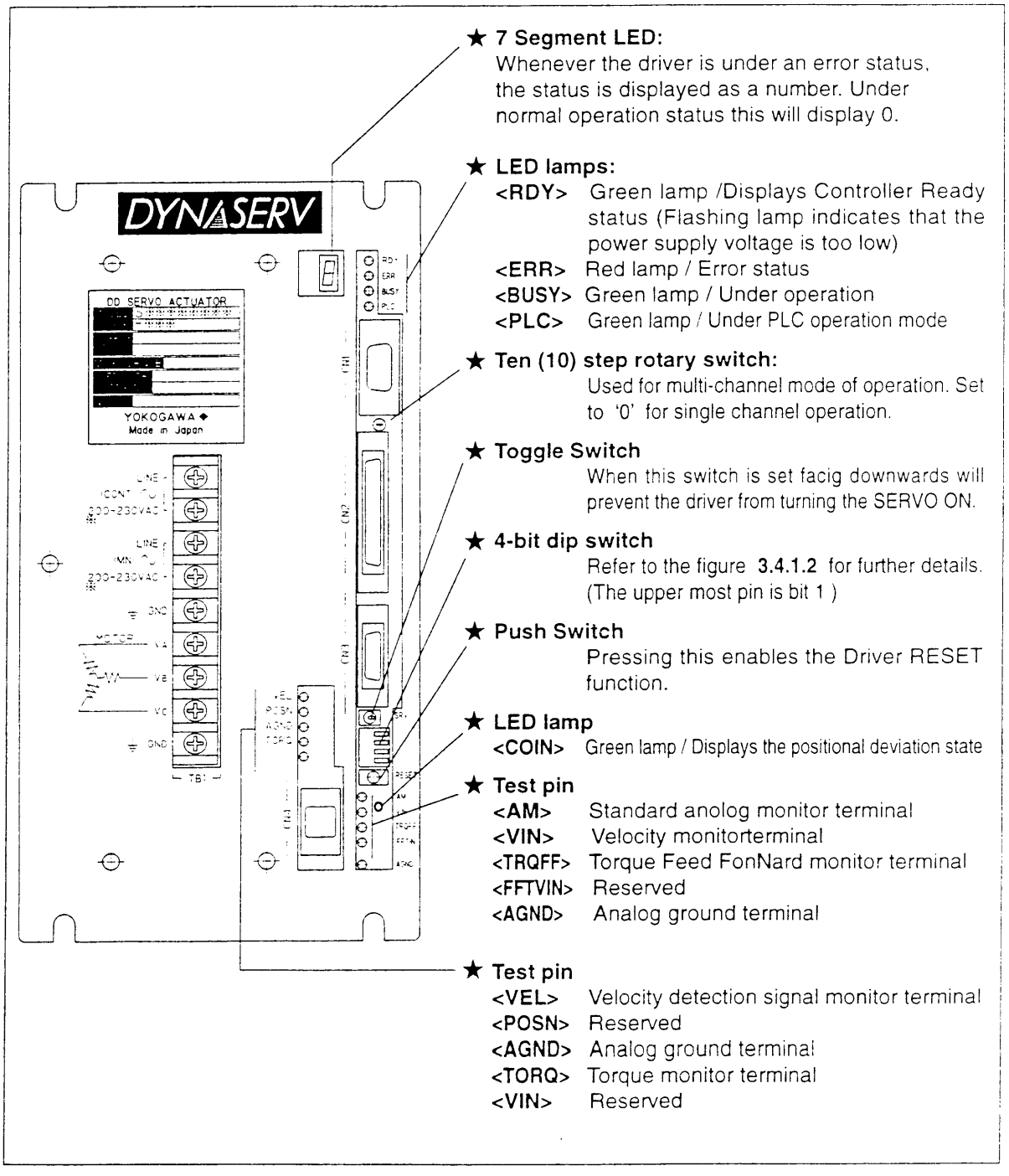
3.4 The Front Panel:

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



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

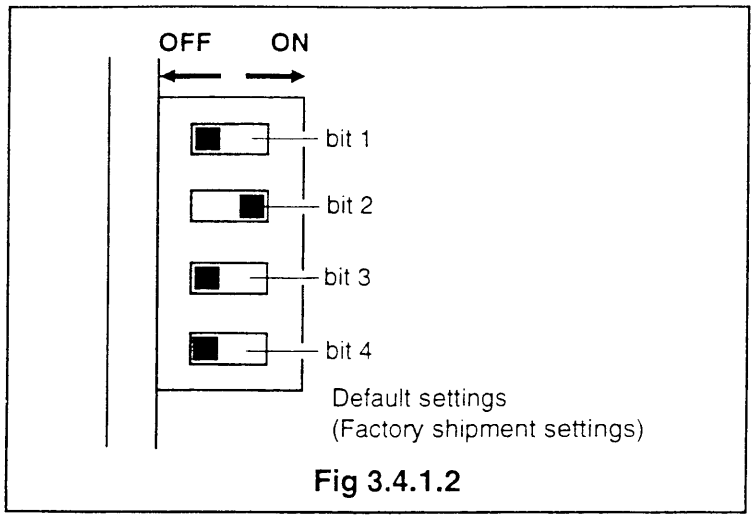


Fig 3.4.1.2

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.

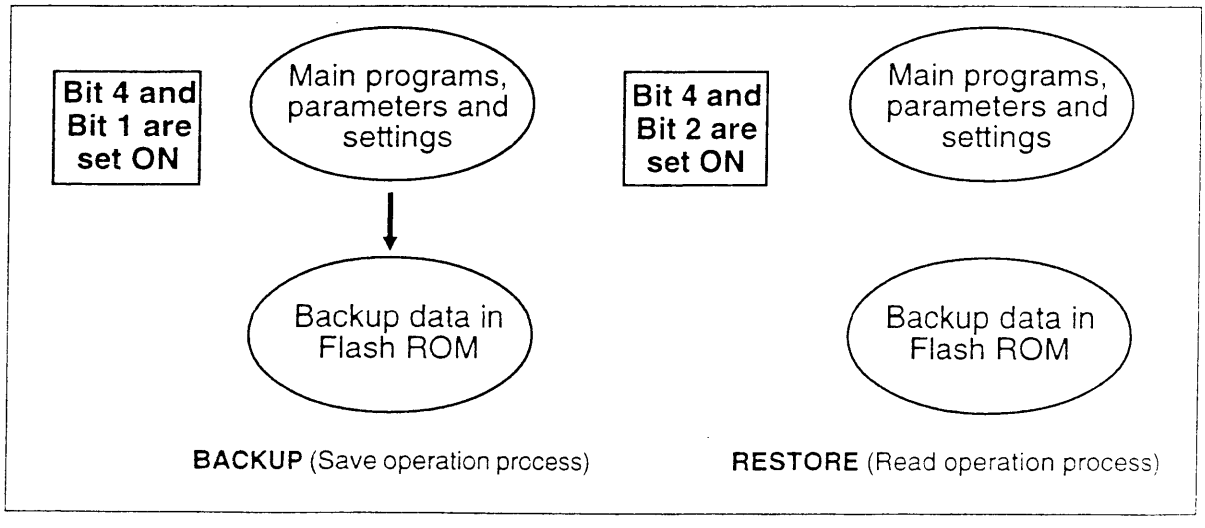
bit 3: DI emulation

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

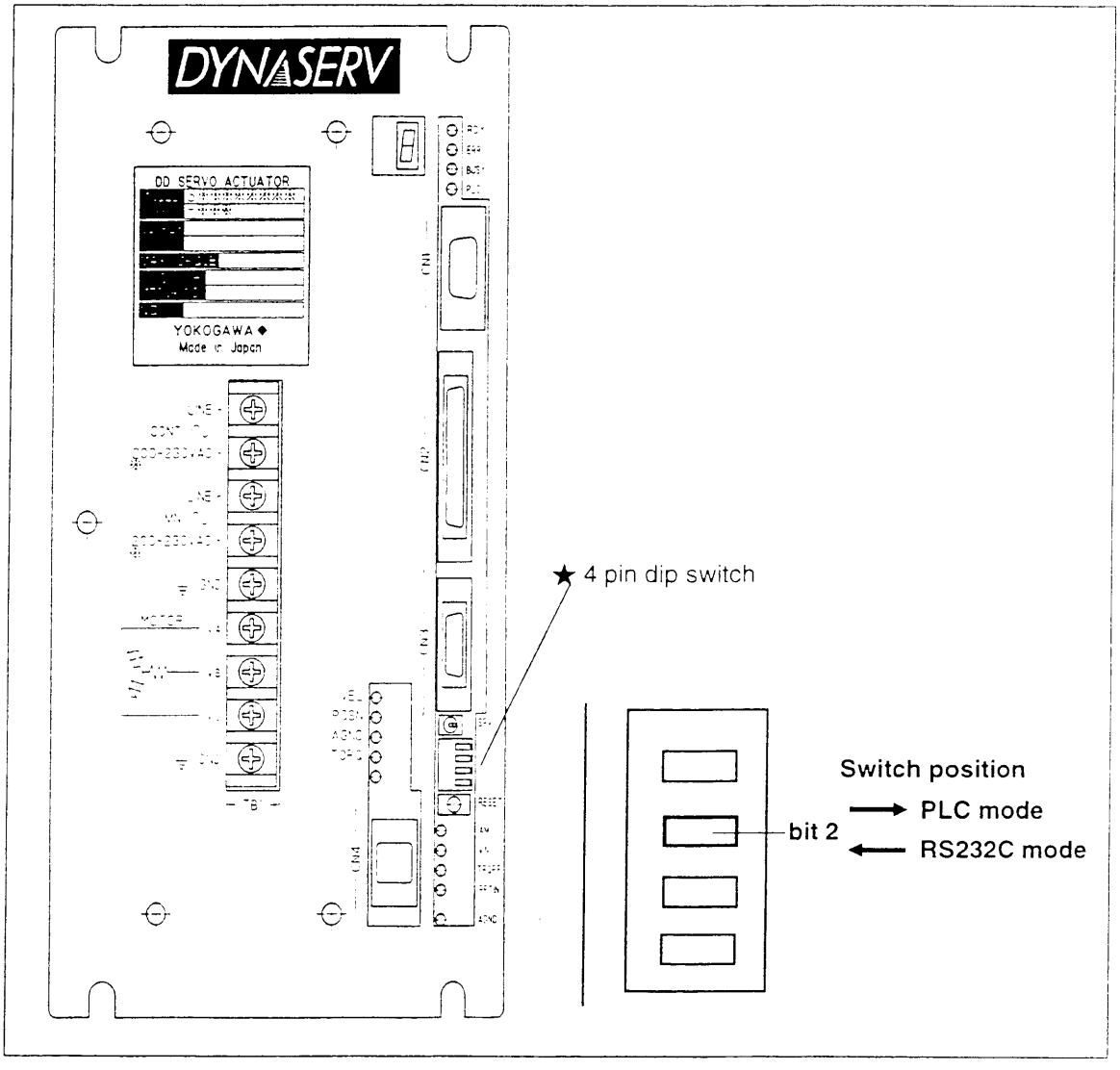
If the bit 4 is turned ON along with the bit 1, and reset is pressed then the set parameters, programs, component backup data etc., are all copied into the flash ROM. Upon the completion of this operation, the "PLC LED" Lamp will start flashing as an indication of completion. (As the flash ROM doesn't 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, and reset is pressed 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.



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. However, evry while in PLC mode, it is possible to acces the drive RS232C. Refer to the additional sheet for Accesible/Disabled/Invalid commands list under each mode of operation.



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

○ : Enable × : Disable — : Invalid

Commands			RS232C Mode			PLC Mode		
Item	RS232C	PLC	RS232C Command	TBX Command	PLC Command	RS232C Command	TBX Command	PLC Command
Emergency stop		IN_EMG	—	○	○	—	○	○
Servo on	@8		○	○	—	×	×	—
Start operation	@3	IN_MODE_START	○	○	×	×	×	○
Stop operation	@2	IN_MODE_ENDE	○	○	×	×	×	○
Program auto rewind		IN_PROG_REWIND	—	—	○	—	—	○
Interloch		IN_INTERLOCK	—	—	○	—	—	○
Abort	@1	IN_ABORT	○	○	○	○	○	○
Error reset	@4	IN_ERR_RESET	○	○	○	○	○	○
M – answer	@9	IN_M_ANS	※1	※1	※1	※1	※1	※1
Error request		IN_ERRCODE_REQ	—	—	○	—	—	○
Data enable		IN_DATE_EN	—	—	×	—	—	○
Disable integral move execution		IN_POS_INH	—	—	○	—	—	○
Velocity override selection		IN_OVERRIDE_SEL	—	—	○	—	—	○
Jog	@11	IN_JOG_UP	※2	※2	※2	※2	※2	※2
		IN_JOG_DN						
Homing offset	@10		○	○	×	○	○	×

※1 Based on # 102 parameter value
※2 Based on # 217 parameter 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.

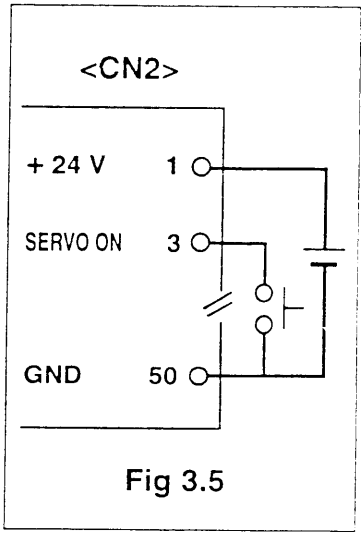


Fig 3.5

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.